ENGINE CONTROL SYSTEM (M9R)

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< BASIC INSPECTION >

BASIC INSPECTION DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

А

ECR

[M9R]

INFOID:000000001581365

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

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< 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-319, "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-314</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-315, "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]

	[•]	
Detect malfunctioning system according to <u>ECR-319</u> , "Symptom Table step 4, and determine the trouble diagnosis order based on possible c	e" based on the confirmed symptom in auses and symptom.	А
>> GO TO 8.		
8. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDUR	E	ECR
Inspect according to Diagnosis Procedure of the system.		
The Diagnosis Procedure in EC section described based on open circles also required for the circuit check in the Diagnosis Procedure. For tion".	cuit inspection. A short circuit inspection details, refer to <u>GI-41, "Circuit Inspec-</u>	С
Is malfunctioning part detected?		D
YES >> GO TO 9.		
NO >> Monitor input data from related sensors or check voltage SULT-III. Refer to <u>ECR-287, "Reference Value"</u> .	of related ECM terminals using CON-	Е
9. REPAIR OR REPLACE THE MALFUNCTIONING PART		
 Repair or replace the malfunctioning part. Reconnect parts or connectors disconnected during Diagnosis Pr ment. 	ocedure again after repair and replace-	F
3. Check 1st trip DTC. If 1st trip DTC is displayed, erase it. Refer to	ECR-97, "Diagnosis Description".	G
>> GO TO 10.		
10. FINAL CHECK		Н
When DTC was detected in step 2, perform DTC CONFIRMATION	PROCEDURE or Component Function	
Check again, and then make sure that the malfunction have been repa When symptom was described from the customer, refer to confirmed that the symptom is not detected.	aired securely. symptom in step 3 or 4, and make sure	I
Is DTC detected and does symptom remain?		
YES-1 >> DTC is detected: GO TO 8.		J
YES-2 >> Symptom remains: GO TO 6.	erase unnecessary DTC in FCM	
Diagnostic Work Shoot		K
Diagnostic Work Sheet	INFOID:000000001581366	
DESCRIPTION		
There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.	KEY POINTS	L
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	Μ
tomer complaint.	WHERE Road conditions	
to organize all the information for troubleshooting. Some conditions may cause the MIL to come on steady or blink and	HOW Operating conditions, Weather conditions, Symptoms	Ν
 Vehicle ran out of fuel, which caused the engine to misfire. 		\cap
· · · · · · · · · · · · · · · · · · ·	SEE907	0

- 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

SEF907L

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

WORKSHEET SAMPLE

Customer name MR/MS		Model & Year	VIN	
Engine #		Trans.	Mileage	
Incident Date		Manuf. Date	In Service Date	
Fuel and fuel filler cap		 Vehicle ran out of fuel causing misfire Fuel filler cap was left off or incorrectly screwed on. 		
	☐ Startability	Impossible to start No combust Partial combustion affected by th Partial combustion NOT affected Possible but hard to start Other	tion Partial combustion arottle position by throttle position ers []	
Symptoms	Idling	□ No fast idle □ Unstable □ H □ Others [High idle ☐ Low idle]	
Gymptomo	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) Ierating ng	
Incident occurrence		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 conditions		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 conditions		Not affected At starting While idling While accelerating While cruis While decelerating While turnin Vabiala appage	☐ At racing ing ng (RH/LH)	
		0 10 20	30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on		

MTBL0017

INSPECTION AND ADJUSTMENT	
< BASIC INSPECTION >	[M9R]
INSPECTION AND ADJUSTMENT	
BASIC INSPECTION	A
BASIC INSPECTION : Special Repair Requirement	NFOID:0000000001581367
1.INSPECTION START	
 Check service records for any recent repairs that may indicate a related incident. Check the current need for scheduled maintenance, especially for fuel filter and air cleaner f MA-9, "Periodic Maintenance". Open engine hood and check the following: Harness connectors for improper connections Vacuum hoses for splits, kinks, or improper connections Wiring for improper connections, pinches, or cuts Start engine and warm it up to the normal operating temperature. >> GO TO 2. 	ilter. Refer to C
	SEF142I
For procedure, refer to <u>ECR-13</u> , "IDLE SPEED : Special Repair Requirement". For specification, refer to <u>ECR-331</u> , "Idle Speed". <u>Is the inspection result normal?</u>	I
YES >> INSPECTION END	
3. CHECK FOR INTAKE AIR LEAK	
 Stop engine. Listen for an intake air leak after the mass air flow sensor. Is the inspection result normal? YES >> GO TO 4. 	K
4 BLEED AIR FROM FLIEL SYSTEM	
Use priming pump to bleed air from fuel system. Refer to <u>FL-33, "Air Bleeding"</u> .	M
>> GO TO 5. 5. CHECK IDLE SPEED AGAIN	Ν
Check idle speed. For procedure, refer to <u>ECR-13</u> , "IDLE <u>SPEED</u> : <u>Special Repair Requirement</u> ". For specification, refer to <u>ECR-331</u> , "Idle <u>Speed</u> ". <u>Is the inspection result normal?</u> YES >> INSPECTION END NO >> GO TO 6.	O
6.DRAIN WATER FROM FUEL FILTER	
1. Stop engine.	

2. Drain water from fuel filter. Refer to FL-33, "Water Draining".

< 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-331</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-3, "Work Flow".

Is the inspection result normal?

YES >> Check charging system. Refer to CHG-5, "M9R/HR16DE/MR20DE MODELS : Work Flow".

NO >> Repair or replace.

11.CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-351, "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-331</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:000000001581368

When replacing ECM, this procedure must be performed.

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Re-

[M9R]

ECR-12

< BASIC INSPECTION > [M9	₽R]
quirement	1581369 Δ
1.PERFORM INJECTOR ADJUSTMENT VALUE REGISTRATION	~
Perform ECR-14, "INJECTOR ADJUSTMENT VALUE REGISTRATION : Special Repair Requirement".	EC
>> GO TO 2.	
2.PERFORM ZFC VALVE RESET	С
Perform ECR-14, "ZFC VALUE RESET : Special Repair Requirement".	
>> GO TO 3. 3. PERFORM EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING	D
Perform <u>ECR-15, "EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING : Special Reguirement"</u> .	<u>pair</u> E
>> GO TO 4.	F
4. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING	
Perform ECR-16. "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".	G
>> GO TO 5. 5. PERFORM DPF DATA CLEAR	Н
Perform ECR-17, "DPF DATA CLEAR : Special Repair Requirement".	
>> GO TO 6. 6.PERFORM AIR FUEL RATIO LEARNING VALVE CLEAR	I
Perform ECR-18, "AIR FUEL RATIO SENSOR LEARNING VALUE CLEAR : Special Repair Requirement".	J
>> END IDLE SPEED	K
IDLE SPEED : Description	1581370
This describes how to check the idle speed. For the actual procedure, follow the instructions in "BAS INSPECTION".	SIC
IDLE SPEED : Special Repair Requirement	1581371 M
1.CHECK IDLE SPEED	
With CONSULT-III Check idle speed in "DATA MONITOR" mode with CONSULT-III. With GST Check idle speed with Service \$01 of GST.	N 0
>> INSPECTION END ZFC VALUE RESET	Р
ZFC VALUE RESET : Description	1581372
Wear of injector opening portion (blocking or enlargement of the hall) due to secular change causes erro injected amount of fuel resulting in smoke or large noise. To prevent these conditions, it is necessary to reset ZFC (Zero Fuel Calibration) and NVC (Nominal Volta Calibration).	or of age

ECR-13

< 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:000000001581375

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:000000001581374

< BASIC INSPECTION >



 Turn ignition switch OFF and wait at least 10 seconds. 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:000000001581380

[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:000000001581382

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:000000001581383

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:000000001581384

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 >

[M9R]

< BASIC INSPECTION >
regeneration control correctly. So, perform service regeneration to make the amount of particulate matter in DPE zero
Component Inspection for DPF is performed.
Always replace engine oil and engine oil filter after service regeneration. Fuel mixes with engine oil during service regeneration. The mixture does not occur during the regeneration which is automatically performed under normal operation.
SERVICE REGENERATION : Special Repair Requirement
1.start
 Turn ignition switch ON. Select "SERVC REGENERATION" in "WORK SUPPORT" mode with CONSULT-III. Touch "START". Woit until "CMPT" is displayed.
NOTE:
 Make sure that accelerator pedal is fully released during service regeneration, or service regeneration is canceled. When service regeneration is canceled, retry from step1. It will take approximately 40 minutes until "CMPLT" is displayed. Turn ignition switch OFF
6. Replace engine oil and engine oil filter.
G G
DPF DATA CLEAR
DPF DATA CLEAR : Description
Perform "DPF DATA CLEAR" in "WORK SUPPORT" mode with CONSULT-III when oxidation catalyst with DPF is replaced as new one. Based on the signal from sensors ECM estimates the amount of particulate matter in DPF and stores the value in EEPROM as DPF data. When oxidation catalyst with DPF is replaced as new one, there is a difference between DPF data stored in ECM and the actual amount of particulate matter in
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 clear DPF data stored in ECM.
Never perform "DPF DATA CLEAR" in "WORK SUPPORT" mode with CONSULT-III when oxidation cat- alyst with DPF is not replaced as new one. DPF may be damaged because regeneration is not per- formed at appropriate timing.
DPF DATA CLEAR : Special Repair Requirement
1.start
 Turn ignition switch ON. Select "DPF DATA CLEAR" in "WORK SUPPORT" mode with CONSULT-III. Touch "CLEAR" and wait a few seconds.
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
 ECM learns the output characteristic of A/F sensor 1 to perform the control of DPF regeneration precisely. A/F sensor learning value should be cleared under the following conditions. A/F sensor 1 is changed.
• 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



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INFOID:000000001581390

< FUNCTION DIAGNOSIS >

System Description

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

Component Parts Location

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INFOID:000000001581391

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- Priming pump 1.
- 4. Refrigerant pressure sensor
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. Cooling fan motor 1 lenoid valve
- 13. Glow control unit
- 16. Mass air flow sensor (with intake air 17. Engine coolant temperature sensor 18. Fuel temperature sensor temperature sensor)
- 19. Fuel pump
- 22. Fuel injector
- 25. Exhaust gas temperature sensor 1

- Fuel rail pressure control valve 2.
- 5. Electric throttle control actuator
- 8. EGR cooler bypass valve
- 14. Turbocharger boost control solenoid 15. ECM valve
- 20. Camshaft position sensor
- 23. Air fuel ratio (A/F) sensor

- 3. Glow plug
- Turbocharger boost sensor 6.

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- Fuel rail pressure sensor 9.
- 12. IPDM E/R
- 21. Crankshaft position sensor
- 24. Exhaust gas pressure sensor

ECR-20

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



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< 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 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
 SET/COAST switch
- CANSEL switch
 MAIN SWITCH

3. RESUME/ACCCELERATE switch

Component Description

INFOID:000000001581393

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"	
Stop lamp switch	ECR-195, "Description"	
Camshaft position sensor	ECR-169. "Description"	
Cooling fan motor	ECR-283. "Description"	
Crankshaft position sensor	ECR-167, "Description"	
Clutch pedal position switch	ECR-281, "Description"	
Differential exhaust pressure sensor	ECR-268. "Description"	
EGR cooler bypass valve control solenoid valve	ECR-261, "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-263. "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-273, "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		Fuel injector	
Camshaft position sensor	Piston position	Piston position		
Intake air temperature sensor	Intake air temperature			
Engine coolant temperature sensor	Engine coolant temperature			N
Fuel rail pressure sensor	Fuel rail pressure sensor			
Accelerator pedal position sensor	Accelerator pedal position	Fuel injection control		
Turbocharger boost sensor	Turbocharger boost			Ν
Ignition switch	Start signal			
Battery	Battery voltage			0
Mass air flow sensor	Amount of intake air			0
Vehicle speed sensor	Vehicle speed*			
Air conditioner switch	Air conditioner switch*			Ρ

*: 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.

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< 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	Fuel injection control Fuel (Start control) Fuel	Fuel injector Fuel pump
Camshaft position sensor	Piston position		
Intake air temperature sensor	Intake air temperature		
Engine coolant temperature sensor	Engine coolant temperature		
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		Fuel injector Fuel pump	,
Accelerator pedal position sensor	Accelerator pedal position			
Engine coolant temperature sensor	Engine coolant temperature			
Intake air temperature sensor	Intake air temperature	Fuel injection control		k
Fuel rail pressure sensor	Fuel rail pressure sensor	(Idle control)		
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

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< FUNCTION DIAGNOSIS >

System Diagram



System Description INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor	Engine speed			
Accelerator pedal position sensor	Accelerator pedal position		Fuel injector	
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 >

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Sensor	Input Signal to ECM	ECM function	Actuator	А
Crankshaft position sensor	Engine speed	Fuel injection control (Maximum control)	Fuel injector	
Accelerator pedal position sensor	Accelerator pedal position			
Engine coolant temperature sensor	Engine coolant temperature			ECR
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*		Fuel injector	K
Crankshaft position sensor	Engine speed	Fuel injection control (Fuel cut control)		
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.

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< FUNCTION DIAGNOSIS >

Component Parts Location

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[M9R]



- Priming pump 1.
- 4. Refrigerant pressure sensor
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. Cooling fan motor 1 lenoid valve
- 13. Glow control unit
- 16. Mass air flow sensor (with intake air 17. Engine coolant temperature sensor 18. Fuel temperature sensor temperature sensor)
- 19. Fuel pump
- 22. Fuel injector
- 25. Exhaust gas temperature sensor 1

- Fuel rail pressure control valve 2.
- Electric throttle control actuator 5.
- 8. EGR cooler bypass valve
- 14. Turbocharger boost control solenoid 15. ECM valve
- 20. Camshaft position sensor
- 23. Air fuel ratio (A/F) sensor

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. IPDM E/R
- 21. Crankshaft position sensor
- 24. Exhaust gas pressure sensor

< FUNCTION DIAGNOSIS >

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C: Vehicle front

- 1. Camshaft Position Sensor
- 2. Fuel injector



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



- <□: 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]



< FUNCTION DIAGNOSIS >



ASDC steering switch 1. SET/COAST switch

4.

- 2. CANSEL switch 5. MAIN SWITCH
- 3.

RESUME/ACCCELERATE switch

Component Description

INFOID:000000001581396

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-281, "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

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INPUT/OUTPUT SIGNAL CHART

Input signal to ECM	ECM function	ECM function	Actuator	K
Crankshaft position sensor	Engine speed	Fuel injection tim- ing control	¹⁻ Fuel injector	
Camshaft position sensor	PIston position			
Engine coolant temperature sensor	Engine coolant temperature			L
Intake air temperature	Intake air temperature sensor			
Fuel rail pressure	Fuel rail pressure			M
Accelerator pedal position sensor	Accelerator pedal position			1 1 1
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.

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FUEL INJECTION TIMING CONTROL SYSTEM

< FUNCTION DIAGNOSIS >

Component Parts Location

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[M9R]



- Priming pump 1.
- 4. Refrigerant pressure sensor
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. Cooling fan motor 1 lenoid valve
- 13. Glow control unit
- 16. Mass air flow sensor (with intake air 17. Engine coolant temperature sensor 18. Fuel temperature sensor temperature sensor)
- 19. Fuel pump
- 22. Fuel injector
- 25. Exhaust gas temperature sensor 1

- Fuel rail pressure control valve 2.
- Electric throttle control actuator 5.
- 8. EGR cooler bypass valve
- 14. Turbocharger boost control solenoid 15. ECM valve
- 20. Camshaft position sensor
- 23. Air fuel ratio (A/F) sensor

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. IPDM E/R
- 21. Crankshaft position sensor
- 24. Exhaust gas pressure sensor
< FUNCTION DIAGNOSIS >

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C: Vehicle front

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



< 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 >

[M9R]



ASDC steering switch 1. SET/COAST switch

4.

2. CANSEL switch 5. MAIN SWITCH

RESUME/ACCCELERATE switch 3.

Component Description

INFOID:000000001581400

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	•
Stop lamp 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	Electric throttle control actuator	
Park/neutral position (PNP) switch	Gear position*			
Wheel sensor	Vehicle speed*			
TCM (A/T models)	Powertrain revolution*			_

*: This signal is also 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.

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< 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

[M9R]

INFOID:000000001585895



25. Exhaust gas temperature sensor 1

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ECR-43

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< FUNCTION DIAGNOSIS >



 \triangleleft : Vehicle front

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



 \triangleleft : Vehicle front

- 1. Camshaft Position Sensor
- 2. Fuel injector



 \triangleleft : Vehicle front

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



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< FUNCTION DIAGNOSIS >

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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

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< 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



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



- 1. Accelerator pedal position sensor 2.
- 2. Stop lamp switch
- 3. Shift lock brake switch



C: Vehicle front

1. Clutch pedal position switch 2. ECM

ECR-46

< FUNCTION DIAGNOSIS >

[M9R]



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

INFOID:000000001581404

Component	Description
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Component	Reference	F
ASCD steering switch	ECR-192, "Description"	
Clutch pedal position switch	ECR-281, "Description"	0
Stop lamp switch	ECR-195, "Description"	G
Electric throttle control actuator	ECR-236, "Description"	
ASCD indicator	ECR-280, "Description"	Н

ECR-47

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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-28, "CAN Communication Signal Chart", about CAN communication for detail.

INFOID:000000001581405

< FUNCTION DIAGNOSIS >

COOLING FAN CONTROL

[M9R]

INFOID:000000001581407



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
Engine coolant temperature sensor	Engine coolant temperature	Control	↓ Cooling fan motor
Air conditioner switch	Air conditioner ON signal*2		
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 3-step control [HIGH/LOW/OFF].

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< FUNCTION DIAGNOSIS >

Cooling Fan Operation



Cooling Fan Relay Operation

The ECM controls cooling fan relays through CAN communication line.

Cooling fan speed	Cooling fan relay		
	1	3	
Stop (OFF)	OFF	OFF	
Low (LOW)	ON	OFF	
High (HI)	OFF	ON	

< FUNCTION DIAGNOSIS >

Component Parts Location

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25. Exhaust gas temperature sensor 1

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< FUNCTION DIAGNOSIS >



 \triangleleft : Vehicle front

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



 \triangleleft : 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

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- $\diamondsuit: \mathsf{Vehicle front}$
- 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. Shift lock brake switch



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

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< FUNCTION DIAGNOSIS >



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

INFOID:000000001581409

Component Description

Component	Reference	F
Camshaft position sensor	ECR-169, "Description"	
Cooling fan motor	ECR-283, "Description"	C
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"	

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< FUNCTION DIAGNOSIS > DPF

System Diagram



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DPF

System Description

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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			Ъ./
Camshaft position sensor	Piston position			IVI
Engine coolant temperature sensor	Engine coolant temperature			
Mass air flow sensor	Amount of intake air		Fuel injector	Ν
Combination meter	Vehicle speed*	Regeneration	Electric throttle control	
Differential exhaust pressure sensor	Differential exhaust pressure		actuator	0
A/F sensor 1	Density of oxygen in exhaust gas			0
Exhaust gas temperature sensor 2	Exhaust gas temperature before DPF			
Exhaust gas temperature sensor 3	Exhaust gas temperature after DPF			Ρ

*: 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.

ECR-57

< 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

ECR 1 Ø ØØ @ 2 16 (15) 1 D Ε F Н \cap Ο Ø) Κ \$ 789偭 2 6 3 4 M JMBIA069277 L Priming pump Fuel rail pressure control valve 2. 3. Glow plug Refrigerant pressure sensor 5. Electric throttle control actuator 6. Turbocharger boost sensor EGR volume control valve 8. EGR cooler bypass valve 9. Fuel rail pressure sensor Μ 10. EGR cooler bypass valve control so- 11. Cooling fan motor 1 12. IPDM E/R lenoid valve 13. Glow control unit 14. Turbocharger boost control solenoid 15. ECM Ν valve 16. Mass air flow sensor (with intake air 17. Engine coolant temperature sensor 18. Fuel temperature sensor temperature sensor) 0 19. Fuel pump 21. Crankshaft position sensor

- 25. Exhaust gas temperature sensor 1

22. Fuel injector

1.

4.

7.

ECR-59

- 20. Camshaft position sensor
- 23. Air fuel ratio (A/F) sensor

- 24. Exhaust gas pressure sensor
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DPF

< 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



[M9R]

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

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< FUNCTION DIAGNOSIS >

[M9R]



 \triangleleft : 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. Shift lock brake switch



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

ECR-62

< FUNCTION DIAGNOSIS >



DPF

ASDC steering switch 1. SET/COAST switch

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- CANSEL switch 2.
- 5. MAIN SWITCH

Component Description

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Component	Reference	F
A/F sensor 1	ECR-137, "Description"	
Camshaft position sensor	ECR-169, "Description"	0
Crankshaft position sensor	ECR-167, "Description"	G
Differential exhaust pressure sensor	ECR-268. "Description"	
Engine coolant temperature sensor	ECR-132, "Description"	Н
Exhaust gas temperature sensor 2	ECR-231, "Description"	
Exhaust gas temperature sensor 3	ECR-263. "Description"	
Fuel injector	ECR-155. "Description"	I
Mass air flow sensor	ECR-123, "Description"	
Throttle position sensor	ECR-134, "Description"	J
Vehicle speed sensor	ECR-184, "Description"	

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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				
Intake air temperature sensor	Intake air temperature				
Mass air flow sensor	Amount of intake air				
Accelerator pedal position sensor	Accelerator pedal position	EGR volume control			
Ignition switch	Start signal		EGR volume control	trol valve	
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:000000001581414

< 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



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< 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:000000001585898



< FUNCTION DIAGNOSIS >

- 1. Priming pump
- 4. Refrigerant pressure sensor
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. Cooling fan motor 1 lenoid valve
- 13. Glow control unit
- Mass air flow sensor (with intake air 17. Engine coolant temperature sensor 16. temperature sensor)
- 19. Fuel pump
- 22. Fuel injector
- 25. Exhaust gas temperature sensor 1

- 2. Fuel rail pressure control valve
- 5. Electric throttle control actuator
- 8. EGR cooler bypass valve
- 14. Turbocharger boost control solenoid 15. ECM valve
- 20. Camshaft position sensor
- 23. Air fuel ratio (A/F) sensor

- 3. Glow plug Turbocharger boost sensor 6.
- 9. Fuel rail pressure sensor
- 12. IPDM E/R

- 18. Fuel temperature sensor
- 21. Crankshaft position sensor
- 24. Exhaust gas pressure sensor



C: Vehicle front

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



: Vehicle front

- Camshaft Position Sensor 1.
- Fuel injector 2.



C: Vehicle front

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

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- $\triangleleft : \mathsf{Vehicle front} \\$
- 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



ECR-68

< FUNCTION DIAGNOSIS >

C: Vehicle front

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

4. Exhaust gas temperature sensor 2



C: Vehicle front

1. Glow control unit

2. Glow plug



- 1. Accelerator pedal position sensor 2.
 - 2. Stop lamp switch
- 3. Shift lock brake switch



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< FUNCTION DIAGNOSIS >

$\diamondsuit : \mathsf{Vehicle front} \\$

1. Clutch pedal position switch 2. ECM



1. ASDC steering switch SET/COAST switch

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2. CANSEL switch 5. MAIN SWITCH

3. **RESUME/ACCCELERATE** switch

Component Description

INFOID:000000001581416

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-261, "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

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System Description

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INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	ĸ
Crankshaft position sensor	Engine speed	Engine torque control	Fuel injector	_
Accelerator pedal position sensor	Accelerator pedal position			
Turbocharger boost pressure sensor	Turbocharger boost pressure			L
EGR volume control valve control position sensor	EGR volume control valve control position			
EGR volume control valve	Rate of EGR			N
ASCD steering switch	ASCD steering switch operation			
Vehicle speed sensor	Vehicle speed*			Ν
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 >

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

Component Parts Location

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- 1. Priming pump
- 4. Refrigerant pressure sensor
- EGR volume control valve 7.
- 10. EGR cooler bypass valve control so- 11. Cooling fan motor 1 lenoid valve
- 13. Glow control unit
- 16. Mass air flow sensor (with intake air 17. Engine coolant temperature sensor 18. Fuel temperature sensor temperature sensor)
- 19. Fuel pump
- 22. Fuel injector
- 25. Exhaust gas temperature sensor 1

- 2. Fuel rail pressure control valve
- 5. Electric throttle control actuator
- 8. EGR cooler bypass valve
- 14. Turbocharger boost control solenoid 15. ECM valve
- 20. Camshaft position sensor
- 23. Air fuel ratio (A/F) sensor

- 3. Glow plug
- Turbocharger boost sensor 6.
- Fuel rail pressure sensor 9.
- 12. IPDM E/R
- 21. Crankshaft position sensor
- 24. Exhaust gas pressure sensor
ENGINE TORQUE CONTROL

< FUNCTION DIAGNOSIS >

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- 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



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< 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 TORQUE CONTROL

< FUNCTION DIAGNOSIS >

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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:000000001581420

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

System Diagram Intervention of the sensor o

System Description

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INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	
Engine coolant temperature sensor	Engine coolant temperature			
Intake air temperature sensor	Intake air temperature	Clow control	Grow control unit	
Battery	Battery voltage	Glow control	✓ Glow plug	
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 K to cooling temperature, inlet air temperature and battery voltage.

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Component Parts Location

INFOID:000000001585900

[M9R]



- Priming pump 1.
- 4. Refrigerant pressure sensor
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. Cooling fan motor 1 lenoid valve
- 13. Glow control unit
- 16. Mass air flow sensor (with intake air 17. Engine coolant temperature sensor 18. Fuel temperature sensor temperature sensor)
- 19. Fuel pump
- 22. Fuel injector
- 25. Exhaust gas temperature sensor 1

- Fuel rail pressure control valve 2.
- Electric throttle control actuator 5.
- 8. EGR cooler bypass valve
- 14. Turbocharger boost control solenoid 15. ECM valve
- 20. Camshaft position sensor
- 23. Air fuel ratio (A/F) sensor

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. IPDM E/R
- 21. Crankshaft position sensor
- 24. Exhaust gas pressure 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



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< FUNCTION DIAGNOSIS >

C: 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



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:000000001581424

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

IDLE SPEED CONTROL

< FUNCTION DIAGNOSIS >

IDLE SPEED CONTROL



INFOID:000000001581426

System Diagram



System Description

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 signal*	Idle speed con-	Fuel injector	.
Rear defogger switch		trol	Fuel pump	0
EPS control unit	Power steering operation*			
Air conditioner switch	Air conditioner operation*			K

*: 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.

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< FUNCTION DIAGNOSIS >

Component Parts Location

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[M9R]



- Priming pump 1.
- 4. Refrigerant pressure sensor
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. Cooling fan motor 1 lenoid valve
- 13. Glow control unit
- 16. Mass air flow sensor (with intake air 17. Engine coolant temperature sensor 18. Fuel temperature sensor temperature sensor)
- 19. Fuel pump
- 22. Fuel injector
- 25. Exhaust gas temperature sensor 1

- Fuel rail pressure control valve 2.
- Electric throttle control actuator 5.
- 8. EGR cooler bypass valve
- 14. Turbocharger boost control solenoid 15. ECM valve
- 20. Camshaft position sensor
- 23. Air fuel ratio (A/F) sensor

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. IPDM E/R
- 21. Crankshaft position sensor
- 24. Exhaust gas pressure sensor

IDLE SPEED CONTROL

< 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



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< FUNCTION DIAGNOSIS >

C: 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



C: Vehicle front

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

IDLE SPEED CONTROL

< FUNCTION DIAGNOSIS >

[M9R]



IDLE SPEED CONTROL

< FUNCTION DIAGNOSIS >



ASDC steering switch 1. SET/COAST switch

4.

2. CANSEL switch 5. MAIN SWITCH

RESUME/ACCCELERATE switch 3.

Component Description

INFOID:000000001581428

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



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< FUNCTION DIAGNOSIS >



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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
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	✓ Turbocharger boost
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	(-
Engine coolant temperature sensor	Engine coolant temperature		Turbocharger cooling pump	
Crankshaft position sensor	Engine speed	Turbocharger cooling control	relay ↓ Turbocharger cooling pump	F

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.

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< FUNCTION DIAGNOSIS >

Component Parts Location

INFOID:000000001585902

[M9R]



- Priming pump 1.
- 4. Refrigerant pressure sensor
- 7. EGR volume control valve
- 10. EGR cooler bypass valve control so- 11. Cooling fan motor 1 lenoid valve
- 13. Glow control unit
- 16. Mass air flow sensor (with intake air 17. Engine coolant temperature sensor 18. Fuel temperature sensor temperature sensor)
- 19. Fuel pump
- 22. Fuel injector
- 25. Exhaust gas temperature sensor 1

- Fuel rail pressure control valve 2.
- Electric throttle control actuator 5.
- 8. EGR cooler bypass valve
- 14. Turbocharger boost control solenoid 15. ECM valve
- 20. Camshaft position sensor
- 23. Air fuel ratio (A/F) sensor

- 3. Glow plug
- 6. Turbocharger boost sensor
- 9. Fuel rail pressure sensor
- 12. IPDM E/R
- 21. Crankshaft position sensor
- 24. Exhaust gas pressure sensor

< FUNCTION DIAGNOSIS >

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C: Vehicle front

1.



C: Vehicle front

- Camshaft Position Sensor 1.
- 2. Fuel injector



C: Vehicle front

- 1. Crankshaft position sensor
- Turbocharger boost control solenoid 2. 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. Exhau
 - 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:000000001581431

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-273. "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:

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.

	sked damg procedures na			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

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< 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 CON Engine stopped	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

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- *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.

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*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 Driving Engine</drivin 	g Pattern A> pattern A means the vehicle of speed should go over 500 rp pealing counter will be set who	opera m at	ation as follows: least 5 seconds and the DTC (e malfunction is detected	Confi	rmation Procedure is performed.	E
 The I The I Characteristics 	nealing counter will be decrem MI will go off when the healing a Pattern B>	ent v coui	when the same malfunction is r nter reaches 0.	not de	etected.	1
Driving Driving	pattern B means the vehicle of pattern A and (1)-(3) are satis	opera sfied.	ation as follows:			G
	Engine °C (°F) coolant temperature		 (3) Ignition switch should be cha (1) Engine coolant temperature sh 	nged fi ould go	rom ON to OFF. o over 70°C (158°F).	Η
	70 (158)		<u></u>			

(2) Engine coolant temperature should change more than

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22°C (72°F) after starting engine.

FUNCTION

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CONSULT-III Function

IGN ON

Diagnostic test mode	Function	Ν
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.*	Ν
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.	C
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.	F

time

IGN OFF

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

• The delete counter will be cleared when the malfunction is detected.

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

Diagnostic trouble codes

• 1st trip diagnostic trouble codes

· 2nd trip diagnostic trouble codes

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

< FUNCTION DIAGNOSIS >

[M9R]

		DIAGNOSTIC TEST MODE				
	Item		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		×	×	
ίTS	INPUT	Battery voltage		×	×	
PAR		Stop lamp switch		×	×	
LN.		Clutch pedal position switch		×	×	
ONE		ASCD steering switch		×		
MP		EGR volume control valve control position sensor		×	×	
о С		Refrigerant pressure sensor		×	×	
ROL		Barometric pressure sensor (built-into ECM)		×	×	
DNT		A/F ratio sensor 1	×	×		
ы Ш		Exhaust gas pressure sensor		×	×	
DIN		Exhaust gas temperature sensor 1		×		
Ň		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		×	×	×
		Turbocharger boost control solenoid valve		×	×	×
	001901	Turbocharger cooling pump		×	×	×
		EGR volume control valve	×	×	×	
		EGR cooler bypass valve control solenoid valve		×	×	×
		Throttle control motor		×		×
		Cooling fan motor		×	×	×

X: Applicable

WORK SUPPORT MODE

Work Item

< FUNCTION DIAGNOSIS >

WORK ITEM	DESCRIPTION	USAGE	A
CONFIG INITIALIZE	In this mode vehicle configuration is initialized.	When ECM is replaced	
INJ ADJ VAL REGIST	In this mode, fuel injector adjustment value is registered.	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	 In this mode, the diagnosis of high pressure fuel circuit is per- formed. 	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	 In this mode, ZFC (Zero Fuel Calibration) and NVC (Nominal Volt- age Calibration) are reset. 	When ECM or fuel injector(s) is re- placed When ECM is reprogrammed	E
A/F LARN CLR	 In this mode, A/F sensor learning value is cleared. 	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	 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). 		Н
SERVC REGENERATION	 In this mode, service regeneration is performed. 	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 - ECR-315, "DTC Index".

