# ENGINE CONTROL SYSTEM

# SECTION EC



# CONTENTS

**GA16DE**

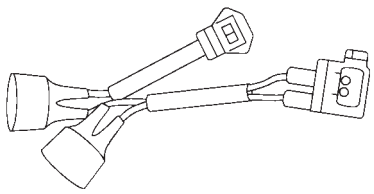
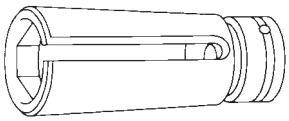
**When you read wiring diagrams:**
- **Read GI section, ''HOW TO READ WIRING DIAGRAMS''.**
- **See EL section, ''POWER SUPPLY ROUTING'' for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

**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<br>Tool name | Description | | |
|---|---|---|---|
| EG11140000<br>Ignition coil adapter harness |  <br>NT338 | Measuring engine speed | X |
| KV10117100<br>Heated oxygen sensor wrench |  <br>NT630 | Loosening or tightening heated oxygen sensor | X |

## Precautions

### SUPPLEMENTAL RESTRAINT SYSTEM (SRS) ''AIR BAG'' and ''SEAT BELT PRE-TENSIONER''

The Supplemental Restraint System ''Air Bag'' and ''Seat Belt Pre-tensioner'', used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of an air bag module (located in the center of the steering wheel and on the instrument panel on the passenger's side, where fitted), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
In addition to the supplemental air bag modules for a frontal collision, the supplemental side air bag used along with the seat belt help to reduce the risk or severity of injury to the driver and front passenger in a side collision. The supplemental side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (one of components of supplemental air bags for a frontal collision), wiring harness, warning lamp (one of components of supplemental air bags for a frontal collision).
Information necessary to service the system safely is included in the **RS section** of this Service Manual.

**WARNING:**

- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation), all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed in this Service Manual. SRS wiring harnesses (except ''SEAT BELT PRE-TENSIONER'' connector) can be identified with yellow harness connector (and with yellow harness protector or yellow insulation tape before the harness connectors). Do not use electrical test equipment on any circuit related to the SRS.**

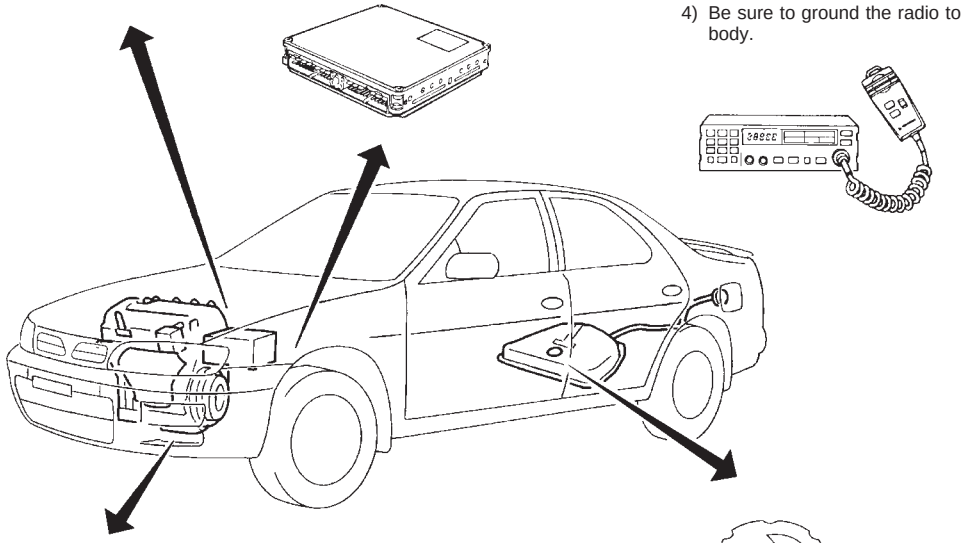
# Engine Fuel & Emission Control System

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

**ECM**
- Do not disassemble ECM (Engine control module).
- Do not turn diagnosis mode selector forcibly.
- 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.

**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.

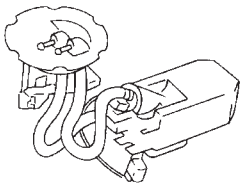
1) Keep the antenna as far away as possible from the ECM.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept small.
4)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





**ENGINE CONTROL MODULE 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 IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor.

**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.



**FUEL PUMP**
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque (Refer to EM section.).

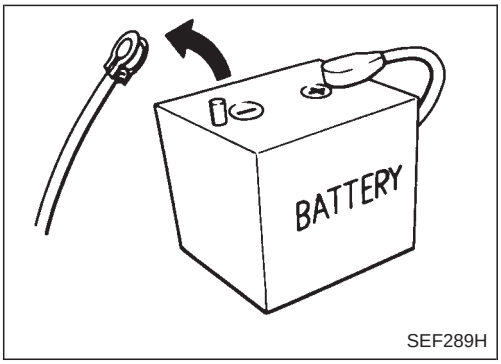
**ENGINE CONTROL MODULE HARNESS HANDLING**
- Correct engine control module harness connectors securely. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, resulting in damage to ICs.
- Keep engine control module harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an engine control module system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep engine control module parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

NEF561

## Precautions for Engine Control Module Trouble Diagnosis of Engine

**CAUTION:**

- **Be sure to turn the ignition switch ‘‘OFF’’ and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause malfunction.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause malfunction due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Be sure to route and clamp the harnesses properly after work. The interference of the harness with a bracket, etc. may cause malfunction due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause malfunction.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) in the ECM before returning the vehicle to the customer.**



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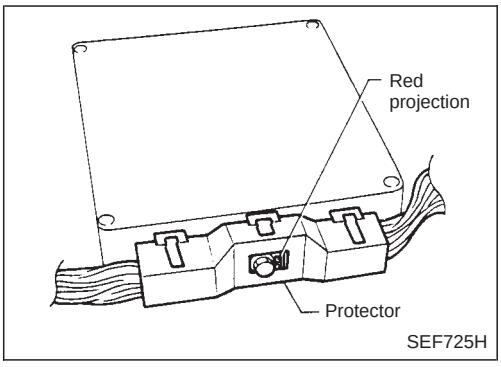
## Precautions

- **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.**



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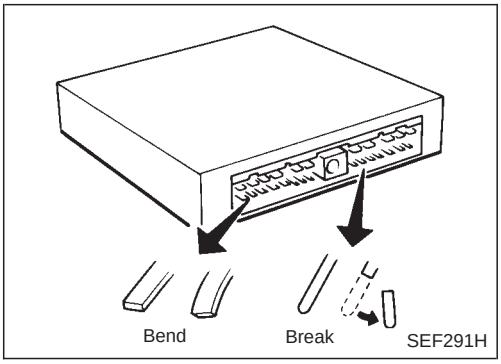
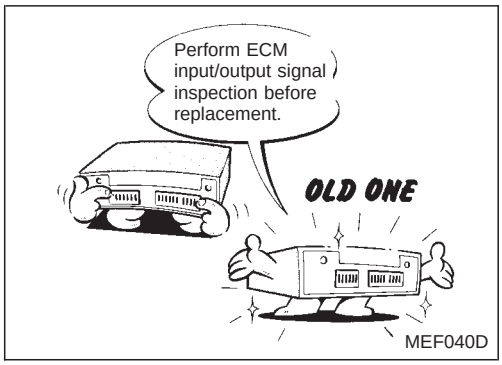
- **When connecting ECM harness connector, tighten securing bolt until red projection is in line with connector face.**
  **: 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)**



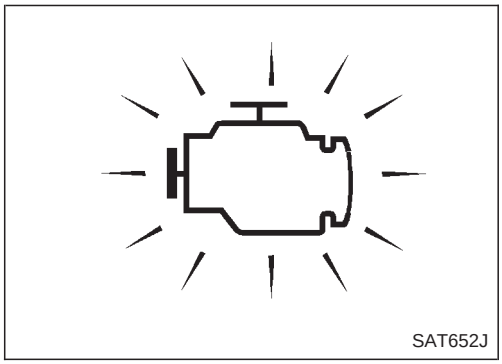
SEF291H

- **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.**

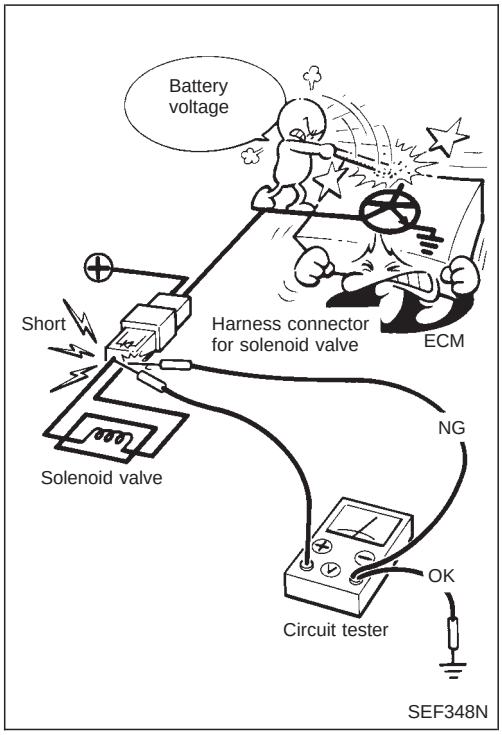
## Precautions (Cont'd)




- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-GA-62.**

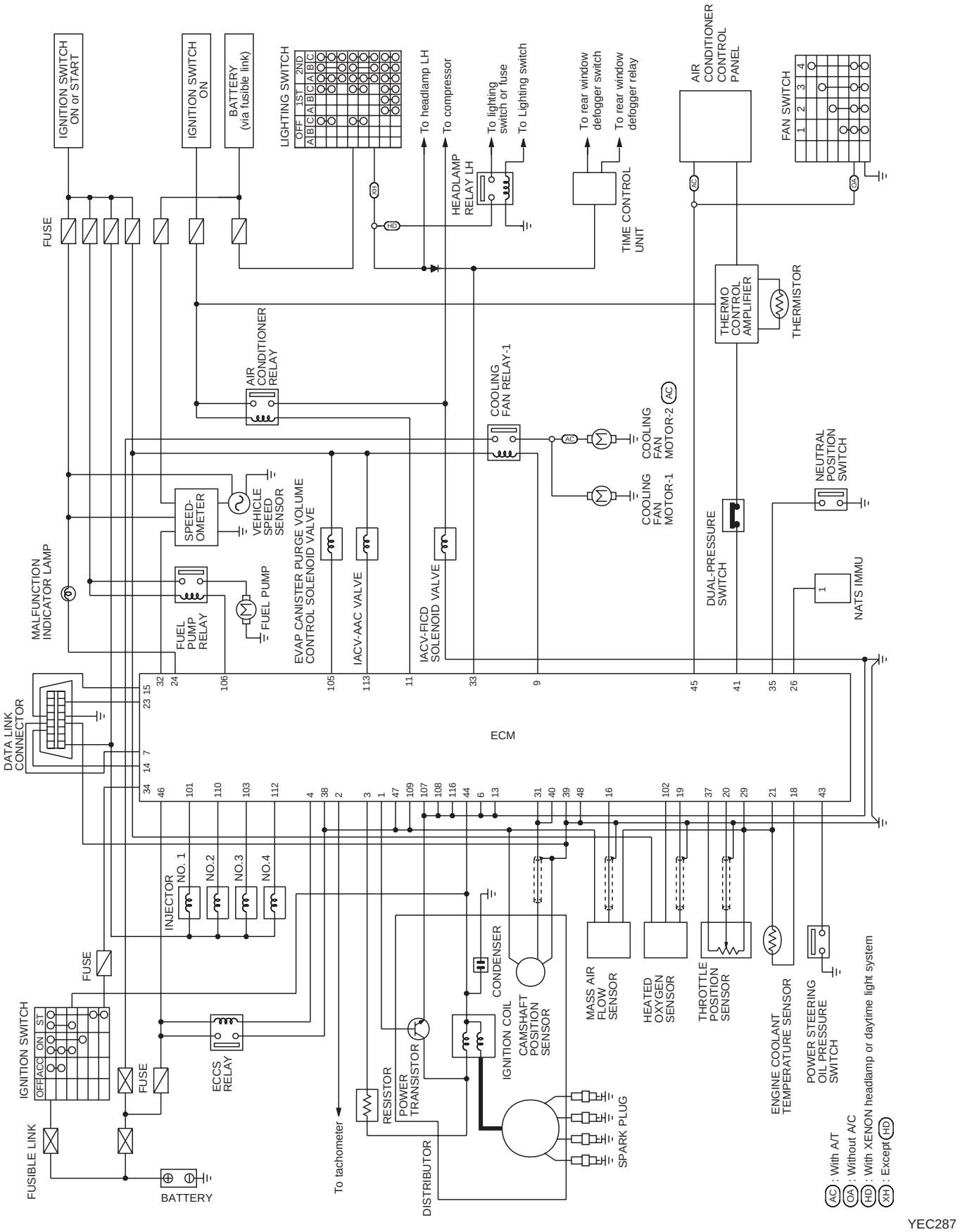



- **After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE".**
  **The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is completed successfully. The "OVERALL FUNCTION CHECK" should be a good result if the repair is completed successfully.**



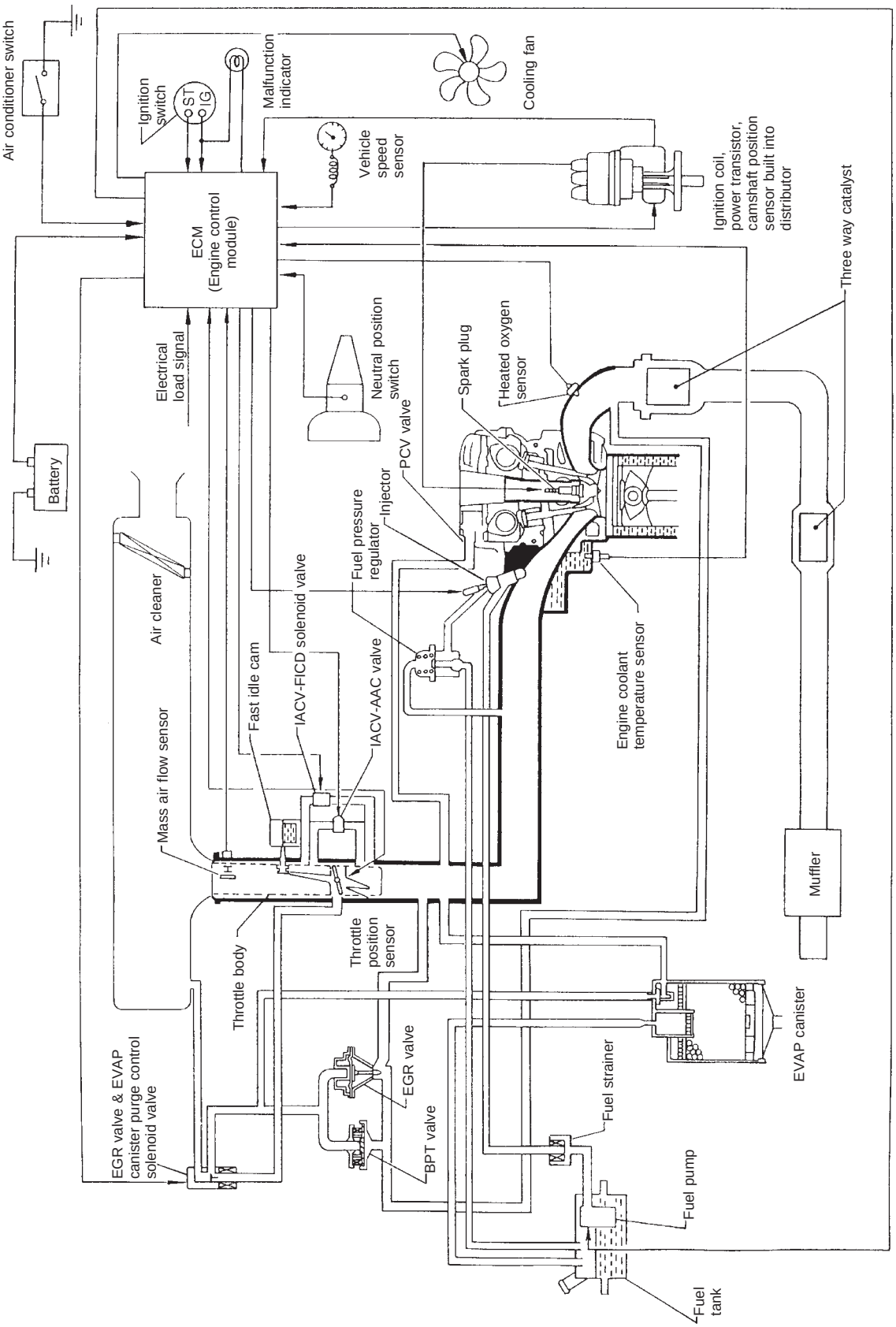

- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  **Accidental contact of probes will cause a short circuit and may damage the ECM power transistor.**

## Circuit Diagram

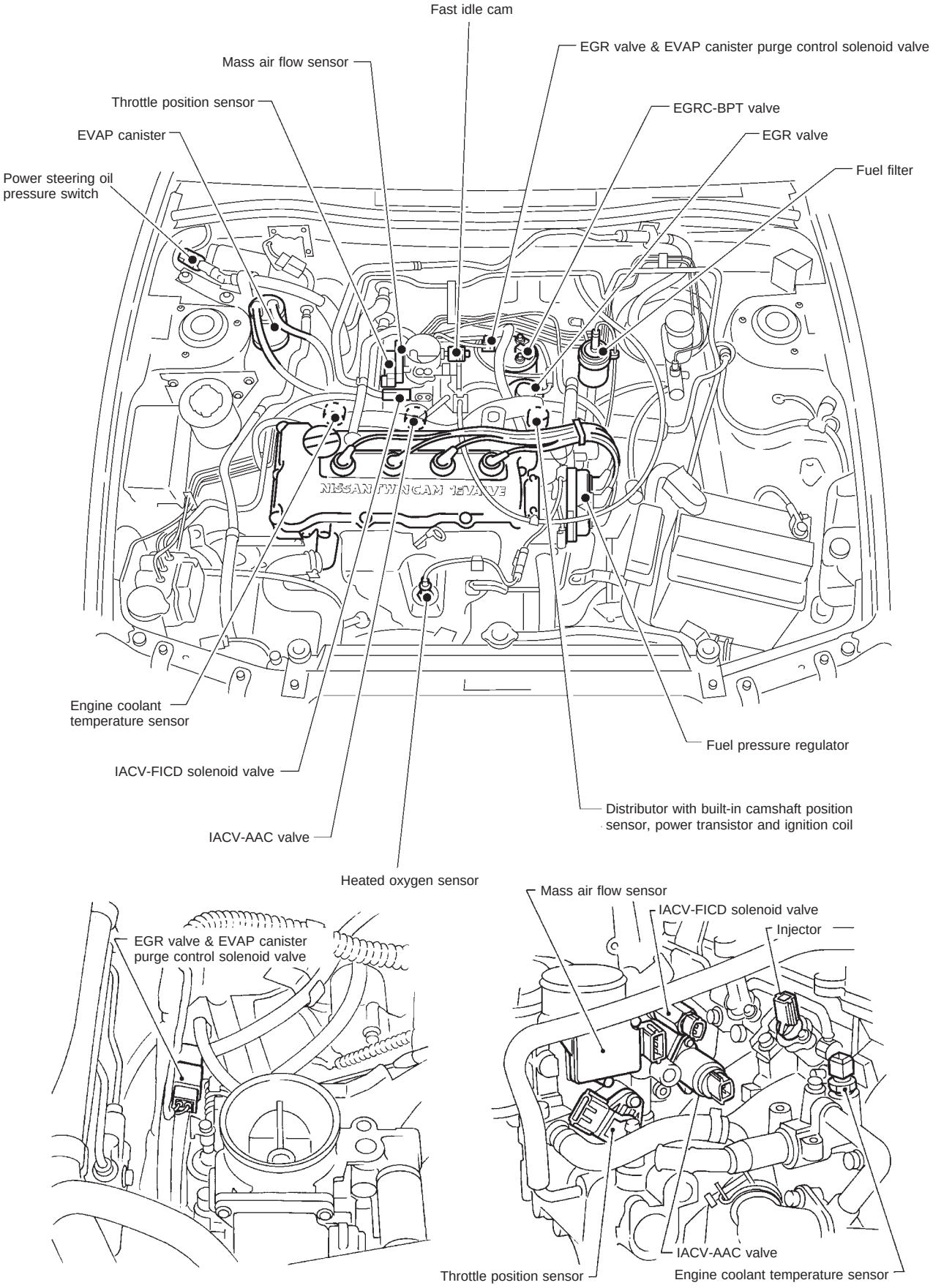



YEC287

## System Diagram



## Engine Control Module Component Parts Location

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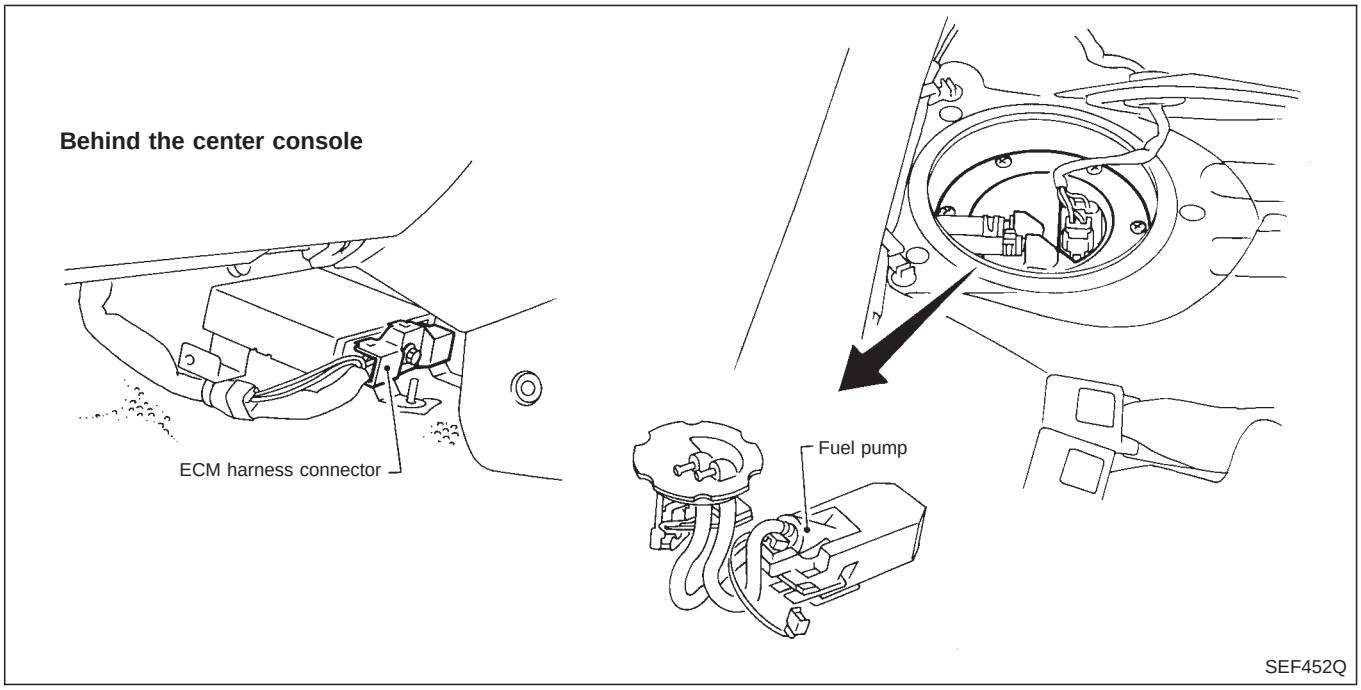
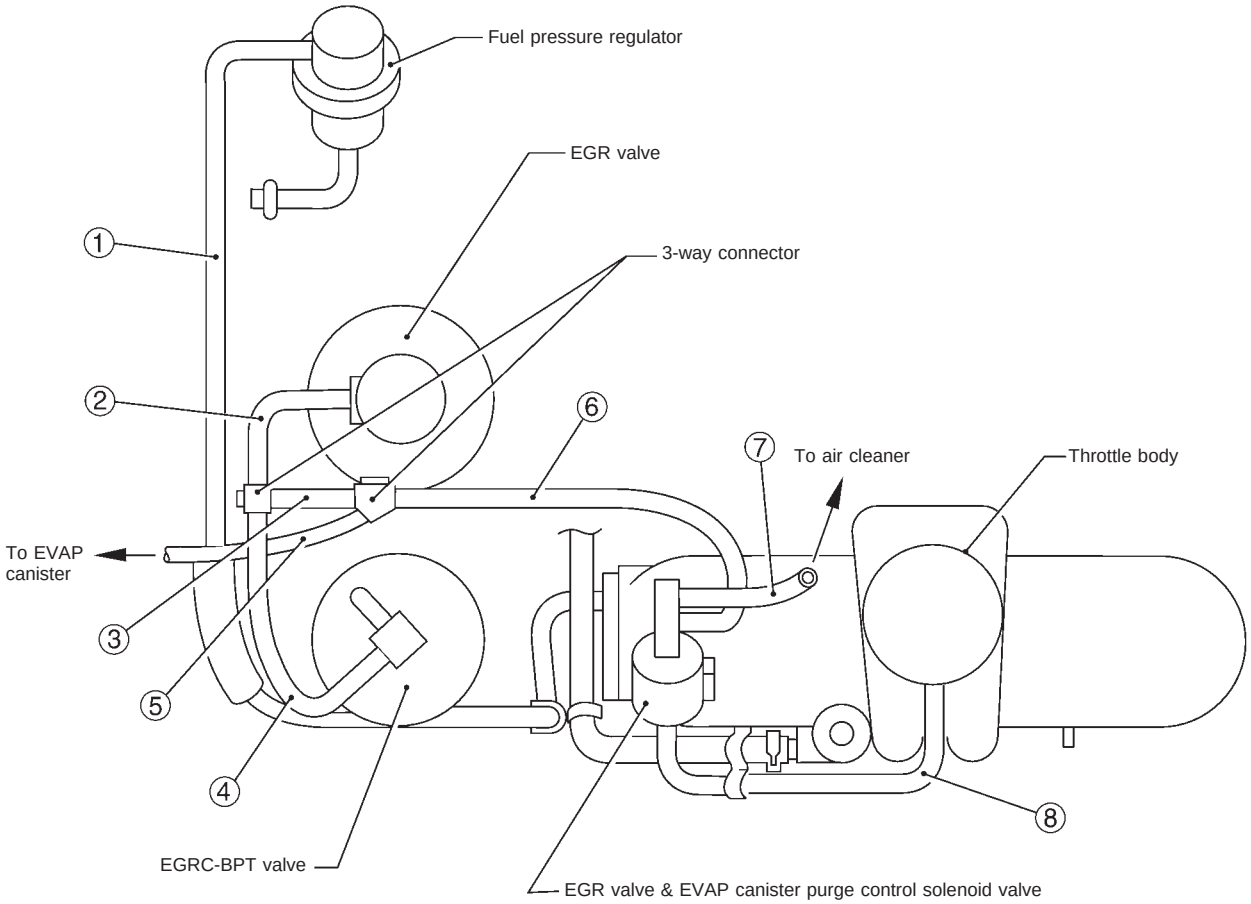
## Engine Control Module Component Parts Location (Cont'd)



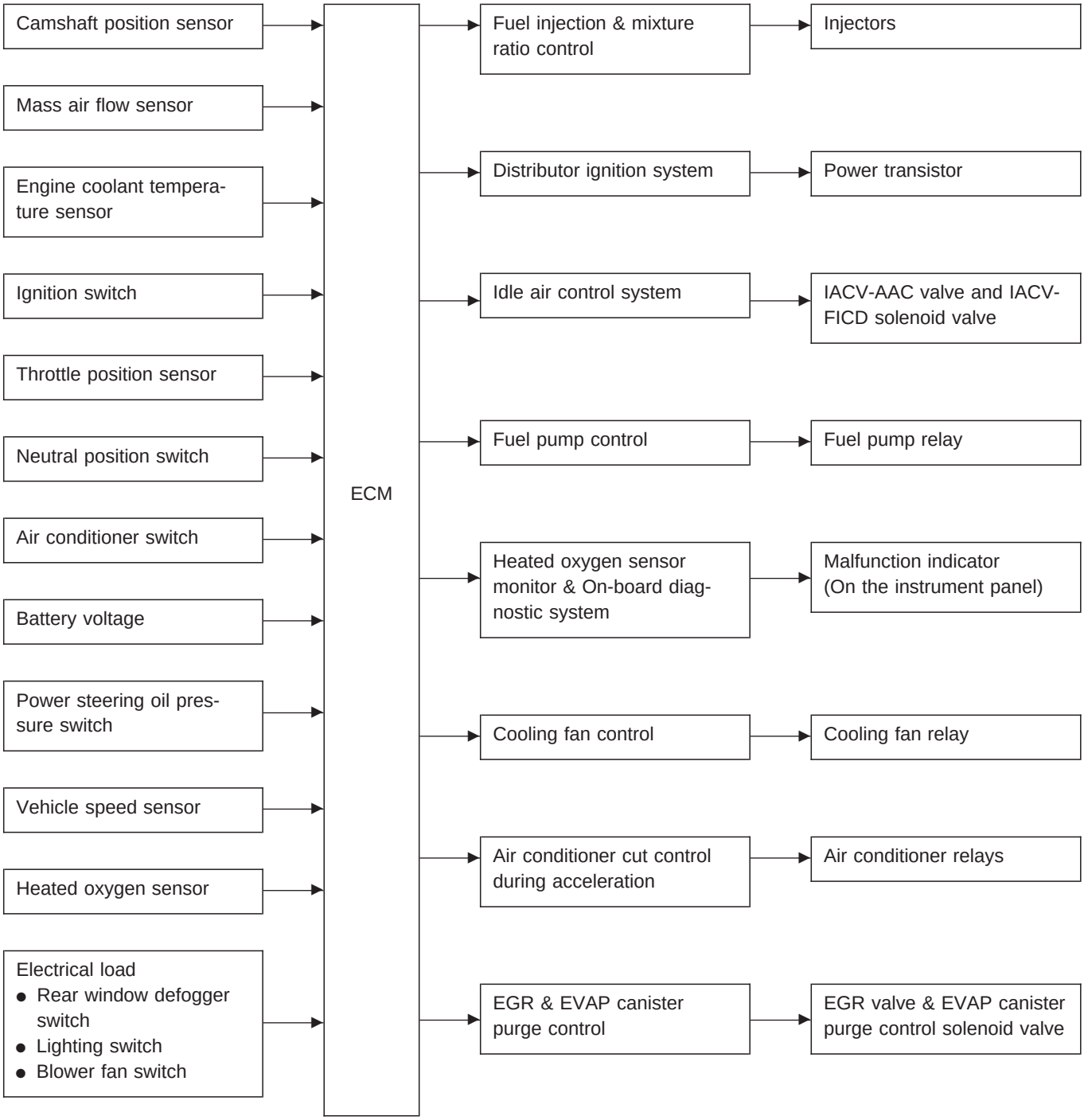
## Vacuum Hose Drawing




NEF366

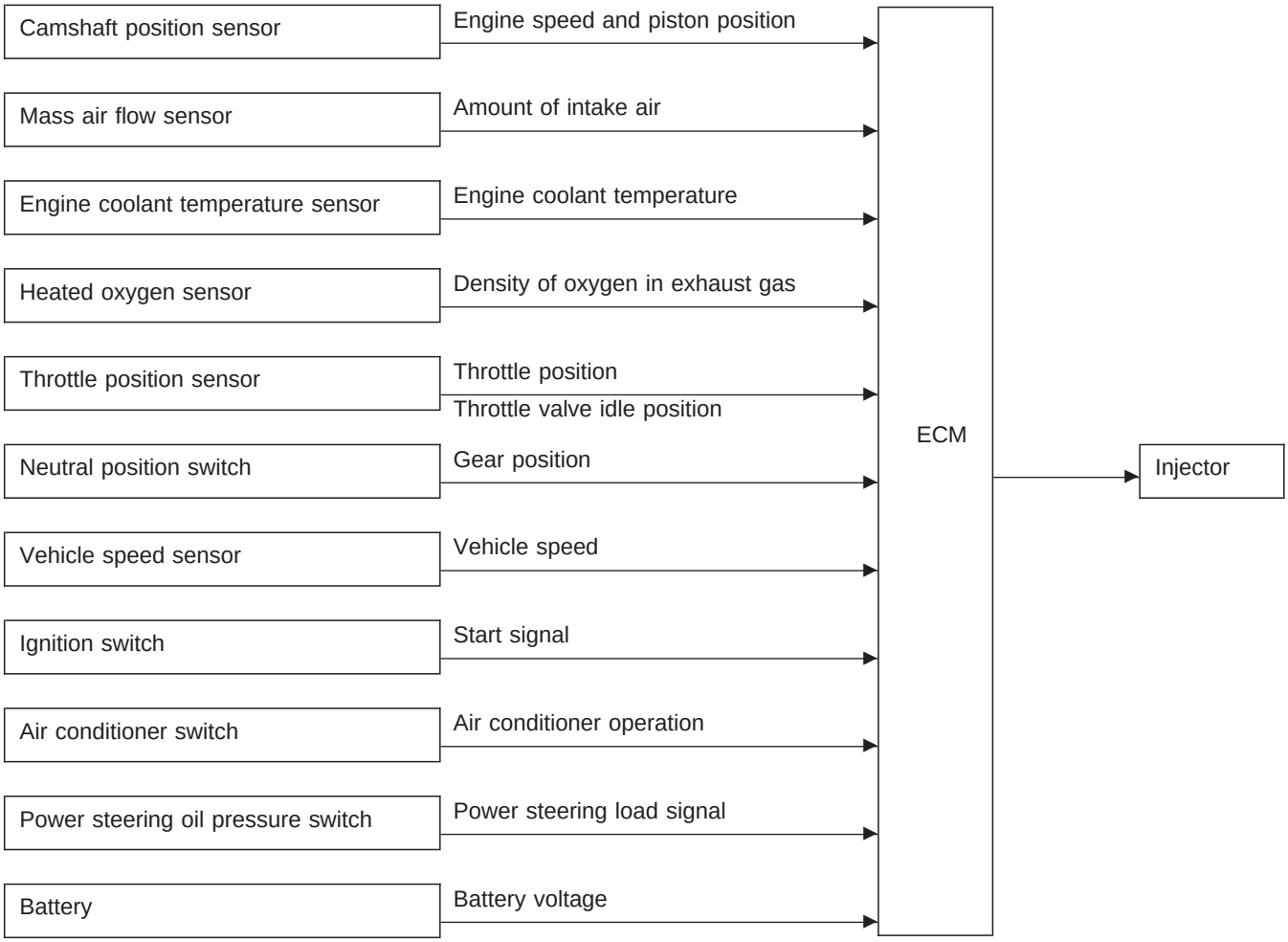
① Fuel pressure regulator to intake manifold
② EGR valve to 3-way connector
③ 3-way connector to 3-way connector
④ EGRC-BPT valve to 3-way connector
⑤ 3-way connector to EVAP canister
⑥ EGR valve & EVAP canister purge control solenoid valve to 3-way connector
⑦ EGR valve & EVAP canister purge control solenoid valve to air cleaner
⑧ EGR valve & EVAP canister purge control solenoid valve to throttle body

## System Chart



## Multiport Fuel Injection (MFI) System

### INPUT/OUTPUT SIGNAL LINE




### BASIC MULTIPORT FUEL INJECTION SYSTEM

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

### VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

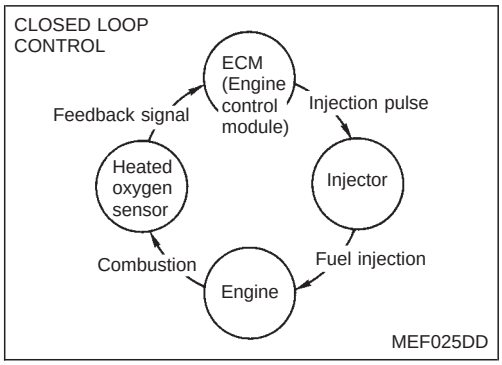
In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

⟨Fuel increase⟩

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

⟨Fuel decrease⟩

- During deceleration




# Multiport Fuel Injection (MFI) System (Cont'd)

## MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then minimize CO, HC and NOx emissions. This system uses a heated oxygen sensor in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. This maintains the mixture ratio within the stoichiometric range (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.

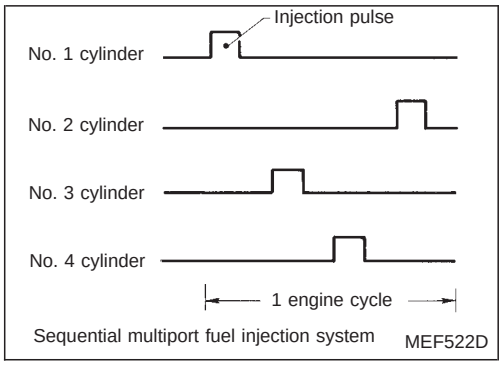
## OPEN LOOP CONTROL

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

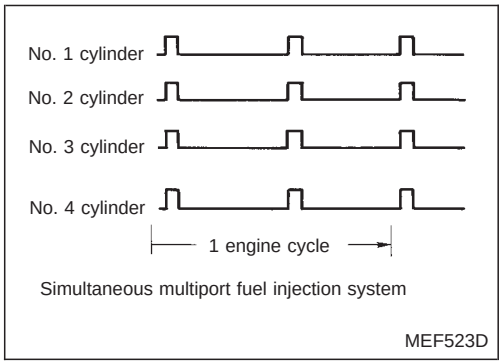
- Deceleration and acceleration
- High-load, high-speed operation
- Engine idling
- Malfunction of heated oxygen sensor or its circuit
- Insufficient activation of heated oxygen sensor at low engine coolant temperature
- High-engine coolant temperature
- During warm-up
- When starting the engine

## MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of ''injection pulse duration'' to automatically compensate for the difference between the two ratios.



Sequential multiport fuel injection system
MEF522D



Simultaneous multiport fuel injection system
MEF523D

# Multiport Fuel Injection (MFI) System (Cont'd)

## FUEL INJECTION TIMING

Two types of systems are used.

### Sequential multiport fuel injection system

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

### Simultaneous multiport fuel injection system

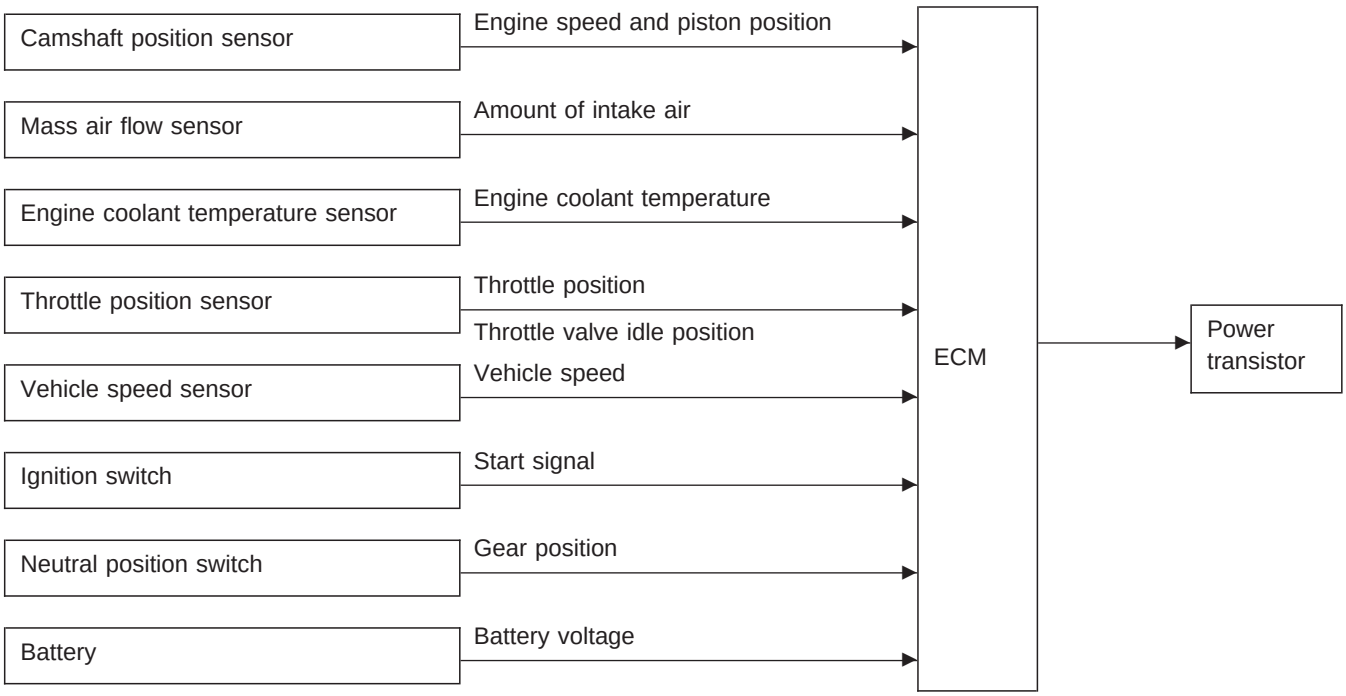
Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals twice for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

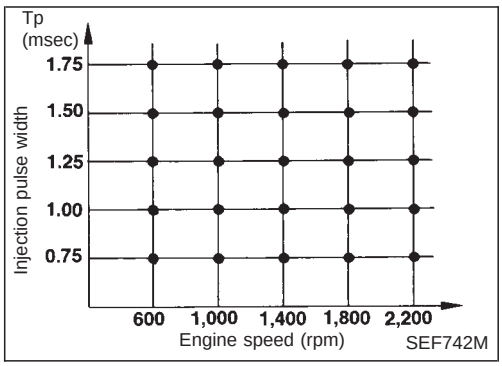
## FUEL SHUT-OFF

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

## Distributor Ignition (DI) System

### INPUT/OUTPUT SIGNAL LINE




### SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every operating condition of the engine.
The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.

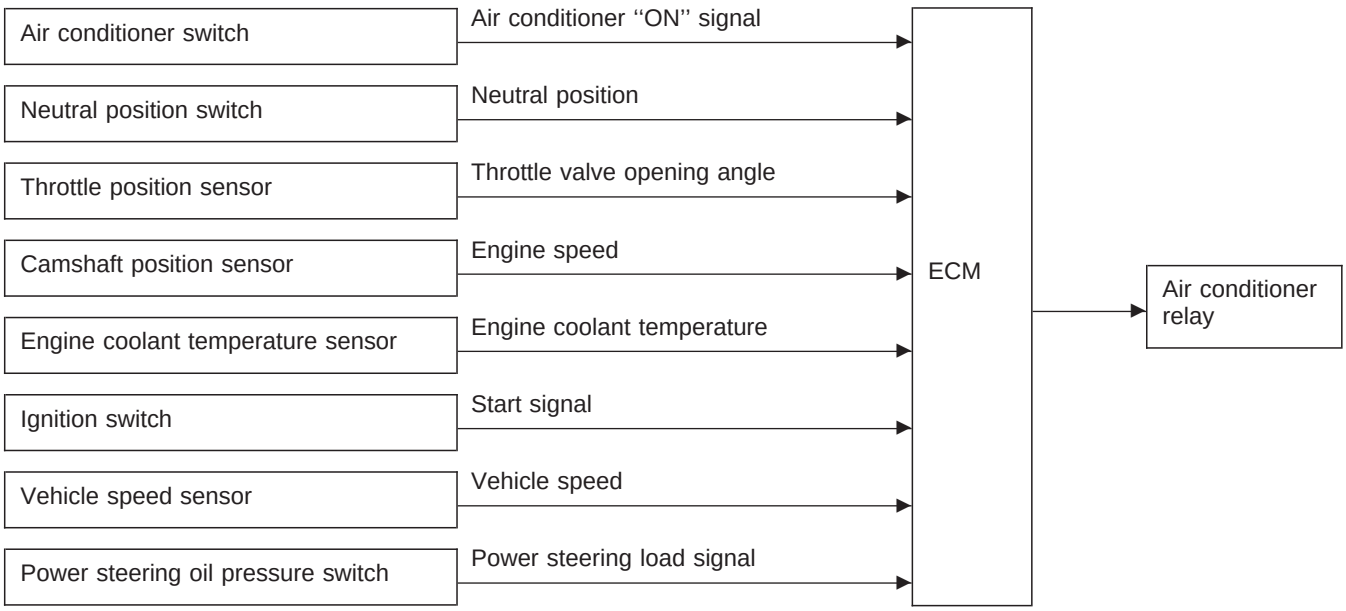
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC

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

- At starting
- During warm-up
- At idle
- Hot engine operation
- During acceleration

## Air Conditioning Cut Control

### INPUT/OUTPUT SIGNAL LINE

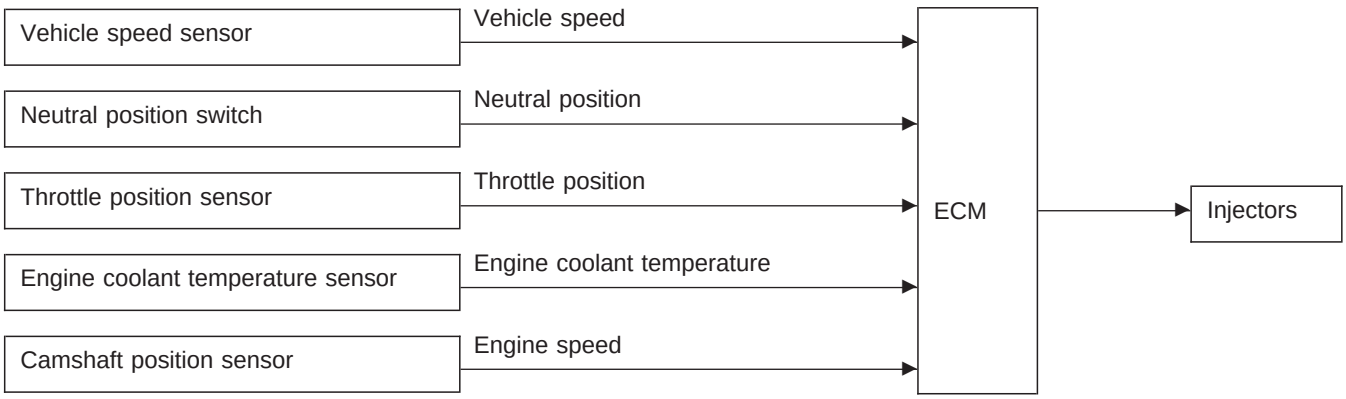



### SYSTEM DESCRIPTION

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.

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

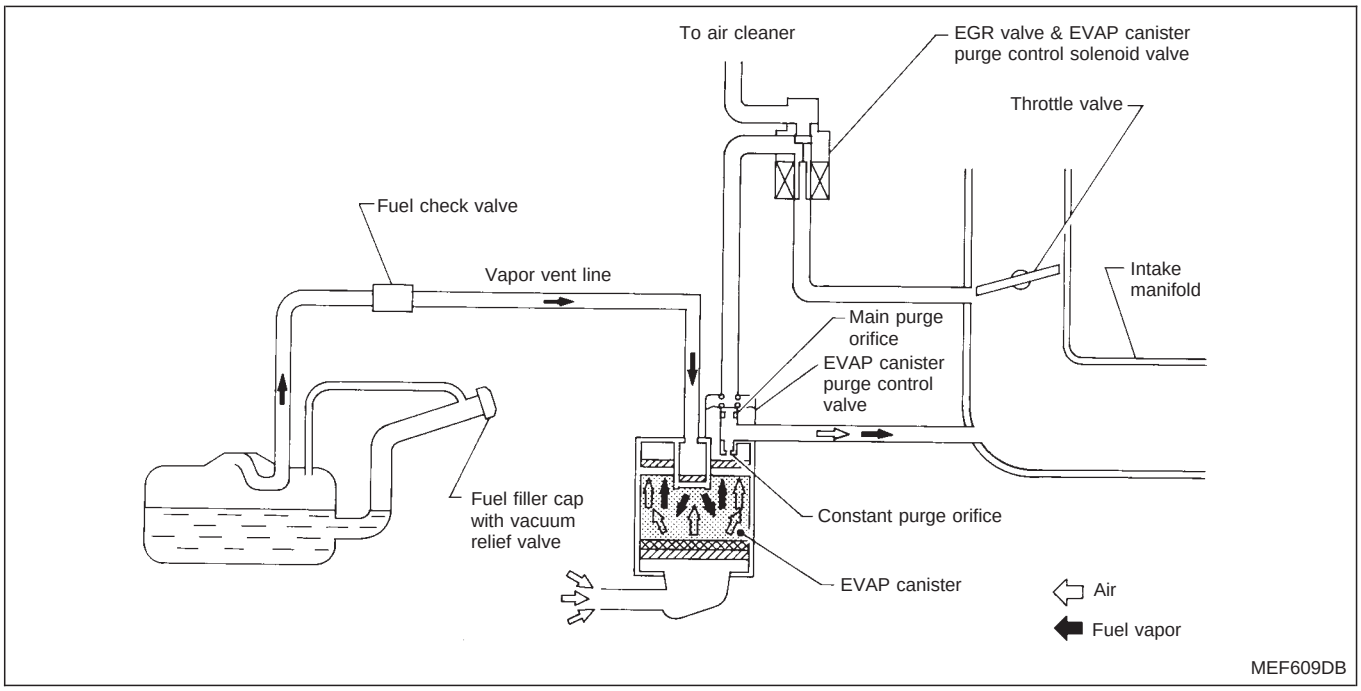
### INPUT/OUTPUT SIGNAL LINE



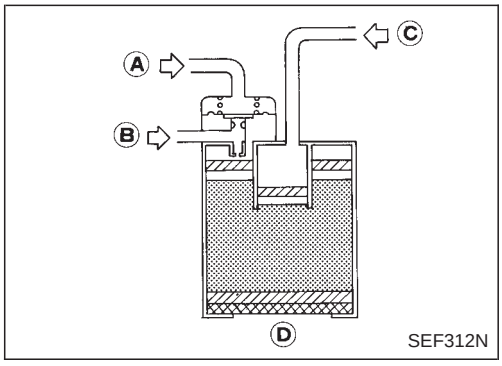

If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.
Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

**NOTE:**
**This function is different than deceleration control listed under "Multiport Fuel Injection (MFI) System" on EC-GA-13.**

## Description




The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor from the sealed fuel tank is routed into the EVAP canister when the engine is off. The fuel vapor is then stored in the EVAP canister. The EVAP canister retains the fuel vapor until the EVAP canister is purged by air.
When the engine is running, the air is drawn through the bottom of the EVAP canister. The fuel vapor will then be fed into the intake manifold.
When the engine runs at idle, the EVAP canister purge control valve is closed. Only a small amount of vapor flows into the intake manifold through the constant purge orifice.
As the engine speed increases and the throttle vacuum rises, the EVAP canister purge control valve opens. The vapor is sucked through both main purge and constant purge orifices.



