

ENGINE CONTROL SYSTEM

SECTION EC

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Alphabetical & P No. Index for DTC

NJEC0600

ALPHABETICAL INDEX FOR DTC

NJEC0600S01

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC		Trip	MI lighting up	Reference page
	CONSULT-II	ECM			
ACCEL POS SENSOR	P0120	0403	1	X	EC-89
BATTERY VOLTAGE	P1660	0502	1	—	EC-183
BRAKE SW	P0571	0807	1	X	EC-109
COOLANT TEMP SEN	P0115	0103	1	X	EC-84
CRANK POS SEN (TDC)	P0335	0407	1	X	EC-99
ECM RLY	P1620	0902	1	X	EC-177
ECM 2	P1607	0301	1	X	EC-175
ECM 10	P1107	0802	1	X	EC-116
ECM 12	P1603	0901	1	X	EC-175
ECM 15	P1621	0903	1	—	EC-181
FUEL CUT SYSTEM2	P1202	1002	1	X	EC-124
MASS AIR FLOW SEN	P0100	0102	1	X	EC-78
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	P0000	0505	—	—	—
OVER HEAT	P1217	0208	1	X	EC-130
P1·CAM POS SEN	P1341	0701	1	X	EC-163
P2·TDC PULSE SIG	P1337	0702	1	X	EC-157
P3·PUMP COMM LINE	P1600	0703	1	X	EC-169
P4·SPILL/V CIRC	P1251	0704	1	X	EC-151
P5·PUMP C/MODULE	P1690	0705	1	X	EC-185
P7·F/INJ TIMG FB	P1241	0707	1	X	EC-145
P9·FUEL TEMP SEN	P1180	0402	1	X	EC-118
VEHICLE SPEED SEN	P0500	0104	1	X	EC-105

TROUBLE DIAGNOSIS — INDEX

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Alphabetical & P No. Index for DTC (Cont'd)

P NO. INDEX FOR DTC

=NJE0600S02

X: Applicable —: Not applicable

DTC		Trip	MI lighting up	Items (CONSULT-II screen terms)	Reference page
CONSULT-II	ECM				
P0000	0505	—	—	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	—
P0100	0102	1	X	MASS AIR FLOW SEN	EC-78
P0115	0103	1	X	COOLANT TEMP SEN	EC-84
P0120	0403	1	X	ACCEL POS SENSOR	EC-89
P0335	0407	1	X	CRANK POS SEN (TDC)	EC-99
P0500	0104	1	X	VEHICLE SPEED SEN	EC-105
P0571	0807	1	X	BRAKE SW	EC-109
P1107	0802	1	X	ECM 10	EC-116
P1180	0402	1	X	P9·FUEL TEMP SEN	EC-118
P1202	1002	1	X	FUEL CUT SYSTEM2	EC-124
P1217	0208	1	X	OVER HEAT	EC-130
P1241	0707	1	X	P7·F/INJ TIMG FB	EC-145
P1251	0704	1	X	P4·SPILL/V CIRC	EC-151
P1337	0702	1	X	P2·TDC PULSE SIG	EC-157
P1341	0701	1	X	P1·CAM POS SEN	EC-163
P1600	0703	1	X	P3·PUMP COMM LINE	EC-169
P1603	0901	1	X	ECM 12	EC-175
P1607	0301	1	X	ECM 2	EC-175
P1620	0902	1	X	ECM RLY	EC-177
P1621	0903	1	—	ECM 15	EC-181
P1660	0502	1	—	BATTERY VOLTAGE	EC-183
P1690	0705	1	X	P5·PUMP C/MODULE	EC-185

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Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

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The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER" used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL N16 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the **RS section** 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 should be performed by an authorized NISSAN 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 RS section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harness can be identified by yellow and/or orange harness connector.

Engine Fuel & Emission Control System

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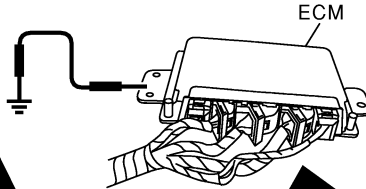
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BATTERY

- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cable while engine is running.

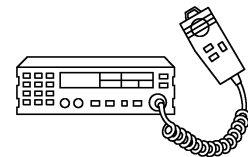
ECM

- Do not disassemble ECM.
- If a battery terminal 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 problem. Do not replace parts because of a slight variation.
- When ECM is removed for inspection, make sure to ground the ECM mainframe.



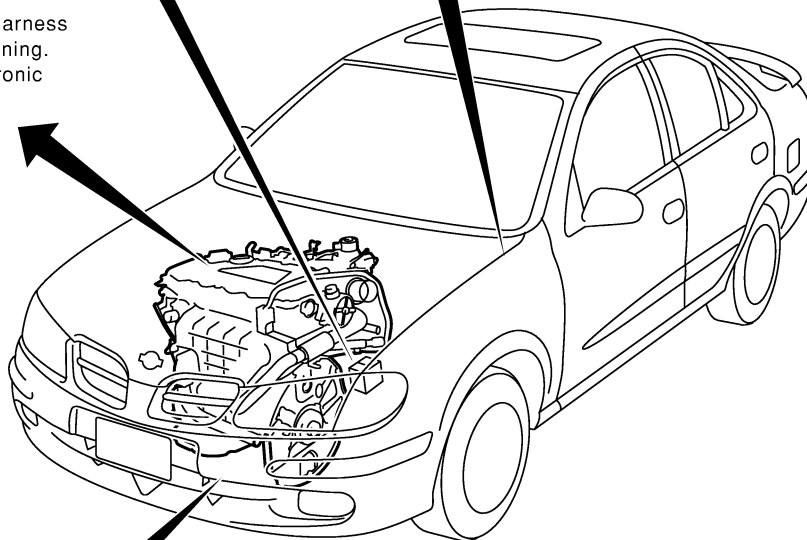
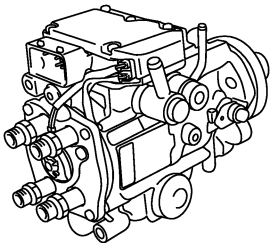
WIRELESS EQUIPMENT

- 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 its installation location.
 - 1) Keep the antenna as far as possible away from the ECM.
 - 2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.
 - 3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
 - 4) Be sure to ground the radio to vehicle body.



ELECTRONIC CONTROL FUEL INJECTION PUMP

- Do not disconnect pump harness connector with engine running.
- Do not disassemble electronic fuel injection pump. If NG, take proper action.



ENGINE CONTROL PARTS HANDLING

- Do not disassemble injection nozzle. If NG, replace injection nozzle.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crankshaft position sensor (TDC).

WHEN STARTING

- 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.

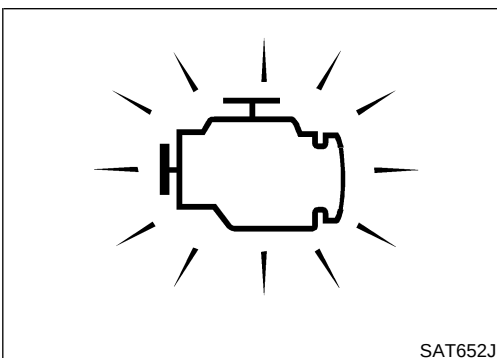
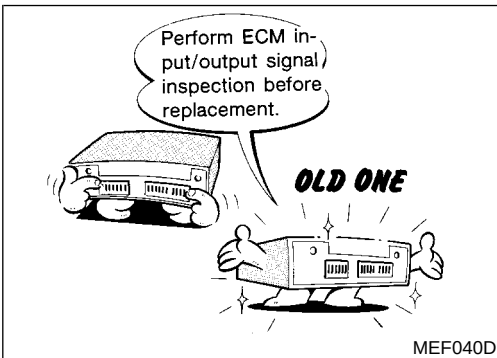
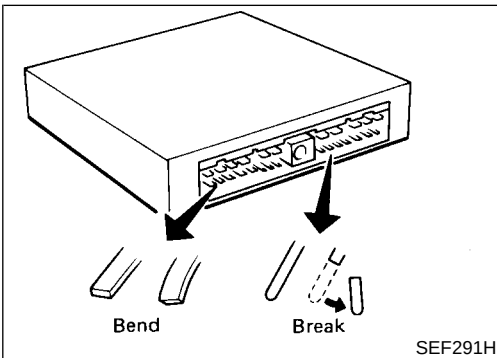
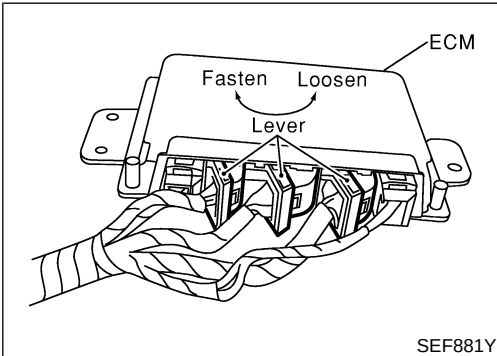
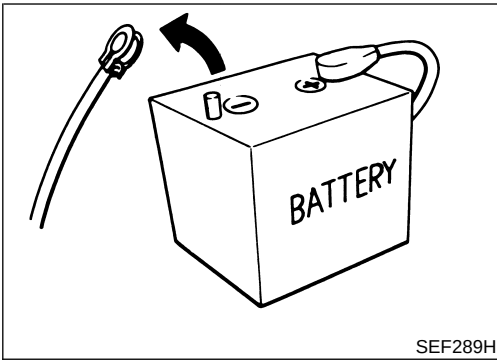


ECM HARNESS HANDLING

- Securely connect ECM harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in the circuit, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECM system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep ECM parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

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Precautions



Precautions

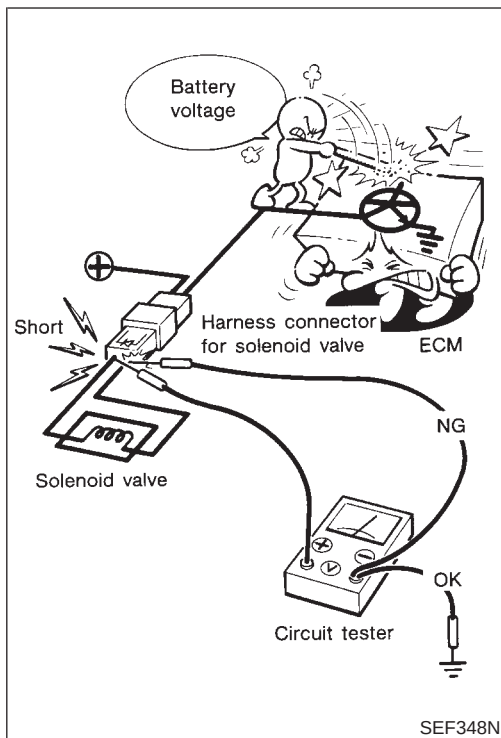
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- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.
- When connecting ECM harness connectors, push in both sides of the connector until you hear a click. Maneuver the lever until you hear the three connectors on the inside click. Refer to the figure at left.
- 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.
- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-66.
- After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check". The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.

PRECAUTIONS

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Precautions (Cont'd)



- 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.
- Install the break-out box between ECM and ECM harness connectors when measuring ECM input/output voltage.

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Wiring Diagrams and Trouble Diagnosis

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When you read Wiring diagrams, refer to the following:

- GI-12, "HOW TO READ WIRING DIAGRAMS"
- EL-12, "POWER SUPPLY ROUTING" for power distribution circuit

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When you perform trouble diagnosis, refer to the following:

- GI-33, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-22, "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"

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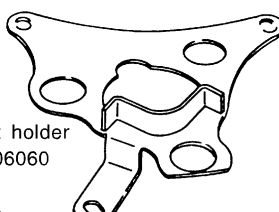
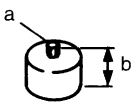
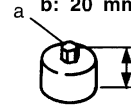
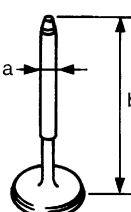
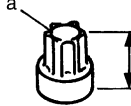
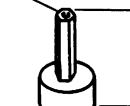
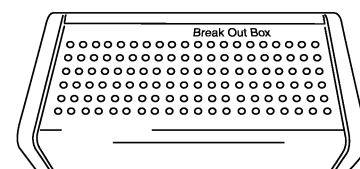
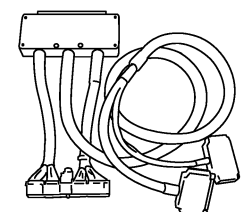
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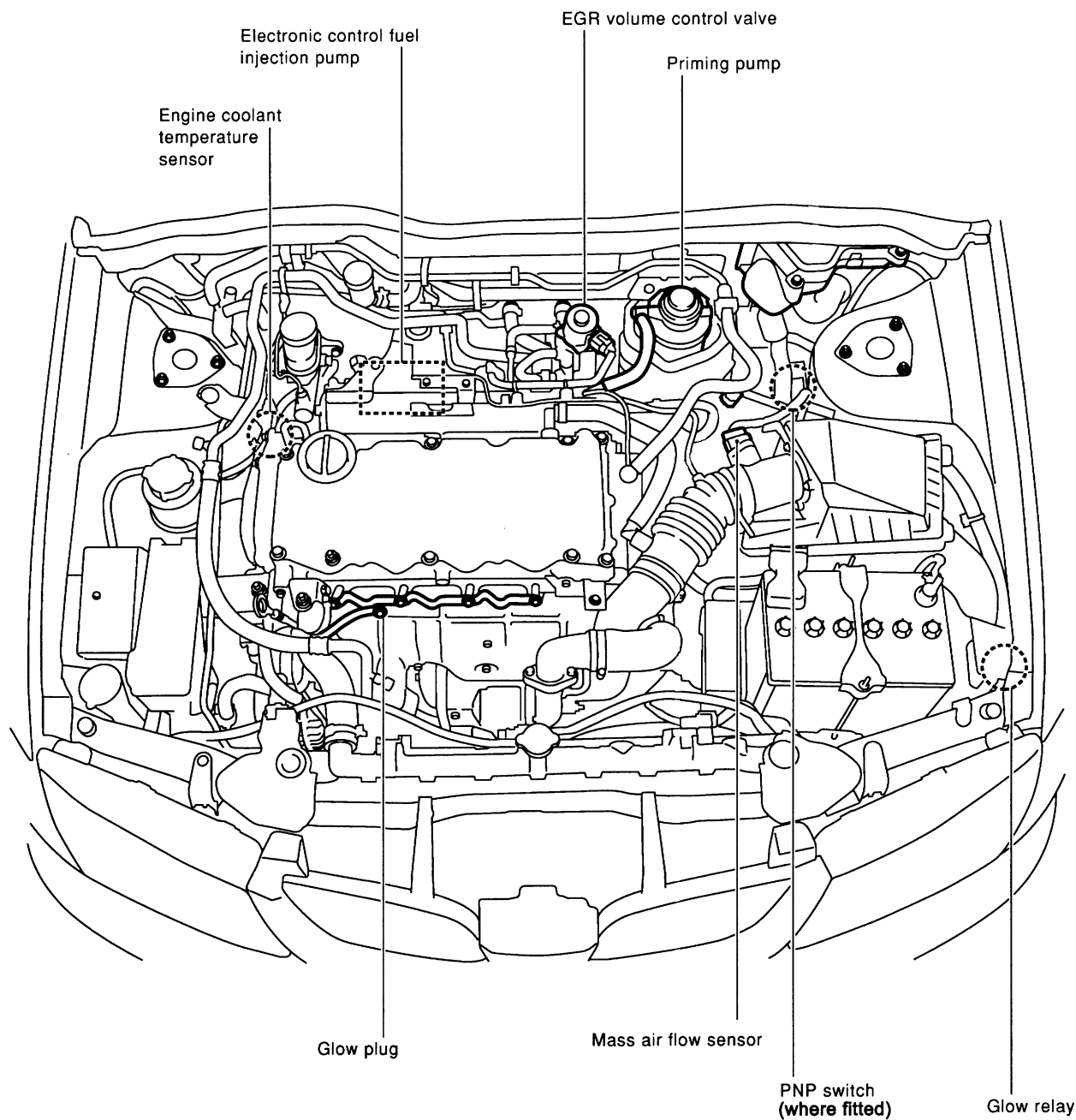
Special Service Tools

NJEC0605

Tool number Tool name	Description
KV111060S0 Removal/Installation tool kit for fuel injection pump	 Sprocket holder KV11106060 a: 9.5 mm (Face to face) b: 29 mm Extension bar KV11106070  a: 5 mm (Face to face) b: 20 mm Hexagon wrench KV11106010  a: 6 mm (Face to face) b: 20 mm Hexagon wrench KV11106020  a: 6 mm dia b: 80 mm Positioning stopper pin KV11106030  a: T70 b: 26 mm Torque wrench KV11106040  a: 6 mm (Face to face) b: 42 mm Hexagon wrench KV11106050
	NT814
KV109E0010 Break-out box	 Break Out Box
	NT825
KV109E0050 Y-cable adapter	
	NT826

Engine Control Component Parts Location

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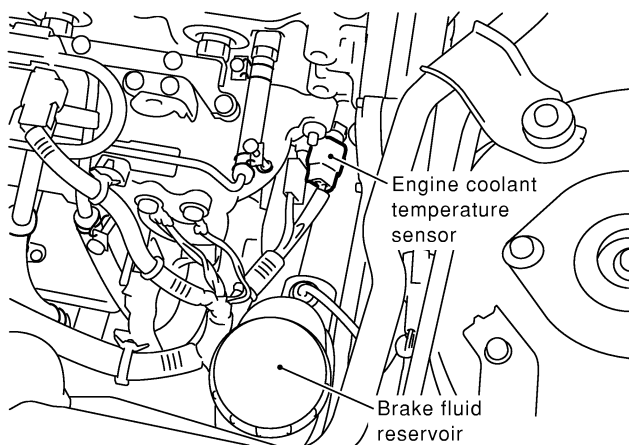
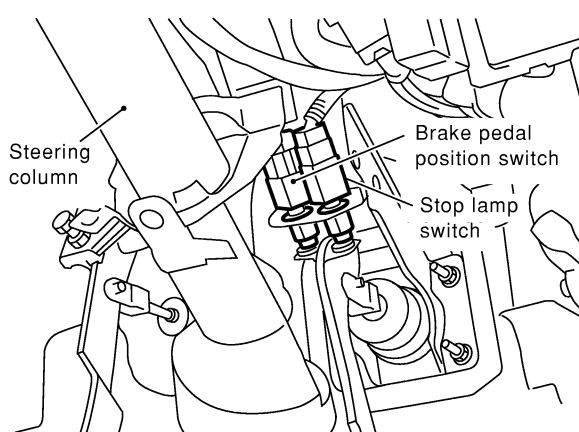
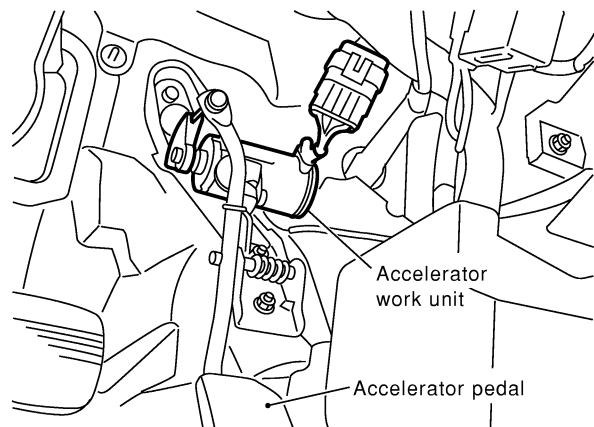
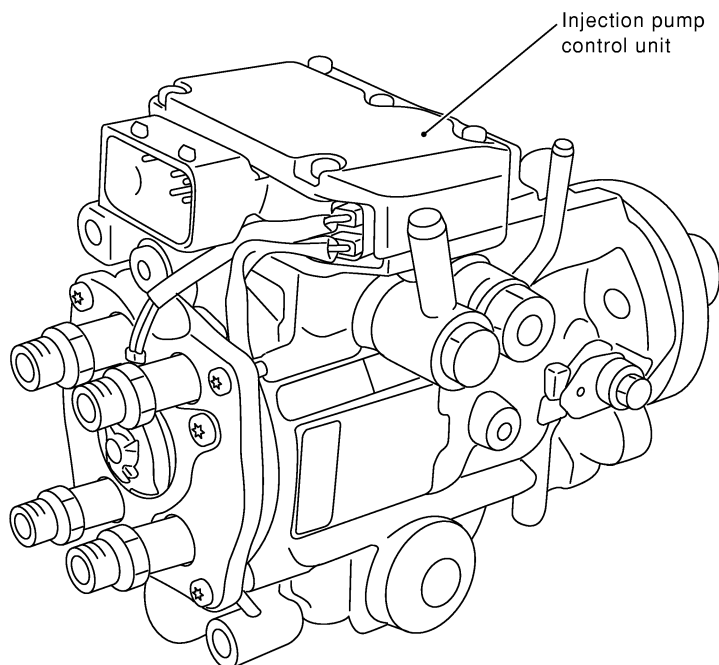
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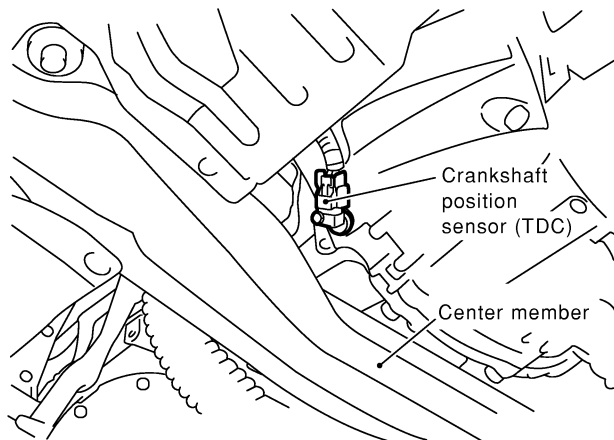
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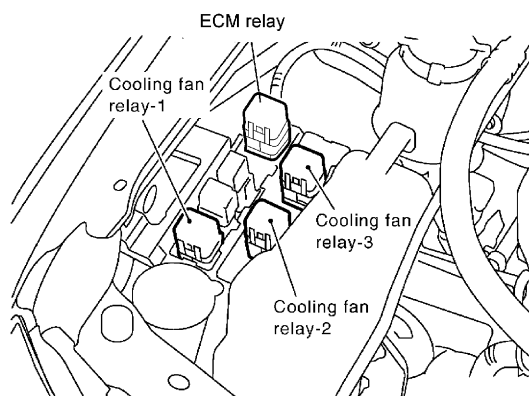
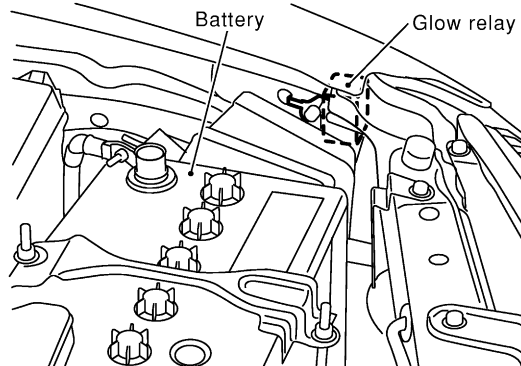
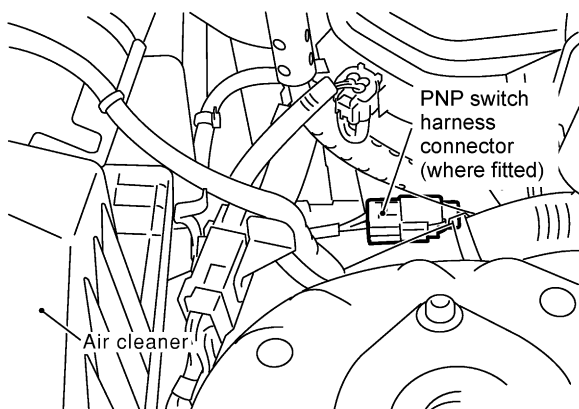
Electronic control fuel injection pump



View from under vehicle



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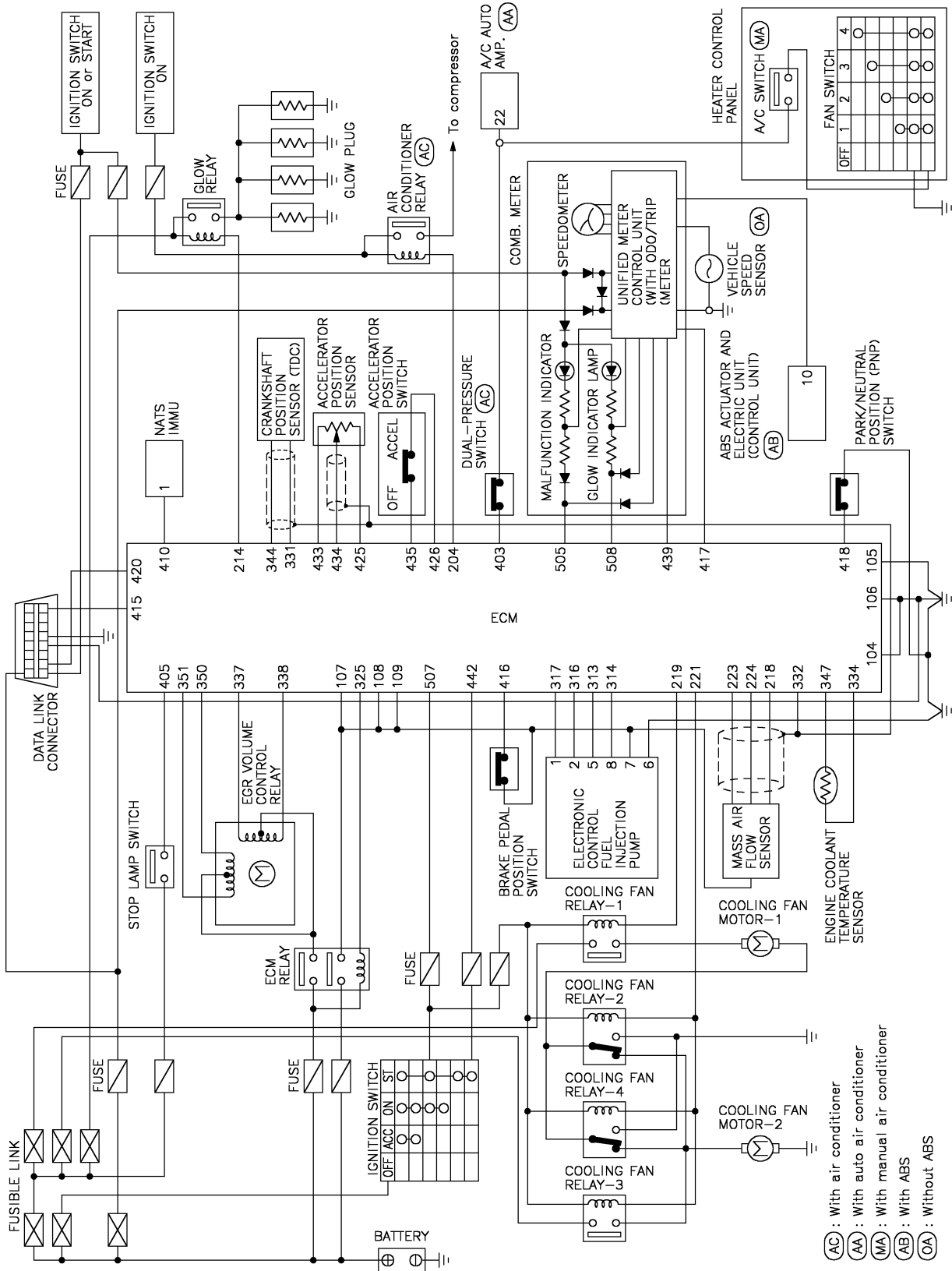
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Circuit Diagram

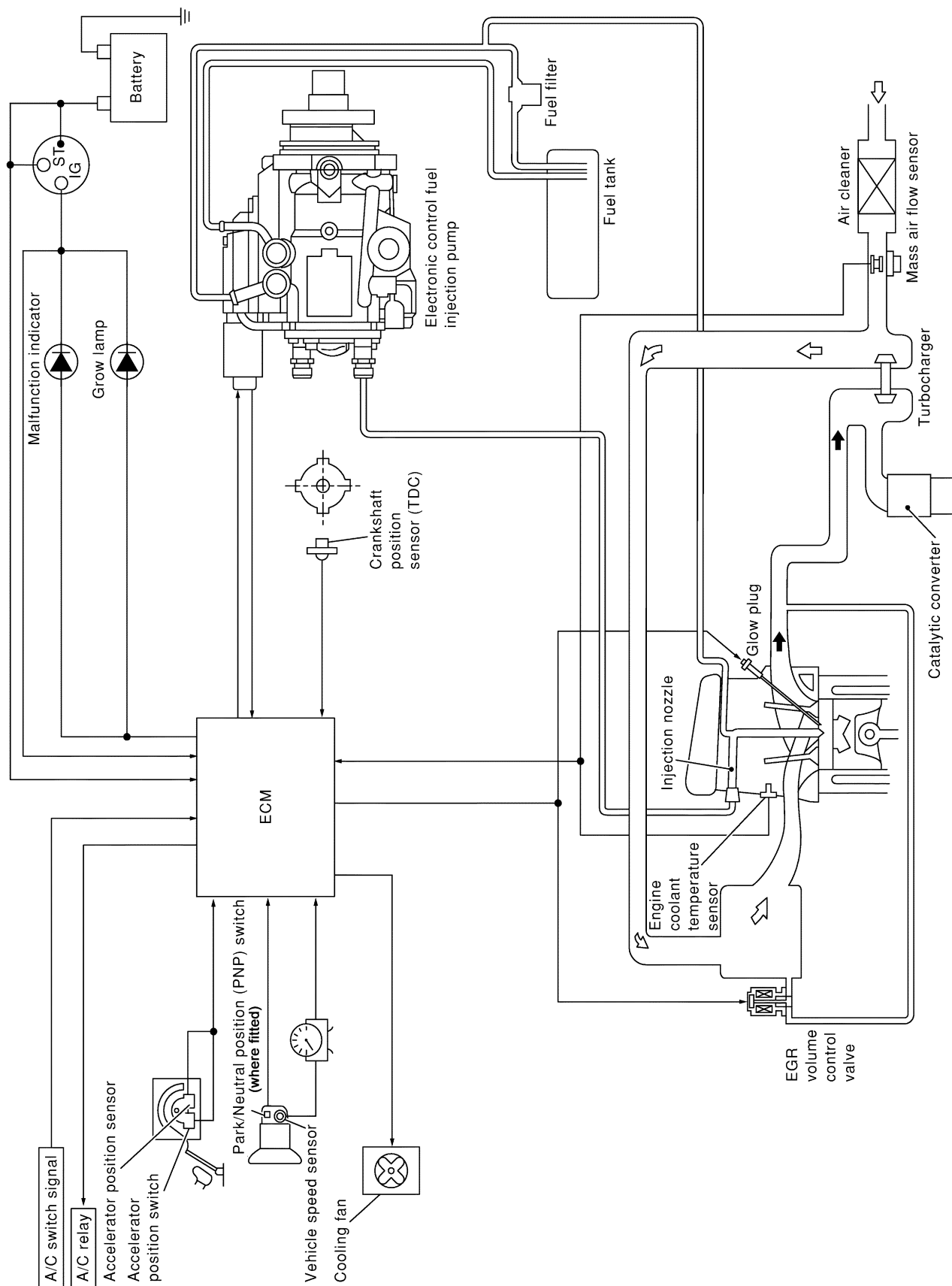
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System Diagram

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System Chart

NJEC0611

Input (Sensor)	ECM Function	Output (Actuator)
• Electronic control fuel injection pump • Crankshaft position sensor (TDC) • Engine coolant temperature sensor • Accelerator position sensor • Accelerator position switch • Park/Neutral position (PNP) switch* • Ignition switch • Battery voltage • Vehicle speed sensor • Air conditioner switch • Mass air flow sensor • Stop lamp switch	Fuel injection control	Electronic control fuel injection pump
	Fuel injection timing control	Electronic control fuel injection pump
	Fuel cut control	Electronic control fuel injection pump
	Glow control system	Glow relay & glow lamp
	On board diagnostic system	MI (On the instrument panel)
	EGR volume control	EGR volume control valve
	Cooling fan control	Cooling fan relay
	Air conditioning cut control	Air conditioner relay

*: If so equipped

Fuel Injection Control System

DESCRIPTION

System Description

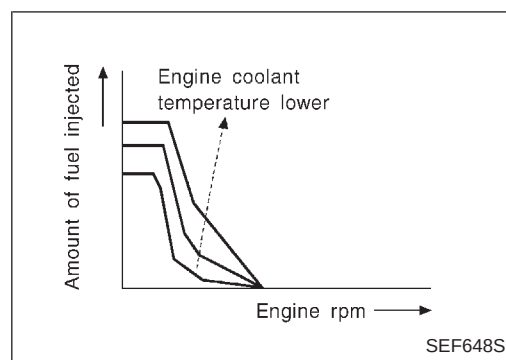
Three types of fuel injection control are provided to accommodate engine operating conditions; normal control, idle control and start control. The ECM determines the appropriate fuel injection control. Under each control, the amount of fuel injected is compensated to improve engine performance.

Pulse signals are exchanged between ECM and electronic control fuel injection pump (control unit is built-in). The fuel injection pump control unit performs duty control on the spill valve (built into the fuel injection pump) according to the input signals to compensate the amount of fuel injected to the preset value.

Start Control

Input/Output Signal Chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Fuel injection control (start control)	Electronic control fuel injection pump
Crankshaft position sensor (TDC)	Engine speed		
Ignition switch	Start signal		



When the ECM receives a start signal from the ignition switch, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed and engine coolant temperature.

For better startability under cool engine conditions, the lower the coolant temperature becomes, the greater the amount of fuel injected. The ECM ends the start control when the engine speed reaches the specific value, and shifts the control to the normal or idle control.

Idle Control

Input/Output Signal Chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Fuel injection control (Idle control)	Electronic control fuel injection pump
Crankshaft position sensor (TDC)	Engine speed		
Battery	Battery voltage		
Accelerator position switch	Idle position		
Vehicle speed sensor	Vehicle speed		
Air conditioner switch	Air conditioner signal		

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

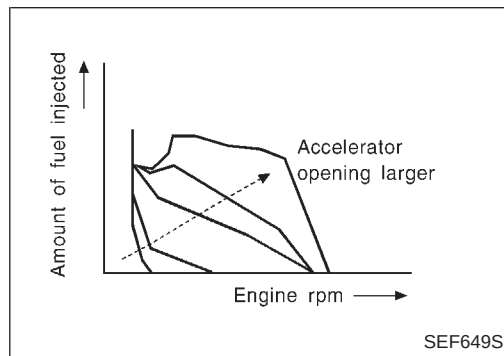
Normal Control

NJEC0612S04

Input/Output Signal Chart

NJEC0612S0401

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (TDC)	Engine speed	Fuel injection control (Normal control)	Electronic control fuel injection pump
Accelerator position sensor	Accelerator position		



The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor (TDC) detects engine speed and the accelerator position sensor detects accelerator position. These sensors send signals to the ECM.

The fuel injection data, predetermined by correlation between various engine speeds and accelerator positions, are stored in the ECM memory, forming a map. The ECM determines the optimal amount of fuel to be injected using the sensor signals in comparison with the map.

Maximum Amount Control

NJEC0612S05

Input/Output Signal Chart

NJEC0612S0501

Sensor	Input Signal to ECM	ECM Function	Actuator
Mass air flow sensor	Amount of intake air	Fuel injection control (Maximum amount control)	Electronic control fuel injection pump
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (TDC)	Engine speed		
Accelerator position sensor	Accelerator position		

The maximum injection amount is controlled to an optimum by the engine speed, intake air amount, engine coolant temperature, and accelerator opening in accordance with the driving conditions.

This prevents the oversupply of the injection amount caused by decreased air density at a high altitude or during a system failure.

Deceleration Control

NJEC0612S06

Input/Output Signal Chart

NJEC0612S0601

Sensor	Input Signal to ECM	ECM Function	Actuator
Accelerator position switch	Accelerator position	Fuel injection control (Deceleration control)	Electronic control fuel injection pump
Crankshaft position sensor (TDC)	Engine speed		

The ECM sends a fuel cut signal to the electronic control fuel injection pump during deceleration for better fuel efficiency. The ECM determines the time of deceleration according to signals from the accelerator position switch and crankshaft position sensor (TDC).

Fuel Injection Timing Control System**DESCRIPTION**

NJEC0613

The target fuel injection timing in accordance with the engine speed and the fuel injection amount are recorded as a map in the ECM beforehand. The ECM and the injection pump control unit exchange signals and perform feedback control for optimum injection timing in accordance with the map.

Air Conditioning Cut Control

DESCRIPTION

Input/Output Signal Chart

NJEC0614

NJEC0614S01

Sensor	Input Signal to ECM	ECM Function	Actuator
Air conditioner switch	Air conditioner "ON" signal	Air conditioner cut control	Air conditioner relay
Accelerator position sensor	Accelerator valve opening angle		
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		

System Description

NJEC0614S02

This system improves acceleration when the air conditioner is used.

When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.

When engine coolant temperature becomes excessively high, the air conditioner is turned off. This continues until the engine coolant temperature returns to normal.

Fuel Cut Control (at no load & high engine speed)

DESCRIPTION

Input/Output Signal Chart

NJEC0615

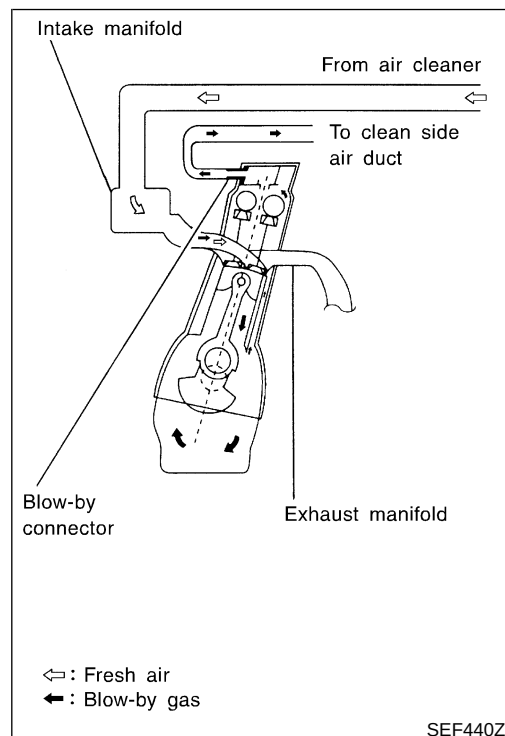
NJEC0615S01

Sensor	Input Signal to ECM	ECM Function	Actuator
Vehicle speed sensor	Vehicle speed	Fuel cut control	Electronic control fuel injection pump
Accelerator position switch	Accelerator position		
Crankshaft position sensor (TDC)	Engine speed		

If the engine speed is above 2,800 rpm with no load (for example, in neutral and engine speed over 2,800 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 operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:

This function is different from deceleration control listed under "Fuel Injection Control System", EC-17.

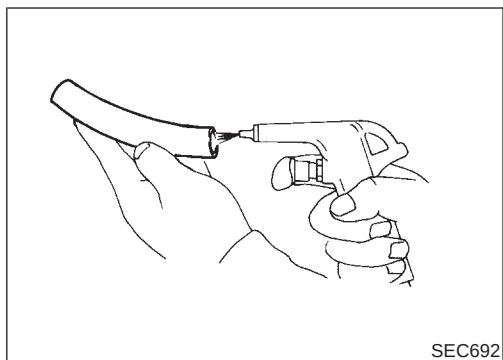


Crankcase Ventilation System

DESCRIPTION

NJEC0616

In this system, blow-by gas is sucked into the air duct after oil separation by oil separator in the rocker cover.



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INSPECTION

Ventilation Hose

NJEC0617

NJEC0617S01

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

Injection Tube and Injection Nozzle REMOVAL AND INSTALLATION

NJEC0618

CAUTION:

- Do not disassemble injection nozzle assembly. If NG, replace injection nozzle assembly.
- Plug flare nut with a cap or rag so that no dust enters the nozzle. Cover nozzle tip for protection of needle.

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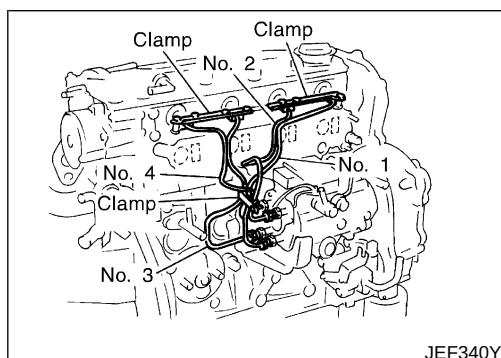
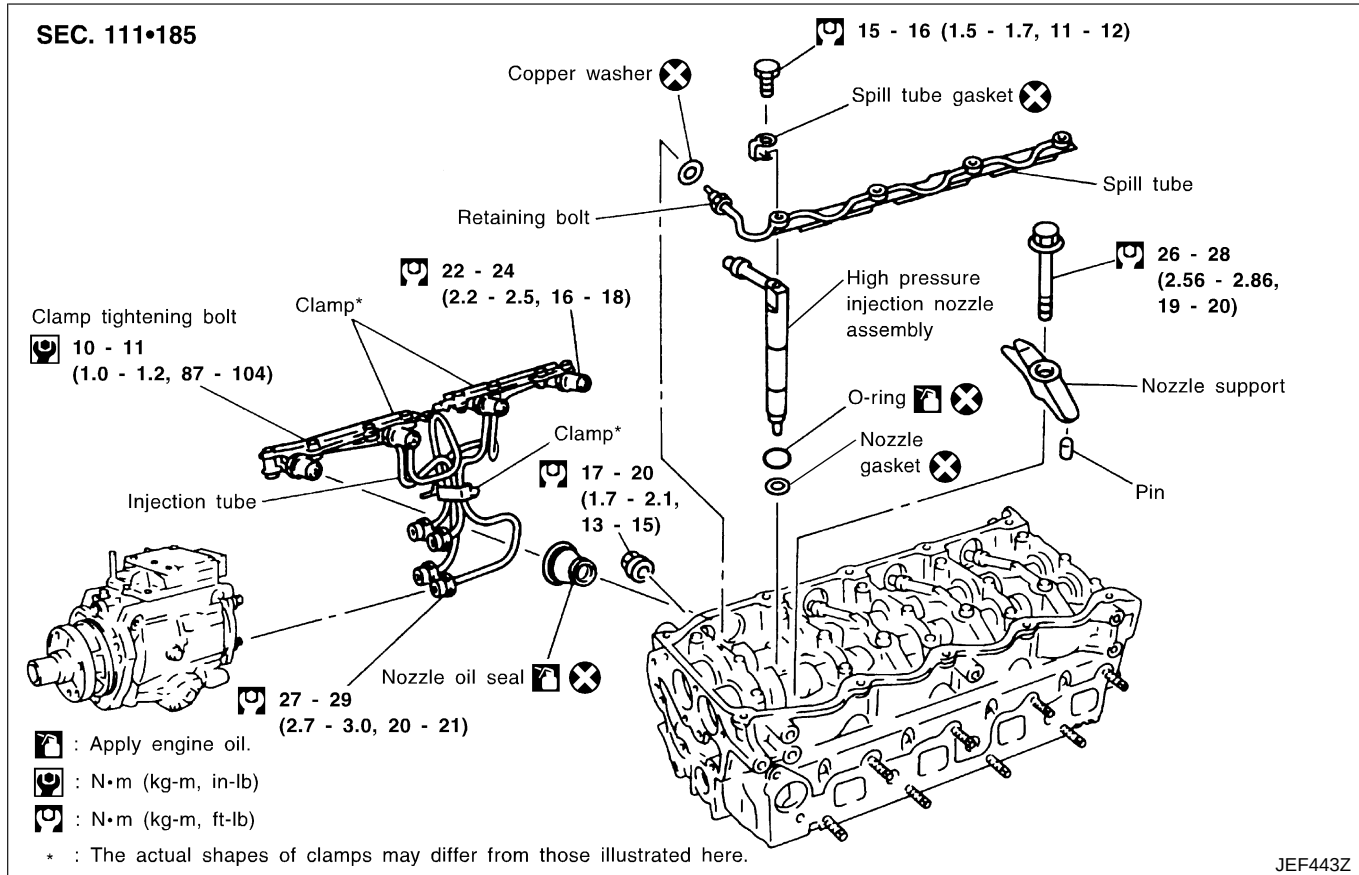
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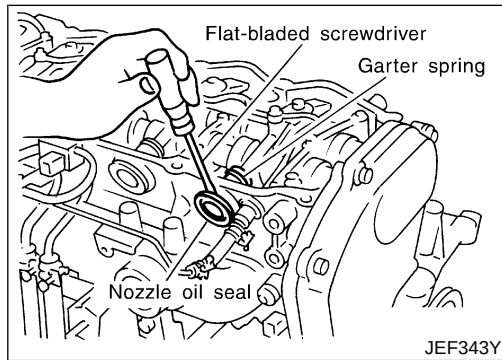
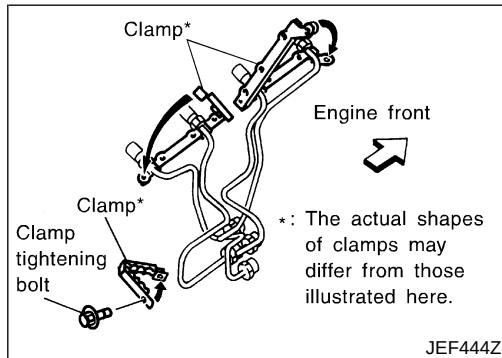
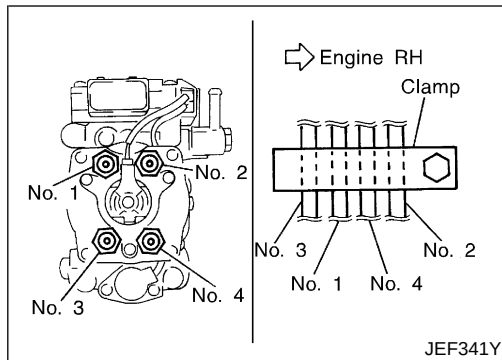
Injection Tube Removal

NJEC0618S01

NJEC0618S0101

- Mark the cylinder Nos. to the injection tubes, then disconnect them.
- Marking should be made at proper locations and by the proper method, so that they are not erased by fuel, etc.
- Remove the clamps, then disconnect the tubes one by one.
- The intake manifold is removed for explanation in the figure.

Injection Tube and Injection Nozzle (Cont'd)



Installation

NJEC0618S0102

1. Referring to the figure and the marking which were made for installation, connect the injection tubes to all the cylinders.
2. Connect temporarily the tubes to the cylinder head side only by screwing 2 to 3 turns. Make sure that all tubes can be connected to the pump side also.
3. Then, tighten the flare nuts of the cylinder head side and pump side, starting from the opposite side from you.
4. Attach the injection tube clamp in the direction shown in the figure.
5. Insert tightening bolts of the clamp (4-tube type) from the rear to the front of the engine.

Injection Nozzle Oil Seal

NJEC0618S02

Removal

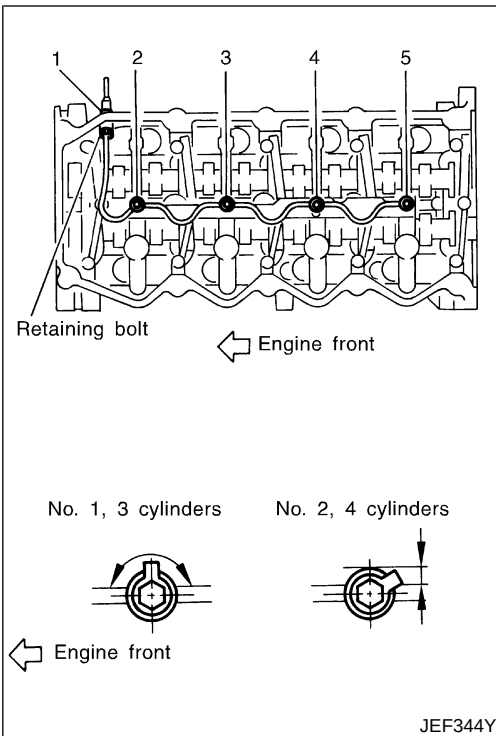
NJEC0618S0201

Using a tool such as a flat-bladed screwdriver, pry the flange of the seal, then remove it.