DATA MONITOR MODE

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

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< FUNCTION DIAGNOSIS >

MONITOR ITEM	UNIT	CONDITION	SPECIFICATION
ENGINE STATUS	'+APC/RUN/OFF	 Engine status is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	
BPP SW	RELSD/PRSSD	 Brake pedal condition is displayed. RELSD: Brake pedal is released. PRSSD: Brake pedal is depressed. 	
ENGINE START	PRHBT/ATHRD	 Engine stating authority is displayed. PRHBT: Prohibited ATHRD: Authorized 	
IMPACT DETECTED	NO/YES	 Impact detection is displayed. NO: Impact is not detected. YES Impact is detected. 	
A/C APPLD	NO/YES	 A/C application is displayed. NO: A/C is not applied. YES: A/C is applied. 	
GLOW CONT SIGNAL	ABSENT/PRESENT	 Glow control signal is displayed. ABSENT: Glow control is OFF. PRESENT: Glow control is ON. 	
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	 Cooling fan high speed control is displayed. INACT: High circuit is OFF. ACTIV: High circuit is ON. 	
CKP CMP SYNCHRO	NODON/DONE	 Crankshaft position sensor and camshaft position sensor synchronization is displayed. NODON: Not synchronized DONE: Synchronized 	
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	 NATS code registration condition is displayed. NO: Not registered. YES Registered. 	
CPP SW	INACT/ACTIV	 Clutch pedal condition is displayed. INACT: Clutch pedal is released. ACTIV: Clutch pedal is depressed. 	
EGR BYPAS S/V	INACT/ACTIV	EGR cooler bypass valve control solenoid valve condi- tion is displayed. INACT: EGR cooler bypass valve control solenoid valve is not operated. ACTIV: EGR cooler bypass valve control solenoid valve is operated.	
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	 A/T gear position is displayed. STAT1: Neutral 1: 1st gear 2: 2nd gear 3: 3rd gear 4: 4th gear 5: 5th gear 6: 6th gear Back: Reverse gear 	A ECR C
RGN INCMP STAT1	'+APC/RUN/OFF	 Incomplete status No. 1 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	D
RGN INCMP STAT2	'+APC/RUN/OFF	 Incomplete status No. 2 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	F
RGN INCMP STAT3	'+APC/RUN/OFF	 Incomplete status No. 3 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	G
RGN INCMP STAT4	'+APC/RUN/OFF	 Incomplete status No. 4 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	H
RGN INCMP STAT5	'+APC/RUN/OFF	 Incomplete status No. 5 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	J
RGN INCMP STAT6	'+APC/RUN/OFF	 Incomplete status No. 6 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	K
RGN INCMP STAT7	'+APC/RUN/OFF	 Incomplete status No. 7 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	Μ
RGN INCMP STAT8	'+APC/RUN/OFF	 Incomplete status No. 8 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	N
RGN INCMP STAT9	'+APC/RUN/OFF	 Incomplete status No. 9 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	P
RGN INCMP STAT10	'+APC/RUN/OFF	 Incomplete status No. 10 of DPF regeneration is displayed. '+APC: Ignition switch ON RUN: Engine is running. OFF: During self shut-off 	

< 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	 Request status No. 6 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off 	
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	 Request status No. 9 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off 	
RGN REQ STAT10	STAT1/STAT2/STAT3/ STAT4	 Request status No. 10 of DPF regeneration is displayed. STAT1: Engine stopped STAT2: Engine starting STAT3: Engine running STAT4: During self shut-off 	
EGR COOL BYPAS/V	INACT/ACTIV	 EGR cooler bypass valve control solenoid valve status is displayed. INACT: EGR cooler bypass valve control solenoid valve is not operated. ACTIV: EGR cooler bypass valve control solenoid valve is operated. 	
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 sensor is displayed. 		E
INT AIR TEMP	۵°	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	 Accelerator pedal position sensor 1 signal voltage is displayed. 		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.		L
VSP/ENG SP RATIO	— or %	Vehicle speed/engine speed ratio is displayed.		-
TRG IDLE SPD	tr/min	Target idle speed is displayed.		M
TC BST PR/S VOLT	V or mV	 Turbocharger boost pressure sensor signal voltage is displayed. 		_
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	 Exhaust gas pressure sensor signal voltage is dis- played. 	

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

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

Diagnosis Tool Function

INFOID:000000001581434

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	ignostic 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	 This diagnostic service can clear all emission-related diagnostic information. This includes: Clear number of diagnostic trouble codes (Service \$01) Clear diagnostic trouble codes (Service \$03) Clear trouble code for freeze frame data (Service \$01) Reset status of system monitoring test (Service \$01) Clear on board monitoring test results (Service \$07)
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.)



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< 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	SIS >			[M9R]
COMP	ONENT	DIAGN	OSIS		
POWER	SUPPLY A	AND GRO	OUND CIRC	CUIT	A
Diagnosis	Procedure				INFOID:000000001581435
1.снеск о	ROUND CON	NECTION			
1. Turn ign 2. Check g Is the inspec YES >> (NO >> I	ition switch OF round connecti tion result norn GO TO 2. Repair or replac	F and wait at on E17. Refe <u>nal?</u> ce ground co	least 20 second r to Ground Insp nnection.	ds. pection in <u>GI-41, "Circuit Inspecti</u>	<u>on"</u> . D
2.снеске	CM GROUND	CIRCUIT FC	R OPEN AND	SHORT	
 Disconne Check the 	ect ECM harne ne continuity be	ess connector etween ECM	s. harness connec	tor and ground.	———— E
E	CM	Ground	Continuity		F
Connector	Terminal	Giouna	Continuity		
E121	123 124 125	Ground	Existed		G
	128	abort to pow			
Is the inspec YES >> (NO >> I	<u>tion result norn</u> GO TO 3. Repair open cir	nal?	o power in harn	ess or connectors.	I
3. СНЕСК Е	CM POWER S		CUIT-I		J
 Reconne Turn ign Check the 	ect ECM harnes ition switch ON ne voltage betw	ss connectors l. veen ECM ha	s. rness connecto	r terminals as follows.	K
	(+)		(-)	Voltago	
Connector	Terminal	Connecto	or Terminal	Voltage	L
E121	109	E121	128	Battery voltage	
YES >> (NO >> (4.DETECT	GO TO 5. GO TO 4. MALFUNCTIO	NING PART			M
Check the fo • Harness co • 10A fuse (I • Harness fo	llowing. pnnectors M77, No. 4) r open or short	, E105 between EC	M and fuse		0
>> I 5. CHECK E	Repair open cir CM POWER S	cuit or short f	o ground or sho CUIT-II	ort to power in harness or connec	tors. P
1. Turn ian	ition switch OF	F and wait at	least 20 second	ds.	

POWER SUPPLY AND GROUND CIRCUIT

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

POWER SUPPLY AND GROUND CIRCUIT

< COMPONENT DIAGNOSIS >

[M9R]

(+)		(-)		Voltage	
Connector	Terminal	Connector	Terminal	voltage	
E132	93	F121	128	After turning ignition switch OFF, battery voltage will ex-	
1 152	94		120	ist 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.

(+)		(Voltago	
Connector	Terminal	Connector	Terminal	voltage
F132	62	E121	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 E11.
- 3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

E	СМ	IPDN	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E132	93	E 11	0	Existed
L 152	94		9	LXISIEU

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, F121

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 E11.
- 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	
F132	62	E11	15	Existed	

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

ECR-112

POWER SUPPLY AND GROUND CIRCUIT	
< COMPONENT DIAGNOSIS >	[M9R]
YES >> GO TO 11.	
10 = 3000000	A
Check the following. Harness or connectors E7_E121	ECR
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.	С
11.CHECK 20A FUSE	
 Disconnect 20A fuse (No. 52) from IPDM E/R. Check 20A fuse. 	D
Is the inspection result normal?	
YES >> GO TO 12.	E
10 >> Replace 20A fuse.	
	——— F
Refer to <u>GI-39, "Intermittent Incident"</u> .	
<u>Is the inspection result normal?</u>	
NO >> Repair open circuit or short to power in harness or connectors.	G
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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:000000001581437

INFOID:000000001581438

INFOID:000000001581436

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.	Harness or connectors (CAN communication line is open or shorted)

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 3 seconds.
- 2. Check 1st trip DTC.
- Is 1st trip DTC detected?
- YES >> ECR-114, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

Go to LAN-13, "Trouble Diagnosis Flow 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.	 Harness or connectors (CKP sensor circuit is open or shorted.) (CMP sensor circuit is open or shorted.) Crankshaft position sensor Camshaft position sensor Timing chain Signal plate
DTC CO	NFIRMATION PROCED	URE	
1. PREC	ONDITIONING		
If DTC C least 20 s	onfirmation Procedure has seconds before conducting	been previously conducted, always the next test.	turn ignition switch OFF and wait at
2	>> GO TO 2.		
Z.PERF	ORM DTC CONFIRMATIC	IN PROCEDURE	
1. Start If the 2. Chec Is 1st trip YES NO	engine and let it idle for at engine does not start, kee k 1st trip DTC. <u>DTC detected?</u> >> Go to <u>ECR-115, "Diagn</u> >> INSPECTION END	least 10 seconds. op ignition switch at START position f osis Procedure".	or at least 10 seconds.
Diagno	sis Procedure		INFOID:000000001581440
1. CHEC	K CMP SENSOR		
Refer to	ECR-171, "Component Ins	pection".	
Is the ins	pection result normal?		
YES : NO :	>> GO TO 2. >> Replace camshaft posit	tion sensor.	
2. CHEC	K SPROCKET		
Visually c	check for chipping signal pl	ate gear tooth.	
Is the ins	pection result normal?		
YES :	>> GO TO 3. >> Repair or replace sproc	kot	
3.CHEC	K CKP SENSOR		
Refer to	ECR-168, "Component Ins	pection".	
Is the ins	pection result normal?		
YES	>> GO TO 4.	ition concor	
	>> Replace cranksnaft pos		
Refer to F		tallation".	

Is the inspection result normal?

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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:000000001581442

INFOID:000000001581441

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	 Harness or connectors (The solenoid valve circuit is open or shorted.) Turbocharger boost control solenoid valve 	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.

2. PERFORM DTC CONFIRMATION PROCEDURE	
 Start engine and let it idle for at least 10 seconds. Check 1st trip DTC. 	
Is 1st trip DTC detected?	
YES >> Go to <u>ECR-117, "Diagnosis Procedure"</u> . NO >> INSPECTION END	
Diagnosis Procedure	INFOID:00000000158144
1. CHECK TURBOCHARGER BOOST CONTROL SOLENOID VALVE POWER SUPPLY C	IRCUIT

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.

Turboc	harger boost c	ontrol solenoid valve	Ground	Voltaga	•
Conn	ector	Terminal	Ground	vollage	
E1:	22	1	Ground	Battery voltage	-
Is the inspec	tion result r	ormal?			•
YES >> (GO TO 3.				
NO >> 0	GO TO 2.				
2.DETECT	MALFUNC	TIONING PART			
Check the fo	llowing.				
Check the fo	llowing.	port between IPDM E/	R and turbocharo	er boost control soler	poid valve

Harness for open or short between IPDM E/R and turbocharger boost control solenoid valve

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

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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	ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E122	2	F132	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:000000001581444

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

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INFOID:000000001581446

INFOID:000000001581445

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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	 Harness or connectors (Fuel pump circuit is open or shorted.) Fuel pump Fuel injector Fuel filter Air mixed with fuel Lack of fuel Fuel rail pressure sensor 	- ([

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-33, "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".	
<u>OK or NG</u>	0
OK >> GO TO 3. NG >> Replace fuel rail.	
3. CHECK FUEL INJECTOR	F
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 diagno	sis 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
TC CONF	FIRMATION PR	ROCEDU	RE	
.PRECOM	NDITIONING			
f DTC Con east 20 sec	firmation Procectoria firmation Procectoria firmation firmation for the fore core contended and the fore contended	lure has b iducting th	een previously conducted, always e next test.	s turn ignition switch OFF and wait a
>>	GO TO 2.			
2.PERFOF	RM DTC CONFI	RMATION	PROCEDURE	
I. Turn igr	nition switch ON	and wait a	at least 10 seconds.	
2. Check	1st trip DTC.			
<u>s 1st trip D</u>	<u>TC detected?</u>	ID: -	ia Drago duna "	
1ES >> NO >>	INSPECTION E	<u>. Diagnos</u> ND	<u>IS Procedure"</u> .	
Diagnosi	s Procedure			N/5215-02020202045944
				119-012.0000000158144
.CHECK	FUEL PUMP PC	WER SUP	PPLY CIRCUIT	
. Turn igr	nition switch OFI	and wait	at least 20 seconds.	
3. Turn igr	nition switch ON	amess cor		
. Check t	he voltage betw	een fuel pi	ump harness connector and grour	nd.
	Terminal	Ground	Voltage	
F143	1	Ground	Battery voltage	
s the inspe	ction result norm	nal?		
YES >>	GO TO 3.			
NO >>	GO TO 2.			
2.DETECT	MALFUNCTIO	NING PAR	Т	
Check the fo	ollowing.	.		
Harness of	connector E7, F1	21 between I	PDM F/R and fuel nump	
Harness fe	or open or short	between E	ECM and fuel pump	
>>	Repair open cir	cuit or sho	rt to ground or short to power in h	arness or connectors.

- 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	Fuel pump		ECM	
Connector	Terminal	Connector Terminal		Continuity
F143	2	F132	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.

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:000000001581452

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	P0100 Mass air flow sensor circuit high input An excessively high voltage from the sensor is sent to ECM. (Mass air flow so or shorted.)	(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 CC	ONFIRMATION PROCEDU	JRE	
1.PREC	CONDITIONING		
If DTC C least 20	Confirmation Procedure has seconds before conducting t	been previously conducted, always tu he next test.	n ignition switch OFF and wait at
•	>> GO TO 2.		
2.PERF	FORM DTC CONFIRMATION	N PROCEDURE-I	
1. Turn 2. Che	ignition switch ON and wait ck 1st trip DTC.	at least 10 seconds.	
<u>Is 1st trip</u>	DTC detected?		
YES NO	>> Go to <u>ECR-123, "Diagno</u> >> GO TO 3.	sis Procedure".	
3.PERF	ORM DTC CONFIRMATION	N PROCEDURE-II	
 Turn Turn Turn Che 	ignition switch OFF and wa ignition switch ON and wait ck 1st trip DTC.	it at least 20 seconds. at least 10 seconds.	I
<u>ls 1st trip</u>	DTC detected?		
YES NO	>> Go to <u>ECR-123, "Diagno</u> >> INSPECTION END	<u>sis Procedure"</u> .	I
Diagno	sis Procedure		INFOID:000000001581453
1.снес	CK GROUND CONNECTION	IS	(
1. Turn 2. Che	ignition switch OFF and wa ck ground connection E17. F	it at least 20 seconds. Refer to Ground inspection in <u>GI-41, "C</u>	rcuit Inspection".
YES	$\sim GOTO 2$		
NO	>> Repair or replace ground	connection.	
2.снес	CK MASS AIR FLOW SENS	OR POWER SUPPLY CIRCUIT	

1. Disconnect mass air flow sensor harness connector.

2. Turn ignition switch ON.

ECR-123

P0100 MAF SENSOR

< COMPONENT DIAGNOSIS >

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

Mass air f	ir flow sensor		Voltago
Connector	Terminal	Ground	voltage
E123	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	Mass air flow sensor		ECM	
Connector	Terminal	Connector	Terminal	Continuity
E123	3	F132	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	
E123	4	F132	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".						
>> INSPECTION END	С					
Component Inspection INFOID:000000001581454	D					
1. CHECK MASS AIR FLOW SENSOR	D					
 Turn ignition switch OFF and wait at least 20 seconds. Reconnect all harness connectors disconnected. 	E					

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

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

	(+)		()	Condition	Voltage	
Connector	Terminal	Connector	Terminal	Condition	vollage	G
				Ignition switch ON (Engine stopped.)	Approx. 0.4V	0
F132	80 (MAF sensor signal)	F132	87 (Sensor ground)	Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.4V	F
	olgitaly		groundy	Idle to about 4,000 rpm	1.1 - 1.4V to Approx. 4.0V*	

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*: 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.

P0101 MAF SENSOR

Description

INFOID:000000001581455

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:000000001581456

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.	 Harness or connectors (Mass air flow sensor circuit is open or shorted.) Mass air flow sensor Intake air leaks Air cleaner Intake air temperature sensor EGR volume control valve Turbocharger boost 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.

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

< COMPONEN	T DIAGNOSI	IS >				[M9R]	
Diagnosis Pr	ocedure					INFOID:000000001581457	~
1.CHECK INTA	KE SYSTEM	1					A
1. Check air cl	eaner for clog	gging.					FCR
 Check the for - Air duct 	ollowing for co	onnection	and cracks.				LON
- Vacuum hos	ses						
- Intake air pa	assage betwe	en air duo	t and intake	manifold			С
VES >> GO	TO 2	<u>al :</u>					
NO >> Rep	air or reconn	ect the pa	rts.				D
2.CHECK GRC	OUND CONN	ECTIONS					
1. Turn ignition	n switch OFF	and wait a	at least 20 se	conds.			
2. Check grou	nd connectior	n E17. Re	fer to Ground	l inspection in <u>(</u>	GI-41, "Circuit Inspectio	<u>'n"</u> .	
Is the inspection	<u>result norma</u>	<u>al?</u>					
NO >> Rep	air or replace	e ground c	onnection.				F
3.CHECK MAS	S AIR FLOW	/ SENSOF	R POWER SI	JPPLY CIRCUI	Т		
1. Disconnect	mass air flow	sensor h	arness conne	ector.			G
2. Turn ignition	n switch ON.				,		-
3. Check the v	oltage betwe	en mass a	air flow senso	or harness conn	ector and ground.		
Mass air flow	sensor						Η
Connector	Terminal	Ground	Voltage				
E123	2	Ground	Battery voltage	ge			
Is the inspection	result norma	al?					
YES >> GO	TO 5.						J
NO >> GO	TO 4.						0
4. DETECT MA	LFUNCTION	ING PART					
Check the follow	ving.	otwoon IF	DME/D and	mana air flow a	anaar		Κ
 Harness for op 	pen or short b	etween E	CM and mas	s air flow senso	or		
							L
>> Rep	air open circu	uit or shor	t to ground o	r short to powe	in harness or connect	ors.	
5. CHECK MAS	S AIR FLOW	/ SENSOF	R GROUND (CIRCUIT FOR (OPEN AND SHORT		NЛ
1. Turn ignition	n switch OFF	and wait a	at least 20 se	conds.			IVI
2. Check the c	continuity betw	ween mas	s air flow sen	isor harness co	nnector and ECM harn	ess connector.	
Mass air	flow sensor		FCN	Л			Ν
Connector	Terminal	C	Connector	Terminal	Continuity		
E123	3	-	F132	87	Existed		0
3. Also check l	harness for sl	hort to arc	ound and sho	rt to power.	<u> </u>		_
Is the inspection	result norma	<u>al?</u>					
YES >> GO	TO 7.						Ρ
NO >> GO	TO 6.						
O.DETECT MA	LFUNCTION	ING PART	「				
Check the follow	ving.						

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
E123	4	F132	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.

NO >> GO IO 8.

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.

				1		LC
	(+)	(-)		Condition	Voltago	
Connector	Terminal	Connector	Terminal	Condition	voltage	
	80 F132 (MAF sensor F132 signal)		Ignition switch ON (Engine stopped.)	Approx. 0.4V	С	
F132		F132	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?

NO >> Replace mass air flow sensor.

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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:000000001581460

INFOID:000000001581461

INFOID:000000001581459

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
 	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
10110	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	open or shorted.) Intake air temperature 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. 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	Voltago	
Connector	Terminal	Cround	voltage	
E123	5	Ground	Approx. 5V	

Is the inspection result normal?

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

2

3.DETECT MALFUNCTIONING PART

Check the following.

ECR-130

P0110 IAT SENSOR

< COMPONENT	DIAGNOSIS >				[M9R]
Harness connectHarness for oper	or E6, F123 or short betwe	een ECM and ma	ass air flow senso	r	A
>> Repair	open circuit or	r short to around	or short to power	· in harness or connec	tors.
4.CHECK INTAKE	· E AIR TEMPEF	RATURE SENSO	R GROUND CIR	CUIT FOR OPEN AN	D SHORT EC
 Turn ignition sv Disconnect EC Check the con 	witch OFF and M harness cor tinuity betweer	wait at least 20 s nnector. n mass air flow se	seconds. ensor harness co	nnector and ECM har	ness connector.
Mass air flow	/ sensor	E	CM	Quationity	D
Connector	Terminal	Connector	Terminal	Continuity	
E123	6	F132	87	Existed	
4. Also check har	ness for short	to ground and sh	nort to power.		E
Is the inspection re	sult normal?				
YES >> GO TO	6.				F
NO >> GOTC) 5.				I
J. DETECT MALF	UNCTIONING	PARI			
 Check the following Harness connect Harness for oper 	g. or E6, F123 i or short betwe	een ECM and ma	ass air flow senso	or	G
					Н
>> Repair	open circuit or	r short to ground	or short to power	in harness or connec	tors.
6.CHECK INTAKE	AIR TEMPER	RATURE SENSO	R		
Refer to ECR-131,	"Component li	nspection".			
Is the inspection re	sult normal?				
YES >> GO TO)7.				
NO >> Replac	e mass air flow	w sensor (with inf	take air temperati	ure sensor).	0
I .CHECK INTERI	MITTENT INCI	DENT			
Refer to GI-39, "Int	ermittent Incide	<u>ent"</u> .			K
>> INSPE	CTION END				
Component Ins	spection				INFOID:000000001581462
1.CHECK INTAKE	AIR TEMPER	RATURE SENSO	R		M
 Turn ignition sv Disconnect ma Check resistar 	witch OFF. ass air flow sen ace between m	isor harness con ass air flow sens	nector. or terminals 5 an	d 6 under the following	g conditions.
Condition	Resista	ance (Ω)			
25°C (77°F)	1.80 -	- 2.20			0
80°C (176°F)	0.28 -	- 0.36			
Is the inspection re	sult normal?				_
YES >> INSPE	CTION END				P

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:000000001581464

INFOID:000000001581465

INFOID:000000001581463

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
DOME	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
10113	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	circuit is open or shorted.) Engine coolant temperature 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. 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	Ground	Voltage	
Connector	Terminal	Ciouna	Voltage
F133	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.

0	perature sensor	EC	CM	Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F133	1	F131	24	Existed	
4. Also check harness fo	r short to ground an	nd short to power.		I	
Is the inspection result nor	mal?				
YES >> GO TO 4.					
NO >> Repair open c	ircuit or short to gro	und or short to powe	er in harness or o	connectors.	
4.CHECK ENGINE COOI	LANT TEMPERATU	JRE SENSOR			
Refer to ECR-133, "Compo	onent Inspection".				
Is the inspection result nor	mal?				
YES >> GO TO 5.	_				
NO >> Replace engin	ie coolant temperati	ure sensor.			
D. CHECK INTERMITTEN	IT INCIDENT				
Refer to <u>GI-39, "Intermitter</u>	<u>nt Incident"</u> .				
>> INSPECTION	END				
Component Inspection	on			II.	NFOID:000000001581466
	DN			h	NFOID:000000001581466
Component Inspection 1.CHECK ENGINE COOL	DN LANT TEMPERATU	IRE SENSOR		h	NFOID:000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF	DN LANT TEMPERATU FF.	IRE SENSOR		, I	NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coor 3. Check resistance betw	DN LANT TEMPERATU FF. plant temperature se veen engine coolant	IRE SENSOR	ector.		NFOID:0000000001581466
COMPONENT INSPECTION CHECK ENGINE COOI Turn ignition switch OF Disconnect engine coor Check resistance betw	DN LANT TEMPERATU FF. Dant temperature se veen engine coolant	IRE SENSOR ensor harness conne t temperature senso	ector. r terminals.		NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coor 3. Check resistance between Terminal	DN LANT TEMPERATU FF. Dlant temperature se veen engine coolant	IRE SENSOR ensor harness conne t temperature senso Resistance	ector. r terminals.	Ш	NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coor 3. Check resistance betwo Terminal 1 and 2	DN LANT TEMPERATU FF. blant temperature se veen engine coolant	JRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ	ector. r terminals.	И	NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coor 3. Check resistance betwo Terminal 1 and 2 Is the inspection result nor	DN LANT TEMPERATU FF. Dlant temperature se veen engine coolant	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ	ector. r terminals.	Л	NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coo 3. Check resistance betw Terminal 1 and 2 Is the inspection result nor YES >> INSPECTION	DN LANT TEMPERATU FF. Dlant temperature se veen engine coolant ween engine coolant	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ	ector. r terminals.		NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coor 3. Check resistance betwo Terminal 1 and 2 Is the inspection result nor YES >> INSPECTION NO >> Replace engine	DN LANT TEMPERATU FF. Dlant temperature se veen engine coolant ween engine coolant comal? END te coolant temperatu	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ ure sensor.	ector. r terminals.		NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coor 3. Check resistance betwo Terminal 1 and 2 Is the inspection result nor YES >> INSPECTION NO >> Replace engin	DN LANT TEMPERATU FF. Dolant temperature se veen engine coolant ween engine coolant mal? END he coolant temperatu	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ ure sensor.	ector. r terminals.	л	NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coor 3. Check resistance betwo Terminal 1 and 2 Is the inspection result nor YES >> INSPECTION NO >> Replace engin	DN LANT TEMPERATU FF. Dlant temperature se veen engine coolant ween engine coolant mal? END he coolant temperatu	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ ure sensor.	ector. r terminals.		NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine cood 3. Check resistance betwood Terminal 1 and 2 S the inspection result nor YES >> INSPECTION NO >> Replace engin	DN LANT TEMPERATU FF. Dolant temperature se veen engine coolant ween engine coolant comal? END he coolant temperatu	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ ure sensor.	ector. r terminals.		NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coor 3. Check resistance betw Terminal 1 and 2 Is the inspection result nor YES >> INSPECTION NO >> Replace engin	DN LANT TEMPERATU FF. Dlant temperature se veen engine coolant ween engine coolant mal? END he coolant temperatu	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ ure sensor.	ector. r terminals.		NFOID:000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine cood 3. Check resistance between Terminal 1 and 2 Is the inspection result nor YES >> INSPECTION NO >> Replace engin	DN LANT TEMPERATU FF. Dant temperature se veen engine coolant ween engine coolant mal? END he coolant temperatu	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ ure sensor.	ector. r terminals.		NFOID:000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine cood 3. Check resistance between Terminal 1 and 2 Is the inspection result nor YES >> INSPECTION NO >> Replace engin	DN LANT TEMPERATU FF. Dant temperature se veen engine coolant ween engine coolant mal? END he coolant temperatu	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ ure sensor.	ector. r terminals.		NFOID:0000000001581466
Component Inspection 1. CHECK ENGINE COOI 1. Turn ignition switch OF 2. Disconnect engine coo 3. Check resistance betw Terminal 1 and 2 Is the inspection result nor YES >> INSPECTION NO >> Replace engin	DN LANT TEMPERATU FF. Dant temperature se veen engine coolant mal? END ne coolant temperatu	IRE SENSOR ensor harness conne t temperature senso Resistance 0.087 - 83 kΩ ure sensor.	ector. r terminals.		NFOID:000000001581466

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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:000000001581468

INFOID:000000001581467

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
	Throttle position sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	or shorted.) Throttle position 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. 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:000000001581469

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	Ground	Voltage	
Connector	Terminal	Ciouna	voltage
F148	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.

Electric throttle	e control actuator	EC	M	Continuity	
Connector	Terminal	Connector Terminal		Continuity	
F148	1	F132	85	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 THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

 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	
F148	6	F132	83	Existed	
2. Also check harness	for short to ground and	short to power.			
Is the inspection result r	ormal?				
YES >> GO TO 5.					
NO >> Repair oper	i circuit or short to grour	nd or short to powe	er in harness or o	connectors.	
D. CHECK THROTTLE	POSITION SENSOR				
Refer to ECR-135, "Con	nponent Inspection".				
Is the inspection result r	ormal?				
YES >> GO TO 6.					
NO >> Replace ele	ctric throttle control actu	lator.			
O. CHECK INTERMITTI	ENT INCIDENT				
Refer to GI-39, "Intermit	tent Incident".				
>> INSPECTIC	N END				
Component Inspec	tion			INFOID:00000000158	1470
- · ·					

- 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	Voltago	
Connector	Terminal	Connector	Terminal	Condition	voltage	F
E122	83	E132	85	For 20 seconds after turning ignition switch OFF	Output voltage fluctuates between 0 V and 5 V	
1 132	(TP sensor)	1 132	(Sensor ground)	More than 20 seconds after turning ignition switch OFF	0.63 - 0.77 V	

Is the inspection result normal?

YES >> INSPECTION END

ECR-135

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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.



DTC Logic

DTC DETECTION LOGIC

DIC NO.	Trouble diagnosis nan	ne DTC	detecting condition	Possible Cause
P0130	Air fuel ratio (A/F) senso circuit	or 1 The A/F signal co fuel ratio sensor range.	omputed by ECM from the air 1 signal is out of the specified	 Harness or connectors (The air fuel ratio sensor 1 circuit is shorted.) Air fuel ratio sensor 1
Diagnosi	s Procedure			INFOID:00000000158147
1.снеск	GROUND CONNEC	CTIONS		
1. Turn ig 2. Check	nition switch OFF ar ground connection E	nd wait at least 20 s E17. Refer to Grou	seconds. nd inspection in <u>GI-41, "(</u>	<u> Circuit Inspection"</u> .
s the inspe	ction result normal?			
YES >> NO >> 2.CHECK	GO TO 2. Repair or replace g AIR FUEL RATIO (A	round connections	WER SUPPLY CIRCUIT	г
		v ,		1
1. Discon	nect A/F sensor 1 ha	arness connector.		ı
1. Discon 2. Turn ig 3. Check	nect A/F sensor 1 ha nition switch ON. the voltage between	arness connector.	ess connector and grou	nd.
1. Discon 2. Turn ig 3. Check A/F	nect A/F sensor 1 ha nition switch ON. the voltage between	arness connector.	ess connector and grou	nd.
1. Discon 2. Turn ig 3. Check A/F Connector	nect A/F sensor 1 ha nition switch ON. the voltage between sensor 1 G Terminal	arness connector. A/F sensor 1 harr round Voltage	ess connector and grou	nd.
1. Discon 2. Turn ig 3. Check A/F Connector F141	nect A/F sensor 1 ha nition switch ON. the voltage between sensor 1 G Terminal G 4 G	arness connector. A/F sensor 1 harr round Voltage round Battery vol	ess connector and groun	nd.
1. Discon 2. Turn ig 3. Check A/F Connector F141 <u>DK or NG</u>	nect A/F sensor 1 ha nition switch ON. the voltage between sensor 1 Terminal 4 G	arness connector. A/F sensor 1 harr round Voltage round Battery vol	ess connector and groun	nd.
1. Discon 2. Turn ig 3. Check A/F Connector F141 <u>OK or NG</u> OK >>	nect A/F sensor 1 ha nition switch ON. the voltage between sensor 1 G Terminal G 4 G GO TO 4.	arness connector. A/F sensor 1 harn round Voltage round Battery vol	tage	nd.
1. Discon 2. Turn ig 3. Check A/F Connector F141 <u>OK or NG</u> OK >> NG >>	nect A/F sensor 1 ha nition switch ON. the voltage between sensor 1 G Terminal G 4 G GO TO 4. GO TO 4.	arness connector. A/F sensor 1 harr round Voltage round Battery vol	tage	nd.
1. Discon 2. Turn ig 3. Check A/F Connector F141 <u>DK or NG</u> OK >> NG >> 3. DETEC	nect A/F sensor 1 ha nition switch ON. the voltage between sensor 1 G Terminal G 4 G GO TO 4. GO TO 4. GO TO 3. MALFUNCTIONIN	arness connector. A/F sensor 1 harn round Voltage round Battery vol	tage	nd.
1. Discon 2. Turn ig 3. Check A/F Connector F141 <u>OK or NG</u> OK >> NG >> 3. DETEC Check the f	nect A/F sensor 1 ha nition switch ON. the voltage between sensor 1 G Terminal G GO TO 4. GO TO 4. GO TO 3. MALFUNCTIONIN ollowing.	arness connector. A/F sensor 1 harn round Voltage round Battery vol	tage	nd.
1. Discon 2. Turn ig 3. Check A/F Connector F141 OK or NG OK >> NG >> 3. DETEC Check the f Harness of Harness of	Anect A/F sensor 1 ha nition switch ON. the voltage between sensor 1 G Terminal G 4 G GO TO 4. GO TO 4. GO TO 3. MALFUNCTIONIN ollowing. connectors E7, F121 or open or short bet	arness connector. A/F sensor 1 harr round Voltage round Battery vol G PART	and IPDM F/R	nd.

>> Repair or replace harness or connectors.

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

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

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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	
F141	2	E122	78	Evictod
	5	FIJZ	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		ECM		Cround	Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity		
	1		81				
E1 41	2	E122	78	Ground	Not existed		
F141	5	F 132	82				
	6	1	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

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.



•••	
1	Turn ignition switch OFE and wait at least 20 s

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

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

A/F sensor 1		Voltage
Terminal	Gibunu	voitage
4	Ground	Battery voltage
O TO 4.		
5103.		
ALFUNCTIO	ONING PAR	Т
wing.	E121	
open or sho	rt between A	/F sensor 1 and
	or 1 Terminal 4 D TO 4. D TO 3. ALFUNCTIO wing. nectors E7, open or sho	sor 1 Terminal 4 Ground C TO 4. C TO 3. ALFUNCTIONING PAR wing. nectors E7, F121 open or short between A

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

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

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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	Evistod
E1 /1	2	F132	78	
F141	5		82	Existed
	6		77	

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

A/F sensor 1		ECM		Cround	Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity
	1		81	- Ground	Not existed
E1 41	2	F132	78		
F141	5		82		
	6	1	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 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

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

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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	Evistod
E1 /1	2	F132	78	
F141	5		82	Existed
	6		77	

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

A/F sensor 1		ECM		Cround	Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity
	1		81	- Ground	Not existed
E1 41	2	F132	78		
F141	5		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.



