PRECAUTIONS FOR PAMER.F.I. ENGINE

# 

#### OMPONENT PARTS LOCATION

# SECTION



# CONTENTS

PRECAUTIONS FOR AN E.F.I.	ac m
ENGINE	EF- 2
DESCRIPTION	EF- 3
Component parts location	EF- 3
Engine control system diagram	EF- 4
E.F.I. SYSTEM OPERATION	EF- 5
Fuel injection control	EF- 5
Signals for control unit	EF- 5
Fuel system	EF- 5
Air flow system	EF- 7
Electrical signal system	EF- 8
DIAGNOSTIC PROCEDURE FOR	
PROBLEMS	EF-11
Diagnosis	EF-11
Diagnostic procedure	EF-11
ELECTRICAL SYSTEM INSPECTION	EF-20
E.F.I. circuit diagram	EF-20
E.F.I. wiring diagram	EF-21
With E.F.I. harness checker	EF-22

With circuit tester	EF-24
Throttle valve switch tests	EF-25
Air flow meter tests	EF-26
Air temperature sensor tests	EF-28
Water temperature sensor test	EF-28
Control unit ground circuit tests	EF-29
Air regulator circuit tests	EF-29
Ignition coil trigger input test	EF-30
Injector circuit tests	EF-30
E.F.I. relay and fuel pump relay tests	EF-32
Ignition start signal test	EF-33
FUEL SYSTEM	EF-34
Releasing fuel pressure	EF-34
Fuel pressure check	EF-34
Removal and installation	EF-35
SERVICE DATA AND	
SPECIFICATIONS	EF-38
Inspection and adjustment	EF-38
Tightening torque	EF-38

 Koch E E F and support of sense at ortion of R circuit's etc.
 Koch E E F and south shares at least 10 cm (3.9 in)
 Keep E.F. Thansas at least 10 cm (3.9 in)
 Keep E.F. Thansas at least 10 cm (3.9 in)
 Rest 10 on of external holes, degraded operation of external holes, degraded operation of R circuit's etc.

8

BEPAIR

EF

PRECAUTIONS FOR AN E.F.I. ENGINE





## ENGINE CONTROL SYSTEM DIAGRAM

0 Fuel line --Vacuum line 1-----Fuel tank Input signal Output signal Distant I Fuel 乱 damper 1111 Pressure regulator. h Fuel filter 19 Fuel pump - Idle speed adjusting screw Air cleaner Injector . 5 2 Air 50////////// flow meter 1 0 4 R 0 Throttle valve switch Air temperature sensor L Air regulator Water temperature sensor N 3 ON OO ST Θ 0 h 00 Control unit Battery ∠ Fuel pump relay L Ignition coil - Ignition switch

# 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.



4.90 bar, 4.3 to 5.0 kg/cm<sup>2</sup>, 61 to 71 psi) due to malfunction in the pressure system.

BATTERY

Operation

Œ

Ignition switch

position

ON

START

ON

E

SIGNALS FOR CONTRO

FUEL PUMP CIRCUIT AND OPERATION

IGNITION SWITCH

Engine speed

Stops

Cranking speed

Below 50 rpm

Above 50 rpm

The check valve prevents abrupt drop of pressure in the fuel pipe when stopping the engine.

the engine, triggered by the ignition

FUEL PUMP

26

18

UNIT

Fuel pump

operation

**Operates** for

Operates

Operates

SEF354A

Stops

a few seconds

CONTROL

FUEL PUMP RELAY

00

From

ignition coil

Fuel pump

relay state

few seconds

ON for a

ON

OFF

ON

#### PRESSURE REGULATOR



The pressure regulator controls the pressure of fuel so that a pressure difference of 250.1 kPa (2.501 bar, 2.55 kg/cm<sup>2</sup>, 36.3 psi) can be maintained between the fuel pressure and intake manifold vacuum. The pressure regulator is divided into the air chamber and fuel chamber by the diaphragm. Intake manifold vacuum. is introduced into the air chamber, thereby keeping differential pressure constant causing excessive fuel to return to the fuel tank through the return side port. This constant differential pressure provides optimum fuel injection in every mode of engine operation.





The fuel damper acts like a shock absorber in fuel flow discharged from the fuel pump. There are not adjustments on this damper.

Change in the pump discharge pressure is monitored by the diaphragm and spring, which vary the volume of the fuel chamber.

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

#### FUEL FILTER





The fuel filter is placed between the fuel damper and the injector, and is used to remove foreign matter in the fuel. Water in the fuel is collected at the bottom of the filter casing.