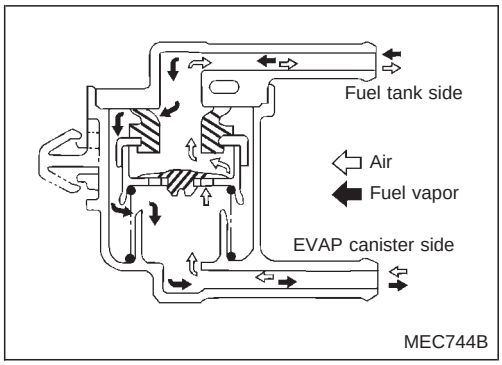

## Inspection

### EVAP CANISTER

Check EVAP canister as follows:
1. Blow air in port Ⓐ and ensure that there is no leakage.
2. Apply vacuum to port Ⓐ. [Approximately −13.3 to −20.0 kPa (−133 to −200 mbar, −100 to −150 mmHg, −3.94 to −5.91 inHg)]
3. Cover port Ⓓ with hand.
4. Blow air in port Ⓒ and ensure free flow out of port Ⓑ.

# Inspection (Cont'd)

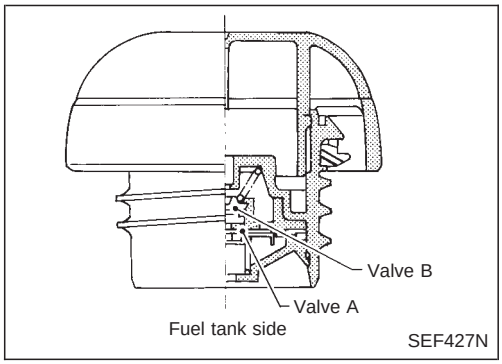
## FUEL CHECK VALVE




### Check valve operation

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side.
   Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not functioning properly in steps 1 and 2 above, replace it.

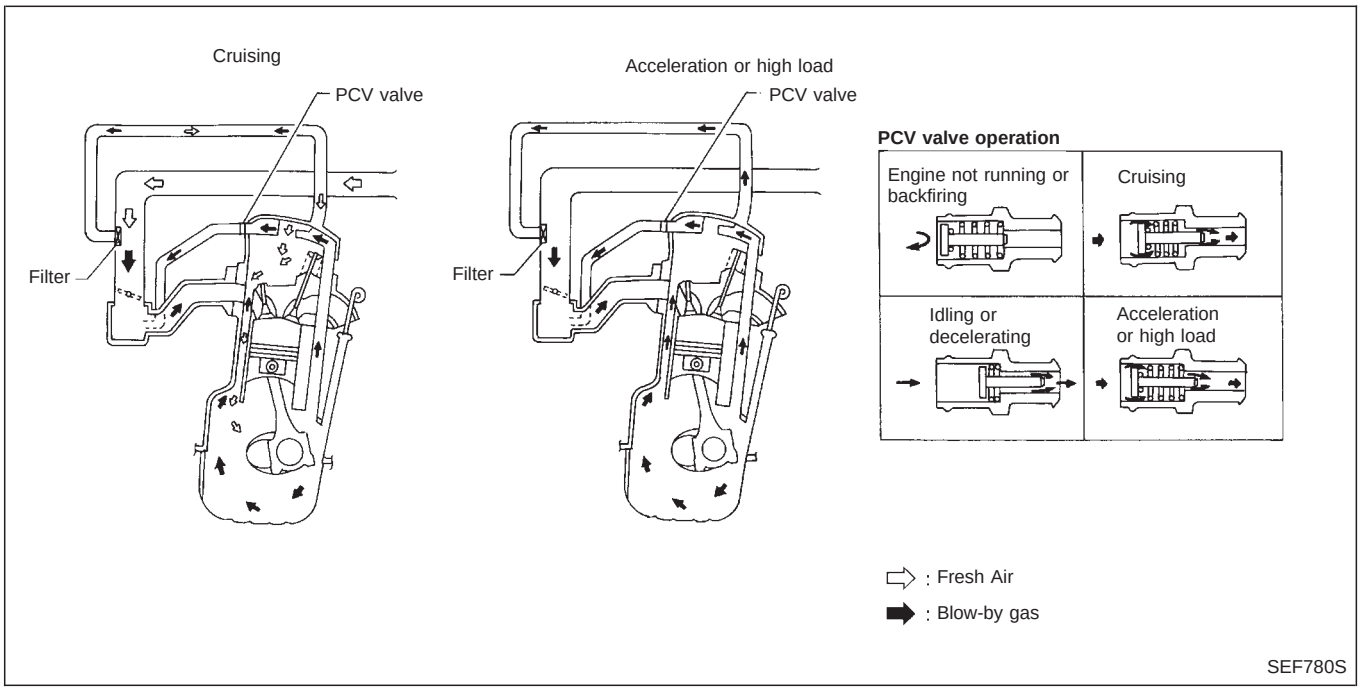
## FUEL TANK VACUUM RELIEF VALVE

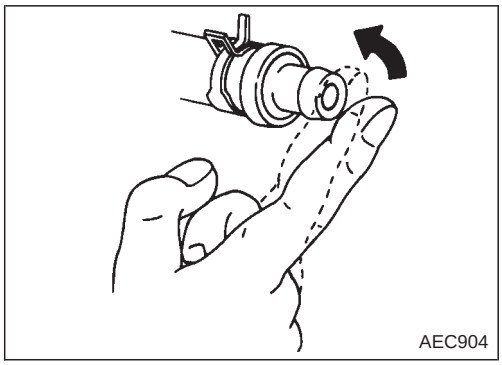


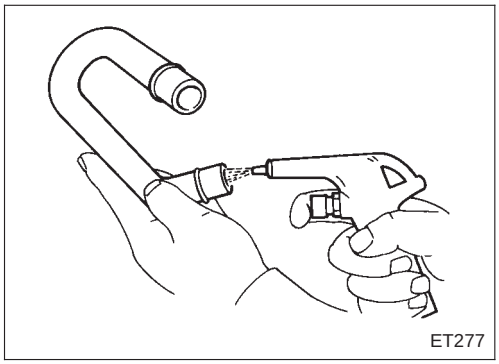

1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve A is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. Blow air on fuel tank side and ensure that continuity of air passage exists through valve B.
4. If valve is clogged or if no resistance is felt, replace cap as an assembly.

## Description

This system returns blow-by gas to the intake manifold collector.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air duct into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the intake manifold collector under all conditions.




AEC904


ET277

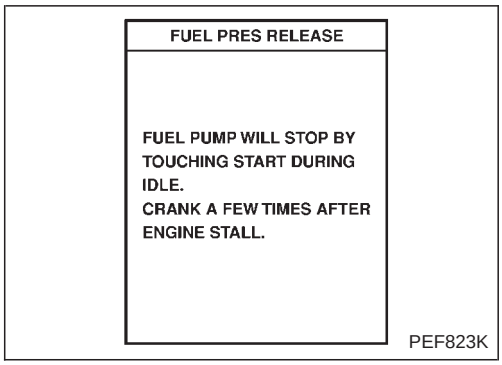
## Inspection

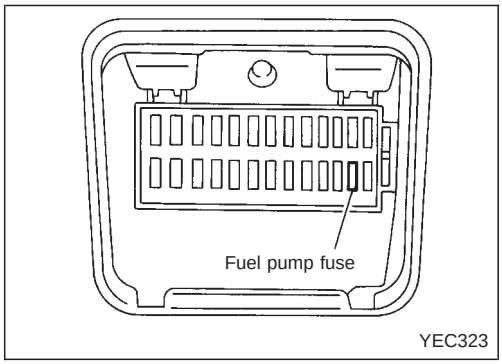
### PCV (Positive Crankcase Ventilation) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.

### PCV 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.




## Fuel Pressure Release

**Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.**

1. Turn ignition switch to the ‘‘ON’’ position.
2. Perform ‘‘FUEL PRESSURE RELEASE’’ in ‘‘WORK SUPPORT’’ mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch to the ‘‘LOCK’’ position.

OR

1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump fuse.

## Fuel Pressure Check

- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**
- **Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.**

1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

**At idling:**

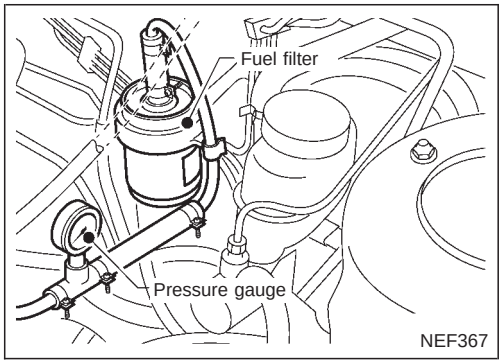
**With vacuum hose connected**

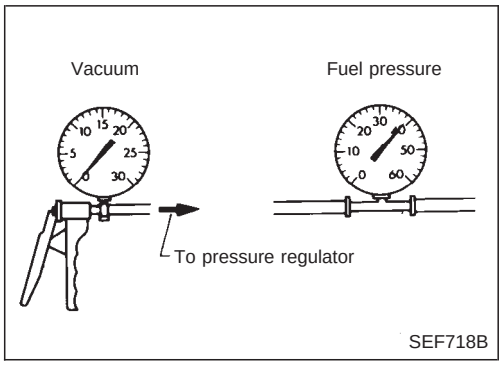
**Approximately 245 kPa (2.45 bar, 2.5 kg/cm$^2$, 36 psi)**

**With vacuum hose disconnected**

**Approximately 294 kPa (2.94 bar, 3.0 kg/cm$^2$, 43 psi)**

If results are unsatisfactory, perform Fuel Pressure Regulator Check.

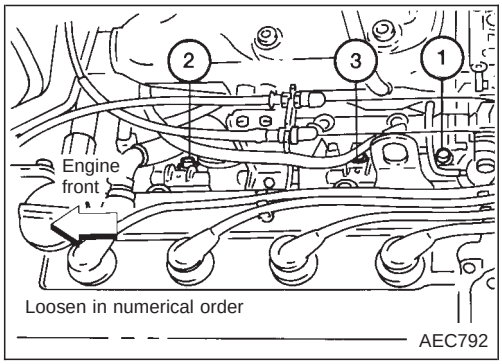





## Fuel Pressure Regulator Check

1. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
2. Plug intake manifold with a rubber cap.
3. Connect variable vacuum source to fuel pressure regulator.
4. Start engine and read indication of fuel pressure gauge as vacuum is changed.

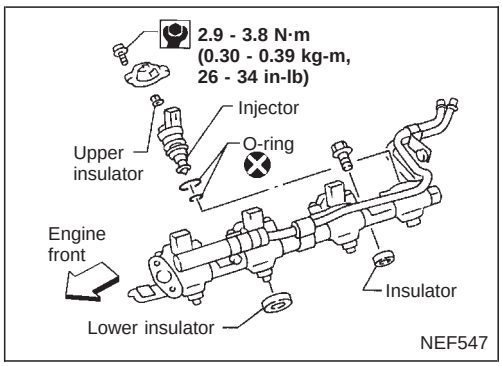
**Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.**




## Injector Removal and Installation

1. Release fuel pressure to zero.
2. Remove injector tube assembly with injectors from intake manifold.
3. Remove injectors from injector tube assembly.

- Push injector tail piece.
- Do not pull on the connector.



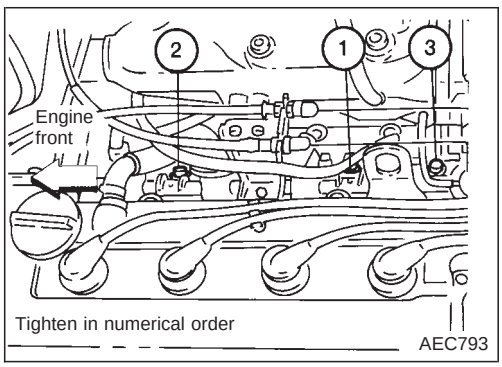

4. Install injectors.

- Clean exterior of injector tail piece.
- Use new O-rings.
- Face metal plate of upper insulator to injector.

**CAUTION:**

**After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.**

5. Assemble injectors to injector tube assembly.
6. Install injector tube assembly to intake manifold.




7. Tighten fuel tube bolts to 9.3 - 10.8 N·m (0.95 - 1.10 kg-m, 82 - 96 in-lb) as shown in the figure. Then tighten the bolts to 20.6 - 26.5 N·m (2.10 - 2.70 kg-m, 15 - 20 ft-lb).

## Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

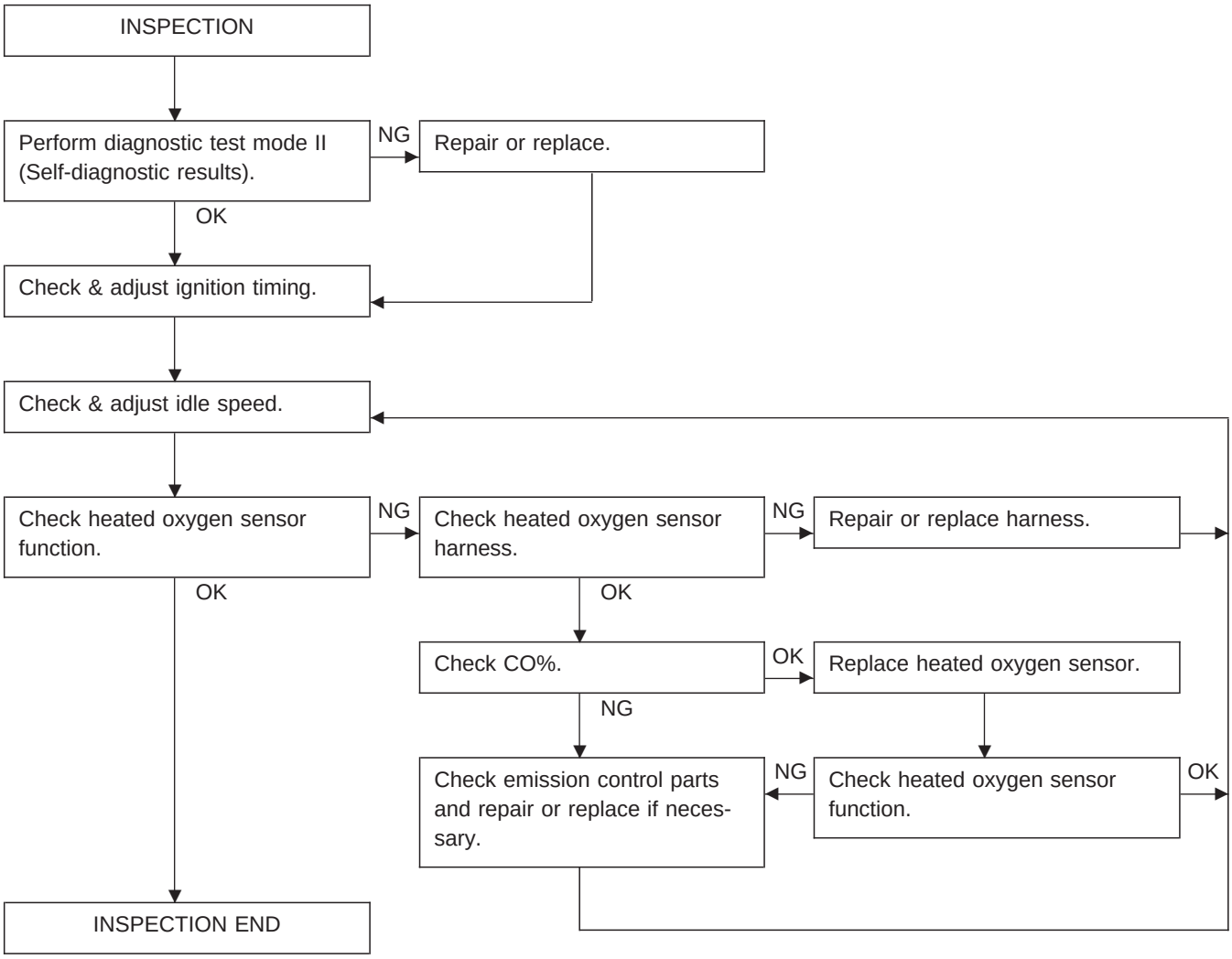
### PREPARATION

- Make sure that the following parts are in good order.

(1) Battery
(2) Ignition system
(3) Engine oil and coolant levels
(4) Fuses
(5) ECM harness connector
(6) Vacuum hoses
(7) Air intake system
(Oil filler cap, oil level gauge, etc.)
(8) Fuel pressure
(9) Engine compression
(10) Throttle valve
(11) EGR valve operation
(12) Evaporative emission system

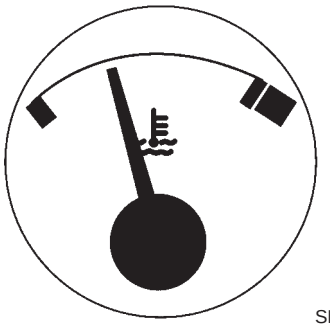
- On models equipped with air conditioner, checks should be carried out while the air conditioner is ''OFF''.
- On models equipped with automatic transaxle, when checking idle speed, ignition timing and mixture ratio, checks should be carried out while shift lever is in ''N'' position.
- When measuring ''CO'' percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
- Turn off headlamps, heater blower, rear window defogger.
- Keep front wheels pointed straight ahead.
- Make the check after the cooling fan has stopped.

### Overall inspection sequence



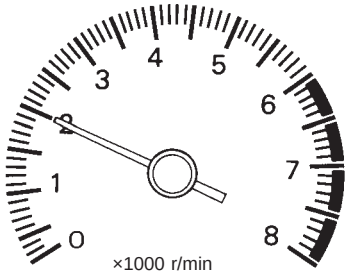
## Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

A



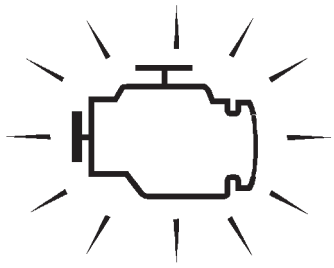
SEF935W

B



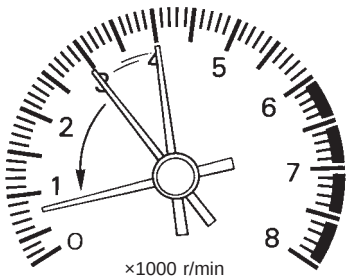

SEF247F

C



SAT652J

D




SEF248F

START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- Electrical connectors
- Gasket
- Throttle valve and throttle position sensor operation

A

Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
Ensure engine stays below 1,000 rpm.

B

Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.

C

Perform ECM on-board diagnostic system (Diagnostic test mode II).

OK

NG

Repair or replace components as necessary.

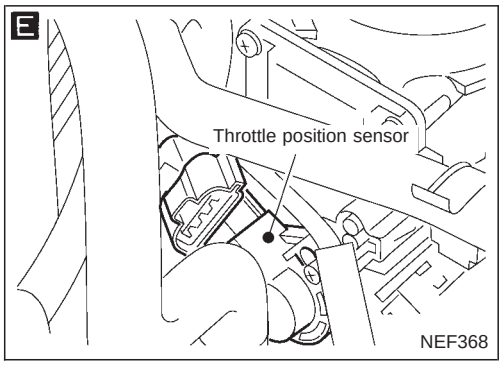
D

Run engine at about 2,000 rpm for about 2 minutes under no-load.
Race engine two or three times under no-load, then run engine for about 1 minute at idle speed.

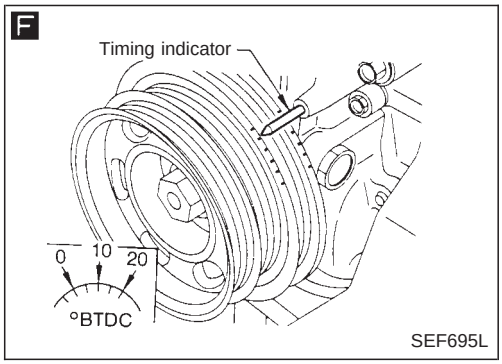
Ⓐ

## Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

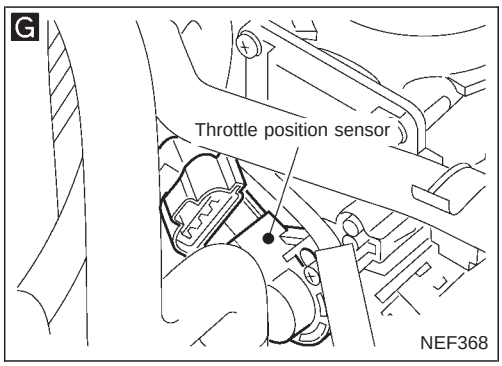
E




F




G




Ⓐ

E 1) Turn off engine and disconnect throttle position sensor harness connector.
2) Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and then run engine at idle speed.

F

Check ignition timing with a timing light.

**Ignition timing: 10°±2° BTDC**

OK

NG

Adjust ignition timing to the specified value by turning distributor after loosening bolts which secure distributor.

**Ignition timing: 10°±2° BTDC**

Ⓑ

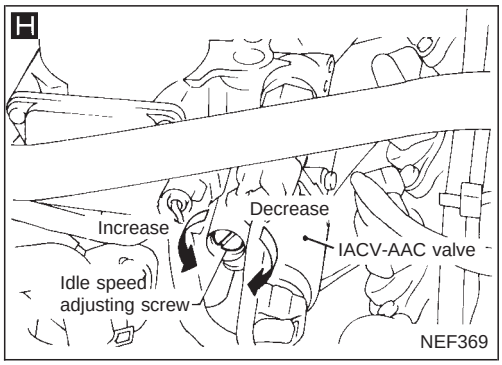
Ⓔ

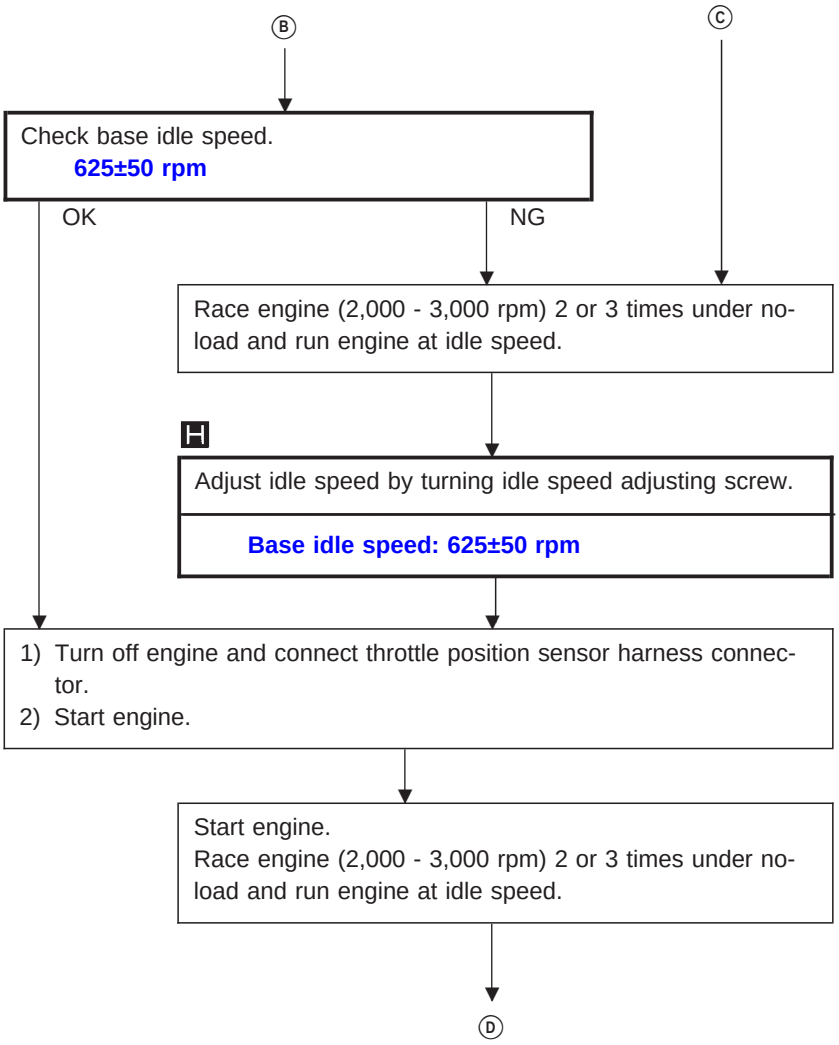
G 1) Turn off engine and disconnect throttle position sensor harness connector.
2) Start engine.

Ⓒ

Ⓑ

## Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



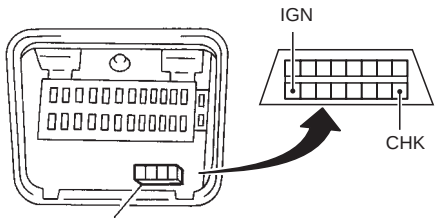
# Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

I

| DATA MONITOR | |
|---|---|
| MONITORING | NO FAIL |
| CMPS~RPM(REF) | XXX rpm |
| FR O2 MNTR | RICH |

PEF054P

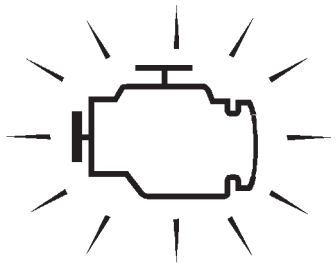
J




Data link connector for CONSULT-II (Connect CHK and IGN terminals with a suitable harness.)

YEC324

K



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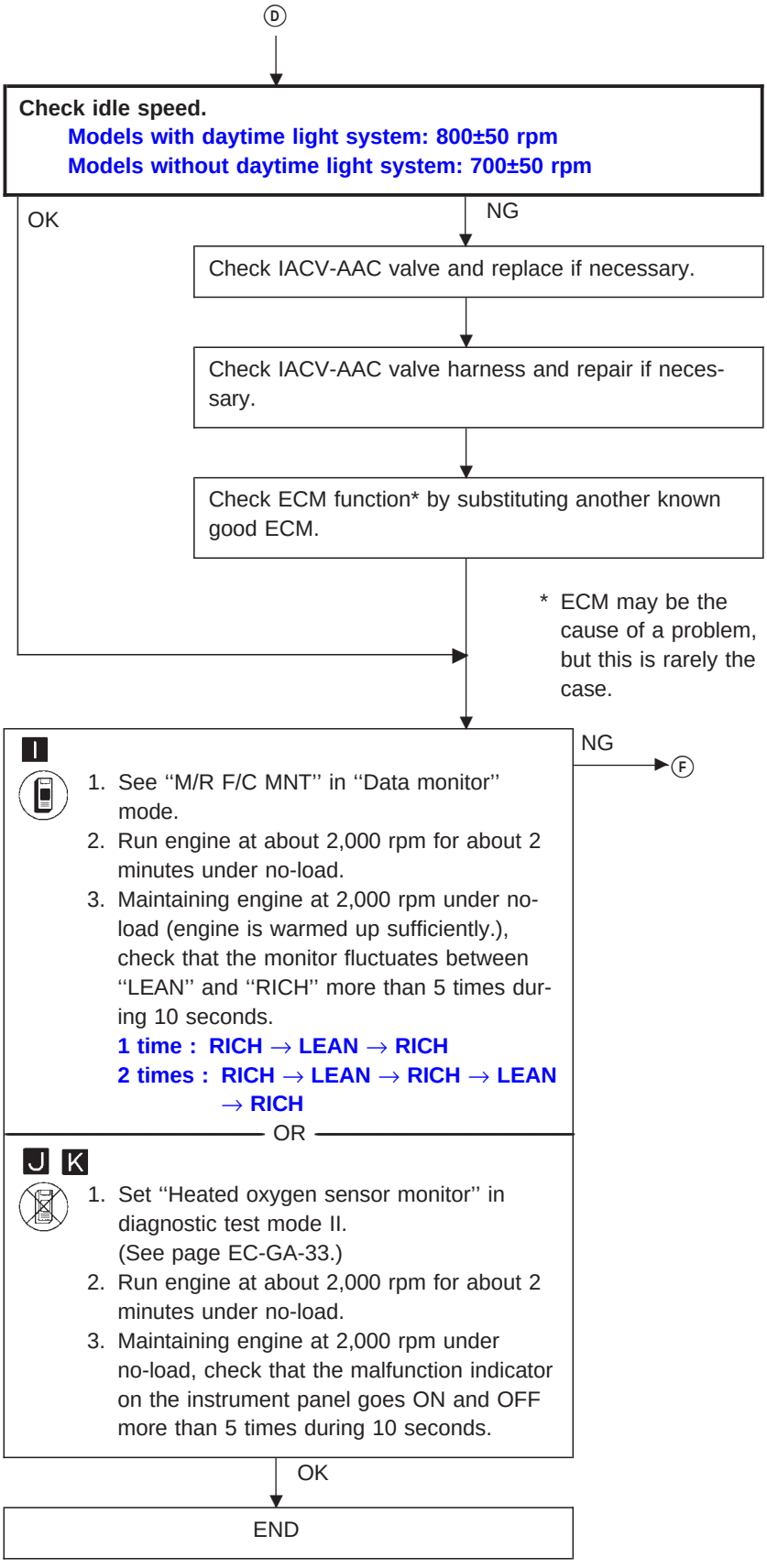
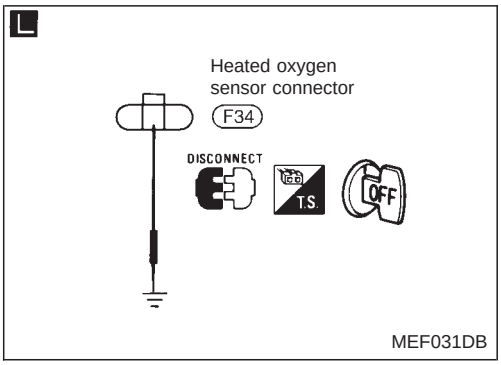


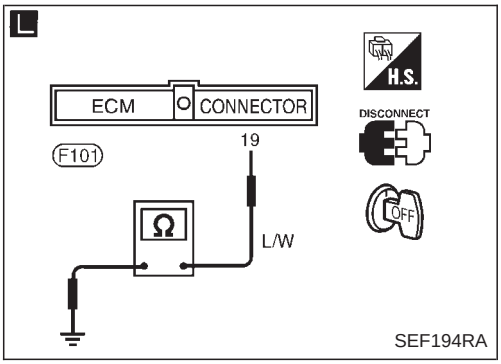
# Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

L




MEF031DB

L



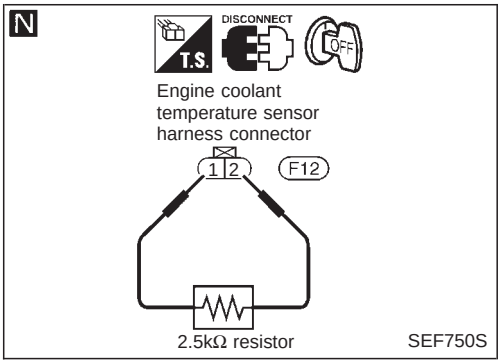

SEF194RA

M

| ACTIVE TEST | |
|---|---|
| COOLANT TEMP | XXX |
| MONITOR | |
| CMPS~RPM(REF) | XXX rpm |
| INJ PULSE | XXX msec |
| IGN TIMING | XXX BTDC |
| | |
| | |
| | |
| | |

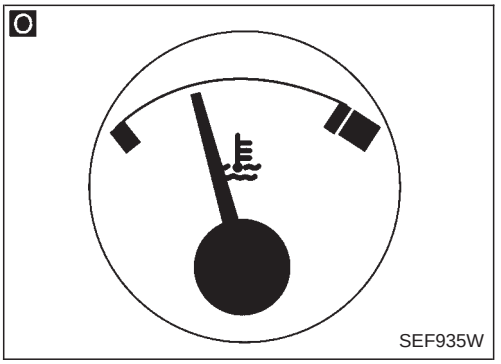
SEF214X

N




SEF750S

O



SEF935W

F

L

Check heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect ECM harness connector from ECM.
3) Disconnect heated oxygen sensor harness connector. Then connect harness side terminal for heated oxygen sensor to ground with a jumper wire.
4) Check for continuity between terminal No. 19 of ECM harness connector and body ground.

**Continuity exists** ..... **OK**
**Continuity does not exist** ..... **NG**

OK

NG

Repair or replace harness.

E

Connect ECM harness connector to ECM.

M N

1) Connect battery ground cable.
2) Select "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
3) Set "COOLANT TEMP" to 20°C (68°F) by touching "Qu" and "Qd" and "UP", "DWN".

OR

1) Disconnect engine coolant temperature sensor harness connector.
2) Connect a resistor (2.5 kΩ) between terminals of engine coolant temperature sensor harness connector.

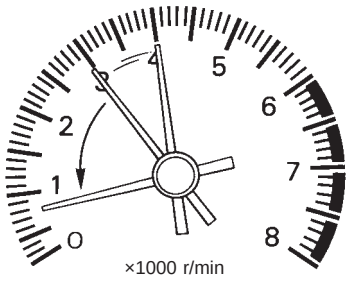
O

Start engine and warm it up until engine coolant temperature indicator points to middle of gauge.

G

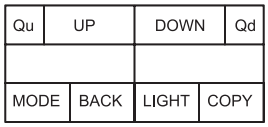
# Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

P




SEF248F

Q



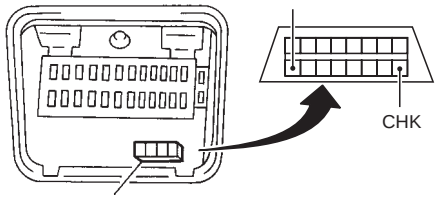

C2QUD01

R

| DATA MONITOR | |
|---|---|
| MONITOR | NO DTC |
| VEHICLE SPEED SE | 0 KM/H |
| P/N POSI SW | OFF |

C2DMM02

S




Data link connector for CONSULT-II (Connect CHK and IGN terminals with a suitable harness.)

YEC324

Ⓖ

P

Race engine two or three times under no-load, then run engine at idle speed.

Check "CO"%.

**Idle CO: Less than 0.3%**

Q

After checking CO%,

1) Touch "BACK".

1) Disconnect the resistor from terminals of engine coolant temperature sensor harness connector.
2) Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.

NG

OK

Replace heated oxygen sensor.

R

1. See "M/R F/C MNT" in "Data monitor" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   **1 time : RICH → LEAN → RICH**
   **2 times : RICH → LEAN → RICH → LEAN → RICH**

OR

S

1. Set "Heated oxygen sensor monitor" in diagnostic test mode II.
   (See page EC-GA-33.)
2. Maintaining engine at 2,000 rpm under no-load, check that the malfunction indicator on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

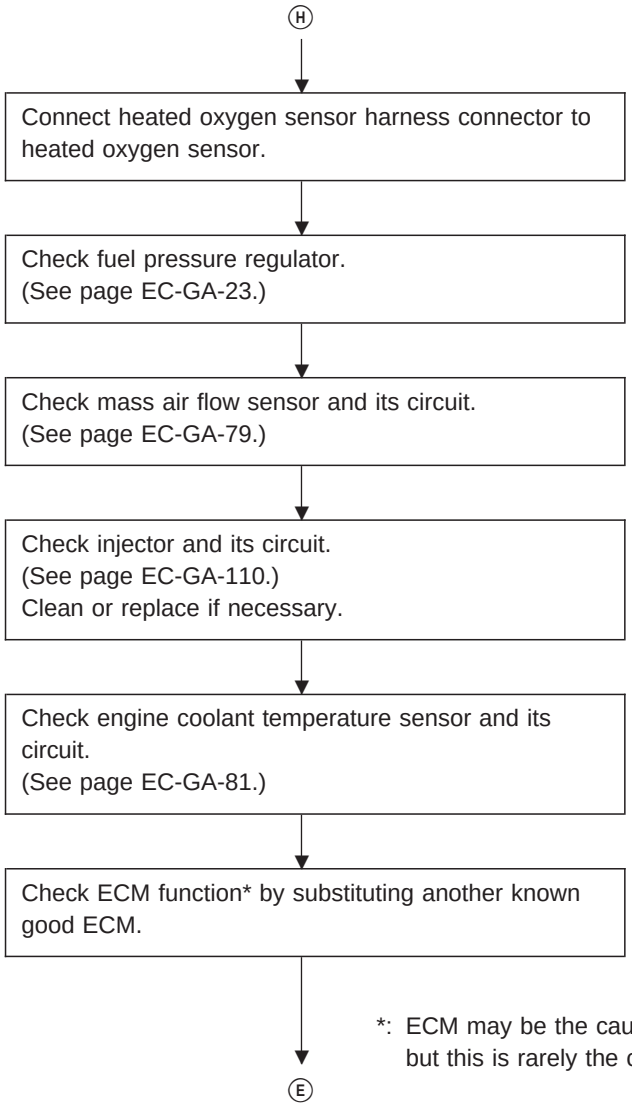
NG

OK

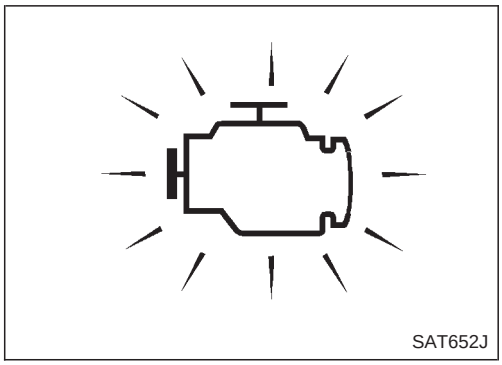
Ⓗ

Ⓔ

## Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)




*: ECM may be the cause of a problem, but this is rarely the case.


SAT652J

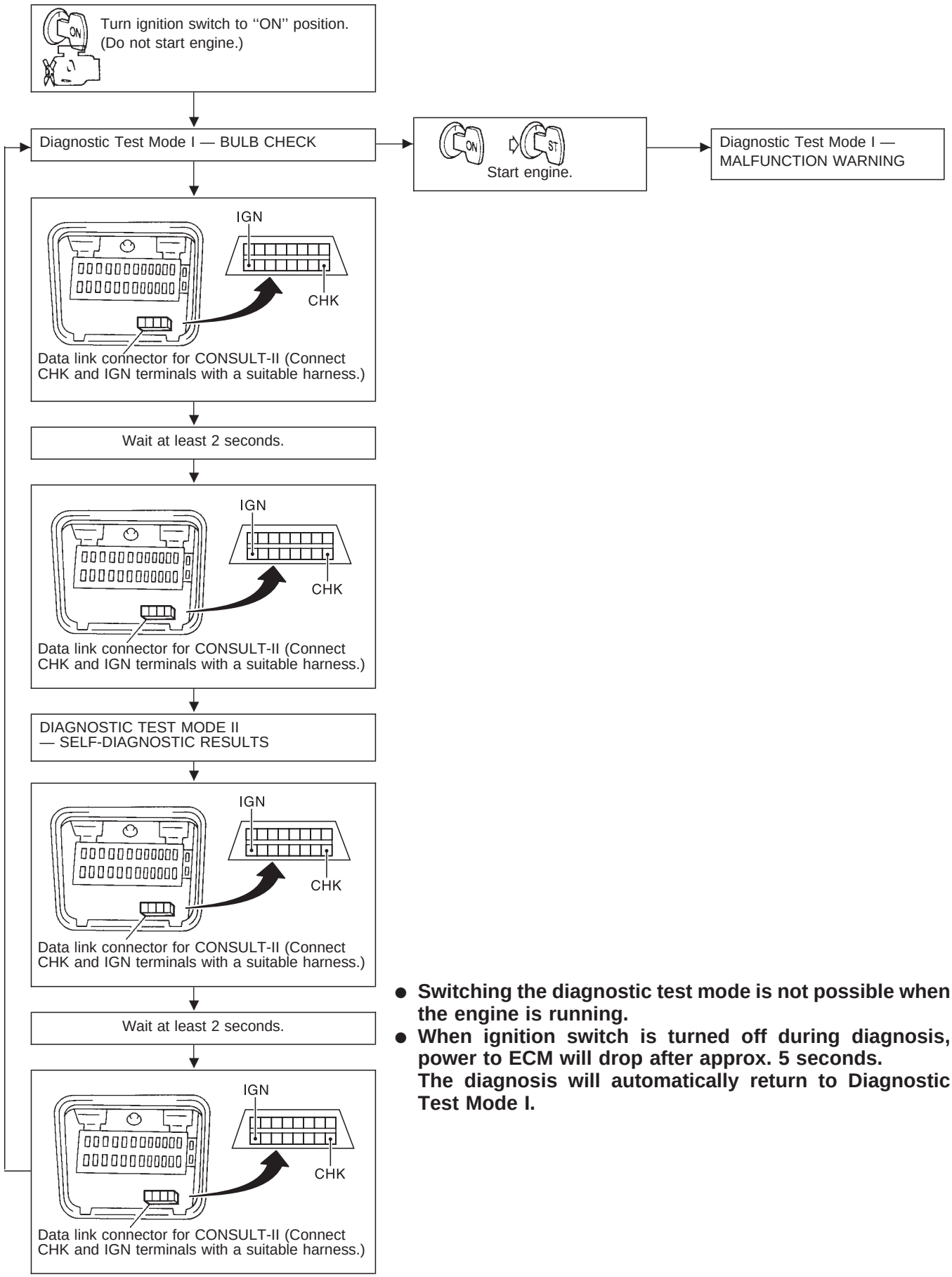
## Malfunction Indicator (MI)

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-GA-141.
2. When the engine is started, the malfunction indicator should go off.

| 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 | HEATED OXYGEN SENSOR MONITOR |

## Malfunction Indicator (MI) (Cont'd)

### HOW TO SWITCH DIAGNOSTIC TEST MODES




- **Switching the diagnostic test mode is not possible when the engine is running.**
- **When ignition switch is turned off during diagnosis, power to ECM will drop after approx. 5 seconds. The diagnosis will automatically return to Diagnostic Test Mode I.**

## 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-GA-141.

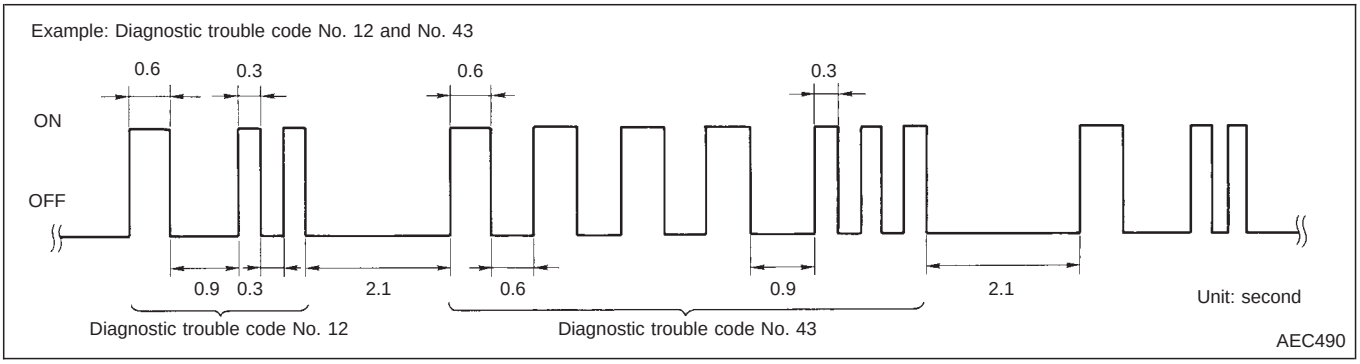
### DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

| MALFUNCTION INDICATOR | Condition |
|---|---|
| ON | Engine coolant temperature sensor circuit malfunction or overheating is detected, or the ECM's CPU is malfunctioning. |
| 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.



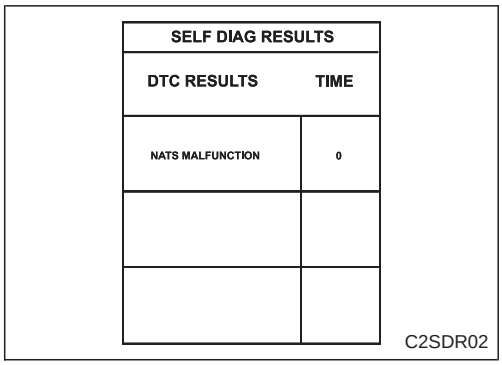

Long (0.6 second) flashes indicate the number of ten digits, and short (0.3 second) flashes indicate the number of single digits. For example, the malfunction indicator flashes 4 times for about 2.5 seconds (0.6 sec x 4 times) and then flashes three times for about 1 second (0.3 sec x 3 times). This indicates the DTC ''43'' and refers to the malfunction of the throttle 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, refer to EC-GA-50.)

### 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 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.**

## Malfunction Indicator (MI) (Cont'd)




- **If the MI flashes or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card (NATS-E960). 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 V.2.0 system and registration of all NATS V.2.0 ignition key IDs must be carried out with CONSULT-II using NATS program card (NATS-E960).**
  **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 V.2.0.**

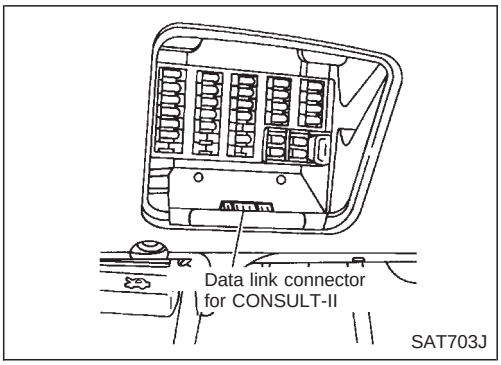
### DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR MONITOR

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

| MALFUNCTION INDICATOR | Fuel mixture condition in the exhaust gas | Air fuel ratio feedback control condition |
|---|---|---|
| ON | Lean | Closed loop system |
| OFF | Rich | |
| *1 Remains ON or OFF | Any condition | Open loop system |

*1: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor function, start engine in Diagnostic Test Mode II. Then warm it up until engine coolant temperature indicator points to middle of gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Make sure that the MALFUNCTION INDICATOR comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

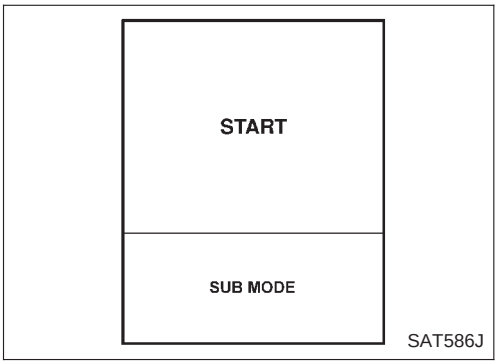


SAT703J

## CONSULT-II

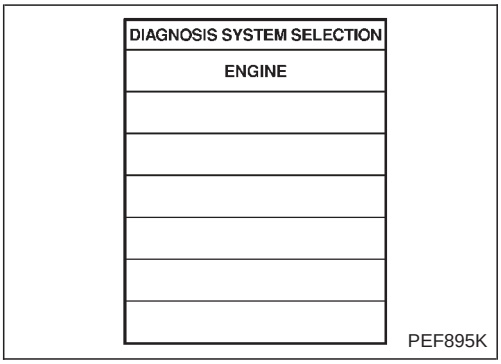
### CONSULT-II INSPECTION PROCEDURE

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.)



