

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

EF&EC

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When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

PRECAUTIONS

Engine Fuel & Emission Control System

Engine Application		Description	Tool number Tool name
GA	BR		
X	X	Wiring harness	EEF118000 Wiring harness

WIRELESS EQUIPMENT

- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.
 - 1) Keep the antenna as far as possible away from the electronic control units.
 - 2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.
 - 3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
 - 4) Be sure to ground the radio to vehicle body.



INJECTOR

- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.

FUEL PUMP

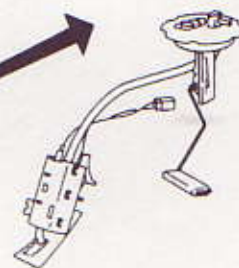
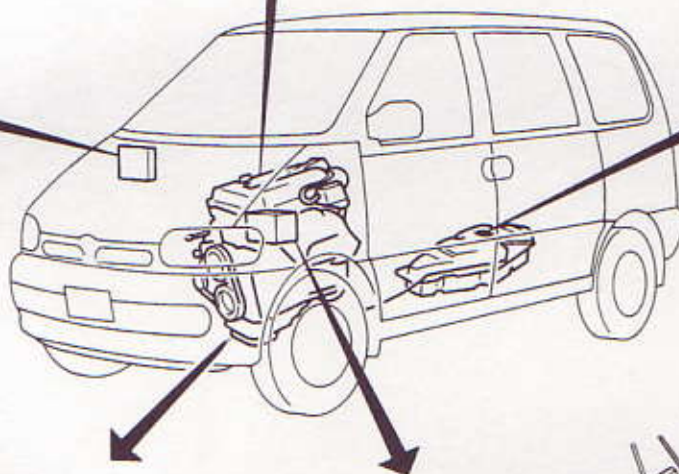
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.

E.C.C.S. HARNESS HANDLING

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

E.C.U.

- Do not disassemble E.C.C.S. control unit (E.C.U.)
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ROM value. The E.C.C.S. 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.



E.C.C.S. PART HANDLING

- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with any type of detergent.
- Do not disassemble auxiliary air control valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crank angle sensor.

BATTERY

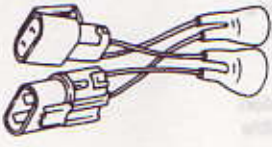
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

WHEN STARTING

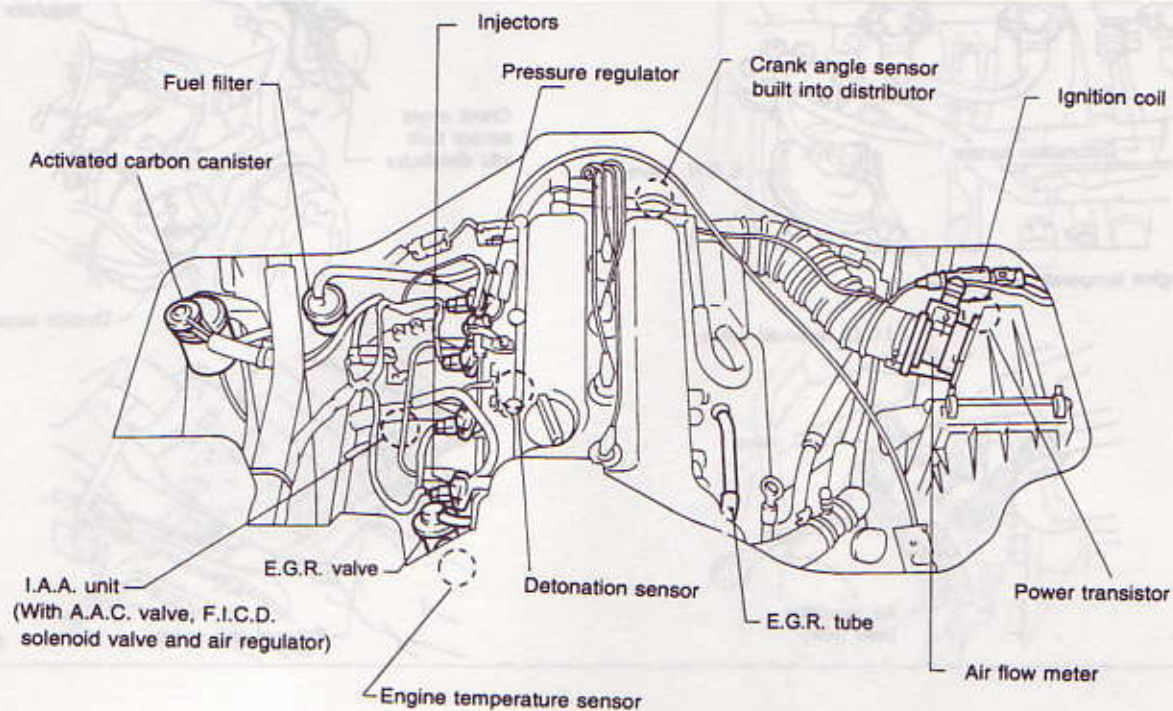
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shut-down.

PREPARATION

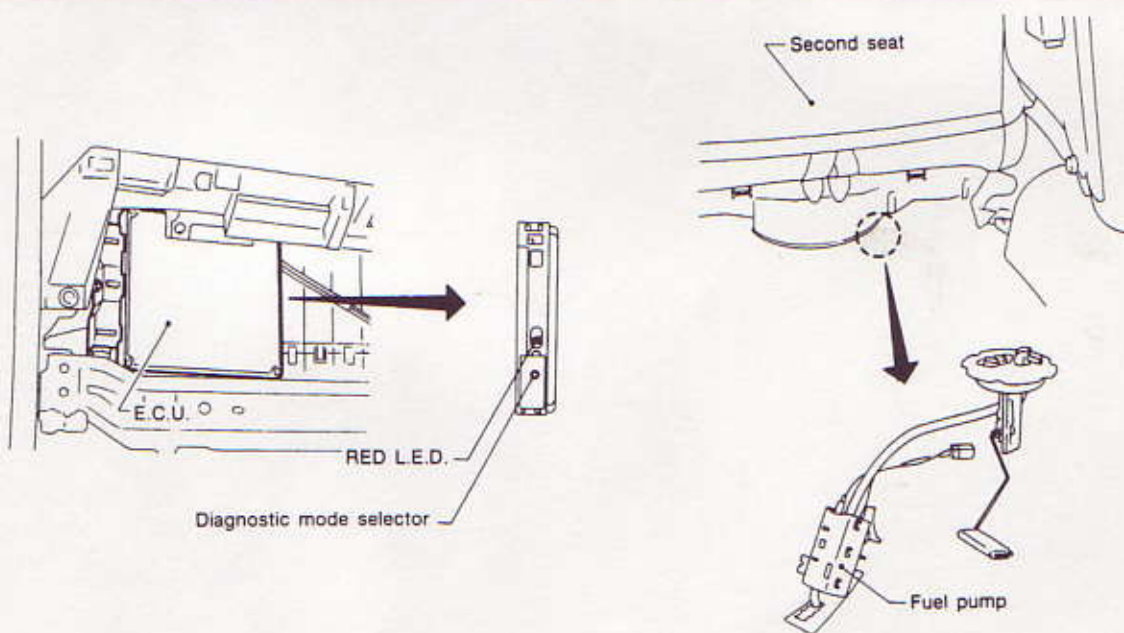
SPECIAL SERVICE TOOL

Tool number Tool name	Description	Engine application	
		SR	GA
EG11160000 Adapter harness	 Measuring engine speed	X	X

E.C.C.S. Component Parts Location

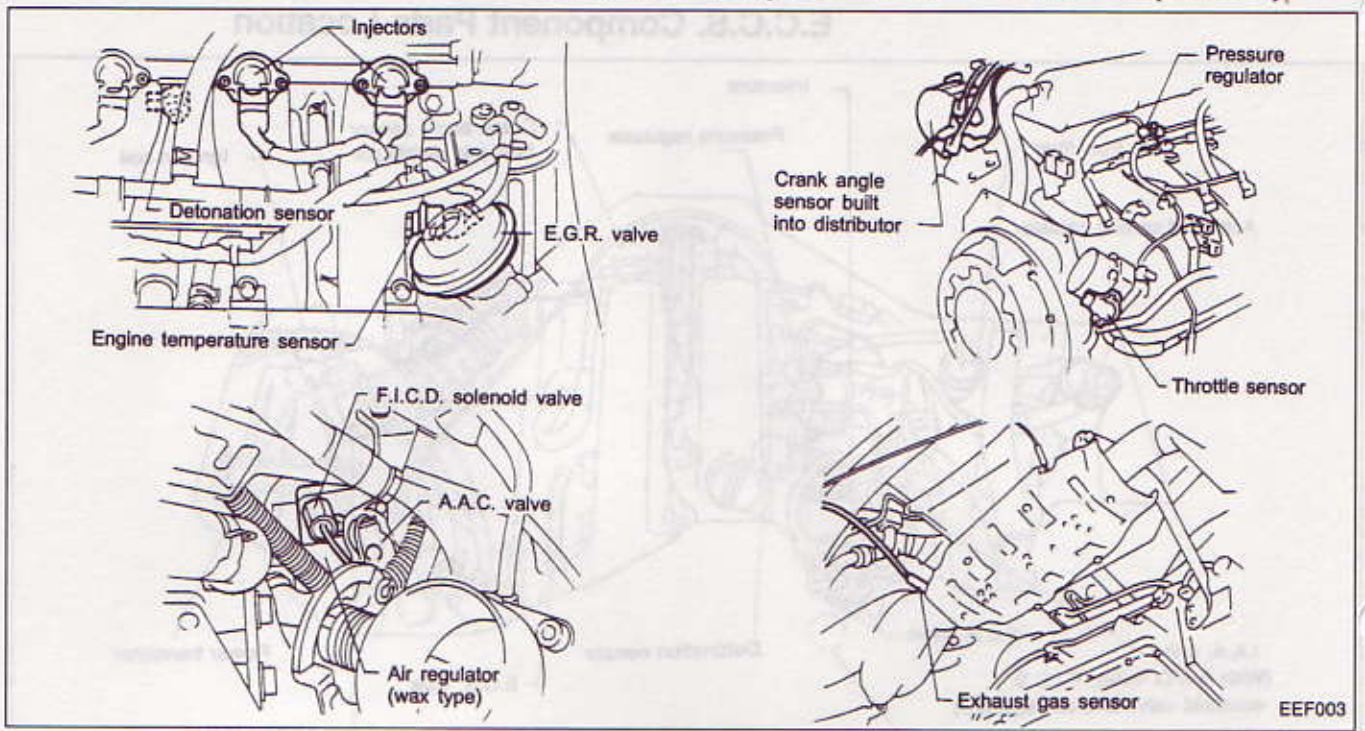


EEF002



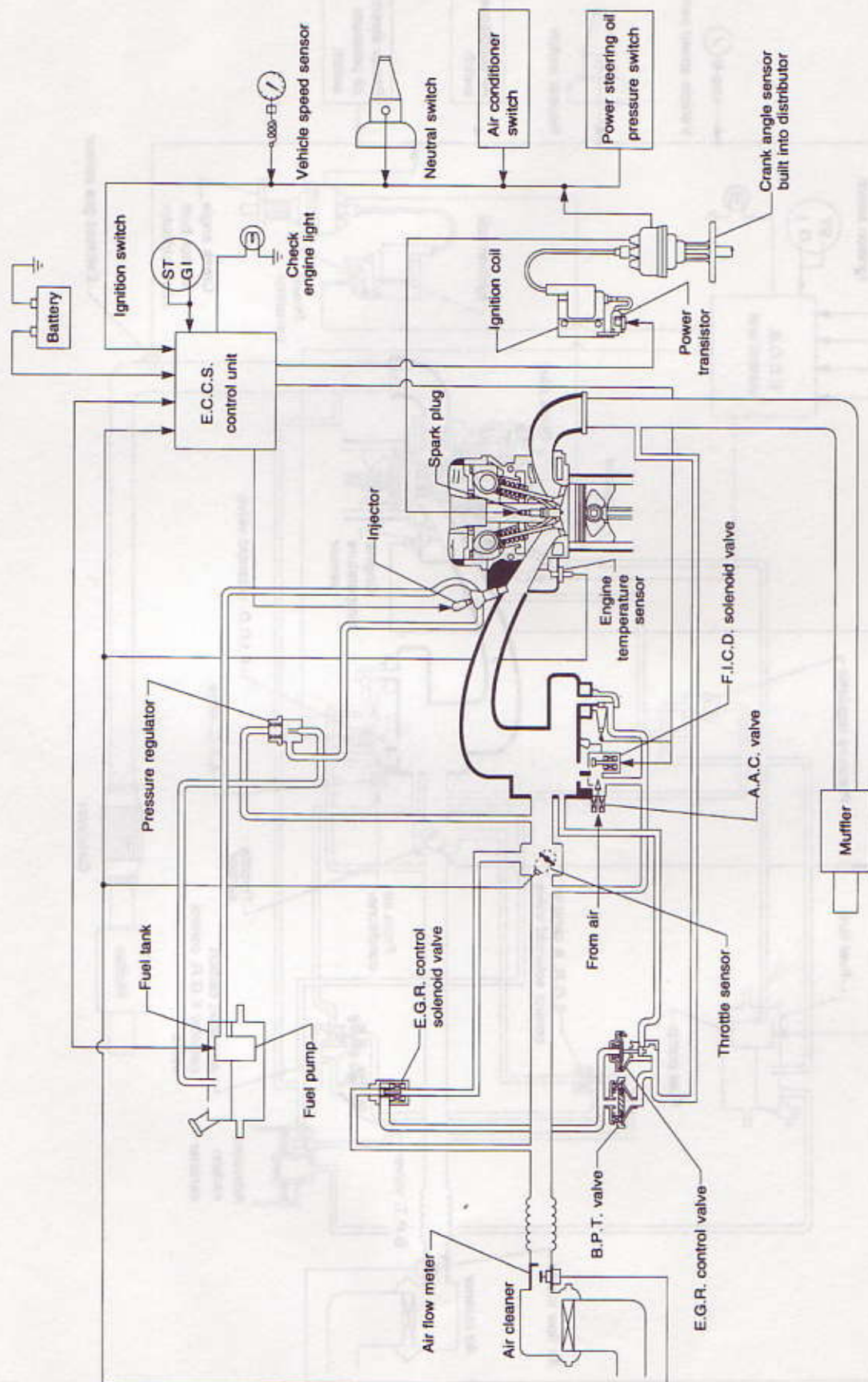
SEF945L

E.C.C.S. Component Parts Location (Cont'd)



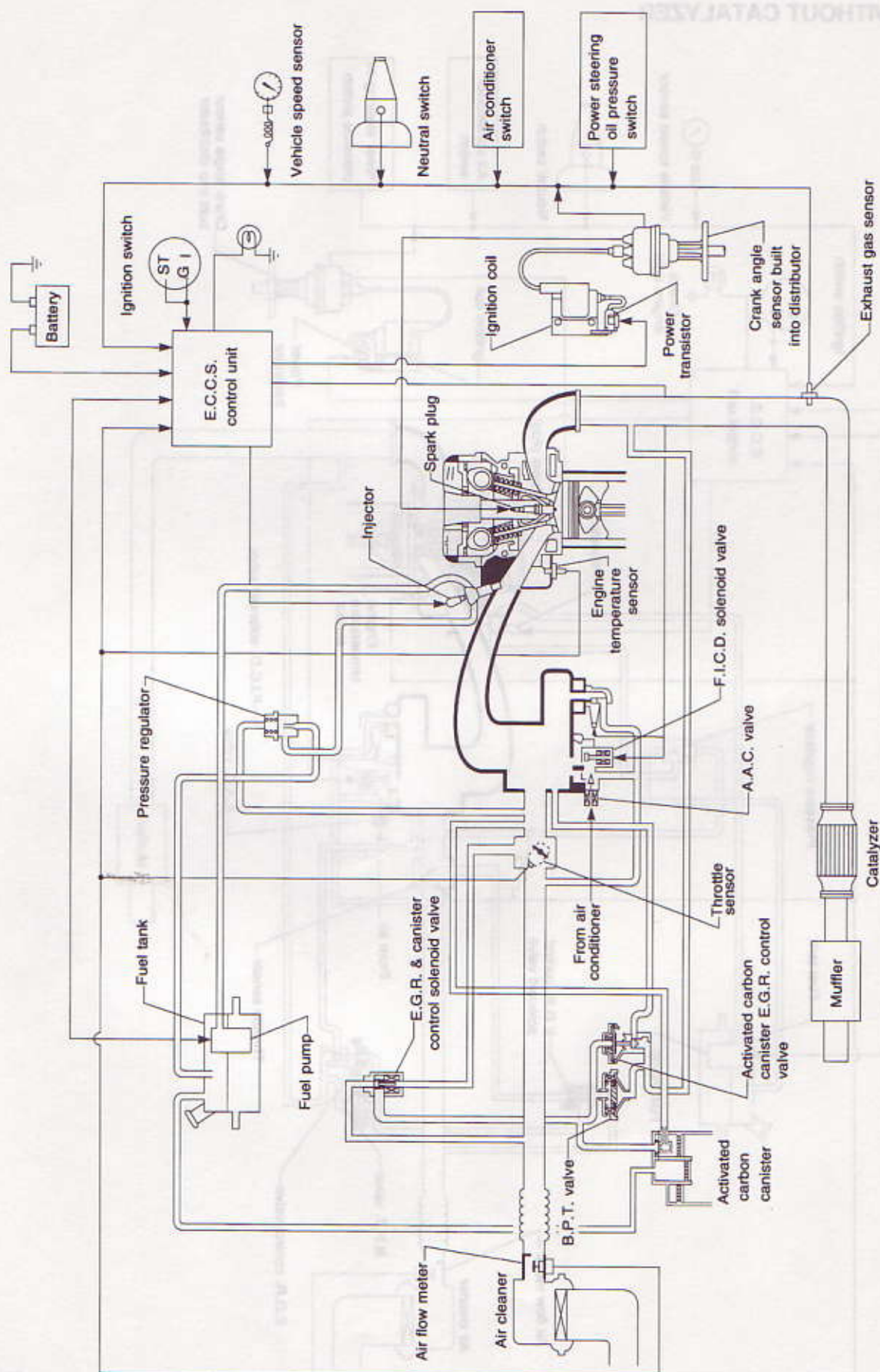
System Diagram

MODELS WITHOUT CATALYZER

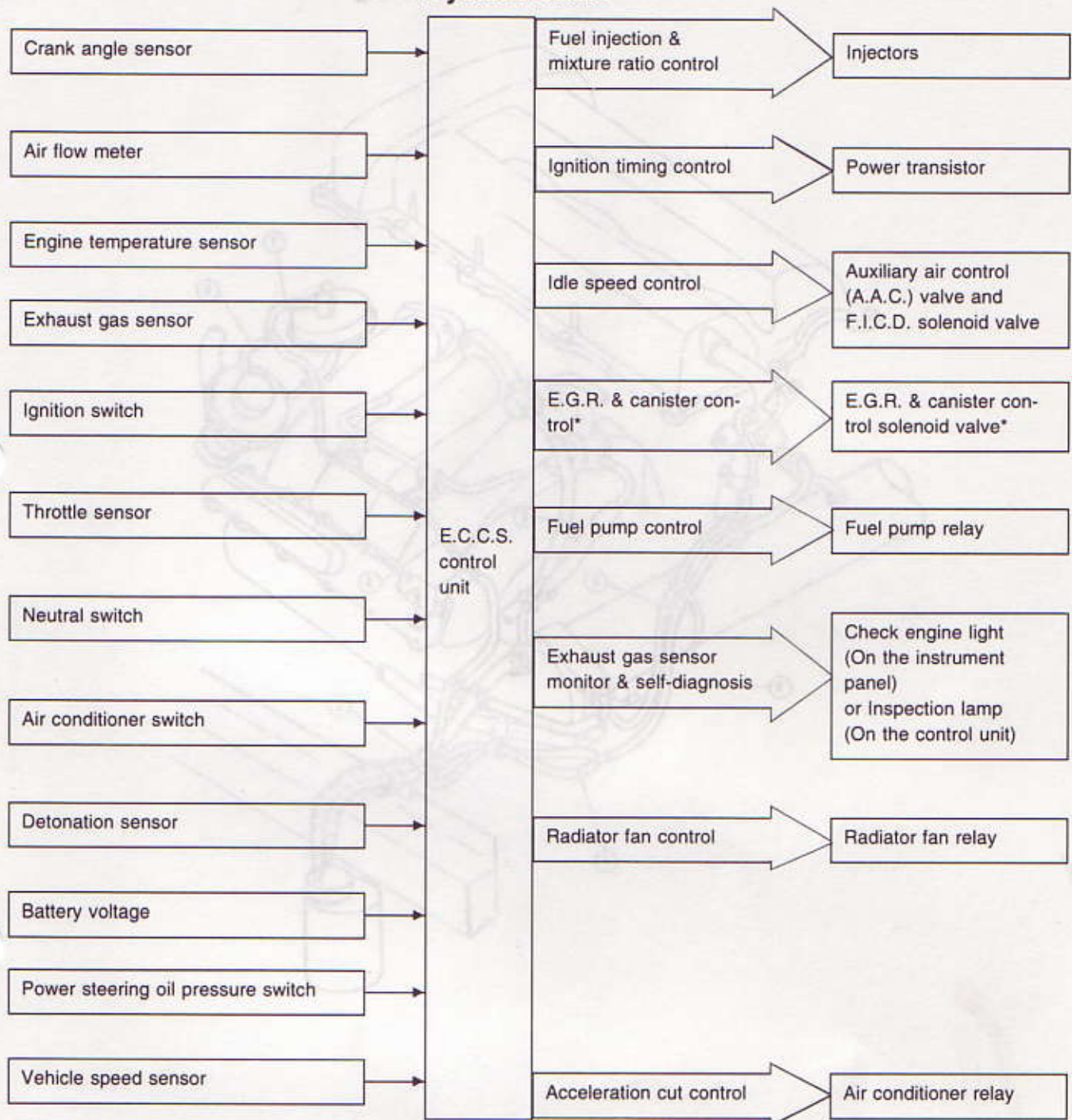


System Diagram (Cont'd)

MODELS WITH CATALYZER



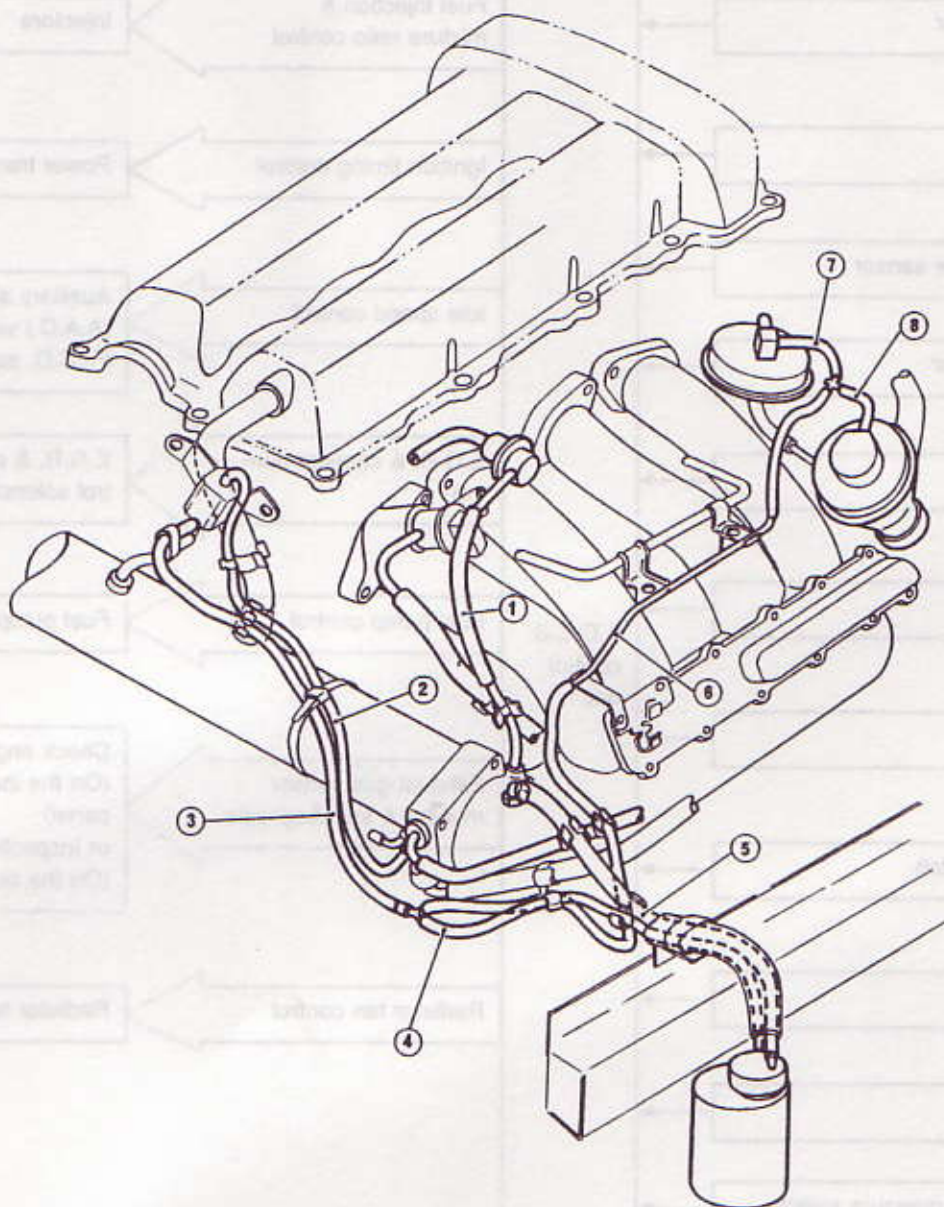
System Chart



*: Models with catalyzer only

Model	Model with E.C.C.S. control unit	Model with E.C.C.S. control unit and catalyzer
EF-9	X	X
EF-8	X	X
EF-7	X	X
EF-6	X	X
EF-5	X	X
EF-4	X	X
EF-3	X	X
EF-2	X	X
EF-1	X	X

Vacuum Hose Drawing

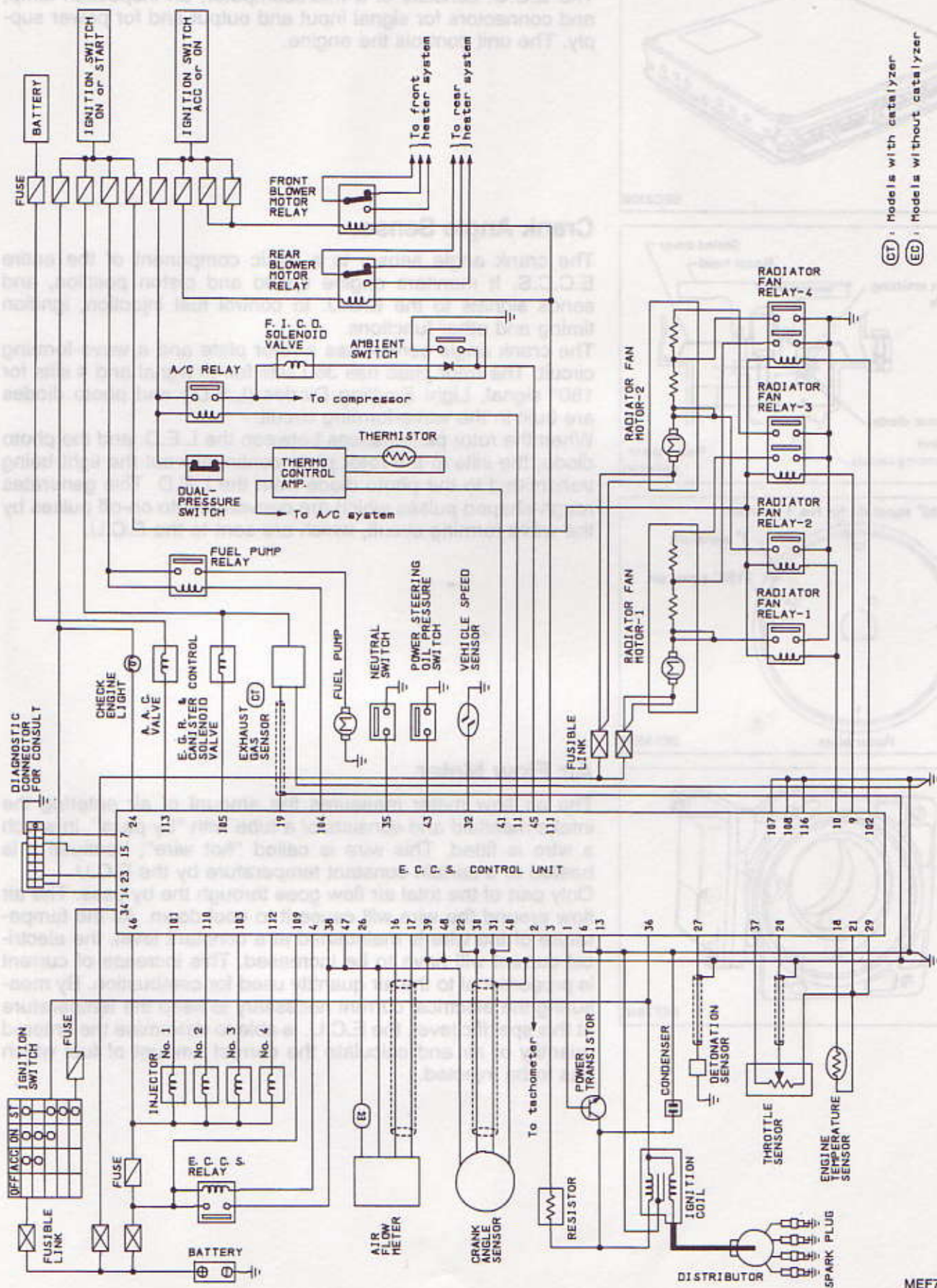


EEF006

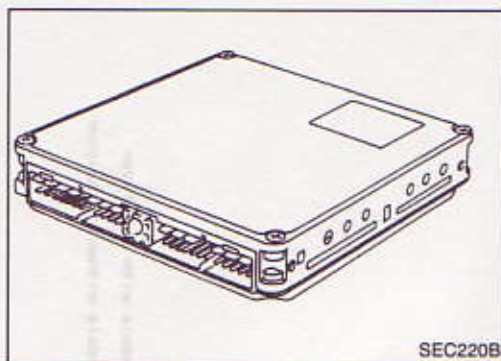
	Models with E.G.R. and A.C.C.★	Models with E.G.R. without A.C.C.
① Intake manifold to pressure regulator	X	X
② Throttle chamber to E.G.R. & canister control solenoid valve	X	X
③ E.G.R. & canister control solenoid valve to 3-way connector	X	X
④ 3-way connector to Activated Carbon Canister (vacuum port)	X	—
⑤ Activated Carbon Canister to intake manifold (purge port)	X	—
⑥ 3-way connector to 3-way connector (E.G.R.)	X	X
⑦ 3-way connector (E.G.R.) to B.P.T. valve	X	X
⑧ 3-way connector (E.G.R.) to E.G.R. control valve	X	X

★ Catalyzer models only.

Circuit Diagram



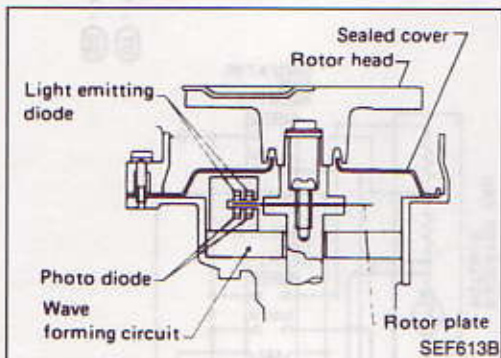
MEF714C



SEC220B

E.C.C.S. Control Unit (E.C.U.)

The E.C.U. consists of a microcomputer, an inspection lamp, and connectors for signal input and output and for power supply. The unit controls the engine.



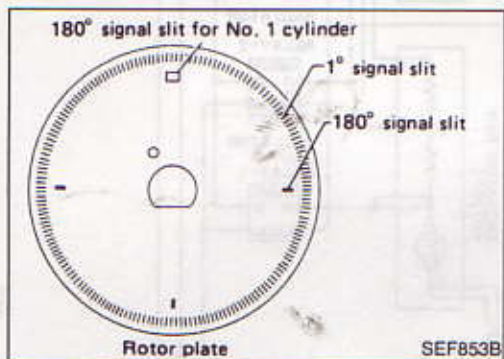
SEF613B

Crank Angle Sensor

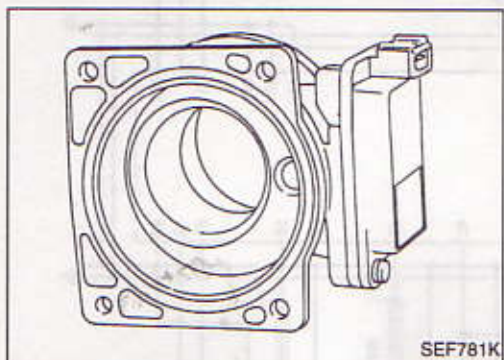
The crank angle sensor is a basic component of the entire E.C.C.S. It monitors engine speed and piston position, and sends signals to the E.C.U. to control fuel injection, ignition timing and other functions.

The crank angle sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 4 slits for 180° signal. Light Emitting Diodes (L.E.D.) and photo diodes are built in the wave-forming circuit.

When the rotor plate passes between the L.E.D. and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the L.E.D. This generates rough-shaped pulses which are converted into on-off pulses by the wave-forming circuit, which are sent to the E.C.U.



SEF853B

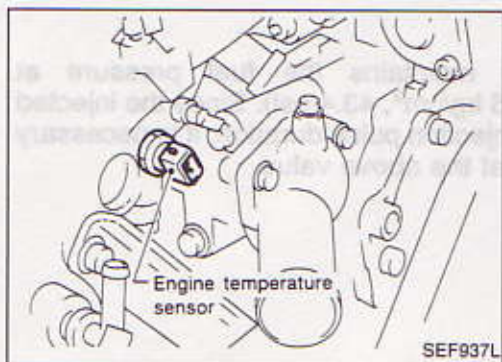


SEF781K

Air Flow Meter

The air flow meter measures the amount of air entering the intake manifold and consists of a tube with "by pass", in which a wire is fitted. This wire is called "hot wire", because it is heated to a certain constant temperature by the E.C.U.

Only part of the total air flow goes through the by pass. The air flow around the wire will cause it to cool down. As the temperature of the wire is maintained at a constant level, the electrical current will have to be increased. This increase of current is proportional to the air quantity used for combustion. By measuring the electrical current necessary to keep the temperature at this specific level, the E.C.U. is able to determine the entered quantity of air and calculate the correct amount of fuel which has to be injected.



Engine Temperature Sensor

The engine temperature sensor, located behind the oil filter, detects engine coolant temperature and transmits a signal to the E.C.U.

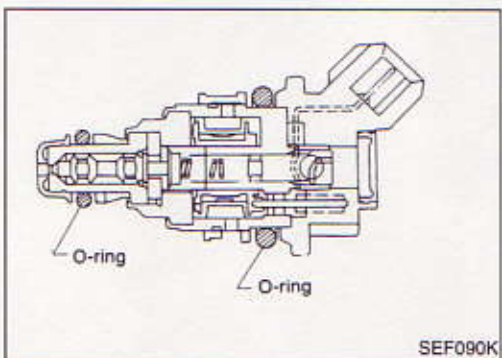
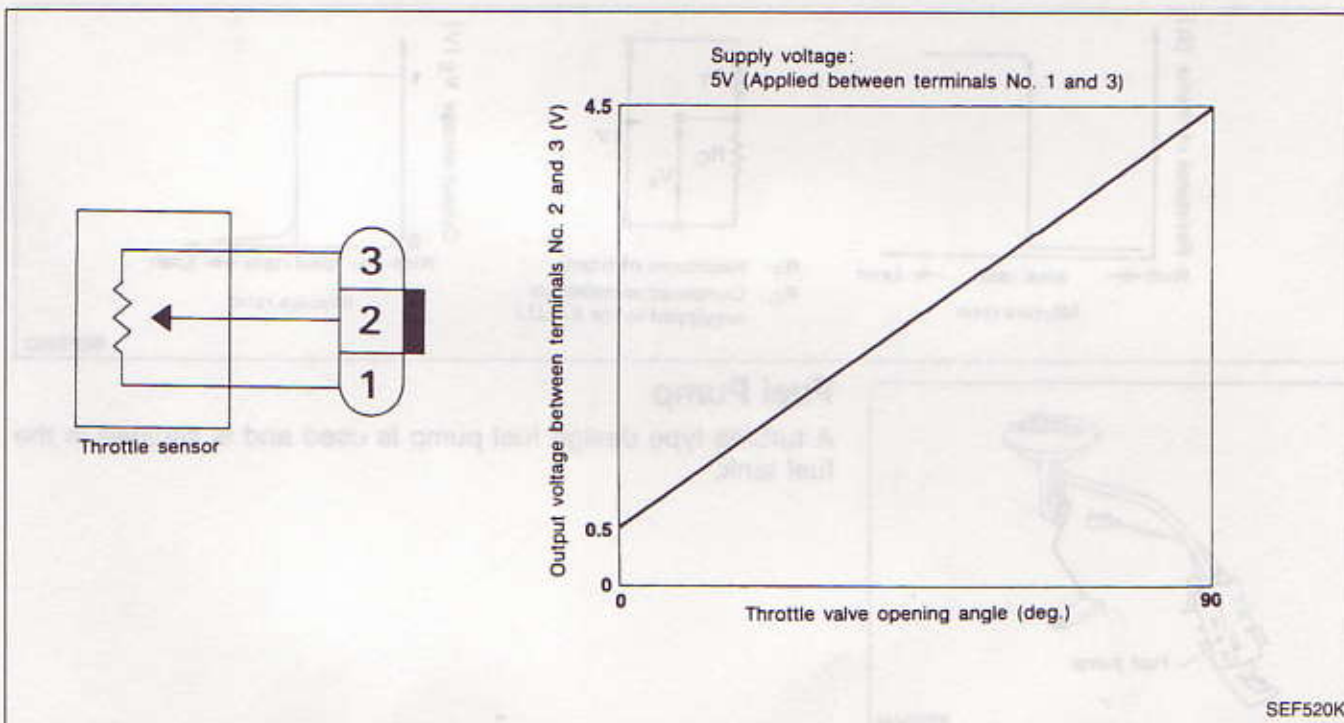
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



Throttle Sensor & Soft Idle Switch

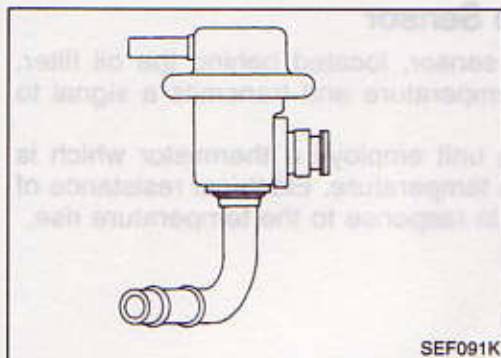
The throttle sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle valve position into output voltage, and emits the voltage signal to the E.C.U. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the E.C.U.