Installation

NJEC0618S0202

1. After the high-pressure injection nozzle assembly is installed, push the seal from the cylinder head side until it contacts the flange.
 2. Make sure that the garter spring of the seal on the high-pressure injection nozzle assembly side is not falling.
- **Replace the oil seal with new one when the high-pressure injection nozzle assembly is removed. (It is not necessary to replace the oil seal when only injection tubes are removed.)**



Spill Tube

Removal

NJEC0618S03

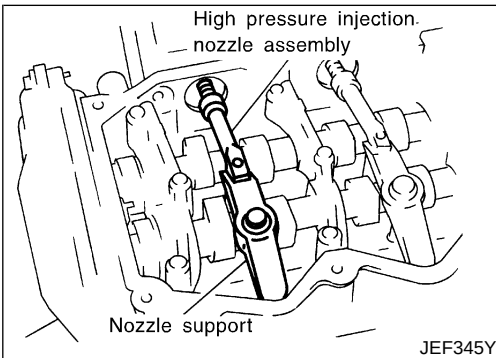
Loosen and remove the mounting bolts and flare nuts in the reverse order of the numbers in the figure.

- When the flare nuts are loosened, hold the head of hexagonal retaining bolts (head inside) using a wrench.

Installation

NJEC0618S0302

- Tighten the flare nuts and mounting bolts in the numerical order shown in the figure.
- When the flare nuts are tightened, hold the head of the hexagonal retaining bolts (head inside) using a wrench.
- To prevent interference with the rocker cover, place the spill gasket joint within the range shown by the arrow, then tighten the mounting bolts. (Be especially careful about No. 2 and 4 cylinders.)
- After the spill tube is installed, check the airtightness of the spill tube.**
- After the bolts are tightened, the joint of the spill tube gasket might be broken. However, this will not affect function.



High Pressure Injection Nozzle Assembly

NJEC0618S04

Removal

NJEC0618S0401

- Remove the nozzle support, then pull out the high-pressure injection nozzle assembly by turning it clockwise/counterclockwise.
- Using a tool such as a flat-head screwdriver, remove the copper washer inside the cylinder head.

CAUTION:

Do not disassemble the high-pressure injection nozzle.

Installation

NJEC0618S0402

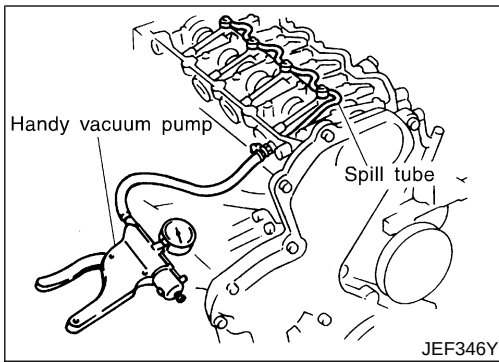
- Insert the nozzle gasket to the cylinder head hole.
- Attach the O-ring to the mounting groove of the nozzle side, then insert it in the cylinder head.

TEST AND ADJUSTMENT

NJEC0619

WARNING:

When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to contact your hands or body, and make sure your eyes are properly protected with goggles.



Inspection for Spill Tube Airtightness

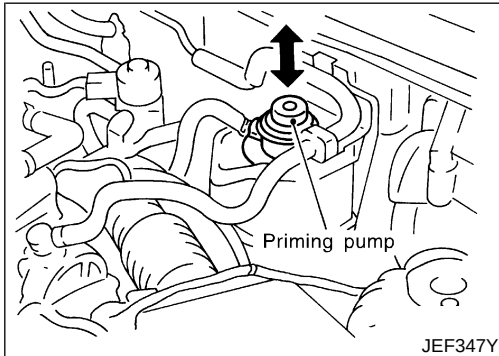
NJEC0619S01

Before the rocker cover is installed, perform the inspection as follows.

1. Connect the handy vacuum pump to the spill hose.
2. Check that the airtightness is maintained after the negative pressure shown below is applied.

Standard:

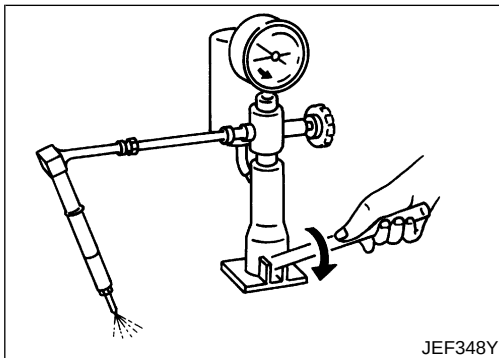
-53.3 to -66.7 kPa (-533 to -667 mbar, -400 to -500 mmHg, -15.75 to -19.69 inHg)



Air Bleeding of Fuel Piping

NJEC0619S02

After the repair, bleed air in the piping by pumping the priming pump up and down until it becomes heavy.



Injection Pressure Test

NJEC0619S03

1. Install injection nozzle assembly to injection nozzle tester and bleed air from flare nut.

2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:

New

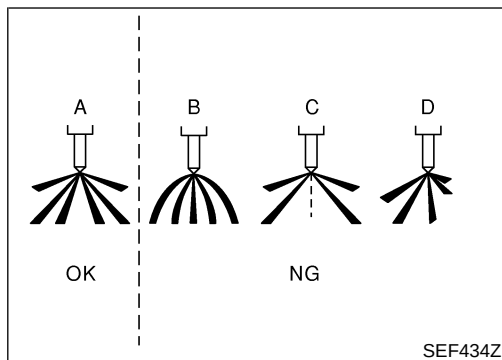
21,476 - 22,457 kPa (214.7 - 224.5 bar, 219 - 229 kg/cm², 3,114 - 3,256 psi)

Limit

18,275 kPa (182.7 bar, 186 kg/cm², 2,650 psi)

- The injection nozzle assembly has a 2-stage pressure injection function. However, the judgement should be made at the first stage of the valve opening pressure.

Always check initial injection pressure using a new nozzle.



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Spray Pattern Test

1. Check spray pattern by pumping tester handle one full stroke per second.

NG spray pattern:

Does not inject straight and strong (B in the figure).

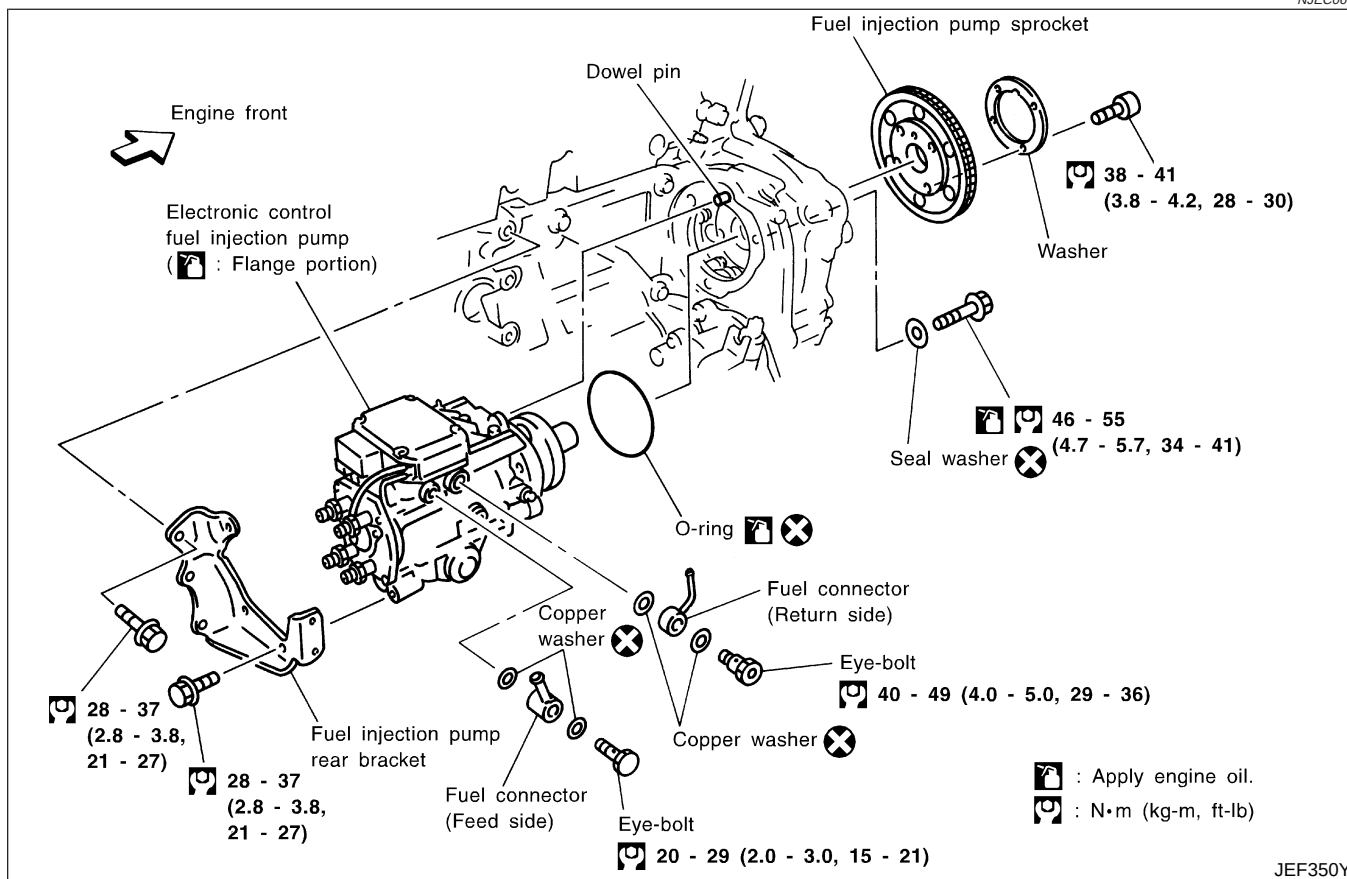
Fuel drips (C in the figure).

Does not inject evenly (D in the figure).

2. If the spray pattern is not correct, replace injection nozzle assembly.

Electronic Control Fuel Injection Pump REMOVAL AND INSTALLATION

NJEC0620



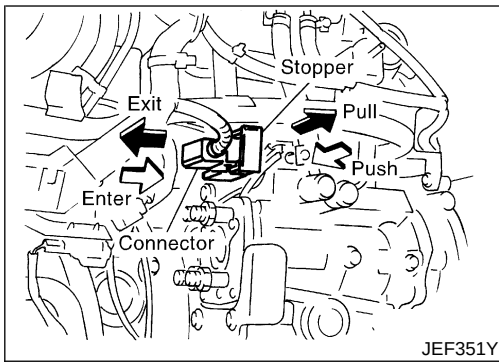
JEF350Y

Removal

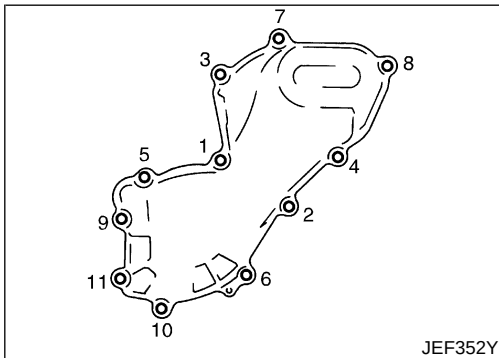
1. Remove the parts shown below.
 - Engine hood
 - Engine coolant (drain)
 - Engine cover
 - Heater pipe under intake manifold
 - Injection tubes
 - Right splash cover (with undercover)
 - Right front wheel

NJEC0620S01

Electronic Control Fuel Injection Pump (Cont'd)



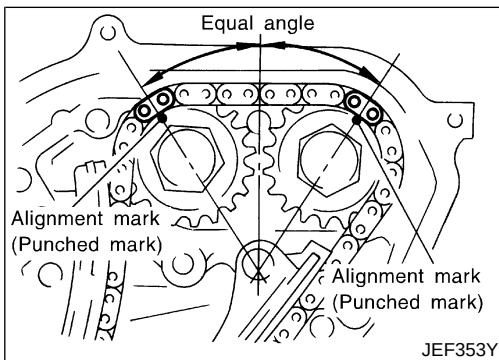
2. Disconnect the fuel hoses from the fuel injection pump.
3. Disconnect the harness connector from the fuel injection pump.
 - Disconnect the connector by pulling the connector stopper fully.
 - When the stopper is fully pulled, the connector will be disconnected together. For installation, push the connector half way first, then press the stopper until it locks, so that the connector is connected together.
4. Remove the fuel injection pump rear bracket.



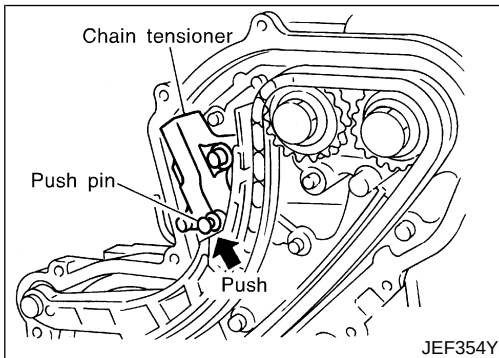
5. Remove the front chain case.
 - Move the power steering fluid reservoir tank from the bracket.
 - Loosen and remove the mounting bolts in the reverse order of the numbers shown in the figure.
 - As for bolts 6, 10, and 11, remove with rubber washer because there is not enough space for removing only the bolts.

CAUTION:

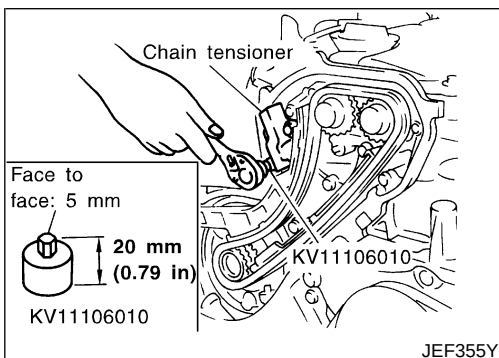
To prevent foreign objects from getting in the engine, cover the opening during the removal of the front chain case.



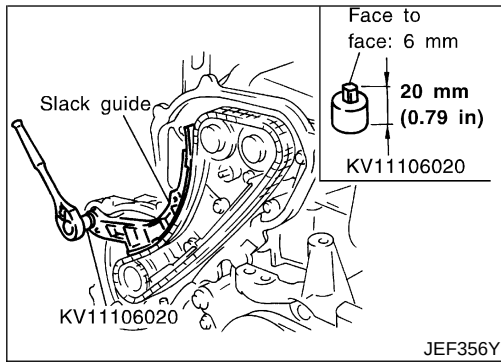
6. Adjust the No. 1 cylinder to the top dead center position.
 - Turn the crankshaft pulley clockwise, then align the alignment mark (punched mark) of the camshaft sprocket to the position shown in the figure.
 - There is no indicator on the crankshaft pulley.
 - It is not necessary to mark the secondary timing chain for removal because it can be matched by the link color for installation. However, the alignment mark on the fuel injection pump sprocket is difficult to see; mark it if necessary.



7. Remove the chain tensioner.
 - a. Push the plunger of the chain tensioner, then fix it with a tool such as a push pin.



- b. Using the hexagon wrench (face to face: 5 mm) (SST), remove the mounting bolts, then remove the chain tensioner.
 - A multi-purpose tool may also be used.



8. Remove the timing chain slack guide.

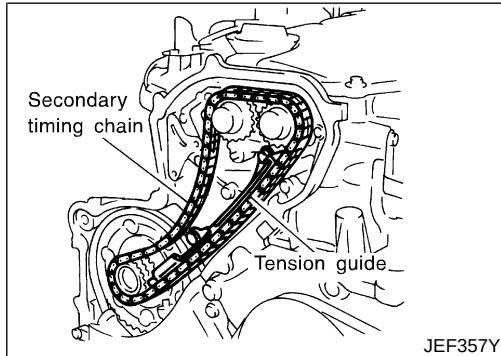
- Using the hexagon wrench (face to face: 6 mm, short-type) (SST), remove the mounting bolts, then remove the timing chain slack guide.

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9. Remove the timing chain tension guide.

10. Remove the secondary timing chain.

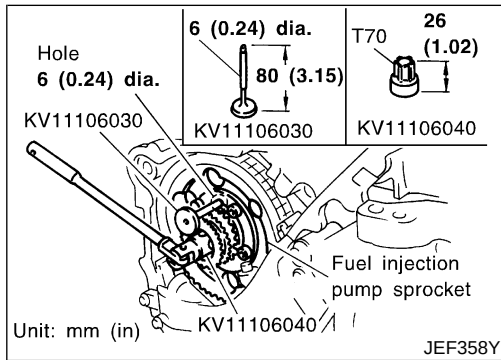
- Only the timing chain can be removed without removing the sprockets.

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11. Fix the fuel injection pump sprocket.

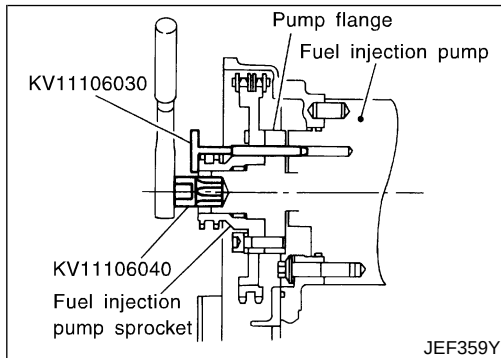
- Insert the positioning stopper pin (SST) in the 6 mm (0.24 in) dia. hole of the fuel injection pump sprocket.
- Using the torx wrench (SST), turn the pump shaft gradually to adjust the hole position of the fuel injection pump sprocket.
- Insert the positioning stopper pin through the fuel injection pump body to fix the sprocket.

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- Insert the positioning stopper pin until its flange contacts the fuel injection pump sprocket.

d. Remove the torx wrench (SST).

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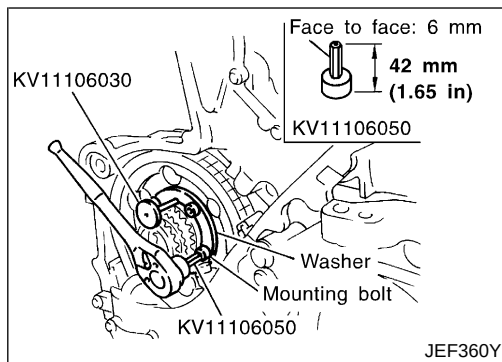
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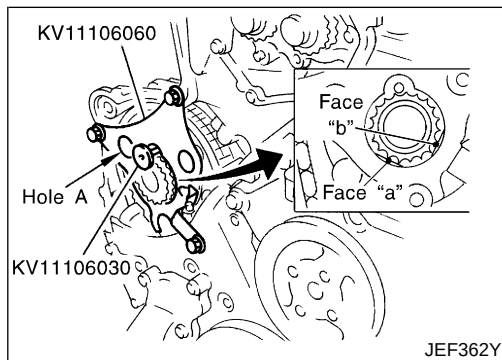
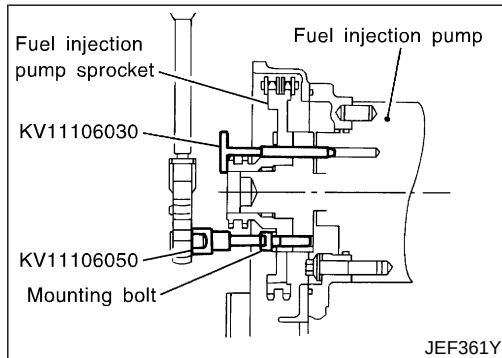
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Electronic Control Fuel Injection Pump (Cont'd)



12. Using the hexagon wrench (face to face: 6 mm, long-type) (SST), remove the mounting bolts of the fuel injection pump sprocket.
 - It is not necessary to remove the washer of the fuel injection pump sprocket.

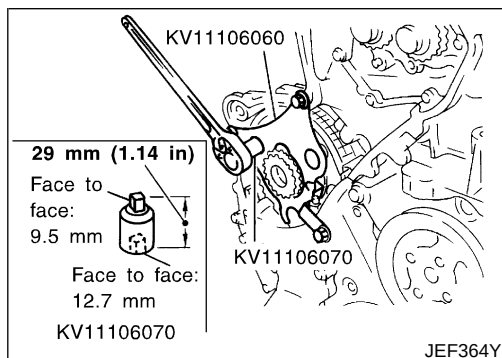
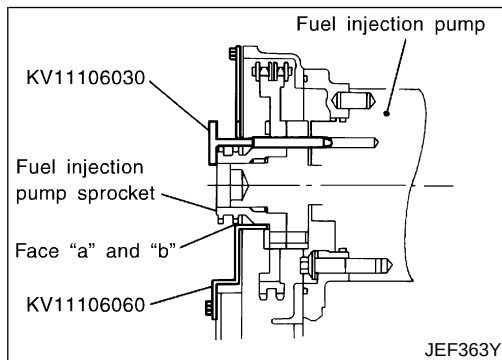


13. Using the sprocket holder (SST), hold the fuel injection pump sprocket to prevent falling.
 - When the sprocket holder is installed, if the positioning stopper pin interferes, pull out the stopper pin approximately 10 mm (0.39 in), then install it.
 - After the sprocket holder is installed temporarily, insert the extension bar (SST) and Torx socket in the three holes A. After positioning the holes, tighten the holder mounting bolts. (Refer to the step 14 about the tool.)
 - The length of the sprocket holder mounting bolts should be approximately 15 mm (0.59 in) (M6 thread length).
 - Make sure that the a- and b-faces of the sprocket holder contact the bottom side of the sprocket 15 mm (0.59 in) (small diameter side).

CAUTION:

Do not remove the sprocket holder until the fuel injection pump is installed.

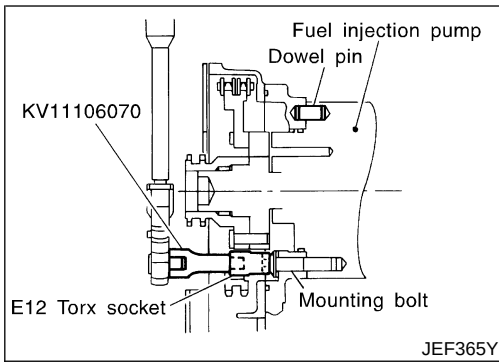
- After the sprocket holder is installed, pull out the positioning stopper pin (SST) from the fuel injection pump sprocket.



14. Using the extension bar [SST: whole length 43 mm (1.69 in)] and the Torx socket (Q6-E12: commercially available), remove the mounting bolts, then remove the fuel injection pump toward the rear of the engine.
 - Even after all the mounting bolts are removed, the fuel injection pump is still held by a dowel pin.

CAUTION:

Do not disassemble or adjust the fuel injection pump.

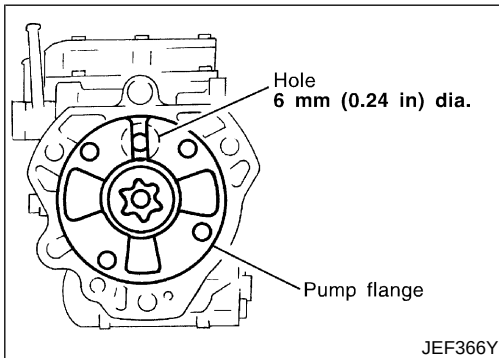


15. Remove the fuel injection pump mounting bolts.

- The seal washer of the mounting bolts cannot be reused.

CAUTION:

For removal, be careful not to drop the seal washer into the engine.



Installation

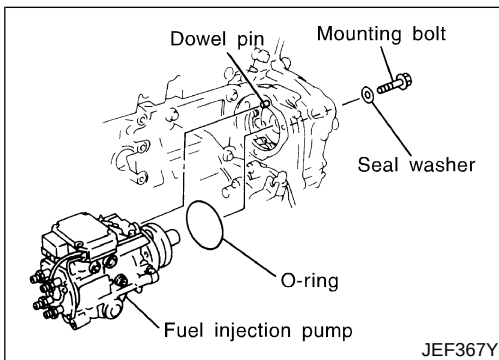
NJEC0620S02

- It is not necessary to adjust the injection timing by changing the installation angle which used to be performed with conventional fuel injection pumps. The installation position can be simply decided by the dowel pin and the mounting bolts.

1. Before the fuel injection pump is installed, check that the notch of its flange and the 6 mm (0.24 in) dia. hole on the body are aligned.

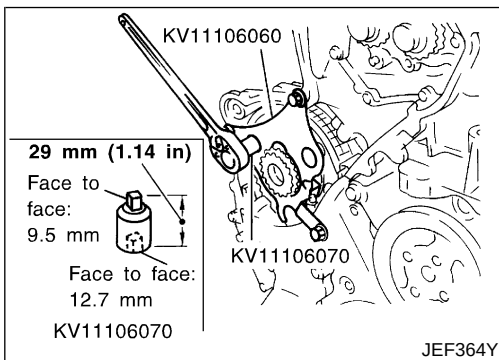
2. Insert the fuel injection pump to the mounting position from the rear of the engine.

- Adjust the fuel injection pump bracket position to the dowel pin, then install it.



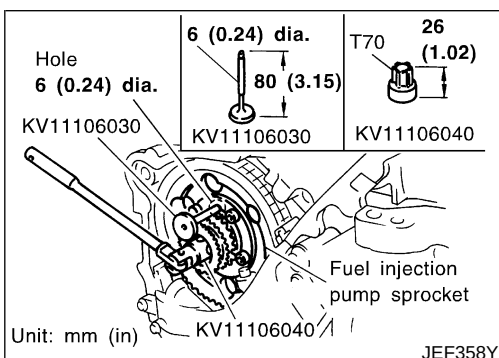
3. Using the extension bar (SST) and the Torx socket, tighten the mounting bolts of the fuel injection pump.

4. Remove the sprocket holder (SST).

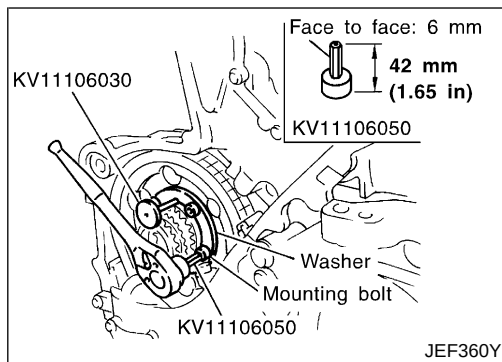


5. Using the torx wrench (SST), turn the pump shaft gradually to adjust the position of the flange. Then, insert the positioning stopper pin (SST) to the 6 mm (0.24 in) dia. hole of the fuel injection pump sprocket through the pump flange and the pump body.

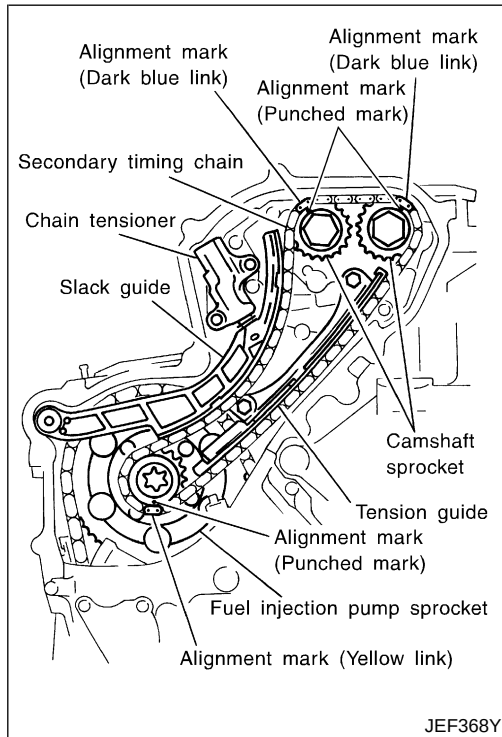
6. Remove the torx wrench (SST).



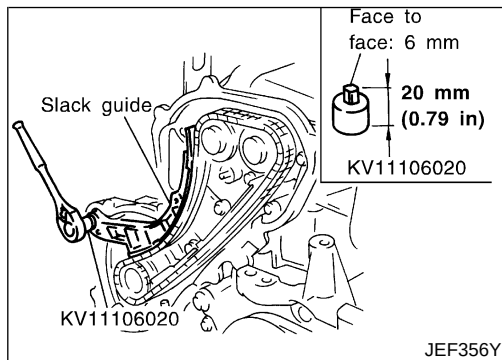
Electronic Control Fuel Injection Pump (Cont'd)



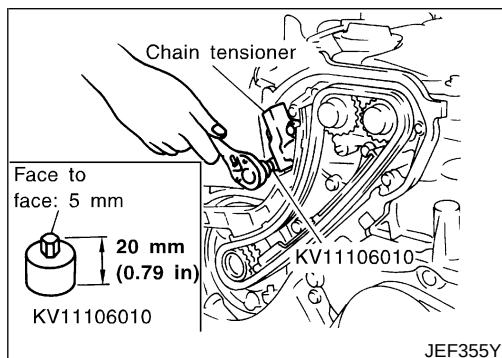
7. Using the hexagon wrench (face to face: 6 mm, long-type) (SST), tighten the sprocket mounting bolt.
 - When the washer of the fuel injection pump sprocket is removed, install it with the marking "F" (front) facing the front of the engine.
8. Pull out the positioning stopper pin (SST).



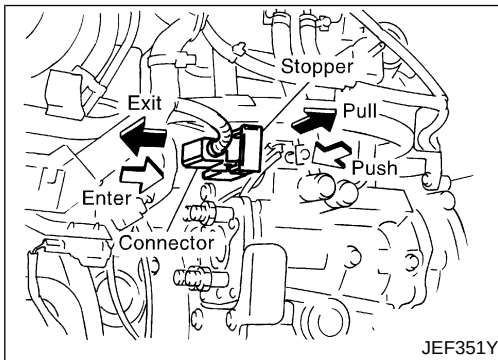
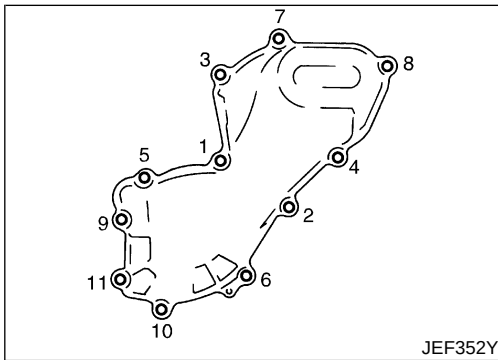
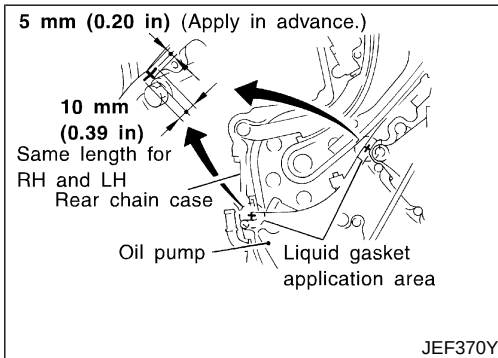
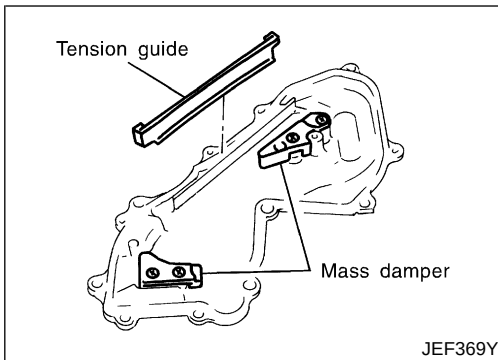
9. Install the secondary timing chain.
 - Align the alignment marks of the sprockets and those of the chain, then install it.
 - The figure shows the installation state and names of the secondary timing chain and other related parts.
10. Install timing chain tension guide.
 - The upper installation bolt is longer than the lower.



11. Using a hexagon wrench (face to face: 6 mm, short-type) (SST), install the timing chain slack guide.



12. Install the chain tensioner.
 - a. Push the plunger of the chain tensioner, then hold it with a tool such as a push pin, and install it.
 - b. Using a hexagon wrench (face to face: 5 mm) (SST), tighten the mounting bolts.
 - Installation is possible by a multi-purpose tool also.
 - c. Pull out the tool such as a push pin which holds the plunger.
 - **Make sure that the alignment marks of the sprockets and timing chain are aligned.**



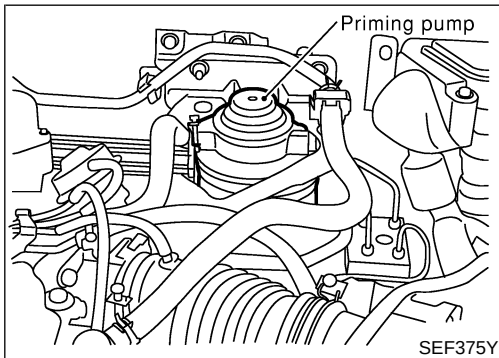
13. Install the front chain case.
 - a. Install the tension guide to the back side of the front chain case.
 - If the front chain case is tilted, the tension guide may fall off. Therefore, when installing the front chain case, hold it vertically.
 - b. Apply Three Bond 1207C (KP510 00150) to both ends of the arch area of the oil pump (contact surface of rear chain case) as shown in the figure.
 - c. Install the front chain case.
 - Align the dowel pin of the oil pump case to the pin hole, then install it.
 - Install bolts 6, 10, and 11 (shown in the figure) with the rubber washer to the front chain case.
 - d. Tighten the mounting bolts in the numerical order shown in the figure.
 - e. After all bolts are tightened, tighten the mounting bolts in the numerical order shown in the figure again.
14. Install the fuel injection pump rear bracket.
 - Tighten all the bolts temporarily, then tighten them securely with the mounting face securely contacting the fuel injection pump and the pump bracket.
15. Connect the fuel injection pump harness connector.
 - Insert the harness connector securely until the stopper locks.
 - Push the connector half way first, then press the stopper until it locks, so that the connector is connected together.
16. Connect the fuel hoses.
 - When the hoses are disconnected at the fuel gallery side, insert until the hoses contact the valve, then install the clamp securely.
17. Install other parts in the reverse order of removal.

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Fuel Filter

DESCRIPTION

A water draining cock is on the lower side and a priming pump for bleeding air is on the upper side. NJEC0623



AIR BLEEDING

1. After the repair, bleed air from the piping by pumping the priming pump up and down until it becomes heavy. NJEC0624
 2. To start the engine, rotate the starter for a maximum of 30 seconds. To start the engine more quickly, crank the engine while pumping the priming pump (requires two workers).
 3. If the engine does not start after rotating the starter for a maximum of 30 seconds, stop it once, and pump the priming pump again until it becomes heavy.
 4. Rotate the starter again until the engine starts running.
 5. After the engine starts, let it idle for at least 1 minute to stabilize the behavior.
- **When air is bled completely, the pumping of the priming pump suddenly becomes heavy. Stop the operation at that time.**
 - **If it is difficult to bleed air by the pumping of the priming pump (the pumping of the priming pump does not become heavy), disconnect the fuel supply hose between the fuel filter and the injection pump. Then, perform the operation described above, and make sure that fuel comes out. (Use a pan, etc. so as not to spill fuel. Do not let fuel get on engine and other parts.) After that, connect the hose, then bleed air again.**
 - **Start engine and let it idle for at least one minute after performing air bleeding.**

WATER DRAINING

1. Remove the fuel filter, filter bracket, protector assembly from the dash panel as follows. NJEC0625
 - a. Remove the air cleaner case (upper), air duct assembly, and vacuum hose for brake booster (between the vacuum pump and vacuum pipe).

CAUTION:

After the duct is removed, cover the opening with gum tape, etc. to prevent foreign object from getting into the engine during the operation.

- b. Disconnect the water level warning sensor harness connector.
 - c. Remove the mounting nuts on the dash panel, then remove the fuel filter, filter bracket, and protector assembly from the dash panel.
- It is not necessary to disconnect the fuel hose.
2. Using a tool such as a pliers, loosen the water draining cock at the bottom of the water level warning sensor located under the fuel filter.

- 3. Install the fuel filter, filter bracket, and protector assembly temporarily. Then, drain the water by pumping the priming pump with the filter standing straight.
- Extend the drain hose if necessary.

Water amount when the MI lights up:
65 - 100 ml (2.3 - 3.5 Imp fl oz)

CAUTION:

When the water is drained, the fuel is also drained. Use a pan, etc. to avoid fuel adherence to the rubber parts such as the engine mount insulator.

- 4. Tighten the water draining cock, then install the fuel filter, filter bracket, protector assembly in the reverse order of removal.

CAUTION:

Do not over-tighten the water draining cock. This will damage the cock thread, resulting in water or fuel leak.

- 5. Bleed air of the fuel filter. Refer to EC-32.
- Start engine and let it idle for at least one minute after performing air bleeding.

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DTC and MI Detection Logic

NJEC0626

When a malfunction is detected, the malfunction (DTC) is stored in the ECM memory. The MI will light up each time the ECM detects malfunction. For diagnostic items causing the MI to light up, refer to "TROUBLE DIAGNOSIS — INDEX", EC-4.

Diagnostic Trouble Code (DTC)

NJEC0627

NJEC0627S01

HOW TO READ DTC

The DTC can be read by the following methods.

⊗ Without CONSULT-II

ECM displays the DTC by a set of four digit numbers with MI illumination in the diagnostic test mode II (Self-diagnostic results). Example: 0103, 0807, 1002, etc.

📱 With CONSULT-II

CONSULT-II displays the DTC in "SELF-DIAG RESULTS" mode. Examples: P0115, P0571, P1202, etc. These DTCs are prescribed by ISO15031-6.

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

- **Output of the trouble code means that the indicated circuit has a malfunction. However, in the Mode II it does not indicate whether the malfunction is still occurring or occurred in the past and returned to normal.**

CONSULT-II can identify them. Therefore, using CONSULT-II (if available) is recommended.

HOW TO ERASE DTC

NJEC0627S02

How to Erase DTC (📱 With CONSULT-II)

NJEC0627S0201

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Touch "ENGINE".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" again.

SELECT SYSTEM
ENGINE

2. Turn CONSULT-II "ON" and touch "ENGINE".

SELECT DIAG MODE
SELF-DIAG RESULTS
DATA MONITOR
ACTIVE TEST
ECM PART NUMBER

3. Touch "SELF-DIAG RESULTS".

SELF DIAG RESULTS	
DTC RESULTS	TIME
COOLANT TEMP SEN [P0115]	0

4. Touch "ERASE". (The DTC in the ECM will be erased.)

SEF246Z

The emission related diagnostic information in the ECM can be erased by selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT-II.

How to Erase DTC (⊗ Without CONSULT-II)

NJEC0627S0202

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Change the diagnostic test mode from Mode II to Mode I by using the data link connector. (See EC-36.)

The emission related diagnostic information in the ECM can be erased by changing the diagnostic test mode.

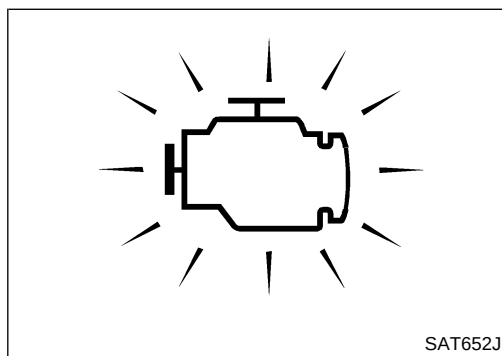
- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**

- Erasing the emission-related diagnostic information using CONSULT-II is easier and quicker than switching the diagnostic test mode using the data link connector.

Malfunction Indicator (MI)

DESCRIPTION

NJEC0628



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 EL-129, EL-129, "WARNING LAMPS" or see EC-213.
- 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.

If MI illuminates or blinks irregularly after starting engine, water may have accumulated in fuel filter. Drain water from fuel filter. Refer to "WATER DRAINING", EC-32.

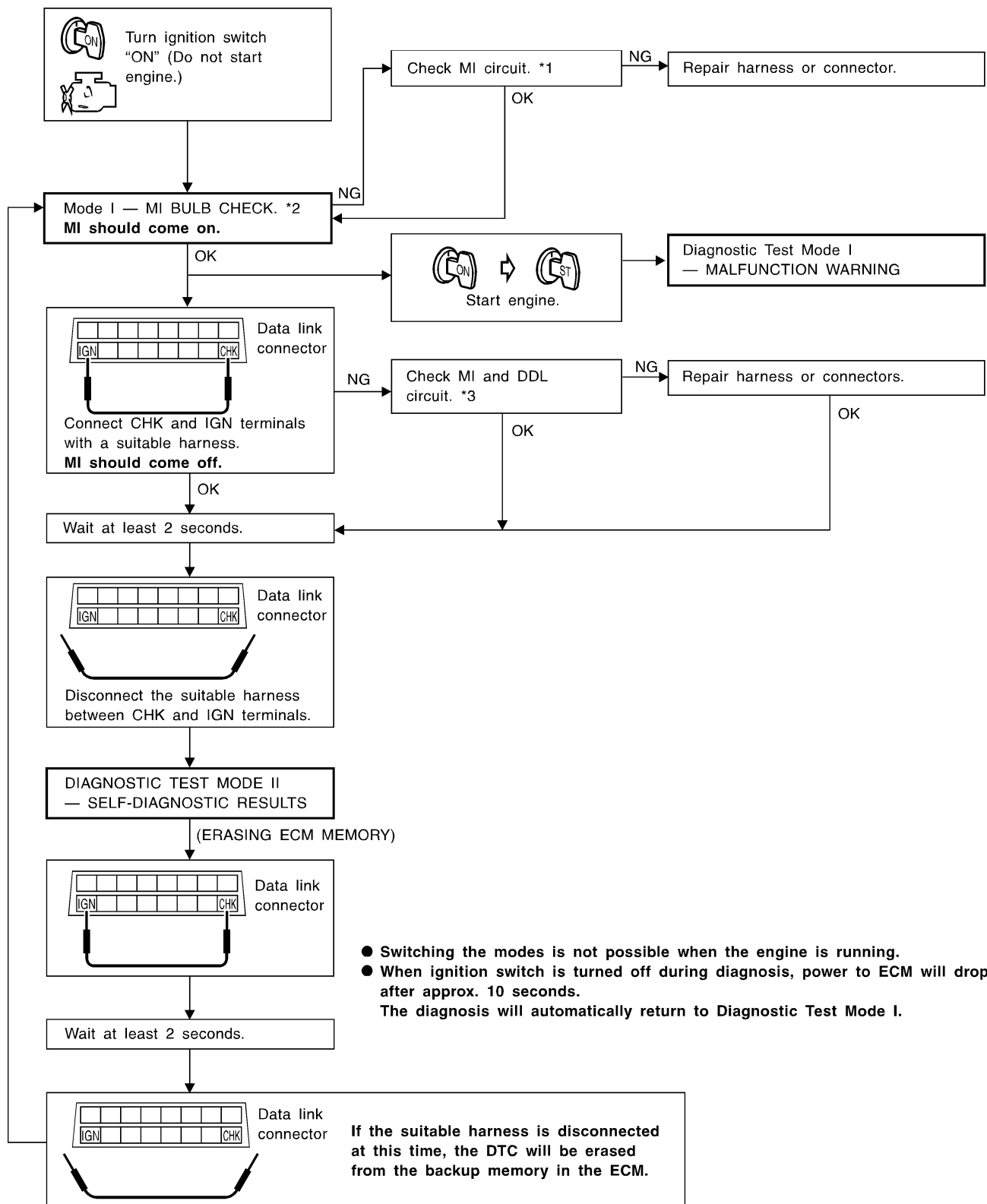
On Board Diagnostic System Function

NJEC0628S01

The on board diagnostic system has the following three functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit. (See EC-213.)
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When ECM detects a malfunction, the MI will light up to inform the driver that a malfunction has been detected.
Mode II	Ignition switch in ON position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs to be read.

How to Switch Diagnostic Test Modes



SEF878Y

*1: EC-213

*2: EC-35

*3: EC-213

Diagnostic Test Mode I — Bulb Check

NJEC0628S03

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL-129, EL-129, "WARNING LAMPS" or see EC-213.

Diagnostic Test Mode I — Malfunction Warning

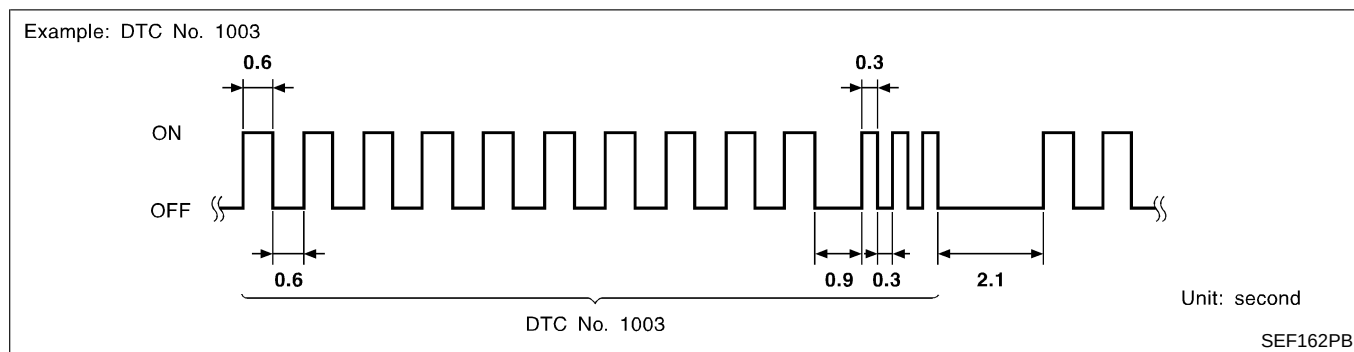
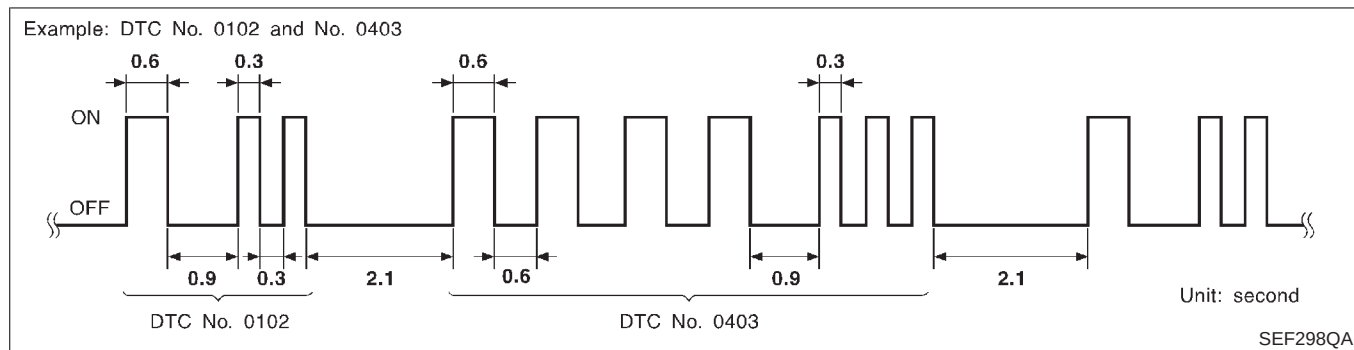
NJEC0628S04

MI	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

Diagnostic Test Mode II — Self-diagnostic Results

NJEC0628S05

In this mode, DTC is indicated by the number of blinks of the MI as shown below.



Long (0.6 second) blinking indicates the two LH digits of number and short (0.3 second) blinking indicates the two RH digits of number. For example, the MI blinks 10 times for 6 seconds (0.6 sec x 10 times) and then it blinks three times for about 1 second (0.3 sec x 3 times). This indicates the DTC "1003".

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC "0505" refers to no malfunction. (See TROUBLE DIAGNOSIS — INDEX, EC-4.)