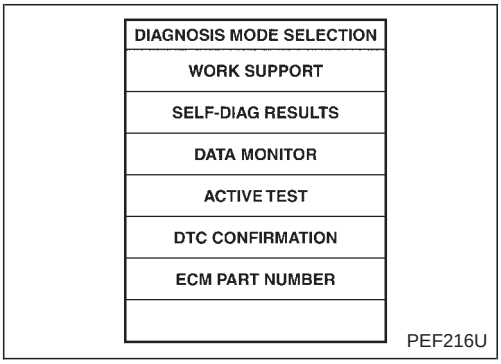
SAT586J

3. Turn on ignition switch.
4. Touch ‘‘START’’.



PEF895K

5. Touch ‘‘ENGINE’’.



PEF216U

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 | | | |
|---|---|---|---|---|---|---|
| | | | WORK SUPPORT | SELF-DIAG-NOSTIC RESULTS | DATA MONITOR | ACTIVE TEST |
| ENGINE CONTROL MODULE COMPONENT PARTS | INPUT | Camshaft position sensor | | X | X | |
| | | Mass air flow sensor | | X | X | |
| | | Engine coolant temperature sensor | | X | X | X |
| | | Heated oxygen sensor | | | X | |
| | | Vehicle speed sensor | | | X | |
| | | Throttle position sensor | | | | |
| | | Ignition switch (start signal) | | | X | |
| | | Air conditioner switch | | | X | |
| | | Neutral position switch | | | X | |
| | | Power steering oil pressure switch | | | X | |
| | | Electrical load signal | | | X | |
| | | Battery voltage | | | X | |
| | OUTPUT | Injectors | | | X | X |
| | | Power transistor (Ignition timing) | X | X (Ignition signal) | X | X |
| | | IACV-AAC valve | X | | X | X |
| | | Air conditioner relay | | | X | |
| | | Fuel pump relay | X | | X | X |
| | | Cooling fan | | | X | X |
| | | EGR valve & EVAP canister purge control solenoid valve | | | X | X |

X: Applicable

### FUNCTION

| Diagnostic test mode | Function |
|---|---|
| Work support | A technician can adjust some devices faster and more accurately by following indications on CONSULT-II. |
| Self-diagnostic results | Self-diagnostic results can be read and erased quickly. |
| Data monitor | Input/Output data in the ECM can be read. |
| Active test | CONSULT-II drives some actuators apart from the ECM's and also shifts some parameters in a specified range. |
| ECM part numbers | ECM part numbers can be read. |

# CONSULT-II (Cont'd)

## WORK SUPPORT MODE

| WORK ITEM | CONDITION | USAGE |
|---|---|---|
| IGNITION TIMING ADJ | ● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR. | When adjusting initial ignition timing |
| IACV-AAC VALVE ADJ | SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS.<br>● ENGINE WARMED UP<br>● NO-LOAD | — |
| FUEL PRESSURE RELEASE | ● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING.<br>CRANK A FEW TIMES AFTER ENGINE STALLS. | When releasing fuel pressure from fuel line |

## SELF DIAGNOSTIC MODE

### Freeze Frame Data and 1st Trip Freeze Frame Data

| Freeze frame data item* | Description |
|---|---|
| DIAG TROUBLE CODE | ● Engine control component part/control system has a trouble code. |
| FUEL SYS-B1 | ● "Fuel injection system status" at the moment a malfunction is detected is displayed.<br>● One mode in the following is displayed.<br>"MODE 2": Open loop due to detected system malfunction<br>"MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment)<br>"MODE 4": Closed loop - using heated oxygen sensor(s) as feedback for fuel control<br>"MODE 5": Open loop - has not yet satisfied condition to go to closed loop |
| CAL/LD VALUE [%] | ● The calculated load value at the moment a malfunction is detected is displayed. |
| COOLANT TEMP [°C] or [°F] | ● The engine coolant temperature at the moment a malfunction is detected is displayed. |
| S-FUEL TRIM-B1 [%] | ● "Short-term fuel trim" at the moment a malfunction is detected is displayed.<br>● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule. |
| L-FUEL TRIM-B1 [%] | ● "Long-term fuel trim" at the moment a malfunction is detected is displayed.<br>● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim. |
| ENGINE SPEED [rpm] | ● The engine speed at the moment a malfunction is detected is displayed. |
| VHCL SPEED [km/h] or [mph] | ● The vehicle speed at the moment a malfunction is detected is displayed. |
| ABSOL PRESS [kPa], [kg/cm$^2$] or [psi] | ● The absolute pressure at the moment a manlfunction is detected is displayed. |
| B/FUEL SCHDL [msec] | ● The base fuel schedule at the moment a malfunction is detected is displayed. |
| INT/A TEMP SE [°C] | ● The intake air temperature at the moment a malfunction is detected is desplayed. |

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

## CONSULT-II (Cont'd)

### SELF-DIAGNOSTIC MODE

**Regarding items detected in ''SELF-DIAG RESULTS'' mode, refer to ''Diagnostic Trouble Code (DTC) Chart''. (Refer to EC-GA-50.)**

### DATA MONITOR MODE

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|---|---|---|---|---|
| CMPS•RPM (REF) [rpm] | ○ | ○ | • Indicates the engine speed computed from the REF signal (180° signal) of the camshaft position sensor. | • Accuracy becomes poor if engine speed drops below the idle rpm.<br>• If the signal is interrupted while the engine is running, an abnormal value may be indicated. |
| 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. |
| 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. |
| O2 SEN [V] | ○ | ○ | • The signal voltage of the heated oxygen sensor is displayed. | |
| M/R F/C MNT [RICH/LEAN] | ○ | ○ | • Display of heated oxygen sensor signal during air-fuel ratio feedback control:<br>RICH ... means the mixture became ''rich'', and control is being effected toward a leaner mixture.<br>LEAN ... means the mixture became ''lean'', and control is being effected toward a rich mixture. | • After turning ON the ignition switch, ''RICH'' is displayed until air-fuel mixture ratio feedback control begins.<br>• When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously. |
| VHCL SPEED SE [km/h] or [mph] | ○ | ○ | • The vehicle speed computed from the vehicle speed sensor signal 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. |
| CLSD THL/POSI [ON/OFF] | ○ | ○ | • Indicates the closed throttle position [ON/OFF] determined by the throttle position sensor signal.<br>ON: Closed throttle position<br>OFF: Other than closed throttle position | |
| AIR COND SIG [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioning signal. | |
| P/N POSI SW [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition from the park/neutral position switch signal. | |
| PW/ST SIGNAL [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal. | |

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 |
|---|---|---|---|---|
| LOAD SIGNAL [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition from the rear defogger signal and/or lighting switch. ON: Rear defogger is operating and/or lighting switch is on. OFF: Rear defogger is not operating and lighting switch is not on. | |
| INJ PULSE [msec] | | ○ | • Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. | • When the engine is stopped, a certain computed value is indicated. |
| IGN TIMING [BTDC] | | ○ | • Indicates the ignition timing computed by ECM according to the input signals. | |
| IACV-AAC/V [%] | | ○ | • Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals. | |
| A/F ALPHA [%] | | ○ | • Indicates the mean value of the air-fuel ratio feedback correction factor per cycle. | • When the engine is stopped, a certain value is indicated.<br>• This data also includes the data for the air-fuel ratio learning control. |
| AIR COND RLY [ON/OFF] | | ○ | • Indicates the air conditioner relay control condition (determined by ECM according to the input signal). | |
| COOLING FAN [ON/OFF] | | ○ | • Indicates the control condition of the cooling fans (determined by ECM according to the input signal). ON ... Operating OFF ... Stopped | |
| FUEL PUMP RLY [ON/OFF] | | ○ | • Indicates the fuel pump relay control condition determined by ECM according to the input signals. | |
| EGRC SOL/V [ON/OFF] | | ○ | • Indicates the control condition of the EGR valve & EVAP canister purge control solenoid valve (determined by ECM according to the input signal). ON ... EGR system operation cut-off OFF ... EGR system operation not cut-off | |
| VOLTAGE [V] | | | • Voltage measured by the voltage probe. | |
| PULSE [msec] or [Hz] or [%] | | | • Pulse width, frequency or duty cycle measured by the pulse probe. | • Only "#" is displayed if item is unable to be measured.<br>• Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured. |

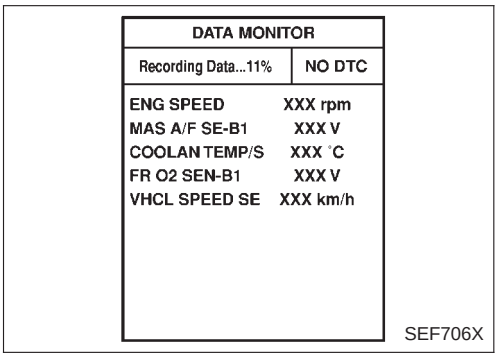
## CONSULT-II (Cont'd)

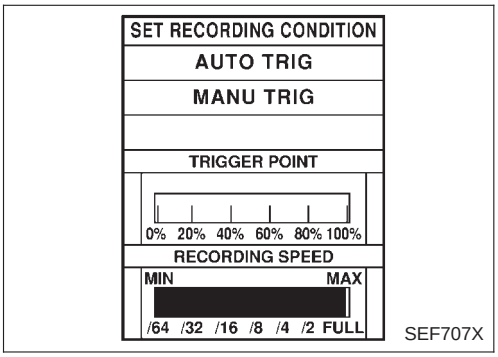
### ACTIVE TEST MODE

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|---|---|---|---|
| FUEL INJECTION | ● Engine: Return to the original trouble condition.<br>● Change the amount of fuel injection using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | ● Harness and connector<br>● Fuel injectors<br>● Heated oxygen sensor |
| IACV-AAC/V OPENING | ● Engine: After warming up, idle the engine.<br>● Change the IACV-AAC valve opening percent using CONSULT-II. | Engine speed changes according to the opening percent. | ● Harness and connector<br>● IACV-AAC valve |
| ENG COOLANT TEMP | ● Engine: Return to the original trouble condition.<br>● Change the engine coolant temperature indication using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | ● Harness and connector<br>● Engine coolant temperature sensor<br>● Fuel injectors |
| IGNITION TIMING | ● Engine: Return to the original trouble condition.<br>● Timing light: Set<br>● Retard the ignition timing using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | ● Adjust initial ignition timing |
| POWER BALANCE | ● Engine: After warming up, idle the engine.<br>● A/C switch "OFF"<br>● Shift lever "N"<br>● Cut off each injector signal one at a time using CONSULT-II. | Engine runs rough or dies. | ● Harness and connector<br>● Compression<br>● Injectors<br>● Power transistor<br>● Spark plugs<br>● Ignition coils |
| COOLING FAN | ● Ignition switch: ON<br>● Turn the cooling fan "ON" and "OFF" using CONSULT-II. | Cooling fan moves and stops. | ● Harness and connector<br>● Cooling fan motor<br>● Cooling fan relay |
| FUEL PUMP RELAY | ● Ignition switch: ON (Engine stopped)<br>● Turn the fuel pump relay "ON" and "OFF" using CONSULT-II and listen to operating sound. | Fuel pump relay makes the operating sound. | ● Harness and connector<br>● Fuel pump relay |
| EGRC SOLENOID VALVE | ● Ignition switch: ON<br>● Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound. | Solenoid valve makes an operating sound. | ● Harness and connector<br>● Solenoid valve |
| SELF-LEARNING CONT | ● In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen. | | |

## CONSULT-II (Cont'd)

### REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)




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/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
  At the moment a malfunction is detected by ECM, ''MONITOR'' in ''DATA MONITOR'' screen is changed to ''Recording Data...xx%'' as shown at left, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, ''REAL-TIME DIAG'' screen is displayed. If 'STOP'' is touched on the screen during ''Recording Data ... xx%, ''REAL-TIME DIAG'' screen is also displayed.
  The recording time after the malfunction detection and the recording speed can be changed by ''TRIGGER POINT'' and ''Recording Speed''. Refer to CONSULT-II OPERATION MANUAL.

2) ''MANU TRIG'' (Manual trigger):

- DTC/1st trip 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.

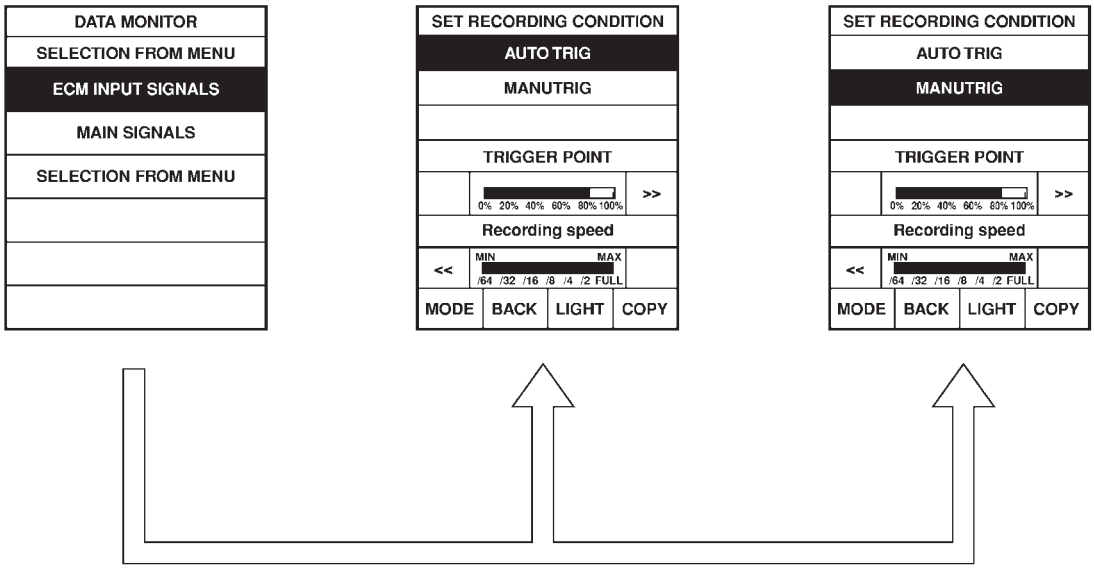
Use these triggers as follows:

1. ''AUTO TRIG''

- While trying to detect the DTC/1st trip DTC by performing the ''DTC Confirmation Procedure'', be sure to select ''DATA MONITOR (AUTO TRIG)'' mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in ''DATA MONITOR (AUTO TRIG)'' mode, especially in case the incident is intermittent.
  When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the ''DTC Confirmation Procedure'', the moment a malfunction is found the DTC/1st trip 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.



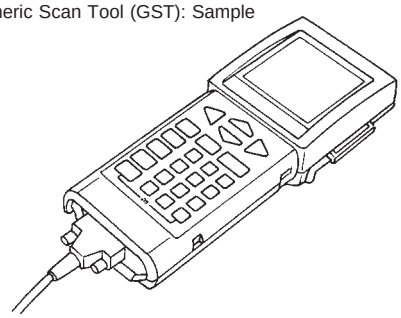

"SETTING"

"AUTO TRIG"
A malfunction can be displayed on "DATA MONITOR" screen automatically if detected.

"MANU TRIG"
A malfunction can not be displayed on "DATA MONITOR" screen automatically even if detected.

SEF720X

Generic Scan Tool (GST): Sample



SEF139P

## Generic Scan Tool (GST)

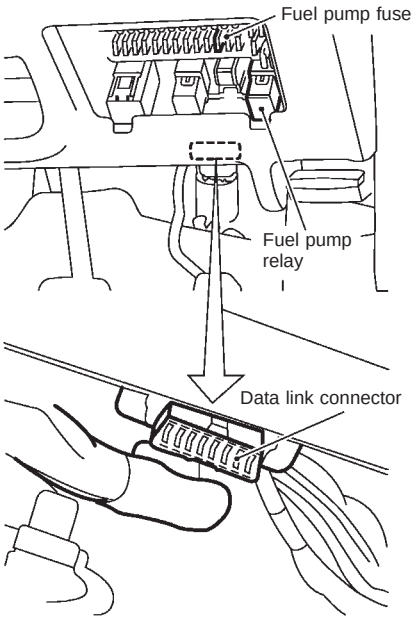
### DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with ISO15031-4 has 9 different functions explained on the next page.
ISO9141 is used as the protocol.
The name "GST" or "Generic Scan Tool" is used in this service manual.

# Generic Scan Tool (GST) (Cont'd)

## GST INSPECTION PROCEDURE

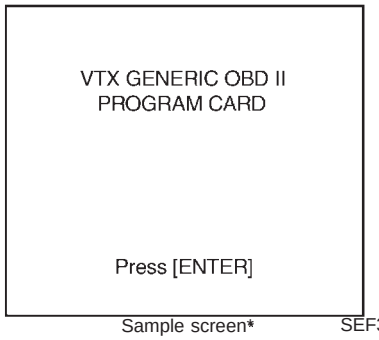
1. Turn ignition switch OFF.
2. Connect "GST" to data link connector. (Data link connector is located under the fuse box cover.)



SEF922W

3. Turn ignition switch ON.
4. Enter the program according to instruction on the screen or in the operation manual.

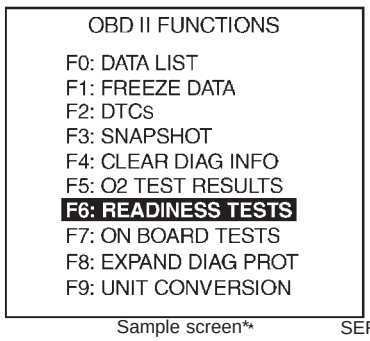
(*: Regarding GST screens in this section, sample screens are shown.)



Sample screen* SEF398S

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

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

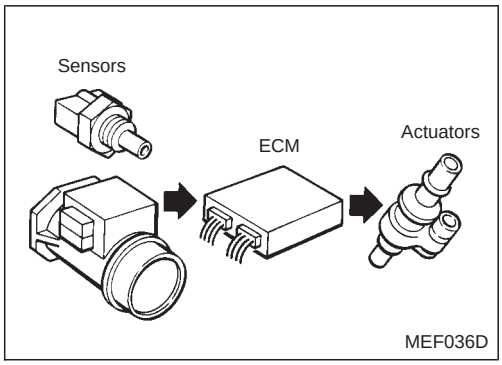


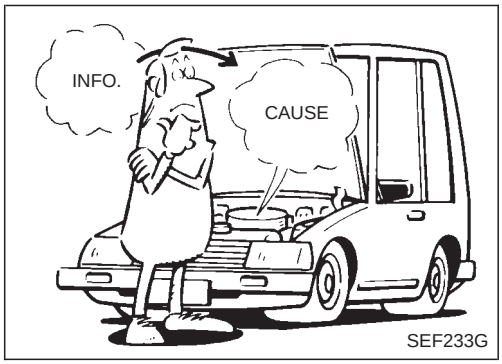
Sample screen** SEF416S

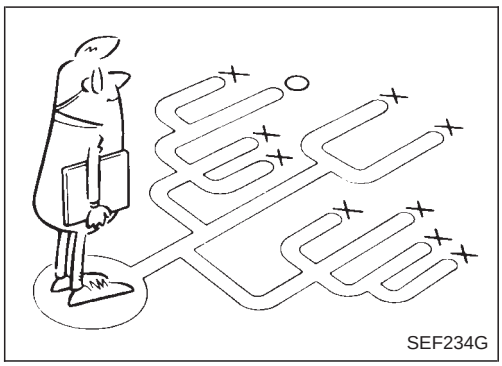
## Generic Scan Tool (GST) (Cont'd)

### FUNCTION

| Diagnostic test mode | | Function |
|---|---|---|
| MODE 1 | READINESS TESTS | This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, distance traveled while MI is activated and system status information. |
| MODE 2 | (FREEZE DATA) | This mode gains access to emission-related data value which were stored by ECM during the freeze frame. [For details, refer to ''Freeze Frame Data'' (EC-GA-38).] |
| MODE 3 | DTCs | This mode gains access to emission-related power train trouble codes which were stored by ECM. |
| MODE 4 | CLEAR DIAG INFO | This mode can clear all emission-related diagnostic information. This includes:<br>● Clear number of diagnostic trouble codes (MODE 1)<br>● Clear diagnostic trouble codes (MODE 3)<br>● Clear trouble code for freeze frame data (MODE 1)<br>● Clear freeze frame data (MODE 2)<br>● Reset status of system monitoring test (MODE 1)<br>● Clear on board monitoring test results (MODE 6 and 7) |
| MODE 6 | (ON BOARD TESTS) | This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored. |
| MODE 7 | (ON BOARD TESTS) | This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions. |
| MODE 8 | — | This mode is not applicable on this vehicle. |
| MODE 9 | (CALIBRATION ID) | This mode enables the off-board (External test equipment) to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs. |




## Introduction

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. 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, fouled spark plugs, or other problems with the engine.

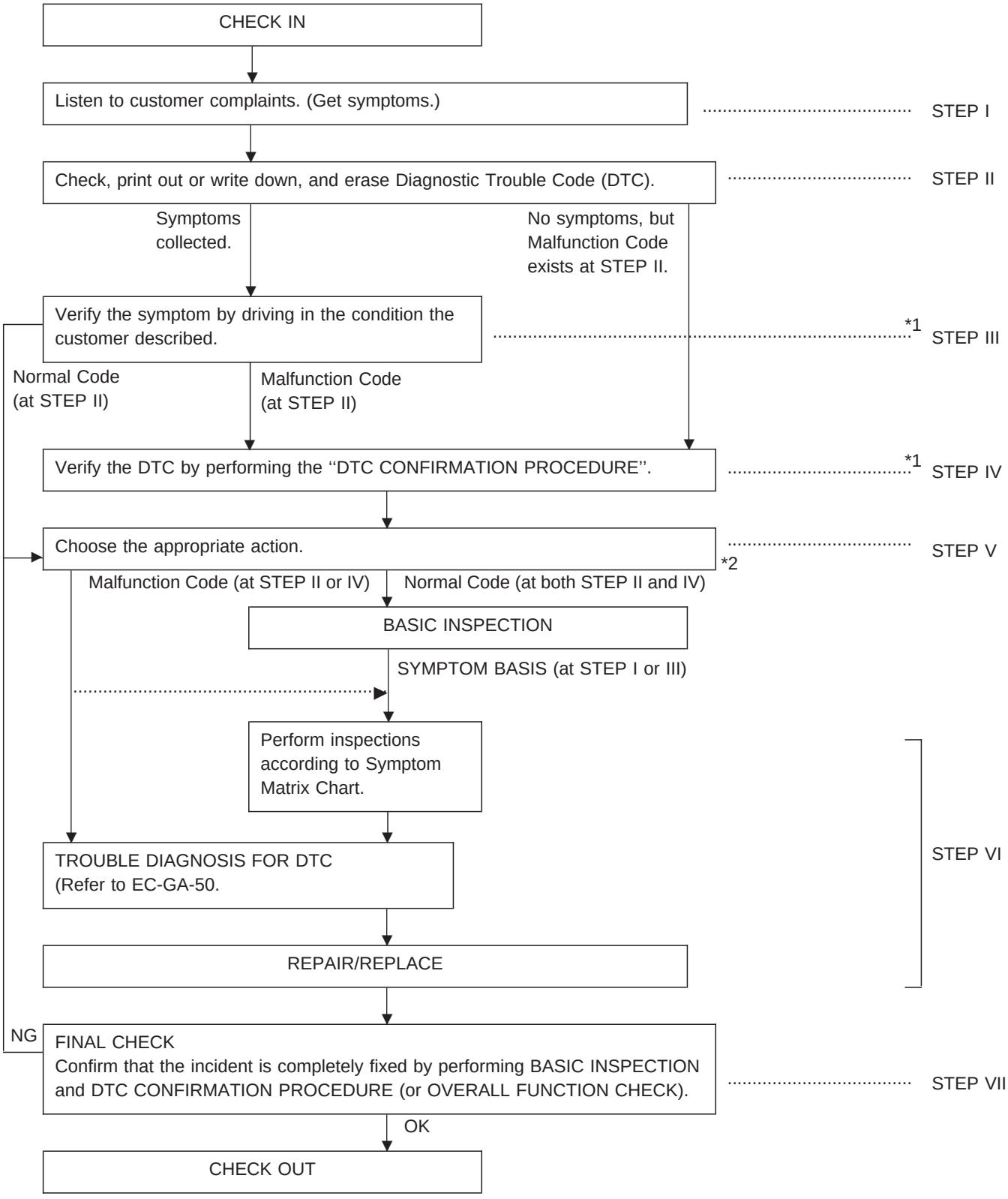
It is much more difficult to diagnose a problem that occurs intermittently rather than catastrophically. Most intermittent problems are caused by poor electrical connections or faulty wiring. In this case, careful checking of suspected circuits may help prevent the unnecessary replacement of good parts.

A visual check only may not find 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 just 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 EC-GA-49 should be used.

Start your diagnosis by looking for ‘‘conventional’’ problems first. This will help troubleshoot driveability problems on a vehicle equipped with an electronically controlled engine.

## 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 POWER SUPPLY'', EC-GA-69.**

## 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. The DTC can be used when duplicating the incident at STEP III & IV.<br>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-GA-56.) |
| STEP III | Try to confirm the symptom and under what conditions the incident occurs.<br>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.<br>If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section.<br>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.<br>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.<br>If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section.<br>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.<br>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.<br>If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC Refer to EC-GA-50.<br>If the normal code is indicated, proceed to the BASIC INSPECTION. Refer to EC-GA-53. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-GA-56. |
| STEP VI | Identify where to begin diagnosis based on the relationship study between symptom and possible causes.<br>Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) ‘‘Harness Layouts’’.<br>Gently shake the related connectors, components or wiring harness with CONSULT-II set in ‘‘DATA MONITOR (AUTO TRIG)’’ mode.<br>Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-GA-59.<br>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 (‘‘HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT’’, ‘‘Circuit Inspection’’).<br>Repair or replace the malfunction 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.<br>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.<br>Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) DTC in ECM. Refer to EC-GA-34. |

**KEY POINTS**

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

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## 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<br>☐ Partial combustion affected by throttle position<br>☐ Partial combustion NOT affected by throttle position<br>☐ Possible but hard to start ☐ Others [ ] | |
| Symptoms — ☐ Idling | ☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle<br>☐ Others [ ] | |
| Symptoms — ☐ Driveability | ☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power<br>☐ Intake backfire ☐ Exhaust backfire<br>☐ Others [ ] | |
| Symptoms — ☐ Engine stall | ☐ At the time of start ☐ While idling<br>☐ While accelerating ☐ While decelerating<br>☐ Just after stopping ☐ While loading | |
| Incident occurrence | ☐ Just after delivery ☐ Recently<br>☐ In the morning ☐ At night ☐ In the daytime | |
| Frequency | ☐ All the time ☐ Under certain conditions ☐ Sometimes | |
| Weather conditions | ☐ Not affected | |
| Weather conditions — Weather | ☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ] | |
| Weather conditions — Temperature | ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F | |
| Engine conditions | ☐ Cold ☐ During warm-up ☐ After warm-up<br>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<br>☐ At starting ☐ While idling ☐ At racing<br>☐ While accelerating ☐ While cruising<br>☐ While decelerating ☐ While turning (RH/LH)<br>Vehicle speed 0 10 20 30 40 50 60 70 80 90 100 mph | |
| Malfunction indicator | ☐ Turned on ☐ Not turned on | |

## 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 ... |
|---|---|---|
| 11 | Camshaft position sensor circuit (CAMSHAFT POSI SEN) | ● 180° signal is not sent to the ECM for the first few seconds during engine cranking.<br>● The pulse width of 180° signal is smaller than the specified value. |
| 12 | Mass air flow sensor circuit (MASS AIR FLOW SEN) | ● An excessively high or low voltage is sent to ECM. |
| 13 | Engine coolant temperature sensor circuit (COOLANT TEMP SEN) | ● An excessively high or low voltage from the sensor is sent to the ECM. |
| 21 | Ignition signal circuit (IGN SIGNAL-PRIMARY) | ● The ignition signal in the primary circuit is not sent to the ECM during engine cranking or running. |
| 28 | OVER HEAT | ● The engine coolant temperature sensor output voltage is below 0.35V. |
| 43 | Throttle position sensor circuit (THROTTLE POSI SEN) | ● An excessively low or high voltage from the sensor is sent to the ECM. |
| 55 | No failure (NO SELF DIAGNOSTIC FAILURE INDICATED...) | ● No malfunction is detected by the ECM. |

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

*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.

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

X: Applicable
—: Not applicable

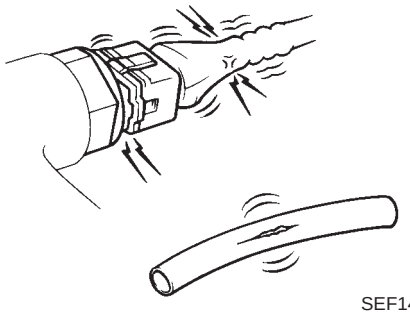
| Check Items (Possible Cause) | "DTC CONFIRMATION PROCEDURE" Quick Ref. *1 | "OVERALL FUNCTION CHECK" Quick Ref. *2 | Fail Safe System | Reference Page |
|---|---|---|---|---|
| • Harness or connectors (The sensor circuit is open or short-circuited.)<br>• Camshaft position sensor<br>• Starter motor (EL section)<br>• Starting system circuit (EL section)<br>• Dead (Weak) battery | RUNNING | — | — | EC-GA-73 |
| • Harness or connectors (The sensor circuit is open or short-circuited.)<br>• Mass air flow sensor | RUNNING | RUNNING | X | EC-GA-77 |
| • Harness or connectors (The sensor circuit is open or short-circuited.)<br>• Engine coolant temperature sensor | IGN: ON | — | X | EC-GA-81 |
| • Harness or connectors (The ignition primary circuit is open or short-circuited.)<br>• Power transistor unit<br>• Resistor<br>• Camshaft position sensor<br>• Camshaft position sensor circuit | RUNNING | — | — | EC-GA-85 |
| Refer to "Overheat cause analysis", ENGINE COOLING SYSTEM in LC section. | — | — | — | LC section |
| • Harness or connectors (The sensor circuit is open or short-circuited.)<br>• Throttle position sensor | — | IGN: ON | X | EC-GA-90 |
| • No failure | — | — | — | — |

## Fail-Safe Chart

The ECM enters fail-safe mode, if any of the following DTCs is recorded due to an open or short-circuit.

<table>
<tr><th>DTC No.</th><th>Detected items</th><th>Engine operating condition in fail-safe mode</th></tr>
<tr><td>12</td><td>Mass air flow sensor circuit</td><td>Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>13</td><td>Engine coolant temperature sensor circuit</td><td>Engine coolant temperature will be determined based on the time after turning ignition switch to ‘‘ON’’ or ‘‘START’’ position.
<table>
<tr><th>Condition</th><th>Engine coolant temperature decided</th></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>35°C (95°F)</td></tr>
<tr><td>More than 4.5 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>35 - 80°C (95 - 176°F)<br>(Depends on the time)</td></tr>
</table>
When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>43</td><td>Throttle position sensor circuit</td><td>Throttle position will be determined based on the injected fuel amount and the engine speed.<br>Therefore, acceleration will be poor.
<table>
<tr><th>Condition</th><th>Driving condition</th></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
</table></td></tr>
<tr><td>—</td><td>ECM</td><td>Fail-safe system activating condition when ECM is malfunctioning<br>The computing function of the ECM was judged to be malfunctioning.<br>When the fail-safe system activates (i.e., if the ECM detects a malfunction condition in the CPU of ECM), the MALFUNCTION INDICATOR on the instrument panel lights to warn the driver.<br>Engine control, with fail-safe system, operates when ECM is malfunctioning<br>When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.
<table>
<tr><th></th><th>Operation</th></tr>
<tr><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm</td></tr>
<tr><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td>Ignition timing</td><td>Ignition timing is fixed at the preset valve</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is ‘‘ON’’ when engine is running and ‘‘OFF’’ when engine stalls</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td>Cooling fans</td><td>Cooling fan relay ‘‘ON’’ when engine is running, and ‘‘OFF’’ when engine stalls</td></tr>
</table></td></tr>
</table>

A



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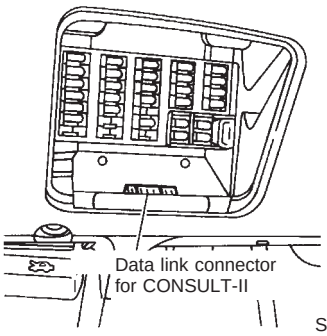
B

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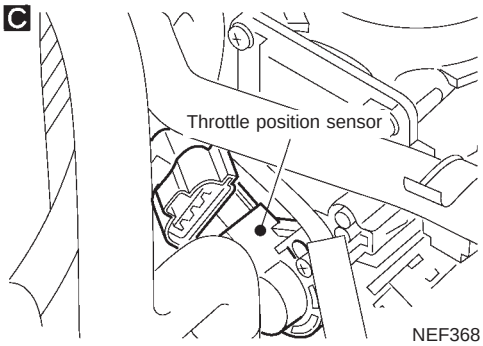


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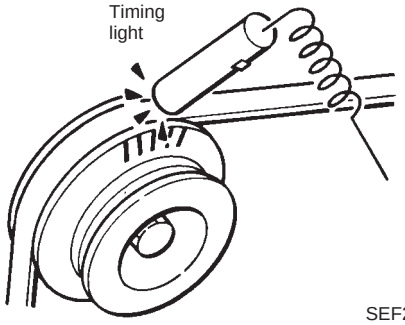


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## Basic Inspection

**Precaution:**

**Perform Basic Inspection without electrical or mechanical loads applied;**

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

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

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-GA-33.

**DOES ENGINE START?** — No → Go to E.

Yes

C

**CHECK IGNITION TIMING.**

1. Warm up engine sufficiently.
2. Stop engine and disconnect throttle position sensor harness connector.
3. Start engine.
4. Check ignition timing at idle using timing light.

**Ignition timing: 10° ± 2° BTDC**

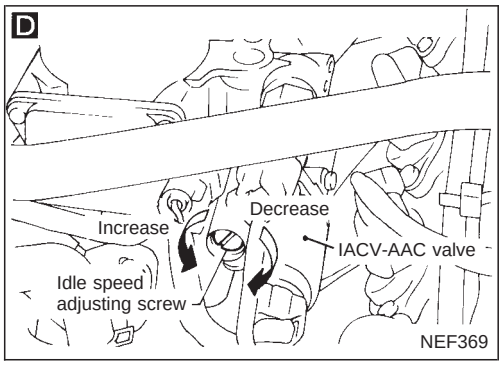
NG → Adjust ignition timing by turning distributor.

OK

(Go to Ⓐ on next page.)

## Basic Inspection (Cont'd)

D

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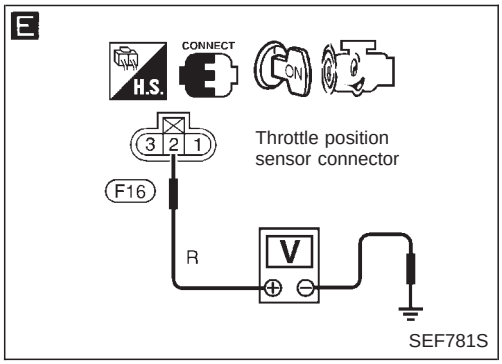



Ⓐ

D

**CHECK IDLE ADJ. SCREW INITIAL SET RPM.**
**Idle speed: 625±50 rpm**

NG → Adjust engine speed by turning idle adjusting screw.

OK

Reconnect throttle position sensor harness connector.

OK

E

**CHECK THROTTLE POSITION SENSOR IDLE POSITION.**
Measure output voltage of throttle position sensor using voltmeter, and check that it is approx. 0.35 to 0.65V. (Throttle valve fully closed.)

NG → Adjust output voltage to 0.50V ± 0.1V by rotating throttle position sensor body.

OK

**RESET IDLE POSITION MEMORY.**

1. Warm up engine sufficiently.
2. Select "CLSD THL/POSI" in "DATA MONITOR" mode with CONSULT-II.
3. Stop engine and wait at least 5 seconds.
4. Turn ignition switch to "ON" position.
5. Turn ignition switch to the "LOCK" position and wait at least 5 seconds.
6. Repeat steps 4. and 5. until "CLSD THL/POSI in "DATA MONITOR" mode with CONSULT-II changes to "ON".
   Repeat steps 4. and 5. 20 times.

**CHECK IDLE SPEED**
Check idle speed.
**Models with daytime light system:**
**800±50 rpm**
**Models without daytime light system:**
**700±50 rpm**

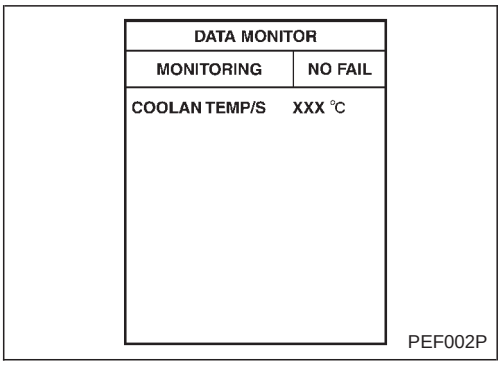
NG → Adjust idle speed by turning idle adjusting screw.

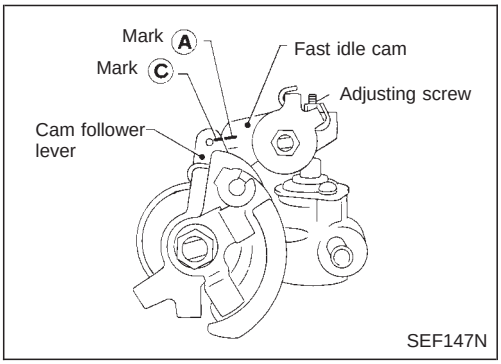
OK

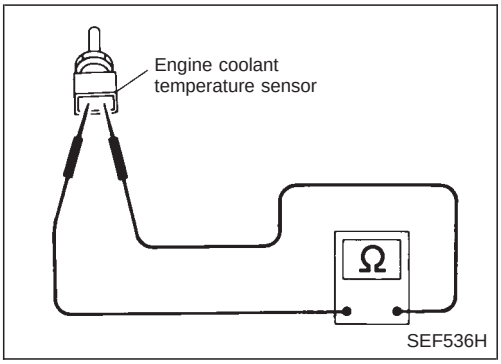
After this inspection, unnecessary diagnostic trouble code No. might be displayed. Erase the stored memory in ECM.

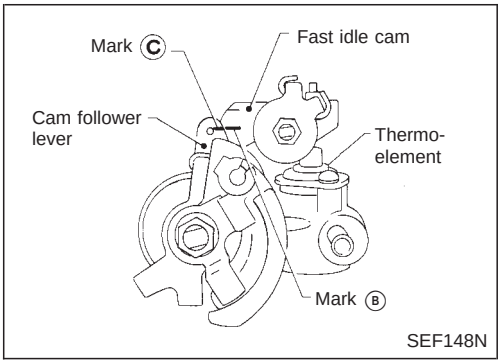
OK

INSPECTION END




## Fast Idle Cam (FIC) Inspection and Adjustment

1. Start engine and warm it up.
2. See ‘‘COOLAN TEMP/S’’ in ‘‘DATA MONITOR’’ mode with CONSULT-II.
3. When engine coolant temperature is 75 to 85°C (167 to 185°F), make sure that mark Ⓐ is aligned with mark Ⓒ as shown in the figure.

2. Disconnect engine coolant temperature sensor harness connector and check resistance of sensor as shown in the figure.
3. When the resistance of engine coolant temperature sensor is 0.26 to 0.39 kΩ, make sure that mark Ⓐ is aligned with mark Ⓒ as shown in the figure.

- If NG, adjust by turning adjusting screw.

**Adjusting screw tightening torque:**
**1.0 - 2.0 N·m (10 - 20 kg-cm, 8.7 - 17.4 in-lb)**

4. Stop engine.
5. Turn ignition switch to ‘‘ON’’ position and see ‘‘COOLAN TEMP/S’’ in ‘‘DATA MONITOR’’ mode with CONSULT-II.
6. When engine coolant temperature is 20 to 30°C (68 to 86°F), make sure that mark Ⓑ is aligned with mark Ⓒ as shown in the figure.

5. When the resistance of engine coolant temperature sensor is 1.65 to 2.40 kΩ, make sure that mark Ⓑ is aligned with mark Ⓒ as shown in the figure.

- If NG, replace thermo-element and perform the above inspection and adjustment again.

## Symptom Matrix Chart

| SYSTEM — Basic engine control system | | SYMPTOM | | | | | | | | | | | | | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | |
| | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Fuel | Fuel pump circuit | ● | ● | ● | ○ | ● | | ● | ● | | | ● | | ○ | EC-GA-113 |
| | Fuel pressure regulator system | ● | ● | ● | ○ | ● | ○ | ● | ● | ○ | | ● | | | EC-GA-23 |
| | Injector circuit | ● | ● | ● | ○ | ● | | ● | ● | | | ● | | | EC-GA-110 |
| | Evaporative emission system | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | | EC-GA-18 |
| Air | Positive crankcase ventilation system | ○ | ○ | ● | ○ | ○ | ○ | ● | ● | ○ | | ○ | | | EC-GA-21 |
| | Incorrect idle speed adjustment | ○ | ○ | | | | ○ | ○ | ○ | ○ | | ○ | | | EC-GA-24 |
| | IACV-AAC valve circuit | ● | ● | ● | ○ | ● | ● | ● | ● | ● | | ● | | ○ | EC-GA-117 |
| | IACV-FICD solenoid valve circuit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | | EC-GA-121 |
| Ignition | Incorrect ignition timing adjustment | ○ | ○ | ● | ● | ● | | ● | ● | | | ● | | | EC-GA-24 |
| | Ignition circuit | ● | ● | ● | ● | ● | | ● | ● | | | ● | | | EC-GA-85 |
| EGR | EGR valve & EVAP canister purge control solenoid valve circuit | | ● | ● | ● | ○ | | | | | | ● | | | EC-GA-100 |
| | EGR system | ○ | ● | ● | ● | ○ | ○ | ● | ● | ○ | | ○ | | | EC-GA-100 |
| Main power supply and ground circuit | | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | | ○ | EC-GA-69 |
| Cooling | Cooling fan circuit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | EC-GA-124 |
| Air conditioner circuit | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ | HA section |
| ENGINE CONTROL MODULE | Camshaft position sensor circuit | ● | ● | ● | ○ | ○ | | ○ | ○ | | | ○ | | | EC-GA-73 |
| | Mass air flow sensor circuit | ● | ● | ● | ○ | ● | | ● | ● | | | ● | | | EC-GA-77 |
| | Heated oxygen sensor circuit | | ● | ● | ○ | ● | | ● | ● | | | ● | | | EC-GA-105 |
| | Engine coolant temperature sensor circuit | ● | ● | ● | ○ | ● | ● | ● | ● | ● | | ● | | | EC-GA-81 |
| | Throttle position sensor circuit | | ● | ● | | ● | ● | ● | ● | ● | | ● | | | EC-GA-90 |
| | Incorrect throttle position sensor adjustment | | ● | ○ | | ○ | ● | ○ | ○ | ● | | ○ | | | EC-GA-53 |
| | Vehicle speed sensor circuit | | ○ | ○ | | ○ | | | | | | ○ | | | EC-GA-95 |
| | ECM | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | EC-GA-65 |
| | Start signal circuit | ○ | | | | | | | | | | | | | EC-GA-98 |
| | Neutral position switch circuit | | | ○ | | ○ | | ○ | ○ | | | ○ | | | EC-GA-132 |
| | Power steering oil pressure switch circuit | | ○ | | | | | ○ | ○ | | | | | | EC-GA-129 |

● ; High Possibility Item
○; Low Possibility Item

(continued on next page)

## Symptom Matrix Chart (Cont'd)

| SYSTEM — Engine mechanical & other | | SYMPTOM | | | | | | | | | | | | | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | |
| | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Fuel | Fuel tank | ○ | ○ | | | | | | | | | | | | |
| | Fuel piping | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | | |
| | Vapor lock | | ○ | | | | | | | | | | | | |
| | Valve deposit | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | | |
| | Poor fuel (Heavy weight gasoline, Low octane) | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | | — |
| Air | Air duct | | ○ | ○ | | ○ | | ○ | ○ | | | ○ | | | |
| | Air cleaner | | ○ | ○ | | ○ | | ○ | ○ | | | ○ | | | |
| | Air leakage from air duct (Mass air flow sensor — throttle body) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | | |
| | Throttle body, Throttle wire | ● | ● | ● | | ● | ● | ● | ● | ● | | ● | | | FE section |
| | Air leakage from intake manifold/ Collector/Gasket | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | | — |
| Cranking | Battery | ○ | ○ | ○ | | ○ | | ○ | ○ | | | ○ | | ○ | |
| | Alternator circuit | ○ | ○ | ○ | | ○ | | ○ | ○ | | | ○ | | ○ | EL section |
| | Starter circuit | ● | | | | | | | | | | | | | |
| | Flywheel | ● | | | | | | | | | | | | | — |
| Engine | Cylinder head | ● | ● | ● | ● | ● | | ● | ● | | | ○ | | | |
| | Cylinder head gasket | ● | ● | ○ | ○ | ● | | ○ | ○ | | ○ | ○ | ○ | | |
| | Cylinder block | ● | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | | |
| | Piston | ● | ● | ○ | ● | ○ | | ○ | ○ | | | ○ | ○ | | |
| | Piston ring | ● | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | | |
| | Connecting rod | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | | |
| | Bearing | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | | |
| | Crankshaft | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | | |
| Valve mechanism | Timing chain | ● | ● | ● | ○ | ● | | ○ | ○ | | | ○ | | | |
| | Camshaft | ● | ● | ● | ○ | ○ | | ● | ● | | | ○ | | | |
| | Intake valve | ● | ○ | ○ | ● | ○ | | ○ | ○ | | | ○ | ○ | | |
| | Exhaust valve | ● | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | | |
| Exhaust | Exhaust manifold/Tube/Muffler/Gasket | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | | — |
| | Three way catalyst | ● | ● | ○ | ○ | ○ | | ○ | ○ | | | ○ | | | |
| Lubrication | Oil pan/Oil strainer/Oil pump/Oil filter/ Oil gallery | ● | ○ | ○ | ○ | ○ | | ● | ● | | | ○ | ○ | | |
| | Oil level (Low)/Filthy oil | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | | |
| Cooling | Radiator/Hose/Radiator filler cap | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | | | |
| | Thermostat | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | |
| | Water pump | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | | | |
| | Water gallery | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | | | |
| | Cooling fan | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | |
| | Coolant level (low)/Contaminated coolant | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | | | |

● ; High Possibility Item
○; Low Possibility Item

## 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.
  (i.e., Adjust ignition timing with a timing light before monitoring IGN TIMING. Specification data might be displayed even when ignition timing is not adjusted to specification. This IGN TIMING monitors the data calculated by the ECM according to the input signals from the camshaft position sensor and other ignition timing related sensors.)
- If the real-time diagnosis results are NG, and the on-board diagnostic system results are OK, when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| CMPS•RPM (REF) | ● Tachometer: Connect<br>● Run engine and compare tachometer indication with the CONSULT-II value. | | Almost the same speed as the CONSULT-II value. |
| MAS AIR/FL SE | ● Engine: After warming up<br>● Air conditioner switch: OFF<br>● Shift lever: ‘‘N’’<br>● No-load | Idle | 1.2 - 1.8V |
| | | 2,000 rpm | 1.7 - 2.3V |
| COOLAN TEMP/S | ● Engine: After warming up | | More than 70°C (158°F) |
| O2 SEN | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ 0.6 - 1.0V |
| M/R F/C MNT | | | LEAN ↔ RICH<br>Changes more than 5 times during 10 seconds. |
| VHCL SPEED SE | ● Turn drive wheels and compare speedometer indication with the CONSULT-II value | | Almost the same speed as the CONSULT-II value |
| BATTERY VOLT | ● Ignition switch: ON (Engine stopped) | | 11 - 14V |
| THRTL POS SEN | ● Ignition switch: ON<br>(Engine stopped) | Throttle valve fully closed | 0.35 - 0.65V |
| | | Throttle valve fully opened | Approx. 4.0V |
| START SIGNAL | ● Ignition switch: ON → START → ON | | OFF → ON → OFF |
| CLSD THL/POSI | ● Ignition switch: ON<br>(Engine stopped) | Throttle valve:<br>Idle position | ON |
| | | Throttle valve:<br>Slightly open | OFF |
| AIR COND SIG | ● Engine: After warming up, idle the engine | A/C switch ‘‘OFF’’ | OFF |
| | | A/C switch ‘‘ON’’<br>(Compressor operates) | ON |
| P/N POSI SW | ● Ignition switch: ON | Shift lever ‘‘P’’ or ‘‘N’’ | ON |
| | | Except above | OFF |
| PW/ST SIGNAL | ● Engine: After warming up, idle the engine | Steering wheel in neutral position (forward direction) | OFF |
| | | The steering wheel is turned | ON |
| LOAD SIGNAL | ● Ignition switch: ON | Rear window defogger is operating and/or lighting switch is on | ON |
| | | Rear window defogger is not operating and lighting switch is not on | OFF |
| INJ PULSE | | Idle | 2.4 - 3.2 msec. |
| | | 2,000 rpm | 1.9 - 3.2 msec. |

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

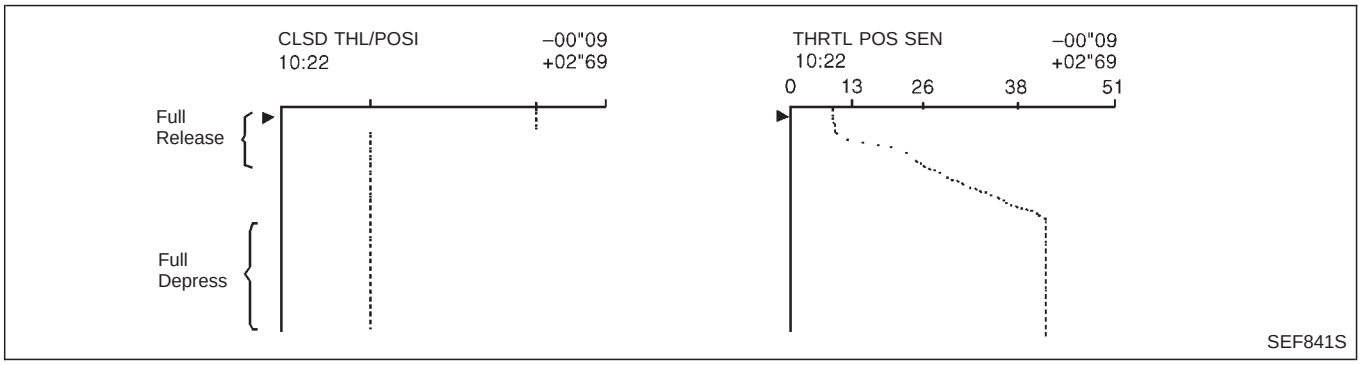
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| IGN TIMING | ● Engine: After warming up<br>● Air conditioner switch: OFF<br>● Shift lever: "N"<br>● No-load | Idle | 2 -10° BTDC |
| | | 2,000 rpm | More than 20° BTDC |
| IACV-AAC/V | ● Engine: After warming up<br>● Air conditioner switch: OFF<br>● Shift lever: N<br>● No-load | Idle | 0 - 40% |
| | | 2,000 rpm | — |
| A/F ALPHA | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 75 - 125% |
| AIR COND RLY | ● Air conditioner switch: OFF → ON | | OFF → ON |
| FUEL PUMP RLY | ● Ignition switch is turned to ON (Operates for 5 seconds)<br>● Engine running and cranking<br>● When engine is stopped (stops in 1.0 seconds) | | ON |
| | ● Except as shown above | | OFF |
| 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 | ● Engine: After warming up<br>● Air conditioner switch: OFF<br>● Shift lever: N<br>● No-load | Idle | ON |
| | | Revving engine from idle to 3,000 rpm in 1st position | OFF |

## 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.)

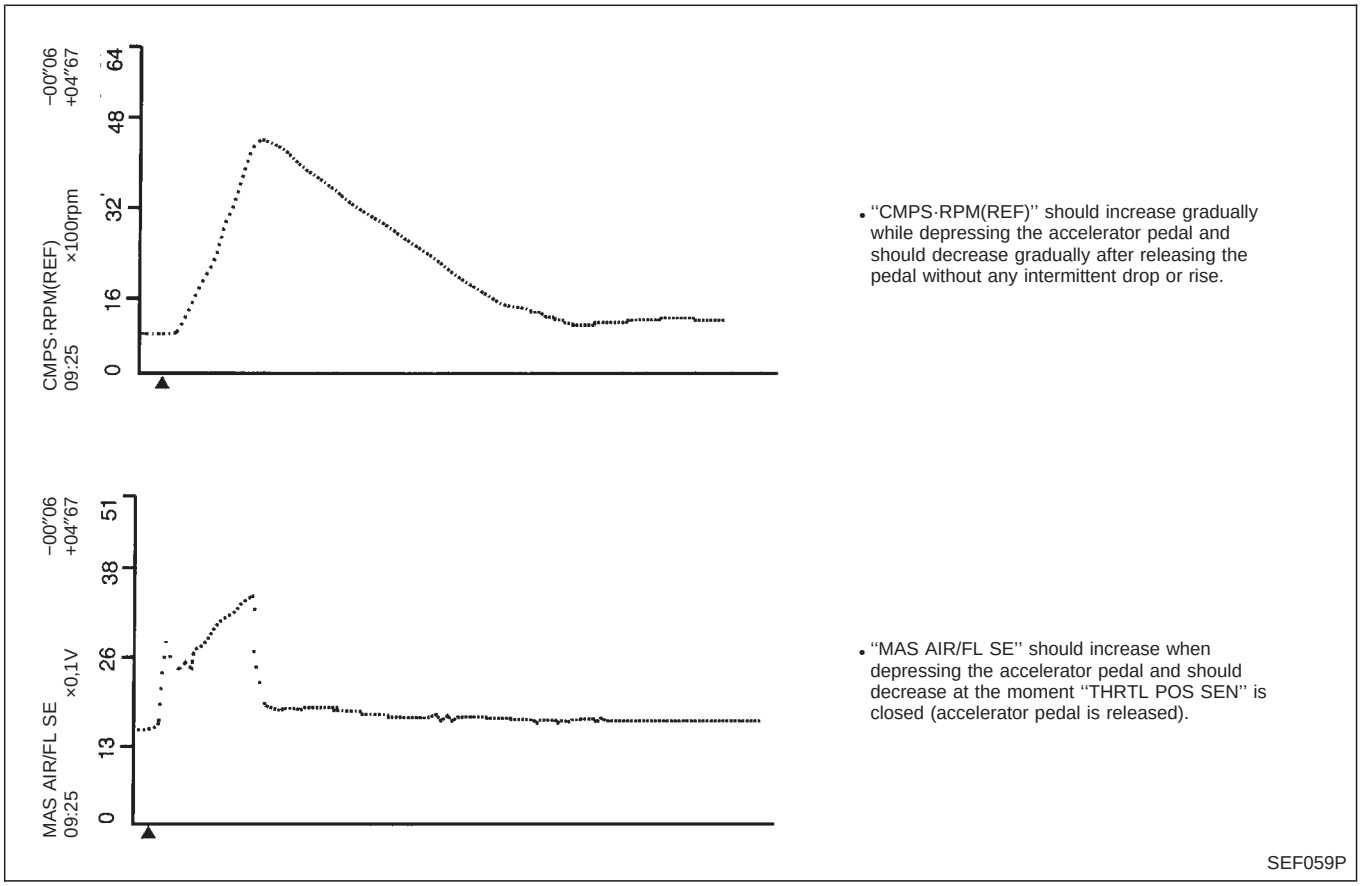
### THRTL POS SEN, CLSD THL/POSI

Below is the data for ''THRTL POS SEN'' and ''CLSD THL/POSI'' when depressing the accelerator pedal with the ignition switch ''ON''.
The signal of ''THRTL POS SEN'' should rise gradually without any intermittent drop or rise after ''CLSD THL/POSI'' is changed from ''ON'' to ''OFF''.