Idle position of the throttle valve is determined by the E.C.U. receiving the signal from the throttle sensor. This system is called "soft idle switch" and controls engine operation such as fuel cut.



Fuel Injector

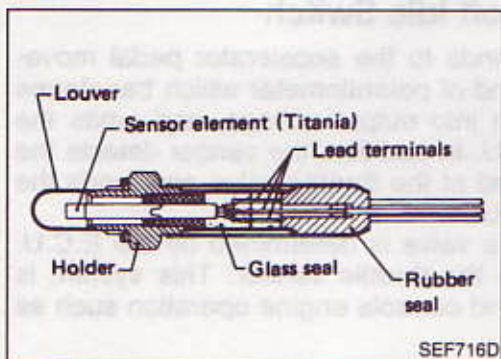
The fuel injector is a small, elaborate solenoid valve. As the E.C.U. sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The quantity of injected fuel is controlled by the E.C.U. in terms of injection pulse duration.



SEF091K

Pressure Regulator

The pressure regulator maintains the fuel pressure at 299.1 kPa (2.991 bar, 3.05 kg/cm², 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



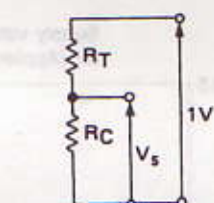
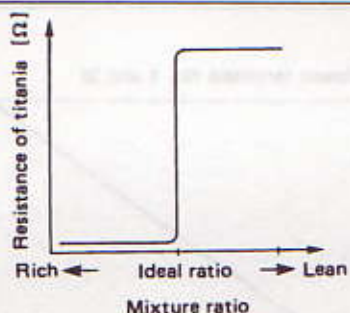
SEF716D

Exhaust Gas Sensor (Models with catalyzer only)

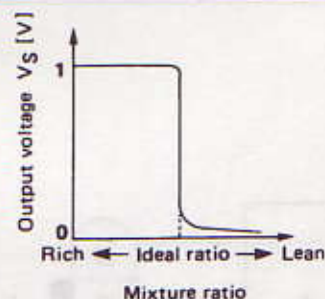
The exhaust gas sensor, located in the exhaust tube, monitors the oxygen level in the exhaust gas.

This sensor is made of ceramic titania, the electric resistance of which drastically changes at the ideal air-fuel ratio.

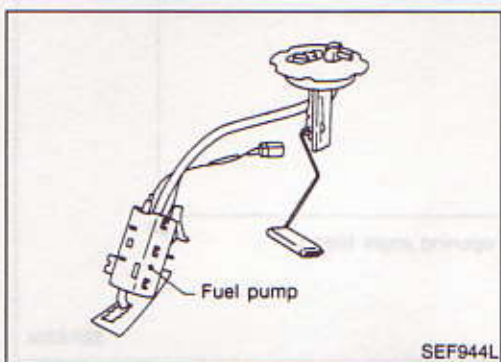
The E.C.U. supplies the sensor with approximately 1V and then measures the output voltage depending on its resistance. In order to activate the sensor element, it is equipped with a heater.



R_T: Resistance of titania
R_C: Comparative resistance (equipped in the E.C.U.)



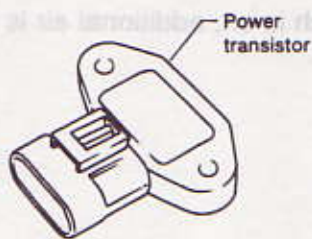
SEF285D



SEF944L

Fuel Pump

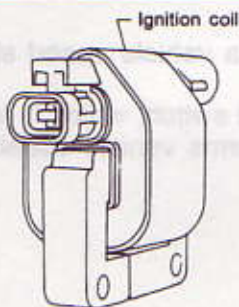
A turbine type design fuel pump is used and is situated in the fuel tank.



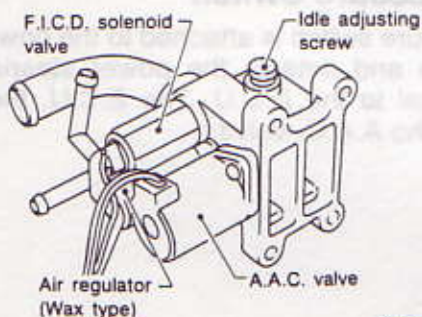
SEC094K

Power Transistor & Ignition Coil

The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, moulded type.



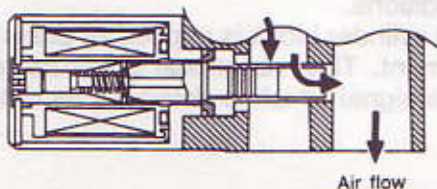
SEF566K



SEF939L

Idle Air Adjusting (I.A.A.) Unit

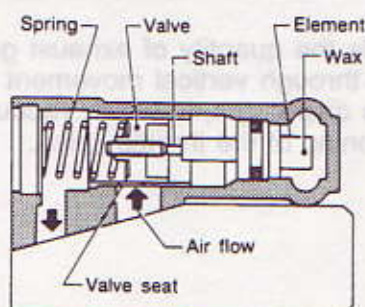
The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve, air regulator and idle adjusting screw. It receives the signal from the E.C.U. and controls the idle speed at the pre-set value.



SEF958L

Auxiliary Air Control (A.A.C.) Valve

The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the A.A.C. valve.

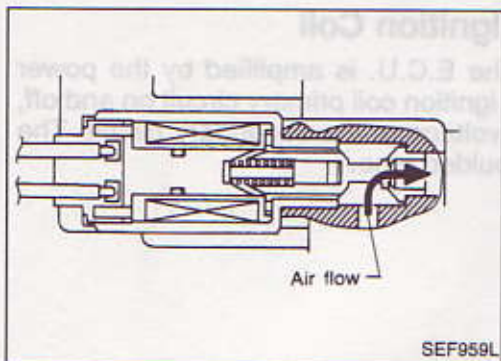


SEF938L

Air Regulator

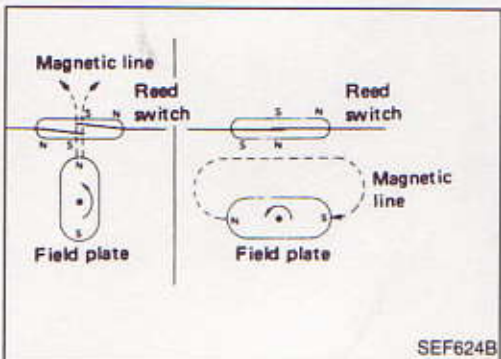
The air regulator provides an air by-pass when the engine is cold for a fast idle during warm-up.

Wax, valve and spring are built into the air regulator. When the coolant temperature is low, the air by-pass port opens. When the coolant temperature is high, the wax expands, moving the valve up and closing the air by-pass port, which decreases the idle speed.



Fast Idle Control Device (F.I.C.D.) Solenoid Valve

When the air conditioner switch is on, additional air is supplied by the F.I.C.D. solenoid valve.



Vehicle Speed Sensor

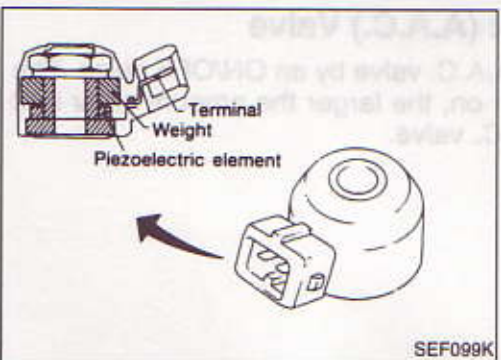
The vehicle speed sensor provides a vehicle speed signal to the E.C.U.

The speed sensor consists of a reed switch, which is installed in the speedometer unit and transforms vehicle speed into a pulse signal.



Power Steering Oil Pressure Switch

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects the power steering load, sending the load signal to the E.C.U. The E.C.U. then sends the idle-up signal to the A.A.C. valve.



Detonation Sensor

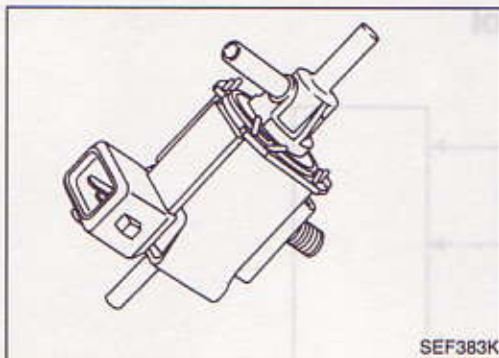
The detonation sensor is attached to the cylinder block and senses engine knocking conditions.

A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is delivered as output.



E.G.R. Control Valve

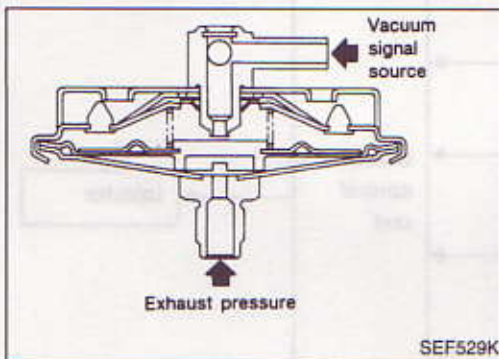
The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.



SEF383K

E.G.R. & Canister Control Solenoid Valve (Models with & without catalyzer)

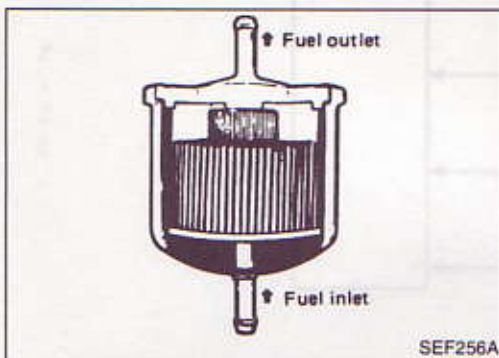
The E.G.R. and canister systems are controlled only by the E.C.U. At both low- and high-speed revolutions of engine, the solenoid valve turns on and accordingly the E.G.R. control valve and canister cut the exhaust gas and fuel vapor leading to the intake manifold.



SEF529K

B.P.T. Valve

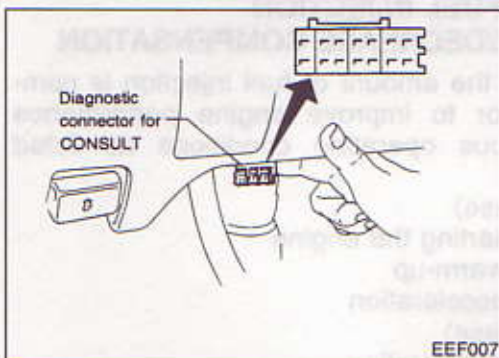
The B.P.T. valve monitors exhaust pressure to activate the diaphragm, controlling throttle chamber vacuum applied to the E.G.R. control valve. In other words, recirculated exhaust gas is controlled in response to positioning of the E.G.R. control valve or to engine operation.



SEF256A

Fuel Filter

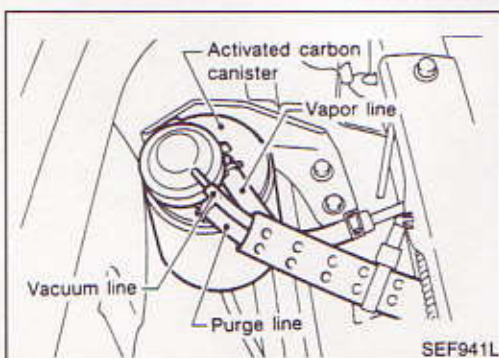
The specially designed fuel filter has a metal case in order to withstand high fuel pressure.



EEF007

Diagnostic Connector for CONSULT

The diagnostic connector for CONSULT is located behind the hood lock release handle.



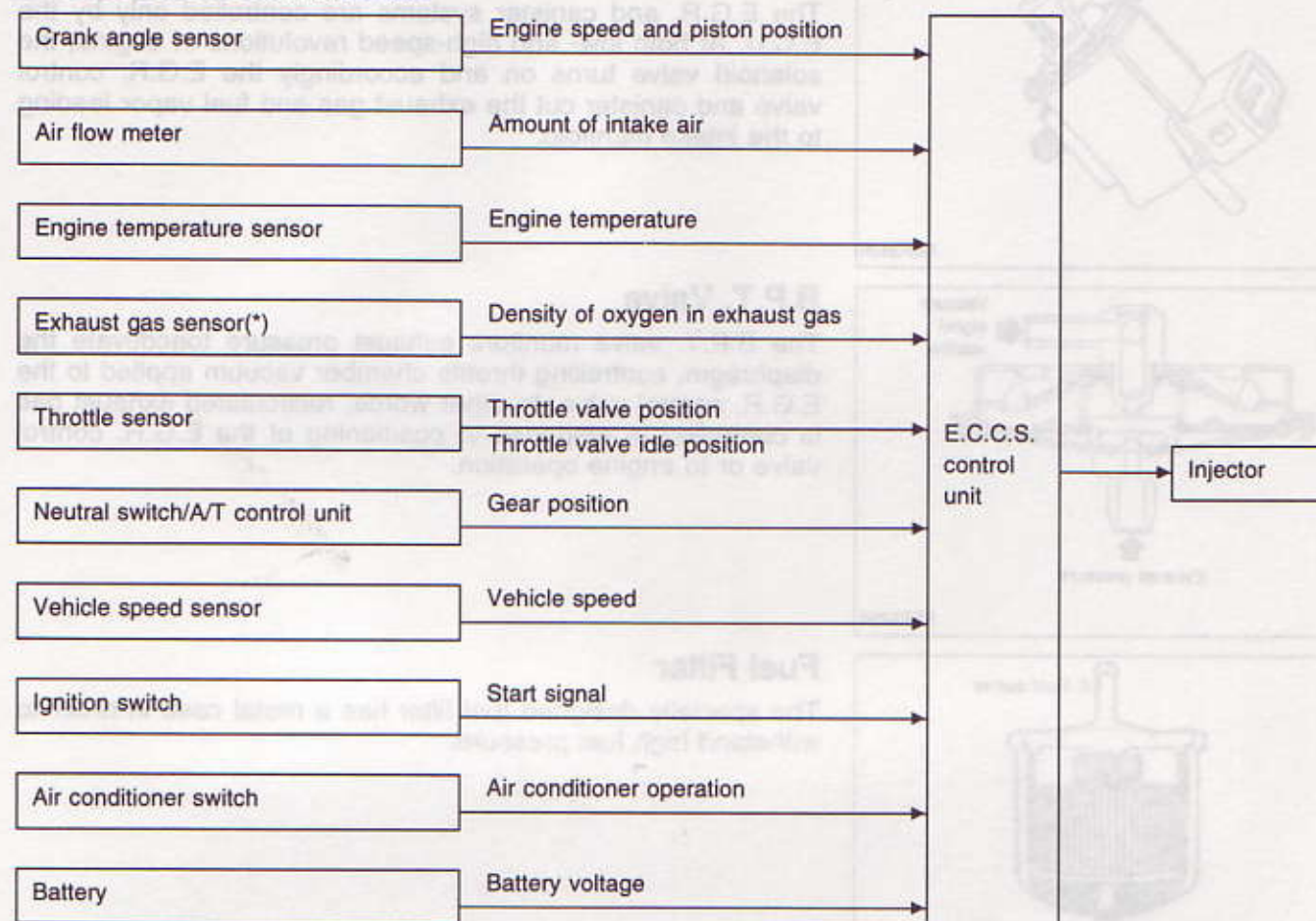
SEF941L

Activated Carbon Canister (Models with catalyzer only)

The carbon canister is filled with active charcoal to absorb evaporative gases produced in the fuel tank. These absorbed gases are then delivered to the intake manifold by manifold vacuum for combustion purposes.

Fuel Injection Control

INPUT/OUTPUT SIGNAL LINE



(*): Models with catalyzer only.

BASIC FUEL INJECTION CONTROL

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the E.C.U. The basic amount of fuel injected is a program value mapped in the E.C.U. ROM memory. In other words, the program value is preset by engine operating conditions determined by input signals (for engine rpm and air intake) from both the crank angle sensor and the air flow meter.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

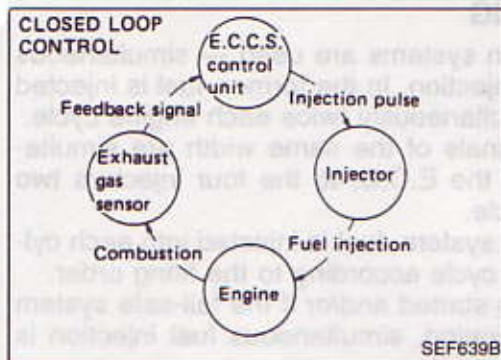
In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below.

(Fuel increase)

- 1) When starting the engine
- 2) During warm-up
- 3) During acceleration

(Fuel decrease)

- 1) During deceleration



Fuel Injection Control (Cont'd)

MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way catalyst can reduce CO, HC and NO_x emissions. This system uses an exhaust gas sensor in the exhaust manifold to check the air-fuel ratio. The control unit adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

This stage refers to the closed-loop control condition. The open-loop control condition refers to that under which the E.C.U. detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

- 1) Deceleration
- 2) High-load operation
- 3) Engine idling
- 4) Malfunction of exhaust gas sensor or its circuit
- 5) Insufficient activation of exhaust gas sensor at low engine temperature
- 6) Engine starting
- 7) When all of the following conditions are met:
 - Ignition switch "ON"
 - Soft idle switch "ON"
 - Neutral switch "OFF"
 - Engine running at idle speed
 - Vehicle running at slow speed

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the exhaust gas sensor. This feedback signal is then sent to the E.C.U. to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., air flow meter hot wire) and changes during operation (injector clogging, etc.) of E.C.C.S. parts which directly affect the mixture ratio.

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

Fuel Injection Control (Cont'd)

FUEL INJECTION TIMING

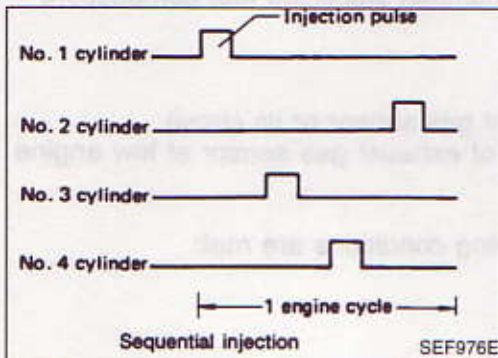
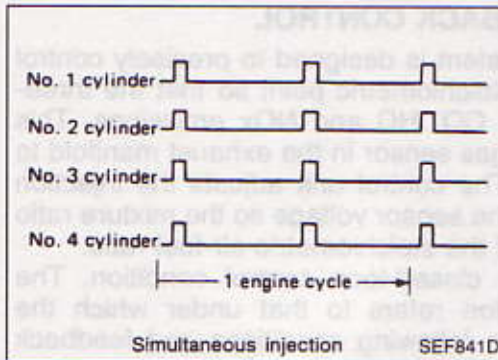
Two types of fuel injection systems are used — simultaneous injection and sequential injection. In the former, fuel is injected into all four cylinders simultaneously twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the E.C.U. to the four injectors two times for each engine cycle.

In the sequential injection system, fuel is injected into each cylinder during each engine cycle according to the firing order. When the engine is being started and/or if the fail-safe system (C.P.U. of E.C.U.) is operating, simultaneous fuel injection is used.

When the engine is running sequential fuel injection is used.

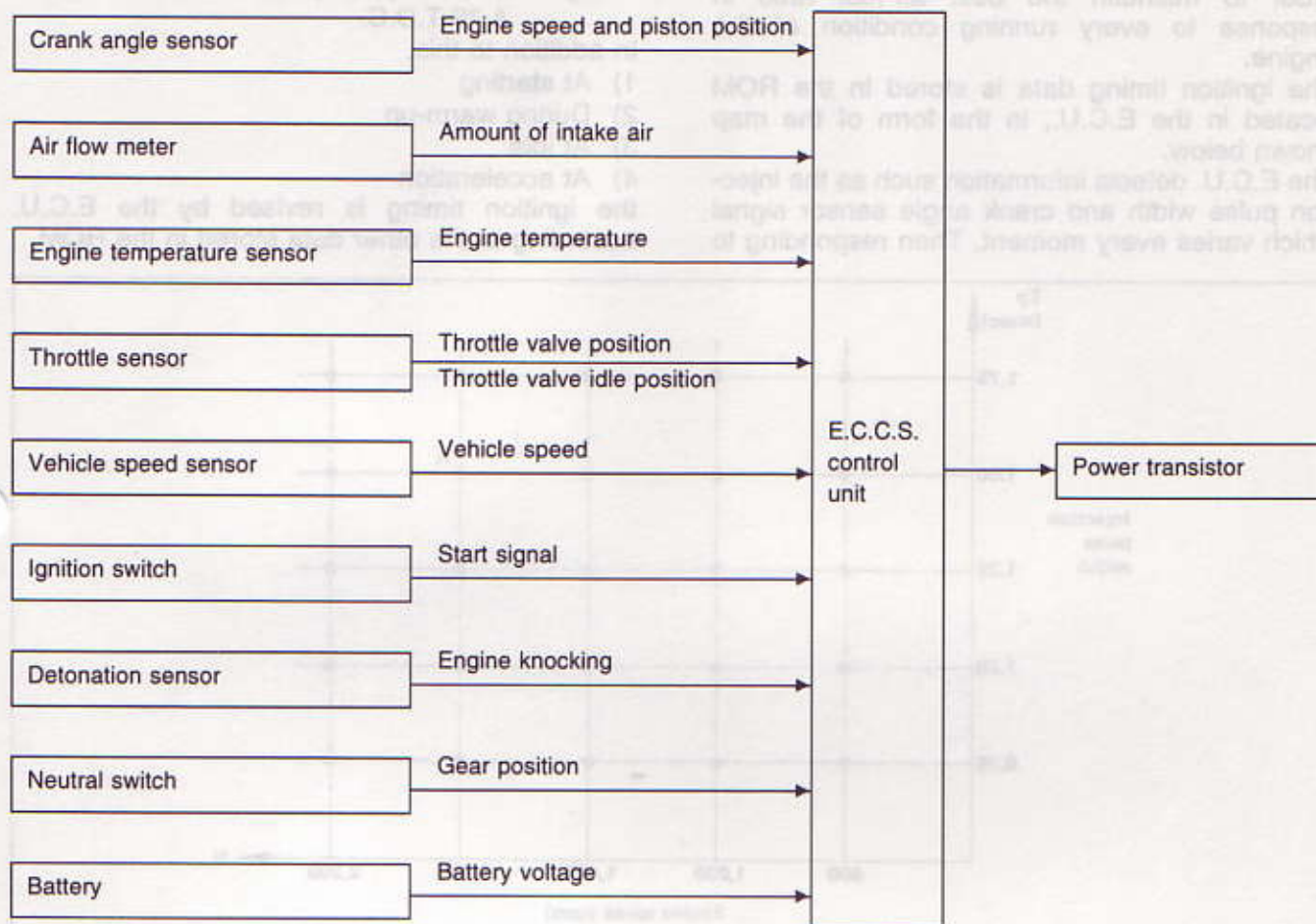
FUEL CUT-OFF

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



Ignition Timing Control

INPUT/OUTPUT SIGNAL LINE



Ignition Timing Control (Cont'd)

SYSTEM DESCRIPTION

The ignition timing is controlled by the E.C.U. in order to maintain the best air-fuel ratio in response to every running condition of the engine.

The ignition timing data is stored in the ROM located in the E.C.U., in the form of the map shown below.

The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to

this information, ignition signals are transmitted to the power transistor.

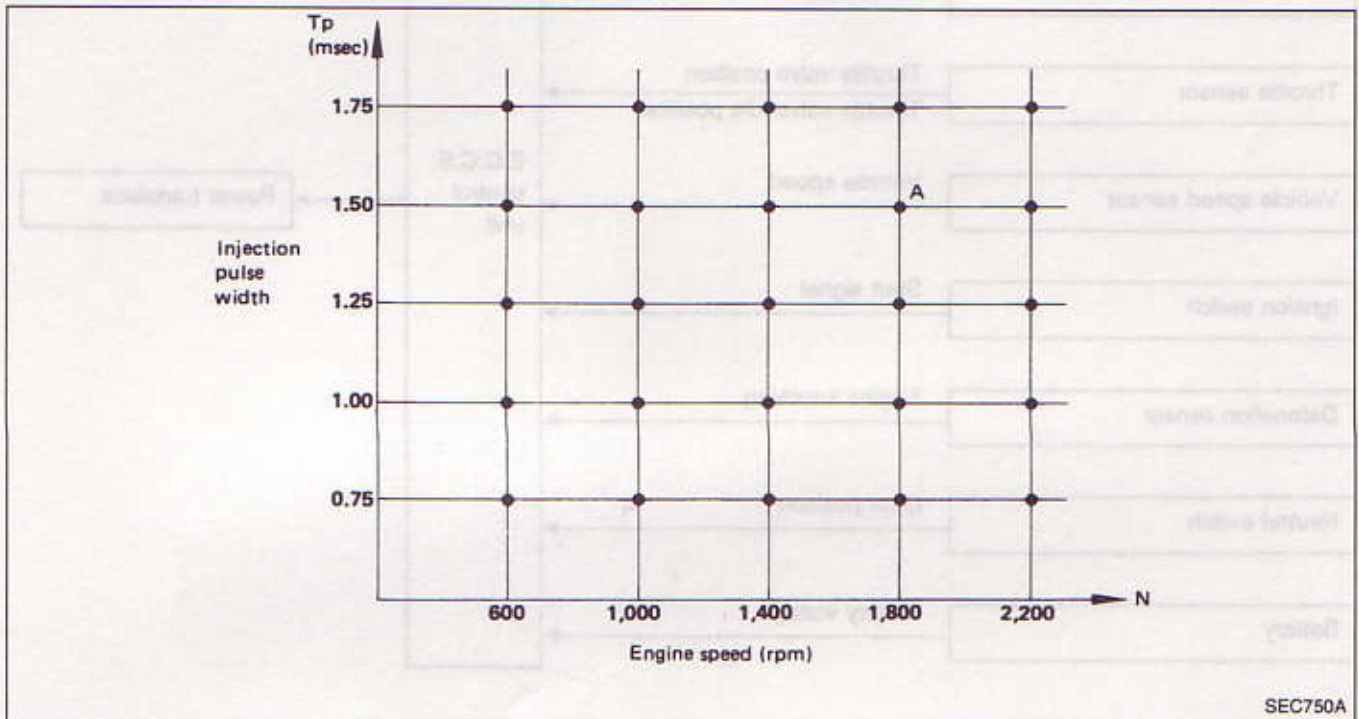
e.g. N: 1,800 rpm, T_p : 1.50 msec

A °B.T.D.C.

In addition to this,

- 1) At starting
- 2) During warm-up
- 3) At idle
- 4) At acceleration

the ignition timing is revised by the E.C.U. according to the other data stored in the ROM.

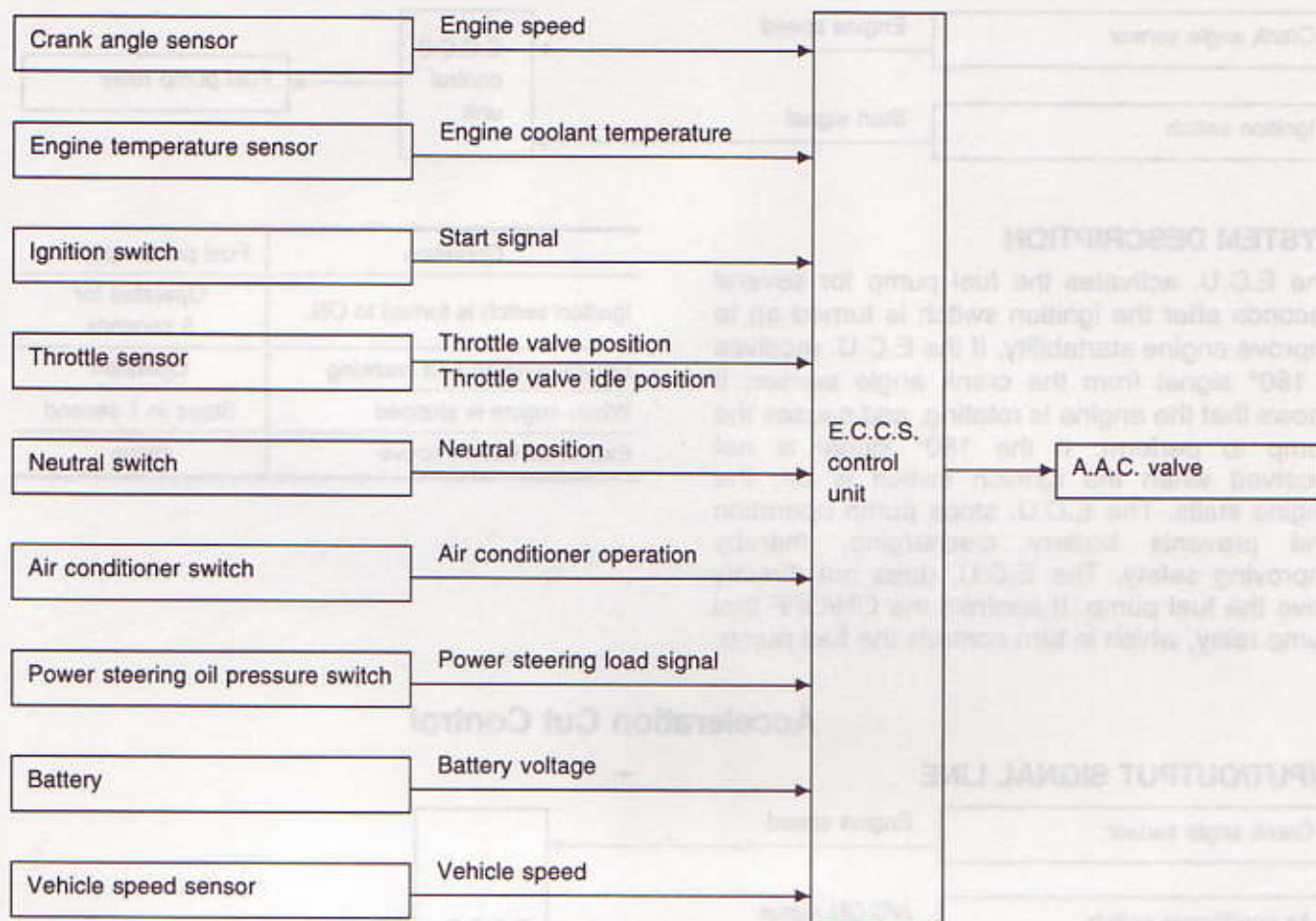


The retard system by detonation sensor is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

However, if engine knocking occurs, the detonation sensor monitors the condition and the signal is transmitted to the E.C.C.S. control unit. After receiving it, the control unit retards the ignition timing to avoid the knocking condition.

Idle Speed Control

INPUT/OUTPUT SIGNAL LINE

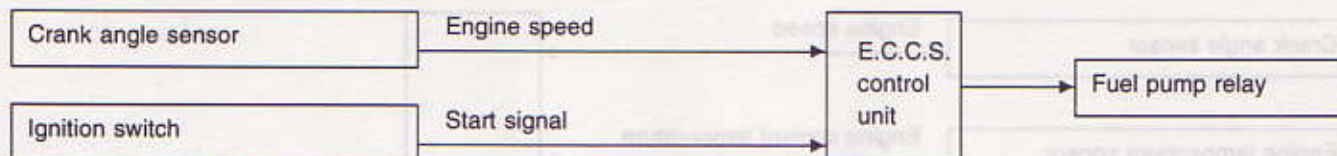


SYSTEM DESCRIPTION

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via A.A.C. valve. The A.A.C. valve repeats ON/OFF operation according to the signal sent from the E.C.U. The crank angle sensor detects the actual engine speed and sends a signal to the E.C.U. The E.C.U. then controls the ON/OFF time of the A.A.C. valve so that engine speed coincides with the target value memorized in ROM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ROM is determined by taking into consideration various engine conditions, such as warming up and during deceleration, fuel consumption, and engine load (air conditioner, electrical load).

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



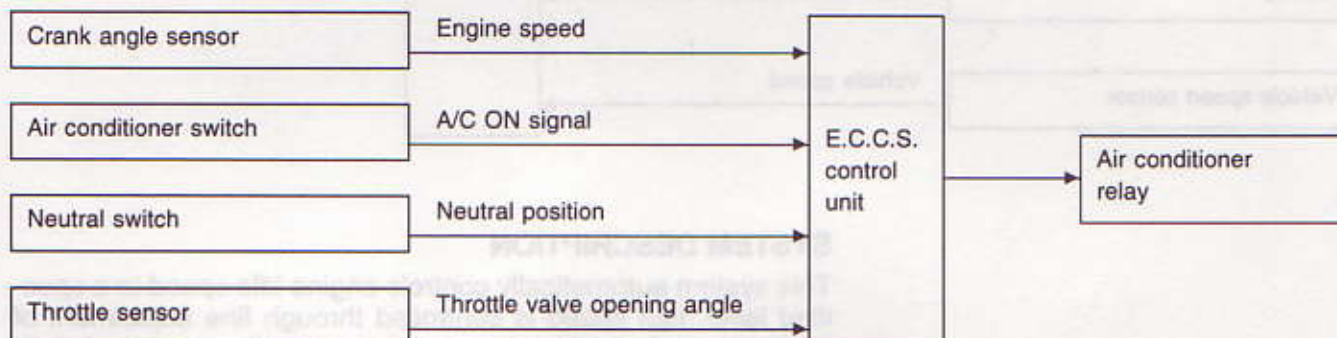
SYSTEM DESCRIPTION

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

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

Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE

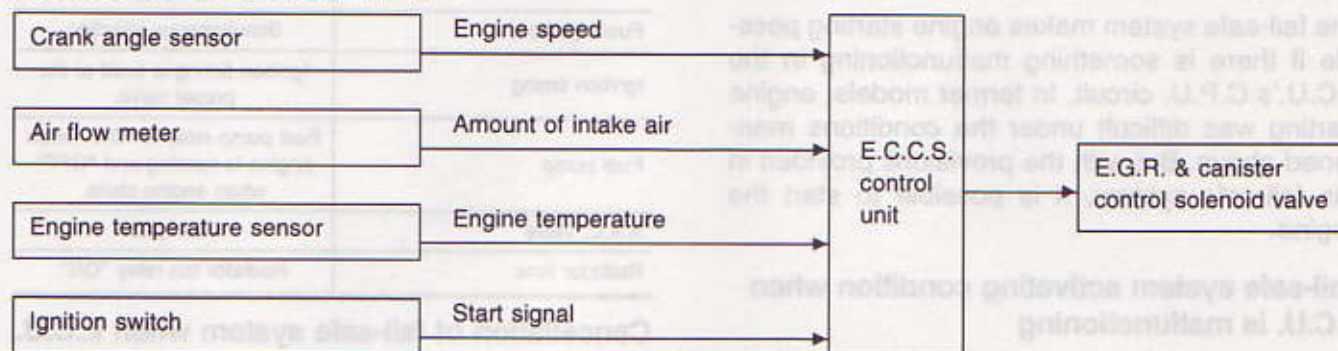


SYSTEM DESCRIPTION

When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds. This system improves acceleration when the air conditioner is used.

E.G.R. (Exhaust Gas Recirculation) & Canister Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

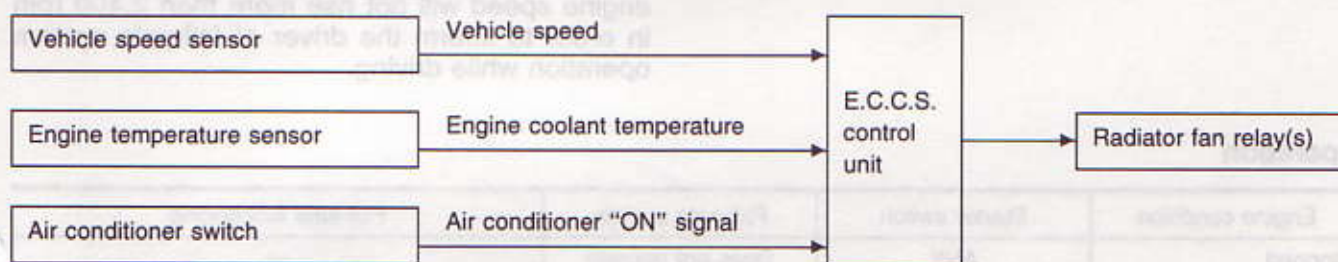
In addition, a system is provided which precisely cuts and controls port vacuum applied to the E.G.R. control valve and canister to suit engine operating conditions. This cut-and-control operation is accomplished through the E.C.U. When the E.C.U. detects any of the following conditions, current flows through the solenoid valve in the E.G.R. and canister control vacuum line.

