CAMRY — LEADED

ELECTRONIC FUEL INJECTION (EFI)

The 1983-85 SV11 series Camry utilizes the 2S-E engine and operates on leaded petrol. The 2S-E engine is a 2 litre, multi-port fuel injected engine. The electronic fuel injection (EFI) system is controlled by a computer unit, which is located under the dashboard *(see Fig. 7-63)*. The computer receives signals from the various engine sensors and determines the optimum air/fuel ratio for the prevailing engine operating conditions.

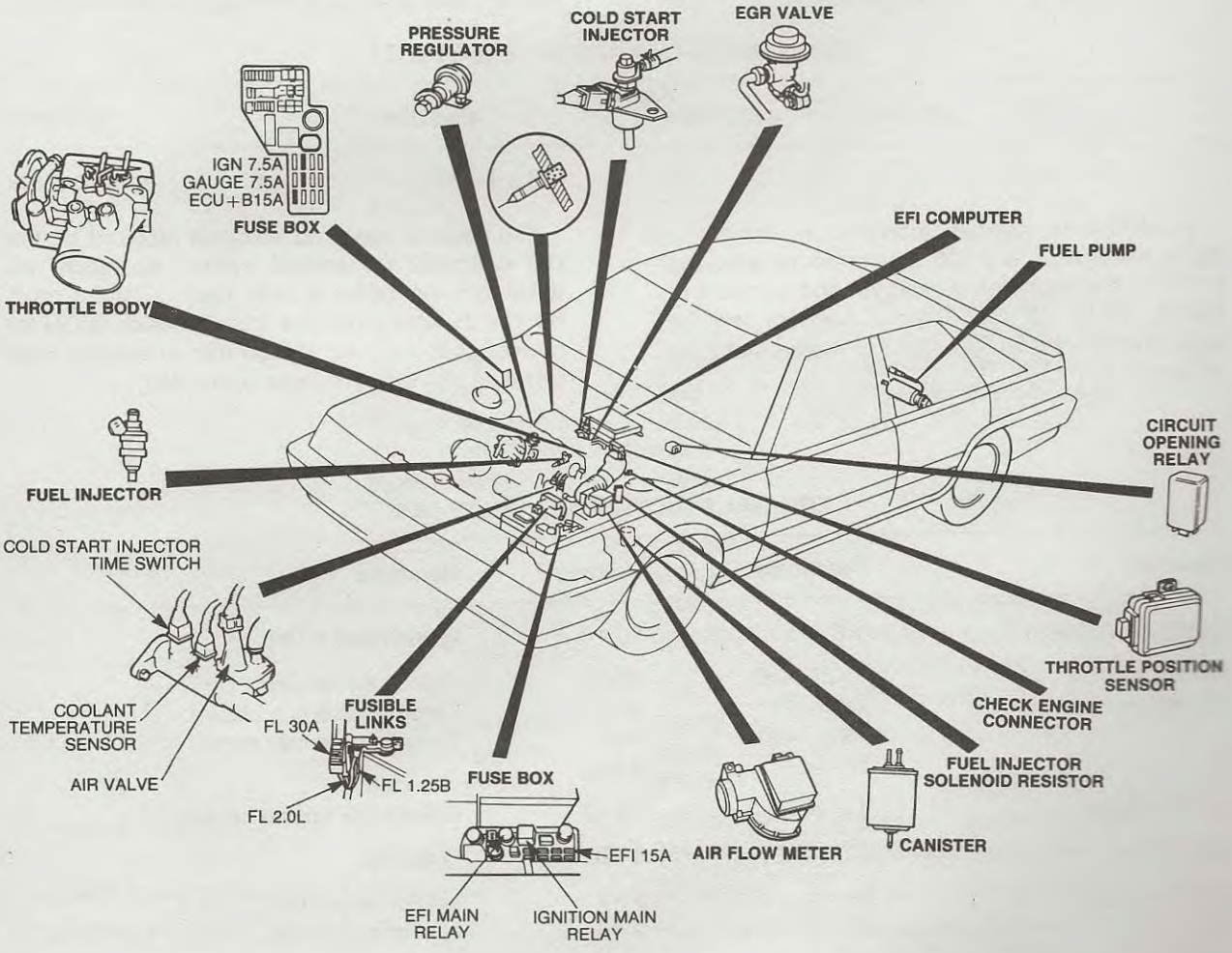


Figure 7-63

The vacuum hose is illustrated in *Fig. 7-64.*

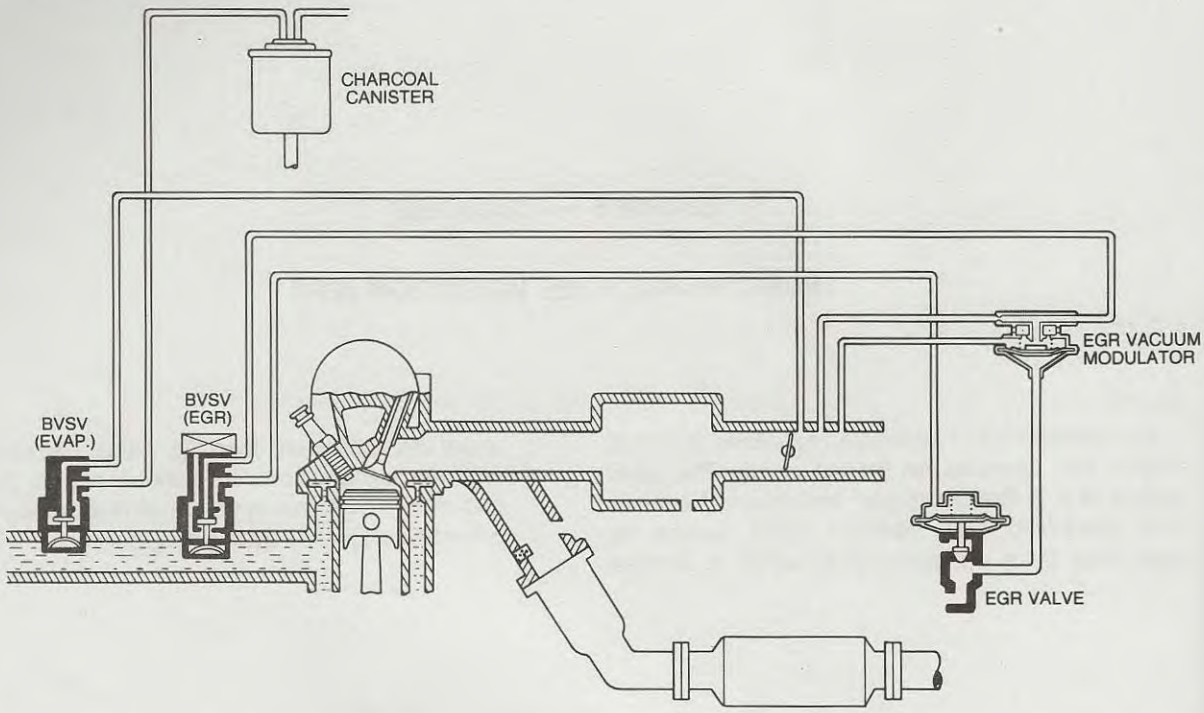


Figure 7-64

In addition to standard workshop equipment, a digital multimeter, a 0-500 kPa pressure gauge, a 0-100 °C thermometer, a hairdryer and a means of heating water to test thermal sensors will be required to isolate faults within the various electrical circuits.

The various operating voltages required by the EFI computer for correct system operation are detailed in the following table. Battery voltage must be 11V or more when the ignition switch is ON for correct operation. All voltage measurements must be taken with wiring harness connected.

TERMINAL FUNCTION AND VOLTAGES

Function	Terminals	Voltage	Remarks
Computer supply voltage	+B — E1	10-14	Ignition switch ON.