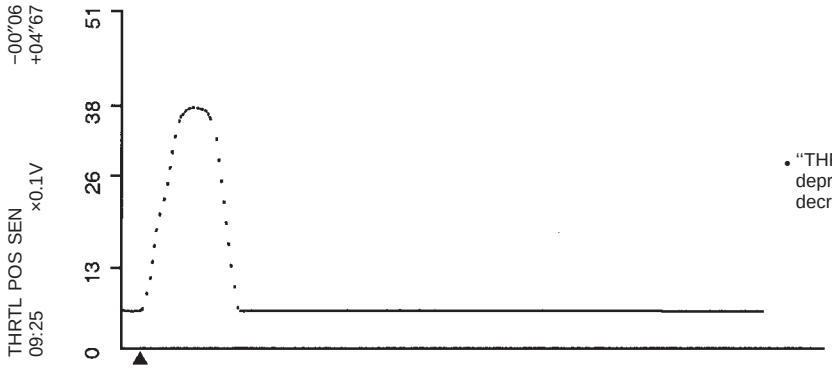



### CMPS•RPM (REF), MAS AIR/FL SE, THRTL POS SEN, O2 SENSOR, INJ PULSE

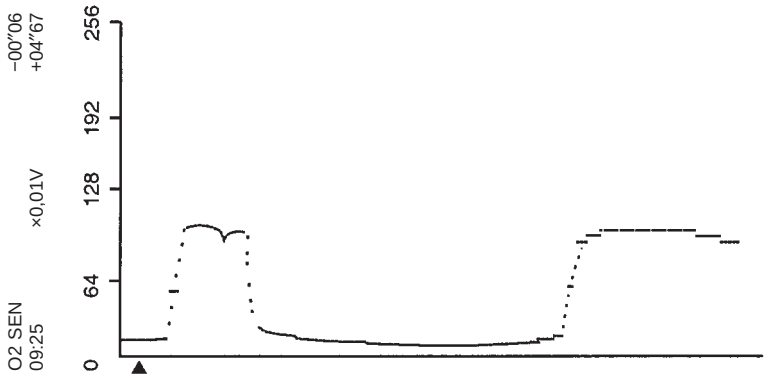
Below is the data for ''CMPS•RPM (REF)'', ''MAS AIR/FL SE'', ''THRTL POS SEN'', ''O2 SENSOR'' and ''INJ PULSE'' when revving quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



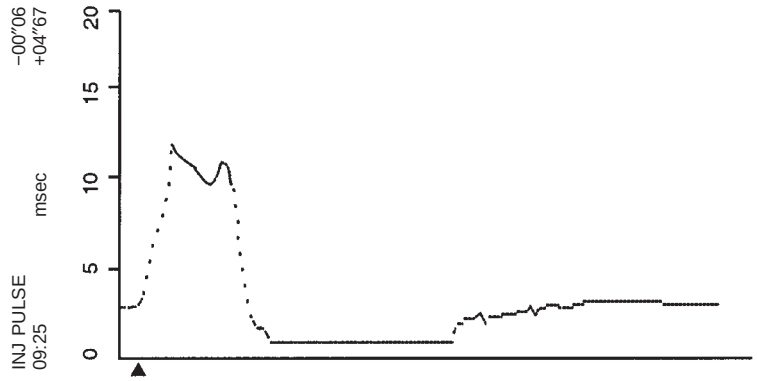
## Major Sensor Reference Graph in Data Monitor Mode (Cont'd)




• "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.

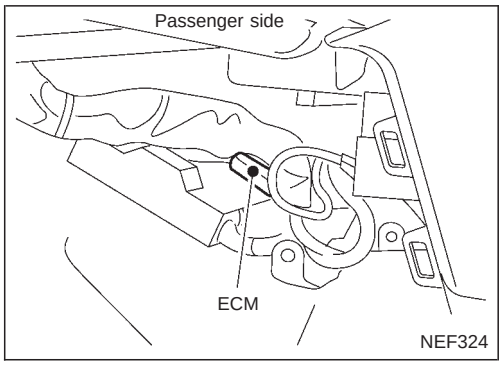



• "O2 SEN" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.




• "INJ PULSE" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

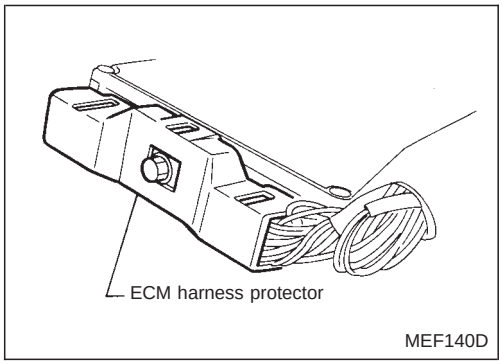
SEF259QA



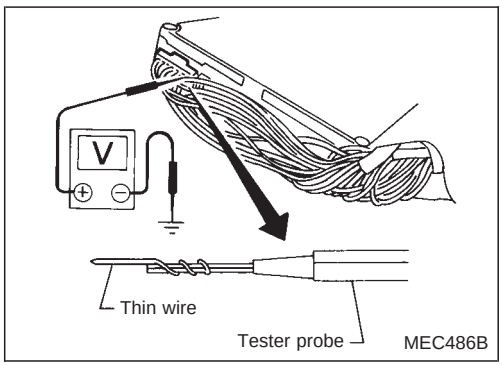

## ECM Terminals and Reference Value

### PREPARATION

1. ECM is located behind the center console panel. For this inspection, remove the center console under cover.

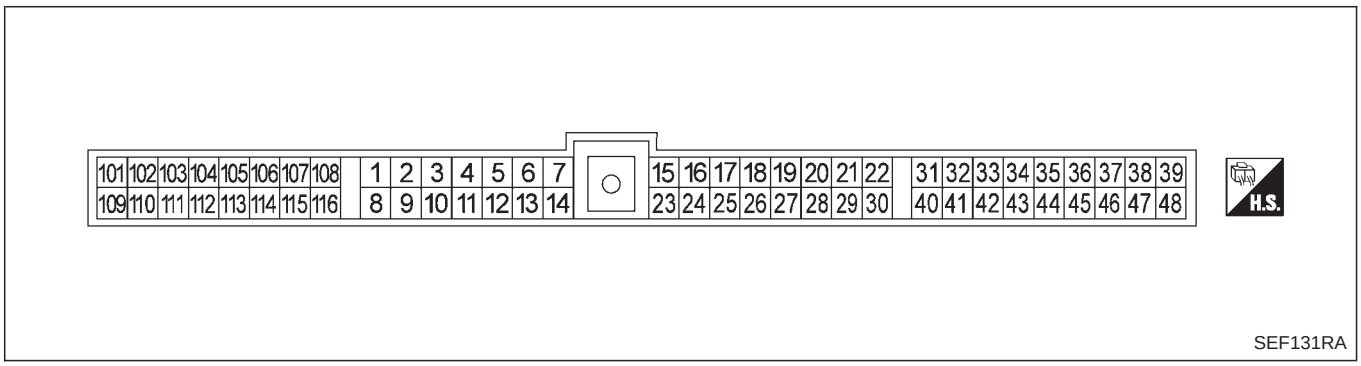



2. Remove ECM harness protector.




3. When checking ECM output voltages, perform all voltage measurements with the connectors connected. Extend tester probe as shown to perform tests easily.

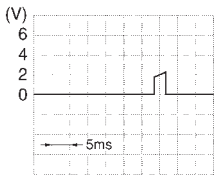
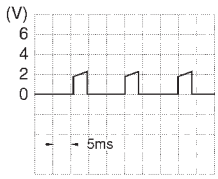
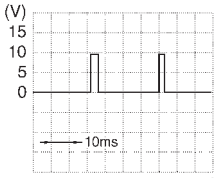
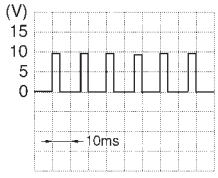
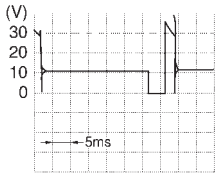
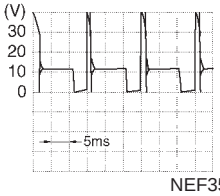
### ECM HARNESS CONNECTOR TERMINAL LAYOUT



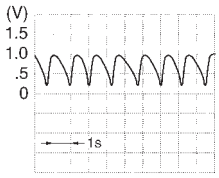
# ECM Terminals and Reference Value (Cont'd)

## ECM INSPECTION TABLE

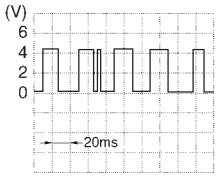
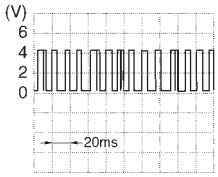
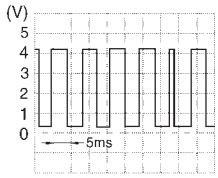
Specification data are reference values and are measured between each terminal and terminal ㊴ (Engine control module ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA |
|---|---|---|---|---|
| 1 | W/B | Ignition signal | Engine is running. (Warm-up condition)<br>└ Idle speed | 0.2 - 0.3V<br>  <br><br>NEF346 |
| | | | Engine is running.<br>└ Engine speed is 2,000 rpm. | Approximately 0.7V<br>  <br><br>NEF347 |
| 2 | L/OR | Tachometer | Engine is running. (Warm-up condition)<br>└ Idle speed | 1.0 - 1.3V<br>  <br><br>NEF348 |
| | | | Engine is running.<br>└ Engine speed is 2,000 rpm. | Approximately 3V<br>  <br><br>NEF349 |
| 3 | Y/PU | Ignition check | Engine is running. (Warm-up condition)<br>└ Idle speed | Approximately 13V<br>  <br><br>NEF350 |
| | | | Engine is running.<br>└ Engine speed is 2,000 rpm. | Approximately 13V<br>  <br><br>NEF351 |

## ECM Terminals and Reference Value (Cont'd)

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA |
|---|---|---|---|---|
| 4 | W/G | Engine control module relay (Self-shutoff) | Engine is running.<br>↓<br>Ignition switch "OFF"<br>└ For a few seconds after turning ignition switch "OFF" | 0 - 1V |
| | | | Ignition switch "OFF"<br>└ Following a few seconds delay after turning ignition switch "OFF" and thereafter | BATTERY VOLTAGE (11 - 14V) |
| 6 | B | Engine control module ground | Engine is running.<br>└ Idle speed | Engine ground |
| 7 | G/B | Data link connector for CONSULT-II | Engine is running.<br>└ Idle speed (DATA MONITOR screen) | Approximately 0V |
| 14 | G/W | | | Approximately 3.5V |
| 15 | GY/L | | | Approximately 3.5V |
| 23 | G/R | | | Approximately 3.5V |
| 9<br>10 | LG/R | Cooling fan relay | Engine is running.<br>└ Cooling fan is not operating. | BATTERY VOLTAGE (11 - 14V) |
| | | | Engine is running.<br>└ Cooling fan is operating. | Approximately 0V |
| 11 | L/W | Air conditioner relay | Engine is running.<br>└ Both A/C switch and blower fan switch are "ON". | Approximately 0V |
| | | | Engine is running.<br>└ A/C switch is "OFF". | BATTERY VOLTAGE (11 - 14V) |
| 13 | B | Engine control module ground | Engine is running.<br>└ Idle speed | Engine ground |
| 16 | Y | Mass air flow sensor | Engine is running. (Warm-up condition)<br>└ Idle speed | 1.2 - 1.8V |
| | | | Engine is running. (Warm-up condition)<br>└ Engine speed is 2,000 rpm. | 1.7 - 2.3V |
| 18 | L/OR | Engine coolant temperature sensor | Engine is running. | Approximately 0 - 4.8V<br>Output voltage varies with engine coolant temperature. |
| 19 | L/W | Heated oxygen sensor | Engine is running.<br>└ After warming up sufficiently and engine speed is 2,000 rpm. | 0 - Approximately 1.0V<br>  <br><br>NEF352 |

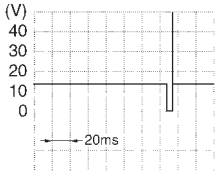
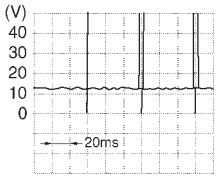
## ECM Terminals and Reference Value (Cont'd)

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA |
|---|---|---|---|---|
| 20 | R | Throttle position sensor | Ignition switch "ON" (Warm-up condition)<br>└ Accelerator pedal released | 0.35 - 0.65V |
| | | | Ignition switch "ON"<br>└ Accelerator pedal fully depressed | Approximately 4V |
| 24 | OR/L | Malfunction indicator | Ignition switch "ON" | Approximately 1.5V |
| | | | Engine is running. | BATTERY VOLTAGE (11 - 14V) |
| 31<br>40 | L/W | Camshaft position sensor (Reference signal) | Engine is running. (Warm-up condition)<br>└ Idle speed | 1.5 - 3.0V<br>  <br><br>NEF370 |
| | | | Engine is running.<br>└ Engine speed is 2,000 rpm. | 1.5 - 3.0V<br>  <br><br>NEF371 |
| 32 | OR/W | Vehicle speed sensor | Ignition switch "ON"<br>├ Raise the vehicle<br>├ In 1st gear position<br>└ Vehicle speed is 40 km/h (25 mph). | 0 - Approximately 4.2V<br>  <br><br>NEF357 |
| 33 | R | Electrical load switch | Engine is running.<br>├ Rear window defogger is operating.<br>└ Lighting switch is "ON". | BATTERY VOLTAGE (11 - 14V) |
| | | | Engine is running.<br>├ Rear window defogger is not operating.<br>└ Lighting switch is "OFF". | 0V |
| 34 | B/Y | Start signal | Ignition switch "ON" | Approximately 0V |
| | | | Ignition switch "START" | BATTERY VOLTAGE (11 - 14V) |

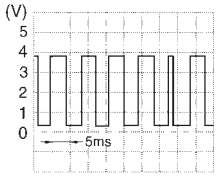
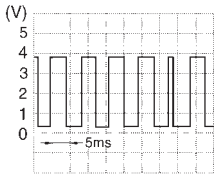
## ECM Terminals and Reference Value (Cont'd)

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA |
|---|---|---|---|---|
| 35 | G/OR | Neutral position switch | Ignition switch "ON"<br>└ Neutral position | 0V |
| | | | Ignition switch "ON"<br>└ Except the above gear position | Approximately 5V |
| 37 | P/L | Throttle position sensor power supply | Ignition switch "ON" | Approximately 5V |
| 38<br>47 | W/R | Power supply for ECM | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 39<br>48 | B | Engine control module ground | Engine is running.<br>└ Idle speed | Engine ground |
| 41 | G/Y | Air conditioner switch | Engine is running.<br>└ Both air conditioner switch and blower fan switch are "ON". | Approximately 0V |
| | | | Engine is running.<br>└ Air conditioner switch is "OFF". | BATTERY VOLTAGE (11 - 14V) |
| 43 | PU/W | Power steering oil pressure switch | Engine is running.<br>└ Steering wheel is being turned. | 0V |
| | | | Engine is running.<br>└ Steering wheel is not being turned. | Approximately 5V |
| 44 | B/R | Ignition switch | Ignition switch "OFF" | 0V |
| | | | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 45 | LG/B | Blower fan switch | Engine is running.<br>└ Blower fan switch is "ON". | Approximately 0V |
| | | | Engine is running.<br>└ Blower fan switch is "OFF". | Approximately 5V |
| 46 | W/L | Power supply (Back-up) | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |

## ECM Terminals and Reference Value (Cont'd)

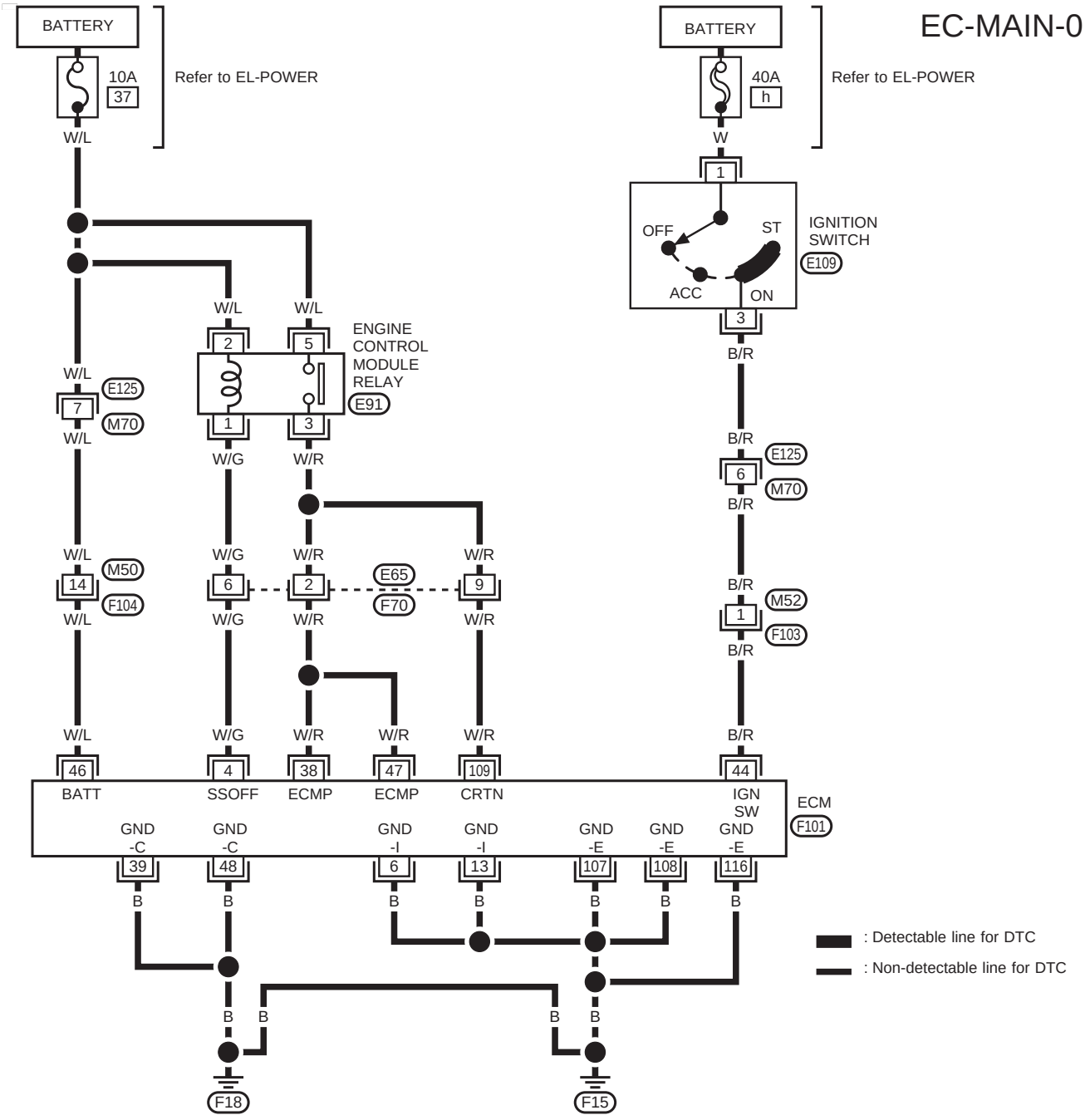
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA |
|---|---|---|---|---|
| 101<br>103 | R/B<br>G/B | Injector No. 1<br>Injector No. 3 | Engine is running. (Warm-up condition)<br>└ Idle speed | BATTERY VOLTAGE (11 - 14V)<br>  <br><br>NEF358 |
| 110<br>112 | Y/B<br>L/B | Injector No. 2<br>Injector No. 4 | Engine is running.<br>└ Engine speed is 2,000 rpm. | BATTERY VOLTAGE (11 - 14V)<br>  <br><br>NEF359 |
| 102 | R/Y | Heated oxygen sensor heater ground | Engine is running.<br>└ Engine speed is above 3,200 rpm. | BATTERY VOLTAGE (11 - 14V) |
| | | | Engine is running.<br>└ Engine speed is below 3,200 rpm. | Approximately 0V |
| 105 | P | EGR valve & EVAP canister purge control solenoid valve | Engine is running. (Warm-up condition)<br>└ Idle speed | Approximately 0V |
| | | | Engine is running. (Warm-up condition)<br>└ Engine speed is 2,000 rpm in 1st position (Raise the vehicle.). | BATTERY VOLTAGE (11 - 14V) |
| 106 | B/P | Fuel pump relay | Ignition switch "ON"<br>└ For 5 seconds after turning ignition switch "ON"<br>Engine is running. | Approximately 0.9V |
| | | | Ignition switch "ON"<br>└ Following a 5 seconds delay after turning ignition switch "ON" and thereafter | BATTERY VOLTAGE (11 - 14V) |
| 107<br>108 | B | Injector ground | Engine is ground.<br>└ Idle speed | Engine ground |

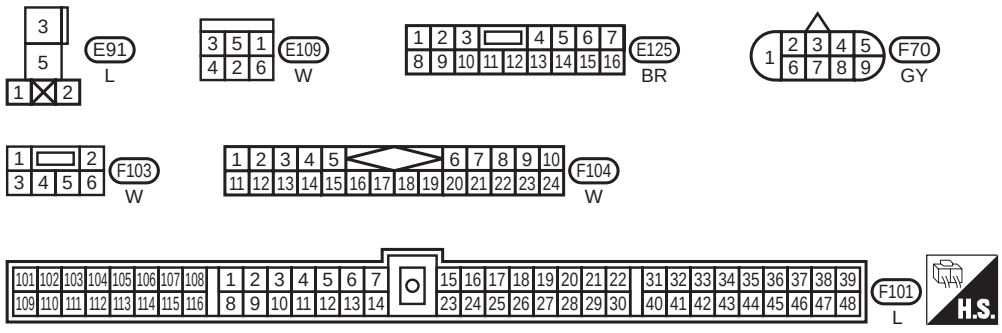
## ECM Terminals and Reference Value (Cont'd)

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA |
|---|---|---|---|---|
| 113 | SB | IACV-AAC valve | Engine is running.<br>└ Idle speed | BATTERY VOLTAGE (11 - 14V)<br>  <br><br>NEF585 |
| | | | Engine is running.<br>└ Engine speed is 2,000 rpm. | 1 - 10V<br>  <br><br>NEF585 |
| 116 | B | Injector ground | Engine is running.<br>└ Idle speed | Engine ground |

## Main Power Supply and Ground Circuit

EC-MAIN-01

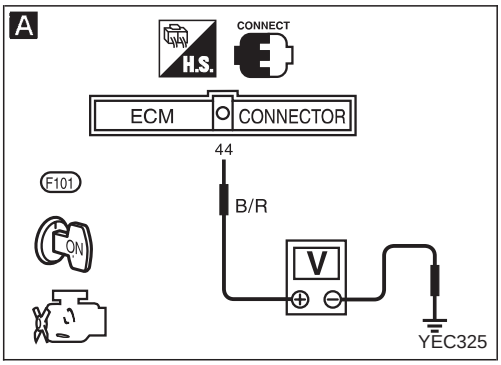


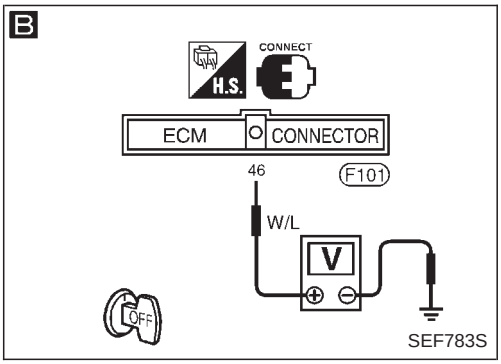

YEC288

# Main Power Supply and Ground Circuit (Cont'd)

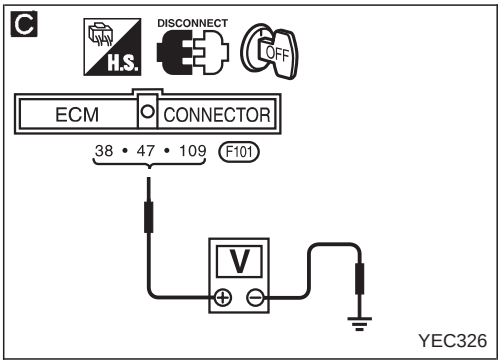
A




B




C




INSPECTION START

Start engine.
**Is engine running?**

No → **A**

**CHECK POWER SUPPLY-I.**
1. Turn ignition switch to "ON" position.
2. Check voltage between ECM connector terminal (44) and ground with CONSULT-II or tester.
   **Voltage: Battery voltage**

If NG, check the following:
- 40A fusible link
- Condition and operation of ignition switch
- Harness connectors (F103), (M52)
- Harness connectors (E125), (M70)
- Harness for open or short-circuit between ECM and ignition switch

If NG, replace 40A fusible link or repair ignition switch, harness or connectors.

OK → Go to **H** "CHECK GROUND CIRCUIT", EC-GA-72.

Yes

**B**

**CHECK POWER SUPPLY-II.**
1. Stop engine.
2. Check voltage between ECM connector terminal (46) and ground with CONSULT-II or tester.
   **Voltage: Battery voltage**

NG → Check the following:
- Harness connectors (F104), (M50)
- Harness connectors (M70), (E125)
- 10A fuse
- Harness for open or short-circuit between ECM and battery.

If NG, replace 7.5A fuse or repair harness or connectors.

OK

**C**

**CHECK POWER SUPPLY-III.**
1. Turn ignition switch to "ON" and then to "LOCK" position.
2. Check voltage between ECM connector terminals (38), (47), (109) and ground with CONSULT-II or tester.
   **After turning ignition switch to "LOCK" position, battery voltage will exist for a few seconds, then drop to approximately 0V.**

OK → Go to **H** "CHECK GROUND CIRCUIT", EC-GA-72.

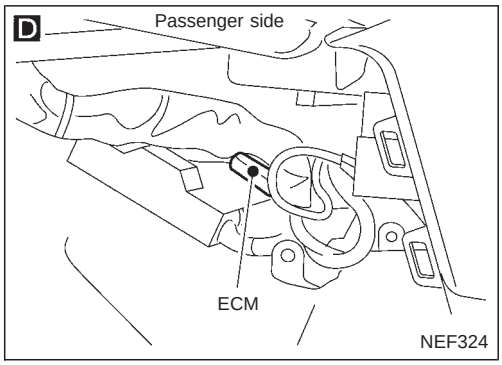
NG

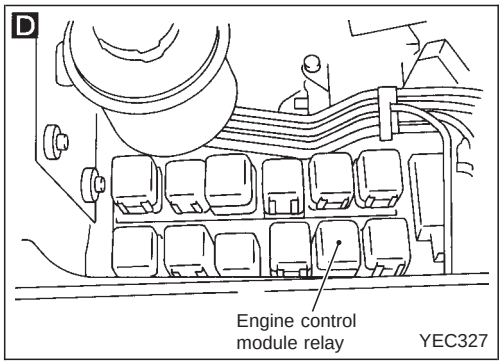
Case-1 → (A)

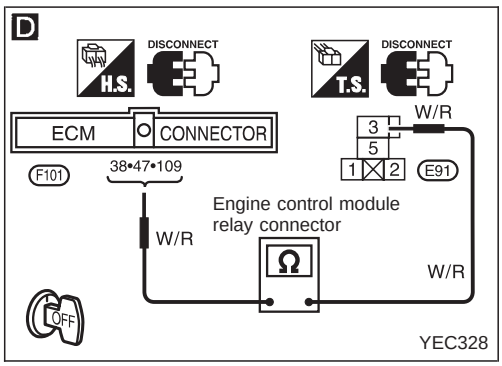
Case-2 → Go to **G** "CHECK ENGINE CONTROL MODULE RELAY" on next page.

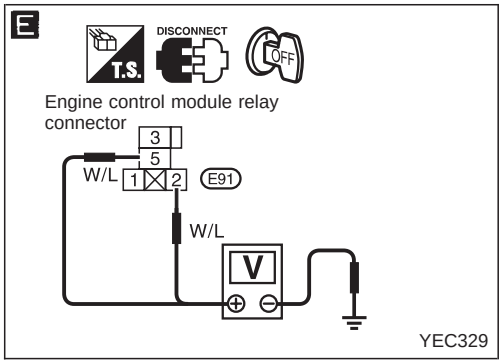
Case-1: Battery voltage does not exist for a few seconds.
Case-2: Battery voltage exists for more than a few seconds.

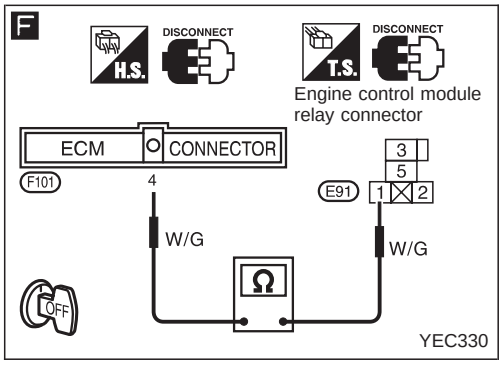
# Main Power Supply and Ground Circuit (Cont'd)




Ⓐ

**D**

**CHECK HARNESS CONTINUITY BETWEEN ENGINE CONTROL MODULE RELAY AND ECM.**

1. Disconnect ECM harness connector.
2. Disconnect engine control module relay.
3. Check harness continuity between ECM connector terminals ㊳, ㊼, ⑩⑨ and engine control module relay connector terminal ③.

**Continuity should exist.**

If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors M65, F70
- Harness for open or short-circuit between ECM and engine control module relay.

If NG, repair harness or connectors.

OK ↓

**E**

**CHECK VOLTAGE BETWEEN ENGINE CONTROL MODULE RELAY AND GROUND.**

Check voltage between engine control module relay connector terminals ②, ⑤ and ground with CONSULT-II or voltage tester.

**Voltage: Battery voltage**

NG → Repair harness or connectors.

OK ↓

**F**

**CHECK OUTPUT SIGNAL CIRCUIT.**

Check harness continuity between ECM connector terminal ④ and engine control module relay connector terminal ①.

**Continuity should exist.**

If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors M65, F70
- Harness for open or short-circuit between ECM and engine control module relay.

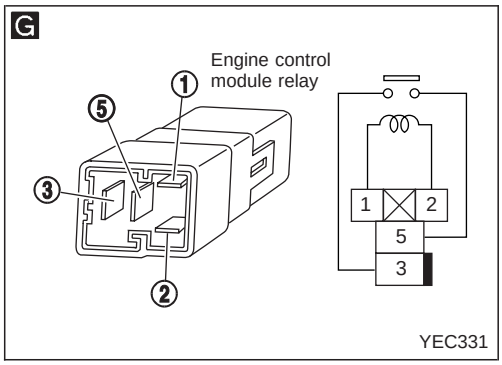
If NG, repair harness or connectors.

OK ↓

Ⓑ

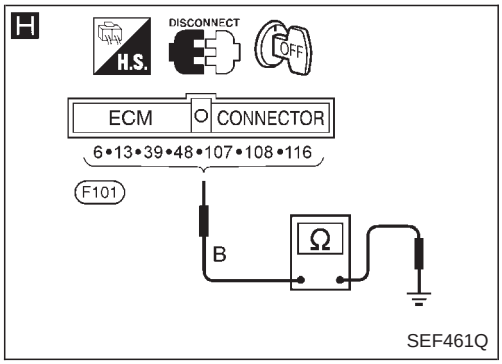
# Main Power Supply and Ground Circuit (Cont'd)

G




YEC331

H




SEF461Q

(B)

G

**CHECK ENGINE CONTROL MODULE RELAY.**

1. Apply 12V direct current between relay terminals (1) and (2).
2. Check continuity between relay terminals (3) and (5).

**12V ((1) - (2)) applied:**
**Continuity ((3) - (5)) exists.**
**No voltage applied:**
**No continuity**

NG → Replace engine control module relay.

OK ↓

H

**CHECK GROUND CIRCUIT.**

1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM connector terminals (6), (13), (39), (48), (107), (108), (116) and engine ground.

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

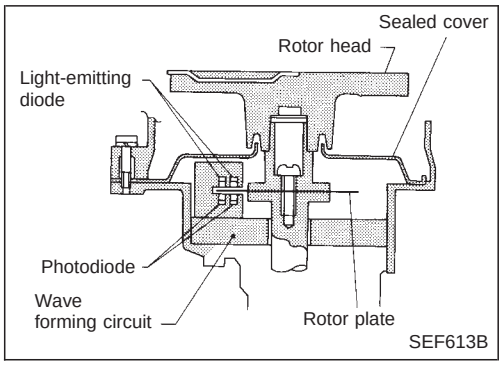
NG → Repair harness or connectors.

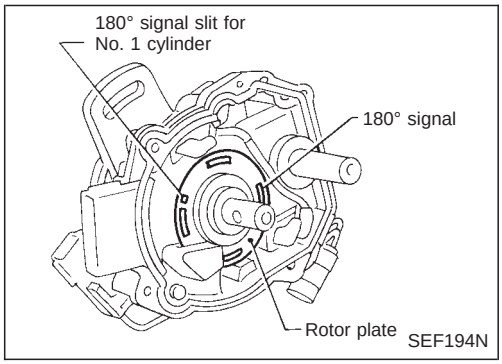
OK ↓

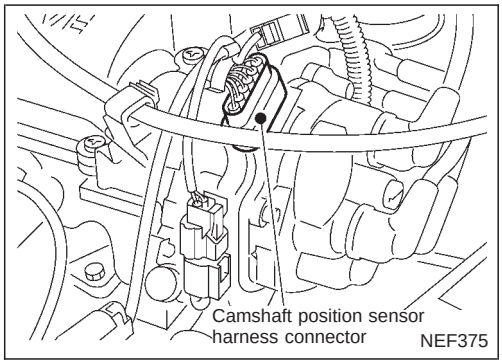
Check ECM pin terminals for damage or the connection of ECM harness connector.

↓

INSPECTION END




## Camshaft Position Sensor (CMPS)

The camshaft position sensor is a basic component of the engine control module. It monitors engine speed and piston position. These input signals to the ECM are used to control fuel injection, ignition timing and other functions.

The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 4 slits for a 180° (REF) signal. The wave-forming circuit consists of Light-emitting Diodes (LED) and photodiodes.

The rotor plate is positioned between the LED and the photo diode. The LED transmits light to the photodiode. As the rotor plate turns, the slits cut the light to generate rough-shaped pulses. These pulses are converted into on-off signals by the wave-forming circuit and sent to the ECM.

The distributor is not repairable and must be replaced as an assembly (except distributor cap).

| Diagnostic Trouble Code No. | Malfunction is detected when .... | Check Items (Possible cause) |
|---|---|---|
| 11 | • 180° signal is not sent to ECM for the first few seconds during engine cranking.<br>.....<br>• The pulse width of 180° signal is smaller than the specified value. | • Harness or connectors (The camshaft position sensor circuit is open or short-circuited.)<br>• Camshaft position sensor<br>• Starter motor (Refer to EL section.)<br>• Starting system circuit (Refer to EL section.)<br>• Dead (Weak) battery |

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

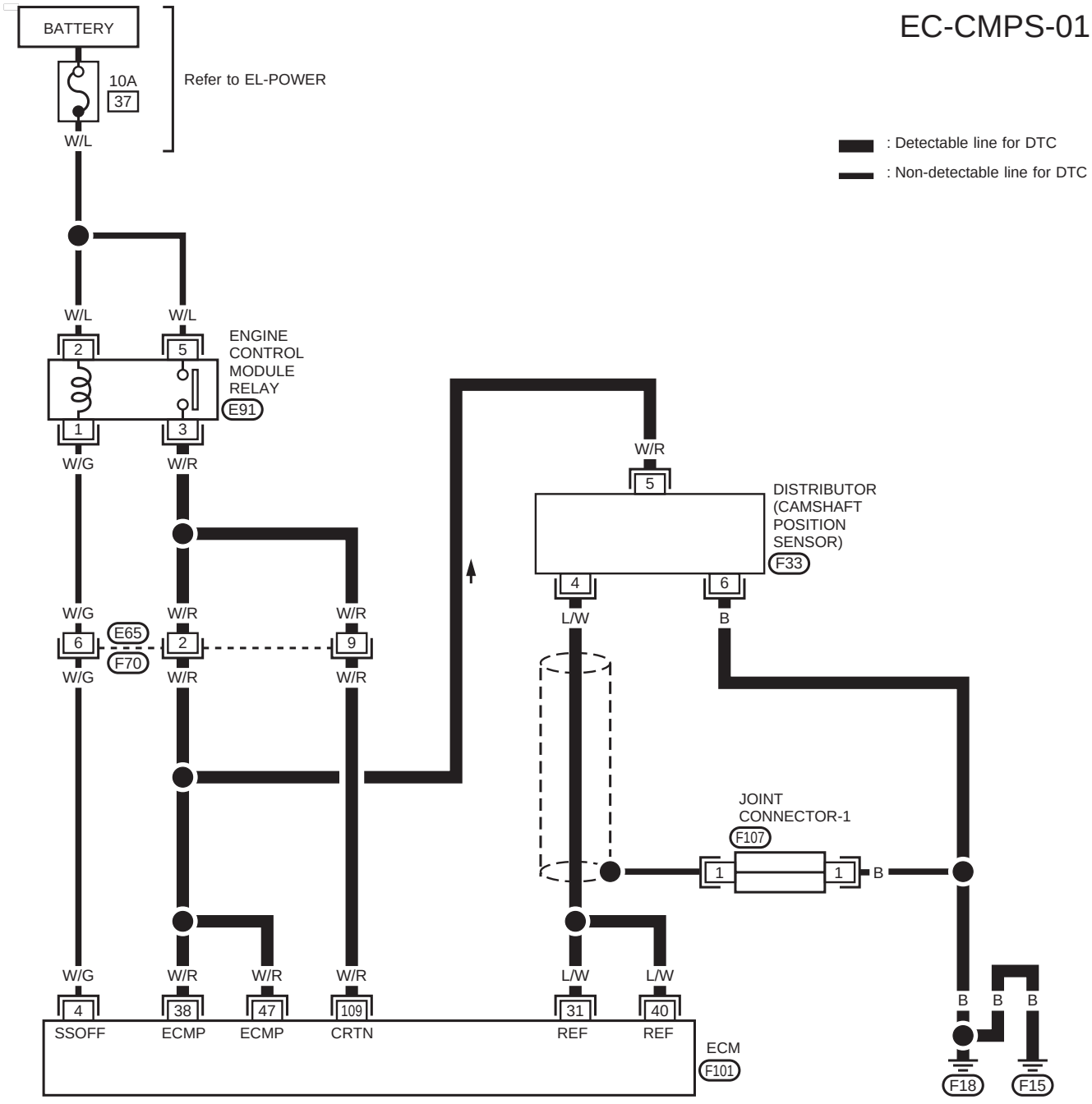
1) Turn ignition switch to ''ON'' position and select ''DATA MONITOR'' mode with CONSULT-II.
2) Crank engine for at least 2 seconds.

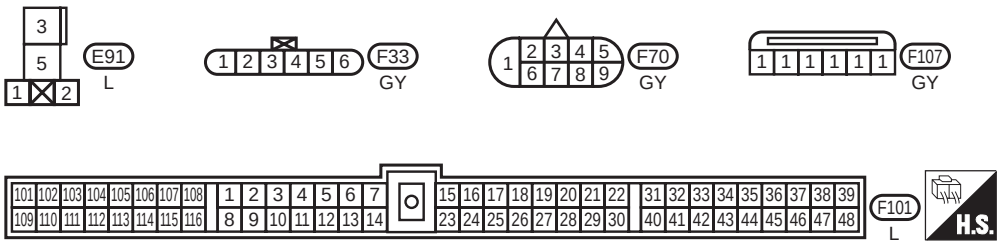
OR

1) Crank engine for at least 2 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) with ECM.

## Camshaft Position Sensor (CMPS) (Cont'd)

EC-CMPS-01



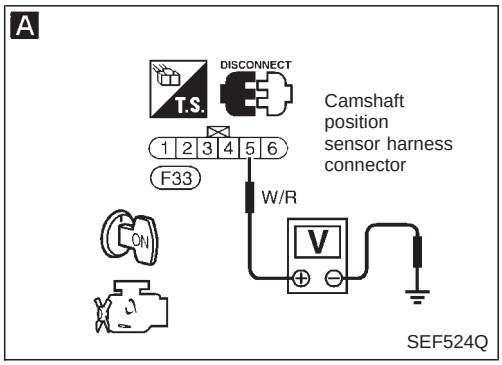




YEC289

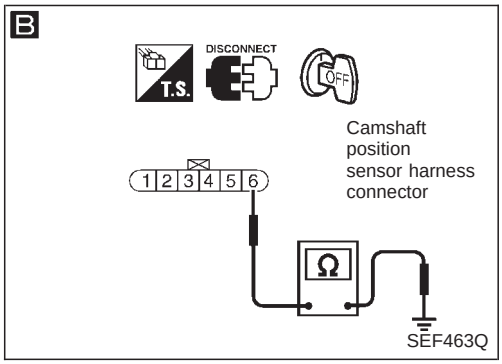
# Camshaft Position Sensor (CMPS) (Cont'd)

## DIAGNOSTIC PROCEDURE

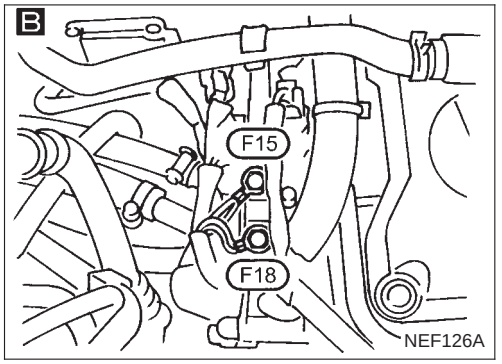
A



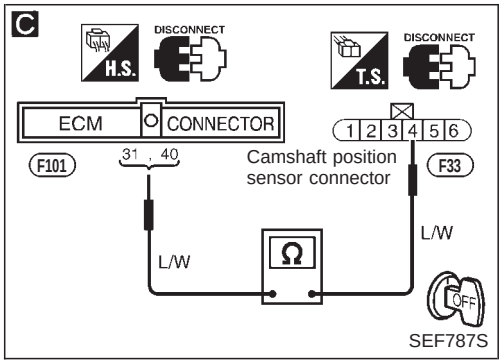

B




B




C




INSPECTION START

A

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

**Voltage: Battery voltage**

NG → Check the following:
- 10A fuse in fusible link holder
- Operation of engine control module relay.
- Harness connectors (F70), (E65)
- Harness for open or short-circuit between camshaft position sensor and engine control module relay.
- Harness for open or short-circuit between engine control module relay and battery power supply.

If NG, replace 10A fuse or engine control module relay, or repair harness or connectors.

OK

B

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between camshaft position sensor connector terminal (6) and engine ground.

**Continuity should exist.**

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

C

**CHECK INPUT SIGNAL CIRCUIT.**
1. Disconnect ECM harness connector.
2. Check harness continuity between camshaft position sensor connector terminal (4) and ECM connector terminals (31) & (40).

**Continuity should exist.**

If OK, check harness for short-circuited.

NG → Repair harness or connectors.

OK

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

NG → Replace camshaft position sensor.

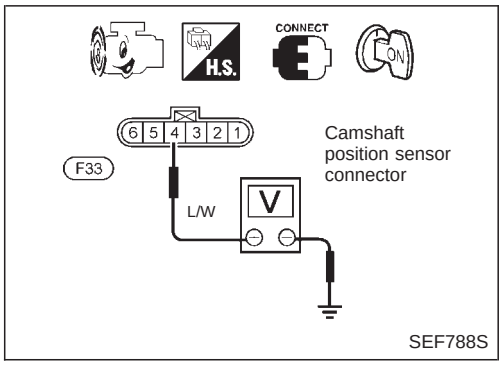
OK

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

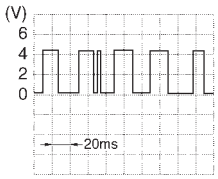
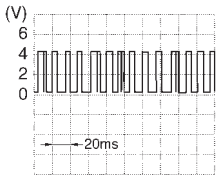



# Camshaft Position Sensor (CMPS) (Cont'd)

## COMPONENT INSPECTION

### Camshaft position sensor

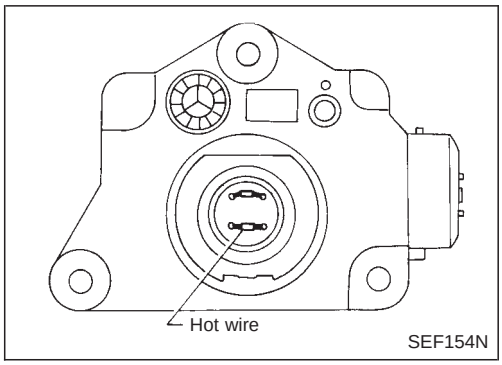
1. Start engine.
2. Check voltage between camshaft position sensor connector terminal ④ and ground with DC range or check pulse signal with oscilloscope under the following conditions:

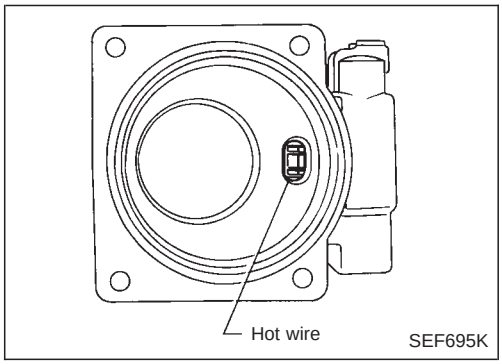
| Condition | Idle | 2,000 rpm |
|---|---|---|
| Voltage | 1.5 - 3.0V | 1.5 - 3.0V |
| Pulse signal |  NEF370 |  NEF371 |

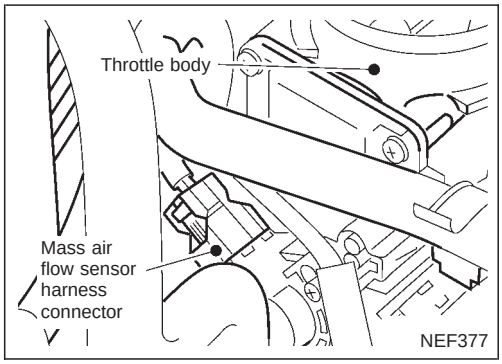


3. If NG, replace distributor assembly with camshaft position sensor.

**After this inspection, diagnostic trouble code No. 11 might be displayed with camshaft position sensor functioning properly. Erase the stored memory.**




## Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the intake air flow rate by analysing from the mass air flow sensor are received by the ECM as on electrical input signal which has a voltage level proportional to a part of the entire flow. Measurements the amount of heat emitted from the hot wire placed in the stream of the intake air.

When intake air flows into the intake manifold through a route around the hot wire, the heat generated from the hot wire is taken connected away by the air. The intensity of heat detected depends on the volume of air flow and in addition, current compensation is introduced so that the temperature of the hot wire is automatically controlled within a limited range °C (°F).

Therefore, when the volume of the air flow is increased it is necessary to supply the hot wire with more electric current in order to maintain the temperature of the hot wire. This enables the ECM to determine the volume of the air flow by means of the electric change.

