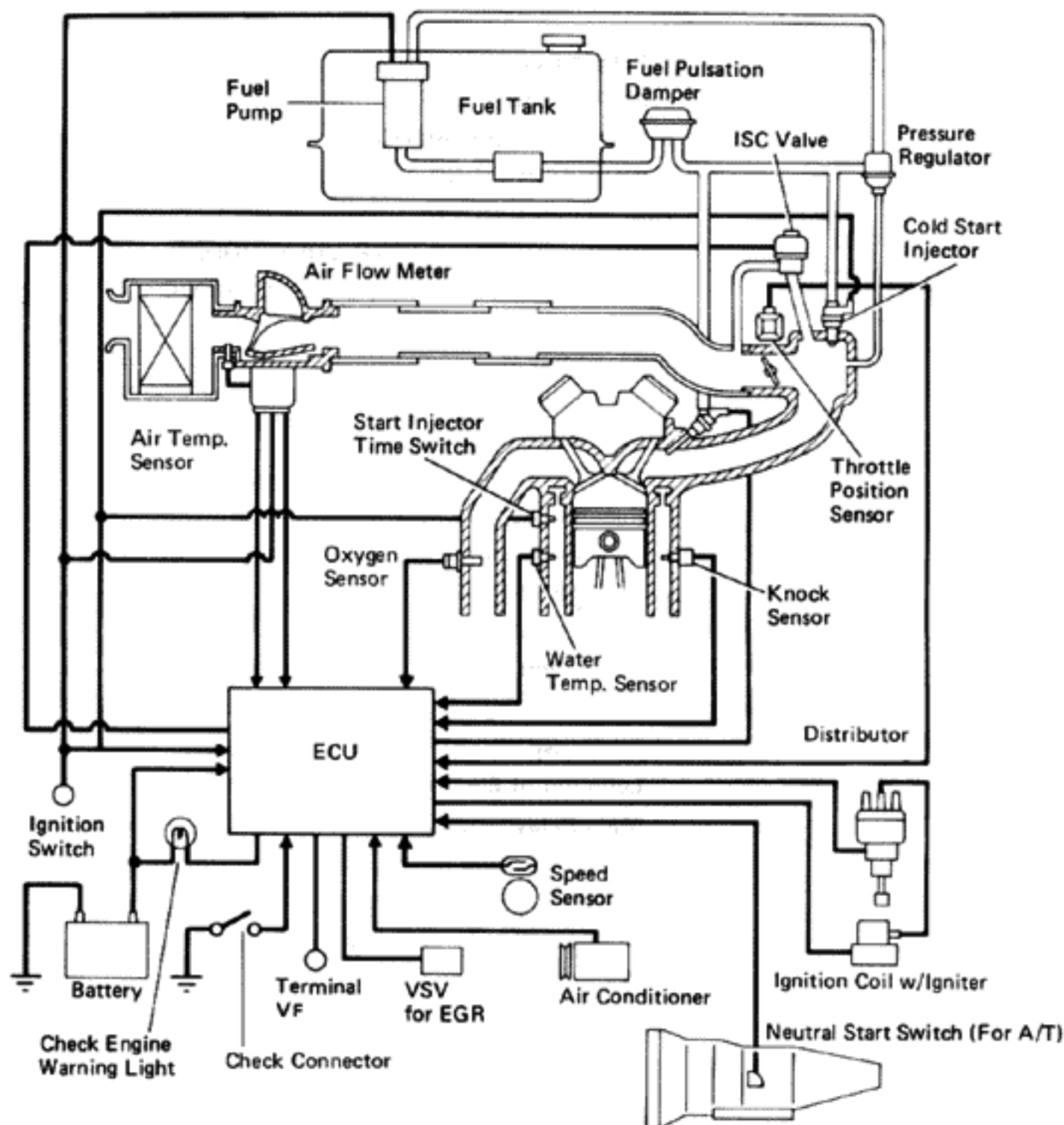


EFI SYSTEM

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FI

SYSTEM DESCRIPTION



The EFI used on Toyotas has three basic systems.

FUEL SYSTEM

An electric fuel pump supplies sufficient fuel, under a constant pressure, to the EFI injectors. These injectors inject a metered quantity of fuel into the intake manifold in accordance with signals from the ECU. Each injector injects, at the same time, one half of the fuel required for ideal combustion with each engine revolution.

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The 5M-GE engine is equipped with a Toyota Computer Control System (TCCS) which centrally controls the EFI, ESA, EGR, 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. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, coolant temperature, etc.), the microcomputer (ECU) triggers the spark at precisely the right instant.
(See IG section)

3. Idle Speed Control (ISC)

The ECU is programmed with target engine speed values to respond to different engine conditions (coolant temperature, air conditioner on/off, etc.). Sensors transmit signals to the ECU which controls the flow of air through the by-pass of the throttle valve and adjusts idle speed to the target value.
(See pages FI-43,60)

4. Exhaust Gas Recirculation (EGR)

The ECU detects the coolant temp. and controls EGR function accordingly.
(See page EC-10)

5. Electronic Controlled Transmission (ECT)
(Automatic Trans. only)

A serial signal is transmitted to the ECT computer to prevent shift up to 3rd or overdrive during cold engine operation.
(See AT section)

6. Diagnostics

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 check connector are short-circuited.
(See page FI-22)

7. Fail-Safe Function

In the event of a computer malfunction, a back-up circuit will take over to provide minimal drivability. Simultaneously, the "CHECK ENGINE" warning light is activated.

PRECAUTIONS

1. Before working on the fuel system, disconnect the negative terminal from the battery.

NOTE: Any diagnosis code retained by the computer will be cleared when the battery terminal is removed. Therefore, if necessary, read the diagnosis before removing the battery terminal.

2. When working on the fuel system, do not smoke or work near any fire.
3. Keep gasoline off rubber or leather parts.

INSPECTION PRECAUTIONS

MAINTENANCE PRECAUTIONS

1. INSURE CORRECT ENGINE TUNE-UP

2. PRECAUTIONS WHEN CONNECTING GAUGE

- (a) Connect the tachometer to the service connector.
- (b) Use the battery as the power source for the timing light, tachometer, etc.

