ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

EF & EC

CONTENTS

Contents (Cont'd)

When you read wiring diagrams:

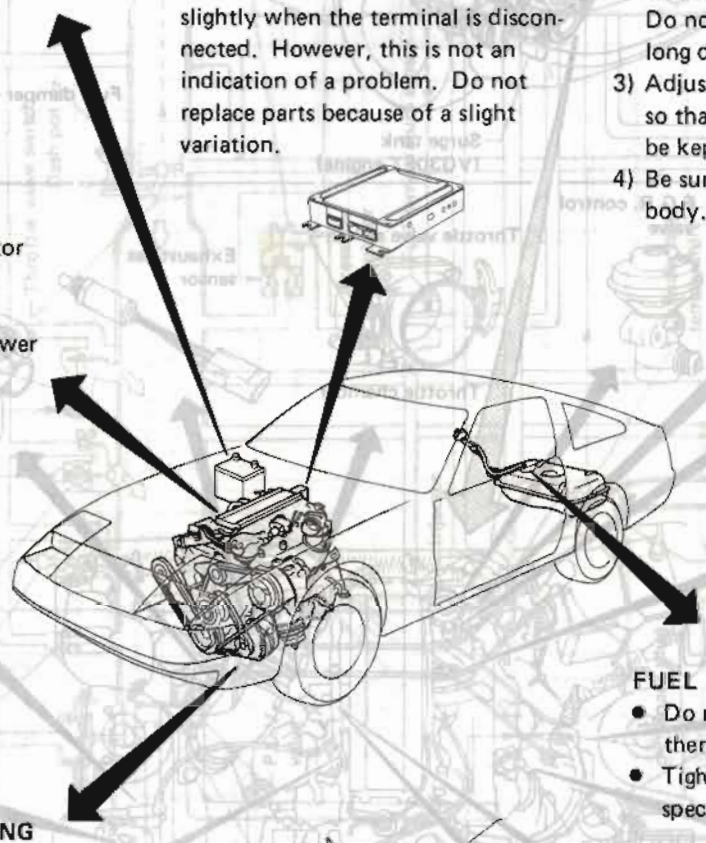
- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

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

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

E.C.C.S. PARTS 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 (VG30ET engine).
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crank angle sensor.

E.C.U.
- Do not disassemble E.C.C.S. control unit.
- Do not turn diagnosis mode selector forcibly.
- Do not disassemble the E.C.U. (the E.C.C.S. control unit).
- 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.



WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up enigne unnecessarily.
- Do not rev up engine just prior to shutdown.

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.

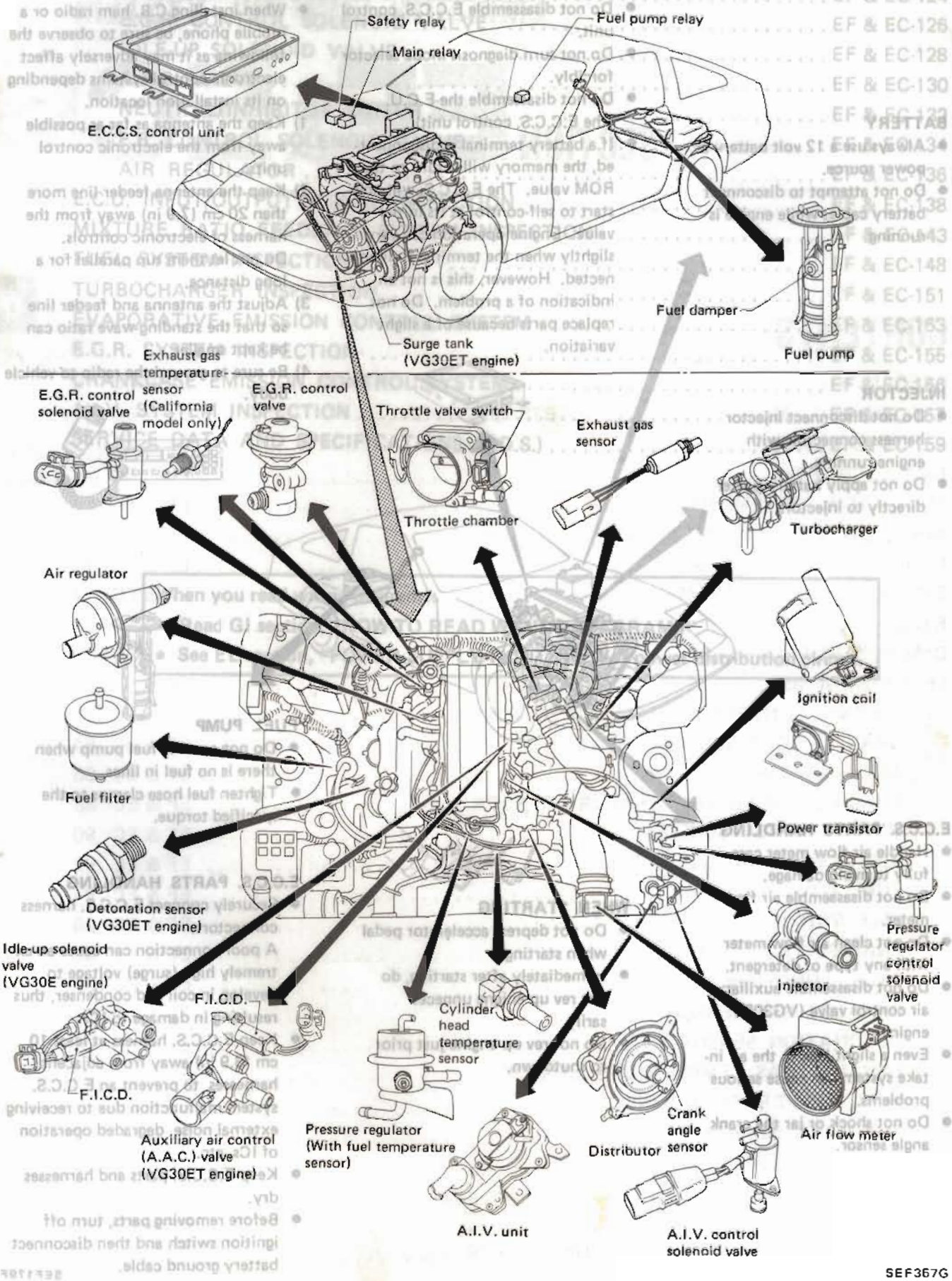
1) Keep the antenna as far as possible away from the electronic control units.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio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

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. PARTS 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 operation 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.

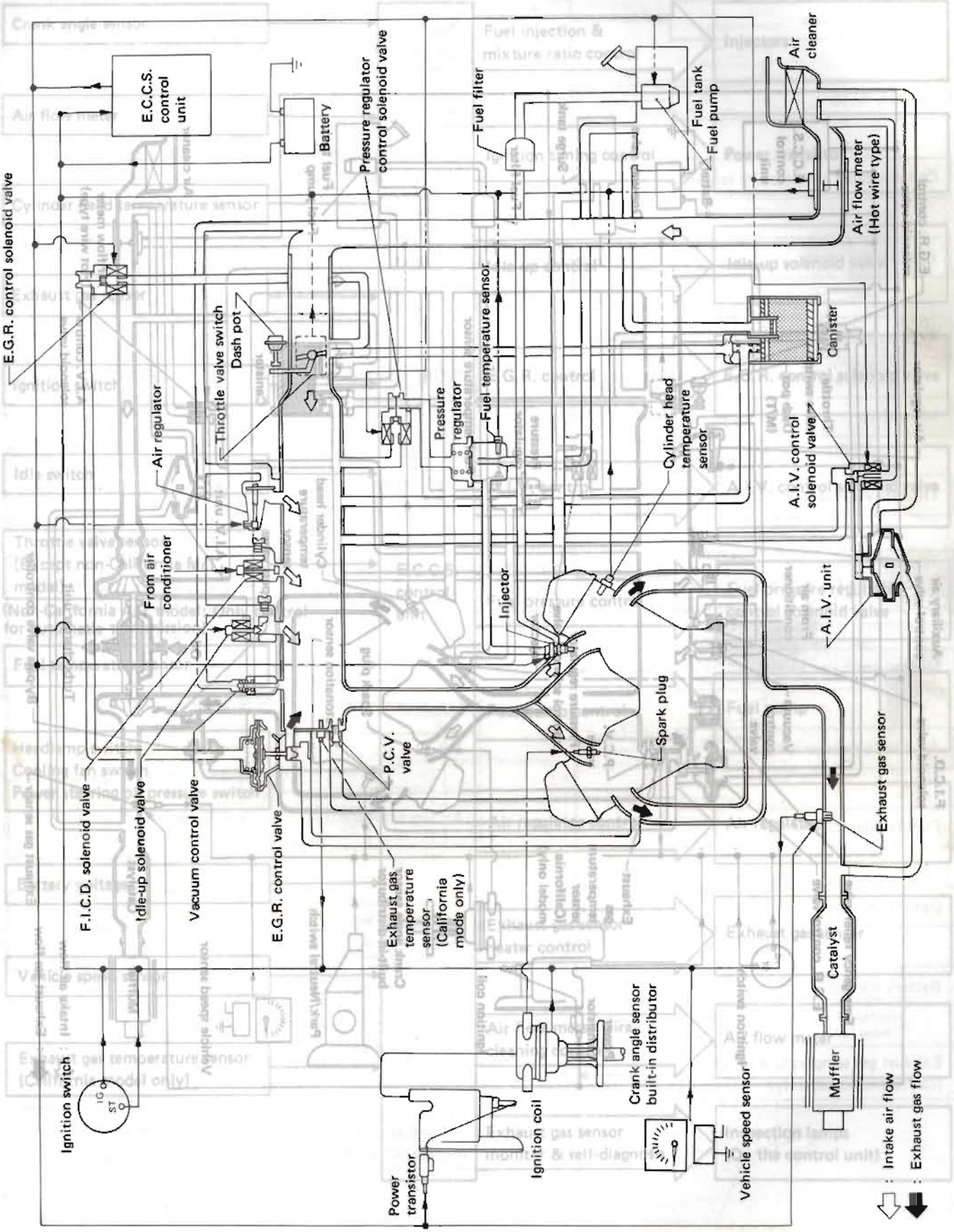
SEF179F

ENGINE AND EMISSION CONTROL PARTS LOCATION



SEF367G

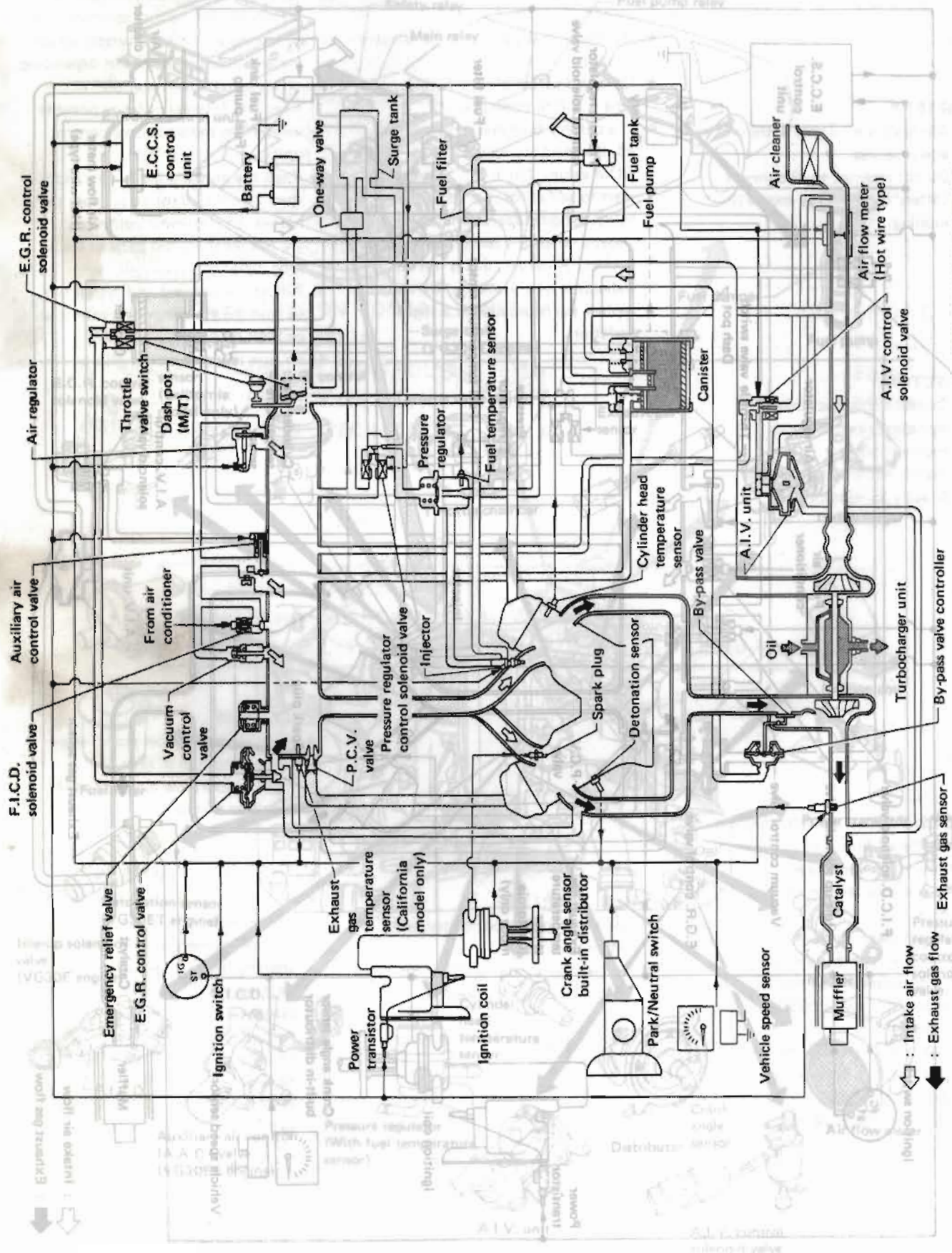
VG30E engine (Without turbocharger)



SEF358G

E.C.C.S. DIAGRAM

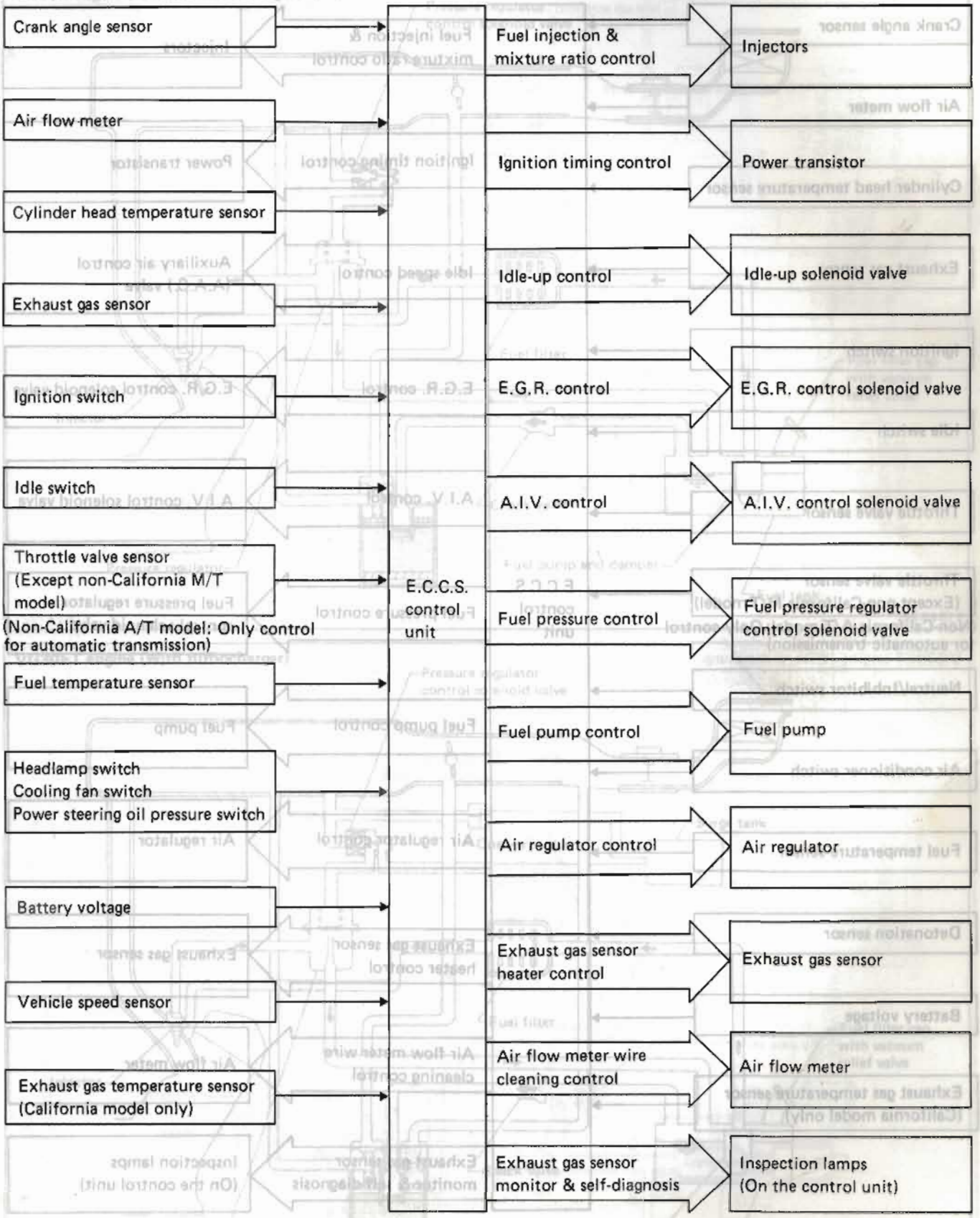
VG30ET engine (With turbocharger)



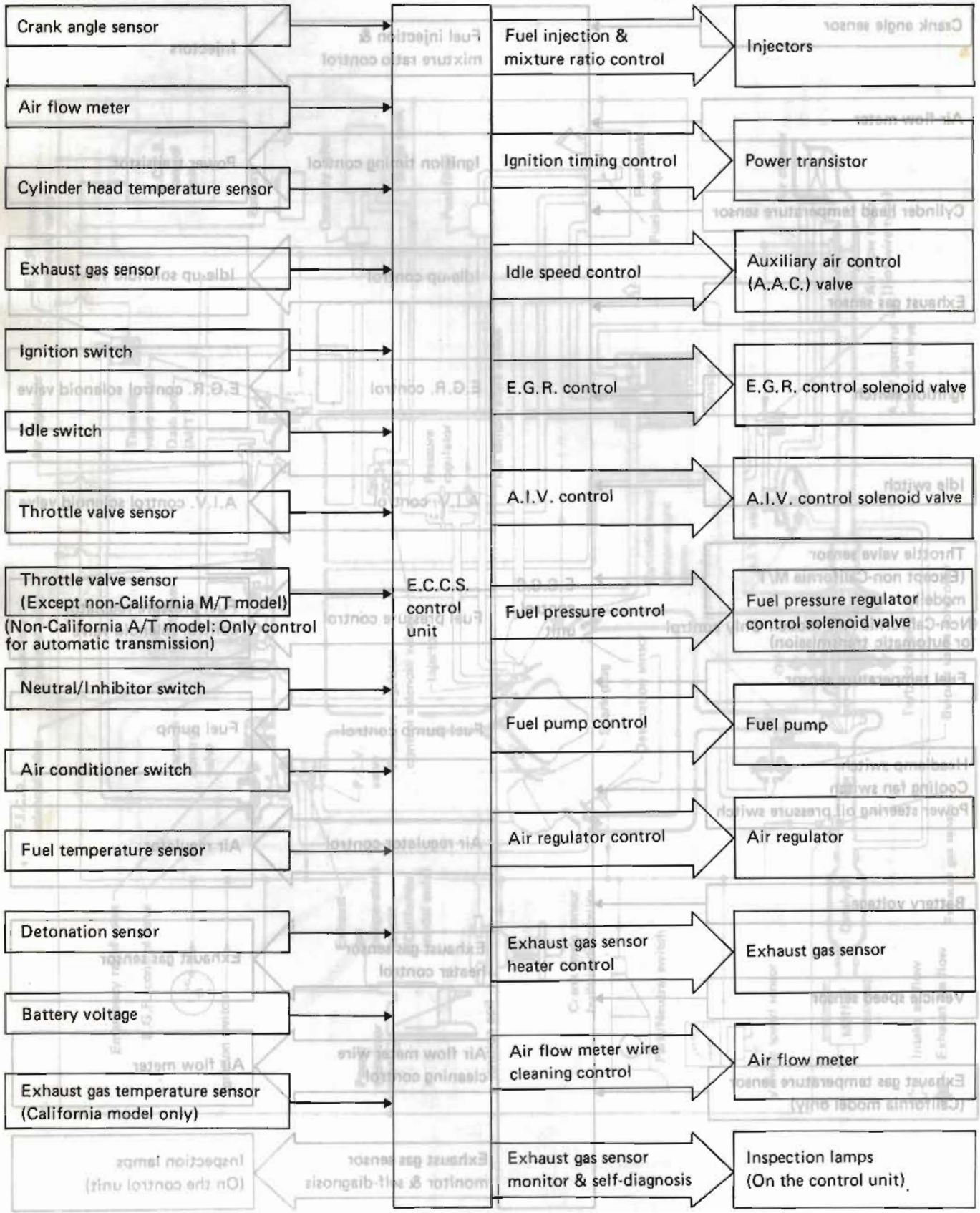
SEF359G

E.C.C.S. CHART

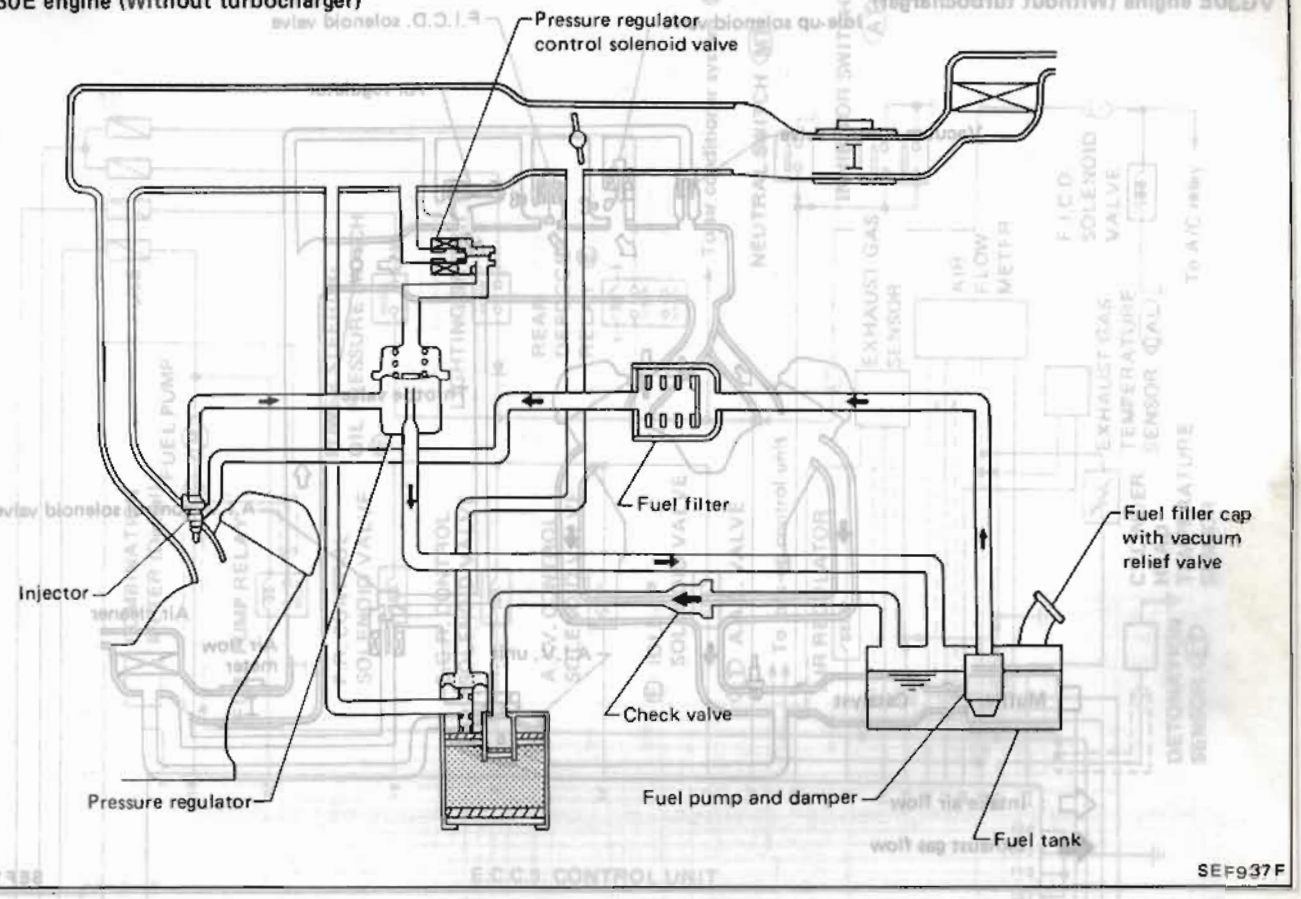
VG30E Engine (Without turbocharger)



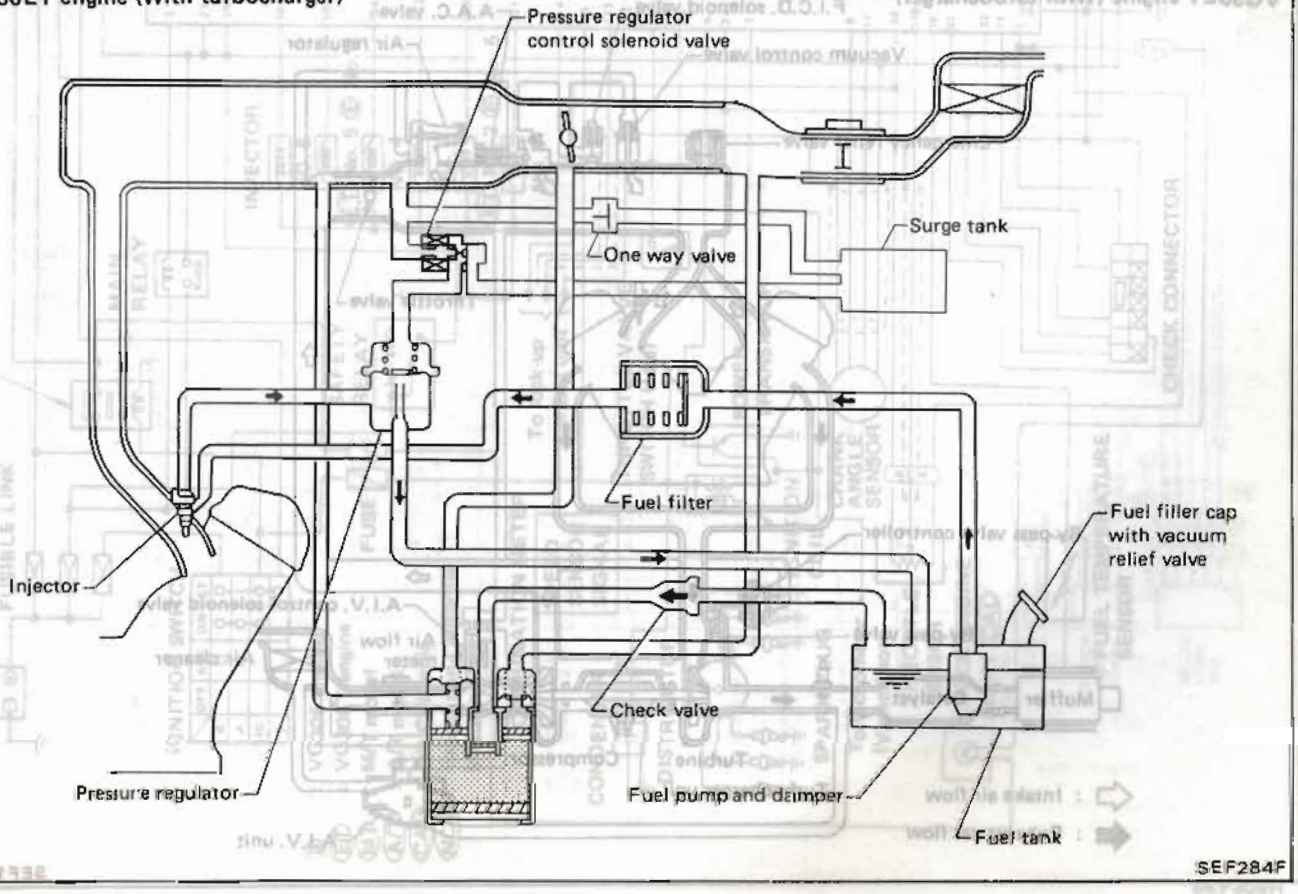
VG30ET Engine (With turbocharger)



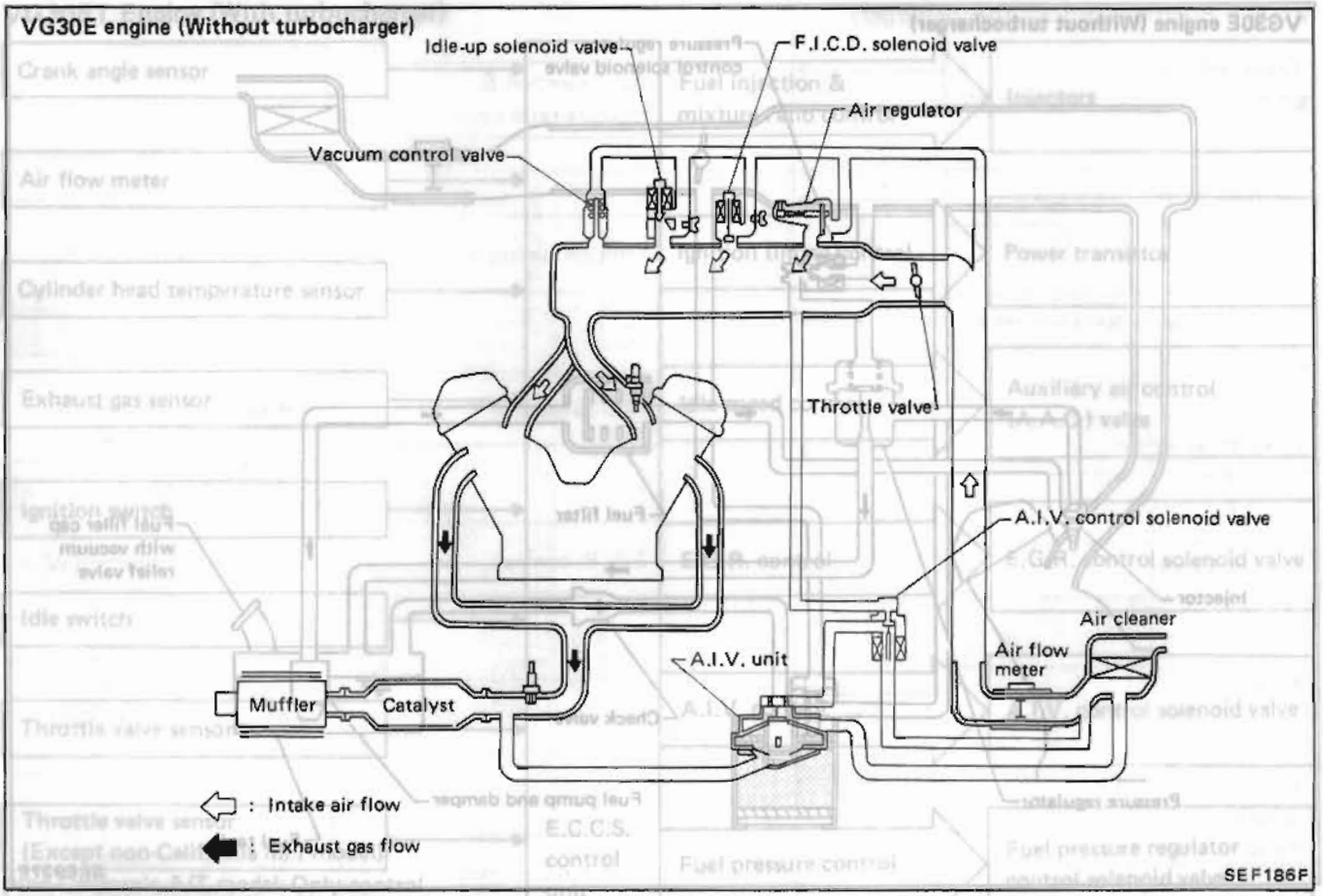
VG30E engine (Without turbocharger)



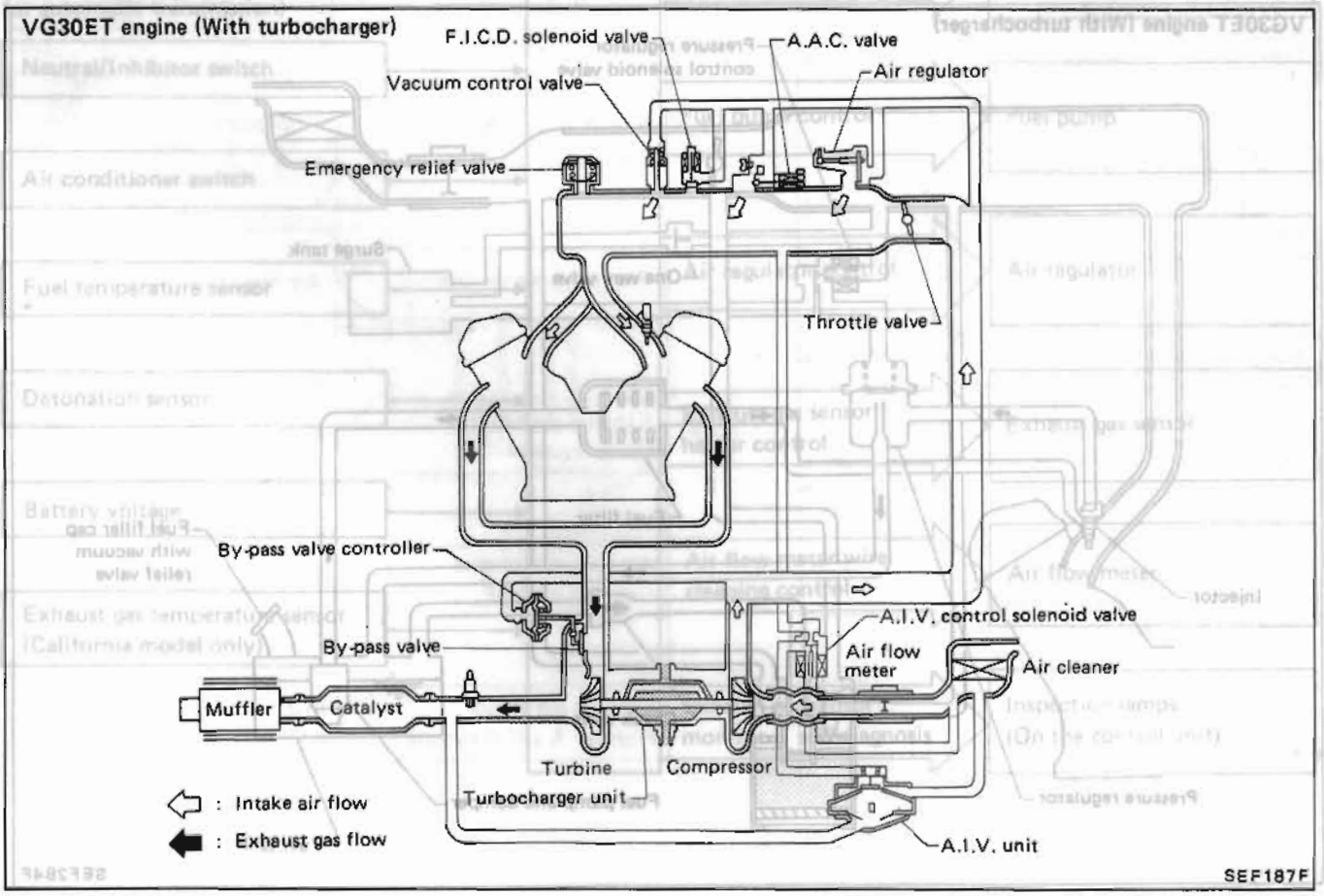
VG30ET engine (With turbocharger)

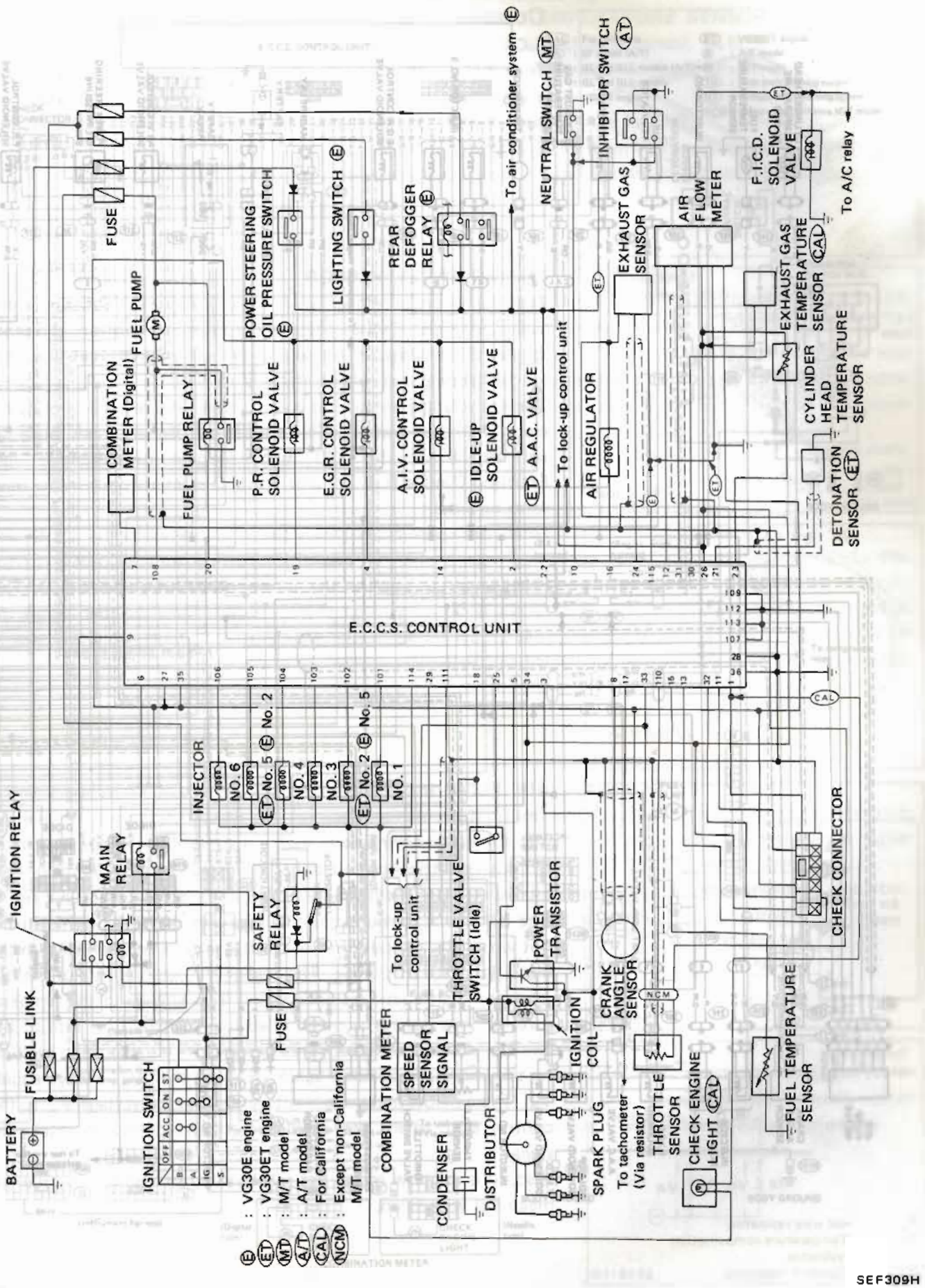


VG30E engine (Without turbocharger)



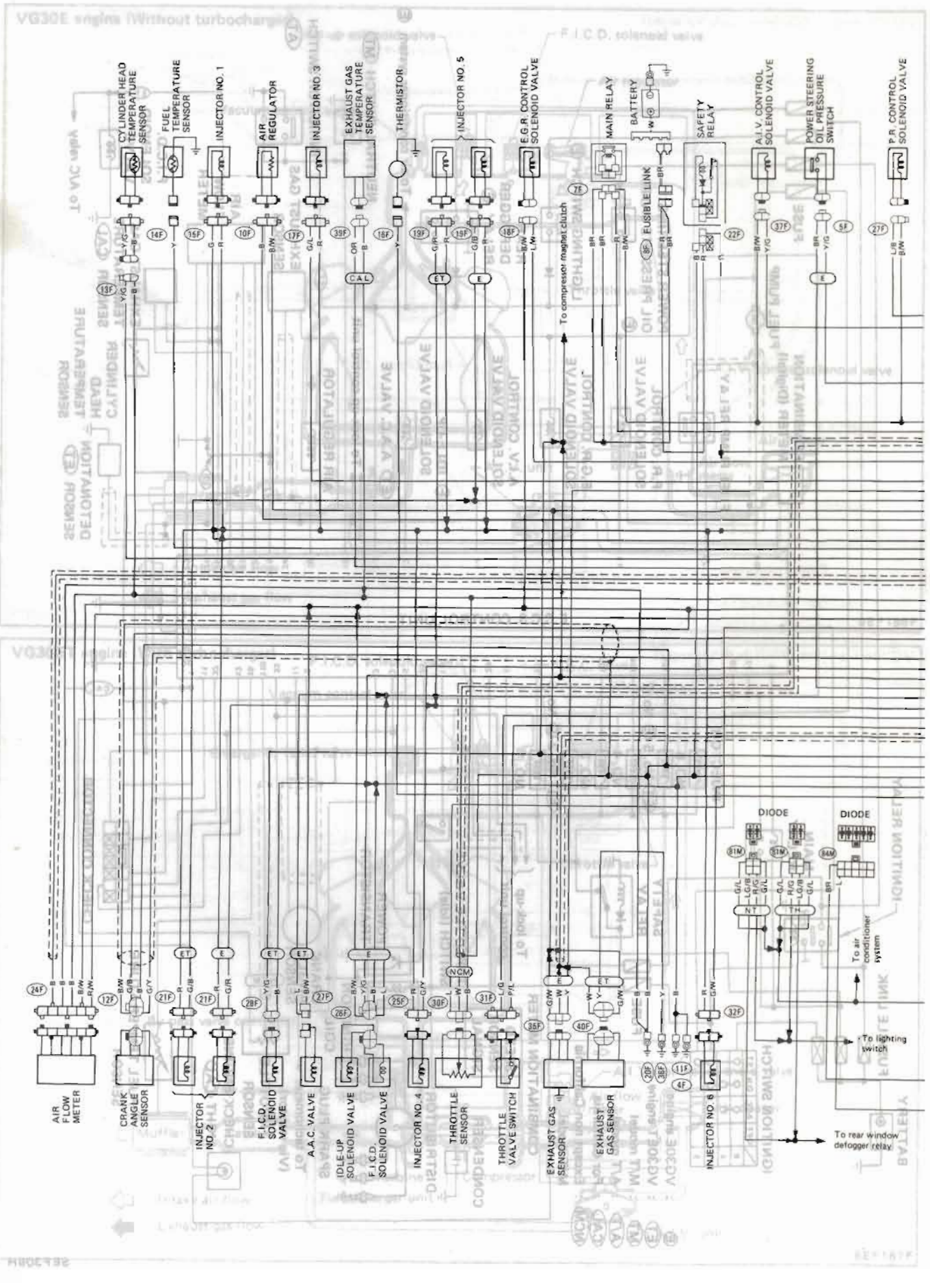
VG30ET engine (With turbocharger)

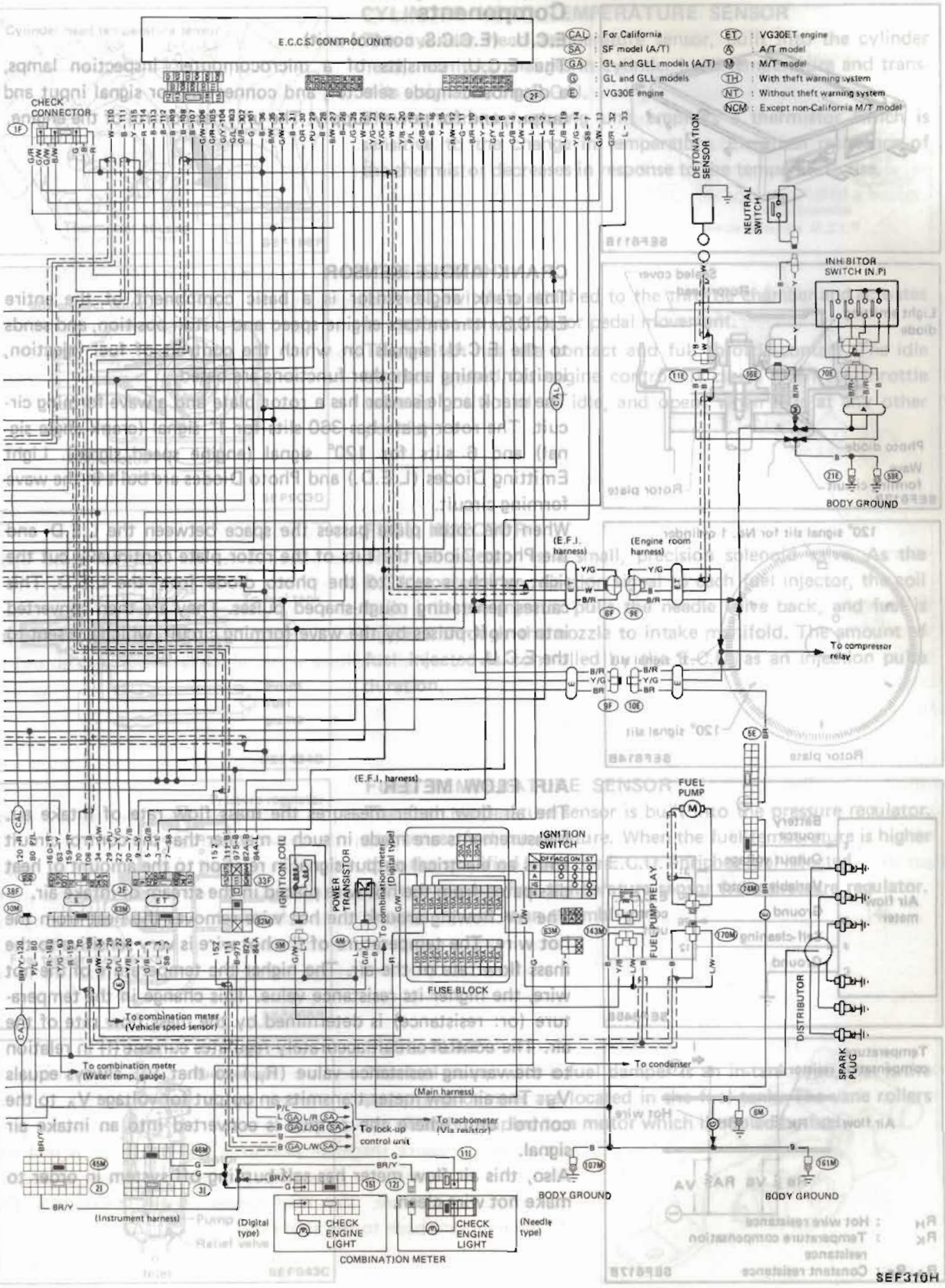


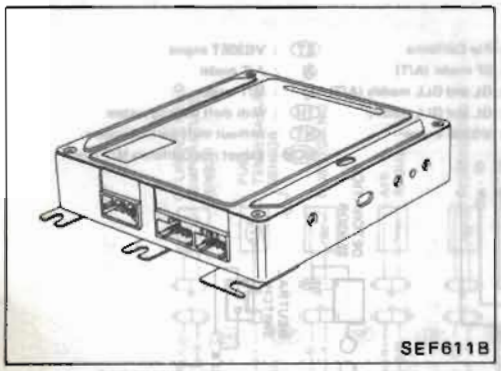

E.C.C.S. CONTROL UNIT
BATTERY
FUSIBLE LINK
IGNITION RELAY
IGNITION SWITCH
OFF ACC ON ST
B A IG S
MAIN RELAY
SAFETY RELAY
FUSE
FUEL PUMP
FUEL PUMP RELAY
COMBINATION METER (Digital)
INJECTOR
NO. 6
No. 5
No. 4
NO. 3
No. 2
NO. 1
P.R. CONTROL SOLENOID VALVE
E.G.R. CONTROL SOLENOID VALVE
A.I.V. CONTROL SOLENOID VALVE
IDLE-UP SOLENOID VALVE
A.A.C. VALVE
POWER STEERING OIL PRESSURE SWITCH
LIGHTING SWITCH
REAR DEFOGGER RELAY
To air conditioner system
To lock-up control unit
NEUTRAL SWITCH
INHIBITOR SWITCH
AIR REGULATOR
EXHAUST GAS SENSOR
AIR FLOW METER
F.I.C.D. SOLENOID VALVE
To A/C relay
EXHAUST GAS TEMPERATURE SENSOR
CYLINDER HEAD TEMPERATURE SENSOR
DETONATION SENSOR
CHECK CONNECTOR
To lock-up control unit
THROTTLE VALVE SWITCH (Idle)
POWER TRANSISTOR
CRANK ANGLE SENSOR
IGNITION COIL
DISTRIBUTOR
SPARK PLUG
CONDENSER
COMBINATION METER
SPEED SENSOR SIGNAL
To tachometer (Via resistor)
THROTTLE SENSOR
CHECK ENGINE LIGHT
FUEL TEMPERATURE SENSOR
E : VG30E engine
ET : VG30ET engine
MT : M/T model
AT : A/T model
CAL : For California
NCM : Except non-California M/T model

SEF309H

E.C.C.S. WIRING DIAGRAM



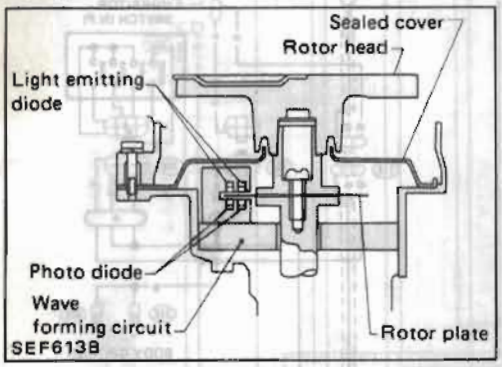

E.C.C.S. CONTROL UNIT
CAL : For California
SA : SF model (A/T)
GA : GL and GLL models (A/T)
G : GL and GLL models
E : VG30E engine
ET : VG30ET engine
A : A/T model
M : M/T model
TH : With theft warning system
NT : Without theft warning system
NCM : Except non-California M/T model
CHECK CONNECTOR
DETONATION SENSOR
NEUTRAL SWITCH
INHIBITOR SWITCH (N.P)
BODY GROUND
(E.F.I. harness)
(Engine room harness)
To compressor relay
IGNITION COIL
POWER TRANSISTOR
To combination meter (Digital type)
IGNITION SWITCH
FUEL PUMP
FUEL PUMP RELAY
FUSE BLOCK
DISTRIBUTOR
SPARK PLUG
To condenser
To combination meter (Vehicle speed sensor)
To combination meter (Water temp. gauge)
(Main harness)
To lock-up control unit
To tachometer (Via resistor)
(Instrument harness)
(Digital type)
CHECK ENGINE LIGHT
(Needle type)
COMBINATION METER
SEF310H


SEF611B

Components

E.C.U. (E.C.C.S. control unit)

The E.C.U. consists of a microcomputer, inspection lamps, a diagnostic mode selector, and connectors for signal input and output, and for power supply. The unit has control of the engine.



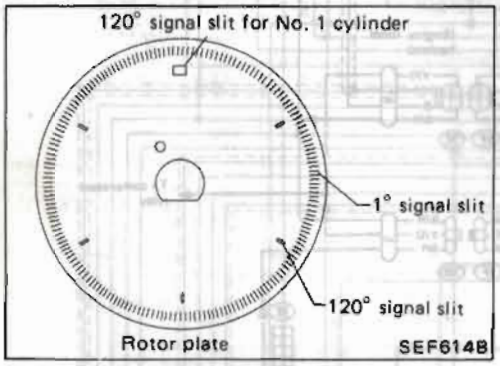
SEF613B

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 to the E.C.U. signals on which the controls of fuel injection, ignition timing and other functions are based.

The crank angle sensor has a rotor plate and a wave forming circuit. The rotor plate has 360 slits for 1° signal (crank angle signal) and 6 slits for 120° signal (engine speed signal). Light Emitting Diodes (L.E.D.) and Photo Diodes are built in the wave forming circuit.

When the rotor plate passes the space between the L.E.D. and the Photo Diode, the slits of the rotor plate continually cut the light which is sent to the photo diode from the L.E.D. This causes generating rough-shaped pulses. They are then converted into on-off pulses by the wave forming circuit, which are sent to the E.C.U.



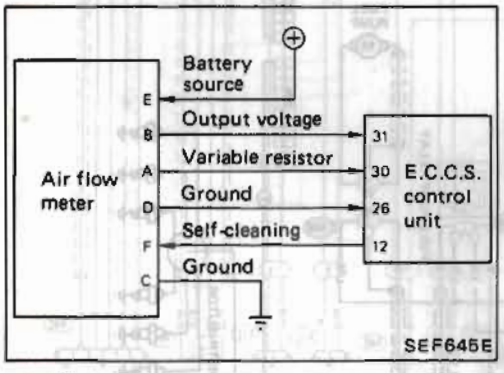
SEF614B

AIR FLOW METER

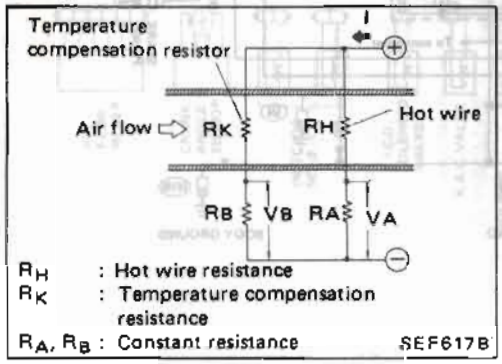
The air flow meter measures the mass flow rate of intake air. Measurements are made in such a manner that the control circuit emits an electrical output signal in relation to the amount of heat dissipated from the hot wire placed in the stream of intake air.

The air flowing around the hot wire removes the heat from the hot wire. The temperature of the hot wire is very sensitive to the mass flow rate of the air. The higher the temperature of the hot wire, the higher its resistance value. This change in the temperature (or: resistance) is determined by the mass flow rate of the air. The control circuit accurately regulates current (I) in relation to the varying resistance value (R_H) so that V_A always equals V_B. The air flow meter transmits an output for voltage V_A to the control unit where the output is converted into an intake air signal.

Also, this air flow meter has self-burning off system in order to make hot wire clean.

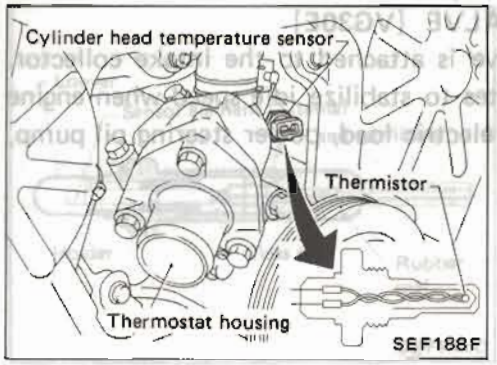


SEF645E



SEF617B

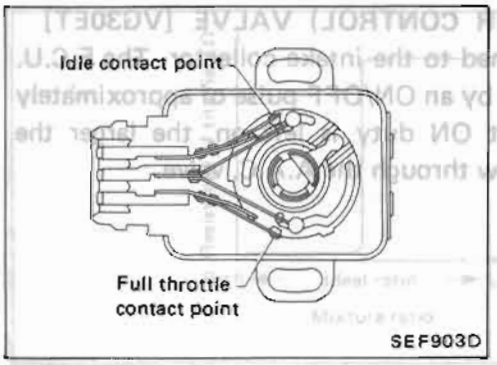
Components (Cont'd)



CYLINDER HEAD TEMPERATURE SENSOR

The cylinder head temperature sensor, built into the cylinder head, monitors changes in cylinder head temperature and transmits a signal to the E.C.U.

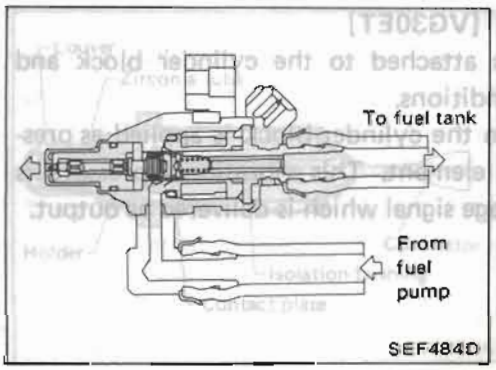
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



IDLE SWITCH

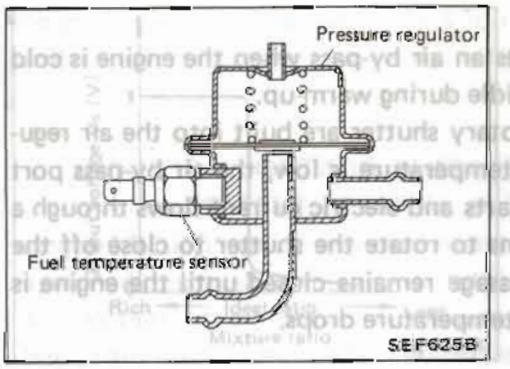
The idle switch is attached to the throttle chamber and actuates in response to accelerator pedal movement.

This switch has idle contact and full throttle contact. The idle contact is used for engine control. It closes when the throttle valve is positioned at idle, and opens when it is at any other position.



FUEL INJECTOR

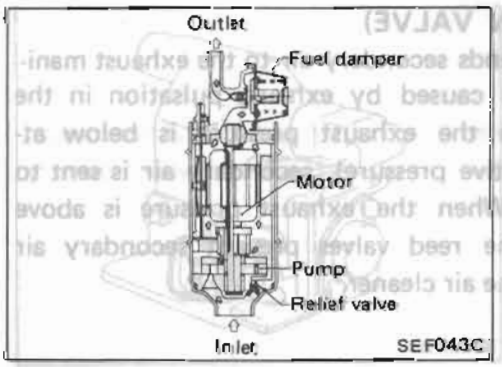
The fuel injector is a small, precision solenoid valve. As the E.C.U. outputs an injection signal to each fuel injector, the coil built into the injector pulls the needle valve back, and fuel is injected through the nozzle to intake manifold. The amount of fuel injected is controlled by the E.C.U. as an injection pulse duration.



FUEL TEMPERATURE SENSOR

The fuel temperature sensor is built into the pressure regulator, and senses fuel temperature. When the fuel temperature is higher than the specified level, the E.C.U. enriches fuel injected.

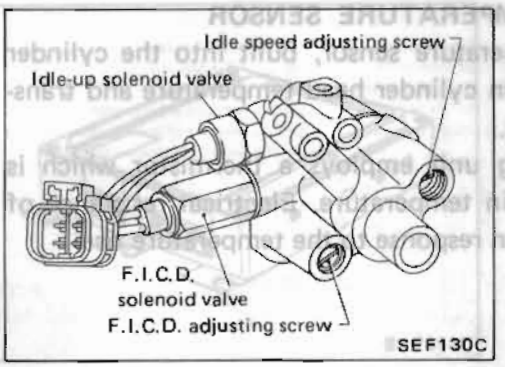
Do not remove fuel temperature sensor from pressure regulator. Always replace as an assembly.



FUEL PUMP

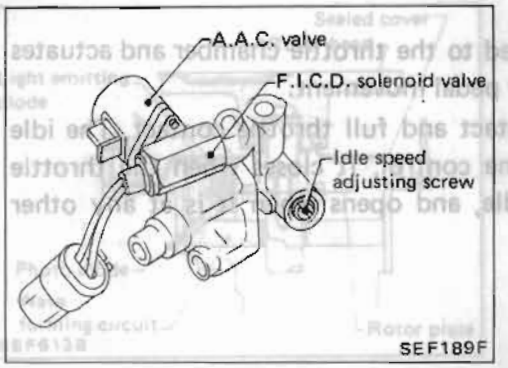
The fuel pump with a fuel damper is an in-tank type, that is the pump and damper are located in the fuel tank. The vane rollers are directly coupled to a motor which is cooled by fuel.

Components (Cont'd)



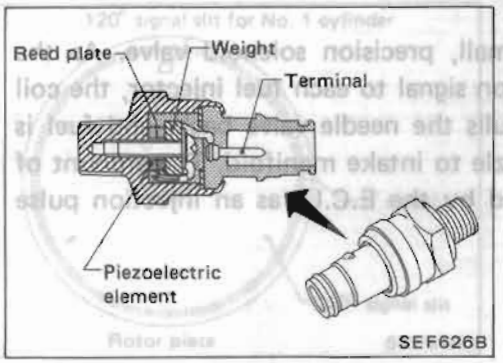
IDLE-UP SOLENOID VALVE [VG30E]

The idle-up solenoid valve is attached to the intake collector. The solenoid valve actuates to stabilize idle speed when engine load is heavy because of electric load, power steering oil pump, etc.



A.A.C. (AUXILIARY AIR CONTROL) VALVE [VG30ET]

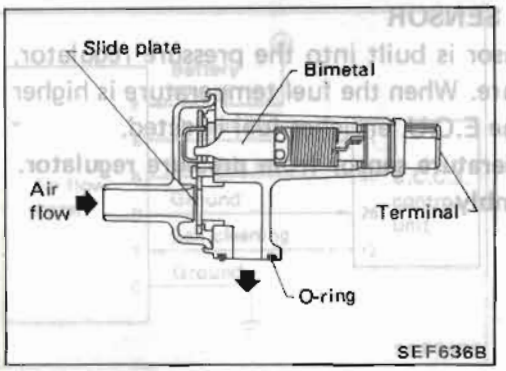
The A.A.C. valve is attached to the intake collector. The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse of approximately 160 Hz. The longer that ON duty is left on, the larger the amount of air that will flow through the A.A.C. valve.



DETONATION SENSOR [VG30ET]

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

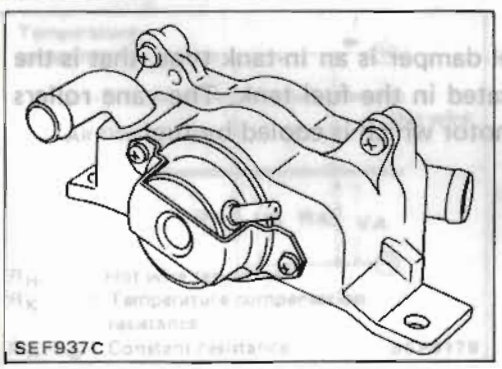
A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is delivered as output.



AIR REGULATOR

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

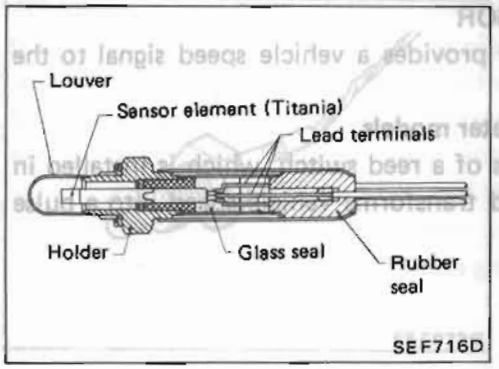
A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port is open. As the engine starts and electric current flows through a heater, the bimetal begins to rotate the shutter to close off the by-pass port. The air passage remains closed until the engine is stopped and the bimetal temperature drops.



A.I.V. (AIR INDUCTION VALVE)

The air induction valve sends secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold. When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold. When the exhaust pressure is above atmospheric pressure, the reed valves prevent secondary air from being sent back to the air cleaner.

