ENGINE CONTROL SYSTEM

SECTION EC

EC

CONTENTS

CD20T

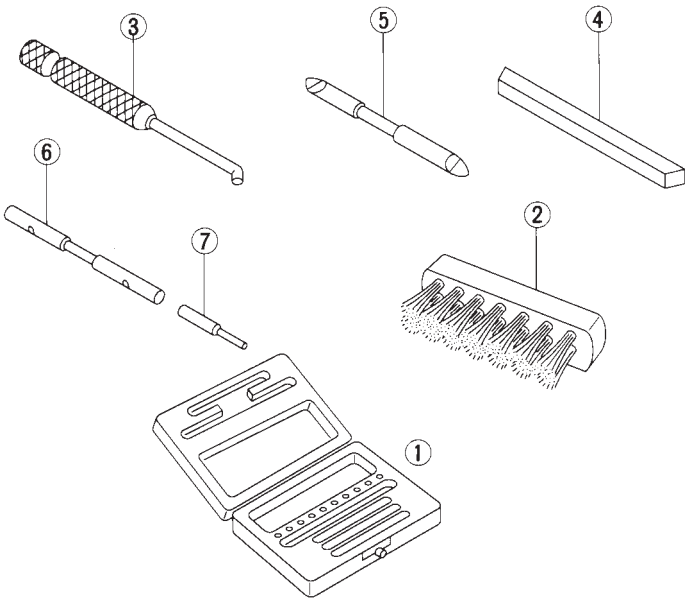
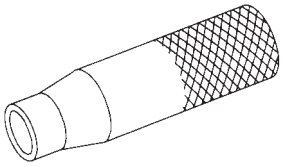
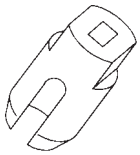
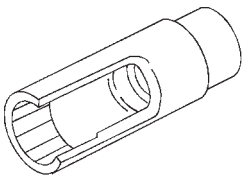
When you read wiring diagrams:
- **Read GI section, ''HOW TO READ WIRING DIAGRAMS''.**
- **See EL section, ''POWER SUPPLY ROUTING'' for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

When you perform trouble diagnoses, read GI section, ''HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES'' and ''HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT''.

For clarification of system component abbreviations and terminology read GI section ''SAE J1930 TERMINOLOGY LIST''.

Special Service Tools

X: Applicable
—: Not applicable

Tool number Tool name	Description	
KV11289004 Nozzle cleaning kit ① KV11290012 Box ② KV11290110 Brush ③ KV11290122 Nozzle oil sump scraper ④ KV11290140 Nozzle needle tip cleaner ⑤ KV11290150 Nozzle seat scraper ⑥ KV11290210 Nozzle holder ⑦ KV11290220 Nozzle hole cleaning needle	 NT296	X
KV11292010 Nozzle centering device	 NT293	X
KV11100300 No. 2-4 injection nozzle holder socket	 NT563	X
KV119E0030 No. 1 injection nozzle holder socket	 NT648	X

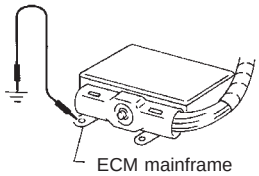
Engine Fuel & Emission Control System

ECM (ECCS-D control module)
- 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.

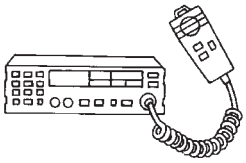
WIRELESS EQUIPMENT
- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.

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 small.
4) Be sure to ground the radio to vehicle body.

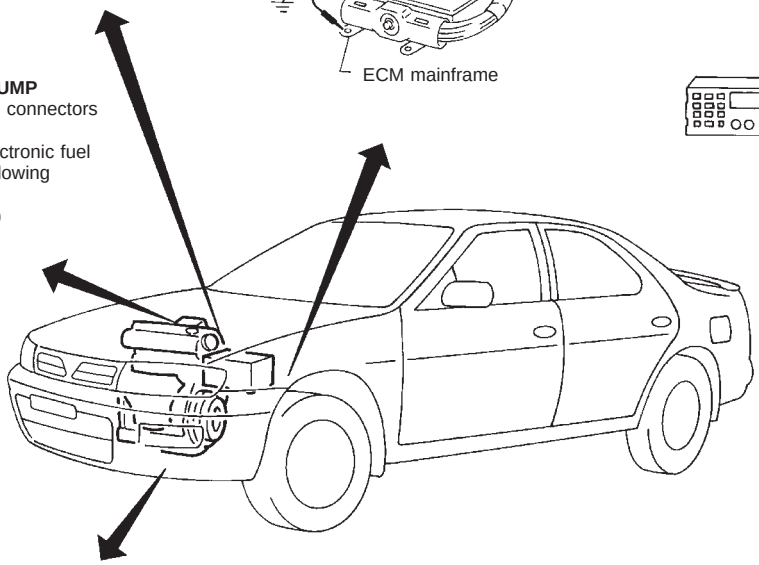
BATTERY
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

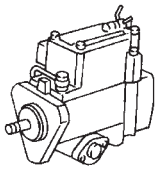


ECM mainframe

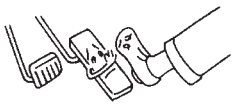


ELECTRONIC FUEL INJECTOR PUMP
- Do not disconnect pump harness connectors with engine running.
- Do not disassemble or adjust electronic fuel injection pump, except for the following parts.
  Camshaft position sensor (pump)
  Injection timing control valve
  Fuel cut solenoid valve





ECM PARTS HANDLING
- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble No. 1 injection nozzle (built-in needle lift sensor).
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft 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
- Connect ECM harness connectors securely. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, 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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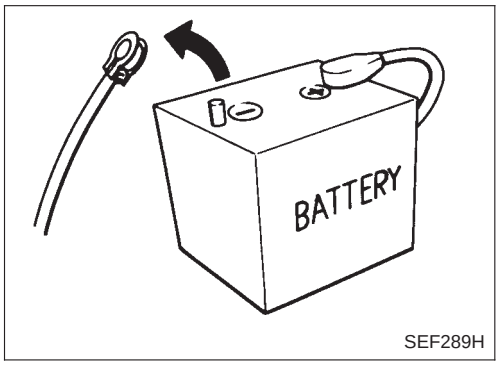
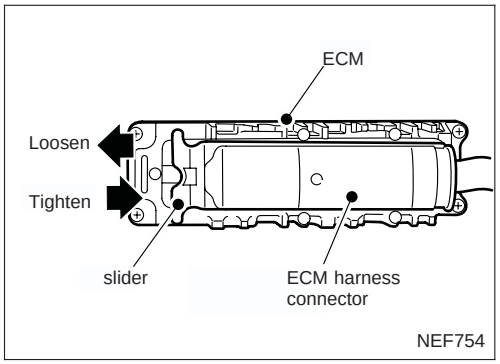
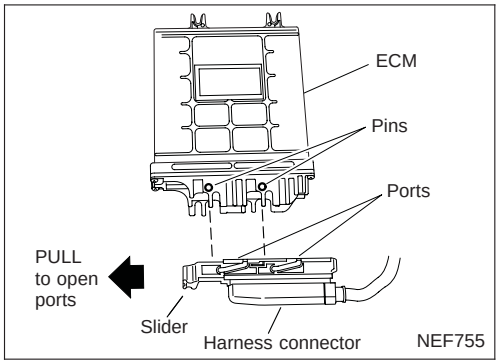


Precautions

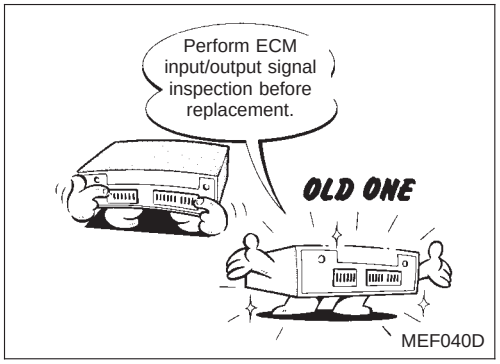
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**



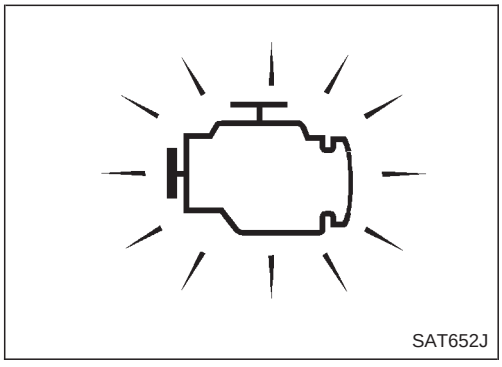
- **When connecting ECM harness connector, open the ports on harness connector, then meet the ports with the pins on the ECM as shown. Push slider on harness until it stops.**



- **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.

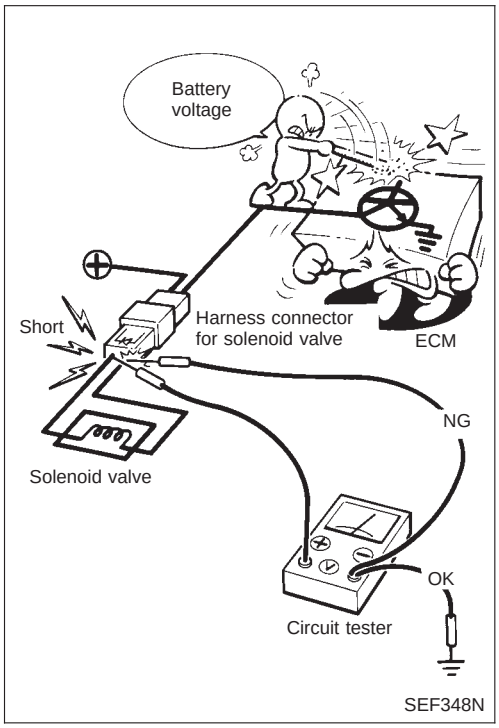


- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-CD-55.**



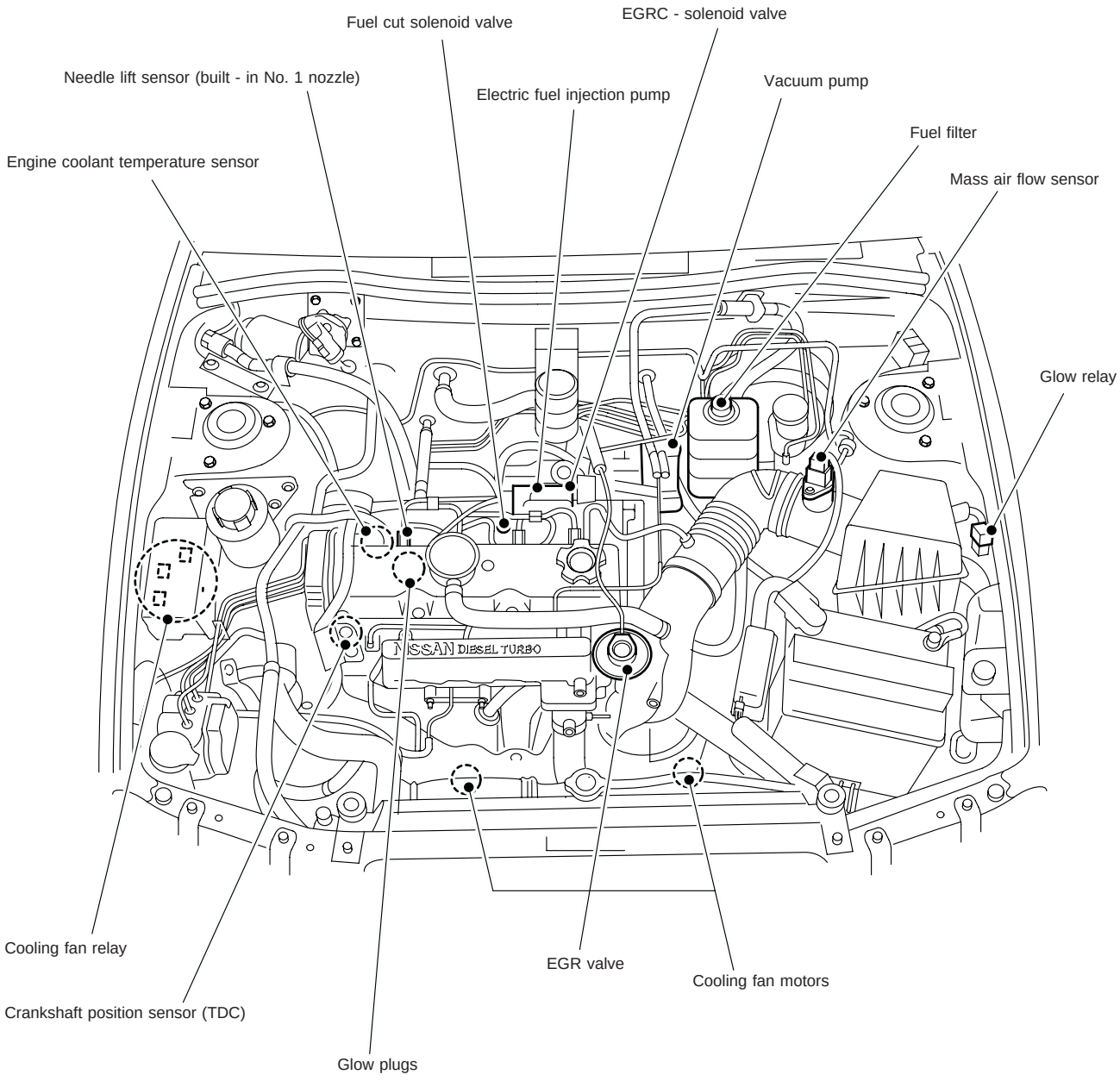
- **If MI illuminates or blinks irregularly during engine running, water may have accumulated in fuel filter. Drain water from fuel filter. If this does not correct the problem, perform specified trouble diagnostic procedures.**
- **After performing each TROUBLE DIAGNOSIS, perform ''OVERALL FUNCTION CHECK'' or ''DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE''.**
  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 (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.

Engine Control Module Component Parts Location



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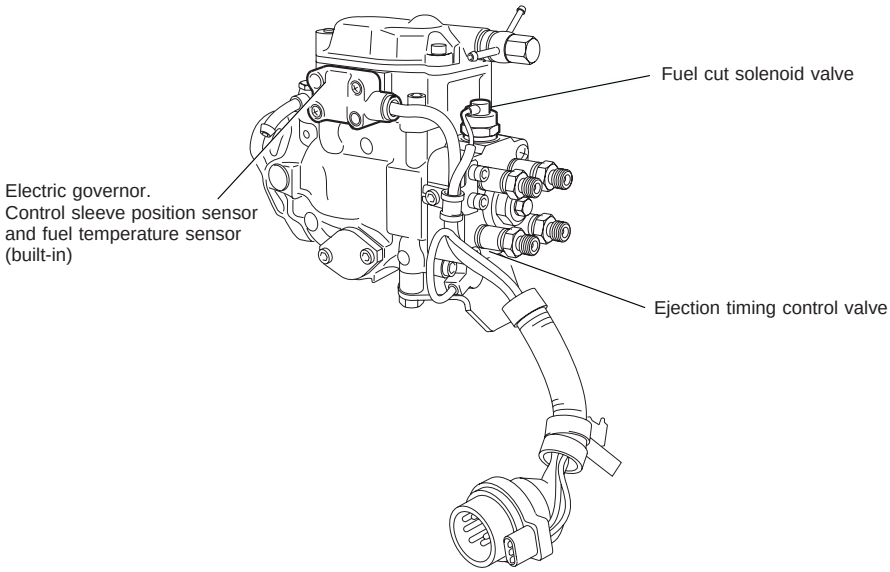
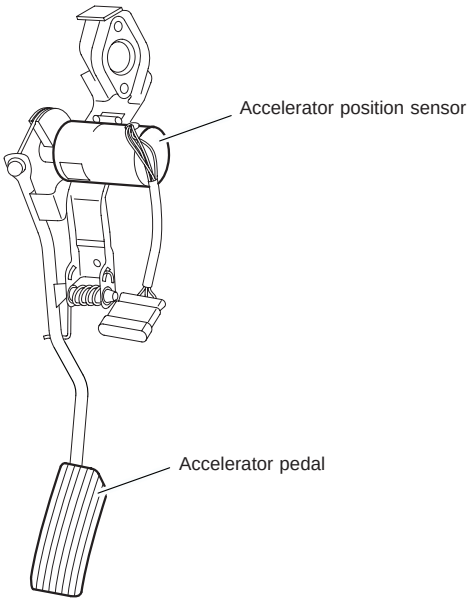
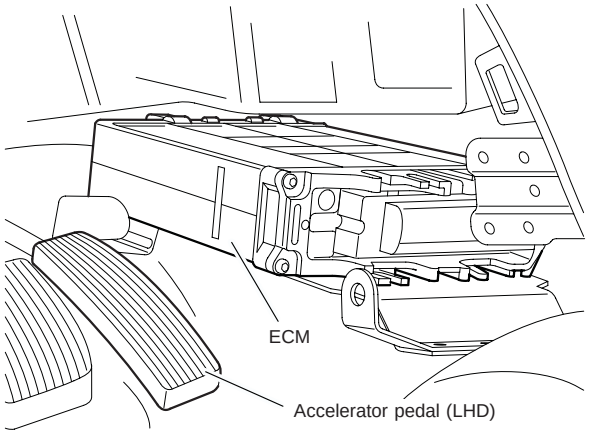
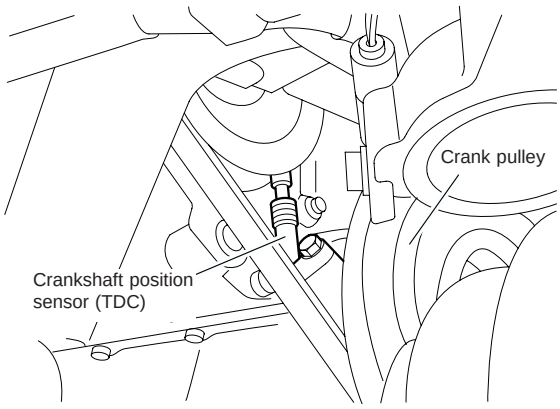
Engine Control Module Component Parts Location (Cont'd)









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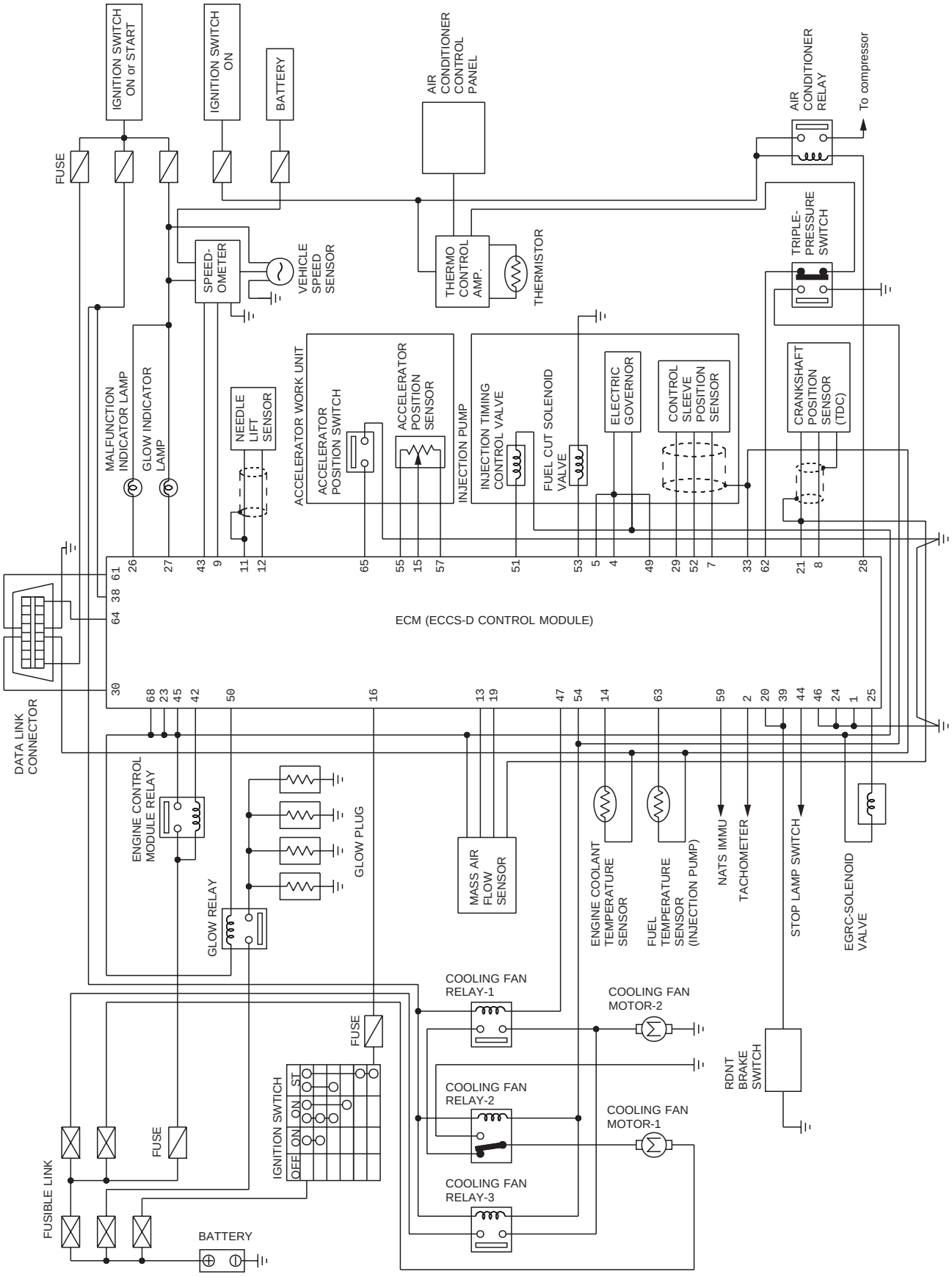
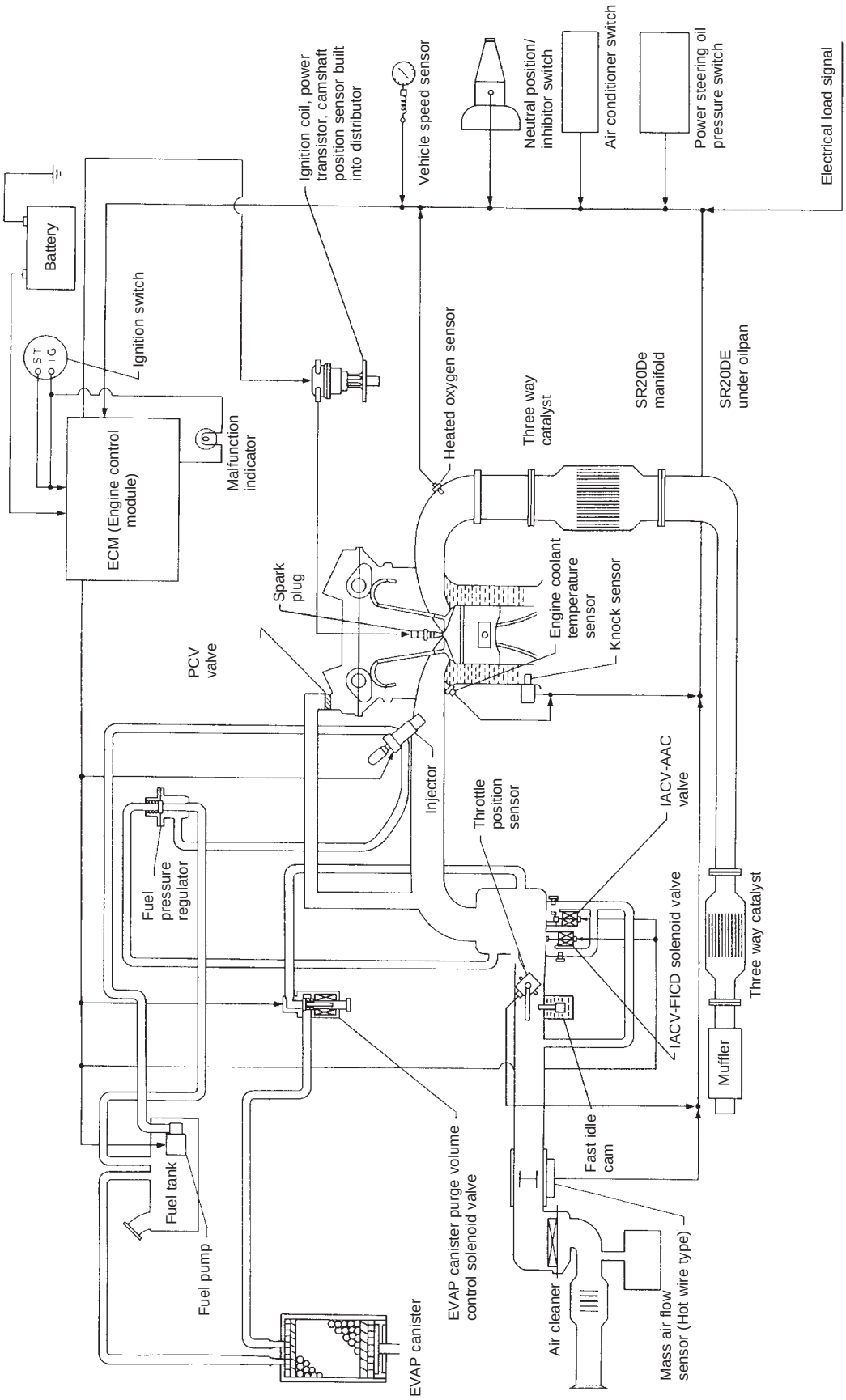
Circuit Diagram



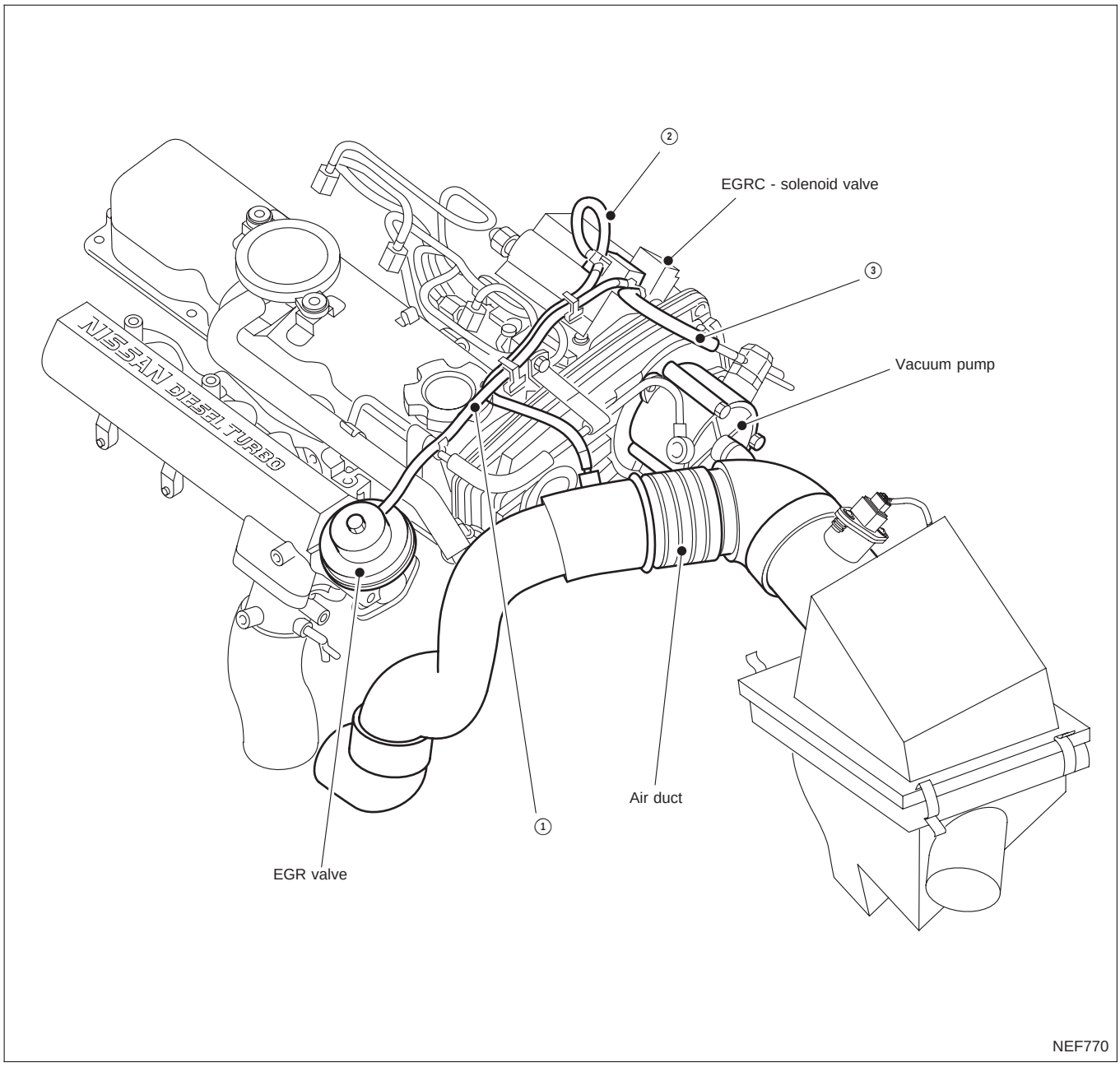
YEC080

System Diagram



SEF830S

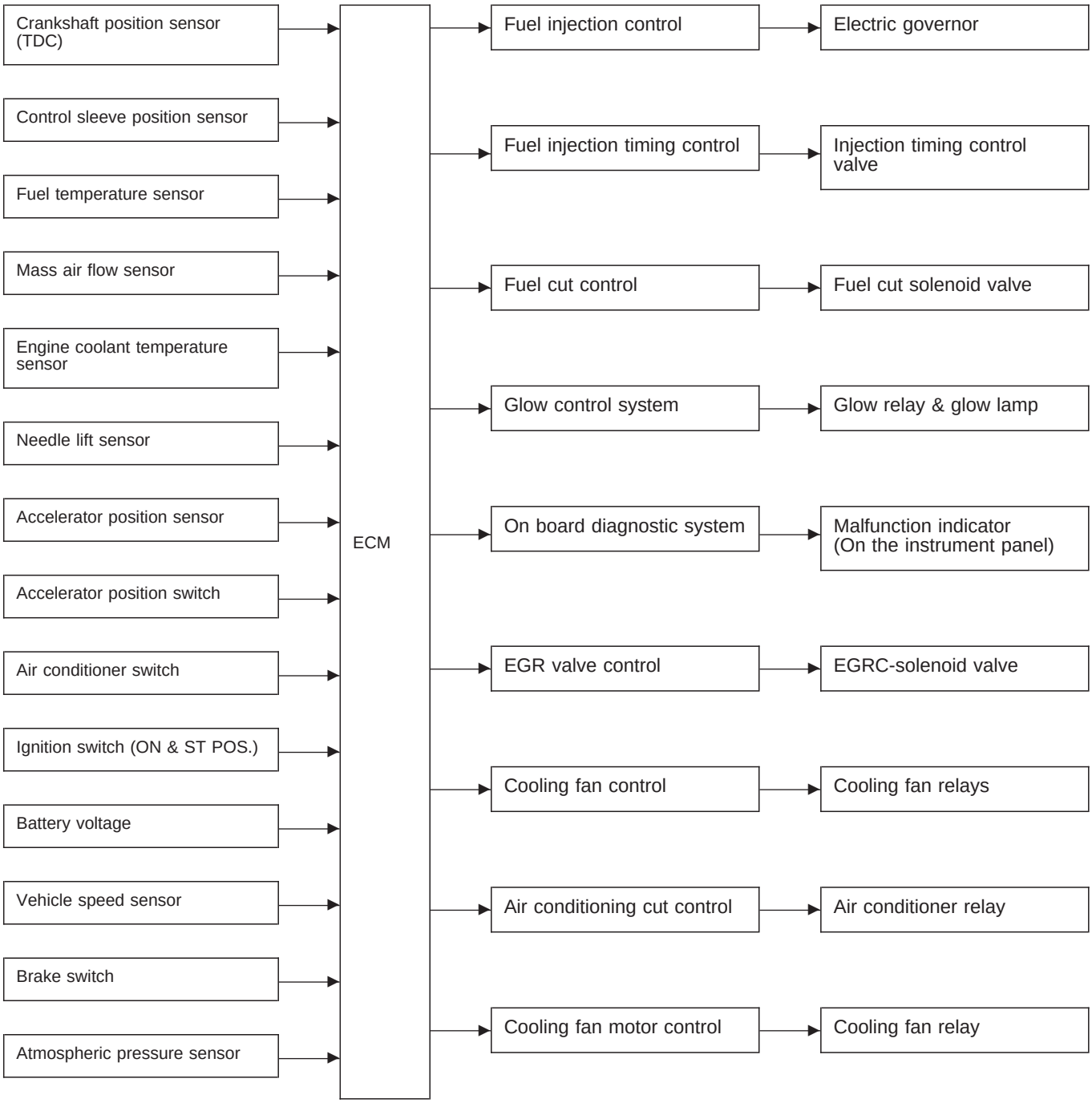
Vacuum Hose Drawing



① EGRC-solenoid valve to EGR valve
② EGRC-solenoid valve to air duct
③ EGRC-solenoid valve to vacuum pump

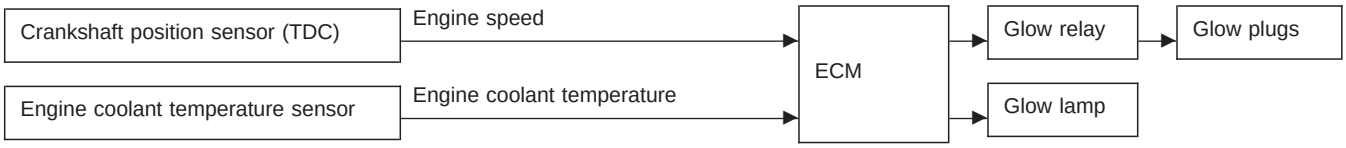
Refer to ‘‘System Diagram’’ on previous page for vacuum control system.

System Chart



Glow Control System

SYSTEM DESCRIPTION



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

- Ignition switch ON
  After the ignition switch has been turned to ON, the glow relay turns ON for a period of time depending on the engine coolant temperature, allowing current to flow through the glow plugs.
- Starting
  After starting the engine, current will flow through the glow plugs for 300 seconds, or until the coolant temperature exceeds 50°C (122°F).

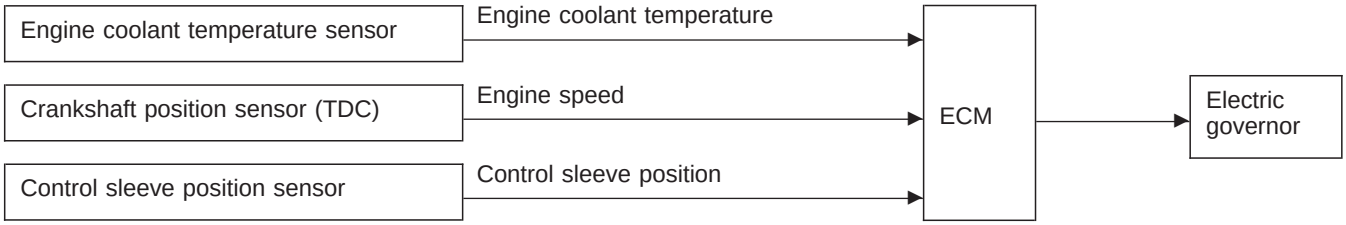
Fuel Injection System

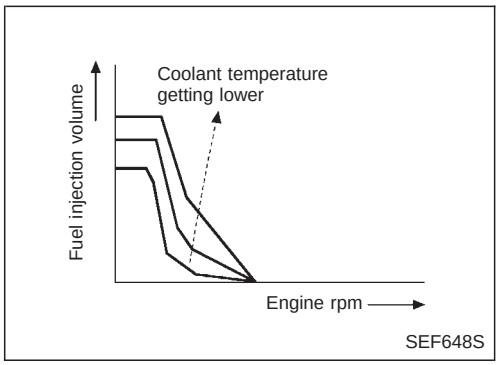
SYSTEM DESCRIPTION

Three types of fuel injection control are provided to accommodate the 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. The ECM performs duty cycle control on the electric governor (built into the fuel injection pump) according to sensor signals to compensate the amount of fuel injected to the preset value.

START CONTROL

Input/output signal line



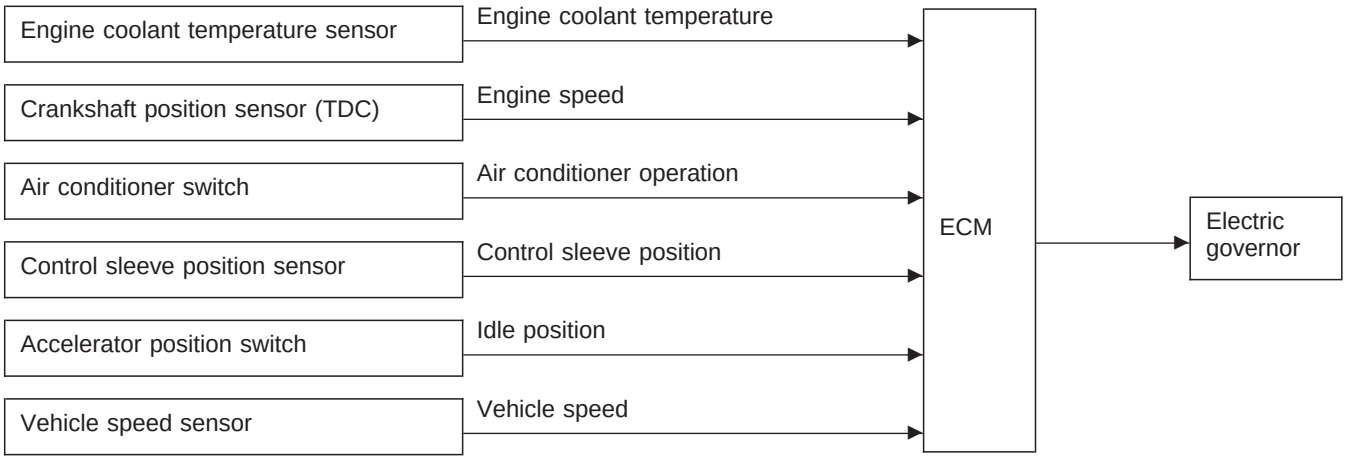


When starting, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed and engine coolant temperature.
For better startability under cool engine conditions, the lower the coolant temperature becomes, the greater the amount of fuel injected. The ECM ends the start control when the engine speed reaches a coolant temperature dependent value.

Fuel Injection System (Cont'd)

IDLE CONTROL

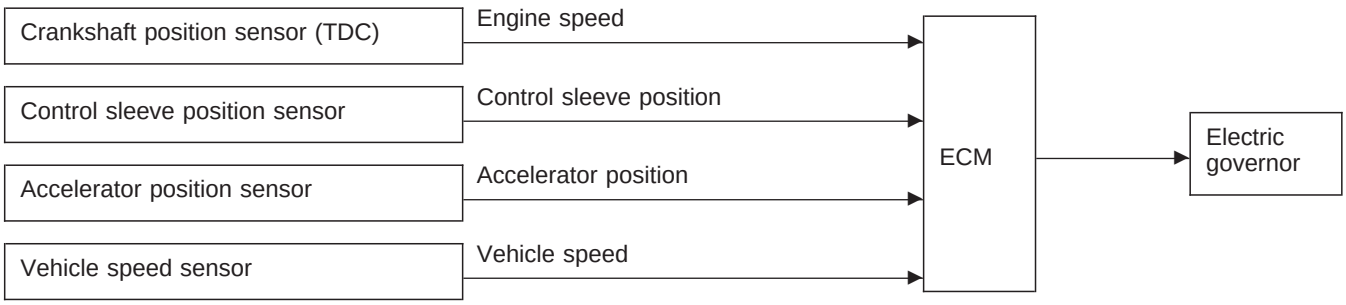
Input/output signal line

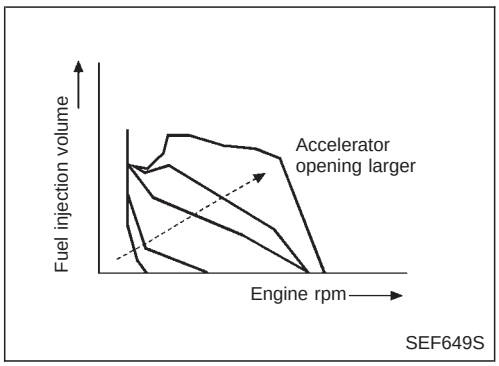


When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. During the first 270s after a cold start, the ECM also provides the system with a fast idle control in response to the engine coolant temperature.

NORMAL CONTROL

Input/output signal line





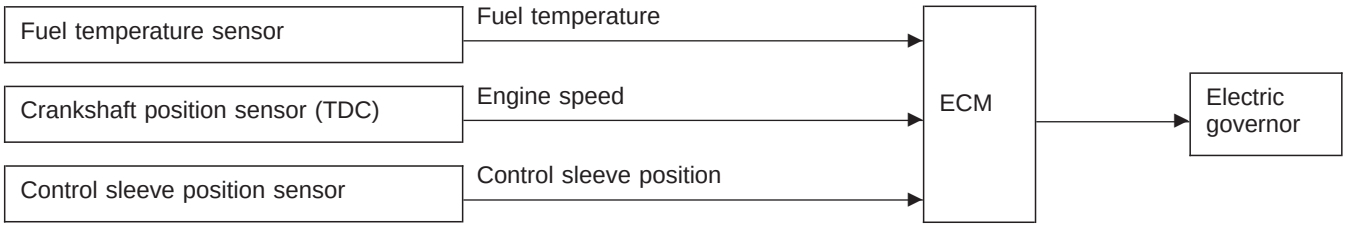
The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor (TDC) detects engine speed and the accelerator position sensor detects accelerator position. These sensors send signals to the ECM.

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.

Fuel Injection System (Cont'd)

FUEL TEMPERATURE COMPENSATION

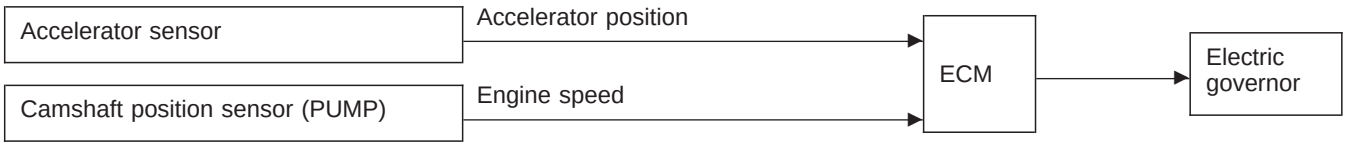
Input/output signal line



The amount of fuel leaking at or around high-pressure parts inside the fuel injection pump varies with fuel temperature and engine speed. This will result in a difference between the target amount of fuel injected and the actual amount. The ECM compensates for the actual amount depending on the signal from the fuel temperature sensor, the control sleeve position sensor and the crankshaft position sensor.

DECELERATION CONTROL

Input/output signal line



The ECM cuts power supply delivery to the electric governor during deceleration for better fuel efficiency. The ECM determines the time of deceleration according to signals from the accelerator sensor and camshaft position sensor (PUMP).

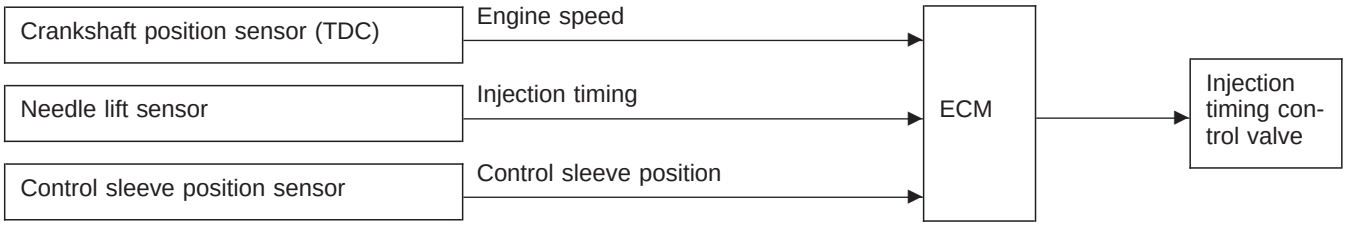
Fuel Injection Timing System

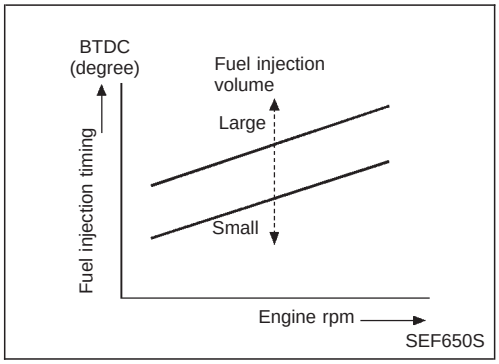
SYSTEM DESCRIPTION

The fuel injection timing system determines the optimal fuel injection timing, based on engine speed, injection quantity, engine coolant temperature and atmospheric pressure. The timing is formed by a basic value (Basic Control) and two correction values. By performing a duty cycle signal on the timing control valve, the ECM allows the valve to provide optimal injection timing. The ECM also performs feedback control on the timing control valve using the signal from the needle lift sensor which detects the actual fuel injection timing.

BASIC CONTROL

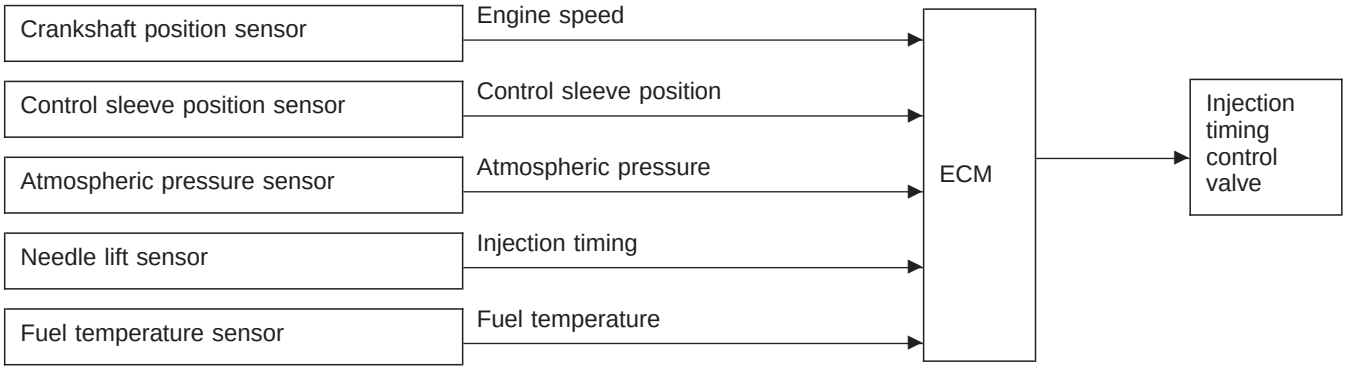
Input/output signal line

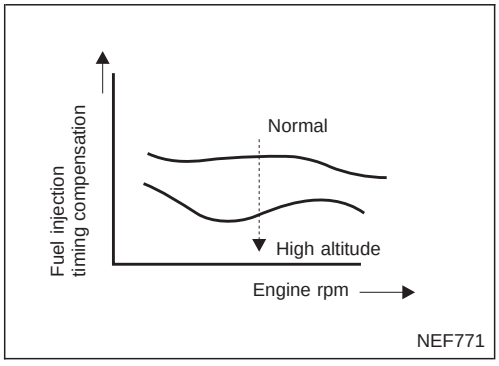




The optimal fuel injection timing data, predetermined in proportion to engine speeds and amount of fuel injected, are stored in the ECM memory. The ECM uses the data to control the fuel injection timing.