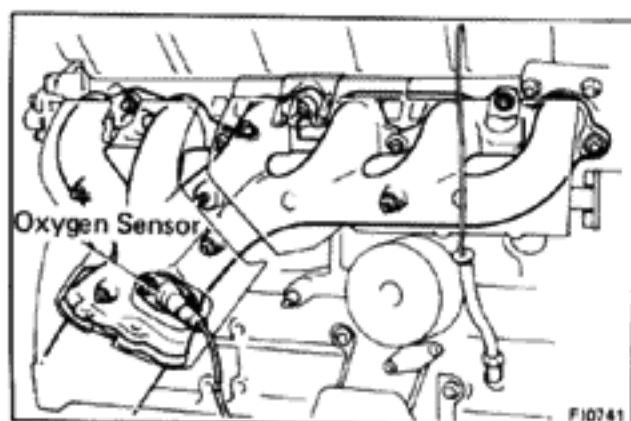
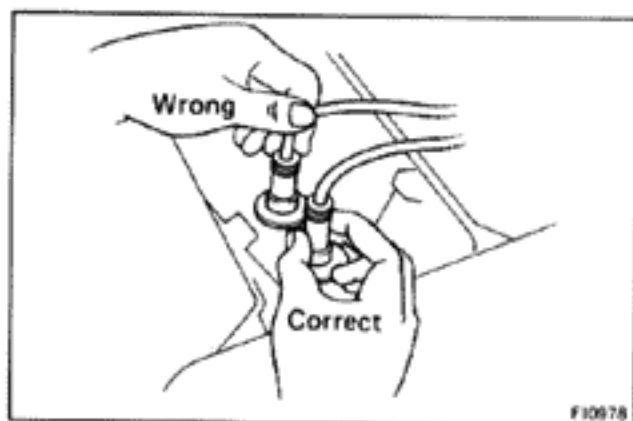
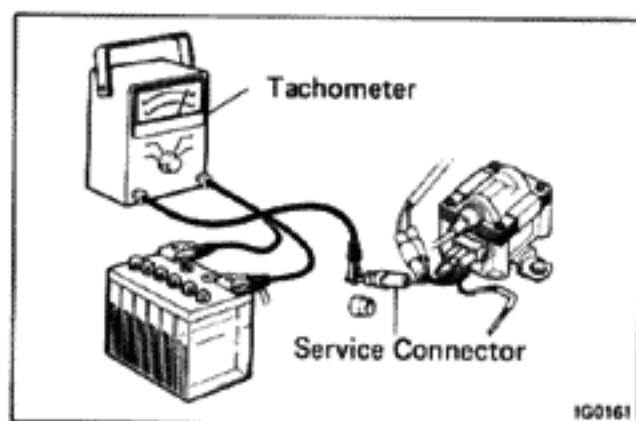
3. IN EVENT OF ENGINE MISFIRE, THE CATALYTIC CONVERTER MAY OVERHEAT. THEREFORE, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN

- (a) Insure correct drive belt adjustment.
- (b) Insure proper connection of battery terminals, etc.
- (c) Handle resistor cords carefully.
- (d) After repair work, insure that the ignition coil terminals and all other ignition system lines are reconnected securely.

When cleaning the engine compartment, be especially careful to protect the electrical system from water.

4. PRECAUTIONS WHEN HANDLING OXYGEN SENSOR

- (a) Do not allow oxygen sensor to drop or hit against an object.
- (b) Do not allow water to come into contact with the sensor or attempt to cool it.



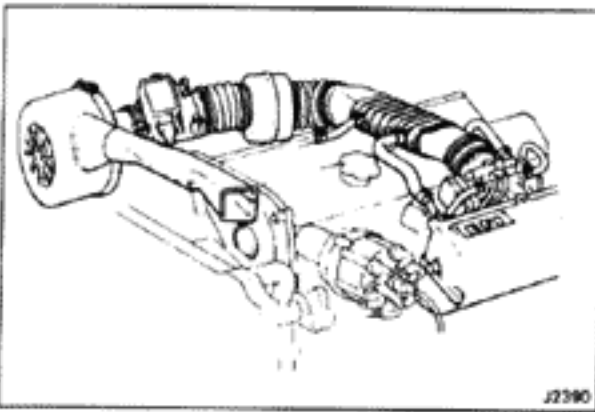
WHEN CAR IS EQUIPPED WITH A MOBILE RADIO SYSTEM (HAM, CB, ETC.)

The ECU has been designed so that it will not be affected by outside interference.

However, if your vehicle is equipped with an amateur radio transceiver, etc.

You must observe the following precautions.

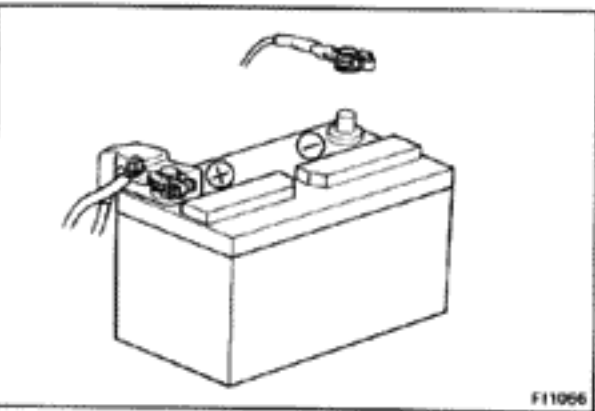
- (a) Install the antenna as far as possible from the ECU. The ECU is located behind the glove box so the antenna should be installed at the rear, left side of the vehicle.
If installing in the bumper, do so on the left side, if possible.
- (b) Keep the antenna feeder as far away as possible from the ECU wires — at least 20 cm (7.87 in.) — and, especially, do not wind them together.
- (c) Insure that the feeder and antenna are properly adjusted.
- (d) Do not equip your vehicle with a powerful mobile radio system.



J2390

AIR INDUCTION SYSTEM

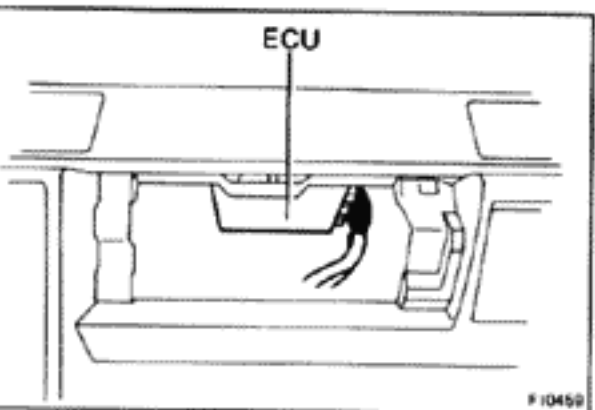
1. Separation of the engine oil level gauge, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air intake system between the air flow meter and cylinder head will allow air suction and cause bad engine tune.