Components (Cont'd)

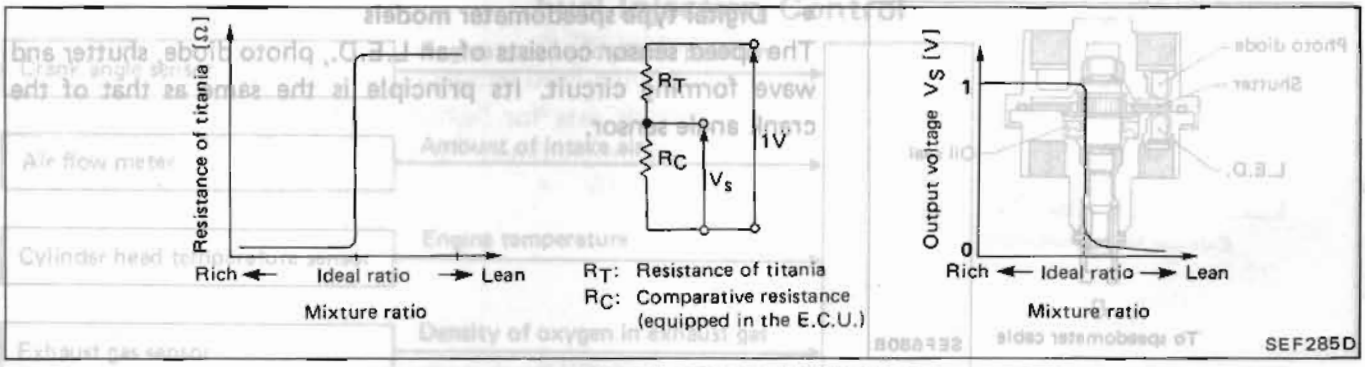


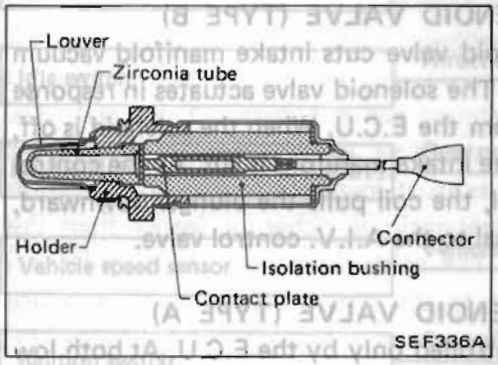
EXHAUST GAS SENSOR (Titania type) [VG30ET]

The exhaust gas sensor, which is placed in the exhaust tube, monitors the amount of oxygen in the exhaust gas.

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

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

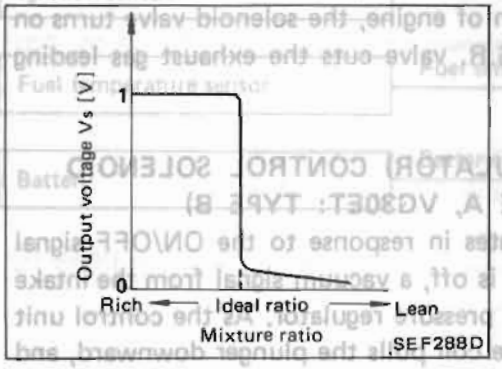


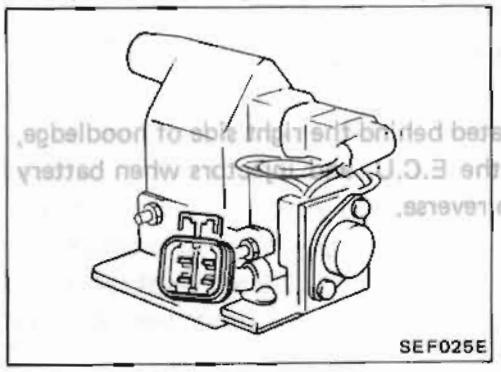


EXHAUST GAS SENSOR (Zirconia type) [VG30E]

The exhaust gas sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas.

The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the exhaust gas sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the E.C.U.

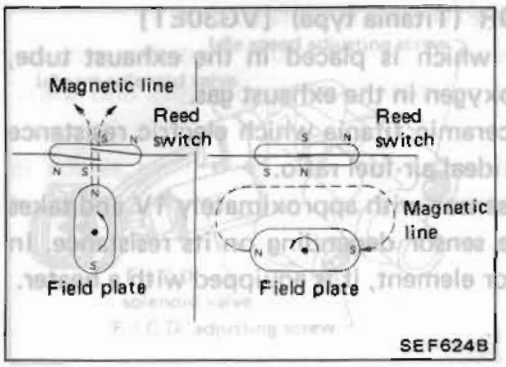




POWER TRANSISTOR AND IGNITION COIL

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.

Components (Cont'd)

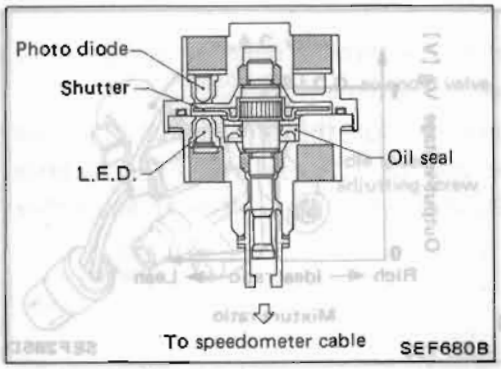


VEHICLE SPEED SENSOR

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

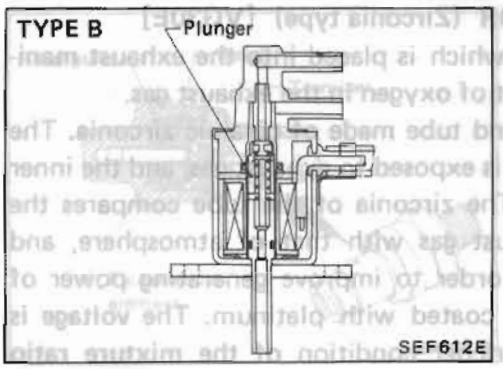
- **Needle type speedometer models**

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



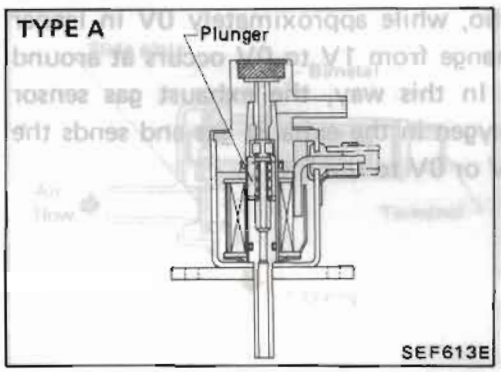
- **Digital type speedometer models**

The speed sensor consists of an L.E.D., photo diode, shutter and wave forming circuit. Its principle is the same as that of the crank angle sensor.



A.I.V. CONTROL SOLENOID VALVE (TYPE B)

The A.I.V. control solenoid valve cuts intake manifold vacuum signal for A.I.V. control. The solenoid valve actuates in response to the ON/OFF signal from the E.C.U. When the solenoid is off, the vacuum signal from the intake manifold is cut. As the control unit outputs an ON signal, the coil pulls the plunger downward, and feeds the vacuum signal to the A.I.V. control valve.

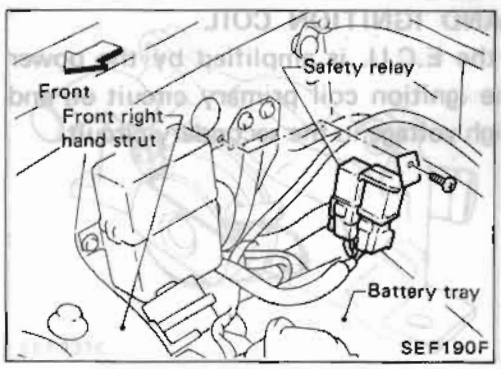


E.G.R. CONTROL SOLENOID VALVE (TYPE A)

The E.G.R. system is controlled only by the E.C.U. At both low and high speed revolution of engine, the solenoid valve turns on and accordingly the E.G.R. valve cuts the exhaust gas leading to the intake manifold.

P.R. (PRESSURE REGULATOR) CONTROL SOLENOID VALVE (VG30E: TYPE A, VG30ET: TYPE B)

The solenoid valve actuates in response to the ON/OFF signal from the E.C.U. When it is off, a vacuum signal from the intake manifold is fed into the pressure regulator. As the control unit outputs an ON signal, the coil pulls the plunger downward, and cuts the vacuum signal.



SAFETY RELAY

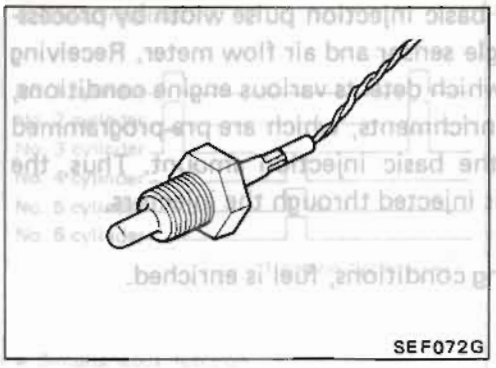
Safety relay, which is located behind the right side of hoodledge, prevents any damage to the E.C.U. and injectors when battery terminals are connected in reverse.

Components (Cont'd)

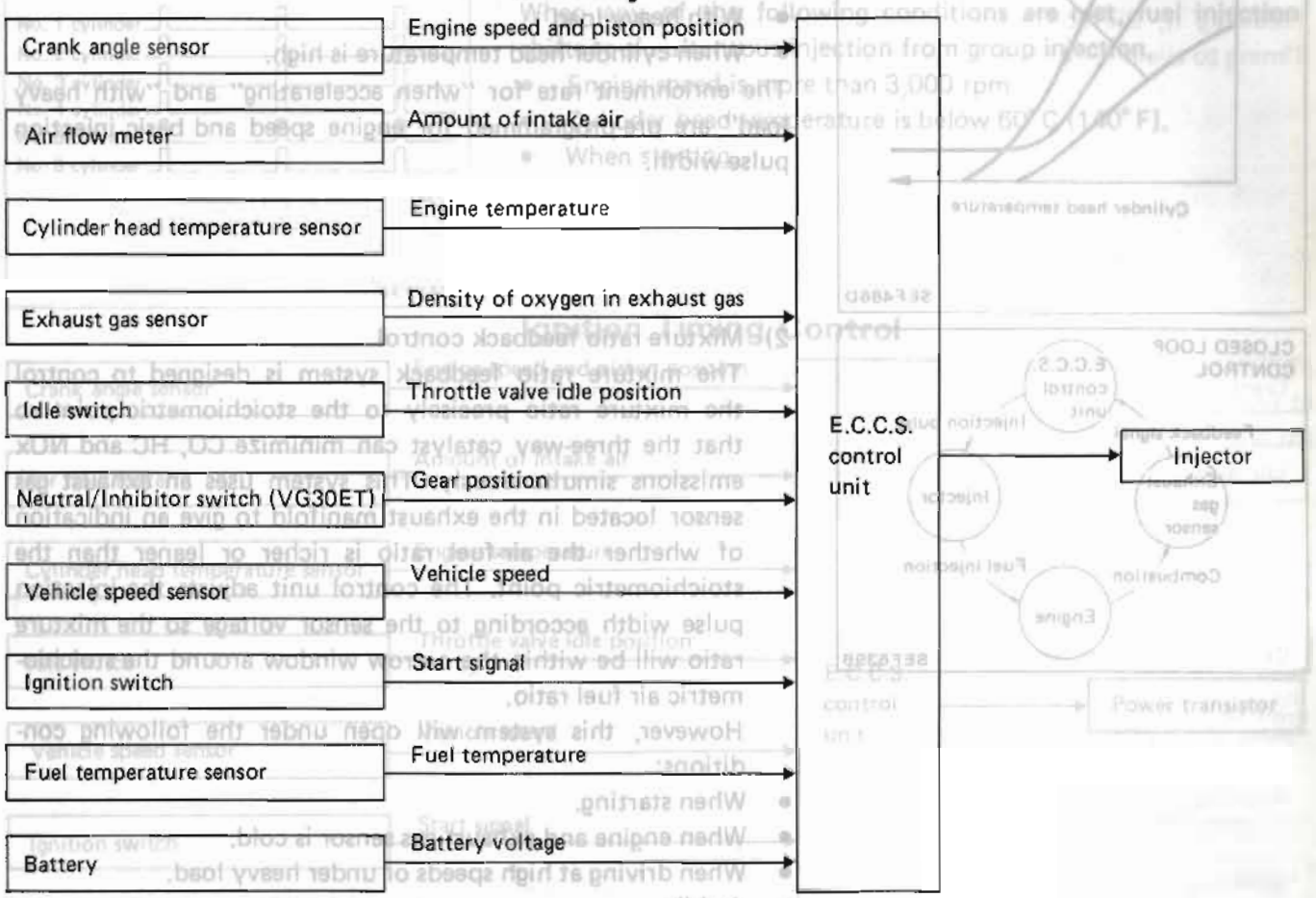
EXHAUST GAS TEMPERATURE SENSOR

[Carifornia model]

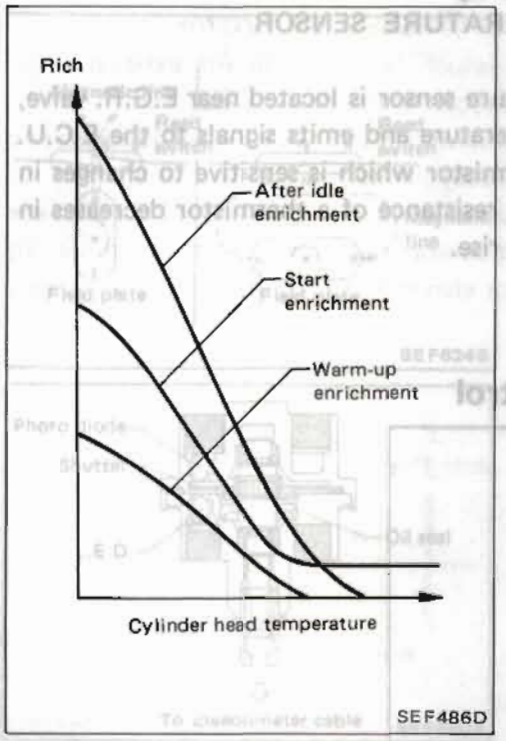
The exhaust gas temperature sensor is located near E.G.R. valve, detects exhaust gas temperature and emits signals to the E.C.U. This part employs a thermistor which is sensitive to changes in temperature. The electric resistance of a thermistor decreases in response to a temperature rise.

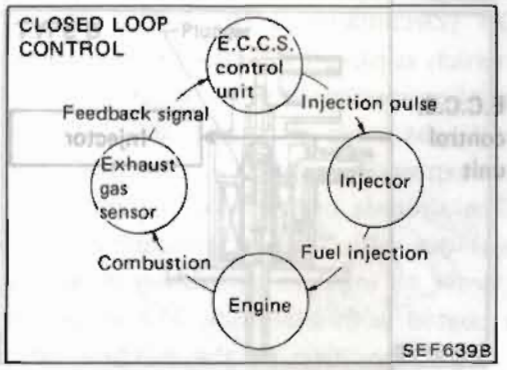


Fuel Injection Control



Fuel Injection Control (Cont'd)





The E.C.U. calculates the basic injection pulse width by processing signals from crank angle sensor and air flow meter. Receiving signals from each sensor which detects various engine conditions, the E.C.U. adds various enrichments, which are pre-programmed in the control unit, to the basic injection amount. Thus, the optimum amount of fuel is injected through the injectors.

1) Fuel enrichment

In each of the following conditions, fuel is enriched.

- During warm-up
- When starting
- After idle
- With heavy load
- When cylinder head temperature is high.

The enrichment rate for "when accelerating" and "with heavy load" are pre-programmed for engine speed and basic injection pulse width.

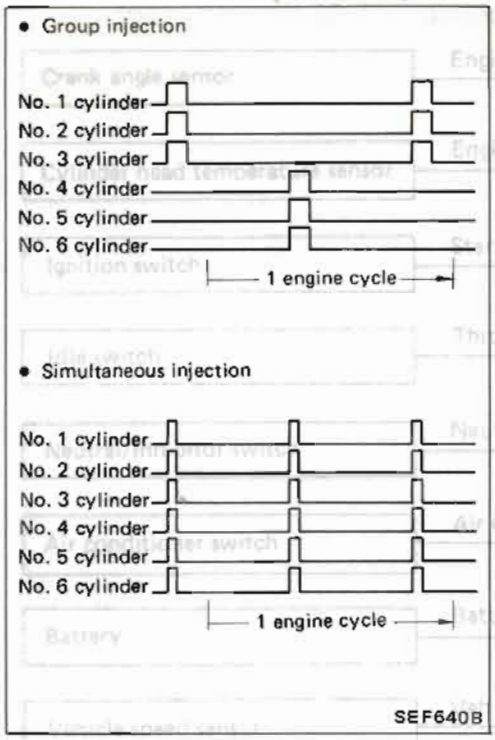
2) Mixture ratio feedback control

The mixture ratio feedback system is designed to control the mixture ratio precisely to the stoichiometric point so that the three-way catalyst can minimize CO, HC and NOx emissions simultaneously. This system uses an exhaust gas sensor located in the exhaust manifold to give an indication of whether the air-fuel ratio is richer or leaner than the stoichiometric point. The control unit adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the narrow window around the stoichiometric air fuel ratio.

However, this system will open under the following conditions:

- When starting.
- When engine and exhaust gas sensor is cold.
- When driving at high speeds or under heavy load.
- At idle
- When exhaust gas sensor monitors a too lean condition for more than 10 seconds.
- When fuel shut-off is in operation.
- When exhaust gas sensor is malfunctioning.
- When pressure regulator control system is in operation.

Fuel Injection Control (Cont'd)



3) Injection timing

Two types of fuel injection systems are used – simultaneous injection and group injection. In the former, fuel is injected into all six cylinders simultaneously twice each engine cycle.

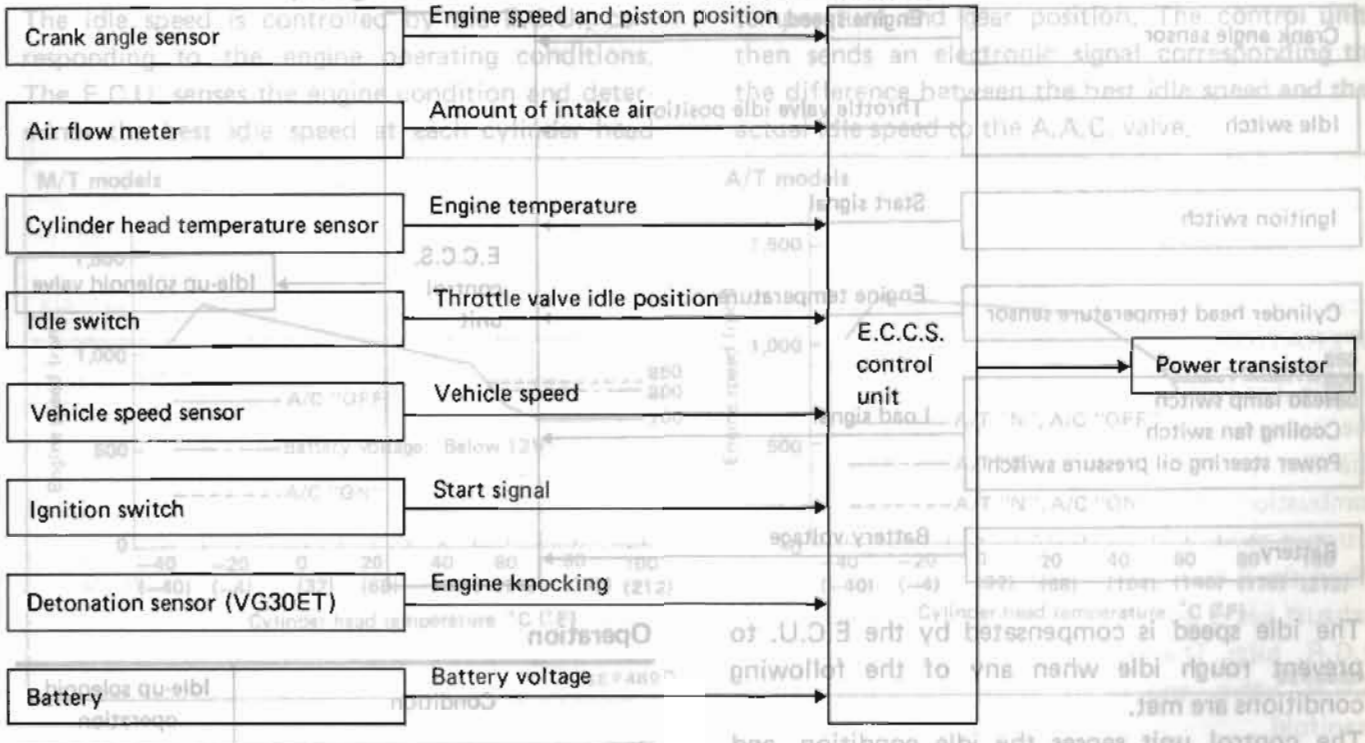
In other words, pulse signals of the same width are simultaneously transmitted from the E.C.U. to the six injectors two times for each engine cycle.

In the group injection system, six injectors are divided into two groups – No. 1, No. 2, No. 3 and No. 4, No. 5, No. 6. And fuel is injected into each group separately once each engine cycle.

When any of the following conditions are met, fuel injection shifts to simultaneous injection from group injection.

- Engine speed is more than 3,000 rpm.
- Cylinder head temperature is below 60°C (140°F).
- When starting.

Ignition Timing Control



Ignition timing is controlled, corresponding to the engine operating conditions, by the E.C.U.: that is, as the optimum ignition timing in each driving condition has been pre-programmed in the control unit, the ignition timing is determined by electrical signals processed in the unit.

The signal from the E.C.U. is transmitted to power transistor, and controls ignition timing.

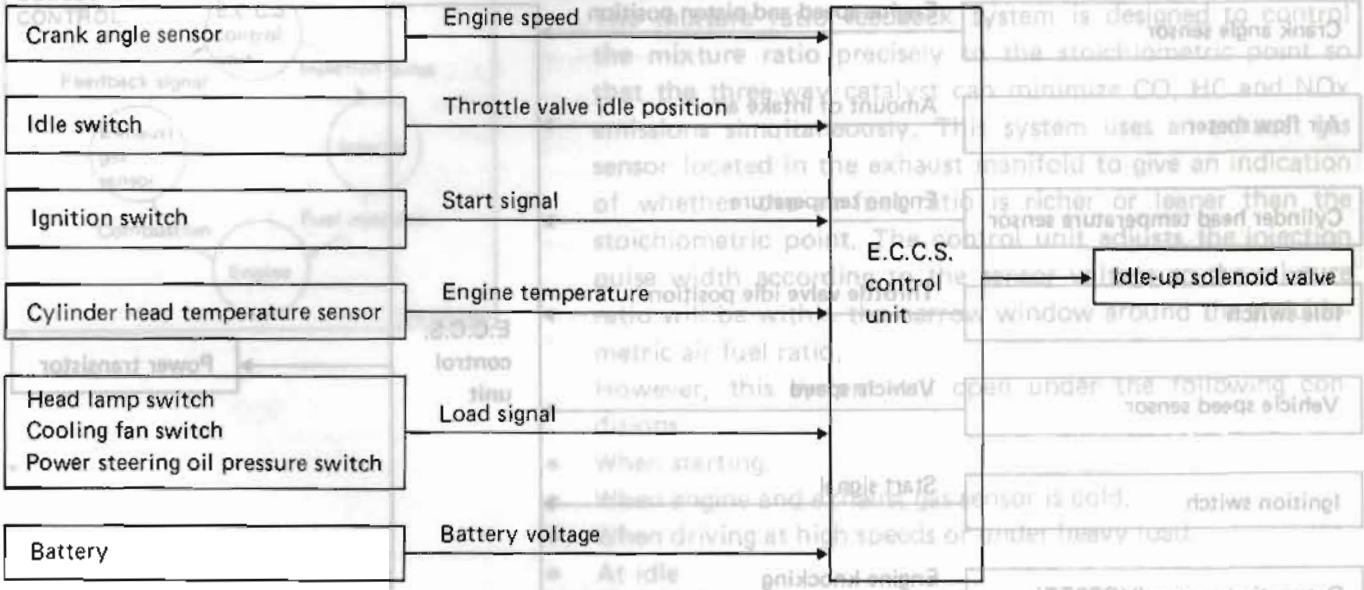
Ignition Timing Control (Cont'd)

Detonation feedback operation

The retard system by detonation sensor is designed only for emergencies on VG30ET engines. 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 knocking condition and the signal is transmitted to the E.C.U. After receiving it, the control unit retards the ignition timing to avoid the knocking condition.

Idle-up Control (VG30E engine)



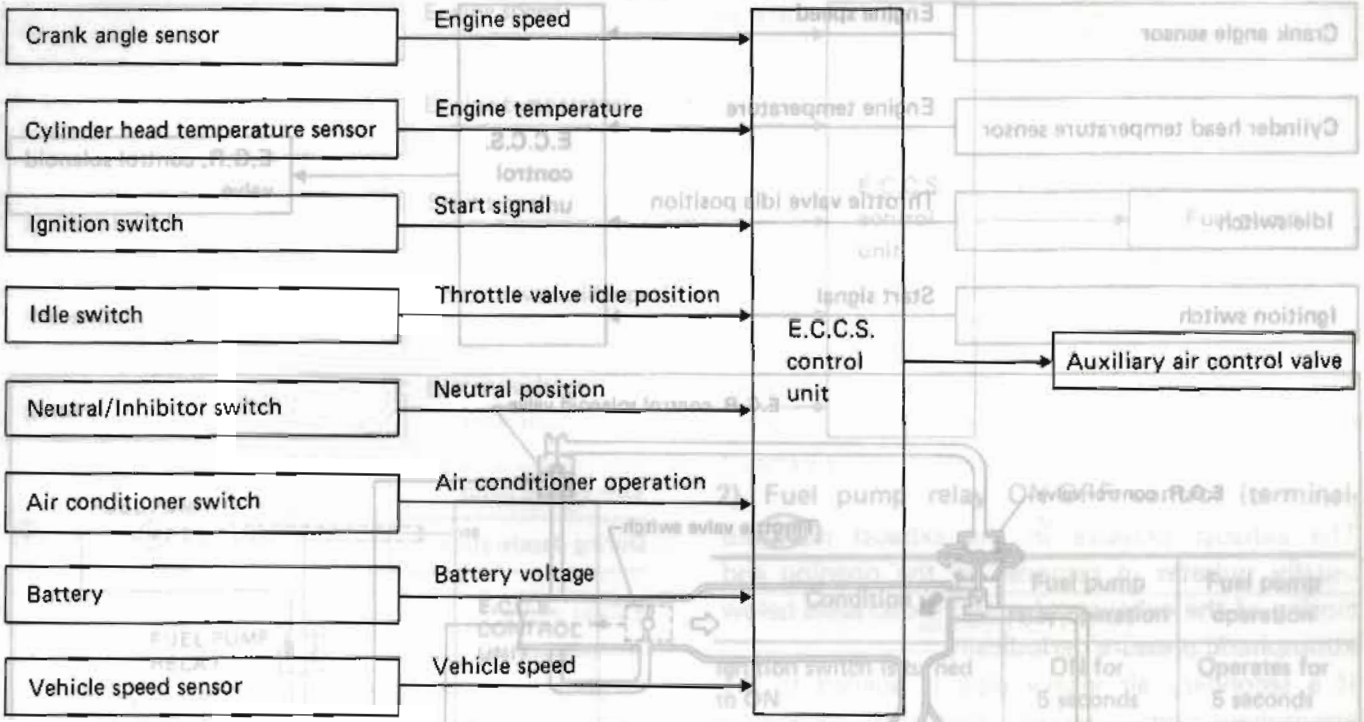
The idle speed is compensated by the E.C.U. to prevent rough idle when any of the following conditions are met.

The control unit senses the idle condition, and determines ON/OFF signal. The signal from the control unit is transmitted to the idle-up solenoid valve to stabilize idle speed.

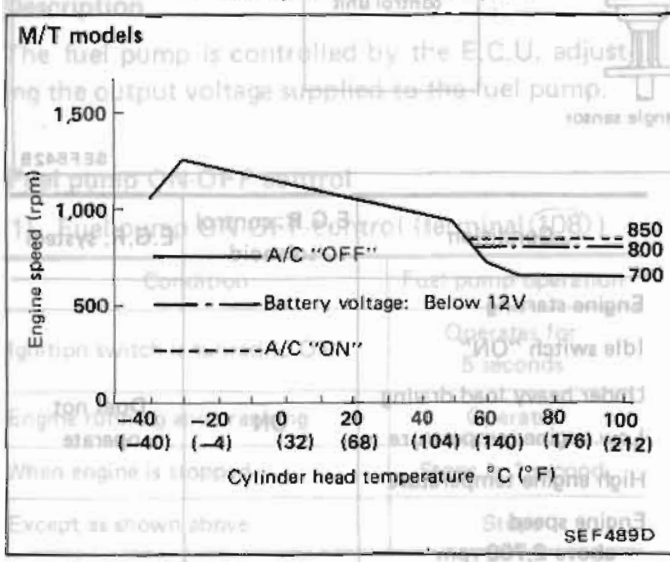
Operation

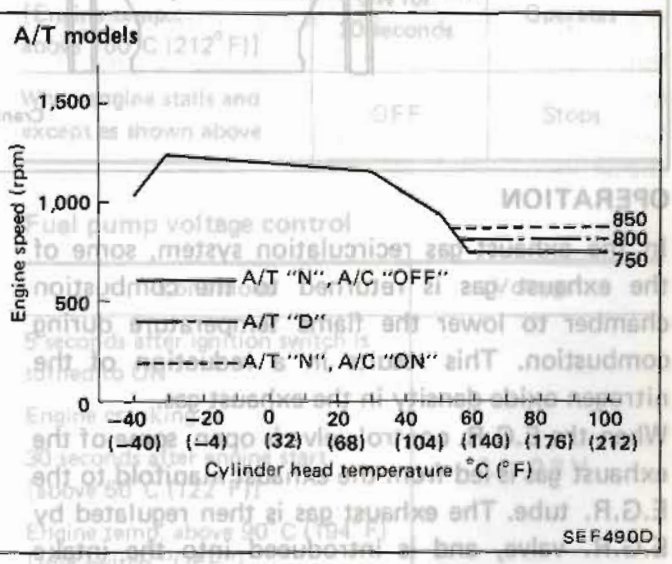
Condition	Idle-up solenoid operation
During engine start 20 seconds after engine start Battery voltage is below 12V Headlamp switch ON Cooling fan switch ON Power steering oil pressure switch ON	ON
Except above	OFF

Idle Speed Control (VG30ET engine)

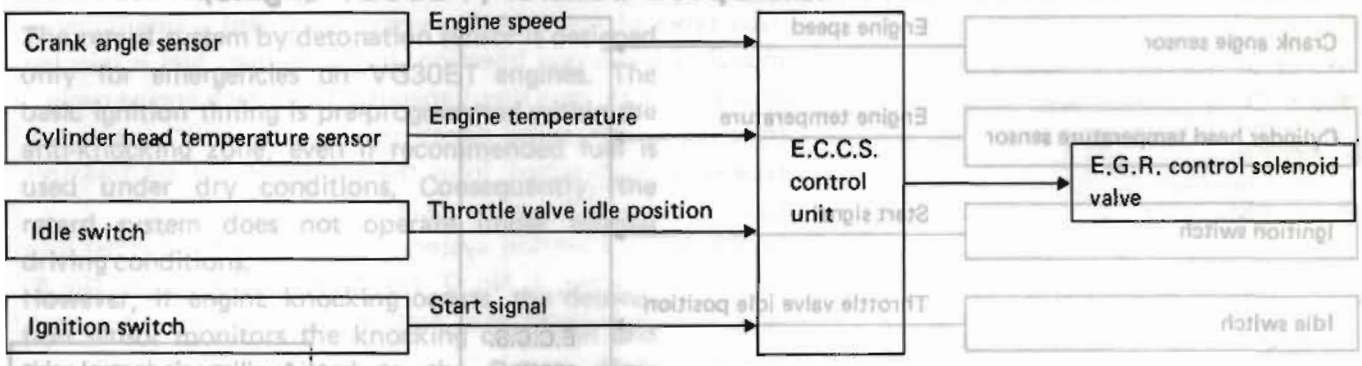


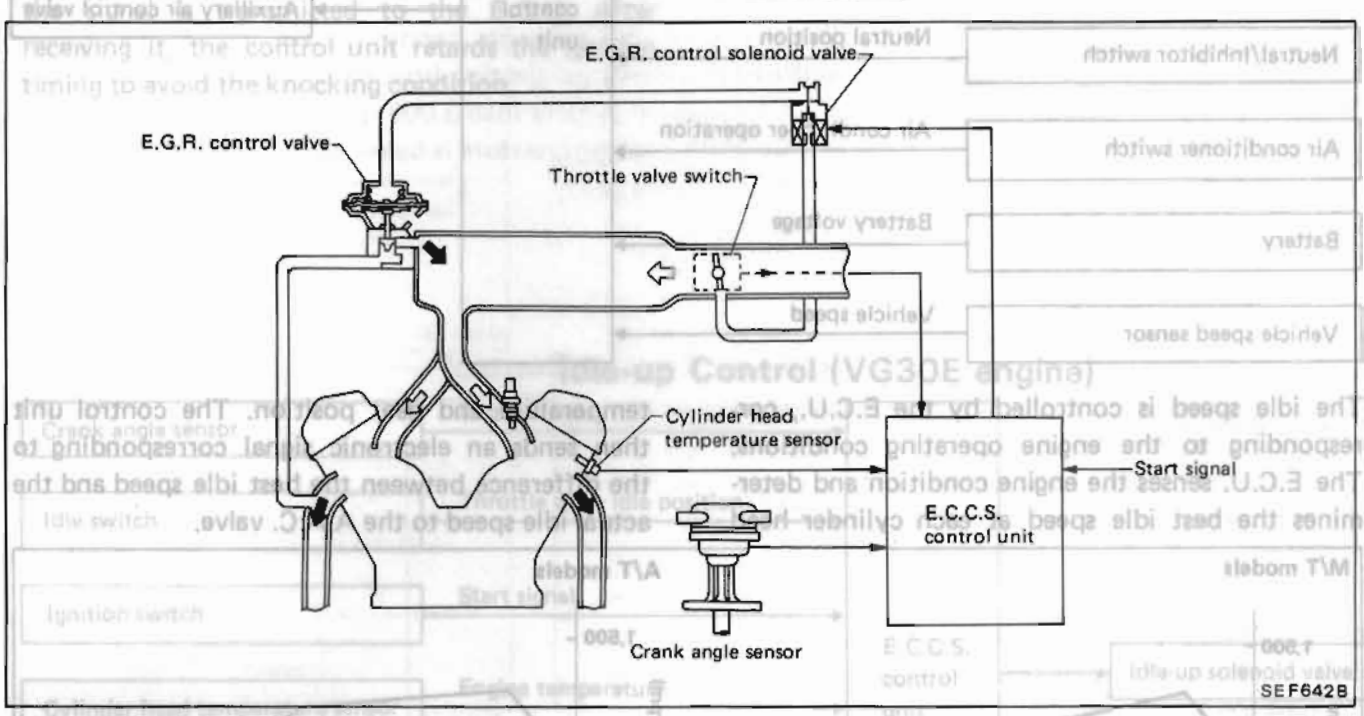
The idle speed is controlled by the E.C.U., corresponding to the engine operating conditions. The E.C.U. senses the engine condition and determines the best idle speed at each cylinder head temperature and gear position. The control unit then sends an electronic signal corresponding to the difference between the best idle speed and the actual idle speed to the A.A.C. valve.





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





OPERATION

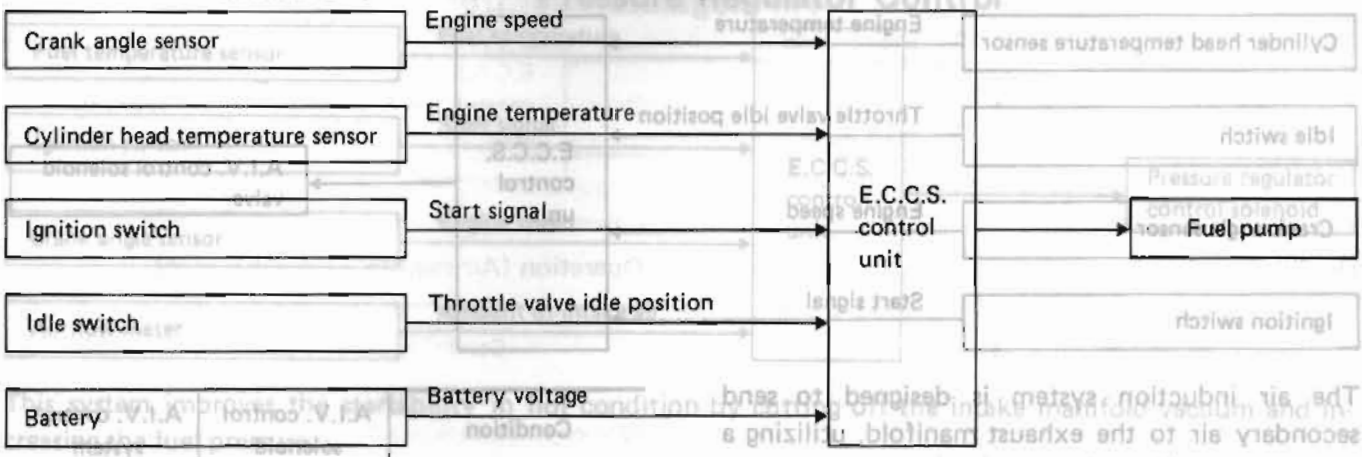
In the exhaust gas recirculation system, some of the exhaust gas is returned to the combustion chamber to lower the flame temperature during combustion. This results in a reduction of the nitrogen oxide density in the exhaust gas.

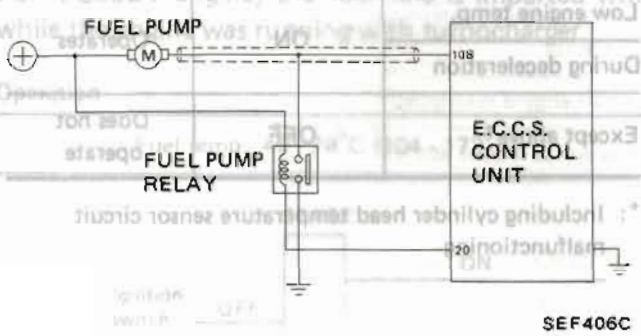
When the E.G.R. control valve is open, some of the exhaust gas is led from the exhaust manifold to the E.G.R. tube. The exhaust gas is then regulated by E.G.R. valve, and is introduced into the intake manifold.

The signal from the E.C.U. is sent to the E.G.R. control solenoid valve, which cuts the vacuum line for the E.G.R. control valve when any of the following conditions are met.

Condition	E.G.R. control solenoid	E.G.R. system
Engine starting Idle switch "ON" Under heavy load driving Low engine temperature High engine temperature Engine speed above 2,700 rpm	ON	Does not operate
Except above	OFF	Operates

Fuel Pump Control





SEF406C

Description

The fuel pump is controlled by the E.C.U. adjusting the output voltage supplied to the fuel pump.

Fuel pump ON-OFF control

1) Fuel pump ON-OFF control (terminal (108))

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

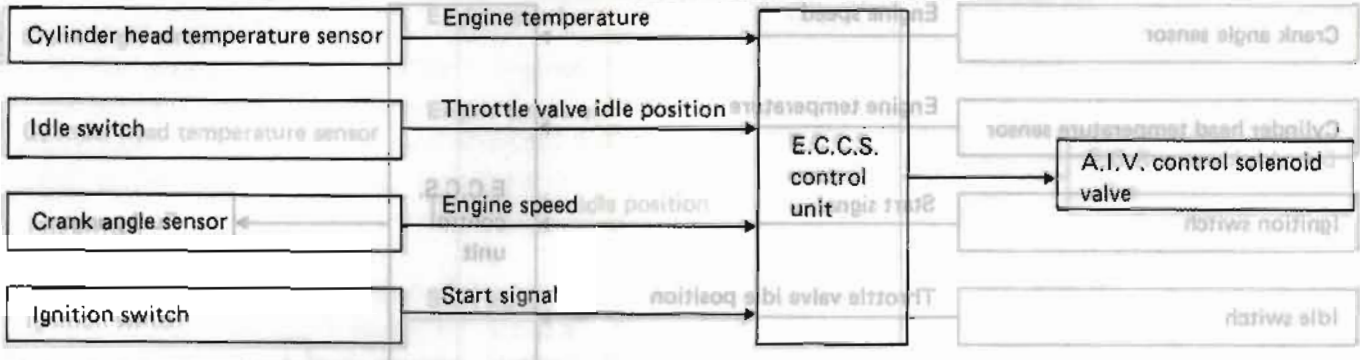
2) Fuel pump relay ON-OFF control (terminal (20))

Condition	Fuel pump relay operation	Fuel pump operation
Ignition switch is turned to ON	ON for 5 seconds	Operates for 5 seconds
When engine is starting [Engine temp.: above 100°C (212°F)]	ON	Operates
After started [Engine temp.: above 100°C (212°F)]	ON for 30 seconds	Operates
When engine stalls and except as shown above	OFF	Stops

Fuel pump voltage control

Conditions	Voltage
5 seconds after ignition switch is turned to ON Engine cranking 30 seconds after engine start [above 50°C (122°F)] Engine temp. above 90°C (194°F) [Idle switch "OFF"] Engine temp. below 10°C (50°F)	0.1 - 0.3 V
Except above	9 - 14 V

Air Induction Valve (A.I.V.) Control



The air induction system is designed to send secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold.

The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and it decreases below atmospheric pressure periodically.

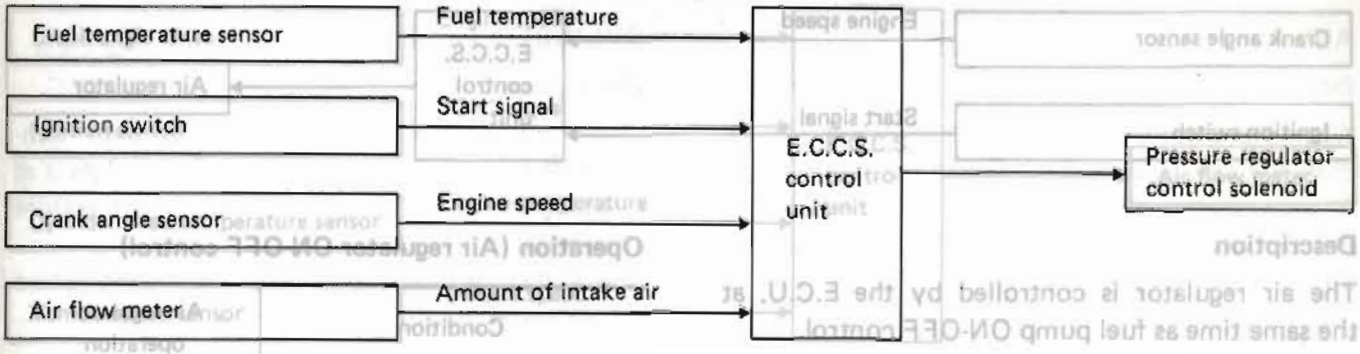
If a secondary air intake pipe is opened to the atmosphere under vacuum conditions, secondary air can be drawn into the exhaust manifold in proportion to the vacuum.

The air induction valve is controlled by the E.C.U., corresponding to the engine temperature. When the engine is cold, the A.I.V. control system operates to activate the 3-way catalytic converter quickly. This system also operates during deceleration for the purpose of blowing off water around the air induction valve.

Condition	A.I.V. control solenoid	A.I.V. control system
Low engine temp.	ON	Operates
During deceleration		
Except above*	OFF	Does not operate

*: Including cylinder head temperature sensor circuit malfunctioning

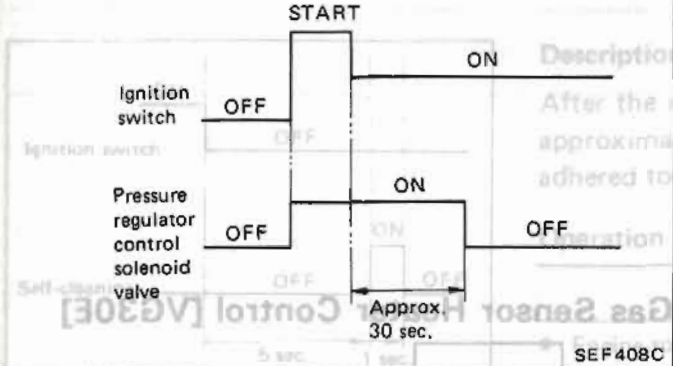
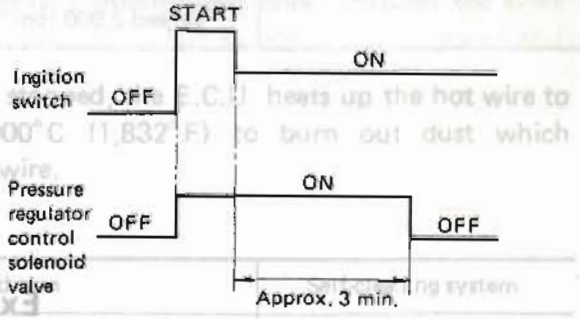
Pressure Regulator Control



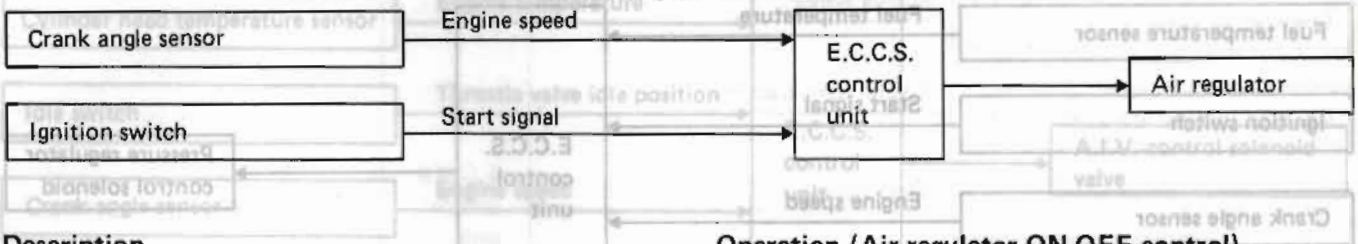
This system improves the startability in hot condition by cutting off the intake manifold vacuum and increasing the fuel pressure.

For VG30ET engine, the fuel line is imparted with high pressure which has been stored in the surge tank while the engine was running with turbocharger.

Operation

Fuel temp. 40 - 78°C (104 - 172°F)	above 78°C (172°F)
	
SEF408C	SEF741B

Air Regulator Control



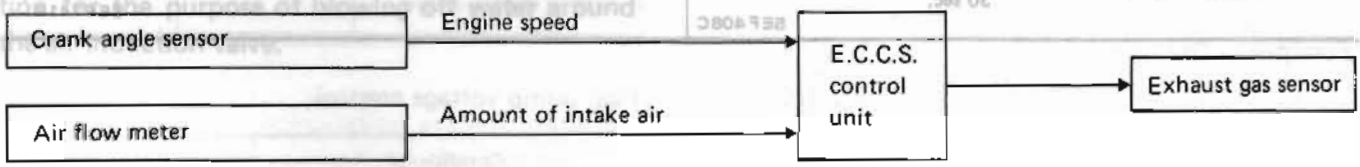
Description

The air regulator is controlled by the E.C.U. at the same time as fuel pump ON-OFF control.

Operation (Air regulator ON-OFF control)

Condition	Air regulator operation
Ignition switch is turned to ON	Operates for 5 seconds
While engine is running and cranking	Operates
When engine is stopped	OFF in 1 second
Except as shown above	OFF

Exhaust Gas Sensor Heater Control [VG30E]

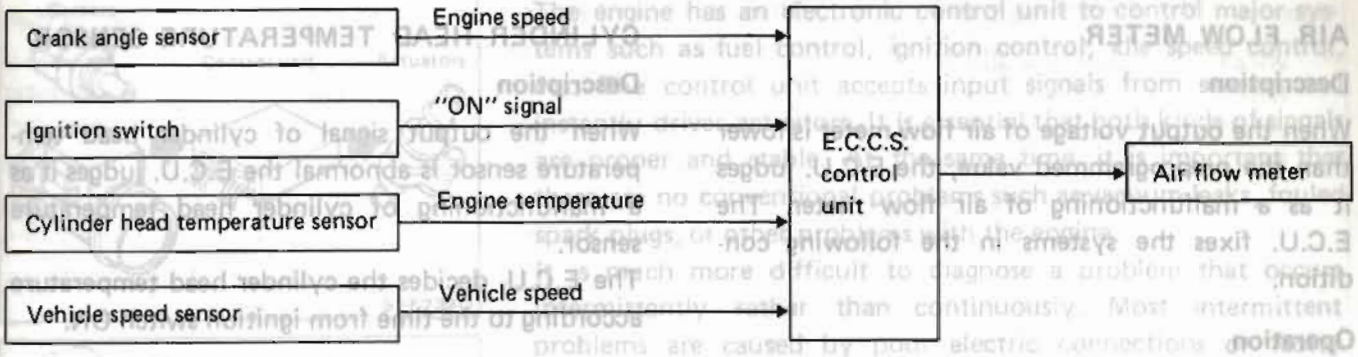


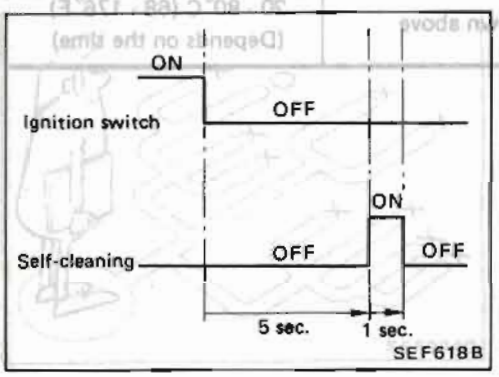
The E.C.U. controls the heater operation in the following way.

Operation

Condition	Exhaust gas sensor heater
• Engine speed is less than 2,800 rpm. • Except under heavy load	ON
Except as shown above	OFF

Air Flow Meter Self-cleaning Control





Description

After the engine is stopped, the E.C.U. heats up the hot wire to approximately 1,000°C (1,832°F) to burn out dust which adhered to the hot wire.

Operation

Condition	Self-cleaning system
• Engine speed has not exceeded 1,500 rpm before key off. • Vehicle speed has not exceeded 20 km/h (12 MPH) before key off. • Cylinder head temperature is higher than 115°C (239°F) when key off. • Engine stall with key in ON position.	Does not operate
Except as shown above	Operates

Fail-safe System

AIR FLOW METER

Description

When the output voltage of air flow meter is lower than the preprogrammed value, the E.C.U. judges it as a malfunctioning of air flow meter. The E.C.U. fixes the systems in the following condition.

Operation

System	Fixed condition
E.G.R. control system	OFF
Idle speed control system	A duty ratio is fixed at the preprogrammed value.
Fuel injection control system	Fuel is shut off above 2,000 rpm. (Engine speed does not exceed 2,000 rpm.)

CYLINDER HEAD TEMPERATURE SENSOR

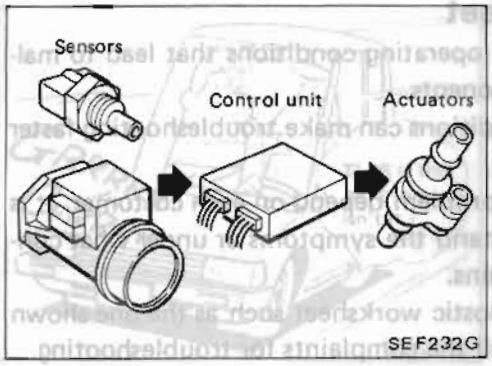
Description

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

The E.C.U. decides the cylinder head temperature according to the time from ignition switch ON.

Operation

Condition	Cylinder head temperature decided
Just as ignition switch is turned ON or Start	20°C (68°F)
More than 6 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)



Introduction

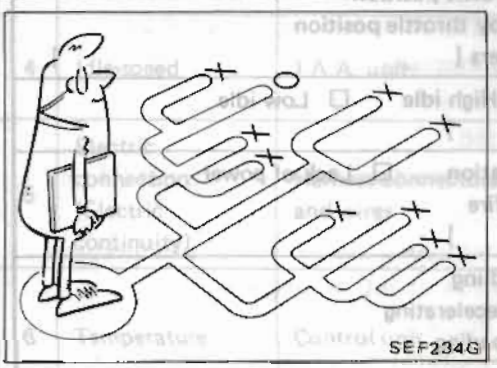
The engine has an electronic control unit to control major systems such as fuel control, ignition control, idle speed control, etc. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it 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 faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

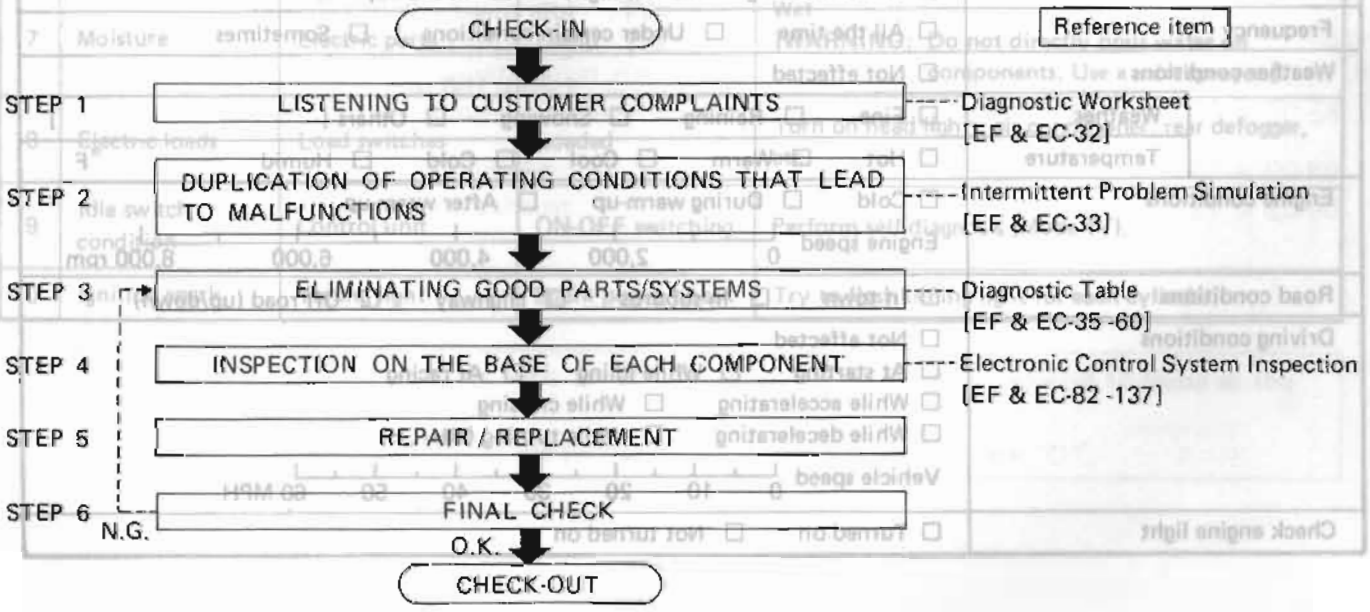
A visual check only may not find the cause of the problems. A road test with a circuit tester connected to a suspected circuit should be performed.

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 the talks 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.



Work Flow



KEY POINTS

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

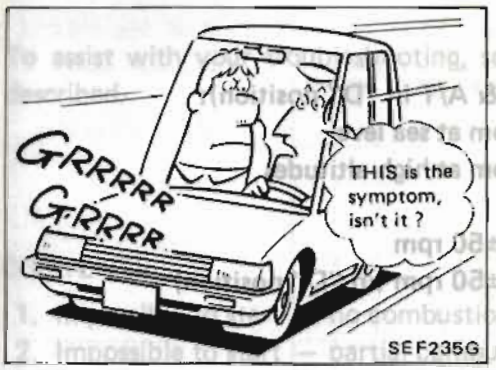
Diagnostic Worksheet

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for troubleshooting.

WORKSHEET SAMPLE

Customer name MR/MS	Model & Year	VIN
Engine #	Trans.	Mileage
Incident Date	Manuf. Date	In Service Date

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

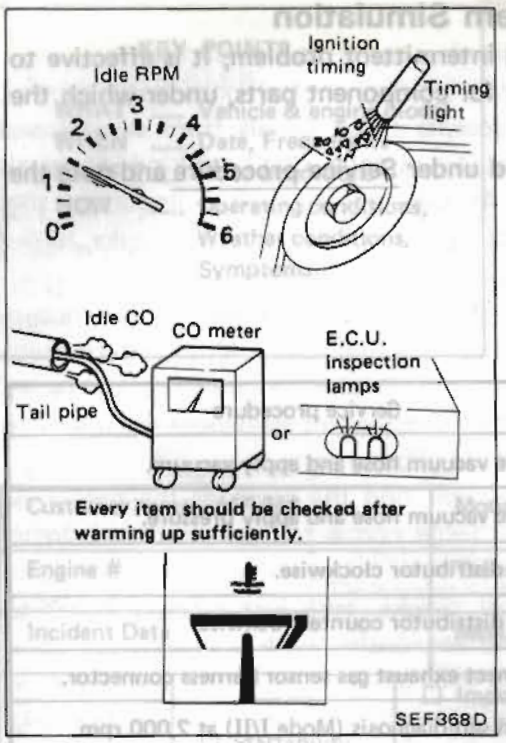


Intermittent Problem Simulation

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	Distributor	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 I/II) at 2,000 rpm.
4	Idle speed	I.A.A. unit	Raised	Turn idle adjust screw counterclockwise.
			Lowered	Turn idle adjust screw clockwise.
5	Electric connection (Electric continuity)	Harness connectors and wires	Poor electric connection or faulty 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 head lights, air conditioner, rear defogger, etc.
9	Idle switch condition	Control unit	ON-OFF switching	Perform self-diagnosis (Mode IV).
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder.



Specifications

1) Idle speed
   - VG30E (M/T & A/T in "D" position):
     - 700±50 rpm at sea level
     - 650±50 rpm at high altitudes
   - VG30ET:
     - M/T; 700±50 rpm
     - A/T; 650±50 rpm (in "D" position)
2) Ignition timing
   - VG30E:
     - M/T; 15°±2° B.T.D.C.
     - A/T; 20°±2° B.T.D.C.
   - VG30ET:
     - M/T; 10°±2° B.T.D.C.
     - A/T; 15°±2° B.T.D.C.
3) Idle CO
   - ○ 0.2 - 8.0% (in tail pipe)
     - • Throttle valve switch harness connector disconnected (No A.I.V. controlled condition)
     - • Cylinder head temperature sensor harness connector disconnected and then 2.5 kΩ resistor connected.
     - • Exhaust gas sensor harness connector disconnected.
   - ○ Flashes of E.C.U. red inspection lamp in mode II (If flashes, O.K.)
4) Mixture ratio at approximately 2,000 rpm of engine speed.
   - Number of flashes of E.C.U. inspection green lamp in mode I:
     - 5 times or more/10 seconds
5) Engine speed of idle switch OFF → ON
   - M/T: Idle speed + 250± 150 rpm
   - A/T: Engine speed (In "N" position) + 250± 150 rpm

DIAGNOSTIC PROCEDURE

Diagnostic Table

To assist with your troubleshooting, some typical diagnostic procedures for the following symptoms are described.

CONTENTS

REMARKS

In the following pages, the numbers such as ❶, ❷ in the above chart correspond to those in the service procedure described below.
Possible causes can be checked through the service procedure shown by the mark "○".

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 1 | Impossible to start – no combustion

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio (too lean)	○	○						
	Ignition sparks (weak, missing)				○	○	○		
	Ignition timing							○	
FUEL SYSTEM	Fuel pump (no operation)	○							
	Fuel pump relay (open circuited)	○							
	Injectors (no operation, clogged)		○						
IGNITION SYSTEM	Ignition switch	○	○	○	○			○	
	Main relay	○	○	○	○			○	
	Power transistor			○	○			○	
	Ignition coil				○			○	
	Center cable (ignition leaks)				○			○	
	Ignition wires (ignition leaks)				○	○			
	Spark plugs						○		
CONTROL SYSTEM	Crank angle sensor	○	○		○			○	○

SERVICE PROCEDURE

❶ LISTEN

Listen for fuel pump operating sound.

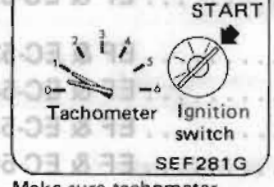
N.G. → Check fuel pump and/or related circuits. [See page EF & EC-94.]

❷ LISTEN

Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-120.]

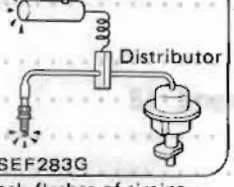
❸ CHECK



Make sure tachometer needle moves when cranking.

N.G. →

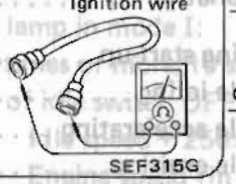
❹ CHECK — Timing light



Check flashes of timing light for weakness.

N.G. →

❺ MEASURE — Ignition wire

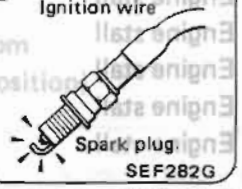


Measure resistance of suspect wires.

N.G. → Replace the wire.

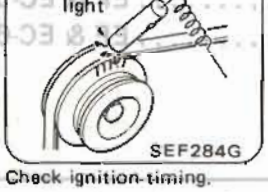
O.K. →

❻ CHECK — Ignition wire



Remove spark plugs and check their ignition sparks.

❼ CHECK — Timing light



Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-34.]

❽ PERFORM — Self-diagnosis Mode III

Perform self-diagnosis Mode III (for crank angle sensor).

N.G. → Check crank angle sensor and/or related circuits. [See page EF & EC-84.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 2 | **Impossible to start – partial combustion**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺
SPECIFICATIONS	Mixture ratio	○	○	○		
	Fuel pressure (too low)				○	
	Ignition timing					○
FUEL SYSTEM	Fuel pump	○				
	Fuel pump relay (open circuited)	○				
	Injectors (clogged)		○			

SERVICE PROCEDURE

❶ **LISTEN**

Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-94.]

O.K. →

❷ **LISTEN**

Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-120.]

O.K. →

❸ **APPLY**

Remove vacuum hose from pressure regulator, and apply vacuum and/or pressure, and try to start.

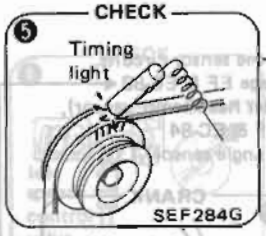
Improved →

❹ **MEASURE** Fuel pressure gauge

Connect vacuum hose to pressure regulator and measure fuel pressure.

Check Mixture ratio feedback system. [See page EF & EC-143.]

❺ **CHECK** Timing light



Check ignition timing.

Adjust ignition timing. [See page EF & EC-34.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 3 — Impossible to start – partial combustion (not affected by throttle position)

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○		○	○								
	Fuel pressure (too low)			○	○	○							
	Ignition timing						○						
FUEL SYSTEM	Fuel filter (clogged)					○							
	Fuel line (clogged)					○							
	Injectors (clogged)	○											
	Pressure regulator				○								
	Pressure regulator vacuum hose (clogged)			○									
IGNITION SYSTEM	Ignition wires (ignition leaks)							○	○				
	Spark plugs (wet with fuel)									○			
	Ignition switch	○						○			○		
INTAKE SYSTEM	Throttle chamber (with ports clogged)		○										
	Throttle valve (clogged)		○										
CONTROL SYSTEM	Cylinder head temperature sensor											○	○
	Crank angle sensor	○						○				○	

SERVICE PROCEDURE

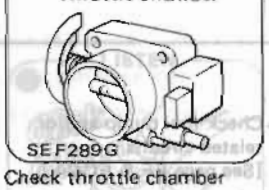
❶ LISTEN

Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-120.]

O.K. ↓

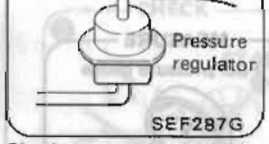
❷ CHECK — Throttle chamber



Check throttle chamber ports and valve for clogging.

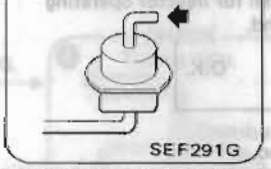
N.G. → Clean the ports and/or throttle valve.

❸ CHECK



Check vacuum hose of pressure regulator for clogging.

O.K. → **❹ REMOVE** — Pressure regulator



Remove vacuum hose from pressure regulator, and try to start.

Improved → **❺ MEASURE** — Fuel pressure

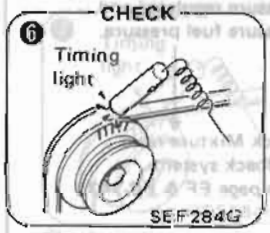
Connect vacuum hose to pressure regulator and measure fuel pressure.

→ Check Mixture ratio feedback system. [See page EF & EC-143.]

N.G. ↓

Repair or replace the hose.

❻ CHECK — Timing light

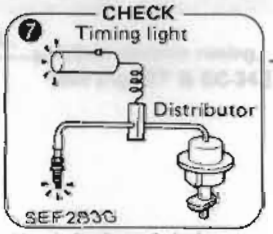


Check ignition timing.