DTC Logic

DTC DETECTION LOGIC

DIC No.	Trouble diagnosi	is name	DTC detecting condition	Possible Cause
P0134	Air fuel ratio (A/F) circuit	sensor 1 fu ra	ne A/F signal computed by ECM from the air el ratio sensor 1 signal is out of the specified nge.	 Harness or connectors (The air fuel ratio sensor 1 circuit is shorted.) Air fuel ratio sensor 1
Diagnosi	s Procedure			INFOID:00000000158794
.снеск	GROUND CON	INECTION	S	
. Turn ig	nition switch OF	F and wait	at least 20 seconds.	ircuit Inspection"
the increa	giouna connect	non ⊑ n. iv mol2		incuit inspection.
		<u>lial (</u>		
	GU IU 2. Poppir or ropio		connections	
>> ∪vi >>				
CHECK	AIR FUEL RAT	io (A/F) se	ENSOR 1 POWER SUPPLY CIRCUIT	
. Discon	nect A/F sensor	1 harness	connector.	
. Turn ig	nition switch ON	۱		
. Check	ne voltage betv	veen A/F s	ensor 1 harness connector and groun	d.
۵/F	sensor 1			
AVF	Tarminal	Ground	Voltage	
Connector	ierminal			
F141	4	Ground	Battery voltage	
<u> OK or NG</u>				
OK >>	GO TO 4.			
NG >>	GO TO 3.			
3. DETECT	MALFUNCTIC	NING PAR	RT	
	ollowing			
`hock tho f	JIOWING.			
heck the f Harness o	onnectors F7	F121		
heck the f Harness o Harness f	connectors E7, I	F121 t between /	A/F sensor 1 and IPDM E/R	
heck the f Harness o Harness f Harness f	connectors E7, I or open or shor or open or shor	F121 t between / t between /	A/F sensor 1 and IPDM E/R 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

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

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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	Evistod
E1 /1	2	F132	78	
F141	5		82	Existed
	6		77	

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

A/F sensor 1		ECM		Cround	Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity
	1		81	- Ground	Not existed
E1 41	2	F132	78		
F141	5		82		
	6	1	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
< COMPONENT DIAGNOSIS >

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			(
Engine coolant temperature sensor	Engine coolant temperature	Air fuel ratio (A/F) sensor 1	Air fuel ratio (A/F) sensor 1	
Exhaust gas temperature sensor	Exhaust gas temperature	Theater control	Tieater	[
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	
 After the vehicle is driven for 6 minutes under the following conditions. Warm-up condition Vehicle speed: 80km/h (50MPH) Shift lever: Suitable gear position 	ON	Н

DTC Logic

INFOID:000000001581484

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)	 Harness or connectors (The air fuel ratio sensor 1 heater circuit is open or shorted.) Air fuel ratio sensor 1 heater 	ŀ

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

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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	ensor 1	Ground	Voltago
Connector	Terminal	Ground	voltage
F141	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

• 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	Connector Terminal	
F141	3	F131	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

< COMPONENT DIA	AGNOSIS >	[M9R]	
7. CHECK INTERMI	TTENT INCIDENT		Λ
Perform GI-39, "Inter	mittent Incident".	<i>r</i>	~
>> Repair o	r replace.	Ε	CR
Component Insp	ection	INFOID:000000001581486	
1.CHECK AIR FUEL	_ RATIO (A/F) SENSOR 1	(С
 Turn ignition swit Disconnect A/F s Check resistance 	ch OFF. sensor 1 harness connector. e between A/F sensor 1 terminal	s as follows.	С
Terminal	Resistance	-	_
3 and 4	2.4 - 4.0 Ω [at 25°C (77°F)]		-
3 and 1, 2 4 and 1, 2	${\stackrel{\scriptstyle ~ \propto \Omega}{\scriptstyle (}}$ (Continuity should not exist)		_
Is the inspection resu YES >> INSPEC NO >> GO TO 2 2.REPLACE AIR FL	<u>ilt normal?</u> TION END 2. JEL RATIO (A/F) SENSOR 1	C	3
Replace malfunctioni	ng air fuel ratio (A/F) sensor 1.	ŀ	-
 Discard any air fu (19.7 in) onto a ha Before installing r Sensor Thread Cle 	iel ratio (A/F) sensor which h rd surface such as a concrete new air fuel ratio (A/F) sensor, eaner tool and approved anti-	as been dropped from a height of more than 0.5 m floor; use a new one. clean exhaust system threads using Heated Oxygen seize lubricant.	I
>> INSPEC	TION END		J
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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:000000001581488

INFOID:000000001581489

INFOID:000000001581487

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
10100	Fuel temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	open or shorted.) Fuel temperature 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. 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 temperature harness sensor connector and ground.

Fuel temper	ature sensor	Ground	Voltage	
Connector	Terminal	Ciouna	voltage	
F140	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 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 >

[M9R]

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2. Disconnect ECM harness connector.

3. Check the continuity between fuel temperature sensor harness connector and ECM harness connector.

Fuel tempera	ature sensor	EC	CM	Continuity		
Connector	Terminal	Connector	Terminal	Continuity		ECF
F140	2	F131	22	Existed		
4. Also check har	ness for short to g	round and short to	o power.	<u>.</u>		С
Is the inspection re	sult normal?					
YES >> GO TO) 4.					
			ion to power in r).	D
Pofor to ECP 140	"Component Insp	etion"				
Is the inspection re	sult normal?	<u>ection</u> .				Ε
YES >> GO TC) 5.					
NO >> Replac	e fuel temperature	e sensor.				F
5. CHECK INTERN	MITTENT INCIDE	NT				1
Refer to GI-39, "Inte	ermittent Incident"	·				
						G
>> INSPE	CTION END					
Component Ins	spection				INFOID:000000001581490	Н
1.CHECK FUEL T	EMPERATURE S	ENSOR				
1. Turn ignition su	witch OFF.					1
2. Disconnect fue	l temperature sen	sor harness conne	ector.			1
3. Check resistan	ce between fuel te	emperature sensor	r terminal.			
Terminals	Res	istance				J
1 and 2	0.085	5 - 50 kΩ				
Is the inspection re	sult normal?					Κ
YES >> INSPE	CTION END					
NO >> Replac	e fuel temperature	e sensor.				I
						M
						Ν
						0
						U
						Ρ

< COMPONENT DIAGNOSIS >

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:000000001581492

INFOID:000000001581493

INFOID:000000001581491

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause
	Fuel rail pressure sensor circuit low input	۵)	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.	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 FOR MALFUNCTION A

- 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-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 1st trip DTC.

Is 1st trip 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.
- 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

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]

Fue	el rail pressure senso					
Connector	Te	erminal	Ground	Volta	age	
F139		1	Ground	round Approx. 5V		
Is the inspection	result normal?					
YES >> GO NO >> Rep	TO 3. air open circuit or	short to groun	Id or short to	o power i	n harness or co	nnectors.
 Turn ignition Disconnect I Check the classical sectors 	switch OFF and ECM harness cor ontinuity between	wait at least 20 inector. fuel rail press) seconds. ure sensor	harness	connector and E	CM harness connector.
Fuel rail pre	ssure sensor		ECM			
Connector	Terminal	Connector	Term	inal	Continuity	
F139	3	F131	34	1	Existed	
4. Also check h	narness for short	to ground and	short to pov	ver.		
Is the inspection YES >> GO NO >> Rep	result normal? TO 4. air open circuit or	short to groun	d or short to	o power i	n harness or co	nnectors.
4. CHECK FUE	L RAIL PRESSU	RE SENSOR IN	NPUT SIGN	IAL CIRC	CUIT FOR OPEN	AND SHORT
Fuel rail pre	ssure sensor		ECM		Continuity	
Connector	Terminal	Connector	Term	inal		
F139	2	F131	30)	Existed	
I <u>s the inspection</u> YES >> GO NO >> Rep 5. CHECK FUEI	<u>result normal?</u> TO 5. air open circuit or L RAIL PRESSUR	short to groun RE SENSOR	d or short to	o power i	n harness or co	nnectors.
Refer to <u>ECR-15</u>	51, "Component Ir	nspection".				
Is the inspection YES >> GO NO >> Rep	<u>result normal?</u> TO 6. lace fuel rail pres	sure sensor.				
6. CHECK INTE	RMITTENT INCI	DENT				
Refer to <u>GI-39,</u> "	Intermittent Incide	ent".				
>> INSI	PECTION END					
Component I	nspection					INFOID:000000001581494
1. CHECK FUE	L RAIL PRESSU	RE SENSOR				
 Turn ignition Reconnect h Turn ignition Select "DAT Check that t Is the value lowe 	a switch OFF and narness connecto a switch ON. A MONITOR" mo he "FUEL RAIL P er than 90 bar?	wait at least 1 r disconnected de with CONSI RES" indicatio	minutes. l. ULT-III. n.			

YES >> INSPECTION END.

< COMPONENT DIAGNOSIS >

NO >> Replace fuel rail pressure sensor.

P0200 FUEL INJECTOR

< COMPONENT DIAGNOSIS >

P0200 FUEL INJECTOR

DTC Logic

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting	condition	Po	ssible Cause	
		An excessively low voltage sent to ECM.	from the injectors is			
P0200	Fuel injector circuit range/ performanceAn excessively high voltage from the sent to ECM.			Harness or connectors (The fuel injector circuit is shorted.)		
		An improper voltage signal through fuel injectors.	is sent to ECM			
TC CON	FIRMATION PROCE	DURE				
.PRECO	NDITIONING					
f DTC Cor	firmation Procedure ha	s been previously cond	ducted, always tur	n ignition swi	tch OFF and wait at	
east 20 se	conds before conducting	g the next test.		C C		
	RM DTC CONFIRMATION	ON PROCEDURE				
. Start er	ngine and let it idle for a	t least 10 seconds.				
. Check	1st trip DTC.					
<u>s 1st trip D</u>	TC detected?					
YES >>	Go to ECR-153, "Diag	nosis Procedure".				
NU >>						
Diagnosi	s Procedure				INFOID:000000001581496	
.CHECK	FUEL INJECTOR POW	/ER SUPPLY CIRCUIT	FOR OPEN AND	SHORT		
Turn in	nition switch OFF and w	vait at least 20 seconds				
. Discon	nect ECM harness conr	nector.	•			
. Discon	nect fuel injector harnes	s connector.				
. Check	the continuity between t	fuel injector harness co	nnector and ECM	harness conr	iector.	
	Fuel injector		ECM			
Cylind	er Connector	Terminal	Connector	Terminal	Continuity	
1	F144	1		6		
2	F145	1	E131	7	Existed	
3	F146	1	ГІЗІ	8	ENSIGN	
4	F147	1		5		
. Also ch	eck harness for short to	o ground and short to p	ower.			
the inspe	ction result normal?					
YES >>	GO TO 2.	•				
NO >>	Repair open circuit or	short to ground or short	to power in harne	ess or connec	tors.	
CHECK	FUEL INJECTOR OUT	PUT SIGNAL CIRCUIT	FOR OPEN AND	SHORT		
. Check	the continuity between	fuel injector harness co	nnector and ECM	harness conr	nector.	

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INFOID:000000001581495

P0200 FUEL INJECTOR

< COMPONENT DIAGNOSIS >

	Fuel injector		E	Continuity	
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F144	2		2	
2	F145	2	E131	3	Evictod
3	F146	2	F131	4	Existed
4	F147	2		1	

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		E	Continuity			
Cylinder	Connector	Terminal	Connector	Terminal	Continuity		
				1			
1	F144	2	F131	3			
				4			
				1			
2	F145	2	F131	2	Not ovistod		
				4			
	F146 2 F131					1	NOT EXISTEN
3		F146 2	F146 2	F131	2		
				3			
				2			
4	F147	2	F131	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 injector eigenitie epon or shorted)				
P0203	NO. 3 cylinder fuel injector circuit	An improper voltage signal is sent to ECM through No. 3 cylinder fuel injector	Fuel injector				
P0204	NO. 4 cylinder fuel injector circuit	An improper voltage signal is sent to ECM through No. 4 cylinder fuel injector					
DTC CONFIRMATION PROCEDURE							
1.PREC	1. PRECONDITIONING						
If DTC C least 20	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. Start	engine and let it idle for at le	east 10 seconds.					
2. Cheo	ck 1st trip DTC.						
<u>ls 1st trip</u> YES NO	Is 1st trip DTC detected? YES >> Go to ECR-155, "Diagnosis Procedure". NO >> INSPECTION END						
Diagnosis Procedure							
1. CHEC	1. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT FOR OPEN						
 Turn Disc Disc 	ignition switch OFF and wai onnect ECM harness connec onnect fuel injector harness	t at least 20 seconds. ctor. connector.					

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

_ 0	Continuity	ECM		Fuel injector ECM			Fuel injector	
	Continuity	Terminal	Connector	Terminal	Connector	Cylinder		
P		6		1	F144	1		
	Eviated	7	F131 -	1	F145	2		
	Existed	8		1	F146	3		
		5		1	F147	4		

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair open circuit in harness or connectors.

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INFOID:000000001581497

INFOID:000000001581498

P0201, P0202, P0203, P0204 FUEL INJECTOR

< COMPONENT DIAGNOSIS >

2.CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN

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

	Fuel injector		ECM		Continuity	
Cylinder	Connector	Terminal	Connector	Terminal	Continuity	
1	F70	2		2		
2	F71	2	E121	3	Eviated	
3	F72	2	F131 -	4	Existed	
4	F73	2		1	1	

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit in harness or connectors.

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

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

	Fuel injector		E	CM	Continuity
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	E144	1	F131	2	
I	F 144	2	1131	6	
2	E145	1	F131	3	
2	1 143	2		7	Not existed
3	E1//6	1	F131	4	Not existed
5	1 140	2	1151	8	
1	E147	1	F131	1	
4	1 147	2		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 6.

>> GO TO 5. NO

5.REPLACE FUEL INJECTOR

1. Replace malfunctioning fuel injector.

Perform <u>ECR-14</u>, "INJECTOR ADJUSTMENT VALUE REGISTRATION : Special Repair Requirement". Perform <u>ECR-14</u>, "ZFC VALUE RESET : Special Repair Requirement". 2.

3

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK FUEL INJECTOR

INFOID:000000001581500

P0201, P0202, P0203, P0204 FUEL INJECTOR [M9R] < COMPONENT DIAGNOSIS > 1. Turn ignition switch OFF. 2. Disconnect fuel injector harness connector. А 3. Check resistance between fuel injector terminals as follows. Terminals Resistance ECR 1 and 2 178.2 - 181.8Ω Is the inspection result normal? С YES >> INSPECTION END NO >> Replace malfunctioning fuel injector. D

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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:000000001581501

INFOID:000000001581502



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 senso (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.

2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

INFOID:000000001581503

[M9R]

P0225 APP SENSOR

< COMPONEN	T DIAGNOSIS	>			` [M9R]	
YES >> GO NO >> Rep	TO 2. pair or replace gr	ound connectio	on.			A
Z.CHECK ACC	ELERATOR PE	DAL POSITION	N SENSOR F	POWER		
1. Disconnect	accelerator ped	al position sens	or harness o	connecto	r.	ECF
3. Check the v	oltage between	accelerator peo	dal position s	sensor co	onnector and ground.	
	_		-			0
Accele	rator pedal position	sensor	Ground	Volt	ade	C
Connecto	r	Terminal	Cround	Voit		
E110		4	Ground	Appro	эх. 5V	D
		5				
YES >> GO NO >> Rep 3.CHECK ACC	<u>n result normal?</u> TO 3. pair open circuit ELERATOR PE	or short to grou	nd or short t	o power GROUNI	in harness or connectors. CIRCUIT FOR OPEN AND SHORT	Е
		d wait at loost ?				F
 Disconnect Check the connector. 	ECM harness continuity between	onnector. en accelerator	pedal posit	ion sens	or harness connector and ECM harness	G
Accelerator peo	lal position sensor		ECM			ш
Connector	Terminal	Connector	Term	ninal	Continuity	П
E110	1	E121	12	20	Existed	1
4. Also check Is the inspection YES >> GO NO >> Rep	harness for shor <u>result normal?</u> TO 4. pair open circuit	t to ground and	I short to pov	wer. o power	in harness or connectors.	J
4.CHECK ACC	ELERATOR PE	DAL POSITION	I SENSOR II	NPUT SI	GNAL CIRCUIT FOR OPEN AND SHORT	Κ
1. Check the connector.	continuity betwe	en accelerator	pedal posit	ion sens	or harness connector and ECM harness	I
Accelerator peo	lal position sensor		ECM			L
Connector	Terminal	Connector	Term	inal	Continuity	
E110	3	E121	12	26 9	Existed	M
2. Also check	harness for shor	t to ground and	I short to pov	wer.		NI
Is the inspection YES >> GO NO >> Rep	n result normal? TO 5. pair open circuit	or short to grou	nd or short t	o power	in harness or connectors.	0
D. CHECK ACC	ELERATOR PE	DAL POSITION	N SENSOR			
Refer to ECR-16	60, "Component	Inspection".				P
Is the inspection	result normal?					1
YES >> GO NO >> Ror	106. Jace accelerato	r pedal position	sensor			
6.CHECK INTE			001001			

Refer to GI-39, "Intermittent Incident".

P0225 APP SENSOR

< COMPONENT DIAGNOSIS >

>> INSPECTION END

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	E	CM	Con	dition	Voltago	
Connector	Terminal	Connector	Terminal	Condition		voltage	
126		127		Fully released	0.6 - 4.6 V		
E121	(APP sensor 1)	E101	(Sensor ground)		Fully depressed	Less than 5 V	
	119 (APP sensor 2)	EIZI	120 (Sensor ground)	Accelerator pedar	Fully released	More than 0.3 V	
					Fully depressed	Less than 2.5 V	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace accelerator pedal assembly.

INFOID:000000001581504

[M9R]

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:000000001581506

INFOID:000000001581505

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
	Turbocharger boost sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors
Turbocharger boost sensor circu high input		An excessively high voltage from the sensor is sent to ECM.	(Turbocharger boost sensor circuit is open or shorted.)
F0233	Turbocharger boost 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)	 Turbocharger boost sensor Barometric pressure sensor (built- into EC)
DTC CC	NFIRMATION PROCEDU	RE	
1.PREC	CONDITIONING		
If DTC C least 20	Confirmation Procedure has be seconds before conducting the	een previously conducted, always turn e next test.	ignition switch OFF and wait at

>> GO TO 2.		1
2. PERFORM DTC CONFIRMATION PROCEDURE		1
 Turn ignition switch ON and wait at least 10 seconds. Check 1st trip DTC. 		J
Is 1st trip DTC detected?		
YES >> Go to <u>ECR-161, "Diagnosis Procedure"</u> . NO >> INSPECTION END		Κ
Diagnosis Procedure	INFOID:000000001581507	
1.CHECK GROUND CONNECTIONS		L
 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>. <u>Is the inspection result normal?</u> 		M
YES >> GO TO 2. NO >> Repair or replace ground connection.		Ν
2. CHECK TUBOCHARGER BOOST SENSOR POWER SUPPLY CIRCUIT		
 Disconnect turbocharger boost sensor harness connector. Turn ignition switch ON. Check the voltage between turbocharger boost sensor harness connector and ground. 		0

Turbocharger	Ground	Voltage		
Connector	Connector Terminal		voltage	
F91	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.

ECR-161

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< COMPONENT DIAGNOSIS >

${f 3.}$ 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.

Turbocharge	er boost sensor	E	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
F91	2	F131	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.

Turbocharger boost sensor		ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
F91	3	F131	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:000000001581509

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.	Eucliniactor	
P0269	NO. 3 cylinder fuel injector performance	The zero fuel calibration value for fuel injector 3 is out of the specified range.	• Fuer injector	
P0272	NO. 4 cylinder fuel injector performance	The zero fuel calibration value for fuel injector 4 is out of the specified range.		
DTC CON	IFIRMATION PROCEDURE			
1.PRECC	NDITIONING			
If DTC Co least 20 se	nfirmation Procedure has been p econds before conducting the next	reviously conducted, always turn test.	gnition switch OFF and wait at	
> 2. PERFC	> GO TO 2. RM DTC CONFIRMATION PROC	CEDURE		
1. Turn ig	nition switch ON and wait at leas	t 10 seconds.		
Is 1st trip [DTC detected?			
YES > NO >	> Go to <u>ECR-163, "Diagnosis Pro</u> > INSPECTION END	cedure".		
Diagnos	is Procedure		INFOID:000000001581510	
1. PERFC	RM INJECTOR ADJUSTAMENT	VALUE REGSITRATION		
1. Turn iç	gnition switch OFF and wait at lea	st 20 seconds.		
3. Perfor	m injector adjustment value regis	tration for malfunctioning cylinder.	Refer to ECR-14, "INJECTOR	
> 2.снеск	CDTC			
Perform D Refer to E	TC CONFIRMATION PROCEDUF CR-163, "DTC Logic".	RE again.		
Is 1st trip [DTC displayed again?			
YES >	> Replace malfunctioning fuel inie	ctor.		

NO >> INSPECTION END

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INFOID:000000001581508

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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:000000001581513

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:000000001581511

INEOID:000000001581512

P0300, P0301, P0302, P0303, P0304 MISFIRE

< COMPONENT DIAGNOSIS >

P0300, P0301, P0302, P0303, P0304 MISFIRE

DTC Logic

INFOID:000000001581514

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	L
P0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	Incorrect fuel injector connection Eucliniector	
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.

- 2. Turn ignition switch OFF and wait at least 20 seconds.
- 3. Restart engine and let it idle for about 30 seconds.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECR-165, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK FOR LEAK

		NЛ
1.	Start engine.	IVI
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.	
ls in	take air leak detected?	0
YE	S >> Discover air leak location and repair.	0
NO	>> GO TO 2.	
2 0		
∠. 0		Ρ
Refe	er to ECR-156, "Component Inspection".	

Is the inspection result normal?

YES >> GO TO 3. NO >> GO TO 4. **3.**CHECK FUEL INJECTOR-II [M9R]

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INFOID:000000001581515

< COMPONENT DIAGNOSIS >

(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</u>, "INJECTOR ADJUSTMENT VALUE <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</u>, "INJECTOR ADJUSTMENT VALUE <u>REGISTRATION : Special Repair Requirement"</u>.
- 6. Select Service \$04 with GST.
- 7. Perform DTC CONFIRMATION PROCEDURE again. Refer to ECR-165. "DTC Logic".

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-351, "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:000000001581517

INFOID:000000001581516

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis	s name	DTC detect	ing condition	Possible cause
P0335	Crankshaft position circuit	sensor Crai dete	nkshaft position s ected by ECM wh	sensor signal is not ien engine is running.	Harness or connectors (The sensor circuit is open or shorted.)
1 0000	Crankshaft position circuit range/perform	sensor Cran nance the r	nkshaft position s normal pattern wl	sensor signal is not in hen engine is running	 Crankshaft position sensor Signal plate
DTC CON	FIRMATION PF	ROCEDURE	Ξ		
1.PRECC	NDITIONING				
If DTC Co	nfirmation Proced	dure has bee	n previously	conducted, alway	ys turn ignition switch OFF and wait at
least 20 se	econds before cor	nducting the	next test.		
>	> GO TO 2.				
2.PERFC		RMATION PI	ROCEDURE		
1 Start e	angine and let it id	lle for at leas	t 10 seconds		
If engi	ne could not start	, keep ignitic	on switch at S	TART position for	r 5 seconds.
2. Check	1st trip DTC.				
ls 1st trip I	DTC detected?				
YES >	> Go to ECR-167	<u>, "Diagnosis</u>	Procedure".		
NU >		IND			
Diagnos	is Procedure				INFOID:000000001581518
1. CHECK		NECTIONS			
1. Turn ig	gnition switch OFI	F and wait at	least 20 seco	onds.	
2. Check	ground connection	on E17. Refe	er to Ground i	nspection in <u>GI-4</u>	1, "Circuit Inspection".
ls the insp	ection result norm	<u>nal?</u>			
YES >	> GO TO 2.		nnontion		
< טעו סבייים כ		ce grouna co			
<pre> LCHECk </pre>	CKP SENSOR (JROUND CI	RCUIT FOR (JPEN AND SHO	КІ
1. Discor	nnect crankshaft p	oosition (CKF	P) sensor hari	ness connector.	
2. DISCOI 3. Check	the continuity be	tween CKP	sensor harnes	s connector and	ECM barness connector
С	KP sensor	E	СМ		
Connecto	r Terminal	Connector	Terminal	Continuity	
F134	2	F132	50	Existed	

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.

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

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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
F134	1	F132	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.

INFOID:000000001581519

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

INFOID:000000001581521

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0240	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 Camshaft position sensor signal is not in the normal pattern when engine is running. Camshaft position sensor Signal plate		Camshaft position sensorSignal plate
DTC CO	NFIRMATION PROCE	DURE	
1.PREC	ONDITIONING		
If DTC C least 20 s	onfirmation Procedure haseconds before conductin	as been previously conducted, always t g the next test.	urn ignition switch OFF and wait at
:	>> GO TO 2.		
2.perf	ORM DTC CONFIRMATI	ON PROCEDURE	
1. Start	engine and let it idle for a	at least 10 seconds.	
2. Chec	k 1st trip DTC.		
YES	<u>DIC detected?</u>	inosis Procedure"	
NO :	>> INSPECTION END		
Diagno	sis Procedure		INFOID:000000001581522
1. CHEC	K GROUND CONNECTI	ONS	
1. Turn	ignition switch OFF and	wait at least 20 seconds.	
2. Chec	k ground connection E17	7. Refer to Ground inspection in GI-41.	Circuit Inspection"
Is the ins	pection result normal?		
YES :	>> GO TO 2.	und connection	
NO -	> Donair ar ranlaca arai		
	>> Repair or replace grou		
NO 2.CHEC	>> Repair or replace grou	R SUPPLY CIRCUIT	
NO 2.CHEC 1. Disco 2. Turn	>> Repair or replace grou K CMP SENSOR POWE onnect camshaft position ignition switch ON.	R SUPPLY CIRCUIT (CMP) sensor harness connector.	

CMP	sensor	Ground	Voltage
Connector	Connector Terminal		Voltage
F138	3	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.

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< COMPONENT DIAGNOSIS >

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	sensor	E	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
F138	1	F131	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		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F138	2	F131	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-384, "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".

< COMPONENT [DIAGNOSIS >	[M]	19R]
>> INSPE	CTION END		
Component Ins	spection	INFOID:00000000	A 01581523
1.CHECK CAMSI	HAFT POSITION SENSOR		ECR
 Turn ignition s Disconnect ca Check the resi 	witch OFF. mshaft position sensor harne istance between camshaft po	connector. ion sensor terminals as follows.	С
Terminals	Resistance		
2 and 3	7.2 - 13.4 kΩ		D
1 and 2	More than 100 k Ω		
1 and 3	More than 100 k Ω		_
Is the inspection re	esult normal?		E
YES >> INSPE NO >> Replac	ECTION END ce camshaft position sensor.		F

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< COMPONENT DIAGNOSIS >

P0380 GLOW CONTROL SYSTEM

DTC Logic

INFOID:000000001581524

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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	 Harness or connectors (Glow plug control circuit is open or shorted.) (Glow control unit input signal circuit is open or shorted.) Glow plug Glow control unit

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:000000001581525

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	Ground	Voltage	
Connector	Cround	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.

• 80A 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 >

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	F131	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 control unit		E	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
F94	3	F132	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	Glow plug			Glow control unit	
Continuity	Terminal	Connector	Terminal	Connector	Cylinder
	1	F95	2		1
Existed	1	F96	7	F94 -	2
Existed	1	F97	1		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.

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P0380 GLOW CONTROL SYSTEM

< COMPONENT DIAGNOSIS >

Component Inspection

INFOID:000000001581526

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 [M9R]

< COMPONENT DIAGNOSIS >

P0409 EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR

Description

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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 С 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:000000001581528

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC det	ecting condition		Possible cause
D 0400	EGR volume control valve control position sensor circuit low input	An excessively sensor is sent t	low voltage from th o ECM.	he	Harness or connectors (EGR volume control valve control position control valve control)
P0409	EGR volume control valve control position sensor circuit high input	An excessively sensor is sent t	high voltage from t o ECM.	the	 EGR volume control valve control position sensor
DTC CC	NFIRMATION PROCEDUR	E			
1.PREC	CONDITIONING				
If DTC C	confirmation Procedure has be	en previously	conducted, alw	ways	turn ignition switch OFF and wait at
least 20 s	seconds before conducting the	next test.			
	>> GO TO 2				
2.PERF	ORM DTC CONFIRMATION F	ROCEDURE			
1. Turn	ignition switch ON and wait at	least 10 seco	nds.		
2. Cheo	ck 1st trip DTC.				
<u>Is 1st trip</u>	DTC detected?				
YES	>> Go to ECR-175, "Diagnosis	<u>Procedure</u> ".			
Diagno	sis Procedure				
					INFOID:000000001581529
1. CHEC	CK GROUND CONNECTIONS				
1. Turn	ignition switch OFF and wait a	at least 20 sec	onds.		
2. Cheo	ck ground connection E17. Ref	er to Ground i	nspection in GI	<u>I-41,</u>	"Circuit Inspection".
	<u>pection result normal?</u>				
TES NO	>> GO TO Z.	onnection			
2 CHEC					
 DISC Turn Cher 	onnect EGR volume control va ignition switch ON. ck the voltage between EGR	volume contro	onnector.		sition sensor harness connector and
grou	nd.			. p0	
EC	GR volume control valve control position	on sensor	Ground		Voltago
	Connector Te	rminal	Giouna		vullaye

onnecto rerminai F99 4 Ground Approx. 5V

Is the inspection result normal?

ECR-175

P0409 EGR VOLUME CONTROL VALVE CONTROL POSITION SENSOR

< COMPONENT DIAGNOSIS >

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INFOID:000000001581530

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	CM	Continuity
Connector	Terminal	Connector Terminal		Continuity
F99	2	F131	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	СМ	Continuity
Connector	Terminal	Connector Terminal		Continuity
F99	6	F131	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.

- 2. 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 kO	
2 and 6	1 - 13 K22	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EGR volume control valve. ECR

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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:000000001581532

INFOID:000000001581533

INFOID:000000001581531

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0470	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.	 (Exhaust gas pressure sensor circuit is open or shorted.) Exhaust gas pressure sensor Barometric pressure sensor (built-into EC) Exhaust manifold and exhaust pipe
	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)	

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]

Exha	iust das pressure ser	sor				А
Connecto	r 7	Ferminal	Ground	Voltag	e	
		1	Ground	Approx.	5V	
Is the inspection	result normal?	-				EC
YES >> GO NO >> Rep 3. CHECK EXH	TO 3. Dair open circuit o IAUST GAS PRE	r short to grou SSURE SENS	Ind or short t	o power in ND CIRCUI	harness or connectors. T FOR OPEN AND SHORT	С
 Turn ignition Check the c tor. 	n switch OFF and continuity betweer	l wait at least 2 n exhaust gas	20 seconds. pressure sei	nsor harnes	ss connector and ECM harness connec-	D
Exhaust gas	pressure sensor		ECM			E
Connector	Terminal	Connector	Term	ninal	Continuity	
F150	3	F131	10	6	Existed	_
3. Also check	harness for short	to ground and	d short to pov	wer.		F
Is the inspection	result normal?	J				
YES >> GO	TO 4.					G
NO >> Rep	oair open circuit o	r short to grou	ind or short t	o power in	harness or connectors.	
4.CHECK EXH	IAUST GAS PRE	SSURE SENS	SOR INPUT	SIGNAL C	IRCUIT FOR OPEN AND SHORT	
1. Check the c	continuity betweer	n exhaust gas	pressure ser	nsor harne	ss connector and ECM harness connec-	Н
tor.	2	0				
						1
Exhaust gas	pressure sensor		ECM		Continuity	
Connector	Terminal	Connector	Term	ninal	Continuity	
F150	2	F131	20	0	Existed	J
2. Also check	harness for short	to ground and	d short to pov	wer.		
Is the inspection	<u>result normal?</u>					
YES >> GO	TO 5.					K
NO >> Rep	pair open circuit o	r short to grou	ind or short t	o power in	harness or connectors.	
5. CHECK EXH	IAUST MANIFOL	D AND EXHA	UST PIPE			1
Check the exha	ust manifold and	exhaust pipe	for clogging a	and cracks		
Is the inspection	n result normal?					
YES >> GO	TO 6.					N
NO >> Rep	pair or replace ex	haust manifold	d or exhaust	pipe.		
6.CHECK INTE	ERMITTENT INC	IDENT				
Refer to GI-39.	Intermittent Incid	lent".				Ν
Is the inspection	n result normal?					
YES >> Rep	blace exhaust gas	s pressure ser	ISOr.			0
NO >> Rep	pair or replace.					0

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:000000001581535

INFOID:000000001581534

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0487	EGR volume control valve circuit	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.	motor circuit is open or shorted.)EGR volume control valve
		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:000000001581536
P0487 EGR VOLUME CONTROL VALVE

< COMPONENT DIAGNOSIS >

[M9R]

2.CHECK	KEGR VOLUME CON	FROL VALVE DC	MOTOR CIRCU	IT		٨
 Discor Discor Discor Check 	nnect EGR volume cor nnect ECM harness co c harness continuity be	trol valve harness nnector. tween the followir	s connector. ng terminals.			ECR
EGR	volume control valve	EC	СМ		-	
Connec	tor Terminal	Connector	Terminal	- Continuity		С
	1		95	Existed	-	
E00	I	E122	96	Not existed	-	
F99	5	F132	95	Not existed	-	D
	5		96	Existed	-	
4. Also c <u>Is the insp</u> YES > NO > 3. CHECK	heck harness for short <u>ection result normal?</u> > GO TO 3. > Repair open circuit o < EGR VOLUME CON ⁻	to ground and sh r short to ground FROL VALVE	ort to power. or short to powe	r in harness or co	onnectors.	E
Refer to E	CR-181, "Component I	nspection".				_
Is the insp	ection result normal?					G
YES > NO > 4.REPLA	> GO TO 5. > GO TO 4. CE EGR VOLUME CC	NTROL VALVE				Н
 Repla Perfor <u>Specia</u> Perfor <u>Requi</u> 	ce the EGR volume co m <u>ECR-15, "EGR VOI</u> al Repair Requirement" m <u>ECR-15, "EGR VOI</u> rement".	ntrol valve. <u>-UME CONTROL</u> - - - <u>UME CONTROL</u>	VALVE CLOSE	D POSITION LE	ARNING VALUE CLEAR : ARNING : Special Repair	l J
>	> INSPECTIO END					
5. CHECK	KINTERMITTENT INC	IDENT				Κ
Refer to G	I-39, "Intermittent Incid	<u>ent"</u> .				
> Compor	> INSPECTION END					L
Compor	ient inspection				INFOID:000000001581537	M
1.CHECK	KEGR VOLUME CON	FROL VALVE CO	NTROL MOTOR			
 Turn ig Discord Check 	gnition switch OFF. nnect EGR volume cor resistance between E	trol valve harness GR volume contro	s connector. ol valve terminals	s as follows.		Ν
Terminals	Resistance					0
1 and 5	1 - 400 Ω					
Is the insp	ection result normal?					P
YES > NO >	> INSPECTION END> Replace EGR volum	e control valve.				I

P0488 EGR SYSTEM

DTC Logic

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

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 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 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	e control valve	ECM		Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F99	2	F132	95	Existed	
	2		96	Not existed	
	6		95	Not existed	
			96	Existed	

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

INFOID:000000001581538

INFOID:000000001581539

P0488 EGR SYSTEM

< COMPONENT DIAGNOSIS > [M9K]
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 VISUALLY
 Remove the EGR volume control valve Check if foreign matter is caught between the EGR volume control valve and the housing.
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 10 6.
6 OUTON SO NOLUME CONTROL VALVE
Refer to ECR-181, "Component Inspection".
Is the inspection result normal?
YES >> GO TO 7.
NO >> GO TO 8.
I .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 Poquiroment"
<u>rrequirement</u> .
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:000000001581541

INFOID:000000001581542

INFOID:000000001581540

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	 Harness or connectors (The CAN communication line is open or shorted) Harness or connectors (The vehicle speed signal circuit is open or shorted) Wheel sensor Combination meter ABS actuator and electric unit (control unit)

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-28, "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-17, "CONSULT-III Function (ABS)"</u> (without ESP) or <u>BRC-95, "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-27, "CONSULT-III Function (METER/M&A)"</u>.