Battery voltage	BATT — E1	10-14	Ignition switch ON or OFF.
Throttle position sensor	IDL — E1	8-14	Throttle valve fully closed.
	PSW — E1	8-14	Throttle valve fully open.
	TL — E1	8-14	—
Ignition signal	IGT — E1	10-12	Cranking or engine running.
Start signal	STA — E1	6-12	Cranking.
Injection pulse	No. 10 — E1	9-14	Ignition switch ON.
	No. 20 — E1	9-14	Ignition switch ON.
Warning light	W — E1	8-14	No trouble and engine running.

TERMINAL FUNCTION AND VOLTAGES (continued)

Function	Terminals	Voltage	Remarks
Air flow meter	VC — E2	4-9	—
	VS — E2	0.5-2.5	Measuring plate fully closed.
	VS — E2	5-8	Measuring plate fully open.
	VS — E2	2.5-5.5	Idling.
Air temperature sensor	THA — E2	2-6	Intake air temperature 20 °C.
Coolant temperature sensor	THW — E2	0.5-2.5	Coolant temperature 80 °C.
Exhaust gas recirculation servo diaphragm	EGR — E1	8-14	Ignition switch ON.
Servo diaphragm	SD — E1	8-14	Ignition switch ON.
Air conditioning	A/C — E1	8-14	Air conditioning ON.
Neutral start switch	N/S — E1	5	L, 2, D, R range on A/T. (Excluding M/T and P or N range on A/T).
	N/S — E1	Zero	M/T and P or N range on A/T.

Pin-to-pin resistances required for correct system operation are detailed in the following table. Perform resistance checks with the ignition switch OFF and the battery disconnected.