N.G. ↓

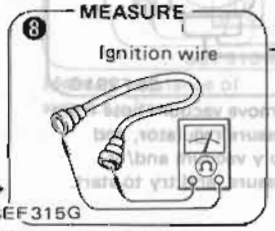
Adjust ignition timing. [See page EF & EC-34.]

❼ CHECK — Timing light



Check flashes of timing light for weakness.

N.G. → **❽ MEASURE** — Ignition wire

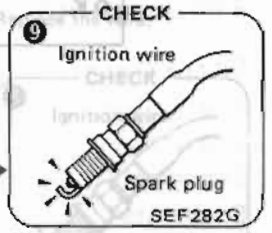


Measure resistance of suspect ignition wires.

N.G. ↓

Replace the wires.

O.K. → **❾ CHECK** — Ignition wire



Remove spark plugs and check their ignition sparks by cranking.

❿ PERFORM — Self-diagnosis Mode IV

N.G. → Check starter circuit. [See page EF & EC-118.]

Perform self-diagnosis Mode IV (for start signal).

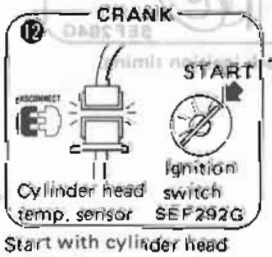
⓫ PERFORM — Self-diagnosis Mode III

for C.A.S. → Check the sensor circuits. [See page EF & EC-88 (cylinder head temp. sensor), page EF & EC-84 (crank angle sensor).]

for C.H.T.S. →

Perform self-diagnosis Mode III (for cylinder head temp. sensor and crank angle sensor).

⓬ CRANK — START



Start with cylinder head temp. sensor connector disconnected.

N.G. → Check the sensor circuits. [See page EF & EC-88 (cylinder head temp. sensor), page EF & EC-84 (crank angle sensor).]

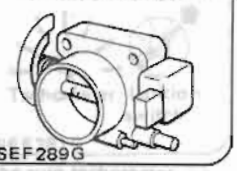
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 4 **Impossible to start – partial combustion (throttle position changes combustion quality)**

	POSSIBLE CAUSES	❶	❷	❸	❹
INTAKE SYSTEM	Throttle chamber (with ports clogged)	○			
	Throttle valve (clogged)		○		
	Air regulator (stuck closed)			○	
	Idle speed control valve				○
CONTROL SYSTEM	Cylinder head temperature sensor				○
	Idle switch				○
	Neutral switch				○

SERVICE PROCEDURE

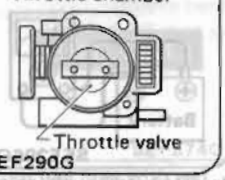
❶ CHECK
Throttle chamber



Check throttle chamber ports for clogging.

N.G. → Clean the ports.

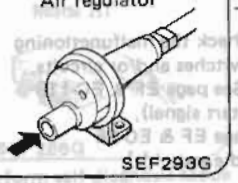
❷ CHECK
Throttle chamber



Check throttle valve for clogging.

N.G. → Clean the valve.

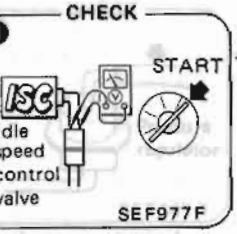
❸ CHECK
Air regulator



Make sure air regulator stays open before warm-up

N.G. → Check air regulator and/or its circuit.
[See page EF & EC-136.]

❹ CHECK



Check terminal voltage of idle speed control valve while cranking.

N.G. → Check idle speed control circuit.
[See page EF & EC-128/130.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 5 Hard to start – before warm-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio			○			○
IGNITION SYSTEM	Ignition switch (no start signal)	○			○		
INTAKE SYSTEM	Air regulator			○			
CONTROL SYSTEM	Cylinder head temperature sensor					○	○
	Idle switch				○		
	Neutral switch	○					
OTHERS	Starter (operation too slow)	○					
	Battery (voltage too low)	○	○				

SERVICE PROCEDURE

❶ CHECK
START
Tachometer
Ignition switch
SEF281G
Make sure tachometer indicates about 300 rpm while cranking.

N.G. → Check injector circuit. [See page EF & EC-120.]

❷ MEASURE
Battery
SEF296G
Measure battery voltage.

N.G. (less than 12V) → Charge the battery.

❸ CHECK
Air regulator
SEF293G
Make sure air regulator stays open before warm-up.

N.G. → Check air regulator and/or its circuit. [See page EF & EC-136.]

❹ PERFORM
Self-diagnosis Mode IV
SEF285G
Perform self-diagnosis Mode IV (for start signal and idle switch).

N.G. → Check the malfunctioning switches and/or circuits. [See page EF & EC-118 (start signal), page EF & EC-96 (idle switch).]

❺ PERFORM
Self-diagnosis Mode III
SEF285G
Perform self-diagnosis Mode III (for cylinder head temp. sensor).

N.G. → Check fuel pressure. [See page EF & EC-34.]

❻ CRANK
START
Cylinder head temp. sensor
Ignition switch
SEF292G
Start with cylinder head temp. sensor connector disconnected.

N.G. → Check sensor circuit. [See page EF & EC-88.]

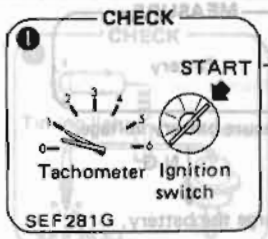
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 6 **Hard to start – after warm-up**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio			○			○	○		
	Fuel pressure			○			○	○	○	
FUEL SYSTEM	Fuel line (hot fuel)			○						
	Pressure regulator (low fuel pressure)						○			
	Pressure regulator vacuum hose (clogged)						○			
	Pressure regulator control solenoid								○	○
	Pressure regulator control solenoid vacuum hose						○			
	Surge tank (cracks)							○		
	Fuel temperature sensor (open circuited)				○					
IGNITION SYSTEM	Ignition switch (no start signal)	○				○				
CONTROL SYSTEM	Cylinder head temperature sensor				○					
	Air flow meter				○					
OTHERS	Starter (operation too slow)	○								
	Battery (voltage too low)	○	○							

SERVICE PROCEDURE

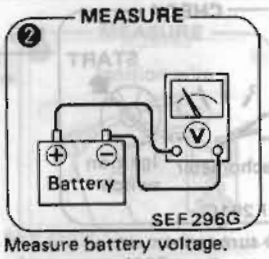
❶ **CHECK**



Make sure tachometer indicates about 300 rpm while cranking.

N.G. →

❷ **MEASURE**



Measure battery voltage.

N.G. (less than 12V) ↓

Charge the battery.

❸ **CRANK**

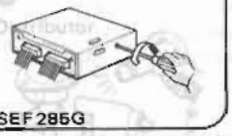
Cool fuel lines with wet rags, etc. and try to start.

No change → Proceed to other steps.

Improved → Proceed to other steps. If everything is O.K., check fuel vapor pressure.

❹ **PERFORM**

Self-diagnosis Mode III

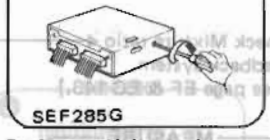


Perform self-diagnosis Mode III (for cylinder head temp. sensor, air flow meter and fuel temp. sensor).

N.G. → Check sensor circuits. [See page EF & EC-88 (cylinder head temp. sensor), page EF & EC-86 (air flow meter), page EF & EC-112 (fuel temp. sensor).]

❺ **PERFORM**

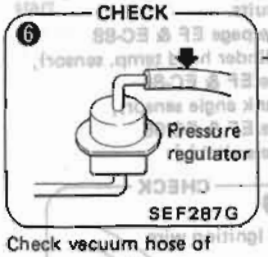
Self-diagnosis Mode IV



Perform self-diagnosis Mode IV (for start signal).

N.G. → Check starter circuit. [See page EF & EC-118.]

❻ **CHECK**



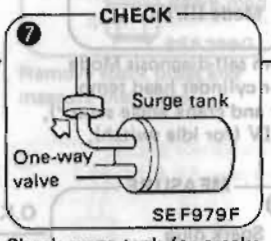
Check vacuum hose of pressure regulator for clogging.

O.K. →

N.G. ↓

Repair or replace the hose.

❼ **CHECK**



Check surge tank for cracks, and one-way valve for clogging.

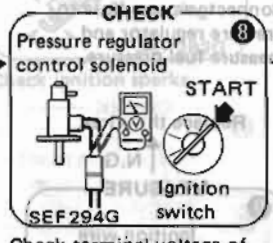
O.K. →

N.G. ↓

Repair/replace the parts.

❽ **CHECK**

Pressure regulator control solenoid



Check terminal voltage of pressure regulator control solenoid while cranking.

N.G. →

❾ **LISTEN**

Pressure regulator control solenoid

Listen for clicking sound from pressure regulator control solenoid when applying battery voltage.

N.G. ↓

Replace the solenoid.

O.K. ↓

Check the solenoid circuit. [See page EF & EC-134.]

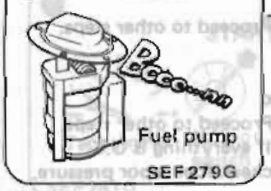
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION **7** Hard to start – every time

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○				○	○						
	Fuel pressure						○	○					
	Ignition sparks (missing)								○	○		○	
	Ignition timing				○								
FUEL SYSTEM	Fuel pump (improper operation)	○											
	Fuel line (clogged)							○					
	Canister (air leaks)					○							
	Pressure regulator (low fuel pressure)						○						
IGNITION SYSTEM	Ignition wires (ignition leaks)								○	○			
	Spark plugs (improper gap)										○		
CONTROL SYSTEM	Crank angle sensor	○							○				○
	Cylinder head temperature sensor												○
	Idle switch												○
	Neutral switch		○										
OTHERS	Starter (operation too slow)		○										
	Battery (voltage too low)		○	○									

SERVICE PROCEDURE

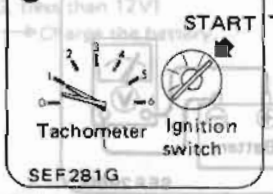
❶ **LISTEN**



Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-94.]

❷ **CHECK** START



Make sure tachometer indicates about 300 rpm while cranking.

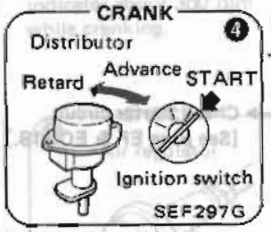
N.G. →

❸ **MEASURE** Battery

Measure battery voltage.

N.G. → Charge the battery.

❹ **CRANK**

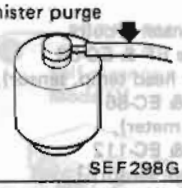


Advance/retard ignition timing and try to start.

No change → [Proceed to other steps.]

Improved →

❺ **CHECK** Canister purge

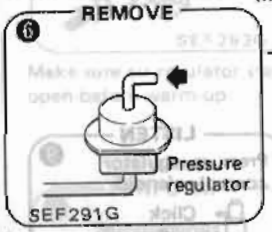


Check vacuum hose of canister for air leaks.

N.G. → Repair or replace the hose.

Check Mixture ratio feedback system. [See page EF & EC-143.]

❻ **REMOVE**



Remove vacuum hose from pressure regulator, and try to start.

❼ **MEASURE** Fuel pressure

Connect vacuum hose to pressure regulator and measure fuel pressure.

⓬ **PERFORM** Self-diagnosis Mode III/IV

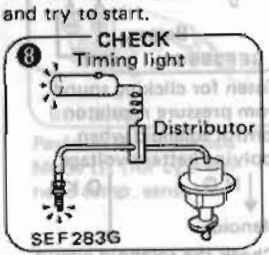
Perform self-diagnosis Mode III (for cylinder head temp. sensor and crank angle sensor), Mode IV (for idle switch).

N.G. → Check the malfunctioning circuits. [See page EF & EC-88 (cylinder head temp. sensor), page EF & EC-84 (crank angle sensor), page EF & EC-96 (idle switch).]

Replace the wires.

N.G. ↑

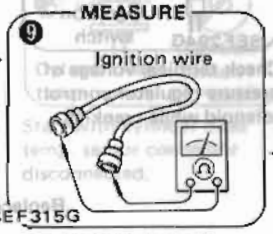
❽ **CHECK** Timing light



Check flashes of timing light for weakness.

N.G. →

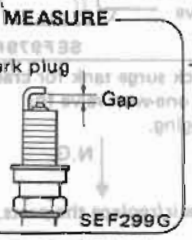
❾ **MEASURE** Ignition wire



Measure resistance of suspect ignition wires.

O.K. →

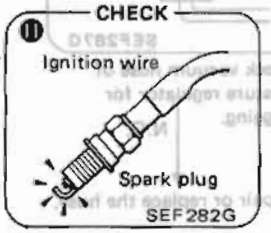
❿ **MEASURE** Spark plug



Remove spark plugs and measure their gaps.

O.K. →

⓫ **CHECK** Ignition wire



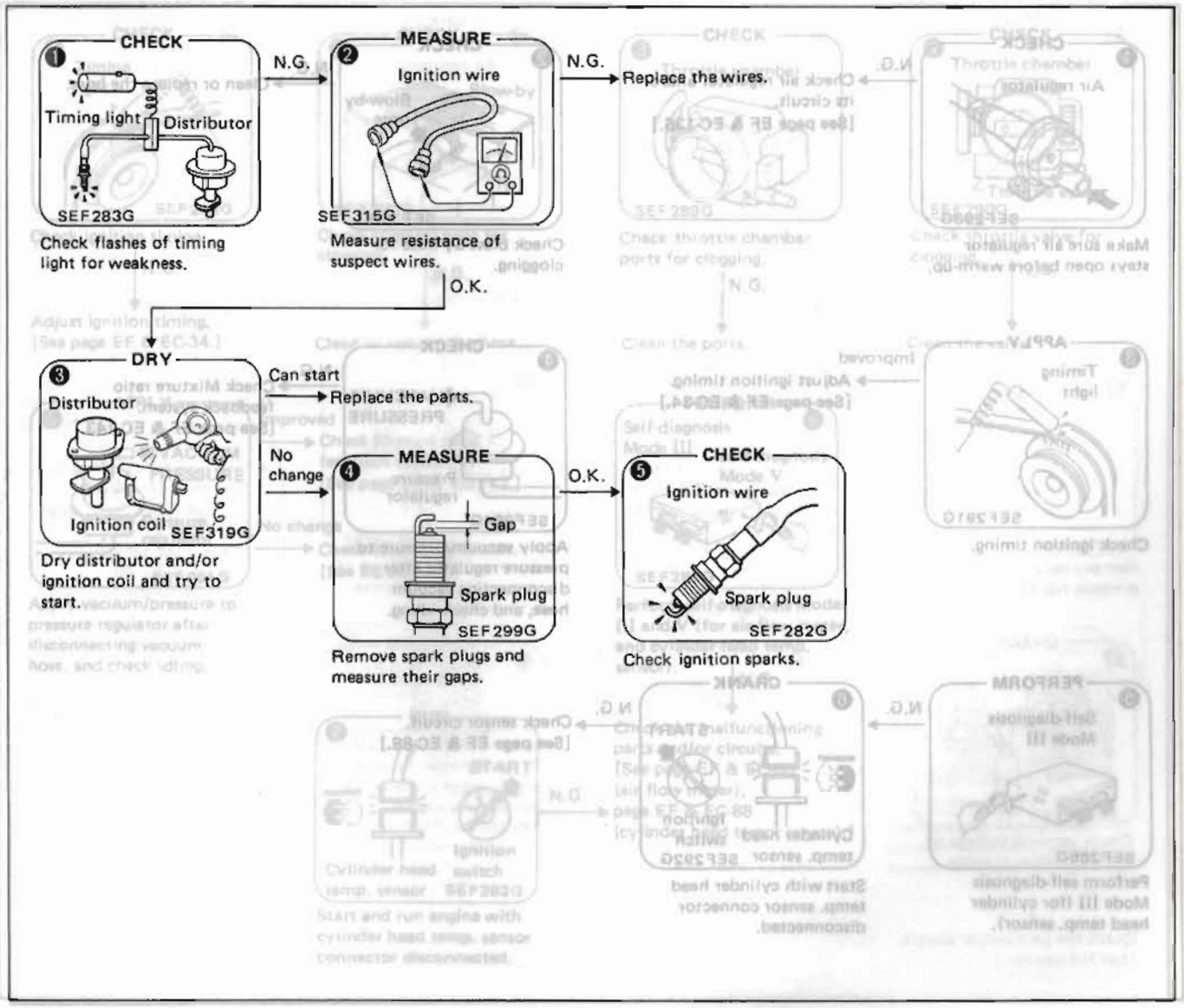
Check ignition sparks.

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 8 **Hard to start – morning after a rainy day**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺
SPECIFICATIONS	Ignition sparks (weak)	○	○			○
IGNITION SYSTEM	Power transistor	○				○
	Ignition coil	○		○		○
	Center cable (ignition leaks)	○				○
	Ignition wires (ignition leaks)	○	○			○
	Distributor cap (ignition leaks)	○		○		○
	Spark plugs (improper gap)				○	○

SERVICE PROCEDURE



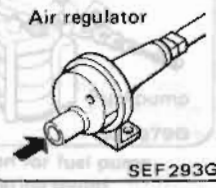
DIAGNOSTIC PROCEDURE

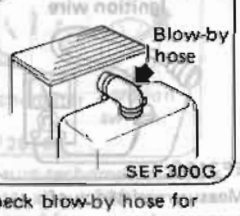
Diagnostic Table (Cont'd)

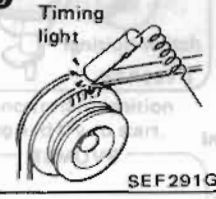
SYMPTOM & CONDITION 9 **Abnormal idling – no fast idle**

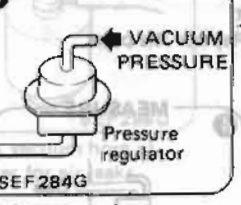
	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio	○	○		○		
	Ignition timing			○			
INTAKE SYSTEM	Blow-by hose (clogged)		○				
	Air regulator (stuck closed)	○					
CONTROL SYSTEM	Cylinder head temperature sensor					○	○

SERVICE PROCEDURE

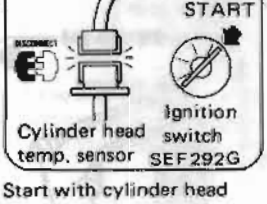
❶ **CHECK**
Air regulator

SEF293G
N.G. → Check air regulator and/or its circuit. [See page EF & EC-136.]
Make sure air regulator stays open before warm-up.

❷ **CHECK**
Blow-by hose

SEF300G
N.G. → Clean or replace the hose.
Check blow-by hose for clogging.

❸ **APPLY**
Timing light

SEF291G
Improved → Adjust ignition timing. [See page EF & EC-34.]
Check ignition timing.

❹ **CHECK**
VACUUM PRESSURE
Pressure regulator

SEF284G
N.G. → Check Mixture ratio feedback system. [See page EF & EC-143.]
Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

❺ **PERFORM**
Self-diagnosis Mode III

SEF285G
N.G. → ❻ **CRANK**
START
Cylinder head temp. sensor
Ignition switch

SEF292G
N.G. → Check sensor circuit. [See page EF & EC-88.]
Perform self-diagnosis Mode III (for cylinder head temp. sensor).
Start with cylinder head temp. sensor connector disconnected.

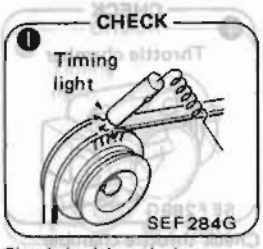
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION **10** **Abnormal idling — low idle (after warm-up)**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio		○			○		
	Ignition timing (too retarded)	○						
INTAKE SYSTEM	Throttle chamber (with ports clogged)			○				
	Throttle valve (clogged)				○			
CONTROL SYSTEM	Crank angle sensor						○	
	Air flow meter						○	
	Cylinder head temperature sensor						○	○
	Load switches (remaining OFF)							

SERVICE PROCEDURE

❶ CHECK

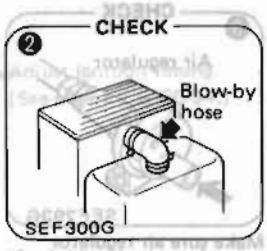


Check ignition timing.

N.G.

Adjust ignition timing. [See page EF & EC-34.]

❷ CHECK



Check blow-by hose for clogging.

N.G.

Clean or replace the hose.

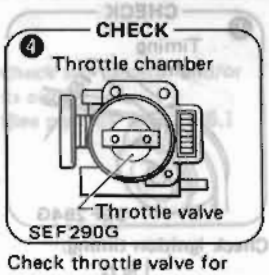
❸ CHECK

Check throttle chamber ports for clogging.

N.G.

Clean the ports.

❹ CHECK



Check throttle valve for clogging.

N.G.

Clean the valve.

❺ APPLY

Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

Improved → Check Mixture ratio feedback system. [See page EF & EC-143.]

No change → Check load signal circuit. [See EL section.]

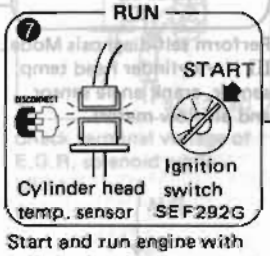
❻ PERFORM

Perform self-diagnosis Modes III and V (for air flow meter, and cylinder head temp. sensor).

N.G.

Check the malfunctioning parts and/or circuits. [See page EF & EC-86 (air flow meter), page EF & EC-88 (cylinder head temp. sensor).]

❼ RUN



N.G.

Start and run engine with cylinder head temp. sensor connector disconnected.

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 11 — **Abnormal idling – high idle (after warm-up)**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Mixture ratio		○	○		○	○			○		
	Ignition timing (too advanced)	○										
INTAKE SYSTEM	Air duct (leaks)		○									
	Throttle chamber (air leaks)				○							
	Throttle valve (stuck control wire)				○							
	Intake manifold (gasket) (air leaks)		○									
	Air regulator (stuck open)			○								
	Idle speed control valve (remaining ON)							○				
	F.I.C.D. solenoid (remaining ON)								○			
CONTROL SYSTEM	Crank angle sensor										○	
	Air flow meter										○	
	Cylinder head temperature sensor										○	○
	Idle switch (remaining OFF)							○		○		
	Load switches (remaining ON)							○	○			
OTHERS	Battery (voltage too low)											

SERVICE PROCEDURE

❶ CHECK

Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-34.]

❷ CHECK

Check intake system for air leaks.

N.G. → Repair/replace the part.

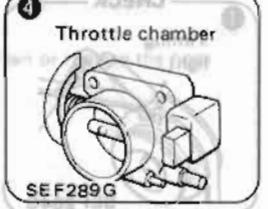
O.K. → Check throttle wire for rough sliding.

❸ CHECK

Make sure air regulator stays closed after warm-up.

N.G. → Check air regulator and/or its circuit. [See page EF & EC-136.]

❹ CHECK



Check throttle chamber ports and valve for clogging.

N.G. → Clean the ports and/or throttle valve.

❺ REMOVE

Remove vacuum hose from pressure regulator, and try to start.

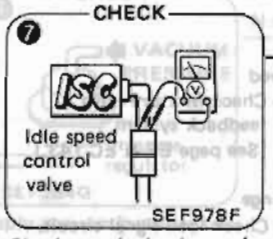
Improved → ❻ MEASURE

Fuel pressure

Connect vacuum hose to pressure regulator and measure fuel pressure.

Check Mixture ratio feedback system. [See page EF & EC-143.]

❼ CHECK

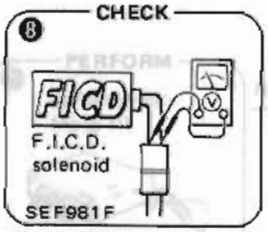


Check terminal voltage of idle speed control valve while idling.

N.G. → Check the part and/or circuit. [See page EF & EC-128/130.]

Check sensor circuit. [See page EF & EC-88 (cylinder head temp. sensor), page EF & EC-84 (crank angle sensor), page EF & EC-86 (air flow meter).]

❽ CHECK



Check terminal voltage of F.I.C.D. solenoid while idling.

Check the part and/or circuit. [See HA section.]

❾ PERFORM

Self-diagnosis Mode IV

Perform self-diagnosis Mode IV (for idle switch).

N.G. → Check the idle switch circuit. [See page EF & EC-118.]

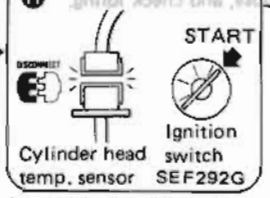
❿ PERFORM

Self-diagnosis Mode III

Perform self-diagnosis Mode III (for cylinder head temp. sensor, crank angle sensor and air flow meter).

N.G.

⓫ CRANK



Start with cylinder head temp. sensor connector disconnected.

N.G.

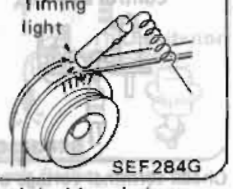
DIAGNOSTIC PROCEDURE

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 12 Unstable idling – before warm-up

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio		○	○					
	Ignition timing	○							
INTAKE SYSTEM	Air regulator (not open enough)		○						
	Idle speed control valve (remaining OFF)				○				
CONTROL SYSTEM	Cylinder head temperature sensor							○	○
E.G.R. SYSTEM	E.G.R. control valve (stuck open)					○			
	E.G.R. solenoid (remaining OFF)					○	○		

SERVICE PROCEDURE

❶ CHECK
Timing light


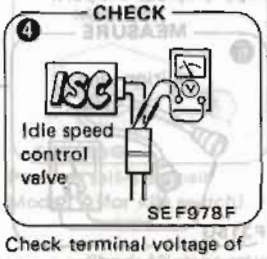
Check ignition timing.
N.G. → Adjust ignition timing. [See page EF & EC-34.]

❷ CHECK
Air regulator

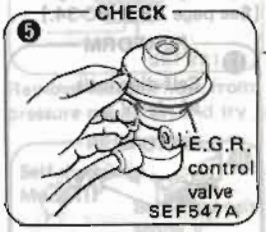

Make sure air regulator stays open before warm-up.
N.G. → Check air regulator and/or its circuit. [See page EF & EC-136.]

❸ APPLY
VACUUM PRESSURE
Pressure regulator

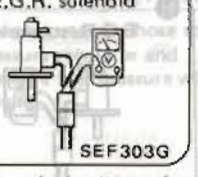

Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.
Improved → Check Mixture ratio feedback system. [See page EF & EC-143.]

❹ CHECK
Idle speed control valve


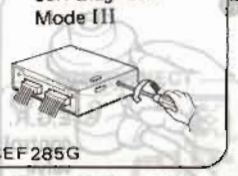
Check terminal voltage of idle speed control valve while idling.
Does not turn ON → Check its circuit. [See page EF & EC-128/130.]

❺ CHECK
E.G.R. control valve


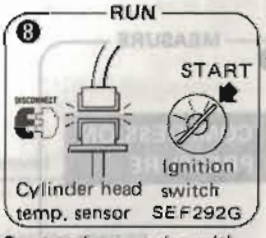
Check E.G.R. valve for operation.
Stays lifted →

❻ CHECK
E.G.R. solenoid


Check terminal voltage of E.G.R. solenoid while idling.
N.G. → Check the solenoid circuit. [See page EF & EC-126.]

❼ PERFORM
Self-diagnosis Mode III


Perform self-diagnosis Mode III (for cylinder head temp. sensor).
N.G. → Check sensor circuit. [See page EF & EC-84.]

❽ RUN
START
Ignition switch
Cylinder head temp. sensor


Start and run engine with cylinder head temp. sensor connector disconnected.
N.G. → Check sensor circuit. [See page EF & EC-84.]

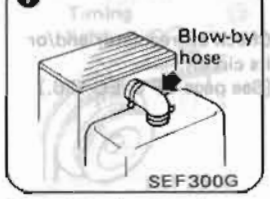
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 13 **Unstable idling – after warm-up**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○	○	○	○								
	Ignition sparks					○	○	○					
	Ignition timing								○				
	Compression pressure									○			
FUEL SYSTEM	Fuel line (clogged)												
	Canister (air leaks)			○									
	Pressure regulator control solenoid				○								
IGNITION SYSTEM	Power transistor					○		○					
	Ignition coil					○		○					
	Ignition wires					○	○	○					
INTAKE SYSTEM	Blow-by hose (leaks)	○											
	Air duct (leaks)		○										
CONTROL SYSTEM	Idle switch												○
	Load switches,												
E.G.R. SYSTEM	E.G.R. control valve										○		
	E.G.R. solenoid										○	○	

SERVICE PROCEDURE

❶ CHECK

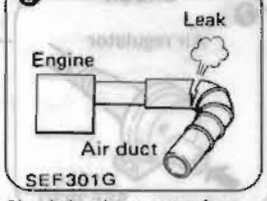


Check blow-by hose for leaks.

N.G.

Repair/replace the hose.

❷ CHECK

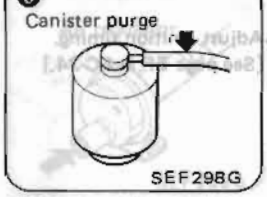


Check intake system for air leaks.

N.G.

Repair/replace the part.

❸ CHECK



Check purge line for leaks.

N.G.

Repair/replace the hose.

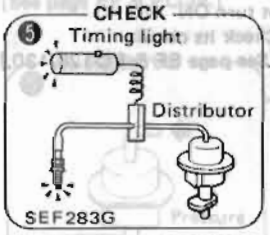
❹ CHECK

Check terminal voltage of the solenoid while idling.

N.G.

Check the solenoid circuit. [See page EF & EC-134.]

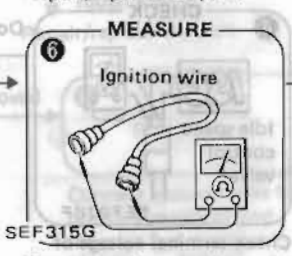
❺ CHECK



Check flashes of timing light for weakness.

N.G.

❻ MEASURE



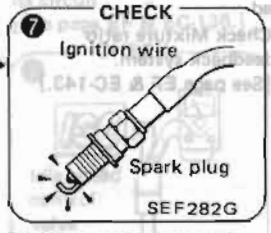
Measure resistance of suspect wires.

O.K.

N.G.

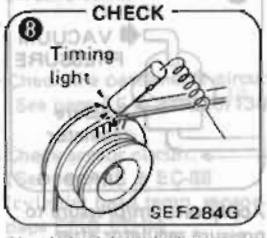
Replace the wire.

❼ CHECK



Remove spark plugs and check their ignition sparks.

❽ CHECK



Check ignition timing.

N.G.

Adjust ignition timing. [See page EF & EC-34.]

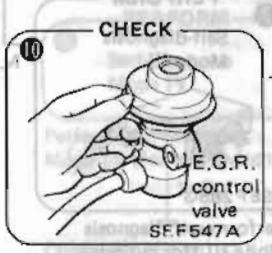
❾ MEASURE

Measure compression pressure.

N.G.

Check cylinder head and gasket. [See EM section.]

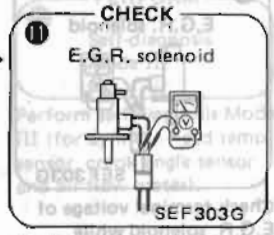
❿ CHECK



Check E.G.R. valve for operation.

Stays lifted

⓫ CHECK



Check terminal voltage of E.G.R. solenoid while idling.

N.G.

Check the solenoid circuit. [See page EF & EC-126.]

⓬ PERFORM

Perform self-diagnosis Mode IV (for idle switch).

N.G.

Check the idle switch circuit. [See page EF & EC-96.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 14 Poor driveability – stumble (while accelerating)

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio				○		○	○		○
	Fuel pressure						○	○		
FUEL SYSTEM	Fuel filter (clogged)							○		
	Fuel line (clogged)							○		
	Injectors (clogged)							○		
IGNITION SYSTEM	Power transistor	○		○						
	Ignition coil	○		○						
	Ignition wires (ignition leaks)	○	○	○						
	Spark plugs (ignition leaks, improper gap)			○						
INTAKE SYSTEM	Air duct (leaks)				○					
CONTROL SYSTEM	Crank angle sensor	○							○	
	Air flow meter								○	
	Cylinder head temperature sensor	○							○	
	Exhaust gas sensor								○	○
	Idle switch (remaining OFF)					○				
OTHERS	Fuel (poor quality)									

SERVICE PROCEDURE

❶ CHECK — Timing light, Distributor — SEF283G
Check flashes of timing light for weakness.
N.G. → **❷ MEASURE** — Ignition wire — SEF315G
Measure resistance of suspect wires.
N.G. → Replace the wires.
O.K. → **❸ CHECK** — Ignition wire, Spark plug — SEF282G
Remove spark plugs and check their ignition sparks.

❹ CHECK — Leak, Engine, Air duct — SEF301G
Check intake system for air leaks.
N.G. → Repair/replace the part.

❺ PERFORM — Self-diagnosis Mode IV — SEF285G
Perform self-diagnosis Mode IV (for idle switch).
N.G. → Check the idle switch circuit. [See page EF & EC-96.]

❻ REMOVE — Pressure regulator — SEF291G
Remove vacuum hose from pressure regulator, and try to drive.
Improved → **❼ MEASURE** — Fuel pressure gauge — SEF286G
Connect vacuum hose to pressure regulator and measure fuel pressure while driving.
→ Check Mixture ratio feedback system. [See page EF & EC-143.]

❽ PERFORM — Self-diagnosis Mode III, Self-diagnosis Mode V — SEF285G
Perform self-diagnosis Mode III and V (for air flow meter and exhaust gas sensor).
N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-86 (air flow meter), page EF & EC-104 (exhaust gas sensor).]

❾ DISCONNECT — Exhaust gas sensor — SEF307G
Disconnect exhaust gas sensor connector, and try to drive.
Improved → Replace the sensor.
No change → Check Mixture ratio feedback system. [See page EF & EC-143.]

DIAGNOSTIC PROCEDURE

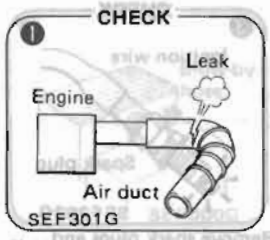
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 15 | **Poor driveability – surge (while cruising)**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too lean)	○				○	○			○
	Fuel pressure (low)					○	○			
	Ignition timing		○							
IGNITION SYSTEM	(missing)								○	
INTAKE SYSTEM	Air duct (leaks)	○								
	Throttle chamber (air leaks)	○								
	Intake manifold (gasket) (air leaks)	○								
CONTROL SYSTEM	Crank angle sensor								○	
	Air flow meter								○	
	Exhaust gas sensor								○	○
	Idle switch							○		
E.G.R. SYSTEM	E.G.R. control valve (stuck open)			○						
	E.G.R. solenoid (remaining OFF)			○	○					
	E.G.R. vacuum hose (removed)			○						

SERVICE PROCEDURE

❶ **CHECK**

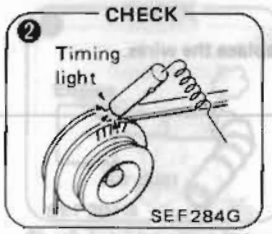


Check intake system for air leaks

N.G. ↓

Repair/replace the part.

❷ **CHECK**

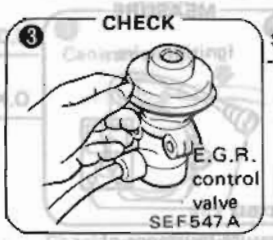


Check ignition timing.

N.G. ↓

Adjust ignition timing. [See page EF & EC-34.]

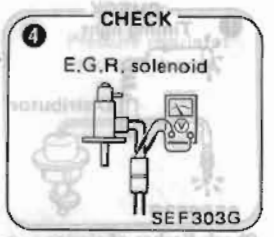
❸ **CHECK**



Stays lifted →

Check E.G.R. valve for operation.

❹ **CHECK**

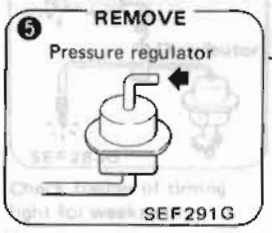


Check terminal voltage of E.G.R. solenoid.

N.G. ↓

Check the solenoid circuit. [See page EF & EC-126.]

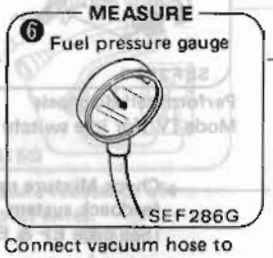
❺ **REMOVE**



Remove vacuum hose from pressure regulator, and try to drive.

Improved →

❻ **MEASURE**



Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

→ Check Mixture ratio feedback system. [See page EF & EC-143.]

❼ **PERFORM**

Perform self-diagnosis Mode IV (for idle switch).

N.G. ↓

Check the idle switch circuit. [See page EF & EC-96.]

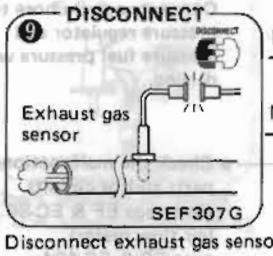
❽ **PERFORM**

Perform self-diagnosis Mode III and V (for crank angle sensor, air flow meter, ignition signal and exhaust gas sensor).

N.G. →

Check the malfunctioning parts and/or circuits. [See page EF & EC-84 (crank angle sensor), page EF & EC-86 (air flow meter), page EF & EC-92 (ignition signal), page EF & EC-104 (exhaust gas sensor).]

❾ **DISCONNECT**



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check mixture ratio feedback system. [See page EF & EC-143.]

DIAGNOSTIC PROCEDURE

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION **16** **Poor driveability – lack of power**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Fuel pressure								○	○		
	Ignition timing		○									
	Compression pressure (too low)							○				
FUEL SYSTEM	Fuel pump (low fuel output)									○		
	Fuel filter (clogged)									○		
	Fuel line (clogged)									○		
	Injectors (clogged)									○		
IGNITION SYSTEM	Ignition wires (ignition leaks)				○	○	○					
	Spark plugs (improper gap)						○					
INTAKE SYSTEM	Air cleaner element (clogged)	○										
	Throttle chamber (clogged)			○								
	Throttle valve (not open enough)			○								
CONTROL SYSTEM	Air flow meter										○	
	Exhaust gas sensor											○

SERVICE PROCEDURE

❶ **CHECK**

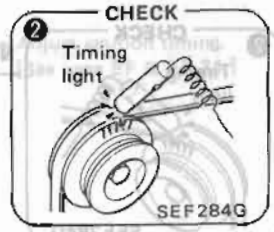
AIR CLEANER ELEMENT

Check air cleaner element for clogging.

N.G.

Replace the part.

❷ **CHECK**

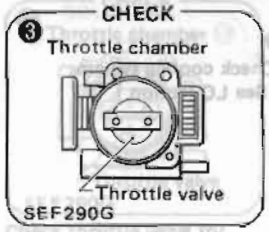


Check ignition timing with a timing light.

N.G.

Adjust ignition timing. [See page EF & EC-34.]

❸ **CHECK**

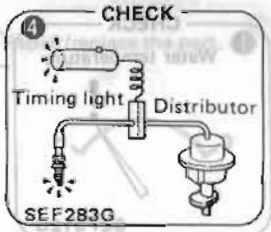


Check throttle valve for rough movement.

N.G.

Repair/replace the part.

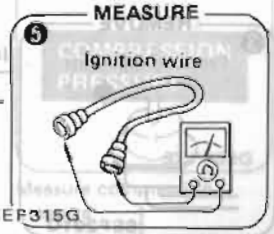
❹ **CHECK**



Check flashes of timing light for weakness.

N.G.

❺ **MEASURE**



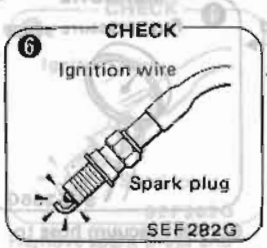
Measure resistance of suspect wires.

N.G.

Replace the wires.

O.K.

❻ **CHECK**



Remove spark plugs and check their ignition sparks.

❼ **MEASURE**

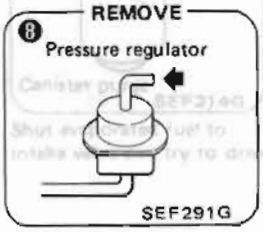
COMPRESSION PRESSURE

Measure compression pressure.

Check cylinder head and gasket. [See EM section.]

❽ **REMOVE**

Pressure regulator

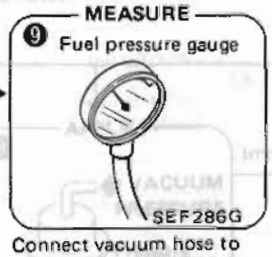


Remove vacuum hose from pressure regulator, and try to drive.

Improved

❾ **MEASURE**

Fuel pressure gauge



Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

Check Mixture ratio feedback system. [See page EF & EC-143.]

❿ **PERFORM**

Self-diagnosis Mode III

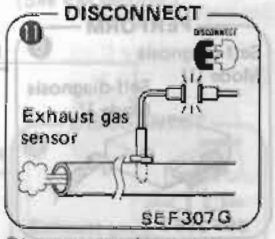
Self-diagnosis Mode V

Perform self-diagnosis Mode III and V (for air flow meter).

N.G.

Check the malfunctioning parts and/or circuit. [See page EF & EC-86.]

⓫ **DISCONNECT**



Disconnect exhaust gas sensor connector, and try to drive.

No change

Improved

Replace the sensor.

Check Mixture ratio feedback system. [See page EF & EC-143.]

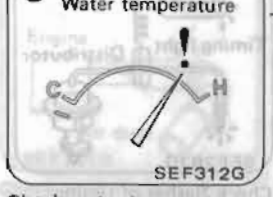
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 17 Poor driveability – detonation

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio (too lean)			○	○		
	Fuel pressure (low)			○			
	Ignition timing (too advanced)		○				
FUEL SYSTEM	Fuel filter (clogged)				○		
	Fuel line (clogged)				○		
	Injectors (clogged)				○		
INTAKE SYSTEM	Turbocharger (too high pressure)					○	
CONTROL SYSTEM	Crank angle sensor (improper 1°-signals)						○
	Air flow meter						○
	Cylinder head temperature sensor						○
OTHERS	Water temperature (too high)	○					
	Fuel (low octane rating, poor quality)						

SERVICE PROCEDURE

❶ **CHECK** Water temperature



Check water temperature.

Too high → Check cooling system. [See LC section.]

❷ **CHECK** Timing light

Check ignition timing.

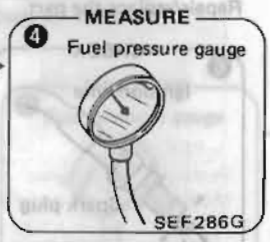
N.G. → Adjust ignition timing. [See page EF & EC-34.]

❸ **REMOVE** Pressure regulator

Remove vacuum hose from pressure regulator, and try to drive.

Improved →

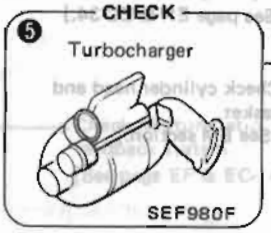
❹ **MEASURE** Fuel pressure gauge



Connect vacuum hose to pressure regulator, and measure fuel pressure while driving.

[TURBOCHARGED ENGINE only]

❺ **CHECK** Turbocharger



Check whether intake air pressure is too high.

N.G. → Check the turbocharger system. [See page EF & EC-151.]

❻ **PERFORM** Self-diagnosis Mode III, Self-diagnosis Mode V

Perform self-diagnosis Mode III and V (for crank angle sensor and air flow meter).

N.G. → Check the malfunctioning parts. [See page EF & EC-84 (crank angle sensor), page EF & EC-86 (air flow meter).]

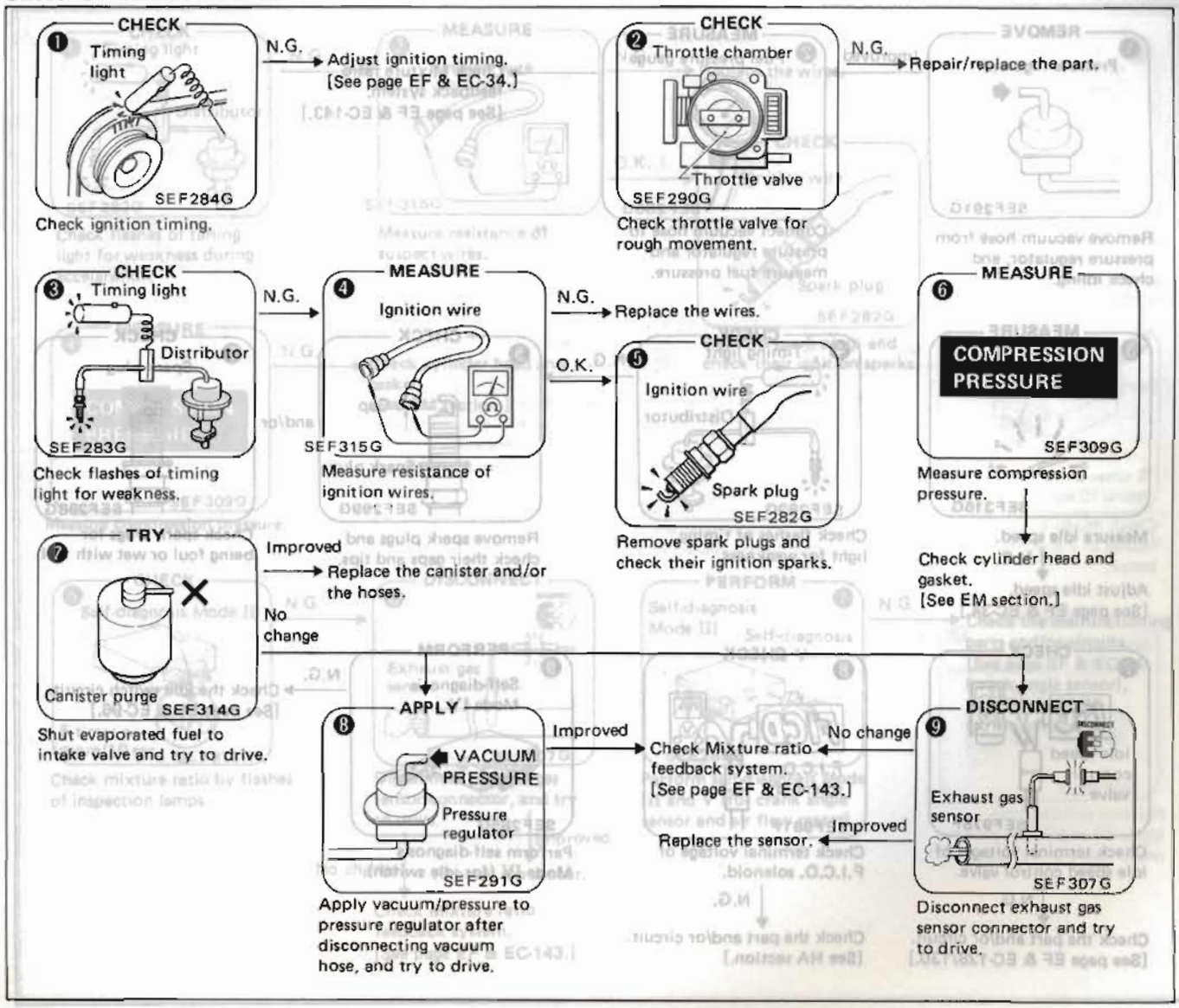
DIAGNOSTIC PROCEDURE

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 18 | **Engine stall — during start-up**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too rich/too lean)							○	○	○
	Ignition sparks (weak)			○	○					
	Ignition timing	○								
	Compression pressure (too low)						○			
FUEL SYSTEM	Canister (too much evaporation to intake)							○		
IGNITION SYSTEM	Ignition wires (ignition leaks)			○	○	○				
	Spark plugs (wet with fuel, improper gap)					○				
INTAKE SYSTEM	Throttle valve (not open enough)		○							

SERVICE PROCEDURE



DIAGNOSTIC PROCEDURE

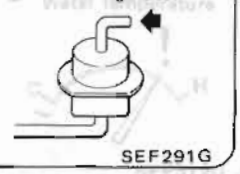
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 19 Engine stall — while idling

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too rich/too lean)	○	○							
	Fuel pressure (low)	○	○							
	Ignition sparks (weak, missing)				○					
	Idle speed (low)			○						
FUEL SYSTEM	Fuel line (clogged)		○							
IGNITION SYSTEM	Spark plugs (wet with fuel, improper gap)					○	○			
INTAKE SYSTEM	Idle speed control valve (improper operation)			○				○		
	F.I.C.D. solenoid (improper operation)			○					○	
CONTROL SYSTEM	Idle switch (remaining OFF)									○
	Neutral switch (remaining OFF)			○						
	Load switches (remaining OFF)							○	○	

SERVICE PROCEDURE

❶ **REMOVE** Pressure regulator



Remove vacuum hose from pressure regulator, and check idling.

Improved →

❷ **MEASURE** Fuel pressure gauge

Connect vacuum hose to pressure regulator and measure fuel pressure.

→ Check Mixture ratio feedback system. [See page EF & EC-143.]

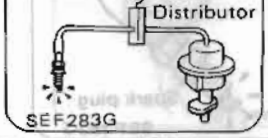
❸ **MEASURE** Tachometer

Measure idle speed.

↓ N.G.

Adjust idle speed. [See page EF & EC-34.]

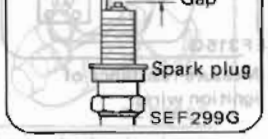
❹ **CHECK** Timing light



Check flashes of timing light for weakness.

N.G. →

❺ **CHECK**



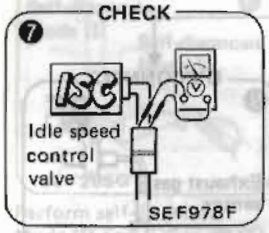
Remove spark plugs and check their gaps and tips.

and/or

❻ **CHECK** Spark plug

Check spark plugs for being foul or wet with fuel.

❼ **CHECK**

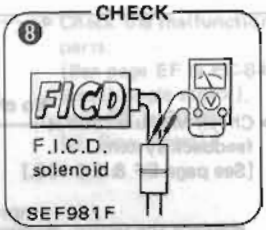


Check terminal voltages of idle speed control valve.

↓ N.G.

Check the part and/or circuit. [See page EF & EC-128/130.]

❽ **CHECK**

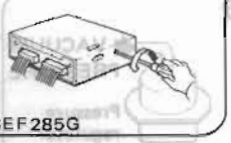


Check terminal voltage of F.I.C.D. solenoid.

↓ N.G.

Check the part and/or circuit. [See HA section.]

❾ **PERFORM** Self-diagnosis Mode IV



Perform self-diagnosis Mode IV (for idle switch).

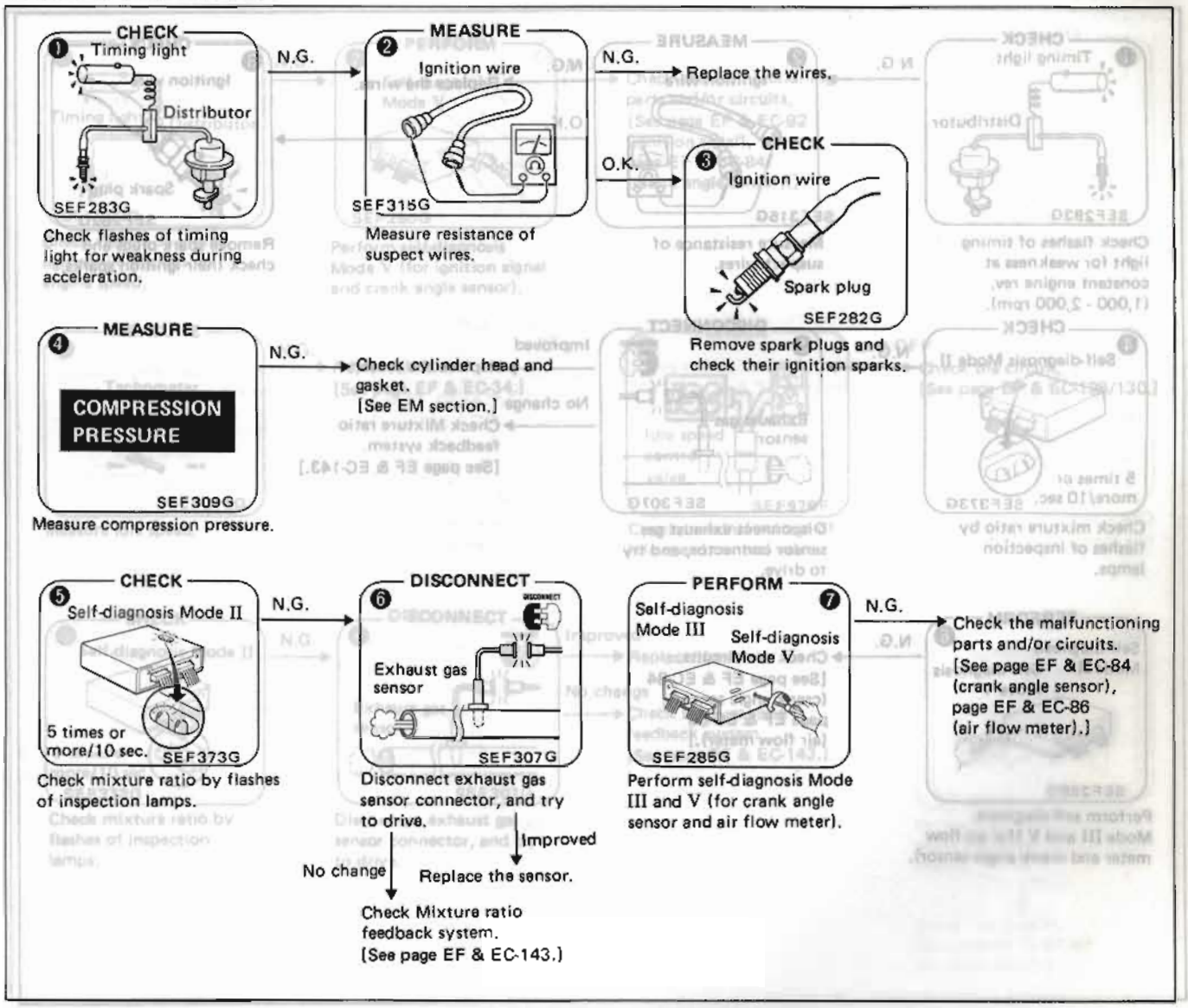
N.G. → Check the idle switch circuit. [See page EF & EC-96.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 20 **Engine stall – while accelerating**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio					○	○	
	Ignition sparks (weak, missing)	○	○	○				
	Compression pressure (low)				○			
CONTROL SYSTEM	Crank angle sensor	○						○
	Air flow meter							○
	Exhaust gas sensor					○	○	

SERVICE PROCEDURE



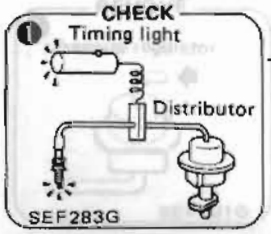
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 21 Engine stall — while cruising

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio				○	○	
	Ignition sparks (weak, missing)	○	○	○			
CONTROL SYSTEM	Crank angle sensor						○
	Air flow meter						○

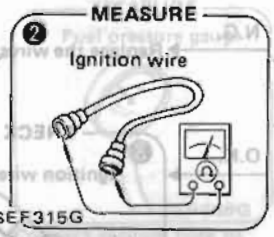
SERVICE PROCEDURE

❶ **CHECK** Timing light



Check flashes of timing light for weakness at constant engine rev. (1,000 - 2,000 rpm).

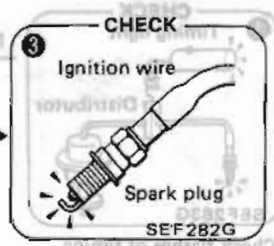
N.G. → ❷ **MEASURE** Ignition wire



Measure resistance of suspect wires.

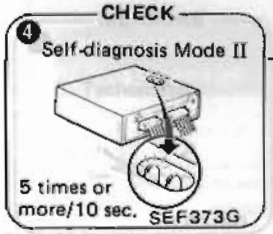
N.G. → Replace the wires.

O.K. → ❸ **CHECK** Ignition wire



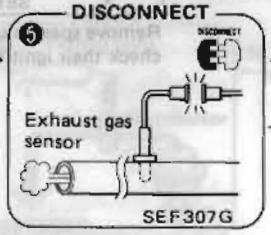
Remove spark plugs and check their ignition sparks.

❹ **CHECK** Self-diagnosis Mode II



Check mixture ratio by flashes of inspection lamps.

N.G. → ❺ **DISCONNECT**



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-143.]

PERFORM

❻ Self-diagnosis Mode III Self-diagnosis Move V

Perform self-diagnosis Mode III and V (for air flow meter and crank angle sensor).

N.G. → Check the circuits. [See page EF & EC-84 (crank angle sensor), page EF & EC-86 (air flow meter).]

DIAGNOSTIC PROCEDURE

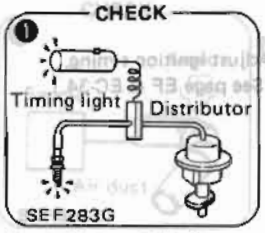
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 22 | **Engine stall — while decelerating/just after stopping**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio					○	○
	Ignition sparks (missing)	○					
	Idle speed (too low)			○			
IGNITION SYSTEM	(missing)	○	○				
INTAKE SYSTEM	Idle speed control valve (remaining OFF)			○	○		
CONTROL SYSTEM	Exhaust gas sensor (malfunctioning feedback control)					○	○
	Crank angle sensor		○				
	Idle switch (remaining OFF)			○			
	Load switches (remaining OFF)			○	○		

SERVICE PROCEDURE

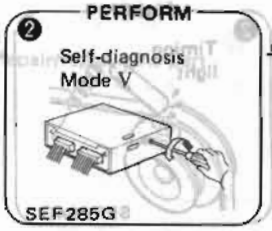
❶ CHECK



Check flashes of timing light while decreasing engine speed.

N.G. →

❷ PERFORM



Perform self-diagnosis Mode V (for ignition signal and crank angle sensor).

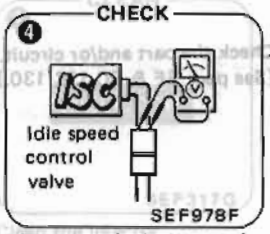
N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-92 (ignition sigial), page EF & EC-84 (crank angle sensor).]

❸ MEASURE

Measure idle speed.

N.G. → Adjust idle speed. [See page EF & EC-34.]

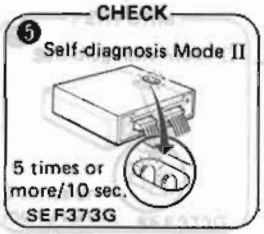
❹ CHECK



Check terminal voltage of idle speed control valve.

Left OFF → Check the circuit. [See page EF & EC-128/130.]

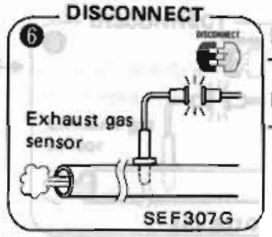
❺ CHECK



Check mixture ratio by flashes of inspection lamps.

N.G. →

❻ DISCONNECT



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

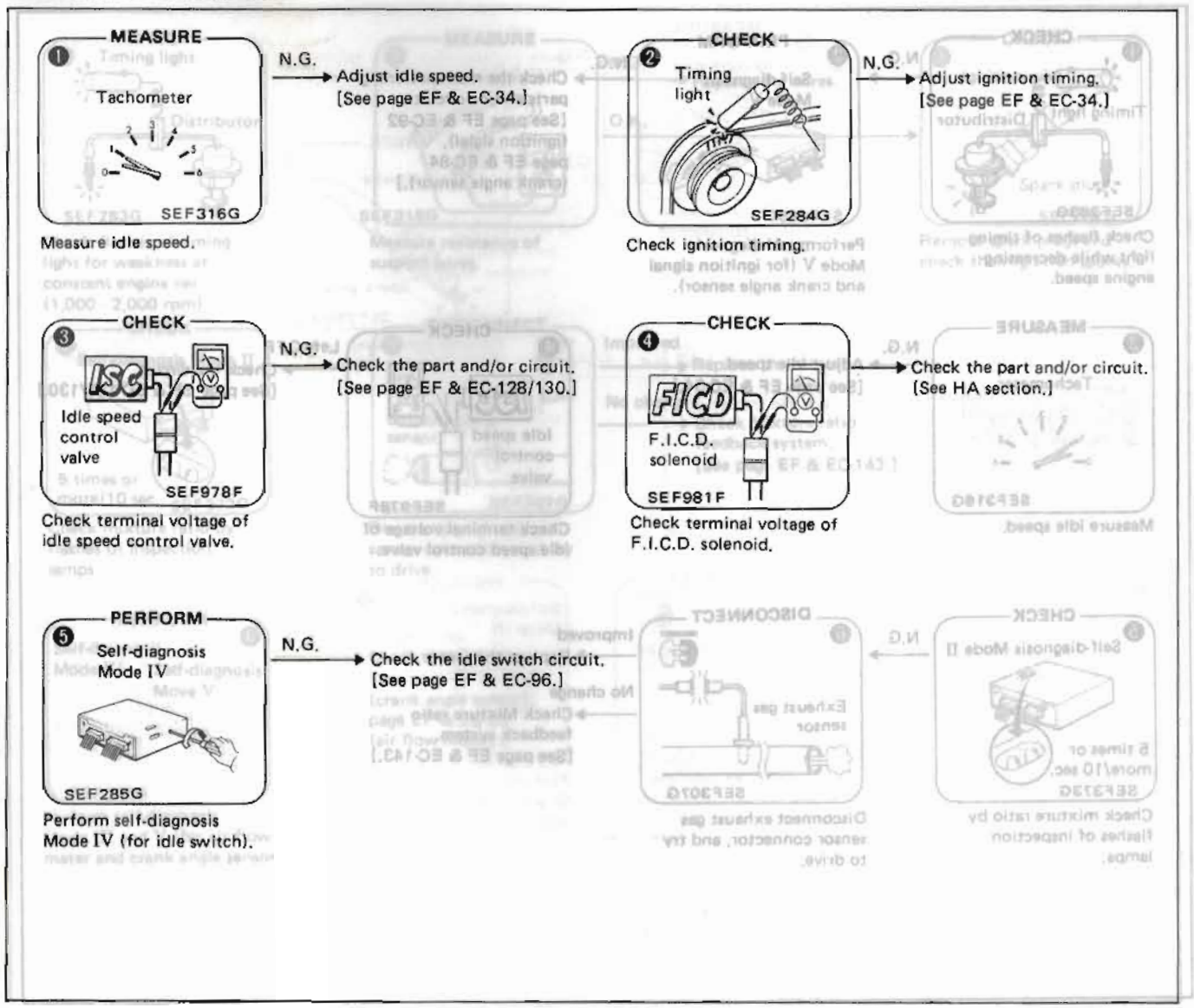
No change → Check Mixture ratio feedback system. [See page EF & EC-143.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 23 Engine stall – while loading

	POSSIBLE CAUSES	❶	❷	❸	❹	❺
SPECIFICATIONS	Ignition timing		○			
	Idle speed (too low)	○				
INTAKE SYSTEM	Idle speed control valve (remaining OFF)	○		○		
	F.I.C.D. solenoid (remaining OFF)	○			○	
CONTROL SYSTEM	Idle switch (remaining OFF)	○				○
	Load switches (remaining OFF)	○		○	○	

SERVICE PROCEDURE



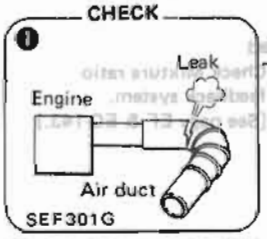
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 24 | **Backfire – through the intake**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio (too lean)	○		○		○	○	
	Ignition timing (too retarded)		○					
FUEL SYSTEM	Injectors (clogged)				○			
INTAKE SYSTEM	Air duct (air leaks)	○						
	Intake manifold (gaskets) (air leaks)	○						
CONTROL SYSTEM	Air flow meter							○
	Exhaust gas sensor					○	○	

SERVICE PROCEDURE

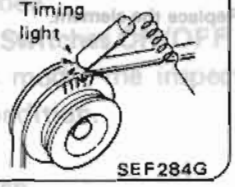
❶ **CHECK**



N.G. → Repair/replace the part.

Check intake system for air leaks.

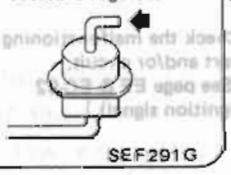
❷ **CHECK**



N.G. → Adjust ignition timing. [See page EF & EC-34.]

Check ignition timing.

❸ **REMOVE**



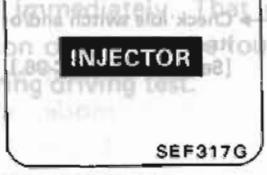
Improved → Check Mixture ratio feedback system. [See page EF & EC-143.]

Remove vacuum hose from pressure regulator, and try to drive.

No change ↓

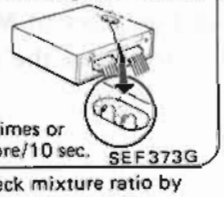
or

❹ **CLEAN**



Clean the injector.

