SECTION ECH А ECH ENGINE CONTROL SYSTEM (HR16DE) c

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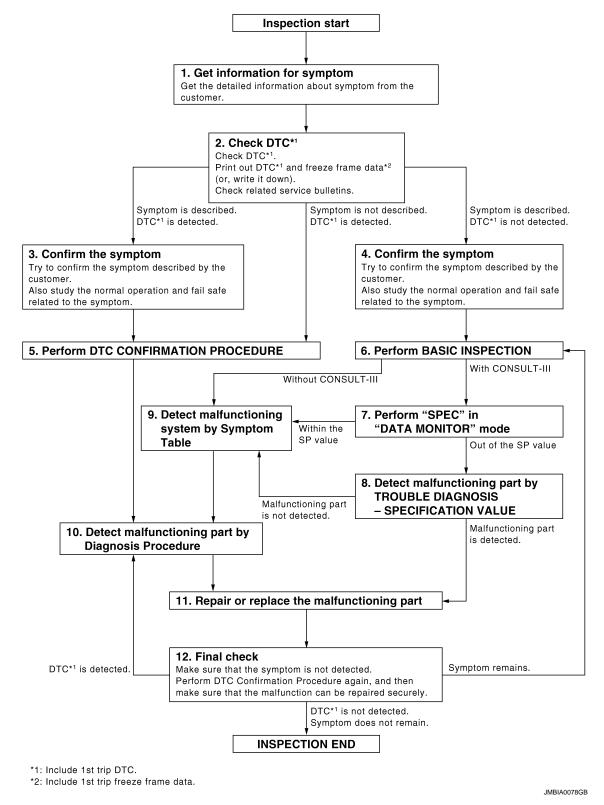
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BASIC INSPECTION DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:000000001179355

OVERALL SEQUENCE



DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

I .GET INFORMATION FOR SYMPTOM	А
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>ECH-12</u> , " <u>Diagnostic Work</u> <u>Sheet</u> ".)	ECH
>> GO TO 2. 2.CHECK DTC	
	С
 Check DTC. Perform the following procedure if DTC is displayed. Record DTC and freeze frame data. (Print them out with CONSULT-III or GST.) Erase DTC. (Refer to <u>ECH-76. "Diagnosis Description"</u>.) Study the relationship between the cause detected by DTC and the symptom described by the customer. 	D
 Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to <u>ECH-334</u>, "Symptom Table".) Check related service bulletins for information. 	E
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.	F
3. CONFIRM THE SYMPTOM	G
Try to confirm the symptom described by the customer (except MI ON). Also study the normal operation and fail safe related to the symptom. Refer to <u>ECH-338</u> , " <u>Description</u> " and <u>ECH-327</u> , "Fail <u>Safe</u> ".	Н
Diagnosis Work Sheet is useful to verify the incident.	
Verify relation between the symptom and the condition when the symptom is detected.	
>> GO TO 5.	
4.CONFIRM THE SYMPTOM	
Try to confirm the symptom described by the customer. Also study the normal operation and fail safe related to the symptom. Refer to <u>ECH-338</u> , " <u>Description</u> " and <u>ECH-327</u> , "Fail Safe".	J
Diagnosis Work Sheet is useful to verify the incident. Verify relation between the symptom and the condition when the symptom is detected.	Κ
>> GO TO 6.	L
5. PERFORM DTC CONFIRMATION PROCEDURE	
Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is	
detected again. If two or more DTCs are detected, refer to ECH-329, "DTC Inspection Priority Chart" and determine trouble	M
diagnosis order. NOTE:	Ν
 Freeze frame data is useful if the DTC is not detected. Perform Component Function Check if DTC CONFIRMATION PROCEDURE is not included on Service Manual. This simplified check procedure is an effective alternative though DTC cannot be detected during this check. 	0
If the result of Component Function Check is NG, it is the same as the detection of DTC by DTC CONFIR- MATION PROCEDURE.	_
Is DTC detected?	Ρ
YES >> GO TO 10.	
NO >> Check according to <u>ECH-330, "DTC Index"</u> .	
O .PERFORM BASIC INSPECTION	
Perform ECH-14, "BASIC INSPECTION : Special Repair Requirement".	

Do you have CONSULT-III?

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

[HR16DE (WITH EURO-OBD)]

YES >> GO TO 7. NO >> GO TO 9.

7.PERFORM SPEC IN DATA MONITOR MODE

With CONSULT-III

Make sure that "MAS A/F SE-B1", "B/FUEL SCHDL" and "A/F ALPHA-B1" are within the SP value using CON-SULT-III in "SPEC" of "DATA MONITOR" mode. Refer to <u>ECH-98, "Component Function Check"</u>.

Is the measurement value within the SP value?

YES >> GO TO 9.

NO >> GO TO 8.

f 8. DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Detect malfunctioning part according to ECH-99, "Diagnosis Procedure".

Is malfunctioning part detected?

YES >> GO TO 11.

NO >> GO TO 9.

9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to <u>ECH-334</u>, "<u>Symptom Table</u>" based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptom.

>> GO TO 10.

10. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE

Inspect according to Diagnosis Procedure of the system.

NOTE:

The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to Circuit Inspection in <u>GI-41</u>, "Circuit Inspection".

Is malfunctioning part detected?

YES >> GO TO 11.

NO >> Monitor input data from related sensors or check the voltage of related ECM terminals using CON-SULT-III. Refer to <u>ECH-306, "Reference Value"</u>.

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

- 1. Repair or replace the malfunctioning part.
- 2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
- 3. Check DTC. If DTC is displayed, erase it. Refer to ECH-76, "Diagnosis Description".

>> GO TO 12.

12.FINAL CHECK

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 repaired securely.

When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected.

Is DTC detected and does symptom remain?

- YES-1 >> DTC is detected: GO TO 10.
- YES-2 >> Symptom remains: GO TO 6.
- NO >> Before returning the vehicle to the customer, make sure to erase unnecessary DTC in ECM. (Refer to <u>ECH-76, "Diagnosis Description"</u>.) If the completion of SRT is needed, drive vehicle under the specific DRIVING PATTERN in <u>ECH-331, "How to Set SRT Code"</u>.

Diagnostic Work Sheet

DESCRIPTION

INFOID:000000001179356

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

Some conditions may cause the MI to come on steady or blink and DTC to be detected. Examples:

Vehicle ran out of fuel, which caused the engine to misfire.

WORKSHEET SAMPLE

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

KEY POINTS

[HR16DE (WITH EURO-OBD)]

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Customer name MR/MS		Model & Year	VIN	
Engine #		Trans.	Mileage	
Incident Date	e	Manuf. Date	In Service Date	
Fuel and fue	l filler cap	 Vehicle ran out of fuel causing misfire Fuel filler cap was left off or incorrectly 		
	Startability	□ Impossible to start □ No combust □ Partial combustion affected by th □ Partial combustion NOT affected □ Possible but hard to start □ Other	hrottle position d by throttle position	
Symptoms	🗌 Idling	No fast idle Unstable H	□ No fast idle □ Unstable □ High idle □ Low idle	
c j inplome	Driveability	Stumble Surge Knock Lack of power Intake backfire Exhaust backfire Others []		
	Engine stall	At the time of start While idling While accelerating While dece Just after stopping While load	elerating	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime		
Frequency		All the time Under certain conditions Sometimes		
Weather con	ditions	☐ Not affected		
	Weather	☐ Fine ☐ Raining ☐ Snowing	Others []	
	Temperature	🗌 Hot 🗌 Warm 🗌 Cool 🗌	Cold Humid °F	
		Cold During warm-up	After warm-up	
Engine conditions		Engine speed	4,000 6,000 8,000 rpm	
Road conditions		🗌 In town 🗌 In suburbs 🗌 Hig	ghway 🗌 Off road (up/down)	
Driving conditions		Not affected At starting While idling While accelerating While cruis While decelerating While turni Vehicle speed	5	
		0 10 20	30 40 50 60 MPH	
Malfunction i	ndicator lamp	Turned on Not turned on		

А

< BASIC INSPECTION >

INSPECTION AND ADJUSTMENT **BASIC INSPECTION**

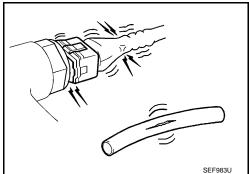
BASIC INSPECTION : Special Repair Requirement

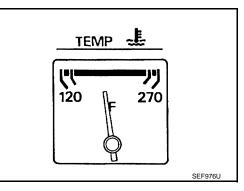
INFOID-000000001179357

1.INSPECTION START

- Check service records for any recent repairs that may indicate a related malfunction, or a current need for 1. scheduled maintenance.
- 2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut _
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket
- 3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.
- Start engine and warm it up until engine coolant temperature 4. indicator points the middle of gauge.

Ensure engine stays below 1,000 rpm.

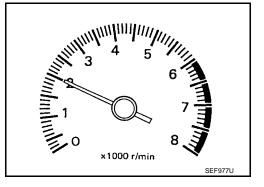




- Run engine at about 2,000 rpm for about 2 minutes under no 5. load.
- 6. Make sure that no DTC is displayed with CONSULT-III or GST.

<u>Is any</u>	DTC	<u>dete</u>	cted?
YES	>>	GO	TO 2

	· · · · · · · · · · · · · · · · · · ·
NO	>> GO TO 3.



2. REPAIR OR REPLACE

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

>> GO TO 3

3.CHECK TARGET IDLE SPEED

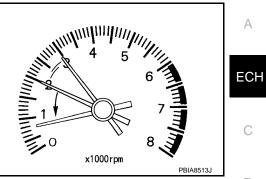
1. Run engine at about 2,000 rpm for about 2 minutes under no load.

< BASIC INSPECTION >

- 2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute. 3.
- Check idle speed. For procedure, refer to ECH-18, "IDLE SPEED : Special Repair Requirement". For specification, refer to ECH-348, "Idle Speed".

Is the inspection result normal?

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



Ρ

	x1000rpm PBIA8513J
4.PERFORM ACCELERATOR PEDAL RELEASED POSITI	
 Stop engine. Perform <u>ECH-18. "ACCELERATOR PEDAL RELEASED</u> <u>ment"</u>. 	POSITION LEARNING : Special Repair Require-
>> GO TO 5.	F
5. PERFORM THROTTLE VALVE CLOSED POSITION LEA	ARNING
Perform ECH-19, "THROTTLE VALVE CLOSED POSITION	
>> GO TO 6. 6. PERFORM IDLE AIR VOLUME LEARNING	G
Perform ECH-19, "IDLE AIR VOLUME LEARNING : Special	Repair Requirement".
Is Idle Air Volume Learning carried out successfully?YES>> GO TO 7.NO>> Follow the instruction of Idle Air Volume Learning	g. Then GO TO 4.
7.CHECK TARGET IDLE SPEED AGAIN	-
 Start engine and warm it up to normal operating tempera Check idle speed. For procedure, refer to <u>ECH-18</u>, "IDLE SPEED : Special For specification, refer to <u>ECH-348</u>, "Idle Speed". 	
Is the inspection result normal? YES >> GO TO 10. NO >> GO TO 8.	L
8.DETECT MALFUNCTIONING PART	
Check the Following. Check camshaft position sensor (PHASE) and circuit. Refe Check crankshaft position sensor (POS) and circuit. Refer 	er to <u>ECH-186, "DTC Logic"</u> .
Is the inspection result normal?	ſ
YES >> GO TO 9. NO >> Repair or replace. Then GO TO 4. 9. CHECK ECM FUNCTION	C

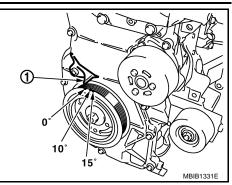
- Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but 1. this is a rare case.)
- Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to SEC-9, "ECM 2. **RE-COMMUNICATING FUNCTION : Description**".

>> GO TO 4. **10.**CHECK IGNITION TIMING

1. Run engine at idle.

< BASIC INSPECTION >

- Check ignition timing with a timing light. For procedure, refer to <u>ECH-18, "IGNITION TIMING : Special</u> <u>Repair Requirement"</u>. For specification, refer to <u>ECH-348, "Ignition Timing"</u>.
 - 1 : Timing indicator
- Is the inspection result normal?
- YES >> GO TO 19.
- NO >> GO TO 11.



[HR16DE (WITH EURO-OBD)]

11.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- 1. Stop engine.
- 2. Perform ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 12.

12.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 14.
- NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

14.CHECK TARGET IDLE SPEED AGAIN

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

 Check idle speed. For procedure, refer to <u>ECH-18</u>, "IDLE SPEED : <u>Special Repair Requirement</u>". For specification, refer to <u>ECH-348</u>, "Idle <u>Speed</u>".

Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 17.

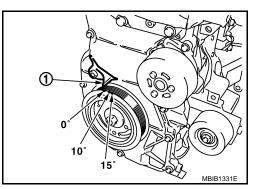
15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.

- Check ignition timing with a timing light. For procedure, refer to <u>ECH-18, "IGNITION TIMING : Special</u> <u>Repair Requirement"</u>. For specification, refer to <u>ECH-348, "Ignition Timing"</u>.
 - 1 : Timing indicator

Is the inspection result normal?

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



16.CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-47, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 17.

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

[HR16DE (WITH EURO-OBD)]

< B/	ASIC INSPECTION >
17	

I 7. DETECT MALFUNCTIONING PART	Δ
 Check the following. Check camshaft position sensor (PHASE) and circuit. Refer to <u>ECH-186, "DTC Logic"</u>. Check crankshaft position sensor (POS) and circuit. Refer to <u>ECH-182, "DTC Logic"</u>. 	A
Is the inspection result normal?	EC⊦
YES >> GO TO 18.	
NO >> Repair or replace. Then GO TO 4.	С
18. CHECK ECM FUNCTION	0
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but	
this is a rare case.)	D
2. Perform initialization of and registration of all NATS ignition key IDs. Refer to <u>SEC-9. "ECM RE-COMMU-NICATING FUNCTION : Description"</u> .	
MCAING FONCTION . Description.	Е
>> GO TO 4.	
19.INSPECTION END	
	F
If ECM is replaced during this BASIC INSPECTION procedure, go to <u>ECH-17, "ADDITIONAL SERVICE</u> WHEN REPLACING CONTROL UNIT : Special Repair Requirement".	
>> INSPECTION END	G
ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT	
ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Description	Н
When replacing ECM, this procedure must be performed.	
ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Re-	
quirement	J
1. perform initialization of nats system and registration of all nats ignition key ids	
Refer to SEC-9, "ECM RE-COMMUNICATING FUNCTION : Description".	
Refer to <u>BEC-5, LOW RE-COMMONICATING FONOTION, Beschption</u> .	Κ
>> GO TO 2.	
2. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING	L
Refer to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Require-	
ment".	
	M
>> GO TO 3.	
3. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING	Ν
Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".	IN
>> GO TO 4.	0
4. PERFORM IDLE AIR VOLUME LEARNING	
Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".	Р
	٢

>> END IDLE SPEED

< BASIC INSPECTION >

IDLE SPEED : Description

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

IDLE SPEED : Special Repair Requirement

1.CHECK IDLE SPEED

With CONSULT-III
Check idle speed in "DATA MONITOR" mode with CONSULT-III.
With GST
Check idle speed with Service \$01 of GST.

>> INSPECTION END IGNITION TIMING

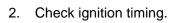
IGNITION TIMING : Description

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

IGNITION TIMING : Special Repair Requirement

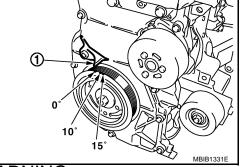
1.CHECK IGNITION TIMING

- 1. Attach timing light to No.1 ignition coil wire harness (1) as shown.
 - 2 : Timing light
 - <□ : Vehicle front



1 : Timing indicator

>> INSPECTION END



ACCELERATOR PEDAL RELEASED POSITION LEARNING

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description INFOLD:00000001179364

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

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Re-

ECH-18

INFOID:0000000001179360

INFOID:000000001179361

INFOID:0000000001179362

INFOID:000000001179363

IMBIA03977

< BASIC INSPECTION >

[HR16DE (WITH EURO-OBD)]

quirement	D:000000001179365
1.start	A
 Make sure that accelerator pedal is fully released. Turn ignition switch ON and wait at least 2 seconds. Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch ON and wait at least 2 seconds. Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch OFF and wait at least 10 seconds. 	ECH C
>> END THROTTLE VALVE CLOSED POSITION LEARNING	D
THROTTLE VALVE CLOSED POSITION LEARNING : Description	D:000000001179366
Throttle Valve Closed Position Learning is a function of ECM to learn the fully closed position of t valve by monitoring the throttle position sensor output signal. It must be performed each time harnes tor of electric throttle control actuator or ECM is disconnected.	
THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Require	F ement D:000000001179367
1.start	G
 Make sure that accelerator pedal is fully released. Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. Make sure that throttle valve moves during above 10 seconds by confirming the operating sounds. 	H
>> END IDLE AIR VOLUME LEARNING	I
IDLE AIR VOLUME LEARNING : Description	J D:000000001179368
 Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions: Each time electric throttle control actuator or ECM is replaced. Idle speed or ignition timing is out of specification. 	idle speed K
IDLE AIR VOLUME LEARNING : Special Repair Requirement	D:0000000001179369
1. PRECONDITIONING	
 Make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment. Battery voltage: More than 12.9V (At idle) Engine coolant temperature: 70 - 100°C (158 - 212°F) Park/neutral position switch: ON 	M
 Electric load switch: OFF (Air conditioner, headlamp, rear window defogger) On vehicles equipped with daytime light systems, set lighting switch to the 1st position to small lamps. 	light only $^{\circ}$
 Steering wheel: Neutral (Straight-ahead position) Vehicle speed: Stopped Transmission: Warmed-up Drive vehicle for 10 minutes Do you have CONSULT-III? 	Ρ
YES >> GO TO 2. NO >> GO TO 3.	
2.IDLE AIR VOLUME LEARNING	

< BASIC INSPECTION >

With CONSULT-III

- Perform Accelerator Pedal Released Position Learning. Refer to <u>ECH-18</u>, "ACCELERATOR PEDAL <u>RELEASED POSITION LEARNING : Special Repair Requirement"</u>.
- 2. Perform Throttle Valve Closed Position Learning. Refer to <u>ECH-19</u>, "<u>THROTTLE VALVE CLOSED POSI-</u> <u>TION LEARNING : Special Repair Requirement</u>".
- 3. Start engine and warm it up to normal operating temperature.
- 4. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
- 5. Touch "START" and wait 20 seconds.

Is "CMPLT" displayed on CONSULT-III screen?

YES >> GO TO 4.

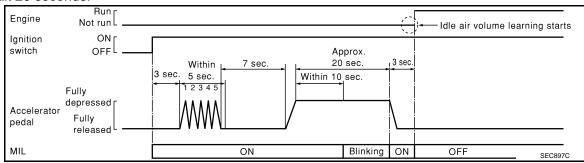
NO >> GO TO 5.

3. IDLE AIR VOLUME LEARNING

Without CONSULT-III

NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- 1. Perform Accelerator Pedal Released Position Learning. Refer to <u>ECH-18</u>, "ACCELERATOR PEDAL <u>RELEASED POSITION LEARNING : Special Repair Requirement"</u>.
- 2. Perform Throttle Valve Closed Position Learning. Refer to <u>ECH-19</u>, "THROTTLE VALVE CLOSED POSI-<u>TION LEARNING : Special Repair Requirement</u>".
- 3. Start engine and warm it up to normal operating temperature.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 6. Repeat the following procedure quickly five times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
- 7. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MI stops blinking and turned ON.
- 8. Fully release the accelerator pedal within 3 seconds after the MI turned ON.
- 9. Start engine and let it idle.
- 10. Wait 20 seconds.



>> GO TO 4.

4.CHECK IDLE SPEED AND IGNITION TIMING

Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

For specification, refer to ECH-348, "Idle Speed" and ECH-348, "Ignition Timing".

Is the inspection result normal?

YES >> INSPECTION END NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following

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

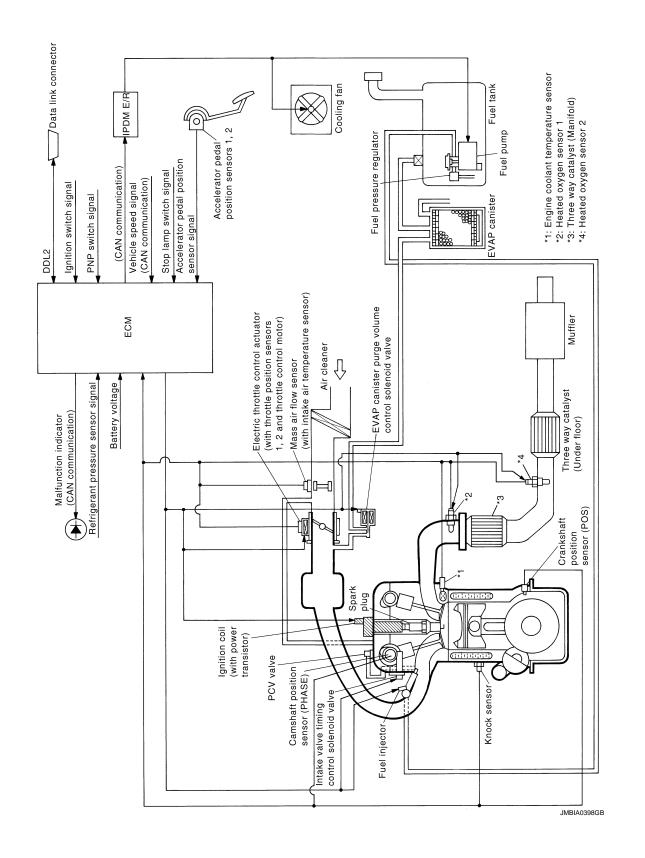
< BASIC INSPECTION >

Is the inspection result normal? YES >> GO TO 6. NO >> Repair or replace malfunctioning part.	A
6. DETECT MALFUNCTIONING PART	
Engine component parts and their installation condition are questionable. Check and eliminate the cause of	ECH
 the incident. It is useful to perform "TROUBLE DIAGNOSIS - SPECIFICATION VALUE". Refer to <u>ECH-98</u>, "<u>Description</u>". If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning all over again: Engine stalls. 	С
Erroneous idle.	D
>> INSPECTION END MIXTURE RATIO SELF-LEARNING VALUE CLEAR	E
MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description	
This describes how to erase the mixture ratio self-learning value. For the actual procedure, follow the instruc- tions in "Diagnosis Procedure".	F
MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement	G
1.start	Н
 With CONSULT-III Start engine and warm it up to normal operating temperature. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-III. Clear mixture ratio self-learning value by touching "CLEAR". With GST 	I
 Start engine and warm it up to normal operating temperature. Turn ignition switch OFF. Disconnect mass air flow sensor harness connector. 	J
 Restart engine and let it idle for at least 5 seconds. Stop engine and reconnect mass air flow sensor harness connector. Select Service \$03 with GST. Make sure DTC P0102 is detected. Select Service \$04 with GST to erase the DTC P0102. 	К
>> END	L
	Μ
	Ν
	0
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FUNCTION DIAGNOSIS ENGINE CONTROL SYSTEM

System Diagram

INFOID:000000001179372



< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

System Description

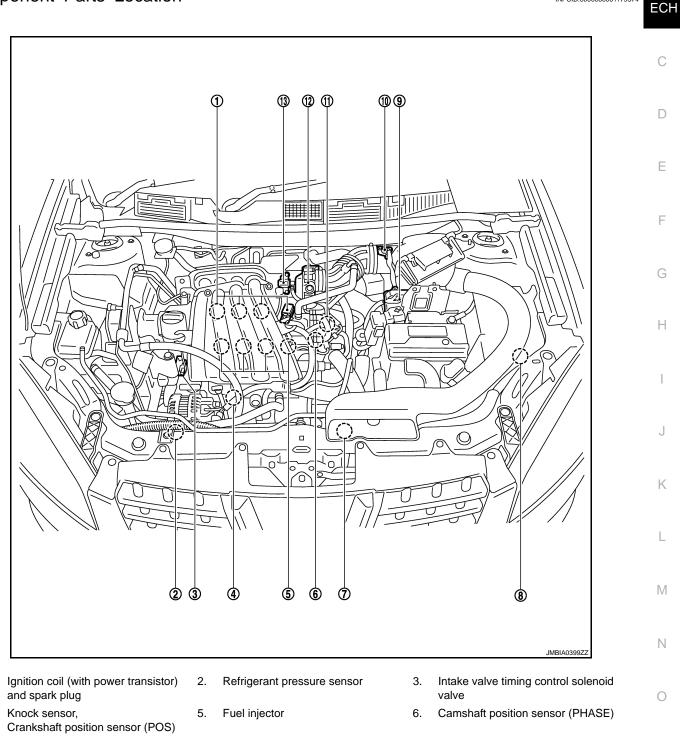
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INFOID:000000001179374

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

Component Parts Location

А



Cooling fan motor 7.

1.

4.

- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- IPDM E/R 8.
- 11. Engine coolant temperature sensor

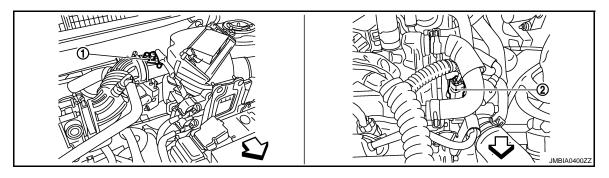
ECM

9.

12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

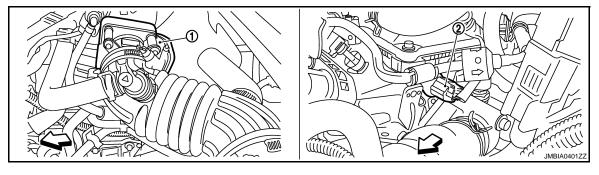
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< FUNCTION DIAGNOSIS >



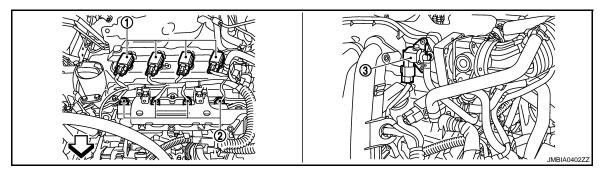
- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

✓ Vehicle front



- 1. Electric throttle control actuator
- 2. Camshaft position sensor (PHASE)

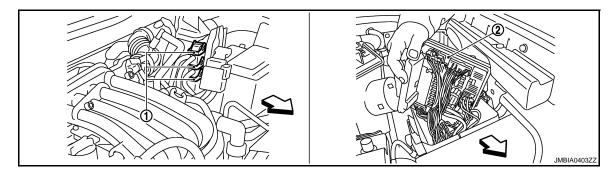
✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

√ Vehicle front



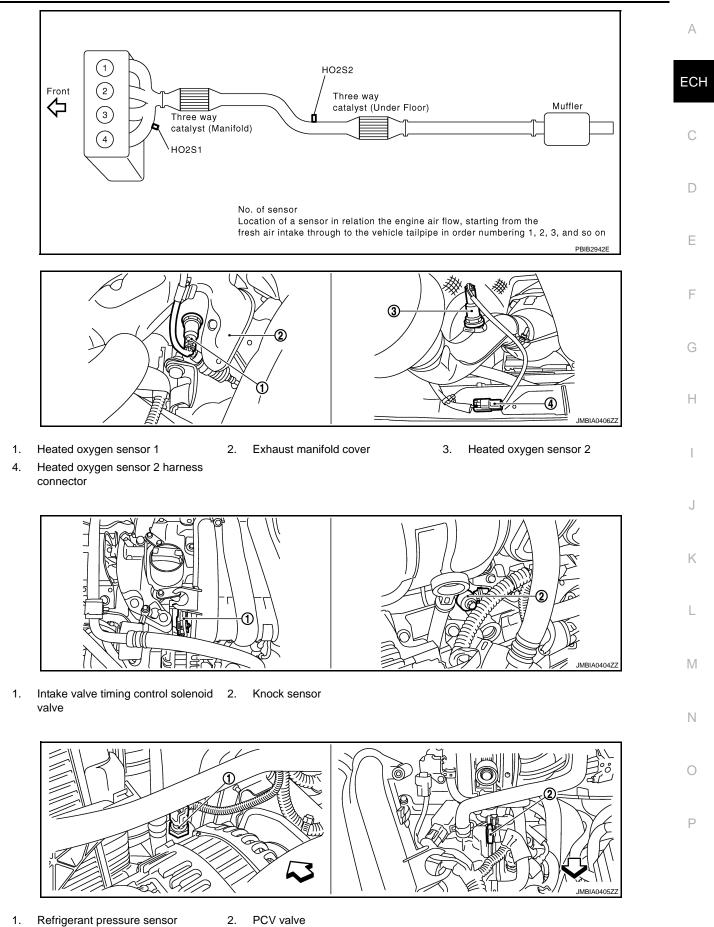
- 1. ECM harness connector 2.
- ✓⊃ Vehicle front

ECH-24

IPDM E/R

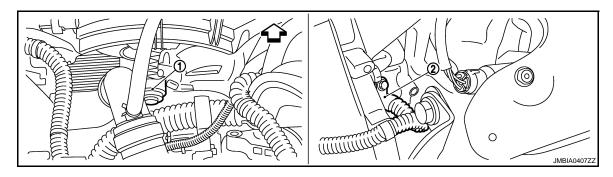
< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]



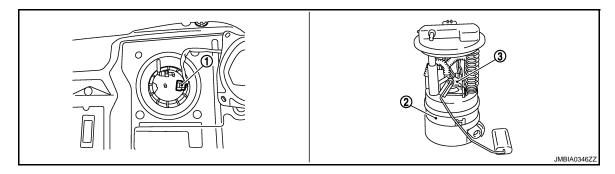
√ Vehicle front

< FUNCTION DIAGNOSIS >

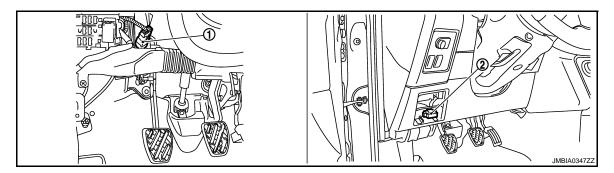


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

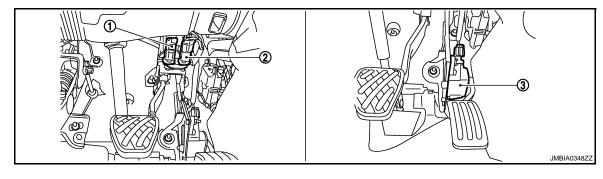
✓ Vehicle front



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

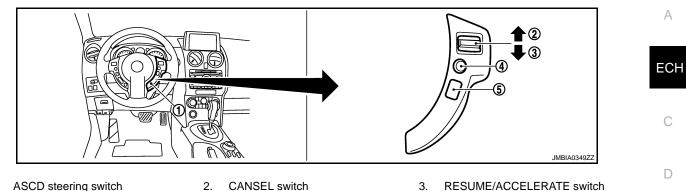


- 1. ASCD clutch switch
- 2. Data link connector



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

< FUNCTION DIAGNOSIS >



ASCD steering switch 1. SET/COAST switch

4.

- 2. CANSEL switch
- 5. MAIN switch

Ε

INFOID:000000001179375

Component Description

Component	Reference	
Accelerator pedal position sensor	ECH-268, "Description"	
ASCD brake switch	ECH-282, "Description"	
ASCD steering switch	ECH-252, "Description"	
ASCD vehicle speed sensor	ECH-261, "Description"	
Camshaft position sensor (PHASE)	ECH-186, "Description"	
Crankshaft position sensor (POS)	ECH-182, "Description"	
Cooling fan motor	ECH-287, "Description"	
Electric throttle control actuator	ECH-206, "Description"	
Engine coolant temperature sensor	ECH-124, "Description"	
Fuel injector	ECH-291, "Description"	
Fuel pump	ECH-294, "Description"	
Heated oxygen sensor 1	ECH-130, "Description"	
Heated oxygen sensor 1 heater	ECH-145, "Description"	
Heated oxygen sensor 2	ECH-148, "Description"	
Heated oxygen sensor 2 heater	ECH-160, "Description"	
Ignition signal	ECH-297, "Description"	
Intake air temperature sensor	ECH-121, "Description"	
Intake valve timing control solenoid valve	ECH-204, "Description"	
Knock sensor	ECH-180. "Description"	
Mass air flow sensor	ECH-116, "Description"	
Park/neutral position switch	ECH-263, "Description"	
PCV valve	ECH-303, "Description"	
Refrigerant pressure sensor	ECH-304, "Description"	
Stop lamp switch	ECH-266, "Description"	
Throttle control motor	ECH-215, "Description"	
Throttle control motor relay	ECH-212, "Description"	
Throttle position sensor	ECH-127, "Description"	
Vehicle speed sensor	ECH-198, "Description"	

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

INFOID:000000001179376

MULTIPORT FUEL INJECTION SYSTEM

System Diagram

Crankshaft position sensor (POS) Engine speed^{*2} & Piston position Camshaft position sensor (PHASE) Amount of intake air Mass air flow sensor Intake air temperature Intake air temperature sensor Engine coolant temperature Engine coolant temperature sensor Density of oxygen in exhaust gas Heated oxygen sensor 1 Throttle position Fuel injection & Throttle position sensor mixture ratio Accelerator pedal position control Accelerator pedal position sensor ECM Fuel injector Gear position Park/neutral position (PNP) switch Battery voltage*2 Battery Engine knocking condition Knock sensor Power steering operation EPS control unit Density of oxygen in exhaust gas Heated oxygen sensor 2*1 Vehicle speed Combination meter Air conditioner operation всм *1 : This sensor is not used to control the engine system under normal conditions *2 : ECM determines the start signal status by the signals of engine speed and battery voltage. : This signal is sent through CAN communication line. JMBIA0408

System Description

INFOID:000000001179377

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed* ³		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Intake air temperature sensor	Intake air temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position	Fuel injection	
Accelerator pedal position sensor	Accelerator pedal position	& mixture ratio control	Fuel injector
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage* ³		
Knock sensor	Engine knocking condition		
EPS control unit	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
BCM* ²	Air conditioner operation		
Combination meter*2	Vehicle speed		

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

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

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

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

SYSTEM DESCRIPTION

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

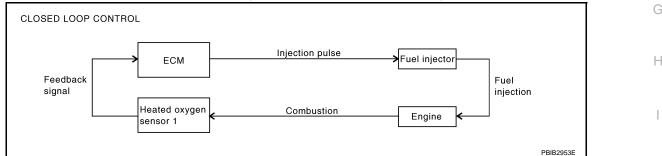
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. J The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to <u>ECH-130, "DTC Logic"</u>. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

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

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

Open Loop Control

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

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

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

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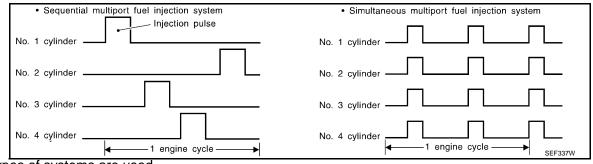
< FUNCTION DIAGNOSIS >

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

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

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

FUEL INJECTION TIMING



Two types of systems are used.

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

FUEL SHUT-OFF

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

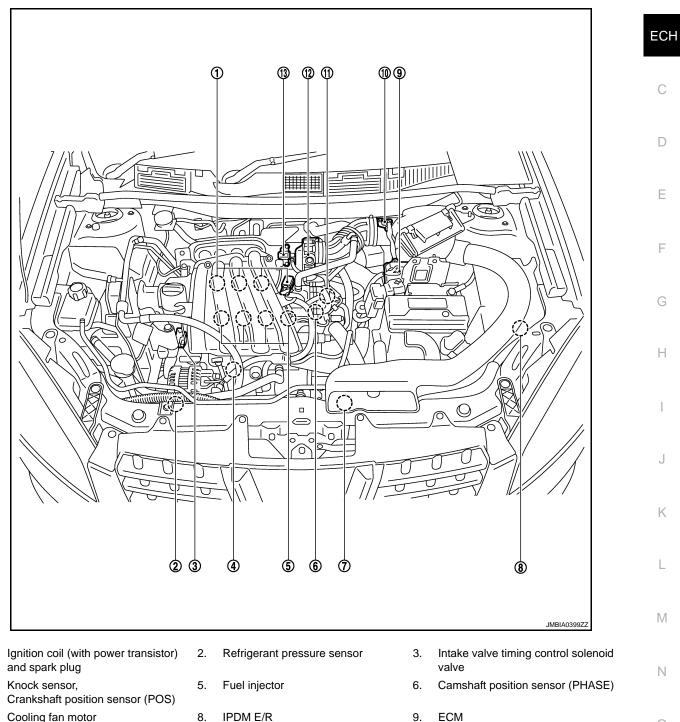
< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Component Parts Location

INFOID:000000001179378

А



12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

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13. EVAP canister purge volume control solenoid valve

10. Mass air flow sensor (with intake

temperature sensor)

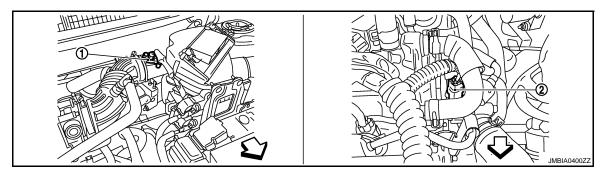
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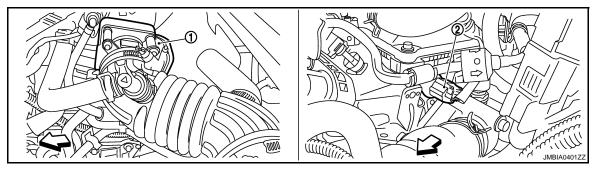
- 8. IPDM E/R
- 11. Engine coolant temperature sensor

< FUNCTION DIAGNOSIS >



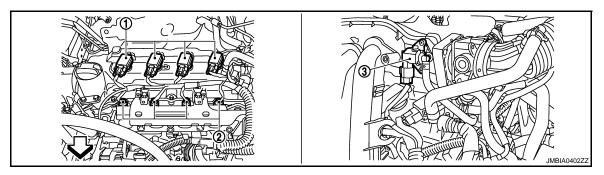
- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

✓ Vehicle front



- 1. Electric throttle control actuator
- 2. Camshaft position sensor (PHASE)

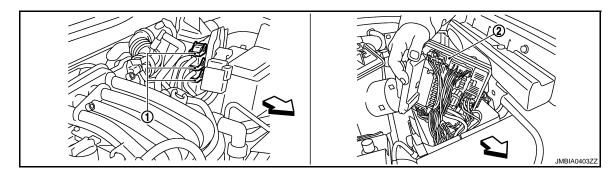
✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front



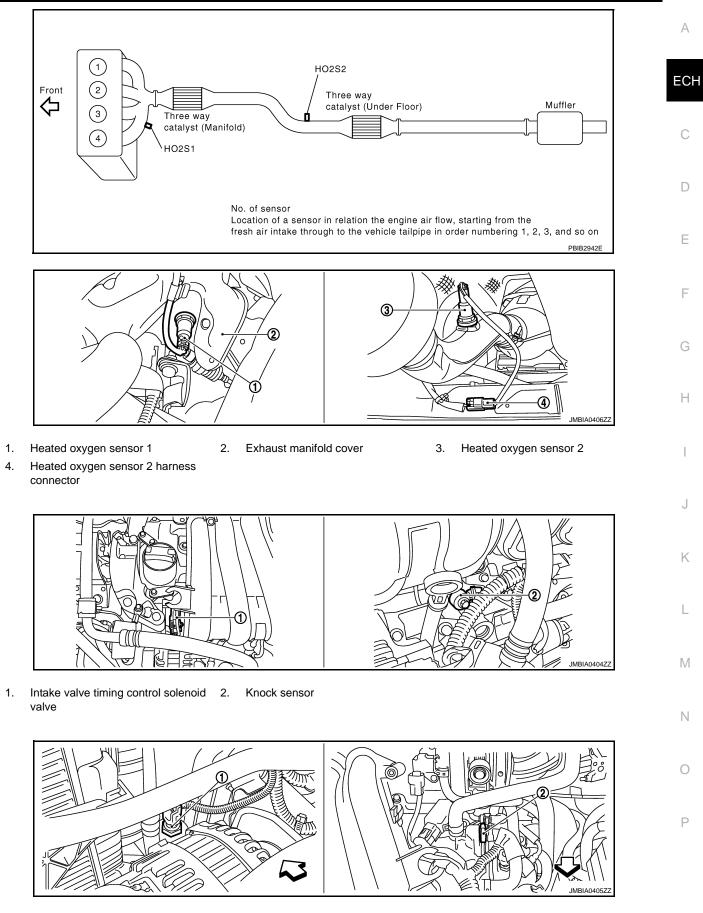
- 1. ECM harness connector2.
- √ Vehicle front

ECH-32

IPDM E/R

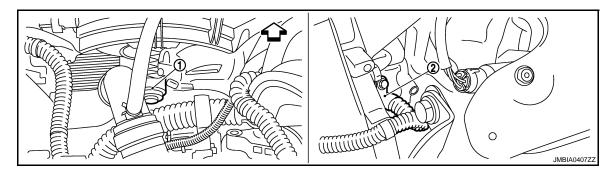
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[HR16DE (WITH EURO-OBD)]



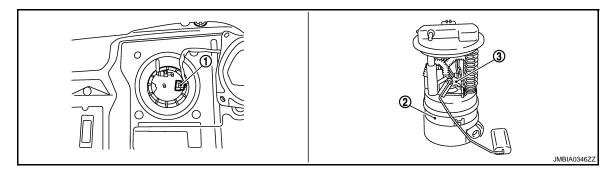
- 1. Refrigerant pressure sensor 2. PCV valve
- ✓ Vehicle front

< FUNCTION DIAGNOSIS >

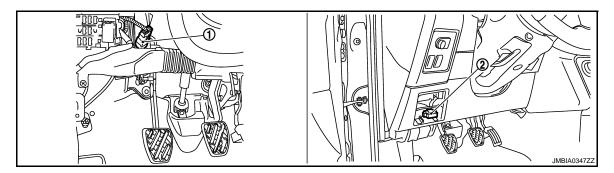


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

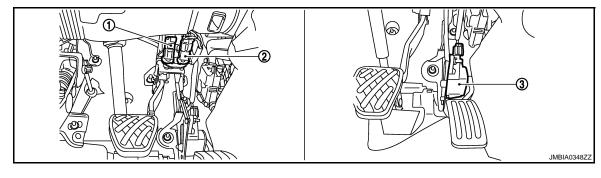
✓ Vehicle front



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

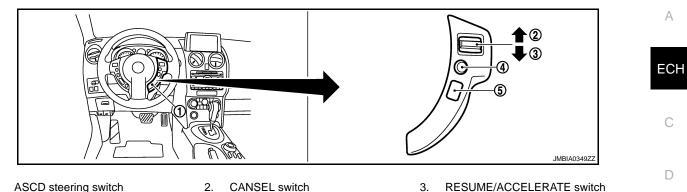


- 1. ASCD clutch switch
- 2. Data link connector



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

< FUNCTION DIAGNOSIS >



ASCD steering switch 1. SET/COAST switch

4.

- 2. CANSEL switch
- 5. MAIN switch

Component Description

INFOID:000000001179379

Ε

Component	Reference	F
Accelerator pedal position sensor	ECH-268. "Description"	
Camshaft position sensor (PHASE)	ECH-186, "Description"	
Crankshaft position sensor (POS)	ECH-182, "Description"	G
Engine coolant temperature sensor	ECH-124, "Description"	
Fuel injector	ECH-291, "Description"	Н
Heated oxygen sensor 1	ECH-130, "Description"	
Heated oxygen sensor 2	ECH-160, "Description"	
Intake air temperature sensor	ECH-121, "Description"	
Knock sensor	ECH-180, "Description"	
Mass air flow sensor	ECH-116, "Description"	J
Park/neutral position (PNP) switch	ECH-263. "Description"	
Throttle position sensor	ECH-127, "Description"	
Vehicle speed sensor	ECH-198, "Description"	K

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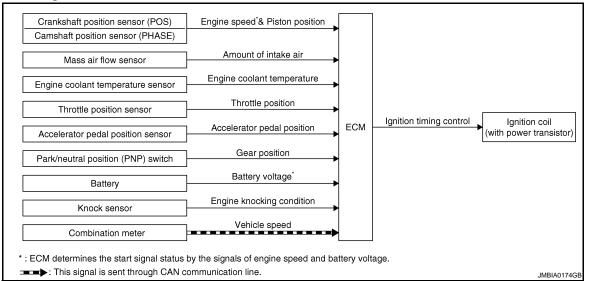
ELECTRIC IGNITION SYSTEM

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

ELECTRIC IGNITION SYSTEM

System Diagram



System Description

INFOID:000000001179381

INFOID:000000001179380

INPUT/OUTPUT SIGNAL CHART

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

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

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

SYSTEM DESCRIPTION

Firing order: 1 - 3 - 4 - 2

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

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

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

· At starting

- During warm-up
- At idle
- At low battery voltage

During acceleration

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

< FUNCTION DIAGNOSIS >

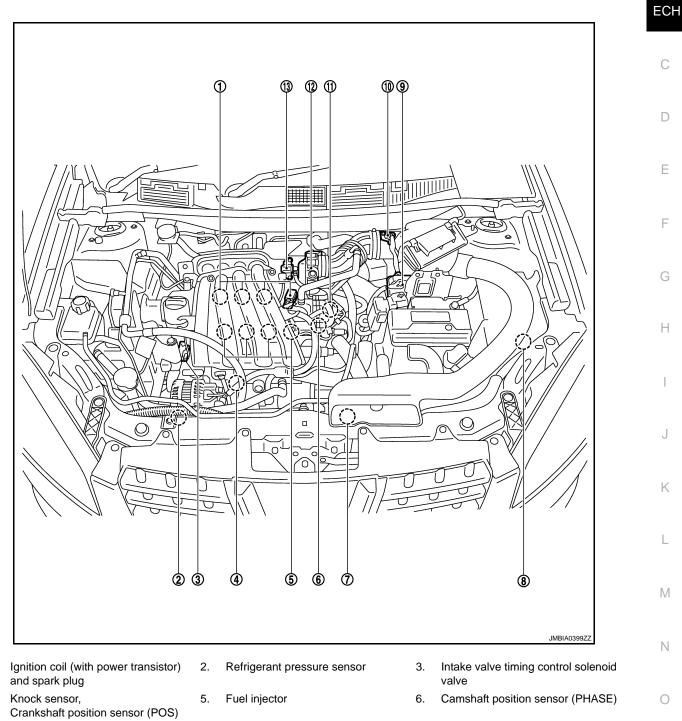
[HR16DE (WITH EURO-OBD)]

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

Component Parts Location

INFOID:000000001179382

А



7. Cooling fan motor

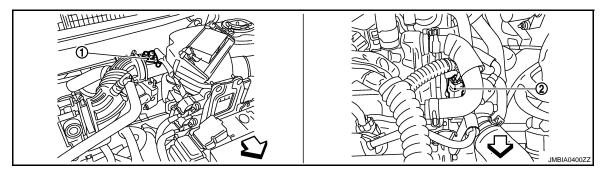
1.

4.

- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- 8. IPDM E/R
- 11. Engine coolant temperature sensor
- 9. ECM
- 12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

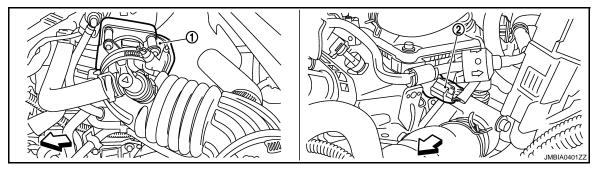
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< FUNCTION DIAGNOSIS >



- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

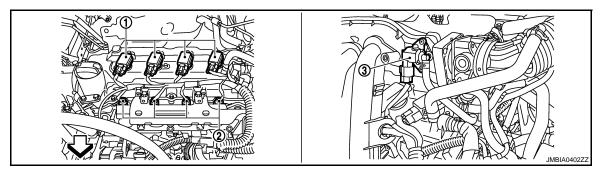
✓ Vehicle front



- 1. Electric throttle control actuator
- 2. Camshaft position sensor (PHASE)

✓ Vehicle front

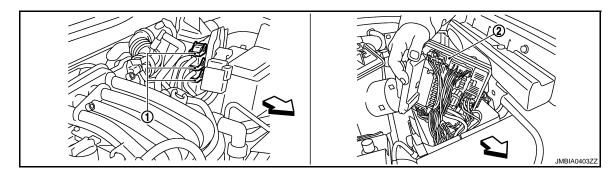
Carrisnan position sensor (FTASE



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front



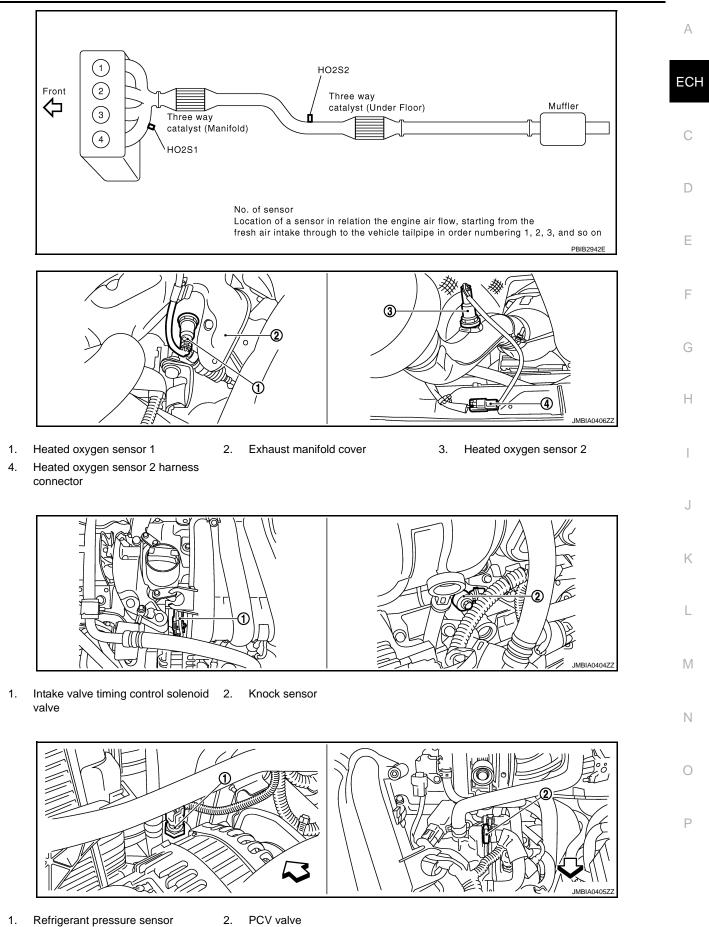
- 1. ECM harness connector2.
- √ Vehicle front

ECH-38

IPDM E/R

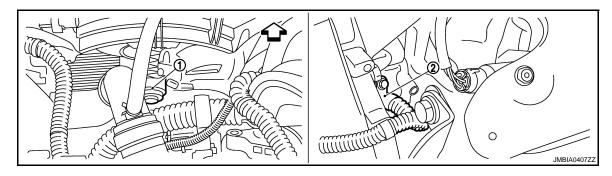
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[HR16DE (WITH EURO-OBD)]



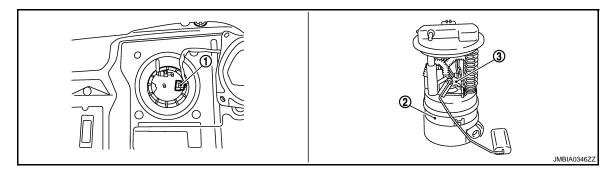
√ Vehicle front

< FUNCTION DIAGNOSIS >

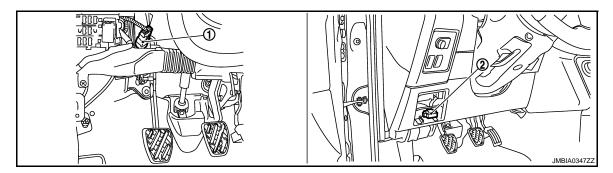


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

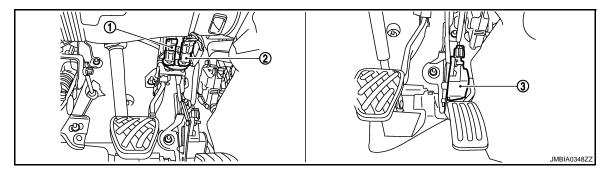
✓ Vehicle front



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

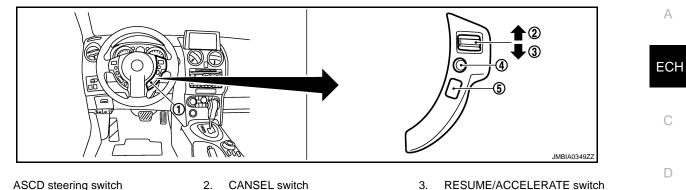


- 1. ASCD clutch switch
- 2. Data link connector



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

< FUNCTION DIAGNOSIS >



ASCD steering switch 1. SET/COAST switch

4.

- 2. CANSEL switch
- 5. MAIN switch
- **Component Description**

INFOID:000000001179383

Ε

Component	Reference	F
Accelerator pedal position sensor	ECH-268, "Description"	
Camshaft position sensor (PHASE)	ECH-186, "Description"	
Crankshaft position sensor (POS)	ECH-182, "Description"	G
Engine coolant temperature sensor	ECH-124, "Description"	
Ignition signal	ECH-297, "Description"	Н
Knock sensor	ECH-180, "Description"	
Mass air flow sensor	ECH-116. "Description"	
Park/neutral position (PNP) switch	ECH-263, "Description"	
Throttle position sensor	ECH-127, "Description"	
Vehicle speed sensor	ECH-198, "Description"	J

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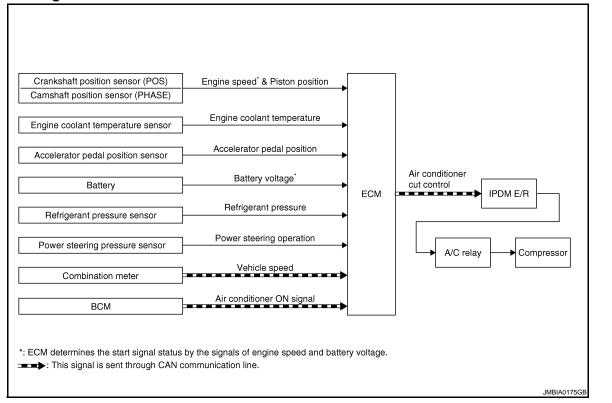
< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

INFOID:000000001179384

AIR CONDITIONING CUT CONTROL

System Diagram



System Description

INFOID:000000001179385

INPUT/OUTPUT SIGNAL CHART

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

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

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

SYSTEM DESCRIPTION

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

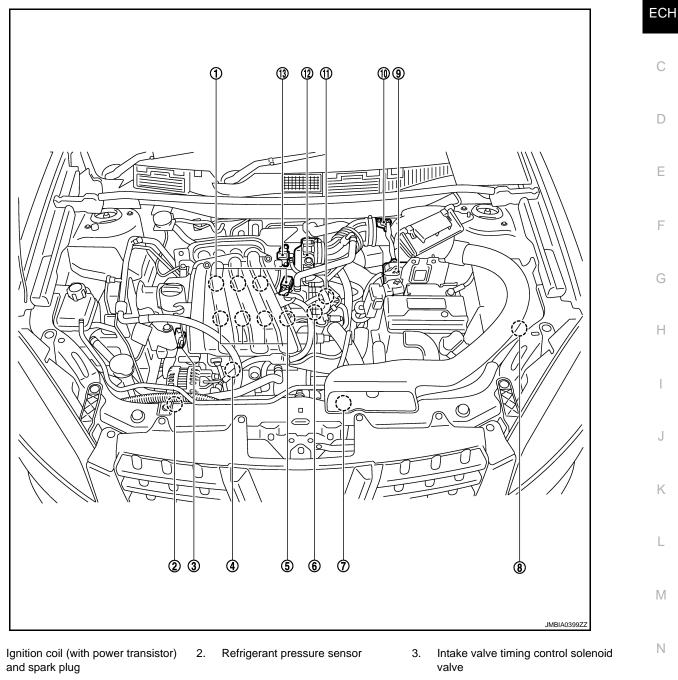
- Under the following conditions, the air conditioner is turned off.
- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.

ECH-43

• When refrigerant pressure is excessively low or high.

Component Parts Location

< FUNCTION DIAGNOSIS >



- Knock sensor, 4. Crankshaft position sensor (POS)
- 7. Cooling fan motor

1.

- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- 5. Fuel injector
- 8. IPDM E/R
- 11. Engine coolant temperature sensor
- Camshaft position sensor (PHASE) 6.
- 9. ECM
- 12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

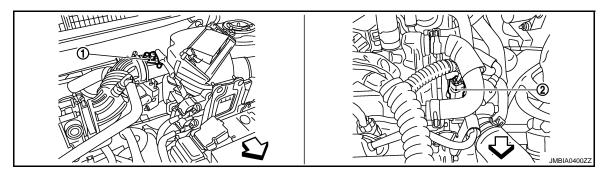
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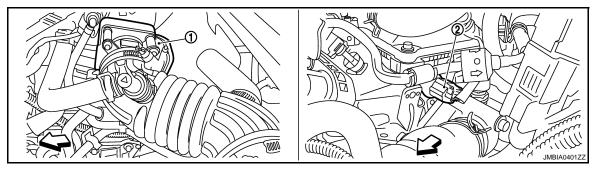
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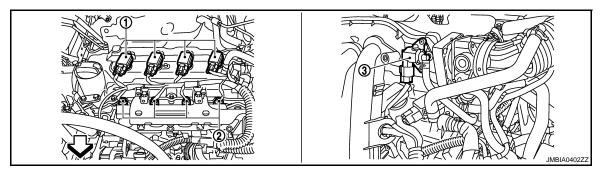
- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

✓ Vehicle front



- 1. Electric throttle control actuator
- 2. Camshaft position sensor (PHASE)

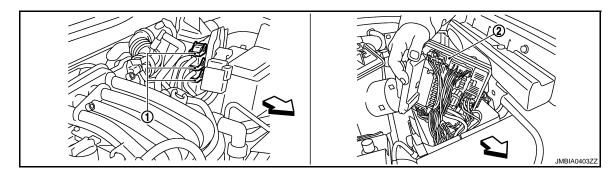
✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front



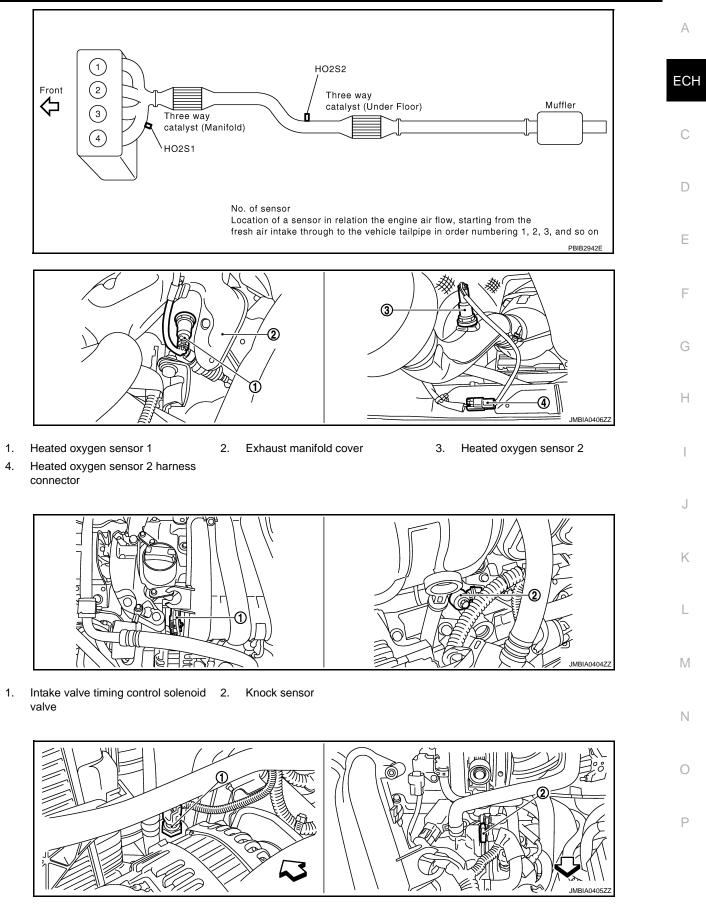
- 1. ECM harness connector 2.
- √ Vehicle front

ECH-44

IPDM E/R

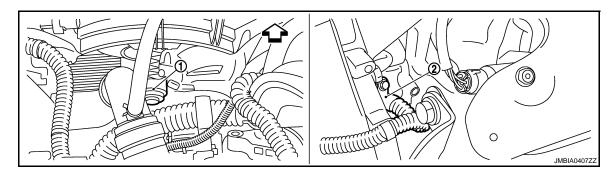
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[HR16DE (WITH EURO-OBD)]



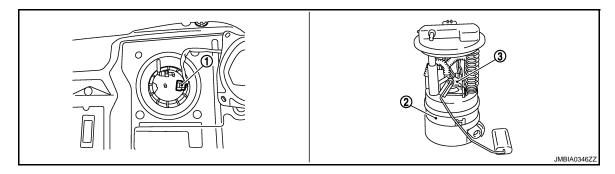
- 1. Refrigerant pressure sensor 2. PCV valve
- ✓ Vehicle front

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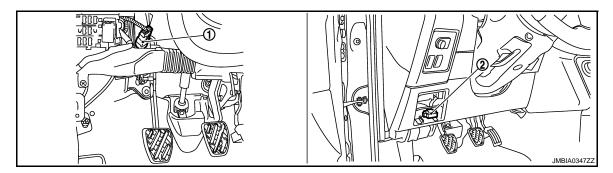


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

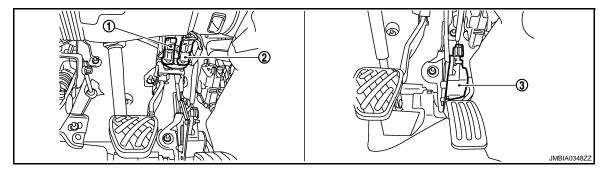
✓ Vehicle front



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

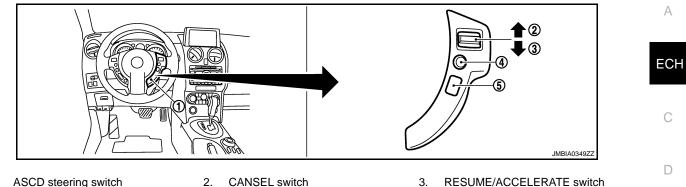


- 1. ASCD clutch switch
- 2. Data link connector



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

< FUNCTION DIAGNOSIS >



ASCD steering switch 1. SET/COAST switch

4.

- 2. CANSEL switch
 - 5. MAIN switch

INFOID:000000001179387

Component I	Description
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Component	Reference	F
Accelerator pedal position sensor	ECH-268. "Description"	•
Camshaft position sensor (PHASE)	ECH-186, "Description"	0
Crankshaft position sensor (POS)	ECH-182, "Description"	G
Engine coolant temperature sensor	ECH-124, "Description"	
EPS contro unit	STC-4, "System Description"	Н
Refrigerant pressure sensor	ECH-304, "Description"	
Vehicle speed sensor	ECH-198, "Description"	

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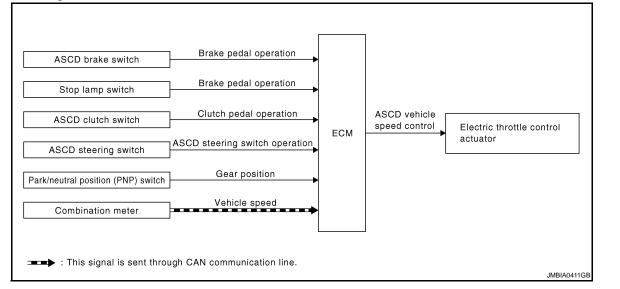
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< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Diagram



System Description

INFOID:000000001179389

INFOID:000000001179388

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation		
Stop lamp switch			Electric throttle control
ASCD clutch switch	Clutch pedal operation		
ASCD steering switch	ASCD steering switch operation	ASCD vehicle speed control	actuator
Park/neutral position switch	Gear position		
Combination meter*	Vehicle speed		

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

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/ h (25 MPH) and 180 km/h (112 MPH).

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

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

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 180 km/h (112 MPH), press SET/COAST switch. (Then SET lamp in combination meter illuminates.)

ACCELERATE OPERATION

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

CANCEL OPERATION

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

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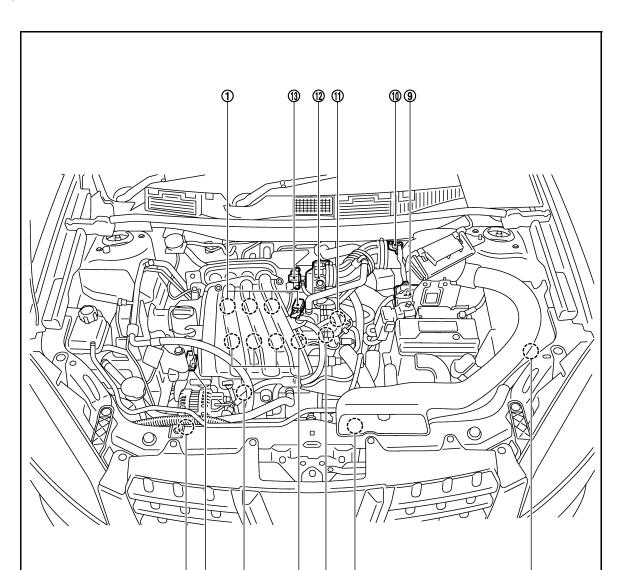
- [HR16DE (WITH EURO-OBD)]
- CANCEL switch is pressed More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared) А Brake pedal is depressed Clutch pedal is depressed or gear position is changed to neutral position. Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed ECH 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/ D 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 Е speed memory will be erased. COAST OPERATION When the SET/COAST switch is pressed during cruise control driving, decrease vehicle set speed until the F 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 Н Clutch pedal is released Vehicle speed is greater than 40 km/h (25 MPH) and less than 180km/h (112 MPH) Κ L Μ Ν
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AUTOMATIC SPEED CONTROL DEVICE (ASCD) NOSIS > [HR16DE (WITH EURO-OBD)]

< FUNCTION DIAGNOSIS >

Component Parts Location

INFOID:000000001179390



- 1. Ignition coil (with power transistor) 2. and spark plug
- 4. Knock sensor, Crankshaft position sensor (POS)
- 7. Cooling fan motor
- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve

Refrigerant pressure sensor

(5)

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- 5. Fuel injector
- 8. IPDM E/R

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- 11. Engine coolant temperature sensor
- Intake valve timing control solenoid valve

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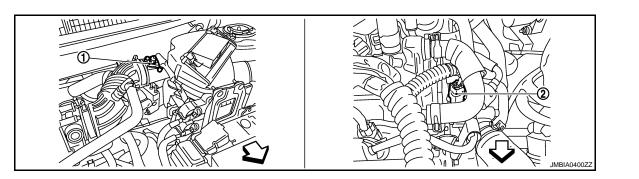
JMBIA0399Z

6. Camshaft position sensor (PHASE)

9. ECM

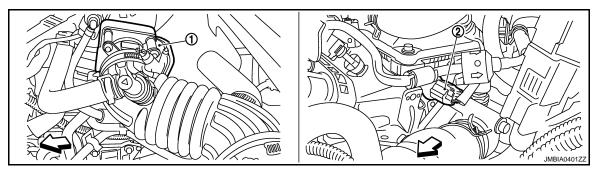
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

< FUNCTION DIAGNOSIS >



- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

✓ Vehicle front

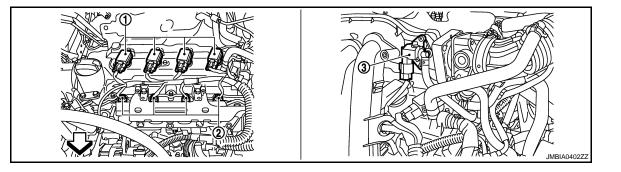


- 1. Electric throttle control actuator
- Camshaft position sensor (PHASE)

2.

✓ Vehicle front





1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

√ Vehicle front

- 1. ECM harness connector 2. IPDM E/R
- √ Vehicle front

ECH-51

[HR16DE (WITH EURO-OBD)]

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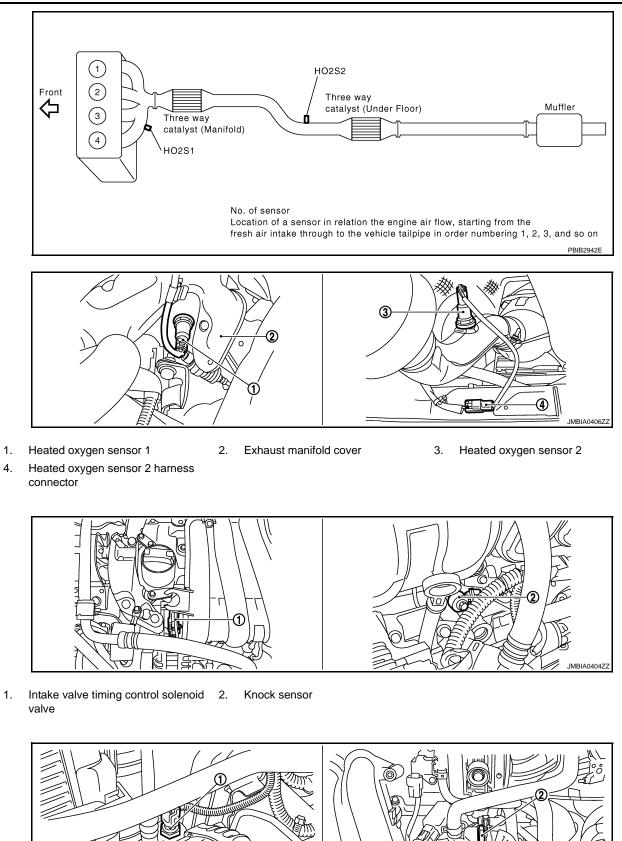
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< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

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- 1. Refrigerant pressure sensor 2. PCV valve
- ✓ Vehicle front

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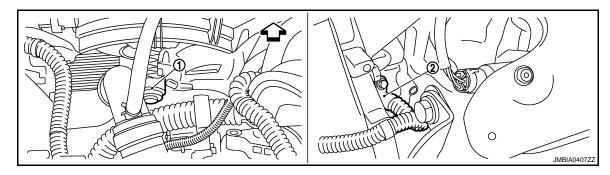
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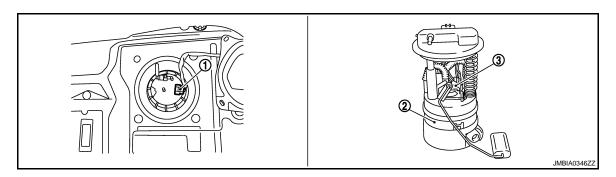
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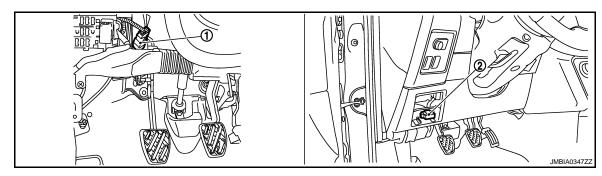


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

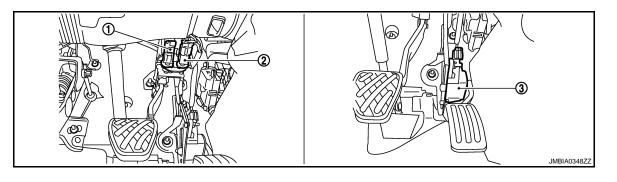
✓ Vehicle front



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

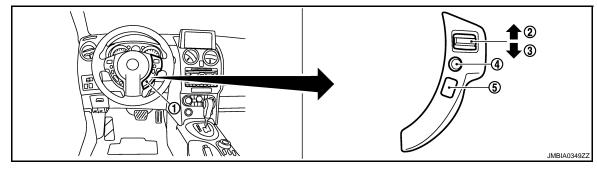


- 1. ASCD clutch switch
- 2. Data link connector



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

< FUNCTION DIAGNOSIS >



- ASCD steering switch
 SET/COAST switch
- 2. CANSEL switch
- 5. MAIN switch

3. RESUME/ACCELERATE switch

Component Description

INFOID:000000001179391

Component	Reference
ASCD steering switch	ECH-252, "Description"
ASCD clutch switch	ECH-282, "Description"
ASCD brake switch	ECH-282, "Description"
ASCD indicator	ECH-286, "Description"
Stop lamp switch	ECH-266, "Description"
Electric throttle control actuator	ECH-206, "Description"

CAN COMMUNICATION

System Description

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle mul-ECH tiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only. Refer to LAN-28, "CAN Communication Signal Chart", about CAN communication for detail.

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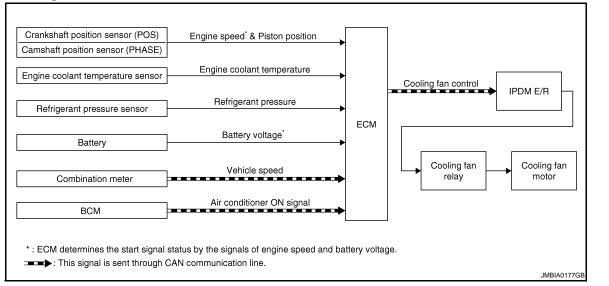
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< FUNCTION DIAGNOSIS >

COOLING FAN CONTROL

System Diagram



System Description

INFOID:000000001179394

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INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1			
Battery	Battery voltage*1	-	IPDM E/R ↓ Cooling fan relay ↓ Cooling fan motor	
Combination meter	Vehicle speed*2	Cooling fan		
Engine coolant temperature sensor	Engine coolant temperature			
BCM	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.

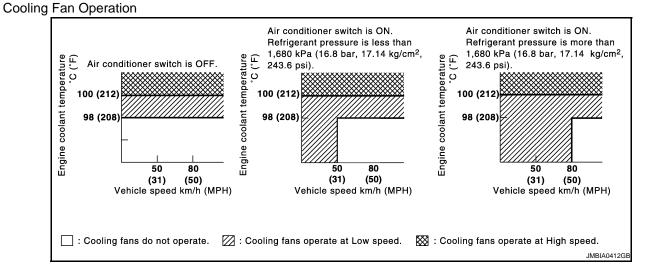
*2: This signal is sent to ECM through CAN communication line.

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].

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]



Cooling Fan Relay Operation

The ECM controls cooling fan relays through CAN communication line.

Cooling for spood	Cooling fan relay		
Cooling fan speed	1	2	G
Stop (OFF)	OFF	OFF	
Low (LOW)	ON	OFF	Н
High (HI)	OFF	ON	



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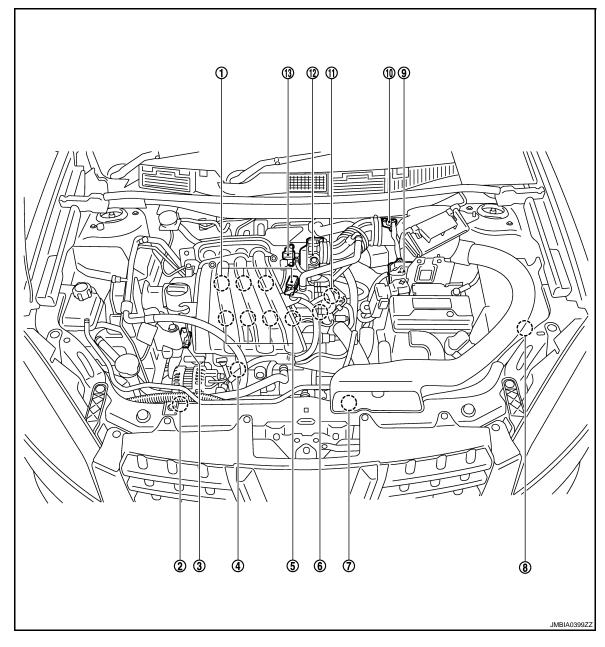
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< FUNCTION DIAGNOSIS >

Component Parts Location

INFOID:000000001179395

[HR16DE (WITH EURO-OBD)]



- 1. Ignition coil (with power transistor) and spark plug
- 4. Knock sensor, Crankshaft position sensor (POS)
- 7. Cooling fan motor
- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve

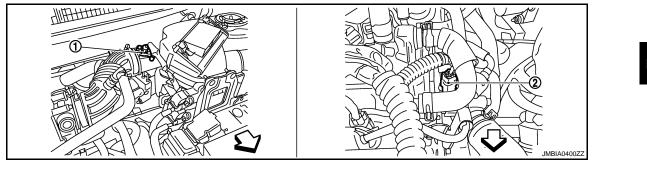
- 2. Refrigerant pressure sensor
- 5. Fuel injector
- 8. IPDM E/R
- 11. Engine coolant temperature sensor
- Intake valve timing control solenoid valve
- 6. Camshaft position sensor (PHASE)

9. ECM

12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

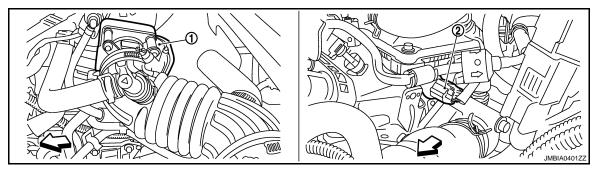
< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]



- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

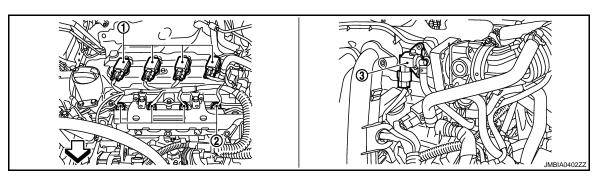
✓ Vehicle front



- 1. Electric throttle control actuator
- Camshaft position sensor (PHASE)

2.

✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front

- 1. ECM harness connector 2. IPDM E/R
- Vehicle front

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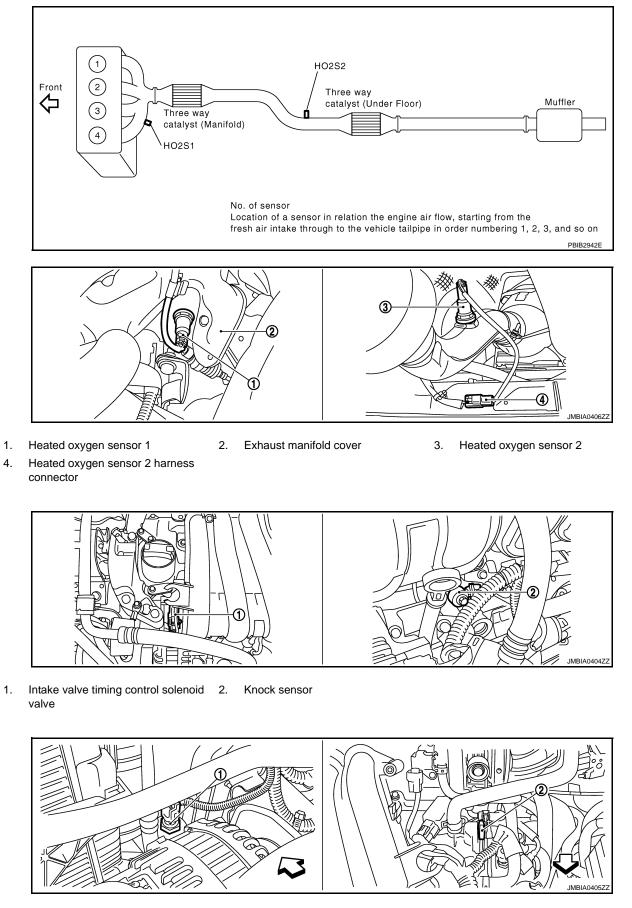
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< FUNCTION DIAGNOSIS >



- 1. Refrigerant pressure sensor 2. PCV valve
- ✓ Vehicle front

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

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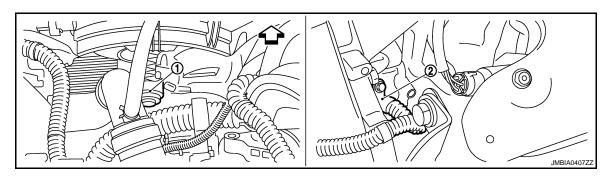
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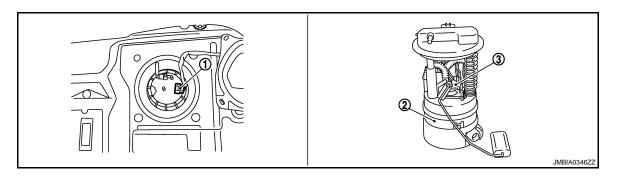
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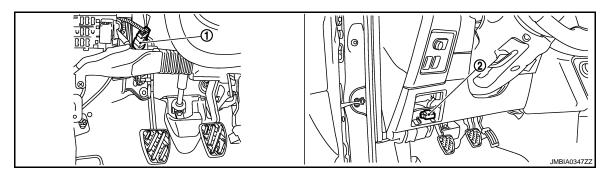


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

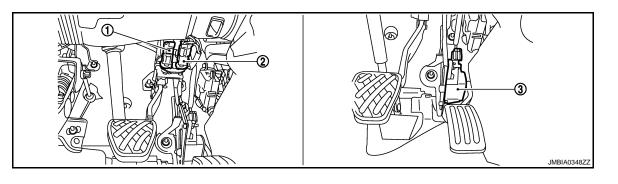
✓ Vehicle front



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

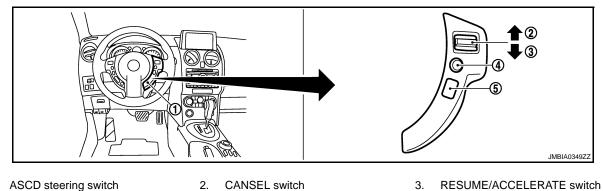


- 1. ASCD clutch switch
- 2. Data link connector



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

< FUNCTION DIAGNOSIS >



ASCD steering switch 1. SET/COAST switch

4.

- 2. CANSEL switch
- 5. MAIN switch

Component Description

INFOID:000000001179396

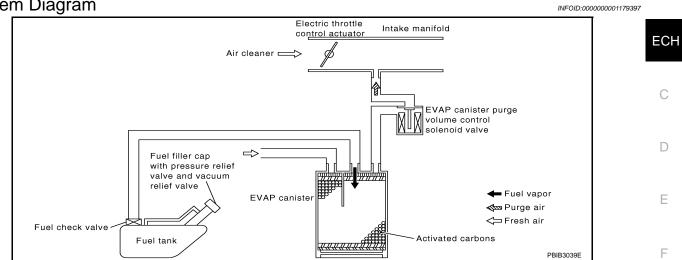
Component Reference	
Camshaft position sensor (PHASE)	ECH-186. "Description"
Crankshaft position sensor (POS)	ECH-182, "Description"
Cooling fan motor	ECH-56. "System Description"
Engine coolant temperature sensor	ECH-124, "Description"
Refrigerant pressure sensor	ECH-304, "Description"

< FUNCTION DIAGNOSIS >

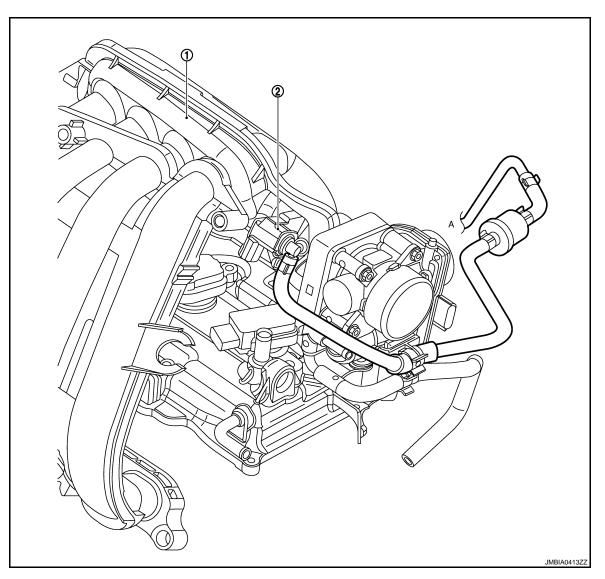
[HR16DE (WITH EURO-OBD)]

EVAPORATIVE EMISSION SYSTEM





EVAPORATIVE EMISSION LINE DRAWING



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< FUNCTION DIAGNOSIS >

1. Intake manifold collector

2. EVAP canister purge volume control solenoid valve

A. To EVAP canister

NOTE:

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

System Description

INFOID:000000001179398

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed ^{*1}			
Mass air flow sensor	Amount of intake air	_	EVAP canister purge vol- ume control solenoid valve	
Engine coolant temperature sensor	Engine coolant temperature	-		
Battery	Battery voltage*1	EVAP canister purge flow control		
Throttle position sensor	Throttle position			
Accelerator pedal position sensor	Accelerator pedal position			
Heated oxygen sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	_		
Combination meter*2	Vehicle speed			

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

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

SYSTEM DESCRIPTION

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

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

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

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

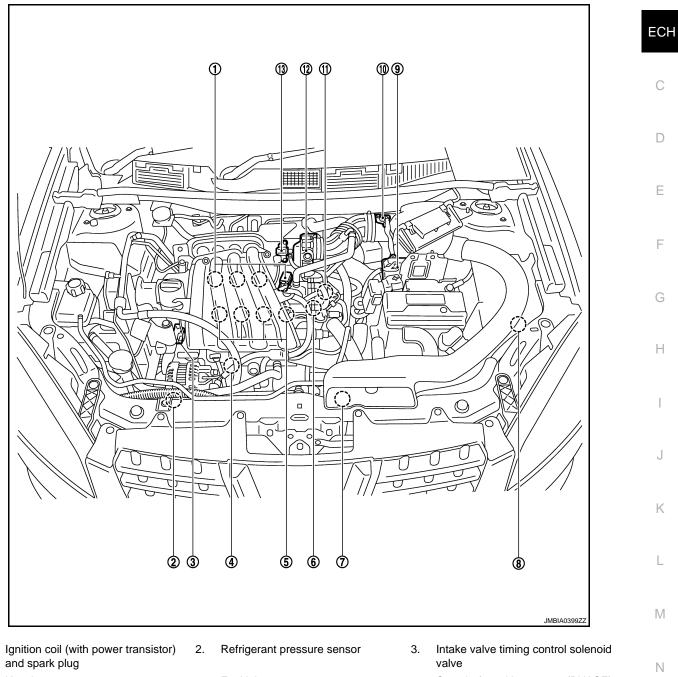
< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Component Parts Location

INFOID:000000001179399

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- 4. Knock sensor, Crankshaft position sensor (POS)
- 7. Cooling fan motor

1.

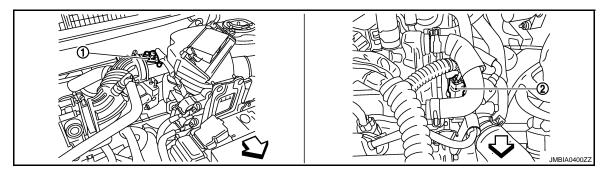
- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve
- 5. Fuel injector
- 8. IPDM E/R
- 11. Engine coolant temperature sensor
- 6. Camshaft position sensor (PHASE)

9. ECM

12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

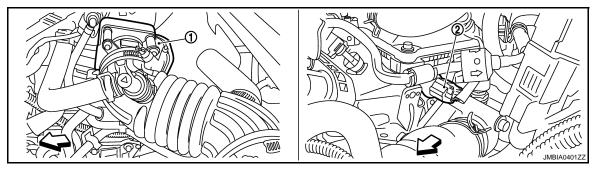
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< FUNCTION DIAGNOSIS >



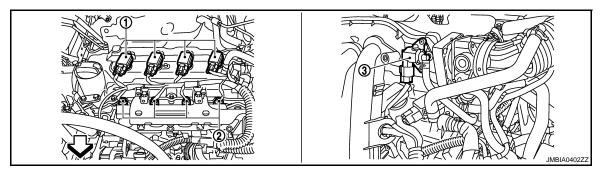
- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

✓ Vehicle front



- 1. Electric throttle control actuator
- 2. Camshaft position sensor (PHASE)

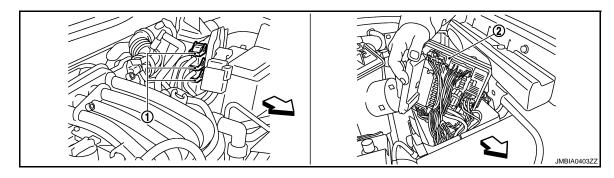
✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front



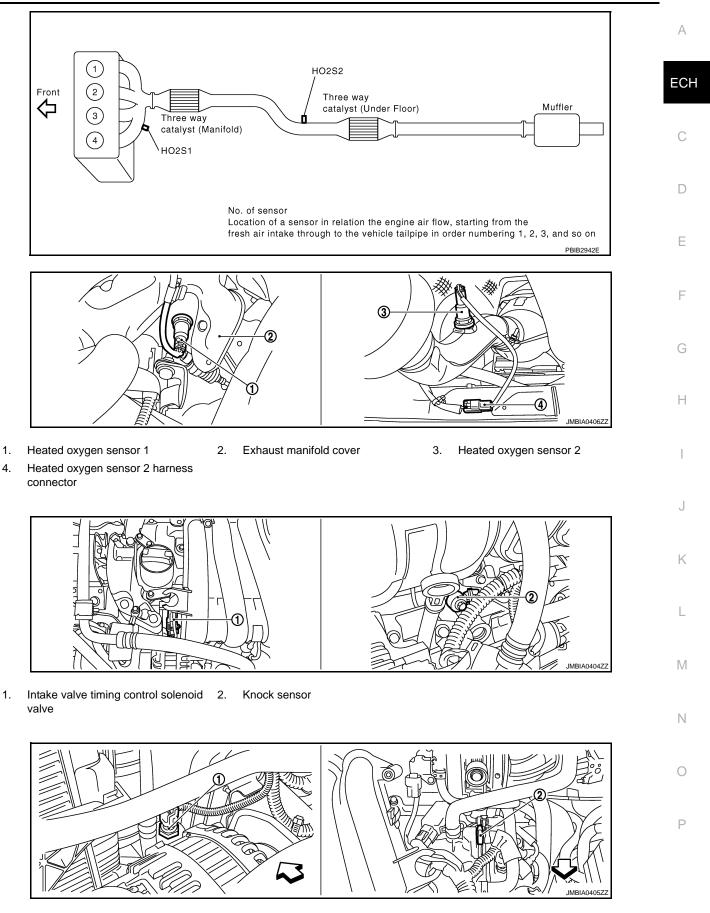
- 1. ECM harness connector 2.
- √ Vehicle front

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IPDM E/R

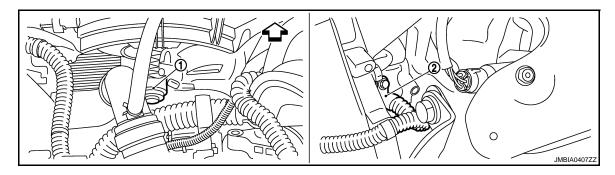
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[HR16DE (WITH EURO-OBD)]



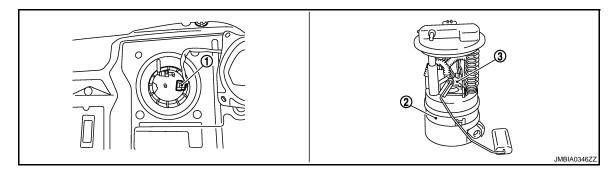
- 1. Refrigerant pressure sensor 2. PCV valve
- ✓ Vehicle front

< FUNCTION DIAGNOSIS >

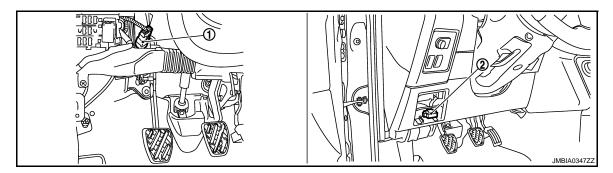


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

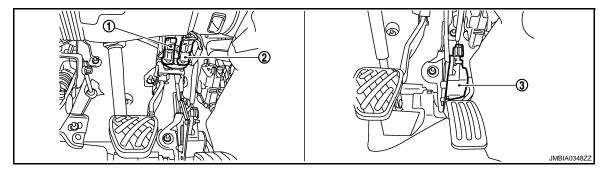
✓ Vehicle front



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

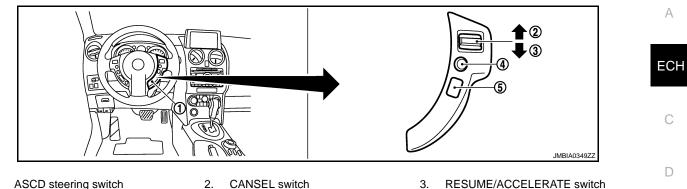


- 1. ASCD clutch switch
- 2. Data link connector



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

< FUNCTION DIAGNOSIS >



ASCD steering switch 1. SET/COAST switch

4.

- 2. CANSEL switch
- 5. MAIN switch

Component Description

INFOID:000000001179400

Component	Reference	F
Accelerator pedal position sensor	ECH-268, "Description"	
Camshaft position sensor (PHASE)	ECH-186, "Description"	
Crankshaft position sensor (POS)	ECH-182, "Description"	G
Engine coolant temperature sensor	ECH-124, "Description"	
EVAP canister purge volume control solenoid valve	ECH-195, "Description"	Н
Heated oxygen sensor 1	ECH-130, "Description"	
Mass air flow sensor	ECH-116. "Description"	
Throttle position sensor	ECH-127, "Description"	
Vehicle speed sensor	ECH-198, "Description"	

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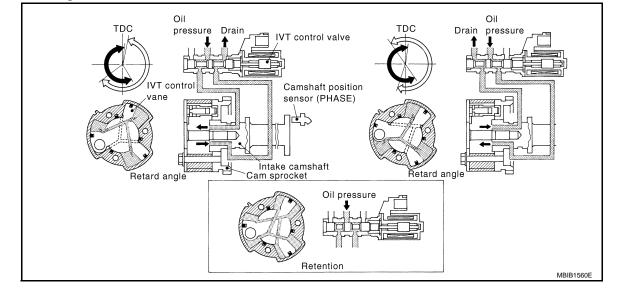
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< FUNCTION DIAGNOSIS >

INTAKE VALVE TIMING CONTROL

System Diagram



System Description

INFOID:000000001179402

INFOID:000000001179401

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS)	Engine speed and piston position	Intake valve timing control		
Camshaft position sensor (PHASE)			Intake valve timing control solenoid valve	
Engine coolant temperature sensor	Engine coolant temperature			
Combination meter*	Vehicle speed			

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

SYSTEM DESCRIPTION

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

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

INTAKE VALVE TIMING CONTROL

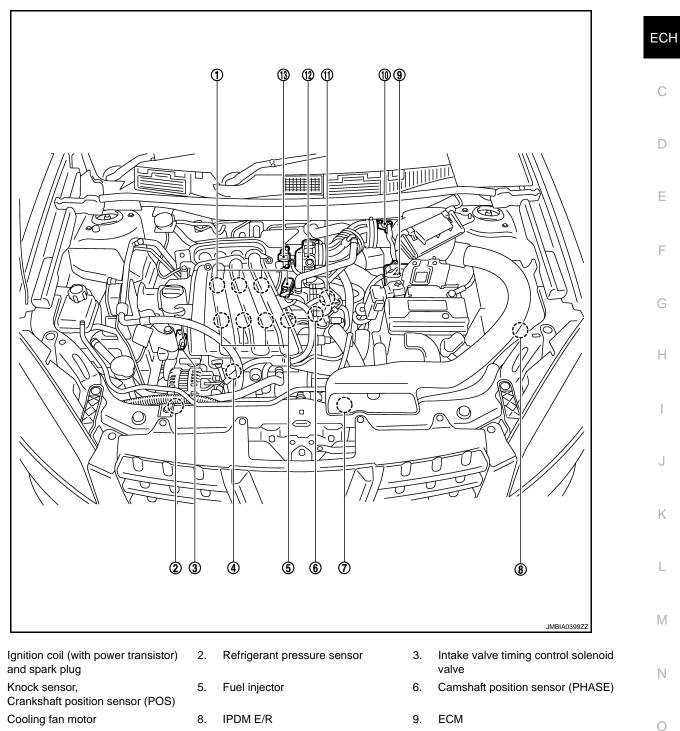
< FUNCTION DIAGNOSIS >

Component Parts Location

[HR16DE (WITH EURO-OBD)]

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10. Mass air flow sensor (with intake temperature sensor)

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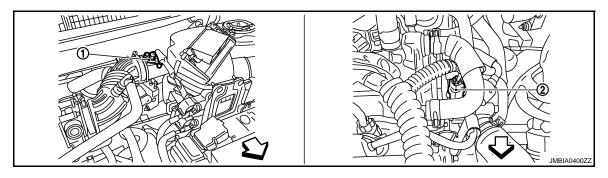
- 13. EVAP canister purge volume control solenoid valve
- IPDM E/R
- 11. Engine coolant temperature sensor

ECM

12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

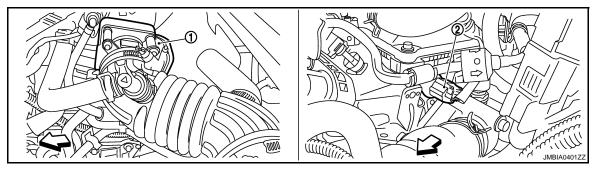
INTAKE VALVE TIMING CONTROL

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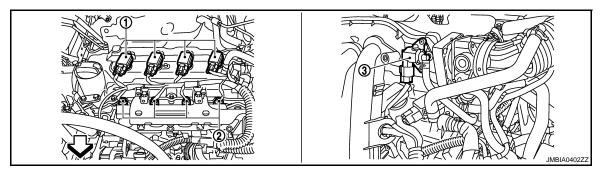
- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

✓ Vehicle front



- 1. Electric throttle control actuator
- 2. Camshaft position sensor (PHASE)

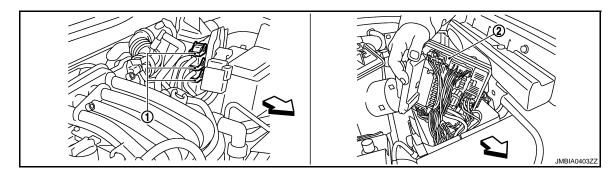
✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front



- 1. ECM harness connector2.
- √ Vehicle front

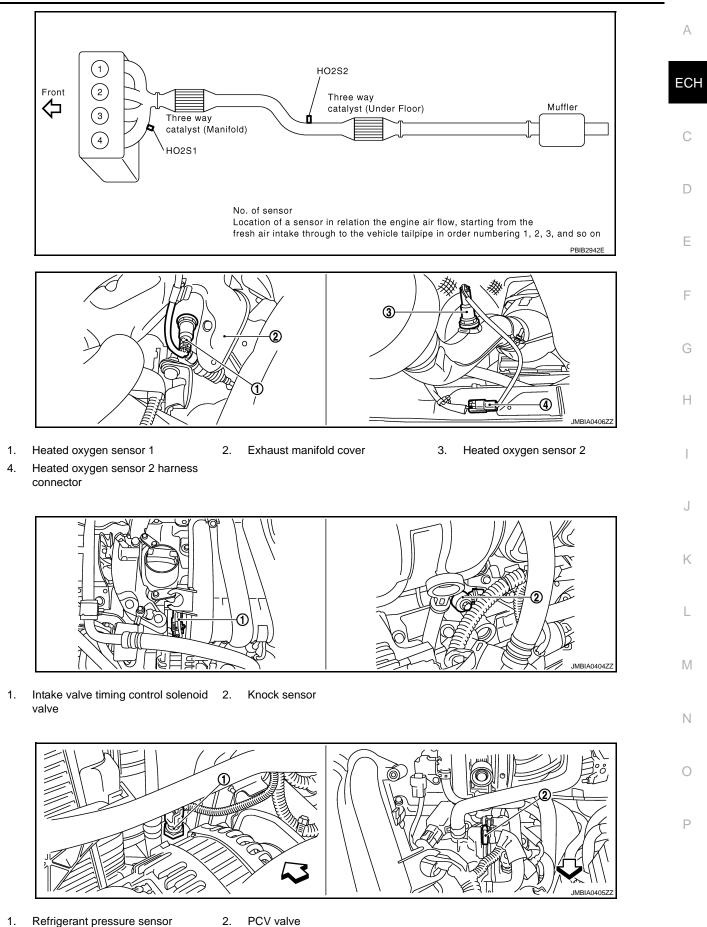
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IPDM E/R

INTAKE VALVE TIMING CONTROL

< FUNCTION DIAGNOSIS >

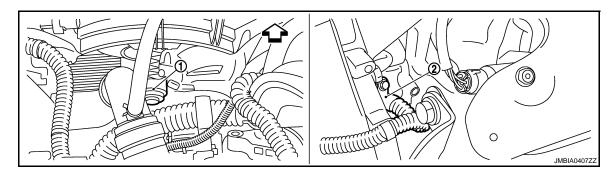
[HR16DE (WITH EURO-OBD)]



✓ Vehicle front

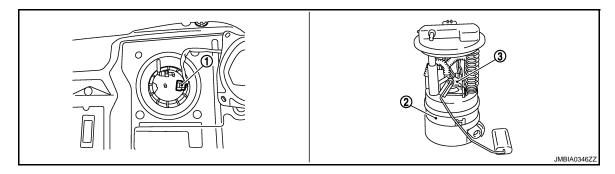
INTAKE VALVE TIMING CONTROL

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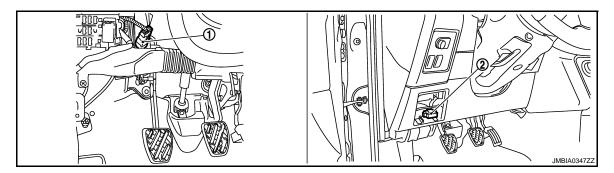


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

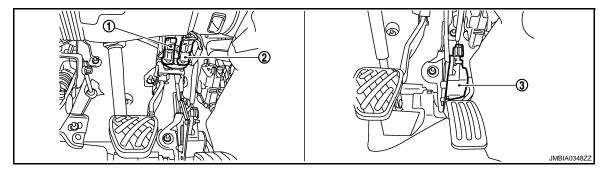
✓ Vehicle front



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



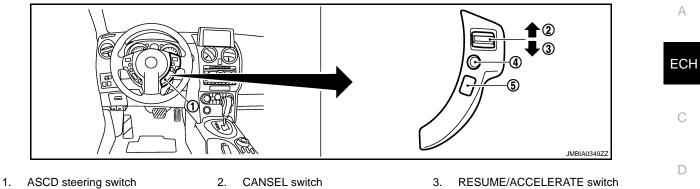
- 1. ASCD clutch switch
- 2. Data link connector



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

INTAKE VALVE TIMING CONTROL

< FUNCTION DIAGNOSIS >



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

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Component Description

Component	Reference		
Camshaft position sensor (PHASE)	ECH-186. "Description"		
Crankshaft position sensor (POS)	ECH-182, "Description"		
Engine coolant temperature sensor	ECH-124, "Description"	G	
Intake valve timing control solenoid valve	ECH-70, "System Description"		
Vehicle speed sensor	ECH-198, "Description"	Н	

< FUNCTION DIAGNOSIS >

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000001179405

[HR16DE (WITH EURO-OBD)]

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	Diagnostic service
Diagnostic Trouble Code (DTC)	Service \$03 of ISO 15031-5
Freeze Frame data	Service \$02 of ISO 15031-5
System Readiness Test (SRT) code	Service \$01 of ISO 15031-5
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Service \$07 of ISO 15031-5
1st Trip Freeze Frame data	
Test values and Test limits	Service \$06 of ISO 15031-5

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

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-III	×	×	×	×	×	—
GST	×	×	×	_	×	×
ECM	×	×*			_	—

*: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator lamp (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to <u>ECH-327</u>, <u>"Fail Safe"</u>.)

TWO TRIP DETECTION LOGIC

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

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

×: Applicable —: Not applicable

		Ν	/1		D	тс	1st trip DTC		
Items	1st	trip	2nc	l trip	1st trip	2nd trip	1st trip	2nd trip	
	Blinking	Lighting up	Blinking	Lighting up	displaying		displaying	display- ing	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	_	_	_	_	_	×	_	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	_	_	×	_	_	×	_	_	
One trip detection diagnoses (Re- fer to <u>ECH-330, "DTC Index"</u> .)	_	×	_	_	×	—	_	_	
Except above			—	×		×	×		

DTC AND FREEZE FRAME DATA

DTC and 1st Trip DTC

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The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.

If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MI lights up. In other words, the DTC is stored in the ECM memory and the MI lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MI during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".

For malfunctions in which 1st trip DTCs are displayed, refer to "EMISSION-RELATED DIAGNOSTIC INFOR-MATION ITEMS". These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-III.

1st trip DTC is specified in Service \$07 of ISO 15031-5. 1st trip DTC detection occurs without lighting up the MI and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to <u>ECH-10</u>, "Work Flow". Then perform DTC CONFIR-MATION PROCEDURE or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

Freeze Frame Data and 1st Trip Freeze Frame Data

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

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-III or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-III screen, not on the GST. Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM has the following priorities to update the data.

Priority		Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172	L
2		Except the above items	
3	1st trip freeze frame d	ata	M

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

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".

How to Read DTC and 1st Trip DTC

With CONSULT-III

With GST

CONSULT-III or GST (Generic Scan Tool) Examples: P0340, P1148, 1706, etc. These DTCs are prescribed by ISO 15031-5.

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(CONSULT-III also displays the malfunctioning component or system.)

The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0340, 1148, 1706, etc.

These DTCs are controlled by NISSAN.

- 1st trip DTC No. is the same as DTC No.
- Output of a DTC indicates a malfunction. However, GST or the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-III can identify malfunction status as shown below. Therefore, using CONSULT-III (if available) is recommended.

DTC or 1st trip DTC of a malfunction is displayed in "SELF-DIAGNOSTIC RESULTS" mode of CONSULT-III. Time data indicates how many times the vehicle was driven after the last detection of a DTC.

If the DTC is being detected currently, the time data will be [0].

If a 1st trip DTC is stored in the ECM, the time data will be [1t].

How to Erase DTC and 1st Trip DTC

With CONSULT-III

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 10 seconds and then turn it ON (engine stopped) again.
- 2. Select Service \$04 with GST (Generic Scan Tool).

No Tools

- 1. If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
- 2. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal.
- 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
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

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.

SYSTEM READINESS TEST (SRT) CODE

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

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

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

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

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

NOTE:

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

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

NOTE:

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

SRT Item

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

SRT item (CONSULT-III indication)	Performance Priority*	Required self-diagnostic items to set the SRT to "CMPLT"	Corresponding DTC No.	(
CATALYST	2	Three way catalyst function	P0420	
HO2S	1	Heated oxygen sensor 1	P0133	
		Heated oxygen sensor 1	P1143	Ľ
		Heated oxygen sensor 1	P1144	
		Heated oxygen sensor 2	P0139	F
		Heated oxygen sensor 2	P1146	L
	4	Heated oxygen sensor 1 heater	P0135	
HO2S HTR	1	Heated oxygen sensor 2 heater	P0141	F

*: If completion of several SRTs is required, perform driving patterns (DTC CONFIRMATION PROCEDURE), one by one based on the priority for models with CONSULT-III.

SRT Set Timing

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

				Example		
Self-diagnosis result		Diagnosis	$\leftarrow ON \rightarrow$		on cycle DFF $\leftarrow ON \rightarrow OF$	FF \leftarrow ON \rightarrow
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	"CMPLT"	"CMPLT"	"CMPLT"	"CMPLT"
-	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	"INCMP"	"INCMP"	"CMPLT"	"CMPLT"
NG exists	Case 3	P0400	ОК	ОК	—	—
		P0402	—	_	—	—
	P1402	NG	_	NG	NG (Consecutive NG)	
		(1st trip) DTC	1st trip DTC	_	1st trip DTC	DTC (= MI ON)
		SRT of EGR	"INCMP"	"INCMP"	"INCMP"	"CMPLT"

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

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

-: Self-diagnosis is not carried out.

When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate "CMPLT". \rightarrow Case 1 above

When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate "CMPLT" at the time the respective self-diagnoses have at least one OK result. \rightarrow Case 2 above

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

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

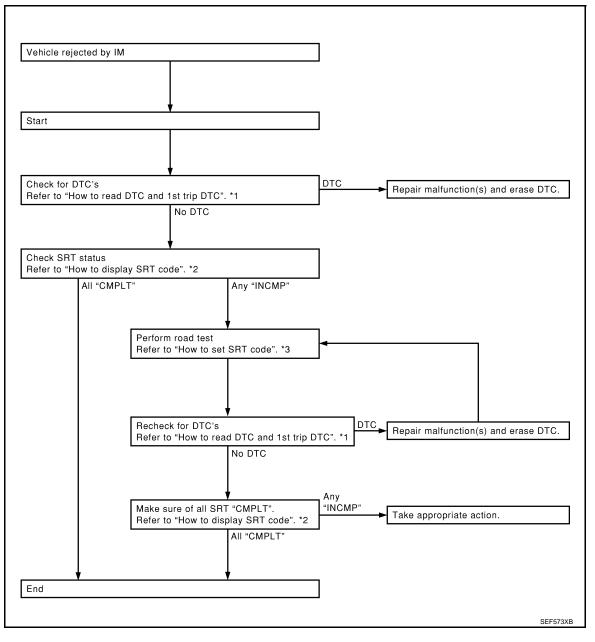
- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory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

NOTE:

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

SRT Service Procedure

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



*1 "How to Read DTC and 1st Trip DTC" *2 "How to Display SRT Status"

*3 "How to Set SRT Code"

How to Display SRT Status

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BWITH CONSULT-III

Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-III. For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-III screen; for items whose SRT codes are not set, "INCMP" is displayed.

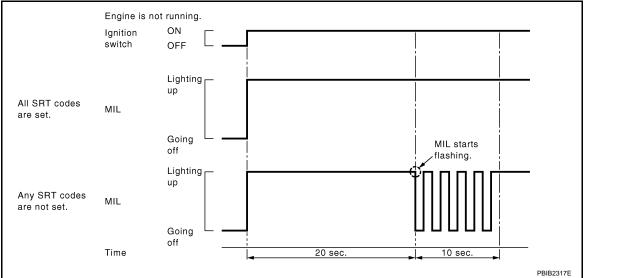
WITH GST

Selecting Service \$01 with GST (Generic Scan Tool)

NO TOOLS

A SRT code itself can not be displayed while only SRT status can be.

- 1. Turn ignition switch ON and wait 20 seconds.
- 2. SRT status is indicated as shown below.
 - When all SRT codes are set, MI lights up continuously.
 - When any SRT codes are not set, MI will flash periodically for 10 seconds.