TERMINAL FUNCTION AND RESISTANCES

Function	Terminals	Resistance	Remarks
System earth	E1 — Body Earth	Zero	
	E1 — E2	Zero	
	E1 — E01	Zero	
	E1 — E02	Zero	
Throttle position sensor	TL — IDL	Zero	Throttle valve fully closed.
	TL — IDL	Infinity	Throttle valve fully open.
	TL — PSW	Infinity	Throttle valve fully closed.
	TL — PSW	Zero	Throttle valve fully open.
	TL — Body Earth	Infinity	
	IDL — Body Earth	Infinity	
	PSW — Body Earth	Infinity	
Air flow meter	VB — E2	200-400	
	VC — E2	100-300	
	VS — E2	20-400	Measuring plate fully closed.
	VS — E2	20-1000	Resistance will vary as measuring plate is moved from fully closed to fully open.
	VB — Body Earth	Infinity	
	VC — Body Earth	Infinity	
	VS — Body Earth	Infinity	
(Fuel pump switch)	FC — E1	Infinity	Measuring plate closed.
	FC — E1	Zero	Measuring plate open.
Coolant temperature sensor	THW — E2	200-400	Coolant temperature 80 °C.
Air temperature sensor	THA — E2	2000-3000	Intake air temperature 20 °C.
Neutral start switch	N/S — Body Earth	Zero	M/T and P or N for A/T.

NOTE

1. Before proceeding with any test on the EFI system, read the WARNINGS detailed on page ii.
2. Replacement procedures are not described in this text.

Fig. 7-73 illustrates the EFI system for the Camry, and should be utilized when carrying out the test procedure. However, the following preliminary checks should be carried out before commencing the test procedure:

a. Inspect the engine and the electronic fuel injection system (EFI) wiring for damage and faulty connections. Check for air leaks at the inlet manifold and at the air intake system, and check the fuel lines and air hoses for damage or leaks. Repair or replace parts as necessary.
b. Check the condition of the air cleaner element. Replace the element if it is clogged or damaged.
c. Inspect the ignition wiring for damage or faulty connections. Repair or replace the wiring as necessary.
d. Ensure that both the EGR valve and the air regulator valve are functioning correctly. Repair or replace the valves as necessary.
e. Ensure that the engine is in good mechanical condition, i.e. the engine compression pressures and the valve clearances are to specification, and that the ignition system high tension circuit is functioning correctly. Also ensure that the battery is fully charged and that there is fuel (petrol) in the fuel tank.
f. Ensure that the crankcase ventilation system is free from air leaks, and that the oil filler cap, dipstick and by-pass hose are properly installed and seal correctly. Also ensure that the PCV valve (where fitted) is secure and operating correctly.

Self-Diagnostic Check.

The Camry, incorporates a self-diagnosis system which utilizes the CHECK ENGINE lamp, located on the instrument panel, to display a coded message to indicate the trouble area. The self-diagnosis mode is initiated when the following conditions are satisfied:

a. Battery voltage exceeds 11 volts.
b. Throttle valve is fully closed (throttle position sensor TL-IDL points closed).
c. Transmission is in neutral.
d. All accessories are switched OFF.
e. Engine is at normal operating temperature.
f. Ignition switch is ON (engine not running).
g. Terminals T and E1, of the CHECK ENGINE connector are shorted together *(see Fig. 7-65)*.

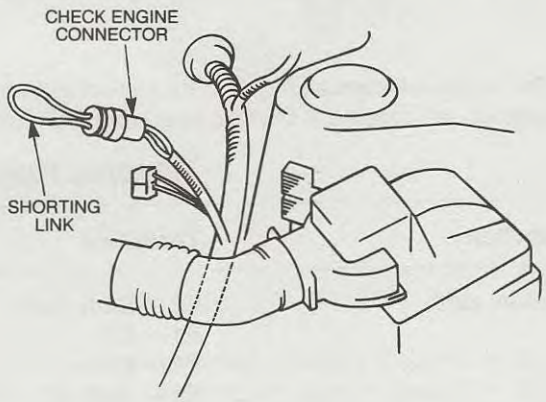


Figure 7-65

Decoding the displayed messages is provided by the following table.

DECODING CHART

Code No.	Fault	Corrective Action
1. Lamp blinks once every three seconds.	No fault — system normal.	Nil.
2. Lamp blinks twice every three seconds.	Air flow meter signals VC or VB.	Refer to para. k.
3. Lamp blinks three times every three seconds.	Air flow meter signals VS or VB.	Refer to para. k.
4. Lamp blinks four times every three seconds.	Coolant temperature circuit.	Refer to para. j.
5. There is no diagnosis code 5.	—	—
6. Lamp blinks six times every three seconds.	Ignition signal.	Refer to para. d.
7. Lamp blinks seven times every three seconds.	Throttle position sensor circuit.	Refer to para. i.

After repair, the diagnostic code retained in memory by the EFI computer must be cancelled out by removing the fuse ECU+B (15A) located behind driver's kick panel, for 30 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out), with the ignition switch OFF.

NOTE

1. Cancellation can also be done by removing the battery negative (–) terminal, but in this case other memory systems (radio ETR, etc.) will also be cancelled out.
2. If the diagnostic code is not cancelled out, it will be retained by the EFI computer and appear along with a new code in event of future trouble.
3. If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic code is detected.

