

SECTION EF

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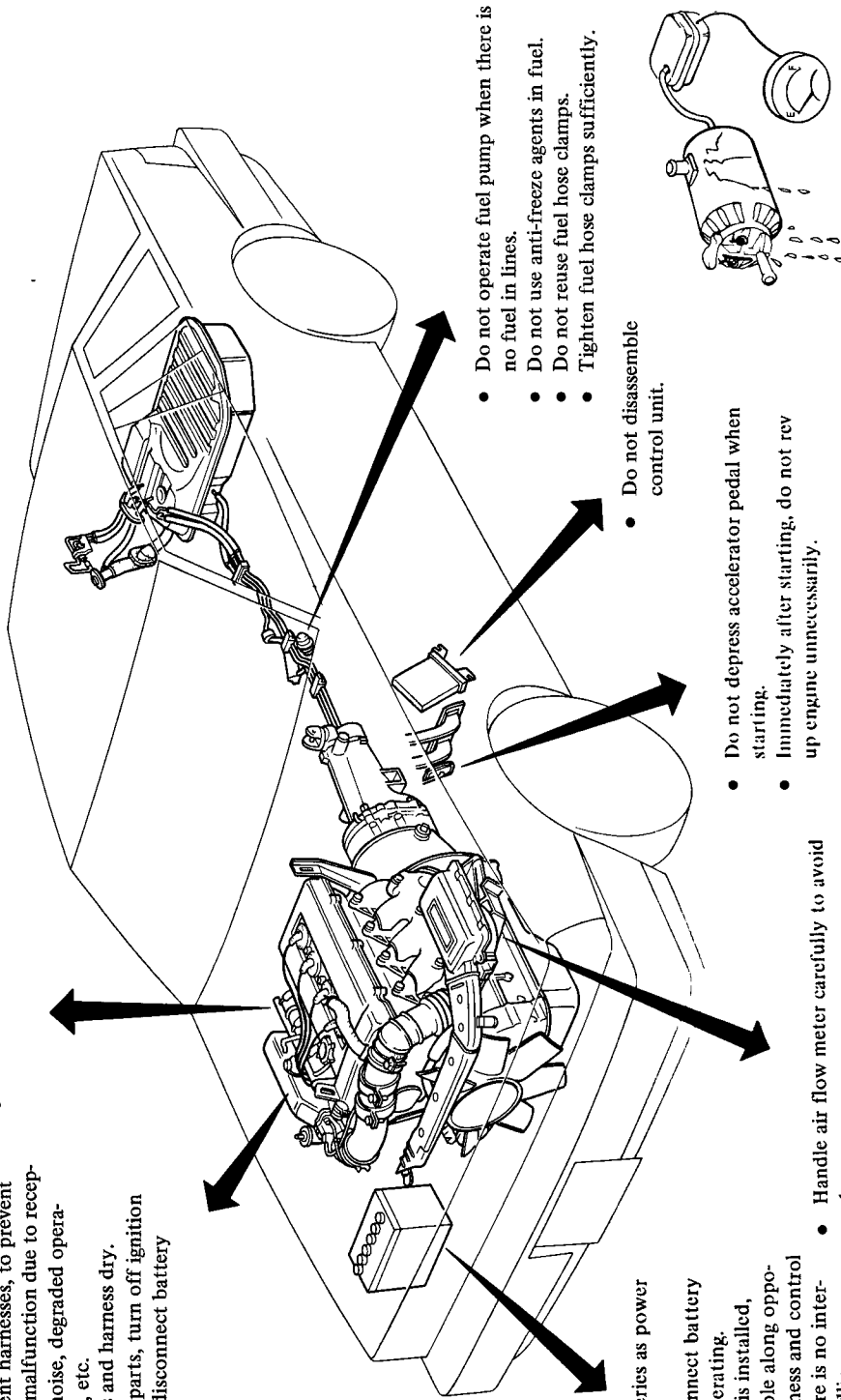
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EF

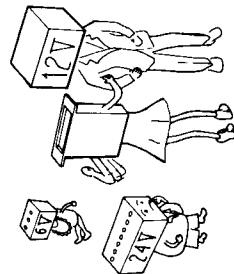
PRECAUTIONS FOR AN E.F.I. ENGINE

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

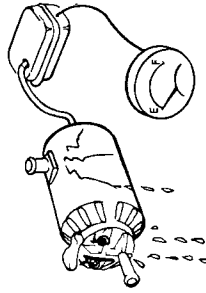
- Do not apply battery power directly to injectors.



- Always use 12-volt batteries as power source.
- Do not attempt to disconnect battery cables while engine is operating.
- If a receiver-transmitter is installed, route antenna feeder cable along opposite side from E.F.I. harness and control unit. Make sure that there is no interference while engine is idling.



- Do not operate fuel pump when there is no fuel in lines.
- Do not use anti-freeze agents in fuel.
- Do not reuse fuel hose clamps.
- Tighten fuel hose clamps sufficiently.

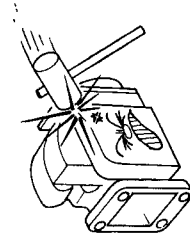


- Do not disassemble control unit.

- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.

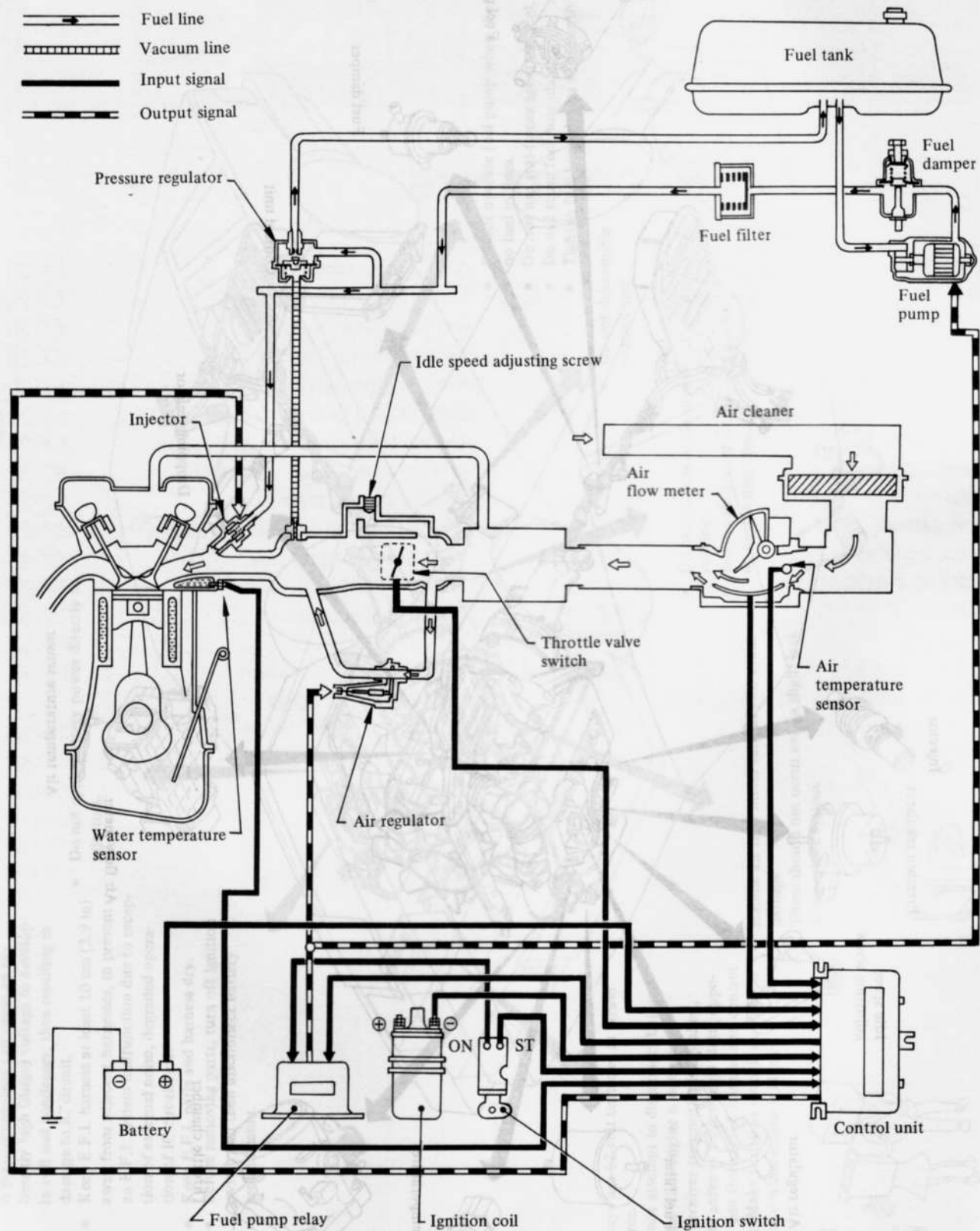


- Handle air flow meter carefully to avoid damage.
- There should not occur even a slight leak in air intake system.



FUEL INJECTION CONTROL

ENGINE CONTROL SYSTEM DIAGRAM



E.F.I. SYSTEM OPERATION

FUEL INJECTION CONTROL

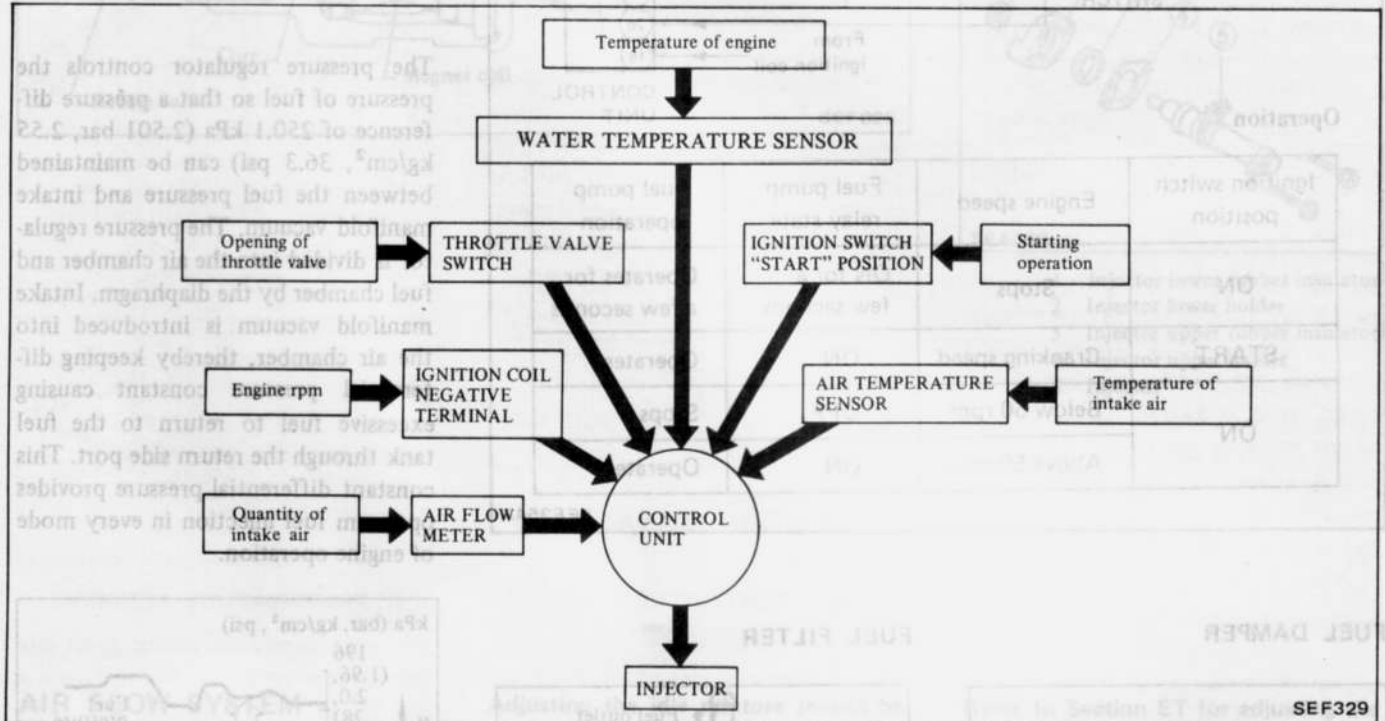
The fuel injectors are electrically connected, in parallel, in the control unit. All injectors receive the injection signal from the control unit at the same time. Therefore, injection is made independently of the engine stroke cycle (intake, combustion, and exhaust). In the four-cycle engine, injection

is made once every revolution of the engine, triggered by the ignition coil.

Fuel in this E.F.I. system is not injected directly into the cylinder, but is injected into the intake port. Therefore, the air-fuel mixture is drawn into the cylinder when the intake valve opens to start the intake stroke.

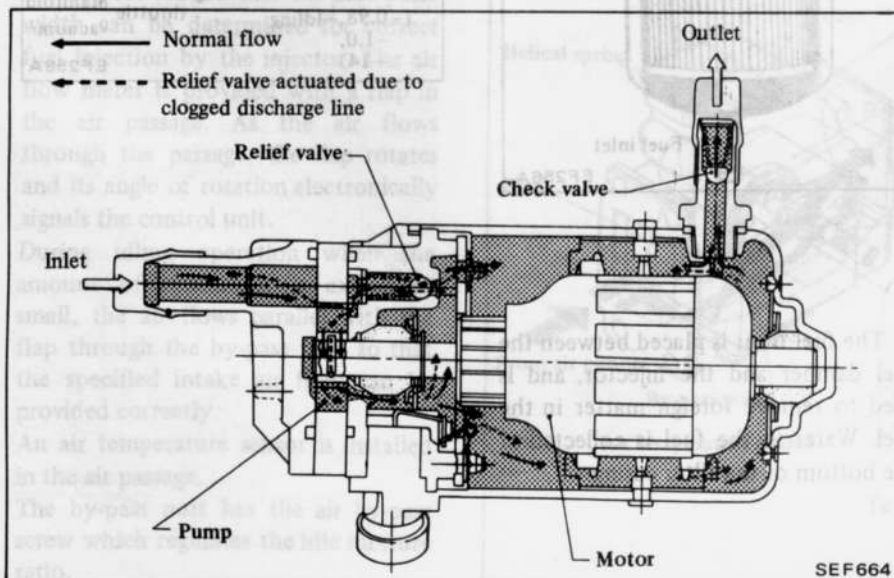
SIGNALS FOR CONTROL UNIT

An electrical signal from each sensor is introduced into the control unit for computation. The open-valve time period of the injector is controlled by the duration of the pulse computed in the control unit.