HIGH ALTITUDE COMPENSATION



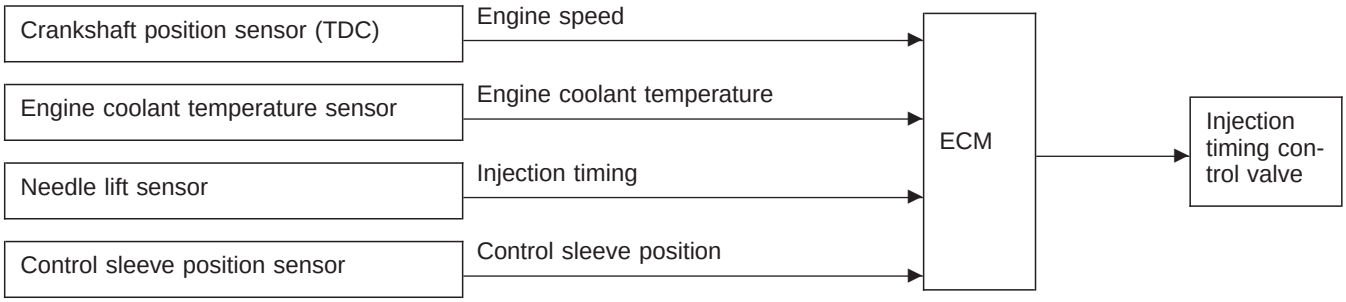


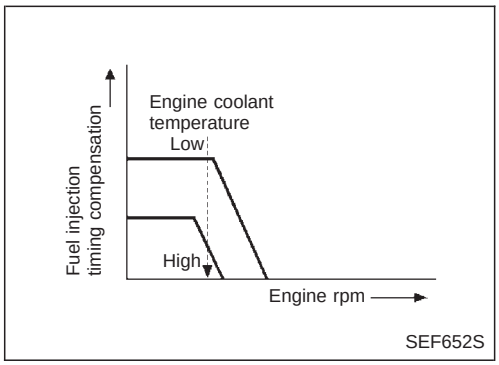
For better drivability in high altitude areas, the fuel injection timing is advanced and the fuel quantity is reduced according to the atmospheric pressure.

Fuel Injection Timing System (Cont'd)

ENGINE COOLANT TEMPERATURE COMPENSATION (During driving)

Input/output signal line

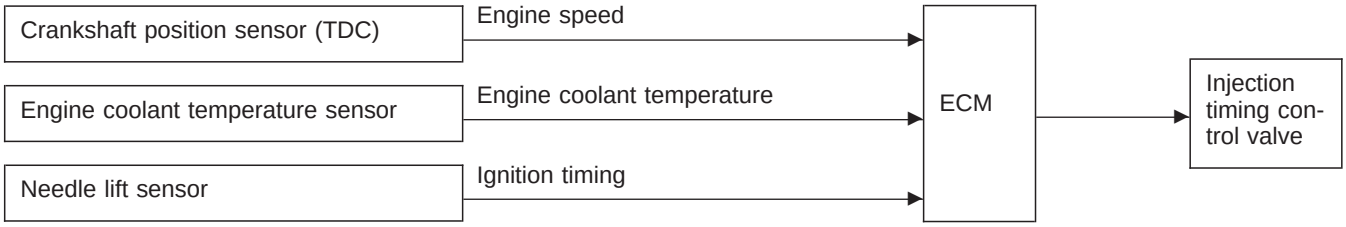


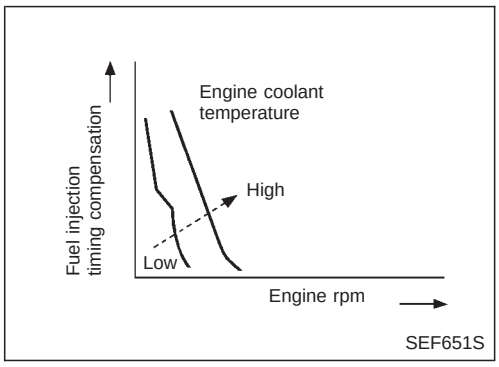


For better exhaust efficiency under cool engine conditions, the fuel injection timing is controlled within a compensation range depending on the engine speed, engine coolant temperature and amount of fuel injected.

ENGINE COOLANT TEMPERATURE COMPENSATION (When starting)

Input/output signal line

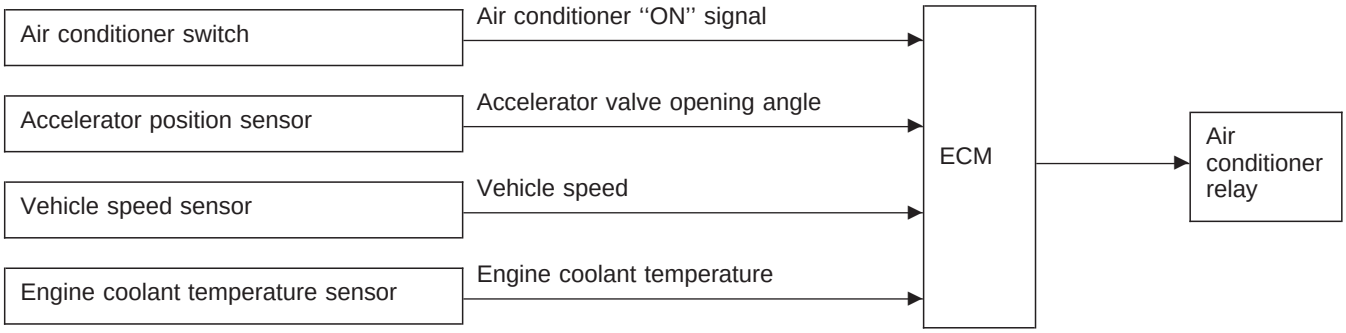




For better startability under cool engine conditions, the fuel injection timing is compensated according to the engine coolant temperature.

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE

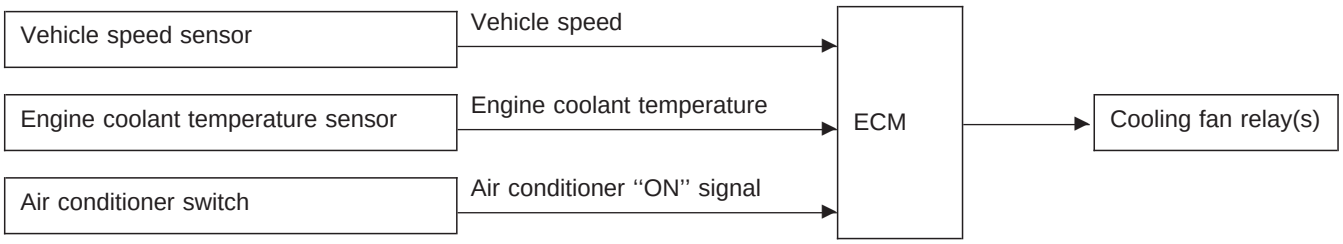


SYSTEM DESCRIPTION

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 coolant temperature returns to normal.

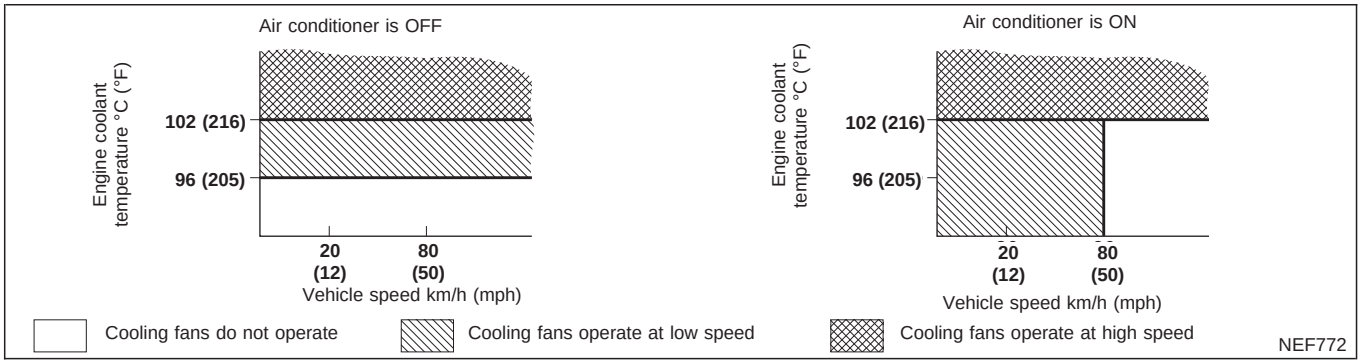
Cooling Fan Control

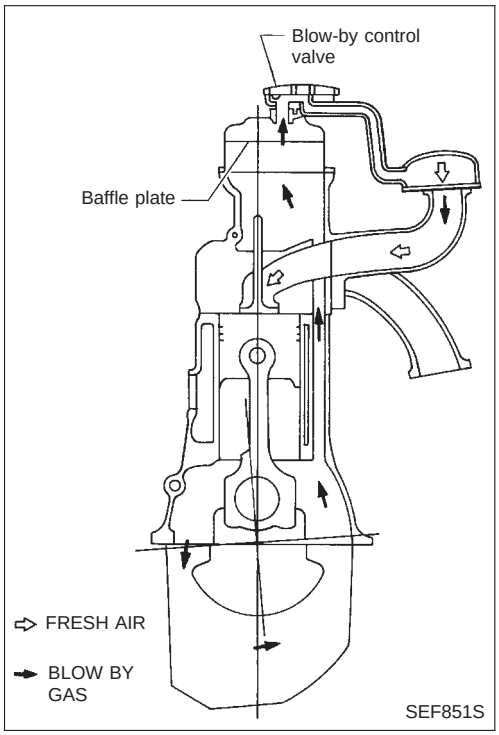
INPUT/OUTPUT SIGNAL LINE



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

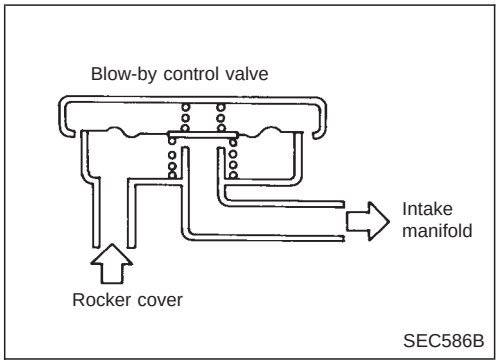
Operation





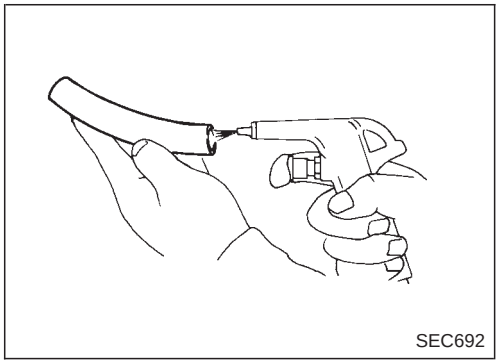
Description

- In this system blow-by gas is sucked into the air inlet pipe through the control valve after oil separation by the oil separator in the rocker cover.



Blow-by Control Valve

- Check control valve for clogging and abnormalities.

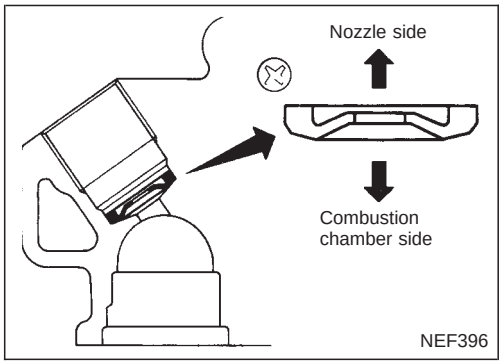


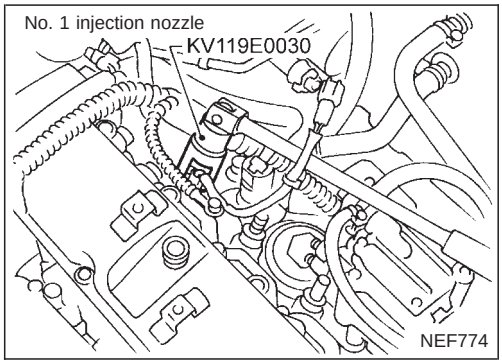
Ventilation Hose

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.

CAUTION:

- **Do not disassemble injection nozzle assembly. Entrust disassembly or adjustment to BOSCH service shop.**
- **Plug flare nut with a cap or rag so that no dust enters the nozzle.**





Removal and Installation

1. Remove fuel injection tube and spill tube.
2. Remove injection nozzle assembly.

Also remove gasket from nozzle end.

3. Install injection nozzle in the reverse order of removal.

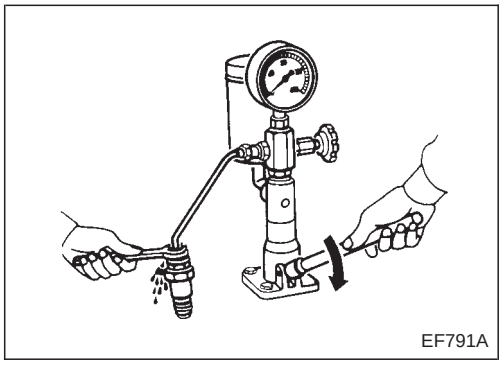
Injection nozzle to engine:
: 59 - 69 N·m (6.0 - 7.0 kg-m, 43 - 51 ft-lb)
Injection nozzle to tube:
: 22 - 25 N·m (2.2 - 2.5 kg-m, 16 - 18 ft-lb)
Spill tube:
: 39 - 49 N·m (4.0 - 5.0 kg-m, 29 - 36 ft-lb)

a. Always clean the nozzle holes.
b. Always use new injection nozzle gasket.
c. Note that small washer should be installed in specified direction.
d. Bleed air from fuel system.

Test and Adjustment

WARNING:

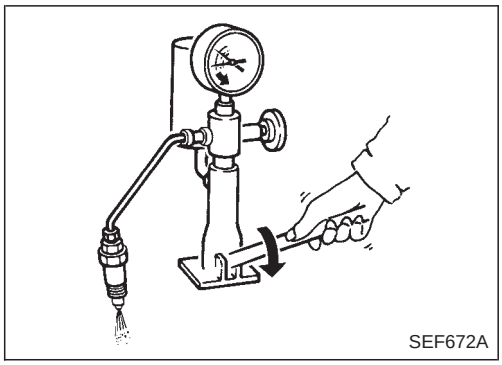
When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to contact your hands or body, and make sure your eyes are properly protected with goggles.



INJECTION PRESSURE TEST

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

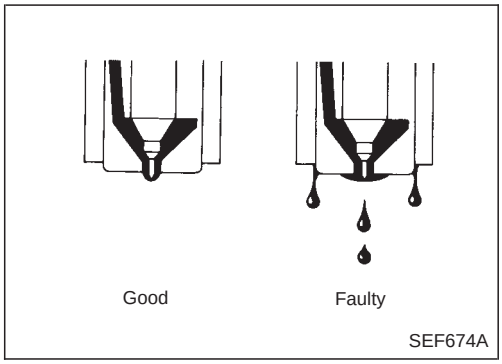
Test and Adjustment (Cont'd)


SEF672A

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:
Used
14,423 - 15,651 kPa
(144.2 - 156.5 bar,
148 - 159 kg/cm^2, 2,091 - 2,269 psi)
New
15,000 - 16,000 kPa
(150.0 - 160.0 bar,
153 - 163 kg/cm^2, 2,175 - 2,320 psi)

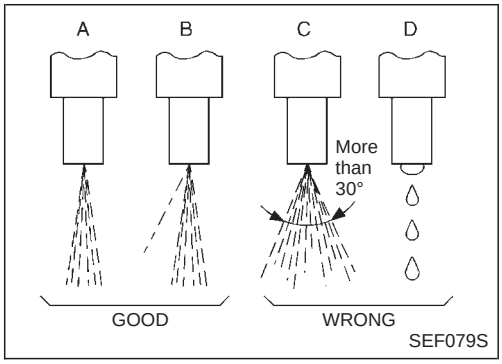
Always check initial injection pressure using a new nozzle. If the pressure is not correct, replace nozzle assembly.



SEF674A

LEAKAGE TEST

1. Maintain the pressure at about 981 to 1,961 kPa (9.8 to 19.6 bar, 10 to 20 kg/cm^2, 142 to 284 psi) below initial injection pressure.
2. Check that there is no dripping from the nozzle tip or around the body.
3. If there is leakage, replace nozzle.



SEF079S

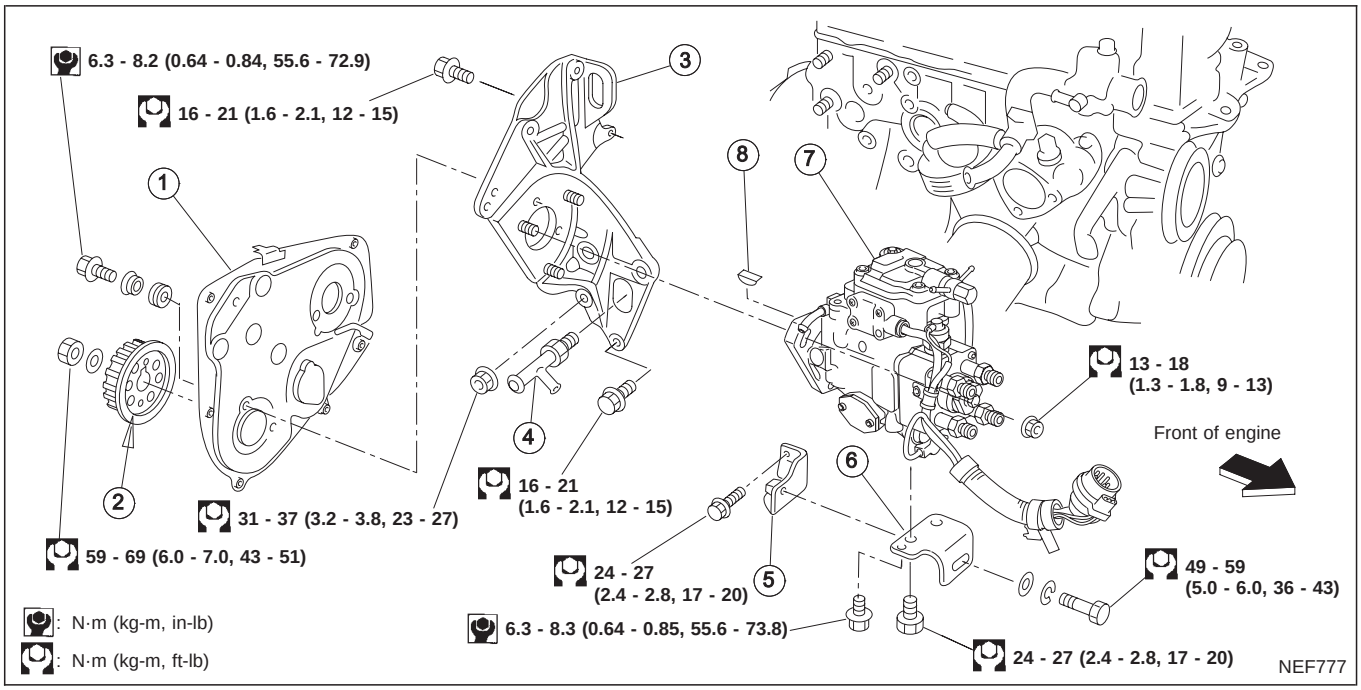
SPRAY PATTERN TEST

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

a. If main spray angle is within 30 degrees as shown, injection nozzle is good.

b. It is still normal even if a thin stream of spray deviates from the main spray (pattern B).

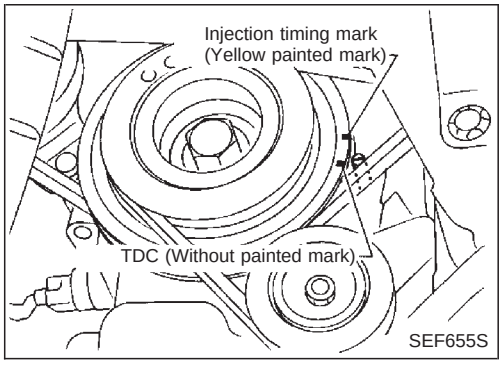
2. Test again and if spray pattern is not corrected, replace nozzle.



① Rear back cover
② Injection pump sprocket
③ Injection pump bracket
④ Water connector
⑤ Bracket
⑥ Bracket
⑦ Electronic fuel injection pump
⑧ Key

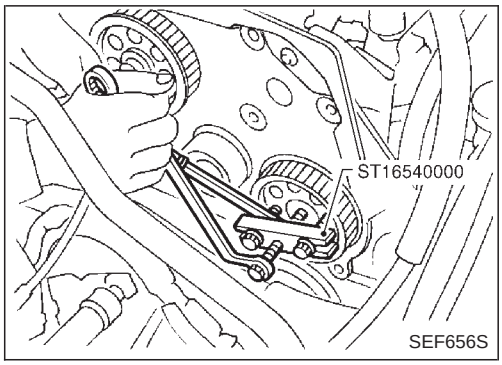
Removal

1. Remove battery.
   Disconnect electronic injection pump harness connectors.

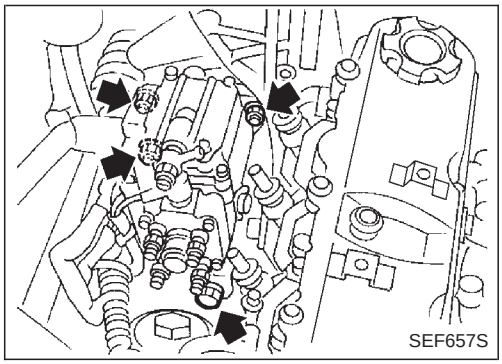


2. Set No. 1 piston at TDC on its compression stroke.
   TDC: Crankshaft pulley notch without painted mark
3. Remove fuel hoses (supply, return and spill) and injection tubes.
4. Remove air duct and injection pump timing belt cover.
5. Remove injection pump timing belt.
   Refer to EM section (“Injection Pump Timing Belt”).

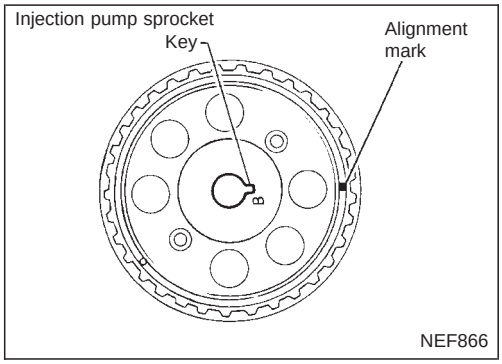
Removal (Cont'd)



6. Remove injection pump sprocket with Tool.
- **Remove key from injection pump shaft and store safely.**



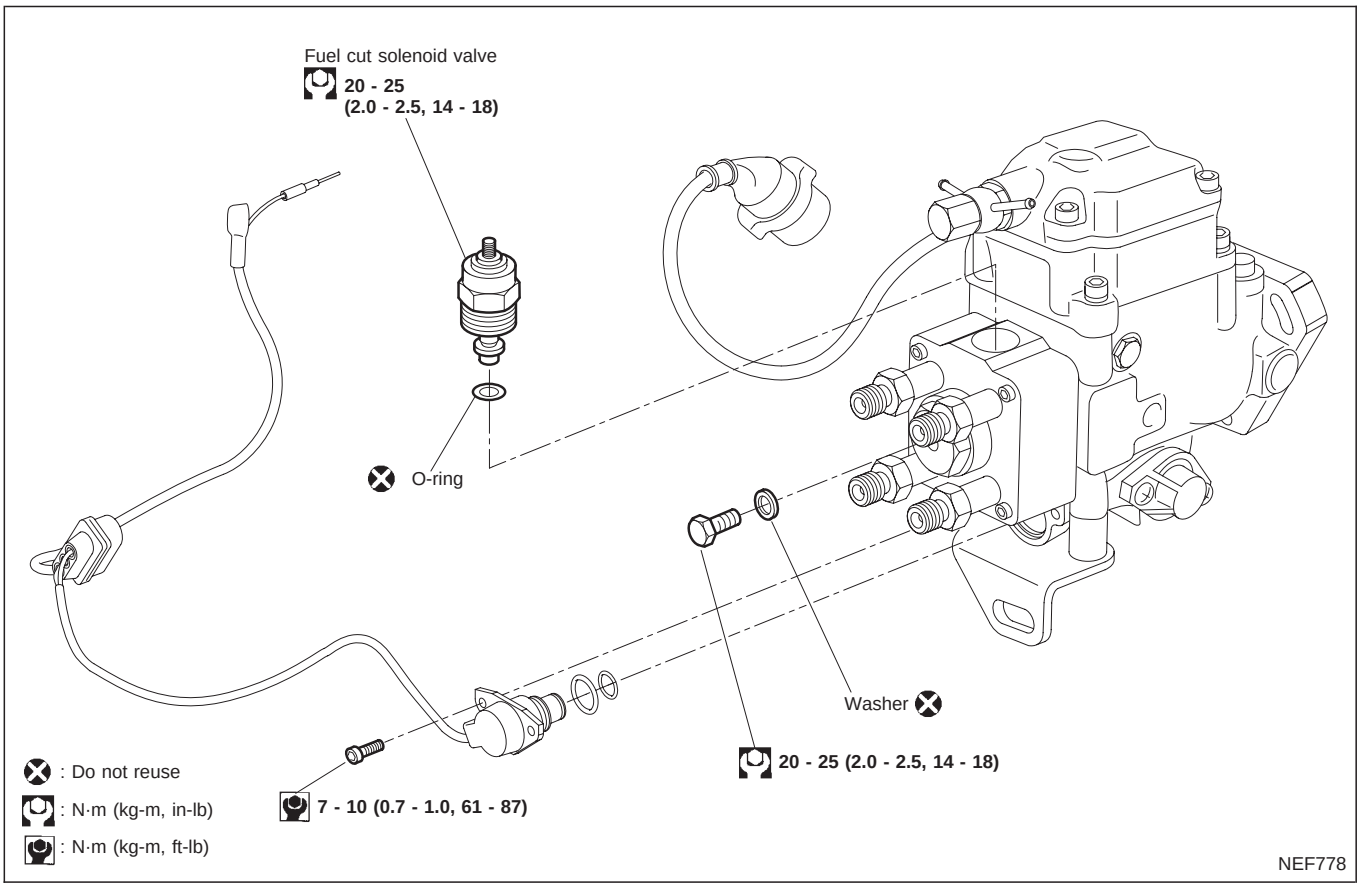
7. Remove injection pump assembly.



Installation

1. Install key on injection pump shaft, then install injection pump sprocket.
2. Install injection pump timing belt.
   Refer to EM section (''Injection Pump Timing Belt'').
3. Adjust injection timing.
   Refer to ''Basic Inspection'', EC-CD-40.
4. Install all parts removed.

Installation (Cont'd)



Disassembly and Assembly

CAUTION:

- **Do not disassemble the parts not shown in the illustration above.**
- **Before installing injection timing control valve, apply a coat of diesel fuel to O-ring and its mating area. Insert injection timing control valve straight into bore in fuel pump body. After properly positioning injection timing control valve, visually check for fuel leaks.**
- **After assembling the parts, erase Diagnostic Trouble Code (DTC), and perform DTC CONFIRMATION PROCEDURE (or OVERALL FUNCTION CHECK).**

DTC and MI Detection Logic

When a malfunction is detected for the first time, the malfunction (DTC) is stored in the ECM memory. The MI will light up each time the ECM detects a malfunction. However, if the same malfunction is experienced in two consecutive driving patterns and the engine is still running, the MI will stay lit up. For diagnostic items causing the MI to light up, refer to ''Diagnostic Trouble Code (DTC) Chart'', EC-CD-42.

Diagnostic Trouble Code (DTC)

HOW TO READ DTC

The diagnostic trouble code can be read by the following methods.

1. The number of flashes of the malfunction indicator in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 11, 13, 14, etc.
   These DTCs are controlled by NISSAN.
2. CONSULT-II Examples: ''CRANK POS SEN (TDC)'', etc.

- **Output of the trouble code warns that the indicated circuit has a malfunction. However, when using MI in Mode II there is no indication to determine whether the malfunction is still occurring or has occurred in the past and row returned to normal.**
  CONSULT-II can identify the timing of a malfunctions and so use of CONSULT-II (if available) is recommended.
- **DTCs are stored up to a maximum of 7 items that have highest priority in each grouped DTC occurred at that time. A new entry of DTC can overwrite an existing entry with a lower priority if the DTC memory is full. If 7 DTCs are read, other remained DTCs can be read after the existing DTC item has been corrected and the DTC is erased.**

HOW TO ERASE DTC

The diagnostic trouble code can be erased by the following methods.

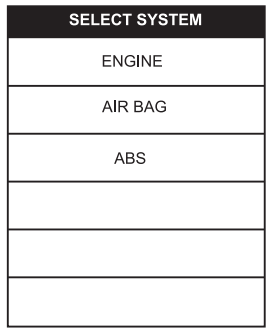
Selecting ''ERASE'' in the ''SELF-DIAG RESULTS'' mode with CONSULT-II.

Changing the diagnostic test mode from Diagnostic Test Mode II to Mode I twice. (Refer to ''HOW TO SWITCH DIAGNOSTIC TEST MODES''.)

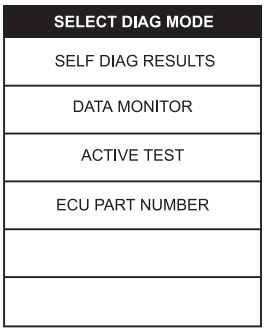
- **If the battery terminal is disconnected, the diagnostic trouble code will be lost within 24 hours.**
- **When you erase the DTC, using CONSULT-II is easier and quicker than switching the diagnostic test modes.**
- **Erasing DTC is possible only when the ECM has recognised the DTC item is corrected.**
  If erasing is not possible, turn the ignition switch to the ''LOCK'' position once. Wait for at least 5 seconds and then turn it ''ON'' (engine stopped) again.

HOW TO ERASE DTC (With CONSULT-II)

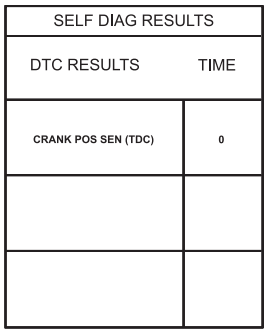
1. If the ignition switch stays ''ON'' after repair work, be sure to turn ignition switch to the ''LOCK'' position once. Wait for at least 5 seconds and then turn it ''ON'' (Engine stopped) again.
2. Turn CONSULT-II ''ON'' and touch ''ENGINE''.
3. Touch ''SELF-DIAG RESULTS''.
4. Touch ''ERASE''. (The DTC in the ECM will be erased.)



1. Touch ''Engine''.



2. Touch ''SELF-DIAG RESULTS''.



3. Touch ''ERASE''. (The DTC in the ECM will be erased.)

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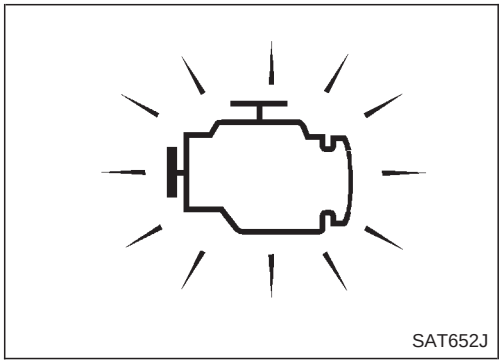
Diagnostic Trouble Code (DTC) (Cont'd)

HOW TO ERASE DTC (No Tools)

1. If the ignition switch stays ''ON'' after repair work, be sure to turn ignition switch to ''LOCK'' position once. Wait at least 5 seconds and then turn it ''ON'' again.
2. Change the diagnostic test mode from Mode II to Mode I twice. When changing modes, wait at least 2 seconds. (Refer to EC-CD-27.)



Malfunction Indicator (MI)

1. The malfunction indicator will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator does not light up, refer to EL section (''WARNING LAMPS AND CHIME'') or see EC-CD-27.

2. When the engine is started, the malfunction indicator should go off.
   If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

If MI illuminates or flashes irregularly after starting engine, water may have accumulated in fuel filter. Drain water from fuel filter.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The ON BOARD DIAGNOSTIC SYSTEM FUNCTION
The on board diagnostic system has the following three functions:

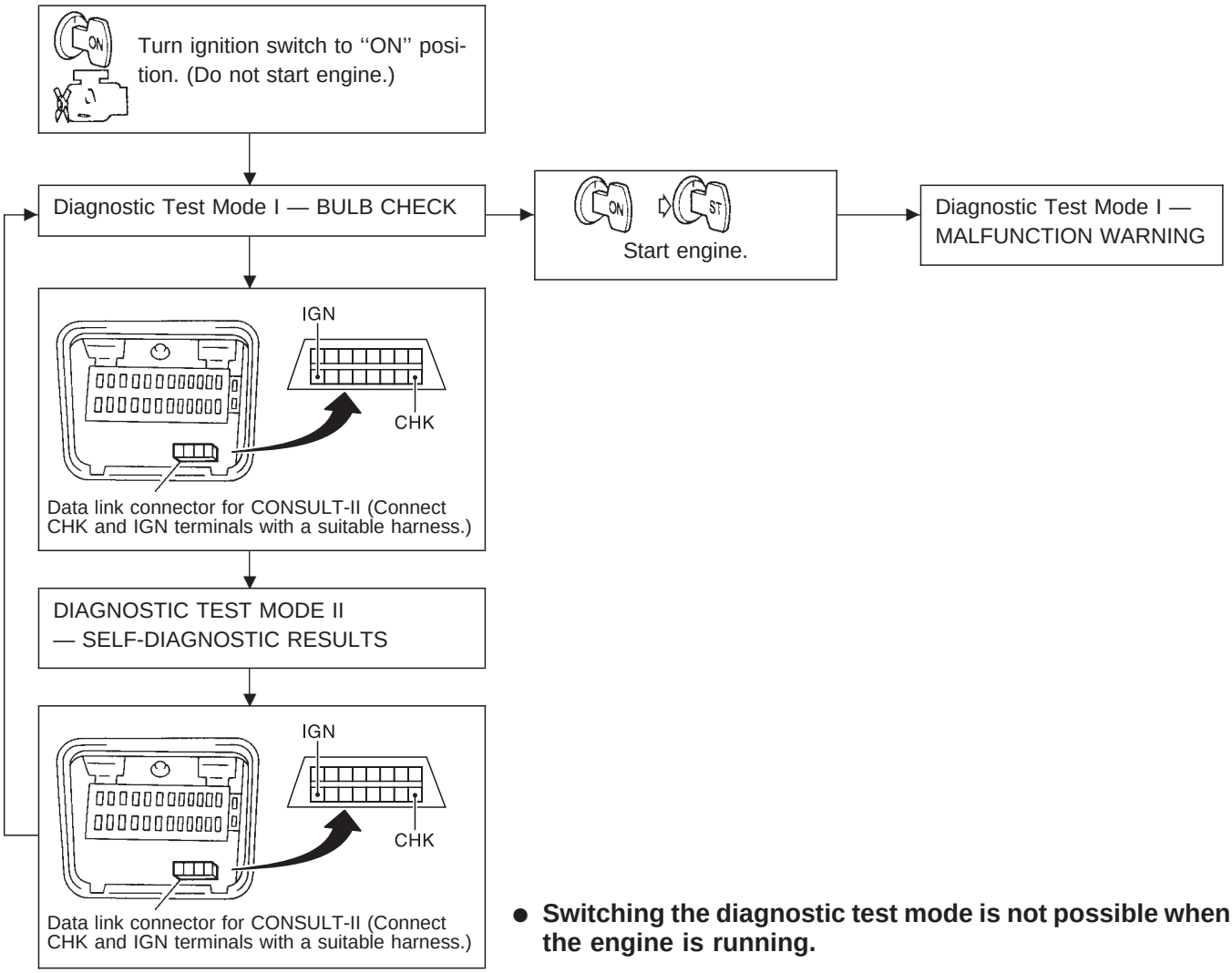
1. BULB CHECK : This function checks the MI bulb for damage (blown, open circuit, etc.).
2. MALFUNCTION WARNING : This is a usual driving condition. When a malfunction is detected, the MI will light up to inform the driver that a malfunction has been detected.
3. SELF-DIAGNOSTIC RESULTS : This function allows diagnostic trouble codes to be read.

Refer to ''HOW TO SWITCH DIAGNOSTIC TEST MODES'' on next page.

Condition		Diagnostic Test Mode I	Diagnostic Test Mode II
Ignition switch in ''ON'' position	Engine stopped	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running	MALFUNCTION WARNING	—

Malfunction Indicator (MI) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



- **Switching the diagnostic test mode is not possible when the engine is running.**

Malfunction Indicator (MI) (Cont'd)

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MALFUNCTION INDICATOR on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section (''WARNING LAMPS AND CHIME'') or see EC-CD-27.

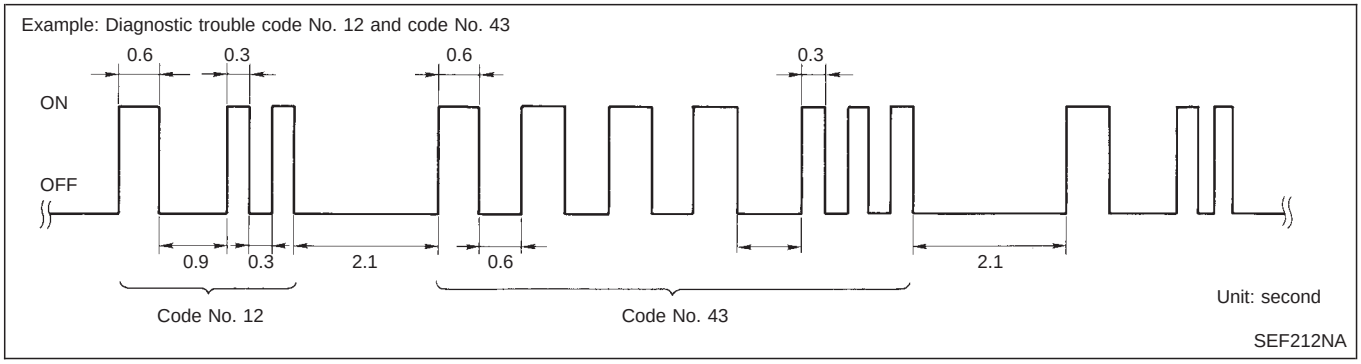
DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MALFUNCTION INDICATOR	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning. (The ''MI Illumination'' of the ''DTC Chart''.) Refer to EC-CD-43.
OFF	No malfunction.

- These Diagnostic Trouble Code Numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS).

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, a diagnostic trouble code is indicated by the number of flashes of the MALFUNCTION INDICATOR as shown below.

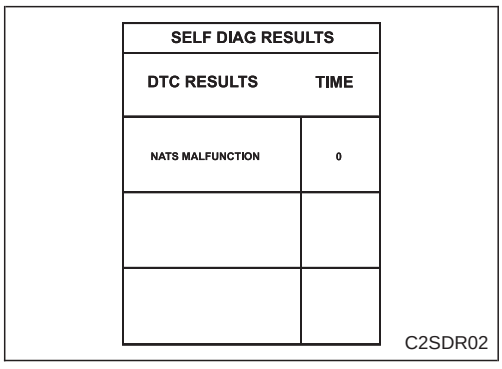


Long (0.6 second) flashes indicate the number of ten digits, and short (0.3 second) flashes indicate the number of single digits. For example, the malfunction indicator flashes 4 times for 0.6 sec and then it flashes three times for about 0.3 sec. This indicates the DTC ''43'' and refers to the malfunction of the accelerator position sensor.
In this way, all the detected malfunctions are classified by their diagnostic trouble code numbers. The DTC ''55'' refers to no malfunction. (See DIAGNOSTIC TROUBLE CODE CHART, EC-CD-44.)

HOW TO ERASE DIAGNOSTIC TEST MODE II (Self-diagnostic results)

The diagnostic trouble code can be erased from the backup memory in the ECM when the diagnostic test mode is changed twice from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to ''HOW TO SWITCH DIAGNOSTIC TEST MODES'' on previous page.)

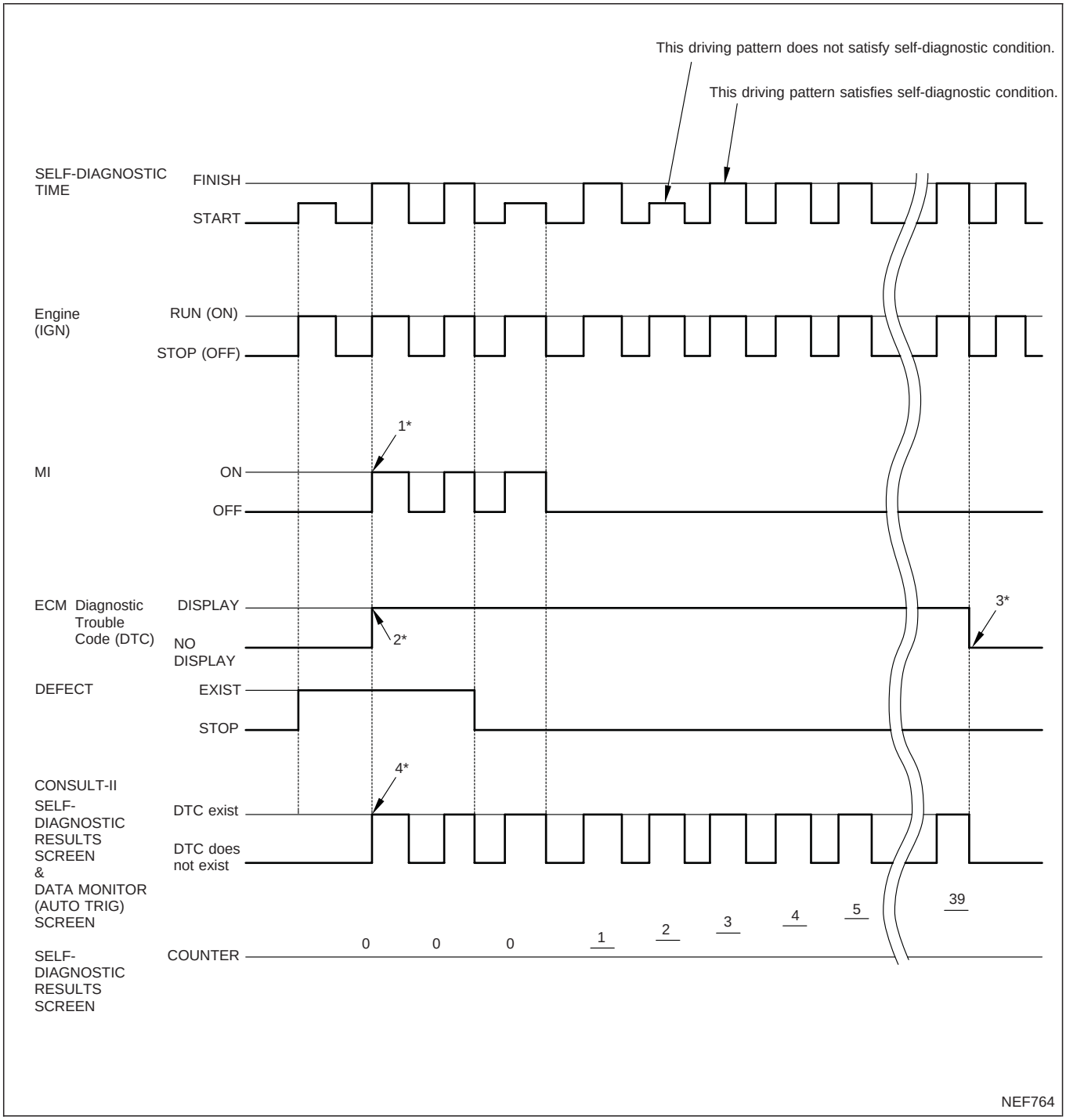
- **If the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**



- **If the MI blinks or ''NATS MALFUNCTION'' is displayed on ''SELF-DIAG RESULTS'' screen, perform self-diagnostic results mode with CONSULT-II using NATS program card (NATS-E940). Refer to EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching ''ERASE'' in ''SELF-DIAG RESULTS'' mode with CONSULT-II.**
- **When replacing ECM, initialisation of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card (NATS-E940).**
  Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NATS initialisation and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.

Malfunction Indicator (MI) (Cont'd)

RELATIONSHIP BETWEEN MI, DTC, CONSULT-II AND DRIVING PATTERNS

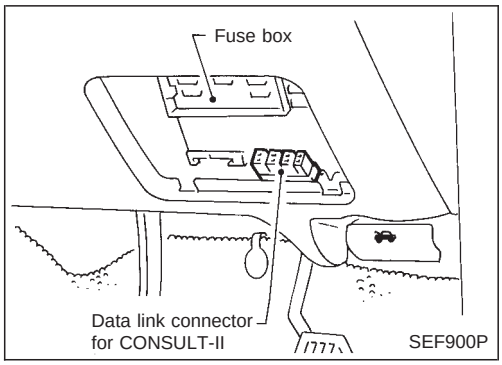


*1: When a malfunction is detected, MI will light up.

*2: When a malfunction is detected for the first time, the DTC will be stored in ECM.

*3: The DTC will not be displayed any longer after vehicle is driven 40 times without the same malfunction. (The DTC still remains in ECM.)