This causes the port vacuum to be discharged into the atmosphere so that the E.G.R. control valve and canister remain closed.

- 1) Low engine temperature
- 2) Engine starting
- 3) High-speed engine operation
- 4) Engine idling
- 5) Excessively high engine temperature
- 6) Air flow meter malfunction

Radiator Fan Control

INPUT/OUTPUT SIGNAL LINE



The E.C.U. controls the radiator fan corresponding to the vehicle speed, engine temperature, and air conditioner ON signal. The control system has 3-step control [ON/OFF].

OPERATION

Air conditioner switch is "OFF"

Engine coolant temperature (°C)	Radiator fan	Remarks
< 90	Disconnected (OFF)	—
90 - 95	Disconnected (OFF)	Vehicle speed less than 80 km/h
	Connected (ON)	Vehicle speed over 80 km/h
> 95	Connected (ON)	—

Air conditioner switch is "ON"

Engine coolant temperature (°C)	Radiator fan	Remarks
≤ 90	Disconnected (OFF)	Vehicle speed over 80 km/h
	Connected (ON)	Vehicle speed less than 80 km/h
> 90	Connected (ON)	—

Fail-safe System

C.P.U. MALFUNCTION OF E.C.U.

Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the E.C.U.'s C.P.U. circuit. In former models, engine starting was difficult under the conditions mentioned above. But with the provisions provided in this fail-safe system, it is possible to start the engine.

Fail-safe system activating condition when E.C.U. is malfunctioning

The computing function of the E.C.U. was judged to be malfunctioning.

When the fail-safe system activates, i.e. if the E.C.U. detects a malfunction condition in the C.P.U. of E.C.U., the CHECK ENGINE LIGHT on the instrument panel lights to warn the driver.

Engine control, with fail-safe system, operates when E.C.U. is malfunctioning

When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, A.A.C. valve operation and radiator fan operation are controlled under certain limitations.

Operation

	Operation
Fuel injection	Simultaneous injection
Ignition timing	Ignition timing is fixed at the preset value.
Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.
A.A.C. valve	Full open
Radiator fans	Radiator fan relay "ON"

Cancellation of fail-safe system when E.C.U. is malfunctioning

Activation of the fail-safe system is canceled each time the ignition switch is turned OFF. The system is reactivated if all of the above-mentioned activating conditions are satisfied after turning the ignition switch from OFF to ON.

AIR FLOW METER MALFUNCTION

If the air flow meter output voltage is above or below the specified value, the E.C.U. senses an air flow meter malfunction. In case of a malfunction, the throttle sensor substitutes for the air flow meter.

Though air flow meter is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 2,400 rpm in order to inform the driver of fail-safe system operation while driving.

Operation

Engine condition	Starter switch	Fail-safe system	Fail-safe functioning
Stopped	ANY	Does not operate	—
Cranking	ON	Operates	Engine will be started by a pre-determined injection pulse on E.C.U.
Running	OFF		Engine speed will not rise above 2,400 rpm

Fail-safe System (Cont'd)

ENGINE TEMPERATURE SENSOR MALFUNCTION

When engine temperature sensor output voltage is below or above the specified value, water temperature is fixed at the preset value as follows:

Operation

Condition	Engine temperature decided
Just as ignition switch is turned ON or START	30°C (86°F)
More than 6 minutes after ignition ON or START	80°C (176°F)
Except as shown above	30 - 80°C (86 - 176°F) (Depends on the time)

DETONATION SENSOR MALFUNCTION

When the output signal of the detonation sensor is abnormal, the E.C.U. judges it to be malfunctioning. When detonation sensor is malfunctioning, ignition timing will retard according to operating conditions.

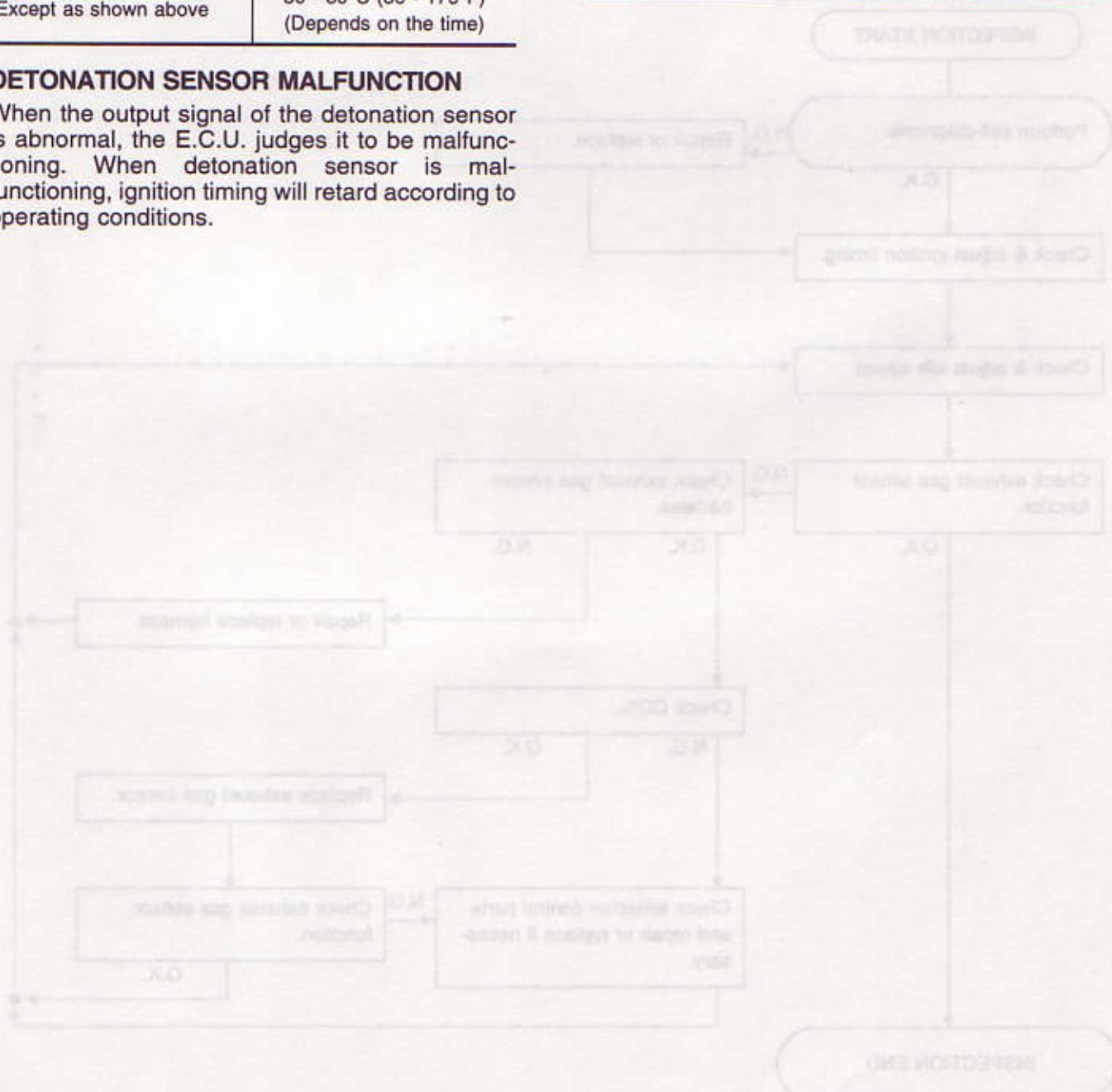
THROTTLE SENSOR MALFUNCTION**Description**

When the output signal of throttle sensor is abnormal the E.C.U. judges it as a malfunctioning of throttle sensor.

The E.C.U. does not use the throttle sensor signal, but judges the idle position by the amount of fuel injected and the engine rpm.

Operation

	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration



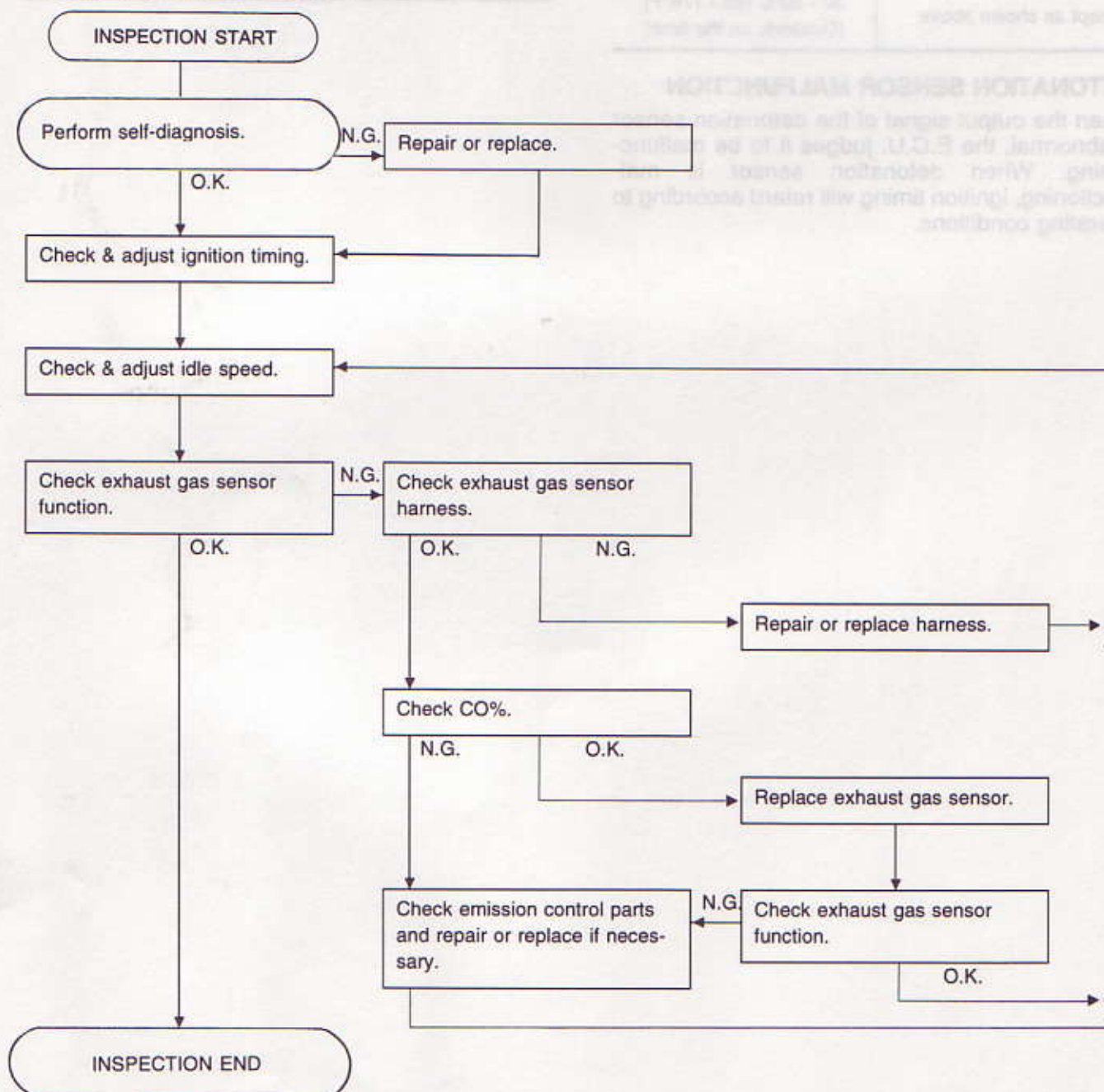
PREPARATION

- Make sure that the following parts are in good order.
 - Battery
 - Ignition system
 - Engine oil and coolant levels
 - Fuses
 - E.C.U. harness connector
 - Vacuum hoses
 - Air intake system (Oil filler cap, oil level gauge, etc.)
 - Fuel pressure

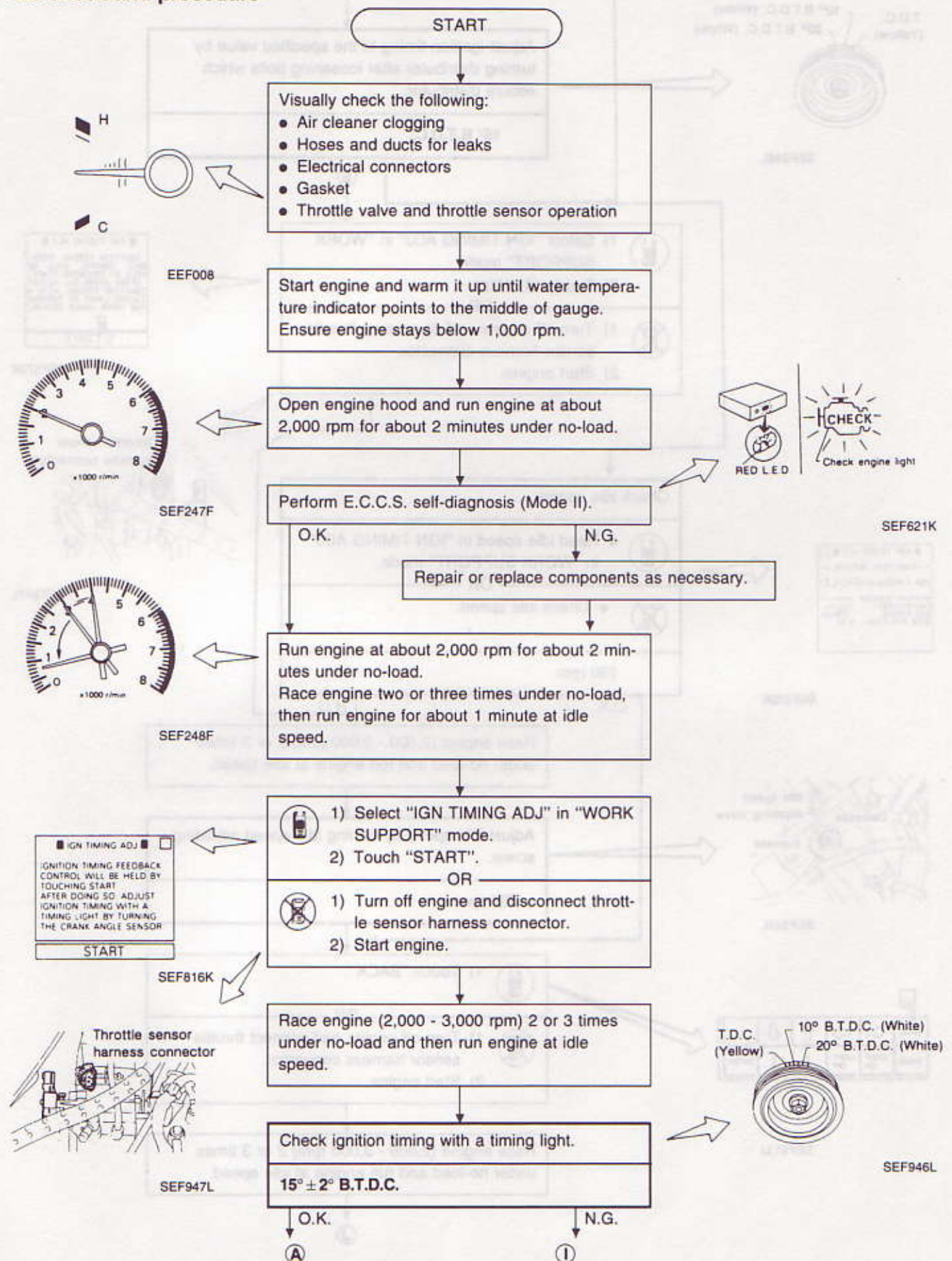
- Engine compression
 - Throttle valve
- On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
 - When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
 - Turn off headlamps, heater blower, rear defogger.
 - Keep front wheels pointed straight ahead.
 - Make the check after the radiator fan has stopped.

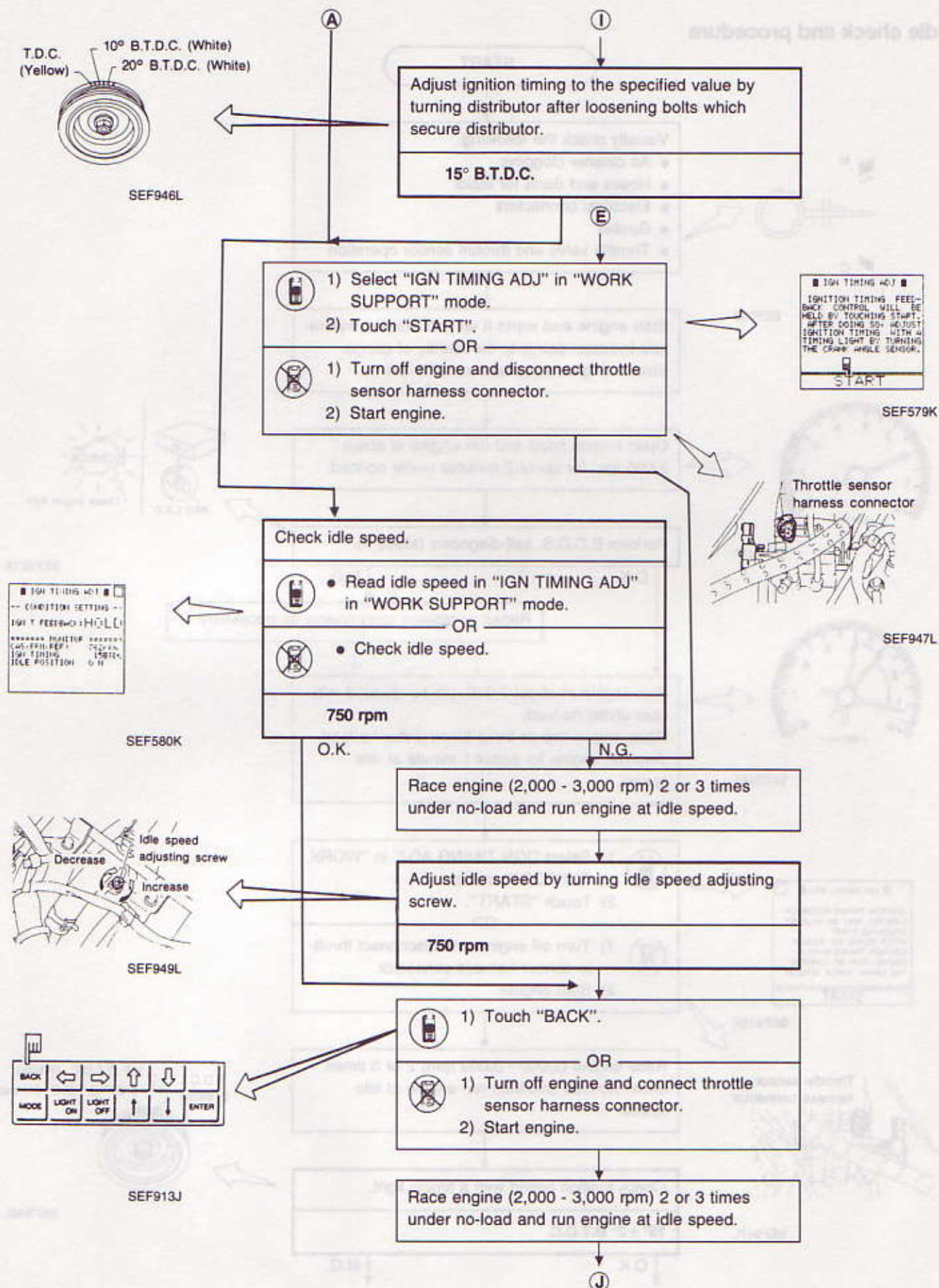
FOR MODELS WITH CATALYZER

Overall inspection sequence



Idle check and procedure





☆ MONITOR

☆ NO FAIL

☐

CAS-RPM (REF)

812rpm

RECORD

SEF817K

Check idle speed.



- Read idle speed in "DATA MONITOR" mode with CONSULT.

OR



- Check idle speed.

800 ± 50 rpm

O.K.

N.G.

Check A.A.C. valve and replace if necessary.

Check A.A.C. valve harness and repair if necessary.

Check E.C.U. function* by substituting another known good E.C.U.

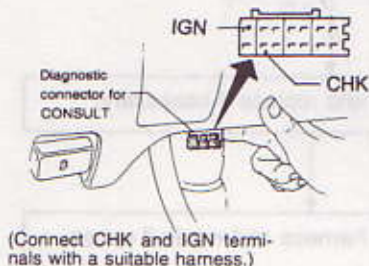
* E.C.U. may be the cause of a problem, but this is rarely the case.

END

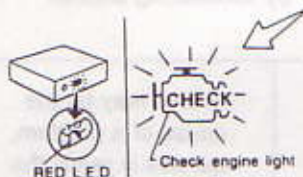
B

☆ MONITOR	☆ NO FAIL
CAS-RPM (REF)	2000rpm
M/R F/C MNT	RICH
RECORD	

SEF818K



EEF007



SEF621K



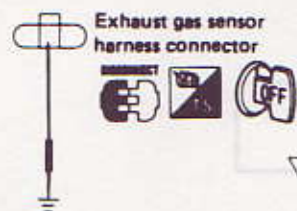
1. See "M/R F/C MNT" in "Data monitor" mode.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
RICH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



1. Set "Exhaust gas sensor monitor" in the self-diagnostic mode II.
(See page EF & EC-51.)
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintaining engine at 2,000 rpm under no-load, check to make sure that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

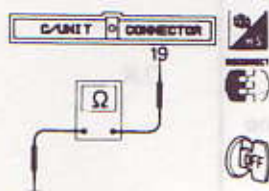
O.K.

END



As for the location of exhaust gas sensor harness connector, refer to page EF&EC-127

SEC240B



SEC241B

Check exhaust gas sensor harness:

- 1) Turn off engine and disconnect battery ground cable.
- 2) Disconnect E.C.U. S.M.J. harness connector from E.C.U.
- 3) Disconnect exhaust gas sensor harness connector and connect main harness side terminal for exhaust gas sensor to ground with a jumper wire.
- 4) Check for continuity between terminal No. 19 of E.C.U. S.M.J. harness connector and body ground.

Continuity exists.....O.K.
Continuity does not existN.G.

O.K.

N.G.

Repair or replace harness.

Connect E.C.U. S.M.J. harness connector to control unit.

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

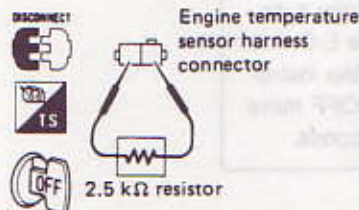
OR

- 1) Disconnect engine temperature sensor harness connector.
- 2) Connect a resistor (2.5 kΩ) between terminals of engine temperature sensor harness connector.
- 3) Connect battery ground cable.

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



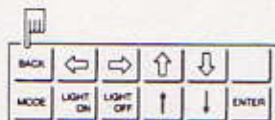
EEF008



SEC242B



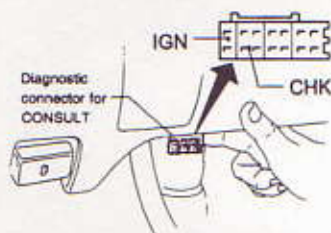
SEF248F



SEF913J



SEF818K



(Connect CHK and IGN terminals with a suitable harness.)

EEF007



SEF621K

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

Check "CO"%.

Idle CO: Less than 1.0%

After checking CO%,

1) Touch "BACK".

1) Disconnect the resistor from terminals of engine temperature sensor harness connector.

2) Connect engine temperature sensor harness connector to engine temperature sensor.

N.G.

Replace exhaust gas sensor.

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.

RICH → LEAN → RICH →
1 time 2 times
LEAN → RICH
OR

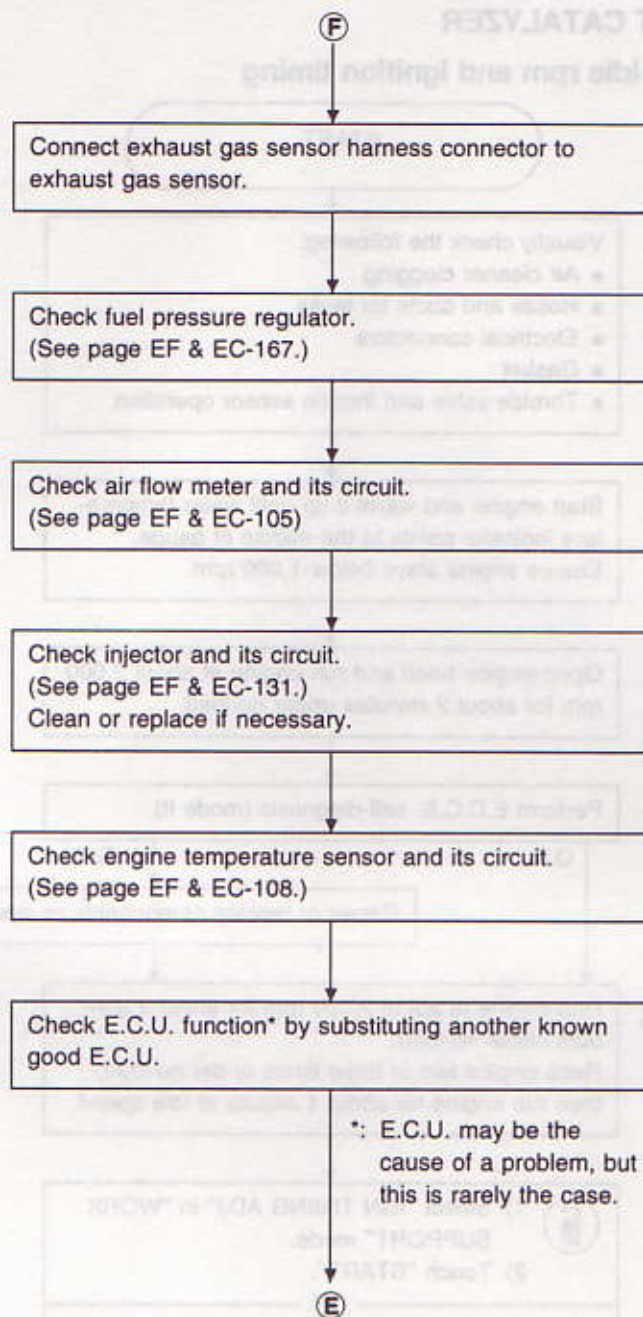
1. Set "Exhaust gas sensor monitor" in the self-diagnostic mode II. (See page EF & EC-51.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

N.G.

O.K.

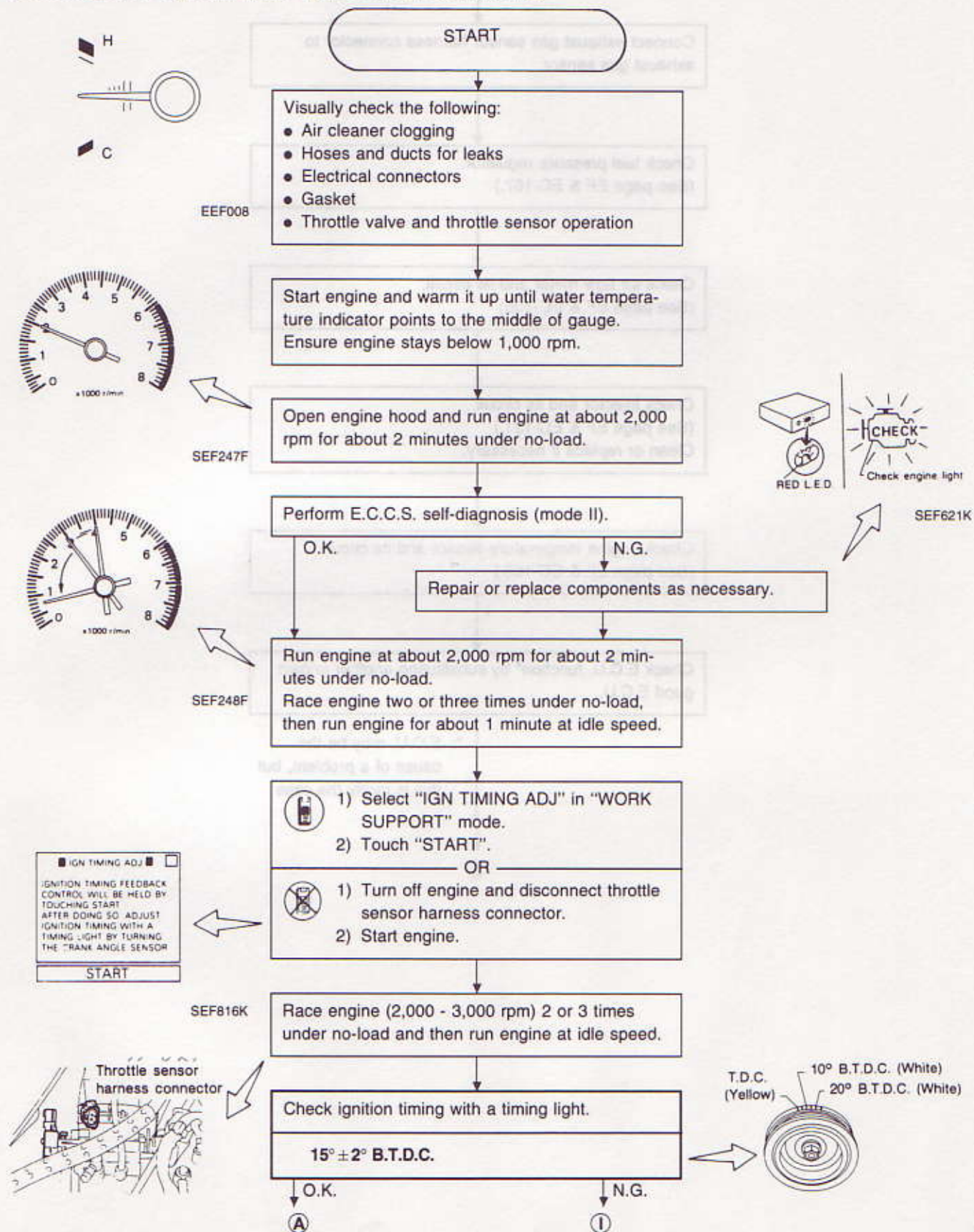
F

E



FOR MODELS WITHOUT CATALYZER

Checking and adjusting idle rpm and ignition timing



SEF947L

SEF946L

T.D.C.
(Yellow)
10° B.T.D.C. (White)
20° B.T.D.C. (White)



SEF946L

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

15° B.T.D.C.

Check idle speed.



- Read idle speed in "IGN TIMING ADJ" in "WORK SUPPORT" mode.

OR



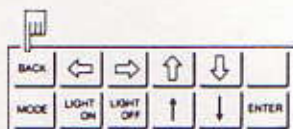
- Check idle speed.

750 ± 50

SEF580K



SEF949L



SEF913J

O.K.

N.G.

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

Adjust idle speed by turning idle speed adjusting screw.

750 ± 50



- 1) Touch "BACK".

OR



- 1) Turn off engine and connect throttle sensor harness connector.
- 2) Start engine.

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

J



SEF817K

Check idle speed.



- Read idle speed in "DATA MONITOR" mode with CONSULT.

OR



- Check idle speed.

800 ± 50 rpm

O.K.

N.G.

Check A.A.C. valve and replace if necessary.

Check A.A.C. valve harness and repair if necessary.

Check E.C.U. function* by substituting another known good E.C.U.

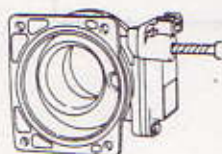
- * E.C.U. may be the cause of a problem, but this is rarely the case.

INSPECTION END

Checking and adjusting mixture ratio [With "CO"-meter]



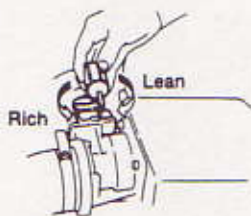
SMA957A



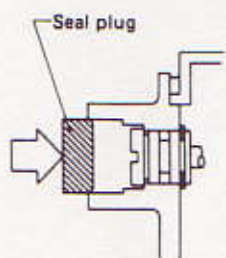
SEF567K



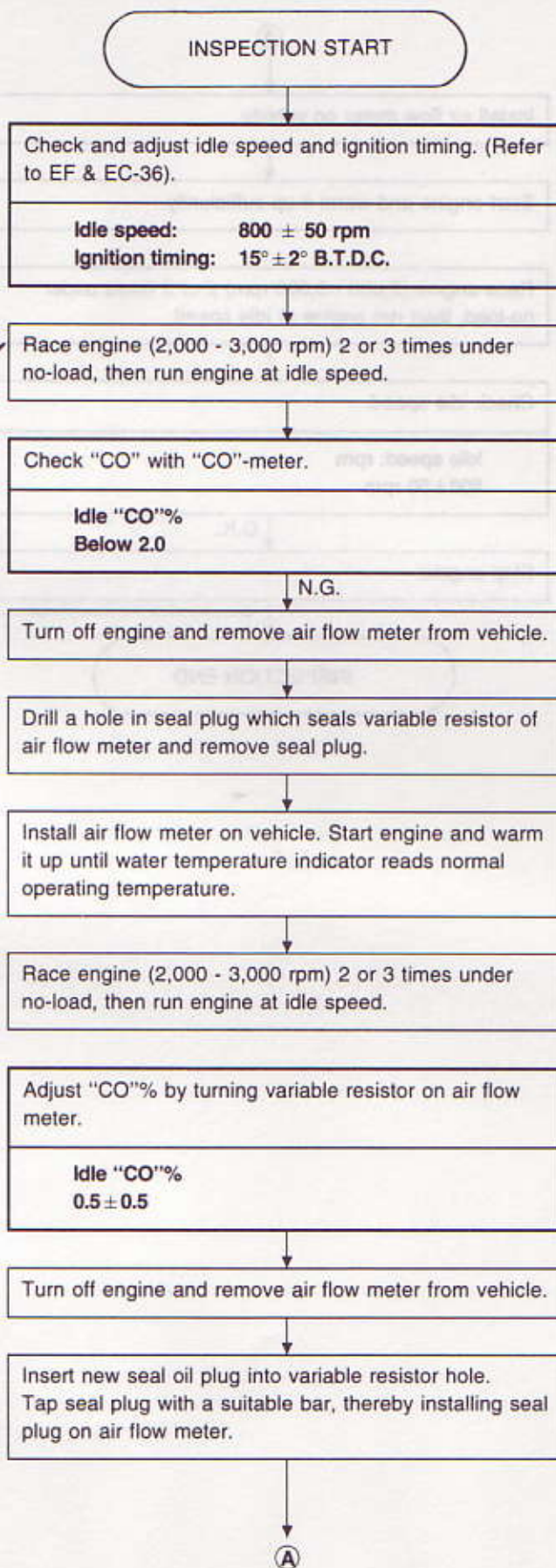
EEF008

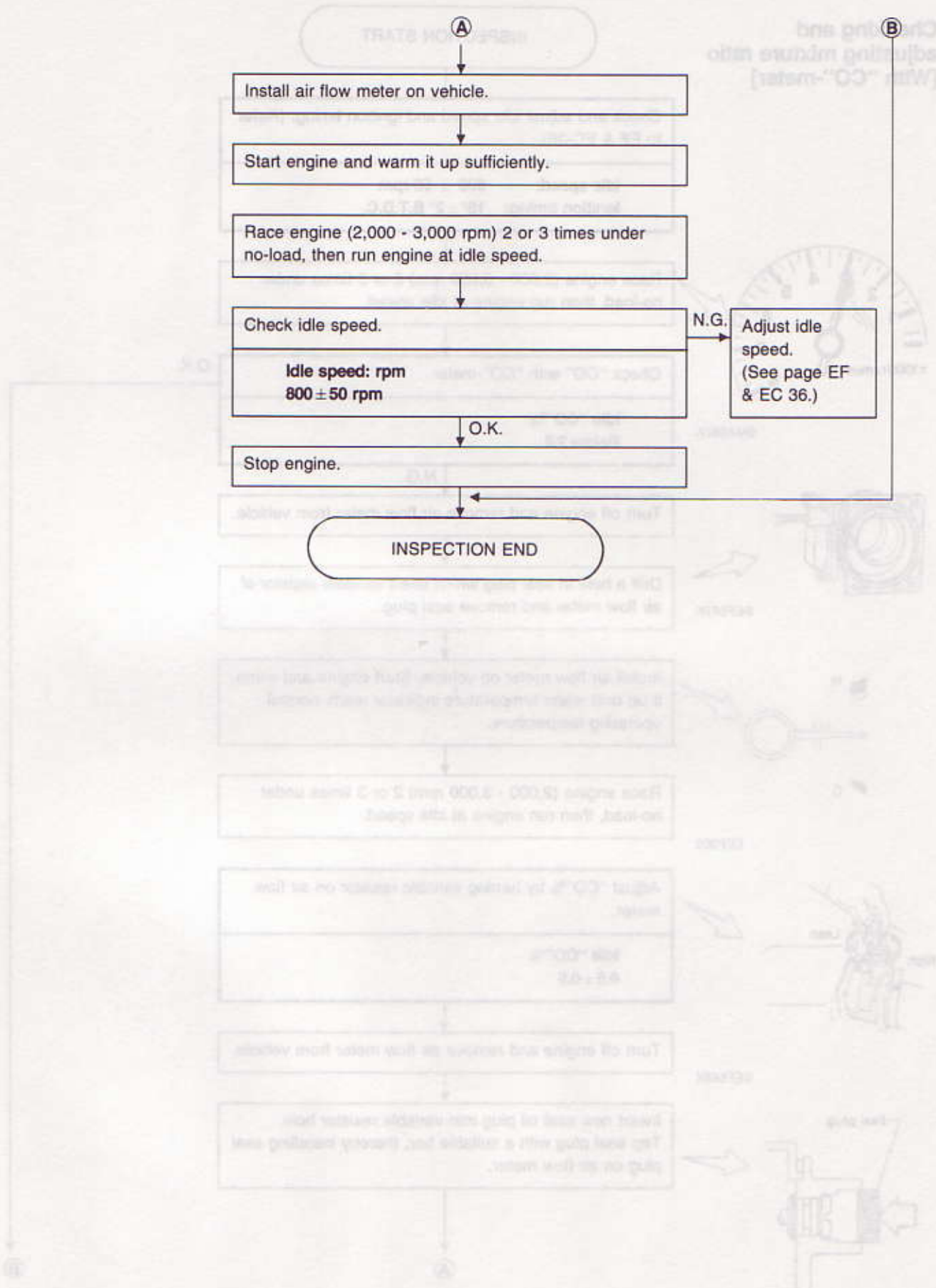


SEF568K



SEF713B





[Without "CO"-meter]

INSPECTION START

Check and adjust idle speed and ignition timing.
(Refer to EF & EC-36)

Idle speed: 800 ± 50 rpm
Ignition timing: $15^\circ \pm 2^\circ$ B.T.D.C.