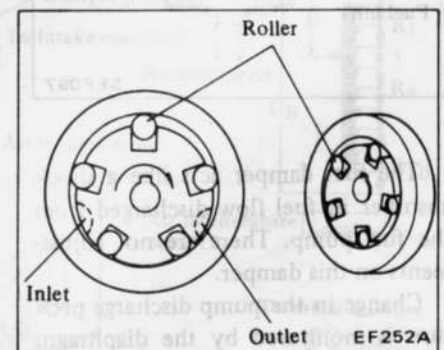


FUEL SYSTEM

FUEL PUMP



The fuel pump is a wet type pump where the vane rollers are directly coupled to a motor which is filled with fuel.

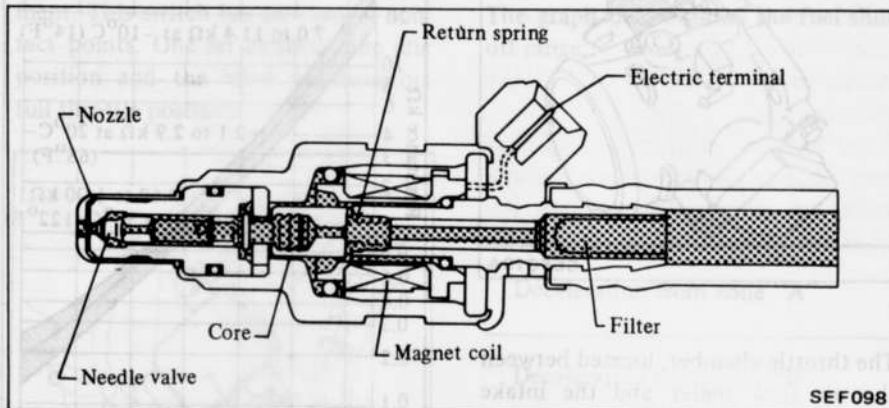


A relief valve in the pump is designed to open when the pressure in the fuel line rises over 422 to 490 kPa (4.22 to

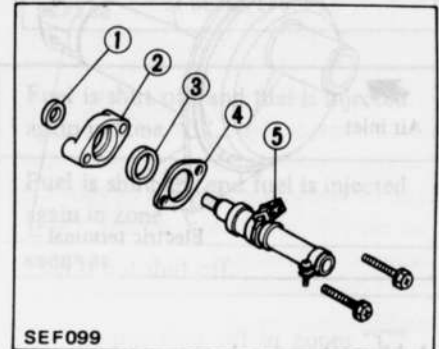
INJECTOR

The injector receives the pulse signal from the control unit, and injects

the fuel toward the intake valve in the cylinder head.



The injector operates on the solenoid valve principle. When an electric signal is applied to the coil built into the injector, the plunger is pulled into the solenoid, thereby opening the needle valve for fuel injection. The quantity of injected fuel is in proportion to the duration of the pulse applied from the control unit.



- 1 Injector lower rubber insulator
- 2 Injector lower holder
- 3 Injector upper rubber insulator
- 4 Injector upper holder
- 5 Injector

AIR FLOW SYSTEM

AIR FLOW METER

The air flow meter measures the quantity of intake air, and sends a signal to the control unit so that the base pulse width can be determined for correct fuel injection by the injector. The air flow meter is provided with a flap in the air passage. As the air flows through the passage, the flap rotates and its angle of rotation electronically signals the control unit.

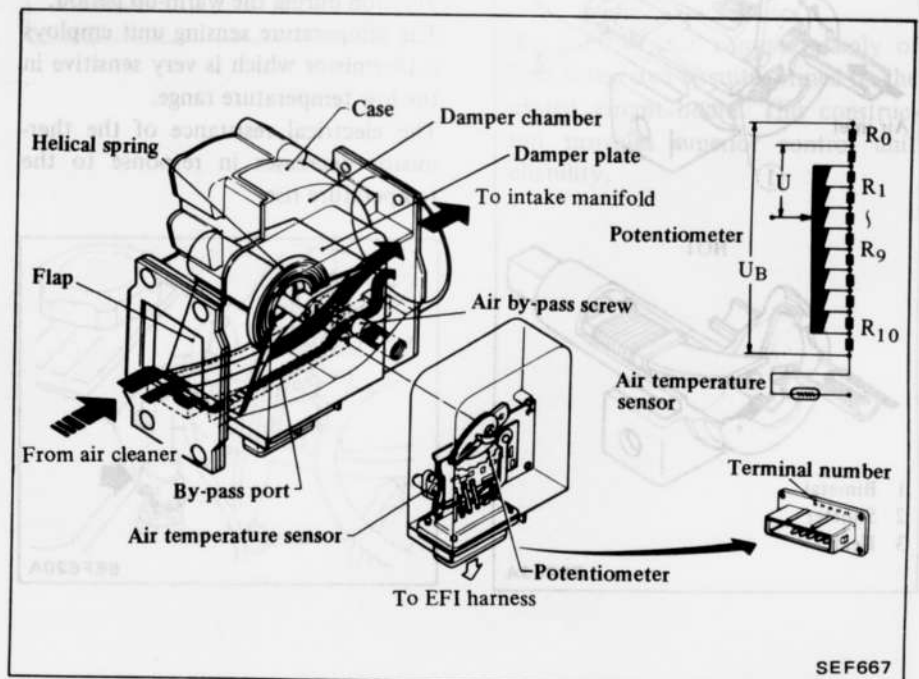
During idling operation when the amount of intake air is extremely small, the air flows parallel with the flap through the by-pass port so that the specified intake air flow can be provided correctly.

An air temperature sensor is installed in the air passage.

The by-pass port has the air by-pass screw which regulates the idle mixture ratio.

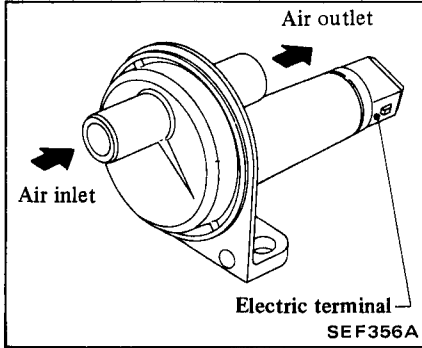
Adjusting the idle mixture should be performed only when it is necessary.

Refer to Section ET for adjusting the idle mixture.

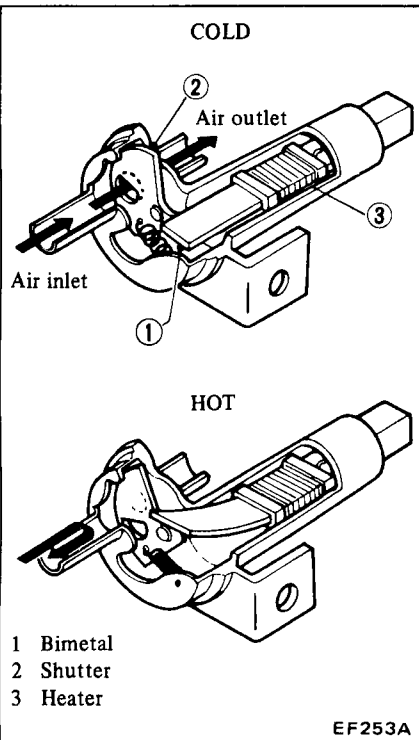


AIR REGULATOR

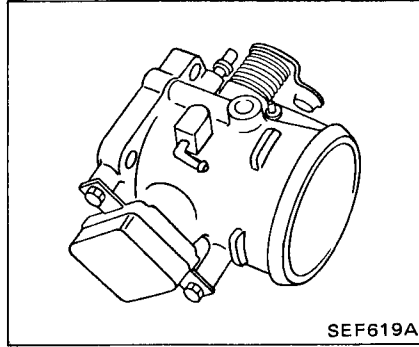
The air regulator by-passes the throttle valve to control the quantity of air for increasing the engine idling speed when starting the engine at a bimetal temperature of below 80°C (176°F).



A bimetal and a heater are built into the air regulator. When the ignition switch is turned to the "START" position or engine running, electric current flows through the heater, and the bimetal, as it is heated by the heater, begins to move and closes the air passage in a few minutes. The air passage remains closed until the engine is stopped and the bimetal temperature drops to below 80°C (176°F).



THROTTLE CHAMBER

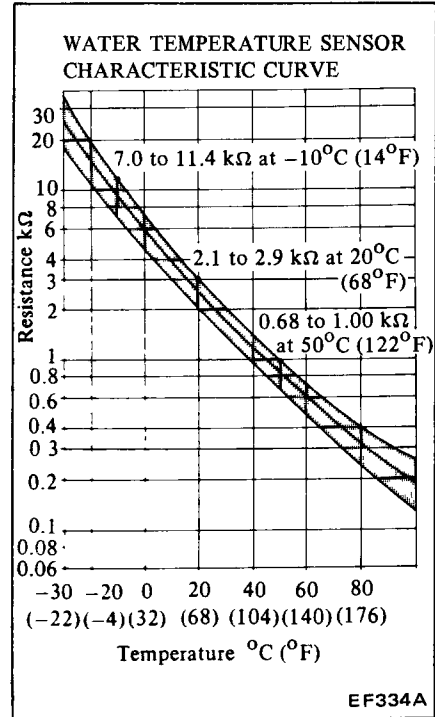
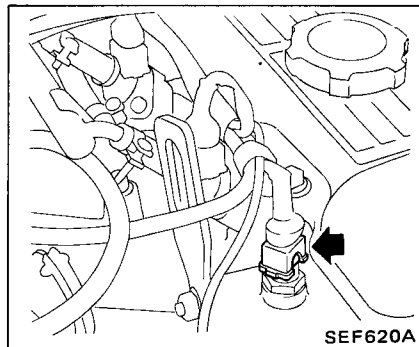


The throttle chamber, located between the air flow meter and the intake manifold, is equipped with a valve. This valve controls the intake air flow in response to accelerator pedal movement. The rotary shaft of this valve is connected to the throttle valve switch.

ELECTRICAL SIGNAL SYSTEM

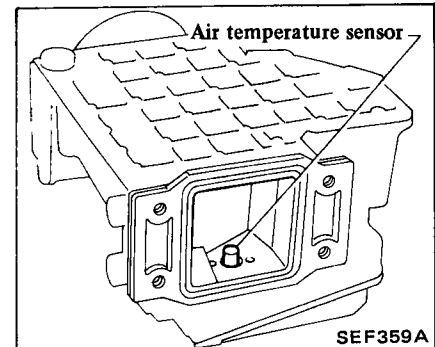
WATER TEMPERATURE SENSOR

The water temperature sensor, built into the thermostat housing, monitors change in water temperature and transmits a signal to increase the pulse duration during the warm-up period. The temperature sensing unit employs a thermistor which is very sensitive in the low temperature range. The electrical resistance of the thermistor decreases in response to the temperature rise.



AIR TEMPERATURE SENSOR

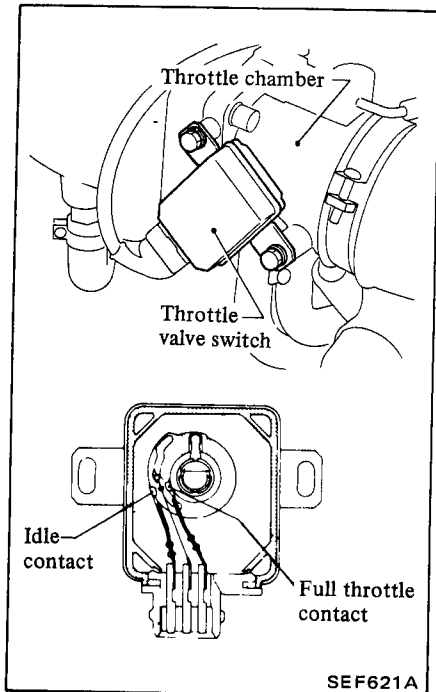
The air temperature sensor, built into the air flow meter, monitors change in the intake air temperature and transmits a signal for the fuel enrichment to change the pulse duration. The temperature sensing unit employs a thermistor which is very sensitive in the low temperature range. The electrical resistance of the thermistor decreases in response to air temperature rise.



E.F.I. SYSTEM OPERATION

THROTTLE VALVE SWITCH

The throttle valve switch is attached to the throttle chamber and actuates in response to accelerator pedal movement. This switch has two sets of contact points. One set monitors the idle position and the other set monitors full throttle position.



Idle contact

The idle contact closes when the throttle valve is positioned at idle and opens when it is at any other position. The idle contact compensates for after idle enrichment, and sends the fuel shut-off signal.

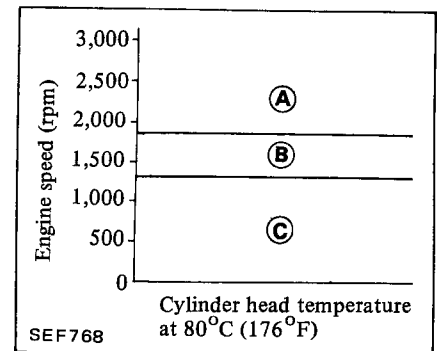
Full throttle contact

The full throttle contact closes only when the throttle valve is positioned at full throttle (more than 35 degree opening of the throttle valve). The contact is open while the throttle valve is at any other position. The full contact compensates for enrichment in full throttle.

FUEL SHUT-OFF

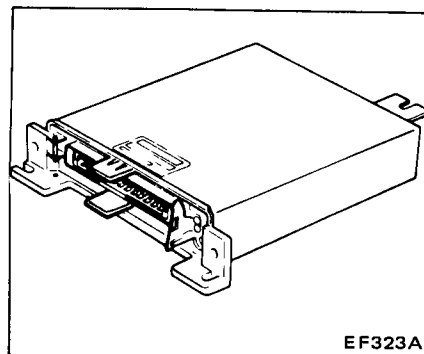
Fuel shut-off is accomplished during deceleration when the engine does not require fuel.

The graph below shows the fuel shut-off range.



Deceleration from zone "A"	Fuel is shut off; and fuel is injected again in zone "C".
Deceleration from zone "B"	Fuel is shut off; and fuel is injected again in zone "C".
Deceleration from zone "C"	Fuel is not shut off.
Engine rpm increased in order of "C", "B", and "A". (Idle switch ON, downhill driving, etc.)	Fuel is not shut off in zones "C" and "B"; in zone "A", fuel is shut off.

