

EFI SYSTEM

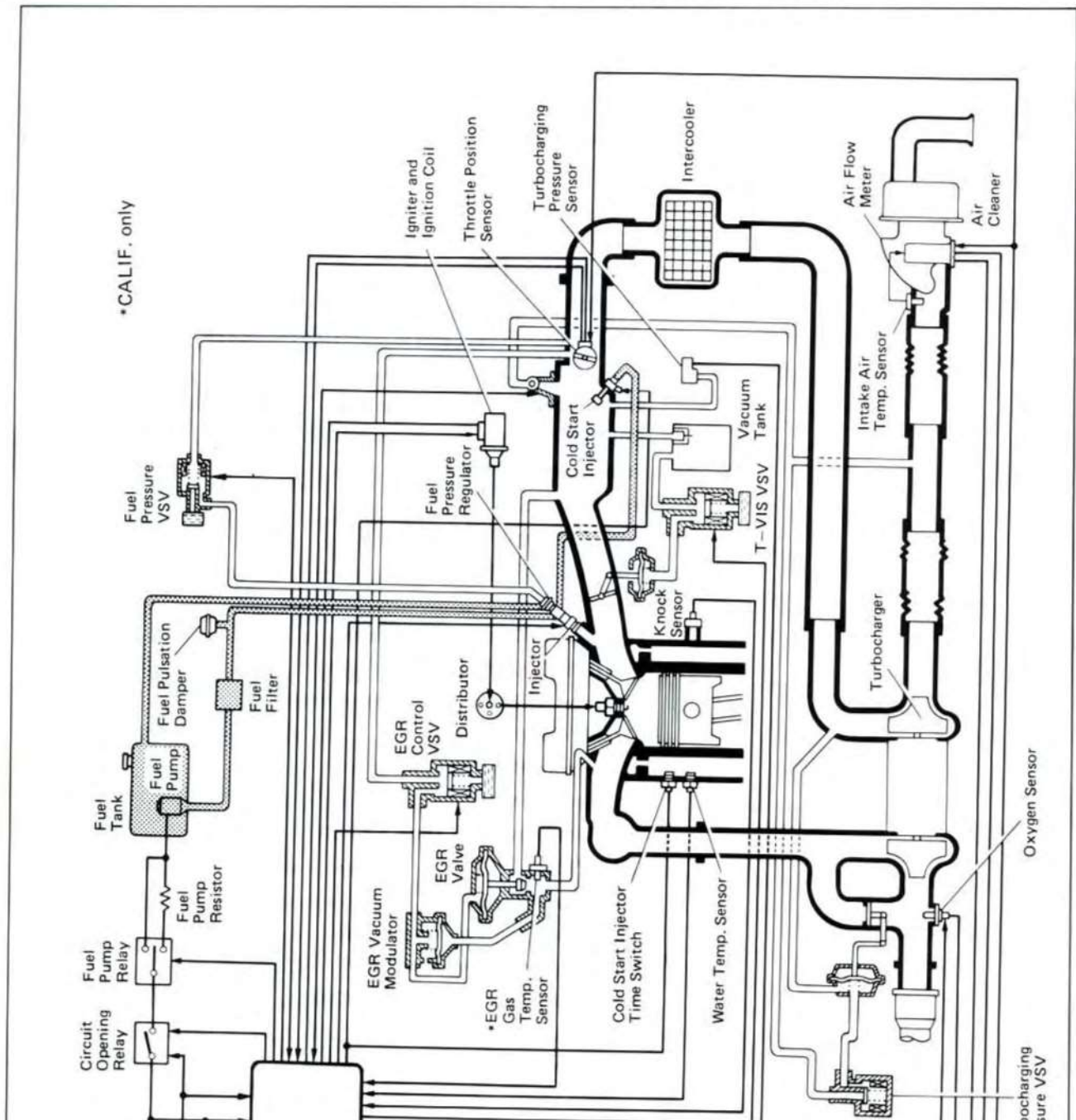
REFER TO 1988 CELICA REPAIR MANUAL (Pub. No. RM071U)

NOTE: The following pages contain only the points which differ from the above listed manual.

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FI

SYSTEM DESCRIPTION



EFI SYSTEM — System Description

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The EFI system is composed of three basic sub-systems: Fuel Induction, Air Induction and Electronic Control Systems.

FUEL SYSTEM

Fuel is supplied under constant pressure to the EFI injectors by an electric fuel pump. The injectors inject a metered quantity of fuel into the intake manifold in accordance with signals from the ECU (Electronic Control Unit).

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The Celica 3S-GTE engine is equipped with a Toyota Computer Control System (TCCS) which centrally controls the EFI, ESA, ISC, Diagnosis systems, etc. by means of an Electronic Control Unit (ECU — formerly EFI computer) employing a microcomputer.

By means of the ECU, the TCCS controls the following functions:

1. Electronic Fuel Injection (EFI)

The ECU receives signals from various sensors indicating changing engine operating conditions such as:

- Intake air volume
- Intake air temperature
- Coolant temperature
- Engine rpm
- Acceleration/deceleration
- Exhaust oxygen content etc.

These signals are utilized by the ECU to determine the injection duration necessary for an optimum air-fuel ratio.

2. Electronic Spark Advance (ESA)

The ECU is programmed with data for optimum ignition timing under any and all operating conditions.

3. Idle Speed Control (ISC)

The ECU is programmed with target idling speed values to respond to different engine conditions (coolant temperature, air conditioner on/off, etc.). Sensors transmit signals to the ECU which control the flow of air through the by-pass of the throttle valve and adjust idle speed to the target value. (See page FI-44)

4. Diagnosis

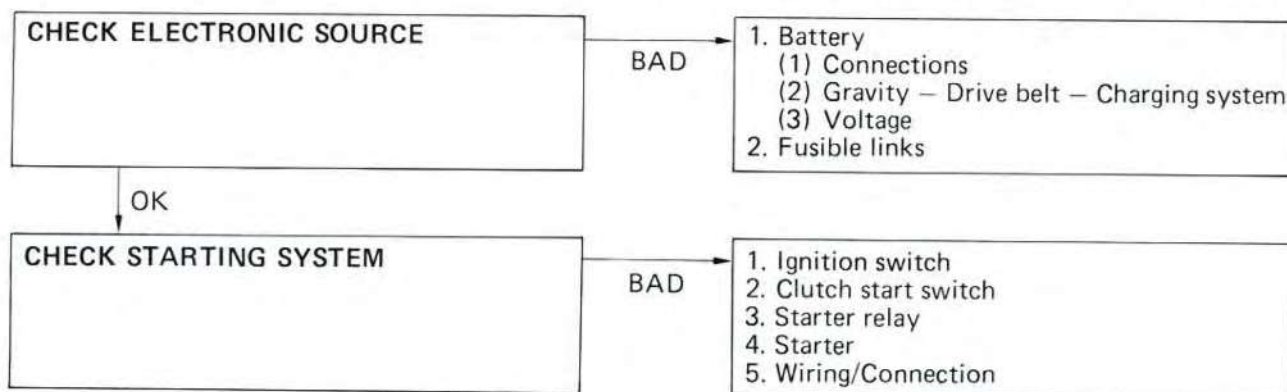
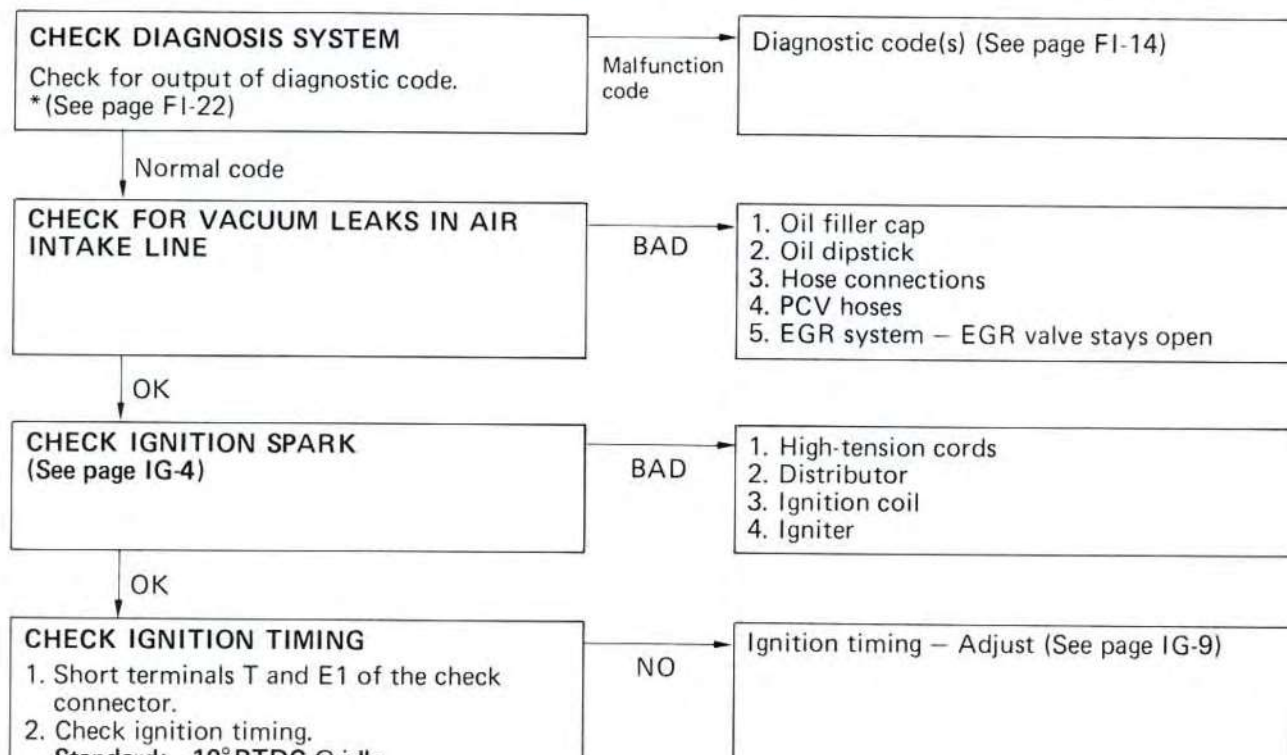
The ECU detects any malfunctions or abnormalities in the sensor network and lights a check engine warning light on the instrument panel. At the same time, the trouble is identified and a diagnostic code is recorded by the ECU. The diagnostic code can be read by the number of blinks of the check engine warning light when terminals T and E1 are short-circuited. The diagnostic codes are refer to the later page. (See page FI-14)

5. Fail-Safe Function

In the event of the sensor malfunctioning, a back-up circuit will take over to provide minimal driveability, and the check engine warning light will light.

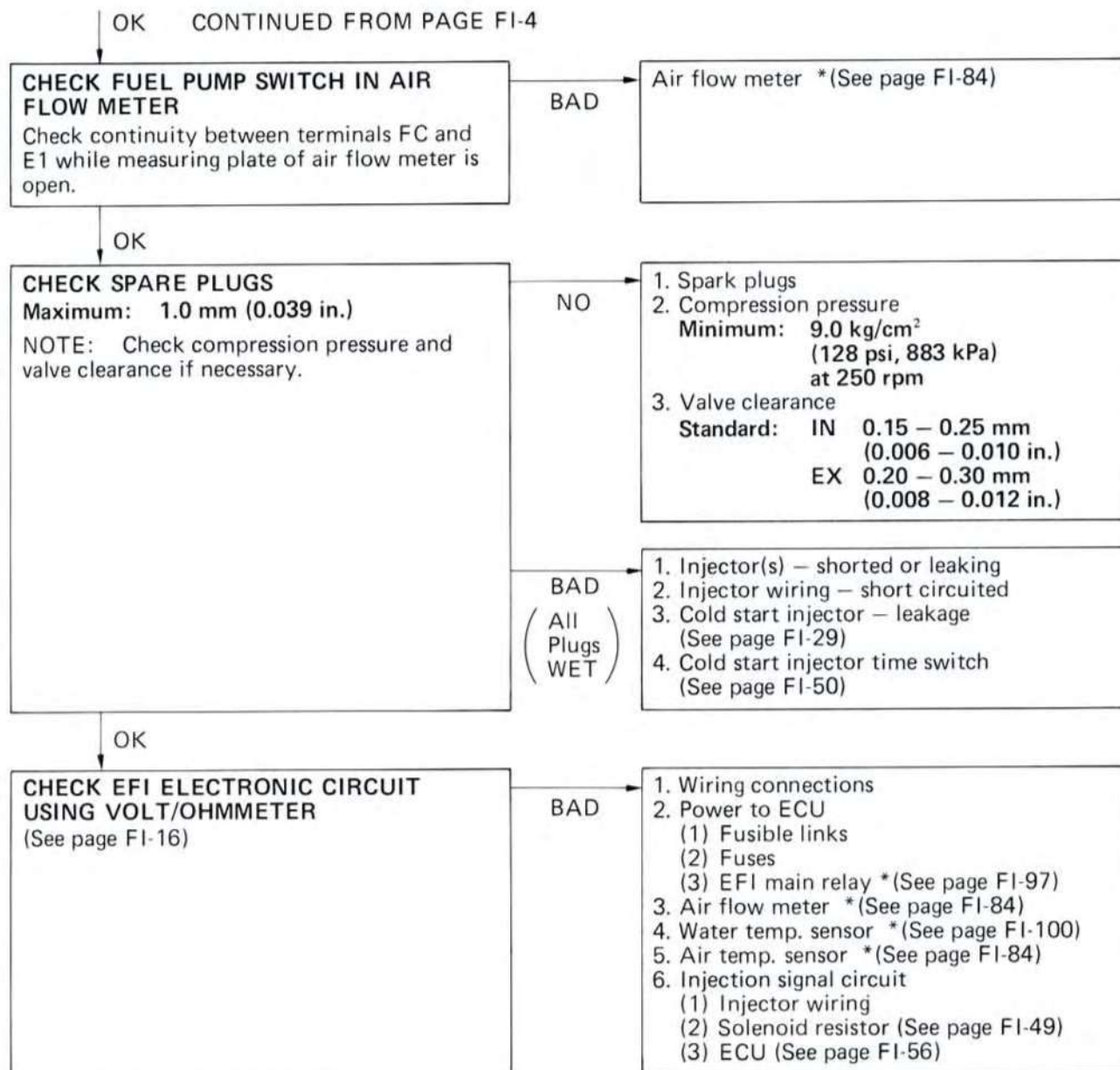
FI-4

EFI SYSTEM — Troubleshooting

TROUBLESHOOTING**TROUBLESHOOTING PROCEDURES****SYMPTOM — DIFFICULT TO START OR NO START
(ENGINE WILL NOT CRANK OR CRANKS SLOWLY)****SYMPTOM — DIFFICULT TO START OR NO START (CRANKS OK)**