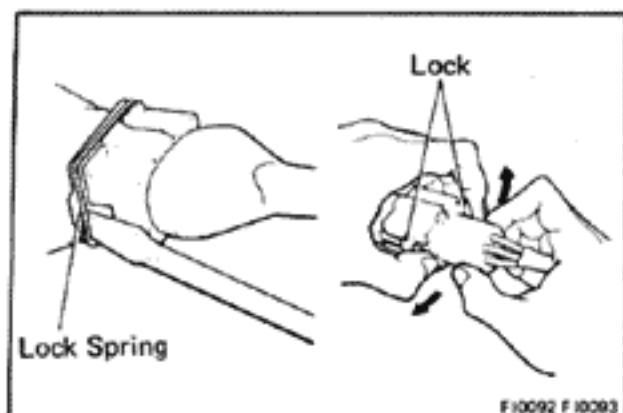
F11066

ELECTRONIC CONTROL SYSTEM

1. Before removing EFI wiring connectors, terminals, etc., first disconnect power by either turning OFF the ignition switch or disconnecting the battery terminals.
2. When installing a battery, be especially careful not to incorrectly connect the positive and negative cables.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all EFI parts carefully and, in particular, the ECU.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECU cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the EFI parts and wiring connectors.
7. Parts should be replaced as an assembly.

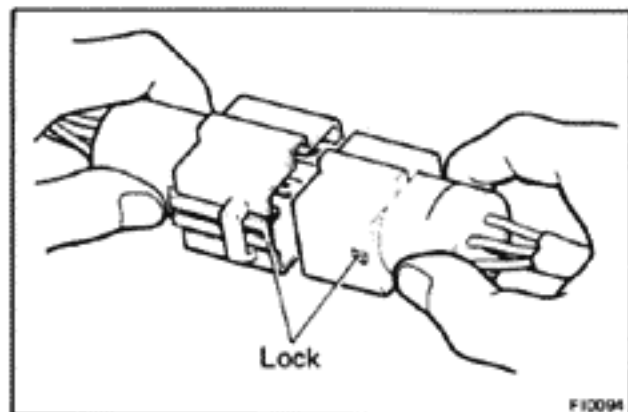


F10459

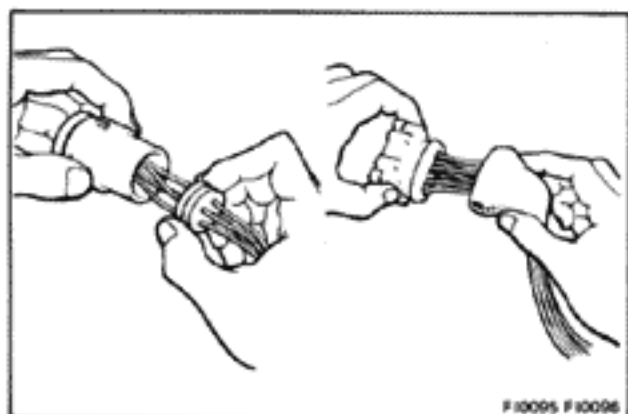


8. Sufficient care is required when pulling out and inserting wiring connectors.

(a) Release the lock and pull out the connector, pulling on the connectors.

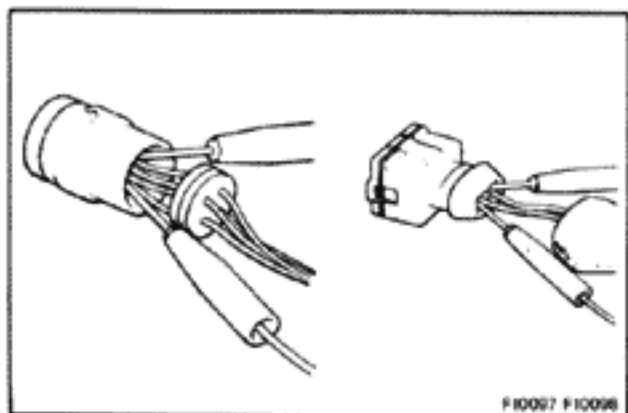


(b) Fully insert the connector and insure that it is locked.



9. When inspecting a connector with a volt/ohmmeter.

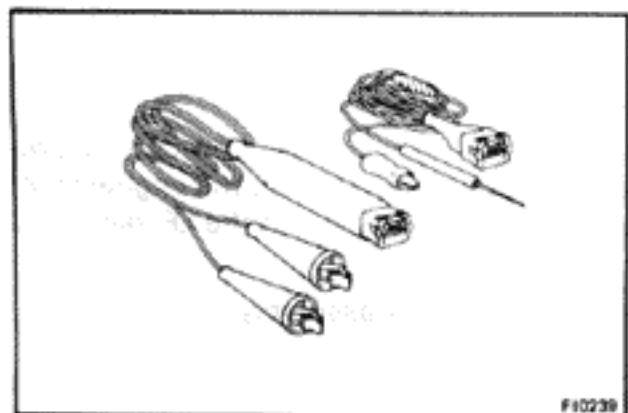
(a) Carefully take out the water-proofing rubber if it is a water-proof type connector.



(b) Insert the tester probe into the connector from the wiring side when checking the continuity, amperage or voltage.

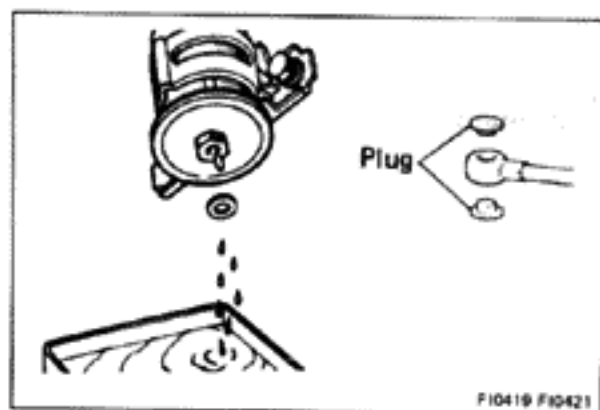
(c) Do not apply unnecessary force to the terminal.

(d) After checking, install the water-proofing rubber on the connector securely.