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:000000001581544

INFOID:000000001581543

DTC DETECTION LOGIC

Refrigerant pressure sensor circuit low input An excessively low voltage from the sensor is sent to ECM. • Harness or connectors (Refrigerant pressure sensor open or shorted.) P0530 An excessively high voltage from the sensor is sent to ECM. • Harness or connectors (Refrigerant pressure sensor open or shorted.) PTC CONFIRMATION PROCEDURE An excessively high voltage from the sensor is sent to ECM. • Refrigerant pressure sensor open or shorted.) PRECONDITIONING TOTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF a east 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 sts trip DTC detected? . YES > Go to ECR-185. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure . 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". sthe inspection result normal? YES > GO TO 2. NO >> Repair or replace ground connection. 2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch	e
Refrigerant pressure sensor circuit high input An excessively high voltage from the sensor is sent to ECM. open or shorted.) PTC CONFIRMATION PROCEDURE . Refrigerant pressure sensor .PRECONDITIONING . Refrigerant pressure sensor f DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF a east 20 seconds before conducting the next test.	nsor circuit is
DTC CONFIRMATION PROCEDURE 1.PRECONDITIONING If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF a east 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-185. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure second 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 REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Image: Second	ISOF
I.PRECONDITIONING f DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF a east 20 seconds before conducting the next test. >> GO TO 2. 2.PERFORM DTC CONFIRMATION PROCEDURE I. Turn ignition switch ON and wait at least 10 seconds. 2. Check 1st trip DTC. s 1st trip DTC detected? YES >> Go to ECR-185. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure	
f DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF a east 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. 3. Stattrip DTC detected? YES >> Go to ECR-185. "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". 3. Ste inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. 2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Refrigerant pressure sensor Ground Voltage Refrigerant pressure sensor Ground Voltage	
>> 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-185. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure Immediate 1. CHECK GROUND CONNECTIONS 1. 1. Turn ignition switch OFF and wait at least 20 seconds. 2. 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 REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Image: Connector Terminal Ground Voltage E50 3	and wait at
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-185. "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 REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Xeffigerant pressure sensor Ground Voltage Kontage Zonnector Terminal Ground Voltage	
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-185. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure □NFORE 1. CHECK GROUND CONNECTIONS I. 1. Turn ignition switch OFF and wait at least 20 seconds. I. 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 REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Image: Connector Terminal Image: Con	
Is 1st trip DTC detected? YES >> Go to ECR-185. "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure Imform 1.CHECK GROUND CONNECTIONS Imform 1. Turn ignition switch OFF and wait at least 20 seconds. Imform 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection". Is the inspection result normal? YES >> GO TO 2. NO NO >> Repair or replace ground connection. 2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Image: Connector Terminal Ground Voltage Yoltage	
YES >> Go to ECR-185, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure Immodel in the importance of the	
Diagnosis Procedure Immon 1. CHECK GROUND CONNECTIONS Immon 1. Turn ignition switch OFF and wait at least 20 seconds. Immon 2. Check ground connection E17. Refer to Ground inspection in GI-41, "Circuit Inspection". Immon Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. Immon 2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT Immon 1. Disconnect refrigerant pressure sensor harness connector. Immon 2. Turn ignition switch ON. Ground the voltage between refrigerant pressure sensor connector and ground. Immon Immon Immon Ground Voltage Immon Immon Immon Ground Approx. 5V	
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 REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Image: Connector Terminal Ground E50 3	OID:000000001581545
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 REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Refrigerant pressure sensor Ground Voltage Voltage Solution Solution Solution Solution Solution Solution Solution Substance S	
Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. 2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Image: Connector of the voltage between refrigerant pressure sensor connector and ground. Image: Connector of the voltage between refrigerant pressure sensor connector and ground. Image: Connector of the voltage between refrigerant pressure sensor connector of the voltage between refrigerant pressure sensor connector and ground. Image: Connector of the voltage between refrigerant pressure sensor connector of the voltage between refrigerant pressure sensor connector of the voltage between refrigerant pressure sensor of the voltage between refrigerant pressure sensor connector of the voltage between refrigerant pressure sensor connector of the voltage between refrigerant pressure sensor connector of the voltage between refrigerant pressure sensor of the voltage between refrigerant pressure sensor connector of the voltage between refrigerant pressure sensor of	
YES >> GO TO 2. NO >> Repair or replace ground connection. 2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Refrigerant pressure sensor Ground Voltage E50 3 Ground Approx. 5V	
NO >> Repair or replace ground connection. 2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT 1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Image: Connector Image: Connecto	
CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT Disconnect refrigerant pressure sensor harness connector. Turn ignition switch ON. Check the voltage between refrigerant pressure sensor connector and ground. <u>Refrigerant pressure sensor</u> <u>Ground</u> Voltage <u>Connector</u> <u>Terminal</u> <u>Sensor</u> <u>Ground</u> <u>Approx. 5V</u>	
1. Disconnect refrigerant pressure sensor harness connector. 2. Turn ignition switch ON. 3. Check the voltage between refrigerant pressure sensor connector and ground. Refrigerant pressure sensor Ground Voltage E50 Ground Approx. 5V	
Refrigerant pressure sensor connector and ground. Refrigerant pressure sensor Connector Terminal Voltage E50 3 Ground Approx. 5V	
Refrigerant pressure sensorGroundVoltageConnectorTerminalFoundApprox. 5V	
Connector Terminal Ground Voltage E50 3 Ground Approx. 5V	
E50 3 Ground Approx. 5V	
ESO S Ground Approx. SV	

3.DETECT MALFUNCTIONING PART

Check the following.

Harness connector E6, F123

[M9R]

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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 p	ressure sensor	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E50	1	F131	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 p	ressure sensor	ECM		Continuity	
Connector Terminal		Connector	Terminal	Continuity	
E50	2	F131	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:000000001581547

INFOID:000000001581546

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DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
D0544	Exhaust gas temperature sensor 1 circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors (Exhaust gas temperature sensor 1
1 0044	Exhaust gas temperature sensor 1 circuit high input	An excessively high voltage from the sensor is sent to ECM.	circuit is open or shorted.) Exhaust gas temperature sensor 1
IOD DTC	NFIRMATION PROCEDURE		
1.PREC	ONDITIONING		
If DTC Co least 20 s	onfirmation Procedure has been econds before conducting the n	n previously conducted, always tu ext test.	rn ignition switch OFF and wait a
>	-> GO TO 2.		
2.PERFC	ORM DTC CONFIRMATION PR	OCEDURE-I	
1. Turn i 2. Checl	gnition switch ON and wait at le k 1st trip DTC.	ast 10 seconds.	
<u>Is 1st trip</u>	DTC detected?		
YES >	So to <u>ECR-187, "Diagnosis F</u> SO TO 3	<u>Procedure"</u> .	
3.PERFO	DRM DTC CONFIRMATION PR	OCEDURE-II	
1. Start	engine and drive vehicle under	the following conditions for at lea	st 10 seconds.
- Gear - Vehic	position: 3rd position le speed: Accelerates from 55kr	n/h (34 MPH) to 70 km/h (43 MPI	H)
2. Uneci Is 1st trin	TSt trip DTC.		
YES > NO >	>> Go to <u>ECR-187, "Diagnosis F</u> >> INSPECTION END	Procedure".	
Diagnos	sis Procedure		INFOID:0000000015815
1. CHEC	K GROUND CONNECTIONS		
1. Turn i	gnition switch OFF and wait at I	east 20 seconds.	
2. Checl	k ground connection E17. Refer	to Ground inspection in <u>GI-41, "C</u>	Circuit Inspection".
Is the insp	pection result normal?		
	> GO TO 2. > Repair or replace around con	nection.	
	K EXHAUST GAS TEMPERATI	JRE SENSOR 1 POWER SUPPL	Y CIRCUIT
	nnect exhaust das temperature	sensor 1 harness connector	
2 Turn i	anition switch ON		

3. Check the voltage between exhaust gas temperature sensor 1 harness connector and ground.

P0544 EGT SENSOR 1

< COMPONENT DIAGNOSIS >

[M9R]

Exhaust gas tem	Ground	Voltago	
Connector	Terminal	Giodila Voltage	
F142	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 ten	nperature sensor 1	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F142	2	F131	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

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INFOID:000000001581549

[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.	Battery Battery terminal
		An improper voltage is sent to ECM through battery	Alternator IPDM E/R
DTC CON	IFIRMATION PROCED	DURE	
1.PRECC	NDITIONING		
If DTC Co least 20 se	nfirmation Procedure has econds before conducting	s been previously conducted, all the next test.	ways turn ignition switch OFF and wait at
>	> GO TO 2.		
2.PERFC	RM DTC CONFIRMATIO	ON PROCEDURE	
1. Turn iç	gnition switch ON and wa	it at least 30 seconds.	
Is 1st trip [DTC detected?		
YES >	> Go to <u>ECR-189, "Diagr</u>	nosis Procedure".	
Diagnos	is Procedure		INECUD:00000001581550
1.снеск	BATTERY VOLTAGE		
1. Turn ig 2. Check	gnition switch ON.		
Vo	Itage: Above 11V		
Is the insp	ection result normal?		
YES >	> GO TO 2.		
	BATTERY TERMINALS		
1. Turn ig	gnition switch OFF and w	ait at least 20 seconds.	
2. Check	battery terminals conditi	on.	
YES >	> GO TO 3.		
NO >	> Repair the battery term	inals.	
3.CHECK	BATTERY AND ALTER	NATOR	
Check that Refer to, P	t the proper type of batter <u>'G-116, "Battery"</u> and <u>CH</u>	ry and type of alternator are insta <u>G-35, "Alternator"</u> .	illed.
Is the insp	ection result normal?		
YES > NO >	> GO TO 4. > Replace with a proper	one.	
4.CHECK	ECM POWER SUPPLY	CIRCUIT-I	

Check the voltage between ECM harness connector and ground.

P0560 BATTERY VOLTAGE

< COMPONENT DIAGNOSIS >

EC	CM	Ground	Voltago	
Connector	Terminal	Ground	vollage	
F132	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 E11.
- 3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDN	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E132	93	E 11	0	Existed
L132	94		9	LAISIEU

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, F121

• 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 E11.
- 3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDN	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F132	62	E11	15	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, F121

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. 52) from IPDM E/R.

2. Check 20A fuse.

Is the inspection result normal?

		P0	560 BATTI	ERY VOLTAGE		
< COMPON	ENT DIAGNO	OSIS >			[M9R]	
YES >>	GO TO 10. Replace 20A f					^
10.снеск	GROUND C	ONNECTION				A
Check groun	nd connection	E17. Refer to	Ground Inspe	ection in GI-41, "Circuit Inspection".		500
Is the inspec	tion result nor	mal?				ECR
YES >>	GO TO 11. Repair or repla	ace around co	nnection			
11.снеск	CECM GROUN	ND CIRCUIT	FOR OPEN A	ND SHORT		С
1. Check th	ne continuity b	etween ECM	harness conn	ector and ground.		
	_		T			D
E	ECM Torminal	Ground	Continuity			
Connector	123			-		Е
E 404	124	-	Eviated			
EIZI	125	Giouna	EXISIED			F
	128			-		
2. Also che Is the inspec	ck narness to	r snort to pow mal?	/er.			G
YES >>	GO TO 12.					
NO >>	Repair open ci	ircuit or short	power in harn	ess or connectors.		Н
		ENT INCIDEN	11			
Is the inspec	tion result nor	mal?				I
YES >>	Replace IPDM	IE/R.				
NO >>	Repair or repla	ace.				J
						K
						L
						M
						*
						Ν
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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:000000001581552

INFOID:000000001581551

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.	 Harness or connectors (The switch circuit is open or shorted.) ASCD steering switch 	
		ECM detects that the ASCD steering switch is stuck ON.	

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:000000001581553

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]

Connector	- · ·	~			Condition	Voltage	
Connector	Terminal	Connector	Terminal				
				MAIN swite	ch: Pressed	Approx. 0	
	110		111	CANSEL s	witch: Pressed	Voltage	
E121	(ASCD steering	E121	(ASCD steerin	SET/COAS	ST switch: Pressed	Approx. 2	
	Switch Signal)		Switch ground	RESUME/	ACCELERATE switch: Pressed	Approx. 3	
				All ASCD s	teering switches: Released	Approx. 4	
CHECK A Turn ign Disconn Disconn Check tl	GO TO 8. GO TO 3. ASCD STEERIN ition switch OFF ect combinatior ect ECM harnes he continuity be	IG SWITCH (and wait at switch harn ss connector. tween combi	GROUND CIR least 20 seco ess connector nation switch	CUIT FOR nds. (spiral cable	OPEN AND SHORT) and ECM harness connect	ctor.	
Combinatio	on switch (spiral cat		ECM				
				Terminal	- Continuity		
Connector	161111110		:101	111	Existed	-	
<u>the inspec</u> YES >> NO >> .DETECT	GO TO 5. GO TO 5. GO TO 4. MALFUNCTIOI	NING PART					
s the inspec YES >> NO >> DETECT Harness co Combination Harness fo >> O.CHECK A	GO TO 5. GO TO 5. GO TO 4. MALFUNCTION onnectors M77, on switch (spira or open or short Repair open circ ASCD STEERIN he continuity be	NING PART E105 I cable) between EC cuit or short t IG SWITCH I	M and combir o ground or sl NPUT SIGNA nation switch	ation switch hort to powe L CIRCUIT (spiral cable	r in harness or connectors. FOR OPEN AND SHORT) and ECM harness connec	ctor.	
the inspec YES >> NO >> DETECT Harness cr Combinatio Harness fo >> CHECK A . Check the Combinatio	GO TO 5. GO TO 5. GO TO 4. MALFUNCTIOI onnectors M77, on switch (spira or open or short Repair open circ ASCD STEERIN he continuity be	NING PART E105 I cable) between EC cuit or short t IG SWITCH I tween combi	M and combir o ground or sl NPUT SIGNA nation switch ECM	ation switch hort to powe L CIRCUIT (spiral cable	r in harness or connectors. FOR OPEN AND SHORT) and ECM harness connec	ctor.	
the inspec YES >> NO >> DETECT Harness co Combination Harness for >> O.CHECK A Check the Combination Combination	GO TO 5. GO TO 5. GO TO 4. MALFUNCTION onnectors M77, on switch (spira or open or short Repair open cire ASCD STEERIN he continuity be	NING PART E105 I cable) between EC cuit or short t IG SWITCH I tween combi	M and combir o ground or sl NPUT SIGNA nation switch ECM	ation switch hort to powe L CIRCUIT (spiral cable	r in harness or connectors. FOR OPEN AND SHORT) and ECM harness connect	ctor.	
the inspec YES >> NO >> .DETECT Harness co Combination Harness for >> .CHECK A . Check the Combination Connector 	GO TO 5. GO TO 5. GO TO 4. MALFUNCTION onnectors M77, on switch (spira or open or short Repair open cire ASCD STEERIN he continuity be on switch (spiral cat r Termina 14	NING PART E105 I cable) between EC cuit or short t IG SWITCH I tween combi	M and combir o ground or sl NPUT SIGNA nation switch ECM inector	ation switch hort to powe L CIRCUIT (spiral cable Terminal 110	r in harness or connectors. FOR OPEN AND SHORT) and ECM harness connec 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	MAIN switch: Pressed		
		MAIN switch: Pressed	Approx. 0 Ω	
		CANCEL switch: Pressed	Approx. 250 Ω	
M352	14 and 15 (Combination switch)	SET/COAST switch: Pressed	Approx. 660 Ω	
		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:000000001581554

P0571 BPP SWITCH

Description

Brake pedal position signal is applied to the ECM through the stop lamp switch 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:000000001581556

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause		
P0571	Brake pedal position switch/stop lamp switch inconsistency	Stop lamp switch does not operate properly	 Harness or connectors (Stop lamp switch circuit is open or shorted) (The CAN communication line is open or shorted) Stop lamp switch BCM 		
DTC CON	FIRMATION PROCEDUR	E			
1.PRECO	NDITIONING		(
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.PERFO	RM DTC CONFIRMATION P	ROCEDURE			
 Start en Apply s Check 	ngine and let it idle for at leas service brake for at least 30 s 1st trip DTC.	st 30 seconds. seconds.			
<u>Is 1st trip D</u>	TC detected?				
YES >> NO >>	 Go to <u>ECR-195, "Diagnosis</u> INSPECTION END 	Procedure".	I		
Diagnosi	s Procedure		INFOID:000000001581557		

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 STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch ON.

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

ECM		Ground		Condition	Voltage
Connector	Terminal	Ground		Condition	
E121	116	Ground	Broko podol	Fully released	Battery voltage
EIZI	(Stop lamp switch)	Ground	Blake pedal	Slightly depressed	0V

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 3.

NO >> GO TO 3.

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P0571 BPP SWITCH

< COMPONENT DIAGNOSIS >

$\overline{\mathbf{3.}}$ Check stop lamp switch power supply circuit

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

Stop lan	np switch	Ground	Voltago	
Connector	Connector Terminal		voltage	
E118	4	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. 4)

Harness for open or short between fuse and stop lamp switch

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

5. Check stop LAMP 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 stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		E	Continuity		
Connector	Terminal	Connector	Terminal	Continuity	
E118	3	E121	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 STOP LAMP SWITCH

Refer to ECR-197, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace stop lamp switch.

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7. СНЕСК ВСМ
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Refer to BCS-18, "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-28, "CAN Communication Signal Chart".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace

9.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

) <<	NSPECTION	END			А	
Componer	nt Inspectio	n		INFOID:000000001581558		
1.CHECK S	TOP LAMP S	WITCH-I			ECF	
 Turn ignit Disconne Check the 	tion switch Of act stop lamp e continuity b	F. switch harness conr etween stop lamp s	nector. witch terminals ι	under the following conditions.	С	
Terminals	Terminals Condition Continuity					
1 and 2	Brake pedal	Fully released	Not existed	-	D	
3 and 4	Brake pedal	Fully released Slightly depressed	Existed Not existed	-	Ε	
<u>Is the inspect</u> YES >> II	ion result nor	<u>mal?</u> END		•	F	
NO >> G 2.CHECK S	GO TO 2. TOP LAMP S	WITCH-II			G	
 Adjust sto <u>"Inspectio</u> Check the 	op lamp switc on and Adjust e continuity b	ch installation. Refer <u>ment"</u> (RHD models etween stop lamp s [,]	to <u>BR-8, "Inspe</u> s). witch terminals ι	ction and Adjustment" (LHD models) or <u>BR-55,</u> Inder the following conditions.	Н	
Terminals		Condition	Continuity	-		
1 and 2	Praka podal	Fully released	Not existed	-		
T and Z	Diake peual	Slightly depressed	Existed	-		
3 and 4	Brake pedal	Fully released	Existed	_	J	
	'	Slightly depressed	Not existed	-		
Is the inspect YES >> II NO >> R	<u>ion result nor</u> NSPECTION Replace stop l	<u>mal?</u> END amp switch.			Κ	
					L	
					M	
					Ν	
					0	
					Ρ	

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:000000001581560

INFOID:000000001581561

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.	 Harness or connectors (ASCD steering switch circuit is open or shorted.) ASCD steering switch

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.
- 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 and ground.

	(+)	(-)		Condition		
Connector	Terminal	Connector	Terminal	Condition	voltage	
				MAIN switch: Pressed	Approx. 0V	
	110		111	CANSEL switch: Pressed	Approx. 1V	
E121	(ASCD steering	E121	(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.

INFOID:000000001581559

P0575 ASCD STEERING SWITCH

< COMPONENT DIAGNOSIS >

[M9R]

3.CHECK ASC	D STEERING SV	VITCH GROUND	CIRCUIT FOR	OPEN AND SHO	 २T
 Turn ignition Disconnect Disconnect Check the c 	n switch OFF and combination switc ECM harness cor continuity betweer	wait at least 20 s ch harness conne nector. n combination sw	seconds. ector. itch (spiral cable) and ECM harnes	ss connector.
Combination sw	vitch (spiral cable)	F(CM		
Connector	Terminal	Connector	Terminal	Continuity	
	15	E121	111	Existed	
5. Also check l	harness for short	to ground and sh	ort to power.		
Is the inspection	result normal?	-	·		
YES >> GO	TO 5.				
NO >> GO		DADT			
4.DETECT MA	LFUNCTIONING	PARI			
 Harness conne Combination s 	ectors M77, E105 witch (spiral cable	_)			
 Harness for op 	pen or short betwe	een ECM and cor	mbination switch	I	
>> Rep	air open circuit or	short to ground	or short to powe	r in harness or co	nnectors.
5. CHECK ASC	D STEERING SV	VITCH INPUT SI	GNAL CIRCUIT	FOR OPEN AND	SHORT
1. Check the c	ontinuity betweer	combination sw	itch (spiral cable) and ECM harnes	ss connector.
Combination sw	vitch (spiral cable)	EC	CM		
Connector	Terminal	Connector	Terminal	- Continuity	
	14	E6121	110	Existed	
2. Also check I	harness for short	to ground and sh	ort to power.		
Is the inspection	result normal?				
YES >> GO	TO 7.				
6 DETECT MA					
		FARI			
 Harness conne Combination s 	ectors M77, E105 witch (spiral cable	ə)			
Harness for op	pen or short betwe	en ECM and cor	mbination switch	I	
>> Rep	pair open circuit or	short to ground	or short to powe	r in harness or co	nnectors.
I.CHECK ASC	D STEERING SV	VITCH			
Refer to ECR-19	<u>99, "Component Ir</u>	nspection".			
Is the inspection	result normal?				
YES >> GO	TO 8.	na switch			
		ny Swiich. Dent			
Refer to <u>GI-39, "</u>	Intermittent Incide	<u>ent"</u> .			
Component					
Component	nspection				INFOID:000000001581562
1.CHECK ASC	D STEERING SV	VITCH			

1. Disconnect combination switch (spiral cable) harness connector M352.

P0575 ASCD STEERING SWITCH

< COMPONENT DIAGNOSIS >

2. Check the continuity between combination switch harness connector terminals under following conditions.

Combination meter		Condition	Posistanco	
Connector	Terminals	Condition	Resistance	
	M352 14 and 15 (Combination switch)	MAIN switch: Pressed	Approx. 0 Ω	
		CANCEL switch: Pressed	Approx. 250 Ω	
M352		SET/COAST switch: Pressed	Approx. 660 Ω	
(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	
		han a second	
lt DTC Con least 20 sec	infirmation Procedure has	the next test	n ignition switch OFF and wait a
000120000			
>>	GO TO 2.		
2.PERFOR	RM DTC CONFIRMATIO	N PROCEDURE FOR MALFUNCTION	
1 Turn ia	nition switch ON		
2. Check	1st trip DTC.		
s 1st trip D	TC detected?		
YES >>	Go to ECR-201, "Diagn	osis Procedure".	
NO >>	INSPECTION END		
Diagnosi	s Procedure		INFOID:00000000158156
1			
I.INSPEC	TION START		
With CO	NSULT-III		
1. Turn ig 2. Select '	"SELF-DIAG RESULTS"	mode with CONSULT-III.	
3. Touch '	'ERASE".		
4. Perfor		PROCEDURE.	
טפפ <u>) </u> פס מ ו ווער:	<u>JR-201, "DTG LOGIC"</u> . T		
≝ Turn ia	nition switch ON.		
2. Select	Service \$04 with GST.		
3. Perfori		PROCEDURE.	
See <u>c</u>	<u>N-201, DIGLOUIC</u> .	again?	
	COTO 2	ayanı:	
NO >>	INSPECTION END		
2.REPLAC	CE ECM		
-			

A INFOID:000000001581563



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INFOID:000000001581564

P0606 ECM

< COMPONENT DIAGNOSIS >

2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

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
DTC CON	FIRMATION PROCED	URE	
1.PRECO	NDITIONING		
	firmation Procedure bas	been previously conducted always tur	a ignition switch OFF and wait a
east 20 se	conds before conducting	the next test.	rightion switch of r and wait a
	0		
>>	GO TO 2.		
2.PERFO	RM DTC CONFIRMATIO	N PROCEDURE FOR MALFUNCTION	
1. Turn ig	nition switch ON.		
2. Check	1st trip DTC.		
<u>s 1st trip D</u>	TC detected?		
YES >>	Go to ECR-203, "Diagn	osis Procedure".	
Jiagnosi	s Procedure		INFOID:00000000158156
1.INSPEC	TION START		
With CO			
1. Turn ig	nition switch ON.		
2. Select	"SELF-DIAG RESULTS"	mode with CONSULT-III.	
3. Iouch 4 Perfor	"ERASE". m DTC CONFIRMATION		
See EC	CR-203, "DTC Logic".		
With GS	T		
1. Turn ig 2 Select	Nition switch ON. Service \$04 with GST		
3. Perfor	m DTC CONFIRMATION	I PROCEDURE.	
See <u>E(</u>	CR-203, "DTC Logic".		
is the 1st tr	ip DTC P060B displayed	again?	
YES >>	GO TO 2.		
אי שאו >> 2 מרחי אי			
 Replace 	e ECM.		

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INFOID:000000001581567

INFOID:000000001581566

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P060B ECM

< COMPONENT DIAGNOSIS >

2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

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.	 CONSULT-III communication status (The status of CONSULT-III communication becomes improper during Injector Adjustment Value Registration.) ECM 	,
	Injector adjustment value data uninput	At least one injector adjustment value is not stored in ECM.	 Injector adjustment value (Injector adjustment value has not been written onto ECM memory yet, or the value has been initialized.) 	ŀ

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".

ECR-205

INFOID:000000001581569

INFOID:000000001581570

[M9R]

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INFOID:00000000158157

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 CON	FIRMATION PROCED	URE	
1. PRECO	NDITIONING		
If DTC Cor	nfirmation Procedure has	been previously conducted, always tur	n ignition switch OFF and wait a
least 20 se	conds before conducting	the next test.	5
>> • • • • • •	• GO TO 2.		
Z .PERFO	RM DTC CONFIRMATIO	N PROCEDURE FOR MALFUNCTION	
1. Turn ig	nition switch ON.		
∠. Check Is 1st trip Γ	TC detected?		
YES >>	Go to ECR-207, "Diagn	osis Procedure".	
NO >>	INSPECTION END		
Diagnosi	s Procedure		INFOID:00000000158157
1			
I.INSPEC	CTION START		
With CO	NSULT-III		
1. Turn ig 2. Select	INITION SWITCH OIN.	mode with CONSULT-III.	
3. Touch	"ERASE".		
4. Perfor		I PROCEDURE.	
ા ≣With GS	ST		
1. Turn ig	nition switch ON.		
2. Select	Service \$04 with GST.		
3. Perfor See E(CR-207. "DTC Logic".	I PROCEDURE.	
ls the 1st tr	ip DTC P0606 displayed	again?	
YES >>	• GO TO 2.		
NO >>	INSPECTION END		
2.REPLA	CE ECM		
1. Replac	e ECM.		

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INFOID:000000001581573

P062B ECM

< COMPONENT DIAGNOSIS >

2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

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

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 least 20 see	firmation Procedure has be conds before conducting the	een previously conducted, always tur e next test.	n ignition switch OFF and wait a
>>	GO TO 2.		
2.PERFO	RM DTC CONFIRMATION I	PROCEDURE-I	
1. Turn ig	nition switch ON and wait a	t least 10 seconds.	
2. Check Is 1st trip D	TSI INP DTC. TC detected?		
YES >>	Go to ECR-209, "Diagnosi	s Procedure".	
NO >>	GO TO 3.		
3. PERFO	RM DTC CONFIRMATION I	PROCEDURE-II	
 Turn ig Turn ig Check 	nition switch OFF and wait a nition switch ON and wait a 1st trip DTC.	at least 20 seconds. t least 10 seconds.	
<u>Is 1st trip D</u>	TC detected?		
YES >> NO >>	 Go to <u>ECR-209, "Diagnosi</u> INSPECTION END 	<u>s Procedure"</u> .	
Diagnosi	s Procedure		INFOID:00000000158157
1.INSPEC	TION START		
With CO	NSULT-III		
1. Turn ig	nition switch ON. "SELE-DIAC RESULTS" ma		
3. Touch '	'ERASE".		
4. Perfor	m DTC CONFIRMATION P	ROCEDURE.	
	<u>CR-209, "DTC Logic"</u> . T		
1 Turn io	I nition switch ON		
2. Select	Service \$04 with GST.		

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INFOID:000000001581575

INFOID:000000001581576

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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".

P0641 SENSOR POWER SUPPLY

< COMPONENT DIAGNOSIS >

DTC DETECTION LOGIC

P0641 SENSOR POWER SUPPLY

DTC Logic

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INFOID:000000001581578

[M9R]

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 1 power supply circuit is shorted.) (Turbocharger boost sensor circuit is shorted.)
P0641	Sensor power supply circuit high	ECM detects a voltage of power source for sensor is excessively high.	 (Exhaust gas pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 1) Turbocharger boost sensor Exhaust gas pressure sensor
DTC CON	FIRMATION PROCE	DURE	
1. PRECO	NDITIONING		
If DTC Cor least 20 se	nfirmation Procedure ha conds before conducting	s been previously conducted g the next test.	I, always turn ignition switch OFF and wait at
>>	• GO TO 2.		
2.PERFO	RM DTC CONFIRMATIO	ON PROCEDURE	
1. Start e 2. Check	ngine and let it idle for a 1st trip DTC.	t least 10 seconds.	
<u>Is 1st trip D</u>	TC detected?		
YES >> NO >>	> Go to <u>ECR-211, "Diag</u> e > INSPECTION END	nosis Procedure".	
Diagnosi	s Procedure		INFOID:000000001581579
1. снеск	GROUND CONNECTIO	NC	
1. Turn ig	nition switch OFF and w	vait at least 20 seconds.	
 Check Is the inspectively 	ground connection E 17	. Refer to Ground Inspection	in <u>GI-41, Circuit Inspection</u> .
YES >>	> GO TO 2.		
NO >>	Repair or replace grou	nd connection.	
2.CHECK	ACCELERATOR PEDA	L POSITION SENSOR 1 PC	WER SUPPLY CIRCUIT
1. Discon 2. Turn ig	nect accelerator pedal p nition switch ON.	oosition (APP) sensor harnes	s connector.
3. Check	the voltage between AF	PP sensor harness connector	and ground.
/	APP sensor		
Connecto	or Terminal G	round Voltage	
E110	4 G	round Approx. 5V	
Is the inspe	ection result normal?		
YES >>	• GO TO 4.		
NO >>	> GO TO 3.		
J.CHECK	SENSOR POWER SUF	PPLY CIRCUITS	

Check harness for short to power and short to ground, between the following terminals.

P0641 SENSOR POWER SUPPLY

< COMPONENT DIAGNOSIS >

[M9R]

ECM		Sensor			
Connector	Terminal	Name	Connector	Terminal	
E121	122	Accelerator pedal position sensor	E110	4	
F131	25	Exhaust gas pressure sensor	F150	1	
1131	21	Turbocharger boost sensor	F91	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".

P0651 SENSOR POWER SUPPLY

< COMPONENT DIAGNOSIS >

P0651 SENSOR POWER SUPPLY

DTC Logic

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INFOID:000000001581581

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.)
P0651	Sensor power supply circuit high	ECM detects a voltage of power source for sensor is excessively high.	 (Differential exhaust pressure sensor circuit is shorted.) (EGR volume control valve control position sensor circuit is shorted.) (Throttle position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 2) Exhaust differential pressure sensor EGR volume control valve control position sensor Throttle position sensor Refrigerant pressure sensor Refrigerant pressure sensor
DTC CO 1.prec	NFIRMATION PROCE	DURE	
If DTC C least 20 s	onfirmation Procedure h seconds before conductir	as been previously conducted, ng the next test.	always turn ignition switch OFF and wait a
	>> GO TO 2.		
2.perf	ORM DTC CONFIRMAT	ION PROCEDURE	
1. Start 2. Chec	engine and let it idle for k 1st trip DTC.	at least 10 seconds.	
Is 1st trip	DTC detected?		

YES >> Go to ECR-213, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

CHECK GROUND CONNECTION
 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 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	Cround	vollage	
E110	5	Ground	Approx. 5V	

Is the inspection result normal?

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

NO >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
E121	118	APP sensor	E110	5
F132	75	Throttle position sensor	F148	3
	37	Exhaust differential pressure sensor	F135	3
F131	33	EGR volume control valve (EGR volume control valve control posi- tion sensor)	F99	4
	41	Refrigerant pressure sensor	E50	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-</u> <u>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".