EFI SYSTEM — Troubleshooting

FI-5

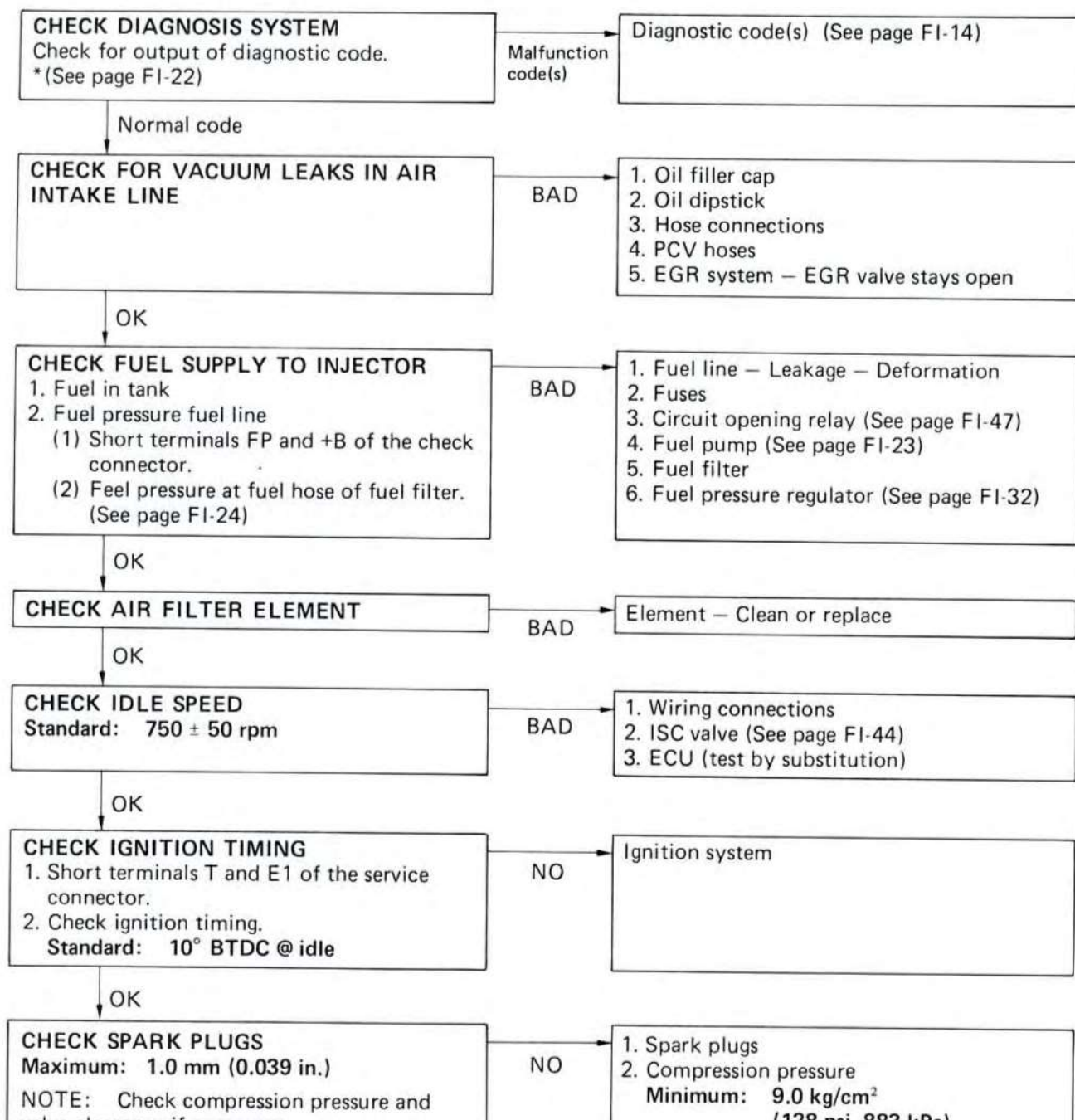


* See Pub. No. RM071U

FI-6

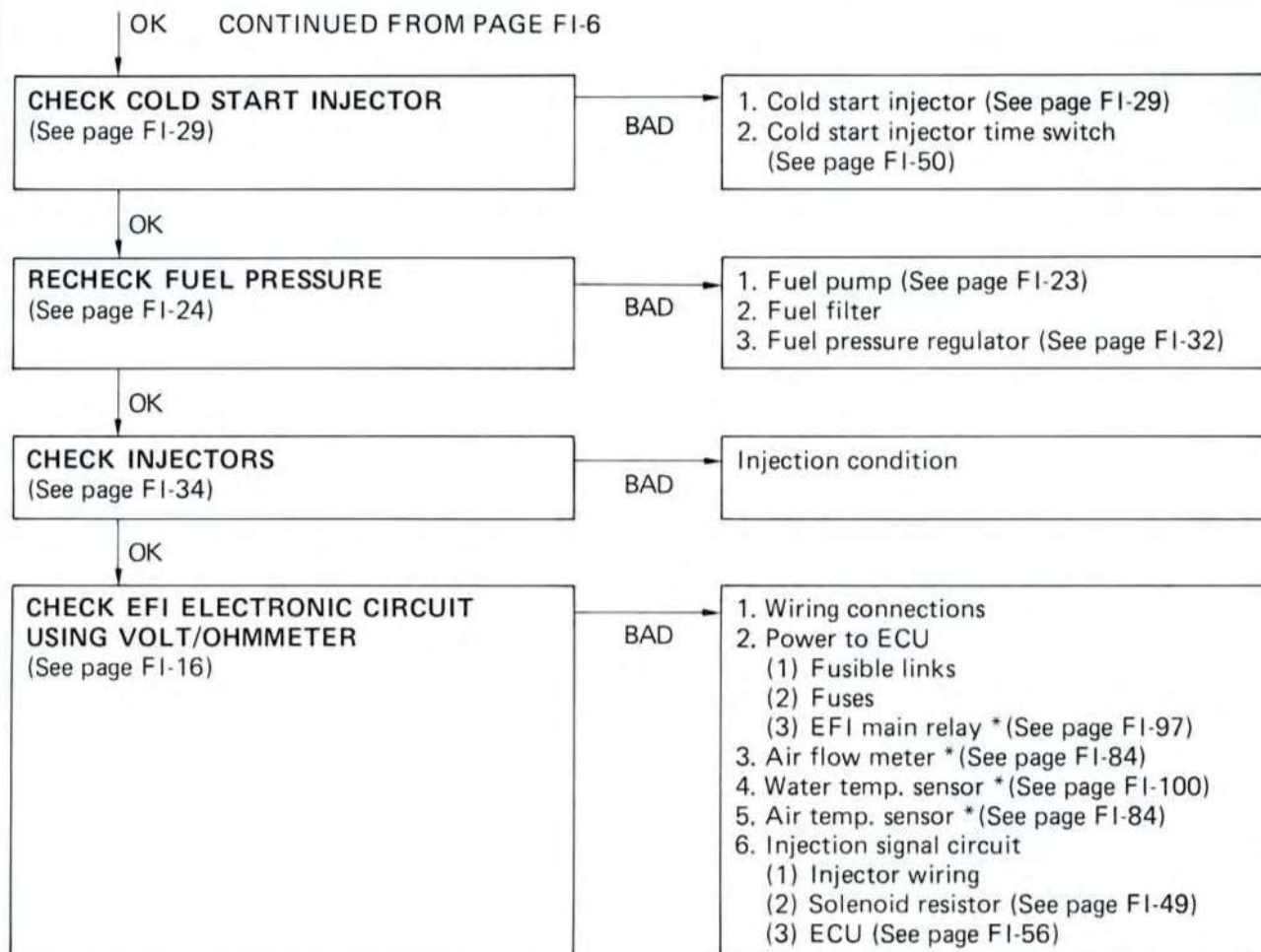
EFI SYSTEM — Troubleshooting

SYMPTOM — ENGINE OFTEN STALLS

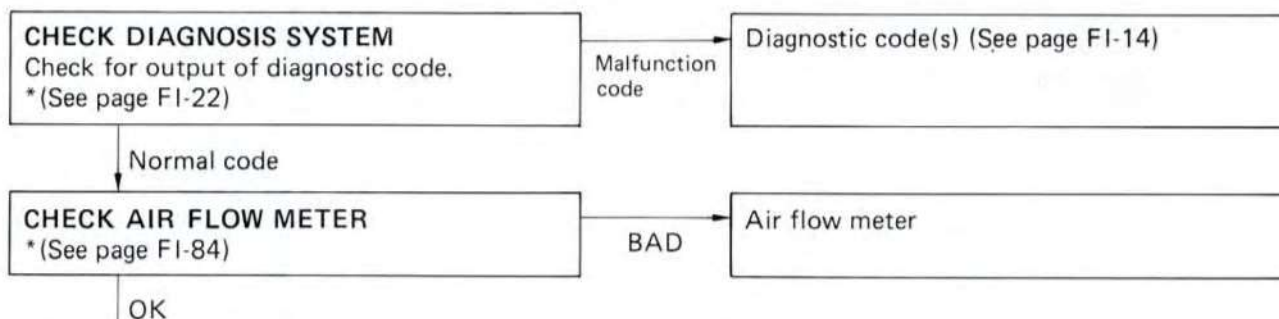


EFI SYSTEM — Troubleshooting

FI-7



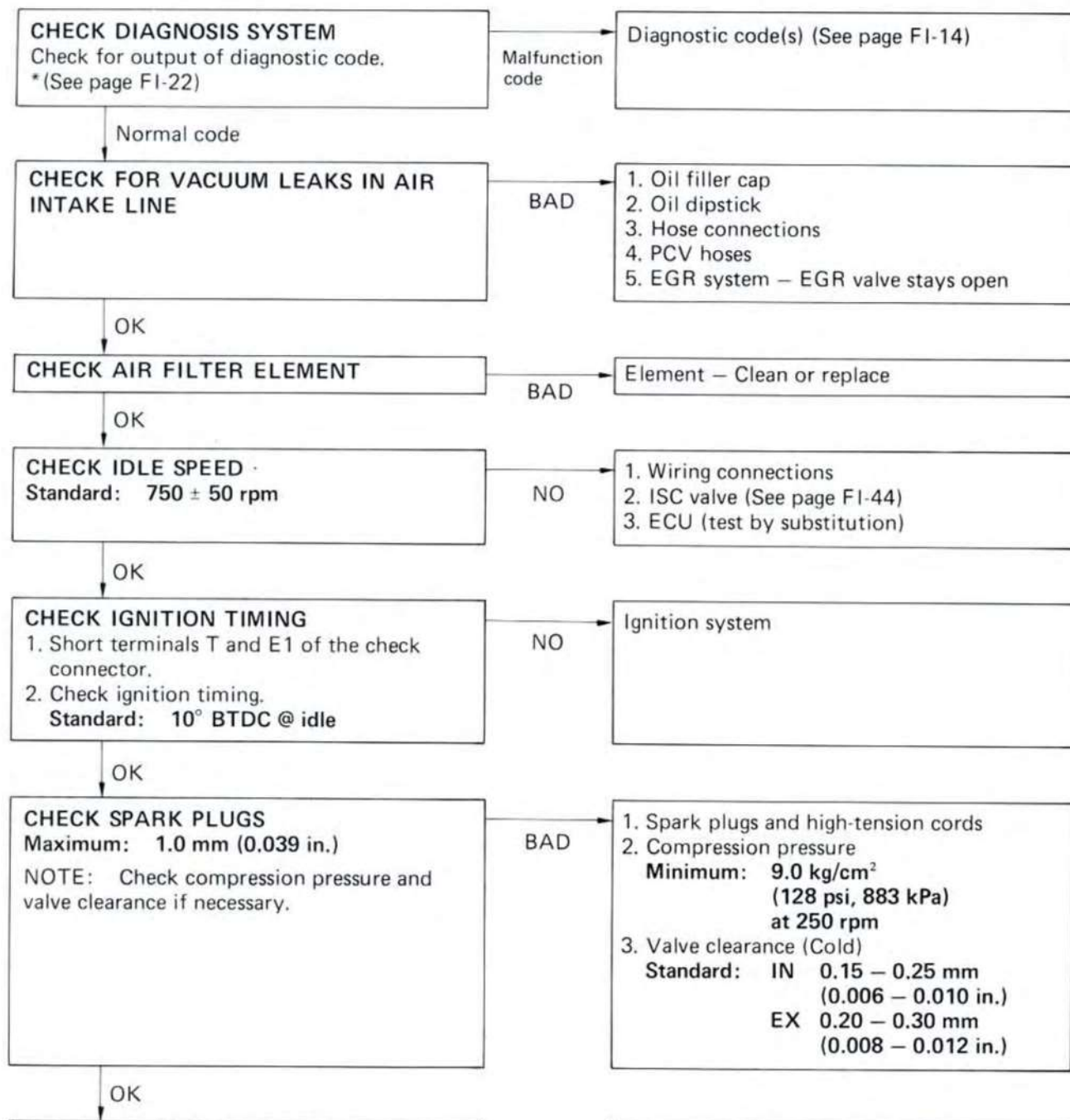
SYMPTOM — ENGINE SOMETIMES STALLS

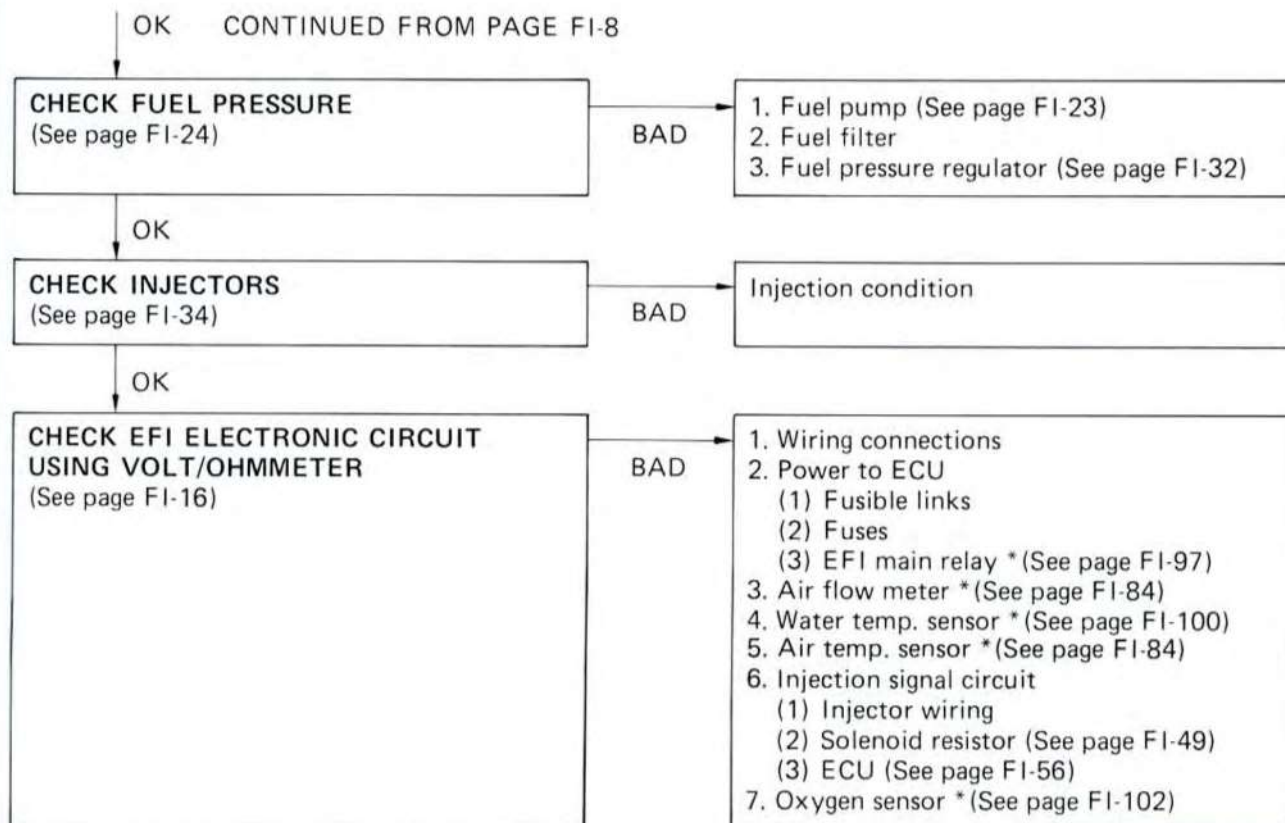
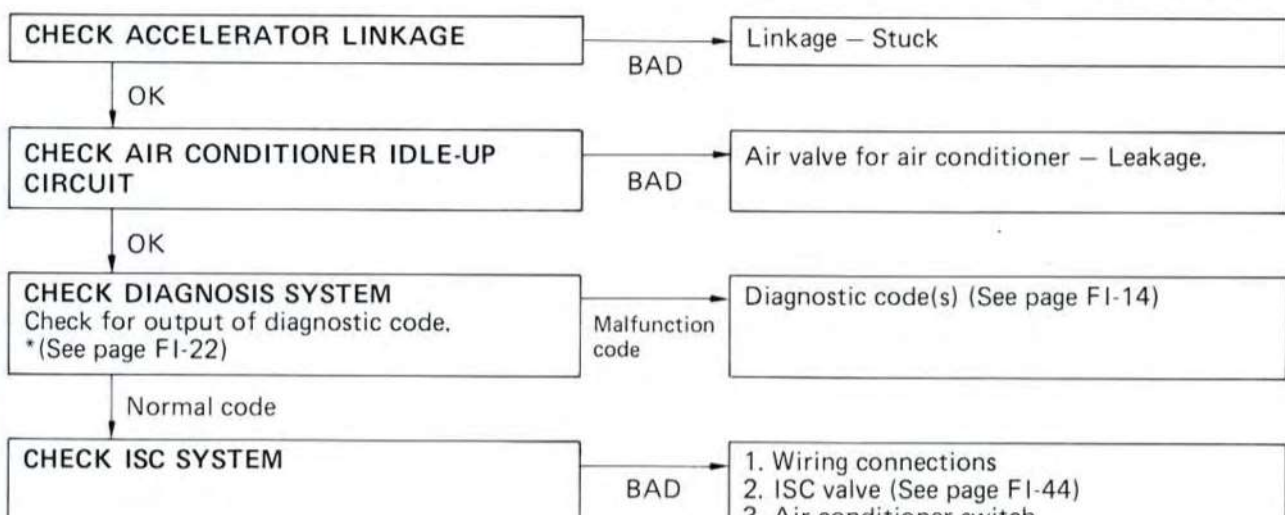


FI-8

EFI SYSTEM — Troubleshooting

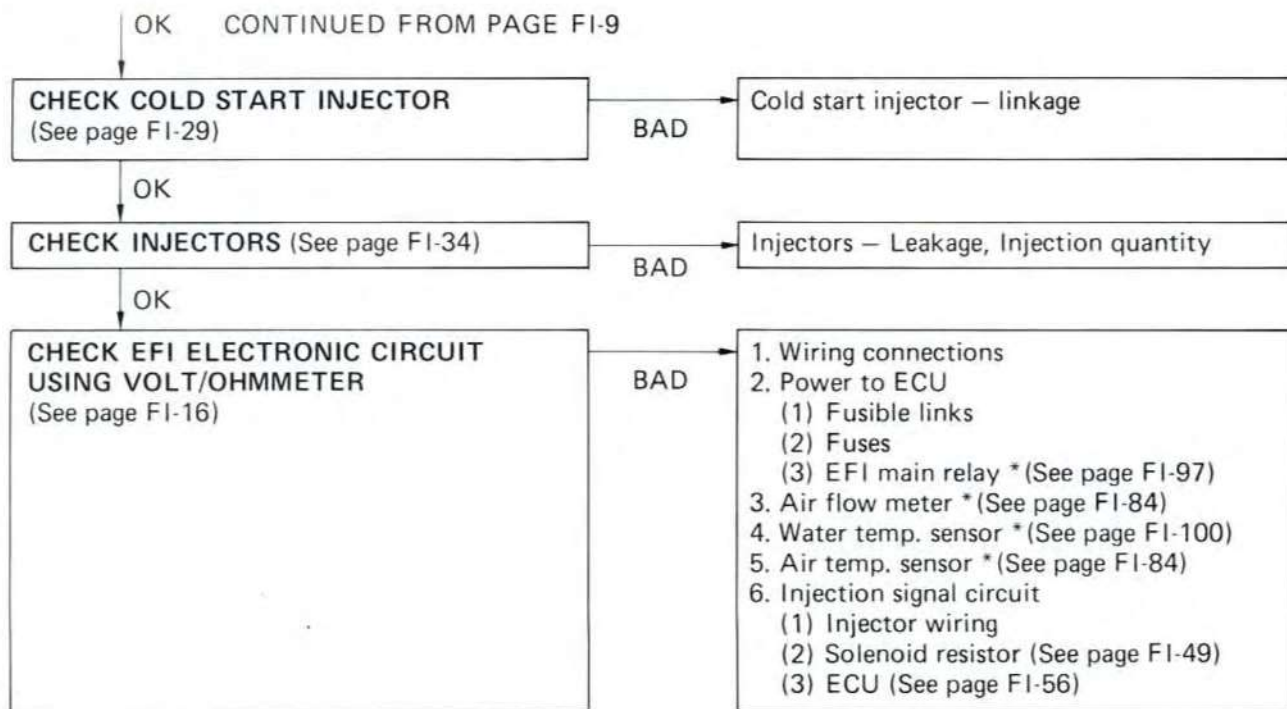
SYMPTOM — ROUGH IDLING AND/OR MISSING



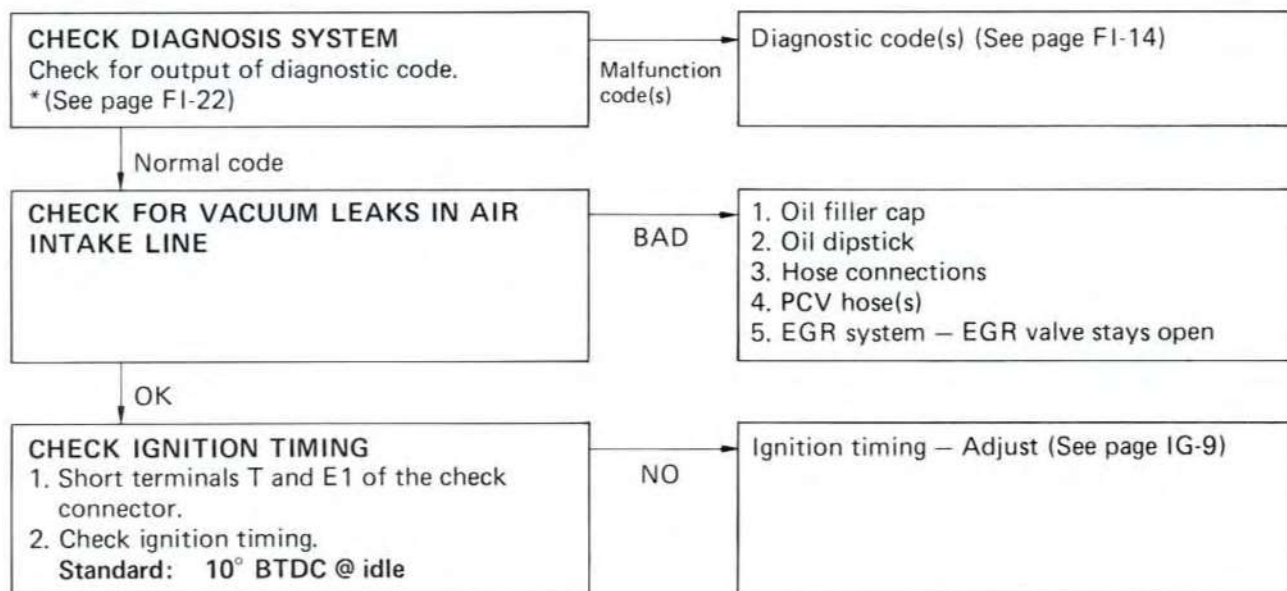
EFI SYSTEM — Troubleshooting**FI-9****SYMPTOM — HIGH ENGINE IDLE SPEED (NO DROP)**