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

Turn off engine and remove air flow meter from vehicle.

Drill a hole in seal plug which seals variable resistor of air flow meter and remove seal plug.

Install air flow meter on vehicle. Start engine and warm it up until water temperature indicator reads normal operating temperature.

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

Adjust mixture ratio with engine speed set at maximum by turning variable resistor.

Turn variable resistor of air flow meter one full turn counter-clockwise.

Turn off engine and remove air flow meter from vehicle.

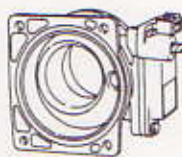
Insert new seal plug into variable resistor hole.
Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.

Install air flow meter on vehicle.

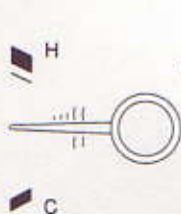
A



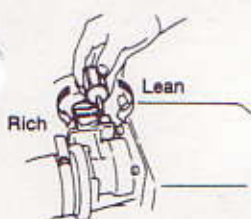
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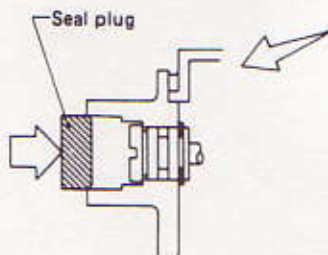
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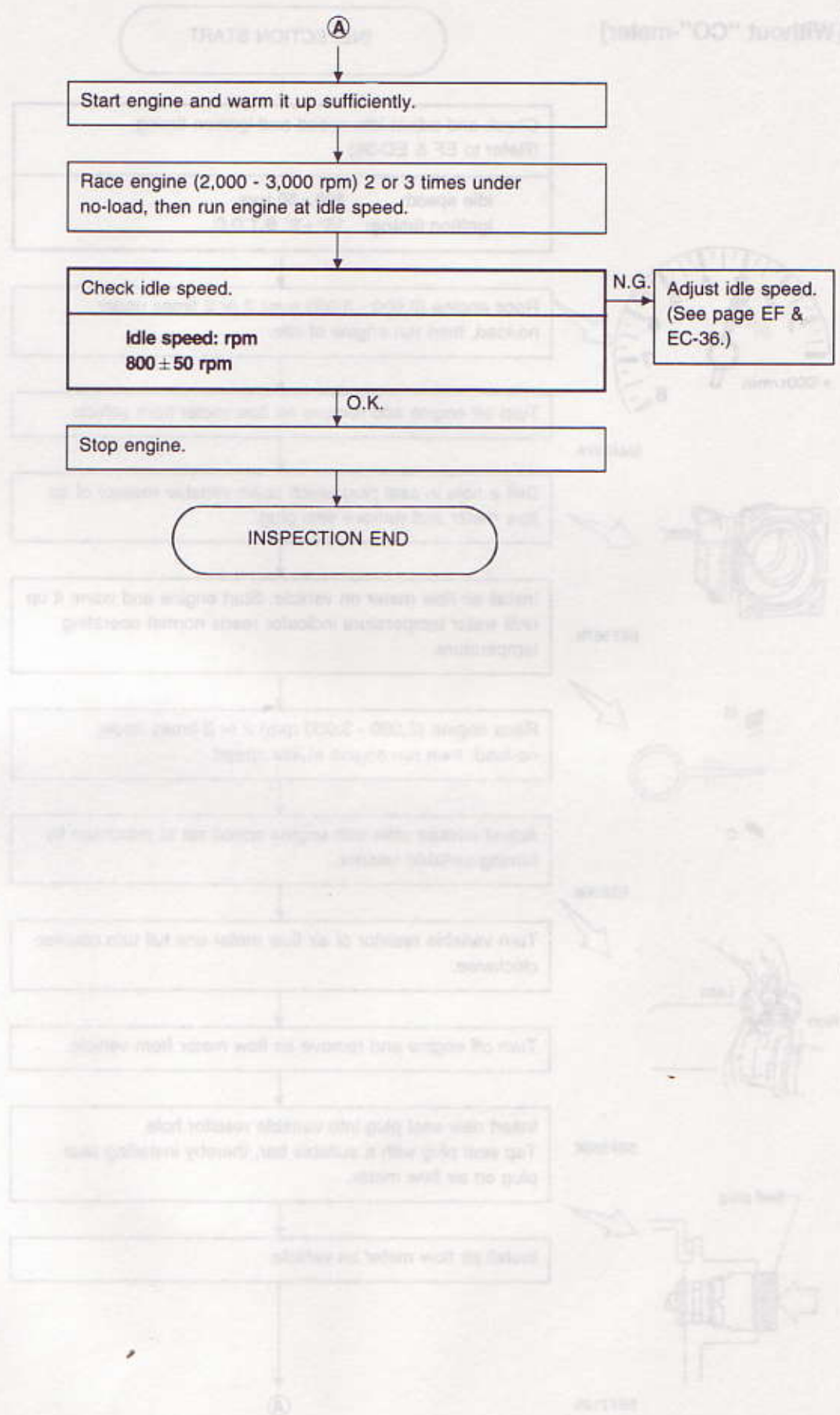
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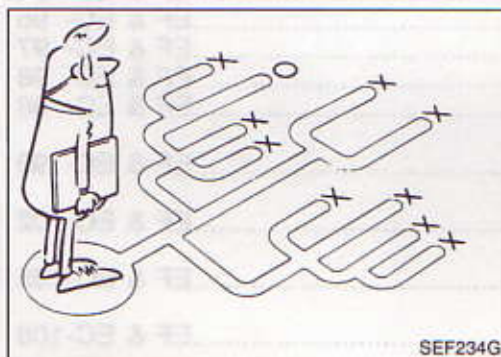
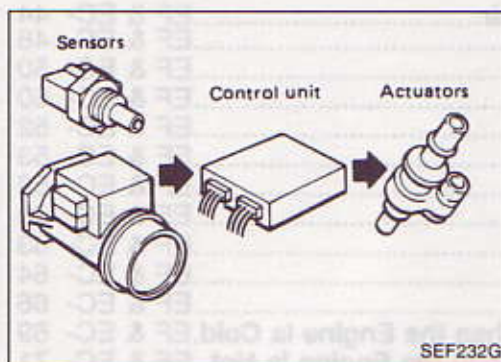


SEF713B



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How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The engine has an electronic control unit to control major systems such as fuel control, ignition control, idle speed control, etc. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional 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 continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

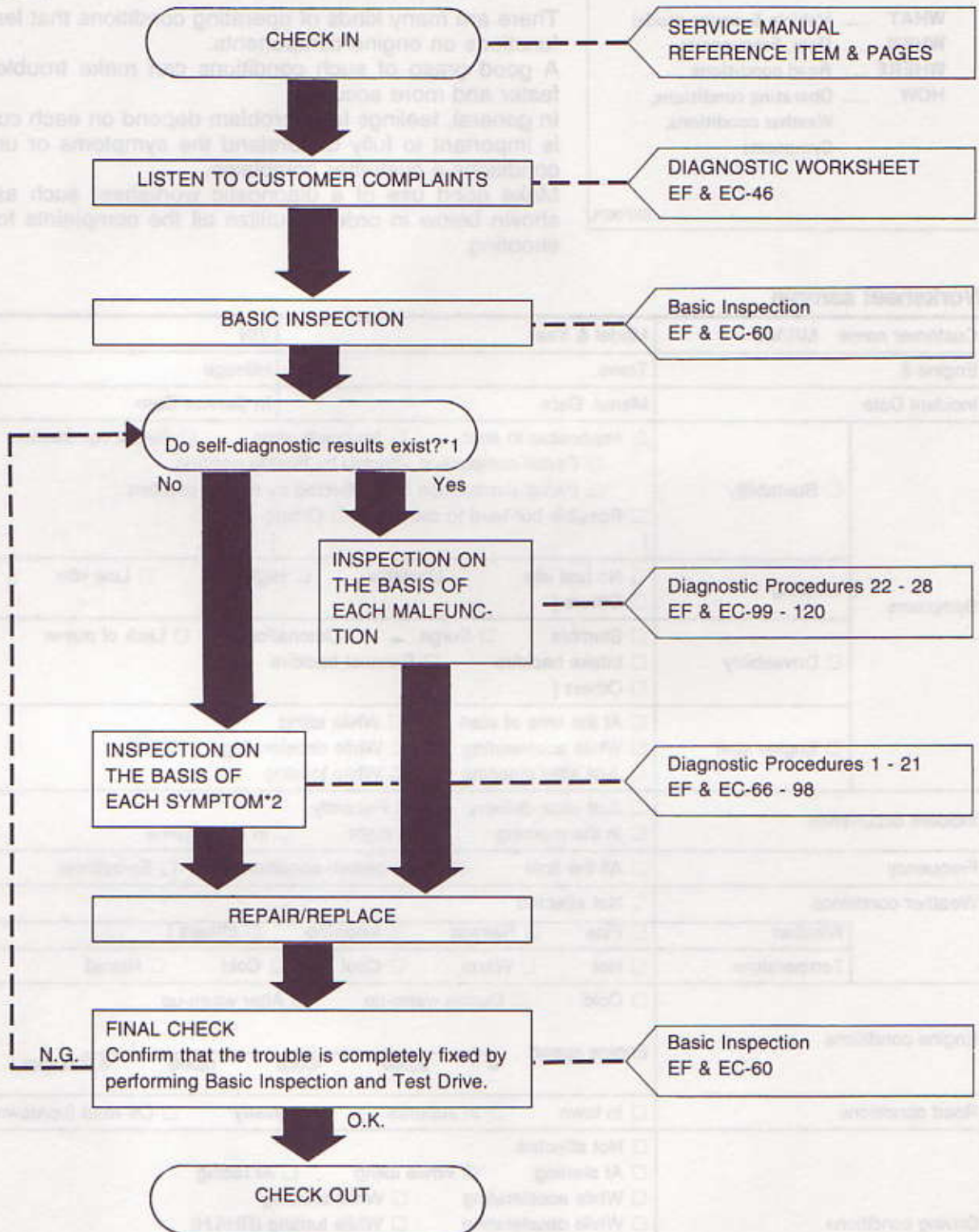
A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through interaction with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



*1: If the self-diagnosis cannot be performed, check main power supply and ground circuit. (See Diagnostic Procedure 22.)

*2: If the trouble is not duplicated, see INTERMITTENT PROBLEM SIMULATION (EF & EC-47).

DIAGNOSTIC WORKSHEET

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

SEF907L

Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for troubleshooting.

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



How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

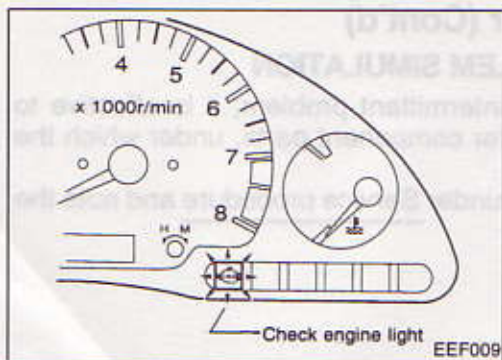
INTERMITTENT PROBLEM SIMULATION

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.

Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Crank angle sensor	Advanced	Rotate distributor clockwise.
			Retarded	Rotate distributor counterclockwise.
3*	Mixture ratio feedback control	Exhaust gas sensor	Suspended	Disconnect exhaust gas sensor harness connector.
		Control unit	Operation check	Perform self-diagnosis (Mode II) at 2,000 rpm.
4	Idle speed	A.A.C. valve	Raised	Turn idle adjusting screw counterclockwise.
			Lowered	Turn idle adjusting screw clockwise.
5	Electrical connection (Electric continuity)	Harness connectors and wires	Poor electrical connection or improper wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Temperature	Control unit	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. [WARNING: Do not overheat the unit.]
7	Moisture	Electric parts	Damp	Wet. [WARNING: Do not directly pour water on components. Use a mist sprayer.]
8	Electric loads	Load switches	Loaded	Turn on headlamps, air conditioner, rear defogger, etc.
9	Idle switch condition	Control unit	ON-OFF switching	Rotate throttle sensor body.
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder using ignition coil adapter (S.S.T.).

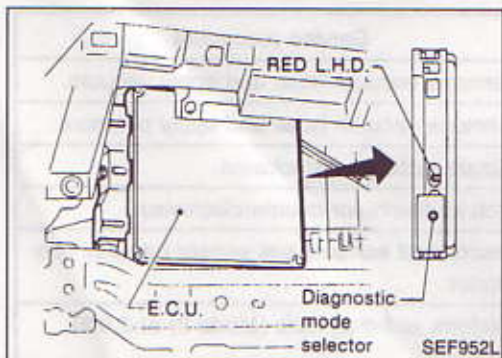
*: Models with catalyzer only



Self-diagnosis

CHECK ENGINE LIGHT




A check engine light has been adopted on all models. This light blinks simultaneously with the RED L.E.D. on the E.C.U.



E.C.U. L.E.D.

The E.C.U. is situated behind the glove box, and only has one RED L.E.D.

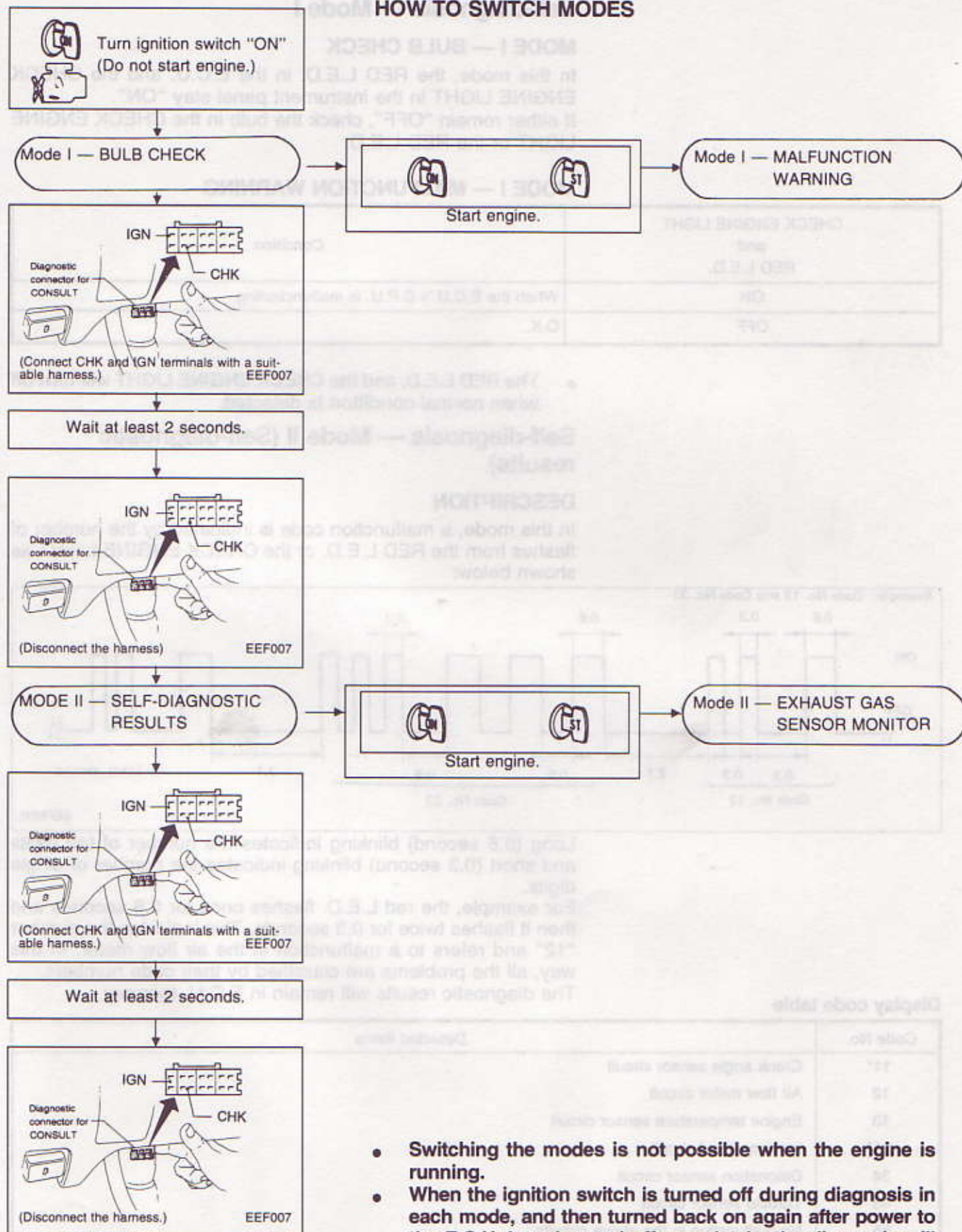
SELF-DIAGNOSTIC FUNCTION

Mode		Mode I	Mode II
Condition			
Ignition switch in "ON" position 	Engine stopped 	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running 	MALFUNCTION WARNING	EXHAUST GAS SENSOR MONITOR*

*: Models with catalyzer only

Self-diagnosis (Cont'd)

HOW TO SWITCH MODES



*: Models with catalyzer only

- Switching the modes is not possible when the engine is running.
- When the ignition switch is turned off during diagnosis in each mode, and then turned back on again after power to the E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.

Self-diagnosis — Mode I

MODE I — BULB CHECK

In this mode, the RED L.E.D. in the E.C.U. and the CHECK ENGINE LIGHT in the instrument panel stay "ON".

If either remain "OFF", check the bulb in the CHECK ENGINE LIGHT or the RED L.E.D.

MODE I — MALFUNCTION WARNING

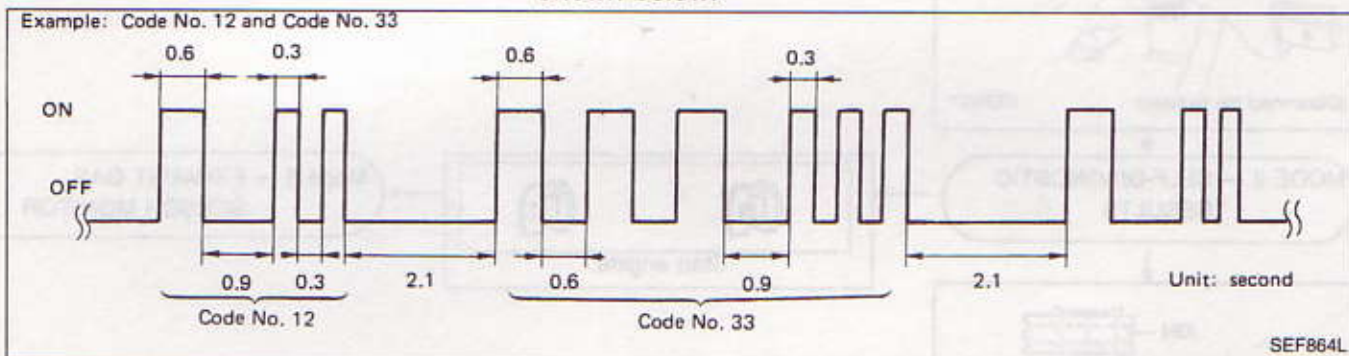
CHECK ENGINE LIGHT and RED L.E.D.	Condition
ON	When the E.C.U.'s C.P.U. is malfunctioning.
OFF	O.K.

- The RED L.E.D. and the CHECK ENGINE LIGHT will turn off when normal condition is detected.

Self-diagnosis — Mode II (Self-diagnostic results)

DESCRIPTION

In this mode, a malfunction code is indicated by the number of flashes from the RED L.E.D. or the CHECK ENGINE LIGHT as shown below:



Long (0.6 second) blinking indicates the number of ten digits and short (0.3 second) blinking indicates the number of single digits.

For example, the red L.E.D. flashes once for 0.6 seconds and then it flashes twice for 0.3 seconds. This indicates the number "12" and refers to a malfunction in the air flow meter. In this way, all the problems are classified by their code numbers. The diagnostic results will remain in E.C.U. memory.

Display code table

Code No.	Detected items
11*	Crank angle sensor circuit
12	Air flow meter circuit
13	Engine temperature sensor circuit
21*	Ignition signal circuit
34	Detonation sensor circuit
43	Throttle sensor circuit
55	No malfunction in the above circuits

*: Check items causing a malfunction of crank angle sensor circuit first, if both code No. 11 and 21 are displayed at the same time.

Self-diagnosis — Mode II (Self-diagnostic results) (Cont'd)

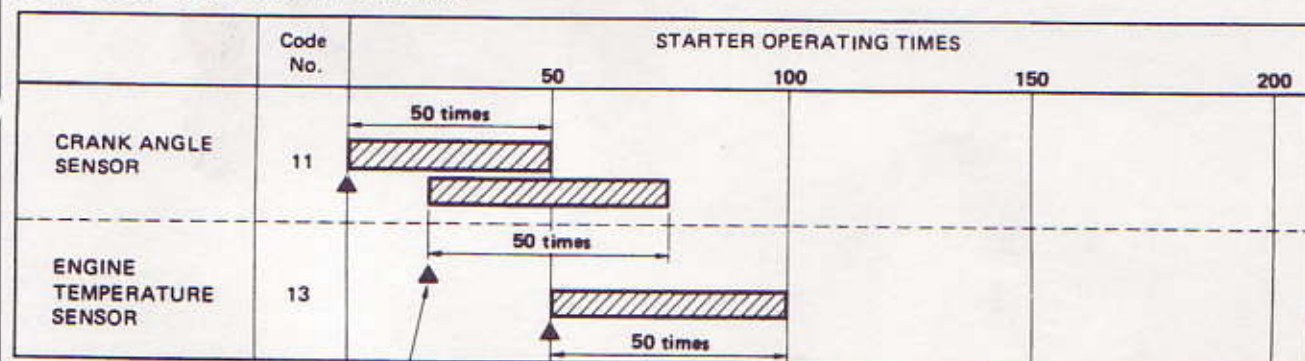
Code No.	Detected items	Malfunction is detected when ...	Check item (remedy)
*11	Crank angle sensor circuit	<ul style="list-style-type: none"> Either 1° or 180° signal is not entered for the first few seconds during engine cranking. Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm. 	<ul style="list-style-type: none"> Harness and connector (If harness and connector are normal, replace crank angle sensor.)
12	Air flow meter circuit	<ul style="list-style-type: none"> The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> Harness and connector (If harness and connector are normal, replace air flow meter.)
13	Engine temperature sensor circuit	<ul style="list-style-type: none"> The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) 	<ul style="list-style-type: none"> Harness and connector Engine temperature sensor
*21	Ignition signal circuit	<ul style="list-style-type: none"> The ignition signal in the primary circuit is not entered during engine cranking or running. 	<ul style="list-style-type: none"> Harness and connector Power transistor unit
34	Detonation sensor circuit	<ul style="list-style-type: none"> The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> Harness and connector Detonation sensor
43	Throttle sensor circuit	<ul style="list-style-type: none"> The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> Harness and connector Throttle sensor

*: Check items causing a malfunction of crank angle sensor circuit first, if both code No. 11 and 21 come out at the same time.

RETENTION OF DIAGNOSTIC RESULTS

The diagnostic results will remain in E.C.U. memory until the starter is operated fifty times after a diagnostic item has been judged to be malfunctioning. The diagnostic result will then be canceled automatically. If a diagnostic item which has been judged to be malfunctioning and stored in memory is again judged to be malfunctioning before the starter is operated fifty times, the second result will replace the previous one. It will be stored in E.C.U. memory until the starter is operated fifty times more.

RETENTION TERM CHART (Example)



: Retention term



: Malfunction detecting point

If the same diagnostic item is judged to be malfunctioning before the starter is operated fifty times, it will be stored in E.C.U. memory until the starter is operated fifty times from this point in time.

SEF793D

Self-diagnosis — Mode II (Self-diagnostic results) (Cont'd)

HOW TO ERASE SELF-DIAGNOSTIC RESULTS

The malfunction code is erased from the backup memory on the E.C.U. when the diagnostic mode is changed from Mode II to Mode I. (Refer to "HOW TO SWITCH MODES".)

- When the battery terminal is disconnected, the malfunction code will be lost from the backup memory within 24 hours.
- Before starting self-diagnosis do not erase the stored memory.

Self-diagnosis — Mode II (Exhaust gas sensor monitor — Models with catalyzer only)

DESCRIPTION

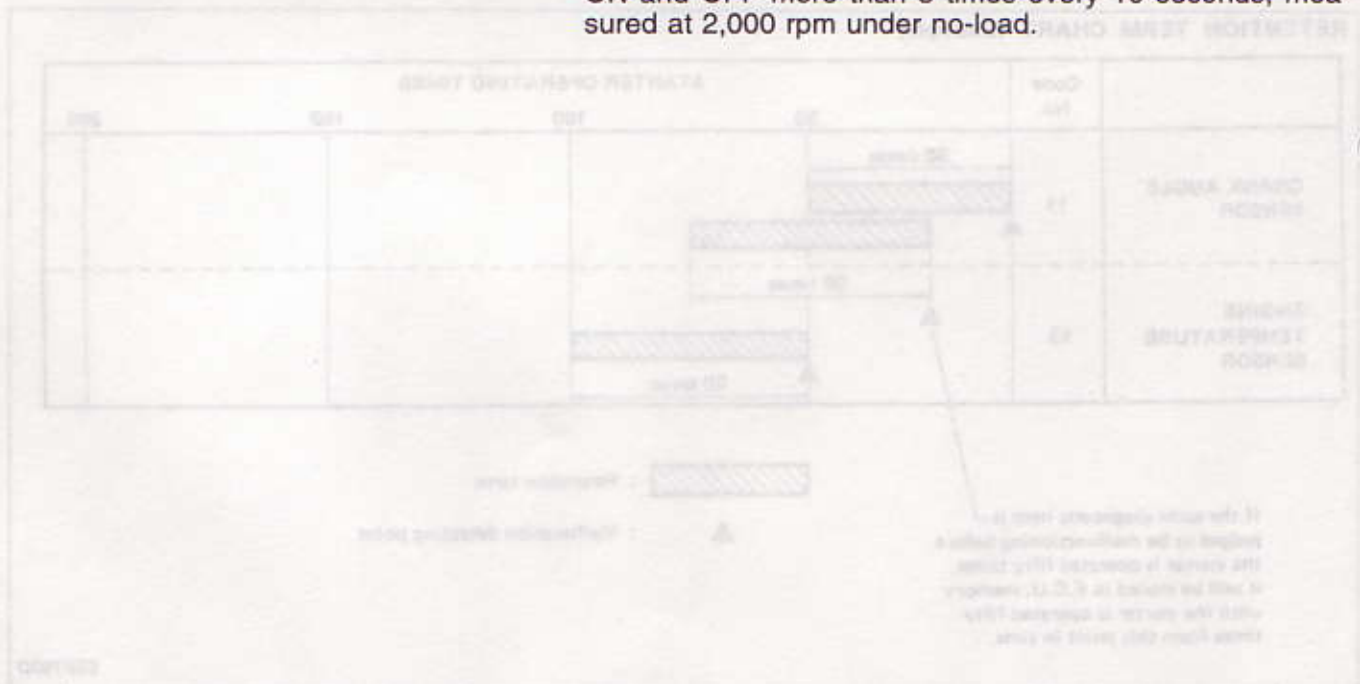
In this mode, the CHECK ENGINE LIGHT and RED L.E.D. display the condition of the fuel mixture (lean or rich) which is monitored by the exhaust gas sensor.

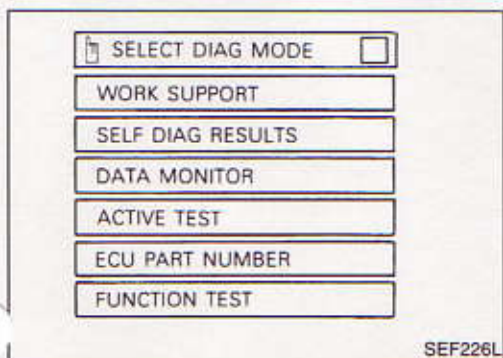
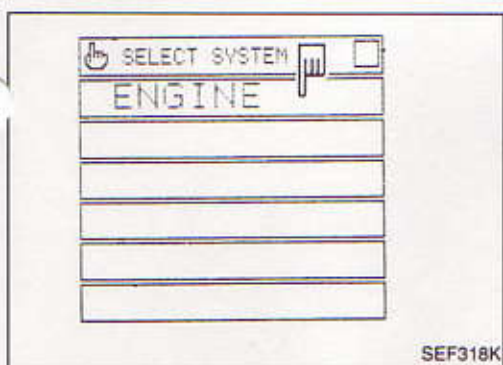
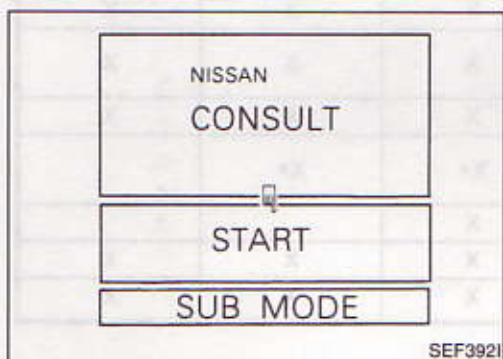
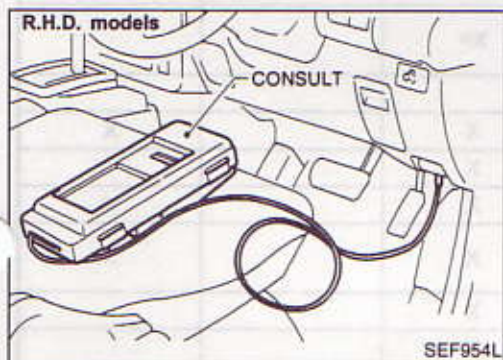
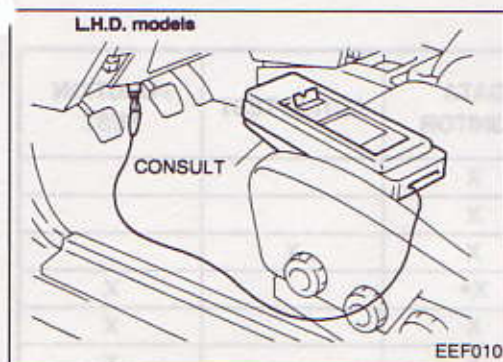
CHECK ENGINE LIGHT and RED L.E.D.	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop control
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop control

*: Maintains conditions just before switching to open loop.

HOW TO CHECK EXHAUST GAS SENSOR

1. Set Mode II. (Refer to "HOW TO SWITCH MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure RED L.E.D. or CHECK ENGINE LIGHT goes ON and OFF more than 5 times every 10 seconds; measured at 2,000 rpm under no-load.





Consult

CONSULT INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector.
(Diagnostic connector is located behind the fuse box cover.)

3. Turn on ignition switch.
4. Touch "START".

5. Touch "ENGINE".

6. Perform each diagnostic mode according to the inspection sheet as follows:

For further information, see the CONSULT Operation Manual.

Consult (Cont'd)

E.C.C.S. COMPONENT PARTS APPLICATION

MODE E.C.C.S. COMPONENT PARTS		WORK SUPPORT	SELF- DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST	FUNCTION TEST
INPUT	Crank angle sensor		X	X		
	Air flow meter		X	X		
	Engine temperature sensor		X	X	X	
	Exhaust gas sensor*			X*		X
	Vehicle speed sensor			X		X
	Throttle sensor	X	X	X		X
	Exhaust gas temperature sensor*			X*		
	Detonation sensor		X			
	Ignition switch (start signal)			X		X
	Air conditioner switch			X		
	Neutral switch			X		X
	Power steering oil pump switch			X		X
	Ambient temperature switch			X		
	Battery			X		
OUT- PUT	Injectors			X	X	X
	Power transistor (ignition timing)	X	X (Ignition signal)	X	X	X
	A.A.C. valve	X		X	X	X
	E.G.R. & canister control solenoid valve*			X*	X*	
	Air conditioner relay			X		
	Fuel pump relay	X		X	X	X
	Radiator fan			X	X	X

X: Applicable

*: Models with catalyzer only

FUNCTION

Diagnostic mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.
Data monitor	Input/Output data in the control unit can be read.
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.
E.C.U. part numbers	E.C.U. part numbers can be read.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".

Consult (Cont'd)

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THROTTLE SENSOR ADJUSTMENT	CHECK THE THROTTLE SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED 	When adjusting throttle sensor initial position.
IGNITION TIMING ADJUSTMENT	<ul style="list-style-type: none"> ● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANK ANGLE SENSOR. 	When adjusting initial ignition timing.
AAC VALVE ADJUSTMENT	SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● ENGINE WARMED UP ● NO-LOAD 	When adjusting idle speed.
FUEL PRESSURE RELEASE	<ul style="list-style-type: none"> ● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. 	When releasing fuel pressure from fuel line.

SELF-DIAGNOSTIC RESULTS MODE

DIAGNOSTIC ITEM	DIAGNOSTIC ITEM IS DETECTED WHEN ...	CHECK ITEM (REMEDY)
CRANK ANGLE SENSOR*	<ul style="list-style-type: none"> ● Either 1° or 180° signal is not entered for the first few seconds during engine cranking. ● Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm. 	<ul style="list-style-type: none"> ● Harness and connector (If harness and connector are normal, replace crank angle sensor.)
AIR FLOW METER	<ul style="list-style-type: none"> ● The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector (If harness and connector are normal, replace air flow meter.)
ENGINE TEMP SENSOR	<ul style="list-style-type: none"> ● The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Engine temperature sensor
IGN SIGNAL-PRIMARY*	<ul style="list-style-type: none"> ● The ignition signal in primary circuit is not entered during engine cranking or running. 	<ul style="list-style-type: none"> ● Harness and connector ● Power transistor unit
DETONATION SENSOR	<ul style="list-style-type: none"> ● The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Detonation sensor
THROTTLE SENSOR	The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	<ul style="list-style-type: none"> ● Harness and connector ● Throttle sensor

*: Check items causing a malfunction of crank angle sensor circuit first, if both "CRANK ANGLE SENSOR" and "IGN SIGNAL-PRIMARY" come out at the same time.

Consult (Cont'd)

DATA MONITOR MODE

Remarks:

- The monitor item marked * is applicable to vehicles with catalyzer.
 - Specification data are reference values.
 - Specification data are output/input values which are detected or supplied by the E.C.U. at the connector.
 - * Specification data may not be directly related to their components signals/values/operations.
- i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the E.C.U. according to the signals input from the crank angle sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
CAS, RPM (REF)	<ul style="list-style-type: none">● Tachometer: Connect● Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.	<ul style="list-style-type: none">● Harness and connector● Crank angle sensor
AIR FLOW MTR	<ul style="list-style-type: none">● Engine: After warming up, idle the engine● A/C switch "OFF"● Shift lever "N"	Idle	1.3 - 1.8V	<ul style="list-style-type: none">● Harness and connector● Air flow meter
		2,000 rpm	1.7 - 2.1V	
ENG TEMP SEN	<ul style="list-style-type: none">● Engine: After warming up		More than 70°C (158°F)	<ul style="list-style-type: none">● Harness and connector● Engine temperature sensor
EXH GAS SEN*	<ul style="list-style-type: none">● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V	<ul style="list-style-type: none">● Harness and connector● Exhaust gas sensor● Intake air leaks● Injectors
M/R F/C MNT*			LEAN ↔ RICH Changes more than 5 times during 10 seconds.	
CAR SPEED SEN	<ul style="list-style-type: none">● Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value	<ul style="list-style-type: none">● Harness and connector● Vehicle speed sensor
BATTERY VOLT	<ul style="list-style-type: none">● Ignition switch: ON (Engine stopped)		11 - 14V	<ul style="list-style-type: none">● Battery● E.C.U. power supply circuit
THROTTLE SEN	<ul style="list-style-type: none">● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.45 - 0.55V	<ul style="list-style-type: none">● Harness and connector● Throttle sensor● Throttle sensor adjustment
		Throttle valve fully opened	Approx. 4.0V	
START SIGNAL	<ul style="list-style-type: none">● Ignition switch: ON → START		OFF → ON	<ul style="list-style-type: none">● Harness and connector● Starter switch
IDLE POSITION	<ul style="list-style-type: none">● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON	<ul style="list-style-type: none">● Harness and connector● Throttle sensor● Throttle sensor adjustment
		Throttle valve: Slightly open	OFF	
AIR COND SIG	<ul style="list-style-type: none">● Engine: After warming up, idle the engine	A/C switch "OFF"	OFF	<ul style="list-style-type: none">● Harness and connector● Air conditioner switch
		A/C switch "ON"	ON	
NEUTRAL SW	<ul style="list-style-type: none">● Ignition switch: ON	Shift lever in neutral	ON	<ul style="list-style-type: none">● Harness and connector● Neutral switch
		Except above	OFF	
PW/ST SIGNAL	<ul style="list-style-type: none">● Engine: After warming up, idle the engine	Steering wheel in neutral (forward direction)	OFF	<ul style="list-style-type: none">● Harness and connector● Power steering oil pressure switch
		The steering wheel is turned	ON	
FUEL PUMP RLY	<ul style="list-style-type: none">● Ignition switch is turned to ON (Operates for 5 seconds)● Engine running and cranking● When engine is stopped (stops in 1.0 seconds)		ON	<ul style="list-style-type: none">● Harness and connector● Fuel pump relay
	Except as shown above		OFF	
RADIATOR FAN	<ul style="list-style-type: none">● Engine: After warming up, idle the engine.● A/C switch "OFF"	Engine temperature is 89°C (192°F) or less	OFF	<ul style="list-style-type: none">● Harness and connector● Radiator fan relay● Radiator fan
		Engine temperature is 90°C (194°F) or more	ON	
INJ PULSE	<ul style="list-style-type: none">● Engine: After warming up● A/C switch "OFF"● Shift lever "N"● No-load	Idle	2.4 - 3.2 msec.	<ul style="list-style-type: none">● Harness and connector● Injector● Air flow meter● Intake air system
		2,000 rpm	1.9 - 2.8 msec.	