After cancellation, perform a road test, if necessary, to confirm that a "normal" code (No. 1) is now read on the CHECK ENGINE warning light. If the same diagnostic code is still indicated, it indicates that the trouble area has not been repaired thoroughly.

Test Procedure

CAUTION

As some of the following tests involve cranking the engine, appropriate safety precautions must be observed.

NOTE

Ensure that the ignition switch is OFF before checking wiring for continuity.

a. Fuel Pump.
   1. Turn the ignition switch ON and check that the fuel pump can be heard. If the fuel pump can be heard and the engine fails to start when cranked, check the fuel pressure (refer to para. o) and volume pumped. If necessary, replace the fuel pump. If the fuel pump can not be heard, connect a voltmeter across the fuel pump terminals and check for a reading of approximately + 12V. If the supply voltage is present, replace the fuel pump. If not, connect the voltmeter to pin FP on the circuit opening relay *(see Fig. 7-73)* and check for approximately + 12V. If the voltage is present at FP, check for defective wiring between the relay and the fuel pump. If no voltage is present, check for the voltage at relay pin B. If the voltage is present at B, replace the circuit opening relay. If no voltage is present, check for the voltage at pin 4 of the EFI relay. If the voltage is present at pin 4, check for defective wiring between the EFI relay and the circuit opening relay. If no voltage is present at pin 4, check for the voltage at pin 2 of the EFI relay. If no voltage is present at pin 2, check for a blown fuse, blown fusible link or defective wiring between the EFI relay and the battery. If the voltage is present at pin 2, check for the voltage at pin 3 of the EFI relay. If the voltage is present, replace the EFI relay. If no voltage is present at pin 3, check for the voltage at pin IG2 of the ignition switch. If the voltage is present, check for a blown fuse or defective wiring between the ignition switch and the EFI relay. If the voltage is not present at IG2, check for the voltage at pin AM2 of the ignition switch. If the voltage is not present at AM2, check for a blown fusible link or defective wiring from the ignition switch to the battery *(see Fig. 7-73)*. If the voltage is present at AM2, replace the ignition switch.

b. Check Engine Warning Lamp.
   1. With the ignition ON, the CHECK ENGINE lamp should be illuminated. If not, connect the voltmeter to computer terminals W and E1, and check for a reading of 8-14 V. If the voltage is present, replace the EFI computer. If no voltage is present, connect the voltmeter to ignition switch pin IG1 and body earth, and check for approximately + 12V. If the voltage is present, check for a blown fuse (GAUGE), blown lamp (CHECK ENGINE) or defective wiring between the ignition switch and the EFI computer. If no voltage is present at IG1, check for the voltage at pin AM1 of the ignition switch. If the voltage is present, replace the ignition switch. If no voltage is present, check for a blown fusible link (1.25B) or defective wiring between the ignition switch and the battery *(see Fig. 7-73)*.

c. Cold Start Injector and Time Switch.
   1. Remove the connector from the cold start injector and connect the voltmeter to the wiring harness connector (positive lead to terminal STA). Turn the ignition to START and check that a reading of approximately + 12V is indicated on the voltmeter. If no voltage is present, check for the voltage at ignition switch pin ST1. If the voltage is present, check for a defective neutral start switch (A/T only) or defective wiring between the ignition switch and the cold start injector *(see Fig. 7-73)*. If no voltage is

present at ST1, check for the voltage at pin AM1 on the ignition switch. If the voltage is present replace the ignition switch. If no voltage is present at AM1, check for a blown fusible link (1.25B) or defective wiring between the ignition switch and the battery *(see Fig. 7-73)*. Using an ohmmeter, check the resistance across the cold start injector terminals. A reading of 2-4 ohms should be obtained. Replace the cold start injector as necessary.

2. Using the ohmmeter, check the resistance across the time switch terminals STA and STJ. The resistance indicated should be 30-50 ohms with a coolant temperature of below 35°C and 70-90 ohms with a coolant temperature above 35°C. Connect the ohmmeter between terminal STA and earth and check for a reading of 30-90 ohms. Replace the time switch as necessary.

d. Ignition Signal.
   1. Connect the voltmeter to computer terminals IG and E1 and turn the ignition switch ON. Check for a reading of 10-12V. If no voltage is present on IG, check for a voltage on the negative terminal of the coil. If the voltage is present at the coil, check for defective wiring between the ignition coil and the computer connector. If no voltage is present at the coil, check for a voltage at pin IG2 of the ignition switch. If the voltage is present at IG2, check for defective wiring between the ignition switch and the ignition coil. If no voltage is present a IG2, check for a voltage at pin AM2 of the ignition switch. If the voltage is present at AM2, replace the ignition switch. If no voltage is present at AM2, check for a blown fusible link or defective wiring between the ignition switch and the battery.