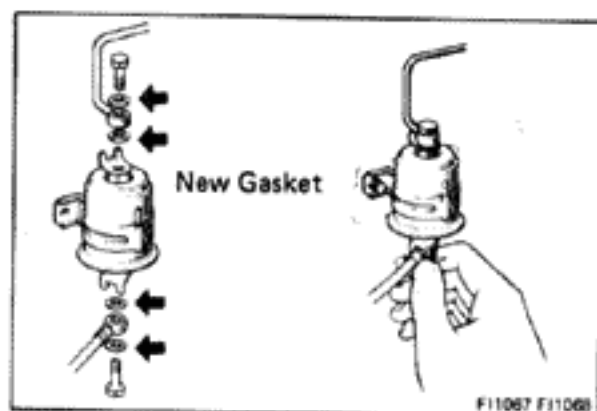
10. Use SST for inspection or test of the injector, cold start injector or its wiring connector.

SST 09842-30020 and 09842-30050



FUEL SYSTEM

1. When disconnecting high fuel pressure line the connection, a large amount of gasoline will come out, so observe the following procedure.
 - (a) Put a container under the connection.
 - (b) Slowly loosen the connection.
 - (c) Disconnect the connection.
 - (d) Plug the connection with a rubber plug.



2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedure.

[Union bolt type]

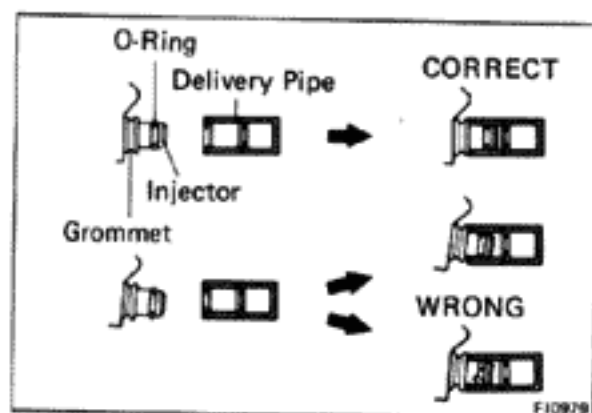
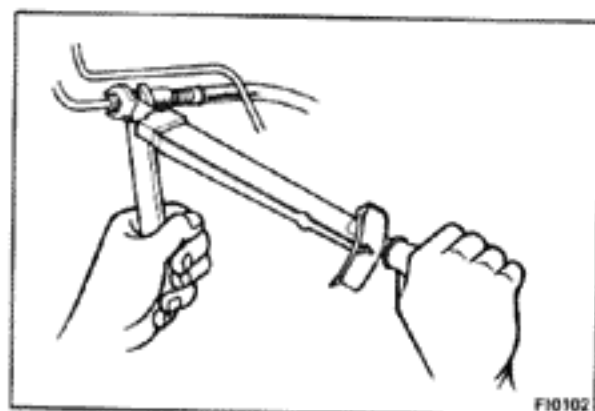
- (a) Always use a new gasket.
- (b) First tighten the union bolt by hand.
- (c) Then tighten the bolt to the specified torque.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

[Flare nut type]

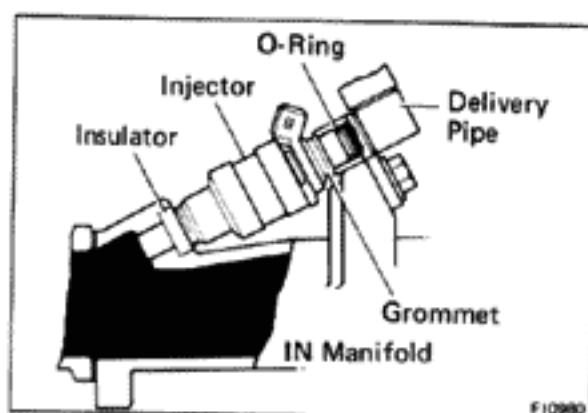
- (a) Apply a thin coat of oil to the flare and first tighten the flare nut by hand.
- (b) Then tighten the nut to the specified torque.

Torque: 350 kg-cm (25 ft-lb, 34 N·m)

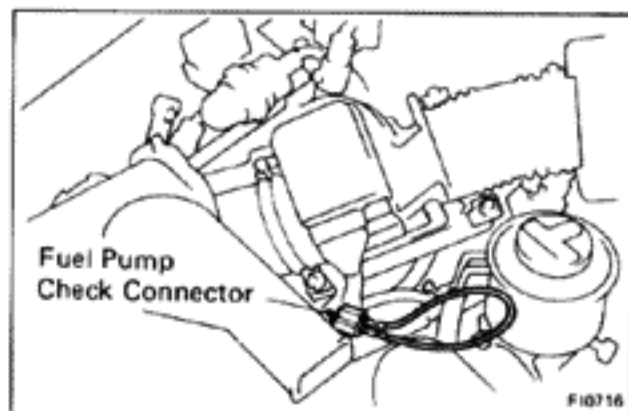


3. Take the following precautions when removing and installing the injectors.

- (a) Never re-use an O-ring.
- (b) When placing an O-ring on the injector, use care not to damage it in any way.
- (c) Lubricate the O-ring with spindle oil or gasoline before installing — never use engine, gear or brake oil.



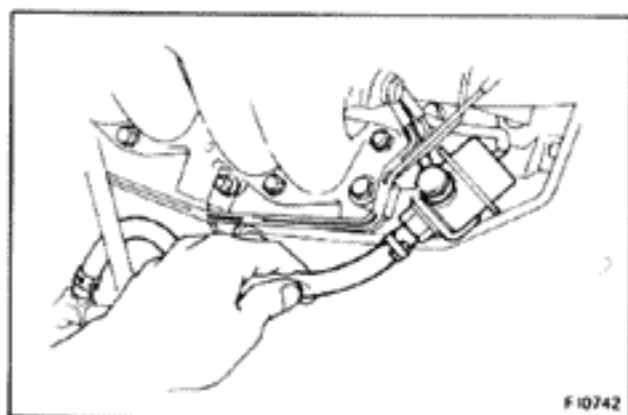
4. Install the injector to the delivery pipe and intake manifold as shown in the figure.



5. Confirm that there are no fuel leaks after performing maintenance on the fuel system.
 - (a) With engine stopped, turn the ignition switch on.
 - (b) Short circuit terminals of the fuel pump check connector.

- (c) When the pressure regulator fuel return hose (shown in the figure at left), is pinched, the pressure within the high pressure line will rise to about 4 kg/cm² (57 psi, 392 kPa). In this state, check to see that there are no leaks from any part of the fuel system.