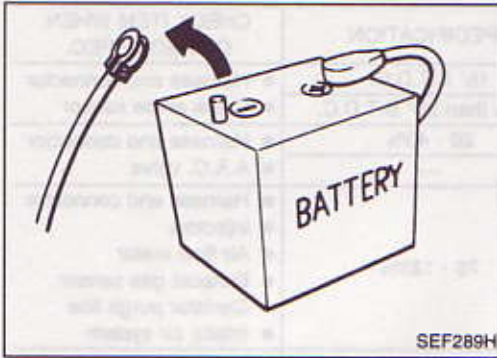
Consult (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
IGN TIMING	ditto	Idle	15° B.T.D.C.	<ul style="list-style-type: none"> ● Harness and connector ● Crank angle sensor
		2,000 rpm	More than 25° B.T.D.C.	
AAC VALVE	ditto	Idle	20 - 40%	<ul style="list-style-type: none"> ● Harness and connector ● A.A.C. valve
		2,000 rpm	—	
A/F ALPHA	<ul style="list-style-type: none"> ● Engine: After warming up 	Maintaining engine speed at 2,000 rpm	75 - 125%	<ul style="list-style-type: none"> ● Harness and connector ● Injectors ● Air flow meter ● Exhaust gas sensor ● Canister purge line ● Intake air system
AIR COND RLY	<ul style="list-style-type: none"> ● Air conditioner switch OFF → ON 		OFF → ON	<ul style="list-style-type: none"> ● Harness and connector ● Air conditioner switch ● Air conditioner relay
EGR CONT S/V**	<ul style="list-style-type: none"> ● Engine: After warming up ● A/C switch "OFF" ● Shift lever "N" ● No-load 	Idle	ON	<ul style="list-style-type: none"> ● Harness and connector ● E.G.R. & canister control solenoid valve
		2,000 rpm	OFF	
AMB TEMP SW	<ul style="list-style-type: none"> ● Ignition switch: ON ● Compare ambient temperature with the following: 	Below 19 - 22°C (66 - 72°F)	OFF	<ul style="list-style-type: none"> ● Harness and connector ● Ambient switch
		Above 22 - 25°C (72 - 77°F)	ON	

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION TEST	<ul style="list-style-type: none"> ● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> ● Harness and connector ● Fuel injectors ● Exhaust gas sensor
AAC/V OPENING TEST	<ul style="list-style-type: none"> ● Engine: After warming up, idle the engine. ● Change the AAC valve opening percent using CONSULT. 	Engine speed changes according to the opening percent.	<ul style="list-style-type: none"> ● Harness and connector ● AAC valve
ENGINE TEMP TEST	<ul style="list-style-type: none"> ● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> ● Harness and connector ● Engine temperature sensor ● Fuel injectors
IGN TIMING TEST	<ul style="list-style-type: none"> ● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> ● Adjust initial ignition timing
EGR CONT SOL/V TEST*	<ul style="list-style-type: none"> ● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound. 	Each solenoid valve makes an operating sound.	<ul style="list-style-type: none"> ● Harness and connector ● Solenoid valve
POWER BALANCE TEST	<ul style="list-style-type: none"> ● Engine: After warming up, idle the engine. ● A/C switch "OFF" ● Shift lever "N" ● Cut off each injector signal one at a time using CONSULT. 	Engine runs rough or dies.	<ul style="list-style-type: none"> ● Harness and connector ● Compression ● Injectors ● Power transistor ● Spark plugs ● Ignition coils
RADIATOR FAN TEST	<ul style="list-style-type: none"> ● Ignition switch: ON ● Turn the radiator fan "ON" and "OFF" using CONSULT. 	Radiator fan moves and stops.	<ul style="list-style-type: none"> ● Harness and connector ● Radiator fan motor
FUEL PUMP RLY TEST	<ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound. 	Fuel pump relay makes the operating sound.	<ul style="list-style-type: none"> ● Harness and connector ● Fuel pump relay
SELF-LEARN CONT TEST*	<ul style="list-style-type: none"> ● In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen. 		

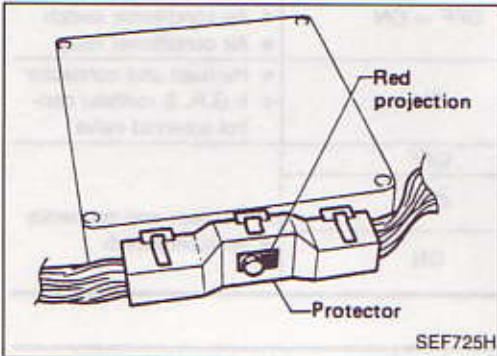
Remarks: The monitor item marked "*" is applicable to vehicles with catalyzer only.



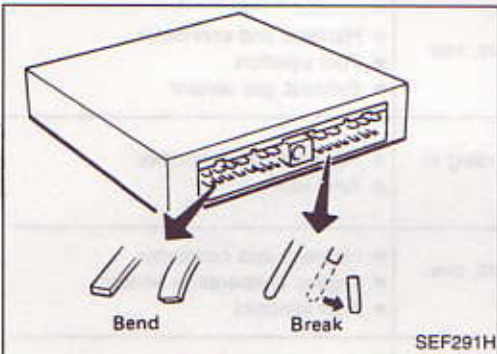
Diagnostic Procedure

CAUTION:

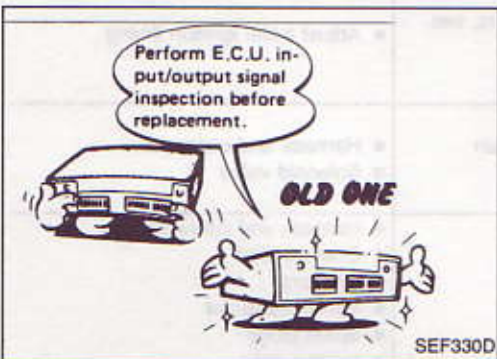
1. Before connecting or disconnecting the E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Failure to do so may damage the E.C.U.



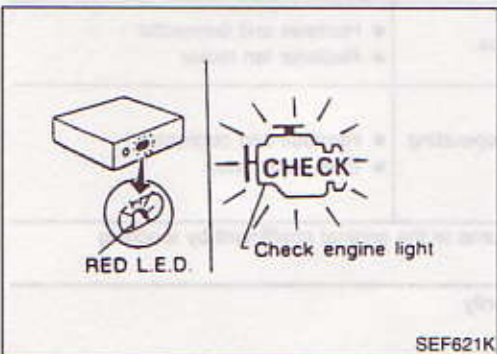
2. When connecting E.C.U. harness connector, tighten securing bolt until red projection is in line with connector face.



3. When connecting or disconnecting pin connectors into or from E.C.U., take care not to damage pin terminals (bend or break).
4. Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors.



5. Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-155.)

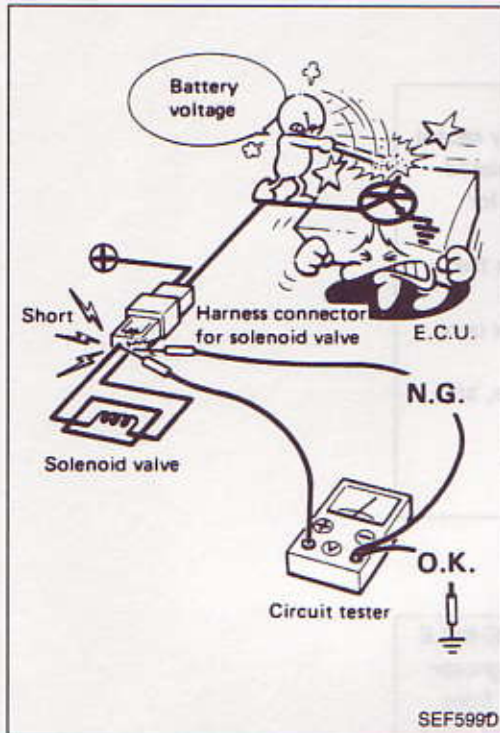


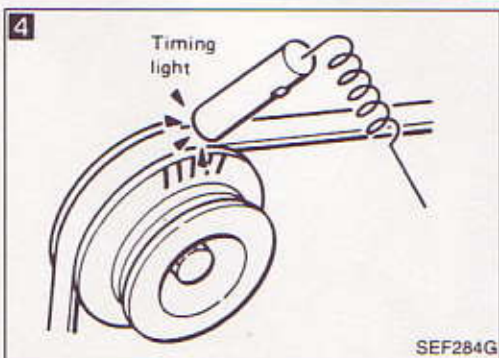
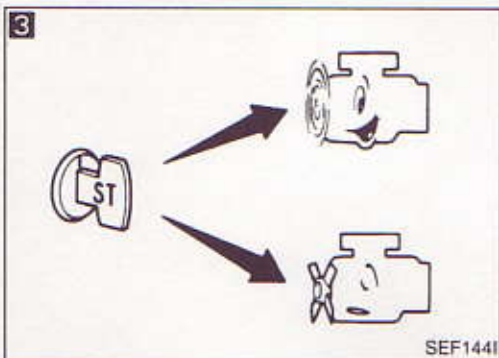
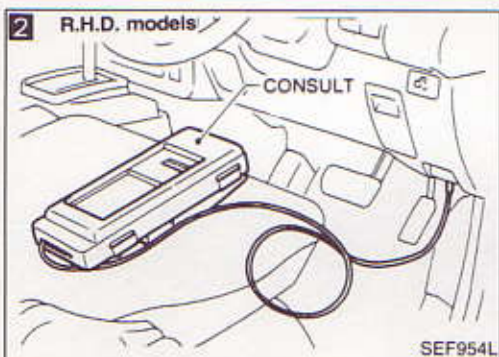
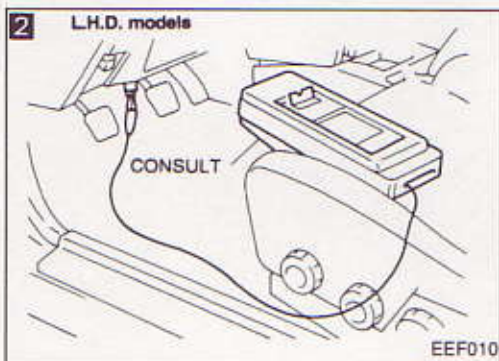
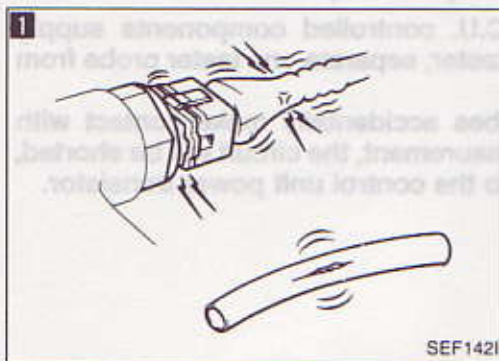
6. After performing this "Diagnostic Procedure", perform E.C.C.S. self-diagnosis and driving test.

Diagnostic Procedure (Cont'd)

7. When measuring E.C.U. controlled components supply voltage with a circuit tester, separate one tester probe from the other.

If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the control unit power transistor.





Basic Inspection

1

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 proper connections
 - Vacuum hoses for splits, kinks, and proper connections
 - Wiring for proper connections, pinches, and cuts

2

CONNECT CONSULT TO THE VEHICLE

Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-53.)

3

DOES ENGINE START?

No

Go to 6

Yes

4

CHECK IGNITION TIMING.

Warm up engine sufficiently and check ignition timing at idle using timing light. (Models with catalyzer: Refer to page EF & EC-29)
Models without catalyzer: Refer to page EF & EC-36)

Ignition timing:
 $15^{\circ} \pm 2^{\circ}$ B.T.D.C.

N.G.

Adjust ignition timing by turning crank angle sensor.

O.K.

(Go to A on next page.)

Basic Inspection (Cont'd)

5

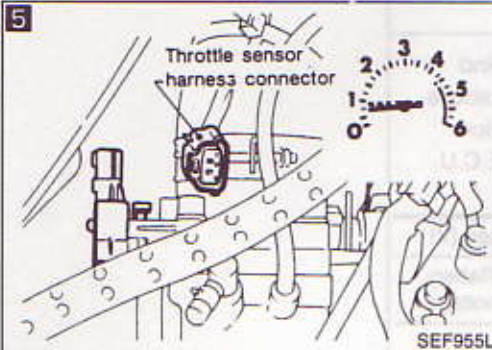
■ IGN TIMING ADJ ■ □

IGNITION TIMING FEEDBACK
CONTROL WILL BE HELD BY
TOUCHING START
AFTER DOING SO ADJUST
IGNITION TIMING WITH A
TIMING LIGHT BY TURNING
THE CRANK ANGLE SENSOR

START

SEF816K

5



SEF955L

6

■ THROTTLE SEN ADJ ■ □

*****ADJ MONITOR*****

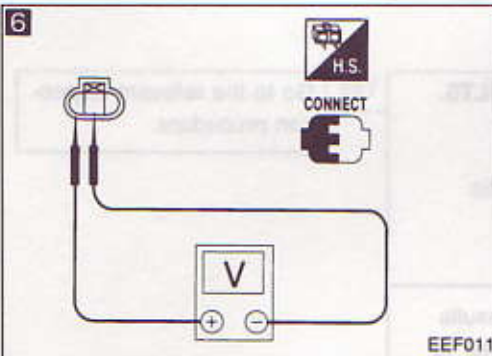
THROTTLE SEN 0.52V

===== MONITOR =====

CAS-RPM (REF) 0rpm
IDLE POSITION ON

SEF794K

6



EEF011

A

5

CHECK IDLE ADJ. SCREW INITIAL SET RPM.



1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine rpm fall to 750 ± 50 rpm (in "N" position)?

OR



When disconnecting throttle sensor harness connector, does engine rpm fall to 750 ± 50 rpm (in "N" position)?

No

Adjust engine rpm by turning idle adjusting screw.

Yes

6

CHECK THROTTLE SENSOR IDLE POSITION.



1. Perform "THROTTLE SEN. ADJ" in "WORK SUPPORT" mode.
2. Check that output voltage of throttle sensor is 0.45 to 0.55V. (Throttle valve fully closes.) and "IDLE POSITION" stays "ON".

OR



Measure output voltage of throttle sensor using voltmeter, and check that it is 0.45 to 0.55V. (Throttle valve fully closed.)

N.G.

1. Adjust output voltage by rotating throttle sensor body.
2. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "IDLE POSITION" stays "ON".

O.K.

(Go to (B) on next page.)

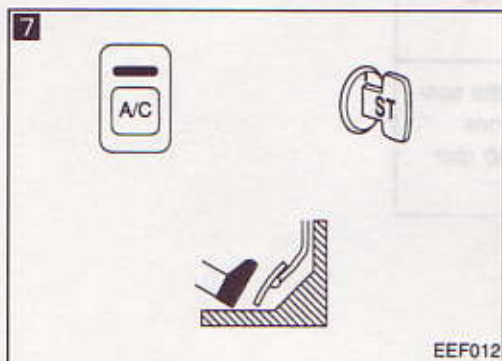
Basic Inspection (Cont'd)

7

★ MONITOR	★ NO FAIL	<input type="checkbox"/>
START SIGNAL	OFF	
IDLE POSITION	ON	
AIR COND SIG	OFF	
NEUTRAL SW	ON	

RECORD

SEF821K



8

■ SELF-DIAG RESULTS ■

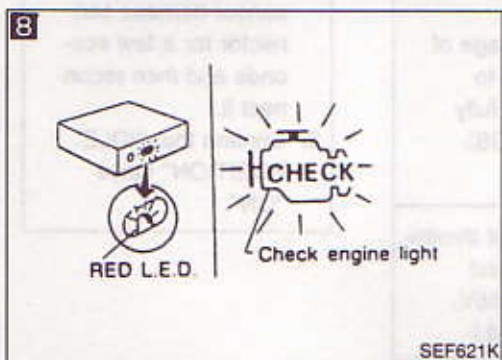
FAILURE DETECTED TIME

• NO SELF DIAGNOSTIC FAILURE INDICATED.

FURTHER TESTING MAY BE REQUIRED **

ERASE PRINT

SEF227L



7

CHECK SWITCH INPUT SIGNAL.

Select the following switches in "DATA MONITOR" mode,

- Start signal,
- Idle position,
- Air conditioner signal,
- Neutral (Parking) switch,

and check the switches' ON-OFF operation.

N.G. Repair or replace the malfunctioning switch or its circuit.

OR

Remove E.C.U. from behind glove box and check the above switches' ON-OFF operation using voltmeter at each E.C.U. terminal.

Switch	Condition	Voltage (V)
Start signal	IGN → IGN ON → START	0 → Battery voltage
Idle position	Accelerator pedal released → Accelerator pedal fully depressed	0.45 - 0.55 → Approx. 4.0
A/C signal	A/C OFF → A/C ON (Engine running)	Approx. 9.0 → 0 - 0.3
Neutral (Parking switch)	Shift lever is Neutral position → Except Neutral position	0 → Approx. 6.0

O.K.

8

READ SELF-DIAGNOSTIC RESULTS.

- Perform "SELF-DIAG RESULTS" mode.
- Read out self-diagnostic results.
- Is a failure detected?

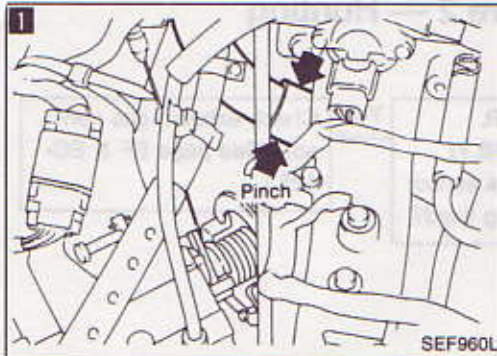
OR

- Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-49.)
- Count the number of RED L.E.D. or check engine light flashes and read out the codes.
- Are the codes shown?

Yes Go to the relevant inspection procedure.

No

INSPECTION END



Diagnostic Procedure 1 — High Idling after Warm-up

1

CHECK I.A.A. UNIT.

When pinching the I.A.A. unit hose, does the engine speed drop?

Yes

Check air regulator, A.A.C. valve and circuit. (See page EF & EC-137.)

No

2

CHECK INTAKE AIR LEAK. (MODELS WITH CATALYZER ONLY)



1. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode.
2. Clear the self-learning control coefficient by touching "CLEAR".
3. Does the engine speed drop?

OR



1. Disconnect exhaust gas sensor harness connector.
2. After racing engine at 2,000 rpm under no-load for about 30 seconds, does the engine speed drop?

Yes

Discover air leak location and repair.

No

3

CHECK THROTTLE LINKAGE.

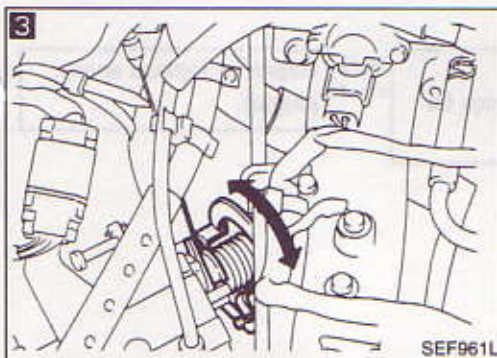
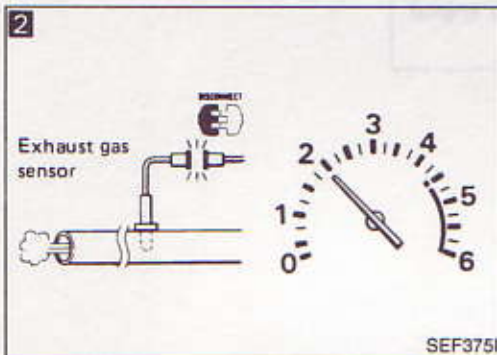
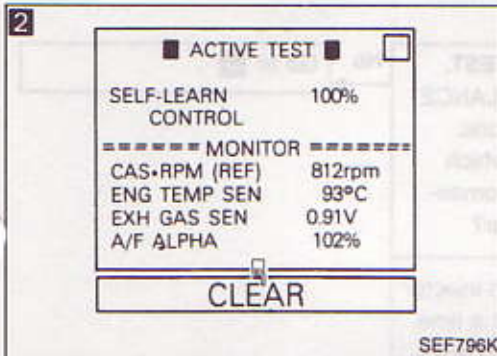
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

N.G.

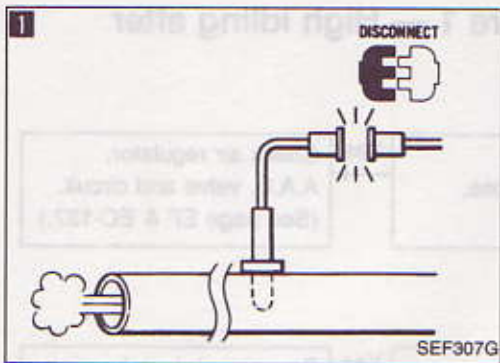
Repair throttle linkage or sticking of throttle valve.

O.K.

INSPECTION END



Diagnostic Procedure 2 — Hunting

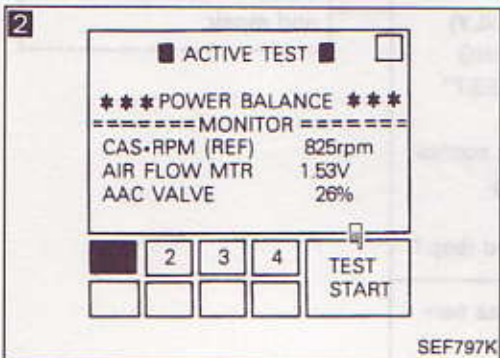
**1**

CHECK EXHAUST GAS SENSOR.
(MODELS WITH CATALYZER ONLY)
When disconnecting exhaust gas sensor harness connector, is the hunting fixed?

Yes

Check exhaust gas sensor. (See page EF & EC-125.)

No

**2**

PERFORM POWER BALANCE TEST.



1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No

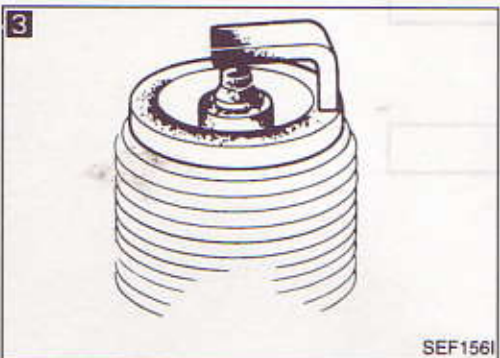
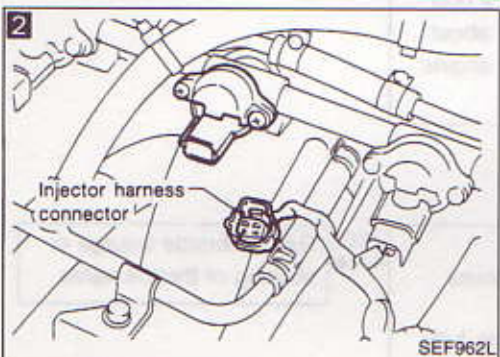
Go to **4**.

OR



When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

**3**

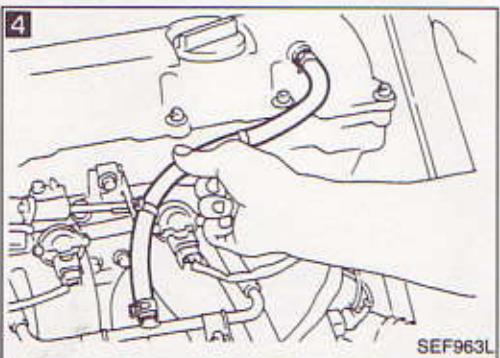
CHECK SPARK PLUGS.

Remove the spark plugs and check for fouling, etc.

N.G.

Repair or replace spark plug(s).

O.K.

**4**

CHECK FOR INTAKE AIR LEAK.

When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

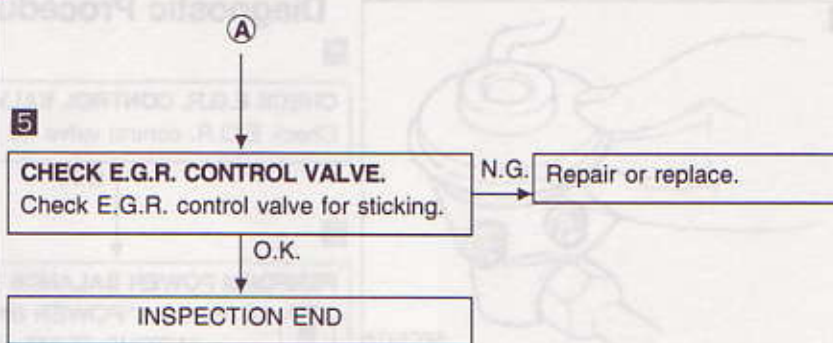
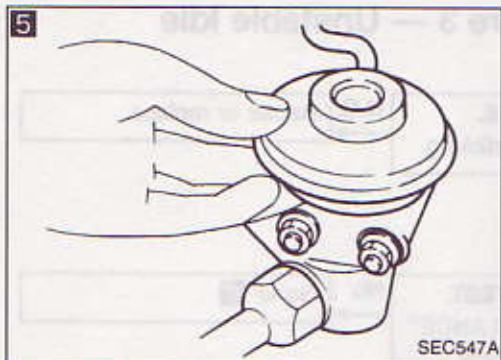
Yes

Discover air leak location and repair.

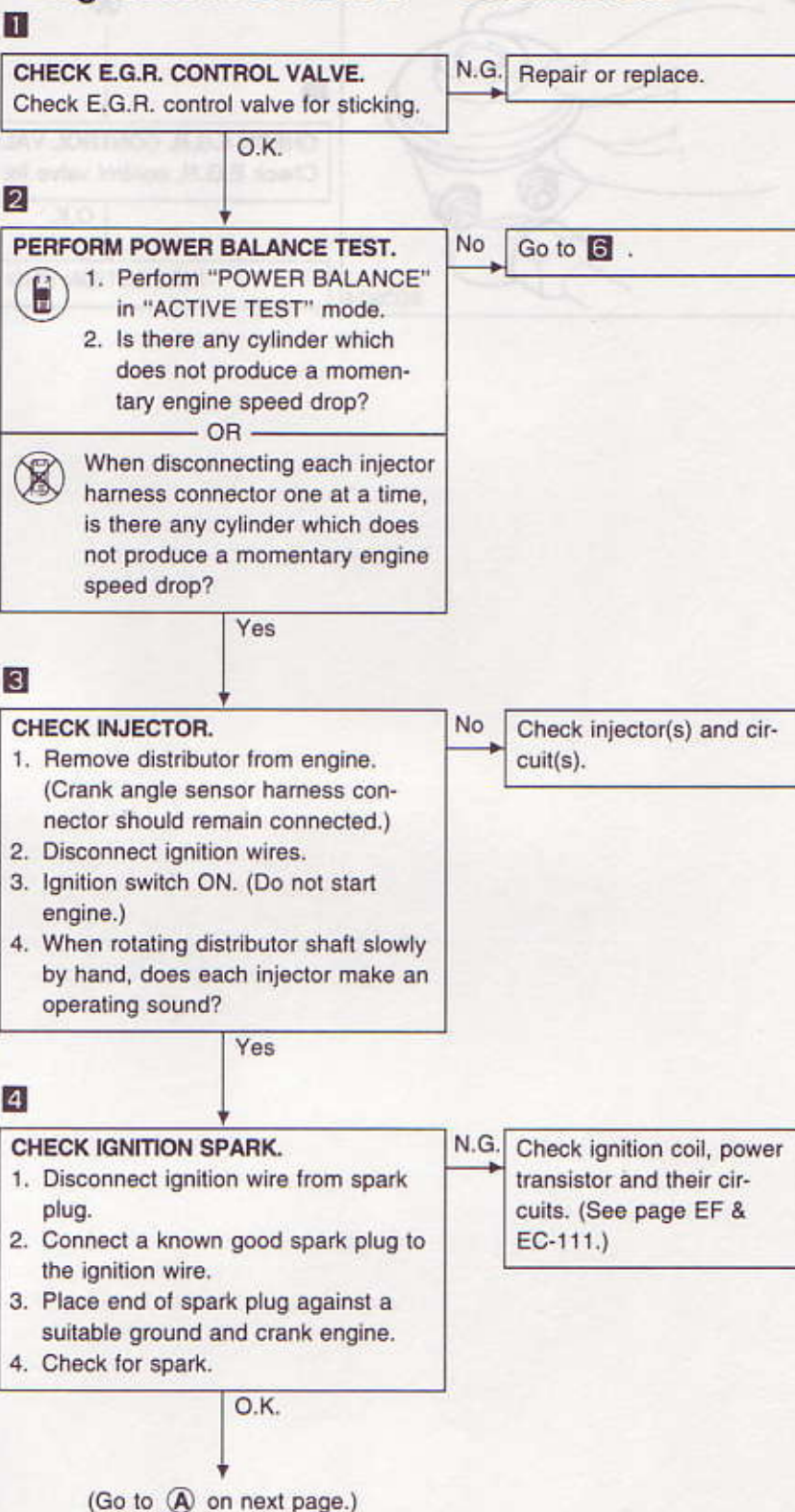
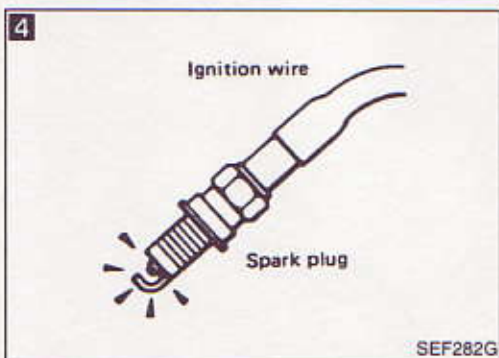
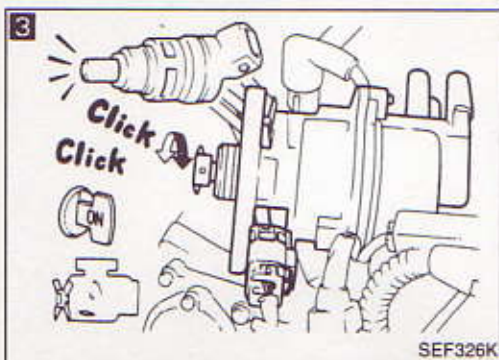
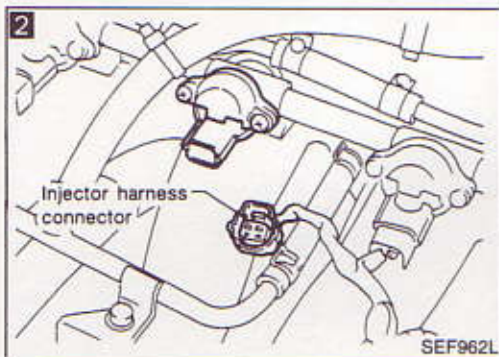
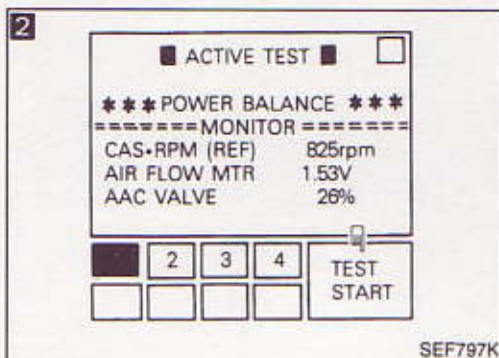
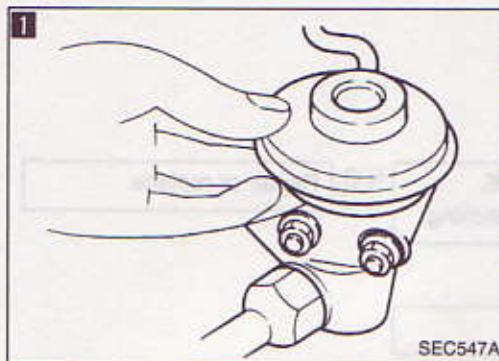
No

(Go to **A** on next page.)