CONTROL UNIT



The control unit is connected to the E.F.I. harness by means of a multi-connector, and the E.F.I. harness is connected to other sensors.

The essential role of the control unit is to generate a pulse. Upon receiving an electrical signal from each sensor, the control unit generates a pulse whose duration (injector open-valve time period) is controlled to provide an optimum quantity of fuel according to the engine characteristics.

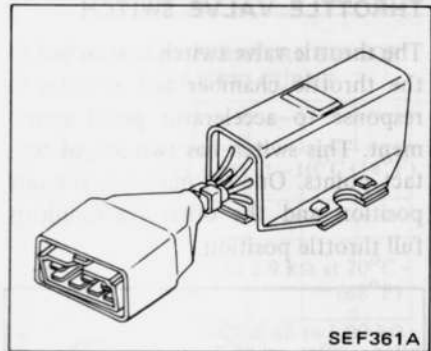
The control unit consists mainly of three integrated circuits formed on the printed circuit board. This construction provides superior control unit reliability.

If your car is equipped with electronic controls, use of a transmitter, such as a radio transmitter (but not a receiver, such as a radio) may interfere with unshielded electronic controls and cause them to malfunction. Car manufacturers do not necessarily use electronic controls in the same ways or for the same operations. Examples of vehicle functions which may involve electronic controls include fuel delivery systems, engine timing, brakes, emission control and cruise control. Definite information regarding the type of electronic controls in your car can only be obtained from the manufacturer. Consult your NISSAN/DATSUN dealer regarding the need for modifications to your car's electronic controls before installation or use of a transmitter.

The dropping resistor is used to lower the source voltage to a level suitable for the injector.

The dropping resistor is connected in series with the injector. It reduces the voltage to approximately 1/4 of the source voltage.

These resistors protect the injectors from alternator voltage surges and the effects of other components in the vehicle's electrical system.



SE F361A

DIAGNOSTIC PROCEDURE FOR PROBLEMS

DIAGNOSIS

INTERMITTENT PROBLEM

DIAGNOSTIC CHARTS CANNOT BE USED TO DIAGNOSE INTERMITTENT FAILURES. This is because many intermittent problems are caused at electrical connections, and if intermittent problems are not corrected, unnecessary component replace-

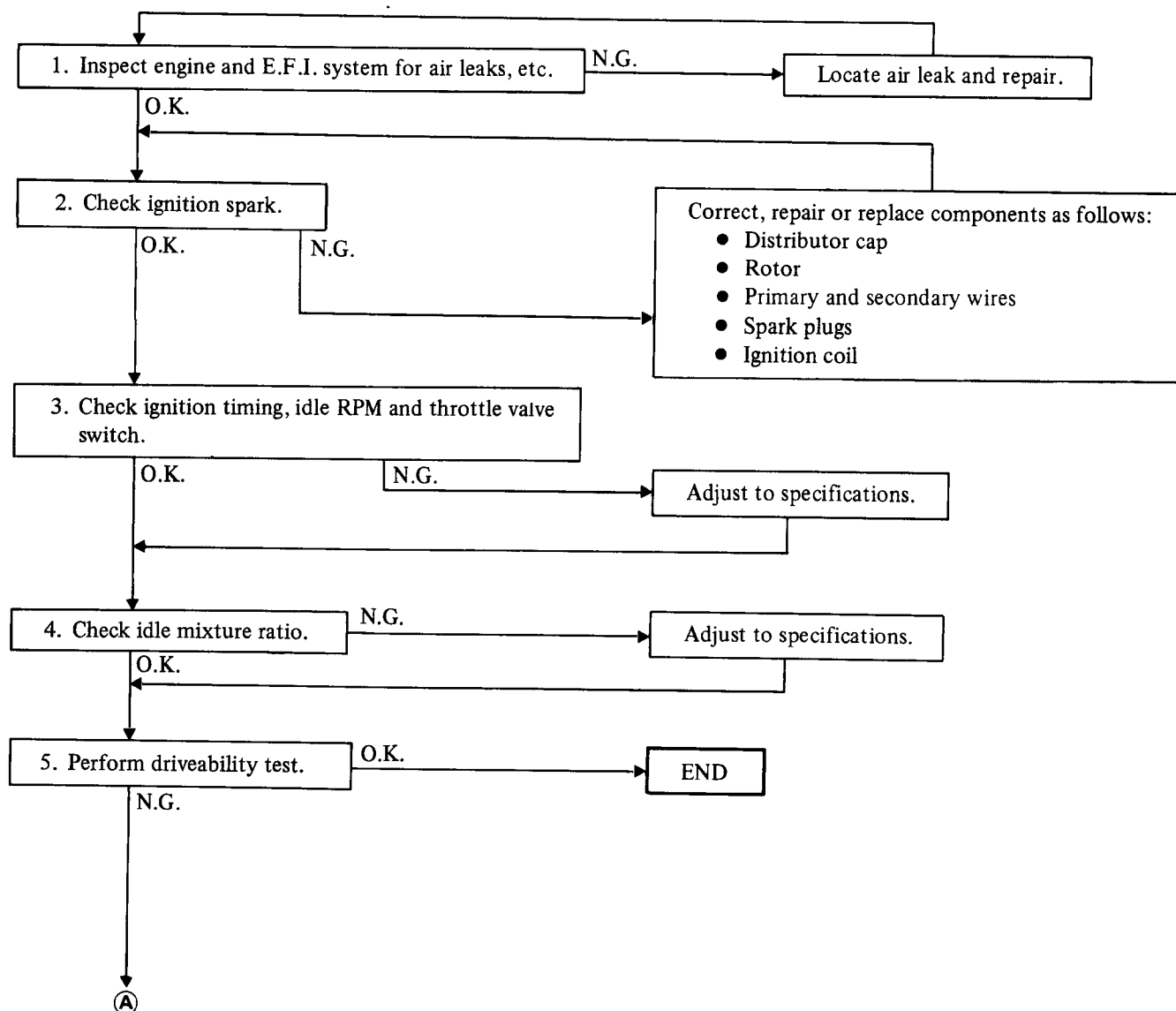
ment will be indicated and the problems may remain. Therefore, DIAGNOSIS OF INTERMITTENT PROBLEMS SHOULD START WITH A VISUAL AND PHYSICAL INSPECTION OF THE CONNECTORS involved in the circuit, especially control unit, air flow meter, and water temperature sensor.

CAUTION:

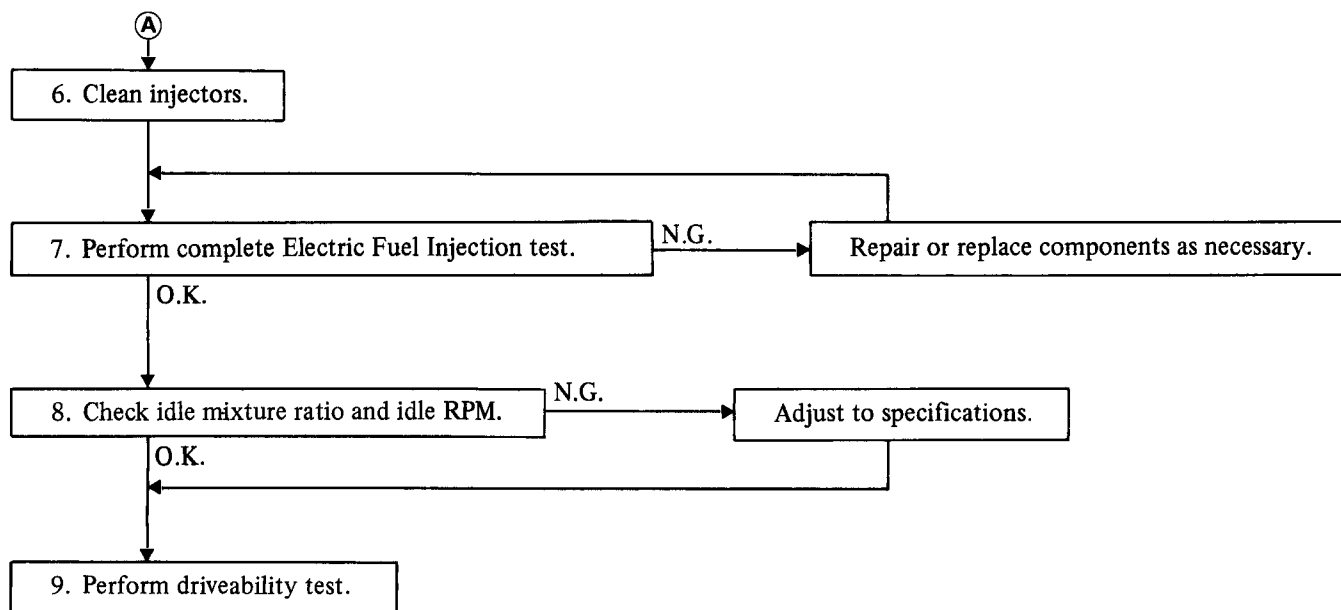
When connecting or disconnecting E.F.I. harness connector to or from any E.F.I. unit, ensure that the ignition switch is in the "OFF" position and that the negative battery terminal is disconnected. Removing and installing these connectors with the ignition switch left in the "ON" position will damage control unit.