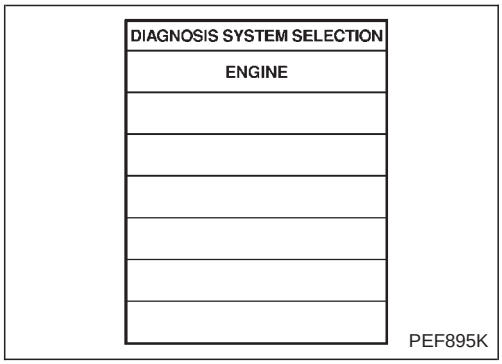
*4: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.



CONSULT-II

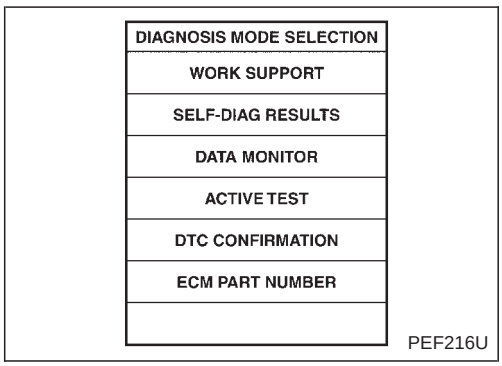
CONSULT-II INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect ‘‘CONSULT-II’’ to data link connector for CONSULT-II.
   (Data link connector for CONSULT-II is located behind the fuse box cover.)



3. Turn on ignition switch.
4. Touch ‘‘START’’.
5. Touch ‘‘ENGINE’’.
6. Perform each diagnostic test mode according to each service procedure.

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



CONSULT-II (Cont'd)

ENGINE CONTROL MODULE COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item			DIAGNOSTIC TEST MODE		
			SELF-DIAG-NOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
ENGINE CONTROL MODULE COMPONENT PARTS	INPUT	Camshaft position sensor (PUMP) *1	X *2	X	
		Mass air flow sensor	X	X	
		Engine coolant temperature sensor	X	X	
		Control sleeve position sensor	X	X	X
		Fuel temperature sensor	X	X	
		Vehicle speed sensor	X	X	
		Accelerator position sensor	X	X	
		Accelerator position switch		X	
		Brake lamp switch	X *2	X	
		Crankshaft position sensor (TDC)	X	X	
		Needle lift sensor	X	X	
		Ignition switch (start signal)		X	
		Ignition switch (ON signal)		X	
		Air conditioner switch		X	
		Brake switch		X	
		Battery voltage		X	
	OUTPUT	Injection timing control valve	X	X	X
		Fuel cut solenoid valve	X	X	X
		Air conditioner relay		X	
		Glow relay		X	X
		EGRC-solenoid valve		X	X
		Cooling fan relay		X	X

X: Applicable
*1: Imaginary sensor, which produces secondary engine revolution signal using needle lift sensor pulse.
*2: CONSULT-II may not display, but self-diagnostic results are available with MI.

CONSULT-II (Cont'd)

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "Diagnostic Trouble Code (DTC) chart". (See EC-CD-28.)

DATA MONITOR MODE

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 camshaft position sensor (PUMP) signal 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 (determined by the signal voltage of the fuel temperature sensor) is displayed.	
ACCEL POS SEN [V]	○	○	• The accelerator position sensor signal voltage is displayed.	
OFF ACCEL POS [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the accelerator position switch signal.	
C/SLEEV POS/S [V]	○	○	• The control sleeve position sensor signal voltage is displayed.	
BATTERY VOLT [V]	○	○	• The power supply voltage of ECM is displayed.	
START SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the starter signal.	• After starting the engine, [OFF] is displayed regardless of the starter signal.
AIR COND SIG [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
BRAKE SW [ON/OFF]	○		• Indicates [ON/OFF] condition of the stio lamp switch.	
BRAKE SW2 [ON/OFF]	○		• Indicates [ON/OFF] condition of the stio lamp switch 2.	
IGN SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from ignition switch.	
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.
ACT INJ TIMG [°]	○		• The actual injection timing angle determined by the ECM (an approximate average angle between injection start and end from TDC) is displayed.	
TARGET F/INJ [mm^3/STROKE]	○		• The target fuel injection quantity (determined by the ECM according to the input signal) is indicated.	

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

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
FUEL CUT S/V [ON/OFF]			● The control condition of the fuel cut solenoid valve (determined by ECM according to the input signal) is indicated. ● OFF ... Fuel cut solenoid valve is not operating. ON ... Fuel cut solenoid valve is operating.	● When the fuel cut solenoid valve is not operating, fuel supply is shut off.
AIR COND RLY [ON/OFF]		◯	● The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
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.	
EGRC SOL/V A [ON/OFF]			● The control condition of the EGRC-solenoid valve (determined by ECM according to the input signal) is indicated. ● OFF ... EGRC-solenoid valve is not operating. ON ... EGRC-solenoid valve is operating.	

CONSULT-II (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
TARGET F/INJ	● Engine: Return to the original trouble condition ● Fix the target injection quantity using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Control sleeve position sensor
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
FUEL CUT SOL/V	● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
EGRC SOL/V A	● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid 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 ● Fuel pump relay
INJ TIMING	● Engine: Return to the original trouble condition ● Retard the injection timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Adjust initial injection timing

CONSULT-II (Cont'd)

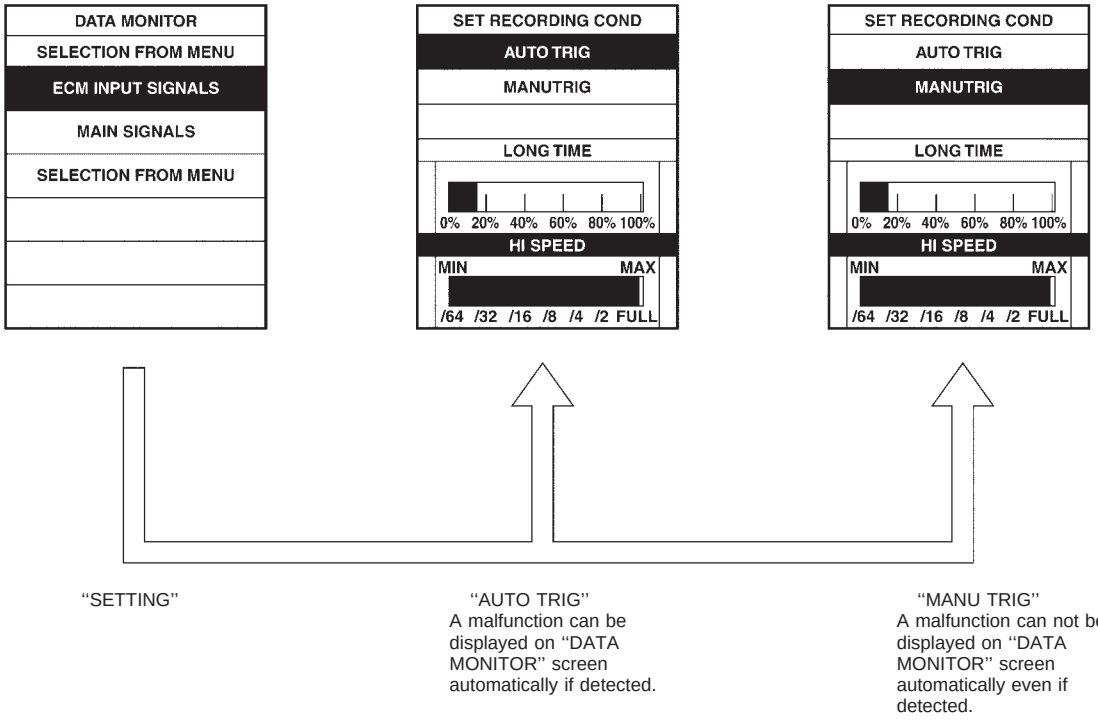
REAL TIME DIAGNOSIS IN DATA MONITOR MODE

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 and malfunction item will be displayed at the moment the malfunction is detected by ECM.
     DATA MONITOR can be performed continuously until a malfunction is detected. However, DATA MONITOR cannot continue any longer after the malfunction detection.
2. ''MANU TRIG'' (Manual trigger):
   - DTC and malfunction item 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.
     Inspect the circuit by gently shaking (or twisting) suspicious connectors, components and harness in the ''DTC CONFIRMATION PROCEDURE''. The moment a malfunction is found the DTC will be displayed. (Refer to GI section, ''Incident Simulation Tests'' in ''HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT''.)
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.



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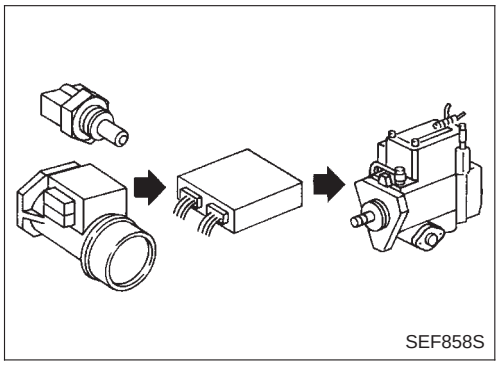
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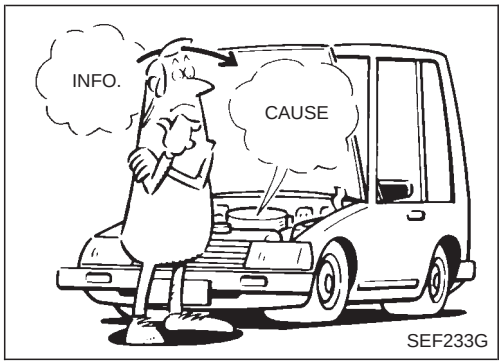

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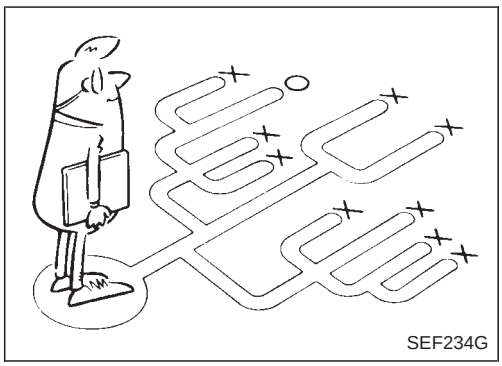
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Introduction

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 drive the electronic fuel injection pump use the data to based on current ambient conditions. It is essential that both input and output signals are correct and stable. At the same time, it is important that there are no problems such as vacuum leaks, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than catastrophically. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

A visual check only may not be sufficiënt to determine the cause of the problems. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the ‘‘Work Flow’’ on the next page.

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 problems, 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’’ problems first. This will help troubleshoot driveability problems on a vehicle with an electronically controlled engine.

KEY POINTS

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

SEF907L

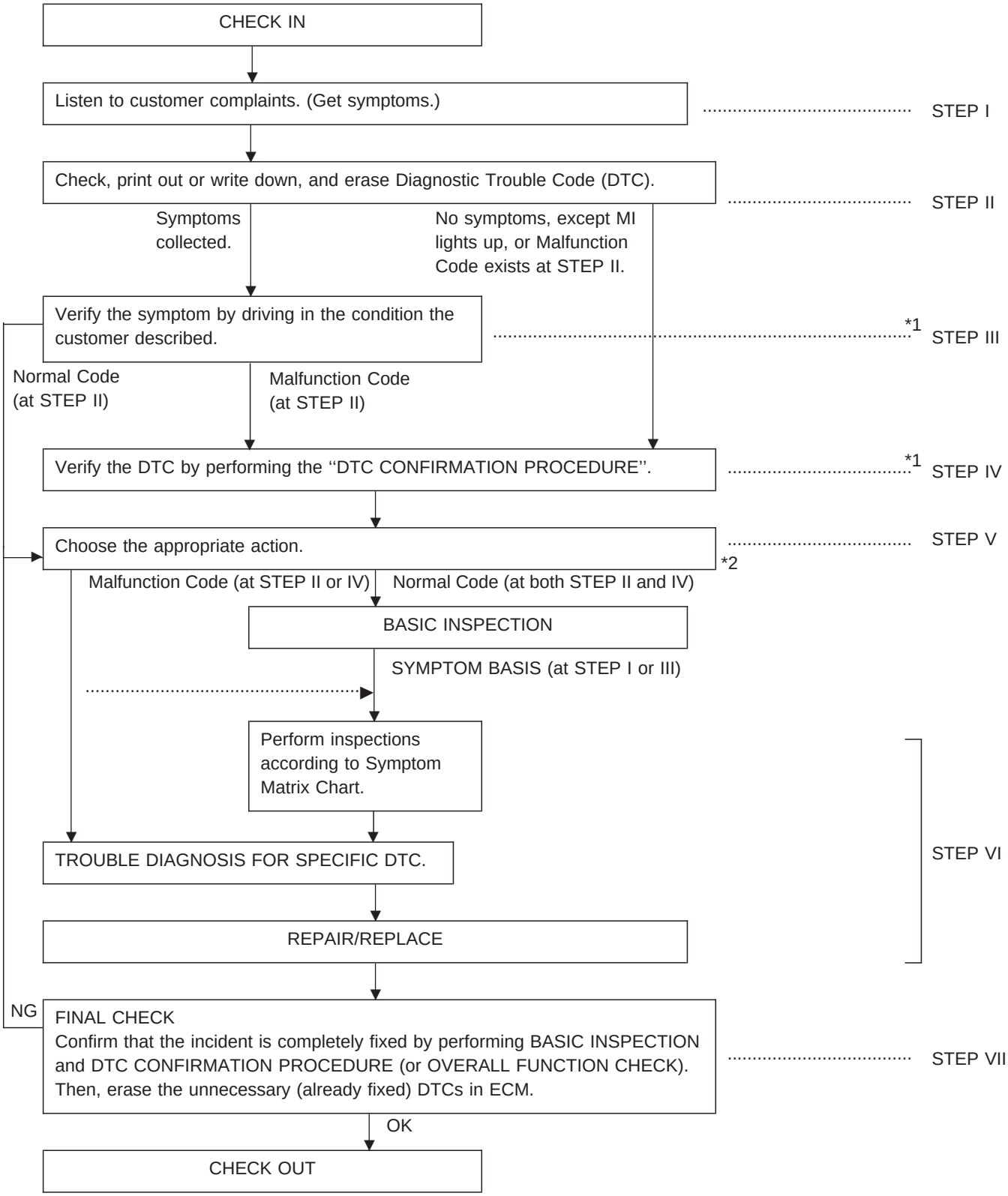
Diagnostic Worksheet

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a problem. 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.

WORKSHEET SAMPLE

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion when warming-up engine ☐ Partial combustion when cooling down engine ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 70 80 90 100 mph	
Malfunction indicator		☐ Turned on ☐ Not turned on	

Work Flow



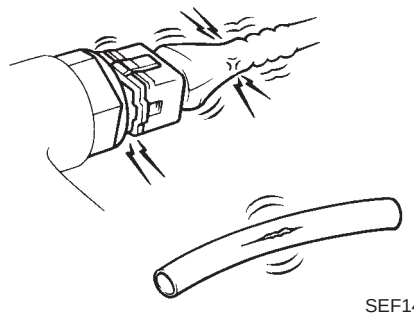
***1: If the incident cannot be duplicated, refer to GI section (''Incident Simulation Tests'', ''HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT'').**

***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to ''TROUBLE DIAGNOSIS FOR MAIN POWER SUPPLY AND GROUND CIRCUIT'', EC-CD-62.**

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the ‘‘DIAGNOSTIC WORKSHEET’’ as shown on the next page.
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the Diagnostic Trouble Code (DTC), then erase the code. Refer to EC-CD-25.) The DTC can be used when duplicating the incident at STEP III & IV. 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-CD-50.)
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 INCIDENT SIMULATION TESTS. Refer to GI section. If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the Diagnostic Trouble Code (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 INCIDENT SIMULATION TESTS. Refer to GI section. 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.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to specific TROUBLE DIAGNOSIS FOR DTC. If the normal code is indicated, proceed to the BASIC INSPECTION. Refer to EC-CD-40. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-CD-50.
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-CD-55. 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 section (‘‘Circuit Inspection’’, ‘‘HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT’’). Repair or replace the malfunctioning parts.
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 (Diagnostic trouble code No. 55) 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-CD-25.)

A



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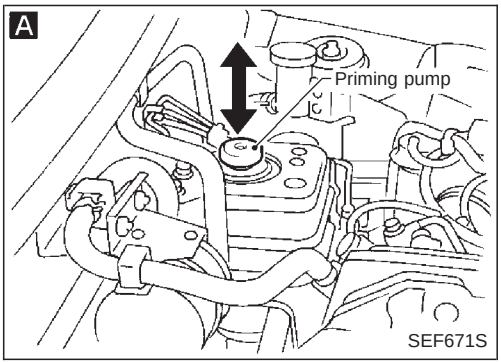
A



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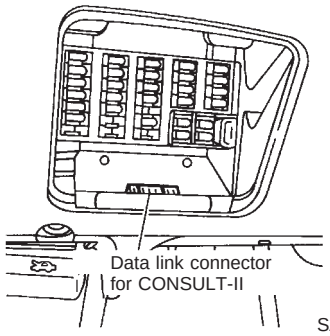

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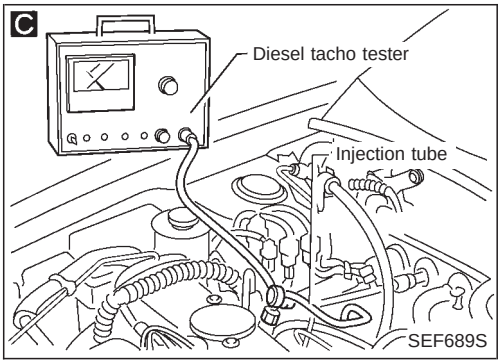

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C

DATA MONITOR	
MONITORING	NO FAIL
CMPS~RPM(REF) XXX rpm	

PEF190P

Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

- **Headlamp switch is off,**
- **Air Conditioner switch is off,**
- **Rear defogger switch is off,**
- **Steering wheel is in the straight-ahead position, etc.**

A

BEFORE STARTING

1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:

- Harness connectors for faulty connections
- Vacuum hoses for splits, kinks, or faulty connections
- Wiring for faulty connections, pinches, or cuts

3. Using priming pump, bleed air from fuel system. Refer to ''Fuel Filter Check'' in MA section.

B

CONNECT CONSULT-II TO THE VEHICLE.

Connect ''CONSULT-II'' to the data link connector for CONSULT-II and select ''ENGINE'' from the menu. Refer to EC-CD-30.

DOES ENGINE START?

No → Turn ignition switch to the ''LOCK'' position, wait 5 seconds and then start engine. If engine fails to start, check diagnostic trouble code (DTC).

Yes

Run engine for 10 minutes.

C

CHECK IDLE SPEED.

Read engine idle speed in ''DATA MONITOR'' mode with CONSULT-II.
825 rpm ± 25 (in N position)

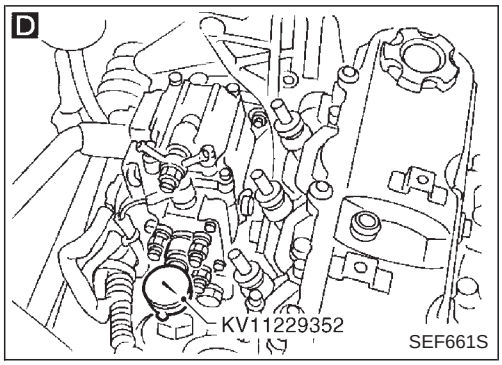
OR

Check idle speed using tachometer tester.
825 rpm ± 25 (in N position)

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)

D



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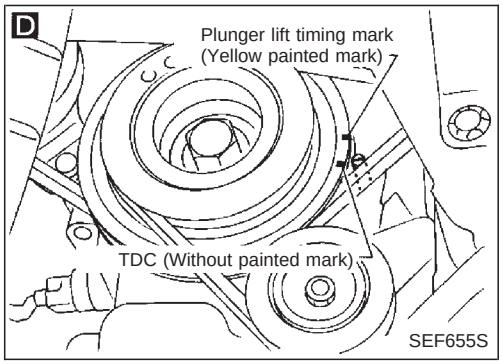

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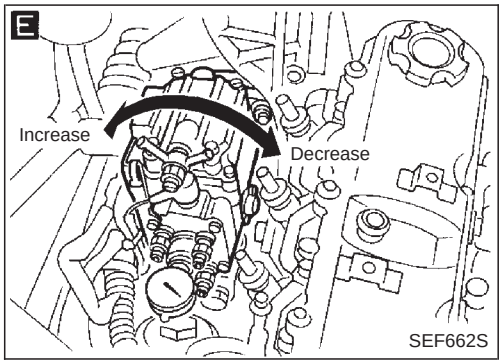

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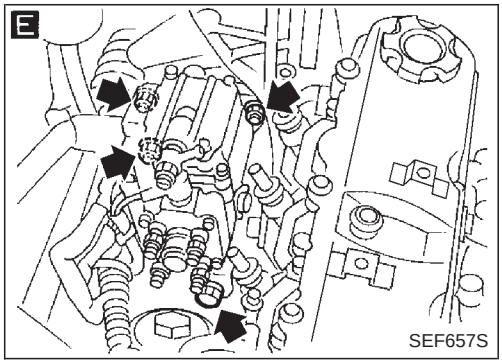


Ⓐ

D

CHECK INJECTION TIMING.

1. Set No. 1 piston at TDC on its compression stroke.
   TDC: Without painted mark
2. Remove injection tubes and air bleeder on the back of injection pump.
3. Set dial gauge so its indicator points to somewhere between 1.0 and 2.0 mm (0.039 and 0.079 in) on the scale.
4. Turn crankshaft 2 turns clockwise and check that dial gauge indicates the same value again.
5. Turn crankshaft counterclockwise about 100 degrees, then turn crankshaft slowly clockwise, and set dial gauge indicator to 0 mm at the position it stops.
6. Turn crankshaft clockwise and set it at plunger lift timing mark using the mark on the crankshaft pulley.
   plunger lift timing mark: Yellow painted mark
7. Read plunger lift.
   Plunger lift:
   0.89 ± 0.08 mm (0.0350 ± 0.0031 in) at plunger lift timing mark

- **When repeating the checking, start with step 5.**

OK → Bleed air from fuel system.
After this inspection, unnecessary diagnostic trouble code No. might be displayed.
Erase the stored memory in ECM.
Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" (EC-CD-25).

OK → INSPECTION END

NG

E

Adjusting

1. If plunger lift is not within the specified value, adjust by turning injection pump.

- **If indication is smaller than the specified value, turn pump body away from engine.**
- **If indication is larger than the specified value, turn pump body towards engine.**

2. Tighten injection pump securing bolts and nuts.
   Nut:
   : 20 - 25 N·m (2.0 - 2.6 kg-m, 15 - 18 ft-lb)
   Bolt:
   : 25 - 35 N·m (2.6 - 3.6 kg-m, 18 - 26 ft-lb)
3. Remove dial gauge and install air bleeder with new washer.
4. Install injection tubes.
   Flare nut:
   : 14 - 20 N·m (1.4 - 2.0 kg-m, 10 - 15 ft-lb)
5. Bleed air from fuel system.

Refer to "Water Draining, Fuel Filter Check and Replacement" of "ENGINE MAINTENANCE" in MA section.

→ Go to A

Diagnostic Trouble Code (DTC) Chart

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT-II, ''SELF-DIAG RESULTS'' mode)	Malfunction is detected when ...
12	Mass air flow sensor circuit (MASS AIR FLOW SEN)	● An excessively high or low voltage from the sensor is detected by the ECM.
13	Engine coolant temperature sensor circuit (COOLANT TEMP SEN)	● An excessively high or low voltage from the sensor is detected by the ECM.
14	Vehicle speed sensor circuit (VEHICLE SPEED SEN)	● The almost 0 km/h (0 mph) signal from the sensor is detected by the ECM even when vehicle is being driven.
15	Control sleeve position sensor circuit (CONT SLEEV POS SEN)	● An excessively high or low voltage from the sensor is detected by the ECM. ● An incorrect voltage signal from the sensor is detected by the ECM during engine running.
18	Fuel injection feedback 2 (F/INJ F/B 2)	● The fuel injection feedback system (consists of the ECM, electric governor and control sleeve position sensor) does not operate properly.
21	Fuel injection timing feedback (F/INJ TIMG F/B)	● The fuel injection timing feedback system (consists of the ECM, fuel injection timing control valve and needle lift sensor) does not operate properly.

Abbreviations for Quick Reference of ''DTC CONFIRMATION PROCEDURE''
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of ''OVERALL FUNCTION CHECK''
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC Confirmation Procedure Quick Ref. *1	Overall Function Check *2	MI Illumination	Reference Page
● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor	IGN: ON	—	—	EC-CD-65
● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor	IGN: ON	—	Lighting up	EC-CD-69
● Harness or connectors (The sensor circuit is open or shorted.) ● Vehicle speed sensor	—	LIFTING	—	EC-CD-73
● Harness or connectors (The sensor circuit is open or shorted.) ● Control sleeve position sensor	RUNNING	—	Lighting up	EC-CD-76
● Main power supply circuit (ECM terminals (23), (45)), (68) and fuse ● Harness or connectors (Electric governor and control sleeve position sensor circuit) ● Electronic fuel injection pump ● ECM ● Electric governor	RUNNING (DRIVING)	—	Lighting up	EC-CD-80
● Harness or connectors (Injection timing control valve, Needle lift sensor and Crankshaft position sensor (TDC) circuit] ● Injection timing control valve ● Needle lift sensor ● Crankshaft position sensor ● Air in fuel line	RUNNING (DRIVING)	—	Lighting up	EC-CD-85

*1: ● This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each TROUBLE DIAGNOSIS FOR DTC.

*2: ● The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
● During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
● This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each TROUBLE DIAGNOSIS FOR DTC.

Diagnostic Trouble Code (DTC) Chart (Cont'd)

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT-II, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
28	Cooling fan (OVER HEAT)	● An excessive high engine coolant temperature sensor signal is detected by the ECM. (Overheat)
31	ECM2 (ECM2)	● ECM calculation function is malfunctioning.
34	Needle lift sensor circuit (NEEDLE LIFT SEN)	● An incorrect signal from the sensor is detected by the ECM during engine running.
36	Fuel cut solenoid valve 1 (FUEL CUT S/V 1)	● Fuel cut solenoid valve circuit is malfunctioning.
42	Fuel temperature sensor circuit (FUEL TEMP SENSOR)	● An excessively high or low voltage from the sensor is detected by the ECM.
43	Accelerator position sensor circuit (ACCEL POS SENSOR)	● An excessively high or low voltage from the sensor is detected by the ECM.
47	Crankshaft position sensor (TDC) [CRANK POS SEN (TDC)]	● An incorrect signal from the sensor is detected by the ECM during engine running and cranking.
55	No failure (NO SELF DIAGNOSTIC FAILURE INDICATED)	No malfunction is detected by the ECM.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC *1 Confirmation Procedure Quick Ref.	*2 Overall Function Check	MI Illumination	Reference Page
● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat ● Fan belt ● Engine coolant temperature sensor For more information, refer to "12 MAIN CAUSES OF OVERHEATING". (EC-CD-99)	—	IGN: ON (RUNNING)	Lighting up	EC-CD-80
● ECM	IGN: ON	—	Lighting up	EC-CD-90
● Harness or connectors (The sensor circuit is open or shorted.) ● Needle lift sensor ● Air in fuel line ● Clogging No. 1 injection nozzle	RUNNING	—	Lighting up	EC-CD-101
● Harness or connectors (The solenoid valve circuit is open or shorted.) ● Fuel cut solenoid valve	RUNNING	—	Lighting up	EC-CD-104
● Harness or connectors (The sensor circuit is open or shorted.) ● Fuel temperature sensor	IGN: ON	—	—	EC-CD-108
● Harness or connectors (The sensor circuit is open or shorted.) ● Accelerator position sensor ● Accelerator position switch	IGN: ON	—	Lighting up	EC-CD-112
● Harness or connectors (The sensor circuit is open or shorted.) ● Crankshaft position sensor (TDC)	RUNNING	—	Lighting up	EC-CD-119
● No failure	—	—	—	—

*1: ● This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

*2: ● The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
● During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
● This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

Diagnostic Trouble Code (DTC) Chart (Cont'd)

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT-II, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
82	Atmospheric pressure sensor *5 (—) *3	● An excessively high or low voltage from the sensor is detected by the ECM.
83	Glow relay circuit (GLOW RELAY)	● Glow relay circuit is open or shorted.
84	ECM (—)*3	● ECM reference voltage (2.5V) is excessively high or low.
85	Air conditioner relay circuit (—)*3	● Air conditioner relay circuit is shorted.
86	EGRC-solenoid valve A (EGR SYS)	● EGRC-solenoid valve A is open or shorted.
87	Brake switch circuits (—)*3	● Brake switch circuits are open or shorted.
91	ECM (—)*3	● ECM version number or switching function is not plausible.
92	ECCS-D relay circuit (—)*3	● ECCS-D relay shut-off time is too late.
93	Ignition switch "ON" signal circuit (—)*3	● Ignition switch "ON" signal evaluation circuit in ECM is malfunctioning.
94	Injection timing control valve circuit (INJ TIMING CONT/V)	● Injection timing control valve circuit is open or shorted.
96	Camshaft position sensor (PUMP)*4 (—)*3	● An improper signal is calculated by the ECM.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC *1 Confirmation Procedure Quick Ref.	*2 Overall Function Check	MI Illumination	Reference Page
● ECM	IGN: ON	—	—	EC-CD-90
● Harness or connectors (The glow relay circuit is open or shorted.) ● Glow relay	IGN: ON	—	—	EC-CD-123
● ECM	IGN: ON	—	—	EC-CD-90
● Harness or connectors (The air conditioner relay circuit is open or shorted.) ● Air conditioner relay	IGN: ON	—	—	EC-CD-131
● Harness or connectors (The EGRC-solenoid valve A circuit is open or shorted.) ● EGRC-solenoid valve	RUNNING	—	Lighting up	EC-CD-134
● Harness or connectors (Brake switch circuits are open or shorted.) ● Brake lamp switch ● RDNT brake switch	RUNNING	—	Lighting up	EC-CD-141
● ECM	IGN: ON	—	—	EC-CD-90
● Harness or connectors (The ECCS-D relay circuit is shorted.) ● ECCS-D relay ● ECM	IGN: ON	—	Lighting up	EC-CD-90
● ECM	IGN: ON	—	Lighting up	EC-CD-90
● Harness or connectors (The injection timing control valve circuit is open or shorted.) ● Injection timing control valve	IGN: ON	—	Lighting up	EC-CD-85
● ECM ● Needle lift sensor ● Low battery voltage	RUNNING	—	Lighting up	EC-CD-101

*1: ● This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

*2: ● The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
● During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
● This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

*3: CONSULT-II may not detect, but self-diagnostic results are available with MI.

*4: Imaginary sensor, which produces secondary engine revolution signal using needle lift sensor pulse.

*5: The atmospheric pressure sensor is located inside the ECM and is not replaceable.

Diagnostic Trouble Code (DTC) Chart (Cont'd)

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT-II, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
97	MI (—)*3	● MI (malfunction indicator) circuit is open or shorted.
98	GLOW LAMP CIRCUIT (—)*3	● Glow lamp circuit is open or shorted.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC Confirmation Procedure Quick Ref. *1	Overall Function Check *2	MI Illumination	Reference Page
● Harness or connectors (The MI circuit is open or shorted.) ● MI lamp ● ECM	IGN: ON	—	—	EC-CD-146
● Harness or connectors (The glow indicator lamp circuit is open or shorted.) ● Glow lamp	IGN: ON	—	—	EC-CD-123

*1: ● This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

*2: ● The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
● During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
● This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

*3: CONSULT-II may not detect, but self-diagnostic results are available with MI.

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM: HARD/NO START/RESTART (EXCP. HA) — NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	SYMPTOM: ENGINE STALL — AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR — BLACK SMOKE	ABNORMAL SMOKE COLOR — WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator illuminates.	Can be detected by CONSULT-II?	Fuel cut	Reference page	Feature of symptom, Check point
New CT/CS		AA				AB			AC	AD	AE		AF		AG	AH	AJ	AK	AL	AM	AP		HA					
Injection timing	Advanced	○	○	●	●			○		●					○	○					●				○		EC-CD-41	
	Retarded	○	○	●	●			○			●				○	○						●			○		EC-CD-41	
Electric injection pump mainframe		●	●	●	●	○	○	○	○	○	●	○	○	○	●	●	○		○		●	○		○	○	○	—	*1
Injection nozzle		○	○	○	○	○	○	○		●	○	○		○	●	●					●						EC-CD-20	*2
Glow system		○	○	●	●					●												●					EC-CD-123	
Engine body		○	○	●	●	○	○	○		●	○	○		○	●	●		○	○	○		●					EM-section	*3
EGR system											●	●									●						EC-CD-134	
Air cleaner and ducts											●	●									●				○		MA-section	*4

● ; High Possibility Item
○; Low Possibility Item
*1: Insufficient or excess amount. Governor 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.

Symptom Matrix Chart (Cont'd)

Feature of symptom / Check point					Compensation according to engine coolant temperature does not function.				Injection timing cannot be controlled.				Engine runs on after turning ignition switch OFF.	Compensation for amount of fuel injected according to fuel temperature does not function.			
Reference page					EC-CD-65		EC-CD-69	EC-CD-73	EC-CD-76	EC-CD-80		EC-CD-85		EC-CD-101	EC-CD-104	EC-CD-108	EC-CD-112	EC-CD-119	
SYMPTOM	Fuel cut								○	○					○	○			
	Can be detected by CONSULT-II?				○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Malfunction indicator illuminates.						○		○	○	○	○	○	○	○		○	○	○
	DEAD BATTERY (UNDER CHARGE)			HA															
	ABNORMAL SMOKE COLOR	WHITE SMOKE		AP								○		○					
		BLACK SMOKE				○							○						
	EXCESSIVE OIL CONSUMPTION			AM															
	EXCESSIVE FUEL CONSUMPTION			AL															
	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE			AK															
	SLOW/NO RETURN TO IDLE			AJ															
	IDLING VIBRATION			AH			○									○		○	
	ROUGH IDLE/HUNTING			AG			○									○		○	
	LOW IDLE			AF			○									○			
	HI IDLE																		
	POOR ACCELERATION			AE	○			○								○	○		
	LACK OF POWER				○											○	○		
	SPARK KNOCK/DETONATION			AD								○		○					
	HESITATION/SURGING/FLAT SPOT			AC	○	○										○	○		
	ENGINE STALL	WHEN DECELERATING		AB			○		○	○					○	○			○
		DURING DRIVING							○	○					○				○
		AT IDLE					○		○	○					○	○			○
	HARD/NO START/ RESTART (EXCP. HA)	HARD TO START WHEN ENGINE IS HOT		AA												○			
		HARD TO START WHEN ENGINE IS COLD					○												
		NO START (without first firing)								○					○				
		NO START (with first firing)																	
Malfunction				New CT/CS	open, ground short	short	open, short	open, short	open, short	open, ground short	short	open, short	ground short	open, short	open, ground short	short	open, short	open, short	open, short	noise
SYSTEM — Engine control module system				Engine control module	Mass air flow sensor circuit		Engine coolant temperature sensor circuit	Vehicle speed sensor circuit	Control sleeve position sensor circuit	Electric governor circuit		Injection timing control valve circuit		Needle lift sensor circuit	Fuel cut solenoid valve circuit		Fuel temperature sensor circuit	Accelerator position sensor circuit	Crankshaft position sensor (TDC) circuit	

Symptom Matrix Chart (Cont'd)

Feature of symptom / Check point				Start control does not function.	Air conditioner does not stop operating.	Air conditioner does not work.	Accelerator position sensor NG signal is output.	Engine does not stop.			Does not stop operating.	Glow lamp does not turn on.	Glow lamp does not turn off.	Ground short makes engine unable to stop.	Air conditioner does not operate.	Air conditioner does not stop operating.		
Reference page				EC-CD-149	EC-CD-131		EC-CD-112	EC-CD-62		EC-CD-62		EC-CD-134	EC-CD-123	EC-CD-62	EC-CD-131		EC-CD-141	EC-CD-90
SYMPTOM	Fuel cut									○				○				○
	Can be detected by CONSULT-II?						○			○	○	○	○	○				○
	Malfunction indicator illuminates.						○			○	○	○	○	○		○	○	○
	DEAD BATTERY (UNDER CHARGE)		HA															○
	ABNORMAL SMOKE COLOR	WHITE SMOKE	AP										○					○
		BLACK SMOKE										○						○
	EXCESSIVE OIL CONSUMPTION		AM															○
	EXCESSIVE FUEL CONSUMPTION		AL															○
	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE		AK															○
	SLOW/NO RETURN TO IDLE		AJ															○
	IDLING VIBRATION		AH											○				○
	ROUGH IDLE/HUNTING		AG											○				○
	LOW IDLE		AF				○											○
	HI IDLE																	○
	POOR ACCELERATION		AE				○									○		○
	LACK OF POWER						○											○
	SPARK KNOCK/DETONATION		AD															○
	HESITATION/SURGING/FLAT SPOT		AC				○											○
	ENGINE STALL	WHEN DECELERATING	AB			○		○						○				○
		DURING DRIVING						○						○				○
		AT IDLE				○		○						○				○
	HARD/NO START/ RESTART (EXCP. HA)	HARD TO START WHEN ENGINE IS HOT	AA	○									○					○
		HARD TO START WHEN ENGINE IS COLD		○									○					○
		NO START (without first firing)						○					○					○
		NO START (with first firing)											○					○
Malfunction				open, short	open, ground short	short	open, ground short	open	short	open	short	open, short	ground short	open	short	open	short	open	short	open, short
SYSTEM — Engine control module system			New CT/CS	Start signal circuit	Air conditioner switch circuit		Accelerator position switch (Idle) circuit	Ignition switch circuit (ON signal)		Power supply for ECM circuit		EGRC-solenoid valve circuit		Glow relay circuit		Engine control module relay (Self-shutoff) circuit		Air conditioner relay circuit		Brake switch circuits		ECM, Connector circuit
			Engine control module																			

CONSULT-II Reference Value in Data Monitor Mode

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.

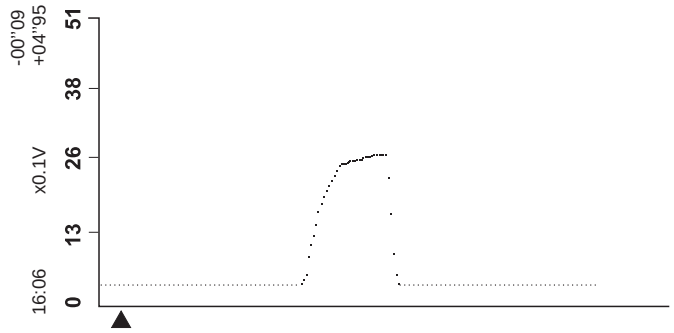
MONITOR ITEM	CONDITION		SPECIFICATION
CKPS•RPM (TDC)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
CKPS•RPM-PUMP			
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	• Turn drive 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: release	Approx. 0.40V
		Accelerator pedal: depress	Approx. 3.3V
OFF ACCEL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: release	ON
		Accelerator pedal: slightly open	OFF
C/SLEEV POS/S	• Engine: After warming up		Approx. 2.5V
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: ‘‘OFF’’	OFF
		Air conditioner switch: ‘‘ON’’ (Compressor operates.)	ON
IGN SW	• Ignition switch: ON → OFF		ON → OFF
MAS AIR/FL SE	• Engine: After warming up • Air conditioner switch: ‘‘OFF’’ • Shift lever: ‘‘N’’ • No-load	Idle	0.8 - 2.7V
		2,000 rpm	2.2 - 2.8V
ACT INJ TIMG	• Engine: After warming up • Air conditioner switch: ‘‘OFF’’ • Shift lever: ‘‘N’’ • No-load • At sea level	Idle	-0.5 to -1.5°
		2,000 rpm	+2.5° to +3.5°
TARGET F/INJ	• Engine: After warming up • Air conditioner switch: ‘‘OFF’’ • Shift lever: ‘‘N’’ • No-load • At sea level	Idle	8.0 - 8.8 mm^3/stroke
		2,000 rpm	Approx. 7.6 mm^3/stroke
BRAKE SW	• Ignition switch: ON	Brake pedal: released	OFF
		Brake pedal: depressed	ON
BRAKE SW 2	• Ignition switch: ON	Brake pedal: released	OFF
		Brake pedal: depressed	ON
FUEL CUT S/V	• Ignition switch: ON → OFF		ON → OFF
AIR COND RLY	• Air conditioner switch: OFF → ON		OFF → ON
GLOW RLY	• Refer to EC-CD-129.		
COOLING FAN	• When cooling fan is stopped.		OFF
	• When cooling fan operates at low speed.		LOW
	• When cooling fan operates at high speed.		HI
EGRC SOL/V A	• Engine: After warming up • Air conditioner switch: ‘‘OFF’’ • Shift lever: ‘‘N’’ • No-load • At sea level	Idle	OFF
		2,800 rpm	ON

Major Sensor Reference Graph in Data Monitor Mode

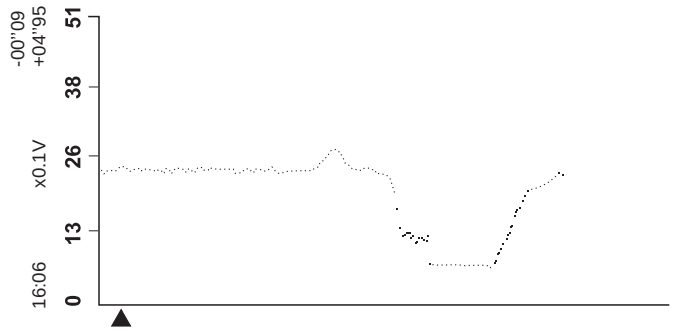
The following are the major sensor reference graphs in ‘‘DATA MONITOR’’ mode.
(Select ‘‘HI SPEED’’ in ‘‘DATA MONITOR’’ with CONSULT-II.)

ACCEL POS SEN, C/SLEEV POS/S, ACT INJ TIMG

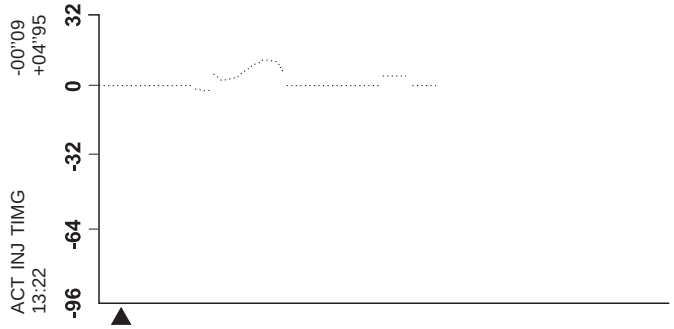
Below is the data for ‘‘ACCEL POS SEN’’, ‘‘C/SLEEV POS/S’’ and ‘‘ACT INJ TIMG’’ when revving engine quickly up to 3,000 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



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



- ‘‘C/SLEEV POS/S’’ should increase when depressing the accelerator pedal and should decrease when the pedal is released.



- ‘‘ACT INJ TIMG’’ should increase when depressing the accelerator pedal and should decrease when the pedal is released.

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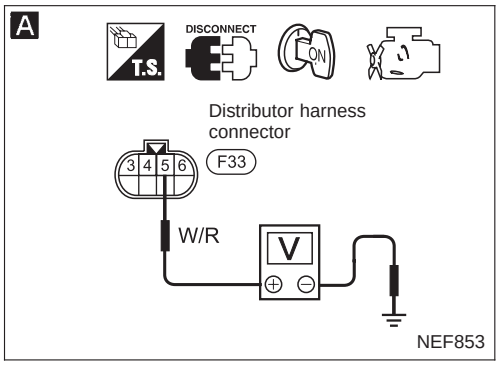
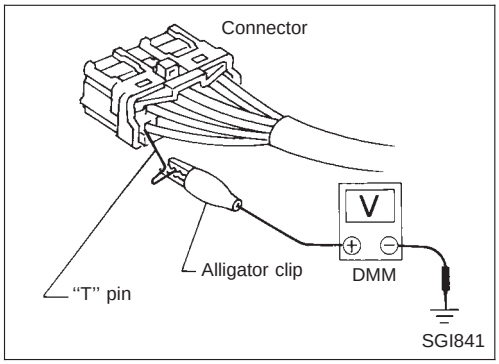




ECM Terminals and Reference Value

PREPARATION

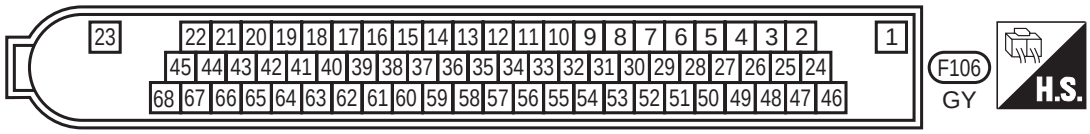
The ECM is located beneath the heater unit. To access the ECM, remove the center console under cover at the passenger side. Perform all voltage measurements with all connectors connected. Since the ECM harness connector cannot be accessed from the backside, voltages should be measured at the nearest connector to the sensors or actuators to be measured.

When measuring:

- Use extreme care not to touch 2 pins at the same time.
- Note that the data is for comparison and may not be exact.
- Use care not to enlarge the opening to keep the seal in good condition.