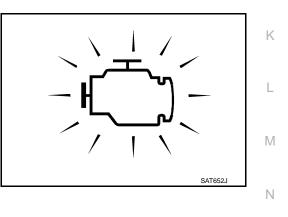


MALFUNCTION INDICATOR (MI)

Description

The MI is located on the instrument panel.

- The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check. If the MI does not light up, refer to <u>ECH-302</u>, "Component Function 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 four functions.

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Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running	MALFUNCTION WARNING	 This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MI in the 1st trip. Misfire (Possible three way catalyst damage) One trip detection diagnoses
Mode II	Ignition switch in ON position	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

MI Flashing Without DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode. How to switch the diagnostic test function modes, and details of the above functions are described later.

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

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

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. Refer to <u>ECH-302, "Component Function Check"</u>.

Diagnostic Test Mode I — Malfunction Warning

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

This DTC number is clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

Diagnostic Test Mode II - Self-diagnostic Results

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI as shown below. The DTC and 1st trip DTC are displayed at the same time. If the MI does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MI illumi-

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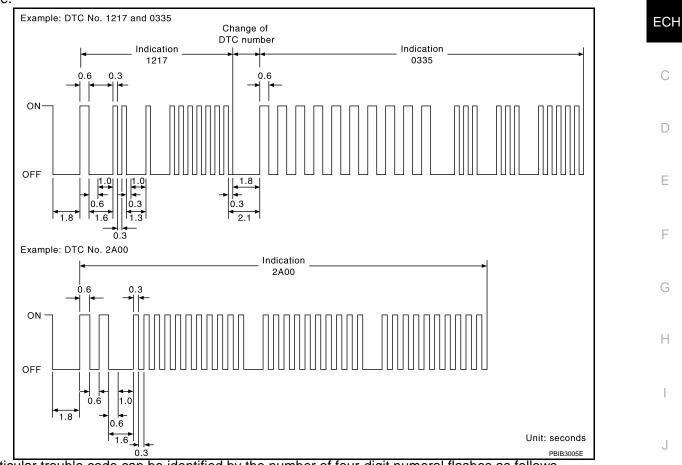
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nates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-III or GST. A DTC will be used as an example for how to read a code.



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

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

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

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

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. (See <u>ECH-330, "DTC Index"</u>)

Diagnostic Test Mode II — Heated oxygen sensor 1 monitor

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition	
ON	Lean	Closed loop system	P
OFF	Rich		
*Remains ON or OFF	Any condition	Open loop system	-

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.

Nest run engine at about 2,000 rpm for about 2 minutes under no load conditions. Then make sure that the MI comes ON more than 5 times within 1 seconds with engine running at 2,000 rpm under no load.

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How to Switch Diagnostic Test Mode

NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- Always ECM returns to Diagnostic Test Mode I after ignition switch is turned OFF.
 HOW TO SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)
- 1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- Repeat the following procedure quickly five times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
- 3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.

NOTE:

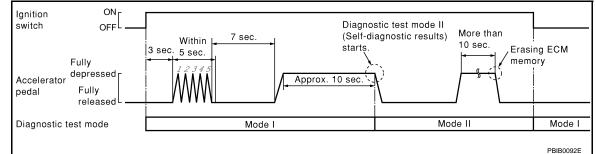
Do not release the accelerator pedal for 10 seconds if MI may start blinking on the halfway of this 10 seconds. This blinking is displaying SRT status and is continued for another 10 seconds.

4. Fully release the accelerator pedal.

ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).

NOTE:

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



HOW TO SET DIAGNOSTIC TEST MODE II (HEATE OXYGEN SENSOR 1 MONITOR)

- 1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results).
- Refer to "How to Set Diagnostic Test Mode II (Self-diagnostic Results)".
- 2. Start Engine.

ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

- 1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to "How to Set Diagnostic Test Mode II (Self-diagnostic Results)".
- Fully depress the accelerator pedal and keep it for more than 10 seconds. The emission-related diagnostic information has been erased from the backup memory in the ECM.
- 3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to "How to Erase Diagnostic Test Mode II (Self-diagnostic Results)".

- If the battery is disconnected, the DTC will be lost from the backup memory within 24 hours.
- Be careful not to erase the stored memory before starting trouble diagnoses.

OBD System Operation Chart

Relationship Between MI, 1st Trip DTC, DTC and Detectable Items

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MI will come on.
- The MI will go off after the vehicle is driven 3 times (pattern B) with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (pattern C) without

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the same malfunction recurring. The "TIME" in "SELF-DIAGNOSTIC RESULTS" mode of CONSULT-III will count the number of times the vehicle is driven.

• The 1st trip DTC is not displayed when the self-diagnosis results in OK for the 2nd trip.

Summary Chart

			ECH
Fuel Injection System	Misfire	Other	
3 (pattern B)	3 (pattern B)	3 (pattern B)	
80 (pattern C)	80 (pattern C)	40 (pattern A)	С
1 (pattern C), *1	1 (pattern C), * ¹	1 (pattern B)	
*1, *2	*1, *2	1 (pattern B)	D
	3 (pattern B) 80 (pattern C) 1 (pattern C), * ¹	3 (pattern B) 3 (pattern B) 80 (pattern C) 80 (pattern C) 1 (pattern C), *1 1 (pattern C), *1	3 (pattern B)3 (pattern B)3 (pattern B)80 (pattern C)80 (pattern C)40 (pattern A)1 (pattern C), *11 (pattern C), *11 (pattern B)

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

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

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

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

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

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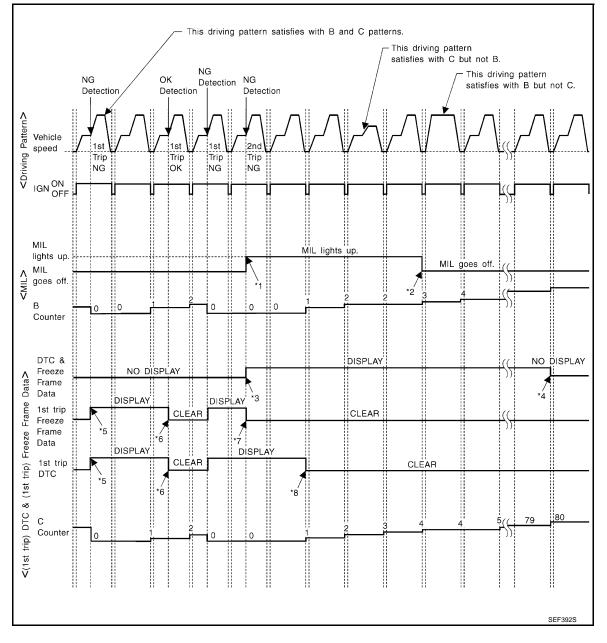
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- *1: When the same malfunction is detected in two consecutive trips, MI will light up.
- *4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and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

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

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

Driving pattern B means the vehicle operation as follows:

All components and systems should be monitored at least once by the OBD system.

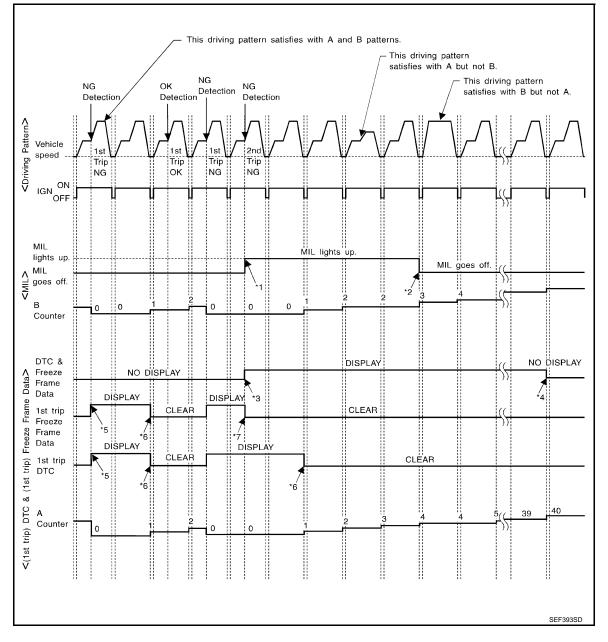
[HR16DE (WITH EURO-OBD)]

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< FUNCTION DIAGNOSIS >	[HR16DE (WITH EURO-OBD)]	
 The B counter will be cleared when the malfunction i The B counter will be counted up when driving patter The MI will go off when the B counter reaches 3. (*2 Chriving Pattern C> 	n B is satisfied without any malfunction.	А
Driving pattern C means the vehicle operation as follow		ECH
The following conditions should be satisfied at the sam Engine speed: (Engine speed in the freeze frame data Calculated load value: (Calculated load value in the free Engine coolant temperature (T) condition: • When the freeze frame data shows lower than 70°C) ±375 rpm eeze frame data) x (1±0.1) [%]	С
	ual to 70°C (158°F), T should be higher than or equal to	D
Example:		D
If the stored freeze frame data is as follows: Engine speed: 850 rpm, Calculated load value: 30%, E To be satisfied with driving pattern C, the vehicle shoul Engine speed: 475 - 1,225 rpm, Calculated load value: (158°F)		Е
 The C counter will be cleared when the malfunction i The C counter will be counted up when vehicle cond The DTC will not be displayed after C counter reached 	itions above is satisfied without the same malfunction.	F
	ounted once without the same malfunction after DTC is	G
	Patterns Except For "Misfire < Exhaust Quality Deteriora-	
tion>", "Fuel Injection System"		Н
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< FUNCTION DIAGNOSIS >





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

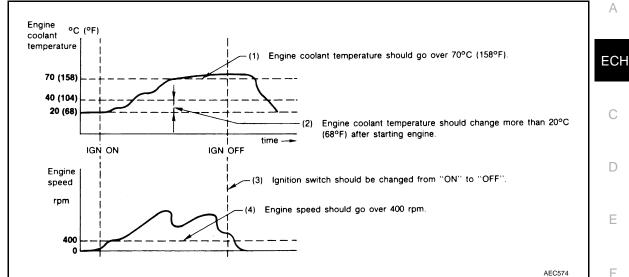
- *2: MI will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- *5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- *3: When the same malfunction is detected in two consecutive trips, the DTC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

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

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

<Driving Pattern A>



- The A counter will be cleared when the malfunction is detected regardless of (1) (4).
- The A counter will be counted up when (1) (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:

- All components and systems should be monitored at least once by the OBD system.
- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MI will go off when the B counter reaches 3 (*2 in OBD SYSTEM OPERATION CHART).

CONSULT-III Function

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FUNCTION

Diagnostic test mode	Function	
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the in- dications on the CONSULT-III unit.	
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*	
Data monitor	Input/Output data in the ECM can be read.	
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.	
DTC & SRT confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.	
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.	
ECU part number	ECM part number can be read.	

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

• Diagnostic trouble codes

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

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

< FUNCTION DIAGNOSIS >

					DIAGNOS	STIC TEST	MODE		
				SELF-DIAGNOSTIC RESULTS		DATA	ACTIVE TEST	DTC 8 CONFIRI	
	Item		WORK SUPPORT	DTC*1	FREEZE FRAME DATA*2	MONI- TOR		SRT STA- TUS	DTC WORK SUP- PORT
		Crankshaft position sensor (POS)		×	×	×			
		Camshaft position sensor (PHASE)		×	×	×			
		Mass air flow sensor		×		×			
		Engine coolant temperature sensor		×	×	×	×		
		Heated oxygen sensor 1		×		×		×	×
s		Heated oxygen sensor 2		×		×		×	×
ART		Vehicle speed sensor		×	×	×			
Ę		Accelerator pedal position sensor		×		×			
NEN		Throttle position sensor		×	×	×			
IPOI		Intake air temperature sensor		×	×	×			
NON S	INPUT	Knock sensor		×					
oL 0	Ä	Refrigerant pressure sensor				×			
ONTR	ENGINE CONTROL COMPONENT PARTS INPUT	Closed throttle position switch (accel- erator pedal position sensor signal)				×			
ЦПО		Air conditioner switch				×			
V GIN		Park/neutral position (PNP) switch		×		×			
Ē		Stop lamp switch		×		×			
		EPS control unit				×			
		Battery voltage				×			
		Load signal				×			
		ASCD steering switch		×		×			
		ASCD brake switch		×		×			
		Fuel injector				×	×		
TS		Power transistor (Ignition timing)				×	×		
PAR		Throttle control motor relay		×		×			
Ĭ		Throttle control motor		×					
ENGINE COTNROL COMPONENT PARTS	_	EVAP canister purge volume control solenoid valve		×		×	×		×
NOC	OUTPUT	Air conditioner relay				×			
oL (DUT	Fuel pump relay	×			×	×		
INR	NRC NRC	Cooling fan relay		×		×	×		
БÖ		Heated oxygen sensor 1 heater		×		×		×	
ШZ		Heated oxygen sensor 2 heater		×		×		×	
ENG		Intake valve timing control solenoid valve		×		×	×		
		Calculated load value			×	×			

X: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-III screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to <u>ECH-76</u>, "Diagnosis Description".

< FUNCTION DIAGNOSIS >

F

Work Item

			Α
WORK ITEM	CONDITION	USAGE	
FUEL PRESSURE RELEASE	 FUEL PUMP WILL STOP BY TOUCHING "START" DUR- ING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. 	When releasing fuel pressure from fuel line	ECH
IDLE AIR VOL LEARN	• THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume	С
SELF-LEARNING CONT	• THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEF- FICIENT.	When clearing mixture ratio self- learning value	D
TARGET IDLE RPM ADJ*	IDLE CONDITION	When setting target idle speed	
TARGET IGN TIM ADJ*	IDLE CONDITION	When adjusting target ignition tim- ing	Е

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

SELF-DIAG RESULTS MODE

Self Diagnostic Item Regarding items of DTC and 1st trip DTC, refer to <u>ECH-330, "DTC Index"</u>.)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description		
DIAG TROUBLE CODE [PXXXX]	 The engine control component part/control system has a trouble code, it is displayed as PXXXX. (Refer to <u>ECH-330, "DTC_Index"</u>.) 		
FUEL SYS-B1	 "Fuel injection system status" at the moment a malfunction is detected is displayed. One mode in the following is displayed. Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop 		
CAL/LD VALUE [%]	The calculated load value at the moment a malfunction is detected is displayed.		
COOLANT TEMP [°C] or [°F]	The engine coolant temperature at the moment a malfunction is detected is displayed.		
L-FUEL TRM-B1 [%]	 "Long-term fuel trim" at the moment a malfunction is detected is displayed. The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim. 		
 S-FUEL TRM-B1 [%] "Short-term fuel trim" at the moment a malfunction is detected is displayed. The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base full. 			
ENGINE SPEED [rpm]	The engine speed at the moment a malfunction is detected is displayed.		
VEHICL SPEED [km/h] or [mph]	The vehicle speed at the moment a malfunction is detected is displayed.		
ABSOL TH-P/S [%]	The throttle valve opening angle at the moment a malfunction is detected is displayed.		
B/FUEL SCHDL [msec]	The base fuel schedule at the moment a malfunction is detected is displayed.		
INT/A TEMP SE [°C] or [°F]	The intake air temperature at the moment a malfunction is detected is displayed.		
INT MANI PRES [kPa]	 Always a certain value is displayed. This item is not efficient for J10 models.		

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

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Monitored Item

×: Applicable

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	 Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE). 	 Accuracy becomes poor if engine speed drops below the idle rpm. If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1	V	 The signal voltage of the mass air flow sensor is displayed. 	 When the engine is stopped, a certain value is indicated. When engine is running specification range is indicated in "SPEC".
B/FUEL SCHDL	msec	"Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	When engine is running specification range is indicated in "SPEC".
A/F ALPHA-B1	%	 The mean value of the air-fuel ratio feedback cor- rection factor per cycle is indicated. 	 When the engine is stopped, a certain value is indicated. When engine is running specification range is indicated in "SPEC". This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S	°C or °F	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	 When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The en- gine coolant temperature determined by the ECM is displayed.
HO2 SEN1 (B1)	V	• The A/F signal computed from the input signal of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1)	V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR(B1)	RICH/LEAN	 Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH: means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN: means the mixture became "lean", and control is being affected toward a rich mixture. 	 After turning ON the ignition switch, "RICH" is displayed until air-fuel mix- ture ratio feedback control begins. When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR(B1)	RICH/LEAN	 Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large. 	• When the engine is stopped, a certain value is indicated.
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.	
BATTERY VOLT	V	• The power supply voltage of ECM is displayed.	
ACCEL SEN 1		The accelerator pedal position sensor signal volt-	ACCEL SEN 2 signal is converted by
ACCEL SEN 2	V	age is displayed.	ECM internally. Thus, it differs from ECM terminal voltage signal.
TP SEN 1-B1		The throttle position sensor signal voltage is dis-	TP SEN 2-B1 signal is converted by EOM intermediate Three is different from:
TP SEN 2-B1	V	played.	ECM internally. Thus, it differs from ECM terminal voltage signal.
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
START SIGNAL	ON/OFF	 Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage. 	 After starting the engine, [OFF] is dis- played regardless of the starter sig- nal.

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Monitored item	Unit	Description	Remarks	Λ
CLSD THL POS	ON/OFF	 Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal. 		A
AIR COND SIG	ON/OFF	• Indicates [ON/OFF] condition of the air condition- er switch as determined by the air conditioner sig- nal.		ECH
P/N POSI SW	ON/OFF	• Indicates [ON/OFF] condition from the park/neu- tral position (PNP) switch signal.		С
PW/ST SIGNAL	ON/OFF	• [ON/OFF] condition of the power steering system (determined by the signal sent from EPS control unit) is indicated.		D
LOAD SIGNAL	ON/OFF	 Indicates [ON/OFF] condition from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and light- ing switch are OFF. 		E
IGNITION SW	ON/OFF	Indicates [ON/OFF] condition from ignition switch signal.		
CLUTCH P/P SW	ON/OFF	 Indicates [ON/OFF] condition from the clutch switch signal. 		G
HEATER FAN SW	ON/OFF	 Indicates [ON/OFF] condition from the heater fan switch signal. 		Н
BRAKE SW	ON/OFF	 Indicates [ON/OFF] condition from the stop lamp switch signal. 		
INJ PULSE-B1	msec	 Indicates the actual fuel injection pulse width compensated by ECM according to the input sig- nals. 	• When the engine is stopped, a certain computed value is indicated.	I
IGN TIMING	BTDC	Indicates the ignition timing computed by ECM according to the input signals.	When the engine is stopped, a certain value is indicated.	J
CAL/LD VALUE	%	• "Calculated load value" indicates the value of the current air flow divided by peak air flow.		
MASS AIRFLOW	g∙m/s	• Indicates the mass air flow computed by ECM ac- cording to the signal voltage of the mass air flow sensor.		K
PURG VOL C/V	%	 Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. The opening becomes larger as the value increases. 		L
INT/V TIM (B1)	°CA	 Indicates [°CA] of intake camshaft advance an- gle. 		
INT/V SOL-B1	%	 The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. The advance angle becomes larger as the value increases. 		N
AIR COND RLY	ON/OFF	• The air conditioner relay control condition (deter- mined by ECM according to the input signals) is indicated.		Ρ
FUEL PUMP RLY	ON/OFF	 Indicates the fuel pump relay control condition determined by ECM according to the input sig- nals. 		
THRTL RELAY	ON/OFF	 Indicates the throttle control motor relay control condition determined by the ECM according to the input signals. 		

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Monitored item	Unit	Description	Remarks
COOLING FAN	HI/LOW/OFF	 Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI: High speed operation LOW: Low speed operation OFF: Stop 	
HO2S1 HTR (B1)	ON/OFF	 Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals. 	
HO2S2 HTR (B1)	ON/OFF	 Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals. 	
IDL A/V LEARN	YET/CMPLT	 Display the condition of Idle Air Volume Learning YET: Idle air volume learning has not been per- formed yet. CMPLT: Idle air volume learning has already been performed successfully. 	
TRVL AFTER MIL	km or mile	Distance traveled while MI is activated.	
O2 SEN HTR DTY	%	 Heated oxygen sensor 1 heater control value computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. 	
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.	
SET VHCL SPD	km/h or mph	The preset vehicle speed is displayed.	
MAIN SW	ON/OFF	 Indicates [ON/OFF] condition from MAIN switch signal. 	
CANCEL SW	ON/OFF	 Indicates [ON/OFF] condition from CANCEL switch signal. 	
RESUME/ACC SW	ON/OFF	Indicates [ON/OFF] condition from RESUME/AC- CELERATE switch signal.	
SET SW	ON/OFF	 Indicates [ON/OFF] condition from SET/COAST switch signal. 	
BRAKE SW1	ON/OFF	 Indicates [ON/OFF] condition from ASCD brake switch signal. 	
BRAKE SW2	ON/OFF	 Indicates [ON/OFF] condition of stop lamp switch signal. 	
VHCL SPD CUT	NON/CUT	 Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off. 	
LO SPEED CUT	NON/CUT	 Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low, and ASCD operation is cut off. 	
CRUISE LAMP	ON/OFF	 Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals. 	
SET LAMP	ON/OFF	Indicates [ON/OFF] condition of SET lamp deter- mined by the ECM according to the input signals.	

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

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Monitored item	Unit	Description	Remarks
Voltage	V		
Frequency	msec, Hz or %	Voltage, frequency, duty cycle or pulse width measured by the probe. to b Figure The	 Only "#" is displayed if item is unable to be measured.
DUTY-HI			 Figures with "#"s are temporary ones.
DUTY-LOW	-		They are the same figures as an actu- al piece of data which was just previ-
PLS WIDTH-HI			ously measured.
PLS WIDTH-LOW	-		

NOTE:

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

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	 Engine: Return to the original trouble condition Change the amount of fuel injec- tion using CONSULT-III. 	If trouble symptom disappears, see CHECK ITEM.	 Harness and connectors Fuel injector Heated oxygen sensor 1
IGNITION TIMING	 Engine: Return to the original trouble condition Timing light: Set Retard the ignition timing using CONSULT-III. 	If trouble symptom disappears, see CHECK ITEM.	Perform Idle Air Volume Learn- ing.
POWER BALANCE	 Engine: After warming up, idle the engine. A/C switch OFF Shift lever: Neutral Cut off each fuel injector signal one at a time using CONSULT-III. 	Engine runs rough or dies.	 Harness and connectors Compression Fuel injector Power transistor Spark plug Ignition coil
COOLING FAN*	 Ignition switch: ON Turn the cooling fan "LOW", "HI" and "OFF" CONSULT-III. 	Cooling fan moves and stops.	 Harness and connectors IPDM E/R (Cooling fan relay) Cooling fan motor
ENG COOLANT TEMP	 Engine: Return to the original trouble condition Change the engine coolant tem- perature using CONSULT-III. 	If trouble symptom disappears, see CHECK ITEM.	 Harness and connectors Engine coolant temperature sensor Fuel injector
FUEL PUMP RELAY	 Ignition switch: ON (Engine stopped) Turn the fuel pump relay "ON" and "OFF" using CONSULT-III and listen to operating sound. 	Fuel pump relay makes the operat- ing sound.	Harness and connectorsFuel pump relay
PURG VOL CONT/V	 Engine: After warming up, run engine at 1,500 rpm. Change the EVAP canister purge volume control solenoid valve opening percent using CON-SULT-III. 	Engine speed changes according to the opening percent.	Harness and connectorsSolenoid valve
V/T ASSIGN ANGLE	 Engine: Return to the original trouble condition Change intake valve timing using CONSULT-III. 	If trouble symptom disappears, see CHECK ITEM.	 Harness and connectors Intake valve timing control sole- noid valve

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

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode For details, refer to <u>ECH-76, "Diagnosis Description"</u>.

SRT WORK SUPPORT Mode

< FUNCTION DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

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

DTC WORK SUPPORT Mode

Test mode	Test item	Condition	Reference page
HO2S1	HO2S1 (B1) P0133		ECH-134
	HO2S1 (B1) P0134		<u>ECH-140</u>
	HO2S1 (B1) P1143		ECH-217
	HO2S1 (B1) P1144	Refer to corresponding trouble diagnosis for DTC.	ECH-222
HO2S2	HO2S2 (B1) P0139		ECH-153
	HO2S2 (B1) P1146		ECH-227
	HO2S2 (B1) P1147		ECH-234

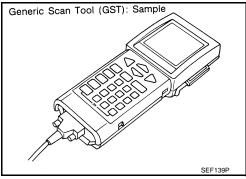
Diagnosis Tool Function

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with ISO 15031 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.



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FUNCTION

Dia	agnostic Service	Function
Service \$01	READINESS TESTS	This diagnostic service gains access to current emission-related data values, including an- alog inputs and outputs, digital inputs and outputs, and system status information.
Service \$02	(FREEZE DATA)	This diagnostic service gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to <u>ECH-330</u> , " <u>DTC Index</u> ".
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) Clear freeze frame data (Service \$02) Reset status of system monitoring test (Service \$01) Clear on board monitoring test results (Service \$06 and \$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 \$08	—	This diagnostic service is not applicable on this vehicle.
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.

2. Connect "GST" to data link connector, which is located under dash panel near the hood opener handle.

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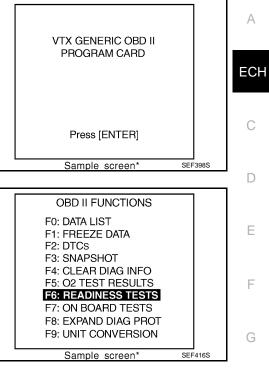
the tool maker.

[HR16DE (WITH EURO-OBD)]

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.)

5. Perform each diagnostic mode according to each service proce-

For further information, see the GST Operation Manual of



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< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

COMPONENT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

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INFOID:000000001179409

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

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

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

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

Component Function Check

1.START

Make sure that all of the following conditions are satisfied.

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 104.3 kPa (0.983 1.043 bar, 1.003 1.064 kg/cm², 14.25 15.12 psi)
- Atmospheric temperature: 20 30°C (68 86°F)
- Engine coolant temperature: 75 95°C (167 203°F)
- Transmission: Warmed-up
- After the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
- Electrical load: Not applied*
- Engine speed: Idle

*: Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.

>> GO TO 2.

2.PERFORM "SPEC" OF "DATA MONITOR" MODE

With CONSULT-III NOTE:

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

1. Perform ECH-14, "BASIC INSPECTION : Special Repair Requirement".

- Select "B/FUEL SCHDL", "A/F ALPHA-B1" and "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode with CONSULT-III.
- 3. Make sure that monitor items are within the SP value.

Is the inspection result normal?

- YES >> END
- NO >> Go to ECH-99, "Diagnosis Procedure".

< COMPONENT DIAGNOSIS >

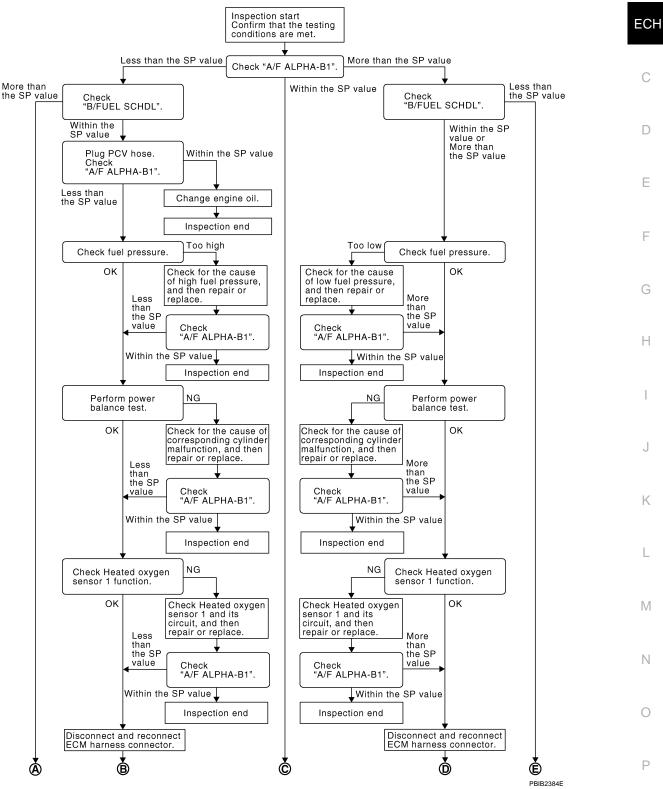
Diagnosis Procedure

INFOID:000000001179410

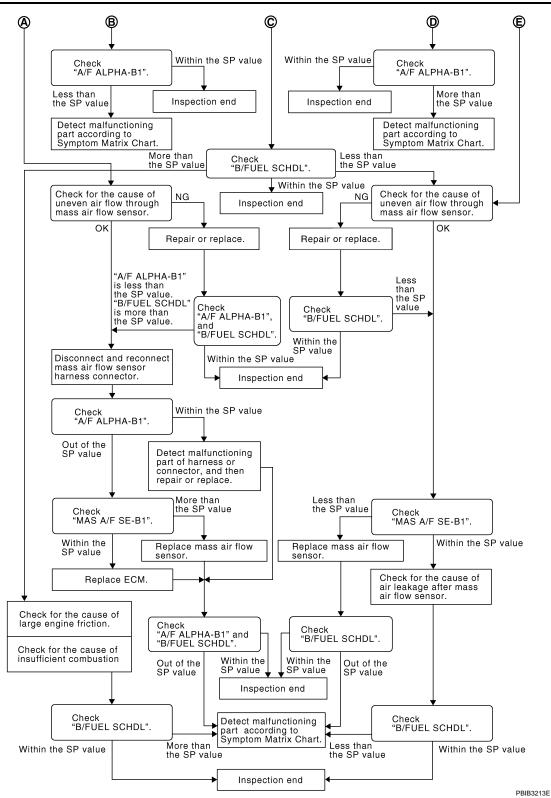
А

[HR16DE (WITH EURO-OBD)]

OVERALL SEQUENCE



< COMPONENT DIAGNOSIS >



DETAILED PROCEDURE

1.CHECK "A/F ALPHA-B1"

With CONSULT-III

- 1. Start engine.
- 2. Confirm that the testing conditions are met. Refer to ECH-98, "Component Function Check".
- Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.
 NOTE:

TROUBLE DIAGNOSIS - SPECIFICATION VALUE	
< COMPONENT DIAGNOSIS > [HR16DE (WITH EURO-OBD	[(כ
Check "A/F ALPHA-B1" for approximately 1 minute because they may fluctuate. It is NG if the indication out of the SP value even a little.	n is A
Is the measurement value within the SP value?	
YES >> GO TO 17. NO-1 >> Less than the SP value: GO TO 2. NO-2 >> More than the SP value: GO TO 3.	ECH
2.CHECK "B/FUEL SCHDL"	
Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.	he ^C
Is the measurement value within the SP value?	D
YES >> GO TO 4. NO >> More than the SP value: GO TO 19.	D
3. CHECK "B/FUEL SCHDL"	
Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within t	E the
SP value.	
Is the measurement value within the SP value?	F
YES >> GO TO 6. NO-1 >> More than the SP value: GO TO 6.	
NO-2 $>>$ Less than the SP value: GO TO 25.	G
4.CHECK "A/F ALPHA-B1"	0
1. Stop the engine.	H
 Disconnect PCV hose, and then plug it. Start engine. 	
 Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is with the SP value. 	hin
Is the measurement value within the SP value?	
YES >> GO TO 5. NO >> GO TO 6.	J.
5. CHANGE ENGINE OIL	
1. Stop the engine.	
2. Change engine oil. NOTE:	K
This symptom may occur when a large amount of gasoline is mixed with engine oil because of drivi conditions (such as when engine oil temperature does not rise enough since a journey distance is a short during winter). The symptom will not be detected after changing engine oil or changing driving co dition.	too L
>> INSPECTION END	M
6.check fuel pressure	
Check fuel pressure. (Refer to ECH-345, "Inspection".)	— N
Is the inspection result normal?	
YES >> GO TO 9.	0
 NO-1 >> Fuel pressure is too high: Replace "fuel filter and fuel pump assembly" and then GO TO 8. NO-2 >> Fuel pressure is too low: GO TO 7. 	0
LOETECT MALFUNCTIONING PART	P
Check fuel hoses and fuel tubes for clogging	
<u>Is the inspection result normal?</u> YES >> Replace "fuel filter and fuel pump assembly" and then GO TO 8.	
 YES >> Replace "fuel filter and fuel pump assembly" and then GO TO 8. NO >> Repair or replace and then GO TO 8. 	
8. CHECK "A/F ALPHA-B1"	

1. Start engine.

< COMPONENT DIAGNOSIS >	[HR16DE (WITH EURO-OBD)]
 Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, an the SP value. 	d make sure that the indication is within
Is the measurement value within the SP value?	
YES >> INSPECTION END NO >> GO TO 9.	
9. PERFORM POWER BALANCE TEST	
 Perform "POWER BALANCE" in "ACTIVE TEST" mode. Make sure that the each cylinder produces a momentary engine s 	peed drop.
Is the inspection result normal?	
YES >> GO TO 12.	
NO >> GO TO 10.	
10. DETECT MALFUNCTIONING PART	
Check the following.	
 Ignition coil and its circuit (Refer to <u>ECH-297, "Component Function</u>) Fuel injector and its circuit (Refer to <u>ECH-291, "Component Function</u>) 	
3. Intake air leakage	
 Low compression pressure (Refer to <u>EM-25, "Inspection"</u>.) 	
s the inspection result normal?	
YES >> Replace fuel injector and then GO TO 11.	
NO >> Repair or replace malfunctioning part and then GO TO 11.	
11. CHECK "A/F ALPHA-B1"	
 Start engine. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, an the SP value. 	d make sure that the indication is within
Is the measurement value within the SP value?	
YES >> INSPECTION END	
NO >> GO TO 12.	
12. CHECK HEATED OXYGEN SENSOR 1 FUNCTION	
1. Run engine at about 2,000 rpm for about 2minutes under no load.	
2. Select "HO2S1 MNTR (B1)", in "DATA MONITOR" mode.	
Running engine at 2,000 rpm under no load (The engine is warme check that the monitor fluctuates between LEAN and RICH more t	d up to normal operating temperature.), han 5 times during 10 seconds.
1 time : RICH \rightarrow LEAN \rightarrow RICH	
2 times : RICH \rightarrow LEAN \rightarrow RICH \rightarrow LEAN \rightarrow RICH	
Is the inspection result more than 5 times during 10 seconds?	
YES >> GO TO 15.	
NO >> GO TO 13.	
13. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT	
Check heated oxygen sensor and its circuit. Refer to ECH-130, "DTC I	Logic".
>> GO TO 14.	
14. CHECK "A/F ALPHA-B1"	
1. Start engine.	

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> GO TO 15.

15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

< COMPONENT DIAGNOSIS > [HR16DE (WITH EURO-OBD)]
 Stop the engine. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it.
>> GO TO 16. 16. CHECK "A/F ALPHA-B1"
 Start engine. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.
Is the measurement value within the SP value? YES >> INSPECTION END NO >> Detect malfunctioning part according to <u>ECH-334. "Symptom Table"</u> . 17. CHECK "B/FUEL SCHDL"
Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.
Is the measurement value within the SP value?YES>> INSPECTION ENDNO-1>> More than the SP value: GO TO 18.NO-2>> Less than the SP value: GO TO 25.
18.DETECT MALFUNCTIONING PART
 Check for the cause of large engine friction. Refer to the following. Engine oil level is too high Engine oil viscosity Belt tension of alternator, A/C compressor, etc. is excessive
 Noise from engine Noise from transmission, etc. Check for the cause of insufficient combustion. Refer to the following. Valve clearance malfunction Intake valve timing control function malfunction
- Camshaft sprocket installation malfunction, etc.
>> Repair or replace malfunctioning part, and then GO TO 30. 19.CHECK INTAKE SYSTEM
 Check for the cause of uneven air flow through mass air flow sensor. Refer to the following. Crushed air ducts Malfunctioning seal of air cleaner element Uneven dirt of air cleaner element
Improper specification of intake air system <u>Is the inspection result normal?</u>
YES >> GO TO 21. NO >> Repair or replace malfunctioning part, and then GO TO 20. 20. CHECK "A/F ALPHA-B1", AND "B/FUEL SCHDL"
Select "A/F ALPHA-B1" and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the each indication is within the SP value.
Is the measurement value within the SP value? YES >> INSPECTION END
NO >> "B/FUEL SCHDL" is more, "A/F ALPHA-B1" is less than the SP value: GO TO 21 21.DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR
1. Stop the engine.

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

< COMPONENT DIAGNOSIS >

22.CHECK "A/F ALPHA-B1"

1. Start engine.

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

Is the measurement value within the SP value?

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to <u>ECH-116, "DTC</u> <u>Logic"</u>. Then GO TO 29.

NO >> GO TO 23.

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

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

Is the measurement value within the SP value?

YES >> GO TO 24.

NO >> More than the SP value: Replace mass air flow sensor, and then GO TO 29.

- 24.REPLACE ECM
- 1. Replace ECM.
- Go to <u>ECH-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"</u>.

>> GO TO 29.

25.CHECK INTAKE SYSTEM

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

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

Is the inspection result normal?

YES >> GO TO 27.

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

26.CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

- YES >> INSPECTION END
- NO >> Less than the SP value: GO TO 27.

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

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

Is the measurement value within the SP value?

YES >> GO TO 28.

NO >> Less than the SP value: Replace mass air flow sensor, and then GO TO 30.

28.CHECK INTAKE SYSTEM

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

· Disconnection, looseness, and cracks in air duct

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

< COMPONENT DIAGNOSIS >	[HR16DE (WITH EURO-OBD)]
 Malfunctioning seal of intake air system, etc. 	A
>> GO TO 30.	A
29.CHECK "A/F ALPHA-B1" AND "B/FUEL SCHDL"	ECH
Select "A/F ALPHA-B1" and "B/FUEL SCHDL" in "SPEC" of "DATA MONIT indication is within the SP value.	
Is the measurement value within the SP value?	С
YES >> INSPECTION END NO >> Detect malfunctioning part according to ECH-334, "Symptom T	
NO >> Detect malfunctioning part according to <u>ECH-334</u> , "Symptom T 30. CHECK "B/FUEL SCHDL"	<u>able</u> . D
Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and the	
within the SP value. <u>Is the measurement value within the SP value?</u>	Е
YES >> INSPECTION END	
NO >> Detect malfunctioning part according to <u>ECH-334</u> . "Symptom T	<u>able"</u> . F
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INFOID:000000001179411

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

1.INSPECTION START

Start engine.

Is engine running?

YES >> GO TO 8.

NO >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF and then ON.

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

EC	CM	Ground	Voltago
Connector Terminal		Ground	Voltage
E16	93	Ground	Battery voltage

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E105, M77
- 10A fuse (No. 4)

• Harness for open or short between ECM and fuse

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

4.CHECK GROUND CONNECTION-I

1. Turn ignition switch OFF.

2. Check ground connection E21. Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace ground connection.

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

1. Disconnect ECM harness connectors.

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

E	СМ	Ground	Continuity
Connector Terminal		Ground	Continuity
F7	10		
17	11	Ground	Existed
E16	108		

3. Also check harness for 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 F121, E7

Harness for open or short between ECM and ground

POWER SUPPLY AND GROUND CIRCUIT

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

	CM harned	s connecto	ors			
2. Turn ignition	switch ON					ECH
3. Check the vo	ltage betw	een IPDM	E/R harness co	nnector and	ground.	
IPDM E/R				_		С
	erminal	Ground	Voltage			
E11	15	Ground	Battery voltage	_		D
Is the inspection r	esult norm	nal?		-		
		<u>, "Diagnosi</u>	<u>s Procedure"</u> .			_
NO >> GO T						E
8.CHECK ECM						
			at least 10 seco narness connec		od.	F
2. Check the vo	llage betw			tor and groui	u.	
ECM					-	G
Connector Term	inal Grou	nd	Voltage			0
		After turr	ning ignition switch	OFF. batterv vol		
= 1 0 1 0	- 0					
E16 10	5 Grou	-	exist for more than p approximately 0V	a few seconds,		Н
E16 10		then dro	exist for more than	a few seconds,	-	Η
Is the inspection r YES >> GO T	esult norm O 15.	then dro	exist for more than p approximately 0V	a few seconds,	-	H
Is the inspection r YES >> GO T NO-1 >> Batte	esult norm O 15. ry voltage	then dro nal? does not e	exist for more than p approximately 0V xist: GO TO 9.	a few seconds,	-) TO 12	Η
Is the inspection r YES >> GO T NO-1 >> Batte NO-2 >> Batte	esult norm O 15. ry voltage ry voltage	then dro nal? does not e exists for n	exist for more than p approximately 0V xist: GO TO 9. nore than a few	a few seconds,	-) TO 12.	H
Is the inspection r YES >> GO T NO-1 >> Batte NO-2 >> Batte 9.CHECK ECM	esult norm O 15. ry voltage ry voltage POWER S	then dro nal? does not e exists for n UPPLY CIF	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV	a few seconds,	_) TO 12.	 H I J
Is the inspection r YES >> GO T NO-1 >> Batte NO-2 >> Batte 9. CHECK ECM 1. Turn ignition	esult norm O 15. ry voltage ry voltage POWER S switch OFI	then dro nal? does not e exists for n UPPLY CIF F and wait	exist for more than p approximately 0V xist: GO TO 9. nore than a few	a few seconds,		 H I J
Is the inspection r YES >> GO T NO-1 >> Batte NO-2 >> Batte 9. CHECK ECM 1. Turn ignition	esult norm O 15. ry voltage ry voltage POWER S switch OFI	then dro nal? does not e exists for n UPPLY CIF F and wait	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 secc	a few seconds,		 H J K
Is the inspection r YES >> GO T NO-1 >> Batte NO-2 >> Batte 9.CHECK ECM 1. Turn ignition 2. Check the vo	esult norm O 15. ry voltage ry voltage POWER S switch OFI Itage betw	then dro nal? does not e exists for n UPPLY CIF F and wait	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 seco narness connec	a few seconds,		l
Is the inspection r YES >> GO T NO-1 >> Batte NO-2 >> Batte 9. CHECK ECM 1. Turn ignition 2. Check the vo	esult norm O 15. ry voltage ry voltage POWER S switch OFI Itage betw	then dro nal? does not e exists for n UPPLY CIF F and wait een ECM h	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 seco harness connect	a few seconds,		 l
Is the inspection r YES >> GO T NO-1 >> Batte NO-2 >> Batte 9.CHECK ECM 1. Turn ignition = 2. Check the vo ECM Connector 1 F7	esult norm O 15. ry voltage POWER S switch OFI Itage betw	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 seco narness connec	a few seconds,		 l
Is the inspection r YES >> GO T NO-1 >> Batte NO-2 >> Batte 9.CHECK ECM 1. Turn ignition 2. Check the vo ECM Connector F7 Is the inspection r	esult norm O 15. ry voltage ry voltage POWER S switch OFI Itage betw	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 seco harness connect	a few seconds,		I J K L
Is the inspection r YES >> GO T NO-1 >> Batte NO-2 >> Batte 9.CHECK ECM 1. Turn ignition 2. Check the vo ECM Connector F7 Is the inspection r YES >> GO T	esult norm O 15. ry voltage ry voltage POWER S switch OFI Itage betw erminal 32 esult norm O 10.	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 seco harness connect	a few seconds,		J
$\begin{tabular}{ c c c c } \hline Is the inspection red \\ YES >> GO T \\ NO-1 >> Batte \\ NO-2 >> Batte \\ \hline 0.CHECK ECM \\ \hline 1. Turn ignition \\ \hline 2. Check the vo \\ \hline \hline 1. Turn ignition \\ \hline 2. Check the vo \\ \hline \hline 1. Turn ignition \\ \hline 1. Tu$	esult norm O 15. ry voltage POWER S switch OFI Itage betw Ferminal 32 esult norm O 10. O 12.	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground al?	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 secc harness connec Voltage Battery voltage	a few seconds,		I J K L
$\begin{tabular}{ c c c c c } \hline Is the inspection red \end{tabular} \\ YES >> GO T \\ NO-1 >> Batte \\ NO-2 >> Batte \\ \hline 0.CHECK ECM \end{tabular} \\ \hline 1. Turn ignition = $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$	esult norm O 15. ry voltage POWER S switch OFI Itage betw erminal 32 O 10. O 10. O 12. M POWER	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground al?	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 seco harness connec Voltage Battery voltage	a few seconds,		I J K L
$\begin{tabular}{ c c c c c } \hline Is the inspection red Formula of $	esult norm O 15. ry voltage POWER S switch OFI Itage betw erminal 32 O 10. O 12. M POWER CM harne PDM E/R h	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground al? SUPPLY (ss connecte arness cor	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 seco harness connec Voltage Battery voltage CIRCUIT-V or. nnector E11.	a few seconds,	nd.	 I J K L
$\begin{tabular}{ c c c c c } \hline Is the inspection red Formula of $	esult norm O 15. ry voltage POWER S switch OFI Itage betw erminal 32 O 10. O 12. M POWER CM harne PDM E/R h	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground al? SUPPLY (ss connecte arness cor	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 seco harness connec Voltage Battery voltage CIRCUIT-V or. nnector E11.	a few seconds, seconds: GC onds. tor and grour		 I J K L
$\begin{tabular}{ c c c c c } \hline Is the inspection red product of the inspectic red product of t$	esult norm O 15. ry voltage POWER S switch OFI Itage betw erminal 32 O 10. O 12. M POWER CM harne PDM E/R h	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground al? SUPPLY C ss connecto arness cor tween ECN	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 secc harness connector Voltage Battery voltage CIRCUIT-V or. nnector E11. <i>I</i> harness connector	a few seconds, seconds: GC onds. tor and grour	nd.	 I J K L M
$\begin{tabular}{ c c c c c } \hline Is the inspection red Field of the inspection of the inspection red Field of the $	esult norm O 15. ry voltage POWER S switch OFI Itage betw erminal 32 O 10. O 12. M POWER CM harner DM E/R h ntinuity be	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground around SUPPLY C ss connecte iarness cor tween ECM	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 seco harness connect Voltage Battery voltage CIRCUIT-V or. nector E11. A harness connect	a few seconds, seconds: GC onds. tor and grour	nd.	 I J K L M
$\begin{tabular}{ c c c c c } \hline Is the inspection red Field of the inspection of the inspection red Field of the $	esult norm O 15. ry voltage POWER S switch OFI Itage betw erminal 32 O 10. O 12. M POWER CM harne PDM E/R h	then dro nal? does not e exists for n UPPLY CIF F and wait a een ECM h Ground Ground al? SUPPLY C ss connecto arness cor tween ECN	exist for more than p approximately 0V xist: GO TO 9. nore than a few RCUIT-IV at least 10 secc harness connector Voltage Battery voltage CIRCUIT-V or. nnector E11. <i>I</i> harness connector	a few seconds, seconds: GC onds. tor and grour	nd.	 I J K L M

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

11. CHECK ECM POWER SUPPLY CIRCUIT-VI

POWER SUPPLY AND GROUND CIRCUIT

< COMPONENT DIAGNOSIS >

- 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	ECM IF		/I E/R	Continuity
Connector	Terminal	Connector Terminal		Continuity
F7	32	E11	15	Existed

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

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F123, E6

• 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.

13.CHECK 20A FUSE

1. Disconnect 20A fuse (No. 51) from IPDM E/R.

2. Check 20A fuse.

Is the inspection result normal?

YES >> GO TO 17.

NO >> Replace 20A fuse.

14.CHECK GROUND CONNECTION-II

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Repair or replace ground connection.

15. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect ECM harness connector.

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

E	СМ	Ground	Continuity
Connector Terminal		Ground	Continuity
F7	10		
17	11	Ground	Existed
E16	108		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 17.

NO >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

• Harness or connectors F121, E7

• Harness for open or short between ECM and ground

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

POWER SUPPLY AND GROUND CIRCUIT

[HR16DE (WITH EURO-OBD)]

COMPONENT DIAGNOSIS >	[HR16DE (WITH EURO-OBD)]
7. CHECK INTERMITTENT INCIDENT	
efer to <u>GI-39, "Intermittent Incident"</u> .	
the inspection result normal? (ES >> Replace IPDM E/R. NO >> Repair open circuit or short to power in harness or con	nectors.

U1001 CAN COMM CIRCUIT

Description

INFOID:000000001179412

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:000000001179413

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

- YES >> ECH-110, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179414

Go toLAN-13, "Trouble Diagnosis Flow Chart".

U1010 CONTROL UNIT (CAN)

Description

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

DTC Logic

INFOID:000000001179416 D

INFOID:000000001179415

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1010	CAN communication bus	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM
TC CON	FIRMATION PROCED	URE	
.PERFO	RM DTC CONFIRMATIO	N PROCEDURE	
. Turn ig 2. Check	nition switch ON.		
s DTC det	-		
YES >>	 Go to <u>ECH-111, "Diagno</u> INSPECTION END 	osis Procedure".	
Diagnosi	s Procedure		INFOID:000000001179417
1.INSPEC	TION START		
	NSULT-III		
2. Select		mode with CONSULT-III.	
	"ERASE". m DTC CONFIRMATION	PROCEDURE.	
See <u>E(</u> 5. Check	<u>CH-111, "DTC Logic"</u> . DTC.		
ுWith GS	т		
2. Select	nition switch ON. "Service \$04" with GST.		
	m DTC CONFIRMATION CH-111, "DTC Logic".	PROCEDURE.	
1. Check	DTC.		
	<u>U1010 displayed again?</u> > GO TO 2.		
-	INSPECTION END		
2.REPLAC	CE ECM		
2.REPLAC	e ECM.	SERVICE WHEN REPLACING CONTRO	

>> INSPECTION END

А

С

INFOID:000000001179418

[HR16DE (WITH EURO-OBD)]

DTC DETECTION LOGIC

NOTE:

• If DTC P0011 is displayed with DTC P1111, first perform the trouble diagnosis for DTC P1111, refer to <u>ECH-204, "Description"</u>.

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

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

ENG SPEED	1,200 - 2,000 rpm
COOLAN TEMP/S	More than 60°C (140°F)
B/FUEL SCHDL	More than 3.5 msec
Shift lever	Neutral position

CAUTION:

Always drive at a safe speed.

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

With GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

- YES >> Go to ECH-113. "Diagnosis Procedure"
- NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT-III

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

ECH-112

P0011 IVT CONTROL

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)		
COOLAN TEMP/S	More than 70°C (221°F)		
Shift lever	1st or 2nd position		
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)		
CAUTION: Always drive at 2. Check 1st trip DT			
With GST Follow the procedure	"With CONSULT-III" above.		
Is 1st trip DTC detectYES>> Go to ECNO>> INSPEC	CH-113, "Diagnosis Procedure"		
Diagnosis Proce	dure	INFOID:000000001179419	
1.CHECK OIL PRES	SSURE WARNING LAMP		
 Start engine. Check oil pressunated. 	ure warning lamp and confirm it is not illumi-		
Is oil pressure warnin YES >> Go to MV	NI-32, "Description".		
NO >> GO TO 2	2.		
		PBIA8559J	
2. CHECK INTAKE V	ALVE TIMING CONTROL SOLENOID VALVE		
Refer to ECH-114, "C	Component Inspection".		
Is the inspection resu			
YES >> GO TO 3 NO >> Replace	3. intake valve timing control solenoid valve.		
· ·	HAFT POSITION SENSOR (POS)		
	Component Inspection".		
Is the inspection resu			
YES >> GO TO 4			
NO >> Replace	crankshaft position sensor (POS).		
4.CHECK CAMSHA	FT POSITION SENSOR (PHASE)		
Refer to ECH-188, "C	Component Inspection".		
Is the inspection resu			
YES >> GO TO 5 NO >> Replace	5. camshaft position sensor (PHASE).		
5.CHECK CAMSHA	•		

Check the following.

P0011 IVT CONTROL

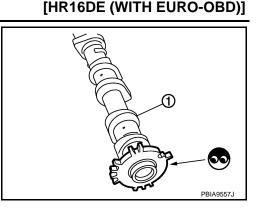
< COMPONENT DIAGNOSIS >

- Accumulation of debris to the signal plate of camshaft (1) rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

YES >> GO TO 6.

NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



6. CHECK TIMING CHAIN INSTALLATION

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

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

YES >> Check timing chain installation. Refer to <u>EM-47, "Removal and Installation"</u>.

NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Refer to LU-3, "Engine Lubrication System".

Is the inspection result normal?

NO >> Clean lubrication line.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

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

Terminals	Resistance [at 20°C (68°F)]
1 and 2	6.7 - 7.7 Ω
1 or 2 and ground	${}_\infty \Omega$ (Continuity should not exist)

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace intake valve timing control solenoid valve.

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

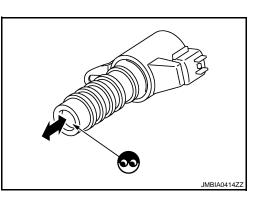
1. Remove intake valve timing control solenoid valve.

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

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

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

Is the inspection result normal?



ECH-114

INFOID:000000001179420

YES >> INSPECTION END

NO >> Replace intake valve timing control solenoid valve.

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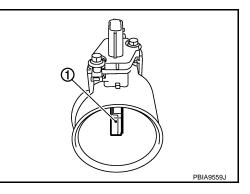
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P0102, P0103 MAF SENSOR

Description

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

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



DTC Logic

DTC DETECTION LOGIC

INFOID:000000001179422

INFOID:000000001179421

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

Which DTC is detected?

P0102 >> GO TO 2. P0103 >> GO TO 3.

P0103 >> G0103.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102

1. Start engine and wait at least 5 seconds.

2. Check DTC.

Is DTC detected?

YES >> Go to ECH-117, "Diagnosis Procedure".

NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-I

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

Is DTC detected?

YES >> Go to ECH-117, "Diagnosis Procedure".

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-II

- 1. Start engine and wait at least 5 seconds.
- 2. Check DTC.
- Is DTC detected?
- YES >> Go to ECH-117, "Diagnosis Procedure".

P0102, P0103 MAF SENSOR

< COMPONENT			,		[HR16DE (WI	TH EURO-OBD)]
NO >> INSF	PECTION	END				
Diagnosis Pro	ocedure					INFOID:000000001179423
1.INSPECTION	START					EC
Confirm the dete	cted DTC.					
<u>Which DTC is de</u>	etected?					
P0102 >> GO						С
P0103 >> GO						
2.CHECK INTA	KE SYSTE	M				
Check the follow	ing for con	nection.				D
Air ductVacuum hoses						
Intake air pass		en air duct t	o intake manifo	ld		E
Is the inspection	result norr	nal?				
YES >> GO						_
•	onnect the	•				F
3.CHECK GRO						
1. Turn ignition			for to Cround l	opposition in C	1.44. "Circuit Increation	G
2. Check groun Is the inspection				ispection in G	il-41, "Circuit Inspection	-
YES >> GO		<u>11a1 :</u>				
		ce ground c	onnection.			Н
4.CHECK MAF	SENSOR	POWER SL	JPPLY CIRCUI	Т		
1. Disconnect r	nass air flo	ow (MAF) se	ensor harness o	connector.		
2. Turn ignition	switch ON	l. `´´				
3. Check the vo	oltage betv	veen MAF s	ensor harness	connector and	d ground.	
MAF sens	or			-		J
	Terminal	Ground	Voltage			
Connector E18	5	Ground	Battery voltage	_		K
_	-		Dattery voltage	_		
<u>Is the inspection</u> YES >> GO		<u>11ai :</u>				
		rcuit or shor	t to ground or s	hort to power	in harness or connector	rs.
5.CHECK MAF	SENSOR	GROUND C		OPEN AND SI	HORT	
1. Turn ignition						M
2. Disconnect E	ECM harne	ess connecto				
3. Check the co	ontinuity be	etween MAF	sensor harnes	s connector a	ind ECM harness conne	
						Ν
MAF sens			ECM	Continuity		
	Terminal	Connector	Terminal			0
E18	4	F8	52	Existed		
		-	ound and short	to power.		
Is the inspection		nal?				P
YES >> GO NO >> GO						
6.DETECT MAL			F			

Check the following.

• Harness connectors F121, E7

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

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

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

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

MAF	sensor	E	СМ	Continuity
Connector	Terminal	Connector Terminal		Continuity
E18	3	F8	45	Existed

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

Is the inspection result normal?

YES >> GO TO 8.

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

8.CHECK MASS AIR FLOW SENSOR

Refer to ECH-118, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace mass air flow sensor.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK MASS AIR FLOW SENSOR-I

(B) With CONSULT-III

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

Monitor item	Condition	MAS A/F SE-B1
	Ignition switch ON (Engine stopped.)	Approx. 0.4V
MAS A/F SE-B1	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Start engine and warm it up to normal operating temperature.
- 4. Check the voltage between ECM harness connector and ground.

	ECM	Ground	Condition	Voltage
Connector	Terminal	Giouna	Conducin	vollage
	45 MAF sensor signal) Ground	Ignition switch ON (Engine stopped.)	Approx. 0.4V	
F8 (MAF sensor signal)		Idle (Engine is warmed-up to normal operating tempera- ture.)	1.0 - 1.3V	
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

ECH-118

INFOID:0000000001179424

P0102, P0103 MAF SENSOR

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< COMPONEN	NT DIAGNOS	SIS >		[HR16D	E (WITH EURO-OBD)]
	<u>n result norm</u>) TO 4.) TO 2.	<u>al?</u>				A
2.CHECK FOR	R THE CAUS	E OF UN	EVEN AIR FLOW THROUGH M	IASS AIR FLOV	V SENSOR	ECH
 Check for t Crushed ai 		uneven air	flow through mass air flow sen	sor. Refer to foll	owing.	C ECH
- Uneven dir	t of air cleane	er element	t			
Is the inspectio	<u>n result norm</u>		r system parts			D
) TO 4.) TO 3.					
3. СНЕСК МА	SS AIR FLOW	V SENSO	R-II			E
 Start engin Connect C 	eplace malfu e and warm i	t up to nor ind select	mal operating temperature. "DATA MONITOR" mode.			F
4. Ocicet 107						G
Monitor item			Condition	MAS A/F	SE-B1	
	Ignition switch	ON (Engine	stopped.)	Approx.	0.4V	Н
MAS A/F SE-B1	Idle (Engine is	warmed-up	to normal operating temperature.)	1.0 - 1		
	Idle to about 4	•		1.0 - 1.3V to Ap	prox. 2.4V*	
Without CO	NSULT-III		e to engine being increased to about 4,	000 rpm.		I
2. Start engin		t up to nor	part. mal operating temperature. harness connector and ground.			J
EC	M	Ground	Condition		Voltago	K

	ECM	Ground	Condition	Voltago	
Connector	Terminal	Giouna	Condition	Voltage	
			Ignition switch ON (Engine stopped.)	Approx. 0.4V	•
F8 (MAF sensor signal)		Idle (Engine is warmed-up to normal operating tem- perature.)	1.0 - 1.3V		
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*	•

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

Is the inspection result normal?

YES >> INSPECTION END

4.CHECK MASS AIR FLOW SENSOR-III

With CONSULT-III

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

Monitor item	Condition	MAS A/F SE-B1
	Ignition switch ON (Engine stopped.)	Approx. 0.4V
MAS A/F SE-B1	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

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

ECM Connector Terminal		Ground	Condition	Voltage	
		Ground	Condition		
			Ignition switch ON (Engine stopped.)	Approx. 0.4V	
F8	45 (MAF sensor signal)	Ground	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V	
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*	

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

Is the inspection result normal?

YES >> INSPECTION END

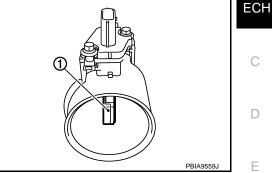
NO >> Clean or replace mass air flow sensor.

P0112, P0113 IAT SENSOR

Description

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

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



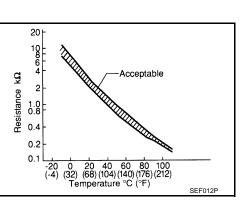
<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance $k\Omega$
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

*: These data are reference values and are measured between ECM terminal 46 (Intake air temperature sensor) and ground.

CAUTION:

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.



DTC Logic

INFOID:000000001179426

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	K
P0112	Intake air tempera- ture sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors (The concern circuit is open or shorted.)	L
P0113	Intake air tempera- ture sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	(The sensor circuit is open or shorted.)Intake air temperature sensor	M

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

- YES >> Go to ECH-122, "Diagnosis Procedure".
- NO >> INSPECTION END

INFOID:0000000001179425

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P0112, P0113 IAT SENSOR

< COMPONENT DIAGNOSIS >

Diagnosis Procedure

INFOID:000000001179427

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. 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.

MAF	sensor	Ground	Voltage
Connector	Terminal	Cround	voltage
E18	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.

${f 3.}$ CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

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

MAF	sensor	E	Continuity		
Connector Terminal		Connector Terminal		Continuity	
E18	1	F8	55	Existed	

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

Is the inspection result normal?

YES >> GO TO 4.

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

4.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to ECH-122, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK INTAKE AIR TEMPERATURE SENSOR

1. Turn ignition switch OFF.

2. Disconnect mass air flow sensor harness connector.

3. Check resistance between mass air flow sensor terminals as follows.

INFOID:000000001179428

ECH-122

P0112, P0113 IAT SENSOR

< COMPONENT DIAGNOSIS >

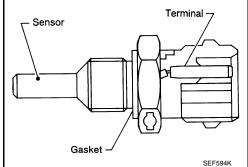
d 2 Temperature C°(F°) 25 (77) 1.800 - 2.200 kΩ inspection result normal? >> INSPECTION END >> Replace mass air flow sensor (with intake air temperature s

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P0117, P0118 ECT SENSOR

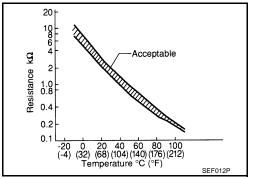
Description

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



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance $k\Omega$
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260



*: These data are reference values and are measured between ECM terminal 38 (Engine coolant temperature sensor) and ground.

CAUTION:

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.

DTC Logic

INFOID:000000001179430

DTC DETECTION LOGIC

DTC No. Trouble Diagnosis Name		DTC Detecting Condition	Possible Cause		
P0117	Engine coolant tem- perature sensor cir- cuit low input	An excessively low voltage from the sensor is sent to ECM.	 Harness or connectors (The sensor circuit is open or shorted.) 		
P0118	Engine coolant tem- perature sensor cir- cuit high input	An excessively high voltage from the sensor is sent to ECM.	Engine coolant temperature sensor		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check DTC.

Is DTC detected?

- YES >> Go to ECH-125, "Diagnosis Procedure".
- NO >> INSPECTION END

INFOID:000000001179429

P0117, P0118 ECT SENSOR

[HR16DE (WITH EURO-OBD)]

Diagnosis Proc	edure				INFOID:000000001179431
1.CHECK GROUN	ID CONNECTION				
 Turn ignition sv Check ground of Is the inspection respection respection respection 	connection E21. Re	fer to Ground I	nspection in <u>G</u>	GI-41, "Circuit Inspection"	
YES >> GO TO NO >> Repair 2.CHECK ECT SE	or replace ground of		т		
 Disconnect eng Turn ignition sv 	gine coolant temper	ature (ECT) se	nsor harness		
FOT server			_		
ECT sensor Connector Ter	Ground	Voltage			
F28	1 Ground	Approx. 5V	_		
• ·	3.	•	•	in harness or connectors	S.
. Turn ignition sv					
	M harness connect inuity between EC1		s connector a	and ECM harness connec	xtor.
ECT sensor		ECM			
	minal Connector	Terminal	Continuity		
F28	2 F8	44	Existed	-	
Also check har	ness for short to gro sult normal?	ound and short	to power.		
YES >> GO TO	94.				
· ·	open circuit or sho E COOLANT TEMP	0	•	in harness or connectors	3.
	"Component Inspec				
s the inspection re					
YES >> GO TO NO >> Replac	95. e engine coolant te	mperature sens	sor		
	AITTENT INCIDEN				
	ermittent Incident".				
	CTION END				
Component Ins					INFOID:000000001179432
	-				ini 012.000000001119432
	E COOLANT TEMP	ERATURE SEI	NSOR		
. Turn ignition sv					

Disconnect engine coolant temperature sensor harness connector.
 Remove engine coolant temperature sensor.

< COMPONENT DIAGNOSIS >

P0117, P0118 ECT SENSOR

< COMPONENT DIAGNOSIS >

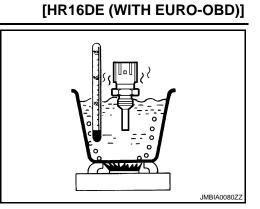
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

Terminals	Conditio	Resistance	
		20 (68)	2.1 - 2.9 kΩ
1 and 2	Temperature °C (°F)	50 (122)	0.68 - 1.00 kΩ
		90 (194)	0.236 - 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor.



P0122, P0123 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0122 or P0123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	Harness or connectors (TP sensor 2 circuit is open or shorted.)	Н
P0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	 Electric throttle control actuator (TP sensor 2) 	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

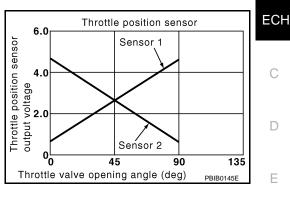
Start engine and let it idle for 1 second. 1. M Check DTC. 2. Is DTC detected? YES >> Go to ECH-127, "Diagnosis Procedure". Ν NO >> INSPECTION END Diagnosis Procedure INFOID:000000001179435 1.CHECK GROUND CONNECTION Turn ignition switch OFF. 1. Ρ 2. Check ground connection E21. Refer to Ground Inspection 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 2 POWER SUPPLY CIRCUIT Disconnect electric throttle control actuator harness connector. 1

2. Turn ignition switch ON.

ECH-127

INFOID:000000001179433

INFOID:000000001179434



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P0122, P0123 TP SENSOR

< COMPONENT DIAGNOSIS >

3. Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle	control actuator	Ground	Voltage	
Connector	Terminal	Ground	vollage	
F29	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 THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle control actuator		E	Continuity		
Connector	Terminal	Connector	Terminal	Continuity	
F29	4	F8	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.

 ${f 4.}$ CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		E	Continuity		
Connector	Terminal	Connector Terminal		Continuity	
F29	3	F8	34	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 THROTTLE POSITION SENSOR

Refer to ECH-129, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to ECH-129, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P0122, P0123 TP SENSOR

[HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSIS > Component Inspection

INFOID:000000001179436

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1.CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Perform ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
- 4. Turn ignition switch ON.
- 5. Set shift lever to 1st position.
- 6. Check the voltage between ECM harness connector and ground.

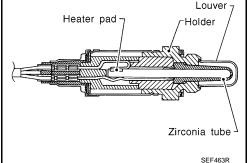
	ECM	<u> </u>				
Connector	Terminal	Ground	Condition		Voltage	
	33			Fully released	More than 0.36V	
F8	(TP sensor 1 signal)	Ground	Accelerator pedal	Fully depressed	Less than 4.75V	
ГО	34		Accelerator pedal	Fully released	Less than 4.75V	
	(TP sensor 2 signal)			Fully depressed	More than 0.36V	
Is the insp	ection result norma	<u>al?</u>				
	> INSPECTION EN	ND				
~	> GO TO 2.					
	CE ELECTRIC TH			TUATOR		
	ce electric throttle (ECH-129, "Special					
2. 00.10						
			<u>rtequirement</u> .			
>	> INSPECTION EN		<u>rtequirement</u> .			
		ND	<u>requirement</u> .			INFO/ID-00000001170/27
Special	Repair Require	ND ement				INFOID:000000001179437
Special		ND ement		ON LEARNING		INFOID:000000001179437
Special 1.perfc	Repair Require	ND ement ALVE CI	-OSED POSITIC		NG : Special Re	INFOID:000000001179437 Ppair Requirement"
Special 1.PERFC Refer to <u>E</u>	Repair Require PRM THROTTLE V CH-19, "THROTTL	ND ement ALVE CI	-OSED POSITIC		NG : Special Re	
Special 1. PERFC Refer to E	Repair Require PRM THROTTLE V <u>CH-19, "THROTTL</u> > GO TO 2	ND ement ALVE CL E VALVE	-OSED POSITIC		NG : Special Re	
Special 1. PERFC Refer to E	Repair Require PRM THROTTLE V CH-19, "THROTTL	ND ement ALVE CL E VALVE	-OSED POSITIC		NG : Special Re	
Special 1.PERFC Refer to <u>E</u> 2.PERFC	Repair Require PRM THROTTLE V <u>CH-19, "THROTTL</u> > GO TO 2	ND ement ALVE CL E VALVE	LOSED POSITIC E CLOSED POS	BITION LEARNI		
Special 1.PERFC Refer to E > 2.PERFC Refer to E	Repair Require orm throttle V CH-19, "Throttl > GO TO 2 orm IDLE AIR VOL CH-19, "IDLE AIR	ND ement ALVE CL E VALVE	LOSED POSITIC E CLOSED POS	BITION LEARNI		
Special 1.PERFC Refer to E > 2.PERFC Refer to E	Repair Require orm throttle v <u>CH-19, "throttl</u> > GO TO 2 orm idle air vol	ND ement ALVE CL E VALVE	LOSED POSITIC E CLOSED POS	BITION LEARNI		
Special 1.PERFC Refer to E > 2.PERFC Refer to E	Repair Require orm throttle V CH-19, "Throttl > GO TO 2 orm IDLE AIR VOL CH-19, "IDLE AIR	ND ement ALVE CL E VALVE	LOSED POSITIC E CLOSED POS	BITION LEARNI		
Special 1.PERFC Refer to E > 2.PERFC Refer to E	Repair Require orm throttle V CH-19, "Throttl > GO TO 2 orm IDLE AIR VOL CH-19, "IDLE AIR	ND ement ALVE CL E VALVE	LOSED POSITIC E CLOSED POS	BITION LEARNI		

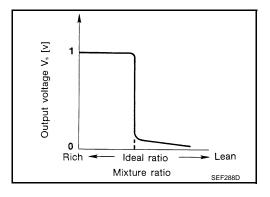
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Description

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





INFOID:000000001179439

DTC Logic

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 is not inordinately high.

ОК	NG
1.2V	
	PBIB1848E

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132	heated oxygen sensor 1 cir- cuit high voltage	An excessively high voltage from the sensor is sent to ECM.	 Harness or connectors (The sensor circuit is open or short- ed.) heated oxygen sensor 1

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.



INFOID:000000001179438

< COMPONE	ENT DIAGNO	DSIS >	10101		[HR16DE (WITH EURO-OBD)]
2.PERFORM	I DTC CONF	IRMATION P	ROCEDURE		
 Start eng Turn ignit 	ine and warm tion switch Ol	it up to norm FF and wait a it idle for 2 m	al operating t t least 10 sec	temperature.	
4. Check 1s	st trip DTC.		indles.		E
Is 1st trip DTO YES >> 0		<u>?</u> 1. "Diagnosis	Procedure".		
NO >> II	NSPECTION	END			
Diagnosis					INFOID:000000001179440
1. CHECK G	ROUND COM	NECTION			
2. Check gr Is the inspect	ion result nor	tion E21. Refe	er to Ground	Inspection in	GI-41, "Circuit Inspection".
	GO TO 2. Repair or repla	ace ground co	onnection.		
2.RETIGHT	EN HEATED	OXYGEN SE	NSOR 1		
Loosen and r	etighten heat	ed oxygen se	nsor 1.		
Tight	ening torque	: 50 N⋅m (5.1	kg-m, 37 ft-	lb)	
>> G 3.снеск н	GO TO 3.				
		ygen sensor 1			
2. Disconne	ect ECM harn	ess connecto	r.		and ECM harness connector.
НО	2S1	E	CM	Continuity	
Connector	Terminal	Connector	Terminal		-
F30	1 ck barness fo	F8 r short to grou	56	existed	
Is the inspect		-		t to power.	
	GO TO 4.				
NO >> F 4.CHECK H	· ·		0	•	r in harness or connectors.
					and ECM harness connector.
1. Check ha			10231 Hame		
HO	2S1	E	CM	Continuity	
Connector	Terminal	Connector	Terminal	Continuity	_
F30	4	F8	49	existed	
2. Check ha	arness contin	uity between I	HO2S1 harne	ess connector	or ECM harness connector.
НО	2S1	E	CM	_	
Connector	Terminal	Connector	Terminal	Ground	Continuity

	F30	4	F8	49
3	Also cho	ck harnoss fo	r short to now	or

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

Ground

Not existed

< COMPONENT DIAGNOSIS >

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

5.CHECK HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 connector for water.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace harness or connectors.

6.CHECK HEATED OXYGEN SENSOR 1

Refer to ECH-132, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2. CHECK HEATED OXYGEN SENSOR 1

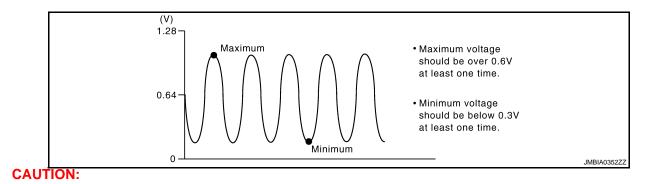
With CONSULT-III

- T. Start engine and warm it up to normal operating temperature.
- 2. Set "POST TRIGGER" to 100% in "DATA MONITOR" mode with CONSULT-III.
- 3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-III screen.
- 6. Check the following.
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
 5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

cycle		1	2	3	4	5	
HO2S1	MNTR (B1)	R-L-F	₹-L-F	R-L-I	R-L-F	R-L-F	F

R means HO2S1 MNTR (B1) indicates RICH L means HO2S1 MNTR (B1) indicates LEAN

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ECH-132

INFOID:0000000001179441

[HR16DE (WITH EURO-OBD)]

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

Is the inspection result normal?

YES >> INSPECTION END NO >> GO TO 3.

 $\mathbf{3}.$ CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check the voltage between ECM harness connector and ground under the following condition.

E	ECM		Condition	Valtara	
Connector	Terminal	ground	Condition	Voltage	
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	 The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. The maximum voltage is over 0.6V at least 1 time. The minimum voltage is below 0.3V at least 1 time. The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 	F

CAUTION:

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

Is the inspection result normal?

YES	>> INSPECTION END
NO	>> GO TO 4
4.REF	LACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

CAUTION:

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

>> INSPECTION END

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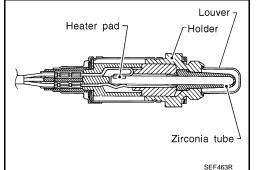
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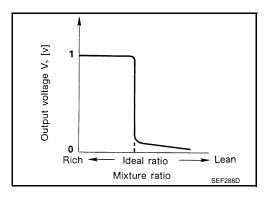
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Description

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



[HR16DE (WITH EURO-OBD)]

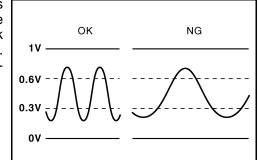


INFOID:000000001179443

DTC Logic

DTC DETECTION LOGIC

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.



			PBIB2991E
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0133	Heated oxygen sensor 1 circuit slow response	 The response of the voltage signal fror sensor takes more than the specified ti 	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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< COMPONENT DIAGNOSIS >

TESTING CONDITION:

Always perform at a temperature above -10°C (14°F). Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

Do you have CONSULT-III?

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

2. PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine and wait at least 10 seconds.
- 3. Turn ignition switch ON and select "HO2S1 (B1) P0133" of "HO2S1" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 4. Touch "START".
- 5. Start engine and let it idle for at least 3 minutes. **NOTE:**

Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

 When the following conditions are met, "TESTING" will be displayed on the CONSULT-III screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 40 to 50 seconds.)

CAUTION:

Always drive vehicle at a safe speed.

ENG SPEED	2,400 - 4,200 rpm		Н
VHCL SPEED SE	More than 80 km/h (50 MPH)		
B/FUEL SCHDL	2.8 - 12.0 msec		
Shift lever	Suitable position		I
If "TESTING" is 7. Touch "SELF-DIA	not displayed after 5 minutes, rook of RESULTS".	etry from step 2.	
Which displayed on C	OUSULT-III screen?		J

OK >> INSPECTION END.

NG >> Go to <u>ECH-135, "Diagnosis Procedure"</u>.

3. PERFORM COMPONENT FUNCTION CHECK

Without CONSULT-III

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

2. Set voltmeter probes between ECM harness connector and ground.

	ECM	Ground	Condition	Voltage	
Connector	Terminal	Ground	Condition	volage	N
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage fluctuates between 0 yo 0.3v and 0.6 to 1.0v more than 5 times within 10 seconds. 1 time: $0 - 0.3V \rightarrow 0.6 - 1.0V \rightarrow 0 - 0.3V$ 2 times: $0 - 0.3V \rightarrow 0.6 - 1.0V \rightarrow 0 - 0.3V \rightarrow 0.6 - 1.0V$ $\rightarrow 0 - 0.3V$	0

Is the inspection result normal?

YES >> INSPECTION END.

NO >> Go to ECH-135, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

ECH-135

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INFOID:000000001179444

Is the inspection result normal?

NO >> Repair or replace ground connection.

2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten the heated oxygen sensor 1.

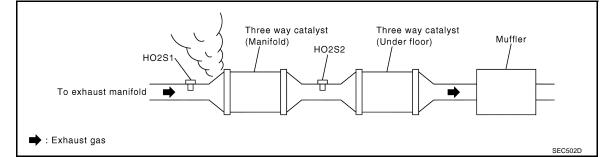
Tightening torque: 50 N-m (5.1 kg-m, 37 ft-lb)

>> GO TO 3.

3.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.

2. Listen for an exhaust gas leak before three way catalyst (manifold).



Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 4.

4.CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 5.

5.clear the mixture ratio self-learning value

- Clear the mixture ratio self-learning value. Refer to <u>ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement"</u>.
- 2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to <u>ECH-163, "DTC Logic"</u> or <u>ECH-167,</u> "DTC Logic".

NO >> GO TO 6.

6.CHECK HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between HO2S1 harness connector and ECM harness connector.

HO2	S1	EC	М	Continuity
Connector	Terminal	Connector Terminal		Continuity
F30	1	F8	56	Existed

4. Check the continuity between HO2S1 harness connector or ECM harness connector and ground.

ECH-136

< COMPONENT DIAGNOSIS >

HO2	2S1	ECI	M			А
Connector	Terminal	Connector	Terminal	Ground	Continuity	
F30	4	F8	49	Ground	Not existed	ECH
5. Also che	eck harness	s for short to	power.		·	EOI
Is the inspec	tion result i	normal?				
	GO TO 7.	e sinsuit su sk		und nu nh		С
				una or sr	hort to power in harness or connectors.	
		FLOW SENS	OR			D
Check mass		nsor. <u>nponent Insp</u>	ection"			_
Is the inspec						
	GO TO 8.					E
•	•	ass air flow s	ensor.			
8.CHECK F	PCV VALVE					F
Refer to ECH	<u></u>	mponent Insp	ection".			
Is the inspec		normal?				
	GO TO 9. Repair or re	eplace PCV v	valve			G
-	-	XYGEN SEN				
		mponent Insp				Н
Is the inspec			<u>ection</u> .			
-	GO TO 10.					1
		eated oxygen				1
10.CHECK		TTENT INCI	DENT			
Refer to GI-3	39, "Intermi	ttent Incident	<u>"</u> .			J
_	INSPECTIO					K
Compone	nt Inspec	ction			INFO/D:000000001179445	ř.
1.INSPECT	ION STAR	т				L
Do you have						
Do you have		<u>-III?</u>				
	GO TO 2.					M
•	GO TO 3.					
	HEATED O	XYGEN SEN	SOR 1			N
With CON		ormo it uno to co	ormalars	rating to	moratura	
		arm it up to n ER" to 100%			mperature.)R" mode with CONSULT-III.	~
3. Select "I	HO2S1 (B1)" and "HO28	S1 MNTR	(B1)".		0
		at 2,000 rpm on CONSULT			ring the following steps.	
5. 100011 I						Ρ

< COMPONENT DIAGNOSIS >

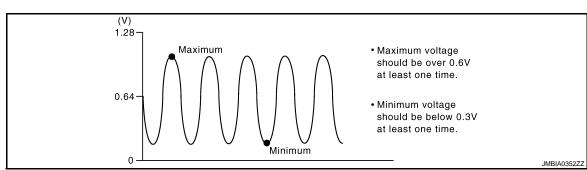
[HR16DE (WITH EURO-OBD)]



- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
- 5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

R means HO2S1 MNTR (B1) indicates RICH L means HO2S1 MNTR (B1) indicates LEAN

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CAUTION:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

3.CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check the voltage between ECM harness connector and ground under the following condition.

E	ECM		Condition	Voltago
Connector	Terminal	ground	Condition Voltage	
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	 The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. The maximum voltage is over 0.6V at least 1 time. The minimum voltage is below 0.3V at least 1 time. The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

CAUTION:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1. CAUTION:

ECH-138

cycle | 1 | 2 | 3 | 4 | 5 | HO2S1 MNTR (B1) R-L-R-L-R-L-R-L-R

[HR16DE (WITH EURO-OBD)]

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

>> INSPECTION END

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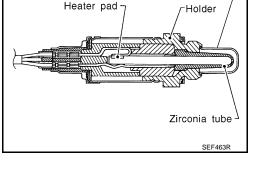
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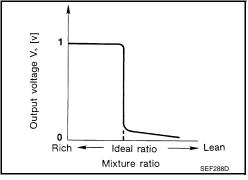
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P0134 HO2S1

Description

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



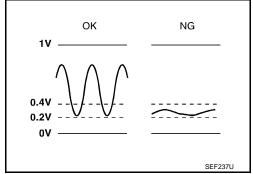


INFOID:0000000001179447

DTC Logic

DTC DETECTION LOGIC

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	Harness or connectors (The sensor circuit is open or shorted.)Heated oxygen sensor 1

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

ECH-140

TESTING CONDITION:

Always perform at a temperature above -10°C (14°F).

Before performing the following procedure, confirm that battery voltage is more than 11V at idle. Do you have CONSULT-III?

INFOID:000000001179446

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[HR16DE (WITH EURO-OBD)]

>> GO TO 3.

YES >> GO TO 2.

NO

[HR16DE (WITH EURO-OBD)]

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NO >> GO TO 3. 2.PERFORM DTC CONFIRMATION PROCEDURE-I							
Z.PERFOR	RM DTC CONF	IRMATION	N PROCEDURE-I				
2. Stop er	ngine and warm	at least 10	ormal operating temperatu seconds. ect "HO2S1 (B1) P0133" (re. of "HO2S1" in "DTC WORK SUPPORT" mode	ECH		
with CC 4. Touch " 5. Start er	 with CONSULT-III. Touch "START". Start engine and let it idle for at least 3 minutes. NOTE: Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, 						
Never		peed abo	ve 3,600 rpm after this	step. If the engine speed limit is exceeded,	D		
6. When t the con 50 seco CAUT	he following co aditions continu onds.)	ously until	"TESTING" changes to "C	displayed on the CONSULT-III screen. Maintain COMPLETED". (It will take approximately 40 to	E		
ENG SPEED)	1,800 - 3,	400 mm				
					G		
VHCL SPEED SEMore than 60 km/h (40 MPH)B/FUEL SCHDL2.0 - 12.0 msec							
Shift lever Suitable position							
			after 5 minutes, retry fro	m step 2.	Η		
	SELF-DIAG RI		con?				
	INSPECTION						
•		-	osis Procedure".				
3. PERFOR	RM COMPONE	NT FUNC	TION CHECK		J		
	ngine and warm		ormal operating temperatu CM harness connector and		K		
	ECM				L		
Connector	Terminal	Ground	Condition	Voltage			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage dose not remain in the range of 0.2 to 0.4.	Μ		
YES >>	ction result nor INSPECTION Go to <u>ECM-13</u>	END.	osis Procedure".		Ν		
Diagnosis	s Procedure	;		INFOID:000000001179448			
1.снеск	GROUND COM	NECTION	J		0		
	nition switch OI ground connec		Refer to Ground Inspection	n in <u>GI-41, "Circuit Inspection"</u> .	Ρ		
	ction result nor	mal?					
	GO TO 2. Repair or repla	ace around	1 connection				
-		-	JIT FOR OPEN AND SHO	RT			
1. Discon		/gen senso	or 1 harness connector.				
			ECH-141				

P0134 HO2S1

< COMPONENT DIAGNOSIS >

3. Check harness continuity between HO2S1 harness connector and ECM harness connector.

HO	2S1	E	Continuity	
Connector	Terminal	Connector	Continuity	
F30	1	F8	56	Existed

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

Is inspection result normal?

YES >> GO TO 3.

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

3.CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S1 harness connector and ECM harness connector 49.

HO	2S1	E	CM	Continuity
Connector	Terminal	Connector	Continuity	
F30	4	F8	49	Existed

2. Check harness continuity between ECM harness connector 49 or HO2S1 harness connector and ground.

HO	2S1	1 ECM			Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity
F30	4	F8	49	Ground	Not existed

3. Also check harness for short to power.

Is 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 HEATED OXYGEN SENSOR 1

Refer to ECH-142, "Component Inspection".

Is inspection result normal?

YES >> GO TO 5.

NO >> Replace heated oxygen sensor 1.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT-III? Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 1

(I) With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Set "POST TRIGGER" to 100% in "DATA MONITOR" mode with CONSULT-III.
- 3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-III screen.

ECH-142

INFOID:000000001179449

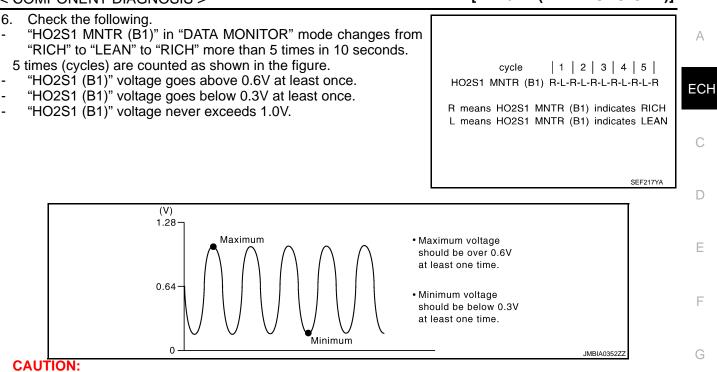
P0134 HO2S1

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

 ${f 3.}$ CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Check the voltage between ECM harness connector and ground under the following condition. 2.

ECM		around	Condition	Voltage	
Connector	Terminal	ground	Condition	voltage	L
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	 The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. The maximum voltage is over 0.6V at least 1 time. The minimum voltage is below 0.3V at least 1 time. The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 	M

CAUTION:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1. **CAUTION:**

ECH-143

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

>> INSPECTION END

P0135 HO2S1 HEATER

< COMPONENT DIAGNOSIS >

P0135 HO2S1 HEATER

Description

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator	
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater	С
Mass air flow sensor	Amount of intake air		lieater	

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

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater	
Above 3,600	OFF	F
Below 3,600 rpm after the following conditions are met.Engine: After warming up	ON	

DTC Logic

INFOID:0000000001179451

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031	Heated oxygen sensor 1 heater control circuit low	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	 Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) heated oxygen sensor 1 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE		IVI
 Start engine and let it idle for at least 10 seconds. Check 1st trip DTC. 		Ν
Is 1st trip DTC detected?		
YES >> Go to <u>ECH-145, "Diagnosis Procedure"</u> . NG >> INSPECTION END		0
Diagnosis Procedure	INFOID:000000001179452	
1.CHECK GROUND CONNECTION		Ρ

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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INFOID:000000001179450

2.CHECK HO2S1 POWER SUPPLY CIRCUIT

- 1. Disconnect HO2S1 harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between HO2S1 harness connector and ground.

HO	2S1	Ground	Voltage	
Connector	Terminal	Cround	voltage	
F30	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 connectors F123, E6
- 10A fuse (No. 56)
- Harness for open or short between HO2S1 and fuse

>> Repair or replace harness or connectors.

4.CHECK HO2S1 HEATER OUTPUT SIGNAL CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between HO2S1 harness connector and ECM harness connector.

HC)2S1	S1 ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F30	3	F7	3	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 HO2S1 HEATER

Refer to ECH-147, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE HO2S1

Replace HO2S1.

CAUTION:

- Discard any heated oxygen sensor 1 which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor 1, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

>> Repair or replace.

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Component Inspection

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1.CHECK HEATED OXYGEN SENSOR 1

1. Turn ignition switch OFF.

2. Disconnect heated oxygen sensor 1 harness connector.

3. Check resistance between HO2S1 terminals as follows.

2.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1. CAUTION:

• Discard any 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 sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

>> INSPECTION END

P0138 HO2S2

Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

DTC Logic

INFOID:000000001179455

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.

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

OTC No. Trouble diagnosis name DTC detecting condition

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	 Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

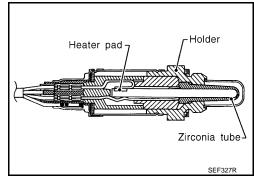
>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 2 minutes.
- 5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-149, "Diagnosis Procedure".
- NO >> INSPECTION END



INFOID:000000001179454

P0138 HO2S2

[HR16DE (WITH EURO-OBD)]

< COMPO			>		[HR16DE (WITH	EURO-OBD)]
Diagnosi	s Proce	dure				INFOID:000000001179456
1.снеск	GROUNE		TION			A
2. Check Is the inspe	-	onnection E	21. Refer	to Grou	Ind Inspection in <u>GI-41, "Circuit Inspection"</u> .	EC
NO >>	Repair o	r replace gr			EN AND SHORT	С
2. Discon	nect ECM	ed oxygen s I harness co nuity betwee	onnector.		connector. s connector and ECM harness connector.	D
HO2	S2	EC	М	0 // ·		E
Connector	Terminal	Connector	Terminal	Continui	ity	
E58	1	F8	59	Existed		F
			t to groun	d and sl	hort to power.	
Is the inspe						G
	• GO TO 4 • GO TO 3					
3.DETECT			9 PART			Н
Check the f						
 Harness d 	connector				FOM	
 Harness f 	or open o	or short betw	veen HO2	Sz and	ECM	
>>	Repair o	pen circuit d	or short to	ground	l or short to power in harness or connectors.	
	-	-		-	R OPEN AND SHORT	J
1. Check	the contin	uity betwee	n HO2S2	harnes	s connector and ECM harness connector.	
						K
HO2	S2	EC	М	Continu	ity	
Connector	Terminal	Connector	Terminal			1
E58	4	F8	50	Existed		L
2. Check	the contin	uity betwee	en HO2S2	harnes	s connector or ECM harness connector and g	round.
HO2	S2	EC	M			M
Connector	Terminal	Connector	Terminal	Ground	Continuity	
E58	4	F8	50	Ground	Not existed	Ν
3. Also ch	eck harne	ess for shor	t to power	r.		1.4
Is the inspe			•			
	GOTO					0
_						
5.DETECT			PARI			P
Check the fHarness d		s F121 F7				
 Harness f 			veen HO2	S2 and	ECM	
	De:: -'				les chest te service la benerie de la company	
>>	 kepair ol 	pen circuit (or snort to	ground	l or short to power in harness or connectors.	

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

6.CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace harness or connectors.

7.CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-150. "Component Inspection".

Is the inspection result normal?

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

8.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

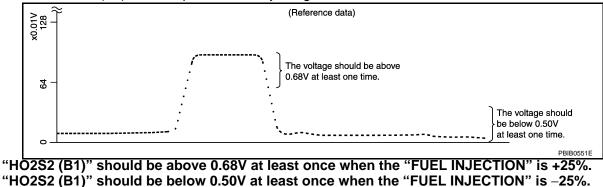
YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.
- 7. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



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< COMPONENT DIAGNOSIS >
Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground	Condition	Voltage	
Connector	Terminal	Giouna	Condition	voltage	
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.	

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage	
Connector	Terminal	Giouna	Condition	voltage	
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 min- utes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.	

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector and ground under the following condition.

	ECM		Condition	Voltago	
Connector	Terminal	Ground	Condition	Voltage	N
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.	١
Is the inspe	ection result nor	mal?			С

YES >> INSPECTION END

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

P0139 H02S2

Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

DTC Logic



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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond be- tween rich and lean than the specified time.	 Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 Fuel pressure Fuel injector Intake air leaks

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III? Do you have CONSULT-III?

>> GO TO 2. YES NO >> GO TO 11.

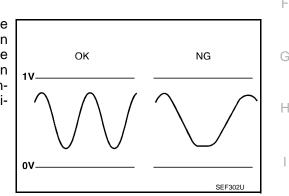
2. PRECONDITIONING

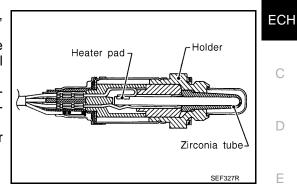
NOTE:

- If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds.
- For the best results, perform DTC WORK SUPPORT at a temperature of 0 to 30°C (32 to 86°F)
- "COMPLETED" will appear on CONSULT-III screen when all tests "COND1", "COND2" and "COND3" are completed.

TESTING CONDITION:

Never stop engine during this procedure. If the engine is stopped, retry this procedure from 4. PER-FORM PROCEDURE FOR COND1-I.





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>> GO TO 3.

3.PERFORM PROCEDURE FOR COND1

Start engine and warm it up to normal operating temperature.

>> GO TO 4.

4.PERFORM PROCEDURE FOR COND1-I

Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 5.

5.PERFORM PROCEDURE FOR COND1-II

- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. 1.
- 2. Let engine idle 1 minute.
- Select "HO2S2 (B1) P0139" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III. 3.
- Touch "START". 4
- 5. Start engine and let it idle for at least 30 seconds.
- Rev engine up to 2,000 rpm two or three times guickly under no load.

Is "CONPLETED" appears on CONSULT-III screen?

YES >> GO TO 9.

NO >> GO TO 6.

6.PERFORM PROCEDURE FOR COND1-I

When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-III screen. Maintain the condition continuously until "TESTING" changes to "COMPLETED" (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLAN TEMP/S	More than 70°C (158°F)
Shift level	Suitable position

Which displayed on CONSULT-III screen?

COND1: OUT OF CONDITION>>GO TO 4.

COND1: COMPLETED COND2: INCOMPLETED>>GO TO 7. COND1: COMPLETED COND2: COMPLETED>>GO TO 8.

PERFORM PROCEDURE FOR COND2

While driving, release accelerator pedal completely from the above condition until "INCOMPLETED" at "COND2" on CONSULT-III screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

Which displayed on CONSULT-III screen?

COND2: COMPLETED COND3: INCOMPLETED>>GO TO 8. COND2: COMPLETED COND3: COMPLETED>>GO TO 9.

8.PERFORM PROCEDURE FOR COND3

Stop vehicle and let it idle until "INCOMPLETED" of "COND3" on CONSULT-III screen has turned to "COM-PLETED". (It will take a maximum of approximately 6 minutes.)

>> GO TO 9.

9.PERFORM PROCEDURE FOR COND3-I

Touch "SELF DIAGRESULTS".

Which displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Go to <u>ECH-156</u>, "<u>Diagnosis Procedure</u>". CAN NOT BE DIAGNOSED>>GO TO 10.

10.PERFORM PROCEDURE FOR COND3-II 1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle). Turn ignition switch ON and select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-III. 2. 3. Start engine and warm it up while monitoring "COOLAN TEMP/S" indication on CONSULT-III. 4. When "COOLAN TEMP/S" indication reaches to 70°C (158°F). >> GO TO 5. 11.PREFORM COMPONENT FUNCTION CHECK Perform component function check. Refer to ECH-157, "Component Inspection". NOTE: Use component function check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed. Is the inspection result normal? YES >> INSPECTION END NO >> Go to ECH-157, "Component Inspection". Component Function Check INFOID:000000001179460 1.PERFORM COMPONENT FUNCTION CHECK-I Without CONSULT-III Start engine and warm it up to the normal operating temperature. 1. 2. Turn ignition switch OFF and wait at least 10 seconds. 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. Let engine idle for 1 minute. 4 5. Check the voltage between ECM harness connector and ground under the following condition. ECM Condition Voltage Ground Connector Terminal 50 Revving up to 4,000 rpm under no A change of voltage should be more than 0.12V for 1 F8 Ground (HO2S2 signal) load at least 10 times second during this procedure. Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2. PERFORM COMPONENT FUNCTION CHECK-II Check the voltage between ECM harness connector and ground under the following condition. ECM Ground Condition Voltage

Connector	Terminal						
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	A change of voltage should be more than 0.12V for 1 second during this procedure.	Ν		
la the inspection result normal?							

Is the inspection result normal?

< COMPONENT DIAGNOSIS >

YES >> INSPECTION END

NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage	
Connector	Terminal	Ground	Condition	Voltage	
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear po- sition	A change of voltage should be more than 0.12V for 1 second during this procedure.	

Is the inspection result normal?

ECH-155

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YES >> INSPECTION END NO >> Go to <u>ECH-156, "Diagnosis Procedure"</u>.

Diagnosis Procedure

INFOID:000000001179461

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. 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. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

 Clear the mixture ratio self-learning value. Refer to <u>ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement"</u>.

2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to <u>ECH-163, "DTC Logic"</u> or <u>ECH-167,</u> <u>"DTC Logic"</u>.

NO >> GO TO 3.

 ${
m 3.}$ CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

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

HO2	S2	EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E58	1	F8	59	Existed

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

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F121, E7

Harness for open or short between HO2S2 and ECM

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

5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

HO2	S2	EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E58	4	F8	50	Existed

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

HO2	S2	EC	М	Ground	Continuity
Connector	Terminal	Connector	Terminal	Cround	Continuity
E58	4	F8	50	Ground	Not existed

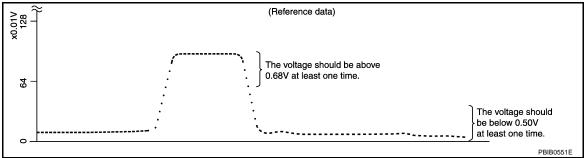
3. Also check harness for short to power.

< COMPON				P0139 HO2S2
	IENT DIA	GNOSIS >		[HR16DE (WITH EURO-OBD)]
Is the inspec	ction resul	t normal?		
	GO TO 7.			
~	GO TO 6.			
				OR OPEN AND SHORT
	nition swite		nsor 2 ha	arness connector.
		harness cor		
I. Check t	he continu	uity between	HO2S2 h	harness connector and ECM harness connector.
	_			
HO2		EC		Continuity
Connector	Terminal	Connector	Terminal	
E58	1	F8	59	Existed
			to ground	d and short to power.
<u>s the inspec</u> YES >>	GO TO 8.			
	GO TO 8. GO TO 7.			
7.DETECT	MALFUN	CTIONING	PART	
Check the fo				
Harness c		F121, E7		
Harness for	or open or	short betwe	en HO2S	S2 and ECM
	• •		-	ground or short to power in harness or connectors.
3. CHECK	HEATED (DXYGEN SE	ENSOR 2	2
Refer to <u>EC</u>	<u>H-157, "C</u>	omponent Ir	nspection"	<u>)"</u> .
s the inspec				
YES >>	GO TO 10			
NO >>	GO TO 9.			
NO >> 9.replac	GO TO 9. E HEATE	D OXYGEN		R 2
NO >> 9.REPLAC Replace hea	GO TO 9. E HEATE	D OXYGEN		R 2
NO >> 9.REPLAC Replace hea CAUTION:	GO TO 9. E HEATE	D OXYGEN en sensor 2.		
NO >> REPLAC Replace hea CAUTION: Discard a in) onto a	GO TO 9. E HEATE ated oxyge iny heated hard sur	D OXYGEN en sensor 2. d oxygen se face such a	ensor wh	hich has been dropped from a height of more than 0.5 m (19.7 crete floor; use a new one.
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[HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSIS >

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.
- 7. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)" should be below 0.50V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

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

)

3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

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

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

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

ECM		Ground	Condition	Voltage
Connector	Terminal	Giouna	Condition	Voltage
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage	
Connector	Terminal	Cibulia	Condition	voltage	
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 min- utes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.	

Is the inspection result normal?

YES	>> INSPECTION END

NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector and ground under the following condition.

< COMPONENT DIAGNOSIS >

	ECM		6	
Connector	Terminal	Ground	Condition	Voltage
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.
	ection result nor			
	INSPECTION	END		
-	GO TO 6.			
	CE HEATED OX		ENSOR 2	
Replace he CAUTION:	eated oxygen se	ensor 2.		
Discard a	any heated oxy			om a height of more than 0.5 m (19.7
in) onto a Refere in	a hard surface	such as	a concrete floor; use a new one.	reads using Oxygen Sensor Thread
			seize lubricant.	reads using Oxygen Sensor Thread
>>	INSPECTION	END		

P0141 HO2S2 HEATER

Description

INFOID:000000001179463

SYSTEM DESCRIPTION

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

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

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,900	OFF
 Below 3,900 rpm after the following conditions are met. Engine: After warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	ON

DTC Logic

INFOID:000000001179464

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0141	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sen- sor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	 Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) Heated oxygen sensor 2 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st tip DTC detected?

- YES >> Go to ECH-160, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

ECH-160

INFOID:000000001179465

P0141 HO2S2 HEATER

	ENT DIAGNO)SIS >		[HR16DE (WITH EURO-(JRD)]
2. Check gr		tion E21. Ref	er to Ground Ir	nspection in <u>GI-41, "Circuit Inspection"</u> .	
	ion result nor	mal?			
	GO TO 2. Repair or repla	ace around co	onnection		E
-	02S2 POWE	•			
	ect HO2S2 ha tion switch OI		ctor.		
			harness conn	ector and ground.	
				_	
	2S2	Ground	Voltage		
Connector	Terminal			_	
E58	2	Ground	Battery voltage	_	
-	ion result nor	mal?			
	GO TO 4. GO TO 3.				
-	MALFUNCTIC				
Check the fol 10A fuse (N 					
		rt between he	ated oxvgen s	ensor 2 and fuse	
	•		,,,		
>> F	Repair open c	ircuit or short	to ground or s	hort to power in harness or connectors.	
4.снеск н	02S2 OUTPI				
				UPEN AND SHORI	
				OPEN AND SHORT	
1. Turn ignit	tion switch Ol	FF.		OPEN AND SHORT	
1. Turn ignit 2. Disconne	tion switch Ol ect ECM harn	FF. ess connecto	r.	nnector and ECM harness connector.	
 Turn ignit Disconne Check th 	tion switch OI ect ECM harn e continuity b	FF. ess connecto etween HO23	r. S2 harness coi		
 Turn ignit Disconne Check th HO 	tion switch Ol ect ECM harn e continuity b 2S2	F. ess connecto etween HO2	r. S2 harness col		
 Turn ignit Disconne Check th HO Connector 	tion switch Ol ect ECM harn e continuity b 2S2 Terminal	F. ess connecto etween HO2 E Connector	r. S2 harness col CM Terminal	nnector and ECM harness connector.	
1. Turn ignit 2. Disconne 3. Check th HO Connector E58	tion switch Ol ect ECM harn e continuity b 2S2 Terminal 3	F. ess connecto etween HO2 E Connector F7	r. S2 harness col CM Terminal 5	nnector and ECM harness connector. Continuity Existed	
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1. Turn ignit 2. Disconne 3. Check th 3. Check th Connector E58 4. Also check YES $>> C$ NO $>> C$ 5.DETECT I Check the fol • Harness co • Harness for S>F 6.CHECK H Refer to ECH Is the inspect YES $>> C$ 0. CHECK H Refer to ECH Is the inspect YES $>> C$ 0. CHECK H	tion switch Of ect ECM harn e continuity b 22S2 Terminal 3 ck harness fo ion result nor 6O TO 6. 6O TO 6. 6O TO 5. MALFUNCTIC lowing. nnectors F12 open or sho Repair open c O2S2 HEATE -162. "Competion result nor 6O TO 8. 6O TO 7.	F. ess connecto etween HO23 Connector F7 r short to grou mal? DNING PART 1, E7 t between he ircuit or short R Dnent Inspect mal?	r. S2 harness col CM Terminal 5 und and short eated oxygen s to ground or s	nnector and ECM harness connector.	

P0141 HO2S2 HEATER

[HR16DE (WITH EURO-OBD)]

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

>> INSPECTION END

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000001179466

1.CHECK HEATED OXYGEN SENSOR 2 HEATER

- 1. Turn ignition switch OFF.
- 2. Disconnect heated oxygen sensor 2 harness connector.
- 3. Check resistance between HO2S2 terminals as follows.

Terminals	Resistance [at 25°C (77°F)]
2 and 3	3.3 - 4.4 Ω
1 and 2, 3, 4	$\Omega \propto$
4 and 1, 2, 3	(Continuity should not exist)

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

P0171 FUEL INJECTION SYSTEM FUNCTION NOSIS > [HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSIS >

P0171 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:000000001179467

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and lights up the MI (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
Heated oxygen sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	_
P0171	Fuel injection system too lean	 Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) 	 Intake air leaks Heated oxygen sensor 1 Fuel injector Exhaust gas leaks Incorrect fuel pressure Lack of fuel Mass air flow sensor Incorrect PCV hose connection 	G

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

	1.7
 Clear the mixture ratio self-learning value. Refer to <u>ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement"</u>. 	
2. Start engine.	L
Is it difficult to start engine?	
YES >> GO TO 3. NO >> GO TO 4.	M
3. RESTART ENGINE	
If it is difficult to start engine, the fuel injection system has a malfunction, too. Crank engine while depressing accelerator pedal.	Ν
Does engine start?	
YES >> Go to <u>ECH-164, "Diagnosis Procedure"</u> . NO >> Check exhaust and intake air leak visually.	0
4.PERFORM DTC CONFIRMATION PROCEDURE-II	
 Start engine and let it idle for at least 10 minutes. Check 1st trip DTC. 	Ρ
Is 1st trip DTC detected?	
YES >> Go to <u>ECH-164, "Diagnosis Procedure"</u> . NO >> GO TO 5.	
5. PERFORM DTC CONFIRMATION PROCEDURE-III	

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

ECH-163

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< COMPONENT DIAGNOSIS >

INFOID:000000001179468

2. Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for 10 minutes. Refer to the table below.

Hold the accelerator pedal as steady as possible.

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data \pm 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data \pm 10 km/h (6 MPH)
Engine coolant temperature (T) condition	When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F).
Engine coolant temperature (1) condition	When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F).

3. Check 1st trip DTC.

Is 1st trip DTC detected?

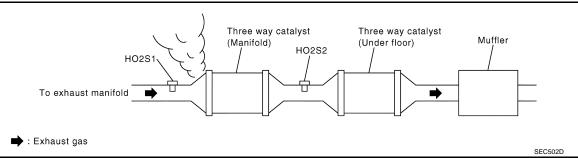
YES >> Go to ECH-164, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before three way catalyst (manifold).



Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAK AND PCV HOSE

- 1. Listen for an intake air leak after the mass air flow sensor.
- 2. Check PCV hose connection.

Intake air leak detected?

YES >> Repair or replace.

3.CHECK HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT

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

Heated oxy	Heated oxygen sensor 1		CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F30	4	F8	49	Existed

5. Check the continuity between heated oxygen sensor 1 harness connector or ECM harness connector and ground.

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

	en sensor 1	EC	М	0	Continuit	
Connector	Terminal	Connector	Terminal	Ground	Continuity	
F30	4	F8	49	Ground	Not existed	
6. Also che	eck harness f	or short to p	ower.			
<u>s the inspec</u>	tion result no	ormal?				
	GO TO 4.	-!!(
4			ort to ground	d or short to	power in narne	ss or connectors.
	UEL PRESS					
		e to zero. Re			ection". er to <u>ECH-345.</u>	"Inspection"
2. 115tali 10	ei piessuie (yauye anu ci	leck luel pro		er to <u>Lon-343,</u>	Inspection.
At id	ling: Approx	kimately 350) kPa (3.5 ba	ar, 3.57 kg/o	cm ² , 51 psi)	
s the inspec	tion result no	ormal?				
	GO TO 6.					
	GO TO 5.					
D . DETECT	MALFUNCT	FIONING PA	RT			
Check fuel h	oses and fue	el tubes for c	logging.			
	tion result no					
		I filter and fu	el pump ass	sembly".		
~	Repair or rep					
	AAGG AID EI	OW SENSO	סו			
		_OW SENSC	DR			
With CON	ISULT-III		DR			
With CON	ISULT-III I removed pa	arts.		DR" mode w	rith CONSULT-I	 II.
With CON I. Install all 2. Check "N	ISULT-III I removed pa MASS AIR F	arts. LOW" in "DA	TA MONITO	DR" mode w	vith CONSULT-I	II.
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 With CON Install all Check "№ 1.0 - 2.0 - With GST Install all Check m 	ISULT-III I removed pa MASS AIR F 4.0 g·m/sec 10.0 g·m/sec I removed pa nass air flow	arts. LOW" in "DA : at idlin c: at 2,50 arts. sensor signa	TA MONITO 9 0 rpm al in Service			ΙΙ.
With CON I. Install all C. Check "N I.0 - 2.0 - With GST I. Install all C. Check m I.0 -	ISULT-III I removed pa MASS AIR F 4.0 g·m/sec 10.0 g·m/sec I removed pa hass air flow 4.0 g·m/sec	arts. LOW" in "DA : at idlin c: at 2,50 arts. sensor signa : at idlir	TA MONITO 9 0 rpm al in Service			II.
With CON I. Install all C. Check "N I.0 - 2.0 - With GST I. Install all C. Check m I.0 -	ISULT-III I removed pa MASS AIR F 4.0 g·m/sec 10.0 g·m/sec I removed pa nass air flow	arts. LOW" in "DA : at idlin c: at 2,50 arts. sensor signa : at idlir	TA MONITO 9 0 rpm al in Service			ΙΙ.
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With CON I. Install all C. Check "N I.0 - 2.0 - With GST I. Install all C. Check m I.0 - 2.0 - I. Install all L. Check m I.0 - 2.0 - Is the measu YES >> (ISULT-III I removed pa MASS AIR F 4.0 g·m/sec 10.0 g·m/sec 1 removed pa hass air flow 4.0 g·m/sec 10.0 g·m/sec urement value GO TO 7.	arts. LOW" in "DA : at idlin c: at 2,50 arts. sensor signa : at idlin c: at 2,50 e within the s	TA MONITO g 0 rpm al in Service ng 0 rpm specification	\$01 with G <u>1?</u>	ST.	
With CON I. Install all C. Check "N I.0 - 2.0 - With GST I. Install all C. Check m I.0 - 2.0 - State measu YES >> (NO >> (NO >> ()	ISULT-III I removed pa MASS AIR F 4.0 g·m/sec 10.0 g·m/sec 1 removed pa hass air flow 4.0 g·m/sec 10.0 g·m/sec urement value GO TO 7. Check conne	arts. LOW" in "DA : at idlin c: at 2,50 arts. sensor signa : at idlin c: at 2,50 e within the s	TA MONITO g 0 rpm al in Service ng 0 rpm specification sted termina	\$01 with G <u>1?</u> Is or loose o	ST.	II. he mass air flow sensor circuit or
With CON I. Install all C. Check "N I.0 - 2.0 - With GST I. Install all C. Check m I.0 - 2.0 - I. Install all C. Check m I. Install all C. Check m I. Install all C. Check m I.0 - 2.0 - 2.0 -	ISULT-III I removed pa MASS AIR F 4.0 g-m/sec 10.0 g-m/sec I removed pa hass air flow 4.0 g-m/sec 10.0 g-m/sec 10.0 g-m/sec 10.0 g-m/sec Check conne grounds. Ref	arts. LOW" in "DA : at idlin c: at 2,50 arts. sensor signa : at idlin c: at 2,50 e within the s ectors for rus fer to <u>ECH-1</u>	TA MONITO g 0 rpm al in Service ng 10 rpm Specification sted termina 16, "DTC Lo	\$01 with G <u>1?</u> Is or loose o	ST.	
With CON I. Install all C. Check "N I.0 - 4 2.0 - 4 With GST I. Install all C. Check m I.0 - 4 C.0 - 4 I.0 -	ISULT-III I removed pa MASS AIR F 4.0 g·m/sec 10.0 g·m/sec I removed pa hass air flow 4.0 g·m/sec 10.0 g·m/sec	arts. LOW" in "DA : at idlin c: at 2,50 arts. sensor signa : at idlin c: at 2,50 e within the s	TA MONITO g 0 rpm al in Service ng 10 rpm Specification sted termina 16, "DTC Lo	\$01 with G <u>1?</u> Is or loose o	ST.	
With CON Install all Install all Check "N 1.0 - 2.0 - With GST Install all Check m 1.0 - 2.0 - Sthe measu YES >> 0 NO >> 0 G CHECK F With CON	ISULT-III I removed pa MASS AIR F 4.0 g·m/sec 10.0 g·m/sec I removed pa hass air flow 4.0 g·m/sec 10.0 g·m/sec	arts. LOW" in "DA : at idlin c: at 2,50 arts. sensor signa : at idlin c: at 2,50 e within the s ectors for rus fer to <u>ECH-1</u>	TA MONITO g 0 rpm al in Service ng 10 rpm Specification sted termina 16, "DTC Lo	\$01 with G <u>1?</u> Is or loose o	ST.	
With CON I. Install all C. Check "N I.0 - 2.0 - With GST I. Install all C. Check m I.0 - 2.0 - State measu YES >> (NO >> (S C.CHECK F I. Start eng C. Perform	ISULT-III I removed pa MASS AIR F 4.0 g·m/sec 10.0 g·m/sec I removed pa hass air flow 4.0 g·m/sec 10.0 g·m/sec 10.0 g·m/sec IGO TO 7. Check conne grounds. Ref UNCTION C ISULT-III gine. "POWER BA	arts. LOW" in "DA : at idlin c: at 2,50 arts. sensor signa : at idlin c: at 2,50 e within the s ectors for rus fer to <u>ECH-1</u> DF FUEL INJ	TA MONITO g 0 rpm al in Service ng 0 rpm specification sted termina 16, "DTC Lo ECTOR "ACTIVE TE	\$01 with G <u>1?</u> Is or loose o ogic".	ST.	he mass air flow sensor circuit or

1. Let engine idle.

< COMPONENT DIAGNOSIS >

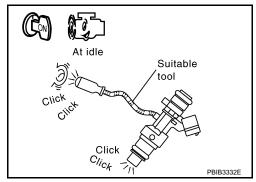
[HR16DE (WITH EURO-OBD)]

2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to ECH-291, "Component Function Check".