DIAGNOSTIC PROCEDURE

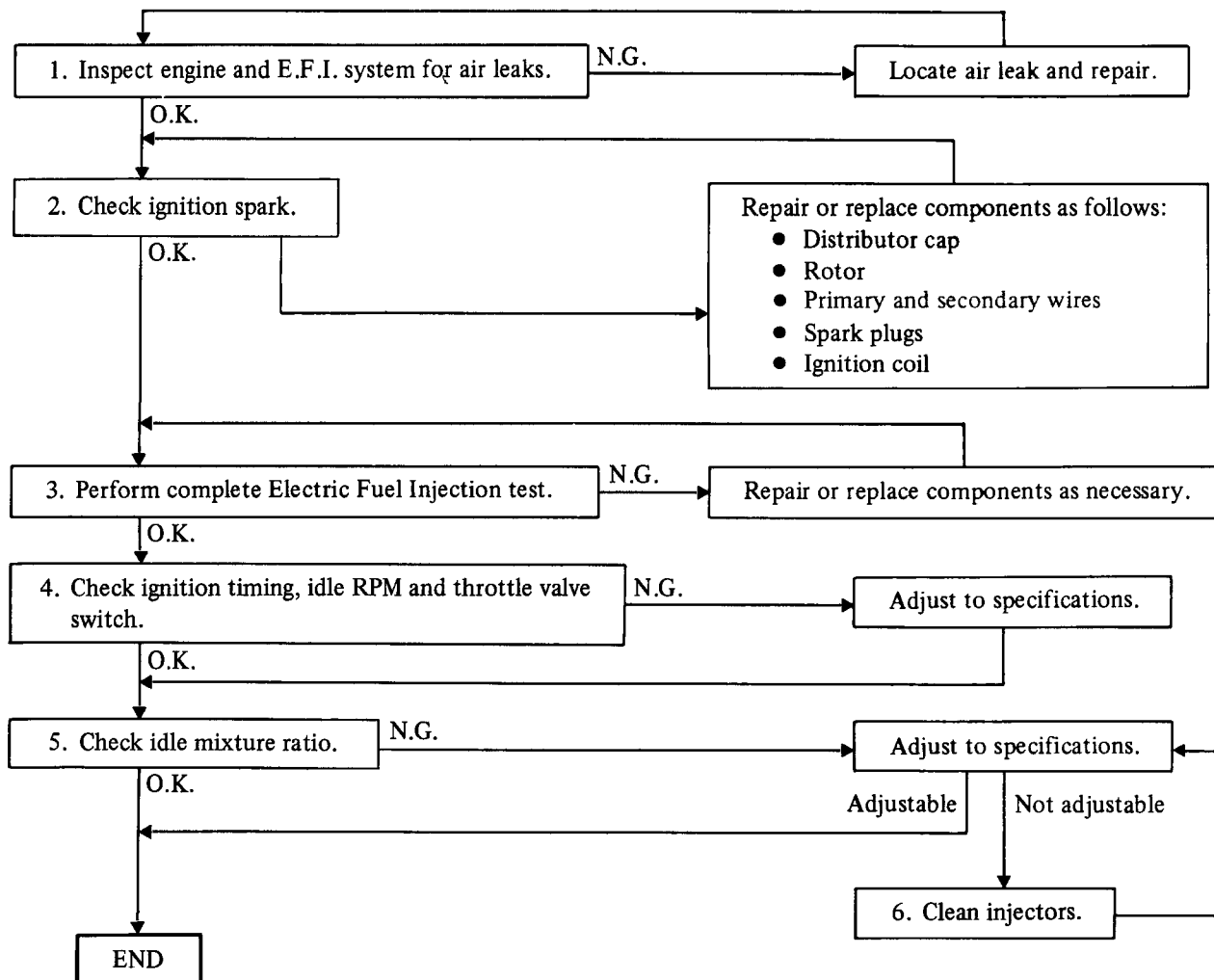
DRIVEABILITY



DIAGNOSTIC PROCEDURE FOR PROBLEMS

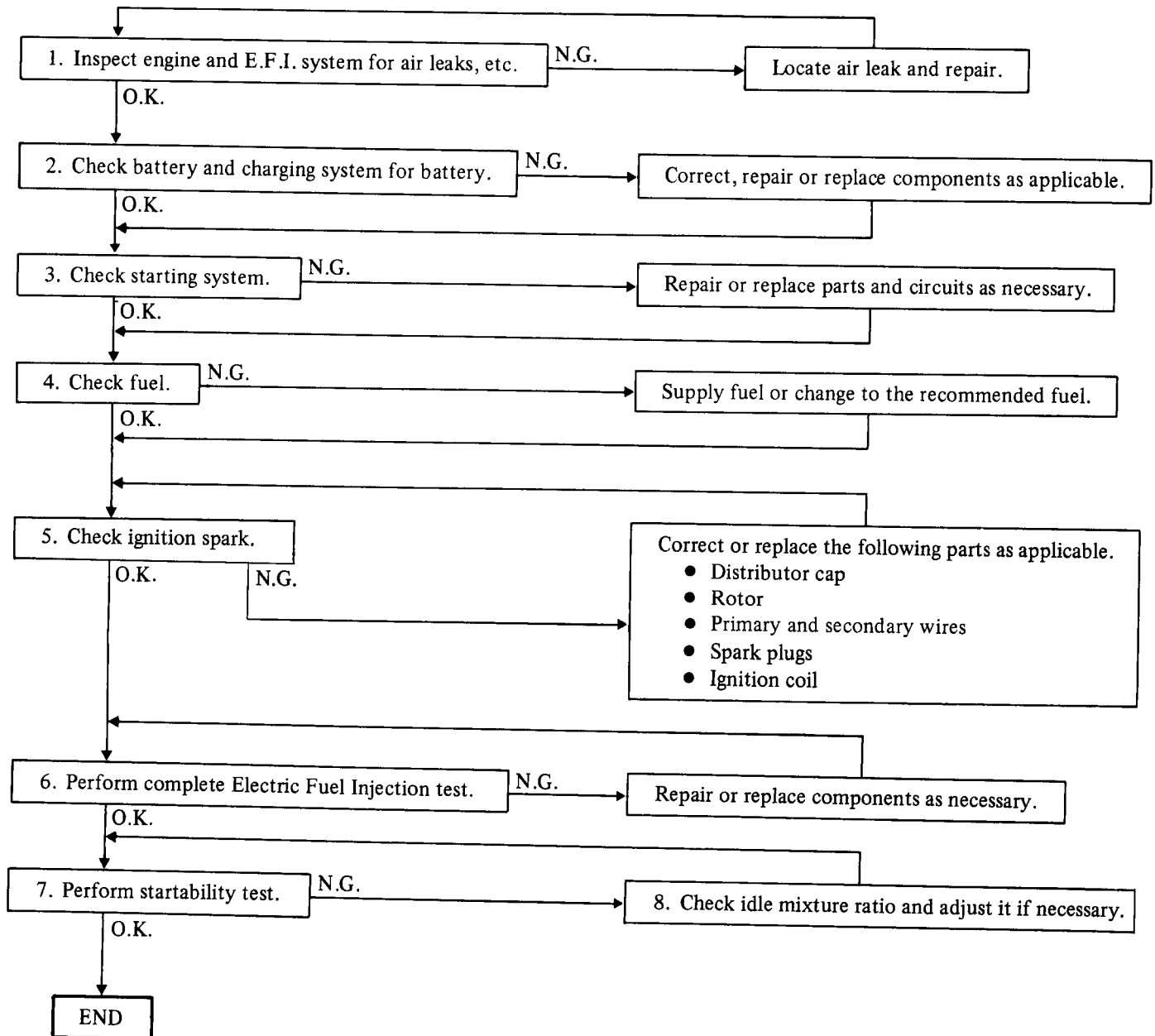


IMPROPER IDLING



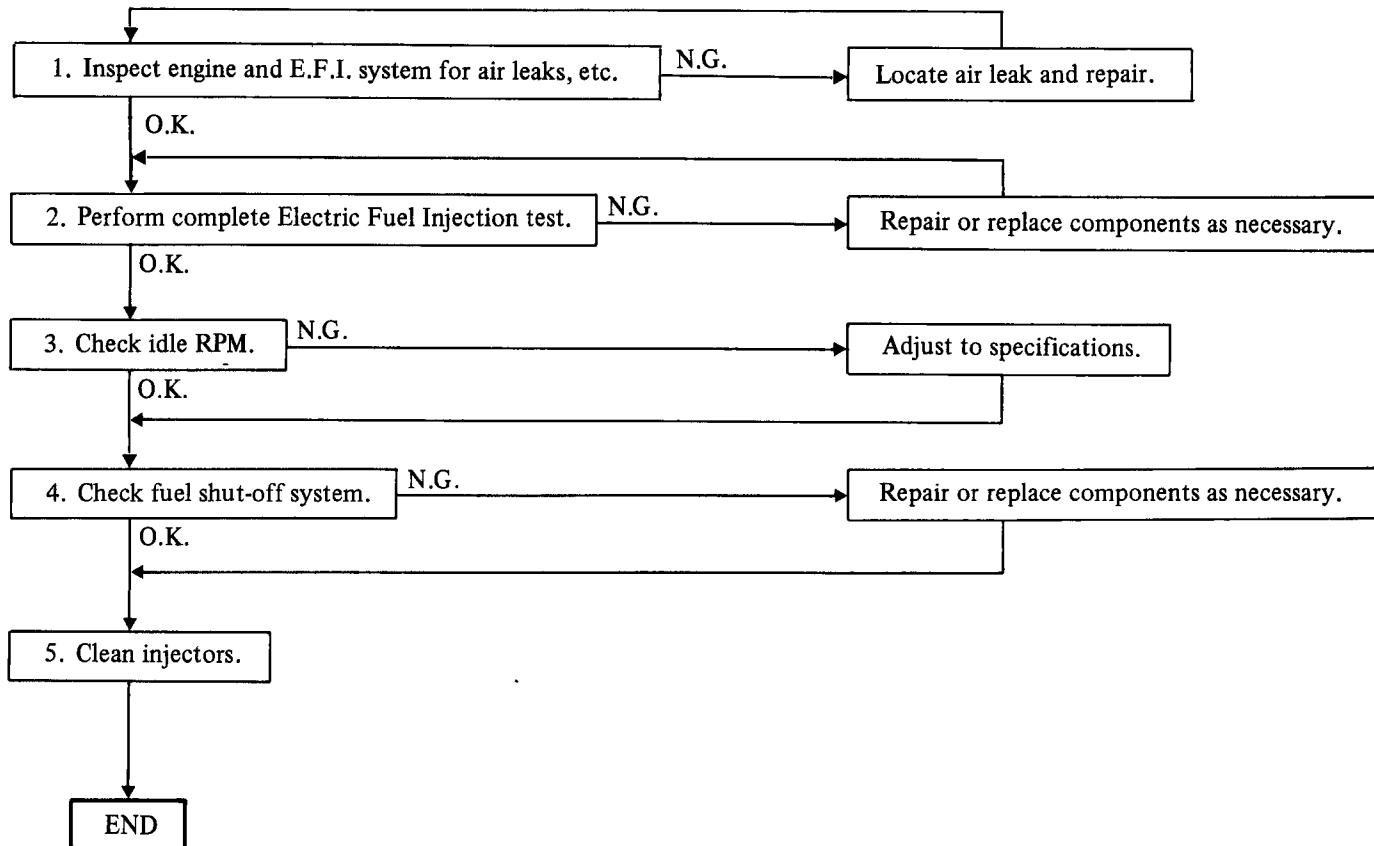
DIAGNOSTIC PROCEDURE FOR PROBLEMS

ENGINE STARTABILITY



DIAGNOSTIC PROCEDURE FOR PROBLEMS

ENGINE STALL



DIAGNOSTIC STEPS FOR DRIVEABILITY

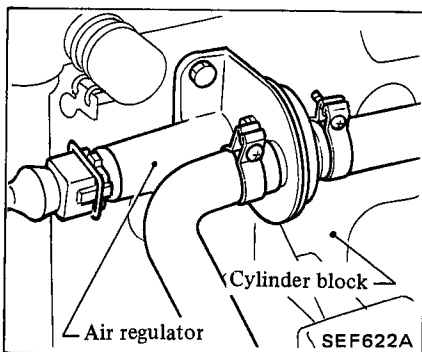
1. Inspect engine and E.F.I. system for leaks.

- (1) Check clamps at all air intake components.
- (2) Check vacuum hoses for leakage.
- (3) Check air cleaner filter for clogging.
- (4) Visually inspect for leaks at the following:

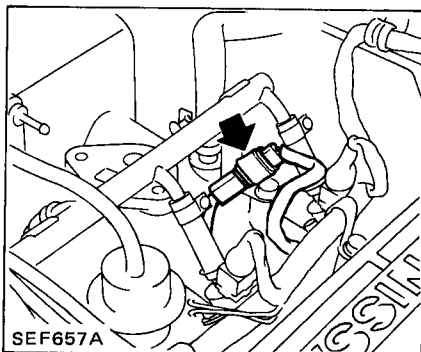
- Engine oil dipstick
- Intake manifold gasket
- Valve rocker cover
- Oil filler cap
- Air intake hoses and duct
- P.C.V. valve
- Idle speed adjusting screw unit

(5) Check air regulator operation.

- a. Starting engine, and pinch rubber hose between throttle chamber and air regulator.



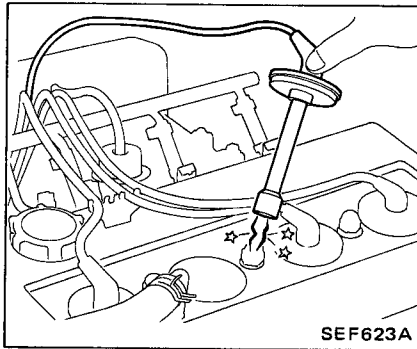
- Engine speed decreases during warm-up O.K.
 - Engine speed remains unchanged after warm-up O.K.
- b. Disconnect electric connector of air regulator, and check continuity. Continuity should exist. If not, air regulator is faulty.



2. Check ignition spark.

- (1) Disconnect high tension cable.

- (2) Hold high tension cable and crank engine. Check for ignition spark.



- (3) If weak spark or no spark, check ignition system and repair or replace.

3. Check ignition timing, idle rpm and throttle valve switch.

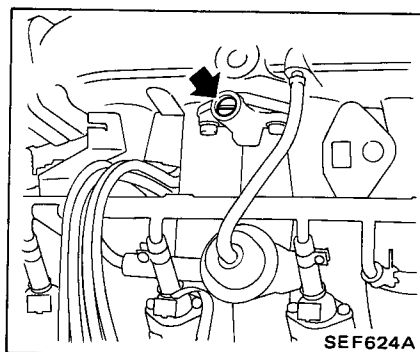
- (1) Checking and adjusting ignition timing and idle speed.

Checks and adjustments are made with the air conditioning compressor "OFF".

- a. Verify that engine is at operating temperature.
- b. Disconnect distributor vacuum hose from distributor vacuum controller, and plug hose with proper plug.
- c. Rev the engine to 4,000 rpm two or three times under no-load, then allow it to run at idle speed for one minute.
- d. Check idle speed.

900±50 rpm

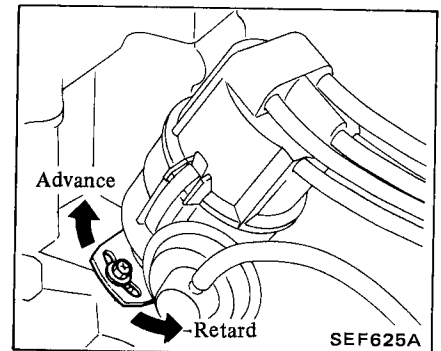
If necessary, adjust to the specified rpm by turning the idle speed adjusting screw.



- e. Check ignition timing with a timing light.

4°±1° B.T.D.C.

Adjust as necessary.



- f. Connect distributor vacuum hose.
- g. Rev the engine to 4,000 rpm two or three times under no-load, then allow it to run at idle speed for one minute.
- h. Verify that idle speed and ignition timing are in the specified range.

Idle speed:

900±50 rpm

Ignition timing:

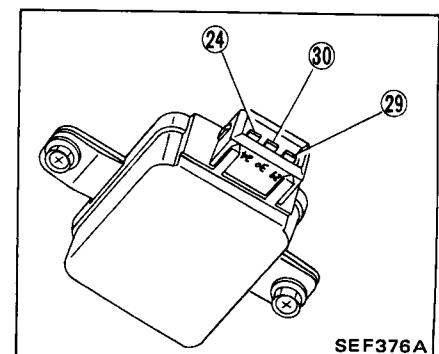
20°±5° B.T.D.C.

- (2) Check throttle valve switch.

A) Idle contact

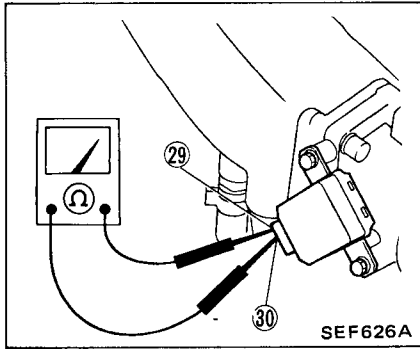
Use ohmmeter.

- a. Disconnect throttle valve switch harness connector from throttle switch body.
- b. Connect an ohmmeter between terminals 29 and 30, make sure continuity exists.



- c. Increase engine speed. The ohmmeter should show continuity until about 1,100 rpm, and at that point the circuit should break and cause the ohmmeter to indicate an open

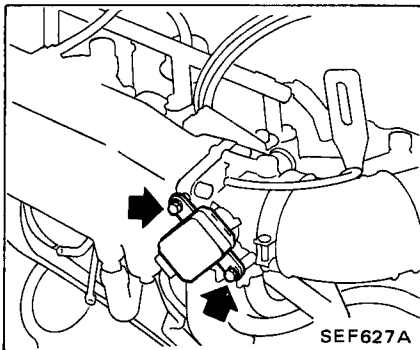
circuit. If incorrect, adjust as follows.



- d. Hold engine speed at about 1,100 rpm by manually opening the throttle.

Important: Do not use the idle speed screw.

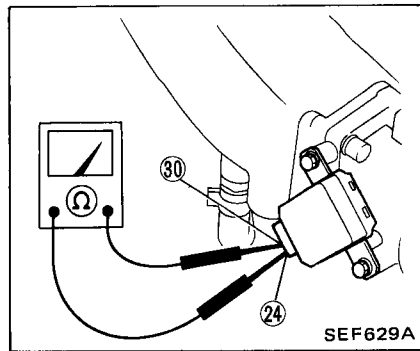
- e. Loosen the throttle switch mounting screws and turn the switch body until the ohmmeter shows a closed circuit.
- f. Slowly rotate the switch counter-clockwise until the ohmmeter indicates an open circuit; at that exact point, tighten the mounting screws.



- g. Recheck the adjustment.
- h. Reset idle speed if necessary.

B) Full throttle contact

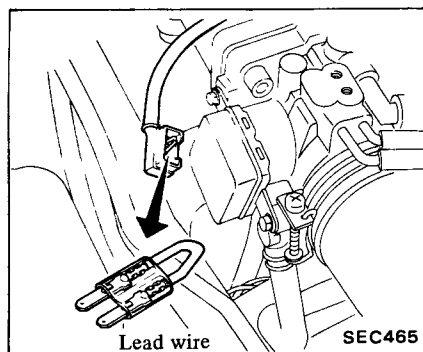
- a. Disconnect ground cable from battery.
- b. Remove throttle valve switch connector.
- c. Connect ohmmeter between terminals 24 and 30, and make sure continuity does not exist.