ECM Terminals and Reference Value (Cont'd)

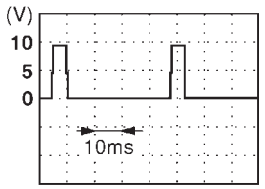
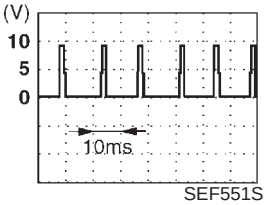
ECM HARNESS CONNECTOR TERMINAL LAYOUT



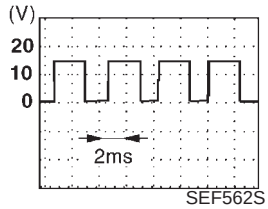
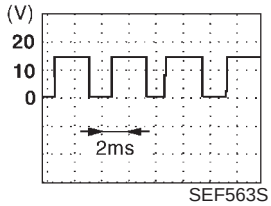
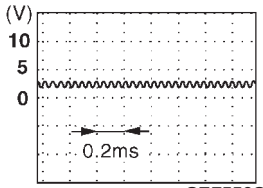
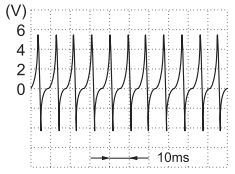
NEF781

ECM INSPECTION TABLE

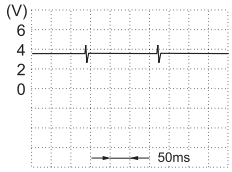
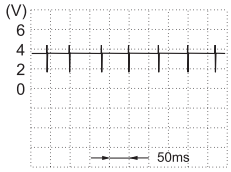
Specification data are reference values and are measured between each terminal and ㊻ (Engine control module ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
1 24 46	B	ESSC ground	Engine is running. └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
2	L/OR	Tachometer	Engine is running. (Warm-up condition) └ Idle speed	Approximately 1.1 - 1.5V  SEF550S
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 1.1 - 1.5V  SEF551S

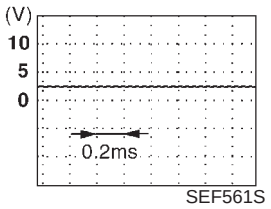
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
4 5 49	B/L	Electric governor ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 10.5V  SEF562S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 10.5  SEF563S
7	W	Control sleeve position sensor power supply	Engine is running. └ Idle speed	Approximately 2.6V  SEF559S
8	W	Crankshaft position sensor (TDC) (Signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V  NEF867
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0V  NEF868
11	B	Needle lift sensor ground	Ignition switch "ON"	Approximately 0V

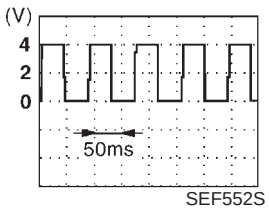
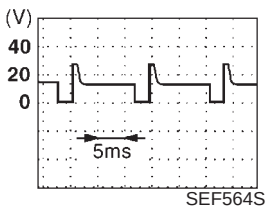
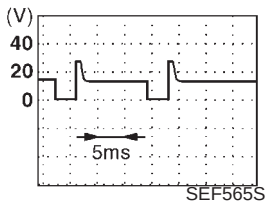
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
12	W	Needle lift sensor	Engine is running. (Warm-up condition) └ Idle speed	Approximately 3.8 - 4.0V  NEF869
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 3.8 - 4.0V  NEF870
13	L/W	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.9 - 2.3V
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	2.5 - 2.9V
14	L/OR	Engine coolant temperature sensor	Engine is running.	0.6 - 4.8V Output voltage varies with engine coolant temperature.
15	W	Accelerator position sensor	Ignition switch "ON" └ Accelerator pedal released	0.4 - 0.6V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4.0V
16	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
19	W	Mass air flow sensor power supply	Ignition switch "ON"	Approximately 5V
20 39	R/B	Brake switch 2	Ignition switch "ON" └ Brake pedal released	Battery voltage (11 -14V)
			Ignition switch "ON" └ Brake pedal depressed	0V
21	OR	Crankshaft position sensor (TDC) ground & mass air flow sensor ground	Engine is running. └ Idle speed	Approximately 0V

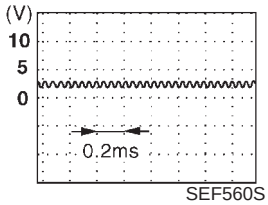
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
23 45 68	R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
25	P	EGRC-solenoid valve A	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Engine speed is 2,800 rpm	Approximately 0.3V
26	OR/L	Malfunction indicator	Ignition switch "ON"	Approximately 1.0V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
27	OR	Glow lamp	Ignition switch "ON" └ Glow lamp is "ON".	Approximately 1.0V
			Ignition switch "ON" └ Glow lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)
28	L/W	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON"	Approximately 0.4V
			Engine is running. └ A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
29	R	Control sleeve position sensor (Reference signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.6V  SEF561S
30	G/B	Data link connector for CONSULT-II	Engine is running. └ Idle speed (CONSULT-II is connected and turned on)	Approximately 0V
61	GY/L			Approximately 4 - 9V
64	G/R			Approximately 0V
33	B	Sensors' ground	Engine is running. └ Idle speed	Approximately 0V
38	BR	Ignition switch	Ignition switch "LOCK"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ECM Terminals and Reference Value (Cont'd)

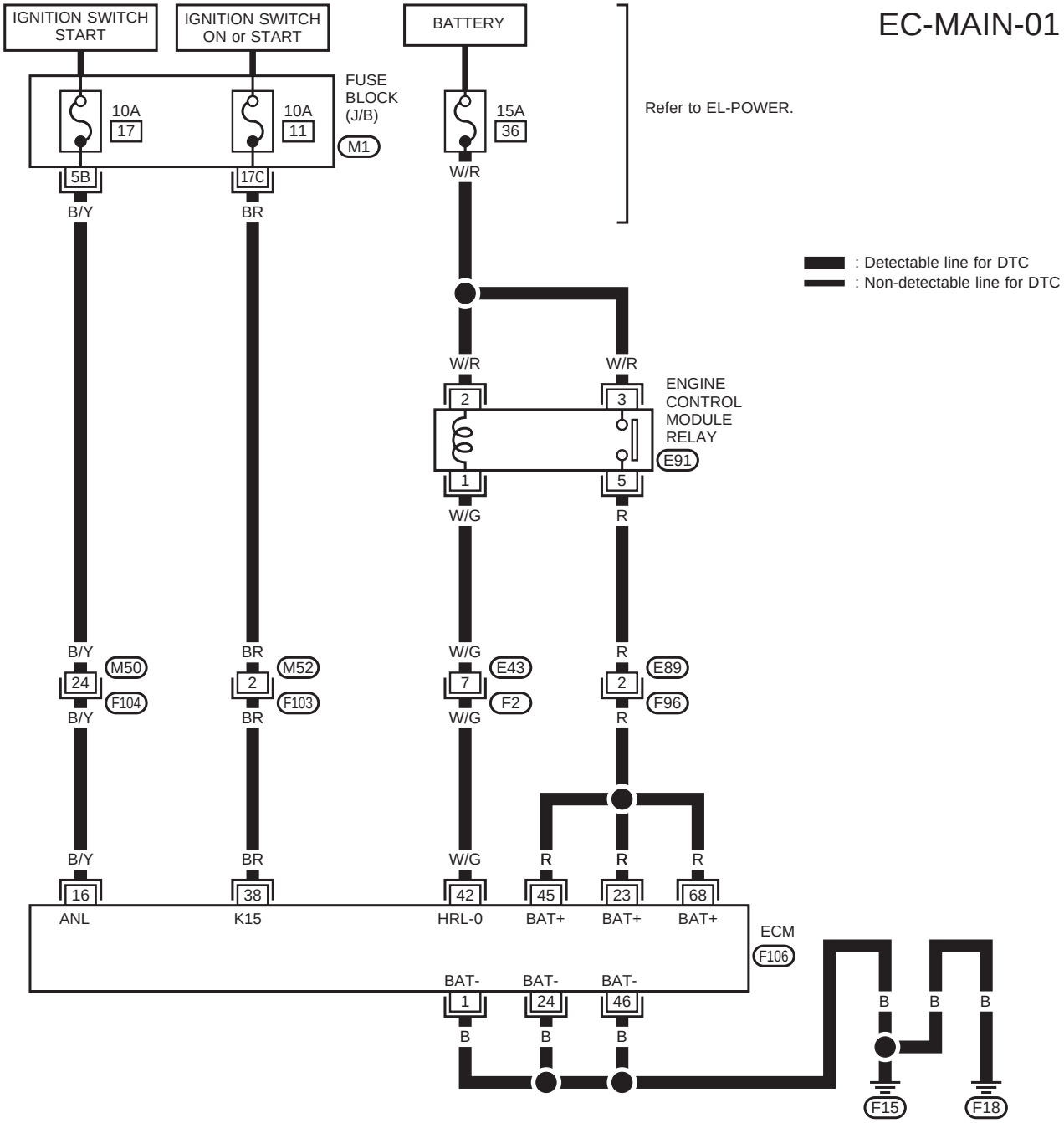
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
42	W/G	Engine control module relay (Self-shutoff)	Engine is running. Ignition switch "LOCK" └ For a few seconds after turning ignition switch to the "LOCK" position	0 - 1V
			Ignition switch "LOCK" └ Following a few seconds delay after turning ignition switch to the "LOCK" position	BATTERY VOLTAGE (11 - 14V)
43	OR/W	Vehicle speed sensor	Engine is running. └ Lift up the vehicle. └ In 2nd gear position └ Vehicle speed is 40 km/h (25 mph)	0 - Approximately 4.2V  SEF552S
44	R/G	Stop lamp switch	Ignition switch "ON" └ Brake pedal released	0V
			Ignition switch "ON" └ Brake pedal depressed	Battery voltage (11 - 14V)
47	LG/R	Cooling fan relay (Low speed)	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating.	Approximately 0.4V
50	W/R	Glow relay	Refer to "Glow control System".	
51	B/Y	Injection timing control valve	Engine is running. (Warm-up condition) └ Idle speed	Approximately 9V  SEF564S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 8V  SEF565S

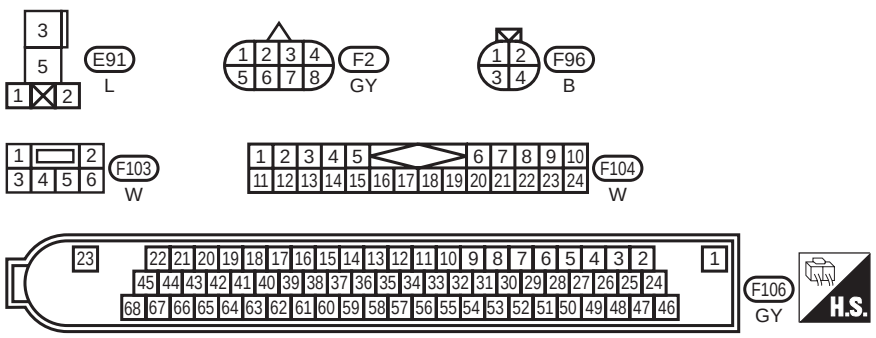
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
52	B	Control sleeve position sensor ground	Engine is running. └ Idle speed	Approximately 2.6V  SEF560S
53	SB	Fuel cut solenoid valve	Ignition switch "LOCK"	Approximately 0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
54	LG	Cooling fan relay (High speed)	Engine is running. ├ Cooling fan is not operating. └ Cooling fan is operating at low speed.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating at high speed.	Approximately 0.5V
55	BR	Accelerator position sensor ground	Engine is running. └ Idle speed	Approximately 0V
57	LG/W	Accelerator position sensor power supply	Ignition switch "ON"	Approximately 5V
59	OR	Immobilizer communication	Ignition switch "ON"	BATTERY VOLTAGE (4 - 14V)
62	GY	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			Engine is running. └ Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
63	R/Y	Fuel temperature sensor	Engine is running.	0.6 - 4.8V Output voltage varies with fuel temperature.
65	GY	Accelerator position switch (Idle)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0V
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 2.7V

Main Power Supply and Ground Circuit

EC-MAIN-01



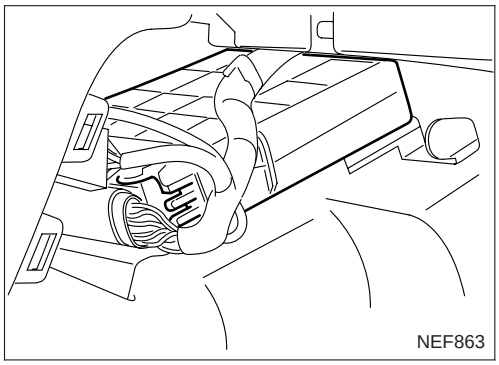


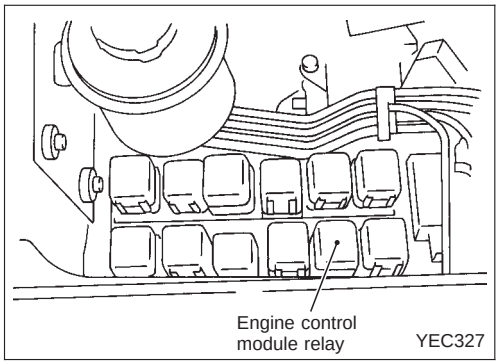
REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

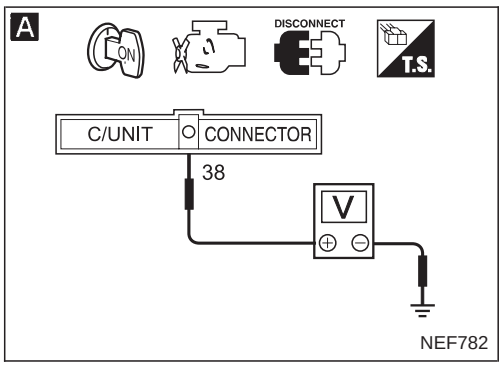
YEC307

Main Power Supply and Ground Circuit (Cont'd)

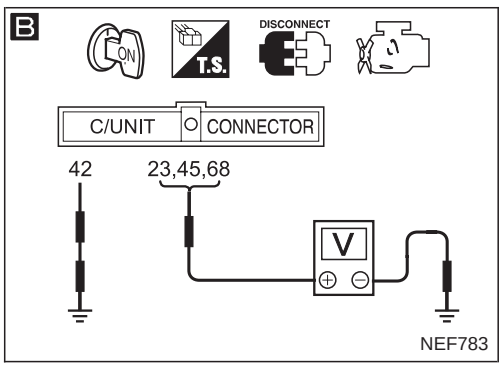

NEF863



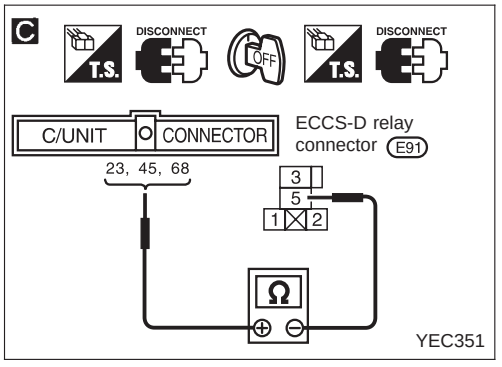
YEC327



NEF782



NEF783



YEC351

INSPECTION START

Start engine.
Is engine running?

No → **A**

CHECK POWER SUPPLY-I.
1. Disconnect ECM harness connector.
2. Turn ignition switch to "ON" position.
3. Check voltage between ECM connector terminal (38) and ground
   Voltage: Battery voltage

If NG, check the following:
- 10A fuse
- Harness connectors (M52), (F103)
- Harness for open or short-circuit between ECM and ignition switch.

If NG, replace 10A fuse or repair harness or connectors.

OK

Yes

1. Stop engine.
2. Disconnect ECM harness connector.
3. Turn ignition switch to "ON" position.

B

CHECK POWER SUPPLY-II.
1. Short between ECM connector terminal (42) and engine ground with a jump wire.
2. Check voltage between ECM terminals (23), (45), (68) and ground.
   Voltage: Battery voltage

OK → Go to **G** "CHECK GROUND CIRCUIT" on page EC-CD-64.

NG

C

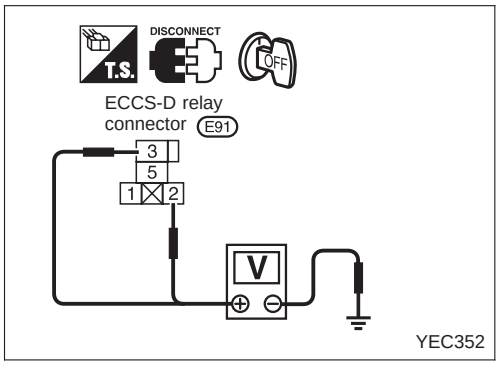
CHECK HARNESS CONTINUITY BETWEEN ENGINE CONTROL MODULE RELAY AND ECM
Check harness continuity between ECM connector terminals (23), (45) (68) and engine control module relay connector terminal (5).
Continuity should exist.
If OK, check harness for short.

NG → Check the following:
- Harness connectors (M89), (F96)
- Harness for open or short-circuit between engine control module relay and ECM.

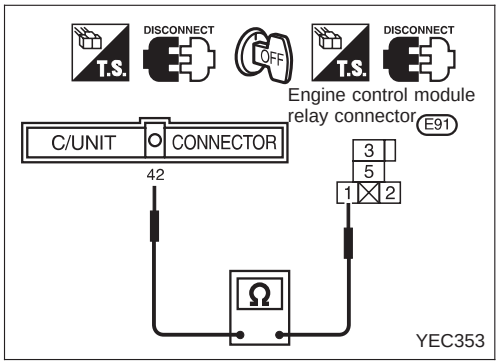
If NG, repair harness or connectors.

OK → (A)

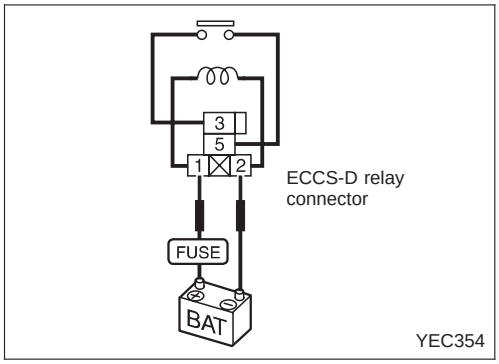
Main Power Supply and Ground Circuit (Cont'd)



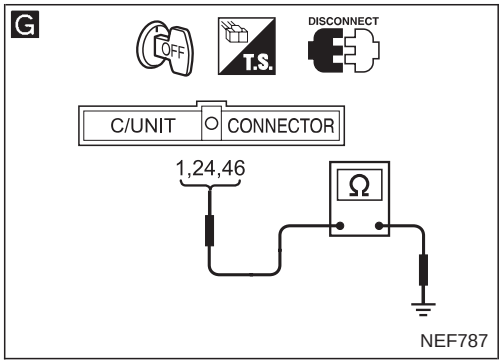
YEC352



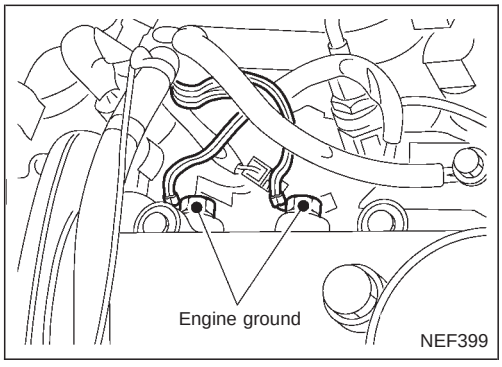
YEC353



YEC354



NEF787



NEF399

Ⓐ

D

CHECK VOLTAGE BETWEEN ENGINE CONTROL MODULE RELAY AND GROUND.
Check voltage between engine control module relay connector terminals ②, ③ and ground with CONSULT-II or tester.
Voltage: Battery voltage

NG → Check the following:
- 15A fuse
- Harness for open or short-circuit between engine control module relay and battery.

If NG, replace fuse or repair harness or connectors.

OK ↓

E

CHECK OUTPUT SIGNAL CIRCUIT.
Check harness continuity between ECM connector terminal ㊷ and engine control module relay connector terminal ①.
Continuity should exist.
If OK, check harness for short-circuit.

NG → ● Check harness connectors E43, F2
Repair harness or connectors.

OK ↓

F

CHECK ENGINE CONTROL MODULE RELAY.
1. Apply 12V direct current between engine control module relay connector terminals ① and ②.
2. Check continuity between engine control module relay connector terminals ③ and ⑤.

12V (① - ②) applied:
Continuity exists.
No voltage applied:
No continuity

NG → Replace engine control module relay.

OK ↓

G

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between ECM connector terminals ①, ㉔, ㊻ and engine ground.
Continuity should exist.
If resistance is too high, loosen, clean and retighten engine ground.
If OK, check harness for short-circuit.

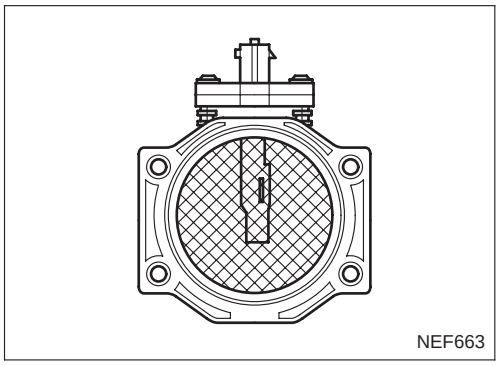
NG → Repair harness or connectors.

OK ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector.

↓

INSPECTION END


NEF663

Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the amount of intake air by analysing a part of the entire flow. When intake air flows into the intake manifold, heat is withdrawn from the hot film. By regulating the electrical current that flows through the hot film, the ECM maintains the hot film temperature on a constant level. The amount of electric current that is needed to keep the hot film on a constant temperature level is proportional to the mass of air that flows into the engine.

Diagnostic Trouble Code No.	Malfunction is detected when . . .	Check Items (Possible Cause)
12	● An excessively high or low voltage from the sensor is entered to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

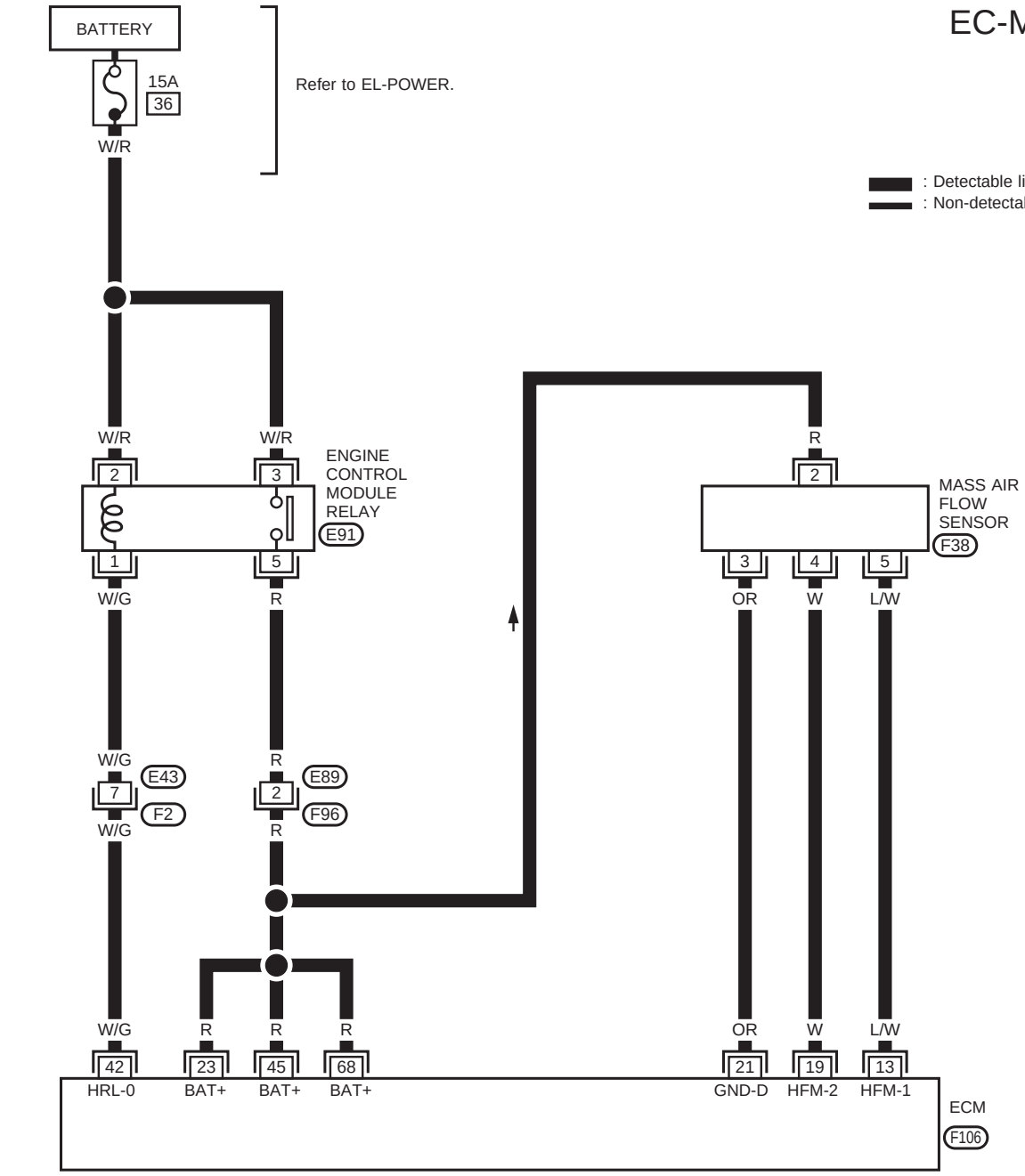
1) Turn ignition switch to ‘‘ON’’ position.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Start engine and wait for at least 20 seconds.

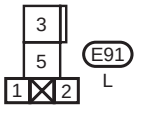
OR

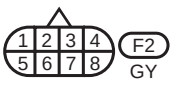
1) Start engine and wait for at least 20 seconds.
2) Turn ignition switch to ‘‘LOCK’’ position, wait for at least 5 seconds and then turn to ‘‘ON’’ position.
3) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results).

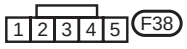
Mass Air Flow Sensor (MAFS) (Cont'd)

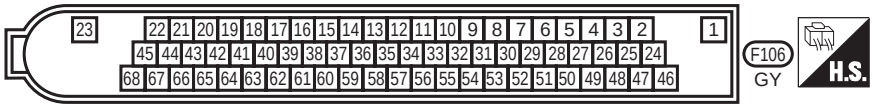
EC-MAFS-01







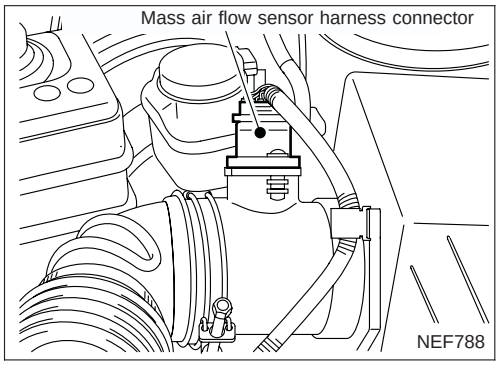


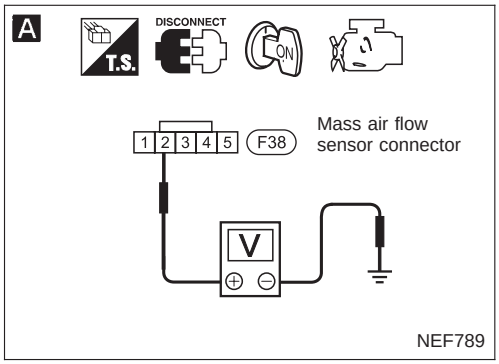


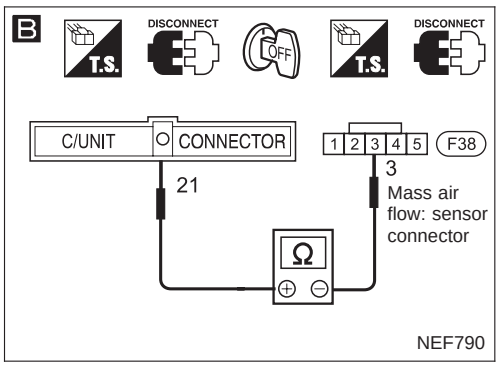
YEC308

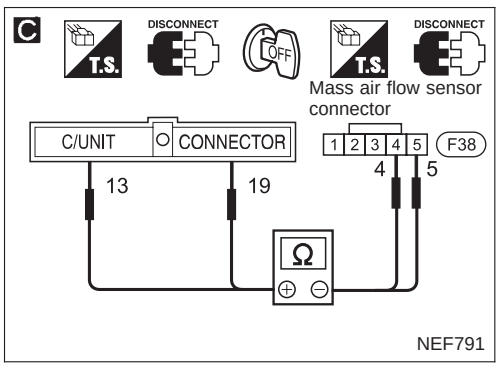
Mass Air Flow Sensor (MAFS) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect mass air flow sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between mass air flow sensor connector terminal ② and ground.

Voltage: Battery positive voltage

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between mass air flow sensor connector terminal ③ and ECM connector terminal ㉑.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between mass air flow sensor connector terminal ④ and ECM connector terminal ⑲, mass air flow sensor connector terminal ⑤ and ECM connector terminal ⑬.

Continuity should exist.

If OK, check harness for short.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Mass air flow sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace mass air flow sensor.

OK

Disconnect and reconnect harness connectors in the circuits. Then retest.

Trouble is not fixed.

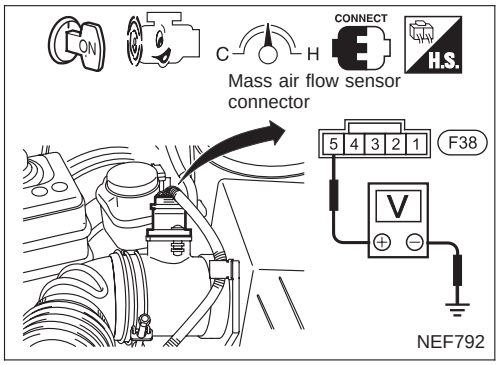
Check ECM pin terminals for damage or the connection of ECM harness connector.

INSPECTION END

Mass Air Flow Sensor (MAFS) (Cont'd)

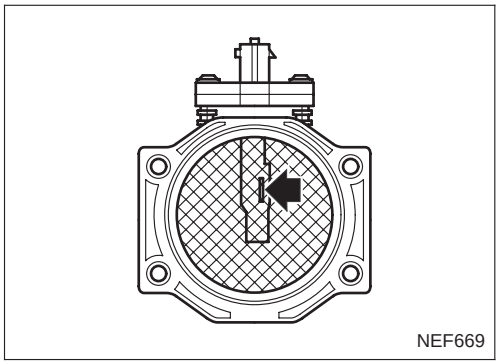
COMPONENT INSPECTION

Mass air flow sensor

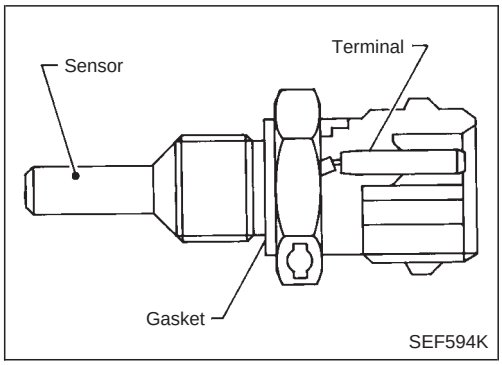


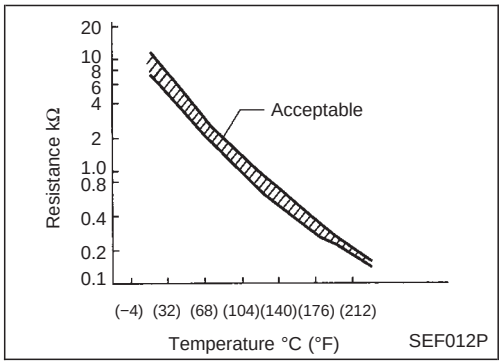
1. Turn ignition switch to ''ON'' position.
2. Start engine and warm it up sufficiently.
3. Check voltage between mass air flow sensor connector terminal ⑤ and ground.

Conditions	Voltage V
Ignition switch ''ON'' position (Engine stopped.)	Approximately 1.0
Idle (Engine is warmed-up sufficiently.)	1.9 - 2.3



4. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.





Engine Coolant Temperature (ECT) Sensor

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

〈Reference data〉

Engine coolant temperature °C (°F)	Voltage (V)	Resistance (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

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
13	● 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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

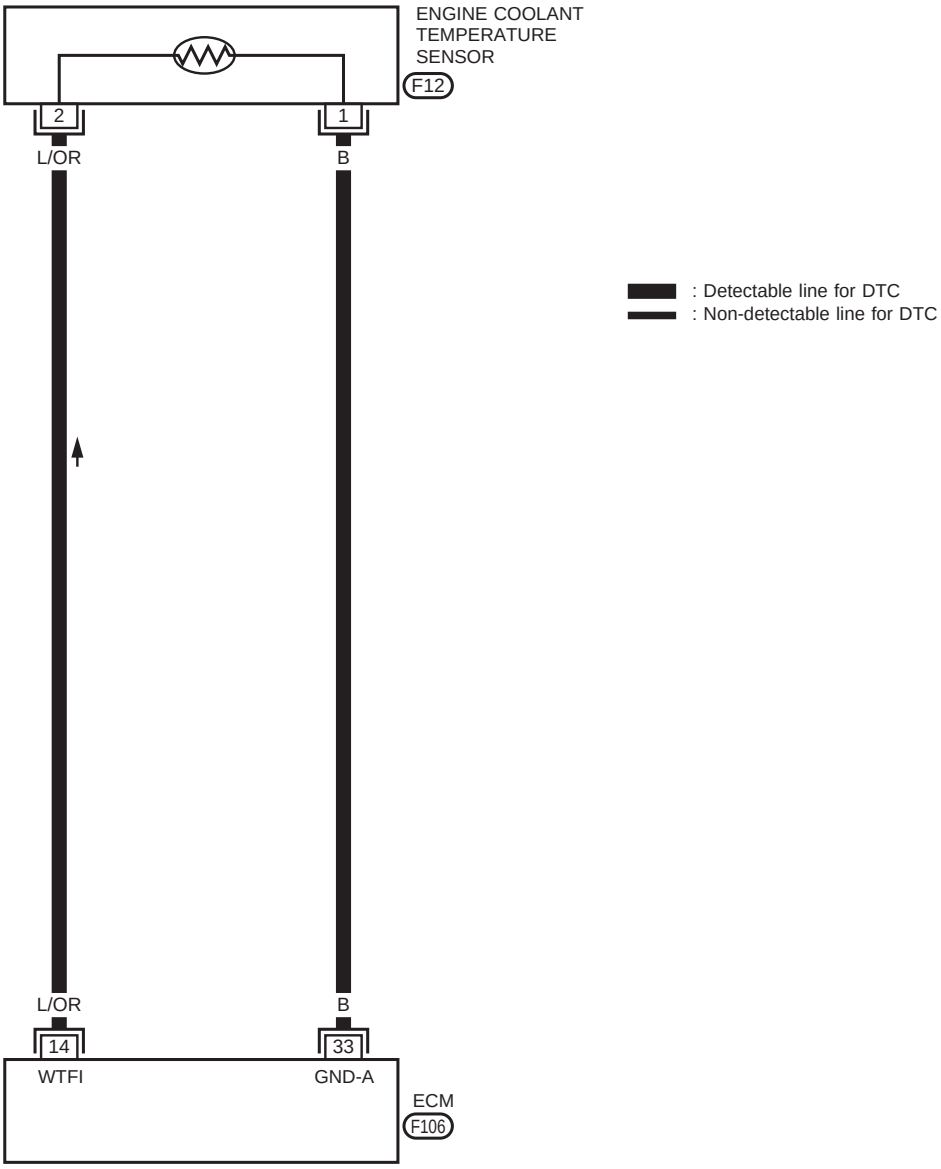
1) Turn ignition switch to ‘‘ON’’ position.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Wait at least 5 seconds.

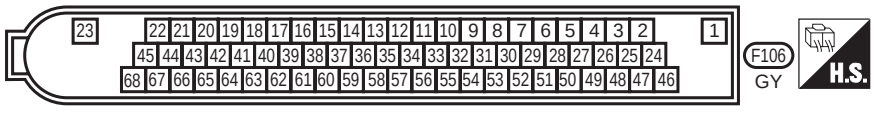
OR

1) Turn ignition switch to ‘‘ON’’ position and wait at least 5 seconds.
2) Turn ignition switch to ‘‘LOCK’’ position, wait at least 5 seconds and then turn to ‘‘ON’’ position.
3) Perform diagnostic test mode II (Self-diagnostic results).

Engine Coolant Temperature (ECT) Sensor (Cont'd)

EC-ECTS-01

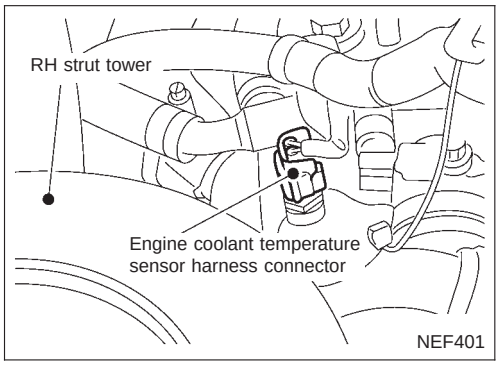


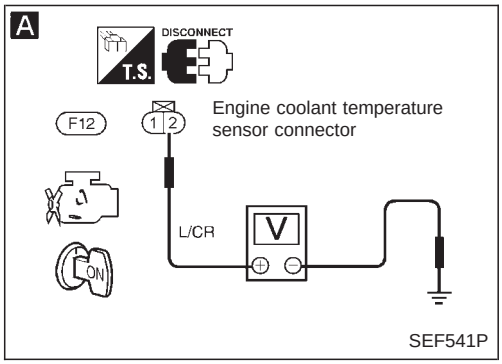


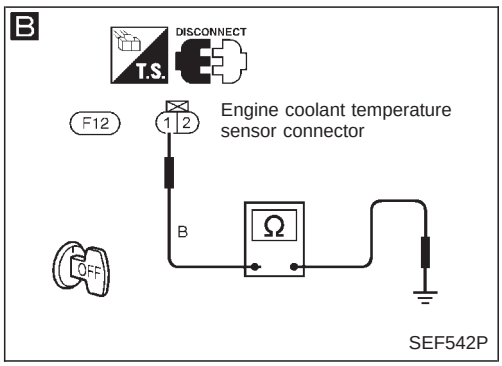
YEC417

Engine Coolant Temperature (ECT) Sensor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect engine coolant temperature sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between engine coolant temperature sensor connector terminal ② and ground with CONSULT-II or tester.

Voltage:
Approximately 4.9V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between engine coolant temperature sensor connector terminal ① and engine ground.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Engine coolant temperature sensor).
Refer to "COMPONENT INSPECTION"
on next page.

NG → Replace engine coolant temperature sensor.

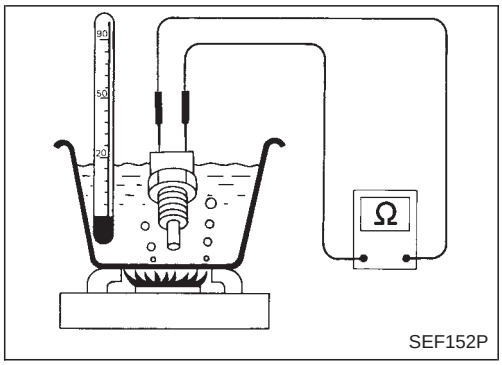
OK

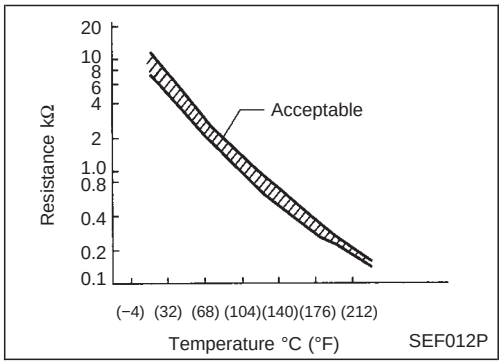
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END





Engine Coolant Temperature (ECT) Sensor (Cont'd)

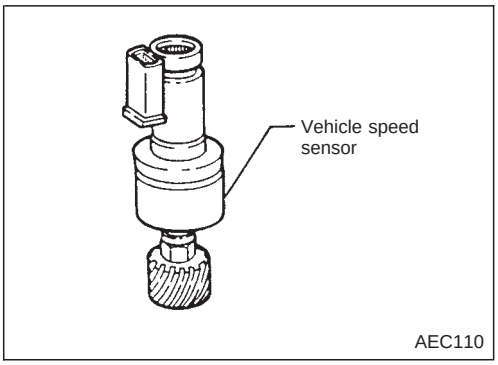
COMPONENT INSPECTION

Engine coolant temperature sensor

Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
90 (194)	0.236 - 0.260

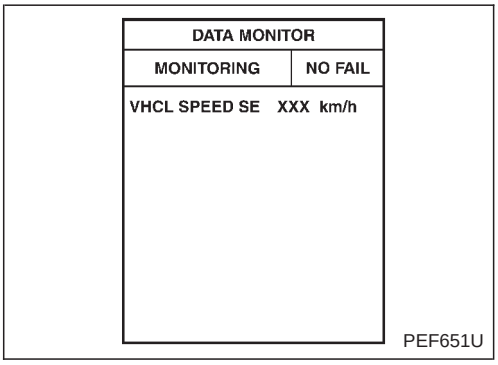
If NG, replace engine coolant temperature sensor.

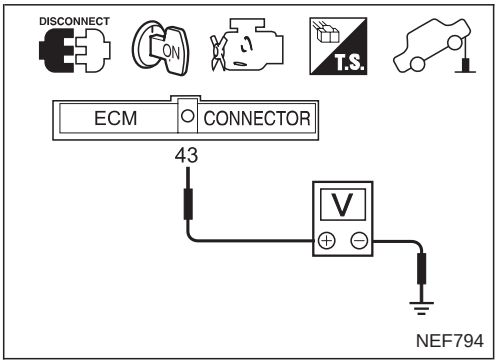


Vehicle Speed Sensor (VSS)

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.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
14	● 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





OVERALL FUNCTION CHECK

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

1) Jack up drive wheels.
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.

OR

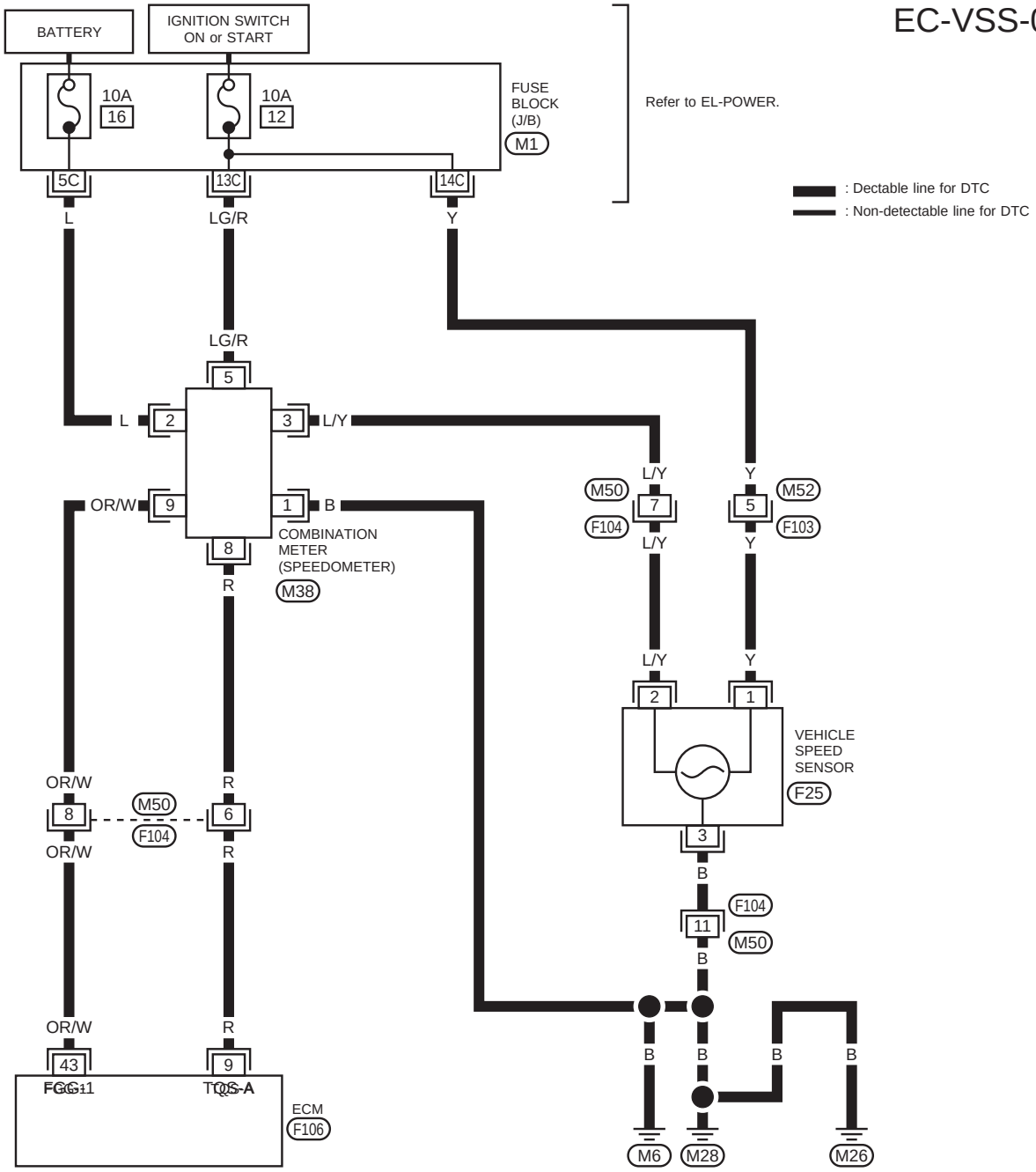
NO TOOLS

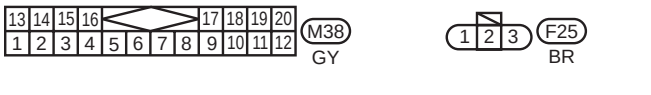
1) Jack up drive wheels.
2) Start engine.
3) Rotate drive wheel by hand.
4) Check voltage between ECM connector terminal ㊸ and ground with voltage tester.

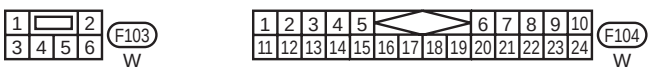
Voltage should vary between approx. 0 - 0.6V.

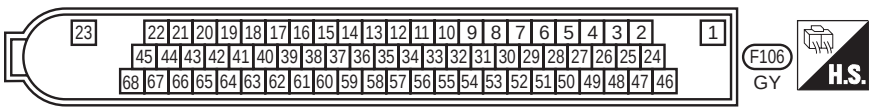
Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01









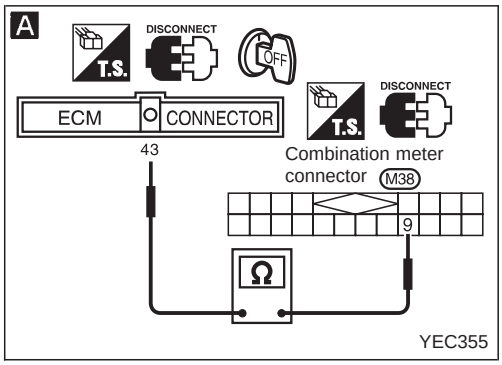
REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

YEC309

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM connector terminal (43) and combination meter connector terminal (9).

Continuity should exist.

If OK, check harness for short-circuit.

NG →
Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and combination meter.

If NG, repair harness or connectors.

OK ↓

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions correctly.

NG →
Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between combination meter and vehicle speed sensor.

If NG, repair harness or connectors.
Check vehicle speed sensor and its circuit. Refer to EL section.