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

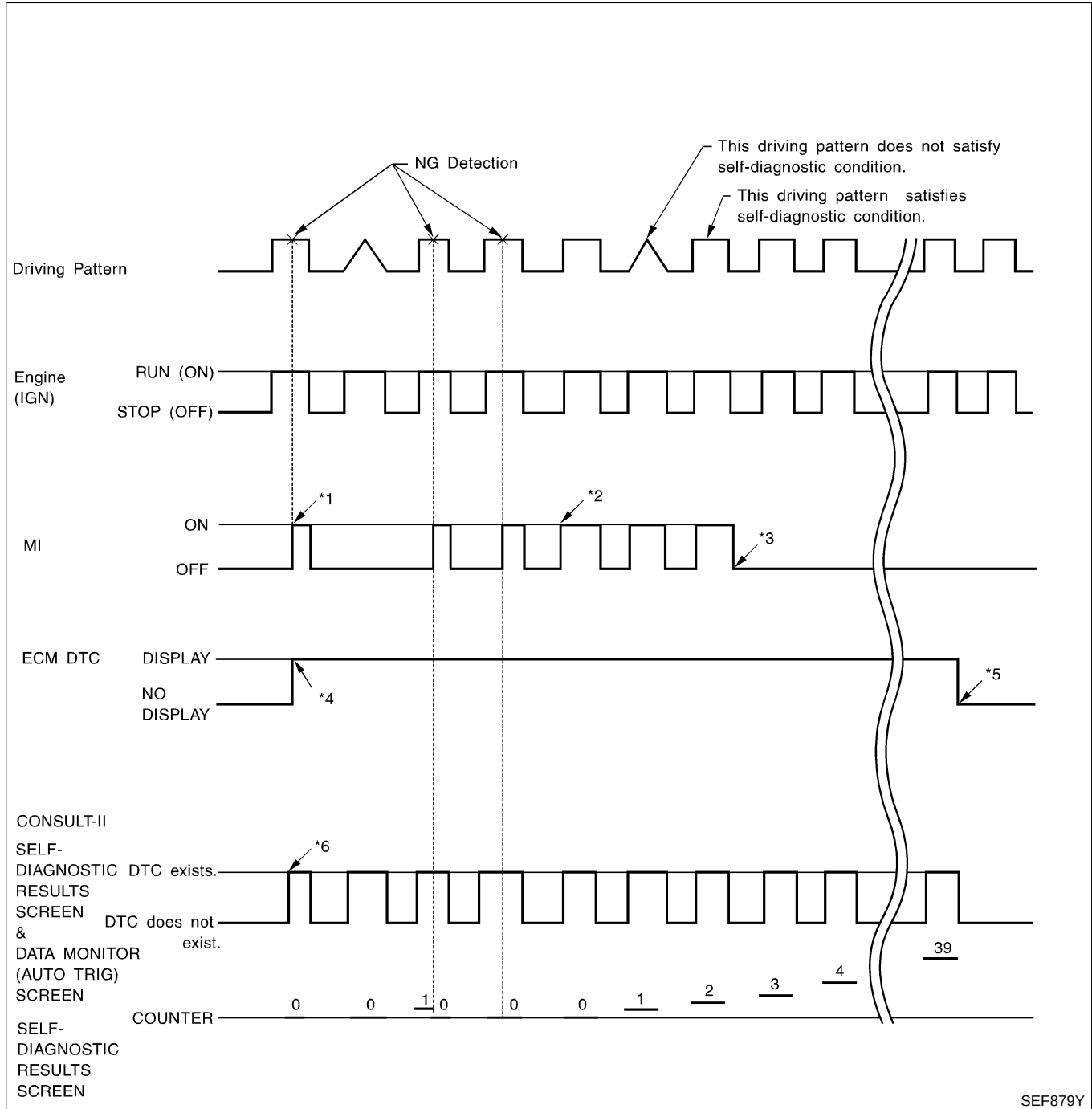
NJEC0628S06

The DTC can be erased from the backup memory in the ECM when the diagnostic test mode is changed from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to "How to Switch Diagnostic Test Modes", EC-36.)

- If the battery terminal 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.

Relationship Between MI, DTC, CONSULT-II and Driving Patterns

NJEC0628S07

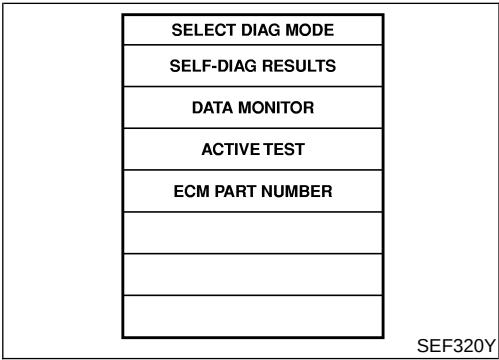
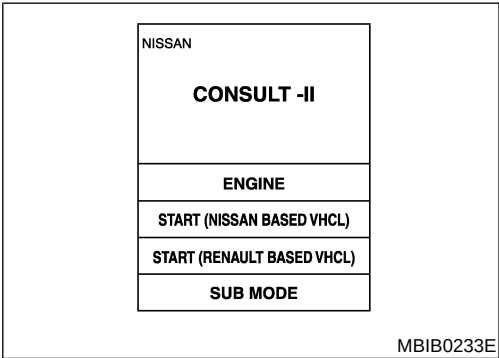
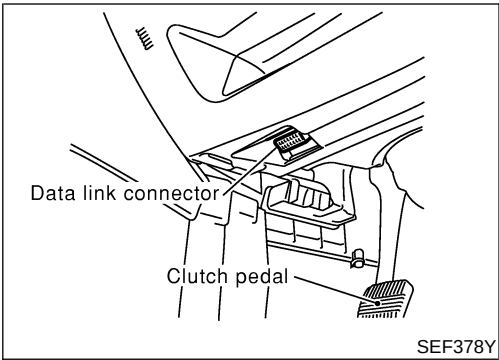


SEF879Y

- *1: When a malfunction is detected, MI will light up.
- *2: When the same malfunction is detected in two consecutive driving patterns, MI will stay lit up.
- *3: MI will go off after vehicle is driven three times without any malfunctions.

- *4: When a malfunction is detected for the first time, the DTC will be stored in ECM.
- *5: The DTC will not be displayed any longer after vehicle is driven 40 times without the same malfunction. (The DTC still remain in ECM.)

- *6: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.



CONSULT-II

CONSULT-II INSPECTION PROCEDURE

NJEC0629

NJEC0629S01

1. Turn ignition switch OFF.
2. Connect "CONSULT-II" and "CONSULT-II CONVERTER" to data link connector.
(Data link connector is located under the driver side dash panel.)
3. Turn ignition switch ON.
4. Touch "START (NISSAN BASED VHCL)".
5. Touch "ENGINE".
If "ENGINE" is not indicated, go to GI-38, "CONSULT-II Data Link Connector (DLC) Circuit".
6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.

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ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

=NJE0629S02

Item			DIAGNOSTIC TEST MODE		
			SELF-DIAG RESULTS	DATA MONITOR	ACTIVE TEST
ENGINE CONTROL COMPONENT PARTS	INPUT	Engine coolant temperature sensor	X	X	
		Vehicle speed sensor	X	X	
		Accelerator position sensor	X	X	
		Accelerator position switch	X	X	
		Crankshaft position sensor (TDC)	X	X	
		Ignition switch (start signal)		X	
		Park/Neutral position (PNP) switch (where fitted)		X	
		Battery voltage	X	X	
		Mass air flow sensor	X	X	
		Stop lamp switch	X	X	
	OUTPUT	Glow relay		X	X
		EGR volume control valve		X	X
		Cooling fan relay	X	X	X

X: Applicable

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "TROUBLE DIAGNOSIS — INDEX", EC-4.

NJE0629S03

DATA MONITOR MODE

NJE0629S04

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CKPS-RPM (TDC) [rpm]	○	○	The engine speed computed from the crankshaft position sensor (TDC) signal is displayed.	
CMPS-RPM-PUMP [rpm]	○	○	The engine speed computed from the pulse signal sent from electronic control fuel injection pump is displayed.	
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.
VHCL SPEED SE [km/h] or [mph]	○	○	The vehicle speed computed from the vehicle speed sensor signal is displayed.	
FUEL TEMP SEN [°C] or [°F]	○	○	The fuel temperature (sent from electronic control fuel injection pump) is displayed.	
ACCEL POS SEN [V]	○	○	The accelerator position sensor signal voltage is displayed.	
OFF ACCEL SW [ON/OFF]	○	○	Indicates [ON/OFF] condition from the accelerator position switch signal.	

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

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CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
SPILL/V [°CA]		○	The control position of spill valve (sent from electronic control fuel injection pump) is displayed.	
BATTERY VOLT [V]	○	○	The power supply voltage of ECM is displayed.	
P/N POSI SW*1 [ON/OFF] (where fitted)	○	○	Indicates [ON/OFF] condition from the park/neutral position switch signal.	
START SIGNAL [ON/OFF]	○	○	Indicates [ON/OFF] condition from the starter signal.	After starting the engine, [OFF] is displayed regardless of the starter signal.
BRAKE SW [ON/OFF]	○	○	Indicates [ON/OFF] condition from the stop lamp switch signal.	
BRAKE SW2 [ON/OFF]	○	○	Indicates [ON/OFF] condition from the brake pedal position switch signal.	
IGN SW [ON/OFF]	○	○	Indicates [ON/OFF] condition from ignition switch signal.	
MAS AIR/FL SE [V]	○	○	The signal voltage of the mass air flow sensor is displayed.	When the engine is stopped, a certain value is indicated.
INT/A VOLUME [mg/]			The intake air volume computed from the mass air flow sensor signal is displayed.	
F/CUT SIGNAL [ON/OFF]		○	- The [ON/OFF] condition from deceleration fuel cut signal (sent from electronic control fuel injection pump) is displayed. - OFF...Fuel is cut off. - ON...Fuel is not cut off.	
GLOW RLY [ON/OFF]		○	The glow relay control condition (determined by ECM according to the input signal) is displayed.	
COOLING FAN [LOW/HI/OFF]		○	- Indicates the control condition of the cooling fans (determined by ECM according to the input signal). - LOW ... Operates at low speed. - HI ... Operates at high speed. - OFF ... Stopped.	
BARO SEN [kPa]	○	○	The barometric pressure (determined by the signal voltage from the barometric pressure sensor built into the ECM) is displayed.	
EGR VOL CON/V [step]		○	- Indicates the EGR volume control value computed by the ECM according to the input signals. - The opening becomes larger as the value increases.	

*1: On models not equipped with park/neutral position (PNP) switch, "OFF" is always displayed regardless of gear shift position.

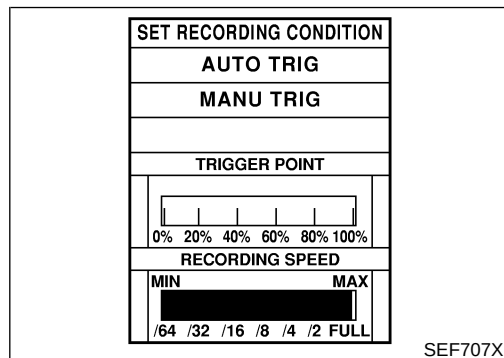
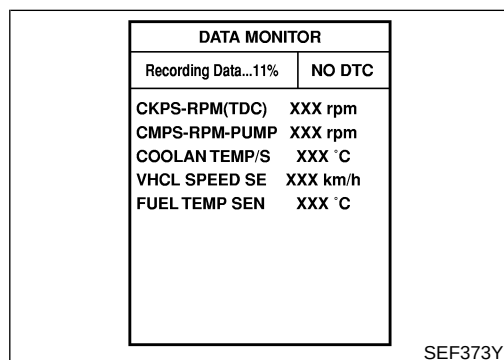
NOTE:

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

ACTIVE TEST MODE

NJEC0629S05

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
COOLING FAN	- Ignition switch: ON - Operate the cooling fan at "LOW", "HI" speed and turn "OFF" using CONSULT-II.	Cooling fan moves at "LOW", "HI" speed and stops.	- Harness and connector - Cooling fan motor - Cooling fan relay
EGR VOL CONT/V	- Ignition switch: ON - Change EGR volume control valve opening step using CONSULT-II.	EGR volume control valve makes an operating sound.	- Harness and connector - EGR volume control valve
GLOW RLY	- Ignition switch: ON (Engine stopped) - Turn the glow relay "ON" and "OFF" using CONSULT-II and listen to operating sound.	Glow relay makes the operating sound.	- Harness and connector - Glow relay



REAL TIME DIAGNOSIS IN DATA MONITOR MODE

NJEC0629S06

CONSULT-II has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

1) "AUTO TRIG" (Automatic trigger):

- The malfunction will be identified on the CONSULT-II screen in real time.

In other words, DTC will be displayed if the malfunction is detected by ECM.

At the moment a malfunction is detected by ECM, "MONITOR" in "DATA MONITOR" screen is changed to "Recording Data ... xx%" as shown at left, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, "REAL-TIME DIAG" screen is displayed. If "STOP" is touched on the screen during "Recording Data ... xx%", "REAL-TIME DIAG" screen is also displayed.

The recording time after the malfunction detection and the recording speed can be changed by "TRIGGER POINT" and "Recording Speed". Refer to CONSULT-II OPERATION MANUAL.

2) "MANU TRIG" (Manual trigger):

- DTC will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.

DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:

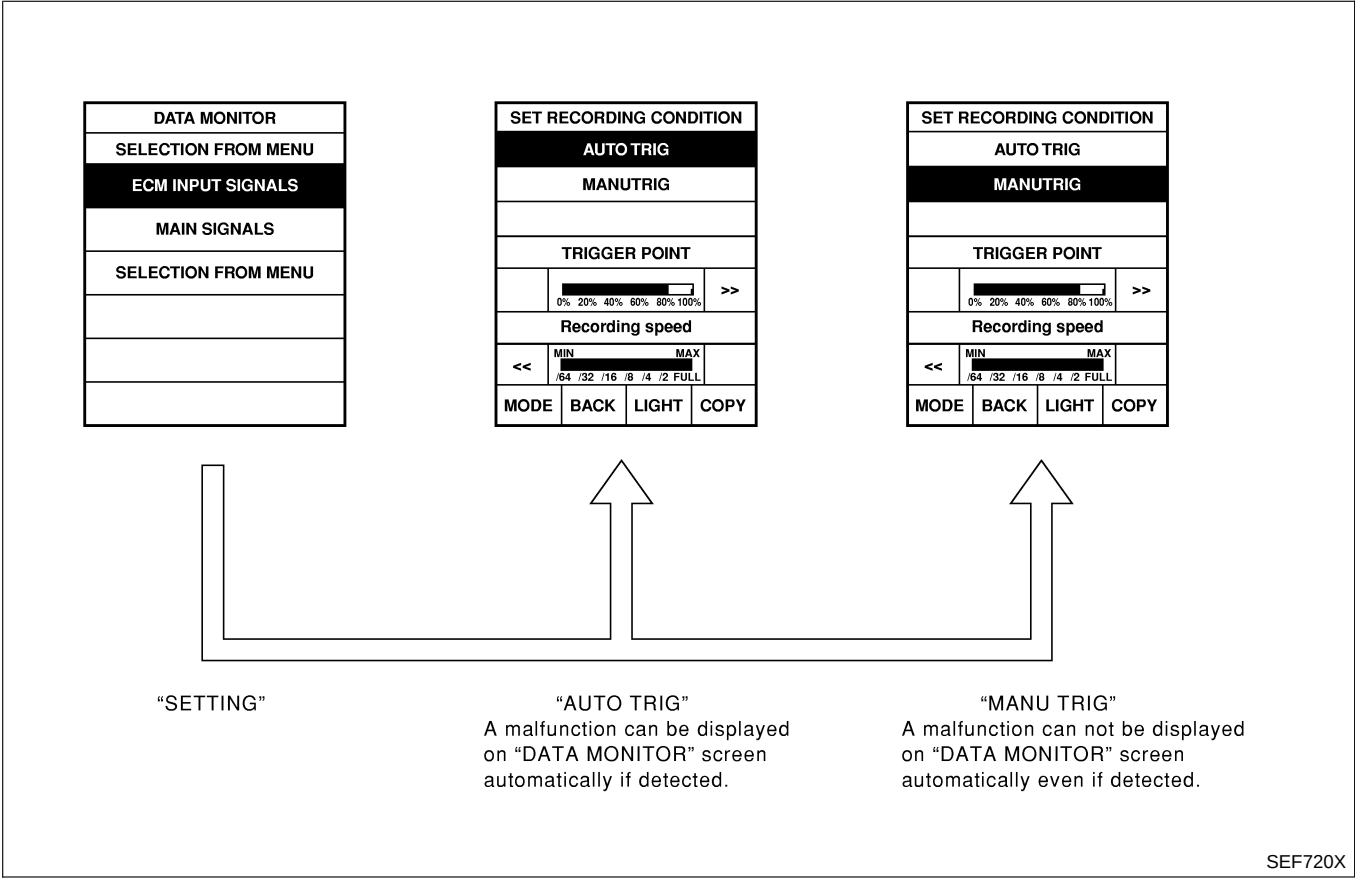
1) "AUTO TRIG"

- While trying to detect the DTC by performing the "DTC Confirmation Procedure", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent.

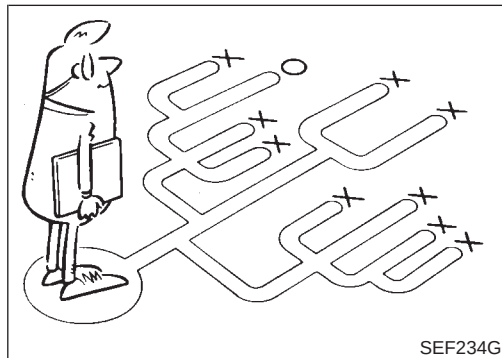
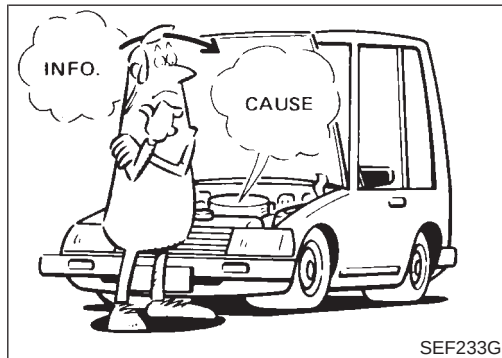
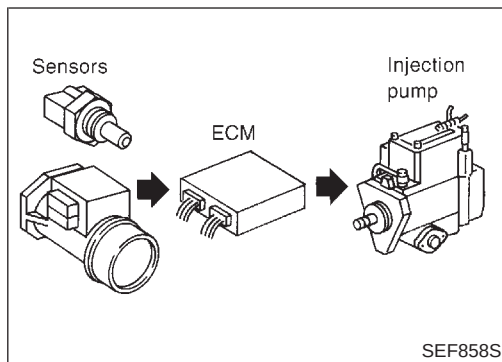
When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in

the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC will be displayed. Refer to GI-23, “Incident Simulation Tests”.

- 2) “MANU TRIG”
- If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.



Introduction



KEY POINTS

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

SEF907L

Introduction

NJEC0630

The engine has an ECM to control major systems such as fuel injection control, fuel injection timing control, glow control system, etc. The ECM accepts input signals from sensors and instantly drives electronic control fuel injection pump. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, or other malfunctions with the engine.

It is much more difficult to diagnose an incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the malfunctions. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the "Work Flow", EC-46.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A "Diagnostic Worksheet" like the example on next page should be used.

Start your diagnosis by looking for "conventional" malfunctions first. This will help troubleshoot driveability incidents on an electronically controlled engine vehicle.

DIAGNOSTIC WORKSHEET

NJEC0630S01

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

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

Utilize a diagnostic worksheet like the one shown below in order to organize all the information for troubleshooting.

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Worksheet Sample

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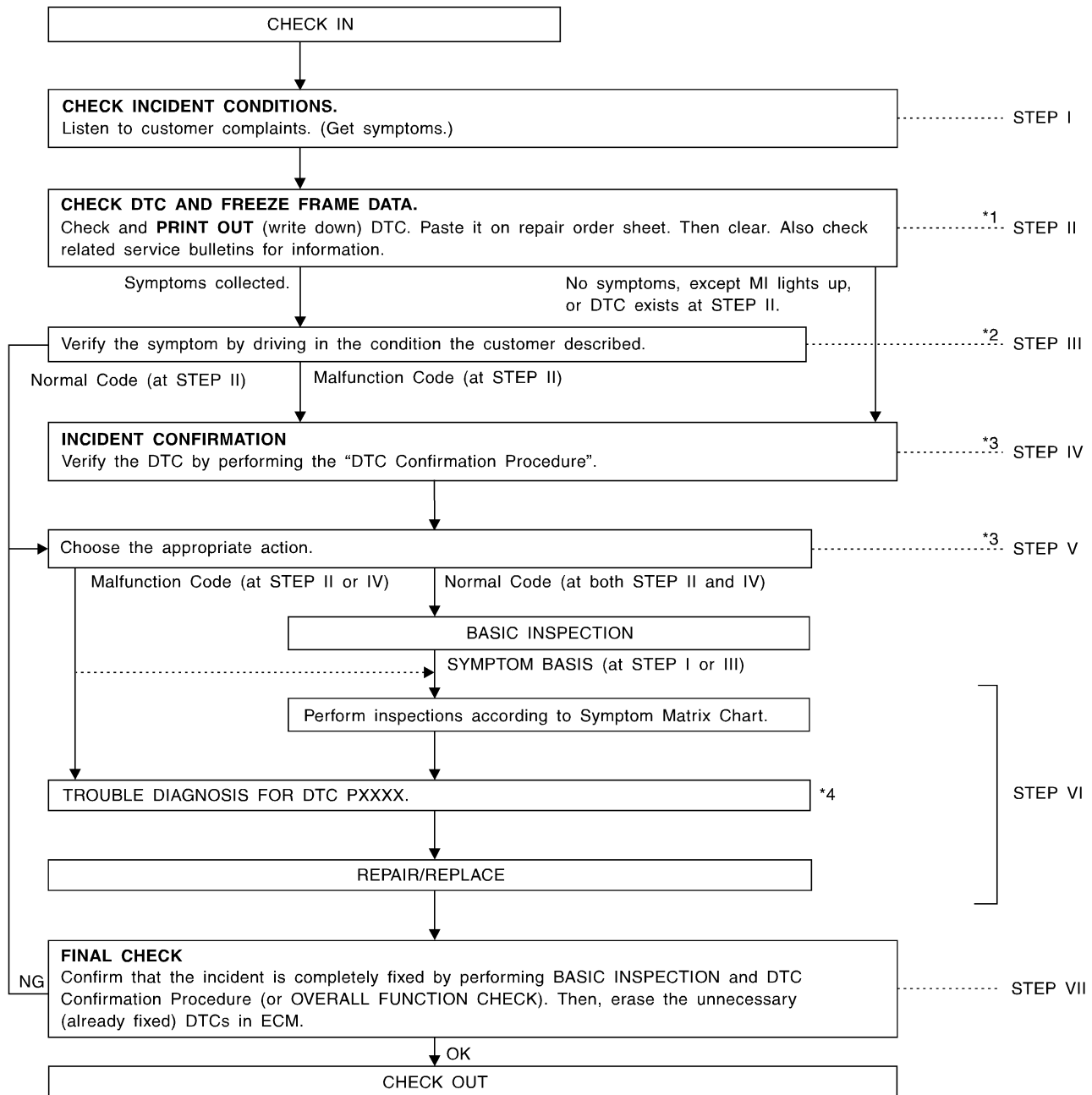
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Work Flow

NJEC0631



YEC400A

*1 If time data of "SELF-DIAG RESULTS" is other than "0", perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.

*2 If the incident cannot be verified,

perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.

*3 If the on board diagnostic system cannot be performed, check main power supply and ground circuit.

*4 Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-72.
If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.

DESCRIPTION FOR WORK FLOW

=NJE0631S01

STEP	DESCRIPTION	
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORKSHEET", EC-44.	GI
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the DTC, then erase the DTC. Refer to EC-34. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71. Study the relationship between the cause, specified by DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. Refer to EC-53.) Also check related service bulletins for information.	MA EM
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The "DIAGNOSTIC WORK SHEET" is useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71. If the malfunction code is detected, skip STEP IV and perform STEP V.	LC EC
STEP IV	Try to detect the DTC by driving in (or performing) the "DTC Confirmation Procedure". Check and read the DTC by using CONSULT-II. During the DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71. In case the "DTC Confirmation Procedure" is not available, perform the "Overall Function Check" instead. The DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "Overall Function Check" is the same as the DTC detection.	FE CL MT
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the Basic Inspection, EC-48. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-53.	AT
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) "Harness Layouts". Gently shake the related connectors, components or wiring harness with CONSULT-II set in "DATA MONITOR (AUTO TRIG)" mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-66 or EC-63. The "Diagnostic Procedure" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to GI-25, "Circuit Inspection". Repair or replace the malfunction parts. If the malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.	AX SU BR ST
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the "DTC Confirmation Procedure" and confirm the normal code (DTC P0000 or 0505) is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) DTC in ECM. (Refer to EC-34.)	RS BT HA SC EL IDX

Basic Inspection

NJEC0632

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

- Headlamp switch is OFF,
- On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Air conditioner switch is OFF,
- Rear defogger switch is OFF,
- Steering wheel is in the straight-ahead position, etc.

1	INSPECTION START
	1. Check service records for any recent repairs that may indicate a related incident. 2. Check the current need for scheduled maintenance, especially for fuel filter and air cleaner filter. Refer to MA-4, "Periodic Maintenance". 3. Open engine hood and check the following: • Harness connectors for improper connections • Vacuum hoses for splits, kinks, or improper connections • Wiring for improper connections, pinches, or cuts SEF142I 4. Start engine and warm it up to the normal operating temperature.
	GO TO 2.

2	PREPARATION FOR CHECKING IDLE SPEED
	With CONSULT-II Connect CONSULT-II to the data link connector.
	Without CONSULT-II Install diesel tachometer to the vehicle.
	GO TO 3.

3	CHECK IDLE SPEED							
 With CONSULT-II 1. Select "CKPS-RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II. 2. Read idle speed.								
<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">DATA MONITOR</th> </tr> <tr> <th>MONITOR</th> <th>NO DTC</th> </tr> </thead> <tbody> <tr> <td>CKPS-RPM (TDC)</td> <td>XXX rpm</td> </tr> </tbody> </table>			DATA MONITOR		MONITOR	NO DTC	CKPS-RPM (TDC)	XXX rpm
DATA MONITOR								
MONITOR	NO DTC							
CKPS-RPM (TDC)	XXX rpm							
SEF817Y								
 Without CONSULT-II Check idle speed. 725±25 rpm								
OK or NG								
OK	▶	INSPECTION END						
NG	▶	GO TO 4.						

4	CHECK FOR INTAKE AIR LEAK	
Listen for an intake air leak after the mass air flow sensor.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Repair or replace.

5	BLEED AIR FROM FUEL SYSTEM	
1. Stop engine. 2. Use priming pump to bleed air from fuel system. Refer to "AIR BLEEDING", EC-32.		
	▶	GO TO 6.

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Basic Inspection (Cont'd)

6	CHECK IDLE SPEED AGAIN							
 With CONSULT-II 1. Start engine and let it idle. 2. Select "CKPS-RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II. 3. Read idle speed. <table border="1" style="border-collapse: collapse; width: 150px; margin: 0 auto;"> <tr> <th colspan="2" style="padding: 2px;">DATA MONITOR</th> </tr> <tr> <th style="width: 50%; padding: 2px;">MONITOR</th> <th style="width: 50%; padding: 2px;">NO DTC</th> </tr> <tr> <td colspan="2" style="padding: 2px;">CKPS-RPM (TDC) XXX rpm</td> </tr> </table> SEF817Y			DATA MONITOR		MONITOR	NO DTC	CKPS-RPM (TDC) XXX rpm	
DATA MONITOR								
MONITOR	NO DTC							
CKPS-RPM (TDC) XXX rpm								
 Without CONSULT-II 1. Start engine and let it idle. 2. Check idle speed. 725±25 rpm OK or NG								
OK ▶		INSPECTION END						
NG ▶		GO TO 7.						

7	DRIN WATER FROM FUEL FILTER
Drain water from fuel filter. Refer to "WATER DRAINING", EC-32.	
	▶ GO TO 8.

8	CHECK IDLE SPEED AGAIN							
 With CONSULT-II 1. Start engine and let it idle. 2. Select "CKPS-RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II. 3. Read idle speed. <table border="1" style="border-collapse: collapse; width: 150px; margin: 0 auto;"> <tr> <th colspan="2" style="padding: 2px;">DATA MONITOR</th> </tr> <tr> <th style="width: 50%; padding: 2px;">MONITOR</th> <th style="width: 50%; padding: 2px;">NO DTC</th> </tr> <tr> <td colspan="2" style="padding: 2px;">CKPS-RPM (TDC) XXX rpm</td> </tr> </table> SEF817Y			DATA MONITOR		MONITOR	NO DTC	CKPS-RPM (TDC) XXX rpm	
DATA MONITOR								
MONITOR	NO DTC							
CKPS-RPM (TDC) XXX rpm								
 Without CONSULT-II 1. Start engine and let it idle. 2. Check idle speed. 725±25 rpm OK or NG								
OK ▶		INSPECTION END						
NG ▶		GO TO 9.						

9	CHECK AIR CLEANER FILTER
Check air cleaner filter for clogging or braks.	
OK or NG	
OK	▶ GO TO 10.
NG	▶ Replace air cleaner filter.

10	CHECK FUEL INJECTION NOZZLE
Check fuel injection nozzle opening pressure. Refer to "Injection Pressure Test", EC-24.	
OK or NG	
OK	▶ GO TO 11.
NG	▶ Replace fuel injection nozzle assembly.

11	CHECK IDLE SPEED AGAIN						
 With CONSULT-II - Start engine and let it idle. - Select "CKPS-RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II. - Read idle speed.							
<table border="1" data-bbox="685 835 948 1159"> <thead> <tr> <th colspan="2">DATA MONITOR</th></tr> <tr> <th>MONITOR</th><th>NO DTC</th></tr> </thead> <tbody> <tr> <td>CKPS-RPM (TDC)</td><td>XXX rpm</td></tr> </tbody> </table>		DATA MONITOR		MONITOR	NO DTC	CKPS-RPM (TDC)	XXX rpm
DATA MONITOR							
MONITOR	NO DTC						
CKPS-RPM (TDC)	XXX rpm						
SEF817Y							
 Without CONSULT-II - Start engine and let it idle. - Check idle speed. 725±25 rpm							
OK or NG							
OK	▶ INSPECTION END						
NG	▶ GO TO 12.						

12	CHECK COMPRESSION PRESSURE
Check compression pressure. Refer to EM-9, "MEASUREMENT OF COMPRESSION PRESSURE".	
OK or NG	
OK	▶ GO TO 13.
NG	▶ Follow the instruction of "MEASUREMENT OF COMPRESSION PRESSURE".

Basic Inspection (Cont'd)

13	CHECK IDLE SPEED AGAIN						
 With CONSULT-II 1. Start engine and let it idle. 2. Select "CKPS-RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II. 3. Read idle speed. <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <th colspan="2" style="padding: 2px;">DATA MONITOR</th> </tr> <tr> <th style="padding: 2px;">MONITOR</th> <th style="padding: 2px;">NO DTC</th> </tr> <tr> <td colspan="2" style="padding: 2px;">CKPS-RPM (TDC) XXX rpm</td> </tr> </table> SEF817Y		DATA MONITOR		MONITOR	NO DTC	CKPS-RPM (TDC) XXX rpm	
DATA MONITOR							
MONITOR	NO DTC						
CKPS-RPM (TDC) XXX rpm							
 Without CONSULT-II 1. Start engine and let it idle. 2. Check idle speed. 725±25 rpm OK or NG							
OK	▶ INSPECTION END						
NG	▶ Replace electronic control fuel injection pump.						

Symptom Matrix Chart

NJEC1257

SYSTEM — Basic engine control system	SYMPTOM												Reference page	Feature of symptom, Check point				
	HARD/NO START/RESTART (EXCP. HA)				ENGINE STALL			HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE			LOW IDLE			
	NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING											
	AA				AB			AC	AD	AE		AF						
	Electronic control fuel injection pump mainframe	4	4	4	4	4	4	4	4	4	5	5			4	4	—	*1
	Injection nozzle	3	3	3	3	3	3	3	3	3	4	4			3	3	EC-21	*2
	Glow system	1	1	1	1					1							EC-188	
	Engine body	3	3	3	3	3	3	3		3	4	4				3	EM section	*3
	EGR system										3	3					EC-197	
	Air cleaner and ducts										3	3					MA section	*4

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

(continued on next page)

*1: Fuel injection system malfunction or fuel injection timing control system malfunction may be the cause.

*2: Depends on open-valve pressure and spray pattern.

*3: Caused mainly by insufficient compression pressure.

*4: Symptom varies depending on off-position of air duct, etc.

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

Symptom Matrix Chart (Cont'd)

SYSTEM — Basic engine control system	SYMPTOM										Reference page	Feature of symptom, Check point	
	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR		DEAD BATTERY (UNDER CHARGE)	Malfunction indicator illuminates.			Can be detected by CONSULT-II?
							BLACK SMOKE	WHITE SMOKE					
Warranty symptom code	AG	AH	AJ	AK	AL	AM	AP		HA				
Electronic control fuel injection pump mainframe	4	4	3		4		5	4		3	3	—	*1
Injection nozzle	3	3			3		4	3				EC-21	*2
Glow system								1		1		EC-188	
Engine body	3	3		3	3	3		3				EM section	*3
EGR system							3					EC-197	
Air cleaner and ducts							3				3	MA section	*4

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TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system			Malfunction	SYMPTOM												Reference page		Feature of symptom, Check point	
				HARD/NO START/RESTART (EXCP. HA)				ENGINE STALL			HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE				LOW IDLE
				NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT												
Warranty symptom code			AA				AB			AC	AD	AE		AF					
ENGINE CONTROL	Electronic control fuel injection pump circuit	*a, *b		1		1	1	1	1	1	1	1	1	1	1	—			
		*c, *d																	
	Mass air flow sensor circuit	*a, *c								1		1	1			EC-78			
		*b																	
		Engine coolant temperature sensor circuit	*a, *b			1		1		1						1	EC-84	*1	
	Vehicle speed sensor circuit	*a, *b											1			EC-105			

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

(continued on next page)

*a: Open

*b: Short

*c: Ground short

*d: Noise

*1: Compensation according to engine coolant temperature does not function.

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TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system			Malfunction	SYMPTOM										Reference page		Feature of symptom, Check point	
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										BLACK SMOKE	WHITE SMOKE						
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA						
ENGINE CONTROL	Electronic control fuel injection pump circuit	*a, *b	1				1				1		1	1	—		
		*c, *d								1							
	Mass air flow sensor circuit	*a, *c												1	EC-78		
		*b								1							
	Engine coolant temperature sensor circuit	*a, *b	1	1		1								1	1	EC-84	*1
Vehicle speed sensor circuit	*a, *b													1	EC-105		

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(continued on next page)

*a: Open

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TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system			Malfunction	SYMPTOM												Reference page	Feature of symptom, Check point	
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Warranty symptom code				AA				AB			AC	AD	AE		AF			
ENGINE CONTROL	Fuel cut system line	*a, *c															EC-124	*2
		*b		1			1	1	1									
	Accelerator position sensor circuit	*a, *b								1		1	1				EC-89	
	Crankshaft position sensor (TDC) circuit	*a, *b			1	1	1	1	1	1	1	1	1				EC-99	
*d																		

1 - 5: The numbers refer to the order of inspection.
(continued on next page)

*a: Open

*b: Short

*c: Ground short

*d: Noise

*2: Engine runs on after turning ignition switch OFF.

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system			Malfunction	SYMPTOM										Reference page	Feature of symptom, Check point	
				ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BLACK SMOKE	WHITE SMOKE	ABNORMAL SMOKE COLOR	DEAD BATTERY (UNDER CHARGE)			Malfunction indicator illuminates.
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA					
ENGINE CONTROL	Fuel cut system line	*a, *c											1	1	EC-124	*2
		*b														
	Accelerator position sensor circuit	*a, *b											1	1	EC-89	
	Crankshaft position sensor (TDC) circuit	*a, *b	1	1									1	1	EC-99	
*d																

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

(continued on next page)

*a: Open

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*c: Ground short

*d: Noise

*2: Engine runs on after turning ignition switch OFF.

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system										SYMPTOM										Reference page		Feature of symptom, Check point																	
Malfunction		NO START (with first firing)				NO START (without first firing)				HARD TO START WHEN ENGINE IS COLD				HARD TO START WHEN ENGINE IS HOT				HARD/NO START/RESTART (EXCP. HA)					ENGINE STALL				HESITATION/SURGING/FLAT SPOT				KNOCK/DETONATION		LACK OF POWER		POOR ACCELERATION		HI IDLE		LOW IDLE
		Warranty symptom code										AA				AB				AC		AD		AE		AF		Reference page		Feature of symptom, Check point									
ENGINE CONTROL	Start signal circuit		*a, *b	1	1	1	1																						EC-205		*3								
	Accelerator position switch (Idle) circuit		*a, *c				1	1		1			1															1	EC-89	*4									
			*b												1			1	1																				
	Ignition switch circuit		*a			1					1	1	1																EC-72	*5									
			*b																																				
	Power supply for ECM circuit		*a			1					1	1	1																EC-72										
*b																																							

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

(continued on next page)

*a: Open

*b: Short

*c: Ground short

*d: Noise

*3: Start control does not function.

*4: Accelerator position sensor NG signal is output.

*5: Engine does not stop.

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system			Malfunction	SYMPTOM										Reference page	Feature of symptom, Check point	
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Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA					
ENGINE CONTROL	Start signal circuit	*a, *b													EC-205	*3
	Accelerator position switch (Idle) circuit	*a, *c													EC-89	
		*b											1	1		
	Ignition switch circuit	*a													EC-72	
		*b														
	Power supply for ECM circuit	*a												1	1	EC-72
*b																

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

(continued on next page)

*a: Open

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TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system			Malfunction	SYMPTOM												Reference page	Feature of symptom, Check point	
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Warranty symptom code			AA				AB			AC	AD	AE		AF				
ENGINE CONTROL	EGR volume control valve circuit	*a, *b															EC-197	
		*c								1		1	1			*6		
	Glow relay circuit	*a	1	1	1	1											EC-188	*7
		*b																*8
	ECM relay (Self-shutoff) circuit	*a		1			1	1	1								EC-177	
		*b																*9
	ECM, Connector circuit	*a, *b	2	2	2	2	2	2	2	2	2	2	2	2	2	2	EC-175, 116	
	Air conditioner relay circuit	*a															EC-212	*10
		*b											1					*11
	Air conditioner switch circuit	*a, *c															EC-212	*11
*b																*12		

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

(continued on next page)

*a: Open

*b: Short

*c: Ground short

*d: Noise

*6: Does not stop operating.

*7: Glow lamp does not turn on.

*8: Glow lamp does not turn off.

*9: Ground short makes engine unable to stop.

*10: Air conditioner does not operate.

*11: Air conditioner does not stop operating.

*12: Air conditioner does not work.

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system			Malfunction	SYMPTOM										Reference page	Feature of symptom, Check point	
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Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA					
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		*c							1						*6	
	Glow relay circuit	*a									1				EC-188	*7
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		*b														*9
	ECM, Connector circuit	*a, *b	2	2	2	2	2	2	2	2	2	2	2	2	EC-175, 116	
	Air conditioner relay circuit	*a													EC-212	*10
*b														*11		
Air conditioner switch circuit	*a, *c													EC-212	*11	
	*b														*12	

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*9: Ground short makes engine unable to stop.

*10: Air conditioner does not operate.

*11: Air conditioner does not stop operating.

*12: Air conditioner does not work.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0634

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.

MONITOR ITEM	CONDITION		SPECIFICATION
CKPS-RPM (TDC)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
CMPS-RPM-PUMP			
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value		Almost the same speed as the CONSULT-II value
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
ACCEL POS SEN	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	0.30 - 0.50V
		Accelerator pedal: fully depressed	3.0 - 4.3V
OFF ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly open	OFF
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°C
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
P/N POSI SW*1 (where fitted)	● Ignition switch: ON	Shift lever: Neutral position	ON
		Except above	OFF
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
IGN SW	● Ignition switch: ON → OFF		ON → OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: depressed	ON
		Brake pedal: released	OFF
BRAKE SW2	● Ignition switch: ON	Brake pedal: depressed	ON
		Brake pedal: released	OFF
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	Idle	1.5 - 2.0V
INT/A VOLUME	● Engine: After warming up, idle the engine.		150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON
GLOW RLY	● Refer to EC-188.		
COOLING FAN	● When cooling fan is stopped.		OFF
	● When cooling fans operate at low speed.		LOW
	● When cooling fans operate at high speed.		HIGH

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION
BARO SEN	Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm ² , 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm ² , 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm ² , 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm ² , 11.36 psi)
EGR VOL CON/V	- Engine: After warming up - Air conditioner switch: "OFF" - Shift lever: Neutral position - No-load	After one minute at idle	More than 10 steps
		Revving engine from idle to 3,200 rpm	0 steps

*1: On models not equipped with park/neutral position (PNP) switch, "OFF" is always displayed regardless of gear shift position.

Major Sensor Reference Graph in Data Monitor Mode

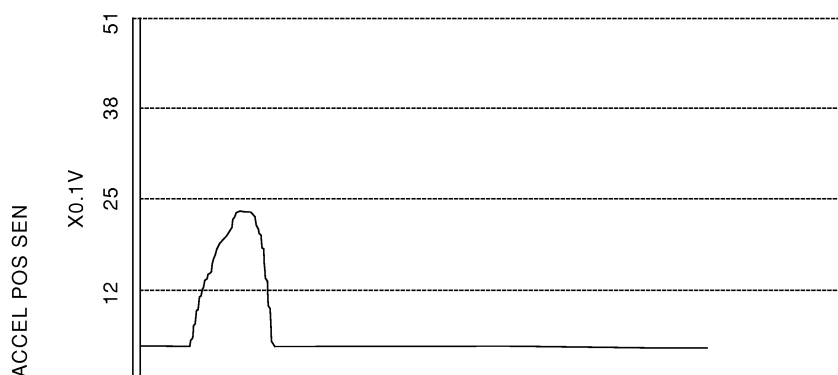
=NJEC0635

The following are the major sensor reference graphs in "DATA MONITOR" mode.

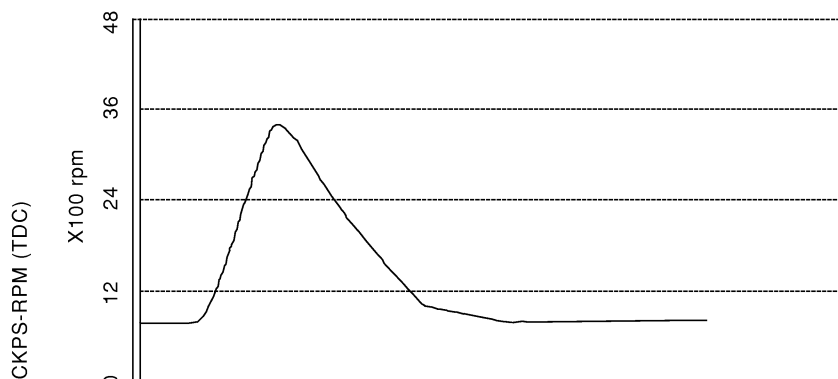
ACCEL POS SEN, "CKPS-RPM (TDC)", "MAS AIR/FL SE"

NJEC0635S01

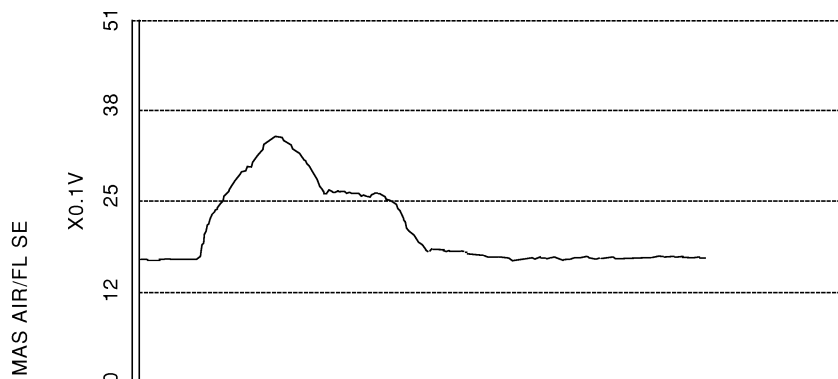
Below is the data for "ACCEL POS SEN", "CKPS-RPM (TDC)" and "MAS AIR/FL SE" when revving engine quickly up to 3,000 rpm under no load after warming up engine to the normal operating temperature. Each value is for reference, the exact value may vary.



- "ACCEL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.

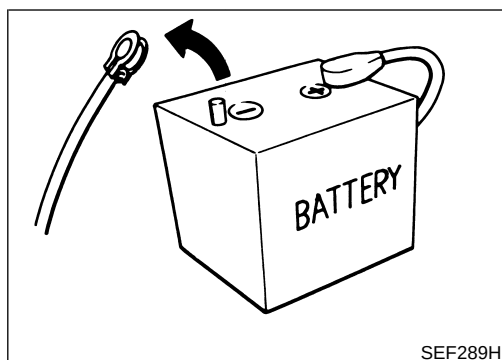


- "CKPS-RPM (TDC)" should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intermittent drop or rise.

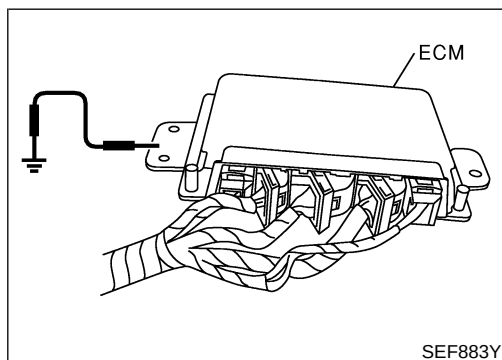


- "MAS AIR/FL SE" should increase while depressing the accelerator pedal and should decrease gradually after releasing the pedal.

SEF321Y



SEF289H



SEF883Y

ECM Terminals and Reference Value

NJEC0636

PREPARATION

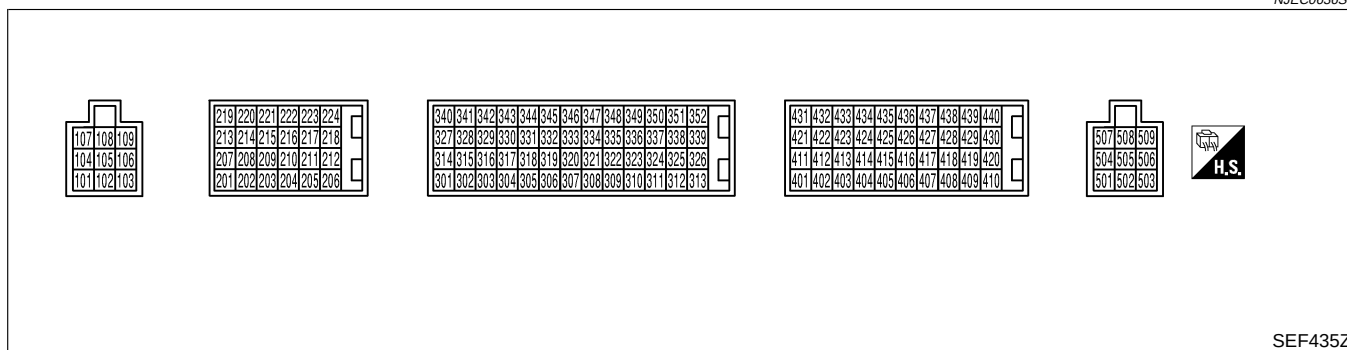
NJEC0636S01

ECM is located beside of blower unit.