P0651 SENSOR POWER SUPPLY		
< COMPONENT DIAGNOSIS > [M9R]		
Is 1st trip DTC P0651 displayed again?		
YES >> GO TO 11.	А	
NO >> INSPECTION END		
	FCR	
1. Replace ECM.		
2. Go to ECR-12, ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT: Special Repair Require- ment".		
	С	
>> INSPECTION END		
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P0670 GLOW CONTROL SYSTEM

DTC Logic

[M9R]

INFOID:000000001581582

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.	Harness or connectors (Clow control unit circuit is open or chorter)	
		ECM detects open circuit in output signal circuit.	Glow control unit	

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:000000001581583

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	Ciouna	voltage	
F94	4	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.
P0670 GLOW CONTROL SYSTEM

[M9R]

2. DETECT MA	LFUNCTIONIN	G PART				Δ
Check the follow • 80A fusible link • Harness for op	ving. k (letter N) ben and short be	tween glow contro	ol unit and battery	/		ECR
>> Rep	air open circuit	or short to ground	or short to powe	r in harness or co	nnectors.	
3. CHECK GLO	W CONTROL L	INIT GROUND CII	RCUIT FOR OPE	EN AND SHORT		С
 Turn ignition Disconnect Check the c 	n switch OFF an ECM harness c ontinuity betwee	d wait at least 20 s onnector. en glow control uni	seconds. t harness conne	ctor and ECM hai	ness connector.	D
Glow co	ontrol unit	E	CM	Continuity		_
Connector	Terminal	Connector	Terminal	Continuity		E
F94	5	F131	9	Existed		
4. Also check h	harness for sho	t to ground and sh	ort to power.			F
Is the inspection	result normal?					
YES >> GO NO >> Rep 4. CHECK GLO	TO 4. air open circuit W CONTROL L	or short to ground	or short to powe	r in harness or co OR OPEN AND \$	nnectors. SHORT	G
1. Check the c	ontinuity betwee	en glow control uni	t harness conne	ctor and ECM har	ness connector.	Н
Glow co	ontrol unit	E	CM	Continuity		
Connector	Terminal	Connector	Terminal	Continuity		
F94	8	F132	63	Existed		
2. Also check h	harness for sho	t to ground and sh	ort to power.			
Is the inspection	result normal?					J
YES >> GO NO >> Rep	TO 5. air open circuit	or short to ground	or short to powe	r in harness or co	nnectors.	
5. CHECK INTE	RMITTENT INC	CIDENT				r.
Refer to GI-39, "	Intermittent Inci	dent".				
Is the inspection	result normal?					L
YES >> Rep NO >> Rep	lace glow contro air or replace.	ol unit.				
Component I	nspection				INFOID:000000001581584	Μ
1.CHECK GLO	W PLUG					NI
 Turn ignition Disconnect Check resist 	n switch OFF. glow plug harne tance between e	ss connector. glow plug terminals	s as follows.			
Tormina	1	Popiatanaa				0
	round (1 - 1 0 0 [at 20°C /69	°F)]			
le the inenection		1.0 32 [dt 20 0 (00	• /1			Ρ
YES >> INS	PECTION END					

NO >> Replace malfunctioning glow plug.

P0685 ECM RELAY

< COMPONENT DIAGNOSIS >

P0685 ECM RELAY

DTC Logic

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

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	
F132	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 E11.
- 3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

E	СМ	IPDN	M E/R	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F132	93	F11	٩	Existed
1 152	94		9	LAISIEU

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

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 3. INFOID:000000001581585

P0685 ECM RELAY

< COMPONE	ENT DIAGNO	OSIS >			[M9R]
3.DETECT	MALFUNCTIO	ONING PART			Δ
Check the fol • Harness or • Harness for	lowing. connectors E r open or sho	7, F121 t between EC	CM and IPDM	E/R	A
>> F 4. СНЕСК Е	Repair open c CM POWER	ircuit or short SUPPLY CIR	to ground or s CUIT-III	hort to power in harness or connectors.	C
 Disconne Disconne Disconne Check th 	ect ECM harn ect IPDM E/R e continuity b	ess connecto harness conr etween ECM	r. nector E11. harness conn	ector and IPDM E/R harness connector.	D
E	СМ	IPD	M E/R		
Connector	Terminal	Connector	Terminal	Continuity	E
F132	62	E11	15	Existed	
4. Also che	ck harness fo	r short to arou	und and short	to power.	F
Is the inspect	ion result nor	mal?		·	I
YES >> C	GO TO 5				
_NO >> F	Repair open c	ircuit or short	to ground or s	hort power in harness or connectors.	G
5. CHECK 20	0A FUSE				
1. Disconne	ect 20A fuse (No. 52) from	IPDM E/R.		н
2. Check 20	DA fuse.	10			11
Is the inspect	<u>ion result nor</u>	mal?			
YES >> (NO >> F	50 10 6. Replace 20A f	use			I
6.CHECK G	ROUND CON				
Check group	d connection	F17 Refer to	Ground Inspe	ction in GI-41 "Circuit Inspection"	
Is the inspect	ion result nor	mal?			0
YES >> (GO TO 7.				
NO >> F	Repair or repla	ace ground co	onnection.		K
7. СНЕСК Е	CM GROUNE	CIRCUIT FO	OR OPEN ANI	D SHORT	
1. Check th	e continuity b	etween ECM	harness conn	ector and ground.	
	•			-	L
E	СМ	Cround	Continuity		
Connector	Terminal	Ground	Continuity		M
	123				
F 464	124		Eviet 1		
E121	125	Ground	Existed		Ν
	128	1			
2. Also che	ck harness fo	r short to pow	ver.		0
Is the inspect	<u>ion result nor</u>	mal?			0
YES >> C	GO TO 8.				
NO >> F	Repair open c	ircuit or short	power in harn	ess or connectors.	Р
8.CHECK IN	ITERMITTEN	IT INCIDENT			
Refer to GI-3	9, "Intermitter	nt Incident".			
le the increat	ion result per	mal2			

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:000000001581587

INFOID:000000001581588

[M9R]

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0607	Sensor power supply circuit low	ECM detects a voltage of power source for sensor is excessively low.	Harness or connectors (Fuel rail pressure sensor circuit is shorted.)
1 0037	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 pres	ssure sensor	Ground	Voltage
Connector	Terminal	Ground	vollage
F139	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]

E	СМ	Se	nsor		A
Connector	Terminal	Name	Connector	Terminal	
F131	29	Fuel rail pressure sensor	F139	1	ECE
Is the inspecti	on result norr	<u>mal?</u>			
YES >> G NO >> R	O TO 4. epair short to	ground or short to power	in harness or	connectors.	C
4.CHECK FU	JEL RAIL PRI	ESSURE SENSOR			C
Refer to ECR.	-151, "Compo	nent Inspection".			
Is the inspecti	on result norr	<u>mal?</u>			D
YES >> G NO >> R	iO TO 5. eplace fuel ra	ail pressure sensor.			
5.CHECK IN	TERMITTEN	TINCIDENT			E
Refer to GI-39	9, "Intermitten	t Incident".			
					F
>> II'	NSPECTION I	END			
					G
					Н
					I
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P1201, P1202, P1203, P1204 FUEL INJECTOR

< COMPONENT DIAGNOSIS >

P1201, P1202, P1203, P1204 FUEL INJECTOR

Description

INFOID:000000001581589

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:000000001581590

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.	(The fuel injector circuit is open or
P1203	Fuel injector No. 3 performance	Fuel injector No. 3 does not operate properly.	shorted.)
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:000000001581591

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	F144	1		6	
2	F145	1	E121	7	Evictod
3	F146	1		8	Existed
4	F147	1	1	5	

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]



	Fuel injector		EC	M	Continuity
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F144	2		2	
2	F145	2	E121	3	Evictod
3	F146	2		4	EXISTED
4	F147	2		1	
. Also check ha	arness for short to g	round and short to	o power.		
s the inspection r	esult normal?				
YES >> GO T	O 3. ir open circuit or sha	ort to ground or sh	port to power in ha	rness or connec	tore
			ion to power in na		1013.
		a Cara II			
the inspection r	esult normal?	<u>ection</u> .			
YFS >> GO T	0 4				
NO >> Repla	ace fuel injector.				
CHECK INTER	RMITTENT INCIDEN	IT			
efer to <u>GI-39,</u> "Ir	ntermittent Incident".				
>> INSP	ECTION END				
component In	spection				INFOID:000000001581592
. Turn ignition s	switch OFF. Jel injector barness (
. Check resista	nee between fuel in	ronnector			
	ince between luerin	connector. jector terminals a	s follows.		
		connector. jector terminals a	s follows.		
Terminals	Resistance	connector. jector terminals a	s follows.		
Terminals 1 and 2	Resistance	connector. jector terminals a	s follows.		
Terminals 1 and 2 5 the inspection r	Resistance 178.2 - 181.8Ω esult normal?	connector. jector terminals a	s follows.		
Terminals 1 and 2 s the inspection r YES >> INSP NO >> Repla	Resistance 178.2 - 181.8Ω esult normal? ECTION END acce malfunctioning fr	connector. jector terminals a	s follows.		
Terminals 1 and 2 5 the inspection r YES >> INSP NO >> Repla	Resistance 178.2 - 181.8Ω esult normal? ECTION END ace malfunctioning fu	connector. jector terminals a	s follows.		
Terminals 1 and 2 5 the inspection r YES >> INSP NO >> Repla	Resistance 178.2 - 181.8Ω esult normal? ECTION END ace malfunctioning fu	connector. jector terminals a 	s follows.		
Terminals 1 and 2 5 the inspection r YES >> INSP NO >> Repla	Resistance 178.2 - 181.8Ω esult normal? ECTION END ace malfunctioning fu	connector. jector terminals a	s follows.		
Terminals 1 and 2 the inspection r YES >> INSP NO >> Repla	Resistance 178.2 - 181.8Ω esult normal? ECTION END ace malfunctioning fu	connector. jector terminals a 	s follows.		
Terminals 1 and 2 the inspection r YES >> INSP NO >> Repla	Resistance 178.2 - 181.8Ω esult normal? ECTION END ace malfunctioning fu	connector. jector terminals a	s follows.		
Terminals 1 and 2 the inspection r YES >> INSP NO >> Repla	Resistance 178.2 - 181.8Ω esult normal? ECTION END ace malfunctioning fu	connector. jector terminals a	s follows.		

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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:000000001581594

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		A INFOID:000000001581595
1.CHECK DPF		EC
Refer to ECR-232, "Component Inspection	<u>n"</u> .	EC
<u>OK or NG</u>		
OK >> INSPECTION END		С
2 pediace ppe		
		D
2. Perform "DPF Data Clear". Refer to \underline{E}	CR-17, "DPF DATA CLEAR	: Special Repair Requirement".
>> INSPECTION END		E
Component Inspection		INFOID:000000001581596
1.CHECK DPF-I		F
Check DPF for damage.		
Is the inspection result normal?		G
YES >> GO TO 2.		
		Н
1 Derform "Service Degeneration" D	ofor to ECD 17 "SED\//CE	E RECENERATION : Special Repair
Requirement".	elei lu <u>eck-17, sekvici</u>	
2. Start engine and warm it up to normal	operating temperature.	1
4. Select "DIFF EXH PRES" and check t	the indication under the follow	ving conditions.
		J
Condition	DIFF EXH PRES [mbar]	
• ENGINE SPEED: 2000 tr/min	Less then 2.0	К
 EXH GAS TEMP2: 150 - 200 C (302 - 392 F) EXH GAS TEMP3: 150 - 200°C (302 - 392°F) 	Less than 5.0	
Is the inspection result normal?		
YES >> INSPECTION END		L
NO $>>$ GO 10 3.		
		M
 Replace DPF. Perform "DPF Data Clear". Refer to E 	CR-17, "DPF DATA CLEAR	<u>: Special Repair Requirement"</u> .
_		N
>> INSPECTION END		
		0

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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:000000001581598

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:000000001581599
1.CHECK DPF		ECT
Refer to ECR-232, "Component Inspection	<u>n"</u> .	
<u>OK or NG</u>		
OK >> INSPECTION END		С
2 pediace ppe		
		D
2. Perform "DPF Data Clear". Refer to \underline{E}	CR-17, "DPF DATA CLEAR : Special R	epair Requirement".
>> INSPECTION END		Е
Component Inspection		INFOID:000000001581600
1.CHECK DPF-I		F
Check DPF for damage.		
Is the inspection result normal?		G
YES >> GO TO 2.		
		Н
1 Derform "Service Degeneration" D	ofer to ECD 17 "SEDVICE DECEN	EDATION : Special Depair
Requirement".	elei lo <u>ecr-17, service regen</u>	
2. Start engine and warm it up to normal	operating temperature.	I
4. Select "DIFF EXH PRES" and check t	the indication under the following condit	ions.
	U	J
Condition	DIFF EXH PRES [mbar]	
• ENGINE SPEED: 2000 tr/min		K
 EXH GAS TEMP2: 150 - 200°C (302 - 392°F) EXH GAS TEMP3: 150 - 200°C (302 - 392°F) 	Less than 3.0	
Is the inspection result normal?		
YES >> INSPECTION END		L
NO >> GO TO 3.		
J. REPLACE DPF		M
 Replace DPF. Perform "DPF Data Clear". Refer to E 	CR-17, "DPF DATA CLEAR : Special R	epair Requirement".
		Ν
>> INSPECTION END		
		0

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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

MBIB1517E

INFOID:000000001581602

INFOID:000000001581601

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 trap-Κ ping particulate matter and regeneration.

DTC Logic

INFOID:000000001581605

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DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	N
P2002	Diesel particulate filter (DPF) efficiency below threshold	 Differential exhaust pressure exceeds a standard level for more than 10 seconds. Exhaust gas temperature does not raise during DPF regeneration. 	 DPF Exhaust gas temperature sensor 2 Exhaust gas temperature sensor 3 	١

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

Start engine and let it idle for at least 5 minutes. 1.

Drive vehicle under the following conditions for at least 2 minutes. 2.

Gear position: 3rd position

ECR-229

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- Engine speed: About 3,000 rpm

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>ECR-187</u>, "Diagnosis Procedure". 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-265, "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]
 ENGINE SPEED.: 2000 tr/min EXH GAS TEMP2: 150 - 200°C (302 - 392°F) EXH GAS TEMP3: 150 - 200°C (302 - 392°F) 	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:000000001581606

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>.

DICINO.	i rouble diagnosis name	DIC detecting condition	Possible cause	
P2031	Exhaust gas temperature sensor 2 circuit low input	An excessively low voltage from the sensor is sent to ECM.	 Harness or connectors (Exhaust gas temperature sensor 2 circuit is open or shorted.) Exhaust gas temperature sensor 2 	
	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 TO 2.	
-------------	--

2.PERFORM DTC CONFIRMATION PROCEDURE-I	М
 Turn ignition switch ON and wait at least 10 seconds. Check 1st trip DTC. 	
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
 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) Check 1st trip DTC. 	Ρ

Is 1st trip DTC detected?

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

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INFOID:000000001581608

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 tem	Ground	Voltago	
Connector	Terminal	Ciouna	voitage
F136	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 ten	nperature sensor 2	ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F136	2	F131	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:000000001581611

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
EXI	H GAS TEMP2	60 - 950 °C (°F)
With Follow	n GST the procedure "\	With CONSULT-III" above.
<u>Is the ir</u>	nspection result	normal?
YES NO	>> INSPECTI	ON END xhaust gas temperature sensor 2

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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:000000001581613

INFOID:000000001581614

INFOID:000000001581612

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	Voltago	
Connector	Connector Terminal		voltage
F142	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 terr	nperature sensor 1	EC	M	Continuity	ECR
Connector	Terminal	Connector	Terminal	Continuity	
F142	2	F131	10	Existed	
3. Also check I Is the inspection	harness for short to result normal?	o ground and sh	ort to power.	·	С
YES >> GO NO >> Rep 4.CHECK INTE	TO 4. air open circuit or ERMITTENT INCII	short to ground o	or short to powe	r in harness or connectors.	D
Refer to GI-39. "	Intermittent Incide	ent".			E
Is the inspection	result normal?				
YES >> Rep NO >> Rep	lace exhaust gas air or replace.	temperature sens	sor 1.		F
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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:000000001581616

INFOID:000000001581615

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.	 Harness or connectors (Throttle control motor circuit is open or shorted) Electric throttle control actuator

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 >

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Electric throttle	control actuator	EC	M			А
Connector	Terminal	Connector	Terminal	Continuity		
	4		91	Existed		
F1 40	4	F100	92	Not existed		LON
F148		F132	91	Not existed		
	5		92	Existed		С
4. Also check h	arness for short	to ground and sh	ort to power.			
Is the inspection YES >> GO NO >> Repart	<u>result normal?</u> TO 3. air open circuit o	r short to ground o	or short to powe	r in harness or connecto	rs.	D
3.CHECK THR	OTRTLE CONTR	ROL MOTOR				Е
Perform <u>ECR-23</u> Is the inspection YES >> GO NO >> Repl	7, "Component I result normal? TO 4. lace electric throi	nspection". ttle control actuate	or.			F
4. CHECK INTE	RMITTENT INCI	DENT				
Refer to <u>GI-39,</u> "	Intermittent Incid	ent".				G
>> Repa	air open circuit o	r short to ground (or short to powe	r in harness or connecto	rs.	Н
Component I	nspection				INFOID:000000001581618	

Component Inspection

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$1. {\sf check\ electric\ throttle\ control\ motor}$

1. Reconnect all harness connectors disconnected.

2. Check the voltage between ECM harness connectors terminals under the following conditions.

(+)			()	Condition	Voltago
Connector	Terminal	Connector	Terminal	Condition	voitage
				[Engine is running] • Warm-up condition • Idle speed	0 - 2 V★ 500µSec/div
F132	91 (Throttle control motor)	E121	128 (ECM ground)	 [Ignition switch: OFF] For 20 seconds after turning ignition switch OFF 	0 - 2 V★ 500µSec/div
				[Ignition switch: OFF] • More than 20 seconds after turning ignition switch OFF	0.1 V
	92 (Throttle control motor)	+		[Engine is running] • Warm-up condition • Idle speed	0 V

ECR-237

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:000000001581619

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

DTC DETECTION LOGIC NOTE:

If DTC P2101 is displayed with DTC P0606, first perform the trouble diagnosis for DTC P0606. Refer to <u>ECR-201, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2101	Electric throttle control actuator performance	Electric throttle control actuator does not functions properly.	 Harness or connectors (Electric throttle control actuator circuit is open or shorted.) Electric throttle control actuator
DTC CON	NFIRMATION PROCEDUF	RE	
1.PRECO	ONDITIONING		ŀ
If DTC Co least 20 so	onfirmation Procedure has be econds before conducting the	een previously conducted, always e next test.	turn ignition switch OFF and wait at
2.PERFC	DRM DTC CONFIRMATION	PROCEDURE	
1. Turn i 2. Check Is 1st trip YES > NO >	gnition switch ON and wait a < 1st trip DTC. <u>DTC detected?</u> -> Go to <u>ECR-239, "Diagnosi</u> -> INSPECTION END	t least 10 seconds. <u>s Procedure"</u> .	ŀ
Diagnos	sis Procedure		INF0ID:000000001581622
1. CHEC	GROUND CONNECTIONS	3	Ν
1. Turn i 2. Check Is the insp YES > NO > 2. CHECK	gnition switch OFF and wait c ground connection E17. Re <u>vection result normal?</u> -> GO TO 2. -> Repair or replace ground of C ELECTRIC THROTTLE CO	at least 20 seconds. fer to Ground inspection in <u>GI-41.</u> connection. DNTROL ACTUATOR CIRCUIT-I	<u>"Circuit Inspection"</u> .
 Disco Disco Disco Check nector 	nnect electric throttle control nnect ECM harness connect < the continuity between elec r.	actuator harness connector. ors. stric throttle control actuator harnes	ss connector and ECM harness con-

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INFOID:000000001581620

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< COMPONENT DIAGNOSIS >

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
	1		85	
F148	3	F132	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	e control actuator	E	CM	
Connector	Terminal	Connector	Terminal	Continuity
E149	4	F122	91	Eviated
F140	5	F 132	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:000000001581623

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]

	(+)		(-)	0	
Connector	Terminal	Connector	Terminal	Condition	Voltage
				[Engine is running] • Warm-up condition • Idle speed	0 - 2 V★ 500µSec/div ↓↓↓↓↓↓ ↓↓↓↓↓↓ 10V/div JMBIA0547GB
F132	91 (Throttle control motor)	E121	128 (ECM ground)	 [Ignition switch: OFF] For 20 seconds after turning ignition switch OFF 	0 - 2 V★ 500µSec/div
				[Ignition switch: OFF] • More than 20 seconds after turning ignition switch OFF	0.1 V
	92 (Throttle control motor)	•		[Engine is running] • Warm-up condition • Idle speed	0 V
Is the inspe	ection result nor	mal?			
YES >> NO >> 2. REPLA	> INSPECTION > GO TO 2. CE ELECTRIC ⁻	END THROTTLE	CONTROL AC	CTUATOR	
 Replace Perform 	ce electric thrott m <u>ECR-238, "S</u> t	le control a pecial Repa	ctuator. ir Requirement	-	
>>	> INSPECTION	END			
Special F	Repair Requ	irement			INFOID:000000001581624
1.PERFO	RM THROTTLE	E VALVE CL	OSED POSITI	ON LEARNING VALUE	CLEAR
Refer to <u>E</u> Requireme	CR-16, "THRO ent"	TTLE VAL	VE CLOSED P	OSITION LEARNING \	ALUE CLEAR : Special Repair
>> 2.perfo	> GO TO 2. RM THROTTLE	E VALVE CL	OSED POSITI	ON LEARNING	
Refer to EC	CR-16, "THROT	TLE VALVE	E CLOSED POS	SITION LEARNING : Spe	ecial Repair Requirement"
>>	> 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.

DTC Logic

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors
P2120	Accelerator pedal position sensor 2 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 sense (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

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

Check 1st trip DTC. 2.

Is 1st trip DTC detected?

YES >> Go to ECR-242, "Diagnosis Procedure". >> INSPECTION END NO

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 GI-41. "Circuit Inspection". 2.

Is the inspection result normal?

INFOID:000000001581625



INFOID:000000001581626

INFOID:000000001581627

ECR-242

P2120 APP SENSOR

		FZ120	AFF SENSUR	ί.				
< COMPONENT	DIAGNOSIS >				[M9R]			
YES >> GO T	02.							
NO >> Repa	ir or replace groun	d connection			A			
2.CHECK ACCE	LERATOR PEDAL	POSITION S	SENSOR 2 POWE	R SUPPLY CIRCUIT				
1. Disconnect a	Disconnect accelerator pedal position sensor harness connector.							
2. Turn ignition	switch ON.	-	1		ECI			
3. Check the vo	itage between acc	elerator peda	I position sensor co	onnector and ground.				
	al position sensor				С			
Connector		Ground	Voltage					
E110	5	Ground			_			
		Giouna	Appiox. 5V		D			
Is the inspection I	result normal?							
NO >> Repa	03. ir open circuit or sl	nort to around	d or short to power	in harness or connectors.	F			
	ELERATOR PEDAL	POSITION	SENSOR 2 GROUI					
1. Turn Ignition 2. Disconnect F	Switch OFF and wa	alt at least 20	seconds.		F			
3. Check the co	ontinuity between	accelerator p	edal position sens	or harness connector and	ECM harness			
connector.	,		•					
					G			
Accelerator ped	al position sensor		ECM	Continuity				
Connector Terminal Connector Terminal								
E110 1 E121 120 Existed								
4. Also check ha	arness for short to	ground and s	hort to power.					
Is the inspection	result normal?							
YES >> GO T	O 4.							
NO >> Repa	ir open circuit or sl	nort to ground	d or short to power	in harness or connectors.				
4.CHECK ACCI	ELERATOR PEDA	L POSITION	I SENSOR 2 INPU	JT SIGNAL CIRCUIT FO	r open and \exists			
SHORT								
1. Check the co	ontinuity between	accelerator p	edal position sens	or harness connector and	ECM harness			
connector.								
	lal position concor		ECM					
		Connector	Torminal	Continuity	L			
	reiminai	Connector	110	Eviated				
E110	6	E121	119	Existed	N.4			
2. Also check h	arness for short to	ground and s	short to power.		IVI			
Is the inspection i	result normal?							
YES >> GO I NO >> Rena	U 5. Iir open circuit or st	port to around	d or short to power	in harness or connectors	Ν			
			SENSOR					
Refer to ECR-244	1. "Component Insp	<u>pection"</u> .			0			
Is the inspection	result normal?							
YES >> GOT	U 6. ace accelerator por	dal nosition o	ensor		5			
		uai position s NT			Р			

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		Voltago	
Connector	Terminal	Connector	Terminal	Condition		vonage	
	126		127		Fully released	0.6 - 4.6 V	
E121 -	(APP sensor 1)	E121	(Sensor ground)	Accolorator podal	Fully depressed	Less than 5 V	
	119 (APP sensor 2)	120	Accelerator pedar	Fully released	More than 0.3 V		
			(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.

	Fuel injector ECM			CM	Continuity	D
Cylinder	Connector	Terminal	Connector	Terminal	Continuity	Г
1	F144	1		6		
2	F145	1	E404	7	Eviated	
3	F146	1	- F131	8	Existed	
4	F147	1		5		

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

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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.

\mathbf{Z} .PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCT	ION
---	-----

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		ЪЛ
Diagnosis Procedure	INFOID:000000001581634	IVI
1.INSPECTION START		Ν
With CONSULT-III		
Turn ignition switch ON.		
2. Select "SELF-DIAG RESULTS" mode with CONSULT-III.		0
3. IOUCH "ERASE".		
4. Perform DTC CONFIRMATION PROCEDURE.		
See <u>ECR-247, DTC Logic</u> .		Ρ
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



Possible cause

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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.



>> Repair or replace harness or connectors.

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

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





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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	
E1 /1	2	F132	78	Existed
F141	5		82	
	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		A/F sensor 1 ECM		CM	Cround	Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity		
	1		81				
E1 41	2	E122	78	Ground	Not existed		
F141	5	F I JZ	82				
	6		77	1			

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:000000001581639

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2263	Turbocharger boost control system performance	 ECM detects that turbocharger boost pressure is lower than the target value. ECM detects that turbocharger boost pressure is higher than the target value. 	 Harness or connectors (Turbocharger boost control solenoid valve circuit is open or shorted.) Turbocharger boost control solenoid valve Turbocharger boost sensor Electric throttle control actuator Intake air duct Vacuum pump Vacuum hose Turbocharger
DTC CON	FIRMATION PROCE	DURE	
1.PRECC	ONDITIONING		
If DTC Co least 20 se	nfirmation Procedure ha	as been previously conducted, alwa g the next test.	ys turn ignition switch OFF and wait at
2.PERFC	> GO TO 2.)RM DTC CONFIRMATI	ON PROCEDURE	
1. Start e 2. Check Is 1st trip I YES > NO >	engine and keep engine (1st trip DTC. <u>DTC detected?</u> > Go to <u>ECR-251, "Diag</u> > INSPECTION END	speed more than 3,000 rpm for at le nosis Procedure".	east 10 seconds.
Diagnos	is Procedure		INFOID:000000001581640
1.CECHE	ECK VACUUM HOSES A	AND VACUUM GALLERY	
1. Turn ig 2. Check or imp <u>Is the insp</u> Yes > No >	gnition switch OFF and v vacuum hoses and va proper connection. Refer <u>ection result normal?</u> > Repair or replace. > GO TO 2.	vait at least 20 seconds. cuum gallery for clogging, cracks [to <u>ECR-89. "System Description"</u> .	Clogging
			Improper connection
2.CHECK	AIR FILTER		

Check that air filter is not obstructed. Is the inspection result normal?

INFOID:000000001581638

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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	Voltago	
Connector	Connector Terminal		vollage	
E122	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	E	CM	Continuity
Connector	Terminal	Connector Terminal		Continuity
E122	2	F132	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.

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ECR-252
P2263 TC SYSTEM

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< COMPONENT D	DIAGNOSIS >	[M9R]	
9.CHECK TURBC	CHARGER BOOST CONTF	ROL SOLENOID VALVE	Δ
Refer to ECR-253.	"Component Inspection".		
Is the inspection re	sult normal?		
YES >> GO TO) 10.		ECF
	e turbocharger boost control	solenoid valve.	
			С
Refer to <u>ECR-237</u> ,	"Component Inspection"		0
Is the inspection re	<u>suit normal?</u>		
NO >> Replac	ce turbocharger boost sensor		D
11.CHECK INTER			
Refer to GI-39 "Int	ermittent Incident"		Е
Is the inspection re	sult normal?		
YES >> Replac	ce turbocharger boost sensor		
NO >> Repair	or replace.		F
Component Ins	spection	INFOID:000000001581641	
1. CHECK TURBC	CHARGER BOOST CONTF	ROL SOLENOID VALVE	G
1. Turn ignition s	witch OFF.		
2. Disconnect tur	bocharger boost control sole	noid valve harness connector.	Н
3. Check the resi	stance between turbocharge	r boost control solenoid valve terminals as follows.	
VES >> INSPE			J
NO >> Replac	ce turbocharger boost control	solenoid valve.	
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P2293 FRP CONTROL SYSTEM

Description

INFOID:000000001581642

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:000000001581643

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.	 Harness or connectors (Fuel rail pressure control valve circuit is open or shorted.) 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. 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:000000001581644

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	Ciouna	voltage
F149	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.

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 pressure control valve ECM Continuity Connector Terminal Connector Terminal F149 2 F132 90 Existed 4. Also check harness for short to ground and short to power. Issted 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 RAIL PRESSURE CONTROL VALVE Refer to ECR-255. "Component Inspection". Is the inspection result normal? Yes Yes >> GO TO 5. No >> Replace fuel rail pressure control valve. 5. CHECK INTERMITTENT INCIDENT Refer to GI-39, "Intermittent Incident". >> INSPECTION END Component Inspection 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal?							
Connector Terminal Connector Terminal Connector F149 2 F132 90 Existed 4. Also check harness for short to ground and short to power. Is the inspection result normal? YES > GOTO 4. NO >> Repair open circuit or short to ground or short to power in harness or connectors. 4. CHECK FUEL RAIL PRESSURE CONTROL VALVE Refer to ECR-255. "Component Inspection". Is the inspection result normal? Yes >> GOTO 5. No >> Replace fuel rail pressure control valve. 5.CHECK INTERMITTENT INCIDENT Refer to GI-39. "Intermittent Incident". > INSPECTION END Component Inspection 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Imminals Resistance 1 and 2 2 6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	Fuel rail press	ure control valve	EC	CM	Continuity		
F143 2 F132 90 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 RAIL PRESSURE CONTROL VALVE Refer to ECR-255. "Component Inspection". Is the inspection result normal? Yes >> GO TO 5. No >> Replace fuel rail pressure control valve. 5.CHECK INTERMITTENT INCIDENT Refer to GI-39. "Intermittent Incident". >> INSPECTION END Component Inspection ************************************	Connector	Terminal	Connector	Terminal	Continuity		
 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 RAIL PRESSURE CONTROL VALVE Refer to ECR-255. "Component Inspection". Is the inspection result normal? Yes >> GO TO 5. No >> Replace fuel rail pressure control valve. 5. CHECK INTERMITTENT INCIDENT Refer to GI-39. "Intermittent Incident". >> INSPECTION END Component Inspection Pressure control valve harness connector. Check rule RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	F149	2	F132	90	Existed		
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 RAIL PRESSURE CONTROL VALVE Refer to ECR-255. "Component Inspection". Is the inspection result normal? Yes >> GO TO 5. No >> Replace fuel rail pressure control valve. 5. CHECK INTERMITTENT INCIDENT Refer to GI-39. "Intermittent Incident". >> INSPECTION END Component Inspection 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. CHECK FUEL RAIL PRESSURE control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	4. Also checl	k harness for sh	ort to ground a	and short to p	ower.		
$\begin{array}{llllllllllllllllllllllllllllllllllll$	Is the inspection	<u>on result normal</u>	<u>?</u>				
NO >> Repair open circuit of short to ground of short to power in namess of connectors. 4. CHECK FUEL RAIL PRESSURE CONTROL VALVE Refer to ECR-255. "Component Inspection". Is the inspection result normal? Yes >> GO TO 5. No >> Replace fuel rail pressure control valve. 5. CHECK INTERMITTENT INCIDENT Refer to GI-39. "Intermittent Incident". >> INSPECTION END Component Inspection 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2-6Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	YES >> G	O TO 4.					
+.CHECK FUEL RAIL PRESSURE CONTROL VALVE Refer to ECR-255. "Component Inspection". Is the inspection result normal? Yes >> GO TO 5. No >> Replace fuel rail pressure control valve. 5.CHECK INTERMITTENT INCIDENT Refer to GI-39. "Intermittent Incident". >> INSPECTION END Component Inspection 1.CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.		spair open circui	it or short to gi	round or shor	t to power in i	arness or connectors.	
Refer to ECR-255. "Component Inspection". Is the inspection result normal? Yes >> GO TO 5. No >> Replace fuel rail pressure control valve. 5. CHECK INTERMITTENT INCIDENT Refer to GI-39, "Intermittent Incident". >> INSPECTION END Component Inspection 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES > INSPECTION END NO >> Replace fuel rail pressure control valve.	H.CHECK FU	EL RAIL PRES	SURE CONTR				
Is the inspection result normal? Yes >> GO TO 5. No >> Replace fuel rail pressure control valve. 5.CHECK INTERMITTENT INCIDENT Refer to GI-39, "Intermittent Incident". >> INSPECTION END Component Inspection 1.CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES > INSPECTION END NO >> Replace fuel rail pressure control valve.	Refer to <u>ECR-</u>	255. "Componei	nt Inspection".				
No >> Replace fuel rail pressure control valve. 5. CHECK INTERMITTENT INCIDENT Refer to GI-39, "Intermittent Incident". >> INSPECTION END Component Inspection 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2-6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	<u>Is the inspection</u>	<u>on result normal</u>	<u>7</u>				
5. CHECK INTERMITTENT INCIDENT Refer to GI-39, "Intermittent Incident". >> INSPECTION END Component Inspection 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals 1 and 2 2 - 6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	No $>> Re$	eplace fuel rail p	ressure contro	ol valve.			
Refer to GI-39, "Intermittent Incident". >> INSPECTION END Component Inspection 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2-6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	5.CHECK INT			-			
>> INSPECTION END Component Inspection 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	Refer to GI-39	"Intermittent In	cident"				
>> INSPECTION END Component Inspection 1.CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.							
Component Inspection INFORMATION CONTROL VALVE 1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2-6 Ω Is the inspection result normal? YES > INSPECTION END NO >> Replace fuel rail pressure control valve.	>> IN	SPECTION EN	D				
1. CHECK FUEL RAIL PRESSURE CONTROL VALVE 1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	Component	t Inspection				INFOID:000000001581645	;
1. Turn ignition switch OFF. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES > INSPECTION END NO >> Replace fuel rail pressure control valve.	1 .CHECK FU	FI RAIL PRES	SURE CONTR				
1. Full rightion switch of 1. 2. Disconnect fuel rail pressure control valve harness connector. 3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.							•
3. Check resistance between fuel rail pressure control valve terminals as follows. Terminals Resistance 1 and 2 2 - 6 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	2. Disconnec	t fuel rail pressu	ure control val	ve harness co	onnector.		
TerminalsResistance1 and 22 - 6 ΩIs the inspection result normal?YES>> INSPECTION ENDNO>> Replace fuel rail pressure control valve.	3. Check res	istance betweer	n fuel rail press	sure control v	alve terminals	as follows.	
IterminalsResistance1 and 22 - 6 ΩIs the inspection result normal?YES>> INSPECTION ENDNO>> Replace fuel rail pressure control valve.	Taurainala		:				
Is the inspection result normal? YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	1 erminals						
YES >> INSPECTION END NO >> Replace fuel rail pressure control valve.	I and 2		2 - 0 52				
NO >> Replace fuel rail pressure control valve.			<u>ŕ</u> D				
	NO >> Re	eplace fuel rail p	oressure contro	ol valve.			