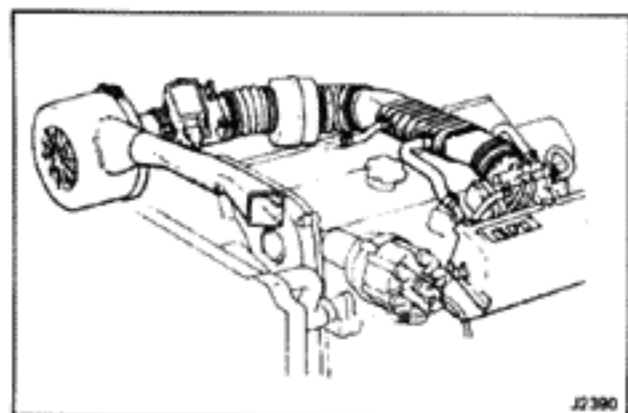
CAUTION: Always pinch the hose. Avoid bending as it may cause the hose to crack.

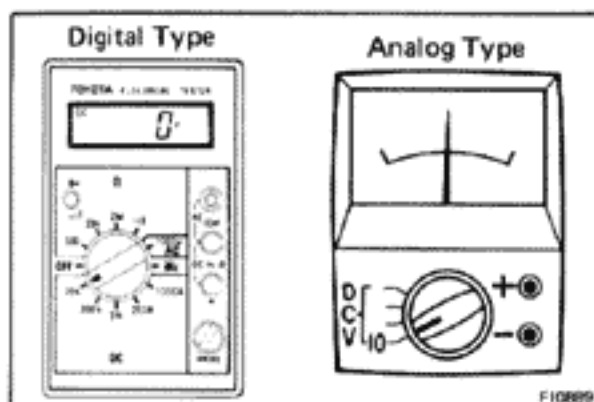
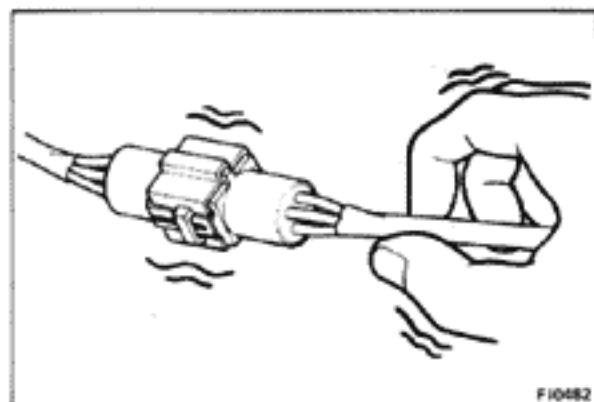
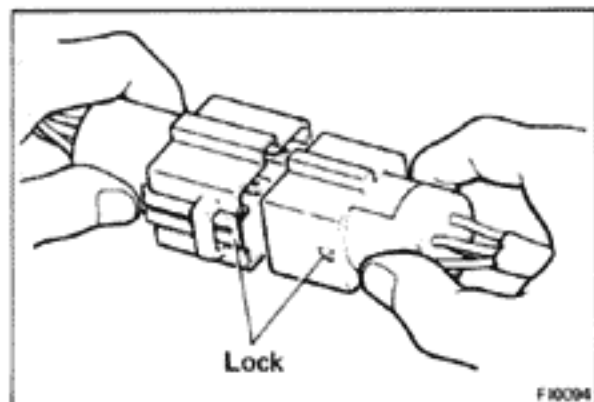


TROUBLESHOOTING

TROUBLESHOOTING HINTS

1. Engine troubles are usually not caused by the EFI system. When troubleshooting, always first check the condition of the other systems.
 - (a) Electronic source
 - Battery
 - Fusible links
 - Fuses
 - (b) Body ground
 - (c) Fuel supply
 - Fuel leakage
 - Fuel filter
 - Fuel pump
 - (d) Ignition system
 - Spark plug
 - High-tension cord
 - Distributor
 - Igniter and ignition coil
 - (e) Air intake system
 - Vacuum leaks
 - (f) Emission control system
 - EGR system
 - PCV system
 - (g) Others
 - Ignition timing (ESA system)
 - Idle speed (ISC system)
 - etc.