OK ↓

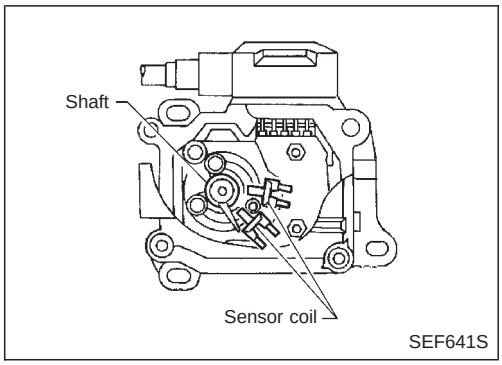
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

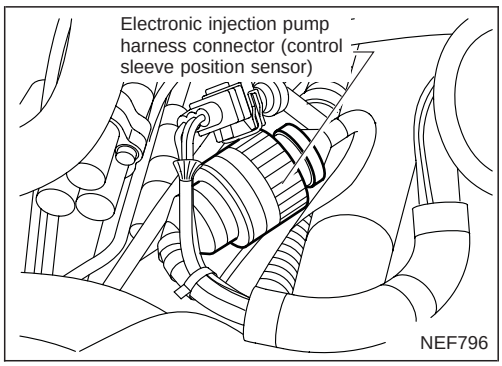
INSPECTION END



Control Sleeve Position Sensor (CSPS)

The control sleeve position sensor is installed on the electric governor. It senses the position of control sleeve (rotor angle) while the control sleeve is being driven by the electric governor, and feeds it back to the ECM.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
15	● An excessively high or low voltage from the sensor is detected by ECM. ..... ● An incorrect voltage signal from the sensor is detected by ECM during engine running.	● Harness or connectors (The control sleeve position sensor circuit is open or shorted.) ● Control sleeve position sensor



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

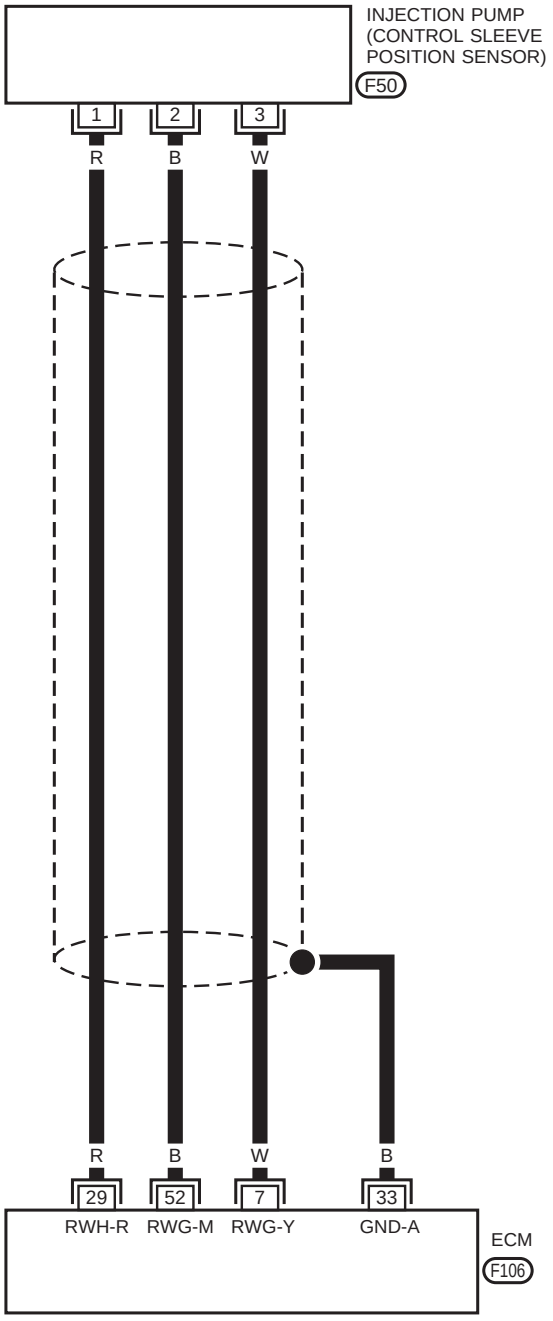
1) Turn ignition switch to ‘‘ON’’ position and select ‘‘DATA MONITOR’’ mode with CONSULT-II.
2) Start engine and run it for at least 2 seconds at idle speed.

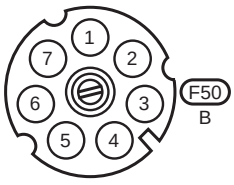
OR

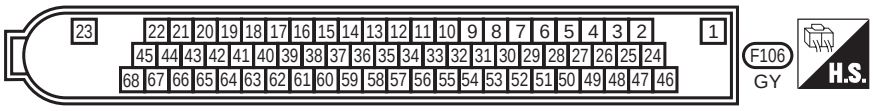
1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch to ‘‘LOCK’’ position, wait at least 5 seconds and then turn to ‘‘ON’’ position.
3) Perform ‘‘Diagnostic Test Mode II (Self-diagnostic results)’’.

Control Sleeve Position Sensor (CSPS) (Cont'd)

EC-CSPS-01



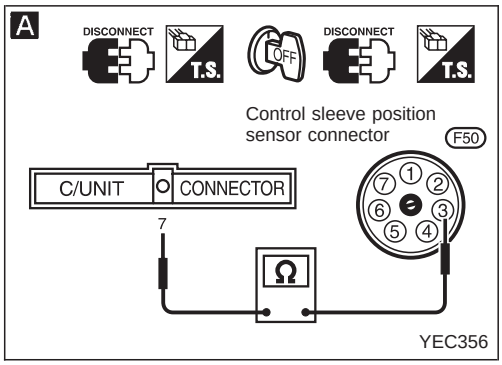


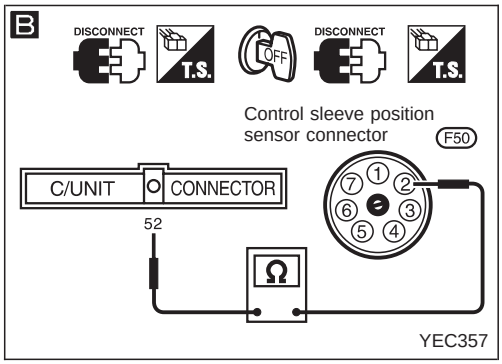


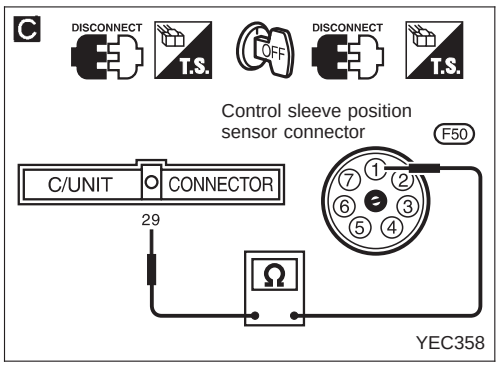
YEC418

Control Sleeve Position Sensor (CSPS) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between control sleeve position sensor connector terminal ③ and ECM connector terminal ⑦.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

B

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between control sleeve position sensor connector terminal ② and ECM terminal ⑫.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

C

CHECK REFERENCE SIGNAL CIRCUIT.
Check harness continuity between control sleeve position sensor connector terminal ① and ECM connector terminal ㉙

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Control sleeve position sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Have the injection pump assembly serviced by an authorised service representative.

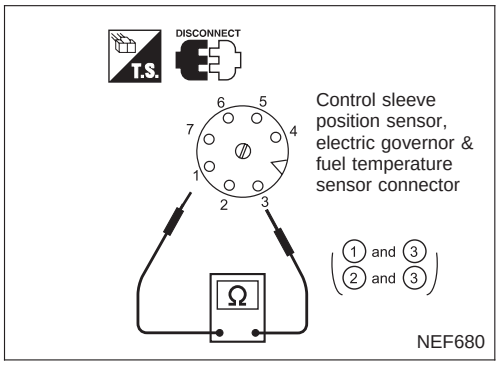
OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

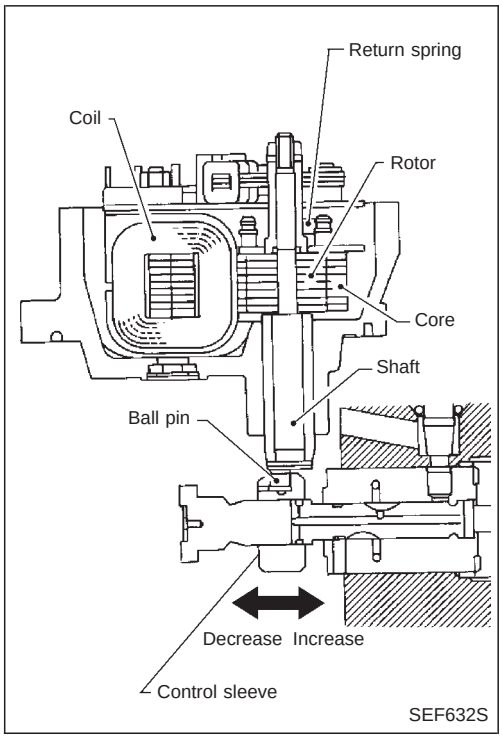


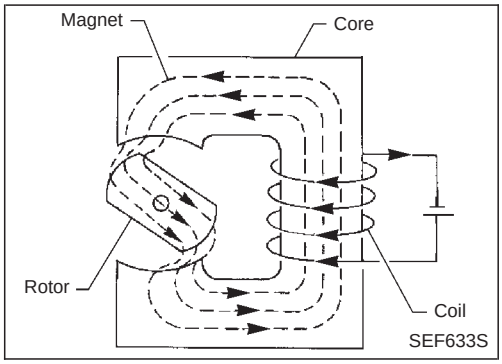
Control Sleeve Position Sensor (CSPS) (Cont'd)

COMPONENT INSPECTION

Control sleeve position sensor

1. Disconnect electronic injection pump harness connector.
2. Check continuity between terminals ① and ③, ② and ③.
   Resistance: Approximately 6.0Ω [at 25°C (77°F)]
   If NG, take proper action.





Electric Governor

The electric governor is built into the fuel injection pump. It moves the control sleeve to increase or decrease the amount of fuel injected.
When current flows through the coil, a magnetic force is produced, rotating the rotor. The rotor shaft is installed to the control sleeve via a ball pin which is eccentrically situated in relation to the rotor shaft. With this arrangement, the control sleeve can be moved in relation to rotor rotation.
The rotor's rotating angle is determined by a balanced condition of magnetic force (generated by current flow regulated by means of the ECM) and tension of return spring (installed to rotor). The larger the current flow through the coil, the greater the rotor's rotating angle. This means that the control sleeve moves to the right, increasing the amount of fuel injected.
The ECM regulates the current flow through the coil by changing the duty cycle ratio which controls the ON-OFF operation of the electric governor grounding circuit.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
18	• Fuel injection feedback system does not operate properly. [This system consists essentially of ECM, electric governor and control sleeve position sensor.]	• Main power supply circuit (ECM connector terminals (23), (45), (68)) and fuse • Harness or connectors (Electric governor and control sleeve position sensor circuit) • Electric governor • ECM

Electric Governor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

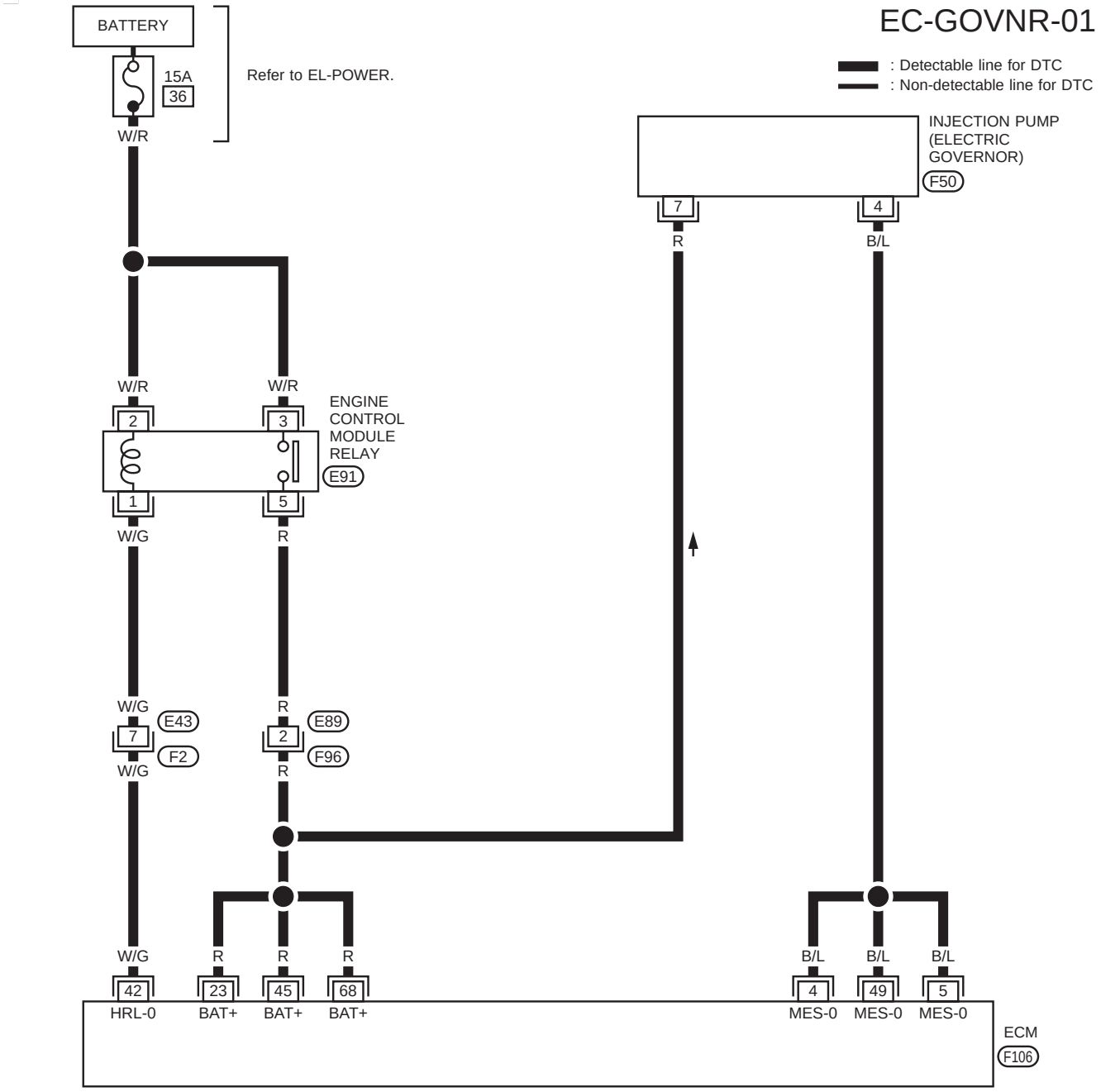
1) Turn ignition switch to ''ON'' position and select ''DATA MONITOR'' mode with CONSULT-II.
2) Start engine above 1,200 rpm.
3) Run it for 2 seconds above 1,200 rpm. Return engine speed to idle.

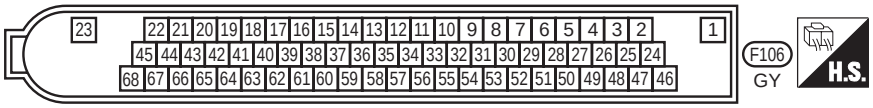
OR

1) Start engine above 1,200 rpm.
2) Run engine for 2 seconds above 1,200 rpm. Return engine speed to idle.
3) Turn ignition switch to ''LOCK'' position, wait at least 5 seconds and then turn to ''ON'' position.
4) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

Note: If malfunction occurs intermittently, conduct suitable driving pattern for 10 minutes. This makes it possible to determine DTC.

Electric Governor (Cont'd)

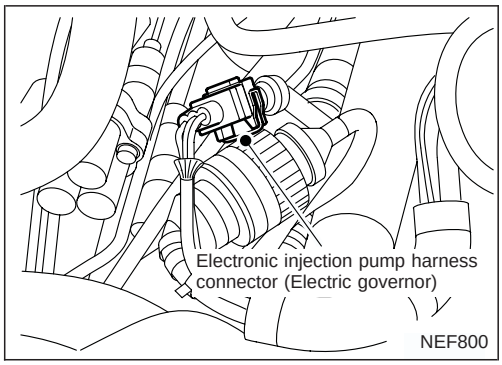


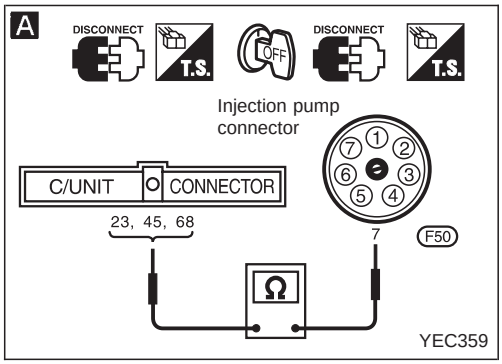


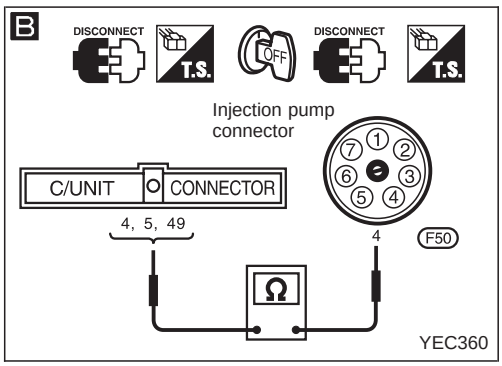
YEC310

Electric Governor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

CHECK MAIN POWER SUPPLY.
Refer to EC-CD-62.

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between injection pump connector terminal ⑦ and ECM connector terminals ㉓, ㊺, ㊽.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
Check harness continuity between injection pump connector terminal ④ and ECM connector terminals ④, ⑤, ㊾.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Electric governor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Have the injection pump assembly serviced by an authorised service representative.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

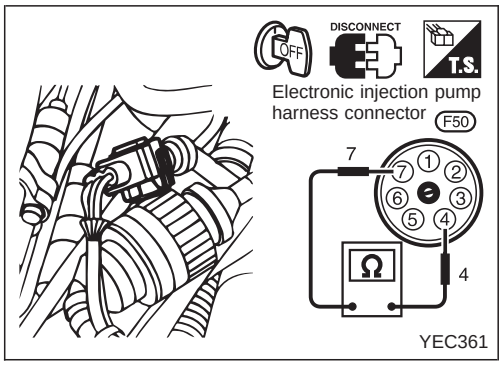
Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Electric Governor (Cont'd)

COMPONENT INSPECTION

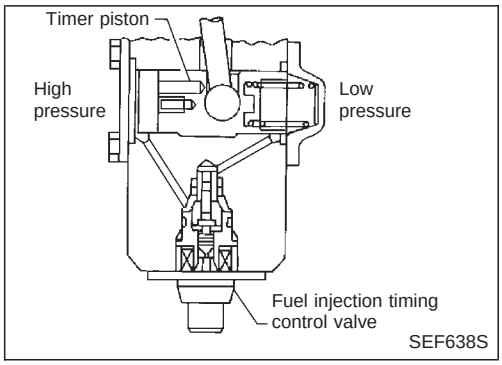


Electric governor

1. Disconnect electronic injection pump harness connector.
2. Check continuity between injection pump connector terminals ④ and ⑦.

Resistance: Approximately 1.0Ω [at 25°C (77°F)]

If NG, replace.



Injection Timing Control Valve

The injection timing control valve is built into the fuel injection pump. It controls the timer piston to change the fuel injection timing.
The timing control valve is a solenoid valve located in the line between high-pressure chamber and low-pressure chamber. It changes fuel pressure in the high-pressure chamber.
When current flows through the solenoid (the solenoid turns ON), the timing control valve opens, advancing fuel injection timing. When current does not flow through it, the timing control valve closes, retarding injection timing.
The ECM emits an ON-OFF duty cycle signal. The longer the OFF-duration, the greater the advance angle. The longer the ON-duration, the greater the retard angle. This means that changing the ON-OFF duty cycle ratio makes it possible to achieve an optimal advance angle and accurately control fuel injection timing.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
21	● Injection timing feedback system does not operate properly. (This system consists essentially of ECM, injection timing control valve and needle lift sensor.)	● Harness or connectors [Injection timing control valve, needle lift sensor, crankshaft position sensor (TDC) circuits] ● Injection timing control valve ● Needle lift sensor ● Crankshaft position sensor (TDC) ● Air in fuel line
94	● Injection timing control valve circuit it open or shorted.	● Harness or connectors (The Injection timing control valve is open or shorted.) ● Injection timing control valve

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC 21 and 34 or 47 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 34 or 47. (See EC-CD-101 or EC-CD-119.)

1) Turn ignition switch to ''ON'' position and select ''DATA MONITOR'' mode with CONSULT-II.
2) Start engine. Run engine for 10 seconds at idle.

OR

1) Start engine. Run engine for 10 seconds at idle.
2) Turn ignition switch to ''LOCK'' position, wait at least 5 seconds and then turn to ''ON'' position.
3) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

Note: If malfunction occurs intermittently, conduct suitable driving pattern for 10 minutes. This makes it possible to determine DTC.

Injection Timing Control Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE 94 CONFIRMATION PROCEDURE

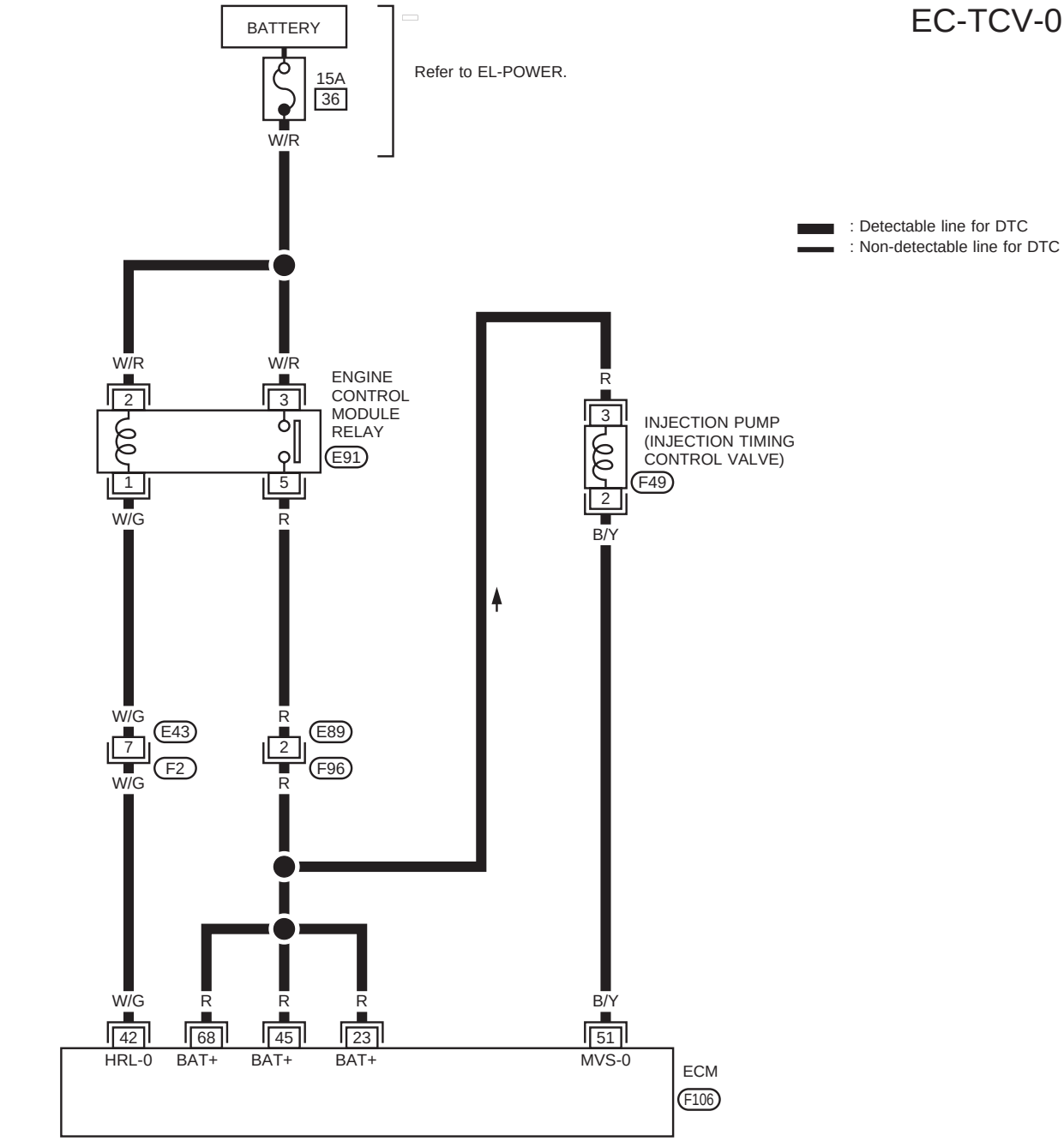
1) Turn ignition switch to ''ON'' position.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Wait at least 2 seconds.

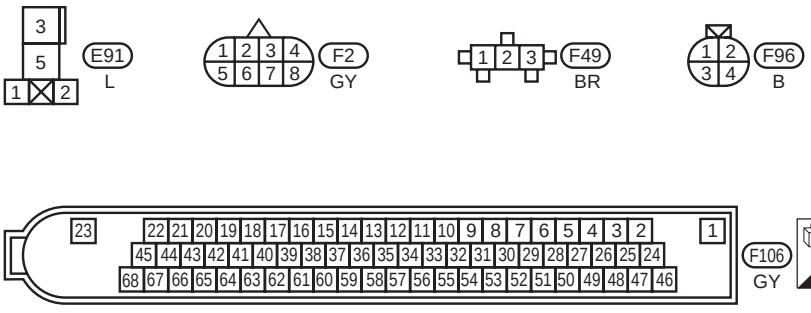
OR

1) Turn ignition switch to ''ON'' position.
2) Wait at least 2 seconds.
3) Turn ignition switch to ''LOCK'' position, wait at least 5 seconds and turn to ''ON'' position.
4) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

Injection Timing Control Valve (Cont'd)

EC-TCV-01

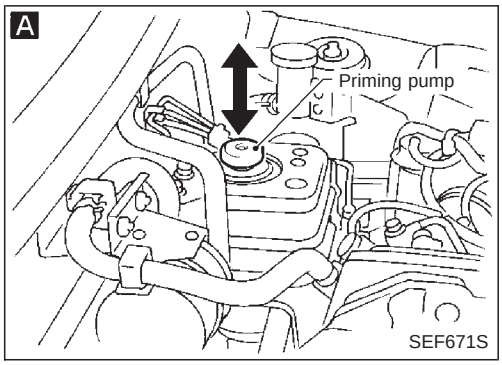


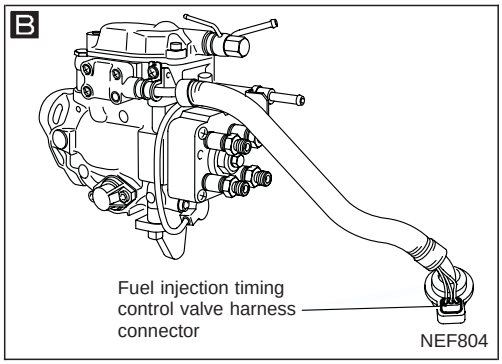


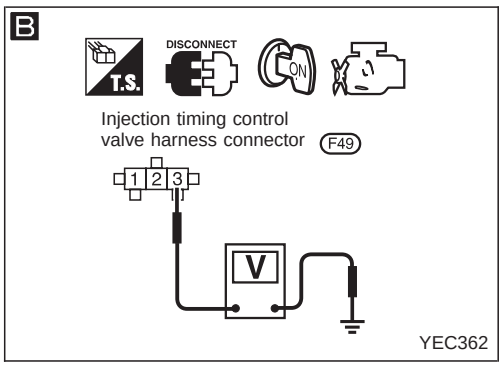
YEC311

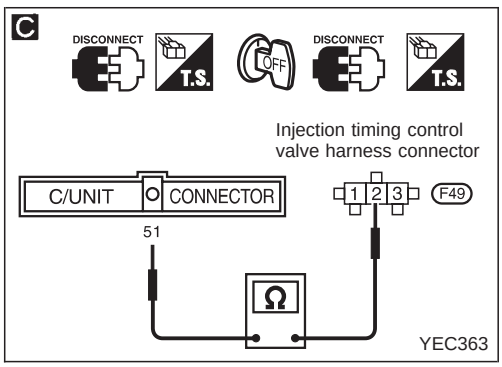
Injection Timing Control Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK FOR AIR IN FUEL FILTER.

1. Move priming pump up and down to purge air from fuel filter.
2. Perform "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".

B

CHECK POWER SUPPLY.

1. Turn ignition switch to "LOCK" position.
2. Disconnect injection timing control valve harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between injection timing control valve connector terminal ③ and ground with CONSULT-II or tester.

Voltage: Battery voltage

NG

Check the following:

- Harness connectors E89, F96
- Electronic injection pump harness connector F49
- 15A fuse
- Harness for open or short-circuit between injection timing control valve harness connector and engine control module relay.

If NG, repair harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between injection timing control valve connector terminal ② and ECM terminals ⑤1.

Continuity should exist.

If OK, check harness for short-circuit.

NG

Check the following:

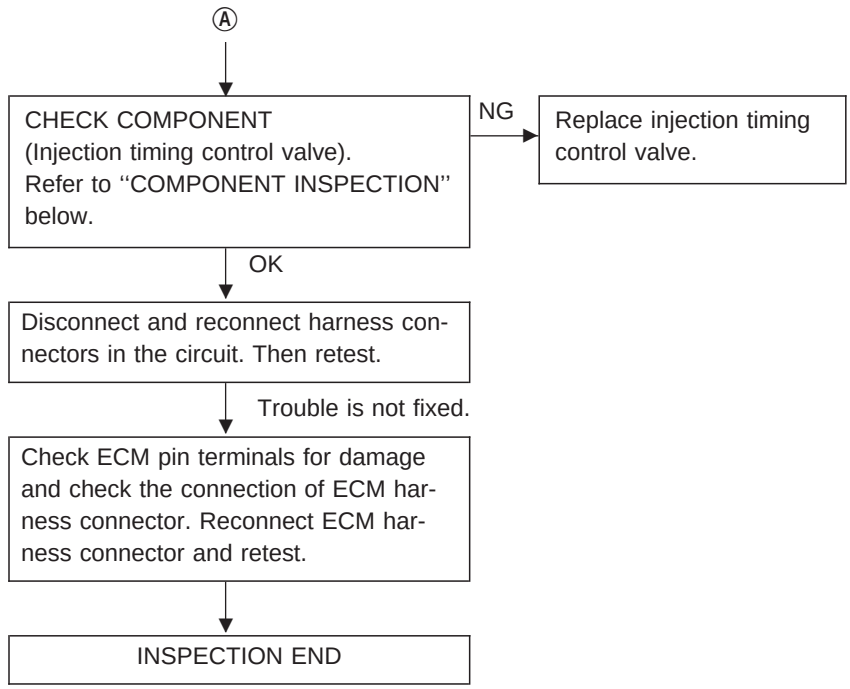
- Electronic injection pump harness connector F49
- Harness for open or short-circuit between injection timing control valve and ECM.

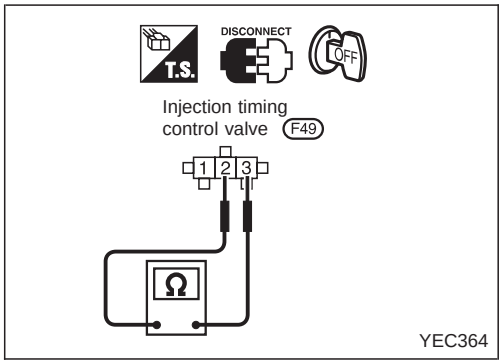
If NG, repair harness or connectors.

OK

Ⓐ

Injection Timing Control Valve (Cont'd)

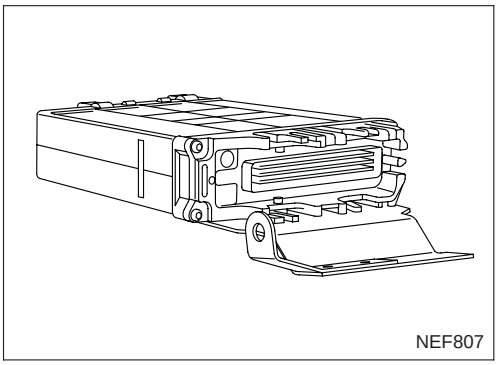




COMPONENT INSPECTION

Injection timing control valve

1. Disconnect injection timing control valve harness connector.
2. Check resistance between terminals ② and ③.
   Resistance: Approximately 15Ω [at 25°C (77°F)]
   If NG, replace injection timing control valve.


NEF807

Engine Control Module (ECM)

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

Diagnostic Trouble Code No.	Malfunction is detected when	Check Item (Possible Cause)
31	● ECM calculation function is malfunctioning.	● ECM *
82	● An excessively high or low voltage from the atmospheric pressure sensor is detected by the ECM.	● ECM *
84	● ECM reference voltage (2.5V) is excessively high or low.	● ECM *
91	● ECM version number or switching function is not plausible.	● ECM *
93	● Ignition switch ‘‘ON’’ signal evaluation circuit in ECM is malfunctioning.	● ECM *

* Actually inspecting the ECM inside circuit is impossible. Then, ECM may be replaced.

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

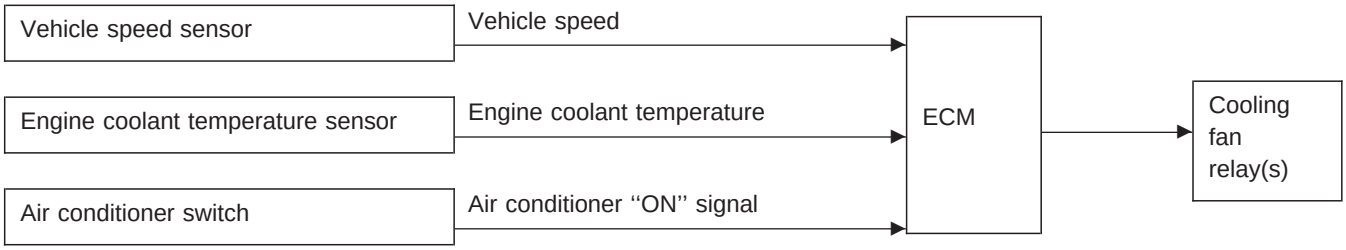
1) Turn ignition switch to ‘‘ON’’ position.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Wait at least 2 seconds.

OR

1) Turn ignition switch to ‘‘ON’’ position.
2) Wait at least 2 seconds.
3) Turn ignition switch to ‘‘LOCK’’ position, wait at least 5 seconds and then turn to ‘‘ON’’ position.
4) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results).

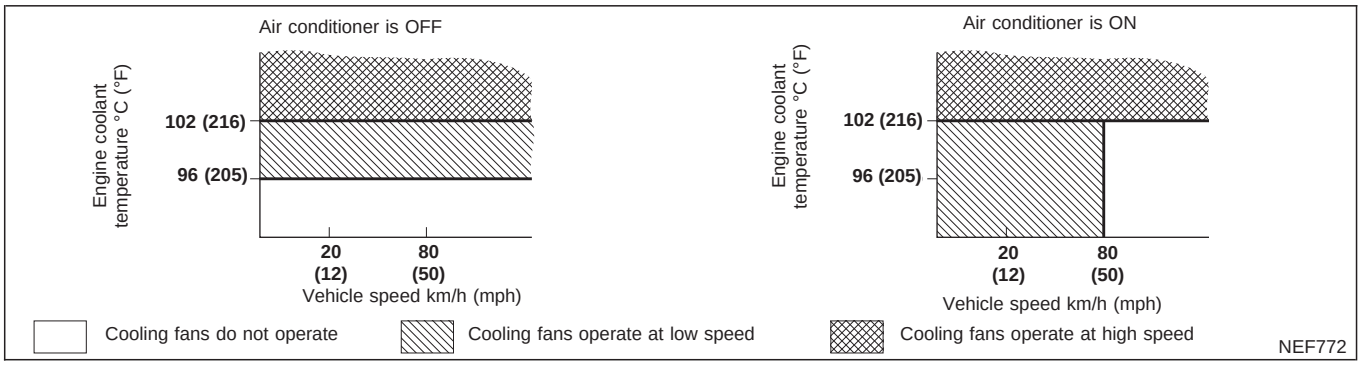
Cooling Fan (Overheat)

SYSTEM DESCRIPTION



The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, air conditioner system pressure and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF]. This system indirectly relates to diagnostic trouble code 28 (Overheat).

Operation



ON-BOARD DIAGNOSIS LOGIC

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.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
28	● An excessive high engine coolant temperature sensor signal is detected by the ECM. (Overheat)	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat ● Fan belt ● Engine coolant temperature sensor For more information, refer to "12 MAIN CAUSES OF OVERHEATING", EC-CD-99.

CAUTION:
When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.

a. 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 section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").

b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

Cooling Fan (Overheat) (Cont'd)

OVERALL FUNCTION CHECK

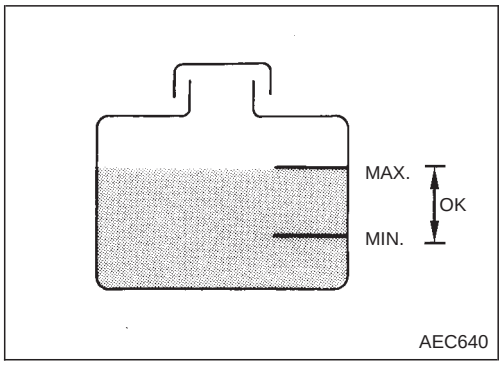
Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

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.

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-CD-94.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-CD-94.



AEC640

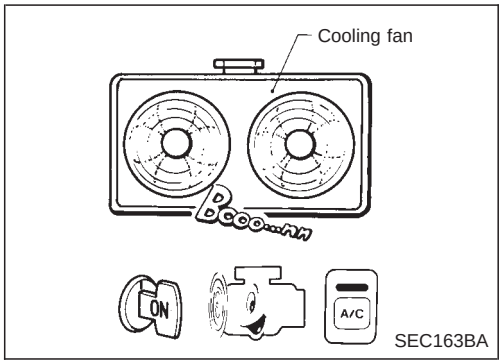
ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF111X

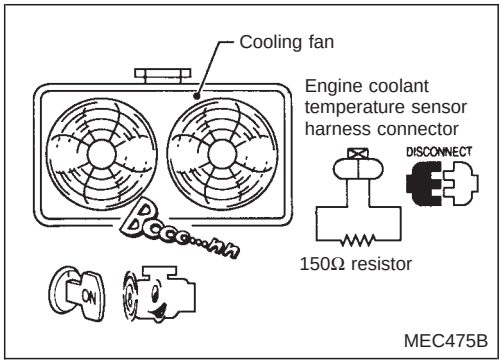
3) Turn ignition switch to "ON" position.
4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II (LOW speed and HI speed).

OR

3) Start engine.
   Be careful not to overheat engine.
4) Set temperature control switch to full cold position.
5) Push Air Conditioner switch to "ON" position.
6) Turn blower fan switch to "ON" position.
7) Run engine at idle for a few minutes with Air Conditioner operating.
   Be careful not to overheat engine.
8) Make sure that both cooling fans operate at low speed.
9) Turn ignition switch to "LOCK" position.
10) Push Air Conditioner switch and blower fan switch to "OFF" position.
11) Disconnect engine coolant temperature sensor harness connector.
12) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
13) Restart engine and make sure that both cooling fans operate at higher speed than low speed.
    Be careful not to overheat engine.



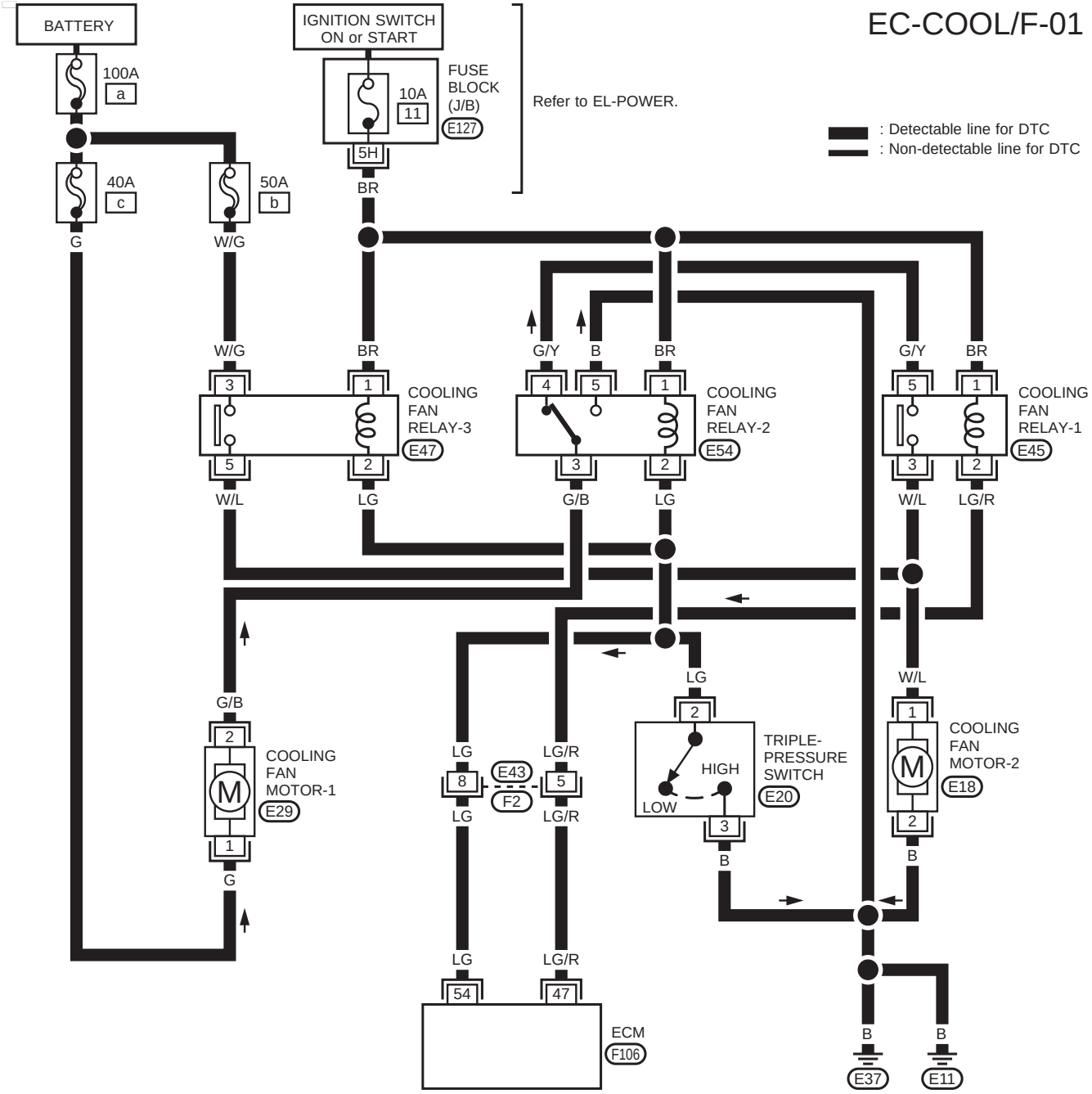
SEC163BA

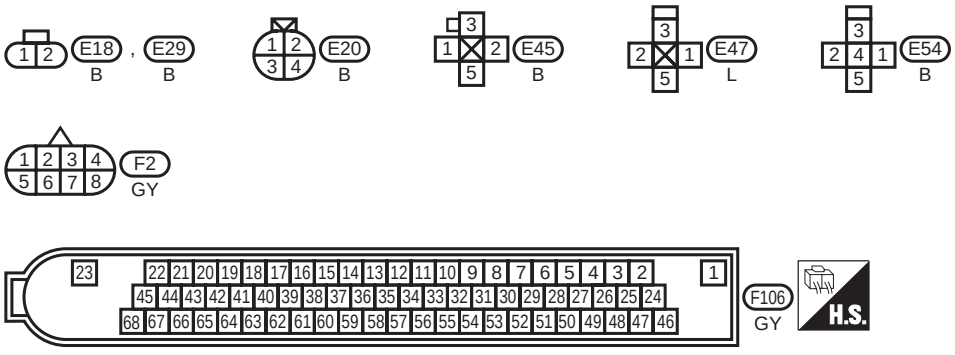


MEC475B

Cooling Fan (Overheat) (Cont'd)

EC-COOL/F-01





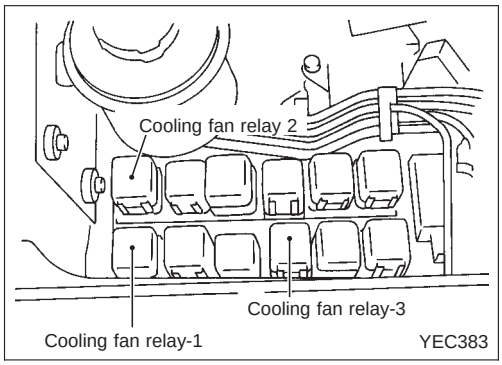
REFER TO THE FOLLOWING

E127 FUSE BLOCK - Junction Box (J/B)

YEC312

Cooling Fan (Overheat) (Cont'd)

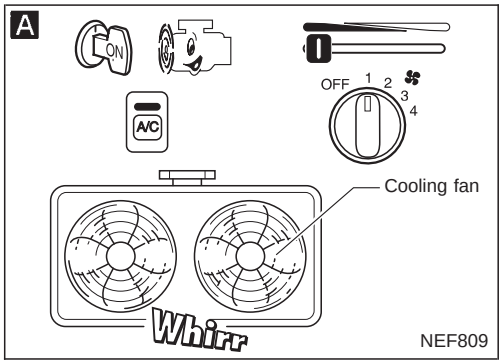
DIAGNOSTIC PROCEDURE



A

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

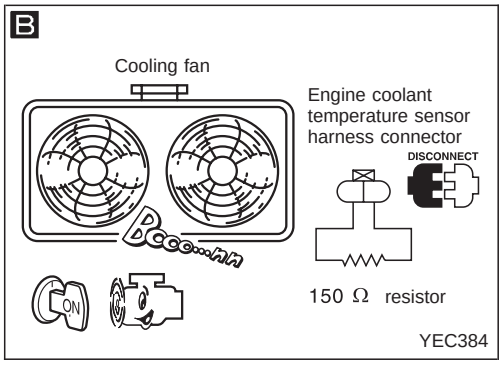
SEF111X



B

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

SEF111X



INSPECTION START

A

CHECK COOLING FAN LOW SPEED OPERATION.