#### INJECTOR

The injector receives the pulse signal from the control unit, and injects the fuel toward the intake valve in the cylinder head.



# 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.

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.



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  $80^{\circ}C(176^{\circ}F)$ .



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  $80^{\circ}C$  (176°F).







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

aw connerts

#### 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.



screw which regulates the idle mixture ratio.

## 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.



#### FUEL SHUT-OFF

Fuel shut-off is accomplished during deceleration when the engine does not require fuel. The graph below shows the fuel shutoff 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 multiconnector, and the E.F.I. harness is connected to other sensors.

61

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.

### **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.



#### WARNING:

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.

id ant bar, reteat ant duronth avoit The control and is connected to the EEP 1: Eathers by means of a multiconnector, and the E.F.T. names is connector, and the E.F.T. names is connected to other sensors. The essential folls 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 to the engine characteristics) to the engine characteristics to the engine characteristics to the engine characteristics three integrated circuits formed on the printed circuit soard. The construction provides superior control unit reliability.



#### DROPPING RESISTOR

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.

nevered betaool radman altroit an Deceleration from zone B income Beceleration from zone B income Beceleration from come C view and Peceleration from come C view and Peceleration from come of a constrain and the switch of the state of the constraint of the switch of the downhill the mode etc.)

#### CONTROL UNIT

ELECTRICAL STONAL SYSTEM The water temperature and into the thermostal provide a monitors change in which temperature and transmits a signal temperature and transmits a signal temperature and duration during the warm up patiod. ASSERT menature sensing and convoy a thermistor which is very sensitive in the low temperature rates.

The electrical resistance of the thermistor decreases in response to the temperature rise.



AIR TEMPERATURE SENSER

telle contractorense sur la selle a service rotinom available The idle contact closes when the inrottle valve is positioned at alle and opens when it is at any other position. The idle contact compensates for attact idle enrichment, and sends the juel shut-off signal.

Full throttle contact and investigated full throttle contact assess only when the full innottle contact closes only when the throttle valve is positioned at full innottle (more than 35 degree opening of the throttle valve). The contact is open while the illicit (le valve) is at any other position.

#### DIAGNOSIS

#### INTERMITTENT PROBLEM

DIAGNOSTIC CHARTS CANNOT BE USED TO DIAGNOSE INTER-MITTENT FAILURES. This is because many intermittent problems are caused at electrical connections, and if intermittent problems are not corrected, unnecessary component replacement will be indicated and the problems may remain. Therefore, DIAGNOSIS OF INTERMITTENT PROBLEMS SHOULD START WITH A VISUAL AND PHYSICAL IN-SPECTION 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