- d. Depress accelerator pedal to floor. If continuity exists between terminals 24 and 30, full throttle contact is functioning properly.

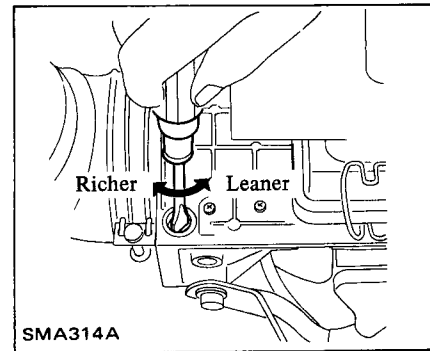
4. Check idle mixture ratio.

- (1) Verify that engine is at operating temperature.
- (2) With the hood open, run engine at 2,000 rpm for 2 minutes at no-load, to stabilize its condition.
- (3) Reset idle speed to the specified speed.
- (4) Turn the ignition switch to the "OFF" position.
- (5) Disconnect the throttle valve switch harness connector.
- (6) Connect a lead wire, as shown between terminals No. 24 and No. 30 of the throttle valve switch harness connector.



- (7) Rev the engine to 4,000 rpm 2 or 3 times under no-load, finally, allow it to run at idle speed for one minute.
- (8) Adjust mixture ratio with engine speed set at maximum by turning air by-pass screw.

When adjusting mixture ratio, remove blind plug from air flow meter. After adjustment, install the plug on air flow meter.



- (9) Stop engine, remove the lead wire and reconnect the throttle valve switch harness to the throttle valve switch.
- (10) Check the idle speed. Readjust to the specified speed.

5. Perform driveability test.

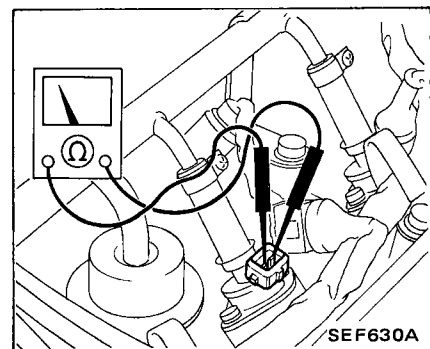
- (1) Evaluate effectiveness of adjustments by driving vehicle.
- (2) If unsatisfactory, proceed to step 6.

6. Clean injectors.

7. Perform complete Electric Fuel Injection test.

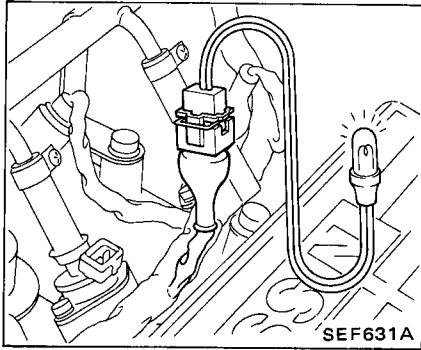
- (1) Use E.F.I. harness checker and adapter or circuit tester. Refer to Electrical System Inspection.
- (2) Check injector.

- a. Disconnect ground cable from battery.
- b. Disconnect electric connectors from injectors.
- c. Check continuity between the two terminals. Continuity should exist. If not, injector(s) are faulty.



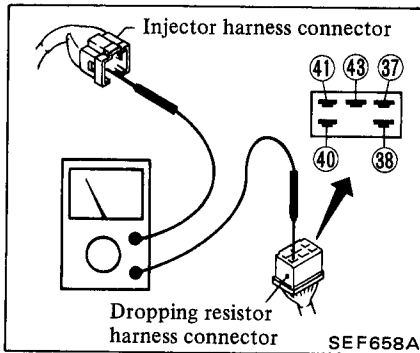
- d. Connect inspection lamp to injection harness connector and start engine. Check inspection lamp to

see if it flashes at regular intervals. If so, it is normal.



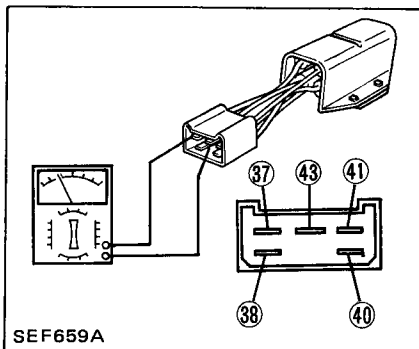
e. Connect injector harness, start engine and listen for the "clicking" sound which confirms the injector is operating. The interval between clicks shortens when engine speed is increased.

(3) Check dropping resistor circuit.
a. Continuity



- No. 1 cylinder connector and 37
- No. 2 cylinder connector and 38
- No. 3 cylinder connector and 40
- No. 4 cylinder connector and 41

b. Resistance



- 43 and 37 (No. 1 cylinder)
- 43 and 38 (No. 2 cylinder)
- 43 and 40 (No. 3 cylinder)
- 43 and 41 (No. 4 cylinder)

The resistance should be approximately 6 ohms [at 20°C (68°F)] . . . O.K.

(4) Check fuel shut off system.
Increase engine speed to each zone,

respectively, and release accelerator pedal. Check inspection lamp illumination.

Check inspection lamp with engine speed in each zone, as shown in chart below.

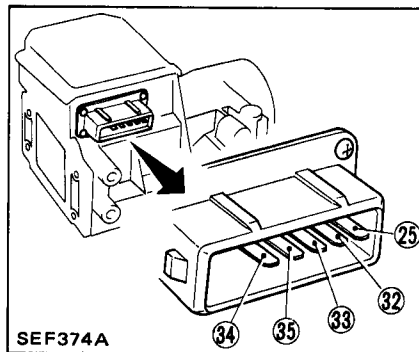
While inspection lamp is off, fuel shut-off is operational.

	* Engine rpm	"A"	"B"	"C"
Deceleration from zone "A"	Above 1,900	OFF	OFF	ON
Deceleration from zone "B"	1,300 - 1,900	—	ON	ON
Deceleration from zone "C"	Below 1,300	—	—	ON
Engine rpm increase in order of "C", "B" and "A" (Idle switch ON, downhill driving, etc.)	—	OFF	ON	ON

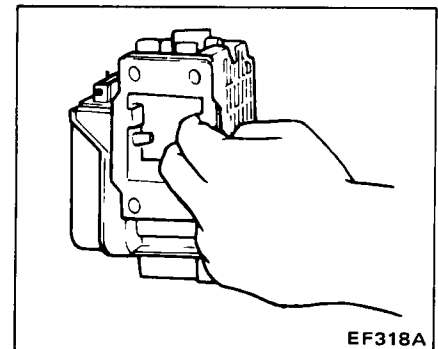
*: Engine rpm at water temperature of 80°C (176°F).

ON: Lamp ON
OFF: Lamp OFF

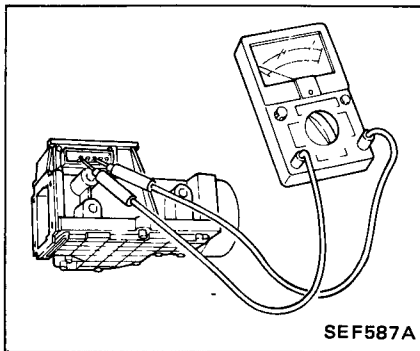
(5) Check air flow meter.



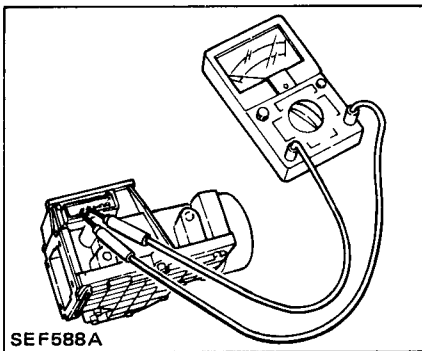
a. Fully open the flap by hand to check that it opens smoothly without binding. If it doesn't, it is out of order.



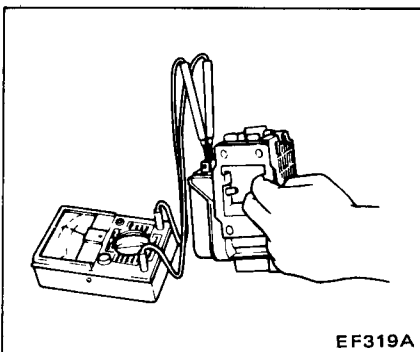
- b. Measure the resistance between terminals ③③ and ③④ . The standard resistance is 100 to 400 ohms.



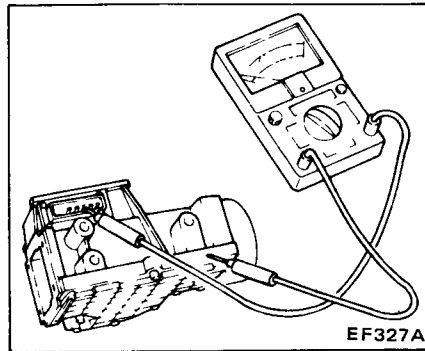
- c. Measure the resistance between terminals ③④ and ③⑤ . The standard resistance is 200 to 500 ohms.



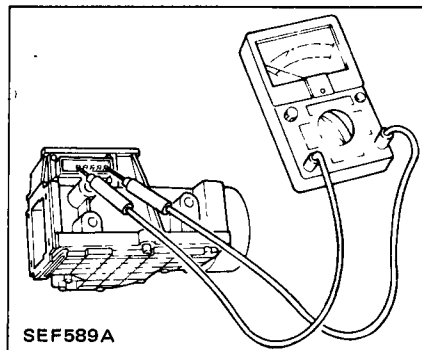
- d. While sliding flap, measure resistance between terminals ③② and ③④ . If resistance is at any value other than 0 and ∞ ohm, air flow meter is normal.



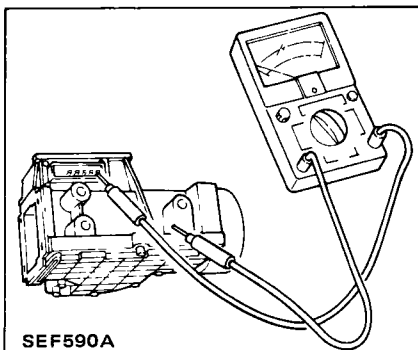
- e. Check insulation resistance between the air flow meter body and any one of the terminals ③② , ③③ , ③④ and ③⑤ . If continuity exists, the air flow meter is out of order.



- f. Check air temperature sensor.
- Measure the outside air temperature.
 - Measure resistance between terminals ②⑤ and ③④ of the air flow meter connector.



- Check insulation resistance between terminal ②⑤ and air flow meter body.



8. Check idle mixture ratio and idle rpm. Follow the procedure in step 4, operations (1) through (5).
9. Perform driveability test. Re-evaluate vehicle performance.

DIAGNOSTIC STEPS FOR IMPROPER IDLING

1. Inspect engine and E.F.I. system for leaks.
2. Check ignition spark.
3. Perform complete Electric Fuel Injection test.
4. Check ignition timing, idle rpm and throttle valve switch.
5. Check idle mixture ratio.
6. Clean injectors.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY on the inspection procedure of each item.

ENGINE STARTABILITY

1. Inspect engine and E.F.I. system for leaks.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

2. Check battery and charging system for battery.
 - (1) Check battery voltage.
 - (2) If poor battery voltage, check charging system for battery.

- Alternator
- Voltage regulator
- Others

Refer to EL section.

3. Check starting system.
 - (1) Check starter operation.
 - (2) If it does not operate, check the following:

- Starter
- Ignition relay
- Ignition switch
- Others

Refer to EL section.

4. Check fuel.
 - (1) Check fuel level. If low or empty, add fuel.
 - (2) Check fuel octane rating. If not proper, change to the recommended gasoline.

5. Check ignition spark. Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

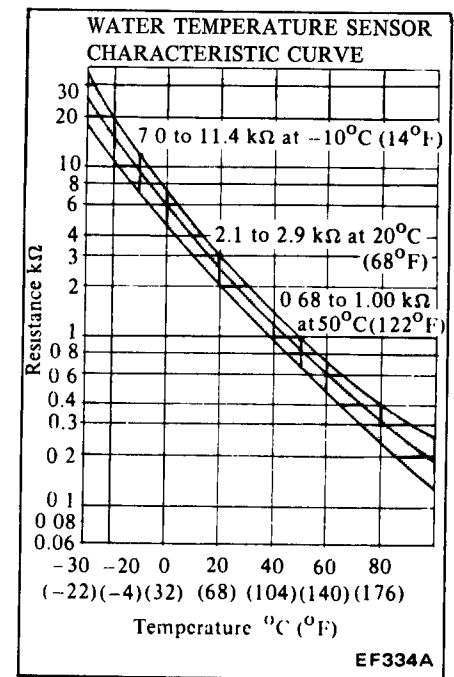
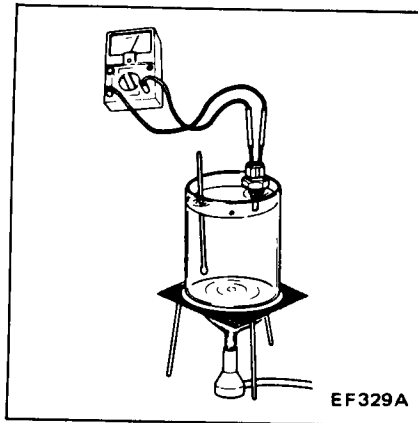
6. Perform complete Electric Fuel Injection test. Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

7. Perform startability test.
 - (1) Start engine with the recommended starting procedure.
 - (2) If engine does not start, proceed to step 8.
 8. Check and adjust idle mixture ratio.
- Follow the procedure in step 4, operations (1) through (5) in **DIAGNOSTIC STEPS FOR DRIVEABILITY**.

ENGINE STALL

1. Inspect engine and E.F.I. system for leaks.
Refer to **DIAGNOSTIC STEPS FOR DRIVEABILITY**.
2. Perform complete Electric Fuel Injection test.
Refer to **DIAGNOSTIC STEPS FOR DRIVEABILITY**.
3. Check idle rpm.
Check idle rpm. Follow the procedure in step 3, operations (1)-a through (1)-h, in **DIAGNOSTIC STEPS FOR DRIVEABILITY**.