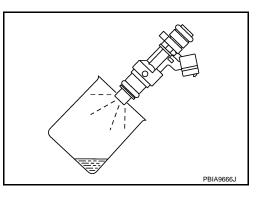
8. CHECK FUEL INJECTOR

- 1. Turn ignition switch OFF.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Disconnect all fuel injector harness connectors.
- Remove fuel tube assembly. Refer to <u>EM-36, "Removal and Installation"</u>. Keep fuel hose and all fuel injectors connected to fuel tube.
- 5. Disconnect all ignition coil harness connectors.
- 6. Prepare pans or saucers under each fuel injector.
- 7. Crank engine for about 3 seconds.

Fuel should be sprayed evenly for each fuel injector.

Is the inspection result normal?

- YES >> GO TO 9.
- NO >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones.



9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

< COMPONENT DIAGNOSIS >

P0172 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:000000001179469

[HR16DE (WITH EURO-OBD)]

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and lights up the MI (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
heated oxygen sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	F	
P0172	Fuel injection system too rich	 Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) 	 Heated oxygen sensor 1 Fuel injector Exhaust gas leaks Incorrect fuel pressure Mass air flow sensor 	G	
DTC CONFIRMATION PROCEDURE 1.PRECONDITIONING					
	onfirmation Procedure seconds before conduct	has been previously conducted, always tur ing the next test.	n ignition switch OFF and wait at	I	

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

 Clear the mixture ratio self-learning value. Refer to <u>ECH-21</u>, "MIXTURE RATIO SELF-LEARNING VALUE <u>CLEAR</u>: <u>Special Repair Requirement</u>". 	
2. Start engine.	Κ
Is it difficult to start engine?	
YES >> GO TO 3. NO >> GO TO 4.	L
3.RESTART ENGINE	
If it is difficult to start engine, the fuel injection system has a malfunction, too. Crank engine while depressing accelerator pedal.	M
Does engine start?	
 YES >> Go to <u>ECH-168, "Diagnosis Procedure"</u>. NO >> Remove spark plugs and check for fouling, etc. 	Ν
4. PERFORM DTC CONFIRMATION PROCEDURE-II	0
1. Start engine and let it idle for at least 10 minutes.	0
Is 1st trip DTC detected?	
YES >> Go to <u>ECH-168, "Diagnosis Procedure"</u> . NO >> GO TO 5.	Ρ
5. PERFORM DTC CONFIRMATION PROCEDURE-III	

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

Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for 10 minutes. Refer to the table below.
 Hold the accelerator pedal as steady as possible.

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< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data ±400 rpm		
Vehicle speed	Vehicle speed in the freeze frame data \pm 10 km/h (6 MPH)		
Engine coolant temperature (T) condition	When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F).		
	When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F).		

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-168, "Diagnosis Procedure".

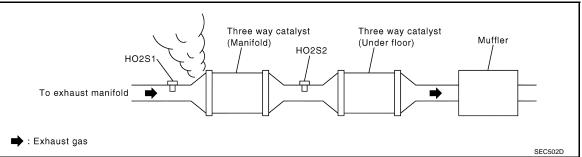
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179470

1.CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before three way catalyst (manifold).



Is exhaust gas leak detected?

YES >> Repair or replace. NO >> GO TO 2.

2. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 3.

3.CHECK HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.

- 2. Disconnect corresponding heated oxygen sensor 1 harness connector.
- 3. Disconnect ECM harness connector.
- 4. Check the continuity between heated oxygen sensor 1 harness connector and ECM harness connector.

Heated oxygen sensor 1		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F30	4	F8	49	Existed

5. Check the continuity between heated oxygen sensor 1 harness connector or ECM harness connector and ground.

Heated oxygen sensor 1		ECM		Ground	Continuity	
Connector	Terminal	Connector Terminal		Cround	Continuity	
F30	4	F8	49	Ground	Not existed	

P01/2 FUEL INJECTION SYSTEM FUNCTION	
< COMPONENT DIAGNOSIS > [HR16DE (WITH EURO-OBD)]	
6. Also check harness for short to power.	
Is the inspection result normal?	А
 YES >> GO TO 4. NO >> Repair open circuit or short to ground or short to power in harness or connectors. 	
4. CHECK FUEL PRESSURE	ECH
1. Release fuel pressure to zero. Refer to ECH-345, "Inspection".	
2. Install fuel pressure gauge and check fuel pressure. Refer to ECH-345, "Inspection".	С
At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm ² , 51 psi)	
Is the inspection result normal?	D
YES >> GO TO 6.	
NO >> GO TO 5.	
5. DETECT MALFUNCTIONING PART	E
Check fuel hoses and fuel tubes for clogging.	
Is the inspection result normal?	F
YES >> Replace "fuel filter and fuel pump assembly". NO >> Repair or replace	
NO >> Repair or replace 6.CHECK MASS AIR FLOW SENSOR	
	G
With CONSULT-III Justelli all removed parts	
 Install all removed parts. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III. 	Н
1.0 - 4.0 g·m/sec: at idling	
2.0 - 10.0 g⋅m/sec: at 2,500 rpm	I
With GST	
 Install all removed parts. Check mass air flow sensor signal in "Service \$01" with GST. 	J
1.0 - 4.0 g·m/sec: at idling	
2.0 - 10.0 g⋅m/sec: at 2,500 rpm	K
Is the measurement value within the specification?	
YES >> GO TO 7.	L
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to <u>ECH-116</u> , " <u>DTC Logic</u> ".	
7. CHECK FUNCTION OF FUEL INJECTOR	
	Μ
With CONSULT-III Start engine.	
 Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III. 	Ν
3. Make sure that each circuit produces a momentary engine speed drop.	
	-
Without CONSULT-III 1. Let engine idle.	0
	Р

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< COMPONENT DIAGNOSIS >

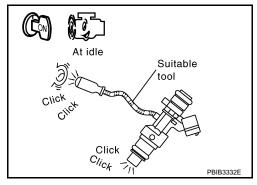
[HR16DE (WITH EURO-OBD)]

2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to ECH-291, "Component Function Check".



8. CHECK FUELINJECTOR

- 1. Remove fuel injector assembly. Refer to <u>EM-36, "Removal and Installation"</u>. Keep fuel hose and all fuel injectors connected to fuel tube.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Disconnect all fuel injector harness connectors.
- 4. Disconnect all ignition coil harness connectors.
- 5. Prepare pans or saucers under each fuel injectors.
- Crank engine for about 3 seconds. Make sure fuel does not drip from fuel injector.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P0222, P0223 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0222 or P0223 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	Harness or connectors (TP sensor 1 circuit is open or shorted.)
P0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	Electric throttle control actuator (TP sensor 1)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

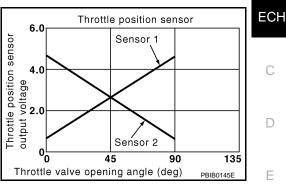
Start engine and let it idle for 1 second. 1. M Check DTC. 2. Is DTC detected? YES >> Go to ECH-171, "Diagnosis Procedure". Ν NO >> INSPECTION END Diagnosis Procedure INFOID:000000001179473 1.CHECK GROUND CONNECTION 1. Turn ignition switch OFF. Ρ 2. Check ground connection E21. Refer to Ground Inspection 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 1 POWER SUPPLY CIRCUIT Disconnect electric throttle control actuator harness connector. 1

2. Turn ignition switch ON.

ECH-171

INFOID:00000000117947

INFOID:000000001179472



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P0222, P0223 TP SENSOR

< COMPONENT DIAGNOSIS >

3. Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle c	Ground	Voltage	
Connector	Connector Terminal		vollage
F29	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 THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle control actuator		ECM		Continuity
Connector	Connector Terminal		Terminal	Continuity
F29	4	F8	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 THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
F29	2	F8	33	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 THROTTLE POSITION SENSOR

Refer to ECH-173, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to ECH-173, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P0222, P0223 TP SENSOR

[HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSIS > **Component Inspection**

1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Perform ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
- 4. Turn ignition switch ON.
- 5. Set shift lever to 1st position.
- 6. Check the voltage between ECM harness connector and ground.

	ECM					
Connector	Terminal	Ground	Condition		Voltage	
	33			Fully released	More than 0.36V	
F8	(TP sensor 1 signal)	Ground	Accelerator pedal	Fully depressed	Less than 4.75V	
	34	0.00.00		Fully released	Less than 4.75V	
	(TP sensor 2 signal)			Fully depressed	More than 0.36V	
	ection result norma					
	> INSPECTION EN > GO TO 2.	ND				
_	CE ELECTRIC TH	ROTTI F		TUATOR		
	ce electric throttle					
2. Go to	ECH-173, "Special	Repair	Requirement".			
>	> INSPECTION EN	١D				
Special	Repair Require	ement				INFOID:000000001179475
1. PERFC		ALVE CI	OSED POSITIC	ON LEARNING		
Refer to E	CH-19, "THROTTL	E VALVI	E CLOSED POS	ITION LEARNI	NG : Special Repair	Requirement"
•	> GO TO 2.					
2.PERFC	ORM IDLE AIR VOL	UME LE	EARNING			
	-					
Refer to <u>E</u>	<u>CH-19, "IDLE AIR </u>	VOLUM	E LEARNING : S	Special Repair F	<u>Requirement</u>	
Refer to <u>E</u>	CH-19, "IDLE AIR	VOLUMI	<u>E LEARNING : S</u>	Special Repair F	<u>kequirement"</u>	
	<u>CH-19, "IDLE AIR `</u> > END	VOLUMI	<u>E LEARNING : S</u>	Special Repair F	<u>Requirement</u>	
		VOLUMI	<u>E LEARNING : S</u>	Special Repair F	<u>Requirement"</u>	
		VOLUMI	<u>E LEARNING : S</u>	Special Repair F	<u>kequirement"</u>	
		VOLUMI	<u>E LEARNING : S</u>	Special Repair F	<u>kequirement"</u>	
		VOLUMI	<u>E LEARNING : S</u>	Special Repair F	<u>kequirement"</u>	
		VOLUMI	<u>E LEARNING : S</u>	Special Repair F	<u>kequirement"</u>	

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< COMPONENT DIAGNOSIS >

P0300, P0301, P0302, P0303, P0304 MISFIRE

DTC Logic

INFOID:000000001179476

[HR16DE (WITH EURO-OBD)]

DTC DETECTION LOGIC

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

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

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)

On the 1st trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MI will blink.

When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.

When the misfire condition decreases to a level that will not damage the TWC, the MI will turn off. If another misfire condition occurs that can damage the TWC on a second trip, the MI will blink. When the misfire condition decreases to a level that will not damage the TWC, the MI will remain on. If another misfire condition occurs that can damage the TWC, the MI will begin to blink again.

 Two Trip Detection Logic (Exhaust quality deterioration) For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MI will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.

A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	Improper spark plug
P0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	Insufficient compression Incorrect fuel pressure
P0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	The fuel injector circuit is open or shorted
P0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	Fuel injector Intake air leak
P0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	 The ignition signal circuit is open or shorted Lack of fuel Signal plate Heated oxygen sensor 1 Incorrect PCV hose connection

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Restart engine and let it idle for about 15 minutes.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-175, "Diagnosis Procedure".

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

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

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

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Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.
 Hold the accelerator pedal as steady as possible.

The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

CAUTION:

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

5			С
Engine speed	Engine speed in the freeze frame data \pm 400 rpm		
Vehicle speed	Vehicle speed in the freeze frame data \pm 10 km/h (6 MPH)		D
Engine coolant temperature (T)	When the freeze frame data shows lower than 70 $^\circ C$ (158 $^\circ F), T should be lower than 70 ^\circ C (158 ^\circ F).$		D
condition	When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F).		E
The time to driving var	ies according to the engine speed in the freeze frame data.		_
Engine speed	Time		F
Around 1,000 rpm	Approximately 10 minutes		
Around 2,000 rpm	Approximately 5 minutes		G
More than 3,000 rpm	Approximately 3.5 minutes		
3. Check 1st trip DTC.			Н
Is 1st trip DTC detected?			
YES >> Go to <u>ECH-17</u> NO >> INSPECTION	<u>5, "Diagnosis Procedure"</u> . END		
Diagnosis Procedure		INFOID:000000001179477	I
1. CHECK FOR INTAKE A	IR LEAK AND PCV HOSE		J
 Start engine and run it Listen for the sound of 			
3. Check PCV hose conn			Κ
Is intake air leak detected?			
	ak location and repair.		
NO >> GO TO 2.			L
2.CHECK FOR EXHAUS			
, ,	neck exhaust tube, three way catalyst and muffler for dents.		M
Is the inspection result nor			
YES-1 >> With CONSUL YES-2 >> Without CONS			
NO >> Repair or repla			Ν
3.PERFORM POWER BA			
With CONSULT-III			0
1. Start engine.			
	ANCE" in "ACTIVE TEST" mode with CONSULT-III.		Р
Is the inspection result nor			I
YES >> GO TO 9.			
NO >> GO TO 4.			

4. CHECK FUNCTION OF FUEL INJECTOR

1. Start engine and let engine idle.

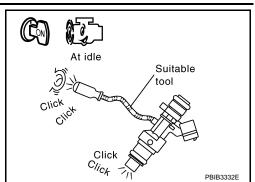
< COMPONENT DIAGNOSIS >

2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to <u>ECH-292, "Component Inspection"</u>.



5.CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Do the following procedure in the place where ventilation is good without the combustible.

- 1. Turn ignition switch OFF.
- 2. Remove fuel pump fuse in IPDM E/R to release fuel pressure. **NOTE:**

Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.

- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 7. Remove ignition coil and spark plug of the cylinder to be checked.
- 8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 9. Connect spark plug and harness connector to ignition coil.
- 10. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- Do not approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken. NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is mal-functioning.

Is the inspection result normal?

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

6. CHECK FUNCTION OF IGNITION COIL-II

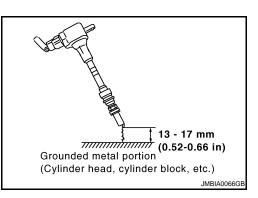
- 1. Turn ignition switch OFF.
- 2. Disconnect spark plug and connect a known-good spark plug.
- 3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

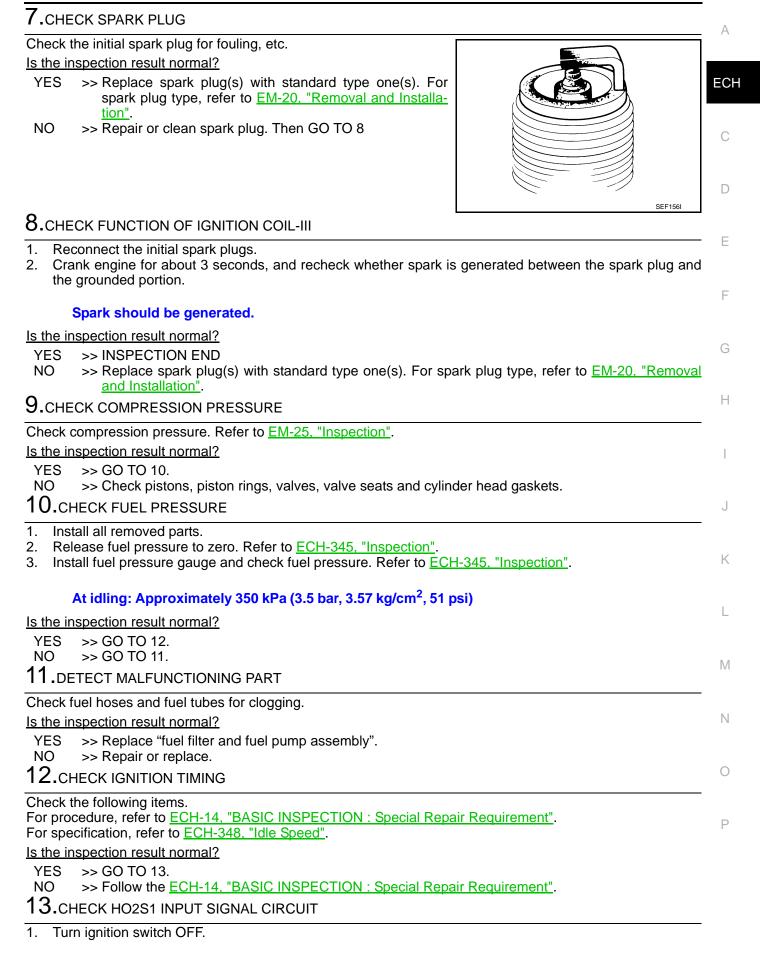
YES >> GO TO 7.

NO >> Check ignition coil, power transistor and their circuits. Refer to <u>ECH-297, "Component Function</u> <u>Check"</u>.



< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]



< COMPONENT DIAGNOSIS >

2. Disconnect corresponding HO2S1 harness connector.

3. Disconnect ECM harness connector.

4. Check the continuity between HO2S1 harness connector and ECM harness connector.

HO	2S1	E	Continuity	
Connector Terminal		Connector	Terminal	Continuity
F30	4	F8	49	Existed

5. Check the continuity between HO2S1 harness connector or ECM harness connector and ground.

HO2S1		ECM		Ground	Continuity	
Connector	Terminal	Connector	Terminal	Oround	Continuity	
F30	4	F8	49	Ground	Not existed	

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 14.

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

14.CHECK HO2S1 HEATER

Refer to ECH-147, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace HO2S sensor 1.

15.CHECK MASS AIR FLOW SENSOR

With CONSULT-III

Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III.

1.0 - 4.0 g·m/sec : at idling

2.0 - 10.0 g·m/sec : at 2,500 rpm

With GST

Check mass air flow sensor signal in Service \$01 with GST.

1.0 - 4.0 g·m/sec : at idling 2.0 - 10.0 g·m/sec : at 2,500 rpm

Is the measurement value within the specification?

- YES >> GO TO 16.
- NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to <u>ECH-116, "DTC Logic"</u>.

16.CHECK SYMPTOM TABLE

Check items on the rough idle symptom in ECH-334, "Symptom Table".

Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair or replace.

17.ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.

Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to <u>ECH-76, "Diagnosis Description"</u>.

>> GO TO 18. **18.**CHECK INTERMITTENT INCIDENT

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	[HR16DE (WI	TH EURO-O

< COMPONENT DIAGNOSIS >	[HR16DE (WITH EURO-OBD)]	_	
Refer to GI-39, "Intermittent Incident".		А	
>> INSPECTION END			
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P0327, P0328 KS

Description

INFOID:000000001179478

[HR16DE (WITH EURO-OBD)]

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

DTC Logic

INFOID:000000001179479

INFOID:000000001179480

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detected condition	Possible cause
P0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	 Harness or connectors (The sensor circuit is open or shorted.)
P0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	Knock sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and run it for at least 5 seconds at idle speed.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-180, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection E21. 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 KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect knock sensor harness connector and disconnect ECM harness connector.
- 2. Check the continuity between knock sensor harness connector and ECM harness connector.

Knock	sensor	EC	Continuity	
Connector Terminal		Connector	Terminal	Continuity
F12	2	F8	40	Existed

3. 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.

P0327, P0328 KS

< COMPONENT DIAGNOSIS > ${f 3.}$ CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT А 1. Check the continuity between knock sensor harness connector and ECM harness connector. Knock sensor ECM ECH Continuity Connector Terminal Connector Terminal F12 1 F8 37 Existed 2. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 4. D NO >> Repair open circuit or short to ground or short to power in harness or connectors. 4.CHECK KNOCK SENSOR Е Refer to ECH-181, "Component Inspection". Is the inspection result normal? YES >> GO TO 5. F NO >> Replace knock sensor. **5.**CHECK INTERMITTENT INCIDENT Refer to GI-39, "Intermittent Incident". >> INSPECTION END Н Component Inspection INFOID:000000001179481 1.CHECK KNOCK SENSOR Turn ignition switch OFF. 1. 2. Disconnect knock sensor harness connector. 3. Check resistance between knock sensor terminals as follows. NOTE: It is necessary to use an ohmmeter which can measure more than 10 M Ω . Κ 1

Ierminals	Resistance [at 20°C (68°F)]
1 and 2	Approx. 532 - 588 kΩ

CAUTION:

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones. Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace knock sensor. L

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P0335 CKP SENSOR (POS)

Description

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at end of the crankshaft. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet and Hall IC.

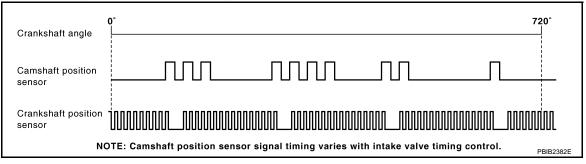
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

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

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

ECM receives the signals as shown in the figure.



DTC Logic

INFOID:000000001179483

INFOID:000000001179482

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335	Crankshaft position sen- sor (POS) circuit	 The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. The crankshaft position sensor (POS) signal is not in the normal pattern during engine run- ning. 	 Harness or connectors [Crankshaft position sensor (POS) circuit is open or shorted.] (Refrigerant pressure sensor circuit is shorted.) (Accelerator pedal position sensor circuit is shorted.) Crankshaft position sensor (POS) Refrigerant pressure sensor Accelerator pedal position sensor Signal plate

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

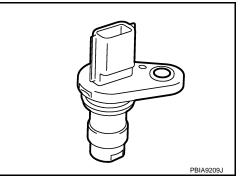
TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds. If engine does not start, crank engine for at least 2 seconds.



P0335 CKP SENSOR (POS)

		NOSIS >)]
	st trip DTC.					
<u>ls 1st trip DT</u>		_				
	Go to <u>ECH-</u> INSPECTIO	<u>183, "Diagno</u> N END	<u>sis Procedu</u>	<u>re"</u> .		
Diagnosis	Procedu	re			INFOID:0000000117	9484
1.снеск с	GROUND C	ONNECTION	N			
	ition switch					
-	rouna conne ction result n		Refer to Grou	and inspectic	n in <u>GI-41, "Circuit Inspection"</u> .	
-	GO TO 2.					
		place ground	d connection			
CHECK C	CRANKSHA	FT POSITIO	N (CKP) SE	NSOR (POS) POWER SUPPLY CIRCUIT-I	
					ess connector.	
. Turn ign	ition switch	ON.	·	. ,		
. Check th	ne voltage b	etween CKP	' sensor (PO	S) harness c	onnector and ground.	
UKD	sensor (POS)					
Connector			Ground	Voltage		
F20	1		Ground	Approx. 5V		
-	tion result n		Jouriu			
YES >>	GO TO 8.					
B.CHECK C			N (CKP) SE	NSOR (POS) POWER SUPPLY CIRCUIT-II	
B. CHECK C . Turn ign 2. Disconn	CRANKSHA ition switch ect ECM ha	OFF. Irness conne	ctor.) POWER SUPPLY CIRCUIT-II	
B. CHECK (1. Turn ign 2. Disconn 3. Check th	CRANKSHA ition switch ect ECM ha	OFF. Irness conne / between Cl	ctor.	POS) harness		
B. CHECK (1. Turn ign 2. Disconn 3. Check th	CRANKSHA ition switch ect ECM ha ne continuity	OFF. Irness conne / between Cl	ctor. KP sensor (F			
CHECK C Turn ign Disconn Check th	CRANKSHA ition switch ect ECM ha ne continuity sor (POS)	OFF. Irness conne / between Cl	ctor. KP sensor (F ^{CM}	POS) harness		
B.CHECK C Turn ign Disconn Check th CKP sens Connector F20	CRANKSHA ition switch ect ECM ha ne continuity sor (POS) Terminal	OFF. Irness conne / between Cl Ef Connector F8	ctor. KP sensor (F CM Terminal	POS) harness Continuity		
B.CHECK C . Turn ign 2. Disconn 3. Check th CKP sens Connector F20 s the inspec YES >>	CRANKSHA ition switch ect ECM ha ne continuity sor (POS) Terminal 1 ction result n GO TO 4.	OFF. rness conne / between Cl Connector F8 hormal?	ctor. KP sensor (F CM Terminal	POS) harness Continuity		
CHECK C Turn ign Disconn Check th CKP sens Connector F20 Sthe inspec YES >> NO >>	CRANKSHA ition switch ect ECM ha ne continuity sor (POS) Terminal 1 2tion result n GO TO 4. Repair open	OFF. Inness conner between Cl Connector F8 hormal? h circuit.	ctor. KP sensor (F CM Terminal 75	POS) harness Continuity Existed	s connector and ECM harness connector.	
CHECK C . Turn ign . Disconn . Check th CKP sens Connector F20 s the inspec YES >> NO >> .CHECK C	CRANKSHA ition switch ect ECM ha he continuity sor (POS) Terminal 1 ction result n GO TO 4. Repair open CRANKSHA	OFF. rness conne / between Cl Connector F8 normal? n circuit. FT POSITIO	ctor. KP sensor (F CM Terminal 75 W (CKP) SE	POS) harness Continuity Existed NSOR (POS	s connector and ECM harness connector.	
CHECK C Turn ign Disconn Check th CKP sens Connector F20 S the inspec YES >> NO >> CHECK C	CRANKSHA ition switch ect ECM ha he continuity sor (POS) Terminal 1 ction result n GO TO 4. Repair open CRANKSHA	OFF. rness conne / between Cl Connector F8 normal? n circuit. FT POSITIO	ctor. KP sensor (F CM Terminal 75 W (CKP) SE	POS) harness Continuity Existed NSOR (POS	s connector and ECM harness connector.	
CHECK C Turn ign Disconn Check th CKP sens Connector F20 Sthe inspec YES >> NO >> CHECK C Check harne	CRANKSHA ition switch ect ECM ha he continuity sor (POS) Terminal 1 ction result n GO TO 4. Repair open CRANKSHA ess for short	OFF. rness conne / between Cl Connector F8 normal? n circuit. FT POSITIO	ctor. KP sensor (F CM Terminal 75 N (CKP) SE d short to gro	POS) harness Continuity Existed NSOR (POS	s connector and ECM harness connector.	
CHECK (Turn ign Disconn Check th CKP sens Connector F20 S the inspec YES >> NO >> CHECK (Check harne EC	CRANKSHA ition switch ect ECM ha ne continuity sor (POS) Terminal 1 ction result n GO TO 4. Repair open CRANKSHA ess for short	OFF. rness conne / between Cl Connector F8 normal? n circuit. FT POSITIO to power an	ctor. KP sensor (F CM Terminal 75 N (CKP) SE d short to gro Ser	POS) harness Continuity Existed NSOR (POS bund, betwee	s connector and ECM harness connector.) POWER SUPPLY CIRCUIT-III en the following terminals.	
CHECK C Turn ign Disconn Check th CKP sens Connector F20 S the inspec YES >> NO >> CHECK C Check harne	CRANKSHA ition switch ect ECM ha ne continuity sor (POS) Terminal 1 ction result n GO TO 4. Repair open CRANKSHA ess for short CM Terminal	OFF. rness conne / between Cl Connector F8 normal? n circuit. FT POSITIO to power an Na	ctor. KP sensor (F CM Terminal 75 N (CKP) SE d short to gro Ser	POS) harness Continuity Existed NSOR (POS bund, betwee nsor Connector	o connector and ECM harness connector.) POWER SUPPLY CIRCUIT-III en the following terminals.	
CHECK C Turn ign Disconn Check th CKP sens Connector F20 S the inspec YES >> NO >> CHECK C Check harne EC	CRANKSHA ition switch ect ECM ha ne continuity sor (POS) Terminal 1 ction result n GO TO 4. Repair open CRANKSHA ess for short CM Terminal 74	OFF. Inness conner between Cl Connector F8 ormal? n circuit. FT POSITIO to power an Na Refrigerant pr	ctor. KP sensor (F CM Terminal 75 N (CKP) SE d short to gro Ser ame ressure sensor	POS) harness Continuity Existed NSOR (POS bund, betweet nsor Connector E49) POWER SUPPLY CIRCUIT-III en the following terminals.	
CHECK C Turn ign Disconn Check th CKP sens Connector F20 Sthe inspect YES >> NO >> CHECK C Check harne EC Connector F8	CRANKSHA ition switch ect ECM ha ne continuity sor (POS) Terminal 1 ction result n GO TO 4. Repair open CRANKSHA ess for short CM Terminal 74 75	OFF. rness conne / between Cl Connector F8 normal? n circuit. FT POSITIO to power an Na Refrigerant pi CKP sensor (ctor. KP sensor (F CM Terminal 75 N (CKP) SE d short to gro Ser ame ressure sensor	POS) harness Continuity Existed NSOR (POS bund, betwee nsor Connector E49 F20) POWER SUPPLY CIRCUIT-III en the following terminals.	
3. CHECK C Turn ign Disconn Check th CKP sens Connector F20 S the inspect YES >> C NO >> 1. CHECK C Check harne EC Connector F8 E16	CRANKSHA ition switch ect ECM ha ne continuity sor (POS) Terminal 1 ction result n GO TO 4. Repair open CRANKSHA ess for short CM Terminal 74	OFF. Inness conner between Cl Connector F8 ormal? n circuit. FT POSITIO to power an Refrigerant pr CKP sensor (APP sensor	ctor. KP sensor (F CM Terminal 75 N (CKP) SE d short to gro Ser ame ressure sensor	POS) harness Continuity Existed NSOR (POS bund, betweet nsor Connector E49) POWER SUPPLY CIRCUIT-III en the following terminals.	

• Refrigerant pressure sensor (Refer to HAC-172, "Component Inspection")

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Replace malfunctioning components.

6.CHECK APP SENSOR

Refer to ECH-273, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.

2. Go to ECH-274, "Special Repair Requirement".

>> INSPECTION END

$\mathbf{8}$.CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sens	or (POS)	EC	М	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F20	2	F8	62	Existed

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

Is the inspection result normal?

YES >> GO TO 9.

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

 ${f 9.}$ CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

2. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sens	or (POS)	EC	М	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F20	3	F8	61	Existed

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

Is the inspection result normal?

YES >> GO TO 10.

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

10.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to ECH-185, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace crankshaft position sensor (POS).

11.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace the signal plate.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

P0335 CKP SENSOR (POS)

< COMPONENT DIAGNOSIS >

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>> INSPECTION END	А
1.CHECK CRANKSHAFT POSITION SENSOR (POS)-I	ECH
 Turn ignition switch OFF. Loosen the fixing bolt of the sensor. Disconnect crankshaft position sensor (POS) harness connector. Remove the sensor. 	С
5. Visually check the sensor for chipping.	D
YES >> GO TO 2. NO >> Replace crankshaft position sensor (POS).	E
	F

$2. {\sf CHECK \ CRANKSHAFT \ POSITION \ SENSOR \ (POS)-II}$

Check resistance between crankshaft position sensor (POS) terminals as follows.

Terminals (Polarity)	Resistance [at 25°C (77°F)]
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or $\sim \Omega$
2 (+) - 3 (-)	

YES >> INSPECTION END

NO >> Replace crankshaft position sensor (POS).

P0340 CMP SENSOR (PHASE)

Description

The camshaft position sensor (PHASE) senses the protrusion of camshaft (INT) to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.

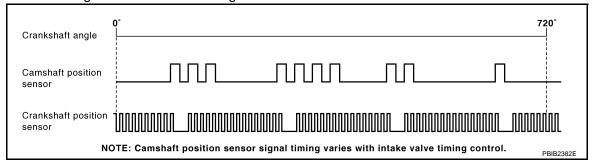
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

The sensor consists of a permanent magnet and Hall IC.

When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes. ECM receives the signals as shown in the figure.



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0340 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-250, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340	Camshaft position sen- sor (PHASE) circuit	 The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. The cylinder No. signal is not sent to ECM during engine running. The cylinder No. signal is not in the normal pattern during engine running. 	 Harness or connectors (The sensor circuit is open or shorted) Camshaft position sensor (PHASE) Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

- Start engine and let it idle for at least 5 seconds. If engine does not start, crank engine for at least 2 seconds.
- 2. Check 1st trip DTC.

ECH-186

INFOID:000000001179486

PBIA9209.

INFOID:0000000001179487

DO240 CMD CENCOD (DUACE)

			P SENSOR	
COMPONENT DIAG	NOSIS >			[HR16DE (WITH EURO-OBD)]
s 1st trip DTC detected	?			
YES >> Go to ECH-	<u>187, "Diagno</u>	osis Procedu	<u>ire"</u> .	
NO >> GO TO 3.				
PERFORM DTC CO				
 Maintaining engine Check 1st trip DTC. 	speed at mo	re than 800	rpm for at lea	st 5 seconds.
s 1st trip DTC detected	2			
YES >> Go to ECH-		osis Procedu	ıre".	
NO >> INSPECTIO				
iagnosis Procedu	re			INFOID:000000001179488
.CHECK STARTING	SYSTEM			
urn ignition switch to S	TART positic	on.		
oes the engine turn ov	er? Does the	e starter mot	or operate?	
YES >> GO TO 2.				
NO >> Check start	• •			
CHECK GROUND C		N		
. Turn ignition switch		Pofer to Gro	und Inspectic	n in <u>GI-41, "Circuit Inspection"</u> .
the inspection result r				In <u>Gr-41, Great Inspection</u> .
YES >> GO TO 3.	<u>ionnar.</u>			
NO >> Repair or re				
CHECK CAMSHAFT	POSITION	(CMP) SENS	SOR (PHASE) POWER SUPPLY CIRCUIT
. Disconnect camsha		MP) sensor	(PHASE) ha	ness connector.
 Turn ignition switch Check the voltage b 		Deensor (PL		s connector and ground.
. Oneok the voltage i		301301 (11		s connector and ground.
CMP sensor (PHASE)			-	
Connector Terminal	Ground	Voltage		
F26 1	Ground	Approx. 5V	_	
the inspection result r	ormal?	l.	-	
YES >> GO TO 4.				
		•		oower in harness or connectors.
CHECK CMP SENS		GROUND	CIRCUIT FO	OPEN AND SHORT
 Turn ignition switch Check the continuity 		MP concor (ess connector and ECM harness connector.
			FHAGE) Hall	
CMP sensor (PHASE)	E	СМ		
Connector Terminal	Connector	Terminal	Continuity	
F26 2	F8	63	Existed	
Also check harness	for short to r		L	
the inspection result r	•			
•				
YES >> GO TO 5. NO >> Repair oper				power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

2. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

P0340 CMP SENSOR (PHASE)

< COMPONENT DIAGNOSIS >

CMP sense	or (PHASE)	E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F26	3	F8	65	Existed

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 CAMSHAFT POSITION SENSOR (PHASE)

Refer to ECH-188, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace camshaft position sensor (PHASE).

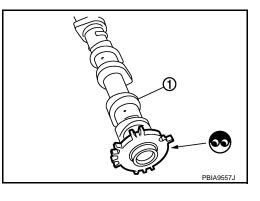
7.CHECK CAMSHAFT (INT)

Check the following.

- · Accumulation of debris to the signal plate of camshaft (1) rear end
- Chipping signal plate of camshaft rear end
- Is the inspection result normal?

YES >> GO TO 8.

NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

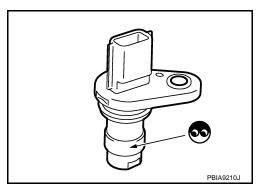
INFOID:000000001179489

1.CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

- 1. Turn ignition switch OFF.
- 2. Loosen the fixing bolt of the sensor.
- 3. Disconnect camshaft position sensor (PHASE) harness connector.
- 4. Remove the sensor.
- 5. Visually check the sensor for chipping.

Is the inspection result normal?

NO >> Replace camshaft position sensor (PHASE).



2.CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) terminals as follows.

P0340 CMP SENSOR (PHASE)

< COMPONENT DIAGNOSIS >

Terminals (Polarity)	Resistance [at 25°C (77°F)]
1 (+) - 2 (-)	First 0 and 0
1 (+) - 3 (-)	Except 0 or $\sim \Omega$
2 (+) - 3 (-)	
Is the inspection res YES >> INSPEC	
NO >> Replace	camshaft position sensor (

< COMPONENT DIAGNOSIS >

P0420 THREE WAY CATALYST FUNCTION

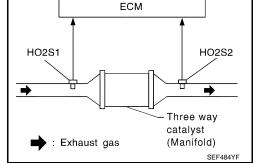
DTC Logic

DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of heated oxygen sensor 1 and heated oxygen sensor 2.

A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of heated oxygen sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420	Catalyst system efficien- cy below threshold	 Three way catalyst (manifold) does not oper- ate properly. Three way catalyst (manifold) does not have enough oxygen storage capacity. 	 Three way catalyst (manifold) Exhaust tube Intake air leaks Fuel injector Fuel injector leaks Spark plug Improper ignition timing

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

YES >> GO TO 2. NO >> GO TO 7.

2. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Do not hold engine speed for more than the specified minutes below.

>> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
- If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches to 70°C (158°F). 7. Open engine hood.
- 8. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT-III.
- 9. Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
- 10. Check the indication of "CATALYST".

Which is displayed on CONSULT-III screen?

ECH-190

[HR16DE (WITH EURO-OBD)]

INFOID:000000001179490

MANY CATAL VOT FUNCTI

P0420 THREE WAY CATALYST FUNCTION	
< COMPONENT DIAGNOSIS > [HR16DE (WITH EURO-OBD)]	
CMPLT >> GO TO 6. INCMP >> GO TO 4.	А
4. PERFORM DTC CONFIRMATION PROCEDURE-II	
 Wait 5 seconds at idle. Rev engine up to 2,000 to 3,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes). 	ECH
Does the indication change to "CMPLT"?	C
YES >> GO TO 6. NO >> GO TO 5.	C
5. PERFORM DTC CONFIRMATION PROCEDURE AGAIN	
1. Stop engine and cool it down to less than 70°C (158°F).	D
2. Perform DTC CONFIRMATION PROCEDURE again.	
>> GO TO 3.	E
6. PERFORM DTC CONFIRMATION PROCEDURE-III	
Check 1st trip DTC.	F
Is 1st trip DTC detected?	
YES >> Go to <u>ECH-192, "Diagnosis Procedure"</u> . NO >> INSPECTION END	G
7. PERFORM COMPONENT FUNCTION CHECK	
Perform component function check. Refer to ECH-191, "Component Function Check".	Н
NOTE: Use component function check to check the overall function of the three way catalyst (manifold). During this	
check, a 1st trip DTC might not be confirmed.	I
Is the inspection result normal?	
YES >> INSPECTION END NO >> Go to <u>ECH-192, "Diagnosis Procedure"</u> .	I
Companent Eurotian Chack	0
1.PERFORM COMPONENT FUNCTION CHECK-I	K
Without CONSULT-III	
 Start engine and warm it up to the normal operating temperature. Turn ignition switch OFF and wait at least 10 seconds. 	L
 Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. Let engine idle for 1 minute. 	
5. Check the voltage between ECM harness connector and ground under the following condition.	Μ

ECM		Ground	Condition	Specification	
Connector	Terminal	Ground	Condition	Specification	
F8	49 (HO2S1 signal)	Ground	Keeping engine speed at 2,000 rpm constant under no load	The voltage switch peridically more than 5 times within 10 seconds.	0
					0

Ρ

Is the inspection result normal?

YES >> GO TO 2

NO >> Go to ECM-136, "DTC Logic".

2.PERFORM COMPONENT FUNCTION CHECK-II

Without CONSULT-III

- 1. Set voltmeter probes between ECM terminals and ground.
- 2. Make sure that the voltage switching frequency (high&low) HO2S2 voltage is very less than that of HO2S1 voltage under the following condition.

< COMPONENT DIAGNOSIS >

ECM		Ground	Condition	Specification	
Connector	Terminal	Ground	Condition	Specification	
F8	49 (HO2S1 signal)		Keeping engine speed at 2,000 rpm constant	Switching freqency ratio (A/B) : Less than 0.75 A : Heated oxygen sensor 2 voltage switching	
	50 (HO2S2 signal)	Ground	under no load	frequency B : Heated oxygen sensor 1 voltage switching frequency	

Is the inspection result normal?

YES >> INSPECTION END

NO >> If the ratio is greater than above (0.75), it means three way catalyst does not operate properly. Go to <u>ECM-191</u>, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000001179492

CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dent.

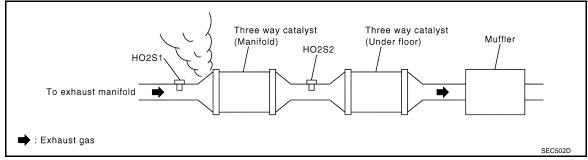
Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

2.CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before the three way catalyst (manifold).



Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 3.

3.CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.

4.CHECK IGNITION TIMING AND IDLE SPEED

Check the following items. Refer to ECH-14, "BASIC INSPECTION : Special Repair Requirement".

For specification, refer to ECH-348, "Ignition Timing"

For specification, refer to ECH-348, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Follow the ECH-14, "BASIC INSPECTION : Special Repair Requirement".

5.CHECK FUEL INJECTOR

1. Stop engine and then turn ignition switch ON.

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

< COMPONENT DIAGNOSIS >

		1				4
		Ground	Voltage			ŀ
Connector	Terminal 31			-		
	30	-				E
F7	29	Ground	Battery voltage			
	25	-				(
Is the inspec	tion result no	ormal?	l	•		
	GO TO 6.					r
<u>~</u>			nosis Procedur	<u>e"</u> .		
	UNCTION C	of Ignition	N COIL-I			
CAUTION:	wing proco	turo in tho	place where w	ntilation is good	l without the combustible.	E
	ition switch (simation is good	i without the compustible.	
2. Remove NOTE:	fuel pump fu	use in IPDM	I E/R to release	fuel pressure.		F
-	ise CONSUL	T-III to relea	ase fuel pressur	e, or fuel pressure	e applies again during the following pro-	
cedure.	nin o		-	-		
 Start english After english 		rank it two o	or three times to	release all fuel pr	essure.	(
5. Turn ign	ition switch C	DFF.				
				void the electrical ler to be checked.	discharge from the ignition coils.	
B. Crank er	ngine for 5 se	econds or m	nore to remove of	combustion gas in		
			connector to ig	nition coil. - 17 mm (0.52 -		
				grounded metal		
	as shown in t		do and shoold	whether enerty is	andri	
				whether spark is nded metal por-	E.	
tion.			5 5			
Spar	k should be	generated	_			
CAUTIO		gonoratoa			13 - 17 mm 7//////////////////////////////////	
		to the spa	ark plug and t	ne ignition coil	Grounded metal portion (Cylinder head, cylinder block, etc.)	
				et an electrical	JMBIA0066GB	
	e becomes			rical discharge		
• It mig				f the gap of more	e than 17 mm (0.66 in) is taken.	
NOTE: When the	he dan is le	ss than 13	mm (0 52 in)	the snark might	be generated even if the coil is mal-	
functior				cho opant ingri		
	tion result no	ormal?				
-	GO TO 10. GO TO 7.					
_	GO TO 7. FUNCTION C					
	ition switch (ect spark plu		ect a known-go	od spark plug.		
8. Crank ei	ngine for abo	out 3 secon			generated between the spark plug and	
the grou	nded metal p	portion.				
Spar	k should be	generated				
s the inspec	tion result no	ormal?				

YES >> GO TO 8.

< COMPONENT DIAGNOSIS >

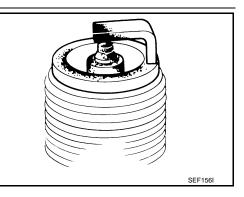
[HR16DE (WITH EURO-OBD)]

NO >> Check ignition coil, power transistor and their circuits. Refer to <u>ECH-297, "Diagnosis Procedure"</u>.

8.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.<u>EM-21, "Inspection"</u> Is the inspection result normal?

- YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to <u>EM-44</u>, "<u>Removal and Installa-tion</u>".
- NO >> Repair or clean spark plug. Then GO TO 9



9. CHECK FUNCTION OF IGNITION COIL-III

- 1. Reconnect the initial spark plugs.
- 2. Crank engine for about three seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-44, "Removal and Installation".

10.CHECK FUEL INJECTOR

- 1. Turn ignition switch OFF.
- Remove fuel injector assembly. Refer to <u>EM-36, "Removal and Installation"</u>. Keep fuel hose and all fuel injectors connected to fuel tube.
- 3. Disconnect all ignition coil harness connectors.
- 4. Reconnect all fuel injector harness connectors disconnected.
- 5. Turn ignition switch ON.

Does fuel drip from fuel injector?

- YES >> GO TO 11.
- NO >> Replace the fuel injector(s) from which fuel is dripping.

11. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the trouble fixed?

- YES >> INSPECTION END
- NO >> Replace three way catalyst assembly.

P0444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE [HR16DE (WITH EURO-OBD)] < COMPONENT DIAGNOSIS >

P0444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

The EVAP canister purge volume control solenoid valve uses a ON/ OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

ECH D Е PBIA9215J

DTC Logic

DTC DETECTION LOGIC

DTC No. Trouble diagnosis name DTC detecting condition Possible cause Harness or connectors EVAP canister purge volume (The solenoid valve circuit is open or An excessively low voltage signal is sent P0444 control solenoid valve circuit shorted.) to ECM through the valve open EVAP canister purge volume control solenoid valve DTC CONFIRMATION PROCEDURE 1.CONDITIONING If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test. **TESTING CONDITION:** Before performing the following procedure, confirm battery voltage is more than 11V at idle. Κ >> GO TO 2. 2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 13 seconds.

Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-195, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

Disconnect EVAP canister purge volume control solenoid valve harness connector. 2.

Turn ignition switch ON. 3.

4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

EVAP canister purge volu	Ground	Voltage		
Connector Terminal		Oround	volidye	
F32	1	Ground	Battery voltage	

Is the inspection result normal?

ECH-195

INFOID:000000001179493

INFOID:000000001179494

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INFOID:000000001179495 Ν

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P0444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

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

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E7, F121
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

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

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

EVAP canister purge vol	ume control solenoid valve	E	CM	Continuity
Connector	Connector	Terminal	Continuity	
F32	2	F7	9	Existed

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

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 4.

YES-2 >> Without CONSULT-III: GO TO 5.

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

4.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

- 1. Reconnect all harness connectors disconnected.
- 2. Start engine.
- 3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 6.

NO >> GO TO 5.

5.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to ECH-196, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace EVAP canister purge volume control solenoid valve.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000001179496

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

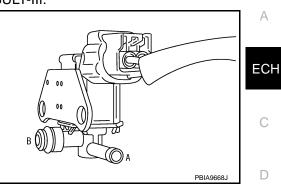
- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Turn ignition switch ON.

P0444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE [HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSIS >

- Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III. 5.
- 6. Touch "Qd" and "Qu" on CONSULT-III screen to adjust "PURG VOL CONT/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL CONT/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed



Without CONSULT-III

- Turn ignition switch OFF. 1.
- Disconnect EVAP canister purge volume control solenoid valve harness connector.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace EVAP canister purge volume control solenoid valve

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P0500 VSS

Description

INFOID:000000001179497

[HR16DE (WITH EURO-OBD)]

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:000000001179498

DTC DETECTION LOGIC **NOTE**:

- If DTC P0500 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001.Refer to <u>ECH-110, "DTC Logic"</u>.
- If DTC P0500 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to <u>ECH-111, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	 Harness or connectors (The CAN communication line is open or short- ed) Harness or connectors (The vehicle speed signal circuit is open or shorted) Wheel sensor Combination meter

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 3.

3.CHECK VEHICLE SPEED SENSOR FUNCTION

NOTE:

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

- With CONSULT-III
- 1. Start engine.
- 2. Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-III. The vehicle speed on CON-SULT-III should exceed 10 km/h (6 mph) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Go to ECH-199, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- 2. Warm engine up to normal operating temperature.
- 3. Maintain the following conditions for at least 50 consecutive seconds. CAUTION:

Always drive vehicle at a safe speed.

P0500 VSS

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ENG SPEED COOLAN TEMP/S B/FUEL SCHDL Shift lever PW/ST SIGNAL 4. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to ECH-199, "Diad NO >> INSPECTION END 5.PERFORM COMPONENT FUI	2,500 - 6,000 rpm More than 70°C (158°F) 4.3 - 31.8 msec Except Neutral position OFF gnosis Procedure".	
B/FUEL SCHDL Shift lever PW/ST SIGNAL 4. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to ECH-199, "Diagon NO NO >> INSPECTION END	4.3 - 31.8 msec Except Neutral position OFF	
Shift lever PW/ST SIGNAL 4. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to ECH-199, "Diagonal provide the second sec	Except Neutral position OFF	
PW/ST SIGNAL 4. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to ECH-199, "Diag NO >> INSPECTION END	OFF	
 4. Check 1st trip DTC. <u>Is 1st trip DTC detected?</u> YES >> Go to <u>ECH-199, "Diac</u> NO >> INSPECTION END 		
Is 1st trip DTC detected? YES >> Go to <u>ECH-199, "Diac</u> NO >> INSPECTION END	gnosis Procedure".	
YES >> Go to <u>ECH-199, "Diac</u> NO >> INSPECTION END	gnosis Procedure".	
NO >> INSPECTION END	gnosis Procedure".	
_		
O. PERFORM COMPONENT FU		
	NCTION CHECK	
check, a 1st trip DTC might not be <u>Is the inspection result normal?</u> YES >> INSPECTION END	o check the overall function o e confirmed.	onent Function Check". f the vehicle speed sensor circuit. During this
NO >> Go to <u>ECH-199, "Diac</u> Component Function Chec	-	INFOID:000000001179499
1.PERFORM COMPONENT FUI	NCTION CHECK	
 With GST 1. Lift up drive wheels. 2. Start engine. 3. Read vehicle speed sensor sinthe vehicle speed sensor on suitable gear position. Is the inspection result normal? YES >> INSPECTION END NO >> Go to ECH-199. "Diagent sensor in the sensor of th	GST should be able to excee	ed 10 km/h (6 MPH) when rotating wheels with
Diagnosis Procedure		INFOID:00000001179500
1. CHECK DTC WITH "ABS ACT	UATOR AND ELECTRIC UNI	T (CONTROL UNIT)"
Refer to <u>BRC-57</u> , " <u>DTC No. Index</u> <u>Is the inspection result normal?</u> YES >> GO TO 2. NO >> Repair or replace. 2. CHECK COMBINATION METE		
Refer to <u>MWI-57, "DTC Index"</u> .		
>> INSPECTION END		

P0605 ECM

Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

DTC Logic

DTC No.

DTC DETECTION LOGIC

Trouble diagnosis name

		A)	ECM calculation function is malfunctioning.			
P0605	Engine control module	B)	ECM EEP-ROM system is malfunctioning.	• ECM		
		C)	ECM self shut-off function is malfunctioning.			
DTC CONFIRMATION PROCEDURE						

DTC detecting condition

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

- 1. Turn ignition switch ON.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-201, "Diagnosis Procedure".
- NO >> GO TO 3.

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

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-201, "Diagnosis Procedure".

NO >> GO TO 4.

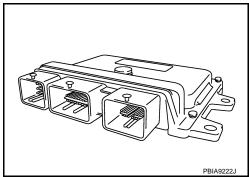
4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

- 1. Turn ignition switch ON and waitait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 3. Repeat step 2 for 32 times.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-201, "Diagnosis Procedure".
- NO >> INSPECTION END

ECH-200



INFOID:000000001179501

INFOID:000000001179502

Possible cause

< COMPONENT DIAGNOSIS >	
Diagnosis Procedure	

1.INSPECTION START 1. Turn ignition switch ON. Select "SELF-DIAG RESULTS" mode with CONSULT-III.

2. 3 Touch "FRASE"

(B)With CONSULT-III

4.	Perform DTC CONFIRMATION PROCEDURE.
	See ECH-200, "DTC Logic".

With GST

Turn ignition switch ON. 1.

- 2. Select Service \$04 with GST.
- Perform DTC CONFIRMATION PROCEDURE. 3. See ECH-200, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

- YES >> GO TO 2.
- NO >> INSPECTION END

2.REPLACE ECM

1. Replace ECM.

2. Go to ECH-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

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P1065 ECM

Description

ECM has the memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the Idle Air Volume Learning value memory, etc. even when the ignition switch is turned OFF.

DTC Logic

DTC DETECTION LOGIC

P1065 Engine control module ECM back-up RAM system does not function properly.	DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
	P1065	Engine control module		• ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Start engine and let it idle for 1 second.
- 3. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 4. Repeat steps 2 and 3 for four times.
- 5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>ECH-202</u>, "<u>Diagnosis Procedure</u>". NO >> INSPECTION END

Diagnosis Procedure

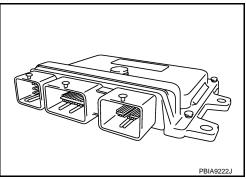
1.INSPECTION START

- With CONSULT-IIITurn ignition switch ON.
- Select "SELF-DIAG RESULTS" mode with CONSULT-III.
- 3. Touch "ERASE".
- 4. **Perform DTC CONFIRMATION PROCEDURE.** See <u>ECH-202</u>, "DTC Logic".

With GST

- 1. Turn ignition switch ON.
- 2. Select Service \$04 with GST.
- 3. Perform DTC CONFIRMATION PROCEDURE. See <u>ECH-202, "DTC Logic"</u>.
- Is the 1st trip DTC P1065 displayed again?
- YES >> GO TO 2.

INFOID:000000001179504



INFOID:000000001179505

INFOID:000000001179506

[HR16DE (WITH EURO-OBD)]

Replace ECM. Go to ECH-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Require- ment"	EC
ment".	
>> INSPECTION END	С
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P1111 IVT CONTROL SOLENOID VALVE

< COMPONENT DIAGNOSIS >

P1111 IVT CONTROL SOLENOID VALVE

Description

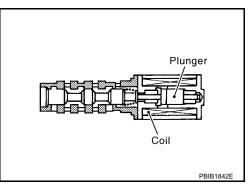
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

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

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

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



DTC Logic

DTC DETECTION LOGIC

INFOID:000000001179508

INFOID:000000001179507

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	 Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) Intake valve timing control solenoid valve

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 5 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

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

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179509

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

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

IVT control s	olenoid valve	Ground	Voltage	
Connector	Terminal	Oround		
F41	2	Ground	Battery voltage	

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 INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN

ECH-204

[HR16DE (WITH EURO-OBD)]

P1111 IVT CONTROL SOLENOID VALVE

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

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AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between intake valve timing control solenoid valve harness connector and ECM harness connector.

IVT control sole	noid valve	EC	M	Continuity		
Connector	Terminal	Connector	Terminal	Continuity		(
F41	1	F8	73	Existed		
		r short to grou	nd and short	to power.		Γ
s the inspection		mal?				
YES >> GO NO >> Rep		irouit or abort t	o ground or a	hart to nowar in k	arnaaa ar aannaatara	
3. CHECK INTA	•		-	•	narness or connectors.	E
Refer to <u>ECH-20</u>			<u>on"</u> .			F
Is the inspectior YES >> GO		<u>mar:</u>				
		e valve timing o	control solend	oid valve.		
4.CHECK INTE	RMITTEN	IT INCIDENT				(
Refer to <u>GI-39,</u> '	'Intermitter	nt Incident".				
						ŀ
>> INS	PECTION	END				
Component	Inspectio	on			INFC/ID:000000001179510	
	•					
1. CHECK INTA	KE VALVE	E TIMING CON	ITROL SOLE	NOID VALVE-I		
	intake valv	e timing contro		alve harness conr htrol solenoid valv	nector. ve terminals as follows.	
Terminals	Resis	tance [at 20°C (68	3°F)]			ŀ
1 and 2		6.7 - 7.7 Ω				
1 or 2 and ground	d is	∞Ω				l
_	(Cont	inuity should not e	exist)			
Is the inspectior YES >> GO		mal?				ľ
		e valve timing o	control solen	oid valve.		1
2.снеск і мта			ITROL SOLE	NOID VALVE-II		
1. Remove inta						ľ
2. Provide 12	/ DC betw	veen intake va	live timing co	ontrol solenoid		
		2, and then int wn in the figur		e sure that the		(
CAUTION:	03 83 310					
				onds or more.		
Doing so r timing con			o the coll if	n intake valve	5 Million	
NOTE:					Mar and a second	
	place O-ri		ake valve t	iming control		

solenoid valve is removed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace intake valve timing control solenoid valve.



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P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

< COMPONENT DIAGNOSIS >

P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

Description

INFOID:0000000001179511

[HR16DE (WITH EURO-OBD)]

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:000000001179512

INFOID:000000001179513

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause
	Electric throttle control	A)	Electric throttle control actuator does not func- tion properly due to the return spring malfunc- tion.	
P1121	actuator	B)	Throttle valve opening angle in fail-safe mode is not in specified range.	Electric throttle control actuator
		C)	ECM detect the throttle valve is stuck open.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Set shift lever to 1st position and wait at least 3 seconds.
- 3. Set shift lever to Neutral position.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON and wait at least 1 second.
- 6. Set shift lever to 1st position and wait at least 3 seconds.
- 7. Set shift lever to Neutral position.
- 8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 9. Check DTC.

Is DTC detected?

- YES >> Go to ECH-206, "Diagnosis Procedure".
- NO >> GO TO 3.

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

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Set shift lever to 1st position and wait at least 3 seconds.
- 3. Set shift lever to Neutral position.
- 4. Start engine and let it idle for 3 seconds.
- 5. Check DTC.

Is DTC detected?

- YES >> Go to ECH-206, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

< COMPONENT DIAGNOSIS >

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct.
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

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INFOID:000000001179514

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace electric throttle control actuator.
- 2. Go to ECH-207, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

[HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSIS >

P1122 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:000000001179515

[HR16DE (WITH EURO-OBD)]

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:000000001179516

DTC DETECTION LOGIC

NOTE: If DTC P1122 is displayed with DTC P1121 or P1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to <u>ECH-212, "DTC Logic"</u> or <u>ECH-206, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122	Electric throttle control performance	Electric throttle control function does not oper- ate 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 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V when engine is running.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- 3. Check DTC.

Is DTC detected?

YES >> Go to <u>ECH-208</u>, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179517

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. 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 CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

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

< COMPONENT DIAGNOSIS >

	CM					А
Connector	Terminal	Ground	Conditi	on	Voltage	
	Terminar		Ignition swite	h OFF	Approx. 0V	
F7	2	Ground	Ignition swite		Battery voltage	ECH
Is the insp	ection resu	ult norma	al?			
	> GO TO S					С
•	> GO TO (
						D
1. Check	the contin	nuity bet	ween ECM	harne	ess connector and IPDM E/R harness connector.	
IPDN	I E/R		ECM			Е
Connector	Terminal	Connec	tor Termina	– Cor I	ntinuity	
E12	32	F7	2	E>	xisted	
2. Also c	heck harn	ess for s	short to grou	ind an	nd short to power.	F
Is the insp			<u>al?</u>			
-	> GO TO	-				G
			IING PART			
Check the						Н
 Harness 	connector					
 Harness 	for open o	or short b	between thr	ottle n	notor relay and ECM	
>	> Repair o	pen or s	short to arou	ind or	short to power in harness or connectors.	
_	•	-	•		RELAY POWER SUPPLY CIRCUIT-III	
	gnition swi					J
				ss cor	nnector and ground.	
	~					K
	CM	Gro	und \	oltage/		
Connector F7	Terminal 15	Gro	und Batte	ery volta		
					nd short to power.	L
Is the insp			•			
YES >	> GO TO 7	7.				M
	> GO TO (-	_			
O. DETEC	T MALFU	NCTION	IING PART			N
Check theHarness		s F123	E6			
				ottle n	notor relay and ECM	\bigcirc
						0
_	-	pen or s	short to grou	ind or	short to power in harness or connectors.	
1.CHECK	FUSE					Р
	nnect 15A 15A fuse		o. 51) from m.	PDM	E/R.	
Is the insp			<u>al?</u>			
	> GO TO 8 > Replace		e			
•	-		INCIDENT			
0.0.1201						

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair or replace harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.

- 2. Disconnect electric throttle control actuator harness connector.
- 3. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle c	control actuator	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
	5	F7	1	Not existed
F29			4	Existed
129			1	Existed
	0		4	Not existed

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

Is the inspection result normal?

YES >> GO TO 10.

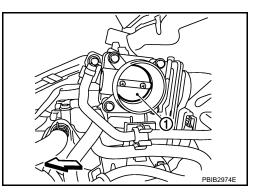
NO >> Repair or replace.

10.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Remove the intake air duct.
- 2. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

- YES >> GO TO 11.
- NO >> Remove the foreign matter and clean the electric throttle control actuator inside.



11. CHECK THROTTLE CONTROL MOTOR

Refer to ECH-211, "Component Inspection".

Is the inspection result normal?

- YES >> GO TO 12.
- NO >> GO TO 13.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-39. "Intermittent Incident".

Is the inspection result normal?

- YES >> GO TO 13.
- NO >> Repair or replace harness or connectors.
- $13. {\tt replace electric throttle control actuator}$
- 1. Replace malfunction electric throttle control actuator.

Go to <u>ECH-211, "Special Repair Requirement"</u>.

>> INSPECTION END

[HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSIS >	[HR16DE (WITH EURO-OBD)]
Component Inspection	INFOID:000000001179518
1. CHECK THROTTLE CONTROL MOTOR	
 Disconnect electric throttle control actuator harness connector. Check resistance between electric throttle control actuator terminals a 	as follows.
Terminals Resistance [at 25 °C (77°F)]	
5 and 6 Approx. 1 - 15 Ω	
<u>Is the inspection result normal?</u> YES >> INSPECTION END	
NO $>>$ GO TO 2.	
2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR	
 Replace electric throttle control actuator. Go to <u>ECH-211, "Special Repair Requirement"</u>. 	
>> INSPECTION END	
Special Repair Requirement	INF0/D:000000001179519
1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING	
Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING :	Special Repair Requirement"
>> GO TO 2.	
2. PERFORM IDLE AIR VOLUME LEARNING	
Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requi	rement"
>> END	

P1124, P1126 THROTTLE CONTROL MOTOR RELAY

< COMPONENT DIAGNOSIS >

P1124, P1126 THROTTLE CONTROL MOTOR RELAY

Description

INFOID:0000000001179520

[HR16DE (WITH EURO-OBD)]

Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

DTC Logic

INFOID:000000001179521

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	 Harness or connectors (Throttle control motor relay circuit is shorted) Throttle control motor relay
P1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	 Harness or connectors (Throttle control motor relay circuit is open) Throttle control motor relay

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8V.

Witch DTC is detected?

P1124 >> GO TO 2.

P1126 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1124

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

Is DTC detected?

- YES >> Go to ECH-212, "Diagnosis Procedure".
- NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1126

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- 3. Check DTC.

Is DTC detected?

YES >> Go to <u>ECH-212</u>, "Diagnosis Procedure". NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179522

1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Check voltage between ECM harness connector and ground.

P1124, P1126 THROTTLE CONTROL MOTOR RELAY

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

EC	M				
Connector	Terminal	Ground	Voltag	је	
F7	15	Ground	Battery vo	oltage	
Is the inspe	ction resu	It normal?			
	GO TO 3 GO TO 2				
2.DETECT			PART		
Check the f					<u> </u>
• Harness d	connectors				
 Harness f 	or open oi	r short betw	een throttle	motor relay and ECM	
>>	Repair or	oen or short	to around a	or short to power in harness or connectors.	
~	• •		-	RELAY INPUT SIGNAL CIRCUIT-I	
	nition swite				
2. Disconr	nect ECM	harness co		540	
		1 E/R harnes uitv betweer		or E12. ness connector and IPDM E/R harness connector.	
		,			
ECI	М	IPDM E	E/R	ontinuity	
Connector	Terminal	Connector	Terminal	Junitary	
F7	15	E12	25 E	Existed	
			to ground a	and short to power.	
Is the inspe					
	GO TO 5 GO TO 4				
4.DETECT		ICTIONING	PART		
Check the f	ollowing.				
• Harness of	connectors	,			
 Harness f 	or open oi	r snort detw	een throttle	motor relay and ECM	
	Repair or	oen or short	to around a	or short to power in harness or connectors.	
>>	• •			•	
_	THROTTL	E CONTRO	DL MOTOR	RELAY POWER SUPPLY CIRCUIT-II	
5.снеск				RELAY POWER SUPPLY CIRCUIT-II	
5.CHECK 1. Reconr 2. Turn igi	nect ECM	and IPDM E ch ON.	E/R harness	s connectors.	
5.CHECK 1. Reconr 2. Turn igi	nect ECM	and IPDM E ch ON.	E/R harness		
5.CHECK 1. Reconr 2. Turn igr 3. Check	nect ECM nition swite voltage be	and IPDM E ch ON.	E/R harness	s connectors.	
5.CHECK 1. Reconr 2. Turn igi	nect ECM nition swite voltage be	and IPDM E ch ON.	E/R harness	s connectors. onnector and ground.	
5.CHECK 1. Reconr 2. Turn igr 3. Check	nect ECM nition swite voltage be	and IPDM E ch ON. etween ECM	E/R harness	s connectors. onnector and ground. ge	
5.CHECK 1. Reconr 2. Turn igr 3. Check EC Connector	nect ECM nition swite voltage be :M Terminal 2	and IPDM E ch ON. etween ECM Ground Ground	E/R harness 1 harness co Voltaç	s connectors. onnector and ground. ge	
5.CHECK 1. Reconr 2. Turn igr 3. Check EC Connector F7 Is the inspe YES >>	nect ECM nition swite voltage be m Terminal 2 ction resu GO TO 8	and IPDM E ch ON. etween ECM Ground Ground It normal?	E/R harness 1 harness co Voltaç	s connectors. onnector and ground. ge	
5.CHECK 1. Reconr 2. Turn igr 3. Check EC Connector F7 Is the inspe YES >> NO >>	Terminal 2 CCION TO 8 CO TO 8 CO TO 6	and IPDM E ch ON. etween ECM Ground Ground It normal?	E/R harness 1 harness co Voltag Battery vo	s connectors. onnector and ground. ge	

EC	М	IPDM	Continuity		
Connector	Terminal	Connector	Terminal	Continuity	
F7	2	E12	32	Existed	

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

Is the inspection result normal?

YES >> GO TO 8.

NG >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F12, E9

Harness for open or short between throttle motor relay and ECM

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

8.CHECK FUSE

1. Disconnect 15A fuse (No. 51) from IPDM E/R.

2. Check 15A fuse for blown.

- Is the inspection result normal?
- YES >> GO TO 9.
- NO >> Replace 15A fuse.

9. 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 connectors.

P1128 THROTTLE CONTROL MOTOR

Description

The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:000000001179524

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P1128	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	 Harness or connectors (Throttle control motor circuit is shorted.) Electric throttle control actuator (Throttle control motor) 	E

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 2 seconds. 1. 2. Start engine and let it idle for 5 seconds. Check DTC. 3 Is DTC detected? YES >> Go to ECH-215, "Diagnosis Procedure". NO >> INSPECTION END Κ Diagnosis Procedure INFOID:000000001179525 1.CHECK GROUND CONNECTION L Turn ignition switch OFF. 1.
- 2. Check ground connection E21. 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 CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect electric throttle control actuator harness connector.

- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle of	control actuator	E	Continuity		
Connector	Terminal	Connector	Terminal	Continuity	
	5	F7	1	Not existed	
F29			4	Existed	
125	6		1	Existed	
	0		4	Not existed	

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P1128 THROTTLE CONTROL MOTOR

< COMPONENT DIAGNOSIS >

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

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3.CHECK THROTTLE CONTROL MOTOR

Refer to ECH-216, "Component Inspection".

Is the inspection result normal?

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

4.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace harness or connectors.

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to ECH-216, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

1.CHECK THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.

2. Check resistance between electric throttle control actuator terminals as follows.

Terminals Resistance [at 25 °C (77°F)]

5 and 6 Approx. 1 - 15 Ω

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to ECH-216, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000001179527

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

ECH-216

INFOID:000000001179526

P1143 HO2S1

Description

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



DTC DETECTION LOGIC

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the "rich" output is sufficiently high and whether the "lean" output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.

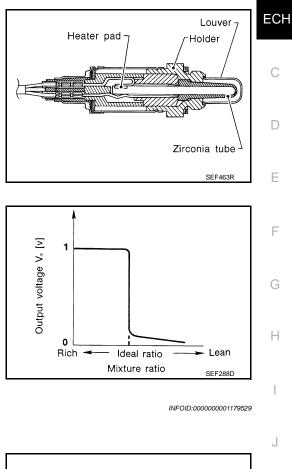
DTC No. Trouble diagnosis name DTC detecting condition Possible cause Heated oxygen sensor 1 · Heated oxygen sensor 1 heater Heated oxygen sensor 1 The maximum and minimum voltage from the P1143 Fuel pressure lean shift monitoring sensor are not reached to the specified voltages. · Fuel injector · Intake air leaks Ρ

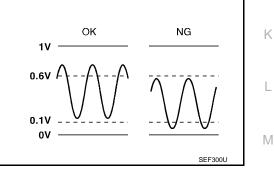
DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test. **TESTING CONDITION:**

Always perform at a temperature above -10°C (14°F)





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Before performing the following procedure, confirm that battery voltage is more than 11V at idle. Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 3.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

- 2. Stop engine and wait at least 10 seconds.
- 3. Turn ignition switch ON and select "HO2S1 (B1) P1143" of "HO2S1" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 4. Touch "START".
- 5. Start engine and let it idle for at least 3 minutes. NOTE:

Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

 When the following conditions are met, "TESTING" will be displayed on the CONSULT-III screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds or more.)

CAUTION:

Always drive vehicle at a safe speed.

ENG SPEED	1,500 - 3,900 rpm
VHCL SPEED SE	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	2.0 - 12.0 msec
Shift lever	Suitable position

If "TESTING" is not displayed after 5 minutes, retry from step 2.

7. Touch "SELF-DIAG RESULT"

Which is displayed on CONSULT-III screen?

- OK >> INSPECTION END
- NG >> Go to ECH-218, "Diagnosis Procedure".

 ${\it 3.}$ PERFORM COMPONENT FUNCTION CHECK

With GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Set voltmeter probes between EM harness connector and ground under the following condition.

EC	ECM Ground		Condition	Voltage	
Connector	Terminal	Giouna	Condition	voitage	
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant un- der no load	 The maximum voltage is over 0.6 at least 1 time. The minimum voltage is over 0.1 at least 1 time. 	

NOTE:

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

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to ECH-218, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

ECH-218

< COMPONENT DIAGNOSIS >	
NO >> Repair or replace ground connection.	
2.RETIGHTEN HEATED OXYGEN SENSOR 1	А
Loosen and retighten heated oxygen sensor 1.	
	ECH
Tightening torque: 50 N·m (5.1 kg-m, 37 ft-lb)	
>> GO TO 3. 3. CLEAR THE SELF-LEARNING DATA	С
 Clear the mixture ratio self-learning value, refer to <u>ECH-21, "MIXTURI</u> <u>CLEAR : Special Repair Requirement"</u>. 	E RATIO SELF-LEARNING VALUE
2. Run engine for at least 10 minutes at idle speed.	
	E
<u>Is the 1st trip DTC P0171 detected? Is it difficult to start engine?</u> Yes >> Perform trouble diagnosis for DTC P0171. Refer to <u>ECH-163.</u>	
No $>>$ GO TO 4.	<u>Dre Logic</u> .
4. CHECK HEATED OXYGEN SENSOR 1 HEATER	F
Refer to ECH-219, "Component Inspection".	
Is inspection result normal?	G
YES >> GO TO 5.	
NO >> Replace heated oxygen sensor 1. 5.CHECK INTERMITTENT INCIDENT	Н
Perform <u>GI-39, "Intermittent Incident"</u> . Is the inspection result normal?	
YES >> GO TO 6.	I
NO >> Repair or replace.	
6. REPLACE HEATED OXYGEN SENSOR 1	J
Replace heated oxygen sensor 1.	
	К
>> INSPECTION END	IX.
Component Inspection	INFOID:000000001179531
1.INSPECTION START	L
Do you have CONSULT-III?	
Do you have CONSULT-III?	M
YES >> GO TO 2.	
NO >> GO TO 3.	Ν
2.CHECK HEATED OXYGEN SENSOR 1	1.4
With CONSULT-III Start angine and warm it up to parmal operating temperature	
 Start engine and warm it up to normal operating temperature. Set "POST TRIGGER" to 100% in "DATA MONITOR" mode with CONS 	SULT-III.
3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".	
 Hold engine speed at 2,000 rpm under no load during the following ste Touch "RECORD" on CONSULT-III screen. 	ps. P

P1143 HO2S1

< COMPONENT DIAGNOSIS >

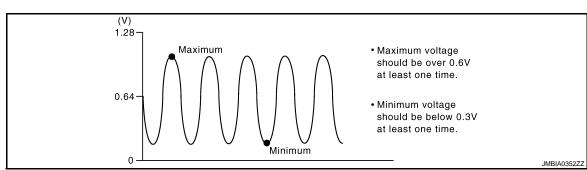
[HR16DE (WITH EURO-OBD)]



- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
- 5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

R means HO2S1 MNTR (B1) indicates RICH L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA



CAUTION:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

3.CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check the voltage between ECM harness connector and ground under the following condition.

E	ECM		Condition	Voltage	
Connector	Terminal	ground	Condition	voltage	
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	 The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. The maximum voltage is over 0.6V at least 1 time. The minimum voltage is below 0.3V at least 1 time. The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 	

CAUTION:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4

4.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1. CAUTION:

ECH-220

cycle | 1 | 2 | 3 | 4 | 5 | HO2S1 MNTR (B1) R-L-R-L-R-L-R-L-R

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

>> INSPECTION END

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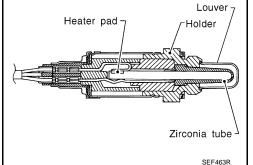
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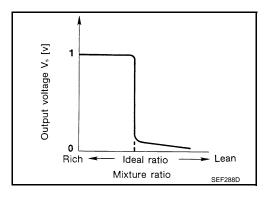
А

P1144 HO2S1

Description

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





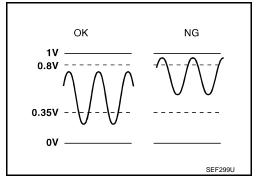
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DTC Logic

DTC DETECTION LOGIC

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the "rich" output is sufficiently high and "lean" output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1144	Heated oxygen sensor 1 rich shift monitoring	The maximum and minimum voltages from the sensor are beyond the specified voltages.	 Heated oxygen sensor 1 Heated oxygen sensor 1 heater Fuel pressure Fuel injector

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Always perform at a temperature above -10°C (14°F).

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

[HR16DE (WITH EURO-OBD)]

< COMPON	IENT DI	AGNOS	IS >	[HR16DE (WITH EURO-OBD)]					
Do you have									
	GO TO 2 GO TO 3								
-			MATION PROCEDURE						
. Start engine and warm it up to normal operating temperature.									
 Turn igr with CC Touch "5 Start en 	nition swi NSULT-I START".	itch ON	east 10 seconds. and select "HO2S1 (B1) P1143" of "H e for at least 3 minutes.	O2S1" in "DTC WORK SUPPORT" mode					
NOTE: Never r	raise en	gine sp	eed above 3,600 rpm after this step	. If the engine speed limit is exceeded,					
6. When the con seconds	to step 5 ne followi ditions c s or more DN:	ing cond ontinuo(e.)	itions are met, "TESTING" will be displa	ayed on the CONSULT-III screen. Maintain MPLETED". (It will take approximately 50					
				_					
ENG SPEED			1,500 - 3,900 rpm						
VHCL SPEE			Less than 100 km/h (62 MPH)						
B/FUEL SCHDL 2			.0 - 12.0 msec						
Shift lever Suitable position									
NG >> 3.PERFOR With GS1 1. Start en	RM COMI F Igine and	<u>CH-218,</u> PONEN ⁻	"Diagnosis Procedure". T FUNCTION CHECK up to normal operating temperature. ween EM harness connector and grou	nd under the following condition.					
ECM	1								
	Terminal	Ground	Condition	Voltage					
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant un- der no load	 The maximum voltage is over 0.8 at least 1 time. The minimum voltage is over 0.35 at least 1 time. 					
			ck to check the overall function of the hot be confirmed.	neated oxygen sensor 1 circuit. During this					
Is the inspec	ction resu	ult norma	al?						
-	INSPEC Go to E	-	ND "Diagnosis Procedure".						
Diagnosis			<u> </u>	INFOID:000000001179534					
1. снеска			ECTION						
1. Turn igr	nition swi ground co	tch OFF onnectio	n E9. Refer to Ground Inspection in <u>GI</u>	-41, "Circuit Inspection".					

Is the inspection result normal?

YES >> GO TO 2.

>> Repair or replace ground connection. NO

2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 50 N·m (5.1 kg-m, 37 ft-lb)

>> GO TO 3.

3.CLEAR THE SELF-LEARNING DATA

- 1. Clear the mixture ratio self-learning value, refer to <u>ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement"</u>.
- 2. Run engine for at least 10 minutes at idle speed.

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

Yes >> Perform trouble diagnosis for DTC P0172. Refer to <u>ECH-167, "DTC Logic"</u>.

No >> GO TO 4

4.CHECK HO2S1 CONNECTOR FOR WATER

1. Turn ignition switch OFF.

2. Disconnect heated oxygen sensor 1 harness connector.

3. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace harness or connectors.

5.CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to ECH-147, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace heated oxygen sensor 1.

6.CHECK HEATED OXYGEN SENSOR 1

Refer to ECH-231, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to <u>GI-39, "Intermittent Incident"</u>. For circuit, refer to <u>ECH-317, "Wiring Diagram - ENGINE CONTROL SYSTEM -"</u>.

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 1

With CONSULT-III

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

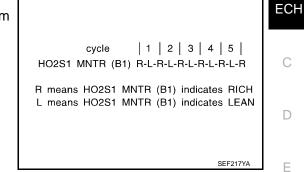
P1144 HO2S1

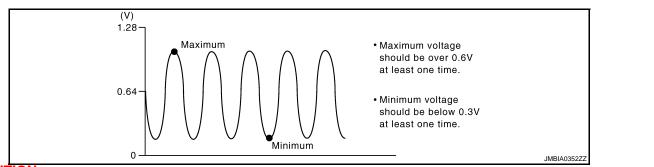


- 3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-III screen.
- 6. Check the following.

< COMPONENT DIAGNOSIS >

- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
- 5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.





CAUTION:

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

• Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

3. CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check the voltage between ECM harness connector and ground under the following condition.

EC	CM	Ground	Condition	Voltage	Ъ.Л
Connector	Terminal	Ground	Condition	Vollage	M
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load	 The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. The maximum voltage is over 0.6V at least 1 time. The minimum voltage is below 0.3V at least 1 time. The voltage never exceeds 1.0V. time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 	N

CAUTION:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

ECH-225

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4.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

CAUTION:

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

>> INSPECTION END

P1146 HO2S2

Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

DTC Logic

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuelcut.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146	Heated oxygen sensor 2 circuit low voltage	The maximum voltage from the sensor is not reached to the specified voltage.	 Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 Fuel pressure Fuel injector Intake air leaks

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III? Do you have CONSULT-III?

YES >> GO TO 2. NO >> GO TO 11.

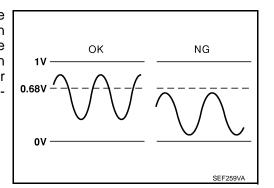
2.PRECONDITIONING

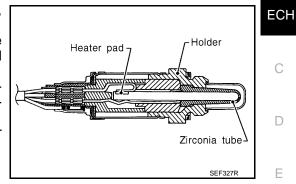
"COMPLETED" will appear on CONSULT-III screen when all tests "COND1", "COND2" and "COND3" are completed.

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

For the best results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F). Never stop engine during this procedure. If the engine is stopped, retry this procedure from 4. PER-FORM PROCEDURE FOR COND1-I.





[HR16DE (WITH EURO-OBD)]

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>> GO TO 3.

3.PERFORM PROCEDURE FOR COND1

Start engine and warm it up to normal operating temperature.

>> GO TO 4.

4.PERFORM PROCEDURE FOR COND1-I

Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 5.

5. PERFORM PROCEDURE FOR COND1-II

- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. 1.
- 2. Let engine idle 1 minute.
- Select "HO2S2 (B1) P1146" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III. 3.
- Touch "START". 4
- 5. Start engine and let it idle for at least 30 seconds.
- Rev engine up to 2,000 rpm two or three times guickly under no load.

Is "CONPLETED" appears on CONSULT-III screen?

YES >> GO TO 7.

NO >> GO TO 4.

6.PERFORM PROCEDURE FOR COND1-I

When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-III screen. Maintain the condition continuously until "TESTING" changes to "COMPLETED" (It will take approximately 60 seconds.)

ENG SPEED	More than 1,200 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLAN TEMP/S	More than 70°C (158°F)
Shift level	Suitable position

Which displayed on CONSULT-III screen?

COND1: OUT OF CONDITION>>GO TO 4.

COND1: COMPLETED COND2: INCOMPLETED>>GO TO 7. COND1: COMPLETED COND2: COMPLETED>>GO TO 8.

PERFORM PROCEDURE FOR COND2

While driving, release accelerator pedal completely from the above condition until "INCOMPLETED" at "COND2" on CONSULT-III screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

Which displayed on CONSULT-III screen?

COND2: COMPLETED COND3: INCOMPLETED>>GO TO 8. COND2: COMPLETED COND3: COMPLETED>>GO TO 9.

8.PERFORM PROCEDURE FOR COND3

Stop vehicle and let it idle until "INCOMPLETED" of "COND3" on CONSULT-III screen has turned to "COM-PLETED". (It will take a maximum of approximately 6 minutes.)

>> GO TO 9.

9.PERFORM PROCEDURE FOR COND3-I

Touch "SELF DIAGRESULTS".

Which displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Go to <u>ECH-230</u>, "Diagnosis Procedure". CAN NOT BE DIAGNOSED>>GO TO 10.

P1146 HO2S2

< COMPONENT DIAGNOSIS > 10.PERFORM PROCEDURE FOR COND3-II 1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle). Turn ignition switch ON and select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-III. 2. 3. Start engine and warm it up while monitoring "COOLAN TEMP/S" indication on CONSULT-III. 4. When "COOLAN TEMP/S" indication reaches to 70°C (158°F). >> GO TO 5. 11.PREFORM COMPONENT FUNCTION CHECK Perform component function check. Refer to ECH-231, "Component Inspection". NOTE: Use component function check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed. Is the inspection result normal? YFS >> INSPECTION END NO >> Go to ECH-230, "Diagnosis Procedure". Component Function Check INFOID:000000001179538 1.PERFORM COMPONENT FUNCTION CHECK-I With GST
 1. Start engine and warm it up to the normal operating temperature. 2. Turn ignition switch OFF and wait at least 10 seconds. 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. Let engine idle for 1 minute. 4 5. Check the voltage between ECM harness connector and ground under the following condition. ECM Condition Voltage Ground Terminal Connector 50 Revving up to 4,000 rpm under no The voltage should be above 0.68V at least once during F8 Ground (HO2S2 signal) load at least 10 times this procedure. Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2. PERFORM COMPONENT FUNCTION CHECK-II Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground	Condition	Voltage	IVI
Connector	Terminal	Giouna	Condition	voltage	
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68V at least once during this procedure.	Ν
		10			

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

 ${f 3}.$ PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage	
Connector	Terminal	Ground	Condition	voltage	
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear po- sition	The voltage should be above 0.68V at least once during this procedure.	

Is the inspection result normal?

ECH-229

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INFOID:000000001179539

< COMPONENT DIAGNOSIS >

YES >> INSPECTION END NO >> Go to <u>ECH-230, "Diagnosis Procedure"</u>.

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. 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. CLEAR THE SELF-LEARNING DATA

1. Clear the mixture ratio self-learning value, refer to <u>ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE</u> <u>CLEAR : Special Repair Requirement"</u>.

2. Run engine for at least 10 minutes at idle speed.

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

YES >> Perform trouble diagnosis for DTC P0172. Refer to ECH-167, "DTC Logic".

NO >> GO TO 3.

 $\mathbf{3.}$ CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

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

HO2	S2	EC	Continuity	
Connector Terminal		Connector	Terminal	Continuity
E58	1	F8	59	Existed

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

Is the inspection result normal?

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

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F121, E7

Harness for open or short between HO2S2 and ECM

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

5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

HO2S2		ECM		Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
E58	4	F8	50	Existed	

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

HO2S2		ECM		Ground	Continuity
Connector	Terminal	Connector Terminal		Cround	Continuity
E58	4	F8	50	Ground	Not existed

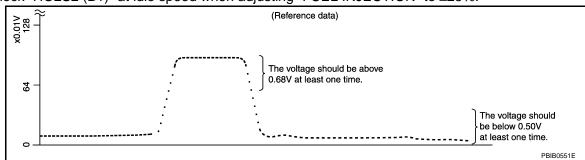
3. Also check harness for short to power.

< COMPONENT DIAGNOSIS >	[
Is the inspection result normal?	
YES >> GO TO 7.	A
NO >> GO TO 6	
6.DETECT MALFUNCTIONING PART	
Check the following.	ΞΕ
Harness connectors F121, E7	
 Harness for open or short between HO2S2 and ECM 	
	(
>> Repair open circuit or short to ground or short to power in ha	rness or connectors.
7.CHECK HEATED OXYGEN SENSOR 2	I
Refer to ECH-231, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 9.	E
NO >> GO TO 8.	
8. REPLACE HEATED OXYGEN SENSOR 2	
Replace heated oxygen sensor 2.	I
CAUTION:	
 Discard any heated oxygen sensor which has been dropped from 	a height of more than 0.5 m (19.7
in) onto a hard surface such as a concrete floor; use a new one.Before installing new oxygen sensor, clean exhaust system thre	
Cleaner tool and approved anti-seize lubricant.	aus using oxygen sensor rineau
	ŀ
>> INSPECTION END	
9. CHECK INTERMITTENT INCIDENT	
Refer to GI-39, "Intermittent Incident".	
>> INSPECTION END	
Component Inspection	INF0ID:000000001179540
1.INSPECTION START	ŀ
Do you have CONSULT-III?	
Do you have CONSULT-III?	l
YES >> GO TO 2. NO >> GO TO 3.	
	Ν
2.CHECK HEATED OXYGEN SENSOR 2	Ν
With CONSULT-III	
1. Turn ignition switch ON and select "DATA MONITOR" mode with CO	NSULT-III.
 Start engine and warm it up to the normal operating temperature. Turn ignition switch OFF and wait at least 10 seconds. 	1
 Start engine and keep the engine speed between 3,500 and 4,000 rp 	m for at least 1 minute under no load.
5. Let engine idle for 1 minute.	(
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "H	
CONSULT-III.	
	F

P1146 HO2S2

< COMPONENT DIAGNOSIS >

7. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%. "HO2S2 (B1)" should be below 0.50V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground	Condition	Voltage
Connector	Terminal	Giouna	Condition	voltage
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground	Condition	Voltage
Connector	Terminal	Giouna	Condition	voltage
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 min- utes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector and ground under the following condition.

ECH-232

P1146 HO2S2

< COMPONENT DIAGNOSIS >

<u> </u>	ECM			
^		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.
	ection result nor			
NO >:	> INSPECTION > GO TO 6.			
J. REPLA	CE HEATED OX	YGEN S	ENSOR 2	
CAUTION Discard in) onto Before i	any heated oxy a hard surface nstalling new c	ygen ser such as oxygen s	a concrete floor; use a new one.	om a height of more than 0.5 m (19. reads using Oxygen Sensor Threa
>:	> INSPECTION	END		

P1147 HO2S2

Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

DTC Logic

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DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.

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

-	

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	 Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

YES >> GO TO 2. NO >> GO TO 11.

NO >> GO TO 11.

2. PRECONDITIONING

"COMPLETED" will appear on CONSULT-III screen when all tests "COND1", "COND2" and "COND3" are completed.

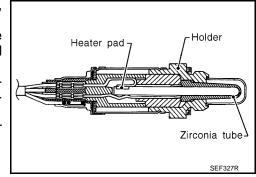
If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

Never stop engine during this procedure. If the engine is stopped, retry this procedure from 4. PER-FORM PROCEDURE FOR COND1-I.

ECH-234



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[HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSI	S > [HR16DE (WITH EURO-OBD)]
3.PERFORM PROCEDURE	FOR COND1
Start engine and warm it up to	o normal operating temperature.
>> GO TO 4. 4. PERFORM PROCEDURE	
Turn ignition switch OFF and	
>> GO TO 5.	
5.PERFORM PROCEDURE	
 Let engine idle 1 minute. Select "HO2S2 (B1) P114 Touch "START". Start engine and let it idle 	om two or three times quickly under no load.
NO >> GO TO 6.	
6.PERFORM PROCEDURE	FOR COND1-I
	s are met, "TESTING" will be displayed at "COND1" on the CONSULT-III screen. Jously until "TESTING" changes to "COMPLETED" (It will take approximately 60
ENG SPEED	More than 1,200 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLAN TEMP/S	More than 70°C (158 °F)
Shift level	Suitable position
	ON>>GO TO 4. ND2: INCOMPLETED>>GO TO 7. ND2: COMPLETED>>GO TO 8.
	erator pedal completely from the above condition until "INCOMPLETED" at
"COND2" on CONSULT-III scr Which displayed on CONSUL COND2: COMPLETED CON	reen has turned to "COMPLETED". (It will take approximately 4 seconds.)
8.PERFORM PROCEDURE	FOR COND3
	til "INCOMPLETED" of "COND3" on CONSULT-III screen has turned to "COM- num of approximately 6 minutes.)
>> GO TO 9.	
9.PERFORM PROCEDURE	FOR COND3-I
Touch "SELF DIAGRESULTS"	
Which displayed on CONSUL	
OK >> INSPECTION EN	ID 'Diagnosis Procedure"

NG >> Go to <u>ECH-237</u>, "Diagnosis Procedure". CAN NOT BE DIAGNOSED>>GO TO 10.

P1147 HO2S2

< COMPONENT DIAGNOSIS >

10.PERFORM PROCEDURE FOR COND3-II

- 1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- 2. Turn ignition switch ON and select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-III.
- 3. Start engine and warm it up while monitoring "COOLAN TEMP/S" indication on CONSULT-III.
- 4. When "COOLAN TEMP/S" indication reaches to 70°C (158°F).

>> GO TO 5.

11. PREFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-238, "Component Inspection".

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-237, "Diagnosis Procedure".

Component Function Check

INFOID:000000001179543

1.PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector and ground under the following condition.

	ECM Ground		Condition	Voltage
Connector	Terminal	Ground	Sound Condition	vonage
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground	Condition	Voltage
Connector	Terminal	Giouna	Condition	volage
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

$\mathbf{3}.$ PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground	Condition	Voltage
Connector	Terminal	Giouna	Condition	voltage
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear po- sition	The voltage should be above 0.50V at least once during this procedure.

Is the inspection result normal?

ECH-236

< COMPONEN	T DIAGNOSI	S >	• •	[HR16DE (WITH EURO-OBD)]	
	PECTION EN to <u>ECH-237,</u> "		Procedu	ure". A	4
Diagnosis P	ocedure			INFO/D:000000001179544	
1.CHECK GRO		CTION		EC	СН
2. Check grou <u>Is the inspection</u> YES >> GO	result norma	<u>?</u>		ound Inspection in <u>GI-41, "Circuit Inspection"</u> .	_
· · ·		-		PEN AND SHORT)
2. Disconnect	heated oxyge ECM harness ontinuity betw	connector.		ess connector.	-
HO2S2		CM	- Continu	F	_
Connector Terr	inal Connecto	r Terminal	Continu		
E58		59	Existe		3
 4. Also check harness for short to ground and short to power. <u>Is the inspection result normal?</u> YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART 					-
 Harness conn Harness for openetsed to the second secon	ectors F121, E	7.	2S2 and	nd ECM.	
	•		0	nd or short to power in harness or connectors. OR OPEN AND SHORT	J
1. Check the o	ontinuity betw	een HO2S	2 harnes	ess connector and ECM harness connector.	<
HO2S2	E	CM			
Connector Term	inal Connecto	Terminal	Continu	uity	_
E58 4	F8	50	Existed	ed	
2. Check the o	ontinuity betw	een HO2S	2 harnes	ess connector or ECM harness connector and ground. \mathbb{N}	Л
HO2S2	E	СМ	Oraciand		
Connector Term	inal Connector	Terminal	Ground	d Continuity	1
E58 4	F8	50	Ground	d Not existed	
	harness for sh	•	ər.	C)
<u>Is the inspection result normal?</u> YES >> GO TO 6.					-
NO >> GO 5. DETECT MA		NG PART		P	C
Harness conn	ectors F121, I	7.	000		

• Harness for open or short between HO2S2 and ECM.

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

 $6. {\sf CHECK} {\rm HO2S2} {\rm CONNECTOR} {\rm FOR} {\rm WATER}$

Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace harness or connectors.

7.CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-238. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8.replace heated oxygen sensor 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

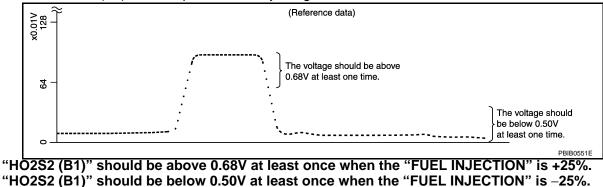
YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.
- 7. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



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< COMPONENT DIAGNOSIS >
Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal	Giouna	Condition	voltage
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage	
Connector	Terminal	Giouna	Condition	voltage	
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 min- utes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.	

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground Condition	Voltage	M	
Connector	Terminal	Giouna	Condition	vollage	
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.	Ν
Is the inspection result normal?					

YES >> INSPECTION END

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

P1212 TCS COMMUNICATION LINE

P1212 TCS COMMUNICATION LINE

Description

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and "ABS actuator and electric unit (control unit)". Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.

DTC Logic

DTC DETECTION LOGIC

< COMPONENT DIAGNOSIS >

NOTE:

- If DTC P1212 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to <u>ECH-110, "DTC Logic"</u>.
- If DTC P1212 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to <u>ECH-111, "DTC Logic"</u>.

Freeze frame data is not stored in the ECM for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P1212	TCS communication line	ECM can not receive the information from "ABS actuator and electric unit (control unit)" continuously.	 Harness or connectors (The CAN communication line is open or short- ed.) ABS actuator and electric unit (control unit) Dead (Weak) battery 	G

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:

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

>> GO TO 2. 2. PERFORM DTC CONFIRMATION PROCEDURE Κ Start engine and let it idle for at least 10 seconds. 1. Check 1st trip DTC. 2. Is 1st trip DTC detected? L YES >> Go to ECH-241, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure M INFOID:000000001179548 Go to BRC-6, "Work Flow". Ν

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INFOID:000000001179546

P1217 ENGINE OVER TEMPERATURE

< COMPONENT DIAGNOSIS >

P1217 ENGINE OVER TEMPERATURE

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1217 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to <u>ECH-110, "DTC Logic"</u>.
- If DTC P1217 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to <u>ECH-111, "DTC Logic"</u>.

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217	Engine over tempera- ture (Overheat)	 Cooling fan does not operate properly (Overheat). Cooling fan system does not operate properly (Overheat). Engine coolant was not added to the system using the proper filling method. Engine coolant is not within the specified range. 	 Harness or connectors (The cooling fan circuit is open or short- ed.) IPDM E/R (Cooling fan relays -1 and -2) Cooling fan motor Radiator hose Radiator Radiator cap Reservoir tank Water pump Thermostat

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to <u>CO-9</u>, <u>"Inspection"</u>. Also, replace the engine oil. Refer to <u>LU-6</u>, <u>"Inspection"</u>.

- 1. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to <u>LU-6</u>, "Inspection".
- 2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-242, "Component Function Check".

NOTE:

Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to ECH-243, "Diagnosis Procedure".

Component Function Check

INFOID:000000001179550

1.PERFORM COMPONENT FUNCTION CHECK-I

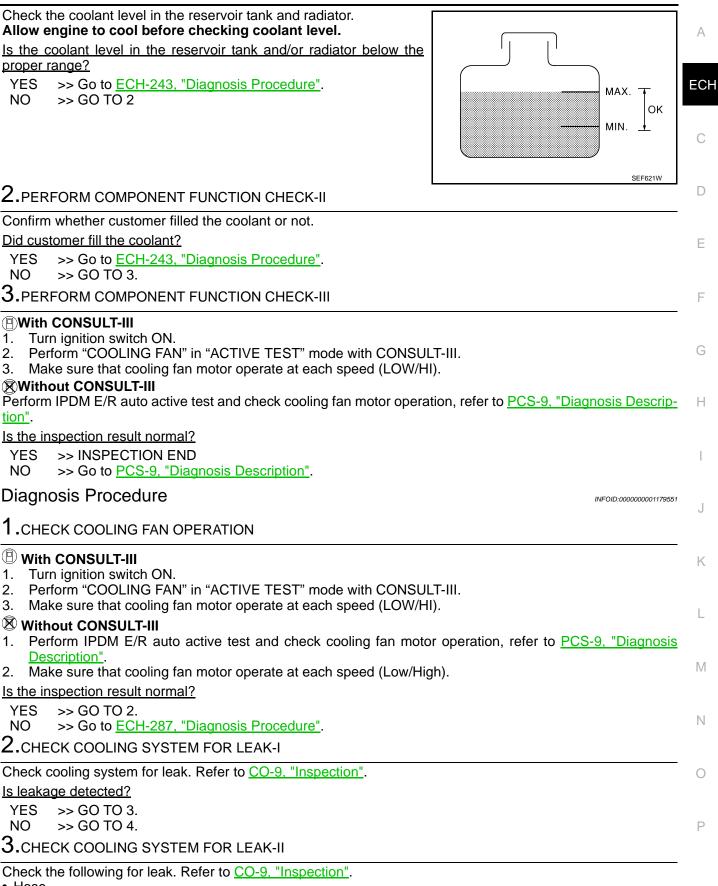
WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

P1217 ENGINE OVER TEMPERATURE

[HR16DE (WITH EURO-OBD)]



- Hose
- Radiator
- Water pump

< COMPONENT DIAGNOSIS >

P1217 ENGINE OVER TEMPERATURE

< COMPONENT DIAGNOSIS >

>> Repair or replace malfunctioning part.

4.CHECK RADIATOR CAP

Check radiator cap. Refer to CO-13, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator cap.

5.CHECK THERMOSTAT

Check thermostat. Refer to CO-19. "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat.

6.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to ECH-125, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace engine coolant temperature sensor.

7.CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	 Blocked radiator Blocked condenser Blocked radiator grille Blocked bumper 	• Visual	No blocking	_
-	2	Coolant mixture	Coolant tester	50 - 50% coolant mixture	CO-9, "Inspection"
-	3	Coolant level	Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-9, "Inspection"
-	4	Radiator cap	Pressure tester	59 - 98 kPa (0.6 - 1.0 bar, 0.6 - 1.0 kg/ cm ² , 9 - 14 psi) (Limit)	CO-14, "Inspection"
ON* ²	5	Coolant leaks	Visual	No leaks	CO-9, "Inspection"
ON* ²	6	Thermostat	 Touch the upper and lower radiator hoses 	Both hoses should be hot	CO-20, "Inspection"
ON* ¹	7	Cooling fan motor	CONSULT-III	Operating	ECH-288, "Component Inspection (Cooling Fan Motor)"
OFF	8	Combustion gas leak	Color checker chemical tester 4 Gas analyzer	Negative	_
ON* ³	9	Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	_
		Coolant overflow to res- ervoir tank	• Visual	No overflow during driving and idling	CO-9, "Inspection"
OFF* ⁴	10	Coolant return from res- ervoir tank to radiator	• Visual	Should be initial level in reservoir tank	CO-9, "Inspection"
OFF	11	Cylinder head	Straight gauge feeler gauge	0.1 mm (0.004 in) Maxi- mum distortion (warping)	EM-81, "Inspection"
	12	Cylinder block and pis- tons	Visual	No scuffing on cylinder walls or piston	EM-102, "Inspection"

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.



P1217 ENGINE OVER TEMPERATURE [HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSIS >	[HR16DE (WITH EURO-OBD)]	
*4: After 60 minutes of cool down time.		
For more information, refer to <u>CO-5, "Troubleshooting Chart"</u> .		А
>> INSPECTION END		

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P1225 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

6.0 4.0 4.0 4.0 4.0 4.0 5 ensor 1 4.0 5 ensor 1 5 ensor 1 5 ensor 2 5 ensor 4 6 ensor 4 5 ensor 4 6 ensor 4

DTC Logic

DTC DETECTION LOGIC

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INFOID:000000001179552

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225	Closed throttle position learning performance	Closed throttle position learning value is excessively low.	Electric throttle control actuator (TP 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 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>ECH-246, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.

2. Remove the intake air duct.

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[HR16DE (WITH EURO-OBD)]

P1225 TP SENSOR

< COMPONENT DIAGNOSIS >

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

Replace electric throttle control actuator. 2. Go to ECH-247, "Special Repair Requirement".

2. PERFORM IDLE AIR VOLUME LEARNING

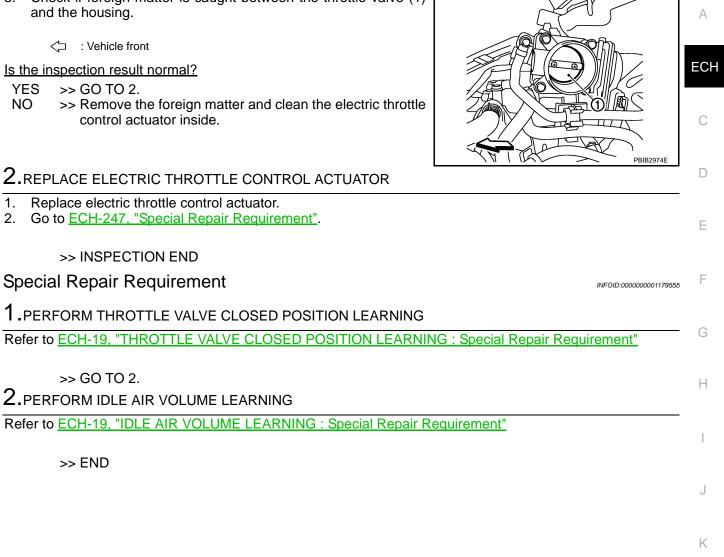
>> INSPECTION END

Special Repair Requirement

YES >> GO TO 2.

1.

>> Remove the foreign matter and clean the electric throttle NO control actuator inside.



>> END

>> GO TO 2.

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[HR16DE (WITH EURO-OBD)]

P1226 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

6.0 Throttle position sensor output voltage 0 0 0 0 0 Sensor 1 Seńsor 2 0 0 45 90 135 Throttle valve opening angle (deg) PBIB0145E

DTC Logic

DTC DETECTION LOGIC

INFOID:000000001179557

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226	Closed throttle position learning performance	Closed throttle position learning is not per- formed successfully, repeatedly.	Electric throttle control actuator (TP 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 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- Turn ignition switch OFF, wait at least 10 seconds. 2.
- Turn ignition switch ON. 3.
- Repeat steps 2 and 3 for 32 times. 4.
- Check 1st trip DTC. 5.

Is 1st trip DTC detected?

- YES >> Go to ECH-248, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179558

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- Turn ignition switch OFF. 1.
- 2. Remove the intake air duct.

Throttle position sensor

P1226 TP SENSOR

< COMPONENT DIAGNOSIS >

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

<□ : Vehicle front

Is the inspection result normal?

Replace electric throttle control actuator. 2. Go to ECH-247, "Special Repair Requirement".

2. PERFORM IDLE AIR VOLUME LEARNING

>> INSPECTION END

Special Repair Requirement

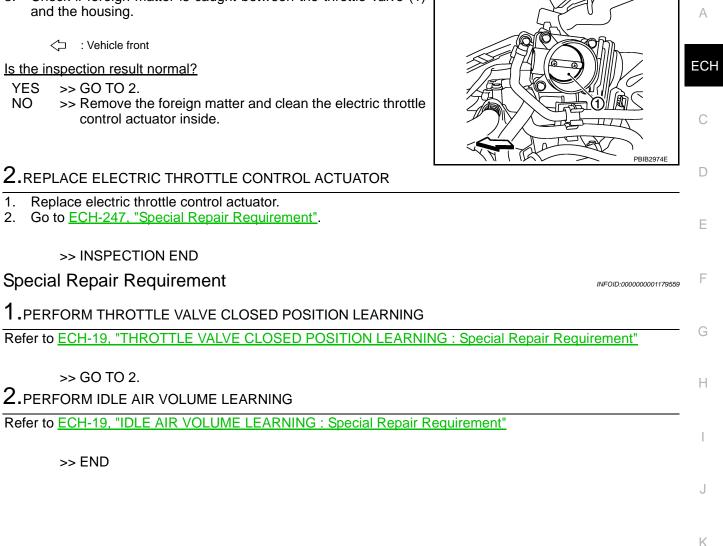
>> GO TO 2.

>> END

YES >> GO TO 2.

1.

>> Remove the foreign matter and clean the electric throttle NO control actuator inside.



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[HR16DE (WITH EURO-OBD)]

P1229 SENSOR POWER SUPPLY

DTC Logic

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[HR16DE (WITH EURO-OBD)]

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	 Harness or connectors (APP sensor 1 circuit is shorted.) (TP sensor circuit is shorted.) [Camshaft position sensor (PHASE) circuit is shorted.] Accelerator pedal position sensor Throttle position sensor Camshaft position sensor (PHASE)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

- YES >> Go to ECH-250, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection E21. 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 ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.

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

APP s	sensor	Ground	Voltage	
Connector	Terminal	Crodina	vollage	
E110	4	Ground	Approx. 5V	

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUITS

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

ECH-250

P1229 SENSOR POWER SUPPLY

< COMPONENT DIAGNOSIS >

E	ECM Sensor			А		
Connector	Terminal	Item	Connector	Terminal		
	72	Electric throttle control actuator	F29	1		ECF
F8	78	CMP sensor (PHASE)	F26	1		
E16	106	APP sensor	E110	4		
Is the inspecti	on result norr	mal?				С
	O TO 4.					
NO >> R 4.CHECK CO	-	ground or short to power in ha	rness or conne	ectors.		D
 Check the foll Camshaft period 		r (PHASE) (Refer to <u>ECH-188,</u>	"Component Ir	spection".)		_
Is the inspecti		. , .		<u> </u>		Е
	O TO 5.					
_	•	nctioning component.				F
5.CHECK TR	P SENSOR					
		onent Inspection"				G
Is the inspecti		<u>mal?</u>				G
	O TO 9. O TO 6.					
•		HROTTLE CONTROL ACTUA	TOR			Н
		e control actuator.				
2. Go to <u>EC</u>		LERATOR PEDAL RELEASE	D POSITION L	EARNING	: Special Repair Require-	
<u>ment"</u> .						
>> IN	SPECTION	END				1
7. CHECK AF						J
		onent Inspection".				
Is the inspecti						Κ
	io to 9.					
_	io to 8.					I
8.REPLACE	ACCELERAT	FOR PEDAL ASSEMBLY				
		edal assembly.		_		
2. Go to <u>EC</u> <u>ment"</u> .	H-18, "ACCE	ELERATOR PEDAL RELEASE	<u>D POSITION L</u>	<u>EARNING</u>	: Special Repair Require-	M
<u>ment</u> .						
>> II	SPECTION	END				Ν
9.CHECK IN	TERMITTEN	T INCIDENT				
Refer to GI-39, "Intermittent Incident".						~
						0
>> INSPECTION END						
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P1564 ASCD STEERING SWITCH

Description

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated. Refer to <u>ECH-48</u>, "System Description" for the ASCD function.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>ECH-200, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564	ASCD steering switch	 An excessively high voltage signal from the ASCD steering switch is sent to ECM. ECM detects that input signal from the ASCD steering switch is out of the specified range. ECM detects that the ASCD steering switch is stuck ON. 	 Harness or connectors (The switch circuit is open or shorted.) ASCD steering switch ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Wait at least 10 seconds.
- 3. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 4. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 5. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 6. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 7. Check DTC.