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P2294 FRP CONTROL VALVE

Description

INFOID:000000001581646

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:000000001581647

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
P2294	Fuel rail pressure control valve circuit	An excessively high voltage from the control valve is sent to ECM.	(Fuel rail pressure control valve circuit is open or shorted.)
		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:000000001581648

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	Oround	
F149	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 >

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>> Re	pair open circui	t or short to gr	ound or sho	rt to power in l	narness or connectors.	
3.CHECK FU	EL RAIL PRESS	SURE CONTR	OL VALVE C	UTPUT SIGN	AL CIRCUIT FOR OPEN AND SHORT	А
 Turn ignition Disconnect Check the nector. 	on switch OFF a t ECM harness continuity betw	nd wait at leas connector. reen fuel rail p	t 20 second ressure cont	s. rol valve harr	ess connector and ECM harness con-	ECR
Fuel rail press	ure control valve	EC	M	0	-	С
Connector	Terminal	Connector	Terminal	Continuity		
F149	2	F132	90	Existed	-	D
4. Also check	charness for sh	ort to ground a	nd short to p	ower.	-	
Is the inspection	on result normal	<u>?</u>				_
YES >> GO	D TO 4.	t or chort to ar	ound or cho	t to power in l	arrage or connectors	E
				t to power in i		
			OL VALVE			F
Refer to <u>ECR-2</u>	257, "Componei an rocult normal	nt inspection".				
	TO 5	<u>'</u>				
No $>> Re$	place fuel rail p	ressure contro	l valve.			G
5.CHECK INT		NCIDENT				
Refer to GI-39	"Intermittent In	cident".				Н
>> IN	SPECTION EN	D				
Component	Inspection	-			INF01D:000000001581649	I
1.снеск ец	FI RAII PRES	SURE CONTR				
			02 17 12 12			J
2. Disconnec	t fuel rail pressu	ire control valv	e harness c	onnector.	f -ll	
3. Uneck res	stance betweer	i fuel rall press	ure control v	aive terminais	s as follows.	K
Terminals	R	esistance				
1 and 2	0.0	002 - 1 kΩ				L
Is the inspection	on result normal	?				
YES >> IN	SPECTION ENI	D ,				Μ
NO >> Re	epiace ruei rail p	ressure contro	i vaive.			
						Ν
						0

P2299 ACCELERATOR/BRAKE PEDAL POSITION INCONSISTENCY

< COMPONENT DIAGNOSIS >

P2299 ACCELERATOR/BRAKE PEDAL POSITION INCONSISTENCY

DTC Logic

INFOID:000000001581650

INFOID:000000001581651

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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	 Harness or connectors (Accelerator pedal position sensor circuit is open or shorted.) (Stop lamp switch circuit is open or shorted.) Accelerator pedal position sensor (APP sensor 1 and 2) Stop lamp switch Accelerator pedal installation
	Accelerator pedal position sensor circuit	No signal from accelerator pedal position sensor is sent to ECM	 Harness or connectors (Accelerator pedal position sensor circuit is open or shorted.) Accelerator pedal position sensor (APP sensor 1 and 2)

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 STOP LAMP SWITCH CIRCUIT

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals as follows.

	(+)	(-)		Condition		Voltago	
Connector	Terminal	Connector	Terminal			voltage	
E121	116	E121	128	Brako podal	Fully released	Battery voltage	
EIZI	110	EIZI	120	Brake pedar	Slightly depressed	0 V	

Is the inspection result normal?

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YES >> GO TO 3.
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NO >> GO TO 8.

P2299 ACCELERATOR/BRAKE PEDAL POSITION INCONSISTENCY

< COMPONENT DIAGNOSIS >

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3.CHECK ACCELERATOR PEDAL POSITION SENSOR CIRCUIT

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

(+)	(-)		andition	Voltago		
Connector Terminal	Connector	terminal		Jonation	voltage		
110				Fully released	0.3 - 0.6 V		
E121	E121	100	Accelerator	Slightly depressed	1.95 - 2.4 V		
126	E121	120	pedal	Fully released	0.6 - 0.9 V		
120				Slightly depressed	3.9 - 4.7 V		
NO >> GO TO 4. CHECK ACCELERA Turn ignition switch Disconnect accelera Turn ignition switch Check the voltage b	TOR PEDAL F OFF and wait ator pedal pos ON. etween accele	POSITION SE at least 20 s ition sensor h erator pedal p	ENSOR POW econds. narness conne position senso	ER SUPPLY CIRCU ector. r harness connecto	JIT or and ground.		
Ac	celerator pedal p	elerator pedal position sensor		Ground	Valtara		
Sensor	Connec	tor	Terminal	Ground	voltage		
1	E11(4	Ground	Approx 51/		
2	Line		5	Cround	Appiox. 5v		
s the inspection result r	ormal?						

J.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.
- Check the continuity between accelerator pedal position sensor harness connector and ECM harness connector.

Accelerator pedal position sensor			ECM		Continuity
Sensor	Connector	Terminal	Connector	Terminal	Continuity
1	E110	2	E121	127	Existed
2	EIIU	1		120	

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 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 connector.

Continuity	СМ	E	Accelerator pedal position sensor		
Continuity	Terminal	Connector	Terminal	Connector	Sensor
Existed	126	E121	3	E110	1
EXISIED	119		6	LIIU	2

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

P2299 ACCELERATOR/BRAKE PEDAL POSITION INCONSISTENCY

< COMPONENT DIAGNOSIS >

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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 STOP LAMP SWITCH POWER SUPPLY CIRCUIT

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

Stop lamp switch		Ground	Voltago	
Connector	Terminal	Cround	voltage	
E118	4	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. 4)

Harness for open or short between fuse and stop lamp switch

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

10. CHECK STOP LAMP 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 stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E118	3	E121	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 STOP LAMP SWITCH

Refer to ECR-197, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace stop lamp switch.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P2425 EGR COOLER BYPASS VALVE CONTROL SOLENOID VALVE

< COMPONENT DIAGNOSIS >

P2425 EGR COOLER BYPASS VALVE CONTROL SOLENOID VALVE

Description

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:000000001581653

INFOID:000000001581652

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P2425 EGR cooler bypass valve control solenoid valve circuit	An excessively low voltage from the solenoid valve is sent to ECM.	Harness or connectors	E	
	An excessively high voltage from the solenoid valve is sent to ECM.	 (EGR cooler bypass valve control solenoid valve circuit is open or shorted.) EGR cooler bypass valve control solenoid 	F	
		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 H least 20 seconds before conducting the next test.

>> GO TO 2.					
2.PERFORM DTC CON	IFIRMATION PROCED	DURE			
 Start engine and let i Check 1st trip DTC. 	t idle for at least 10 se	conds.			J
Is 1st trip DTC detected?					
YES >> Go to <u>ECR-2</u> NO >> INSPECTIO	<u>861, "Diagnosis Procec</u> N END	<u>lure"</u> .			Κ
Diagnosis Procedui	е			INFOID:000000001581654	
1.CHECK EGR COOLE	R BYPASS VALVE CO	ONTROL SOLEN	IOID VALVE POWER	SUPPLY CIRCUIT	L
 Turn ignition switch (Disconnect EGR cod Turn ignition switch (Check the voltage I ground. 	DFF and wait at least 2 bler bypass valve contr DN. between EGR cooler	20 seconds. ol solenoid valve bypass valve c	e harness connector. ontrol solenoid valve	harness connector and	M
EGR cooler bypass valve	e control solenoid valve		N/ 1/		
Connector	Terminal	Ground	Voltage		0
F151	1	Ground	Battery voltage		
Is the inspection result ne	ormal?				Р

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-261

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P2425 EGR COOLER BYPASS VALVE CONTROL SOLENOID VALVE

< COMPONENT DIAGNOSIS >

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

3. CHECK EGR COOLER BYPASS VALVE 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 EGR cooler bypass valve control solenoid valve harness connector and ECM harness connector.

EGR cooler bypass valve control solenoid valve		E	Continuity		
Connector	Terminal	Connector Terminal			
F151	2	F132	59	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 COOLER BYPASS VALVE CONTROL SOLENOID VALVE

Refer to ECR-262, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace EGR cooler bypass valve control solenoid valve.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000001581655

[M9R]

1.CHECK EGR COOLER BYPASS VALVE CONTROL SOLENOID VALVE

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

Terminals	Resistance
1 and 2	43 - 49 Ω [at 25°C (77°F)]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EGR cooler bypass valve control solenoid valve.

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

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P242A Exhaust gas temperature sensor 3 circuit low input Exhaust gas temperature sensor 3 circuit high input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors (Exhaust gas temperature sensor 3	
	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

TC 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.
- Check 1st trip DTC. 2.

Is 1st trip DTC detected?

YES >> Go to ECR-264, "Diagnosis Procedure". NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

() With CONSULT-III

- Start engine and warm it up to normal operating temperature. 1.
- Select "EXH GAS TEMP2" in "DATA MONITOR" mode with CONSULT-III. 2.
- Drive vehicle under the following conditions for at least 70 seconds. 3.

Monitor item	Indication
EXH GAS TEMP2	More than 340 °C (644 °F)

Check 1st trip DTC. 4.

With GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Go to ECR-264, "Diagnosis Procedure". А

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INFOID:000000001581656

< COMPONENT DIAGNOSIS >

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001581658

[M9R]

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 3 POWER SUPPLY CIRCUIT

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 temp	perature sensor 3	rature sensor 3 Terminal Ground	
Connector	Terminal		
B50	1	Ground	Approx. 5V

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors E6, F123

• Harness connectors B11, E101

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

- 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.

Exhaust gas terr	nperature sensor 3	ECM		Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
B50	2	F131	23	Existed	

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

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E6, F123
- Harness connectors B11, E101
- 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.

6.CHECK EXHAUST GAS TEMPERATURE SENSOR 3

Refer to <u>ECR-265, "Component Inspection"</u>. <u>Is the inspection result normal?</u>

P242A EGT SENSOR 3

< COMPONENT DIAC	GNOSIS >	[M9R]	
YES >> GO TO 7.	who use to move turn consor 2		٨
7. CHECK INTERMIT	TENT INCIDENT	F	A
Refer to GI-39, "Interm	ittent Incident".		
		E	CR
>> INSPECTI	ON END		
Component Inspe	ction	INFOID:000000001581659	С
1.CHECK EXHAUST	GAS TEMPERATURE SENSOR 3		
 With CONSULT-III Turn ignition switch Start engine and di Check "EXH GAS" 	n ON and select "EXH GAS TEMP3" in "DATA MONITOR" mode w rive vehicle at a speed of 120 km/h (75 MPH) for at least 2 minute. TEMP3" indication during driving.	rith CONSULT-III	Ð
Manitanitan	Indication		
	1001cation	F	F
Follow the procedure " <u>Is the inspection result</u> YES >> INSPECTI NO >> Replace ex	With CONSULT-III" above. <u>normal?</u> ON END xhaust gas temperature sensor 3.	C F	G H J
		ł	K
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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 trapping particulate matter and regeneration.

DTC Logic

INFOID:000000001581661

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P242F	Diesel particulate filter (DPF) performance	DPF is overloaded with particulate matter.	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 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
- Engine speed: About 3,000 rpm
- 3. Check 1st trip DTC.

ECR-266

< COMPONENT DIAGNOSIS >		[M9R]	
Is 1st trip DTC detected?			
YES >> Go to <u>ECR-267, "Diagnosis F</u> NO >> INSPECTION END	<u>Procedure"</u> .	A	
Diagnosis Procedure		INF0ID:000000001581662	2
1.CHECK DPF			
Refer to ECR-232, "Component Inspectio	<u>n"</u> .	С	
OK or NG			
NG >> GO TO 2.		D	
2.REPLACE DPF			
 Replace DPF. Perform "DPF Data Clear". Refer to E 	CR-17. "DPF DATA CLEAR :	<u>Special Repair Requirement"</u> .	
>> INSPECTION END			
Component Inspection		INFOID:000000001581663	
1.CHECK DPF-I		G	
Check DPF for damage.			
Is the inspection result normal?		H	
YES >> GO TO 2. NO >> GO TO 3.			
2.CHECK DPF-II			
1. Perform "Service Regeneration". R	efer to ECR-17, "SERVICE	REGENERATION : Special Repair	
Requirement".	l operating temperature		
3. Connect CONSULT-III and select "D	ATA MONITOR" mode.	L	
4. Select "DIFF EXH PRES" and check	the indication under the follow	ring conditions.	
Condition	DIFF EXH PRES [mbar]	К	
ENGINE SPEED: 2000 tr/min			
 EXH GAS TEMP2: 150 - 200°C (302 - 392°F) EXH GAS TEMP3: 150 - 200°C (302 - 392°F) 	Less than 3.0	L	
Is the inspection result normal?			
YES >> INSPECTION END		Μ	
3 REPLACE DPE			
1. Replace DPF.		N	
2. Perform "DPF Data Clear". Refer to E	CR-17, "DPF DATA CLEAR :	Special Repair Requirement".	
>> INSPECTION END		0	
		D	

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 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.

>> 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-268, "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 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.

ECR-268

INFOID:000000001581664

INFOID:000000001581665

P2452 DIFFERENTIAL EXHAUST PRESSURE SENSOR

< COMPONENT DIAGNOSIS >

[M9R]

Different	ial exhaust pressure	sensor					А
Connector	· Т	erminal	Ground	Vol	ltage		
F135		3	Ground	Appr	ox. 5V		
Is the inspection	result normal?						ECK
YES >> GO NO >> Rep 3. CHECK DIFF	TO 3. air open circuit o ERENTIAL EXA	r short to ground JST PRESSUR	l or short to E SENSOI	o power R GROI	in harness or co JND CIRCUIT F	onnectors. OR OPEN AND SHORT	С
 Turn ignition Check the c connector. 	a switch OFF and continuity betwee	wait at least 20 n differential exh	seconds. naust press	sure ser	nsor harness co	nnector and ECM harness	D
Differential exhau	ist pressure sensor	E	CM			-	Ε
Connector	Terminal	Connector	Term	inal	Continuity		
F135	2	F131	42	2	Existed	-	F
3. Also check I Is the inspection	harness for short result normal?	to ground and s	hort to pov	ver.		-	Г С
NO >> Rep 4.CHECK DIFI SHORT	air open circuit o	r short to ground	l or short to RE SENS	o power OR INP	in harness or co PUT SIGNAL CI	onnectors. RCUIT FOR OPEN AND	H
1. Check the c connector.	continuity betwee	n differential exh	aust pres	sure ser	nsor harness co	nnector and ECM harness	I
Differential exhau	ist pressure sensor	E	CM		Orationity	-	
Connector	Terminal	Connector	Term	inal	Continuity		J
F135	1	F131	38	3	Existed	-	0
2. Also check I <u>Is the inspection</u> YES >> GO NO >> Rep F	narness for short <u>result normal?</u> TO 5. air open circuit o	to ground and s r short to ground	hort to pov I or short to	ver. o power	in harness or co	onnectors.	K
D. CHECK INTE	RMITTENT INCI	DENT					
Refer to GI-39.	Intermittent Incid	<u>ent"</u> .					
Is the inspection YES >> Rep NO >> Rep	<u>result normal?</u> lace differential e air or replace.	xhaust pressure	e sensor.				Μ
							Ν
							0

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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 name
 DTC detecting condition
 Possible cause

 P2453
 Differential exhaust pressure sensor (Upstream)
 Differential exhaust pressure sensor (Upstream) malfunction.

 • Differential exhaust pressure sensor (Upstream) malfunction.

 • Differential pressure sensor tube in-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-270, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001581669

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.

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.

ECR-270

INFOID:000000001581667

< 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.

DTC Logic

DTC No.

P2505

DTC DETECTION LOGIC

ignition switch is turned ON. Ignition relay DTC CONFIRMATION PROCEDURE 1.PRECONDITIONING If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at

DTC detecting condition

Ignition signal is not entered to ECM when

least 20 seconds before conducting the next test.

2. PERFORM DTC CONFIRMATION PROCEDURE

Trouble diagnosis name

Ignition signal circuit

- 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-271, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1. CHECK ECM INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

(+) Connector Terminal		(-)	Voltage	
		Connector	Terminal	voltage	
E121	109	E121	128	Battery voltage	

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

ECR-271

INFOID:000000001581670

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Possible cause

(Ignition relay circuit is open or shorted.)

Harness or connectors



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P2505 ECM POWER SUPPLY

< COMPONENT DIAGNOSIS >

• 10A fuse (No. 4)

- IPDM E/R harness connector E15
- Harness for open or short between ECM and fuse

>> Repair or replace harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace harness or connectors.

4.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase the DTC.
- 3. Perform DTC CONFIRMATION PROCEDURE again. See <u>ECR-271, "DTC Logic"</u>.

Is the 1st trip DTC P2505 displayed again?

YES >> GO TO 5.

NO >> INSPECTION END

5.REPLACE ECM

1. Replace ECM.

2. Go to ECR-12, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

P2600 TC COOLING PUMP

< COMPONENT DIAGNOSIS >

P2600 TC COOLING PUMP

Description

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:000000001581674

INFOID:000000001581673

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.	 (Turbocharger cooling pump circuit is open or shorted.) Turbocharger cooling pump
		An improper voltage is sent to ECM through control valve.	Turbocharger cooling pump relay
DTC CON	FIRMATION PROCEDU	JRE	
1.PRECO	NDITIONING		
If DTC Cor least 20 se	nfirmation Procedure has conds before conducting t	been previously conducted, alway he next test.	ys turn ignition switch OFF and wait at
× د	> GO TO 2.		
Z .PERFO	RM DTC CONFIRMATION	N PROCEDURE-I	
1. Turn ig	nition switch ON and wait	at least 10 seconds.	
2. Check Is 1st trip Γ	TSI IIIP DTC.		
YES >>	Go to ECR-273, "Diagno"	sis Procedure".	
NO >>	> GO TO 3.		
3.perfo	RM DTC CONFIRMATION	N PROCEDURE-II	
 Turn ig Turn ig Check 	nition switch OFF and wa nition switch ON and wait 1st trip DTC.	it at least 20 seconds. at least 10 seconds.	
<u>Is 1st trip D</u>	DTC detected?		
YES >> NO >>	> Go to <u>ECR-273, "Diagno</u> > INSPECTION END	sis Procedure".	
Diagnosi	s Procedure		INFOID:000000001581675
1.снеск	TURBOCHARGER COO	LING PUMP POWER SUPPLY CI	RCUIT-I
1. Turn ig 2 Discon	nition switch OFF and wa	it at least 20 seconds.	
3. Turn ig	inition switch ON.	pamp rolay.	
4. Check	the voltage between turbo	ocharger cooling pump relay harne	ess connector and ground.

Turbocharger co	oling pump relay	Ground	Voltago	
Connector Terminal		Glound	voltage	
E56	2	Ground	Battery voltage	
LSO	3	Ground		

Is the inspection result normal?

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< COMPONENT DIAGNOSIS >

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

2. DETECT MALFUNCTIONING PART

Check the following.

- 20A fuse (No. 31)
- Harness for open or short between turbocharger cooling pump relay and battery
- Harness for open or short between turbocharger cooling pump relay and IPDM E/R

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

3.CHECK TURBOCHARGER COOLING PUMP POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Disconnect turbocharger cooling pump harness connector.
- 3. Check the continuity between turbocharger cooling pump harness connector and turbocharger cooling pump relay harness connector.

Turbocharger cooling pump		Turbocharge co	Continuity	
Connector Terminal		Connector	Terminal	Continuity
F137	1	E56	5	Existed

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

Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4.

NO >> GO TO 4

4. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors E7, F121

• Harness for open or short between turbocharger cooling pump and turbocharger cooling pump relay

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

5.CHECK TURBOCHARGER COOLING PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between turbocharger cooling pump harness connector and ground.

Turbocharge	r cooling pump	Ground	Continuity	
Connector	Connector Terminal		Continuity	
F137	2	Ground	Existed	

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E7, F121

• Harness for open or short between turbocharger cooling pump and ground

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

7. CHECK TURBOCHARGER COOLING PUMP OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connectors.

Check the continuity between turbocharger cooling pump relay harness connector and ECM harness connector.

P2600 TC COOLING PUMP

< COMPONENT DIAGNOSIS >

[M9R]

Turbo	charger coc	oling pump relay	E	M			А
Conne	ector	Terminal	Connector	Terminal	- Continuity		
E5	6	1	F132	56	Existed		FC
Is the insp	ection res	sult normal?			·		LU
YES >	> GO TO	9.					
NO >			DT.				С
O.DETEC	I MALFU	JNCTIONING PA	AR I				
Check the	following	. Dro E7 E121					D
 Harness Harness 	for open	or short betweer	n ECM and turboo	charger cooling	pump relay		
	•			5 5			
>	> Repair	open circuit or sł	nort to ground or s	short to power i	n harness or connectors.		Е
9.CHECK	(TURBO	CHARGER COC	LING PUMP REL	_AY			
Refer to E	CR-275, '	"Component Insp	pection (Turbocha	Irger Cooling Pu	ump Relay)".		F
Is the insp	ection res	sult normal?					
YES >	> GO TO	10.					
NO >	> Replac	e turbocharger c	ooling pump relay	<i>'</i> .			G
10.CHE	CK TURE	BOCHARGER CO	DOLING PUMP				
Refer to E	CR-275, '	Component Insp	bection (Turbocha	irger Cooling Pu	<u>ump)"</u> .		Н
Is the insp	ection res	sult normal?					
YES >	> GO TO	11. 					
II.CHE			DENT				
Refer to G	<u>il-39, "Inte</u>	ermittent Incident	<u></u> .				1
							0
>							
Compor	nent Ins	pection (Turb	ocharger Coc	bling Pump)		INFOID:000000001581676	Κ
1.CHECK	(TURBO	CHARGER COC	LING PUMP				
1 Turn i	anition sw						1
2. Disco	nnect turk	ocharger cooling	g pump harness c	onnector F137.			
3. Suppl	y turboch	arger cooling pui	mp terminal with t	pattery voltage a	and check operation.		
							M
Term	ninals		Operation				
(+)	(-)		-				N
1	2	Turbocharger cool	ng pump operates.				IN
Is the insp	ection res	sult normal?					
YES >	> INSPE	e turbocharger o	oolina pump				0
Compor	ont Inc	noction (Turk	ochorgor Coc	ling Dump			
Compor			Conarger Col		velay)	INFOID:000000001581677	Þ
1.CHECH	K TURBO	CHARGER COC	LING PUMP REL	_AYS			Г
1 Turn i	anition su						

Turn ignition switch OFF.
 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 5	12V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace turbocharger cooling pump relay.



P2A00 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.



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

nsor 1	Ground	Voltage
Terminal	Cround	volidge
4	Ground	Battery voltage
O TO 4.		
10103.		_
ALFUNCTIO	JNING PAR	Γ
owing.	E404	
nnectors E7, onnector E11	F121 I	
	nsor 1 Terminal 4 O TO 4. O TO 3. MALFUNCTIC owing. nnectors E7, onnector E1	nsor 1 Terminal 4 Ground 4 Ground 0 TO 4. 0 TO 3. MALFUNCTIONING PAR owing. nnectors E7, F121 onnector E11

- 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

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< COMPONENT DIAGNOSIS >

- 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	F132	81	
E141	2		78	Evictod
1 141	5		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	Ground	Continuity
	1		81		
E1 41	2	F132	78	Ground	Not ovicted
F141	5		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

P3031 SERVICE REGENERATION

Description

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

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
Diagnos	is Procedure		INFOID:000000001581683
1.PERFC	RM SERVICE REGENERATIO	NC	
Refer to E	CR-17, "SERVICE REGENER	ATION : Special Repair Requireme	ent".
> 2.erase	> GO TO 2. E DTC		
With CO 1. Turn ig 2. Select 3. Touch With GS 1. Turn is	DNSULT-III gnition switch ON. t "SELF-DIAG RESULTS" mod "ERASE". ST gnition switch ON	e with CONSULT-III.	
2. Select	ased?		
YES > NO > 3. CHECH	> INSPECTION END > GO TO 3. (INTERMITTENT INCIDENT		
Refer to G	I-39, "Intermittent Incident".		
>	> INSPECTION END		

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INFOID:000000001581681

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 • MAIN switch: Pressed at the 1st time \rightarrow at the 2nd time		Illuminated \rightarrow Not illuminated
MAIN switch: ON	ASCD: Operating	Illuminated
 When vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH) 	ASCD: Not operating	Not illuminated

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECR-280, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000001581686

1.CHECK CAN COMMUNICATION LINE

Refer to LAN-22, "CAN System Specification Chart".

<u>OK or NG</u>

OK >> GO TO 2.

NG >> Repair or replace.

2. CHECK COMBINATION METER OPERATION

Refer to MWI-27, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Check combination meter circuit. Refer to <u>MWI-7, "METER SYSTEM : System Diagram"</u>.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

INFOID:000000001581684

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	round		ondition	Voltago
Connector	Terminal	Connector	Terminal		Condition	
E121	108 (Clutch pedal positio	E121	128 (ECM ground)	Clutch pedal	Slightly depressed	Battery voltage
	switch signal)		(Lotti ground)		Fully released	Approx. UV
s the inspec	tion result normal	<u>?</u>				
YES >> I NO >> (NSPECTION EN Go to <u>ECR-281, "I</u>). Diagnosis Proce	edure".			
Diagnosis	Procedure					INFOID:000000001581689
1.снеск с	ROUND CONNE	CTIONS				
1. Turn ign 2. Check g	ition switch OFF a round connection	nd wait at least E17. Refer to G	20 seconds. Ground inspectio	on in <u>GI-41, "Cir</u>	cuit Inspection".	
s the inspec	tion result normal	2				
YES >> (GO TO 2.					
NO >> I כ	Repair or replace	ground connect	ion.			
	LUTCH PEDAL F	OSITION SWI	TCH GROUD C	IRCUIT FOR O	PEN AND SHORT	
1. Disconn 2. Check th	CLUTCH PEDAL F ect clutch pedal p ne continuity betw	OSITION SWI	TCH GROUD C arness connecto al position switch	IRCUIT FOR O	PEN AND SHORT	
1. Disconn 2. Check th Clutch pe	CLUTCH PEDAL F ect clutch pedal p ne continuity betwo edal position switch	OSITION SWI position switch have not clutch peda	TCH GROUD C arness connecto al position switch	IRCUIT FOR O or. harness conn	PEN AND SHORT	
Clutch pe Connector	CLUTCH PEDAL F ect clutch pedal p ne continuity betw edal position switch Terminal	OSITION SWI position switch have no clutch peda	TCH GROUD C arness connecto al position switch Continuity	IRCUIT FOR O	PEN AND SHORT	
2. Check th Clutch pe Connector E111	CLUTCH PEDAL F ect clutch pedal p ne continuity betwo edal position switch Terminal	OSITION SWI position switch have een clutch peda Ground E38	TCH GROUD C arness connecto al position switch Continuity Existed	IRCUIT FOR O or. h harness conn /	PEN AND SHORT	
Clutch per Connector E111 Also che	CLUTCH PEDAL F ect clutch pedal p ne continuity betw edal position switch Terminal 1 eck harness for sh	OSITION SWI position switch have een clutch peda Ground E38 ort to power.	TCH GROUD C arness connecto al position switch Continuity Existed	IRCUIT FOR O	PEN AND SHORT	
Clutch pe Clutch pe Connector E111 Also che s the inspec	CLUTCH PEDAL F ect clutch pedal p ne continuity betwo edal position switch Terminal 1 eck harness for sh tion result normal	OSITION SWI position switch have en clutch peda Ground E38 ort to power.	TCH GROUD C arness connecto al position switch Continuity Existed	IRCUIT FOR O or. harness conn harness conn /	PEN AND SHORT	
Clutch pe Clutch pe Connector E111 Clutch pe Connector E111 Connector E111 Clutch pe Connector E111 Clutch pe Connector Clutch pe Connector Clutch pe Clutch	CLUTCH PEDAL F ect clutch pedal p ne continuity betw edal position switch Terminal 1 eck harness for sh tion result normal GO TO 3.	OSITION SWI position switch have en clutch peda Ground E38 prt to power.	TCH GROUD C arness connecto al position switch Continuity Existed	IRCUIT FOR O	PEN AND SHORT	
Clutch per Clutch per Connector E111 Also che s the inspec YES >> 0 NO >> 1	CLUTCH PEDAL F ect clutch pedal p ne continuity betw edal position switch Terminal 1 eck harness for sh tion result normal GO TO 3. Repair open circuit	OSITION SWI position switch have een clutch peda Ground E38 ort to power. 2 t or short to power	TCH GROUD C arness connecto al position switch Continuity Existed	IRCUIT FOR O	PEN AND SHORT	
1. Disconn 2. Check th Clutch pe Connector E111 3. Also che <u>s the inspec</u> YES >> 0 NO >> I 3. CHECK C	CLUTCH PEDAL F ect clutch pedal p ne continuity betw edal position switch Terminal 1 eck harness for sh tion result normal GO TO 3. Repair open circuit CLUTCH PEDAL F	OSITION SWI position switch have en clutch peda Ground E38 ort to power. CosiTION SWI	TCH GROUD C arness connecto al position switch Continuity Existed	IRCUIT FOR O	PEN AND SHORT ector and ground.	SHORT
Clutch performance Clutch performance Connector E111 Also cher Sthe inspec YES >> 0 NO >> 1 CHECK C Disconne Check the	CLUTCH PEDAL F ect clutch pedal p ne continuity betw edal position switch Terminal 1 eck harness for sh tion result normal GO TO 3. Repair open circuit CLUTCH PEDAL F ect ECM harness ne continuity betw	OSITION SWI Desition switch have a clutch peda Ground E38 Ort to power. Connectors. Den clutch peda	TCH GROUD C arness connecto al position switch Continuity Existed wer in harness c TCH INPUT SIG	IRCUIT FOR O	PEN AND SHORT ector and ground. FOR OPEN AND S	SHORT
1. Disconn 2. Check th Clutch pe Connector E111 3. Also che s the inspec YES >> 0 NO >> I 3.CHECK C 1. Disconne 2. Check th tor.	CLUTCH PEDAL F ect clutch pedal p ne continuity betw edal position switch Terminal 1 eck harness for sh tion result normal GO TO 3. Repair open circuit CLUTCH PEDAL F ect ECM harness ne continuity betw	OSITION SWIT position switch have clutch peda Ground E38 ort to power. Conshort to power. COSITION SWIT Connectors. Seen clutch peda	TCH GROUD C arness connecto al position switch Continuity Existed	IRCUIT FOR O	PEN AND SHORT ector and ground. FOR OPEN AND S	SHORT
Clutch period Clutch period Connector E111 Also che sthe inspec YES >> 0 NO >> 1 Disconne Check th tor. Clutch pedal	CLUTCH PEDAL F ect clutch pedal p ne continuity betw edal position switch Terminal 1 eck harness for sh tion result normal GO TO 3. Repair open circui CLUTCH PEDAL F ect ECM harness ne continuity betw	OSITION SWIT	TCH GROUD C arness connecto al position switch Continuity Existed Wer in harness c TCH INPUT SIG	IRCUIT FOR O	PEN AND SHORT ector and ground. FOR OPEN AND s	SHORT Irness connec-

 E111
 2
 E121
 108
 Existed

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

Is the inspection result normal?

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INFOID:000000001581687



CLUTCH PEDAL POSITION SWITCH

< COMPONENT DIAGNOSIS >

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

4.CHECK CLUTCH PEDAL POSITION SWITCH

Refer to ECR-282, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace clutch pedal position switch.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000001581690

1.CHECK CLUTCH PEDAL POSITION SWITCH-I

1. Turn ignition switch OFF.

2. Disconnect clutch pedal position switch harness connector.

3. Check the continuity between clutch pedal position switch terminals under the following conditions.

Terminals	Con	Continuity	
1 and 2	Clutch pedal	Fully released	Existed
	and 2 Clutch pedal		Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK CLUTCH PEDAL POSITION SWITCH-II

1. Adjust clutch pedal position switch installation. Refer to CL-6, "Inspection and Adjustment".

2. Check the continuity between clutch pedal position switch terminals under the following conditions.

Terminals	Con	Continuity	
1 and 2	Clutch podal	Fully released	Existed
	Ciulon pedal	Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace clutch pedal position switch.