e. Ignition Main Relay.
   1. To check the ignition main relay operation, connect the voltmeter to computer terminals EGR and E1 or SD and E1. With the ignition switch ON, check for a reading of 8-14V at both sets of terminals. If the voltage is not present at both sets of terminals, replace the VSV (EGR of SD) corresponding to the terminals with no voltage *(see Fig. 7-73)*. If no voltage is present at either set of terminals, check for approximately +12V at pin 5 of the ignition relay. If the voltage is present at pin 5, check for a blown fuse (ENGINE) or defective wiring between the ignition relay and the computer. If no voltage is present at pin 5, check for the voltage at pin 2. If no voltage is present at pin 2, check for a blown fusible link (1.25B) or defective wiring between the ignition relay and the battery. If the voltage is present at pin 2, check for approximately +12V at pin 1. If the voltage is present at pin 1, replace the ignition relay. If no voltage is present at pin 1, refer to *Fig. 7-73* to trace the defective component or wiring.

f. Start Pulse.
   1. Connect the voltmeter to computer terminals STA and E1, and turn the ignition switch to START. Check for a reading of 6-12V. If no voltage is present, check for a defective neutral start switch (A/T only) or defective wiring between the ignition switch and the computer terminal *(see Fig. 7-73)*.

g. Computer Supply Voltage and Battery Voltage.
   1. To check the computer supply voltage and earth, connect the voltmeter to computer terminals +B and E1 and turn the ignition switch ON. Check for a reading of 10-14 V. If no voltage is present, check for defective wiring between pin 4 of the EFI relay and terminal +B, and also between body earth and terminal E1.
   2. Turn the ignition switch OFF and connect the voltmeter to terminals BATT and E1. Check for a reading of 10-14 V. If no voltage is present, check for a blown fuse, (ECU +B) or defective wiring between the BATT terminal and the battery. If all voltages are correct, replace the computer.

h. Fuel Injectors.
   1. Connect the voltmeter to computer terminals No. 10 and E1 and turn the ignition switch ON. Check for a reading of 9-14 V, which should also be indicated between pins No. 20 and E1. If the voltage is correct, replace the computer. If no voltage is present, connect the voltmeter to the +B side of the injector resistors *(see Fig. 7-66)* and check for approximately 9-14 V. If no voltage is present, check for

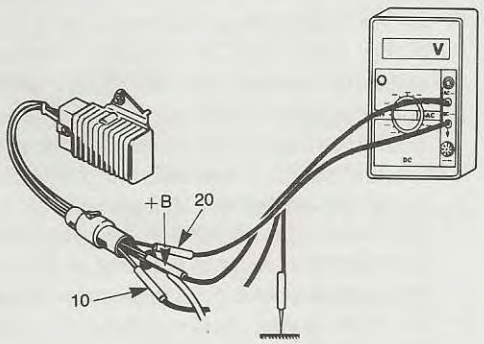


Figure 7-66

defective wiring between the ignition switch pin IG2 and the resistor network. If the voltage is present at the +B side of the resistor network, check for approximately 9-14 V on the opposite side of the resistor network. If no voltage is present at one or more terminals, replace the resistor network. If the voltage is present, turn the ignition switch OFF and check the resistance of the coil in each injector with an ohmmeter *(see Fig. 7-67)*. A reading of 1.5-3 ohms should be obtained for each injector. Replace injectors as necessary. If all injectors appear serviceable, check for defective wiring between the resistor network and computer terminals No. 10 and No. 20, via each injector.

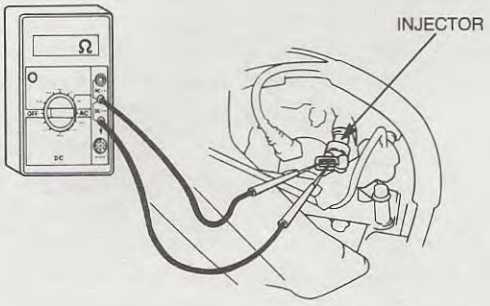


Figure 7-67

i. Throttle Position Sensor.
   1. Correct operation of the throttle positioner sensor can be verified by connecting a voltmeter to computer terminals TL and E1. With the ignition switch ON, a reading of 8-14 V should be obtained. If no voltage is present, check for 10-14 V at computer terminal +B. If the voltage is correct at terminal +B, replace the computer. If no voltage is present at +B, use *Fig. 7-73* to trace the defective component or wiring. If the voltmeter indicated 8-14 V at computer terminal TL initially, connect the voltmeter to terminals IDL and E1. With the accelerator pedal in the idle position, the voltmeter should indicate 8-14 V. Depress the accelerator pedal and note that the voltage drops to zero. Connect the voltmeter to computer terminals PSW and E1. With the accelerator pedal in the idle position, the voltmeter should indicate zero. Depress the accelerator pedal fully and check that the voltmeter now indicates 8-14 V. If the voltage indications are not as specified, carry out continuity checks to determine if the throttle position sensor or wiring is defective. If necessary, replace the computer.