FI-10

EFI SYSTEM — Troubleshooting

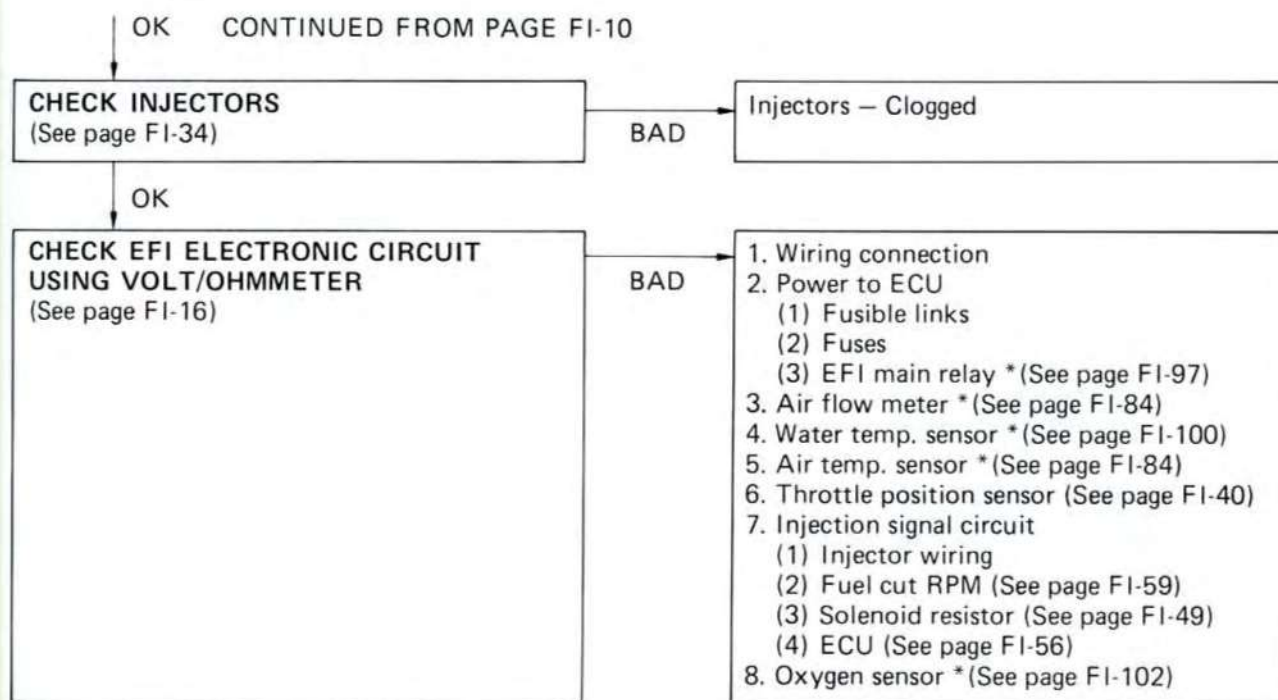


SYMPTOM — ENGINE BACKFIRES-Lean Fuel Mixture

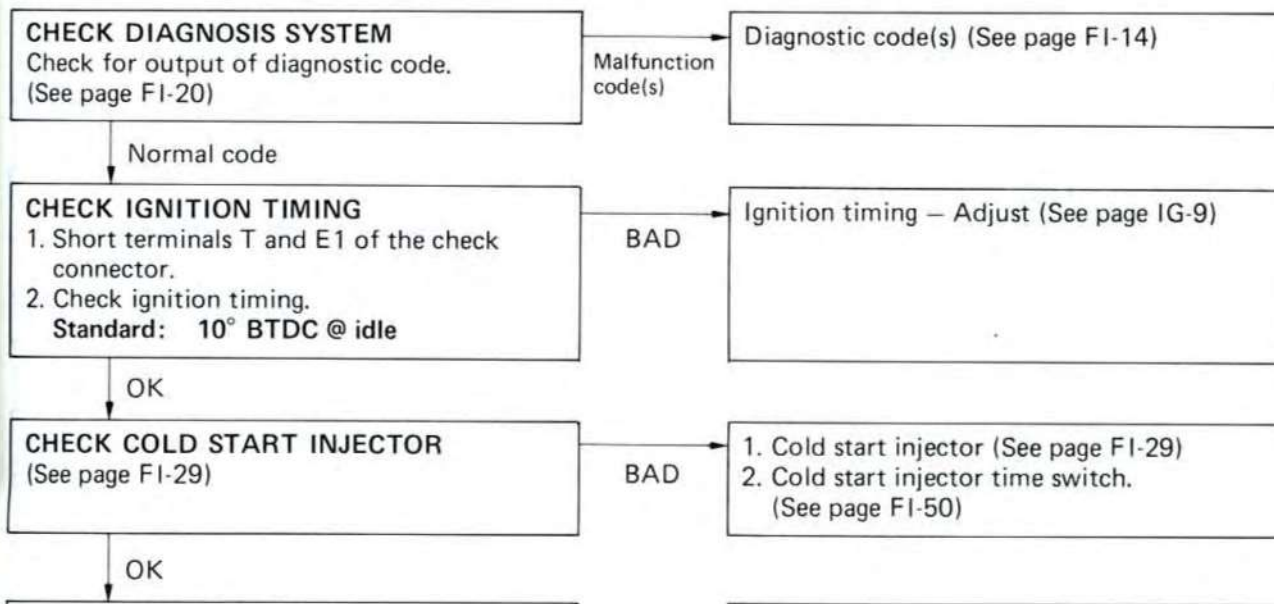


EFI SYSTEM — Troubleshooting

FI-11

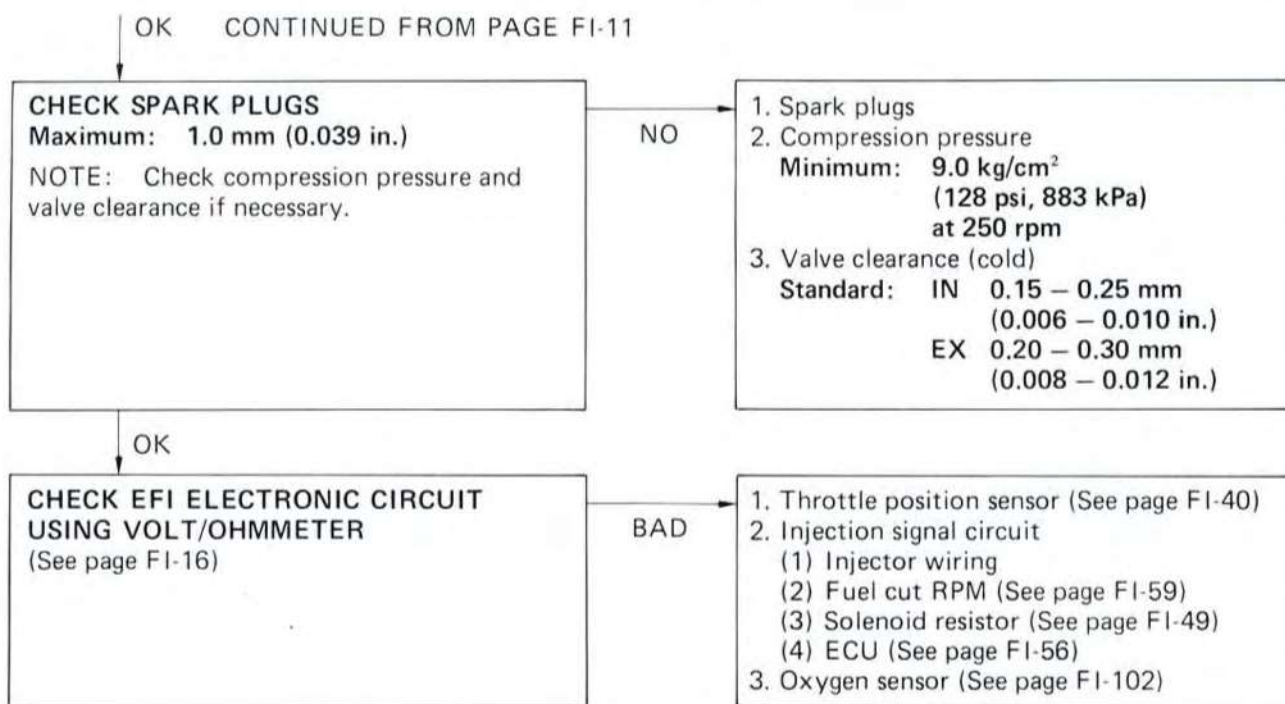


SYMPTOM — MUFFLER EXPLOSION (AFTER FIRE)-Rich Fuel Mixture-Misfire

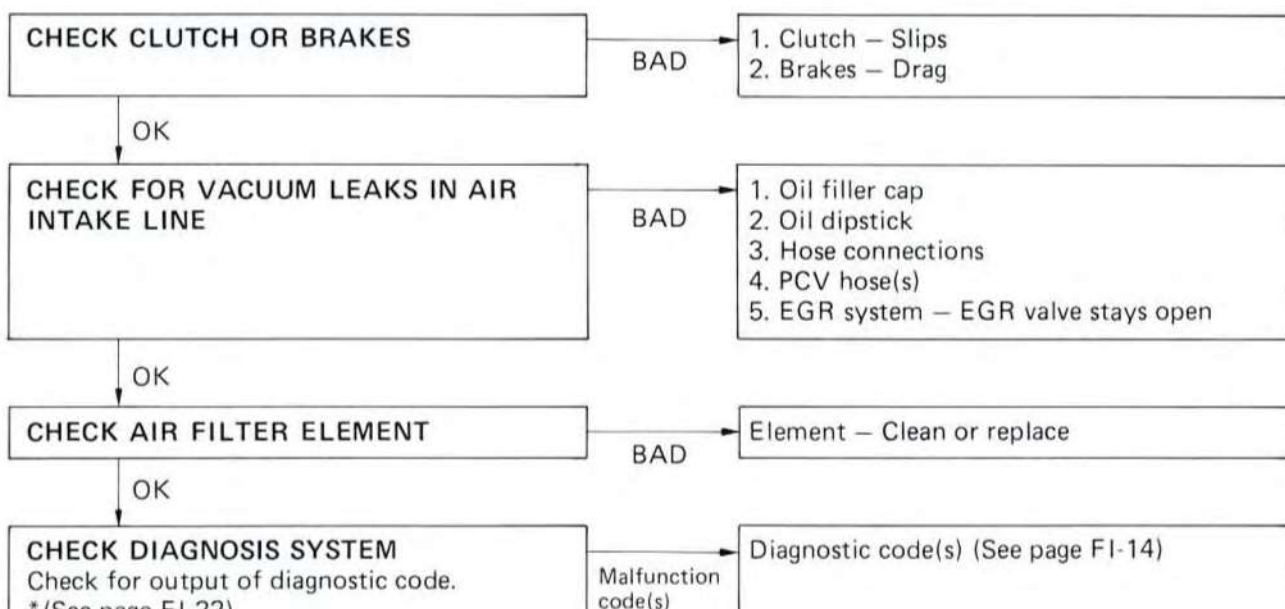


FI-12

EFI SYSTEM — Troubleshooting

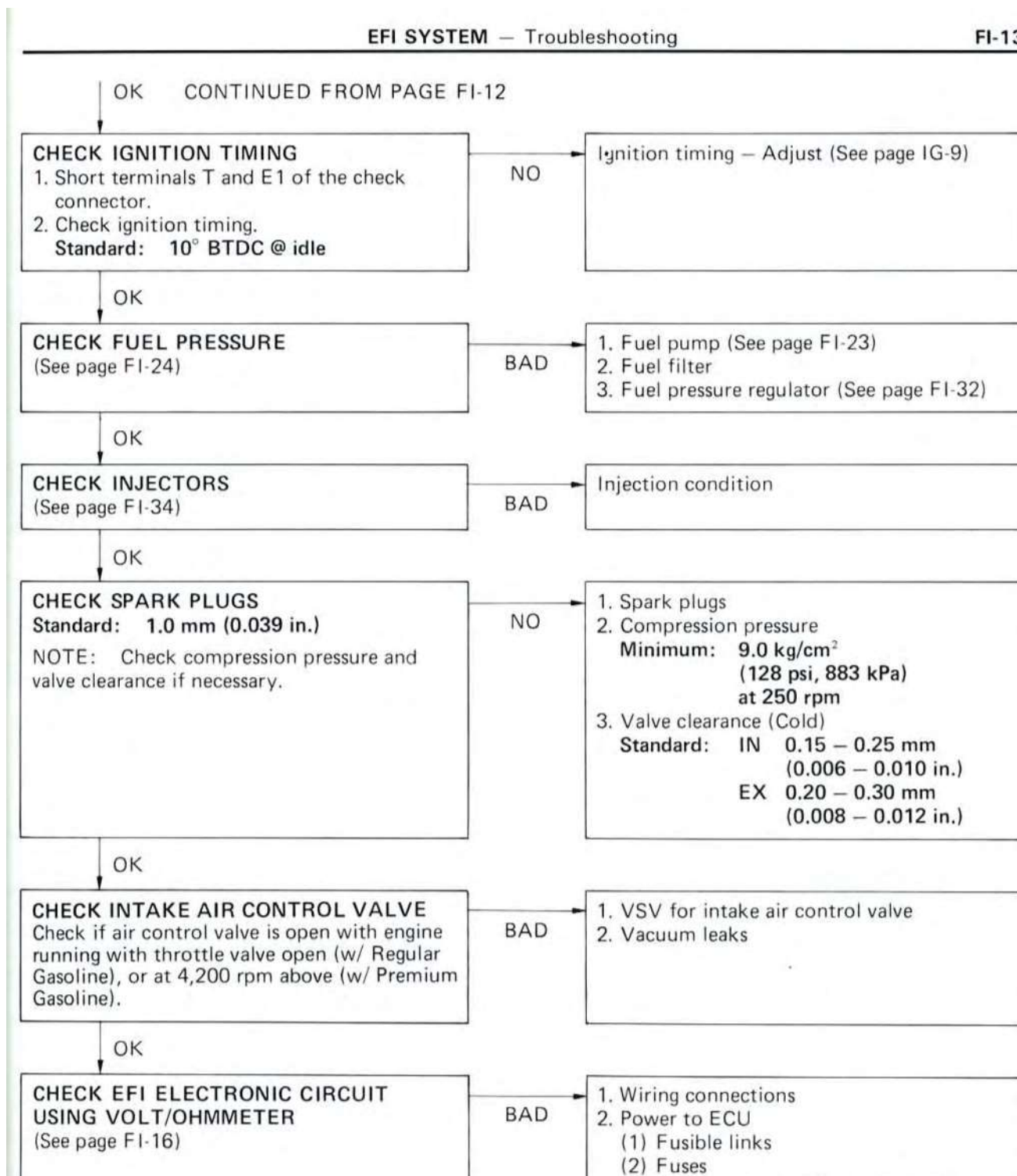


SYMPTOM — ENGINE HESITATES AND/OR POOR ACCELERATION



EFI SYSTEM — Troubleshooting

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FI-14

EFI SYSTEM — Diagnosis System

DIAGNOSIS SYSTEM

DIAGNOSTIC CODES

Code No.	Number of check engine blinks	System	Diagnosis	Trouble area	See page
—	 ON OFF FI1401	Normal	This appears when none of the other codes are identified.	—	—
11	 FI1388	ECU (+B)	Momentary interruption in power supply to ECU.	• IG switch circuit • IG switch • Main relay circuit • Main relay • ECU	* FI-46
12	 FI1389	RPM Signal	No "NE" or "G" signal to ECU within 2 seconds after engine has been cranked.	• Distributor circuit • Distributor • Starter signal circuit • ECU	IG-3
13	 FI1390	RPM Signal	No "NE" signal to ECU when engine speed is above 1,000 rpm.	• Distributor circuit • Distributor • ECU	—
14	 FI1391	Ignition Signal	No "IGF" signal to ECU 8 — 11 times in succession.	• Igniter and ignition coil circuit • Igniter and ignition coil • ECU	* FI-50
21	 FI1400	Oxygen Sensor Signal	Detection of oxygen sensor deterioration.	• Oxygen sensor circuit • Oxygen sensor • ECU	* FI-58
		Oxygen Sensor Heater Circuit	Open or short circuit in oxygen sensor heater.	• Oxygen sensor heater circuit • Oxygen sensor heater • ECU	* FI-58
22	 FI1392	Water Temp. Sensor Signal	Open or short circuit in water temp. sensor signal (THW).	• Water temp. sensor circuit • Water temp. sensor • ECU	* FI-56
24	 FI1611	Intake Air Temp. Sensor Signal	Open or short circuit in intake air temp. sensor signal (THA).	• Intake air temp. sensor circuit • Intake air temp. sensor • ECU	* FI-55
25	 FI2562	Air-fuel Ratio Lean Malfunction	(1) When oxygen sensor signal at the upper (rich) or lower (lean) limit for a certain period of time during feedback condition. (2) When air-fuel ratio feedback compensation value or adaptive control value continues at the upper (rich) or lower (rich) limit renewed for a certain period of time. (3) When air-fuel ratio feedback compensation value or adaptive control value feedback frequency is abnormally high during	• Injector circuit • Injector • Oxygen sensor circuit • Oxygen sensor • ECU • Fuel line pressure • Air flow meter • Air intake system • Ignition system	* FI-58
				• Injector circuit	

EFI SYSTEM — Diagnosis System

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DIAGNOSTIC CODES (Cont'd)

Code No.	Number of check Engine blinks	System	Diagnosis	Trouble area	See page
34	 FI3047	Turbocharging Pressure Signal	When the fuel cut-off due to high turbocharging pressure is occurred.	• Turbocharger • Turbocharging pressure sensor circuit • Turbocharging pressure sensor • ECU	—
35	 FI3048	Turbocharging Pressure Sensor Signal	Open or short circuit in turbocharging sensor pressure sensor signal (PIM).	• Turbocharging pressure sensor circuit • Turbocharging pressure sensor • ECU	FI-21
41	 FI1396	Throttle Position Sensor Signal	Open or short circuit in throttle position sensor signal (VTA).	• Throttle position sensor circuit • Throttle position sensor • ECU	* FI-48
42	 FI1397	Vehicle Speed Sensor Signal	No "SPD" signal for 8 seconds when engine speed is between 2,500 rpm and 6,000 rpm and coolant temp. is below 80°C (176°F) except when racing the engine.	• Vehicle speed sensor circuit • Vehicle speed sensor • ECU	—
43	 FI1398	Starter Signal	No "STA" signal to ECU unit engine speed reaches 800 rpm with vehicle not moving.	• Ignition switch circuit • Ignition switch • ECU	* FI-51
52	 FI1618	Knock Sensor Signal	Open or short circuit in knock sensor signal (KNK).	• Knock sensor circuit • Knock sensor • ECU	—
53	 FI1619	Knock Control Signal in ECU	Knock control in ECU faulty	• ECU	—
54	 FI3049	Intercooler ECU Signal	(1) When coolant level for intercooler is lower than standard. (2) When water pump motor for intercooler locked or opened.	• Intercooler coolant • Coolant level sensor circuit • Coolant level sensor • Intercooler water pump circuit • Intercooler water pump • Intercooler ECU circuit • Intercooler ECU • ECU	—
71	GALIF. only  FI2622	EGR Malfunction	EGR gas temp. below predetermined level for during EGR control.	• EGR system (EGR valve, EGR hose etc.) • EGR gas temp. sensor circuit • EGR gas temp. sensor • EGR control VSV • EGR control VSV circuit • ECU	FI-22

FI-16

EFI SYSTEM — Troubleshooting with Volt/Ohmmeter

TROUBLESHOOTING WITH VOLT/OHMMETER

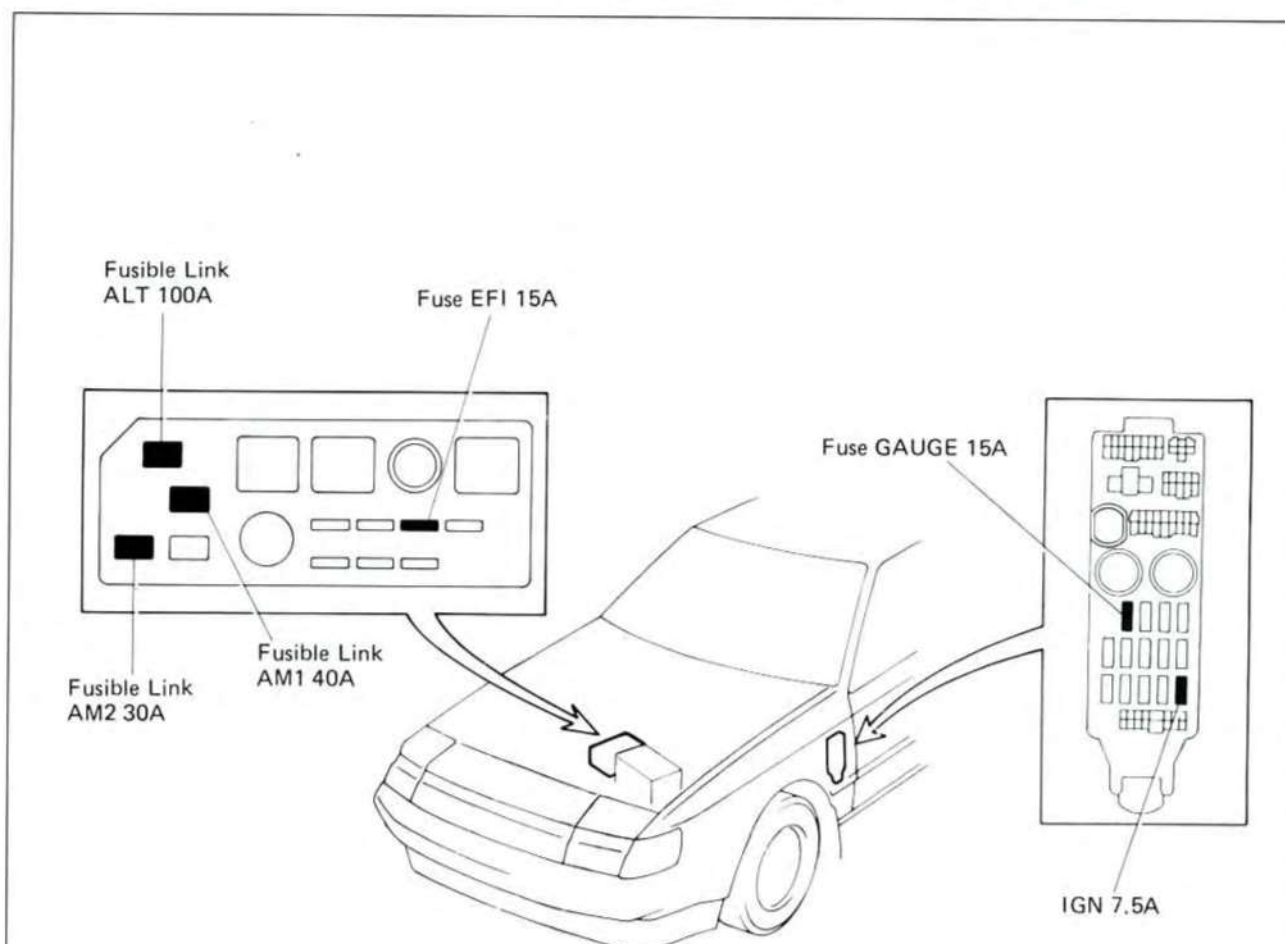
NOTE: The following troubleshooting procedures are designed for inspection of each separate system, and therefore the actual procedure may vary somewhat. However, troubleshooting should be performed referring to the inspection methods described in this manual.

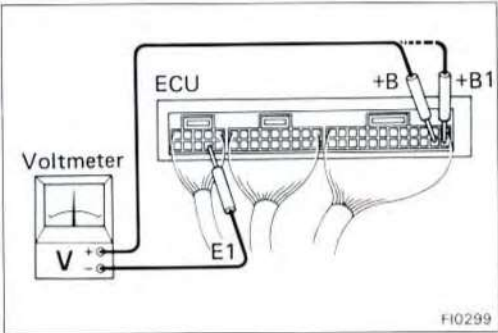
Before beginning inspection, it is best to first make a simple check of the fuses, fusible links and the condition of the connectors.

The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit in a component outside the computer or a short circuit within the computer.

If engine trouble occurs even though proper operating voltage is detected in the computer connector, then it can be assumed the ECU is faulty and should be replaced.

LOCATION OF FUSES AND FUSIBLE LINKS





EFI SYSTEM CHECK PROCEDURE

- NOTE:
- Perform all voltage measurements with the connectors connected.
 - Verity that the battery voltage is 11 V or more when the ignition switch is at "ON".
- Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

Terminals of ECU

Symbol	Terminal name	Symbol	Terminal name	Symbol	Terminal name
E01	ENGINE GROUND	T	CHECK CONNECTOR	A/C	A/C MAGNET SWITCH
E02	ENGINE GROUND	G2	DISTRIBUTOR	SPD	SPEED SENSOR
ISC1	ISC VALVE	VTA	THROTTLE POSITION SENSOR	W	WARNING LIGHT
ISC2	ISC VALVE	NE	DISTRIBUTOR	STP	STOP LIGHT SWITCH
STA	STARTER SWITCH	IDL	THROTTLE POSITION SENSOR	FPU	FUEL PRESSURE VSV
IGT	IGNITER	FPR	FUEL PUMP RELAY	THA	AIR TEMP. SWITCH
STJ	COLD START INJECTOR	HT	OXYGEN SENSOR HEATER	KNK	KNOCK CONTROL SENSOR
E1	ENGINE GROUND	IGF	IGNITER	VS	AIR FLOW METER
T-VIS	T-VIS VSV	OX	OXYGEN SENSOR	PIM	TURBOCHARGING PRESSURE SENSOR
No. 1	No. 1 INJECTOR	THW	WATER TEMP. SENSOR	VC	AIR FLOW METER
No. 2	No. 2 INJECTOR	E2	SENSOR GROUND	*THG	EGR GAS TEMP. SENSOR
No. 3	No. 3 INJECTOR	WIN	INTERCOOLER ECU	BATT	BATTERY
No. 4	No. 4 INJECTOR	E22	SENSOR GROUND	+B	MAIN RELAY
G ⊖	DISTRIBUTOR	TPC	TURBOCHARGING PRESSURE VSV	ELS	HEADLIGHT and DEFOGGER
VF	CHECK CONNECTOR	EGR	EGR CONTROL VSV	+B1	MAIN RELAY
G1	DISTRIBUTOR	*CALIF. only			
ECU Terminals					

FI-18

EFI SYSTEM — Troubleshooting with Volt/Ohmmeter

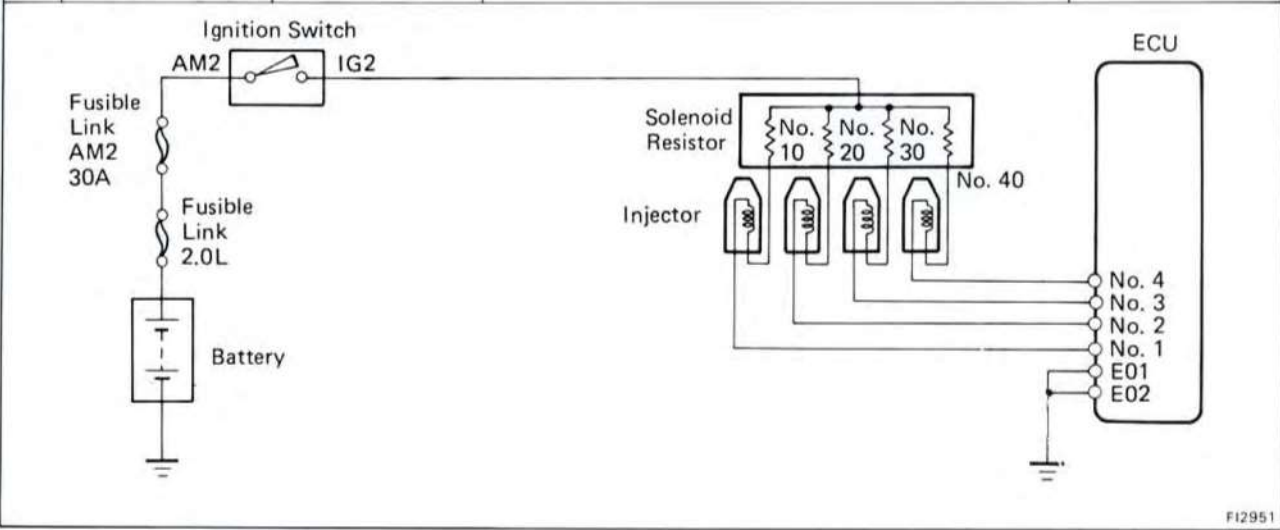
Voltage at ECU Wiring Connectors

No.	Terminals	STD voltage (V)	Condition		See page
1	+B +B1 — E1	10 — 14	Ignition S/W ON		*FI-46
2	BATT — E1	10 — 14	—		*FI-47
3	IDL — E2	4 — 6	Ignition S/W ON	Throttle valve open	*FI-48
	VTA — E2	0.1 — 1.0		Throttle valve fully closed	
		3 — 4.5		Throttle valve open	
	VC — E2	4 — 6		—	
4	IGT — E1	0.7 — 1.0	Cranking or idling		*FI-50
5	STA — E1	6 — 14	Cranking		*FI-51
6	No. 1 No. 2 — E01 No. 3 — E02 No. 4	10 — 14	Ignition S/W ON		FI-19
7	W — E1	8 — 14	No trouble (Check engine warning light off) and engine running		*FI-53
8	VC — E2	4 — 6	Ignition S/W ON	—	*FI-54
	VS — E2	4 — 6		Measuring plate fully closed	
		1.0 or less		Measuring plate fully open	
		2 — 4	Idling		
9	THA — E2	1 — 3	Ignition S/W ON	Intake air temp. 20°C (68°F)	*FI-55
10	THW — E2	0.1 — 1.0		Coolant temp. 80°C (176°F)	*FI-56
11	ISC1 ISC2 — E1	9 — 14	Ignition S/W ON		FI-20
12	PIM — E2	2.5 — 4.5			FI-21
	VC — E2	4 — 6			

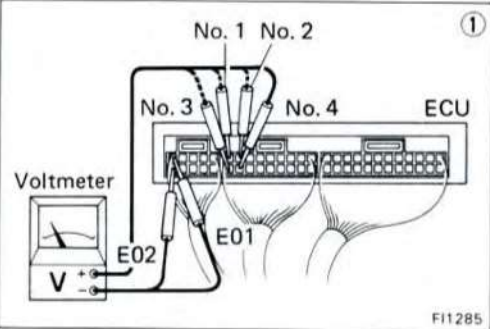
EFI SYSTEM – Troubleshooting with Volt/Ohmmeter

FI-19

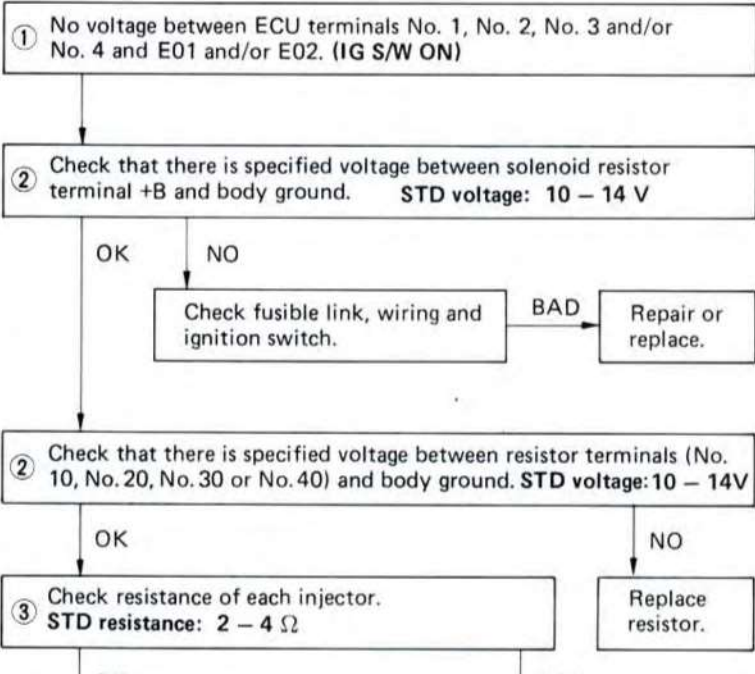
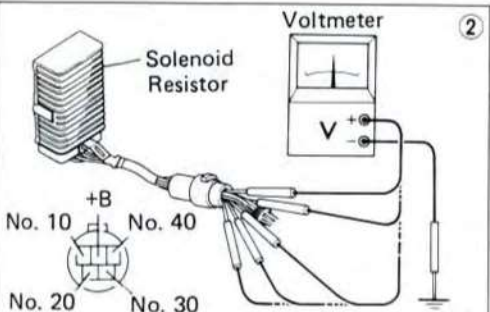
No.	Terminals	Trouble	Condition	STD voltage
6	No. 1 No. 2 – E01 No. 3 – E02 No. 4	No voltage	IG S/W ON	10 – 14 V