o. cican injectors.	ov source shi a se				
TION: No. a rait of may interfere set	UA9 Tholasoffing	autorio is den	manald	MELENT PROBLEM	
harness connector to or tr	STREET LINES	Tinketao Hai	LIAGNOS		9M81
7. Perform complete Electric	Fuel Injection test.	N.G.	-> Repair or repla	ace components as necessar	ry.
O.K.	ADARTES TARKST and a	LOPISTIC THE	AGELORIAL	intermittent controllege	vo vo
connected. Removing and inst				<b>s electrica</b> l connections, an	
8 Check idle mixture ratio an	d idle RPM N.G.	ical syl08032 5	diust to specificatio	Scessery comission for	
O.K.					
nite inferention tenteding	the				
only be obtained from the m					
9. Perform driveability test.	AV.				
ifications to your car's electr	onic				NOA
ROPER IDLING	Locate air				
I. Inspect engine and E.F.I. sy	stem for air leaks.	.G.	Locate a	air leak and repair.	
1. Inspect engine and E.F.I. sy O.K.	stem for air leaks.	.G.	Locate a	air leak and repair.	2. CI
I. Inspect engine and E.F.I. sy O.K.	stem for air leaks.	.G.	Locate a	air leak and repair.	2. CI
<ol> <li>Inspect engine and E.F.I. sy</li> <li>O.K.</li> <li>Check ignition spark.</li> </ol>	stem for air leaks.	.G.	► Locate a	air leak and repair.	2. CI
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K.	stem for air leaks.	.G.	<ul> <li>Locate a</li> <li>Pair or replace comp</li> <li>Distributor cap</li> </ul>	air leak and repair.	2. (1
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K.	stem for air leaks.	.G.	<ul> <li>Locate a</li> <li>Epair or replace composition</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and sector</li> </ul>	air leak and repair.	2. (1
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K.	stem for air leaks.	.G.	<ul> <li>Locate a</li> <li>Epair or replace comp</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and seco</li> <li>Spark plugs</li> </ul>	air leak and repair.	2. Cl 3. Cl 3. Cl
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K.	stem for air leaks.	.G.	<ul> <li>Locate a</li> <li>Epair or replace comp</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and seco</li> <li>Spark plugs</li> <li>Ignition coil</li> </ul>	air leak and repair.	2. Cl 3. Cl s.v
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K.	stem for air leaks.	.G.	<ul> <li>Locate a</li> <li>epair or replace composition</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and seccion</li> <li>Spark plugs</li> <li>Ignition coil</li> </ul>	air leak and repair.	2. Cl 3. Cl
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K.	stem for air leaks.	.G. Re	<ul> <li>Locate a</li> <li>epair or replace com</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and secc</li> <li>Spark plugs</li> <li>Ignition coil</li> </ul>	air leak and repair.	2. Cl 3. Cl sw
<ul> <li>Inspect engine and E.F.I. sy</li> <li>O.K.</li> <li>Check ignition spark.</li> <li>O.K.</li> <li>O.K.</li> <li>B. Perform complete Electric F</li> </ul>	stem for air leaks.	N.G.	<ul> <li>Locate a</li> <li>Epair or replace comp</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and secc</li> <li>Spark plugs</li> <li>Ignition coil</li> <li>Epair or replace comp</li> </ul>	air leak and repair.	2. Cl 3. Cl sw
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K. 3. Perform complete Electric F	stem for air leaks.	.G. Re	<ul> <li>Locate a</li> <li>epair or replace comp</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and secce</li> <li>Spark plugs</li> <li>Ignition coil</li> <li>epair or replace comp</li> </ul>	air leak and repair.	2. Cl 3. Cl stv
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K. 3. Perform complete Electric F O.K. . Check ignition timing, idle R switch.	stem for air leaks.	.G. Re N.G. Re	<ul> <li>Locate a</li> <li>epair or replace com</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and secc</li> <li>Spark plugs</li> <li>Ignition coil</li> </ul>	air leak and repair.	2. Cl 3. Cl sw
<ul> <li>Inspect engine and E.F.I. sy</li> <li>O.K.</li> <li>Check ignition spark.</li> <li>O.K.</li> <li>Perform complete Electric F</li> <li>O.K.</li> <li>Check ignition timing, idle R switch.</li> <li>O.K.</li> </ul>	stem for air leaks.	.G. Re N.G. Re	<ul> <li>Locate a</li> <li>Epair or replace comp</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and secc</li> <li>Spark plugs</li> <li>Ignition coil</li> </ul>	air leak and repair.	2. Cl 3. Cl sw
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K. 3. Perform complete Electric F O.K. . Check ignition timing, idle R switch.	stem for air leaks.	.G. Re N.G. N.G.	<ul> <li>Locate a</li> <li>epair or replace comp</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and secce</li> <li>Spark plugs</li> <li>Ignition coil</li> </ul>	air leak and repair.	2. Cl 3. Cl 5.v
1. Inspect engine and E.F.I. sy O.K. 2. Check ignition spark. O.K. 3. Perform complete Electric F O.K. . Check ignition timing, idle R switch. O.K. 5. Check idle mixture ratio.	stem for air leaks.	.G. Re N.G. N.G.	<ul> <li>Locate a</li> <li>epair or replace comp</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and secc</li> <li>Spark plugs</li> <li>Ignition coil</li> </ul>	air leak and repair.	2. Cl 3. Cl sw
1. Inspect engine and E.F.I. sy         O.K.         2. Check ignition spark.         O.K.         O.K.         B. Perform complete Electric F         O.K.         O.K.	stem for air leaks.	.G. Re N.G. N.G.	<ul> <li>Locate a</li> <li>Epair or replace comp</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and secc</li> <li>Spark plugs</li> <li>Ignition coil</li> </ul>	air leak and repair.	2. (1 3. (1 5.)
1. Inspect engine and E.F.I. sy         O.K.         2. Check ignition spark.         O.K.         3. Perform complete Electric F         O.K.         O.K.	stem for air leaks.	.G. Re	<ul> <li>Locate a</li> <li>epair or replace comp</li> <li>Distributor cap</li> <li>Rotor</li> <li>Primary and secce</li> <li>Spark plugs</li> <li>Ignition coil</li> </ul>	air leak and repair. ponents as follows: ondary wires ponents as necessary. to specifications. Not adjustable	2. Cl 3. Cl 500