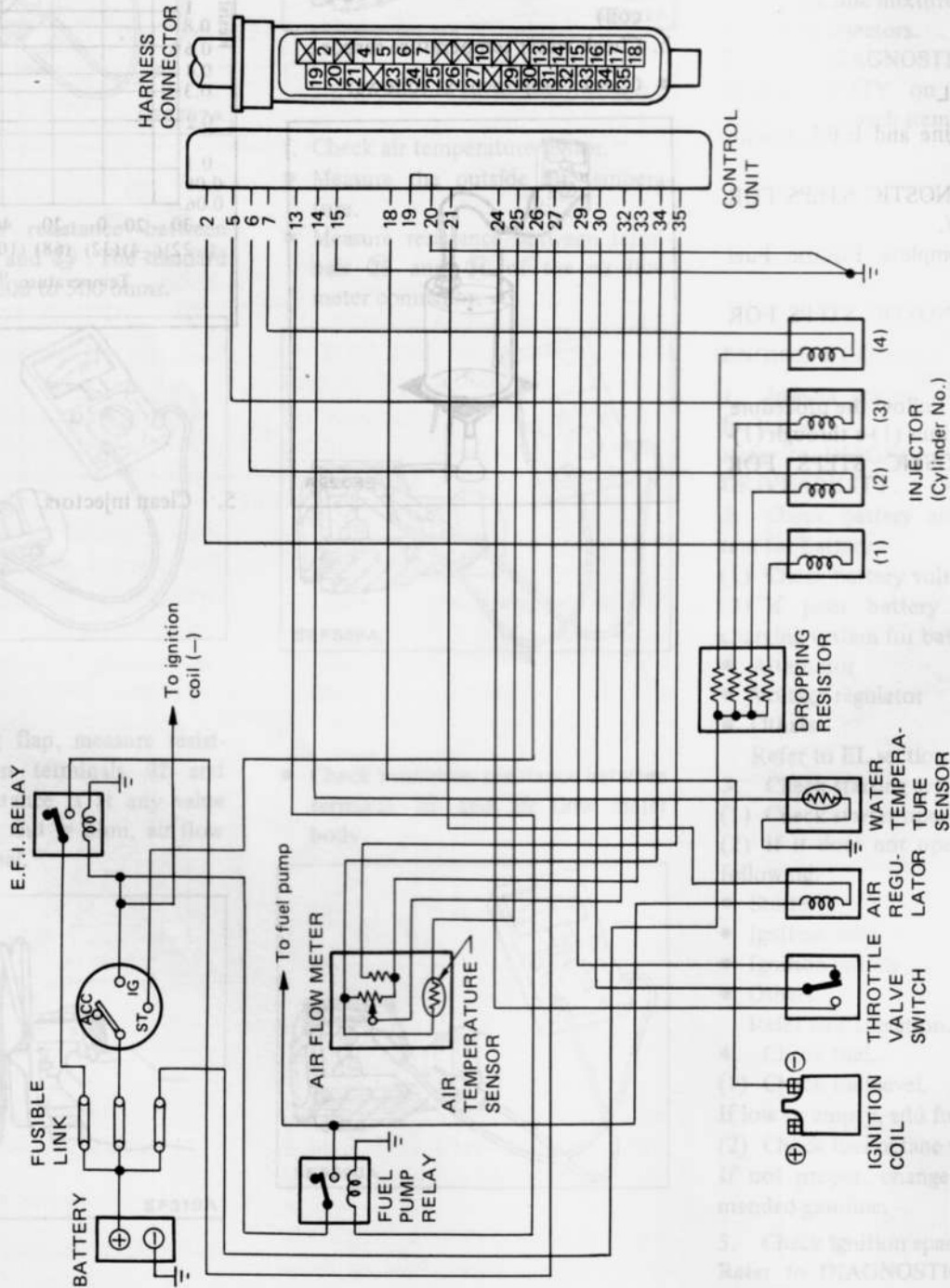
4. Check fuel shut-off system.
 - (1) Check fuel shut-off system.
Follow the procedure in step 7, operation (4), in **DIAGNOSTIC STEPS FOR DRIVEABILITY**.
 - (2) If unsatisfactory, check as follows:
 - a. Check engine speed signal. (ignition coil-trigger input transmitted to E.F.I. control unit from ignition coil)
 - b. Check water temperature sensor.
- Check component as follows:



5. Clean injectors.

ELECTRICAL SYSTEM INSPECTION

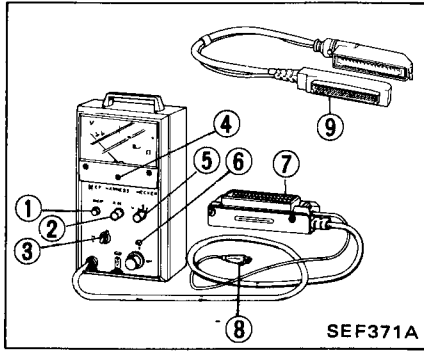
E.F.I. CIRCUIT DIAGRAM



E.F.I. WIRING DIAGRAM



WITH E.F.I. HARNESS CHECKER



- | | |
|------------------------|--------------------|
| 1 Check button | 6 Tumbler switch |
| 2 Ω -SET knob | 7 35-pin connector |
| 3 Rotary switch | 8 Ground clip |
| 4 V-SET screw | 9 Adapter |
| 5 Ω -V selector | |

PREPARATIONS FOR INSPECTION

1. Turn ignition switch to "OFF" position.

CAUTION:

Before disconnecting and connecting electrical connectors, ensure that ignition switch is in the "OFF" position.

2. Disconnect battery ground cable.
3. Disconnect lead wire from "S" terminal of starter motor.
4. Remove air cleaner cover and filter so that air flow meter flap can be moved by hand.
5. Disconnect E.F.I. harness connector from control unit.

CAUTION:

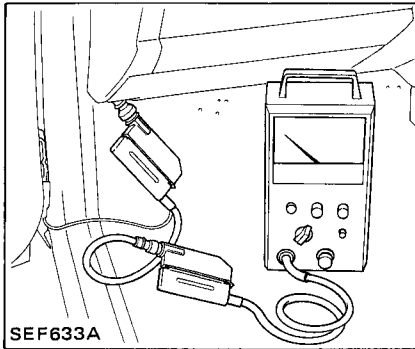
- a. Before disconnecting E.F.I. harness connector, ensure that ignition switch is in the "OFF" position.
- b. Be extremely careful not to break or bend pins when disconnecting terminal.

Checker preparations

1. Set Ω -V selector on "V", and adjust voltmeter to zero, using "V-SET" screw.
2. Set Ω -V selector on " Ω -SET", and adjust ohmmeter to zero, using " Ω -SET" knob.

Connecting checker

1. Securely connect E.F.I. harness connector to checker connector via adapter.



CAUTION:

When inserting connector into control unit, insert slowly, securely and straight, being careful not to bend or break the pin terminals.

2. Securely clamp ground clip on a metal portion of vehicle.

Body earth should be made by connecting with unpainted metal such as bolt.

INSPECTION

For items to be checked, refer to Inspection Procedure Table.

Resistance measurement

1. Set Ω -V selector in " Ω ".
2. Set tumbler switch in "A".
3. Measure resistance by pushing check button at each position of rotary switch from "2" to "12".
4. Set tumbler switch on "B".
5. Measure resistance by pushing check button at position of rotary switch "3".

Voltage measurement

Inspection with ignition switch in "OFF" position

1. Set Ω -V selector in "V".
2. Securely connect battery ground cable.
3. Tumbler switch remains in "B" position.
4. Turn ignition switch "OFF" and measure voltage by pushing check button in each position of the rotary switch from "5" to "8".

Inspection with ignition switch in "START" position

1. Set Ω -V selector in "V".
2. Securely connect battery ground cable.
3. Tumbler switch remains in "B" position.
4. Set ignition switch in "START" and measure voltage by pushing check button of rotary switch "2".
5. Turn ignition switch "OFF".
6. Connect lead wire to "S" terminal of starter motor.
7. Set ignition switch to "ON" and watch deflection of meter pointer by pushing check button in position "4" of rotary switch.

Inspection with ignition switch in "ON" position

1. Turn ignition switch "ON" and measure voltage by pushing check button in each position of rotary switch "1".
2. Set tumbler switch on "A".
3. Turn ignition switch "ON" and measure voltage by pushing check button in position "1" of rotary switch.
4. Measure voltage by pushing check button
5. Turn ignition switch "OFF".
6. Disconnect pin connector from E.F.I. harness connector.

CAUTION:

Be extremely careful not to break or bend the pin terminals when disconnecting.

7. Connect E.F.I. harness connector to control unit.

CAUTION:

- a. Before connecting E.F.I. harness connector, ensure that ignition switch is in the "OFF" position.
- b. When inserting connector into control unit, insert slowly, securely and straight, being careful not to bend or break the pin terminals.

8. Bring air flow meter back to its original condition.

ELECTRICAL SYSTEM INSPECTION

INSPECTION PROCEDURE TABLE

How to use

1. Inspection procedure table is designed so that items to inspect are arranged in a sequential order according

to measurements to be made with E.F.I. Harness Checker.

2. After measuring, compare measured values with standard values to determine whether circuits/parts are malfunctioning or not.

3. When a malfunctioning circuit is

located, again check measurements involved in that circuit. In this case, check ignition switch, Ω -V selector, tumbler switch, rotary switch, ground clip, etc. to be certain they are set at proper positions.

Inspection procedure table (With E.F.I. harness checker)

Note: Before disconnecting and connecting electrical connectors and terminals, ensure that ignition switch is in "OFF" position.

* Although voltage may drop below battery voltage, this is not an indication of abnormality.

Step	Inspection circuit		Ignition switch	Ω -V selector	Tumbler switch	Rotary switch	Auxiliary operation or condition		Standard value
1. Disconnect battery negative terminal, starter motor "S" terminal and E.F.I. harness connector from control unit. 2. Connect checker connector to E.F.I. harness connector and clamp ground clip. 3. Arrange so that air flow meter flap can be pushed from air cleaner side.									
1	Air flow meter (potentiometer) sliding resistor and circuit		OFF	Ω	A	2	Push air flow meter flap.		Any value except 0 and $\infty \Omega$
2	Ground circuit					3			0 Ω
3						4			
4						5			
5	Throttle valve switch idle contact and circuit					7	Accelerator pedal	Fully depressed	$\infty \Omega$
6	Throttle valve switch full throttle contact and circuit					8		Released	0 Ω
							Fully depressed	0 Ω	
							Released	$\infty \Omega$	
7	Water temperature sensor and circuit					9	Water temperature	20° C (68° F) or above	Below 2.9 k Ω
8	Air temperature sensor and circuit					10		Intake air temperature	Below 20° C (68° F)
			20° C (68° F) or above	Below 2.9 k Ω					
			Below 20° C (68° F)	2.1 k Ω or above					
9	Air flow meter (potentiometer) resistor and circuit		11			100 to 400 Ω			
10			12			200 to 500 Ω			
11	Circuit between air regulator and fuel pump			B	3			Below 300 Ω	
Connect battery negative terminal.									
12	Battery, E.F.I. relay, dropping resistor and injector circuits	Injector 1	OFF	V	B	5			Battery voltage
13		Injector 2				6			
14		Injector 3				7			
15		Injector 4				8			
16	*Circuit between ignition switch and control unit power source		START			2			
Connect starter motor "S" terminal. CAUTION: Exercise care in performing step 17 as it involves turning engine.									
17	Ignition coil trigger circuit		START	V	B	4			Pointer deflects.
18	Battery, E.F.I. relay and control unit power source circuits		ON		A	1			Battery voltage
Disconnect checker connector from E.F.I. harness connector and connect E.F.I. harness connector to control unit.									

WITH CIRCUIT TESTER

PREPARATIONS FOR INSPECTION

1. Turn ignition switch to "OFF" position.

CAUTION:

Before disconnecting and connecting electrical connectors, ensure that ignition switch is in the "OFF" position.

2. Disconnect battery ground cable.
3. Disconnect lead wire from "S" terminal of starter motor.
4. Arrange so that air flow meter flap can be pushed by hand from air cleaner side.
5. Disconnect E.F.I. harness connector from control unit.

CAUTION:

- a. Before disconnecting E.F.I. harness connector, ensure that ignition

switch is in the "OFF" position.

- b. Be extremely careful not to break or bend pins when disconnecting terminal.

Do not touch the circuit tester probe to any unnecessary pin on the connector. Doing so could cause damage to the circuit tester.

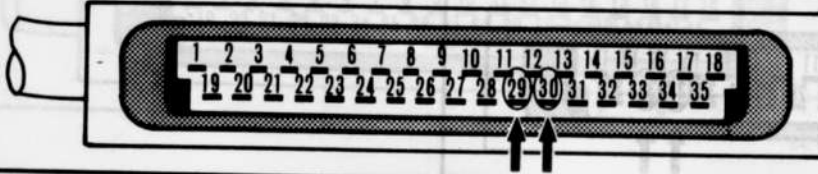
- c. After inspection or replacement, securely connect E.F.I. harness connector with control unit, and then test it to make sure.
-

ELECTRICAL SYSTEM INSPECTION

THROTTLE VALVE SWITCH TESTS

Test No. 1 Idle contacts

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Ohmmeter	(+)	(-)	Throttle released	Continuity
	29	30	Throttle depressed	No continuity



SEF681

If test is O.K., go to Test No. 2.
If test is not O.K., go to Throttle Valve Switch Adjustment.

Test No. 2 Full throttle contacts

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Ohmmeter	(+)	(-)	Throttle released	No continuity
	24	30	Full throttle	Continuity

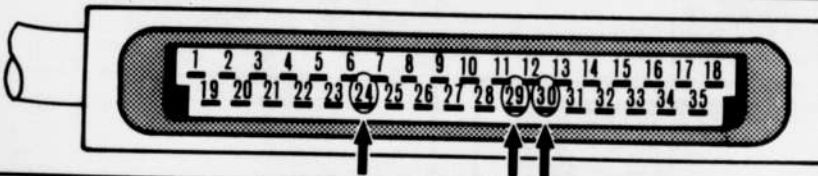


SEF682

If test is O.K., go to Test No. 3.
If test is not O.K., go to Full Throttle Contact Check.