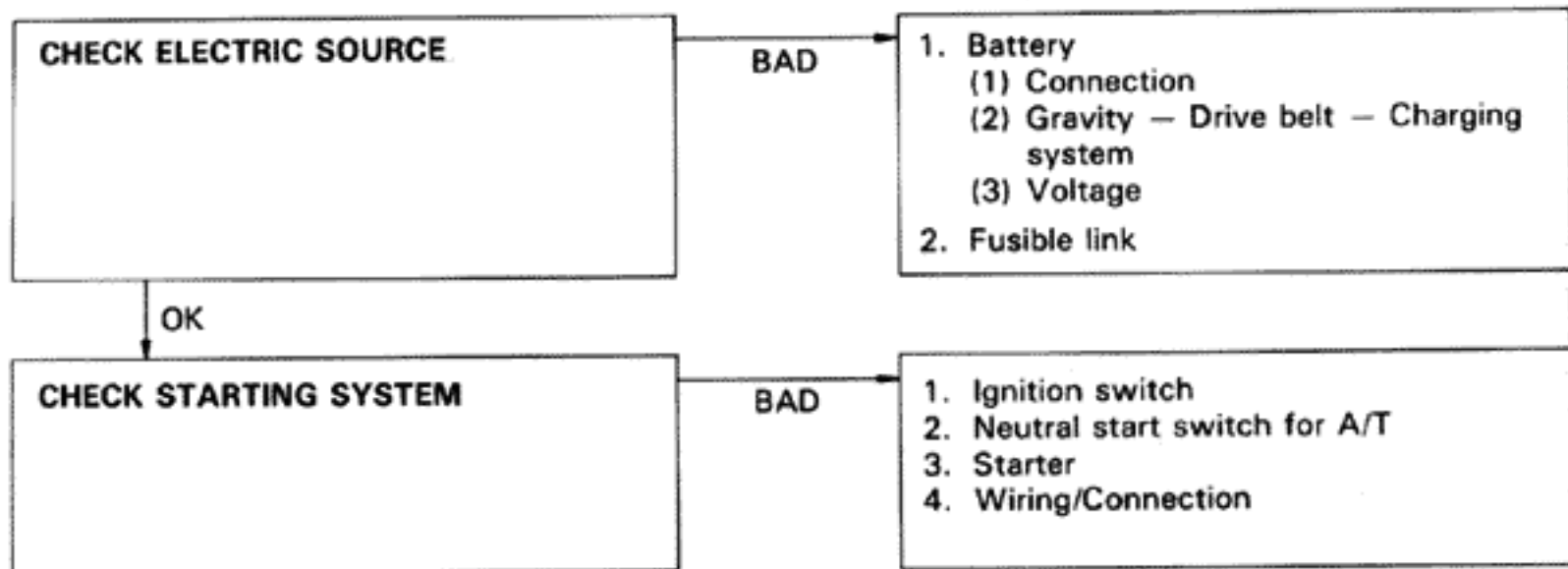


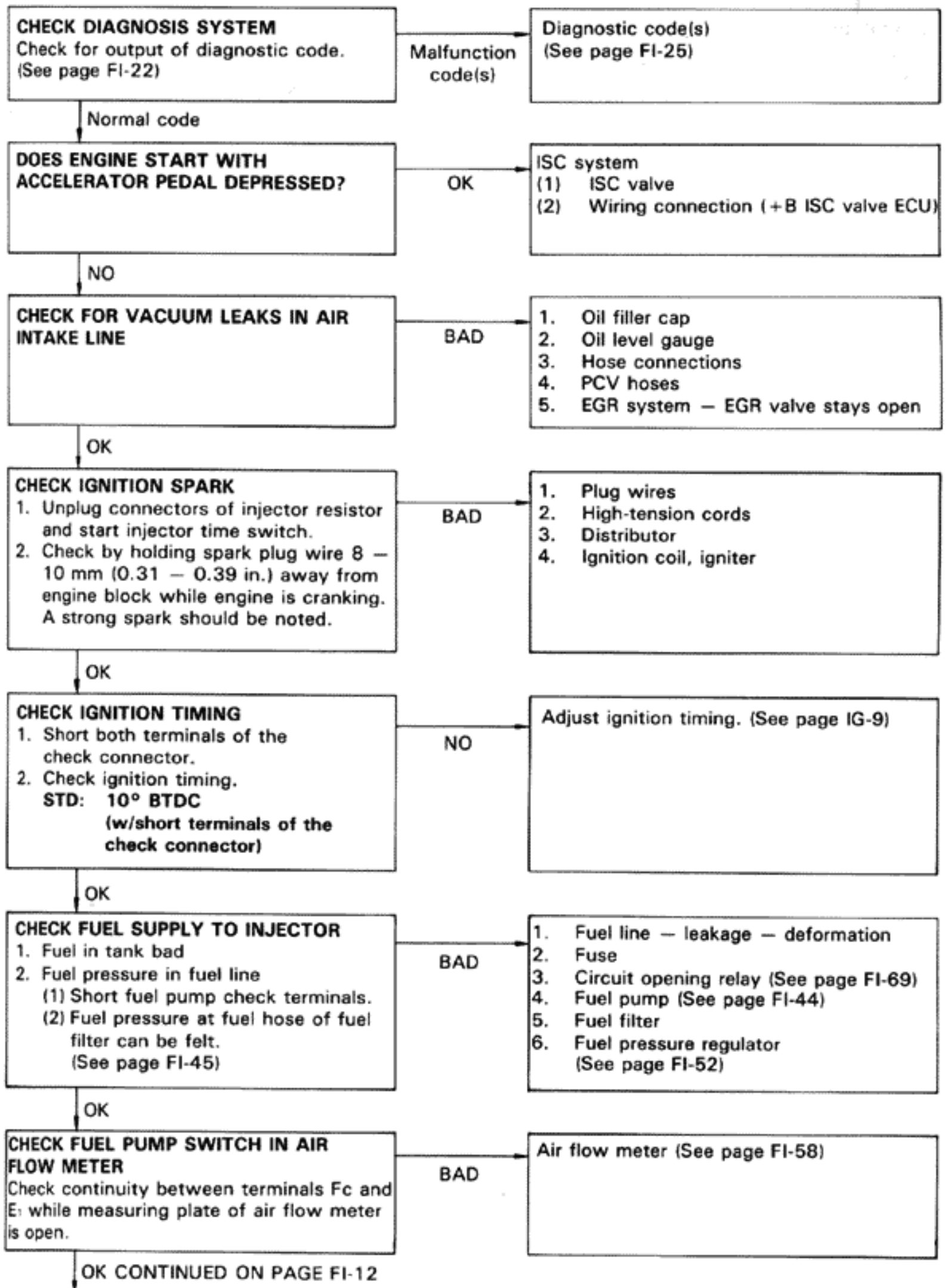
2. The most frequent cause of problems is simply a bad contact in wiring connectors. So always make sure that connections are secure.

When inspecting the connector, pay particular attention to the following points:

- (a) Check to see that the terminals are not bent.
- (b) Check to see that the connector is pushed in completely and locked.
- (c) Check to see that there is no signal change when the connector is slightly tapped or wiggled.
3. Sufficiently troubleshoot for other causes before replacing the computer. The computer is of high quality and it is expensive.
4. Use volt/ohmmeter with high-impedance (10 k Ω /V minimum).

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)

OK CONTINUED FROM PAGE FI-11

CHECK SPARK PLUGS

Max. allowable gap: 1.4 mm (0.055 in.)

Correct insulation resistance:
10 MΩ or morePrecaution: Never attempt to adjust gap
on used platinum tipped spark plug.

— Note —

Check compression pressure if necessary.
(See page EM-6)

NO

1. Spark plug
2. Compression pressure
Limit: 9.0 kg/cm² (128 psi, 883 kPa)
at 250 rpm

NO

(All
Plugs
WET)