teopost copperand to parameter			A Lat
1. Inspect engine and E.F.I. system	n for air leaks, etc.	Locate :	air leak and repair.
O.K.			O.K. S. A. sure
2. Check battery and charging syst	tem for battery. N.G.	→ Correct, repair or re	place components as applicable
O.K.			
3. Check starting system. N.G.	TRUBA DE COS	Repair or replace pa	its and circuits as necessary
O.K.			
4. Check fuel. N.G.	(B) If work sports or p	Supply fuel or chan	to the recommended C at
r replace components. N.O	enatives maises will Repair o	- Supply fuel of chang	ge to the recommended fuel.
Check or regulator operation.	and througe valve switch		es times under O-loid, t
5 Chack ignition grants	timing and sole speed.	and Same	e pinute.
O.K. N.G.	Chiefles and adjustment with the air conditionin	• Distributor cap	e following parts as applicable
	"OFF".	<ul> <li>Rotor</li> <li>Primary and set</li> </ul>	condary wires
CAPP MAG		Spark plugs	condury writes
M. AIL		Ignition coil	END
gut KI	and plus hose with so	in coptroller	
			All of the second s
6. Perform complete Electric Fuel	Injection test N.G.	Papair or realized	IN CONTRET
6. Perform complete Electric Fuel O.K.	Injection test. N.G.	Repair or replace cor	nponents as necessary.
6. Perform complete Electric Fuel	Injection test. N.G.	Repair or replace cor	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test.	Injection test. N.G.	<ul> <li>Repair or replace cor</li> <li>8. Check idle mixtur</li> </ul>	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K.	Injection test. N.G.	<ul> <li>Repair or replace cor</li> <li>8. Check idle mixtur</li> </ul>	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	Repair or replace cor 8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	Repair or replace cor 8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	Repair or replace cor 8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	Repair or replace cor 8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	Repair or replace cor     8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	Repair or replace cor     8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	Repair or replace cor         8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	Repair or replace cor         8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	8. Check idle mixtur	nponents as necessary.
6. Perform complete Electric Fuel O.K. 7. Perform startability test. O.K. END	Injection test. N.G.	Repair or replace cor	nponents as necessary.

1. Inspect engine and E.F.I. system for air leaks, etc. N.	.G. Locate air leak and renair
ОК.	xo
2. Perform complete Electric Fuel Injection test. N.G.	Repair or replace components as necessary.
0.K.	
Check idle RPM N.G.	3. Check starts
O.K.	Adjust to specifications.
4. Check fuel shut-off system. N.G. and yigge?	Repair or replace components as necessary.
O.K.	
Clean inizatora	
Crean injectors.	
Rotor     Primary and secondary wires	
Spark plugs     Spark plugs	
END lies noiting	
lok.	

#### 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.



Check ignition spark.
 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.



peed set at maximum by turning air

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.



#### Aquatest distributor vacuum hose. Rev the engire to 4,000 rpin two

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 counterclockwise 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 con-
- tact is functioning properly.4. Check idle mixture ratio.
- Verify that engine is at operating temperature.
   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.



Engine oil dipstick
 Intake manifold gasket
 Valve rocker cover

Oil filler cap

(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.ed each

(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 shorters 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 ④
- No. 4 cylinder connector and ④
- b. Resistance



njochton test. Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

- (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 shutoff is operational.

		The rest of the re	a generative sector and the sector of the se	A REAL PROPERTY AND A REAL
A TERRER B. Chuck water temperature	* Engine rpm	"A"	"В"	"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	1-) <u>(0</u> 3-81 1002: 67-0	1917 <u>19</u> 19 a 1106 13 20	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  $80^{\circ}C$  (176°F).

OFF: Lamp OFF

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

of order.

ON: Lamp ON

EF318A

(5) Check air flow meter.





e. Check insulation resistance between the air flow meter body and any one of the terminals (2), (3), (3) and (3). If continuity exists, the air flow meter is out of order.

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



b. Measure the resistance between terminals ③ and ④ . 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.



- of order.
- d. While sliding flap, measure resistance between terminals 32 and 33 . 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

- 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.
- Check starting system.
   Check starter operation.

(1) one state operation.(2) If it does not operate, check the following:

- Starter s to to anno a sharily a E . old •
- 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 staring 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, opera-

tion (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.

126932/

#### ELECTRICAL SYSTEM INSPECTION



#### ELECTRICAL SYSTEM INSPECTION



#### WITH E.F.I. HARNESS CHECKER



7

- $2 \Omega$ -SET knob
- 3 Rotary switch
- 4 V-SET screw
- 5  $\Omega$ -V selector

8 Ground clip9 Adapter

35-pin connector

#### 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  $\Omega$ -V selector on "V", and adjust voltmeter to zero, using "V-SET" screw.