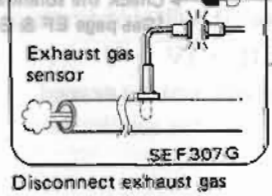
❺ **PERFORM**



N.G. →

Check mixture ratio by flashes of inspection lamps.

❻ **DISCONNECT**



Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-143.]

Disconnect exhaust gas sensor connector, and try to drive.

❼ **CHECK**

Perform self-diagnosis Mode III and V (for air flow meter).

N.G. ↓

Check the circuits. [See page EF & EC-86 (air flow meter).]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 25 Backfire – through the exhaust

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio (too rich)	○	○				
FUEL SYSTEM	Injectors (fuel leaks)		○				
IGNITION SYSTEM	(missing)			○			
INTAKE SYSTEM	Air cleaner element (clogged)	○					
	A.I.V. (always operating)					○	
	A.I.V. solenoid (remaining ON)					○	○
CONTROL SYSTEM	Idle switch (remaining OFF)			○			

SERVICE PROCEDURE

❶ CHECK — AIR CLEANER ELEMENT — SEF320G

Check air cleaner element for clogging.

N.G. → Replace the element.

❷ APPLY PRESSURE — Pressure regulator — SEF291G

Apply pressure to pressure regulator after disconnecting vacuum hose, and try to drive.

Improved → Check Mixture ratio feedback system. [See page EF & EC-143.]

❸ PERFORM — Self-diagnosis Mode IV — SEF285G

Perform self-diagnosis Mode IV (for idle switch).

N.G. → Check idle switch and/or its circuit. [See page EF & EC-96.]

❹ PERFORM — Self-diagnosis Mode V — SEF285G

Perform self-diagnosis Mode V (for ignition signal).

N.G. → Check the malfunctioning part and/or circuit. [See page EF & EC-92 (ignition signal).]

❺ CHECK — A.I.V. — SEF375G

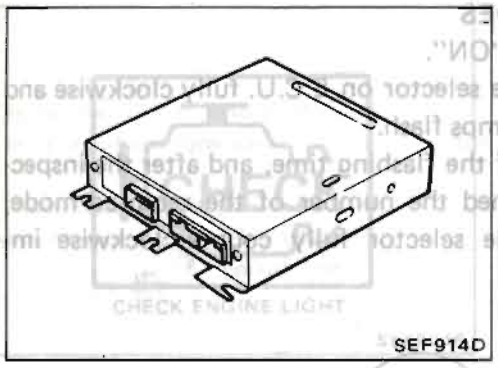
Check secondary air to exhaust system.

Keeps flowing →

❻ CHECK — A.I.V. solenoid — SEF372G

Check terminal voltage of A.I.V. solenoid.

Left ON → Check the solenoid circuit. [See page EF & EC-124.]


SEF914D

Description

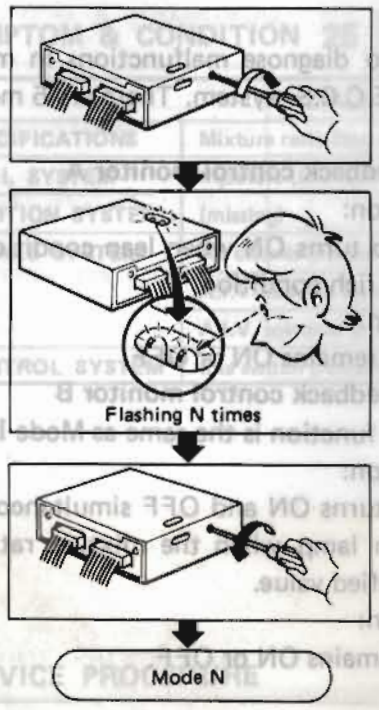
The self-diagnosis is useful to diagnose malfunctions in major sensors and actuators of the E.C.C.S. system. There are 5 modes in the self-diagnosis system.

1. **Mode I – Mixture ratio feedback control monitor A**
   - During closed loop condition:
     The green inspection lamp turns ON when lean condition is detected and goes OFF by rich condition.
   - During open loop condition:
     The green inspection lamp remains ON or OFF.
2. **Mode II – Mixture ratio feedback control monitor B**
   The green inspection lamp function is the same as Mode I.
   - During closed loop condition:
     The red inspection lamp turns ON and OFF simultaneously with the green inspection lamp when the mixture ratio is controlled within the specified value.
   - During open loop condition:
     The red inspection lamp remains ON or OFF.
3. **Mode III – Self-diagnosis**
   This mode is the same as the former self-diagnosis in self-diagnosis mode.
4. **Mode IV – Switches ON/OFF diagnosis**
   During this mode, the inspection lamps monitor the switch ON-OFF condition.
   - Idle switch
   - Starter switch
   - Vehicle speed sensor
5. **Mode V – Real time diagnosis**
   The moment the malfunction is detected, the display will be presented immediately. That is, the condition at which the malfunction occurs can be found by observing the inspection lamps during driving test.

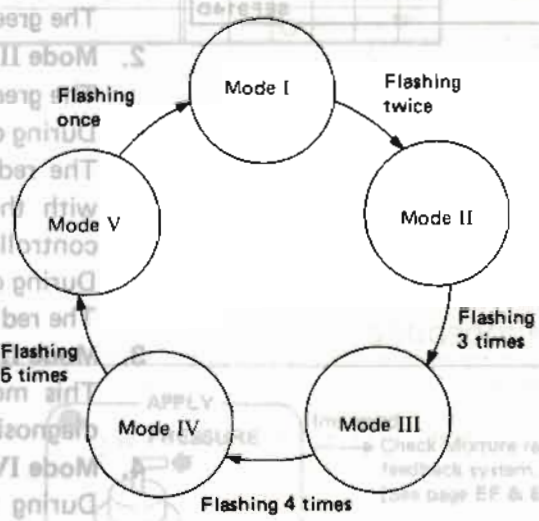
Description (Cont'd)

SWITCHING THE MODES

1. Turn ignition switch "ON".
2. Turn diagnostic mode selector on E.C.U. fully clockwise and wait the inspection lamps flash.
3. Count the number of the flashing time, and after the inspection lamps have flashed the number of the required mode, turn diagnostic mode selector fully counterclockwise immediately.



SEF872D



SEF989D

When the ignition switch is turned off during diagnosis, in each mode, and then turned back on again after the power to the E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.

The stored memory would be lost if:

1. Battery terminal is disconnected.
2. After selecting Mode III, Mode IV is selected.
   However, if the diagnostic mode selector is kept turned fully clockwise, it will continue to change in the order of Mode I → II → III → IV → V → I ... etc., and in this state the stored memory will not be erased.

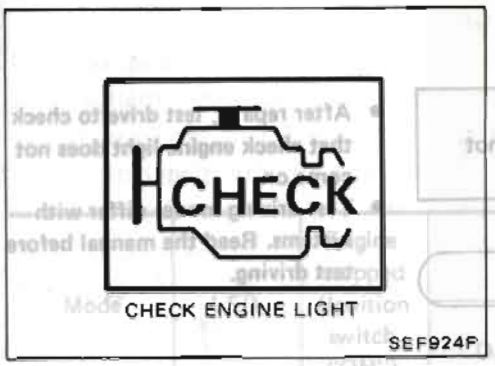
Description (Cont'd)

CHECK ENGINE LIGHT (For California only)

This vehicle has a check engine light on instrument panel. This light comes ON under the following conditions:

1) When ignition switch is turned "ON" (for bulb check).
2) When systems related to emission performance malfunction in Mode I (with engine running).

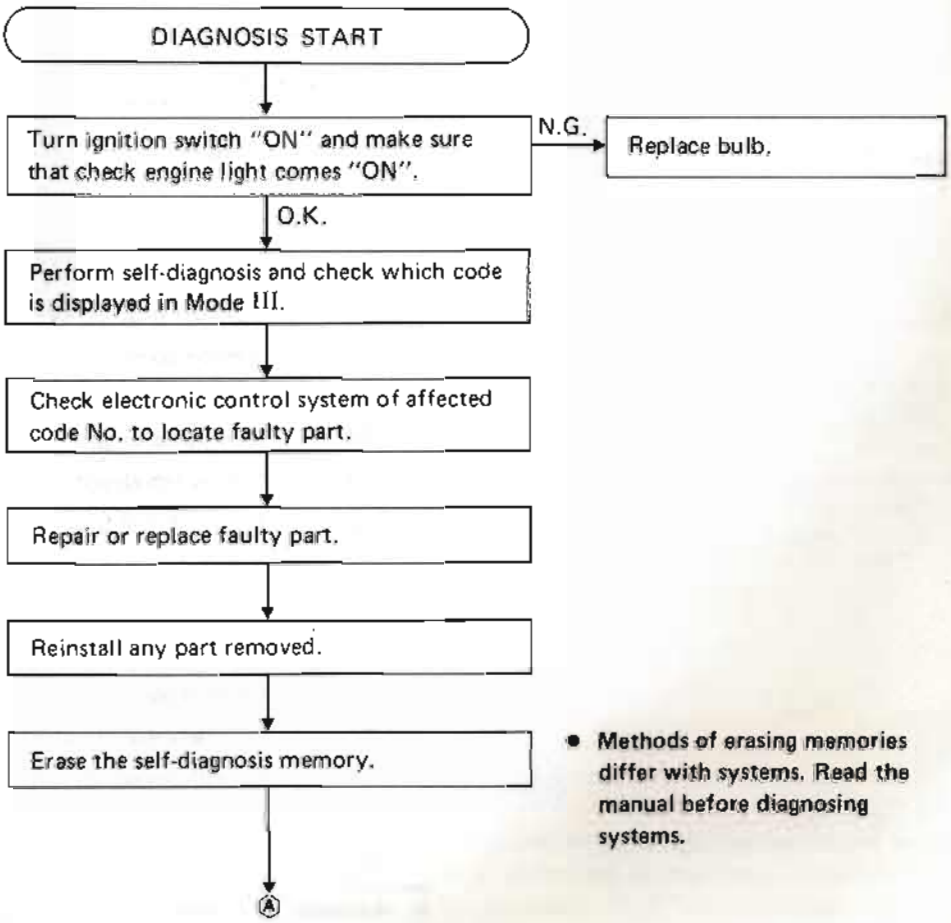
- **This check engine light always illuminates and is synchronous with red L.E.D.**
- **Malfunction systems related to emission performance can be detected by self-diagnosis, and they are clarified as self-diagnostic codes in Mode III.**



CHECK ENGINE LIGHT
SEF924P

Code No.	Malfunction
12	Air flow meter circuit
14	Vehicle speed sensor circuit
23	Idle switch circuit
31	E.C.U. (E.C.C.S. control unit)
32	E.G.R. function
33	Exhaust gas sensor circuit
45	Injector leak

Use the following diagnostic flowchart to check and repair a malfunctioning system.



- **Methods of erasing memories differ with systems. Read the manual before diagnosing systems.**

Description (Cont'd)

Ⓐ

Perform driving test.
Make sure that check engine light does not come "ON" during this test.

DIAGNOSIS END

- After repairs, test drive to check that check engine light does not come on.
- Test driving modes differ with systems. Read the manual before test driving.

Modes I & II — Mixture Ratio Feedback Control Monitors A & B

In these modes, the control unit provides the Air-fuel ratio monitor presentation and the Air-fuel ratio feedback coefficient monitor presentation.

<table>
<tr><td rowspan="2">Mode</td><td rowspan="2">LED</td><td rowspan="2">Engine stopped (Ignition switch "ON")</td><td colspan="4">Engine running</td></tr>
<tr><td colspan="2">Open loop condition</td><td colspan="2">Closed loop condition</td></tr>
<tr><td rowspan="2">Mode I (Monitor A)</td><td>Green</td><td>ON</td><td colspan="2">*Remains ON or OFF</td><td colspan="2">Blinks</td></tr>
<tr><td>Red</td><td>ON</td><td colspan="2">Except for California model
• OFF</td><td colspan="2">For California model
• ON: when the CHECK ENGINE LIGHT ITEMS are stored in the E.C.U.
• OFF: except for the above condition</td></tr>
<tr><td rowspan="3">Mode II (Monitor B)</td><td>Green</td><td>ON</td><td colspan="2">*Remains ON or OFF</td><td colspan="2">Blinks</td></tr>
<tr><td rowspan="2">Red</td><td rowspan="2">OFF</td><td rowspan="2">*Remains ON or OFF (synchronous with green LED)</td><td colspan="2">Compensating mixture ratio</td></tr>
<tr><td>More than 5% rich</td><td>Between 5% lean and 5% rich</td><td>More</td></tr>
<tr><td></td><td></td><td></td><td>OFF</td><td>Synchronized with green LED</td><td>Remains ON</td></tr>
</table>

*: Maintains conditions just before switching to open loop

Mode III — Self-diagnostic System

The E.C.U. constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the E.C.U. and can be retrieved from the memory by turning on the diagnostic mode selector, located on the side of the E.C.U. When activated, the malfunction is indicated by flashing a red and a green L.E.D. (Light Emitting Diode), also located on the E.C.U. Since all the self-diagnostic results are stored in the E.C.U.'s memory even intermittent malfunctions can be diagnosed.

A malfunctioning part's group is indicated by the number of both the red and the green L.E.D.s flashing. First, the red L.E.D. flashes and the green flashes follow. The red L.E.D. refers to the number of tens while the green one refers to the number of units. For example, when the red L.E.D. flashes once and then the green one flashes twice, this means the number "12" showing the air flow meter signal is malfunctioning. In this way, all the problems are classified by the code numbers.

- **When engine fails to start, crank engine more than two seconds before starting self-diagnosis.**
- **Before starting self-diagnosis, do not erase stored memory. If doing so, self-diagnosis function for intermittent malfunctions would be lost.**

The stored memory would be lost if:

1. Battery terminal is disconnected.
2. After selecting Mode III, Mode IV is selected.

DISPLAY CODE TABLE

Code No.	Detected items	California	Non-California
11	Crank angle sensor ciruit	X	X
12	Air flow meter circuit	X	X
13	Cylinder head temperature sensor circuit	X	X
14	Vehicle speed sensor circuit	X	X
21	Ignition signal missing in primary coil	X	X
22	Fuel pump circuit	X	X
23	Idle switch circuit	X	X
31	E.C.U. (E.C.C.S. control unit)	X	X
32	E.G.R. function	X	–
33	Exhaust gas sensor circuit	X	X
34	Detonation sensor circuit (VG30ET)	X	X
35	Exhaust gas temperature circuit	X	–
42	Fuel temperature sensor circuit	X	X
43	Throttle sensor circuit	X	–
45	Injector leak	X	–
55	No malfunction in the above circuit	X	X

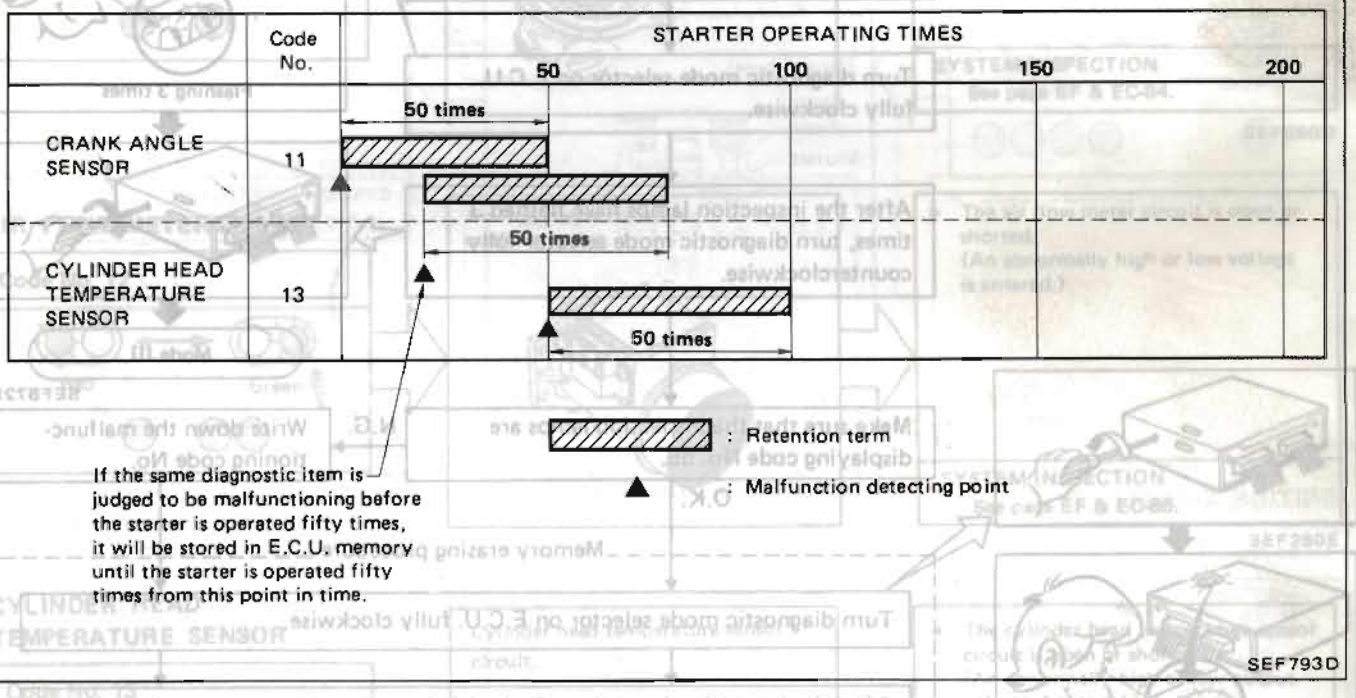
X: Available —: Not available

Mode III — Self-diagnostic System (Cont'd)

RETENTION OF DIAGNOSTIC RESULTS

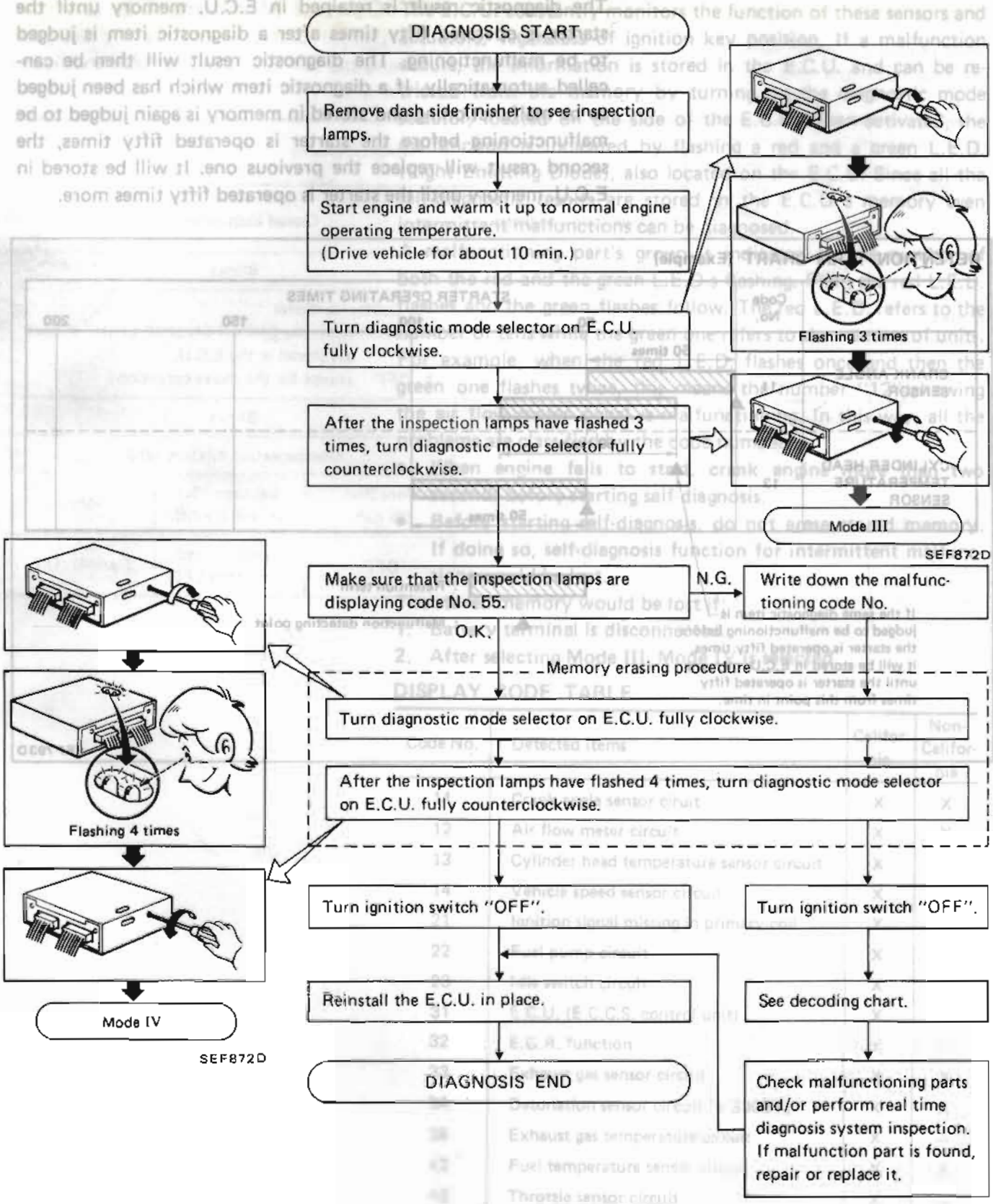
The diagnostic result is retained in E.C.U. memory until the starter is operated fifty times after a diagnostic item is judged to be malfunctioning. The diagnostic result will then be cancelled automatically. If a diagnostic item which has been judged to be malfunctioning and stored in memory is again 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)



Mode III — Self-diagnostic System (Cont'd)

SELF-DIAGNOSTIC PROCEDURE

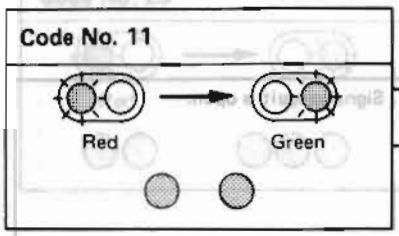
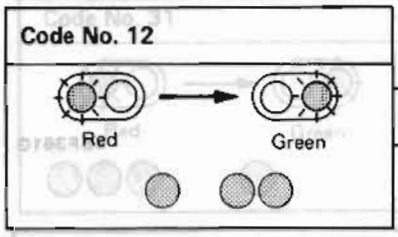
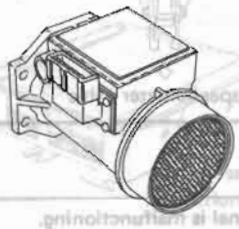
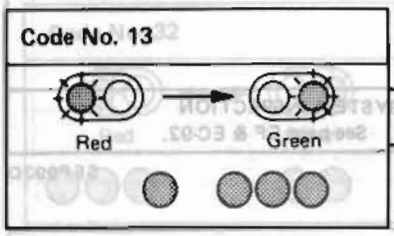


CAUTION:

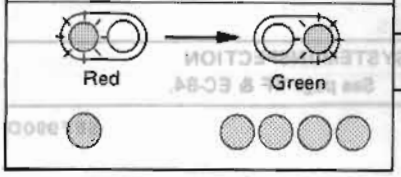
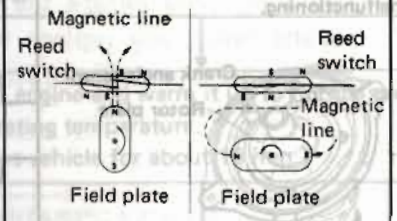
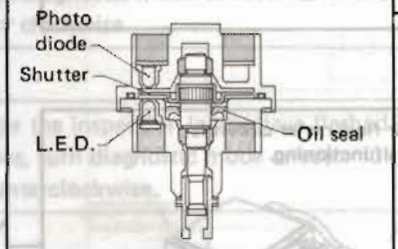
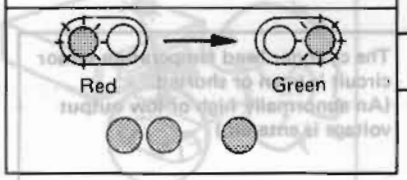
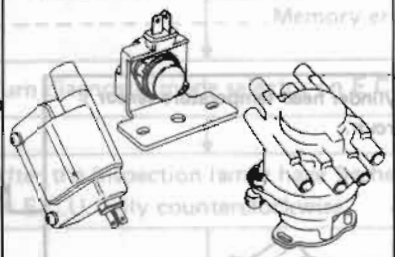
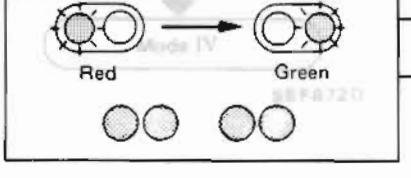
During displaying code No. in self-diagnosis mode (mode III), if the other diagnostic mode should be done, make sure to write down the malfunctioning code No. before turning diagnostic mode selector on E.C.U. fully clockwise, or select the diagnostic mode after turning switch "OFF". Otherwise self-diagnosis information stored in E.C.U. memory until now would be lost.

Mode III — Self-diagnostic System (Cont'd)

DECODING CHART

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
CRANK ANGLE SENSOR Code No. 11 	Crank angle sensor circuit is malfunctioning. 	• Either 1° or 120° signal is no entered for the first few seconds during engine cranking. • Either 1° or 120° signal is not input often enough while the engine speed is higher than the specified rpm. SYSTEM INSPECTION See page EF & EC-84. SEF990D
AIR FLOW METER CHECK Code No. 12 	Air flow meter circuit is malfunctioning. 	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.) SYSTEM INSPECTION See page EF & EC-86. SEF280E
CYLINDER HEAD TEMPERATURE SENSOR Code No. 13 	Cylinder head temperature sensor circuit. 	• The cylinder head temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) SYSTEM INSPECTION See page EF & EC-88. SEF833C

Mode III — Self-diagnostic System (Cont'd)

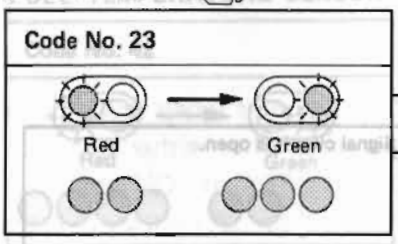
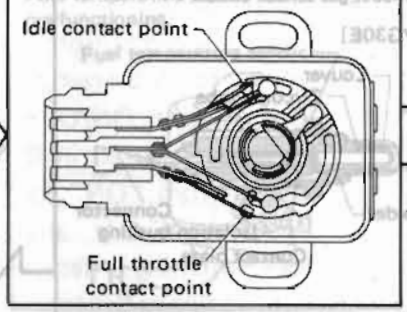
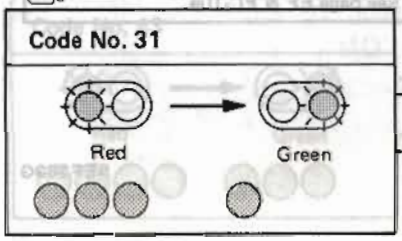
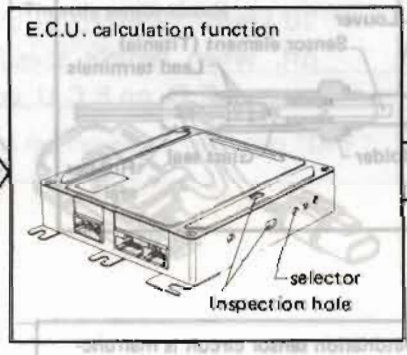
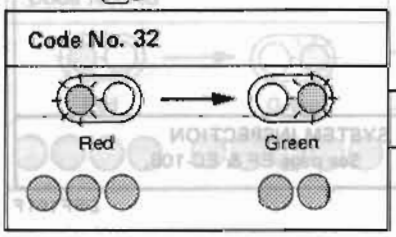
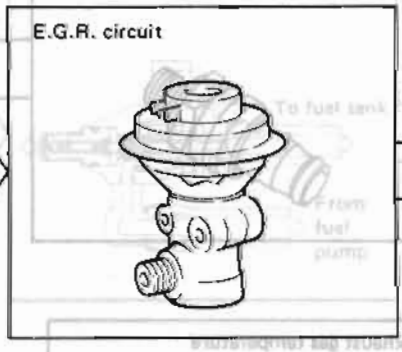
Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected
VEHICLE SPEED SENSOR (CHECK) Code No. 14  	Vehicle speed sensor circuit [Needle type]  [Digital type]  	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-90.
IGNITION SIGNAL Code No. 21  	Ignition signal is malfunctioning. 	• The ignition signal in primary circuit is not entered during engine cranking or running. SYSTEM INSPECTION See page EF & EC-92.
FUEL PUMP CONTROL Code No. 22  	Fuel pump circuit is malfunctioning. 	• Idle speed control valve circuit is open or short. (Idle speed is higher than target idle speed in spite of feedback control.) • Fuel circuit is open or short. (An extremely high or low current is entered.) SYSTEM INSPECTION See page EF & EC-94.

SEF361G

SEF993D

SEF994D

Mode III — Self-diagnostic System (Cont'd)

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected
IDLE SWITCH (CHECK) Code No. 23 	Throttle valve switch circuit 	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-96.
E.C.U. (E.C.C.S. CONTROL UNIT) (CHECK) Code No. 31 	E.C.U. calculation function 	• Signal is beyond "normal" range. SYSTEM INSPECTION See page EF & EC-98.
E.G.R. (CHECK) (California model only) Code No. 32 	E.G.R. circuit 	• E.G.R. valve does not operate. (E.G.R. valve spring does not lift.) SYSTEM INSPECTION See page EF & EC-100/155.

Mode III — Self-diagnostic System (Cont'd)

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
EXHAUST GAS SENSOR (CHECK) Code No. 33 Red — Green	Exhaust gas sensor circuit [VG30E] Louver, Zirconia tube, Holder, Connector, Isolation bushing, Contact plate [VG30ET] Louver, Sensor element (Titania), Lead terminals, Holder, Glass seal, Rubber seal	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-104.
DETONATION SENSOR [VG30ET] Code No. 34 Red — Green	Detonation sensor circuit is malfunctioning.	• The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.) SYSTEM INSPECTION See page EF & EC-106.
EXHAUST GAS TEMPERATURE SENSOR CIRCUIT (California model only) Code No. 35 Red — Green	Exhaust gas temperature sensor circuit	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-108.

SEF363G

SEF191F

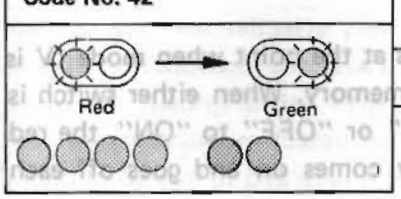
SEF239G

Mode III — Self-diagnostic System (Cont'd)

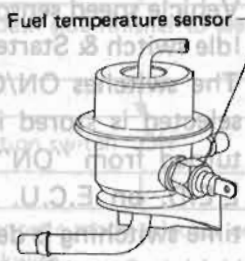
Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected

FUEL TEMPERATURE SENSOR

Code No. 42



Fuel temperature sensor circuit is malfunctioning.



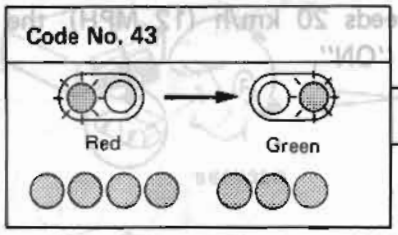
- Fuel temperature circuit is open or short.
  (An abnormally high or low voltage has entered.)

SYSTEM INSPECTION
See page EF & EC-112.

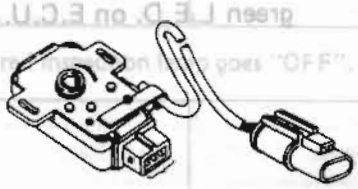
SEF945F

THROTTLE SENSOR
(California model only)

Code No. 43



Throttle sensor circuit



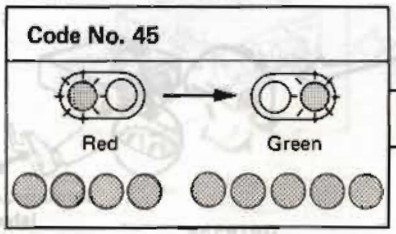
- Throttle sensor circuit is open or short.
  (Output voltage is too high or too low.)

SYSTEM INSPECTION
See page EF & EC-114.

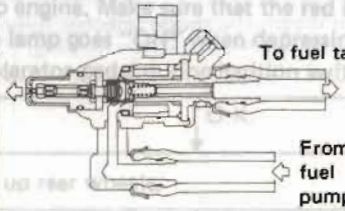
SEF980F

INJECTOR LEAK (CHECK)
(California model only)

Code No. 45



Fuel leak

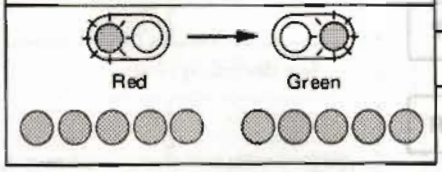


Fuel leak from injector

SYSTEM INSPECTION
See page EF & EC-116.

SEF364G

Code No. 55



E.C.C.S. normal operation.

SEF946F

Mode IV — Switches ON/OFF Diagnostic System

In switches ON/OFF diagnosis system, ON/OFF operation of the following switches can be detected continuously.

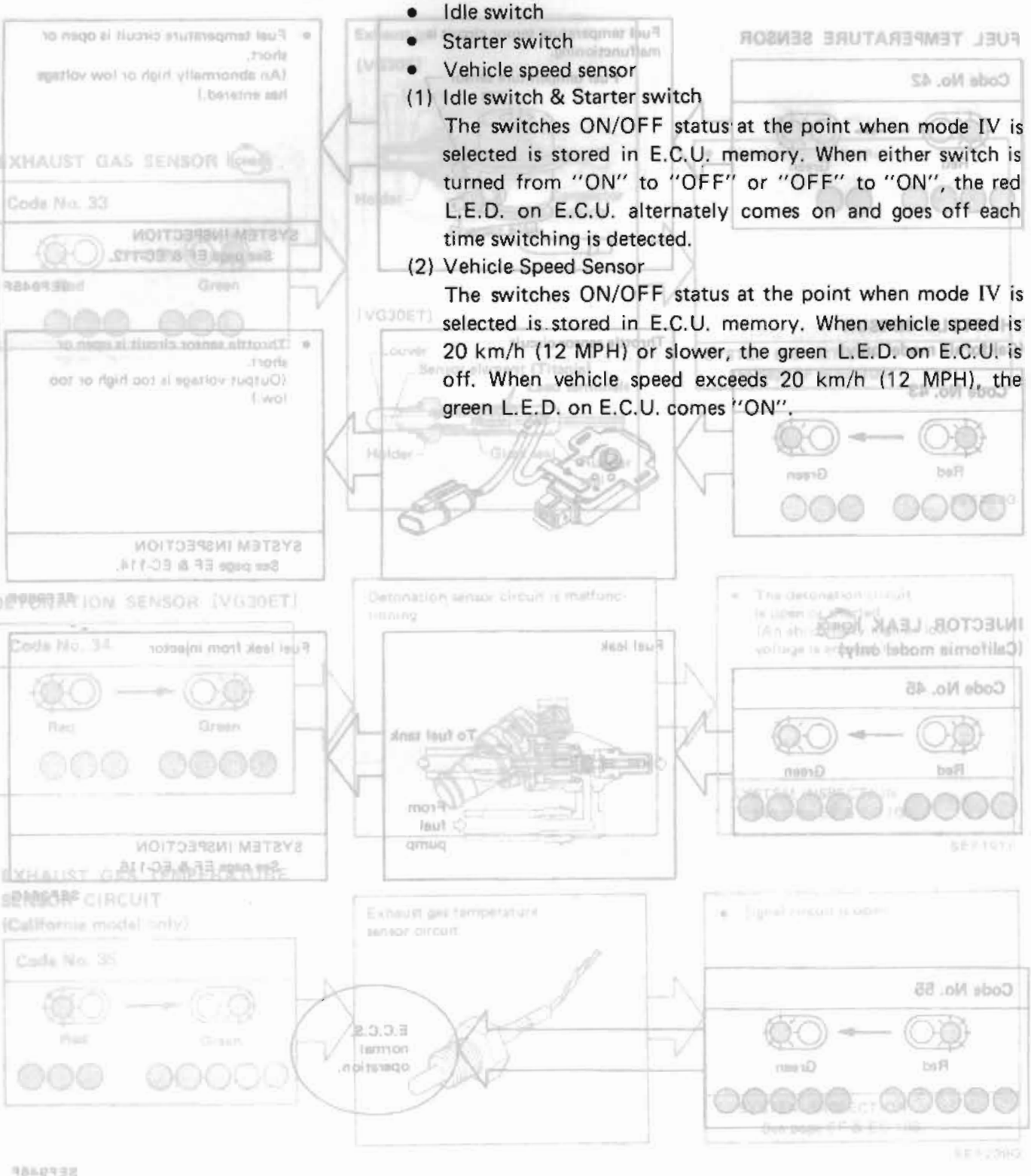
- Idle switch
- Starter switch
- Vehicle speed sensor

(1) Idle switch & Starter switch

The switches ON/OFF status at the point when mode IV is selected is stored in E.C.U. memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red L.E.D. on E.C.U. alternately comes on and goes off each time switching is detected.

(2) Vehicle Speed Sensor

The switches ON/OFF status at the point when mode IV is selected is stored in E.C.U. memory. When vehicle speed is 20 km/h (12 MPH) or slower, the green L.E.D. on E.C.U. is off. When vehicle speed exceeds 20 km/h (12 MPH), the green L.E.D. on E.C.U. comes "ON".



Mode IV — Switches ON/OFF Diagnostic System (Cont'd)

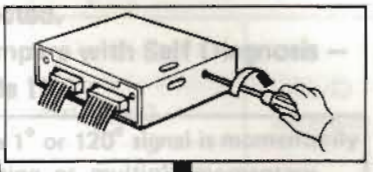
SELF-DIAGNOSTIC PROCEDURE

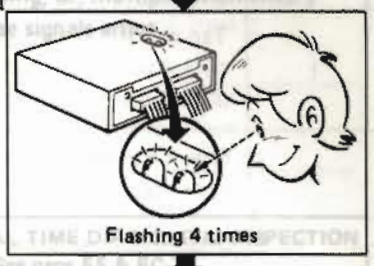
DIAGNOSIS START

Remove dash side finisher to see inspection lamps.

Turn ignition switch "ON".

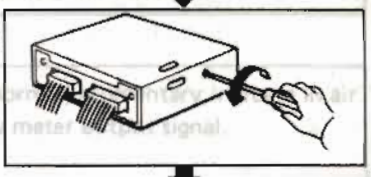
Turn diagnostic mode selector on E.C.U. fully clockwise.



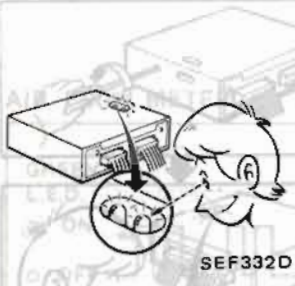


Flashing 4 times

After the inspection lamps have flashed 4 times, turn diagnostic mode selector fully counterclockwise.



The red inspection lamp goes "OFF".



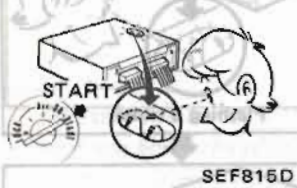
SEF332D

Mode IV

SEF872D

Make sure that the red inspection lamp goes "ON" during turning ignition switch "START".

N.G. → Check starter signal circuit.

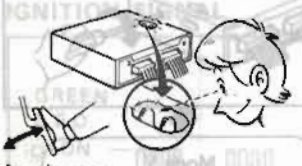


SEF815D

O.K.

Stop engine. Make sure that the red inspection lamp goes "ON" when depressing accelerator pedal during ignition switch "ON".

N.G. → Check idle switch circuit.



SEF816D

O.K.

Lift up rear wheels.

Drive vehicle. Make sure that the green inspection lamp goes "ON" when vehicle speed is 20 km/h (12 MPH) or faster.

N.G. → Check vehicle speed sensor circuit.

O.K.

Turn ignition switch "OFF".

Reinstall the E.C.U. in place.

DIAGNOSIS END

CAUTION:

- **For safety, do not drive rear wheels at higher speed than required.**

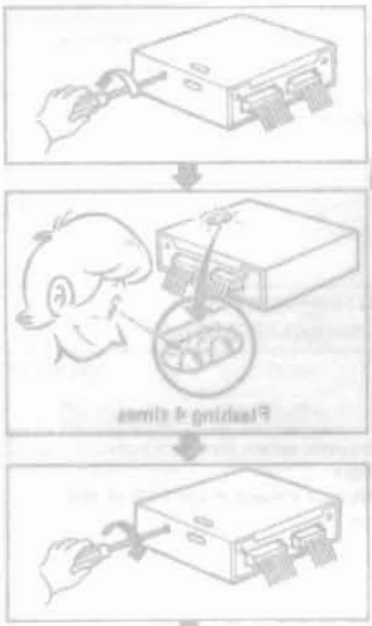
Mode V — Real Time Diagnostic System

In real time diagnosis, if any of the following items are judged to be faulty, a malfunction is indicated immediately.

- Crank angle sensor (120°-signal & 1° signal)
- Ignition signal
- Air flow meter output signal
- Fuel pump

Consequently, this diagnosis is a very effective measure to diagnose whether the above systems cause the malfunction or not, during driving test. Compared with self-diagnosis, real time diagnosis is very sensitive, and can detect malfunctioning conditions in a moment. Further, items regarded to be malfunctions in this diagnosis are not stored in E.C.U. memory.

SELF-DIAGNOSTIC PROCEDURE

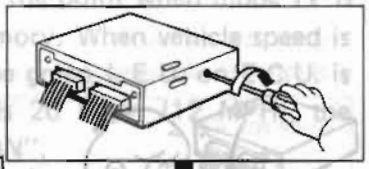


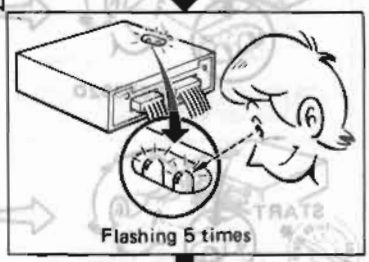
DIAGNOSIS START

Remove dash side finisher to see inspection lamps.

Start engine.

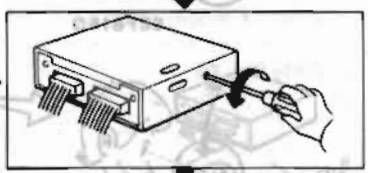
Turn diagnostic mode selector on E.C.U. fully clockwise.





Flashing 5 times

After the inspection lamps have flashed 5 times, turn diagnostic mode selector fully counterclockwise.



Mode V

SEF872D

SEF332D

Make sure that the inspection lamps are not flashing for 5 min. when idling or racing.

N.G.

If flashing, count no. of flashes.

O.K.

Turn ignition switch "OFF".

Turn ignition switch "OFF".

See decoding chart.

Reinstall the E.C.U. in place.

Perform real time-diagnosis system inspection.
If malfunction part is found, repair or replace it.

DIAGNOSIS END

CAUTION:

In real time diagnosis, pay attention to inspection lamp flashing. E.C.U. displays the malfunction code only once, and does not memorize the inspection.

Mode V — Real Time Diagnostic System (Cont'd)

DECODING CHART

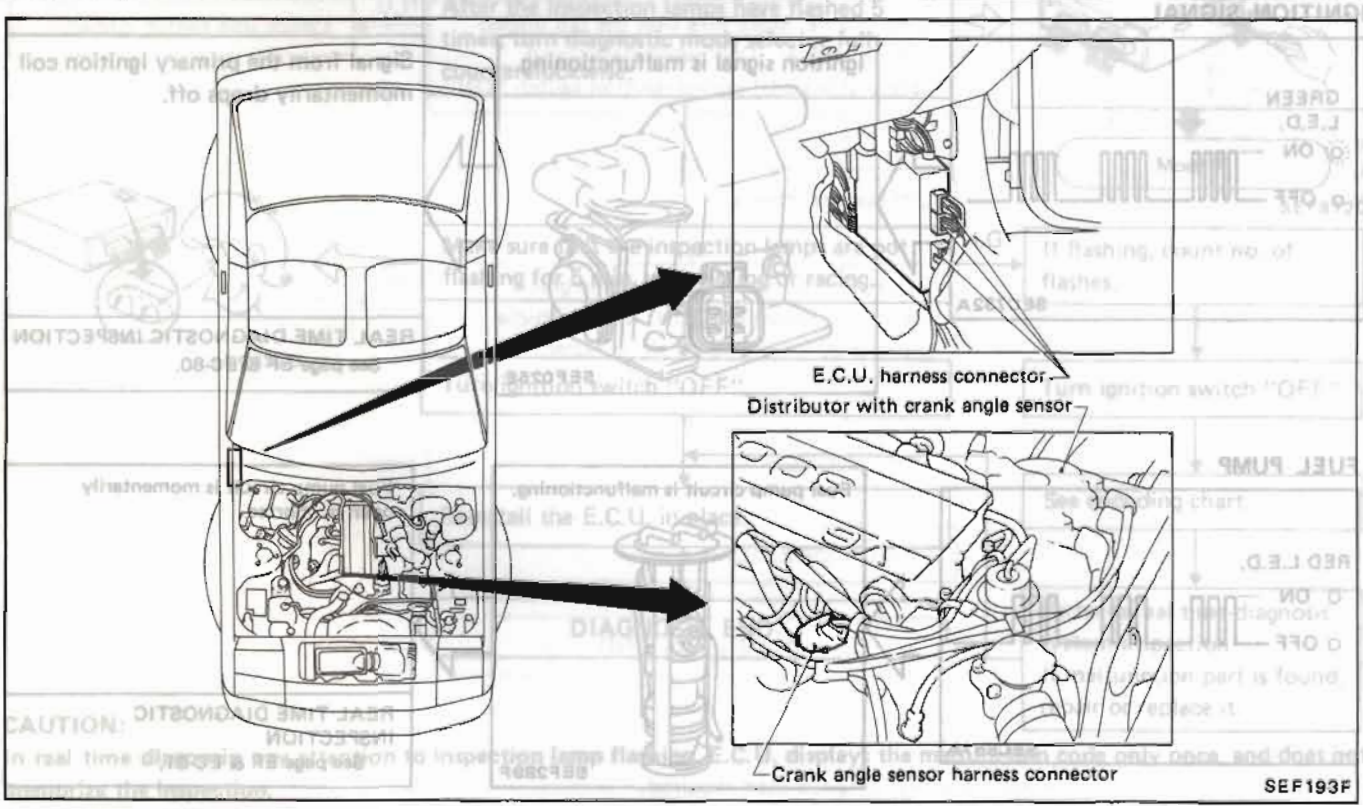
Display presentation	Malfunction circuit or parts	Control unit shows a malfunction signal when the following conditions are detected. (Compare with Self Diagnosis — Mode III.)
CRANK ANGLE SENSOR RED L.E.D. ON / OFF SEC730A	Crank angle sensor circuit is malfunctioning. Crank angle sensor Rotor plate SEF612B	The 1° or 120° signal is momentarily missing, or, multiple, momentary noise signals enter. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-78.
AIR FLOW METER GREEN L.E.D. ON / OFF SEC731A	Air flow meter circuit is malfunctioning. SEF397C	Abnormal, momentary increase in air flow meter output signal. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-79.
IGNITION SIGNAL GREEN L.E.D. ON / OFF SEC732A	Ignition signal is malfunctioning. SEF025E	Signal from the primary ignition coil momentarily drops off. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-80.
FUEL PUMP RED L.E.D. ON / OFF SEC887A	Fuel pump circuit is malfunctioning. SEF289F	Fuel pump circuit is momentarily open or shorted. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-81.

Mode V — Real Time Diagnostic System (Cont'd)

REAL TIME DIAGNOSTIC INSPECTION

Crank Angle Sensor

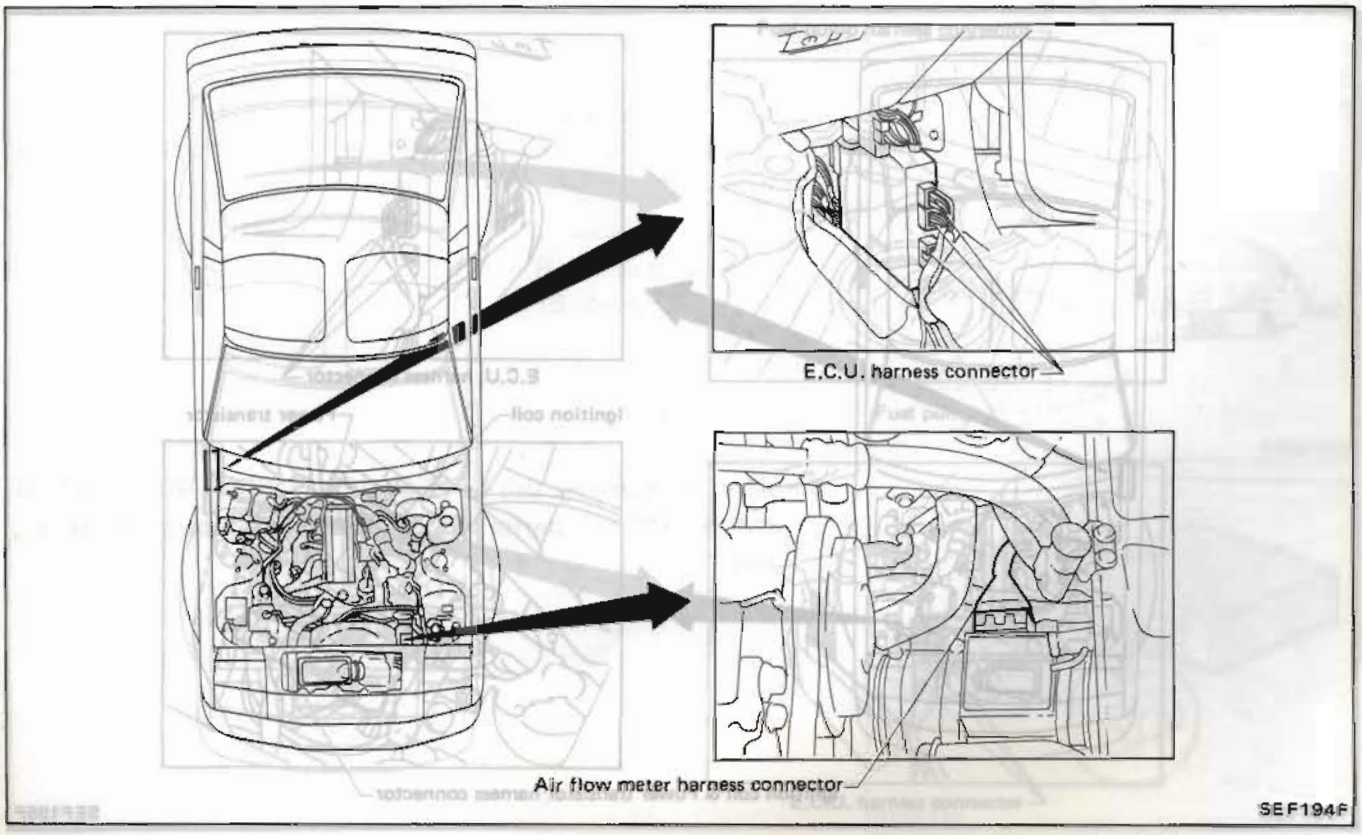
Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Crank angle sensor harness connector	Sensor & actuator	E.C.U. 20- & 16-pin connector	
1	Tap and wiggle harness connector or component during real time diagnosis.	During real time diagnosis	○	○	○	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	○	X	X	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	○	X	○	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	X	X	○	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	○	X	X	Replace terminal.
6	Tap and wiggle harness connector or component during real time diagnosis.	During real time diagnosis	○	○	○	If malfunction codes are displayed during real time diagnosis, replace terminal.



Mode V — Real Time Diagnostic System (Cont'd)

Air Flow Meter

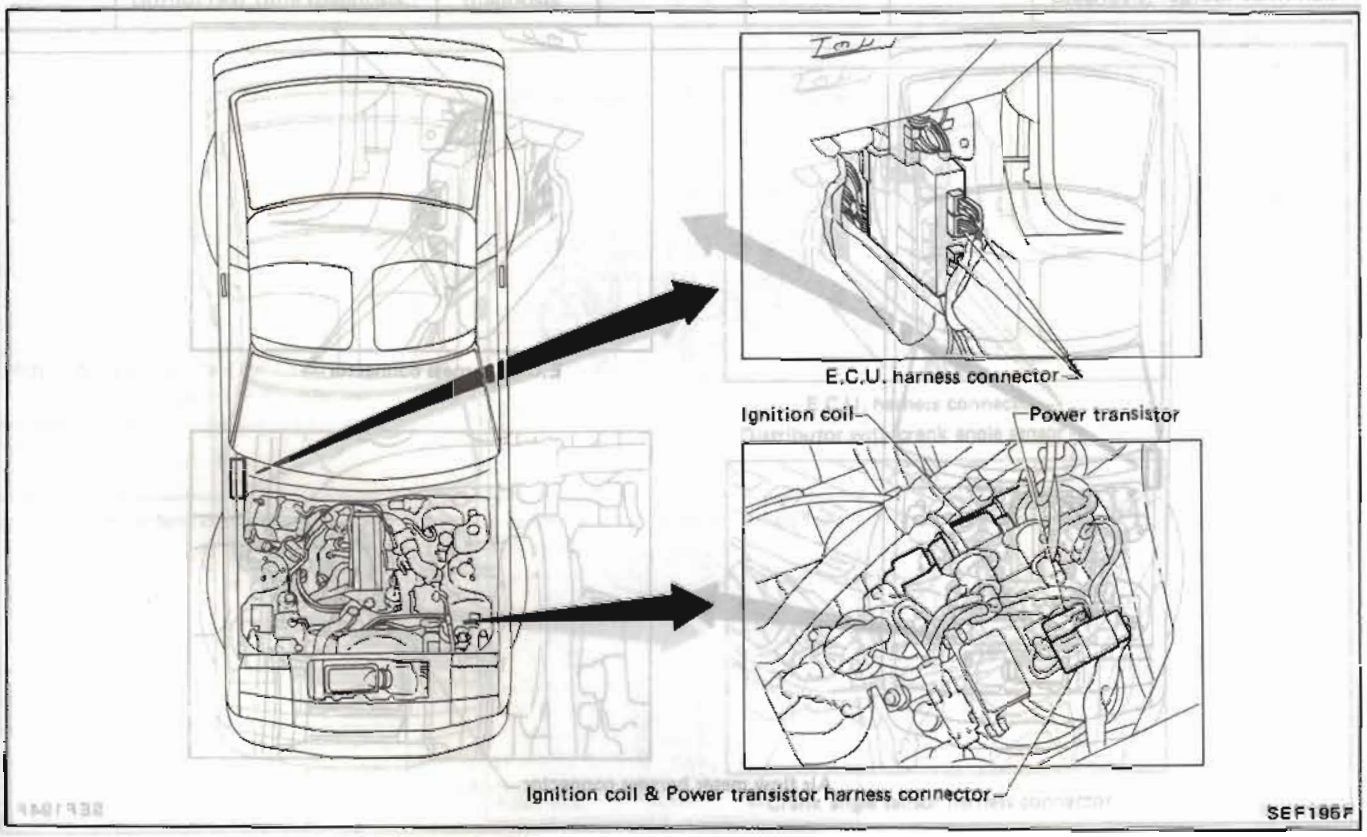
Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Air flow meter harness connector	Sensor & actuator	E.C.U. 20- & 16-pin connector	
1	Tap and wiggle harness connector or component during real time diagnosis.	During real time diagnosis	○	○	○	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	○	X	X	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	○	X	○	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	X	X	○	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	○	X	X	Replace terminal.
6	Tap and wiggle harness connector or component during real time diagnosis.	During real time diagnosis	○	○	○	If malfunction codes are displayed during real time diagnosis, replace terminal.



Mode V — Real Time Diagnostic System (Cont'd)

Ignition Signal

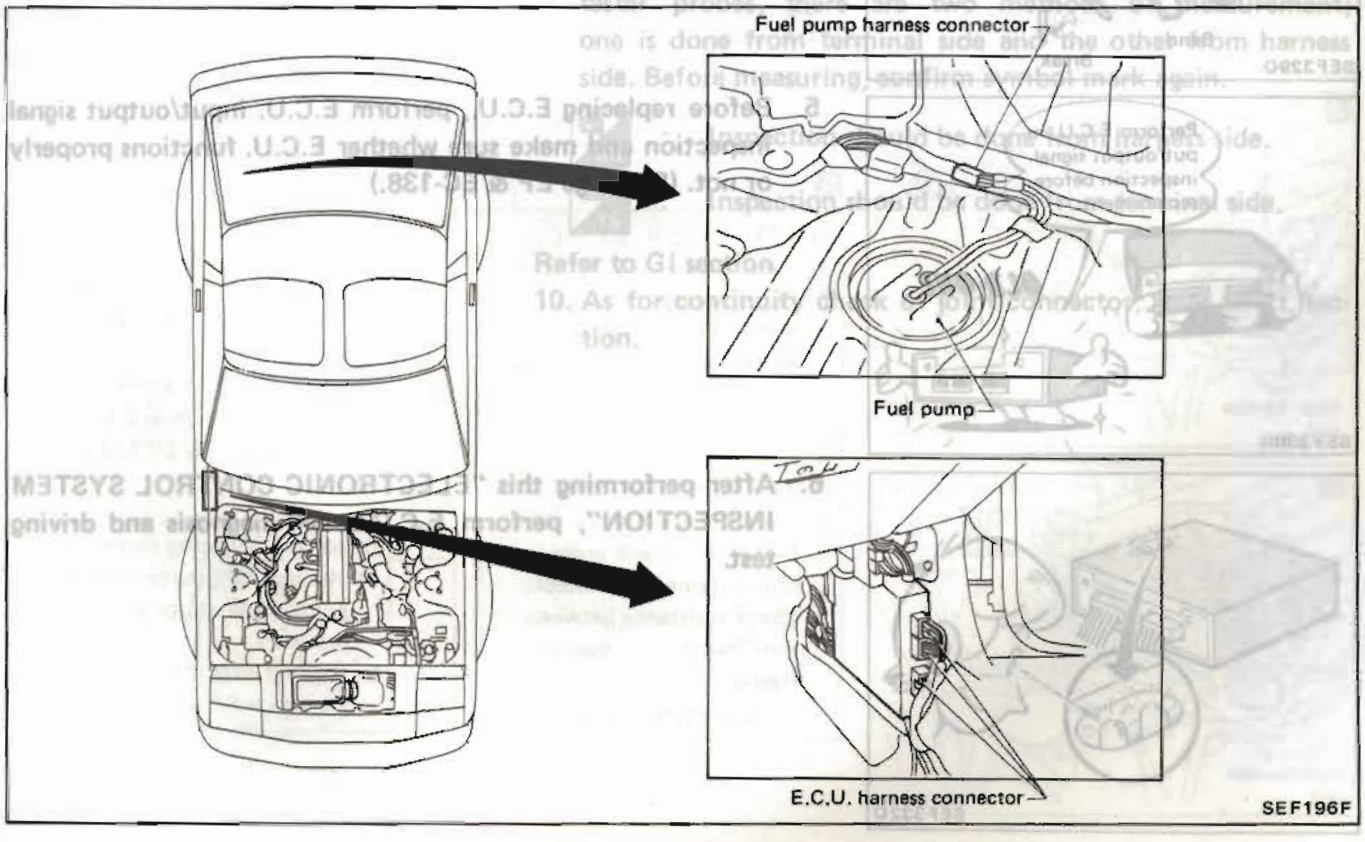
Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Ignition signal harness connector	Sensor & actuator	E.C.U. 20- & 16-pin connector	
1	Tap and wiggle harness connector or component during real time diagnosis.	During real time diagnosis	○	○	○	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	○	X	X	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	○	X	○	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	X	X	○	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	○	X	X	Replace terminal.
6	Tap and wiggle harness connector or component during real time diagnosis.	During real time diagnosis	○	○	○	If malfunction codes are displayed during real time diagnosis, replace terminal.

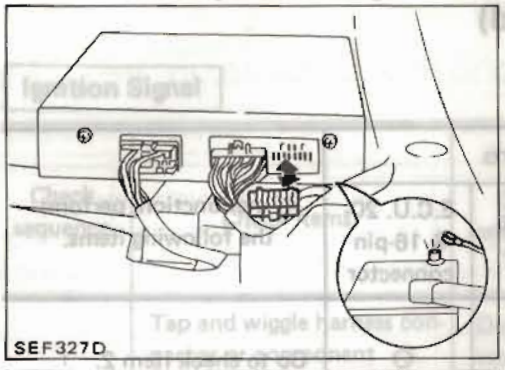


Mode V — Real Time Diagnostic System (Cont'd)

Fuel pump

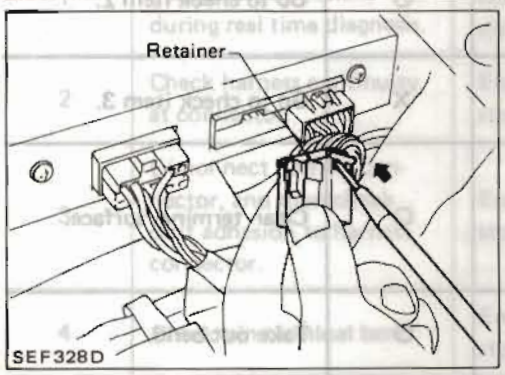
Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Fuel pump harness connector	Sensor & actuator	E.C.U. 20- & 16-pin connector	
1	Tap and wiggle harness connector or component during real time diagnosis.	During real time diagnosis	O	O	O	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	O	X	X	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	O	X	O	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	X	X	O	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	O	X	X	Replace terminal.
6	Tap and wiggle harness connector or component during real time diagnosis.	During real time diagnosis	O	O	O	If malfunction codes are displayed during real time diagnosis, replace terminal.




SEF327D

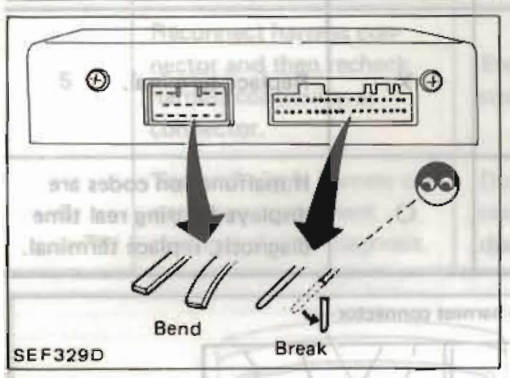
CAUTION:

1. Before connecting or disconnecting 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. Otherwise, there may be damage to the E.C.U.



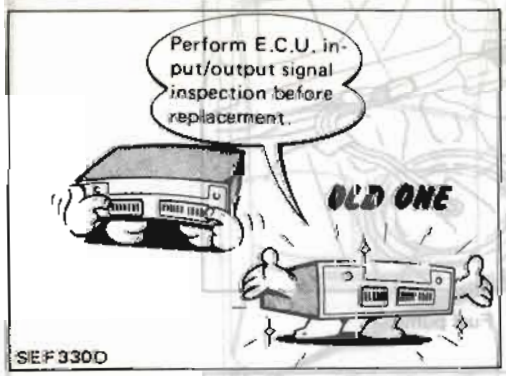
SEF328D

2. When performing E.C.U. input/output signal inspection, remove pin terminal retainer from 20- and 16-pin connector to make it easier to insert tester probe into connector.



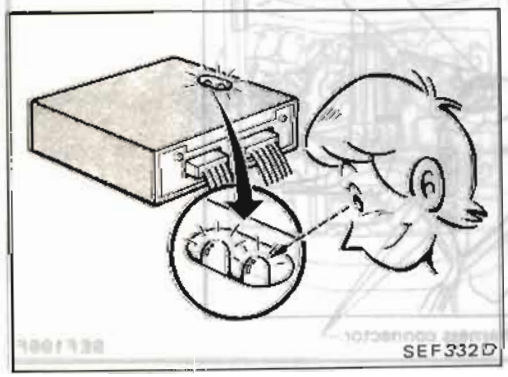
SEF329D

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

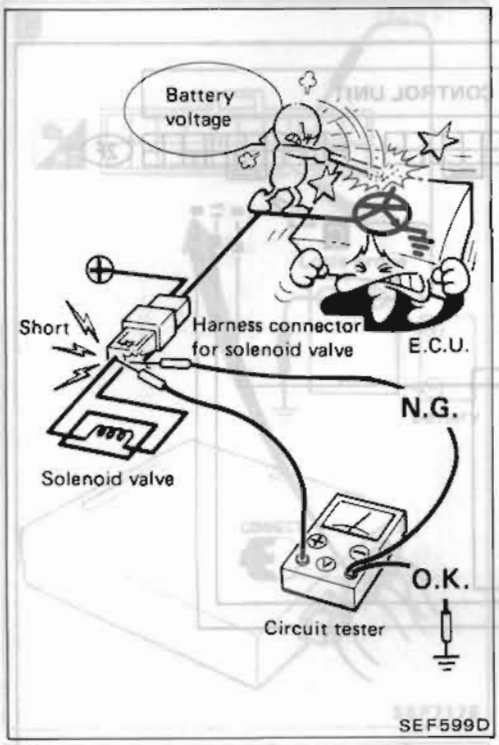


SEF330D

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-138.)