Is DTC detected?

- YES >> Go to ECH-252, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

- YS >> GO TO 2.
- NO >> Repair or replace ground connection.
- 2.CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT-III

1. Turn ignition switch ON.

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INFOID:000000001179563

P1564 ASCD STEERING SWITCH

< COMPONENT DIAGNOSIS >

- Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check each item indication under the following conditions.

Monitor item	Condition	Indication	
MAIN SW	MAIN switch	Pressed	ON
		Released	OFF
CANCEL SW	CANCEL switch	Pressed	ON
CANCEL SW		Released	OFF
RESUME/ACC SW	RESUME/ACCELERATE switch	Pressed	ON
RESOME/ACC SW		Released	OFF
SET SW	SET/COAST switch	Pressed	ON
		Released	OFF

Without CONSULT-III

1. Turn ignition switch ON.

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

E16	Termina	al	- Ground	Condition	Voltage
E16					
E16				MAIN switch: Pressed	Approx. 0V
E16				CANSEL switch: Pressed	Approx. 1\
	94 ASCD steering sv	• ·	Ground	SET/COAST switch: Pressed	Approx. 2
	(ACCED Steering S	witch orginally		RESUME/ACCELERATE switch: Pressed	Approx. 3V
				All ASCD steering switches: Released	Approx. 4V
CHECK AS . Turn igniti . Disconne . Disconne	ion switch OFF. ct ECM harness ct combination sv	connector. vitch harnes	s connecto	RCUIT FOR OPEN AND SHORT or M352. itch and ECM harness connector.	
ASCD steering	switch E0	CM	0		
Terminal	Connector	Terminal	Continuity		
15	E16	95	Existed		
<u>s the inspections</u> YES >> G	k harness for sho on result normal O TO 5. O TO 4. IALFUNCTIONIN	2	and short	to power.	

Harness connectors M77, E105

• Combination switch (spiral cable)

Harness for open and short between ECM and ASCE steering switch

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

5. Check ascd steering switch input signal circuit for open and short

[HR16DE (WITH EURO-OBD)]

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P1564 ASCD STEERING SWITCH

< COMPONENT DIAGNOSIS >

INFOID:000000001179565

1. Check the continuity between ECM harness connector and ASCD steering switch.

ASCD steering switch	ECM		Continuity
Terminal	Connector	Terminal	Continuity
14	E16	94	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.

NO >> GO | O b.

6.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, E105
- Combination switch (spiral cable)

· Harness for open and short between ECM and ASCE steering switch

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

7.CHECK ASCD STEERING SWITCH

Refer to ECH-254, "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.

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

Combination meter			Desisteres	
Connector	Terminals	Condition	Resistance	
	MAIN switch: Pressed		Approx. 0 Ω	
		CANCEL switch: Pressed	Approx. 250 Ω	
M325	14 and 15	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

< COMPONENT DIAGNOSIS > P1572 ASCD BRAKE SWITCH

Description

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal). Refer to <u>ECH-48</u>, "System Description" for the ASCD function.

DTC Logic

DTC DETECTION LOGIC **NOTE**:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>ECH-200, "DTC Logic"</u>.
- This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
		A) When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time.	(The stop lamp switch circuit is shorted.)Harness or connectors (The ASCD brake switch circuit is shorted.)
P1572	ASCD brake switch	ASCD brake switch signal is not sent to B) ECM for extremely long time while the ve- hicle is driving.	 Harness or connectors (The ASCD clutch switch circuit is shorted.) Stop lamp switch ASCD brake switch ASCD clutch switch Incorrect stop lamp switch installation Incorrect ASCD brake switch installation ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

NOTE:

Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for malfunction B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

With CONSULT-III

- 1. Start engine.
- 2. Select "ĎATA MONITOR" mode with CONSULT-III.
- 3. Press MAIN switch and make sure that CRUISE indicator is displayed in combination meter.
- 4. Drive the vehicle for at least 5 consecutive seconds under the following conditions.
- CAUTION:

Always drive vehicle at a safe speed. NOTE:

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

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VHCL SPEED SE

More than 30 km/h (19 mph) Suitable position

5. Check 1st trip DTC.

With GST

Shift lever

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Go to ECH-256, "Diagnosis Procedure".

NO >> GO TO 3.

${f 3.}$ perform dtc confirmation procedure for malfunction b

(P)With CONSULT-III

Drive the vehicle for at least 5 consecutive seconds under the following conditions. 1.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

VHCL SPEED SE	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

With GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

- >> Go to ECH-256, "Diagnosis Procedure". YES NO
- >> INSPECTION END

Diagnosis Procedure

1.CHECK OVERALL FUNCTION-I

(I) With CONSULT-III

- Turn ignition switch ON. 1.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "BRAKE SW1" indication under the following conditions.

Monitor item	Condition	Indication	
BRAKE SW1	Brake pedal and clutch pedal	Slightly depressed	OFF
DINARE SWI	Brake pedal and clutch pedal	Fully released	ON

Without CONSULT-III

1. Turn ignition switch ON.

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

ECM		Ground	Condition		Voltage
Connector	Terminal	Giouna	Condition		voltage
E16	100	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V
L10	(ASCD brake switch signal)	Gibunu	Brake pedar and clutch pedar	Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.

ECH-256

[HR16DE (WITH EURO-OBD)]

			515 >			[
•	>> GO TO						Δ
Z.CHEC	K ASCD E	RAKE S	SWITCH CIR	CUIT			A
	ignition sv			ness connector.			
	ignition sv						ECH
				rake switch harne	ess connector a	nd ground.	
			1				С
ASCD Clu	utch switch	Ground	C	Condition	Voltage (V)		C
Connector	Terminal						
E112	1	Ground	Clutch pedal	Slightly depressed	Approx. 0		D
				Fully released	Battery voltage		
Is the insp			<u>nal?</u>				Е
	>> GO TO >> GO TO						
•				NER SUPPLY CI	PCUIT		
							F
	ignition sv			ness connector.			
3. Turn	ignition sv	itch ON					G
4. Chec	k the volta	ige betw	een ASCD c	lutch switch harn	ess connector a	ind ground.	G
	lutch switch	Groun	d Voltage				Н
Connector			L Datta and				
E111		Groun	-	ige			
Is the insp			<u>nal?</u>				I
	>> GO TO >> GO TO						
4			NING PART				J
Check the							
			E105, M77				LZ.
• 10A fus							Κ
 Harness 	s for open	or snort	between AS	CD brake switch	and fuse		
	-> Ronair	onen cir	cuit or short	to around or shor	t to nower in ha	rness or connectors.	L
_	•	•		UT SIGNAL CIR	•		
							5.4
	ignition sv k the con			D brake switch h	arness connect	tor and ASCD clutch switch harness	M
conne		interty by					
							Ν
ASCD b	orake switch	AS	CD clutch switc	h Continuity			
Connector	Termina	I Conn	ector Termir	al			
E112	1	E1	11 2	Existed			0
3. Also	check har	ness for	short to grou	ind and short to p	ower.		
Is the insp			<u>nal?</u>				Р
-	>> GO TO	-		to around creker	tto powerin k -	mana ar anna stara	-
~	-	-		to ground or shor	t to power in ha	rness or connectors.	
6.CHEC							
				on (ASCD Brake	<u>Switch)"</u> .		
Is the insp	pection res	<u>sult norn</u>	nal?				

YES >> GO TO 14.

< COMPONENT DIAGNOSIS >

< COMPONENT DIAGNOSIS >

NO >> Replace ASCD brake switch.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

ECM		ASCD brake switch		Continuity
Connector	Terminal	Connector Terminal		Continuity
E16	100	E112	2	Existed

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

Is the inspection result normal?

YES >> GO TO 8.

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

8.CHECK ASCD CLUTCH SWITCH

Refer to ECH-259, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace ASCD clutch switch.

9.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp	o switch	Ground	Voltage	
Connector	Terminal	Gibana		
E114	1	Ground	Battery voltage	

Is the inspection result normal?

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

10. DETECT MALFUNCTIONING PART

Check the following.

• 10A fuse (No.11)

• Harness for open or short between stop lamp switch and battery

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

11. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

2. Check the continuity between ECM harness connector and stop lamp switch harness connector.

ECM		Stop lamp switch		Continuity
Connector	Terminal	Connector Terminal		Continuity
E10	106	E114	2	Existed

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

Is the inspection result normal?

YES >> GO TO 13.

NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

А

Harness for open or short between ECM and stop lamp switch

< COMPONENT DIAGNOSIS >

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

		MP SWITCH	to ground or short to power in namess or connectors.	ECH
Refer to EC	CH-260, "Coi	mponent Inspecti	on (Stop Lamp Switch)".	
	ection result			
-	> GO TO 14. > Replace store	op lamp switch.		С
	•	TTENT INCIDEN	т	
		ttent Incident".		D
	> INSPECTIO			E
Compon	ent Inspec	ction (ASCD E	Brake Switch)	INFOID:000000001179569
1.снеск	ASCD BRA	KE SWITCH-I		F
0	nition switch			
		brake switch harr	hess connector. I brake switch terminals under the following conditions.	G
			5	
Terminals	C	ondition	Continuity	Н
1 and 2	Brake pedal	Fully released	Existed	11
		Slightly depressed	Not existed	
	ection result > INSPECTIO			
	> GO TO 2.			
2.снеск	ASCD BRA	KE SWITCH-II		J
			on. Refer to <u>BR-18, "Inspection and Adjustment"</u> .	
2. Check	the continuit	ty between ASCE	brake switch terminals under the following conditions.	K
Terminals	С	ondition	Continuity	
		Fully released	Existed	1
1 and 2	Brake pedal	Slightly depressed	Not existed	
Is the inspe	ection result	normal?		
		ON END SCD brake switch		M
	•			
Compon	ent inspec		Clutch Switch)	INFOID:000000001179570
1.снеск	ASCD CLU	TCH SWITCH-I		
	nition switch) OFF. clutch switch harr	and connector	0
) clutch switch terminals under the following conditions.	
				P
Terminals	С	ondition	Continuity	i.
1 and 2	Clutch pedal	Fully released	Existed	
		Slightly depressed	Not existed	

Is the inspection result normal?

2.CHECK ASCD CLUTCH SWITCH-II

- 1. Adjust ASCD clutch switch installation. Refer to <u>CL-9. "Removal and Installation"</u>.
- 2. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	С	Continuity	
1 and 2	Clutch pedal	Fully released	Existed
T and 2	Cluten pedal	Slightly depressed	Not existed

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace ASCD clutch switch.

Component Inspection (Stop Lamp Switch)

1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.

2. Disconnect stop lamp switch harness connector.

3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
T and Z		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-18, "Inspection and Adjustment".

2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	Brake pedal	Fully released	Not existed
	Блаке рецаг	Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch.

P1574 ASCD VEHICLE SPEED SENSOR

Description

The ECM receives two vehicle speed sensor signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to ECH-48, "System Description" for ASCD functions.

DTC Logic

DTC DETECTION LOGIC

< COMPONENT DIAGNOSIS >

NOTE:

- If DTC P1574 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to ECH-110, "DTC Logic".
- If DTC P1574 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to ECH-111, "DTC Logic".
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to ECH-198, "DTC Logic"
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer F to ECH-200, "DTC Logic"

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	G
P1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	 Harness or connectors (The CAN communication line is open or shorted.) (Combination meter circuit is open or shorted.) Combination meter ABS actuator and electric unit (control unit) Wheel sensor ECM 	H

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2. 2. PERFORM DTC CONFIRMATION PROCEDURE 1. Start engine. 2. Drive the vehicle at more than 40 km/h (25 MPH). **CAUTION:** Always drive vehicle at a safe speed. NOTE: This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle. 3. Check DTC. Is DTC detected? YES >> Go to ECH-261, "Diagnosis Procedure". >> INSPECTION END NO Diagnosis Procedure

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

Refer to BRC-17, "CONSULT-III Function (ABS)".

Is the inspection result normal?

YES >> GO TO 2.

[HR16DE (WITH EURO-OBD)]

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NO >> Repair or replace.

 $2. {\sf CHECK} \ {\sf COMBINATION} \ {\sf METER}$

Check combination meter function. Refer to <u>MWI-27, "CONSULT-III Function (METER/M&A)"</u>.

>> INSPECTION END

P1706 PNP SWITCH

Description

When the shift lever position is in the neutral position, ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

INFOID:000000001179576

INFOID:000000001179575

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	 Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.] Park/neutral position (PNP) switch 	
	IFIRMATION PROC	EDURE		
Do you hav	ve CONSULT-III?			
Do you hav	ve CONSULT-III?			(
	> GO TO 2.			

NO >> GO TO 5. 2

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 3.

3.CHECK PNP SWITCH FUNCTION

With CONSULT-III

1. Turn ignition switch ON.

 Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-III. Then check the "P/N POSI SW" signal under the following conditions.

Position (Shift lever)	Known-good signal		
Neutral position	ON		
Except above position	OFF		
Is the inspection result normal?			
YES >> GO TO 4.			
NO >> Go to <u>ECH-264, "Diagnosis Procedure"</u> .			
4.PERFORM DTC CONFIRMATION	ON PROCEDURE		
1. Select "DATA MONITOR" mod			
	normal operating temperature.		
 Maintain the following condition CAUTION: 	ns for at least 50 consecutive sec		
Always drive vehicle at a saf	e speed.		

ENG SPEED	1,925 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2.5 - 31.8 msec

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P1706 PNP SWITCH

< COMPONENT DIAGNOSIS >

VHCL SPEED SE	More than 64 km/h (40 mph)	
Shift lever	Suitable position	

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-264, "Diagnosis Procedure".

NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-264, "Component Function Check".

NOTE:

Use component function check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to <u>ECH-264</u>, "Diagnosis Procedure".

Component Function Check

1.PERFORM COMPONENT FUNCTION CHECK

1. Turn ignition switch ON.

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

ECM		Ground	C	ondition	Voltage
Connector	Terminal		Condition		voltage
F8	69	Ground	Shift lever	Neutral position	Approx. 0V
ı⁼o	(PNP switch signal)	Gibunu	Similiever	Except above	BATTERY VOLTAGE

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-264, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000001179578

INFOID:000000001179577

1.CHECK PNP SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect Park/neutral position (PNP) switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between PNP switch harness connector and ground.

PNF	'switch	Ground	Voltage
Connector Terminal		Ground	voltage
F46	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following

• Harness connectors E6, F123

• Harness for open or short between neutral position switch and IPDM E/R

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

 ${f 3.}$ CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

P1706 PNP SWITCH

[HR16DE (WITH EURO-OBD)]

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< C	< COMPONENT DIAGNOSIS >			
2.	Disconnect ECM harness connector.			

3. Check the continuity between PNP switch harness connector and ECM harness connector.

PNP	switch	EC	M			
Connector	Terminal	Connector	Terminal	Continuity		ECH
F46	3	F8	69	Existed		
Is the inspe			to ground a	and short to	power.	С
	Repair op	en circuit oi	short to g	round or sh	ort to power in harness or connectors.	D
Refer to The Inspection Reference The Inspecti			L POSITIC	<u>)n (PNP) s'</u>	WITCH : Component Inspection".	Е
	•	PNP switch.				F
	-39, "Intern	ittent Incide	ent".			G
						Н

P1805 BRAKE SWITCH

Description

INFOID:000000001179579

[HR16DE (WITH EURO-OBD)]

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

DTC Logic

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INFOID:000000001179581

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805	Brake switch	A brake switch signal is not sent to ECM for ex- tremely long time while the vehicle is driving.	 Harness or connectors (Stop lamp switch circuit is open or short- ed.) Stop lamp switch

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

2. Fully depress the brake pedal for at least 5 seconds.

- 3. Erase the DTC with CONSULT-III.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>ECH-266</u>, "Diagnosis Procedure". NO >> INSPECTION END

Diagnosis Procedure

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.

2. Check the stop lamp when depressing and releasing the brake pedal.

Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

Is 1st trip DTC detected?

YES >> GO TO 4.

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the voltage between stop lamp switch harness connector and ground.

Stop lan	np switch	Ground	Voltage
Connector	Terminal	Ciouna	voltage
E114 1		Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors E105, M77

P1805 BRAKE SWITCH

< COMPO	ONENT DI		> '	[HR16DE (WITH EURO-OBD)]	
10A fusHarness		or short betv	veen sto	op lamp switch and battery	А
	>> Repair c	pen circuit o	or short	t to ground or short to power in harness or connectors.	
	•	•		JT SIGNAL CIRCUIT FOR OPEN AND SHORT	ECH
		I harness co			_
2. Chec	k the contir	nuity betwee	en ECM	I harness connector and stop lamp switch harness connector.	С
E	СМ	Stop lamp	switch	Occtionity	
Connecto	Terminal	Connector	Terminal	Continuity	D
E16	99	E114	2	Existed	
		ess for shor <u>ult normal?</u>	t to grou	und and short to power.	E
NG >	•	-		t to ground or short to power in harness or connectors.	F
Refer to	CH-267, "	Component	Inspect	tion (Stop Lamp Switch)".	-
		ult normal?			G
	>> GO TO		witch		
•	•	stop lamp s		-	Н
		rmittent Inci			_
	<u> </u>		<u>uont</u> .		1
>	>> INSPEC	TION END			I
Compo	nent Insp	pection (S	Stop La	amp Switch) INFOLD.0000000117958	2
1.CHEC	K STOP LA	MP SWITC	:H-I		J
	ignition swi				K
				ess connector. lamp switch terminals under the following conditions.	
0. 01100		iaity betwee	11 0100		
Terminals		Condition		Continuity	
1 and 2	Broko podo	Fully release	ed I	Not existed	
1 and 2	Brake peda	Slightly dep	ressed	Existed	M
Is the insp	pection res	ult normal?			
		TION END			
-	> GO TO :				Ν
		MP SWITC			-
		np switch ii <u>Adjustment'</u>		ion. Refer to <u>BR-18, "Inspection and Adjustment"</u> (LHD) or <u>BR-65</u>	0
2. Chec	k the contir	nuity betwee	en stop l	lamp switch terminals under the following conditions.	
Terminals		Condition		Continuity	Ρ
		Fully release		Not existed	
1 and 2	Brake peda				

Is the inspection result normal?

Brake pedal

YES >> INSPECTION END

NO >> Replace stop lamp switch.

Slightly depressed

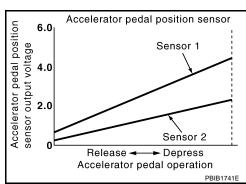
Existed

P2122, P2123 APP SENSOR

Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2122 or P2123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-250, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122	Accelerator pedal posi- tion sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	Harness or connectors (APP sensor 1 circuit is open or shorted.)
P2123	Accelerator pedal posi- tion sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	 Accelerator pedal position sensor (APP sensor 1)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

- YES >> Go to ECH-268, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

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INFOID:000000001179584

INFOID:000000001179585

P2122, P2123 APP SENSOR

		210010 >				1
NO >> F	Repair or r	eplace gro	und conn	ection.		_
2. СНЕСК А	PP SENS	OR 1 POW	/ER SUP	PLY CIRCUIT		A
1. Disconne	ect accelei	rator pedal	position	(APP) sensor	harness connector.	_
	tion switch				and the stand service of	ECH
3. Check th	ie voltage	between A	PP sense	or namess col	nnector and ground.	
APP s	ensor					
Connector	Terminal	Ground	Volta	ge		С
E110	4	Ground	Approx	. 5V		
Is the inspect	tion result	normal?				D
· · · · ·	GO TO 3.					
		en circuit or	short to	ground or sho	rt to power in harness or connectors.	
3. CHECK A	PP SENS	OR 1 GRC	UND CIF	CUIT FOR O	PEN AND SHORT	E
1. Turn igni	tion switch	n OFF.				_
		arness cor				F
3. Check th	ie continui	ty between	APP ser	isor harness (connector and ECM harness connector.	
APP ser	sor	ECI	1			
Connector	Terminal	Connector	Terminal	Continuity		G
E110	2	E16	111	Existed		
		-			nower	Н
4. Also che Is the inspect			to ground	and short to	power.	
	<u>GO TO 4.</u>	<u>nonnai :</u>				
		en circuit or	short to	ground or sho	rt to power in harness or connectors.	
4.CHECK A	PP SENS	OR 1 INPL	JT SIGNA	L CIRCUIT F	OR OPEN AND SHORT	
1. Check th	ne continui	tv between	APP ser	sor harness o	connector and ECM harness connector.	-
		.,				J
APP ser	nsor	ECM	Л			
Connector	Terminal	Connector	Terminal	Continuity		K
E110	3	E16	110	Existed		
2. Also che	ck harnes	s for short	to ground	and short to	power.	
Is the inspect			0			L
YES >> (GO TO 5.					
_			short to	ground or sho	rt to power in harness or connectors.	M
5. CHECK A	PP SENS	OR				
Refer to ECH	I-270, "Co	mponent Ir	nspection	<u>.</u>		_
Is the inspec	tion result	normal?				N
	GO TO 7.					
•	GO TO 6.					0
6.REPLACE	E ACCELE	RATOR PI	EDAL AS	SEMBLY		0
		or pedal as		_		_
2. Go to <u>EC</u>)H-270, "S	Special Rep	air Requi	<u>rement"</u> .		Ρ
-	NSPECTI					
	NIERMIT	IENT INCI	DENT			

Refer to GI-39, "Intermittent Incident".

< COMPONENT DIAGNOSIS >

>> INSPECTION END

P2122, P2123 APP SENSOR

< COMPONENT DIAGNOSIS >

Component Inspection

INFOID:000000001179586

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[HR16DE (WITH EURO-OBD)]

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

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

ECM		Ground Condi		lition	Voltage	
Connector Terminal		Ground	Condition		voltage	
	110			Fully released	0.6 - 0.9V	
E16	(APP sensor 1 signal)	Ground	Accelerator pedal	Fully depressed	3.9 - 4.7V	
	103			Fully released	0.3 - 0.6V	
	(APP sensor 2 signal)			Fully depressed	1.95 - 2.4V	

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.

2. Go to ECH-270, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3. Perform idle air volume learning

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

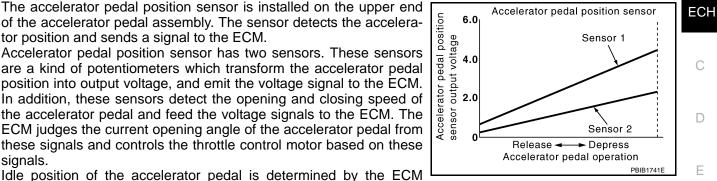
>> END

P2127, P2128 APP SENSOR

Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

DTC Logic

INFOID-000000001179589

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P2127	Accelerator pedal posi- tion sensor 2 circuit low input	An excessively low voltage from the APP sen- sor 2 is sent to ECM.	Harness or connectors (APP sensor 2 circuit is open or shorted.) [Crankshaft position sensor (POS) circuit	ŀ
P2128	Accelerator pedal posi- tion sensor 2 circuit high input	An excessively high voltage from the APP sen- sor 2 is sent to ECM.	 is shorted.] (Refrigerant pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 2) Crankshaft position sensor (POS) Refrigerant pressure sensor 	Ţ

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second. 1.
- Check DTC. 2.

Is DTC detected?

YES >> Go to ECH-271, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection". 2.

ECH-271

Is the inspection result normal?

YES >> GO TO 2.

[HR16DE (WITH EURO-OBD)]

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P2127, P2128 APP SENSOR

< COMPONENT DIAGNOSIS >

NO >> Repair or replace ground connection.

2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between APP sensor harness connector and ground.

APP	sensor	Ground	Voltage	
Connector	Terminal	Oround	vollage	
E110	5	Ground	Approx. 5V	

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 3.

3.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP	sensor	E	CM	Continuity
Connector	Terminal	Connector	Continuity	
E110	5	E16	102	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 APP SENSOR 2 POWER SUPPLY CIRCUIT-III

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

EC	М	Sensor		
Connector	Terminal	Item	Connector	Terminal
F8	74	Refrigerant pressure sensor	E49	3
10	75	CKP sensor (POS)	F20	1
E16	102	APP sensor	E110	5

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to ECH-185, "Component Inspection".)
- Refrigerant pressure sensor (Refer to HAC-70, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace malfunctioning component.

6.CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

P2127, P2128 APP SENSOR

< COMPONENT DIAGNOSIS >

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APP sensor		EC	M	Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
E110	1	E16	104	Existed	
. Also che	eck harness	for short to g	round and s	short to power.	
-	tion result n	ormal?			
	GO TO 7. Banair anan	airauit ar abr	ort to group	d or abort to newer in borness or connectors	
-			•	d or short to power in harness or connectors. CUIT FOR OPEN AND SHORT	
. Check th	ne continuity	between AP	P sensor ha	arness connector and ECM harness connector.	
APP s	sensor	EC	M		
Connector	Terminal	Connector	Terminal	Continuity	
E110	6	E16	103	Existed	
. Also che	eck harness	for short to g	round and s	short to power.	
	tion result n	-			
-	GO TO 8.	-in-uit 1		d an all and the maximum in the max	
	• •		ort to groun	d or short to power in harness or connectors.	
	APP SENSO				
		ponent Inspe	ection".		
	<u>:tion result n</u> GO TO 10.	<u>onnal?</u>			
	GO TO 9.				
.REPLACI	E ACCELER	ATOR PEDA	L ASSEME	BLY	
. Replace	accelerator	pedal assem	nbly.		
. Go to <u>E(</u>	<u>CH-274, "Sp</u>	ecial Repair	Requiremer	<u>nt"</u> .	
-					
eter to GI-3	<u>39, "Intermitt</u>	ent Incident"			
		N FND			
>>	INSPECTIO				
	INSPECTIO	tion			
	nt Inspec	tion		INFOID:000	0000001179591
ompone	nt Inspec	TOR PEDAL	POSITION		0000001179591
Compone	nt Inspec	OR PEDAL		SENSOR	0000001179591
CHECK A	nt Inspec ACCELERAT ect all harne	OR PEDAL ss connector ON.	s disconneo	SENSOR	0000001179591

ECM		Ground	Cond	Voltage	
Connector	nector Terminal		Condition		
	110	Ground	Accelerator pedal	Fully released	0.6 - 0.9V
E16	(APP sensor 1 signal)			Fully depressed	3.9 - 4.7V
	103 (APP sensor 2 signal)		Accelerator pedar	Fully released	0.3 - 0.6V
				Fully depressed	1.95 - 2.4V

Is the inspection result normal?

YES >> INSPECTION END

P2127, P2128 APP SENSOR

< COMPONENT DIAGNOSIS >

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.

2. Go to ECH-274. "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000001179592

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

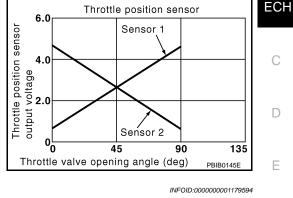
>> END

P2135 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2135 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-250, "DTC Logic"</u>.

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DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	-
P2135	Throttle position sensor circuit range/perfor- mance	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	 Harness or connector (TP sensor 1 and 2 circuit is open or shorted.) Electric throttle control actuator (TP sensor 1 and 2) 	- H

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test. **TESTING CONDITION:**

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

>> GO TO 2.	L	
2. PERFORM DTC CONFIRMATION PROCEDURE		
 Start engine and let it idle for 1 second. Check DTC. 	M	1
Is DTC detected?		
YES >> Go to <u>ECH-275, "Diagnosis Procedure"</u> . NO >> INSPECTION END	Ν	
Diagnosis Procedure	00001179595)
1.CHECK GROUND CONNECTION	0	
 Turn ignition switch OFF. Check ground connection E21. Refer to Ground Inspection in <u>GI-41, "Circuit Inspection"</u>. 	Р)
Is the inspection result normal?		
YES >> GO TO 2.		
NO >> Repair or replace ground connection.		
2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I		
1. Disconnect electric throttle control actuator harness connector.		

ECH-275

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P2135 TP SENSOR

< COMPONENT DIAGNOSIS >

2. Turn ignition switch ON.

3. Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle c	Ground	Voltage	
Connector	Terminal	Clound	voltage
F29	1	Ground	Approx. 5V

Is the inspection result normal?

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

 $\sim > 00103$

3.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between electric throttle control actuator harness connector and ground.

Electric throttle	Electric throttle control actuator		ECM		
Connector	Terminal	Connector	Terminal	Continuity	
F29	1	F8	72	Existed	

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit.

${f 4.}$ CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between electric throttle control actuator harness connector and ground.

Electric throttle	control actuator	EC	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F29	4	F8	36	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 THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle	control actuator	EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F29	2	F8	33	Existed
123	3	10	34	LAISIEU

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 THROTTLE POSITION SENSOR

Refer to ECH-277, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

P2135 TP SENSOR

< COMPON	NENT DIAGNOS	IS >	1210011	OLNOON	[HR16D	E (WITH EURO-OBD)]
7.REPLAC	E ELECTRIC TH	ROTTL	E CONTROL AC	TUATOR		
1. Replace	e electric throttle o	control a	ictuator.			
2. <u>ECH-27</u>	77, "Special Repa	<u>ır Requi</u>	rement"			
>>	INSPECTION EN	١D				
8.CHECK	INTERMITTENT	INCIDE	NT			
Refer to GI-	39, "Intermittent I	ncident"	·			
>>	INSPECTION EN	JD				
_	ent Inspection					INFOID:000000001179596
						INFOID.000000001173598
	THROTTLE POS	ITION S	ENSOR			
	nition switch OFF. nect all harness co	onnector	s disconnected.			
 Perform Turn igr 	n <u>ECH-277, "Spec</u> nition switch ON.	ial Repa	air Requirement"			
5. Set shif	ft lever to 1st posi					
6. Check t	the voltage betwe	en ECM	harness connec	ctor and ground	l.	
	ECM	Crownd	Cana	lition	Valtara	
Connector	Terminal	Ground	Conc	nuon	Voltage	
	33 (TP sensor 1 signal)			Fully released	More than 0.36V	
F8 —	· - ·	Ground	Accelerator pedal	Fully depressed Fully released	Less than 4.75V Less than 4.75V	
	34 (TP sensor 2 signal)			Fully depressed	More than 0.36V	
Is the inspe	ction result norma	<u>al?</u>				
	INSPECTION EN GO TO 2.	1D				
	CE ELECTRIC TH	ROTTL	E CONTROL AC	TUATOR		
	e electric throttle of					
	CH-277, "Special					
>>	INSPECTION EN	JD				
_	Repair Require					INECID-00000004170507
						INFOID:000000001179597
	RM THROTTLE V					
Refer to <u>EC</u>	<u>H-19, "THROTTL</u>	<u>e valv</u>	E CLOSED POS	SITION LEARN	NG : Special Re	pair Requirement"
>>	GO TO 2.					
2.PERFOR	RM IDLE AIR VOL	UME LI	EARNING			
Refer to EC	H-19, "IDLE AIR '	VOLUM	E LEARNING : S	Special Repair F	Requirement"	
<u>.</u>						

>> END

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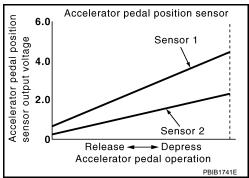
< COMPONENT DIAGNOSIS >

P2138 APP SENSOR

Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2138 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-250, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138	Accelerator pedal posi- tion sensor circuit range/ performance	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	 Harness or connector (APP sensor 1 and 2 circuit is open or shorted.) [Crankshaft position sensor (POS) circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 1 and 2) Crankshaft position sensor (POS) Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

- YES >> Go to ECH-278, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

P2138 APP SENSOR

< COMPO		IAGN	OSIS >			[HR16DE (WITH EURO-OB	D)]
2. Check	ground c	onne	ction E21. F	Refer to Grou	Ind Inspection	in <u>GI-41, "Circuit Inspection"</u> .	
Is the inspe	ection res	ult nc	ormal?		-		A
	- GO TO						
-			-	l connection			EC
Z. CHECK	APP SE	NSOF	R 1 POWER	SUPPLY C	IRCUIT		EC
				sition (APP)	sensor harnes	s connector.	
	nition sw			aanaar harn	ann ann antar	and ground	С
3. Check	the volta	ge be	elween APP	sensor nam	ess connector	and ground.	
APP	, sensor						
Connector	Termi	nal	Ground	Voltage			D
E110	4	iai	Ground	Approx. 5V			
				Appiox. 3V			E
<u>Is the inspe</u> YES >>	- GO TO		<u>nnar</u>				-
			circuit or sh	ort to around	d or shot to pov	ver in harness or connectors.	
•	•	•		SUPPLY C	•		F
	nition sw the volta			sensor harn	ess connector	and ground.	-
21 011001		90.00					G
APF	' sensor						
Connector	Termi	nal	Ground	Voltage			Н
E110	5		Ground	Approx. 5V			
Is the inspe		ult no					
	> GO TO		<u>innar:</u>				I
	• GO TO						
4. CHECK	APP SE	NSOF	R 2 POWER	SUPPLY C	IRCUIT-II		
	nition sw						J
			ness conne	ctor.			
3. Check	the conti	nuity	between AF	PP sensor ha	arness connect	or and ECM harness connector.	K
APP	' sensor		EC	CM	Continuity		
Connector	Termi	nal	Connector	Terminal			L
E110	5		E16	102	Existed		
Is the inspe	ection res	ult no	ormal?				M
	SO TO						IVI
_	•	•		•	•	ver in harness or connectors.	
5. CHECK	APP SE	NSOF	R 2 POWER	SUPPLY C	IRCUIT-III		Ν
Check harr	ness for s	hort t	o power and	d short to gro	ound, between	the following terminals.	
ECI	M			Sensor	r		0
Connector	Terminal		lte	m	Connector	Terminal	
F0	74	Refri	gerant pressur	e sensor	E49	3	
F8 -	75	CKP	sensor (POS)		F20	1	Р
E16	102	APP	sensor		E110	5	

Is the inspection result normal?

YES >> GO TO 6.

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

6.CHECK COMPONENTS

P2138 APP SENSOR

< COMPONENT DIAGNOSIS >

Check the following.

- Crankshaft position sensor (POS) (Refer to ECH-185, "Component Inspection".)
- Refrigerant pressure sensor (Refer to HAC-70, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning component.

7. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between APP sensor harness connector and ECM harness connector as follows.

APP	sensor	EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E110	1	E16	104	Existed
LIIU	2		111	LAISteu

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

Is the inspection result normal?

YES >> GO TO 8.

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

f 8.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector as follows.

APP	sensor	EC	Continuity		
Connector	Terminal	Connector	Terminal	Continuity	
E110	3	E16	110	Existed	
EIIU	6	EIO	103	Existed	

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

Is the inspection result normal?

YES >> GO TO 9.

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

9.CHECK APP SENSOR

Refer to ECH-280, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.

2. Go to ECH-281. "Special Repair Requirement".

>> INSPECTION END

11.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.

P2138 APP SENSOR

< COMPONENT DIAGNOSIS >

2.

Turn ignition switch ON. Check the voltage between ECM harness connector and ground. 3.

	ECM	Ground	Conc	lition	Voltage		
Connector	Terminal	Ground	Conc	mon	voltage		ECH
	110			Fully released	0.6 - 0.9V		
E110	(APP sensor 1 signal)	Ground	Accelerator pedal	Fully depressed	3.9 - 4.7V		С
Eno	103	Cround		Fully released	0.3 - 0.6V		
	(APP sensor 2 signal)			Fully depressed	1.95 - 2.4V		_
YES > NO >	<u>ection result normal</u> > INSPECTION EN > GO TO 2. CE ACCELERATOF	D	L ASSEMBLY				D
1. Replace 2. Go to	ce accelerator peda ECH-281, "Special > INSPECTION EN	l assem Repair F	bly.				F
	Repair Require					INFOID:000000001179602	G
						IN 012.000000001113002	
	RM ACCELERATO					G : Special Repair Require-	Н
•	> GO TO 2. PRM THROTTLE VA	LVE CL	OSED POSITIO	N LEARNING			I
					NG : Specia	l Repair Requirement".	J
3.PERFC	> GO TO 3. PRM IDLE AIR VOLI						K
Refer to E	CH-19, "IDLE AIR V	OLUME	LEARNING : S	pecial Repair R	equirement	." 	I
>	> END						L
							M
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ASCD BRAKE SWITCH

Description

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal). Refer to <u>ECH-48</u>, "System Description" for the ASCD function.

Component Function Check

1.CHECK FOR ASCD BRAKE SWITCH FUNCTION

With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "BRAKE SW1" indication under the following conditions.

Monitor item	Condition	Indication	
BRAKE SW1	Brake pedal and clutch pedal	Slightly depressed	OFF
BRARE SWI	Brake pedal and clutch pedal	Fully released	ON

Without CONSULT-III

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

ECM Connector Terminal		Ground	Condition	Voltage	
		Giouna	Condition		voltage
E16	100	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V
EIO	(ASCD brake switch signal)	Ground	Brake pedarand clutch pedar	Fully released	Battery voltage

Is the inspection result normal?

- YES >> INSPECTION END.
- NO >> Go to ECH-282, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK ASCD BRAKE SWITCH CIRCUIT - I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD clu	Itch switch	Ground	Voltage (V)
Connector	Connector Terminal		voltage (v)
E112	1	Ground	Battery voltage

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

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT - II

1. Turn ignition switch OFF.

2. Disconnect ASCD clutch switch harness connector.

3. Turn ignition switch ON.

4. Check the voltage between ASCD clutch switch harness connector and ground.

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INFOID:000000001179603

ASCD BRAKE SWITCH

ASCD clu	tch switch	Ground		_
Connector	Terminal	Cround	Voltage (V))
E111	1	Ground	Battery voltag	ge
Is the inspec	tion result n	ormal?	I	
	GO TO 4. GO TO 3.			
•		FIONING PA	RT	
Check the fo				
 Harness or 	r connectors	E105, M77		
 10A fuse (I Harposs for 		ort botwoon	ASCD brok	e switch and fuse
			ASCD DIAN	e switch and ruse
>>	Repair oper	circuit or sh	ort to ground	d or short to power in harness or connectors.
			-	IAL CIRCUIT FOR OPEN AND SHORT-I
	ition switch			
2. Check tl	he continuit		SCD brake	switch harness connector and ASCD clutch switch harness
connect	or.			
ASCD bra	ake switch	ASCD clu	utch switch	
Connector	Terminal	Connector	Terminal	Continuity
E112	1	E111	2	Existed
3. Also che	eck harness	for short to a	around and s	short to power.
Is the inspec		-	,	
	GO TO 5.			
NO >>	Repair oper	circuit or sh	ort to ground	d or short to power in harness or connectors.
5. CHECK A	ASCD CLUT	CH SWITCH	1	
Refer to EC	H-284, "Com	nponent Insp	ection (ASC	D Clutch Switch)".
Is the inspec	tion result n	ormal?		
-	GO TO 6.		vitala	
~	•	CD clutch sv		
			INPUT SIGN	IAL CIRCUIT FOR OPEN AND SHORT-II
	ition switch	OFF. rness conne	ctor	
				witch harness connector and ECM harness connector.
	-			
ASCD bra	ake switch	E	СМ	Continuity
Connector	Terminal	Connector	Terminal	
E112	2	E16	100	Existed
		-	ground and s	short to power.
Is the inspec		ormal?		
	GO TO 7. Repair oper	circuit or ch	ort to group	d or short to power in harness or connectors.
7. CHECK <i>A</i>				
			ection (ASC	D Brake Switch)".
l <u>s the inspec</u> YES >>	<u>ction result n</u> GO TO 8.			
			Stat.	

NO >> Replace ASCD brake switch.

[HR16DE (WITH EURO-OBD)]

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

1.CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.

- 2. Disconnect ASCD brake switch harness connector.
- 3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	Brake pedal	Fully released	Existed
T anu z	Brake pedar	Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH-II

- 1. Adjust ASCD brake switch installation. Refer to <u>BR-17</u>, "Removal and Installation" (LHD) or <u>BR-64</u>, <u>"Removal and Installation"</u> (RHD).
- 2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	Brake pedal	Fully released	Existed
1 and 2		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch.

Component Inspection (ASCD Clutch Switch)

1.CHECK ASCD CLUTCH SWITCH-I

1. Turn ignition switch OFF.

2. Disconnect ASCD clutch switch harness connector.

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

Terminals	C	Continuity	
1 and 2	Clutch pedal	Fully released	Existed
1 and 2	Ciuton pedal	Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation. Refer to CL-9, "Removal and Installation".

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

Terminals	С	Continuity	
1 and 2	Clutch pedal	Fully released	Existed
T anu z	Clutch pedal	Slightly depressed	Not existed

INFOID:000000001179607

Is the in	nspection result normal?	
YES NO	>> INSPECTION END >> Replace ASCD clutch switch.	А
		ECH
		С
		D
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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.

Refer to ECH-48, "System Description" for the ASCD function.

Component Function Check

INFOID:000000001179609

INFOID:000000001179610

INFOID:000000001179608

1.ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CON	SPECIFICATION	
CRUISE LAMP	Ignition switch: ON	 MAIN switch: Pressed at the 1st time →at the 2nd time 	$ON\toOFF$
	 MAIN switch: ON When vehicle speed: Be- tween 40 km/h (25 MPH) and 144 km/h (89 MPH) 	ASCD: Operating	ON
SET LAMP		ASCD: Not operating	OFF

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-286, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK DTC

Check that DTC U1001 is not displayed.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble diagnosis for DTC U1001. Refer to <u>ECH-110, "DTC Logic"</u>.

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-49</u>, "Wiring Diagram - METER -".

3.CHECK INTERMITTENT INCIDENT

Refer to GI-39. "Intermittent Incident".

>> INSPECTION END

COOLING FAN

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

< COMPONE	INT DIAGE	10212 >				
COOLING	G FAN					
Descriptior	า					INFOID:000000001179611
Cooling fan op Refer to <u>ECH</u>					flows in the cooling fan i	motor.
Componen	t Functio	on Check				INFOID:000000001179612
1.снеск со	OOLING F	AN LOW SP	EED FUNC	TION		
2. Perform "	ion switch	FAN" in "AC		Г" mode with and high spee		
Without C 1. Perform I Description	PDM E/R		test and ch	neck cooling t	an motor operation, refe	er to <u>PCS-9, "Diagnosis</u>
2. Make sur	e that cooli	•	ates at low	and high spee	ed.	
	ISPECTIO		osis Proced	ure".		
Diagnosis I	Procedu	re				INFOID:000000001179613
1.CHECK IP	DM E/R PO	OWER SUP	PLY CIRCU	ЛТ		
2. Disconne		R harness c		14. ess connecto	r and ground.	
IPDM Connector	E/R Terminal	Ground	Voltage			
E14	53	Ground	Battery volta	age		
	O TO 2. epair open	circuit or sh	-		power in harness or con	nectors
 Turn igniti Disconne 	ion switch (ct cooling f	OFF. an motor ha	rness conn	ector.	connector and IPDM E/F	R harness connector.
Cooling fan motor		IPDN	PDM E/R Continuity			
Connector	Terminal	Connector	Terminal	Continuity		
		E14	52	Existed		
E3	1	C14	54			
			-		connector and ground.	
	e continuity	between co	-		connector and ground.	

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

E10

E3

2

5

6

Ground

Existed

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

3.DETECT MALFUNCTIONING PART

Check the following.

- Resistor E57.
- Harness for open or short between IPDM E/R and cooling fan.
- Harness for open or short between cooling fan and ground.
- Harness for open or short between IPDM E/R and ground.

>> Repair or replace malfunctioning part.

4.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace ground connection.

5.CHECK COOLING FAN MOTOR

Refer to ECH-288. "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning cooling fan motor.

6.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.

Component Inspection (Cooling Fan Motor)

1.CHECK COOLING FAN MOTOR

- 1. Turn ignition switch OFF.
- 2. Disconnect cooling fan motor harness connector E3.
- 3. Supply cooling fan motor terminals with battery voltage and check operation.

Term	ninals	Operation
(+)	(-)	
1	2	Cooling fan operates.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan motor.

ELECTRICAL LOAD SIGNAL

< COMPONENT DIAGNOSIS >

ELECTRICAL LOAD SIGNAL

Description

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred through the CAN communication line from BCM to ECM via IPDM E/R.

Component Function Check

1. CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

- 1. Turn ignition switch ON.
- 2. Connect CONSULT-III and select "DATA MONITOR" mode.
- 3. Select "LOAD SIGNAL" and check indication under the following conditions.

Monitor item Condition Ir					
	Rear window defogger switch	ON	ON		
LOAD SIGNAL	Real window delogger switch	OFF	OFF		
Is the inspection result normal?					

Is the inspection result norma

1ES	>> GO TO Z.
NO	>> Go to ECH-289, "Diagnosis Procedure".

2.CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication under the following conditions.

Monitor item	Co	Indication	
LOAD SIGNAL	Lighting switch	ON at 2nd position	ON
	Lighting Switch	OFF	OFF

Is the inspection result normal?

YES	>> GO TO 3.
160	~~ GO TO J.

NO >> Go to ECH-289, "Diagnosis Procedure".

${f 3.}$ CHECK HEATER FAN CONTROL SWITCH FUNCTION

Select "HEATER FAN SW" and check indication under the following conditions.

Monitor item	Condition		Indication
HEATER FAN SW	Heater fan control switch	ON	ON
	Heater fan control switch	OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-289, "Diagnosis Procedure".

Diagnosis Procedure

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to <u>ECH-289, "Com-</u> ponent Function Check".

Which circuit is related to the incident?

Rear window defogger>>GO TO 2 Headlamp>>GO TO 3.

Heater fan>>GO TO 4.

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to <u>DEF-3</u>, "Work Flow".

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INFOID:000000001179617

ELECTRICAL LOAD SIGNAL

< COMPONENT DIAGNOSIS >

3.CHECK HEADLAMP SYSTEM

Refer to EXL-7, "Work Flow".

>> INSPECTION END

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

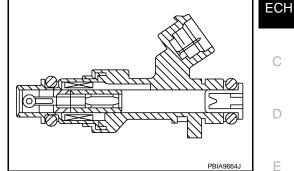
Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

FUEL INJECTOR

Description

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



Component Function Check

1.INSPECTION START

Turn ignition switch to START.

Is any cylinder ignited?

YES >> GO TO 2.

NO >> Go to ECH-291, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

With CONSULT-III

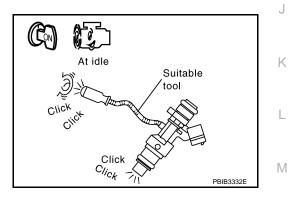
- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that each circuit produces a momentary engine speed drop.
- Without CONSULT-III
- 1. Let engine idle.
- 2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-291, "Diagnosis Procedure".



Diagnosis Procedure

INFOID:000000001179620

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1.CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect fuel injector harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between fuel injector harness connector and ground.

[HR16DE (WITH EURO-OBD)]

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INFOID:000000001179618

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FUEL INJECTOR

	Fuel inject	or	Ground	Voltage	
Cylinder	Connector	Terminal	Giouna	voltage	
1	F37	1			
2	F38	1	Ground	Battery voltage	
3	F39	1	Giouna		
4	F40	1			

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F123, E6

• 10A fuse (No. 58)

• Harness for open or short between fuel injector and fuse

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

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

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

	Fuel injecto	r	ECM		Continuity
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F37	2		31	
2	F38	2	F7	30	Existed
3	F39	2		29	EXISTED
4	F40	2		25	

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 INJECTOR

Refer to ECH-292, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning fuel injector.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

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

Component Inspection

INFOID:000000001179621

1.CHECK FUEL INJECTOR

1. Turn ignition switch OFF.

2. Disconnect fuel injector harness connector.

3. Check resistance between fuel injector terminals as follows.

FUEL INJECTOR

< COMPONENT DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Terminals Resistance [at 10 - 60°C (50 - 140°F)] 1 and 2 11.1 - 14.5 Ω Is the inspection result normal? YES >> INSPECTION END NO >> Replace malfunctioning fuel injector.
YES >> INSPECTION END NO >> Replace malfunctioning fuel injector.

FUEL PUMP

Description

INFOID:000000001179622

[HR16DE (WITH EURO-OBD)]

Sensor	Input signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE) Engine speed*		Fuel pump control	Fuel pump relay ↓
Battery	Battery voltage*	*	Fuel pump

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

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation	
Ignition switch is turned to ON.	Operates for 1 second.	
Engine running and cranking	Operates.	
When engine is stopped	Stops in 1.5 seconds.	
Except as shown above	Stops.	

Component Function Check

1.CHECK FUEL PUMP FUNCTION

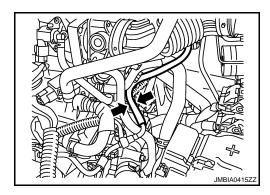
- 1. Turn ignition switch ON.
- 2. Pinch fuel feed hose with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

Is the inspection result normal?

YES >> INSPECTION END

NO >> ECH-294, "Diagnosis Procedure".



Diagnosis Procedure

INFOID:000000001179624

INFOID:000000001179623

1.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ECM harness connector and ground.

EC	ECM		Voltage	
Connector	Terminal	Ground	voltage	
F7	23	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 2.

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

FUEL PUMP

< COMPONENT DIAGNOSIS >

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- 1. Turn ignition switch OFF.
- 2. Disconnect IDPDM E/R harness connector.
- 3. Check the continuity between IPDM E/R harness connector and ECM harness connector.

ECM		IPDI	IPDM E/R	
Connector	Terminal	Connector	Terminal	Continuity
F7	23	E13	33	Existed

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.DETECT MALFUNCTIONING PART

Check the following.

• Harness or connectors E6, F123.

Harness for open or short to ground and short power.

>> Repair harness or connectors.

4.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.

- 3. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 4. Turn ignition switch ON.
- 5. Check voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

NO >> GO TO 5.

5.CHECK 10A FUSE

- 1. Turn ignition switch OFF.
- 2. Disconnect 10A fuse (No. 57) from IPDM E/R.

3. Check 10A fuse.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace fuse.

6.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

1. Disconnect IPDM E/R harness connector.

 Check the continuity between IPDM E/R harness connector and "fuel level sensor unit and fuel pump" C harness connector.

IPDN	/I E/R	Fuel level sensor unit and fuel pump		Continuity
Connector	Terminal	Connector	Terminal	
F13	42	B40	1	Existed

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

Is the inspection result normal?

YES >> GO TO 10.

ECH-295

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NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B10, E101

• Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"

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

8.CHECK FUEL PUMP GROUND CIRCUIT

1. Check the continuity between "fuel level sensor unit and fuel pump" and ground.

Fuel level s and fue		Ground	Continuity	
Connector	Terminal			
B40	3	Ground	Existed	
2 Alea haak harnaga far ahart ta nawar				

2. Also heck harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

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

9.CHECK FUEL PUMP

Refer to ECM-299. "Component Inspection (Fuel Pump)".

Is the inspection result normal?

- YES >> GO TO 10.
- NO >> Replace fuel pump.

10.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 connectors.

Component Inspection (Fuel Pump)

INFOID:000000001179625

1.CHECK FUEL PUMP

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Check resistance between "fuel level sensor unit and fuel pump" terminals as follows.

Terminals	Resistance [at 25°C (77°F)]
1 and 3	0.2 - 5.0 Ω

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump".

IGNITION SIGNAL

Description

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.

Component Function Check	INFOID:000000001179627	С
1.INSPECTION START		
Turn ignition switch OFF, and restart engine.		D
Does the engine start?		
YES-1 >> With CONSULT-III: GO TO 2. YES-2 >> Without CONSULT-III: GO TO 3. NO >> Go to <u>ECH-297, "Diagnosis Procedure"</u> .		Е
2. IGNITION SIGNAL FUNCTION		F
With CONSULT-III		1
 Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III. Make sure that each circuit produces a momentary engine speed drop. <u>Is the inspection result normal?</u> 		G
YES >> INSPECTION END NO >> Go to <u>ECH-297, "Diagnosis Procedure"</u> . 3. IGNITION SIGNAL FUNCTION		Н

Without CONSULT-III

1. Let engine idle.

2. Read the voltage signal between ECM harness connector and ground.

EC	М	Ground	Voltage signal
Connector	Terminal	Ciouna	vollage signal
	17		
	18		
F7	22	Crownd	
F7	21	Ground	→ → → → → → → → → → → → → → → → → → →
			PBIA9265J
NOTE The pu		change	s depending on rpm at idle.
Is the insp			

YES	>> INSPECTION END
NO	>> Go to ECH-297, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.

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

EC	CM	Ground	Voltage
Connector	Terminal	Cround	Voltage
E16	105	Ground	Battery voltage

[HR16DE (WITH EURO-OBD)]

INFOID:000000001179626

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Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to ECH-106, "Diagnosis Procedure".

2. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

2. Disconnect condenser harness connector.

3. Turn ignition switch ON.

4. Check the voltage between condenser harness connector and ground.

Conc	lenser	Ground	Voltage
Connector	Terminal	Oround	vollage
F13	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

 ${
m 3.}$ CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.

2. Disconnect IPDM E/R harness connector E11.

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

IPDN	/I E/R	Condenser		Continuity
Connector	Terminal	Connector Terminal		Continuity
E11	10	F13	1	Existed

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

Is the inspection result normal?

YES >> Go to ECH-106, "Diagnosis Procedure".

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

4.CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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

Con	denser	Ground Continuity	
Connector Terminal		Ground	Continuity
F13	2	Ground	Existed

3. 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 CONDENSER

Refer to ECH-300, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 6.

NG >> Replace condenser.

6.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Reconnect all harness connectors disconnected.

2. Disconnect ignition coil harness connector.

3. Turn ignition switch ON.

4. Check the voltage between ignition coil harness connector and ground.

IGNITION SIGNAL

< COMPONENT DIAGNOSIS >

Cylinder Connector Terminal <		Ignition coil					A
2 F34 3 Ground Battery voltage C 3 F36 3 C C C C 4 F36 3 C C C C C 1 the inspection result normal? C	Cylinder	Connector	Terminal	Ground	Voltage		
2 F34 3 Ground Battery voltage 3 F36 3 Ground Battery voltage C 1s the inspection result normal? YES S CO TO 7. C NO >> Repair open circuit or short to ground or short to power in harness or connectors. D 7.CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT E 1. Turn ignition switch OFF. E 2. Check the continuity between ignition coil harness connector and ground. F 2 F34 2 3 F35 2 3 F35 2 3. Also check harness for short to power. Existed 8.OHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT H 1. Disconnect ECM harness connector. I 2. Check the continuity between ECM harness connector and ignition coil harness connector. K 2. Check the continuity between ECM harness connector and ignition coil harness connector. K 3. Also check harness for short to ground and short to power. Isother continuity between ECM harness connector. K 4. F36 1 F7 I I 2. Check the continuity between ECM harness c	1	F33	3				FO
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YES >> GO TO 7. NO >> Repair open circuit or short to ground or short to power in harness or connectors. D YES >> GO TO 7. NO >>> Repair open circuit or short to ground or short to power in harness or connectors. D YES >> Check the continuity between ignition coil harness connector and ground. E I Turn ignition switch OFF. E 2 F34 2 Ground 3 F35 2 Ground Existed 4 F36 2 Ground Existed 3. Also check harness for short to power. E E Is the inspection result normal? YES >> GO TO 8. I YES >> GO TO 0. I I I 1 F33 1 F7 I I 2 F34 1 F7 I I 3. Also check harness for short to ground or short to power in harness connectors. I I 4 F33 1 F7 I I 1. Disconnect ECM harness connector I I I I 2	4	F36	3	-			С
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4F362H3. Also check harness for short to power.Is the inspection result normal?IIs the inspection result normal?YES >> GO TO 8.INO >> Repair open circuit or short to ground or short to power in harness or connectors.88.CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORTJ1. Disconnect ECM harness connector.22. Check the continuity between ECM harness connector and ignition coil harness connector.KVerified Connector Terminal Connector Terminal101F3311F3312F3413F3513F35213. Also check harness for short to ground and short to power.Is the inspection result normal?YES >> GO TO 9.NO>> Repair open circuit or short to ground or short to power in harness or connectors.9.CHECK IGNITION COIL WITH POWER TRANSISTORRefer to ECH-300. "Component Inspection (Ignition Coil with Power Transistor)".NO>> Replace malfunctioning ignition coil with power transistor.10.CHECK INTERMITTENT INCIDENT	-	_		Ground	Existed		
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$\frac{ \text{gnition coil}}{ \text{Cylinder} } \xrightarrow{ \text{Connector} } Terminal Connector Terminal Continuity} \\ \hline \frac{ \text{Cylinder} }{ 1 } \xrightarrow{ \text{F33} 1 } = \frac{ 17 }{ 18 } \\ \hline \frac{ 17 }{ 22 } = \frac{ 17 }{ 22 } \\ \hline \frac{ 18 }{ 21 } = \frac{ 17 }{ 22 } \\ \hline \frac{ 18 }{ 21 } = \frac{ 17 }{ 22 } \\ \hline \frac{ 18 }{ 21 } = \frac{ 17 }{ 22 } \\ \hline \frac{ 18 }{ 21 } = \frac{ 16 }{ 21 } \\ \hline \frac{ 18 }{ 21 } = \frac{ 16 }{ 21 } \\ \hline \frac{ 18 }{ 21 } = \frac{ 16 }{ 21 } \\ \hline \frac{ 16 }{ 21 $	2. Check t	he continuity	between E	CM harn	ess connector	and ignition coil harness connector.	K
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		Ignition coil			ECM	Continuity	IX.
2 F34 1 3 F35 1 4 F36 1 3. Also check harness for short to ground and short to power. Image: Comparison of the image: Comparison of t	Cylinder	Connector	Terminal	Connect	or Terminal	Continuity	
3 F35 1 F7 22 Existed M 3 F36 1 21 M M M 3. Also check harness for short to ground and short to power. Is the inspection result normal? N N YES >> GO TO 9. NO >> Repair open circuit or short to ground or short to power in harness or connectors. O 9. CHECK IGNITION COIL WITH POWER TRANSISTOR O Refer to ECH-300, "Component Inspection (Ignition Coil with Power Transistor)". Is the inspection result normal? P YES >> GO TO 10. NO >> Replace malfunctioning ignition coil with power transistor. P 10.CHECK INTERMITTENT INCIDENT INCIDENT Intermittent incident Intermittent incident	1	F33	1		17		L
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4 F36 1 21 3. Also check harness for short to ground and short to power. Is the inspection result normal? N YES >> GO TO 9. NO >> Repair open circuit or short to ground or short to power in harness or connectors. N 9. CHECK IGNITION COIL WITH POWER TRANSISTOR O Refer to ECH-300, "Component Inspection (Ignition Coil with Power Transistor)". Is the inspection result normal? P YES >> GO TO 10. NO >> Replace malfunctioning ignition coil with power transistor. P 10.CHECK INTERMITTENT INCIDENT INCIDENT Interminian and a short to power transistor. Interminian and a short to power transistor.	3	F35	1		22		в. Л
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NO >> Replace malfunctioning ignition coil with power transistor. 10.CHECK INTERMITTENT INCIDENT	•		ormal?				Р
10.check intermittent incident			functioning	ignition	coil with nowe	transistor.	
		•	-	-			
Refer to <u>GI-39. "Intermittent Incident"</u> .							

>> INSPECTION END

IGNITION SIGNAL

[HR16DE (WITH EURO-OBD)]

< COMPONENT DIAGNOSIS > Component Inspection (Ignition Coil with Power Transistor)

INFOID:000000001179629

1.CHECK IGNITION COIL WITH POWER TRANSISTOR-I

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

Terminals	Resistance [at 25°C (77°F)]	
1 and 2	Except 0 or ∞ Ω	
1 and 3	Except 0 Ω	
2 and 3		

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning ignition coil with power transistor.

2.CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:

Do the following procedure in the place where ventilation is good without the combustible.

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Remove fuel pump fuse in IPDM E/R to release fuel pressure.
- NOTE:

Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.

- 4. Start engine.
- 5. After engine stalls, crank it two or three times to release all fuel pressure.
- 6. Turn ignition switch OFF.
- 7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 8. Remove ignition coil and spark plug of the cylinder to be checked.
- 9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- 10. Connect spark plug and harness connector to ignition coil.
- 11. Fix ignition coil using a rope etc. with gap of 13 17 mm (0.52 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- 12. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

• Do not approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.

• It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken. NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace malfunctioning ignition coil with power transistor.

Component Inspection (Condenser)

INFOID:000000001179630

13 - 17 mm

(0.52-0.66 in)

JMBIA0066GE

mmm

(Cylinder head, cylinder block, etc.)

Grounded metal portion

- 1.CHECK CONDENSER
- 1. Turn ignition switch OFF.
- 2. Disconnect condenser harness connector.

IGNITION SIGNAL

< COMPONENT DIAGNOSIS >

2 Charle registered between condensor terminals of follows	
3. Check resistance between condenser terminals as follows.	A
Terminals Resistance [at 25°C (77°F)]	
1 and 2 Above 1 MΩ	
Is the inspection result normal?	ECH
YES >> INSPECTION END NO >> Replace condenser.	С
	D
	E
	F
	G
	Н
	I
	J
	K
	L
	Μ
	Ν
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	Р

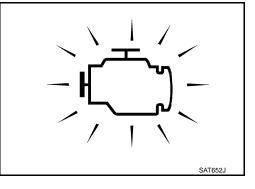
MALFUNCTION INDICATOR

Description

The Malfunction Indicator (MI) is located on the combination meter. 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.

For details, refer to ECH-302, "Diagnosis Procedure".



Component Function Check

1.CHECK MI FUNCTION

1. Turn ignition switch ON.

2. Make sure that MI lights up.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-302, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK DTC

Check that DTC U1001 is not displayed.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble diagnosis for DTC U1001. Refer to ECH-110, "Diagnosis Procedure".

2. CHECK COMBINATION METER

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

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter.

NO >> Repair or replace.

INFOID:000000001179633

INFOID:000000001179632

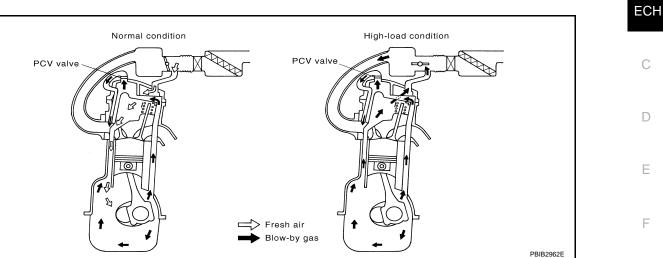
INFOID:0000000001179631

POSITIVE CRANKCASE VENTILATION

Description

INFOID:000000001179634

[HR16DE (WITH EURO-OBD)]



This system returns blow-by gas to the intake manifold.

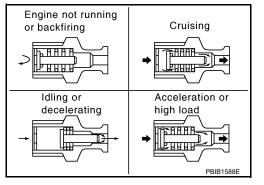
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.



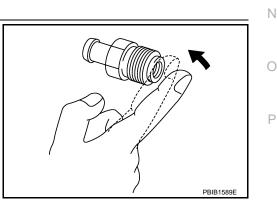
Component Inspection

1.CHECK PCV VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace PCV valve.



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INFOID:000000001179635

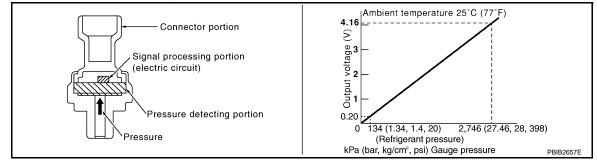
[HR16DE (WITH EURO-OBD)]

REFRIGERANT PRESSURE SENSOR

Description

INFOID:0000000001179636

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



Component Function Check

INFOID:000000001179637

INFOID:000000001179638

1.CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn A/C switch and blower fan switch ON.
- 3. Check the voltage between ECM harness connector and ground.

	ECM	Ground	Voltage	
Connector	Terminal	Ground	vollage	
F8	41 (Refrigerant pressure sensor signal)	Ground	1.0 - 4.0V	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-304, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn A/C switch and blower fan switch OFF.
- 2. Stop engine.
- 3. Turn ignition switch OFF.
- 4. Check ground connection E21. 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 harness connector and ground.

Refrigerant pre	essure sensor	Ground	Voltage
Connector	Terminal	Ground	voltage
E49	3	Ground	Approx. 5V

Is the inspection result normal?

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

REFRIGERANT PRESSURE SENSOR

[HR16DE (WITH EURO-OBD)]

< COMPONE	ENT DIAG	NOSIS >			[HR16DE (WITH EURO-OBD)]
3.DETECT	MALFUNCT	IONING PA	RT		
Check the fol					
 Harness co 					
 Harness to 	r open or sr	iort between	ECIM and	refrigerant	pressure sensor
	Popoir opop	oirouit or ch	ort to group	ad ar chart	to nower in horness or connectore
	• •		•		to power in harness or connectors.
			URE SENS		ND CIRCUIT FOR OPEN AND SHORT
	tion switch		otor		
		rness conne v between re		ressure ser	nsor harness connector and ECM harness connec-
tor.		botwoonine	ingolan p		
Refrigerant pre	essure sensor	EC	CM		
Connector	Terminal	Connector	Terminal	- Continuity	
E49	1	F8	48	Existed	
1. Also che	ck harness	for short to	ground and	short to po	wer.
s the inspect				1	
	GO TO 6.				
NO >> 0	GO TO 5.				
DETECT	MALFUNCT	IONING PA	RT		
>> F	Repair open	circuit or sh	ort to grou	nd or short	to power in harness or connectors.
6. снеск	EFRIGERA	NT PRESS	URE SENS	OR INPUT	SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Check th	ne continuity	v between E	CM harnes	s connecto	r and refrigerant pressure sensor harness connec-
tor.					
Refrigerant pre	essure sensor	EC	M	Continuity	
Connector	Terminal	Connector	Terminal		
E49	2	F8	41	Existed	
2. Also che	ck harness	for short to	ground and	short to po	wer.
s the inspect	<u>tion result n</u>	ormal?			
	GO TO 8.				
-	GO TO 7.				
.DETECT	MALFUNCT	IONING PA	RT		
Check the fol	llowing.				
Harness co					
Harness to	r open or sh	iort between		rerrigerant	pressure sensor
-		aira: .!	out to an-	ad an al (to now or in hornood or connectors
^			-	nd or short	to power in harness or connectors.
8.CHECK IN	NTERMITTE	NT INCIDE	NT		
Refer to GI-3	9, "Intermitt	ent Incident			
Is the inspect	tion result n	ormal?			

YES >> Replace refrigerant pressure sensor.

NO >> Repair or replace.

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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.

I.e. 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	C	condition	Values/Status	
ENG SPEED	Run engine and compare CONSL	ILT-III value with the tachometer indication.	Almost the same speed as the tachometer indication.	
MAS A/F SE-B1	See ECH-99, "Diagnosis Procedure			
B/FUEL SCHDL	See ECH-99, "Diagnosis Procedure			
A/F ALPHA-B1	See ECH-99, "Diagnosis Procedure	<u>.</u>		
COOLAN TEMP/S	Engine: After warming up		More than 70°C (158F)	
HO2S1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V	
HO2S2 (B1)	are met. - Engine: After warming up	00 rpm quickly after the following conditions en 3,500 and 4,000 rpm for 1 minute and at	0 - 0.3V ←→ Approx. 0.6 - 1.0V	
HO2S1 MNTR (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	$\begin{array}{l} \text{LEAN} \leftarrow \rightarrow \text{RICH} \\ \text{Changes more than 5 times} \\ \text{during 10 seconds} \end{array}$	
HO2S2 MNTR (B1)	are met. - Engine: After warming up	 Engine: After warming up After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at 		
VHCL SPEED SE	Turn drive wheels and compare C dication.	ONSULT-III value with the speedometer in-	Almost the same speed as speedometer indication	
BATTERY VOLT	Ignition switch: ON (Engine stopp)	ed)	11 - 14V	
ACCEL SEN 1	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V	
ACCEL SEN I	(Engine stopped)	Accelerator pedal: Fully depressed	4.0 - 4.8V	
ACCEL SEN 2	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V	
ACCEL SEN 2	(Engine stopped)	Accelerator pedal: Fully depressed	3.9 - 4.8V	
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36V	
THRL SEN 1-B1	(Engine stopped)Shift lever: 1st	Accelerator pedal: Fully depressed	Less than 4.75V	
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36V	
THRL SEN 2-B1	(Engine stopped) • Shift lever:1st	Accelerator pedal: Fully depressed	Less than 4.75V	
START SIGNAL	• Ignition switch: $ON \rightarrow START \rightarrow O$	DN	$OFF\toON\toOFF$	
CLSD THL POS	Ignition switch: ON	Accelerator pedal: Fully released	ON	
CLOD INL PUS	(Engine stopped)	Accelerator pedal: Slightly depressed	OFF	

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[HR16DE (WITH EURO-OBD)]

Monitor Item	C	ondition	Values/Status
	• Engine: After warming up, idle the	Air conditioner switch: OFF	OFF
AIR COND SIG	engine	Air conditioner switch: ON (Compressor operates.)	ON
		Shift lever: Neutral	ON
P/N POSI SW	Ignition switch: ON	Shift lever: Except above	OFF
PW/ST SIGNAL	• Engine: After warming up, idle the	Steering wheel: Not being turned	OFF
-W/ST SIGNAL	engine	Steering wheel: Being turned	ON
		Rear window defogger switch: ON and/or Lighting switch: 2nd position	ON
LOAD SIGNAL	Ignition switch: ON	Rear window defogger switch and lighting switch: OFF	OFF
IGNITION SW	• Ignition switch: $ON \rightarrow OFF \rightarrow ON$	l	$ON\toOFF\toON$
	• Engine: After warming up, idle the	Heater fan switch: ON	ON
HEATER FAN SW	engine	Heater fan switch: OFF	OFF
	Ignition switch: ON	Brake pedal: Fully released	OFF
BRAKE SW	Ignition switch: ON	Brake pedal: Slightly depressed	ON
	Engine: After warming up	Idle	2.0 - 3.0 msec
NJ PULSE-B1	 Shift lever: Neutral Air conditioner switch: OFF No load 	2,000 rpm	1.9 - 2.9 msec
	Engine: After warming up Shift lever: Neutral	Idle	10° - 20° BTDC
GN TIMING	Air conditioner switch: OFF No load	2,000 rpm	25° - 45° BTDC
CAL/ALD VALUE	Engine: After warming upShift lever: Neutral	Idle	10% - 35%
CAL/ALD VALUE	Air conditioner switch: OFFNo load	2,500 rpm	10% - 35%
MASS AIRFLOW	Engine: After warming upShift lever: Neutral	Idle	1.0 - 4.0 g·m/s
	 Air conditioner switch: OFF No load	2,500 rpm	2.0 - 10.0 g⋅m/s
	 Engine: After warming up Shift lever: Neutral 	Idle	0%
PURG VOL C/V	 Shift lever: Neutral Air conditioner switch: OFF No load 	2,000 rpm	0% - 50%
	Engine: After warming up	Idle	–5° - 5°CA
NT/V TIM (B1)	 Shift lever: Neutral Air conditioner switch: OFF No load 	2,000 rpm	Approx. 0° - 40°CA
	Engine: After warming up	ldle	0% - 2%
NT/V SOL (B1)	 Shift lever: Neutral Air conditioner switch: OFF No load 	2,000 rpm	Approx. 0% - 90%
		Air conditioner switch: OFF	OFF
AIR COND RLY	• Engine: After warming up, idle the engine	Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	 For 1 seconds after turning ignition Engine running or cranking 		ON
	Except above		OFF
THRTL RELAY	Ignition switch: ON		ON

< ECU DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Monitor Item	C	Condition	Values/Status
		Engine coolant temperature is 98°C (208F) or less	OFF
COOLING FAN	 Engine: After warning up, idle the engine Air conditioner switch: OFF 	Engine coolant temperature is between 98°C (208°F) and 99°C (210°F)	LOW
		Engine coolant temperature is 100°C (212°F) or more	HIGH
HO2S1 HTR (B1)	Engine: After warming upEngine speed: Below 3,600rpm		ON
	Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1)	 Engine speed: Below 3,900 rpm a Engine: After warming up Keeping the engine speed betwee idle for 1 minute under no load 	fter the following conditions are met. en 3,500 and 4,000 rpm for 1 minute and at	ON
VEHICLE SPEED	• Turn drive wheels and compare C dication.	ONSULT-III value with the speedometer in-	Almost the same speed as the speedometer indication
IDL A/V LEARN		Idle air volume learning has not been per- formed yet.	YET
IDL A/V LEARIN	• Engine. running	Idle air volume learning has already been performed successfully.	CMPLT
TRVL AFTER MIL	Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,535 km (0 - 40,723 miles)
O2 SEN HTR DTY	Engine coolant temperature whenEngine speed: Below 3,600 rpm	engine started: More than 80°C (176 - F)	Approx. 30%
AC PRESS SEN	Engine: IdleBoth A/C switch and blower fan switch	1.0 - 4.0V	
VHCL SPEED SE	Turn drive wheels and compare C dication.	Almost the same speed as the speedometer indication	
SET VHCL SPD	Engine: Running	ASCD: Operating	The preset vehicle speed is displayed
MAIN SW	Ignition switch: ON	MAIN switch: Pressed	ON
		MAIN switch: Released	OFF
CANCEL SW	Ignition switch: ON	CANCEL switch: Pressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON
		RESUME/ACCELERATE switch: Re- leased	OFF
SET SW	Ignition switch: ON	SET/COAST switch: Pressed	ON
021 011		SET/COAST switch: Released	OFF
BRAKE SW1	 Engine speed: Below 3,600rpm Engine speed: Above 3,600 rpm Engine: After warming up Keeping the engine speed betwee idle for 1 minute under no load Turn drive wheels and compare 0 dication. Engine: running Engine coolant temperature whe engine speed: Below 3,600 rpm Engine: Idle Both A/C switch and blower fan set engine: Idle Both A/C switch and blower fan set engine: Running Ignition switch: ON 	Brake pedal and clutch pedal: Fully re- leased	ON
(ASCD brake switch)		Brake pedal and/or clutch pedal: Slightly depressed	OFF
BRAKE SW2	Ignition switch: ON	Brake pedal: Fully released	OFF
(Stop lamp switch)		Brake pedal: Slightly depressed	ON
VHCL SPD CUT	Ignition switch: ON		NON
LO SPEED CUT	Ignition switch: ON		NON
AT OD MONITOR	Ignition switch: ON		OFF
AT OD CANCEL	Ignition switch: ON		OFF
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at the 1st time \rightarrow at the 2nd time	$ON\toOFF$



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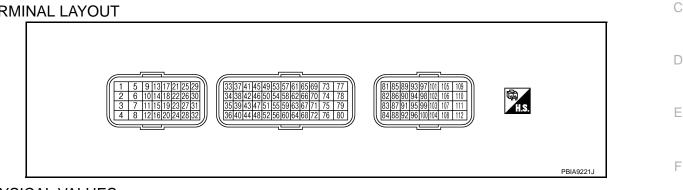
[HR16DE (WITH EURO-OBD)]

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Monitor Item	C	condition	Values/Status	_
	MAIN switch: ON	ASCD: Operating	ON	A
SET LAMP	When vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)		OFF	ECH

*: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

TERMINAL LAYOUT



PHYSICAL VALUES

NOTE:

- ECM is located in the engine room left side near battery.
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT-III.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECMs transistor. Use a ground other than ECM terminals, such as the ground.

Term	inal No.	Wire	Description			Value	
+		color	Signal name	Input/ Output	Condition	(Approx.)	J
1	Ground	L/W	Throttle control motor (Open)	Output	 [Ignition switch: ON] Engine stopped Shift lever: 1st Accelerator pedal: Fully depressed 	3.2V★	K
2	Ground	R/Y	Throttle control motor relay power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	M
3	Ground	LG/R	Heated oxygen sensor 1 heater	Output	[Engine is running]Warm up conditionEngine speed: Below 3,600 rpm	Approximately 3.2V★	N
					 [Engine is running] Warm-up condition Idle speed [Engine is running] Engine speed: Above 3,600 rpm 	BATTERY VOLTAGE (11 - 14V)	P



[HR16DE (WITH EURO-OBD)]

< ECU DIAGNOSIS >

+ color Signal name Input/ Output Condition (Approx.) 4 Ground P Throttle control motor (Close) Output Ignition switch: ON] • Shift ever; 1st • Accelerator pedal: Fully re- leased 0 - 14V ★ 5 Ground R Heated oxygen sensor 2 heater Output Image: Approx.) 0 - 14V ★ 6 Ground R Heated oxygen sensor 2 heater Output Image: Approx.) 0 - 14V ★ 9 Ground R Heated oxygen sensor 2 heater Output Image: Approx.) 0 - 14V ★ 9 Ground R Heated oxygen sensor 2 heater Output Image: Approx.) 0 - 14V ★ 9 Ground W/B EVAP canister purge volume control solenoid valve Output Image: Approx.) Image: Approx.) 9 Ground W/B EVAP canister purge volume control solenoid valve Output Image: Approx.) BatTERY VOLTAGE (11 - 14V) ★ 9 Ground W/B EVAP canister purge volume control solenoid valve Output Image: Approx.) BatTERY VOLTAGE (11 - 14V) ★ 10 Ground Bw ECM ground <th>Term</th> <th>inal No.</th> <th>Wire</th> <th>Description</th> <th></th> <th></th> <th>Value</th> <th></th>	Term	inal No.	Wire	Description			Value	
4 Ground P Throttle control motor (Close) Output Ignition switch: ON) - Engine stopped - Accelerator pedal: Fully re- leased Image: Stopped - Engine speed: Below 3.900 - Engine stopped - Image: Atowa 3.900 - Engine stopped - Engine stopped - Image: Atowa 3.900 - Image: Atowa 3.900 - Engine stopped - Image: Atowa 3.900 - Engine stopped - Image: Atowa 3.900 - Engine stopped - Image:	+			Signal name		Condition		
5 Ground R Heated oxygen sensor 2 heater Output • Engine: after warming up - Engine: after warming up - Reging the engine speed: between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load • • Engine: stare warming up - Regine: after warming up - Regine: stopped • • Engine: stopped • • Engine: stopped 1 Image: Stopped St	4	Ground	Ρ		Output	Engine stoppedShift lever: 1stAccelerator pedal: Fully re-		PBIA8149J
9 Ground W/B EVAP canister purge volume control solenoid valve Output [Engine is running] BATTERY VOLTAGE (11 - 14V) 9 Ground W/B EVAP canister purge volume control solenoid valve Output [Engine is running] BATTERY VOLTAGE (11 - 14V)* 10 Ground B ECM ground — [Engine is running] • Idle speed 10 Ground B BCM ground — [Engine is running] • Idle speed 10 Ground B BCM ground — [Engine is running] • Idle speed 10 Ground B BCM ground — [Engine is running] • Idle speed 10 Ground B B ECM ground — [Engine is running] • Body ground 11 Ground B B ECM ground — [Engine is running] • Body ground	5	Ground	R		Output	 Engine speed: Below 3,900 rpm after the following con- ditions are met Engine: after warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle 		PBIA8148J
9 Ground W/B EVAP canister purge volume control solenoid valve Output [Engine is running] • Idle speed Image: Control solenoid valve BATTERY VOLTAGE (11 - 14V)* 9 Ground W/B EVAP canister purge volume control solenoid valve Output [Engine is running] • Idle speed BATTERY VOLTAGE (11 - 14V)* 10 Ground B BCM ground — [Engine is running] • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine.) Image: Control solenoid valve 10 Ground B ECM ground — [Engine is running] • Idle speed Body ground 11 Ground B ECM ground — [Engine is running] • Idle speed Body ground						Engine stopped[Engine is running]Engine speed: Above 3,900		
Control solenoid valve Image: Control solenoid valve <	0	Ground	\M//P	EVAP canister purge volume	Output		(11 - 14V)★	PBIB0050E
11 Ground B/W EChil ground 11 B/W B/W Idle speed Body ground Illanition switch: OFF1 BATTERY VOLTAGE	э	Ground	VV/D	control solenoid valve	Output	Engine speed: About 2,000 rpm (More than 100 sec-	(11 - 14V)★	PBIB0520E
		Ground		ECM ground			Body ground	
15 Ground G/L Throttle control motor relay Output [Ignition switch: ON] (11 - 14V) [Ignition switch: ON] 0 - 1.0V	15	Ground	G/L	Throttle control motor relay	Output	[Ignition switch: OFF]	(11 - 14V)	

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[HR16DE (WITH EURO-OBD)]

Termi	inal No.	10/:	Description			Value	
+		Wire color	Signal name	Input/ Output	Condition	Value (Approx.)	А
17 18	Ground	L/Y BR/Y	Ignition signal No. 1 Ignition signal No. 2	Quitout	 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle 	0 - 0.3V★	C D
21 22	Ground	R/G SB	Ignition signal No. 4 Ignition signal No. 3	Output	[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	0.2 - 0.5V★	E
		5/0			 [Ignition switch: ON] For 1 second after turning ignition switch ON [Engine is running] 	0 - 1.0V	G
23	Ground	B/O	Fuel pump relay	Output	 [Ignition switch: ON] More than a few seconds after turning ignition switch ON 	BATTERY VOLTAGE (11 - 14V)	Н
						BATTERY VOLTAGE (11 - 14V)★	Ι
					 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle 		J
25 29	Ground	R/O Y	Fuel injector No. 4 Fuel injector No. 3	Output		▶ 10.0 V/Div 50 ms/Div T PBIB0529E	ſŇ
30 31	Ground	O L	Fuel injector No. 2 Fuel injector No. 1	Output		BATTERY VOLTAGE (11 - 14V)★	L
					[Engine is running]Warm-up conditionEngine speed: 2,000 rpm	> 10.0 V/Div 50 ms/Div T	M
	Ground	Y/L	ECM relay	Output	[Engine is running][Ignition switch: OFF]A few seconds after turning ignition switch OFF	0 - 1.0V	0
	Cround	1/2	(Self shut-off)		 [Ignition switch: OFF] More than a few seconds after turning ignition switch OFF 	BATTERY VOLTAGE (11 - 14V)	Ρ



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[HR16DE (WITH EURO-OBD)]

Term	inal No.	14/:	Description				
+		Wire color	Signal name	Input/ Output	Condition	Value (Approx.)	
33	Ground	L/R	Throttle position sensor 1	Input	 [Ignition switch: ON] Engine stopped Shift lever: 1st Accelerator pedal: Fully released 	More than 0.36V	
	Cround	Lin		mpar	[Ignition switch: ON]Engine stoppedShift lever: 1stAccelerator pedal: Fully depressed	Less than 4.75V	
34	Ground	L/O	Throttle position sensor 2	Input	 [Ignition switch: ON] Engine stopped Shift lever: 1st Accelerator pedal: Fully released 	Less than 4.75V	
	Cround	20		mput	 [Ignition switch: ON] Engine stopped Shift lever: 1st Accelerator pedal: Fully depressed 	More than 0.36V	
36	Ground	V/W	Sensor ground (Throttle position sensor)	_	[Engine is running]Warm-up conditionIdle speed	ΟV	
37	Ground	W	Knock sensor	Input	[Engine is running] • Idle speed	2.5V	
38	Ground	GR/B	Engine coolant temperature sensor	Input	[Engine is running]	0 - 4.8V Output voltage varies with engine coolant temperature.	
40	Ground	_	Sensor ground (Knock sensor)	_	[Engine is running]Warm-up conditionIdle speed	0V	
41	Ground	G/P	Refrigerant pressure sensor	Input	 [Engine is running] Warm-up condition Both A/C switch and blower fan motor switch: ON (Com- pressor operates) 	1.0 - 4.0V	
44	Ground	В	Sensor ground (Engine coolant temperature sensor)		[Engine is running]Warm-up conditionIdle speed	0V	
					[Ignition switch ON] Engine stopped 	0.4V	
45	Ground	BR	Mass air flow sensor	Input	[Engine is running] • Warm-up condition • Idle speed	1.0 - 1.3V	
					[Engine is running]Warm-up conditionEngine is revving from idle to about 4,000 rpm	1.0 - 1.3 to 2.4V (Check for linear voltage rise in response to en- gine being increased to about 4,000 rpm.)	
46	Ground	V	Intake air temperature sen- sor	Input	[Engine is running]	0 - 4.8V Output voltage varies with intake air temperature.	
48	Ground	R/L	Sensor ground (Refrigerant pressure sen- sor)		[Engine is running]Warm-up conditionIdle speed	0V	

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[HR16DE (WITH EURO-OBD)]

Terminal No.			Description				
+		Wire color	Signal name	Input/ Output	Condition	Value (Approx.)	A
49	Ground	L/G	Heated oxygen sensor 1	_	[Engine is running]Warm-up conditionEngine speed: 2,000 rpm	0 - 1.0V (Periodically change)	ECH
50	Ground	Y	Heated oxygen sensor 2	Input	 [Engine is running] Revving engine from idle to 3,000 rpm quickly after the following conditions are met Engine: after warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	0 - 1.0V	C D E
52	Ground	LG	Sensor ground (Mass air flow sensor)	_	[Engine is running]Warm-up conditionIdle speed	0V	_
55	Ground	0	Sensor power supply (Intake air temperature sen- sor)	_	[Engine is running]Warm-up conditionIdle speed	0V	F
56	Ground	Ρ	Sensor ground (Heated oxygen sensor 1)	_	[Engine is running]Warm-up conditionIdle speed	0V	G
59	Ground	SB	Sensor ground (Heated oxygen sensor 2)	_	[Engine is running]Warm-up conditionIdle speed	0V	Н
61	Ground	LG/B	Crankshaft position sensor	Input	 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle 	0 - 1.0V★	I J K
01	Glound	LG/B	(POS)	niput	[Engine is running] • Engine speed: 2,000 rpm	0 - 1.0V★	L
62	Ground	GR/L	Sensor ground [Crankshaft position sensor (POS)]	_	[Engine is running] • Warm-up condition • Idle speed	OV	Ν
63	Ground	L	Sensor ground [Camshaft position sensor (PHASE)]	_	[Engine is running]Warm-up conditionIdle speed	0V	0

Ρ

[HR16DE (WITH EURO-OBD)]

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Term	Terminal No.		Description		Value	
+		Wire color	Signal name	Input/ Output	Condition	(Approx.)
65	Ground	G	Camshaft position sensor	Input	 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle 	0 - 1.0V★
00	Glound	0	(PHASE)	mput	[Engine is running] • Engine speed is 2,000 rpm	0 - 1.0V★
					[Ignition switch: ON] Neutral 	BATTERY VOLTAGE (11 - 14V)
69	Ground	W/B	Neutral position switch	Input	[Ignition switch: ON] • Shift lever: Except above position	ov
72	Ground	V/R	Sensor power supply (Throttle position sensor)	_	[Ignition switch: ON]	5V
					[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14V)
73	Ground	Y/R	Intake valve timing control solenoid valve	Output	[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 10V★
74	Ground	Y/W	Sensor power supply (Refrigerant pressure sen- sor)		[Ignition switch: ON]	5V
75	Ground	L/W	Sensor power supply [Crankshaft position sensor (POS)]		[Ignition switch: ON]	5V
78	Ground	Y/V	Sensor power supply [Camshaft position sensor (PHASE)]		[Ignition switch: ON]	5V
83	Ground	Ρ	CAN communication line	Input/ Output	_	_
84	Ground	L	CAN communication line	Input/ Output	_	_
88	Ground	0	Data link connector	Input/ Output	[Ignition switch: ON]CONSULT-III or GST: Disconnected	2.7V
93	Ground	W/L	lapition switch	Innut	[Ignition switch: OFF]	0V
93	Ground	vv/L	Ignition switch	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

< ECU DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Term	Terminal No.		Description			Value	
+		Wire color	Signal name	Input/ Output	Condition	(Approx.)	А
					[Ignition switch: ON] • ASCD steering switch: OFF	4V	ECH
					[Ignition switch: ON] • CANCEL switch: Pressed	1V	
94	Ground	V	ASCD steering switch	Input	[Ignition switch: ON] • MAIN switch: Pressed	٥V	С
					[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3V	D
					[Ignition switch: ON] • SET/COAST switch: Pressed	2V	Е
95	Ground	В	Sensor ground (ASCD steering switch)	_	[Engine is running]Warm-up conditionIdle speed	0V	F
					[Ignition switch: OFF] • Brake pedal: Fully released	0V	0
99	Ground	R/W	/W Stop lamp switch	Input	[Ignition switch: OFF]Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)	G
100	Onerrod	6		land	[Ignition switch: ON]Brake pedal and clutch ped- al: Slightly depressed	0V	Н
100	Ground	R	ASCD brake switch	Input	[Ignition switch: ON] • Brake pedal and/or clutch pedal: Fully released	BATTERY VOLTAGE (11 - 14V)	I
102	Ground	BR	Sensor power supply (Accelerator pedal position sensor 2)	_	[Ignition switch: ON]	5V	J
103	Cround	GR	Accelerator pedal position	Innut	[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released	0.3 - 0.6V	K
103	Ground	GK	sensor 2	Input	[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully depressed	1.95 - 2.4V	L
104	Ground	Y	Sensor ground (Accelerator pedal position sensor 2)	_	[Engine is running] • Warm-up condition • Idle speed	0V	
105	Ground	G	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	Ν
106	Ground	V	Sensor power supply (Accelerator pedal position sensor 1)	_	[Ignition switch: ON]	5V	0
108	Ground	В	ECM ground	_	[Engine is running] • Idle speed	Body ground	Ρ

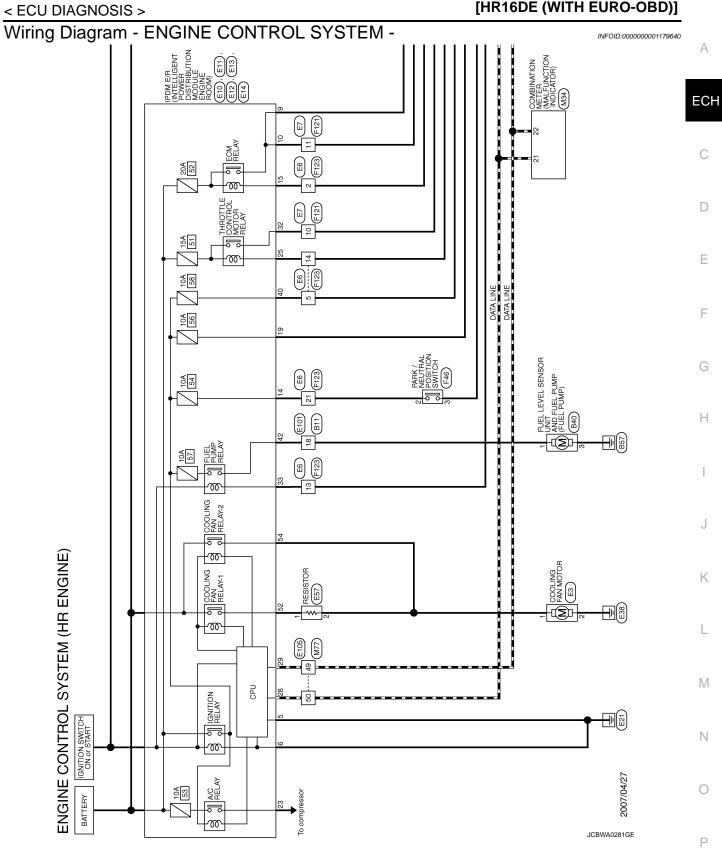
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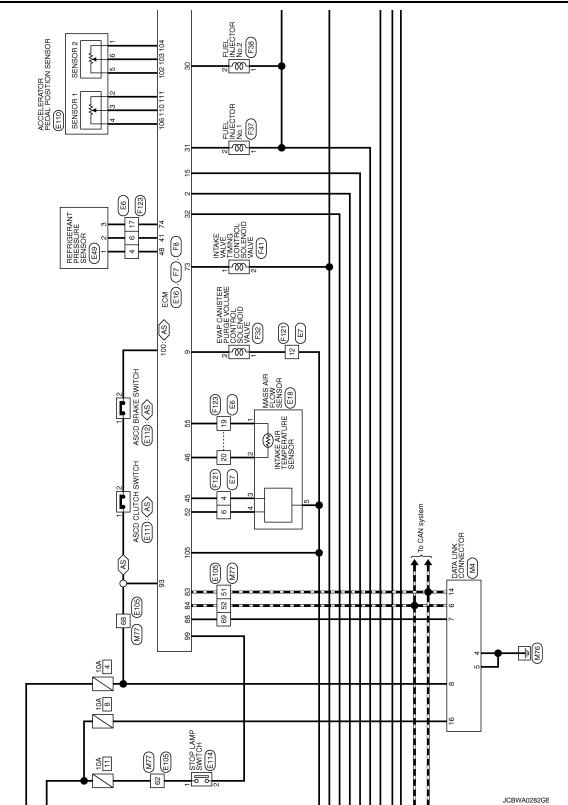
[HR16DE (WITH EURO-OBD)]

Terminal No.		Wire	Description			Value	
+		color	Signal name	Input/ Output	Condition	(Approx.)	
110	Accelerator pedal position			0.6 - 0.9V			
110	Ground	0	sensor 1	Input	[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully depressed	3.9 - 4.7V	
111	Ground	R	Sensor ground (Accelerator pedal position sensor 1)		[Engine is running]Warm-up conditionIdle speed	0V	

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

[HR16DE (WITH EURO-OBD)]

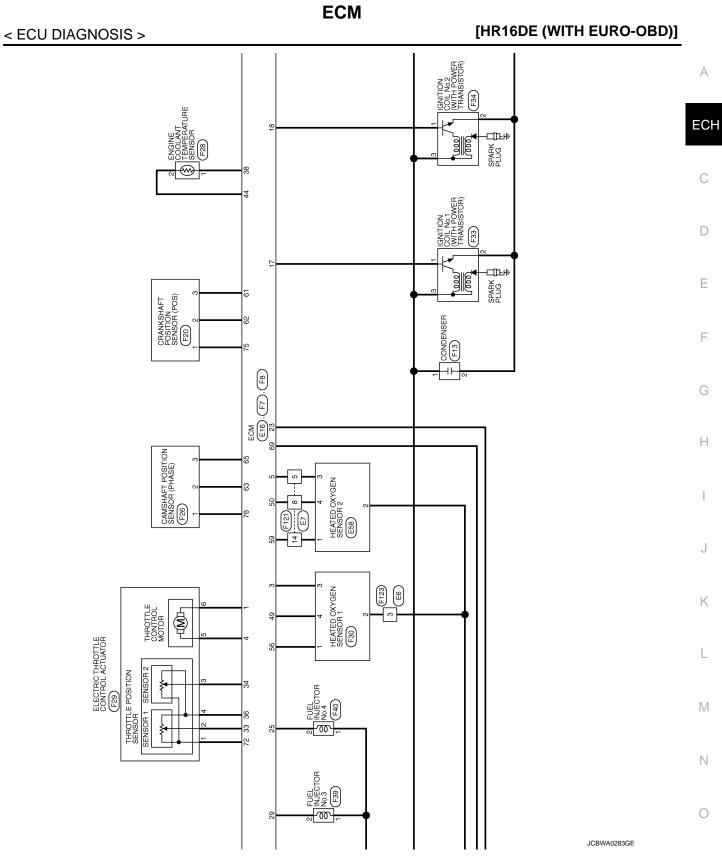




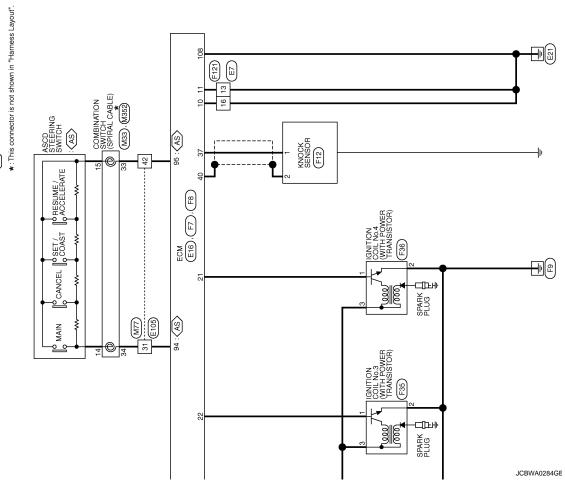
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AS>: With ASCD

[HR16DE (WITH EURO-OBD)]



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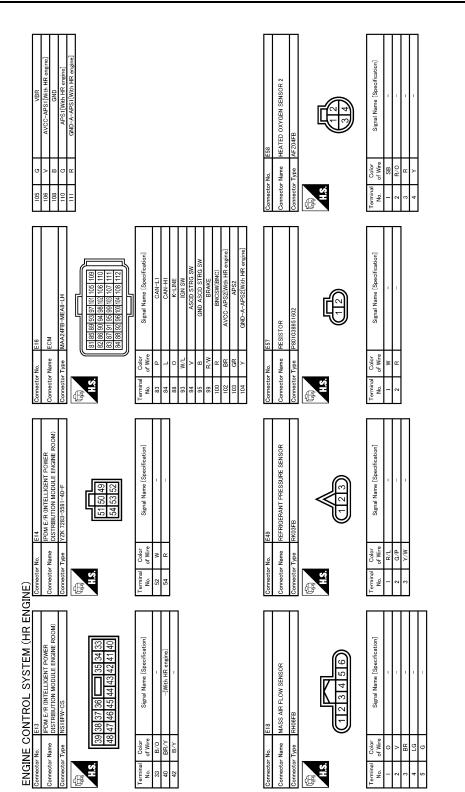
AS>: With ASCD

 • • • This connector is not shown in "Harness

8 8 9 10 21 22 23 24	tion]	R ROOM)	lion	A
<u>8</u> 1920	Signal Name (Specification) -[Except A.7] -[Except M9R engine] - -[Except M9R engine] -[With gasoline engine] -[With gasoline engine]	E12 IPDM E.R. (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) NS12FW-CS 25 24 23 22 21 26 24 23 22 21 27 26	Signal Name [Specification]	ECH
E6 MIRE TO WIRE me WIRE TO WIRE pe TRZAMW-TV 13 14 15 6 13 14 15 16 17	Color of Wire R/L R/L B/O B/O C/P B/O V/W V/W V/W V/W R/L R/L R/L R/L R/L R/L R/L R/L C 0 / 0 1 / 1 / 1 / 1 / 1 / 1 / 1 / 1 / 1 / 1 /	e .	Calor of Mire Sig Mire VB Color VB Color L L L L L	С
Connector No. Connector Name Connector Type	Terminal 0 from 0 f 1 0 0 0 f 2 1 0 0 0 f 5 1 0 0 0 f 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Connector Neme Connector Neme Connector Type H.S.	Terminal C No. of 23 0 23 1 28 2 29 5 29 5 29 5 29 5 29 5 29 5 5	D
	[lication]	ower Naine Room) 14	(fication)	Е
E3 COCUNG FAN MOTOR PS0103851502	Signal Name (Specification)	R ONTELLIGENT P TOTON MODULE E 2-CS 18 17 16 15	Signal Name [Specification] [With gasofine engine]	F
	Odior of Wine B R	e e	Color of Wire G L/R R/B R/0 R/0	G
Commetter No. Commetter Name Commetter Type	Terminal No.	Connector No. Connector Type H.S.	Terminal No. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Н
	Specification	ETO IPDM E.R. (NITELLIGENT POWER DISTRBUTION MODULE ENGINE ROOM) MOBFB-LC B 7 6 8 7 6	pecification]	I
Electron Line and Fuel. Fuel. Level. Sensor unit and Fuel. Fuel. For the control of the control	Signal Name [Specification]	A E/R (INTELLICEN RIBUTION MODUL EB-LC	Signal Name [Specification]	J
octor No. octor Name	b intral Objer B B	Connector No. E10 Connector Name IPDN Connector Type M061 H.S.	B B B	К
	Terminal No. 3 3		A Normality of the second seco	L
YSTEM (HI	Signal Name (Specification) -	4 5 6 7 13 14 15 16	Signal Name (Specification) -(With gasoline engine) -(With gasoline engine) -(With gasoline engine) -(With gasoline engine) -(With gasoline engine) -(Evcept MBR engine) -(Evcept MBR engine)	Μ
ENGINE CONTROL SYSTEM (HR ENGINE) Commence Name Write TO WISE Commence Type Kr(MW-NSB Commence Type Kr(MM-NSB Commence Type Kr(MA-NSB Commenc	Signal Ma	E7 WIRE TO WIRE NSTBMW-CS	Signal Ma - (With) - (With) - (Exect - (Exect - (With) - (With) - (Exect - (Exect	Ν
ENGINE CO Connector Name Connector Type Last	Reminal Color No. of Wire 18 B/Y	Connector No. Connector Name Connector Type H.S.	Terminal Color Nn. of Wire Nn of Wire Nn 6 0 7 1 1 1 1 1 1 1 1 1 1 1 1 1 3 1 3 1 3 1 3 1 3 1 3 1 3	0
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[HR16DE (WITH EURO-OBD)]

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21 R/G IGN COLL#4 22 5h IGN COLL#4 23 B/O FPR 29 Y/O N.J#2[With HF angine] 20 O N.J#2[With HF angine] 21 Y/O N.J#2[With HF angine] 21 L N.J#2[With HF angine] 23 V.L SSOFF	A ECH C D
Turnetter Ma F7 Connector Man E/N Connector Type MA24FGY-MEA8-FH Connector Type MA24FGY-MEA8-FH Turninal Color No. of Nurse 2 F1115103227331 1 1115103227331 2 F1115103227331 1 1115103227331 2 F1115103227331 1 No. 6 Nore 1 L/W N NOTOR1 1 B/W 1 B/W 1 B/W 1 B/W 1 B/W 0<010	E F G
Connector No. E114 Connector Non STOP LAMP SWITCH Connector None STOP LAMP SWITCH Connector None MOZFB No. Office No. of Wire 2 R.M	I J K
Temperature No. Else Connector No. Else Connector Type ASCD BRAKE SWITCH Connector Type ASCD BRAKE SWITCH	L M N

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	Connector No. F13 Connector Name CONDENSER Connector Type MO2FW-GY-LC Connector Type Image: Connector Type Connector Type Connector Type	Connector No. P29 Connector Name Connector Type Connector Type RHOBFB	Terminal Color Signal Mame [Specification] No. of Wree Signal Mame [Specification] 1 V.R -[With HR engine] 2 L/R -[With HR engine] 3 L/O -[With HR engine] 4 V -[With HR engine] 6 L/W -
	Connector No. F12 Connector Name KNOK SENSOR Connector Type BS02FB-AHY-S All S02FB-AHY-S All Connector Type All Connector Type Image: Signal Name (Specification) -	Connector No. F28 Connector Name ENGINE COOLANT TEMPERATURE SENSOR Connector Type EUGEGY-RS	Terminal Color Signal Name (Specification) No. of Wore Signal Name (Specification) 1 GR/B -[With HR engine] 2 B -[With HR engine]
NE)	49 L/G OZSF[With HR engine] 50 Y 025F 55 LG 025F 56 P GMD-ACSF[With HR engine] 56 SB 025F 61 LGB 0A- 59 SB 025F 61 LGB 000-MMD HR engine] 63 GR/L GMD-ADSF[With HR engine] 64 MD-ADSF[With HR engine] 65 MD-ADSF[With HR engine] 66 W/B MOD-ADSF[With HR engine] 72 V/R ACC-TPS[With HR engine] 73 V/R ACC-TPS[With HR engine] 74 Y/M ACC-TPS[With HR engine] 75 L/W ACC-TPS[With HR engine] 76 V/R ACC-TPS[With HR engine] 75 V/R ACC-TPS[With HR engine] 76 V/W PIASE AVCC	Comeetor No. F26 Connector Name Connector Type Connector Type	Terminal No. Color of Wire Signal Name [Specification] 1 Y/V 2 L 3 G -[With HR engine]
ENGINE CONTROL SYSTEM (HR ENGINE)	Connector No. F8 Connector Name ECM MARIDER-MEAB-LH ECM Connector Name ECM Max ECM Signal 414 (6165 506) 601 661 801 73 77 177 57 79 Signal 414 (6165 506) 601 661 801 73 77 177 57 79 Signal 414 (6165 506) 601 661 801 73 77 177 57 79 Signal 414 (6165 506) 601 661 801 73 77 176 179 Signal 414 (6165 506) 601 661 801 73 77 176 179 Signal 414 (6165 506) 601 661 801 73 76 180 Signal 414 (6165 506) 601 661 801 73 76 180 Signal 714 (6165 506) 601 661 801 73 77 175 79 Signal 714 (6165 506) 601 661 801 73 77 180 Signal 714 (6165 506) 601 661 801 73 77 175 170 Signal 714 (6165 506) 71 Name Signal 714 (6165 506) 71 175 170 Signal 714 (6165 506) 71 175 170 Signal 714 (6165 506) 71 175 170 Signal 714 (6165 506) 71 175 170		Terminal Color Signal Name [Specification] No. of Wre Signal Name [Specification] 1 L/M -(Wth HR engine] 3 LG/B -(Wth HR engine]

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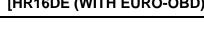
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	Terminal No. Odor No. Signal Name [Specification] 1 BR.V - 2 B - 3 L/R -	Connector No. F38 Connector Name ETEL INJECTOR NO 2 Connector Type HSI2FGY	Terminal No. Color Sanal Mane [Specification] 1 SB - 2 O -[With HR engine]	A ECH C D
	Terminal Coler Signal Name [Secrification] No. of Wree - 2 B - 3 L.R -	Connector No. F37 Connector Name FUEL NUJECTOR NO.1 Connector Type HS02FCY	Terminal Color Signal Name [Specification] No. of Wire Signal Name [Specification] 1 2 L	E F G H
AILE) Connector No. F2 Connector Name Connector Name Conne	Terminal Color Stanal Name (Sneoffication) 1 0 - 2 W/B -	Connector No. F86 Connector Name IdANTICI NO.4 (WITH POWER Donnector Type EG0FGV-F85	Terminal No. Color R/Mre Sural Name [Specification] 1 R/M 2 B 3 L/R	l J K
ENGINE CONTROL SYSTEM (HR ENGINE) Enderter No. F30 Connector Type F30 Connect	Color Signal Name [Specification] F -[With HR engine] R/O -[With HR engine] L/G -[With HR engine]	No. F35 Mame IdoNTICI COL NO.3 (WITH POWER TRANSISTOR) Type EG9FG7-R5	Color Signal Name [Specification] of Wire Specification] B -[With Rengine] L/R -	L M N
	Termino 1	Connector No. Connector Type Connector Type	JCBWA0289GE	O P

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Connector Nu. F46 Connector Name PARK/NEUTRAL POSITION SWITCH Connector Type FEA03FG	Terminal No. Calor Signal Name [Specification] 2 R/B - 3 W/B -	Connector No. M3 Connector Name COMBINATTON SWITCH (SFIRAL CABLE) Connector Type Troug 2010 Connector Type 22 23 23 23	Terminal Color Signal Name [Specification] No. of We - 33 B - 34 V -	
Connector Na. F 41 Connector Name Connector Name Connector Type Connector Type Connector Type	Terminal Calor Sagnal Name [Specification] No. of War - 1 V/R - 2 L/R -	Connector No. M4 Connector Name DATA LINK CONNECTOR Connector Type BD16FW	Terminal No. Caler of Were Signal Name [Specification] 4 B - 5 B - 6 L - 7 O - 8 - - 14 P - 14 P - 16 Y -	
Ginetor Na. F40 Connector Name FEL MJECTOR NO.4 Connector Type HSOFGY	Terminal Color Signal Name [Specification] No. of Wre - 1 SB - 2 R/O -	Oometer No. F 123 Connector Name WHE TO WRE Connector Type Tr23EW-1V Connector Type Tr23EW-1V Land 111109 8 7 Land 22 121 201 12	Terminal No. Color of Wire 2 Signal Name [Specification] 2 r/.L - 2 r/.L - 3 R/.O -[Except MBR engine] 6 G.P - 1 G.P - 13 B/.O - 14 G./L - 17 Y/M - 19 O - 21 R/B -	
ENGINE CONTROL SYSTEM (HR ENGIN Connector Name FUEL NJ/FCTOR NO 3 Connector Type HS02FGY	Terminal Color Signal Name [Specification] No. of Wire - 1 SB - 2 Y -	Connector No. F121 Connector Name WHE TO WIRE Connector Type NS16FW-CS Chill 16 14 16 15 14 16 15 14	Terminal No. Color of Wire BR Signal Mane [Specification] 4 BR -(Wh genoine) 5 R -(Ewth genoine) 6 LG -(Mth genoine) 10 R/Y -(Wth genoine) 11 LR -(Mth genoine engine) 12 G -(Mth genoine engine) 13 B -(Except MSR engine) 14 SB -(Except MSR engine) 16 B -(Except MSR engine)	JCBWA0290GE



Fail Safe





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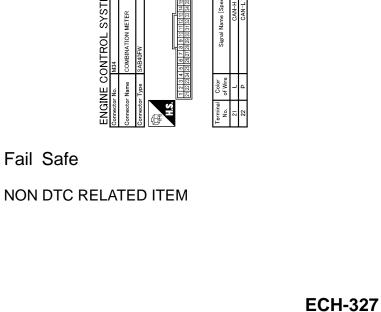
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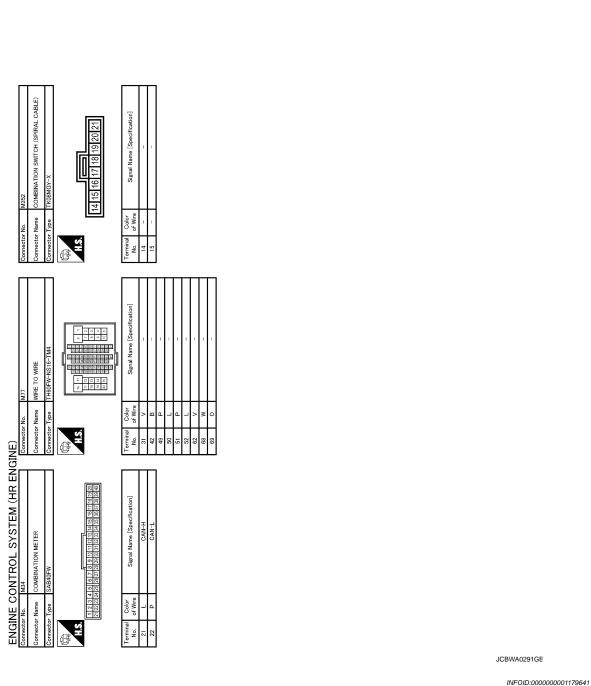
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< ECU DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

Engine operating condi- tion in fail-safe mode	Detected items	Remarks	Reference page
Engine speed will not rise more than 2,500 rpm due to the fuel cut	Malfunction indicator lamp circuit	When there is an open circuit on MI circuit, the ECM cannot warn the driver by lighting up MI when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MI circuit is open by means of operating fail-safe function. The fail-safe function also operates when above diagnoses except MI circuit are detected and demands the driver to repair the malfunction.	ECH-302

DTC RELATED ITEM

DTC No.	Detected items	Engine operating condition in fail-safe mode										
P0011	Intake valve timing control	The signal is not energized to the int control does not function.	take valve timing control solenoid valve and the valve									
P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more that	n 2,400 rpm due to the fuel cut.									
P0117 P0118	Engine coolant tempera- ture sensor circuit	ignition switch ON or START.	determined by ECM based on the time after turning polant temperature decided by ECM.									
		Condition	Engine coolant temperature decided (CONSULT-III display)									
		Just as ignition switch is turned ON or START	40°C (104°F)									
		More than approx. 4 minutes after ignition ON or START	80°C (176°F)									
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)									
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.										
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the norm condition. So, the acceleration will be poor.										
P0605	ECM	(When ECM calculation function is the ECM stops the electric throttle contraction fixed opening (approx. 5 degrees) be ECM deactivates ASCD operation.	rol actuator control, throttle valve is maintained at a									
P1121	Electric throttle control ac- tuator	malfunction:)	tor does not function properly due to the return spring ctuator by regulating the throttle opening around the not rise more than 2,000 rpm.									
			in fail-safe mode is not in specified range:) ontrol actuator by regulating the throttle opening to 20									
		engine stalls.	ve is stuck open:) down gradually by fuel cut. After the vehicle stops, the sition, and engine speed will not exceed 1,000 rpm o									
P1122	Electric throttle control function	ECM stops the electric throttle contr fixed opening (approx. 5 degrees) b	rol actuator control, throttle valve is maintained at a by the return spring.									
P1124 P1126	Throttle control motor relay	ECM stops the electric throttle contr fixed opening (approx. 5 degrees) b	rol actuator control, throttle valve is maintained at a by the return spring.									