1. Disconnect cooling fan relay-3.
2. Turn ignition switch to "ON" position.
3. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II.

OR

2. Start engine.
3. Set temperature switch at full cold position.
4. Turn Air Conditioner switch to "ON" position.
5. Turn blower fan switch to "ON" position.
6. Run engine at idle speed for a few minutes with Air Conditioner operating.
7. Make sure that both cooling fans operate at low speed.

NG → Check cooling fan low speed control circuit. (Go to PROCEDURE A .)

OK

B

CHECK COOLING FAN HIGH SPEED OPERATION.

1. Turn ignition switch to "LOCK" position.
2. Reconnect cooling fan relay-3.
3. Disconnect cooling fan relay-1.
4. Turn ignition switch to "ON" position.
5. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II.

OR

4. Turn Air Conditioner switch and blower fan switch to "OFF" position.
5. Disconnect engine coolant temperature sensor harness connector.
6. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
7. Restart engine and make sure that both cooling fans operate at higher speed than low speed.

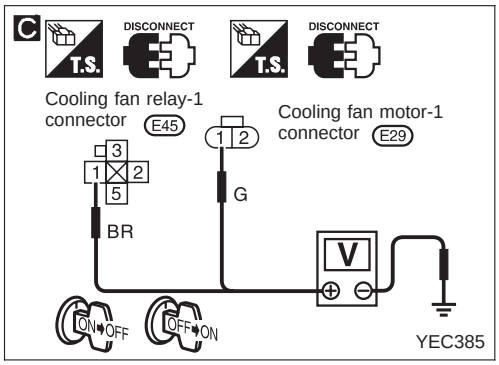
NG → Check cooling fan high speed control circuit. (Go to PROCEDURE B .)

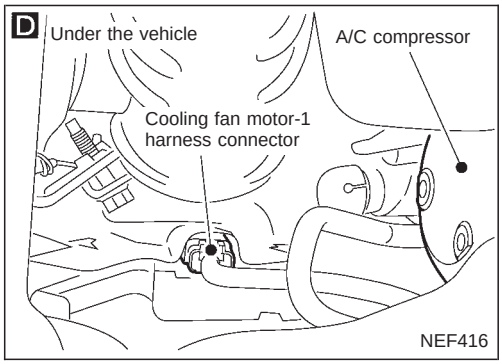
OK

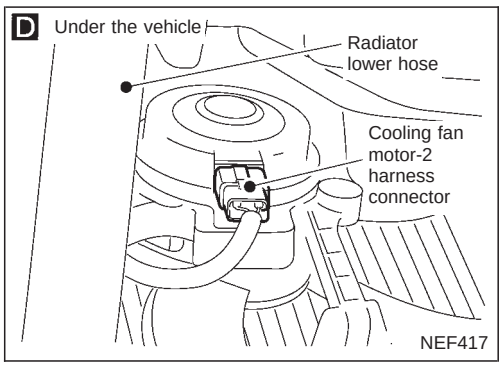
Ⓑ

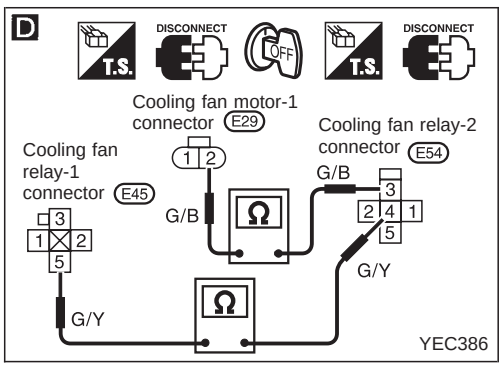
(Go to EC-CD-98.)

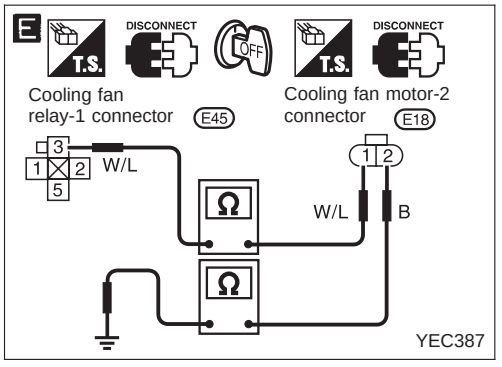
Cooling Fan (Overheat) (Cont'd)











PROCEDURE A

INSPECTION START

C

CHECK POWER SUPPLY.

1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan relay-1 and fan motor-1 connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between cooling fan motor-1 connector terminal ①, fan relay-1 connector terminal ① and ground.

Voltage: Battery voltage

NG → Check the following:
- 10A fuse
- 40A, 100A, fusible links
- Harness for open or short-circuit between cooling fan motor-1 and battery.
- Harness for open or short-circuit between cooling fan relay-1 and fuse.

If NG, replace fuse or fusible links or repair harness or connectors.

OK

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan relay-2 and fan motor-2 harness connector.

D 3. Check harness continuity between cooling fan relay-1 connector terminal ⑤ and cooling fan relay-2 connector terminal ④; cooling fan motor-1 connector terminal ② and cooling fan relay-2 connector terminal ③.

Continuity should exist.

If OK, check harness for short-circuit.

E 4. Check harness continuity between cooling fan motor-2 connector terminal ① and cooling fan relay-1 connector terminal ③; cooling fan motor-2 connector terminal ② and ground.

Continuity should exist.

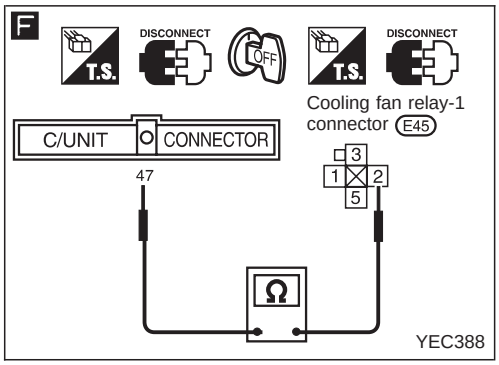
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

Ⓒ

Cooling Fan (Overheat) (Cont'd)



Ⓒ

F

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (47) and cooling fan relay-1 connector terminal (2).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors E43, F2
- Harness for open or short-circuit between cooling fan relay-1 and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-1, 2).
Refer to "COMPONENT INSPECTION", EC-CD-100.

NG → Replace cooling fan relay.

OK ↓

CHECK COMPONENT
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-CD-100.

NG → Replace cooling fan motors.

OK ↓

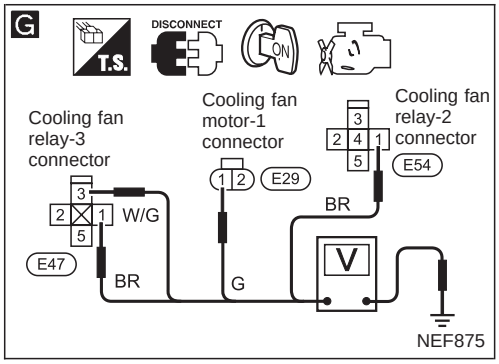
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END



PROCEDURE B

INSPECTION START ↓

G

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan relay-2, 3 and cooling fan motor-1.
3. Turn ignition switch to "ON" position.
4. Check voltage between cooling fan motor-1 connector terminal (1); cooling fan relay-2 connector terminal (1); cooling fan relay-3 connector terminals (1) & (3) and ground.
   Voltage: Battery voltage

NG → Check the following:
- 10A-fuse
- 40A, 50A, 100A fusible links
- Harness for open or short-circuit between fan motor-1, fan relay-3 and fusible link or fan relay-2, 3 and fuse.

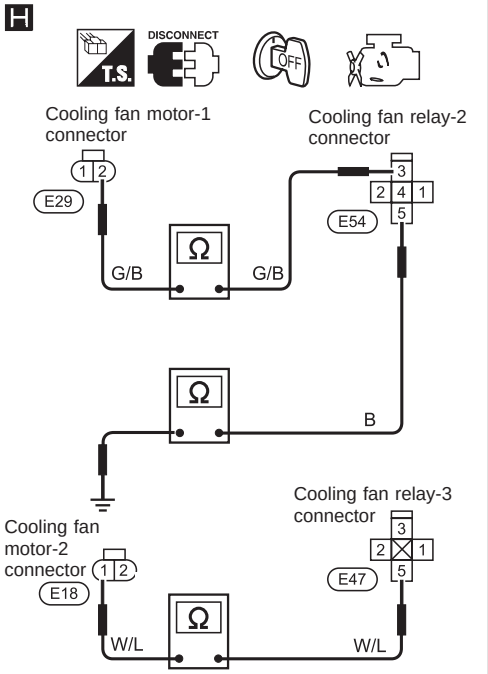
If NG, replace fuse or fusible link or repair harness or connectors.

OK ↓

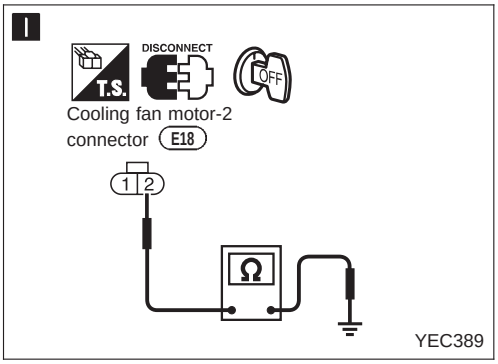
Ⓓ

Cooling Fan (Overheat) (Cont'd)

H



I



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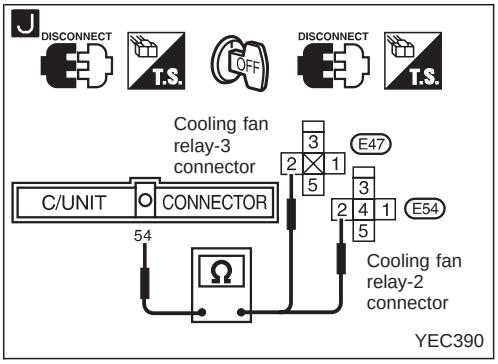


(D)

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan motor-2 harness connector.

H 3. Check harness continuity between cooling fan motor-1 connector terminal (2) and cooling fan relay-2 connector terminal (3); cooling fan motor-2 connector terminal (1) and cooling fan relay-3 connector terminal (5); cooling fan relay-2 connector terminal (5) and ground.
Continuity should exist.
If OK, check harness for short-circuit.

I 4. Check harness continuity between cooling fan motor-2 terminal (2) and ground.

NG → Repair harness or connectors.

OK ↓

J

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (54) and cooling fan relay-3 connector terminal (2) & cooling fan relay-2 connector terminal (2).
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (E43), (F2)
- Harness for open or short-circuit between cooling fan relay-2, 3 and ECM.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-2, 3).
Refer to "COMPONENT INSPECTION", EC-CD-100.

NG → Replace cooling fan relays.

OK ↓

CHECK COMPONENTS
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-CD-100.

NG → Replace cooling fan motors.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed ↓

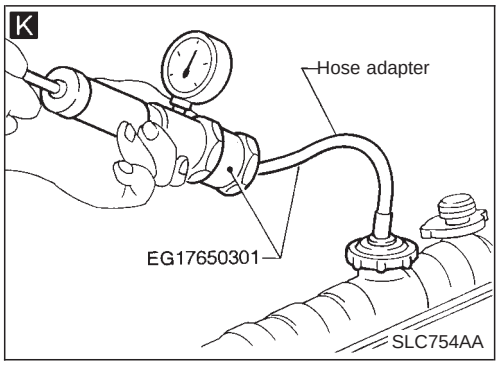
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

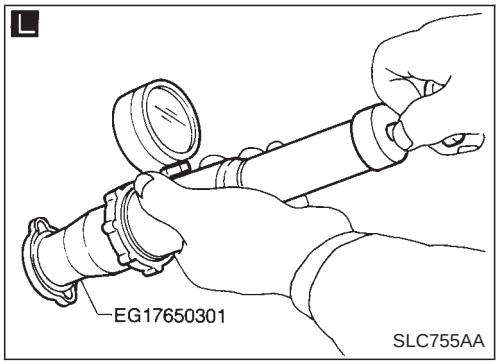
INSPECTION END

Cooling Fan (Overheat) (Cont'd)

K



L



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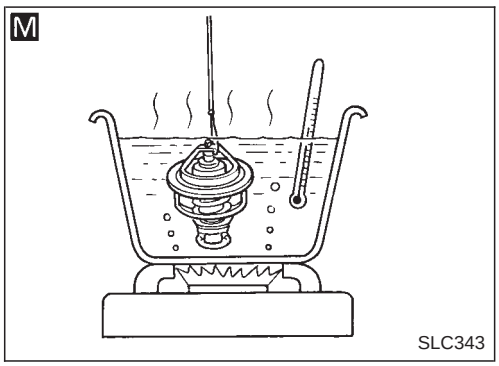


Ⓑ

K

CHECK COOLING SYSTEM FOR LEAK.
Apply pressure to the cooling system with a tester, and check if the pressure drops.
Testing pressure:
157kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)
Pressure should not drop.
CAUTION:
Higher than the specified pressure may cause radiator damage.

NG → Check the following for leaks:
- Hose
- Radiator
- Water pump

Refer to LC section ("Water Pump").

OK ↓

L

CHECK RADIATOR CAP.
Apply pressure to cap with a tester.
Radiator cap relief pressure:
Standard
78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)
Limit
59 - 88 kPa (0.59 - 0.88 bar, 0.6 - 0.9 kg/cm^2, 9 - 13 psi)

NG → Replace radiator cap.

OK ↓

M

CHECK THERMOSTAT.
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and maximum valve lift.
   Valve opening temperature:
   76.5°C (170°F) [standard]
   Maximum valve lift:
   More than 8 mm/90°C (0.31 in/194°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC section ("Thermostat").

NG → Replace thermostat.

OK ↓

Check engine coolant temperature sensor. Refer to "COMPONENT INSPECTION", EC-72.

NG → Replace engine coolant temperature sensor.

OK ↓

If the cause can not be isolated, go to "12 MAIN CAUSES OF OVERHEATING" on next page.

↓

INSPECTION END

Perform FINAL CHECK by the following procedure after repair is completed.

1. Warm up engine. Run the vehicle for at least 20 minutes. Pay attention to engine coolant temperature gauge on the instrument panel. If the reading shows an abnormally high temperature, another part may be malfunctioning.
2. Stop vehicle and let engine idle. Check the intake and exhaust systems for leaks by listening for noise or visually inspecting the components.
3. Allow engine to cool and visually check for oil and coolant leaks. Then, perform "OVERALL FUNCTION CHECK".

Cooling Fan (Overheat) (Cont'd)

12 MAIN CAUSES OF OVERHEATING

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	–
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section.
	4	● Radiator cap	● Pressure tester	78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi) 59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See "System Check" "ENGINE COOLING SYSTEM" in LC section.
ON*2	5	● Coolant leaks	● Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section.
ON*1	7	● Cooling fan	● CONSULT	Operating	See "TROUBLE DIAGNOSIS FOR DTC 28".
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 "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See "ENGINE MAINTENANCE" in MA section.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See "Inspection", "CYLINDER HEAD" in EM section.
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See "Inspection", "CYLINDER BLOCK" in EM section.

*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 "OVERHEATING CAUSE ANALYSIS" in LC section.

Cooling Fan (Overheat) (Cont'd)

COMPONENT INSPECTION

Cooling fan relays-1, -2, -3

Check continuity between terminals ③ and ⑤.

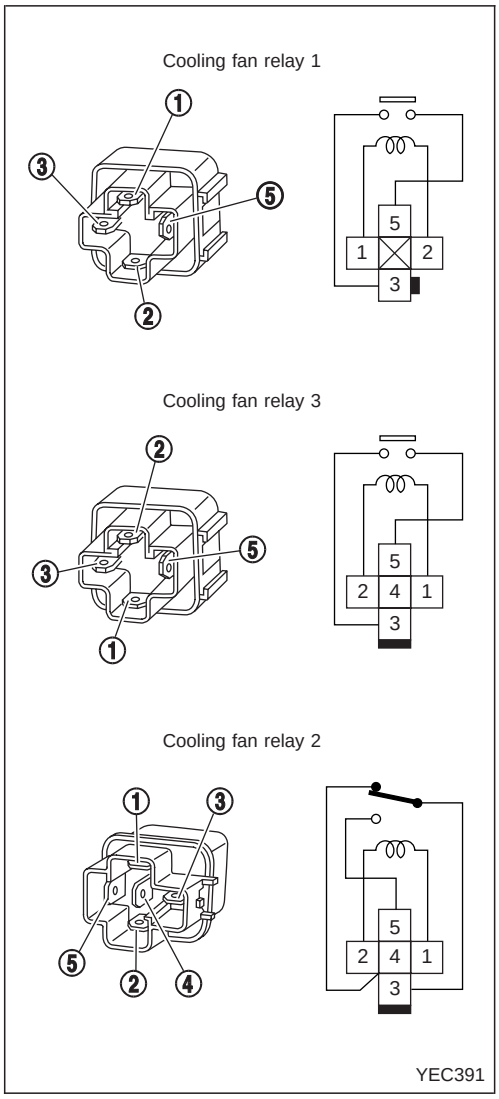
Conditions	Continuity
12V direct current supply between relay terminals ① and ②	Yes
No current supply	No

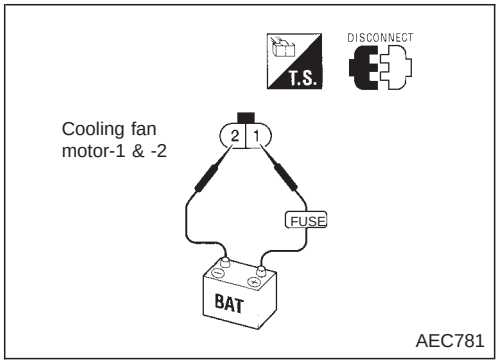
If NG, replace cooling fan relay.

Cooling fan relay-2

Check continuity between terminals ③ and ④.

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





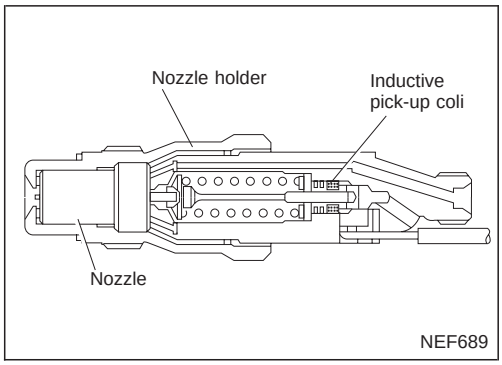
Cooling fan motors-1 and -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(⊕)	(⊖)
Cooling fan motor-1 and -2	①	②

Cooling fan motor should operate.

If NG, replace cooling fan motor.



Needle Lift Sensor (NLS)

The needle lift sensor is built into the No. 1 nozzle. Its inductive pick-up element senses the lifting of the injection nozzle needle and thus the start of injection. The signal is evaluated by the ECM and compared with the target timing. Deviations in timing, for example caused by changes in fuel temperature, are sensed by the ECM and corrected.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
34	● An improper signal from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Needle lift sensor ● Air in fuel line ● Clogging No. 1 injection nozzle

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: Before DTC confirmation, be sure to check battery voltage is above 9V.

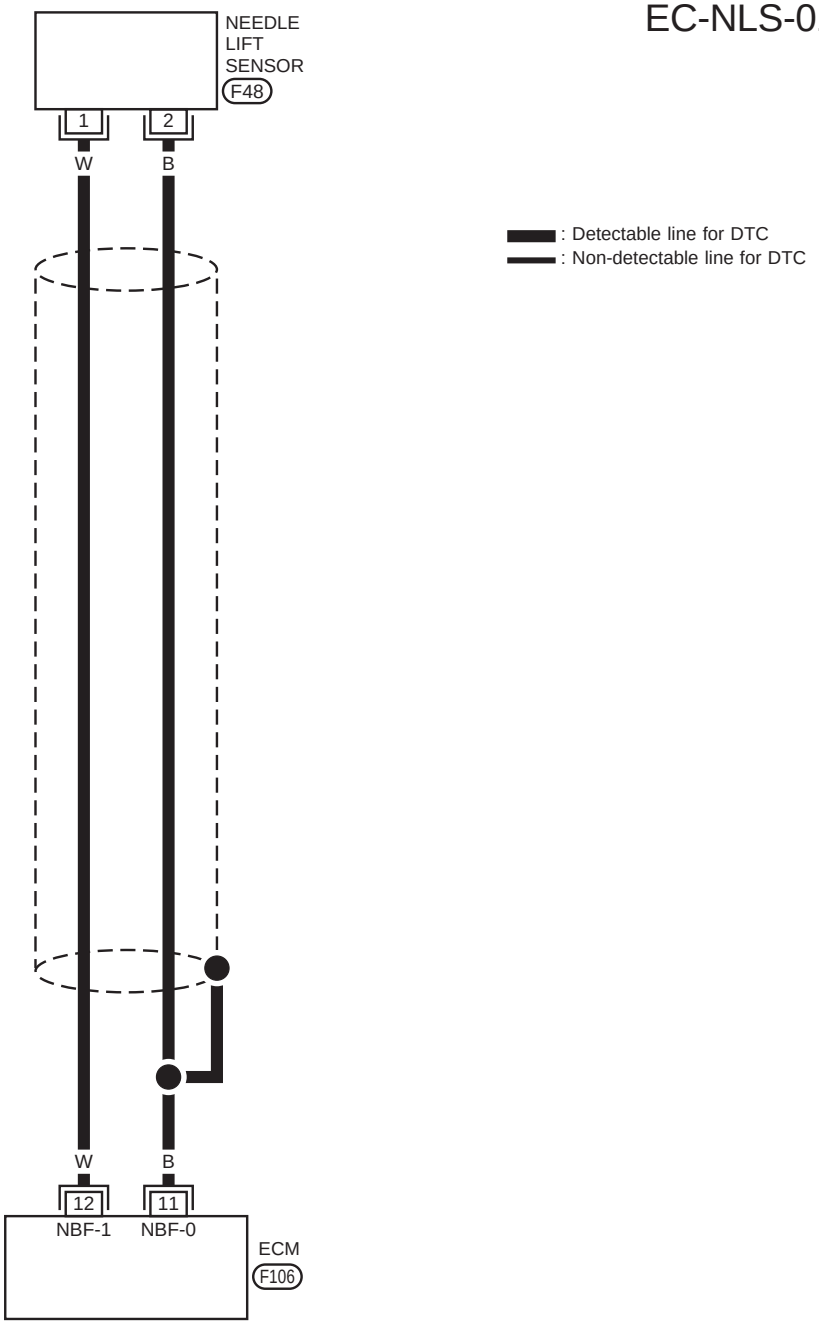
1) Turn ignition switch to ‘‘ON’’ position and select ‘‘DATA MONITOR’’ mode with CONSULT-II.
2) Start engine and run it for 2 seconds above 1,200 rpm.

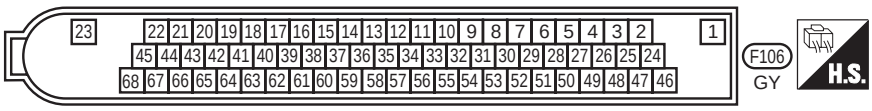
OR

1) Start engine and run it for 215 seconds above 1,200 rpm.
2) Turn ignition switch to ‘‘LOCK’’ position, wait at least 5 seconds and then turn to ‘‘ON’’ position.
3) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results).

Needle Lift Sensor (NLS) (Cont'd)

EC-NLS-01

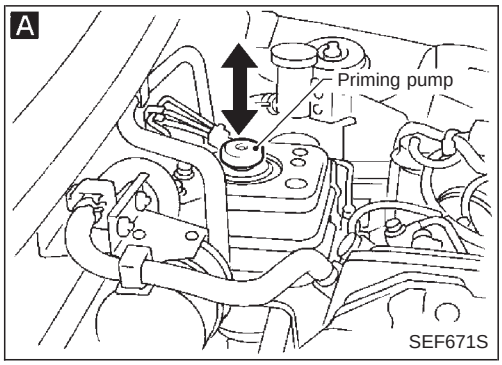


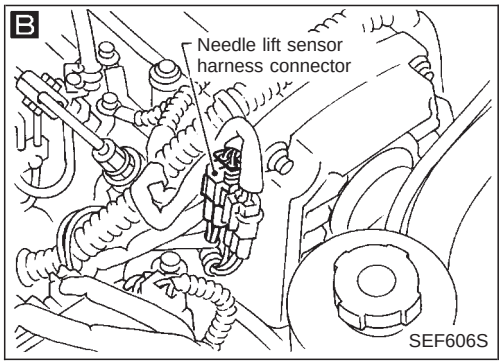


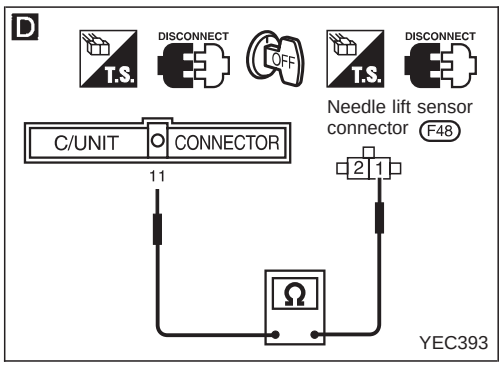
YEC419

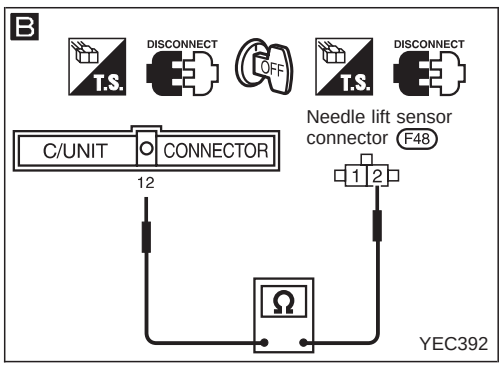
Needle Lift Sensor (NLS) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK FOR AIR IN FUEL FILTER.
1. Move priming pump up and down to purge air from fuel filter.
2. Perform "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and needle lift sensor harness connector.
3. Check harness continuity between needle lift sensor connector terminal ① and ECM connector terminal ⑫.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

D

CHECK GROUND CIRCUIT.
Check resistance between needle lift sensor connector terminal ② and ECM connector terminal ⑪.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

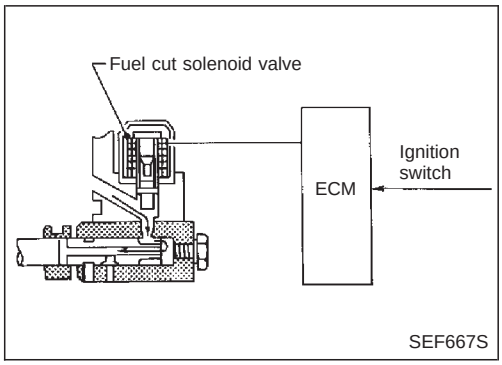
CHECK NO. 1 INJECTION NOZZLE FOR CLOGGING.
Refer to spray pattern test of "INJECTION NOZZLE".
If NG, replace No. 1 injection nozzle.

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END



Fuel Cut Solenoid Valve

When the ignition switch is OFF, the ECM turns the fuel cut solenoid valve OFF (under this condition, no current flows through the fuel cut solenoid valve), shutting off fuel supply.
When the engine is not operating due to trouble, the fuel cut solenoid valve may be OFF even when the ignition switch is ON.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
36	● Fuel cut solenoid valve circuit is malfunctioning.	● Harness or connectors (The solenoid valve circuit is open or shorted.) ● Fuel cut solenoid valve

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If DTC 13 or 47 is displayed at the same time, perform TROUBLE DIAGNOSIS FOR DTC13 OR 47 first.

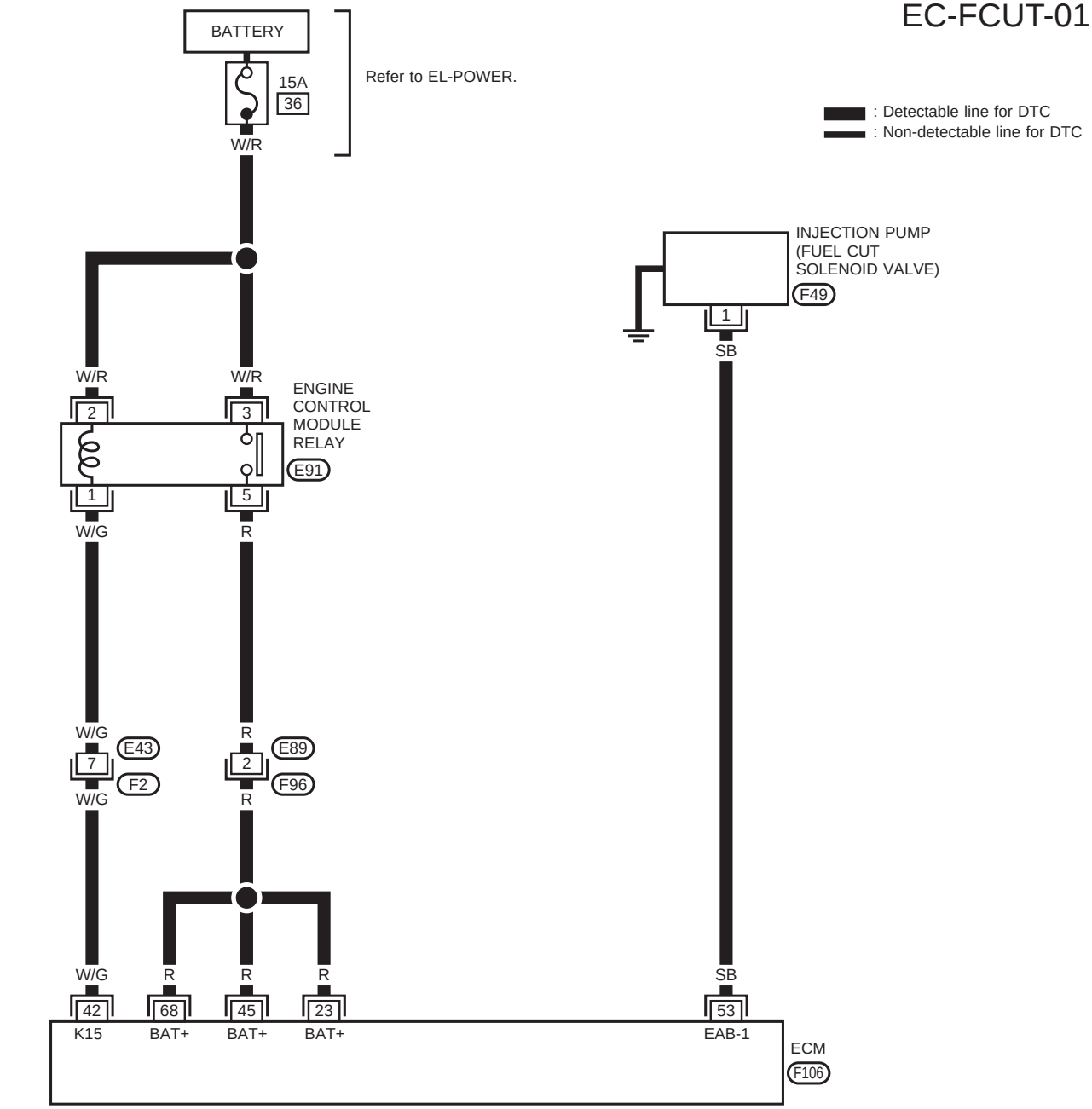
1) Turn ignition switch to ''ON'' position.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Start engine. (If no start, circuit is open).
4) Warm engine up sufficiently.
5) Turn ignition switch to ''LOCK'' position and wait at least 5 seconds.
6) Start engine and rev it up above 1,300 rpm. Release pedal and wait at least 3 seconds.

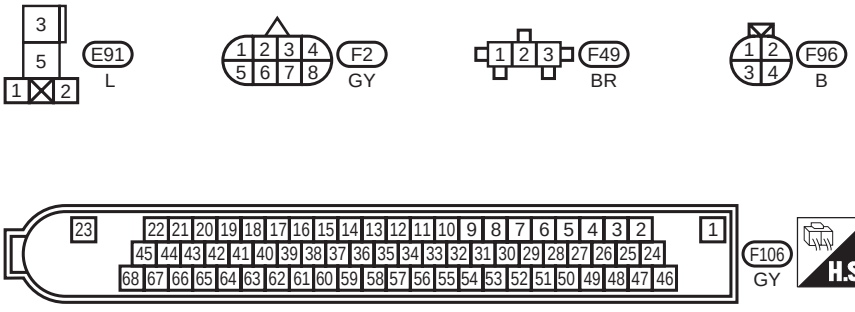
OR

1) Start engine. (If no start, circuit is open).
2) Warm engine up sufficiently.
3) Turn ignition switch to ''LOCK'' position and wait at least 5 seconds.
4) Start engine and rev it up above 1,300 rpm. Release pedal and wait at least 3 seconds.
5) Turn ignition switch to ''LOCK'' position, wait at least 5 seconds and then turn to ''ON'' position.
6) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

Fuel Cut Solenoid Valve (Cont'd)

EC-FCUT-01

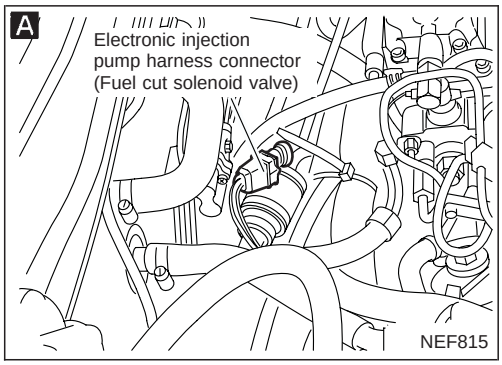




YEC313

Fuel Cut Solenoid Valve (Cont'd)

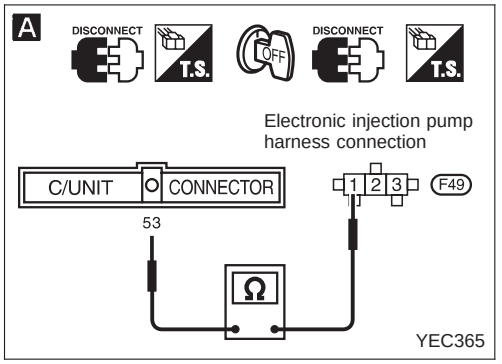
DIAGNOSTIC PROCEDURE



A

ACTIVE TEST	
FUEL CUT SOL/V	ON
MONITOR	
CKPS-RPM(TDC)	0rpm

C2FCS01



INSPECTION START

↓

CHECK MAIN POWER SUPPLY.
Check power supply. Refer to EC-CD-62.

↓

A

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "ON" position.
2. Select "FUEL CUT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "ON" and "OFF" alternately.
4. Check that operating sound is emitted.

OR

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between fuel cut solenoid valve connector terminal ① and ECM connector terminal ㊸.

Continuity should exist.

If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT (Fuel cut solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace fuel cut solenoid valve.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

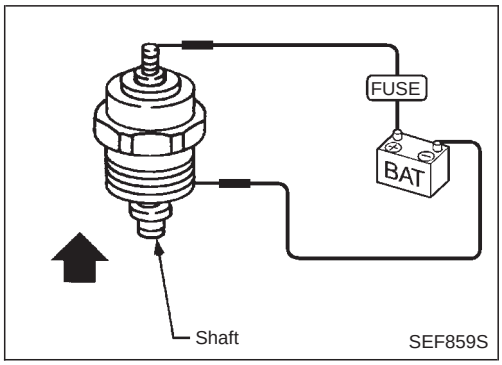
↓

INSPECTION END

Fuel Cut Solenoid Valve (Cont'd)

COMPONENT INSPECTION

Fuel cut solenoid valve



1. Remove fuel cut solenoid valve.
2. Check for lifting shaft when applying 12V direct current to terminals.

If NG, replace fuel cut solenoid valve.

Fuel Temperature Sensor (FTS)

The fuel temperature sensor is used to detect the fuel temperature in the injection pump. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.
The sensor is built into the inside electrical circuit of the injection pump.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
42	● An excessively high or low voltage from the sensor is detected by ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Fuel temperature sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

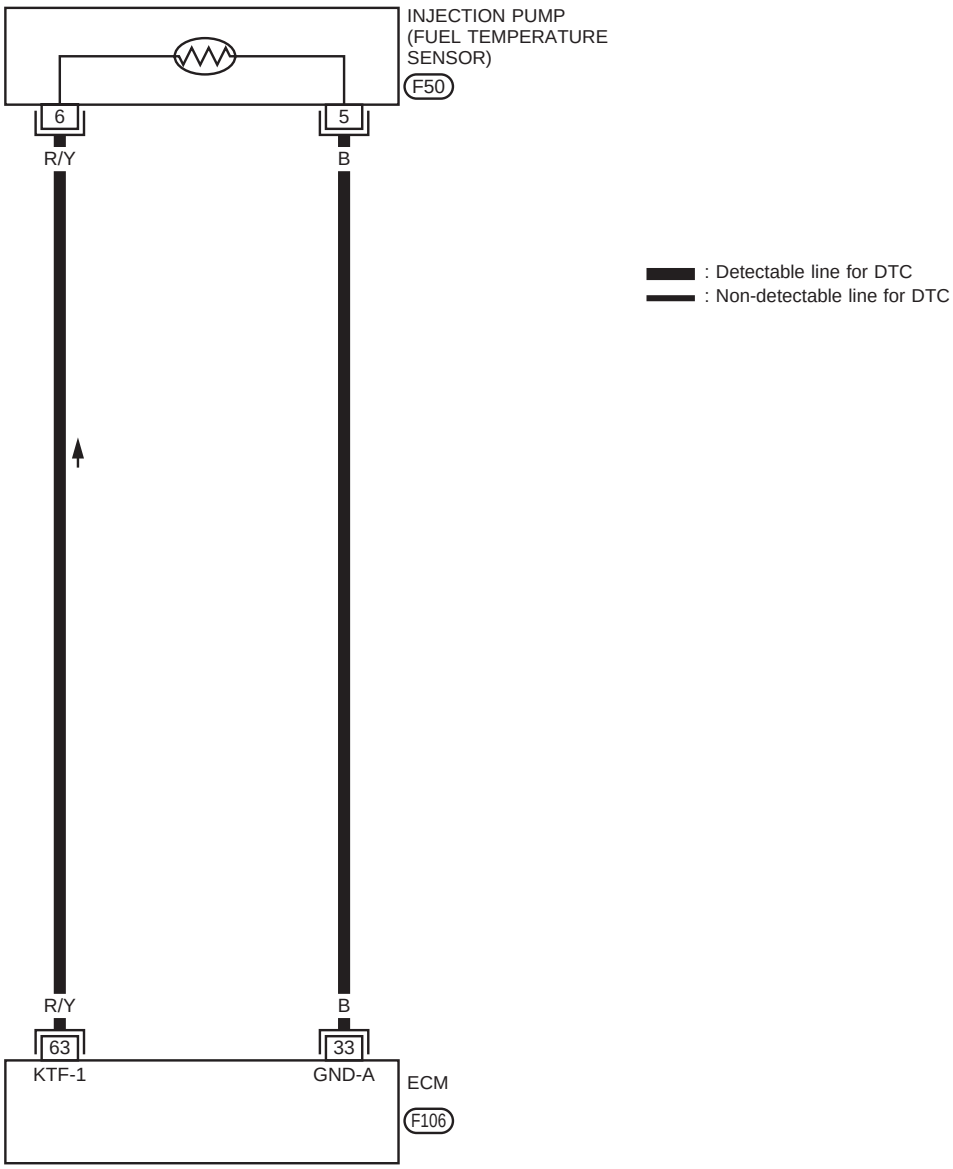
1) Turn ignition switch to ‘‘ON’’ position.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Wait at least 5 seconds.

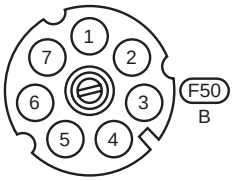
OR

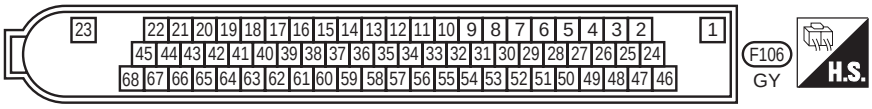
1) Turn ignition switch to ‘‘ON’’ position and wait at least 5 seconds.
2) Turn ignition switch to ‘‘LOCK’’ position, wait at least 5 seconds and then turn to ‘‘ON’’ position.
3) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results).

Fuel Temperature Sensor (FTS) (Cont'd)

EC-FTS-01



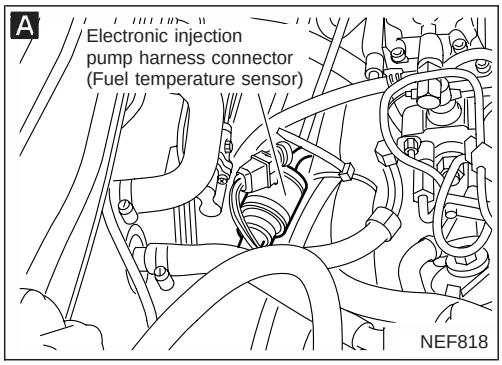


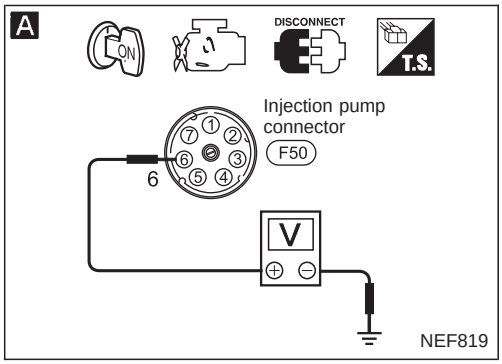


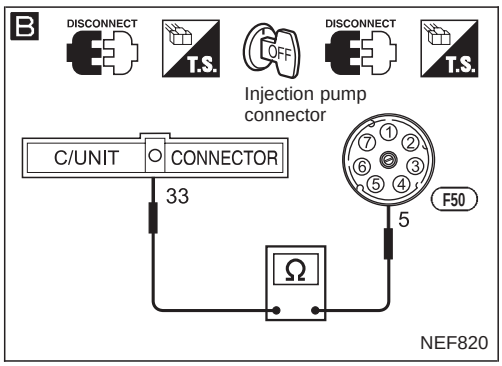
YEC420

Fuel Temperature Sensor (FTS) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect fuel temperature sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between injection pump connector terminal ⑥ and ground with CONSULT-II or voltage tester.

Voltage:
Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between injection pump connector terminal ⑤ and ECM connector terminal ㉝.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT (Fuel temperature sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Have the injection pump assembly serviced by an authorised service representative.

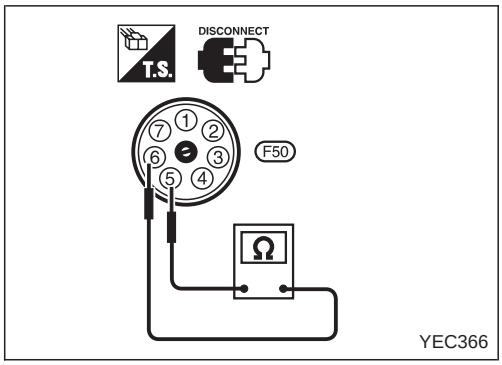
OK

Disconnect and reconnect harness connectors in the circuits. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END



Fuel Temperature Sensor (FTS) (Cont'd)

COMPONENT INSPECTION

Fuel temperature sensor

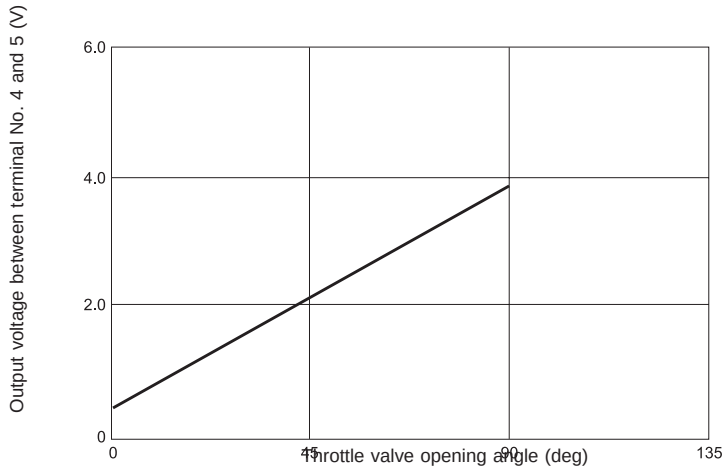
Wait until fuel temperature sensor reaches room temperature. Check resistance between terminals ⑤ and ⑥.

Fuel temperature °C (°F)	Resistance kΩ
25 (77)	Approximately 1.9

If NG, have the injection pump assembly serviced by an authorised service representative.

Accelerator Position Sensor & Switch

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



NEF822

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
43	• An excessively low or high voltage from the sensor is detected by the ECM.	• Harness or connectors (The sensor or switch circuit is open or shorted.) • Accelerator position sensor • Accelerator position switch

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch to ''ON'' position.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Depress accelerator pedal fully and keep it for at least 1 second. Then release it and wait at least 5 seconds.