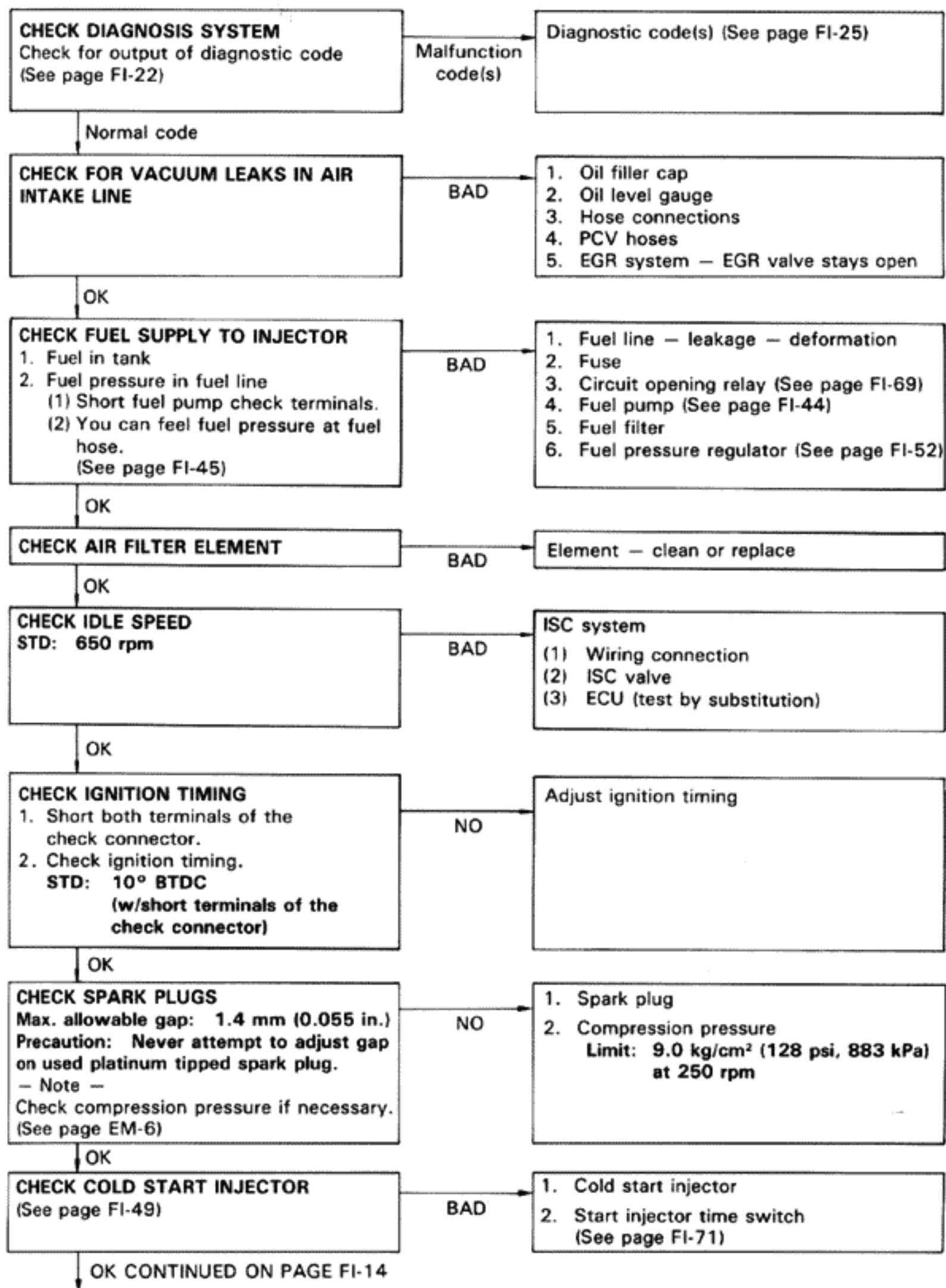
1. Injector(s) — shorted or leaking
2. Injector wiring(s) between resistor and ECU shorted
3. Cold start injector — leakage
(See page FI-49)
4. Start injector time switch
(See page FI-71)

OK

**CHECK EFI ELECTRONIC CIRCUIT
USING VOLT/OHMMETER**

NO

1. Wiring connection
2. Power to ECU
 - (1) Fusible link
 - (2) Fuse
 - (3) No. 1 and No. 2 main relay
3. Air flow meter
4. Water temp. sensor
5. Injection signal circuit
 - (1) Injector wiring
 - (2) Resistor
 - (3) ECU

SYMPTOM — ENGINE OFTEN STALLS

OK CONTINUED FROM PAGE FI-13

CHECK FUEL PRESSURE

(See page FI-45)

BAD

1. Fuel pump (See page FI-44)
2. Fuel filter
3. Fuel pressure regulator (See page FI-52)

OK

CHECK INJECTORS

(See page FI-53)

BAD

Injection condition

OK

**CHECK EFI ELECTRONIC CIRCUIT
USING VOLT/OHMMETER**

BAD

1. Wiring connection
2. Power to ECU
 - (1) Fusible link
 - (2) No. 1 and No. 2 main relay
3. Air flow meter
4. Water temp. sensor
5. Injection signal circuit
 - (1) Injector wiring
 - (2) Resistor
 - (3) ECU

SYMPTOM — ENGINE SOMETIMES STALLS**CHECK DIAGNOSIS SYSTEM**Check for output of diagnostic code.
(See page FI-22)Malfunction
code(s)Diagnostic code(s)
(See page FI-25)

Normal code

CHECK AIR FLOW METER

(See page FI-58)