FI2951

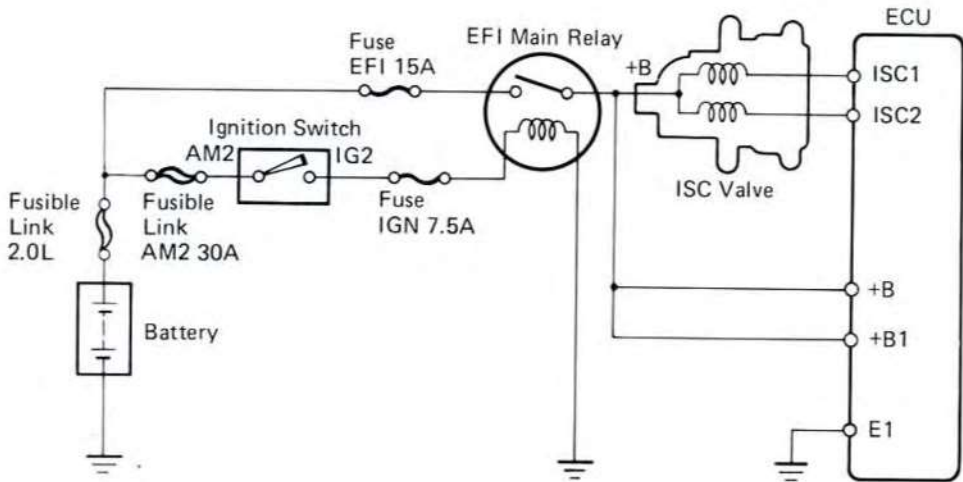


FI1285

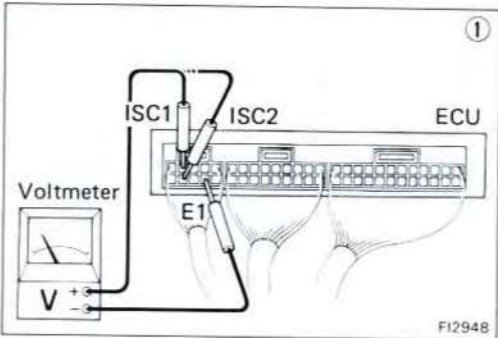


FI-20 EFI SYSTEM — Troubleshooting with Volt/Ohmmeter

No.	Terminals	Trouble	Condition	STD voltage
11	ISC1 ISC2 — E1	No voltage	IG S/W ON	9 – 14 V



FI3062



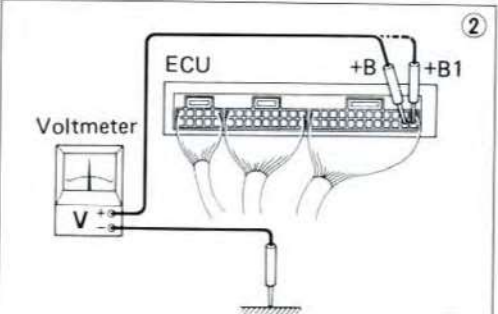
① There is no voltage between ECU terminals ISC1 or ISC2 and E1. (IG S/W ON)

② Check that there is voltage between ECU terminal +B or +B1 and body ground. (IG S/W ON)

OK

NO

Refer to No. 1.
*(See page FI-46)



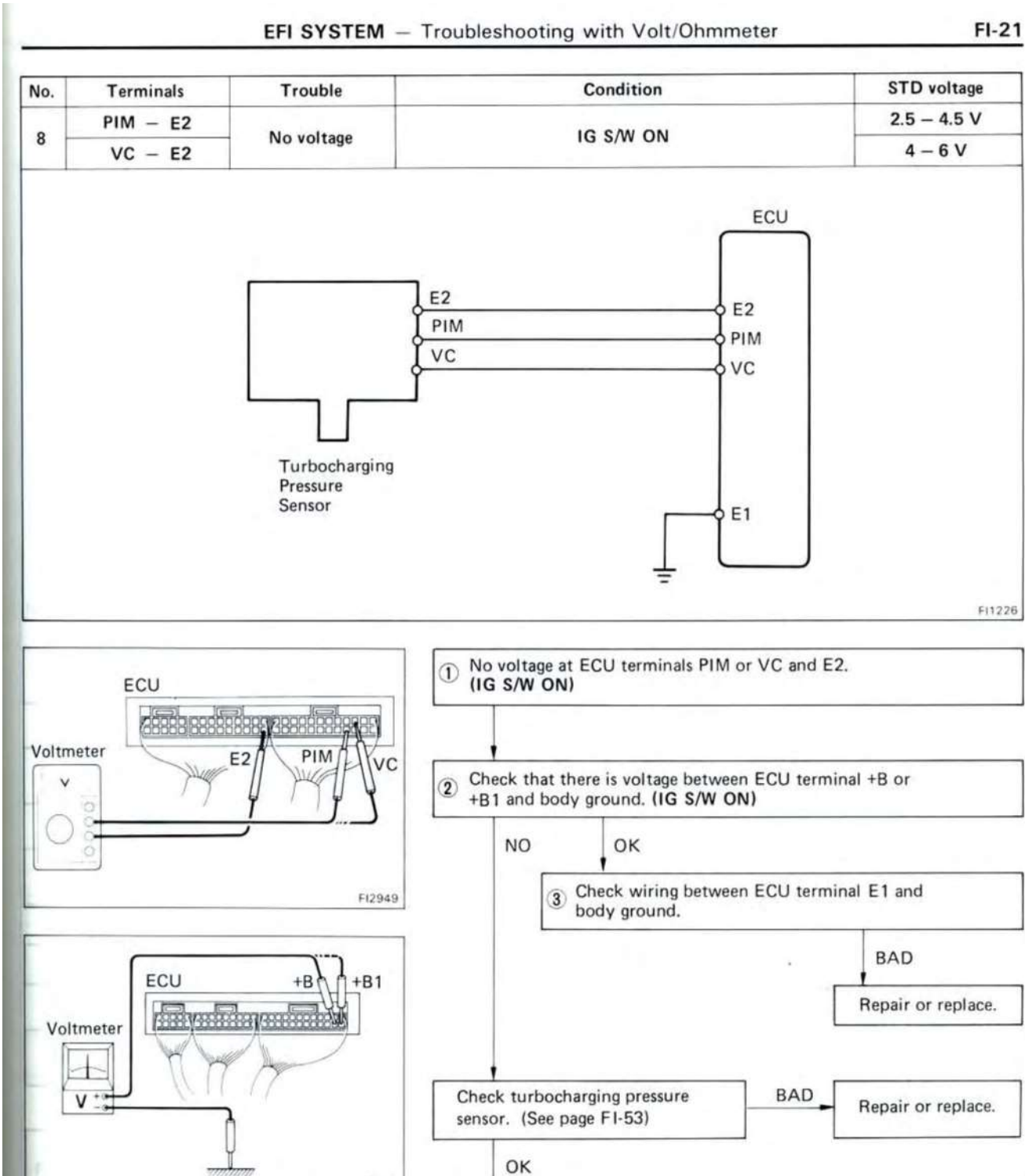
③ Check resistance between ISC valve terminals +B and ISC1 or ISC2. STD resistance: 16.0 – 17.0Ω

BAD → Replace ISC valve.

OK

Check wiring between ECU and ISC valve.

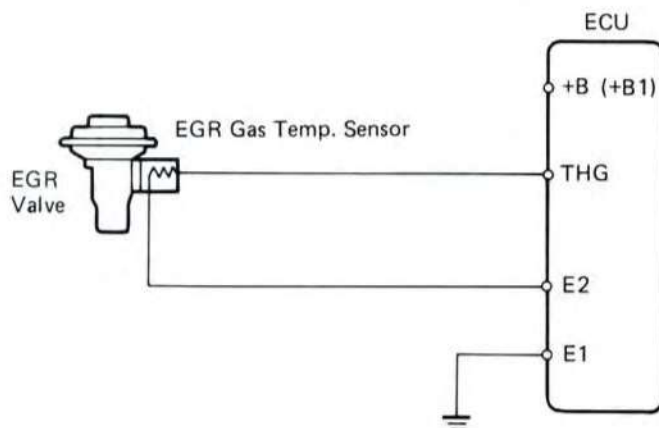
BAD → Repair or replace wiring.



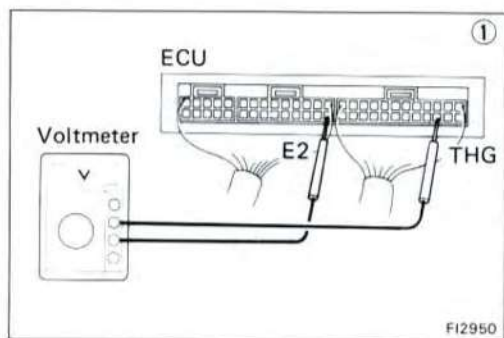
FI-22

EFI SYSTEM — Troubleshooting with Volt/Ohmmeter

CALIF. only



FI2680



① No voltage between ECU terminals THG and E2.
(IG S/W ON)

② Check that there is voltage between ECU terminal +B or +B1
and body ground. (IG S/W ON)

OK

NO

Refer to No. 1.
* (See page FI-46)

Check wiring between ECU terminal E1 and body ground.

OK

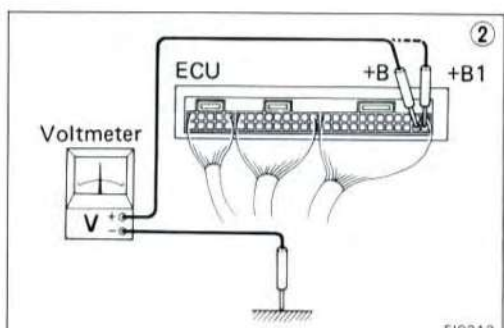
BAD

Repair or replace.

Check EGR system.
(See page EC-19)

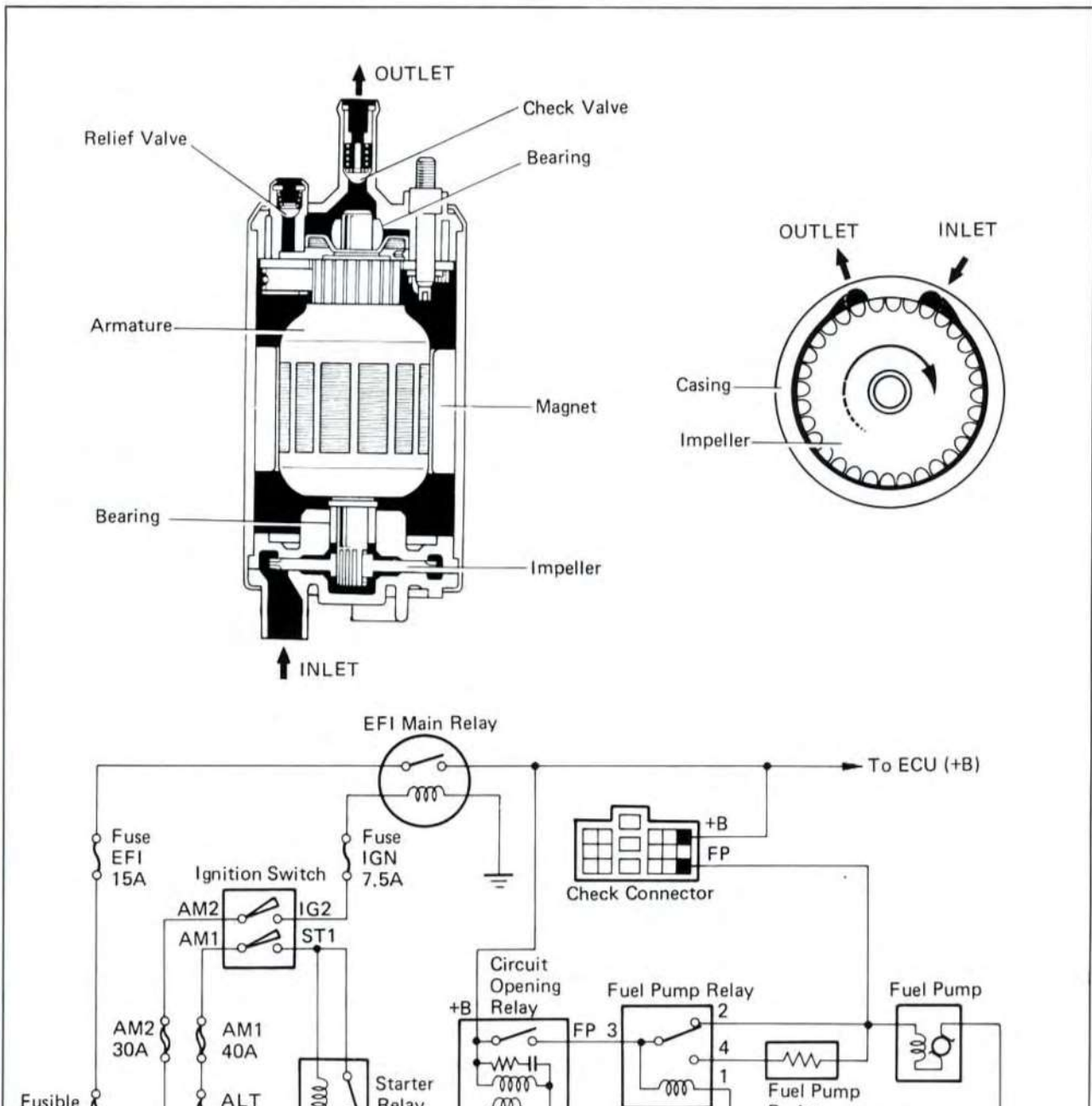
BAD

Repair or replace.



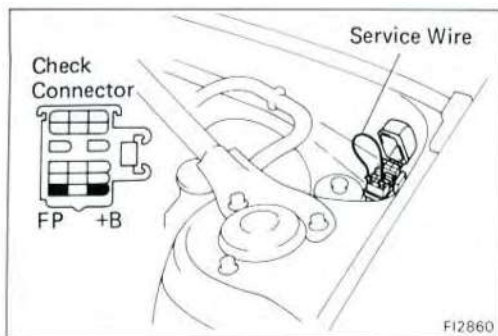
FUEL SYSTEM

Fuel Pump



FI-24

EFI SYSTEM — Fuel System



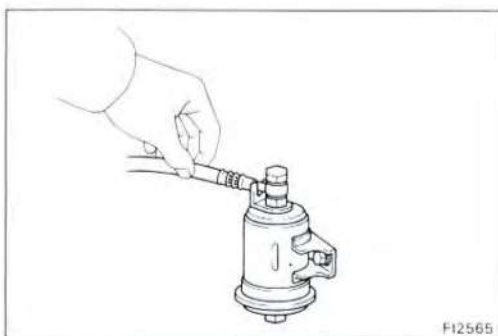
ON-VEHICLE INSPECTION

1. INSPECT FUEL PUMP OPERATION

(a) Using a service wire, short terminals +B and FP of the check connector.

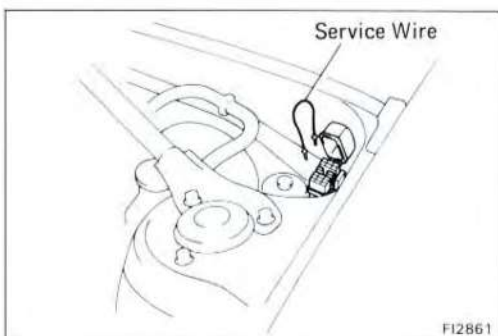
(b) Turn the ignition switch ON.

NOTE: Do not start the engine.



(c) Check that there is pressure in the hose from the fuel filter.

NOTE: At this time, you will hear fuel return noise.



(d) Remove the service wire.

(e) Turn the ignition switch OFF.

If there is no pressure, check the following parts:

- Fusible links
- Fuses (EFI 15A, IGN 7.5A)
- EFI main relay
- Circuit opening relay
- Fuel pump
- Fuel pump relay
- Fuel pump resistor
- Wiring connections

2. INSPECT FUEL PRESSURE

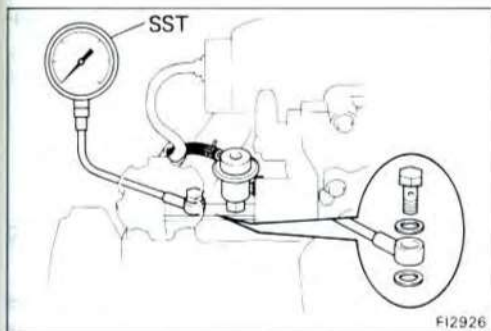
(a) Check the battery voltage above 12 volts.

(b) Disconnect the cable from the negative (⊖) terminal of the battery.

(c) Disconnect the cold start injector connector.

EFI SYSTEM — Fuel System

FI-25

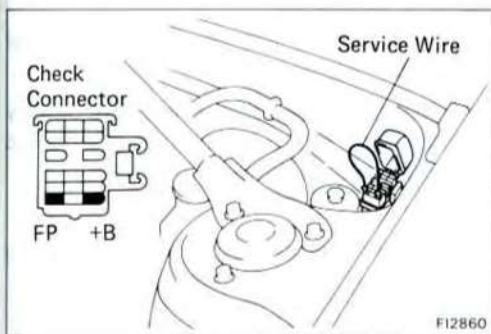


- (f) Install SST (pressure gauge) to the delivery pipe with new two gaskets and union bolt.

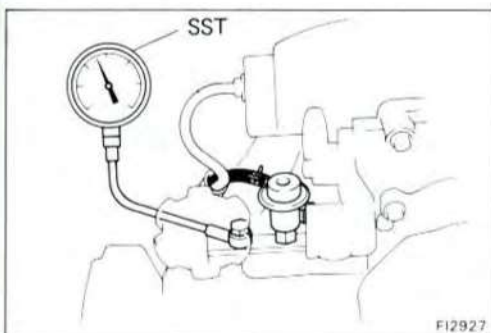
SST 09268-45012

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

- (g) Wipe off any splattered gasoline.
(h) Reconnect the battery negative (⊖) cable.



- (i) Using a service wire, short terminals +B and FP of the check connector.



- (j) Turn the ignition switch ON.
(k) Measure the fuel pressure.

Fuel pressure:

2.3 — 2.7 kg/cm²

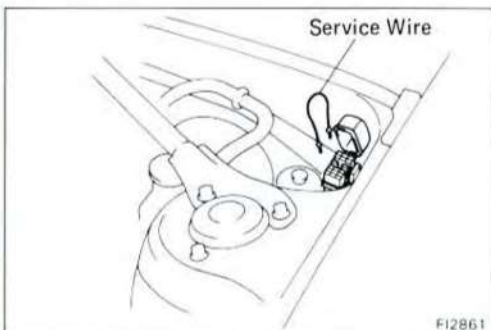
(33 — 38 psi, 226 — 265 kPa)

If pressure is high, replace the fuel pressure regulator.

If pressure is low, check the following parts:

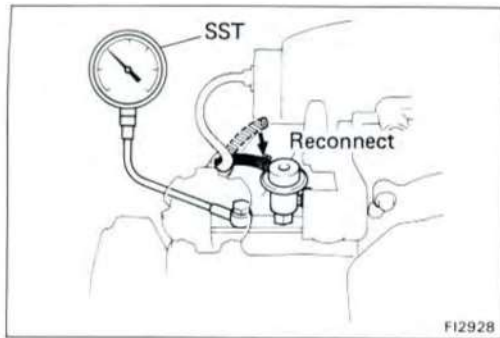
- Fuel hoses and connection
- Fuel pump
- Fuel filter
- Fuel pressure regulator

- (l) Remove the service wire.



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EFI SYSTEM — Fuel System



- (p) Reconnect the vacuum sensing hose to the fuel pressure regulator.
- (q) Measure the fuel pressure at idling.

Fuel pressure:

1.9 – 2.2 kg/cm²

(27 – 31 psi, 186 – 216 kPa)

If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

- (r) Stop the engine. Check that the fuel pressure remains 1.5 kg/cm² (21 psi, 147 kPa) or more for 5 minutes after the engine is turned off.

If pressure is not as specified, check the fuel pump, fuel pressure regulator and/or injector.

- (s) After checking fuel pressure, disconnect the battery negative (⊖) cable and carefully remove the SST to prevent gasoline from splashing.

SST 09268-45012

- (t) Install the cold start injector pipe with new two gaskets and union bolt.

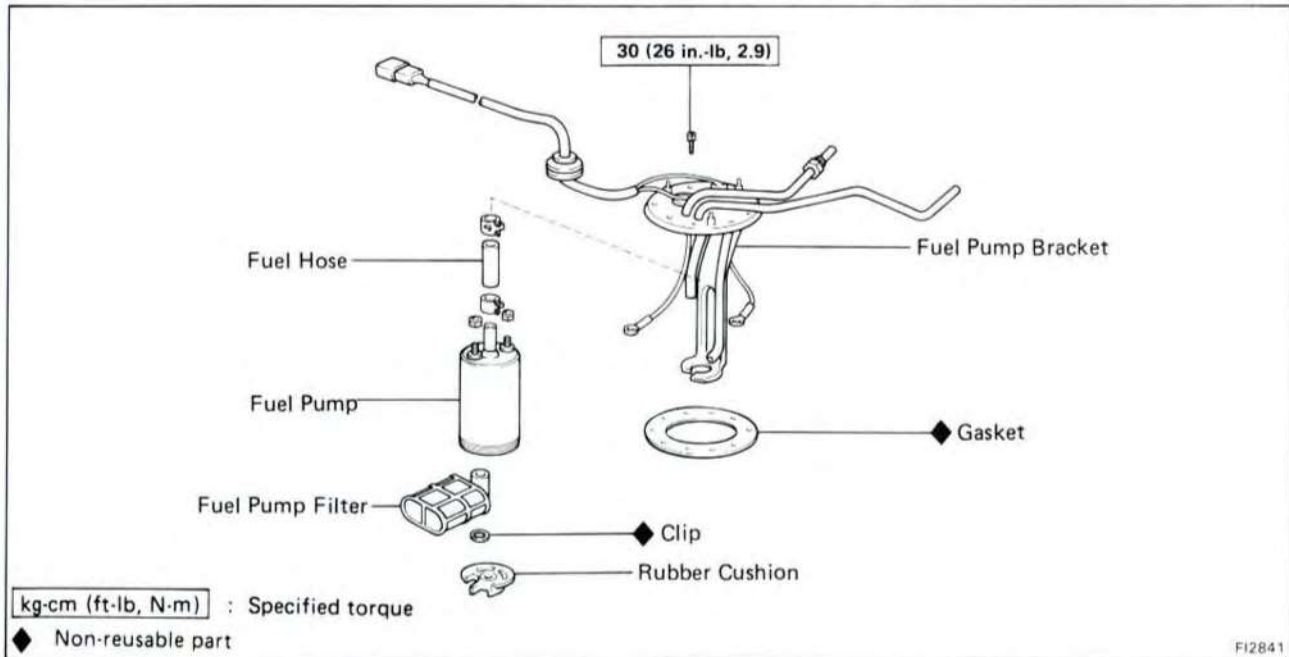
Torque: 180 kg-cm (13 ft-lb, 18 N·m)

- (u) Reconnect the cold start injector connector.
- (v) Reconnect the cable to the negative (⊖) terminal of the battery.
- (w) Check for fuel leakage.

EFI SYSTEM — Fuel System

FI-27

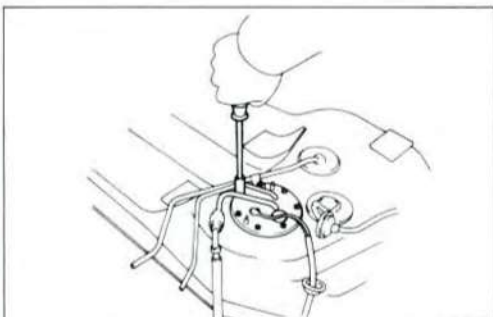
REMOVAL OF FUEL PUMP

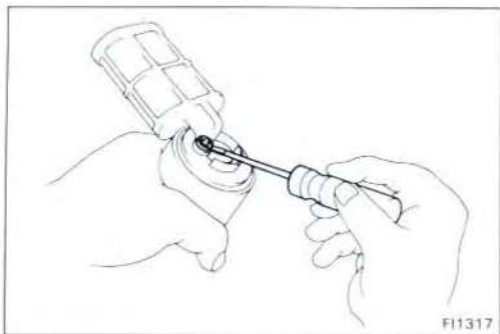


1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. DRAIN FUEL FROM FUEL TANK
WARNING: Do not smoke or work near an open flame when working on the fuel pump.
3. REMOVE FUEL TANK

4. REMOVE FUEL PUMP BRACKET FROM FUEL TANK

- (a) Remove the seven bolts.
- (b) Pull out the pump bracket.