SEF332D

6. After performing this "ELECTRONIC CONTROL SYSTEM INSPECTION", perform E.C.C.S. self-diagnosis and driving test.



7. When measuring supply voltage of E.C.U. controlled components 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 power transistor of the control unit.

8. Keys to symbols

   DISCONNECT : Check after disconnecting the connector to be measured.

   CONNECT : Check after connecting the connector to be measured.

9. When measuring voltage or resistance at connector with tester probes, there are two methods of measurement; one is done from terminal side and the other from harness side. Before measuring, confirm symbol mark again.

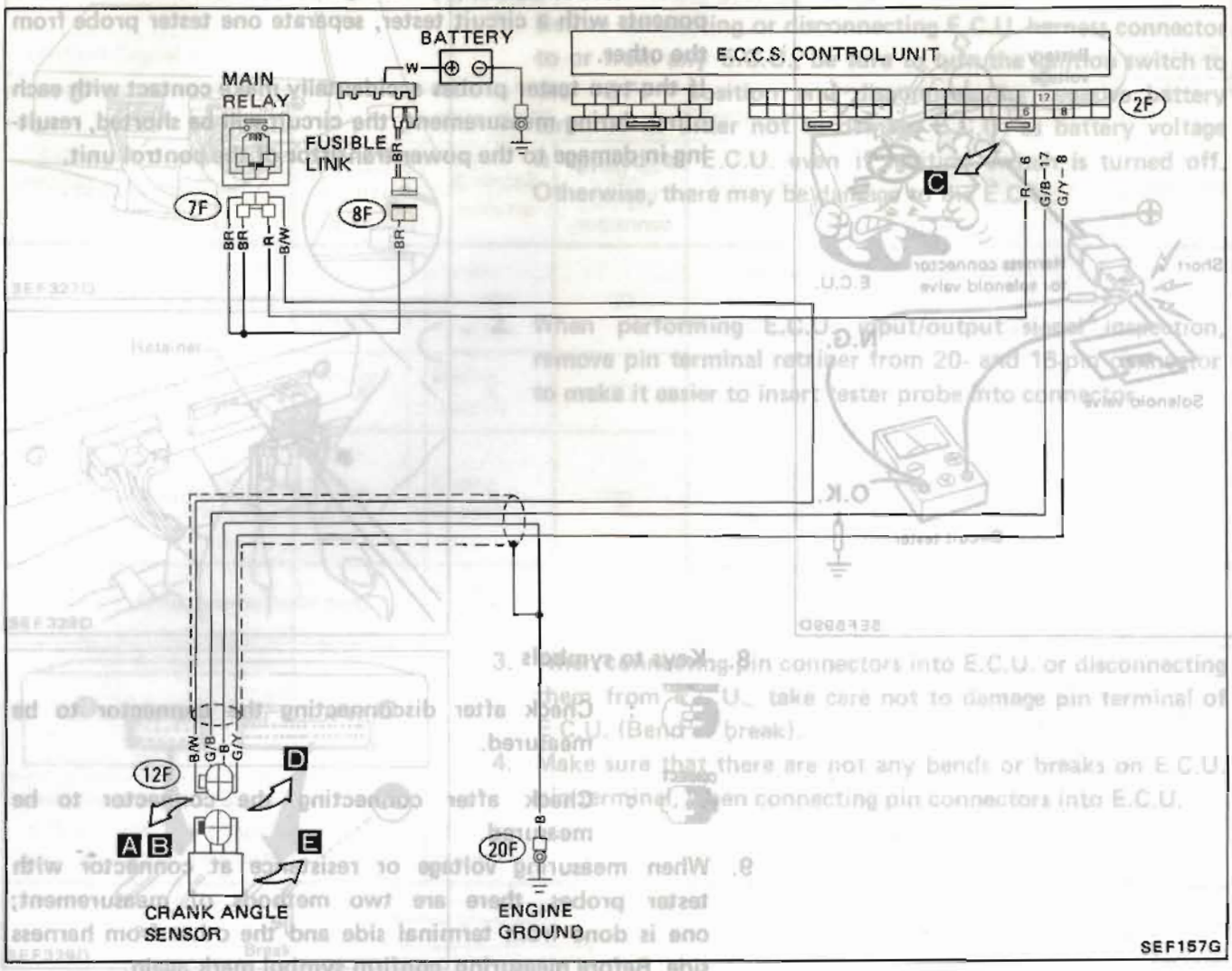
   H.S. : Inspection should be done from harness side.

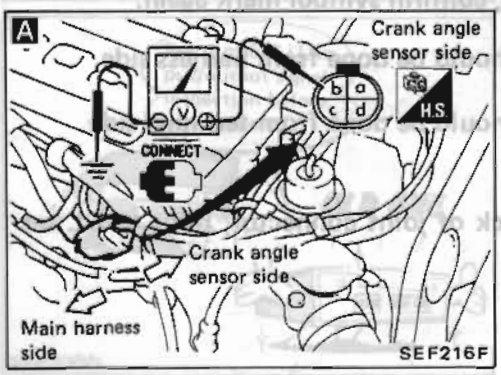
   T.S : Inspection should be done from terminal side.

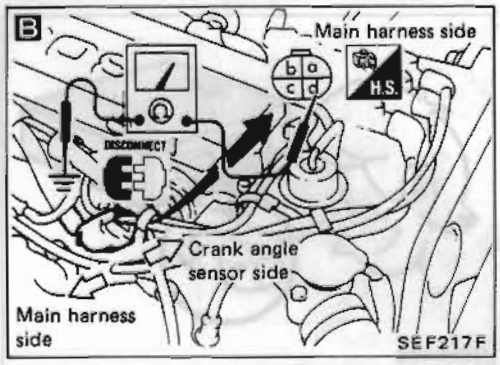
   Refer to GI section.

10. As for continuity check of joint connector, refer to EL section.

CRANK ANGLE SENSOR (Code No. 11)







INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between crank angle sensor and battery.
2) Main relay (Refer to EL section.)
3) "BR" fusible link
4) Power source for E.C.U. (See page EF & EC-122.)

O.K. ↓

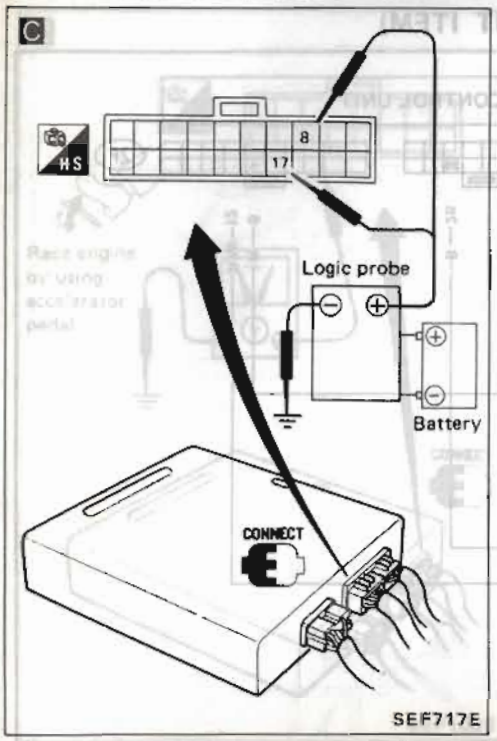
B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect crank angle sensor harness connector.
3) Check resistance between terminal ⓓ and ground.
Resistance:
Approximately 0Ω

N.G. → Check the following items.
1) Harness continuity between crank angle sensor and ground
2) Ground circuit for E.C.U. (See page EF & EC-122.)

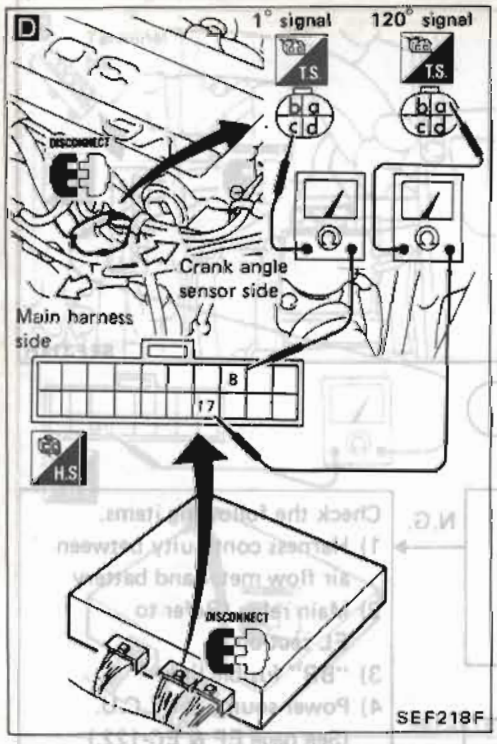
CRANK ANGLE SENSOR (Code No. 11)

C



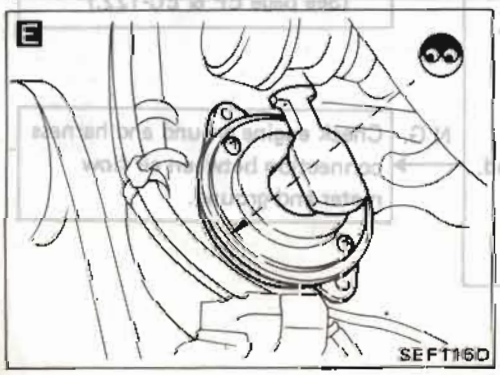
SEF717E

D



SEF218F

E



SEF116D

C

CHECK E.C.U. INPUT SIGNALS.
1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Check that pulse signals exist in E.C.U. terminals ⑧ and ⑰ with logic probe.
Pulse signals should exist.
⑧ : 1° signal
⑰ : 120° signal

N.G. → D

O.K. ↓

Stop engine and check interference between crank angle sensor harness and high-tension cable.

N.G. → Separate them.

O.K. ↓

E

Visually check rotor plate for damage or dust.

N.G. → Clean or replace crank angle sensor.

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

Perform driving test and then perform self-diagnosis (Mode-III) again.

N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K. ↓

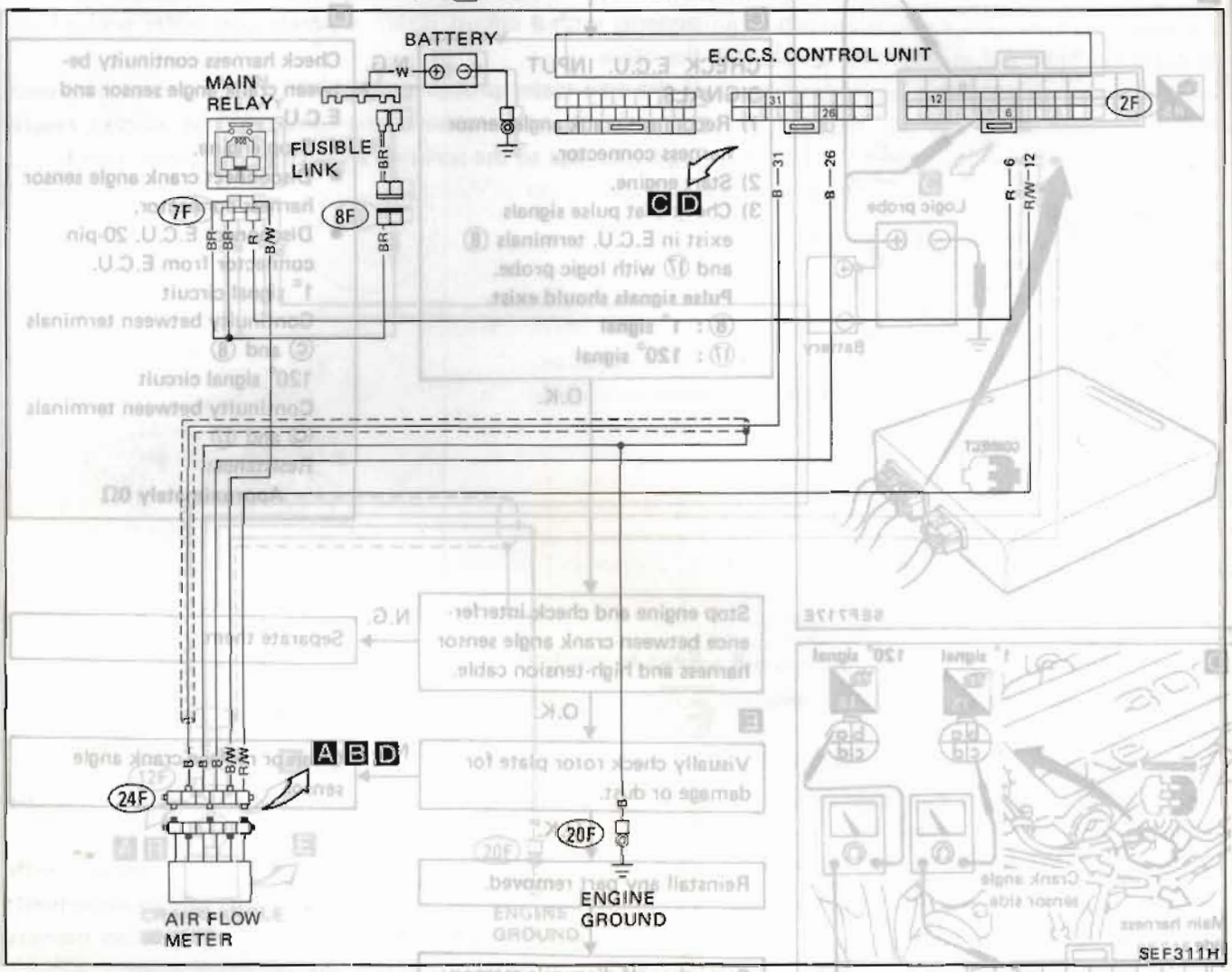
INSPECTION END

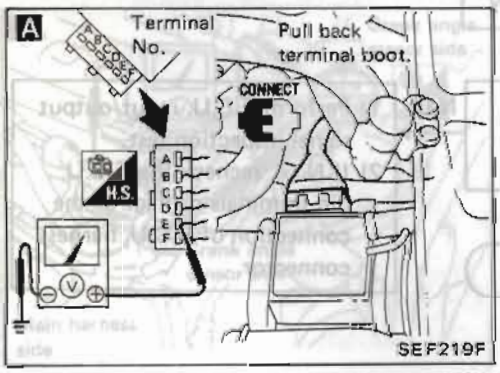
D

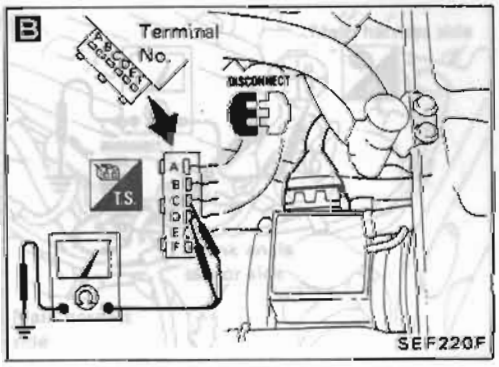
Check harness continuity between crank angle sensor and E.C.U.
- Stop engine.
- Disconnect crank angle sensor harness connector.
- Disconnect E.C.U. 20-pin connector from E.C.U.

1° signal circuit
Continuity between terminals ⓒ and ⑧
120° signal circuit
Continuity between terminals ⓓ and ⑰
Resistance:
Approximately 0Ω

AIR FLOW METER (Code No. 12) (CHECK ENGINE LIGHT ITEM)







INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal (E) and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between air flow meter and battery
2) Main relay (Refer to EL section.)
3) "BR" fusible link
4) Power source for E.C.U. (See page EF & EC-122.)

O.K.

B

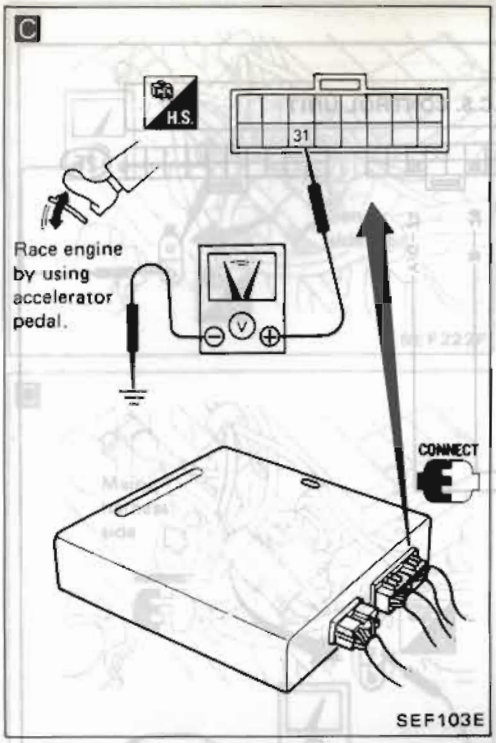
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect air flow meter harness connector.
3) Check resistance between terminals (C), (D) and ground.
4) Shield wire.
Resistance:
Approximately 0Ω

N.G. → Check engine ground and harness connection between air flow meter and ground.

O.K.

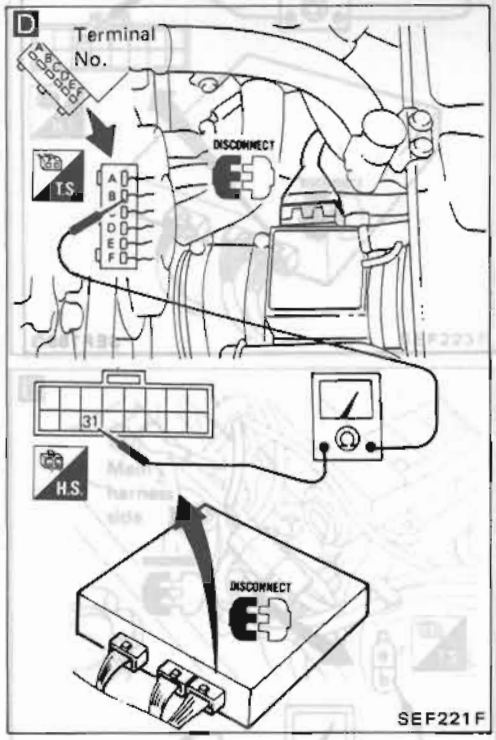
AIR FLOW METER (Code No. 12) (CHECK ENGINE LIGHT ITEM)

C



SEF103E

D



SEF221F

C

CHECK E.C.U. INPUT SIGNAL

1) Reconnect air flow meter harness connector.
2) Start engine and warm it up sufficiently.
3) Make sure that voltage between E.C.U. terminal ㉛ and ground changes under the following conditions.
   Output voltage should change.
   - **When racing engine with accelerator pedal**
     Approximately 2 - 4V
   - **Idling condition**
     2 - 3V

N.G. → D

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

Perform driving test and then perform self-diagnosis (Mode-III) again.

N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K. ↓

INSPECTION END

D

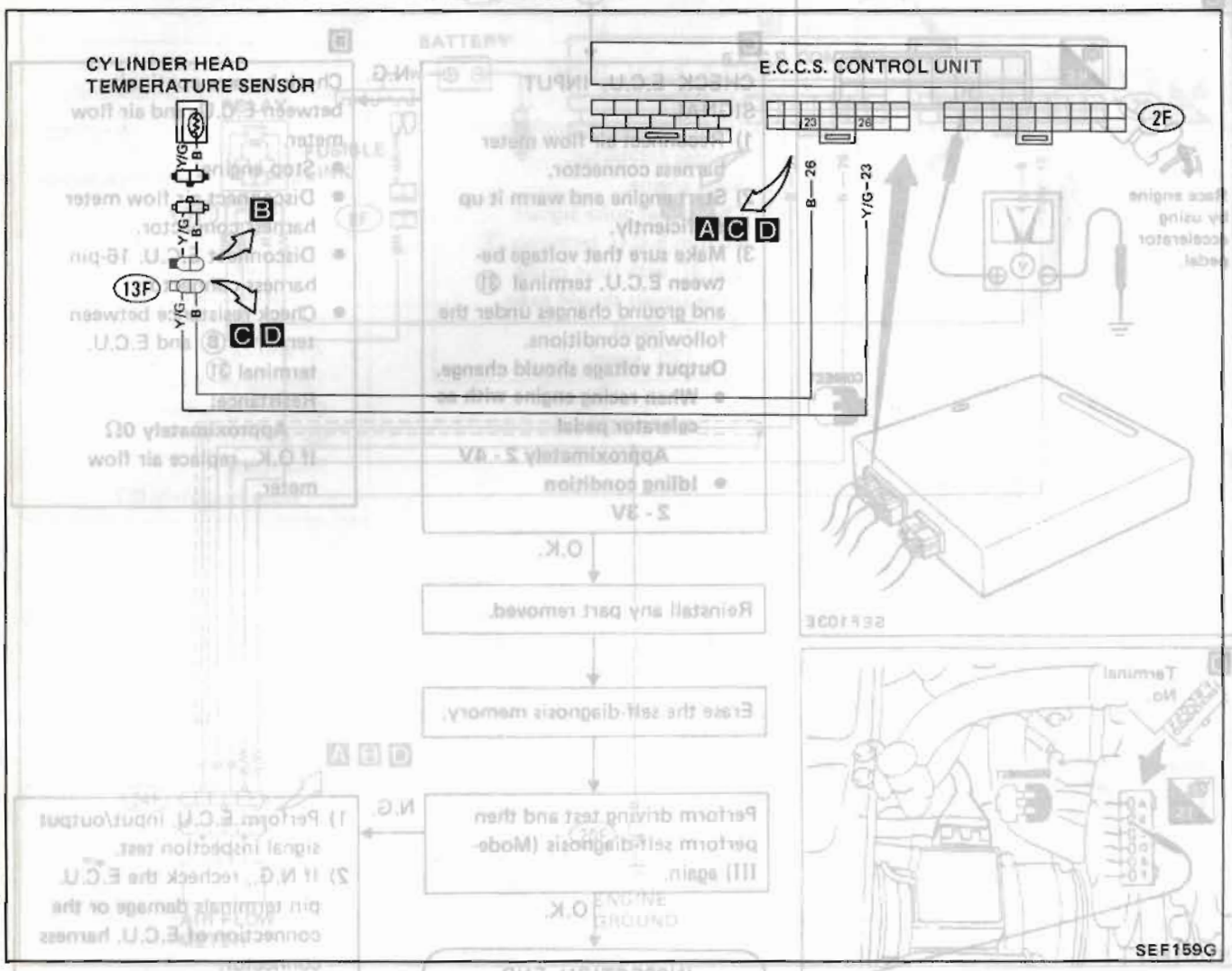
Check harness continuity between E.C.U. and air flow meter.

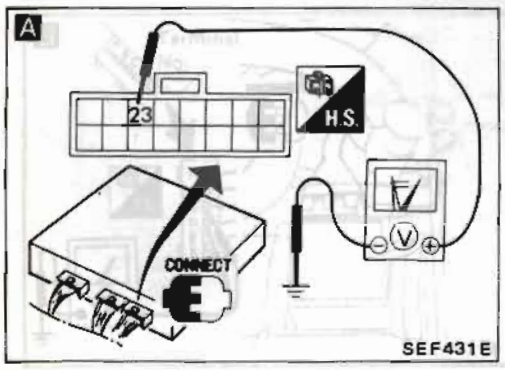
- Stop engine.
- Disconnect air flow meter harness connector.
- Disconnect E.C.U. 16-pin harness connector.
- Check resistance between terminal Ⓑ and E.C.U. terminal ㉛.

Resistance:
Approximately 0Ω

If O.K., replace air flow meter.

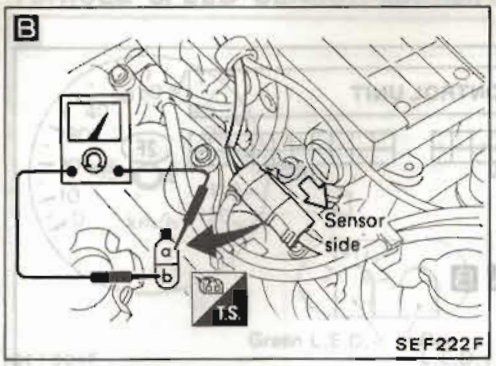
CYLINDER HEAD TEMPERATURE SENSOR (Code No. 13)





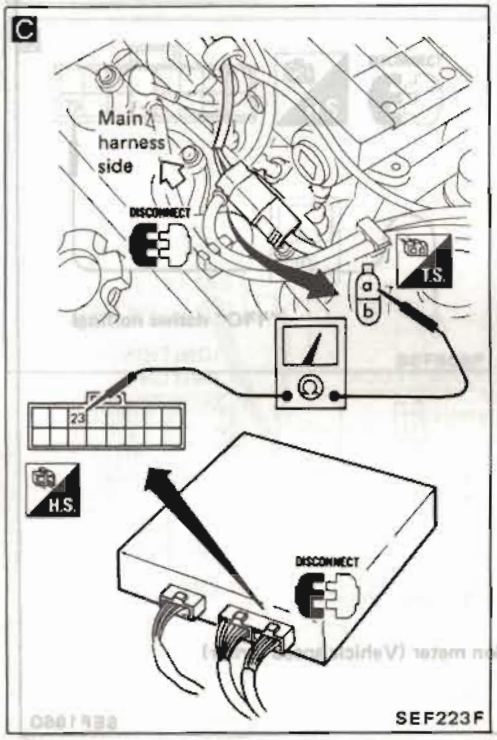
CYLINDER HEAD TEMPERATURE SENSOR (Code No. 13)

B



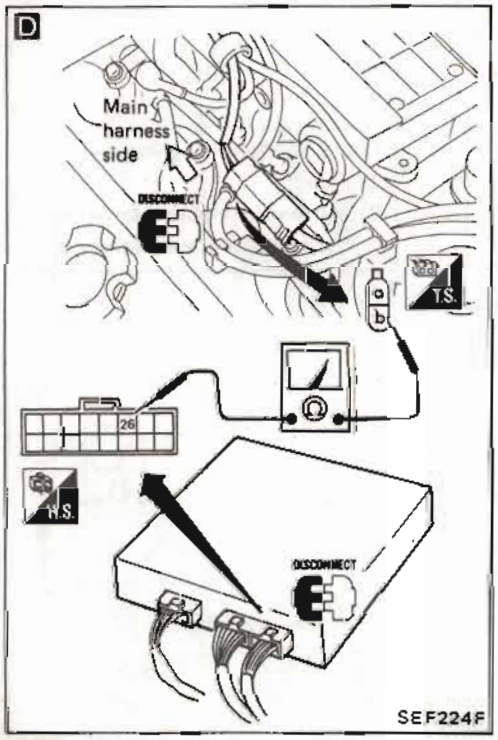
SEF222F

C



SEF223F

D



SEF224F

INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine.
2) Make sure that voltage between E.C.U. terminal ㉓ and ground changes during engine warm up.
Cold → Hot:
Approximately 5 - 0V

N.G. →

B 1) Check cylinder head temperature sensor resistance.
- Stop engine.
- Disconnect cylinder head temperature sensor harness connector.
- Check resistance between terminals.

20°C (68°F)	2.3 - 2.7 kΩ
50°C (122°F)	0.77 - 0.87 kΩ
80°C (176°F)	0.30 - 0.33 kΩ

If no continuity, replace cylinder head temperature sensor.

2) Check power source for E.C.U. (See page EF & EC-122.)

C 3) Check harness continuity between E.C.U. and cylinder head temperature sensor.
- Disconnect 16-pin connector from E.C.U.
- Disconnect cylinder head temperature sensor connector.

Check resistance between terminal ⓐ and E.C.U. terminal ㉓.
Resistance:
Approximately 0Ω

O.K.

D

CHECK GROUND CIRCUIT.
1) Stop engine and disconnect 16-pin connector from E.C.U.
2) Disconnect cylinder head temperature sensor harness connector.
3) Check resistance between terminal ⓑ and E.C.U. terminal ㉖.
Resistance:
Approximately 0Ω

N.G. → Check harness connection between cylinder head temperature sensor and ground.

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.

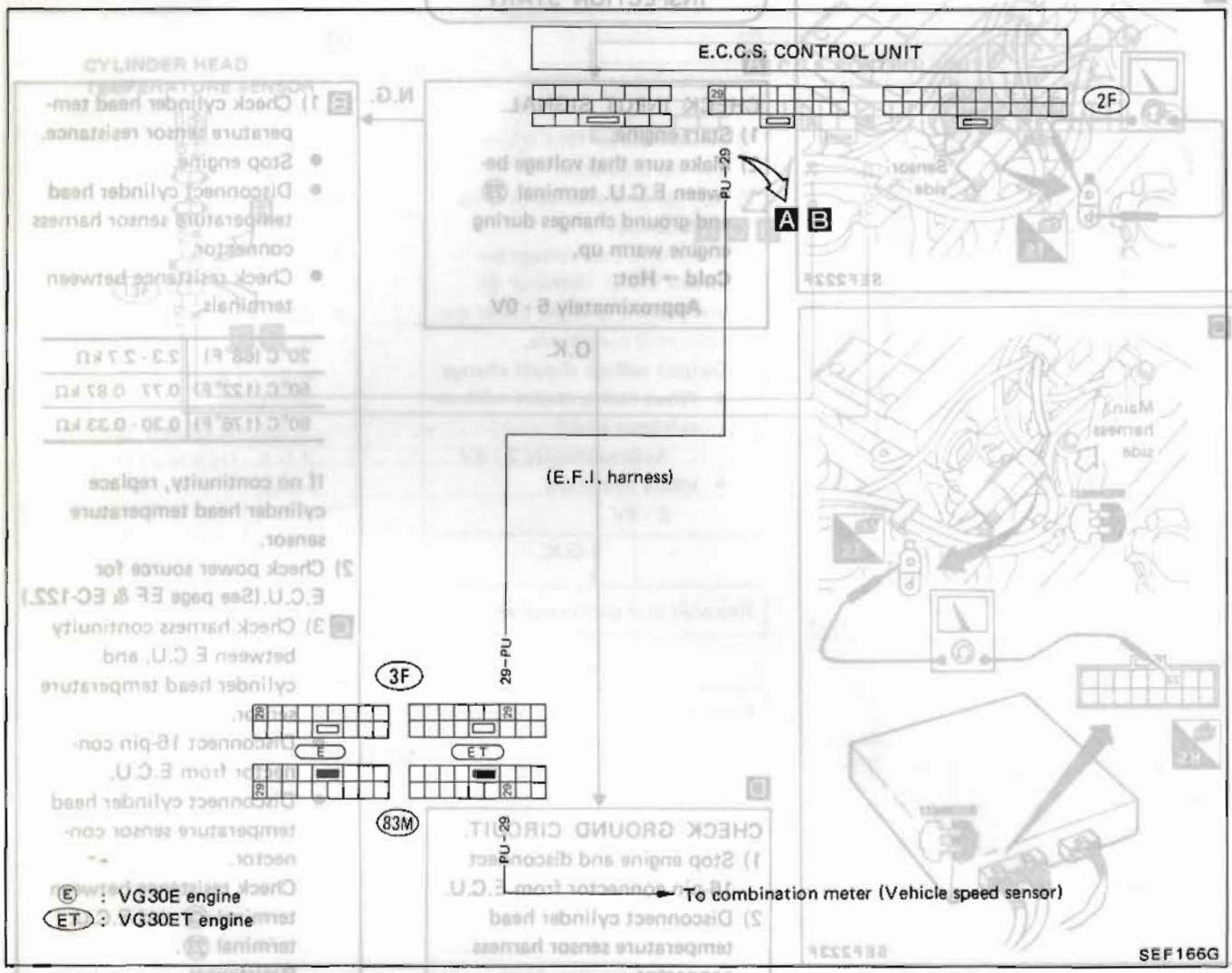
Perform driving test and then perform self-diagnosis (Mode-III) again.

N.G. → 1) Perform E.C.U. in-output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K.

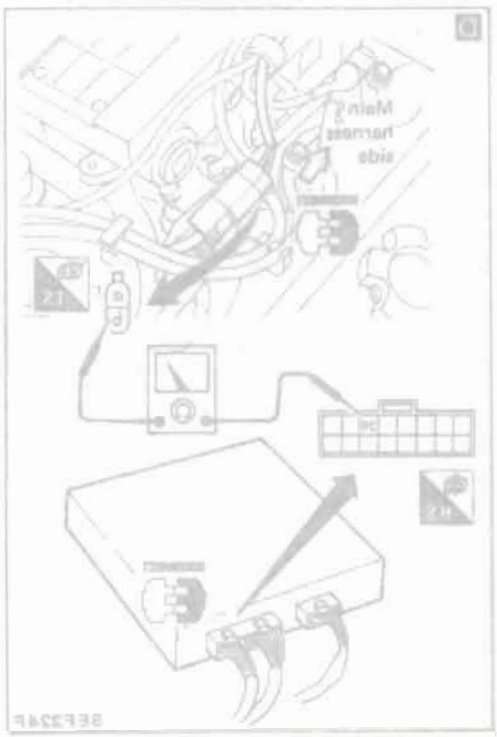
INSPECTION END

VEHICLE SPEED SENSOR (Switch ON/OFF diagnosis) (Code No. 14) (CHECK ENGINE LIGHT ITEM)



The following is necessary to perform this inspection.

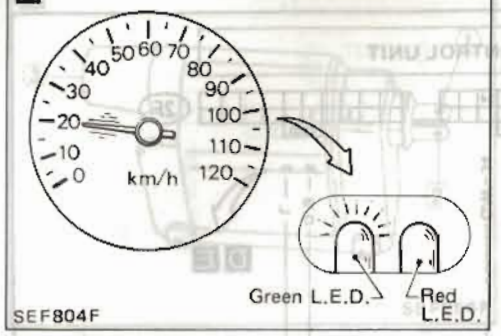
1. Pull out E.C.U. from passenger's dash side.
2. Jack up rear wheels.



ELECTRONIC CONTROL SYSTEM INSPECTION

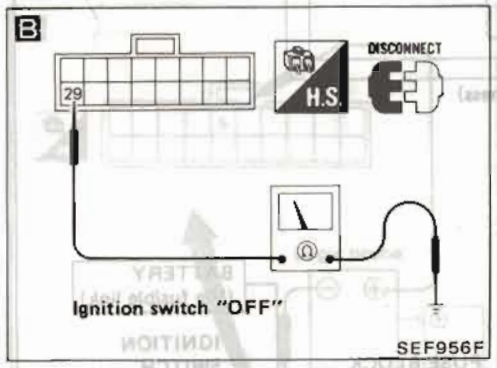
VEHICLE SPEED SENSOR (Switch ON/OFF diagnosis) (Code No. 14) (CHECK ENGINE LIGHT ITEM)

A



SEF804F

B



SEF956F

INSPECTION START

A CHECK INPUT SIGNAL
1) Perform switch ON/OFF diagnosis (in Mode IV).
2) Make sure green L.E.D. on E.C.U. comes "ON" when vehicle speed reaches 20 km/h (12 MPH).

O.K. → INSPECTION END

N.G.

B CHECK CONTINUITY BETWEEN E.C.U. AND VEHICLE SPEED SENSOR
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 16-pin harness connector.
3) Check resistance between E.C.U. terminal (29) and ground by rotating rear wheel by hand.

Continuity should come and go.

N.G. →
1) Repair or replace harness.
2) Check middle harness connector for proper connection.
3) Check S.M.J.

O.K.

CHECK VEHICLE SPEED SENSOR
See EL section.

Reinstall any part removed.

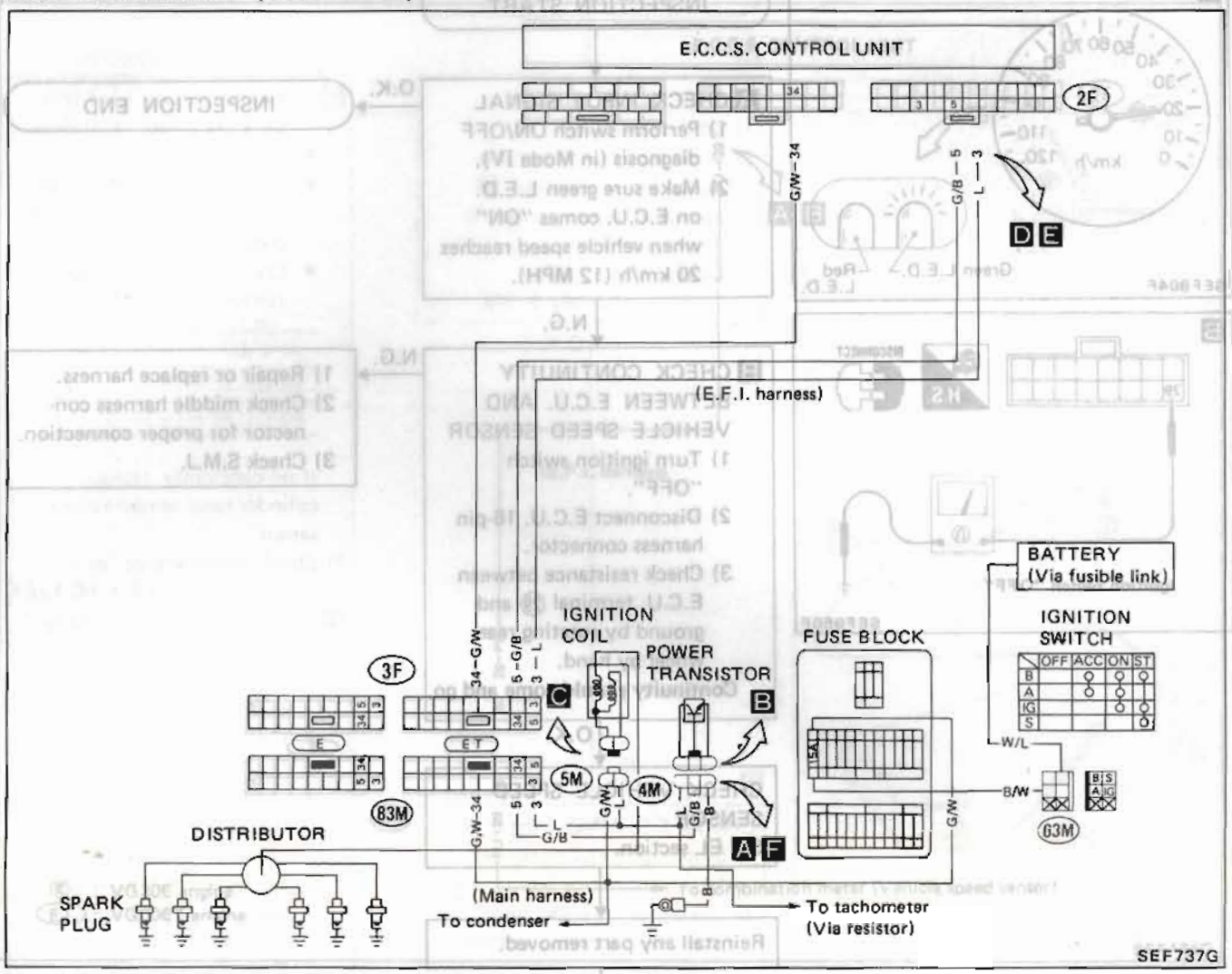
Perform self-diagnosis Mode IV.

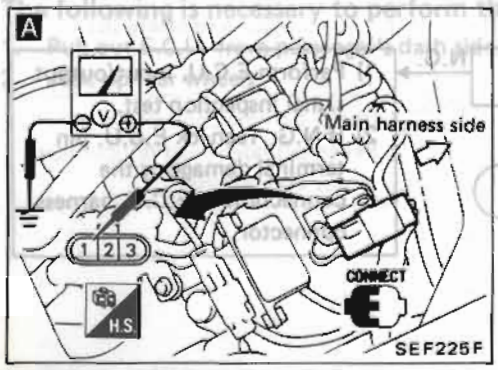
N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck E.C.U. pin terminal damage or the connection of E.C.U. harness connector.

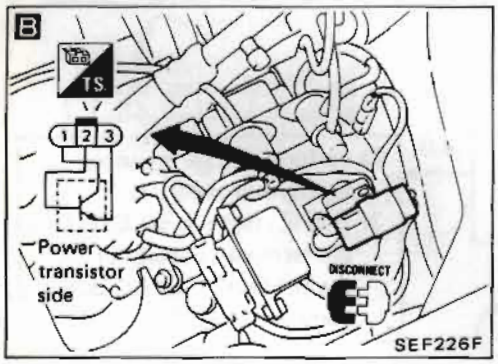
O.K.

INSPECTION END

IGNITION SIGNAL (Code No. 21)







INSPECTION START

A

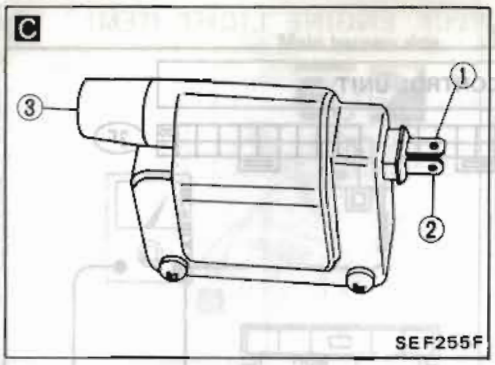
CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ① and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Fuse
2) Harness connection between battery and power transistor

O.K. ↓

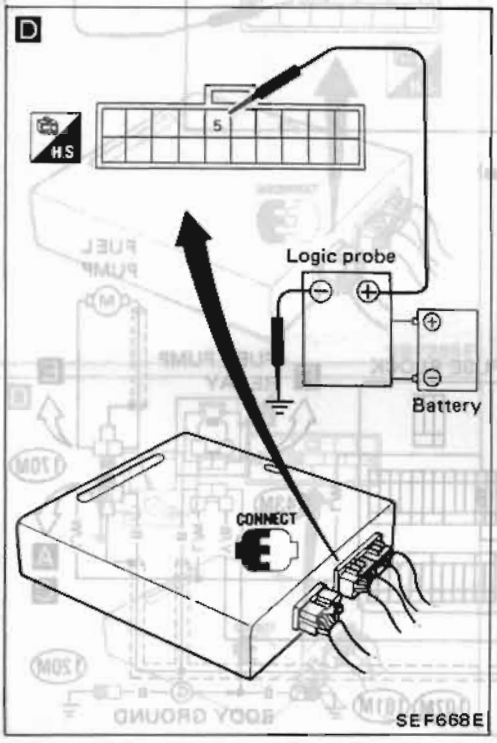
IGNITION SIGNAL (Code No. 21)

C



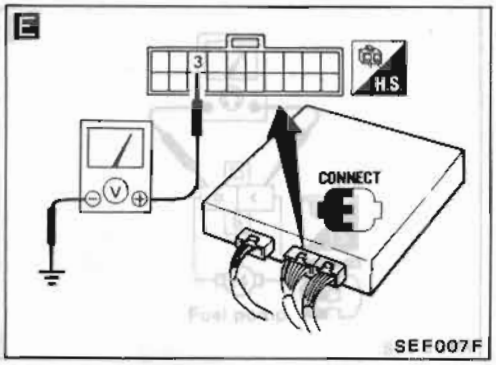
SEF255F

D



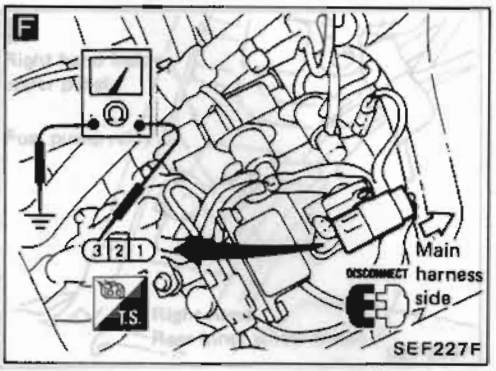
SEF668E

E



SEF007F

F



SEF227F

D

CHECK INPUT SIGNAL.
1) Start engine.
2) Make sure that pulse signals exist between terminal ⑤ and ground with logic probe.
Pulse signal should exist.

N.G. →
1) Stop engine and check harness continuity between power transistor and E.C.U.

B 2) Check power transistor with circuit tester.
- Disconnect harness connector for power transistor.

① : To ignition coil (+) side
② : To E.C.U.
③ : To engine ground

Terminal No.	Tester polarity	Continuity
①	+	No continuity
③	−	
①	−	Continuity should exist.
③	+	
①	+	No continuity
②	−	
①	−	Continuity should exist.
②	+	

If N.G., replace power transistor.

C 3) Check resistance of ignition coil.

Terminal No.	Resistance
① - ②	1Ω
① - ③	10 kΩ

If N.G., replace ignition coil.

O.K. ↓

E

CHECK INPUT SIGNAL.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal ③ and ground.
Battery voltage should exist.

N.G. → Check harness continuity between E.C.U. and battery.

O.K. ↓

F

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect power transistor harness connector.
3) Check resistance between terminal ③ and ground.
Resistance:
Approximately 0Ω

N.G. → Check the following items.
1) Harness connection between power transistor and ground
2) Engine ground

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

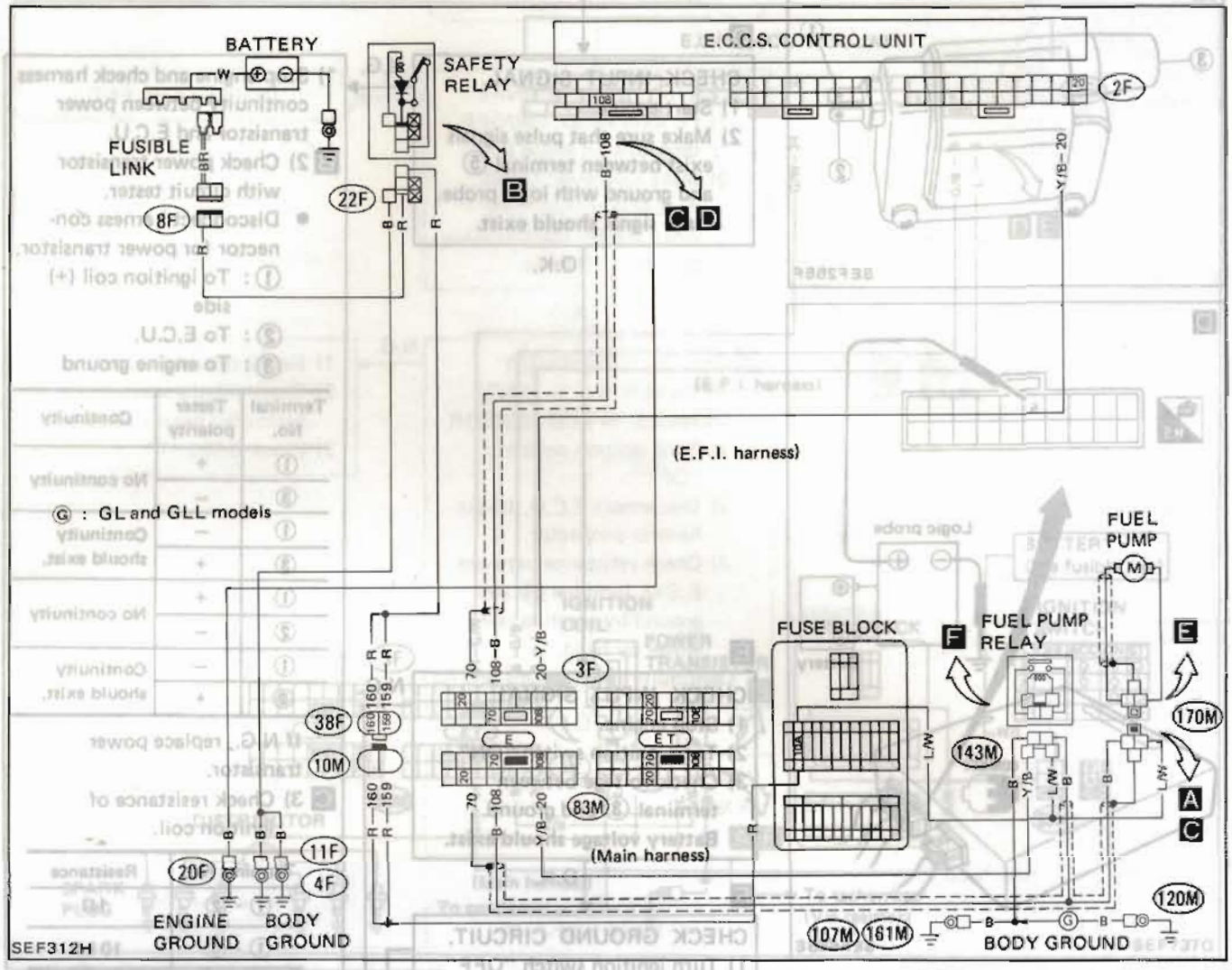
Perform driving test and then perform self-diagnosis (Mode-III) again.

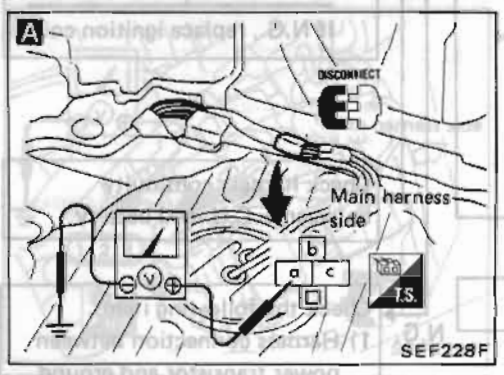
N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

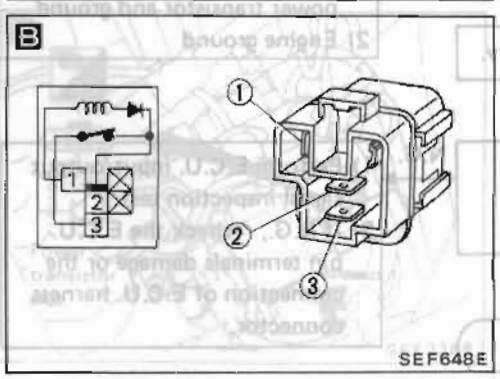
O.K. ↓

INSPECTION END

FUEL PUMP (Code No. 22)

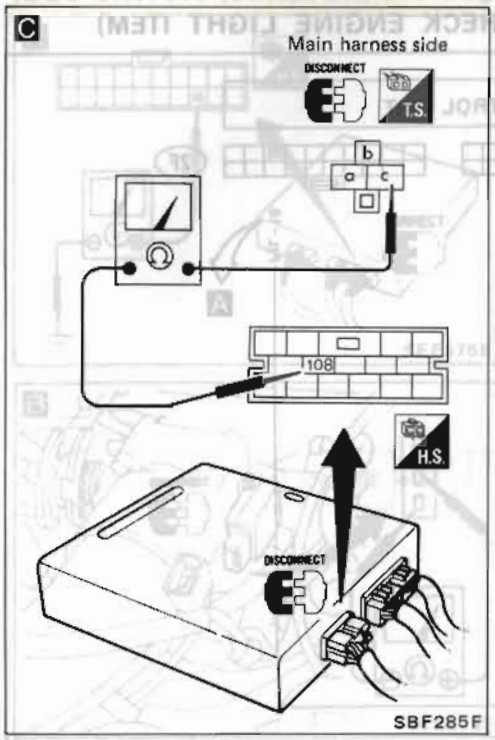






FUEL PUMP (Code No. 22)

C



INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect fuel pump harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. →
Check the following items.
1) Harness continuity between battery and fuel pump.
2) Fuse
3) "BR" fusible link
4) Ignition switch
B 4) Safety relay

12V direct current is applied between terminals ① and ②		Continuity between terminals ② and ③
①	②	
−	+	Yes
+	−	No

O.K. ↓

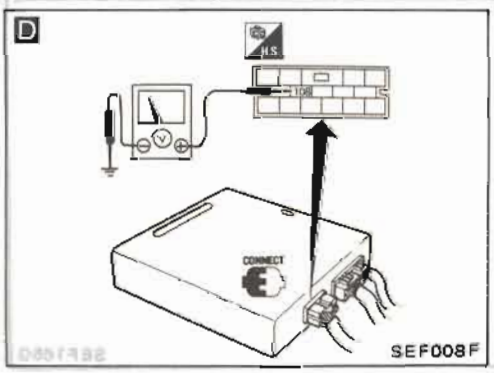
C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 15-pin connector.
3) Check resistance between E.C.U. terminals (108) and ⓒ.
Resistance:
Approximately 0Ω

N.G. → Repair harness.

O.K. ↓

D



D

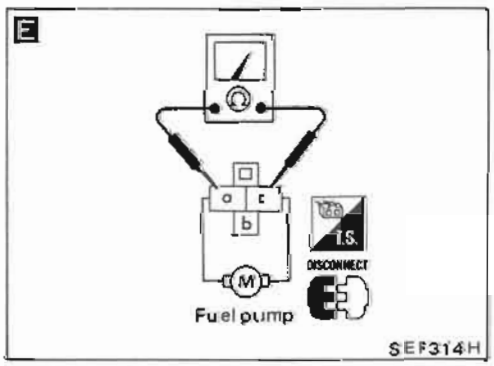
CHECK OUTPUT SIGNAL.
1) Reconnect E.C.U. 15-pin connector and fuel pump harness connector.
2) Turn ignition switch "ON".
3) Check voltage between E.C.U. terminal (108) and ground.
The indicator should read approximately 0V, for 5 seconds after turning ignition switch "ON".

N.G. →
E 1) Check fuel pump.
- Disconnect fuel pump harness connector.
- Check resistance between terminals ⓐ and ⓒ.
Continuity should exist.
If N.G., replace fuel pump.

F 2) Fuel pump relay
(Refer to EL section.)

O.K. ↓

E



Erase the self-diagnosis memory.

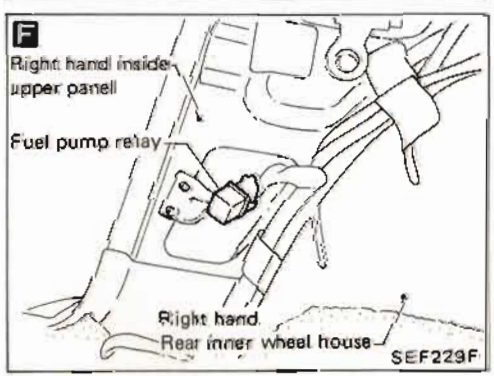
Perform driving test and then perform self-diagnosis again (Mode-III).

N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

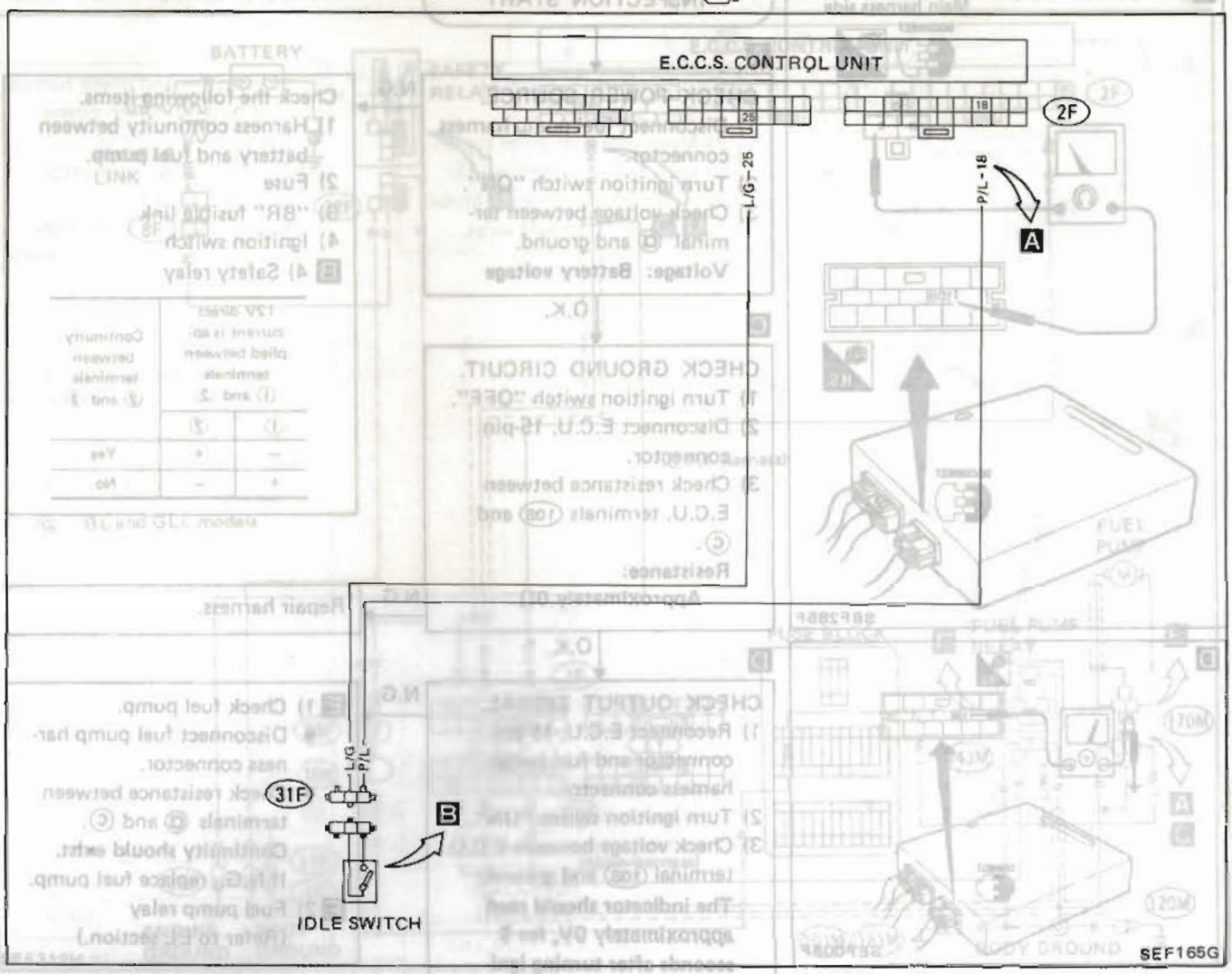
O.K. ↓

INSPECTION END

F



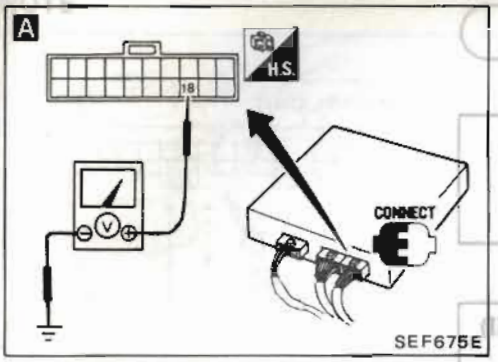
IDLE SWITCH (Switch ON/OFF diagnosis) (Code No. 23) (CHECK ENGINE LIGHT ITEM)

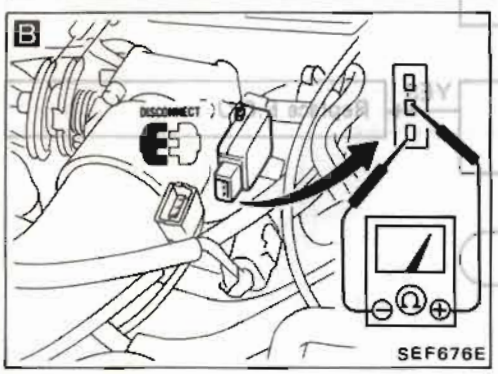


The following is necessary to perform this inspection.

Pull out E.C.U. from passenger's dash side.

IDLE SWITCH (Switch ON/OFF diagnosis) (Code No. 23) (CHECK ENGINE LIGHT ITEM)





INSPECTION START

A

CHECK INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal ⑱ and ground.

Accelerator pedal condition	Voltage
Fully closed	9 - 10V
Open	0V

N.G. →
Check the following items.
1) Harness continuity between E.C.U. and throttle valve switch.
2) Ignition switch
3) "BR" fusible link
4) Continuity of throttle valve switch
- Disconnect throttle valve switch harness connector.

B
- Make sure that continuity exists when fully closed.

5) E.F.I. main relay
6) Power source for E.C.U. & ground circuit for E.C.U. (See page EF & EC-122.)

O.K. ↓

Reinstall any part removed.