j. Coolant Temperature Sensor.
   1. With the engine at normal operating temperature and the ignition switch ON, connect the voltmeter to computer terminals THW and E2. A reading of 0.5-2.5 V should be obtained. If not, disconnect the wiring harness at the temperature sensor and check the wiring harness to the computer terminals for continuity, damage or faulty connection. Repair as necessary.
   2. If there was no fault with the wiring harness, remove the temperature sensor from the cylinder head, connect an ohmmeter to the sensor terminals, then suspend the sensor in a container filled with water, ensuring that the sensor does not touch the container. Place a thermometer with at least a 0-100°C scale in the container and apply heat to the container *(see Fig. 7-68)*. Check the resistance at the sensor terminals at various temperatures (refer to the scale in *Fig. 7-68*). If the ohmmeter readings are not within specification, connect the voltmeter to computer terminals +B and E1, turn the ignitions switch ON. Check for a reading of 10-14V. If correct, replace the computer. If not, use *Fig. 7-73* to trace the defective component or wiring.

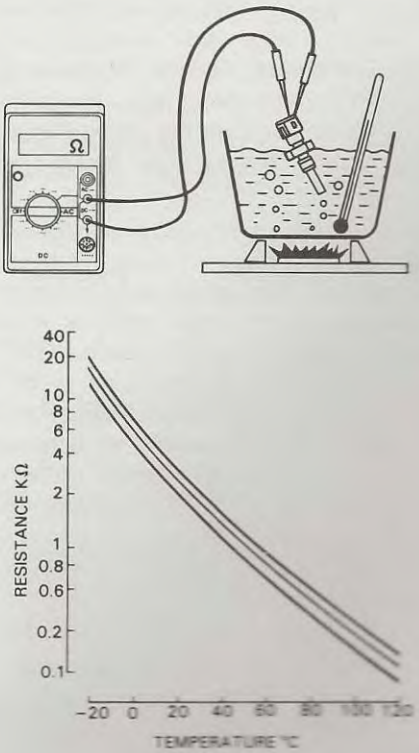


Figure 7-68

k. Air Flow Meter.

1. The air flow meter also comprises the air temperature sensor and the fuel pump switch *(see Fig. 7-73)*. The following voltage and resistance checks should be carried out to determine the serviceability of these items. If not within specification, replace the air flow meter. If no fault is found with the air flow meter assembly, check for defective wiring and/or replace the computer.

NOTE

1. Never use a metal or sharp object to move the measuring plate.
2. A hairdryer or similar can be used to raise the air intake temperature.

(a) Voltage Checks

Terminal	Voltage	Remarks
VB — E2	10-14	Ignition ON.
VC — E2	4-9	Ignition ON.
VS — E2	0.5-2.5	Ignition ON, measuring plate fully closed.
VS — E2	5-8	Ignition ON, measuring plate fully open.
VS — E2	2.5-5.5	Engine idling.
THA — E2	2-6	Ignition ON, intake air temperature 20 ° C.

(b) Resistance Checks. Turn the ignition OFF, disconnect the wiring harness connector from the air flow meter and remove the air flow meter from the vehicle.

Terminal	Resistance	Remarks
VB — E2	200-400	
VC — E2	100-300	
VS — E2	20-400	Measuring plate fully closed.
VS — E2	20-1000	Resistance will vary as the measuring plate is moved from fully closed to fully open.
THA — E2	10-20 k	Air temperature –20°C.
	4-7 k	Air temperature 0 ° C.
	2-3 k	Air temperature 20 ° C.
	0.9-1.3 k	Air temperature 40 ° C.
	0.4-0.7 k	Air temperature 60 ° C.
FC — E1	Infinity	Measuring plate fully closed.
	Zero	Measuring plate at any position other than fully closed.

l. Air Valve.

1. To check the air valve for correct operation, connect a tachometer to the engine then start the engine. Pinch shut the air line shown in *Fig. 7-69* and check that the engine speed drops if the engine is cold (coolant temperature below 60 ° C) but the engine speed does not drop more than 100 rpm if the engine is warm. Turn the ignition OFF and disconnect the wiring harness connector at the air valve. Using an ohmmeter *(see Fig. 7-70)*, check that the resistance across the air valve terminals FP and E1 is 40-60 ohms (coolant temperature 80 ° C). Replace the air valve if necessary.