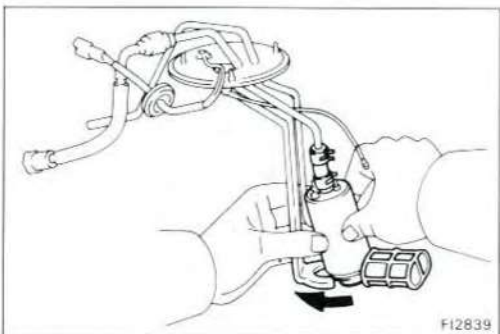


FI-28**EFI SYSTEM — Fuel System**

FI1317

6. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

- (a) Remove the rubber cushion.
- (b) Using a small screwdriver, remove the clip.
- (c) Pull out the pump filter.



FI2839

INSTALLATION OF FUEL PUMP

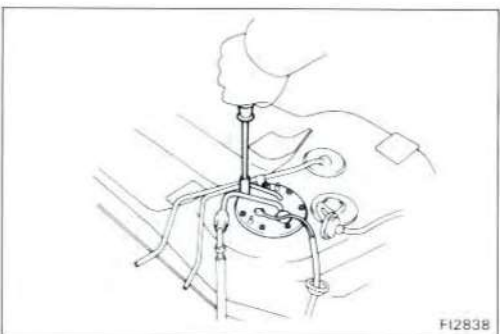
(See page FI-27)

1. INSTALL FUEL PUMP FILTER TO FUEL PUMP

- (a) Install the pump filter with the clip.
- (b) Install the rubber cushion.

2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

- (a) Connect the fuel hose to the outlet port of the fuel pump.
- (b) Push the lower side of the fuel pump, and install the fuel pump.



FI2838

3. INSTALL FUEL PUMP BRACKET TO FUEL TANK

Install a new gasket and the pump bracket with the seven bolts.

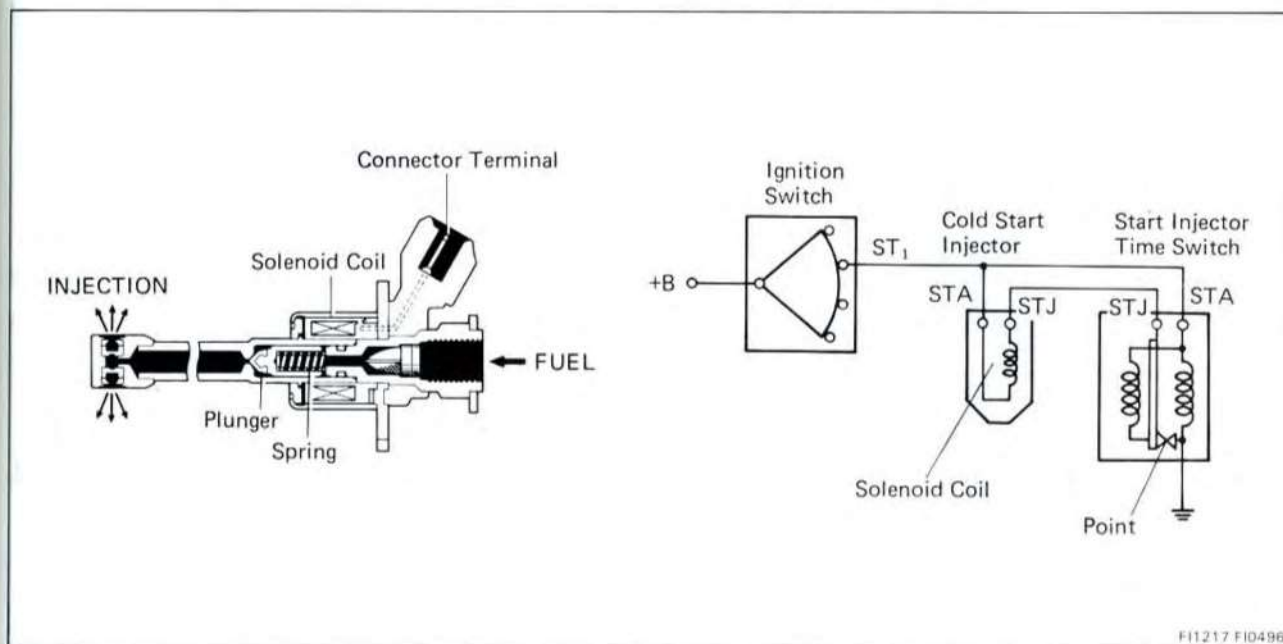
Torque: 30 kg-cm (26 in.-lb, 2.9 N·m)

4. INSTALL FUEL TANK

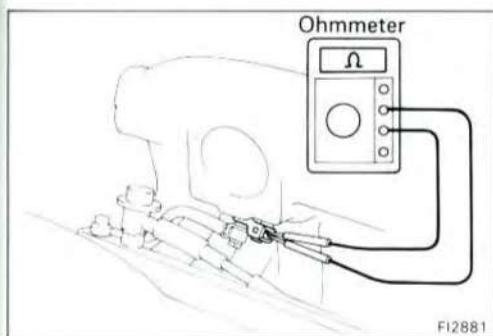
When installing the fuel tank, refer to FI-39 for the installation position of the cushion and the tightening torque.

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Cold Start Injector



FI1217 FI0496



FI2881

ON-VEHICLE INSPECTION

INSPECT RESISTANCE OF COLD START INJECTOR

- Remove the throttle body.
(See steps 1 to 10 on page FI-41)
- Disconnect the cold start injector connector.
- Using an ohmmeter, measure the resistance between the terminals.

Resistance: 2 — 4 Ω

If the resistance is not as specified, replace the injector.

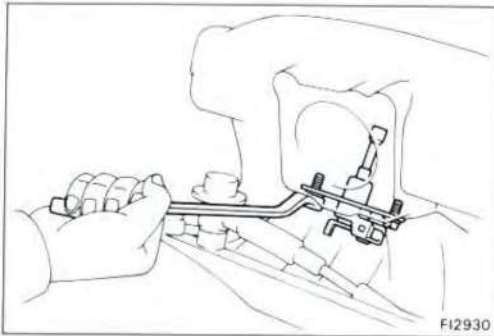
- Reconnect the cold start injector connector.
- Reinstall the throttle body.
(See steps 2 to 12 on page FI-43)

REMOVAL OF COLD START INJECTOR

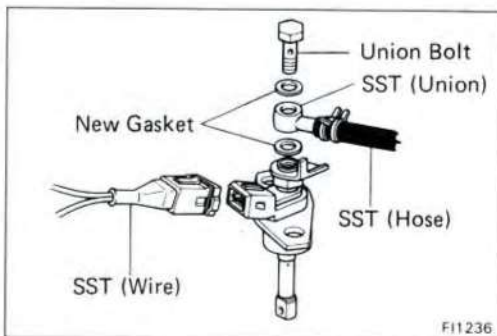
- REMOVE THROTTLE BODY**
(See steps 1 to 10 on page FI-41)
- DISCONNECT COLD START INJECTOR CONNECTOR**

FI-30

EFI SYSTEM — Fuel System

**5. REMOVE COLD START INJECTOR**

Remove the two bolts, injector and gasket.

**INSPECTION OF COLD START INJECTOR****1. INSPECT INJECTION OF COLD START INJECTOR**

WARNING: Keep clear of sparks during the test.

- (a) Install SST (union) to the injector and delivery pipe with new gaskets and the union bolts.

SST 09268-41045

- (b) Connect the unions with SST (hose).

SST 09268-41045

- (c) Connect SST (wire) to the injector.

SST 09842-30050

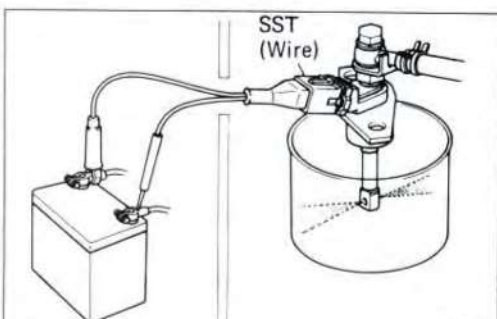
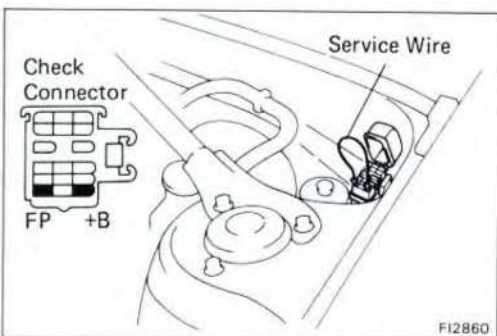
- (d) Put a container under the injector.

- (e) Reconnect the battery negative (⊖) cable.

- (f) Using a service wire, short terminals +B and FP of the check connector.

- (g) Turn the ignition switch ON.

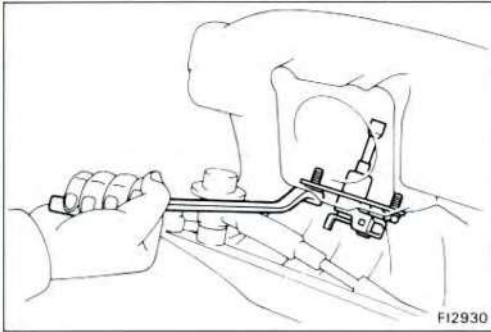
NOTE: Do not start the engine.



- (h) Connect the test probes of the SST (wire) to the battery, and check that the fuel spray is as shown.

SST 09842-30050

CAUTION: Perform this within the shortest possible time.

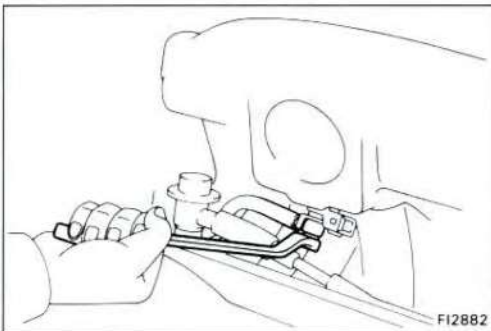


INSTALLATION OF COLD START INJECTOR

1. INSTALL COLD START INJECTOR

Install a new gasket and the injector with the two bolts.

Torque: 60 kg-cm (52 in.-lb, 5.9 N·m)



2. INSTALL COLD START INJECTOR PIPE

Install the injector pipe with new four gaskets and the two union bolts.

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

3. CONNECT COLD START INJECTOR CONNECTOR

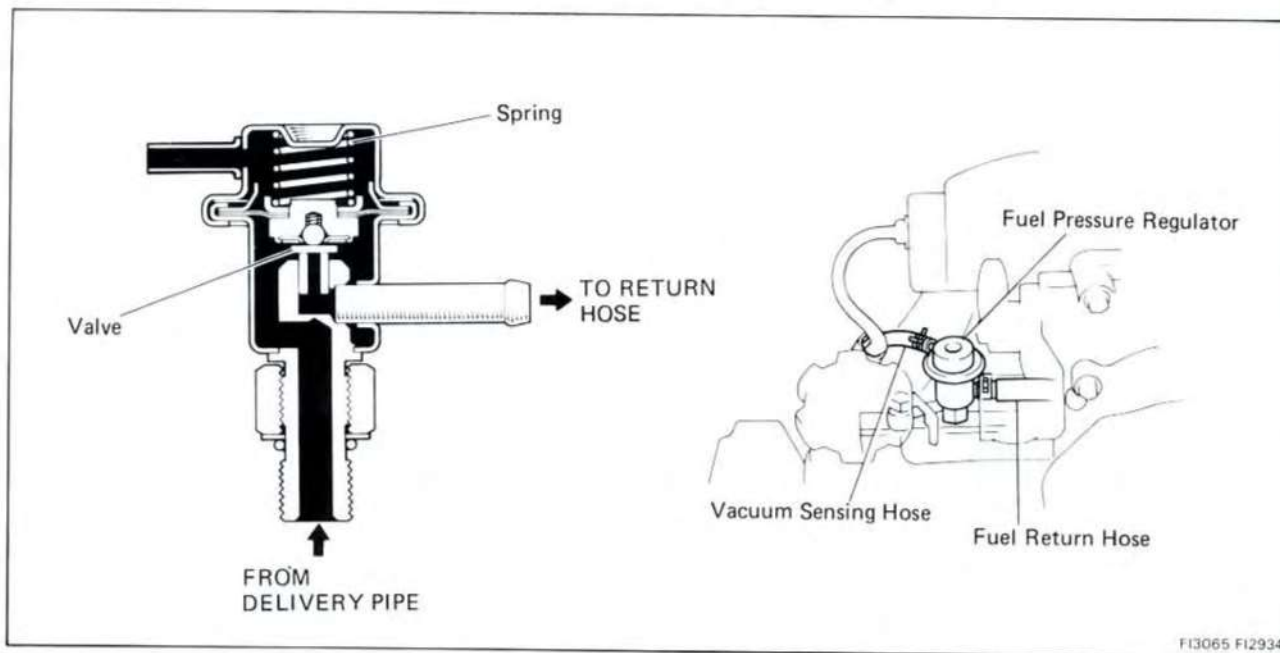
4. INSTALL THROTTLE BODY

(See steps 2 to 12 on page FI-43)

FI-32

EFI SYSTEM — Fuel System

Fuel Pressure Regulator



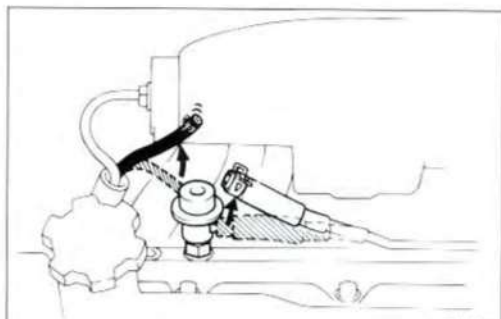
FI3065 FI2934

ON-VEHICLE INSPECTION

INSPECT FUEL PRESSURE (See page FI-24)

REMOVAL OF FUEL PRESSURE REGULATOR

1. REMOVE THROTTLE BODY
(See steps 2 to 10 on page FI-41)
2. DISCONNECT COLD START INJECTOR PIPE
(See step 3 on page FI-29)
3. DISCONNECT VACUUM SENSING HOSE
4. DISCONNECT FUEL RETURN HOSE
 - (a) Put a suitable container or shop towel under the pressure regulator.
 - (b) Disconnect the return hose.

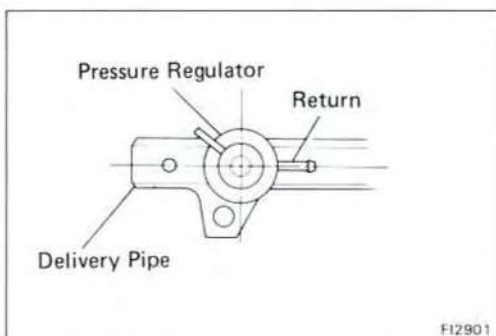


EFI SYSTEM — Fuel System

FI-33

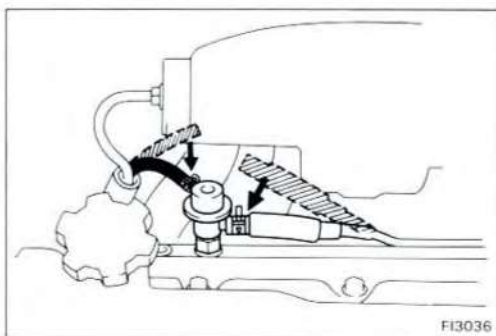
**INSTALLATION OF FUEL PRESSURE REGULATOR****1. INSTALL FUEL PRESSURE REGULATOR**

- (a) Fully loosen the lock nut of the pressure regulator.
- (b) Apply a light coat of gasoline to a new O- ring, and install it to the pressure regulator.



- (c) Thrust the pressure regulator completely into the delivery pipe by hand.
- (d) Turn the pressure regulator counterclockwise until the outlet faces in the direction indicated in the figure.
- (e) Torque the lock nut.

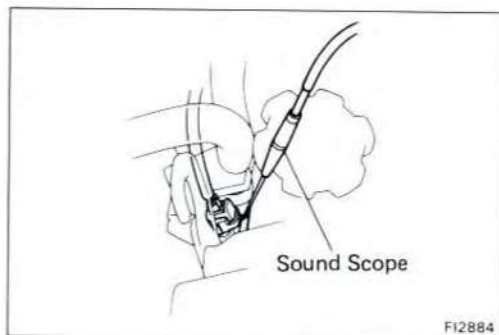
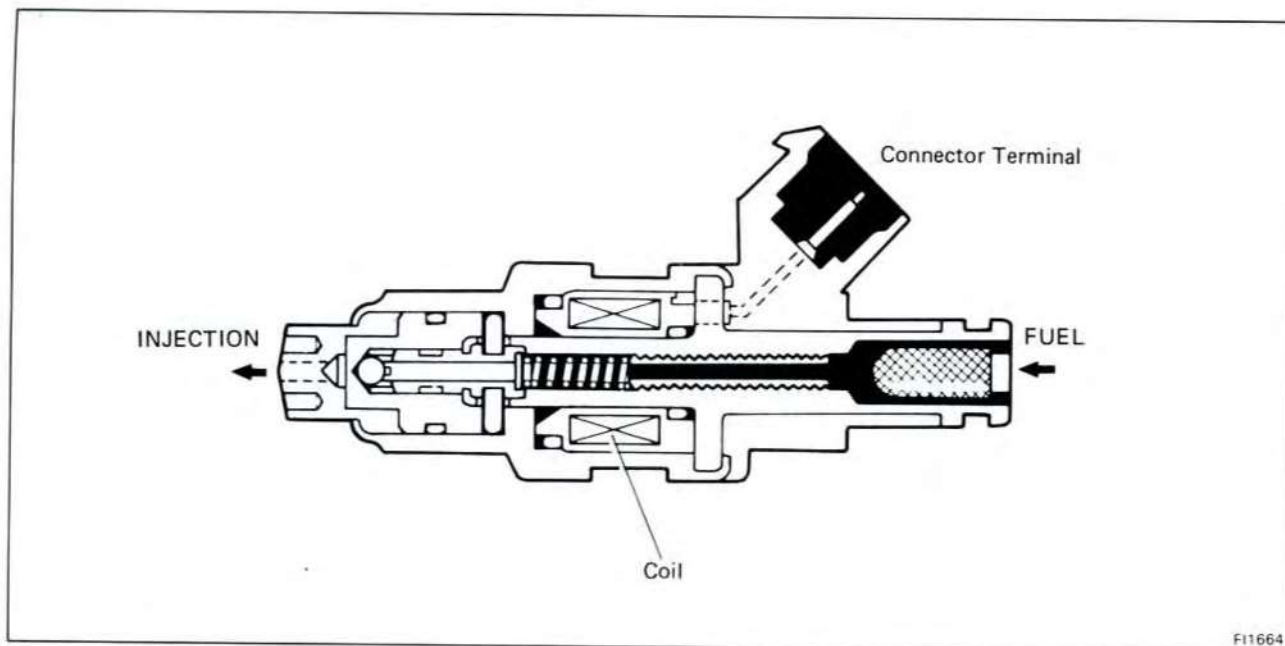
Torque: 300 kg-cm (22 ft-lb, 29 N·m)

**2. CONNECT FUEL RETURN HOSE****3. CONNECT VACUUM SENSING HOSE****4. CONNECT COLD START INJECTOR PIPE**
(See step 2 on page FI-31)**5. INSTALL THROTTLE BODY**
(See steps 2 to 12 on page FI-43)

FI-34

EFI SYSTEM — Fuel System

Injectors



ON-VEHICLE INSPECTION

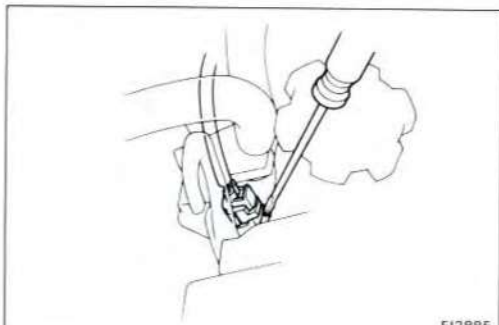
1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

- (a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine rpm.

- (b) If you have no sound scope, you can check the injector transmission operation with a screwdriver.

If no sound or an unusual sound is heard, check the wiring connector, injector, resistor, or injection signal from ECU.



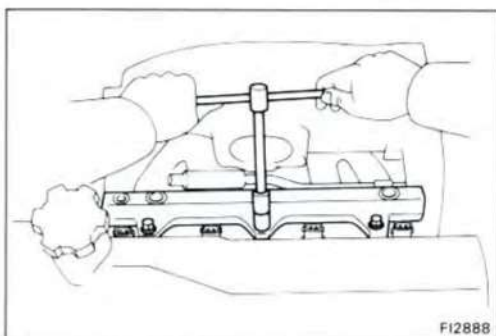
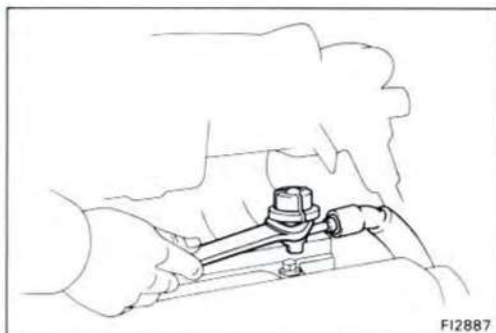
2. INSPECT INJECTOR RESISTANCE

EFI SYSTEM — Fuel System

FI-35

REMOVAL OF INJECTORS

1. **REMOVE THROTTLE BODY**
(See steps 1 and 10 on page FI-41)
2. **REMOVE FUEL PRESSURE REGULATOR**
(See steps 3 to 5 on page FI-54)
3. **REMOVE EGR VACUUM MODULATOR**
4. **DISCONNECT INJECTOR CONNECTORS**
5. **DISCONNECT FUEL INLET HOSE**
Remove the pulsation damper and two gaskets.
6. **DISCONNECT FUEL RETURN HOSE**
Disconnect the fuel hose from the return pipe.



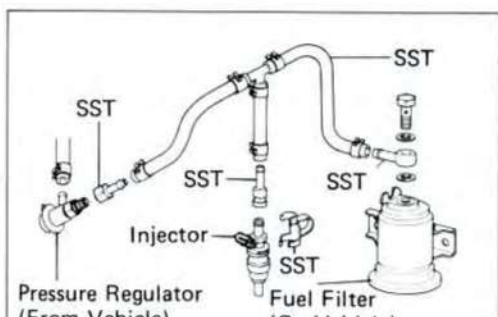
7. **REMOVE DELIVERY PIPE AND INJECTORS**
 - (a) Remove the three bolts and delivery pipe together with the four injectors.

CAUTION: Be careful not to drop the injectors, when the removing the delivery pipe.

 - (b) Remove the three spacers and four insulators from the cylinder head.
 - (c) Pull out the four injectors from the delivery pipe.
8. **REMOVE FUEL RETURN PIPE FROM DELIVERY PIPE**

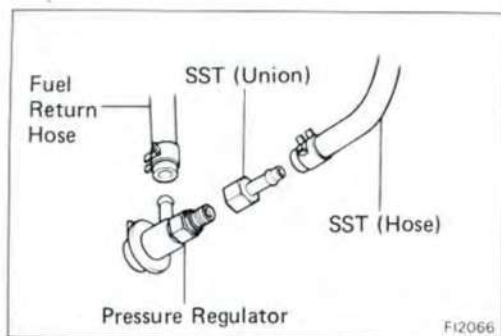
INSPECTION OF INJECTORS

1. **INSPECT INJECTOR INJECTION**
WARNING: Keep clear of sparks during the test.