Test No. 3 Insulation test

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Ohmmeter	24	Body ground		$\infty \Omega$
	29			
	30			



SEF683

If test is O.K., go to Throttle Valve Switch Adjustment.

If test is not O.K., go to Component Check.

AIR FLOW METER TESTS

Test No. 1 Air flow meter resistance

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		100 to 400Ω
	33	34		



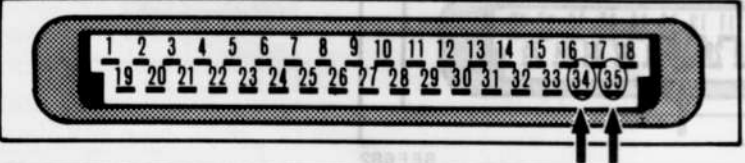
SEF689

If test is O.K., go to Test No. 2.

If test is not O.K., perform component check.

Test No. 2 Air flow meter resistance

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		200 to 500Ω
	34	35		



SEF690

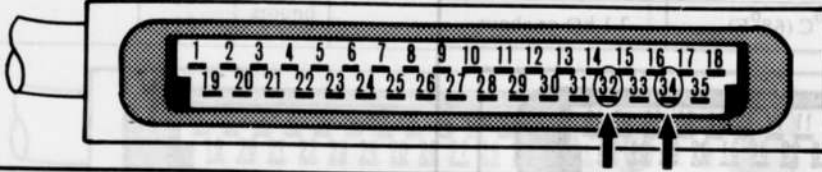
If test is O.K., go to Test No. 3.

If test is not O.K., perform component check.

ELECTRICAL SYSTEM INSPECTION

Test No. 3 Air flow meter resistance

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Ohmmeter	32	34		Except 0 and $\infty\Omega$

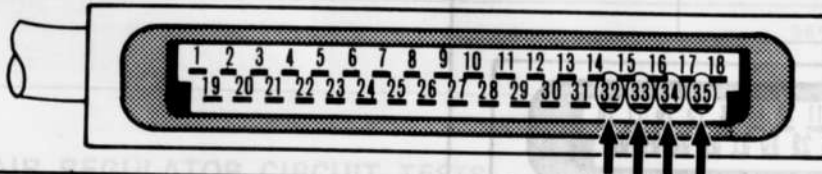


SEF691

If test is O.K., go to Test No. 4.
If test is not O.K., perform component check.

Test No. 4 Insulation resistance

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Ohmmeter	32 33 34 35	Body ground		$\infty\Omega$



SEF692

If test is not O.K., perform component check.

AIR TEMPERATURE SENSOR TESTS

Test No. 1 Air Temperature Sensor

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	Intake air temperature	Below 2.9 k Ω
	25	34	20°C (68°F) or above	
			Below 20°C (68°F)	2.1 k Ω or above

If test is O.K., go to test No. 2.

If test is not O.K., perform component check.



SEF772

Test No. 2 Insulation Resistance

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		$\infty \Omega$
	25	Body ground		

If test is O.K., air temperature sensor is O.K.

If test is not O.K., perform component check.



SEF773

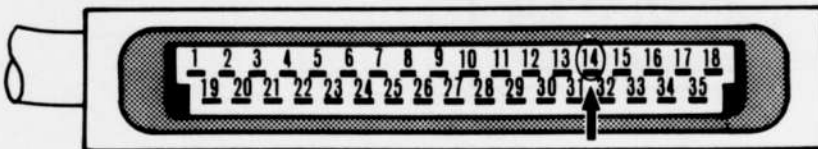
WATER TEMPERATURE SENSOR TEST

Water temperature sensor test

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	20°C (68°F) or above	Below 2.9 k Ω
	14	Body ground	Below 20°C (68°F)	2.1 k Ω or above

If test is O.K., test is complete.

If test is not O.K., perform component check.

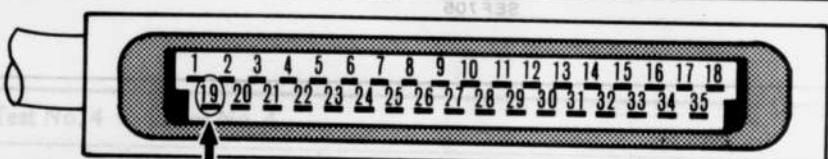
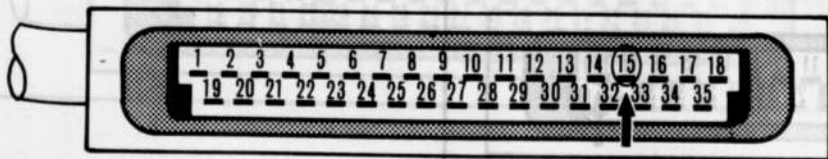


SEF693

ELECTRICAL SYSTEM INSPECTION

CONTROL UNIT GROUND CIRCUIT TESTS

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		Continuity
	15	Body ground		
	19 20			



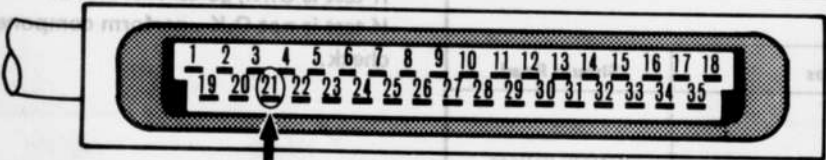
SEF634A

If tests are O.K., ground circuits are O.K.

If test are not O.K., check wiring diagram and harness.

AIR REGULATOR CIRCUIT TESTS

Test No. 1 Air regulator resistance				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		25 to 90Ω
	21	Body ground		



SEF698

If test is O.K., go to Test No. 2.

If test is not O.K., check air regulator.

Test No. 2 Air regulator and fuel pump power circuit

1. Connect E.F.I. harness connector to E.F.I. control unit.

2. Turn ignition switch to "ON".
3. Listen for fuel pump operating sound for a few seconds.
4. If no sound is heard, check fuel

pump relay.

If fuel pump operates, check air regulator.

IGNITION COIL TRIGGER INPUT TEST

Ignition coil trigger input test			
Tester	Leads to Pins		Notes
Voltmeter	(+)	(-)	1. Connect starter motor "S" terminal and battery ground cable. 2. Ignition "ON".
	18	Body ground	

Pointer deflects.

If test is O.K., trigger input to control unit is O.K.

If test is not O.K., check ignition coil and wire harness.

SEF705

INJECTOR CIRCUIT TESTS

Test No. 1 Cylinder No. 1			
Tester	Leads to Pins		Notes
Voltmeter	(+)	(-)	Connect battery ground cable.
	2	Body ground	

Battery voltage

If test is O.K., go to Test No. 2.

If test is not O.K., go to component check.

SEF706

Test No. 2 Cylinder No. 2			
Tester	Leads to Pins		Notes
Voltmeter	(+)	(-)	
	6	Body ground	

Battery voltage

If test is O.K., go to Test No. 3.

If test is not O.K., perform component check.

SEF707

ELECTRICAL SYSTEM INSPECTION

Test No. 3 Cylinder No. 3

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Voltmeter	5	Body ground		Battery voltage



SEF708

If test is O.K., go to Test No. 4.
If test is not O.K., go to component check.

Test No. 4 Cylinder No. 4

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Voltmeter	7	Body ground		Battery voltage

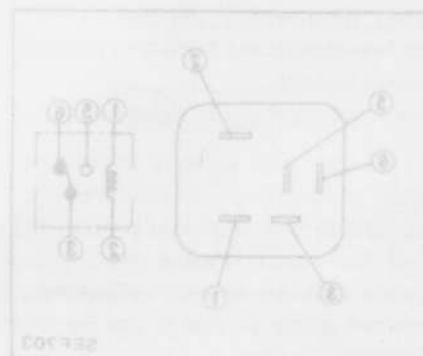


SEF709

If test is O.K., all injectors are O.K.
If test is not O.K., go to component check.

Check terminals	Normal condition	12V direct current is applied between terminals (1) and (3)
(1) - (2)	Continuity	-
(3) - (2)	No continuity	Continuity
(3) - (4)	Continuity	No continuity

If E.F.I. relay and fuel pump relay are O.K., check harness.
If fuel pump and harness are O.K., replace control unit.



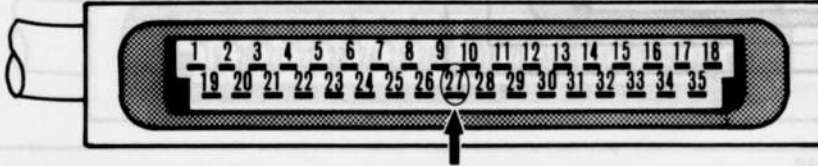
E.F.I. RELAY AND FUEL PUMP RELAY TESTS (Relay Type 1T)

Test No. 1 E.F.I. relay test (Control unit power input circuit test)

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Voltmeter	27	Body ground	1. Connect battery ground cable. 2. Ignition "ON".	Battery voltage

If test is O.K., E.F.I. relay is O.K., go to Test No. 2.

If test is not O.K., check E.F.I. relay.



SEF713

Test No. 2 Fuel pump relay

1. Ignition "ON".
2. Listen to fuel pump operating sound for a few seconds after turning ignition switch to "ON".

If no sound is heard, go to test No. 3.

Test No. 3 Fuel pump relay test

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Ohmmeter	13	Body ground		Except 0 and $\infty\Omega$

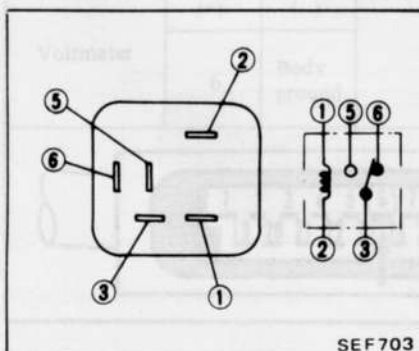
If test No. 3 is O.K., check fuel pump and circuit.

If fuel pump is O.K., check component check.

If test No. 3 is not O.K., go to component check.



SEF343A



SEF703

Check terminals	Normal condition	12V direct current is applied between terminals ① and ②
① - ②	Continuity	—
③ - ⑤	No continuity	Continuity
③ - ⑥	Continuity	No continuity

If E.F.I. relay and fuel pump relay are O.K., check harness.

If fuel pump and harness are O.K., replace control unit.

Ignition start signal test

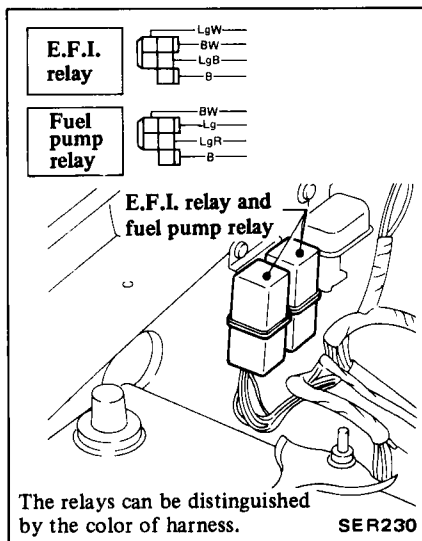
Battery voltage



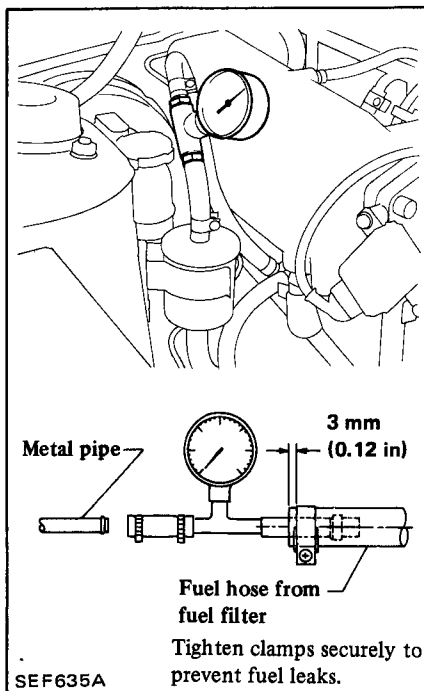
FUEL SYSTEM

RELEASING FUEL PRESSURE

1. Remove relay bracket.
2. Start engine.
3. Disconnect the harness connector of fuel pump relay while the engine is running.



4. After the engine stalls, crank the engine several times.
5. Turn the ignition switch "OFF".
6. Reconnect the harness connector of fuel pump relay.



3. Start engine and read fuel pressure gauge.

At idling:

Approximately 206 kPa (2.06 bar, 2.1 kg/cm², 30 psi)

The moment accelerator pedal is fully depressed:

Approximately 255 kPa (2.55 bar, 2.6 kg/cm², 37 psi)

4. If fuel pressure is not as specified, replace pressure regulator, and repeat fuel pressure check.

If below the specified value, check for clogged or deformed fuel lines, and if necessary, replace fuel pump as an assembly or check valve.

5. Connect variable vacuum source, a handy vacuum gauge or its equivalent, to fuel regulator. Disconnect fuel pressure regulator vacuum hose from intake manifold and attach hose to variable vacuum source.