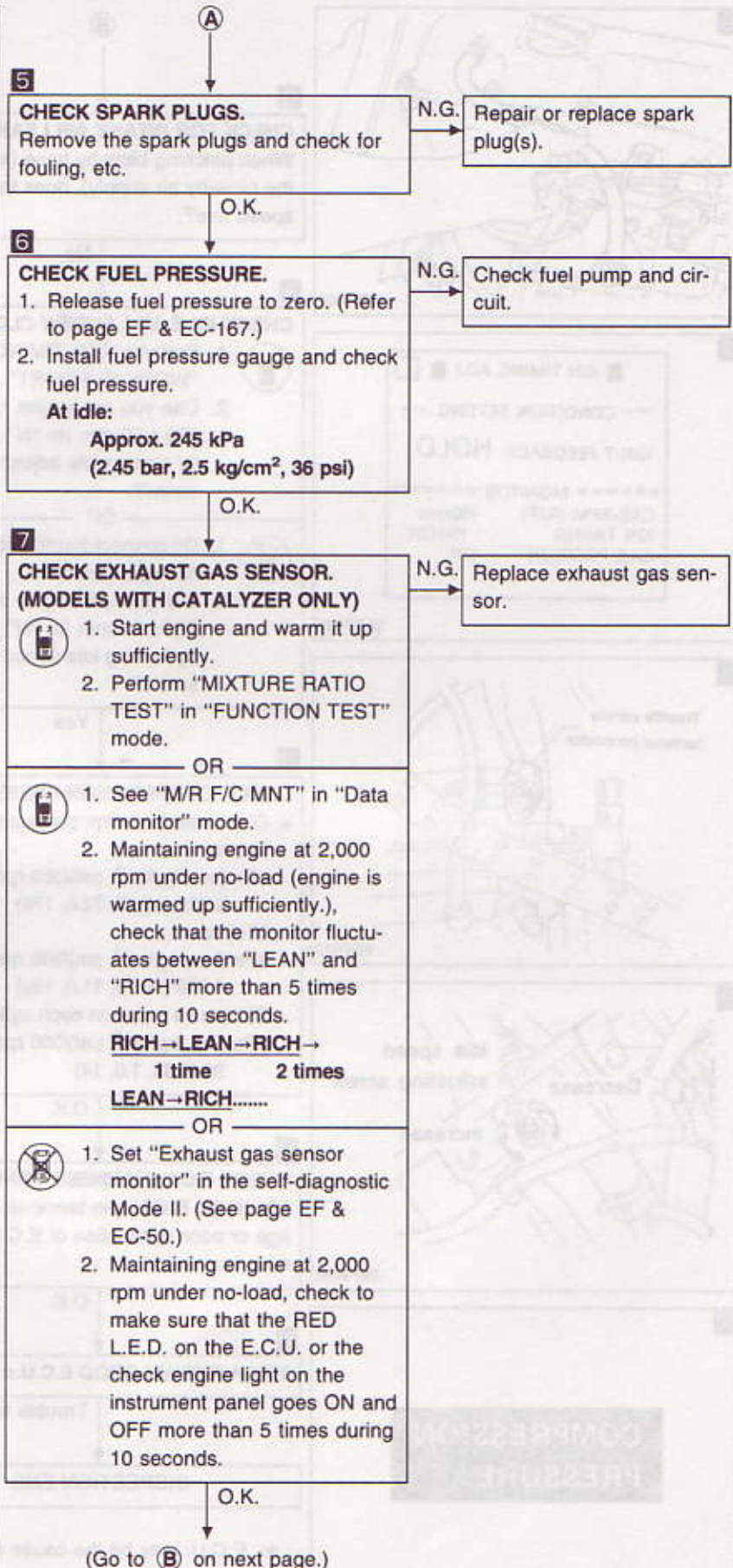
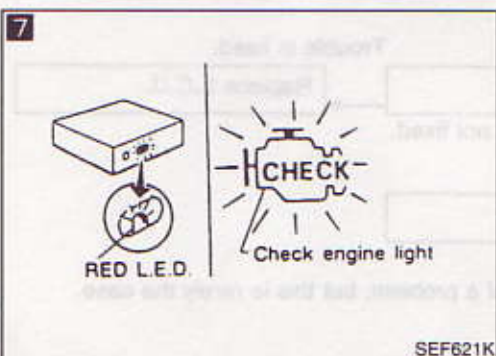
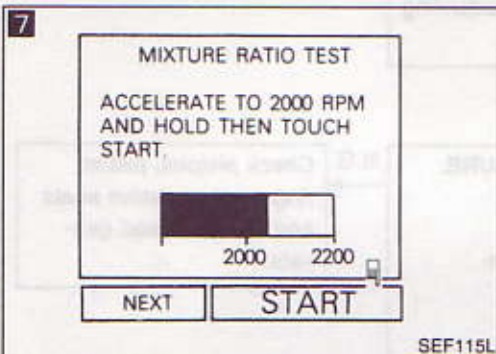
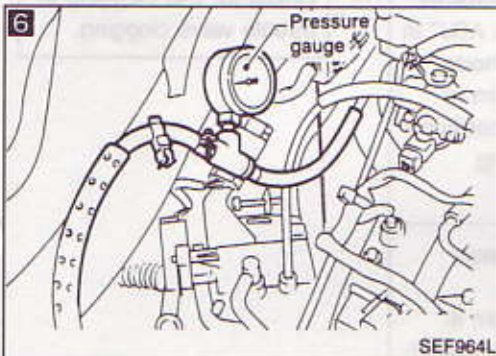
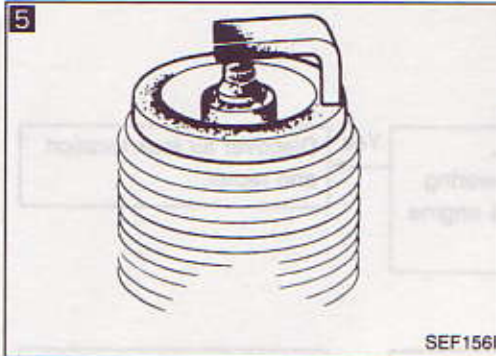
Diagnostic Procedure 2 — Hunting (Cont'd)



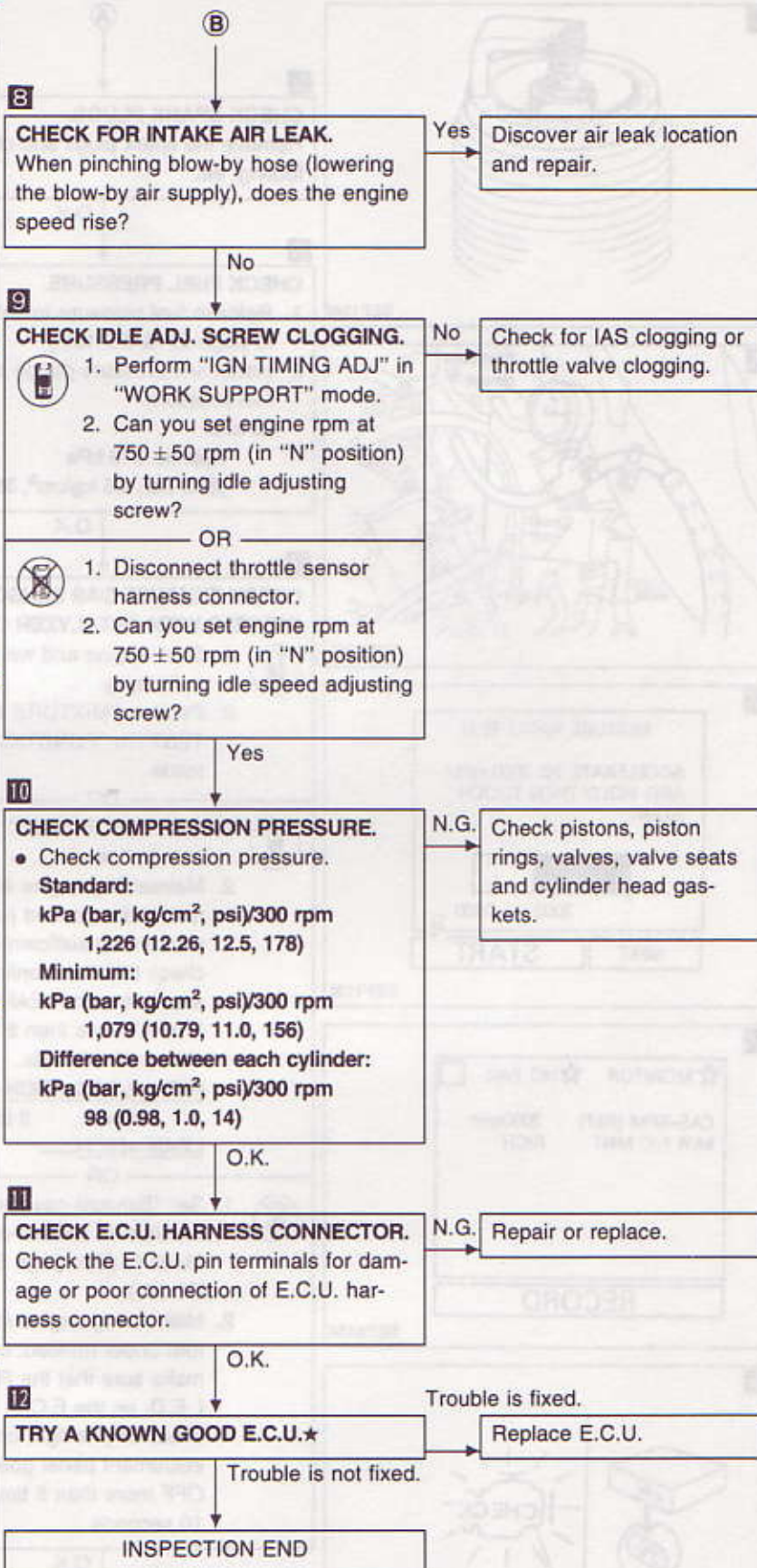
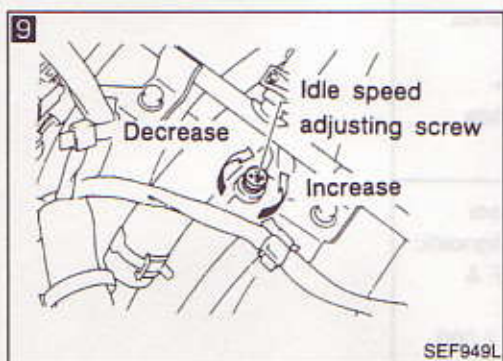
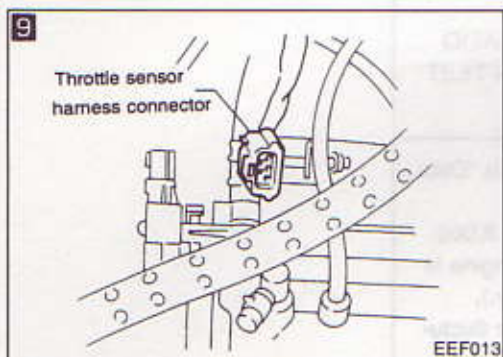
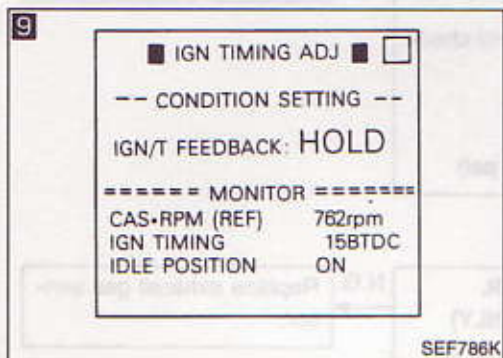
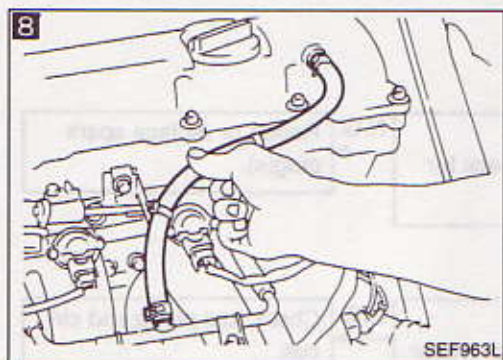
Diagnostic Procedure 3 — Unstable Idle



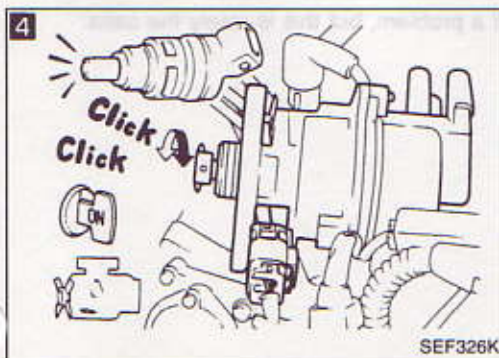
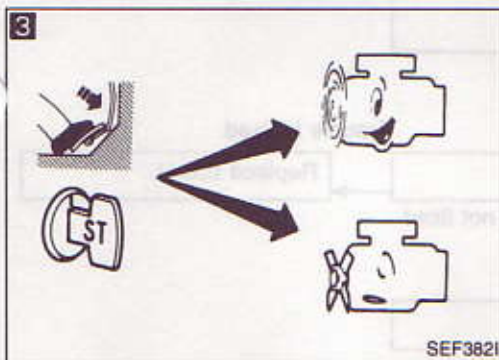
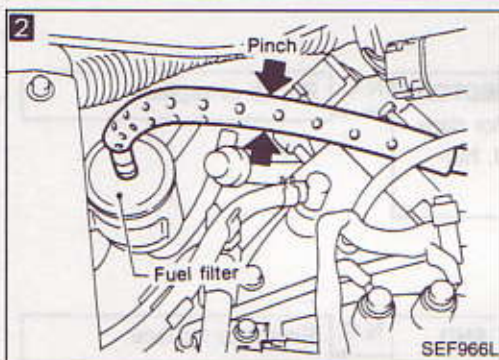
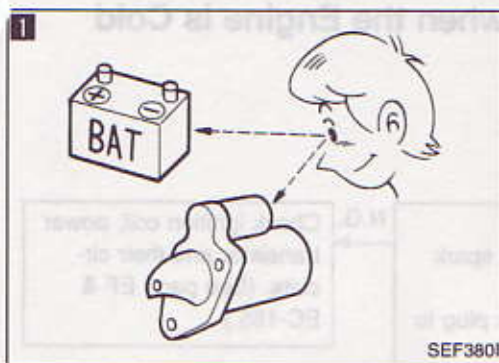
Diagnostic Procedure 3 — Unstable Idle (Cont'd)



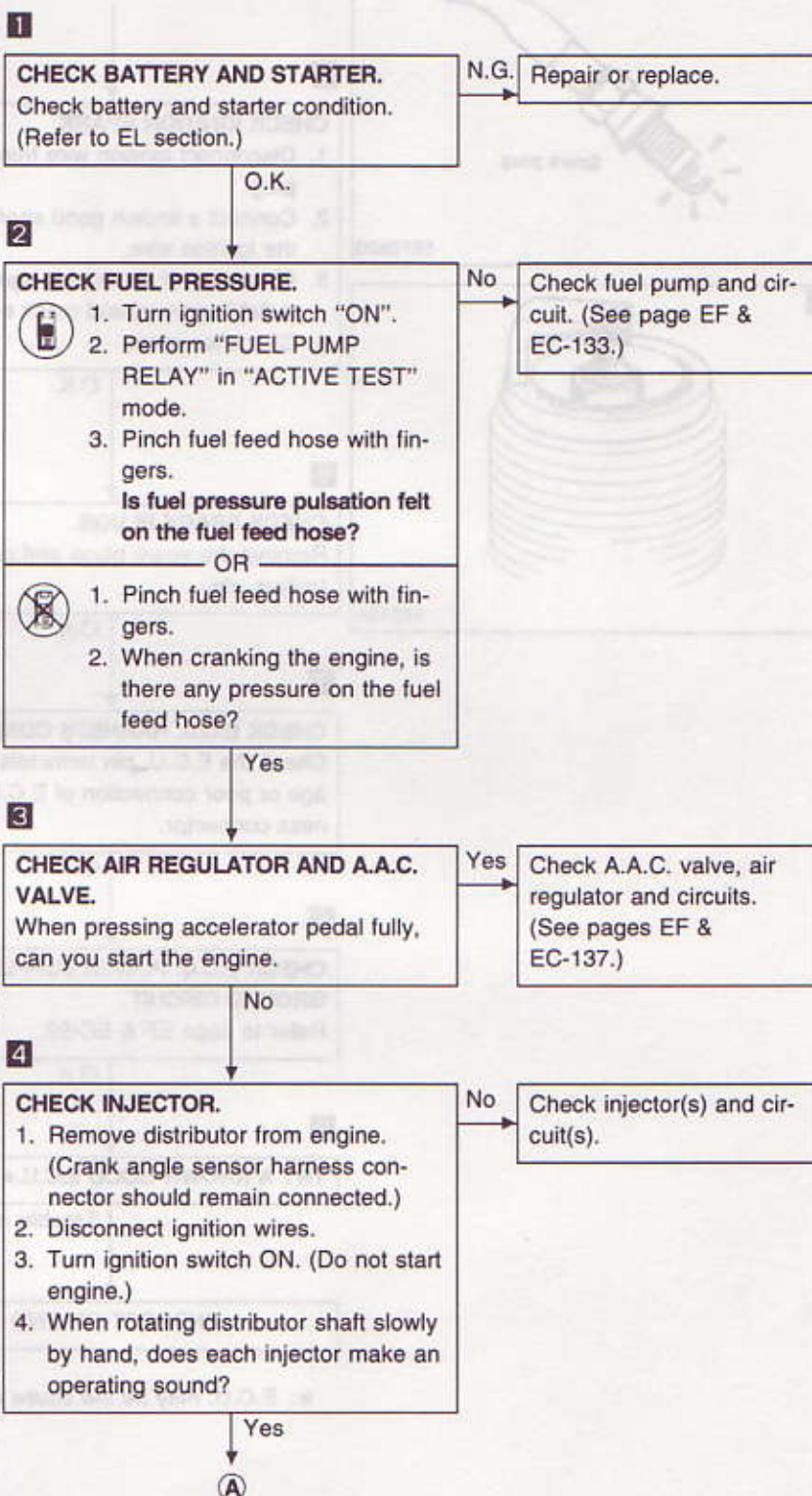
Diagnostic Procedure 3 — Unstable Idle (Cont'd)



★: E.C.U. may be the cause of a problem, but this is rarely the case.

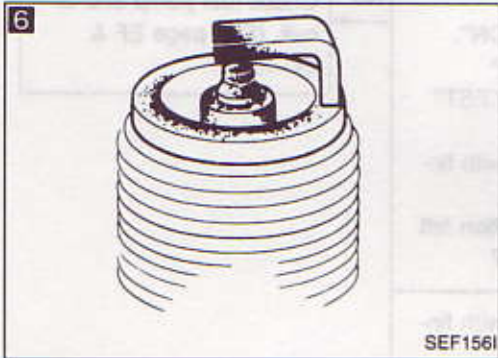
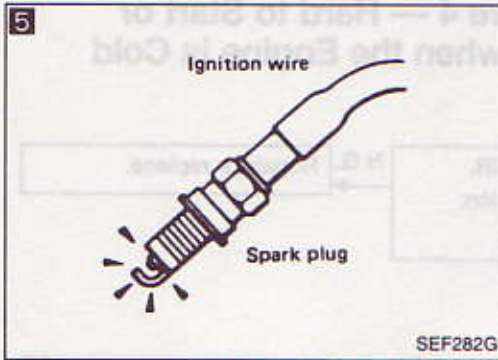


Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold



TROUBLE DIAGNOSES

Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)



- 5
- CHECK IGNITION SPARK.**
1. Disconnect ignition wire from spark plug.
 2. Connect a known good spark plug to the ignition wire.
 3. Place end of spark plug against a suitable ground and crank engine.
 4. Check for spark.

N.G. Check ignition coil, power transistor and their circuits. (See page EF & EC-155.)

O.K.

- 6
- CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.

N.G. Repair or replace spark plug(s).

O.K.

- 7
- CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. Repair or replace.

O.K.

- 8
- CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-99.

N.G. Repair or replace.

O.K.

- 9
- TRY A KNOWN GOOD E.C.U.★**

Trouble is fixed.

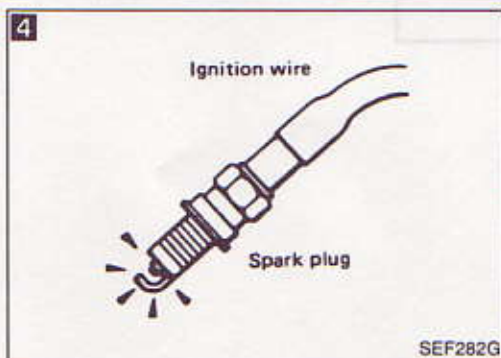
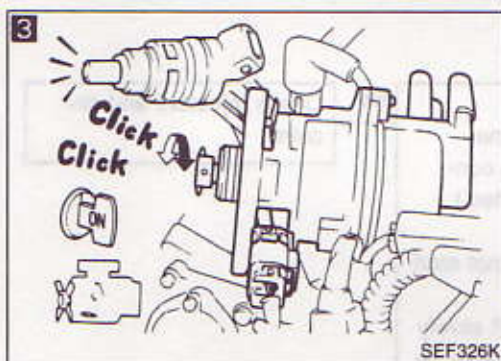
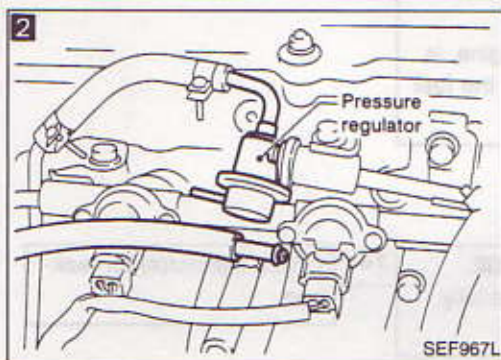
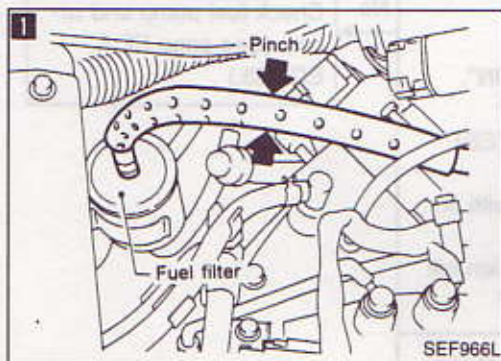
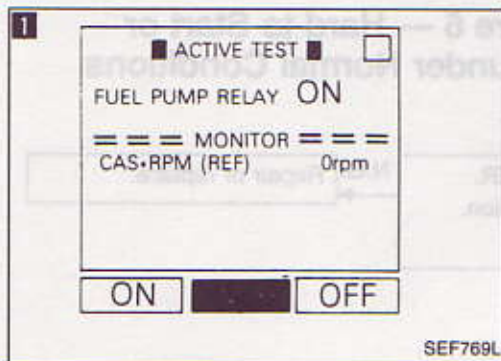
Replace E.C.U.

Trouble is not fixed.

INSPECTION END

★: E.C.U. may be the cause of a problem, but this is rarely the case.

TROUBLE DIAGNOSES



Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot

1**CHECK FUEL PRESSURE.**

1. Turn ignition switch "ON".
 2. Perform "FUEL PUMP RELAY" in "ACTIVE TEST" mode.
 3. Pinch fuel feed hose with fingers.
- Is fuel pressure pulsation felt on the fuel feed hose?

No

Check fuel pump and circuit. (See page EF & EC-133.)

OR

1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

Yes

2**CHECK FUEL VAPOR.**

1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Can you start engine?

Yes

Check fuel properties.

No

3**CHECK INJECTOR.**

Does each injector make an operating sound at idle?

No

Check injector(s) and circuit(s).

Yes

4**CHECK IGNITION SPARK.**

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G.

Check ignition coil, power transistor and circuits. (See page EF & EC-155.)

O.K.

5

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G.

Repair or replace.

O.K.

6

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-99.

N.G.

Repair or replace.

O.K.

7**TRY A KNOWN GOOD E.C.U.***

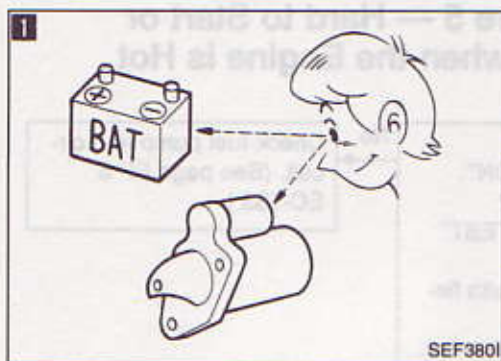
Trouble is fixed.

Replace E.C.U.

Trouble is not fixed.

INSPECTION END

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



Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions

1

CHECK BATTERY AND STARTER.
Check battery and starter operation.
(Refer to EL section.)

N.G. Repair or replace.

O.K.

2

CHECK FUEL PRESSURE.



1. Turn ignition switch "ON".
2. Perform "FUEL PUMP RELAY" in "ACTIVE TEST" mode.
3. Pinch fuel feed hose with fingers.

Is fuel pressure pulsation felt on the fuel feed hose?

OR



1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No Check fuel pump and circuit. (See page EF & EC-133.)

Yes

3

CHECK INJECTOR FOR LEAKAGE.

When pressing accelerator pedal fully, can you start the engine.

Yes Check injector(s) for leakage.

No

4

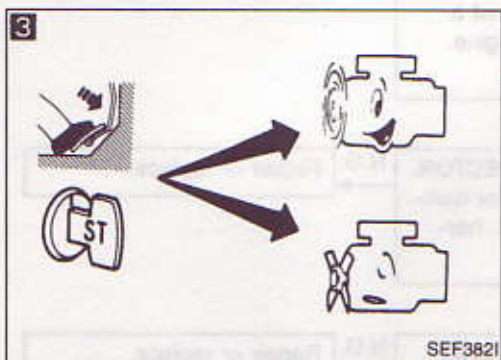
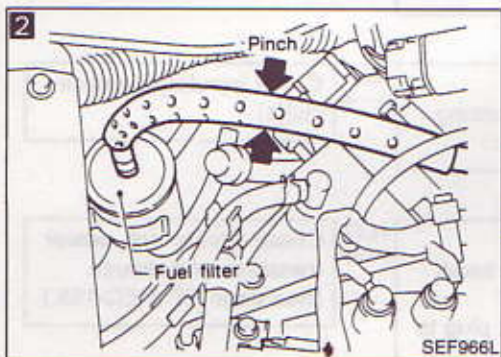
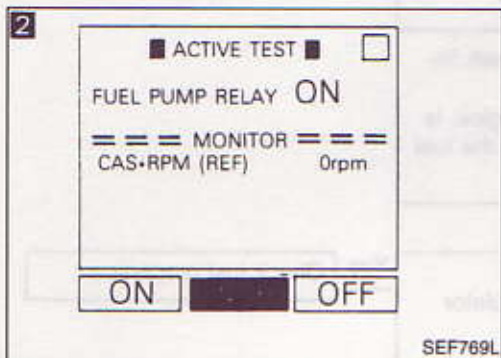
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

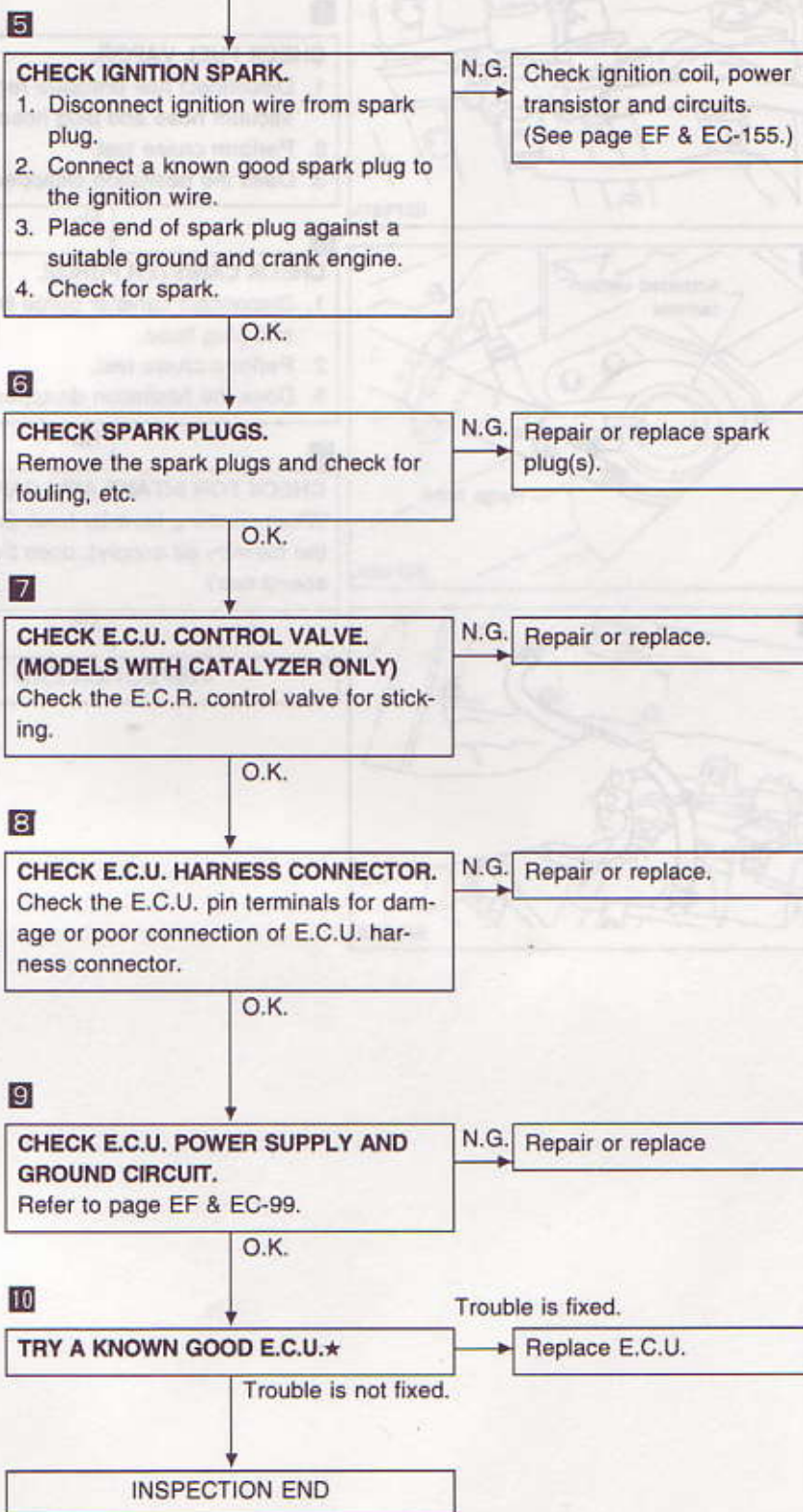
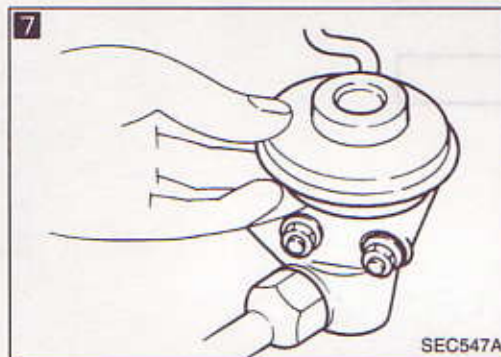
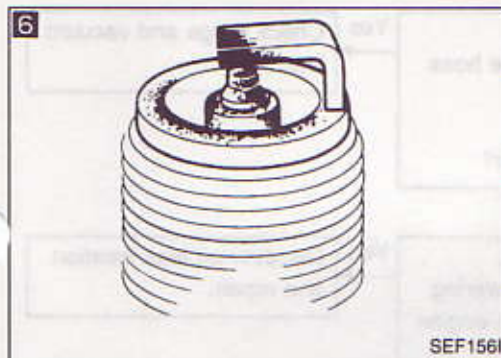
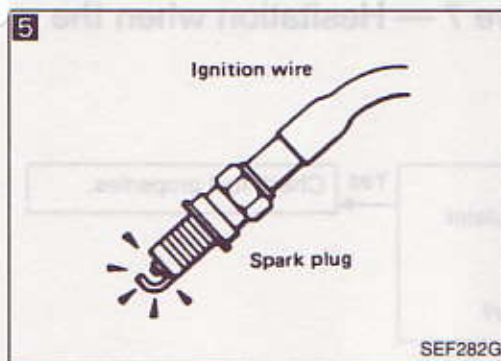
No Check injectors and circuits.

Yes

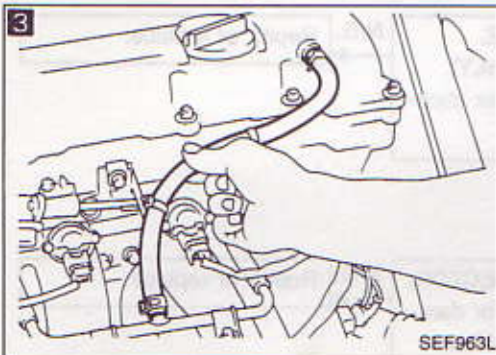
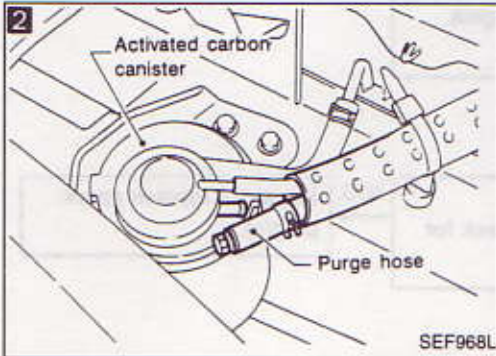
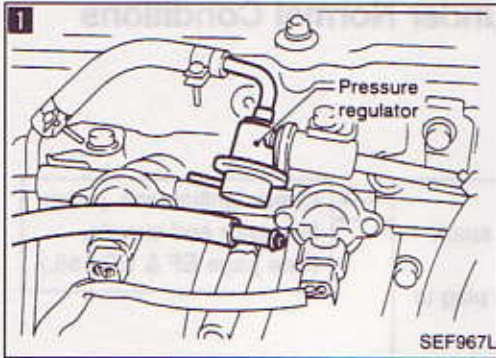
(A)



Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)



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



Diagnostic Procedure 7 — Hesitation when the Engine is Hot

1

CHECK FUEL VAPOR.

1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes

Check fuel properties.

No

2

CHECK CANISTER PURGE.

1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes

Check purge and vacuum line.

No

3

CHECK FOR INTAKE AIR LEAK.

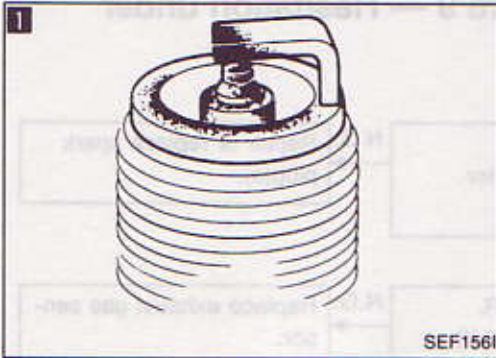
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes

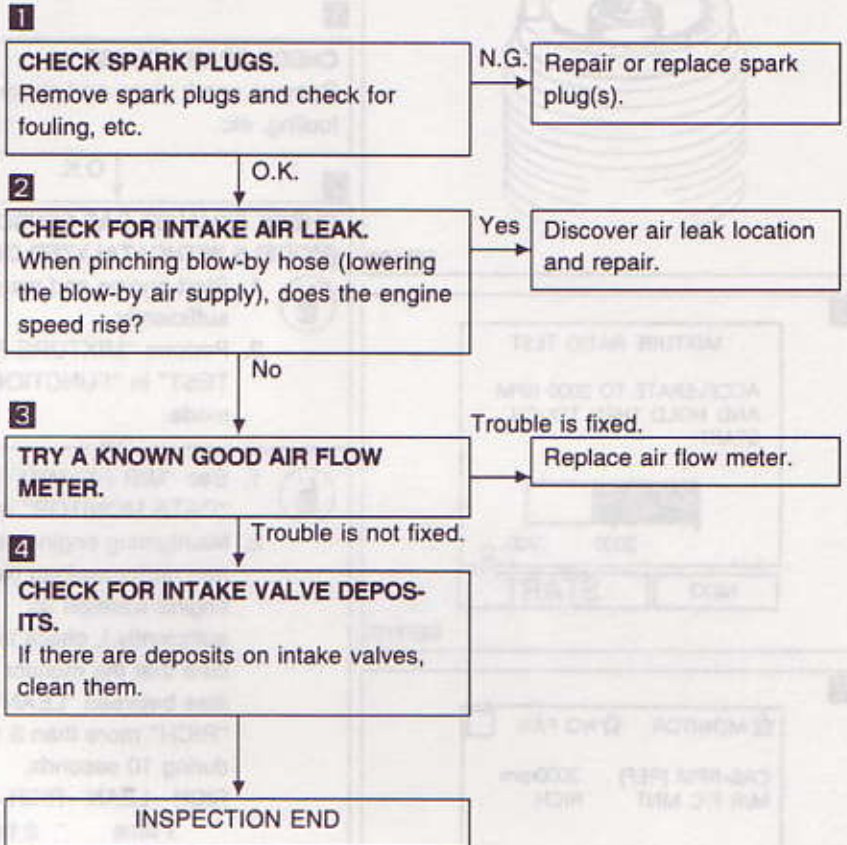
Discover air leak location and repair.

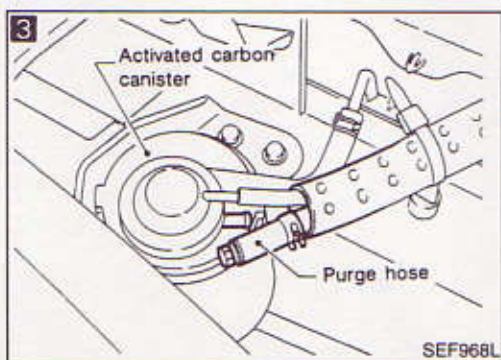
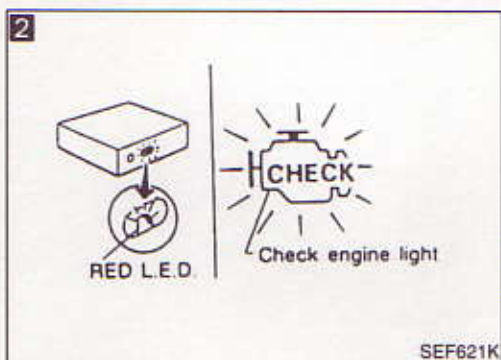
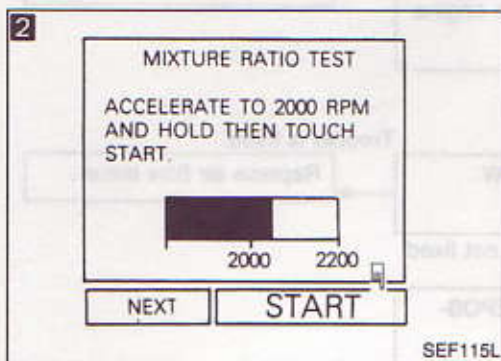
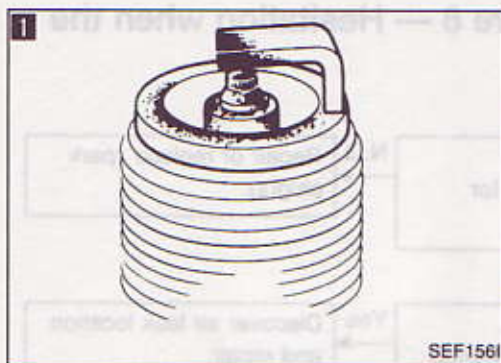
No

INSPECTION END

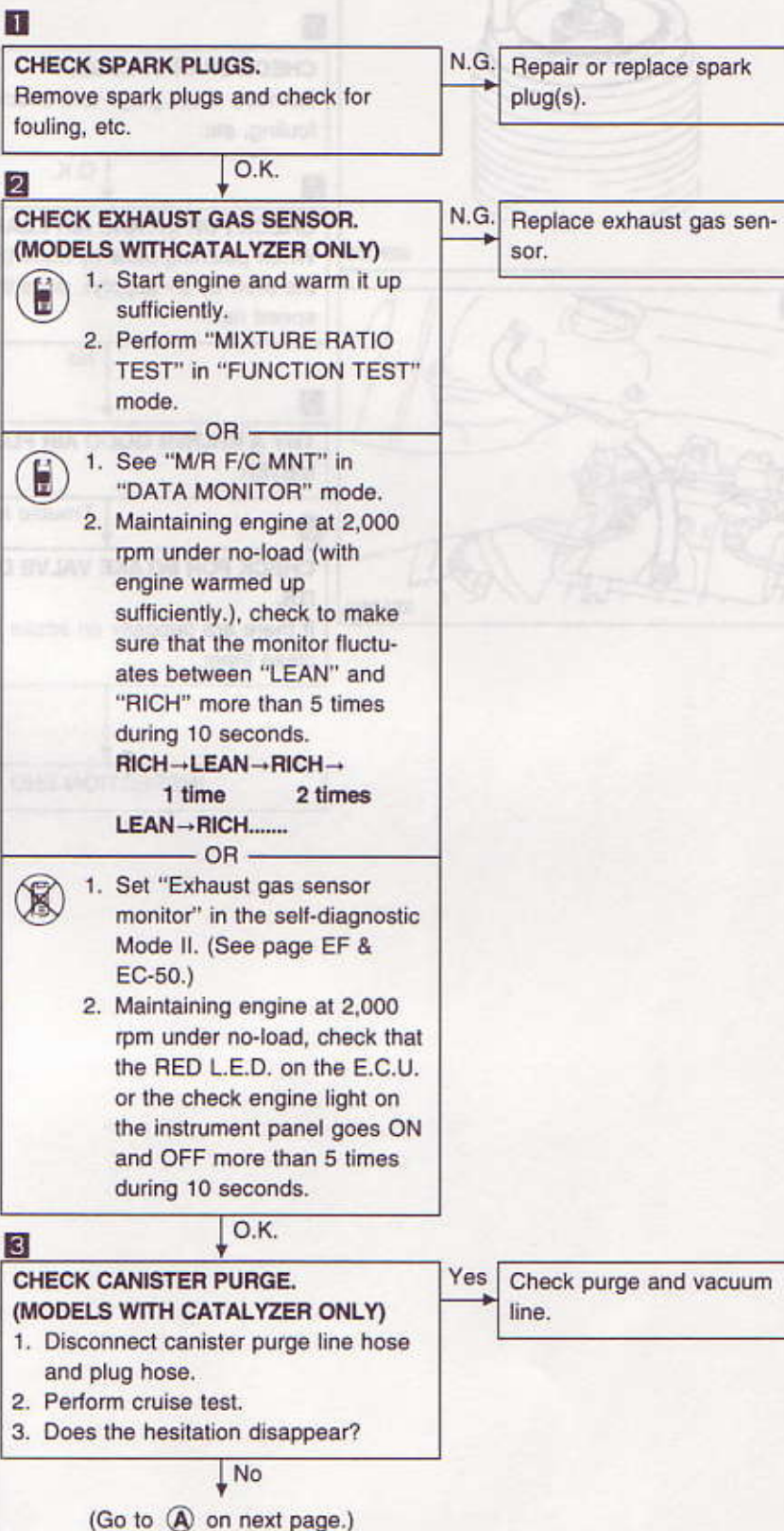


Diagnostic Procedure 8 — Hesitation when the Engine is Cold

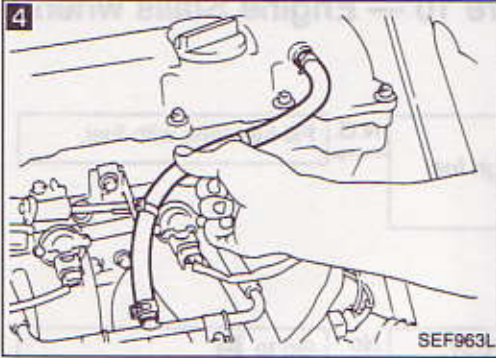




Diagnostic Procedure 9 — Hesitation under Normal Conditions



Diagnostic Procedure 9 — Hesitation under Normal Conditions (Cont'd)



4

CHECK FOR INTAKE AIR LEAK.