2. Set  $\Omega$ -V selector on " $\Omega$ -SET", and adjust ohmmeter to zero, using " $\Omega$ -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  $\Omega$ -V selector in " $\Omega$ ".
- 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  $\Omega$ -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".

#### 

1. Set  $\Omega$ -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.

#### INSPECTION PROCEDURE TABLE

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

the connector. Doing so could cause damage to the circuit tester. After/inspection or replacement, so curely connect E.F.I. harness connector with control-unit, and the 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,  $\Omega$ -V selector, tumbler switch, rotary switch, ground clip, etc. to be certain they are set at proper positions.

CAUTION:

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

#### 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	Inspectio	n circuit	Ignition switch	Ω-V selector	Tumbler switch	Rotary switch	Auxiliary o	peration or condition	Standard value
<ol> <li>Di</li> <li>Di</li> <li>Co</li> <li>A1</li> </ol>	sconnect battery ne onnect checker conn trange so that air flo	gative terminal, s ector to E.F.I. h w meter flap can	starter moto arness conr be pushed	or "S" tern lector and from air c	minal and l clamp grou cleaner side	E.F.I. har and clip.	ness connector	from control unit.	K., go to Full The
1	Air flow meter (p sliding resistor and	otentiometer) d circuit	Theottle m	Jeased		2 2	Push air flow	meter flap.	Any value except 0 and $\infty \Omega$
2	24		Full throt	lo		3			and an and a set of the
3	Ground circuit					4			0Ω
4						5			and the second second
5	Throttle valve swi	tch idle contact	3 3 18		4 15 19 1	7		Fully depressed	∞ Ω
	and circuit	2021212020	nnn		MAG		Accelerator	Released	0 Ω
6	Throttle valve swi	tch full throttle				8	pedal	Fully depressed	0Ω
	contact and circui	t				0		Released	∞ Ω
7	Water temperature	e sensor and	OFF	Ω	A	9	Water	20°C (68°F) or above	Below 2.9 kΩ
<u></u>							temperature	Below 20°C (68°F)	2.1 k $\Omega$ or above
8	Air temperature se	ensor and circuit				10	Intake air	20°C (68°F) or above	Below 2.9 kΩ
	NO. 5 HISLINGO						temperature	Below 20°C (68°F)	2.1 k $\Omega$ or above
9	Air flow meter (po	otentiometer)	No	85		S 11	Read	test is mot	100 to 400 Ω
10	resistor and circuit	t ()				12			200 to 500 Ω
11	Circuit between ai fuel pump	r regulator and			В	3			Below 300 $\Omega$
	30	ground		Connect b	attery nega	tive term	inal.		
12	Battery, E.F.I.	Injector 1				5			
13	relay, dropping	Injector 2	OFF			6			
14	resistor and injector circuits	Injector 3	OFF	V	в	7			
15	injector cheurts	Injector 4		v	D F	8			Battery voltage
16	*Circuit between ig and control unit p	gnition switch power source	START	1-1-	-	2			
	Connect starter m	otor "S" termin	al. C	UTION:	Exercise c	are in per	forming step 1	7 as it involves turning	engine.
17	Ignition coil trigger	r circuit	START		В	4			Pointer deflects.
18	Battery, E.F.I. rela unit power source	y and control circuits	ON	vf	A	1			Battery voltage
	Disconnect che	cker connector f	rom E.F.I.	harness co	nnector an	d connec	t E.F.I. harness	s 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. Disconnect battery ground cable.
 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.