ECM

< ECU DIAGNOSIS >

DTC No. Detected items Engine operating condition in fail-safe mode А ECM stops the electric throttle control actuator control, throttle valve is maintained at a P1128 Throttle control motor fixed opening (approx. 5 degrees) by the return spring. P1229 Sensor power supply ECM stops the electric throttle control actuator control, throttle valve is maintained at a ECH fixed opening (approx. 5 degrees) by the return spring. P1805 Brake switch ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor. Vehicle condition Driving condition When engine is idling Normal D When accelerating Poor acceleration P2122 Accelerator pedal position The ECM controls the electric throttle control actuator in regulating the throttle opening in P2123 sensor order for the idle position to be within +10 degrees. Ε P2127 The ECM regulates the opening speed of the throttle valve to be slower than the normal P2128 condition. P2138 So, the acceleration will be poor.

DTC Inspection Priority Chart

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

Priority	Detected items (DTC)	
1	 U1001 CAN communication line U1010 CAN communication P0102 P0103 Mass air flow sensor 	-
	 P0112 P0113 Intake air temperature sensor P0117 P0118 Engine coolant temperature sensor P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor P0327 P0328 Knock sensor 	
	 P0335 Crankshaft position sensor (POS) P0340 Camshaft position sensor (PHASE) P0500 Vehicle speed sensor 	
	 P0605 ECM P1229 Sensor power supply P1610 - P1615 NATS P1706 Park/neutral position (PNP) switch P2120 P2120 P2120 P2120 Accelerate padel position cancer 	
2	 P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor P0132 P0133 P0134 P1143 P1144 Heated oxygen sensor 1 P0135 Heated oxygen sensor 1 heater P0138 P0139 P1146 P1147 Heated oxygen sensor 2 	-
	 P0141 Heated oxygen sensor 2 heater P0444 EVAP canister purge volume control solenoid valve P1065 ECM 	
	 P1111 Intake valve timing control solenoid valve P1122 Electric throttle control function P1124 P1126 Throttle control motor relay P1128 Throttle control motor 	
	 P1217 Engine over temperature (OVERHEAT) P1805 Brake switch P1564 ASCD steering switch P1572 ASCD brake switch P1574 ASCD vehicle speed sensor 	
3	 P0011 Intake valve timing control P0171 P0172 Fuel injection system function P0300 - P0304 Misfire P0420 Three way catalyst function P1121 Electric throttle control actuator P1212 ESP communication line 	_

ECH-329

[HR16DE (WITH EURO-OBD)]

DTC Index

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 \times :Applicable —: Not applicable

DTC	·*1	Items		Test value/			-: Not applicable
CONSULT-III GST* ²	ECM* ³	(CONSULT-III screen terms)	SRT code	Test limit (GST only)	Trip	MI	Reference page
U1001	1001* ⁴	CAN COMM CIRCUIT	_	_	2		ECH-110
U1010	1010	CONTROL UNIT(CAN)	_	_	2	_	ECH-111
P0000	0000	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	_	_		Flashing* ⁷	_
P0011	0011	INT/V TIM CONT-B1	_	_	2	—	ECH-112
P0102	0102	MAF SEN/CIRCUIT-B1	_	_	1	×	ECH-116
P0103	0103	MAF SEN/CIRCUIT-B1	_	_	1	×	ECH-116
P0112	0112	IAT SEN/CIRCUIT-B1	_	_	2	×	ECH-121
P0113	0113	IAT SEN/CIRCUIT-B1	_	-	2	×	ECH-121
P0117	0117	ECT SEN/CIRC	_	_	1	×	ECH-124
P0118	0118	ECT SEN/CIRC	_	_	1	×	ECH-124
P0122	0122	TP SEN 2/CIRC-B1			1	×	ECH-127
P0123	0123	TP SEN 2/CIRC-B1	_		1	×	ECH-127
P0132	0132	HO2S1 (B1)	_	×	2	×	ECH-130
P0133	0133	HO2S1 (B1)	×	×	2	×	ECH-134
P0134	0134	HO2S1 (B1)	_	×	2	×	ECH-140
P0135	0135	HO2S1 HTR (B1)	×	×	2	×	ECH-145
P0138	0138	HO2S2 (B1)	×	×	2	×	ECH-148
P0139	0139	HO2S2 (B1)	×	×	2	×	ECH-153
P0141	0141	HO2S2 HTR (B1)	×	×	2	×	ECH-160
P0171	0171	FUEL SYS-LEAN-B1	_		2	×	ECH-163
P0172	0172	FUEL SYS-RICH-B1	_	_	2	×	<u>ECH-167</u>
P0222	0222	TP SEN 1/CIRC-B1	_		1	×	ECH-171
P0223	0223	TP SEN 1/CIRC-B1	_		1	×	ECH-171
P0300	0300	MULTICYL MISFIRE			2	×	ECH-174
P0301	0301	CYL 1 MISFIRE	_	_	2	×	<u>ECH-174</u>
P0302	0302	CYL 2 MISFIRE	_		2	×	ECH-174
P0303	0303	CYL 3 MISFIRE			2	×	ECH-174
P0304	0304	CYL 4 MISFIRE	_	_	2	×	<u>ECH-174</u>
P0327	0327	KNOCK SEN/CIRC-B1	_		2	_	ECH-180
P0328	0328	KNOCK SEN/CIRC-B1	_		2	_	ECH-180
P0335	0335	CKP SEN/CIRCUIT			2	×	ECH-182
P0340	0340	CMP SEN/CIRC-B1	_	_	2	×	ECH-186
P0420	0420	TW CATALYST SYS-B1	×	×	2	×	ECH-190
P0444	0444	PURG VOLUME CONT/V			2	×	ECH-195
P0500	0500	VEH SPEED SEN/CIRC*5		_	2	×	ECH-198
P0605	0605	ECM	_	_	1 or 2	× or —	ECH-200
P1065	1065	ECM BACK UP/CIRCUIT	_	_	2	×	ECH-202
P1111	1111	INT/V TIM C/CIRC	_	_	1	×	ECH-204

ECM

< ECU DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

	DTC	,*1 ,	Items		Test value/			Deference	А
	SULT-III ST* ²	ECM* ³	(CONSULT-III screen terms)	SRT code	Test limit (GST only)	Trip	MI	Reference page	~
P1 ²	121	1121	ETC ACTR-B1	—	_	1	×	ECH-206	ECH
P1 [,]	122	1122	ETC FUNCTION/CIRC- B1	_	_	1	×	ECH-208	
P1 ²	124	1124	ETC MOT PWP	—	-	1	×	ECH-212	С
P1	126	1126	ETC MOT PWP-B1	—	-	1	×	ECH-212	
P1 ²	128	1128	ETC MOT-B1	—	-	1	×	ECH-215	_
P1 ²	143	1143	HO2S1 (B1)	×	×	2	×	ECH-217	D
P1 ²	144	1144	HO2S1 (B1)	×	×	2	×	ECH-222	
P1 ²	146	1146	HO2S2 (B1)	×	×	2	×	ECH-227	Е
P1	147	1147	HO2S2 (B1)	×	×	2	×	ECH-234	
P12	212	1212	TCS/CIRC	_	_	2	_	ECH-241	
P12	217	1217	ENG OVER TEMP	_	_	1	×	ECH-242	F
P12	225	1225	CTP LEARNING-B1	—	-	2	—	ECH-246	
P12	226	1226	CTP LEARNING-B1	_	_	2	—	ECH-248	G
P12	229	1129	SENSOR POWER/CIRC	_	_	1	×	ECH-250	0
P1:	564	1564	ASCD SW	—	-	1	—	ECH-252	
P1:	572	1572	ASCD BRAKE SW	—		1	—	ECH-255	Н
P1:	574	1574	ASCD VHL SPD SEN	—	-	1	—	ECH-261	
P10	610	1610	LOCK MODE	—	-	2	—	<u>SEC-15</u>	
P10	611	1611	ID DISCARD IMM-ECM	—	_	2	—	<u>SEC-15</u>	I
P16	612	1612	CHAIN OF ECM-IMMU	—	-	2	—	<u>SEC-15</u>	
P10	615	1615	DIFFERENCE OF KEY	—	_	2	—	<u>SEC-15</u>	J
P1	706	1706	P-N POS SW/CIRCUIT	—	_	2	×	ECH-263	
P18	805	1805	BRAKE SW/CIRCUIT	_	_	2	_	ECH-266	
P2	122	2122	APP SEN 1/CIRC	—	_	1	×	ECH-268	K
P2	123	2123	APP SEN 1/CIRC	—	_	1	×	ECH-268	
P2 ⁻	127	2127	APP SEN 2/CIRC	_	_	1	×	ECH-271	L
P2	128	2128	APP SEN 2/CIRC	—	_	1	×	ECH-271	
P2	135	2135	TP SENSOR-B1	—	—	1	×	ECH-275	
P2 ⁻	138	2138	APP SENSOR	—	_	1	×	ECH-278	Μ
*4 4	DTON		DTO N						

*1: 1st trip DTC No. is the same as DTC No.

*2: This number is prescribed by 15031-5.

*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

*4: The troubleshooting for this DTC needs CONSULT-III.

*5: When the fail-safe operations for both self-diagnoses occur, the MI illuminates.

*6: SRT code will not be set if the self-diagnostic result is NG.

*7: When the ECM is in the mode of displaying SRT status, MI may flash. For the details, refer to "How to Display SRT Status".

How to Set SRT Code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

WITH CONSULT-III

Perform corresponding DTC CONFIRMATION PROCEDURE one by one based on Performance Priority in the table on "SRT Item".

WITHOUT CONSULT-III

ECH-331

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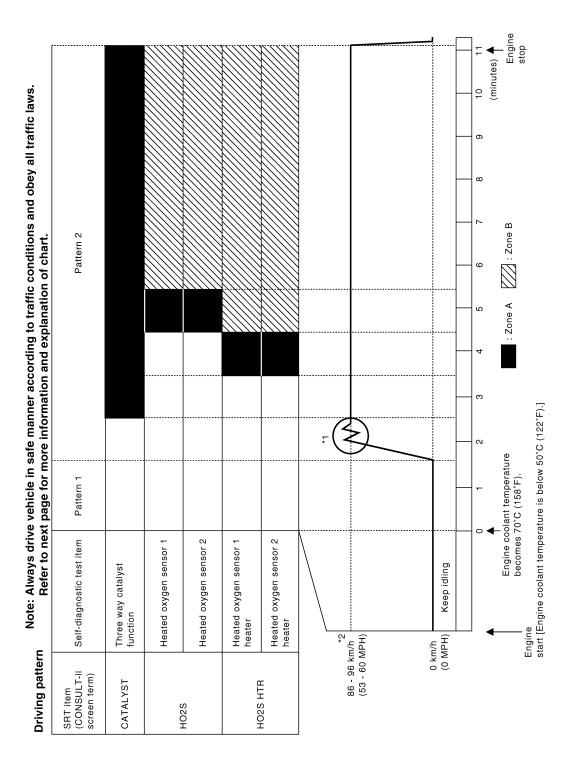
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The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

DRIVING PATTERN

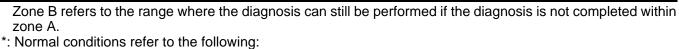


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• The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.

Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.

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ECM

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

 Diagnosis is performed as quickly as possible under normal conditions. Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

 The engine is started at the engine coolant temperature of -10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 38 and ground is 3.0 - 4.3V).

The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 38 and ground is lower than 1.4V).
 Pattern 2:

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

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

*2: Checking the vehicle speed with GST is advised.

Test Value and Test Limit

The following is the information specified in Service \$06 of ISO 15031-5.

The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

ltem	Self-diagnostic test item	DTC		value display)	Test limit
			TID	CID	Test limit Min. Max. Max. Max. Max. Max. Min. Max. Max. Max. Max. Max. Max. Max. Max
CATALYST	Three way actalyst function	P0420	01H	81H	Min.
CATALIST	Three way catalyst function	P0420	02H	81H	Min.
		P0133	09H	04H	Max.
		P1143	0AH	84H	Min.
Heated oxygen sensor 1 HO2S	Heated oxygen sensor 1	P1144	08H	04H	Max.
		P0132	0CH	04H	Max.
HO2S		P0134	0DH	04H	Max.
		P0139	19H	86H	Min.
	Heated owners concer 2	P1147	1AH	86H	Min.
	Heated oxygen sensor 2	P1146	1BH	06H	Max.
		P0138	1CH	06H	Max.
		D0425	29H	08H	Max.
O2S HEATER	Heated oxygen sensor 1 heater	P0135	2AH	88H	Min.
	Upstad susses as see 0 h sets	D04.44	2DH	0AH	Max.
	Heated oxygen sensor 2 heater	P0141	2EH	8AH	Min.

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< SYMPTOM DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:000000001179646

SYSTEM — BASIC ENGINE CONTROL SYSTEM

							S١	(MPT	ОМ						
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
Warranty	y symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	ECH-294
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			ECH-345
	Fuel injector circuit	1	1	2	3	2		2	2			2			ECH-291
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			ECH-63
Air	Positive crankcase ventilation sys- tem	3	3	4	4	4	4	4	4	4		4	1		<u>ECH-303</u>
	Incorrect idle speed adjustment						1	1	1	1		1			<u>ECH-18</u>
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	<u>ECH-206,</u> <u>ECH-208,</u> <u>ECH-215</u>
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			ECH-18
	Ignition circuit	1	1	2	2	2		2	2			2			ECH-297
Main po	wer supply and ground circuit	2	2	3	3	3		3	3		2	3			<u>ECH-106</u>
Mass air	flow sensor circuit	1			2										<u>ECH-116,</u> <u>ECH-116</u>
Engine o	coolant temperature sensor circuit						3			3					<u>ECH-124</u>
Heated	oxygen sensor 1 circuit		1	2	3	2		2	2			2			<u>ECH-130,</u> <u>ECH-134,</u> <u>ECH-140,</u> <u>ECH-140,</u> <u>ECH-145</u>
Throttle	position sensor circuit					+	2			2					ECH-127, ECH-171, ECH-246, ECH-248, ECH-275
Accelera	ator pedal position sensor circuit			3	2	1									<u>ECH-268,</u> <u>ECH-271,</u> <u>ECH-278</u>
Knock se	ensor circuit			2								3			<u>ECH-180</u>

< SYMPTOM DIAGNOSIS >

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	(P. HA)		ЭТ		ERATION					URE HIGH	N		jE)		A ECH
	START/RESTART (EXCP. HA)		GING/FLAT SPOT	TONATION	POOR ACCELE	JLE	TING	7	N TO IDLE	ER TEMPERAT	CONSUMPTION	CONSUMPTION	(UNDER CHARGE)	Reference page	С
	HARD/NO START/I	ENGINE STALL	HESITATION/SURGING/FLAT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE	EXCESSIVE FUEL	EXCESSIVE OIL C	Battery dead (L		D
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA		
Crankshaft position sensor (POS) circuit	2	2												ECH-182	F
Camshaft position sensor (PHASE) circuit	3	2												ECH-186	
Vehicle speed signal circuit		2	3		3						3			ECH-198	G
ECM	2	2	3	3	3	3	3	3	3	3	3			<u>ECH-200,</u> <u>ECH-202</u>	
Intake valve timing control solenoid valve cir- cuit		3	2		1	3	2	2	3		3			<u>ECH-204</u>	Н
PNP switch circuit			3		3		3	3			3			ECH-263	
Refrigerant pressure sensor circuit		2				3			3		4			ECH-304	1
Electrical load signal circuit							3							ECH-289	
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	<u>HAC-122</u> , <u>HAC-212</u>	J
ABS actuator and electric unit (control unit)			4											BRC-9	

1 - 6: The numbers refer to the order of inspection.

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SYSTEM — ENGINE MECHANICAL & OTHER

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< SYMPTOM DIAGNOSIS >

							S	YMPT	ОМ						
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDTE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
Warranty s	symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank														<u>FL-15</u>
		5											-		, <u>FL-17</u>
	Fuel piping		_	5	5	5		5	5			5			<u>FL-5</u>
	Vapor lock		5										-		
	Valve deposit Poor fuel (Heavy weight gasoline,	5		5	5	5		5	5			5			
	Low octane)														_
Air	Air duct														<u>EM-29</u>
	Air cleaner		-					_							<u>EM-29</u>
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)		5	5		5		5	5			5			<u>EM-29</u>
	Electric throttle control actuator	5			5		5			5					<u>EM-30</u>
	Air leakage from intake manifold/ Collector/Gasket														<u>EM-30</u>
Cranking	Battery	1	1	1		1		1	1					1	<u>PG-2</u>
	Generator circuit					'								-	<u>CHG-15</u>
	Starter circuit	3										1			<u>STR-21</u>
	Signal plate	6													<u>EM-102</u>
	PNP switch	4													<u>TM-13</u>
Engine	Cylinder head	5	5	5	5	5		5	5			5			<u>EM-81</u>
	Cylinder head gasket	_	_								4	_	3		
	Cylinder block														
	Piston												4		
	Piston ring	6	6	6	6	6		6	6			6		-	<u>EM-102</u>
	Connecting rod														
	Bearing														
Volue	Crankshaft														EM 54
Valve mecha-	Timing chain														<u>EM-54</u>
nism	Camshaft	F	F	F	F	F		F	F			F			<u>EM-66</u>
	Intake valve timing control	5	5	5	5	5		5	5			5		-	<u>EM-54</u>
	Intake valve Exhaust valve												3		<u>EM-81</u>
		-													

< SYMPTOM DIAGNOSIS >

[HR16DE (WITH EURO-OBD)]

			SYMPTOM													Δ
		(EXCP. HA)		SPOT	7	CELERATION					TEMPERATURE HIGH		NOI	CHARGE)		A ECH
				NG/FLAT	ONATION	DOR ACC	ш	NG		to IDLE		FUEL CONSUMPTION	OIL CONSUMPTION	IDER CH	Reference page	С
		HARD/NO START/RESTART	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	DLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER	EXCESSIVE FUEL C	EXCESSIVE OIL CON	BATTERY DEAD (UNDER	paye	D
		HAR	ENG	HES	SPA	LAC	HIG	ROL	IDLII	SLO	OVE	EXC	EXC	BAT		
Warranty s	symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA		_
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			<u>EM-76,</u> <u>EM-33</u>	F
	Three way catalyst														<u>LIVI-00</u>	0
Lubrica- tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			<u>EM-43</u> , <u>EM-93</u> , <u>LU-9</u> , <u>LU-3</u>	G
	Oil level (Low)/Filthy oil														<u>LU-6</u>	
Cooling	Radiator/Hose/Radiator filler cap														<u>CO-12</u>	
	Thermostat	-								5	-				<u>CO-20</u>	
	Water pump	-									-				<u>CO-18</u>	
	Water gallery	5	5	5	5	5		5	5		4	5			<u>CO-22</u>	J
	Cooling fan	-													<u>CO-15</u>	
	Coolant level (Low)/Contaminat- ed coolant									5					<u>CO-9</u>	K
NATS (NIS	SSAN Vehicle Immobilizer System)	1	1												<u>SEC-15</u>	

1 - 6: The numbers refer to the order of inspection.

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< SYMPTOM DIAGNOSIS >

NORMAL OPERATING CONDITION

Description

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,500 rpm under no load (for example, the shift lever position is neutral and engine speed is over 2,500 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 2,000 rpm, then fuel cut will be cancelled. **NOTE:**

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, <u>ECH-28</u>, <u>"System Description"</u>.

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[HR16DE (WITH EURO-OBD)]

< PRECAUTION > PRECAUTION PRECAUTIONS

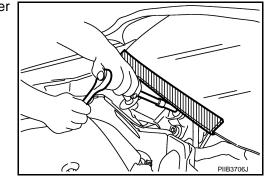
Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the "SRS AIRBAG" and "SEAT BELT" of this Service Manual.

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.
- 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".
- 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 for Procedure without Cowl Top Cover



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When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc.

WARNING:

Comply with the following warnings to prevent any serious accident.

- Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.
- Never work with wet hands.
- Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon headlamp ON in other conditions. Connect the power supply to the vehicle-side connector. (Turning it ON outside the lamp case may cause fire or visual impairments.)

• Never touch the bulb glass immediately after turning it OFF. It is extremely hot.

CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)
- Never perform HID circuit inspection with a tester.

Precautions For Xenon Headlamp Service

- Never touch the xenon bulb glass with hands. Never put oil and grease on it.
- Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.
- Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).

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On Board Diagnostic (OBD) System of Engine

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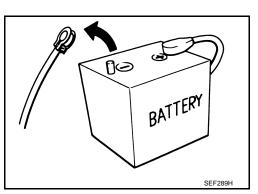
The ECM has an on board diagnostic system. It will light up the malfunction indicator lamp (MI) to warn the driver of a malfunction causing emission deterioration.

CAUTION:

- Be sure to turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the 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 EVAP system or fuel injection system, etc.
- Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.

General Precautions

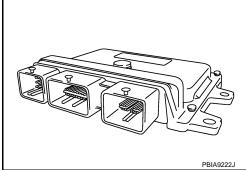
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.

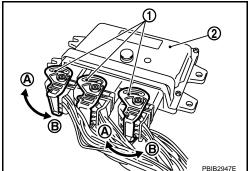


- Do not disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.

The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

- If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- When connecting ECM harness connector (1), fasten (B) it securely with a lever as far as it will go as shown in the figure.
 - 2. ECM
 - A. Loosen





PRECAUTIONS

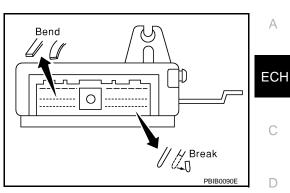
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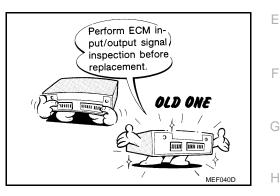
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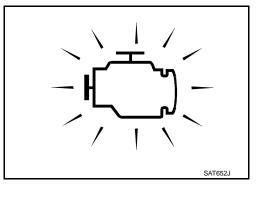
• When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

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 ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.
- Keep engine control system parts and harness dry.
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to <u>ECH-306, "Reference Value"</u>.
- Handle mass air flow sensor carefully to avoid damage.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).
- After performing each TROUBLE DIAGNOSIS, perform DTC CONFIRMATION PROCEDURE or Component Function Check. The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.









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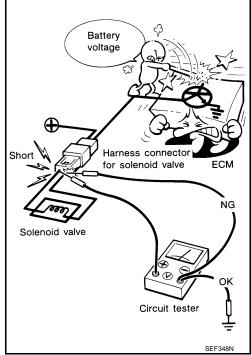
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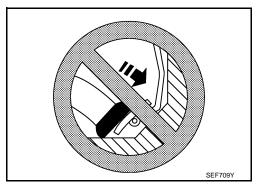
PRECAUTIONS

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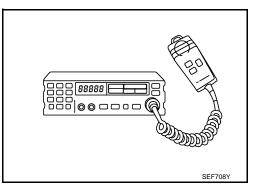
- [HR16DE (WITH EURO-OBD)]
- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and
- damage the ECM power transistor.
 Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's tran-
- put 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 operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.
- Do not depress accelerator pedal when starting.
- Immediately after starting, 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 standing-wave ratio can be kept smaller.
- Be sure to ground the radio to vehicle body.



[HR16DE (WITH EURO-OBD)]

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< PREPARATION > PREPARATION

PREPARATION

Special Service Tools

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Tool number Tool name		Description
KV10117100 Heated oxygen sensor wrench	S-NT379	Loosening or tightening heated oxygen sensor with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	S-NT636	Loosening or tightening heated oxygen sensor 2 a: 22 mm (0.87 in)
EG17550000 Break-out box	ZZA1194D	Measuring ECM signals with a circuit tester
EG17680000 Y-cable adapter	PBIA9379J	Measuring ECM signals with a circuit tester
KV10118400 Fuel tube adapter	A A A A A A A A A A A A A A A A A A A	Measuring fuel pressure
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PREPARATION

[HR16DE (WITH EURO-OBD)]

Commercial Service Tools

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Tool name		Description
Quick connector re- lease	PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Par No. 16441 6N210)
Socket wrench	19 mm (0.75 in) 32 mm (1.26 in) S-NT705	Removing and installing engine coolant tempera- ture sensor
Oxygen sensor thread cleaner	Mating surface shave cylinder	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.

[HR16DE (WITH EURO-OBD)]

<u>< ON-VEHICLE MAINTENANCE ></u> ON-VEHICLE MAINTENANCE > FUEL PRESSURE

Inspection	INFOID:000000001179655	ECH
FUEL PRESSURE RELEASE		
With CONSULT-III1. Turn ignition switch ON.		С
 Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-III. Start engine. 		D
 After engine stalls, crank it two or three times to release all fuel pressure. Turn ignition switch OFF. 		E
🛞 With CONSULT-III		
 Remove fuel pump fuse located in IPDM E/R. Start engine. 		F
 After engine stalls, crank it two or three times to release all fuel pressure. Turn ignition switch OFF. 		G
5. Reinstall fuel pump fuse after servicing fuel system.		
FUEL PRESSURE CHECK CAUTION:		Н
 Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger. The fuel hose connection method used when taking fuel pressure check must not be a purposes. 		
• Be careful not to scratch or put debris around connection area when servicing, so the connector maintains sealability with O-rings inside.	-	I
• Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear or etc.) Fuel pressure gauge may indicate false readings due to varying engine load an		J

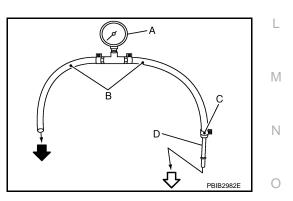
manifold vacuum.

NOTE:

Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because J10 models do not have fuel return system.

- 1. Release fuel pressure to zero.
- 2. Prepare fuel hose for fuel pressure check B and fuel tube adapter (KV10118400) D, then connect fuel pressure gauge A.
 - < : To quick connector

 - C: Clamp
 - Use suitable fuel hose for fuel pressure check (genuine NIS-SAN fuel hose without quick connector).
 - To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
 - Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
 - Use Pressure Gauge to check fuel pressure.
- 3. Remove fuel hose.
 - Do not twist or kink fuel hose because it is plastic hose.



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FUEL PRESSURE

< ON-VEHICLE MAINTENANCE >

- 4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.
 - No.2 spool (5)
 - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
 - Apply proper amount of gasoline between top of the fuel tube (3) and No.1 spool (4).
 - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
 - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
 - When reconnecting fuel line, always use new clamps.
 - Use a torque driver to tighten clamps.
 - Install hose clamp to the position within 1 2 mm (0.04 0.08 in).

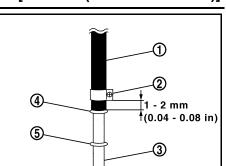
Tightening torque: 1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

- Make sure that clamp screw does not contact adjacent parts.
- 5. Connect fuel tube adapter to quick connector.
 - A: Fuel pressure gauge
 - B: Fuel hose for fuel pressure check
- 6. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
- 7. Turn ignition switch ON and check for fuel leakage.
- 8. Start engine and check for fuel leakage.
- 9. Read the indication of fuel pressure gauge.
 - Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
 - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.

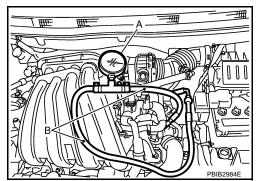
At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm², 51 psi)

- 10. If result is unsatisfactory, go to next step.
- 11. Check the following.
 - Fuel hoses and fuel tubes for clogging
 - Fuel filter for clogging
 - Fuel pump
 - Fuel pressure regulator for clogging
 - If OK, replace fuel pressure regulator.

If NG, repair or replace.



PBIB2983E



[HR16DE (WITH EURO-OBD)]

EVAPORATIVE EMISSION SYSTEM

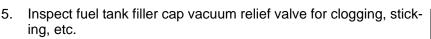
< ON-VEHICLE MAINTENANCE >

EVAPORATIVE EMISSION SYSTEM

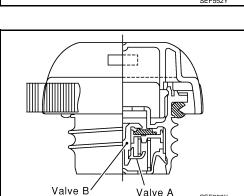
Inspection

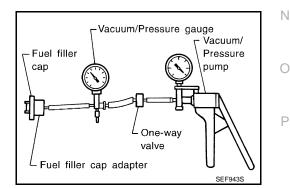
- 1. Visually inspect EVAP vapor lines for improper attachment and for cracks, damage, loose connections, ECH chafing and deterioration.
- Check EVAP canister as follows: 2.
- Block port (B). Orally blow air through port (A). a. Check that air flows freely through port (C).
- Block port (A). Orally blow air through port (B). b. Check that air flows freely through port (C).

- 3. Visually inspect the fuel check valve for cracks, damage, loose connections chafing and deterioration.
- 4. Check fuel check valve as follows:
- Blow air through connector on the fuel tank side. A considerable a. resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
- Blow air through connector on EVAP canister side. Air flow b. should be smoothly directed toward fuel tank side.
- If fuel check valve is suspected or not properly functioning in c. step 1 and 2 above, replace it.



Wipe clean valve housing. a.

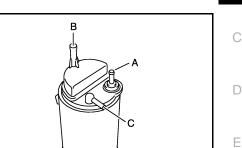




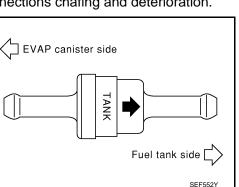
Check valve opening pressure and vacuum. b.

Pressure:	15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/ cm ² , 2.22 - 2.90 psi)
Vacuum:	-6.0 to -3.4 kPa (-0.06 bar to0.034bar, -0.061 to - 0.035 kg/cm ² , -0.87 to -0.49 psi)

If out of specification, replace fuel filler cap as an assembly. c.



[HR16DE (WITH EURO-OBD)]





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

Idle Speed

INFOID:000000001179657

Transmission	Condition	Specification
M/T	No load* (in Neutral position)	650 ±50 rpm

*: Under the following conditions

• A/C switch: OFF

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

• Steering wheel: Kept in straight-ahead position

Ignition Timing

INFOID:000000001179658

Transmission	Condition	Specification
M/T	No load* (in Neutral position)	$15\pm5^\circ$ BTDC

*: Under the following conditions

• A/C switch: OFF

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

· Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:000000001179659

Condition	Specification (Using CONSULT-III or GST)
At idle	10 – 35 %
At 2,500 rpm	10 – 35 %

Mass Air Flow Sensor

INFOID:000000001179660

Supply voltage	Battery voltage (11 – 14 V)
Output voltage at idle	1.0 – 1.3V*
Mass air flow (Using CONSULT-III or GST)	1.0 – 4.0 g⋅m/sec at idle* 2.0 – 10.0 g⋅m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.

[HR16DÉ (WITH EURO-OBD)]

[HR16DE (WITHOUT EURO-OBD)]

BASIC INSPECTION А DIAGNOSIS AND REPAIR WORKFLOW Work Flow INFOID:000000001179661 ECH **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 and freeze frame data*2 F (or, write it down). Check related service bulletins. Symptom is not described. Symptom is described. Symptom is described. DTC^{*1} is detected. DTC*1 is detected. DTC*1 is not detected. 4. Confirm the symptom 3. Confirm the symptom Try to confirm the symptom described by the Try to confirm the symptom described by the customer. customer. Н Also study the normal operation and fail safe Also study the normal operation and fail safe related to the symptom. related to the symptom. 5. Perform DTC CONFIRMATION PROCEDURE 6. Perform BASIC INSPECTION With CONSULT-III Without CONSULT-III 9. Detect malfunctioning 7. Perform "SPEC" in system by Symptom Within the "DATA MONITOR" mode Κ Table SP value Out of the SP value 8. Detect malfunctioning part by **TROUBLE DIAGNOSIS** Malfunctioning part - SPECIFICATION VALUE is not detected Malfunctioning part 10. Detect malfunctioning part by is detected. **Diagnosis Procedure** M Ν 11. Repair or replace the malfunctioning part 12. 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. *2: Include 1st trip freeze frame data. JMBIA0078GB

DETAILED FLOW

< 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>ECH-351</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 and freeze frame data. (Print them out with CONSULT-III.)
- Erase DTC. (Refer to ECH-415, "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>ECH-611, "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 normal operation and fail safe related to the symptom. Refer to <u>ECH-615</u>, "<u>Description</u>" and <u>ECH-606</u>, "Fail <u>Safe</u>".

Diagnosis Work Sheet is useful to verify the incident.

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

>> GO TO 5.

4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.

Also study the normal operation and fail safe related to the symptom. Refer to <u>ECH-615, "Description"</u> and <u>ECH-606, "Fail Safe"</u>.

Diagnosis Work Sheet is useful to verify the incident.

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

>> GO TO 6.

5.PERFORM DTC CONFIRMATION PROCEDURE

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

If two or more DTCs are detected, refer to <u>ECH-608</u>, "<u>DTC Inspection Priority Chart</u>" and determine trouble diagnosis order.

NOTE:

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

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

Is DTC detected?

YES >> GO TO 10.

NO >> Check according to <u>ECH-608, "DTC Index"</u>.

6.PERFORM BASIC INSPECTION

Perform ECH-353, "BASIC INSPECTION : Special Repair Requirement".

Do you have CONSULT-III?

[HR16DE (WITHOUT EURO-OBD)]

7.PERFORM SPEC IN DATA MONITOR MODE Image: State of the s	A CH D
With CONSULT-III Make sure that "MAS A/F SE-B1", "B/FUEL SCHDL" and "A/F ALPHA-B1" are within the SP value using CON- SULT-III in "SPEC" of "DATA MONITOR" mode. Refer to ECH-427, "Component Function Check". Is the measurement value within the SP value? YES >> GO TO 9. NO >> GO TO 9. NO >> GO TO 8. 8.DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE Detect malfunctioning part according to ECH-428, "Diagnosis Procedure". Is malfunctioning part detected? YES >> GO TO 11. NO >> GO TO 9. 9.DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE	C
Make sure that "MAS A/F SE-B1", "B/FUEL SCHDL" and "A/F ALPHA-B1" are within the SP value using CON- SULT-III in "SPEC" of "DATA MONITOR" mode. Refer to ECH-427, "Component Function Check". Is the measurement value within the SP value? YES >> GO TO 9. NO NO >> GO TO 8. 8.DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE Detect malfunctioning part according to ECH-428, "Diagnosis Procedure". Is malfunctioning part detected? YES >> GO TO 9. NO >> GO TO 11. NO >> GO TO 9. 9.DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE	C
YES >> GO TO 9. NO >> GO TO 8. 8.DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE Detect malfunctioning part according to ECH-428, "Diagnosis Procedure". Is malfunctioning part detected? YES >> GO TO 11. NO >> GO TO 9. 9.DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE	
Detect malfunctioning part according to <u>ECH-428</u> , " <u>Diagnosis Procedure</u> ". <u>Is malfunctioning part detected?</u> YES >> GO TO 11. NO >> GO TO 9. 9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE	
Is malfunctioning part detected? YES >> GO TO 11. NO >> GO TO 9. 9.DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE	E
YES >> GO TO 11. NO >> GO TO 9. 9.DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE	E
	F
Detect malfunctioning system according to <u>ECH-611, "Symptom Table"</u> based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptom.	F
>> GO TO 10.	G
10. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE	
Inspect according to Diagnosis Procedure of the system. NOTE:	Η
The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to Circuit Inspection in <u>GI-41. "Circuit Inspection"</u> .	I
Is malfunctioning part detected?	
 YES >> GO TO 11. NO >> Monitor input data from related sensors or check the voltage of related ECM terminals using CON- SULT-III. Refer to <u>ECH-586, "Reference Value"</u>. 	J
11. REPAIR OR REPLACE THE MALFUNCTIONING PART	K
 Repair or replace the malfunctioning part. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement. 	I
3. Check DTC. If DTC is displayed, erase it. Refer to <u>ECH-415, "Diagnosis Description"</u> .	
	M
12. FINAL CHECK	
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 repaired securely. When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure	Ν
that the symptom is not detected.	0
<u>Is DTC detected and does symptom remain?</u> YES-1 >> DTC is detected: GO TO 10.	0
 YES-2 >> Symptom remains: GO TO 6. NO >> Before returning the vehicle to the customer, make sure to erase unnecessary DTC in ECM. (Refer to <u>ECH-415, "Diagnosis Description"</u>.) 	Ρ
Diagnostic Work Sheet	

DESCRIPTION

< BASIC INSPECTION >

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

[HR16DE (WITHOUT EURO-OBD)]

KEY POINTS

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

WORKSHEET SAMPLE

Customer nar	me 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	nrottle position d by throttle position
Symptoms	🗌 Idling	□ No fast idle □ Unstable □ H □ Others [High idle 🔲 Low idle]
	Driveability	Stumble Surge Knock Intake backfire Exhaust backfi Others [Lack of power re]
	Engine stall	At the time of start While idling While accelerating While dece Just after stopping While loadi	lerating
Incident occurrence		Just after delivery In the morning At night	☐ In the daytime
Frequency		All the time Under certain cond	ditions 🗌 Sometimes
Weather conditions		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 conditions		🗌 In town 🗌 In suburbs 🗌 Hig	hway 🗌 Off road (up/down)
Driving conditions		□ Not affected □ At starting □ While idling □ At racing □ While accelerating □ While cruising □ While decelerating □ While turning (RH/LH) Vehicle speed □	
Malfunction in	ndicator lamp	0 10 20	30 40 50 60 MPH
manufication			

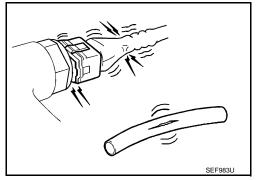
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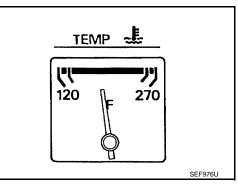
INSPECTION AND ADJUSTMENT BASIC INSPECTION

BASIC INSPECTION : Special Repair Requirement

1.INSPECTION START

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

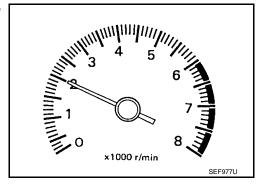




- 5. Run engine at about 2,000 rpm for about 2 minutes under no load.
- 6. Make sure that no DTC is displayed with CONSULT-III.

ls any [DTC detected?
YES	>> GO TO 2.

. = 0	FF 00 10 E
NO	>> GO TO 3.



2.REPAIR OR REPLACE

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

>> GO TO 3

3.CHECK TARGET IDLE SPEED

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

[HR16DE (WITHOUT EURO-OBD)]

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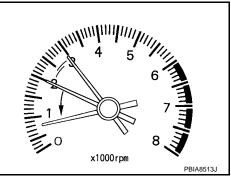
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INFOID:000000001179663

< BASIC INSPECTION >

- Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.
 Check idle speed.
- 5. Check fole speed. For procedure, refer to <u>ECH-357, "IDLE SPEED : Special Repair</u> <u>Requirement"</u>. For specification, refer to <u>ECH-625, "Idle Speed"</u>.
- Is the inspection result normal?
- YES >> GO TO 10.
- NO >> GO TO 4.



4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- 1. Stop engine.
- 2. Perform <u>ECH-357</u>, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair <u>Requirement</u>".

>> GO TO 5.

5.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 6.

6.PERFORM IDLE AIR VOLUME LEARNING

Perform ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 7.
- NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

7.CHECK TARGET IDLE SPEED AGAIN

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

Check idle speed.
 For procedure, refer to <u>ECH-357</u>, "IDLE SPEED : Special Repair Requirement".
 For specification, refer to <u>ECH-625</u>, "Idle Speed".

Is the inspection result normal?

- YES >> GO TO 10.
- NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the Following.

- Check camshaft position sensor (PHASE) and circuit. Refer to <u>ECH-478, "DTC Logic"</u>.
- Check crankshaft position sensor (POS) and circuit. Refer to ECH-474, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 9.

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

9.CHECK ECM FUNCTION

- 1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
- Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to <u>SEC-9, "ECM</u> <u>RE-COMMUNICATING FUNCTION : Description"</u>.

>> GO TO 4. 10.CHECK IGNITION TIMING

1. Run engine at idle.

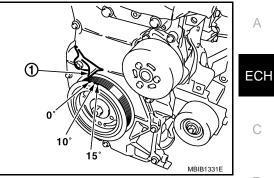
< BASIC INSPECTION >

2. Check ignition timing with a timing light. For procedure, refer to ECH-357, "IGNITION TIMING : Special Repair Requirement". For specification, refer to ECH-625, "Ignition Timing",

1 : Timing indicator

Is the inspection result normal?

- YES >> GO TO 19.
- NO >> GO TO 11.



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11.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- 1. Stop engine.
- 2. Perform ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 12.

12.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 14.
- NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

14.CHECK TARGET IDLE SPEED AGAIN

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check idle speed. For procedure, refer to ECH-357, "IDLE SPEED : Special Repair Requirement". For specification, refer to ECH-625, "Idle Speed".

Is the inspection result normal?

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

15. CHECK IGNITION TIMING AGAIN

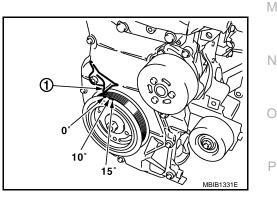
1. Run engine at idle.

2. Check ignition timing with a timing light. For procedure, refer to ECH-357, "IGNITION TIMING : Special Repair Requirement". For specification, refer to ECH-625, "Ignition Timing".

1 : Timing indicator

Is the inspection result normal?

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



16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-47, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 17.

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

< BASIC INSPECTION >

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to ECH-478, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to ECH-474, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 18.

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

18.CHECK ECM FUNCTION

- 1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
- 2. Perform initialization of and registration of all NATS ignition key IDs. Refer to <u>SEC-9, "ECM RE-COMMU-NICATING FUNCTION : Description"</u>.

>> GO TO 4.

19.INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, go to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Description

INFOID:000000001179664

When replacing ECM, this procedure must be performed.

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement

1.PERFORM INITIALIZATION OF NATS SYSTEM AND REGISTRATION OF ALL NATS IGNITION KEY IDS Refer to ECH-356. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> GO TO 2.

2. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> GO TO 3.

3. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 4.

4.PERFORM IDLE AIR VOLUME LEARNING

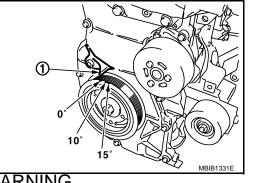
Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END IDLE SPEED

< BASIC INSPECTION >	[HR16DE (WITHOUT EURO-OBD)]	
IDLE SPEED : Description	INFOID:000000001179666	
This describes how to check the idle speed. For the actual procedure, follow the instructions in "BASIC INSPECTION".		
IDLE SPEED : Special Repair Requirement		
1. CHECK IDLE SPEED		
With CONSULT-III Check idle speed in "DATA MONITOR" mode with CONSULT-III. Without CONSULT-III Check the idle speed by installing the pulse type tachometer clamp on No.4 ignition coil harness.		
>> INSPECTION END IGNITION TIMING	E	
IGNITION TIMING : Description		
F This describes how to check the ignition timing. For the actual procedure, follow the instructions in "BASIC INSPECTION".		
IGNITION TIMING : Special Repair Requirement	INFOID:000000001179669 G	
1. CHECK IGNITION TIMING		
 Attach timing light to No.1 ignition coil wire harness (1) as shown. 2 : Timing light <□ : Vehicle front 		
	J JMBIA0397ZZ	

- 2. Check ignition timing.
 - 1 : Timing indicator

>> INSPECTION END



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ACCELERATOR PEDAL RELEASED POSITION LEARNING

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description INFOLD.00000001179670

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

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Re-

< BASIC INSPECTION >

quirement

[HR16DE (WITHOUT EURO-OBD)]

INFOID:000000001179671

1.START

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

>> END THROTTLE VALVE CLOSED POSITION LEARNING

THROTTLE VALVE CLOSED POSITION LEARNING : Description

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

THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

INFOID:000000001179673

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 IDLE AIR VOLUME LEARNING

IDLE AIR VOLUME LEARNING : Description

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps each engine idle speed within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

IDLE AIR VOLUME LEARNING : Special Repair Requirement

1.PRECONDITIONING

Make sure that all of the following conditions are satisfied.

Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 100°C (158 212°F)
- Park/neutral position switch: ON
- Electric load switch: OFF

 (Air conditioner, headlamp, rear window defogger)
 On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- Drive vehicle for 10 minutes

Do you have CONSULT-III?

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

2. IDLE AIR VOLUME LEARNING

ECH-358

INFOID:000000001179674

INFOID:000000001179675

INFOID:000000001179672

< BASIC INSPECTION >

With CONSULT-III

- Perform Accelerator Pedal Released Position Learning. Refer to <u>ECH-357, "ACCELERATOR PEDAL</u> A <u>RELEASED POSITION LEARNING : Special Repair Requirement"</u>.
- Perform Throttle Valve Closed Position Learning. Refer to <u>ECH-358</u>. "THROTTLE VALVE CLOSED POSI-<u>TION LEARNING : Special Repair Requirement</u>".
- 3. Start engine and warm it up to normal operating temperature.
- 4. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
- 5. Touch "START" and wait 20 seconds.

Is "CMPLT" displayed on CONSULT-III screen?

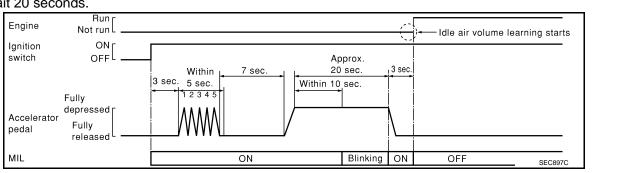
YES >> GO TO 4.

3. IDLE AIR VOLUME LEARNING

Without CONSULT-III

NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- Perform Accelerator Pedal Released Position Learning. Refer to <u>ECH-357</u>, "ACCELERATOR PEDAL <u>RELEASED POSITION LEARNING : Special Repair Requirement"</u>.
- Perform Throttle Valve Closed Position Learning. Refer to <u>ECH-358</u>, "<u>THROTTLE VALVE CLOSED POSI-</u> <u>TION LEARNING</u>: <u>Special Repair Requirement</u>".
- 3. Start engine and warm it up to normal operating temperature.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 6. Repeat the following procedure quickly five times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
- 7. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MI stops blinking and turned ON.
- 8. Fully release the accelerator pedal within 3 seconds after the MI turned ON.
- 9. Start engine and let it idle.
- 10. Wait 20 seconds.



>> GO TO 4.

4.CHECK IDLE SPEED AND IGNITION TIMING

Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

For specification, refer to ECH-625, "Idle Speed" and ECH-625, "Ignition Timing".

Is the inspection result normal?

YES >> INSPECTION END NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following

• Check that throttle valve is fully closed.

Check PCV valve operation.

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

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< BASIC INSPECTION >

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace malfunctioning part.

6.DETECT MALFUNCTIONING PART

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

It is useful to perform "TROUBLE DIAGNOSIS - SPECIFICATION VALUE". Refer to <u>ECH-427</u>, "<u>Description</u>". If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning all over again:

- Engine stalls.
- Erroneous idle.

>> INSPECTION END MIXTURE RATIO SELF-LEARNING VALUE CLEAR

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description

INFOID:000000001179676

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

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement

INFOID:0000000001179677

1.START

With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-III.
- 3. Clear mixture ratio self-learning value by touching "CLEAR".

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF.
- 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure that DTC P0102 is displayed.
- 6. Erase the DTC memory. Refer to ECH-415. "Diagnosis Description".
- 7. Make sure that DTC P0000 is displayed.

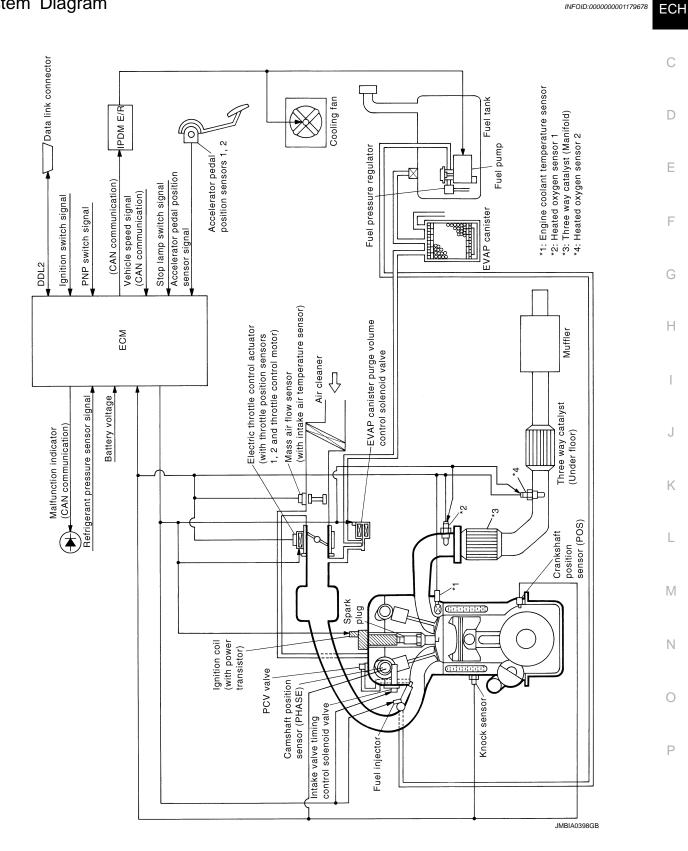
>> END

[HR16DE (WITHOUT EURO-OBD)]

FUNCTION DIAGNOSIS ENGINE CONTROL SYSTEM

System Diagram

INFOID:0000000001179678



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ENGINE CONTROL SYSTEM

< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

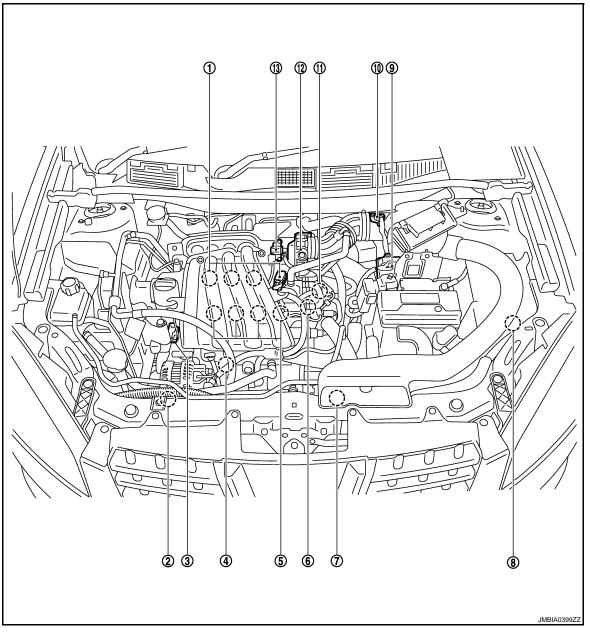
System Description

INFOID:000000001179679

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

Component Parts Location

INFOID:000000001179680



- 1. Ignition coil (with power transistor) and spark plug
- 4. Knock sensor, Crankshaft position sensor (POS)
- 7. Cooling fan motor
- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve

- Refrigerant pressure sensor
- 5. Fuel injector
- 8. IPDM E/R

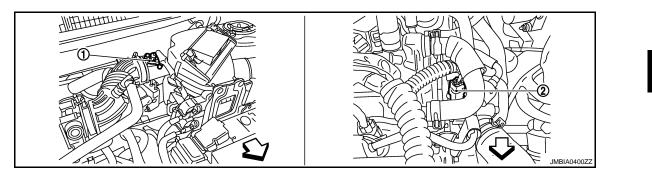
2.

- 11. Engine coolant temperature sensor
- 3. Intake valve timing control solenoid valve
- 6. Camshaft position sensor (PHASE)
- 9. ECM
- Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

ENGINE CONTROL SYSTEM

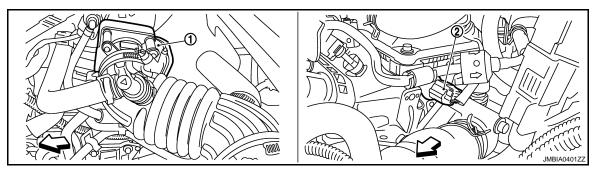
< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]



- Mass air flow sensor 1.
- 2. Engine coolant temperature sensor

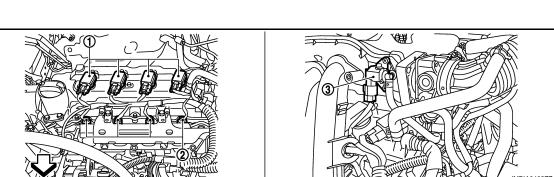
✓ Vehicle front



- Electric throttle control actuator 1.
- Camshaft position sensor (PHASE)

2.

Vehicle front \triangleleft



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

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✓ Vehicle front

 $\setminus V$ JMBIA0403ZZ

- ECM harness connector IPDM E/R 2. 1.
- ✓⊃ Vehicle front

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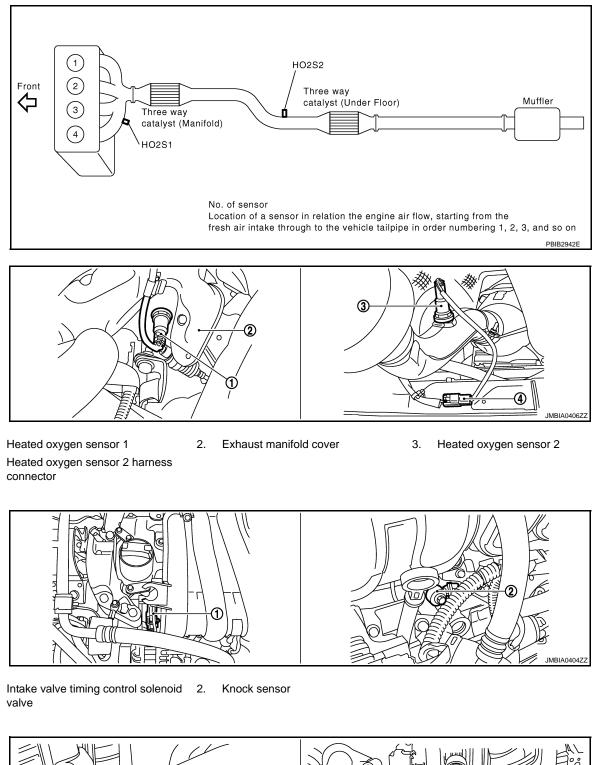
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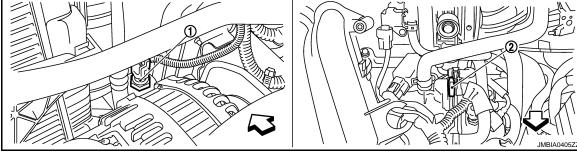
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ENGINE CONTROL SYSTEM





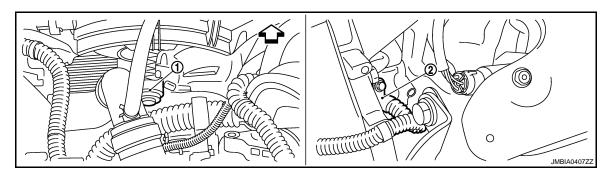
- 1. Refrigerant pressure sensor 2. PCV valve
- ✓ Vehicle front

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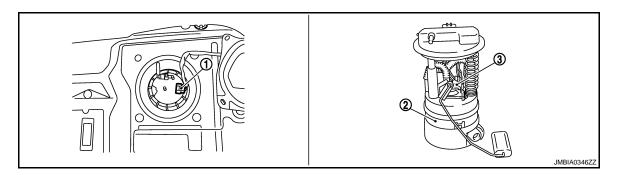
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< FUNCTION DIAGNOSIS >

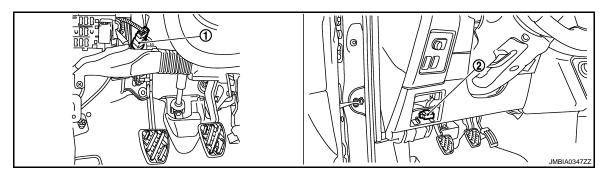


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

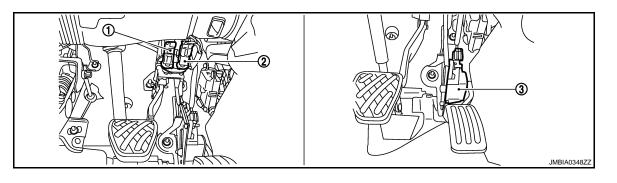
✓ Vehicle front



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



- 1. ASCD clutch switch
- 2. Data link connector



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



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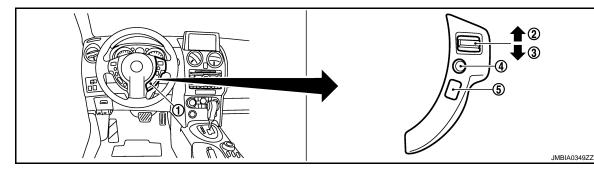
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ENGINE CONTROL SYSTEM

< FUNCTION DIAGNOSIS >



- ASCD steering switch
 SET/COAST switch
- 2. CANSEL switch
- 5. MAIN switch

3. RESUME/ACCELERATE switch

Component Description

INFOID:000000001179681

Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
ASCD brake switch	ECH-541, "Description"
ASCD steering switch	ECH-252, "Description"
ASCD vehicle speed sensor	ECH-261, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Cooling fan motor	ECH-546. "Description"
Electric throttle control actuator	ECH-488. "Description"
Engine coolant temperature sensor	ECH-450, "Description"
Fuel injector	ECH-553, "Description"
Fuel pump	ECH-556. "Description"
Heated oxygen sensor 1	ECH-130, "Description"
Heated oxygen sensor 1 heater	ECH-564, "Description"
Heated oxygen sensor 2	ECH-464, "Description"
Heated oxygen sensor 2 heater	ECH-571, "Description"
Ignition signal	ECH-576, "Description"
Intake air temperature sensor	ECH-574, "Description"
Intake valve timing control solenoid valve	ECH-486. "Description"
Knock sensor	ECH-472, "Description"
Mass air flow sensor	ECH-445, "Description"
Park/neutral position switch	ECH-522, "Description"
PCV valve	ECH-582, "Description"
Refrigerant pressure sensor	ECH-583, "Description"
Stop lamp switch	ECH-525, "Description"
Throttle control motor	ECH-497, "Description"
Throttle control motor relay	ECH-494, "Description"
Throttle position sensor	ECH-453, "Description"
Vehicle speed sensor	ECH-585, "Description"

MULTIPORT FUEL INJECTION SYSTEM

< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

MULTIPORT FUEL INJECTION SYSTEM

System Diagram

Crankshaft position sensor (POS)	Engine speed ^{*2} & Piston position				
Camshaft position sensor (PHASE)					
Mass air flow sensor	Amount of intake air	•			
	Intake air temperature	•			
Intake air temperature sensor					
Engine coolant temperature sensor	Engine coolant temperature	•			
Heated oxygen sensor 1	Density of oxygen in exhaust gas	•			
Throttle position sensor	Throttle position	•	Fuel injection &		
Accelerator pedal position sensor	Accelerator pedal position	•	mixture ratio control	F uck in its stars	
Park/neutral position (PNP) switch	Gear position	ECM		Fuel injector	
Battery	Battery voltage ^{*2}	•			
Knock sensor	Engine knocking condition	•			
	Power steering operation	-			
EPS control unit		►			
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas	•			
Combination meter	Vehicle speed				
BCM	Air conditioner operation				
*1 : This sensor is not used to control	, the engine system under normal conditior	 ۱s.			
	tatus by the signals of engine speed and		tage.		

System Description

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INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator		
Crankshaft position sensor (POS)	Engine speed* ³				
Camshaft position sensor (PHASE)	Piston position				
Mass air flow sensor	Amount of intake air				
Intake air temperature sensor	Intake air temperature				
Engine coolant temperature sensor	Engine coolant temperature				
Heated oxygen sensor 1	Density of oxygen in exhaust gas				
Throttle position sensor	Throttle position	Fuel injection			
Accelerator pedal position sensor	Accelerator pedal position	& mixture ratio	Fuel injector		
Park/neutral position (PNP) switch	Gear position	control			
Battery	Battery voltage* ³				
Knock sensor	Engine knocking condition	-			
EPS control unit	Power steering operation				
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas				
BCM* ²	Air conditioner operation				
Combination meter* ²	Vehicle speed				

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

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

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

< FUNCTION DIAGNOSIS >

SYSTEM DESCRIPTION

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

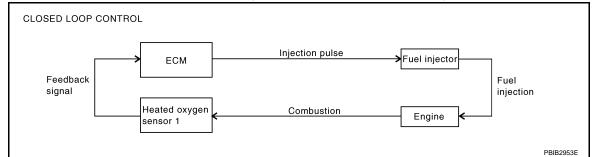
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to <u>ECH-130</u>, "<u>DTC Logic</u>". This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

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

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

Open Loop Control

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

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

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

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

MULTIPORT FUEL INJECTION SYSTEM

< FUNCTION DIAGNOSIS >

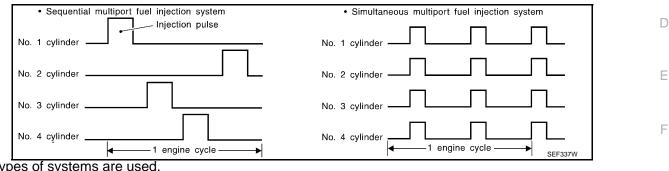
[HR16DE (WITHOUT EURO-OBD)]

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

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

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

FUEL INJECTION TIMING



Two types of systems are used.

- Sequential Multiport Fuel Injection System Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.
- Simultaneous Multiport Fuel Injection System Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

The four injectors will then receive the signals two times for each engine cycle.

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

FUEL SHUT-OFF

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

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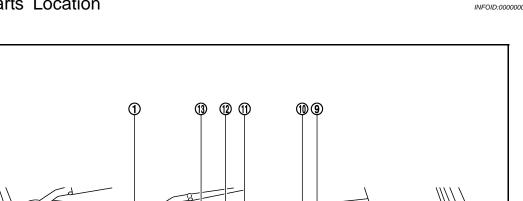
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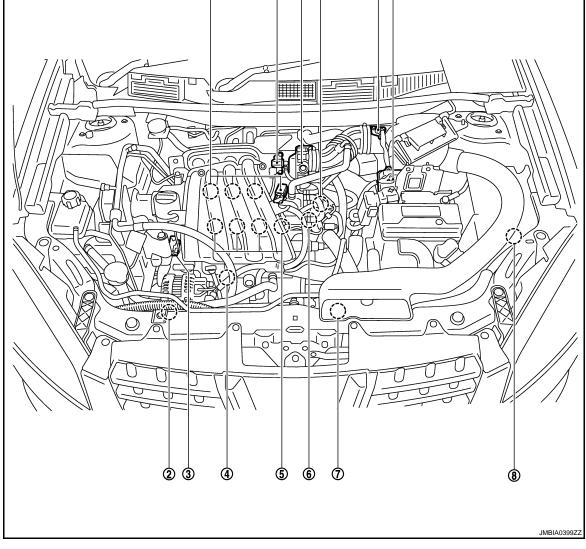
MULTIPORT FUEL INJECTION SYSTEM [HR16DE (WITHOUT EURO-OBD)]

< FUNCTION DIAGNOSIS >

Component Parts Location

INFOID:000000001179684





- Ignition coil (with power transistor) 1. and spark plug
- 4. Knock sensor, Crankshaft position sensor (POS)
- 7. Cooling fan motor
- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve

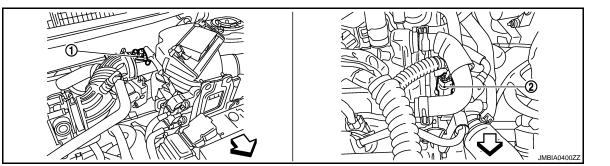
- 2. Refrigerant pressure sensor
- 5. Fuel injector
- 8. IPDM E/R
- 11. Engine coolant temperature sensor
- Intake valve timing control solenoid 3. valve
- 6. Camshaft position sensor (PHASE)

9. ECM

12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

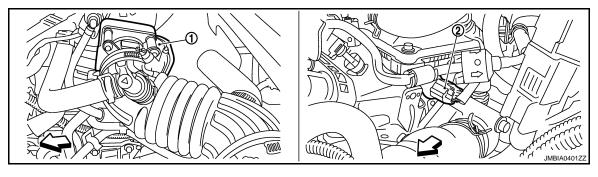
MULTIPORT FUEL INJECTION SYSTEM [HR16DE (WITHOUT EURO-OBD)]

< FUNCTION DIAGNOSIS >



- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

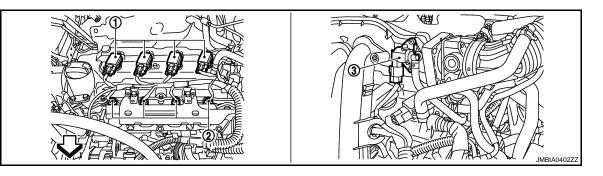
✓ Vehicle front



- 1. Electric throttle control actuator
- Camshaft position sensor (PHASE)

2.

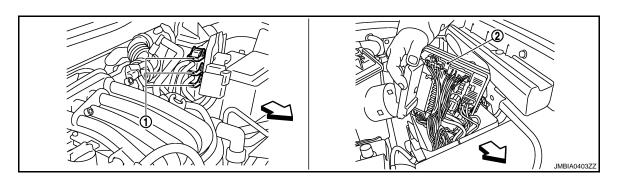
✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front



- 1. ECM harness connector 2. IPDM E/R
- √ Vehicle front

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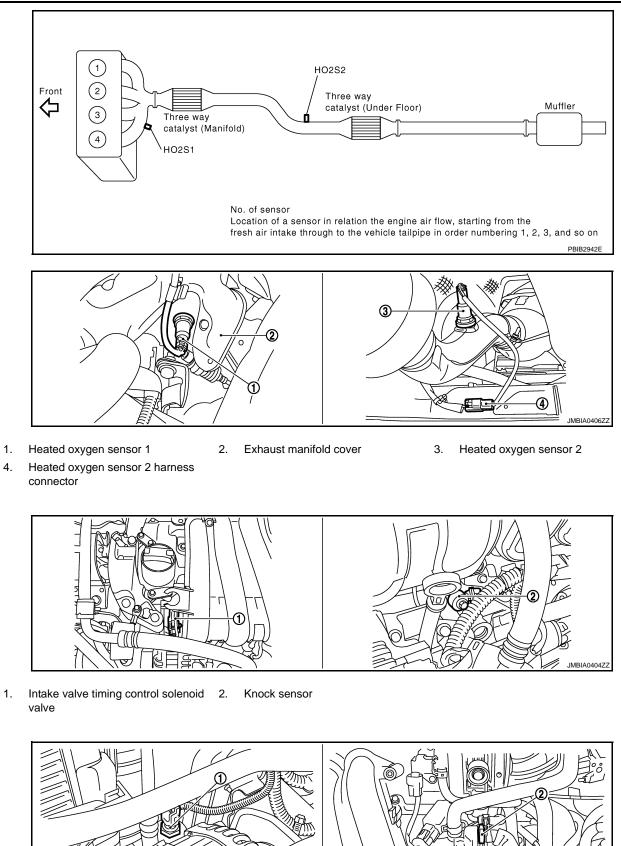
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MULTIPORT FUEL INJECTION SYSTEM

< FUNCTION DIAGNOSIS >

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- 1. Refrigerant pressure sensor 2. PCV valve
- ✓ Vehicle front

MULTIPORT FUEL INJECTION SYSTEM < FUNCTION DIAGNOSIS > [HR16DE (WITHOUT EURO-OBD)]

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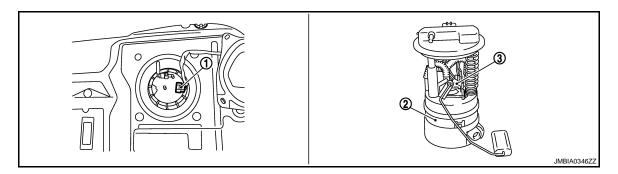
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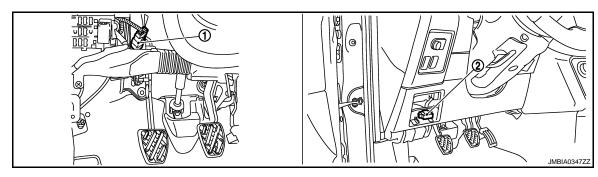
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- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

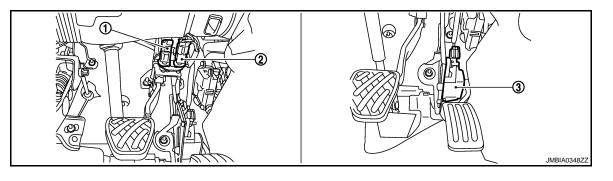
✓ Vehicle front



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



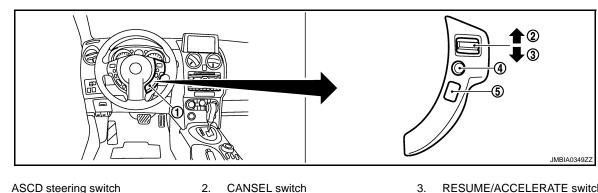
- 1. ASCD clutch switch
- 2. Data link connector



- 1. Stop lamp switch
- 2. ASCD brake pedal
- 3. Accelerator pedal position sensor
- ECH-373

MULTIPORT FUEL INJECTION SYSTEM

< FUNCTION DIAGNOSIS >



- 1. ASCD steering switch 4. SET/COAST switch
- 2. CANSEL switch
- 5. MAIN switch
- **Component Description**

RESUME/ACCELERATE switch

INFOID:000000001179685

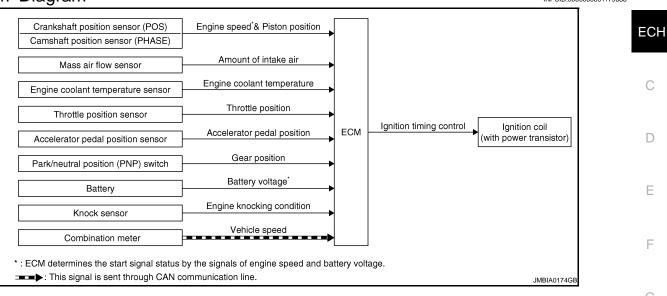
Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450. "Description"
Fuel injector	ECH-553, "Description"
Heated oxygen sensor 1	ECH-130, "Description"
Heated oxygen sensor 2	ECH-571, "Description"
Intake air temperature sensor	ECH-574, "Description"
Knock sensor	ECH-472, "Description"
Mass air flow sensor	ECH-445. "Description"
Park/neutral position (PNP) switch	ECH-522, "Description"
Throttle position sensor	ECH-453, "Description"
Vehicle speed sensor	ECH-585, "Description"

< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

ELECTRIC IGNITION SYSTEM

System Diagram



System Description

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed* ²		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position	Ignition timing	
Accelerator pedal position sensor	Accelerator pedal position	control	
Battery	Battery voltage*2		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Combination meter*1	Vehicle speed		

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

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

SYSTEM DESCRIPTION

Firing order: 1 - 3 - 4 - 2

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

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

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

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

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

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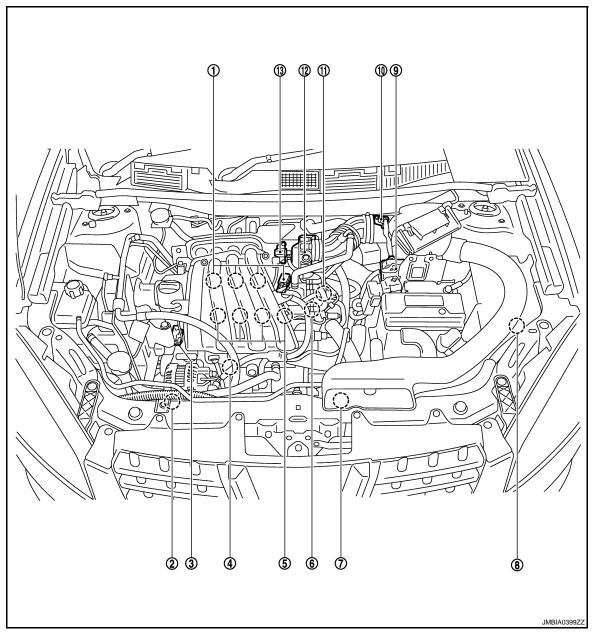
< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

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

Component Parts Location

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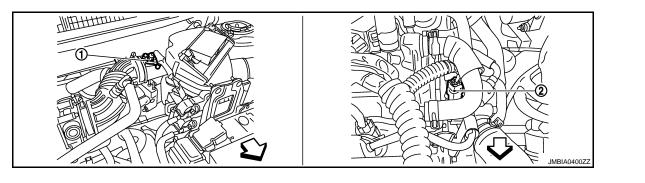


- 1. Ignition coil (with power transistor) and spark plug
- 4. Knock sensor, Crankshaft position sensor (POS)
- 7. Cooling fan motor
- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve

- 2. Refrigerant pressure sensor
- 5. Fuel injector
- 8. IPDM E/R
- 11. Engine coolant temperature sensor
- Intake valve timing control solenoid valve
- 6. Camshaft position sensor (PHASE)
- 9. ECM
- Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

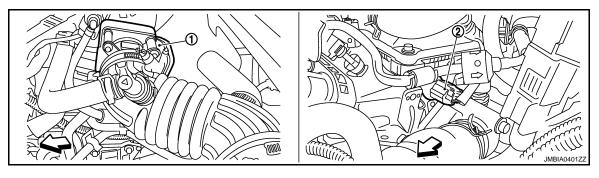
< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]



- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

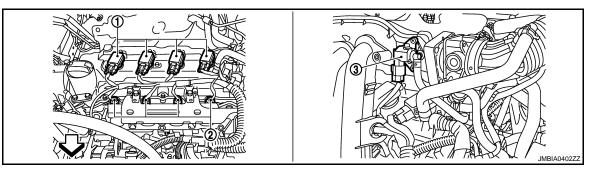
✓ Vehicle front



- 1. Electric throttle control actuator
- Camshaft position sensor (PHASE)

2.

✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front

- 1. ECM harness connector 2. IPDM E/R
- Vehicle front

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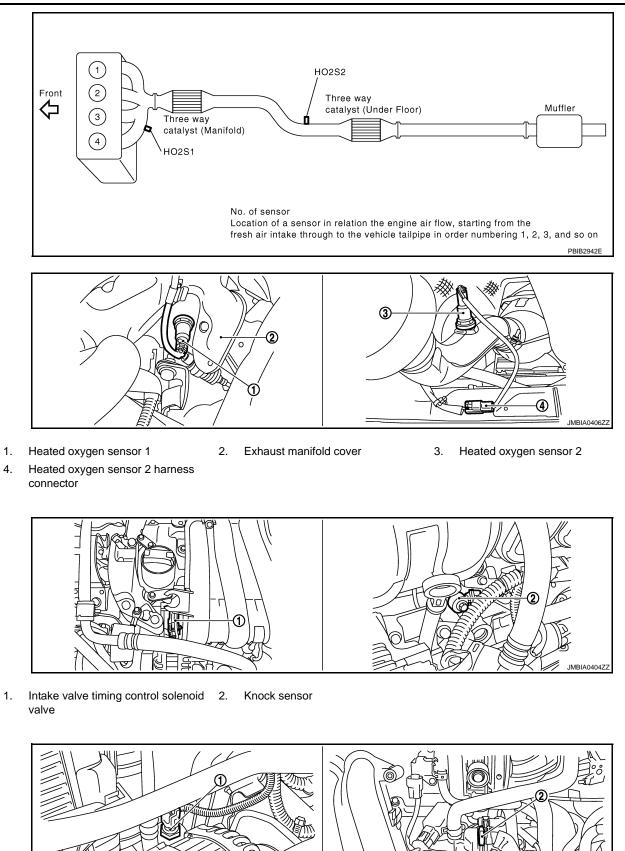
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ELECTRIC IGNITION SYSTEM

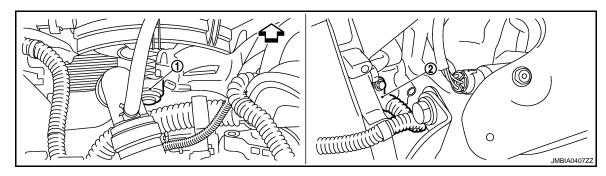
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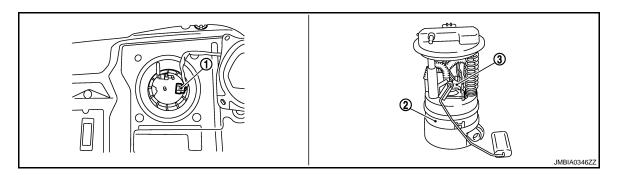
- 1. Refrigerant pressure sensor 2. PCV valve
- ✓⊃ Vehicle front

< FUNCTION DIAGNOSIS >

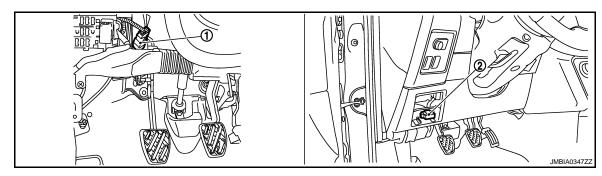


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

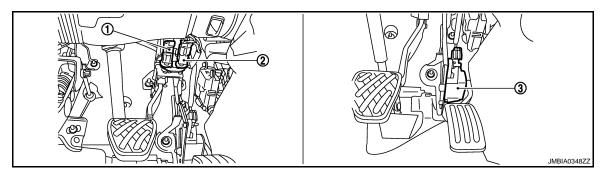
✓ Vehicle front



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



- 1. ASCD clutch switch
- 2. Data link connector



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

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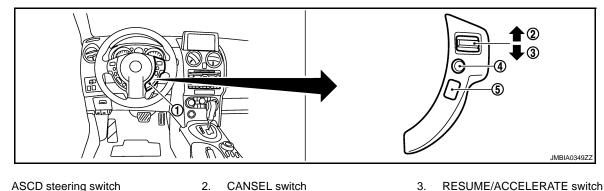
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< FUNCTION DIAGNOSIS >



ASCD steering switch 1. SET/COAST switch

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- 2. CANSEL switch
- 5. MAIN switch

Component Description

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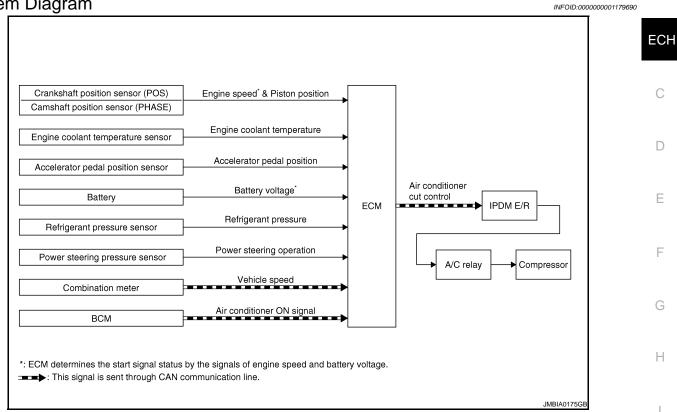
Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450. "Description"
Ignition signal	ECH-576, "Description"
Knock sensor	ECH-472, "Description"
Mass air flow sensor	ECH-116. "Description"
Park/neutral position (PNP) switch	ECH-263. "Description"
Throttle position sensor	ECH-453, "Description"
Vehicle speed sensor	ECH-585. "Description"

< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

AIR CONDITIONING CUT CONTROL





System Description

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INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator	
BCM* ¹	Air conditioner ON signal			
Accelerator pedal position sensor	Accelerator pedal position			
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2		IPDM E/R	
Engine coolant temperature sensor	Engine coolant temperature	Air conditioner cut control ↓ Compressor		
Battery	Battery voltage*2		Ļ	
Refrigerant pressure sensor	Refrigerant pressure		Compressor	
EPS control unit*1	Power steering operation			
Combination meter* ¹	Vehicle speed			

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

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

SYSTEM DESCRIPTION

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

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

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

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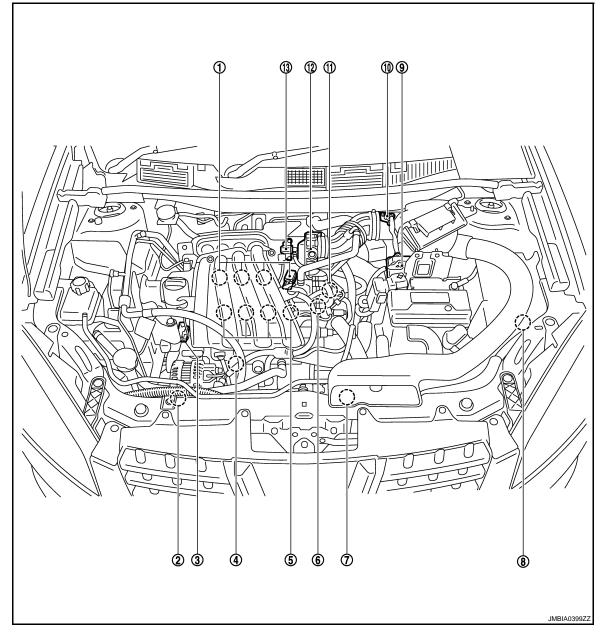
< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

• When refrigerant pressure is excessively low or high.

Component Parts Location

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- 1. Ignition coil (with power transistor) and spark plug
- 4. Knock sensor, Crankshaft position sensor (POS)
- 7. Cooling fan motor
- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve

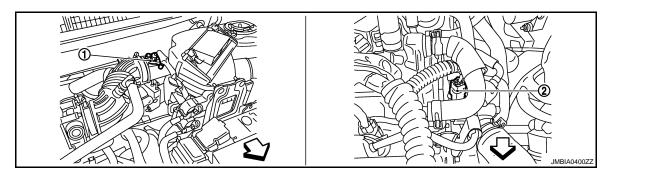
- Refrigerant pressure sensor
- 5. Fuel injector
- 8. IPDM E/R

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- 11. Engine coolant temperature sensor
- 3. Intake valve timing control solenoid valve
- 6. Camshaft position sensor (PHASE)
- 9. ECM
- 12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

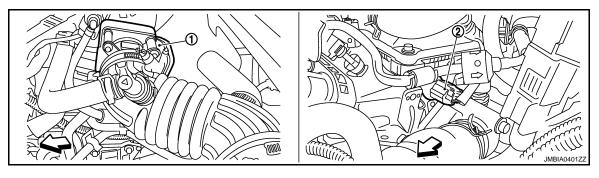
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- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

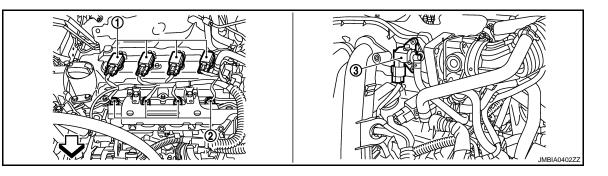
✓ Vehicle front



- 1. Electric throttle control actuator
- Camshaft position sensor (PHASE)

2.

✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

√ Vehicle front

- 1. ECM harness connector 2. IPDM E/R
- Vehicle front

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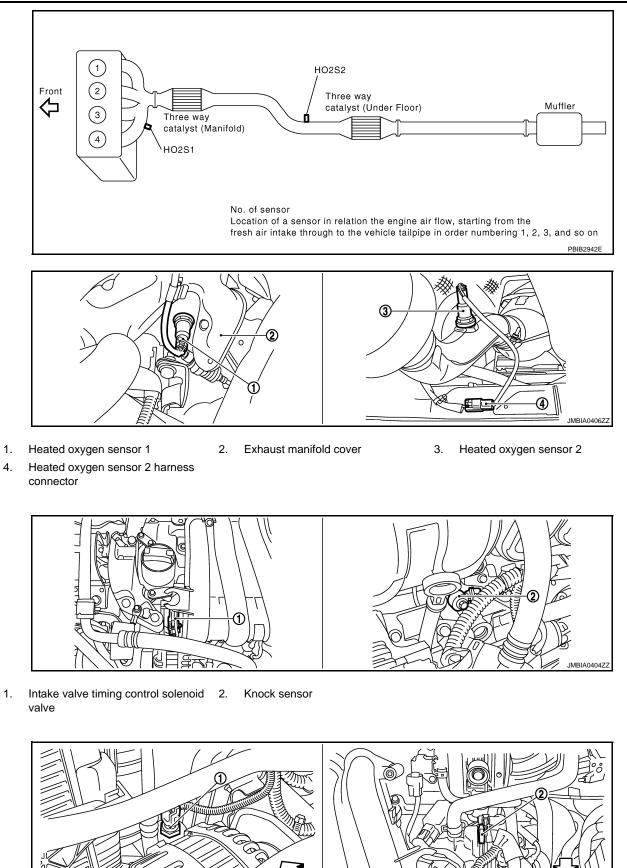
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< FUNCTION DIAGNOSIS >

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- 1. Refrigerant pressure sensor 2. PCV valve
- ✓⊃ Vehicle front

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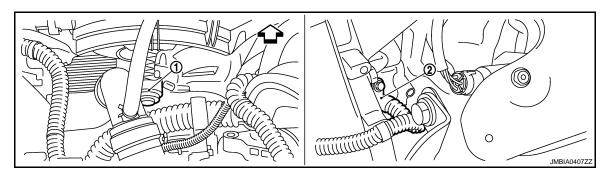
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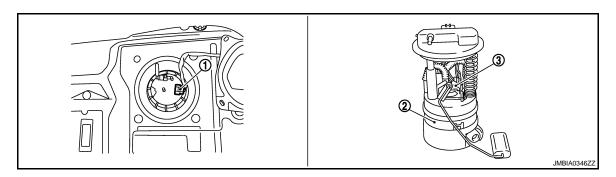
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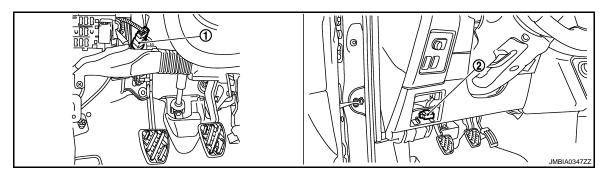


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

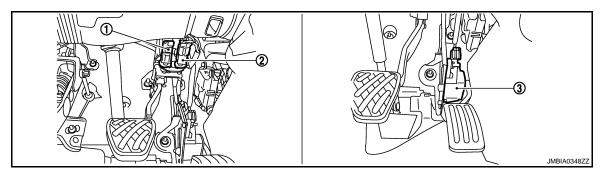
✓ Vehicle front



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

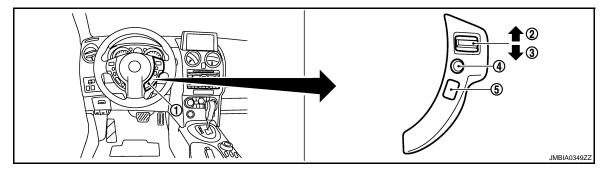


- 1. ASCD clutch switch
- 2. Data link connector



- 1. Stop lamp switch
- 2. ASCD brake pedal
- 3. Accelerator pedal position sensor
- ECH-385

< FUNCTION DIAGNOSIS >



- ASCD steering switch
 SET/COAST switch
- 2. CANSEL switch
- 5. MAIN switch
- **Component Description**

3. RESUME/ACCELERATE switch

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Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450, "Description"
EPS contro unit	STC-4, "System Description"
Refrigerant pressure sensor	ECH-583, "Description"
Vehicle speed sensor	ECH-585, "Description"

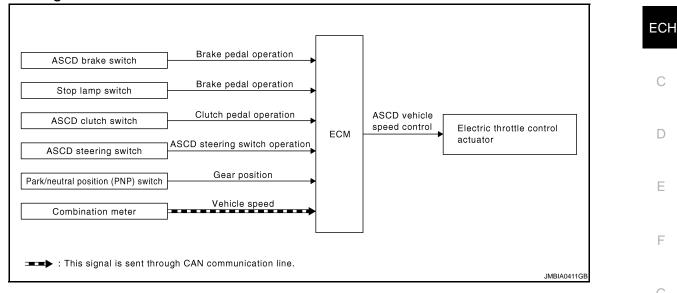
AUTOMATIC SPEED CONTROL DEVICE (ASCD)

< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Diagram



System Description

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator		
ASCD brake switch	Proke podel operation				
Stop lamp switch	Brake pedal operation				
ASCD clutch switch	Clutch pedal operation	ASCD vehicle speed control	Electric throttle control actuator		
ASCD steering switch	ASCD steering switch operation				
Park/neutral position switch	Gear position				
Combination meter*	Vehicle speed				

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

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/ h (25 MPH) and 180 km/h (112 MPH).

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

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

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 180 km/h (112 MPH), press SET/COAST switch. (Then SET lamp in combination meter illuminates.)

ACCELERATE OPERATION

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

CANCEL OPERATION

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

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AUTOMATIC SPEED CONTROL DEVICE (ASCD)

< FUNCTION DIAGNOSIS >

CANCEL switch is pressed More than 2 switches at ASC

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

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

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

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

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

If MAIN switch is turned to OFF 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
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 180km/h (112 MPH)

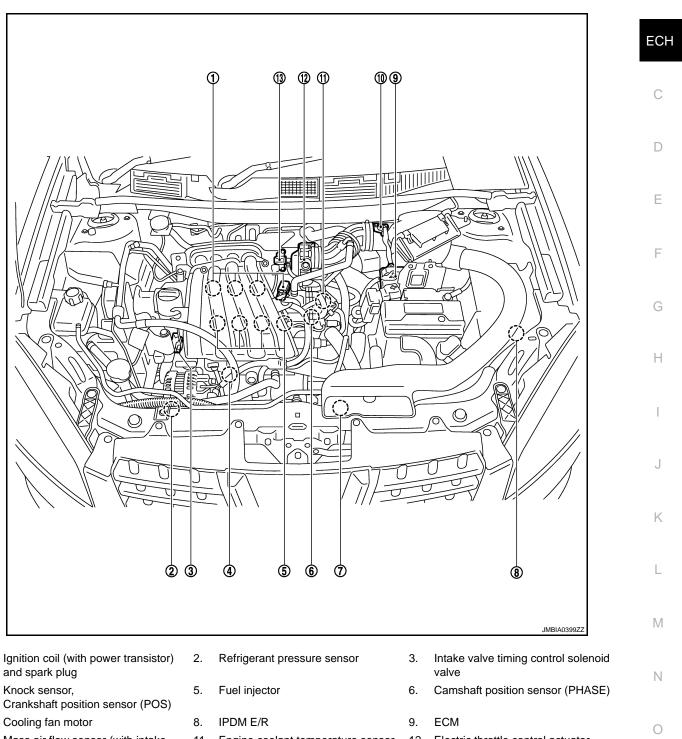
AUTOMATIC SPEED CONTROL DEVICE (ASCD) NOSIS > [HR16DE (WITHOUT EURO-OBD)]

< FUNCTION DIAGNOSIS >

Component Parts Location

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10. Mass air flow sensor (with intake temperature sensor)

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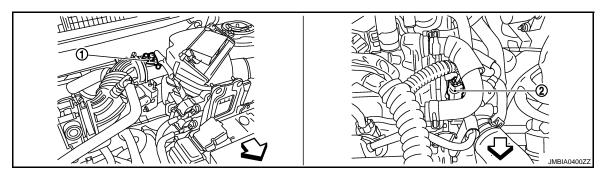
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- 13. EVAP canister purge volume control solenoid valve
- 11. Engine coolant temperature sensor
- 12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

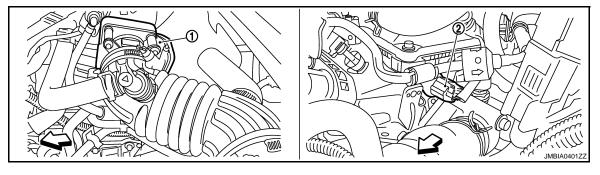
AUTOMATIC SPEED CONTROL DEVICE (ASCD) NOSIS > [HR16DE (WITHOUT EURO-OBD)]

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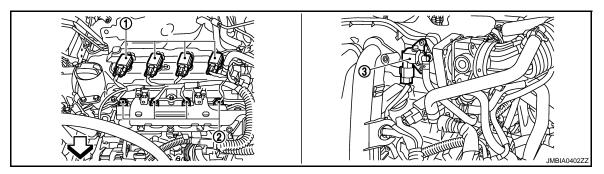
- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

✓ Vehicle front



- 1. Electric throttle control actuator
- 2. Camshaft position sensor (PHASE)

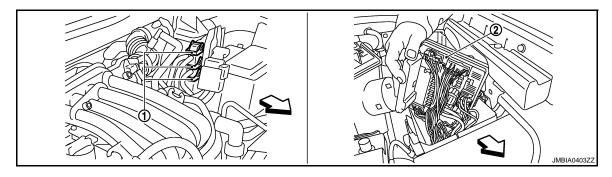
✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front



- 1. ECM harness connector 2.
- √ Vehicle front

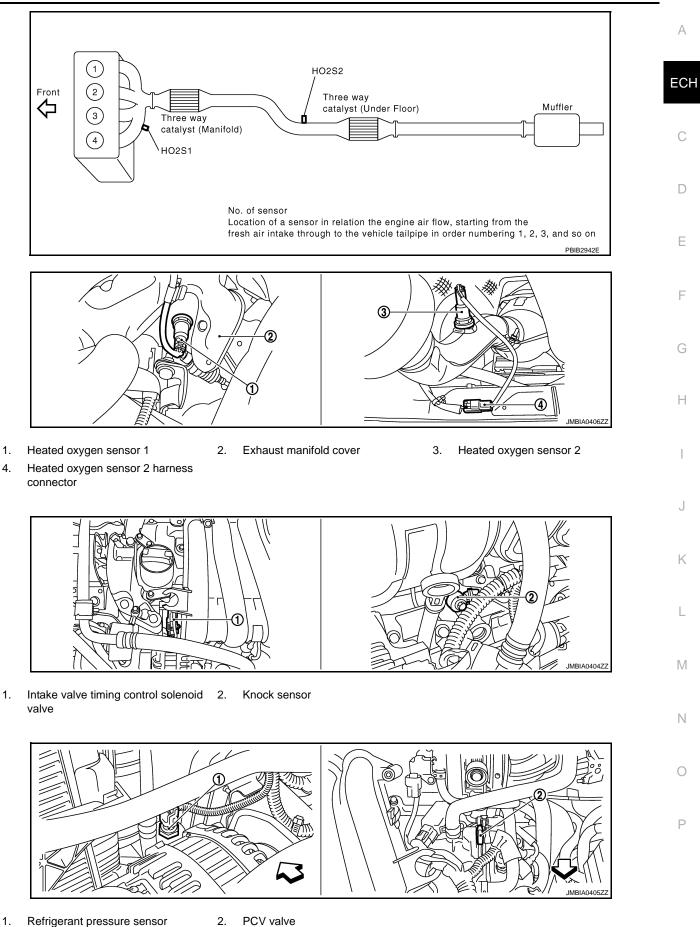
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AUTOMATIC SPEED CONTROL DEVICE (ASCD)

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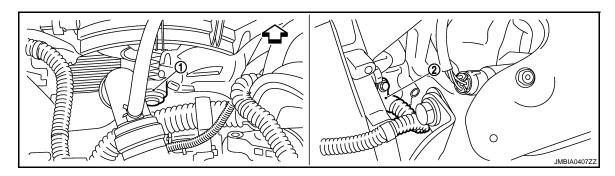
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- √ Vehicle front

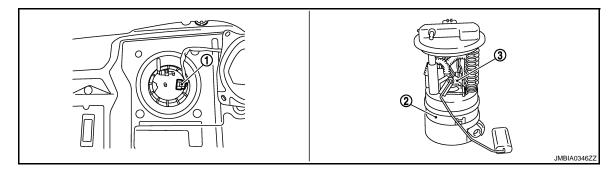
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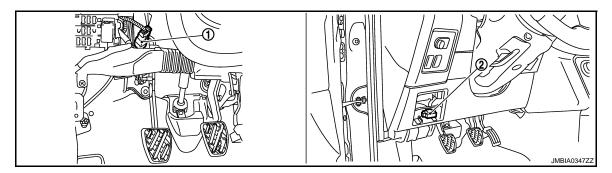


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

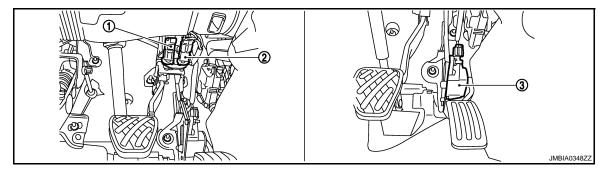
✓ Vehicle front



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



- 1. ASCD clutch switch
- 2. Data link connector

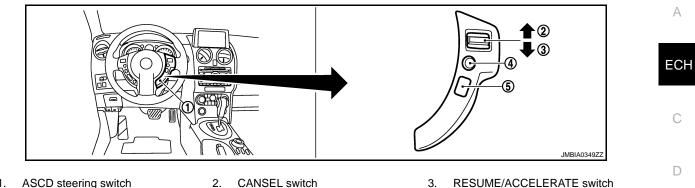


- 1. Stop lamp switch
- 2. ASCD brake pedal
- 3. Accelerator pedal position sensor

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

< FUNCTION DIAGNOSIS >





ASCD steering switch 1. SET/COAST switch

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- 2. CANSEL switch
- 5. MAIN switch

Component Description

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Component	Reference	F
ASCD steering switch	ECH-252, "Description"	
ASCD clutch switch	ECH-541, "Description"	G
ASCD brake switch	ECH-282, "Description"	G
ASCD indicator	ECH-545. "Description"	
Stop lamp switch	ECH-525, "Description"	Н
Electric throttle control actuator	ECH-488, "Description"	

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CAN COMMUNICATION

System Description

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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.

COOLING FAN CONTROL

< FUNCTION DIAGNOSIS >

COOLING FAN CONTROL



А System Diagram INFOID:000000001179699 ECH Crankshaft position sensor (POS) Engine speed * & Piston position Camshaft position sensor (PHASE) Engine coolant temperature Engine coolant temperature sensor Cooling fan control IPDM E/R Refrigerant pressure Refrigerant pressure sensor ECM D Battery voltage* Battery Cooling fan Cooling fan Vehicle speed relay motor Combination meter Е Air conditioner ON signal BCM F * : ECM determines the start signal status by the signals of engine speed and battery voltage. : This signal is sent through CAN communication line. JMBIA0177GI

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INPUT/OUTPUT SIGNAL CHART

System Description

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		
Combination meter	Vehicle speed* ²	Cooling fan ↓ Control ↓	↓ Cooling fan relay ↓ Cooling fan motor	•	
Engine coolant temperature sensor	Engine coolant temperature				
BCM	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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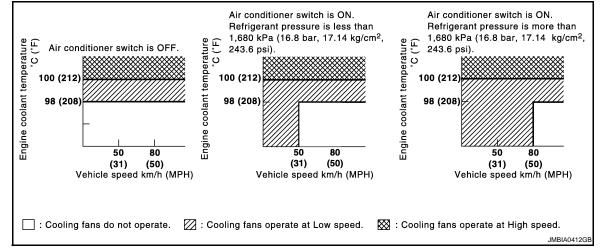
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COOLING FAN CONTROL

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Cooling Fan Operation



Cooling Fan Relay Operation

The ECM controls cooling fan relays through CAN communication line.