1. Remove the ECM bracket fixing.
2. Remove ECM harness protector.
3. Disconnect negative battery terminal.
4. Connect a break out box (SST) between the ECM and ECM harness connectors.
 - Use extreme care not to touch 2 pins at one time.
 - Data is for comparison and may not be exact.
 - Be sure ECM unit is properly grounded before checking.

ECM HARNESS CONNECTOR TERMINAL LAYOUT

NJEC0636S02



SEF435Z

ECM INSPECTION TABLE

NJEC0636S03

Remarks: Specification data are reference values and are measured between each terminal and ground.

Pulse signal is measured by CONSULT-II.

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
104 105 106	B B B	ECM ground	[Engine is running] • Idle speed	Approximately 0V
107 108 109	R R R	Power supply for ECM	[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

ECM Terminals and Reference Value (Cont'd)

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)		
204	L	Air conditioner relay	[Engine is running] Air conditioner switch is “OFF”	BATTERY VOLTAGE (11 - 14V)	GI	
			[Engine is running] Both air conditioner switch and blower fan switch are “ON” (Compressor is operating)	Approximately 0.1V	MA	
214	W/B	Glow relay	Refer to “Glow Control System”, EC-188.			EM
218	B	Sensors’ ground	[Engine is running] Warm-up condition - Idle speed	Approximately 0V	LC	
219	LG/R	Cooling fan relay (Low)	[Engine is running] Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)	EC	
			[Engine is running] Cooling fan is operating	Approximately 0.1V	FE	
221	LG/B	Cooling fan relay (High)	[Engine is running] - Cooling fan is not operating - Cooling fan is operating at low speed	BATTERY VOLTAGE (11 - 14V)	CL	
			[Engine is running] Cooling fan is operating at high speed	Approximately 0.1V	MT	
223	W	Mass air flow sensor power supply	[Ignition switch “ON”]	Approximately 5V	AT	
224	R	Mass air flow sensor	[Engine is running] Warm-up condition - Idle speed	1.5 - 2.0V	AX	
313	L/W	Electronic control fuel injection pump	[Engine is running] Warm-up condition - Idle speed	Approximately 0.1V	SU	
314	L/R	Electronic control fuel injection pump	[Engine is running] Warm-up condition - Idle speed	Approximately 0.4V	BR	
316	PU	Electronic control fuel injection pump	[Engine is running] Warm-up condition - Idle speed	Approximately 2.5V	ST	
317	P	Electronic control fuel injection pump	[Engine is running] Warm-up condition - Idle speed	Approximately 2.5V	RS	
325	G	ECM relay (Self-shutoff)	[Ignition switch “ON”] [Ignition switch “OFF”] For a few seconds after turning ignition switch “OFF”	Approximately 0.25V	HA	
			[Ignition switch “OFF”] A few seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)	SC	
331	OR	Crankshaft position sensor (TDC) ground	[Engine is running] Warm-up condition - Idle speed	Approximately 0V	EL	
334	B/R	Engine coolant temperature sensor ground	[Ignition switch “ON”]	Approximately 0V	IDX	

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

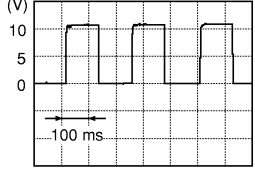
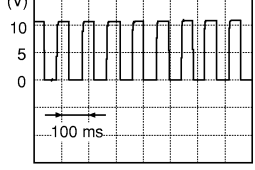
ECM Terminals and Reference Value (Cont'd)

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
337 338 350 351	W/L PU/W GY OR/B	EGR volume control valve	[Engine is running] • Warm-up condition • Idle speed	0.1 - 14V (Voltage signals of each ECM terminals differ according to the control position of EGR volume control valve.)
344	W	Crankshaft position sen- sor (TDC)	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V  SEF333Y
			[Engine is running] • Warm-up condition • Engine speed is 2,000 rpm	Approximately 0V  SEF334Y
347	L/B	Engine coolant tempera- ture sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature
403	R/L	Air conditioner switch	[Engine is running] • Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] • Both air conditioner switch and blower fan switch are "ON" (Compressor is operating)	Approximately 0.1V
405	R/G	Stop lamp switch	[Ignition switch "ON"] • Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] • Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
416	Y/B	Brake pedal position switch	[Ignition switch "ON"] • Brake pedal fully released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] • Brake pedal depressed	Approximately 0V

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

ECM Terminals and Reference Value (Cont'd)

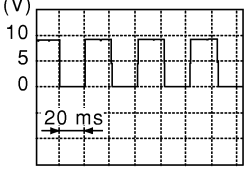
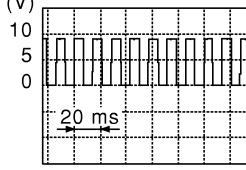
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
417	PU/R	Vehicle speed sensor	[Engine is running] • Lift up the vehicle • In 1st gear position • Vehicle speed is 10 km/h (6 MPH)	0 - Approximately 8V  SEF891Y
			[Engine is running] • Lift up the vehicle • In 2nd gear position • Vehicle speed is 30 km/h (19 MPH)	Approximately 6V  SEF892Y
418	G/OR	Park/Neutral position switch (where fitted)	[Ignition switch "ON"] • Gear position is "Neutral"	Approximately 0V
			[Ignition switch "ON"] • Except the above gear position	BATTERY VOLTAGE (11 - 14V)
422	B/Y	Start signal	[Ignition switch "ON"]	Approximately 0V
			[Ignition switch "START"]	BATTERY VOLTAGE (11 - 14V)
425	P/B	Accelerator position sen- sor ground	[Engine is running] • Warm-up condition • Idle speed	Approximately 0V
426	BR/R	Accelerator position switch (Idle) ground	[Ignition switch "ON"]	Approximately 0V
433	G/Y	Accelerator position sen- sor power supply	[Ignition switch "ON"]	Approximately 5V
434	W	Accelerator position sen- sor	[Ignition switch "ON"] • Accelerator pedal fully released	0.30 - 0.50V
			[Ignition switch "ON"] • Accelerator pedal fully depressed	3.0 - 4.3V
435	W/G	Accelerator position switch (Idle)	[Ignition switch "ON"] • Accelerator pedal fully released	Approximately 0V
			[Ignition switch "ON"] • Accelerator pedal depressed	BATTERY VOLTAGE (11 - 14V)

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TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

YD

ECM Terminals and Reference Value (Cont'd)

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
439	L/OR	Tachometer	[Engine is running] • Warm-up condition • Idle speed	Approximately 4.8V  SEF325Y
			[Engine is running] • Warm-up condition • Engine speed is 2,000 rpm	Approximately 4.6V  SEF326Y
505	OR/L	Malfunction indicator	[Ignition switch "ON"]	Approximately 1V
			[Engine is running] • Idle speed	BATTERY VOLTAGE (11 - 14V)
507	W/R	Ignition switch	[Ignition switch "OFF"]	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
508	OR	Glow lamp	[Ignition switch "ON"] • Glow lamp is "ON"	Approximately 1V
			[Ignition switch "ON"] • Glow lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)

Description

NJEC0637

Intermittent incidents (I/I) may occur. In many cases, the incident resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

COMMON I/I REPORT SITUATIONS

NJEC0637S01

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than "0".
III	The symptom described by the customer does not recur.
IV	DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for XXXX does not indicate the malfunctioning area.

Diagnostic Procedure

NJEC0638

1	INSPECTION START
Erase DTCs. Refer to "HOW TO ERASE DTC", EC-34.	
	▶ GO TO 2.

2	CHECK GROUND TERMINALS
Check ground terminals for corroding or loose connection. Refer to GI-23, "GROUND INSPECTION".	
OK or NG	
OK	▶ GO TO 3.
NG	▶ Repair or replace.

3	SEARCH FOR ELECTRICAL INCIDENT
Perform GI-23, "Incident Simulation Tests".	
OK or NG	
OK	▶ INSPECTION END
NG	▶ Repair or replace.

Main Power Supply and Ground Circuit

ECM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values and are measured between each terminal and ground. NJEC0639

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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
104 105 106	B B B	ECM ground	[Engine is running] ● Idle speed	Approximately 0V
107 108 109	R R R	Power supply for ECM	[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
325	G	ECM relay (Self-shutoff)	[Ignition switch "ON"] [Ignition switch "OFF"] ● For a few seconds after turning ignition switch "OFF"	Approximately 0.25V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
507	W/R	Ignition switch	[Ignition switch "OFF"]	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)

YD

NJEC0640

EC-MAIN-01



■ : DETECTABLE LINE FOR DTC

— : NON-DETECTABLE LINE FOR DTC

 : LHD MODELS

 : RHD MODELS

*1 3: 

7:

*2 7: 

17:

*3 Y:

G/Y :

ECM
F57 , F59 , F61



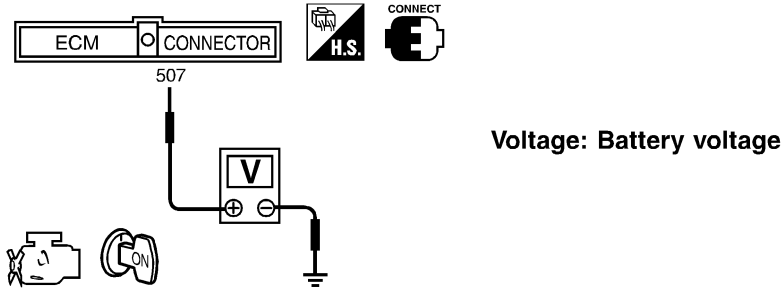
(M1) - FUSE BLOCK-
JUNCTION BOX (J/B)



DIAGNOSTIC PROCEDURE

NJEC0641

1	INSPECTION START
Start engine. Is engine running?	
Yes or No	
Yes	▶ GO TO 13.
No	▶ GO TO 2.

2	CHECK ECM POWER SUPPLY CIRCUIT-I
1. Turn ignition switch "ON". 2. Check voltage between ECM terminal 507 and ground with CONSULT-II or tester.	
 Voltage: Battery voltage SEF895Y	
OK or NG	
OK	▶ GO TO 4.
NG	▶ GO TO 3.

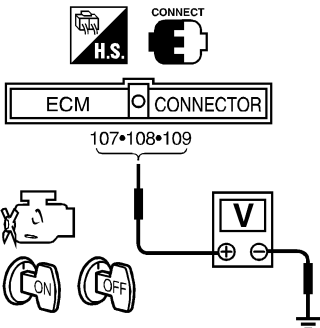
3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M74, F112 ● Fuse block (J/B) connector M1 ● 10A fuse ● Harness for open or short between ECM and fuse	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

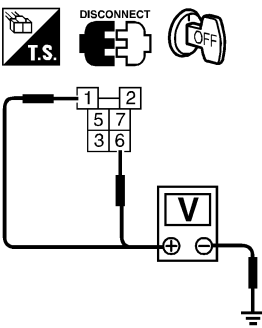
4	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminals 104, 105, 106 and engine ground. Refer to Wiring Diagram. Continuity should exist. 4. Also check harness for short to ground and short to power.	
OK or NG	
OK	▶ GO TO 5.
NG	▶ Repair open circuit or short to ground or short to power in harness or connectors.

TROUBLE DIAGNOSIS FOR POWER SUPPLY

YD

Main Power Supply and Ground Circuit (Cont'd)

5	CHECK ECM POWER SUPPLY CIRCUIT-II
1. Reconnect ECM harness connector. 2. Turn ignition switch "ON" and then "OFF". 3. Check voltage between ECM terminals 107, 108, 109 and ground with CONSULT-II or tester.	
 Voltage: After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V. SEF896Y	
OK or NG	
OK	Check electronic control fuel injection pump power supply circuit. Refer to "Diagnostic Procedure", EC-173.
NG (Battery voltage does not exist.)	GO TO 6.
NG (Battery voltage exists for more than a few seconds.)	GO TO 10.

6	CHECK ECM POWER SUPPLY CIRCUIT-III
1. Disconnect ECM relay. (For ECM relay location, refer to "Engine Control Component Parts Location".) 2. Check voltage between relay terminals 1, 6 and ground with CONSULT-II or tester.	
 Voltage: Battery Voltage SEF399Y	
OK or NG	
OK	GO TO 8.
NG	GO TO 7.

7	DETECT MALFUNCTIONING PART
Check the following. • 20A fuse • 10A fuse • Harness for open or short between ECM relay and battery	
	Repair open circuit or short to ground or short to power in harness or connectors.

TROUBLE DIAGNOSIS FOR POWER SUPPLY

YD

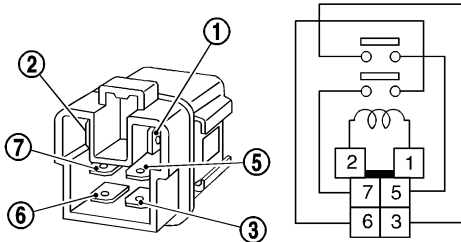
Main Power Supply and Ground Circuit (Cont'd)

8	CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 325 and ECM relay terminal 2. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E174, M159 (LHD models) ● Harness connectors E251, M182 (RHD models) ● Harness connectors M63, F102 ● Harness for open or short between ECM and ECM relay		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

10	CHECK ECM POWER SUPPLY CIRCUIT-IV	
1. Check harness continuity between ECM terminals 107, 108, 109 and ECM relay terminal 7. Refer to Wiring Diagram. Continuity should exist.		
2. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 12.
NG	▶	GO TO 11.

11	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between ECM and ECM relay		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

12	CHECK ECM RELAY							
1. Apply 12V direct current between ECM relay terminals 1 and 2. 2. Check continuity between ECM relay terminals 3 and 5, 7 and 6.								
 <table><tr><th>Condition</th><th>Continuity</th></tr><tr><td>12V direct current supply between terminals 1 and 2</td><td>Yes</td></tr><tr><td>OFF</td><td>No</td></tr></table>			Condition	Continuity	12V direct current supply between terminals 1 and 2	Yes	OFF	No
Condition	Continuity							
12V direct current supply between terminals 1 and 2	Yes							
OFF	No							
SEF296X								
OK or NG								
OK	▶	GO TO 16.						
NG	▶	Replace ECM relay.						

TROUBLE DIAGNOSIS FOR POWER SUPPLY

YD

Main Power Supply and Ground Circuit (Cont'd)

13	CHECK ECM POWER SUPPLY CIRCUIT-V	
	1. Turn ignition switch "OFF". 2. Disconnect ECM relay. (For ECM relay location, refer to "Engine Control Component Parts Location".) 3. Disconnect ECM harness connector. 4. Check harness continuity between ECM terminals 107, 108, 109 and ECM relay terminal 7. Refer to Wiring Diagram. Continuity should exist. 5. Also check harness for short to ground and short to power.	
	OK or NG	
OK	▶	GO TO 15.
NG	▶	GO TO 14.

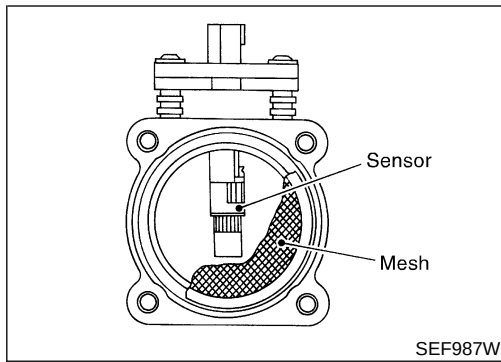
14	DETECT MALFUNCTIONING PART	
	Check the following. ● Harness connectors E75, F36 ● Harness for open or short between ECM and ECM relay	
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

15	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT	
	1. Check harness continuity between ECM terminals 104, 105, 106 and engine ground. Refer to Wiring Diagram. Continuity should exist. 2. Also check harness for short to ground and short to power.	
	OK or NG	
OK	▶	GO TO 16.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

16	CHECK INTERMITTENT INCIDENT	
	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.	
	▶	INSPECTION END

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Component Description



Component Description

NJEC0642

The mass air flow sensor (MAFS) is placed in the stream of intake air. It measures the intake air flow rate by measuring a part of the entire intake air flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0643

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	- Engine: After warming up - Air conditioner switch: "OFF" - Shift lever: Neutral position - No-load	Idle	1.5 - 2.0V

ECM Terminals and Reference Value

NJEC0644

Specification data are reference values, and are measured between each terminal 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.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
218	B	Sensor's ground	[Engine is running] - Warm-up condition - Idle speed	Approximately 0V
223	W	Mass air flow sensor power supply	[Ignition switch "ON"]	Approximately 5V
224	R	Mass air flow sensor	[Engine is running] - Warm-up condition - Idle speed	1.5 - 2.0V

On Board Diagnosis Logic

NJEC0645

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0100 0102	An excessively high or low voltage from the sensor is sent to ECM.	- Harness or connectors (The sensor circuit is open or shorted.) - Mass air flow sensor

3

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

DTC Confirmation Procedure

NJEC0646

WITH CONSULT-II

NJEC0646S01

- 1) Turn ignition switch "ON", and wait at least 6 seconds.
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and wait at least 3 seconds.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-81.

WITHOUT CONSULT-II

NJEC0646S02

- 1) Turn ignition switch "ON", and wait at least 6 seconds.
- 2) Start engine and wait at least 3 seconds.
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-81.

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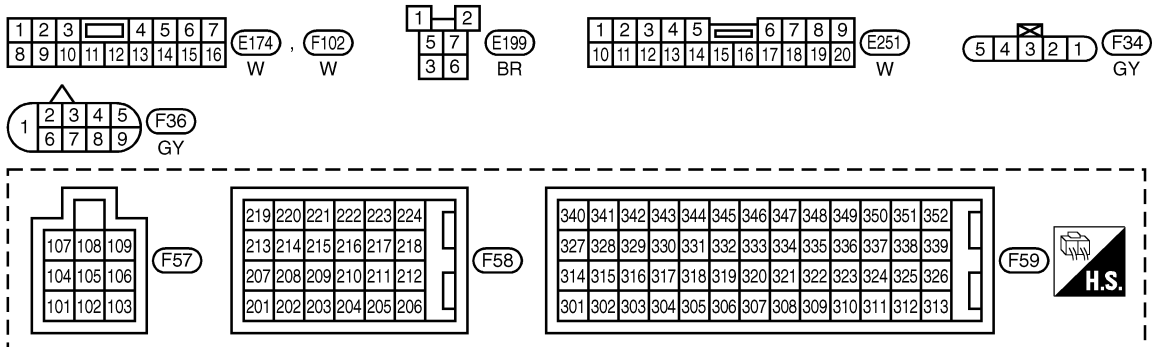
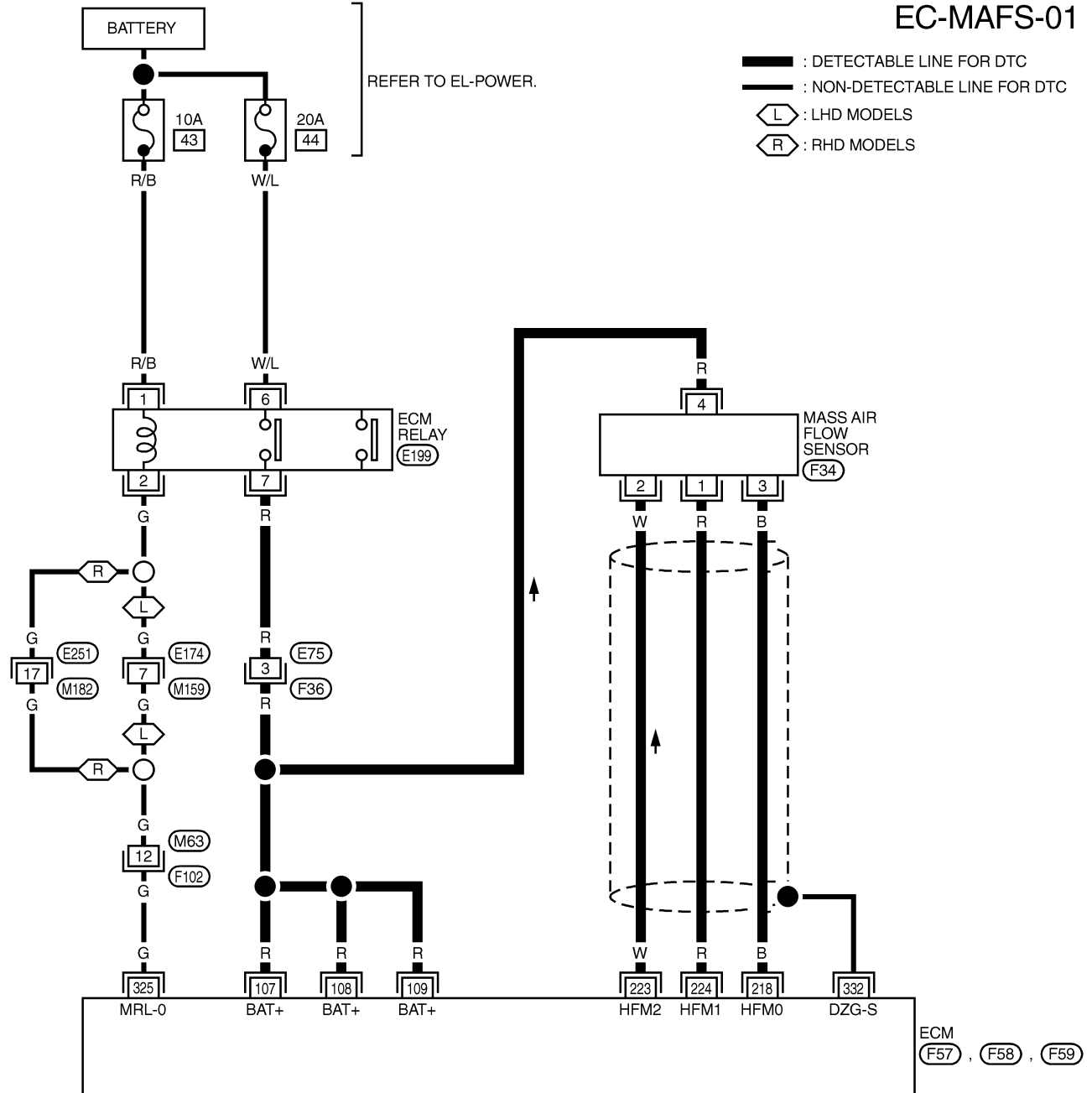
EL

IDX

Wiring Diagram

NJEC0647

EC-MAFS-01



Diagnostic Procedure

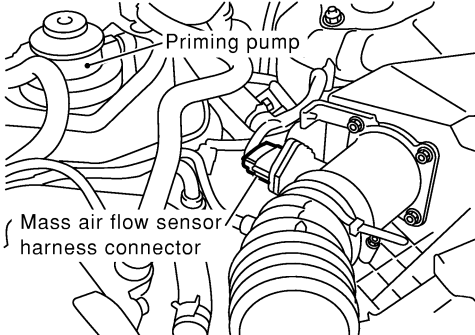
NJEC0648

1

CHECK MAFS POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".

2. Disconnect mass air flow sensor harness connector.

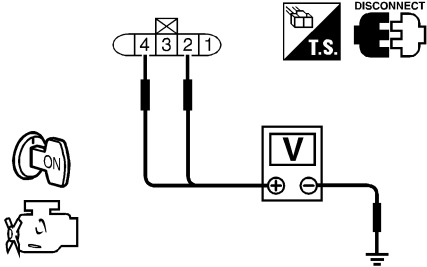


Priming pump

Mass air flow sensor harness connector

3. Turn ignition switch "ON".

4. Check voltage between mass air flow sensor terminals 2, 4 and ground with CONSULT-II or tester.



DISCONNECT

T.S.

Terminal	Voltage
2	Approximately 5
4	Battery voltage

SEF884Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

SEF297X

2

DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E75, F36
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

▶

Repair open circuit or short to ground or short to power in harness or connector.

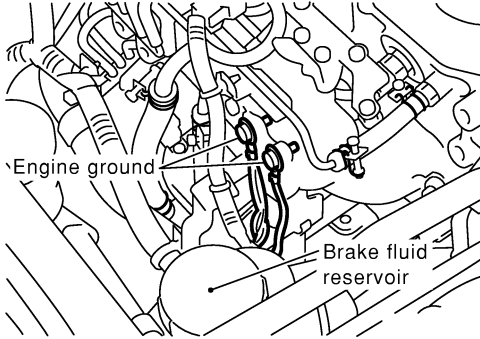
EC-81

3

CHECK MAFS GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".

2. Loosen and retighten engine ground screws.



The diagram shows a top-down view of an engine compartment. Two screws are labeled 'Engine ground' with lines pointing to them. A circular component is labeled 'Brake fluid reservoir' with a line pointing to it.

3. Check harness continuity between mass air flow sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

SEF380Y

SEF380Y

4	DETECT MALFUNCTIONING PART	
Check 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.

5	CHECK MAFS INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Disconnect ECM harness connector. 2. Check harness continuity between mass air flow sensor terminal 1 and ECM terminal 224. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6

CHECK MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.

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

3. Check voltage between ECM terminal 224 (Mass air flow sensor signal) and ground.

ECM

CONNECTOR

224

ON

CONNECT

H.S.

C

H

V

Condition	Voltage V
Ignition switch "ON" (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.5 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

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

4. If the voltage is out of specification, disconnect MAFS harness connector and connect it again. Then repeat above check.

SEF441Z

OK or NG

OK

▶

GO TO 7.

NG

▶

Replace mass air flow sensor.

7

CHECK INTERMITTENT INCIDENT

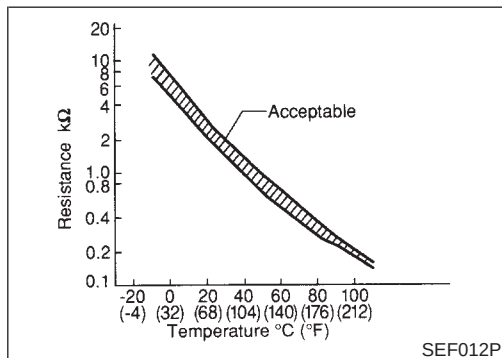
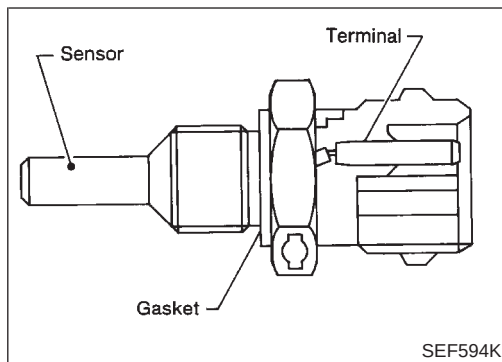
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.

▶

INSPECTION END

EC-83

Description



Description

NJEC0649

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

<Reference data>

Engine coolant temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.3	0.68 - 1.00
90 (194)	1.0	0.236 - 0.260

*: These data are reference values and measured between ECM terminal 347 (Engine coolant temperature sensor) and ground.

CAUTION:

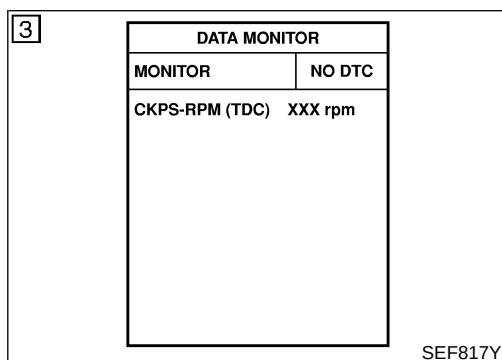
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

NJEC0650

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0115 0103	An excessively high or low voltage from the sensor is entered to ECM.	- Harness or connectors (The sensor circuit is open or shorted.) - Engine coolant temperature sensor



DTC Confirmation Procedure

NJEC0651

① WITH CONSULT-II

NJEC0651S01

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Wait at least 5 seconds.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-87.

② WITHOUT CONSULT-II

NJEC0651S02

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

- 3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
- 4) If DTC is detected, go to “Diagnostic Procedure”, EC-87.

GI

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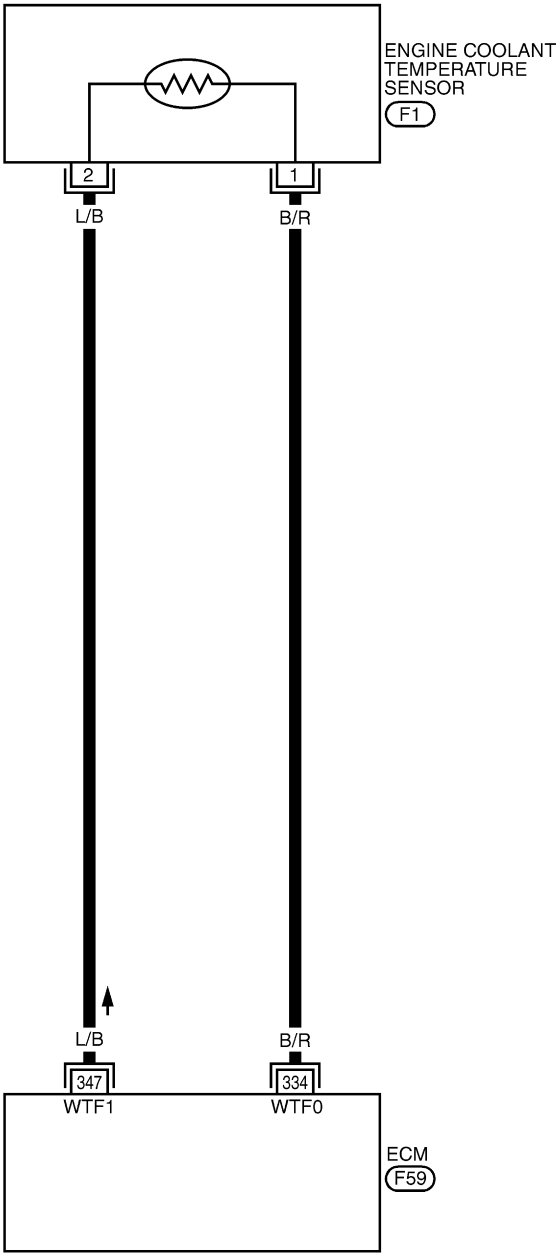
IDX

Wiring Diagram

NJEC0652

EC-ECTS-01

— : DETECTABLE LINE FOR DTC
— : NON-DETECTABLE LINE FOR DTC

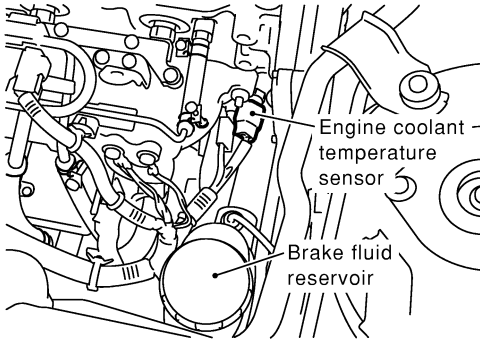
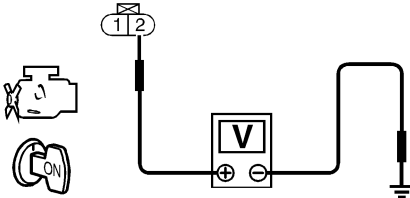


340	341	342	343	344	345	346	347	348	349	350	351	352	
327	328	329	330	331	332	333	334	335	336	337	338	339	
314	315	316	317	318	319	320	321	322	323	324	325	326	
301	302	303	304	305	306	307	308	309	310	311	312	313	



Diagnostic Procedure

NJEC0653

1	CHECK ECTS POWER SUPPLY CIRCUIT	
1. Turn ignition switch "OFF". 2. Disconnect engine coolant temperature sensor harness connector.  Engine coolant - temperature sensor Brake fluid reservoir 3. Turn ignition switch "ON". 4. Check voltage between ECTS terminal 2 and ground with CONSULT-II or tester.   Voltage: Approximately 5V OK or NG		
SEF382Y		
SEF401Y		
OK	▶	GO TO 2.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

2	CHECK ECTS GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch “OFF”. 2. Check harness continuity between ECTS terminal 1 and engine ground. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to ground and short to power. OK or NG		
OK	▶	GO TO 4.
NG	▶	GO TO 3.

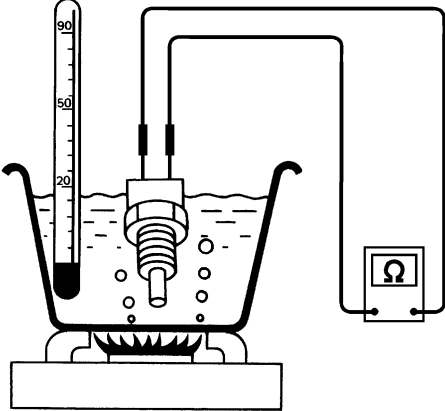
3	DETECT MALFUNCTIONING PART	
Check the following harness for open or short between ECM and engine coolant temperature sensor.		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

4

CHECK ENGINE COOLANT TEMPERATURE SENSOR

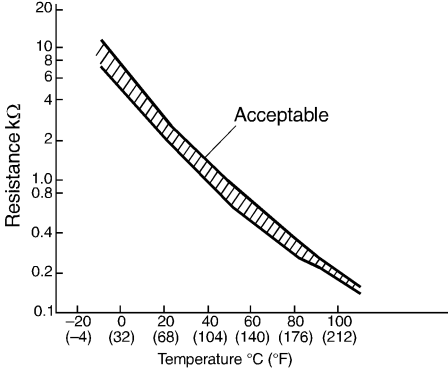
1. Remove engine coolant temperature sensor from the engine.

2. Check resistance between ECTS terminals 1 and 2 as shown in the figure.



<Reference data>

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



SEF304X

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace engine coolant temperature sensor.

5

CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.

▶

INSPECTION END

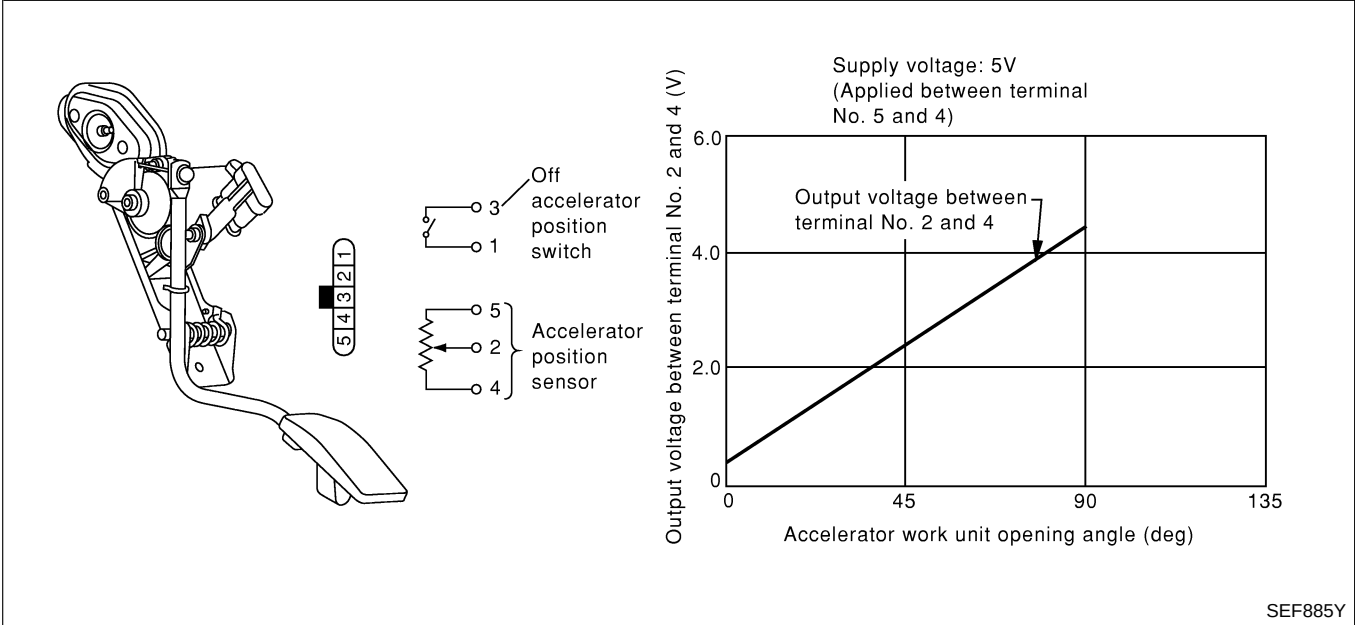
EC-88

Description

NJEC0679

The accelerator work unit is installed on the upper end of the accelerator pedal assembly. The accelerator position sensor and accelerator position switch are built into the accelerator work unit. The sensor detects the accelerator position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.

The accelerator position switch detects Off-accelerator switch signal and send these signals to the ECM. The ECM will then determine engine idle conditions. These signals are also used for diagnosing the accelerator position sensor.



CONSULT-II Reference Value in Data Monitor Mode

NJEC0680

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL POS SEN	● Ignition switch: ON (Engine stopped)	Accelerator pedal: released	0.30 - 0.50V
		Accelerator pedal: depressed	3.0 - 4.3V
OFF ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly open	OFF

ECM Terminals and Reference Value

NJEC0681

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
425	P/B	Accelerator position sensor ground	[Engine is running] ● Warm-up condition ● Idle speed	Approximately 0V
426	BR/R	Accelerator position switch (Idle) ground	[Ignition switch "ON"]	Approximately 0V
433	G/Y	Accelerator position sensor power supply	[Ignition switch "ON"]	Approximately 5V

DTC P0120 ACCEL POS SENSOR

YD

ECM Terminals and Reference Value (Cont'd)

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
434	W	Accelerator position sensor	[Ignition switch "ON"] ● Accelerator pedal fully released	0.30 - 0.50V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.0 - 4.3V
435	W/G	Accelerator position switch (Idle)	[Ignition switch "ON"] ● Accelerator pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Accelerator pedal depressed	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NJEC0682

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	The relation between sensor and switch signals is not in the normal range during the specified accelerator positions.	- Harness or connectors (The sensor circuit is open or shorted.) - Accelerator position sensor - Accelerator position switch

3	DATA MONITOR	
	MONITOR	NO DTC
	CKPS-RPM (TDC) XXX rpm	

SEF817Y

DTC Confirmation Procedure

NJEC0683

WITH CONSULT-II

NJEC0683S01

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Depress and release fully accelerator pedal slowly.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-92.

WITHOUT CONSULT-II

NJEC0683S02

- 1) Turn ignition switch "ON".
- 2) Depress and release fully accelerator pedal slowly.
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-92.

Wiring Diagram

NJEC0684

EC-APS-01

GI

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BR

ST

RS

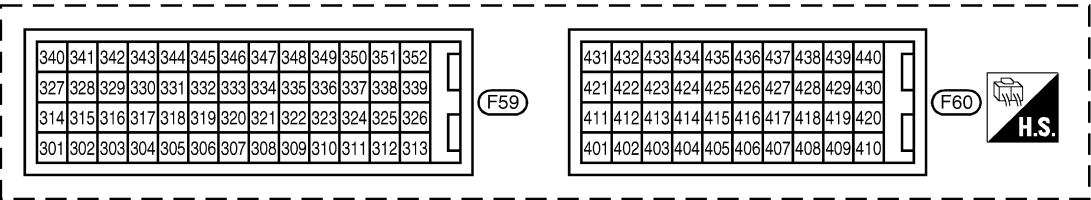
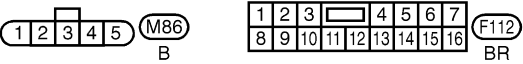
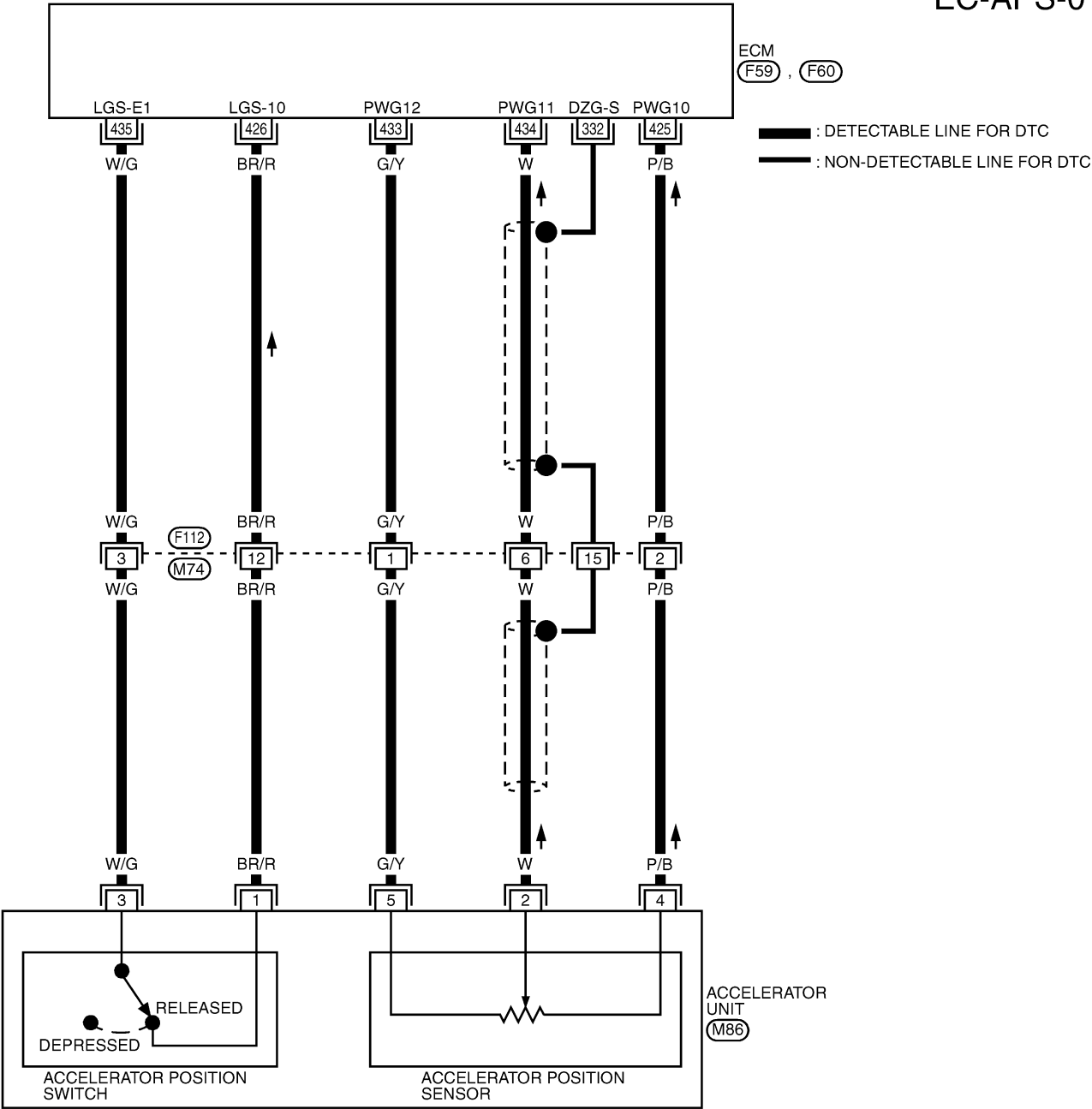
BT

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IDX



Diagnostic Procedure

NJEC0685

1

CHECK ACCELERATOR POSITION SENSOR FUNCTION

With CONSULT-II

1. Turn ignition switch "ON".

2. Select "ACCEL POS SEN" in "DATA MONITOR" mode with CONSULT-II.

3. Check "ACCEL POS SEN" signal under the following conditions.

DATA MONITOR

MONITOR

NO DTC

ACCEL POS SEN

XXX V

Conditions	ACCEL POS SEN
Accelerator pedal fully released	0.30 - 0.50V
Accelerator pedal fully depressed	3.0 - 4.3V

SEF436Z

Without CONSULT-II

1. Turn ignition switch "ON".

2. Check voltage between ECM terminal 434 and ground under the following conditions.

CONNECT

H.S.

ECM

CONNECTOR

434

V

Conditions	Voltage
Accelerator pedal fully released	0.30 - 0.50V
Accelerator pedal fully depressed	3.0 - 4.3V

SEF437Z

OK or NG

OK

▶

GO TO 2.

NG

▶

GO TO 3.

SEF436Z

SEF437Z

2

CHECK ACCELERATOR POSITION SWITCH FUNCTION

With CONSULT-II

1. Select "OFF ACCEL SW" in "DATA MONITOR" mode with CONSULT-II.

2. Check "OFF ACCEL SW" signal under the following conditions.

DATA MONITOR

MONITOR

NO DTC

OFF ACCEL SW

ON

Conditions	OFF ACCEL SW
Accelerator pedal fully released	ON
Accelerator pedal depressed	OFF

SEF910Y

Without CONSULT-II

Check voltage between ECM terminal 435 and ground under the following conditions.

CONNECT

H.S.

ON

ECM

CONNECTOR

435

V

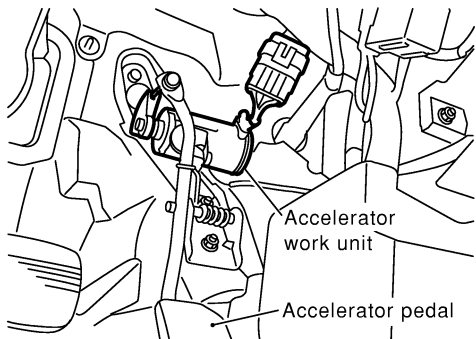
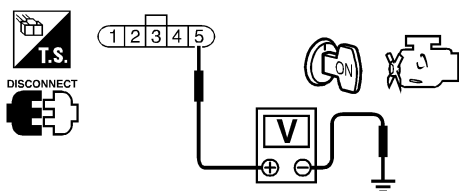
Conditions	Voltage (ECM terminal 435)
Accelerator pedal fully released	Approx. 0V
Accelerator pedal depressed	Battery voltage

SEF911Y

OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 11.

GI
MA
EM
LC
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IDX

3	CHECK ACCELERATOR POSITION SENSOR POWER SUPPLY CIRCUIT	
1. Turn ignition switch "OFF". 2. Disconnect accelerator work unit harness connector.  3. Turn ignition switch "ON". 4. Check voltage between accelerator work unit terminal 5 and ground with CONSULT-II or tester.  SEF886Y SEF897Y OK or NG		
OK	▶	GO TO 5.
NG	▶	GO TO 4.

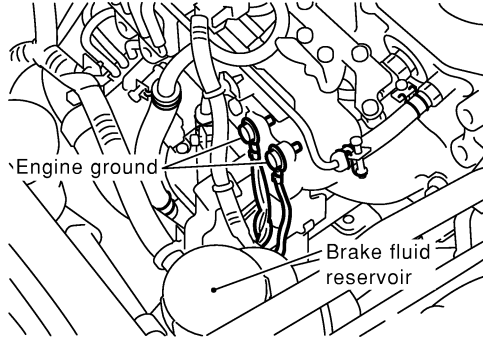
4	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors F112, M74 ● Harness for open or short between ECM and accelerator work unit		
	▶	Repair harness or connectors.

5

CHECK ACCELERATOR POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".

2. Loosen and retighten engine ground screw.



The diagram shows a top-down view of an engine compartment. A line points to a ground screw on the engine block labeled 'Engine ground'. Another line points to a circular component labeled 'Brake fluid reservoir'.

3. Check harness continuity between accelerator work unit terminal 4 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

SEF380Y

6	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors F112, M74 ● Harness for open or short between ECM and accelerator work unit		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK ACCELERATOR POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 434 and accelerator work unit terminal 2. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors F112, M74 ● Harness for open or short between ECM and accelerator work unit		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

9 CHECK ACCELERATOR POSITION SENSOR**With CONSULT-II**

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch "ON".
3. Select "DATA MONITOR" mode with CONSULT-II.
4. Check the indication of "ACCEL POS SEN" under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
ACCEL POS SEN	XXX V

Conditions	ACCEL POS SEN
Accelerator pedal fully released	0.30 - 0.50V
Accelerator pedal fully depressed	3.0 - 4.3V

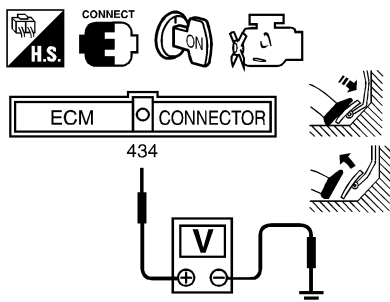
SEF436Z

OK or NG

OK	▶	GO TO 16.
NG	▶	Replace accelerator pedal assembly.