	mess chacker)	napeqtion procedure table (With E.F.J. ha
	a solution why among significant base sectormed facilit	ote: Before disconnecting and connecting aleg
V-SET screw 9 Adapter	ary voltage, this is not an indication of binner malify	* Although voltage may drop helow batt
	When Inserting connector into control	
terraine subscriptions of a subscription of the subscription of th	unit most - towie - tornely I and	a la construcción de la
eration or condition Standard value	switch besterion rewriting switch for the statistic op	Step Inspection chuit
	ter motor "S" terminal and E.F. I. harness connector (	1. Disconnect battery negative terminal, star
	ess connector and clamp ground clip.	2. Connect checker connector to E.F.I. harn
	2. Securely chabin ignals at mark honsur	3. Arrange so mar an now meter the can be
rest of the switch to Tables		Air flow meter (potentiometer)
institute Ω = bas 0		1. Futievin has relaised galbliz N. and
Released 910 and a first ministration		
		4 Menter tweet and exercit
Disconnect' lead wire tremewily	Decisional manufacture and the	
20°C (68° F) oriotorinsatiomiz.siccismin	10 Victoria and Anna Anna Anna Anna Anna Anna Anna	
Remove an cleaner coveravere		A Dimonnect pic competition from
sectors and a (684 B) a (211 has the above as		
100 10 400 17		Based Ainflow mater (potentiometer)
200 to 500 0		10 feasion and circuit boiltneed
Defore disconnecting (E.F.I. herness		
conscions water in ignition	switch ***** 8	Connect S F 1 gaugiout connect
		12 Inimited I
	Inspection with ignition switch in	battery, E.F.I.
		ra relay, dropping lujsetor 2 ve
		and control unit power source
Set Q.V selector on "U" and	T one address of any selection of TE	Connect starter motor "S" terminal
	a darb Bill Koli ad ti ana ana ana ana ana ana ana a	tenti virti directi corrella hot to
		2 bend Wroug man with the Manual State
"TER-IT" no topping Bittlery 152	measure follage by pushing check but NO	18 Battery, E.F.I. Ielay and control
	ton in each polition of the rothry	

# ELECTRICAL SYSTEM INSPECTION

#### THROTTLE VALVE SWITCH TESTS If test is O.K., go to Test No. 2. Test No. 1 Idle contacts If test is not O.K., go to Throttle Valve Switch Adjustment. Tester Leads to Pins Notes and blood? Should Read (+) (-) Throttle released Continuity Ohmmeter 29 30 Throttle depressed No continuity 9 10 11 12 13 14 15 16 17 2 3 4 729X30 35

**SEF681** 



	a second second second		Notes	Should Read
	(+)	(-)		
Dhmmeter	24 29 30	Body ground		Ω∞
	30	ground		

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

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

SEF 683

#### ELECTRICAL SYSTEM INSPECTION

2. Disconnect battery ground cat 2 TEST HOTING BY JAY BITTORHT

### AIR FLOW METER TESTS

If test is O.K., go to Test No. 2. Test No. 1 Air flow meter resistance If test is not O.K., perform component check. Tester Leads to Pins Notes Should Read (+) (-) 1 Ohmmeter 100 to 400 Ω 34 33 3 4 5 6 9 10 11 12 13 14 15 16 17 18 8 **SEF689** 



	Toster
(+)	
	limmeter
	Leads to P (+) 24 29 E

If test is O.K., go to Throttle Valve Switch Adjustment If test is not O.K., go to Compo-

ELECTRICAL SYSTEM INSPECTION



sest is not O.K., check air regulator

WATER TEMPERATURE SENSOR T

# AIR TEMPERATURE SENSOR TESTS

If test is not O.K., perform component

Tester	Leads	to Pins	Notes	Should Read
and the last	(+)	(-)	Intake air temperature	
Ohmmeter			20°C (68°F) or above	Below 2.9 kΩ
	25	34	Bolow 20 <sup>0</sup> C (68 <sup>0</sup> E)	2110

# 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			Should Read	Notes Should Read			If test is O.K., air temperature senso is O.K.		
Tester	Leads	to Pins	Notes	Should Read	If test is not O.K., perform compo				
	(+)	(-)	Ω.oo		check.			Ohmmeter	
Ohmmeter	25	Body ground		Ω∞		benog	35		
6		2 3 4 5 6 20 21 22 23 24	8 9 10 11 12 13 14 15 25 26 27 28 29 30 31 32 3	<u>16 17 18</u> <u>13 34 35</u>	hinn	20 21 22	Ŧ		
			1		J				

SEF773

#### WATER TEMPERATURE SENSOR TEST

Tester	Leads	to Pins	Notes	Should Read
	(+)	(-)	20 <sup>o</sup> C (68 <sup>o</sup> F) or above	Below 2.9 kΩ
Ohmmeter	14	Body ground	Below 20 <sup>o</sup> C (68 <sup>o</sup> F)	2.1 kΩ or above
		2 3 4 5 20 21 22 23	6 7 8 9 10 11 12 13 (14) 15 24 25 26 27 28 29 30 31 32 3	<u>16 17 18</u> <u>13 34 35</u>