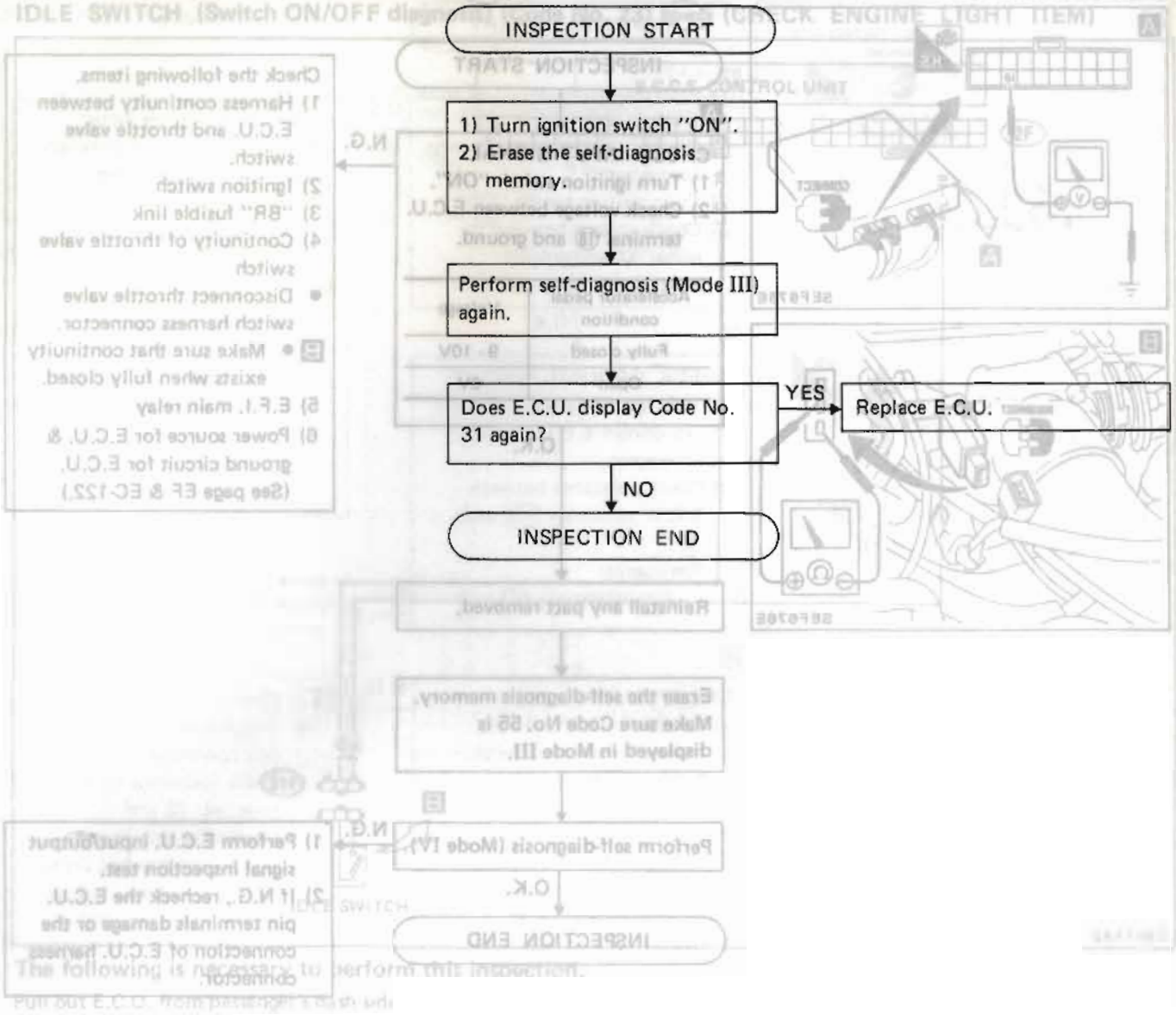
Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

Perform self-diagnosis (Mode IV). N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

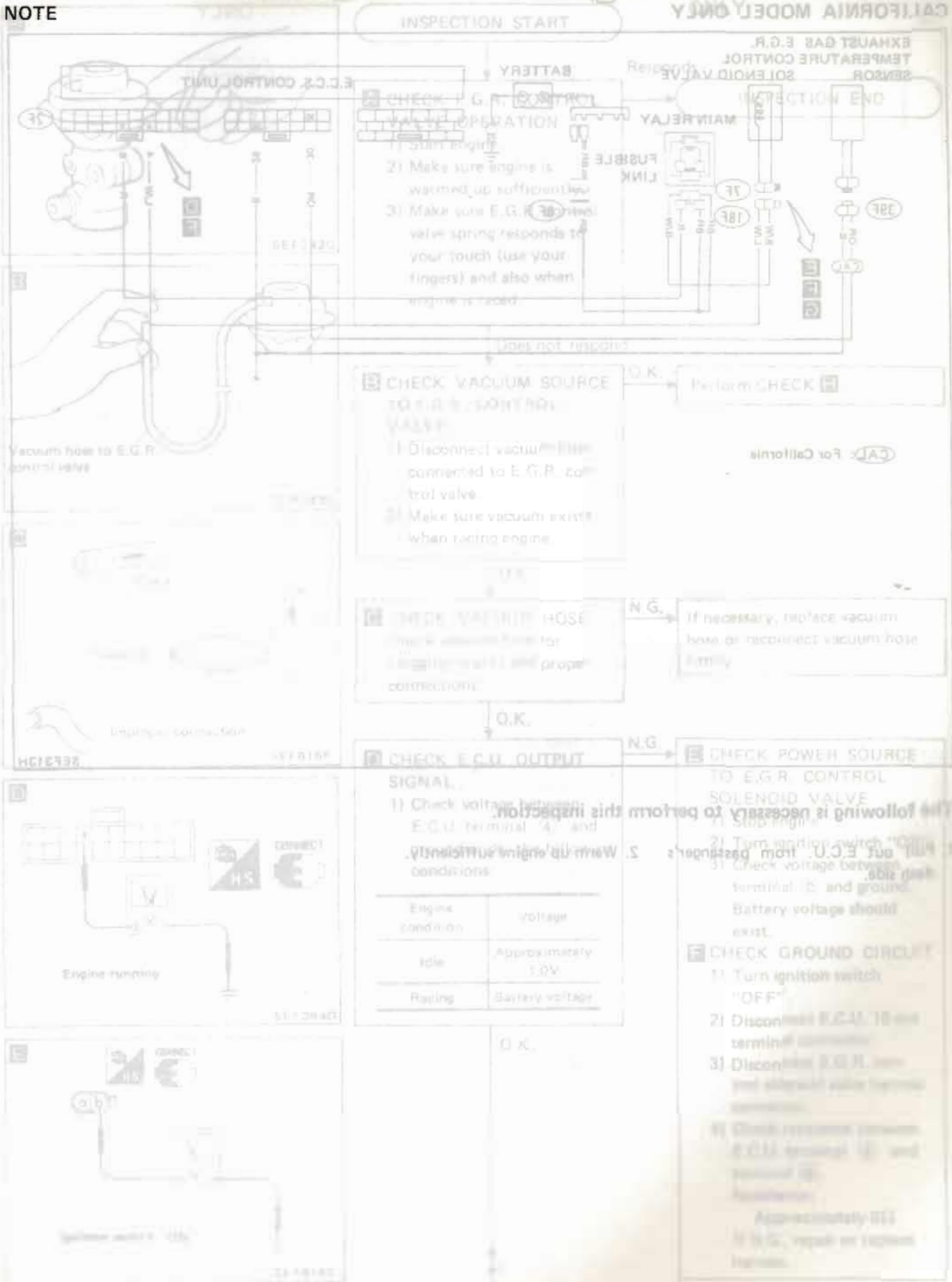
O.K. ↓

INSPECTION END

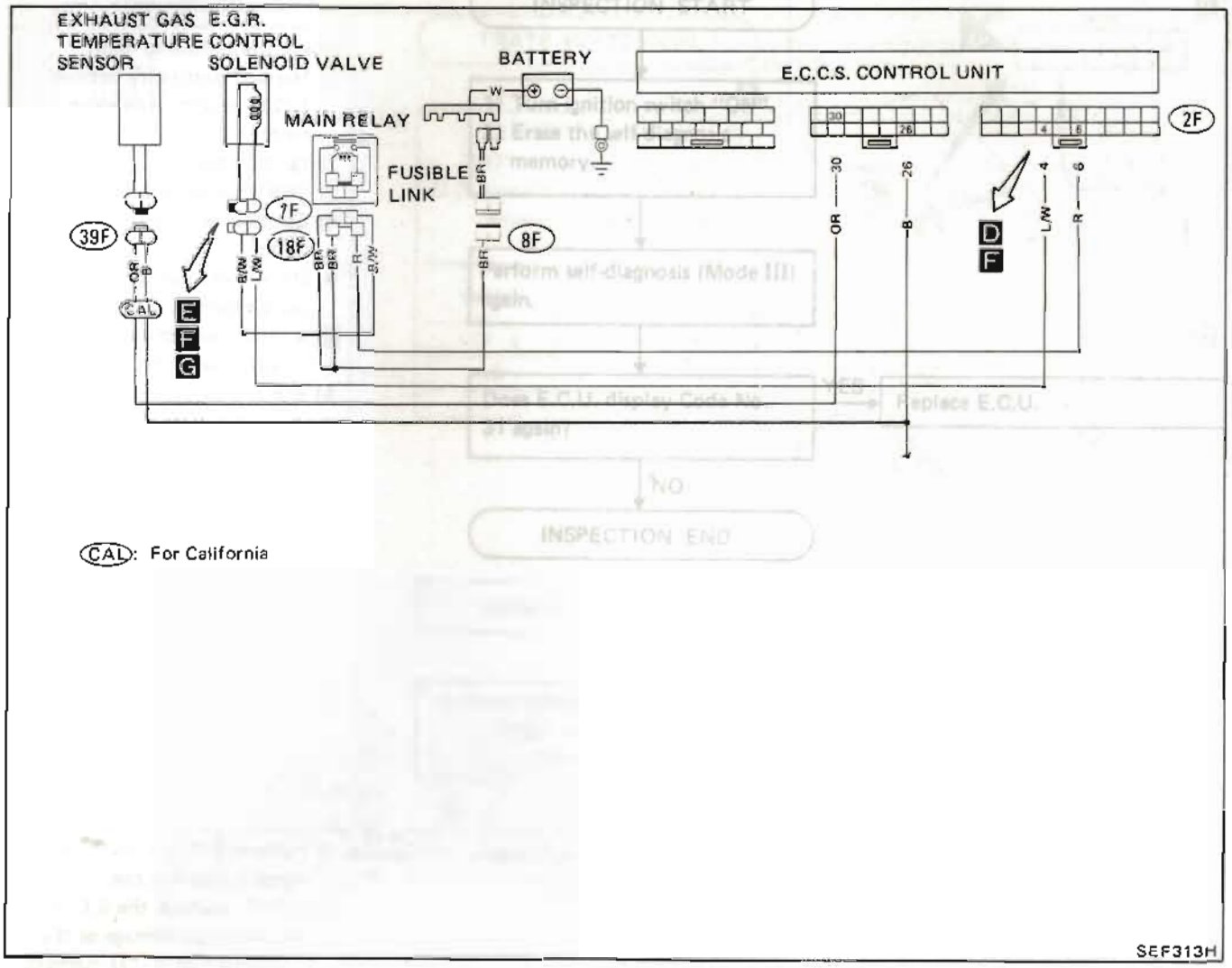
ENGINE CONTROL UNIT (Code No. 31) (CHECK ENGINE LIGHT ITEM)



NOTE


INSPECTION START
CHECK E.G.R. CONTROL VALVE OPERATION
1) Start engine.
2) Make sure engine is warmed up sufficiently.
3) Make sure E.G.R. valve spring responds to your touch (use your fingers) and also when engine is raced.
Does not respond.
CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE
1) Disconnect vacuum hose connected to E.G.R. control valve.
2) Make sure vacuum exists when racing engine.
O.K.
Perform CHECK
CHECK VACUUM HOSE
Check vacuum hose for clogging, split and proper connections.
N.G.
If necessary, replace vacuum hose or reconnect vacuum hose firmly.
O.K.
CHECK E.C.U. OUTPUT SIGNAL
1) Check voltage between E.C.U. terminal 4 and ground under following conditions.
N.G.
CHECK POWER SOURCE TO E.G.R. CONTROL SOLENOID VALVE
1) Turn ignition switch "OFF".
2) Turn ignition switch "ON".
3) Check voltage between terminal 5 and ground. Battery voltage should exist.
CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 16 pin terminal connector.
3) Disconnect E.G.R. control solenoid valve harness connector.
4) Check resistance between E.C.U. terminal 12 and control solenoid valve harness connector.
Approximately 0Ω
N.G. repair or replace harness.
O.K.
Engine condition
Voltage
Idle
Approximately 1.0V
Racing
Battery voltage
Engine running
Vacuum hose to E.G.R. control valve
For California

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY



The following is necessary to perform this inspection.

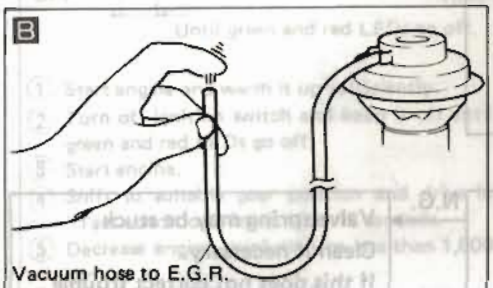
1. Pull out E.C.U. from passanger's dash side.
2. Warm up engine sufficiently.

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

A

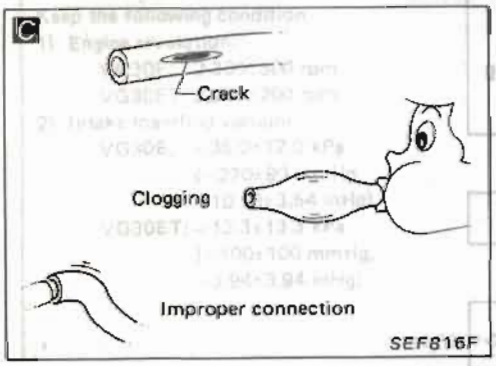
SEF242G

B



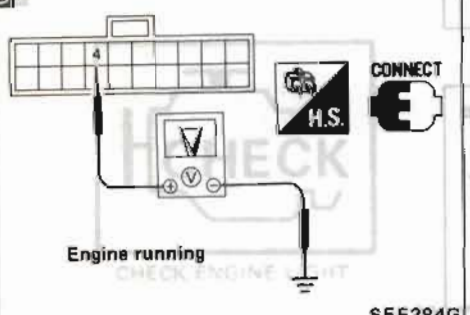
SEF243G

C



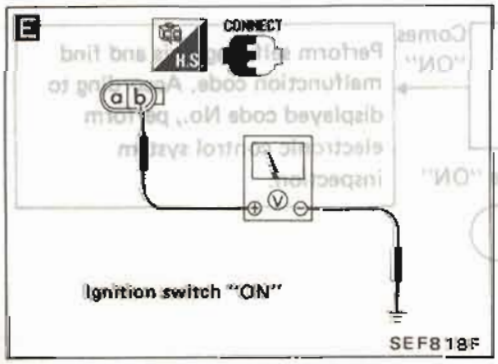
SEF816F

D



SEF384G

E



SEF818F

INSPECTION START

A CHECK E.G.R. CONTROL VALVE OPERATION
1) Start engine.
2) Make sure engine is warmed up sufficiently.
3) Make sure E.G.R. control valve spring responds to your touch (use your fingers) and also when engine is raced.

Responds → INSPECTION END

Does not respond

B CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE
1) Disconnect vacuum hose connected to E.G.R. control valve.
2) Make sure vacuum exists when racing engine.

O.K. → Perform CHECK **H**.

O.K.

C CHECK VACUUM HOSE
Check vacuum hose for clogging, cracks and proper connections.

N.G. → If necessary, replace vacuum hose or reconnect vacuum hose firmly.

O.K.

D CHECK E.C.U. OUTPUT SIGNAL
1) Check voltage between E.C.U. terminal ④ and ground under the following conditions:

Engine condition	Voltage
Idle	Approximately 1.0V
Racing	Battery voltage

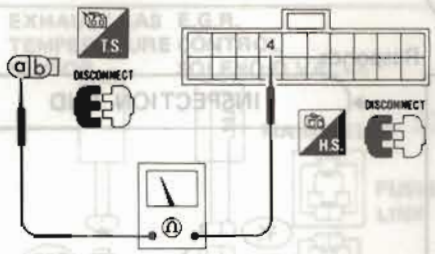
N.G. → **E** CHECK POWER SOURCE TO E.G.R. CONTROL SOLENOID VALVE
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

F CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 16-pin terminal connector.
3) Disconnect E.G.R. control solenoid valve harness connector.
4) Check resistance between E.C.U. terminal ④ and terminal ⓐ.
Resistance:
Approximately 0Ω
If N.G., repair or replace harness.

O.K.

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

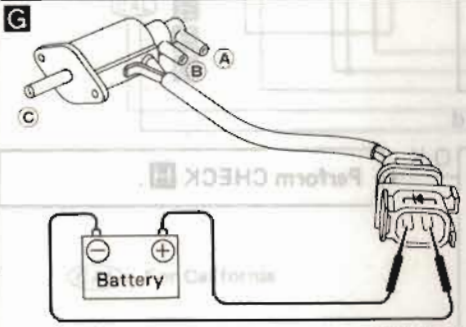
F



Ignition switch "OFF"

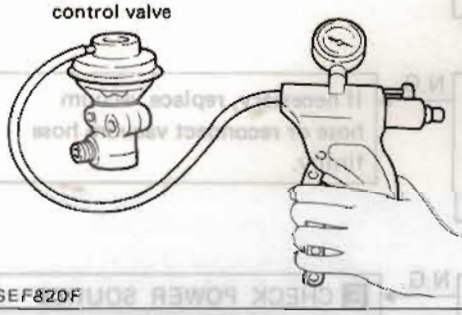
SEF386G

G



SEF762F

H



SEF820F

G CHECK E.G.R. CONTROL SOLENOID VALVE

1) Stop engine.
2) Remove E.G.R. control solenoid valve from vehicle.
3) Check the port continuity.

Solenoid valve	Continuity
When current flows	A – B
When current does not flow	B – C

N.G. → Replace E.G.R. control solenoid valve.

O.K.

H CHECK E.G.R. CONTROL VALVE

1) Remove E.G.R. control valve from vehicle.
2) Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.
   E.G.R. control valve spring should lift.

N.G. → Valve spring may be stuck. Clean if necessary. If this does not correct trouble, replace E.G.R. control valve.

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode II.

I Perform driving test under the following conditions:

1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure **I**.

J Make sure check engine light does not come "ON" during driving test.

Comes "ON" → Perform self-diagnosis and find malfunction code. According to displayed code No., perform electronic control system inspection.

Does not come "ON"

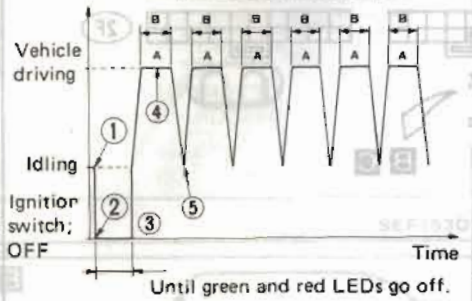
INSPECTION END

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

I

Driving mode

Ⓐ : Test condition
Ⓑ : 17 seconds or more



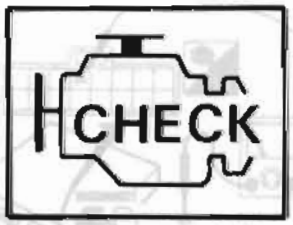
① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until green and red LEDs go off.
③ Start engine.
④ Shift to suitable gear position and drive in "Test condition" for at least 17 seconds.
⑤ Decrease engine revolution to less than 1,000 rpm.
⑥ Repeat steps ④ through ⑤ at least 4 times.

Test condition

Keep the following condition.
1) Engine revolution:
VG30E; 2,300±300 rpm
VG30ET; 2,200±200 rpm
2) Intake manifold vacuum:
VG30E; −36.0±12.0 kPa (−270±90 mmHg, −10.63±3.54 inHg)
VG30ET; −13.3±13.3 kPa (−100±100 mmHg, −3.94±3.94 inHg)

SEF387G

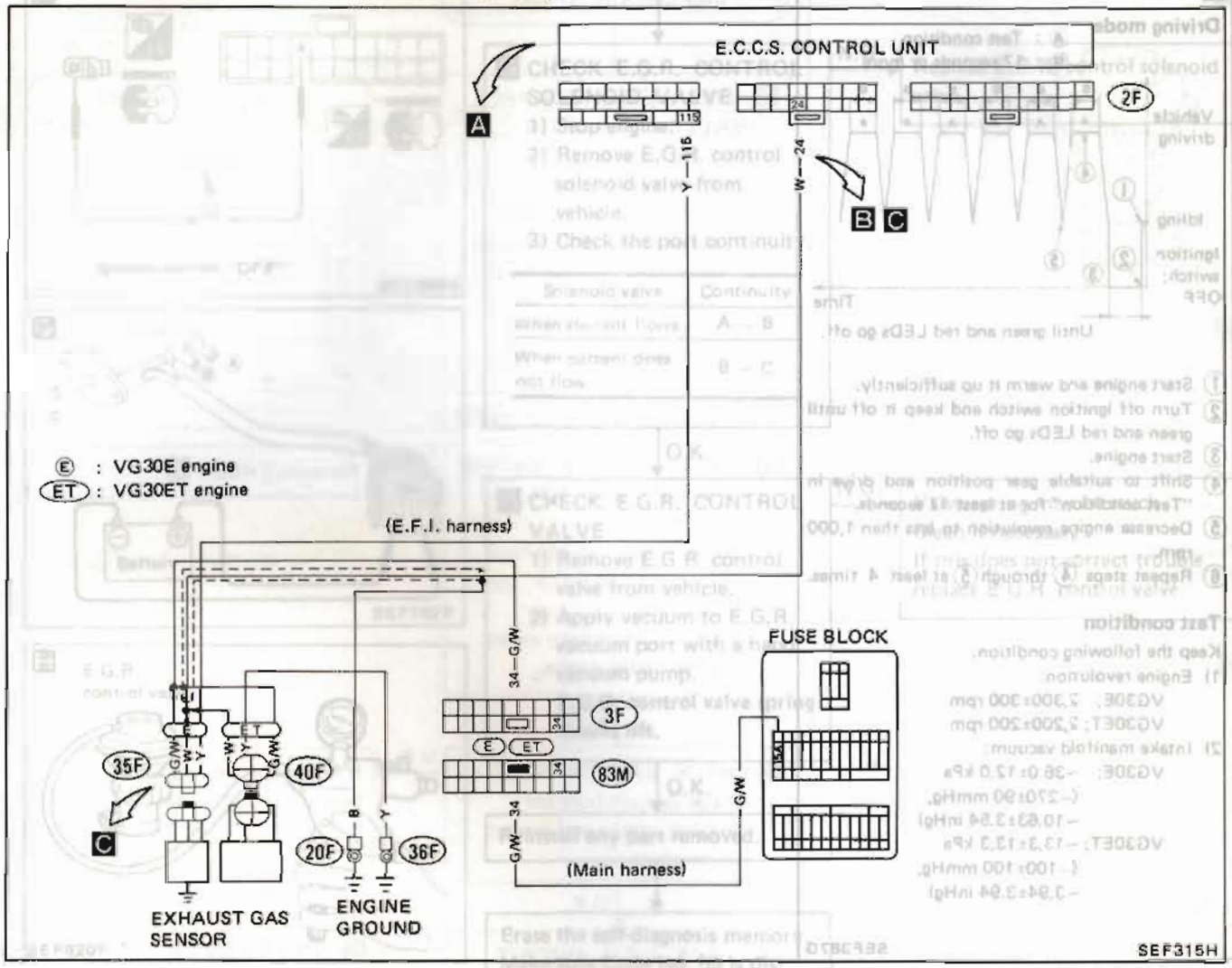
J



CHECK ENGINE LIGHT

SEF924F

EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM)

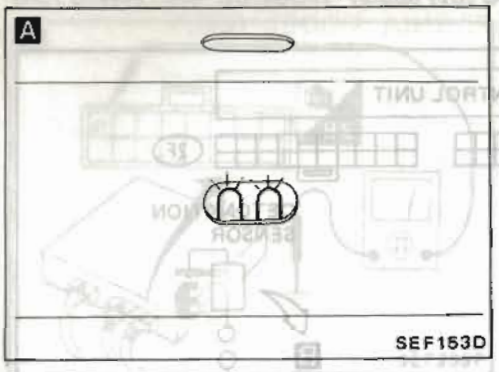


The following is neccessary to perform this inspection.

1. Pull out E.C.U. from passenger's dash side.
2. Warm up engine sufficiently.

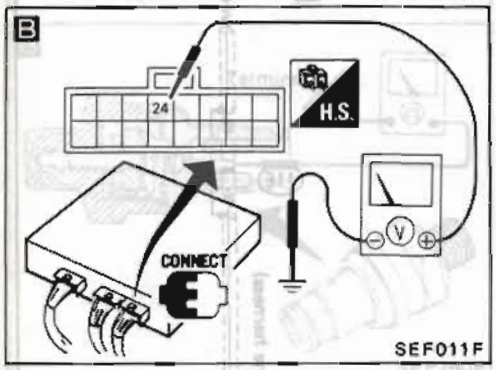
EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM)

A



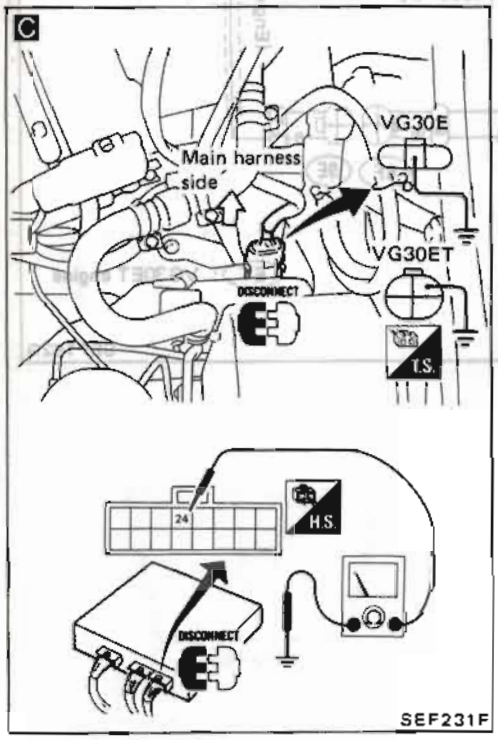
SEF153D

B



SEF011F

C



SEF231F

INSPECTION START

CHECK FLASHES OF INSPECTION LAMPS ON E.C.U.
1) Warm up engine sufficiently.
A 2) Make sure that green inspection lamp goes on and off 5 times or more during 10 seconds at 2,000 rpm.

O.K. → INSPECTION END

N.G.

B

CHECK INPUT SIGNAL.
1) Stop engine.
2) Start engine and make sure that engine has warmed up sufficiently.
If not, warm it up.
3) Check voltage between E.C.U. terminal ㉔ and ground.
Voltage: 0 - 1.0V

N.G.

C

Check harness continuity between E.C.U. and ground.
- Stop engine.
- Disconnect exhaust gas sensor harness connector, and connect main harness side terminal for sensor signal to ground with a jumper wire.
- Disconnect 16-pin connector from E.C.U.
- Check resistance between E.C.U. terminal ㉔ and ground.
Resistance:
Approximately 0Ω

N.G. → Replace exhaust gas sensor.

Reinstall any part removed.

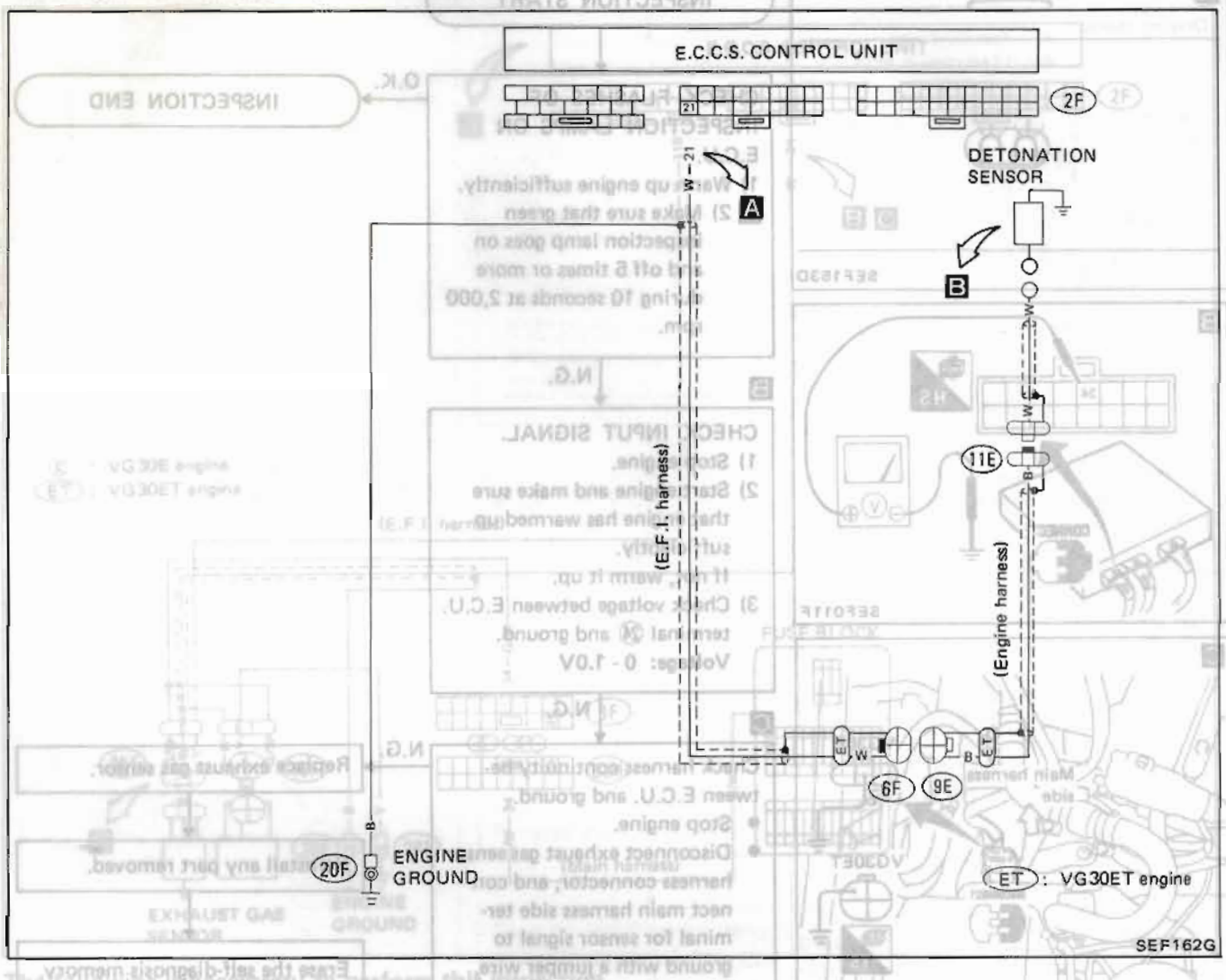
Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

1) Warm up engine sufficiently.
2) Set diagnosis mode to Mode I.
3) Make sure that inspection lamp (Green) on E.C.U. goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm.

N.G. → Perform MIXTURE RATIO FEEDBACK SYSTEM INSPECTION.
(See page EF & EC-143.)

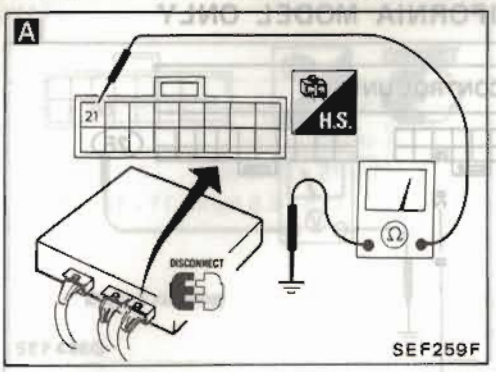
O.K. → INSPECTION END

DETONATION SENSOR (Code No. 34); VG30ET



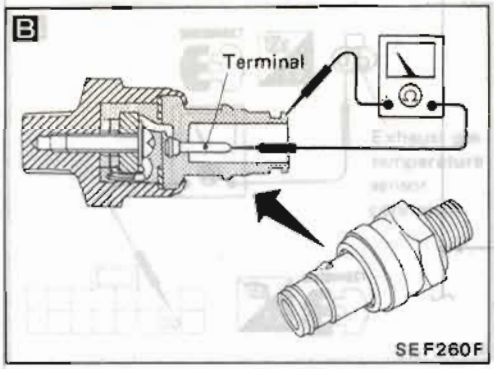
DETONATION SENSOR (Code No. 34); VG30ET

A



SEF259F

B



SEF260F

INSPECTION START

1) Disconnect 16-pin connector from E.C.U.
A 2) Check resistance between terminal ㉑ and ground.
Continuity should not exist.

N.G. → Check the following items.
1) Insulation between ground and harness connecting E.C.U. with detonation sensor.
B 2) Detonation sensor.
Continuity should not exist.
If N.G., replace detonation sensor.

O.K.

Connect 16-pin connector to E.C.U.

Erase the self-diagnosis memory.

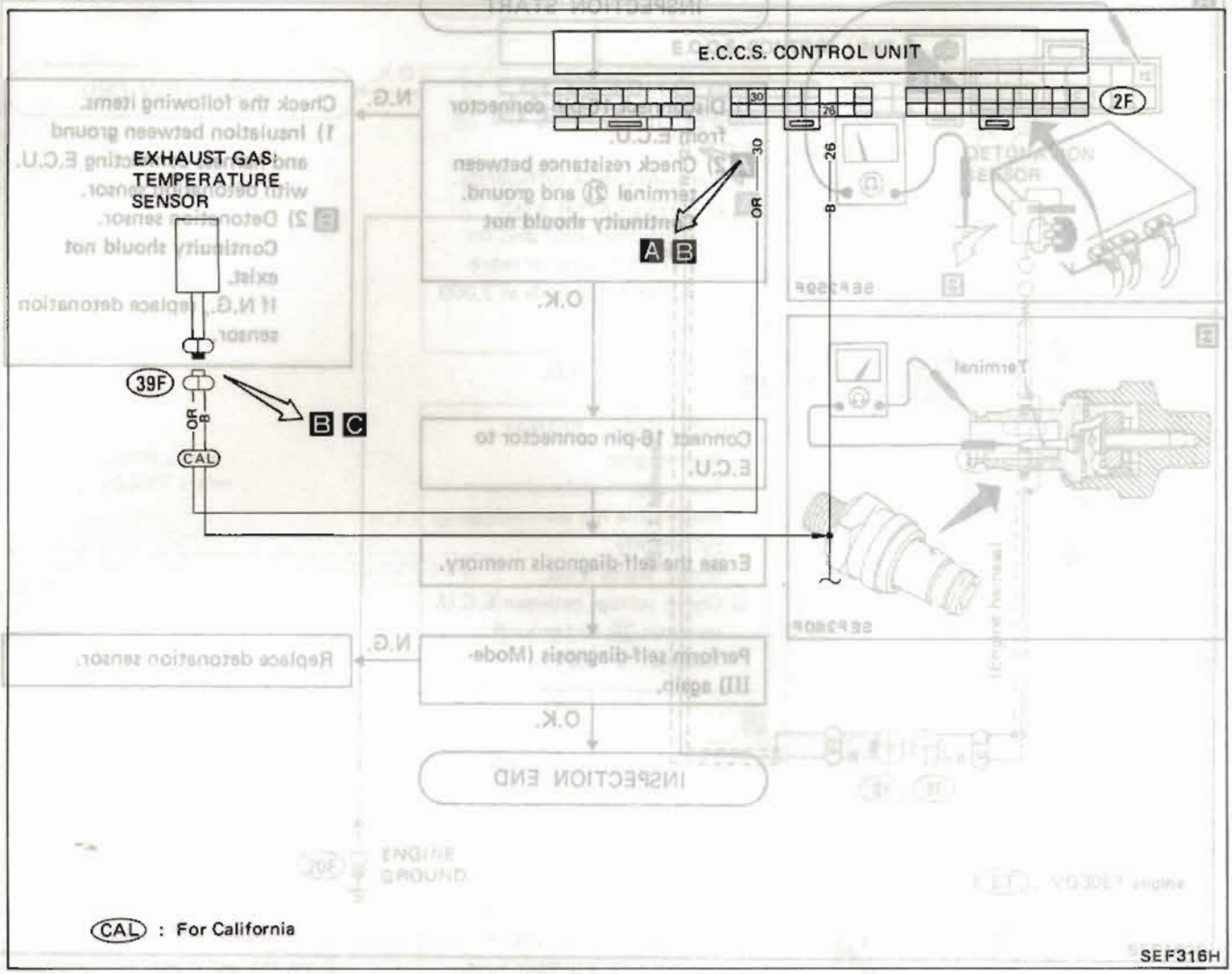
Perform self-diagnosis (Mode-III) again.

N.G. → Replace detonation sensor.

O.K.

INSPECTION END

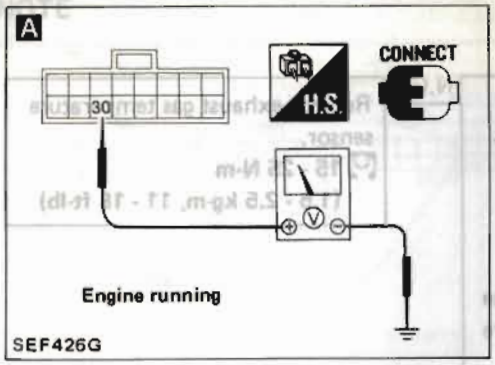
EXHAUST GAS TEMPERATURE SENSOR (Code No. 35); CALIFORNIA MODEL ONLY

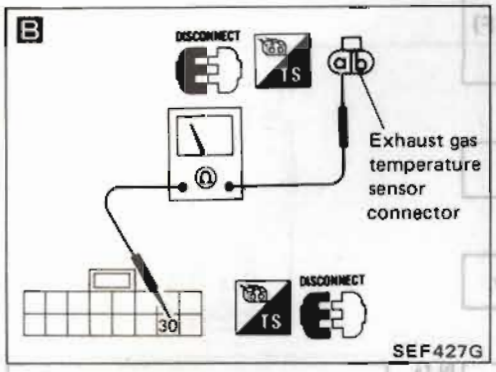


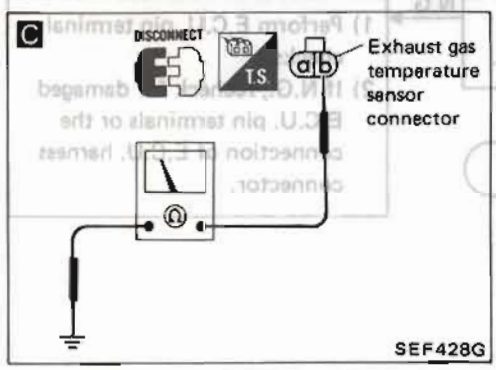
The following is necessary to perform this inspection.

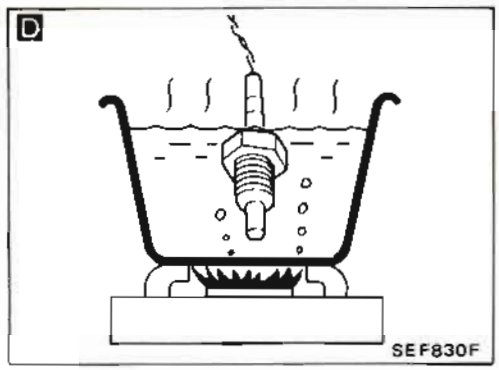
1. Pull out E.C.U. installed passenger's dash side.
2. • Disconnect vacuum hose connected to E.G.R. control valve.
   • Connect a hand vacuum pump to E.G.R. control valve.
3. Warm up engine sufficiently.

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35); CALIFORNIA MODEL ONLY









INSPECTION START

A CHECK INPUT SIGNAL
1) Start engine and warm it up sufficiently.
2) Keep engine speed at approximately 2,000 rpm.
3) Check voltage between E.C.U. terminal ㉚ and ground under the following conditions:

Condition	Voltage
When vacuum is not applied to E.G.R. control valve	1.0V or more
When vacuum is applied to E.G.R. control valve	0 - 1.0V

A sufficient vacuum applied with a hand vacuum pump may cause the engine to stall.

O.K. → INSPECTION END

N.G. ↓

B CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND EXHAUST GAS TEMPERATURE SENSOR
1) Stop engine.
2) Disconnect E.C.U. 16-pin terminal connector.
3) Disconnect exhaust gas temperature sensor harness connector.
4) Check continuity between E.C.U. terminal ㉚ and ⓐ.

N.G. → 1) Check middle harness connector connection.
2) If necessary, repair or replace harness.

O.K. ↓

C CHECK GROUND CIRCUIT
Check continuity between ⓑ and ground.
Resistance:
Approximately 0Ω

N.G. → 1) Check middle harness connector connection.
2) If necessary, repair or replace harness.

O.K. ↓

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35); CALIFORNIA MODEL ONLY

D CHECK COMPONENTS
1) Remove exhaust gas temperature sensor.
2) Check resistance change and resistance value at 100°C (212°F).
- **Resistance should decrease in response to temperature increase.**
- **Resistance: 100°C (212°F) 85.3±8.53 kΩ**

N.G. → Replace exhaust gas temperature sensor.
15 - 25 N·m
(1.5 - 2.5 kg-m, 11 - 18 ft-lb)

Reinstall any part removed.

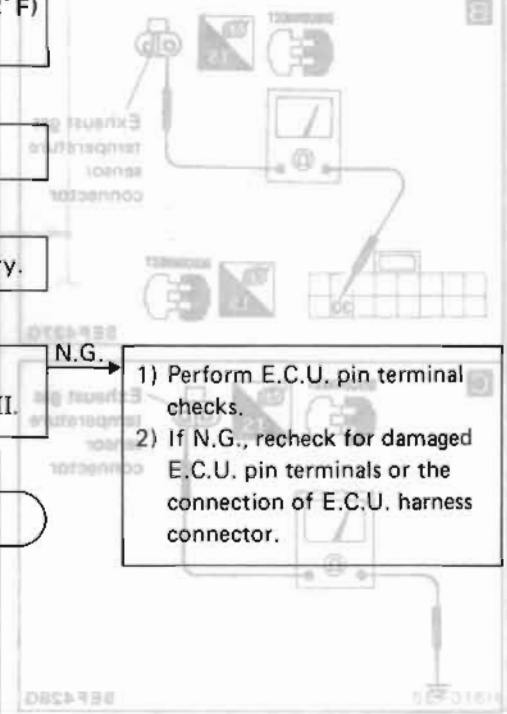
Erase the self-diagnosis memory.

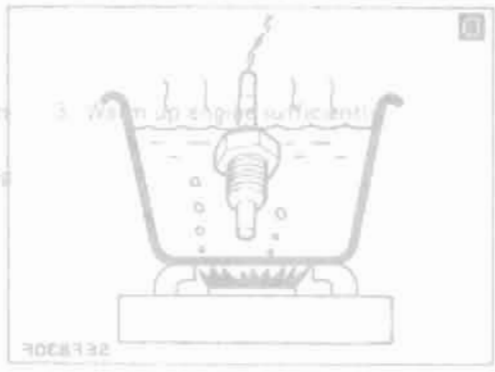
Perform driving test, then perform self-diagnosis Mode III.

N.G. →
1) Perform E.C.U. pin terminal checks.
2) If N.G., recheck for damaged E.C.U. pin terminals or the connection of E.C.U. harness connector.

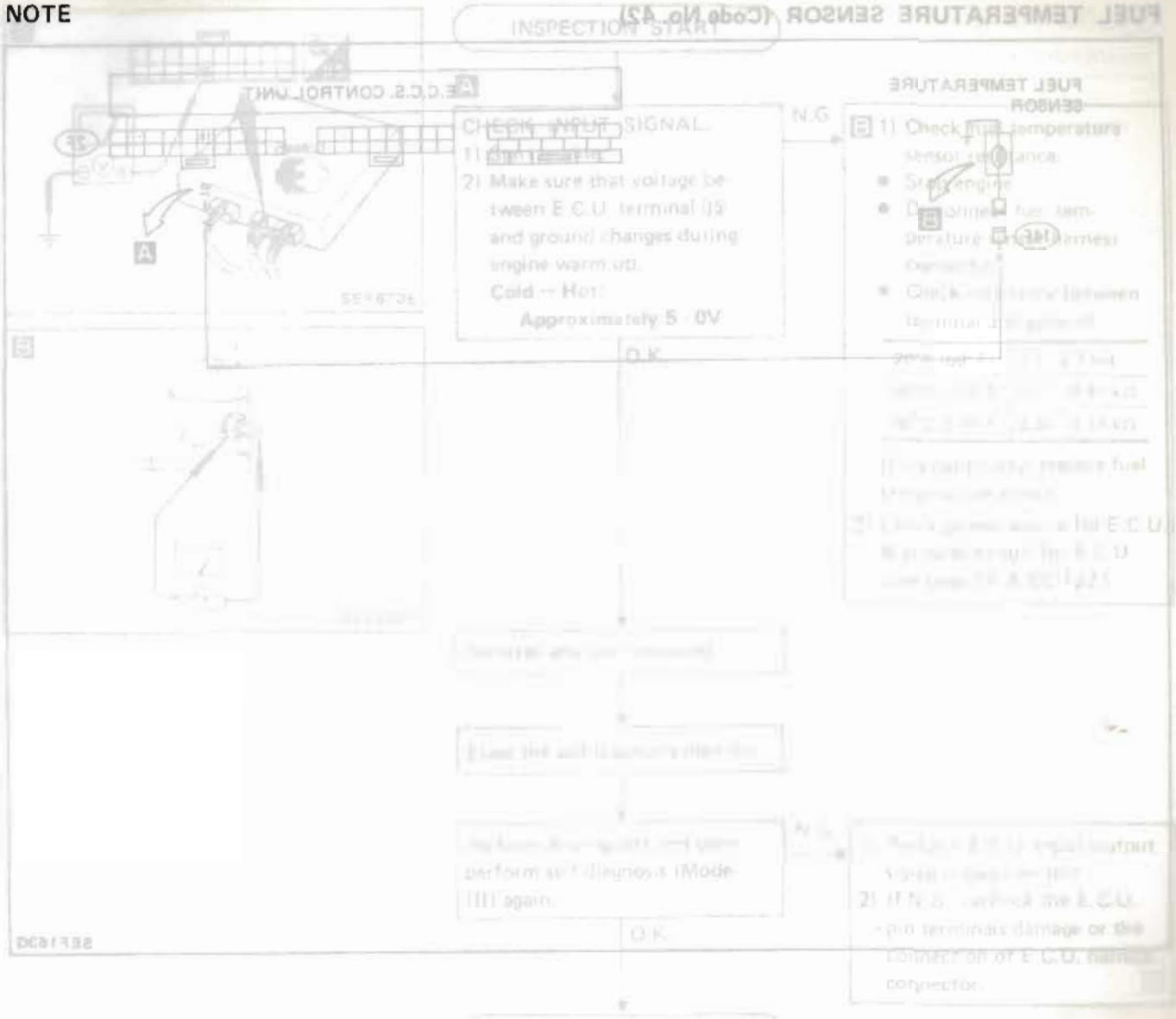
O.K.

INSPECTION END

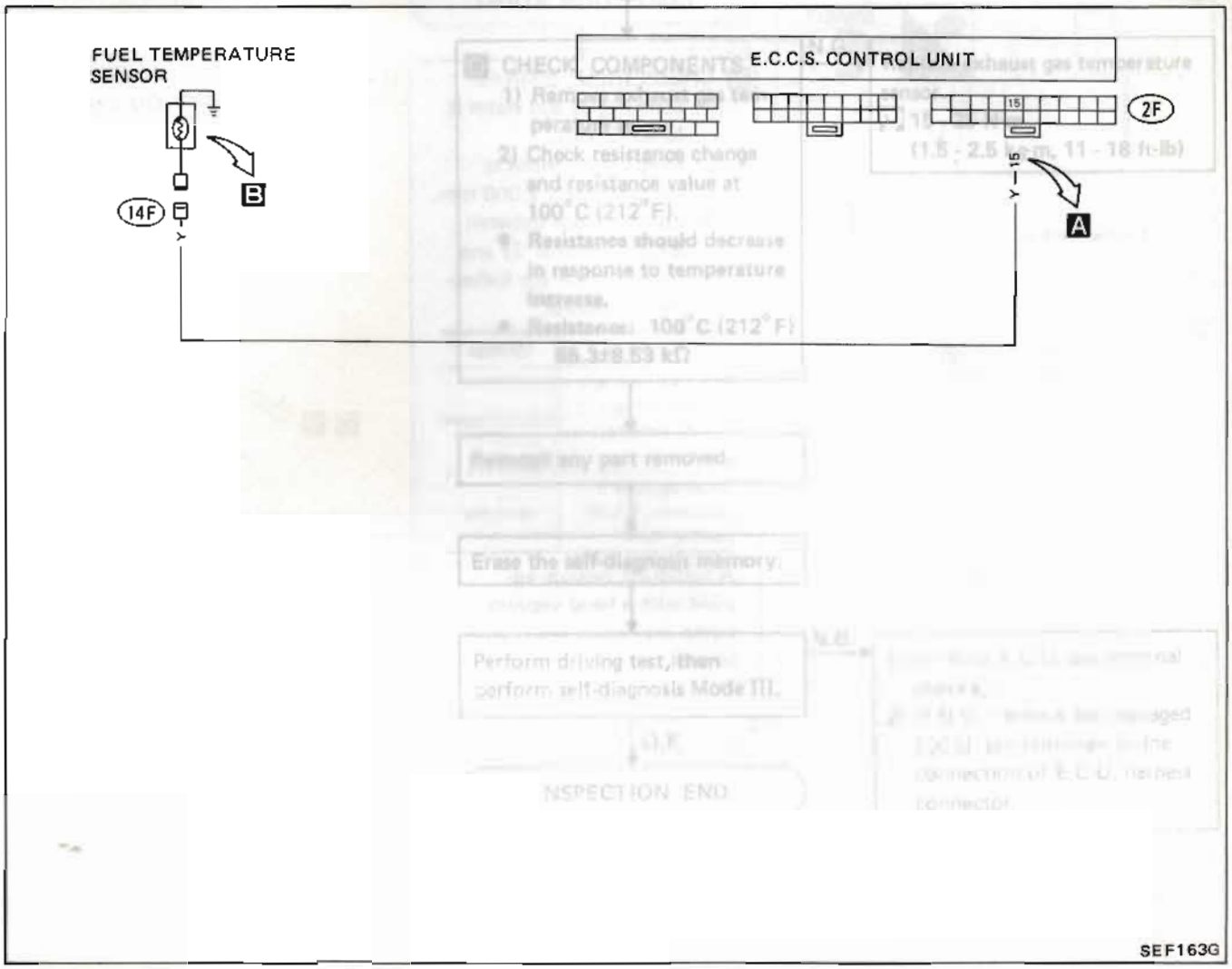




NOTE

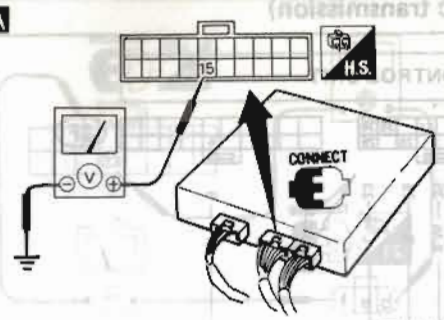

INSPECTION START
CHECK INPUT SIGNAL.
1)
2) Make sure that voltage between E.C.U. terminal (j)5 and ground changes during engine warm up.
Cold → Hot:
Approximately 5 → 0V
N.G
O.K
INSPECTION END

FUEL TEMPERATURE SENSOR (Code No. 42)



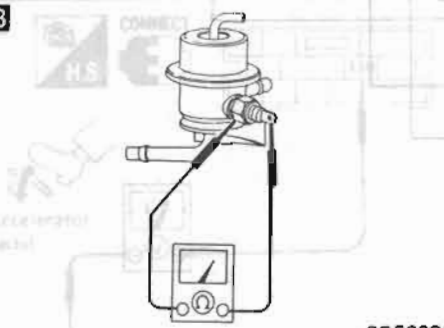
FUEL TEMPERATURE SENSOR (Code No. 42)

A



SEF673E

B



SEF208E

INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine.
2) Make sure that voltage between E.C.U. terminal ⑮ and ground changes during engine warm up.
Cold → Hot:
Approximately 5 - 0V

N.G.

B 1) Check fuel temperature sensor resistance.
- Stop engine.
- Disconnect fuel temperature sensor harness connector.
- Check resistance between terminal and ground.

20°C (68°F)	2.3 - 2.7 kΩ
50°C (122°F)	0.77 - 0.87 kΩ
80°C (176°F)	0.30 - 0.33 kΩ

If no continuity, replace fuel temperature sensor.
2) Check power source for E.C.U. & ground circuit for E.C.U. (See page EF & EC-122.)

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis (Mode-III) again.

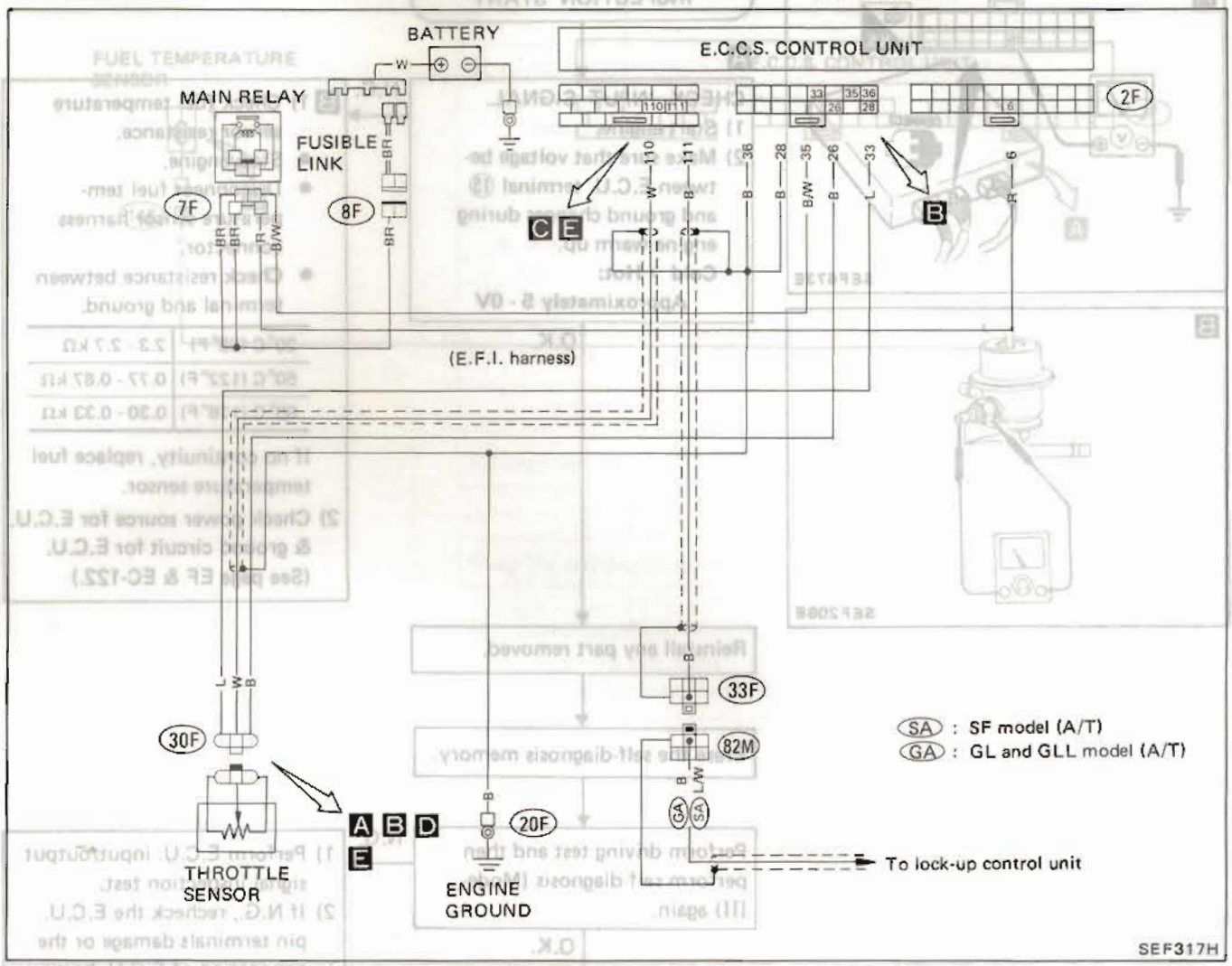
N.G.

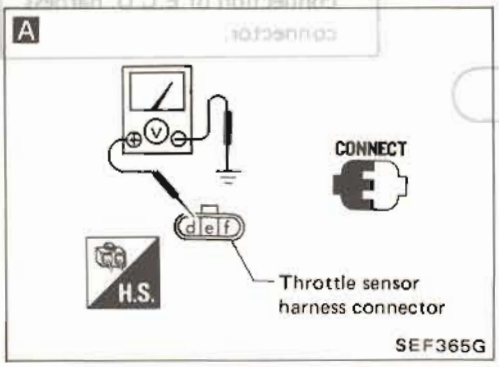
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K.

INSPECTION END

THROTTLE SENSOR (Code No. 43); FOR CALIFORNIA MODEL/(Not self-diagnostic item); FOR NON-CALIFORNIA A/T MODEL (Only control for automatic transmission)





INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓓ and ground.
Voltage:
Approximately 5.0V

N.G.

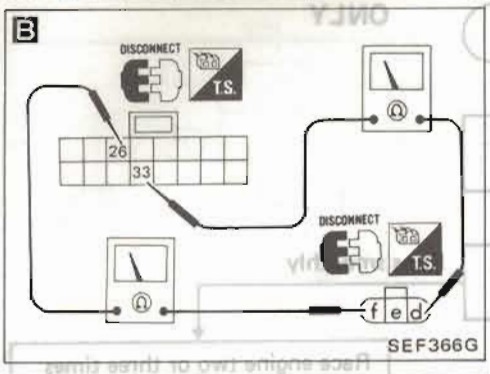
Check the following items.
B 1) Harness continuity between throttle sensor harness connector and E.C.U.
- Turn ignition switch "OFF".
- Disconnect throttle sensor harness connector.
- Disconnect 16-pin connector from E.C.U.
- Check resistance between ⓓ and ㉝.
Resistance:
Approximately 0Ω

2) Power source for E.C.U.
(Refer to page EF & EC-122.)
3) "BR" fusible link

O.K.

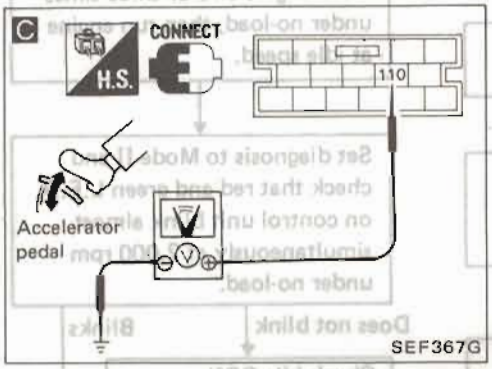
THROTTLE SENSOR (Code No. 43); FOR CALIFORNIA MODEL/(Not self-diagnostic item);
FOR NON-CALIFORNIA A/T MODEL
(Only control for automatic transmission)

B



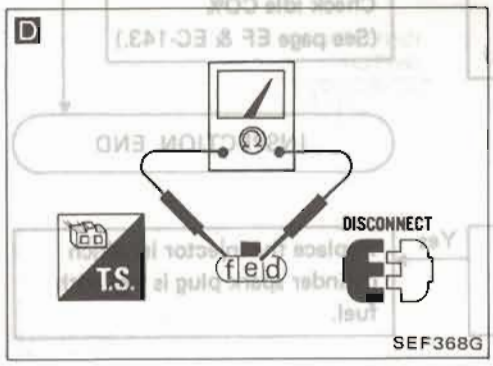
SEF366G

C



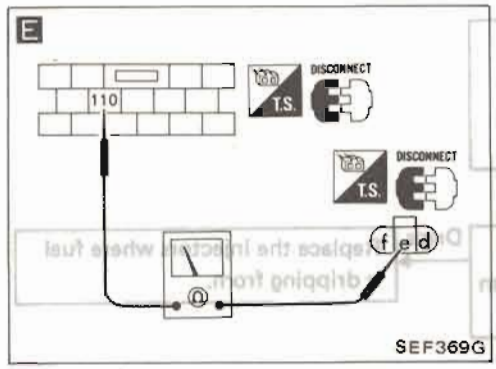
SEF367G

D



SEF368G

E



SEF369G

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF" and disconnect 16-pin connector from E.C.U.
2) Disconnect throttle sensor harness connector.
3) Check resistance between terminal (f) and E.C.U. terminal (26).
Resistance:
Approximately 0Ω

N.G. →
1) Check harness continuity between throttle sensor and ground.
2) E.C.U. ground circuit. (Refer to page EF & EC-122.)

O.K. ↓

C

CHECK INPUT SIGNAL.
1) Reconnect E.C.U. 16-pin terminal and throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Make sure that voltage between terminal (110) and ground changes when accelerator pedal is depressed.
Voltage:
Approximately 0.4 - 4.0V
(in warming up condition)

N.G. →
1) Disconnect throttle sensor harness connector.
D 2) Make sure that resistance between (e) and (f) changes when opening throttle valve manually.
Resistance should change.
If not, replace throttle sensor.
3) Check idle switch OFF → ON speed.
Refer to "ELECTRO INJECTION UNIT INSPECTION".
E 4) Check harness continuity between throttle sensor and E.C.U.
- Disconnect harness connector for throttle sensor.
- Disconnect 16-pin connector from E.C.U.
- Check resistance between terminal (e) and E.C.U. terminal (110).
Resistance:
Approximately 0Ω

O.K. California model
O.K. Non-California A/T model

INSPECTION END

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis (Mode III) again.

N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K. ↓

INSPECTION END

INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

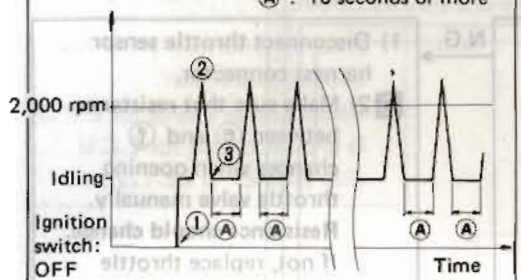
A

SEF832F

B

Engine racing mode

Ⓐ : 10 seconds or more



① Start engine and warm it up sufficiently.
② Race engine revolution higher than 2,000 rpm under no-load.
③ Keep engine at idle speed for at least 10 seconds.
④ Repeat steps ② through ③ at least 10 times.

SEF392G

C

CHECK ENGINE LIGHT

SEF924F

INSPECTION START

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warming.

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

Does not run smoothly → Set the diagnosis mode selector of E.C.U. to Mode I.

Set diagnosis to Mode II and check that red and green L.E.D. on control unit blink almost simultaneously at 2,000 rpm under no-load.

Does not blink → Check idle CO% (See page EF & EC-143.)

Blinks → INSPECTION END

Check if the green lamp stays off during 10 seconds at idle condition.

Stays off

Does not stay off → Check mixture ratio feedback system. (See page EF & EC-143.)

A

Remove all spark plugs from intak manifold. Are plugs wet with fuel?

Yes → Replace the injector in which cylinder spark plug is wet with fuel.

No

Remove injector assembly. (See page EF & EC-150.) Keep fuel hose and all injectors connected to injector gallery.

Turn ignition switch "ON". Make sure fuel does not drip from injector.

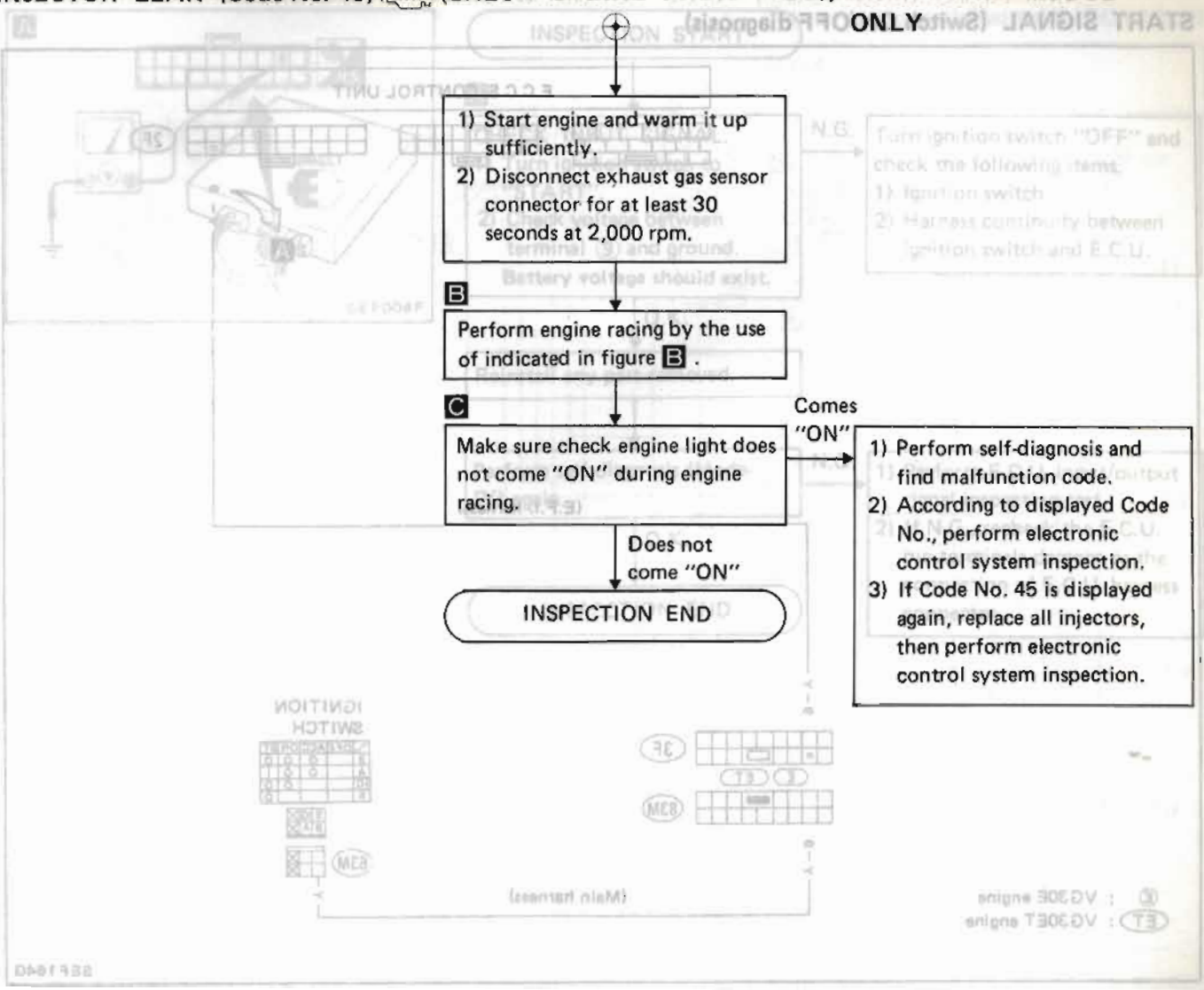
Drips → Replace the injectors where fuel is dripping from.