When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

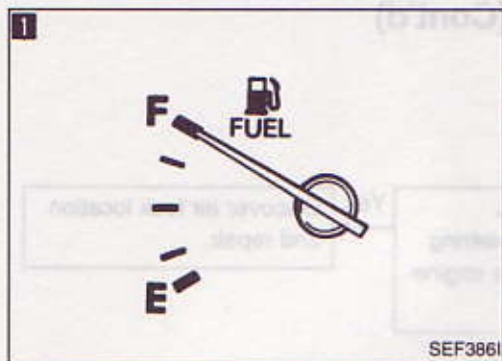
Yes

Discover air leak location and repair.

No

INSPECTION END

Diagnostic Procedure 10 — Engine Stalls when Turning



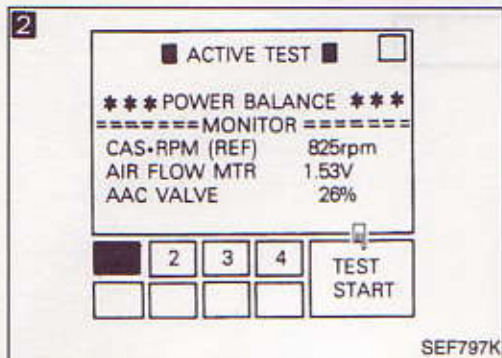
1

CHECK FUEL LEVEL.

Check to see that there is enough fuel in tank.

N.G. Fill fuel tank with fuel.

O.K.



2

PERFORM POWER BALANCE TEST.

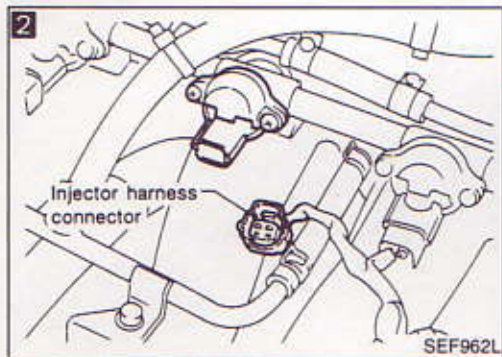
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No Go to 5

Yes



3

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No Check injector(s) and circuit(s).

Yes



4

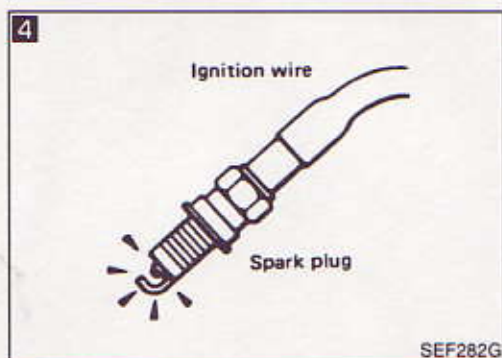
CHECK IGNITION SPARK.

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

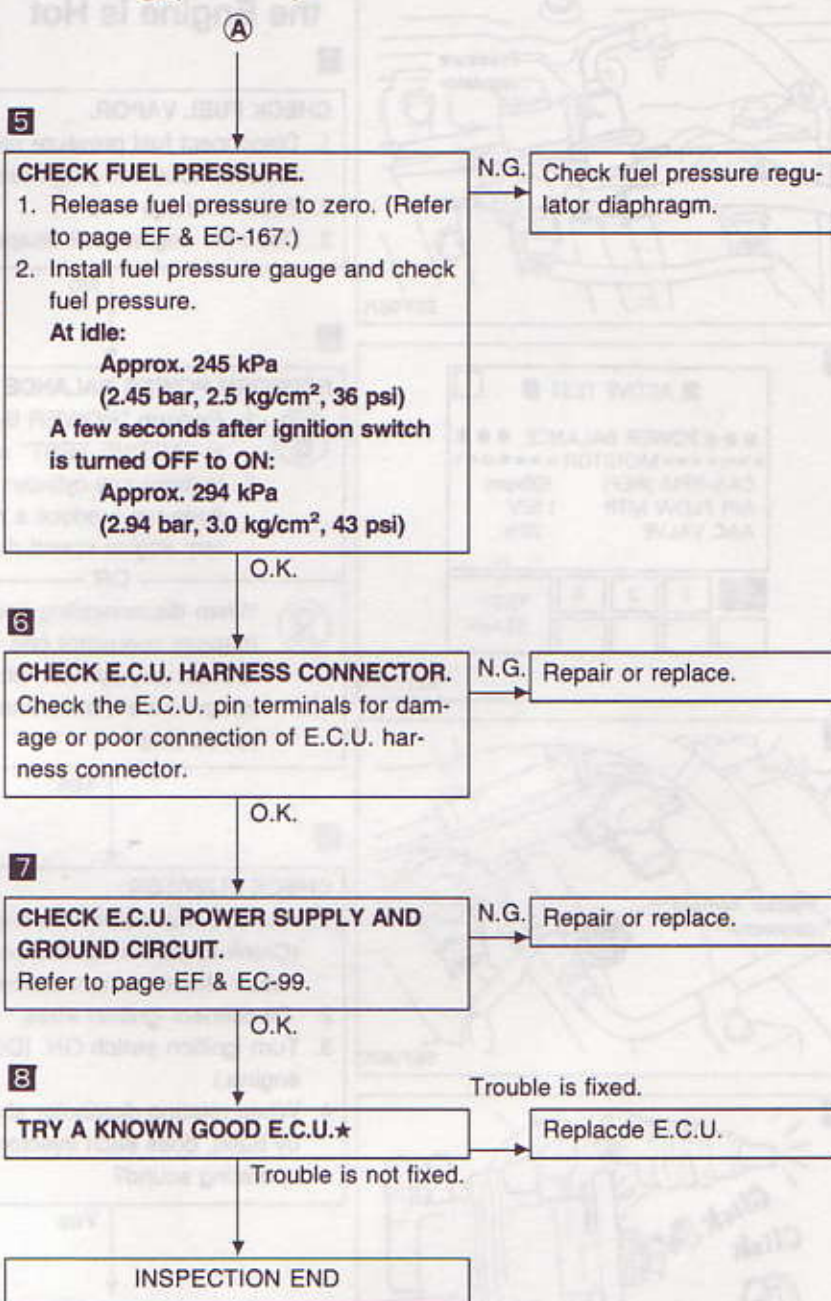
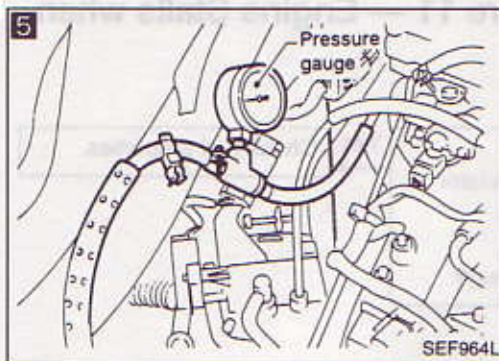
N.G. Check ignition coil, power transistor and circuits. (See page EF & EC-155.)

O.K.

(Go to A on next page.)



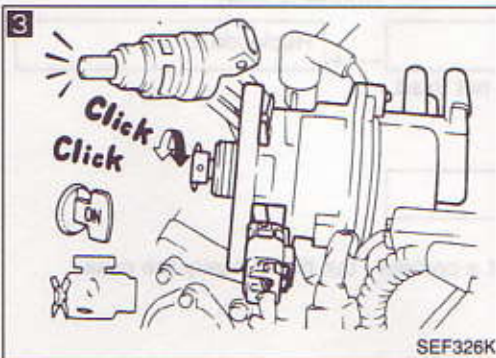
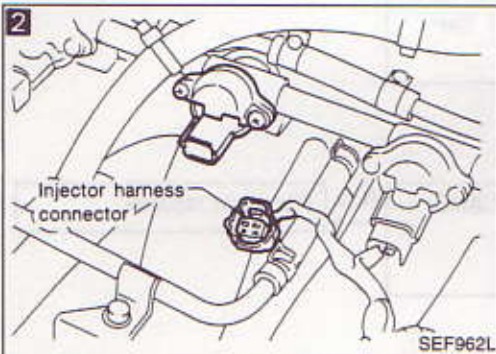
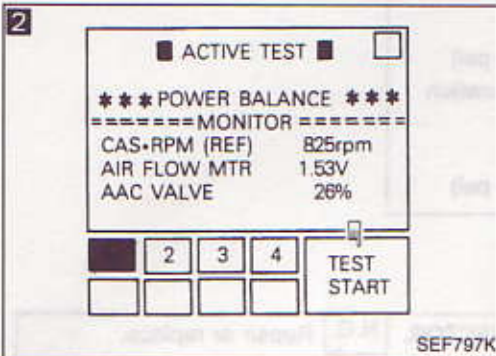
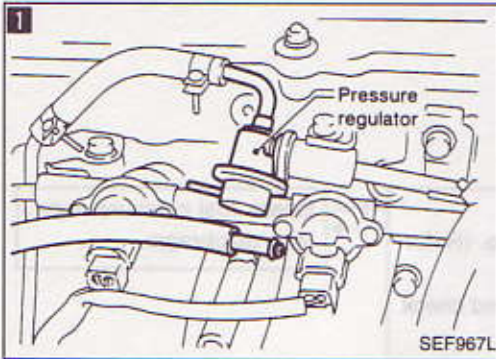
Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)



★: E.C.U. may be the cause of a problem, but this is rarely the case.

TROUBLE DIAGNOSES

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot



1

CHECK FUEL VAPOR.

1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the engine stall disappear?

Yes

Check fuel properties.

No

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No

Go to 5.

OR



When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

3

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

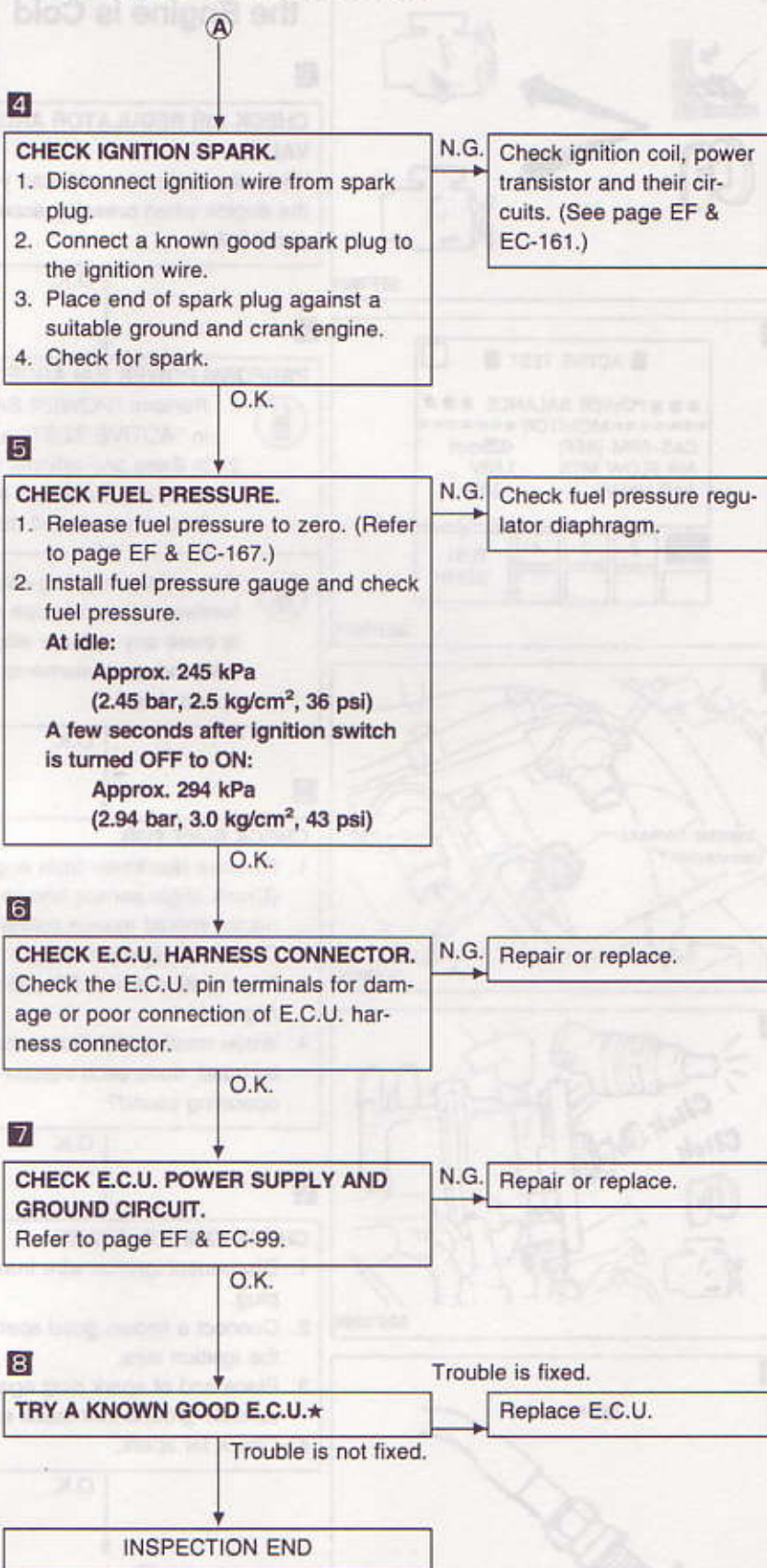
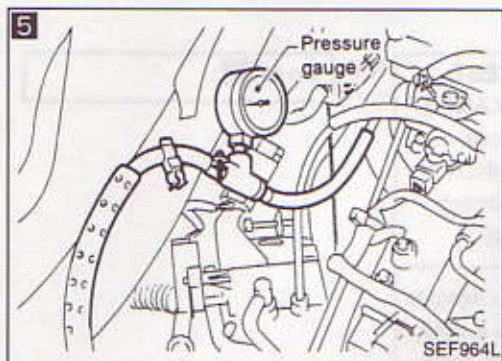
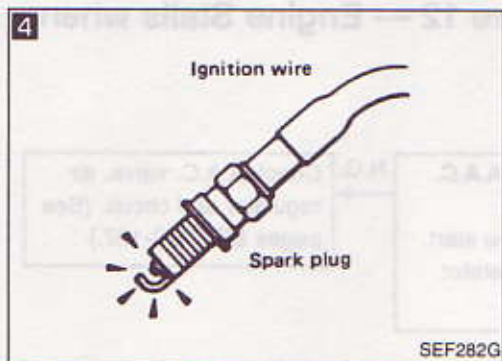
No

Check injector(s) and circuit(s).

Yes

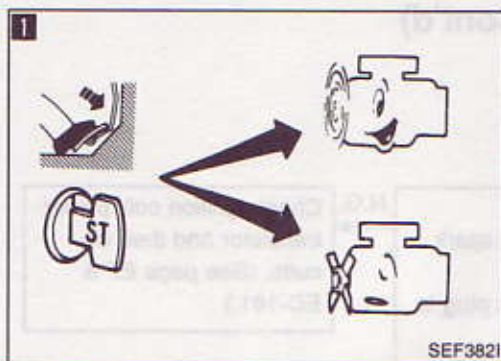
(Go to A on next page.)

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)



★: E.C.U. may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold



1

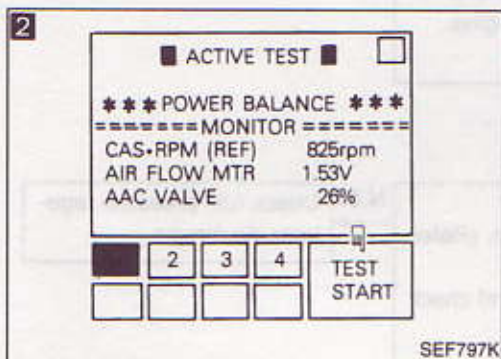
CHECK AIR REGULATOR AND A.A.C. VALVE.

When the engine is cold, can you start the engine when pressing accelerator pedal fully?

N.G.

Check A.A.C. valve, air regulator and circuit. (See pages EF & EC-137.)

O.K.



2

PERFORM POWER BALANCE TEST.



1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

N.G.

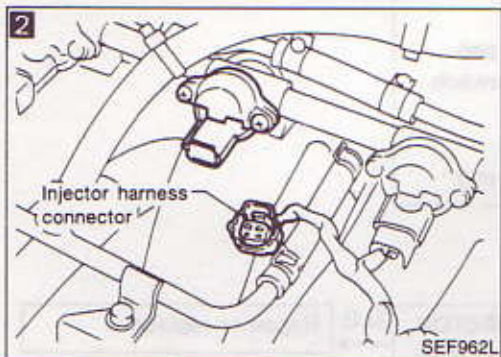
Go to 6.

OR



When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

O.K.



3

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

N.G.

Check injector(s) and circuit(s).

O.K.



4

CHECK IGNITION SPARK.

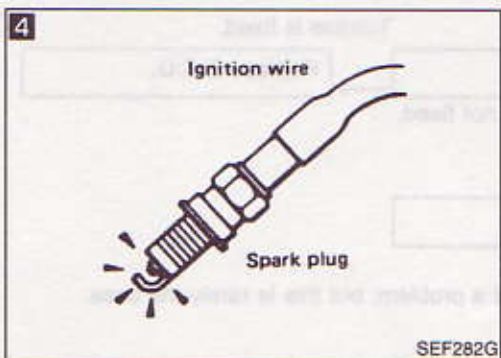
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G.

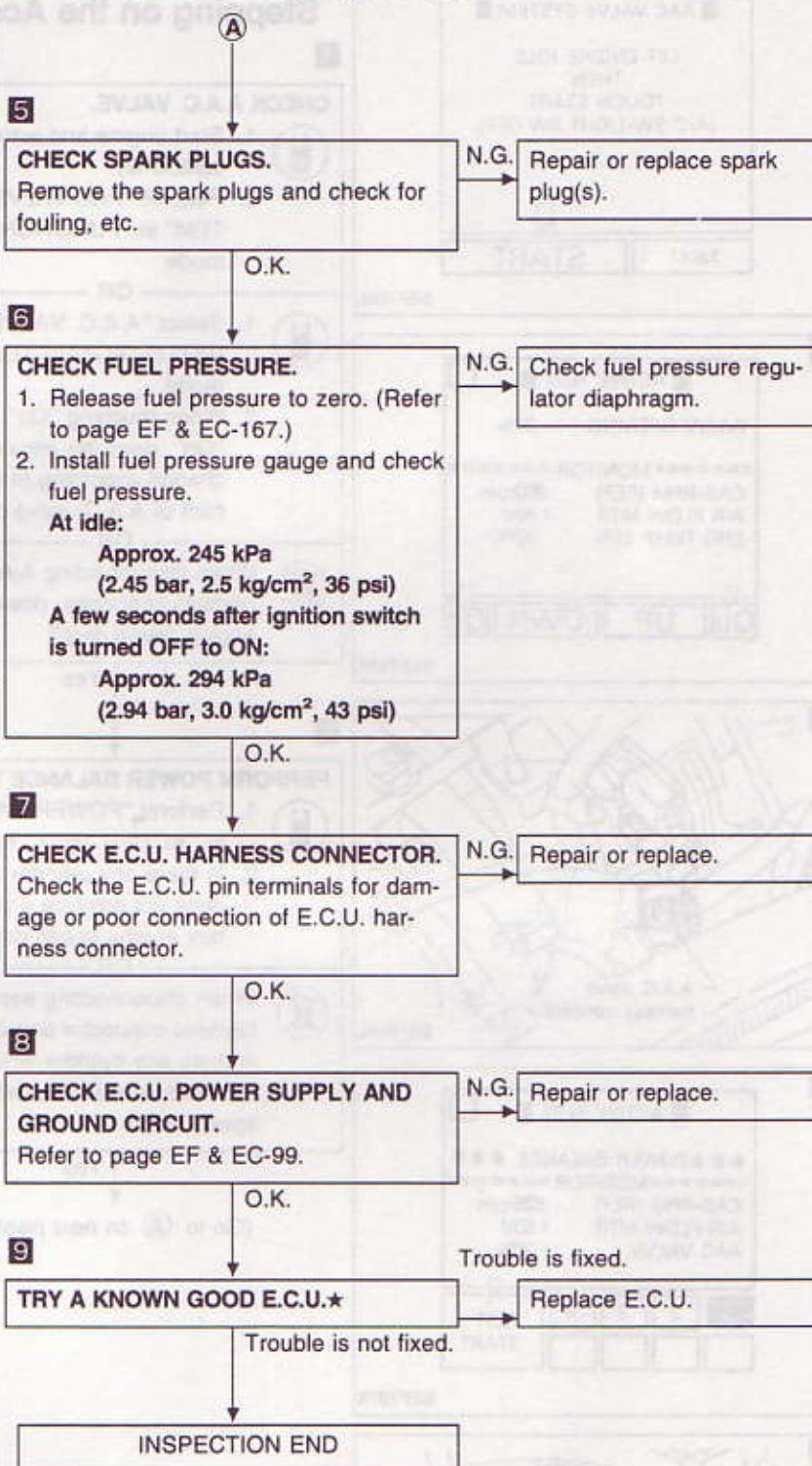
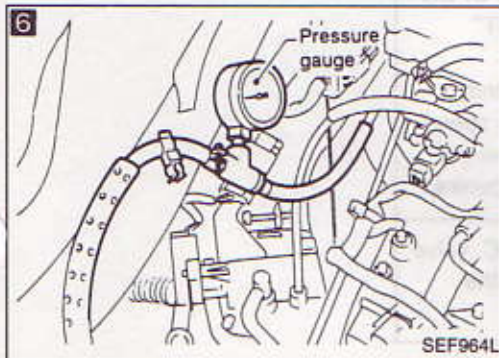
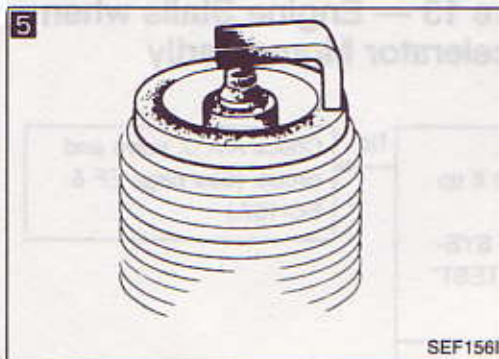
Check ignition coil, power transistor and circuits. (See page EF & EC-155.)

O.K.

(Go to A on next page.)



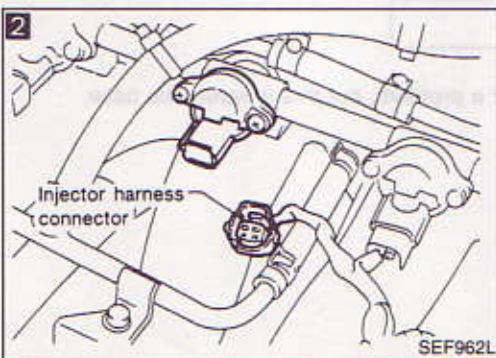
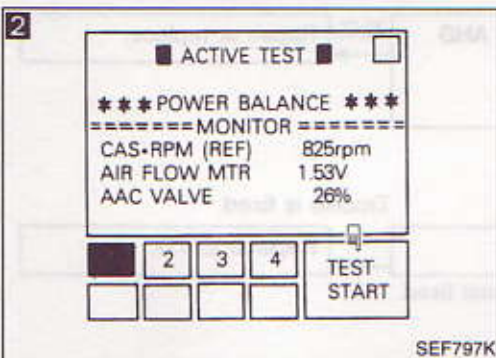
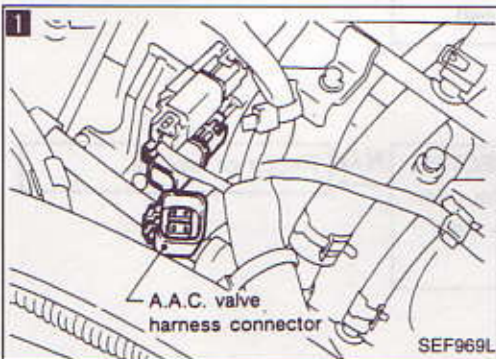
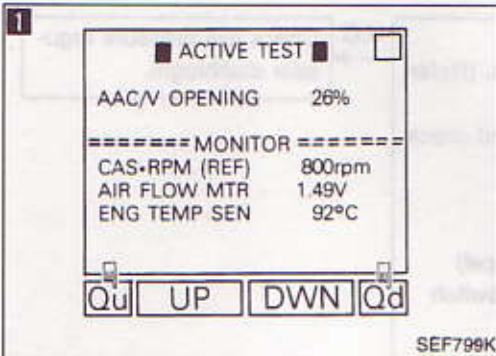
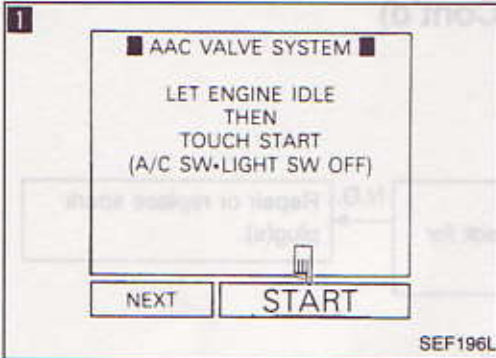
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)



★: E.C.U. may be the cause of a problem, but this is rarely the case.

TROUBLE DIAGNOSES

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

**CHECK A.A.C. VALVE.**

1. Start engine and warm it up sufficiently.
2. Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode.

No

Check A.A.C. valve and circuit. (See page EF & EC-137.)

OR

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

OR

- When disconnecting A.A.C. valve harness connector, does the engine speed drop?

Yes

2 PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No

Go to **5**

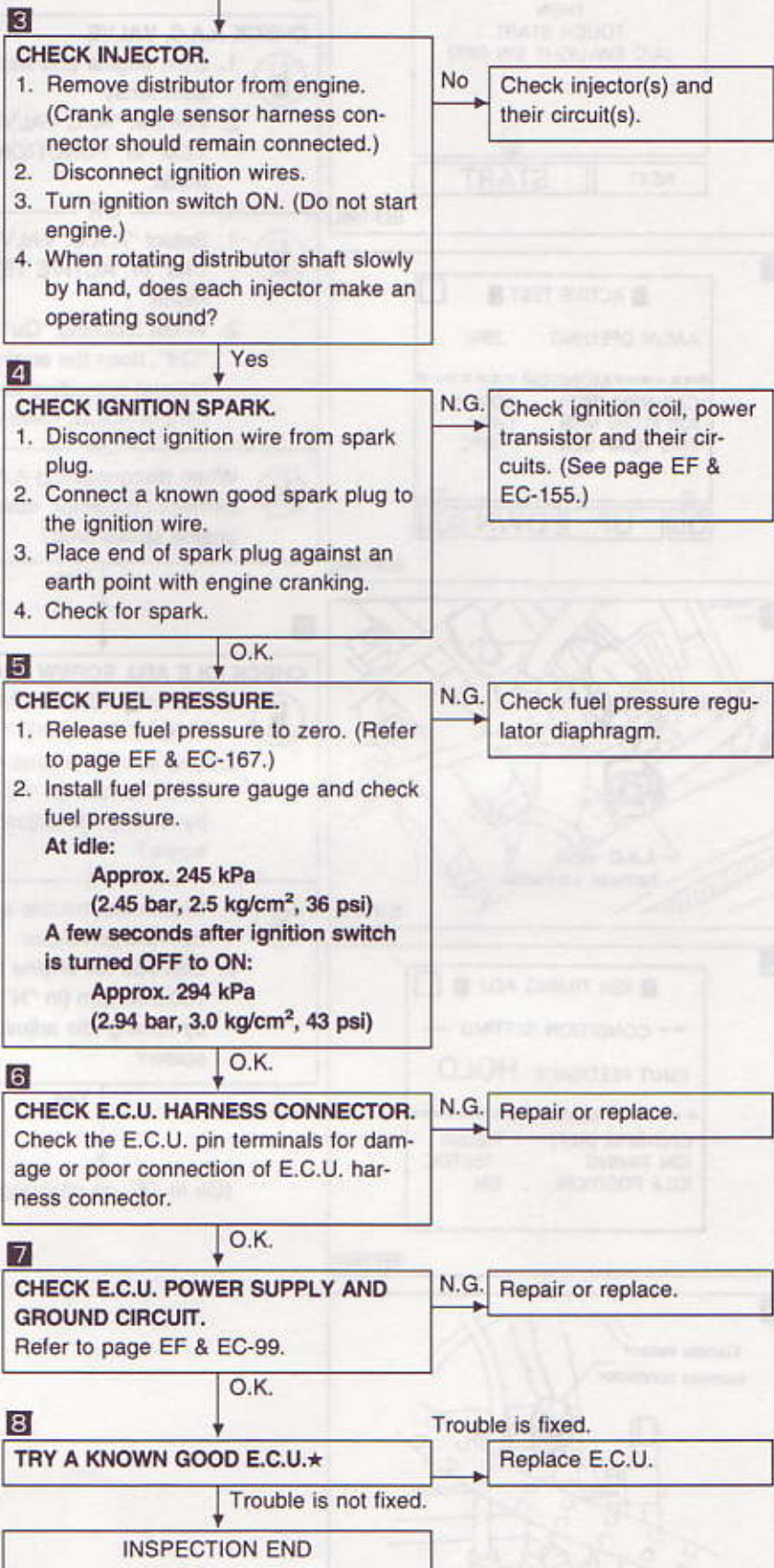
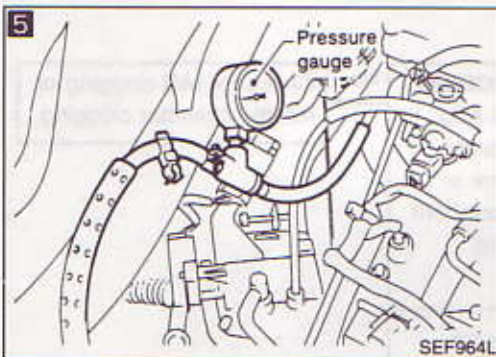
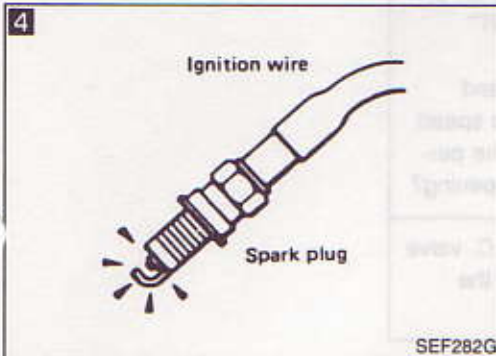
OR

- When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

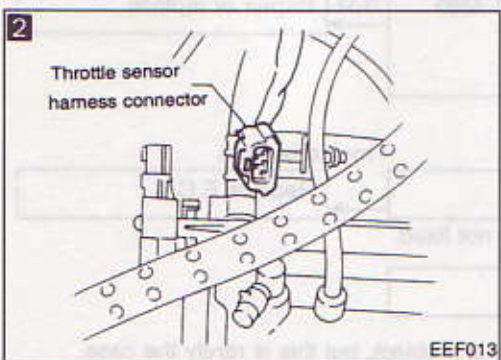
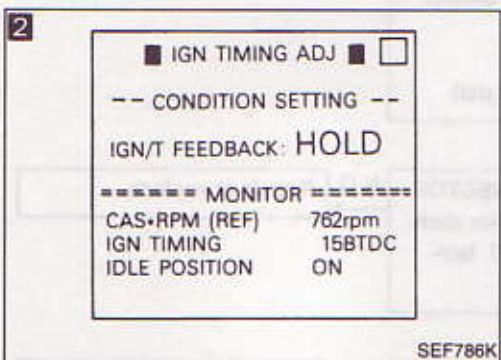
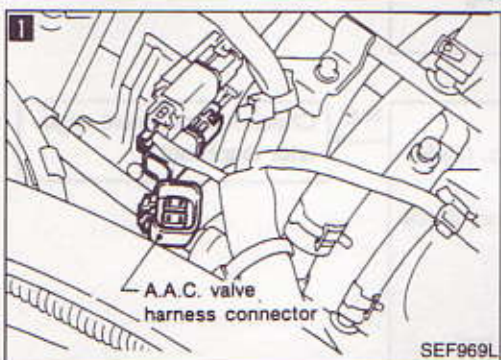
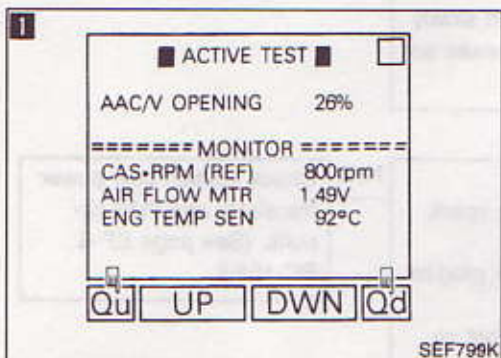
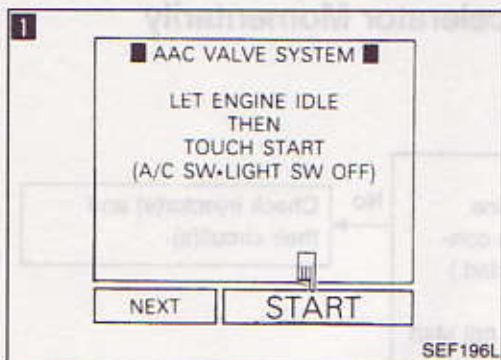
(Go to **A** on next page.)

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)



★: E.C.U. may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 14 — Engine Stalls after Decelerating

**1****CHECK A.A.C. VALVE.**

1. Start engine and warm it up sufficiently.
2. Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode.

No

Check A.A.C. valve and circuit. (See page EF & EC-137.)

OR

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

OR

1. When disconnecting A.A.C. valve harness connector, does the engine speed drop?

Yes

2**CHECK IDLE ADJ. SCREW CLOGGING.**

1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 750 ± 50 rpm (in "N" position) by turning idle adjusting screw?

No

Check for IAS clogging or throttle chamber clogging.

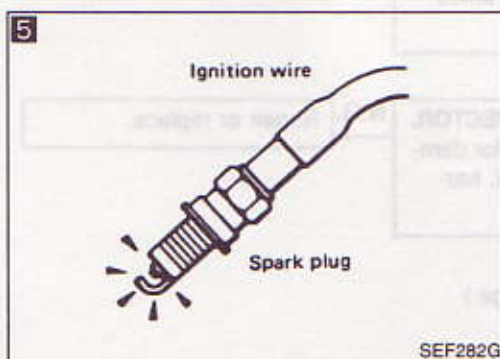
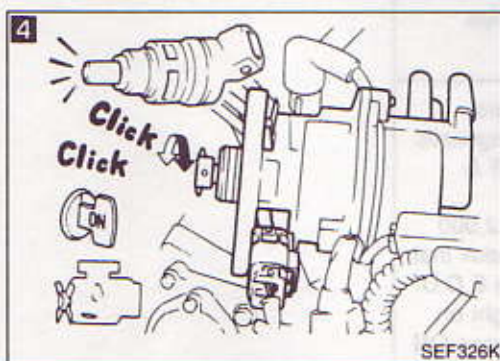
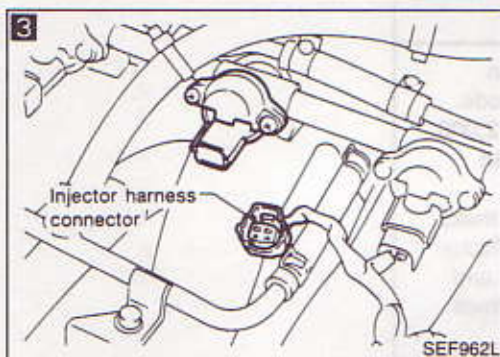
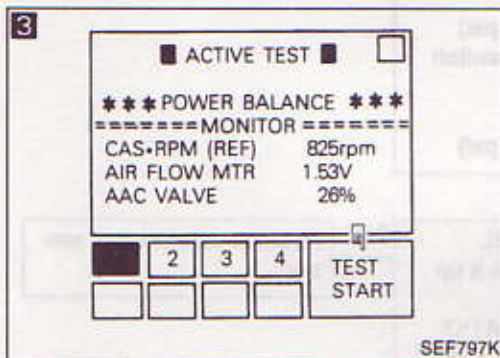
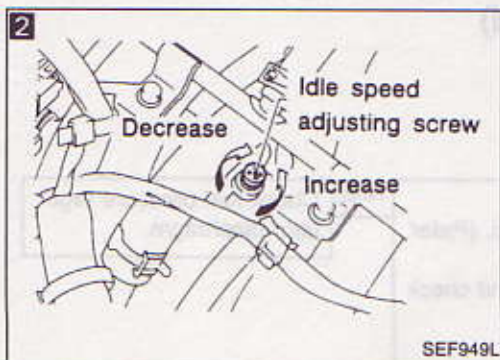
OR

1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm at 750 ± 50 rpm (in "N" position) by turning idle adjusting screw?