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



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

4. If no sound is heard, check fuel

# IGNITION COLL TRIGGER INPUT TEST 2723T TIUSRID GNUORD TINU JORTNOD

Tester 10 Voltmeter	Leads to	o Pins	If to	Notes a blue de	Should Read	If test is not O.K., check	k ignitio
Voltmeter	(+)	0 DOS 110		the second s		and wire harnos	
	18	(-) Body ground	1. Con "S" grou 2. Ignit	nect starter motor terminal and battery ind cable. tion "ON".	Pointer deflects.	eter 15 Body 20 Eround	
		<u>3 4 5</u> 20 <u>21 22</u>	6 7 8 23 24 25 21	<u>9 10 11 12 13 14 15</u> 6 27 28 29 30 31 32 3			3
				C III	SEF705	( I I I I I I I I I I I I I I I I I I I	2
		T TES	те		27 28 29 30 31 32 33 24		U
JECTOR C			15				<u>18 sens</u>
Test No. 1 C	ylinder N	lo. 1		Notes STILLY		If test is O.K., go to lest No.	z. mpone
Tester	Leads to	Pins		Notes	Should Read	check.	
Ohmmeler	(+)	(-)			091		
Voltmeter	2	Body ground	Connect b	battery ground cable.	Battery voltage		
510		$) \frac{3}{0} \frac{4}{21} \frac{5}{22}$	6 7 8 23 24 25 26	<u>9 10 11 12 13 14 15</u> 27 28 29 30 31 32 32			ล สม
						<ol> <li>Air regulator resistance</li> </ol>	Test N
oek air regular	<u>) K. cha</u>	<u>t is not (</u>	if test	Should Reed	SEF706		des T
				25 to 90Ω			
Test No. 2 Cy	linder N	o. 2		100105	Struite Read	If test is O.K., go to Test No.	3.
Tester	Leads to	Pins	2000	Notes	Should Read	check.	mponer
	(+)	(-)	Belov	- 20° - 16			
Voltmeter	6	Body ground		066.000	Battery voltage		
5	12	3 4 5	( <u>6)</u> 7 8	9 10 11 12 13 14 15	16 17 18		
1 B00000	19 2	0 21 22 2	3 24 25 26	77 28 29 30 31 32 33	3 34 35	7 Ale rominator and fuel	ald the

### ELECTRICAL SYSTEM INSPECTION

Test No. 3 Cylinder No. 3					If test is O.K., go to Test No. 4. If test is not O.K., go to compone			
Tester Leads to Pins		Notes	Notes Should Read		check. It is O.K. ignition start sign			
	(+)	(-)	st) to Tes	ower input circuit b	tim long			Test No. J.F
Voltmeter	K, check	Body	Should Beats to account for	Battery voltage	coll a		l zbeed	Tester
Vältmeter	1	ground	2 Connect battery ground	Battery voltage	1.00	()		
6		<u>3</u> 4(5 202122	) 6 7 8 9 10 11 12 13 14 15 23 24 25 26 27 28 29 30 31 32 33	16 17 18 34 35	1. Conn cable. 2. Ignitic	Body ground	27	Voltmeter
4				SEF708		hhh		13
				SEFT				4



EF343A

12V direct current is applied between terminals (1) and (2)		Check terminals
	Continuity	
Continuity	No continuity	
	Continuity	

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



# E.F.I. RELAY AND FUEL PUMP RELAY TESTS

(Relay Type 1T) X.O ton at test th

Tester	Leads	to Pins	Notes low montest	Should Read
	(+)	(-)	<ol> <li>Connect startes motor "S" terminal and battery</li> </ol>	
Voltmeter	27	Body ground	<ol> <li>Connect battery ground cable.</li> <li>Ignition "ON".</li> </ol>	Battery voltage
		ground		
$\lambda$	1	2 3 4 5	6 7 8 9 10 11 12 13 14 15 1	6 17 18

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.

Test No. 2 Fu	Test No. 2 Fuel pump relay		If no sound is h	neard,	go to test No. 3.		Test No. 4 Cylinder No. 4			
2. Listen to	2. Listen to fuel pump operating		besR bluon	Notes Should Read				E Leads to Pins		
sound for a fe ignition switch	ound for a few seconds after turning gnition switch to "ON".		ittery voltage	Battery voltage			s not Q.K., go s not Q.K., go Body	th+Tes ( go		
				Should Read						
Test No. 3 F	uel pun	np relay test	et be day gov		KO 11 12 18 14 15 1	If test and cir	No. 3 is O. cuit.	.K., ch	eck fuel pump	
Tester	Leads	to Pins	Notes	24 25	Should Read	If fue	If fuel pump is O.K., check comp			
	(+)	(-)				If test	No. 3 is no	t O.K.	, go to compo	
Ohmmeter	13	Body ground			Except 0 and ∞Ω	nent c	heck.			
6		2 3 4 5 6 7 9 20 21 22 23 24 23	8 9 10 11 12 (13) 14 26 27 28 29 30 31 3	15 16 2 33 3	<u>17 18</u> 4 <u>35</u>					
Ľ										

SEF343A



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.