Does not drip

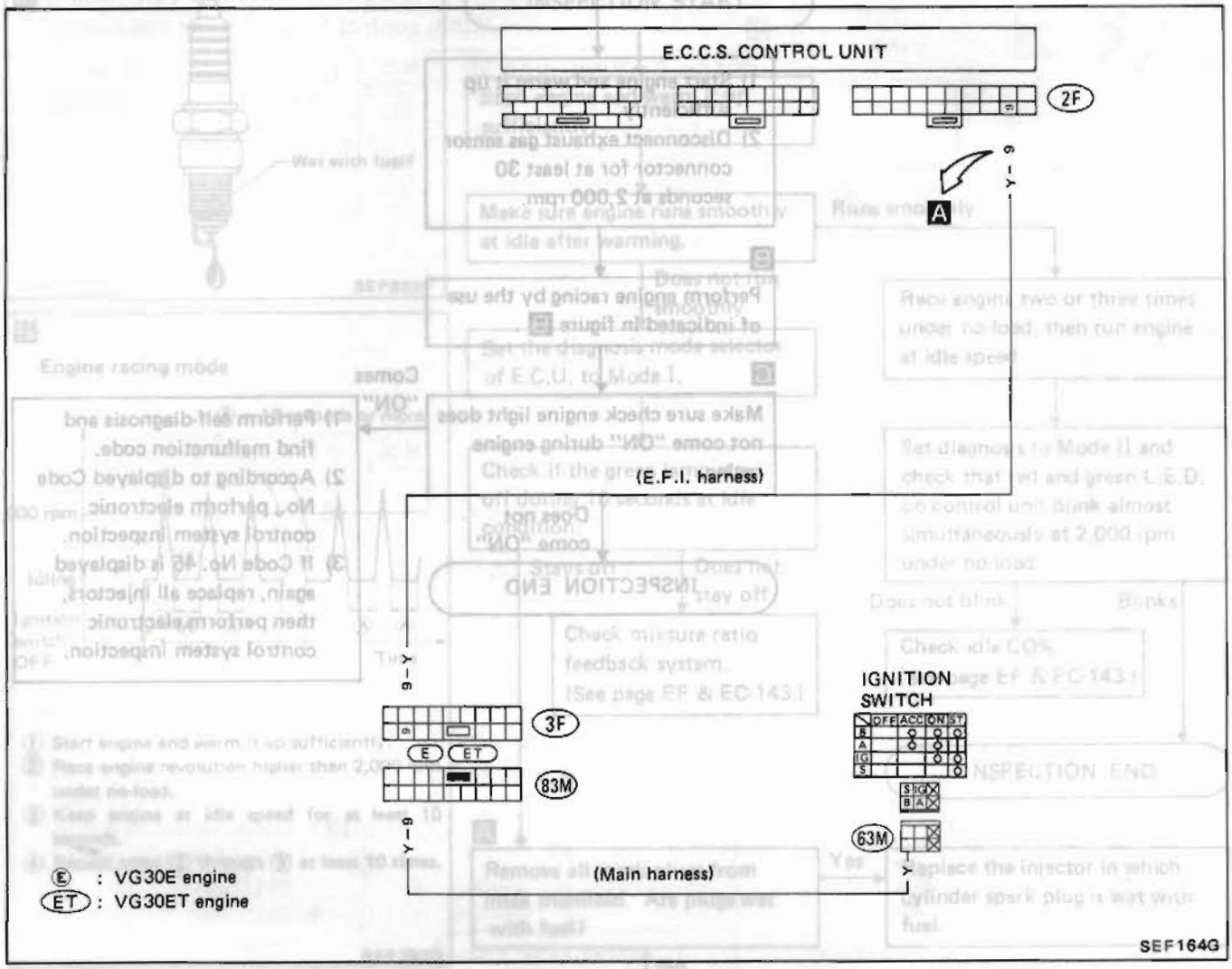
Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

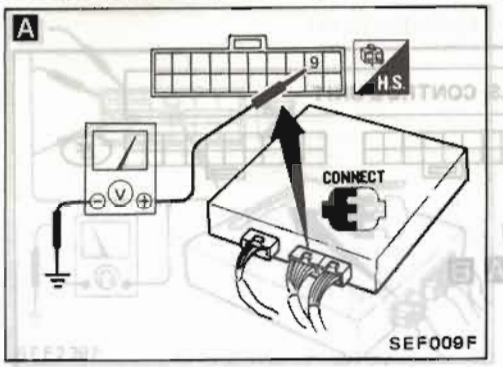
INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY



START SIGNAL (Switch ON/OFF diagnosis)



START SIGNAL (Switch ON/OFF diagnosis)



INSPECTION START

A

CHECK INPUT SIGNAL.
1) Turn ignition switch to "START".
2) Check voltage between terminal ⑨ and ground.
Battery voltage should exist.

N.G. → Turn ignition switch "OFF" and check the following items.
1) Ignition switch
2) Harness continuity between ignition switch and E.C.U.

O.K.

Reinstall any part removed.

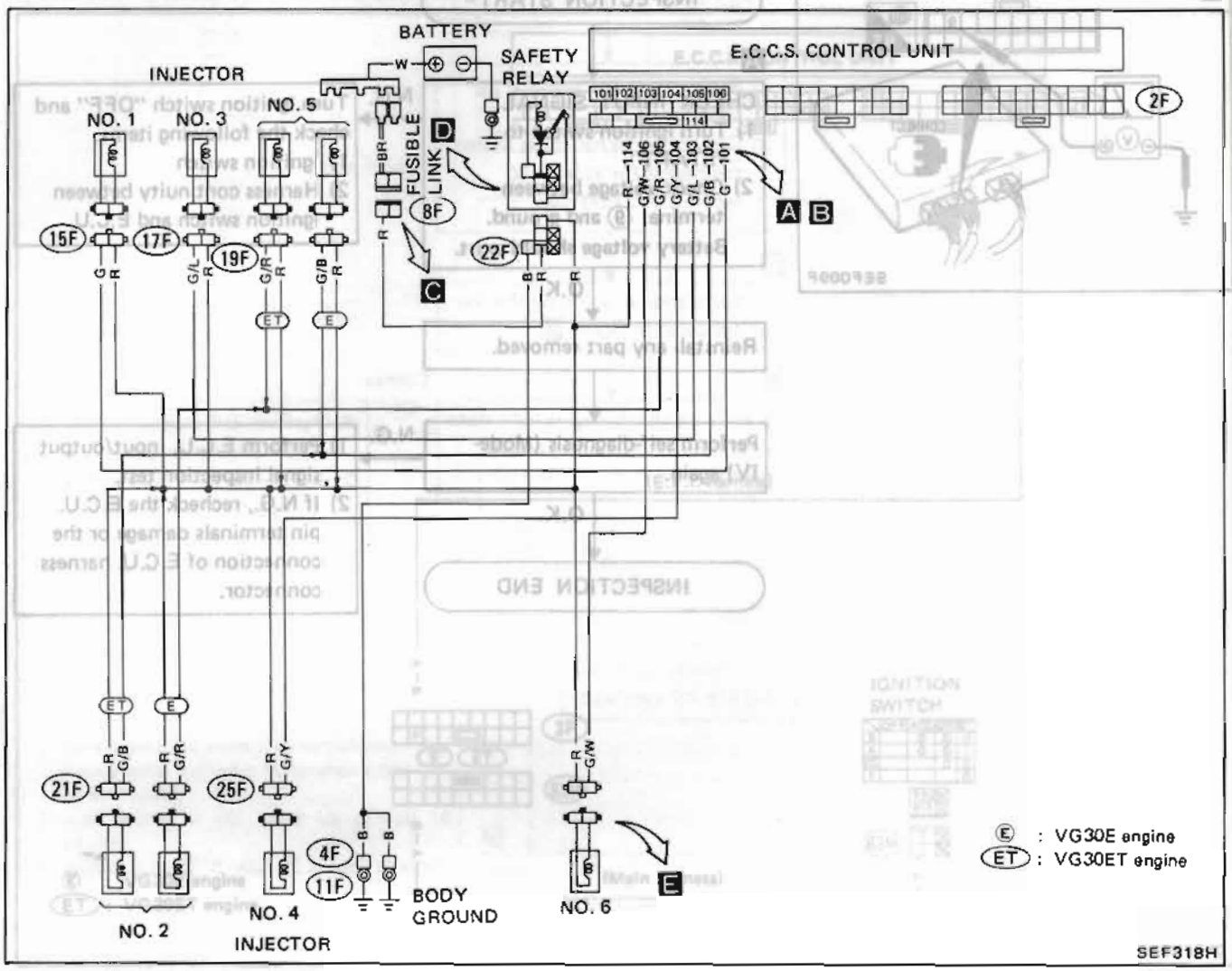
Perform self-diagnosis (Mode-IV) again.

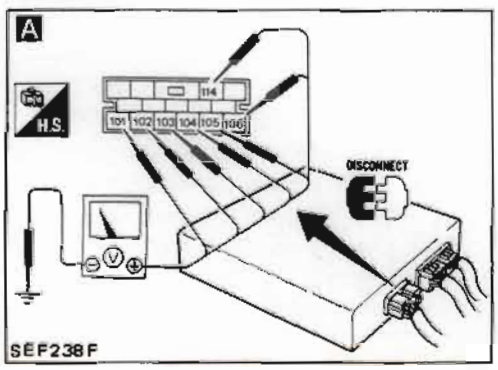
N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K.

INSPECTION END

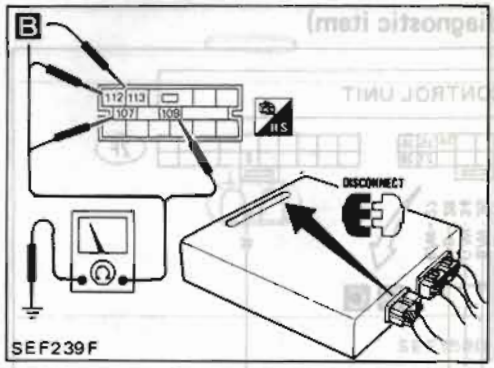
INJECTOR (Not self-diagnostic item)





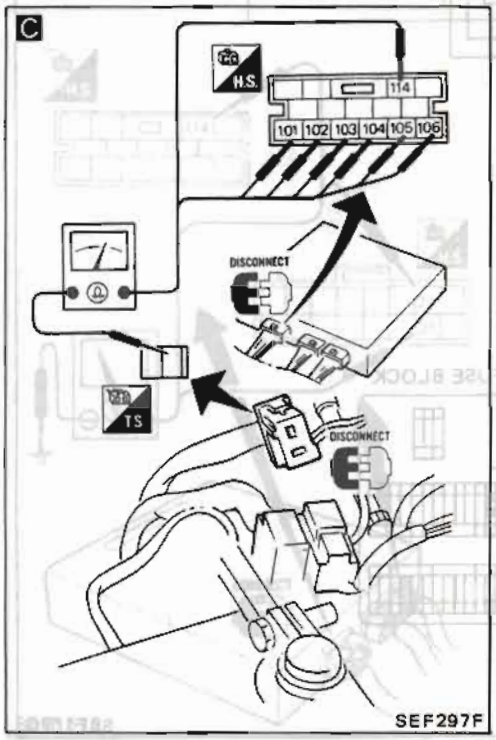
INJECTOR (Not self-diagnostic item)

B



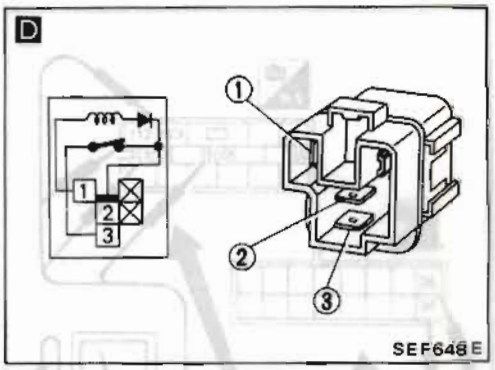
SEF239F

C



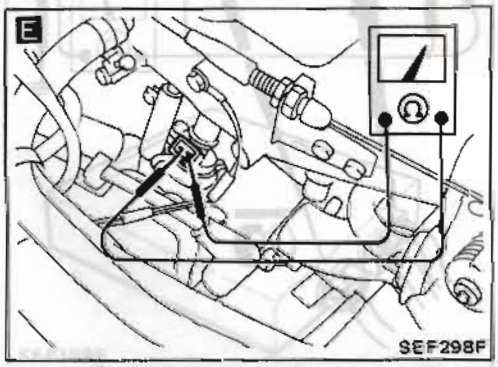
SEF297F

D



SEF648E

E



SEF298F

INSPECTION START

CHECK POWER SOURCE.
1) Disconnect 15-pin connector.
A 2) Check voltage between terminals (101), (102), (103), (104), (105), (106), (114) and ground.
Battery voltage should exist exist.

N.G. → Check the following items.
1) Harness continuity between E.C.U. and battery
- Disconnect fusible link connector.

C
- Check resistance between fusible link connector and E.C.U.
Resistance between terminals (101), (102), (103), (104), (105), (106) and fusible link connector
Resistance:
Approximately 1.5Ω
Resistance between terminal (114) and fusible link connector
Resistance:
Approximately 0Ω

2) Harness connector for injector
3) "BR" fusible link
D 4) Safety relay

12V direct current is applied between terminals ① and ②		Continuity between terminals ② and ③
①	②	
−	+	Yes
+	−	No

O.K.

B

CHECK GROUND CIRCUIT.
1) Disconnect 15-pin connector from E.C.U.
2) Check resistance between terminals (107), (109), (112), (113) and ground.
Resistance:
Approximately 0Ω

N.G. → Check engine ground and harness continuity between E.C.U. and engine ground.

O.K.

Reinstall any part removed.

INSPECTION END

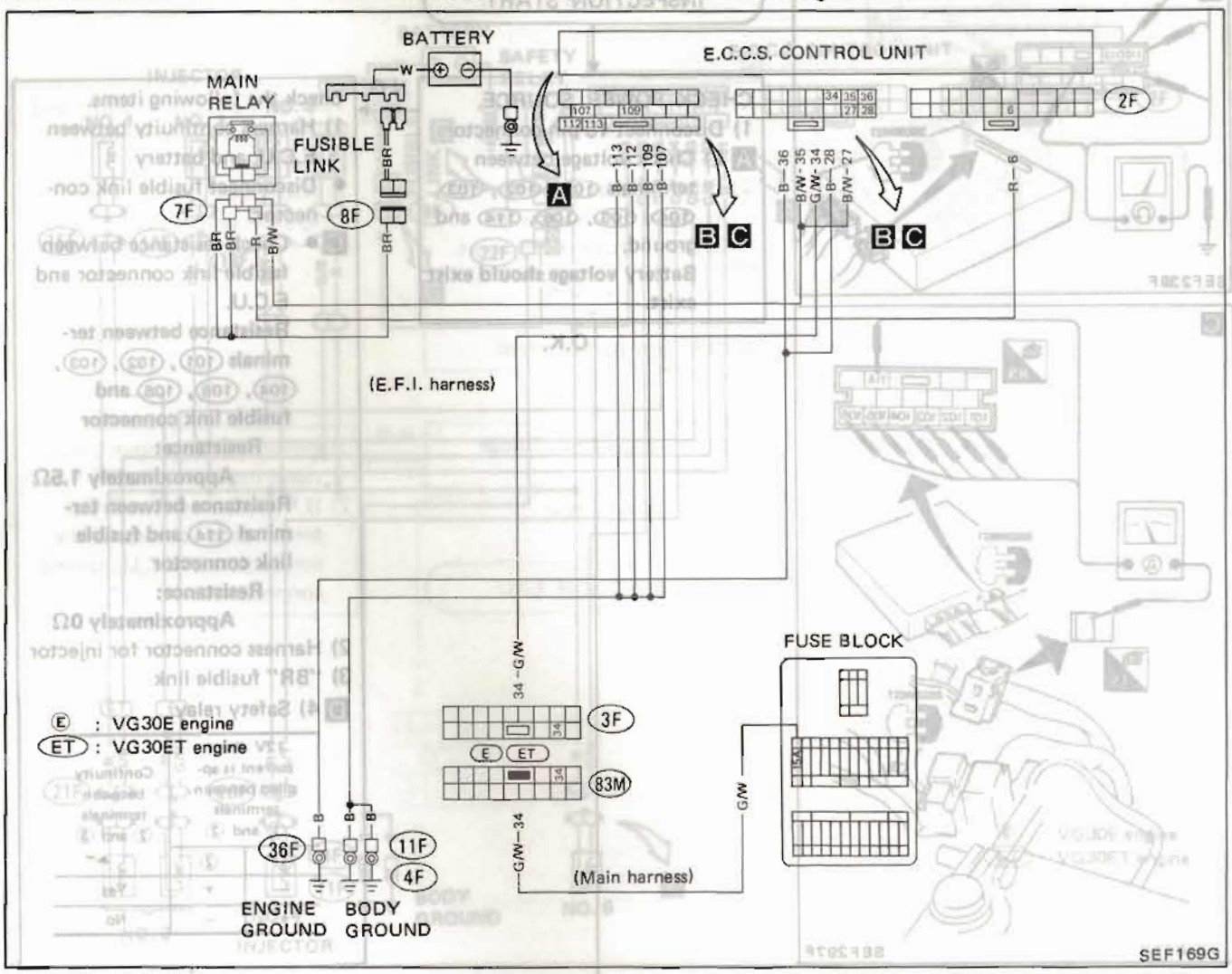
N.G. → E

Check resistance of individual injectors.
- Disconnect injector harness connector.

Resistance:
Approximately 1.5Ω

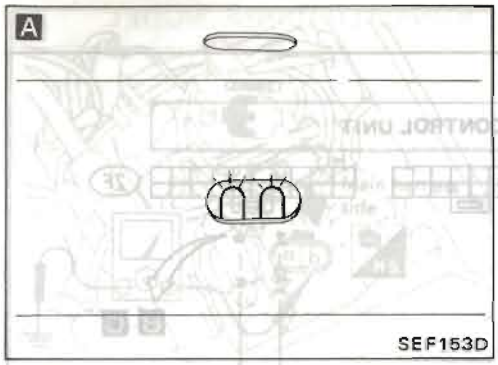
N.G. → Replace injector.

POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnostic item)



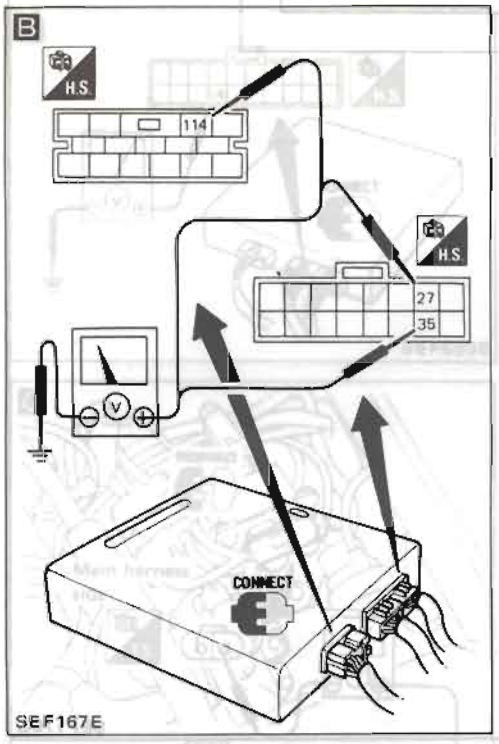
POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnostic item)

A



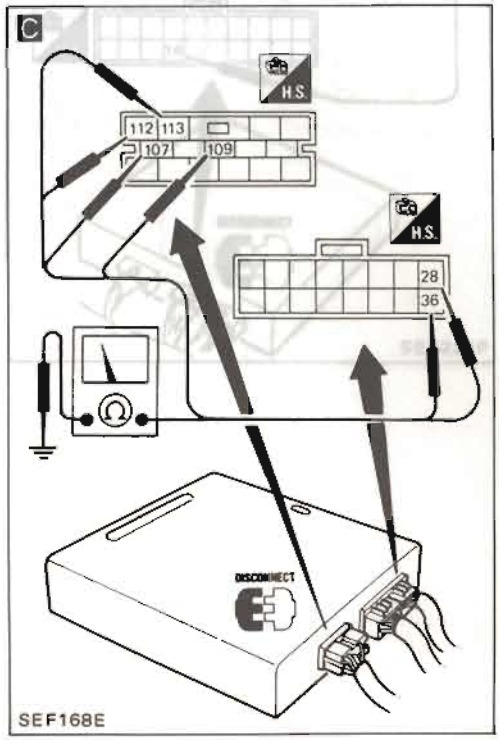
SEF153D

B



SEF167E

C



SEF168E

INSPECTION START

CHECK DIAGNOSTIC MODE ON THE E.C.U.
Verify that diagnostic mode selector on the E.C.U. is turned "OFF".

A

CHECK POWER SOURCE FOR E.C.U.
1) Turn ignition switch "ON".
2) Verify that red and green inspection lamps on the E.C.U. illuminate.

N.G. → B

O.K.

B

1) Turn ignition switch "ON".
2) Check voltage between terminals ㉗, ㉟, ⑭ and ground.
Battery voltage should exist.

Check the following items.
1) Harness continuity between battery and E.C.U.
2) Main relay
(Refer to EL section.)
3) "BR" fusible link

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect 16-pin, 15-pin connector from E.C.U.

C 3) Check resistance between terminals (E.C.U. side) ㉘, ㊱, ⑦, ⑨, ⑫, ⑬ and ground.
Resistance:
Approximately 0Ω

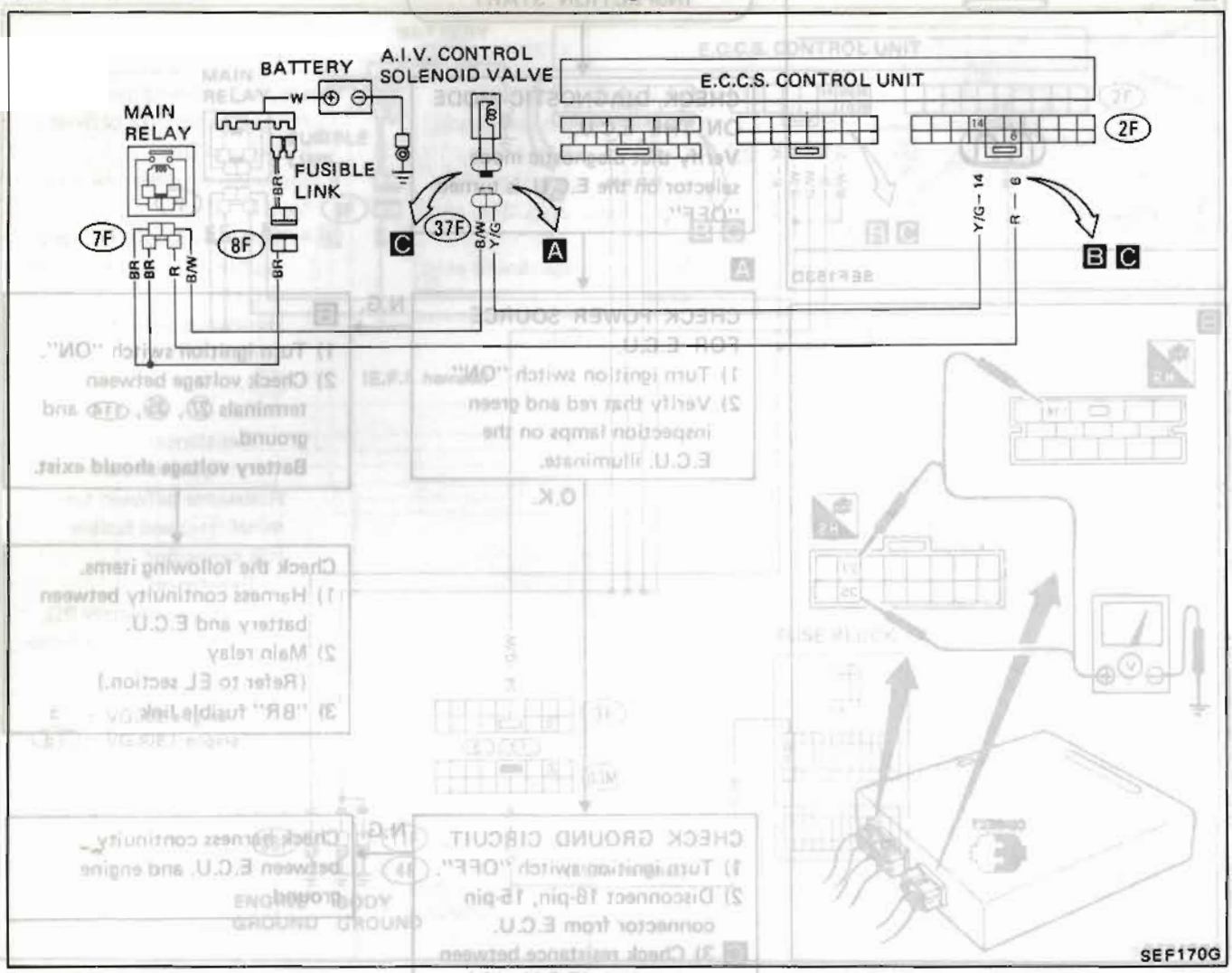
N.G. → Check harness continuity between E.C.U. and engine ground.

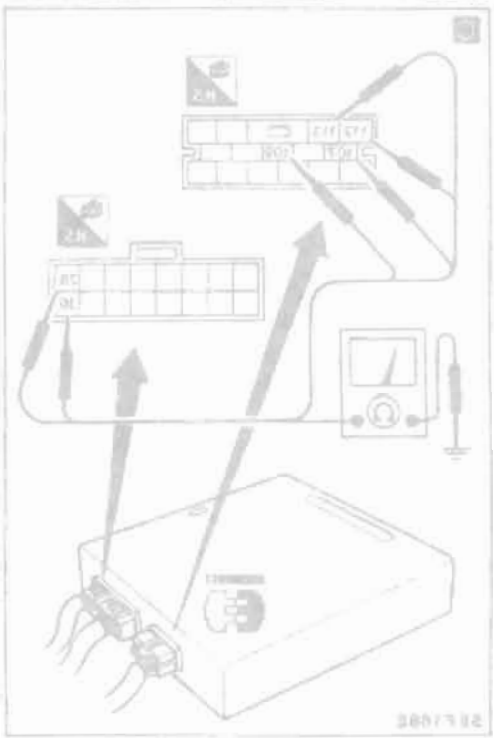
O.K.

Reinstall any part removed.

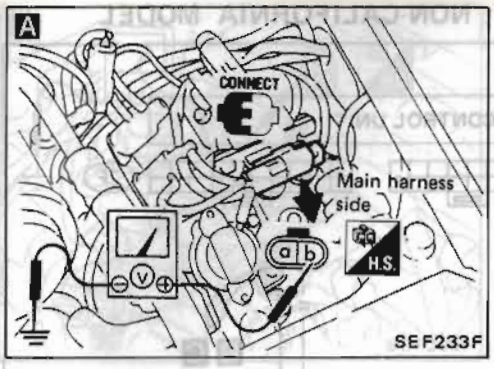
INSPECTION END

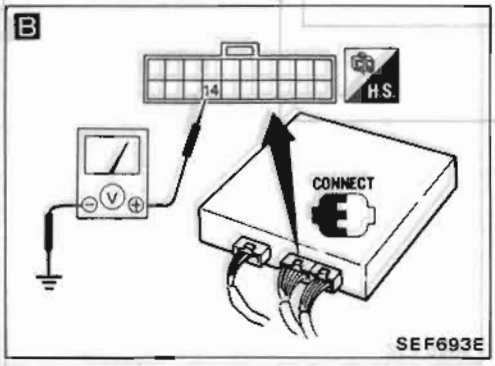
A.I.V. CONTROL SOLENOID VALVE (Not self-diagnostic item)

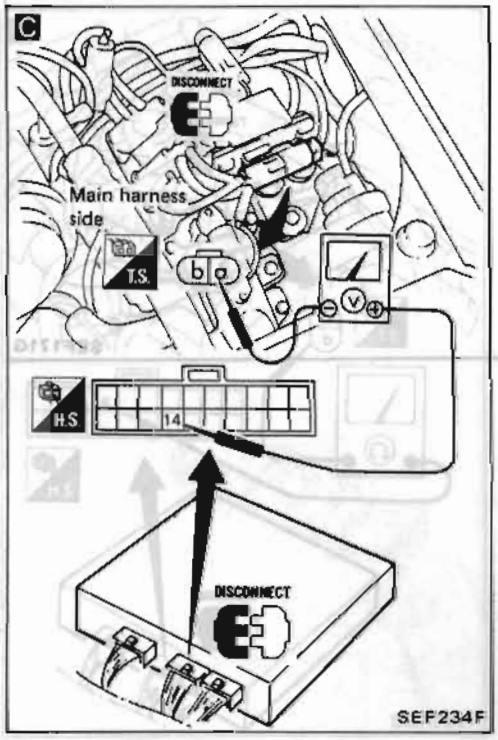




A.I.V. CONTROL SOLENOID VALVE (Not self-diagnostic item)







INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage terminal ⓑ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between A.I.V. solenoid valve and battery
2) "BR" fusible link
3) Main relay
(Refer to EL section.)

O.K.

B

1) Start engine and warm it up sufficiently.
2) Check voltage between E.C.U. terminal ⑭ and ground.

Accelerator pedal position	Voltage
Released	Approximately 0.8V
Depressed	Battery voltage

N.G. → Check the following items.
C 1) Harness continuity between A.I.V. solenoid valve and E.C.U.
- Stop engine.
- Disconnect A.I.V. solenoid valve harness connector.
- Disconnect 20-pin connector from E.C.U.
- Check resistance between terminal ⓐ and E.C.U. terminal ⑭.
Resistance:
Approximately 0Ω

2) A.I.V. solenoid valve
Check resistance:
Approximately 40Ω
3) Ground circuit of E.C.U.
(See page EF & EC-122.)

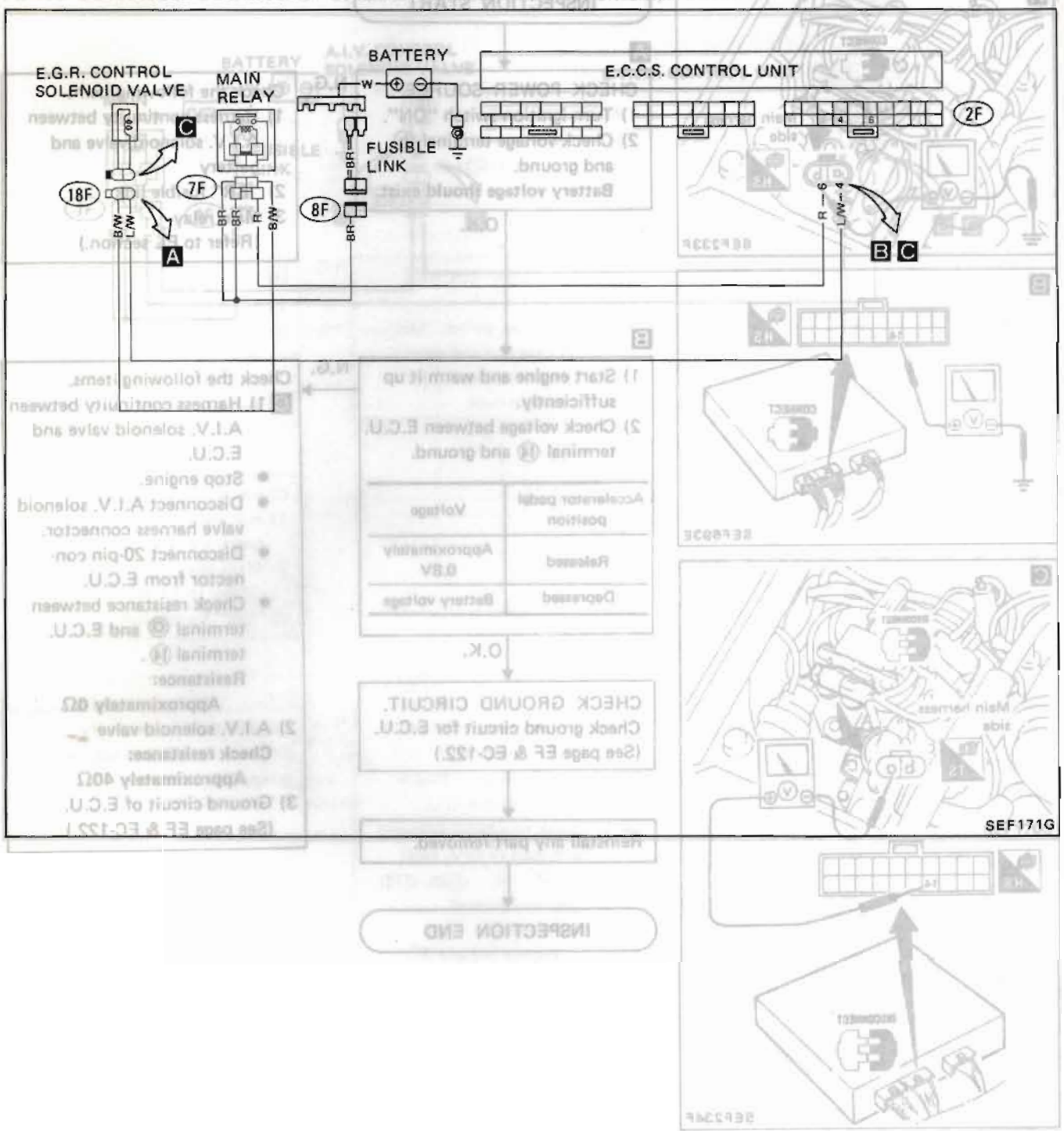
O.K.

CHECK GROUND CIRCUIT.
Check ground circuit for E.C.U.
(See page EF & EC-122.)

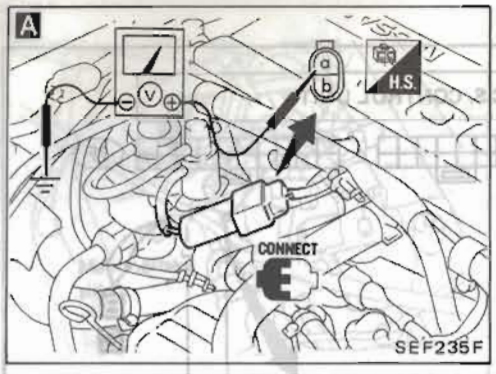
Reinstall any part removed.

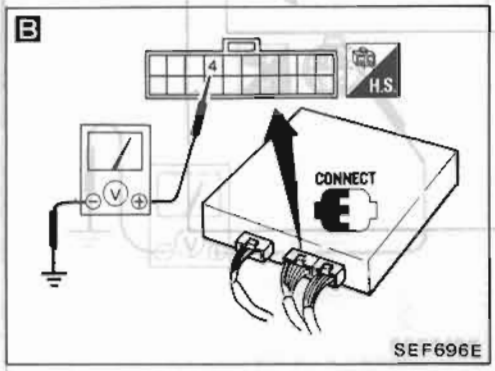
INSPECTION END

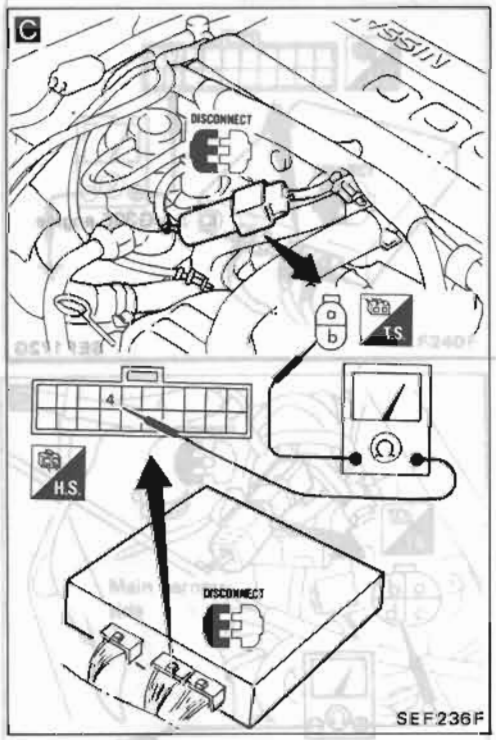
E.G.R. CONTROL SOLENOID VALVE (Not self-diagnostic item); NON-CALIFORNIA MODEL



E.G.R. CONTROL SOLENOID VALVE (Not self-diagnositc item); NON-CALIFORNIA MODEL







INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓐ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between E.G.R. solenoid valve and battery
2) "BR" fusible link
3) Main relay circuit
(Refer to EL section.)

O.K.

B

CHECK OUTPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Check voltage between E.C.U. terminal ④ and ground.

Engine condition	Voltage
At idle	Approximately 1.0V
Around 2,000 rpm	Battery voltage

N.G. → Check the following items.
1) Harness continuity between E.G.R. solenoid valve and E.C.U.
2) E.G.R. solenoid valve
Check resistance between terminals ⓐ and ⓑ.
Resistance:
Approximately 40Ω
3) Ground circuit of E.C.U.
(See page EF & EC-122.)

O.K.

C

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect 20-pin connector from E.C.U.
3) Disconnect E.G.R. solenoid harness connector.
4) Check resistance between terminal ⓑ and E.C.U. terminal ④.
Resistance:
Approximately 0Ω

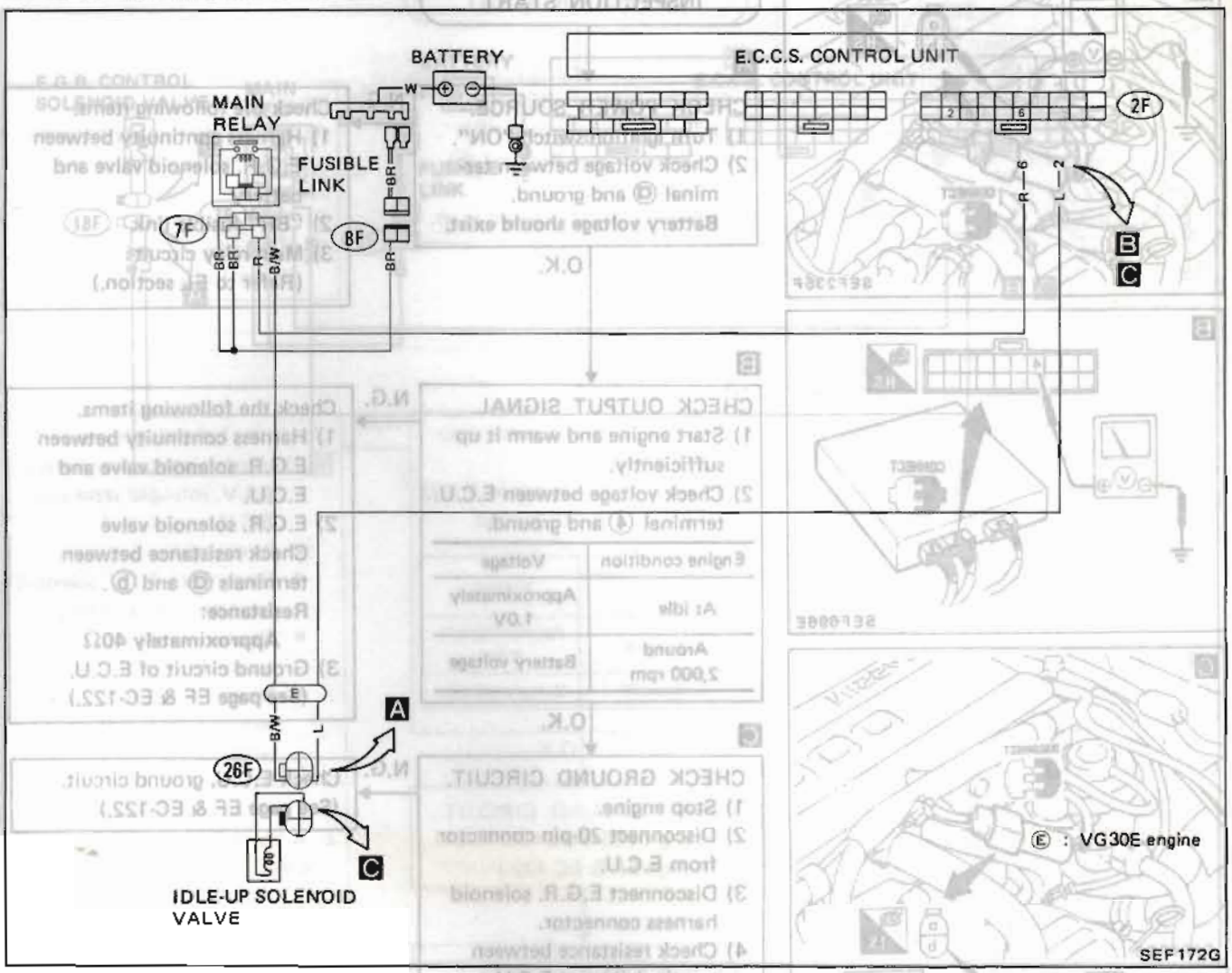
N.G. → Check E.C.U. ground circuit.
(See page EF & EC-122.)

O.K.

Reinstall any part removed.

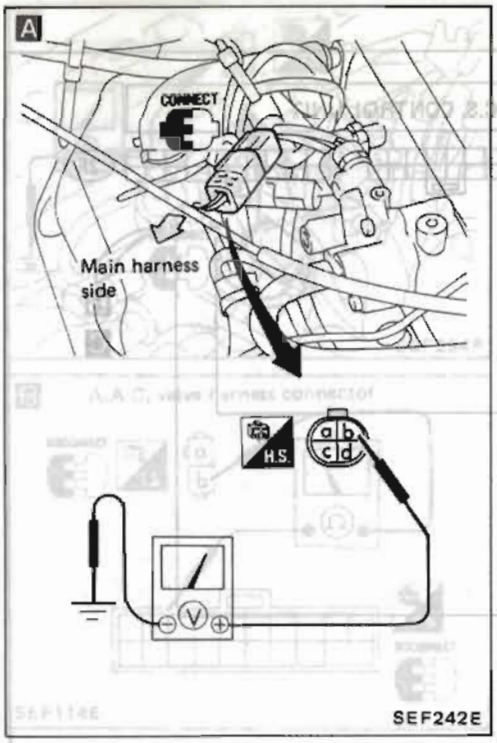
INSPECTION END

IDLE-UP SOLENOID VALVE (Not self-diagnostic item)



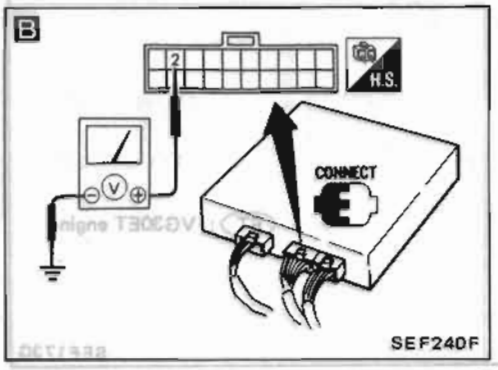
IDLE-UP SOLENOID VALVE (Not self-diagnostic item)

A



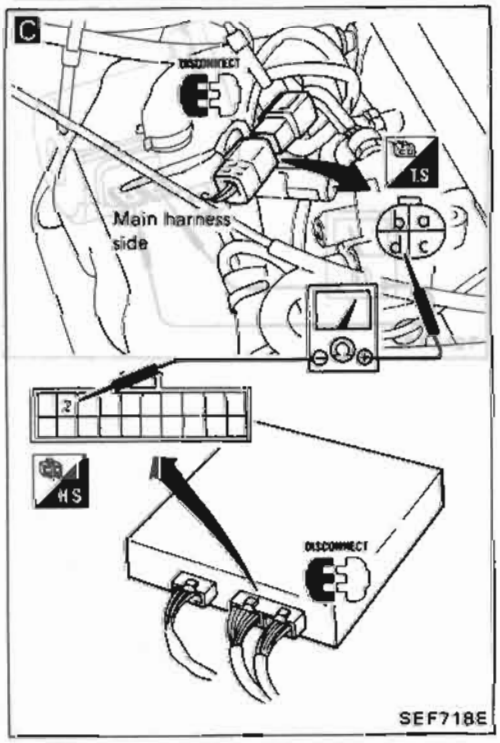
SEF242E

B



SEF240F

C



SEF718E

INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between idle-up solenoid valve and battery
2) "BR" fusible link
3) Main relay
(Refer to EL section.)

O.K.

B

CHECK OUTPUT SIGNAL.
1) Turn ignition switch "OFF".
2) Check voltage between terminal ② and ground under the following conditions.
3) Start engine.
For about 20 seconds after engine has started.
Voltage: 0.1 - 0.4V
4) Turn load switches "ON".
- Lighting switch
- Power steering oil pressure switch
- Rear defogger switch
- Heater or air conditioner switch

Voltage: 0.1 - 0.4V

N.G. → Check the following items.
C 1) Harness continuity between idle-up solenoid valve and E.C.U.
- Disconnect 20-pin connector from E.C.U.
- Check resistance between terminal ⓓ and E.C.U. terminal ②.
Resistance: Approximately 0Ω

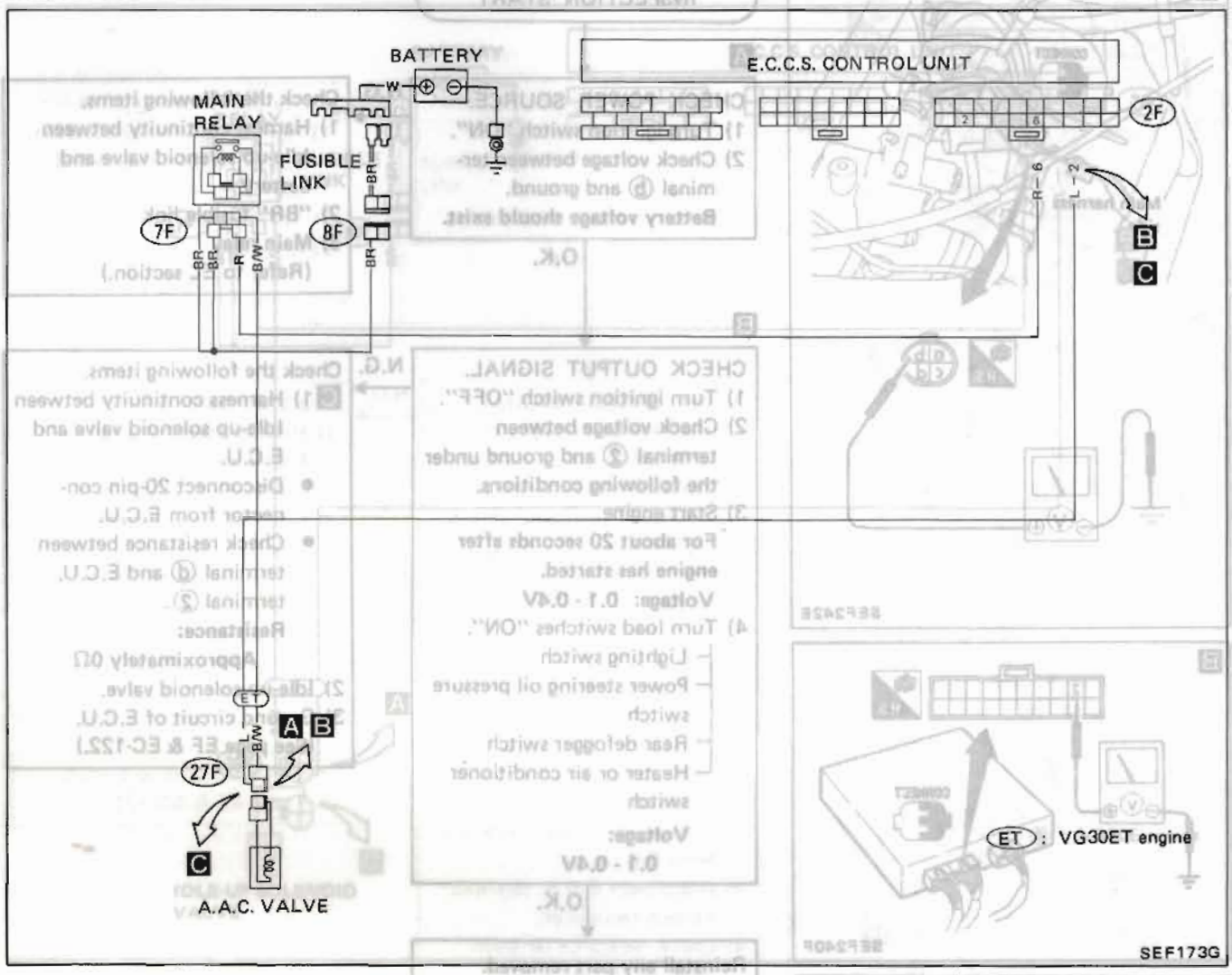
2) Idle-up solenoid valve.
3) Ground circuit of E.C.U.
(See page EF & EC-122.)

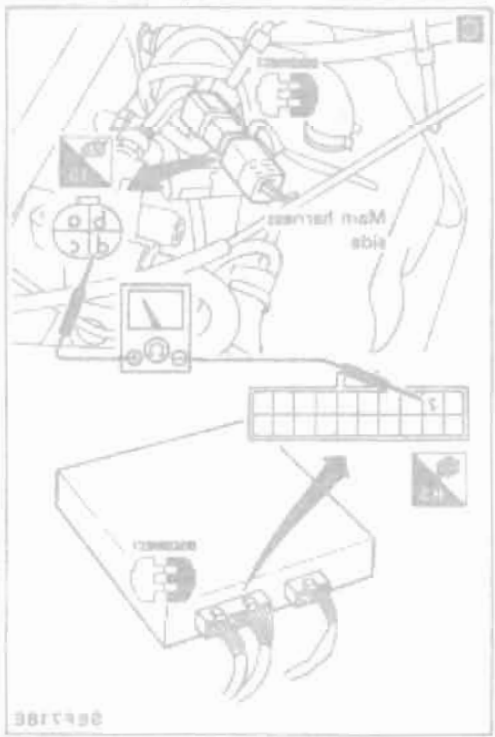
O.K.

Reinstall any part removed.

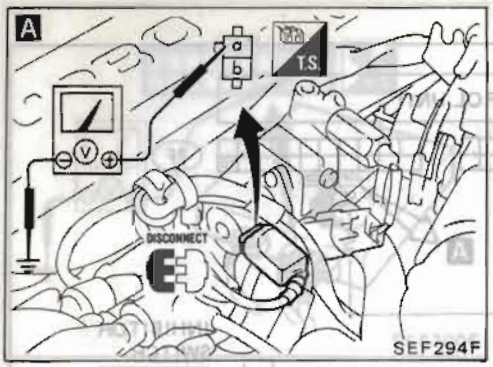
INSPECTION END

A.A.C. VALVE (Not self-diagnostic item)





A.A.C. VALVE (Not self-diagnostic item)



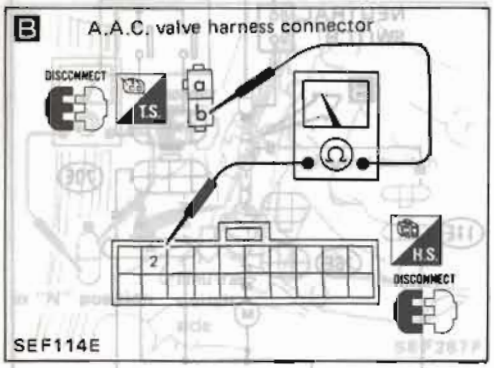
INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect A.A.C. valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following items.
1) Harness continuity between battery and A.A.C. valve.
2) "BR" fusible link
3) Main relay
(Refer to EL section.)

O.K.

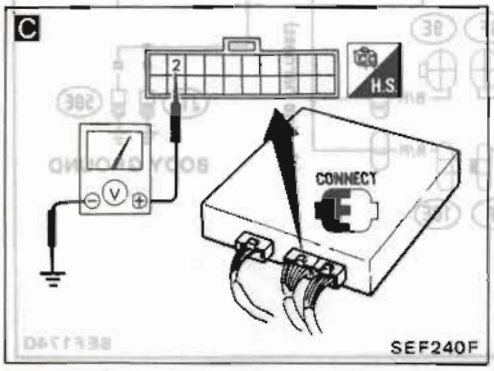


B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF" and disconnect E.C.U. 20-pin connector.
2) Check resistance between terminal ⓑ and E.C.U. terminal ②.
Resistance:
Approximately 0Ω

N.G. → Repair harness.

O.K.



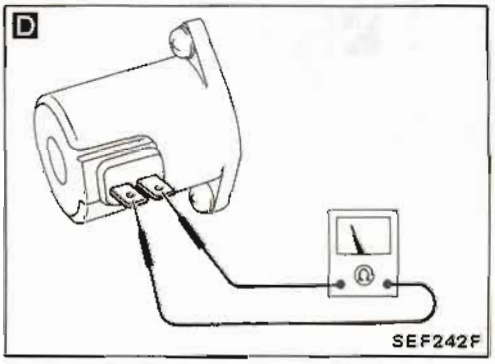
C

CHECK INPUT SIGNAL.
1) Reconnect E.C.U. 20-pin connector and A.A.C. valve harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between E.C.U. terminal ② and ground.
Voltage:
Approximately 6 - 8V
(at idle)

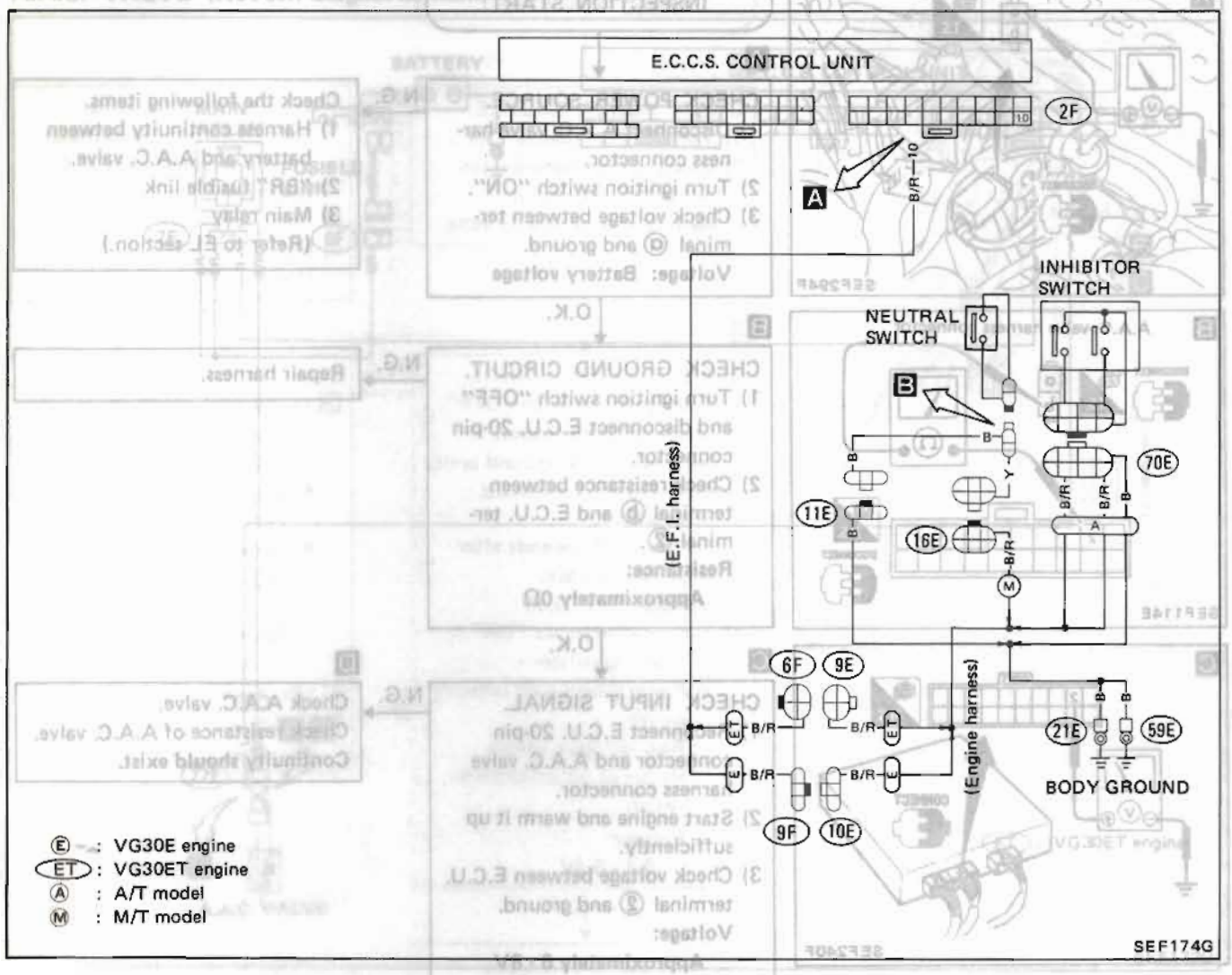
N.G. → **D** Check A.A.C. valve.
Check resistance of A.A.C. valve.
Continuity should exist.

O.K.

INSPECTION END

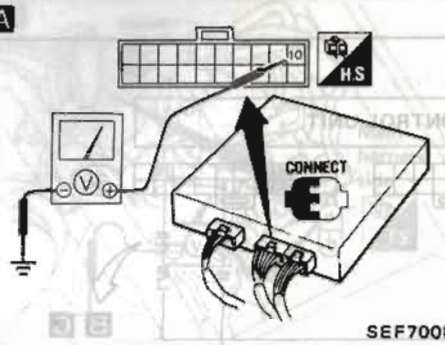


NEUTRAL/INHIBITOR SWITCH (Not self-diagnostic item)

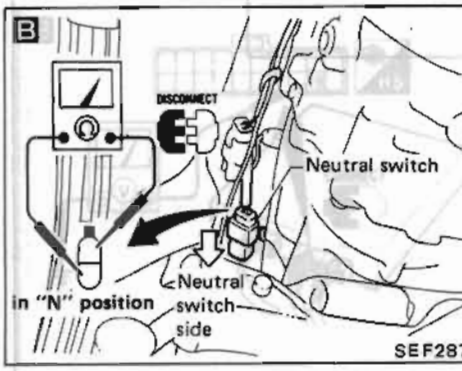


NEUTRAL/INHIBITOR SWITCH (Not self-diagnostic item)

A



B



INSPECTION START

A

CHECK INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal ⑩ and ground.

Gear position	Voltage
Neutral/Park	0V
Others	Battery voltage

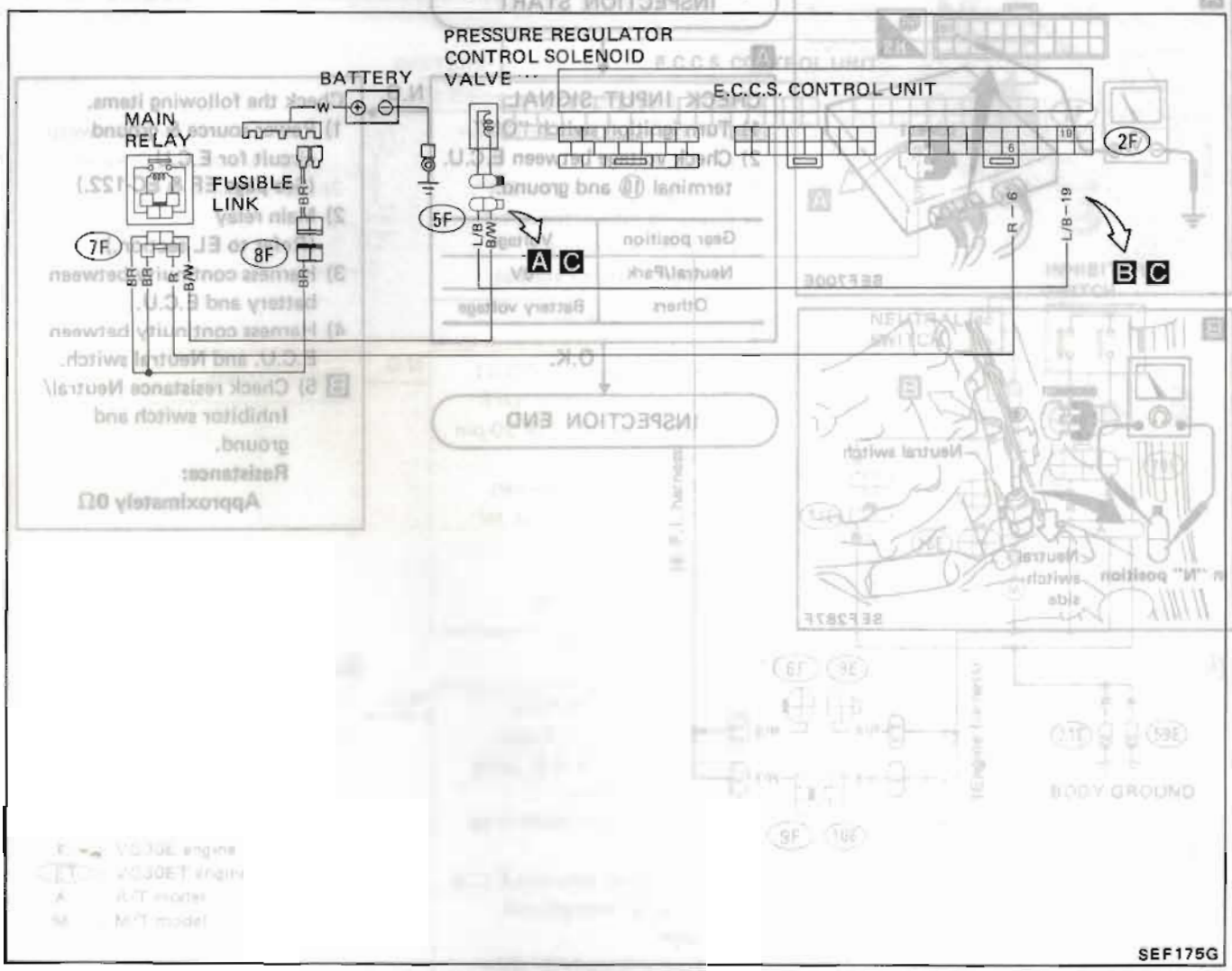
N.G.

Check the following items.
1) Power source & ground circuit for E.C.U. (See page EF & EC-122.)
2) Main relay (Refer to EL section.)
3) Harness continuity between battery and E.C.U.
4) Harness continuity between E.C.U. and Neutral switch.
B 5) Check resistance Neutral/Inhibitor switch and ground.
Resistance:
Approximately 0Ω

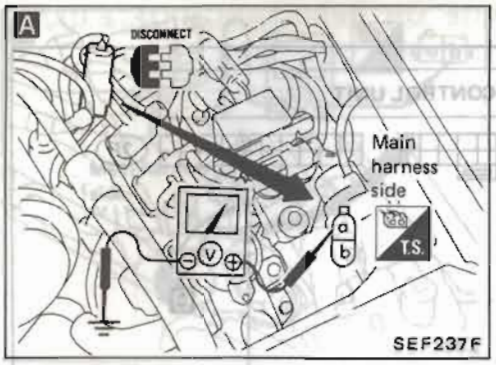
O.K.

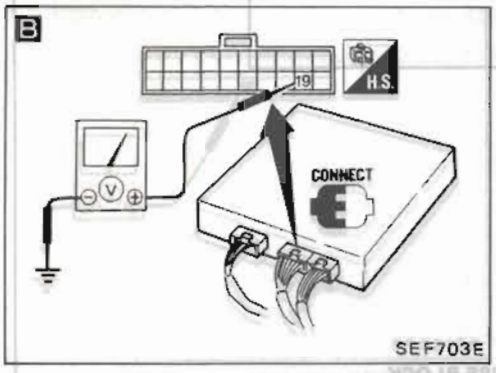
INSPECTION END

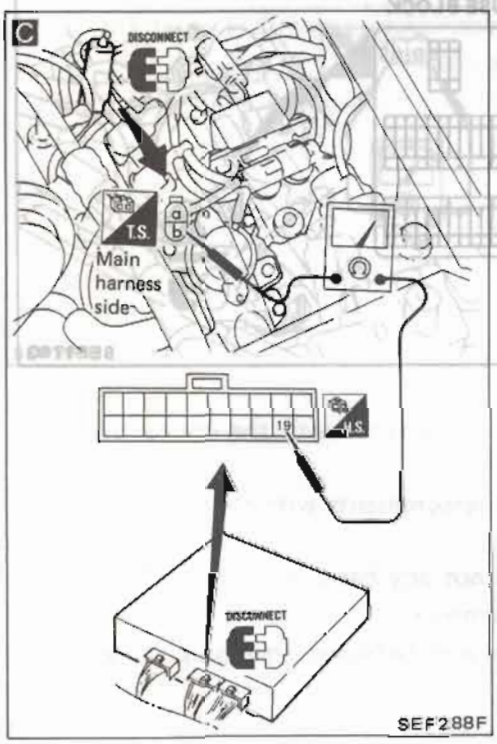
P.R. CONTROL SOLENOID VALVE (Not self-diagnostic item)



P.R. CONTROL SOLENOID VALVE (Not self-diagnostic item)







INSPECTION START

A CHECK POWER SOURCE.
1) Disconnect pressure regulator control solenoid connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between battery and pressure regulator control solenoid
2) Main relay
(Refer to EL section.)
3) Fusible link "BR"

O.K.

B CHECK OUTPUT SIGNAL.
1) Turn ignition switch "OFF".
2) Connect pressure regulator control solenoid.
3) Turn ignition switch to "START".
4) Check voltage between E.C.U. terminal ⑲ and ground.
Voltage:
Approximately 0.9V

N.G. → Check the following items.
C 1) Harness continuity between pressure regulator control solenoid valve and E.C.U.
- Stop engine.
- Disconnect pressure regulator control solenoid valve harness connector.
- Disconnect 20-pin connector from E.C.U.
- Check resistance between terminal ⓑ and E.C.U. terminal ⑲.
Resistance:
Approximately 0Ω

2) Pressure regulator control solenoid valve
Check resistance:
Approximately 40Ω
3) Ground circuit for E.C.U.
(See page EF & EC-122.)