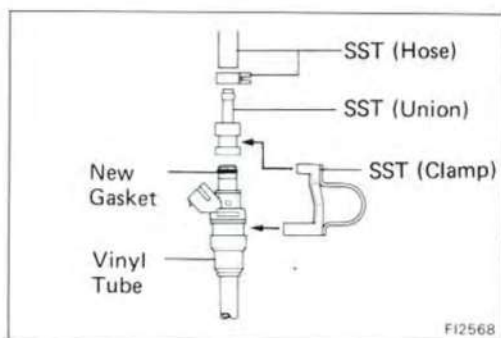
FI-36

EFI SYSTEM — Fuel System



- (c) Connect the fuel return hose and SST (union) to the pressure regulator with SST (union).

SST 09268-41045

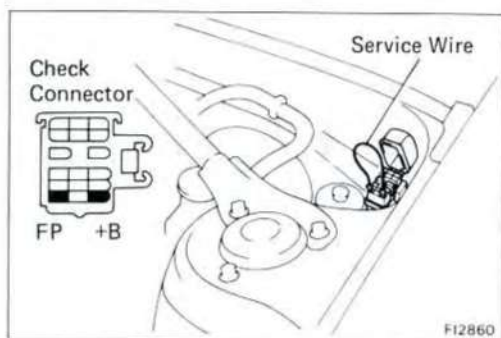


- (d) Connect SST (union and hose) to the injector, and hold the injector and SST (union) with SST (clamp).

SST 09268-41045

- (e) Put the injector into the graduated cylinder.

NOTE: Install the a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

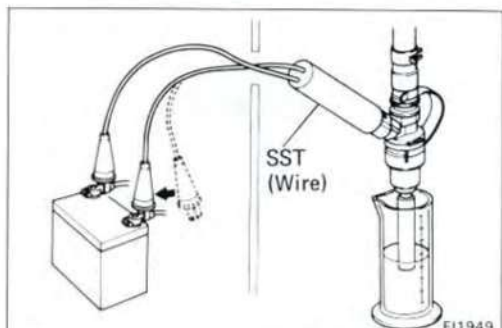


- (f) Reconnect the battery negative (⊖) cable.

- (g) Using a service wire, short terminals +B and FP of the check connector.

- (h) Turn the ignition switch ON.

NOTE: Do not start the engine.



- (i) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector two or three times.

SST 09842-30060

Volume: 104 — 110 cc (6.3 — 6.7 cu in.) per 15 sec.

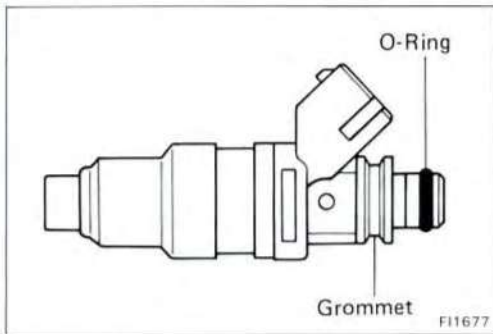
Difference between each injector:

5 cc (0.31 cu in.) or less

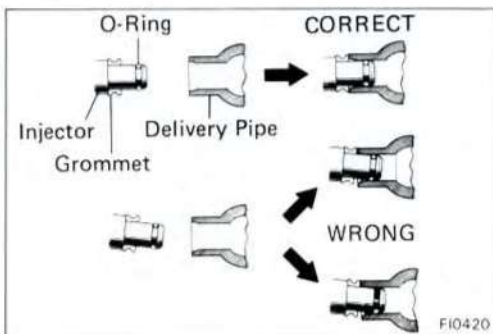
If the injection volume is not as specified, replace the injector.

EFI SYSTEM — Fuel System

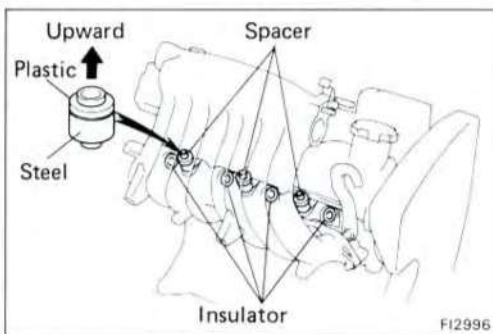
FI-37

**INSTALLATION OF INJECTORS****1. INSTALL FUEL RETURN PIPE TO DELIVERY PIPE****2. INSTALL INJECTORS AND DELIVERY PIPE**

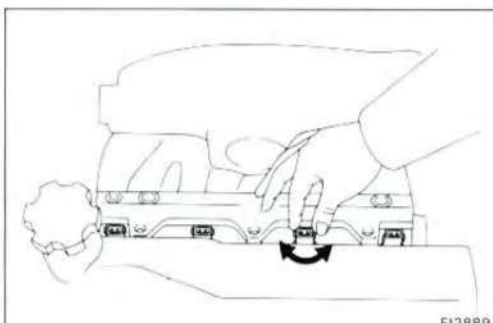
- (a) Install a new grommet to the injector.
- (b) Apply a light coat of gasoline to a new O-ring and install it to the injector.



- (c) While turning the injector left and right, install it to the delivery pipe. Install the four injectors.

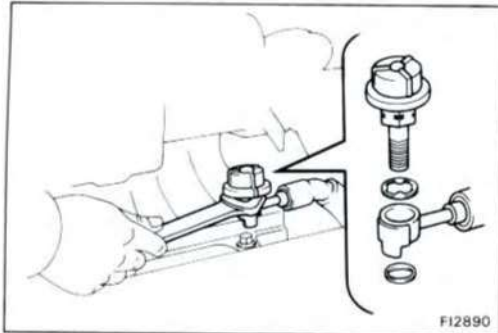


- (d) Place the four insulators and three spacers in position on the cylinder head.
- (e) Place the injectors together with the delivery pipe in position on the cylinder head.



- (f) Check that the injectors rotate smoothly.

NOTE: If the injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings. Replace the O-rings.

FI-38**EFI SYSTEM — Fuel System****3. CONNECT FUEL INLET HOSE**

Connect the inlet hose with new two gaskets and pulsation damper.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

4. CONNECT FUEL RETURN HOSE

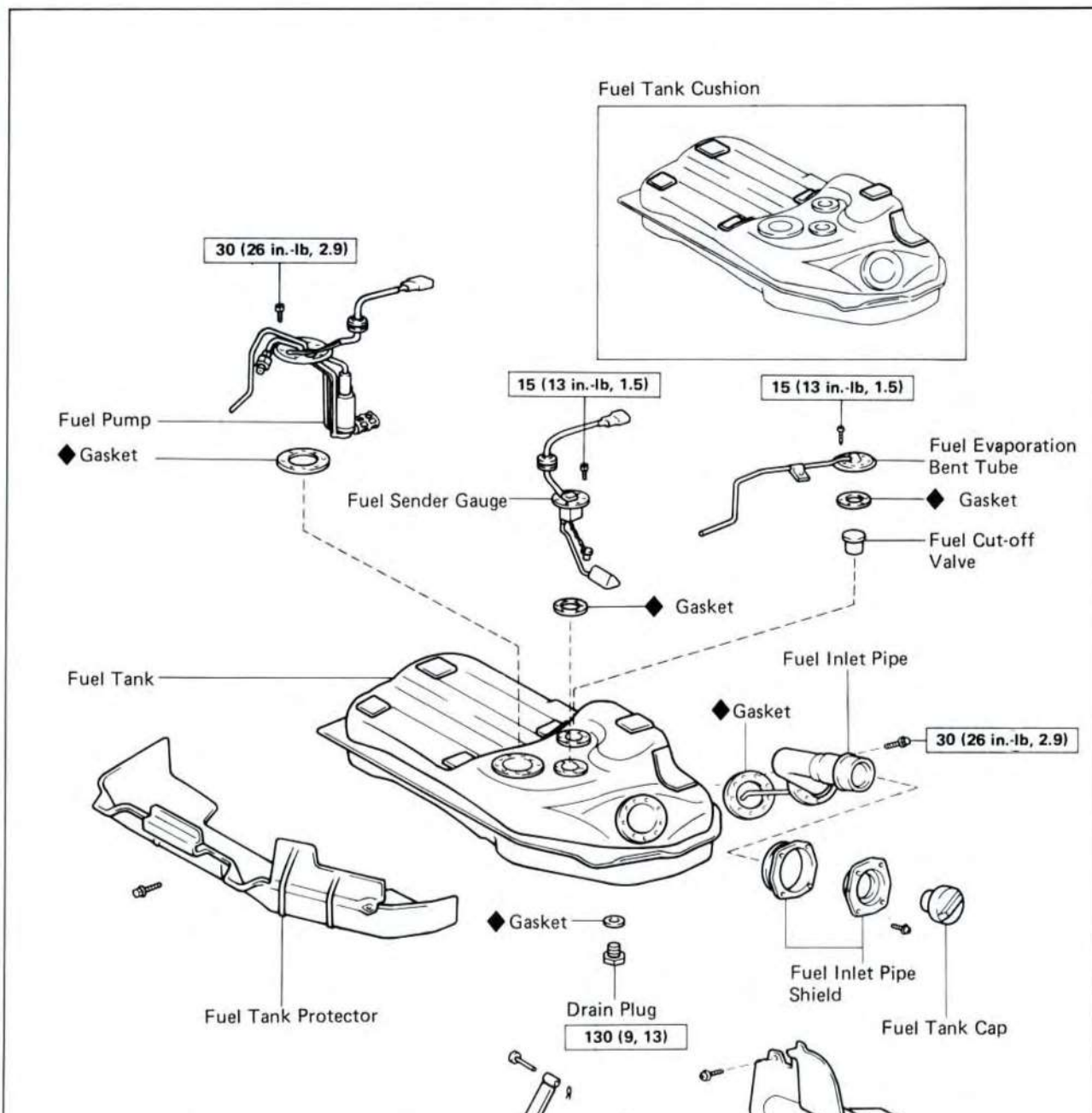
Connect the fuel hose to the return pipe.

5. CONNECT INJECTOR CONNECTORS**6. INSTALL EGR VACUUM MODULATOR****7. INSTALL FUEL PRESSURE REGULATOR**
(See steps 1 to 3 on page FI-33)**8. INSTALL THROTTLE BODY**
(See steps 2 and 12 on page FI-43)

EFI SYSTEM — Fuel System

FI-39

Fuel Tank and Lines COMPONENTS

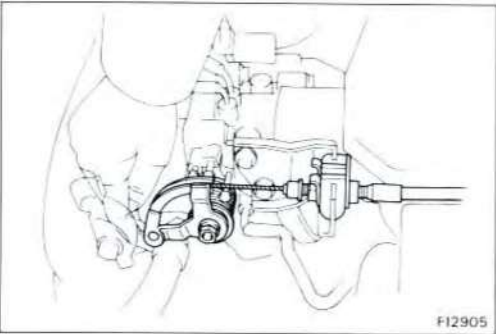
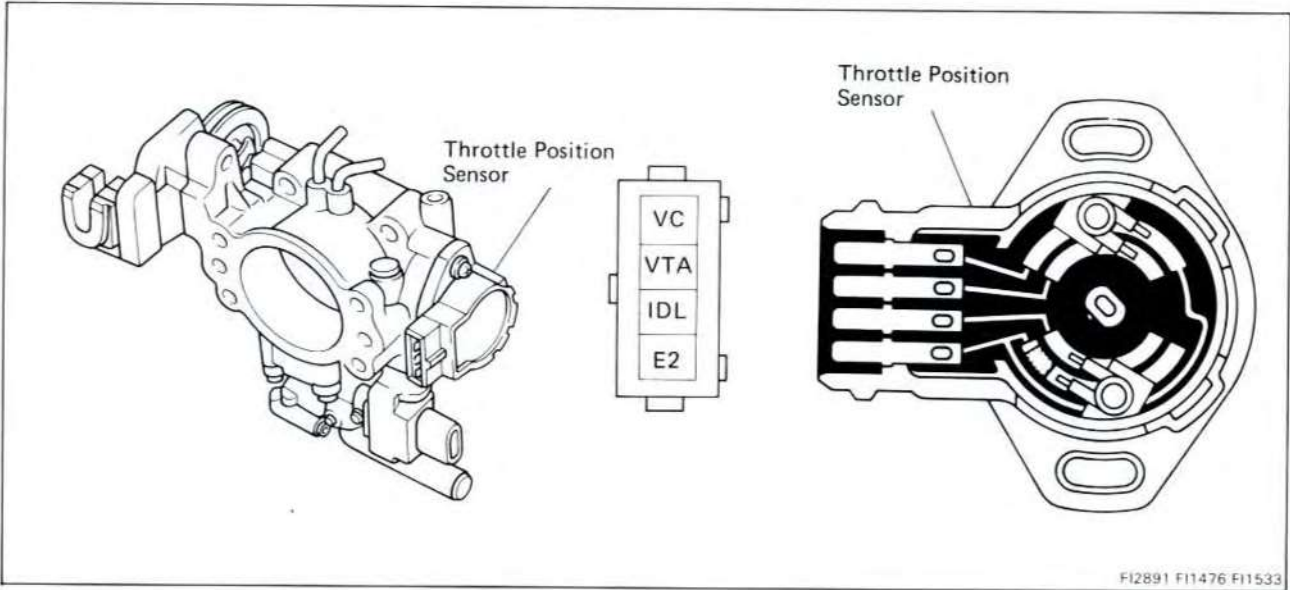


FI-40

EFI SYSTEM — Air Induction System

AIR INDUCTION SYSTEM

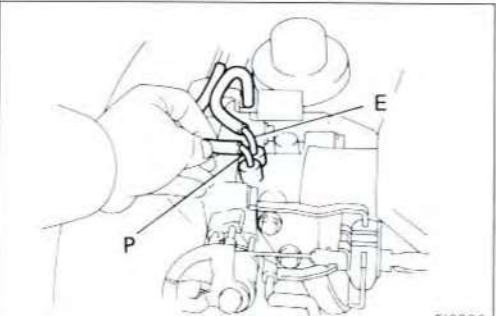
Throttle Body



ON-VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.

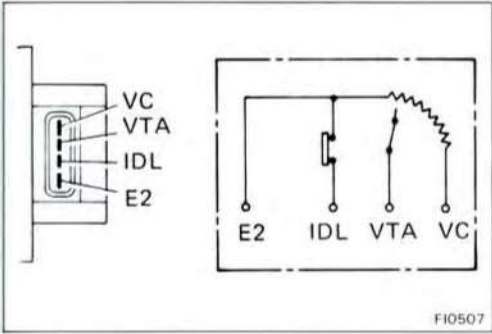


- (b) Check the vacuum at each port.
- Start the engine.
 - Check the vacuum with your finger.

Port No.	At idling	Other than idling
E	No vacuum	Vacuum
P	No vacuum	Vacuum

EFI SYSTEM — Air Induction System

FI-41

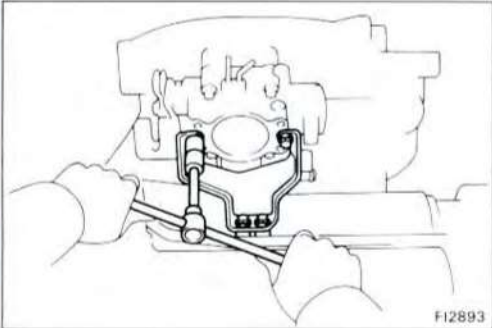
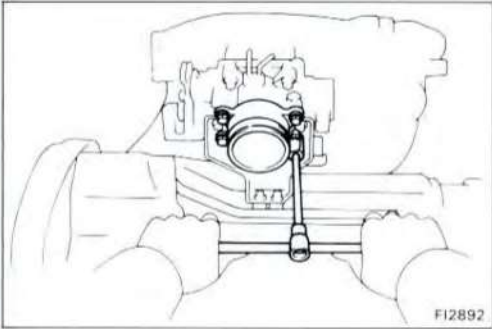


Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA — E2	0.2 — 0.8 k Ω
0.50 mm (0.020 in.)	IDL — E2	2.3 k Ω or less
0.70 mm (0.028 in.)	IDL — E2	Infinity
Throttle valve fully opened	VTA — E2	3.3 — 10.3 k Ω
—	VC — E2	3 — 8.3 k Ω

(d) Reconnect the sensor connector.

REMOVAL OF THROTTLE BODY

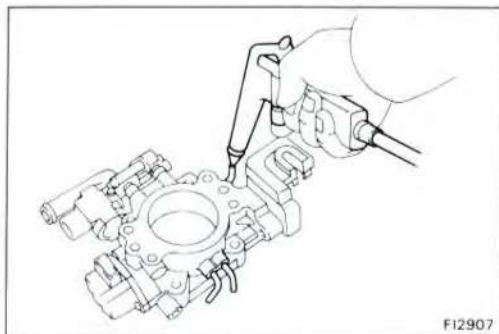
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. DRAIN ENGINE COOLANT (See page CO-4)
3. DRAIN INTERCOOLER COOLANT (See page TC-7)
4. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE
5. REMOVE INTERCOOLER (See step 7 on page TC-10)
6. REMOVE AIR CONNECTOR
Remove the four bolts and air connector.



7. REMOVE AIR CONNECTOR STAY
Remove the four bolts, air connector stay and two spacers.
8. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR
9. DISCONNECT ISC VALVE CONNECTOR

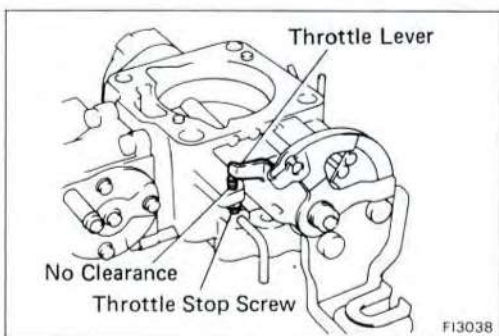
FI-42

EFI SYSTEM — Air Induction System

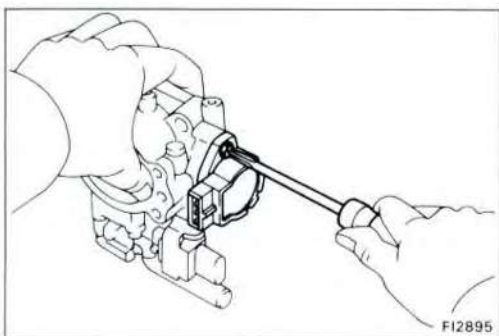
**INSPECTION OF THROTTLE BODY****1. CLEAN THROTTLE BODY**

- (a) Using a soft brush and carburetor cleaner, clean the cast parts.
- (b) Using compressed air, clean all the passages and apertures.

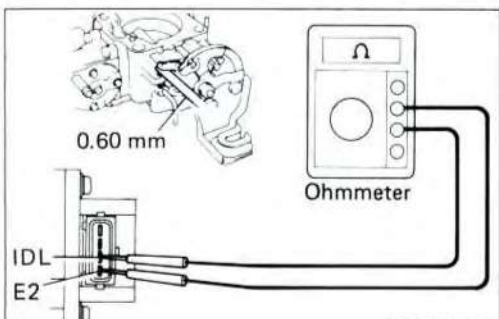
CAUTION: To prevent deterioration, do not clean the throttle position sensor.

**2. INSPECT THROTTLE VALVE**

Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

**3. INSPECT THROTTLE POSITION SENSOR**
(See page 2 on page FI-40)**4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR**

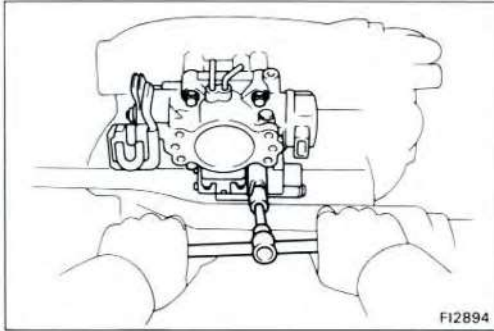
- (a) Loosen the two mount screws of the sensor.



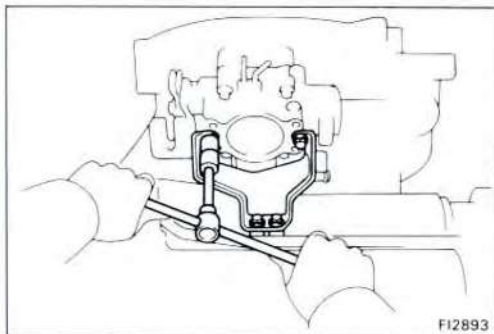
- (b) Insert a feeler gauge 0.60 mm (0.024 in.) between the throttle stop screw and throttle lever.

- (c) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.

- (d) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the screws.

EFI SYSTEM — Air Induction System**FI-43****INSTALLATION OF THROTTLE BODY**

1. **INSTALL ISC VALVE TO THROTTLE BODY**
(See step 1 on page FI-45)
2. **INSTALL THROTTLE BODY**
 - (a) Install a new gasket and the throttle body with the four bolts.
Torque: 195 kg-cm (14 ft-lb, 19 N·m)
 - (b) Connect the following hoses:
 - Water hoses
 - Air tube hose
 - Emission control vacuum hoses
3. **CONNECT ISC VALVE CONNECTOR**
4. **CONNECT THROTTLE POSITION SENSOR CONNECTOR**

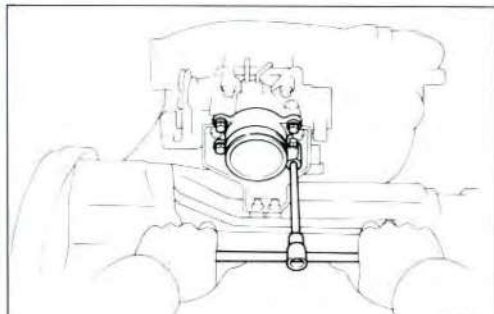


5. **INSTALL AIR CONNECTOR STAY**

Install the air connector stay with the two spacers and four bolts.

Torque:

 - 10 mm bolt head 80 kg-cm (69 in.-lb, 7.8 N·m)
 - 12 mm bolt head 195 kg-cm (14 ft-lb, 19 N·m)



6. **INSTALL AIR CONNECTOR**

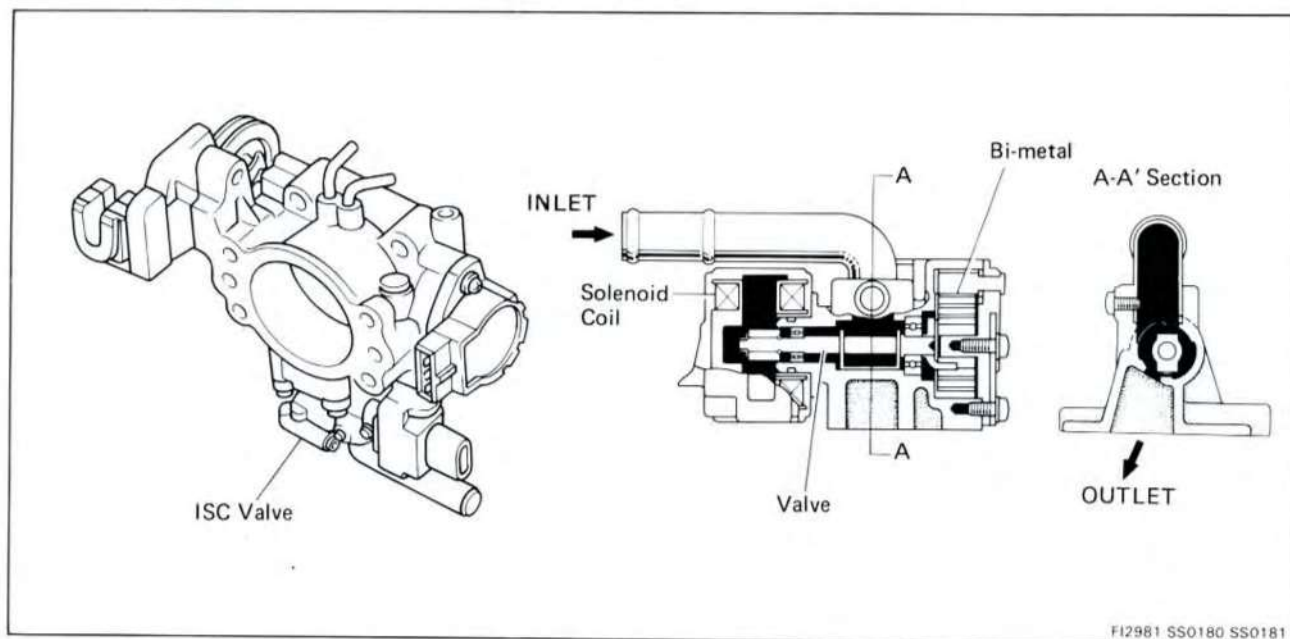
Install the air connector with the four bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

FI-44

EFI SYSTEM — Air Induction System

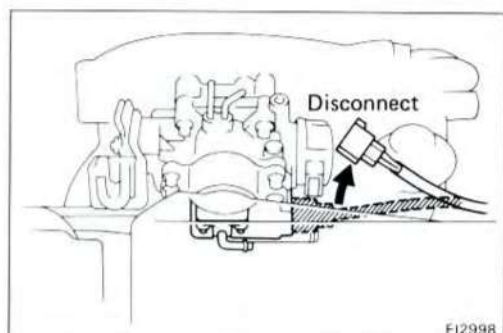
Idle Speed Control (ISC) Valve



ON-VEHICLE INSPECTION

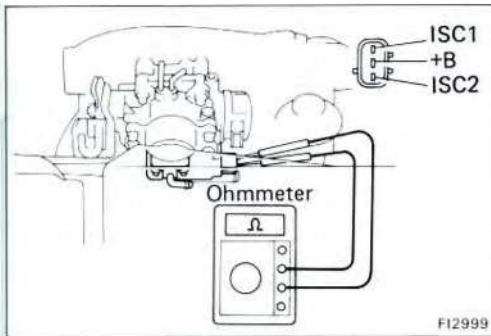
1. INSPECT ISC VALVE OPERATION

- (a) Initial conditions
 - Engine at reach normal operating temperature
 - Idle speed set correctly



- (b) Disconnect the ISC valve connector.
- (c) Check the engine rpm.