10 CHECK ACCELERATOR POSITION SENSOR**Without CONSULT-II**

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminal 434 and ground under the following conditions.

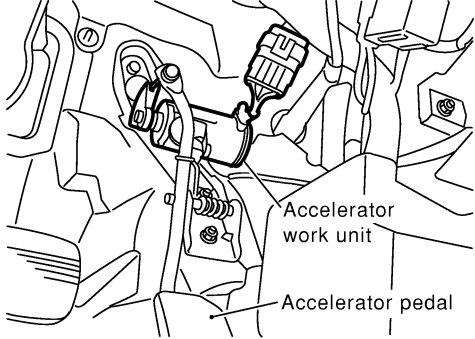
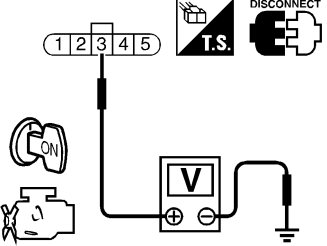


Conditions	Voltage
Accelerator pedal fully released	0.30 - 0.50V
Accelerator pedal fully depressed	3.0 - 4.3V

SEF437Z

OK or NG

OK	▶	GO TO 16.
NG	▶	Replace accelerator pedal assembly.

11	CHECK ACCELERATOR POSITION SWITCH POWER SUPPLY CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect accelerator work unit harness connector.	
 Accelerator work unit Accelerator pedal	
3. Turn ignition switch "ON". 4. Check voltage between accelerator work unit terminal 3 and ground with CONSULT-II or tester.	
 Voltage: Battery voltage	
OK or NG	
OK	▶ GO TO 13.
NG	▶ GO TO 12.

12	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M74, F112 ● Harness for open or short between accelerator work unit and ECM	
	▶ Repair harness or connectors.

13	CHECK ACCELERATOR POSITION SWITCH GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between accelerator work unit terminal 1 and ECM terminal 426. Refer to Wiring Diagram. Continuity should exist. 4. Also check harness for short to ground and short to power.	
OK or NG	
OK	▶ GO TO 15.
NG	▶ GO TO 14.

14	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M74, F112 ● Harness for open or short between ECM and accelerator work unit	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

15

CHECK ACCELERATOR POSITION SWITCH

Check continuity between accelerator position switch terminals 1 and 3 under the following conditions.

Between terminals 1 and 3	
Conditions	Continuity
Accelerator pedal fully released	Should exist.
Accelerator pedal depressed	Should not exist.

SEF913Y

OK or NG

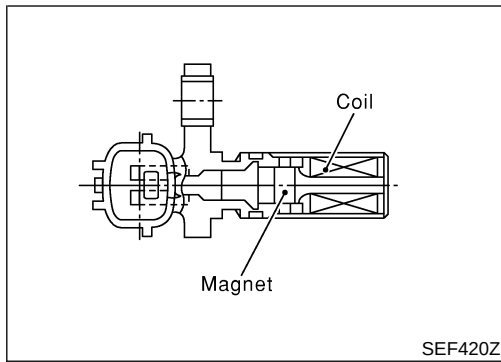
OK	▶	GO TO 16.
NG	▶	Replace accelerator pedal assembly.

16

CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.

▶	INSPECTION END
---	----------------



Description

The crankshaft position sensor (TDC) monitors engine speed by means of signals from the sensing plate (with three protrusions) installed to the crankshaft pulley. The datum signal output is detected at ATDC 10° and sent to the ECM. The sensor signal is used for fuel injection control and fuel injection timing control.

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS-RPM (TDC)	Run engine and compare the CONSULT-II value with tachometer indication.	Almost the same speed as the tachometer indication.

ECM Terminals and Reference Value

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

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.

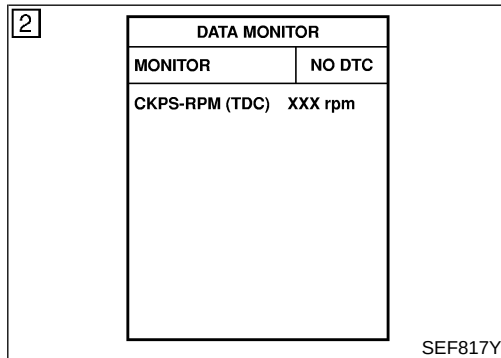
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage and Pulse Signal)
331	OR	Crankshaft position sensor (TDC) ground	[Engine is running] - Warm-up condition - Idle speed	Approximately 0V
344	W	Crankshaft position sensor (TDC)	[Engine is running] - Warm-up condition - Idle speed	Approximately 0V
			[Engine is running] - Warm-up condition - Engine speed is 2,000 rpm	Approximately 0V

On Board Diagnosis Logic

=NJEC0689

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0335 0407	An improper signal from the sensor is sent to ECM during engine running and cranking.	- Harness or connectors (The sensor circuit is open.) - Crankshaft position sensor (TDC)



DTC Confirmation Procedure

NJEC0690

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

WITH CONSULT-II

NJEC0690S01

- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
- 2) Crank engine for at least 1 second.
- 3) Start engine and run it for at least 2 seconds at idle speed.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-102.

WITHOUT CONSULT-II

NJEC0690S02

- 1) Crank engine for at least 1 second.
- 2) Start engine and run it for at least 2 seconds at idle speed.
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-102.

Wiring Diagram

NJEC0691

EC-CKPS-01

GI

MA

EM

LC

EC

FE

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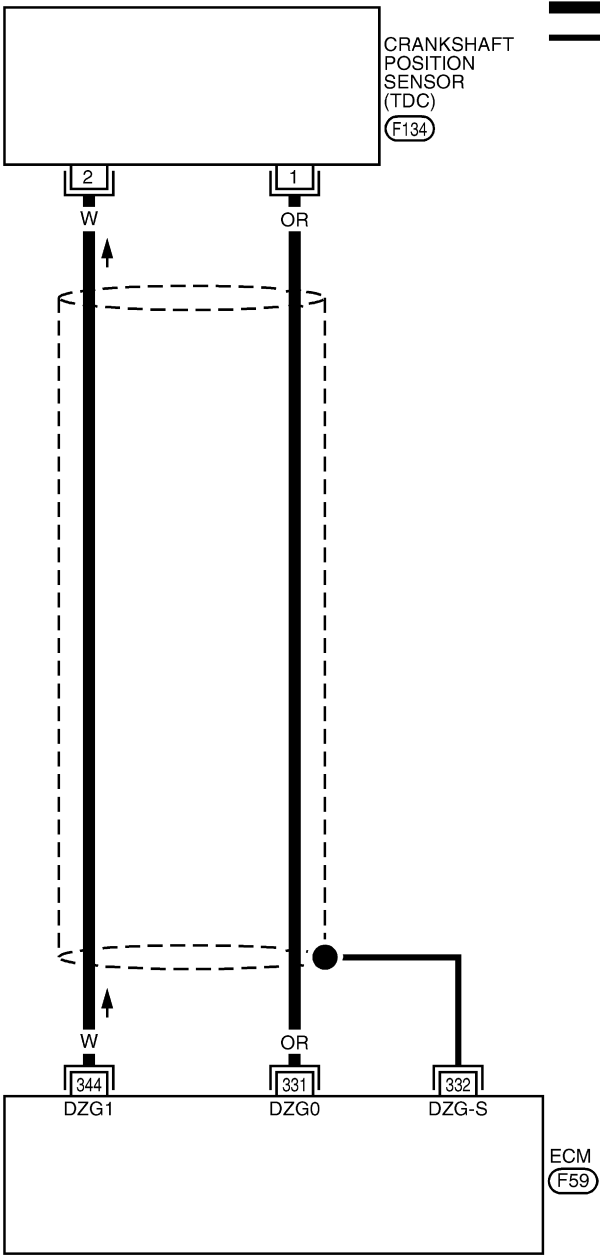
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IDX

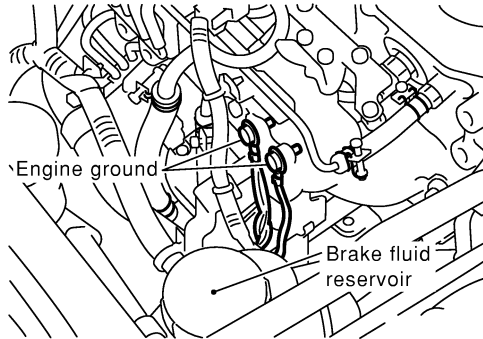
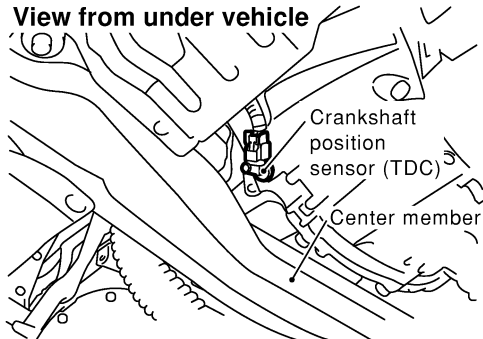


340	341	342	343	344	345	346	347	348	349	350	351	352
327	328	329	330	331	332	333	334	335	336	337	338	339
314	315	316	317	318	319	320	321	322	323	324	325	326
301	302	303	304	305	306	307	308	309	310	311	312	313



Diagnostic Procedure

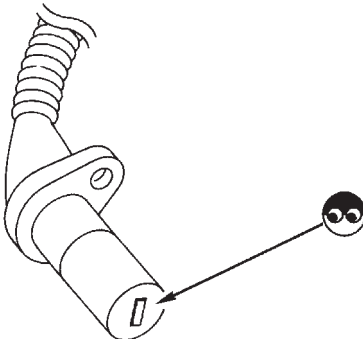
NJEC0692

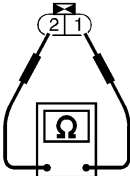
1	CHECK CRANKSHAFT POSITION SENSOR (TDC) GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws.		
 SEF380Y		
3. Disconnect crankshaft position sensor (TDC) harness connector and ECM harness connector.		
View from under vehicle  SEF387Y		
4. Check harness continuity between ECM terminal 331 and crankshaft position sensor (TDC) terminal 1. Refer to Wiring Diagram. Continuity should exist.		
5. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 2.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

SEF380Y

SEF387Y

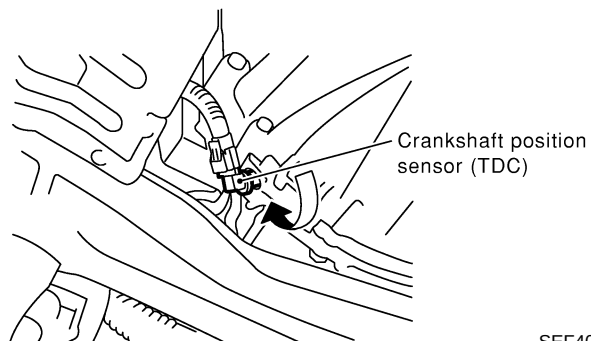
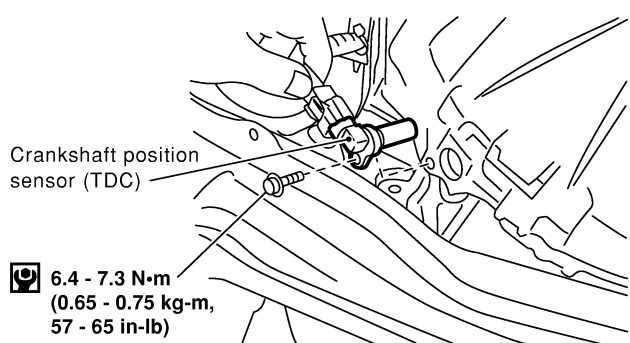
2	CHECK CRANKSHAFT POSITION SENSOR (TDC) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Check harness continuity between crankshaft position sensor (TDC) terminal 2 and ECM terminal 344. Refer to Wiring Diagram. Continuity should exist.		
2. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 3.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK CRANKSHAFT POSITION SENSOR (TDC)-I	
1. Loosen the fixing bolt and remove the crankshaft position sensor (TDC). 2. Visually check the sensor for chipping.  SEF620S OK or NG		
OK	▶	GO TO 4.
NG	▶	Replace crankshaft position sensor (TDC).

4	CHECK CRANKSHAFT POSITION SENSOR (TDC)-II	
1. Disconnect crankshaft position sensor (TDC) harness connector. 2. Check resistance between crankshaft position sensor (TDC) terminals 1 and 2.		
  Resistance: 495 - 605Ω [at 20°C (68°F)]		
SEF408Y		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace crankshaft position sensor (TDC).

5 INSTALL CRANKSHAFT POSITION SENSOR (TDC)

1. Install crankshaft position sensor (TDC) and temporarily tighten the fixing bolt.
2. Turn crankshaft position sensor (TDC) clockwise until it stops.
3. Tighten the fixing bolt.



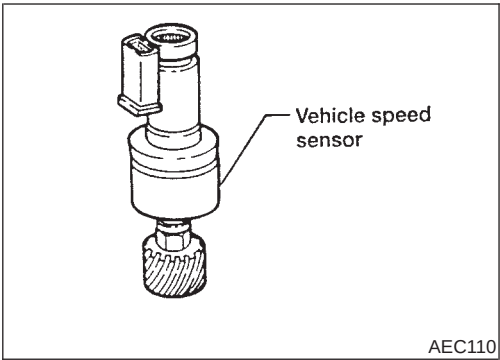
SEF409Y

GO TO 6.

6 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.

INSPECTION END



Description

NJEC0654

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

GI

MA

EM

LC

ECM Terminals and Reference Value

NJEC0655

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

EC

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.

FE

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
417	PU/R	Vehicle speed sensor	[Engine is running] ● Lift up the vehicle. ● In 1st gear position ● Vehicle speed is 10 km/h (6 MPH)	Approximately 8V SEF891Y
			[Engine is running] ● Lift up the vehicle. ● In 2nd gear position ● Vehicle speed is 30 km/h (19 MPH)	Approximately 6V SEF892Y

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On Board Diagnosis Logic

NJEC0656

This self-diagnosis has the one trip detection logic.

BT

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0500 0104	● The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connector (The vehicle speed sensor circuit is open or shorted.) ● Vehicle speed sensor

HA

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IDX

Overall Function Check

3	DATA MONITOR	
	MONITOR	NO DTC
	CKPS-RPM (TDC)	XXX rpm
	VHCL SPEED SE	XXX km/h
	P/N POSI SW	OFF

SEF864Y

Overall Function Check

NJEC0657

Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a DTC might not be confirmed.



WITH CONSULT-II

NJEC0657S01

- 1) Lift up the vehicle.
- 2) Start engine.
- 3) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT-II.

The vehicle speed on CONSULT-II should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

- 4) If NG, go to "Diagnostic Procedure", EC-108.



WITHOUT CONSULT-II

NJEC0657S02

- 1) Lift up the vehicle.
- 2) Start engine.
- 3) Read the voltage signal for the vehicle speed sensor with an oscilloscope. Refer to "ECM Terminals and Reference Value", EC-105.
- 4) Verify that the oscilloscope screen shows the signal wave as shown at "ECM Terminals and Reference Value", EC-105.
- 5) If NG, go to "Diagnostic Procedure", EC-108.

Wiring Diagram

N.JEC-0658

EC-VSS-01

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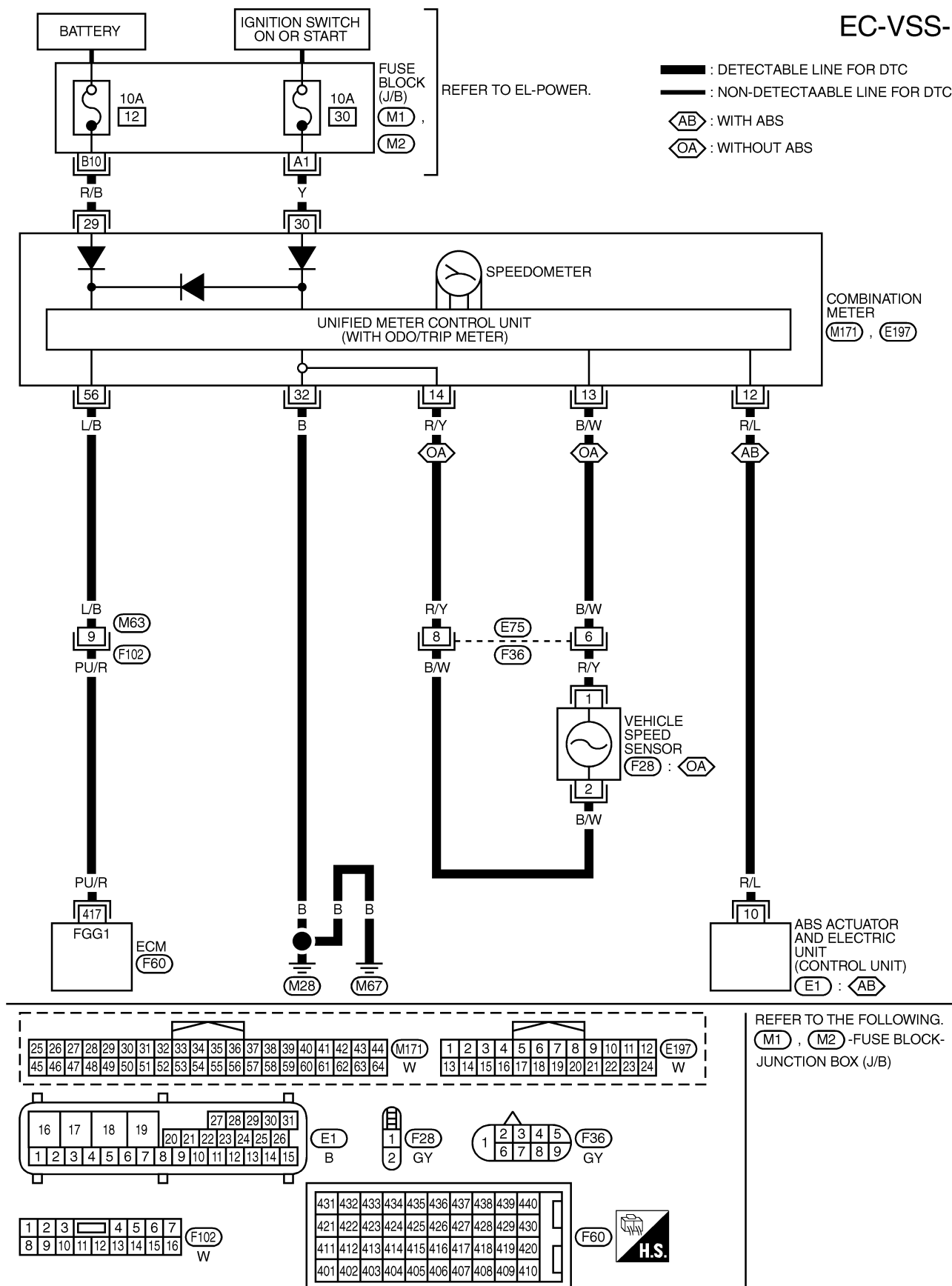
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Diagnostic Procedure

NJEC0659

1	CHECK VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector and combination meter harness connector. 3. Check harness continuity between ECM terminal 417 and combination meter terminal 56. Refer to Wiring Diagram. Continuity should exist. 4. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 3.
NG	▶	GO TO 2.

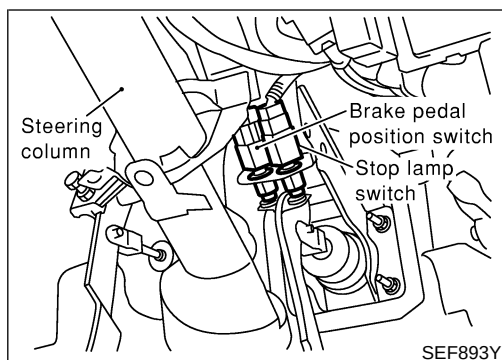
2	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors M63, F102 ● Harness for open or short between ECM and combination meter		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK SPEEDOMETER FUNCTION	
Make sure that speedometer functions properly.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	GO TO 4. (models without ABS) GO TO 5. (models with ABS)

4	CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT	
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between vehicle speed sensor and engine ground ● Harness for open or short between combination meter and vehicle speed sensor		
OK or NG		
OK	▶	Check vehicle speed sensor and combination meter. Refer to EL section.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT	
Check the following. ● Harness for open or short between ABS actuator and electric unit and combination meter		
OK or NG		
OK	▶	Check ABS actuator and electric unit. Refer to BR section.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.		
	▶	INSPECTION END



Description

The stop lamp switch is installed to brake pedal bracket. The switch senses brake pedal position and sends an ON-OFF signal to the ECM. The ECM uses the signal to control the fuel injection control system.

NJEC0738

ECM Terminals and Reference Value

NJEC0739

Specification data are reference values and are measured between each terminal 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.

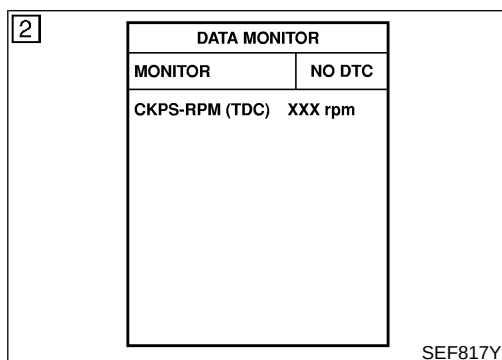
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
405	R/G	Stop lamp switch	[Ignition switch "ON"] ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
416	Y/B	Brake pedal position switch	[Ignition switch "ON"] ● Brake pedal fully released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Brake pedal depressed	Approximately 0V

On Board Diagnosis Logic

NJEC0740

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1571 0807	● An irregular voltage signal from the switch is sent to ECM.	● Harness or connectors (The stop lamp switch circuit is open or shorted.) ● Stop lamp switch



DTC Confirmation Procedure

NJEC0741

WITH CONSULT-II

NJEC0741S01

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Depress and release brake pedal more than 10 times.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-112.

WITHOUT CONSULT-II

NJEC0741S02

- 1) Turn ignition switch "ON".
- 2) Depress and release brake pedal more than 10 times.

- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-112.

Wiring Diagram

NJEC0742

EC-BRK/SW-01

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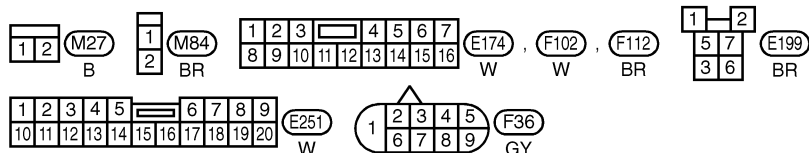
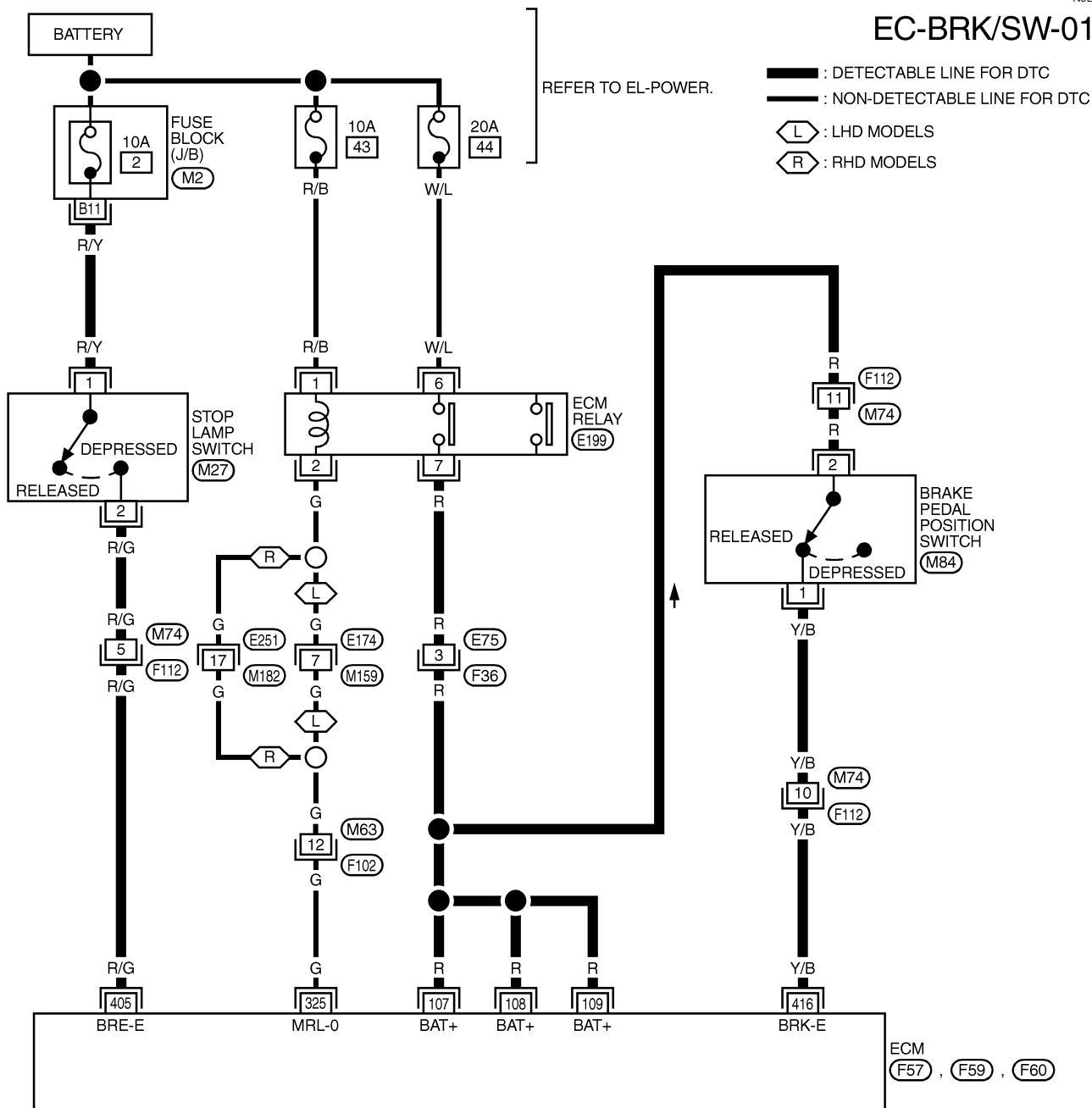
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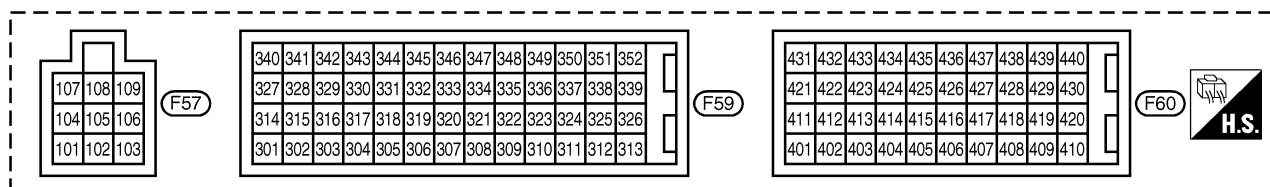
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REFER TO THE FOLLOWING.

M2 - FUSE BLOCK-
JUNCTION BOX (J/B)

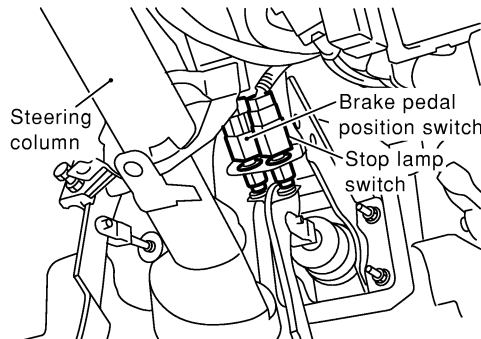
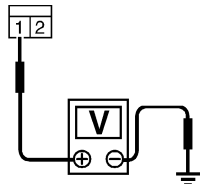


YEC324A

Diagnostic Procedure

NJEC0743

1	CHECK STOP LAMP SWITCH CIRCUIT								
1. Turn ignition switch "OFF". 2. Check the stop lamp when depressing and releasing the stop lamp switch.									
<table><tr><td>Stop lamp switch</td><td>Stop lamp</td></tr><tr><td>Fully released</td><td>Not illuminated</td></tr><tr><td>Depressed</td><td>Illuminated</td></tr></table>				Stop lamp switch	Stop lamp	Fully released	Not illuminated	Depressed	Illuminated
Stop lamp switch	Stop lamp								
Fully released	Not illuminated								
Depressed	Illuminated								
MTBL0443									
OK or NG									
OK	▶	GO TO 4.							
NG	▶	GO TO 2.							

2	CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT	
1. Disconnect stop lamp switch harness connector.		
		
2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.		
		
		
Voltage: Battery voltage		
SEF893Y		
OK or NG		
OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART	
Check the following.		
● Fuse block (J/B) connector M2 ● 10A fuse ● Harness for open and short between stop lamp switch and fuse		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

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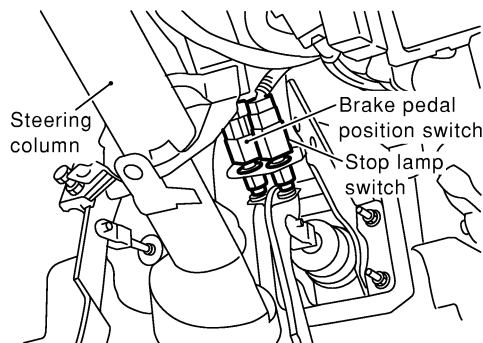
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EL

IDX

4 CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.



SEF893Y

4. Check harness continuity between ECM terminal 405 and stop lamp switch terminal 2. Refer to Wiring Diagram.
Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5 DETECT MALFUNCTIONING PART

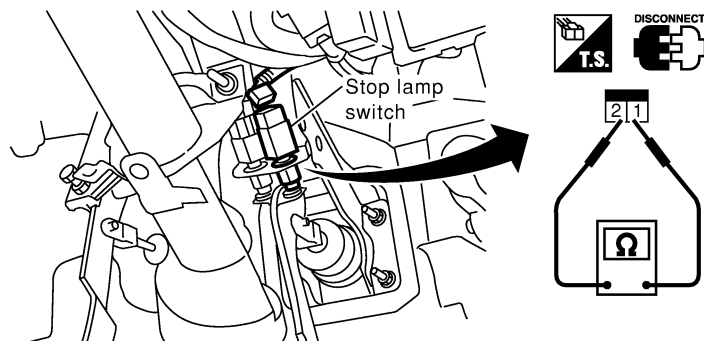
Check the following.

- Harness connectors M74, F112
- 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.

6 CHECK STOP LAMP SWITCH

Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

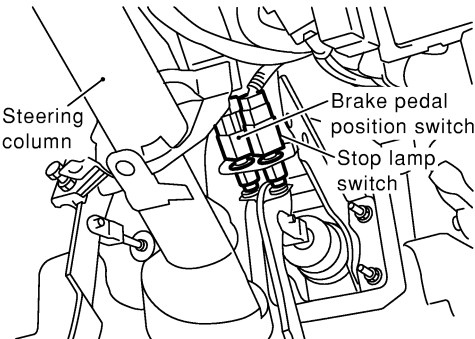
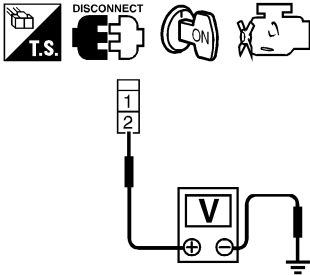


Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

SEF904Y

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace stop lamp switch.

7	CHECK BRAKE PEDAL POSITION SWITCH POWER SUPPLY CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect brake pedal position switch harness connector.	
	
3. Turn ignition switch "ON". 4. Check voltage between brake pedal position switch terminal 2 and ground with CONSULT-II or tester.	
 Voltage: Battery voltage	
OK or NG	
OK	▶ GO TO 9.
NG	▶ GO TO 8.

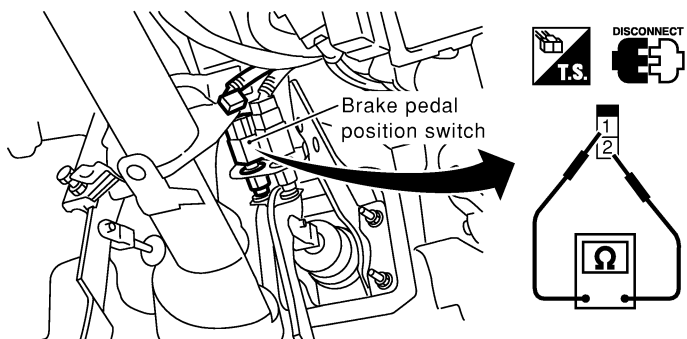
SEF893Y

SEF905Y

8	DETECT MALFUNCTIONING PART
Check the following. • Harness connectors M74, F112 • Harness connector E75, F36 • Harness for open and short between brake pedal position switch and ECM relay • Harness for open and short between brake pedal position switch and ECM	
▶ Repair open circuit or short to ground or short to power in harness or connectors.	

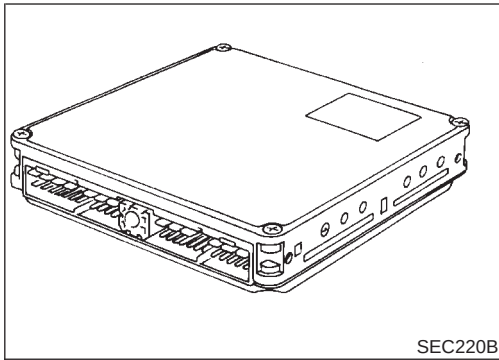
9	CHECK BRAKE PEDAL POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 416 and brake pedal position switch terminal 1. Refer to Wiring Diagram. Continuity should exist. 4. Also check harness for short to ground and short to power.	
OK or NG	
OK	▶ GO TO 11.
NG	▶ GO TO 10.

10	DETECT MALFUNCTIONING PART
Check the following.	
● Harness connectors M74, F112 ● Harness for open or short between ECM and brake pedal position switch	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

11	CHECK BRAKE PEDAL POSITION SWITCH						
Check continuity between brake pedal position switch terminals 1 and 2 under the following conditions.							
							
<table border="1"> <thead> <tr> <th>Conditions</th><th>Continuity</th></tr> </thead> <tbody> <tr> <td>Brake pedal fully released</td><td>Should exist.</td></tr> <tr> <td>Brake pedal depressed</td><td>Should not exist.</td></tr> </tbody> </table>		Conditions	Continuity	Brake pedal fully released	Should exist.	Brake pedal depressed	Should not exist.
Conditions	Continuity						
Brake pedal fully released	Should exist.						
Brake pedal depressed	Should not exist.						
SEF906Y							
OK or NG							
OK	▶ GO TO 12.						
NG	▶ Replace brake pedal position switch.						

12	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.	
▶	INSPECTION END

Description



Description

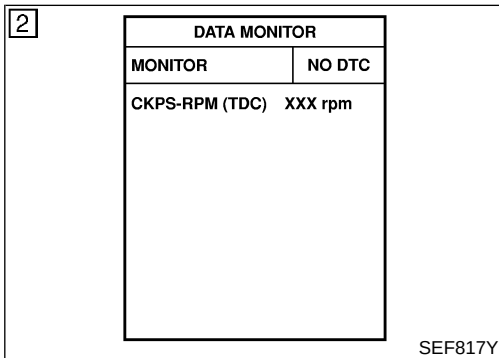
The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine. NJEC0734

On Board Diagnosis Logic

NJEC0735

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1107 0802	An excessively high or low voltage from the absolute pressure sensor (built-into ECM) is sent to ECM.	ECM (ECCS-D control module)



DTC Confirmation Procedure

NJEC0736

WITH CONSULT-II

NJEC0736S01

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and wait at least 2 seconds.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-117.

WITHOUT CONSULT-II

NJEC0736S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Start engine and wait at least 2 seconds.
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-117.

Diagnostic Procedure

NJEC0737

1	INSPECTION START	
 With CONSULT-II 1. Turn ignition switch “ON”. 2. Select “SELF DIAG RESULTS” mode with CONSULT-II. 3. Touch “ERASE”. 4. Perform “DTC Confirmation Procedure”, EC-116, again. 5. Is the DTC P1107 displayed again?		
 Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-116, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0802 displayed again?		
Yes or No		
Yes	▶	Replace ECM.
No	▶	INSPECTION END

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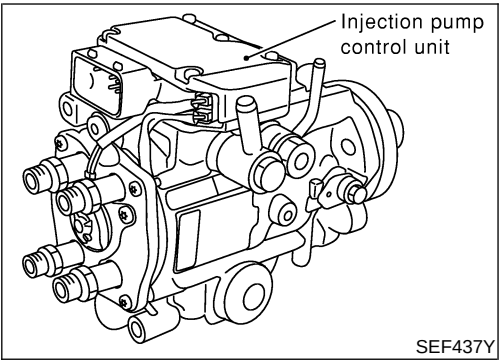
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Description



Description

NJEC0672

SYSTEM DESCRIPTION

NJEC0672S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NJEC0672S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NJEC0672S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NJEC0672S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NJEC0672S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The camshaft position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the camshaft position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0673

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°C
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

DTC P1180 P9-FUEL TEMP SEN

YD

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm ² , 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm ² , 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm ² , 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm ² , 11.36 psi)

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ECM Terminals and Reference Value

NJEC0674

Specification data are reference values and are measured between each terminal 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.

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TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NJEC0675

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when	Check Items (Possible cause)
P1180 0402	An improper voltage signal from fuel temperature sensor (Built-into electronic control fuel injection pump) is sent to injection pump control unit.	- Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) - Electronic control fuel injection pump

RS
BT
HA

2	DATA MONITOR	
	MONITOR	NO DTC
	CKPS-RPM (TDC) XXX rpm	
	SEF817Y	

DTC Confirmation Procedure

NJEC0676

WITH CONSULT-II

NJEC0676S01

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-122.

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WITHOUT CONSULT-II

NJEC0676S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.

- 2) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-122.

Wiring Diagram

NJEC0677

EC-INJPMP-01

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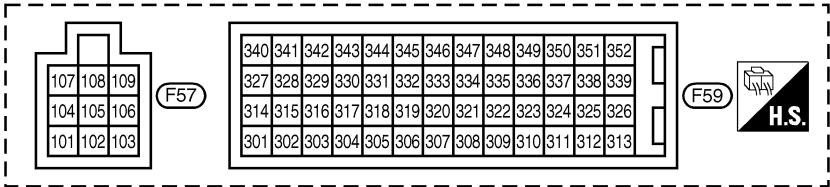
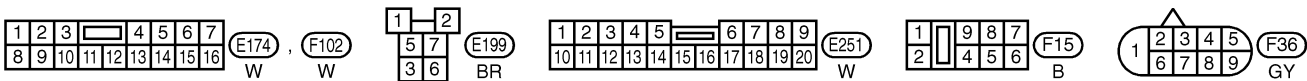
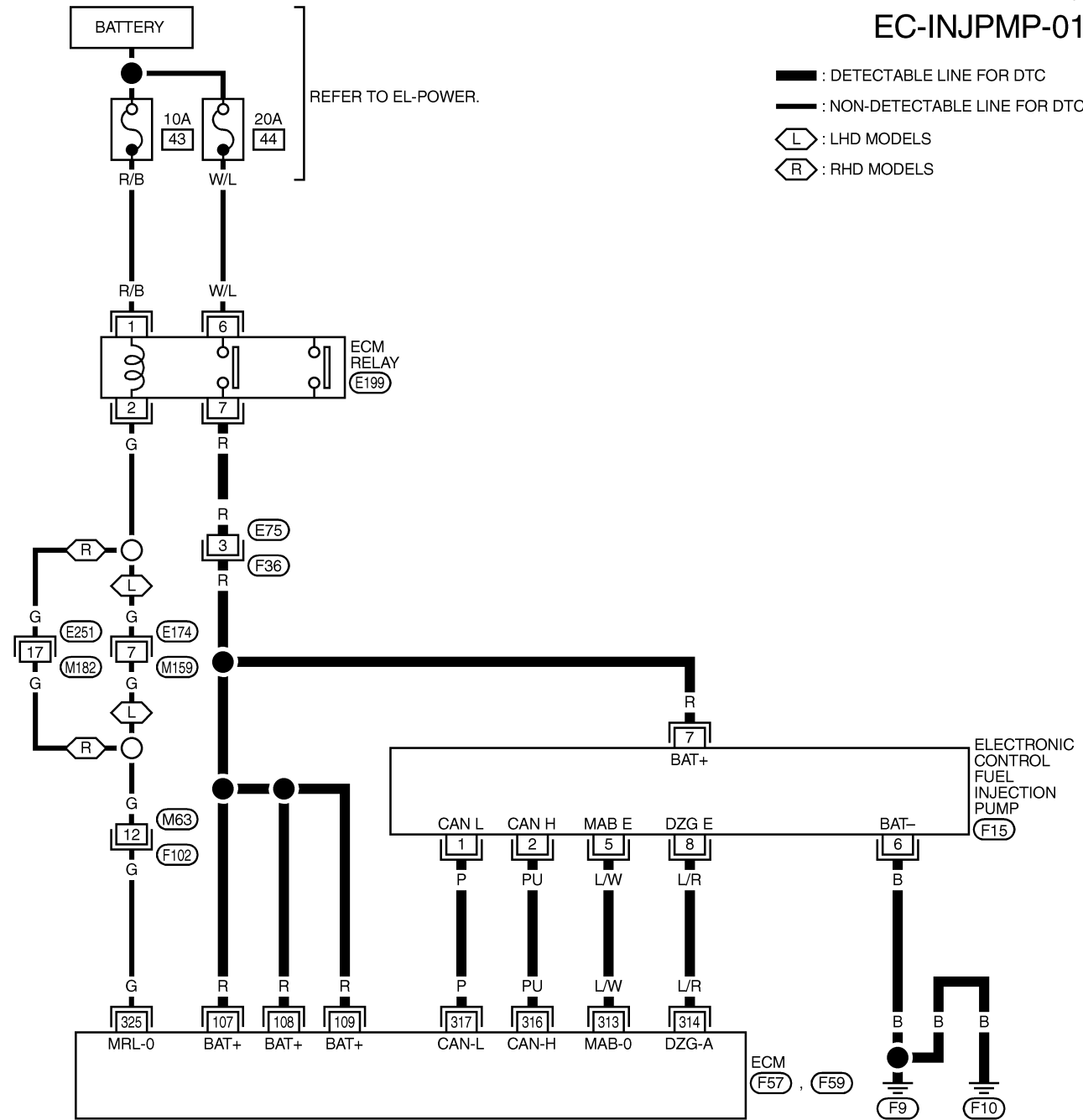
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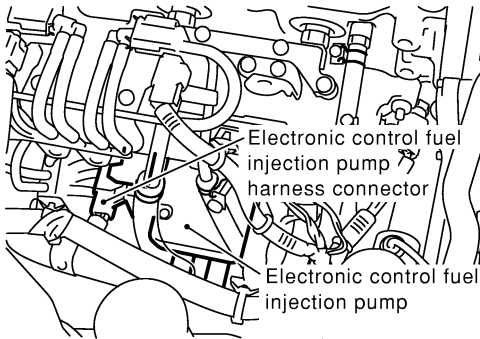
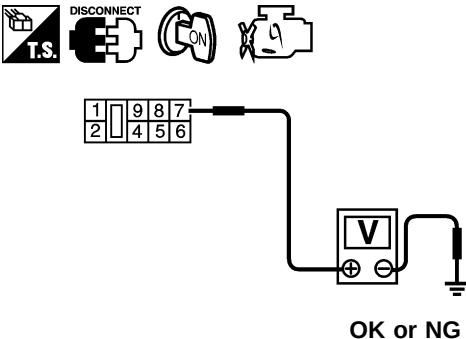
EL

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Diagnostic Procedure

NJEC0678

1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT	
1. Turn ignition switch "OFF". 2. Disconnect electronic control fuel injection pump harness connector.  3. Turn ignition switch "ON". 4. Check voltage between electronic control fuel injection pump terminal 7 and ground.  Voltage: Battery voltage SEF390Y YEC058A		
OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between electronic control fuel injection pump and ECM ● Harness for open or short between electronic control fuel injection pump and ECM relay		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

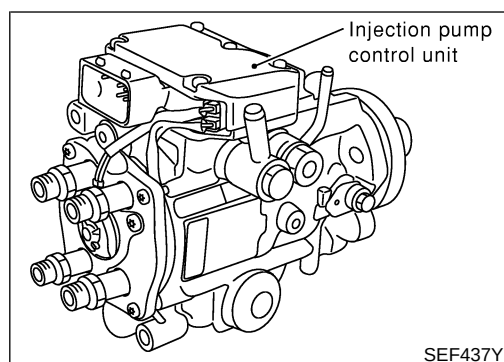
3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch “OFF”. 2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to power. OK or NG		
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to power in harness or connectors.

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT											
1. Check continuity between the following terminals. Refer to Wiring Diagram.												
<table><tr><th>Electronic control fuel injection pump</th><th>ECM</th></tr><tr><td>1</td><td>317</td></tr><tr><td>2</td><td>316</td></tr><tr><td>5</td><td>313</td></tr><tr><td>8</td><td>314</td></tr></table>			Electronic control fuel injection pump	ECM	1	317	2	316	5	313	8	314
Electronic control fuel injection pump	ECM											
1	317											
2	316											
5	313											
8	314											
Continuity should exist.												
2. Also check harness for short to ground and short to power.												
OK or NG												
OK	▶	GO TO 5.										
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.										

5	CHECK INTERMITTENT INCIDENT	
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-71.		
OK or NG		
OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Description



Description

NJEC0753

SYSTEM DESCRIPTION

NJEC0753S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NJEC0753S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NJEC0753S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NJEC0753S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NJEC0753S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0754

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°C
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

DTC P1202 FUEL CUT SYSTEM2

YD

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm ² , 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm ² , 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm ² , 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm ² , 11.36 psi)

ECM Terminals and Reference Value

NJEC0755

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NJEC0756

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when	Check Items (Possible cause)
P1202 1002	Fuel cut control system does not function properly.	- Harness or connectors (Electronic control fuel circuit is open or shorted.) - Electronic control fuel

2	DATA MONITOR	
	MONITOR	NO DTC
	CKPS-RPM (TDC) XXX rpm	

SEF817Y

DTC Confirmation Procedure

NJEC0757

WITH CONSULT-II

NJEC0757S01

- Turn ignition switch "ON" and wait at least 2 seconds.
- Select "DATA MONITOR" mode with CONSULT-II.
- Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- If DTC is detected, go to "Diagnostic Procedure", EC-128.

⊗ WITHOUT CONSULT-II

NJEC0757S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-128.