OR

1) Turn ignition switch to ''ON'' position.
2) Depress accelerator pedal fully and keep it for at least 1 second. Then release it and wait at least 5 seconds.
3) Turn ignition switch to ''LOCK'' position, wait at least 5 seconds and then turn to ''ON'' position.
4) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

Accelerator Position Sensor & Switch (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (For accelerator stiching)

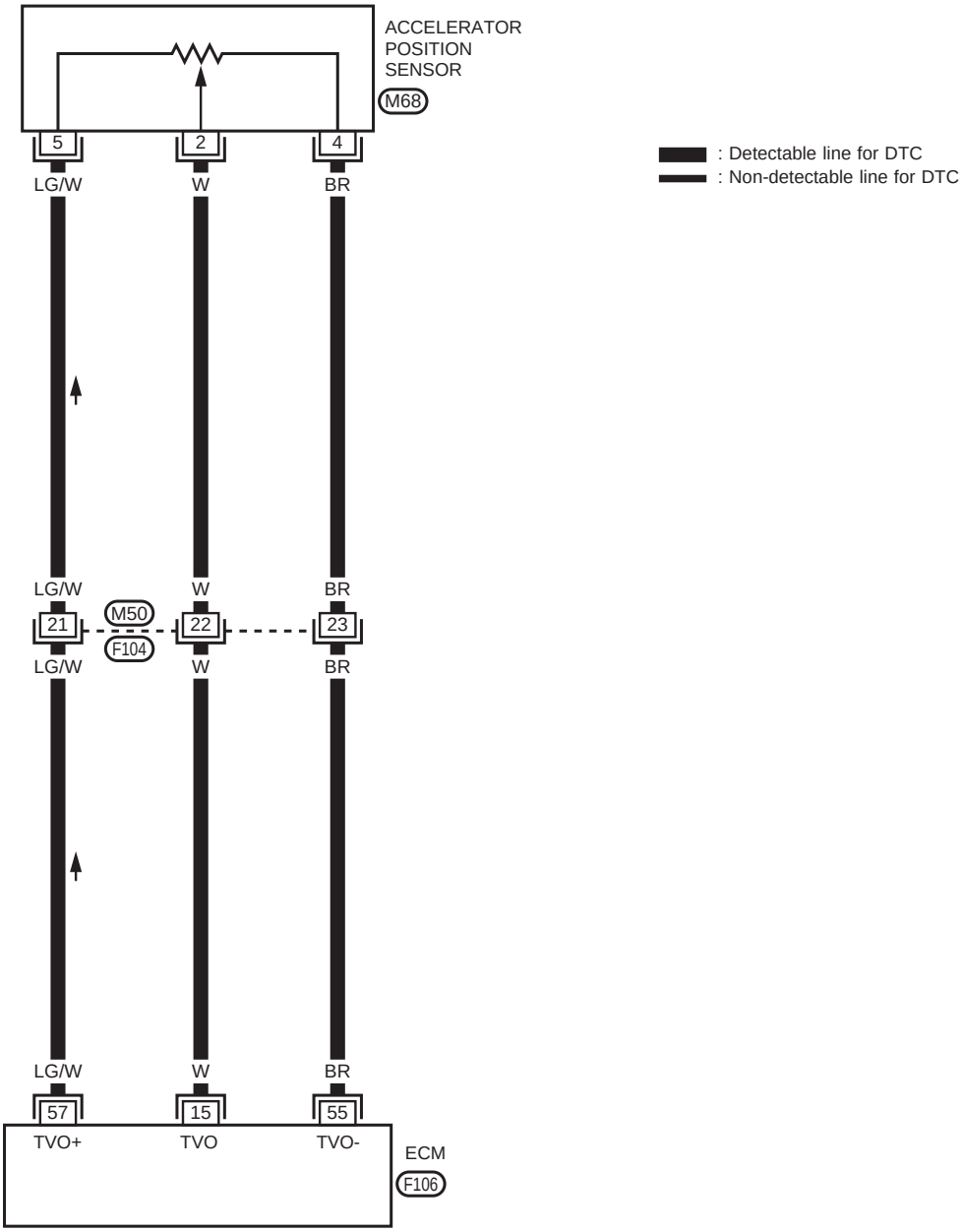
1) Turn ignition switch to ''ON'' position.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Start engine and rev it up above 1,300 rpm.
4) Depress brake pedal immediately after releasing accelerator pedal and keep it at least 5 seconds.

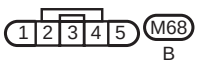
OR

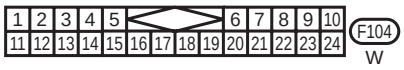
1) Start engine and rev it up above 1,300 rpm.
2) Depress brake pedal immediately after releasing accelerator pedal and keep it at least 5 seconds.
3) Turn ignition switch to the ''LOCK'' position, wait at least 5 seconds and then turn to the ''ON'' position.
4) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results) with ECM.

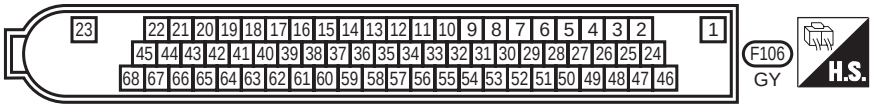
Accelerator Position Sensor & Switch (Cont'd)

EC-APS-01





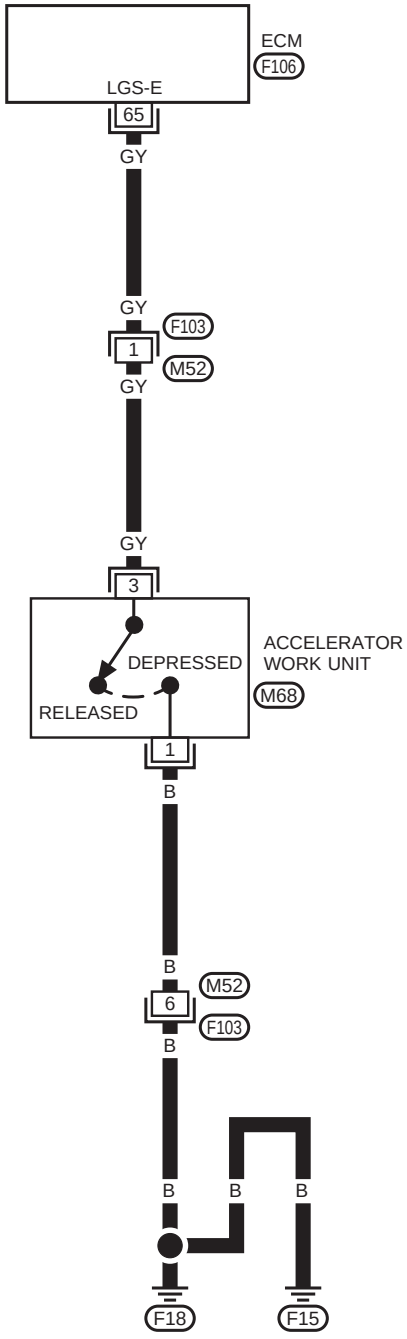




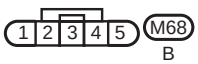
YEC314

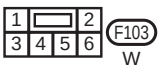
Accelerator Position Sensor & Switch (Cont'd)

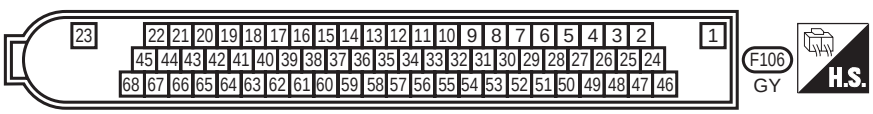
EC-APP/SW-01



: Detectable line for DTC
: Non-detectable line for DTC



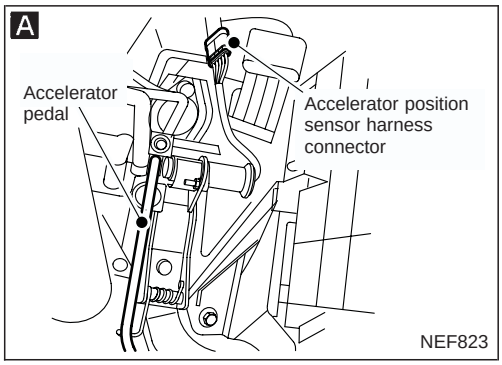


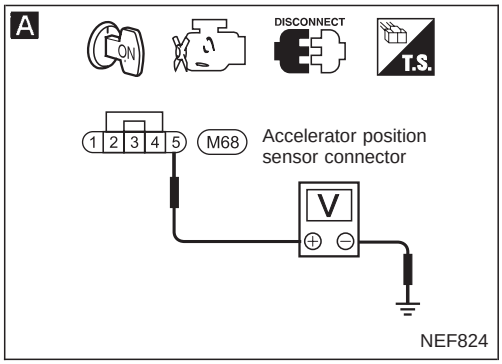


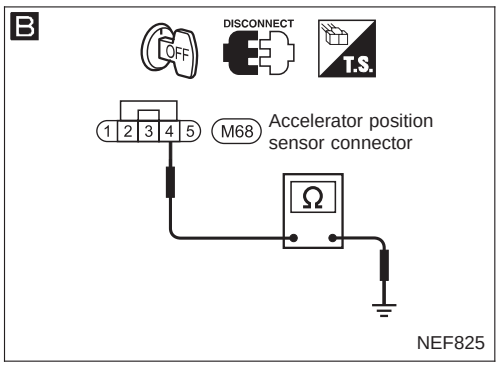
YEC315

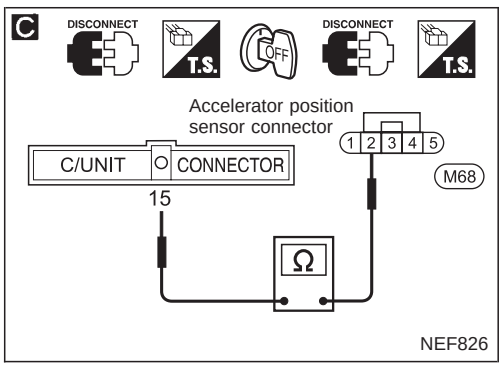
Accelerator Position Sensor & Switch (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START
(Accelerator position sensor)

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect accelerator position sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between accelerator position sensor connector terminal (5) and ground with CONSULT-II or voltage tester.

Voltage: Approximately 5V

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and accelerator position sensor.

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between accelerator position sensor connector terminal (4) and engine ground.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and accelerator position sensor.

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (15) and accelerator position sensor connector terminal (2).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and accelerator position sensor

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Accelerator position sensor).
Refer to "COMPONENT INSPECTION" EC-CD-118.

NG → Replace accelerator pedal assembly.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

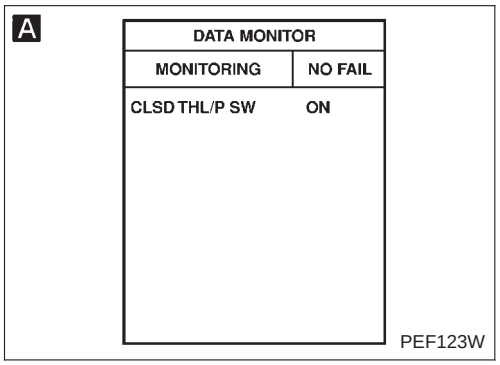
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

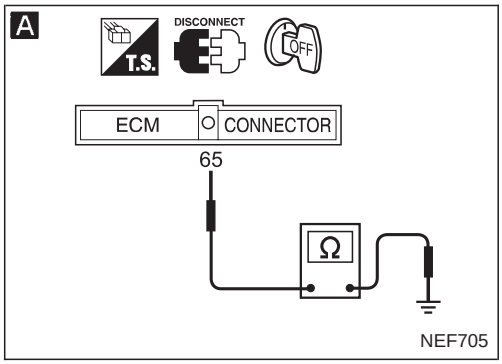
↓

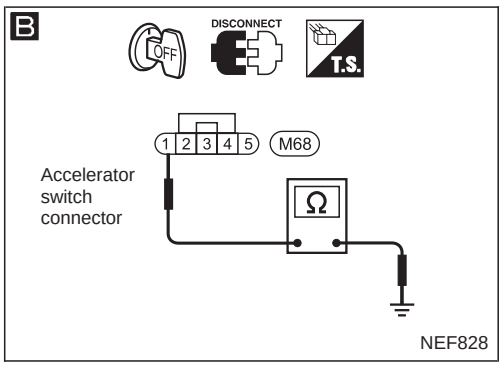
INSPECTION END

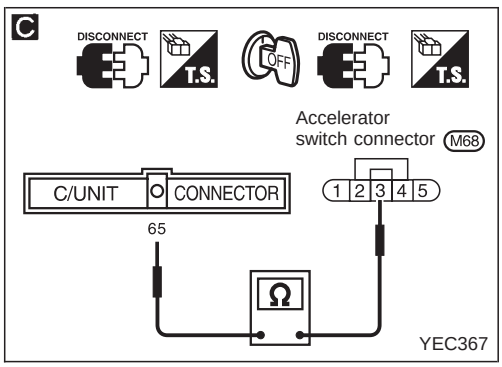
Accelerator Position Sensor & Switch (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START
(Accelerator position switch)

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch to "ON" position.
2. Check "OFF ACCEL POS" in "DATA MONITOR" mode with CONSULT-II.
   Accelerator pedal released: ON
   Accelerator pedal depressed: OFF

OR

1. Turn ignition switch to "LOCK" position.
2. Check continuity between ECM connector terminal (65) and ground.
   Continuity:
   Accelerator pedal released: No
   Accelerator pedal depressed: Yes

OK → INSPECTION END

NG

B

CHECK GROUND CIRCUIT.

1. Disconnect accelerator switch harness connector.
2. Check harness continuity between accelerator switch connector terminal (1) and engine ground.
   Continuity should exist.

NG → Check the following:
- Harness connectors (M52), (F103)
- Harness for open circuit between accelerator switch and engine ground.

If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.

Check harness continuity between ECM connector terminal (65) and accelerator switch connector terminal (3).
Continuity should exist.

NG → Check the following:
- Harness connectors (F103), (M52)
- Harness for open or short-circuit between accelerator switch and ECM

OK

CHECK COMPONENT
(Accelerator switch).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace accelerator switch.

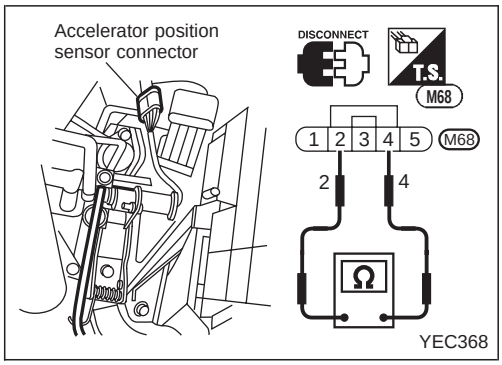
OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END



Accelerator Position Sensor & Switch (Cont'd)

COMPONENT INSPECTION

Accelerator position sensor

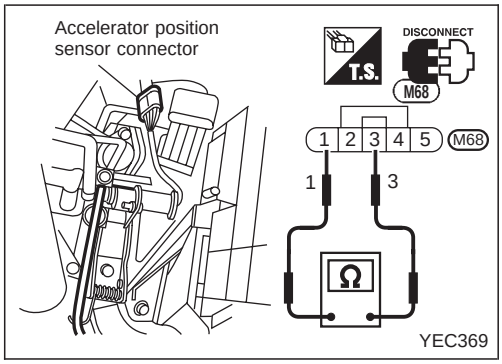
1. Disconnect accelerator position sensor harness connector.
2. Make sure that resistance between accelerator position sensor terminals ② and ④ changes when opening throttle valve manually.

Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 1.2 kΩ
Partially open	1.2 - 1.9 kΩ
Completely open	Approximately 1.9 kΩ

If NG, replace accelerator pedal assembly.

CAUTION:

- **Do not disassemble accelerator pedal assembly.**



COMPONENT INSPECTION

Accelerator switch

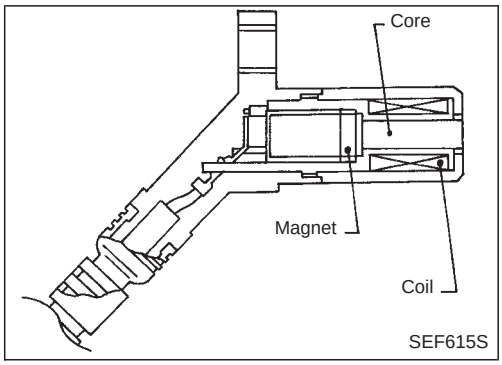
1. Disconnect accelerator switch harness connector.
2. Check continuity between accelerator switch connector terminals ① and ③.

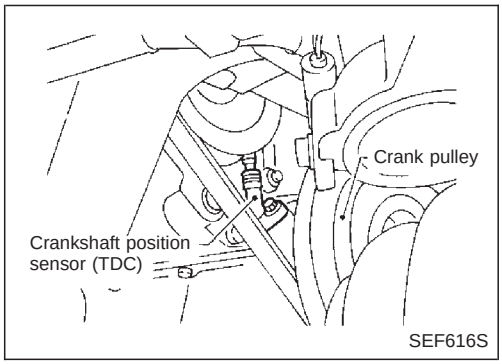
Conditions	Continuity
Accelerator pedal released	No
Accelerator pedal depressed	Yes

If NG, replace accelerator pedal assembly.

CAUTION:

- **Do not disassemble accelerator pedal assembly.**





Crankshaft Position Sensor (TDC)

The crankshaft position sensor (TDC) monitors engine speed by means of signals from the sensing plate (with two protrusions) installed to the crankshaft pulley. The datum signal output is detected at ATDC 70° and sent to the ECM. The sensor signal is used for fuel injection control and fuel injection timing control.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
47	• An incorrect signal from the sensor is detected by ECM during engine running and cranking.	• Harness or connectors (The sensor circuit is open.) • Crankshaft position sensor (TDC)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Before performing the following procedure, confirm that battery voltage is more than 9V.

If DTC 34 is displayed at the same time, perform trouble diagnosis for DTC34 first.

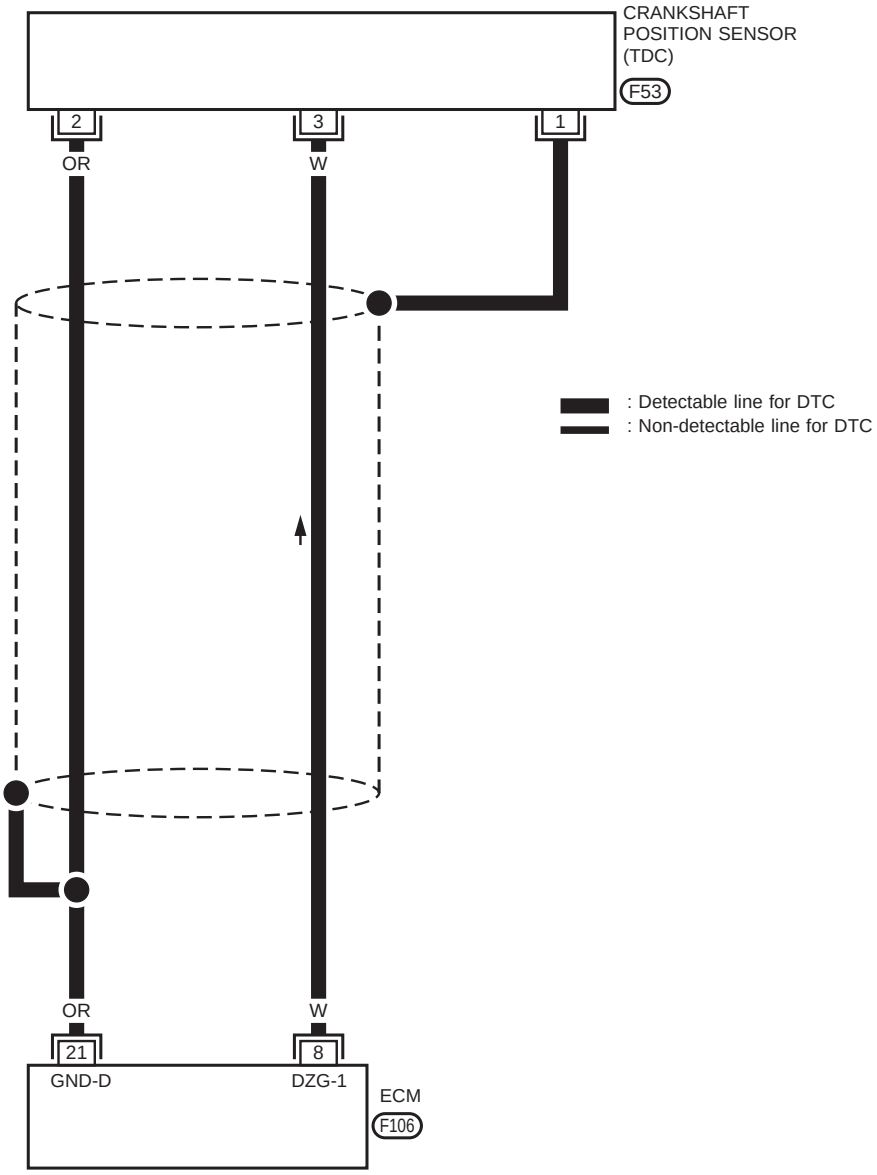
1) Turn ignition switch to ''ON'' position and select ''DATA MONITOR'' mode with CONSULT-II.
2) Start engine and run it for at least 3 seconds above 1,200 rpm.

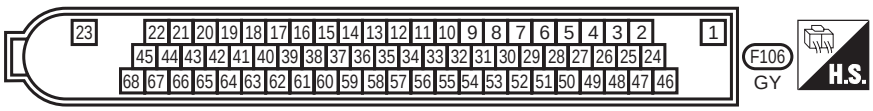
OR

1) Start engine and run it for at least 3 seconds above 1,200 rpm.
2) Turn ignition switch to ''LOCK'' position, wait at least 5 seconds and then turn to ''ON'' position.
3) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

Crankshaft Position Sensor (TDC) (Cont'd)

EC-CKPS-01

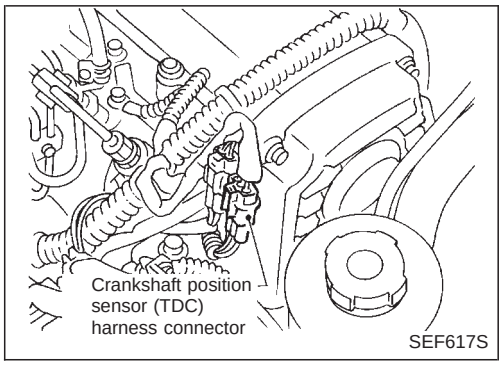


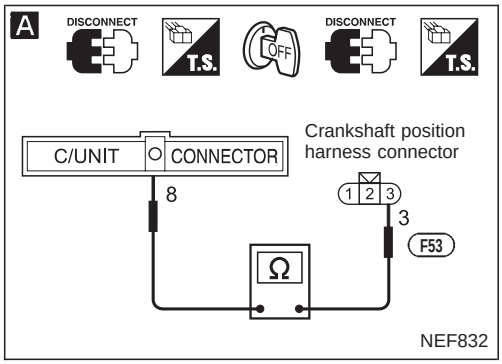


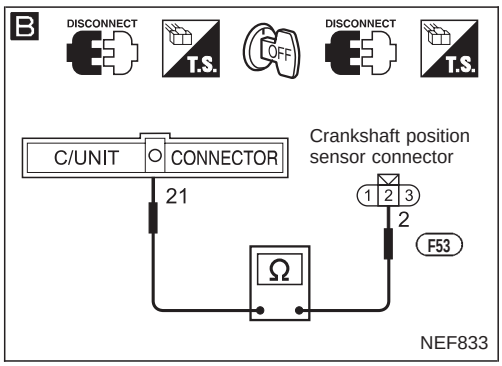
YEC350

Crankshaft Position Sensor (TDC) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect crankshaft position sensor (TDC) and ECM harness connectors.
3. Check continuity between ECM terminal (8) and crankshaft position sensor (TDC) connector terminal (3).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

Loosen and retighten engine ground screws.

OK ↓

B

CHECK GROUND CIRCUIT.

Check harness continuity between crankshaft position sensor (TDC) connector terminal (2) and ECM connector terminal (21).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT [Crankshaft position sensor (TDC)]. Refer to "COMPONENT INSPECTION" on next page.

NG → Replace crankshaft position sensor (TDC).

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed ↓

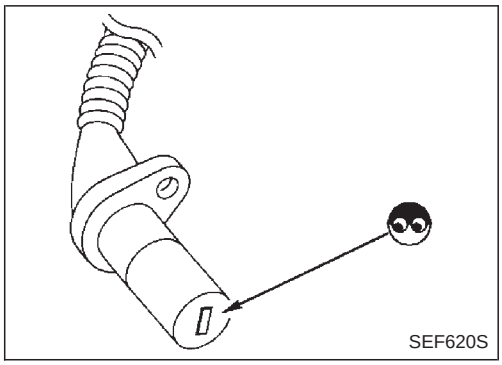
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

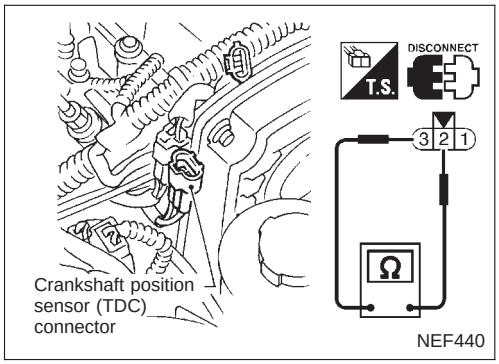
INSPECTION END

Crankshaft Position Sensor (TDC) (Cont'd)

COMPONENT INSPECTION

Crankshaft position sensor (TDC)


SEF620S

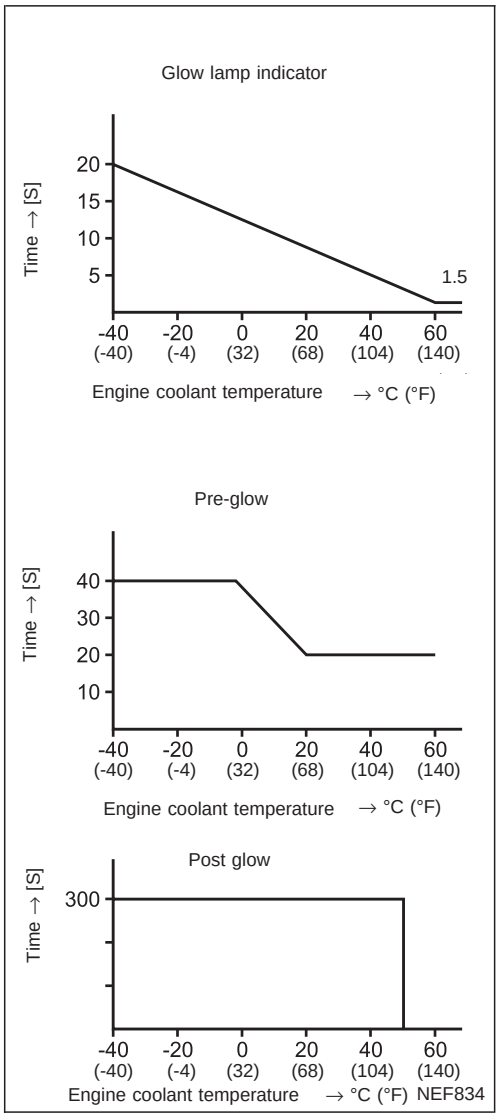


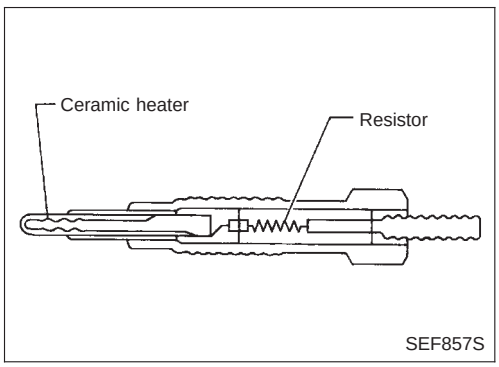
NEF440

1. Disconnect crankshaft position sensor (TDC) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance between crankshaft position sensor (TDC) terminals ② and ③.

   Resistance: Approximately 1.2 - 1.5kΩ [at 25°C (77°F)]

   If NG, replace crankshaft position sensor (TDC).





Glow Control System

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

- Ignition switch ON
  After ignition switch has been turned to ON, the glow relay turns ON for a period of time depending on engine coolant temperature, allowing current to flow through the glow plugs.
- Starting
  After starting the engine, current will flow through the glow plugs for 300 seconds, or until the coolant temperature exceeds 50°C (122°F).

COMPONENT DESCRIPTION

Glow plug

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.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
83	• Glow relay signal circuit is open or shorted.	• Harness or connectors (The glow relay signal circuit is open or shorted) • Glow relay
98	• Glow indicator lamp circuit is open or shorted.	• Harness or connectors (The glow indicator lamp circuit is open or shorted.) • Glow lamp

Glow Control System (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

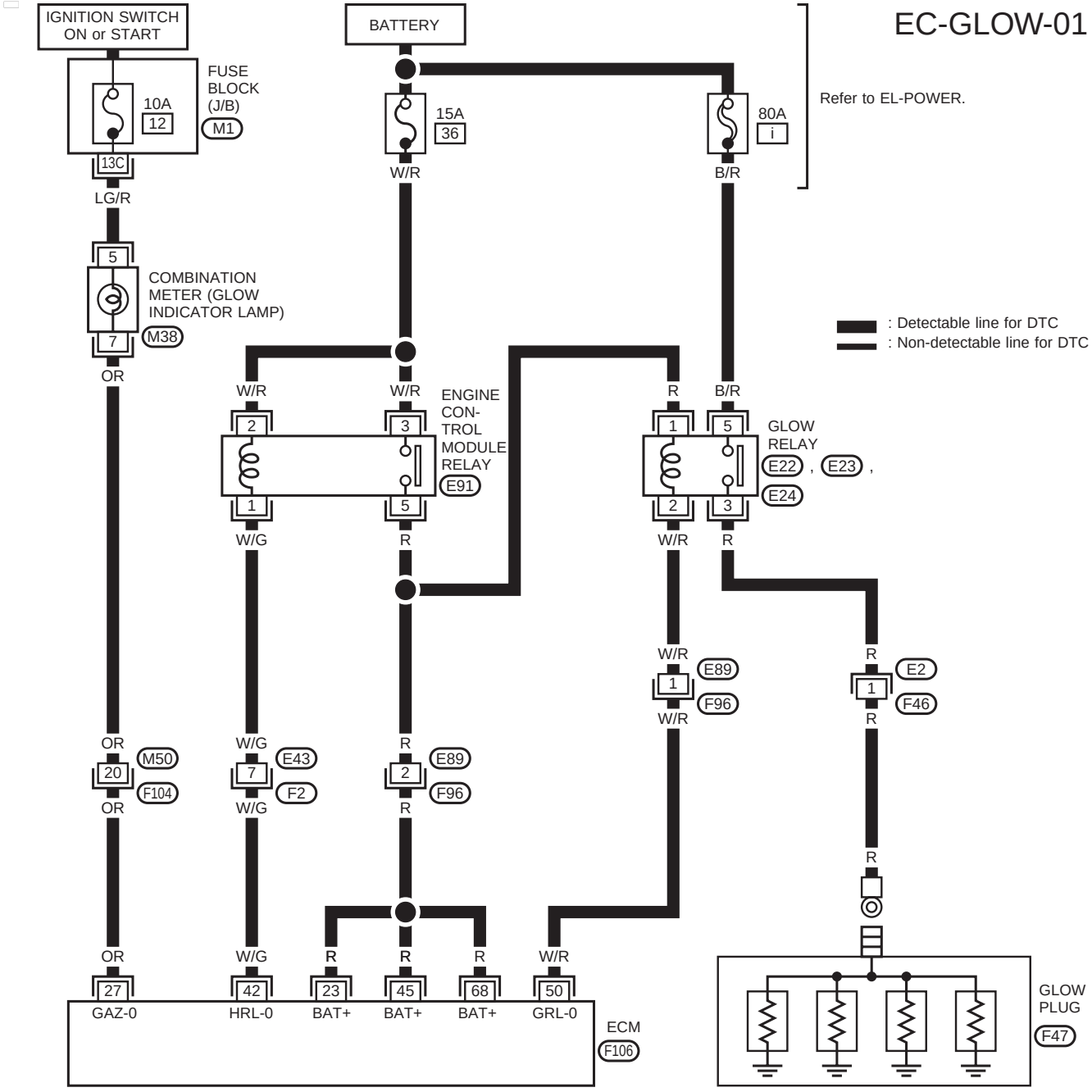
1) Turn ignition switch to ''ON'' position.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Wait at least 5 seconds.

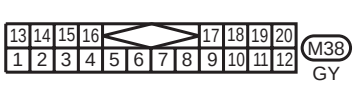
OR

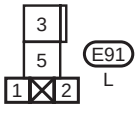
1) Turn ignition switch to ''ON'' position, and wait for at least 5 seconds.
2) Turn ignition switch off, wait for at least 5 seconds and then turn on.
3) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

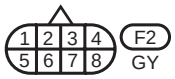
Glow Control System (Cont'd)

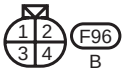
EC-GLOW-01

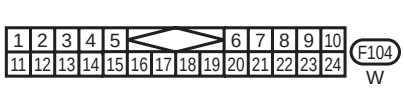


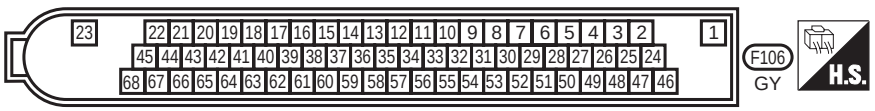












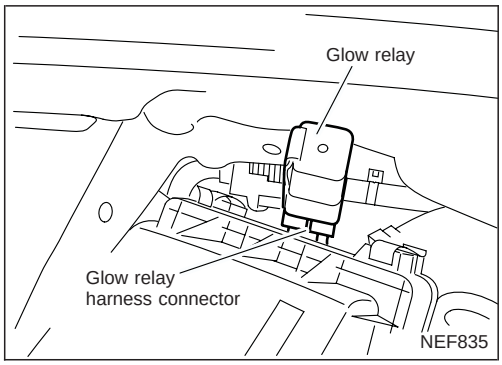
REFER TO THE FOLLOWING

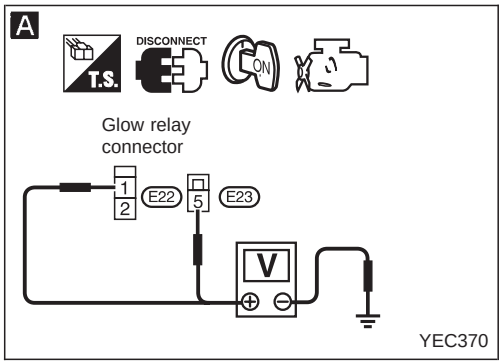
M1 FUSE BLOCK - Junction Box (J/B)

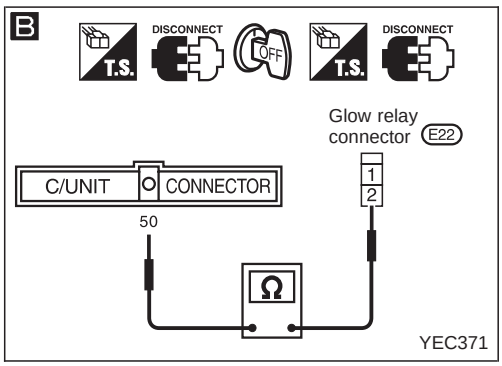
YEC316

Glow Control System (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START
(Glow relay signal circuit)

↓

CHECK MAIN POWER SUPPLY.
Check power supply to ECCS-D relay.
Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY" (EC-CD-62).

↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch to the "LOCK" position.
2. Disconnect glow relay.
3. Turn ignition switch to the "ON" position.
4. Check voltage between glow relay connector terminals ①, ⑤ and ground with tester.
   Voltage: Battery voltage

NG → Check the following:
- 15A fuse
- 80A fusible link
- Harness continuity between glow relay and fuse.

If NG, replace fuse or fusible link or repair harness or connectors.

OK ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to the "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM connector terminal ⑤⓪ and glow relay connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check harness connectors F96, E89
Repair harness or connectors.

OK ↓

CHECK GLOW PLUG AND GLOW RELAY.
Refer to "COMPONENT INSPECTION" (EC-CD-129, 130).

NG → Replace glow plug or glow relay.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

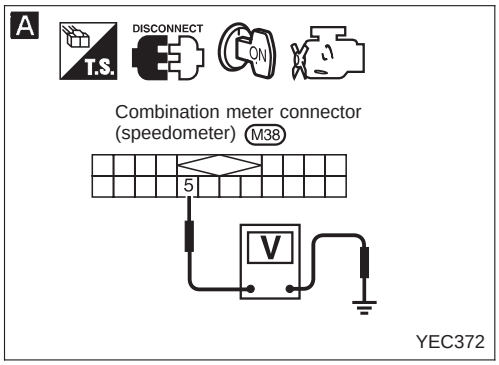
Trouble is not fixed ↓

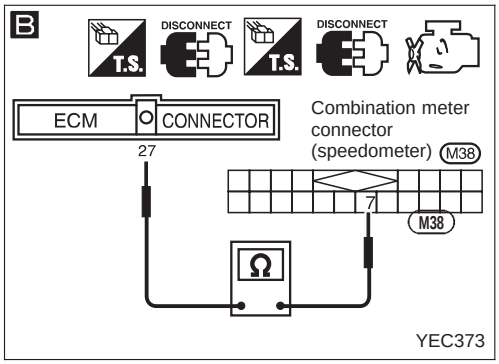
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Glow Control System (Cont'd)





INSPECTION START
(Glow indicator lamp circuit)

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect combination meter harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between combination meter harness connector terminal (5) and body ground.

Voltage: Battery voltage

NG → Check the following:
- Harness for open or short-circuit between combination meter and battery.
- 10A fuse

If NG, replace fuse or repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM connector terminal (27) and combination meter connector terminal (7).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and combination meter.

If NG, repair harness or connectors.

OK ↓

CHECK GLOW INDICATOR LAMP.
Make sure that glow indicator lamp is not burnt out.

NG → Replace glow indicator lamp.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

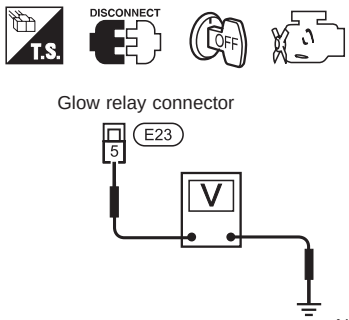
Trouble is not fixed ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

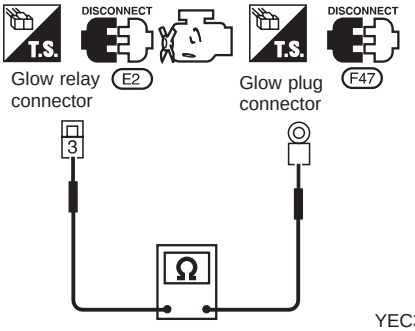
Glow Control System (Cont'd)

A



NEF873

B



YEC374

INSPECTION START
(Glow plug circuit)

A

CHECK POWER SUPPLY-I.
1. Turn ignition switch to "LOCK" position.
2. Disconnect glow relay harness connector.
3. Check voltage between glow relay harness connector terminal (5) and engine ground.

Voltage: Battery voltage

NG → Check the following:
- Harness for open or short-circuit between glow relay and battery.
- 80A fusible link

If NG, replace fusible link and repair harness connectors.

OK ↓

B

CHECK POWER SUPPLY-II.
1. Disconnect glow plug harness connector.
2. Check harness continuity between glow plug harness connector and glow relay harness connector terminal (3).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (E2), (F46)
- Harness for open or short-circuit between glow plug and glow relay.

If NG, repair harness or connector.

OK ↓

CHECK GLOW PLUG AND GLOW RELAY.
Refer to "COMPONENT INSPECTION" (EC-CD-129, 130).

NG → Replace glow plug or glow relay.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

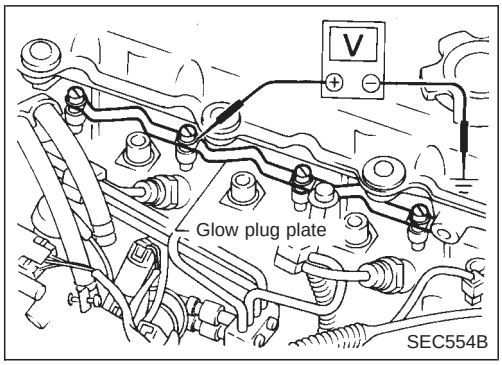
↓

INSPECTION END

Glow Control System (Cont'd)

SYSTEM OPERATION CHECK

Set voltmeter between glow plug and engine body.



1. Pre-glow control system

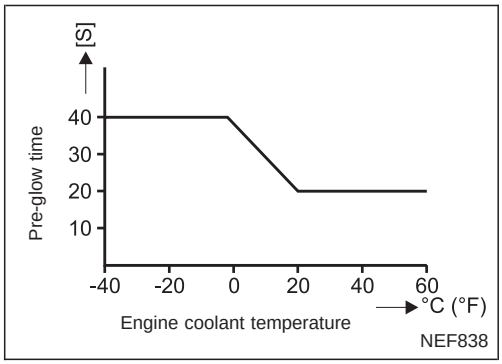
a. Turn ignition switch to "ON" position.

b. Read voltage.

Voltage:

Battery voltage for an engine coolant temperature dependent time.

*** Repeatedly turning the ignition switch to "ON" position and to "LOCK" position may change the pre-glow time.**



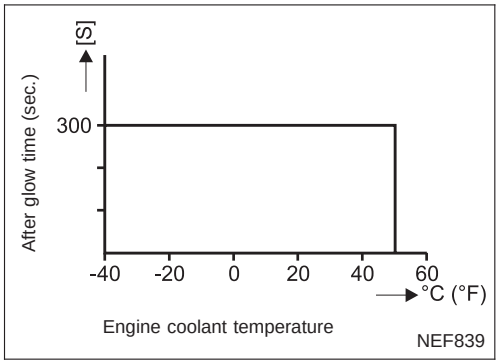
2. After-glow system

Start engine and read voltage.

Voltage:

Battery voltage for 5* minutes

*** Engine coolant temperature is lower than 50°C (122°F).**



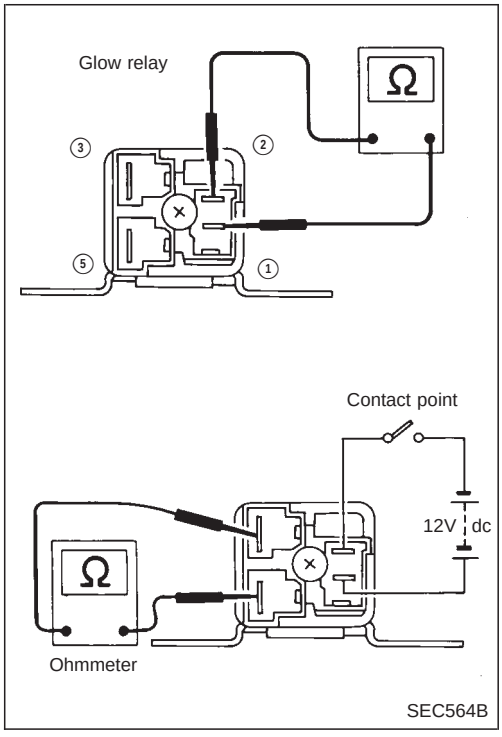
COMPONENT INSPECTION

Glow relay

1. Check relay for coil continuity between glow relay terminals ① and ②.

Continuity should exist.

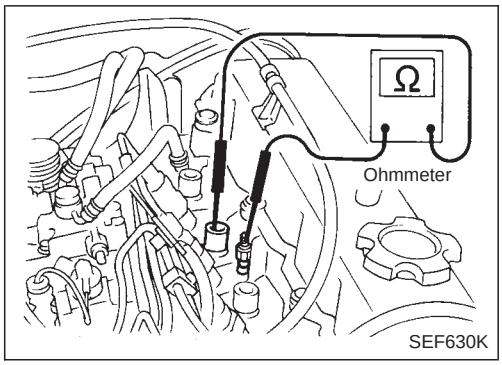
2. Check relay for proper operation by applying 12V dc voltage between glow relay terminals ① and ② and checking continuity between terminals ③ and ⑤.



Coil voltage	Continuity ③ and ⑤	Contact point
0V	No	OFF
12V	Yes	ON

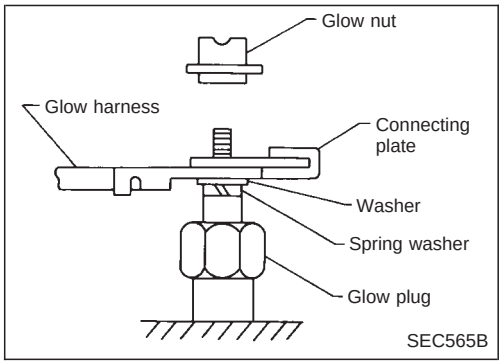
Glow Control System (Cont'd)

Glow plug



1. Remove glow plug connecting plate.
2. Check each glow plug for continuity.
   Continuity should exist:
   Approximately 0.5Ω [at 25°C (77°F)]

- If NG, replace glow plug.



3. Install glow plug connecting plate securely.

- **Do not bump glow plug heating element. If it is bumped, replace glow plug with new one. (If glow plug is dropped from a height of 0.1 m (3.94 in) or greater, replace with new one.)**
- **If glow plug installation hole is contaminated with carbon, remove using a reamer or suitable tool.**
- **Hand-tighten glow plug by turning it 2 to 3 times, then tighten using a tool to specified torque.**

  : 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)

Air Conditioner Cut Control

The Air Conditioner relay is controlled by the ECM. During the following conditions, the ECM will cut the power supply towards the air conditioner relay:

- Starting engine
- Quick acceleration from low speed
- Undershooting of idle speed
- High engine coolant temperature [above 107°C (225°F)].
- Malfunctioning of engine speed sensor, accelerator position sensor or vehicle speed sensor when engine speed is below 2,100 rpm.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
85	● Air conditioner relay signal circuit is shorted.	● Harness or connectors (The air conditioner relay signal circuit is shorted). ● Air conditioner relay

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

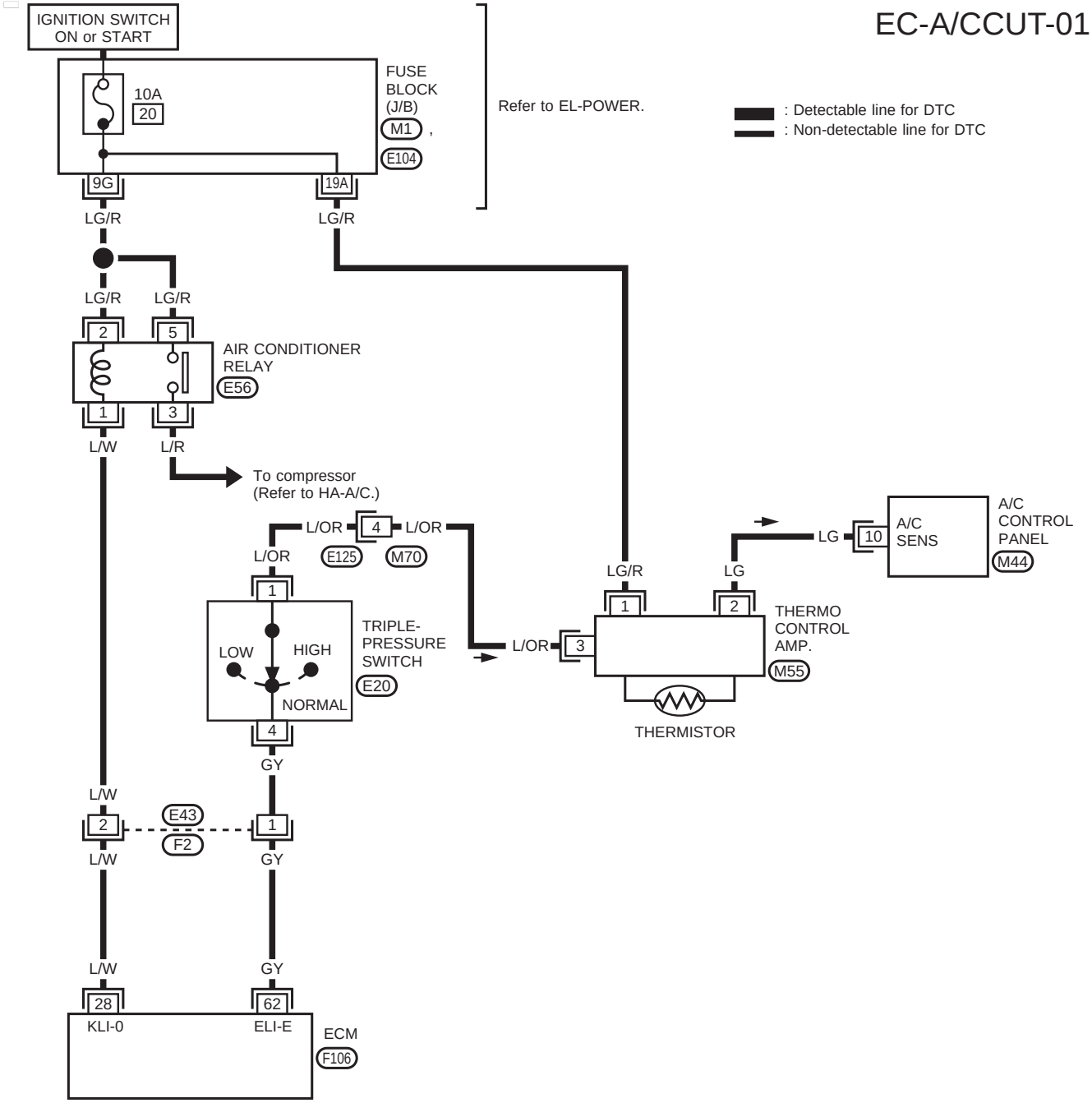
1) Turn ignition switch and air conditioner switch to the ''ON'' position.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Wait at least 2 seconds.