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

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

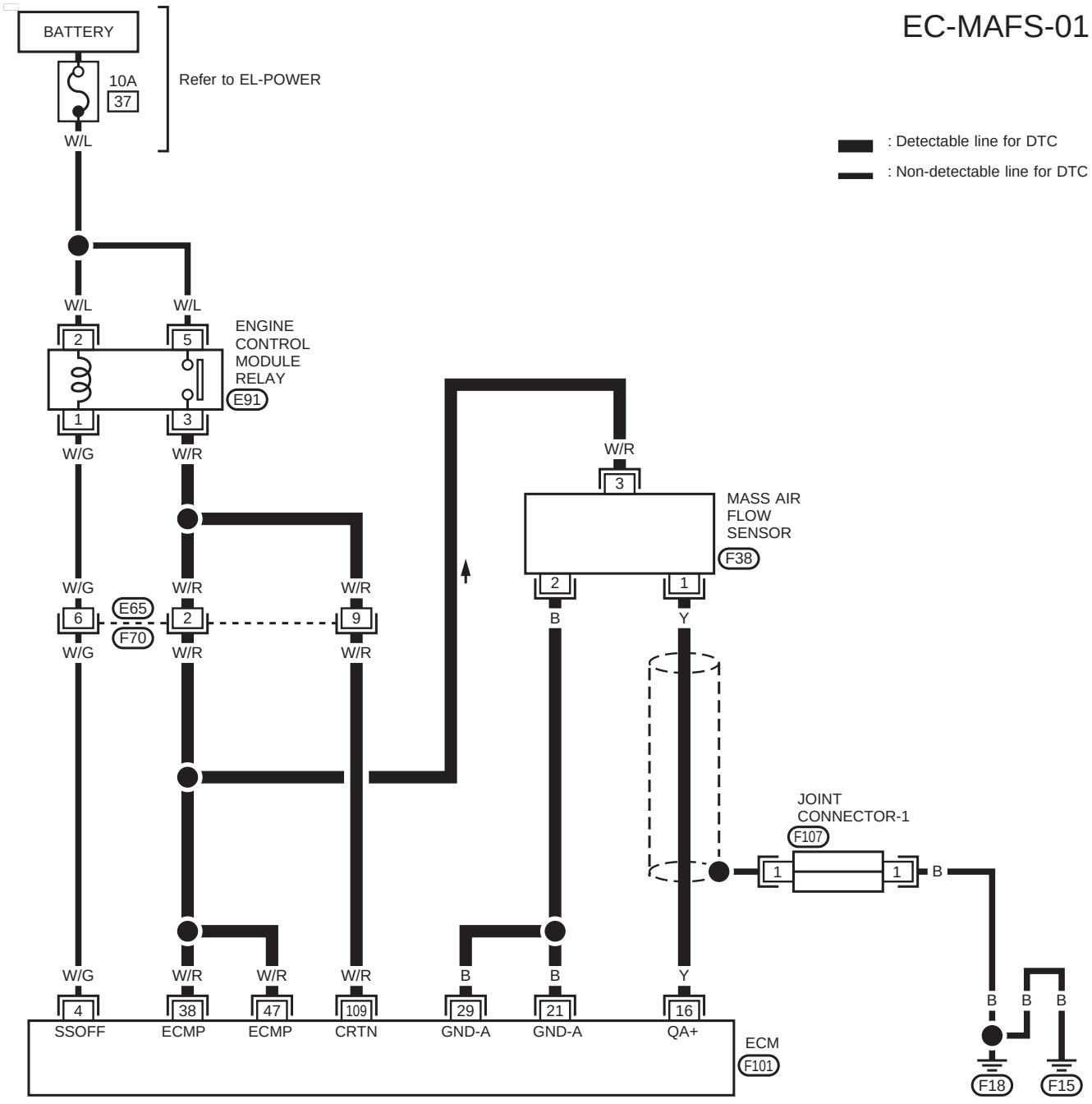
1) Turn ignition switch to ‘‘ON’’ position, and wait at least 6 seconds.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Start engine and wait at least 3 seconds.

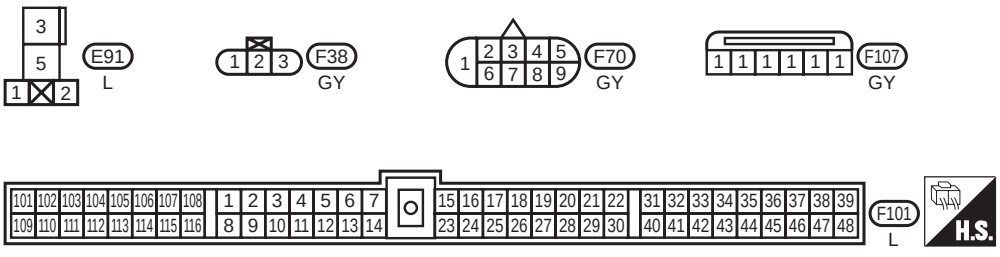
OR

1) Turn ignition switch to ‘‘ON’’ position, and wait at least 6 seconds.
2) Start engine and wait at least 3 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) with ECM.

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

EC-MAFS-01

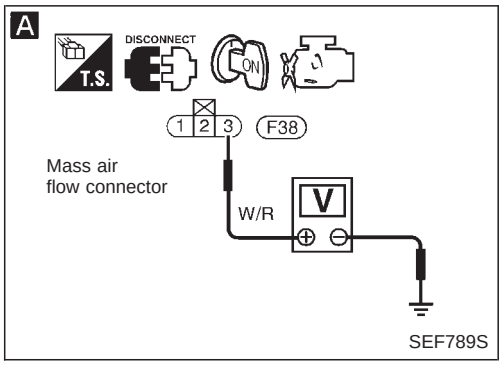


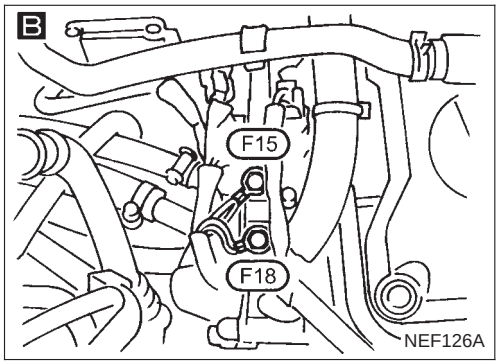



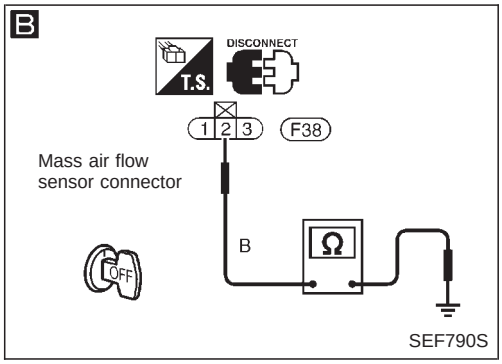

YEC290

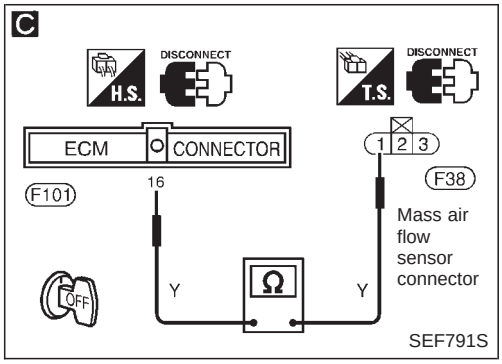
# Mass Air Flow Sensor (MAFS) (Cont'd)

## 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 connector terminal ③ and ground with CONSULT-II or tester.
   **Voltage: Battery positive voltage**

NG → Check the following:
- 10A fuse in fusible link holder
- Operation, of engine control module relay.
- Harness connectors E65, F70
- Harness for open or short-circuit between mass air flow sensor and engine control module relay.
- Harness for open or short-circuit between engine control module relay and battery power supply.

If NG, replace 10A fuse or engine control module relay or repair harness or connectors.

OK

**B**

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between mass air flow sensor connector terminal ② and engine ground.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

**C**

**CHECK INPUT SIGNAL CIRCUIT.**
1. Disconnect ECM harness connector.
2. Check harness continuity between mass air flow sensor connector terminal ① and ECM connector terminal ⑯.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

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.

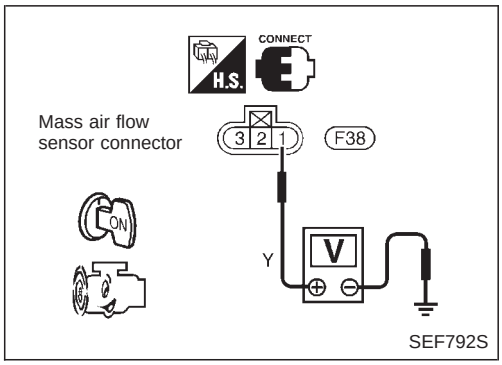
OK

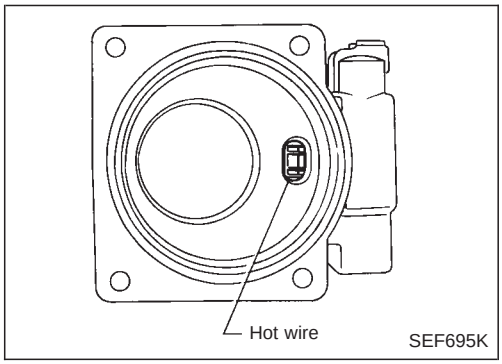
Disconnect and reconnect harness connectors in the circuits. Then retest.

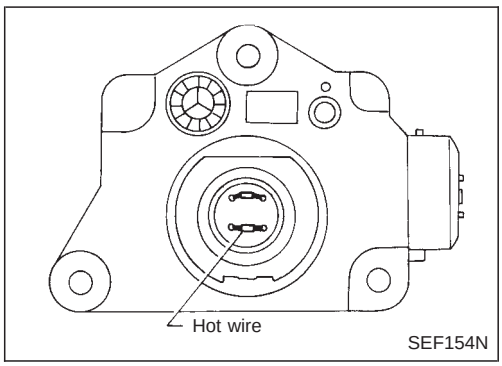
Trouble is not fixed.

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

INSPECTION END




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

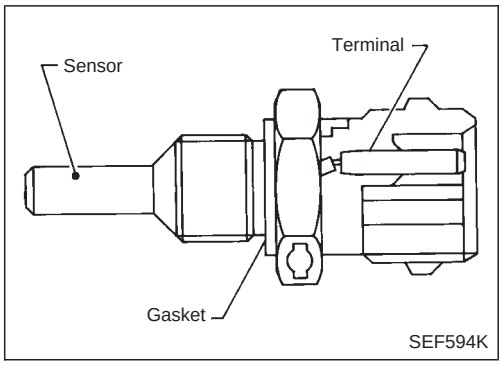
## COMPONENT INSPECTION

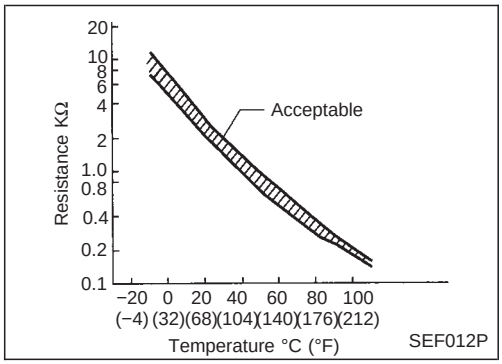
### Mass air flow sensor

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

| Conditions | Voltage V |
|---|---|
| Ignition switch ''ON'' position (Engine stopped.) | Less than 1.0 |
| Idle (Engine is warmed-up sufficiently.) | 1.2 - 1.8 |

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




## Engine Coolant Temperature Sensor (ECTS)

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) | 2.2 | 0.6 - 1.0 |
| 90 (194) | 0.9 | 0.23 - 0.26 |

| 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.)<br>• Engine coolant temperature sensor |

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

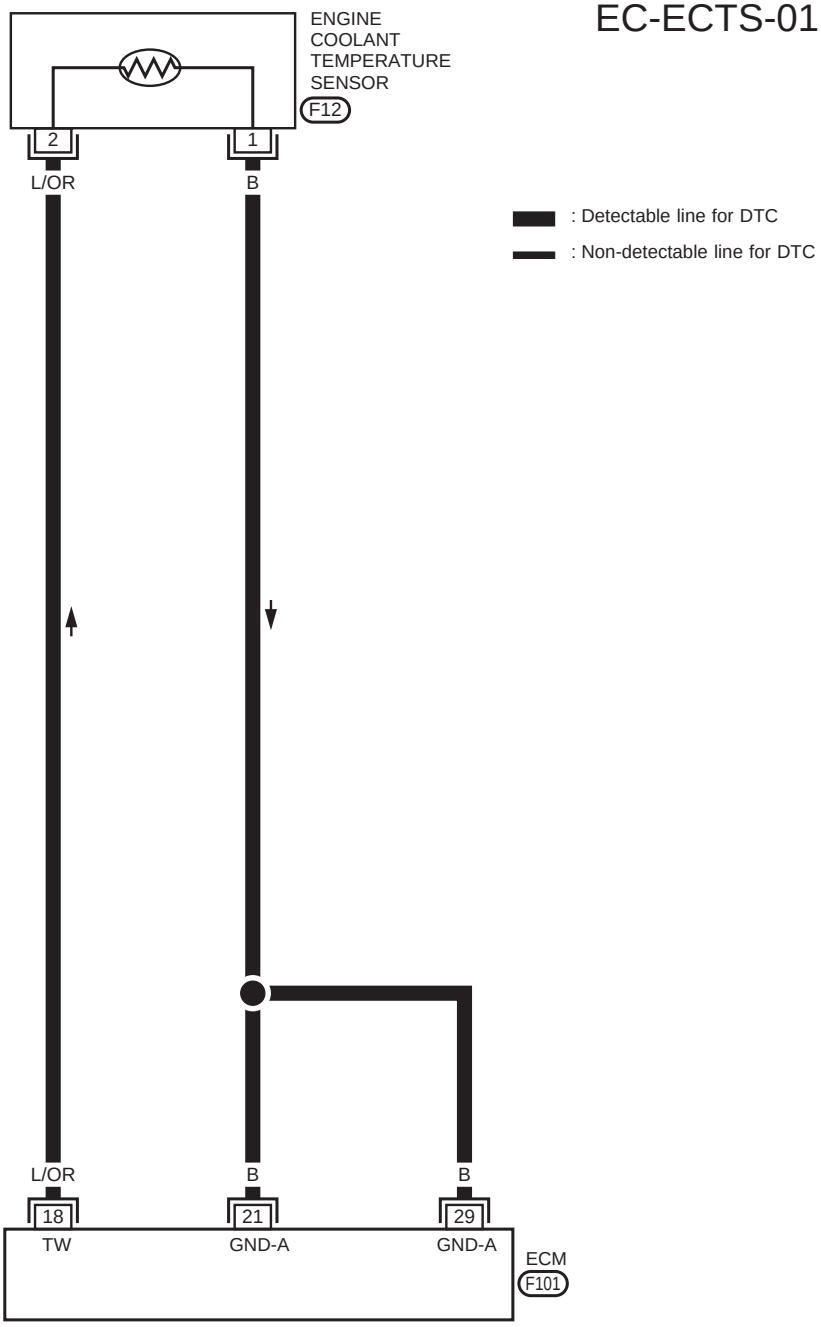
1) Turn ignition switch to ‘‘ON’’ position.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Wait at least 5 seconds.

OR

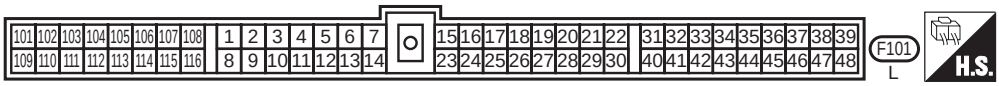
1) Turn ignition switch to ‘‘ON’’ position and wait at least 5 seconds.
2) Turn ignition switch to ‘‘LOCK’’ position, wait at least 5 seconds and then turn to ‘‘ON’’ position.
3) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results) with ECM.

# Engine Coolant Temperature Sensor (ECTS) (Cont'd)

EC-ECTS-01



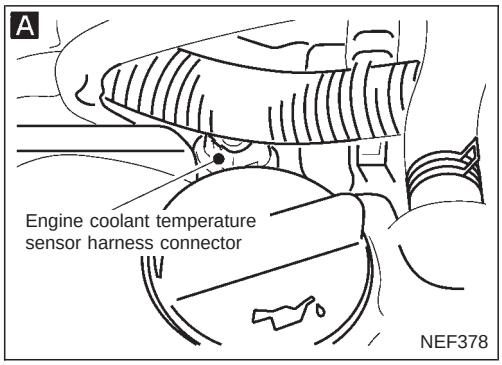


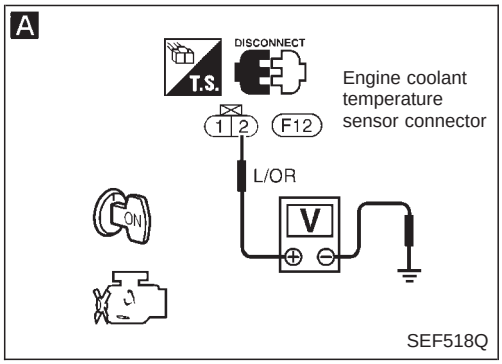


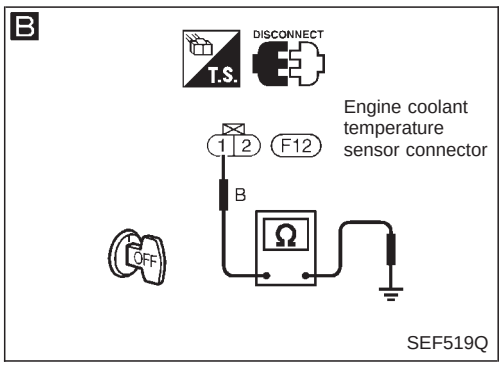

YEC416

# Engine Coolant Temperature Sensor (ECTS) (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 voltage tester.

**Voltage:**
**Approximately 5V**

NG → Check the following:
- Harness for open or short-circuit between ECM and engine coolant temperature sensor.

If 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 → Check the following:
- Harness for open or short-circuit between ECM and engine coolant temperature sensor.

If 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 ↓

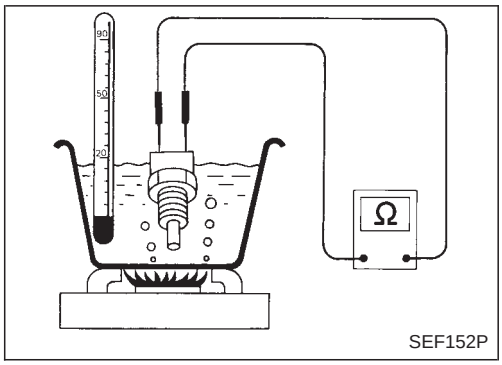
Disconnect and reconnect harness connectors in the circuits. Then retest.

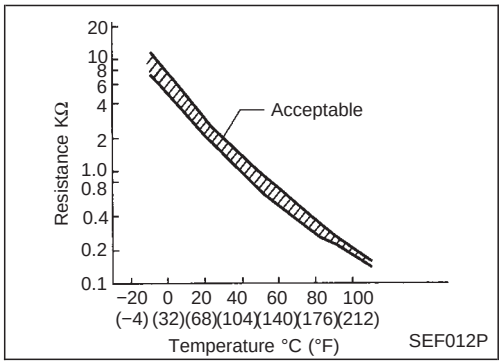
Trouble is not fixed. ↓

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

↓

INSPECTION END




# Engine Coolant Temperature Sensor (ECTS) (Cont'd)

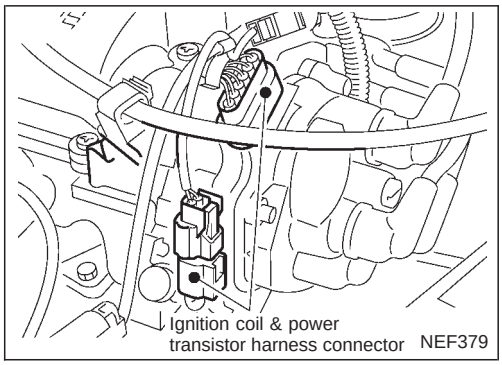
## COMPONENT INSPECTION

### 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 - 1.00 |
| 90 (194) | 0.236 - 0.260 |

If NG, replace engine coolant temperature sensor.


Ignition coil & power transistor harness connector NEF379

## Ignition Signal

### COMPONENT DESCRIPTION

#### Ignition coil & power transistor (Built into distributor)

The ignition coil is built into the distributor. The ignition signal from the ECM is sent to the power transistor. The power transistor switches the ignition coil primary circuit on and off. As the primary circuit is turned on and off, the required high voltage is induced in the coil of the secondary circuit.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| 21 | ● The ignition signal in the primary circuit is not entered to ECM during engine cranking or running. | ● Harness or connectors (The ignition primary circuit is open or shorted.)<br>● Power transistor unit.<br>● Resistor<br>● Camshaft position sensor<br>● Camshaft position sensor circuit |

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

**Note: If both DTC 11 and 21 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 11 first. Refer to EC-GA-73.**

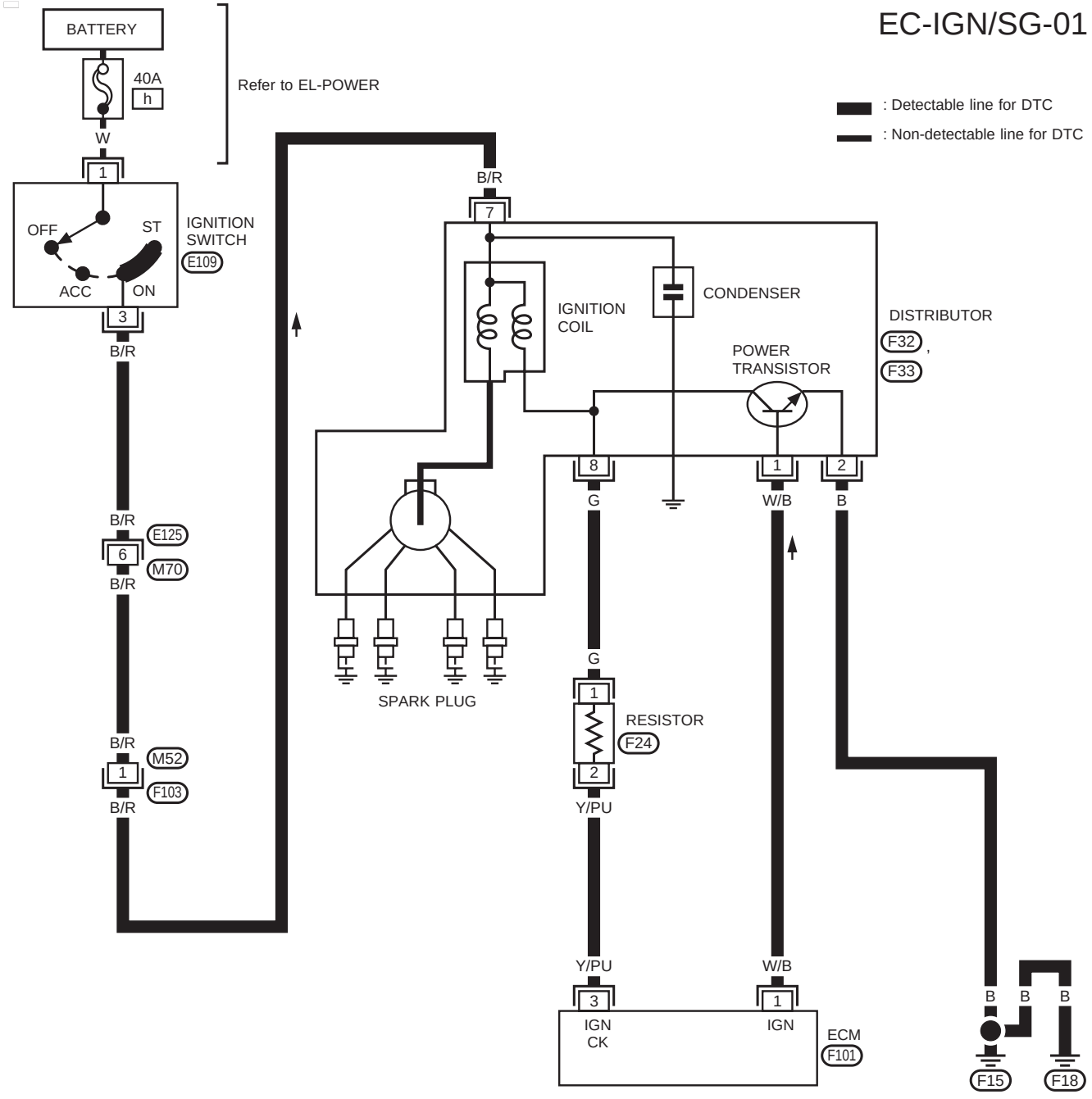
1) Turn ignition switch to ''ON'' position.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Start engine.

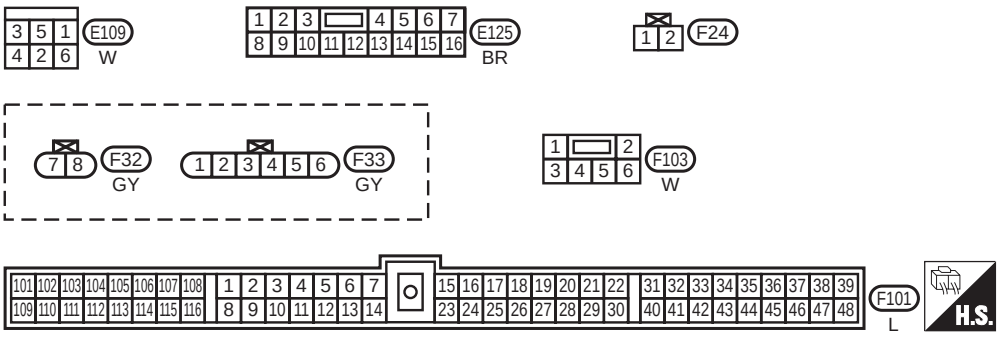
OR

1) Turn ignition switch to ''ON'' position.
2) Start engine.
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) with ECM.

## Ignition Signal (Cont'd)

EC-IGN/SG-01

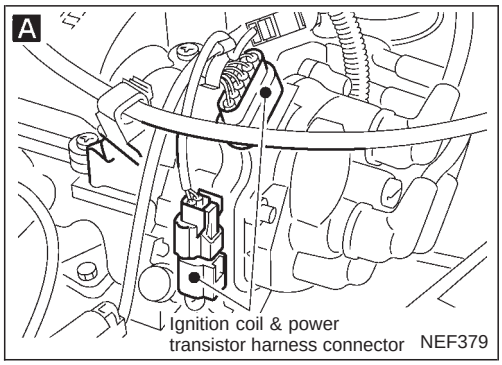


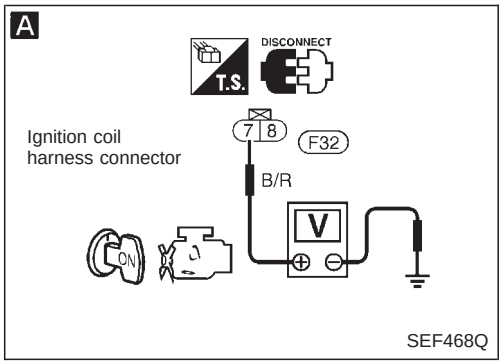



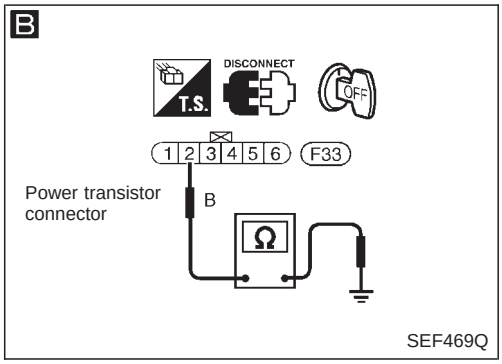

YEC291

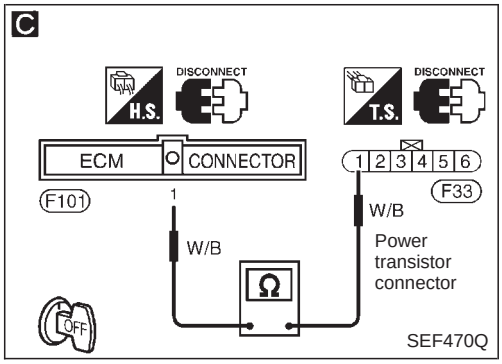
# Ignition Signal (Cont'd)

## DIAGNOSTIC PROCEDURE




INSPECTION START

Turn ignition switch to "LOCK" position, and restart engine.
**Is engine running?**

Yes → Ⓐ

No

**A**

**CHECK POWER SUPPLY.**
1. Turn ignition switch to "OFF" position.
2. Disconnect ignition coil harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between ignition coil connector terminal ⑦ and ground with CONSULT-II or tester.
   **Voltage: Battery voltage**

NG → Check the following:
- 40A fusible link.
- Condition and operation of ignition switch.
- Harness continuity between battery power supply and ignition switch.
- Harness connectors E125, M70
- Harness connectors M52, F103
- Harness for open or short-circuit between ignition coil and ignition switch.

If NG, replace 40A fusible link or repair ignition switch, harness or connectors.

OK

**B**

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Disconnect power transistor harness connector.
3. Check harness continuity between power transistor connector terminal ② and engine ground.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

**C**

**CHECK INPUT SIGNAL CIRCUIT.**
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ① and power transistor connector terminal ①.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENTS (Ignition coil, power transistor).
Refer to "COMPONENT INSPECTION", EC-GA-89.

NG → Replace malfunctioning component(s).

OK

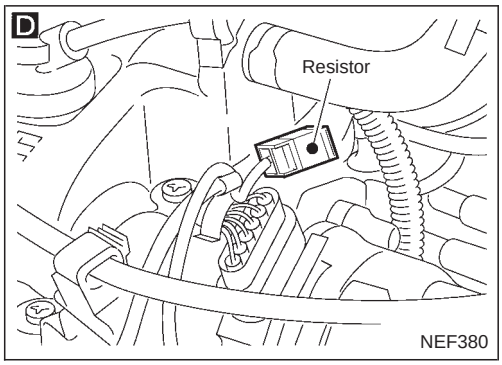
Disconnect and reconnect harness connectors in the circuit. Then retest.

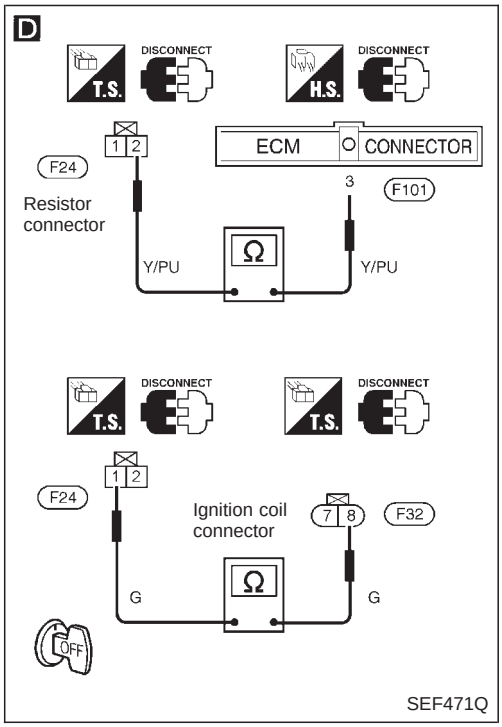
Trouble is not fixed.

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

INSPECTION END

# Ignition Signal (Cont'd)




Ⓐ

**D**

**CHECK INPUT SIGNAL CIRCUIT.**
1. Stop engine.
2. Disconnect ignition coil harness connector.
3. Strip tape covering resistor and disconnect the resistor connector.
4. Disconnect ECM harness connector.
5. Check harness continuity between ignition coil connector terminal Ⓑ and resistor terminal ①; resistor connector terminal ② and ECM connector terminal ③.

**Continuity should exist.**

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENTS (Resistor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace resistor.

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.

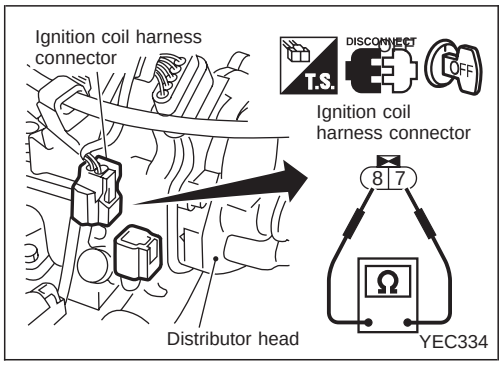
↓

INSPECTION END

# Ignition Signal (Cont'd)

## COMPONENT INSPECTION

### Ignition coil




1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

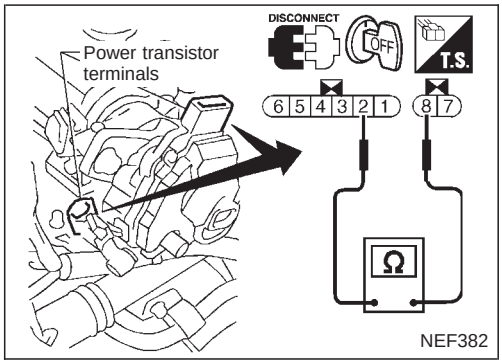
| Terminal | Resistance [at 25°C (77°F)] |
|---|---|
| ⑦ - ⑧ (Primary coil) | Approximately 1 Ω |
| ⑦ - secondary terminal on distributor head (Secondary coil) | Approximately 10 kΩ |

If NG, replace ignition coil.

3. For checking secondary coil, remove distributor cap.
4. Check resistance between ignition coil harness connector terminal ⑦ and the secondary terminal on the distributor head.

If NG, replace distributor.

### Power transistor

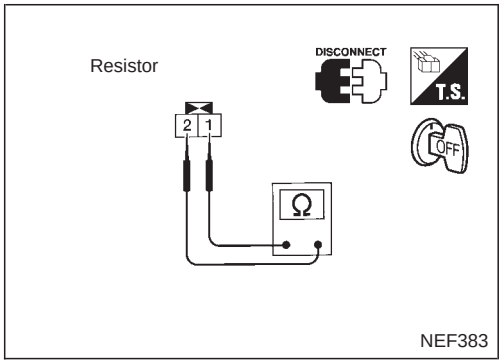



1. Disconnect power transistor harness connector.
2. Check power transistor resistance between terminals ② and ⑧.

| Terminals | Resistance | Result |
|---|---|---|
| ② and ⑧ | Not 0Ω | OK |
| | 0Ω | NG |

If NG, replace distributor.

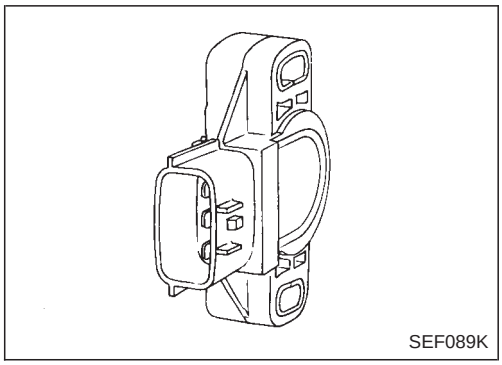
### Resistor

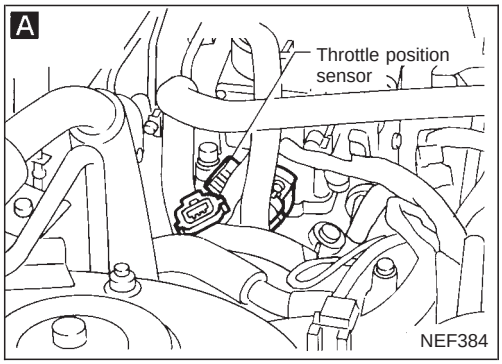



1. Disconnect resistor harness connector.
2. Check resistance between resistor terminals ① and ②.

**Resistance: Approximately 2.2 kΩ [at 25°C (77°F)]**

If NG, replace resistor.

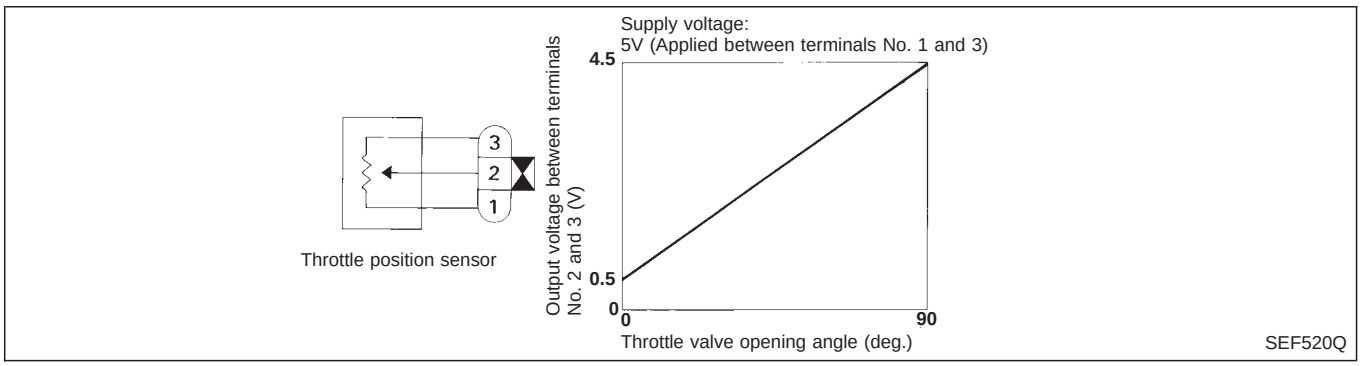

SEF089K




## Throttle Position Sensor

The throttle position sensor responds to the accelerator pedal movement. This sensor is a potentiometer which converts forms the throttle position into a proportional output voltage, which is then used as an input voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and so also feeds the rate of change in voltage signal to the ECM.

Idle position of the throttle valve is determined by the ECM based upon the signal received from the throttle position sensor and also controls engine operation such as fuel cut.

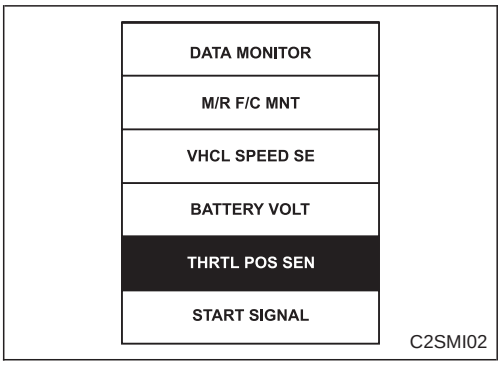


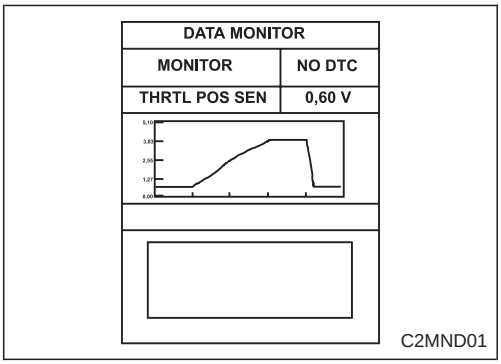

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| 43 | ● An excessively low or high voltage from the sensor is sent to ECM. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Throttle position sensor |

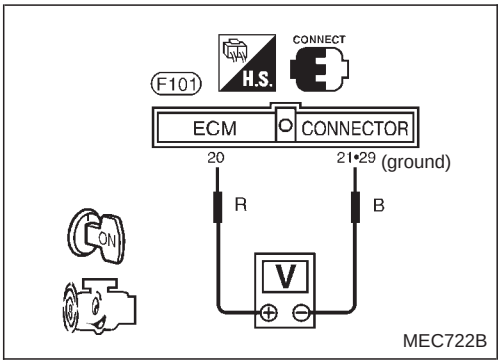
## Throttle Position Sensor (Cont'd)

### OVERALL FUNCTION CHECK

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



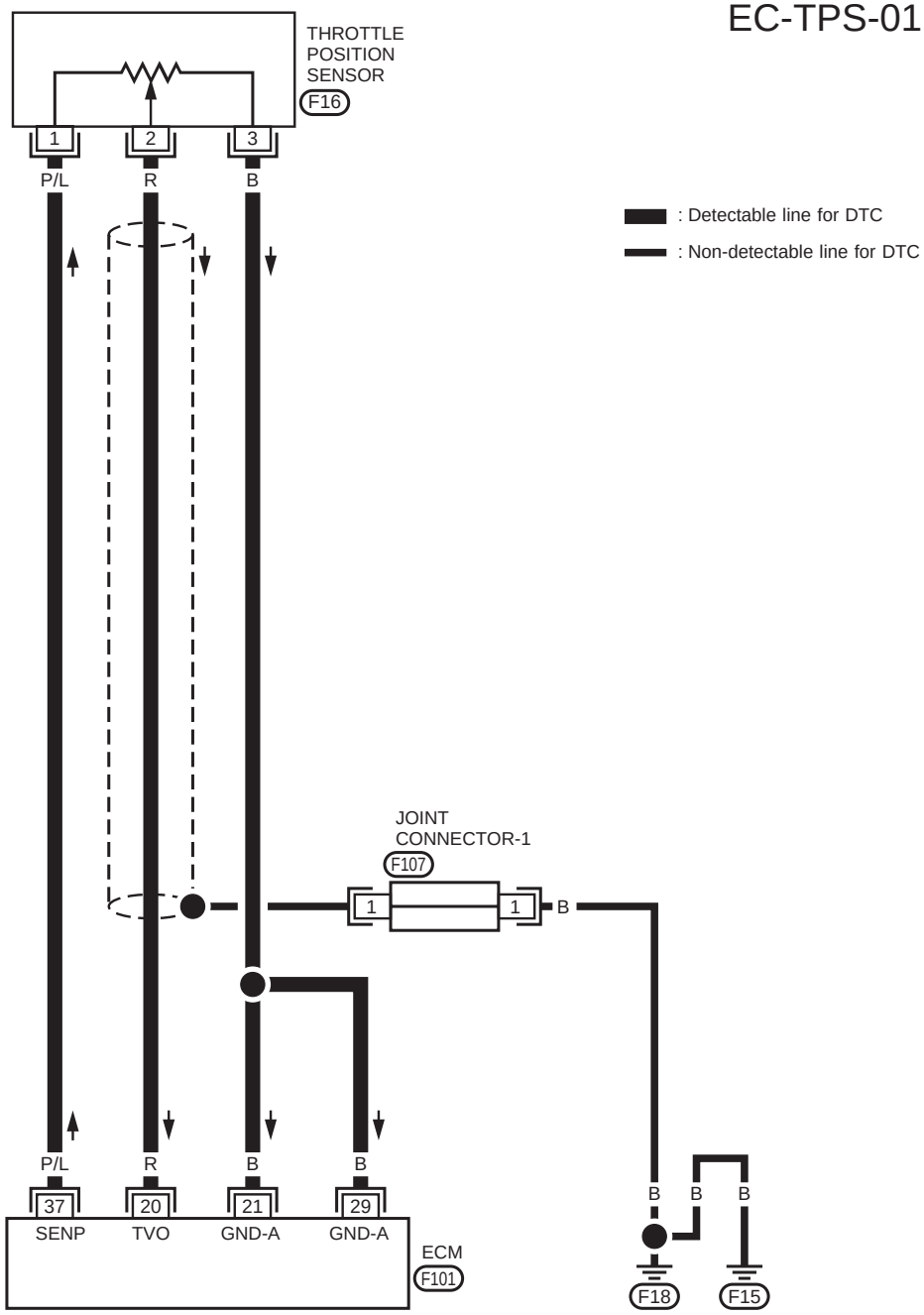

1) Turn ignition switch to "ON" position.
2) Select "THRTL POS SEN" in "DATA MONITOR" (SELECTION FROM MENU) mode with CONSULT-II.
3) Change display mode to "Line graph display".
4) Press START.
5) Monitor the display whilst the accelerator pedal is depressed.
6) Check the following:
   - The voltage when accelerator pedal is fully released is approximately 0.35 - 0.65V.
   - The voltage rise is linear in response to accelerator pedal depression.
   - The voltage when accelerator pedal is fully depressed is approximately 4V.

OR

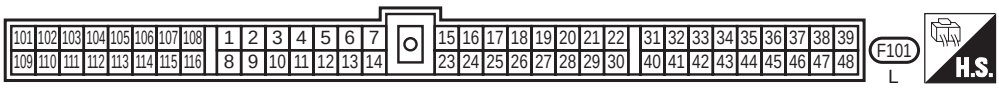
1) Turn ignition switch to "ON" position.
2) Check the voltage between ECM connector terminals ⑳ and ㉑, ㉙ (ground) and check the following:
   - The voltage when accelerator pedal is fully released is approximately 0.35 - 0.65V.
   - The voltage rise is linear in response to accelerator pedal depression.
   - The voltage when accelerator pedal is fully depressed is approximately 4V.

## Throttle Position Sensor (Cont'd)

EC-TPS-01





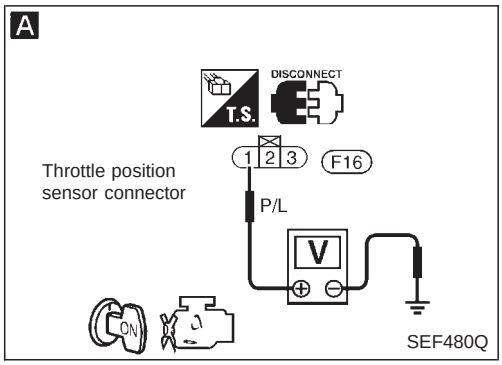



YEC322

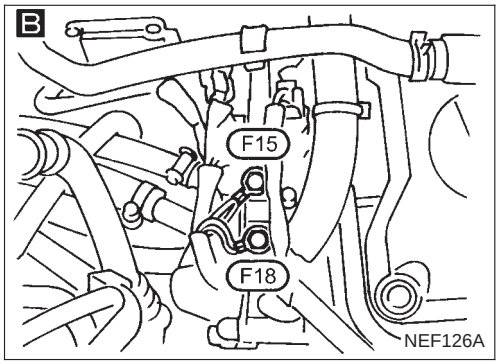
# Throttle Position Sensor (Cont'd)

## DIAGNOSTIC PROCEDURE

A




B

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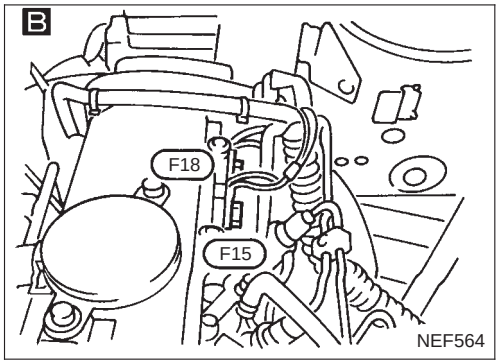


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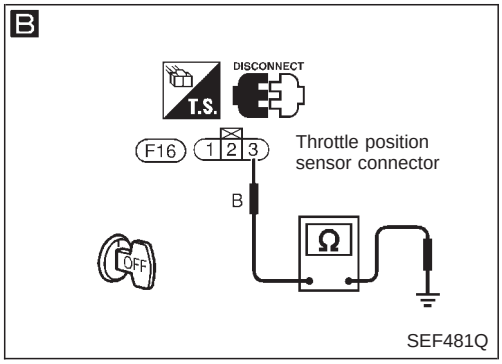
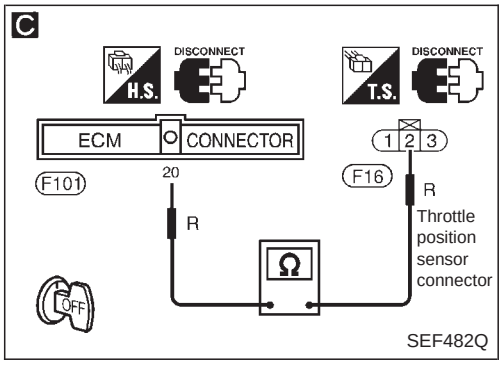



C




INSPECTION START

A

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

**Voltage: Approximately 5V**

NG → Repair harness or connectors.

OK

B

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between throttle position sensor connector terminal ③ and engine ground.

**Continuity should exist.**

If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and throttle 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 connector terminal ⑳ and throttle position sensor connector terminal ②.

**Continuity should exist.**

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

ADJUST THROTTLE POSITION SENSOR.
Perform "Basic Inspection", EC-GA-53.

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

NG → Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-GA-53.

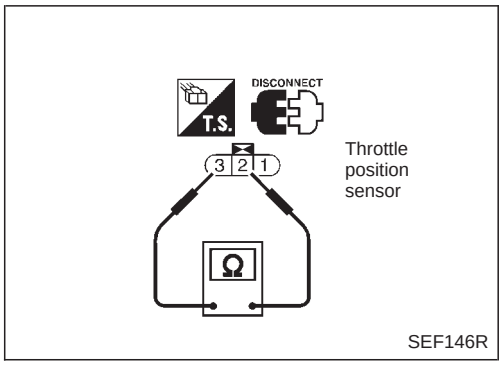
OK

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




# Throttle Position Sensor (Cont'd)

## COMPONENT INSPECTION

### Throttle position sensor

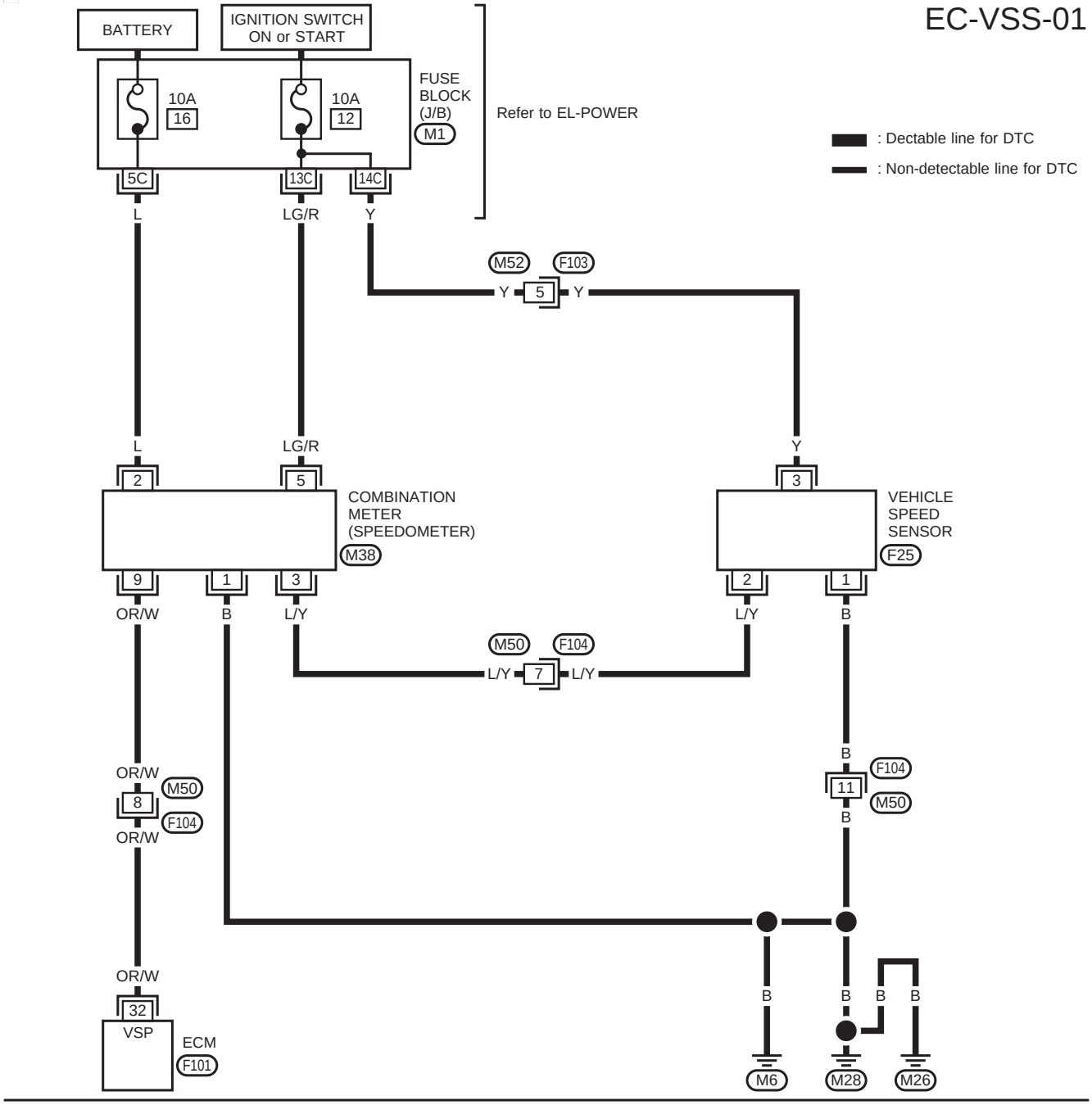
1. Disconnect throttle position sensor harness connector.
2. Make sure that resistance between throttle position sensor terminals ② and ③ changes when opening throttle valve manually.

| Throttle valve conditions | Resistance [at 25°C (77°F)] |
|---|---|
| Completely closed | Approximately 0.5 kΩ |
| Partially open | 0.5 - 4.0 kΩ |
| Completely open | Approximately 4.0 kΩ |

If NG, replace throttle position sensor. To adjust it, perform ''Basic Inspection'', EC-GA-53.