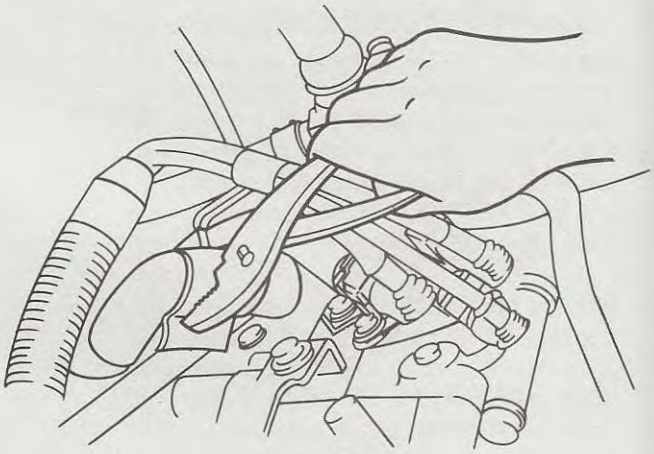


Figure 7-69

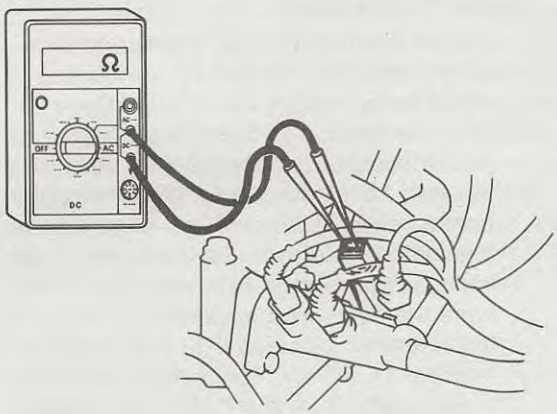


Figure 7-70

m. Air Conditioner.

1. Connect the voltmeter to computer terminals A/C and E1. With the engine running and the air conditioner ON, the voltmeter should indicate 8-14V. If no voltage is present, check for the voltage

between terminal A/C and body earth. If this voltage is correct, check for defective wiring between terminal E1 and body earth. If no fault is found with the earth connection, replace the computer. If no voltage is present at terminal A/C and body earth, check that the air conditioner compressor is running and that the voltage is present at the A/C amplifier output. If the voltage is present, check for defective wiring between the A/C amplifier and the computer. If no voltage is present, check the A/C amplifier and associated wiring for correct operation and rectify faults as necessary.

n. Check Engine Connector.
   1. With the ignition switch OFF, connect an ohmmeter to computer terminals T and E1. Using a shorting link *(see Fig. 7-65)* short the CHECK ENGINE connector terminals T and E1 together and note that the ohmmeter indicates zero ohms. If not, check for defective wiring or a defective CHECK ENGINE connector.

o. Fuel Pressure.
   1. Start the engine then remove the fuel pump fuse (EFI). After the engine stalls, crank the engine several times to ensure that the fuel pressure is released. Turn the ignition OFF and install the fuse.
   2. Disconnect the wiring harness connector from the cold start injector. Slowly loosen the union bolt at the cold start injector hose and remove the bolt and two gaskets from the delivery pipe.
   3. Install a gasket, a zero to 500 kPa pressure gauge, another gasket and a union bolt to the delivery pipe *(see Fig. 7-71)*.

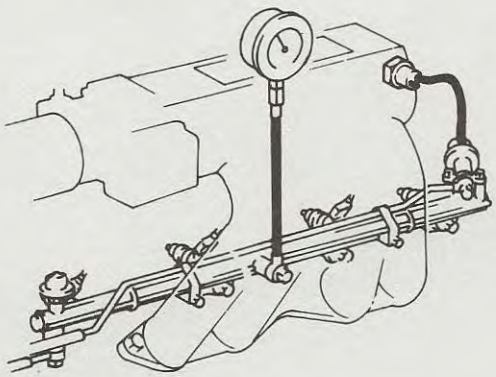


Figure 7-71

   4. Start the engine then disconnect the vacuum sensing hose from the gas filter *(see Fig. 7-72)* At idle, the fuel pressure should be 230-260 kPa. If the pressure is high, replace the pressure regulator. If the pressure is low, check the fuel hoses and connections, the fuel pump, the fuel filter and the pressure regulator respectively.