Wiring Diagram

NJEC0758

EC-INJPMP-01

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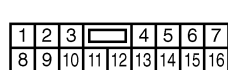
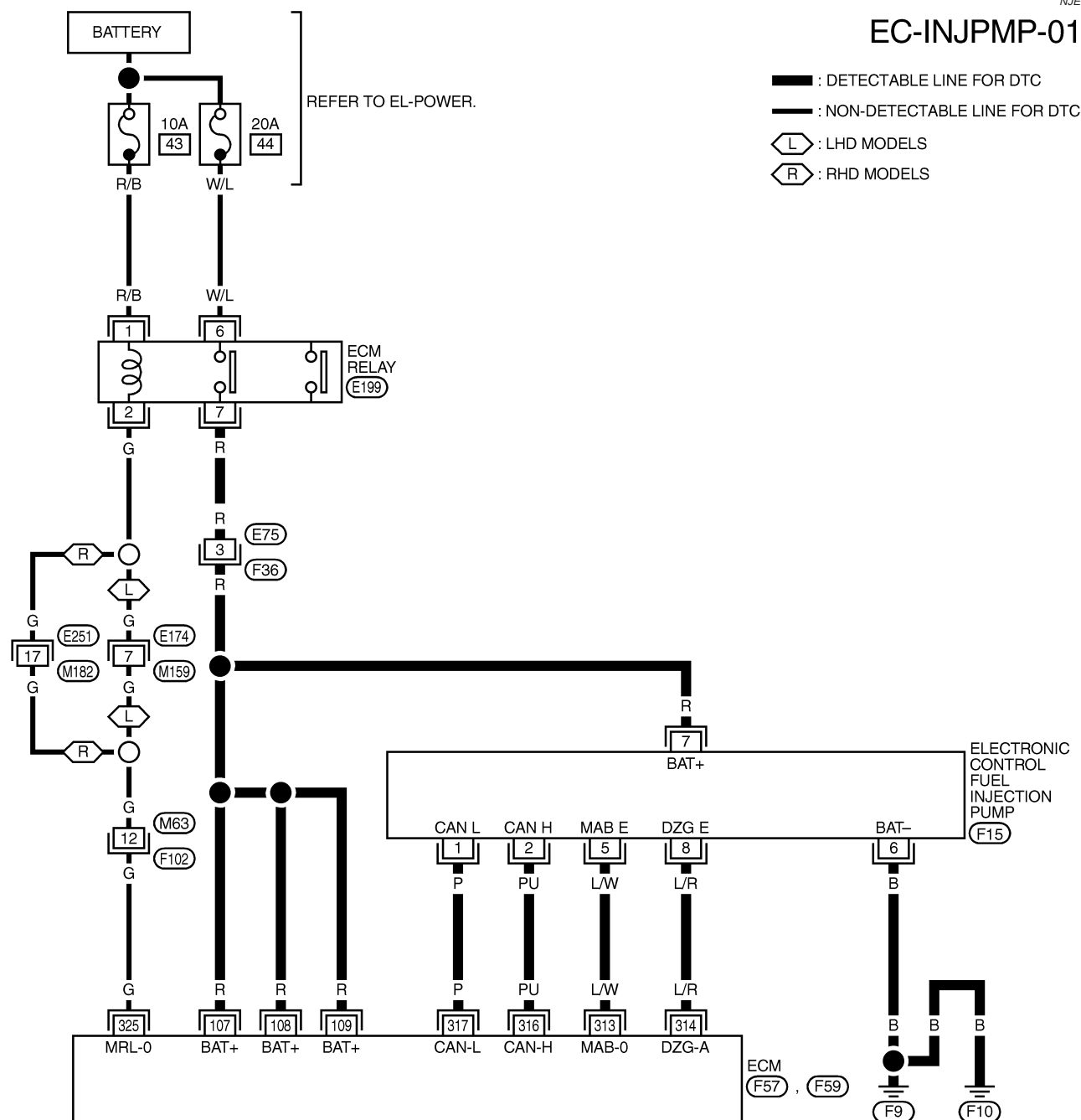
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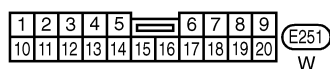
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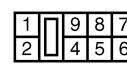
E174 W, F102 W



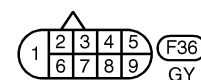
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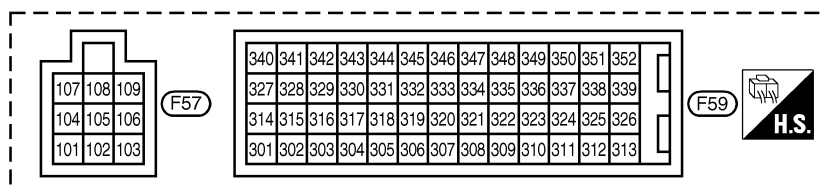
E251 W



F15 B

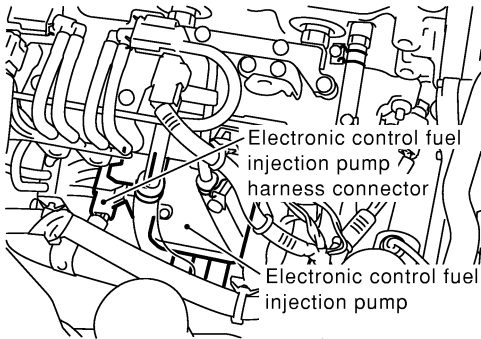
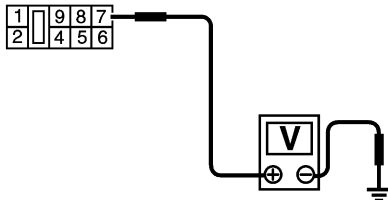


F36 GY



Diagnostic Procedure

NJEC0759

1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT	
1. Turn ignition switch "OFF". 2. Disconnect electronic control fuel injection pump harness connector.		
		
3. Turn ignition switch "ON". 4. Check voltage between electronic control fuel injection pump terminal 7 and ground.		
DISCONNECT  Voltage: Battery voltage OK or NG		
OK	▶	GO TO 3.
NG	▶	GO TO 2.

SEF390Y

YEC058A

2	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between electronic control fuel injection pump and ECM ● Harness for open or short between electronic control fuel injection pump and ECM relay		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch "OFF". 2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to power. OK or NG		
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to power in harness or connectors.

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT											
1. Check continuity between the following terminals. Refer to Wiring Diagram.												
<table><tr><td>Electronic control fuel injection pump</td><td>ECM</td></tr><tr><td>1</td><td>317</td></tr><tr><td>2</td><td>316</td></tr><tr><td>5</td><td>313</td></tr><tr><td>8</td><td>314</td></tr></table>			Electronic control fuel injection pump	ECM	1	317	2	316	5	313	8	314
Electronic control fuel injection pump	ECM											
1	317											
2	316											
5	313											
8	314											
Continuity should exist.												
2. Also check harness for short to ground and short to power.												
OK or NG												
OK	▶	GO TO 5.										
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.										

MTBL0462

5	CHECK INTERMITTENT INCIDENT	
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-71.		
OK or NG		
OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Description

Description

NJEC0660

NJEC0660S01

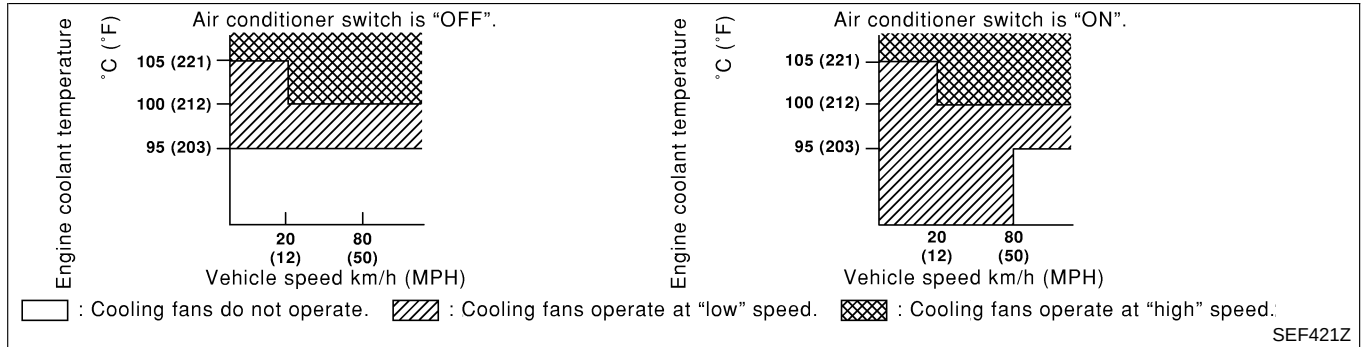
SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Cooling fan control	Cooling fan relay
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner "ON" signal		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION

NJEC0660S02



CONSULT-II Reference Value in Data Monitor Mode

NJEC0661

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● When cooling fan is stopped.		OFF
	● When cooling fans operate at low speed.		LOW
	● When cooling fans operate at high speed.		HIGH

ECM Terminals and Reference Value

NJEC0662

Specification data are reference values and are measured between each terminal 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.

TERMI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
219	LG/R	Cooling fan relay (Low)	[Engine is running] ● Cooling fans are not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fans are operating	Approximately 0.1V

DTC P1217 OVER HEAT

YD

ECM Terminals and Reference Value (Cont'd)

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
221	LG/B	Cooling fan relay (High)	[Engine is running] - Cooling fans are not operating - Cooling fans are operating at low speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] Cooling fans are operating at high speed	Approximately 0.1V

On Board Diagnosis Logic

NJEC0663

This diagnosis continuously monitors the engine coolant temperature.

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.

This self-diagnosis has the one trip detection logic.

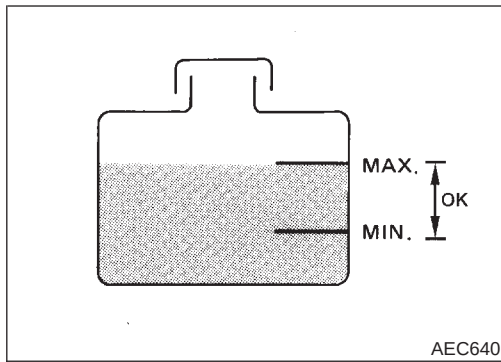
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1217 0208	- Cooling fan does not operate properly (Overheat). - Cooling fan system does not operate properly (Overheat). - Engine coolant was not added to the system using the proper filling method.	- Harness or connectors (The cooling fan circuit is open or shorted.) - Cooling fan - Radiator hose - Radiator - Radiator cap - Water pump - Thermostat - Engine coolant temperature sensor For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-144.

CAUTION:

When a malfunction is indicated, be sure to replace the coolant following the procedure in the LC-43, "Changing Engine Coolant". Also, replace the engine oil.

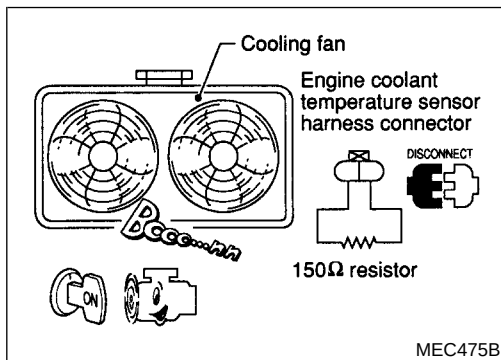
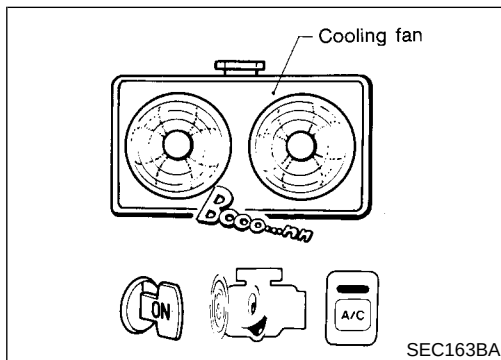
- 1) Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-21, "Engine Coolant Mixture Ratio".
- 2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.

Overall Function Check



ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLANT TEMP/S	XXX °C

SEF111X



Overall Function Check

NJEC0664

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

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 the 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.

④ WITH CONSULT-II

NJEC0664S01

- 1) Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "Diagnostic Procedure", EC-134.
- 2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-134.
- 3) Turn ignition switch "ON".
- 4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II and make sure that cooling fans operate when touching "HIGH" or "LOW".
If NG, go to "Diagnostic Procedure", EC-134.

⊗ WITHOUT CONSULT-II

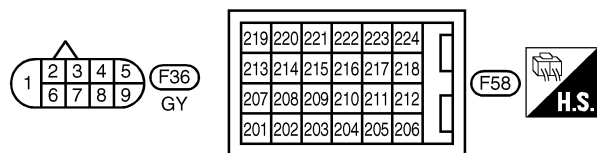
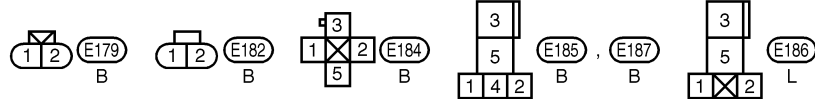
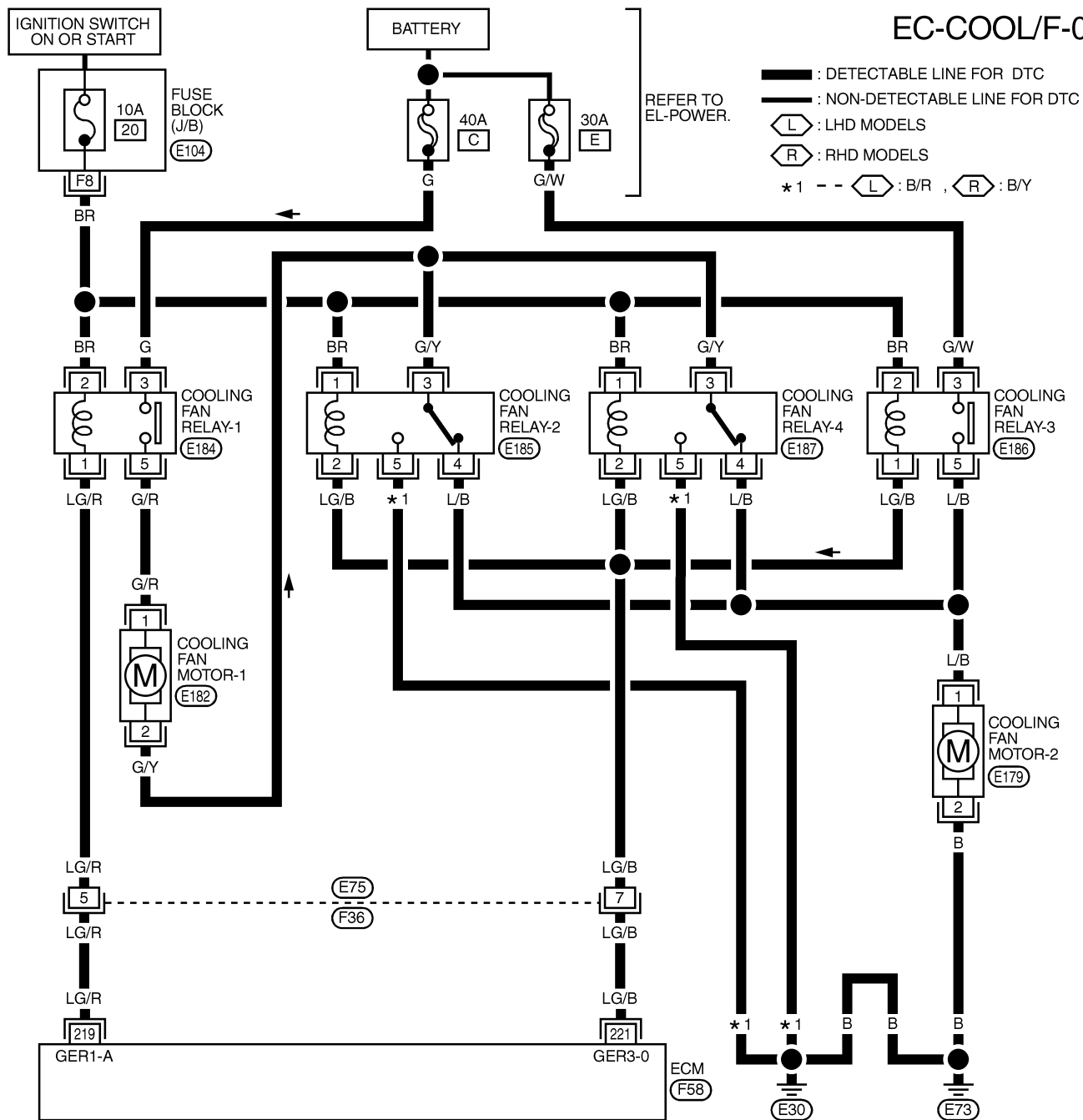
NJEC0664S02

- 1) Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "Diagnostic Procedure", EC-134.
- 2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-134.
- 3) Start engine.
Be careful not to overheat engine.
- 4) Set temperature control lever to full cold position.
- 5) Turn air conditioner switch "ON".
- 6) Turn blower fan switch "ON".
- 7) Run engine at idle for a few minutes with air conditioner operating.
Be careful not to overheat engine.
- 8) Make sure that cooling fans operate at low speed.
- 9) Turn ignition switch "OFF".
- 10) Turn air conditioner switch and blower fan switch "OFF".
- 11) Disconnect engine coolant temperature sensor harness connector.
- 12) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
- 13) Start engine and make sure that cooling fans operate at higher speed than low speed.
Be careful not to overheat engine.
- 14) If NG, go to "Diagnostic Procedure", EC-134.

Wiring Diagram

NJEC0665

EC-COOL/F-01



REFER TO THE FOLLOWING.

(E104) - FUSE BLOCK-JUNCTION BOX (J/B)

Diagnostic Procedure

NJEC0666

1	INSPECTION START	
Do you have CONSULT-II?		
Yes or No		
Yes	▶	GO TO 2.
No	▶	GO TO 4.

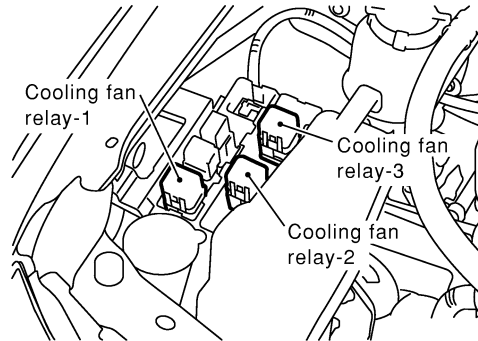
2	CHECK COOLING FAN LOW SPEED OPERATION																							
 With CONSULT-II 1. Turn ignition switch "ON". 2. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II.																								
<table border="1"> <thead> <tr> <th colspan="2">ACTIVE TEST</th> </tr> <tr> <th>COOLING FAN</th> <th>OFF</th> </tr> <tr> <th colspan="2">MONITOR</th> </tr> <tr> <th>COOLAN TEMP/S</th> <th>XXX °C</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>			ACTIVE TEST		COOLING FAN	OFF	MONITOR		COOLAN TEMP/S	XXX °C														
ACTIVE TEST																								
COOLING FAN	OFF																							
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3. Touch "LOW". 4. Make sure that cooling fans-1 and -2 operate at low speed.																								
OK or NG																								
OK	▶	GO TO 3.																						
NG	▶	Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-138.)																						

3	CHECK COOLING FAN HIGH SPEED OPERATION																							
 With CONSULT-II 1. Touch "HIGH".																								
<table border="1"> <thead> <tr> <th colspan="2">ACTIVE TEST</th> </tr> <tr> <th>COOLING FAN</th> <th>OFF</th> </tr> <tr> <th colspan="2">MONITOR</th> </tr> <tr> <th>COOLAN TEMP/S</th> <th>XXX °C</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>			ACTIVE TEST		COOLING FAN	OFF	MONITOR		COOLAN TEMP/S	XXX °C														
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2. Make sure that cooling fans-1 and -2 operate at higher speed than low speed.																								
OK or NG																								
OK	▶	GO TO 6.																						
NG	▶	Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-141.)																						

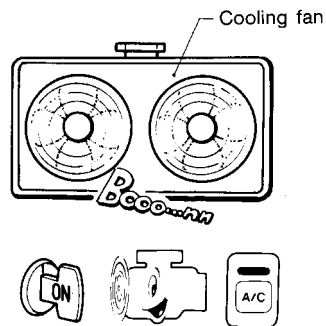
4 CHECK COOLING FAN LOW SPEED OPERATION

 **Without CONSULT-II**

1. Disconnect cooling fan relay-3.



2. Start engine and let it idle.
3. Set temperature lever at full cold position.
4. Turn air conditioner switch "ON".
5. Turn blower fan switch "ON".
6. Make sure that cooling fans-1 and -2 operate at low speed.



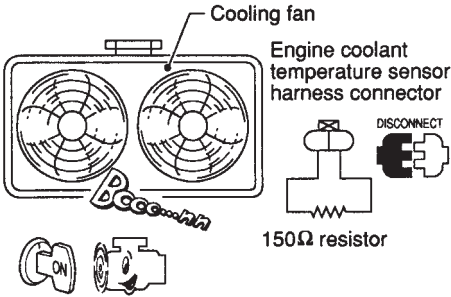
OK or NG

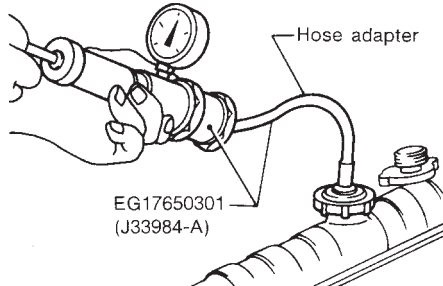
OK	▶	GO TO 5.
NG	▶	Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-138.)

SEF384Y

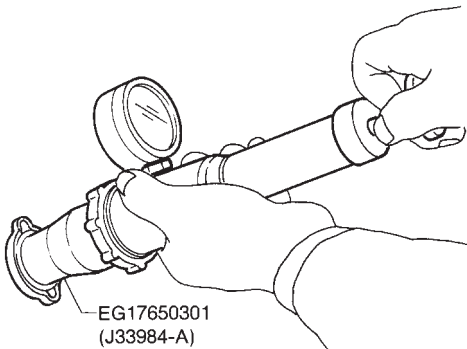
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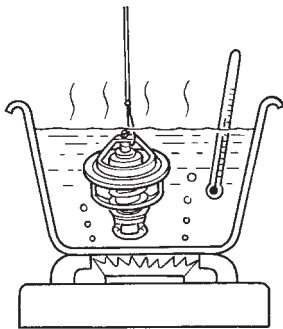
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5	CHECK COOLING FAN HIGH SPEED OPERATION
⊗ Without CONSULT-II 1. Turn ignition switch "OFF". 2. Reconnect cooling fan relay-3. 3. Turn air conditioner switch and blower fan switch "OFF". 4. Disconnect engine coolant temperature sensor harness connector. 5. Connect 150Ω resistor to engine coolant temperature sensor harness connector. 6. Restart engine and make sure that cooling fans-1 and -2 operate at high speed.	
	
MEC475B	
OK or NG	
OK	▶ GO TO 6.
NG	▶ Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-141.)

6	CHECK COOLING SYSTEM FOR LEAK
Apply pressure to the cooling system with a tester, and check if the pressure drops. Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm², 23 psi) CAUTION: Higher than the specified pressure may cause radiator damage.	
	
SLC754A	
Pressure should not drop.	
OK or NG	
OK	▶ GO TO 8.
NG	▶ GO TO 7.

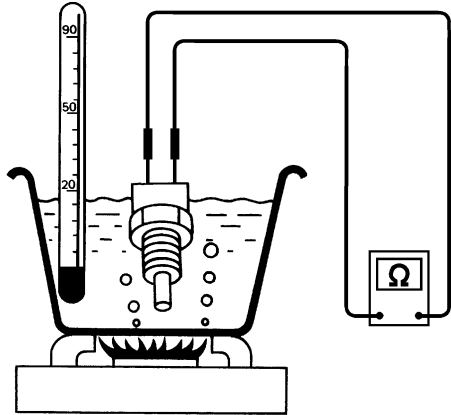
7	DETECT MALFUNCTIONING PART
Check the following for leak. • Hose • Radiator • Water pump (Refer to LC-38, "Water Pump".)	
▶ Repair or replace.	

8	CHECK RADIATOR CAP
Apply pressure to cap with a tester and check radiator cap relief pressure.  EG17650301 (J33984-A) Radiator cap relief pressure: 59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm², 9 - 14 psi) SLC755A OK or NG	
OK	▶ GO TO 9.
NG	▶ Replace radiator cap.

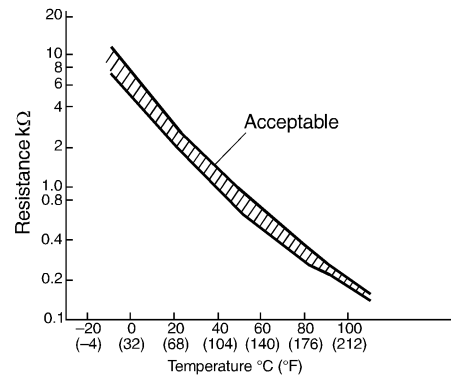
9	CHECK THERMOSTAT
- Remove thermostat. - Check valve seating condition at normal room temperatures. It should seat tightly. - Check valve opening temperature and valve lift.  Valve opening temperature: 82°C (180°F) [standard] Valve lift: More than 8.6 mm/95°C (0.339 in/203°F) 4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to LC-40, "Thermostat". SLC343 OK or NG	
OK	▶ GO TO 10.
NG	▶ Replace thermostat.

10 CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Remove engine coolant temperature sensor.
2. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.

**<Reference data>**

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



SEF304X

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace engine coolant temperature sensor.

11 CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-144.

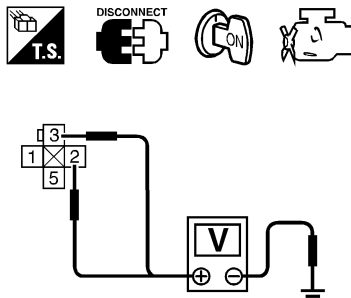
▶ **INSPECTION END**

PROCEDURE A

NJE0666S05

1 CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-1.
3. Turn ignition switch "ON".
4. Check voltage between cooling fan relay-1 terminals 2, 3 and ground with CONSULT-II or tester.

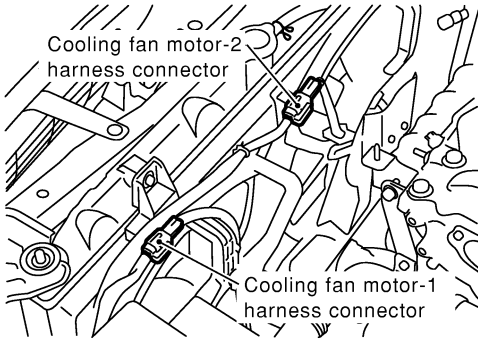
**Voltage: Battery voltage**

SEF899Y

OK or NG

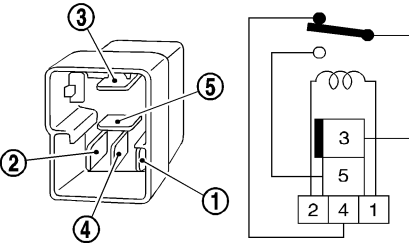
OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART
Check the following. ● Fuse block (J/B) connector E104 ● 10A fuse ● 40A fusible link ● Harness for open or short between cooling fan relay-1 and fuse ● Harness for open or short between cooling fan relay-1 and battery	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT-I
1. Turn ignition switch "OFF". 2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.	
	
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-2 terminal 2 and body ground. Refer to Wiring Diagram. Continuity should exist.	
4. Also check harness for short to ground and short to power.	
OK or NG	
OK ▶	GO TO 4.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

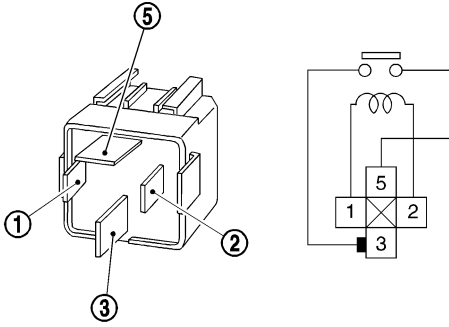
4	CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT-II
1. Check harness continuity between cooling fan motor-1 terminal 2 and cooling fan motor-2 terminal 1. Refer to Wiring Diagram. Continuity should exist.	
2. Also check harness for short to ground and short to power.	
OK or NG	
OK ▶	GO TO 7.
NG ▶	GO TO 5.

5	CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT-III
1. Disconnect cooling fan relays-2, 4. 2. Check harness continuity between cooling fan motor-1 terminal 2 and cooling fan relays-2, 4 terminal 3, cooling fan relays-2, 4 terminal 4 and cooling fan motor-2 terminal 1. Refer to Wiring Diagram. Continuity should exist.	
3. Also check harness for short to ground and short to power.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK COOLING FAN RELAY-2, 4												
Check continuity between cooling fan relays-2, 4 terminals 3 and 4, 3 and 5 under the following conditions.													
 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Conditions</th><th colspan="2">Continuity</th></tr> <tr> <th>terminals 3 and 4</th><th>terminals 3 and 5</th></tr> </thead> <tbody> <tr> <td>12V direct current supply between terminals 1 and 2</td><td style="text-align: center;">No</td><td style="text-align: center;">Yes</td></tr> <tr> <td>No current supply</td><td style="text-align: center;">Yes</td><td style="text-align: center;">No</td></tr> </tbody> </table>			Conditions	Continuity		terminals 3 and 4	terminals 3 and 5	12V direct current supply between terminals 1 and 2	No	Yes	No current supply	Yes	No
Conditions	Continuity												
	terminals 3 and 4	terminals 3 and 5											
12V direct current supply between terminals 1 and 2	No	Yes											
No current supply	Yes	No											
SEF900Y													
OK or NG													
OK	▶	GO TO 11.											
NG	▶	Replace cooling fan relay.											

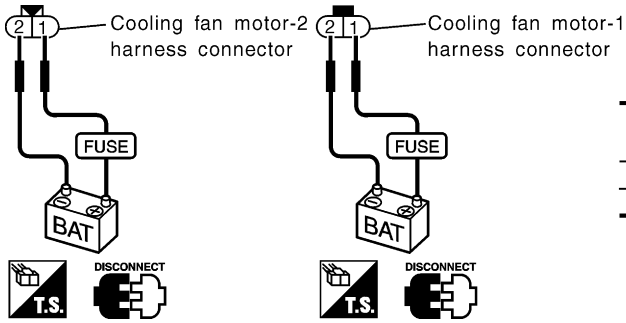
7	CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 219 and cooling fan relay-1 terminal 1. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between cooling fan relay-1 and ECM		
▶ Repair open circuit or short to ground or short to power in harness or connectors.		

9	CHECK COOLING FAN RELAY-1							
Check continuity between cooling fan relay-1 terminals 3 and 5 under the following conditions.								
 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Conditions</th><th>Continuity</th></tr> </thead> <tbody> <tr> <td>12V direct current supply between terminals 1 and 2</td><td style="text-align: center;">Yes</td></tr> <tr> <td>No current supply</td><td style="text-align: center;">No</td></tr> </tbody> </table>			Conditions	Continuity	12V direct current supply between terminals 1 and 2	Yes	No current supply	No
Conditions	Continuity							
12V direct current supply between terminals 1 and 2	Yes							
No current supply	No							
SEF901Y								
OK or NG								
OK	▶	GO TO 10.						
NG	▶	Replace cooling fan relay.						

10 CHECK COOLING FAN MOTORS-1 AND -2

Supply battery voltage between the following terminals and check operation.



	Terminals	
	(+)	(-)
Cooling fan motor-1	1	2
Cooling fan motor-2	1	2

YEC059A

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace cooling fan motors.

11 CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.

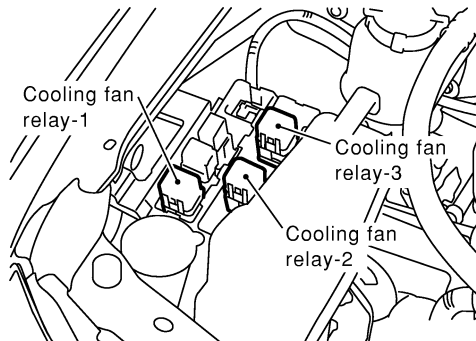
▶ **INSPECTION END**

PROCEDURE B

NJEC0666S06

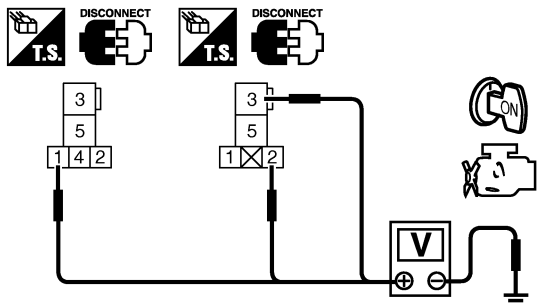
1 CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relays-2, 3 and 4.



SEF384Y

3. Turn ignition switch "ON".
4. Check voltage between cooling fan relays-2, 4 terminals 1 and ground, cooling fan relay-3 terminals 2, 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

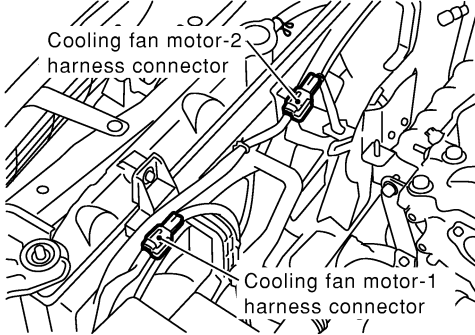
YEC394A

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

Diagnostic Procedure (Cont'd)

2	DETECT MALFUNCTIONING PART
Check the following. ● 30A fusible link ● 10A fuse ● Harness for open or short between cooling fan relays-2, 3, 4 and fuse ● Harness for open or short between cooling fan relay-3 and fusible link	
	▶ Repair harness or connectors.

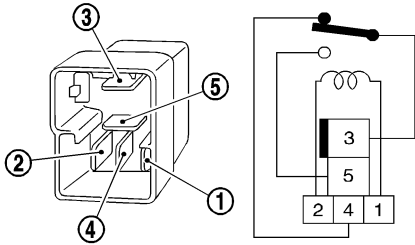
3	CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect cooling fan motor-2 harness connector.	
 SEF385Y	
3. Check harness continuity between cooling fan relays-2, 4 terminal 5 and body ground, cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 1. Refer to Wiring Diagram. Continuity should exist.	
4. Also check harness for short to ground and short to power.	
OK or NG	
OK	▶ GO TO 4.
NG	▶ Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 221 and cooling fan relays-2, 4 terminal 2, cooling fan relay-3 terminal 1. Refer to Wiring Diagram. Continuity should exist.	
3. Also check harness for short to ground and short to power.	
OK or NG	
OK	▶ GO TO 6.
NG	▶ GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between cooling fan relays-2, 3, 4 and ECM	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

6 CHECK COOLING FAN RELAYS-2 AND -4

Check continuity between cooling fan relay-2, -3 terminals 3 and 4, 3 and 5 under the following conditions.



Conditions	Continuity	
	terminals 3 and 4	terminals 3 and 5
12V direct current supply between terminals 1 and 2	No	Yes
No current supply	Yes	No

SEF900Y

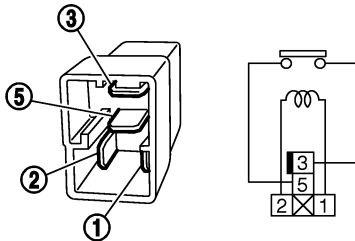
OK or NG

OK ► GO TO 7.

NG ► Replace cooling fan relays.

7 CHECK COOLING FAN RELAY-3

Check continuity between cooling fan relay-3 terminals 3 and 5 under the following conditions.



Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

YEC395A

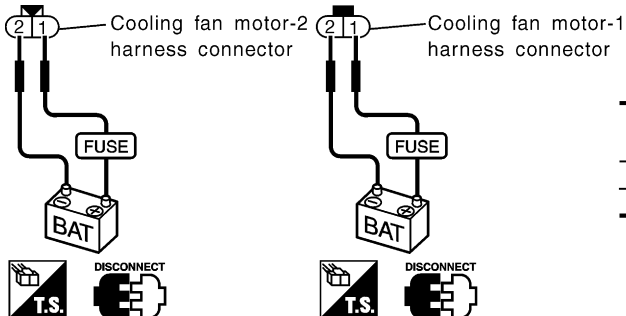
OK or NG

OK ► GO TO 8.

NG ► Replace cooling fan relay.

8 CHECK COOLING FAN MOTORS

Supply battery voltage between the following terminals and check operation.



	Terminals	
	(+)	(-)
Cooling fan motor-1	1	2
Cooling fan motor-2	1	2

YEC059A

OK or NG

OK ► GO TO 9.

NG ► Replace cooling fan motors.

9	CHECK INTERMITTENT INCIDENT
1. Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.	
▶	INSPECTION END

Main 12 Causes of Overheating

NJEC0667

Engine	Step	Inspection item	Equipment	Condition	Reference page
OFF	1	- Blocked radiator - Blocked radiator grille - Blocked bumper	Visual	No blocking	—
	2	Coolant mixture	Coolant tester	50 - 50% coolant mixture	See MA-19, "RECOMMENDED FLUIDS AND LUBRICANTS".
	3	Coolant level	Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See LC-17, "Changing Engine Coolant".
	4	Radiator cap	Pressure tester	78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm ² , 11 - 14 psi)	See LC-37, "System Check".
ON*2	5	Coolant leaks	Visual	No leaks	See LC-37, "System Check".
ON*2	6	Thermostat	Touch the upper and lower radiator hoses	Both hoses should be hot	See LC-40, "Thermostat" and "Radiator".
ON*1	7	Cooling fan	CONSULT-II	Operating	See Trouble Diagnosis for DTC P1217, EC-130.
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 reservoir tank	Visual	No overflow during driving and idling	See LC-43, "Changing Engine Coolant".
OFF*4	10	Coolant return from reservoir tank to radiator	Visual	Should be initial level in reservoir tank	See LC-43, "REFILLING ENGINE COOLANT".
OFF	11	Cylinder head	Straight gauge feeler gauge	0.1mm (0.004 in) Maximum distortion (warping)	See EM-48, "Inspection".
	12	Cylinder block and pistons	Visual	No scuffing on cylinder walls or piston	See EM-70, "Inspection".

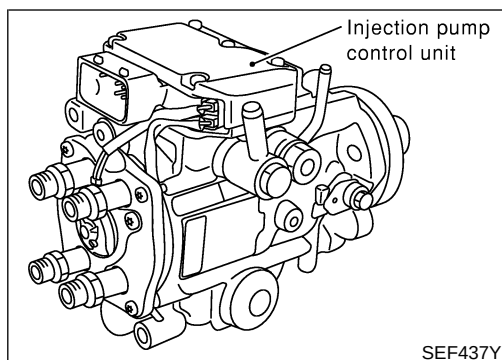
*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

For more information, refer to LC-46, "OVERHEATING CAUSE ANALYSIS".



Description

SYSTEM DESCRIPTION

NJEC0727

NJEC0727S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NJEC0727S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NJEC0727S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NJEC0727S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NJEC0727S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0728

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°C
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm ² , 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm ² , 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm ² , 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm ² , 11.36 psi)

ECM Terminals and Reference Value

NJEC0729

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NJEC0730

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when	Check Items (Possible cause)
P1241 0707	Fuel injection timing control system does not function properly.	- Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) - Electronic control fuel injection pump - Improper fuel quality

2	DATA MONITOR	
	MONITOR	NO DTC
	CKPS-RPM (TDC) XXX rpm	
	SEF817Y	

DTC Confirmation Procedure

NJEC0731

WITH CONSULT-II

NJEC0731S01

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 4) Keep engine speed at more than 2,000 rpm for at least 10 seconds.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-149.

 WITHOUT CONSULT-II

NJEC0731S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 3) Keep engine speed at more than 2,000 rpm for at least 10 seconds.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 6) If DTC is detected, go to "Diagnostic Procedure", EC-149.

GI

MA

EM

LC

EC

FE

CL

MT

AT

AX

SU

BR

ST

RS

BT

HA

SC

EL

IDX

Wiring Diagram

NJEC0732

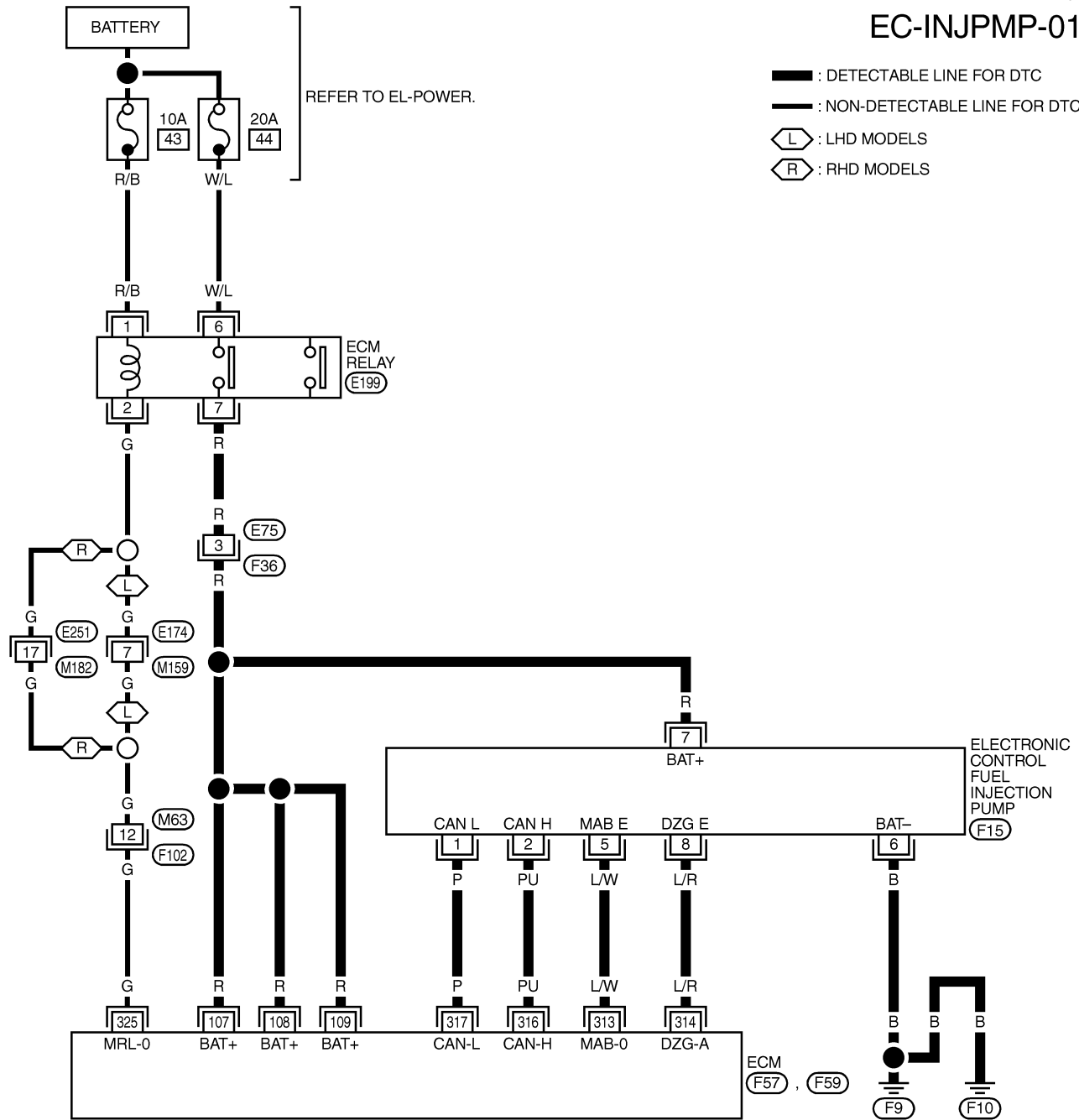
EC-INJPMP-01

— : DETECTABLE LINE FOR DTC

— : NON-DETECTABLE LINE FOR DTC

⬡ : LHD MODELS

⬢ : RHD MODELS



1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16					

E174
WF102
W

1	2
5	7
3	6

E199
BR

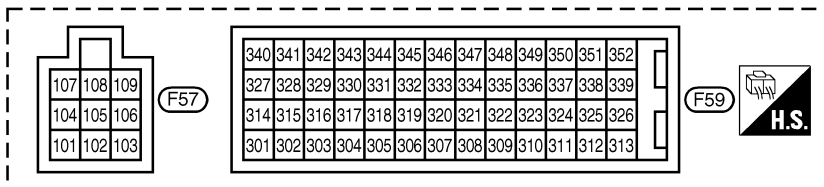
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20							

E251
W

1	9	8	7
2	4	5	6

F15
B

1	2	3	4	5
6	7	8	9	

F36
GY

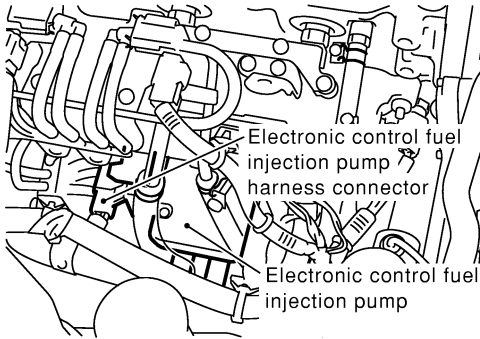
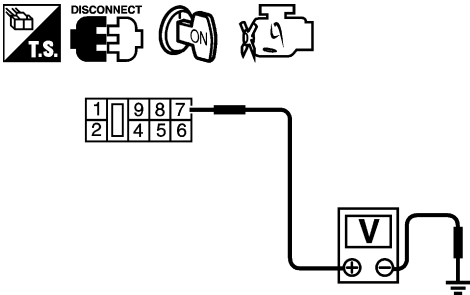
YEC325A

Diagnostic Procedure

NJEC0733

1	INSPECTION START
1. Turn ignition switch "OFF". 2. Perform "AIR BREEDING", EC-32, and "WATER DRAINING", EC-32.	
	▶ GO TO 2.

2	PERFORM DTC CONFIRMATION PROCEDURE AGAIN
Perform "DTC Confirmation Procedure", EC-146 again.	
OK or NG	
OK	▶ INSPECTION END
NG	▶ GO TO 3.

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect electronic control fuel injection pump harness connector.	
	
3. Turn ignition switch "ON". 4. Check voltage between electronic control fuel injection pump terminal 7 and ground.	
	
OK or NG	
OK	▶ GO TO 5.
NG	▶ GO TO 4.

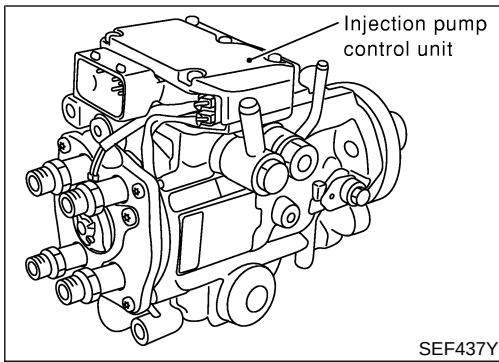
4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between electronic control fuel injection pump and ECM ● Harness for open or short between electronic control fuel injection pump and ECM relay	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

5	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT		
1. Turn ignition switch “OFF”. 2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to power.			
OK or NG			
OK	▶	GO TO 6.	
NG	▶	Repair open circuit or short to power in harness or connectors.	

6	CHECK COMMUNICATION LINE FOR OPEN AND SHORT											
1. Check continuity between the following terminals. Refer to Wiring Diagram.												
<table><tr><td>Electronic control fuel injection pump</td><td>ECM</td></tr><tr><td>1</td><td>317</td></tr><tr><td>2</td><td>316</td></tr><tr><td>5</td><td>313</td></tr><tr><td>8</td><td>314</td></tr></table>			Electronic control fuel injection pump	ECM	1	317	2	316	5	313	8	314
Electronic control fuel injection pump	ECM											
1	317											
2	316											
5	313											
8	314											
MTBL0462												
Continuity should exist.												
2. Also check harness for short to ground and short to power.												
OK or NG												
OK	▶	GO TO 7.										
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.										

7	CHECK INTERMITTENT INCIDENT	
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-71.		
OK or NG		
OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

SYSTEM DESCRIPTION

NJEC0714

NJEC0714S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NJEC0714S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NJEC0714S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NJEC0714S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NJEC0714S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0715

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°C
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm ² , 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm ² , 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm ² , 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm ² , 11.36 psi)

ECM Terminals and Reference Value

NJEC0716

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NJEC0717

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when	Check Items (Possible cause)
P1251 0704	Spill valve (Built-into electronic control fuel injection pump) does not function properly.	- Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) - Electronic control fuel injection pump

2	DATA MONITOR	
	MONITOR	NO DTC
	CKPS-RPM (TDC) XXX rpm	
	SEF817Y	

DTC Confirmation Procedure

NJEC0718

WITH CONSULT-II

NJEC0718S01

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-155.

WITHOUT CONSULT-II

NJEC0718S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.