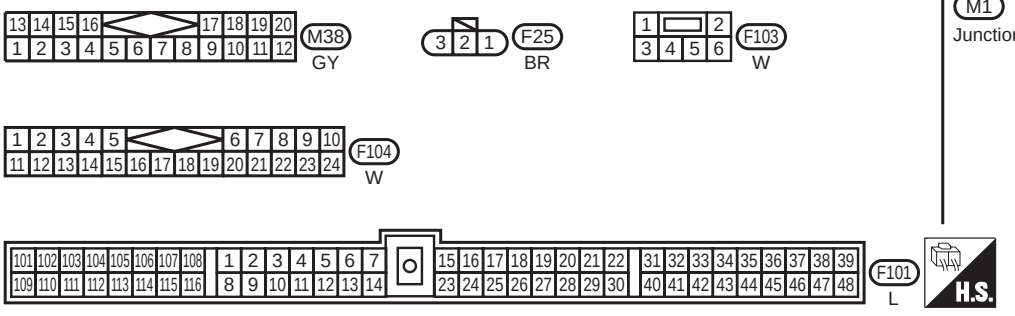
## Vehicle Speed Sensor (VSS)

EC-VSS-01




REFER TO THE FOLLOWING

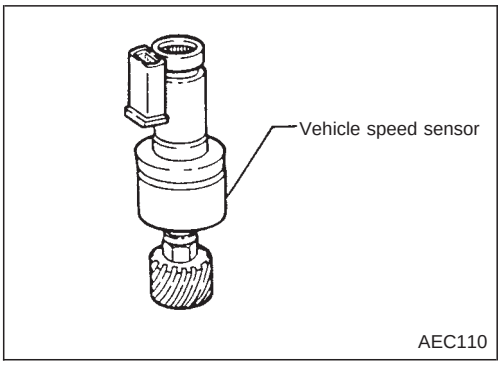
M1 FUSE BLOCK - Junction Box (J/B)

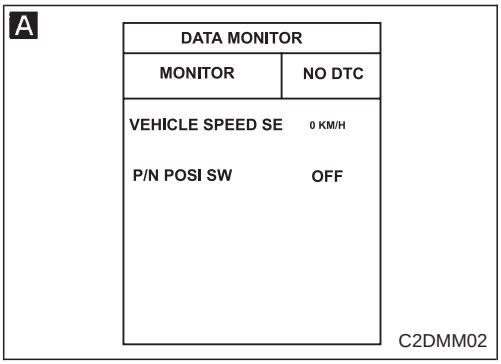


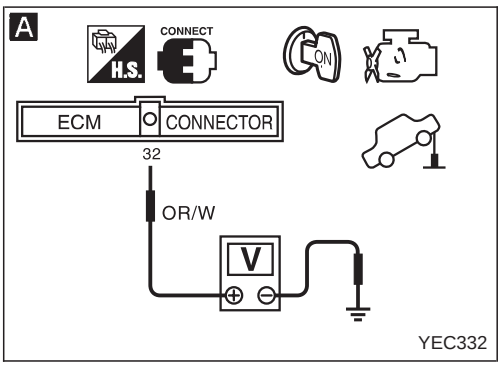

YEC292

## Vehicle Speed Sensor (VSS) (Cont'd)

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 PROCEDURE

INSPECTION START

A

**CHECK OVERALL FUNCTION.**

1. Jack up drive wheels.
2. Read "VHCL SPEED SE" signal in "DATA MONITOR" mode with CONSULT-II.

**CONSULT-II value should be the same as the speedometer indication.**

OK → INSPECTION END

OR

2. Turn ignition switch to "ON" position.
3. Rotate drive wheel by hand.
4. Check voltage between ECM connector terminal (32) and body ground.

**Voltage should vary between approx. 0 - 4.2V.**

NG

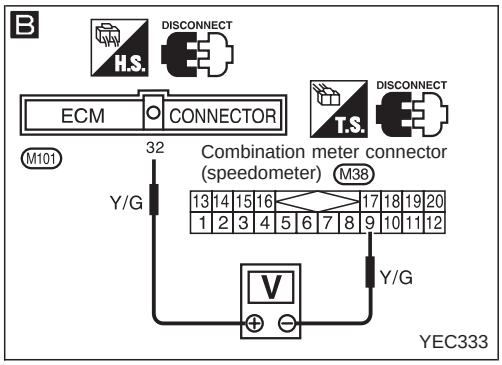
CHECK SPEEDOMETER FUNCTION. Make sure that speedometer functions properly.

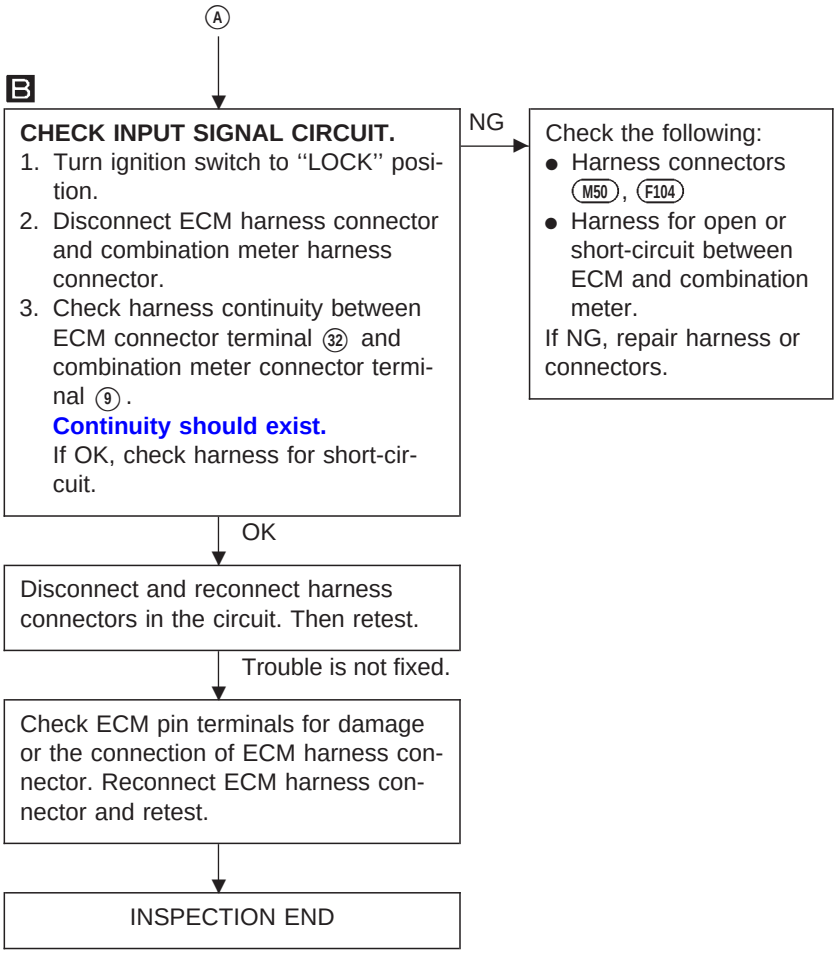
NG → Check vehicle speed sensor and circuit. (Refer to "Inspection/ Speedometer and Vehicle Speed Sensor" of "METER AND GAUGES" in EL section.)

OK

Ⓐ

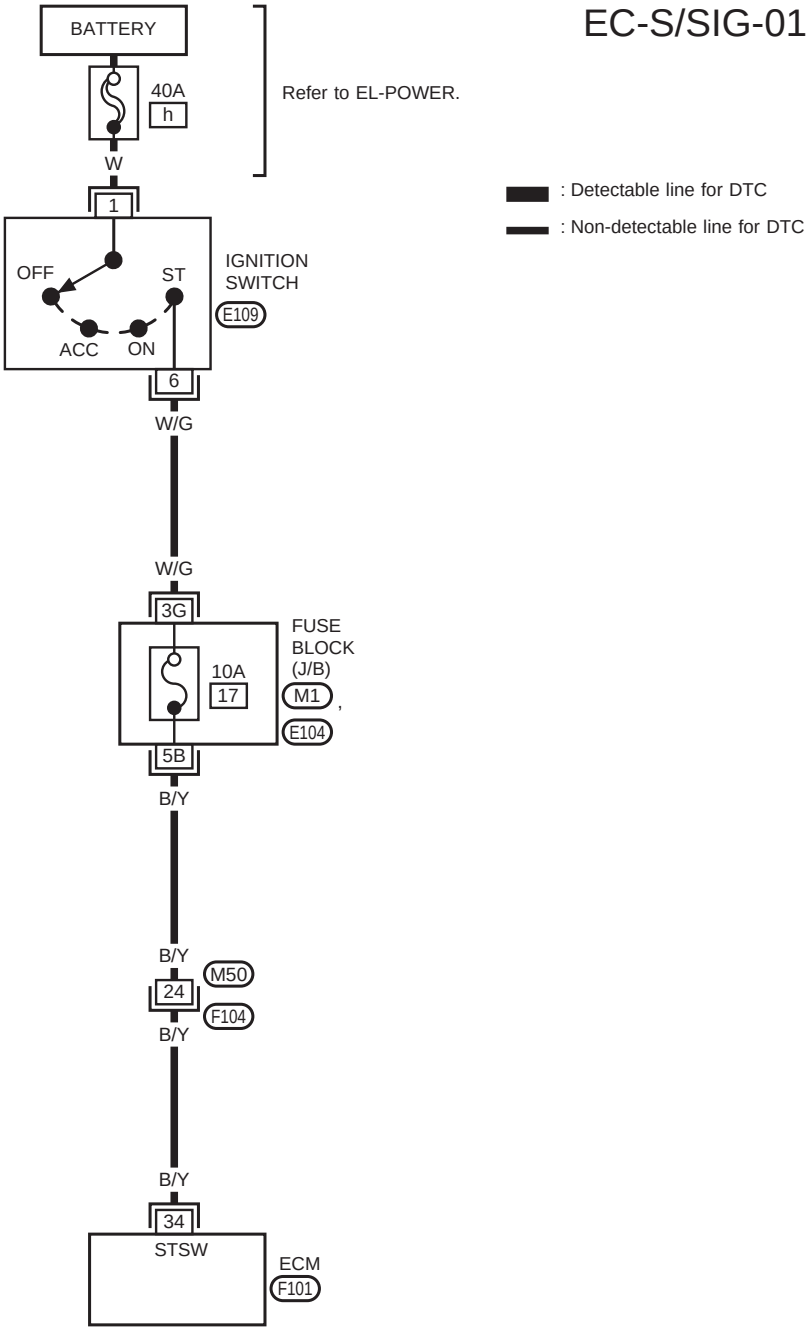
## Vehicle Speed Sensor (VSS) (Cont'd)

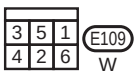


## Start Signal

EC-S/SIG-01



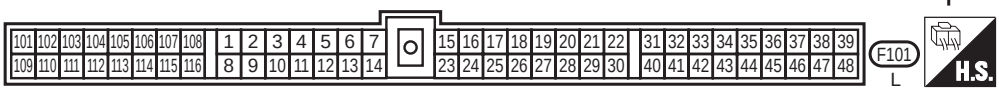





REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

E104 FUSE BLOCK - Junction Box (J/B)




YEC293

# Start Signal (Cont'd)

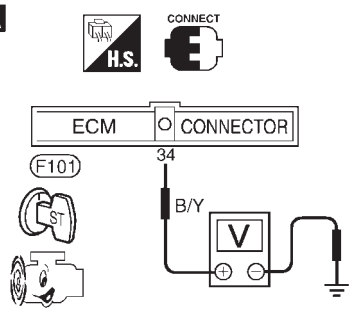
## DIAGNOSTIC PROCEDURE

A

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

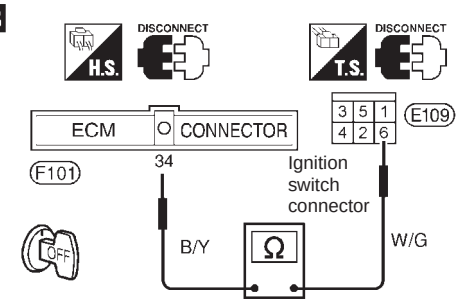
PEF111P

A




MEC725B

B




MEC760B

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 |

OR

1. Turn ignition switch to "START" position.
2. Check voltage between ECM connector terminal (34) and ground.

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

OK → INSPECTION END

NG

Check if 10A fuse, 40A fusible link and operation of ignition switch is OK.

NG → Replace 10A fuse or 40A fusible link, or repair ignition switch.

OK

B

**CHECK INPUT SIGNAL CIRCUIT.**

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and ignition switch harness connector.
3. Check harness continuity between ECM connector terminal (34) and ignition switch connector terminal (6).

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

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness connectors (M1), (E104)
- Harness for open or short-circuit between ECM and ignition switch.

If NG, repair harness or connectors.

OK

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

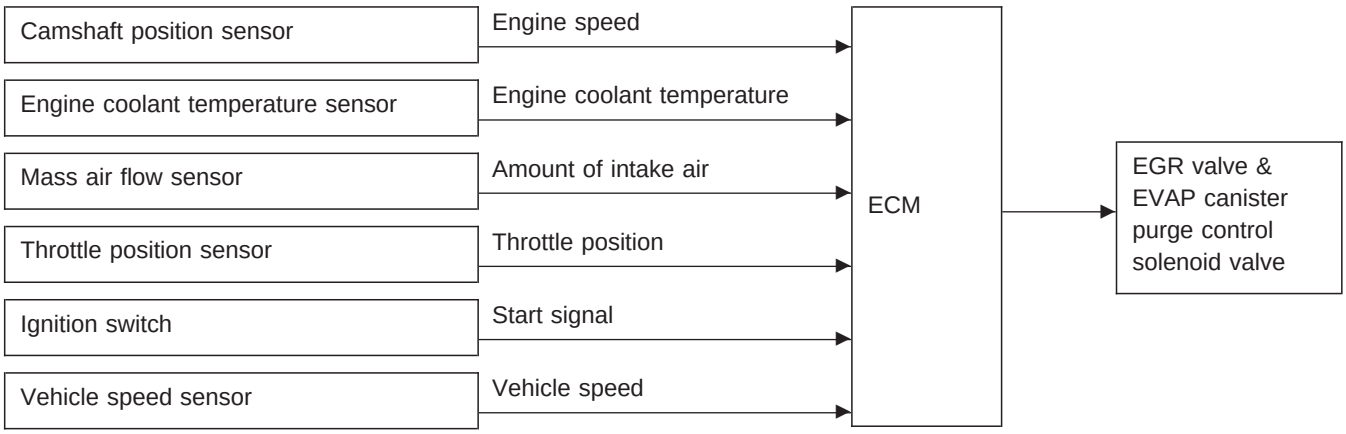
Trouble is not fixed.

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

INSPECTION END

# EGR Valve and EVAP Canister Purge Control Solenoid Valve

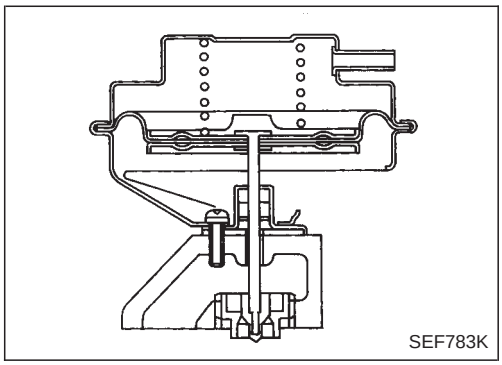
## SYSTEM DESCRIPTION

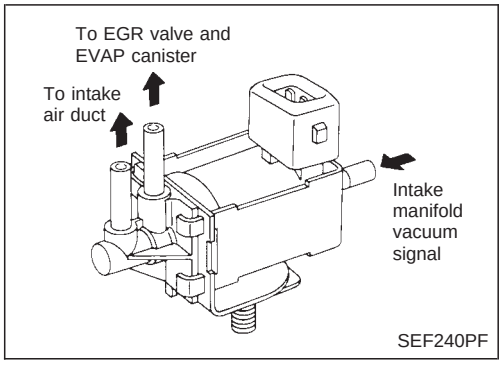



This system cuts and controls the port vacuum applied to the EGR valve and EVAP canister purge control solenoid valve to suit engine operating conditions.
This cut-and-control operation is accomplished through the ECM. When the ECM detects any of the following conditions, current flows through the solenoid valve in the EGR valve and EVAP canister purge control solenoid valve control vacuum line.

This causes the port vacuum to be discharged into the atmosphere so that the EGR valve and EVAP canister purge line remains closed.

- Engine starting
- Closed throttle position
- Low and high engine coolant temperature
- During deceleration
- Engine stopped
- Vehicle speed: below 10 km/h (6 mph)
- Mass air flow sensor malfunction




## COMPONENT DESCRIPTION

### Exhaust gas recirculation (EGR) valve

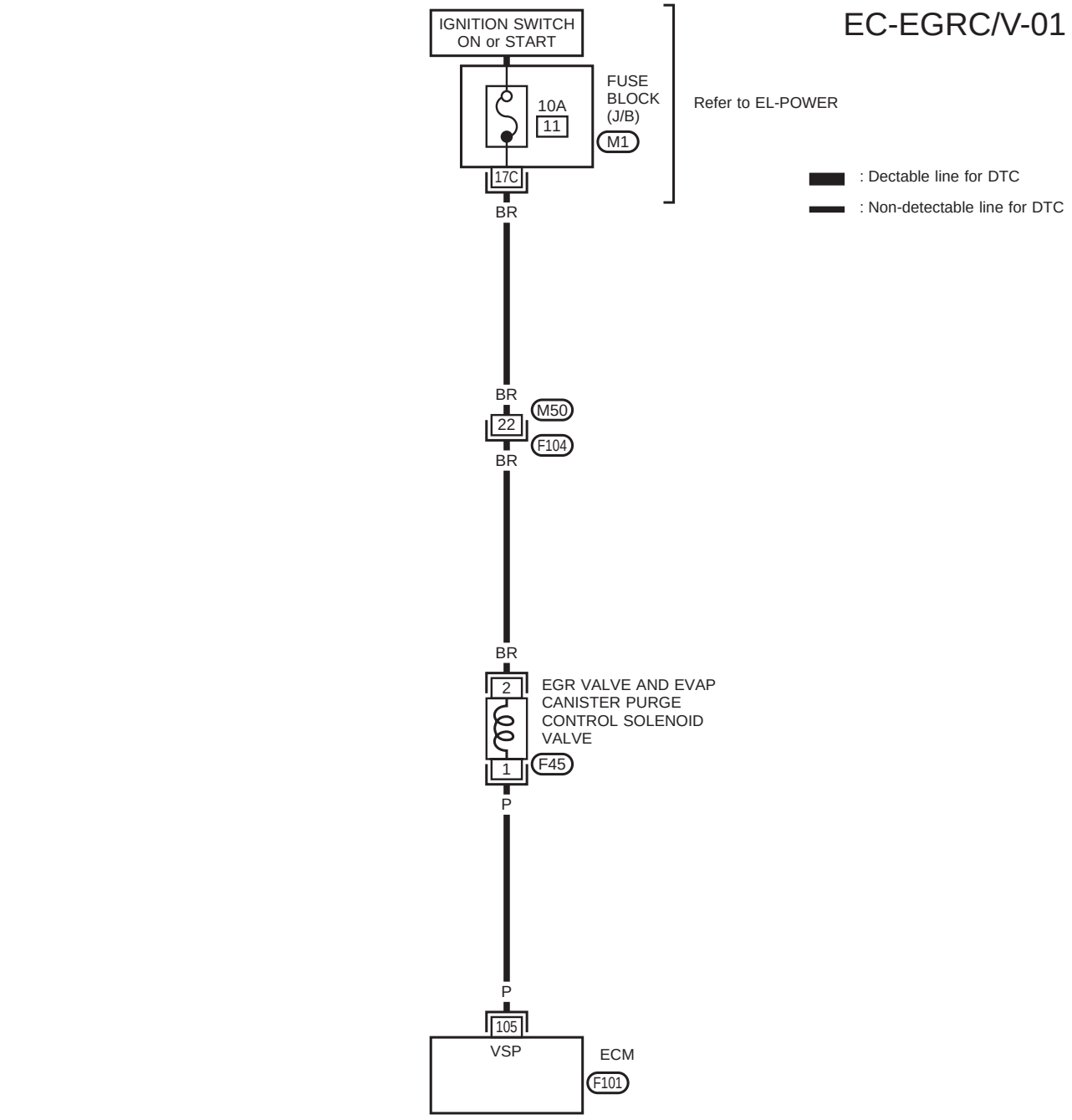
The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to the throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

### EGR valve and EVAP canister purge control solenoid valve

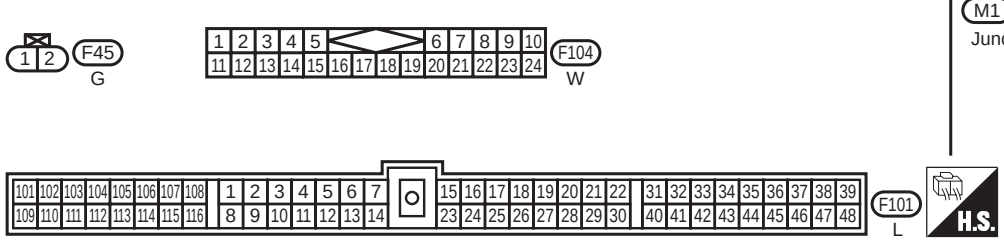
The EGR valve and EVAP canister purge control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to cut the vacuum signal (from the throttle body to the EGR valve and EVAP canister purge valve).
When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve and EVAP canister.

# EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

EC-EGRC/V-01



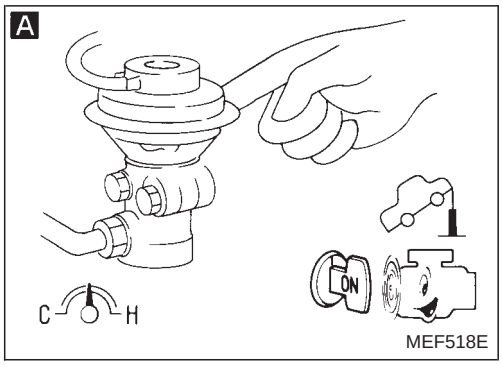

REFER TO THE FOLLOWING
M1 FUSE BLOCK - Junction Box (J/B)

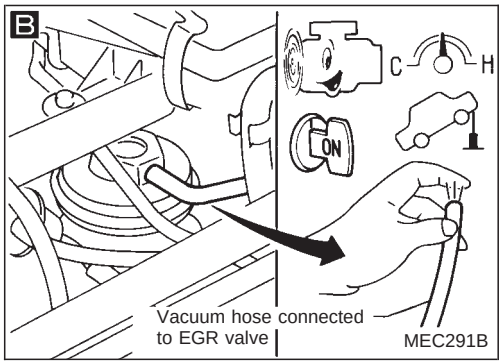


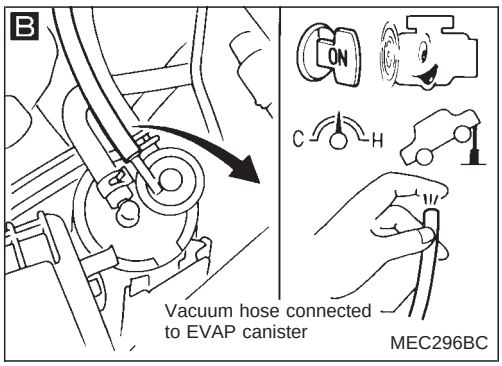

YEC294

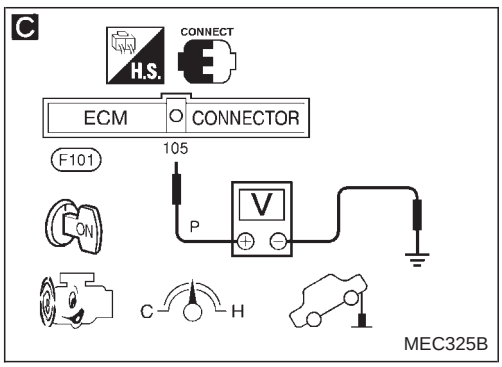
# EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

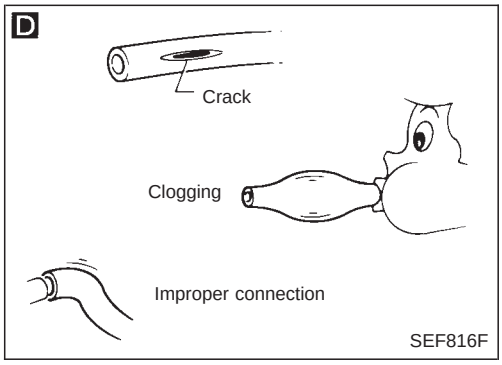
## DIAGNOSTIC PROCEDURE




INSPECTION START

**A**

**CHECK OVERALL FUNCTION.**
1. Jack up drive wheels.
2. Start engine and warm it up sufficiently.
3. Perform diagnostic test mode II (Self-diagnostic results). Make sure that diagnostic trouble code No. 55 is displayed.
4. Set the shift lever to 1st position.
5. Make sure that EGR valve spring moves up and down (Use your finger) under the following conditions:

**At idle:**
**Spring does not move.**
**Revving engine from idle to 3,000 rpm:**
**Spring moves up and down.**

OK → INSPECTION END

NG

**B**

**CHECK VACUUM SOURCES TO EGR VALVE AND EVAP CANISTER.**
1. Disconnect vacuum hoses to EGR valve and EVAP canister.
2. Make sure that vacuum exists under the following conditions.

**At idle:**
**Vacuum should not exist.**
**Revving engine from idle to 3,000 rpm:**
**Vacuum should exist.**

OK → CHECK COMPONENTS (EGR valve, EGRC-BPT valve and EVAP canister). Refer to "COMPONENT INSPECTION". (See page EC-GA-104.)

NG → Replace malfunctioning component(s).

NG

**C**

**CHECK CONTROL FUNCTION.**
Check voltage between ECM connector terminal (105) and ground under the following conditions:

**Voltage:**
**At idle**
**Approximately 0V**
**Engine speed is 2,000 rpm**
**Battery voltage**

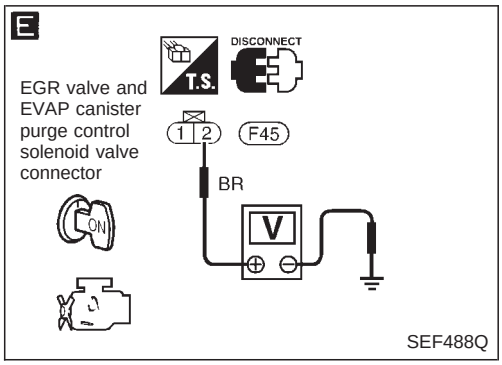
OK → **D**

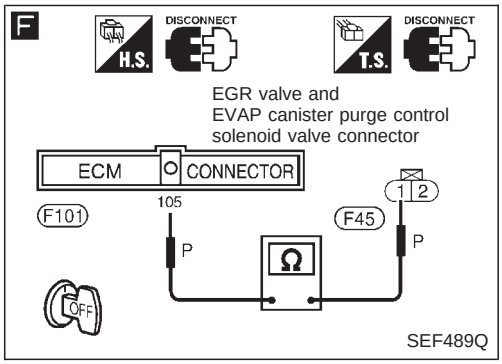
**CHECK VACUUM HOSE.**
Check vacuum hose for clogging, cracks or improper connection.

NG

(A)

# EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)




(A)

**E**

**CHECK POWER SUPPLY.**
1. Stop engine.
2. Disconnect EGR valve & EVAP canister purge control solenoid valve harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between EGR valve & EVAP canister purge control solenoid valve connector terminal (2) and ground.

**Voltage: Battery voltage**

NG → Check the following:
- Harness connectors (M50), (F104)
- 10A fuse
- Harness for open or short-circuit between EGR valve & EVAP canister purge control solenoid valve and fuse.

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

OK ↓

**F**

**CHECK OUTPUT SIGNAL CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM connector terminal (105) and EGR valve & EVAP canister purge control solenoid valve connector terminal (1).

**Continuity should exist.**

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(EGR valve & EVAP canister purge control solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGR valve & EVAP canister purge control solenoid valve.

OK ↓

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

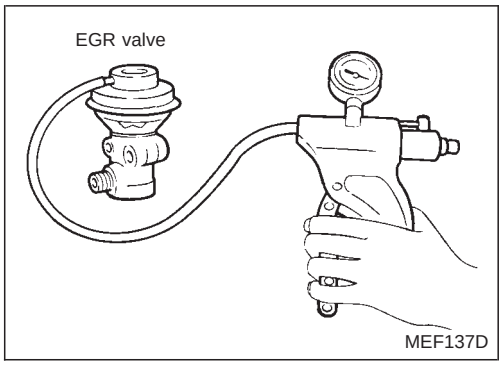
Trouble is not fixed. ↓

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

↓

INSPECTION END

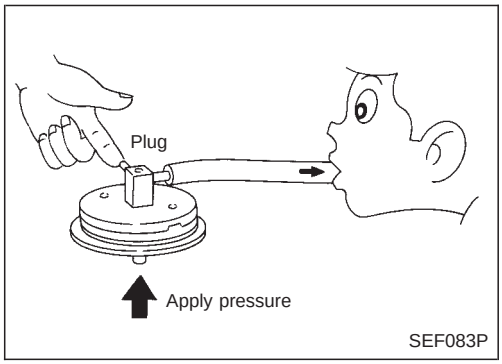
# EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)




## COMPONENT INSPECTION

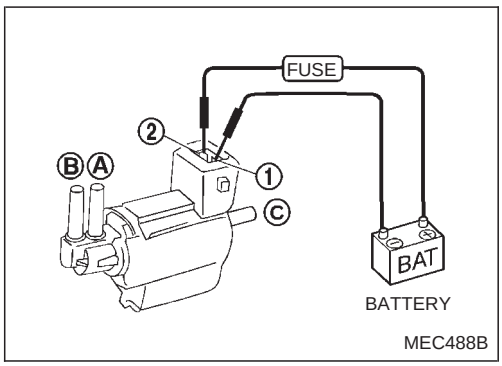
### EGR valve

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




### EGRC-BPT valve

1) Plug one of two ports of EGRC-BPT valve.
2) Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (9.81 mbar, 100 $mmH_2O$, 3.94 $inH_2O$) from under EGRC-BPT valve.
3) If a leakage is noted, replace the valve.




### EGR valve and EVAP canister purge control solenoid valve

Check air passage continuity.

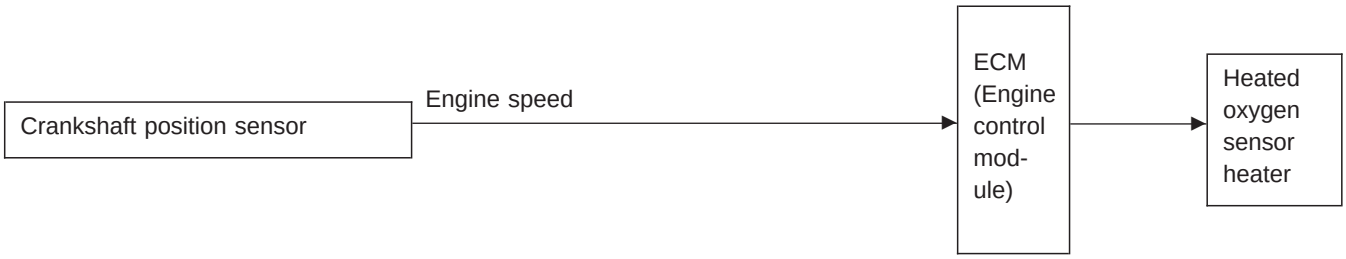
| Condition | Air passage continuity between Ⓐ and Ⓑ | Air passage continuity between Ⓐ and Ⓒ |
|---|---|---|
| 12V direct current supply between terminals ① and ② | Yes | No |
| No supply | No | Yes |

If NG, replace solenoid valve.

# Heated Oxygen Sensor (HO2S)

## SYSTEM DESCRIPTION

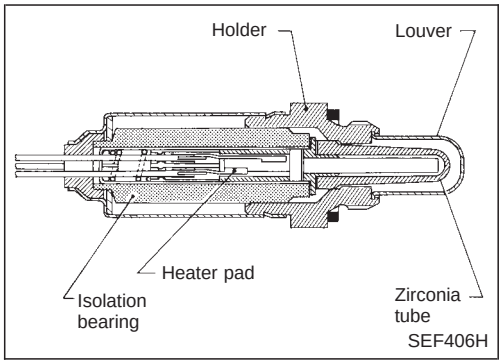
### Heated oxygen sensor heater control

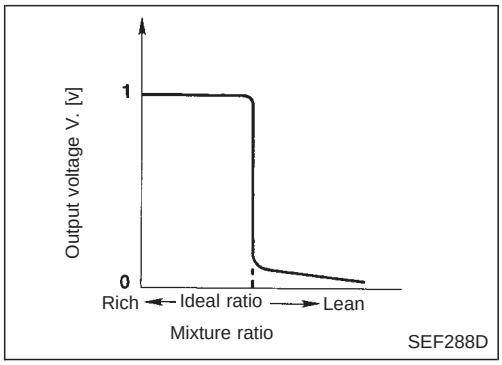


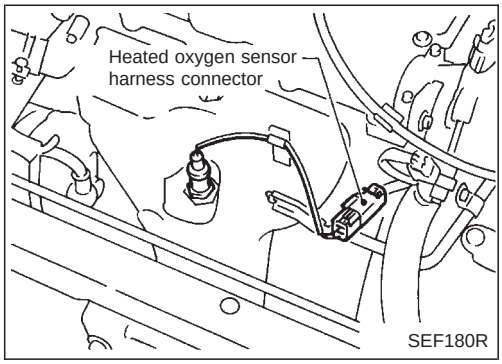

The ECM performs ON/OFF control of the heated oxygen sensor heater corresponding to the engine speed.

## OPERATION

| Engine speed rpm | Heated oxygen sensor heater |
|---|---|
| Above 3,200 | OFF |
| Below 3,200 | ON |



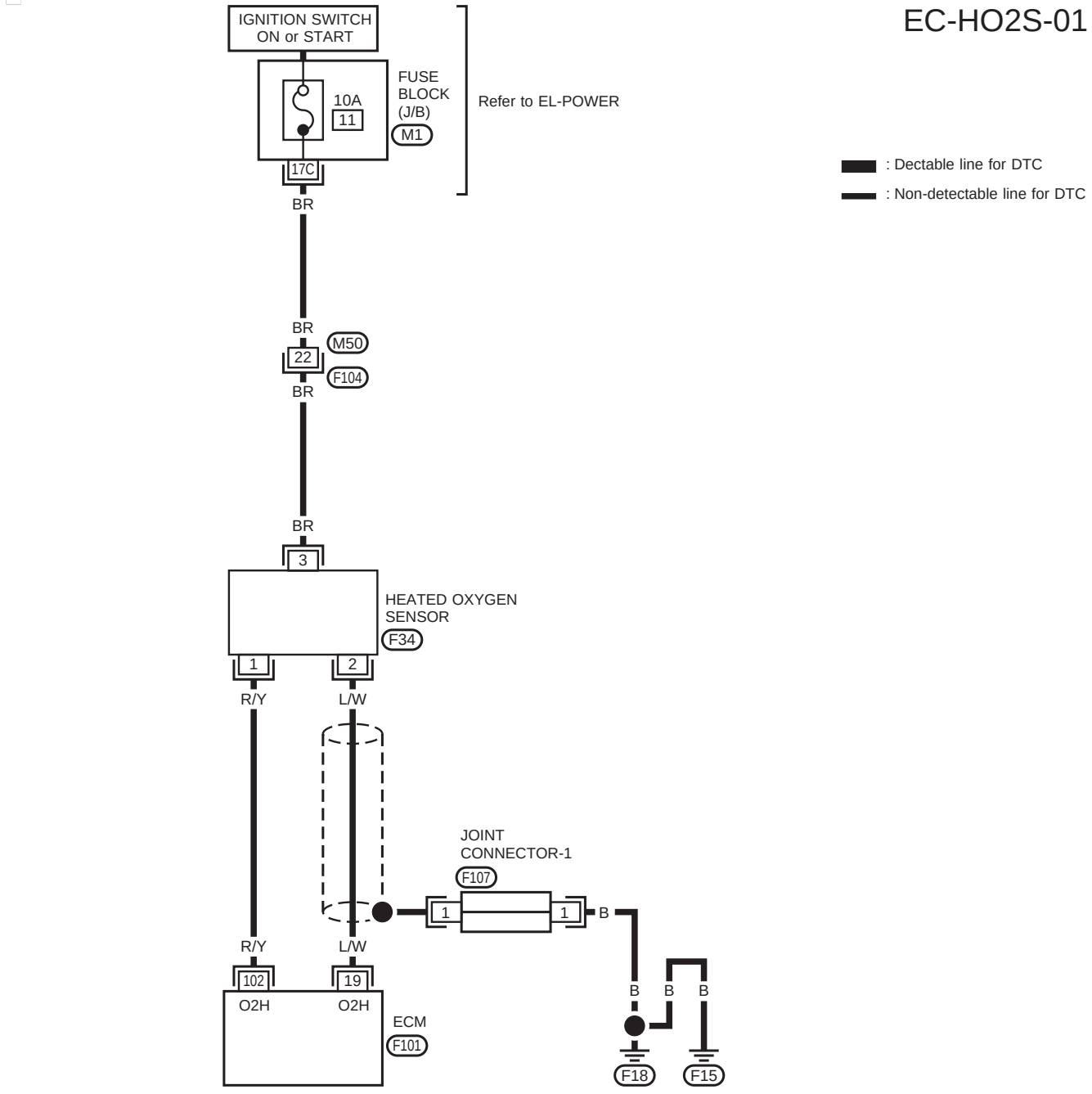



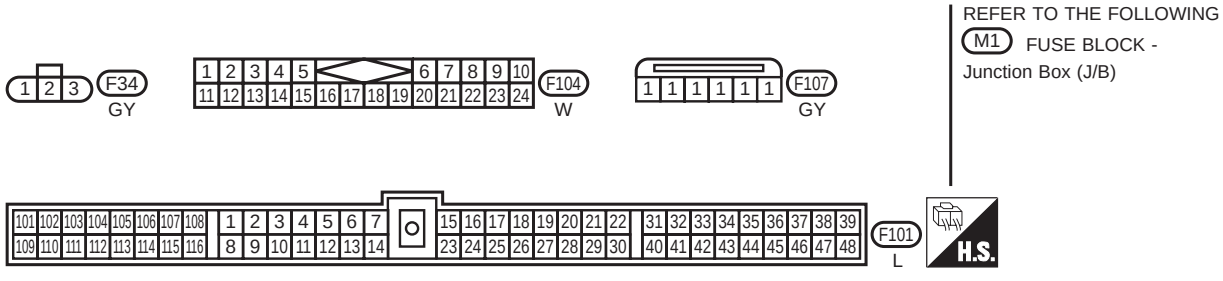

## COMPONENT DESCRIPTION

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

## Heated Oxygen Sensor (HO2S) (Cont'd)

EC-HO2S-01




YEC295

# Heated Oxygen Sensor (HO2S) (Cont'd)

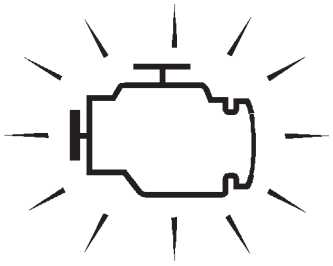
## DIAGNOSTIC PROCEDURE

A

| DATA MONITOR | |
|---|---|
| MONITOR | NO DTC |
| CMPS-RPM(REF) | 0 RPM |
| M/R F/C MNT | LEAN |

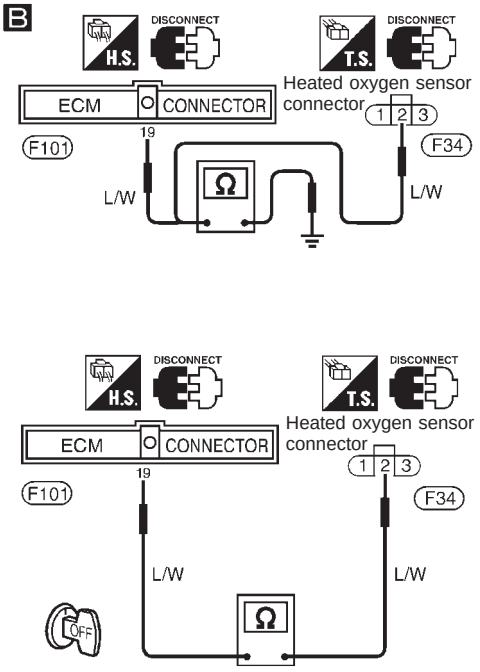
C2DMM03

A



SAT652J

B




MEC735B

INSPECTION START

A

**CHECK OXYGEN SENSOR CIRCUIT.**

1. Start engine and warm it up sufficiently.
2. Make sure that "M/R F/C MNT" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm.

OR

2. Stop engine and set ECM Diagnostic Test Mode II (Heated oxygen sensor monitor).
3. Restart engine and run it at about 2,000 rpm for about 2 minutes under no-load.
4. Keep engine speed at 2,000 rpm and make sure that the malfunction indicator on the instrument panel goes on and off more than 5 times during 10 seconds.

OK → INSPECTION END

NG

B

**CHECK INPUT SIGNAL CIRCUIT.**

1. Stop engine.
2. Disconnect ECM harness connector and heated oxygen sensor harness connector.
3. Check harness continuity between ECM connector terminal ⑲ and heated oxygen sensor connector terminal ②.
   **Continuity should exist.**
4. Check harness continuity between ECM connector terminal ⑲ (or heated oxygen sensor connector terminal ②) and engine ground.
   **Continuity should not exist.**
   If OK, check harness for short-circuit.

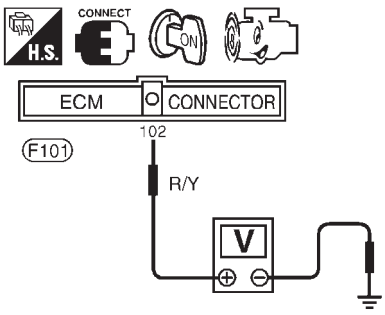
NG → Repair harness or connectors.

OK

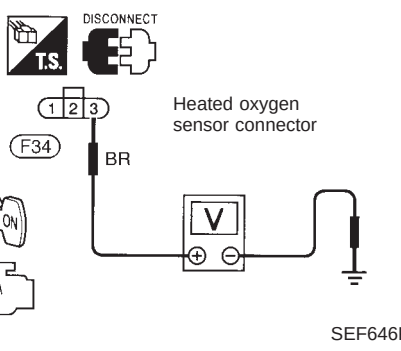
Ⓐ

## Heated Oxygen Sensor (HO2S) (Cont'd)

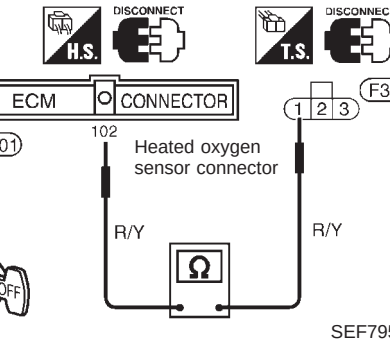
C




D




E

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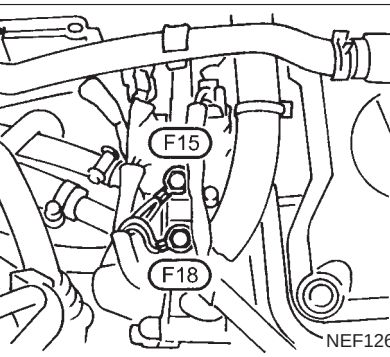


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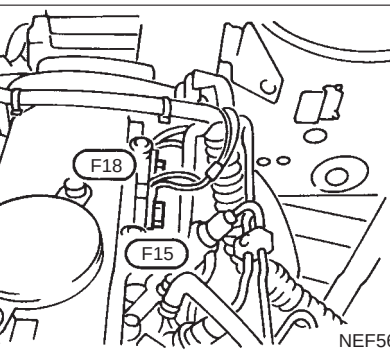



Ⓐ

**C**

**CHECK HEATED OXYGEN SENSOR HEATER CIRCUIT.**

1. Reconnect harness connectors.
2. Start engine.
3. Check voltage between ECM connector terminal (102) and ground with CONSULT-II or tester under the following conditions:

**Voltage:**

**Engine speed is below 3,200 rpm**
**Approximately 0V**
**Engine speed is above 3,200 rpm**
**Battery voltage**

OK → Go to "CHECK COMPONENT".

NG

**D**

**CHECK POWER SUPPLY.**

1. Stop engine.
2. Disconnect heated oxygen sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between heated oxygen sensor connector terminal (3) and ground.

**Voltage: Battery voltage**

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness connector (M1)
- 10A fuse
- Harness for open or short-circuit between heated oxygen sensor and fuse

If NG, replace fuse or repair harness or connectors.

OK

**E**

**CHECK OUTPUT SIGNAL CIRCUIT.**

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between heated oxygen sensor connector terminal (1) and ECM connector terminal (102).

**Continuity should exist.**

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK → Loosen and retighten engine ground screws.

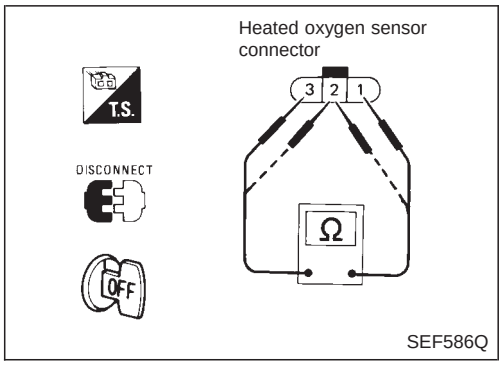
OK → CHECK COMPONENT (Heated oxygen sensor heater). Refer to "COMPONENT INSPECTION" on next page.

NG → Replace heated oxygen sensor.

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.

Trouble is not fixed. → Replace heated oxygen sensor.




# Heated Oxygen Sensor (HO2S) (Cont'd)

## COMPONENT INSPECTION

### Heated oxygen sensor heater

Check resistance between heated oxygen sensor connector terminals ③ and ①.

**Resistance: 2.3 - 4.3Ω at 25°C (77°F)**

Check continuity between terminals ② and ①, ③ and ②.

**Continuity should not exist.**

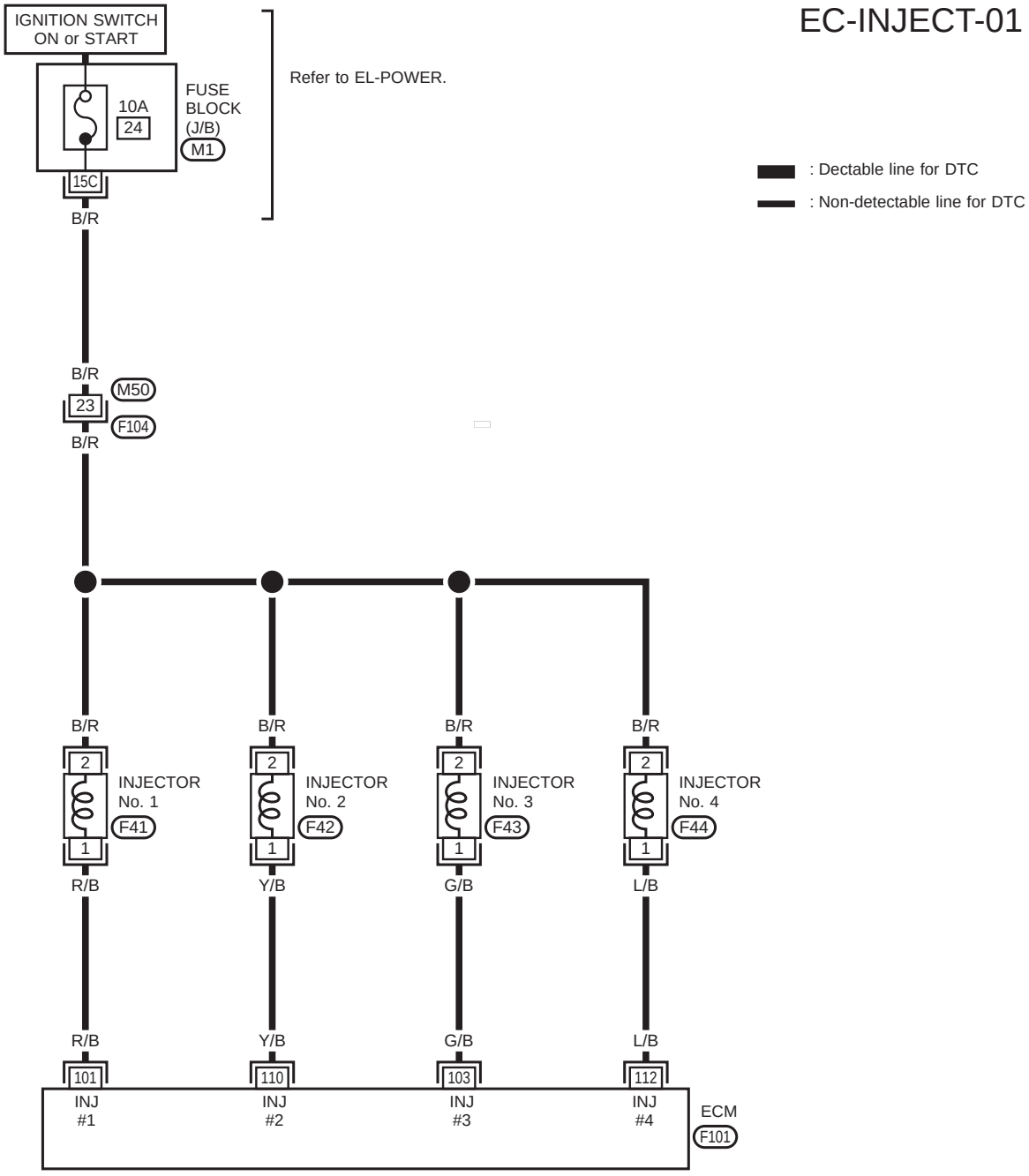
If NG, replace the heated oxygen sensor.