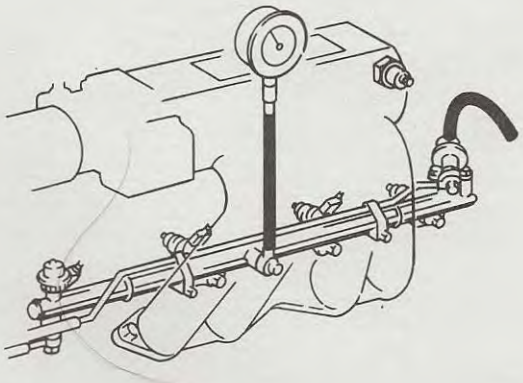
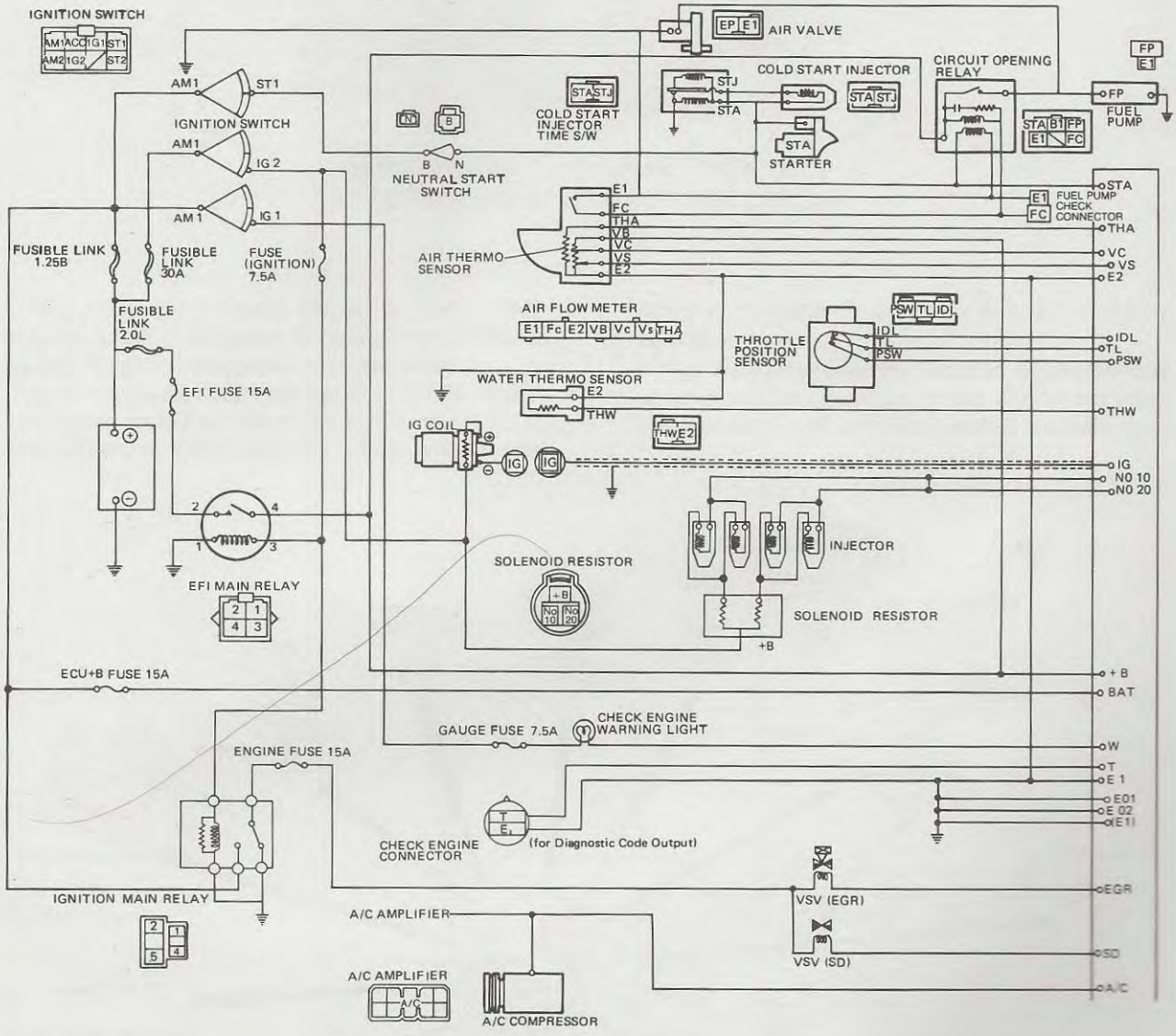


Figure 7-72

   5. Reconnect the vacuum sensing hose to the gas filter and check that the fuel pressure at idle is now approximately 190 kPa. If the pressure is above 230 kPa, replace the pressure regulator.
   6. Stop the engine. If the pressure drops quickly, check the fuel pump, pressure regulator and injectors.
   7. Remove the pressure gauge and replace the gaskets with new gaskets when installing the cold start injector hose.

p. Idle Speed, Ignition Timing and Idle Mixture.
   1. Connect a timing light and a tachometer to the engine, then start the engine and allow the engine to warm up to normal operating temperature. Disconnect the vacuum hoses from the vacuum advancer and plug the hoses. Check that the idle speed is 750 ± 50 rpm and the ignition timing is 10° ± 2° BTDC. If necessary, adjust the distributor to obtain the correct timing figure. Reconnect the vacuum hoses to the vacuum advancer and check that the ignition timing is now 16° ± 3° BTDC. Turn the ignition OFF.
   2. Insert a gas analyser probe 400 mm up the exhaust pipe, start the engine and allow it to idle. Check that the CO concentration is 1.0% ± 0.5%. If the CO concentration is outside specification, remove the plastic cap on the air flow meter and adjust the idle mixture screw to richen, or lean off the mixture. When the CO concentration is within specification, check that idle speed has not changed. If necessary, readjust.



EFI COMPUTER

E_2	Vs	Vc	BAT	THA		STA	A/C	N/S	THW	IDL	(V_f)	T	No 10	E_{01}
IG	(E_2)	W	+B		SPD		EGR	SD	E_1	TL	Psw		No 20	E_{02}

Figure 7-73