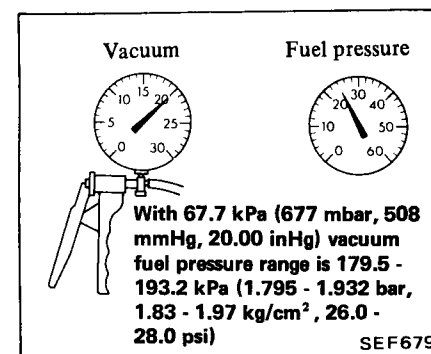
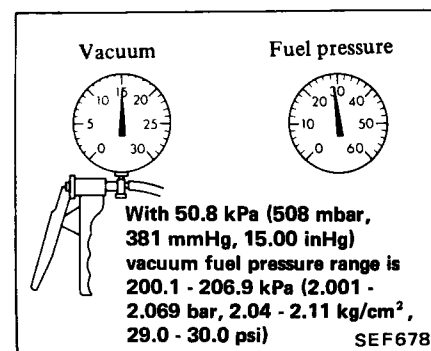
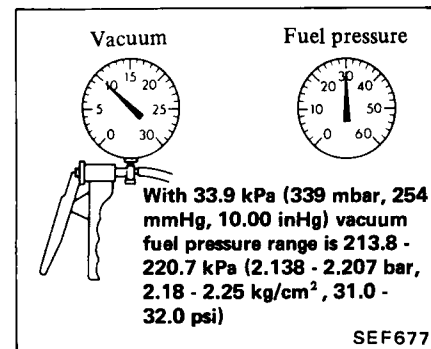
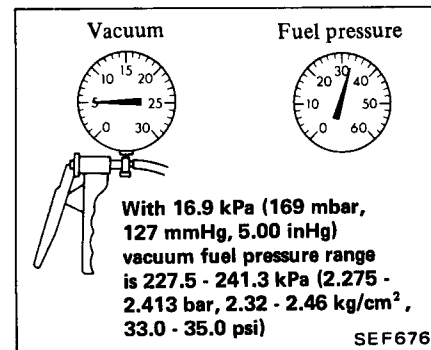
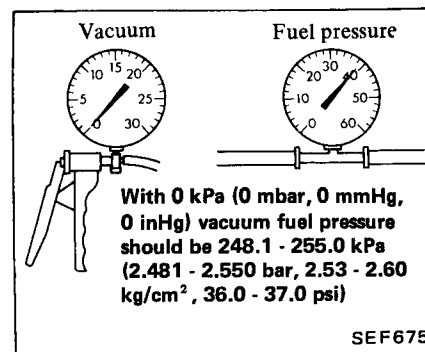
6. Start engine at idle speed.
7. Observe fuel pressure readings as vacuum is changed.

FUEL PRESSURE CHECK

When reconnecting the lines, always use new clamps and be sure to position them correctly.

Use a torque driver to tighten clamps.

1. Release fuel pressure in fuel line. Refer to Releasing Fuel Pressure.
2. Install Pressure Gauge between fuel filter hose and metal pipe at point shown. For convenience in later tests, position gauge so that it can be read from driver's seat.



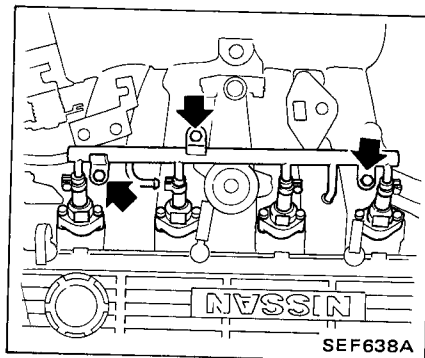
FUEL SYSTEM

Fuel pressure must decrease as vacuum increases. If results are unsatisfactory, replace pressure regulator.

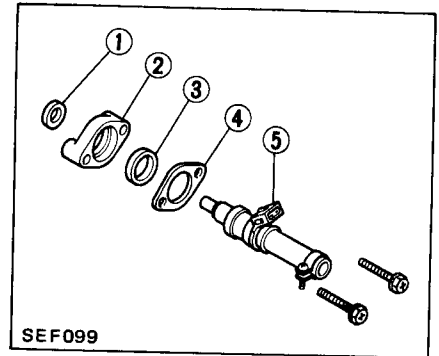
8. Release fuel pressure until it is about 49 kPa (0.49 bar, 0.5 kg/cm², 7 psi).

9. Turn key to "OFF".

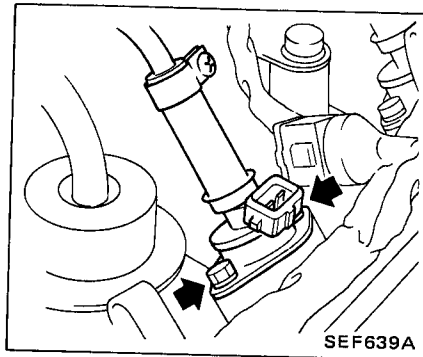
10. Disconnect variable vacuum source and connect fuel pressure regulator vacuum hose to intake manifold.



Place a rag under injector when disconnecting fuel pipe to prevent splashing of fuel.



5. Remove bolts securing fuel injectors.



- 1 Injector lower rubber insulator
- 2 Injector lower holder
- 3 Injector upper rubber insulator
- 4 Injector upper holder
- 5 Injector

9. To install injector and fuel pipe, reverse the order of removal.

- a. When installing injector, check that there are no scratches or abrasion at lower rubber insulator, and securely install it, making sure it is air-tight.
- b. For installation of fuel hose, refer to Fuel Hose.

REMOVAL AND INSTALLATION

Before removing or replacing the fuel system line, release fuel pressure from fuel line for safety reasons.

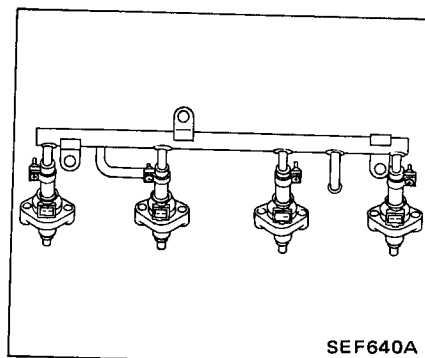
INJECTOR AND FUEL PIPE

1. Release fuel pressure in fuel line. Refer to Releasing Fuel Pressure.
2. Remove or disconnect the following parts and connectors.
 - Injector harness connector.
 - High tension cable.
 - Vacuum hose connecting pressure regulator to intake manifold.
3. Disconnect fuel feed hose and fuel return hose from fuel pipe.

Place a rag under fuel pipe to prevent splashing of fuel.

4. Remove bolts securing fuel pipe.

6. Remove fuel pipe and injector as an assembly.

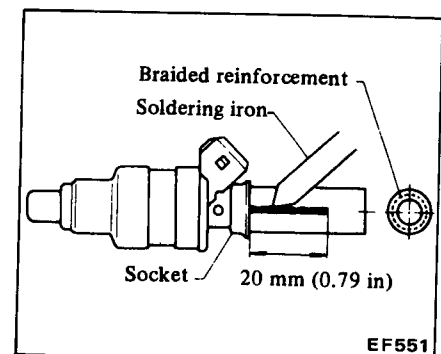


7. Unfasten hose clamp on fuel injector and remove fuel injector from fuel pipe.

Injector rubber hose

If necessary, replace injector rubber hose, proceed as follows:

Removal



1. On injector rubber hose, measure off a point approx. 20 mm (0.79 in) from socket end.
2. Heat soldering iron (150 watt) for 15 minutes. Cut hose into braided reinforcement from mark to socket end.

Do not feed soldering iron until it touches injector tail piece.

CAUTION:

- a. Be careful not to damage socket, plastic connector, etc. with soldering iron.
 - b. Never place injector in a vise when disconnecting rubber hose.
3. Then pull rubber hose out with hand.

Installation

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

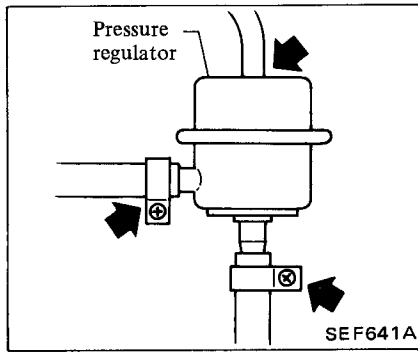
Clamp is not necessary at this connection.

CAUTION:

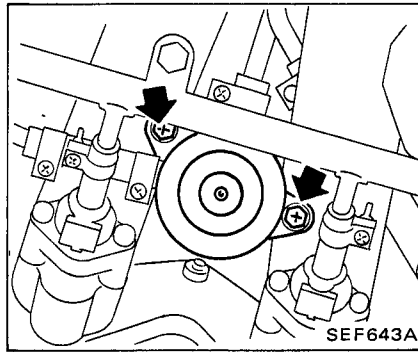
After properly connecting fuel hose to injector, check connection for fuel leakage.

PRESSURE REGULATOR

1. Disconnect fuel inlet and outlet hoses and vacuum hose.



2. Remove pressure regulator from intake manifold.



3. To install pressure regulator, reverse the order of removal.

For installation of fuel hose, refer to Fuel Hose.

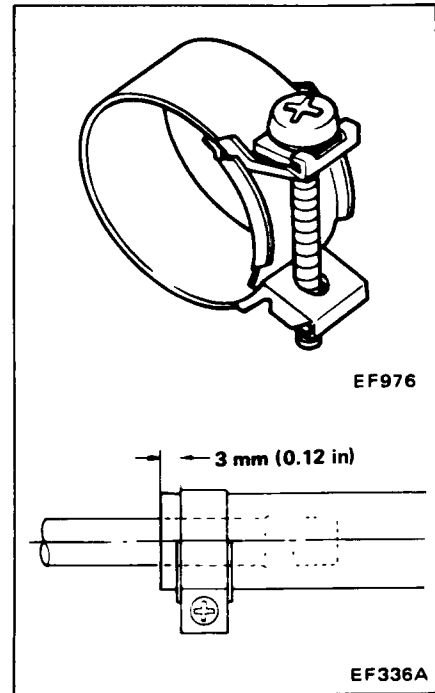
FUEL HOSE

Make sure that all low pressure fuel hoses are fully inserted and are free from undue strain before clamping. When removing or installing high pressure fuel hose, observe the following.

CAUTION:

- a. Do not reuse fuel hose clamps after loosening.
- b. Clean dust and dirt from parts with compressed air when assembling.
- c. Tighten high pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end or screw position (wider than other portions of clamp) is flush with hose end. Tightening torque specifications are the same for all rubber hose clamps.

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



- d. When tightening hose clamp, ensure that screw does not come into contact with adjacent parts.

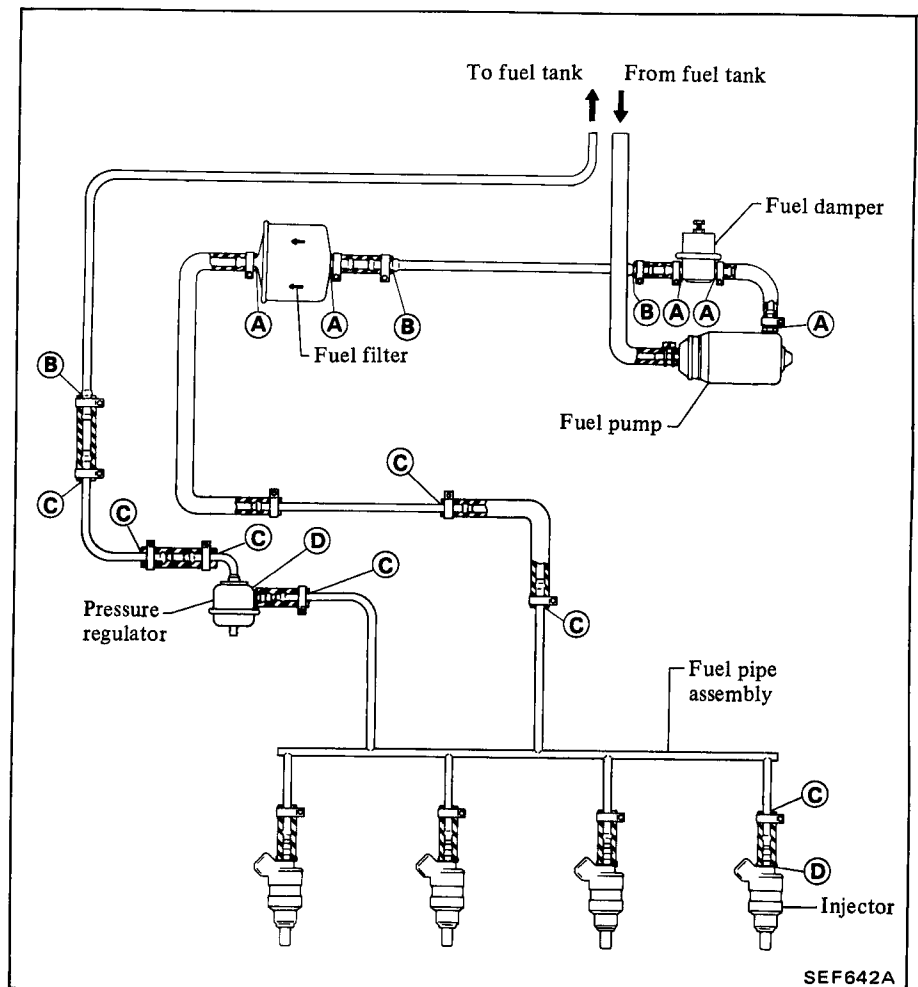
FUEL SYSTEM

Type (A) : Insert rubber hose until its end contacts unit.

Type (B) : Push end of rubber hose onto fuel pipe until it contacts inner bulge.

Type (C) : Push end of injector rubber hose onto fuel pipe until it is 28 mm (1.10 in) from end of pipe.

Type (D) : Push end of rubber hose with hose socket onto unit by hand as far as they will go. Clamp is not necessary at this connection.



SERVICE DATA AND SPECIFICATIONS

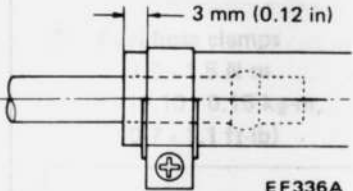
INSPECTION AND ADJUSTMENT

FUEL PRESSURE (Measuring point: between fuel filter and fuel pipe)		
At idling	kPa (bar, kg/cm ² , psi)	Approximately 206 (2.06, 2.1, 30)
The moment accelerator pedal is fully depressed	kPa (bar, kg/cm ² , psi)	Approximately 255 (2.55, 2.6, 37)
AIR FLOW METER		
Potentiometer resistance between terminals ③③ and ③④ Ω		100 - 400
between terminals ③④ and ③⑤ Ω		200 - 500
between terminals ③② and ③④ Ω		Except 0 and ∞
AIR TEMPERATURE SENSOR		
Thermistor resistance at -10°C (14°F) kΩ		7.0 - 11.4
at 20°C (68°F) kΩ		2.1 - 2.9
at 50°C (122°F) kΩ		0.68 - 1.0
THROTTLE VALVE SWITCH		
Engine speed when idle switch is changed from "ON" to "OFF" rpm		About 1,100
WATER TEMPERATURE SENSOR		
Thermistor resistance at -10°C (14°F) kΩ		7.0 - 11.4
at 20°C (68°F) kΩ		2.1 - 2.9
at 50°C (122°F) kΩ		0.68 - 1.0

TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
Throttle chamber securing screw	16 - 21	1.6 - 2.1	12 - 15
Fuel hose clamp	1.0 - 1.5	0.10 - 0.15	0.7 - 1.1

Fuel hose clamping position



EF336A