#### **ELECTRICAL SYSTEM INSPECTION**

### **IGNITION START SIGNAL TEST**



of fuel pump teasy wine the buyer is running. E.F.J. Felay Felay Calay Calay E.F.L. E.

If test is O.K., ignition start signal

coil and harness.

If test is not O.K., inspect ignition

is O.K.

#### injector rubber hore

in necessary, replace injector rubber

#### FUEL PRESSURE CHECK

When reconnecting the lines, always use new clamps and be sure to position them correctlysociates behave Use a forque driver to tighten clamps.

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

FUEL SYSTEM

IGNITION START SIGNAL TEST

#### 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.



#### 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.



3. Start engine and read fuel pressure gauge.

At idling:

Approximately 206 kPa (2.06 bar, 2.1 kg/cm<sup>2</sup>, 30 psi) The moment accelerator pedal is fully depressed: Approximately 255 kPa (2.55 bar, 2.6 kg/cm<sup>2</sup>, 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 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/cm<sup>2</sup>, 7 psi).

9. Turn key to "OFF".

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

Tightening for all rubber hose clamps, the same for all rubber hose clamps.

Feel hose clamps
 1.0 - 1.5 N·m
 (0.10 - 0.15 kg-)



# REMOVAL AND

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.







 To install pressure regulator, reverse the order of removal.

For installation of fuel hose, refer to Fuel Hose.

# 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:

- 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.

hose, proceed as follows:

PUEL PRESSURE CHECK Invomesting the lines always in new clamps and be sure to position term committee of the sure to position term of the sure to position to the sure to position term of the sure to position to the sure to position term of the sure to position to the sure to position term of the sure to position to the sure to position to the sure to position to the sure to position term of the sure to position to the sure to posit

exilion gauge so that it can be real mendriver's seat.

#### 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.

clogged or deformed fuel lines, and a necessary, replace fuel pump as an additional second second second additional second second second bandy vacuum gauge or his equivalent handy vacuum gauge or his equivalent handy vacuum gauge or his equivalent to fuel regulator. Disconness pressure regulator vacuum here pressure regulator vacuum here intake manifold and attack variable vacuum source ani fisch neogimela attacherestashul. A hord hespeniniship avontari bus rotoo vacuum is changed.

#### 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.

 T : 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.

ore namoving or replacing the final

Sefer 10 Releasing Fuer Pressure.
Remove or disconnect the follows
Parts and connectors.
Injector namess connector.
High person cable.
Vacuum hose connectint pressure
Sizeonnect fuel feed hose and fuel
Disconnect fuel feed hose and fuel
Place a feed ment fuel pipe.
Place a feed ment fuel for the present

lers Remove bolts security fuel pipe.







# SERVICE DATA AND SPECIFICATIONS to tuffiant () Fism fuer tank on 1910 p

#### **INSPECTION AND ADJUSTMENT**

TIGHTENING TORQUE

end contacts unit.

Type (8) : Push end of rubber hose

FUEL PRESSURE (Measuring point: between fuel filter and fuel pipe)	o ket	
At idling kPa (bar, kg/cm², psi	Approximately 206 (2.06, 2.1, 30)	
The moment ac- celerator pedal is fully depressed	Approximately 255 (2.55, 2.6, 37)	图
AIR FLOW METER Potentiometer resistance	an D	
33 and $34$	100 - 400	(0)
between terminals $\Omega$ and $\mathfrak{F}$	200 - 500	6
between terminals $\Omega$	Except 0 and ∞	
AIR TEMPERATURE SENSOR Thermistor resistance at $-10^{\circ}$ C (14°F) k $\Omega$	7.0 - 11.4	6
at 20°C (68°F) kΩ	2.1 - 2.9	9))
at 50°C (122°F) kΩ	0.68 - 1.0	M
THROTTLE VALVE SWITCH Engine speed when idle switch is changed from rpm "ON" to "OFF"	About 1,100	COSALINE I
WATER TEMPERATURE SENSO Thermistor resistance	R For installation	at fixel h
at $-10^{\circ}$ C (14°F) k $\Omega$	7.0 - 11.4	
at 20°C (68°F) kΩ	2.1 - 2.9	and the second
at 50°C (122°F) kΩ	0.68 - 1.0	1

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

Iu ga