Engine rpm: 1,000 rpm or more



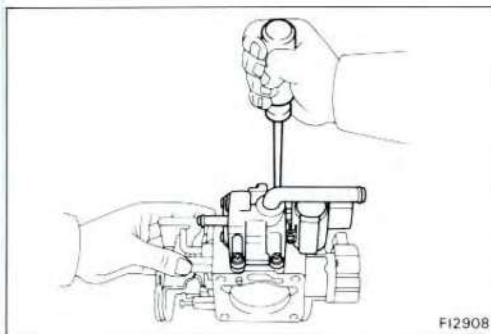
2. INSPECT ISC VALVE RESISTANCE

- Disconnect the ISC valve connector.
- Measure the resistance between the terminal +B and other terminals (ISC1, ISC2).

Resistance: 16.0 — 17.0 Ω each

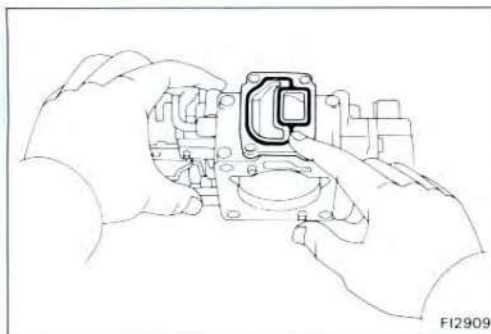
If the resistance is not as specified, replace the valve.

- Reconnect the ISC valve connector.



REMOVAL OF ISC VALVE

- REMOVE THROTTLE BODY**
(See steps 1 to 10 on page FI-41)
- REMOVE ISC VALVE FROM THROTTLE BODY**
Remove the four screws, ISC valve and gasket.



INSTALLATION OF ISC VALVE

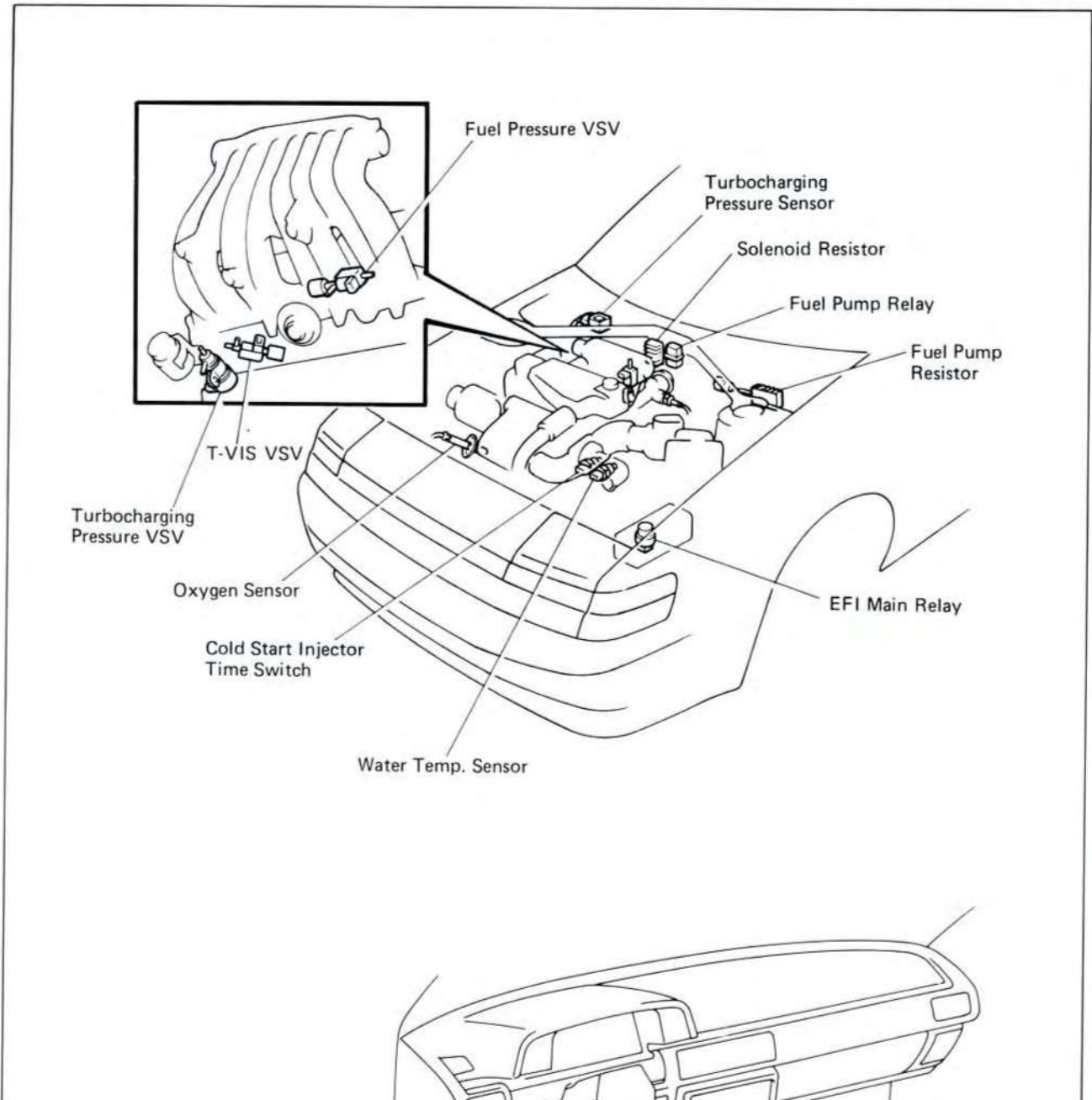
- INSTALL ISC VALVE TO THROTTLE BODY**
 - Place a new gasket on the throttle body.
 - Install the ISC valve with the four screws.
- INSTALL THROTTLE BODY**
(See steps 2 to 12 on page FI-43)

FI-46

EFI SYSTEM — Electronic Control System

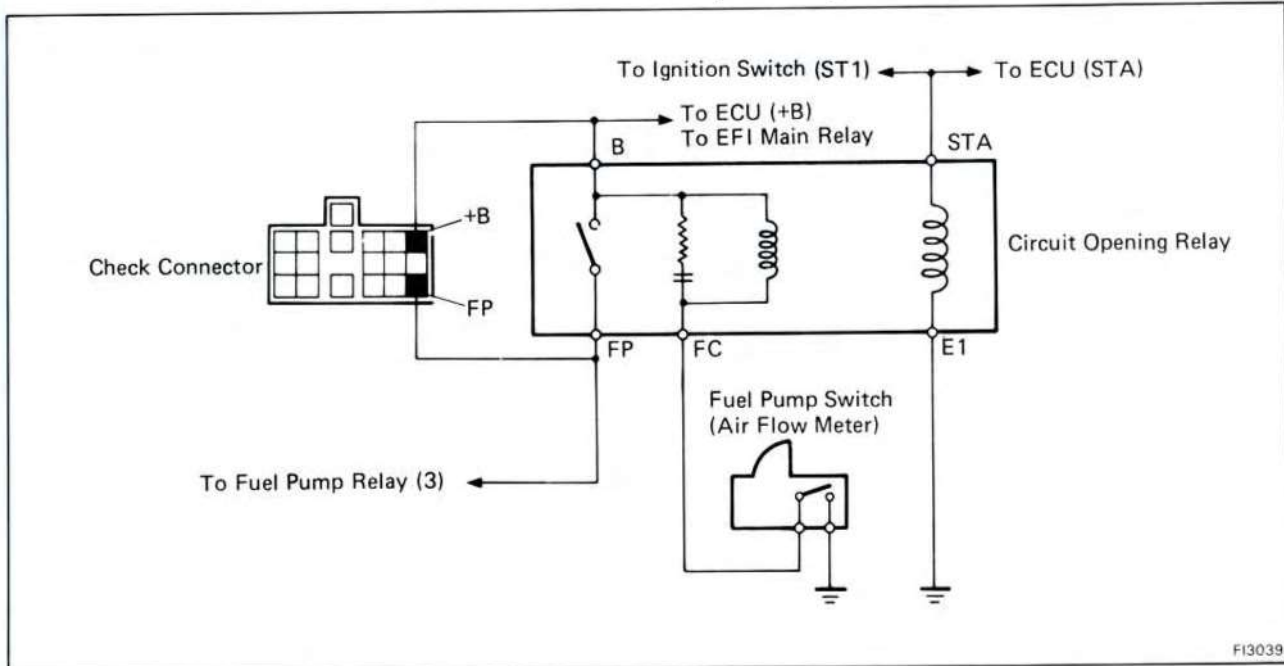
ELECTRONIC CONTROL SYSTEM

Location of Electronic Control Parts



EFI SYSTEM — Electronic Control System

FI-47

Circuit Opening Relay

FI3039

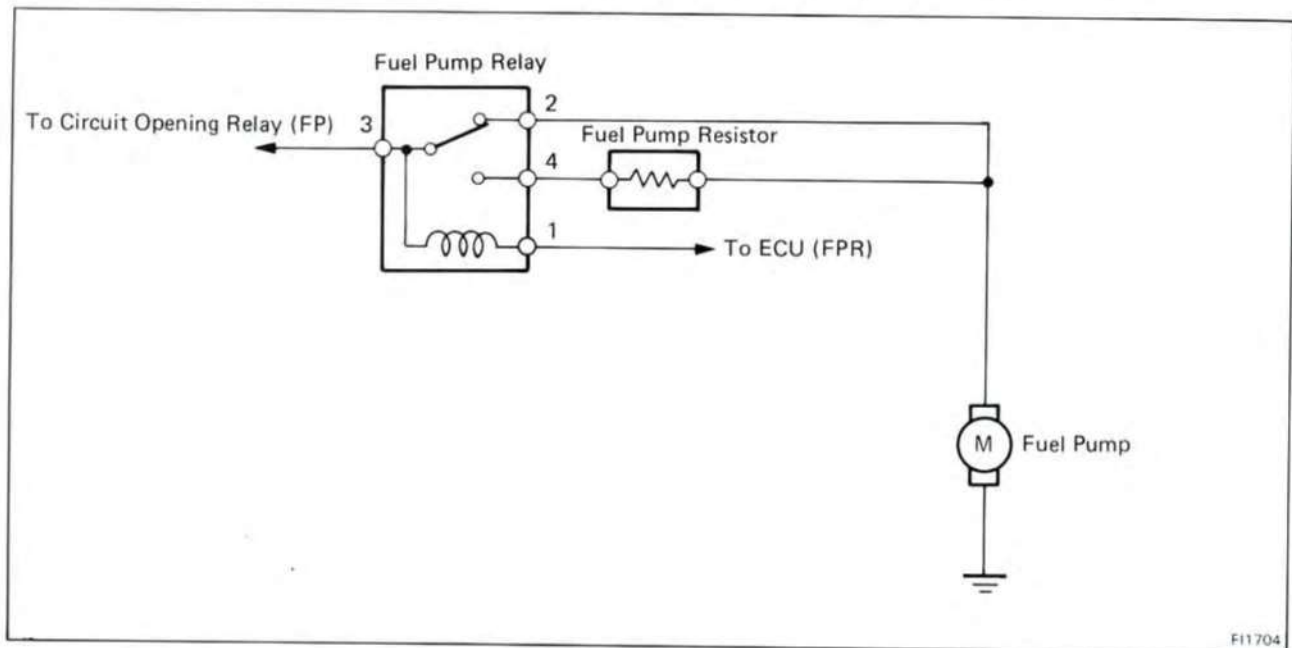
INSPECTION OF CIRCUIT OPENING RELAY

(See Pub. No. RM071U on page FI-98)

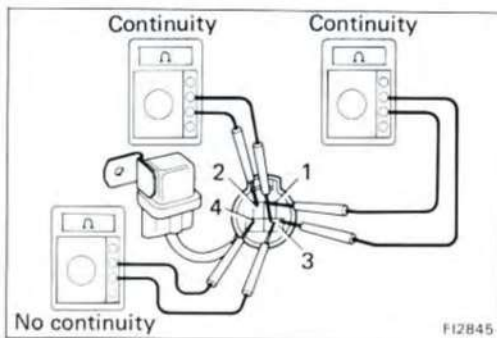
FI-48

EFI SYSTEM — Electronic Control System

Fuel Pump Relay and Resistor



F11704



F12845

INSPECTION OF FUEL PUMP RELAY AND RESISTOR

1. INSPECT FUEL PUMP RELAY

A. Inspect relay continuity

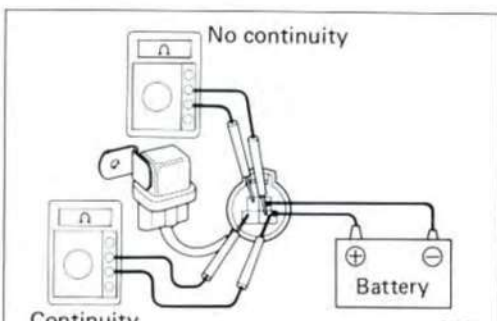
- Using an ohmmeter, check that there is continuity between terminals 1 and 3.
- Check that there is continuity between terminals 2 and 3.
- Check that there is no continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.

B. Inspect relay operation

- Apply battery voltage across terminals 1 and 3.
- Using an ohmmeter, check that there is no continuity between terminals 2 and 3.
- Check that there is continuity between terminals 3 and 4.

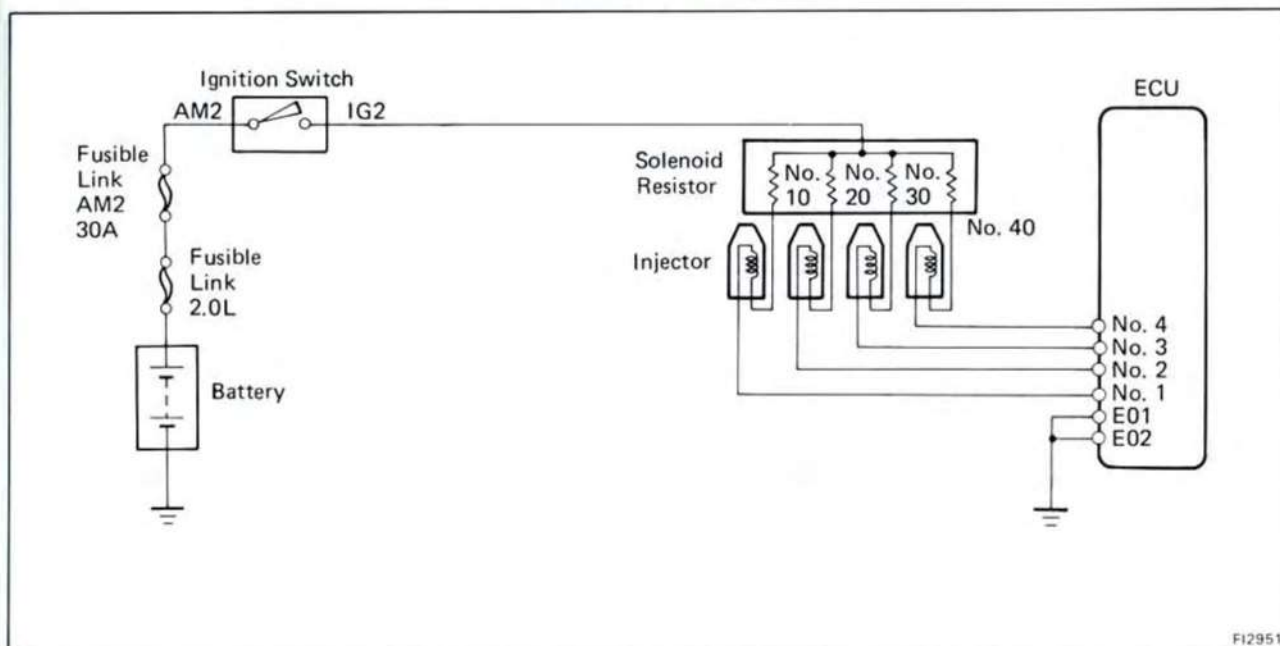
If operation is not as specified, replace the relay.



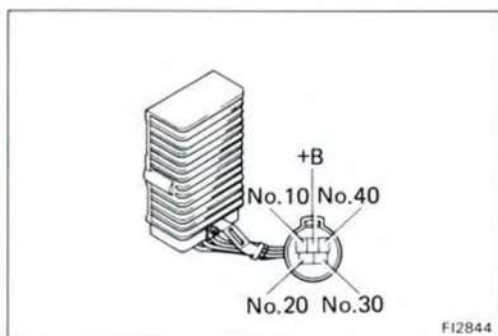
EFI SYSTEM — Electronic Control System

FI-49

Solenoid Resistor



FI2951



FI2844

INSPECTION OF SOLENOID RESISTOR

INSPECT SOLENOID RESISTOR

Using an ohmmeter, measure the resistance between terminal +B and other terminals.

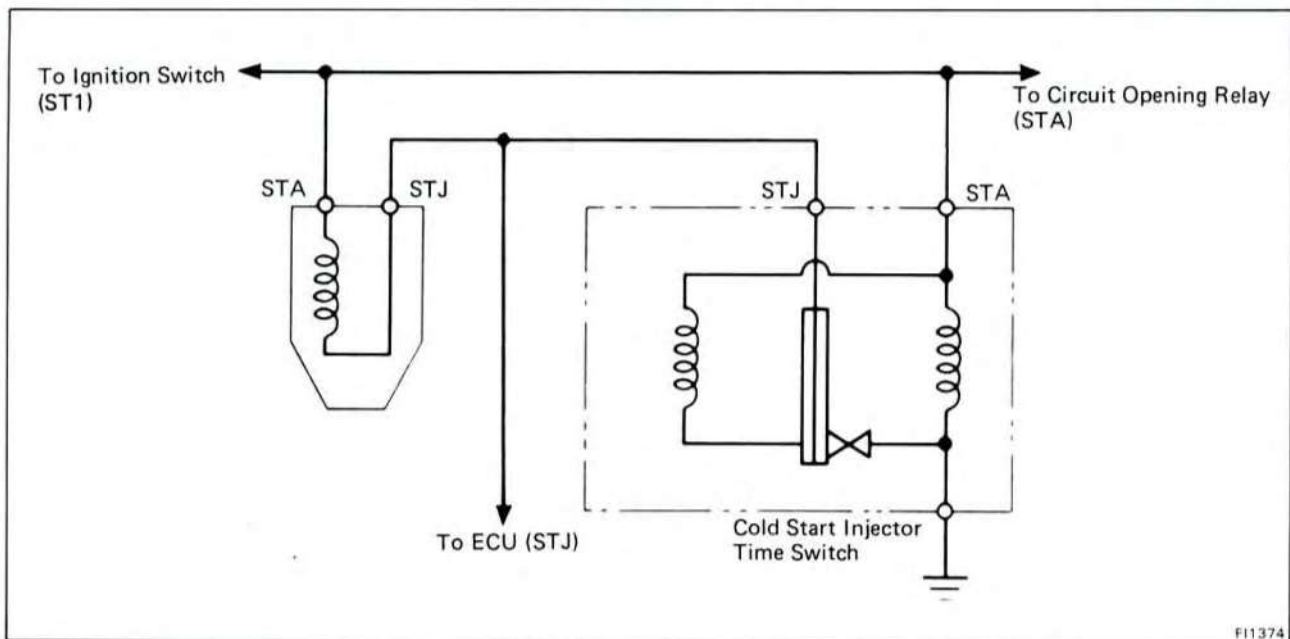
Resistance: 5 — 7 Ω each

If the resistance is not as specified, replace the resistor.

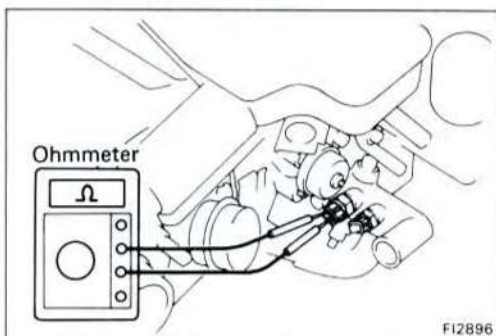
FI-50

EFI SYSTEM — Electronic Control System

Cold Start Injector Time Switch



F11374



F12896

INSPECTION OF COLD START INJECTOR TIME SWITCH

INSPECT COLD START INJECTOR TIME SWITCH

Using an ohmmeter, measure the resistance between each terminal.

Resistance:

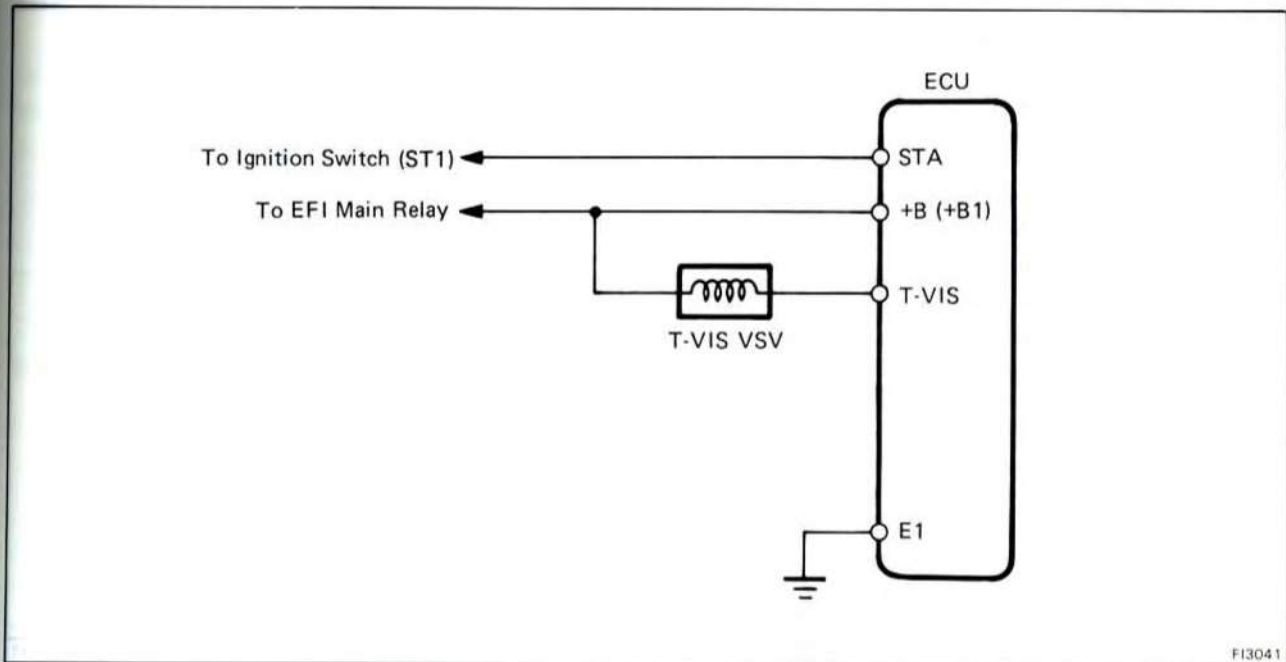
STA — STJ	30 — 50 Ω below 10°C (50°F)
	70 — 90 Ω above 25°C (77°F)
STA — Ground	30 — 90 Ω

If the resistance is not as specified, replace the switch.