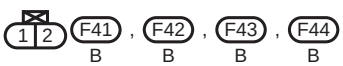
**CAUTION:**

- **Discard any oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor, and replace with a new one.**

## Injector

EC-INJECT-01

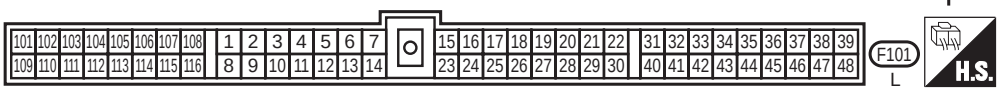




REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

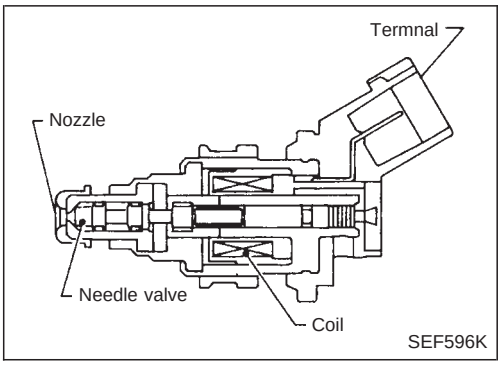



YEC296

# Injector (Cont'd)

## COMPONENT DESCRIPTION

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



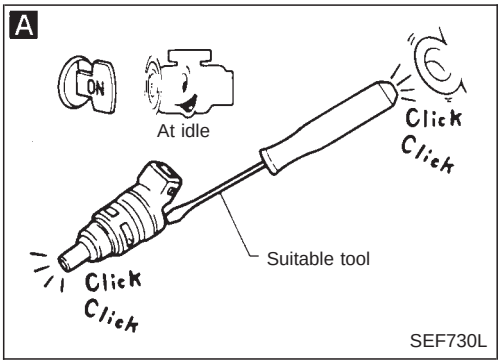
SEF596K

A

| ACTIVE TEST | |
|---|---|
| POWER BALANCE | |
| MONITOR | |
| CMPS~RPM(REF) | XXX rpm |
| MAS AIR/FL SEN | XXX V |
| IACV-AAC/V | XXX % |
| | |
| | |
| | |
| | |

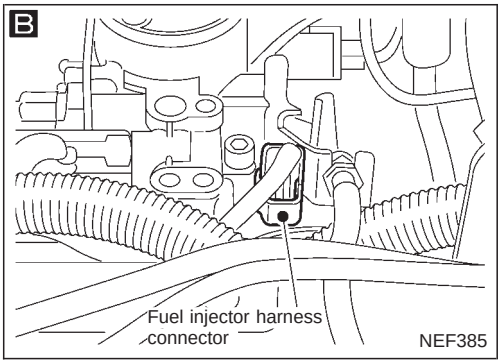
SEF050X

A



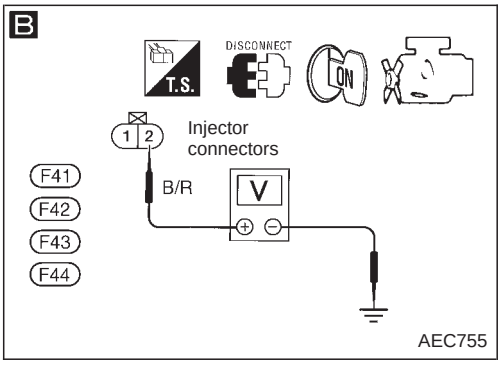
SEF730L

B



NEF385

B



AEC755

## DIAGNOSTIC PROCEDURE

INSPECTION START

A

**CHECK OVERALL FUNCTION.**

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

OR

1. Start engine.
2. Listen to each injector operating sound.

**Clicking noise should be heard.**

OK → INSPECTION END

NG

B

**CHECK POWER SUPPLY.**

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between each injector connector terminal ② and ground with CONSULT-II or tester.

**Voltage: Battery voltage**

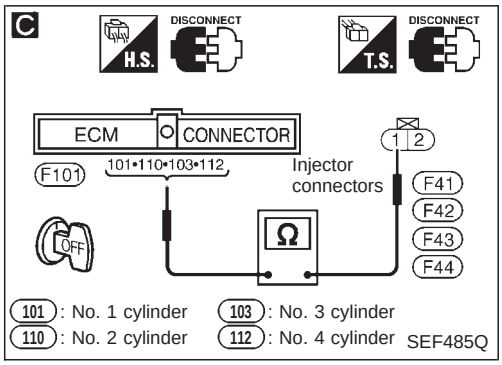
NG → Check the following:
- 10A fuse
- Harness connectors M50, F104
- Harness for open or short-circuit between injector and fuse.

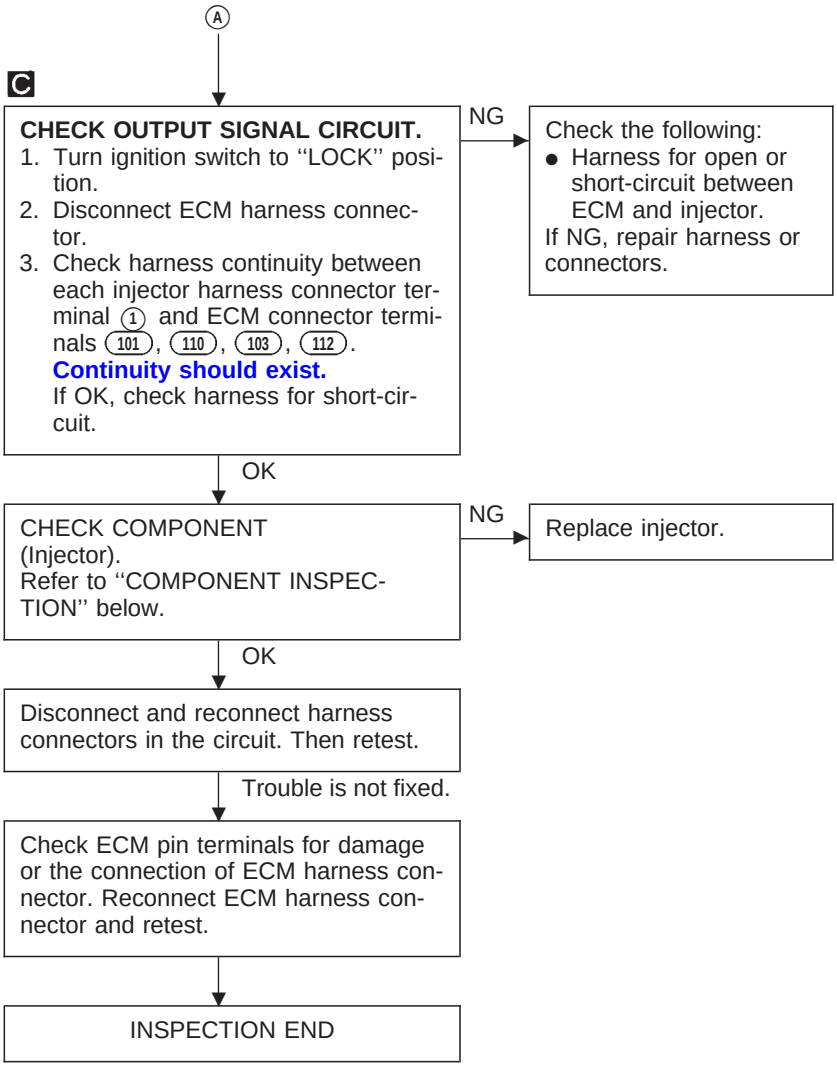
If NG, replace fuse or repair harness or connectors.

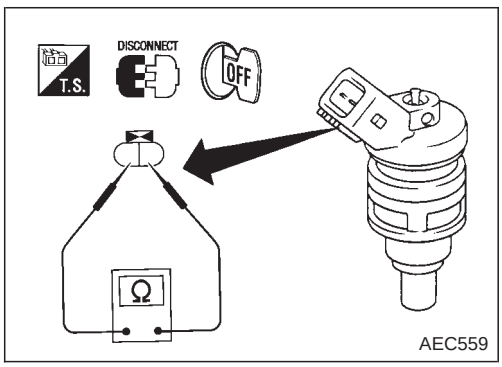
OK

Ⓐ

## Injector (Cont'd)



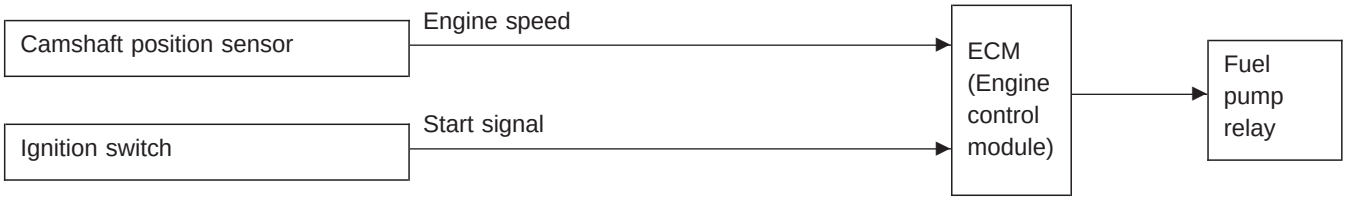

### COMPONENT INSPECTION

#### Injector

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   **Resistance: 10 - 14Ω [at 25°C (77°F)]**
   If NG, replace injector.

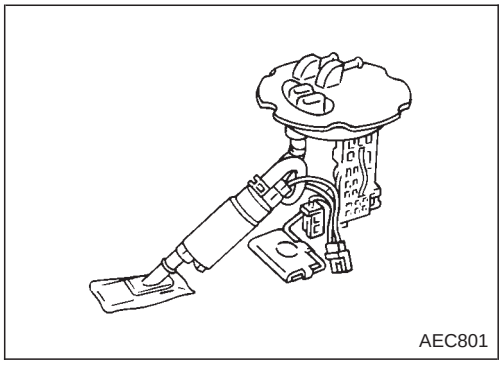
# Fuel Pump

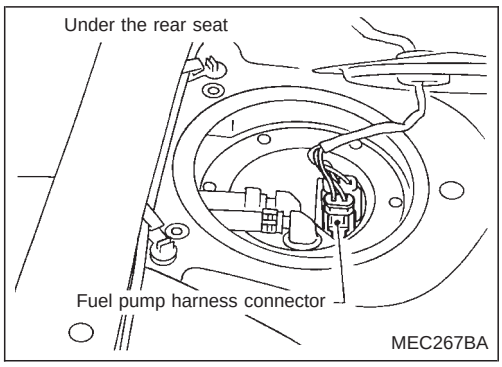
## SYSTEM DESCRIPTION

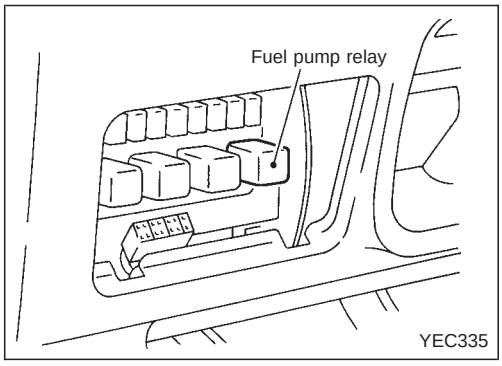



The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to operate. If the 180° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn supplies voltage to the fuel pump.

| Condition | Fuel pump operation |
|---|---|
| Ignition switch is turned to ON. | Operates for 5 seconds |
| Engine running and cranking | Operates |
| When engine is stopped | Stops in 1 second |
| Except as shown above | Stops |



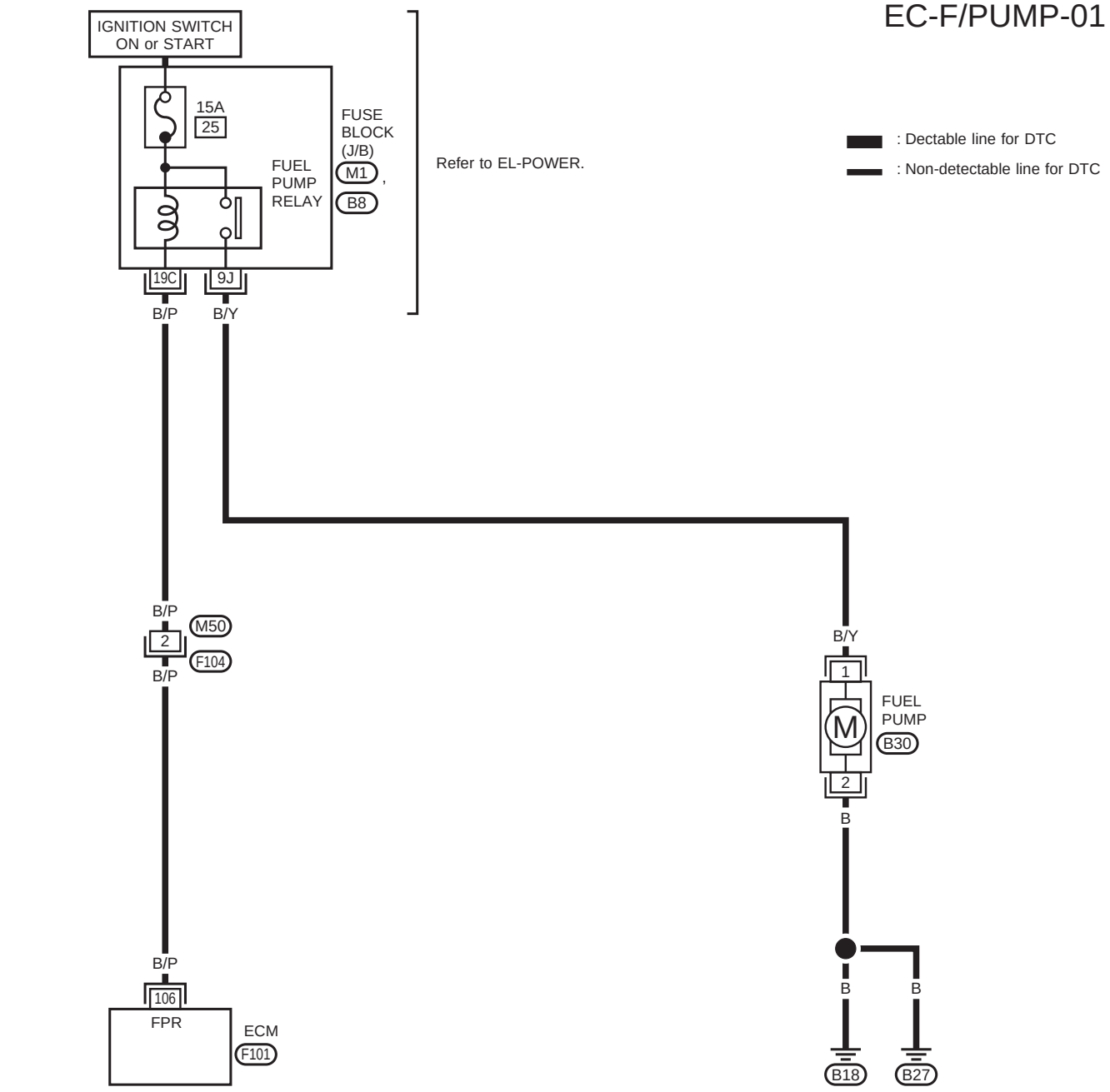



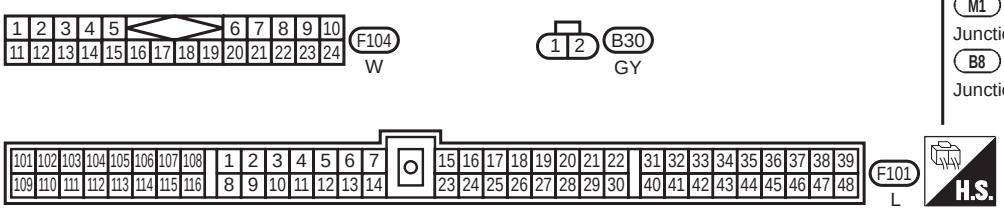

## COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.

## Fuel Pump (Cont'd)

EC-F/PUMP-01



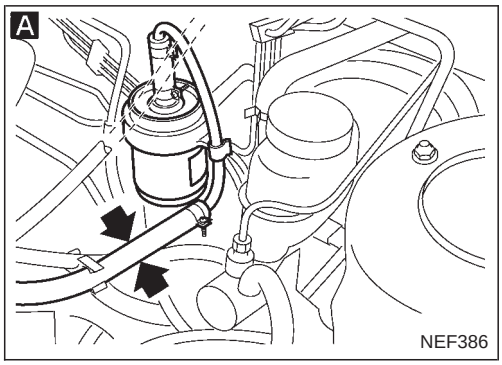



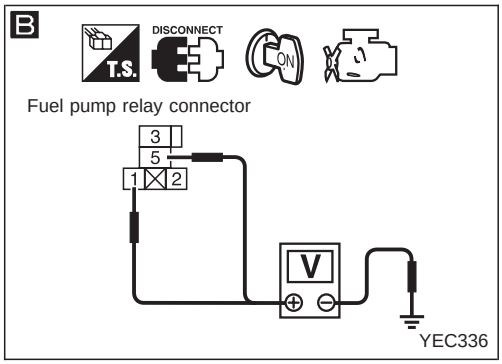

REFER TO THE FOLLOWING
M1 FUSE BLOCK - Junction Box (J/B)
B8 FUSE BLOCK - Junction box (J/B)

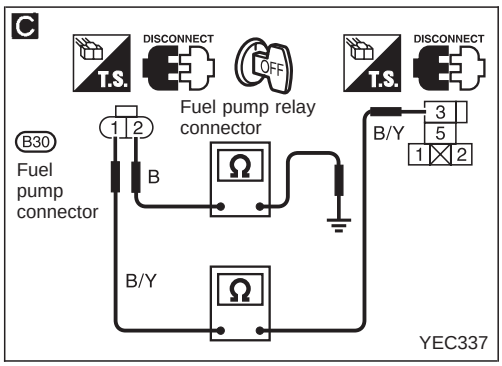
YEC297

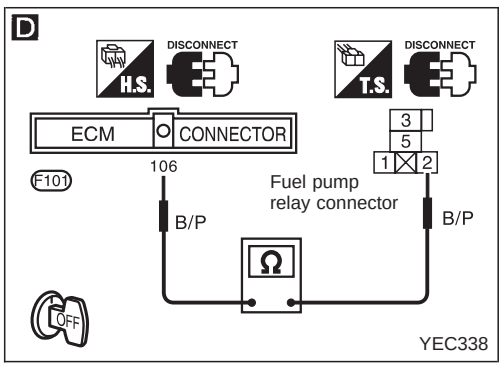
# Fuel Pump (Cont'd)

## DIAGNOSTIC PROCEDURE




INSPECTION START

**A**

**CHECK OVERALL FUNCTION.**
1. Turn ignition switch to "ON" position.
2. Pinch fuel feed hose with fingers.
   **Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned to "ON" position.**

OK → INSPECTION END

NG ↓

**B**

**CHECK POWER SUPPLY.**
1. Turn ignition switch to "LOCK" position.
2. Disconnect fuel pump relay.
3. Turn ignition switch to "ON" position.
4. Check voltage between fuel pump relay connector terminals ①, ⑤ and ground with CONSULT-II or tester.
   **Voltage: Battery voltage**

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

If NG, replace 15A fuse or repair harness or connectors.

OK ↓

**C**

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Disconnect fuel pump harness connector.
3. Check harness continuity between fuel pump connector terminal ② and body ground; fuel pump connector terminal ① and fuel pump relay connector terminal ③.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between fuel pump and body ground.
- Harness for open or short-circuit between fuel pump and fuel pump relay.

If NG, repair harness or connectors.

OK ↓

**D**

**CHECK OUTPUT SIGNAL CIRCUIT.**
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal (106) and fuel pump relay connector terminal ②.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

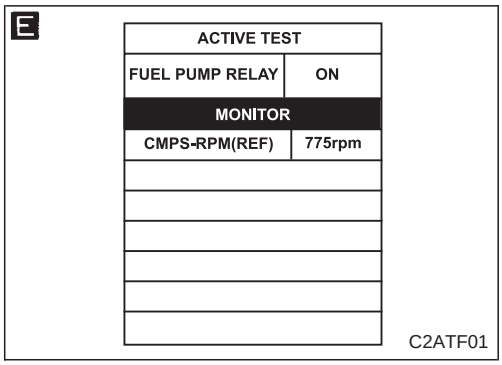
NG → Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short between ECM and fuel pump relay

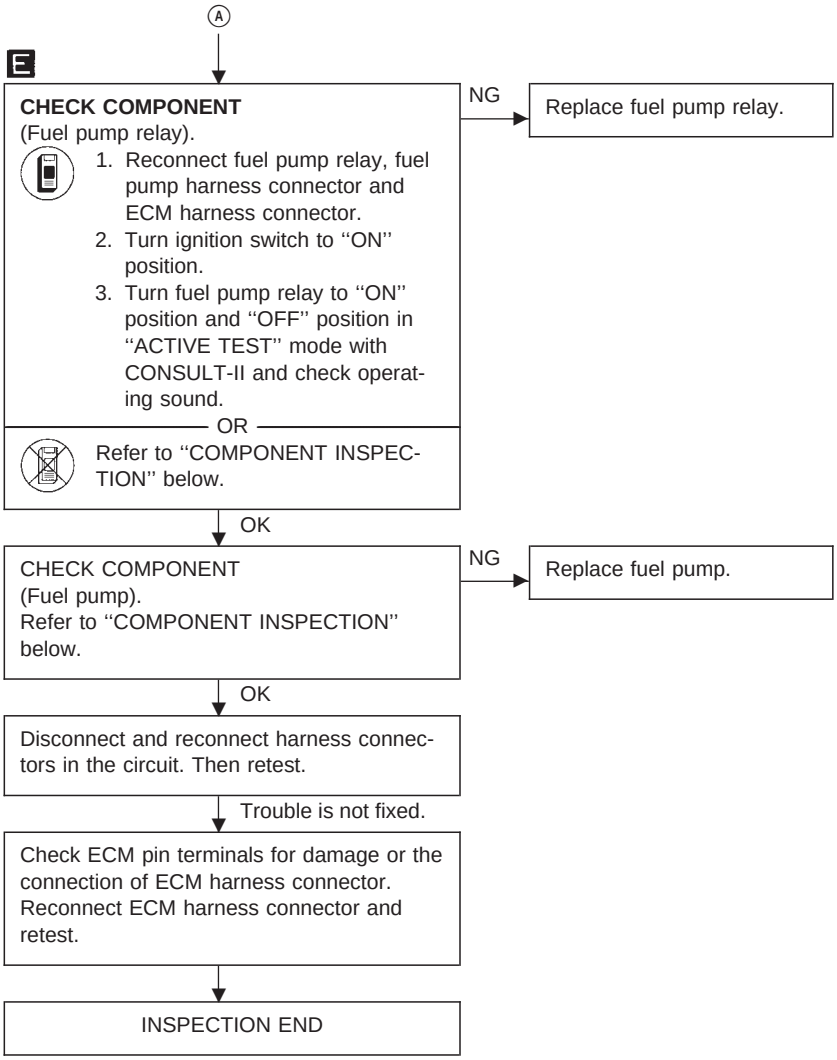
If NG, repair harness or connectors.

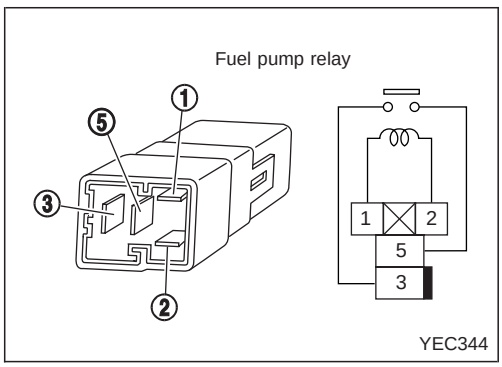
OK ↓

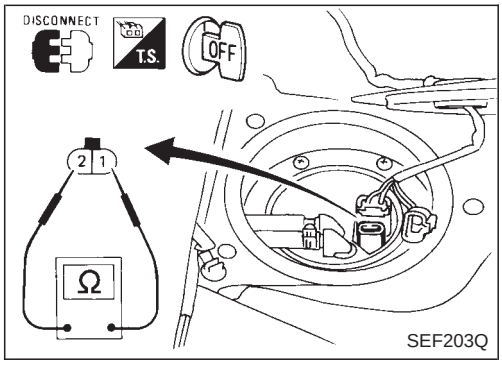
Ⓐ

# Fuel Pump (Cont'd)




## COMPONENT INSPECTION

### Fuel pump relay

Check continuity between fuel pump relay terminals ③ and ⑤.

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

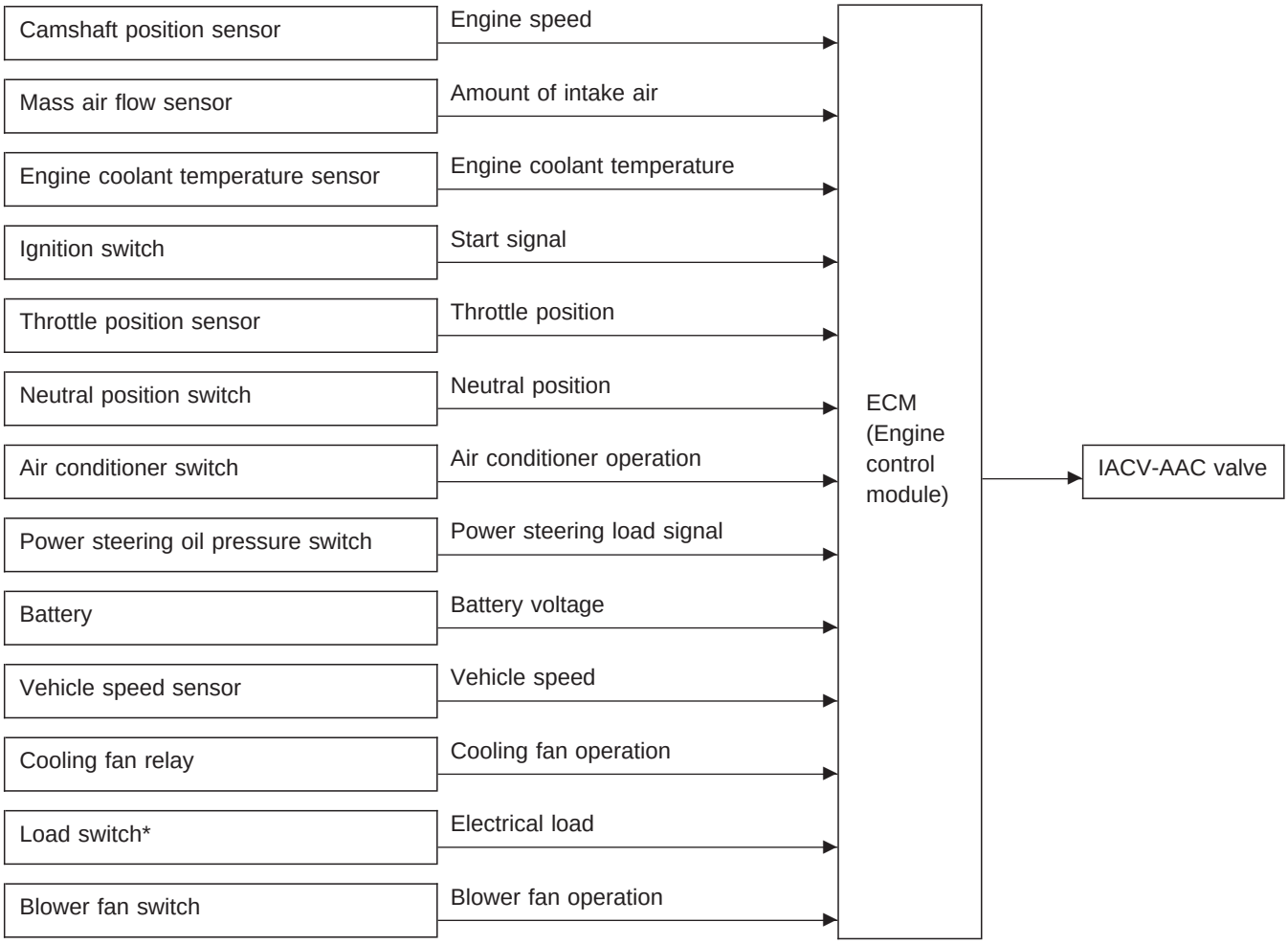
If NG, replace relay.

### Fuel pump

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ① and ②.
   **Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]**
   If NG, replace fuel pump.

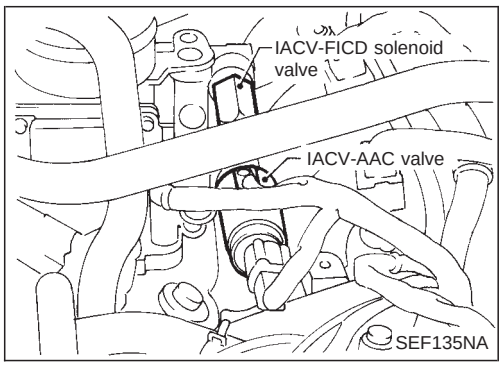
# Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve

## SYSTEM DESCRIPTION




*: Rear window defogger switch and headlamp switch.

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which bypasses the throttle valve via IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering and cooling fan operation).



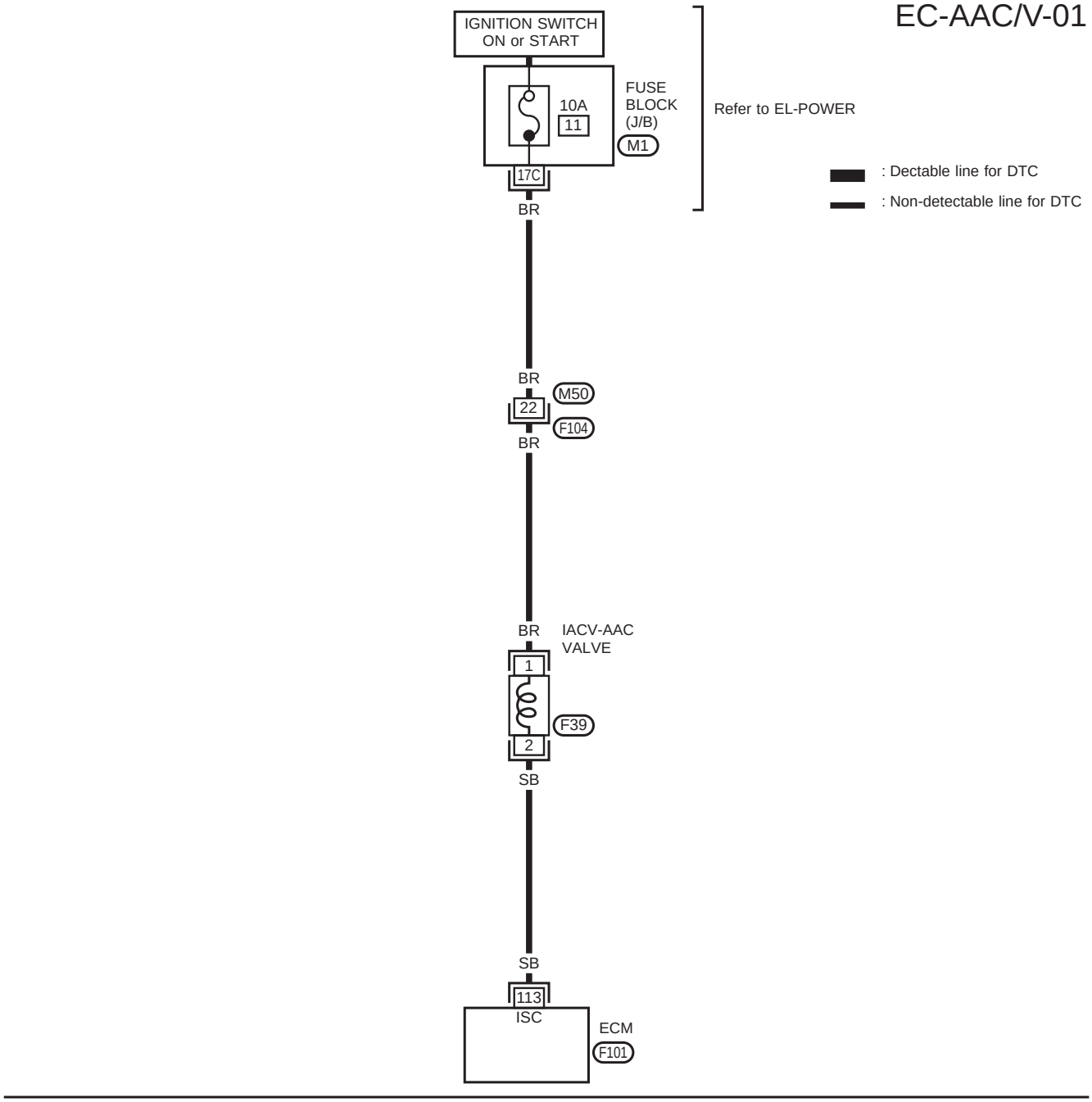

## COMPONENT DESCRIPTION

### IACV-AAC valve

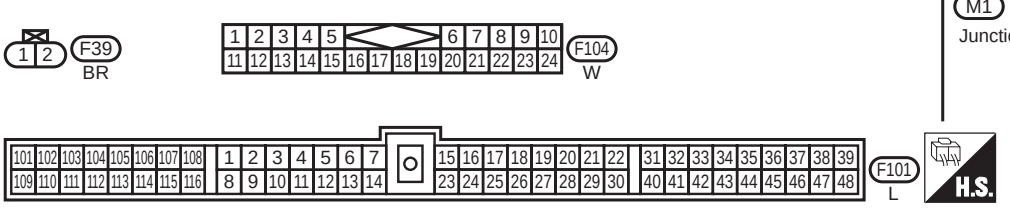
The IACV-AAC valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of air that will flow through the valve. The more air that flows through the valve, the higher the idle speed.

# Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

EC-AAC/V-01




REFER TO THE FOLLOWING
M1 FUSE BLOCK - Junction Box (J/B)

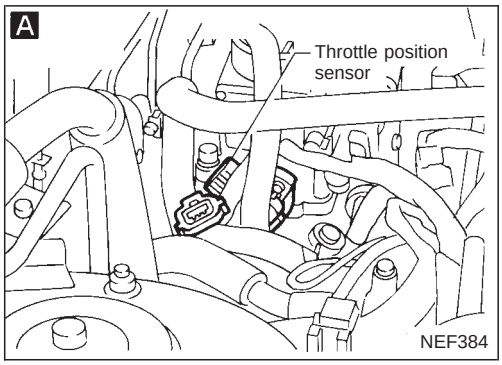



YEC298

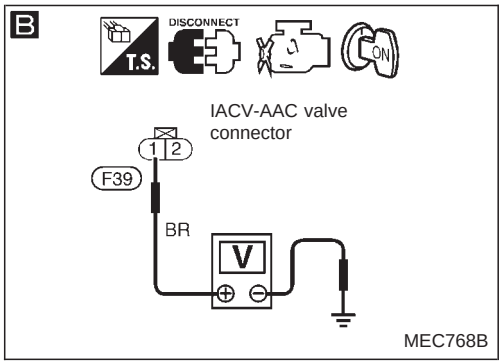
# Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

## DIAGNOSTIC PROCEDURE

A




B

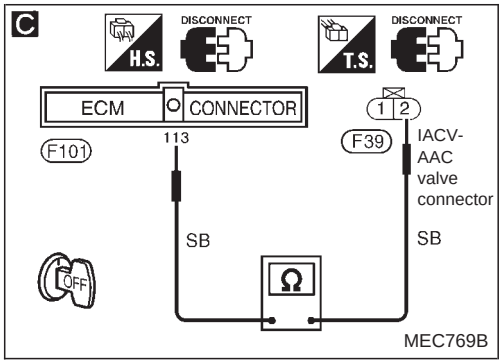



C

| ACTIVE TEST | |
|---|---|
| IACV-AAC/V OPENING | 42% |
| | |
| CMPS-RPM(REF) | 778rpm |
| MAS AIR/FL SE | 1.71V |
| COOLAN TEMP/S | 85°C |
| | |
| | |
| | |
| | |

C2ATI01

C




INSPECTION START

A

**CHECK OVERALL FUNCTION.**
1. Start engine and warm it up sufficiently.
2. Check idle speed.
   **Models with daytime light system: 800±50 rpm**
   **Models without daytime light system: 700±50 rpm**
   If NG, adjust idle speed.
   3. ● Perform "IACV-AAC/V ADJ" in "WORK SUPPORT" mode with CONSULT-II.
   ● Disconnect throttle position sensor harness connector.
4. Make sure that idle speed drops.

OK → INSPECTION END

NG

B

**CHECK POWER SUPPLY.**
1. Stop engine.
2. Disconnect IACV-AAC valve harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between IACV-AAC valve connector terminal (1) and ground.
   **Voltage: Battery voltage**

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness connector (M1)
- 10A fuse
- Harness for open or short-circuit between IACV-AAC valve and fuse.

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

OK

C

**CHECK OUTPUT SIGNAL CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Reconnect IACV-AAC valve harness connector and then start engine.
   3. Perform "IACV-AAC/V OPENING" in "ACTIVE TEST" mode with CONSULT-II.

OR

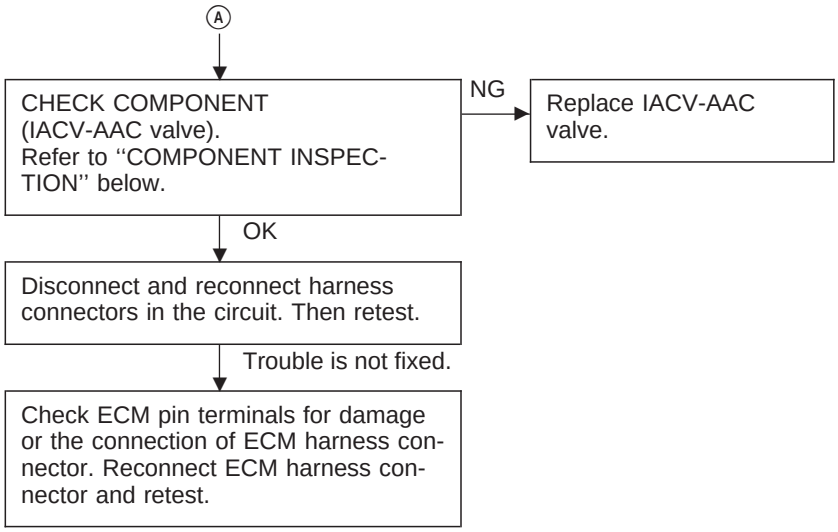
   2. Disconnect ECM harness connector.
   3. Check harness continuity between ECM terminal (113) and IACV-AAC valve connector terminal (2).
   **Continuity should exist.**
   If OK, check harness for short.

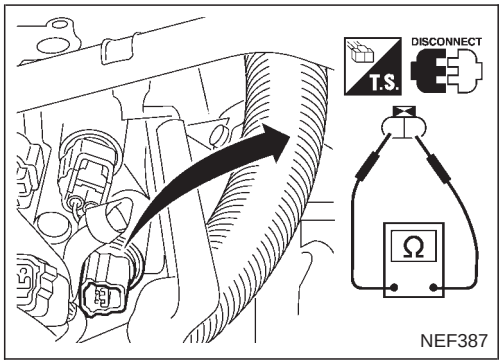
NG → Repair harness or connectors.

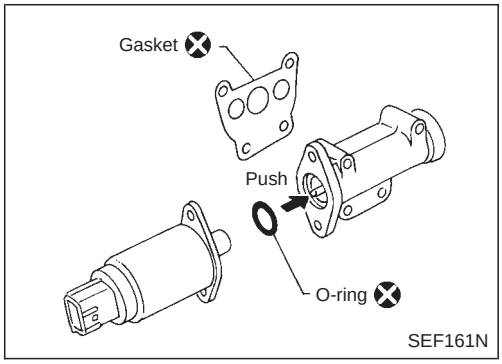
OK

(A)

## Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)




### COMPONENT INSPECTION

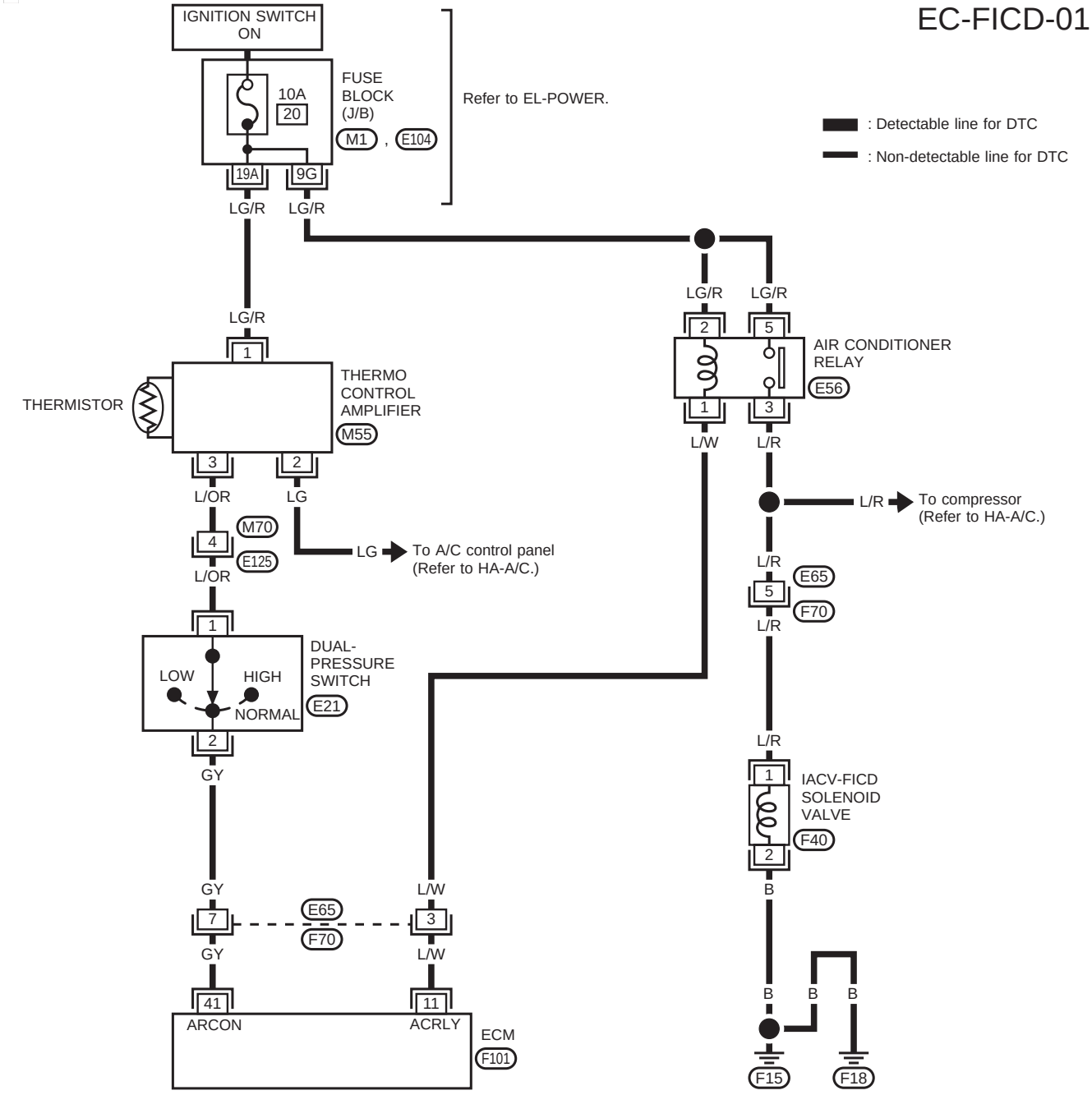
### IACV-AAC VALVE

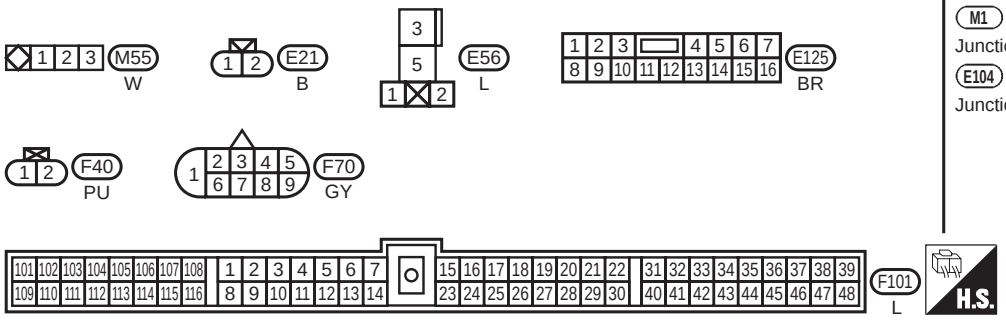
- Check IACV-AAC valve resistance.
  **Resistance:**
  **Approximately 10Ω [at 25°C (77°F)]**

- Check plunger for seizing or sticking.

## IACV-FICD Solenoid Valve

EC-FICD-01




REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

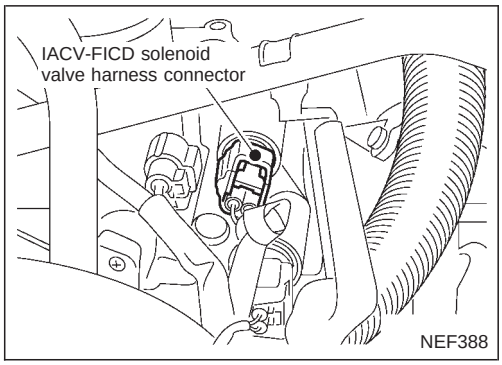
E104 FUSE BLOCK - Junction Box (J/B)

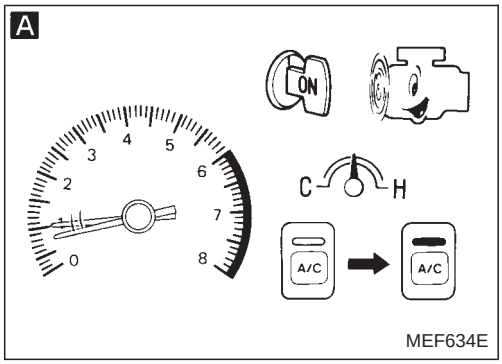
YEC299

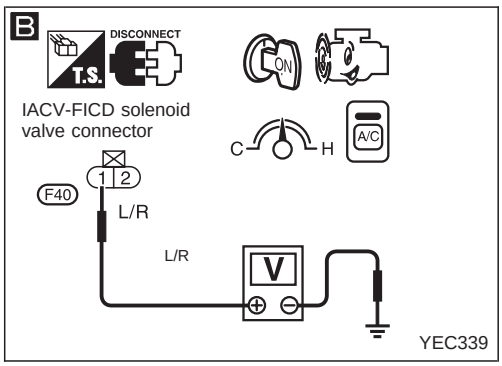
# IACV-FICD Solenoid Valve (Cont'd)

## COMPONENT DESCRIPTION

When the air conditioner is on, the IACV-FICD solenoid valve supplies additional air to adjust to the increased load.




## DIAGNOSTIC PROCEDURE

INSPECTION START

**A**

**CHECK OVERALL FUNCTION.**

1. Start engine and warm it up sufficiently.
2. Check idle speed.
   **Models with daytime light system:**
   **800±50 rpm**
   **Models without daytime light system:**
   **700±50 rpm**
   If NG, adjust idle speed.
3. Turn air conditioner switch and blower fan switch to "ON" position.
4. Recheck idle speed.
   **900 rpm or more**

OK → INSPECTION END

NG

Check if air conditioner compressor functions normally.

NG → Refer to "TROUBLE DIAGNOSES" in HA section.

OK

**B**

**CHECK POWER SUPPLY.**

1. Turn air conditioner switch to "OFF" position and stop engine.
2. Disconnect IACV-FICD solenoid valve harness connector.
3. Restart engine, then turn air conditioner switch and blower fan switch to "ON" position.
4. Check voltage between IACV/FICD solenoid valve connector terminal ① and ground with CONSULT-II or voltage tester.
   **Voltage: Battery voltage**

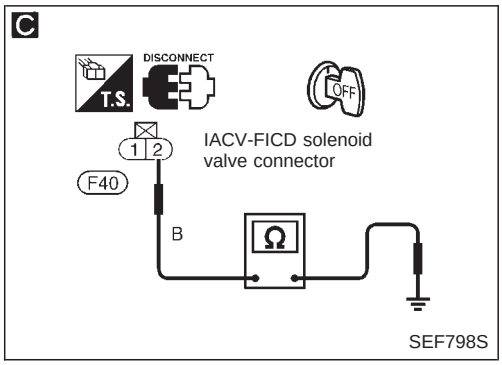
NG → Check the following:
- Harness connectors E65, F70
- Harness for open or short-circuit between IACV-FICD solenoid valve and air conditioner relay.

If NG, repair harness or connectors.

OK

Ⓐ

## IACV-FICD Solenoid Valve (Cont'd)




Ⓐ

C

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between IACV-FICD solenoid valve connector terminal ② and body ground.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT (IACV-FICD solenoid valve).
Refer to "COMPONENT INSPECTION" below.

NG → Replace IACV-FICD solenoid valve.