- 2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-155.

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Wiring Diagram

NJEC0719

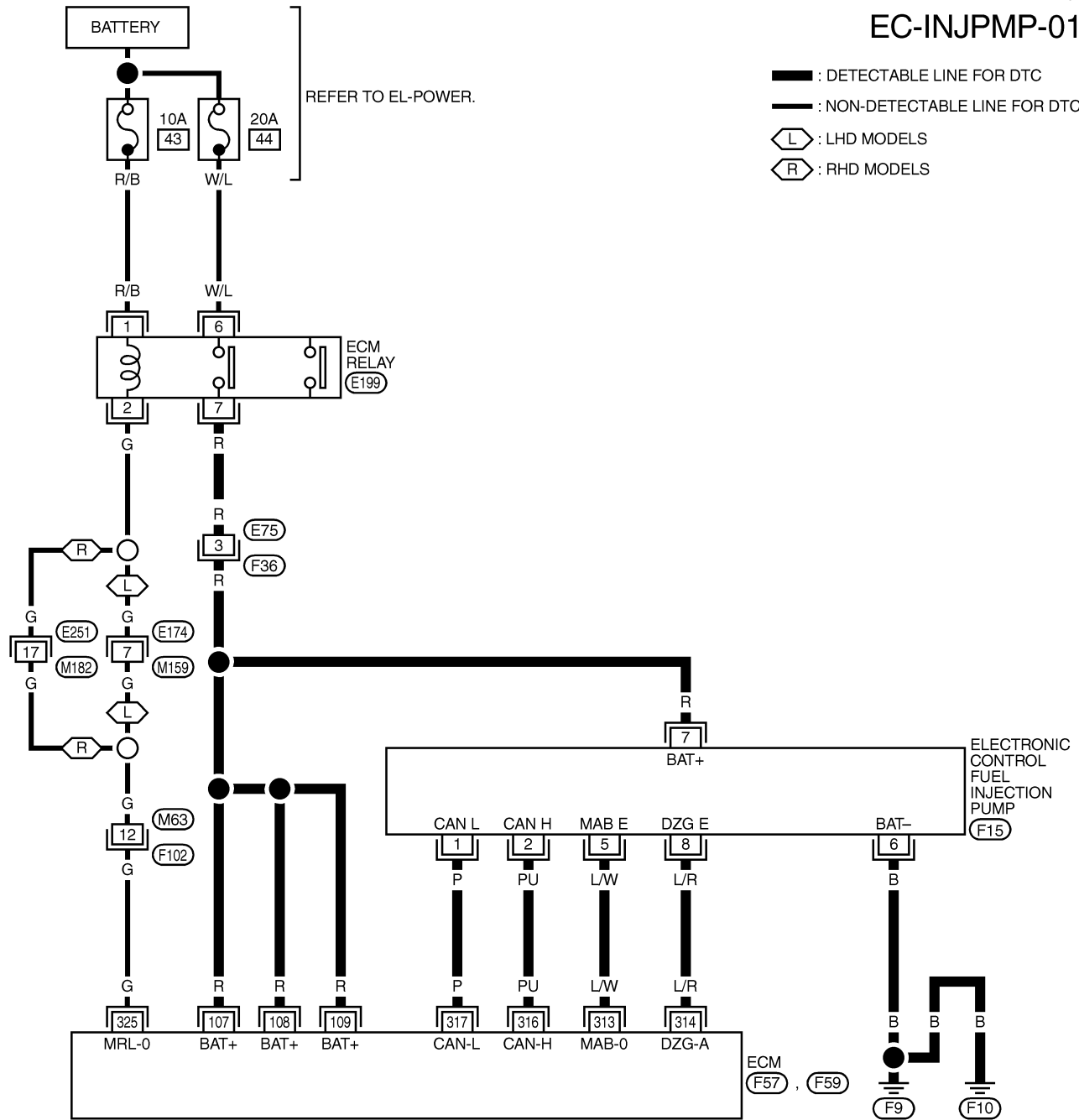
EC-INJPMP-01

— : DETECTABLE LINE FOR DTC

— : NON-DETECTABLE LINE FOR DTC

⬡ : LHD MODELS

⬢ : RHD MODELS



1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16					

E174, F102
W W

1	2
5	7
3	6

E199
BR

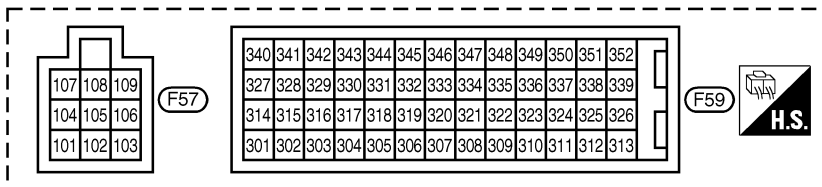
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20							

E251
W

1	9	8	7
2	4	5	6

F15
B

1	2	3	4	5
6	7	8	9	

F36
GY

YEC325A

Diagnostic Procedure

NJEC0720

1

CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect electronic control fuel injection pump harness connector.

3. Turn ignition switch "ON".
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connector E75, F36 ● Harness for open or short between electronic control fuel injection pump and ECM ● Harness for open or short between electronic control fuel injection pump and ECM relay		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

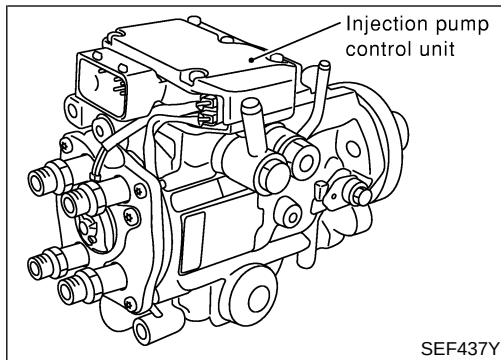
3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch "OFF". 2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to power. OK or NG		
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT											
1. Check continuity between the following terminals. Refer to Wiring Diagram.												
<table><tr><td>Electronic control fuel injection pump</td><td>ECM</td></tr><tr><td>1</td><td>317</td></tr><tr><td>2</td><td>316</td></tr><tr><td>5</td><td>313</td></tr><tr><td>8</td><td>314</td></tr></table>			Electronic control fuel injection pump	ECM	1	317	2	316	5	313	8	314
Electronic control fuel injection pump	ECM											
1	317											
2	316											
5	313											
8	314											
Continuity should exist.												
2. Also check harness for short to ground and short to power.												
OK or NG												
OK	▶	GO TO 5.										
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.										

MTBL0462

5	CHECK INTERMITTENT INCIDENT	
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-71.		
OK or NG		
OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

SYSTEM DESCRIPTION

NJEC0700

NJEC0700S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NJEC0700S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NJEC0700S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NJEC0700S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NJEC0700S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0701

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°C
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm ² , 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm ² , 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm ² , 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm ² , 11.36 psi)

ECM Terminals and Reference Value

NJEC0702

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NJEC0703

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when	Check Items (Possible cause)
P1337 0702	Injection pump control unit input signal [Crankshaft position sensor (TDC) signal] processing function is malfunctioning.	- Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) - Electronic control fuel injection pump

2	DATA MONITOR	
	MONITOR	NO DTC
	CKPS-RPM (TDC) XXX rpm	
	SEF817Y	

DTC Confirmation Procedure

NJEC0704

WITH CONSULT-II

NJEC0704S01

- Turn ignition switch "ON" and wait at least 2 seconds.
- Select "DATA MONITOR" mode with CONSULT-II.
- Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- If DTC P0335 is detected, go to "Diagnostic procedure", EC-102.
If DTC P1337 is detected, go to "Diagnostic Procedure", EC-161.

⊗ WITHOUT CONSULT-II

NJE0704S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC P0335 is detected, go to "Diagnostic Procedure", EC-102.
If DTC P1337 is detected, go to "Diagnostic Procedure", EC-161.

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Wiring Diagram

NJEC0705

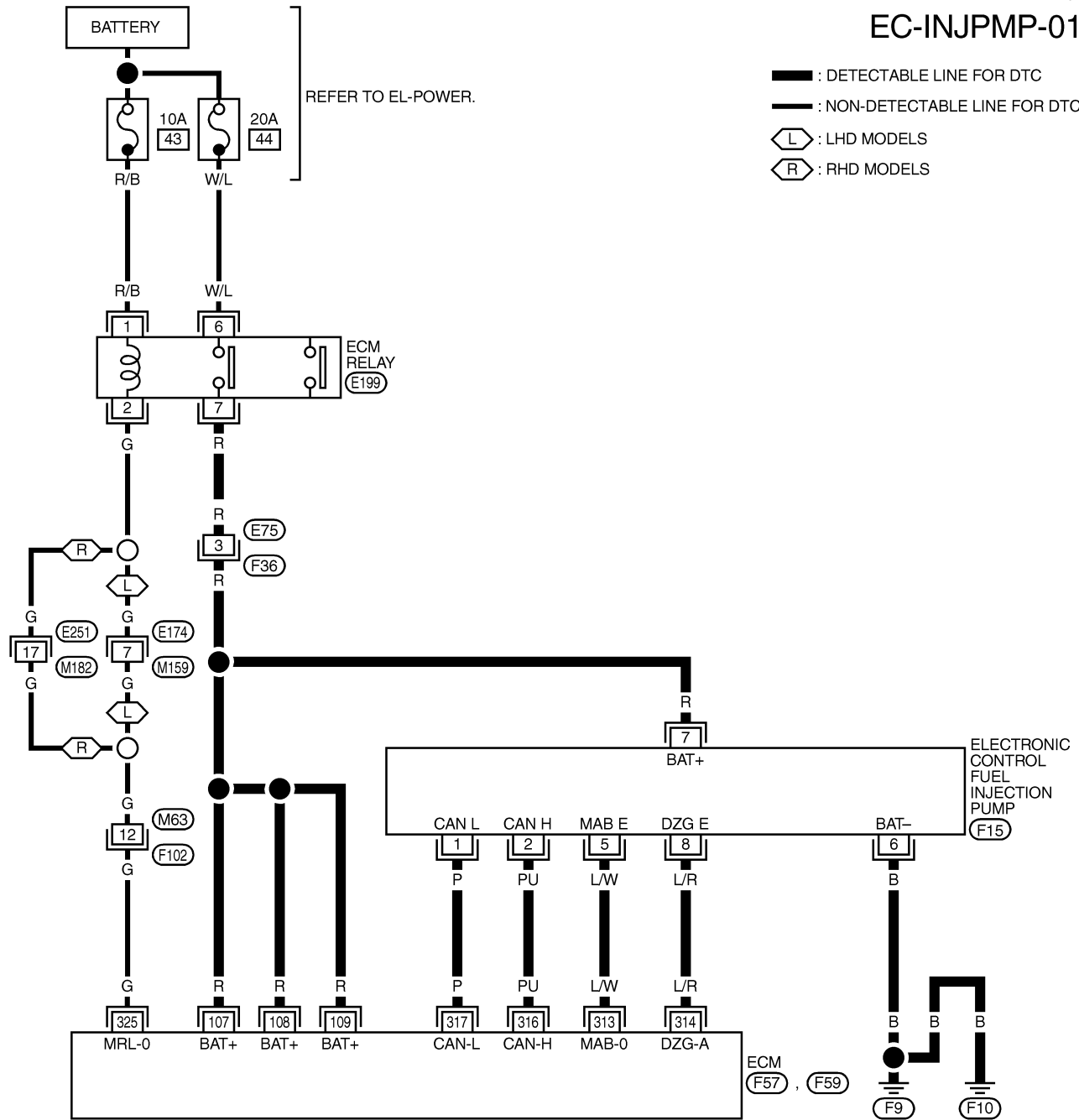
EC-INJPMP-01

— : DETECTABLE LINE FOR DTC

— : NON-DETECTABLE LINE FOR DTC

⬡ : LHD MODELS

⬢ : RHD MODELS



1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16					

E174

F102

W

W

E199

BR

E251

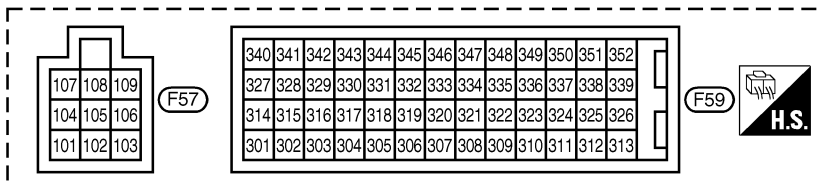
W

F15

B

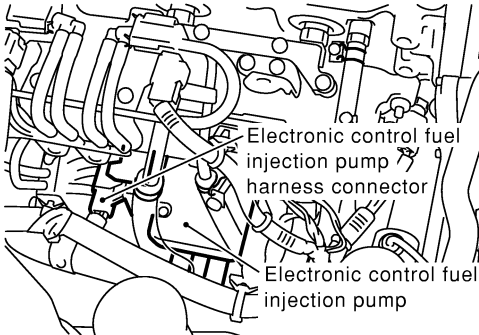
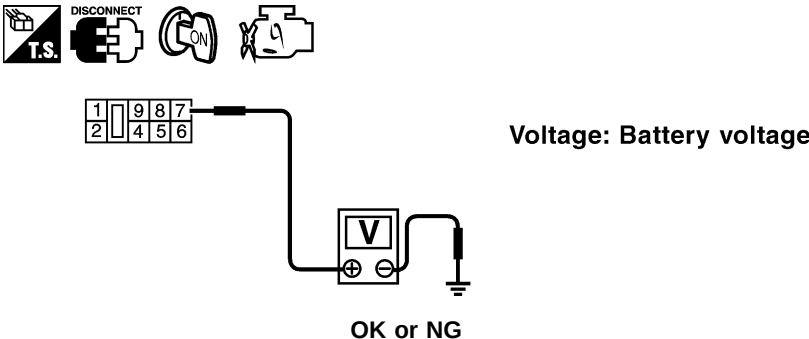
F36

GY



Diagnostic Procedure

NJEC0706

1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect electronic control fuel injection pump harness connector.	
	
3. Turn ignition switch "ON". 4. Check voltage between electronic control fuel injection pump terminal 7 and ground.	
	
OK	▶ GO TO 3.
NG	▶ GO TO 2.

2	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between electronic control fuel injection pump and ECM ● Harness for open or short between electronic control fuel injection pump and ECM relay	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

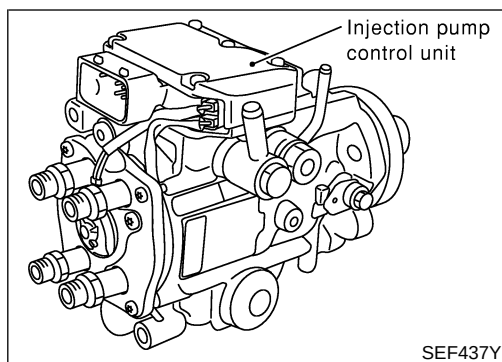
3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to power.	
OK or NG	
OK	▶ GO TO 4.
NG	▶ Repair open circuit or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT											
1. Check continuity between the following terminals. Refer to Wiring Diagram.												
<table><tr><td>Electronic control fuel injection pump</td><td>ECM</td></tr><tr><td>1</td><td>317</td></tr><tr><td>2</td><td>316</td></tr><tr><td>5</td><td>313</td></tr><tr><td>8</td><td>314</td></tr></table>			Electronic control fuel injection pump	ECM	1	317	2	316	5	313	8	314
Electronic control fuel injection pump	ECM											
1	317											
2	316											
5	313											
8	314											
Continuity should exist.												
2. Also check harness for short to ground and short to power.												
OK or NG												
OK	▶	GO TO 5.										
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.										

MTBL0462

5	CHECK INTERMITTENT INCIDENT	
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-71.		
OK or NG		
OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

SYSTEM DESCRIPTION

NJEC0693

NJEC0693S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NJEC0693S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NJEC0693S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NJEC0693S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NJEC0693S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0694

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°C
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

DTC P1341 P1-CAM POS SEN

YD

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm ² , 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm ² , 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm ² , 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm ² , 11.36 psi)

ECM Terminals and Reference Value

NJEC0695

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NJEC0696

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when	Check Items (Possible cause)
P1341 0701	An improper voltage signal from cam position sensor (Built-into electronic control fuel injection pump) is sent to injection pump control unit.	- Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) - Electronic control fuel injection pump

2	DATA MONITOR	
	MONITOR	NO DTC
	CKPS-RPM (TDC) XXX rpm	
	SEF817Y	

DTC Confirmation Procedure

NJEC0697

WITH CONSULT-II

NJEC0697S01

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-167.

WITHOUT CONSULT-II

NJEC0697S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.

EC-164

- 2) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-167.

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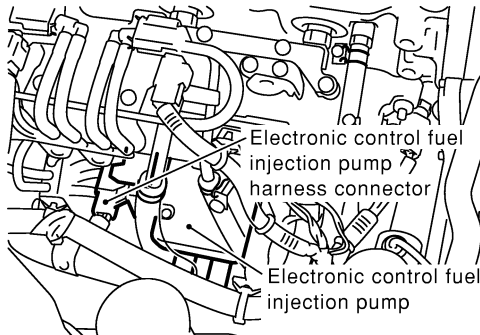
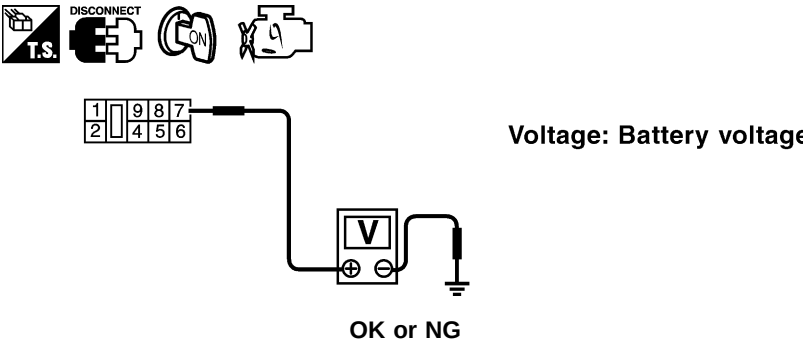
SC

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IDX

Diagnostic Procedure

NJEC0699

1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT	
1. Turn ignition switch "OFF". 2. Disconnect electronic control fuel injection pump harness connector.  3. Turn ignition switch "ON". 4. Check voltage between electronic control fuel injection pump terminal 7 and ground.  SEF390Y YEC058A		
OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between electronic control fuel injection pump and ECM ● Harness for open or short between electronic control fuel injection pump and ECM relay		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

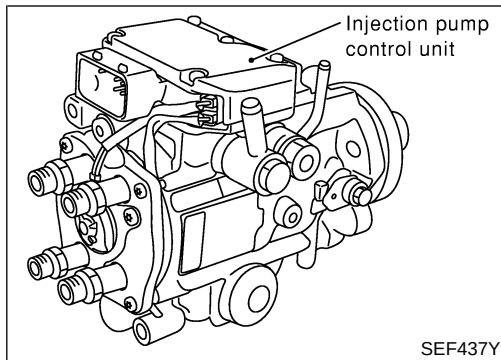
3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch “OFF”. 2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to power. OK or NG		
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT											
1. Check continuity between the following terminals. Refer to Wiring Diagram.												
<table><tr><td>Electronic control fuel injection pump</td><td>ECM</td></tr><tr><td>1</td><td>317</td></tr><tr><td>2</td><td>316</td></tr><tr><td>5</td><td>313</td></tr><tr><td>8</td><td>314</td></tr></table>			Electronic control fuel injection pump	ECM	1	317	2	316	5	313	8	314
Electronic control fuel injection pump	ECM											
1	317											
2	316											
5	313											
8	314											
Continuity should exist.												
2. Also check harness for short to ground and short to power.												
OK or NG												
OK	▶	GO TO 5.										
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.										

MTBL0462

5	CHECK INTERMITTENT INCIDENT	
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-71.		
OK or NG		
OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

SYSTEM DESCRIPTION

NJEC0707

NJEC0707S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NJEC0707S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NJEC0707S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NJEC0707S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NJEC0707S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0708

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 12 - 13°C
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

DTC P1600 P3-PUMP COMM LINE

YD

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm ² , 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm ² , 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm ² , 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm ² , 11.36 psi)

ECM Terminals and Reference Value

NJEC0709

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NJEC0710

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when	Check Items (Possible cause)
P1600 0703	Injection pump control unit receives incorrect voltage signal from ECM continuously.	- Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) - Electronic control fuel injection pump

2	DATA MONITOR
	MONITOR NO DTC
	CKPS-RPM (TDC) XXX rpm
	SEF817Y

DTC Confirmation Procedure

NJEC0711

WITH CONSULT-II

NJEC0711S01

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-173.

WITHOUT CONSULT-II

NJEC0711S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.

- 2) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-173.

GI

MA

EM

LC

EC

FE

CL

MT

AT

AX

SU

BR

ST

RS

BT

HA

SC

EL

IDX

Wiring Diagram

NJEC0712

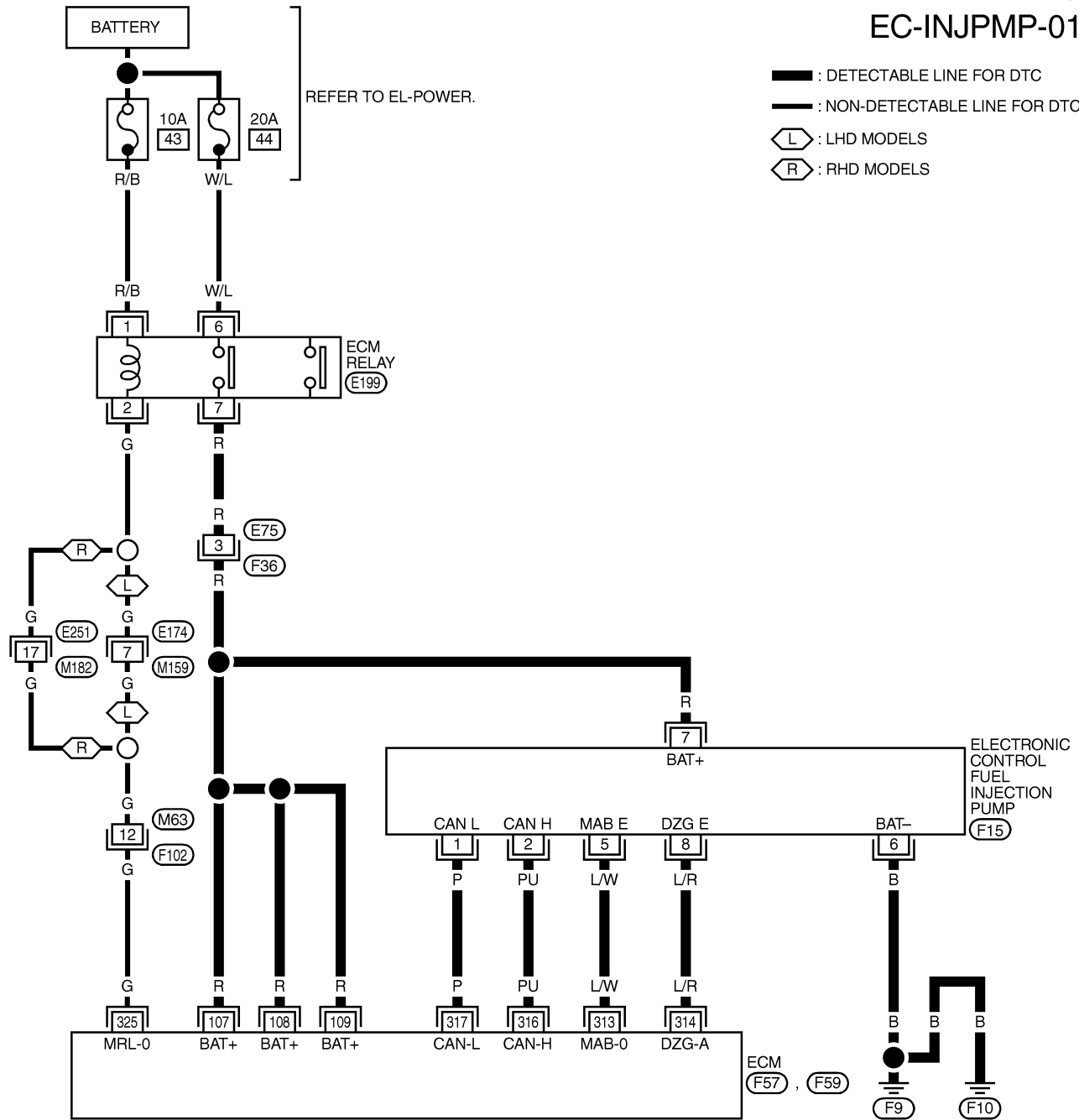
EC-INJPMP-01

— : DETECTABLE LINE FOR DTC

— : NON-DETECTABLE LINE FOR DTC

⬡ : LHD MODELS

⬢ : RHD MODELS



1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16					

E174
WF102
W

1	2
5	7
3	6

E199
BR

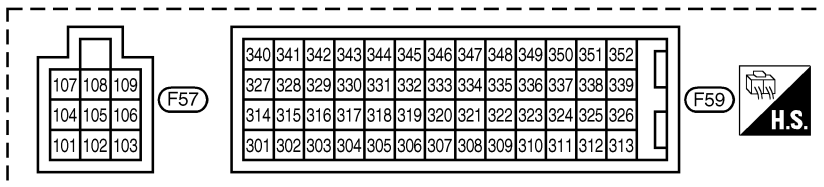
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20							

E251
W

1	9	8	7
2	4	5	6

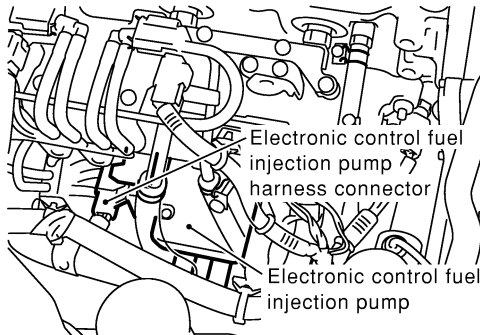
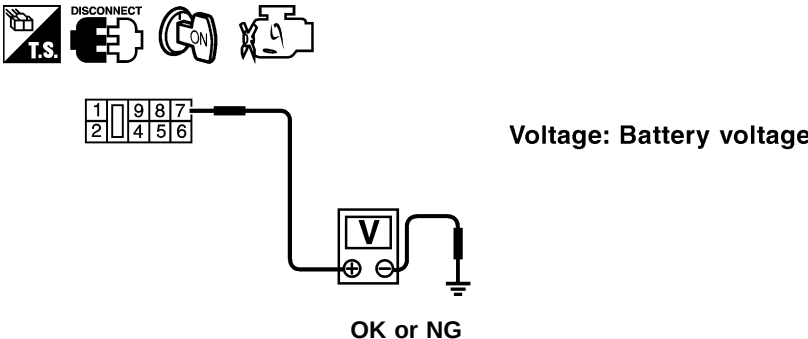
F15
B

1	2	3	4	5
6	7	8	9	

F36
GY

Diagnostic Procedure

NJEC0713

1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT	
1. Turn ignition switch “OFF”. 2. Disconnect electronic control fuel injection pump harness connector.  3. Turn ignition switch “ON”. 4. Check voltage between electronic control fuel injection pump terminal 7 and ground.  SEF390Y YEC058A		
OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between electronic control fuel injection pump and ECM ● Harness for open or short between electronic control fuel injection pump and ECM relay		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

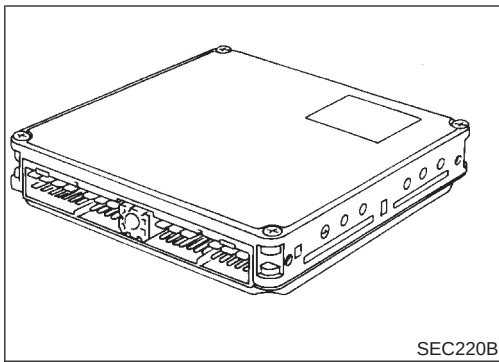
3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch “OFF”. 2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to power. OK or NG		
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK COMMUNICATION LINE FOR OPEN AND SHORT											
1. Check continuity between the following terminals. Refer to Wiring Diagram.												
<table><tr><td>Electronic control fuel injection pump</td><td>ECM</td></tr><tr><td>1</td><td>317</td></tr><tr><td>2</td><td>316</td></tr><tr><td>5</td><td>313</td></tr><tr><td>8</td><td>314</td></tr></table>			Electronic control fuel injection pump	ECM	1	317	2	316	5	313	8	314
Electronic control fuel injection pump	ECM											
1	317											
2	316											
5	313											
8	314											
Continuity should exist.												
2. Also check harness for short to ground and short to power.												
OK or NG												
OK	▶	GO TO 5.										
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.										

MTBL0462

5	CHECK INTERMITTENT INCIDENT	
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-71.		
OK or NG		
OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

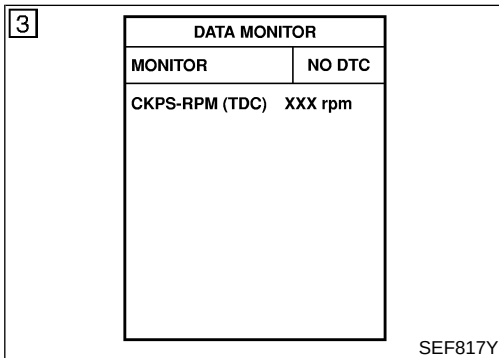
NJEC0668

On Board Diagnosis Logic

NJEC0669

These self-diagnoses have the one trip detection logic.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1603 0901	ECM calculation function is malfunctioning.	ECM (ECCS-D control module)
P1607 0301		



DTC Confirmation Procedure

NJEC0670

NJEC0670S01

WITH CONSULT-II

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and wait at least 2 seconds.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-176.

WITHOUT CONSULT-II

NJEC0670S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Start engine and wait at least 2 seconds.
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-176.

Diagnostic Procedure

NJEC0671

1	INSPECTION START
 With CONSULT-II 1. Turn ignition switch "ON". 2. Select "SELF DIAG RESULTS" mode with CONSULT-II. 3. Touch "ERASE". 4. Perform "DTC Confirmation Procedure", EC-175, again. 5. Is the DTC P1603 or P1607 displayed again?	
 Without CONSULT-II 1. Turn ignition switch "ON". 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform "DTC Confirmation Procedure", EC-175, again. 4. Perform "Diagnostic Test Mode II (Self-diagnostic results)". 5. Is the DTC 0301 or 0901 displayed again?	
Yes or No	
Yes	▶ Replace ECM.
No	▶ INSPECTION END

ECM Terminals and Reference Value

NJEC0744

Specification data are reference values and are measured between each terminal 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.

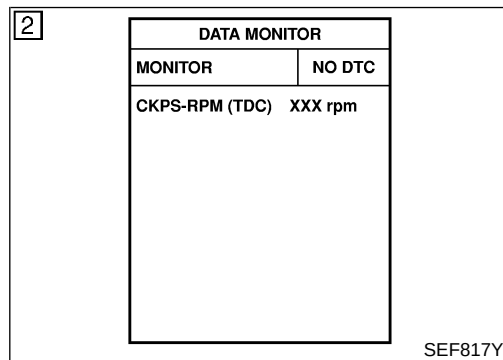
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
107 108 109	R R R	Power supply for ECM	[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
325	G	ECM relay (Self-shutoff)	[Ignition switch "ON"] [Ignition switch "OFF"] ● For a few seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
507	W/R	Ignition switch	[Ignition switch "OFF"]	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NJEC0745

This self-diagnosis has the one trip detection logic.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1620 0902	● An irregular voltage signal from the ECM relay is sent to ECM.	● Harness or connectors (ECM relay circuit is open or shorted.) ● ECM relay



DTC Confirmation Procedure

NJEC0746

Ⓔ WITH CONSULT-II

NJEC0746S01

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Turn ignition switch "OFF", wait at least 20 seconds and then turn "ON".
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-179.

ⓧ WITHOUT CONSULT-II

NJEC0746S02

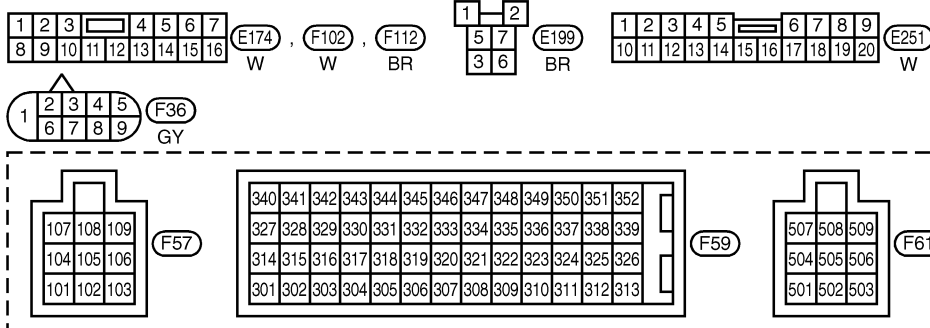
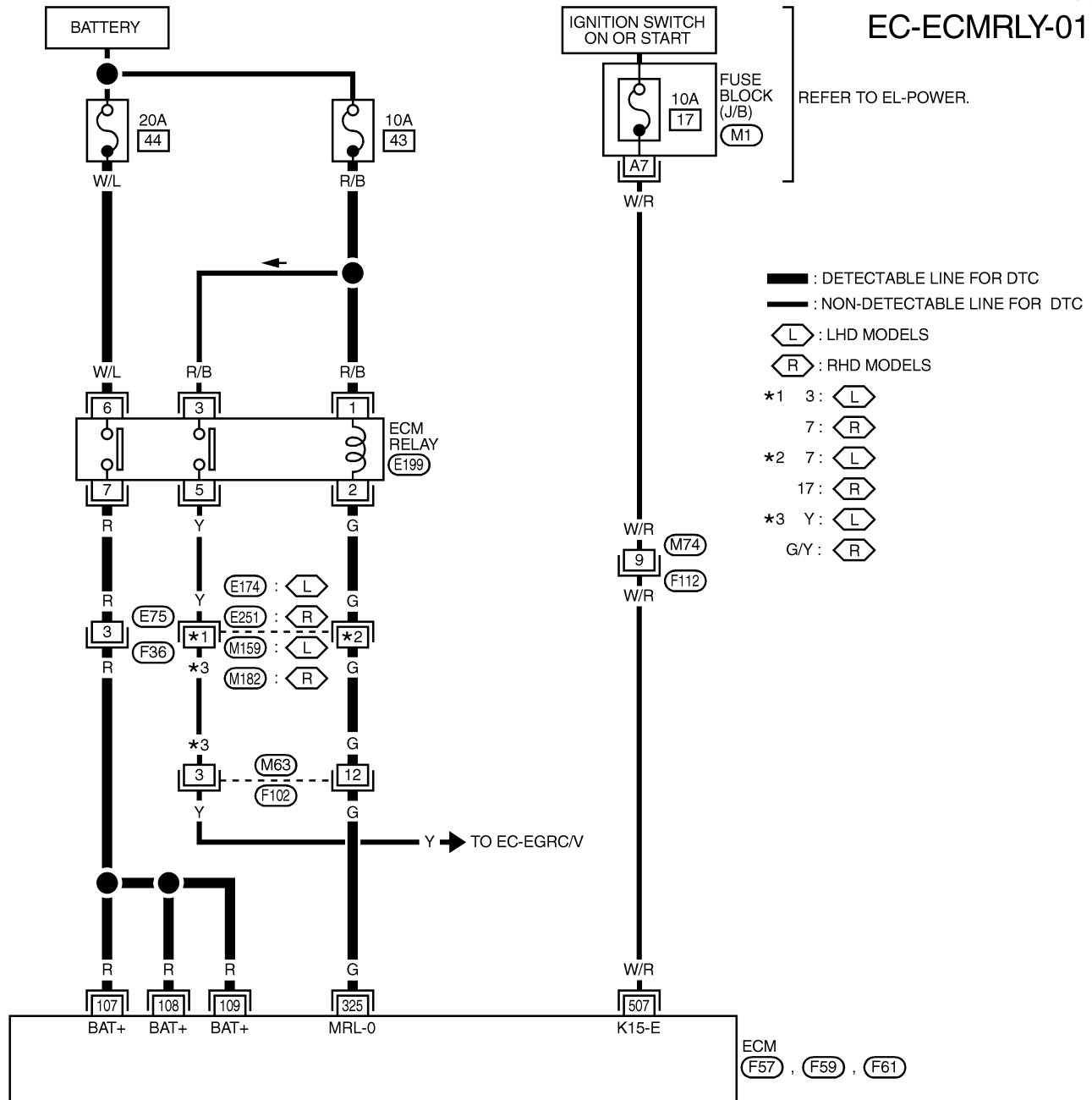
- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF", wait at least 20 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-179.

Wiring Diagram

NJEC0747

EC-ECMRLY-01

REFER TO EL-POWER.

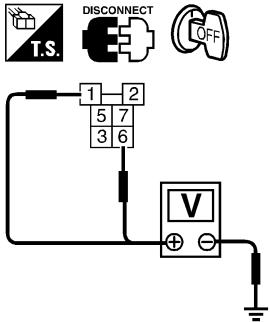


REFER TO THE FOLLOWING.

(M1) - FUSE BLOCK-
JUNCTION BOX (J/B)

Diagnostic Procedure

NJEC0748

1	CHECK ECM POWER SUPPLY CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect ECM relay. (For ECM relay location, refer to "Engine Control Component Parts Location".) 3. Check voltage between ECM terminals 1, 6 and ground with CONSULT-II or tester.	
 Voltage: Battery Voltage SEF399Y OK or NG	
OK	▶ GO TO 3.
NG	▶ GO TO 2.

2	DETECT MALFUNCTIONING PART
Check the following. • 20A fuse • 10A fuse • Harness for open and short between ECM relay and battery	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

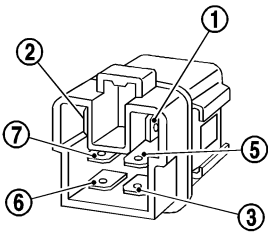
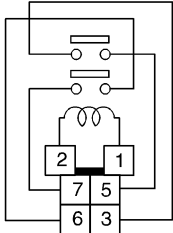
3	CHECK ECM INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminals 107, 108, 109 and ECM relay terminal 7. Refer to Wiring Diagram. Continuity should exist. 4. Also check harness for short to ground and short to power.	
OK or NG	
OK	▶ GO TO 5.
NG	▶ GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the following. 1. Harness connectors E75, F36 2. Harness for open and short between ECM and ECM relay	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

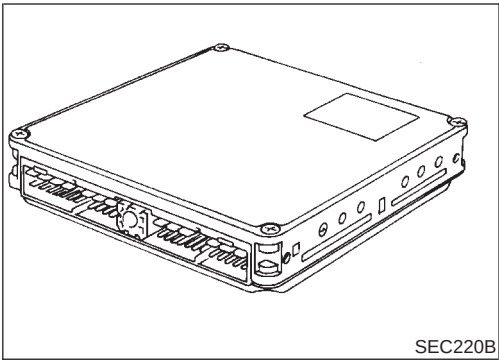
5	CHECK ECM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Check harness continuity between ECM terminal 325 and ECM relay terminal 2. Refer to Wiring Diagram. Continuity should exist. 2. Also check harness for short to ground and short to power.	
OK or NG	
OK	▶ GO TO 7.
NG	▶ GO TO 6.

Diagnostic Procedure (Cont'd)

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E174, M159 (LHD models) ● Harness connectors E251, M182 (RHD models) ● Harness connectors M63, F102 ● Harness for open and short between ECM and ECM relay	
▶ Repair open circuit or short to ground or short to power in harness or connectors.	

7	CHECK ECM RELAY						
1. Apply 12V direct current between ECM relay terminals 1 and 2. 2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.							
  <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Condition</th><th>Continuity</th></tr> </thead> <tbody> <tr> <td>12V direct current supply between terminals 1 and 2</td><td>Yes</td></tr> <tr> <td>OFF</td><td>No</td></tr> </tbody> </table>		Condition	Continuity	12V direct current supply between terminals 1 and 2	Yes	OFF	No
Condition	Continuity						
12V direct current supply between terminals 1 and 2	Yes						
OFF	No						
SEF296X							
OK or NG							
OK	▶ GO TO 8.						
NG	▶ Replace ECM relay.						

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.	
▶ INSPECTION END	



Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

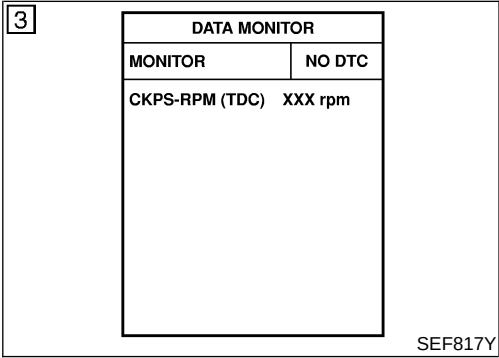
NJEC0749

On Board Diagnosis Logic

NJEC0750

This self-diagnosis has the one trip detection logic.
The MI will not light up for this self-diagnosis.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1621 0903	● ECM input signal processing function is malfunctioning.	● ECM (ECCS-D control module)



DTC Confirmation Procedure

NJEC0751

WITH CONSULT-II

NJEC0751S01

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Turn ignition switch "OFF", wait at least 20 seconds and then turn "ON".
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-182.

WITHOUT CONSULT-II

NJEC0751S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Turn ignition switch "OFF", wait at least 20 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-182.

Diagnostic Procedure

NJEC0752

1	INSPECTION START	
 With CONSULT-II 1. Turn ignition switch “ON”. 2. Select “SELF DIAG RESULTS” mode with CONSULT-II. 3. Touch “ERASE”. 4. Perform “DTC Confirmation Procedure”, EC-181, again. 5. Is the DTC P1621 displayed again?		
 Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-181, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0903 displayed again?		
Yes or No		
Yes	▶	Replace ECM.
No	▶	INSPECTION END

On Board Diagnosis Logic

NJEC1258

The ECM checks if battery voltage is within the tolerance range for the engine control system.

This self-diagnosis has the one trip detection logic.

The MI will not light up for this self-diagnosis.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1660 0502	An abnormally high or low voltage from the battery is sent to ECM.	- Incorrect jump starting - Battery - Alternator - ECM

DTC Confirmation Procedure

NJEC1259

 With CONSULT-II

- Check the following.
 - Jumper cables are connected for jump starting.
 - Battery or alternator has been replaced.
 If the result is "Yes" for one item or more, skip the following steps and go to "Diagnostic Procedure", EC-183.
- Check that the positive battery terminal is connected to battery properly. If NG, reconnect it properly.
- Check that the alternator functions properly. Refer to SC-29, "Trouble Diagnosis".
- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
- Wait one minute.
- If DTC is detected, go to "Diagnostic Procedure", EC-183.
If DTC is not detected, go to next step.
- Start engine and wait one minute at idle.
- If DTC is detected, go to "Diagnostic Procedure", EC-183.

 Without CONSULT-II

- Check the following.
 - Jumper cables are connected for jump starting.
 - Battery or alternator has been replaced.
 If the result is "Yes" for one item or more, skip the following steps and go to "Diagnostic Procedure", EC-183.
- Check that the positive battery terminal is connected to battery properly. If NG, reconnect it properly.
- Check that the alternator functions properly. Refer to SC-29, "Trouble Diagnosis".
- Turn ignition switch "ON" and wait one minute.
- Turn ignition switch "OFF", wait 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic result)" with ECM.
- If DTC is detected, go to "Diagnostic Procedure", EC-183.
If DTC is not detected, go to next step.
- Start engine and wait one minute at idle.
- Turn ignition switch "OFF", wait 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic result)" with ECM.
- If DTC is detected, go to "Diagnostic Procedure", EC-183.

Diagnostic Procedure

NJEC1260

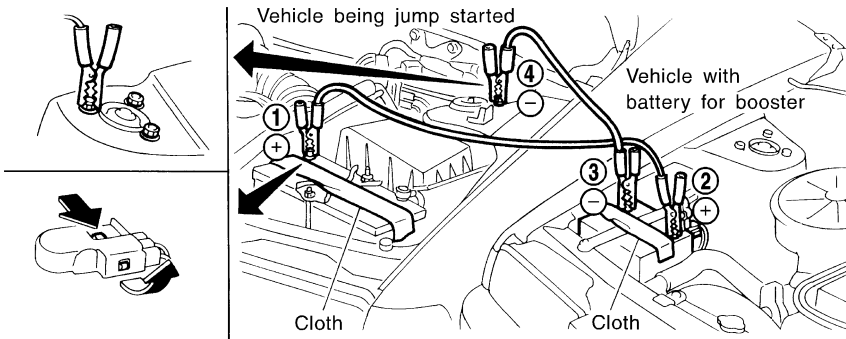
1	INSPECTION START	
Are jumper cables connected for the jump starting?		
Yes or No		
Yes	▶	GO TO 3.
No	▶	GO TO 2.

DTC P1660 BATTERY VOLTAGE

YD

Diagnostic Procedure (Cont'd)

2	CHECK BATTERY AND ALTERNATOR
Check that the proper type of battery and alternator is installed. Refer to SC-37, "Battery" and SC-38, "Alternator".	
OK or NG	
OK	▶ GO TO 5.
NG	▶ Replace with a proper one.

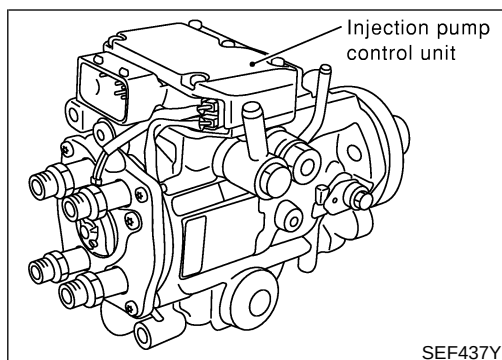
3	CHECK JUMPER CABLES INSTALLATION
Check that the jumper cables are connected in the correct sequence.	
	
OK or NG	
OK	▶ GO TO 4.
NG	▶ Reconnect jumper cables properly.

SEF439Z

4	CHECK BATTERY FOR BOOSTER
Check that the battery for the booster is a 12V battery.	
OK or NG	
OK	▶ GO TO 5.
NG	▶ Change the vehicle for booster.

5	PERFORM DTC CONFIRMATION PROCEDURE AGAIN
Perform "DTC Confirmation Procedure", EC-183, again.	
OK or NG	
OK	▶ GO TO 6.
NG	▶ Replace ECM.

6	CHECK ELECTRICAL PARTS DAMAGE
Check the following for damage.	
• Wiring harness and harness connectors for burn • Fuses for short	
OK or NG	
OK	▶ INSPECTION END
NG	▶ Repair or replace malfunctioning part.



Description

SYSTEM DESCRIPTION

NJEC0721

NJEC0721S01

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).

The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.

By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.

Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

NJEC0721S02

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

NJEC0721S03

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

NJEC0721S04

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

NJEC0721S05

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0722

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up, idle the engine.		Approx. 12 - 13°C
INT/A VOLUME	● Engine: After warming up, idle the engine.		Approx. 150 - 450 mg/st
F/CUT SIGNAL	● Engine: After warming up	Idle	ON

DTC P1690 P5-PUMP C/MODULE

YD

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION	SPECIFICATION
BARO SEN	Ignition switch: ON	Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm ² , 14.59 psi) Approx. 1,000 m (3,218 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm ² , 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm ² , 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm ² , 11.36 psi)

ECM Terminals and Reference Value

NJEC0723

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
313	L/W	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.1V
314	L/R	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 0.4V
316	PU	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V
317	P	Electronic control fuel injection pump	[Engine is running] - Warm-up condition - Idle speed	Approximately 2.5V

On Board Diagnosis Logic

NJEC0724

DTC	Malfunction is detected when	Check Items (Possible cause)
P1690 0705	Injection pump control unit does not function properly.	Electronic control fuel injection pump

2	DATA MONITOR	
	MONITOR	NO DTC
	CKPS-RPM (TDC) XXX rpm	
	SEF817Y	

DTC Confirmation Procedure

NJEC0725

WITH CONSULT-II

NJEC0725S01

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-187.