Cooling fan speed	Cooling fan relay	
	1	2
Stop (OFF)	OFF	OFF
Low (LOW)	ON	OFF
High (HI)	OFF	ON

COOLING FAN CONTROL

< FUNCTION DIAGNOSIS >

Component Parts Location

10. Mass air flow sensor (with intake

13. EVAP canister purge volume control

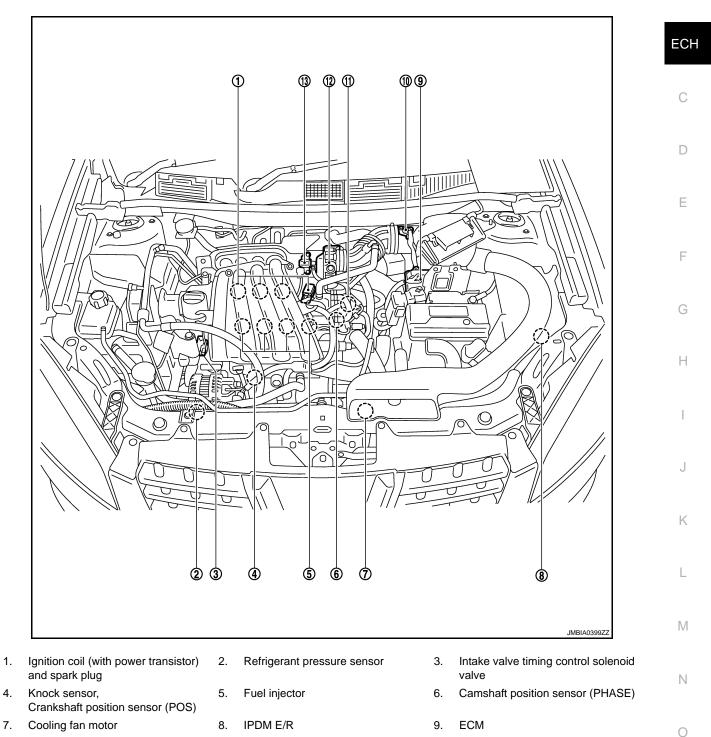
temperature sensor)

solenoid valve

[HR16DE (WITHOUT EURO-OBD)]

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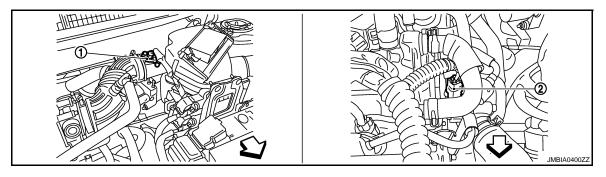


- 12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
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11. Engine coolant temperature sensor

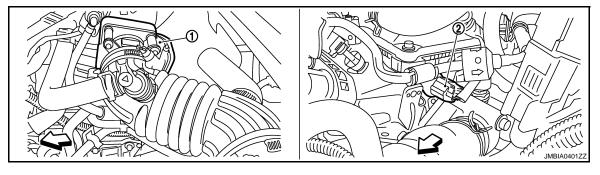
COOLING FAN CONTROL

< FUNCTION DIAGNOSIS >



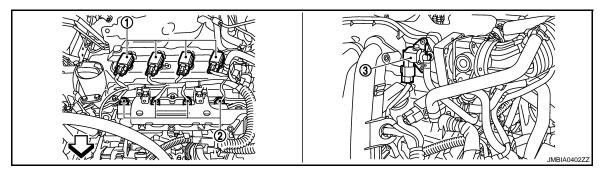
- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

✓ Vehicle front



- 1. Electric throttle control actuator
- 2. Camshaft position sensor (PHASE)

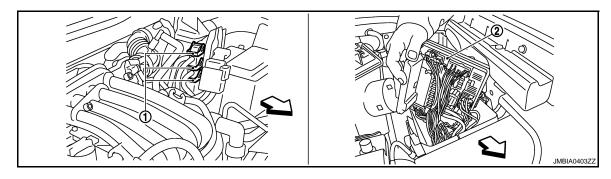
✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front



- 1. ECM harness connector 2.
- Vehicle front

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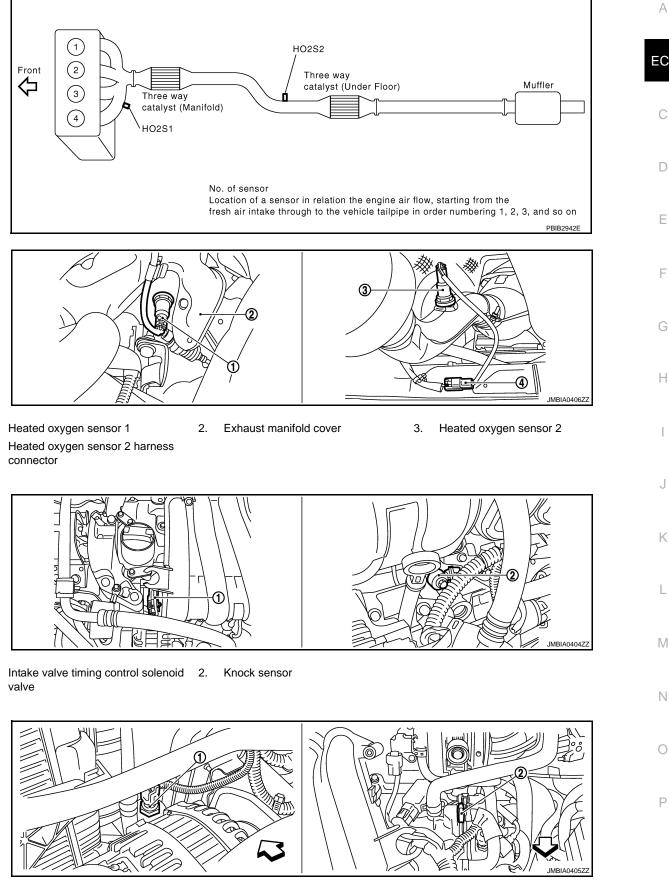
IPDM E/R

< FUNCTION DIAGNOSIS >

COOLING FAN CONTROL

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- Refrigerant pressure sensor 2. PCV valve 1.
- ✓⊃ Vehicle front

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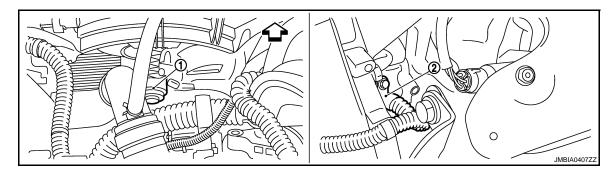
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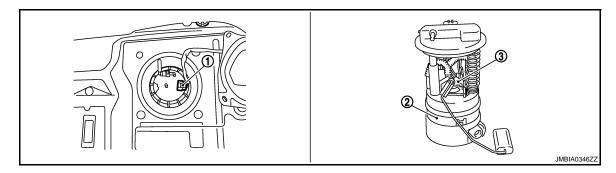
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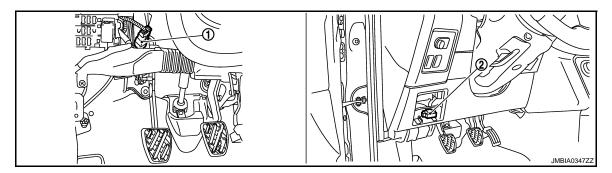


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

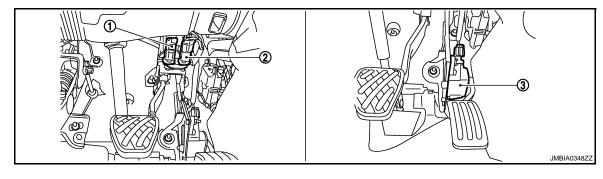
✓ Vehicle front



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



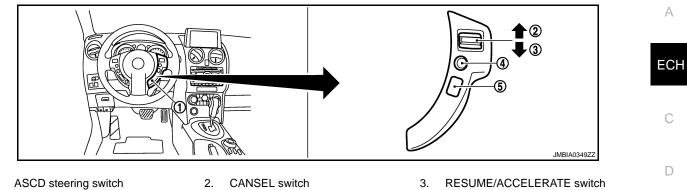
- 1. ASCD clutch switch
- 2. Data link connector



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

COOLING FAN CONTROL

< FUNCTION DIAGNOSIS >



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

INFOID:000000001179702

Component Description

Component	Reference	
Camshaft position sensor (PHASE)	ECH-478, "Description"	
Crankshaft position sensor (POS)	ECH-474, "Description"	C
Cooling fan motor	ECH-395, "System Description"	G
Engine coolant temperature sensor	ECH-450, "Description"	
Refrigerant pressure sensor	ECH-583, "Description"	Н

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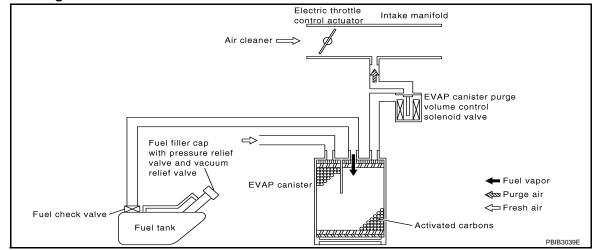
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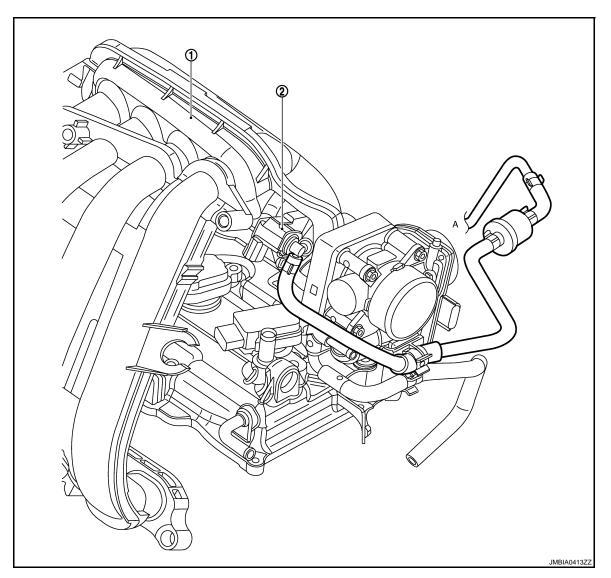
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EVAPORATIVE EMISSION SYSTEM

System Diagram



EVAPORATIVE EMISSION LINE DRAWING



< FUNCTION DIAGNOSIS >

1. Intake manifold collector

 EVAP canister purge volume control solenoid valve

A. To EVAP canister

NOTE:

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

System Description

INFOID:000000001179704

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed ^{*1}			
Mass air flow sensor	Amount of intake air			
Engine coolant temperature sensor	Engine coolant temperature			
Battery	Battery voltage*1	EVAP canister	EVAP canister purge vol-	
Throttle position sensor	Throttle position	purge flow control	ume control solenoid valve	
Accelerator pedal position sensor	Accelerator pedal position			
Heated oxygen sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)			
Combination meter* ²	Vehicle speed			

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

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

SYSTEM DESCRIPTION

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

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

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

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

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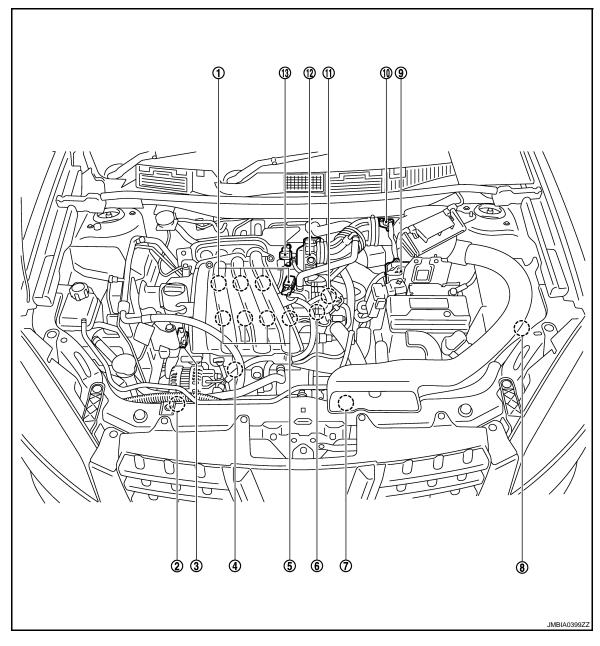
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[HR16DE (WITHOUT EURO-OBD)]

Component Parts Location

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- 1. Ignition coil (with power transistor) and spark plug
- 4. Knock sensor, Crankshaft position sensor (POS)
- 7. Cooling fan motor
- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve

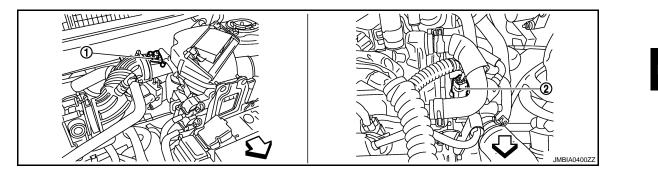
- 2. Refrigerant pressure sensor
- 5. Fuel injector
- 8. IPDM E/R
- 11. Engine coolant temperature sensor
- Intake valve timing control solenoid valve
- 6. Camshaft position sensor (PHASE)

9. ECM

12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

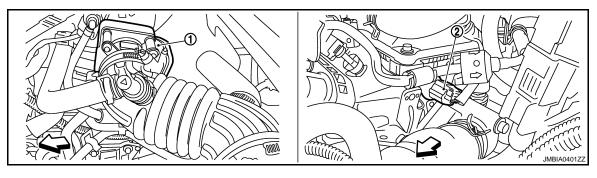
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- 1. Mass air flow sensor
- 2. Engine coolant temperature sensor

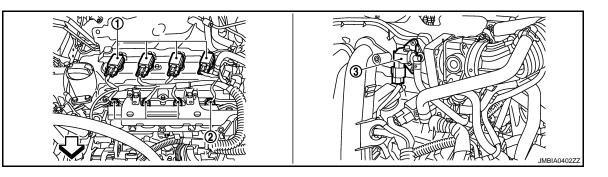
✓ Vehicle front



- 1. Electric throttle control actuator
- Camshaft position sensor (PHASE)

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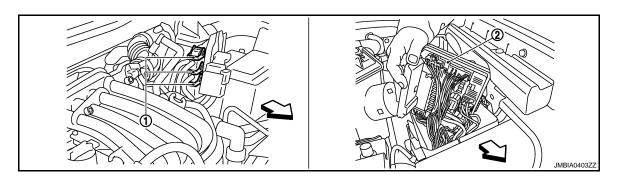
✓ Vehicle front



1. Ignition coil (with power transistor) 2. Fuel injector and spark plug

3 EVAP canister purge volume control solenoid valve

✓ Vehicle front



- 1. ECM harness connector 2. IPDM E/R
- √ Vehicle front

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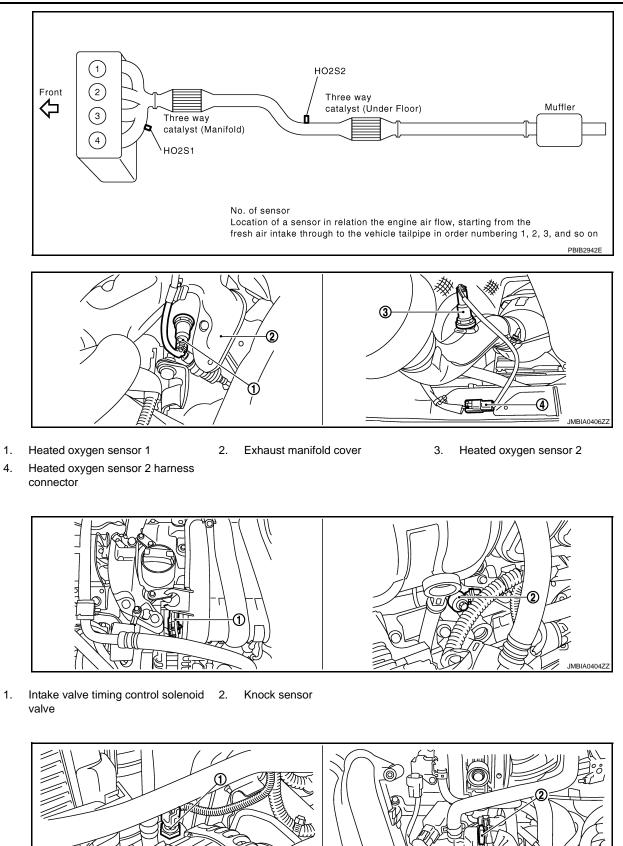
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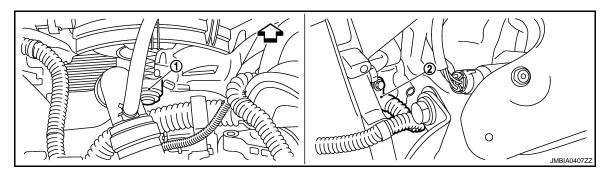
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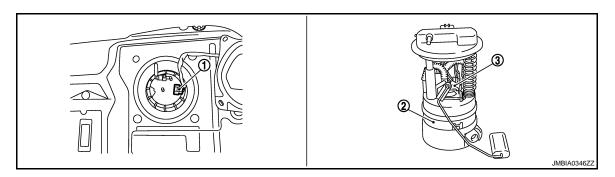
- 1. Refrigerant pressure sensor 2. PCV valve
- ✓ Vehicle front

< FUNCTION DIAGNOSIS >

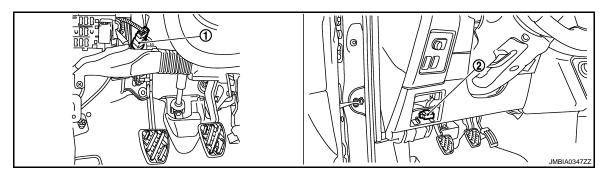


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

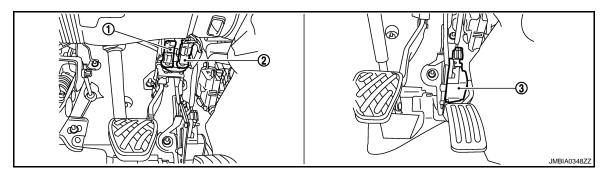
✓ Vehicle front



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



- 1. ASCD clutch switch
- 2. Data link connector



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



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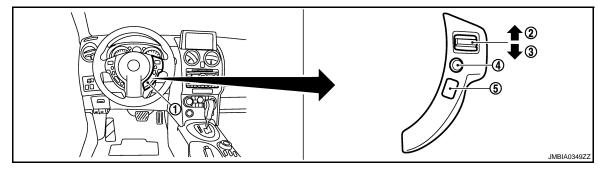
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< FUNCTION DIAGNOSIS >



- ASCD steering switch
 SET/COAST switch
- 2. CANSEL switch
- 5. MAIN switch

3. RESUME/ACCELERATE switch

Component Description

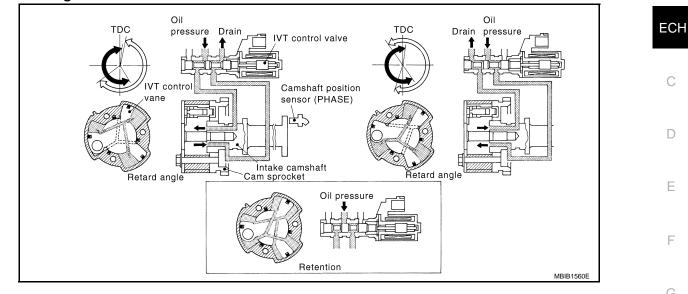
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Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450. "Description"
EVAP canister purge volume control solenoid valve	ECH-550, "Description"
Heated oxygen sensor 1	ECH-456, "Description"
Mass air flow sensor	ECH-445. "Description"
Throttle position sensor	ECH-453. "Description"
Vehicle speed sensor	ECH-585, "Description"

< FUNCTION DIAGNOSIS >

INTAKE VALVE TIMING CONTROL

System Diagram



System Description

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INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS)	 Engine speed and piston position 		Intake valve timing control solenoid valve	
Camshaft position sensor (PHASE)		Intake valve		
Engine coolant temperature sensor	Engine coolant temperature	timing control		
Combination meter*	Vehicle speed			

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

SYSTEM DESCRIPTION

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

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

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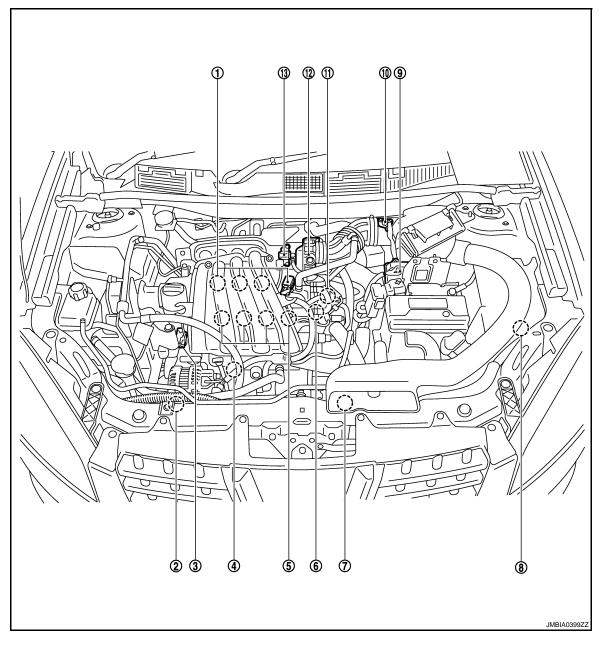
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[HR16DE (WITHOUT EURO-OBD)]

< FUNCTION DIAGNOSIS >

Component Parts Location

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- Ignition coil (with power transistor) 1. and spark plug
- 4. Knock sensor, Crankshaft position sensor (POS)
- 7. Cooling fan motor
- 10. Mass air flow sensor (with intake temperature sensor)
- 13. EVAP canister purge volume control solenoid valve

- 2. Refrigerant pressure sensor
- 5. Fuel injector
- 8. IPDM E/R
- 11. Engine coolant temperature sensor
- Intake valve timing control solenoid 3. valve
- 6. Camshaft position sensor (PHASE)

9. ECM

12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)

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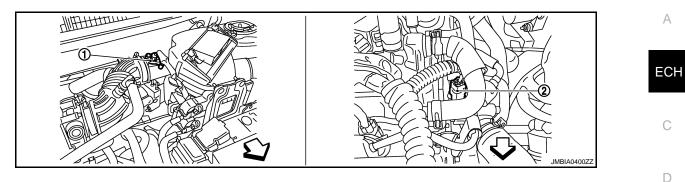
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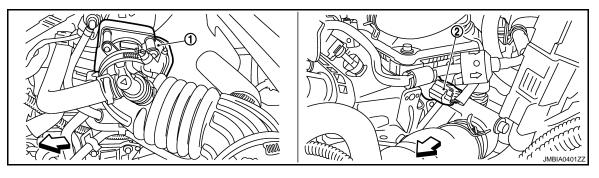
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- Mass air flow sensor 1.
- 2. Engine coolant temperature sensor

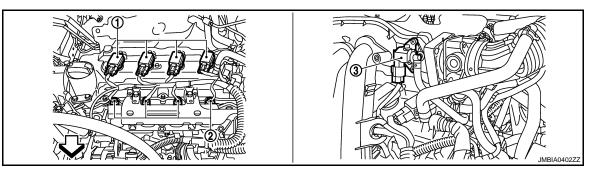
✓ Vehicle front



- Electric throttle control actuator 1.
- Camshaft position sensor (PHASE)

2.

Vehicle front \triangleleft



Ignition coil (with power transistor) 2. Fuel injector 1. and spark plug

3 EVAP canister purge volume control solenoid valve

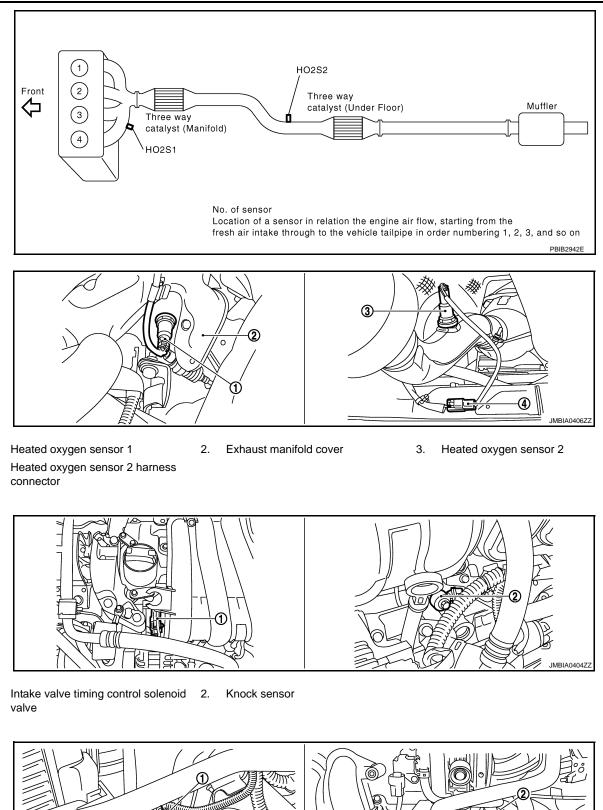
✓ Vehicle front

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- ECM harness connector IPDM E/R 2. 1.
- ✓⊃ Vehicle front

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PCV valve

✓⊃ Vehicle front

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Refrigerant pressure sensor

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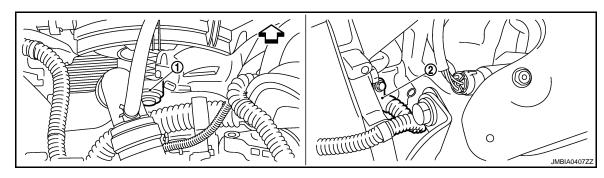
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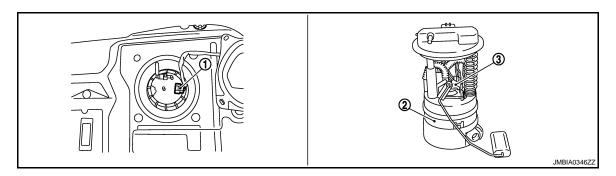
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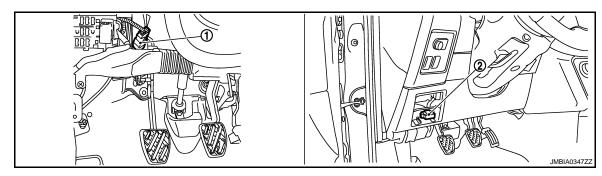


- 1. Cooling fan motor
- 2. Crankshaft position sensor (POS)

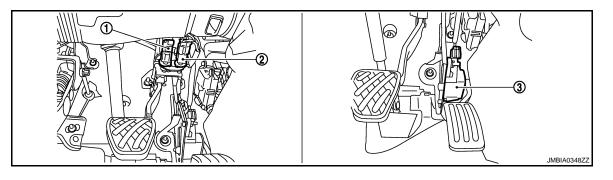
✓ Vehicle front



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

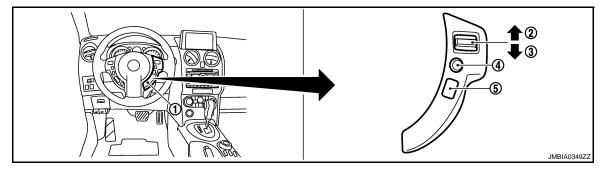


- 1. ASCD clutch switch
- 2. Data link connector



- 1. Stop lamp switch
- 2. ASCD brake pedal
- 3. Accelerator pedal position sensor
- ECH-413

< FUNCTION DIAGNOSIS >



- ASCD steering switch
 SET/COAST switch
- 2. CANSEL switch
- 5. MAIN switch

3. RESUME/ACCELERATE switch

Component Description

INFOID:000000001179710

Component	Reference
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450, "Description"
Intake valve timing control solenoid valve	ECH-486, "Description"
Vehicle speed sensor	ECH-585, "Description"

< FUNCTION DIAGNOSIS >

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

Diagnostic Trouble Code (DTC)

Freeze Frame data

1st Trip Diagnostic Trouble Code (1st Trip DTC)

1st Trip Freeze Frame data

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

1st trip Freeze Frame DTC 1st trip DTC Freeze Frame data data CONSULT-III × × х × ECM ×* \times ____

*: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other. The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to ECM-330, Н "Fail Safe".)

TWO TRIP DETECTION LOGIC

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

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MI lights up. The MI lights up at the same time when the DTC is stored. <2nd trip> The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation.

DTC AND FREEZE FRAME DATA

DTC and 1st Trip DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip L DTC will not be displayed.

If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required Μ driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MI lights up. In other words, the DTC is stored in the ECM memory and the MI lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd Ν trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MI during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to ECM-10, "Work Flow". Then perform DTC CONFIR-Ρ MATION PROCEDURE or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

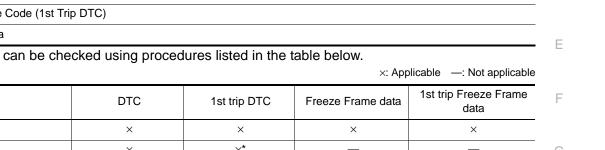
Freeze Frame Data and 1st Trip Freeze Frame Data

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

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

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".

How to Read DTC and 1st Trip DTC

With CONSULT-III

CONSULT-III displays the DTC in "SELF-DIAG RESULTS" mode. Examples: P0340, P1148, P1706, etc.

(CONSULT-III also displays the malfunctioning component or system.)

Without CONSULT-III

The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: P0340, P1148, P1706, etc.

These DTCs are controlled by NISSAN.

- 1st trip DTC No. is the same as DTC No.
- Output of a DTC indicates a malfunction. However, the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-III can identify malfunction status as shown below. Therefore, using CONSULT-III (if available) is recommended.

DTC or 1st trip DTC of a malfunction is displayed in "SELF-DIAGNOSTIC RESULTS" mode of CONSULT-III. Time data indicates how many times the vehicle was driven after the last detection of a DTC.

If the DTC is being detected currently, the time data will be [0].

If a 1st trip DTC is stored in the ECM, the time data will be [1t].

How to Erase DTC and 1st Trip DTC

() With CONSULT-III

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.

Without CONSULT-III

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
- 2. Perform ECH-415, "Diagnosis Description".
- 3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal.
- 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
- Freeze frame data
- 1st trip freeze frame data

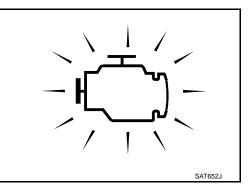
Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

MALFUNCTION INDICATOR (MI)

Description

The MI is located on the instrument panel.

- The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check. If the MI does not light up, check MI circuit. Refer to <u>ECH-581</u>, or see <u>MWI-20</u>.
- 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.



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The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function	
Mode I	Ignition switch in ON position	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.	C D
	Engine running	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is de- tected twice in two consecutive driving cycles (two trip de- tection logic), the MI will light up to inform the driver that a malfunction has been detected. One trip detection diagnoses will light up the MI in the 1st trip.	E
Mode II	Ignition switch in ON position	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.	G
	Engine running	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.	J

When there is an open circuit on MI circuit, the ECM cannot warn the driver by lighting up MI when there is malfunction on engine control system.

Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MI circuit is open by means of operating fail-safe function.

The fail-safe function also operates when above diagnoses except MI circuit are detected and demands the driver to repair the malfunction.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut	в. Л
		IVI

MI FLASHING WITHOUT DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode. How to switch the diagnostic test (function) modes, and details of the above functions are described later. Refer to HOW to SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data

How to Switch Diagnostic Test Mode

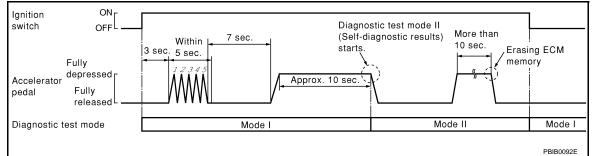
NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- Always ECM returns to Diagnostic Test Mode I after ignition switch is turned OFF. HOW to SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)
- 1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.

< FUNCTION DIAGNOSIS >

- 2. Repeat the following procedure quickly five times within 5 seconds.
- a. Fully depress the accelerator pedal.
- b. Fully release the accelerator pedal.
- 3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.
- Fully release the accelerator pedal. ECM has entered to Diagnostic Test Mode II (Self-diagnostic results). NOTE:

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



HOW to SET DIAGNOSTIC TEST MODE II (HEATED OXYGEN SENSOR 1 MONITOR)

- 1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results).
- Refer to HOW to SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 2. Start Engine.
- ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

HOW to ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

- 1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to HOW to SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).
- 2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
- The emission-related diagnostic information has been erased from the backup memory in the ECM.
- 3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

Diagnostic Test Mode I — Bulb Check

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check MI circuit. Refer to <u>ECH-581</u> or see <u>MWI-20</u>.

Diagnostic Test Mode I — Malfunction Warning

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

This DTC number is clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

Diagnostic Test Mode II - Self-diagnostic Results

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI as shown below.

The DTC and 1st trip DTC are displayed at the same time. If the MI does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MI illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are dis-

[HR16DE (WITHOUT EURO-OBD)]

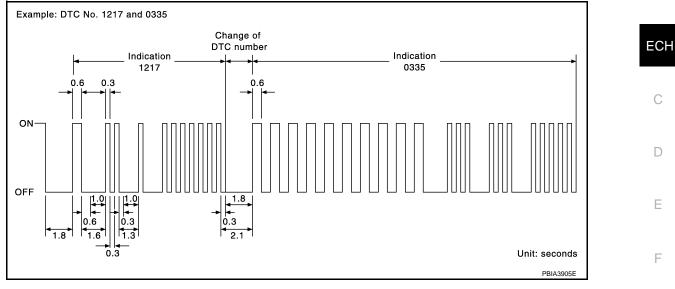
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< FUNCTION DIAGNOSIS >

played, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-III. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The "zero" is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.

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

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

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. (See <u>ECH-608</u>.)

HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to HOW to ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).

- If the battery is disconnected, the DTC will be lost from the backup memory within 24 hours.
- Be careful not to erase the stored memory before starting trouble diagnoses.

Diagnostic Test Mode II — Heated Oxygen Sensor 1 Monitor

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition	
ON	Lean	Closed loop system	
OFF	Rich		M
*Remains ON or OFF	Any condition	Open loop system	

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.

Next run engine at about 2,000 rpm for about 2 minutes under no load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no load.

CONSULT-III Function

INFOID:000000001179712

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the in- dications on the CONSULT-III unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*

< FUNCTION DIAGNOSIS >

Diagnostic test mode	Function	
Data monitor	Input/Output data in the ECM can be read.	
Active test	Active test Diagnostic Test Mode in which CONSULT-III drives some actuators apart from the ECMs and also shift some parameters in a specified range.	
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.	
ECU part number ECM part number can be read.		

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

• Diagnostic trouble codes

• 1st trip diagnostic trouble codes

- Freeze frame data
- 1st trip freeze frame data

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

			DIAGNOSTIC TEST MODE				
	ltem		WORK SUP- PORT	SELF-DIAGNOSTIC RE- SULTS		DATA MONITOR	ACTIVE TEST
				DTC*1	FREEZE FRAME DA- TA*2		
		Crankshaft position sensor (POS)		×	×	×	
		Camshaft position sensor (PHASE)		×	×	×	
		Mass air flow sensor		×		×	
		Engine coolant temperature sensor		×	×	×	×
		Heated oxygen sensor 1		×		×	
လု		Heated oxygen sensor 2		×		×	
ART		Vehicle speed sensor		×	×	×	
Γ		Accelerator pedal position sensor		×		×	
NEN		Throttle position sensor		×	×	×	
ИРО	INPUT	Intake air temperature sensor		×	×	×	
CO		Knock sensor		×			
Р		Refrigerant pressure sensor				×	
ENGINE CONTROL COMPONENT PARTS		Closed throttle position switch (accelerator ped- al position sensor signal)				×	
Щ		Air conditioner switch				×	
NGII		Park/neutral position (PNP) switch		×		×	
Ξ		Stop lamp switch		×		×	
		EPS control unit				×	
		Battery voltage				×	
		Load signal				×	
		ASCD steering switch		×		×	
		ASCD brake switch		×		×	

< FUNCTION DIAGNOSIS >

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				DIAGN	NOSTIC TEST M	ODE		
		ltem	WORK SUP- PORT		GNOSTIC RE- ULTS	DATA MONITOR	ACTIVE TEST	A
				DTC*1	FREEZE FRAME DA- TA*2			ECH
လု		Fuel injector				×	×	
PARTS		Power transistor (Ignition timing)				×	×	С
Ę		Throttle control motor relay		×		×		-
NEN		Throttle control motor		×				D
COTNROL COMPONENT	٦Uc	EVAP canister purge volume control solenoid valve		×		×	×	
с С	оитрит	Air conditioner relay				×		E
NRC	0	Fuel pump relay	×			×	×	-
Ю ТО		Cooling fan relay		×		×	×	-
		Heated oxygen sensor 1 heater		×		×		F
ENGINE		Heated oxygen sensor 2 heater		×		×		-
Ξ		Intake valve timing control solenoid valve		×		×	×	G

X: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-III screen in freeze frame data H mode only if a 1st trip DTC or DTC is detected. For details, refer to ECH-415, "Diagnosis Description".

INSPECTION PROCEDURE

Refer to CONSULT-III Operators Manual.

WORK SUPPORT MODE

Work Item

WORK ITEM CONDITION USAGE FUEL PRESSURE RELEASE • FUEL PUMP WILL STOP BY TOUCHING "START" DUR-When releasing fuel pressure from Κ ING IDLING. fuel line CRANK A FEW TIMES AFTER ENGINE STALLS. IDLE AIR VOL LEARN • THE IDLE AIR VOLUME THAT KEEPS THE ENGINE When learning the idle air volume WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM. SELF-LEARNING CONT THE COEFFICIENT OF SELF-LEARNING CONTROL When clearing mixture ratio self-Μ MIXTURE RATIO RETURNS TO THE ORIGINAL COEFlearning value FICIENT. TARGET IDLE RPM ADJ* IDLE CONDITION When setting target idle speed Ν TARGET IGN TIM ADJ* IDLE CONDITION When adjusting target ignition timing

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

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to ECH-608. "DTC Index".)

Freeze Frame Data and 1st Trip Freeze Frame Data

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< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Freeze frame data item*	Description		
DIAG TROUBLE CODE [PXXXX]	 The engine control component part/control system has a trouble code, it is displayed as PXXXX. (Refer to <u>ECH-608, "DTC Index"</u>.) 		
FUEL SYS-B1	 "Fuel injection system status" at the moment a malfunction is detected is displayed. One mode in the following is displayed. Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop 		
CAL/LD VALUE [%]	The calculated load value at the moment a malfunction is detected is displayed.		
COOLANT TEMP [°C] or [°F]	The engine coolant temperature at the moment a malfunction is detected is displayed.		
L-FUEL TRM-B1 [%]	 "Long-term fuel trim" at the moment a malfunction is detected is displayed. The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim. 		
S-FUEL TRM-B1 [%]	 "Short-term fuel trim" at the moment a malfunction is detected is displayed. The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule. 		
ENGINE SPEED [rpm]	The engine speed at the moment a malfunction is detected is displayed.		
VEHICL SPEED [km/h] or [mph]	The vehicle speed at the moment a malfunction is detected is displayed.		
ABSOL TH-P/S [%]	The throttle valve opening angle at the moment a malfunction is detected is displayed.		
B/FUEL SCHDL [msec]	The base fuel schedule at the moment a malfunction is detected is displayed.		
INT/A TEMP SE [°C] or [°F]	The intake air temperature at the moment a malfunction is detected is displayed.		
INT MANI PRES [kPa]	Always a certain value is displayed.This item is not efficient for J10 models.		

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

DATA MONITOR MODE

Monitored Item

			×: Applicable
Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	 Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE). 	 Accuracy becomes poor if engine speed drops below the idle rpm. If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1	V	 The signal voltage of the mass air flow sensor is displayed. 	 When the engine is stopped, a certain value is indicated. When engine is running specification range is indicated in "SPEC".
B/FUEL SCHDL	msec	"Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	When engine is running specification range is indicated in "SPEC".
A/F ALPHA-B1	%	 The mean value of the air-fuel ratio feedback cor- rection factor per cycle is indicated. 	 When the engine is stopped, a certain value is indicated. When engine is running specification range is indicated in "SPEC". This data also includes the data for the air-fuel ratio learning control.

< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Monitored item	Unit	Description	Remarks
COOLAN TEMP/S	°C or °F	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2 SEN1 (B1)	V	• The A/F signal computed from the input signal of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1)	V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR(B1)	RICH/LEAN	 Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH: means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN: means the mixture became ""lean", and control is being affected toward a rich mixture. 	 After turning ON the ignition switch, "RICH" is displayed until air-fuel mix- ture ratio feedback control begins. When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR(B1)	RICH/LEAN	 Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large. 	 When the engine is stopped, a certain value is indicated.
VHCL SPEED SE	km/h or mph	 The vehicle speed computed from the vehicle speed signal sent from combination meter is dis- played. 	
BATTERY VOLT	V	• The power supply voltage of ECM is displayed.	
ACCEL SEN 1	.,	The accelerator pedal position sensor signal volt-	ACCEL SEN 2 signal is converted by
ACCEL SEN 2	V	age is displayed.	ECM internally. Thus, it differs from ECM terminal voltage signal.
TP SEN 1-B1		The throttle position sensor signal voltage is dis-	• TP SEN 2-B1 signal is converted by
TP SEN 1-B2	V	played.	ECM internally. Thus, it differs from ECM terminal voltage signal.
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
START SIGNAL	ON/OFF	 Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage. 	• After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS	ON/OFF	 Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal. 	
AIR COND SIG	ON/OFF	 Indicates [ON/OFF] condition of the air condition- er switch as determined by the air conditioner sig- nal. 	
P/N POSI SW	ON/OFF	 Indicates [ON/OFF] condition from the park/neu- tral position (PNP) switch signal. 	
PW/ST SIGNAL	ON/OFF	 [ON/OFF] condition of the power steering system (determined by the signal sent from EPS control unit) is indicated. 	
LOAD SIGNAL	ON/OFF	 Indicates [ON/OFF] condition from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and light- ing switch are OFF. 	
IGNITION SW	ON/OFF	 Indicates [ON/OFF] condition from ignition switch signal. 	
CLUTCH P/P SW	ON/OFF	 Indicates [ON/OFF] condition from the clutch switch signal. 	

< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Monitored item	Unit	Description	Remarks
HEATER FAN SW	ON/OFF	 Indicates [ON/OFF] condition from the heater fan switch signal. 	
BRAKE SW	ON/OFF	 Indicates [ON/OFF] condition from the stop lamp switch signal. 	
INJ PULSE-B1	msec	 Indicates the actual fuel injection pulse width compensated by ECM according to the input sig- nals. 	• When the engine is stopped, a certain computed value is indicated.
IGN TIMING	BTDC	 Indicates the ignition timing computed by ECM according to the input signals. 	• When the engine is stopped, a certain value is indicated.
CAL/LD VALUE	%	• "Calculated load value" indicates the value of the current air flow divided by peak air flow.	
MASS AIRFLOW	g⋅m/s	• Indicates the mass air flow computed by ECM ac- cording to the signal voltage of the mass air flow sensor.	
PURG VOL C/V	%	 Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. The opening becomes larger as the value increases. 	
INT/V TIM (B1)	°CA	 Indicates [°CA] of intake camshaft advance an- gle. 	
INT/V SOL-B1	%	 The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. The advance angle becomes larger as the value increases. 	
AIR COND RLY	ON/OFF	• The air conditioner relay control condition (deter- mined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY	ON/OFF	 Indicates the fuel pump relay control condition determined by ECM according to the input sig- nals. 	
THRTL RELAY	ON/OFF	 Indicates the throttle control motor relay control condition determined by the ECM according to the input signals. 	
COOLING FAN	HI/LOW/OFF	 Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI: High speed operation LOW: Low speed operation OFF: Stop 	
HO2S1 HTR (B1)	ON/OFF	 Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals. 	
HO2S2 HTR (B1)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
IDL A/V LEARN	YET/CMPLT	 Display the condition of Idle Air Volume Learning YET: Idle air volume learning has not been per- formed yet. CMPLT: Idle air volume learning has already been performed successfully. 	
TRVL AFTER MIL	km or mile	Distance traveled while MI is activated.	
O2 SEN HTR DTY	%	 Heated oxygen sensor 1 heater control value computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. 	

< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Monitored item	Unit	Description	Remarks
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.	
SET VHCL SPD	km/h or mph	The preset vehicle speed is displayed.	
MAIN SW	ON/OFF	Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW	ON/OFF	 Indicates [ON/OFF] condition from CANCEL switch signal. 	
RESUME/ACC SW	ON/OFF	 Indicates [ON/OFF] condition from RESUME/AC- CELERATE switch signal. 	
SET SW	ON/OFF	 Indicates [ON/OFF] condition from SET/COAST switch signal. 	
BRAKE SW1	ON/OFF	 Indicates [ON/OFF] condition from ASCD brake switch signal. 	
BRAKE SW2	ON/OFF	Indicates [ON/OFF] condition of stop lamp switch signal.	
VHCL SPD CUT	NON/CUT	 Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off. 	
LO SPEED CUT	NON/CUT	 Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low, and ASCD operation is cut off. 	
CRUISE LAMP	ON/OFF	 Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals. 	
SET LAMP	ON/OFF	 Indicates [ON/OFF] condition of SET lamp deter- mined by the ECM according to the input signals. 	
Voltage	V		
Frequency	msec, Hz or %		 Only "#" is displayed if item is unable to be measured.
DUTY-HI		• Voltage, frequency, duty cycle or pulse width	Figures with "#"s are temporary ones.
DUTY-LOW		measured by the probe.	They are the same figures as an actu-
PLS WIDTH-HI			al piece of data which was just previ- ously measured.
PLS WIDTH-LOW			

NOTE:

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

ACTIVE TEST MODE

Test Item

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< FUNCTION DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	 Engine: Return to the original trouble condition Change the amount of fuel injec- tion using CONSULT-III. 	If trouble symptom disappears, see CHECK ITEM.	Harness and connectorsFuel injectorHeated oxygen sensor 1
IGNITION TIMING	 Engine: Return to the original trouble condition Timing light: Set Retard the ignition timing using CONSULT-III. 	If trouble symptom disappears, see CHECK ITEM.	Perform Idle Air Volume Learn- ing.
POWER BALANCE	 Engine: After warming up, idle the engine. A/C switch OFF Shift lever: Neutral Cut off each fuel injector signal one at a time using CONSULT-III. 	Engine runs rough or dies.	 Harness and connectors Compression Fuel injector Power transistor Spark plug Ignition coil
COOLING FAN*	 Ignition switch: ON Turn the cooling fan "LOW", "HI" and "OFF" CONSULT-III. 	Cooling fan moves and stops.	 Harness and connectors IPDM E/R (Cooling fan relay) Cooling fan motor
ENG COOLANT TEMP	 Engine: Return to the original trouble condition Change the engine coolant tem- perature using CONSULT-III. 	If trouble symptom disappears, see CHECK ITEM.	 Harness and connectors Engine coolant temperature sensor Fuel injector
FUEL PUMP RELAY	 Ignition switch: ON (Engine stopped) Turn the fuel pump relay "ON" and "OFF" using CONSULT-III and listen to operating sound. 	Fuel pump relay makes the operat- ing sound.	Harness and connectorsFuel pump relay
PURG VOL CONT/V	 Engine: After warming up, run engine at 1,500 rpm. Change the EVAP canister purge volume control solenoid valve opening percent using CON-SULT-III. 	Engine speed changes according to the opening percent.	Harness and connectorsSolenoid valve
V/T ASSIGN ANGLE	 Engine: Return to the original trouble condition Change intake valve timing using CONSULT-III. 	If trouble symptom disappears, see CHECK ITEM.	 Harness and connectors Intake valve timing control solenoid valve

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

< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

COMPONENT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

D

	ЕСН
The specification (SP) value indicates the tolerance of the value that is displayed in "SPEC" of "DATA MONI- TOR" mode of CONSULT-III during normal operation of the Engine Control System. When the value in "SPEC" of "DATA MONITOR" mode is within the SP value, the Engine Control System is confirmed OK. When the value in "SPEC" of "DATA MONITOR" mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.	С
The CD value is used to detect molfunctions that may affect the Engine Control Cystem, but will not light the	D
 The SP value will be displayed for the following three items: B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction) 	E
 A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle) MAS A/F SE-B1 (The signal voltage of the mass air flow sensor) 	
Component Function Check	F
1.start	G
 Make sure that all of the following conditions are satisfied. Vehicle driven distance: More than 5,000 km (3,107 miles) 	
• Parametria procesure: $0.2 \cdot 10.4.2 \text{ kPa} (0.082 \cdot 1.042 \text{ har} \cdot 1.002 \cdot 1.064 \text{ kg/cm}^2 \cdot 14.25 \cdot 15.12 \text{ poi})$	Η
 After the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes. Electrical load: Not applied* 	
 Engine speed: Idle *: Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead. 	J
>> GO TO 2.	K
2.PERFORM "SPEC" OF "DATA MONITOR" MODE	
With CONSULT-III NOTE:	L
 Perform "SPEC" in "DATA MONITOR" mode in maximum scale display. Perform <u>ECH-353</u>, "<u>BASIC INSPECTION : Special Repair Requirement</u>". Select "B/FUEL SCHDL", "A/F ALPHA-B1" and "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode with CONSULT-III. 	M
3. Make sure that monitor items are within the SP value.	
<u>Is the inspection result normal?</u> YES >> END	Ν
NO >> Go to ECH-428, "Diagnosis Procedure".	\cap

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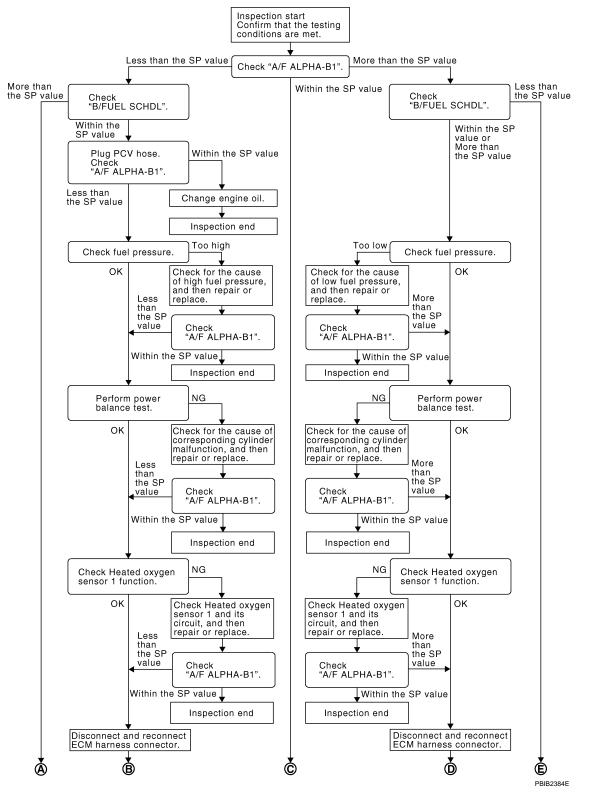
< COMPONENT DIAGNOSIS >

Diagnosis Procedure

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[HR16DE (WITHOUT EURO-OBD)]

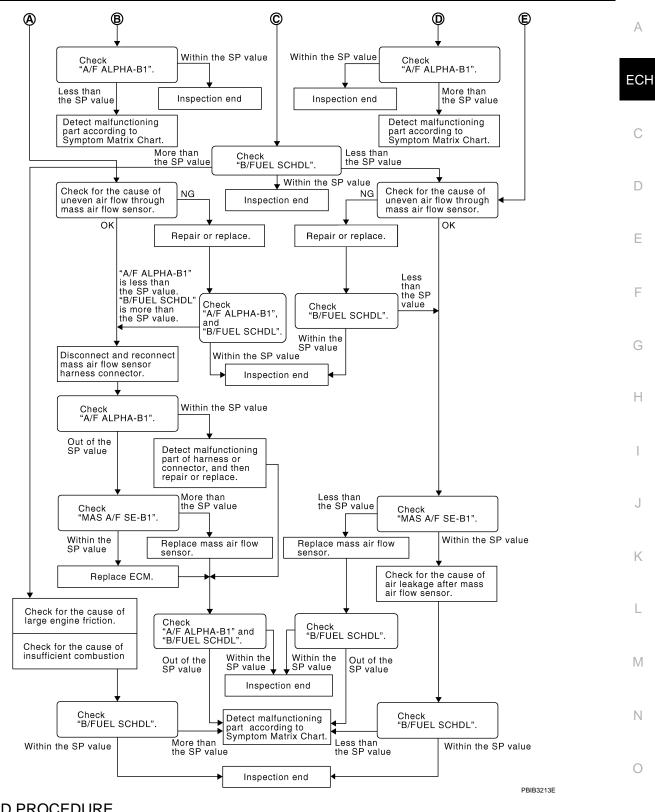
OVERALL SEQUENCE



< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

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DETAILED PROCEDURE

1.CHECK "A/F ALPHA-B1"

With CONSULT-III

- 1. Start engine.
- 2. Confirm that the testing conditions are met. Refer to ECH-427, "Component Function Check".
- Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.
 NOTE:

< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

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

Is the measurement value within the SP value?

YES >> GO TO 17.

NO-1 >> Less than the SP value: GO TO 2.

NO-2 >> More than the SP value: GO TO 3.

2.CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

YES >> GO TO 4.

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

 ${f 3.}$ CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

YES >> GO TO 6.

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

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

4.CHECK "A/F ALPHA-B1"

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

Is the measurement value within the SP value?

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

5. CHANGE ENGINE OIL

1. Stop the engine.

2. Change engine oil.

NOTE:

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

>> INSPECTION END

6.CHECK FUEL PRESSURE

Check fuel pressure. (Refer to <u>ECH-622, "Inspection"</u>.)

Is the inspection result normal?

YES >> GO TO 9.

NO-1 >> Fuel pressure is too high: Replace "fuel filter and fuel pump assembly" and then GO TO 8.

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

7.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly" and then GO TO 8.

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

8.CHECK "A/F ALPHA-B1"

1. Start engine.

< COMPONENT DIAGNOSIS > [HR16DE (WITHOUT EURO-OBD)] 2. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value. Is the measurement value within the SP value? YES >> INSPECTION END
Is the measurement value within the SP value?
NO >> GO TO 9. 9. PERFORM POWER BALANCE TEST
1 Perform "POWER BALANCE" in "ACTIVE TEST" mode
2. Make sure that the each cylinder produces a momentary engine speed drop.
Is the inspection result normal? YES >> GO TO 12.
NO >> GO TO 10.
10. DETECT MALFUNCTIONING PART
 Check the following. Ignition coil and its circuit (Refer to <u>ECH-576, "Component Function Check"</u>.) Fuel injector and its circuit (Refer to <u>ECH-553, "Component Function Check"</u>.)
 Intake air leakage Low compression pressure (Refer to <u>EM-25, "Inspection"</u>.)
Is the inspection result normal? YES >> Replace fuel injector and then GO TO 11.
NO >> Repair or replace malfunctioning part and then GO TO 11.
11. CHECK "A/F ALPHA-B1"
 Start engine. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.
Is the measurement value within the SP value?
YES >> INSPECTION END NO >> GO TO 12.
12. CHECK HEATED OXYGEN SENSOR 1 FUNCTION
1. Run engine at about 2,000 rpm for about 2minutes under no load.
 Select "HO2S1 MNTR (B1)", in "DATA MONITOR" mode. Running engine at 2,000 rpm under no load (The engine is warmed up to normal operating temperature.), check that the monitor fluctuates between LEAN and RICH more than 5 times during 10 seconds.
1 time : RICH \rightarrow LEAN \rightarrow RICH
2 times $: \text{RICH} \rightarrow \text{LEAN} \rightarrow \text{RICH} \rightarrow \text{LEAN} \rightarrow \text{RICH}$
Is the inspection result more than 5 times during 10 seconds? YES >> GO TO 15.
NO >> GO TO 13. 13.CHECK HEATED OXYGEN SENSOR 1 CIRCUIT
Check heated oxygen sensor 1 and its circuit. Refer to <u>ECH-456, "DTC Logic"</u> .
Check heated oxygen sensor i and its circuit. Refer to <u>LOT-450, DTO LOUIC</u> .
>> GO TO 14.
14.снеск "а/ғ аlрна-в1"
 Start engine. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the each indication is within the SP value.
<u>Is the measurement value within the SP value?</u> YES >> INSPECTION END

YES >> INSPECTION END NO >> GO TO 15.

 $15. {\tt disconnect} ~ {\tt and} ~ {\tt reconnect} ~ {\tt ecm} ~ {\tt harness} ~ {\tt connect} {\tt or}$

< COMPONENT DIAGNOSIS >

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

>> GO TO 16.

16.CHECK "A/F ALPHA-B1"

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

Is the measurement value within the SP value?

- YES >> INSPECTION END
- NO >> Detect malfunctioning part according to <u>ECH-611, "Symptom Table"</u>.
- 17.CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

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

18. DETECT MALFUNCTIONING PART

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

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

19.CHECK INTAKE SYSTEM

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

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system
- Is the inspection result normal?

YES >> GO TO 21.

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

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

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

Is the measurement value within the SP value?

YES >> INSPECTION END

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

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

1. Stop the engine.

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

TRO

TROUBLE DIAGNOSIS -	SPECIFICATION VALUE
< COMPONENT DIAGNOSIS >	[HR16DE (WITHOUT EURO-OBD)]

ZZ.CHECK "A/F ALPHA-B1"	Δ
 Start engine. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value. 	ECH
Is the measurement value within the SP value?	ECI
 YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to <u>ECH-445, "DTC</u> <u>Logic"</u>. Then GO TO 29. NO >> GO TO 23. 	С
23.CHECK "MAS A/F SE-B1"	
Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.	D
Is the measurement value within the SP value?	
YES >> GO TO 24.	E
NO >> More than the SP value: Replace mass air flow sensor, and then GO TO 29.	
24.REPLACE ECM	F
 Replace ECM. Go to <u>ECH-356</u>, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair <u>Requirement"</u>. 	
	G
>> GO TO 29.	
25. CHECK INTAKE SYSTEM	Н
Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.	11
Crushed air ducts	
Malfunctioning seal of air cleaner element	
 Uneven dirt of air cleaner element Improper specification of intake air system 	
Is the inspection result normal?	J
YES >> GO TO 27.	J
NO >> Repair or replace malfunctioning part, and then GO TO 26.	
26. CHECK "B/FUEL SCHDL"	Κ
Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.	
Is the measurement value within the SP value?	L
YES >> INSPECTION END	
NO >> Less than the SP value: GO TO 27.	M
27.CHECK "MAS A/F SE-B1"	
Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.	Ν
Is the measurement value within the SP value?	
YES >> GO TO 28. NO >> Less than the SP value: Replace mass air flow sensor, and then GO TO 30.	_
28. CHECK INTAKE SYSTEM	0
 Check for the cause of air leak after the mass air flow sensor. Refer to the following. Disconnection, looseness, and cracks in air duct 	Ρ
 Looseness of oil filler cap 	
Disconnection of oil level gauge	

- Open stuck, breakage, hose disconnection, or cracks of PCV valve
- Disconnection or cracks of EVAP purge hose, open stuck of EVAP canister purge volume control solenoid valve
- Malfunctioning seal of rocker cover gasket

• Disconnection, looseness, or cracks of hoses, such as vacuum hose, connecting to intake air system parts

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< COMPONENT DIAGNOSIS >

• Malfunctioning seal of intake air system, etc.

>> GO TO 30.

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

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

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to <u>ECH-611, "Symptom Table"</u>.

30.CHECK "B/FUEL SCHDL"

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

Is the measurement value within the SP value?

- YES >> INSPECTION END
- NO >> Detect malfunctioning part according to <u>ECH-611, "Symptom Table"</u>.

					Δ
Diagnosis	Procedure	9		INFOID:000000001179716	_
1.INSPECT	ION START				EC
Start engine.					
Is engine run	ning?				
	GO TO 8.				C
-	GO TO 2.				
2.CHECK E	CM POWER	SUPPLY CIR	CUIT-I		
	tion switch O				
2. Check th	ne voltage bet	ween ECM h	arness connect	or and ground.	
	014			-	E
	CM	Ground	Voltage		
Connector	Terminal		D. H.	-	F
E16	93	Ground	Battery voltage	-	
	tion result nor	<u>mai?</u>			
	GO TO 4. GO TO 3.				(
-	MALFUNCTIO	ONING PART			
Check the fol					ŀ
	nowing.)5. M77			1
 10A fuse (N 	No. 4)				
 Harness for 	r open or sho	rt between E	CM and fuse		I
r	-		4		
			to ground or s	nort to power in harness or connectors.	
	ROUND CO				,
	tion switch O		und Increation	in CI 44 "Circuit Increation"	
•	tion result nor		und inspection	in <u>GI-41. "Circuit Inspection"</u> .	k
	<u>GO TO 5.</u>	<u>111ai (</u>			
	Repair or repla	ace ground c	onnection.		
			OR OPEN AND) SHORT-I	L
	ect ECM harn				
				ector and ground.	Ν
	2			u u u u u u u u u u u u u u u u u u u	
E	СМ	Onerred	Questionaites		
Connector	Terminal	- Ground	Continuity		ľ
	10				
F7	11	Ground	Existed		
E16	108	-			0
3. Also che	ck harness fo	or short to pov	ver.		
	tion result nor	•			F
	GO TO 7.				
•	GO TO 6.				
6. DETECT	MALFUNCTIO	ONING PART			
Check the fo	llowing.			<u> </u>	

Check the following.

Harness connectors F121, E7Harness for open or short between ECM and ground

< COMPONENT DIAGNOSIS >

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

7.CHECK ECM POWER SUPPLY CIRCUIT-II

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

IPDN	/IE/R	Ground	Voltage	
Connector Terminal		Cround	voltage	
E11	15	Ground	Battery voltage	

Is the inspection result normal?

YES >> Go to ECH-576, "Diagnosis Procedure".

NO >> GO TO 8.

8. CHECK ECM POWER SUPPLY CIRCUIT-III

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

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

ECM		Ground	Voltage	
Connector	Terminal	Ciouna	voltage	
E16	105	Ground	After turning ignition switch OFF, battery volt- age will exist for more than a few seconds, then drop approximately 0V.	

Is the inspection result normal?

YES >> GO TO 15.

NO-1 >> Battery voltage does not exist: GO TO 9.

NO-2 >> Battery voltage exists for more than a few seconds: GO TO 12.

9.CHECK ECM POWER SUPPLY CIRCUIT-IV

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

EC	CM	Ground	Voltage	
Connector Terminal		Cround	vollage	
F7	32	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 12.

10.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.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector Terminal		Continuity
E16	105	E11	9	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 power in harness or connectors.

11.CHECK ECM POWER SUPPLY CIRCUIT-VI

< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

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- 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		IPDM E/R		Continuity
Connector	Terminal	Connector Terminal		Continuity
F7	32	E11	15	Existed

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

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F123, E6
- 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.

13.CHECK 20A FUSE

Disconnect 20A fuse (No. 51) from IPDM E/R.
 Check 20A fuse.

Is the inspection result normal?

YES >> GO TO 17. NO >> Replace 20A fuse. **14.**CHECK GROUND CONNECTION-II 1. Turn ignition switch OFF. 2. Check ground connection E21. Refer to Ground Inspection in <u>GI-41, "Circuit Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Repair or replace ground connection.

15. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect ECM harness connector.

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

ECM		Ground	Continuity
Connector	Terminal	Clound	Continuity
F7	10		
F/	11	Ground	Existed
E16 108			

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 17.

NO >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

Harness or connectors F121, E7

Harness for open or short between ECM and ground

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

< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

17. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

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

U1001 CAN COMM CIRCUIT

Description

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

DTC Logic

INFOID:000000001179718

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause		
U1001	CAN communication line	munication signal other than ()BL) (emission related munication line is open or shorted)			
DTC CON	FIRMATION PRO	CEDURE			
1.PERFO	RM DTC CONFIRM	ATION PROCEDURE			
2. Check	DTC.	d wait at least 3 seconds.			
	 <u>ECH-439, "Diagnos</u> INSPECTION END 				
Diagnosi	s Procedure		INFOID:0000000011797		
Go toLAN-	13, "Trouble Diagnos	sis Flow Chart".			

[HR16DE (WITHOUT EURO-OBD)]

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U1010 CONTROL UNIT (CAN)

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:000000001179721

INFOID:000000001179722

INFOID:000000001179720

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1010	CAN communication bus	When detecting error during the initial diagno- sis of CAN controller of ECM.	• ECM

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Check DTC.

Is DTC detected?

YES >> Go to <u>ECH-440, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

1.INSPECTION START

With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "SELF-DIAG RESULTS" mode with CONSULT-III.
- 3. Touch "ERASE".
- 4. Perform DTC CONFIRMATION PROCEDURE. See <u>ECH-440</u>, "DTC Logic".
- 5. Check DTC.

Without CONSULT-III

- 1. Turn ignition switch ON.
- 2. Erase the Diagnostic Test Mode II Self-diagnostic results) memory.
- Perform DTC CONFIRMATION PROCEDURE. See ECH-440, "DTC Logic".
- 4. Check DTC.

Is the DTC U1010 displayed again?

- YES >> GO TO 2.
- NO >> INSPECTION END
- 2.REPLACE ECM
- 1. Replace ECM.
- 2. Go to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

ECH-440

[HR16DE (WITHOUT EURO-OBD)]

P0011 IVT CONTROL

[HR16DE (WITHOUT EURO-OBD)]

< COMPONENT DIAGNOSIS > P0011 IVT CONTROL

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P0011 is displayed with DTC P1111, first perform the trouble diagnosis for DTC P1111, refer to <u>ECH-486, "Description"</u>.
- The MI will not light up for this self-diagnosis.

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

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

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

ENG SPEED	1,200 - 2,000 rpm
COOLAN TEMP/S	More than 60°C (140°F)
B/FUEL SCHDL	More than 3.5 msec
Shift lever	Neutral position

CAUTION:

Always drive at a safe speed.

4. Stop vehicle with engine running and let engine idle for 10 seconds.

- 5. Check 1st trip DTC.
- Is 1st trip DTC detected?
- YES >> Go to ECH-442, "Diagnosis Procedure"
- NO >> GO TO 4.

ECH-441

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INFOID:000000001179723

4.PERFORM DTC CONFIRMATION PROCEDURE-II

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

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (221°F)
Shift lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

CAUTION:

Always drive at a safe speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-442, "Diagnosis Procedure"

NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to.

NOTE:

Use component function check to check the overall function of intake valve timing control system. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-442, "Diagnosis Procedure"

Component Function Check

INFOID:000000001179724

1.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and let it idle.
- 4. Check the voltage between ECM harness connector and ground under the following condition.

Connector	ECM	Ground	Condition	Voltage signal	
Connector	Terminal	Ground	Condition		
			At idle	BATTERY VOLTAGE (11 - 14V)	
F8	73 IVT control solenoid valve	Ground	Engine speed: 2,000 rpm	7-12V*	
				≫ 10.0//Div DBIA4937J	

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

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to ECH-291, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK OIL PRESSURE WARNING LAMP

ECH-442

INFOID:000000001179725

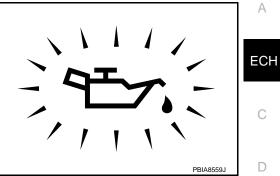
P0011 IVT CONTROL

< COMPONENT DIAGNOSIS >

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

Is oil pressure warning lamp illuminated?

- YES >> Go to <u>MWI-32</u>, "Description".
- NO >> GO TO 2.



2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE	
Refer to ECH-444, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 3.	
NO >> Replace intake valve timing control solenoid valve.	
${f 3.}$ CHECK CRANKSHAFT POSITION SENSOR (POS)	
Refer to ECH-477, "Component Inspection".	
Is the inspection result normal?	
YES >> GO TO 4. NO >> Replace crankshaft position sensor (POS).	
4.CHECK CAMSHAFT POSITION SENSOR (PHASE)	
Refer to ECH-480, "Component Inspection"	
Is the inspection result normal?	
YES >> GO TO 5. NO >> Replace camshaft position sensor (PHASE).	
5. CHECK CAMSHAFT (INTAKE)	
Check the following.Accumulation of debris to the signal plate of camshaft (1) rear end	
 Chipping signal plate of camshaft rear end 	
Is the inspection result normal?	
YES >> GO TO 6.	
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.	(L O
Tear end of replace carifshan.	
	(AM)
	F J - W
	PBIA9557J
6. CHECK TIMING CHAIN INSTALLATION	
Check service records for any recent repairs that may cause timing c	hain misaligned.
Are there any service records that may cause timing chain misaligne	<u>d?</u>
YES >> Check timing chain installation. Refer to <u>EM-47. "Remov</u> NO >> GO TO 7.	al and Installation".
7. CHECK LUBRICATION CIRCUIT	
Refer to LU-3, "Engine Lubrication System".	

Refer to LU-3, "Engine Lubrication System".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

P0011 IVT CONTROL

< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Refer to GI-39. "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000001179726

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.

- 2. Disconnect intake valve timing control solenoid valve harness connector.
- 3. Check resistance between intake valve timing control solenoid valve terminals as follows.

Terminals	Resistance [at 20°C (68°F)]
1 and 2	6.7 - 7.7 Ω
1 or 2 and ground	${}^\infty \Omega$ (Continuity should not exist)

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace intake valve timing control solenoid valve.

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

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

CAUTION:

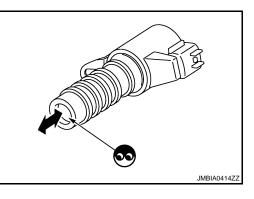
Do not apply 12V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve. NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace intake valve timing control solenoid valve.

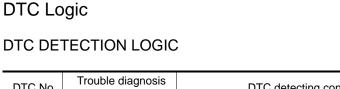


P0102, P0103 MAF SENSOR

Description

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

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



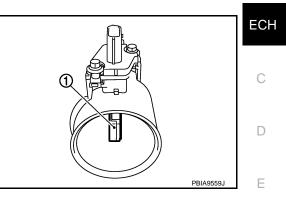
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause			
P0102	Mass air flow sensor circuit low input	 An excessively low voltage from the sensor is sent to ECM. Harness or connectors (The sensor circuit is open or son intake air leaks) Mass air flow sensor 				
P0103	Mass air flow sensor circuit high inputAn excessively high voltage from the sensor is sent to ECM.• Harness or connectors (The sensor circuit is open or sh • Mass air flow sensor					
DTC CO	NFIRMATION PR	ROCEDURE				
1.PREC	ONDITIONING					
least 10 s	seconds before cor	dure has been previously conducted, alwanducting the next test.	ys turn ignition switch OFF and wait at			
	<u>FC is detected?</u> >> GO TO 2.					
	>> GO TO 2.					
2.PERF	ORM DTC CONFI	RMATION PROCEDURE FOR DTC P0102	2			
	engine and wait at	least 5 seconds.				
	k DTC.					
Is DTC de YES		, "Diagnosis Procedure".				
	>> INSPECTION E					
3.PERF	ORM DTC CONFI	RMATION PROCEDURE FOR DTC P0103	3-1			
		and wait at least 5 seconds.				
	k DTC.					
<u>Is DTC detected?</u> YES >> Go to <u>ECH-446, "Diagnosis Procedure"</u> .						
NO :	>> GO TO 4.	-				
4. PERF	ORM DTC CONFI	RMATION PROCEDURE FOR DTC P0103	3-11			
	engine and wait at k DTC.	least 5 seconds.				
Is DTC de	-					
<u>u</u>						

YES >> Go to ECH-446, "Diagnosis Procedure".

ECH-445

INFOID:000000001179727

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NO >> INSPECTION END

Diagnosis Procedure

1.INSPECTION START

Confirm the detected DTC.

Which DTC is detected?

P0102 >> GO TO 2.

P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

Air duct

Vacuum hoses

Intake air passage between air duct to intake manifold

Is the inspection result normal?

YES >> GO TO 3.

NO >> Reconnect the parts.

3. Check ground connection

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace ground connection.

4.CHECK MAF SENSOR POWER SUPPLY CIRCUIT

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

2. Turn ignition switch ON.

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

MAF	sensor	Ground	Voltage	
Connector	Connector Terminal		voltage	
E18	5	Ground	Battery voltage	

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 MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

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

MAF	sensor	E	Continuity	
Connector	Terminal	Connector Terminal		Continuity
E18	4	F8	52	Existed

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

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F121, E7

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

MAEs	continuity be	tween MAF s	sensor narnes	s connector and	d ECM harness co	onnector.	
MAI 3	ensor	EC	CM	Continuity			
Connector	Terminal	Connector	Terminal				
E18	3	F8	45	Existed			
		•	nd and short	to power.			
	<u>on result norm</u> O TO 8.	<u>1al ?</u>					
		cuit or short t	o ground or s	hort to power in	harness or conne	ectors.	
3. СНЕСК МА	ASS AIR FLO	W SENSOR					
Refer to ECH-	447, "Compo	nent Inspectio	<u>on"</u> .				
s the inspection	on result norm						
	O TO 9.	oir flour a se					
	epiace mass a TERMITTENT	air flow senso)r.				
(efer to <u>GI-39</u>	, "Intermittent	<u>Incident"</u> .					
>> IN	ISPECTION E	END					
Componen	t Inspectio	n				101	FOID:000000001179730
-						1141	-012.0000000001119130
.CHECK MA	SS AIR FLO	W SENSOR-					
With CONS		-					
	on switch OF	r. connectors di	isconnected.				
	ne and warm	it up to norma	al operating te				
				IR" mode			
. Connect C	AS A/F SE-B1			in mode.			
. Connect C	AS A/F SE-B1	1" and check i					
. Connect C	AS A/F SE-B ^r	1" and check i			MAS A/F SE	-B1	
. Connect (5. Select "M		1" and check i	indication.		MAS A/F SE Approx. 0.4		
. Connect (5. Select "M	Ignition switch	1" and check i C n ON (Engine sto	indication.			4V	
Monitor item	Ignition switch Idle (Engine is Idle to about 4	1" and check i C n ON (Engine sto s warmed-up to r 4,000 rpm	indication. Condition opped.) normal operating	temperature.)	Approx. 0.4 1.0 - 1.3 1.0 - 1.3V to Appr	4V /	
. Connect (. Select "M Monitor item MAS A/F SE-B1 *: Check for	Ignition switch Idle (Engine is Idle to about 4 linear voltage ris	1" and check i C n ON (Engine sto s warmed-up to r 4,000 rpm	indication. Condition opped.) normal operating		Approx. 0.4 1.0 - 1.3 1.0 - 1.3V to Appr	4V /	
. Connect (. Select "M Monitor item MAS A/F SE-B1 *: Check for Without CC	Ignition switch Idle (Engine is Idle to about 4 linear voltage ris	1" and check i C n ON (Engine sto s warmed-up to r 4,000 rpm e in response to	indication. Condition opped.) normal operating	temperature.)	Approx. 0.4 1.0 - 1.3 1.0 - 1.3V to Appr	4V /	
 Connect (Select "M, Monitor item MAS A/F SE-B1 *: Check for Without CC Turn igniti Reconnect 	Ignition switch Idle (Engine is Idle to about 4 linear voltage ris DNSULT-III on switch OF	1" and check i C n ON (Engine sto s warmed-up to r 4,000 rpm se in response to F. connectors di	indication. Condition opped.) normal operating	temperature.) creased to about 4,	Approx. 0.4 1.0 - 1.3 1.0 - 1.3V to Appr	4V /	

		Ground	Condition	Voltage
Connector	Terminal	Clound	Condition	vollage
		Ignition switch ON (Engine stopped.)	Approx. 0.4V	
F8	F8 (MAF sensor signal)	Ground	Idle (Engine is warmed-up to normal operating tempera- ture.)	1.0 - 1.3V
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

P0102, P0103 MAF SENSOR

< COMPONENT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 2.

2. Check for the cause of uneven air flow through mass air flow sensor

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

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. CHECK MASS AIR FLOW SENSOR-II

With CONSULT-III

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

Monitor item	Condition	MAS A/F SE-B1
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4V
	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

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

ECM		Ground	Condition	Voltage	
Connector	Terminal	Ground	Condition	vollage	
			Ignition switch ON (Engine stopped.)	Approx. 0.4V	
F8	F8 (MAF sensor signal)		Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V	
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*	

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

Is the inspection result normal?

YES >> INSPECTION END NO >> GO TO 4.

 $\sim >> GU IU 4.$

4.CHECK MASS AIR FLOW SENSOR-III

(B) With CONSULT-III

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

P0102, P0103 MAF SENSOR

< COMPONENT DIAGNOSIS >

Monitor item	Condition	MAS A/F SE-B1
	Ignition switch ON (Engine stopped.)	Approx. 0.4V
MAS A/F SE-B1	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

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

ECM		Crownd	Condition	Valtara	-
Connector	Terminal	Ground	Condition	Voltage	
			Ignition switch ON (Engine stopped.)	Approx. 0.4V	-
F8	45 (MAF sensor signal)	Ground	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V	-
		Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*	-	

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Clean or replace mass air flow sensor.

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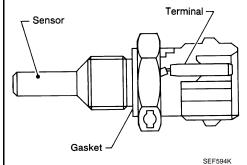
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P0117, P0118 ECT SENSOR

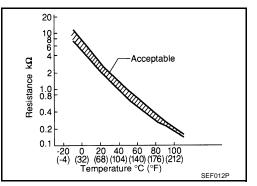
Description

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



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance $k\Omega$
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260



*: These data are reference values and are measured between ECM terminal 38 (Engine coolant temperature sensor) and ground.

CAUTION:

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.

DTC Logic

INFOID:000000001179732

DTC DETECTION LOGIC

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117	Engine coolant tem- perature sensor cir- cuit low input	An excessively low voltage from the sensor is sent to ECM.	 Harness or connectors (The sensor circuit is open or shorted.)
P0118	Engine coolant tem- perature sensor cir- cuit high input	An excessively high voltage from the sensor is sent to ECM.	Engine coolant temperature sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check DTC.

Is DTC detected?

- YES >> Go to ECH-451, "Diagnosis Procedure".
- NO >> INSPECTION END

INFOID:0000000001179731

P0117, P0118 ECT SENSOR

[HR16DE (WITHOUT EURO-OBD)]

Diagnosis Procedure			INF0ID:0000000	01179733
1.CHECK GROUND CON	NECTION			A
-	ion E21. Refe	er to Ground Ir	nspection in <u>GI-41, "Circuit Inspection"</u> .	ECI
Is the inspection result norr YES >> GO TO 2.	<u>nal?</u>			
NO >> Repair or repla	-			С
2.CHECK ECT SENSOR				
 Disconnect engine coo Turn ignition switch ON Check the voltage betw 	۱.		nsor harness connector. connector and ground.	D
			_	E
ECT sensor	Ground	Voltage		
Connector Terminal F28 1	Ground	Approx. 5V	_	F
Is the inspection result norr			_	
YES >> GO TO 3.		to ground or s	short to power in harness or connectors.	G
3. CHECK ECT SENSOR		0	•	
1. Turn ignition switch OF				Н
 Disconnect ECM harne Check the continuity be 			ss connector and ECM harness connector.	
				I
ECT sensor		CM	Continuity	
ConnectorTerminalF282	Connector F8	Terminal 44	Existed	J
4. Also check harness for				
Is the inspection result norr	-			K
YES >> GO TO 4. NO >> Repair open ci	rouit or chort	to ground or a	short to power in harness or connectors.	IX.
4.CHECK ENGINE COOL		-	•	
Refer to ECH-451, "Compo				L
Is the inspection result norr				
YES >> GO TO 5. NO >> Replace engine		noroturo cono		M
		indraining conc		
			501.	
5. CHECK INTERMITTEN	T INCIDENT		501.	N
5.CHECK INTERMITTEN Refer to <u>GI-39, "Intermitten</u>	T INCIDENT		501.	N
5. CHECK INTERMITTEN	T INCIDENT <u>t Incident"</u> .			N 0
5.CHECK INTERMITTEN Refer to <u>GI-39, "Intermitten</u>	T INCIDENT <u>t Incident"</u> . END		INFOID:0000000	0
5.CHECK INTERMITTEN Refer to <u>GI-39</u> , "Intermitten >> INSPECTION B	T INCIDENT <u>t Incident"</u> . END n		INFOID:0000000	0

Disconnect engine coolant temperature sensor harness connector.
 Remove engine coolant temperature sensor.

< COMPONENT DIAGNOSIS >

P0117, P0118 ECT SENSOR

< COMPONENT DIAGNOSIS >

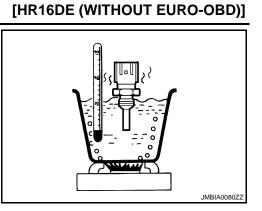
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

Terminals	Conditio	Resistance	
		20 (68)	2.1 - 2.9 kΩ
1 and 2	Temperature °C (°F)	50 (122)	0.68 - 1.00 kΩ
		90 (194)	0.236 - 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor.



P0122, P0123 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



DTC DETECTION LOGIC

NOTE:

1.

If DTC P0122 or P0123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-250, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	Harness or connectors (TP sensor 2 circuit is open or shorted.)	F
P0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	 Electric throttle control actuator (TP sensor 2) 	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

Check DTC. <u>Is DTC detected?</u> YES >> Go to <u>ECH-453, "Diagnosis Procedure"</u>.

Start engine and let it idle for 1 second.

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

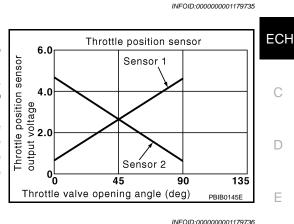
NO >> Repair or replace ground connection.

2.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.

2. Turn ignition switch ON.

ECH-453



[HR16DE (WITHOUT EURO-OBD)]

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INFOID:000000001179737

P0122, P0123 TP SENSOR

< COMPONENT DIAGNOSIS >

3. Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle	control actuator	Ground	Voltage
Connector	Terminal	Ground	voltage
F29	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 THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle control actuator		E	CM	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F29	4	F8	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.

 ${f 4.}$ CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle	control actuator	E	CM	Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F29	3	F8	34	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 THROTTLE POSITION SENSOR

Refer to ECH-455, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to ECH-455, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P0122, P0123 TP SENSOR

[HR16DE (WITHOUT EURO-OBD)]

ECH-455

< COMPONENT DIAGNOSIS >
Component Inspection

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1.CHECK THROTTLE POSITION SENSOR

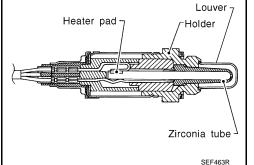
	1.	Turn	ignition	switch OFF.	
--	----	------	----------	-------------	--

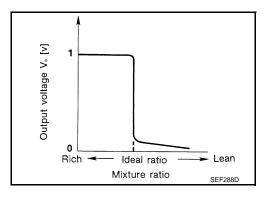
- 2. Reconnect all harness connectors disconnected.
- 3. Perform ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
- 4. Turn ignition switch ON.
- 5. Set shift lever to 1st position.
- 6. Check the voltage between ECM harness connector and ground.

	5			5			
	ECM	Onessed	Corre	111			[
Connector	Terminal	Ground	Conc	aition	Voltage		
	33			Fully released	More than 0.36V		
F8	(TP sensor 1 signal)	Ground	Accelerator pedal	Fully depressed	Less than 4.75V		
10	34	Cround		Fully released	Less than 4.75V		
	(TP sensor 2 signal)			Fully depressed	More than 0.36V		
-	ection result norma						
	> INSPECTION EN > GO TO 2.	ND					
-	CE ELECTRIC TH						
	ce electric throttle						
	ECH-455, "Special						
		·					
>	> INSPECTION EN	ND					
pecial	Repair Require	ement				INFOID:000000001179739	
.PERFC	ORM THROTTLE V	ALVE CI	LOSED POSITIO	ON LEARNING			
					MING · Special R	epair Requirement	
>	> GO TO 2						
2.PERFC	ORM IDLE AIR VOL		EARNING				
Refer to E	CH-358, "IDLE AIF		/ E LEARNING :	Special Repair	Requirement"		
_				· · ·			
>	> END						

Description

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





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INFOID:000000001179740

DTC Logic

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 is not inordinately high.

	ок	NG
1.2V		
	$\overline{\bigcirc}$	
00		PBIB1848E

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132	Heated oxygen sensor 1 cir- cuit high voltage	An excessively high voltage from the sensor is sent to ECM.	 Harness or connectors (The sensor circuit is open or short- ed.) Heated oxygen sensor 1

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.



< COMPONE	ENT DIAGNO	OSIS >	10152	110231	[HR16DE (WITHOUT EURO-OBD)]
2.PERFORM	/I DTC CONF	IRMATION PI	ROCEDURE		Δ
 Turn ignit Restart e Check 1s Is 1st trip DTC YES >> C 	tion switch Of ngine and let st trip DTC. C is detected	2, "Diagnosis	least 10 sec inutes.		EC
Diagnosis	Procedure	9			INFOID:000000001179742
1. снеск g		NECTION			Γ
2. Check gr <u>Is the inspect</u> YES >> G	<u>ion result nor</u> 60 TO 2. Repair or repla	tion E21. Refe <u>mal?</u> ace ground co	nnection.	Inspection in	GI-41, "Circuit Inspection".
Loosen and r	etighten heat	ed oxygen ser	nsor 1.		G
		: 50 N⋅m (5.1	kg-m, 37 ft-	lb)	F
>> G 3. СНЕСК Н	30 TO 3. 0281 GROU				
1. Disconne 2. Disconne	ect heated oxy ect ECM harn	/gen sensor 1 ess connector	harness cor	inector.	and ECM harness connector.
НО	2S1	EC	CM		
Connector	Terminal	Connector	Terminal	Continuity	
F30	1	F8	56	existed	
<u>Is the inspect</u> YES >> G	<u>ion result nor</u> 30 TO 4.			·	r in harness or connectors.
4.CHECK H	O2S1 INPUT	SIGNAL CIR	CUIT FOR O	PEN AND SH	IORT
1. Check ha	arness continu	uity between H	HO2S1 harne	ess connector	and ECM harness connector.
HO	2S1	EC	CM		. N
Connector	Terminal	Connector	Terminal	Continuity	
F30	4	F8	49	existed	C
2. Check ha	arness continu	uity between H	HO2S1 harne	ess connector	or ECM harness connector.
HO	2S1	EC	CM		F
Connector	Terminal	Connector	Terminal	- Ground	Continuity

				Ground	Continuity
Connector	Terminal	Connector	Terminal	Cround	Continuity
F30	4	F8	49	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

< COMPONENT DIAGNOSIS >

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

5.CHECK HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 connector for water.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace harness or connectors.

6.CHECK HEATED OXYGEN SENSOR 1

Refer to ECH-458, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2. CHECK HEATED OXYGEN SENSOR 1

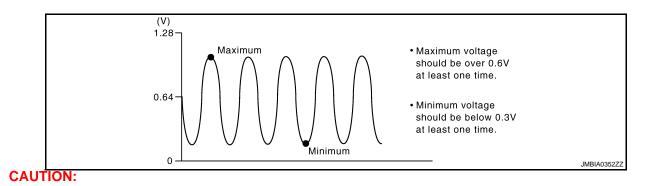
With CONSULT-III

- T. Start engine and warm it up to normal operating temperature.
- 2. Set "POST TRIGGER" to 100% in "DATA MONITOR" mode with CONSULT-III.
- 3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-III screen.
- 6. Check the following.
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
 5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

cycle	1	2	3	4	5	
HO2S1 MNTR (B1) F	R-L-F	R-L-F	R-L-F	R-L-F	₹-L-I	R
			indi			~

R means HO2S1 MNTR (B1) indicates RICH L means HO2S1 MNTR (B1) indicates LEAN

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ECH-458

INFOID:0000000001179743

< COMPONENT DIAGNOSIS >

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

Is the inspection result normal?

YES >> INSPECTION END NO >> GO TO 3.

3.CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check the voltage between ECM harness connector and ground under the following condition.

E	ECM		Condition	Valtara	Г
Connector	Terminal	ground	Condition	Voltage	
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	 The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. The maximum voltage is over 0.6V at least 1 time. The minimum voltage is below 0.3V at least 1 time. The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 	F

CAUTION:

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

Is the inspection result normal?

YES	>> INSPECTION END
NO	>> GO TO 4
4.REP	LACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

CAUTION:

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

>> INSPECTION END

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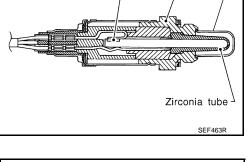
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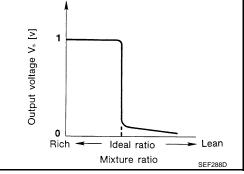
P0134 HO2S1

Description

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



Heater pad



INFOID:000000001179745

INFOID:000000001179744

Louver

Holder

DTC Logic

DTC DETECTION LOGIC

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.

ок 1V ———	NG
0.4V	SEF237U

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	 Harness or connectors (The sensor circuit is open or shorted.) Heated oxygen sensor 1

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Always perform at a temperature above -10°C (14°F).

Before performing the following procedure, confirm that battery voltage is more than 11V at idle. <u>Do vou have CONSULT-III?</u>

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

- T. Start engine and warm it up to normal operating temperature.
- 2. Select "MANU TRIG" in "DATA MONITOR" mode with CONSULT-III, and select "HO2S1 (B1)".
- 3. Hold engine speed at 2,000 rpm under no load.
- 4. Make sure that the indications do not remain in the range between 0.2V to 0.4V.

Is the inspection result normal?

- YES >> INSPECTION END.
- NO >> Go to ECM-137, "Diagnosis Procedure".

3.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Set volmeter probes between ECM harness connector and ground.

ECM		Cround	Condition	Voltore	
Connector	Terminal	Ground	Condition	Voltage	
F8	49 (HO2S1 signal)		Engine speed held at 2,000 rpm constant under no load.	• The voltage dose not remain in the range of 0.2 to 0.4.	
s the inspect	tion result nor	mal?			
-	INSPECTION Go to <u>ECM-13</u>		is Procedure".		
Diagnosis	Procedure)		INF0ID:000000001179746	
1.снеск е		NECTION			
	ition switch Ol		for to Cround Inchastio	n in CL 41. "Circuit Increation"	
-	tion result nor		ier to Ground Inspectio	n in <u>GI-41, "Circuit Inspection"</u> .	
	<u>GO TO 2.</u>				
-	Repair or repla	ace ground c	connection.		
2. снеск н	102S1 GROU	ND CIRCUIT	T FOR OPEN AND SHO	DRT	
· D'		vaen sensor	1 harness connector.		
2. Disconne	ect ECM harn	ess connecto		star and COM however approximation	
2. Disconne	ect ECM harn	ess connecto		ctor and ECM harness connector.	
 Disconne Check has 	ect ECM harn	ess connecto	HO2S1 harness conne		
 Disconne Check has 	ect ECM harn arness contin	ess connecto	HO2S1 harness conne	ector and ECM harness connector.	
2. Disconne 3. Check ha	ect ECM harn arness contine	ess connecto uity between	ECM Terminal		
2. Disconne 3. Check ha Ho Connector F30	ect ECM harn arness contine O2S1 Terminal 1	ess connecto uity between Connector F8	ECM Terminal	inuity	
2. Disconne 3. Check ha Ho Connector F30 4. Also che	ect ECM harn arness contine O2S1 Terminal 1	ess connecto uity between Connector F8 r short to gro	ECM Cont Terminal 56	inuity	
2. Disconne 3. Check ha Ho Connector F30 4. Also che <u>s inspection</u> YES >> 0	ect ECM harn arness contine 02S1 Terminal 1 eck harness fo result normal GO TO 3.	Connector Connector F8 r short to gro	HO2S1 harness conner ECM Cont Terminal 56 Exi bund and short to power	inuity sted r.	
2. Disconne 3. Check ha Ho Connector F30 4. Also che <u>s inspection</u> YES >> C NG >> F	ect ECM harn arness contine 02S1 Terminal 1 eck harness fo result normal GO TO 3. Repair open c	ess connector uity between Connector F8 r short to grc ? ircuit or shor	HO2S1 harness conner ECM Cont Terminal Cont 56 Exi pund and short to power t to ground or short to p	inuity sted r. power in harness or connectors.	
2. Disconne 3. Check ha Ho Connector F30 4. Also che <u>s inspection</u> YES >> C NG >> F	ect ECM harn arness contine 02S1 Terminal 1 eck harness fo result normal GO TO 3. Repair open c	ess connector uity between Connector F8 r short to grc ? ircuit or shor	HO2S1 harness conner ECM Cont Terminal 56 Exi bund and short to power	inuity sted r. power in harness or connectors.	

ECH-461

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P0134 HO2S1

< COMPONENT DIAGNOSIS >

HO	2S1	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F30	4	F8	49	Existed

2. Check harness continuity between ECM harness connector 49 or HO2S1 harness connector and ground.

HO2S1		ECM		Ground	Continuity	
Connector	Terminal	Connector	Terminal	Ciouna	Continuity	
F30	4	F8	49	Ground	Not existed	

3. Also check harness for short to power.

Is 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 HEATED OXYGEN SENSOR 1

Refer to ECH-462, "Component Inspection".

Is inspection result normal?

YES >> GO TO 5.

NO >> Replace heated oxygen sensor 1.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

no *>>* 0010. **7**

2.CHECK HEATED OXYGEN SENSOR 1

(I) With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Set "POST TRIGGER" to 100% in "DATA MONITOR" mode with CONSULT-III.
- 3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-III screen.
- 6. Check the following.
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
- 5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

1 2 3 4 5 cycle HO2S1 MNTR (B1) R-L-R-L-R-L-R-L-R R means HO2S1 MNTR (B1) indicates RICH L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

INFOID:000000001179747

P0134 HO2S1

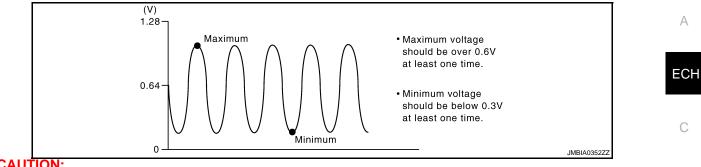
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CAUTION:

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

Is the inspection result normal?

YES >> INSPECTION END NO >> GO TO 4.

 ${f 3.}$ CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

- Start engine and warm it up to normal operating temperature. 1.
- 2. Check the voltage between ECM harness connector and ground under the following condition.

ECM		around	Condition	Voltage	
Connector	Terminal	ground	Condition	vonage	
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	0	

CAUTION:

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

Is the inspection result normal?

-	>> INSPECTION END >> GO TO 4.	Μ
4. RE	PLACE HEATED OXYGEN SENSOR 1	NI
Replac CAUT	ce heated oxygen sensor 1.	IN

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

>> INSPECTION END

P0138 HO2S2

Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

Heater pad Heater pad Linconia tube

DTC Logic

INFOID:000000001179749

INFOID:000000001179748

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.

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

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DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	 Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

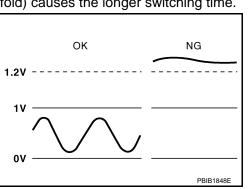
>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 2 minutes.
- 5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-465, "Diagnosis Procedure".
- NO >> INSPECTION END



P0138 HO2S2

[HR16DE (WITHOUT EURO-OBD)]

Diagnosis Procedure 1.check ground connection	INFOID:000000001179750
1. CHECK GROUND CONNECTION	
1. Turn ignition switch OFF.	
0	to Ground Inspection in <u>GI-41, "Circuit Inspection"</u> .
Is the inspection result normal?	
YES >> GO TO 2. NO >> Repair or replace ground conne	portion
2.CHECK HO2S2 GROUND CIRCUIT FO	
 Disconnect heated oxygen sensor 2 ha Disconnect ECM harness connector. 	arness connector.
	harness connector and ECM harness connector.
HO2S2 ECM	Continuity
Connector Terminal Connector Terminal	Continuity
E58 1 F8 59	Existed
4. Also check harness for short to ground	d and short to power.
	-
Is the inspection result normal?	
YES >> GO TO 4.	
YES >> GO TO 4. NO >> GO TO 3.	
YES >> GO TO 4. NO >> GO TO 3.	
YES >> GO TO 4. NO >> GO TO 3. 3. DETECT MALFUNCTIONING PART	
YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7	
YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7	S2 and ECM
YES >> GO TO 4. NO >> GO TO 3. 3. DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7 • Harness for open or short between HO2S	
YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7 • Harness for open or short between HO2S >> Repair open circuit or short to g	ground or short to power in harness or connectors.
YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7 • Harness for open or short between HO2S >> Repair open circuit or short to g 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT
YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7 • Harness for open or short between HO2S >> Repair open circuit or short to g 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT	ground or short to power in harness or connectors.
YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7 • Harness for open or short between HO2S >> Repair open circuit or short to g 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT 1. Check the continuity between HO2S2 h	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector.
YES>> GO TO 4. NONO>> GO TO 3.3.DETECT MALFUNCTIONING PARTCheck the following. • Harness connectors F121, E7 • Harness for open or short between HO2S>> Repair open circuit or short to g $A.CHECK$ HO2S2 INPUT SIGNAL CIRCUIT1. Check the continuity between HO2S2 hereHO2S2ECMConnectorTerminalE584F850	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed
YES>> GO TO 4. NONO>> GO TO 3.3.DETECT MALFUNCTIONING PARTCheck the following. • Harness connectors F121, E7 • Harness for open or short between HO2S>> Repair open circuit or short to g $A.CHECK$ HO2S2 INPUT SIGNAL CIRCUIT1. Check the continuity between HO2S2 hereHO2S2ECMConnectorTerminalE584F850	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector.
YES>> GO TO 4. NONO>> GO TO 3.3.DETECT MALFUNCTIONING PARTCheck the following.Harness connectors F121, E7Harness for open or short between HO2S>> Repair open circuit or short to g4.CHECK HO2S2 INPUT SIGNAL CIRCUIT1. Check the continuity between HO2S2 hereHO2S2ECMConnectorTerminalE584F8502. Check the continuity between HO2S2 here	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed
YES>> GO TO 4. NONO>> GO TO 3.3.DETECT MALFUNCTIONING PARTCheck the following.• Harness connectors F121, E7• Harness for open or short between HO2S>> Repair open circuit or short to g4.CHECK HO2S2 INPUT SIGNAL CIRCUIT1. Check the continuity between HO2S2 hereHO2S2ECMConnectorTerminalE584F8502. Check the continuity between HO2S2 here	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed
YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7 • Harness for open or short between HO2S >> Repair open circuit or short to g 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT 1. Check the continuity between HO2S2 h HO2S2 ECM Connector Terminal	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed harness connector or ECM harness connector and ground. Ground Continuity
YES>> GO TO 4. NO>> GO TO 3.3.DETECT MALFUNCTIONING PARTCheck the following.• Harness connectors F121, E7• Harness for open or short between HO2S>> Repair open circuit or short to g4.CHECK HO2S2 INPUT SIGNAL CIRCUIT1. Check the continuity between HO2S2 hereHO2S2ECMConnectorTerminalE584F8502. Check the continuity between HO2S2 hereHO2S2ECMConnectorTerminalE584F850ConnectorTerminalConnector <td< td=""><td>ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed harness connector or ECM harness connector and ground. Ground Continuity Ground Not existed</br></td></td<>	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector.
YES>> GO TO 4. NO>> GO TO 3.3.DETECT MALFUNCTIONING PARTCheck the following.• Harness connectors F121, E7• Harness for open or short between HO2S>> Repair open circuit or short to g4.CHECK HO2S2 INPUT SIGNAL CIRCUIT1. Check the continuity between HO2S2 h $HO2S2$ ECMConnectorTerminalE584F8502. Check the continuity between HO2S2 hHO2S2ECMConnectorTerminalE584F8503. Also check harness for short to power.	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed harness connector or ECM harness connector and ground. Ground Continuity Ground Not existed
YES>> GO TO 4. NONO>> GO TO 3.3.DETECT MALFUNCTIONING PARTCheck the following.• Harness connectors F121, E7• Harness for open or short between HO2S>> Repair open circuit or short to g4.CHECK HO2S2 INPUT SIGNAL CIRCUIT1. Check the continuity between HO2S2 hHO2S2ECMConnectorTerminalE584F8502. Check the continuity between HO2S2 hHO2S2ECMConnectorTerminalE584F8503. Also check harness for short to power. Is the inspection result normal?	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed harness connector or ECM harness connector and ground. Ground Continuity Ground Not existed
YES>> GO TO 4. NONO>> GO TO 3.3.DETECT MALFUNCTIONING PARTCheck the following.• Harness connectors F121, E7• Harness for open or short between HO2S>> Repair open circuit or short to g4.CHECK HO2S2 INPUT SIGNAL CIRCUIT1. Check the continuity between HO2S2 hHO2S2ECMConnectorTerminalE584F8502. Check the continuity between HO2S2 hHO2S2ECMConnectorTerminalE584F850ConnectorTerminalConnectorTerminalConnectorTerminalConnectorTerminalConnectorTerminalConnectorTerminalConnectorTerminalConnectorTerminalConnectorTerminalConnectorTerminalE584F8503. Also check harness for short to power.Is the inspection result normal?YES> GO TO 6.	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed harness connector or ECM harness connector and ground. Ground Continuity Ground Not existed
YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7 • Harness for open or short between HO2S >> Repair open circuit or short to g 4.CHECK HO2S2 INPUT SIGNAL CIRCUI 1. Check the continuity between HO2S2 h HO2S2 ECM Connector Terminal Solution Solution Solution Solution Check the continuity between HO2S2 h HO2S2 ECM Connector Terminal Solution Solution S	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed harness connector or ECM harness connector and ground. Ground Continuity Ground Not existed
NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7 • Harness for open or short between HO2S >> Repair open circuit or short to g 4.CHECK HO2S2 INPUT SIGNAL CIRCUI 1. Check the continuity between HO2S2 h HO2S2 ECM Connector Terminal Connector Terminal E58 4 F8 50 2. Check the continuity between HO2S2 h HO2S2 ECM Connector Terminal Connector Terminal E58 4 F8 50 3. Also check harness for short to power. Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. 5.DETECT MALFUNCTIONING PART	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed harness connector or ECM harness connector and ground. Ground Continuity Ground Not existed
YES >> GO TO 4. NO >> GO TO 3. 3.DETECT MALFUNCTIONING PART Check the following. • Harness connectors F121, E7 • Harness for open or short between HO2S >> Repair open circuit or short to g 4.CHECK HO2S2 INPUT SIGNAL CIRCUI 1. Check the continuity between HO2S2 h HO2S2 ECM Connector Terminal Solution Go 3. Also check harness for short to power. Is the inspection result normal? YES > GO TO 6.	ground or short to power in harness or connectors. JIT FOR OPEN AND SHORT harness connector and ECM harness connector. Continuity Existed harness connector or ECM harness connector and ground. Ground Continuity Ground Not existed

 $6. {\sf CHECK} {\sf HO2S2} {\sf CONNECTOR} {\sf FOR} {\sf WATER}$

< COMPONENT DIAGNOSIS >

Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace harness or connectors.

7.CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-466. "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8.Replace heated oxygen sensor 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

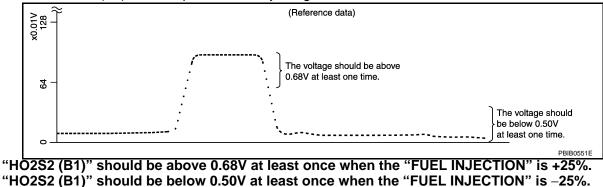
YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to the normal operating temperature.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 5. Let engine idle for 1 minute.
- 6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)" as the monitor item with CONSULT-III.
- 7. Check "HO2S2 (B1)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



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< COMPONENT DIAGNOSIS > Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltago
Connector	Terminal	Ground	Condition	Voltage
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground Condition	Voltage	
Connector	Terminal	Ground	Condition	voltage
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 min- utes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground Condition	Voltogo	ľ	
Connector	Terminal	Ground	Condition	Voltage	
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.	Ν
Is the inspe	ection result nor	mal?			С

YES >> INSPECTION END

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

P0222, P0223 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0222 or P0223 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-508, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	 Harness or connectors (TP sensor 1 circuit is open or shorted.)
P0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	Electric throttle control actuator (TP sensor 1)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

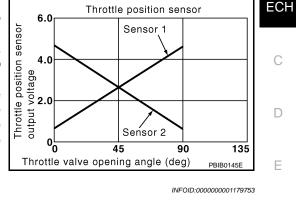
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

Start engine and let it idle for 1 second. 1. M 2. Check DTC. Is DTC detected? YES >> Go to ECH-469, "Diagnosis Procedure". Ν NO >> INSPECTION END Diagnosis Procedure INFOID:000000001179754 1.CHECK GROUND CONNECTION Turn ignition switch OFF. 1. Ρ 2. Check ground connection E21. 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 1 POWER SUPPLY CIRCUIT Disconnect electric throttle control actuator harness connector. 1

2. Turn ignition switch ON.



INFOID:000000001179752

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P0222, P0223 TP SENSOR

< COMPONENT DIAGNOSIS >

3. Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle c	Ground	Voltage	
Connector	Terminal	Giouna	vollage
F29	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.

 ${\it 3.}$ check throttle position sensor 1 ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle	control actuator	E	Continuity	
Connector	Terminal	Connector	Continuity	
F29	4	F8	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.

 ${f 4.}$ CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle	control actuator	E	Continuity	
Connector	Terminal	Connector Terminal		
F29	2	F8	33	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 THROTTLE POSITION SENSOR

Refer to ECH-471, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to ECH-471, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Connector	Terminal	Ground	Conc	lition	Voltage		
	33			Fully released	More than 0.36V		_
F8	(TP sensor 1 signal)	Ground	Accelerator pedal	Fully depressed	Less than 4.75V		Ε
ГО	34	Giouna	Accelerator pedar	Fully released	Less than 4.75V		
	(TP sensor 2 signal)			Fully depressed	More than 0.36V		F
Is the insp	ection result norma	<u>al?</u>					
	> INSPECTION EN	1D					
•							G
	CE ELECTRIC TH			TUATOR			
	ce electric throttle on ECH-471, "Special						Н
2. 0010		Ttopan	<u>Requirement</u> .				
>	> INSPECTION EN	١D					
Special	Repair Require	ment				INFOID:000000001179756	1
						IN 012.00000000 119730	
1. PERFC	ORM THROTTLE V	ALVE CI	_OSED POSITIO	ON LEARNING			J
Refer to E	<u>CH-358, "THROTT</u>	LE VAL	/E CLOSED PO	SITION LEARN	NNG : Special R	epair Requirement"	
							K
•	> GO TO 2.		_				
	ORM IDLE AIR VOL						
Refer to E	CH-358, "IDLE AIR	VOLUN	<u>/IE LEARNING :</u>	Special Repair	Requirement"		L
>	> END						M
							Ν

1. Turn ignition switch OFF.

- 2. Reconnect all harness connectors disconnected.
- 3. Perform ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
- 4. Turn ignition switch ON.

ECM

- 5. Set shift lever to 1st position.
- 6. Check the voltage between ECM harness connector and ground.

Ground

< COMPONENT DIAGNOSIS >

Component Inspection

INFOID:000000001179755

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ECH-471

Condition

Voltage

P0327, P0328 KS

Description

INFOID:000000001179757

[HR16DE (WITHOUT EURO-OBD)]

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

DTC Logic

INFOID:000000001179758

INFOID:000000001179759

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detected condition	Possible cause
P0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	Harness or connectors (The sensor circuit is open or shorted.)
P0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	Knock sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and run it for at least 5 seconds at idle speed.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-472, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection E21. 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 KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect knock sensor harness connector and disconnect ECM harness connector.
- 2. Check the continuity between knock sensor harness connector and ECM harness connector.

Knock	sensor	EC	Continuity	
Connector	Terminal	Connector	Continuity	
F12	2	F8	40	Existed

3. 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.

P0327, P0328 KS

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INFOID:000000001179760

< COMPONENT DIAGNOSIS >

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

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

Knock sensor		E	Continuity	
Connector	Terminal	Connector	Continuity	
F12	1	F8	37	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 KNOCK SENSOR

Refer to ECH-473, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace knock sensor.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK KNOCK SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect knock sensor harness connector.
- Check resistance between knock sensor terminals as follows. NOTE:

It is necessary to use an ohmmeter which can measure more than 10 M Ω .

Terminals	Resistance [at 20°C (68°F)]
1 and 2	Approx. 532 - 588 kΩ

CAUTION:

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones. Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace knock sensor.

P0335 CKP SENSOR (POS)

Description

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at end of the crankshaft. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet and Hall IC.

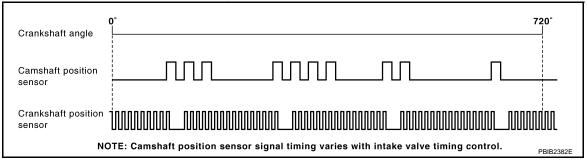
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

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

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

ECM receives the signals as shown in the figure.



DTC Logic

INFOID:000000001179762

INFOID:000000001179761

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335	Crankshaft position sen- sor (POS) circuit	 The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. The crankshaft position sensor (POS) signal is not in the normal pattern during engine run- ning. 	 Harness or connectors [Crankshaft position sensor (POS) circuit is open or shorted.] (Refrigerant pressure sensor circuit is shorted.) (Accelerator pedal position sensor circuit is shorted.) Crankshaft position sensor (POS) Refrigerant pressure sensor Accelerator pedal position sensor Signal plate

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

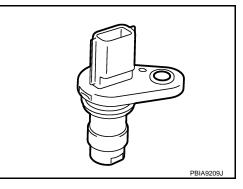
TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds. If engine does not start, crank engine for at least 2 seconds.



P0335 CKP SENSOR (POS)

< COMPON	ENT DIAGI	NOSIS >			[HR16DE (WITHOUT EURO-0)BD)]
2. Check 1	st trip DTC.					
<u>Is 1st trip DT</u>						A
	Go to <u>ECH-</u> INSPECTIO		<u>osis Procedu</u>	<u>re"</u> .		
Diagnosis	Procedu	re			INFOID:00000	00001179763
1.снеск с		ONNECTION	N			С
	ition switch					
2. Check g			Refer to Grou	und Inspectio	on in <u>GI-41. "Circuit Inspection"</u> .	
	GO TO 2.	<u>onnar:</u>				D
		place ground	d connection			
•	•) POWER SUPPLY CIRCUIT-I	Е
					ess connector.	
2. Turn ign	ition switch	ON.	·			
			ensor (PO	S) harness c	connector and ground.	F
CKP s	sensor (POS)		Ground	Voltage		G
Connector	Termi					9
F20	1	G	Ground	Approx. 5V		
Is the inspec	tion result n	ormal?				Н
	GO TO 8.					
•	GO TO 3.					
3. CHECK C	RANKSHA	FT POSITIO	N (CKP) SE	NSOR (POS) POWER SUPPLY CIRCUIT-II	
	ition switch					
		rness conne			s connector and ECM harness connector.	1
5. Check li		between Ci		OS) names		0
CKP sens	sor (POS)	E	СМ			
Connector	Terminal	Connector	Terminal	Continuity		K
F20	1	F8	75	Existed		
	-		15	LAISteu		
<u>Is the inspec</u> YES >> 0	GO TO 4.	<u>ionnal?</u>				L
	GO 10 4. Repair open	o circuit.				
	• •		N (CKP) SE	NSOR (POS) POWER SUPPLY CIRCUIT-III	M
Check harne	ess for short	to power an	d short to gr	ound, betwee	en the following terminals.	
EC	N /		S ou			Ν
EC		N.		nsor		
Connector	Terminal		ame	Connector	Terminal	
F8	74	0 1	ressure sensor	E49	3	0
	75	CKP sensor (POS)	F20	1	
E16	102	APP sensor		E110	5	Р
Is the inspec		ormal?				ſ
	GO TO 5. Depair short			war in here -		
_			or short to po	wer in narne	ss or connectors.	
5. CHECK C		NIS				
Check the fo		ensor (Pefo	-		nt Inspection")	

Refrigerant pressure sensor (Refer to <u>HAC-172, "Component Inspection"</u>)

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Replace malfunctioning components.

6.CHECK APP SENSOR

Refer to ECH-532, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.

2. Go to ECH-533, "Special Repair Requirement".

>> INSPECTION END

$\mathbf{8}$.CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sens	or (POS)	EC	Continuity	
Connector	Terminal	Connector	Continuity	
F20	2	F8	62	Existed

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

Is the inspection result normal?

YES >> GO TO 9.

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

9.CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

2. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sens	CKP sensor (POS)		ECM		
Connector	Terminal	Connector	Terminal	Continuity	
F20	3	F8	61	Existed	

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

Is the inspection result normal?

YES >> GO TO 10.

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

10.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to ECH-477, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace crankshaft position sensor (POS).

11.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace the signal plate.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

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>> INSPECTION END	A
Component Inspection	1179764
1.CHECK CRANKSHAFT POSITION SENSOR (POS)-I	ECH
 Turn ignition switch OFF. Loosen the fixing bolt of the sensor. Disconnect crankshaft position sensor (POS) harness connector. Remove the sensor. 	С
5. Visually check the sensor for chipping. <u>Is the inspection result normal?</u>	D
YES >> GO TO 2. NO >> Replace crankshaft position sensor (POS).	E
	F
2.CHECK CRANKSHAFT POSITION SENSOR (POS)-II	G
Check resistance between crankshaft position sensor (POS) terminals as follows.	Н

Terminals (Polarity)	Resistance [at 25°C (77°F)]
1 (+) - 2 (-)	
1 (+) - 3 (-)	Except 0 or $\infty \Omega$
2 (+) - 3 (-)	
Is the inspection result normal?	

YES >> INSPECTION END

NO >> Replace crankshaft position sensor (POS).

P0340 CMP SENSOR (PHASE)

Description

The camshaft position sensor (PHASE) senses the protrusion of camshaft (INT) to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.

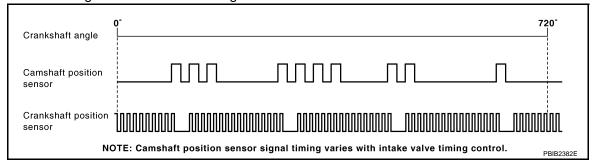
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

The sensor consists of a permanent magnet and Hall IC.

When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes. ECM receives the signals as shown in the figure.



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0340 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-250, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340	Camshaft position sen- sor (PHASE) circuit	 The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. The cylinder No. signal is not sent to ECM during engine running. The cylinder No. signal is not in the normal pattern during engine running. 	 Harness or connectors (The sensor circuit is open or shorted) Camshaft position sensor (PHASE) Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

>> GO TO 2.

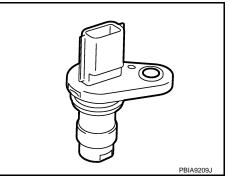
2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Start engine and let it idle for at least 5 seconds. If engine does not start, crank engine for at least 2 seconds.
- 2. Check 1st trip DTC.

ECH-478



INFOID:000000001179766



P0340 CMP SENSOR (PHASE)

	F		P SENSOR (PHASE)
< COMPONENT DIA	GNOSIS >		[HR16DE (WITHOUT EURO-OBD)]
Is 1st trip DTC detecte	ed?		
YES >> Go to ECH NO >> GO TO 3.	1-479, "Diagn	osis Procedu	<u>re"</u> .
3. PERFORM DTC C			
 Maintaining engine Check 1st trip DT(ore than 800 i	rpm for at least 5 seconds.
Is 1st trip DTC detecte			
YES >> Go to ECH		osis Procedu	<u>re"</u> .
NO >> INSPECT			
Diagnosis Proced	lure		INFOID:000000001179767
1.CHECK STARTING	SYSTEM		
Turn ignition switch to	START positio	on.	
Does the engine turn of	•		or operate?
YES >> GO TO 2.			
NO >> Check sta	• •		
2.CHECK GROUND		N	
 Turn ignition switc Check ground cor 		Refer to Grou	und Inspection in <u>GI-41, "Circuit Inspection"</u> .
Is the inspection result			and inspection in <u>GF41, Circuit inspection</u> .
YES >> GO TO 3.	<u>inoman.</u>		
NO >> Repair or	replace groun	d connection	
3. CHECK CAMSHAF	T POSITION	(CMP) SENS	SOR (PHASE) POWER SUPPLY CIRCUIT
		CMP) sensor	(PHASE) harness connector.
 Turn ignition switc Check the voltage 		D sonsor (DL	IASE) harness connector and ground.
5. Oneck the voltage	Detween OM		ACE) harness connector and ground.
CMP sensor (PHASE)			
Connector Terminal	Ground	Voltage	
F26 1	Ground	Approx. 5V	-
Is the inspection result	t normal?		
YES >> GO TO 4.	, .		
		-	d or short to power in harness or connectors.
	-) GROUND (CIRCUIT FOR OPEN AND SHORT
 Turn ignition switc Check the continu 		MP sensor (I	PHASE) harness connector and ECM harness connector.
	ity between C		
CMP sensor (PHASE)	E	CM	
Connector Terminal	Connector	Terminal	Continuity
F26 2	F8	63	Existed
3. Also check harnes	s for short to	power.	
Is the inspection result			
Is the inspection result			
YES >> GO TO 5.			
YES >> GO TO 5. NO >> Repair op		-	d or short to power in harness or connectors. NAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

P0340 CMP SENSOR (PHASE)

< COMPONENT DIAGNOSIS >

CMP sense	or (PHASE)	ECM		Continuity	
Connector	Terminal	Connector Terminal		Continuity	
F26	3	F8	65	Existed	

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 CAMSHAFT POSITION SENSOR (PHASE)

Refer to ECH-480, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace camshaft position sensor (PHASE).

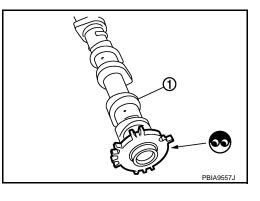
7.CHECK CAMSHAFT (INT)

Check the following.

- · Accumulation of debris to the signal plate of camshaft (1) rear end
- Chipping signal plate of camshaft rear end
- Is the inspection result normal?

YES >> GO TO 8.

NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

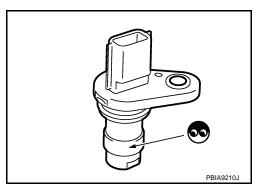
INFOID:000000001179768

1.CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

- 1. Turn ignition switch OFF.
- 2. Loosen the fixing bolt of the sensor.
- 3. Disconnect camshaft position sensor (PHASE) harness connector.
- 4. Remove the sensor.
- 5. Visually check the sensor for chipping.

Is the inspection result normal?

NO >> Replace camshaft position sensor (PHASE).



2.CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) terminals as follows.

P0340 CMP SENSOR (PHASE)

[HR16DE (WITHOUT EURO-OBD)]

		-		Λ
Terminals (Polarity)	Resistance [at 25°C (77°F)]	-		А
1 (+) - 2 (-)	-			
1 (+) - 3 (-)	Except 0 or $\sim \Omega$			EC
2 (+) - 3 (-)		-		
s the inspection resu YES >> INSPEC NO >> Replace		PHASE).		С
				D
				E
				F
				G
				Н
				I
				J
				K
				L
				M
				Ν
				0
				P

P0605 ECM

Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

DTC Logic

DTC No.

DTC DETECTION LOGIC

Trouble diagnosis name

		A)	ECM calculation function is malfunctioning.					
P0605	Engine control module	B)	ECM EEP-ROM system is malfunctioning.	• ECM				
		C)	ECM self shut-off function is malfunctioning.					
DTC CONFIRMATION PROCEDURE								

DTC detecting condition

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

- 1. Turn ignition switch ON.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-483, "Diagnosis Procedure".
- NO >> GO TO 3.

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

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-483, "Diagnosis Procedure".

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

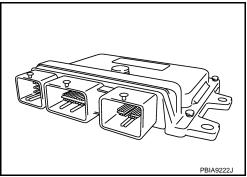
- 1. Turn ignition switch ON and waitait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 3. Repeat step 2 for 32 times.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-483, "Diagnosis Procedure".
- NO >> INSPECTION END

ECH-482





Possible cause

INFOID:0000000001179770

< COMPONENT DIAGNOSIS > Diagnosis Procedure

INFOID:000000001179771

А

1.INSPECTION START

With CONSULT-III	ECH
1. Turn ignition switch ON.	
Select "SELF-DIAG RESULTS" mode with CONSULT-III.	
3. Touch "ERASE".	
4. Perform DTC CONFIRMATION PROCEDURE.	С
See <u>ECH-482, "DTC Logic"</u> .	
Without CONSULT-III	
1. Turn ignition switch ON.	D
Erase the Diagnostic Test Mode II (Self-diagnostic results) memory.	
3. Perform DTC CONFIRMATION PROCEDURE.	
See <u>ECH-482, "DTC Logic"</u> .	_
Is the 1st trip DTC P0605 displayed again?	E
YES >> GO TO 2.	
NO >> INSPECTION END	_
2.REPLACE ECM	F
1. Replace ECM.	
2. Go to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Re	<u>epair</u> G
Requirement".	
>> INSPECTION END	Н

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P1065 ECM

Description

ECM has the memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the Idle Air Volume Learning value memory, etc. even when the ignition switch is turned OFF.