COOLING FAN

< COMPONENT DIAGNOSIS >

COULING FAN		Λ
Description	INFOID:000000001581691	A
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.		ECR
Component Function Check	INFOID:000000001581692	
1. CHECK COOLING FAN OPERATION		С
 With CONSULT-III Start engine and let it idle. Select "COOLING FAN LOW" in "ACTIVE TEST" mode with CONSULT-III. Check that explires for experience at low encoded 		D
 With GST Start engine and let it idle. Turn air conditioner switch and blower fan switch ON. 		E
 Check that cooling fan operates at low speed. <u>Is the inspection result normal?</u> YES >> GO TO 2. 		F
NO >> Check cooling fan low speed control circuit. Refer to <u>ECR-283, "Diagnosis Procedu</u> 2.CHECK COOLING FAN OPERATION	<u>ıre"</u> .	G
 With CONSULT-III Select "COOLING FAN HIGH" in "ACTIVE TEST" mode with CONSULT-III. Check that cooling fan operates at higher speed than low speed. 		Η
 With GST Turn air conditioner switch and blower fan switch OFF. Turn ignition switch OFF. 		I
 Disconnect engine coolant temperature sensor harness connector. Connect 150 Ω resistor to engine coolant temperature sensor harness connector. Check that cooling fan operates at higher speed than low speed. 		J
YES >> INSPECTION END NO >> Check cooling fan high speed control circuit. Refer to <u>ECR-283. "Diagnosis Proced</u>	<u>ure"</u> .	K
Diagnosis Procedure	INFOID:000000001581693	I
1.INSPECTION START		
Confirm the malfunctioning circuit (Low speed or high speed). Refer to ECR-283, "Component Function Check".		M
Which circuit is malfunctioning?		
Low speed>>GO TO 2. High speed>>GO TO 8.		Ν
2. CHECK COOLING FAN POWER SUPPLY CIRCUIT-I		
 Turn ignition switch OFF and wait at least 20 seconds. Disconnect IPDM E/R harness connector E14. Disconnect cooling fan motor harness connector. Check the continuity between IPDM E/R harness connector and cooling fan motor harness 	connector.	O
		- E

IPDM	E/R Cooling fan motor		Cooling fan motor	
Connector	Terminal	Connector	Terminal	Continuity
E14	52	E3	1	Existed

5. Also check harness for short to ground and short to power. Is the inspection result normal?

< COMPONENT DIAGNOSIS >

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

 ${\it 3.}$ detect malfunctioning part

Check the following.

Resistor E57

Harness for open or short between IPDM E/R and cooling fan motor

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

4. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF and wait at least 20 seconds.
- 2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace ground connections.

5. CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between cooling fan motor harness connector and ground.

Cooling fa	Cooling fan motor		Continuity	
Connector	Terminal	Oround	Continuity	
E3	2	Ground	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.

O.CHECK COOLING FAN MOTOR

Refer to ECR-285, "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace cooling fan motor.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair or replace harness or connector.

8.CHECK COOLING FAN POWER SUPPLY CIRCUIT-II

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

Disconnect cooling fan relay-3. 2.

Check the voltage between cooling fan relay-3 harness connector and ground. 3.

Cooling fan relay-3		Ground	Valtaga	
Connector	Terminal	Ground	voltage	
E59	1	Ground	Battery voltage	
E39	3	Ground	Dattery voltage	

Is the inspection result normal?

YES >> GO TO 10. >> GO TO 9.

NO

9. DETECT MALFUNCTIONING PART

Check the following.

COOLING FAN

< COMPONE	NT DIAGNO	OSIS >			[M9R]	
 50A fusible li Harness for e	ink (Letter N open or sho	l) rt between co	ooling fan re	elay-3 and battery	/	A
>> Re	epair open c	ircuit or shor	t to ground	or short to power	in harness or connectors.	
10.снеск о	COOLING F.	AN POWER	SUPPLY C	IRCUIT-III		EC
 Disconnec Check the nector. 	ct cooling far	n motor harne between cool	ess connec ing fan rela	tor. ay-3 harness conr	nector and cooling fan motor harness con-	С
Cooling fa	n relay-3	Coolin	g fan motor	Continuity	_	D
Connector	Terminal	Connector	Termir	nal		D
E59	2	E3	1	Existed	_	
3. Also checl	k harness fo	r short to gro	ound and sh	nort to power.	-	Е
Is the inspection	on result nor	mal?				
YES >> G NO >> R 11.CHECK C	O TO 11. epair open c COOLING F/	ircuit or shor AN CONTRO	t to ground	or short to power FOR OPEN ANI	in harness or connectors. D SHORT	F
 Disconnec Check the 	ct IPDM E/R	harness con etween cooli	nector E13 ng fan rela	y-3 harness conn	ector and IPDM E/R harness connector.	G
Cooling fan	relav-3	IPDM E	=/R			Н
Connector	Terminal	Connector	Terminal	Continuity		
E59	4	E13	48	Existed	-	
3. Also check	k harness fo	r short to gro	und and sh	nort to power.		
Is the inspection	on result nor	mal?				
YES >> GO	O TO 12.					J
	epair open c		to ground	or short to power	in namess or connectors.	
						IZ.
Refer to <u>ECR-</u>	<u>286, "Comp</u>	onent Inspec	tion (Coolir	<u>ng Fan Relay)"</u> .		K
VES >> G		<u>mai :</u>				
NO >> Re	eplace malfu	Inctioning co	oling fan re	lay.		L
13.снески	NTERMITT	ENT INCIDE	NT			
Refer to GI-39	, "Intermitter	nt Incident".				М
Is the inspection	on result nor	mal?				1 V I
YES >> Re	eplace IPDN	1 E/R.				
NO >> Re	epair or repla	ace harness	or connecto	or.		Ν
Component	t Inspectio	on (Coolin	g Fan Mo	otor)	INF0/D:000000001581694	
1.снеск сс	OLING FAN	MOTOR				0
 Turn ignition Disconnection 	on switch Ol ct cooling far	FF. n motor harne	ess connec	tor.		Ĺ
3. Supply co	oling fan mo	tor terminals	with batter	y voltage and che	eck operation.	Р

Terminals		Operation	
(+)	()	Operation	
1	2	Cooling fan operates.	

Is the inspection result normal?

< COMPONENT DIAGNOSIS >

YES >> INSPECTION END

NO >> Replace cooling fan motor.

Component Inspection (Cooling Fan Relay)

1. CHECK COOLING FAN RELAY

- 1. Turn ignition switch OFF.
- 2. Remove cooling fan relay-3.
- 3. Check the continuity between cooling fan relay terminals under the following conditions.

T		
Terminals	Conditions	Continuity
1 and 2	12V direct current supply between terminals 3 and 4	Existed
T and Z	No current supply	Not existed



YES >> INSPECTION END

NO >> Replace cooling fan relay.



INFOID:000000001581695

< ECU DIAGNOSIS > ECU DIAGNOSIS >

ECM

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		Values/Status			
IGN SW	• Ignition switch: $ON \rightarrow OFF -$	$\begin{array}{l} PRESENT \rightarrow ABSENT \rightarrow \\ PRESENT \end{array}$	E		
GLOW CONT	Engine: Running	Engine coolant: Less than 50°C (122°F)	ACTIV	-	
	(Less than 60 seconds after starting engine.)	Engine coolant: More than 80°C (176°F)	INACT	F	
CLUTCH STATUS	Ignition switch: ON	Clutch pedal: Fully released	NO	-	
		Clutch pedal: Slightly depressed	YES	G	
	Engine: After warming up,	Air conditioner switch: OFF	NODON	-	
A/C RELAT	idle the engine	Air conditioner switch: ON	DONE	-	
	Ignition switch: ON	+APC	- H		
ENGINE STATUS	• Engine: Running (Less than 6	RUN	-		
	Ignition switch: OFF (A few seconds after turning)	OFF			
	Ignition switch: ON	Brake pedal: Fully released	RELSD	-	
BPP SW		Brake pedal: Slightly depressed	PRSSD	J	
	Engine: After warming up, idle the engine	Air conditioner switch: OFF	NO	-	
A/C APPLD		Air conditioner switch: ON	YES	-	
	Engine: Running (Less than 60 seconds after starting engine.)	Engine coolant: Less than 50°C (122°F)	PRESENT	- K	
GLOW CONT SIGNAL		Engine coolant: More than 80°C (176°F)	ABSENT	-	
	 Engine: After warming up, idle the engine Air conditioner switch: OFF 	Engine coolant: 99°C (210°F) or less	ACTIV	- L	
COOLING FAN LOW		Engine coolant: 102°C (216°F) or more	INACT	_	
COOLING FAN HIGH	Engine: After warming up, idle the engineAir conditioner switch: OFF	Engine coolant: 99°C (210°F) or less	INACT	M	
		Engine coolant: 102°C (216°F) or more	ACTIV		
ECM-TCM COMM	Ignition switch: ON	ECM-TCM communication: Communicated	PRESENT	N	
		ECM-TCM communication: Not communi- cated	ABSENT		
A/C COMP	Engine: After warming up, idle the engine	Air conditioner switch: OFF	INACT	0	
		Air conditioner switch: ON	ACTIV	-	
NATS CODE RGST	Ignition switch: ON	NATS code registration: Not registered.	NO		
		NATS code registration: Registered.	YES	Р	
	Ignition switch: ON	Clutch pedal: Fully released	INACT	-	
		Clutch pedal: Slightly depressed	ACTIV	-	
EGR BYPAS S/V	Engine Running	Not warm-up condition	INACT	-	
		Warm-up condition	ACTIV	-	

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ECM

< ECU DIAGNOSIS >

Monitor item	condition		Values/Status
TURBO COOL PUMP		Engine coolant temperature: Less than 79°C (174°)	INACT
	Engine Running	Engine coolant temperature: More than 80°C (176°)	ACTIV
	Ignition switch: ON	Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT1		Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
	Ignition switch: ON	Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT2		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
	Ignition switch: ON	Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT4		Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
	Ignition switch: ON	Incomplete condition of DPF regeneration: Ignition switch ON	+APC
RGN INCMP STAT5		Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
RGN INCMP STAT6	Ignition switch: ON	Incomplete condition of DPF regeneration: Ignition switch ON	+APC
		Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
RGN INCMP STAT7	Ignition switch: ON	Incomplete condition of DPF regeneration: Ignition switch ON	+APC
		Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
RGN INCMP STAT8	Ignition switch: ON	Incomplete condition of DPF regeneration: Ignition switch ON	+APC
		Incomplete condition of DPF regeneration: Engine is running.	RUN
		Incomplete condition of DPF regeneration: During self shut-off	OFF
< ECU DIAGNOSIS >

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Monitor item		condition	Values/Status	_
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC	A
RGN INCMP STAT9	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN	ECF
		Incomplete condition of DPF regeneration: During self shut-off	OFF	
		Incomplete condition of DPF regeneration: Ignition switch ON	+APC	C
RGN INCMP STAT10	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine is running.	RUN	D
		Incomplete condition of DPF regeneration: During self shut-off	OFF	
		Incomplete condition of DPF regeneration: Engine stopped	STAT1	E
RGN REO STAT1	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2	F
KON KEQ SIAN	• Ignition Switch. ON	Incomplete condition of DPF regeneration: Engine running	STAT3	
		Incomplete condition of DPF regeneration: During self shut-off	STAT4	G
	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine stopped	STAT1	Н
		Incomplete condition of DPF regeneration: Engine starting	STAT2	
KON NEQ STATZ		Incomplete condition of DPF regeneration: Engine running	STAT3	
		Incomplete condition of DPF regeneration: During self shut-off	STAT4	J
	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine stopped	STAT1	
RGN REO STAT3		Incomplete condition of DPF regeneration: Engine starting	STAT2	Κ
		Incomplete condition of DPF regeneration: Engine running	STAT3	L
		Incomplete condition of DPF regeneration: During self shut-off	STAT4	
		Incomplete condition of DPF regeneration: Engine stopped	STAT1	Μ
RGN REO STAT4	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2	_ N
	Ignition ownord. Or	Incomplete condition of DPF regeneration: Engine running	STAT3	_
		Incomplete condition of DPF regeneration: During self shut-off	STAT4	0
		Incomplete condition of DPF regeneration: Engine stopped	STAT1	D
	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2	- F
	- 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
RGN REQ STAT6		Incomplete condition of DPF regeneration: Engine starting	STAT2
	• 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
	• Ignition quitch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2
KGN REQ STAT	• 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
RGN REO STAT8	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2
KON KEQ OTATO		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
PON DEO STATO	Ignition switch: ON	Incomplete condition of DPF regeneration: Engine starting	STAT2
KON KEQ OTATS		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 REO STAT10		Incomplete condition of DPF regeneration: Engine starting	STAT2
KON KEQ STATIO	• Ignition switch. ON	Incomplete condition of DPF regeneration: Engine running	STAT3
		Incomplete condition of DPF regeneration: During self shut-off	STAT4
EGR COOL BYPAS/		Not warm-up condition	INACT
		Warm-up condition	ACTIV
EGR/// TRG ANGLE	Ignition switch: ON		Less than 1%
	Engine idle		Approx. 20 - 30%
TRG RAIL PRES	Engine Running		Approx. 10 bar
TRG BOOST PRFS	Engine Running	Idle speed	Approx Atmospheric pressure
		Engine speed: 2000 rpm	Approx. 10 bar (1000 mbar)
INJ VOLUME	Engine Running	Idle speed	Approx. 5 - 10 mg/cp
-	5 5	Engine speed: 2000 rpm	Approx. 5 - 10 mg/cp
ACCEL PDL POS	 Ignition switch: ON 	Accelerator pedal: Fully released	0%
ACCEL PDL POS		Accelerator pedal: Fully depressed	100%



[M9R]

Monitor item		condition	Values/Status	٥
			Altitude Approx. 0 m: Approx. 1.0062 bar (100.62 mbar, 1.062kg / cm ² , 14.59 psi) Approx. 1,000 m: Approx. 0.8895 bar (88.95 mbar,	EC
BARO PRES	Ignition switch: ON		0.907kg /cm ² , 12.90 psi) Approx. 1,500 m: Approx. 0.8316 bar (93.16 mbar, 0.848	С
			kg /cm ² , 12.06 psi) Approx. 2,000 m: Approx. 0.7836 bar (78.36 mbar, 0.799	D
			kg /cm ² , 11.36 psi)	
FUEL RAIL PRES	Engine Running		Approx. 9 - 11 bar	Ε
TC BOOST PRES	Engine Running	Idle speed	Approx. Atmospheric pres- sure	
		Engine speed: 2000 rpm	Approx. 10 bar (1000 mbar)	F
EGR VALVE POS	Engine idle		Approx. 20 - 90%	
ENG SPEED	Run engine and compare CC tion.	Almost the same speed as the tachometer indication	G	
INT AIR TEMP	Ignition switch: ON	Indicates intake air tempera- ture		
EXT AIR TEMP	Ignition switch: ON	Indicates external air temper- ature	Н	
FUEL TEMP	Ignition switch: ON	Indicates fuel temperature		
ENG COOLAN TEMP	Ignition switch: ON	Indicates engine coolant tem- perature		
BAT VOLT	Ignition switch: ON		11 - 14V	
EGR POS/S VOLT	Engine idle		Approx. 1 - 4.2V	J
		Idle speed	Approx. 1V (1000 mV)	
FRF SEN VOLI		Engine speed: 2000 rpm	Approx. 1.8V (1800 mV)	Κ
FUEL TEMP/S VOLT	Engine Running		0.3 - 5.0V (300 - 5000 mV) Output voltage varies with fuel temperature.	I
IAT SEN VOLT	Engine Running		0.3 - 5.0V (300 - 5000 mV) Output voltage varies with in- take air temperature.	
ECT SEN VOLT	Engine Running		0.3 - 5.0V (300 - 5000 mV) Output voltage varies with en- gine coolant temperature.	IVI
	• Ignition quitch: ON	Accelerator pedal: Fully released	0.6 - 4.6V (600 - 4600 mV)	Ν
APP JEINT VULL	• ignition switch: ON	Accelerator pedal: Fully depressed	Less than 5V (5000 mV)	
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.3V (300 mV)	\cap
ALT OLINZ VULI		Accelerator pedal: Fully depressed	Less than 2.5V (2500 mV)	0
TRG IDLE SPD	• Engine: After warming up, id	le the engine	750 ± 50 tr/min	
		Idle speed	Approx. 1.2V (1200 mV)	Ρ
TO DOT FIVO VOLI		Engine speed: 2000 rpm	Approx. 1.8V (1800 mV)	

Monitor item	condition		Values/Status
		Ignition switch: ON (Engine stopped)	Approx. 0.4V (400 mV)
	 Engine: After warming up Air conditioner switch: OFF 	Idle speed	1.1 - 1.4V (1100 - 1400 mV)
MAF SEN VOLT	 Shift lever: P or N (A/T), Neutral (M/T) No load 	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	 Engine: After warming up Both A/C switch and blower to (Compressor operates) 	fan switch: ON	1 - 1.25 V (1000 - 1250 mV)
		Idle speed	Approx. 5- 10 mg/cp
INJT ADJ VALUE		Engine speed: 2000 rpm	Approx. 5- 10 mg/cp
		Idle speed	Approx. 5- 10 mg/cp
INJZ ADJ VAEOL		Engine speed: 2000 rpm	Approx. 5- 10 mg/cp
		Idle speed	Approx. 5- 10 mg/cp
INJS ADJ VAEOL	Engine Running	Engine speed: 2000 rpm	Approx. 5- 10 mg/cp
INJ4 ADJ VALUE	Engine Running	Idle speed	Approx. 5- 10 mg/cp
		Engine speed: 2000 rpm	Approx. 5- 10 mg/cp
EXH GAS TEMP2	 Engine: After warming up Drive the vehicle at a speed of 120 km/h (75 MPH) for at least 2 minutes 		Approx. 60°C (140°F) - 950°C (1742°F)
EXH GAS TEMP3	Engine: After warming upRevving engine from idle up	to 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 VOLI	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 switch: ON	A/T gear position: 3rd gear	STAT3
AT GEAR FOS	• 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.

< ECU DIAGNOSIS >

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

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Termir	nal No.	-				
(Wire	color)	Description	I	Condition	Value	ECR
+	-	Signal name	Input/ Output		(Approx.)	
1 (GR) 2 (L/B)	128	Fuel injector No. 4 Fuel injector No. 1		 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle. 	0 - 5 V★ 50mSec/div 50mSec/div 50V/div JMBIA0530GB	C D E
3 (V) 4 (W/L)	(B)	Fuel injector No. 2 Fuel injector No. 3	Input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	5 - 8 V★ 50mSec/div	F
5		Fuel injector power supply			50V/div JMBIA0531GB	Н
6 (E)	128	Fuel injector power supply No. 1	Output	 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle. 	50mSec/div	I
7 (SB) 8 (R/O)	(B)	Fuel injector power supply No. 2 Fuel injector power supply No. 3	Output	 [Engine is running] Warm-up condition Engine speed: 2,000 rpm 	4 - 6 V★ 50mSec/div 50mSec/div 50V/div JMBIA0533GB	K
9 (B)	128 (B)	Glow control unit ground	_	[Engine is running] • Warm-up condition • Idle speed	0 V	Μ
10 (Y/V)		Sensor ground (Exhaust gas temperature sensor 1)			_	N
12 (L/Y)	128 (B)	Air fuel ratio sensor heater	Output	 [Engine is running] After the vehicle is driven for 6 minutes under the following conditions Warm-up condition Vehicle speed: 80 km/h Shift lever: Suitable gear position [Ignition switch ON]	6 - 14 V★ 10mSec/div 5V/div JMBIA0534GB BATTERY VOLTAGE	P
14 (B/P)	10 (Y/V)	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.	



Termir (Wire	nal No. color)	Description		Condition	Value
+	_	Signal name	Input/ Output	Condition	(Approx.)
16 (Y/R)	_	Sensor ground (Exhaust gas pressure sensor)	_	_	_
17 (G)	_	Sensor ground (Turbocharger boost sen- sor)	_	_	_
18	17	Turbashargar baaat aanaar	laput	[Engine is running] • Warm-up condition • Idle speed	1.2 V
(O) (G)	Turbocharger boost sensor	input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.3 V	
19 (P/L)	23 (G/B)	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	16	Exhaust gas pressure sen-	logut	[Engine is running]Warm-up conditionIdle speed	1 V
(W/R)	(Y/R)	sor	input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.4 V
21 (V)	17 (G)	Sensor power supply (Turbocharger boost sen- sor)	_	[Ignition switch: ON]	5 V
22 (L/G)	_	Sensor ground (Fuel temperature sensor)	_	_	_
23 (G/B)	_	Sensor ground (Exhaust gas temperature sensor 3)	_	_	_
24 (Y/B)	_	Sensor ground (Engine coolant tempera- ture sensor)	_	_	_
25 (L)	16 (Y/R)	Sensor power supply (Exhaust gas pressure sensor)	_	[Ignition switch: ON]	5 V
26 (P)	22 (L/G)	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 (GR/ B)	Exhaust gas temperature sensor 2	Input	[Engine is running]Warm-up conditionIdle speed	0.3 - 5.0 V Output voltage varies with exhaust gas temperature.
28 (GR/L)	24 (Y/B)	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 (W)	34 (L)	Sensor power supply (Fuel rail pressure sensor)	_	[Ignition switch: ON]	5 V
30	34	Fuel rail pressure sensor	Input	[Engine is running]Warm-up conditionIdle speed	1 V
(B)	(L)	1 dei fan piessuie sensol	mput	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.8 V

< ECU DIAGNOSIS >

[M9R]

Termir (Wire	nal No. color)	Description		Condition	Value	А
+	-	Signal name	Input/ Output		(Approx.)	
31 (G/P)	35 (R/L)	Refrigerant pressure sen- sor	Input	 [Engine is running] Warm-up condition Both A/C switch and blower fan switch: ON (Compressor operates) 	1 - 2.5 V	ECR
32 (Y/G)	36 (G/R)	EGR volume control valve control position sensor	Input	[Engine is running]Warm-up conditionIdle speed	1 - 4.2 V	
33 (SB)	36 (G/R)	Sensor power supply (EGR volume control valve control position sensor)	_	[Ignition switch: ON]	5 V	
34 (L)	_	Sensor ground (Fuel rail pressure sensor)	_	_	_	E
35 (R/L)	_	Sensor ground (Refrigerant pressure sen- sor)	_	_	_	F
36 (G/R)	_	Sensor ground (EGR volume control valve control position sensor)	_	_	_	G
37 (O)	42 (O/B)	Sensor power supply (Differential exhaust pres- sure sensor)	_	[Ignition switch: ON]	5 V	Н
38 (LG)	42 (O/B)	Differential exhaust pres- sure sensor	Input	[Engine is running]Warm-up conditionIdle speed	1.6 - 4.9 V	I
39 (GR/B)	_	Sensor ground (Exhaust gas temperature sensor 2)	_	_	_	J
41 (Y/W)	35 (P/L)	Sensor power supply (Refrigerant pressure sen- sor)	_	[Ignition switch: ON]	5 V	К
42 (O/B)	_	Sensor ground (Differential exhaust pres- sure sensor)	_	_	_	I
46 (O)	—	Sensor ground (Camshaft position sensor)	—	_	_	L
48	46	Camshaft position sensor	Input	 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle. 	0 - 14 V 20mSec/div 20mSec/div 5V/div JMBIA0535GB	M N O
48 (W)	40 (O)	Camshaft position sensor	Input	 [Engine is running] Warm-up condition Engine speed: 2,000 rpm 	0 - 14 VX 20mSec/div 20mSec/div 5V/div JMBIA0536GB	Ρ

< ECU DIAGNOSIS >

Termir (Wire	nal No. color)	Description		Condition	Value
+	_	Signal name	Input/ Output	Condition	(Approx.)
49	128	Crankshaft position sensor	laput	 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle. 	0-3V* 1mSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div
(R/O) (B)	(B)	(+)	input	 [Engine is running] Warm-up condition Engine speed: 2,000 rpm 	2.5 V★ 1mSec/div 1m
50	128	Crankshaft position sensor		[Engine is running] • Warm-up condition • Idle speed	0 - 4 V★ 1mSec/div
50 1 (L/O) 0	(B)	(-)		 [Engine is running] Warm-up condition Engine speed: 2,000 rpm 	2.5 V★ 1mSec/div 1m
53	128	Glow control unit	Output	 [Engine is running] Idle speed Engine coolant temperature: Less than 50 °C (122 °F) 	BATTERY VOLTAGE (11 - 14 V)
(R/G) (B)	(B)	Giow control unit	Output	 [Engine is running] Idle speed Engine coolant temperature: More than 80 °C (176 °F) 	BATTERY VOLTAGE (11 - 14 V)
56 (R/W)	128 (B)	Turbocharger cooling pump relay	Output	 [Engine is running] Warm-up condition (Engine coolant temperature is more than 80 °C) Idle speed (For 5 minutes) 	0 - 1 V
				Event above conditions	BATTERY VOLIAGE

Except above conditions

(11 - 14 V)

[M9R]

Termir (Wire	nal No. color)	Description		Condition	Value	А
+	_	Signal name	Input/ Output	Condition	(Approx.)	
57 128 (G/R) (B)	128		0 to the	[Engine is running] • Warm-up condition • Idle speed	0 - 5 V 5 mSec/div 5 mSec/div 10V/div JMBIA0541GB	C D
	(B)	solenoid valve	Output	 [Engine is running] Warm-up condition Engine speed: 2,000 rpm 	0 - 5 V 5mSec/div 5mSec/div 10V/div JMBIA0542GB	E
59	128	EGR cooler bypass valve control solenoid valve	Output	[Engine is running]Not warm-up conditionIdle speed	1.5 V	G
(SB)	(SB) (B)			[Engine is running]Warm-up conditionIdle speed	BATTERY VOLTAGE (11 - 14 V)	Н
62 (B/R)	128 (B)	ECM relay (Self shut-off)	Output	 [Ignition switch: ON] [Ignition switch: OFF] For 20 seconds after turning ignition switch OFF 	0 - 1 V	I
				 [Ignition switch: OFF] More than 20 seconds after turning ignition switch OFF 	BATTERY VOLTAGE (11-14 V)	J
63 (D)	128	Glow control unit	Output	 [Engine is running] Idle speed Engine coolant temperature: Less than 50 °C (122 °F) 	Less than 12 V	K
(R)	(B)			 [Engine is running] Idle speed Engine coolant temperature: More than 80 °C (176 °F) 	BATTERY VOLTAGE (11 - 14 V)	M
75 (R/Y)	85 (G/O)	Sensor power supply (Throttle position sensor)	_	[Ignition switch: ON]	5 V	
77	128	Air fuel ratio sensor	Input	[Engine is running]Warm-up conditionIdle speed	3 V	Ν
(O)	(B)			[Engine is running]Warm-up conditionEngine speed: 2,000 rpm	3 V	0
78	128	Air fuel ratio concer	Input	[Engine is running] • Warm-up condition • Idle speed	2.5 V	Ρ
(GR) (B)	Air fuel ratio sensor		[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	2.5 V		

< ECU DIAGNOSIS >

Termir (Wire	nal No. color)	Description		Condition	Value
+	_	Signal name	Input/ Output	Condition	(Approx.)
				[Ignition switch: ON] Engine stopped 	0.4 V
80 (L)	87 (B)	Mass air flow sensor	Input	[Engine is running]Warm-up conditionIdle speed	1.1 - 1.4 V
			 [Engine is running] Warm-up condition Engine is revving from idle to about 4,000 rpm 	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	A. ()		[Engine is running]Warm-up conditionIdle speed	3.1 V
(SB)	(B)	Air fuel ratio sensor	Input	[Engine is running]Warm-up conditionEngine speed: 2,000 rpm	3.1 V
82	128	Air fuel ratio sensor	Input	[Engine is running]Warm-up conditionIdle speed	3.2 V
(V)	(B)	All fuel fallo sensor	input	[Engine is running]Warm-up conditionEngine speed: 2,000 rpm	3.2 V
83	83 85 (GR/L) (G/O) Throttle position sense	Throttle position sensor	Input	 [Ignition switch: OFF] For 20 seconds after turning ignition switch OFF 	0 - 5 V Output voltage fluctuates between 0 V and 5 V.
(GR/L)				 [Ignition switch: OFF] More than 20 seconds after turning ignition switch OFF 	0.7 V
84 (W)	87 (B)	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 (G/O)	_	Sensor ground (Throttle position sensor)		_	_
87 (B)		Sensor ground (Mass air flow sensor/ In- take air temperature sen- sor)	_	_	_
89	128	Fuel nump	Outout	[Engine is running]Warm-up conditionIdle speed	11 - 14 V★ 10mSec/div 10mSec/div 10V/div JMBIA0543GB
оэ (BR)	(B)	3) Fuel pump	Output	 [Engine is running] Warm-up condition Engine speed: 2,000 rpm 	8 - 10 V★ 10mSec/div 10mSec/div 10V/div JMBIA0544GB

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Termir (Wire	nal No. color)	Description		Condition	Value	A
+	_	Signal name	Input/ Output	Condition	(Approx.)	
90 1: (SB) (I	128	Fuel rail pressure control valve	Output	[Engine is running]Warm-up conditionIdle speed	0.4 V★ 1mSec/div	C C
	(B)			[Engine is running]Warm-up conditionEngine speed: 2,000 rpm	0.4 V★ 1mSec/div 	E
91 128 (LG/B) (B)		Throttle control motor (+)	Output	[Engine is running]Warm-up conditionIdle speed	0 - 2 V★ 500µSec/div 	G H
	128 (B)			 [Ignition switch: OFF] For 20 seconds after turning ignition switch OFF 	0 - 2 V★ 500µSec/div 10V/div JMBIA0548GB	J K
				[Ignition switch: OFF]More than 20 seconds after turning ignition switch OFF	0.1 V	L
92 (LG/R)	128 (B)	Throttle control motor (-)	_	[Engine is running]Warm-up conditionIdle speed	0 V	Μ
93 (G) 94 (G)	128 (B)	Power supply for ECM		[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)	N

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< ECU DIAGNOSIS >

Termir (Wire	nal No. color)	Description		Condition	Value	
+	_	Signal name	Input/ Output	Condition	(Approx.)	
95 (PP)	128	EGR volume control valve	Output	 [Ignition switch: OFF] For 20 seconds after the following conditions are met and ignition switch is turned OFF. Warm-up condition Start engine and let it idle for 3 minutes. 	0 - 1 V 1mSec/div 1m	
W)	(B)	(DC motor)	Guiput	 [Engine is running] Warm-up condition Idle speed NOTE: The duty cycle changes depending on EGR volume control valve opera- tion. 	0 - 5 V★ 1mSec/div	
				 [Ignition switch: ON] For 3 seconds after ignition switch is turned ON 	0 - 1 VX 1mSec/div 5 10V/div JMBIA0551GB	
96 (L/W)	128 (B)	EGR volume control valve (DC motor)	Output	 [Ignition switch: ON] More than 3 seconds after ignition switch is turned ON 	0 - 1 V 1mSec/div TmSec/div 1mSec/div 1mSec/div 1mSec/div 1mSec/div JMBIA0552GB	
				 [Engine is running] Warm-up condition Idle speed NOTE: The duty cycle changes depending on EGR volume control valve opera- tion. 	0 - 5 V★ 1mSec/div 	
99 (P)	_	CAN signal (low)	_	_	_	
100 (L)	_	CAN signal (high)	_	—	_	
104 (O)	128 (B)	Data link connector		[Ignition switch: ON] • GST: Disconnected	BATTERY VALTAGE (11 - 14 V)	
108	128	Clutch pedal position	Input	[Ignition switch: ON] • Clutch pedal: Slightly depressed	0 V	
(G)	(B)	switch	mput	[Ignition switch: ON] • Clutch pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)	

[M9R]

ECR-300

(Wire	color)	Description		Condition	Value	А
+	-	Signal name	Input/ Output	Condition	(Approx.)	
400	400			[Ignition switch: OFF]	0 V	ECR
109 (W/L)	128 (B)	Ignition switch	Input	[Ignition switch: ON]	BATTERY VOLATGE (11 - 14 V)	
				[Ignition switch: ON] • ASCD steering switch: OFF	4 V	С
				[Ignition switch: ON] MAIN switch: Pressed 	0 V	D
110 (V)	111 (B)	ASCD steering switch	Input	[Ignition switch: ON] CANCEL switch: Pressed 	1 V	_
				 [Ignition switch: ON] RESUME/ACCELERATE switch: Pressed 	3 V	E
				[Ignition switch: ON] SET/COAST switch: Pressed 	2 V	F
111 (B)		ASCD steering switch ground			_	G
116	128	Ston Jamp switch	Input	[Ignition switch: ON] Brake pedal: Slightly depressed 	٥V	
(O)	(B)		mput	[Ignition switch: ON] Brake pedal: Fully released 	BATTERY VAOLTAGE (11 - 14 V)	Н
118 (R/B)	120 (W/L)	Sensor power supply (Accelerator pedal position sensor 2)	_	[Ignition switch: ON]	5 V	I
119	120	Accelerator pedal position	Input	[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released	More than 0.3 V	J
(R/L)	(W/L)	sensor 2	mpar	[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully depressed	Less than 2.5 V	K
120 (W/L)		Sensor ground (Accelerator pedal position sensor 2)	_	_	_	L
122 (R)	127 (W/B)	Sensor power supply (Accelerator pedal position sensor 1)	_	[Ignition switch: ON]	5 V	Ъ.Л.
123 (B)						IVI
124 (B)	—	ECM ground	_	_	_	Ν
125 (B)						0
126	127	Accelerator pedal position	Input	[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released	0.6 - 4.6 V	0
(R/W)	(W/B)	sensor 1	mput	[Ignition switch ON]Engine stoppedAccelerator pedal: Fully depressed	Less than 5 V	Р
127 (W/B)	_	Sensor ground (Accelerator pedal position sensor 1)	_	_		
128 (B)		ECM ground	_	_		