WITHOUT CONSULT-II

NJEC0725S02

- 1) Turn ignition switch "ON" and wait at least 2 seconds.

- 2) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-187.

Diagnostic Procedure

NJEC0726

1	INSPECTION START	
 With CONSULT-II 1. Turn ignition switch "ON". 2. Select "SELF DIAG RESULTS" mode with CONSULT-II. 3. Touch "ERASE". 4. Perform "DTC Confirmation Procedure", EC-186, again. 5. Is the DTC P1690 displayed again?		
 Without CONSULT-II 1. Turn ignition switch "ON". 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform "DTC Confirmation Procedure", EC-186, again. 4. Perform "Diagnostic Test Mode II (Self-diagnostic results)". 5. Is the DTC 0705 displayed again?		
Yes or No		
Yes	▶	Replace electronic control fuel injection pump.
No	▶	INSPECTION END

Description

SYSTEM DESCRIPTION

NJEC0760

NJEC0760S01

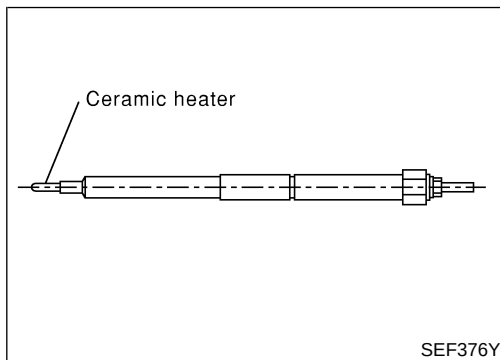
Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (TDC)	Engine speed	Glow control	Glow lamp, Glow relay
Engine coolant temperature sensor	Engine coolant temperature		↓ Glow plugs

When engine coolant temperature is more than approximately 75°C (167°F), the glow relay turns off.

When coolant temperature is lower than approximately 75°C (167°F):

- Ignition switch ON
After ignition switch has turned to ON, the glow relay turns ON for a certain period of time in relation to engine coolant temperature, allowing current to flow through glow plug.
- Cranking
The glow relay turns ON, allowing current to flow through glow plug.
- Starting
After engine has started, current continues to flow through glow plug (after-glow mode) for a certain period in relation to engine coolant temperature.

The glow indicator lamp turns ON for a certain period of time in relation to engine coolant temperature at the time glow relay is turned ON.



COMPONENT DESCRIPTION

NJEC0760S02

Glow Plug

NJEC0760S0201

The glow plug is provided with a ceramic heating element to obtain a high-temperature resistance. It glows in response to a signal sent from the ECM, allowing current to flow through the glow plug via the glow relay.

ECM Terminals and Reference Value

NJEC0761

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
214	W/B	Glow relay	Refer to "SYSTEM DESCRIPTION", EC-188.	
508	OR	Glow indicator lamp	[Ignition switch "ON"] ● Glow indicator lamp is "ON"	Approximately 1V
			[Ignition switch "ON"] ● Glow indicator lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)

GI

MA

EM

LC

EC

FE

CL

MT

AT

AX

SU

BR

ST

RS

BT

HA

SC

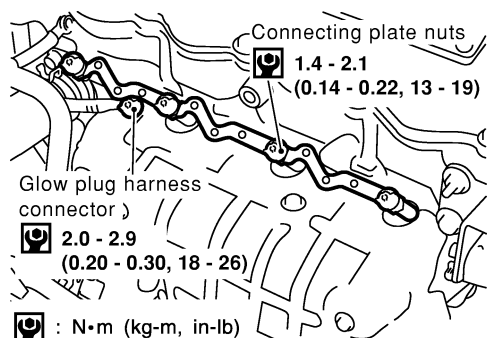
EL

IDX

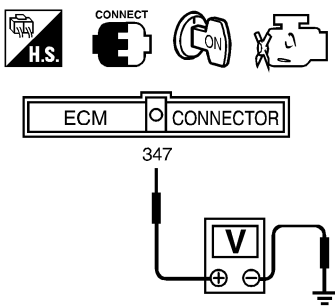
Diagnostic Procedure

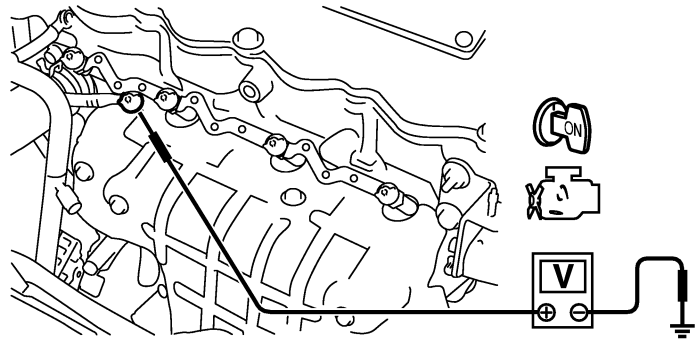
NJEC0763

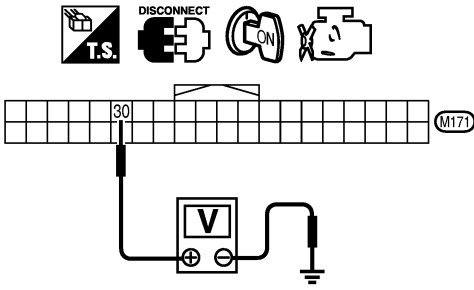
1	INSPECTION START
Check fuel level, fuel supplying system, starter motor, etc.	
OK or NG	
OK	▶ GO TO 2.
NG	▶ Correct.

2	CHECK INSTALLATION
Check that glow plug nut and all glow plug connecting plate nuts are installed properly.	
 Connecting plate nuts 1.4 - 2.1 (0.14 - 0.22, 13 - 19) Glow plug harness connector 2.0 - 2.9 (0.20 - 0.30, 18 - 26) : N•m (kg-m, in-lb)	
OK or NG	
OK (With CONSULT-II)	▶ GO TO 3.
OK (Without CONSULT-II)	▶ GO TO 4.
NG	▶ Install properly.

3	CHECK GLOW INDICATOR LAMP OPERATION						
With CONSULT-II 1. Turn ignition switch "ON". 2. Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-II. 3. Confirm that "COOLAN TEMP/S" indicates below 75°C (167°F). If it indicates above 75°C (167°F), cool down engine.							
<table border="1" data-bbox="682 1302 941 1617"> <thead> <tr> <th colspan="2">DATA MONITOR</th> </tr> <tr> <th>MONITOR</th><th>NO DTC</th></tr> </thead> <tbody> <tr> <td>COOLAN TEMP/S</td><td>XXX °C</td></tr> </tbody> </table>		DATA MONITOR		MONITOR	NO DTC	COOLAN TEMP/S	XXX °C
DATA MONITOR							
MONITOR	NO DTC						
COOLAN TEMP/S	XXX °C						
4. Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON". 5. Make sure that glow indicator lamp is turned "ON" for 1.5 seconds or more after turning ignition switch "ON", and then turned "OFF".							
OK or NG							
OK	▶ GO TO 5.						
NG	▶ GO TO 6.						

4	CHECK GLOW INDICATOR LAMP OPERATION						
⊗ Without CONSULT-II - Turn ignition switch "ON". - Confirm that the voltage between ECM terminal 347 (Engine coolant temperature sensor signal) and ground is above 1.36V. If it is below 1.36V, cool down engine.  Voltage: More than 1.36V SEF442Z - Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON". - Make sure that glow indicator lamp is turned "ON" for 1.5 seconds or more after turning ignition switch "ON", and then turned "OFF". OK or NG <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 20%;">OK</td> <td style="width: 10%; text-align: center;">▶</td> <td>GO TO 5.</td> </tr> <tr> <td>NG</td> <td style="text-align: center;">▶</td> <td>GO TO 6.</td> </tr> </table>		OK	▶	GO TO 5.	NG	▶	GO TO 6.
OK	▶	GO TO 5.					
NG	▶	GO TO 6.					

5	CHECK GLOW CONTROL SYSTEM OVERALL FUNCTION												
- Turn ignition switch "OFF". - Set voltmeter probe between glow plug and engine body. - Turn ignition switch "ON". - Check the voltage between glow plug and engine body under the following conditions.  <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Conditions</th> <th style="text-align: center;">Voltage</th> </tr> </thead> <tbody> <tr> <td>For 20 seconds after turning ignition switch "ON"</td> <td>Battery voltage</td> </tr> <tr> <td>More than 20 seconds after turning ignition switch "ON"</td> <td>Approx. 0V</td> </tr> </tbody> </table> SEF431Y OK or NG <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 20%;">OK</td> <td style="width: 10%; text-align: center;">▶</td> <td>INSPECTION END</td> </tr> <tr> <td>NG</td> <td style="text-align: center;">▶</td> <td>GO TO 11.</td> </tr> </table>		Conditions	Voltage	For 20 seconds after turning ignition switch "ON"	Battery voltage	More than 20 seconds after turning ignition switch "ON"	Approx. 0V	OK	▶	INSPECTION END	NG	▶	GO TO 11.
Conditions	Voltage												
For 20 seconds after turning ignition switch "ON"	Battery voltage												
More than 20 seconds after turning ignition switch "ON"	Approx. 0V												
OK	▶	INSPECTION END											
NG	▶	GO TO 11.											

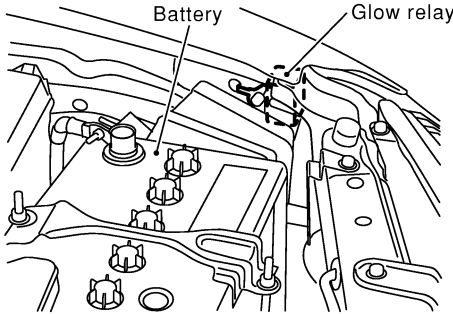
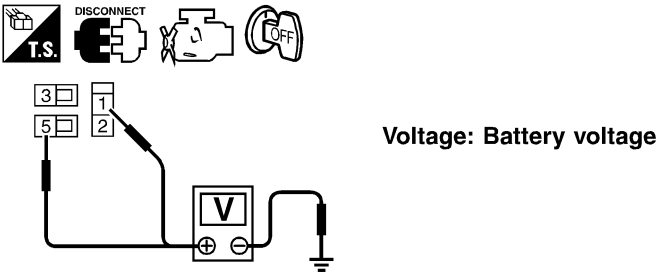
6	CHECK GLOW INDICATOR LAMP POWER SUPPLY CIRCUIT	
1. Turn ignition switch "OFF". 2. Disconnect combination meter harness connector M171. 3. Turn ignition switch "ON". 4. Check voltage between combination meter terminal 30 and ground with CONSULT-II or tester.		
 Voltage: Battery voltage YEC396A OK or NG		
OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART	
Check the following. 1. Fuse block (J/B) connector M1 2. 10A fuse 3. Harness for open or short between combination meter and fuse		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK GLOW INDICATOR LAMP OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Disconnect combination meter harness connector M171. 4. Check harness continuity between ECM terminal 508 and combination meter terminal 47. Refer to Wiring Diagram. Continuity should exist. 5. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART	
Check the following. 1. Harness connectors M63, F102 2. Harness for open or short between combination meter and ECM		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

10	CHECK COMBINATION METER	
Check combination meter and glow indicator lamp. Refer to EL-110, "Meter and Gauges".		
OK or NG		
OK	▶	GO TO 18.
NG	▶	Repair or replace combination meter or glow indicator lamp.

11	CHECK GLOW RELAY POWER SUPPLY CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect glow relay.	
	
3. Check voltage between glow relay terminals 1, 5 and ground with CONSULT-II or tester.	
	
OK or NG	
OK	▶ GO TO 13.
NG	▶ GO TO 12.

SEF391Y

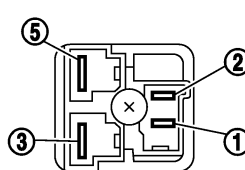
SEF420Y

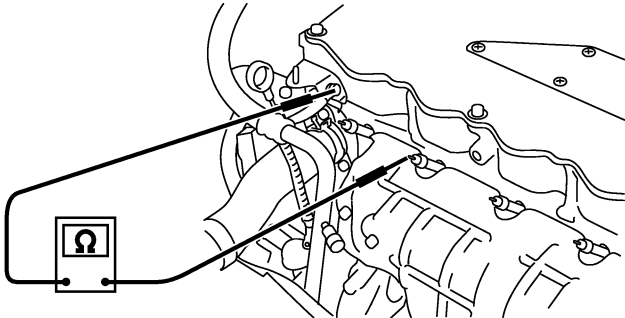
12	DETECT MALFUNCTIONING PART
Check the following. ● 60A fusible link ● Harness for open or short between glow relay and battery	
	▶ Repair harness or connectors.

13	CHECK GLOW RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 214 and glow relay terminal 2. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to ground and short to power.	
OK or NG	
OK	▶ GO TO 15.
NG	▶ GO TO 14.

14	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E75, F36 ● Harness for open or short between glow relay and ECM	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

15	CHECK HARNESS CONTINUITY BETWEEN GLOW RELAY AND GLOW PLUG FOR OPEN AND SHORT	
1. Disconnect glow plug harness connector. 2. Check harness continuity between glow relay terminal 3 and glow plug harness connector. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 16.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

16	CHECK GLOW RELAY							
Check continuity between glow relay terminals 3 and 5 under the following conditions.								
								
<table><tr><th>Conditions</th><th>Continuity</th></tr><tr><td>12V direct current supply between terminals 1 and 2</td><td>Yes</td></tr><tr><td>No current supply</td><td>No</td></tr></table>			Conditions	Continuity	12V direct current supply between terminals 1 and 2	Yes	No current supply	No
Conditions	Continuity							
12V direct current supply between terminals 1 and 2	Yes							
No current supply	No							
Operation takes less than 1 second.								
SEF433Y								
OK or NG								
OK	▶	GO TO 17.						
NG	▶	Replace glow relay.						

17	CHECK GLOW PLUG	
1. Remove glow plug connecting plate. 2. Check glow plug resistance.		
 Resistance: Approximately 0.8Ω [at 25°C (77°F)]		
SEF434Y		
NOTE: - Do not bump glow plug heating element. If it is bumped, replace glow plug with a new one. - If glow plug is dropped from a height of 10 cm (3.94 in) or higher, replace with a new one. - If glow plug installation hole is contaminated with carbon, remove it with a reamer or suitable tool. - Hand-tighten glow plug by turning it two or three times, then tighten using a tool to specified torque.  : 17.7 - 22.5 N·m (1.8 - 2.3 kg-m, 13 - 16 ft-lb)		
OK or NG		
OK	▶	GO TO 18.
NG	▶	Replace glow plug.

Diagnostic Procedure (Cont'd)

18	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.	
	INSPECTION END

Description

SYSTEM DESCRIPTION

NJEC0764

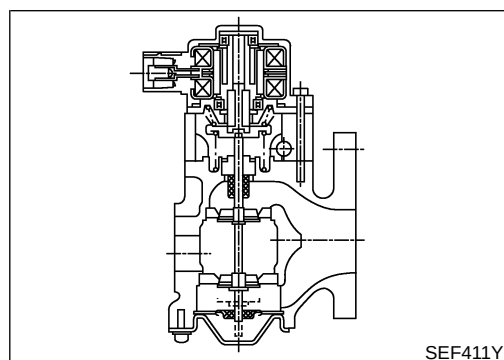
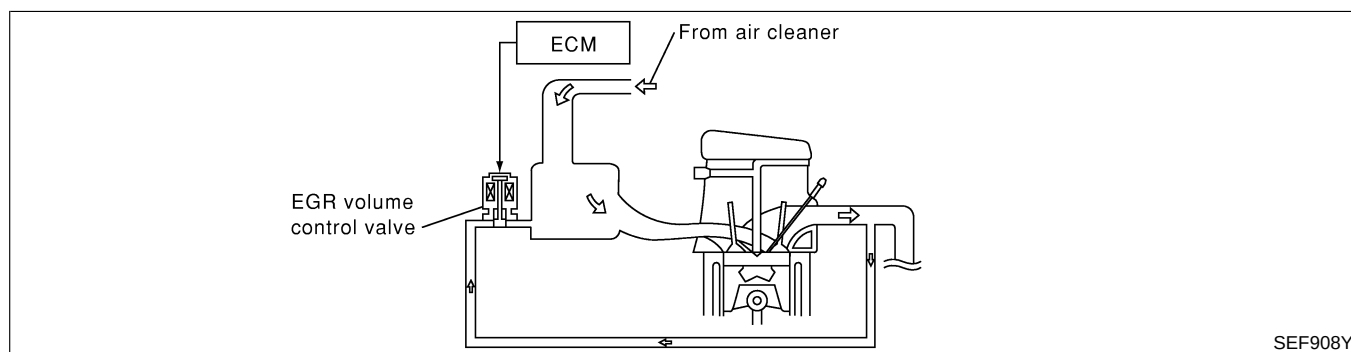
NJEC0764S01

Sensor	Input Signal to ECM	ECM Function	Actuator
Electronic controlled fuel injection pump	Fuel injection signal	EGR volume control	EGR volume control valve
Crankshaft position sensor (TDC)	Engine speed		
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Accelerator position sensor	Accelerator position		
Mass air flow sensor	Amount of intake air		
Air conditioner switch	Air conditioner operation		
Electrical load	Electrical load signal		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions.

The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle



COMPONENT DESCRIPTION

EGR Volume Control Valve

NJEC0764S02

NJEC0764S0201

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

CONSULT-II Reference Value in Data Monitor Mode

NJEC0765

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR VOL CON/V	- Engine: After warming up - Air conditioner switch: "OFF" - Shift lever: Neutral position - No-load	After one minute at idle	More than 10 step
		Revvng engine up to 3,200 rpm	0 step

ECM Terminals and Reference Value

NJEC0766

Specification data are reference values and are measured between each terminal 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.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage)
337 338 350 351	W/L PU/W GY OR/B	EGR volume control valve	[Engine is running] - Warm-up condition - Idle speed	0.1 - 14V (Voltage signals of each ECM terminals differ according to the control position of EGR volume control valve.)

Wiring Diagram

=NJE0767

EC-EGRC/V-01

GI

MA

EM

LC

EC

FE

CL

MT

AT

AX

SU

BR

ST

RS

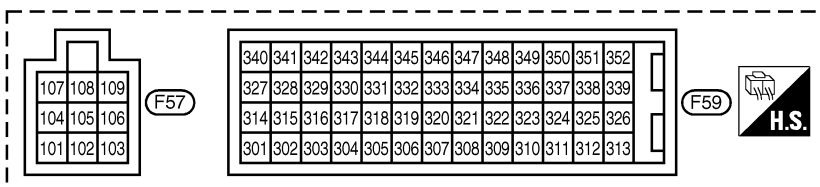
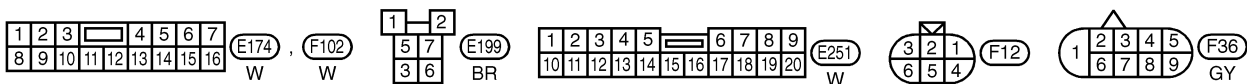
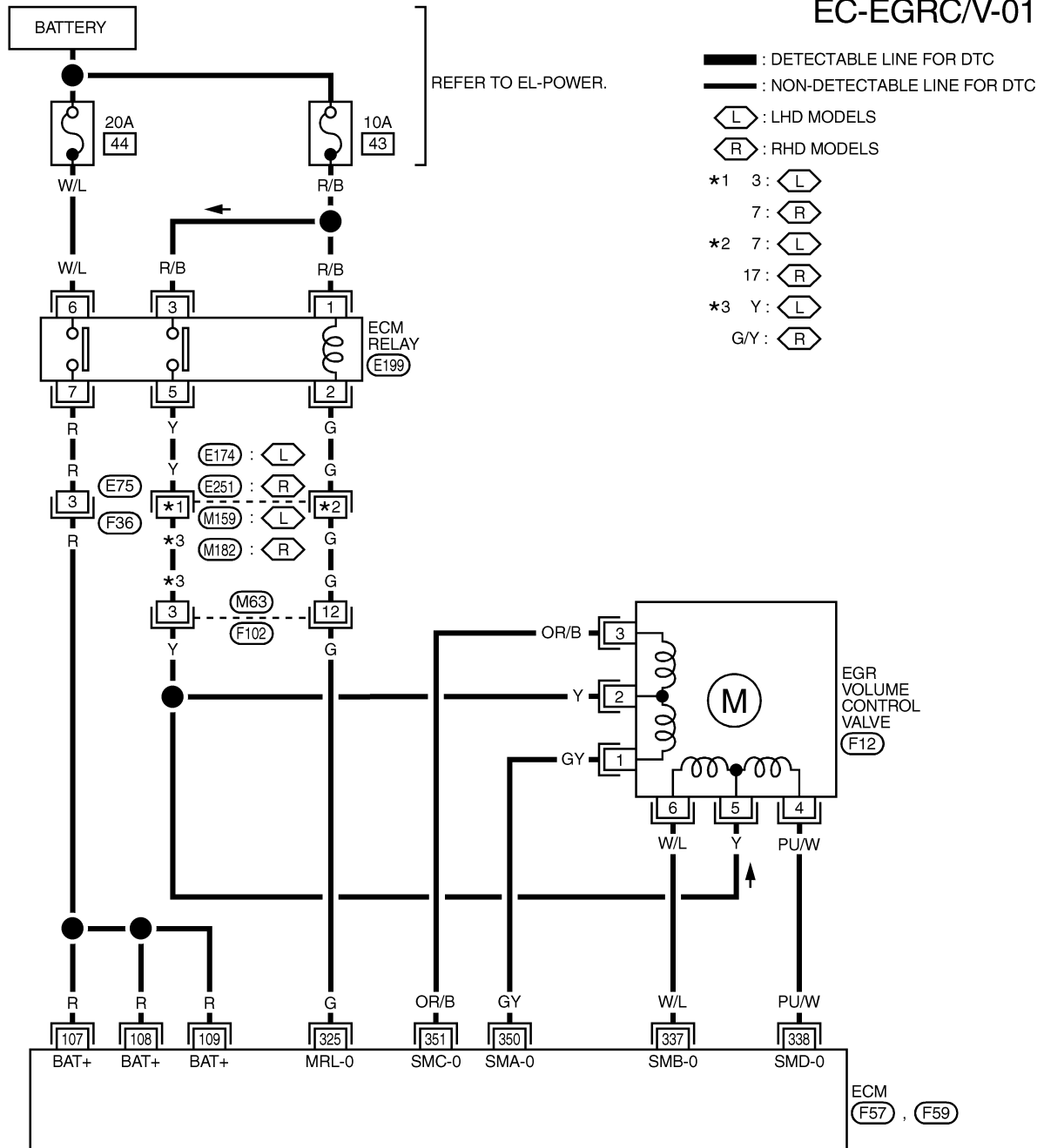
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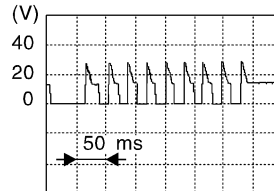
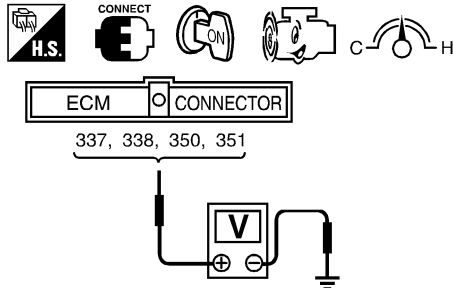


YEC329A

Diagnostic Procedure

NJEC0768

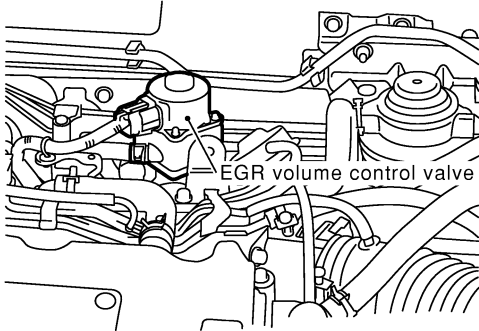
1	CHECK EGR VOLUME CONTROL SYSTEM OVERALL FUNCTION
1. Turn ignition switch "OFF". 2. Set the oscilloscope probe between ECM terminals 337, 338, 350, 351 and ground. 3. Start engine and let it idle. 4. Check the oscilloscope screen when revving engine up to 3,200 rpm and return to idle.	
OK	INSPECTION END
NG	GO TO 2.

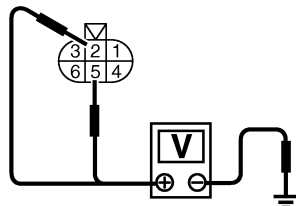


The pulse signal as shown left should appear.

SEF247Z

OK or NG

2	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-I
1. Turn ignition switch "OFF". 2. Disconnect EGR volume control valve harness connector.	
	
OK	GO TO 8.
NG	GO TO 3.



Voltage: Battery voltage

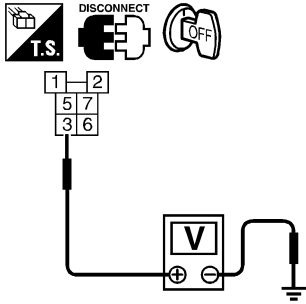
SEF388Y

YEC397A

OK or NG

3	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-II
1. Turn ignition switch "OFF". 2. Disconnect ECM relay. (For ECM relay location, refer to "Engine Control Component Parts Location".) 3. Check harness continuity between ECM relay terminal 5 and EGR volume control valve terminals 2 and 5. Refer to Wiring Diagram. Continuity should exist.	
OK or NG	
OK	▶ GO TO 5.
NG	▶ GO TO 4.

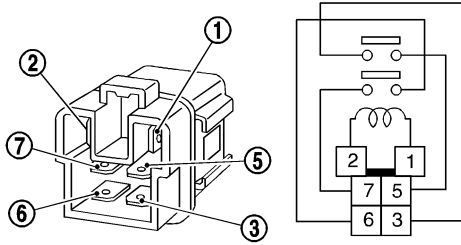
4	DETECT MALFUNCTIONING PART
Check the following. • Harness connectors E174, M159 (LHD models) • Harness connectors E251, M182 (RHD models) • Harness connectors M63, F102 • Harness for open or short between ECM relay and EGR volume control valve	
	▶ Repair open circuit or short to power in harness or connectors.

5	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-III
Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.	
 Voltage: Battery voltage	
SEF413Y	
OK or NG	
OK	▶ GO TO 7.
NG	▶ GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. • 10A fuse • Harness for open or short between ECM relay and battery	
	▶ Repair open circuit or short to ground or short to power in harness or connectors.

7 CHECK ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.



Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

SEF296X

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace ECM relay.

8 CHECK EGR VOLUME CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals and EGR volume control valve terminals as follows.
Refer to Wiring Diagram.

ECM terminal	EGR volume control valve
337	6
338	4
350	1
351	3

MTBL0463

Continuity should exist.

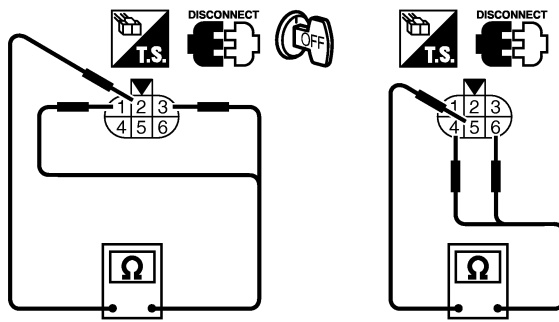
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 9.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

9 CHECK EGR VOLUME CONTROL VALVE-I

Check resistance between EGR volume control valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.



Resistance:
13 - 17Ω [At 20°C (68°F)]

YEC398A

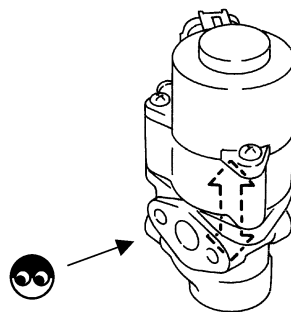
OK or NG

OK (With CONSULT-II) ►	GO TO 10.
OK (Without CONSULT-II) ►	GO TO 11.
NG ►	Replace EGR volume control valve.

10 CHECK EGR VOLUME CONTROL VALVE-II**With CONSULT-II**

1. Remove EGR volume control valve.
2. Reconnect ECM harness connector and EGR volume control valve harness connector.
3. Turn ignition switch "ON".
4. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
5. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening steps.

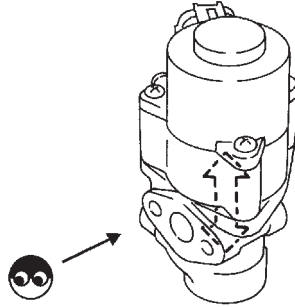
ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
CKPS-RPM (TDC)	XXX rpm



SEF819Y

OK or NG

OK ►	GO TO 12.
NG ►	Replace EGR volume control valve.

11	CHECK EGR VOLUME CONTROL VALVE-II	
Without CONSULT-II 1. Remove EGR volume control valve. 2. Reconnect ECM harness connector and EGR volume control valve harness connector. 3. Turn ignition switch "ON" and "OFF". 4. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.		
 SEF560W		
OK or NG		
OK	▶	GO TO 12.
NG	▶	Replace EGR volume control valve.

12	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.		
	▶	INSPECTION END

Wiring Diagram

NJEC0769

EC-S/SIG-01

GI

MA

EM

LC

EC

FE

CL

MT

AT

AX

SU

BR

ST

RS

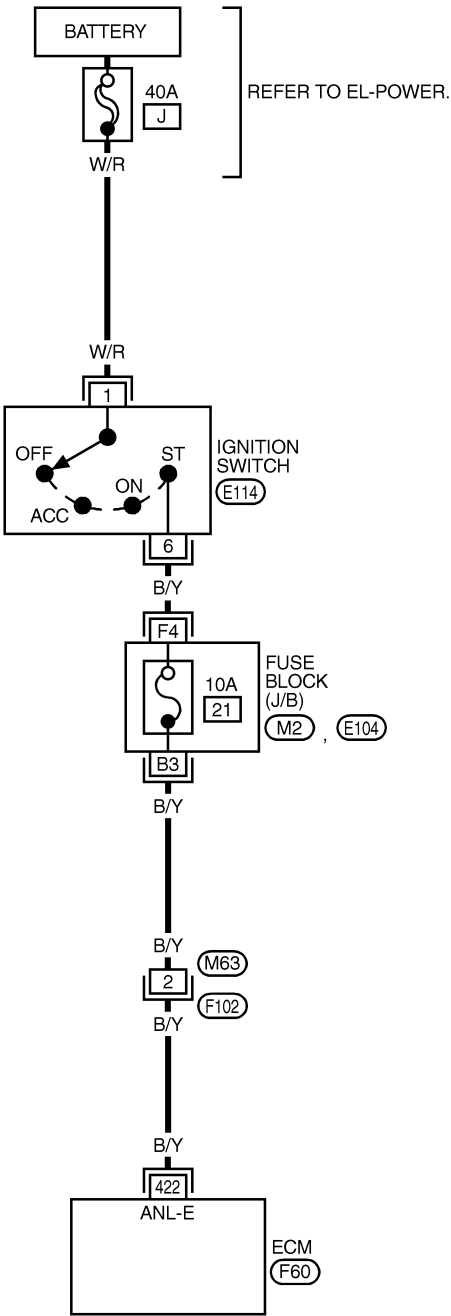
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IDX



— : DETECTABLE LINE FOR DTC
— : NON-DETECTABLE LINE FOR DTC

3	5	1
4	2	6

W

1	2	3		4	5	6	7	
8	9	10	11	12	13	14	15	16

F102
W

431	432	433	434	435	436	437	438	439	440
421	422	423	424	425	426	427	428	429	430
411	412	413	414	415	416	417	418	419	420
401	402	403	404	405	406	407	408	409	410

F60



REFER TO THE FOLLOWING.
(M2), (E104) - FUSE BLOCK-
JUNCTION BOX (J/B)

Diagnostic Procedure

NJEC0770

1 CHECK START SIGNAL OVERALL FUNCTION **With CONSULT-II**

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

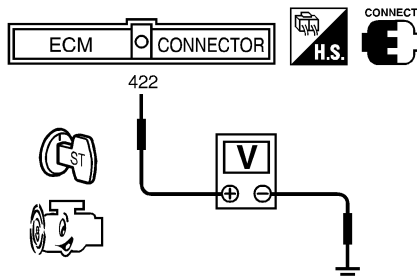
DATA MONITOR	
MONITORING	NO FAIL
START SIGNAL	OFF
CLSD TH/P SW	ON
AIR COND SIG	OFF
P/N POSI SW	ON

Condition	"START SIGNAL"
Ignition switch "ON"	OFF
Ignition switch "START"	ON

SEF604X

 Without CONSULT-II

Check voltage between ECM terminal 422 and ground under the following conditions.



Condition	Voltage
Ignition switch "START"	Battery voltage
Other positions	Approximately 0V

SEF909Y

OK or NG

OK	▶	INSPECTION END
NG	▶	GO TO 2.

2 CHECK START SIGNAL INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and ignition switch harness connector.
3. Check harness continuity between ECM terminal 422 and ignition switch terminal 6. Refer to Wiring Diagram.
Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M63, F102
- 10A fuse
- Fuse block (J/B) connectors M2, E104
- Harness for open or short between ECM and ignition switch

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

START SIGNAL

YD

Diagnostic Procedure (Cont'd)

4	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.	
▶	INSPECTION END

GI

MA

EM

LC

EC

FE

CL

MT

AT

AX

SU

BR

ST

RS

BT

HA

SC

EL

IDX

Description

Description

When the gear position is in "Neutral", neutral position is "ON". ECM detects the position because the continuity of the line (the "ON" signal) exists. NJEC0781

CONSULT-II Reference Value in Data Monitor Mode

NJEC0782

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: Neutral	ON
		Except above	OFF

On models not equipped with park/neutral position (PNP) switch, "OFF" is always displayed regardless of gear shift position.

ECM Terminals and Reference Value

NJEC0783

Specification data are reference values and are measured between each terminal 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.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
418	G/OR	Park/Neutral position switch	[Ignition switch "ON"] ● Gear position is "Neutral"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

NJEC0784

EC-PNP/SW-01

GI

MA

EM

LC

EC

FE

CL

MT

AT

AX

SU

BR

ST

RS

BT

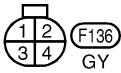
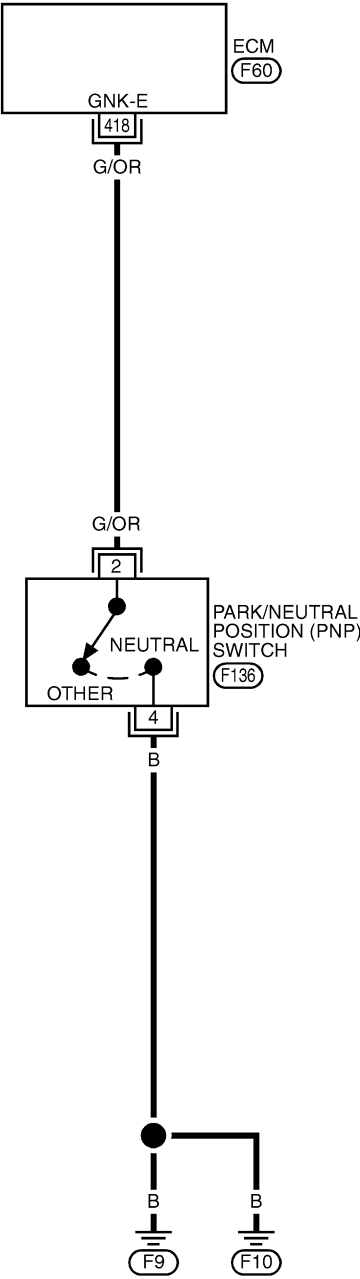
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IDX

— : DETECTABLE LINE FOR DTC
— : NON-DETECTABLE LINE FOR DTC



431	432	433	434	435	436	437	438	439	440
421	422	423	424	425	426	427	428	429	430
411	412	413	414	415	416	417	418	419	420
401	402	403	404	405	406	407	408	409	410



Diagnostic Procedure

NJEC0785

1 CHECK OVERALL FUNCTION **With CONSULT-II**

1. Turn ignition switch "ON".
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check "P/N POSI SW" signal under the following conditions.

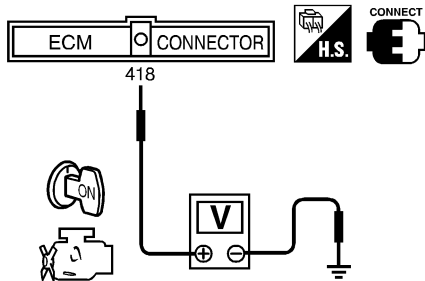
DATA MONITOR	
MONITOR	NO DTC
P/N POSI SW	ON

Shift lever position	P/N POSI SW
Neutral position	ON
Except the above position	OFF

SEF049Y

 Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 418 and ground under the following conditions.

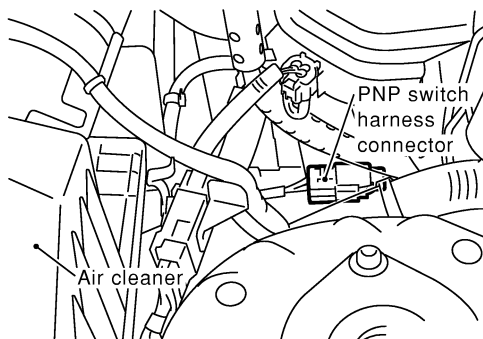


Condition (Gear position)	Voltage V
Neutral position	Approx. 0V
Except the above position	Battery voltage

SEF914Y

OK or NG

OK	►	INSPECTION END
NG	►	GO TO 2.

2	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT	
1. Turn ignition switch "OFF". 2. Disconnect park/neutral position (PNP) switch harness connector.  PNP switch harness connector Air cleaner 3. Check harness continuity between PNP switch terminal 4 and body ground. Refer to Wiring Diagram. Continuity should exist. 4. Also check harness for short to power. OK or NG		
OK	▶	GO TO 3.
NG	▶	Repair open circuit or short to power in harness or connectors.

SEF393Y

3	CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 418 and PNP switch terminal 2. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to ground and short to power.		
OK or NG		
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

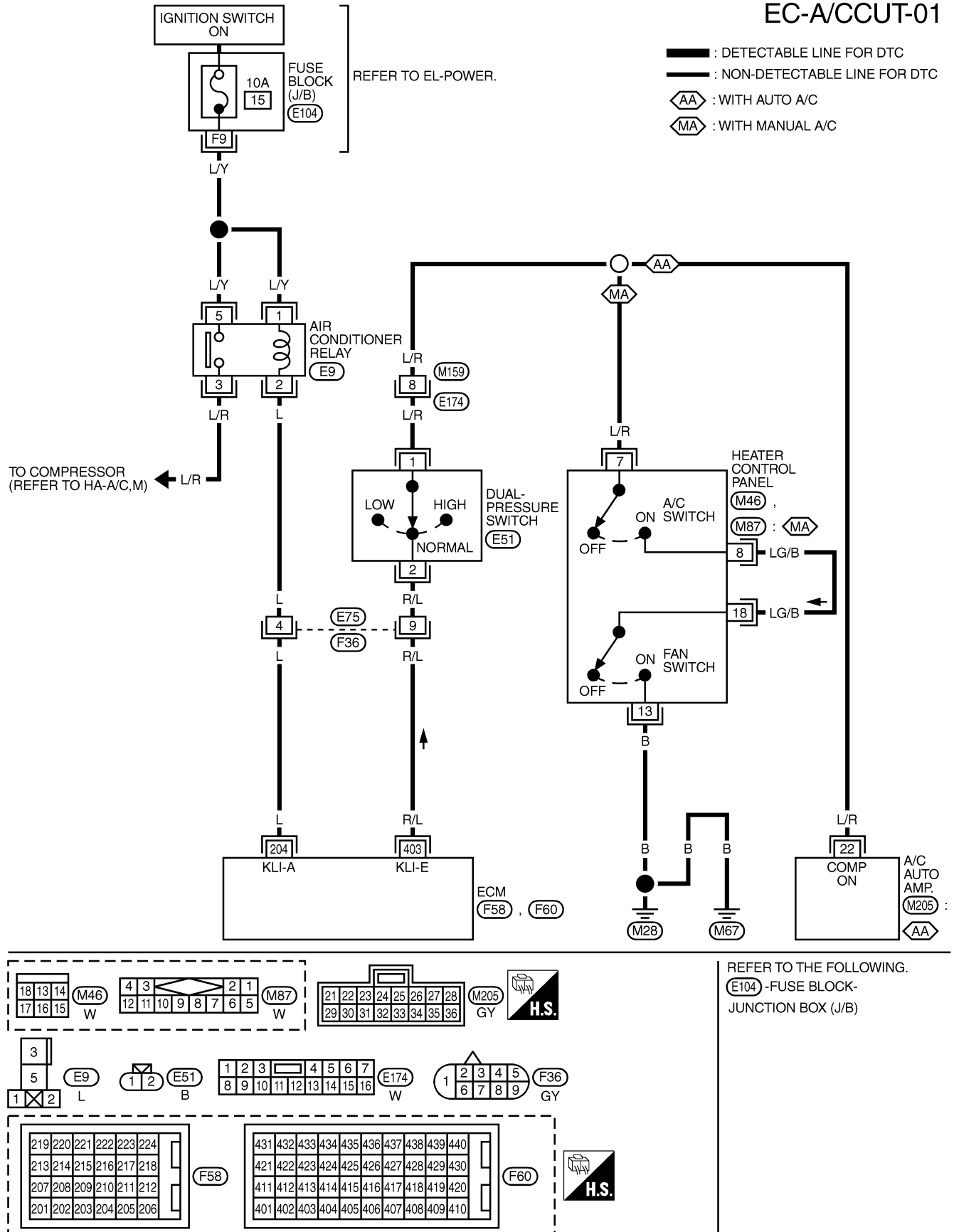
4	CHECK PARK/NEUTRAL POSITION (PNP) SWITCH	
Refer to MT-21, "Position Switch Check".		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace park/neutral position (PNP) switch.

5	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-71.		
	▶	INSPECTION END

Wiring Diagram

NJEC0786

EC-A/CCUT-01



YEC331A

Wiring Diagram

NJEC0787

EC-MIL/DL-01

GI

MA

EM

LC

EC

FE

CL

MT

AT

AX

SU

BR

ST

RS

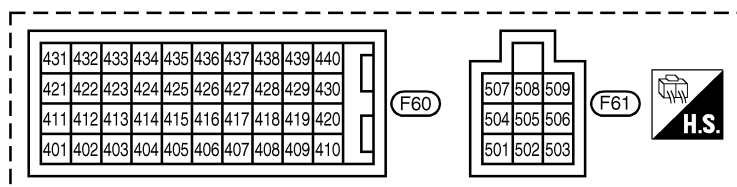
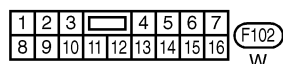
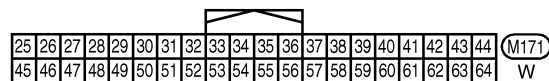
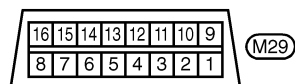
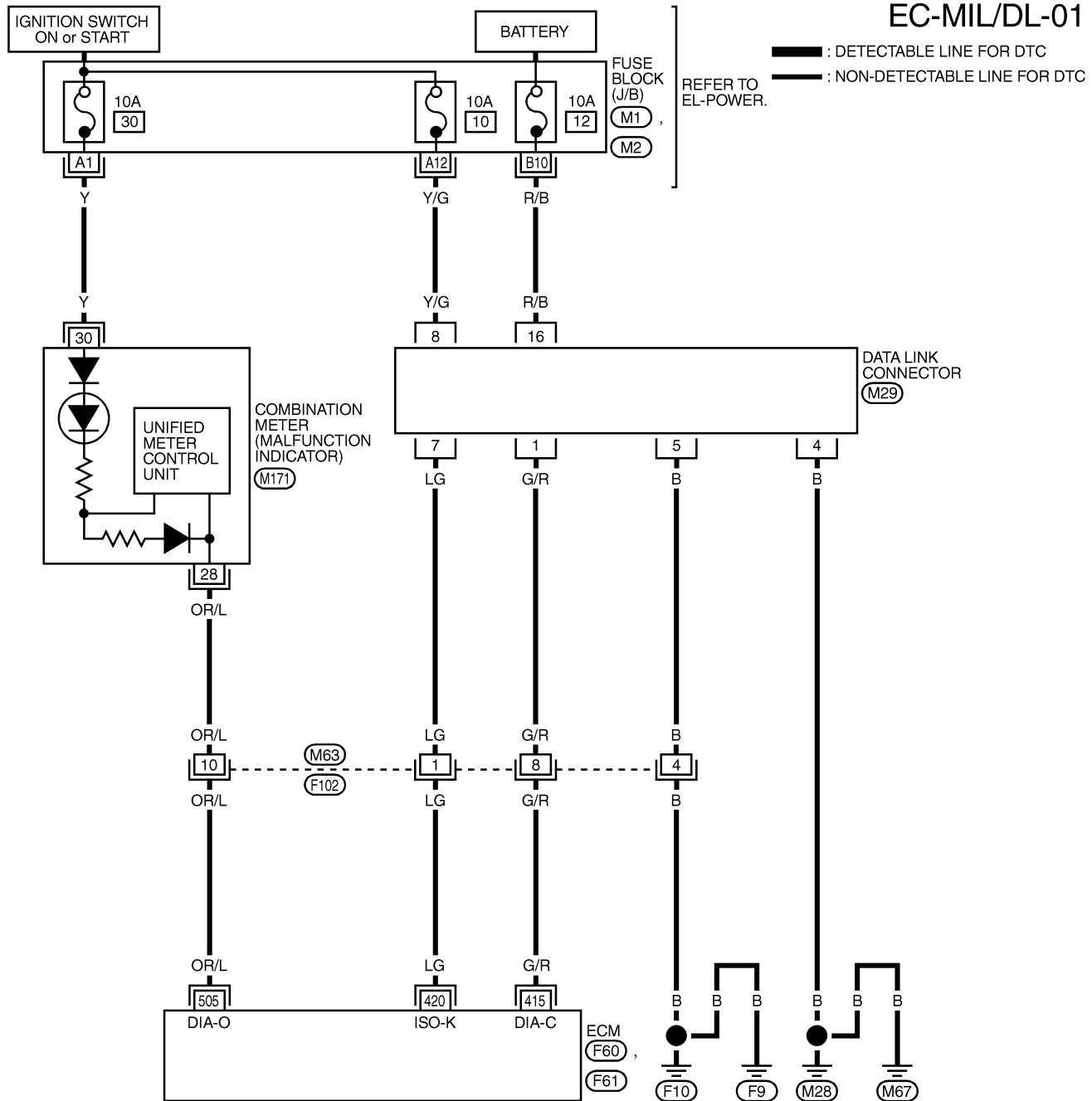
BT

HA

SC

EL

IDX



REFER TO THE FOLLOWING.

M1, M2 - FUSE BLOCK-JUNCTION BOX (J/B)

YEC332A

General Specifications

NJEC0788
Unit: rpm

Engine	YD22DDT
Idle speed	725±25
Maximum engine speed	4,900

Injection Nozzle

NJEC0790
Unit: kPa (bar, kg/cm², psi)

Initial injection pressure	New	21,476 - 22,457 (214.7 - 224.5, 219 - 229, 3,114 - 3,256)
	Limit	18,275 (182.7, 186, 2,650)

Engine Coolant Temperature Sensor

NJEC0791

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

Crankshaft Position Sensor (TDC)

NJEC0792

Resistance [at 20°C (68°F)] Ω	495 - 605
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Glow Plug

NJEC0793

Resistance [at 25°C (77°F)] Ω	0.8
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Accelerator Position Sensor

NJEC0794

Throttle valve conditions	Resistance between terminals 2 and 4 kΩ [at 25°C (77°F)]
Completely closed	0.9 - 1.3
Partially open	0.9 - 2.1
Completely open	1.7 - 2.1

EGR Volume Control Valve

NJEC0795

Resistance [at 25°C (77°F)] Ω	13 - 17
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