DTC Logic

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065	Engine control module	ECM back-up RAM system does not function properly.	• ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Start engine and let it idle for 1 second.
- 3. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 4. Repeat steps 2 and 3 for four times.
- 5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>ECH-484, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

1.INSPECTION START

With CONSULT-III

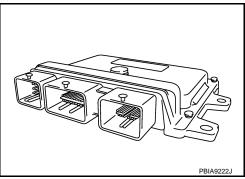
- 1. Turn ignition switch ON.
- 2. Select "SELF-DIAG RESULTS" mode with CONSULT-III.
- 3. Touch "ERASE".
- Perform DTC CONFIRMATION PROCEDURE. See <u>ECH-484, "DTC Logic"</u>.

Without CONSULT-III

- 1. Turn ignition switch ON.
- 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory.
- 3. Perform DTC CONFIRMATION PROCEDURE. See <u>ECH-484, "DTC Logic"</u>.
- Is the 1st trip DTC P1065 displayed again?
- YES >> GO TO 2.

ECH-484

INFOID:000000001179772



INFOID:000000001179773

INFOID:000000001179774

[HR16DE (WITHOUT EURO-OBD)]

Replace ECM								
Replace ECM. Go to <u>ECH-356,</u> <u>Requirement</u> ".	"ADDITIONAL	SERVICE	WHEN	REPLACING	CONTROL	UNIT : Special	Repair	EC⊦
>> INSPECT								С
								D
								E
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P1111 IVT CONTROL SOLENOID VALVE

< COMPONENT DIAGNOSIS >

P1111 IVT CONTROL SOLENOID VALVE

Description

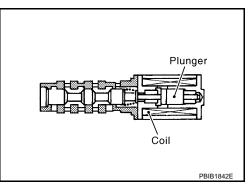
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

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

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

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



DTC Logic

DTC DETECTION LOGIC

INFOID:000000001179776

INFOID:000000001179775

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	 Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) Intake valve timing control solenoid valve

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 5 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-486, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179777

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

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

IVT control s	olenoid valve	Ground	Voltage
Connector	Terminal	Oround	voltage
F41	2	Ground	Battery voltage

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 INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN

ECH-486

[HR16DE (WITHOUT EURO-OBD)]

P1111 IVT CONTROL SOLENOID VALVE

< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

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AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between intake valve timing control solenoid valve harness connector and ECM harness connector.

	olenoid valve	EC	M	Continuity	
Connector	Terminal	Connector	Terminal	Continuity	
F41	1	F8	73	Existed	
		r short to grou	nd and short	to power.	
	ion result nor	mal?			
	60 TO 3. Sepair open ci	rcuit or short t	o around or s	short to power i	n harness or connectors.
	• •	TIMING CON	-	•	
		onent Inspectio			
	ion result nor	-			
	60 TO 4.				
	•	e valve timing o	control solend	old valve.	
	ITERMITTEN				
efer to GI-3	<u>9, "Intermitter</u>	<u>nt Incident"</u> .			
~~ 11	NSPECTION				
omponer	it Inspectio	n			INFOID:000000001179778
.CHECK IN		TIMING CON	NTROL SOLE	NOID VALVE-	
	ITAKE VALVE		ITROL SOLE	NOID VALVE-	
. Turn ignit . Disconne	ion switch OF ct intake valv	FF. e timing contro	ol solenoid va	alve harness co	nnector.
Turn ignit Disconne	ion switch OF ct intake valv	FF. e timing contro	ol solenoid va	alve harness co	l
Turn ignit Disconne	ion switch OF ct intake valv sistance betw	FF. e timing contro	ol solenoid va lve timing cor	alve harness co	nnector.
. Turn ignit Disconne . Check re	ion switch OF ct intake valv sistance betw	F. e timing contro veen intake val	ol solenoid va lve timing cor	alve harness co	nnector.
. Turn ignit Disconne Check re	ion switch OF oct intake valv sistance betw Resis	F. e timing contro veen intake val tance [at 20°C (68	ol solenoid va lve timing cor ^{B°F)]}	alve harness co	nnector.
. Turn ignit Disconne Check re Terminals 1 and 2	ion switch OF oct intake valv sistance betw Resis	F. e timing contro veen intake val tance [at 20°C (68 $6.7 - 7.7 \Omega$ $\infty \Omega$ nuity should not e	ol solenoid va lve timing cor ^{B°F)]}	alve harness co	nnector.
Turn ignit Disconne Check re Terminals 1 and 2 1 or 2 and gro the inspect YES >> C	ion switch OF oct intake valv sistance betw Resis und (Conti ion result nor GO TO 2.	F. e timing controven intake values intake values (68) tance [at 20°C (68) $6.7 - 7.7 \Omega$ $\infty \Omega$ nuity should not emal?	ol solenoid va lve timing cor ^{B°F)]}	alve harness co ntrol solenoid v	nnector.
Turn ignit Disconne Check re Terminals 1 and 2 1 or 2 and gro the inspect YES >> G NO >> R	ion switch OF oct intake valv sistance betw Resis und (Conti ion result nor GO TO 2. Leplace intake	F. e timing contro veen intake val tance [at 20°C (68 $6.7 - 7.7 \Omega$ $\infty \Omega$ nuity should not e mal? e valve timing o	ol solenoid va lve timing cor ^{B°F)]} exist) control solend	alve harness co ntrol solenoid v oid valve.	onnector. alve terminals as follows.
Turn ignit Disconne Check re Terminals 1 and 2 1 or 2 and gro the inspect (ES >> G NO >> R .CHECK IN	ion switch OF oct intake valv sistance betw Resis und (Conti ion result nor GO TO 2. eplace intake ITAKE VALVE	F. e timing contro veen intake val tance [at 20°C (68 $6.7 - 7.7 \Omega$ $\infty \Omega$ nuity should not e mal? e valve timing of E TIMING CON	ol solenoid va lve timing cor ^{B°F)]} exist) control soleno NTROL SOLE	alve harness co ntrol solenoid v oid valve. ENOID VALVE-	onnector. alve terminals as follows.
Turn ignit Disconne Check re Terminals 1 and 2 1 or 2 and gro the inspect YES >> C NO >> R CHECK IN Remove	ion switch OF oct intake valv sistance betw Resis und (Conti ion result nor GO TO 2. eplace intake ITAKE VALVE intake valve t	F. e timing contro veen intake val tance [at 20°C (68 $6.7 - 7.7 \Omega$ $\infty \Omega$ nuity should not e mal? e valve timing o TIMING CON iming control s	ol solenoid va lve timing cor ^{B°F)]} exist) control soleno VTROL SOLE solenoid valve	alve harness co htrol solenoid v oid valve. ENOID VALVE-	onnector. alve terminals as follows.
Turn ignit Disconne Check re Terminals 1 and 2 1 or 2 and gro the inspect YES >> G NO >> R CHECK IN Remove Provide y valve terr	ion switch OF act intake valv sistance betw Resis und (Conti ion result nor GO TO 2. Ceplace intake ITAKE VALVE intake valve t 12V DC betw ninals 1 and 2	F. e timing control veen intake val tance [at 20°C (68 $6.7 - 7.7 \Omega$ $\infty \Omega$ nuity should not e mal? e valve timing of TIMING CON iming control s veen intake va 2, and then int	ol solenoid va lve timing cor B°F)] exist) control soleno NTROL SOLE solenoid valve alve timing co errupt it. Mak	alve harness co ntrol solenoid v oid valve. ENOID VALVE-	nnector. alve terminals as follows.
Turn ignit Disconne Check re Terminals 1 and 2 1 or 2 and gro the inspect YES >> G NO >> R CHECK IN Remove Provide valve terr plunger n	ion switch OF act intake valv sistance betw Resis und (Conti ion result nor GO TO 2. ceplace intake ITAKE VALVE intake valve t 12V DC betw ninals 1 and 2 noves as sho	F. e timing control veen intake val tance [at 20°C (68 $6.7 - 7.7 \Omega$ $\infty \Omega$ nuity should not e mal? e valve timing of TIMING CON iming control s veen intake val	ol solenoid va lve timing cor B°F)] exist) control soleno NTROL SOLE solenoid valve alve timing co errupt it. Mak	alve harness control solenoid v bid valve. ENOID VALVE- e. ontrol solenoid	nnector. alve terminals as follows.
Turn ignit Disconne Check re Terminals 1 and 2 1 or 2 and gro the inspect YES >> C NO >> R CHECK IN Remove Provide valve terr plunger n CAUTIO	ion switch OF act intake valv sistance betw Resis und (Conti ion result nor GO TO 2. Replace intake ITAKE VALVE intake valve t 12V DC betw ninals 1 and 2 noves as shor N:	F. e timing control veen intake value tance [at 20°C (68 $6.7 - 7.7 \Omega$ $\infty \Omega$ nuity should not e mal? e valve timing control so veen intake value 2, and then int wn in the figure	ol solenoid va lve timing cor ^{B°F)]} exist) control soleno NTROL SOLE solenoid valve alve timing co errupt it. Mak e.	alve harness control solenoid v bid valve. ENOID VALVE- e. ontrol solenoid se sure that the	I onnector. alve terminals as follows.
Turn ignit Disconne Check re Terminals 1 and 2 1 or 2 and gro the inspect YES >> C NO >> R CHECK IN Remove Provide 7 valve terr plunger n CAUTIOI Do not a Doing so	ion switch OF act intake valv sistance betw Resis und (Conti ion result nor GO TO 2. ceplace intake ITAKE VALVE intake valve t 12V DC betw ninals 1 and 2 noves as shor N: pply 12V DC	F. e timing control veen intake value tance [at 20°C (68 $6.7 - 7.7 \Omega$ $\infty \Omega$ nuity should not e mal? e valve timing of TIMING CON iming control so veen intake value 2, and then int wn in the figure C continuous in damage to	ol solenoid va lve timing cor B°F)] exist) control soleno VTROL SOLE solenoid valve alve timing ca errupt it. Mak e. ly for 5 secc	alve harness control solenoid v bid valve. ENOID VALVE- e. ontrol solenoid	I onnector. alve terminals as follows.

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace intake valve timing control solenoid valve.



P1121 ELECTRIC THROTTLE CONTROL ACTUATOR DIAGNOSIS > [HR16DE (WITHOUT EURO-OBD)]

< COMPONENT DIAGNOSIS >

P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

Description

INFOID:0000000001179779

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:000000001179780

INFOID:000000001179781

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
	Electric throttle control		Electric throttle control actuator does not func- tion properly due to the return spring malfunc- tion.	
P1121	actuator	B)	Throttle valve opening angle in fail-safe mode is not in specified range.	Electric throttle control actuator
		C)	ECM detect the throttle valve is stuck open.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Set shift lever to 1st position and wait at least 3 seconds.
- 3. Set shift lever to Neutral position.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON and wait at least 1 second.
- 6. Set shift lever to 1st position and wait at least 3 seconds.
- 7. Set shift lever to Neutral position.
- 8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- 9. Check DTC.

Is DTC detected?

- YES >> Go to ECH-488, "Diagnosis Procedure".
- NO >> GO TO 3.

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

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Set shift lever to 1st position and wait at least 3 seconds.
- 3. Set shift lever to Neutral position.
- 4. Start engine and let it idle for 3 seconds.
- 5. Check DTC.

Is DTC detected?

- YES >> Go to ECH-488, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

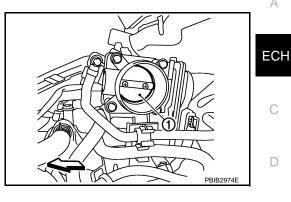
< COMPONENT DIAGNOSIS >

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct.
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Remove the foreign matter and clean the electric throttle control actuator inside.



$2. {\tt Replace electric throttle control actuator}$

- 1. Replace electric throttle control actuator.
- 2. Go to ECH-489, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000001179782

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1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING	
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Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

[HR16DE (WITHOUT EURO-OBD)]

P1122 ELECTRIC THROTTLE CONTROL FUNCTION [HR16DE (WITHOUT EURO-OBD)]

< COMPONENT DIAGNOSIS >

P1122 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:000000001179783

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:000000001179784

DTC DETECTION LOGIC

NOTE: If DTC P1122 is displayed with DTC P1121 or P1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to <u>ECH-494, "DTC Logic"</u> or <u>ECH-488, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122	Electric throttle control performance	Electric throttle control function does not oper- ate 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 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V when engine is running.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- 3. Check DTC.

Is DTC detected?

YES >> Go to <u>ECH-490, "Diagnosis Procedure"</u>. NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179785

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. 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 CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

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

P1122 ELECTRIC THROTTLE CONTROL FUNCTION

< COMPONENT DIAGNOSIS >

EC Connector						ŀ
		Ground	Conditio	'n	Voltage	r
Connector	Terminal		Ignition switc		Approx. 0V	
F7	2	Ground	Ignition switch		Battery voltage	E
Is the inspe	ection resu	ult norma	0			
	> GO TO 9		<u></u>			(
-	> GO TO (
3.CHECK	THROTT	LE CON	ITROL MOT	OR R	ELAY POWER SUPPLY CIRCUIT-II	-
1. Check	the contir	nuity bety	ween ECM h	narnes	ss connector and IPDM E/R harness connector.	
IPDN	-	0	ECM	Con	tinuity	E
Connector	Terminal	Connect		Evi		
E12	32	F7	2		isted	F
2. Also cl Is the inspe			-	nu and	d short to power.	1
	> GO TO {		<u>al : </u>			
	> GO TO 4					(
4.detec	T MALFU	NCTION	ING PART			
Check the	following.					
Harness						
Harness	for open c	or snort c	between thro	ottle m	notor relay and ECM	
	- Popair o	non or s	bort to arou	ndor	short to power in harness or connectors.	
_	•	•	-		short to power in namess of connectors.	
				OR R	ELAY POWER SUPPLY CIRCUIT-III	
1. Turn iç	nition swi	tch OFF.			ELAY POWER SUPPLY CIRCUIT-III	
1. Turn ig	nition swi	tch OFF.				、
1. Turn iç 2. Check	nition swi	tch OFF. etween I	ECM harnes	s con		
1. Turn iç 2. Check	nition swi voltage b	tch OFF. etween I	ECM harnes			
1. Turn ig 2. Check E ⁻	nition swi voltage b	tch OFF. etween I	ECM harnes	s con	nector and ground.	,
1. Turn ig 2. Check E Connector F7 3. Also cl	CM Terminal 15 heck harn	tch OFF. etween I Grou Grou ess for s	ECM harnes und Vo und Batter hort to grou	S CON	nector and ground.	
1. Turn ig 2. Check E Connector F7 3. Also cl s the inspe	CM Terminal 15 heck harn- ection resu	tch OFF. etween I Grou Grou ess for s ult norma	ECM harnes und Vo und Batter hort to grou	S CON	nector and ground.	
1. Turn iç 2. Check Connector F7 3. Also cl <u>s the inspo</u> YES >:	cM Terminal heck harme GO TO T	tch OFF. etween I Grou Grou ess for s ult norma 7.	ECM harnes und Vo und Batter hort to grou	S CON	nector and ground.	
1. Turn ig 2. Check Connector F7 3. Also cl Is the inspective YES >: NO >:	CM Terminal 15 heck harn ection resu > GO TO 7 > GO TO 6	tch OFF. etween I Grou ess for s ult norma 5.	ECM harnes and Vo and Batter hort to groun al?	S CON	nector and ground.	l
1. Turn ig 2. Check Connector F7 3. Also cl s the inspe YES >: NO >: O. DETEC	CM Terminal 15 heck harn ection resu > GO TO 7 > GO TO 6 T MALFU	tch OFF. etween I Grou ess for s ult norma 5.	ECM harnes und Vo und Batter hort to grou	S CON	nector and ground.	ľ
I. Turn ig 2. Check Connector F7 3. Also cl s the insperies YES >: NO >: D .DETEC Check the	CM CM Terminal 15 heck harn ection resu > GO TO 7 > GO TO 6 T MALFU following.	tch OFF. etween I Grou ess for s ult norma 7. 6. NCTION	ECM harnes and Vo and Batter hort to ground al?	S CON	nector and ground.	ſ
Turn ig Check Connector F7 Also cl s the insperies YES >: NO >: DETEC Check the Harness	CM Terminal 15 heck harn ection resu > GO TO 7 > GO TO 7 > GO TO 6 T MALFU following. connector	tch OFF. etween I Grou ess for s <u>ult norma</u> 7. 6. NCTION	ECM harnes und Vo und Batter hort to ground al? ING PART E6	oltage ry voltage nd and	nector and ground.	
1. Turn ig 2. Check 2. Check 6. Connector F7 3. Also cl 3. Also cl 3. Also cl 3. Also cl 3. Also cl 3. Also cl 5. DETEC Check the Harness	CM Terminal 15 heck harn ection resu > GO TO 7 > GO TO 7 > GO TO 6 T MALFU following. connector	tch OFF. etween I Grou ess for s <u>ult norma</u> 7. 6. NCTION	ECM harnes und Vo und Batter hort to ground al? ING PART E6	oltage ry voltage nd and	nector and ground. ge d short to power.	
1. Turn ig 2. Check 2. Check F7 3. Also cl 3. Also cl 3. Also cl 3. Also cl 4. Sthe inspo YES >: NO >: 0.DETEC Check the Harness Harness	mition swi voltage b CM Terminal 15 heck harn ection resu > GO TO 6 > GO TO 6 T MALFU following. connector for open c	tch OFF. etween I Grou ess for s <u>ult norma</u> 7. 6. NCTION rs F123, or short b	ECM harnes and Vo and Batter hort to ground All? ING PART E6 between thro	oltage ry voltag nd and	nector and ground. ge d short to power.	r
1. Turn ig 2. Check E Connector F7 3. Also cl Is the inspe YES >: NO >: 6.DETEC Check the • Harness • Harness	mition swi voltage b CM Terminal 15 heck harn ection resu > GO TO 6 > GO TO 6 T MALFU following. connector for open c	tch OFF. etween I Grou ess for s <u>ult norma</u> 7. 6. NCTION rs F123, or short b	ECM harnes and Vo and Batter hort to ground All? ING PART E6 between thro	oltage ry voltag nd and	nector and ground.	ן א 1
1. Turn ig 2. Check 2. Check F7 3. Also cl 3. Also cl 3. Also cl 3. Also cl 4. Sthe inspo YES >: NO >: 6.DETEC Check the • Harness • Harness • Harness • Harness 1. Discor	mition swi voltage b CM Terminal 15 heck harn ection resi connector following. connector for open c Repair o FUSE nnect 15A	tch OFF. etween I Grou ess for s <u>ult norma</u> 7. 5. NCTION rs F123, or short b open or s fuse (No	ECM harnes und Vo und Batter hort to ground All? ING PART E6 between throw hort to ground hort to ground both to gro	oltage ry voltag nd and ottle m	nector and ground.	ן א 1
1. Turn ig 2. Check 2. Check Connector F7 3. Also cl Is the inspect YES >: NO >: 6.DETEC Check the Harness Harness X 7.CHECK 1. Discor 2. Check	cm Terminal Terminal 15 heck harn ection resu GO TO 7 > GO TO 7 = GO	tch OFF. etween I Grou ess for s <u>ult norma</u> 7. 6. NCTION rs F123, or short b open or s fuse (No for blow	ECM harnes und Vo und Batter hort to groun al? ING PART E6 between thro hort to groun hort to groun b. 51) from If n.	oltage ry voltag nd and ottle m	nector and ground.	۱ ۱ ۱ ۱
1. Turn ig 2. Check E Connector F7 3. Also cl is the inspe YES >: NO >: 6.DETEC Check the Harness Harness T.CHECK 1. Discor 2. Check Is the inspe	cm Terminal Terminal 15 heck harn ection resu GO TO 7 > GO TO 7 = GO	tch OFF. etween I Grou ess for s <u>ult norma</u> 7. 6. NCTION rs F123, or short b open or s fuse (Noc for blow <u>ult norma</u>	ECM harnes und Vo und Batter hort to groun al? ING PART E6 between thro hort to groun hort to groun b. 51) from If n.	oltage ry voltag nd and ottle m	nector and ground.	ן א 1
1. Turn ig 2. Check 2. Check F7 3. Also cl Is the insperies YES >: 6.DETEC Check the • Harness • Harness • Harness • T.CHECK 1. Discor 2. Check Is the insperies YES >: NO >:	mition swi voltage b CM Terminal 15 heck harn ection resu > GO TO 6 T MALFU following. connector for open c > Repair o C FUSE nect 15A 15A fuse ection resu > GO TO 8 > Replace	tch OFF. etween I Grou ess for s <u>ult norma</u> 7. 6. NCTION rs F123, or short b or short b pen or s fuse (No for blow <u>ult norma</u> 3. 15A fus	ECM harnes and Vo and Batter hort to ground All? ING PART E6 between throw hort to ground both to gro	oltage ry voltag nd and ottle m	nector and ground.	K

P1122 ELECTRIC THROTTLE CONTROL FUNCTION

< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair or replace harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.

- 2. Disconnect electric throttle control actuator harness connector.
- 3. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle c	control actuator	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
	5	F7	1	Not existed
F29			4	Existed
	6		1	Existed
	0		4	Not existed

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

Is the inspection result normal?

YES >> GO TO 10.

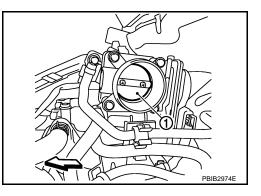
NO >> Repair or replace.

10.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Remove the intake air duct.
- 2. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

- YES >> GO TO 11.
- NO >> Remove the foreign matter and clean the electric throttle control actuator inside.



11. CHECK THROTTLE CONTROL MOTOR

Refer to ECH-493, "Component Inspection".

Is the inspection result normal?

- YES >> GO TO 12.
- NO >> GO TO 13.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

- YES >> GO TO 13.
- NO >> Repair or replace harness or connectors.
- **13.**REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR
- 1. Replace malfunction electric throttle control actuator.

Go to ECH-493, "Special Repair Requirement".

>> INSPECTION END

P1122 ELECTRIC THROTTLE CONTROL FUNCTION

[HR16DE (WITHOUT EURO-OBD)] < COMPONENT DIAGNOSIS > **Component Inspection** INFOID:000000001179786 А 1. CHECK THROTTLE CONTROL MOTOR 1. Disconnect electric throttle control actuator harness connector. ECH 2. Check resistance between electric throttle control actuator terminals as follows. Resistance [at 25 °C (77°F)] Terminals Approx. 1 - 15 Ω 5 and 6 Is the inspection result normal? YES >> INSPECTION END D NO >> GO TO 2. 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Е 1. Replace electric throttle control actuator. Go to ECH-493, "Special Repair Requirement". 2. F >> INSPECTION END Special Repair Requirement INFOID:0000000001179787 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement" Н >> GO TO 2. 2. PERFORM IDLE AIR VOLUME LEARNING Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement" >> END

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P1124, P1126 THROTTLE CONTROL MOTOR RELAY

< COMPONENT DIAGNOSIS >

P1124, P1126 THROTTLE CONTROL MOTOR RELAY

Description

INFOID:0000000001179788

[HR16DE (WITHOUT EURO-OBD)]

Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

DTC Logic

INFOID:000000001179789

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	 Harness or connectors (Throttle control motor relay circuit is shorted) Throttle control motor relay
P1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	 Harness or connectors (Throttle control motor relay circuit is open) Throttle control motor relay

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8V.

Witch DTC is detected?

P1124 >> GO TO 2.

P1126 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1124

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

Is DTC detected?

- YES >> Go to ECH-494, "Diagnosis Procedure".
- NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1126

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- 3. Check DTC.

Is DTC detected?

YES >> Go to <u>ECH-494</u>, "Diagnosis Procedure". NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179790

1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Check voltage between ECM harness connector and ground.

P1124, P1126 THROTTLE CONTROL MOTOR RELAY

< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

EC	М	Ground	Voltaga		
Connector	Terminal	Ground	Voltage		
F7	15	Ground	Battery voltage		
the inspe	ction resul	t normal?			
	GO TO 3. GO TO 2.				
.DETECT	MALFUN	ICTIONING	PART		
heck the fo					
		F123, E6			
Harness to	or open or	Short Detwo	een throttle motor r	aay and ECM	
>>	Repair op	en or short	to around or short	o power in harness or connectors.	
	• •		-	INPUT SIGNAL CIRCUIT-I	
	nition swite				
Disconr	nect ECM	harness co			
			s connector E12.	nector and IPDM E/R harness connector.	
		any Derweel			
ECM	N	IPDM E	/R		
Connector	Terminal	Connector	Continuity Terminal		
F7	15	E12	25 Existed		
. Also ch	eck harne	ss for short	to ground and shor	to power.	
s the inspe					
	GO TO 5. GO TO 4.				
		ICTIONING			
		ICTIONING	PARI		
heck the fo Harness c		F123, E6			
			een throttle motor r	elay and ECM	
-			•	o power in harness or connectors.	
				POWER SUPPLY CIRCUIT-II	
	ect ECM a		R harness connec	ors.	
			harness connecto	and ground.	
				-	
EC	M	Ground	Voltage		
Connector	Terminal	Cround	Voltage		
F7	2	Ground	Battery voltage		
s the inspe					
	GO TO 8. GO TO 6.				
				INPUT SIGNAL CIRCUIT-II	
				nector and IPDM E/R harness connector.	

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

EC	М	IPDM	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
F7	2	E12	32	Existed

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

Is the inspection result normal?

YES >> GO TO 8.

NG >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F12, E9

Harness for open or short between throttle motor relay and ECM

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

8.CHECK FUSE

- 1. Disconnect 15A fuse (No. 51) from IPDM E/R.
- 2. Check 15A fuse for blown.
- Is the inspection result normal?
- YES >> GO TO 9.
- NO >> Replace 15A fuse.

9. 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 connectors.

P1128 THROTTLE CONTROL MOTOR

Description

The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:000000001179792

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P1128	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	 Harness or connectors (Throttle control motor circuit is shorted.) Electric throttle control actuator (Throttle control motor) 	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 2 seconds. 1. 2. Start engine and let it idle for 5 seconds. Check DTC. 3 Is DTC detected? YES >> Go to ECH-497, "Diagnosis Procedure". NO >> INSPECTION END Κ Diagnosis Procedure INFOID:000000001179793 1.CHECK GROUND CONNECTION L Turn ignition switch OFF. 1.
- 2. Check ground connection E21. 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 CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect electric throttle control actuator harness connector.

- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle of	control actuator	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
	5		1	Not existed
F29	5	F7	4	Existed
F29	6		1	Existed
	0		4	Not existed

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INFOID:000000001179791	

P1128 THROTTLE CONTROL MOTOR

< COMPONENT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

 ${
m 3.}$ CHECK THROTTLE CONTROL MOTOR

Refer to ECH-498, "Component Inspection".

Is the inspection result normal?

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

4.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace harness or connectors.

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to ECH-498, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

1.CHECK THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.

2. Check resistance between electric throttle control actuator terminals as follows.

Terminals Resistance [at 25 °C (77°F)]

5 and 6 Approx. 1 - 15 Ω

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to ECH-498, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000001179795

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358. "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

INFOID:000000001179794

P1212 TCS COMMUNICATION LINE

Description

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and "ABS actuator and electric unit (control unit)". Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.

DTC Logic

DTC DETECTION LOGIC

< COMPONENT DIAGNOSIS >

NOTE:

- If DTC P1212 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to <u>ECH-439, "DTC Logic"</u>.
- If DTC P1212 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to <u>ECH-439, "DTC Logic"</u>.

Freeze frame data is not stored in the ECM for this self-diagnosis.

DTC No	. Trouble diagnosis name	DTC detecting condition	Possible cause	
P1212	TCS communication line	ECM can not receive the information from "ABS actuator and electric unit (control unit)" continuously.	 Harness or connectors (The CAN communication line is open or short- ed.) ABS actuator and electric unit (control unit) Dead (Weak) battery 	G

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:

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

>> GO TO 2. 2. PERFORM DTC CONFIRMATION PROCEDURE Κ Start engine and let it idle for at least 10 seconds. 1. 2. Check 1st trip DTC. Is 1st trip DTC detected? L YES >> Go to ECH-499, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure M INFOID:000000001179798 Go to BRC-6, "Work Flow". Ν

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[HR16DE (WITHOUT EURO-OBD)]

INFOID:000000001179796

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P1217 ENGINE OVER TEMPERATURE

< COMPONENT DIAGNOSIS >

P1217 ENGINE OVER TEMPERATURE

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1217 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to <u>ECH-439, "DTC Logic"</u>.
- If DTC P1217 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to <u>ECH-440, "DTC Logic"</u>.

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217	Engine over tempera- ture (Overheat)	 Cooling fan does not operate properly (Overheat). Cooling fan system does not operate properly (Overheat). Engine coolant was not added to the system using the proper filling method. Engine coolant is not within the specified range. 	 Harness or connectors (The cooling fan circuit is open or short- ed.) IPDM E/R (Cooling fan relays -1 and -2) Cooling fan motor Radiator hose Radiator Radiator cap Reservoir tank Water pump Thermostat

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to <u>CO-9</u>, <u>"Inspection"</u>. Also, replace the engine oil. Refer to <u>LU-6</u>, <u>"Inspection"</u>.

- 1. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to <u>LU-6</u>, "Inspection".
- 2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-500, "Component Function Check".

NOTE:

Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-501, "Diagnosis Procedure".

Component Function Check

INFOID:000000001179800

1.PERFORM COMPONENT FUNCTION CHECK-I

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

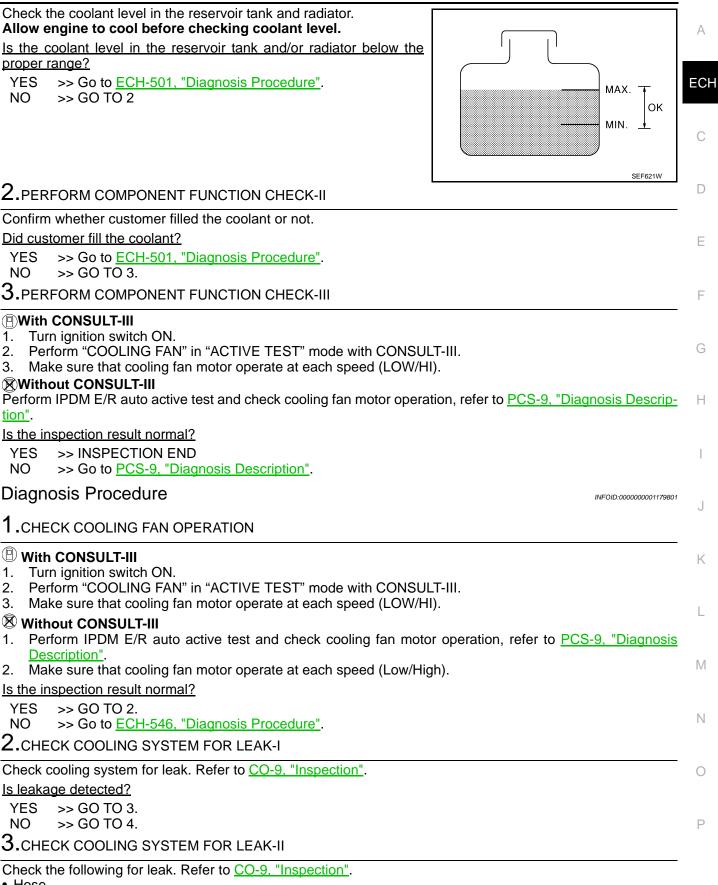
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

ECH-500

[HR16DE (WITHOUT EURO-OBD)]

INFOID:0000000001179799

P1217 ENGINE OVER TEMPERATURE < COMPONENT DIAGNOSIS > [HR16DE (WITHOUT EURO-OBD)]



- Hose
 Padiate
- Radiator
- Water pump

P1217 ENGINE OVER TEMPERATURE

< COMPONENT DIAGNOSIS >

>> Repair or replace malfunctioning part.

4.CHECK RADIATOR CAP

Check radiator cap. Refer to CO-13, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator cap.

5.CHECK THERMOSTAT

Check thermostat. Refer to CO-19. "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat.

6.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to ECH-451, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace engine coolant temperature sensor.

7.CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	 Blocked radiator Blocked condenser Blocked radiator grille Blocked bumper 	• Visual	No blocking	_
	2	Coolant mixture	Coolant tester	50 - 50% coolant mixture	CO-9, "Inspection"
	3	Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-9, "Inspection"
	4	Radiator cap	Pressure tester	59 - 98 kPa (0.6 - 1.0 bar, 0.6 - 1.0 kg/ cm ² , 9 - 14 psi) (Limit)	CO-14, "Inspection"
ON* ²	5	Coolant leaks	Visual	No leaks	CO-9, "Inspection"
ON* ²	6	Thermostat	Touch the upper and lower radiator hoses	Both hoses should be hot	CO-20, "Inspection"
ON* ¹	7	Cooling fan motor	CONSULT-III	Operating	ECH-547, "Component Inspection (Cooling Fan Motor)"
OFF	8	Combustion gas leak	Color checker chemical tester 4 Gas analyzer	Negative	_
ON* ³	9	Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	_
		Coolant overflow to res- ervoir tank	Visual	No overflow during driving and idling	CO-9, "Inspection"
OFF* ⁴	10	Coolant return from res- ervoir tank to radiator	Visual	Should be initial level in reservoir tank	CO-9, "Inspection"
OFF	11	Cylinder head	Straight gauge feeler gauge	0.1 mm (0.004 in) Maxi- mum distortion (warping)	EM-81, "Inspection"
	12	Cylinder block and pis- tons	• Visual	No scuffing on cylinder walls or piston	EM-102, "Inspection"

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.



P1217 ENGINE OVER TEMPERATURE SIS > [HR16DE (WITHOUT EURO-OBD)]

< COMPONENT DIAGNOSIS >	[HR16DE (WITHOUT EURO-OBD)]	
*4: After 60 minutes of cool down time.		
For more information, refer to CO-5, "Troubleshooting Chart".	А	
>> INSPECTION END	ECH	

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P1225 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

DTC DETECTION LOGIC

INFOID:000000001179803

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225	Closed throttle position learning performance	Closed throttle position learning value is excessively low.	Electric throttle control actuator (TP 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 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to <u>ECH-504</u>, "Diagnosis Procedure". NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179804

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.

2. Remove the intake air duct.



INFOID:000000001179802

P1225 TP SENSOR

< COMPONENT DIAGNOSIS >

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

Replace electric throttle control actuator.

>> INSPECTION END

Special Repair Requirement

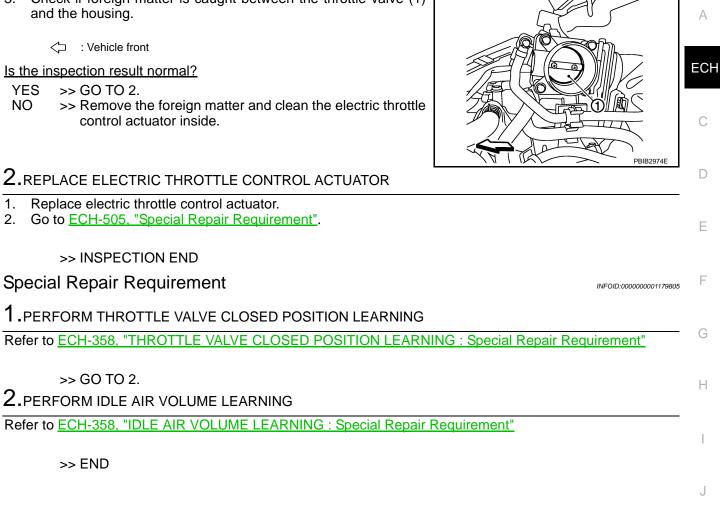
>> GO TO 2.

>> END

YES >> GO TO 2.

1.

>> Remove the foreign matter and clean the electric throttle NO control actuator inside.



[HR16DE (WITHOUT EURO-OBD)]

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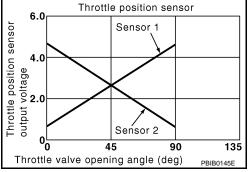
[HR16DE (WITHOUT EURO-OBD)]

P1226 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



DTC Logic

DTC DETECTION LOGIC

INFOID:000000001179807

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226	Closed throttle position learning performance	Closed throttle position learning is not per- formed successfully, repeatedly.	Electric throttle control actuator (TP 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 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Turn ignition switch OFF, wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 4. Repeat steps 2 and 3 for 32 times.
- 5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-506, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179808

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct.

INFOID:0000000001179806

P1226 TP SENSOR

< COMPONENT DIAGNOSIS >

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

Replace electric throttle control actuator.

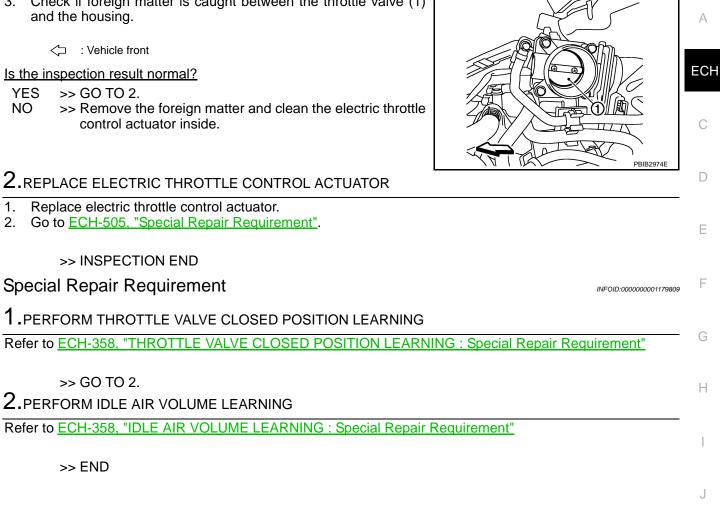
>> INSPECTION END

Special Repair Requirement

YES >> GO TO 2.

1.

>> Remove the foreign matter and clean the electric throttle NO control actuator inside.



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>> END

>> GO TO 2.

[HR16DE (WITHOUT EURO-OBD)]

P1229 SENSOR POWER SUPPLY

DTC Logic

INFOID:000000001179810

INFOID:000000001179811

[HR16DE (WITHOUT EURO-OBD)]

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	 Harness or connectors (APP sensor 1 circuit is shorted.) (TP sensor circuit is shorted.) [Camshaft position sensor (PHASE) circuit is shorted.] Accelerator pedal position sensor Throttle position sensor Camshaft position sensor (PHASE)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

- YES >> Go to ECH-508, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. 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 ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.

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

APP s	sensor	Ground	Voltage
Connector	onnector Terminal		voltage
E110	4	Ground	Approx. 5V

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUITS

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

P1229 SENSOR POWER SUPPLY

< COMPONENT DIAGNOSIS >

E	СМ	Sensor				А
Connector	Terminal	Item	Connector	Terminal		
	72	Electric throttle control actuator	F29	1		ECH
F8	78	CMP sensor (PHASE)	F26	1		
E16	106	APP sensor	E110	4	-	
Is the inspecti	on result nor	mal?			•	С
	•	ground or short to power in har S	ness or conne	ectors.		D
Check the foll • Camshaft po Is the inspection	osition senso	r (PHASE) (Refer to <u>ECH-480, "(</u> <u>mal?</u>	Component Ir	nspection".)		Е
		nctioning component.				F
Is the inspecti	on result nor	onent Inspection". mal?				G
NO >> G	O TO 9. O TO 6. ELECTRIC 1	THROTTLE CONTROL ACTUAT	OR			Н
		e control actuator. ELERATOR PEDAL RELEASE	D POSITION	LEARNING	: Special Repair Require-	I
>> IN 7. CHECK AF	SPECTION	END				J
Is the inspecti	on result nor	onent Inspection". mal?				К
NO >> G	O TO 9. O TO 8. ACCELERA ⁻	FOR PEDAL ASSEMBLY				L
 Replace accelerator pedal assembly. Go to <u>ECH-357</u>, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Require- ment". 						
>> IN 9.CHECK IN	SPECTION					Ν
	Refer to <u>GI-39, "Intermittent Incident"</u> .					
>> INSPECTION END						Ρ

P1564 ASCD STEERING SWITCH

Description

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.

Refer to <u>ECH-387</u>, "System Description" for the ASCD function.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>ECM-199, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564	ASCD steering switch	 An excessively high voltage signal from the ASCD steering switch is sent to ECM. ECM detects that input signal from the ASCD steering switch is out of the specified range. ECM detects that the ASCD steering switch is stuck ON. 	 Harness or connectors (The switch circuit is open or shorted.) ASCD steering switch ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Wait at least 10 seconds.
- 3. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 4. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 5. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 6. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 7. Check DTC.

Is DTC detected?

- YES >> Go to ECH-510, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YS >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT-III

1. Turn ignition switch ON.

ECH-510

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P1564 ASCD STEERING SWITCH

< COMPONENT DIAGNOSIS >

- Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode with 2. CONSULT-III.
- 3. Check each item indication under the following conditions.

Monitor item	Condition	Indication	
MAIN SW	MAIN switch	Pressed	ON
		Released	OFF
CANCEL SW	CANCEL switch	Pressed	ON
		Released	OFF
RESUME/ACC SW	RESUME/ACCELERATE switch	Pressed	ON
RESSINE/ACC SW	RESOME/AGGELENATE SWIGH	Released	OFF
SET SW	SET/COAST switch	Pressed	ON
SET SW		Released	OFF

Without CONSULT-III

1. Turn ignition switch ON.

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

ECM		Ground	d Condition	Voltage		
Connector		Termina	al	Giouna	Condition	voltage
					MAIN switch: Pressed	Approx. 0V
					CANSEL switch: Pressed	Approx. 1
E16	(ASC	94 D steering sv	witch signal)	Ground	SET/COAST switch: Pressed	Approx. 2\
	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	b otooning o	inter eignal)		RESUME/ACCELERATE switch: Pressed	Approx. 3
					All ASCD steering switches: Released	Approx. 4
s the inspec			2			
	GO TO					
	GO TO	-				
			SWITCH		RCUIT FOR OPEN AND SHORT	
		itch OFF.				
		A harness		ss connecto	or M352	
					itch and ECM harness connector.	
ASCD steerir	ng switch	E	CM			
Termin	al	Connector	Terminal	Continuity		
15		E16	95	Existed		
5. Also che	eck harn	ess for sho	ort to arour	d and short	to power.	
s the inspec			-		•	
	GO TO		-			
NO >>	GO TO	4.				
4.detect	MALFU	NCTIONIN	IG PART			
Check the fo	llowing.					

 Harness connectors M77, E105 Combination switch (spiral cable)

• Harness for open and short between ECM and ASCE steering switch

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

5. Check ascd steering switch input signal circuit for open and short

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P1564 ASCD STEERING SWITCH

< COMPONENT DIAGNOSIS >

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1. Check the continuity between ECM harness connector and ASCD steering switch.

ASCD steering switch	E	СМ	Continuity
Terminal	Connector	Terminal	Continuity
14	E16	94	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.

NO >> GO | O b.

6.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, E105
- Combination switch (spiral cable)

· Harness for open and short between ECM and ASCE steering switch

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

7.CHECK ASCD STEERING SWITCH

Refer to ECH-512, "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.

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

Combination meter		Condition	Resistance	
Connector	Terminals	Condition	Resistance	
		MAIN switch: Pressed	Approx. 0 Ω	
		CANCEL switch: Pressed	Approx. 250 Ω	
M325	14 and 15	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

 ${f 3.}$ PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

With CONSULT-III

- 1. Start engine.
- 2. Select "DATA MONITOR" mode with CONSULT-III.
- 3. Press MAIN switch and make sure that CRUISE indicator is displayed in combination meter.
- Drive the vehicle for at least 5 consecutive seconds under the following conditions. CAUTION:

P1572 ASCD BRAKE SWITCH

P1572 ASCD BRAKE SWITCH

< COMPONENT DIAGNOSIS >

Description

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal). Refer to <u>ECH-48</u>, "System Description" for the ASCD function.

DTC Logic

DTC DETECTION LOGIC **NOTE**:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>ECM-199, "DTC Logic"</u>.
- This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

DTC No.	Trouble diagnosis name		DTC detecting condition	Possible cause	
		A)	When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time.	 Harness or connectors (The stop lamp switch circuit is shorted.) Harness or connectors (The ASCD brake switch circuit is shorted.) 	G
P1572	ASCD brake switch	B)	ASCD brake switch signal is not sent to ECM for extremely long time while the ve- hicle is driving.	 Harness or connectors (The ASCD clutch switch circuit is shorted.) Stop lamp switch ASCD brake switch ASCD clutch switch Incorrect stop lamp switch installation Incorrect ASCD brake switch installation Incorrect ASCD clutch switch installation ECM 	⊓ I J

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?.

Do you have CONSULT-III?

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

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

NOTE: Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for mal-

function B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.

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NOTE:

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

VHCL SPEED SE	More than 30 km/h (19 mph)
Shift lever	Suitable position

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-515, "Diagnosis Procedure".

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

With CONSULT-III

T. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

VHCL SPEED SE	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to ECH-515, "Diagnosis Procedure".
- NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component check. Refer to

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-515, "Diagnosis Procedure".

Component Function Check

INFOID:000000001179818

1.PERFORM COMPONENT FUNCTION CHECK-I

Without CONSSULT-III

1. Turn ignition switch ON.

2. Check voltage between ECM harness connector and ground.

ECM		Ground Condition			Voltago	
Connector	Terminal	Giouna	Condition		Voltage	
E16	100	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V	
EIO	(ASCD brake switch signal)	Ground	Brake pedar and clutch pedar	Fully released	Battery voltage	

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to ECM-198, "Diagnosis Procedure".

2. PERFORM COMPONENT FUNCTION CHECK-II

< COMPONENT DIAGNOSIS >

Without CONSSULT-III

Check voltage between ECM harness connector and ground.

	ECM	Ground		Conditior		Voltage
Connector	Terminal	Ground		Condition	1	voltage
E16	99	Ground	Brake pedal and clutch pedal		Slightly depressed	Approx. 0V
LIU	(Stop lamp switch signal)	Ground	Diake pedal and di	luten pedai	Fully released	Battery voltage
s the inspe	ection result normal?					
	> INSPECTION END					
NO >>	> Go to <u>ECM-198</u> , "Diag	inosis Pr	<u>ocedure"</u> .			
Diagnosi	is Procedure					INFOID:000000001
	OVERALL FUNCTION	1				
_		-1				
With C						
. Turn ig	nition switch ON.	α ΜΟΝΙΤ	OR" mode with (CONSULT-II	l	
. Turn ig 2. Select					I.	
. Turn ig 2. Select	gnition switch ON. "BRAKE SW1" in "DAT				Ι.	
. Turn ig 2. Select	nition switch ON. "BRAKE SW1" in "DAT "BRAKE SW1" indicatio				I.	
. Turn ig 2. Select 3. Check Monitor iten	gnition switch ON. "BRAKE SW1" in "DAT "BRAKE SW1" indicatio	on under		nditions.	l.	
. Turn ig . Select 3. Check Monitor iten	gnition switch ON. "BRAKE SW1" in "DAT "BRAKE SW1" indicatio	on under	the following con	Indication	I.	
. Turn ig 2. Select 3. Check Monitor iten BRAKE SW	gnition switch ON. "BRAKE SW1" in "DAT "BRAKE SW1" indicatio	on under	the following con Slightly depressed	Indication OFF	Ι.	
. Turn ig 2. Select 3. Check Monitor iten BRAKE SW Withou . Turn ig	gnition switch ON. "BRAKE SW1" in "DAT, "BRAKE SW1" indication n Consultation of the second secon	on under ondition edal	the following con Slightly depressed Fully released	Indication OFF ON	I.	
. Turn ig 2. Select 3. Check Monitor iten BRAKE SW Withou . Turn ig	gnition switch ON. "BRAKE SW1" in "DAT, "BRAKE SW1" indication n Co The Brake pedal and clutch per t CONSULT-III	on under ondition edal	the following con Slightly depressed Fully released	Indication OFF ON	Ι.	
. Turn ig 2. Select 3. Check Monitor iten BRAKE SW Withou . Turn ig	gnition switch ON. "BRAKE SW1" in "DAT, "BRAKE SW1" indication n Consultation of the consultation of th	on under ondition edal	the following con Slightly depressed Fully released	Indication OFF ON	I.	
Turn ig Select Select Monitor iten BRAKE SW Withou Turn ig Check	gnition switch ON. "BRAKE SW1" in "DAT, "BRAKE SW1" indication n Consultation of the provided and clutch provided and clutc	on under ondition edal	the following con Slightly depressed Fully released	Indication OFF ON	I.	Voltage
. Turn ig 2. Select 3. Check Monitor iten BRAKE SW Withou . Turn ig	gnition switch ON. "BRAKE SW1" in "DAT, "BRAKE SW1" indication I Brake pedal and clutch per t CONSULT-III gnition switch ON. the voltage between EC ECM Terminal	on under ondition edal CM harne	the following con Slightly depressed Fully released	Indication OFF ON d ground.		
Turn ig Select Select Monitor iten BRAKE SW Withou Turn ig Check	gnition switch ON. "BRAKE SW1" in "DAT, "BRAKE SW1" indication n Consultation of the provided and clutch provided and clutc	on under ondition edal CM harne Ground	the following con Slightly depressed Fully released	Indication OFF ON d ground. Condition	I. Slightly depressed	Voltage Approx. 0V Battery voltage

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

2. CHECK OVERALL FUNCTION-II

(P) With CONSULT-III

Select "BRAKE SW2" and check indication in "DATA MONITOR" mode.

Monitor item	Condition		Indication
BDAKE SWO	Brake pedal and clutch pedal	Slightly depressed	ON
DIVARE SW2	Brake pedar and clutch pedar	Fully released	OFF

Without CONSULT-III

Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage	
Connector	Terminal	Giouna	Condition		voltage	
E16	99	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V	
L 10	(Stop lamp switch signal)	Gibunu	Brake pedarang Clutch pedar	Fully released	Battery voltage	

Is the inspection result normal?

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YES >> GO TO 15. NO >> GO TO 6.

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3.CHECK ASCD BRAKE SWITCH CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.

3. Turn ignition switch ON.

4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD Clutch switch		Ground		Condition	Voltago (V/)	
Connector	Terminal	Ground	Condition		Voltage (V)	
F112	1	Ground	Clutch ped-	Slightly depressed	Approx. 0	
LIIZ	1	Ciouna	al	Fully released	Battery voltage	

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 4.

4.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

- 2. Disconnect ASCD clutch switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ASCD clutch switch harness connector and ground.

ASCD clu	itch switch	Ground	Voltage	
Connector	Terminal	Ciouna	voltage	
E111	1	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

Junction block connector E105, M77

10A fuse (No.4)

• Harness for open or short between ASCD brake switch and fuse

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

$\mathbf{6}.$ CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Check the continuity between ASCD brake switch harness connector and ASCD clutch switch harness connector.

ASCD brake switch		ASCD clu	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E112	1	E111	2	Existed

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

Is the inspection result normal?

YES >> GO TO 7.

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

I.CHECK ASCD BRAKE SWITCH

Refer to <u>ECH-518</u>, "Component Inspection (ASCD Brake Switch)". <u>Is the inspection result normal?</u>

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YES	>> GO TO 11.	
NO	>> Replace ASCD brake switch.	
8.CHE	CK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR C	PEN AND SHORT

1. Turn ignition switch OFF.

Disconnect ECM harness connector. 2.

Check the continuity between ECM harness connector and ASCD brake switch harness connector. 3.

E	ECM		ASCD brake switch	
Connector	Terminal	Connector	Terminal	Continuity
E16	100	E112	2	Existed

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

Is the inspection result normal?

YFS >> GO TO 9.

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

9.CHECK ASCD CLUTCH SWITCH

Refer to ECH-518, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 15.

- NO >> Replace ASCD clutch switch.
- 10. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT
- Turn ignition switch OFF. 1
- Disconnect stop lamp switch harness connector. 2.
- Check the voltage between stop lamp switch harness connector and ground. 3.

Stop lamp	o switch	Ground	Voltage	
Connector	Terminal	Cround		
E114	1	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 12.

11. DETECT MALFUNCTIONING PART

Check the following.

10A fuse (No.11)

Harness for open or short between stop lamp switch and battery

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

12. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

Check the continuity between ECM harness connector and stop lamp switch harness connector.

EC	ECM		Stop lamp switch		
Connector	Terminal	Connector	Terminal	Continuity	
E10	106	E114	2	Existed	

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

Is the inspection result normal?

YES >> GO TO 14.

NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

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Check the following.

• Harness for open or short between ECM and stop lamp switch

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

14.CHECK STOP LAMP SWITCH

Refer to ECH-519, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace stop lamp switch.

15. CHECK INTERMITTENT INCIDENT

Refer to .

>> INSPECTION ENDGI-39, "Intermittent Incident"

Component Inspection (ASCD Brake Switch)

INFOID:000000001179820

1.CHECK ASCD BRAKE SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2 Bra	Brake pedal	Fully released	Existed
	Diake peual	Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH-II

- 1. Adjust ASCD brake switch installation. Refer to <u>BR-8, "Inspection and Adjustment"</u>.
- 2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	and 2 Brake pedal		Existed
	Diake peual	Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch.

Component Inspection (ASCD Clutch Switch)

INFOID:000000001179821

1.CHECK ASCD CLUTCH SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD clutch switch harness connector.
- 3. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	С	Continuity	
1 and 2	Clutch pedal	Fully released	Existed
	Clutch pedal	Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

[HR16DE (WITHOUT EURO-OBD)]

Adjust ASCD clutch switch installation. Refer to <u>CL-6. "Inspection and Adjustment"</u> . Check the continuity between ASCD clutch switch terminals under the following conditions. Terminals Condition 1 and 2 Clutch pedal Fully released Existed Silghtly depressed Not existed Sthe inspection result normal? YES YES >> INSPECTION END NO >> Replace ASCD clutch switch. Component Inspection (Stop Lamp Switch)		GO TO 2. ASCD CLU	TCH SWITCH-II			
Check the continuity between ASCD clutch switch terminals under the following conditions. Terminals Condition Continuity 1 and 2 Clutch pedal Fully released Existed 3 the inspection result normal? Sightly depressed Not existed 2 Main Spection result normal? Product the switch. 2 Momponent Inspection (Stop Lamp Switch) ************************************				ion. Refer to	CL-6. "Inspection and Adjustment".	
1 and 2 Clutch pedal Fully released Existed 3 the inspection result normal? YES >> INSPECTION END NO >> Replace ASCD clutch switch. Component Inspection (Stop Lamp Switch) ####################################						ons.
1 and 2 Clutch pedal Fully released Existed 1 and 2 Clutch pedal Fully released Not existed Is the inspection result normal? YES >> INSPECTION END December 2012 YES >> INSPECTION END December 2012 December 2012 NO >> Replace ASCD clutch switch. December 2012 Component Inspection (Stop Lamp Switch) December 2012 December 2012 1. Turn ignition switch OFF. Disconnect stop lamp switch harness connector. Bightly depressed Existed 1. and 2 Brake pedal Fully released Not existed Existed Is the inspection result normal? YES >> INSPECTION END Not existed NO >> GO TO 2. Decek the continuity between stop lamp switch terminals under the following conditions. YES >> INSPECTION END Not existed 1. Adjust stop lamp switch installation. Refer to <u>BR-18. "Inspection and Adjustment"</u> 2. Check the continuity between stop lamp switch terminals under the following conditions. Terminals Condition Continuity 1 and 2 Brake pedal Fully released Not existed Sightly depressed Ex						
1 and 2 Clutch pedal Slightly depressed Not existed Is the inspection result normal? Slightly depressed Not existed YES >> INSPECTION END Immodel in the inspection (Stop Lamp Switch) NO >> Replace ASCD clutch switch. Component Inspection (Stop Lamp Switch) Immodel inspection (Stop Lamp Switch) 1. CHECK STOP LAMP SWITCH-I 1 1. Turn ignition switch OFF. Disconnect stop lamp switch harness connector. 3. Check the continuity between stop lamp switch terminals under the following conditions. Terminals Condition 1 and 2 Brake pedal Fully released Not existed Sightly depressed Existed Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2. CHECK STOP LAMP SWITCH-II 1. Adjust stop lamp switch installation. Refer to BR-18. "Inspection and Adjustment" 2. Check the continuity between stop lamp switch terminals under the following conditions. Terminals Condition I and 2 Brake pedal Not existed Sightly depressed Existed Is the inspection result normal?	Terminals			_		
Slightly depressed Not existed Is the inspection result normal? YES >> INSPECTION END NO >> Replace ASCD clutch switch. Component Inspection (Stop Lamp Switch) ##00x000000000000000000000000000000000	1 and 2	Clutch peda	I			
YES >> INSPECTION END NO >> Replace ASCD clutch switch. Component Inspection (Stop Lamp Switch)			•••	ed Not existed		
NO >> Replace ASCD clutch switch. Component Inspection (Stop Lamp Switch) Notecococcentrates 1.CHECK STOP LAMP SWITCH-I						
Component Inspection (Stop Lamp Switch) 1.CHECK STOP LAMP SWITCH-I 1. Turn ignition switch OFF. 2. Disconnect stop lamp switch harness connector. 3. Check the continuity between stop lamp switch terminals under the following conditions. <u>terminals</u> <u>Condition</u> <u>Continuity</u> <u>1 and 2</u> <u>Brake pedal</u> <u>Fully released</u> <u>Not existed</u> <u>Slightly depressed Existed</u> Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2. CHECK STOP LAMP SWITCH-II 1. Adjust stop lamp switch installation. Refer to <u>BR-18. "Inspection and Adjustment"</u> 2. Check the continuity between stop lamp switch terminals under the following conditions. <u>Terminals</u> <u>Condition</u> <u>Continuity</u> 1. Adjust stop lamp switch installation. Refer to <u>BR-18. "Inspection and Adjustment"</u> 2. Check the continuity between stop lamp switch terminals under the following conditions. <u>Terminals</u> <u>Condition</u> <u>Continuity</u> <u>1 and 2</u> <u>Brake pedal</u> <u>Fully released Not existed</u> <u>Siightly depressed Existed</u> <u>Is the inspection result normal?</u> YES _> INSPECTION END				:h		
1. CHECK STOP LAMP SWITCH-I 1. Turn ignition switch OFF. 2. Disconnect stop lamp switch harness connector. 3. Check the continuity between stop lamp switch terminals under the following conditions. Terminals Condition Condition Continuity 1 and 2 Brake pedal Fully released Not existed Slightly depressed Existed Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2. CHECK STOP LAMP SWITCH-II 1. Adjust stop lamp switch installation. Refer to BR-18. "Inspection and Adjustment" 2. Check the continuity between stop lamp switch terminals under the following conditions. Terminals Condition Continuity 1 and 2 Brake pedal Fully released Not existed Slightly depressed Existed Slightly depressed Existed Ising to perform result normal? Slightly depressed YES >> INSPECTION END		•				
1. Turn ignition switch OFF. 2. Disconnect stop lamp switch harness connector. 3. Check the continuity between stop lamp switch terminals under the following conditions. Terminals Condition 1 and 2 Brake pedal Fully released Not existed Slightly depressed Existed Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2.CHECK STOP LAMP SWITCH-II 1. Adjust stop lamp switch installation. Refer to <u>BR-18. "Inspection and Adjustment"</u> 2. Check the continuity between stop lamp switch terminals under the following conditions. Terminals Condition 1 and 2 Brake pedal Fully released Not existed 1 and 2 Brake pedal Fully released Not existed Slightly depressed Existed Is the inspection result normal? YES >> INSPECTION END	Jompond				1)	INFOID:000000001179822
 2. Disconnect stop lamp switch harness connector. 3. Check the continuity between stop lamp switch terminals under the following conditions. Terminals Condition Continuity 1 and 2 Brake pedal Fully released Not existed Stightly depressed Existed S the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. 2. CHECK STOP LAMP SWITCH-II 1. Adjust stop lamp switch installation. Refer to <u>BR-18. "Inspection and Adjustment"</u> 2. Check the continuity between stop lamp switch terminals under the following conditions. Terminals Condition Continuity 1 and 2 Brake pedal Fully released Not existed Sightly depressed Existed 1 and 2 Brake pedal Fully released Not existed Sightly depressed Existed	1.CHECK	STOP LAM	P SWITCH-I			
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P1574 ASCD VEHICLE SPEED SENSOR

Description

The ECM receives two vehicle speed sensor signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to <u>ECH-48, "System Description"</u> for ASCD functions.

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1574 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to <u>ECH-439, "DTC Logic"</u>.
- If DTC P1574 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to <u>ECH-440, "DTC Logic"</u>.
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>ECH-482, "DTC Logic"</u>

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	 Harness or connectors (The CAN communication line is open or shorted.) (Combination meter circuit is open or shorted.) Combination meter ABS actuator and electric unit (control unit) Wheel sensor ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine.
- 2. Drive the vehicle at more than 40 km/h (25 MPH).
 - CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

3. Check DTC.

Is DTC detected?

- YES >> Go to ECH-520, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179825

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

Refer to <u>BRC-57, "DTC No. Index"</u>.

Is the inspection result normal?

- YES >> GO TO 2. NO >> Repair or rep
- NO >> Repair or replace.

2. CHECK COMBINATION METER

ECH-520

INFOID:000000001179823

INFOID:000000001179824

P1574 ASCD VEHICLE SPEED SENSOR

< COMPONENT DIAGNOSIS >

Check combination meter function. Refer to <u>MWI-27, "CONSULT-III Function (METER/M&A)"</u>.

>> INSPECTION END

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P1706 PNP SWITCH

Description

When the shift lever position is in the neutral position, ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

INFOID:000000001179827

INFOID:000000001179826

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	 Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.] Park/neutral position (PNP) switch

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 3.

3.CHECK PNP SWITCH FUNCTION

With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-III. Then check the "P/N POSI SW" signal under the following conditions.

Position (Shift lever)	Known-good signal
Neutral position	ON
Except above position	OFF

Is the inspection result normal?

YES >> GO TO 4.

NO >> Go to ECH-523, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Maintain the following conditions for at least 50 consecutive seconds. CAUTION:

Always drive vehicle at a safe speed.

ENG SPEED	1,925 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2.5 - 31.8 msec

P1706 PNP SWITCH

< COMPON	IENT DIAGNO	SIS >		••••••	[HR16DE (V	VITHOUT EURO-OBD)]
VHCL SPEED) SE	More tha	n 64 km/h (40	mph)		
Shift lever		Suitable	position			
<u>Is 1st trip DT</u>	st trip DTC. <u>C detected?</u> Go to <u>ECH-523</u>	3, "Diagn	osis Proced	<u>ure"</u> .		
_	INSPECTION		TION CHE	СК		
Perform com		n check.	Refer to <u>EC</u>	CH-523, "Compo	onent Function Check	<u><"</u> .
	ent function ch trip DTC might			ion of the park/r	neutral position (PNP)	switch circuit. During this
Is the inspec	ction result norr	mal?				
	INSPECTION Go to <u>ECH-523</u>		neie Procod	uro"		
		-		<u>ule</u> .		
Compone	nt Function	Check				INFOID:000000001179828
1.PERFOR		NT FUNC	TION CHE	СК		
	ition switch ON					
2. Check tl	he voltage betv	veen ECN	/I harness c	connector and g	round.	
	ECM	Ground				
Connector	Terminal	Ground	Co	ondition	Voltage	
ГО	69	Crownd	Chift lover	Neutral position	Approx. 0V	
F8 (PNP switch signal) Ground	Shift lever	Except above	BATTERY VOLTAGE	
	ction result norr					
	INSPECTION Go to ECH-523		osis Proced	ure"		
	Procedure	<u>, Diagri</u>		<u>ure</u> .		
Jiagnosis	FIUCEUUIE					INFOID:000000001179829
1. CHECK F	PNP SWITCH F	POWER	SUPPLY CI	RCUIT		
	ition switch OF		(5) := `			
	ect Park/neutra		n (PNP) swi	tch harness cor	nnector.	
			switch har	ness connector	and ground.	
PNP s	Gr	ound	Voltage			
Connector F46	Terminal 2 Gr	ound Bat	tery voltage			
	ztion result norr		lory voltage			
	GO TO 3.	<u></u>				
NO >>	GO TO 2.					
2.DETECT	MALFUNCTIC	NING PA	RT			
Check the fo						
	onnectors E6, l		neutral no	sition switch an	d IPDM F/R	

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

 $\mathbf{3.}$ Check PNP switch input signal circuit for open and short

P1706 PNP SWITCH

< COMPONENT DIAGNOSIS >

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between PNP switch harness connector and ECM harness connector.

PNP	PNP switch EC		CM	Continuity
Connector	Terminal	Connector Terminal		Continuity
F46	3	F8	69	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 PNP SWITCH

Refer to TM-13, "PARK/NEUTRAL POSITION (PNP) SWITCH : Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace PNP switch.

5. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P1805 BRAKE SWITCH

Description

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

DTC Logic

INFOID:000000001179831

INFOID:000000001179830

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	C
P1805	Brake switch	A brake switch signal is not sent to ECM for ex- tremely long time while the vehicle is driving.	 Harness or connectors (Stop lamp switch circuit is open or short- ed.) Stop lamp switch 	E
DTC CON	FIRMATION PROC	EDURE		_
1.PERFO	RM DTC CONFIRMA	TION PROCEDURE		F
1.Turn ig2.Fully d3.Erase4.CheckIs 1st trip DYES>>	nition switch ON. epress the brake ped the DTC with CONSL 1st trip DTC. <u>DTC detected?</u> S Go to <u>ECH-525, "Di</u> a	al for at least 5 seconds. ILT-III.		C F
	NSPECTION END			
Diagnosi	s Procedure		INFOID:000000001179832	I
1. CHECK	STOP LAMP SWITC	H CIRCUIT		
	nition switch OFF.			J
2. Check	the stop lamp when o	lepressing and releasing the brake peda	l.	
Brake pe	dal Stop lamp			k
Fully relea				
Slightly dep	ressed Illuminated			L
ls 1st trip D	TC detected?			
	> GO TO 4. > GO TO 2.			Ν
•		H POWER SUPPLY CIRCUIT		IV
	nition switch OFF.			
2. Discon	nect stop lamp switch			Ν
3. Check	the voltage between	stop lamp switch harness connector and	ground.	
Stop lam	n switch			C
Connector	Terminal	Voltage		
E114		ttery voltage		F
Is the inspe	ection result normal?			
	• GO TO 4.			
•	GO TO 3.			
J.DETEC	T MALFUNCTIONING	5 PAR [

Check the following.

• Harness connectors E105, M77

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P1805 BRAKE SWITCH

< COMPONENT DIAGNOSIS >

- 10A fuse (No. 11)
- Harness for open or short between stop lamp switch and battery

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

4.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

2. Check the continuity between ECM harness connector and stop lamp switch harness connector.

EC	ECM Stop lamp switch		Continuity	
Connector	Terminal	Connector Terminal		Continuity
E16	99	E114	2	Existed

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

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK STOP LAMP SWITCH

Refer to ECH-526, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace stop lamp switch.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-39. "Intermittent Incident".

>> INSPECTION END

Component Inspection (Stop Lamp Switch)

INFOID:000000001179833

1.CHECK STOP LAMP SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	Brake pedal	Fully released	Not existed
i allu z	Diake peual	Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

- Adjust stop lamp switch installation. Refer to <u>BR-18</u>, "Inspection and Adjustment"(LHD) or <u>BR-65</u>, <u>"Inspection and Adjustment"(LHD)</u>.
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	C	Continuity	
1 and 2	Brake pedal	Fully released	Not existed
T and Z		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END

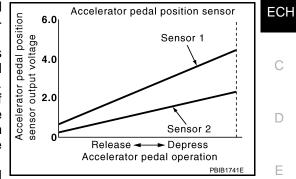
NO >> Replace stop lamp switch.

P2122, P2123 APP SENSOR

Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM PBB1741E receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2122 or P2123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-508, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause	
P2122	Accelerator pedal posi- tion sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	 Harness or connectors (APP sensor 1 circuit is open or shorted.) 	I
P2123	Accelerator pedal posi- tion sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	 Accelerator pedal position sensor (APP sensor 1) 	,

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.	
2. PERFORM DTC CONFIRMATION PROCEDURE	NI
 Start engine and let it idle for 1 second. Check DTC. 	N
Is DTC detected?	\cap
YES >> Go to <u>ECH-527, "Diagnosis Procedure"</u> . NO >> INSPECTION END	0
Diagnosis Procedure	; P
1.CHECK GROUND CONNECTION	
1. Turn ignition switch OFF.	

Check ground connection E21. Refer to Ground Inspection in <u>GI-41, "Circuit Inspection"</u>.

Is the inspection result normal?

YES >> GO TO 2.

[HR16DE (WITHOUT EURO-OBD)]

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P2122, P2123 APP SENSOR

< COMPONENT DIAGNOSIS >

NO >> Repair or replace ground connection.

2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.

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

APP se	ensor	Ground	Voltage
Connector	Terminal	Cround	voltage
E110	E110 4		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 APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP s	APP sensor		М	Continuity
Connector	Terminal	Connector	Terminal	Continuity
E110	2	E16	111	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 APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

APP sensor		EC	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E110	3	E16	110	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 APP SENSOR

Refer to ECH-529, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.

2. Go to ECH-529. "Special Repair Requirement".

>> INSPECTION END

I.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P2122, P2123 APP SENSOR [HR16DE (WITHOUT EURO-OBD)]

< COMPONENT DIAGNOSIS >

Component Inspection

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1.CHECK ACCELERATOR PEDAL POSITION SENSOR

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

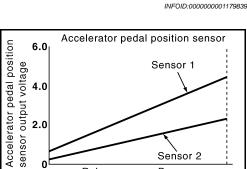
	ECM						С
Connector	Terminal	Ground	Conc	lition	Voltage		
	110			Fully released	0.6 - 0.9V		D
-	(APP sensor 1 signal)	a		Fully depressed	3.9 - 4.7V		D
E16	103	Ground	Accelerator pedal	Fully released	0.3 - 0.6V		
	(APP sensor 2 signal)			Fully depressed	1.95 - 2.4V		Е
YES > NO >	ection result normal > INSPECTION EN > GO TO 2. CE ACCELERATOR	D	L ASSEMBLY				F
	ce accelerator peda ECH-529. "Special						G
>	> INSPECTION EN	D					Н
Special Repair Requirement							
	ORM ACCELERATO						Ι
Refer to <u>E</u> ment".	<u>CH-357, "ACCELE</u>	RAIOR	PEDAL RELEA	SED POSITIOI	<u>N LEARNI</u>	NG : Special Repair Require-	
>	> GO TO 2.						J
	ORM THROTTLE VA						K
Refer to E	<u>CH-358, "THROTTL</u>	<u>E VALV</u>	E CLOSED POS	SITION LEARN	ING : Spec	ial Repair Requirement".	
>	> GO TO 3.						L
•	ORM IDLE AIR VOLU	JME LE	ARNING				
	Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".						M
					·		
>	> END						Ν
							0

P2127, P2128 APP SENSOR

Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Release -

Accelerator pedal operation

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

DTC Logic

INFOID:000000001179840

Depress

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127	Accelerator pedal posi- tion sensor 2 circuit low input	An excessively low voltage from the APP sen- sor 2 is sent to ECM.	Harness or connectors (APP sensor 2 circuit is open or shorted.) [Crankshaft position sensor (POS) circuit
P2128	Accelerator pedal posi- tion sensor 2 circuit high input	An excessively high voltage from the APP sen- sor 2 is sent to ECM.	 is shorted.] (Refrigerant pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 2) Crankshaft position sensor (POS) Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

YES >> Go to ECH-530, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

INFOID:000000001179841

P2127, P2128 APP SENSOR

[HR16DE	(WITHOUT	EURO-OBD)]
---------	----------	------------

2. Turn ig	nition sw	elerator pedal po itch ON. ge between APP	-				
ΔΡΕ	o sensor			-			-
Connector	Termir	Ground	Voltage				
E110	5	Ground	Approx. 5V	_			
YES >> NO >>	> GO TO > GO TO	3.					
		NSOR 2 POWER	RSUPPLY		I		
	Inition sw Inect ECN	A harness conne	ctor.				
. Check	the conti	nuity between Al	PP sensor h	arness co	nnector	and ECM harness connector.	
ΔΡΕ	sensor	E	СМ				
Connector	Termir		Terminal	- Continui	ity		
F 4 4 5							
E110	5	E16	102	Existed	<u>, t</u>		
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2. Disconnect ECM harness connector.

< COMPONENT DIAGNOSIS >

3. Check the continuity between APP sensor harness connector and ECM harness connector.

P2127, P2128 APP SENSOR

< COMPONENT DIAGNOSIS >

APP	sensor	E	ECM	
Connector	Terminal	Connector	Terminal	Continuity
E110	1	E16	104	Existed

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

Is the inspection result normal?

YES >> GO TO 7.

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

I.CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

APP	sensor	E	ECM		
Connector	Terminal	Connector	Terminal	Continuity	
E110	6	E16	103	Existed	

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

Is the inspection result normal?

YES >> GO TO 8.

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

8.CHECK APP SENSOR

Refer to ECH-532, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 9.

9.replace accelerator pedal assembly

1. Replace accelerator pedal assembly.

2. Go to ECH-533, "Special Repair Requirement".

>> INSPECTION END

10. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.

2. Turn ignition switch ON.

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

ECM		Ground	Condition		Voltage	
Connector	Terminal	Giouna	Cond		voliage	
	110			Fully released	0.6 - 0.9V	
E16	(APP sensor 1 signal)	Ground	A l	Fully depressed	3.9 - 4.7V	
EIU	103	Ground	Accelerator pedal	Fully released	0.3 - 0.6V	
	(APP sensor 2 signal)			Fully depressed	1.95 - 2.4V	

Is the inspection result normal?

YES >> INSPECTION END

ECH-532

INFOID:000000001179842

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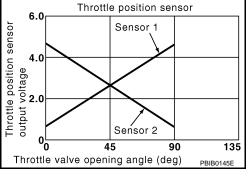
<pre>< COMPONENT DIAGNOSIS > [HR16DE (WITHOUT EURO-OBD)]</pre>	
NO >> GO TO 2.	
2.REPLACE ACCELERATOR PEDAL ASSEMBLY	А
 Replace accelerator pedal assembly. Go to <u>ECH-533, "Special Repair Requirement"</u>. 	ECH
>> INSPECTION END	
Special Repair Requirement	С
1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING	
Refer to ECH-357. "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Require- ment".	D
>> GO TO 2. 2. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING	E
Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".	F
>> GO TO 3. 3. PERFORM IDLE AIR VOLUME LEARNING	G
Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".	
>> END	Н
>> END	
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P2135 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2135 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-250, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2135	Throttle position sensor circuit range/perfor- mance	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	 Harness or connector (TP sensor 1 and 2 circuit is open or shorted.) Electric throttle control actuator (TP 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 10 seconds before conducting the next test.

TESTING CONDITION:

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

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.
- Is DTC detected?
- YES >> Go to ECH-534, "Diagnosis Procedure".
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000001179846

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection E21. 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 THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.

ECH-534

INFOID:000000001179844

INFOID:000000001179845

P2135 TP SENSOR

< COMPONENT DIAGNOSIS >

- 2.
- Turn ignition switch ON. Check the voltage between electric throttle control actuator harness connector and ground. 3.

Electric throttle	control actuator		N/ 14				
Connector	Terminal	Ground	Voltag	e			
F29	1	Ground	Approx.	5V			
the inspecti	on result norn	nal?					
	O TO 4.						
	O TO 3.	_		-			
			SENSC	or powe	ER SUPPLY C	SIRCUIT-II	
	on switch OF		aatar				
	ct ECM harne continuity be			hrottle cc	ntrol actuator	harness connector ar	nd around.
	,						0
Electric throttle	control actuator		ECM		Continuity		
Connector	Terminal	Connec	ctor 7	Ferminal	Continuity		
F29	1	F8		72	Existed		
•	<u>on result norr</u>	nal?					
	O TO 4.	ouit					
	epair open cir		05100				
.CHECK IF	IROTTLE PO	SHION	SENSO	R GROU	IND CIRCUIT	FOR OPEN AND SH	IORI
Turn ignit	on switch OF		octor				
. Turn ignit . Disconne	ct ECM harne	ss conne		hrottle cc	entrol actuator	harness connector ar	nd ground.
. Turn ignit . Disconne	ct ECM harne	ss conne		hrottle cc	ntrol actuator	harness connector ar	nd ground.
. Turn ignit Disconne . Check the	ct ECM harne	ss conne		hrottle cc		harness connector ar	nd ground.
Turn ignit Disconne Check the	ct ECM harne continuity be	ss conne	ECM	hrottle cc	ntrol actuator	harness connector ar	nd ground.
Turn ignit Disconne Check the	ct ECM harne continuity be control actuator	ess conne etween e	ECM			harness connector ar	nd ground.
Turn ignit Disconne Check the Electric throttle Connector F29 Also chec	ct ECM harne continuity be control actuator Terminal 4 k harness for	SS CONNE etween e Conne F8 short to	ECM	Terminal 36	Continuity Existed	harness connector ar	nd ground.
Turn ignit Disconne Check the Electric throttle Connector F29 Also chec the inspecti	ct ECM harne continuity be control actuator Terminal 4 k harness for on result norm	SS CONNE etween e Conne F8 short to	ECM	Terminal 36	Continuity Existed	harness connector ar	nd ground.
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Turn ignit Disconne Check the Electric throttle Connector F29 Also chec the inspecti (ES >> G NO >> R	ct ECM harne continuity be control actuator Terminal 4 k harness for on result norm O TO 5. epair open cir	Conne Conne F8 Short to nal?	ECM ECM ground	Terminal 36 and sho ground oi	Continuity Existed rt to power.	er in harness or conne	ectors.
Turn ignit Disconne Check the Electric throttle Connector F29 Also chec the inspecti (ES >> G NO >> R .CHECK Th	ct ECM harne continuity be control actuator Terminal 4 k harness for on result norm O TO 5. epair open cir IROTTLE PO	Conne Conne F8 Short to nal? SITION	ECM ECM ground hort to g	Terminal 36 and sho ground oi 0R INPUT	Continuity Existed rt to power.	er in harness or conne RCUIT FOR OPEN AN	ectors. ND SHORT
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Turn ignit Disconne Check the Electric throttle Connector F29 Also chece the inspecti YES >> G NO >> R CHECK TH Check the Electric throttle Connector F29	ct ECM harne continuity be control actuator Terminal 4 k harness for O TO 5. epair open cir IROTTLE PO continuity be control actuator Terminal 2 3	SS Conne Conne F8 Short to nal? Cuit or sl SITION etween e	ECM ECM ECTOR B B B B B B B B B B B B B B B B B B B	Terminal 36 and sho ground of PR INPUT hrottle co A Terminal 33 34	Continuity Existed rt to power. Short to power SIGNAL CIR ontrol actuator Continuity Existed	er in harness or conne RCUIT FOR OPEN AN	ectors. ND SHORT
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Is the inspection result normal?

>> GO TO 8. YES NO >> GO TO 7.

_	-	-	-	_	-	-	 	-

А

7.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace electric throttle control actuator.
- 2. ECH-536, "Special Repair Requirement"

>> INSPECTION END

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Perform ECH-536, "Special Repair Requirement".
- 4. Turn ignition switch ON.
- 5. Set shift lever to 1st position.
- 6. Check the voltage between ECM harness connector and ground.

ECM		Ground	Cond	lition	Voltage	
Connector	Terminal	Ground	Condition		voltage	
	33			Fully released	More than 0.36V	
F8	(TP sensor 1 signal)	Ground		Fully depressed	Less than 4.75V	
10	34	Ground		Fully released	Less than 4.75V	
	(TP sensor 2 signal)			Fully depressed	More than 0.36V	

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to ECH-536, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000001179848

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

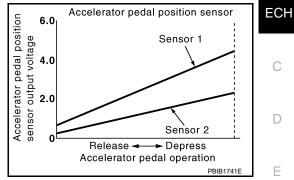
ECH-536

INFOID:000000001179847

Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2138 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to <u>ECH-250, "DTC Logic"</u>.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138	Accelerator pedal posi- tion sensor circuit range/ performance	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	 Harness or connector (APP sensor 1 and 2 circuit is open or shorted.) [Crankshaft position sensor (POS) circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 1 and 2) Crankshaft position sensor (POS) Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test. **TESTING CONDITION:**

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

>> GO TO 2.

 2.PERFORM DTC CONFIRMATION PROCEDURE
 0

 1. Start engine and let it idle for 1 second.
 0

 2. Check DTC.
 1

 Is DTC detected?
 P

 YES
 >> Go to ECH-537, "Diagnosis Procedure".

 NO
 >> INSPECTION END

 Diagnosis Procedure
 INFOID.00000001179861

 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

[HR16DE (WITHOUT EURO-OBD)]

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INFOID:000000001179849

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< COMPONENT DIAGNOSIS >

2. Check ground connection E21. 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 APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.

2. Turn ignition switch ON.

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

APP	sensor	Ground	Voltage	
Connector	Terminal	Oround	voltage	
E110	4	Ground	Approx. 5V	

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.

2. Check the voltage between APP sensor harness connector and ground.

APP :	sensor	Ground	Voltage	
Connector	Terminal	Oround	voltage	
E110	5	Ground	Approx. 5V	

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 4.

4.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

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

3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP	sensor	E	Continuity	
Connector	Terminal	Connector	Terminal	Continuity
E110	5	E16	102	Existed

Is the inspection result normal?

YES >> GO TO 5.

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

5.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-III

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

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F8	74	Refrigerant pressure sensor	E49	3
10	75	CKP sensor (POS)	F20	1
E16	102	APP sensor	E110	5

Is the inspection result normal?

YES >> GO TO 6.

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

O.CHECK COMPONENTS

< COMPONENT DIAGNOSIS >

Charletter fo	مالمي بينايم مر					
	t position se				nponent Inspection".)	А
-	-		to <u>HAC-70.</u>	"Componen	it Inspection".)	
Is the inspect YES >>	GO TO 11.	<u>onnai :</u>				ECH
<u>NO</u> >>	Replace ma	lfunctioning of	-			
/ .CHECK /	APP SENSO	R GROUND	CIRCUIT F	OR OPEN A	AND SHORT	C
2. Disconr		rness conne		arness conne	ector and ECM harness connector as follows.	D
APP	sensor	EC	CM		-	
Connector	Terminal	Connector	Terminal	Continuity		Е
E110	1	E16	104	Existed	-	
4 Ale e ele	2	f	111		-	_
	eck namess	-	round and s	short to powe	er.	F
YES >>	GO TO 8.					
^	•		•	•	power in harness or connectors.	G
					PEN AND SHORT	
1. Check t	ne continuity	between AF	P sensor n	arness conno	ector and ECM harness connector as follows.	Η
APP	sensor	EC	CM		-	
Connector	Terminal	Connector	Terminal	Continuity	_	
Connector E110	3	Connector E16	110	Existed	-	I
E110	3 6	E16	110 103	- Existed	- -	l J
E110 2. Also che	3 6	E16 for short to g	110 103		- - er.	l J
E110 2. Also che ls the inspec YES >>	3 6 eck harness ction result n GO TO 9.	E16 for short to g ormal?	110 103 pround and s	Existed		I J K
E110 2. Also cho <u>Is the inspec</u> YES >> NO >>	3 6 eck harness <u>ction result n</u> GO TO 9. Repair open	E16 for short to g ormal? circuit or sh	110 103 pround and s	Existed	- er. bower in harness or connectors.	
E110 2. Also cho <u>Is the inspec</u> YES >> NO >> 9. CHECK A	3 6 eck harness <u>ction result n</u> GO TO 9. Repair open APP SENSO	E16 for short to g ormal? circuit or sh R	110 103 Iround and s	Existed		-
E110 2. Also che Is the inspec YES >> NO >> 9.CHECK / Refer to EC	3 6 eck harness <u>ction result n</u> GO TO 9. Repair open APP SENSO	E16 for short to g ormal? circuit or sh R ponent Insp	110 103 Iround and s	Existed		
E110 2. Also che Is the inspec YES >> NO >> 9.CHECK Refer to EC Is the inspec YES >>	3 6 eck harness <u>ction result n</u> GO TO 9. Repair open APP SENSO H-539. "Com ction result n GO TO 11.	E16 for short to g ormal? circuit or sh R ponent Insp	110 103 Iround and s	Existed		K
E110 2. Also che Is the inspec YES >> NO >> 9.CHECK / Refer to EC Is the inspec YES >> NO >>	3 6 eck harness ction result n GO TO 9. Repair open APP SENSO H-539. "Com ction result n GO TO 11. GO TO 10.	E16 for short to g ormal? circuit or sh R ponent Insp ormal?	110 103 fround and s ort to groun ection".	Existed		
E110 2. Also che Is the inspec YES >> NO >> 9.CHECK / Refer to EC Is the inspec YES >> NO >> 10.REPLA	3 6 eck harness ction result n GO TO 9. Repair open APP SENSO H-539, "Com ction result n GO TO 11. GO TO 10. ACE ACCELE	E16 for short to g ormal? circuit or sh R ponent Insp ormal? ERATOR PE	110 103 pround and s ort to groun ection".	Existed		K L M
E110 2. Also che Is the inspec YES >> NO >> 9.CHECK / Refer to EC Is the inspec YES >> NO >> 10.REPLA 1. Replace	3 6 eck harness ction result n GO TO 9. Repair open APP SENSO H-539. "Com ction result n GO TO 11. GO TO 11. GO TO 10. ACE ACCELE	E16 for short to g ormal? circuit or sh R ponent Insp ormal?	110 103 round and s ort to groun ection". DAL ASSEM	Existed short to powe		K
E110 2. Also che Is the inspect YES >> NO >> 9.CHECK / Refer to EC Is the inspect YES >> NO >> 10.REPLA 1. Replace 2. Go to E	3 6 eck harness ction result n GO TO 9. Repair open APP SENSO H-539. "Com ction result n GO TO 11. GO TO 11. GO TO 10. ACE ACCELE accelerator CH-540. "Sp	E16 for short to g ormal? circuit or sh R ponent Insp ormal? ERATOR PE pedal asser ecial Repair	110 103 round and s ort to groun ection". DAL ASSEM	Existed short to powe		K L M
E110 2. Also che Is the inspec YES >> NO >> 9.CHECK / Refer to EC Is the inspec YES >> NO >> 10.REPLA 1. Replace 2. Go to E >>	3 6 eck harness ction result n GO TO 9. Repair open APP SENSO H-539. "Com ction result n GO TO 11. GO TO 11. GO TO 11. GO TO 11. GO TO 10. ACE ACCELE accelerator CH-540. "Sp INSPECTIO	E16 for short to g ormal? circuit or sh r ponent Insp ormal? ERATOR PE pedal asser ecial Repair N END	110 103 pround and s ort to ground ection".	Existed short to powe		K L M
E110 2. Also che Is the inspec YES >> NO >> 9.CHECK / Refer to EC Is the inspec YES >> NO >> 10.REPL/ 1. Replace 2. Go to E >> 11.CHECK	3 6 eck harness <u>ction result n</u> GO TO 9. Repair open APP SENSO H-539. "Com ction result n GO TO 11. GO TO 11. GO TO 11. GO TO 10. ACE ACCELE accelerator CH-540. "Sp INSPECTIO (INTERMIT	E16 for short to g ormal? circuit or sh r ponent Insp ormal? ERATOR PE pedal asser ecial Repair N END TENT INCID	110 103 pround and s ort to ground ection". DAL ASSEM nbly. Requirement ENT	Existed short to powe		K L M
E110 2. Also che Is the inspec YES >> NO >> 9.CHECK / Refer to EC Is the inspec YES >> NO >> 10.REPL/ 1. Replace 2. Go to E >> 11.CHECK	3 6 eck harness <u>ction result n</u> GO TO 9. Repair open APP SENSO H-539. "Com ction result n GO TO 11. GO TO 11. GO TO 11. GO TO 10. ACE ACCELE accelerator CH-540. "Sp INSPECTIO (INTERMIT	E16 for short to g ormal? circuit or sh r ponent Insp ormal? ERATOR PE pedal asser ecial Repair N END	110 103 pround and s ort to ground ection". DAL ASSEM nbly. Requirement ENT	Existed short to powe		K L M
E110 2. Also che Is the inspec YES >> 9. CHECK / Refer to EC Is the inspec YES >> NO >> 10. REPLA 1. Replace 2. Go to E >> 11. CHECK Refer to GI-	3 6 eck harness <u>ction result n</u> GO TO 9. Repair open APP SENSO H-539. "Com ction result n GO TO 11. GO TO 11. GO TO 11. GO TO 10. ACE ACCELE accelerator CH-540. "Sp INSPECTIO (INTERMIT	E16 for short to g ormal? circuit or short recircuit or short recircui	110 103 pround and s ort to ground ection". DAL ASSEM nbly. Requirement ENT	Existed short to powe		K L M N
E110 2. Also che Is the inspec YES >> 9. CHECK / Refer to EC Is the inspec YES >> NO >> 10. REPLA 1. Replace 2. Go to E >> 11. CHECK Refer to GI-	3 6 eck harness ction result n GO TO 9. Repair open APP SENSO H-539, "Com ction result n GO TO 11. GO TO 11. GO TO 11. GO TO 10. ACE ACCELI accelerator CH-540, "Sp INSPECTIO (INTERMIT 39, "Intermitt	E16 for short to g ormal? circuit or sh R ponent Insp ormal? ERATOR PE pedal asser ecial Repair N END TENT INCID cent Incident' N END	110 103 pround and s ort to ground ection". DAL ASSEM nbly. Requirement ENT	Existed short to powe		K L M N
E110 2. Also che Is the inspect YES >> NO >> 9.CHECK / Refer to EC Is the inspect YES >> NO >> 10.REPL/ 1. Replace 2. Go to E >> 11.CHECK Refer to GI- >>	3 6 eck harness ction result n GO TO 9. Repair open APP SENSO H-539, "Com ction result n GO TO 11. GO TO 11. GO TO 11. GO TO 11. GO TO 10. ACE ACCELI accelerator CH-540, "Sp INSPECTIO (INTERMIT 39, "Intermitt INSPECTIO ent Inspect	E16 for short to g ormal? circuit or sh R ponent Insp ormal? ERATOR PE pedal asser ecial Repair N END TENT INCID cent Incident' N END	110 103 round and s ort to groun ection". DAL ASSEM nbly. Requirement ENT	Existed short to powe d or shot to p MBLY <u>ht"</u> .	bower in harness or connectors.	K L M N
E110 2. Also che Is the inspect YES >> NO >> 9.CHECK / Refer to EC Is the inspect YES >> NO >> 10.REPLA 1. Replace 2. Go to E 11.CHECK Refer to GI- >> Compone 1.CHECK /	3 6 eck harness ction result n GO TO 9. Repair open APP SENSO H-539. "Com ction result n GO TO 11. GO TO 11. GO TO 11. GO TO 11. GO TO 10. ACE ACCELE accelerator CH-540. "Sp INSPECTIO (INTERMIT 39. "Intermitt INSPECTIO ent Inspec ACCELERAT	E16 for short to g ormal? circuit or short ponent Insp ormal? ERATOR PE pedal asser ecial Repair N END TENT INCID rent Incident' N END tent Incident	110 103 round and s ort to groun ection". DAL ASSEM nbly. Requiremen ENT	Existed short to powe d or shot to p MBLY <u>nt"</u> .	bower in harness or connectors.	K L M N

< COMPONENT DIAGNOSIS >

2. Turn ignition switch ON.

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

ECM		Ground	Condition		Voltage
Connector	Terminal				voltage
E110	110 (APP sensor 1 signal)	Ground	Accelerator pedal	Fully released	0.6 - 0.9V
				Fully depressed	3.9 - 4.7V
	103 (APP sensor 2 signal)			Fully released	0.3 - 0.6V
				Fully depressed	1.95 - 2.4V

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.

2. Go to ECH-540, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:000000001179853

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-357. "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

ASCD BRAKE SWITCH А Description INFOID:000000001179854 When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECH ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal). Refer to ECH-387, "System Description" for the ASCD function. **Component Function Check** INFOID:000000001179855 CHECK FOR ASCD BRAKE SWITCH FUNCTION D With CONSULT-III Turn ignition switch ON. 1. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III. 2. 3. Check "BRAKE SW1" indication under the following conditions. Е Monitor item Condition Indication F OFF Slightly depressed **BRAKE SW1** Brake pedal and clutch pedal Fully released ON **Without CONSULT-III** 1. Turn ignition switch ON. 2. Check the voltage between ECM harness connector and ground. н Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 2. Ρ 2.check ascd brake switch power supply circuit - II Turn ignition switch OFF. 1.

Disconnect ASCD clutch switch harness connector. 2.

3. Turn ignition switch ON.

< COMPONENT DIAGNOSIS >

Check the voltage between ASCD clutch switch harness connector and ground. 4.

	ECM	Grour	od Conditi	Condition		
Connector	Terminal	Gioui	Condition		Voltage	
E16	100	., Grour	nd Brake pedal and clutch pedal	Slightly depressed	Approx. 0V	
LIU	(ASCD brake switch sig	gnal)	Diake pedal and cluten pedal	Fully released	Battery voltage	
Is the insp	ection result normal	?				
	> INSPECTION EN					
NO >:	> Go to <u>ECH-541, "I</u>	Diagnosis	Procedure".			
Diagnos	is Procedure				INFOID:0000000011798	6
1. CHECK	ASCD BRAKE SW	ITCH CIR	CUIT - I			
1. Turn iç	nition switch OFF.					
1. Turn iç 2. Discor	nition switch OFF.					
1. Turn iç 2. Discor 3. Turn iç	nition switch OFF. nect ASCD brake s nition switch ON.	witch harn		or and ground.		
1. Turn iç 2. Discor 3. Turn iç	nition switch OFF. nect ASCD brake s nition switch ON.	witch harn	less connector.	or and ground.		
1. Turn iç 2. Discor 3. Turn iç 4. Check	gnition switch OFF. Inect ASCD brake s gnition switch ON. the voltage betwee	witch harn n ASCD b	ness connector. rake switch harness connect	or and ground.		
1. Turn iç 2. Discor 3. Turn iç 4. Check	gnition switch OFF. Innect ASCD brake s gnition switch ON. the voltage betwee	witch harn n ASCD b	less connector.	or and ground.		

ASCD BRAKE SWITCH

ASCD clu	itch switch	Ground		
Connector	Terminal		Voltage (V)	
E111	1	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

Harness or connectors E105, M77

• 10A fuse (No. 4)

Harness for open or short between ASCD brake switch and fuse

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

4.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.

2. Check the continuity between ASCD brake switch harness connector and ASCD clutch switch harness connector.

ASCD bra	ake switch	ASCD clutch switch		Continuity
Connector	Terminal	Connector Terminal		Continuity
E112	1	E111	2	Existed

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

Is the inspection result normal?

YES >> GO TO 5.

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

CHECK ASCD CLUTCH SWITCH

Refer to ECH-543, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace ASCD clutch switch.

6.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector

3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

ASCD bra	ake switch	E	Continuity	
Connector	Terminal	Connector Terminal		Continuity
E112	2	E16	100	Existed

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

Is the inspection result normal?

YES >> GO TO 7.

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

I.CHECK ASCD BRAKE SWITCH

Refer to ECH-543, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace ASCD brake switch.

ASCD BRAKE SWITCH

< COMPON	ENT DIAGN	OSIS >		[HR16DE (WITHOUT EURO-OBD)]
8.CHECK II	NTERMITTEN	NT INCIDENT		
Refer to GI-3	<u>39, "Intermitte</u>	nt Incident".		
1	INSPECTION			
		on (ASCD E	eraka Swit	rch)
	•			INFOID:000000001179857
	SCD BRAKE			
	ition switch O ect ASCD bra	FF. Ike switch harn	ess connecto	or.
Check th	ne continuity b	between ASCD	brake switch	n terminals under the following conditions.
Terminals	Cond	lition	Continuity	
	Fu	lly released	Existed	
and 2 E	Brake pedal Sli	ghtly depressed	Not existed	
the inspec	tion result no	rmal?		
	INSPECTION GO TO 2.	END		
-	GO TO 2. ASCD BRAKE			
			ion Pofor t	o <u>BR-17, "Removal and Installation"</u> (LHD) or <u>BR-64,</u>
	al and Installa			$D = \frac{D - 17}{D - 17}$, Removal and installation (LID) of $\frac{D - 04}{D - 04}$.
			brake switch	n terminals under the following conditions.
Terminolo	Can	dition	Continuity	
Terminals		dition	Continuity	
1 and 2	Brake pedal	ully released lightly depressed	Not existed	
the inspec	tion result no			
	INSPECTION			
NO >> I	Replace ASC	D brake switch		
ompone	nt Inspection	on (ASCD C	lutch Swi	tch) INFOID:00000001179858
-CHECK A	ASCD CLUTC	H SWITCH-I		
	ition switch O			
		tch switch harn	ess connect	or.
. Check th	ne continuity b	between ASCD	clutch switcl	h terminals under the following conditions.
Terminals	C	ondition	Continuity	-
		Fully released	Existed	-
1 and 2	Clutch pedal	Slightly depresse	d Not existed	-
the inspec	tion result no	rmal?	1	-
		END		
	GO TO 2.			
	SCD CLUTC			
				CL-9, "Removal and Installation". h terminals under the following conditions.
Terminals	Co	ondition	Continuity	

Terminals	C	Continuity	
1 and 2	Clutch pedal	Fully released	Existed
T and 2	Cluten peda	Slightly depressed	Not existed

Is the inspection result normal? YES >> INSPECTION END

NO >> Replace ASCD clutch switch.

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.

Refer to ECH-387, "System Description" for the ASCD function.

Component Function Check

1.ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CON	DITION	SPECIFICATION
CRUISE LAMP	Ignition switch: ON	• MAIN switch: Pressed at the 1st time →at the 2nd time	$ON\toOFF$
	MAIN switch: ON	ASCD: Operating	ON
SET LAMP	When vehicle speed: Be- tween 40 km/h (25 MPH) and 144 km/h (89 MPH)	ASCD: Not operating	OFF
Is the inspection result nor	mal?		
YES >> INSPECTION NO >> Go to <u>ECH-54</u>	END 5, "Diagnosis Procedure".		
Diagnosis Procedure			INFOID:000000001179861
1.снеск отс			
Check that DTC U1001 is r	not displayed.		
Is the inspection result norr	mal?		
YES >> GO TO 2.			
-	-	Refer to ECH-439. "DTC Log	<u>ic"</u> .
2. CHECK COMBINATION	I METER OPERATION		
Refer to MWI-27, "CONSU	LT-III Function (METER/M&	<u>A)"</u> .	
Is the inspection result norr	mal?		
YES >> GO TO 3.			
•		MWI-49, "Wiring Diagram - N	<u>IETER -"</u> .
3. CHECK INTERMITTEN	T INCIDENT		
Refer to GI-39, "Intermitten	t Incident".		
>> INSPECTION	END		

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[HR16DE (WITHOUT EURO-OBD)]

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INFOID:000000001179859

INFOID:000000001179860

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COOLING FAN

Description

Cooling fan operates at low and high speed when the current flows in the cooling fan motor. Refer to <u>ECH-395, "System Diagram"</u> for cooling fan operation.

Component Function Check

INFOID:000000001179863

INFOID:000000001179862

1. CHECK COOLING FAN LOW SPEED FUNCTION

With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that cooling fan operates at low and high speed.

® Without CONSULT-III

- 1. Perform IPDM E/R auto active test and check cooling fan motor operation, refer to <u>PCS-9</u>, "<u>Diagnosis</u> <u>Description</u>".
- 2. Make sure that cooling fan operates at low and high speed.

Is the inspection result normal?

- YES >> INSPECTION END.
- NO >> Go to ECH-546, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000001179864

1.CHECK IPDM E/R POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect IPDM E/R harness connector E14.
- 3. Check the voltage between IPDM E/R harness connector and ground.

IPDN	IPDM E/R		Voltage
Connector	Terminal	Ground	voltage
E14	53	Ground	Battery voltage

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 COOLING FAN MOTOR CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect cooling fan motor harness connector.
- 3. Check the continuity between cooling fan motor harness connector and IPDM E/R harness connector.

Cooling far	motor	IPDM E/R		Continuity
Connector	Terminal	Connector	Connector Terminal	
E3	1	E14	52	Existed
ES	I	⊑14	54	EXISTED

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

Cooling	Cooling fan motor		IPDM/ER		Continuity
Connector	Terminal	Connector	Terminal	Ground	Continuity
E3	C	E10	5	Ground	Existed
ES	2	EIU	6	Ground	Existed

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

YES >> GO TO 4. NO >> GO TO 3.	А
3. DETECT MALFUNCTIONING PART	Λ
Check the following.	ECH
Resistor E57.Harness for open or short between IPDM E/R and cooling fan.	
 Harness for open or short between cooling fan and ground. 	
 Harness for open or short between IPDM E/R and ground. 	С
>> Repair or replace malfunctioning part.	
4. CHECK GROUND CONNECTION	D
1. Turn ignition switch OFF.	
Check ground connection E21. Refer to Ground Inspection in <u>GI-41, "Circuit Inspection"</u>.	Е
Is the inspection result normal?	
YES >> GO TO 5.	
NO >> Repair or replace ground connection.	F
5. CHECK COOLING FAN MOTOR	
Refer to ECH-547, "Component Inspection (Cooling Fan Motor)".	0
Is the inspection result normal?	G
YES >> GO TO 6.	
NO >> Replace malfunctioning cooling fan motor.	Н
6.CHECK INTERMITTENT INCIDENT	
Refer to GI-39, "Intermittent Incident".	
Is the inspection result normal?	1
YES >> Replace IPDM E/R.	
NO >> Repair or replace harness or connector.	
Component Inspection (Cooling Fan Motor)	J
1. CHECK COOLING FAN MOTOR	
	K
 Turn ignition switch OFF. Disconnect cooling fan motor harness connector E3. 	
3. Supply cooling fan motor terminals with battery voltage and check operation.	
	L
Terminals Operation	
(+) (-) Operation	M
1 2 Cooling fan operates.	
Is the inspection result normal?	
YES >> INSPECTION END	Ν
NO >> Replace cooling fan motor.	
	0
	0

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ELECTRICAL LOAD SIGNAL

< COMPONENT DIAGNOSIS >

ELECTRICAL LOAD SIGNAL

Description

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred through the CAN communication line from BCM to ECM via IPDM E/R.

Component Function Check

INFOID:000000001179867

INFOID:000000001179866

[HR16DE (WITHOUT EURO-OBD)]

$1. \mathsf{CHECK} \ \mathsf{REAR} \ \mathsf{WINDOW} \ \mathsf{DEFOGGER} \ \mathsf{SWITCH} \ \mathsf{FUNCTION}$

- 1. Turn ignition switch ON.
- 2. Connect CONSULT-III and select "DATA MONITOR" mode.
- 3. Select "LOAD SIGNAL" and check indication under the following conditions.

Monitor item	Condition	Indication	
LOAD SIGNAL Rear window defogger switch		ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to ECH-548, "Diagnosis Procedure".

2.CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication under the following conditions.

Monitor item	Condition		Indication
	Lighting switch	ON at 2nd position	ON
LOAD SIGNAL	Lighting switch	OFF	OFF

Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to ECH-548, "Diagnosis Procedure".

3. CHECK HEATER FAN CONTROL SWITCH FUNCTION

Select "HEATER FAN SW" and check indication under the following conditions.

Monitor item	Condition		Indication
HEATER FAN SW	Heater fan control switch	ON	ON
	ricater fair control switch	OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-548, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000001179868

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to <u>ECH-548</u>, "Component Function Check".

Which circuit is related to the incident?

Rear window defogger>>GO TO 2 Headlamp>>GO TO 3.

Heater fan>>GO TO 4.

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to <u>DEF-3</u>, "Work Flow".

ELECTRICAL LOAD SIGNAL

< COMPONENT DIAGNOSIS >	[HR16DE (WITHOUT EURO-OBD)]	
>> INSPECTION END		
3. CHECK HEADLAMP SYSTEM		А
Refer to EXL-7, "Work Flow".		
>> INSPECTION END		ECH
4. CHECK HEATER FAN CONTROL SYSTEM		
Refer to GI-39, "Intermittent Incident".		С
>> INSPECTION END		D
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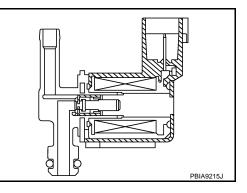
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EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE < COMPONENT DIAGNOSIS > [HR16DE (WITHOUT EURO-OBD)]

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

The EVAP canister purge volume control solenoid valve uses a ON/ OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



Component Function Check

INFOID:000000001179870

INFOID:000000001179869

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE FUNCTION

With CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Disconnect the EVAP purge hose from EVAP canister purge volume control solenoid valve (EVAP canister side).
- 3. Start engine and let it idle.
- 4. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode wit CONSULT-III.
- 5. Touch "Qu" and "Qd" on CONSULT-III screen to adjust "PURG VOL CONT/V" and check vacuum existence under the following conditions.

PURG VOL CONT/V	Vacuum
100%	Existed
0 %	Not existed

Without CONSULT-III

- 1. Turn ignition switch OFF.
- Disconnect the EVAP purge hose from EVAP canister purge volume control solenoid valve (EVAP canister side).
- 3. Start engine and let it idle for at least 100 seconds.
- 4. Check vacuum existence under the following conditions.

Condition	Vacuum	
At idle	Not existed	
About 2,000 rpm	Existed	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-550, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK EVAP CANISTER

Refer to ECH-624, "Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

2.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect EVAP canister purge volume control solenoid valve harness connector.

ECH-550

INFOID:000000001179871

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE [HR16DE (WITHOUT EURO-OBD)]

< COMPONENT DIAGNOSIS >

3. Turn ignition switch ON.

Check the voltage between EVAP canister purge volume control solenoid valve harness connector and 4. А ground.

0	ume control solenoid valve	Ground	Voltage		
Connector	Terminal	Crownd	Dottomu voltore		_
F32	1	Ground	Battery voltage	_	
<u>s the inspection resul</u> YES >> GO TO 4.					
NO >> GO TO 3.					
B. DETECT MALFUN	CTIONING PART				
heck the following.					
Harness connectors		ooniotor nuro		rel colonaid volve and IDDM E/D	
				rol solenoid valve and IPDM E/R rol solenoid valve and ECM	
•		1 0			
· · ·	•		•	arness or connectors.	
		UME CONTR	ROL SOLENO	D VALVE OUTPUT SIGNAL CIF	RCUIT
OR OPEN AND SHO					
 Turn ignition switc Disconnect ECM 	ch OFF. harness connector.				
		nister purge v	olume control	solenoid valve harness connecto	or and
ECM harness con					
	Ime control solenoid valve		ECM	Continuity	
	Terminal	Connector			
Connector			Terminal	Evistod	
F32	2	F7	9	Existed	
F32 4. Also check harnes	2 ss for short to ground a	F7	9	Existed	
F32 4. Also check harnes s the inspection resul	2 ss for short to ground a t normal?	F7	9	Existed	
F32 Also check harnes <u>s the inspection resul</u> YES-1 >> With CON YES-2 >> Without C	2 ss for short to ground a t normal? ISULT-III: GO TO 5. ONSULT-III: GO TO 6	F7 and short to	9 power.		
F32 4. Also check harnes <u>s the inspection resul</u> YES-1 >> With CON YES-2 >> Without C NO >> Repair op	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g	F7 and short to round or sho	9 power. rt to power in h	arness or connectors.	
F32 4. Also check harnes Is the inspection result YES-1 >> With CON YES-2 >> Without C NO >> Repair op	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g	F7 and short to round or sho	9 power. rt to power in h		
F32 4. Also check harnes <u>s the inspection resul</u> YES-1 >> With CON YES-2 >> Without C NO >> Repair op D.CHECK EVAP CAN With CONSULT-III	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU	F7 and short to p round or sho JME CONTR	9 power. rt to power in h	arness or connectors.	
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F32 4. Also check harnes <u>s the inspection resul</u> YES-1 >> With CON YES-2 >> Without C NO >> Repair op D. CHECK EVAP CAN With CONSULT-III 1. Reconnect all har 2. Start engine. 3. Perform "PURG V	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU ness connectors disco	F7 and short to round or sho JME CONTF onnected.	9 power. rt to power in h CL SOLENOI	arness or connectors.	d var-
F32 4. Also check harnes Is the inspection result YES-1 >> With CON YES-2 >> Without C NO >> Repair op 5.CHECK EVAP CAN With CONSULT-III 1. Reconnect all har 2. Start engine. 3. Perform "PURG V ies according to th	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU ness connectors disco OL CONT/V" in "ACTI ne valve opening.	F7 and short to p round or sho JME CONTF onnected. VE TEST" m	9 power. rt to power in h ROL SOLENOI	arness or connectors. D VALVE OPERATION	d var-
F32 4. Also check harnes <u>s the inspection result</u> YES-1 >> With CON YES-2 >> Without C NO >> Repair op D.CHECK EVAP CAN With CONSULT-III 1. Reconnect all har 2. Start engine. 3. Perform "PURG V ies according to the Does engine speed variable.	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU ness connectors disco OL CONT/V" in "ACTI ne valve opening. ary according to the va	F7 and short to p round or sho JME CONTF onnected. VE TEST" m	9 power. rt to power in h ROL SOLENOI	arness or connectors. D VALVE OPERATION	d var-
F32 4. Also check harnes s the inspection result YES-1 >> With CON YES-2 >> Without C NO >> Repair op D.CHECK EVAP CAN With CONSULT-III 1. Reconnect all har 2. Start engine. 3. Perform "PURG V ies according to th	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU ness connectors disco OL CONT/V" in "ACTI ne valve opening. ary according to the va	F7 and short to p round or sho JME CONTF onnected. VE TEST" m	9 power. rt to power in h ROL SOLENOI	arness or connectors. D VALVE OPERATION	d var-
F32 4. Also check harnes s the inspection result YES-1 >> With CON YES-2 >> Without C NO >> Repair op D.CHECK EVAP CAN With CONSULT-III 1. Reconnect all har 2. Start engine. 3. Perform "PURG V ies according to th Does engine speed var YES >> GO TO 7. NO >> GO TO 6.	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU ness connectors disco OL CONT/V" in "ACTI ne valve opening. ary according to the va	F7 and short to p round or sho JME CONTF onnected. VE TEST" m Ive opening?	9 power. rt to power in h COL SOLENOI	arness or connectors. D VALVE OPERATION SULT-III. Check that engine spee	d var-
F32 4. Also check harnes s the inspection result YES-1 >> With CON YES-2 >> Without C NO >> Repair op D .CHECK EVAP CAN With CONSULT-III 1. Reconnect all har 2. Start engine. 3. Perform "PURG V ies according to th Does engine speed var YES >> GO TO 7. NO >> GO TO 6. D .CHECK EVAP CAN	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU ness connectors disco (OL CONT/V" in "ACTI ne valve opening. ary according to the va	F7 and short to p round or sho JME CONTR onnected. VE TEST" m Ive opening? JME CONTR	9 power. rt to power in h COL SOLENOI	arness or connectors. D VALVE OPERATION SULT-III. Check that engine spee	d var-
F32 4. Also check harnes is the inspection result YES-1 >> With CON YES-2 >> Without C NO >> Repair op 5. CHECK EVAP CAN With CONSULT-III 1. Reconnect all har 2. Start engine. 3. Perform "PURG V ies according to th Does engine speed van YES >> GO TO 7. NO >> GO TO 6. 6. CHECK EVAP CAN Refer to ECH-552. "Compared to the second seco	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU ness connectors disco OL CONT/V" in "ACTI ne valve opening. ary according to the va	F7 and short to p round or sho JME CONTR onnected. VE TEST" m Ive opening? JME CONTR	9 power. rt to power in h COL SOLENOI	arness or connectors. D VALVE OPERATION SULT-III. Check that engine spee	d var-
F32 4. Also check harnes Is the inspection result YES-1 >> With CON YES-2 >> Without C NO >> Repair op 5.CHECK EVAP CAN With CONSULT-III 1. Reconnect all har 2. Start engine. 3. Perform "PURG V ies according to th Does engine speed van YES >> GO TO 7. NO >> GO TO 6. 6.CHECK EVAP CAN Refer to ECH-552, "Constant of the section result YES >> GO TO 7.	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU ness connectors disco (OL CONT/V" in "ACTI ne valve opening. ary according to the valve NISTER PURGE VOLU omponent Inspection". t normal?	F7 and short to p round or sho JME CONTR onnected. VE TEST" m Ive opening? JME CONTR	9 power. rt to power in h COL SOLENOI	arness or connectors. D VALVE OPERATION SULT-III. Check that engine spee	d var-
F32 4. Also check harnes Is the inspection result YES-1 >> With CON YES-2 >> Without C NO >> Repair op 5.CHECK EVAP CAN With CONSULT-III 1. Reconnect all har 2. Start engine. 3. Perform "PURG V ies according to th Does engine speed van YES >> GO TO 7. NO >> GO TO 6. 6.CHECK EVAP CAN Refer to ECH-552, "Constant of the section result YES >> GO TO 7.	2 ss for short to ground a <u>t normal?</u> ISULT-III: GO TO 5. ONSULT-III: GO TO 6 en circuit or short to g NISTER PURGE VOLU ness connectors disco OL CONT/V" in "ACTI ne valve opening. ary according to the va NISTER PURGE VOLU omponent Inspection". t normal? EVAP canister purge v	F7 and short to p round or sho JME CONTR onnected. VE TEST" m Ive opening? JME CONTR	9 power. rt to power in h COL SOLENOI	arness or connectors. D VALVE OPERATION SULT-III. Check that engine spee	d var-

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE ONENT DIAGNOSIS > [HR16DE (WITHOUT EURO-OBD)]

< COMPONENT DIAGNOSIS >

Component Inspection

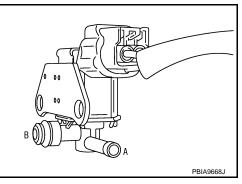
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1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Turn ignition switch ON.
- 5. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.
- Touch "Qd" and "Qu" on CONSULT-III screen to adjust "PURG VOL CONT/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL CONT/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed



Without CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- 3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- 4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)	
12V direct current supply between terminals 1 and 2	Existed	
No supply	Not existed	

Is the inspection result normal?