OK ↓

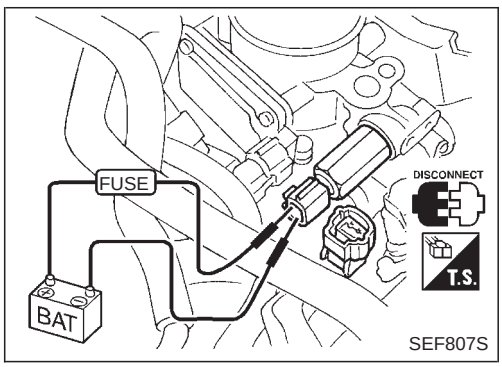
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

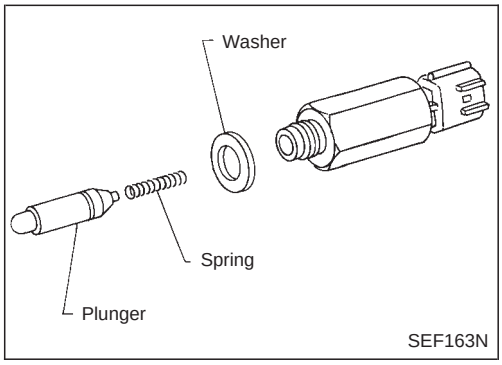
INSPECTION END




## COMPONENT INSPECTION

### IACV-FICD solenoid valve

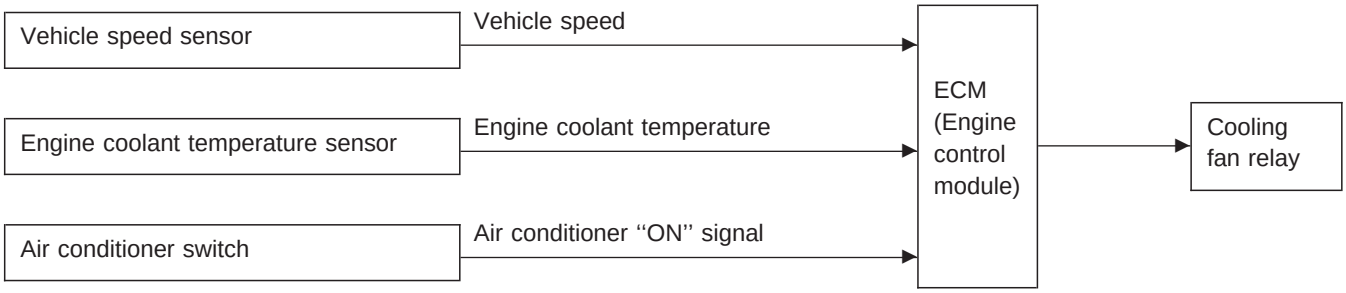
- Check for clicking sound when applying 12V direct current to IACV-FICD solenoid valve terminals.




- Check plunger for seizing or sticking.
- Check for broken spring.

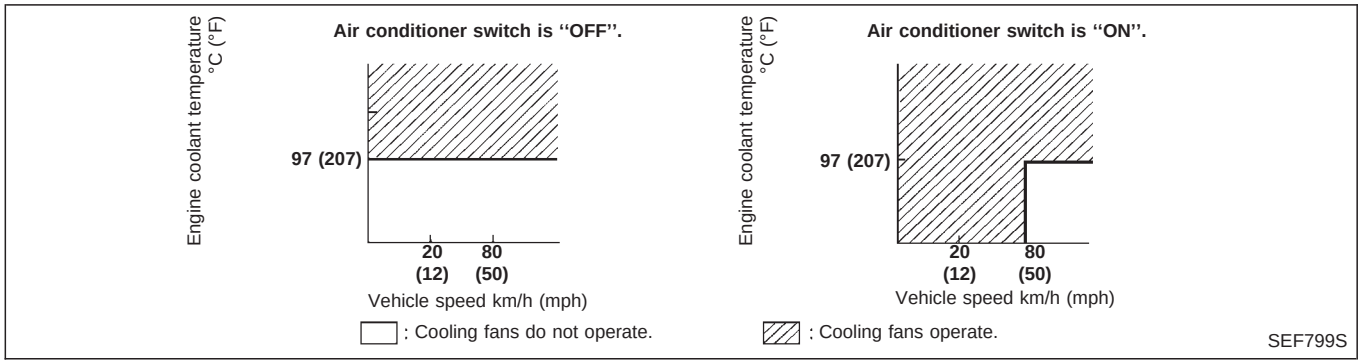
# Cooling Fan Control

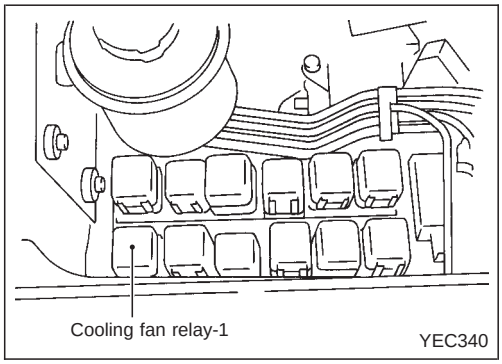
## SYSTEM DESCRIPTION




The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal. The control system has 2-step control [ON/OFF].

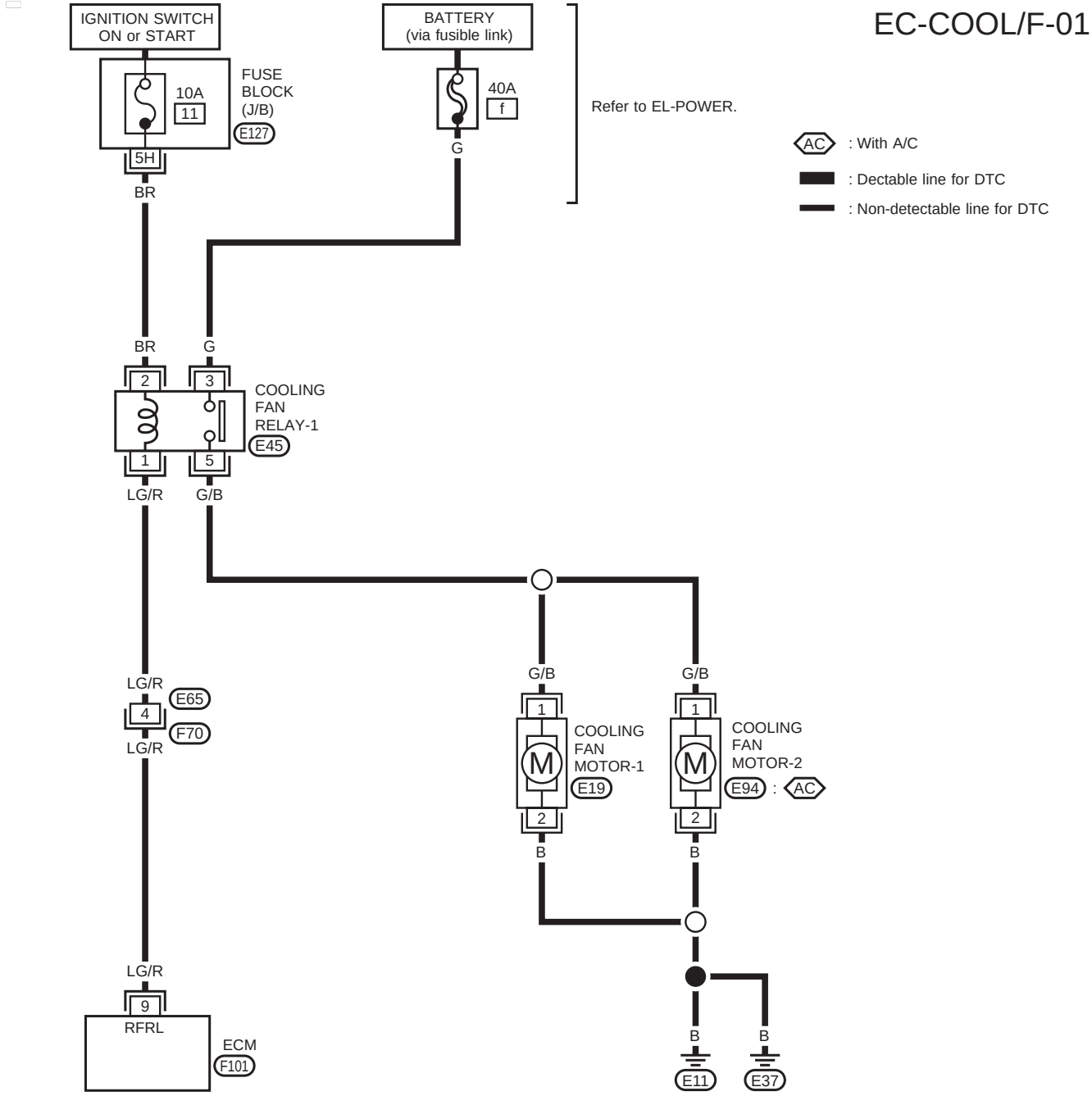
### Operation

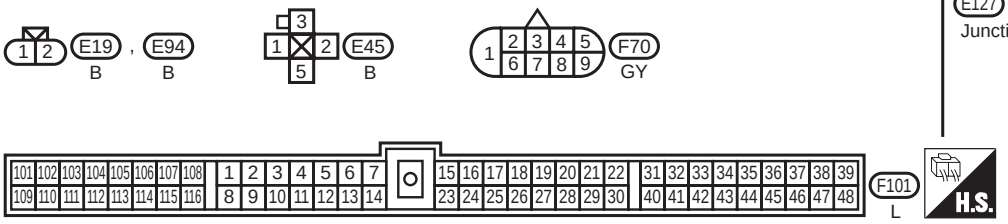


## Cooling Fan Control (Cont'd)

EC-COOL/F-01




REFER TO THE FOLLOWING

E127 FUSE BLOCK - Junction Box (J/B)

YEC300

# Cooling Fan Control (Cont'd)

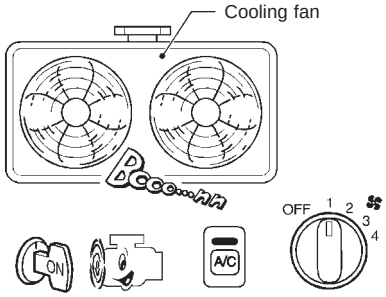
## DIAGNOSTIC PROCEDURE

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

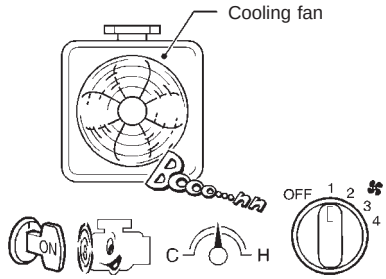
SEF111X

A

**With air conditioner**

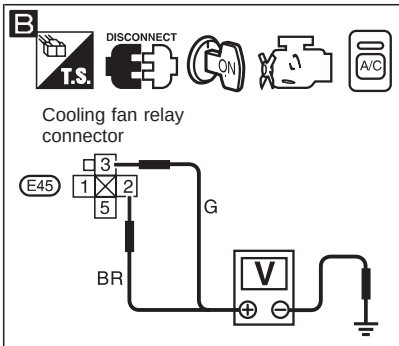



**Without air conditioner**




MEF277G

B




YEC345

INSPECTION START

A

**CHECK OVERALL FUNCTION.**

1. Turn ignition switch to "ON" position.
2. Select "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II.

OR

With Air Conditioner

1. Start engine.
2. Set temperature switch at full cold position.
3. Turn air conditioner switch to "ON" position.
4. Turn blower fan switch to "ON" position.
5. Run engine at idle for a few minutes with air conditioner operating.
6. Make sure that cooling fan operates.

Without Air Conditioner

1. Start engine.
2. Keep engine speed at about 2,000 rpm until engine is warmed up sufficiently.
3. Make sure that cooling fan begins to operate during warm-up.

OK → INSPECTION END

NG

B

**CHECK POWER SUPPLY.**

1. Turn air conditioner switch to "OFF" position.
2. Turn blower fan switch to "OFF" position.
   (Step 1 and 2 are only performed for models with air conditioner.)
3. Stop engine.
4. Disconnect cooling fan relay.
5. Turn ignition switch to "ON" position.
6. Check voltage between cooling fan relay connector terminals ②, ③ and ground.
   **Voltage: Battery voltage**

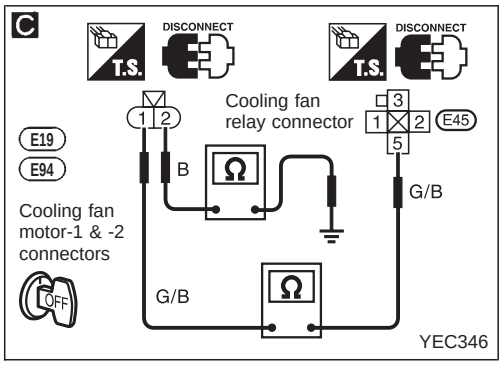
NG → Check the following:

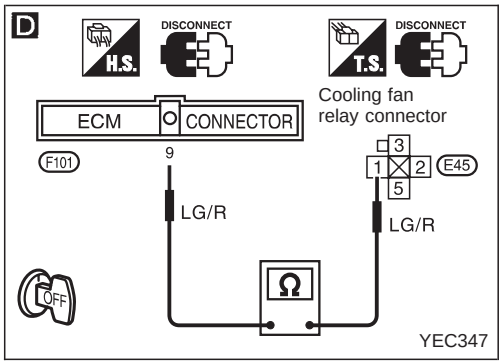
- Harness connector E127
- 40A fusible link
- 10A fuse
- Harness for open or short-circuit between fuse and cooling fan relay.
- Harness for open or short-circuit between battery and cooling fan relay.

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

OK → Ⓐ

# Cooling Fan Control (Cont'd)




Ⓐ

**C**

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan motor-1 & -2 connector terminals ① and cooling fan relay connector terminal ⑤; cooling fan motor-1 & -2 connector terminals ② and body ground.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

**D**

**CHECK OUTPUT SIGNAL CIRCUIT.**
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ⑨ and cooling fan relay connector terminal ①.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors F70, E65
- Harness for open or short-circuit between ECM and cooling fan relay.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace cooling fan relay.

OK ↓

CHECK COMPONENTS
(Cooling fan motors).
Refer to "COMPONENT INSPECTION" on next page.

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.

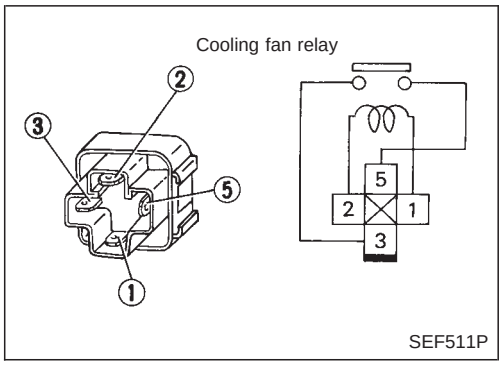
↓

INSPECTION END

# Cooling Fan Control (Cont'd)

## COMPONENT INSPECTION

### Cooling fan relay

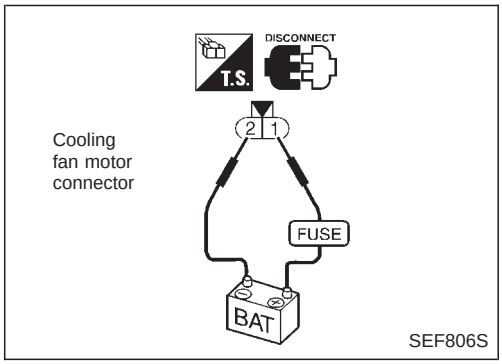



Check continuity between cooling fan relay terminals ③ and ⑤.

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

If NG, replace relay.

### 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.

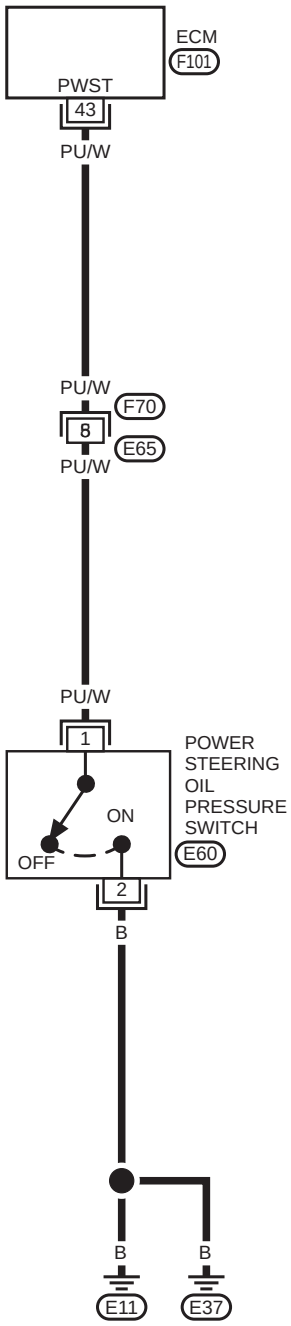
| | Terminals | |
|---|---|---|
| | (⊕) | (⊖) |
| Cooling fan motor | ① | ② |

**Cooling fan motor should operate.**

If NG, replace cooling fan motor.

## Power Steering Oil Pressure Switch

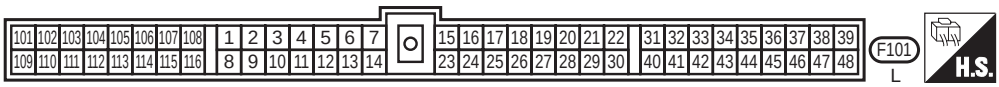
EC-PST/SW-01




: Detectable line for DTC

: Non-detectable line for DTC



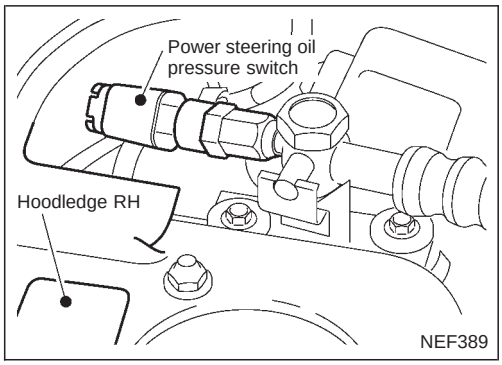


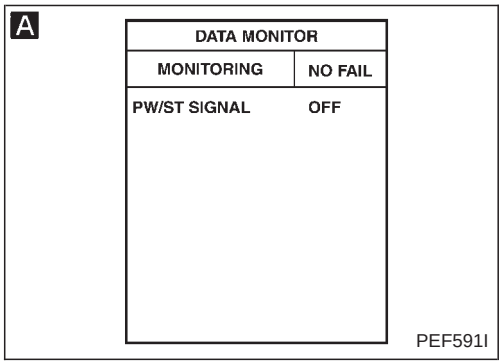

YEC301

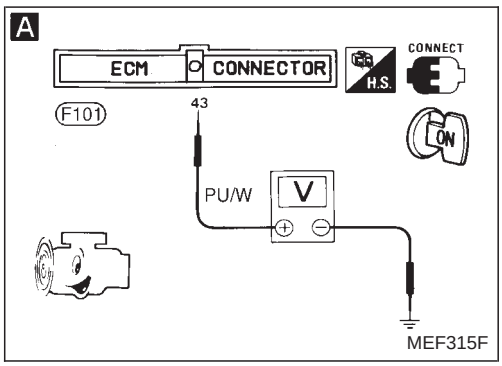
# Power Steering Oil Pressure Switch (Cont'd)

## COMPONENT DESCRIPTION

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.




## DIAGNOSTIC PROCEDURE

INSPECTION START

A

**CHECK OVERALL FUNCTION.**

1. Start engine and warm it up sufficiently.
2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT-II.

**Steering is in neutral position:**
**OFF**
**Steering is turned:**
**ON**

OR

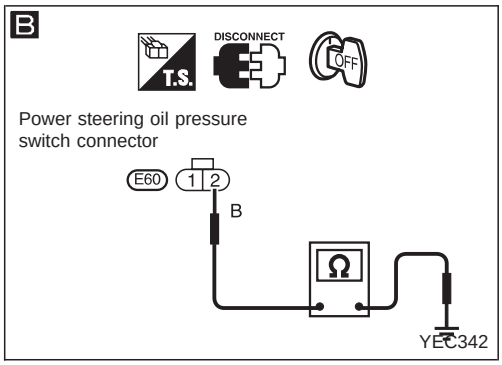
2. Check voltage between ECM connector terminal (43) and ground.

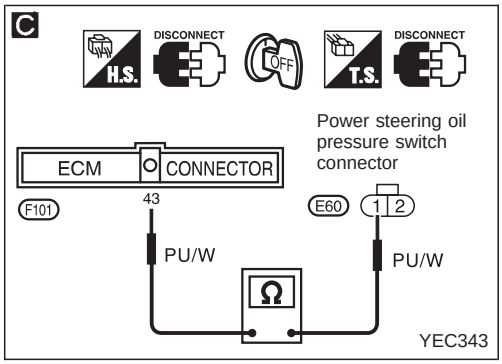
**Voltage:**
**When steering wheel is turned quickly.**
**Approximately 0V**
**Except above**
**Approximately 5V**

OK → INSPECTION END

NG → (A)

## Power Steering Oil Pressure Switch (Cont'd)




Ⓐ

**B**

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Disconnect power steering oil pressure switch harness connector.
3. Check harness continuity between power steering oil pressure switch connector terminal ② and engine ground.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

**C**

**CHECK INPUT SIGNAL CIRCUIT.**
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ㊸ and power steering oil pressure connector terminal ①.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors F70, E65
- Harness for open or short-circuit between ECM and power steering oil pressure switch.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "COMPONENT INSPECTION" below.

NG → Replace power steering oil pressure switch.

OK ↓

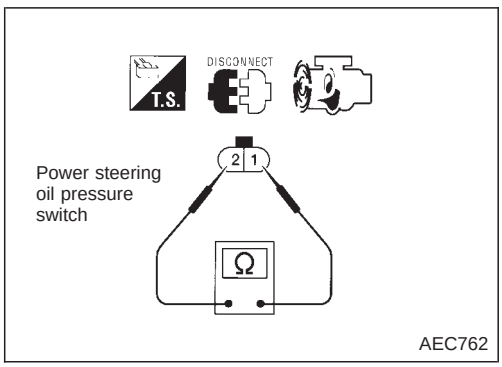
Disconnect and reconnect harness connectors in the circuit. Then retest.

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




## COMPONENT INSPECTION

### Power steering oil pressure switch

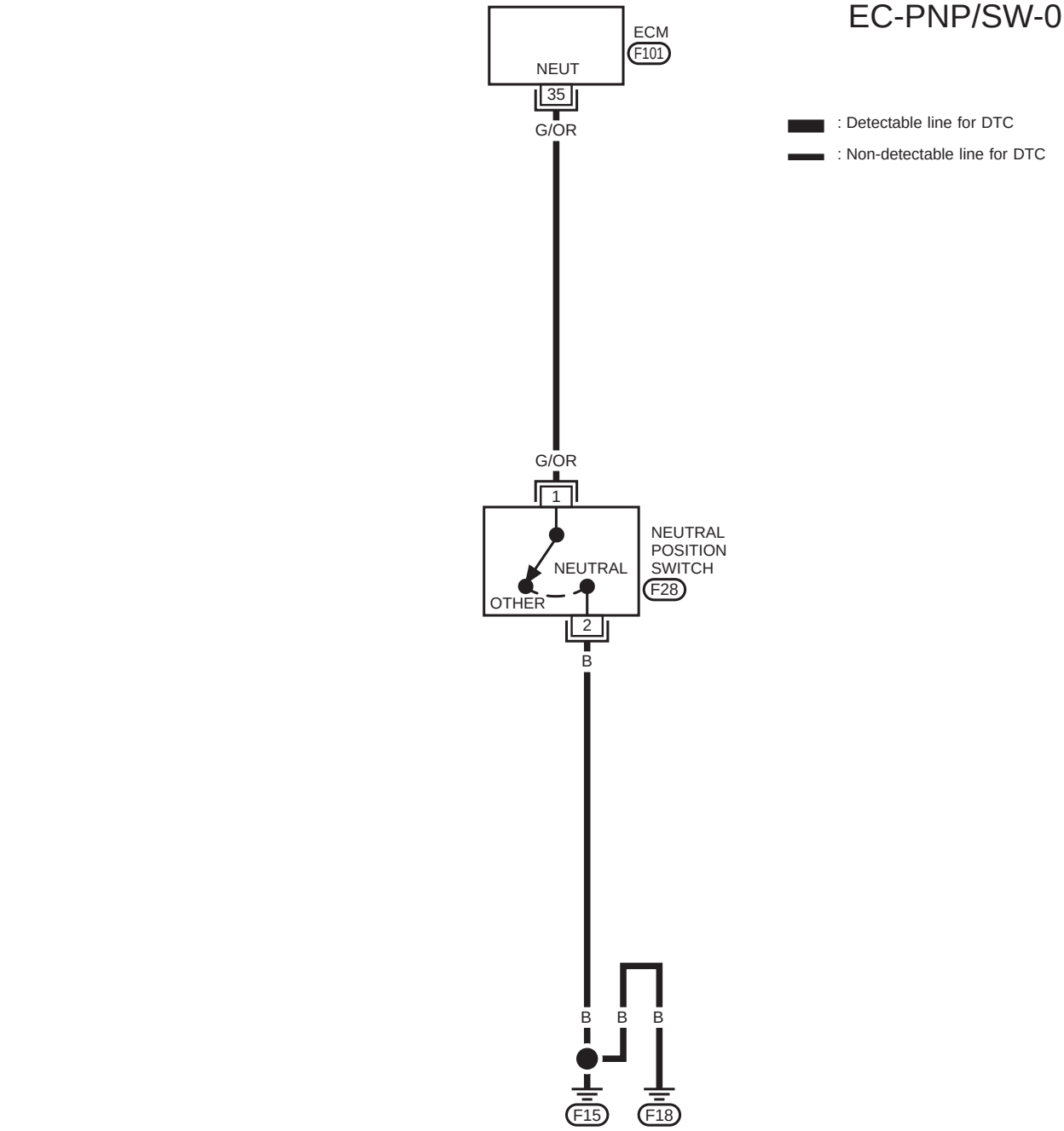
1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between power steering oil pressure switch terminals ① and ②.

| Conditions | Continuity |
|---|---|
| Steering wheel is being turned | Yes |
| Steering wheel is not being turned | No |

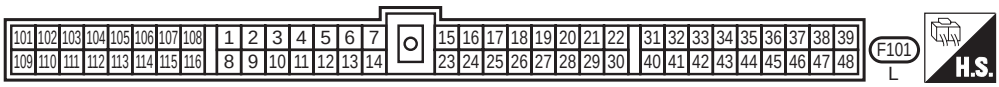
If NG, replace power steering oil pressure switch.

## Neutral Position Switch

EC-PNP/SW-01








YEC302

## Neutral Position Switch (Cont'd)

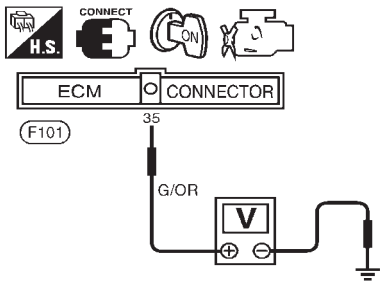
When the gear position is in neutral position, neutral position switch is ''ON''. ECM detects the position because the continuity of the line (the ''ON'' signal) exists.

A

| DATA MONITOR | |
|---|---|
| MONITOR | NO DTC |
| CMPS-RPM(REF) | 0 RPM |
| M/R F/C MNT | LEAN |

C2DMM03

A




MEC779B

### DIAGNOSTIC PROCEDURE

INSPECTION START

A

**CHECK OVERALL FUNCTION.**

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

**Neutral position: ON**
**Except neutral position: OFF**

OR

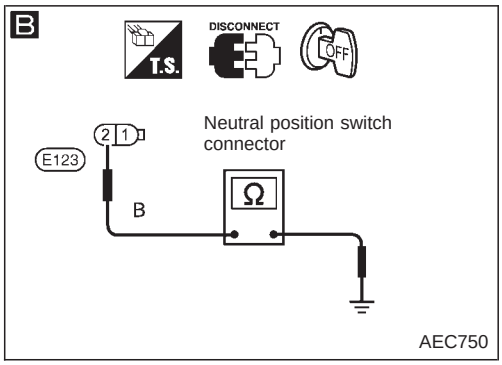
2. Check voltage between ECM terminal (35) and ground under the following conditions:

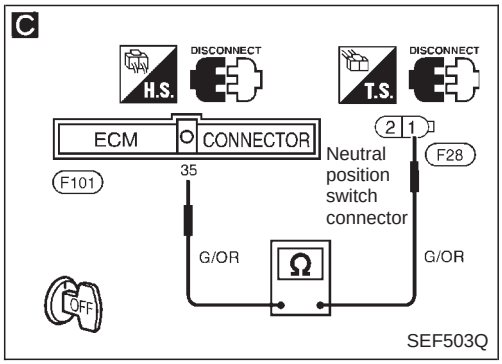
**Voltage:**
**Neutral position**
**Approximately 0V**
**Except neutral position**
**Approximately 5V**

OK → INSPECTION END

NG → (A)

## Neutral Position Switch (Cont'd)




Ⓐ

**B**

**CHECK GROUND CIRCUIT.**

1. Turn ignition switch to "LOCK" position.
2. Disconnect neutral position switch harness connector.
3. Check harness continuity between neutral position switch connector terminal ② and body ground.
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

**C**

**CHECK INPUT SIGNAL CIRCUIT.**

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ㉟ and neutral position switch connector terminal ① .
   **Continuity should exist.**
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Neutral position switch).
Refer to MT section.

NG → Replace neutral position switch.

OK ↓

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

Trouble is not fixed. ↓

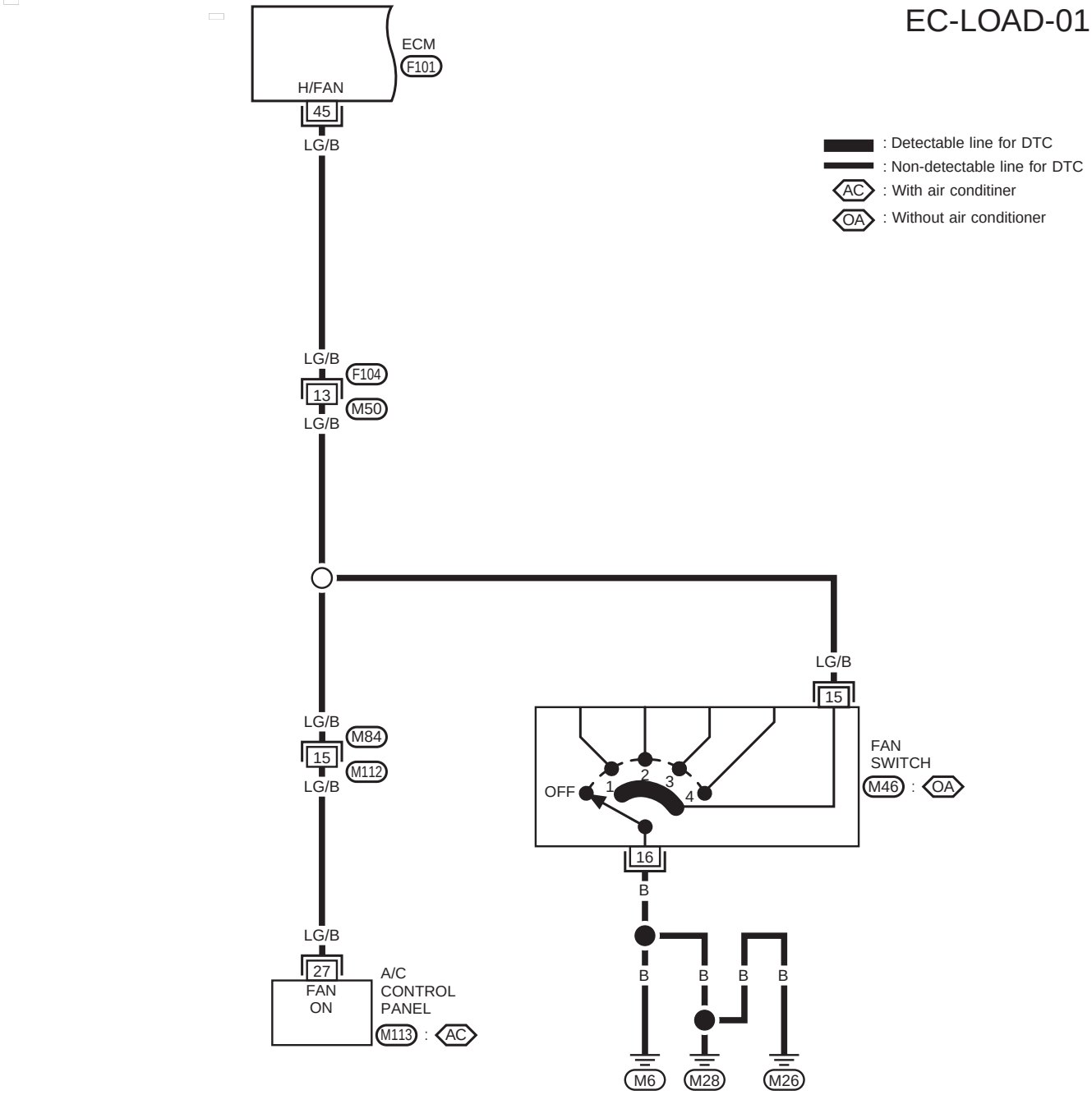
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

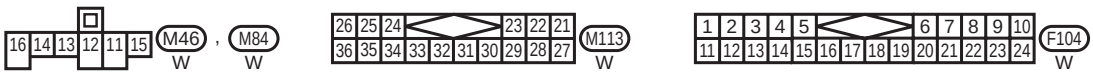
↓

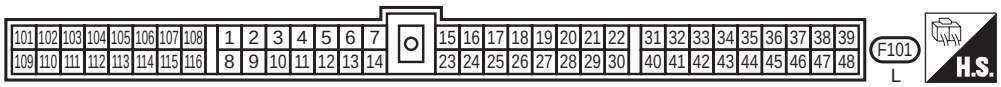
INSPECTION END

# Electrical Load Signal

EC-LOAD-01



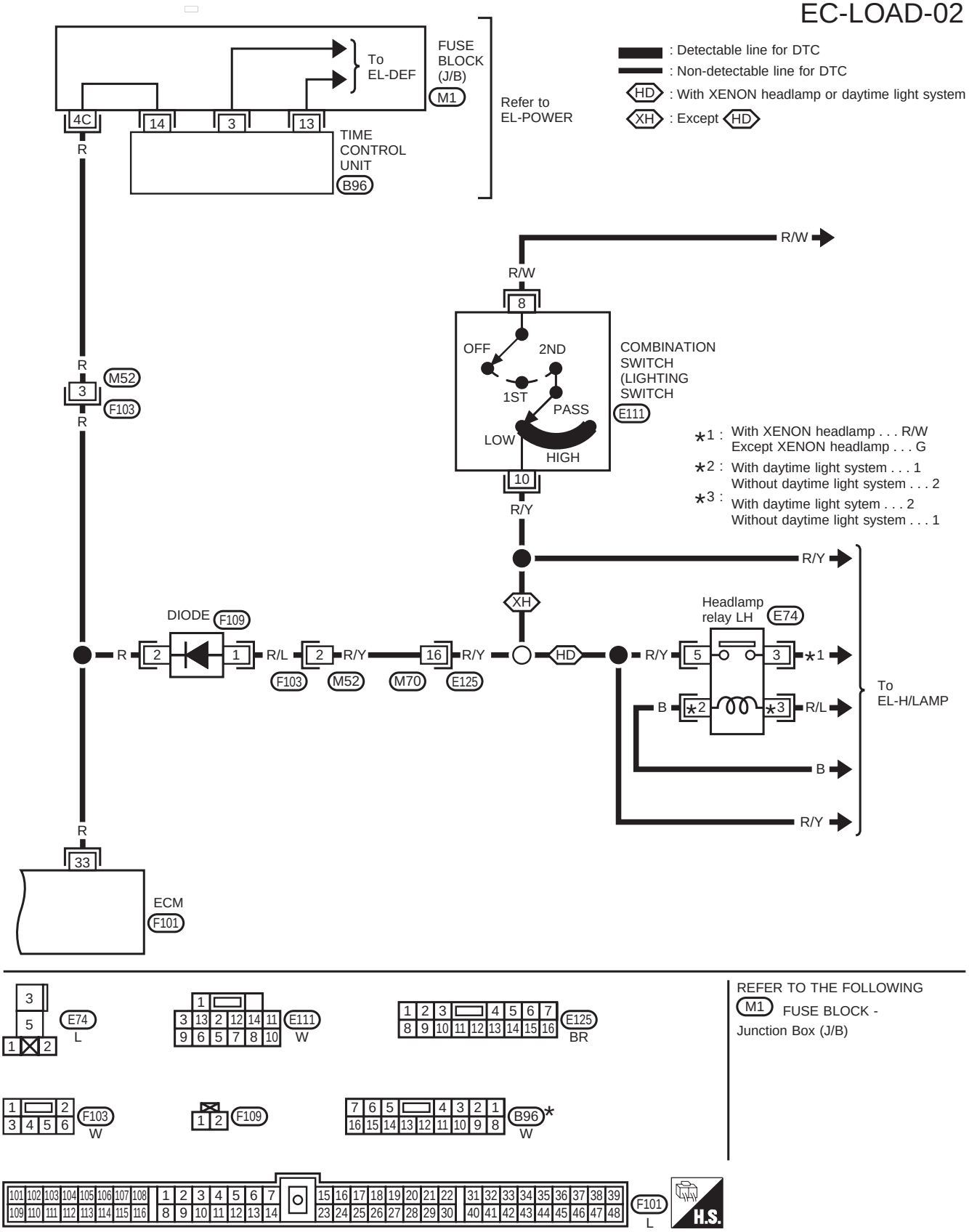




YEC303

# Electrical Load Signal (Cont'd)

EC-LOAD-02







REFER TO THE FOLLOWING
M1 FUSE BLOCK - Junction Box (J/B)

*: This connector is not shown in "HARNESS LAYOUT" of EL section.

YEC304

# Electrical Load Signal (Cont'd)

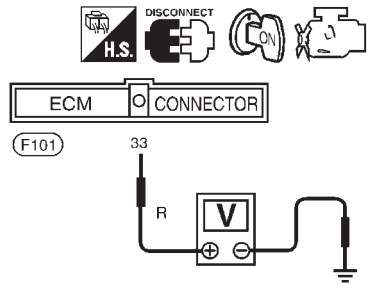
## DIAGNOSTIC PROCEDURE

A

| DATA MONITOR | |
|---|---|
| MONITOR | NO DTC |
| P/N POSI SW | ON |

C2DMM04

A



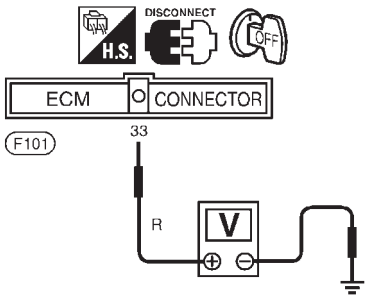

SEF801S

A

| DATA MONITOR | |
|---|---|
| MONITOR | NO DTC |
| P/N POSI SW | ON |

C2DMM04

B




SEF802S

INSPECTION START

A

**CHECK OVERALL FUNCTION-I.**

1. Turn ignition switch to "ON" position.
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II.
   **Rear window defogger switch is "ON": ON**
   **Rear window defogger switch is "OFF": OFF**

OR

2. Check voltage between ECM connector terminal (33) and ground under the following conditions:
   **Voltage:**
   **Rear window defogger switch is "ON":**
   **Battery voltage**
   **Rear window defogger switch is "OFF":**
   **Approximately 0V**

NG → Check rear window defogger circuit. (Go to Procedure A .)

OK

B

**CHECK OVERALL FUNCTION-II.**

1. Turn rear window defogger switch to "OFF" position.
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II.
   **Lighting switch is "ON": ON**
   **Lighting switch is "OFF": OFF**

OR

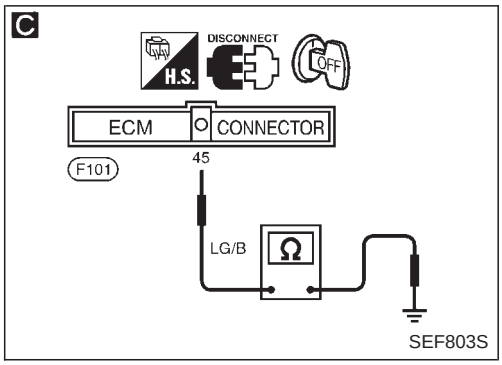
2. Turn ignition switch to "LOCK" position.
3. Check voltage between ECM connector terminal (33) and ground under the following conditions:
   **Voltage:**
   **Lighting switch is "ON":**
   **Battery voltage**
   **Lighting switch is "OFF":**
   **Approximately 0V**

NG → Check lighting switch circuit. (Go to Procedure B .)

OK

(A)

## Electrical Load Signal (Cont'd)




Ⓐ

C

**CHECK POWER AND GROUND CIRCUIT.**

1. Turn ignition switch to "LOCK" position.
2. Check continuity between ECM connector terminal (45) and ground.

**Blower fan switch "ON":**
**Continuity should exist.**

**Blower fan switch "OFF":**
**Continuity should not exist.**

NG →

Check the following:
- Harness connectors (M50), (F104)
- Harness connectors (M84), (M112)
- Harness continuity between ECM and fan switch, fan switch and ground.
- Fan switch (Refer to HA section.)

If NG, repair harness or connectors.

OK ↓

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

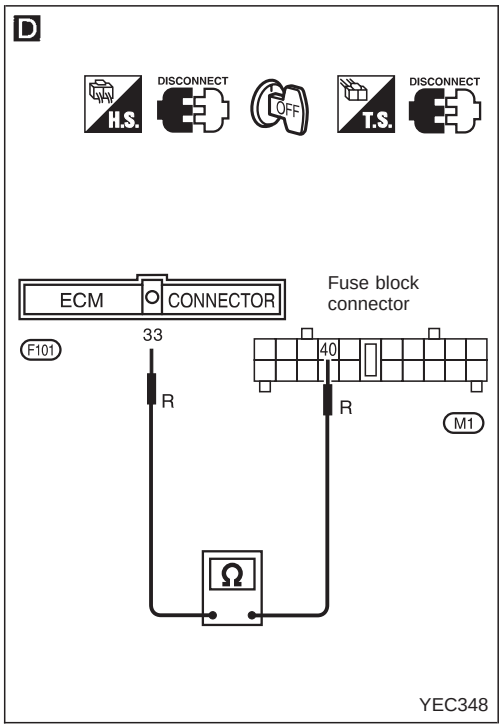
Trouble is not fixed. ↓

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

↓

INSPECTION END

## Electrical Load Signal (Cont'd)




**PROCEDURE A**

INSPECTION START

Check if rear window defogger functions normally.

NG → Check rear window defogger circuit. (Refer to "REAR WINDOW DEFOGGER" in EL section.)

OK

D

**CHECK INPUT SIGNAL CIRCUIT.**

1. Turn rear window defogger switch to "OFF" position.
2. Turn ignition switch to "LOCK" position.
3. Disconnect ECM harness connector and fuse block harness connector.
4. Check harness continuity between ECM connector terminal (33) and fuse block harness connector terminal (4C).

**Continuity should exist.**

If OK, check harness for short-circuit.

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

If NG, repair harness or connectors.

OK

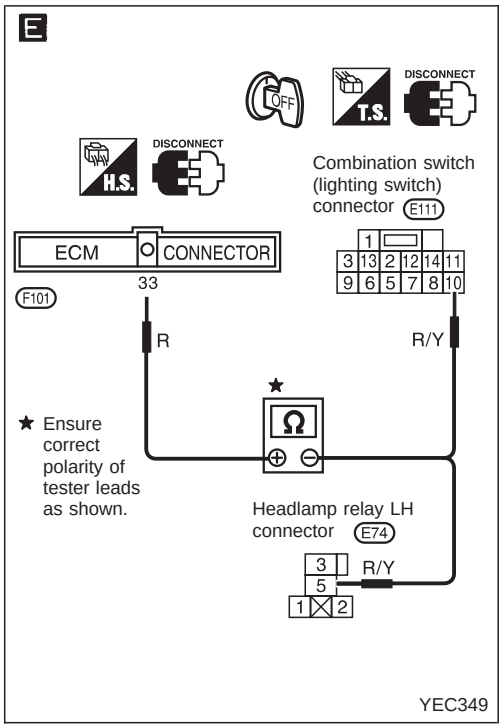
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

INSPECTION END

## Electrical Load Signal (Cont'd)




**PROCEDURE B**

INSPECTION START

Check if lamps light when lighting switch is turned to "ON" position.

NG → Check lighting switch circuit and headlamp circuit. (Refer to "COMBINATION SWITCH" and "HEADLAMP" in EL section.)

OK

E

**CHECK INPUT SIGNAL CIRCUIT.**

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and lighting switch harness connector or headlamp relay LH.
3. Check harness continuity between ECM connector terminal (33) and combination switch (lighting switch) connector terminal (10) or headlamp relay LH connector terminal (5).
   **Continuity should exist.**
   If OK, check harness for short.

NG → Check the following:

- Harness connectors E125, M70
- Harness connectors M52, F103
- Diode F109
- Harness for open or short-circuit between lighting switch and ECM.
- Harness for open or short-circuit between headlamp relay LH and ECM.

If NG, repair harness or connectors.

OK

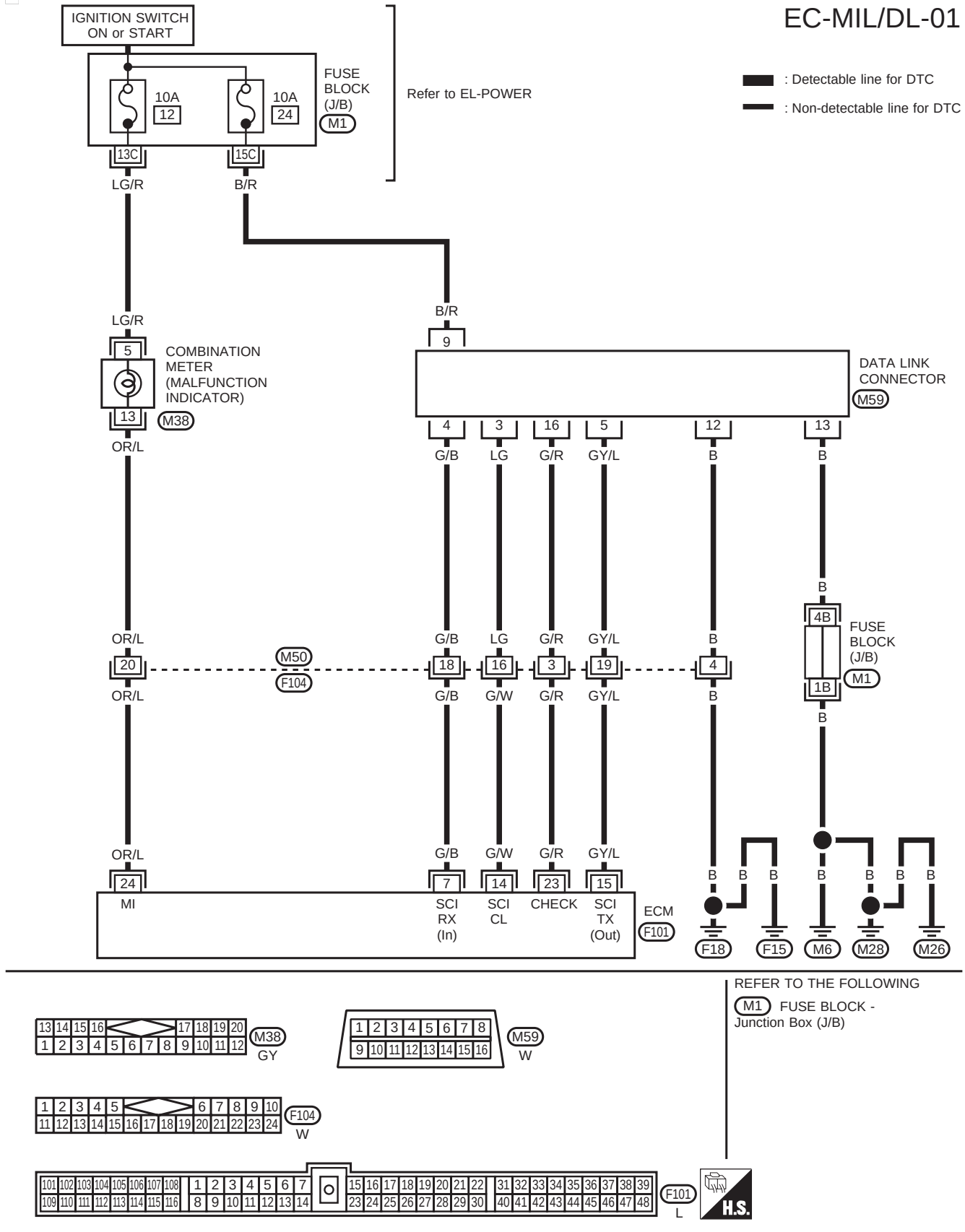
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

INSPECTION END

## MI & Data Link Connectors




YEC305

## General Specifications

| PRESSURE REGULATOR | Fuel pressure at idling kPa (bar, kg/cm$^2$, psi) |
|---|---|
| Vacuum hose is connected | Approximately 245 (2.45, 2.5, 36) |
| Vacuum hose is disconnected | Approximately 294 (2.94, 3.0, 43) |

## Inspection and Adjustment

| | |
|---|---|
| Idle speed*1 rpm | Models with daytime light system 800±50 |
| No-load*2 | Models without daytime light system 750±50 |
| Air conditioner: ON | 900 or more |
| Ignition timing | 10°±2° BTDC |
| Throttle position sensor idle position*3 V | 0.35 - 0.65 |

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater, fan & rear defogger)

*3: Engine is warmed up sufficiently.

### IGNITION COIL

| | | |
|---|---|---|
| Primary voltage | V | 12 |
| Primary resistance [at 20°C (68°F)] | Ω | Approximately 2 |
| Secondary resistance [at 20°C (68°F)] | kΩ | Approximately 12 |

### MASS AIR FLOW SENSOR

| | | |
|---|---|---|
| Supply voltage | V | Battery voltage |
| Output voltage | V | 1.4 - 1.8* |

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

### 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 |

### HEATED OXYGEN SENSOR HEATER

| | | |
|---|---|---|
| Resistance [at 25°C (77°F)] | Ω | 2.3 - 4.3 |

### FUEL PUMP

| | | |
|---|---|---|
| Resistance [at 25°C (77°F)] | Ω | Approximately 0.2 - 5 |

### IACV-AAC VALVE

| | | |
|---|---|---|
| Resistance [at 25°C (77°F)] | Ω | Approximately 10 |

### INJECTOR

| | | |
|---|---|---|
| Resistance [at 25°C (77°F)] | Ω | Approximately 10 - 14 |

### RESISTOR

| | | |
|---|---|---|
| Resistance [at 25°C (77°F)] | kΩ | Approximately 2.2 |

### THROTTLE POSITION SENSOR

| Accelerator pedal conditions | Resistance kΩ [at 25°C (77°F)] |
|---|---|
| Completely released | Approximately 0.5* |
| Partially released | 0.5 - 4 |
| Completely depressed | Approximately 4 |

*: Engine is warmed up sufficiently.