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)





ECR-303

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[M9R]



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Connector No. E6 Connector Name WIRE TO WIRE Connector Type Fr2AMM-1V Connector Type Fr2AMM-1V L1 2 3 4 6 7 8 9 10111 12 13 14 16 17 18 10 1011	Terminal Color Signal Name (Specification) No. of Wire - A R/L - 5 G/P -(With MgR angine) 6 G/P -(With MgR angine) 13 P/L - 14 R/M -(With MgR angine) 12 Y/W - 13 L - 19 L - 19 M -(With MgR angine) 20 W -(With MgR angine)	Connector Nu. E11 Connector Name PETR (INTELLICENT POWER Connector Name INSTREPTICS MODULE ENGINE ROOM) Connector Type NST2FER-GS NST2FER-GS 13 12 11 10 9 20 19 18 17 16 15 14	Terminal Color Signal Name [Specification] No. of Wre - 9 G - 15 B/R [With diesel engine]
Commetor No. E3 Commetor Name COOLING FAN MOTOR Commetor Type P801038351602	Terminal Color Signal Name [Specification] No. of Wire - 1 R - 2 B -	Connector No. E10 Connector Name DETRIBUTION MODULE ENGINE ROOM) Connector Name DISTRIBUTION MODULE ENGINE ROOM) Connector Type MOSFB-LC MOSFB-LC B 7 6	Terminal Color Signal Name (Specification) No. 6 B - -
NGINE) Connector No. B50 Connector Name EXHAUST GAS TEMPERATURE SENSOR 3 Connector Type VZK-7282-7022-30 Connector Type VZK-7282-7022-30	Terminal Color Signal Name [Specification] No. of Wree - 1 P/L - 2 G/B -	Connector No. E8 Connector Name WRE TO WIRE Connector Type M02MW-LC	Terminal Color Skanal Name [Specification] No. of Wre
ENGINE CONTROL SYSTEM (M9R El Connector Name MIRE TO WIRE Connector Type MIRE TO WIRE Connector Type MIRE TO WIRE MIS MIS MIS MIS MIS MIS MIS MIS	Terminal Color Signal Name [Specification] No. of Wire - 2 P.L - 3 G/B -	Connector No. E7 Connector Name WIRE TO WIRE Connector Type NS 18MW-CS A13. H12 3 4 5 6 7 B 9 10 11 12 13 14 15 16	Terminal No. Calor of Wire 5 Signal Name [Specification] 0. of Wire 0.R -[With Mare expine] 10 0.R -[With Mare expine] 13 B -[With Mare expine] 14 G -[With Mare expine] 16 G -[With Mare expine]

[M9R]

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	Name (Specification GND PD AVSS	14 13 12	Name (Specificatio		ECR
BEFRICE	Signal Signal	EI01 wire to wire TK10FW-NS8 9876	S Signal		С
Connector No. Connector Nam Connector Type	Terminal Col. No. of W. 1 R/V. 3 Y/A	Connector Nam Connector Type H.S 10 11	Terminal Coli No. of W 3 0/1/		D
WER GINE ROOM)	feation]		foation]		Е
R (WTELLGENT PC UTION MODULE EN 3-5591-40-F 54 53 52	Signal Name (Speci	6 FAN RELAY-3	Signal Name (Speci		F
r No. E14 r Name PPDM E/ Type YZK 728	of Wire W	r No. E59 r Name COOLIN	clor of Wire W B W/B W/B		G
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GND-AP

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Connector No. F35 Connector Name QLOW PLUG NO.1 Connector Type TYCO-AMP BSS831-1	Terminal No. Color of Wre Signal Name [Specification] 1 L -	Connector No. F99 Connector Name EGR VOLUME CONTROL VALVE Connector Type FEP-42121200 Connector Type FEP-42121200	Terminal No. Color of Wer of Wer Signal Name [Speafication] 1 BZ-VM -[Wth MBR engine] 2 GR -[Wth MBR engine] 4 S/B -[Wth MBR engine] 5 L/W -[Wth MBR engine] 6 Y/G -[Wth MBR engine]		A ECR C D
Connector No. F81 Connector Name Connector Type BOSCH 1928404073	Terminal No. Color of Wire Signal Name [Specification] 1 V 5V 2 G CMD 3 0 VS	Connector No. F18 Connector Name GL OW PLUG NO.4 Connector Type TYCO-AMP 953831-1	Terminal Color Signal Name [Specification] No. of Wer 1 Y		E F G
GINE) Connector No. F5 Connector Name FUSIBLE LINK HOLDER Connector Type LOIFB-MC	Terminal Color Signal Name (Specification) No. of Wire - 6 W -	Connector Mo. F97 Connector Name dL.OW PLUG NO.3 Connector Type TYCO-AMP 953831-1	Terminal Color Signal Name [Specification] N. of Nire		I J K
ENGINE CONTROL SYSTEM (M9R EN Connector No. E125 Connector Name CLITCH PEDAL POSITION SWITCH Connector Type M02FBR-LC	Terminal No. Color 6 Wire Signal Name [Seecification] 1 G - 2 B -	Domector Nu. F96 Connector Name GLOW FLUG NO 2 Connector Type TYCO-AMP 953631-1 Connector Type TYCO-AMP 953631-1	Terminal Color Signal Name [Specification] No. of Wire -		L M N
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Image: State of the state			Connector No. F123 Connector Name WITE TO WIEE Connector Type ITC24FW-1V Connector Type ITC34FW-1V Connector Type ITC34FW-1V Lab ITC34FW-1V Lab ITC34FW-1V Lab ITC34FW-1V Lab ITC34FW-1V Lab ITC34FW-1V	Terminal Color Signal Name [Specification] No. of Mire Signal Name [Specification] 4 R./L - 5 G./B - 6 G./P - 11 R./W - 12 Y.M - 13 Y.M - 18 L - 19 B - 13 Y.M - 14 R.W - 13 Y.M - 14 B - 13 V.M - 14 B - 15 V - 16 B - 17 With MSR engine] -	
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Control Control <t< td=""><td>RENGINE Connector Name Connector Name Connector Name Name Name Connector Name Name Connector Name Name Connector Name Name Connector Name Size Connector Name <t< td=""><td>Sourred SYSTEM (M9R ENGINE) Fils Connector Nun a.uw control. UNIT Connector Nun Fils autor control. UNIT Connector Nun El zupcossionis Connector Nun Connector Nun Connector Nun El zupcossionis Connector Nun El zupcossionis Connector Nun El zupcossionis Connector Nun Connector Connector Nun El zupcossionis Connector Nun El zupcossi</td><td>To write EW-CS 5 4</td><td>Signal Name (Specification) -(With MBR angulue) -(With diesel angulue) -(With MBR angulue) -(With MBR angulue) -(With MBR angulue)</td><td>TURBINE TEMP GIND-TURBINE FRESS GIND DOOST PRESS BOOST PRESS BOOST PRESS BOOST PRESS BOOST PRESS AVCS-BOONT FEMP TURBINE FRESS AND-WATTEN TEMP AVCC-BOONT FEMP AVCC-BOONT FEESS GIND FRECON FRESS GIND FRECON FRESS GIND FRECON FRESS GIND FRECON FRESS AND FRESS AND FRECON FRESS AND FRESS AN</td></t<></td></t<>	RENGINE Connector Name Connector Name Connector Name Name Name Connector Name Name Connector Name Name Connector Name Name Connector Name Size Connector Name <t< td=""><td>Sourred SYSTEM (M9R ENGINE) Fils Connector Nun a.uw control. UNIT Connector Nun Fils autor control. UNIT Connector Nun El zupcossionis Connector Nun Connector Nun Connector Nun El zupcossionis Connector Nun El zupcossionis Connector Nun El zupcossionis Connector Nun Connector Connector Nun El zupcossionis Connector Nun El zupcossi</td><td>To write EW-CS 5 4</td><td>Signal Name (Specification) -(With MBR angulue) -(With diesel angulue) -(With MBR angulue) -(With MBR angulue) -(With MBR angulue)</td><td>TURBINE TEMP GIND-TURBINE FRESS GIND DOOST PRESS BOOST PRESS BOOST PRESS BOOST PRESS BOOST PRESS AVCS-BOONT FEMP TURBINE FRESS AND-WATTEN TEMP AVCC-BOONT FEMP AVCC-BOONT FEESS GIND FRECON FRESS GIND FRECON FRESS GIND FRECON FRESS GIND FRECON FRESS AND FRESS AND FRECON FRESS AND FRESS AN</td></t<>	Sourred SYSTEM (M9R ENGINE) Fils Connector Nun a.uw control. UNIT Connector Nun Fils autor control. UNIT Connector Nun El zupcossionis Connector Nun Connector Nun Connector Nun El zupcossionis Connector Nun El zupcossionis Connector Nun El zupcossionis Connector Nun Connector Connector Nun El zupcossionis Connector Nun El zupcossi	To write EW-CS 5 4	Signal Name (Specification) -(With MBR angulue) -(With diesel angulue) -(With MBR angulue) -(With MBR angulue) -(With MBR angulue)	TURBINE TEMP GIND-TURBINE FRESS GIND DOOST PRESS BOOST PRESS BOOST PRESS BOOST PRESS BOOST PRESS AVCS-BOONT FEMP TURBINE FRESS AND-WATTEN TEMP AVCC-BOONT FEMP AVCC-BOONT FEESS GIND FRECON FRESS GIND FRECON FRESS GIND FRECON FRESS GIND FRECON FRESS AND FRESS AND FRECON FRESS AND FRESS AN
		Pilos Common Pilos Common <td>ettor No. F121 estor Type NS16 1615</td> <td>G G G G G G G G G G G G G G G G G G G</td> <td>B/P B/P B/P 0 0 0 B/P 0 0 0 0 D 0 0 0 0 0 D 0 0 0 0 0 0 D 0 0 0 0 0 0 0 D 0</td>	ettor No. F121 estor Type NS16 1615	G G G G G G G G G G G G G G G G G G G	B/P B/P B/P 0 0 0 B/P 0 0 0 0 D 0 0 0 0 0 D 0 0 0 0 0 0 D 0 0 0 0 0 0 0 D 0

Connector No. F134 Connector Name CRAMKSHAFT POSTTON SENSOR Connector Type FCI-21 IE02255049 Connector Type FCI-21 IE02255049	Connector No. F138 Connector Name CAMSHAFT POSITION SENSOR Connector Type FCI-211FC022S0049 Connector Type FCI-211FC022S0049	Terminal No. Calor of War No. Sugral Name [Specification] 1 0 0ND 3 GND SIG 0.1 O.01N O.01N	A ECR C D
Connector Nu. F13 Connector Name EVIGINE COLANT TEMPERATURE SENSOR Connector Type EVIGINE Connector Type EVIGINE	Gomestor No. F137 Connector Name TURBOCHARGER COOLING PUMP Connector Type TVCO-1-0967412-2 Miss TVCO-1-0967412-2	Terminal No. Color of Ware Sagnal Name [Speer/frauton] 1 G - 2 B -	E F G H
GINE BI 20 AIR FLOW 81 58 CAT UEOD SENS 82 CAT UEOD SENS 82 CAT UEOD SENS 83 CAT UEOD SENS 84 MITACE AIR TEMP 85 COT UEOD SENS 86 MITACE AIR TEMP 87 B MITACE AIR TEMP 87 B OND ELAP DOSTITION 87 LOR 89 LUR 80 NTARE FLAP DO- 91 LG/R NTARE FLAP DO- 92 CG/R NTARE FLAP DO- 93 C 94 C 95 L/W 96 L/W	Connector Name F136 Connector Name DFF UF TEMP SENS Connector Type YZK-7282-7022-10	Terminal Color Signal Name [Specification] No. of Wic - 1 GR - 2 GR/B -	l J K
ENGINE CONTROL SYSTEM (M9R EN connector Name F132 Connector Name EOM State Connector Name State Connector Name <tr< td=""><td>Comeetor No. F135 Connector Name SERNSOR Demestor Pressure Connector Type BOSCH 1928404073 Connector Type Connector Type</td><td>Terminal No. Color of Wise Signal Name [Specification] 1 1 1 3 0 0 3 0 0</td><td>L M N O</td></tr<>	Comeetor No. F135 Connector Name SERNSOR Demestor Pressure Connector Type BOSCH 1928404073 Connector Type Connector Type	Terminal No. Color of Wise Signal Name [Specification] 1 1 1 3 0 0 3 0 0	L M N O

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Commettor No. F142 Commettor Name EXHAUST CAST TEMPERATURE SENSOR 1 Commettor Type EXHAUST CAST TEMPERATURE SENSOR 1 Commettor Type FCI-211FC02254049	Terminal Color No. of Nee 1 B.P 2 Y/V	Connector No. F145 Connector Name EUEL INJECTOR NO.3 Connector Type BOSCH 1928404072 Connector Type BOSCH 1928404072	Terminal Color Signal Name [Specification] No. of Wire Signal Name [Specification] 1 R/O - 2 W/L -
Connector No. F141 Connector Name AIR FUEL RATIO SENSOR Connector Type BOSCH 1928404869 Connector Type BOSCH 1928404869	Terminal Color Signal Mame (Specification) No. of Wre Signal Mame (Specification) 1 SB PUMPING CURRENT 2 GR VIRTUELLE GMD 3 LOY HEATRE< -	Connector No. F 145 Connector Name FUEL INJECTOR NO 2 Connector Type BOSCH 1928404072 Connector Type Connector Type	Terminal No. Cofor of Wire Signal Name [Specification] 1 S./B 2 V
VGINE) Connector No. F140 Connector Name Connector Type Connector Type Co	Terminal Color No. of Wre No. of Wre 1 p 2 L/G	Connector No. F 144 Connector Name FUEL INJECTOR NO.1 Connector Type BOSCH 1928404072 Connector Type C21	Terminal Color Signal Mane [Specification] No. of Wive Signal Mane [Specification] 1 of Wive - 2 UB -
ENGINE CONTROL SYSTEM (M9R Er Connector Name Connector Name Connector Type BOSCH 1928403988 Connector Type	Terminal Color Signal Name [Specification] 1 W VCC 2 B VIGC 3 L GND	Connector No. F143 Connector Name EUEL PUNP Connector Type BOSCH 1928404072	Terminal Color Signal Name [Specification] No. of Wire Signal Name [Specification] 1 0 (-) 2 ER (-)

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SOL VALVE	ation]	AL CABLE)	ation]		Е
HALL PRESSURE CONIT	Signal Name (Specific (-)	EINATION SWITCH (SPIR F6Y-1V 24 26 26 27 31 32 33 34	Signal Name (Specific		F
tetor No. F149 tetor Name FUEL BOSS	and Color of Wire S/B S/B	ictor No. M33 ictor Name COMI ictor Type TK08	rail Color of Wire B V		G
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te ochron, worde	(Specification) AND 5V (-) SIG	тоя 141516 678	Specification]		I
	Signal Market	SEW 5FW 0 11 12 13 2 3 4 5	Signal Nam		J
SINE) Connector Name Reserved Connector Name Reserved Connector Type BOS	Terminal Color NG. of Wite NG. a 1 R/V 3 R/V 5 LG/R 6 GR/L	Connector No. M4 Connector Name DAT Connector Type BD11 H1S	Torminal Calor MG. of Wite 4 B 6 L 7 O 8 P 16 Y		K
		TROL			L
ROL SYSTEM (A NUECTOR NO.4	Signal Name (Specification) 	OLER BYPASS VALVE CON HOLD VALVE B-AHV-S B-AHV-S	Signal Name [Specification] (+) (-)		Μ
LE CONT 400 F147 1990 BOSCH	of Wire Galar	No. F151 Name EGR C SOLEN Fype BS02F	of Wire SB SB		IN
ENGIN Commetor I Commetor I	Terminal No.	Connector I Connector I Connector	Terminal No. – – 2 2 – 2		0
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[M9R]



Fail Safe

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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.

DTC Inspection Priority Chart

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

Priority	Detected items (DTC)	ECF
1	U1000 CAN communication line P0016 Crankshaft position - camshaft position correlation P0100 Mass air flow sensor	С
	 P0110 Intake air temperature sensor P0115 Engine coolant temperature sensor P0120 Throttle position sensor P0130 P0131 P0133 P0134 P2231 P2A00 Air fuel ratio (A/F) sensor 1 P0135 Air fuel ratio (A/E) sensor 1 bester 	D
	 P0135 Air Idei faito (A/F) sensor Fileater P0180 Fuel temperature sensor P0190 P2293 Fuel rail pressure sensor P0225 P2120 Accelerator pedal position sensor 	E
	 P0235 Turbocharger boost sensor P0335 Crankshaft position sensor P0340 Camshaft position sensor P0409 EGR volume control valve control position sensor P0470 Exhaust das pressure sensor 	F
	 P0500 Vehicle speed sensor P0530 Refrigerant pressure sensor P0544 Exhaust gas temperature sensor 1 	G
	 P0560 Battery voltage P0606 P060B P062B P062F P1607 ECM P0611 Fuel injector adjustment value P0641 P0651 P0697 Sensor power supply P1610 - P1616 NATS 	Н
	 P1010 - P1010 NATS P2031 Exhaust gas temperature sensor 2 P2080 P242A Exhaust gas temperature sensor 3 P2226 Barometric pressure sensor P2299 Accelerator pedal - brake pedal position inconsistency P2452 P2453 Differential exhaust gas pressure sensor 	l
2	 P0045 Turbocharger boost control solenoid valve P0089 P2294 Fuel rail pressure control valve P0090 Fuel pump P0200 P0201 - P0204 P0263 P0266 P0269 P0272 P1201 - P1204 P2146 P2149 Fuel injector P0380 P0670 Glow control system 	K
	 P0487 P0488 EGR volume control valve P0571 Brake pedal position switch P0685 ECM relay P2100 P2101 Electric throttle control actuator 	L
	 P2425 EGR cooler bypass valve control solenoid valve P2505 Ignition relay P2600 Turbocharger cooling pump 	M
٢	 P0300 - P0304 Misfire P0564 P0575 ASCD steering switch P1435 P1436 DPF regeneration P2002 P242F DPF 	Ν
	P2263 Turbocharger system	0

DTC Index

INFOID:000000001581700

X: Applicable —: Not applicable

DTC*	Items (CONSULT-III screen terms)	Trip	MI lighting up	Reference page
U1000	CAN COMM CIRCUIT	3	-	<u>ECR-114</u>
P0016	CMP/CKP RELATION	3	_	ECR-115
P0045	TC BOOST SOL/V	3	×	<u>ECR-117</u>

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DTC*		Trip	MI lighting up	Reference page
P0080		3	~	ECP-110
P0089		3	*	ECR-121
P0100		3	~	ECP-123
P0100		3	~	ECP-126
P0101		2	*	ECR 120
P0115		2	*	ECR 122
P0115		3	×	<u>ECR-132</u>
P0120		3	×	<u>EGR-134</u>
P0130		3	×	<u>EUR-137</u>
P0131	A/F SENSOR1	3	×	<u>EGR-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	×	ECR-155
P0202	CYL 2 INJECTOR	3	×	ECR-155
P0203	CYL 3 INJECTOR	3	×	ECR-155
P0204	CYL 4 INJECTOR	3	×	ECR-155
P0225	APP SENSOR 1	3	×	ECR-158
P0235	TC BOOST SENSOR	3	×	ECR-161
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	-	<u>ECR-165</u>
P0303	CYL 3 MISFIRE	3	-	ECR-165
P0304	CYL 4 MISFIRE	3	_	ECR-165
P0335	CKP SENSOR	3	×	ECR-167
P0340	CMP SENSOR	3	×	ECR-169
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	×	ECR-180
P0488	EGR SYSTEM	3	×	ECR-182
P0500	VEHICLE SPEED	3	_	<u>ECR-184</u>
P0530	REFRGRT PRESS SEN	3	_	<u>ECR-185</u>
P0544	EGT SENSOR 1	3	_	ECR-187
P0560	BATTERY VOLTAGE	3	_	<u>ECR</u> -189
P0564	ASCD SW	3	_	ECR-192
P0571	BPP SW	3	_	 ECR-195
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DTC*	Items (CONSULT-III screen terms)	Trip	MI lighting up	Reference page	А
P0575	ASCD SW	3	_	ECR-198	_
P0606	ECM	3	ON or –	<u>ECR-201</u>	
P060B	ECM	3	×	ECR-203	
P0611	INJ ADJ VAL	3	×	ECR-205	
P062B	ECM	3	ON or –	<u>ECR-207</u>	С
P062F	ECM	3	×	ECR-209	_
P0641	SENSOR PWR/CIRC1	3	×	ECR-211	_
P0651	SENSOR PWR/CIRC2	3	×	ECR-213	D
P0670	GLOW CONT SYSTEM	3	-	ECR-216	_
P0685	ECM RELAY	3	×	ECR-218	E
P0697	SENSOR PWR/CIRC3	3	×	<u>ECR-220</u>	
P1201	CYL 1 INJECTOR	3	-	<u>ECR-222</u>	
P1202	CYL 2 INJECTOR	3	-	ECR-222	F
P1203	CYL 3 INJECTOR	3	-	ECR-222	
P1204	CYL 4 INJECTOR	3	-	ECR-222	G
P1435	DPF REGENERATION	3	×	ECR-224	
P1436	DPF REGENERATN	3	-	<u>ECR-226</u>	
P1607	ECM	3	×	ECR-228	Н
P1610	LOCK MODE	3	-	<u>SEC-35</u>	
P1611	ID DISCORD, IMMU-ECM	3	-	SEC-36 or SEC-188	_
P1612	CHAIN OF ECM-IMMU	3	-	SEC-38 or SEC-189	_
P1614	CHAIN OF IMMU-KEY	3	-	SEC-39 or SEC-190	
P1615	DIFFERENCE OF KEY	3	-	SEC-41 or SEC-192	J
P1616	ECM	3	-	SEC-42 or SEC-193	_
P2002	PM OVER ACCMLT	3	-	ECR-229	
P2031	EGT SENSOR 2	3	-	ECR-231	- K
P2080	EGT SENSOR 1	3	-	ECR-234	_
P2100	ETC FUNCTION	3	-	ECR-236	L
P2101	ETC FUNCTION	3	-	ECR-239	_
P2120	APP SENSOR 2	3	×	ECR-242	_
P2146	INJ PWR/CIRC	3	×	ECR-245	M
P2149	INJ PWR/CIRC	3	×	ECR-245	
P2226	BARO SENSOR	3	×	<u>ECR-247</u>	N
P2231	A/F SENSOR1	3	×	ECR-249	
P2263	TC SYSTEM	3	×	ECR-251	
P2293	FRP CONTROL SYSTEM	3	×	<u>ECR-254</u>	0
P2294	FRP CONTROL VALVE	3	×	ECR-256	
P2299	APP/BPP INCNSSTNCY	3	-	ECR-258	P
P2425	EGR COOLER BYP/V	3	_	ECR-261	
P242A	EGT SENSOR 3	3	-	ECR-263	_
P242F	DPF	3	-	ECR-266	
P2452	DIFF EX PRESS SEN	3	×	ECR-268	
P2453	DIFF EX PRESS SWN	3	×	ECR-270	
P2505	ECM POWER SUPPLY	3	-	<u>ECR-271</u>	_

[M9R]

DTC*	Items (CONSULT-III screen terms)	Trip	MI lighting up	Reference page
P2600	TC COOLING PUMP	3	_	<u>ECR-273</u>
P2A00	A/F SENSOR1	3	×	<u>ECR-277</u>
P3031	SERVICE REGENERATN	3	_	<u>ECR-279</u>

*: This number is prescribed by ISO 15031-6.

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

	SYMPTOM														C
						ENGINE STALL									D E F
SYSTEM — Basic engine control system		-	_ 											Reference	G
		NE IS COL				pago	Н								
	st firing)	first firing)	HEN ENGI	HEN ENGI			ING.	ING/FLAT S	NC		NOI				
	(with first	(without	START W	START W		RIVING	CELERAT	N/SURG	TONATIO	OWER	ELERAT				J
	NO START	NO START	HARD TO S	HARD TO S	AT IDLE	DURING DI	WHEN DEO	HESITATIO	KNOCK/DE	LACK OF P	POOR ACC	HI IDLE	LOW IDLE		K
Warranty symptom code		ŀ	٩A			AB		AC	AD	A	λE	A	١F		I
Fuel pump	5	5	5	5	5	5	5	5		5	5		5	—	
Fuel injector	3	3	3	3	3	3	3	3	3	4	4	3	3	<u>ECR-163,</u> <u>ECR-222</u>	M
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-403</u>	Ν
EGR system										3	3			<u>ECR-182</u>	
Air cleaner and duct										3	3			<u>EM-354</u>	
Turbocharger cooling pump										3	3			ECR-273	0
Electric throttle control actuator	2	2	2	2	1	1	1			1	1			<u>ECR-236,</u> <u>ECR-239</u>	D

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< SYMPTOM DIAGNOSIS >

[M9R]

		SYMPTOM													
SYSTEM — Basic engine control system							ENGINE STALL								Deferme
	SYSTEM — Basic engine control system		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	NOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	Reference page
Warı	anty symptom code		ŀ	١A			AB		AC	AD	ļ	λE	ŀ	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	<u>ECR-155</u>
	Fuel injector adjustment value registra- tion								1	1	1	1			<u>ECR-205</u>
ROL	Mass air flow sensor circuit								1		1	1			ECR-123
ILIN	Engine coolant temperature circuit			1		1		1						1	ECR-132
00	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> ECR-242
	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 >

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SYMPTOM															^	
545	TEM — Basic engine control system		μαλολικό ετλοτάτας το για αλ				ENGINE STALL								Deferrers	C ECR
STSTEM — Basic engine control system				INE IS COLD	INE IS HOT				SPOT						page	F
		t firing)	first firing)	/HEN ENG	/HEN ENG			LING	ING/FLAT	NO		NOI				G
		RT (with firs	RT (without	O START M	O START M		DRIVING	ECELERA	ION/SURG	DETONATI	F POWER	CCELERAT		щ		Η
		NO STAF	NO STAF	HARD TO	HARD TO	AT IDLE	DURING	WHEN D	HESITAT	KNOCK/	LACK OF	POOR A	HI IDLE	LOW IDL		I
Warr	anty symptom code		A	λA			AB		AC	AD	A	λE	1	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	Κ
	Turbocharger boost control solenoid valve circuit								1		1	1			ECR-117	
ОГ	Start signal circuit	1	1	1	1	1		1	1		1	1			<u>STR-21</u>	
NTR	Ignition switch circuit		1			1	1	1							<u>ECR-111</u>	
col	Power supply for ECM circuit		1			1	1	1							ECR-271	D. 4
INE	EGR volume control valve circuit								1		1	1			ECR-180	IVI
ENG	EGR cooler bypass valve control solenoid valve														ECR-261	NI
	Differential exhaust pressure sensor cir- cuit										3	3	3		ECR-268	IN
	Exhaust gas temperature sensor 1 circuit														ECR-187	\cap
	Exhaust gas temperature sensor 2 circuit														ECR-231	0
	Exhaust gas temperature sensor 3 circuit														<u>ECR-263</u>	

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< SYMPTOM DIAGNOSIS >

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							SY	′MPT	OM						
SYSTEM — Basic engine control system							ENGINE STALL								Deference
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	LOW IDLE	Reference
Warr	anty symptom code		A	٨A			AB		AC	AD	A	λE	Å	١F	
	Exhaust gas pressure sensor circuit										3	3			<u>ECR-178</u>
ROL	Throttle position sensor circuit														ECR-134
DNT	Refrigerant pressure sensor circuit					2	2	2							<u>ECR-185</u>
ы Ш	ECM relay (Self shut-off) circuit		1				1	1	1						ECR-218
ENGIN	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	NATS (Nissan Anti-theft System)		1												<u>SEC-15,</u> <u>SEC-171</u>

1 - 5: The numbers refer to the order of inspection.

(continued on next page)

< SYMPTOM DIAGNOSIS >

[M9R]

							SYM	PTOM							А
SYSTEM — Basic engine control system				DLE	VE COOLANT TEMPERATURE	SUMPTION	MPTION			R CHARGE)	*	es.	т-Ш?	Reference	C D
		ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO I	OVERHEAT/HIGH ENGIN	EXCESSIVE FUEL CONS	EXCESSIVE OIL CONSU	BLACK SMOKE	WHITE SMOKE	DEAD BATTERY (UNDEF	F warning light illuminates.	Ifunction indicator illuminat	n be detected by CONSUL		E
Warr	anty symptom code	AG	AH	AJ	AK	AL	AM	AP F		HA	Б	Ma	Ca		G
Fuel	pump	5	5	5		5					3	1	1	_	
Fuel	injector	3	3	3		4		3	3		1	1	1	<u>ECR-163,</u> ECR-222	Н
Glow	control system								1					<u>ECR-172,</u> ECR-216	
Engir	ne body		3	3	3	3	1		3					<u>EM-403</u>	
EGR	system							3			1			ECR-182	
Air cl	eaner and duct							3						<u>EM-354</u>	.1
Elect	ric throttle control actuator										1	1	1	<u>ECR-236,</u> ECR-239	0
Turbo	ocharger cooling pump													ECR-273	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	<u>ECR-155</u>	
	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	М
8	A/F sensor 1 circuit										2	1	1	<u>ECR-137</u>	
INE INE	Vehicle speed signal circuit											1	1	<u>ECR-184</u>	
ENG	Accelerator pedal position sensor circuit			1								1	1	<u>ECR-158,</u> ECR-242	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													<u>ECR-148</u>	

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< SYMPTOM DIAGNOSIS >

							SYM	PTON	I					
SYST	ΈΜ — Basic engine control system			IDLE	NE COOLANT TEMPERATURE	SUMPTION	UMPTION			R CHARGE)	*	ites.	1 1 1 1 1 1	Reference page
		ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO	OVERHEAT/HIGH ENGI	EXCESSIVE FUEL CON	EXCESSIVE OIL CONSI	BLACK SMOKE	WHITE SMOKE	DEAD BATTERY (UNDE	PF warning light illuminates	alfunction indicator illumina	an be detected by CONSUI	
Warra	anty symptom code	AG	AH	AJ	AK	AL	AM	ŀ	١P	HA	ā	ž	Ű	
	Crankshaft position sensor circuit	1	1								3	1	1	<u>ECR-167</u>
	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-21</u>
	Ignition switch circuit													<u>ECR-111</u>
	Power supply for ECM circuit											1	1	<u>ECR-271</u>
TROL	EGR cooler bypass valve control solenoid valve circuit					3		1						<u>ECR-261</u>
NO	EGR volume control valve circuit							1			1			ECR-182
GINE C	Differential exhaust gas pressure sensor cir- cuit										2	1	1	ECR-268
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-263
	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
NATS	6 (Nissan Anti-theft System)												1	<u>SEC-15,</u> SEC-171

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:000000001581703 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:000000001581704 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

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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.

On Board Diagnostic (OBD) System of Engine

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-104, "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.

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.







INFOID:000000001581705

INFOID:000000001581707

< PRECAUTION >

- When connecting ECM harness connector, fasten (A) it securely with levers (1) as far as they will go as shown in the figure.
- ECM (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.
- 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.







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< PRECAUTION >

- Do not depress accelerator pedal when staring.
- Immediately after staring, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.



- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.
- 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.
- Adjust the antenna and feeder line so that the standingwave radio can be kept smaller.
- Be sure to ground the radio to vehicle body.
- Cylinder NO.1 is at the flywheel end.
 - -1: Crankshaft pulley



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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

INFOID:000000001581708



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RISKS ASSOCIATED WITH CONTAMINATION The high pressure direct injection system is highly sensitive to contamination. The risks associated withcon-	А
tamination are:	
 components jamming, 	FCR
 components losing seal integrity. All After-Sales operations must be performed under very clean conditions. This means that no impurities (par- 	LON
ticles 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?	С
 metal or plastic chips, paint, fibres: from cardboard 	D
 from brushes, from paper, from clothing, 	E
 from cloths, foreign bodies such as hair, ambient air 	F
• 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.	G
INSTRUCTIONS TO BE FOLLOWED BEFORE CARRYING OUT ANY WORK	Н
Before any work is carried out on the high pressure injection system, protect:	
 the accessories and tining bells, the electrical accessories, (starter, alternator, electric power assisted steering pump), the flywheel surface, to prevent any diesel from running onto the clutch friction plate. 	I
 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. 	J
 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 con- 	K
taminate 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 uncon-	L
 taminated 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. 	М
 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.	Ν
 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. 	0
 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. 	Ρ
 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.	

ECR-329

< PREPARATION > PREPARATION PREPARATION

Special Service Tools

INFOID:000000001605922

[M9R]

Tool number Tool name		Description
KV10114400 Heated oxygen sensor wrench	S-NT636	Loosening or tightening heated oxygen sensor 2 a: 22 mm (0.87 in)

Commercial Service Tools

INFOID:000000001605923

Tool name		Description
Oxygen sensor thread cleaner	AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti- seize lubricant shown below. a: 18 mm diameter with pitch 1.5 mm for Zirco- nia Oxygen Sensor b: 12 mm diameter with pitch 1.25 mm for Tita- nia Oxygen Sensor
Anti-seize lubricant i.e.: (Permatex TM 133AR or equivalent meeting MIL specifica- tion MIL-A-907)	S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS) SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

Condition	Specification	
No load* (in Neutral position)	750 ± 50 rpm	

*: Under the following conditions

• A/C switch: OFF

• Electric load: OFF (Lights, glow plug, heater fan & rear window defogger)

· Steering wheel: Kept in straight-ahead position

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