Yes

(Go to **A** on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)



3

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **6**.

4

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

5

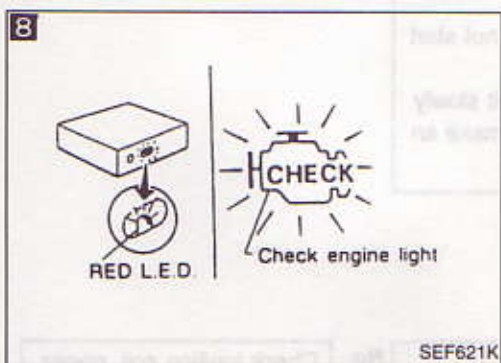
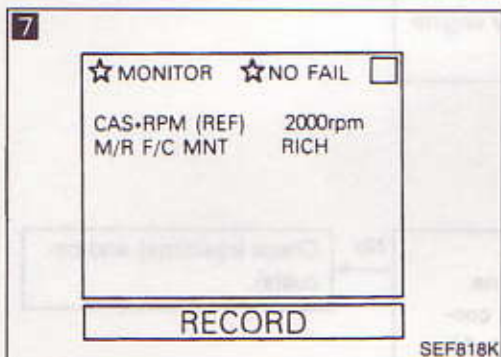
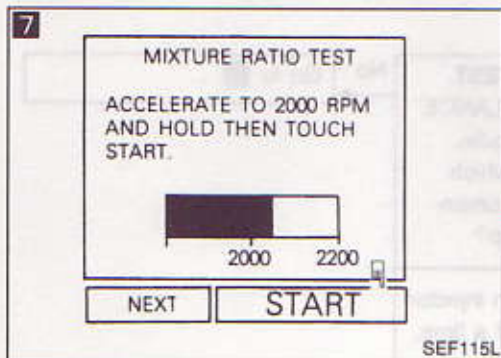
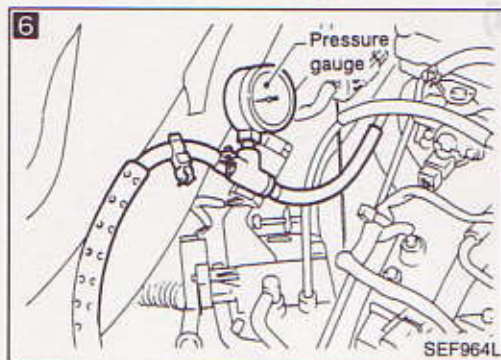
CHECK IGNITION SPARK.

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

No → Check ignition coil, power transistor and circuits. (See page EF & EC-155.)

Yes
(Go to **B** on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)



- 6**
- CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-167.)
 2. Install fuel pressure gauge and check fuel pressure.
- At idle:**
- Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)
- A few seconds after ignition switch is turned OFF to ON:**
- Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. Check fuel pressure regulator diaphragm.

- 7**
- CHECK EXHAUST GAS SENSOR.**
1. Start engine and warm it up sufficiently.
 2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode.

N.G. Replace exhaust gas sensor.

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

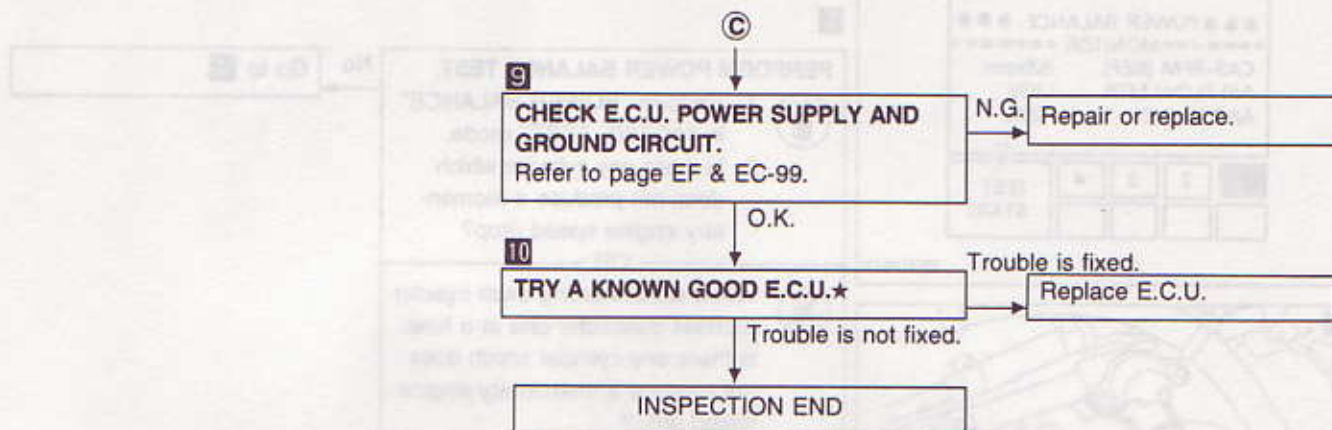
- OR
1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-50.)
 2. Maintaining engine at 2,000 rpm under no-load, check that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

- 8**
- CHECK E.C.U. HARNESS CONNECTOR.**
- Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. Repair or replace.

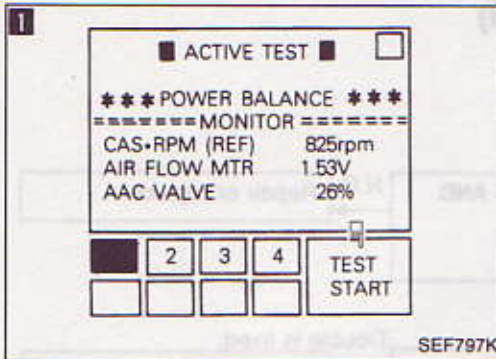
O.K.

(Go to ③ on the next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

★: E.C.U. may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed

**1****PERFORM POWER BALANCE TEST.**

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

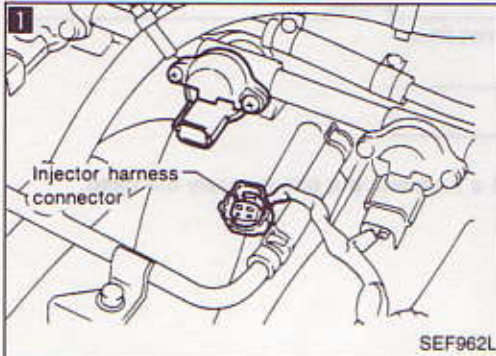
No → Go to **4**

OR



When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

**2****CHECK INJECTOR.**

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

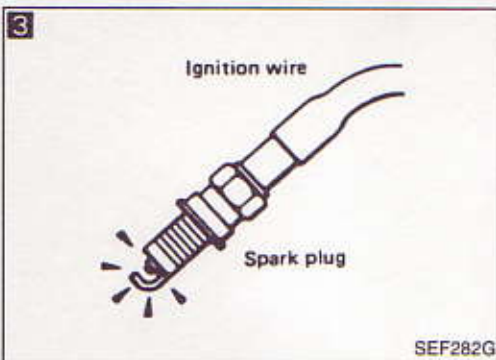
Yes

**3****CHECK IGNITION SPARK.**

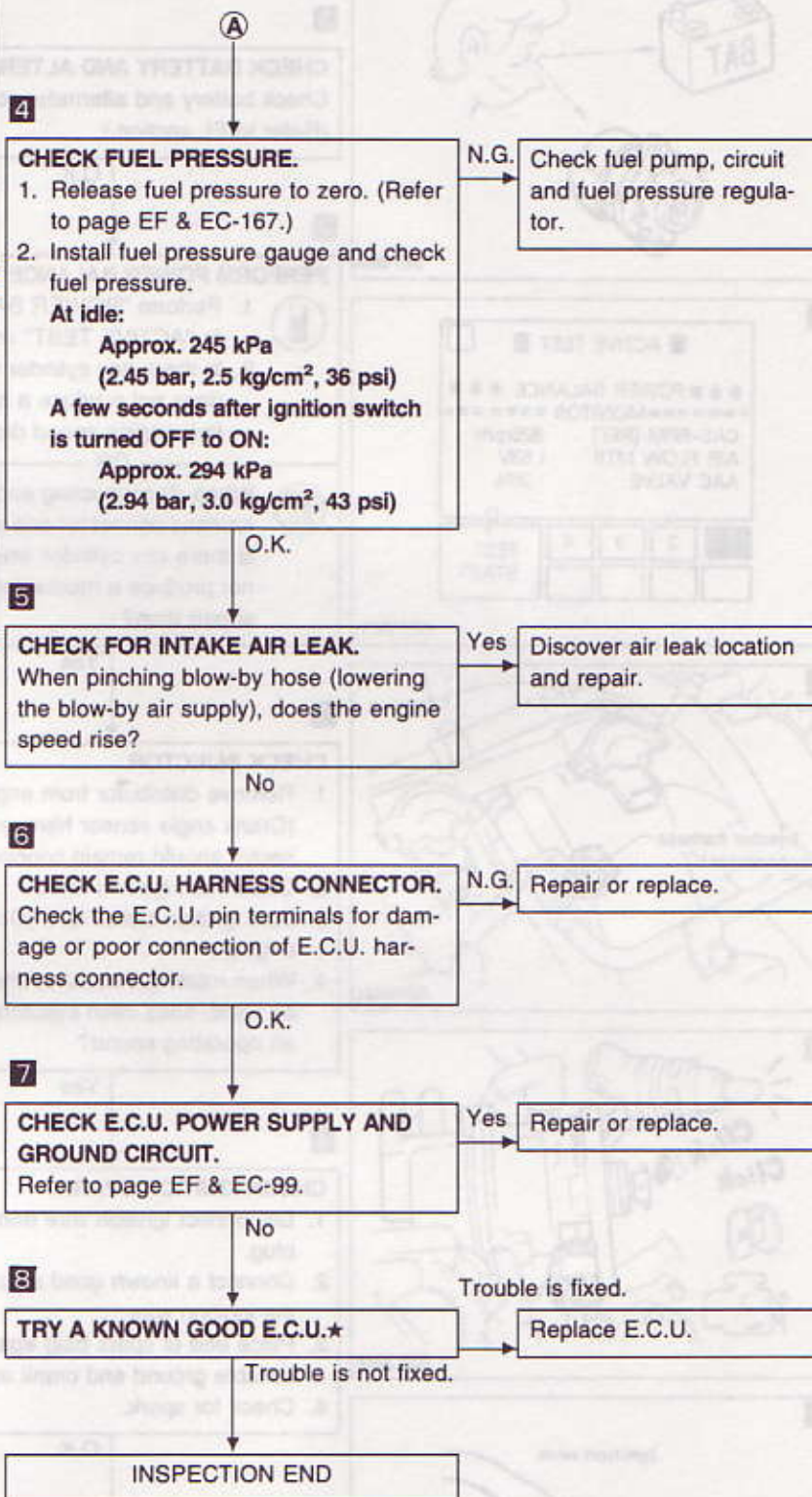
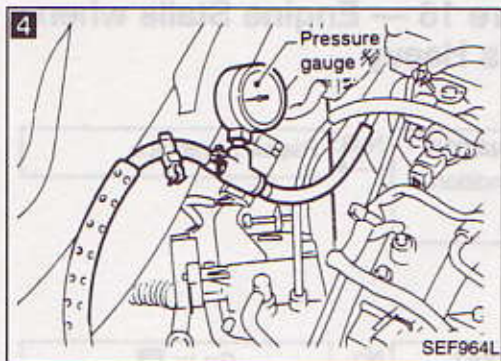
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

No → Check ignition coil, power transistor and circuits. (See page EF & EC-155.)

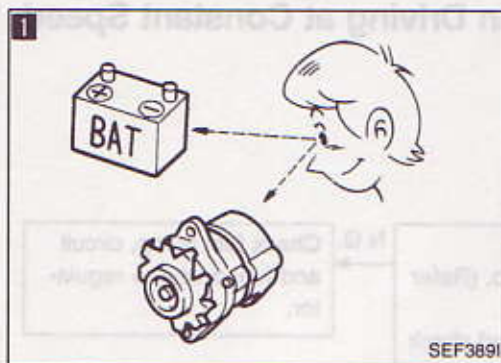
Yes

(Go to **A** on next page.)

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)



★: E.C.U. may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy

1

CHECK BATTERY AND ALTERNATOR.

Check battery and alternator condition. (Refer to EL section.)

N.G. Repair or replace.

O.K.

2

PERFORM POWER BALANCE TEST.



1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

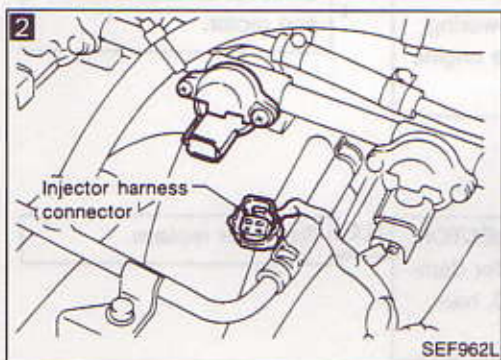
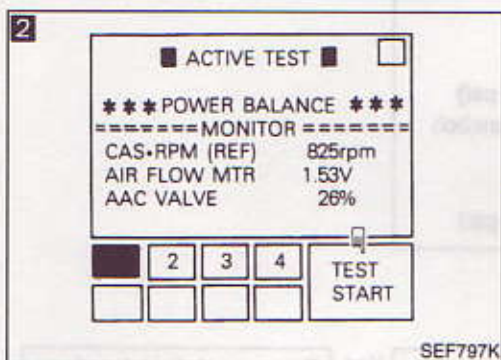
OR



When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No Go to 5.

Yes



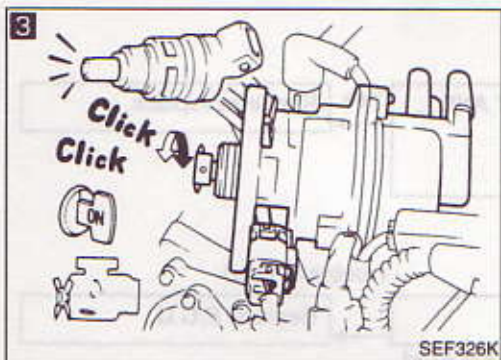
3

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No Check injector(s) and circuit(s).

Yes



4

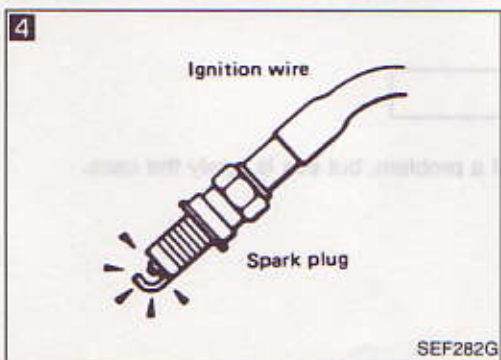
CHECK IGNITION SPARK.

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

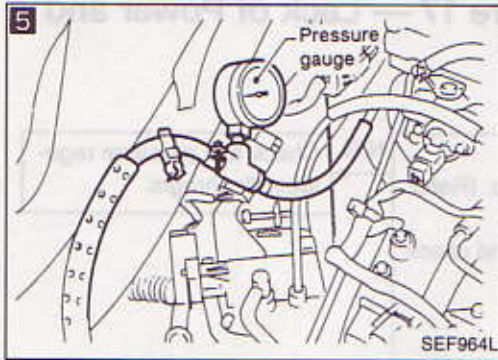
N.G. Check ignition coil, power transistor and circuits. (See page EF & EC-155.)

O.K.

(Go to A on next page.)



Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)



5

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-167.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)

A few seconds after ignition switch is turned OFF to ON:

Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G. Check fuel pressure regulator diaphragm.

O.K.

6

CHECK E.C.U. HARNESS CONNECTOR.

Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. Repair or replace.

O.K.

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.

Refer to page EF & EC-99.

N.G. Repair or replace.

O.K.

8

TRY A KNOWN GOOD E.C.U.★

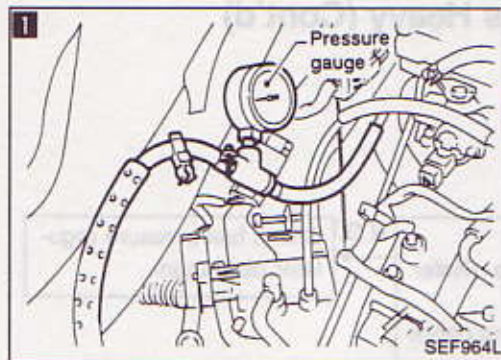
Trouble is fixed.

Replace E.C.U.

Trouble is not fixed.

INSPECTION END

★: E.C.U. may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 17 — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-167.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 245 kPa
(2.45 bar, 2.5 kg/cm², 36 psi)

A few seconds after ignition switch is turned OFF to ON:

Approx. 294 kPa
(2.94 bar, 3.0 kg/cm², 43 psi)

N.G.

Check fuel pressure regulator diaphragm.

O.K.

2

CHECK FOR INTAKE AIR LEAK.

When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes

Discover air leak location and repair.

No

INSPECTION END

Diagnostic Procedure 18 — Detonation



1

CHECK FOR INTAKE AIR LEAK.

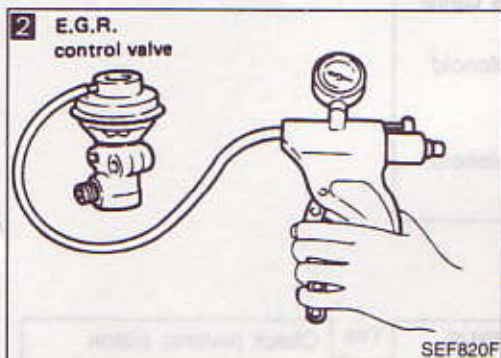
When pinching blow-by hose (lowering the blow-by air supply), does the engine rpm rise?

Yes

Discover air leak location and repair.

No

2

**CHECK E.G.R. OPERATION.****(MODELS WITH CATALYZER ONLY)**

1. Apply vacuum directly to the E.G.R. valve using a handy vacuum pump.
2. Check to see that the engine runs rough or dies.

No

Check E.G.R. valve for sticking.

Yes

3

CHECK E.G.R. & CANISTER CONTROL SOLENOID VALVE.**(MODELS WITH CATALYZER ONLY)**

1. Select "E.G.R. CONT SOL VALVE" in "ACTIVE TEST" mode.
2. Turn E.G.R. & canister control solenoid valve ON and OFF.
3. Check operating sound.

OR



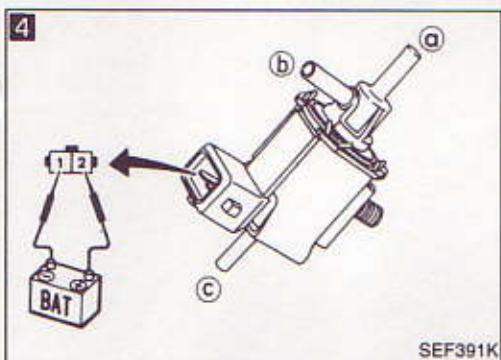
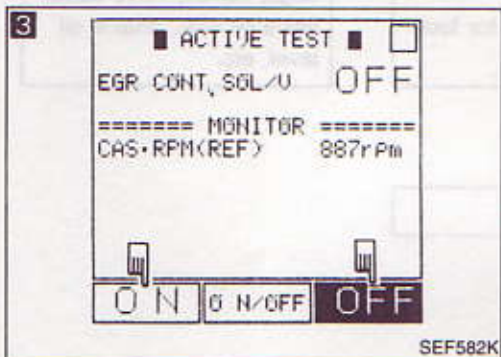
1. Disconnect E.G.R. & canister control solenoid valve harness connector.
2. Supply E.G.R. & canister control solenoid valve terminals with battery current and check operating sound.

N.G.

Check solenoid valve and circuit.

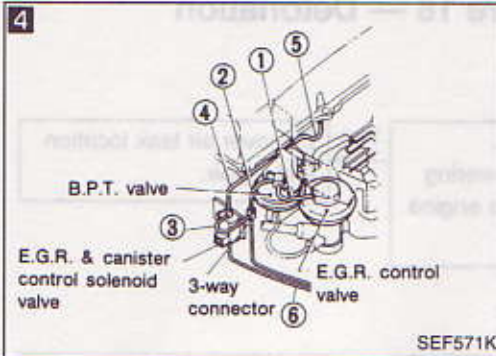
O.K.

(Go to (A) on next page.)



TROUBLE DIAGNOSES

Diagnostic Procedure 18 — Detonation (Cont'd)



CHECK VACUUM HOSES.

(MODELS WITH CATALYZER ONLY)

Check the following vacuum hoses for clogging, cracks and poor connection.

- ① E.G.R. control valve to B.P.T. valve
- ② B.P.T. valve to 3-way connector
- ③ 3-way connector to E.G.R. & canister control solenoid valve
- ④ E.G.R. & canister control solenoid valve to vacuum tube
- ⑤ Vacuum tube to air cleaner
- ⑥ E.G.R. & canister control solenoid valve to lower throttle body

N.G. → Repair or replace.

O.K. →

5

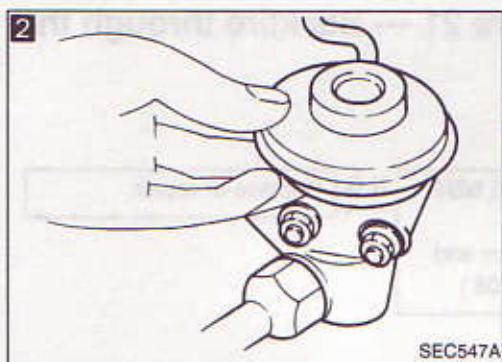
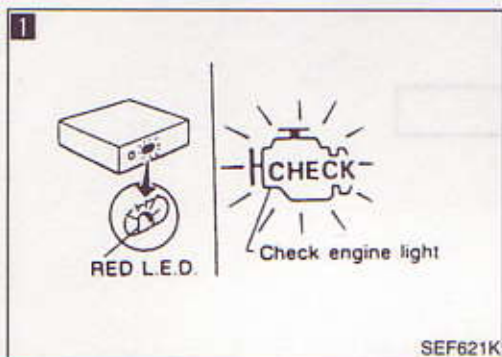
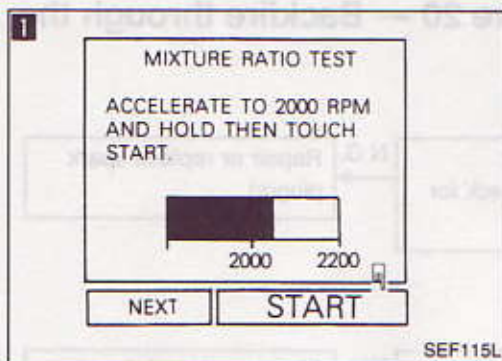
CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

No →

INSPECTION END

Diagnostic Procedure 19 — Surge



1

CHECK EXHAUST GAS SENSOR.

1. Start engine and warm it up sufficiently.
2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode.

N.G. Replace exhaust gas sensor.

OR

1. See "M/R F/C MNT" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently.), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.

RICH → LEAN → RICH →
1 time 2 times
LEAN → RICH.....

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-50.)
2. Maintaining engine at 2,000 rpm under no-load, check that the RED L.E.D. on the E.C.U. or the check engine light on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

O.K.

2

CHECK E.G.R. CONTROL VALVE.
Check E.G.R. control valve for sticking.

N.G. Repair or replace.

O.K.

3

TRY A KNOWN GOOD E.C.U.*

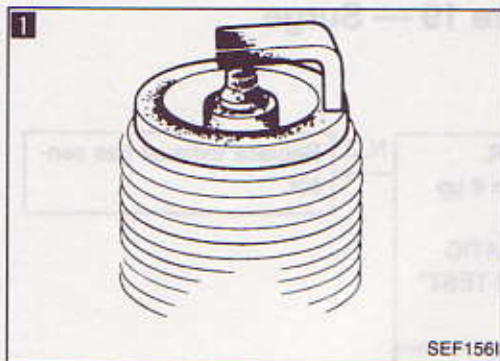
Trouble is fixed.

Replace E.C.U.

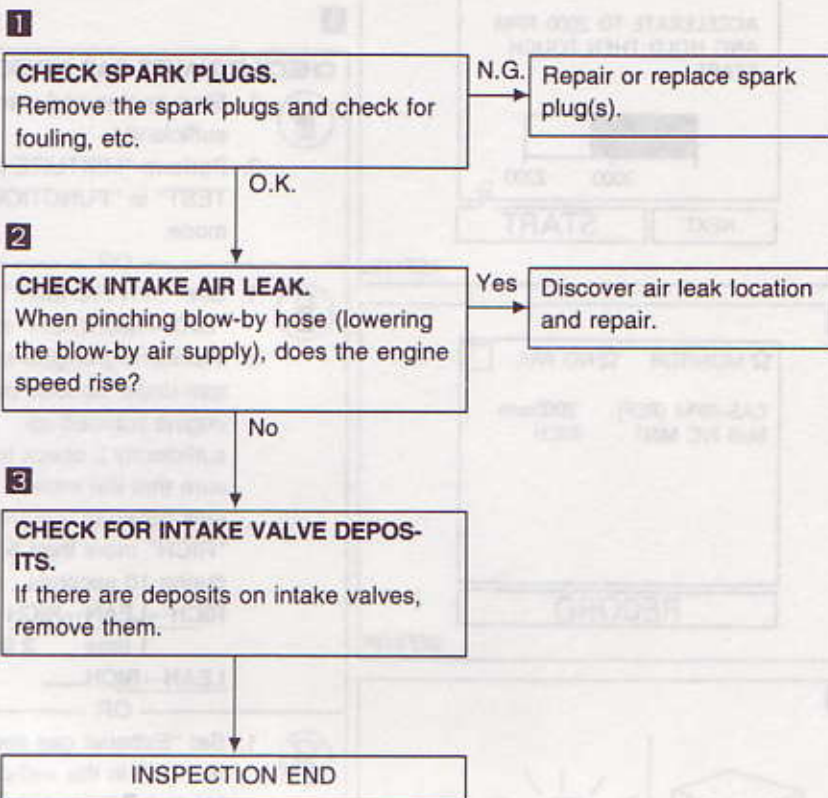
Trouble is not fixed.

INSPECTION END

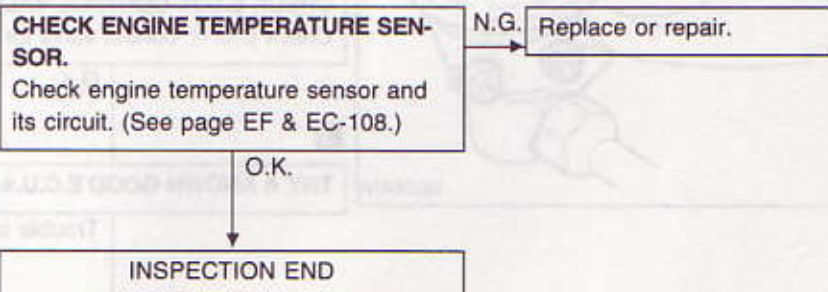
★: E.C.U. may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 20 — Backfire through the Intake

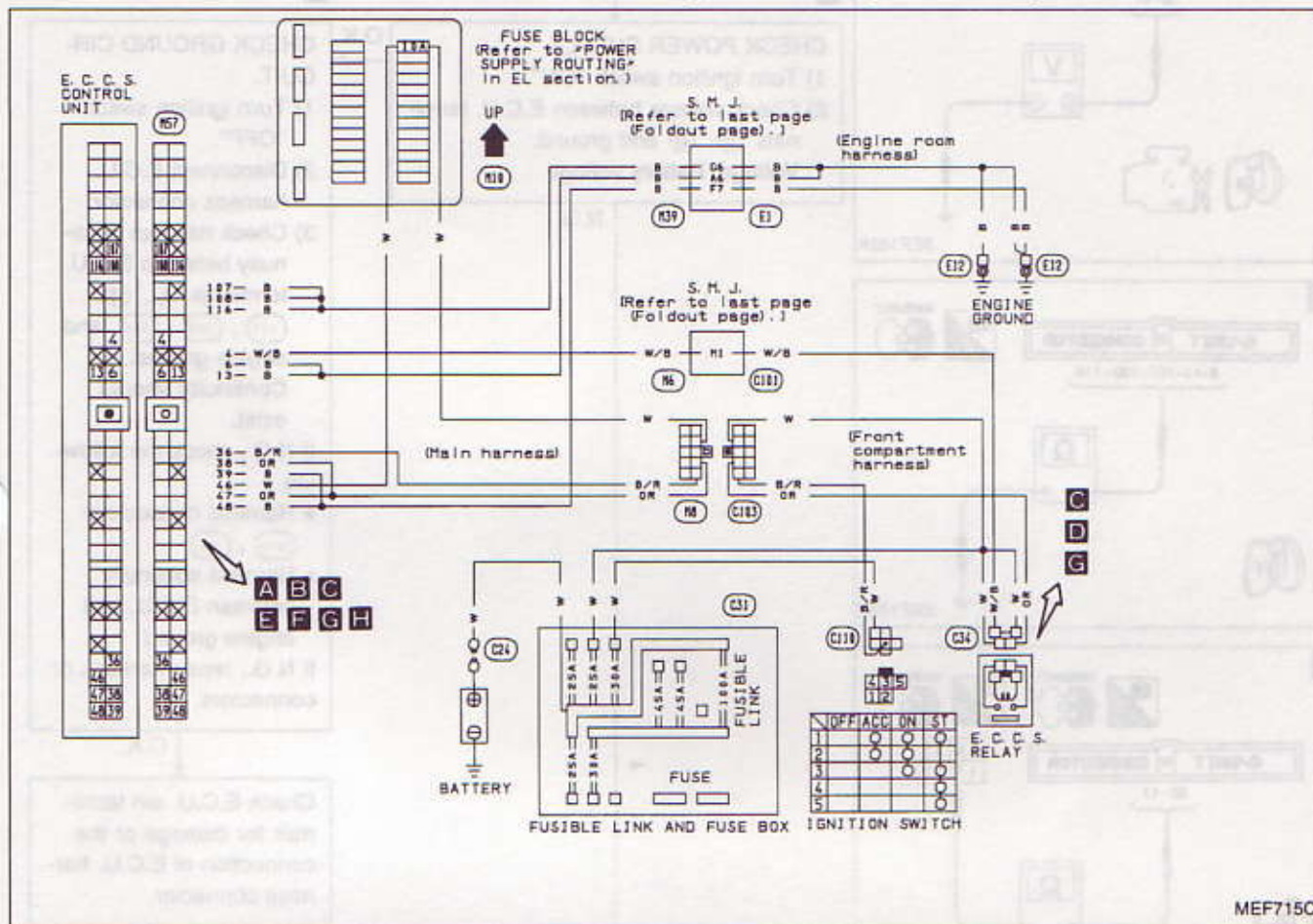


Diagnostic Procedure 21 — Backfire through the Exhaust

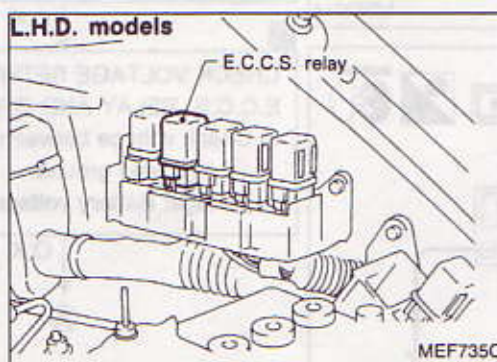
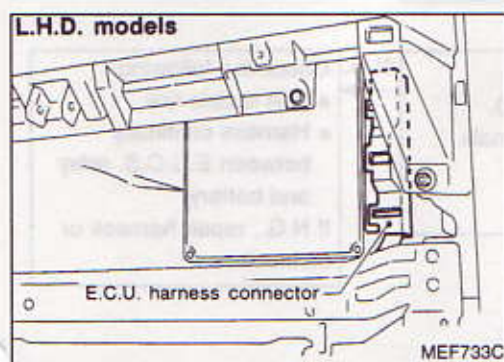
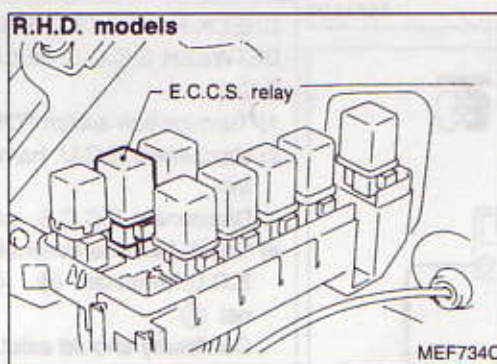
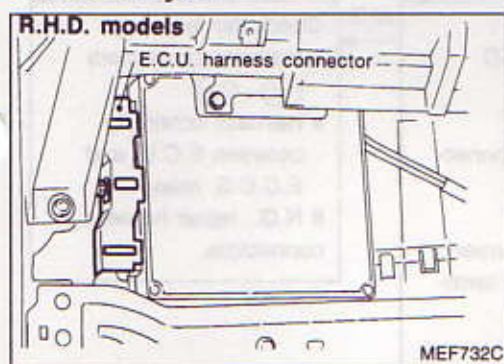


Diagnostic Procedure 22

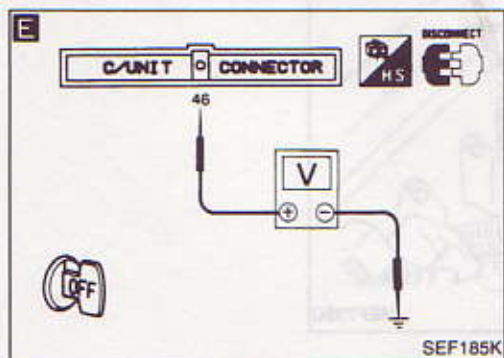
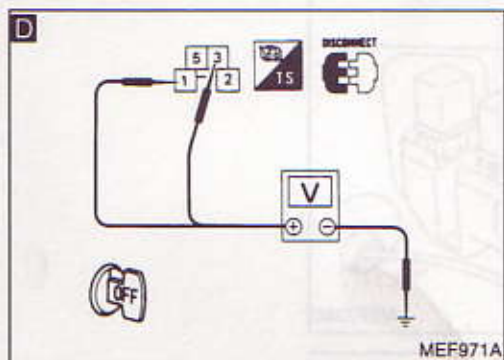
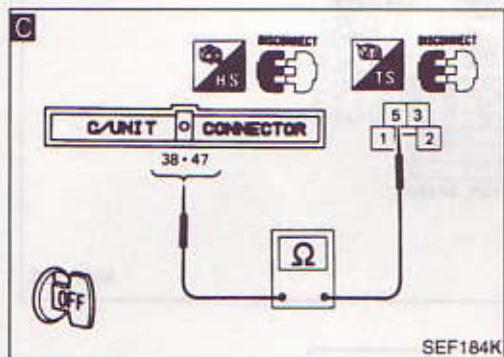
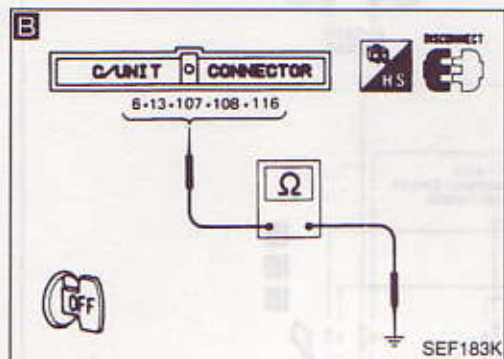
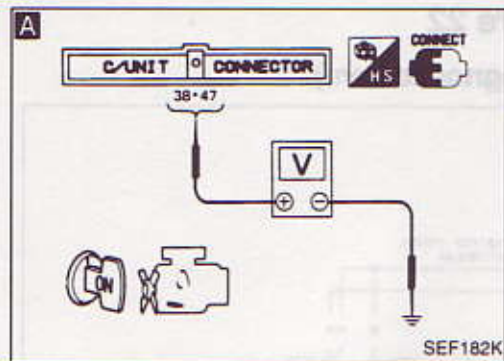
MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



Harness layout



Diagnostic Procedure 22 (Cont'd)



INSPECTION START

A

CHECK POWER SUPPLY.

- 1) Turn ignition switch "ON".
- 2) Check voltage between E.C.U. terminals (38), (47) and ground.

Voltage: Battery voltage

N.G.

B

CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
 - 2) Disconnect E.C.U. harness connector.
 - 3) Check harness continuity between E.C.U. terminals (6), (13), (107), (108), (116) and engine ground.
- Continuity should exist.**

If N.G., check the following.

- Harness connectors (M19), (E1)
 - Harness continuity between E.C.U. and engine ground
- If N.G., repair harness or connectors.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

C

CHECK HARNESS CONTINUITY BETWEEN E.C.C.S. RELAY AND E.C.U.

- 1) Turn ignition switch "OFF".
- 2) Disconnect E.C.U. harness connector.
- 3) Disconnect E.C.C.S. relay.
- 4) Check harness continuity between E.C.U. terminals (38), (47) and terminal (5).

Continuity should exist.

N.G.

Check the following.

- Harness connectors (MR), (C103)
 - Harness continuity between E.C.U. and E.C.C.S. relay
- If N.G., repair harness or connectors.

O.K.

D

CHECK VOLTAGE BETWEEN E.C.C.S. RELAY AND GROUND.

- 1) Check voltage between terminals (1), (3) and ground.

Voltage: Battery voltage

O.K.

A

N.G.

Check the following.

- 25A fusible link
 - Harness continuity between E.C.C.S. relay and battery
- If N.G., repair harness or connectors.