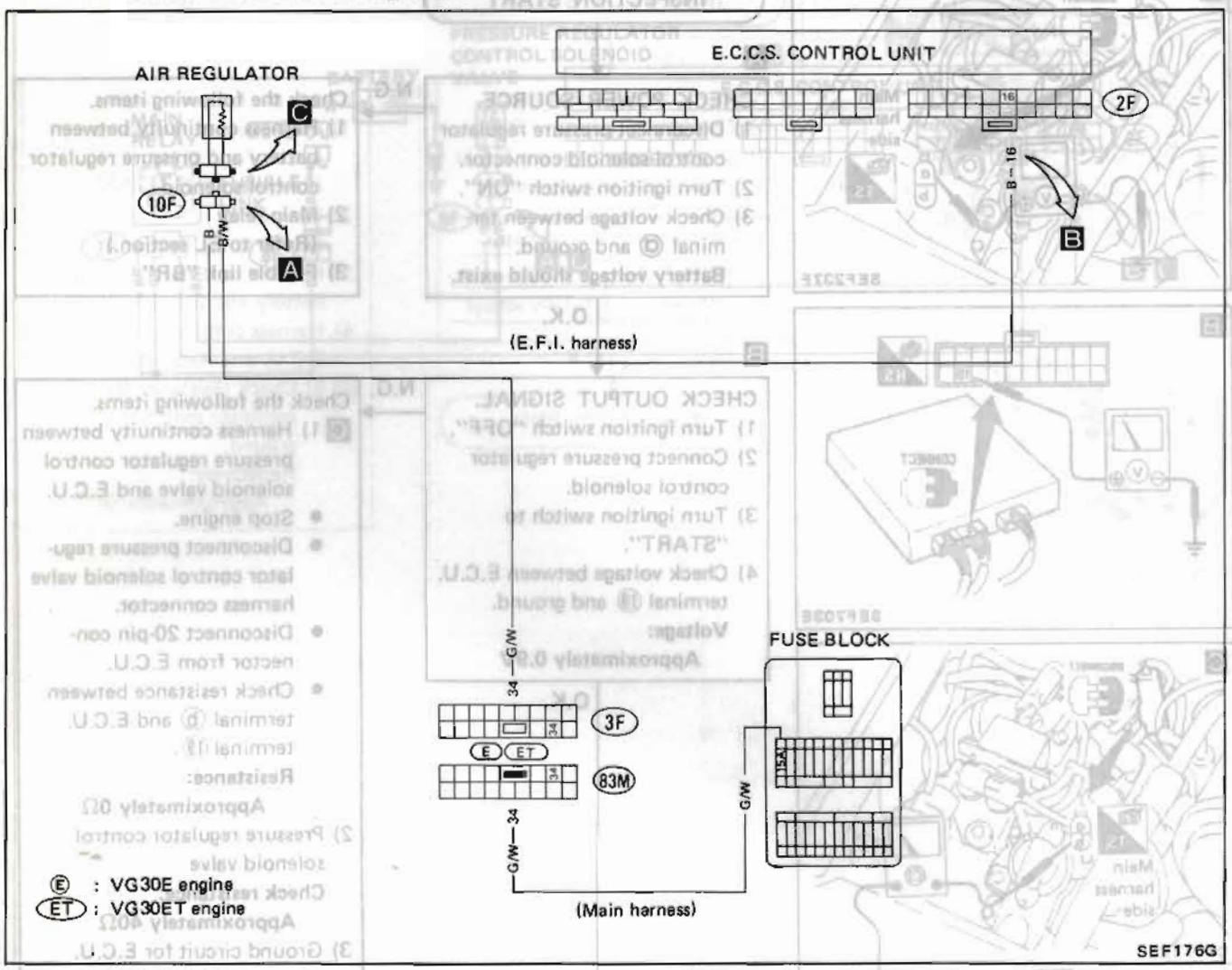
O.K.

CHECK GROUND CIRCUIT.
Check ground circuit for E.C.U.
(See page EF & EC-122.)

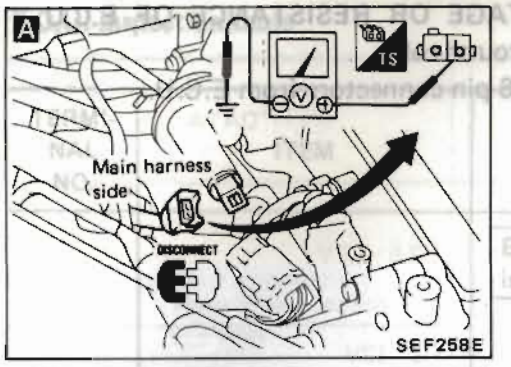
Reinstall any part removed.

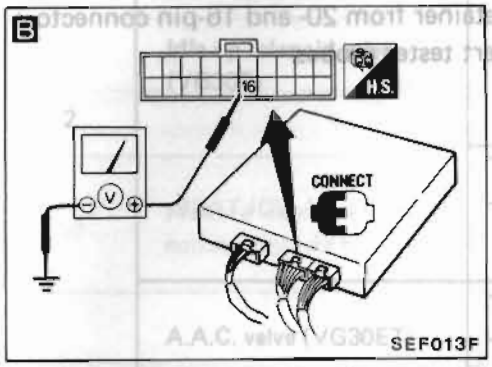
INSPECTION END

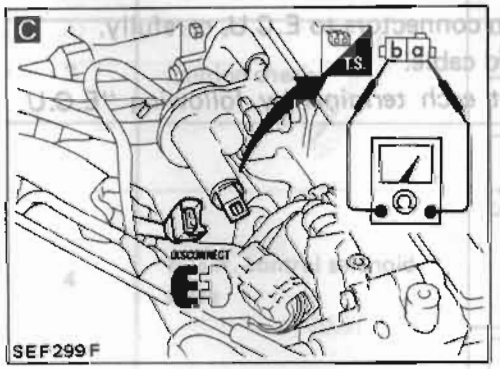
AIR REGULATOR (Not self-diagnostic item)



AIR REGULATOR (Not self-diagnostic item)







INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect air regulator harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between battery and air regulator.
2) Fuse

O.K.

B

CHECK OUTPUT SIGNAL.
1) Turn ignition switch "OFF".
2) Connect air regulator harness connector.
3) Turn ignition switch "START".
4) Check voltage between E.C.U. terminal ⑯ and ground.
0.6 to 0.9V should appear for 5 seconds after turning ignition switch "START".

N.G. → 1) Check harness continuity between E.C.U. and air regulator.
C 2) Check air regulator.
- Disconnect air regulator harness connector.
- Check resistance between terminals ⓐ and ⓑ.
Resistance:
Approximately 70Ω

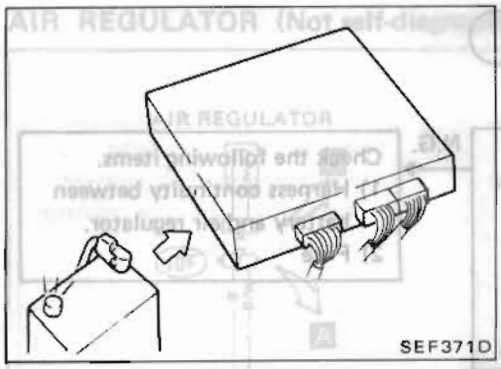
3) Check power source for E.C.U.

O.K.

CHECK GROUND CIRCUIT.
Check ground circuit for E.C.U.
(See page EF & EC-122.)

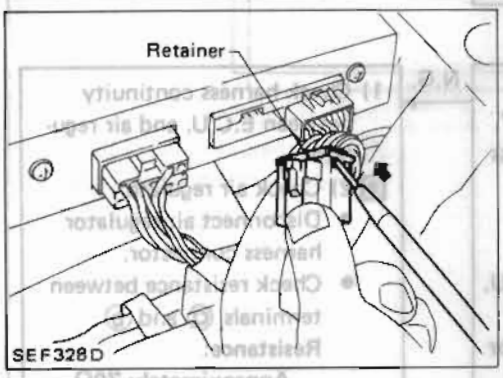
Reinstall any part removed.

INSPECTION END


SEF371D

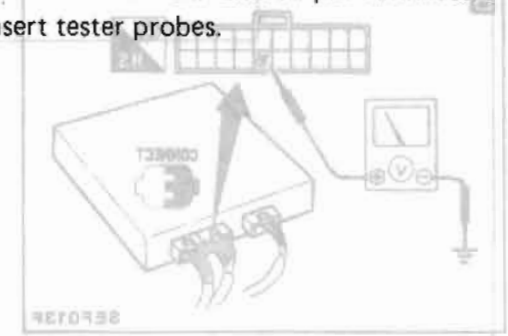
MEASUREMENT VOLTAGE OR RESISTANCE OF E.C.U.

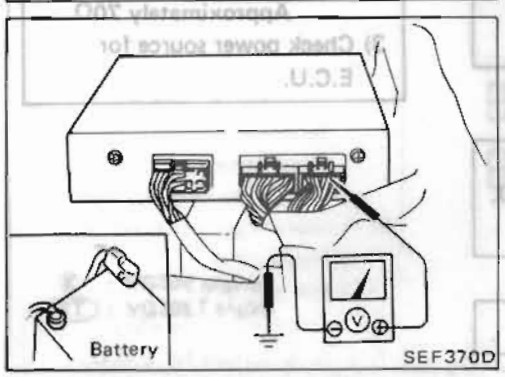
1. Disconnect battery ground cable.
2. Disconnect 20- and 16-pin connectors from E.C.U.



SEF328D

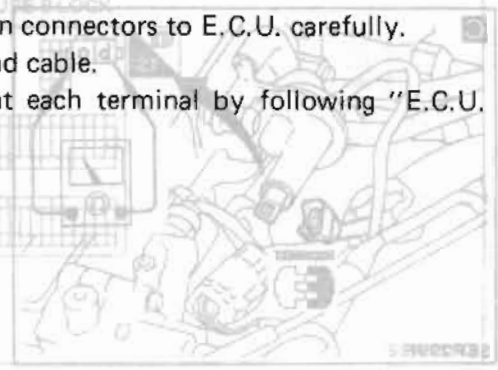
3. Remove pin terminal retainer from 20- and 16-pin connectors to make it easier to insert tester probes.

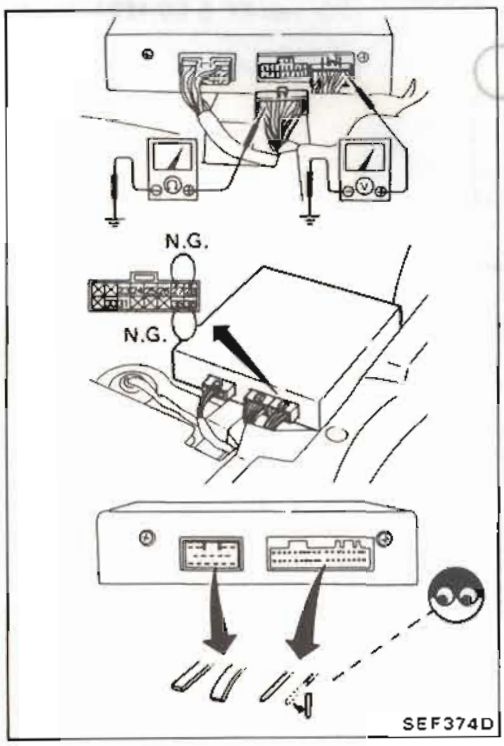




SEF370D

4. Connect 20- and 16-pin connectors to E.C.U. carefully.
5. Connect battery ground cable.
6. Measure the voltage at each terminal by following "E.C.U. inspection table".





SEF374D

CAUTION:

a. Perform all voltage measurements with the connectors connected.
b. Perform all resistance measurements with the connectors disconnected.
c. Make sure that there is not any bend or break on E.C.U. pin terminal before measurements.
d. Do not touch tester probes between terminals ㉗ and ㉘, ㉟ and ㊱.

E.C.U. inspection table

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
2	Idle-up solenoid valve (VG30E)	Engine is running and gear position is in P or N (A/T). — For about 20-seconds after starting engine — Steering wheel is turned. — Blower and air conditioner switches are "ON". — Lighting switch is "ON".	0.1 - 0.4V
		Engine is running. — Except the conditions shown above	BATTERY VOLTAGE (11 - 14V)
	A.A.C. valve (VG30ET)	Engine is running. — Idle speed (after warm-up)	6.0 - 8.0V
3	Ignition check	Engine is running. — Idle speed	9 - 12V (Decreases as engine is revved up.)
4	E.G.R. control solenoid valve	Engine is running after being warmed up. — High engine revolution — Idle speed (Throttle valve switch "ON".)	Approximately 1.0V
		Engine is running. — Low engine revolution	BATTERY VOLTAGE (11 - 14V)
5	Ignition signal	Engine is running. — Idle speed	0.4 - 0.6V
		Engine is running. — Engine speed is 2,000 rpm.	1.2 - 1.5V
6	E.C.C.S. relay-1 (Main relay)	Engine is running. ↓ Ignition switch "OFF" — For approximately 8 seconds after turning ignition switch "OFF"	0.7 - 0.9V
		Ignition switch "OFF" — Within approximately 8 seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
8	Crank angle sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.5 - 2.7V
9	Start signal	Cranking	8 - 12V
10	Neutral switch (M/T) Inhibitor switch (A/T)	Ignition switch "ON" └ Gear position is in Neutral or Parking.	0V
		Ignition switch "ON" └ Any gear position except Neutral or Parking	BATTERY VOLTAGE (11 - 14V)
12	Air flow meter burn-off signal	Engine revolution is above 1,500 rpm and vehicle speed is more than 20 km/h (12MPH). ↓ Ignition switch "OFF" └ For 6 seconds after turning ignition switch "OFF"	0V
		Engine revolution is above 1,500 rpm and vehicle speed is more than 20 km/h (12 MPH). ↓ Ignition switch "OFF" └ For 1 second after the above 6 seconds have passed.	9.0 - 10.0V
14	A.I.V. control solenoid valve	Ignition switch "ON" └ Release accelerator pedal. (Throttle valve switch "ON")	0.7 - 0.9V
		Ignition switch "ON" └ Depress accelerator pedal. (Throttle valve switch "OFF")	BATTERY VOLTAGE (11 - 14V)
15	Fuel temperature sensor	Engine is running. └ Idle speed	0.5V Output voltage varies with engine temperature.
16	Air regulator	Engine is running.	0.6 - 0.9V
17	Crank angle sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	0.2 - 0.4V

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

*Data are reference values.

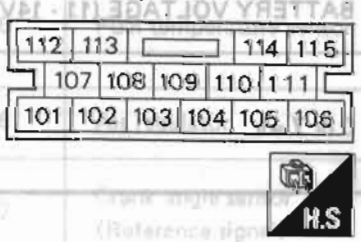
TERMINAL NO.	ITEM	CONDITION	*DATA
18	Throttle valve switch (⊖ side)	Ignition switch "ON" — Release accelerator pedal. (Throttle valve switch "OFF")	9.0 - 10.0V
		Ignition switch "ON" — Depress accelerator pedal. (Throttle valve switch "ON")	0V
19	Pressure regulator control solenoid valve	Stop and restart engine after warming it up. — For 30 seconds	0.8 - 1.0V
		Stop and restart engine after warming it up. — After 3 minutes	BATTERY VOLTAGE (11 - 14V)
20	Fuel pump relay	Engine is running.	BATTERY VOLTAGE (11 - 14V)
22	Load signal	Engine is running and gear position is in P or N (A/T). — Steering wheel is turned. — Blower and air conditioner switchs are "ON". — Lighting switch is "ON".	BATTERY VOLTAGE (11 - 14V)
		Engine is running. — Except conditions shown above	0V
23	Cylinder head temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine temperature.
24	Exhaust gas sensor	Engine is running. — After warming up sufficiently	0 - Approximately 1.0V
25	Idle switch (⊕side)	Ignition switch "ON"	9.0 - 10.0V
27 35	Power source for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
29	Vehicle speed sensor	Ignition switch "ON" — While rotating rear wheel slowly	0 or 7.4V

*Data are reference values.

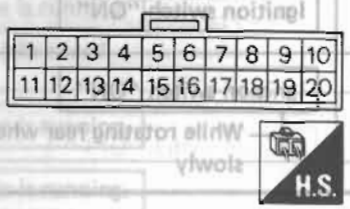
TERMINAL NO.	ITEM	CONDITION	*DATA
30	Exhaust gas temperature sensor (Only for California model)	Engine is running. └ Idle speed	1.0V or more
		Engine is running. └ E.G.R. system is operating.	0 - 1.0V
31	Air flow meter	Engine is running. **Do not run engine at high speed under no-load.**	2.0 - 4.0V Output voltage varies with engine revolution and throttle valve movement.
34	Ignition switch signal	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
101 102 103 104 105 106 114	Injector	Engine is running.	BATTERY VOLTAGE (11 - 14V)
108	Fuel pump	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON"	0.1 - 0.3V
		Ignition switch "ON" └ After 5 seconds have passed	9 - 14V
110	Throttle sensor (Only for California model)	Ignition switch "ON"	0.4 - 4.0V
115	Exhaust gas sensor heater	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

VG30 PIN CONNECTOR TERMINAL LAYOUT

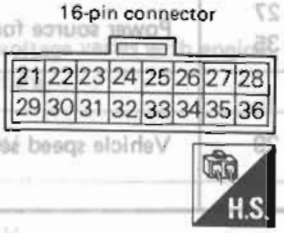
15-pin connector



20-pin connector



16-pin connector



SEF262F

PREPARATION

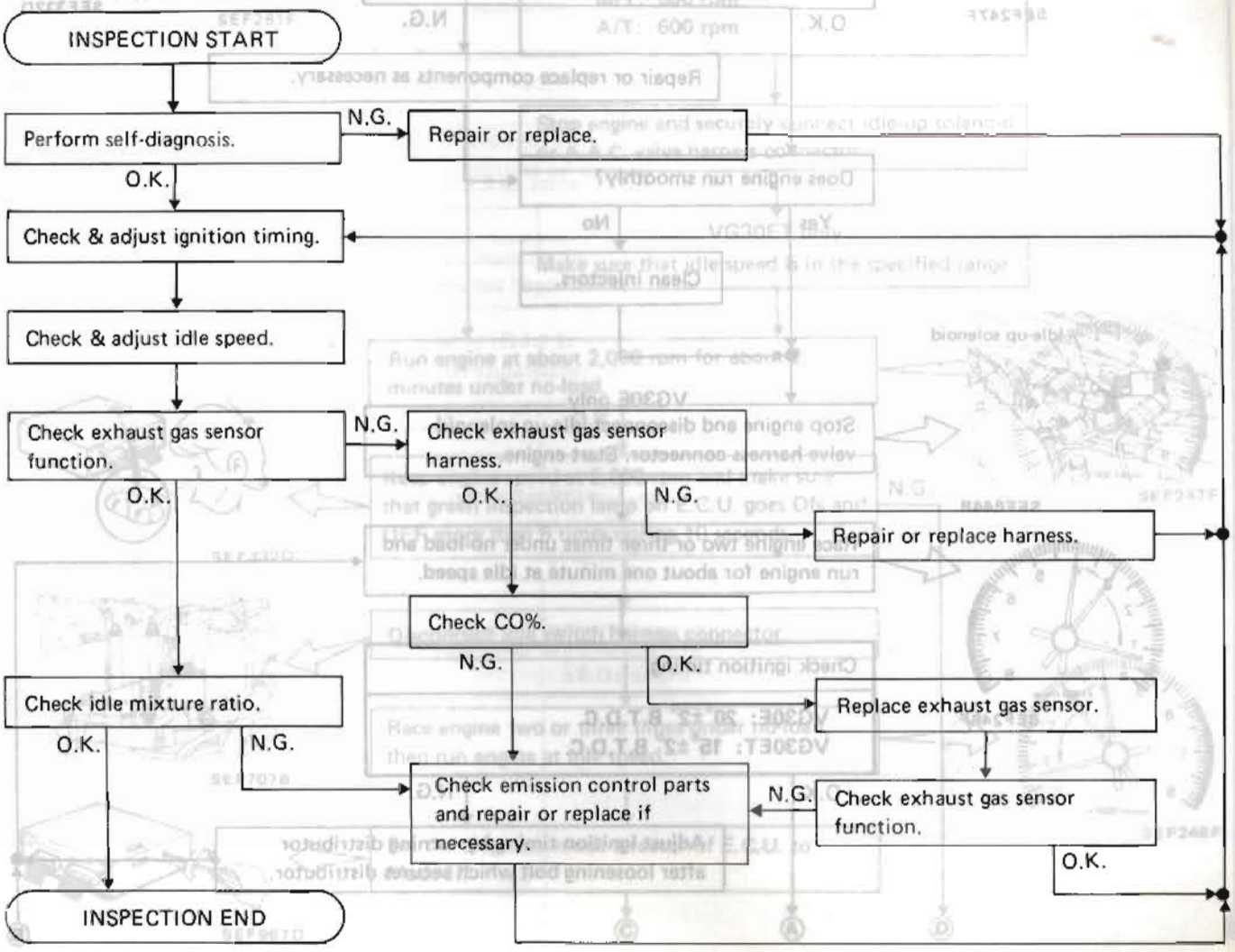
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connectors
- Vacuum hoses
- Air intake system (oil filler cap, oil level gauge, etc.)
- Fuel pressure
- A.I.V. hose
- Engine compression
- E.G.R. valve operation
- Throttle valve

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "D" position.
4. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamps, heater blower, rear defogger (if equipped).
6. Keep front wheels pointed straight ahead (if equipped with power steering).
7. Make the check after the radiator cooling fan has stopped.

WARNING:

a. When selector lever is shifted to "D" position, apply parking brake and block both front and rear wheels with chocks.
b. Depress brake pedal while racing the engine to prevent forward surge of vehicle.
c. After the adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.

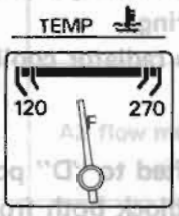
Overall inspection sequence



Idle Check and Set Procedure

INSPECTION START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- E.G.R. valve operation
- Electrical connectors
- Gaskets
- Idle switch operation
- A.I.V. hose



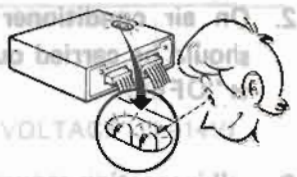
SEF246F

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

SEF247F

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

Perform E.C.C.S. self-diagnosis.


SEF332D

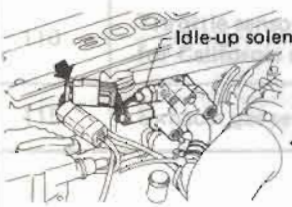
O.K. / N.G.

Repair or replace components as necessary.

Does engine run smoothly?

Yes / No

Clean injectors.



SEF644B

VG30E only

Stop engine and disconnect idle-up solenoid valve harness connector. Start engine.

SEF248F

Race engine two or three times under no-load and run engine for about one minute at idle speed.

Check ignition timing.

VG30E: 20°±2° B.T.D.C.
VG30ET: 15°±2° B.T.D.C.

O.K. / N.G.

Adjust ignition timing by turning distributor after loosening bolt which secures distributor.

Ⓐ Ⓑ

Ⓐ

Check idle speed (A/T: in "D" position).

VG30E: M/T & A/T
700±50 rpm at sea level
650±50 rpm at high altitudes
VG30ET:
M/T: 700±50 rpm
A/T: 650±50 rpm

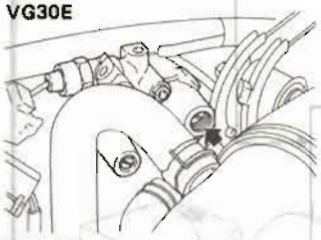

SEF646B

O.K. — N.G.

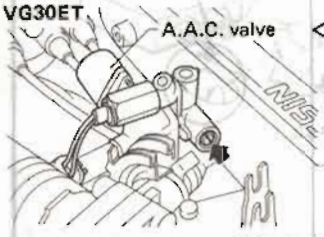
VG30E only

Stop engine and disconnect A.A.C. valve harness connector. Start engine.

VG30E



VG30ET — A.A.C. valve


SEF261F

Adjust engine speed by turning idle speed adjusting screw. (A/T: in "D" position)

VG30E: M/T & A/T
700±50 rpm at sea level
650±50 rpm at high altitudes
VG30ET:
M/T: 650 rpm
A/T: 600 rpm

Stop engine and securely connect idle-up solenoid or A.A.C. valve harness connector.

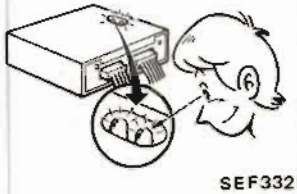
VG30ET only

Make sure that idle speed is in the specified range.

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

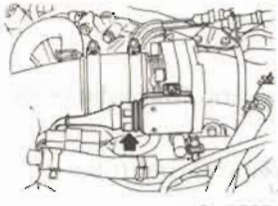
SEF247F

O.K.


SEF332D

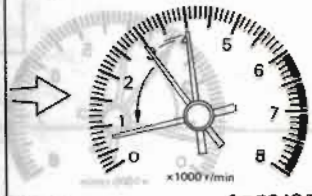
Keep engine speed at 2,000 rpm and make sure that green inspection lamp on E.C.U. goes ON and OFF more than 5 times during 10 seconds.

N.G.

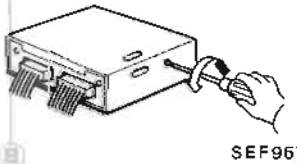

SEF707B

Disconnect idle switch harness connector.

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



SEF248F


SEF967D

Set the diagnosis mode selector of E.C.U. to Mode-II.

Ⓒ Ⓓ Ⓑ

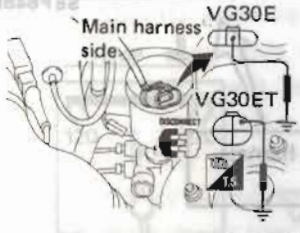
SEF332D

Check whether green and red inspection lamps on E.C.U. flash simultaneously.

N.G. O.K.

Connect idle switch harness connector.

INSPECTION END

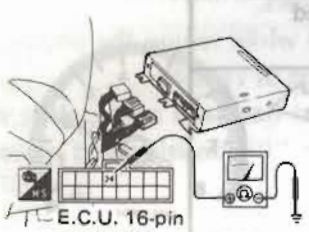


SEF249F

Check exhaust gas sensor harness:

1) Turn off engine and disconnect battery ground cable.
2) Disconnect 16-pin 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. 24 of 16-pin connector and body ground.

Continuity exists ..... O.K.
Continuity does not exist ..... N.G.

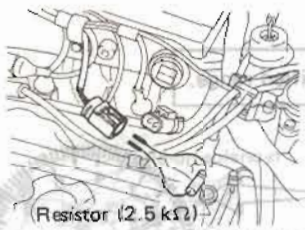


SEF959D

O.K. N.G.

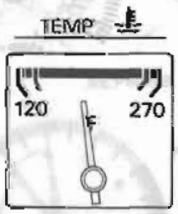
Repair or replace harness.

Connect 16-pin connector to E.C.U.



SEF711B

- Disconnect cylinder head temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of cylinder head temperature sensor harness connector.



SEF246F

Connect battery ground cable, start engine and warm it up until water temperature indicator points to middle of gauge.

SEF248F

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

Ⓔ

Ⓕ

Check CO%.

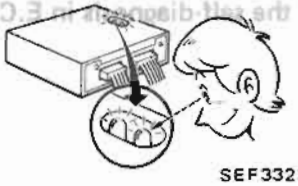
Idle CO: 0.2 - 8.0%

After checking CO%,
1) Disconnect the resistor from terminals of cylinder head temperature sensor harness connector.
2) Connect cylinder head temperature sensor harness connector to cylinder head temperature sensor.

N.G.

O.K.

Replace exhaust gas sensor.



SEF332D

Run engine at 2,000 rpm and make sure that green inspection lamp on E.C.U. goes ON and OFF more than 5 times during 10 seconds.

O.K.

Ⓑ

N.G.

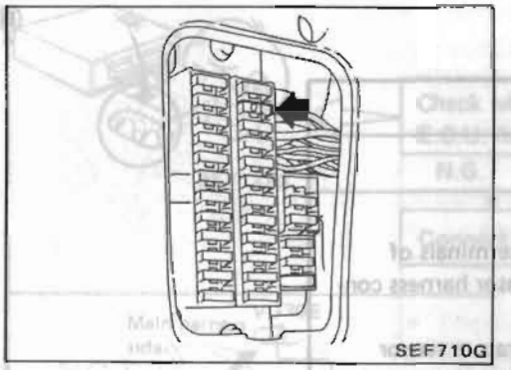
Connect exhaust gas sensor harness connector to exhaust gas sensor.

Check fuel pressure regulator.
(See pages EF & EC-134, 148.)

Check air flow meter.
(See page EF & EC-86.)

Check injector
(See pages EF & EC-116, 120.)
Clean or replace if necessary.

Check cylinder head temperature sensor.
(See page EF & EC-88.)


SEF710G

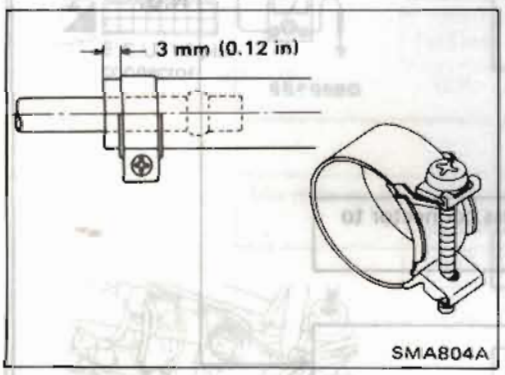
Releasing Fuel Pressure

WARNING:

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

1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that pressure is released.
4. Turn ignition switch off and install the fuse.

Erase the memory (Code No. 22) of the self-diagnosis in E.C.C.S. control unit.



SMA804A

Fuel Pressure Check

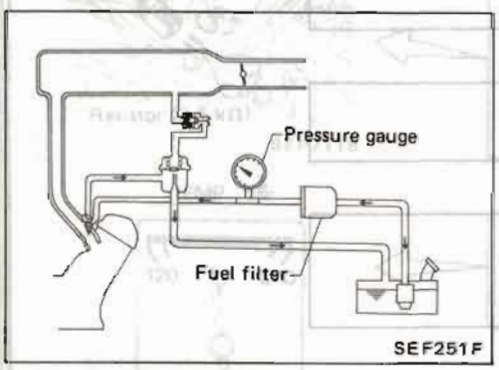
a. Tighten the clamp so its end is 3 mm (0.12 in) from the hose end.

b. Make sure that the screw of the clamp does not contact with any adjacent parts.

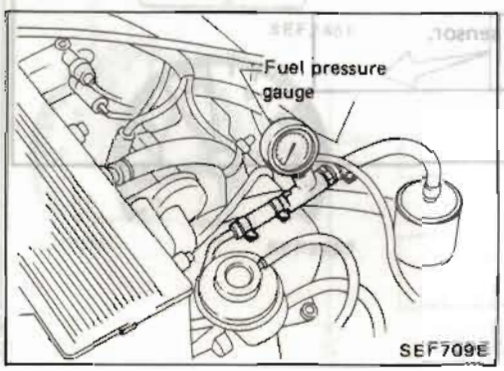
: Fuel hose clamps
1.0 - 1.5 N·m
(0.10 - 0.15 kg-m, 0.7 - 1.1 ft-lb)

c. Disconnect pressure regulator control solenoid valve harness connector.

d. Use Pressure Gauge to check fuel pressure.



SEF251F



SEF709E

1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.

Fuel Pressure Check (Cont'd)

4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

At idling:

Approximately 206 kPa (2.1 kg/cm², 30 psi)

The moment accelerator pedal is fully depressed:

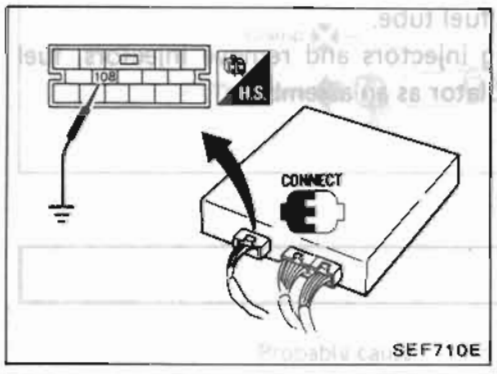
[VG30E]

Approximately 255 kPa (2.6 kg/cm², 37 psi)

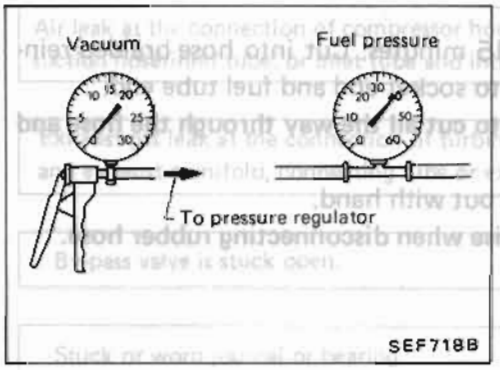
[VG30ET]

Approximately 304 kPa (3.1 kg/cm², 44 psi)

6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake collector.
7. Plug intake collector with a rubber cap.
8. Connect a handy vacuum pump to fuel pressure regulator.



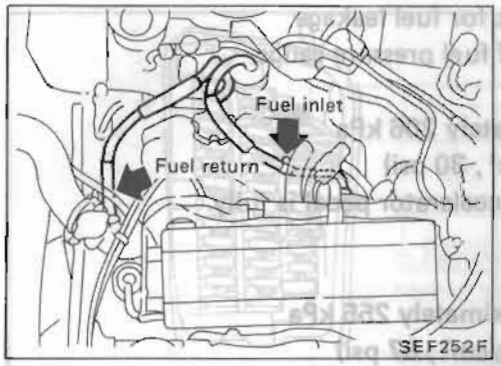
9. Jump No. (108) connector of E.C.U. to body ground.



10. Turn ignition switch to "ON" and read the indication of fuel pressure gauge as vacuum is changed.

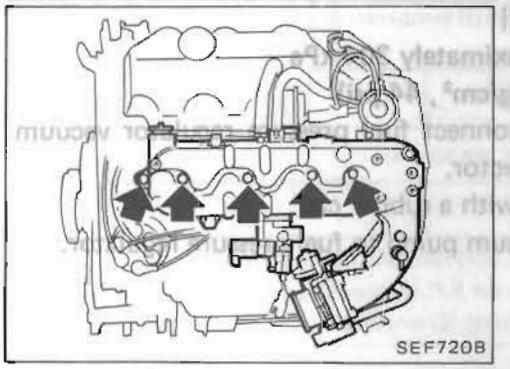
Vacuum kPa (mmHg, inHg)	Fuel pressure kPa (kg/cm², psi)
0 (0, 0)	248.1 - 255.0 (2.53 - 2.60, 36.0 - 37.0)
16.9 (127, 5.00)	227.5 - 241.3 (2.32 - 2.46, 33.0 - 35.0)
33.9 (254, 10.00)	213.8 - 220.7 (2.18 - 2.25, 31.0 - 32.0)
50.8 (381, 15.00)	200.1 - 206.9 (2.04 - 2.11, 29.0 - 30.0)
67.7 (508, 20.00)	179.5 - 193.2 (1.83 - 1.97, 26.0 - 28.0)

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

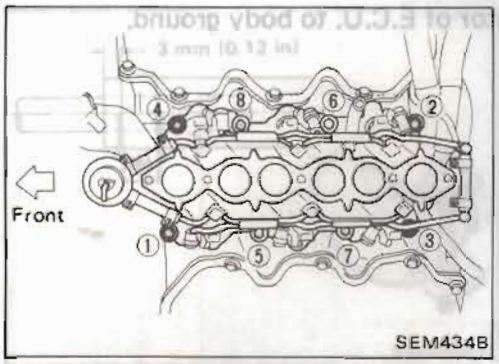


Injector Removal and Installation

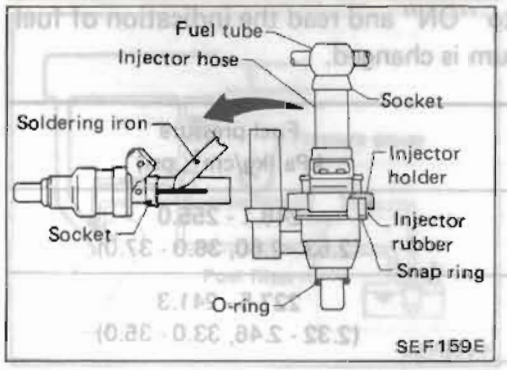
1. Release fuel pressure to zero.
2. Disconnect the following from intake collector.
   - Air duct
   - Accelerator wire
   - Blow-by hoses
   - Air regulator hose
   - E.G.R. tube
   - Harness clamps
   - Harness connectors
   - Intake collector cover
   - Water hoses
3. Disconnect fuel hoses.



4. Remove intake collector.



5. Remove bolts securing fuel tube.
6. Remove bolts securing injectors and remove injectors, fuel tubes and pressure regulator as an assembly.



7. Remove fuel hose.

1) Heat sharp knife for 15 minutes. Cut into hose braided reinforcement from mark to socket end and fuel tube end.

Do not allow sharp knife to cut all the way through the hose and touch injector tail piece.

2) Then pull rubber hose out with hand.

Never place injector in a vise when disconnecting rubber hose.

8. Install fuel hose as follows:

1) Clean exterior of injector tail piece and fuel tube end.
2) Wet inside of new rubber hose with fuel.
3) Push end of rubber hose with hose sockets onto injector tail piece and fuel tube end by hand as far as they will go.

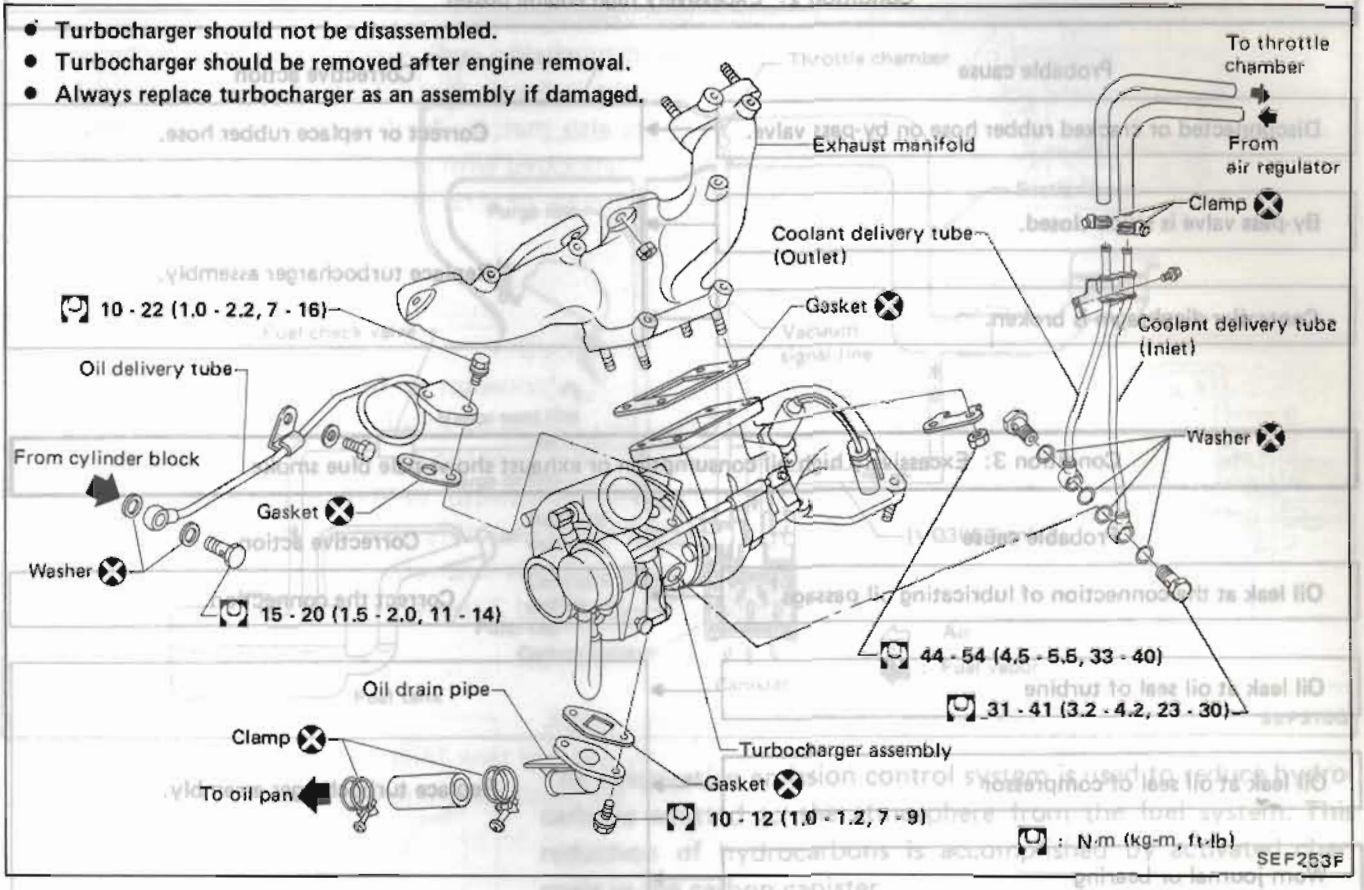
Clamp is not necessary at the connections.

CAUTION:

After properly connecting fuel hose to injector and fuel tube, check connection for fuel leakage.

Disassembly and Assembly

- Turbocharger should not be disassembled.
- Turbocharger should be removed after engine removal.
- Always replace turbocharger as an assembly if damaged.



Inspection

Condition 1: Low engine power

Probable cause	Corrective action
Air leak at the connection of compressor housing and suction hose/inlet tube, or inlet tube and intake manifold.	Correct the connection.
Exhaust gas leak at the connection of turbine housing and exhaust manifold, connecting tube or exhaust outlet	Correct the connection or replace gasket.
By-pass valve is stuck open.	Replace turbocharger assembly.
Stuck or worn journal or bearing	
Broken shaft	
Sludge on back of tubine wheel	
Broken turbine wheel	

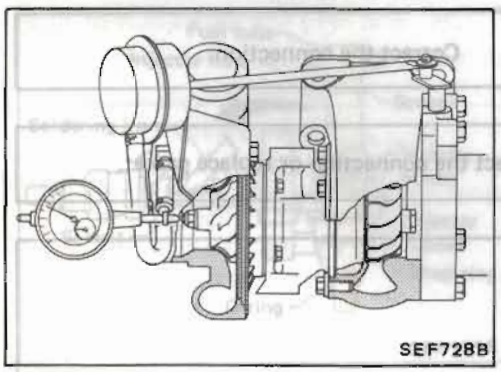
Inspection (Cont'd)

Condition 2: Excessively high engine power

Probable cause	Corrective action
Disconnected or cracked rubber hose on by-pass valve.	Correct or replace rubber hose.
By-pass valve is stuck closed.	Replace turbocharger assembly.
Controller diaphragm is broken.	

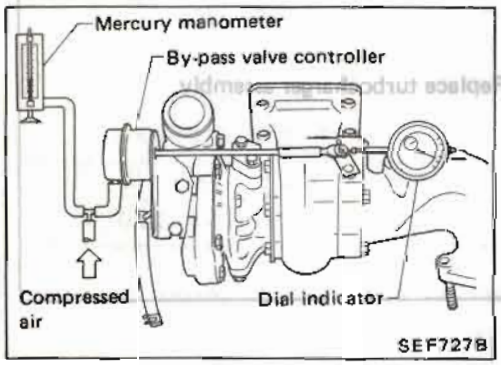
Condition 3: Excessively high oil consumption or exhaust shows pale blue smoke

Probable cause	Corrective action
Oil leak at the connection of lubricating oil passage	Correct the connection.
Oil leak at oil seal of turbine	Replace turbocharger assembly.
Oil leak at oil seal of compressor	
Worn journal or bearing	


SEF728B

1. Inspect turbine and compressor wheel as follows:
- Visually check for cracks, clogging, deformity or other damage.
- Revolve wheels to make sure that they turn freely without any abnormal noise or friction.
- Measure play in axial direction.

Play (axial direction):
0.013 - 0.091 mm (0.0005 - 0.0036 in)



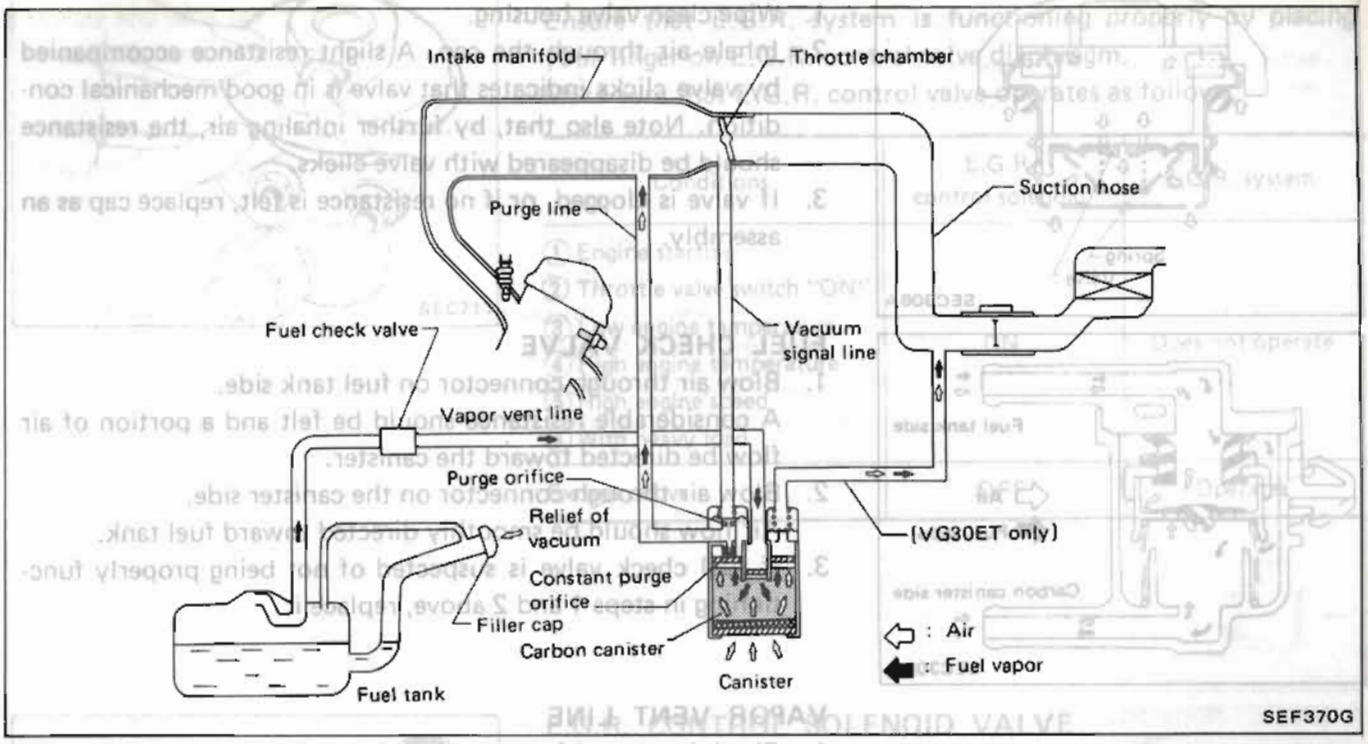
SEF727B

2. Check operation of by-pass valve controller.
- Move by-pass valve to make sure that it is not sticking or scratched.
- Measure rod end play of the by-pass valve controller.

Do not apply more than 66.7 kPa (500 mmHg, 19.69 inHg) pressure to controller diaphragm.

By-pass valve controller stroke/pressure:
0.38 mm (0.0150 in)/35.2 - 40.5 kPa
(264 - 304 mmHg, 10.39 - 11.97 inHg)

Description



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

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.

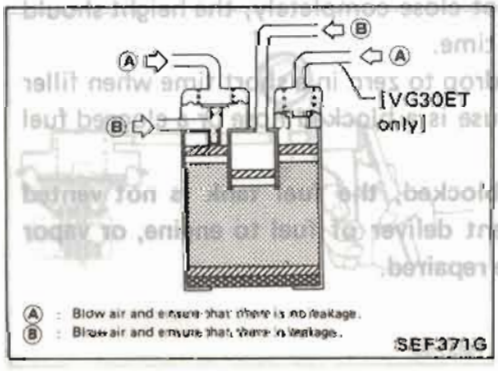
Inspection

CARBON CANISTER

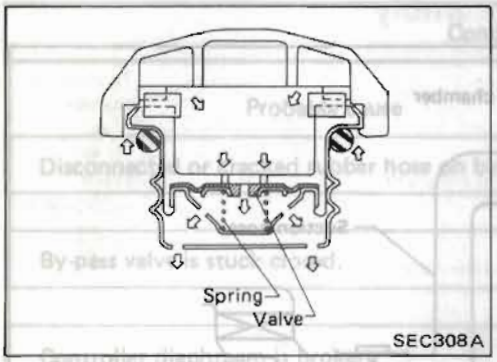
Check carbon canister as follows.

Ⓐ : Blow air and ensure that there is no leakage.

Ⓑ : Blow air and ensure that there is leakage.

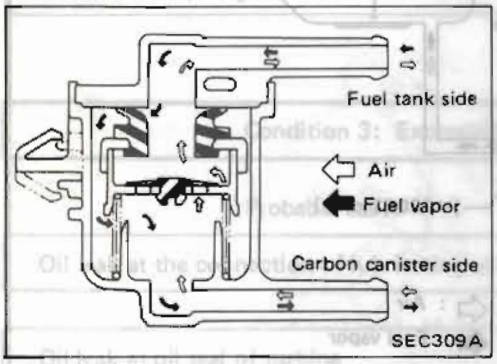


Inspection (Cont'd)



FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Inhale air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembly.

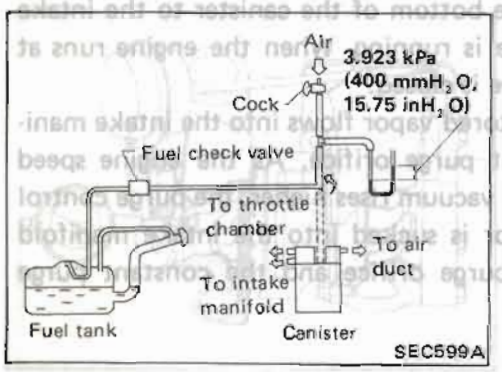


FUEL CHECK VALVE

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

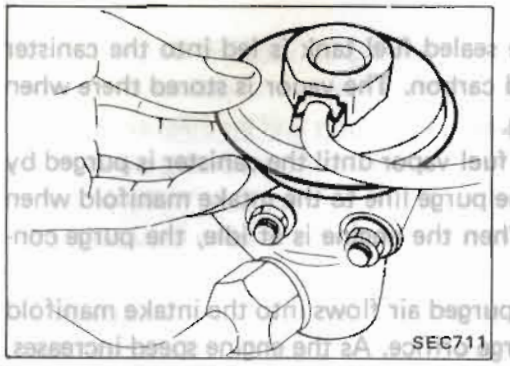
VAPOR VENT LINE

1. Check hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to fuel tank.



3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 3.923 kPa (400 mmH_2O, 15.75 inH_2O).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain at 0.245 kPa (25 mmH_2O, 0.98 inH_2O).
8. When filler cap does not close completely, the height should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, the cause is a blocked hose or a clogged fuel check valve.

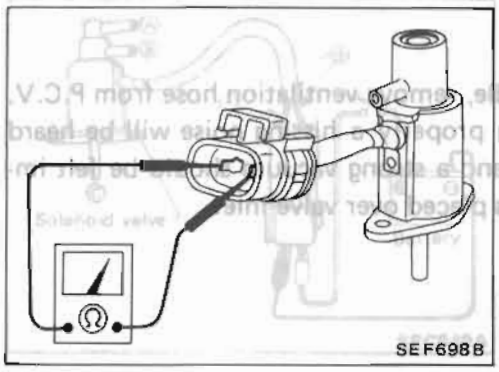
In case the vent line is blocked, the fuel tank is not vented properly causing insufficient deliver of fuel to engine, or vapor lock. It must, therefore, be repaired.



E.G.R. SYSTEM

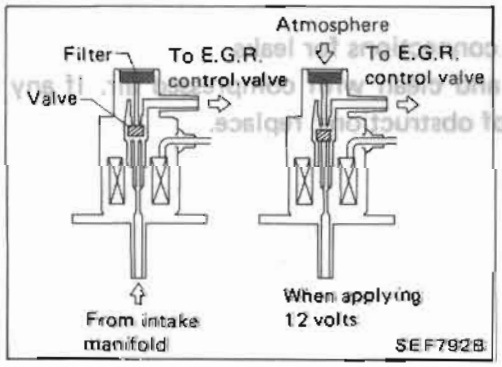
Ensure that E.G.R. system is functioning properly by placing your finger on E.G.R. control valve diaphragm.
Make sure that E.G.R. control valve operates as follows.

Conditions	E.G.R. control solenoid	E.G.R. system
① Engine starting ② Throttle valve switch "ON" ③ Low engine temperature ④ High engine temperature ⑤ High engine speed ⑥ With heavy load	ON	Does not operate
Except above	OFF	Operates



E.G.R. CONTROL SOLENOID VALVE

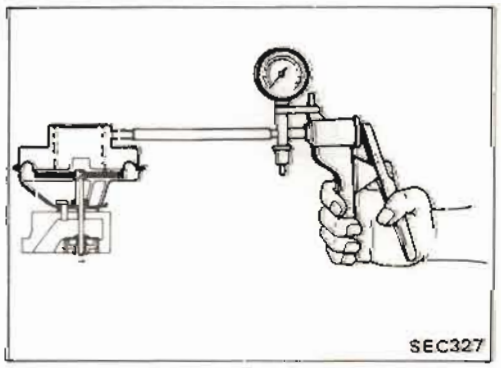
1. Check the solenoid valve for electric continuity, after disconnecting the harness connector.
   Resistance: 30 - 40Ω



2. Check the solenoid valve for normal operation as shown.

CAUTION:

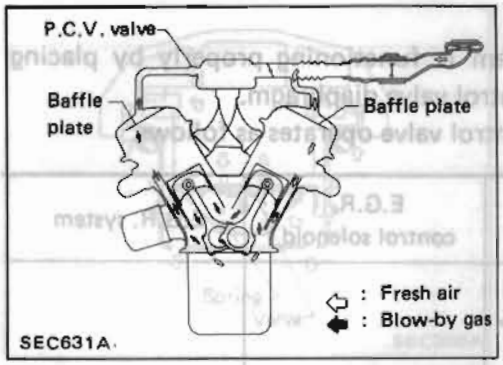
- **Be sure to connect ⊕ terminal of battery with white harness of solenoid valve.**
- **Perform E.G.R. circuit test. (See pages EF & EC-100, 126.)**
- **Perform E.C.U. input/output test. (See page EF & EC-138.)**



E.G.R. CONTROL VALVE

1. Supply the E.G.R. control valve with vacuum using a handy vacuum pump.
2. Place a finger on the diaphragm of the valve, and make sure that the diaphragm lifts up and down in response to the vacuum leading to the valve.

   Full open of E.G.R. valve:
   Over −16.0 kPa
   (−120 mmHg, −4.72 inHg)

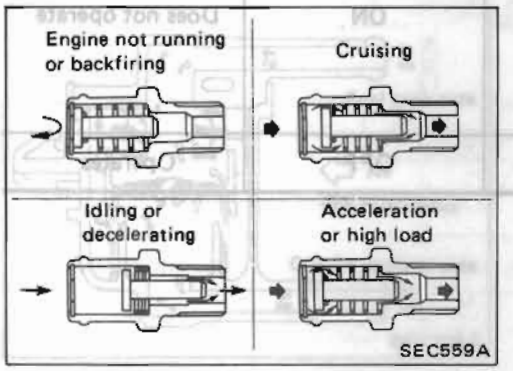


Description

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon. The vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the purge line to the intake manifold when the engine is running. When the engine is at idle, the purge control valve is closed.

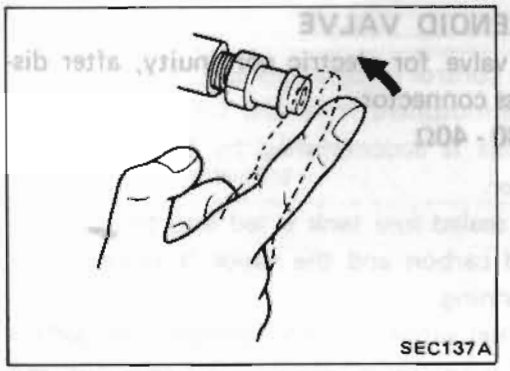
Only a small amount of purged air flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum rises higher the purge control valve opens and the vapor is drawn into the intake manifold through both the purge orifice and the constant purge orifice.



Inspection

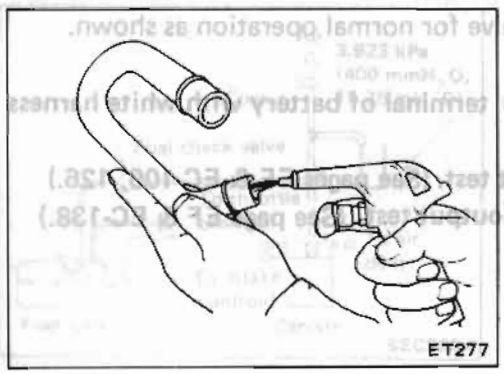
P.C.V. VALVE

With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



VENTILATION HOSE

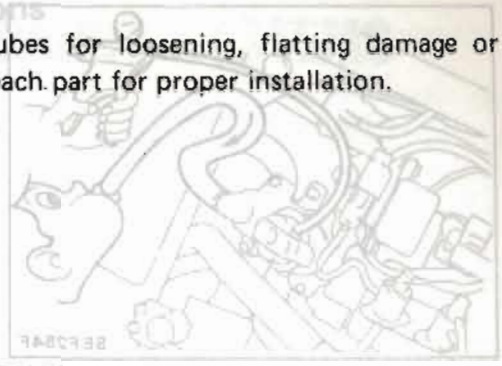
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



VISUAL CHECK

Check the hoses and tubes for loosening, flatting damage or faulty connections, and each part for proper installation.

- Replace, if necessary.

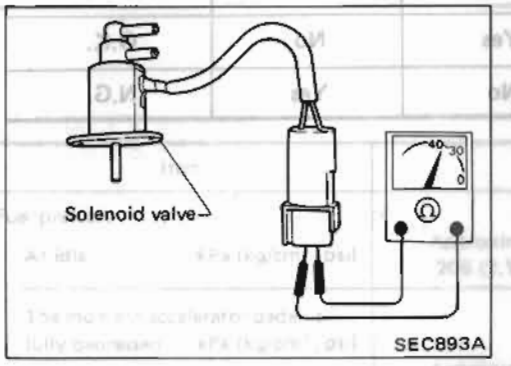


A.I.V. CONTROL SOLENOID

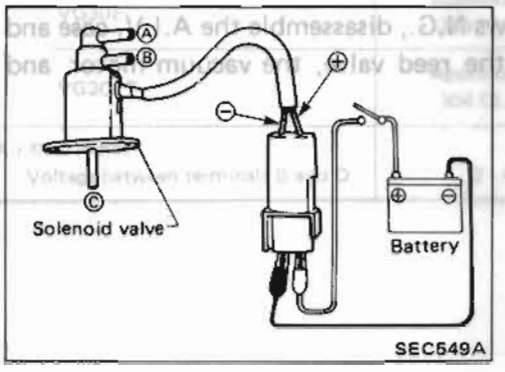
Subject the solenoid valve to independent inspection, after disconnecting the harness connector and all the vacuum hoses.

1) Check it for electric continuity.

Resistance: Approximately 40Ω



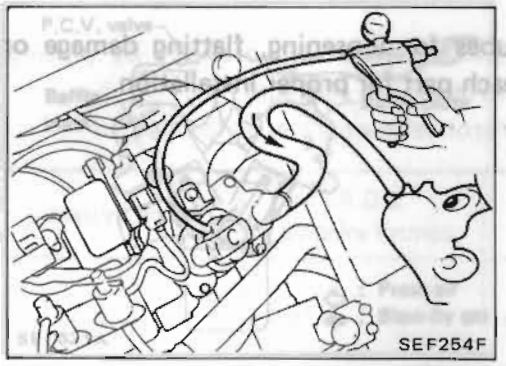
2) Check the solenoid valve for normal operation. Supply it with battery voltage, and check whether there is continuity between ports A, B and C.



Item \ Solenoid valve	OFF	ON
Continuity	B-C	A-B

CAUTION:

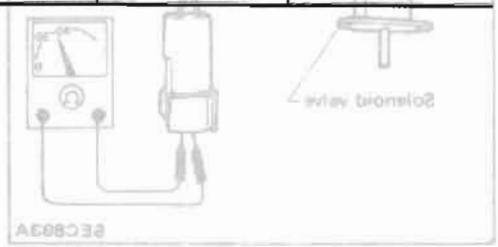
- **Be sure to connect ⊕ terminal of battery with white harness of solenoid valve.**
- **Perform A.I.V. circuit test. (See page EF & EC-124.)**
- **Perform E.C.U. input/output test. (See page EF & EC-138.)**


SEF254F

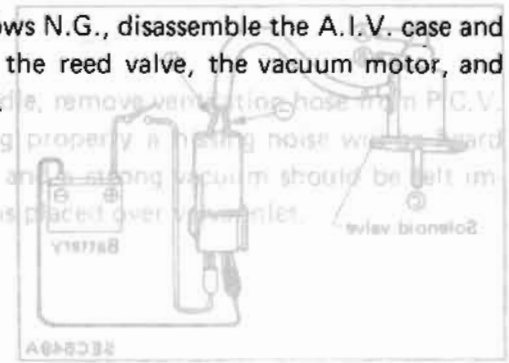
A.I.V. UNIT

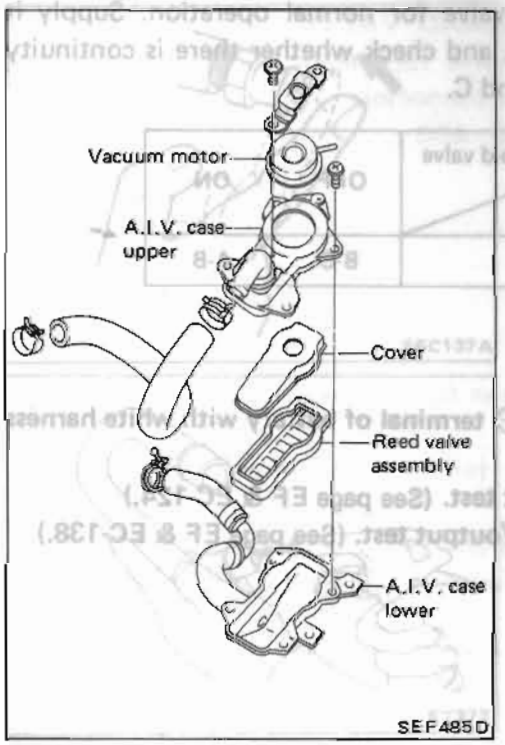
1. Disconnect vacuum hose leading to vacuum motor and set a handy vacuum pump there.
2. Disconnect hose between A.I.V. unit and air cleaner.
3. Subject A.I.V. unit to inspection in the following way.
   Connect suitable hose to A.I.V. unit and try to blow A.I.V. unit through the hose, when vacuum is lead to vacuum motor and when no vacuum exists.

	Vacuum	No vacuum	Parts condition
Can you blow?	Yes	No	O.K.
	No	Yes	N.G.



4. If the inspection shows N.G., disassemble the A.I.V. case and check such parts as the reed valve, the vacuum motor, and the connecting hoses.





SEF485D

General Specifications

Fuel pump	
Cut-off discharge pressure kPa (kg/cm², psi)	422 - 490 (4.3 - 5.0, 61 - 71)
Pressure regulator	
Regulated pressure kPa (kg/cm², psi)	250 (2.55, 36.3)
Air regulator	
Air flow amount [at 20°C (68°F)] m³ (cu ft)/hr	14.5 (512)

Inspection and Adjustment

Item	
Fuel pressure	
At idle kPa (kg/cm², psi)	Approximately 206 (2.1, 30)
The moment accelerator pedal is fully depressed kPa (kg/cm², psi)	
VG30E	Approximately 255 (2.6, 37)
VG30ET	Approximately 304 (3.1, 44)
Air flow meter	
Voltage between terminals B and D	2 - 4V

Item	
Cylinder head temperature sensor and fuel temperature sensor	
Thermistor resistance at 20°C (68°F)	2.3 - 2.7 kΩ
at 50°C (122°F)	0.77 - 0.87Ω
at 80°C (176°F)	0.30 - 0.33Ω
Idle switch	
Engine speed when idle switch is turned from "OFF" to "ON"	Idle speed ± 250 rpm allowance: ±150 rpm
Dash pot rpm	
Touch speed	VG30E: 2,200 - 2,800 VG30ET (M/T model only): 2,200 - 2,800

Tightening Torque

Unit	N·m	kg-m	ft-lb
Throttle chamber securing bolt	18 - 22	1.8 - 2.2	13 - 16
Intake collector cover bolt	6 - 8	0.6 - 0.8	4.3 - 5.8
Intake collector bolt	18 - 22	1.8 - 2.2	13 - 16
Cylinder head temperature sensor	12 - 16	1.2 - 1.6	9 - 12
Exhaust gas sensor			
(VG30E)	40 - 50	4.1 - 5.1	30 - 37
(VG30ET)	18 - 24	1.8 - 2.4	13 - 17
E.G.R. control valve	18 - 23	1.8 - 2.3	13 - 17
E.G.R. tube	34 - 44	3.5 - 4.5	25 - 33
Fuel hose clamp	1.0 - 1.5	0.10 - 0.15	0.7 - 1.1