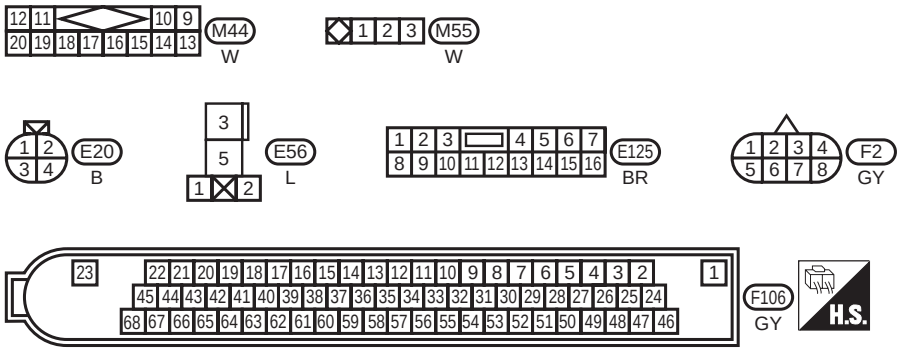
OR

1) Turn ignition switch and air conditioner switch to the ''ON'' position.
2) Turn ignition switch to the ''LOCK'' position, wait at least 5 seconds and then turn to the ''ON'' position.
3) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

Air Conditioner Cut Control (Cont'd)

EC-A/CCUT-01





REFER TO THE FOLLOWING

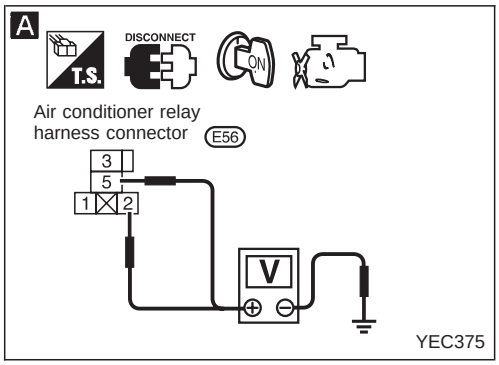
M1 FUSE BLOCK - Junction Box (J/B)

E104 FUSE BLOCK - Junction Box (J/B)

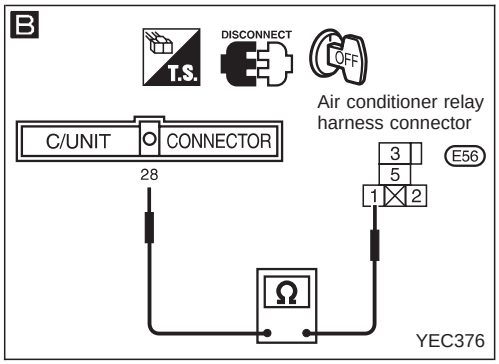
YEC317

Air Conditioner Cut Control (Cont'd)

A



B



INSPECTION START
(Air conditioner relay signal circuit)

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect air conditioner relay harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between air conditioner relay connector terminals ②, ⑤ and engine ground.

Voltage: Battery voltage

NG → Check the following:
- Harness and connectors for open or short-circuit between ignition switch and air conditioner relay.
- 10A fuse

If NG, replace or repair the parts affected.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM harness connector terminal ㉘ and air conditioner relay harness connector terminal ①.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors E43, F2
- Harness for open or short-circuit between ECM and air conditioner relay.

If NG, repair harness or connectors.

OK ↓

CHECK AIR CONDITIONER RELAY.
Refer to HA section for inspection.

NG → Replace air conditioner relay.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

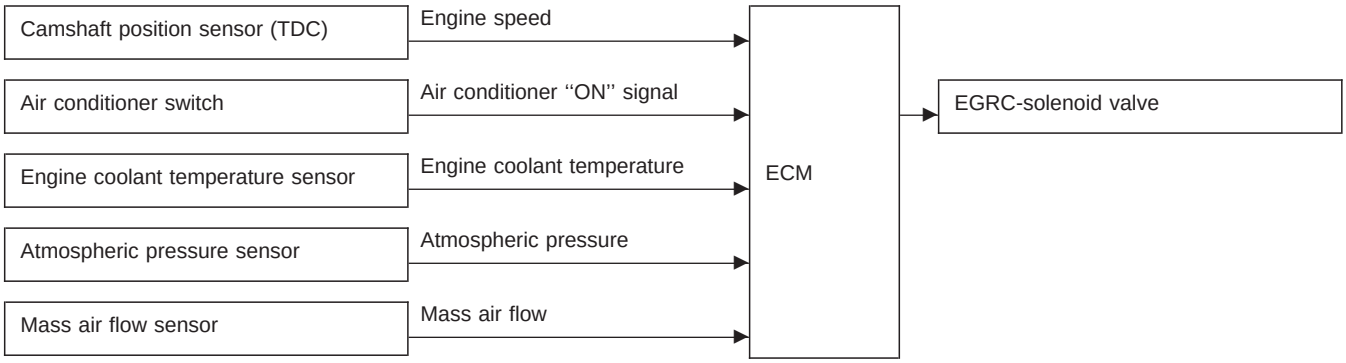
Trouble is not fixed ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

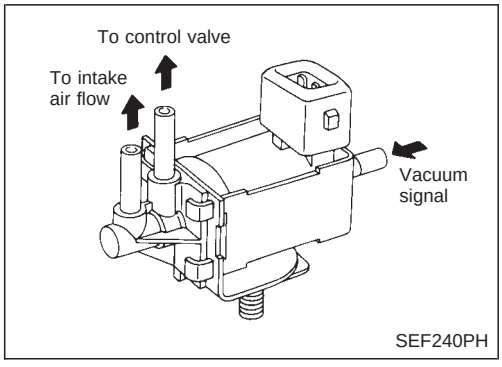
EGRC-Solenoid Valve

SYSTEM DESCRIPTION



The ECM receives signals sent from the engine coolant temperature sensor, crankshaft position sensor (TDC), atmospheric pressure sensor, mass air flow sensor and air conditioner switch to determine engine speed and operating conditions. Based on these signals, the ECM controls the EGR control solenoid valve operation.
No EGR operation will take place when the engine coolant temperature is below 70°C (158°F), when idling, at starting and during a period of time after starting the engine (70 - 200 seconds, depending on engine coolant temperature).

Engine coolant temperature °C (°F)	Load	EGRC-solenoid valve	EGR valve	Amount of EGR gas
Below 70 (158)	Any	OFF (Closed)	Fully closed	—
Above 70 (158)	Low load	ON (Open)	Fully open	Large
	High load	OFF (Closed)	Fully closed	—



COMPONENT DESCRIPTION

The EGR control solenoid valves control vacuum pressure acting on the EGR valve. The EGR control valve will then be fully opened or fully closed, as required.
Thus, intake air passages are opened or closed in relation to exhaust gas and intake air. Utilizing the relationship between exhaust gas pressure and intake air pressure control, the amount of EGR (exhaust gas recirculated) is regulated in large or small volumes.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
86	• EGRC-solenoid valve A circuit is shorted.	• Harness or connectors (EGRC-solenoid valve A circuit is open or shorted). • EGRC solenoid valve A

EGRC-Solenoid Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

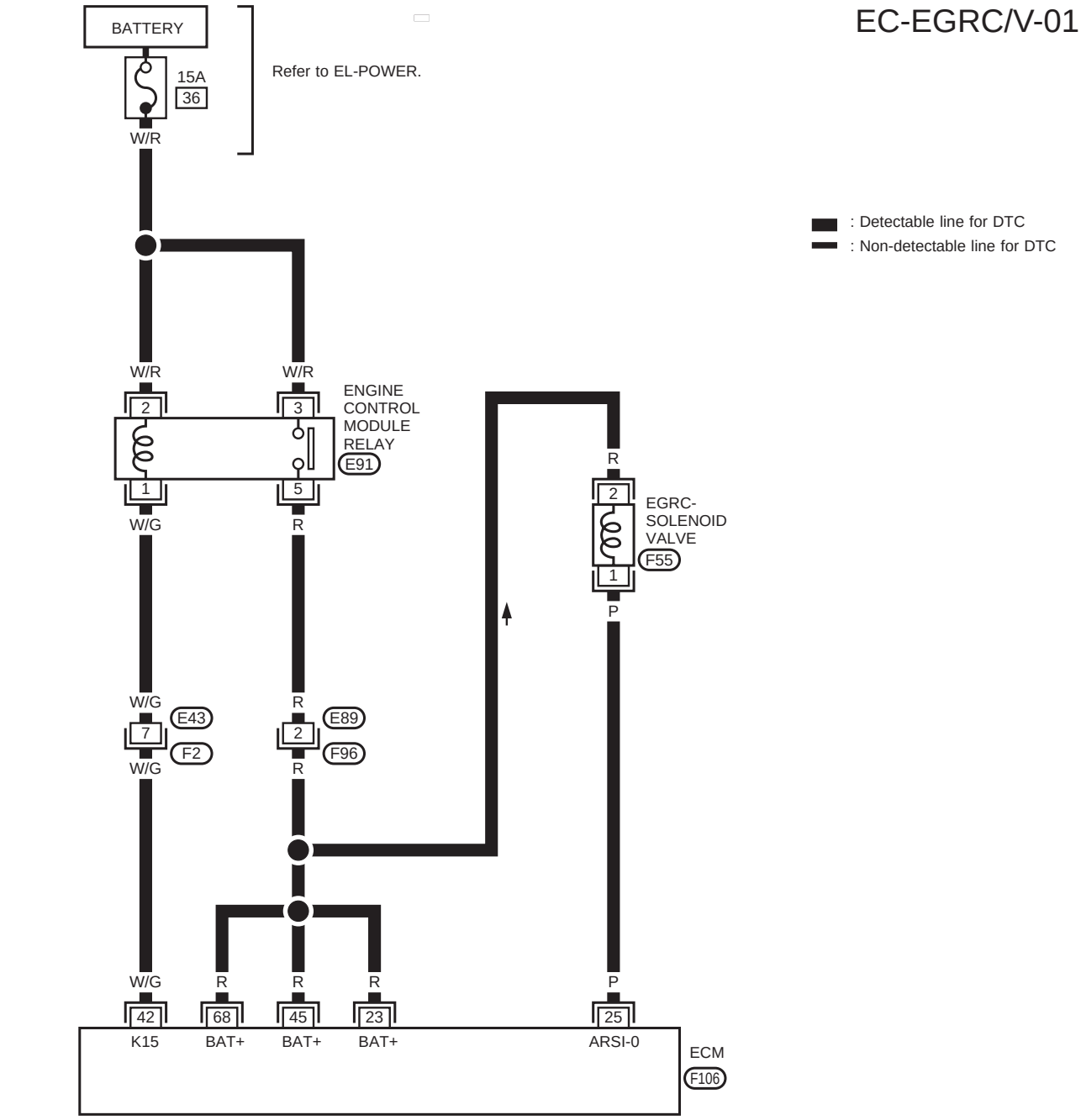
1) Turn ignition switch to the ''ON'' position.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Wait at least 2 seconds.

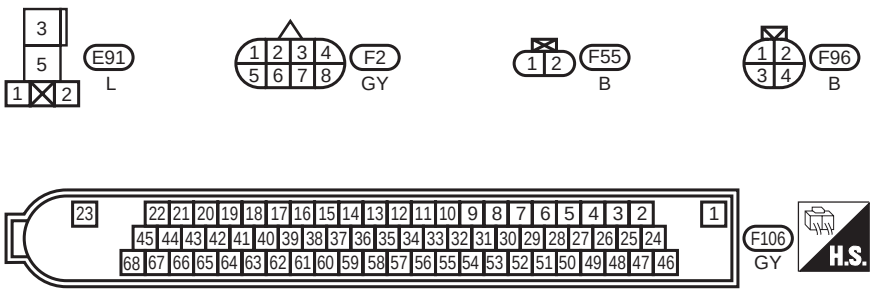
OR

1) Turn ignition switch to the ''ON'' position and wait at least 2 seconds.
2) Turn ignition switch to the ''LOCK'' position, wait at least 5 seconds and then turn to the ''ON'' position.
3) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

EGRC-Solenoid Valve (Cont'd)

EC-EGRC/V-01

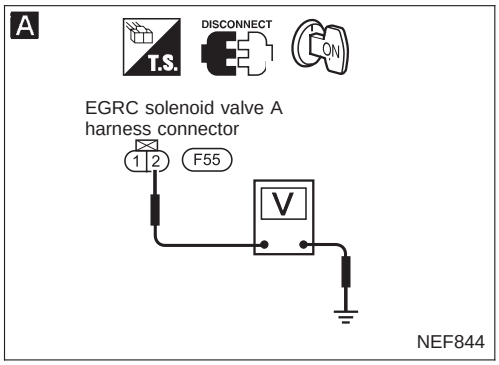


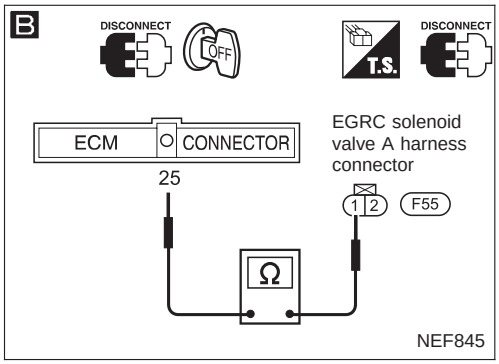


YEC318

EGRC-Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START
(Circuit for EGRC-solenoid valve A)

↓

CHECK MAIN POWER SUPPLY.
Refer to Trouble Diagnosis for main power supply (EC-CD-62)

↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch to the "LOCK" position.
2. Disconnect EGRC-solenoid valve A harness connector.
3. Turn ignition switch to the "ON" position.
4. Check voltage between connector terminal ② and engine ground.
   Voltage: Battery voltage

NG → Check the following:
- Harness continuity between ECCS-D relay and EGRC-solenoid valve A connector.

If NG, repair harness or connectors.

OK ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to the "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM harness connector terminal ㉕ and EGRC solenoid valve A connector terminal ①.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and solenoid valve.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENTS (EGRC-solenoid valve).
Refer to "COMPONENT INSPECTION" EC-CD-140.

NG → Replace malfunctioning component(s).

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

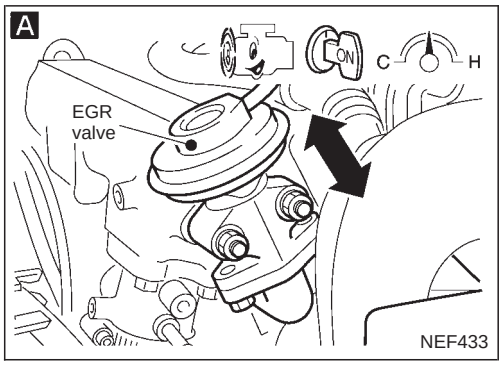
↓

INSPECTION END

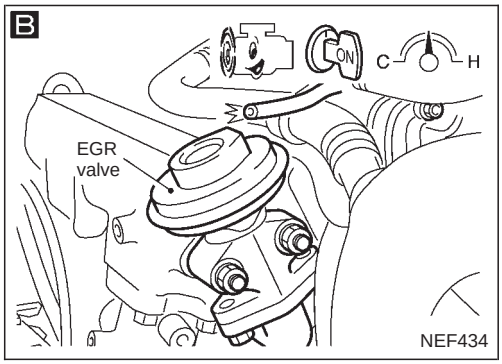
EGRC-Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE

A



B



INSPECTION START
EGR CONTROL OPERATION

A

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently. (Air conditioner is "OFF").
2. Perform diagnostic test mode II (Self-diagnostic results).
   Make sure that diagnostic trouble code No. 55 is displayed.
3. Make sure that EGR diaphragm moves up and down (Use your finger or a suitable tool) under the following conditions:
   At idle:
   Spring does not move.
   Racing engine from idle to 2800 rpm:
   Spring moves up and down.

OK → INSPECTION END

NG

B

CHECK VACUUM SOURCES TO EGR VALVE.

1. Disconnect vacuum hoses to EGR valve.
2. Make sure that vacuum exists under the following conditions:
   At idle:
   Vacuum should not exist.
   Racing engine from idle to 2800 rpm:
   Vacuum should exist.

OK → CHECK COMPONENTS (EGR valve).
(See page EC-CD-140.)

NG → Replace malfunctioning component(s).

NG

Ⓐ

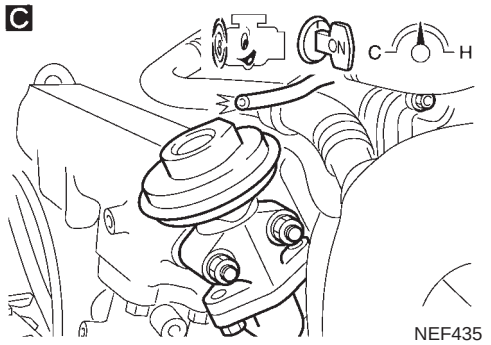
EGRC-Solenoid Valve (Cont'd)

C

ACTIVE TEST	
EGR SOL/V A	OFF
MONITOR	
CKPS-RPM(TDC)	0rpm

C2ESA01

C



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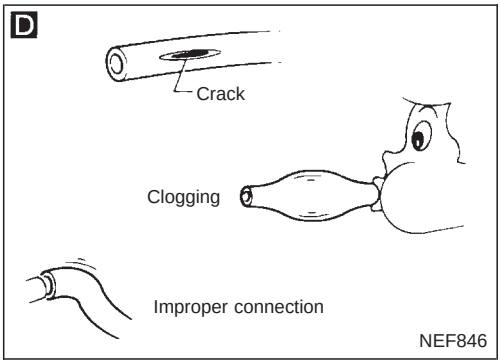
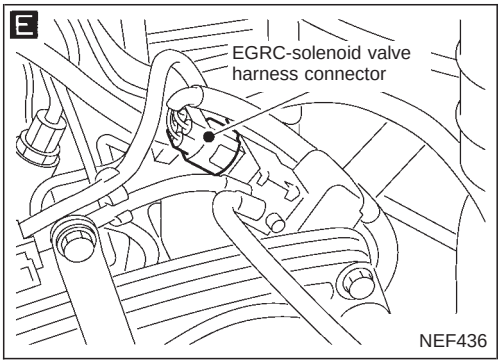
D



NEF846

E



NEF436

Ⓐ

C

CHECK CONTROL FUNCTION.

1. Turn ignition switch to "ON" position.
2. Turn EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT-II and check operating sound.

OR

1. Check voltage between EGRC solenoid valve connector terminal ①, and ground with tester under the following conditions:

Voltage:
At idle
Battery voltage
Engine speed is 2,800 rpm
Approximately 0.4V

OK → D

CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connection.

NG

E

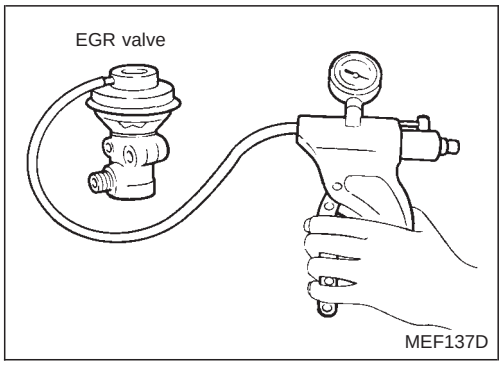
Perform electrical circuit inspection.
Refer to EC-CD-137.

OK

Ⓑ

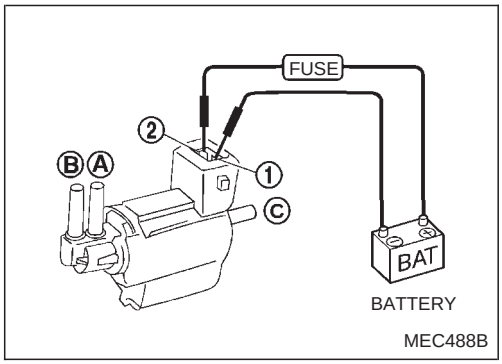
EGRC-Solenoid Valve (Cont'd)

COMPONENT INSPECTION



EGR valve

Apply vacuum to EGR vacuum port with a hand vacuum pump.
EGR valve spring should lift.
If NG, replace EGR valve.



EGRC-solenoid valve

Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.

Brake Switch

The ECM receives signals from two brake switches. One is a conventional brake lamp switch, the other is referred to as a redundant (RDNT) brake switch.
In case the accelerator pedal does not return to the idle position (pedal sticks), the driver will react by depressing the brake. In this (emergency) situation, the ECM will disregard the accelerator pedal signal and bring back the engine speed to 1200 rpm.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
87	• Brake switch circuits are open or shorted.	• Harness or connectors (Brake switch circuits are open or shorted.) • Stop lamp switch • RDNT brake switch

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

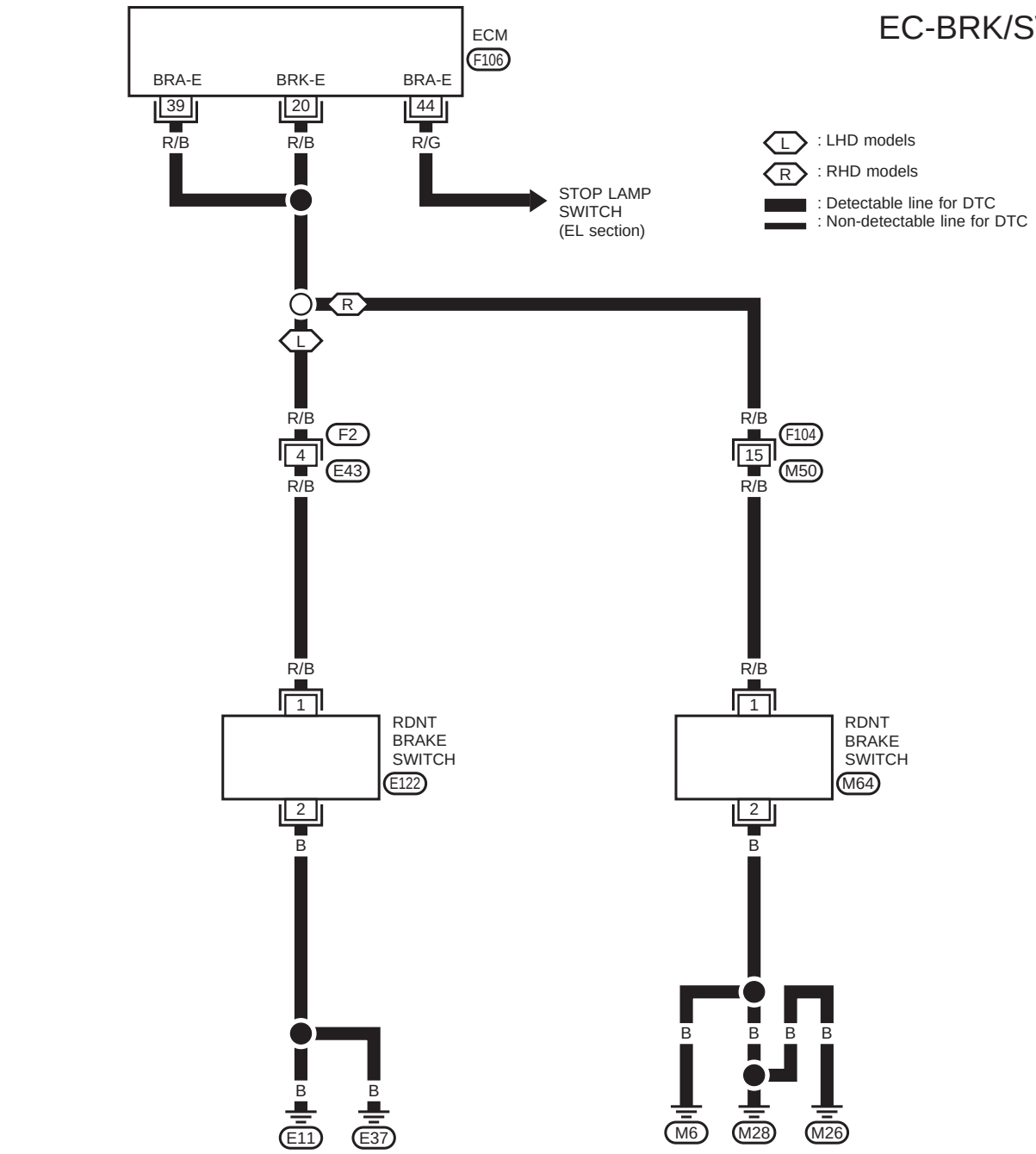
1) Turn ignition switch to ''ON'' position and select ''DATA MONITOR'' mode with CONSULT-II.
2) Depress brake pedal for at least 1 minute.

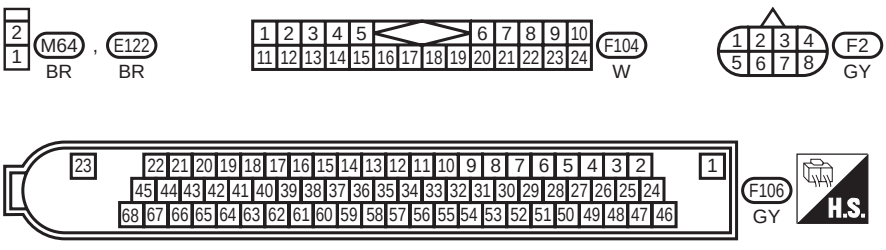
OR

1) Turn ignition switch to ''ON'' position.
2) Depress brake pedal for at least 1 minute.
3) Turn ignition switch to ''LOCK'' position, wait at least 5 seconds and then turn to ''ON'' position.
4) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

Brake Switch (Cont'd)

EC-BRK/SW-01



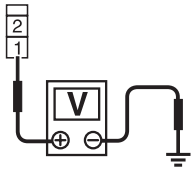


YEC319

Brake Switch (Cont'd)

A

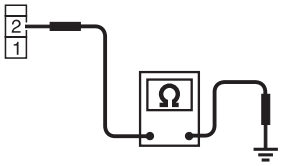
RDNT brake switch harness connector



YEC377

B

RDNT brake switch harness connector



YEC378

INSPECTION START
(RDNT brake switch)

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect RDNT brake switch harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between RDNT brake switch harness connector terminal ① and body ground.

Voltage: Battery voltage

NG → Check the following:
- Harness connectors F104, M50 (RHD models)
- Harness connectors F2, E43 (LHD models)
- Harness for open or short-circuit between RDNT brake switch harness connector terminal ① and ECM connector terminal ⑳, ㊴.

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between RDNT brake switch harness connector terminal ② and body ground.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT.
(RDNT brake switch)
Refer to "COMPONENT INSPECTION" on next page.

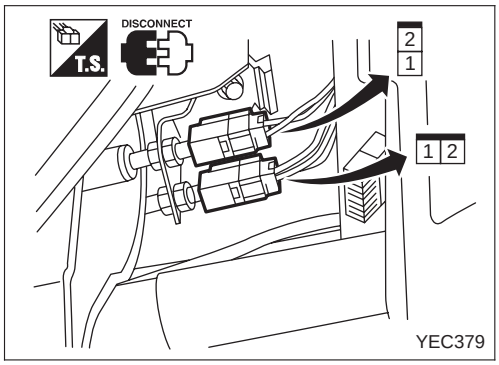
OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END



Brake Switch (Cont'd)

COMPONENT INSPECTION

Stop lamp switch and RDNT brake switch

1. Turn ignition switch to ''LOCK'' position.
2. Disconnect switch harness connectors.
3. Check continuity between terminals ① and ②.

Continuity:

Brake pedal	Stop lamp switch	RDNT brake switch
Released	No	No
Depressed	Yes	Yes

If NG, replace stop lamp switch or RDNT brake switch.

ECCS-D Relay

The ECCS-D Relay shuts off the main power supply to the ECM within 5 seconds after the ignition switch has turned to the ''LOCK'' position.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
92	● ECCS-D relay shut-off time is too late.	● Harness or connectors (The ECCS-D relay circuit is shorted). ● ECCS-D relay ● ECM

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch to the ''ON'' position and select ''DATA MONITOR'' mode with CONSULT-II.
2) Turn ignition switch to the ''LOCK'' position and wait at least 5 seconds.
3) Turn ignition switch to the ''ON'' position and wait at least 2 seconds.

OR

1) Turn ignition switch to the ''ON'' position.
2) Turn it to the ''LOCK'' position, wait at least 5 seconds.
3) Turn ignition switch to the ''ON'' position and perform ''Diagnostic Test Mode II'' (Self-diagnostic results).

DIAGNOSTIC PROCEDURE

Refer to ''Trouble Diagnosis for Power Supply'' (EC-CD-62) for ECCS-D relay circuit inspection.

MI & Data Link Connectors

Malfunction indicator (MI) circuit is monitored for open or short-circuit. If the circuit is malfunctioning, MI can not report it but CONSULT-II can.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
97	• MI circuit is open or shorted.	• Harness or connectors (MI circuit is open or shorted). • MI lamp • ECM

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch to ''ON'' position and select ''DATA MONITOR'' mode with CONSULT-II.
2) Start engine and run it for at least 2 seconds at idle speed.

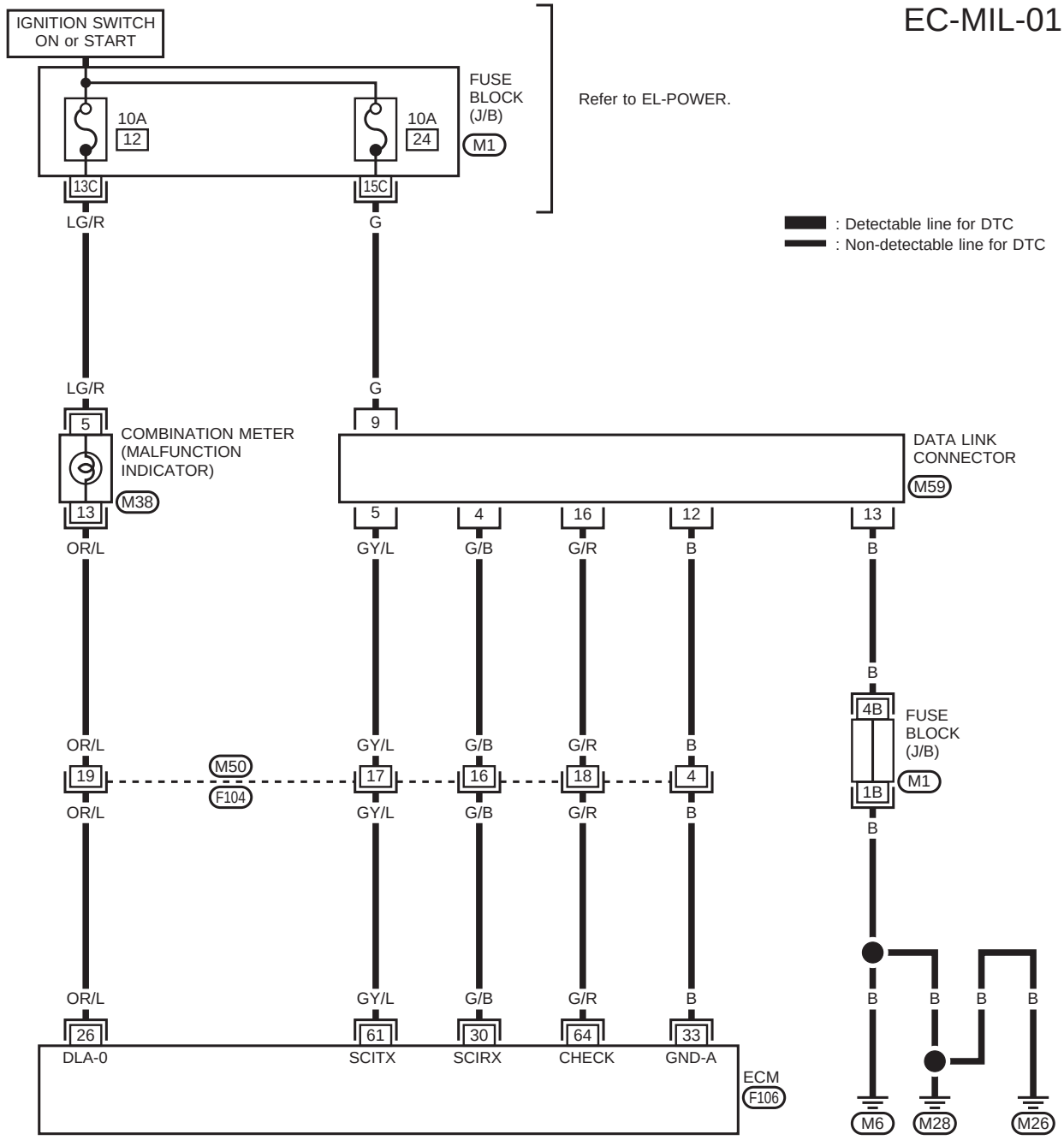
OR

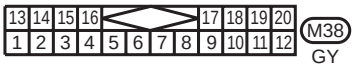
OVERALL FUNCTION CHECK

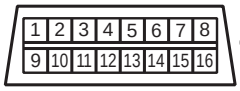
1) Turn ignition switch to ''ON'' position.
2) Check that MI lits on.

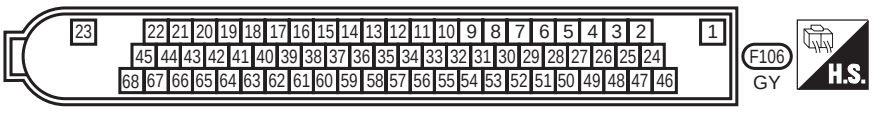
MI & Data Link Connectors (Cont'd)

EC-MIL-01









REFER TO THE FOLLOWING

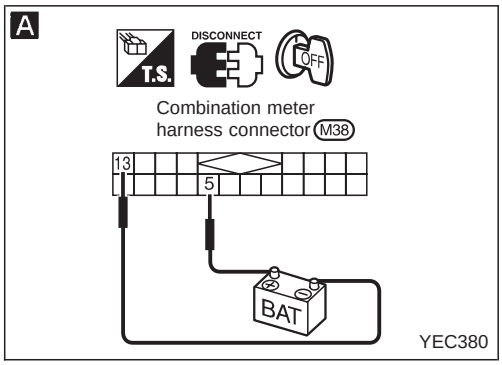
M1 FUSE BLOCK - Junction Box (J/B)

YEC320

MI & Data Link Connectors (Cont'd)

DIAGNOSTIC PROCEDURE

A



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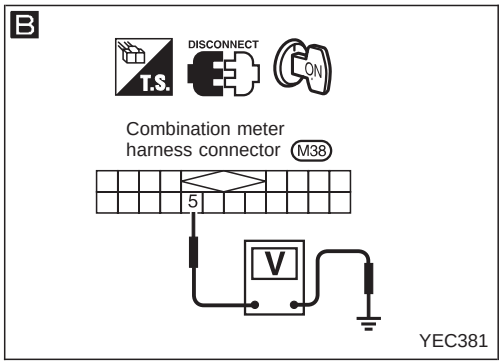
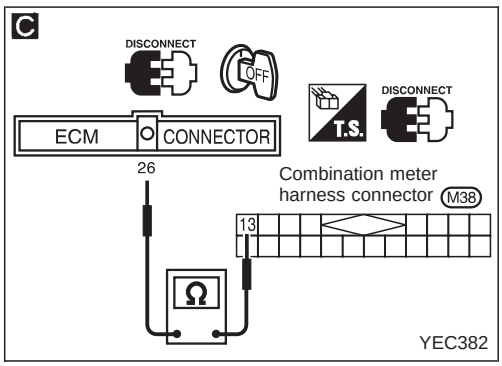


C



INSPECTION START
(MI circuit)

A

CHECK MI BULB.
1. Turn ignition switch to "LOCK" position.
2. Disconnect combination meter harness connector.
3. Apply battery voltage between combination meter terminal (5) and (13).
4. Check that MI lits on.

NG → Replace MI bulb.

OK

B

CHECK POWER SUPPLY.
1. Turn ignition switch to "ON" position.
2. Check voltage between combination meter terminal (5) and body ground.
   Voltage: Battery voltage

NG → Check the following:
- Harness for open or short-circuit between combination meter and ignition switch.
- 10A fuse

If NG, repair or replace harness or fuse.

OK

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check continuity between combination meter connector terminal (13) and ECM connector terminal (26).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M50), (F104)

If NG, repair harness or connectors.
- Harness and connectors for open or short-circuit between ECM and combination meter.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

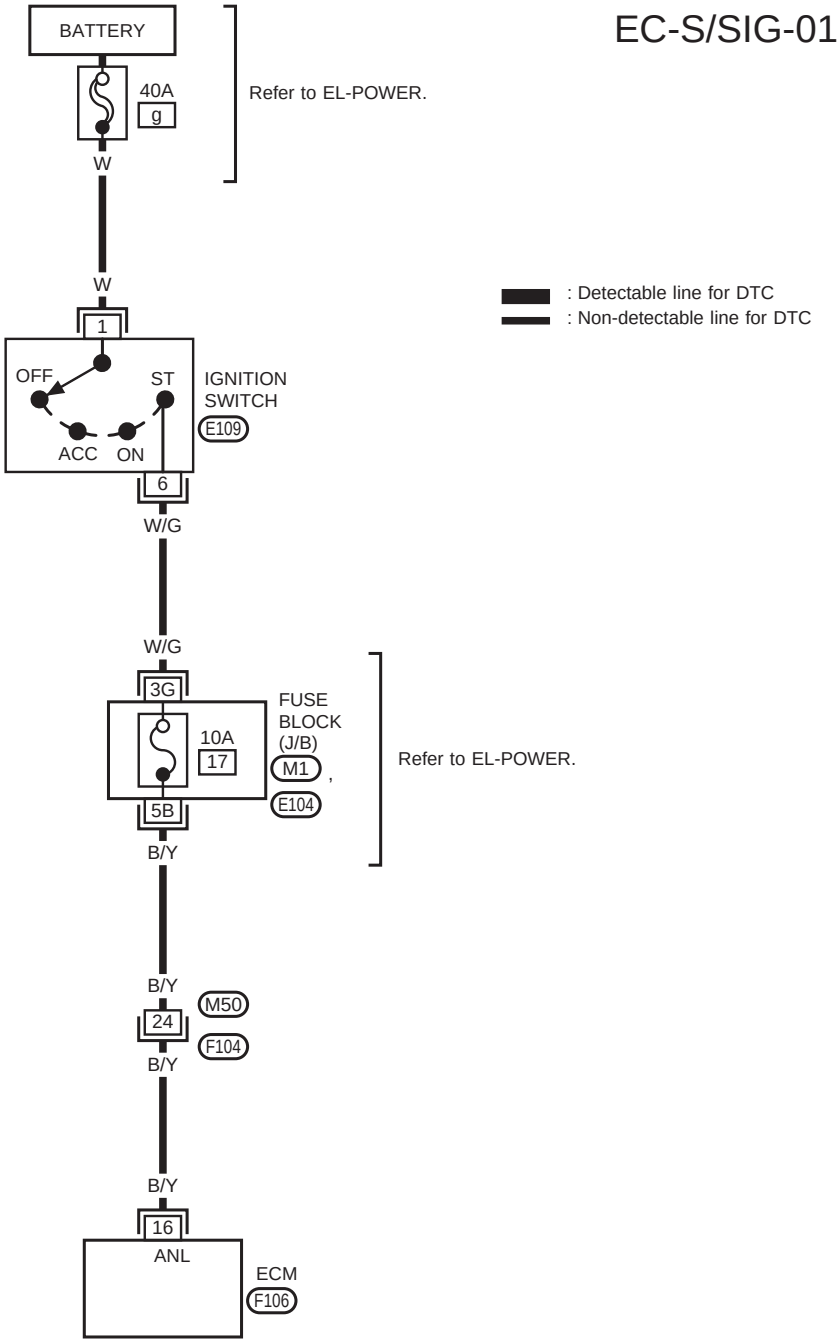
Trouble is not fixed

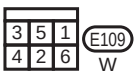
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

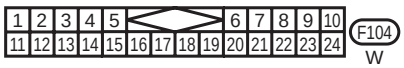
INSPECTION END

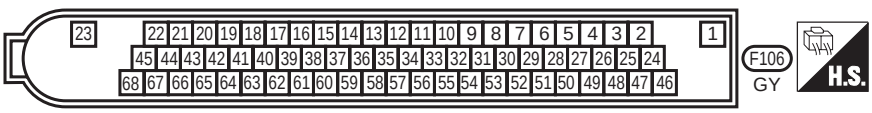
Start Signal

EC-S/SIG-01









REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

E104 FUSE BLOCK - Junction Box (J/B)

YEC321

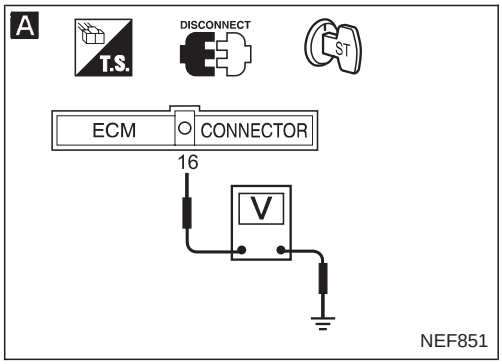
Start Signal (Cont'd)

DIAGNOSTIC PROCEDURE

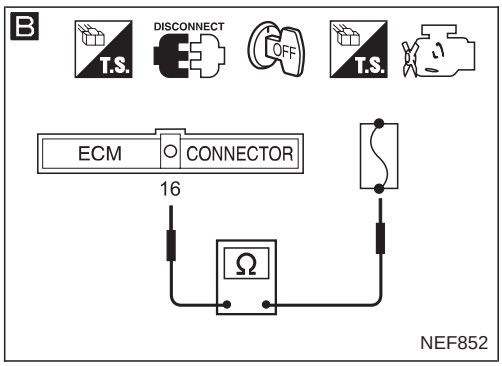
A

DATA MONITOR	
MONITOR	NO DTC
P/N POSI SW	ON

C2DMM04



NEF851



NEF852

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch to "ON" position.
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT-II.

IGN "ON"	OFF
IGN "START"	ON

OK → INSPECTION END

OR

1. Turn ignition switch to the "LOCK" position.
2. Disconnect ECM harness connector.
3. Turn ignition switch to "START" position.
4. Check voltage between ECM connector terminal (16) and ground.

Voltage:
Ignition switch "START" — Battery voltage
Except above — Approximately 0V

NG

Check if 10A fuse is OK.

NG → Replace 10A fuse.

OK

B

CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch to "LOCK" position.
2) Disconnect 10A fuse.
3) Check harness continuity between ECM connector terminal (16) and fuse block.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness or connectors (M50), (F104)
- Harness for open or short-circuit between ECM and fuse block.

If NG, repair harness or connectors.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

General Specifications

Unit : rpm

Engine		CD20T
Maximum engine speed		5,400
Idle speed	A/C ON	825 ± 25
	A/C OFF	825 ± 25

Pump numbers

Engine	Part number	Pump assembly number
CD20T	16700 2J620	NP-VE4/ 10E2200L736

Pump data is not yet available.
Refer to CALIBRATION STANDARD published by BOSCH.)

Injection Nozzle

INSPECTION AND ADJUSTMENT

Injection nozzle assembly

Unit: kPa (bar, kg/cm^2, psi)

Initial injection pressure	
New	14,423 - 15,651 (144.2 - 156.5, 148 - 159, 2,091 - 2,269)
Used	15,000 - 16,000 (150.0 - 160.0, 153 - 163, 2,175 - 2,320)

Inspection and Adjustment

Plunger lift (Injection timing)	mm (in)	0.89 ± 0.08 at plunger lift timing mark

ELECTRIC GOVERNOR

Resistance [at 25°C (77°F)]	Ω	1.0

MASS AIR FLOW SENSOR

Supply voltage	V	5.0V
Output voltage	V	1.9 - 2.3*

*: Engine is warmed up sufficiently and idling under no-load.

CRANKSHAFT POSITION SENSOR (TDC)

Resistance [at 25°C (77°F)]	Ω	Approximately 1,215 - 1,485

GLOW PLUG

Resistance [at 25°C (77°F)]	Ω	0.5

ENGINE COOLANT TEMPERATURE SENSOR

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

ACCELERATOR POSITION SENSOR

Throttle valve conditions	Resistance kΩ [at 25°C (77°F)]
Completely closed	Approximately 1.2
Partially open	1.2 - 1.9
Completely open	Approximately 1.9

CONTROL SLEEVE POSITION SENSOR

Resistance [at 25°C (77°F)]	Ω	6.0

FUEL TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
25 (77)	Approximately 1.9

INJECTION TIMING CONTROL VALVE

Resistance [at 25°C (77°F)]	Ω	Approximately 15

NOTE