EFI SYSTEM — Electronic Control System

FI-51

T-VIS VSV

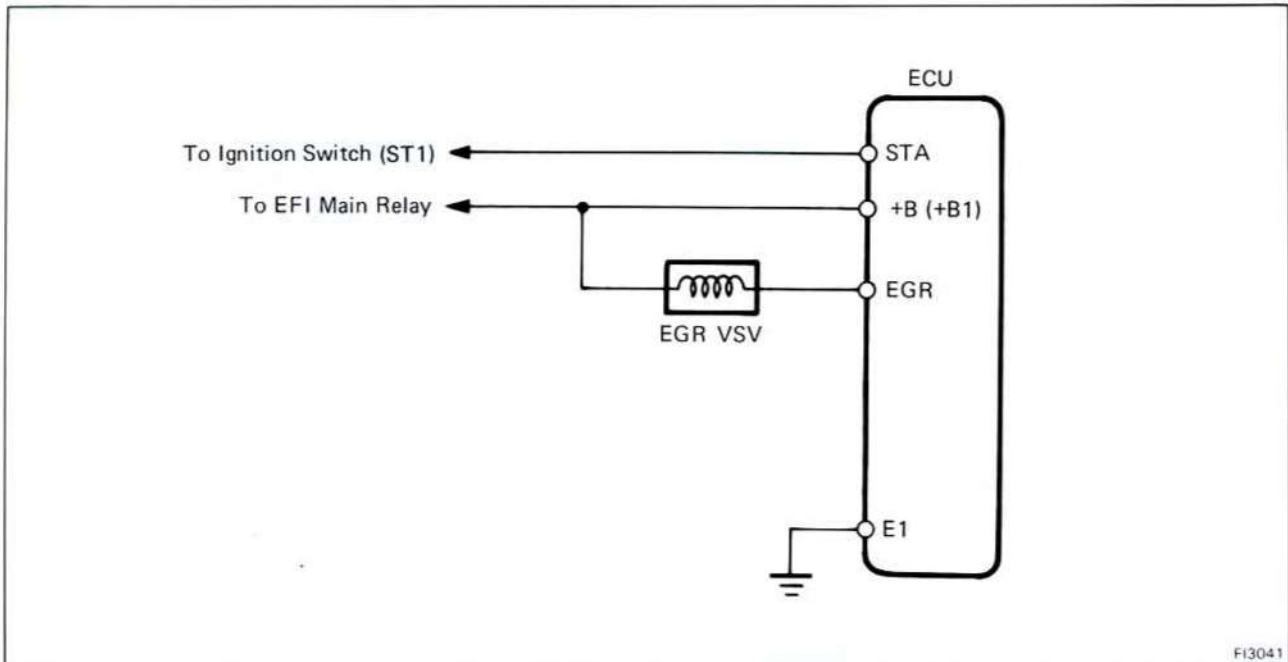


INSPECTION OF T-VIS VSV

(See page EM-33)

FI-52

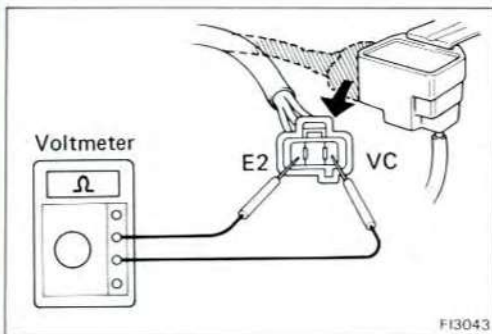
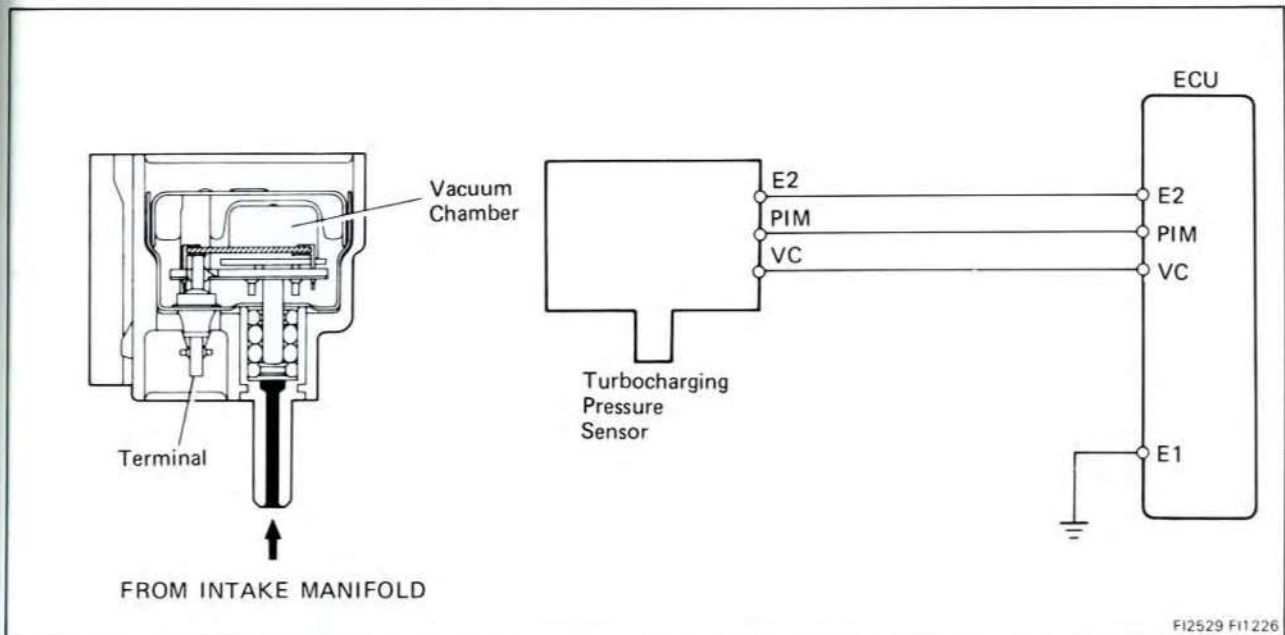
EFI SYSTEM — Electronic Control System

EGR Control VSV**INSPECTION OF EGR CONTROL VSV**
(See page EC-10)

EFI SYSTEM — Electronic Control System

FI-53

Turbocharging Pressure Sensor



INSPECTION OF TURBOCHARGING PRESSURE SENSOR

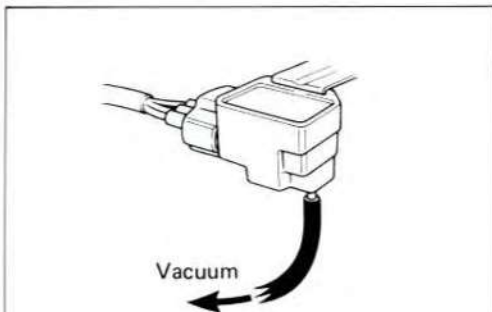
1. INSPECT POWER SOURCE VOLTAGE OF TURBOCHARGING PRESSURE SENSOR

- (a) Turn the ignition switch ON.
- (b) Using a voltmeter, measure the voltage between terminals VC and E2.

Voltage: 4 — 6 V

2. INSPECT POWER OUTPUT OF TURBOCHARGING PRESSURE SENSOR

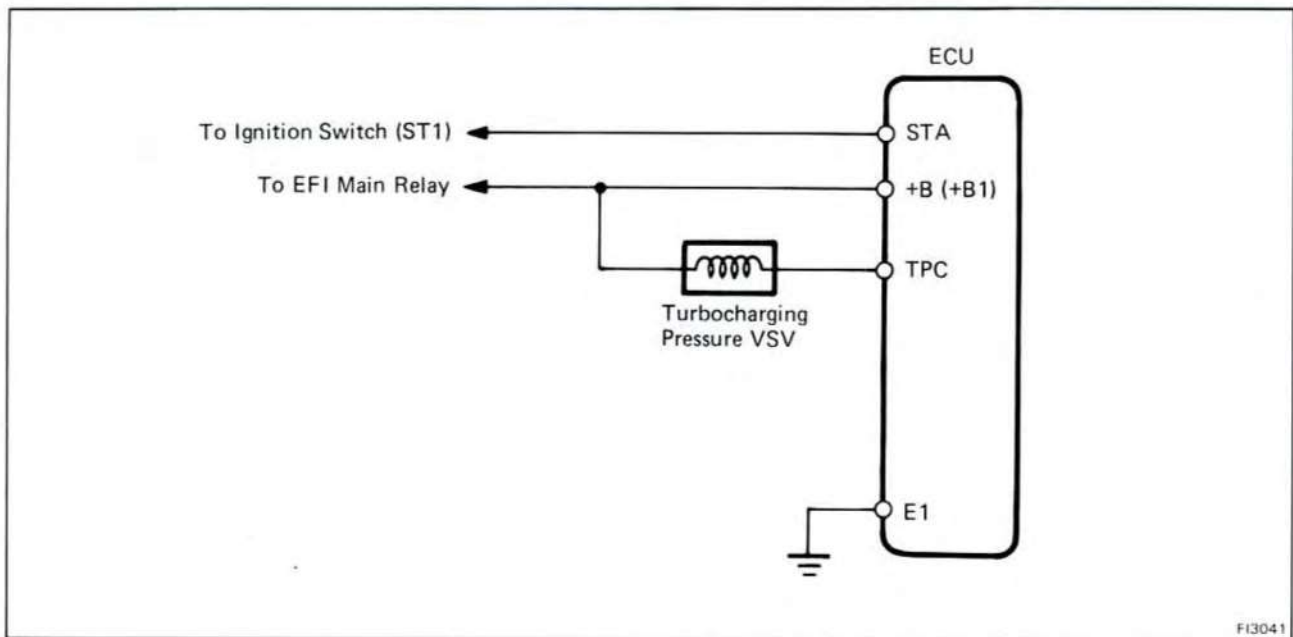
- (a) Turn the ignition switch ON.
- (b) Disconnect the vacuum hose of the intake manifold (chamber) side.
- (c) Connect a voltmeter to terminals PIM and E2 of the pressure sensor, and measure and record the output voltage under ambient atmospheric pressure.
- (d) Apply vacuum to the pressure sensor in 100 mmHg



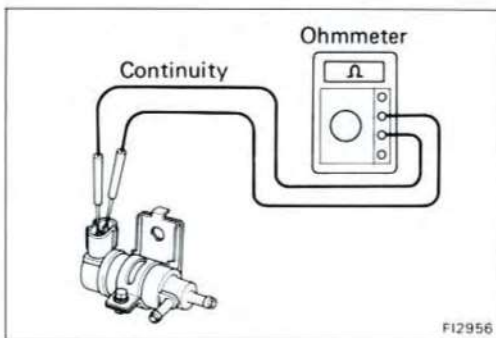
FI-54

EFI SYSTEM — Electronic Control System

Turbocharging Pressure VSV



FI3041



FI2956

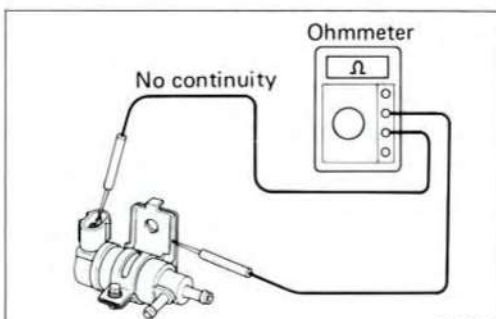
INSPECTION OF TURBOCHARGING PRESSURE VSV

1. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold): 24 — 30 Ω

If there is no continuity, replace the VSV.

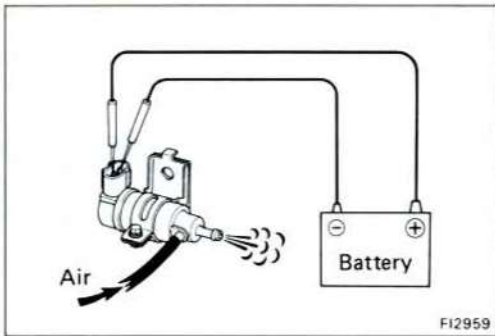


FI2957

2. INSPECT VSV FOR GROUND

Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.

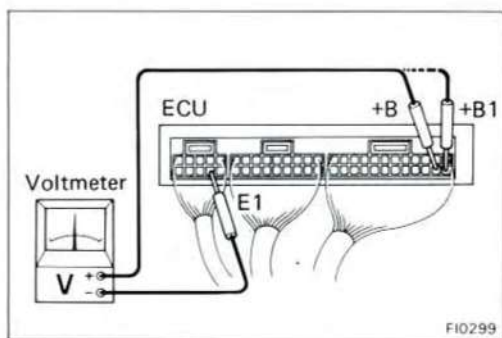
EFI SYSTEM — Electronic Control System**FI-55**

- (b) Apply battery voltage across the terminals.
 - (c) Check that air flows from pipe E to F.
- If operation is not as specified, replace the VSV.

Electronic Controlled Unit (ECU)

INSPECTION OF ECU

NOTE: The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.



1. INSPECT VOLTAGE OF ECU

Check the voltage between each terminal of the wiring connectors.

- Turn the ignition switch ON.
- Measure the voltage at each terminal.

NOTE:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

EFI SYSTEM — Electronic Control System

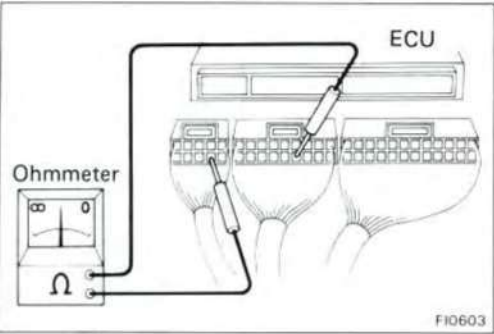
FI-57

Voltage at ECU Wiring Connectors

Terminals	Condition		STD voltage (V)
+B +B1 — E1	Ignition S/W ON		10 — 14
BATT — E1	—		10 — 14
IDL — E2	Ignition S/W ON	Throttle valve open	4 — 6
VTA — E2		Throttle valve fully closed	0.1 — 1.0
		Throttle valve open	3 — 4.5
VC — E2		—	4 — 6
IGT — E1	Cranking or idling		0.7 — 1.0
STA — E1	Cranking		6 — 14
No. 1 No. 2 — E01 No. 3 — E02 No. 4	Ignition S/W ON		10 — 14
W — E1	No trouble (Check engine warning light off) and engine running		8 — 14
VS — E2	Ignition S/W ON	Measuring plate fully closed	4 — 6
		Measuring plate fully open	1.0 or less
	Idling		2 — 4
THA — E2	Ignition S/W ON	Intake air temp. 20°C (68°F)	1 — 3
THW — E2		Coolant temp. 80°C (176°F)	0.1 — 1.0
ISC1 ISC2 — E1	Ignition S/W ON		9 — 14
PIM — E2			2.5 — 4.5
A/C — E1	Ignition S/W ON	Air conditioning ON	8 — 14
*1 T-VIS — E1		Throttle valve fully closed	2 or less
		Throttle valve open	10 — 14
*2 T-VIS — E1	Idling		2 or less

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EFI SYSTEM — Electronic Control System



2. INSPECT RESISTANCE OF ECU

CAUTION:

- Do not touch the ECU terminals.
- The tester probe should be inserted into the wiring connector from the wiring side.

Check the resistance between each terminal of the wiring connectors.

- Disconnect the connectors from the ECU.
- Measure the resistance at each terminal.

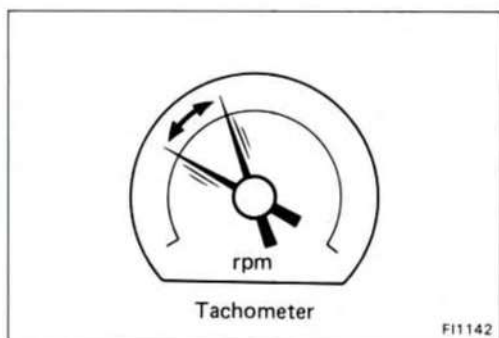
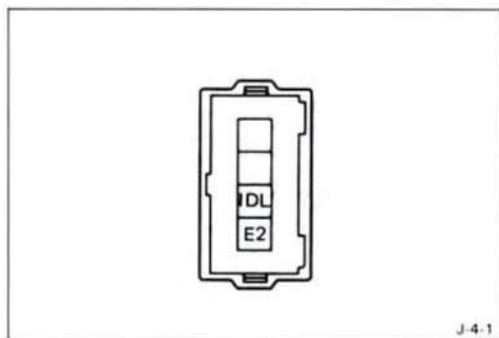
Resistance of ECU Wiring Connectors

Terminals	Condition	Resistance (Ω)
IDL — E2	Throttle valve open	Infinity
	Throttle valve fully closed	2,300 or less
VTA — E2	Throttle valve fully open	3,300 — 10,000
	Throttle valve fully closed	200 — 800
VS — E2	Measuring plate fully closed	200 — 600
	Measuring plate fully open	20 — 1,000
THA — E2	Intake air temp. 20°C (68°F)	2,000 — 3,000
THW — E2	Coolant temp. 80°C (176°F)	200 — 400
G1 G2 — G ⊖ NE	—	140 — 180

ECU Terminals

E01	ISC1	STA	STJ		No. 1	No. 2	G ⊖	G1	G2	NE	FPR	IGF	THW	WIN	TPC				SPD	STP	THA	VS	VC	BA TT	ELS
E02	ISC2	IGT	E1	T-VIS	No. 3	No. 4	VF	T	VTA	IDL	HT	OX	E2	E22	EGR			A/C	W	FPU	KNK	PIM	THG	+B	+B1

FI0574



Fuel Cut RPM

INSPECTION OF FUEL CUT RPM

1. WARM UP ENGINE

Allow the engine to reach normal operating temperature.

2. INSPECT FUEL CUT RPM

- Disconnect the connector from the throttle position sensor.
- Short terminals IDL and E2 of the wiring connector.
- Gradually raise the engine rpm and check that there is fluctuation between the fuel cut and fuel return points.

NOTE: The vehicle should be stopped.

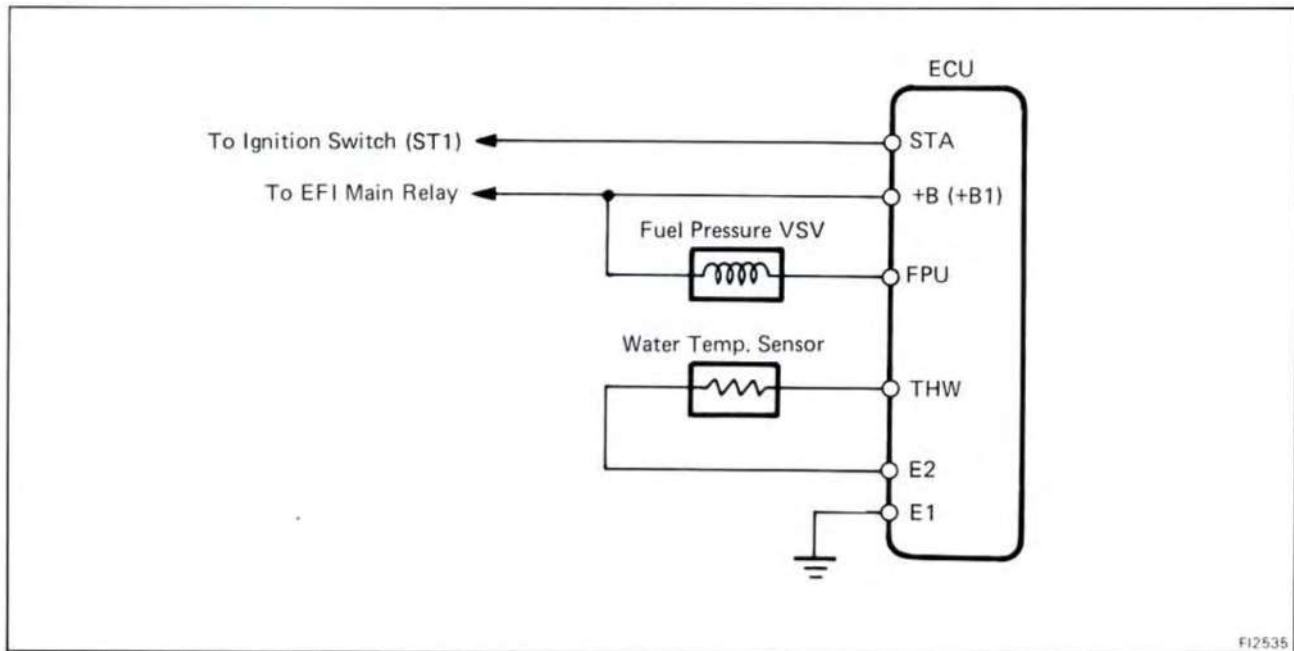
Fuel cut rpm: 2,000 rpm

Fuel return rpm: 1,600 rpm

FI-60

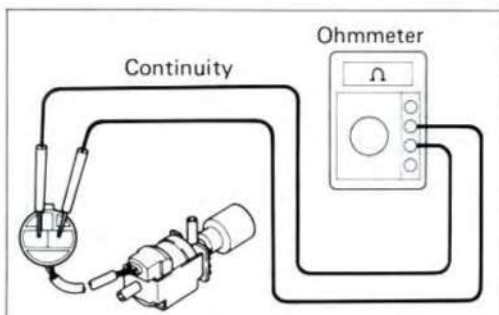
EFI SYSTEM — Electronic Control System

High-temperature Line Pressure Up System



INSPECTION OF HIGH-TEMPERATURE LINE PRESSURE UP SYSTEM

1. INSPECT WATER TEMPERATURE SENSOR
(See Pub. No.RM071U on page FI-100)



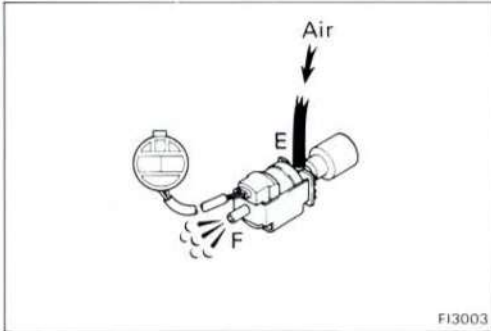
2. INSPECT FUEL PRESSURE VSV

A. Inspect VSV for open circuit

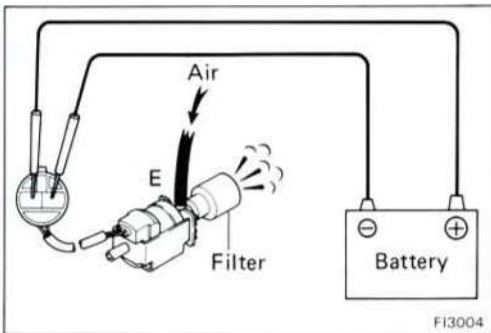
Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold): 33 — 39 Ω

If there is no continuity, replace the VSV.

EFI SYSTEM — Electronic Control System**FI-61****C. Inspect VSV operation**

- (a) Check that air flows from pipe E to pipe F.



- (b) Apply battery voltage across the terminals.
(c) Check that air flows from pipe E to the filter.
If operation is not as specified, replace the VSV.