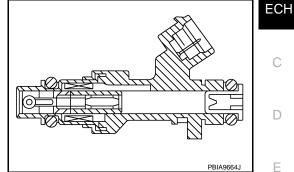
YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve

FUEL INJECTOR

Description

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



Component Function Check

1.INSPECTION START

Turn ignition switch to START.

Is any cylinder ignited?

YES >> GO TO 2.

NO >> Go to ECH-553, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

With CONSULT-III

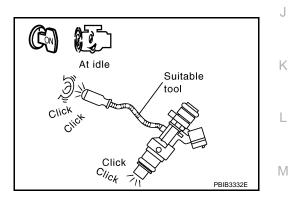
- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that each circuit produces a momentary engine speed drop.
- Without CONSULT-III
- 1. Let engine idle.
- 2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

Is the inspection result normal?

YES	>> INSPECTION END
-----	-------------------

NO >> Go to ECH-553, "Diagnosis Procedure".



Diagnosis Procedure

INFOID:000000001179875

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1.CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect fuel injector harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between fuel injector harness connector and ground.

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INFOID:000000001179873

INFOID:000000001179874

FUEL INJECTOR

	Fuel inject	or	Ground	Voltage	
Cylinder	Connector	Terminal	Giouna	Voltage	
1	F37	1		Battery voltage	
2	F38	1	Ground		
3	F39	1	Giodila		
4	F40	1			

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors F123, E6

• 10A fuse (No. 58)

• Harness for open or short between fuel injector and fuse

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

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

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

	Fuel injector		ECM		Continuity
Cylinder	Connector	Terminal	Connector	Terminal	Continuity
1	F37	2		31	
2	F38	2	F7	30	Existed
3	F39	2		29	EXISTED
4	F40	2		25	

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 INJECTOR

Refer to ECH-554, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning fuel injector.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

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

Component Inspection

INFOID:000000001179876

1.CHECK FUEL INJECTOR

1. Turn ignition switch OFF.

2. Disconnect fuel injector harness connector.

3. Check resistance between fuel injector terminals as follows.

FUEL INJECTOR

< COMPONENT DIAGNOSIS >

Terminals Resi	stance [at 10 - 60°C (50 - 140°F)]		
1 and 2	11.1 - 14.5 Ω		
	n result normal?		
YES >> INS NO >> Re	SPECTION END place malfunctioning fuel inje	ctor	
		5101.	

FUEL PUMP

Description

INFOID:000000001179877

[HR16DE (WITHOUT EURO-OBD)]

Sensor	Input signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay ↓
Battery	Battery voltage*	*	Fuel pump

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

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

Component Function Check

1.CHECK FUEL PUMP FUNCTION

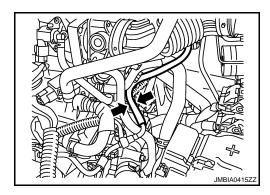
- 1. Turn ignition switch ON.
- 2. Pinch fuel feed hose with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

Is the inspection result normal?

YES >> INSPECTION END

NO >> ECH-294, "Diagnosis Procedure".



Diagnosis Procedure

INFOID:000000001179879

INFOID:000000001179878

1.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ECM harness connector and ground.

EC	M	Ground	Voltage	
Connector	Terminal	Ciouna	volidye	
F7	23	Ground	Battery voltage	

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 2.

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

FUEL PUMP

< COMPONENT DIAGNOSIS >

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- 1. Turn ignition switch OFF.
- 2. Disconnect IDPDM E/R harness connector.
- 3. Check the continuity between IPDM E/R harness connector and ECM harness connector.

EC	ECM IPDM E/R		IPDM E/R	
Connector	Terminal	Connector Terminal		Continuity
F7	23	E13	33	Existed

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. DETECT MALFUNCTIONING PART

Check the following.

Harness or connectors E6, F123.

Harness for open or short to ground and short power.

>> Repair harness or connectors.

4.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.

- 3. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 4. Turn ignition switch ON.
- 5. Check voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

NO >> GO TO 5.

5.CHECK 10A FUSE

- 1. Turn ignition switch OFF.
- 2. Disconnect 10A fuse (No. 57) from IPDM E/R.

3. Check 10A fuse.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace fuse.

6.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

1. Disconnect IPDM E/R harness connector.

 Check the continuity between IPDM E/R harness connector and "fuel level sensor unit and fuel pump" C harness connector.

IPDN	/I E/R	Fuel level sensor unit and fuel pump		Continuity
Connector	Terminal	Connector Terminal		
F13	42	B40	1	Existed

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

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors B10, E101

Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"

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

8.CHECK FUEL PUMP GROUND CIRCUIT

1. Check the continuity between "fuel level sensor unit and fuel pump" and ground.

Fuel level sensor unit and fuel pump		Ground	Continuity	
Connector	Terminal			
B40	3	Ground	Existed	
2 Alas heak harness for short to power				

2. Also heck harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

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

9.CHECK FUEL PUMP

Refer to ECM-299, "Component Inspection (Fuel Pump)".

Is the inspection result normal?

- YES >> GO TO 10.
- NO >> Replace fuel pump.

10.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 connectors.

Component Inspection (Fuel Pump)

INFOID:0000000001179880

1.CHECK FUEL PUMP

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Check resistance between "fuel level sensor unit and fuel pump" terminals as follows.

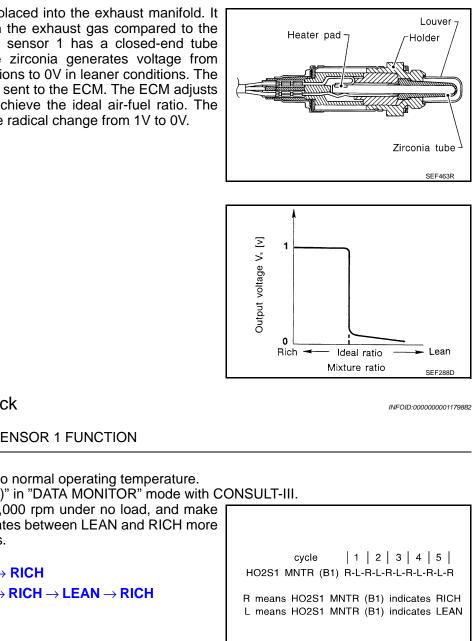
Terminals	Resistance [at 25°C (77°F)]
1 and 3	0.2 - 5.0 Ω

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump".

[HR16DE (WITHOUT EURO-OBD)]



< COMPONENT DIAGNOSIS >

HO2S1

Description

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

Component Function Check

1.CHECK HEATED OXYGEN SENSOR 1 FUNCTION

(P)With CONSULT-III

- Ì. Start engine and warm it up to normal operating temperature.
- Select "HO2S1 MNITOR (B1)" in "DATA MONITOR" mode with CONSULT-III. 2.
- 3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuates between LEAN and RICH more than five times in 10 seconds.

1 times: RICH \rightarrow LEAN \rightarrow RICH 2 times: RICH \rightarrow LEAN \rightarrow RICH \rightarrow LEAN \rightarrow RICH

cycle 1 2 3 4 5 HO2S1 MNTR (B1) R-L-R-L-R-L-R-L-R	L
R means HO2S1 MNTR (B1) indicates RICH L means HO2S1 MNTR (B1) indicates LEAN	M
SEF217YA	Ν

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 10 seconds. 2.
- 3. Set ECM in Diagnostic test mode - II (Heated oxygen sensor 1 monitor).

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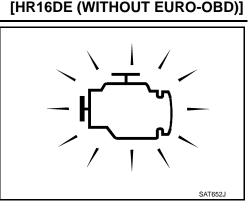
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HO2S1

< COMPONENT DIAGNOSIS >

4. Keep the engine speed at 2,000 rpm under no load, and make sure that the MI comes ON more than five times in 10 seconds.



Is the inspection result normal?

YES >> INSPECTION END.

NO >> Go to ECH-135, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:000000001179883

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. 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.RETIGHTEN HEATED OXYGEN SENSOR 1

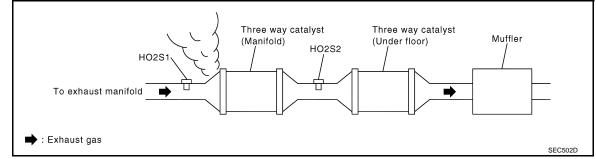
Loosen and retighten the heated oxygen sensor 1.

Tightening torque: 50 N-m (5.1 kg-m, 37 ft-lb)

>> GO TO 3.

3. CHECK EXHAUST GAS LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust gas leak before three way catalyst (manifold).



Is exhaust gas leak detected?

YES >> Repair or replace.

4.CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 5.

5. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

HO2S1

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< COMPONENT DIAGNOSIS >

- 2. Disconnect heated oxygen sensor 1 harness connector.
- 3. Disconnect ECM harness connector.

4. Check harness continuity between HO2S1 harness connector and ECM harness connector.

-	HO2S1		ECM		Continuity
	Connector	Terminal	Connector Terminal		Continuity
	F30	1	F8	56	existed

5. 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 HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector Terminal		Continuity
F30	1	F8	56	Existed

2. Check the continuity between HO2S1 harness connector or ECM harness connector and ground.

HO2	S1	ECM		Continuity	
Connector	Terminal	Connector	Terminal	Giouna	Continuity
F30	4	F8	49	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.

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

7.CHECK MASS AIR FLOW SENSOR

Check mass air flow sensor. Refer to <u>ECH-447, "Component Inspection"</u> .					
Is the inspection result normal?					
YES >> GO TO 8. NO >> Replace mass air flow sensor.	L				
8. CHECK PCV VALVE					
Refer to ECM-306, "Component Inspection".	M				
Is the inspection result normal?					
YES >> GO TO 9. NO >> Repair or replace PCV valve.	Ν				
9. CHECK HEATED OXYGEN SENSOR 1					
Perform ECH-562, "Component Inspection".	0				
Is the inspection result normal?	0				
YES >> GO TO 10.					
NO >> Replace heated oxygen sensor 1.	P				
10. CHECK INTERMITTENT INCIDENT	1				
Refer to GL-39 "Intermittent Incident"					

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:000000001179884

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

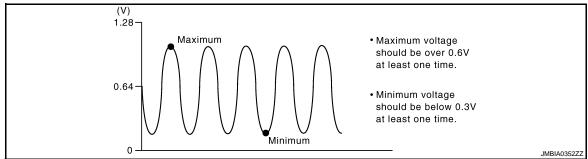
2. CHECK HEATED OXYGEN SENSOR 1

- With CONSULT-III
- T. Start engine and warm it up to normal operating temperature.
- 2. Set "POST TRIGGER" to 100% in "DATA MONITOR" mode with CONSULT-III.
- 3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-III screen.
- 6. Check the following.
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
 5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.

```
cycle | 1 | 2 | 3 | 4 | 5 |
HO2S1 MNTR (B1) R-L-R-L-R-L-R-L-R
```

R means HO2S1 MNTR (B1) indicates RICH L means HO2S1 MNTR (B1) indicates LEAN

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CAUTION:

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

Is the inspection result normal?

YES >> INSPECTION END

3.CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check the voltage between ECM harness connector and ground under the following condition.

[HR16DE (WITHOUT EURO-OBD)]

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ECM		around	Condition	Voltage	
Connector	Terminal	ground	Condition	voltage	
				 The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. The maximum voltage is over 0.6V at least 1 time. 	ECH
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The minimum voltage is below 0.3V at least 1 time. • The voltage never exceeds 1.0V. 1 time: $0 - 0.3V \rightarrow 0.6 - 1.0V \rightarrow 0 - 0.3V$ 2 times: $0 - 0.3V \rightarrow 0.6 - 1.0V \rightarrow 0 - 0.3V \rightarrow 0.6 - 1.0V$ $\rightarrow 0 - 0.3V$	С
AUTION:					D

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

Is the inspection result normal?

YES >> INSPECTION END NO >> GO TO 4

4.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

CAUTION:

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

>> INSPECTION END

HO2S1 HEATER

Description

INFOID:000000001179885

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Mass air flow sensor	Amount of intake air		liedtei

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

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600 rpm after the following conditions are met.Engine: After warming up	ON

Component Function Check

INFOID:000000001179886

1.CHECK HEATED OXYGEN SENSOR 2 HEATER FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Set tester prove between ECM harness connection and ground.
- 4. Start engine and let it idle.
- 5. Check the voltage under the following conditions. Verify that the oscilloscope screen shows the signal waves as shown below.

	ECM	Ground	Condition	Voltage
Connector	Terminal	Ground	Condition	Voltage
F7	3 (HO2S1 HEATER signal)	Ground	At idle	Approximately 7.0★ 50mSec/div € 10V/div JMBIA0325GB
			Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)

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

Is the inspection result normal?

YES >> INSPECTION END.

NO >> Go to ECH-135, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK GROUND CONNECTION

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

ECH-564

INFOID:000000001179887

^{1.} Turn ignition switch OFF.

HO2S1 HEATER

< COMPONE	NT DIAGNO	SIS >	110201	[HR16DE (WITHOUT EURO-OBD)]
NO >> Re	epair or repla	ace ground c	onnection.	
2. СНЕСК НС	02S1 POWE	R SUPPLY (CIRCUIT	
1. Disconned	ct HO2S1 ha	rness conne	ctor.	
	on switch ON			a star and ground
3. Check the	voltage bet	ween HO25	i narness conn	nector and ground.
HO2	S1			_
Connector	Terminal	Ground	Voltage	
F30	2	Ground	Battery voltage	
Is the inspection	on result nor	mal?		_
	O TO 4. O TO 3.			
3. DETECT M			r	
Check the follo				
 Harness con 	nectors F12	3, E6		
 10A fuse (No Harness for (,	t between H	O2S1 and fuse	
				-
>> Re	epair or repla	ace harness	or connectors.	
4.снеск но	02S1 HEATE	R OUTPUT	SIGNAL CIRC	TUIT
1. Turn igniti	on switch OF	FF.		
2. Disconneo	ct ECM harne	ess connecto		
 Check the 	continuity d	etween HO2	S1 harness co	onnector and ECM harness connector.
HO2	S1		ECM	
Connector	Terminal	Connector	Terminal	Continuity
F30	3	F7	3	Existed
I. Also chec	k harness fo	r short to gro	ound and short	to power.
s the inspection	on result nor	mal?		
YES >> G		rouit or obor	t to around or o	
NO >> Re D .CHECK HC	• •		t to ground or s	short to power in harness or connectors.
Refer to <u>ECH-</u>			<u>tion"</u> .	
ls the inspection YES >> G	<u>on result nor</u> O TO 7.	<u>IIIal ?</u>		
	O TO 6.			
3. REPLACE	HEATED OX	YGEN SEN	SOR 1	
Replace Heate	ed oxygen se	ensor 1.		
CAUTION: Discard any	hasted and	an sansa	1 which has b	been dropped from a height of more than 0.5 m (19.7
				; use a new one.
 Before insta 	alling new h	eated oxyg	en sensor 1, c	clean exhaust system threads using Oxygen Sensor
i nread Clea	aner tool and	a approved	anti-seize lub	pricant.
55 IN	ISPECTION	FND		
7. CHECK IN			-	

Perform GI-39, "Intermittent Incident".

>> Repair or replace.

Component Inspection

INFOID:000000001179888

1.CHECK HEATED OXYGEN SENSOR 1

- 1. Turn ignition switch OFF.
- Disconnect heated oxygen sensor 1 harness connector. 2.
- 3. Check resistance between HO2S1 terminals as follows.

Terminals	Resistance [at 25°C (77°F)]
2 and 3	3.4 - 4.4 Ω
1 and 2, 3, 4	$\infty \Omega$
4 and 1, 2, 3	(Continuity should not exist)

Is the inspection result normal?

YES >> INSPECTION END NO >> GO TO 2.

2.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1. **CAUTION:**

- Discard any 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 sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

>> INSPECTION END

HO2S2

Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

Component Function Check

1.PERFORM COMPONENT FUNCTION CHECK-I

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground Condition		Voltage		
Connector	Terminal	Giouna	Condition	Voltage		
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage does not remain in the range of 0.2 - 0.4V.		
s the insp	the inspection result normal?					

YES >> INSPECTION END

NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground Condition Voltage		Voltago	L
Connector	Terminal	Giouna	Condition	volage	
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage does not remain in the range of 0.2 - 0.4V.	\mathbb{N}

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 3.

${f 3.}$ PERFORM COMPONENT FUNCTION CHECK-III

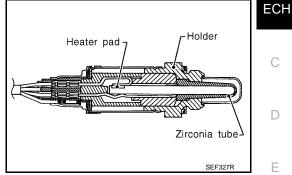
Check the voltage between ECM harness connector and ground under the following condition.

		ECM	Ground	Condition Voltage		
-	Connector	Terminal	Giouna	Condition	voitage	
-	F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 3rd gear po- sition	The voltage does not remain in the range of 0.2 - 0.4V.	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECM-570, "Diagnosis Procedure".



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Diagnosis Procedure

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[HR16DE (WITHOUT EURO-OBD)]

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. 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 HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect heated oxygen sensor 2 harness connector.

- 3. Disconnect ECM harness connector.
- 4. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2	2S2	EC	М	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F42	1	F13	35	Existed

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

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Harness or connectors F121, E7

• Harness for open or short between HO2S2 and ECM.

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

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

HO2	2S2	EC	М	Continuity
Connector	Terminal	Connector	Terminal	Continuity
F42	4	F13	33	Existed

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

HO2S2		EC	М	Continuity	
Connector	Terminal	Connector	Terminal	Ground Continuity	
F42	4	F13	33	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Harness or connectors F121, E7

Harness for open or short between HO2S2 and ECM.

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

6.CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-569, "Component Inspection".

< COMPONENT DIAGNOSIS >	[HR16DE (WITHOUT EURO-OBD)]
Is the inspection result normal?	
YES >> GO TO 8. NO >> GO TO 7.	A
I .REPLACE HEATED OXYGEN SENSOR 2	EC
Replace heated oxygen sensor 2.	
	as been dropped from a height of more than 0.5 m (19.7
in) onto a hard surface such as a concrete f	loor; use a new one.
Cleaner tool and approved anti-seize lubrica	
	D
>> INSPECTION END	
8.CHECK INTERMITTENT INCIDENT	E
Refer to GI-39. "Intermittent Incident".	
>> INSPECTION END	F
Component Inspection	
	INFOID:000000001179892
1. INSPECTION START	G
Do you have CONSULT-III?	
Do you have CONSULT-III? YES >> GO TO 2.	Н
NO >> GO TO 3.	
2. CHECK HEATED OXYGEN SENSOR 2	1
With CONSULT-III	
 Turn ignition switch ON and select "DATA Me Start engine and warm it up to the normal op 	
3. Turn ignition switch OFF and wait at least 10	seconds.
 Start engine and keep the engine speed betv Let engine idle for 1 minute. 	veen 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Select "FUEL INJECTION" in "ACTIVE TES	T" mode, and select "HO2S2 (B1)" as the monitor item with $^{ extsf{K}}$
CONSULT-III. 7. Check "HO2S2 (B1)" at idle speed when adj	usting "FUEL INJECTION" to ±25%.
~	(Reference data)
728 128 128	
//////////////////////////////////////	The voltage should be above
8 - · · · ·	$\int 0.68V \text{ at least one time.}$
	∫ The voltage should N
· · · · · · · · · · · · · · · · · · ·	be below 0.50V at least one time.
"HO2S2 (P1)" should be above 0.69\/ at //	
	east once when the "FUEL INJECTION" is +25%.
Is the inspection result normal?	
YES >> INSPECTION END NO >> GO TO 6.	P
NO >> GO TO 6. 3. CHECK HEATED OXYGEN SENSOR 2-I	

Without CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 2.
- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load. 3.

4. Let engine idle for 1 minute.

5. Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground	Condition	Voltage	
Connector	Terminal	Giodila	Condition	voltage	
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.	

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage	
Connector	Terminal	Giounu	Condition	voltage	
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 min- utes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.	

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground	Condition	Voltage
Connector	Terminal	Giouna	Condition	vollage
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

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

• Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.

>> INSPECTION END

HO2S2 HEATER

< COMPONENT DIAGNOSIS >

HO2S2 HEATER

Description

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SYSTEM DESCRIPTION

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

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

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater	– F
Above 3,900	OFF	
 Below 3,900 rpm after the following conditions are met. Engine: After warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	ON	G

Component Function Check

1.CHECK HEATED OXYGEN SENSOR 2 HRATER FUNCTION

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Start engine and let it idle.
- 4. Check the voltage between ECM harness connector and ground under the following condition.

	ECM	Ground	Condition	Voltage signal	
Connector	Terminal	Giouna	Condition	voltage signal	
F7	5 (HO2S2 heater signal)	Ground	At idle	Approx. 10V★ 50mSec/div € 10V/div JMBIA0325GB	
			Engine speed: Above 3,900 rpm	BATTERY VOLTAGE (11 - 14V)	

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

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-571, "Diagnosis Procedure"

Diagnosis Procedure

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

HO2S2 HEATER

< COMPONENT DIAGNOSIS >

NO >> Repair or replace ground connection.

2.CHECK HO2S2 POWER SUPPLY CIRCUIT

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

НО	2S2	Ground	Voltage	
Connector	Terminal		voltage	
E58	2	Ground	Battery voltage	

Is the inspection result normal?

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

NU >> UU IU

3. DETECT MALFUNCTIONING PART

Check the following.

IPDM E/R connector E11

10A fuse (No. 56)

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

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

4.CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between HO2S2 harness connector and ECM harness connector.

HC)2S2	ECM		Continuity
Connector	Terminal	Connector	Terminal	Continuity
E58	3	F7	5	Existed

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

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F121, E7

Harness for open or short between heated oxygen sensor 2 and ECM

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

6.CHECK HO2S2 HEATER

Refer to ECH-573, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

7.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

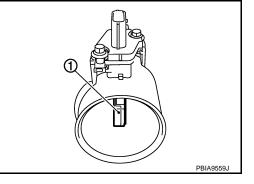
CHECK INTERMITTENT IN tefer to GI-39. "Intermittent In-		
>> INSPECTION ENI	D	
Component Inspection		INFOID:000000001179896
.CHECK HEATED OXYGEN	I SENSOR 2 HEATER	
. Turn ignition switch OFF.		
	n sensor 2 harness connector. n HO2S2 terminals as follows.	
Terminals	Resistance [at 25°C (77°F)]	
2 and 3	3.3 - 4.4 Ω	
1 and 2, 3, 4	$\infty \Omega$	
4 and 1, 2, 3	(Continuity should not exist)	
the inspection result normal	<u>?</u>	
	D	
NO >> GO TO 2.		
NO >> GO TO 2. REPLACE HEATED OXYG	EN SENSOR 2	
NO >> GO TO 2. REPLACE HEATED OXYG eplace heated oxygen senso	EN SENSOR 2 r 2.	
NO >> GO TO 2. REPLACE HEATED OXYG ceplace heated oxygen senso AUTION: Discard any heated oxygen	EN SENSOR 2 r 2. n sensor which has been dropped from a heig	ht of more than 0.5 m (19.7
NO >> GO TO 2. REPLACE HEATED OXYG eplace heated oxygen senso AUTION: Discard any heated oxygen in) onto a hard surface suc Before installing new oxyg	EN SENSOR 2 or 2. n sensor which has been dropped from a heig ch as a concrete floor; use a new one. gen sensor, clean exhaust system threads usi	-
NO >> GO TO 2. REPLACE HEATED OXYG eplace heated oxygen senso AUTION: Discard any heated oxygen in) onto a hard surface suc	EN SENSOR 2 or 2. n sensor which has been dropped from a heig ch as a concrete floor; use a new one. gen sensor, clean exhaust system threads usi	-
NO >> GO TO 2. REPLACE HEATED OXYG eplace heated oxygen senso AUTION: Discard any heated oxygen in) onto a hard surface suc Before installing new oxyg Cleaner tool and approved	EN SENSOR 2 or 2. In sensor which has been dropped from a heig ch as a concrete floor; use a new one. gen sensor, clean exhaust system threads usi anti-seize lubricant.	-
NO >> GO TO 2. .REPLACE HEATED OXYG eplace heated oxygen senso AUTION: Discard any heated oxygen in) onto a hard surface suc Before installing new oxygen	EN SENSOR 2 or 2. In sensor which has been dropped from a heig ch as a concrete floor; use a new one. gen sensor, clean exhaust system threads usi anti-seize lubricant.	-
NO >> GO TO 2. .REPLACE HEATED OXYG eplace heated oxygen senso AUTION: Discard any heated oxygen in) onto a hard surface suc Before installing new oxyg Cleaner tool and approved	EN SENSOR 2 or 2. In sensor which has been dropped from a heig ch as a concrete floor; use a new one. gen sensor, clean exhaust system threads usi anti-seize lubricant.	-
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NO >> GO TO 2. REPLACE HEATED OXYG eplace heated oxygen senso AUTION: Discard any heated oxygen in) onto a hard surface suc Before installing new oxyg Cleaner tool and approved	EN SENSOR 2 or 2. In sensor which has been dropped from a heig ch as a concrete floor; use a new one. gen sensor, clean exhaust system threads usi anti-seize lubricant.	-
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NO >> GO TO 2. .REPLACE HEATED OXYG eplace heated oxygen senso AUTION: Discard any heated oxygen in) onto a hard surface suc Before installing new oxyg Cleaner tool and approved	EN SENSOR 2 or 2. In sensor which has been dropped from a heig ch as a concrete floor; use a new one. gen sensor, clean exhaust system threads usi anti-seize lubricant.	-
NO >> GO TO 2. REPLACE HEATED OXYG eplace heated oxygen senso AUTION: Discard any heated oxygen in) onto a hard surface suc Before installing new oxyg Cleaner tool and approved	EN SENSOR 2 or 2. In sensor which has been dropped from a heig ch as a concrete floor; use a new one. gen sensor, clean exhaust system threads usi anti-seize lubricant.	-

IAT SENSOR

Description

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

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



20

10 6 4

0.2

0.1

Resistance kΩ 2 1.0 0.8 0.4

[HR16DE (WITHOUT EURO-OBD)]

<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance $k\Omega$
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

*: These data are reference values and are measured between ECM terminal 46 (Intake air temperature sensor) and ground.

CAUTION:

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.

Component Function Check

1. CHECK INTAKE AIR TEMPERATURE SENSOR FUNCTION

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

EC	M	Ground	Voltage	
Connector Terminal		Ciouna	voltage	
F8	46	Ground	Approx. 0 - 4.8V	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to ECH-574, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection". 2.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK 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.

0 20 40 60 80 100 (32) (68) (104) (140) (176) (212) Temperature °C (°F) SEE012E

Acceptable

INFOID:000000001179898

INFOID:000000001179899

INFOID:000000001179897

IAT SENSOR

< COMPONENT DIAGNOSIS >

MAEs	sensor			_	
Connector	Terminal	Ground	Voltage		
E18	2	Ground	Approx. 5V	_	
Is the inspect	ion result nor	mal?		_	E
NO >> R			-		in harness or connectors. CUIT FOR OPEN AND SHORT
2. Disconne	ion switch Of ct ECM harne e continuity b	ess connecto		or harness cor	nnector and ECM harness connector.
MAF	sensor	E	СМ	Continuity	-
Connector	Terminal	Connector	Terminal	Continuity	_
E18	1	F8	55	Existed	_
1. Also cheo	ck harness fo	r short to gro	und and short	to power.	
	60 TO 4.		to ground or s	hort to power	in harness or connectors.
4.CHECK IN	ITAKE AIR TE	EMPERATUR	RE SENSOR		
Refer to <u>ECH</u>	-575, "Compo	onent Inspect	<u>ion"</u> .		
s the inspect	ion result nor	mal?			
	O TO 5.	- : (1			
	eplace mass		or (with intake	air temperatu	ure sensor).
Refer to GI-39	<u>9, "Intermitter</u>	nt Incident".			
>> II	NSPECTION				
Componer	it Inspectio	on			INFO/D:000000001179900
	ITAKE AIR TE	EMPERATUR	RE SENSOR		
1. Turn ignit	ion switch OF	-F.			
2. Disconne	ct mass air fl	ow sensor ha	arness connect		
3. Check re	sistance betw	leen mass ai	r flow sensor to	erminals as fo	ollows.
Terminala	Condi	tion	Booir	tanaa	
Terminals 1 and 2 Ter	Condi mperature C°° (F			tance 2.200 kΩ	
	•	, , ,	1.000 - /	2.200 N32	
s the inspect YES >> II					
	NSPECTION eplace mass		or (with intake	air temperatu	ure sensor).

Ρ

IGNITION SIGNAL

Description

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.

Component Function Check

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT-III: GO TO 2.

YES-2 >> Without CONSULT-III: GO TO 3.

NO >> Go to ECH-576, "Diagnosis Procedure".

2. IGNITION SIGNAL FUNCTION

With CONSULT-III

- 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 2. Make sure that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

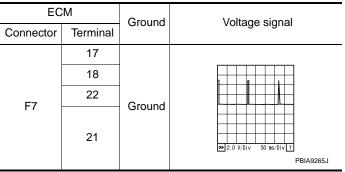
YES >> INSPECTION END

NO >> Go to ECH-576, "Diagnosis Procedure".

3.IGNITION SIGNAL FUNCTION

Without CONSULT-III

- 1. Let engine idle.
- 2. Read the voltage signal between ECM harness connector and ground.



NOTE:

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to ECH-576, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
- 2. Check the voltage between ECM harness connector and ground.

E	CM	Ground	Voltage	
Connector	Terminal	Oround		
E16	105	Ground	Battery voltage	

INFOID:000000001179901

INFOID:000000001179903

ECH-576

INFOID:0000000001179902

< COMPON	ENT DIAG	NOSIS >		[HR16DE (WITHOUT EURO-OBD)]	_
Is the inspec	tion result n	ormal?			•
	GO TO 2.				А
•		-	osis Procedu		
2.CHECK I	GNITION CO	OIL POWER	R SUPPLY C	IRCUIT-II	ECH
	ition switch				
	ect condens ition switch		connector.		
0			denser harne	ess connector and ground.	С
	Ū			u u u u u u u u u u u u u u u u u u u	
Cond	enser	Oraciand		—	
Connector	Terminal	Ground	Voltage		D
F13	1	Ground	Battery voltag	ge	
Is the inspec	tion result n	ormal?		_	Е
-	GO TO 4.				
NO >>	GO TO 3.				
3. CHECK I	GNITION CO	OIL POWER	SUPPLY C	IRCUIT-III	F
1. Turn ign	ition switch	OFF.			
2. Disconn	ect IPDM E/	R harness o	connector E1		0
3. Check th	ne continuity	between IF	PDM E/R har	ness connector and condenser harness connector.	G
IPDM	/IE/R	Con	denser	Continuity	Н
Connector	Terminal	Connector	Terminal		
E11	10	F13	1	Existed	
4. Also che	eck harness	for short to	ground and s	short to power.	
Is the inspec	<u>tion result n</u>	ormal?			
			<u>osis Procedu</u>		
4	• •		•	d or short to power in harness or connectors.	J
4.CHECK C	CONDENSE	R GROUNE	CIRCUIT F	OR OPEN AND SHORT	_
	ition switch				K
2. Check the	ne continuity	between co	ondenser hai	mess connector and ground.	
Conde	(Ground Cont	nuity		L
Connector	Terminal				
F13		Ground Exis			в./
	eck harness		power.		M
Is the inspec		ormal?			
	GO TO 5.	oirouit ar al	art to group	d ar abart to power in borneas or connectors	Ν
_			ion to groun	d or short to power in harness or connectors.	
5. снеск с	CONDENSE	R			_
Refer to ECH			pection (Con	denser)"	0
Is the inspec		ormal?			
	GO TO 6. Bablaca cor	doncor			5
•	Replace cor				Р
6.CHECK 1	GNITION CO		K SUPPLY C		_
			ors disconneo	cted.	
	ect ignition of ition switch		connector.		

Turn ignition switch ON.
 Check the voltage between ignition coil harness connector and ground.

< COMPONENT DIAGNOSIS >

	Ignition coil	Ground	Voltage	
Cylinder	Connector	Terminal	Giouna	vollage
1	F33	3		
2	F34	3	Ground	Battery voltage
3	F35	3	Giouna	
4	F36	3	1	

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 IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Check the continuity between ignition coil harness connector and ground.

	Ignition coil	Ground	Continuity	
Cylinder	Cylinder Connector Terminal			Continuity
1	F33	2		
2	F34	2	Ground	Existed
3	F35	2		
4	F36	2		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.

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

8.CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

2. Check the continuity between ECM harness connector and ignition coil harness connector.

	Continuity					
Cylinder	Connector	Terminal	Connector	Terminal	Continuity	
1	F33	1		17		
2	F34	1	F7	18	Existed	
3	F35	1		22	Existed	
4	F36	1		21		

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

Is the inspection result normal?

YES >> GO TO 9.

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

9.CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to ECH-579, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace malfunctioning ignition coil with power transistor.

10. CHECK INTERMITTENT INCIDENT

Refer to GI-39. "Intermittent Incident".

NENT DIAGNOSIS >		[HR16DE (WITHOUT EURO-OBD	<u>)]</u>
ent Inspection (Ignit	tion Coil with Power Transi	stor) INFOID:00000000117	79904
(IGNITION COIL WITH P	OWER TRANSISTOR-I		
nnect ignition coil harness			
Resistance [at 25°C (77°F)]			
Except 0 or $\infty\Omega$			
Except 0 Ω			
 > GO TO 2. > Replace malfunctioning 			
:			
gnition switch OFF.		I without the combustible.	
: t use CONSULT-III to rele	-	e applies again during the following p	ro-
engine. engine stalls, crank it two o gnition switch OFF.			
ve ignition coil and spark engine for 5 seconds or r ect spark plug and harnes	plug of the cylinder to be checked. nore to remove combustion gas in s connector to ignition coil.		
n) between the edge of the n as shown in the figure. engine for about three se herated between the spar	e spark plug and grounded metal conds, and check whether spark	WEITER AND	
		Ę	
TON: not approach to the sp	ark plug and the ignition coil	f 13 - 17 mm (0.52-0.66 in) Grounded metal portion (Cylinder head, cylinder block, etc.) JMBIA006	6GB
ck while checking, bec age becomes 20kV or m ight cause to damage th	ause the electrical discharge ore.	e than 17 mm (0.66 in) is taken.	
the gap is less than 13 oning.	8 mm (0.52 in), the spark might	be generated even if the coil is m	al-
> INSPECTION END	ignition coil with power transistor.		
	1		79905
ent Inspection (Con	denser)	INFOID:00000000117	
CONDENSER	denser)	INFOID:00000000117	
	C IGNITION COIL WITH P gnition switch OFF. nnect ignition coil harness a resistance between ignition Resistance [at 25°C (77°F)] Except 0 or $\infty \Omega$ Except 0 or $\infty \Omega$ ection result normal? > GO TO 2. > Replace malfunctioning C IGNITION COIL WITH P C Iowing procedure in the gnition switch OFF. nect all harness connector ve fuel pump fuse in IPDN t use CONSULT-III to releve. engine. engine stalls, crank it two of gnition switch OFF. ve all ignition coil harness ve ignition coil and spark engine for 5 seconds or r ect spark plug and harness intion coil using a rope etch n as shown in the figure. engine for about three seconds it use CONSULT-III to releve. engine for 5 seconds or r ect spark plug and harness intion coil using a rope etch n as shown in the figure. engine for about three seconds it on coil using a rope etch n as shown in the figure. engine for about three seconds it the gap is less than 13 oning. ection result normal? > INSPECTION END	X IGNITION COIL WITH POWER TRANSISTOR-I gnition switch OFF. nectignition coil harness connector. resistance between ignition coil terminals as follows. Resistance [at 25°C (77°F)] Except 0 Ω Eccept 0 Ω Eccept 0 Ω Eccept 0 Ω Eccept 0 Ω Eccept 0 C S GO TO 2. > Replace malfunctioning ignition coil with power transistor. X IGNITION COIL WITH POWER TRANSISTOR-II Image and the place where ventilation is good gnition switch OFF. Inter all harness connectors disconnected. ve fuel pump fuse in IPDM E/R to release fuel pressure. angine. angine. angine. angine stalls, crank it two or three times to release all fuel pr gnition switch OFF. ve all ignition coil harness connectors to avoid the electrical ve ignition coil and spark plug of the cylinder to be checked engine for 5 seconds or more to remove combustion gas in act spark plug and harness connector to ignition coil. hition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 1) between the edge of the spark plug and grounded metal n as shown in the figure. engine for about three seconds, and check whether spark herated between the spark plug and the grounded metal n. ark should be generated. ION: not approach to the spark plug and the ignition coil in 50 cm (19.7 in). Be careful not to get an electrical ck while checking, because the electrical discharge age becomes 20kV or more. ight cause to damage the ignition coil if the gap of more :: the gap is less than 13 mm (0.52 in), the spark might oning. ection result normal? > INSPECTION END	CIGNITION COIL WITH POWER TRANSISTOR-I gnition switch OFF: need: ignition coil harness connector. resistance lat 25°C (77°F)] Except 0 or ~Ω Selface malfunctioning ignition coil with power transistor. CIGNITION COIL WITH POWER TRANSISTOR-II Selface malfunctioning ignition scill and park to release fuel pressure. gnition switch OFF. need all harness connectors disconnected. ve fuel pump fuse in IPDM E/R to release fuel pressure. gnition switch OFF. using an estalls, crank it two or three times to release all fuel pressure. gnition switch OFF. ve ignition coil and spark plug of the cylinder to be checked. act spark p

< COMPONENT DIAGNOSIS >

3. Check resistance between condenser terminals as follows.

Terminals	Resistance [at 25°C (77°F)]	
1 and 2	Above 1 M Ω	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace condenser.

< COMPONENT DIAGNOSIS >

MALFUNCTION INDICATOR

Description

The Malfunction Indicator (MI) is located on the combination meter. 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.

For details, refer to ECH-581, "Diagnosis Procedure".



А INFOID:000000001179906

ECH С D Е SAT652J

Component Function Check

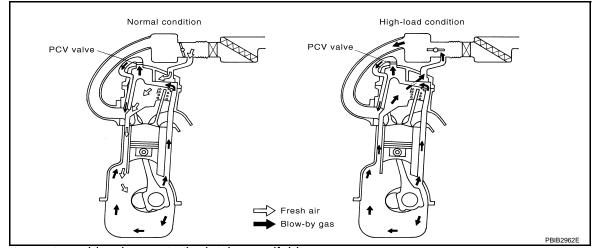
1.CHECK MI FUNCTION	F
 Turn ignition switch ON. Make sure that MI lights up. Is the inspection result normal? YES >> INSPECTION END NO >> Go to ECH-581, "Diagnosis Procedure". 	(
Diagnosis Procedure	9
1.снеск отс	1
Check that DTC U1001 is not displayed.	-
<u>Is the inspection result normal?</u> YES >> GO TO 2. NO >> Perform trouble diagnosis for DTC U1001. Refer to <u>ECH-439</u> , "Diagnosis Procedure".	,
2.CHECK COMBINATION METER	
Refer to MWI-27, "CONSULT-III Function (METER/M&A)".	- ľ
Is the inspection result normal?	
YES >> GO TO 3. NO >> Repair or replace.	L
3. CHECK INTERMITTENT INCIDENT	
Refer to GI-39, "Intermittent Incident".	- 1
Is the inspection result normal?	
YES >> Replace combination meter. NO >> Repair or replace.	Ν
	C

< COMPONENT DIAGNOSIS >

POSITIVE CRANKCASE VENTILATION

Description

INFOID:000000001179909



This system returns blow-by gas to the intake manifold.

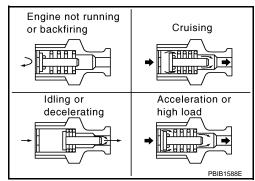
The positive crankcase ventilation (PCV) value is provided to conduct crankcase blow-by gas to the intake manifold.

During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.



INFOID:000000001179910

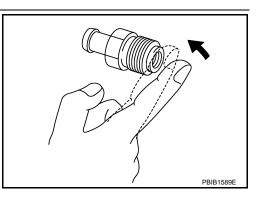
Component Inspection

1.CHECK PCV VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace PCV valve.

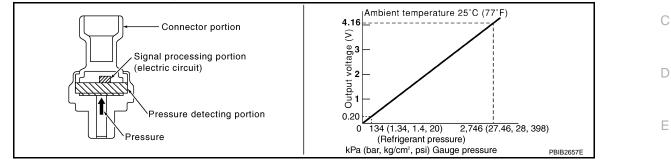


< COMPONENT DIAGNOSIS >

REFRIGERANT PRESSURE SENSOR

Description

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



Component Function Check

1.CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn A/C switch and blower fan switch ON.
- 3. Check the voltage between ECM harness connector and ground.

	ECM	Ground	Voltage
Connector	Terminal	Ground	voltage
F8	41 (Refrigerant pressure sensor signal)	Ground	1.0 - 4.0V

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Go to ECH-583, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK GROUND CONNECTION

- 1. Turn A/C switch and blower fan switch OFF. 2. Stop engine. Turn ignition switch OFF. 3. M Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection". 4. Is the inspection result normal? YES >> GO TO 2. Ν NO >> Repair or replace ground connection. 2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT
- 1. Disconnect refrigerant pressure sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between refrigerant pressure sensor harness connector and ground.

Refrigerant pre	ssure sensor	Ground	Voltage	
Connector	Terminal	Ground		
E49	3	Ground	Approx. 5V	

Is the inspection result normal?

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INFOID:000000001179911

INFOID:000000001179912

INFOID:000000001179913

REFRIGERANT PRESSURE SENSOR

< COMPONENT DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

3. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F123, E6

• 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.
- 2. Disconnect ECM harness connector.
- Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pre	essure sensor	E	Continuity	
Connector	Connector Terminal Connector		Terminal	Continuity
E49	1	F8	48	Existed

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

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F123, E6

• 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

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

Refrigerant pre	essure sensor	E	Continuity	
Connector Terminal		Connector	Terminal	Continuity
E49 2		F8	41	Existed

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

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F123, E6

• 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.

[HR16DE (WITHOUT EURO-OBD)]

VSS

< COMPONENT DIAGNOSIS >

Description INFOID:000000001179914 The vehicle speed signal is sent to the combination meter from the "ABS actuator and electric unit (control ECH unit)" by CAN communication line. The combination meter then sends a signal to the ECM by CAN communication line. **Diagnosis** Procedure INFOID:000000001179915 С **1**.INSPECTION START Do you have CONSULT-III? D Do you have CONSULT-III? YFS >> GO TO 2. Е NO >> GO TO 3. 2. PERFORM COMPONENT FUNCTION CHECK 1. Turn ignition switch OFF. F 2. Lift up the vehicle. 3. Start engine and let it idle. Select "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-III. 4. 5. Select "VHCL SPEED SE" indication whe n rotating wheels with suitable gear position. "VHCL SPEED SE" indication should exceed 10 km/h (6 MPH). Н Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 3. ${f 3.}$ CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)" Refer to BRC-35, "DTC Logic". Is the inspection result normal? YES >> GO TO 4. NO >> Repair or replace. Κ 4. CHECK COMBINATION METER FUNCTION Refer to MWI-31, "DTC Logic". L >> INSPECTION END Μ Ν

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< ECU DIAGNOSIS > ECU DIAGNOSIS

ECM

Reference Value

INFOID:000000001179916

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.

I.e. 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	C	condition	Values/Status		
ENG SPEED	Run engine and compare CONSL	ILT-III value with the tachometer indication.	Almost the same speed as the tachometer indication.		
MAS A/F SE-B1	See ECH-428, "Diagnosis Procedur				
B/FUEL SCHDL	See ECH-428, "Diagnosis Procedur	<u>e"</u> .			
A/F ALPHA-B1	See ECH-428, "Diagnosis Procedur	<u>e"</u> .			
COOLAN TEMP/S	Engine: After warming up		More than 70°C (158F)		
HO2S1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	$0 - 0.3V \leftrightarrow Approx. 0.6 - 1.0V$		
HO2S2 (B1)	are met. - Engine: After warming up	Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. Engine: After warming up After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at			
HO2S1 MNTR (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN $\leftarrow \rightarrow$ RICH Changes more than 5 times during 10 seconds		
HO2S2 MNTR (B1)	are met. - Engine: After warming up	 Engine: After warming up After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at 			
VHCL SPEED SE	Turn drive wheels and compare C dication.	ONSULT-III value with the speedometer in-	Almost the same speed as speedometer indication		
BATTERY VOLT	Ignition switch: ON (Engine stopp)	ed)	11 - 14V		
	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V		
ACCEL SEN 1	(Engine stopped)	Accelerator pedal: Fully depressed	4.0 - 4.8V		
ACCEL SEN 2	Ignition switch: ON	Accelerator pedal: Fully released	0.6 - 0.9V		
ACCEL SEN 2	(Engine stopped)	Accelerator pedal: Fully depressed	3.9 - 4.8V		
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36V		
THRL SEN 1-B1	(Engine stopped) • Shift lever: 1st	Accelerator pedal: Fully depressed	Less than 4.75V		
	Ignition switch: ON	Accelerator pedal: Fully released	More than 0.36V		
THRL SEN 2-B1	(Engine stopped)Shift lever:1st	Accelerator pedal: Fully depressed	Less than 4.75V		
START SIGNAL	• Ignition switch: $ON \rightarrow START \rightarrow O$	N	$OFF\toON\toOFF$		
	Ignition switch: ON	Accelerator pedal: Fully released	ON		
CLSD THL POS	(Engine stopped)	Accelerator pedal: Slightly depressed	OFF		

ECM

< ECU DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Monitor Item	C	ondition	Values/Status
	• Engine: After warming up idle the	Air conditioner switch: OFF	OFF
AIR COND SIG	engine	Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	 Ignition switch: ON 	Shift lever: Neutral	ON
F/IN F 031 3W	· Ignition switch. ON	Shift lever: Except above	OFF
PW/ST SIGNAL	• Engine: After warming up, idle the	Steering wheel: Not being turned	OFF
FW/ST SIGNAL	engine	Steering wheel: Being turned	ON
LOAD SIGNAL	Ignition quitch: ON	Rear window defogger switch: ON and/or Lighting switch: 2nd position	ON
LOAD SIGNAL	• Ignition switch. ON	Rear window defogger switch and lighting switch: OFF	OFF
IGNITION SW	• Ignition switch: $ON \rightarrow OFF \rightarrow ON$		$ON\toOFF\toON$
	• Engine: After warming up, idle the	Heater fan switch: ON	ON
HEATER FAN SW	engine	Heater fan switch: OFF	OFF
	 Ignition switch: ON Engine: After warming up, idle thengine Ignition switch: ON Ignition switch: ON → OFF → C Engine: After warming up, idle thengine Ignition switch: ON Engine: After warming up Shift lever: Neutral Air conditioner switch: OFF No load Engine: After warming up Shift lever: Neutral Air conditioner switch: OFF No load Engine: After warming up Shift lever: Neutral Air conditioner switch: OFF No load Engine: After warming up Shift lever: Neutral Air conditioner switch: OFF No load Engine: After warming up Shift lever: Neutral Air conditioner switch: OFF No load Engine: After warming up Shift lever: Neutral Air conditioner switch: OFF No load Engine: After warming up Shift lever: Neutral Air conditioner switch: OFF No load Engine: After warming up Shift lever: Neutral Air conditioner switch: OFF No load Engine: After warming up Shift lever: Neutral Air conditioner switch: OFF No load Engine: After warming up, idle thengine For 1 seconds after turning ignite Engine running or cranking Except above Ignition switch: ON Engine: After warming up, idle thengine Air conditioner switch: OFF No load Engine: After warming up, idle thengine Air conditioner switch: OFF No load Engine: After warming up, idle thengine Air conditioner switch: OFF No load Engine: After warming up, idle thengine Air conditioner switch: OFF Engine: After warming up 	Brake pedal: Fully released	OFF
BRAKE SW		Brake pedal: Slightly depressed	ON
		Idle	2.0 - 3.0 msec
NJ PULSE-B1	Air conditioner switch: OFF	2,000 rpm	1.9 - 2.9 msec
		ldle	10° - 20° BTDC
GN TIMING	Air conditioner switch: OFF	2,000 rpm	25° - 45° BTDC
		ldle	0%
PURG VOL C/V	Air conditioner switch: OFF	2,000 rpm	0% - 50%
		ldle	–5° - 5°CA
NT/V TIM (B1)	Air conditioner switch: OFF	2,000 rpm	Approx. 0° - 40°CA
		Idle	0% - 2%
NT/V SOL (B1)	Air conditioner switch: OFF	2,000 rpm	Approx. 0% - 90%
		Air conditioner switch: OFF	OFF
AIR COND RLY		Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	For 1 seconds after turning ignitionEngine running or cranking	n switch: ON	ON
	Except above		OFF
THRTL RELAY	Ignition switch: ON		ON
	• Engines Affersuencing up into the	Engine coolant temperature is 98°C (208F) or less	OFF
COOLING FAN	engine	Engine coolant temperature is between 98°C (208°F) and 99°C (210°F)	LOW
		Engine coolant temperature is 100°C (212°F) or more	HIGH
HO2S1 HTR (B1)			ON
	• Engine speed: Above 3,600 rpm		OFF

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< ECU DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Monitor Item	C	ondition	Values/Status
HO2S2 HTR (B1)	 Engine speed: Below 3,900 rpm a Engine: After warming up Keeping the engine speed betwee idle for 1 minute under no load 	fter the following conditions are met. n 3,500 and 4,000 rpm for 1 minute and at	ON
VEHICLE SPEED	 Turn drive wheels and compare C dication. 	ONSULT-III value with the speedometer in-	Almost the same speed as the speedometer indication
IDL A/V LEARN	Engine: running	Idle air volume learning has not been per- formed yet.	YET
		Idle air volume learning has already been performed successfully.	CMPLT
TRVL AFTER MIL	Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,535 km (0 - 40,723 miles)
O2 SEN HTR DTY	Engine coolant temperature whenEngine speed: Below 3,600 rpm	engine started: More than 80°C (176 - F)	Approx. 30%
AC PRESS SEN	Engine: IdleBoth A/C switch and blower fan sw	vitch: ON (Compressor operates)	1.0 - 4.0V
VHCL SPEED SE	• Turn drive wheels and compare C dication.	ONSULT-III value with the speedometer in-	Almost the same speed as the speedometer indication
SET VHCL SPD	Engine: Running	ngine: Running ASCD: Operating	
		MAIN switch: Pressed	ON
MAIN SW	 Ignition switch: ON 	MAIN switch: Released	OFF
CANCEL SW		CANCEL switch: Pressed	ON
CANCEL SW	 Ignition switch: ON 	CANCEL switch: Released	OFF
		RESUME/ACCELERATE switch: Pressed	ON
RESUME/ACC SW	Ignition switch: ON	RESUME/ACCELERATE switch: Re- leased	OFF
		SET/COAST switch: Pressed	ON
SET SW	Ignition switch: ON	SET/COAST switch: Released	OFF
BRAKE SW1	Ignition switch: ON	Brake pedal and clutch pedal: Fully re- leased	ON
(ASCD brake switch)	• Ignition switch. ON	Brake pedal and/or clutch pedal: Slightly depressed	OFF
BRAKE SW2	 Ignition switch: ON 	Brake pedal: Fully released	OFF
(Stop lamp switch)	 Ignition switch: ON 	Brake pedal: Slightly depressed	ON
VHCL SPD CUT	Ignition switch: ON		NON
LO SPEED CUT	Ignition switch: ON		NON
AT OD MONITOR	Ignition switch: ON		OFF
AT OD CANCEL	Ignition switch: ON		OFF
CRUISE LAMP	Ignition switch: ON	MAIN switch: Pressed at the 1st time \rightarrow at the 2nd time	$ON \rightarrow OFF$
	MAIN switch: ON	ASCD: Operating	ON
SET LAMP	When vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)	ASCD: Not operating	OFF

*: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

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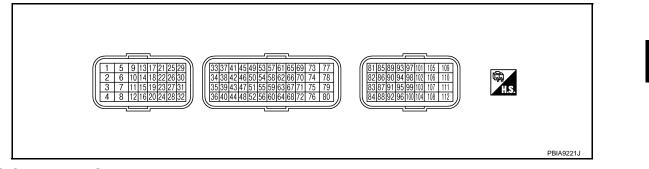
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< ECU DIAGNOSIS >

TERMINAL LAYOUT



PHYSICAL VALUES

NOTE:

- ECM is located in the engine room left side near battery.
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT-III.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECMs transistor. Use a ground other than ECM terminals, such as the ground.

Term	inal No.	Wire	Description			Value	(
+		color	Signal name	Input/ Output	Condition	(Approx.)	
1	Ground	L/W	Throttle control motor (Open)	Output	[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully de- pressed	3.2V★	
2	Ground	R/Y	Throttle control motor relay power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	
3	Ground	LG/R	Heated oxygen sensor 1 heater	Output	[Engine is running]Warm up conditionEngine speed: Below 3,600 rpm	Approximately 3.2V★	ľ
					 [Engine is running] Warm-up condition Idle speed [Engine is running] Engine speed: Above 3,600 rpm 	BATTERY VOLTAGE (11 - 14V)	(
4	Ground	Ρ	Throttle control motor (Close)	Output	 [Ignition switch: ON] Engine stopped Shift lever: 1st Accelerator pedal: Fully released 	0 - 14V★	I

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< ECU DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Term	inal No.	\\/ire	Description			Value
+		Wire color	Signal name	Input/ Output	Condition	value (Approx.)
5	Ground	R	Heated oxygen sensor 2 heater	Output	 [Engine is running] Engine speed: Below 3,900 rpm after the following conditions are met Engine: after warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	10V★
					[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,900 rpm	BATTERY VOLTAGE (11 - 14V)
0	Ground		EVAP canister purge volume	Output	[Engine is running] • Idle speed	BATTERY VOLTAGE (11 - 14V)★
9	Ground	W/B	control solenoid valve	Output	 [Engine is running] Engine speed: About 2,000 rpm (More than 100 seconds after starting engine.) 	BATTERY VOLTAGE (11 - 14V)★
10 11	Ground	B B/W	ECM ground	_	[Engine is running] • Idle speed	Body ground
15	Ground	G/L	Throttle control motor relay	Output	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)
					[Ignition switch: ON]	0 - 1.0V
17 18	Ground	L/Y BR/Y R/G SB	BR/YIgnition signal No. 2R/GIgnition signal No. 4	Output -	 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle 	0 - 0.3V★
21 22	Ground				[Engine is running]Warm-up conditionEngine speed: 2,500 rpm	0.2 - 0.5V★



< ECU DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Term	inal No.	Mire	Description			Value	-
+		Wire color	Signal name	Input/ Output	Condition	Value (Approx.)	A
23	Ground	B/O	Fuel pump relay	Output	 [Ignition switch: ON] For 1 second after turning ignition switch ON [Engine is running] 	0 - 1.0V	ECI
23	Ground	БЮ	T dei pump relay	Output	 [Ignition switch: ON] More than a few seconds after turning ignition switch ON 	BATTERY VOLTAGE (11 - 14V)	С
						BATTERY VOLTAGE (11 - 14V)★	D
					[Engine is running] • Warm-up condition • Idle speed NOTE:		E
25 29	Ground	R/O Y	Fuel injector No. 4 Fuel injector No. 3	Output	The pulse cycle changes de- pending on rpm at idle	≫ 10.0 V/Div 50 ms/Div T PBIB0529E	F
30 31	Cround	O L	Fuel injector No. 2 Fuel injector No. 1	Culput		BATTERY VOLTAGE (11 - 14V)★	G
					[Engine is running]Warm-up conditionEngine speed: 2,000 rpm		Н
						≫10.0 V/Div 50 ms/Div T PBIA4943J	
32	Ground	Y/L	ECM relay	Output	[Engine is running][Ignition switch: OFF]A few seconds after turning ignition switch OFF	0 - 1.0V	J
52	Cround	1/2	(Self shut-off)	Output	 [Ignition switch: OFF] More than a few seconds after turning ignition switch OFF 	BATTERY VOLTAGE (11 - 14V)	K
33	Ground	L/R	Throttle position sensor 1	Input	 [Ignition switch: ON] Engine stopped Shift lever: 1st Accelerator pedal: Fully released 	More than 0.36V	L
55	Ground	L/K		input	 [Ignition switch: ON] Engine stopped Shift lever: 1st Accelerator pedal: Fully depressed 	Less than 4.75V	N
34	Ground	1/0	Throttle position consor 2	Input	 [Ignition switch: ON] Engine stopped Shift lever: 1st Accelerator pedal: Fully released 	Less than 4.75V	O
54	Ground	Ground L/O Throttl	Throttle position sensor 2 Input		 [Ignition switch: ON] Engine stopped Shift lever: 1st Accelerator pedal: Fully depressed 	More than 0.36V	-



[HR16DE (WITHOUT EURO-OBD)]

< ECU DIAGNOSIS >

Term	inal No.	Mire	Description			Value
+		Wire color	Signal name	Input/ Output	Condition	Value (Approx.)
36	Ground	V/W	Sensor ground (Throttle position sensor)		[Engine is running]Warm-up conditionIdle speed	0V
37	Ground	W	Knock sensor	Input	[Engine is running] • Idle speed	2.5V
38	Ground	GR/B	Engine coolant temperature sensor	Input	[Engine is running]	0 - 4.8V Output voltage varies with engine coolant temperature.
40	Ground	_	Sensor ground (Knock sensor)		[Engine is running]Warm-up conditionIdle speed	0V
41	Ground	G/P	Refrigerant pressure sensor	Input	 [Engine is running] Warm-up condition Both A/C switch and blower fan motor switch: ON (Com- pressor operates) 	1.0 - 4.0V
44	Ground	В	Sensor ground (Engine coolant temperature sensor)	—	[Engine is running]Warm-up conditionIdle speed	0V
					[Ignition switch ON]Engine stopped	0.4V
45	Ground	BR	Mass air flow sensor	Input	[Engine is running] • Warm-up condition • Idle speed	1.0 - 1.3V
					[Engine is running]Warm-up conditionEngine is revving from idle to about 4,000 rpm	1.0 - 1.3 to 2.4V (Check for linear voltage rise in response to en- gine being increased to about 4,000 rpm.)
46	Ground	V	Intake air temperature sen- sor	Input	[Engine is running]	0 - 4.8V Output voltage varies with intake air temperature.
48	Ground	R/L	Sensor ground (Refrigerant pressure sen- sor)		[Engine is running] • Warm-up condition • Idle speed	0V
49	Ground	L/G	Heated oxygen sensor 1		[Engine is running]Warm-up conditionEngine speed: 2,000 rpm	0 - 1.0V (Periodically change)
50	Ground	Y	Heated oxygen sensor 2	Input	 [Engine is running] Revving engine from idle to 3,000 rpm quickly after the following conditions are met Engine: after warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	0 - 1.0V
52	Ground	LG	Sensor ground (Mass air flow sensor)		[Engine is running]Warm-up conditionIdle speed	0V
55	Ground	0	Sensor power supply (Intake air temperature sen- sor)	_	[Engine is running]Warm-up conditionIdle speed	0V
56	Ground	Ρ	Sensor ground (Heated oxygen sensor 1)	—	[Engine is running]Warm-up conditionIdle speed	0V



[HR16DE (WITHOUT EURO-OBD)]

< ECU DIAGNOSIS >

Term	inal No.	Wire	Description			Value	
+		color	Signal name	Input/ Output	Condition	(Approx.)	A
59	Ground	SB	Sensor ground (Heated oxygen sensor 2)		[Engine is running]Warm-up conditionIdle speed	0V	ECH
					 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle 	0 - 1.0V★	C
61	Ground	LG/B	Crankshaft position sensor (POS)	Input			E
					[Engine is running] • Engine speed: 2,000 rpm	20 0.5 V/Div 5 ms/Div	F
			Sensor ground		[Engine is running]	MBIB1454E	
62	Ground	GR/L	[Crankshaft position sensor (POS)]	_	Warm-up conditionIdle speed	0V	Н
63	Ground	L	Sensor ground [Camshaft position sensor (PHASE)]	_	[Engine is running]Warm-up conditionIdle speed	0V	I
					 [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle 	0 - 1.0V★	J
65	Ground	G	Camshaft position sensor (PHASE)	Input		MBIB1455E 0 - 1.0V★	L
				[Engine is running] • Engine speed is 2,000 rpm	▶ 0.5 V/D/v 10 ms/D/v T MBIB 1456E	M	
		<u> </u>			[Ignition switch: ON] • Neutral	BATTERY VOLTAGE (11 - 14V)	
69	69 Ground W/B Neutral position switch Input	Input	[Ignition switch: ON] • Shift lever: Except above position	0V	0		
72	Ground	V/R	Sensor power supply (Throttle position sensor)		[Ignition switch: ON]	5V	Ρ

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< ECU DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Term	Terminal No.		Description			Value	
+		Wire color	Signal name	Input/ Output	Condition	(Approx.)	
					[Engine is running]Warm-up conditionIdle speed	BATTERY VOLTAGE (11 - 14V)	
73	Ground	Y/R	Intake valve timing control solenoid valve	Output	[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 10V★	
74	Ground	Y/W	Sensor power supply (Refrigerant pressure sen- sor)	_	[Ignition switch: ON]	5V	
75	Ground	L/W	Sensor power supply [Crankshaft position sensor (POS)]		[Ignition switch: ON]	5V	
78	Ground	Y/V	Sensor power supply [Camshaft position sensor (PHASE)]		[Ignition switch: ON]	5V	
83	Ground	Ρ	CAN communication line	Input/ Output	_	_	
84	Ground	L	CAN communication line	Input/ Output	_	_	
88	Ground	0	Data link connector	Input/ Output	[Ignition switch: ON] • CONSULT-III: Disconnected	2.7V	
					[Ignition switch: OFF]	0V	
93	Ground	W/L	Ignition switch	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	
					[Ignition switch: ON] • ASCD steering switch: OFF	4V	
					[Ignition switch: ON] • CANCEL switch: Pressed	1V	
94	Ground	V	ASCD steering switch	Input	[Ignition switch: ON]MAIN switch: Pressed	0V	
			, , , , , , , , , , , , , , , , , , ,		[Ignition switch: ON]RESUME/ACCELERATE switch: Pressed	3V	
					[Ignition switch: ON] • SET/COAST switch: Pressed	2V	
95	Ground	В	Sensor ground (ASCD steering switch)		[Engine is running]Warm-up conditionIdle speed	0V	
					[Ignition switch: OFF]Brake pedal: Fully released	0V	
99	Ground	R/W	Stop lamp switch	Input	[Ignition switch: OFF]Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)	



[HR16DE (WITHOUT EURO-OBD)]

< ECU DIAGNOSIS >

Terminal No.		14/2	Description																						
+		Wire color	Signal name	Input/ Output	Condition	Value (Approx.)	A																		
100	Ground	R	ASCD brake switch	Input	[Ignition switch: ON]Brake pedal and clutch ped- al: Slightly depressed	0V	ECH																		
100	Ground	K		mput	[Ignition switch: ON]Brake pedal and/or clutch pedal: Fully released	BATTERY VOLTAGE (11 - 14V)	С																		
102	Ground	BR	Sensor power supply (Accelerator pedal position sensor 2)	_	[Ignition switch: ON]	5V	D																		
103	Ground	CP	Accelerator pedal position	loput	[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released	0.3 - 0.6V	E																		
103	Ground	Ground GR Sensor 2	Input	mpar				inpat	mpar											•			[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully depressed	1.95 - 2.4V	F
104	Ground	Y	Sensor ground (Accelerator pedal position sensor 2)	_	[Engine is running]Warm-up conditionIdle speed	0V	G																		
105	Ground	G	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)	Н																		
106	Ground	V	Sensor power supply (Accelerator pedal position sensor 1)	_	[Ignition switch: ON]	5V	I																		
108	Ground	В	ECM ground	_	[Engine is running] • Idle speed	Body ground																			
110	Ground	G	Accelerator pedal position	Input	[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released	0.6 - 0.9V	J																		
110	Ground		sensor 1	input	[Ignition switch: ON]Engine stoppedAccelerator pedal: Fully depressed	3.9 - 4.7V	L																		
111	Ground	R	Sensor ground (Accelerator pedal position sensor 1)		[Engine is running]Warm-up conditionIdle speed	٥V	M																		

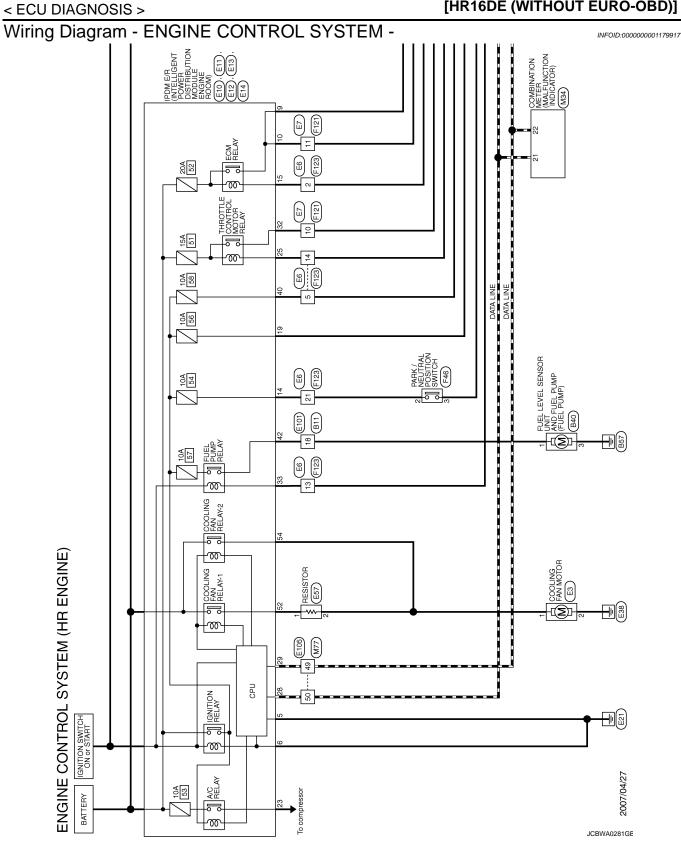
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

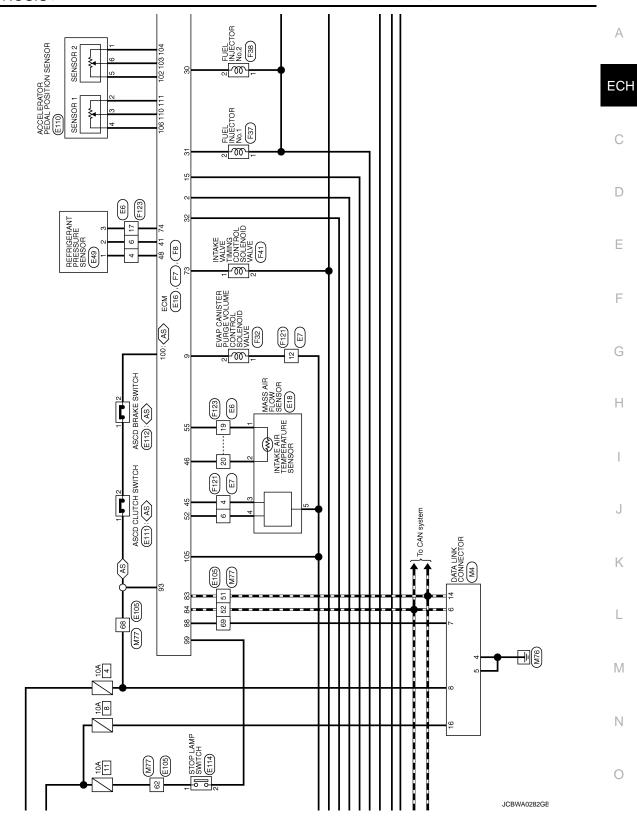
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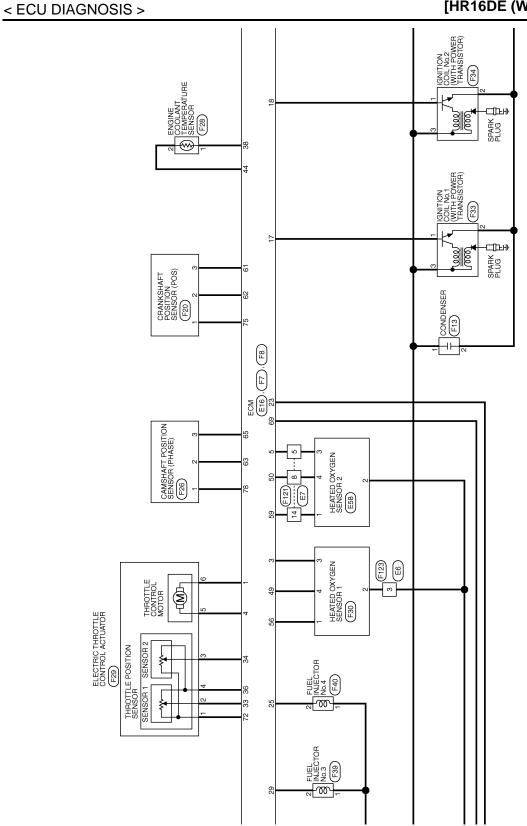


AS>: With ASCD

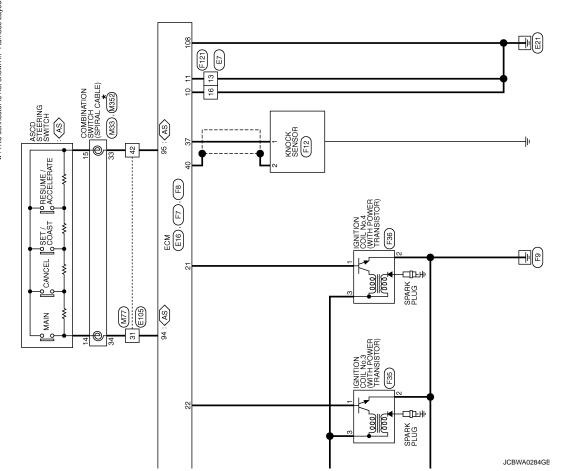
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AS>: With ASCD

*: This connector is not shown in "Harness Layout".

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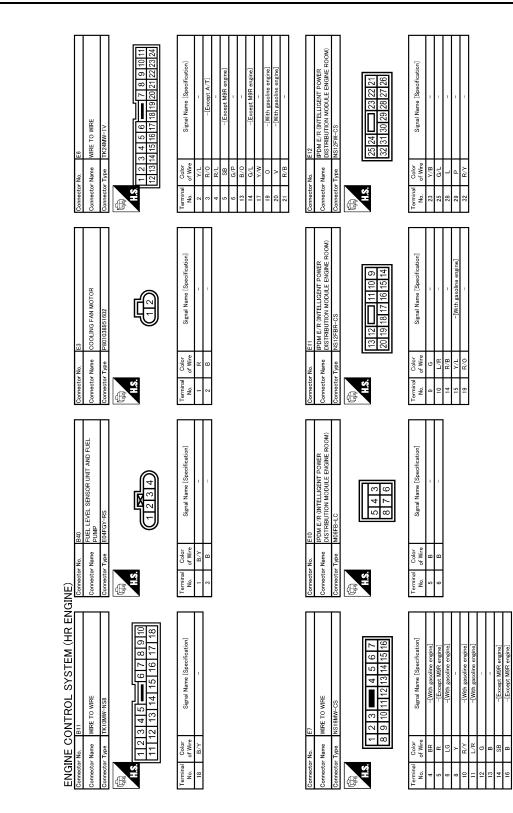
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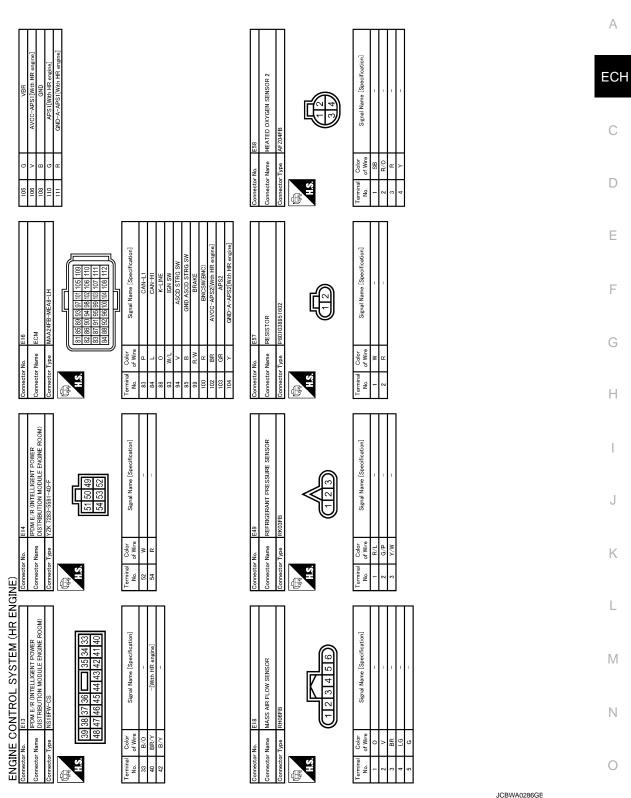
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[HR16DE (WITHOUT EURO-OBD)]

Connector No. E111 Connector Name ASCD CLUTCH SWITCH Connector Type MOZFBF-LC Connector Type MOZFBF-LC	21 R/G IGN COLL#I 22 Sb ION COLL#I 23 B/O HAR 25 R/O MUBH 26 N.O IMJH 27 O MLH 29 V MLH 31 L MLH 32 V/L SSOFF
Commetter No. E110 Connector Name ACCELERATOR PEDAL POSITION SENSOR Connector Type RH06FB Connector Type RH06FB	Connector No. F7 Connector Name ECM Connector Type MAX24FGY-MEA3-FH Connector Type Connector Type Connector Type Connector Type To LW MAX24FGY-MEA3-FH I LW MOTORI I DA Connector Type Mort Type Connector Type Connector Type I DA MOTORI I <td< td=""></td<>
GINE Connector Name Connector Name Connector Name Connector Name Connector Name	Connector No. E114 Connector Name STOP LAMP SWITCH Connector Type MO2FB Torninal Odir Torninal Odir 1 V 2 R/W
ENGINE CONTROL SYSTEM (HR ENG Connector Name WRE TO WRE Connector Type MRE TO WRE Connector Type MR	Connector No. E112 Connector Name ASCD BRAKE SWITCH Connector Type MOZFBR-LC Connector Type MOZFBR-LC Image Signal Name [Specification] 1 O 2 R

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ECU DIAGNOSIS >			
Connector No. F13 Connector Name CONDENSER Connector Type MO2FW-GV-LC Connector Type MO2FW-GV-LC Image: Signal Name Signal Name [Specification] 2 B	Connector Na. 729 Connector Name ELECTRIC THROTTLE CONTROL Connector Type PHOFE	Terminal Mo. Galor of Wre 2 Signal Name [Specification] 2 L/R [With HR engine] 3 L/O [With HR engine] 4 V/M [With HR engine] 6 L/W -	A ECH C D
Connector No. F12 Connector Name KNO/X SENSOR Connector Name KNO/X SENSOR Connector Type BS22FB-AHY-S Connector Name KNO/X SENSOR Connector Name KNO/X SENSOR Connector Name KNO/X SENSOR Connector Name SS27B-AHY-S	Connector No. 728 Connector Name ENGINE COOLANT TEMPERATURE SENSOR Connector Type EU2F GY-RS	Tarninal Mo. Calor of Wire Signal Name [Specification] 1 GR VB -[With HR angine] 2 B -[With HR angine]	E F G
AINE) 49 L/G OZSF[With HR engine] 50 V V OZSF 55 P OND-A OZSF 56 P OXSF OA 56 P OXSF OA 66 P OXSF OA 67 C OA OA 68 L CAU-PANSE[With HR engine] OA 69 W MCUTH RE engine] OA 73 V/R AVOCEPPRES] OA 73 V/R AVOCEPPRES] OA 73 V/N PHASE AVOC OA 74 V/V PHASE AVOC OA	Connector No. F26 Connector Name CAMSHAFT POSITION SENSOR (PHASE) Connector Type RHQ3FB	Torminal Calor Signal Name [Specification] No. of Wre Signal Name [Specification] 2 L (With HR engine] 3 G (With HR engine]	I J K
Formation Control SYSTEM (HR ENGINE) Commetter Nin. Colspan="2">Colspan="2">Colspan="2" Colspan="2" Social Colspan="2" Social Colspan="2" Social Colspan="2" Colspan= Name (Specification) Colspan= Colspan="2" Colspan= Colspan="2"	Connector No. 720 Connector Name CRANKSHAFT POSITION SENSOR (POS) Connector Type H03FB	Terminal Mo. Color of Wore Signal Name [Specification] 1 LU - 2 LU - 3 L0/B -	L M N
		JCBWA0288GE	

Ρ

< ECU DIAGNOSIS >

Connector No. F34 Connector Name TRANISSTOR? Connector Name TRANISSTOR? Connector Type E00FGY-RS	Terminal Color No. of Wree Signal Name [Specification] 1 BR/Y 2 B 3 L/R	Gomestor No. 738 Connoctor Name FUEL INJECTOR NO.2 Connoctor Type HS02FGY	Terminal Color Signal Name [Specification] No. of Wree Signal Name [Specification] 1 SB -[Mth HR engine] 2 0 -[Mth HR engine]
Connector No. F:3 Connector Name IGNNTION COIL NO.1 (WITH POWER Connector Type E03FGY-RS	Terminal Color Signal Name [Specification] No. of Wre 1 L/Y 2 B 3 L/R	Gometor No. F37 Connector Name FUEL INJECTOR NO. 1 Connector Type HSQFGY	Terminal No. Color of Wire Signal Name (Specification) 1 1 88 - 2 L - -
Comeator No. F2 Comeator Name Commeter Name Control Solt Eval Control Control Solt Eval Control Control Solt Solt Solt Solt Solt Solt Solt So	Terminal No. Color Signal Name [Specification] 1 G - 2 W/B -	Gomester No. 736 Connector Name IGNITION COLI NO.4 (WITH POWER Connector Type E03FGV-RS.	Terminal Mo. Color Signal Name [Speeification] No. of Wre - 1 R/G - 2 B - 3 J.CR -
ENGINE CONTROL SYSTEM (HR ENGINE) Connector Name Dometer Name Dometer Type AFZU4FB Control Contr	Terminal No. Color Signal Name [Specification] 1 P -[With HR engine] 2 R/O -[With HR engine] 3 LG/R -[With HR engine] 4 L/G -[With HR engine]	Generator No. F35 Connector Name IdANTICIN COLI NO.3 (WTH POWER Donnector Type E03FCV-F63	Terrintal Color Stanal Name [Specification] No. of Wire Specification] 1 SB -[With HR angine] 2 B - 3 1 P

JCBWA0289GE

DIAGNOSIS >			[
ГТ					A
Connector No. F46 Connector Name PARK/NEUTRAL POSITION SWITCH Connector Type EAOBFG	Terminal No. Color of Wise Signal Name [Specification] 2 R:B - 3 W/B -	Corrector No. M33 Connector Name COMBINATION SWITCH (SPIRAL CABLE) Connector Type IK08FGY-1V Connector Type IK08FGY-1V M4.S. 21 22 25 26 27 31 32 33 34	Terminal Color of Wre Signal Name [Specification] No. of Wre 33 E		C D
			1 emiin No. 3 3 3 3		_
F41 INTARE VALVE TIMING CONTROL BOLENDD VALVE E02FG-RS-LGV	Signal Name (Specification)	M4 DATA LINK CONNECTOR BD16FW 9 10 111 12 13 14 15 16 1 2 3 4 5 6 7 8	Signal Name [Specification]		E
e e	of Wire V/R L/R		of Mine Mine ≺ P ≰ O ⊢ B B B		G
Connetor No. Connetor Name Connetor Type	Terminal No. 2	Connector Name Connector Name Connector Type	Terminal No. 6 6 6 7 7 7 7 16 11 8 11 6		Н
F40 FUEL INJECTOR NO.4 HS02FGY	Signal Name [Secification]	ro wrec w-rv 7	Signal Name [Specification] - [Eccept A/T] - [Eccept ANT] - [Eccept ANR engine] - [Eccept ANR engine] - [With gasoline engine] - [With gasoline engine]		I J
LINE) Connector No. F40 Connector Name FUEL IN Connector Type HS027F	Terminal Color No. of Wee 1 SB 2 R/O	Connector No. F123 Connector Name WIRE TO WIRE Donnector Type TrC2#FW-1V HAS 242322212019	Terminal Color No. of Wre No. of Wre No. of Wre 3 R/L 4 R/L 6 G,P 13 B,O 19 O 21 R/B		K
HHENO					L
ENGINE CONTROL SYSTEM (HR ENGINE) <u>Connector Na. F30</u> <u>Connector Name</u> F1 <u>Connector Name</u> F1 <u>Connector Type</u> HS02FGY	Signal Name [Specification] - Landre - [With HR engine]	o wire w-cs 1 4 1 3 2 1 4 13 12 11 10 9 8	Signal Name (Specification) -[With gasoline engine] -[Eccept UNR eagine] -[With gasoline engine] -[With gasoline engine] -[With gasoline engine] -[Eccept M9R engine] -[Eccept M9R engine]		Μ
Definition of the second secon	of Wire A B ≺ S	Pilot F121 Pilot WIRE TO WIRE Pilot VISTEFW-CS T6 5 4 1 16 15 14 13	Color of Wire Wire B R B B B B B B B B B B B B B B B B B B		Ν
ENGINI Gometor Ne Connector Ne Connector Ty HAS	No. of 1	Connector No. Connector Name Connector Type	Terminal No. of No. of 6 6 6 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		0
				JCBWA0290GE	Ρ

NON DTC RELATED ITEM

Fail Safe

WIRE TO WIRE 75 71 78 73 78 73 90 75 Connector Name ALS. Termir No. No. 31 50 51 52 68 68 69 ENGINE CONTROL SYSTEM (HR ENGINE) G Signal Name [Specification] OMBINATION METER Color of Wire · Name 2 T

MBINATION SWITCH (SPIRAL CABLE)

Name

H.S.	Terminal No.	14	15								
	Signal Name [Specification]	-	-	-	-	-	-	-	-	-	
	Color of Wire	^	в	Ч	-	٩.	_	>	M	0	
Ś	ninal o.	_	2			_	~	~	8	_	

Signal Name [Specification]

Color of Wire

JCBWA0291GE

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< ECU DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

Engine operating condi- tion in fail-safe mode	Detected items	Remarks	Reference page	А
Engine speed will not rise more than 2,500 rpm due to the fuel cut	Malfunction indicator lamp circuit	When there is an open circuit on MI circuit, the ECM cannot warn the driver by lighting up MI when there is malfunction on engine control system.		ECH
		Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MI circuit is open by means of operating fail-safe function. The fail-safe function also operates when above diagnoses except MI circuit the malfunction and the detected and the malfunction and the malfunction.	<u>ECH-415</u>	С
		circuit are detected and demands the driver to repair the malfunction.		D

DTC RELATED ITEM

DTC No.	Detected items	Engine operat	ing condition in fail-safe mode							
P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.								
P0117 P0118	Engine coolant tempera- ture sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch ON or START. CONSULT-III displays the engine coolant temperature decided by ECM.								
		Condition Engine coolant temperature dec (CONSULT-III display)								
		Just as ignition switch is turned ON or START 40°C (104°F)								
		More than approx. 4 minutes after gnition ON or START 80°C (176°F)								
		Except as shown above	40 - 80°C (104 - 176°F)							
			(Depends on the time)							
		When the fail-safe system for engine coolant temperature sensor is activated, the coolin fan operates while engine is running.								
P0122 P0123 P0222 P0223 P2135 P1121	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.								
P1121	Electric throttle control ac- tuator	malfunction:)	or does not function properly due to the return spring ruator by regulating the throttle opening around the not rise more than 2,000 rpm.							
		(When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.								
		 (When ECM detects the throttle valve is stuck open:) While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in Neutral position, and engine speed will not exceed 1,000 rpm or more. 								
P1122	Electric throttle control function	ECM stops the electric throttle contro fixed opening (approx. 5 degrees) by	ol actuator control, throttle valve is maintained at a y the return spring.							
P1124 P1126	Throttle control motor relay	ECM stops the electric throttle contro fixed opening (approx. 5 degrees) by	ol actuator control, throttle valve is maintained at a y the return spring.							
P1128	Throttle control motor	ECM stops the electric throttle contro fixed opening (approx. 5 degrees) by	ol actuator control, throttle valve is maintained at a y the return spring.							
P1229	Sensor power supply	ECM stops the electric throttle contro fixed opening (approx. 5 degrees) by	ol actuator control, throttle valve is maintained at a / the return spring.							

< ECU DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

DTC No.	Detected items	Engine operating condition in fail-safe mode									
P1805	Brake switch	ECM controls the electric throttle co small range. Therefore, acceleration will be pool	ontrol actuator by regulating the throttle opening to a r.								
		Vehicle condition	Driving condition								
		When engine is idling	Normal								
		When accelerating	Poor acceleration								
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	order for the idle position to be with	tle control actuator in regulating the throttle opening in in +10 degrees. eed of the throttle valve to be slower than the normal								

DTC Inspection Priority Chart

INFOID:000000001179919

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

Priority	Detected items (DTC)
1	 U1001 CAN communication line U1010 CAN communication P0102 P0103 Mass air flow sensor P0117 P0118 Engine coolant temperature sensor P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor P0327 P0328 Knock sensor P0335 Crankshaft position sensor (POS) P0340 Camshaft position sensor (PHASE) P0605 ECM P1229 Sensor power supply P1610 - P1615 NATS P1706 Park/neutral position (PNP) switch P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor
2	 P0132 P0134 Heated oxygen sensor 1 P0138 Heated oxygen sensor 2 P1065 ECM power supply P1111 Intake valve timing control solenoid valve P1122 Electric throttle control function P1124 P1126 Throttle control motor relay P1128 Throttle control motor P1217 Engine over temperature (OVERHEAT) P1564 ASCD steering switch P1572 ASCD brake switch P1572 ASCD vehicle speed sensor P1805 Brake switch
3	 P0011 Intake valve timing control P1121 Electric throttle control actuator P1212 ESP communication line

DTC Index

INFOID:000000001179920

×:Applicable —: Not applicable

DTC	×1	Items	Trip	MI	Reference
CONSULT-III*2	ECM* ³	(CONSULT-III screen terms)	пр	IVII	page
U1001	1001* ⁴	CAN COMM CIRCUIT	2	—	ECH-439
U1010	1010	CONTROL UNIT(CAN)	2	—	ECH-440
P0000	0000	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	_	Flashing	_
P0011	0011	INT/V TIM CONT-B1	2	—	<u>ECH-441</u>

ECM

< ECU DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

DTC		Items (CONSULT-III screen terms)	Trip	MI	Reference
CONSULT-III*2	ECM* ³				page
P0102	0102	MAF SEN/CIRCUIT-B1	1	×	<u>ECH-445</u>
P0103	0103	MAF SEN/CIRCUIT-B1	1	×	<u>ECH-445</u>
P0117	0117	ECT SEN/CIRC	1	×	<u>ECH-450</u>
P0118	0118	ECT SEN/CIRC	1	×	<u>ECH-450</u>
P0122	0122	TP SEN 2/CIRC-B1	1	×	<u>ECH-453</u>
P0123	0123	TP SEN 2/CIRC-B1	1	×	<u>ECH-453</u>
P0132	0132	HO2S1 (B1)	2	×	<u>ECH-456</u>
P0134	0134	HO2S1 (B1)	2	×	<u>ECH-460</u>
P0138	0138	HO2S2 (B1)	2	×	<u>ECH-464</u>
P0222	0222	TP SEN 1/CIRC-B1	1	×	ECH-469
P0223	0223	TP SEN 1/CIRC-B1	1	×	ECH-469
P0327	0327	KNOCK SEN/CIRC-B1	2	_	ECH-472
P0328	0328	KNOCK SEN/CIRC-B1	2	—	ECH-472
P0335	0335	CKP SEN/CIRCUIT	2	×	ECH-474
P0340	0340	CMP SEN/CIRC-B1	2	×	ECH-478
P0605	0605	ECM	1 or 2	× or —	ECH-482
P1065	1065	ECM BACK UP/CIRCUIT	2	×	<u>ECH-484</u>
P1111	1111	INT/V TIM C/CIRC	1	×	ECH-486
P1121	1121	ETC ACTR-B1	1	×	ECH-488
P1122	1122	ETC FUNCTION/CIRC-B1	1	×	ECH-490
P1124	1124	ETC MOT PWP	1	×	ECH-494
P1126	1126	ETC MOT PWP-B1	1	×	<u>ECH-494</u>
P1128	1128	ETC MOT-B1	1	×	ECH-497
P1212	1212	TCS/CIRC	2		ECH-241
P1217	1217	ENG OVER TEMP	1	×	ECH-500
P1225	1225	CTP LEARNING-B1	2	_	ECH-504
P1226	1226	CTP LEARNING-B1	2		ECH-506
P1229	1129	SENSOR POWER/CIRC	1	×	ECH-508
P1564	1564	ASCD SW	1		ECH-252
P1572	1572	ASCD BRAKE SW	1		ECH-255
P1574	1574	ASCD VHL SPD SEN	1	_	ECH-261
P1610	1610	LOCK MODE	2		<u>SEC-15</u>
P1611	1611	ID DISCARD IMM-ECM	2		SEC-15
P1612	1612	CHAIN OF ECM-IMMU	2	_	<u>SEC-15</u>
P1615	1615	DIFFERENCE OF KEY	2	<u> </u>	<u>SEC-15</u>
P1706	1706	P-N POS SW/CIRCUIT	2	×	ECH-522
P1805	1805	BRAKE SW/CIRCUIT	2	_	ECH-525
P2122	2122	APP SEN 1/CIRC	1	×	ECH-527
P2123	2123	APP SEN 1/CIRC	1	×	ECH-527
P2127	2127	APP SEN 2/CIRC	1	×	ECH-530
P2128	2128	APP SEN 2/CIRC	1	×	ECH-530
P2135	2135	TP SENSOR-B1	1	×	ECH-534
P2138	2138	APP SENSOR	1	×	ECH-537

*1: 1st trip DTC No. is the same as DTC No.

< ECU DIAGNOSIS >

*2: This number is prescribed by 15031-5.

*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

*4: The troubleshooting for this DTC needs CONSULT-III.

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:000000001179921 ECH

SYSTEM — BASIC ENGINE CONTROL SYSTEM

	SYMPTOM															С
						7					н					
		NO START/RESTART (EXCP. HA)	E STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	SIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page	D E F
		HARD/NO	ENGINE	HESIT/	SPARK	LACK (HGH II	ROUG	DLING	SLOW/	OVERH	EXCES	EXCESSIVE	BATTE		
Warrant	y symptom code	AA	AB	AC	AD	AE	AF	AG	– AH	AJ	AK	AL	AM	HA		Н
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	ECH-294	
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4		-	<u>ECH-622</u>	1
	Fuel injector circuit	1	1	2	3	2		2	2			2			ECH-553	
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			ECH-402	
Air	Positive crankcase ventilation sys- tem	3	3	4	4	4	4	4	4	4		4	1		ECH-582	J
	Incorrect idle speed adjustment	-					1	1	1	1		1			ECH-357	K
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	ECH-206, ECH-208, ECH-488	Γ
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			ECH-357	L
	Ignition circuit	1	1	2	2	2		2	2			2			ECH-576	
Main po	wer supply and ground circuit	2	2	3	3	3		3	3		2	3			ECH-435	M
Mass ai	r flow sensor circuit	1			2										<u>ECH-445,</u> <u>ECH-445</u>	
Engine	coolant temperature sensor circuit						3			3					<u>ECH-450</u>	Ν
Heated	oxygen sensor 1 circuit		1	2	3	2		2	2			2			ECH-456, ECH-460, ECH-559, ECH-559, ECH-559	0
Throttle	position sensor circuit						2	+		2					ECH-453, ECH-469, ECH-504, ECH-506, ECH-534	Ρ
Accelera	ator pedal position sensor circuit			3	2	1									ECH-527, ECH-530, ECH-537	
Knock s	ensor circuit			2								3			ECH-472	

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[HR16DE (WITHOUT EURO-OBD)]

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

		SYMPTOM												
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	ΗΙΘΗ ΙDΓΕ/ΓΟΜ IDΓΕ	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Crankshaft position sensor (POS) circuit	2	2												<u>ECH-474</u>
Camshaft position sensor (PHASE) circuit	3	2												ECH-478
Vehicle speed signal circuit		2	3		3						3			ECH-585
ECM	2	2	3	3	3	3	3	3	3	3	3			<u>ECH-482,</u> <u>ECH-484</u>
Intake valve timing control solenoid valve cir- cuit		3	2		1	3	2	2	3		3			<u>ECH-486</u>
PNP switch circuit			3		3		3	3			3			ECH-522
Refrigerant pressure sensor circuit		2				3			3		4			ECH-583
Electrical load signal circuit							3							ECH-548
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	<u>HAC-122</u> , <u>HAC-212</u>
ABS actuator and electric unit (control unit)			4											BRC-9
1 - 6: The numbers refer to the order of inspection	20													

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

ENGINE CONTROL SYSTEM SYMPTOMS [HR16DE (WITHOUT EURO-OBD)]

< SYMPTOM DIAGNOSIS >

							S	MPT	OM							А
		HA)				ATION					RE HIGH					ECH
		HARD/NO START/RESTART (EXCP. HA)	IALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDRE/LOW IDLE	ROUGH IDLE/HUNTING	RATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	E OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page	C
		HARD/NO	ENGINE STALL	HESITATIC	SPARK KN	LACK OF F	HIGH IDLE	ROUGH ID	IDLING VIBRATION	ON/MOTS	OVERHEA'	EXCESSIV	EXCESSIVE	BATTERY I		E
Warranty s	ymptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA		F
Fuel	Fuel tank	F													<u>FL-15</u> , <u>FL-17</u>	
	Fuel piping	5		5	5	5	-	5	5			5			<u>FL-5</u>	G
	Vapor lock		5													0
	Valve deposit		-										-			
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5			_	Η
Air	Air duct														<u>EM-29</u>	1
	Air cleaner														<u>EM-29</u>	1
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)		5	5		5		5	5			5			<u>EM-29</u>	J
	Electric throttle control actuator	5			5		5			5					<u>EM-30</u>	
	Air leakage from intake manifold/ Collector/Gasket														<u>EM-30</u>	Κ
Cranking	Battery Generator circuit	1	1	1		1		1	1					1	<u>PG-2</u> <u>CHG-15</u>	L
	Starter circuit	3										1			<u>STR-21</u>	
	Signal plate	6													<u>EM-102</u>	D. 4
	PNP switch	4													<u>TM-13</u>	M
Engine	Cylinder head	5	5	5	5	5		5	5			5			<u>EM-81</u>	
	Cylinder head gasket						-				4		3	-		Ν
	Cylinder block															
	Piston												4			0
	Piston ring	6	6	6	6	6		6	6			6		-	<u>EM-102</u>	0
	Connecting rod															
	Bearing Crankshaft															Ρ
Valve	Timing chain														EM-54	
mecha-	Camshaft														<u>EM-66</u>	
nism	Intake valve timing control	5	5	5	5	5		5	5			5			<u>EM-54</u>	
	Intake valve															
	Exhaust valve												3		<u>EM-81</u>	

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[HR16DE (WITHOUT EURO-OBD)]

		SYMPTOM													
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDRE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			<u>EM-76,</u> EM-33
	Three way catalyst														<u>LIVI-55</u>
Lubrica- tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			<u>EM-43,</u> <u>EM-93,</u> <u>LU-9,</u> <u>LU-3</u>
	Oil level (Low)/Filthy oil														<u>LU-6</u>
Cooling	Radiator/Hose/Radiator filler cap														<u>CO-12</u>
	Thermostat									5					<u>CO-20</u>
	Water pump														<u>CO-18</u>
	Water gallery	5	5	5	5	5		5	5		4	5			<u>CO-22</u>
	Cooling fan														<u>CO-15</u>
	Coolant level (Low)/Contaminat- ed coolant									5					<u>CO-9</u>
NATS (NIS	SSAN Vehicle Immobilizer System)	1	1												SEC-15

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION [HR16DE (WITHOUT EURO-OBD)]

< SYMPTOM DIAGNOSIS >

NORMAL OPERATING CONDITION

Description

Description INFOID:000000001179922	
FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED) If the engine speed is above 2,500 rpm under no load (for example, the shift lever position is neutral and engine speed is over 2,500 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off var-	ECH
ies based on engine speed. Fuel cut will be operated until the engine speed reaches 2,000 rpm, then fuel cut will be cancelled. NOTE:	С
This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, <u>ECH-367, "System Description"</u> .	D
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< PRECAUTION > PRECAUTION PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the "SRS AIRBAG" and "SEAT BELT" of this Service Manual.

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.
- 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".
- 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 for Procedure without Cowl Top Cover

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When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc.

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WARNING:

Comply with the following warnings to prevent any serious accident.

- Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.
- Never work with wet hands.
- Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon headlamp ON in other conditions. Connect the power supply to the vehicle-side connector. (Turning it ON outside the lamp case may cause fire or visual impairments.)
- Never touch the bulb glass immediately after turning it OFF. It is extremely hot.

CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)
- Never perform HID circuit inspection with a tester.

Precautions For Xenon Headlamp Service

- Never touch the xenon bulb glass with hands. Never put oil and grease on it.
- Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.
- Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).

ECH-616

< PRECAUTION > On Board Diagnostic (OBD) System of Engine

The ECM has an on board diagnostic system. It will light up the malfunction indicator lamp (MI) to warn the driver of a malfunction causing emission deterioration.

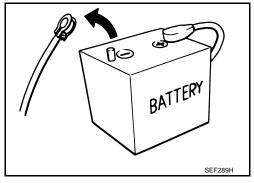
CAUTION:

- Be sure to turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the 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 PG-104, "Description".
- 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 EVAP system or fuel injection system, etc.
- Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.

ECH-617

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 and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- · Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.

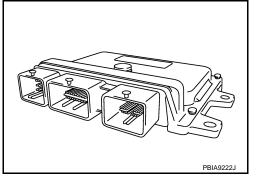


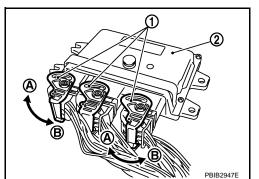
[HR16DE (WITHOUT EURO-OBD)]

- Do not disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.

The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

- If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- When connecting ECM harness connector (1), fasten (B) it securely with a lever as far as it will go as shown in the figure.
 - ECM 2.
 - A. Loosen





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PRECAUTIONS

< PRECAUTION >

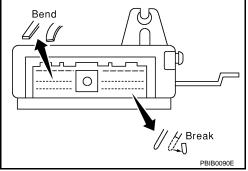
• When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

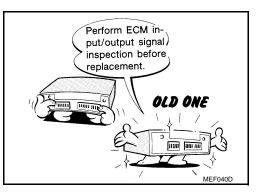
Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

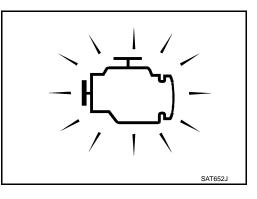
- Securely connect ECM harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs. etc.
- Keep engine control system parts and harness dry.
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to ECH-586, "Reference Value".
- Handle mass air flow sensor carefully to avoid damage.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).
- After performing each TROUBLE DIAGNOSIS, perform DTC CONFIRMATION PROCEDURE or Component Function **Check.** The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.



[HR16DE (WITHOUT EURO-OBD)]







PRECAUTIONS

< PRECAUTION >

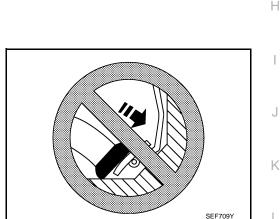
When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.

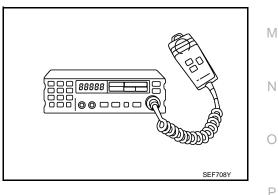
Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

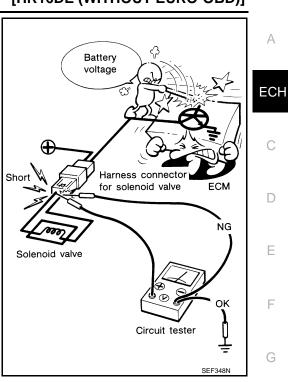
• Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.
- Do not depress accelerator pedal when starting.
- Immediately after starting, 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 standing-wave ratio can be kept smaller.
- Be sure to ground the radio to vehicle body.







[HR16DE (WITHOUT EURO-OBD)]

< PREPARATION > PREPARATION

PREPARATION

Special Service Tools

INFOID:000000001179928

Tool number Tool name		Description
KV10117100 Heated oxygen sensor wrench	S-NT379	Loosening or tightening heated oxygen sensor with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	a a S-NT636	Loosening or tightening heated oxygen sensor 2 a: 22 mm (0.87 in)
EG17550000 Break-out box	ZZA1194D	Measuring ECM signals with a circuit tester
EG17680000 Y-cable adapter	РВІА9379Ј	Measuring ECM signals with a circuit tester
KV10118400 Fuel tube adapter	PBIB3043E	Measuring fuel pressure

< PREPARATION >

Commercial Service Tools

PREPARATION [HR16DE (WITHOUT EURO-OBD)]

Tool name		Description
Quick connector re- lease		Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Par No. 16441 6N210)
Socket wrench	PBIC0198E	Removing and installing engine coolant tempera- ture sensor
	19 mm (0.75 in) Nore than 32 mm (1.26 in) S-NT705	
Oxygen sensor thread cleaner	Mating surface shave cylinder	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.

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<u>< ON-VEHICLE MAINTENANCE ></u> ON-VEHICLE MAINTENANCE > FUEL PRESSURE

Inspection

FUEL PRESSURE RELEASE

(I) With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-III.
- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch OFF.

With CONSULT-III

- 1. Remove fuel pump fuse located in IPDM E/R.
- 2. Start engine.
- 3. After engine stalls, crank it two or three times to release all fuel pressure.
- 4. Turn ignition switch OFF.
- 5. Reinstall fuel pump fuse after servicing fuel system.

FUEL PRESSURE CHECK

CAUTION:

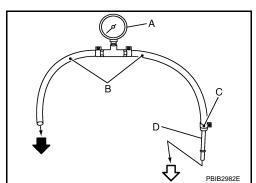
- Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.
- The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.
- Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains sealability with O-rings inside.
- Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C, etc.) Fuel pressure gauge may indicate false readings due to varying engine load and changes in manifold vacuum.

NOTE:

Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because J10 models do not have fuel return system.

- 1. Release fuel pressure to zero.
- 2. Prepare fuel hose for fuel pressure check B and fuel tube adapter (KV10118400) D, then connect fuel pressure gauge A.
 - < : To quick connector

 - C: Clamp
 - Use suitable fuel hose for fuel pressure check (genuine NIS-SAN fuel hose without quick connector).
 - To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
 - Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
 - Use Pressure Gauge to check fuel pressure.
- 3. Remove fuel hose.
 - Do not twist or kink fuel hose because it is plastic hose.



FUEL PRESSURE

< ON-VEHICLE MAINTENANCE >

- 4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.
 - No.2 spool (5)
 - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
 - Apply proper amount of gasoline between top of the fuel tube (3) and No.1 spool (4).
 - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
 - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
 - When reconnecting fuel line, always use new clamps.
 - Use a torque driver to tighten clamps.
 - Install hose clamp to the position within 1 2 mm (0.04 0.08 in).

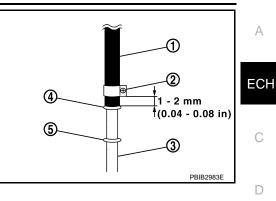
Tightening torque: 1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

- Make sure that clamp screw does not contact adjacent parts.
- 5. Connect fuel tube adapter to quick connector.
 - A: Fuel pressure gauge
 - B: Fuel hose for fuel pressure check
- 6. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
- 7. Turn ignition switch ON and check for fuel leakage.
- 8. Start engine and check for fuel leakage.
- 9. Read the indication of fuel pressure gauge.
 - Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
 - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.

At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm², 51 psi)

- 10. If result is unsatisfactory, go to next step.
- 11. Check the following.
 - Fuel hoses and fuel tubes for clogging
 - Fuel filter for clogging
 - Fuel pump
 - Fuel pressure regulator for clogging
 - If OK, replace fuel pressure regulator.
 - If NG, repair or replace.





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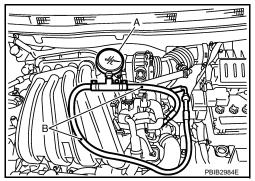
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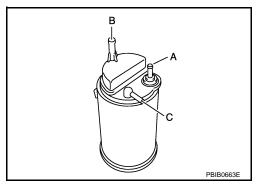
EVAPORATIVE EMISSION SYSTEM

< ON-VEHICLE MAINTENANCE >

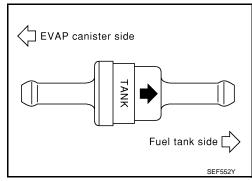
EVAPORATIVE EMISSION SYSTEM

Inspection

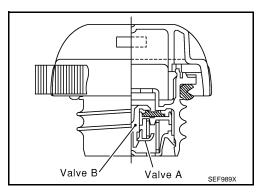
- 1. Visually inspect EVAP vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
- 2. Check EVAP canister as follows:
- a. Block port (B). Orally blow air through port (A). Check that air flows freely through port (C).
- b. Block port (A). Orally blow air through port (B). Check that air flows freely through port (C).



- 3. Visually inspect the fuel check valve for cracks, damage, loose connections chafing and deterioration.
- 4. Check fuel check valve as follows:
- a. Blow air through connector on the fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
- b. Blow air through connector on EVAP canister side. Air flow should be smoothly directed toward fuel tank side.
- c. If fuel check valve is suspected or not properly functioning in step 1 and 2 above, replace it.



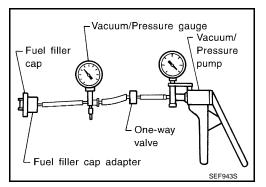
- 5. Inspect fuel tank filler cap vacuum relief valve for clogging, sticking, etc.
- a. Wipe clean valve housing.



b. Check valve opening pressure and vacuum.

Pressure: $15.3 - 20.0 \text{ kPa} (0.153 - 0.200 \text{ bar}, 0.156 - 0.204 \text{ kg/} \text{ cm}^2, 2.22 - 2.90 \text{ psi})$ Vacuum: $-6.0 \text{ to} -3.4 \text{ kPa} (-0.06 \text{ bar to} -0.034 \text{ bar}, -0.061 \text{ to} -0.035 \text{ kg/cm}^2, -0.87 \text{ to} -0.49 \text{ psi})$

c. If out of specification, replace fuel filler cap as an assembly.



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SERVICE DATA AND SPECIFICATIONS (SDS) D SPECIFICATIONS (SDS) [HR16DE (WITHOUT EURO-OBD)]

< SERVICE DATA AND SPECIFICATIONS (SDS)

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

Idle Speed

Transmission	Condition	Specification
M/T	No load* (in Neutral position)	650 ±50 rpm
: Under the following conditions A/C switch: OFF Electric load: OFF (Lights, heater fa Steering wheel: Kept in straight-ahe gnition Timing		INF0ID:000000001179933
Transmission	Condition	Specification
M/T	No load* (in Neutral position)	$15\pm5^\circ$ BTDC
 Under the following conditions A/C switch: OFF Electric load: OFF (Lights, heater fa Steering wheel: Kept in straight-ahe 		

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