BAD

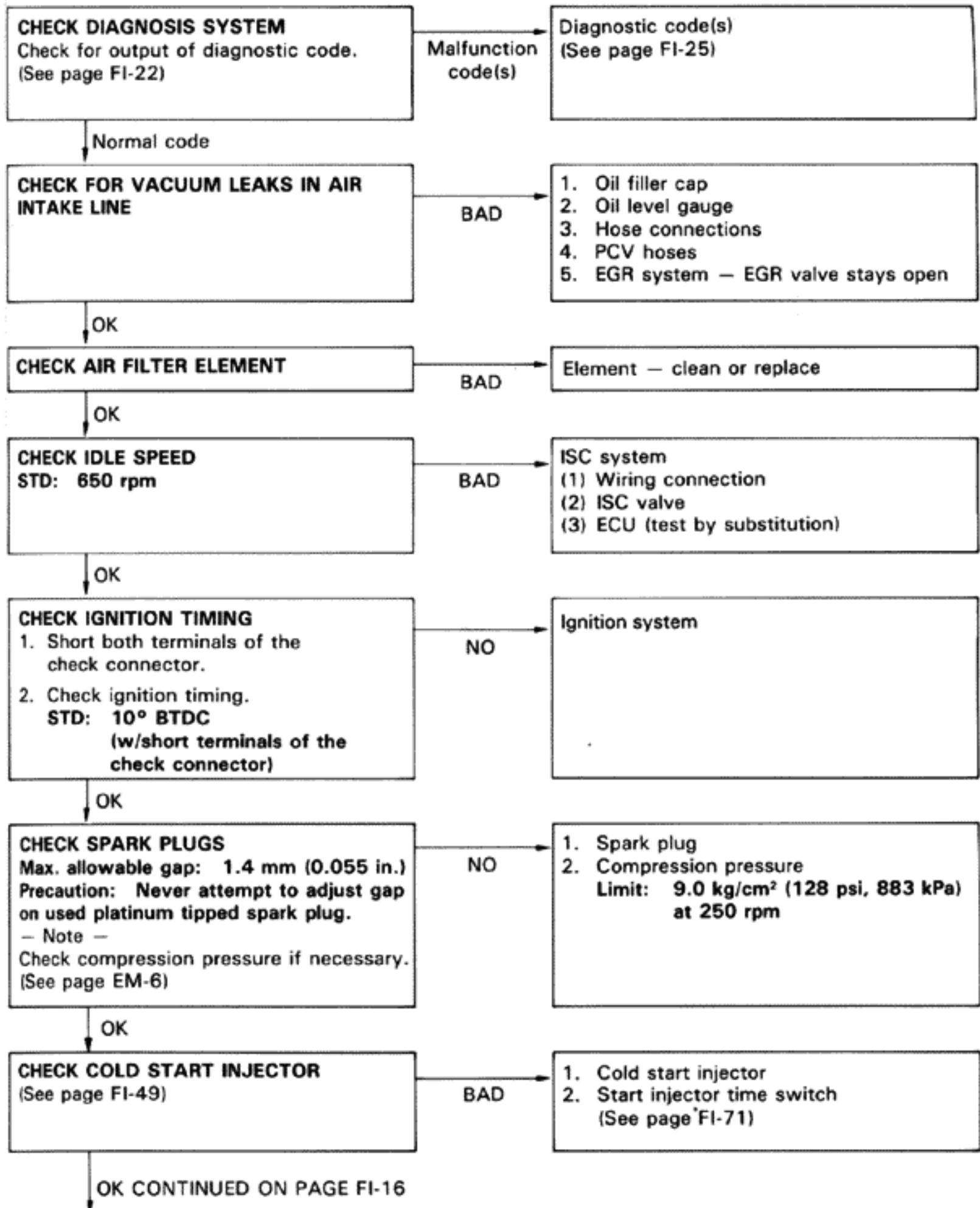
Air flow meter

OK

**CHECK WIRING CONNECTORS AND
RELAYS**Check that there is a signal change when
the connector or relay is slightly tapped
or wiggled.

BAD

1. Connector
2. No.1 and No. 2 main relay
(See page FI-68)
3. Circuit opening relay (See page FI-69)

SYMPTOM — ROUGH IDLING AND/OR MISSING

OK CONTINUED FROM PAGE FI-15

CHECK FUEL PRESSURE
(See page FI-45)

BAD

1. Fuel pump (See page FI-44)
2. Fuel filter
3. Fuel pressure regulator
(See page FI-52)

OK

CHECK INJECTORS
(See page FI-53)

BAD

Injection condition

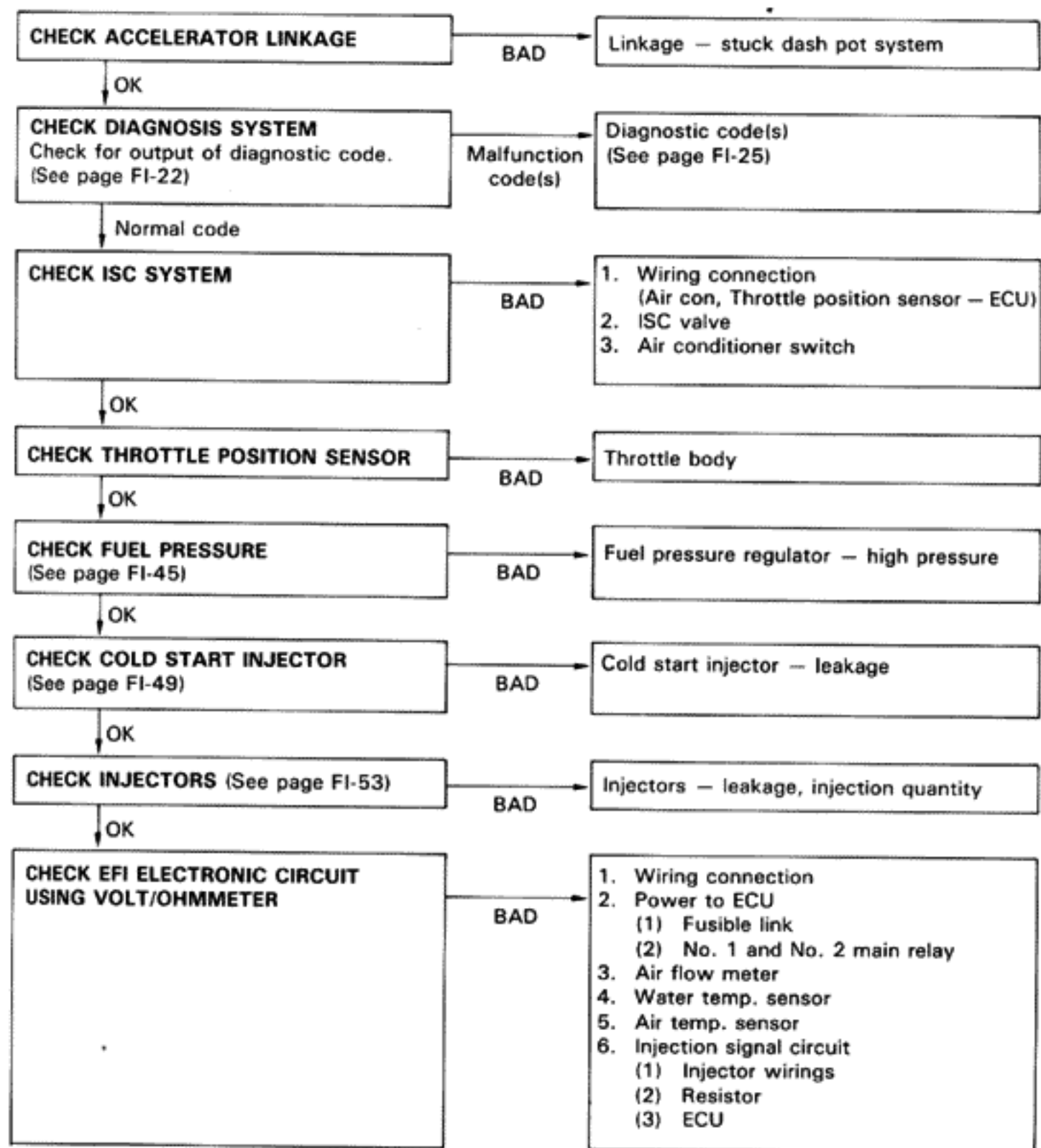
OK

**CHECK EFI ELECTRONIC CIRCUIT
USING VOLT/OHMMETER**

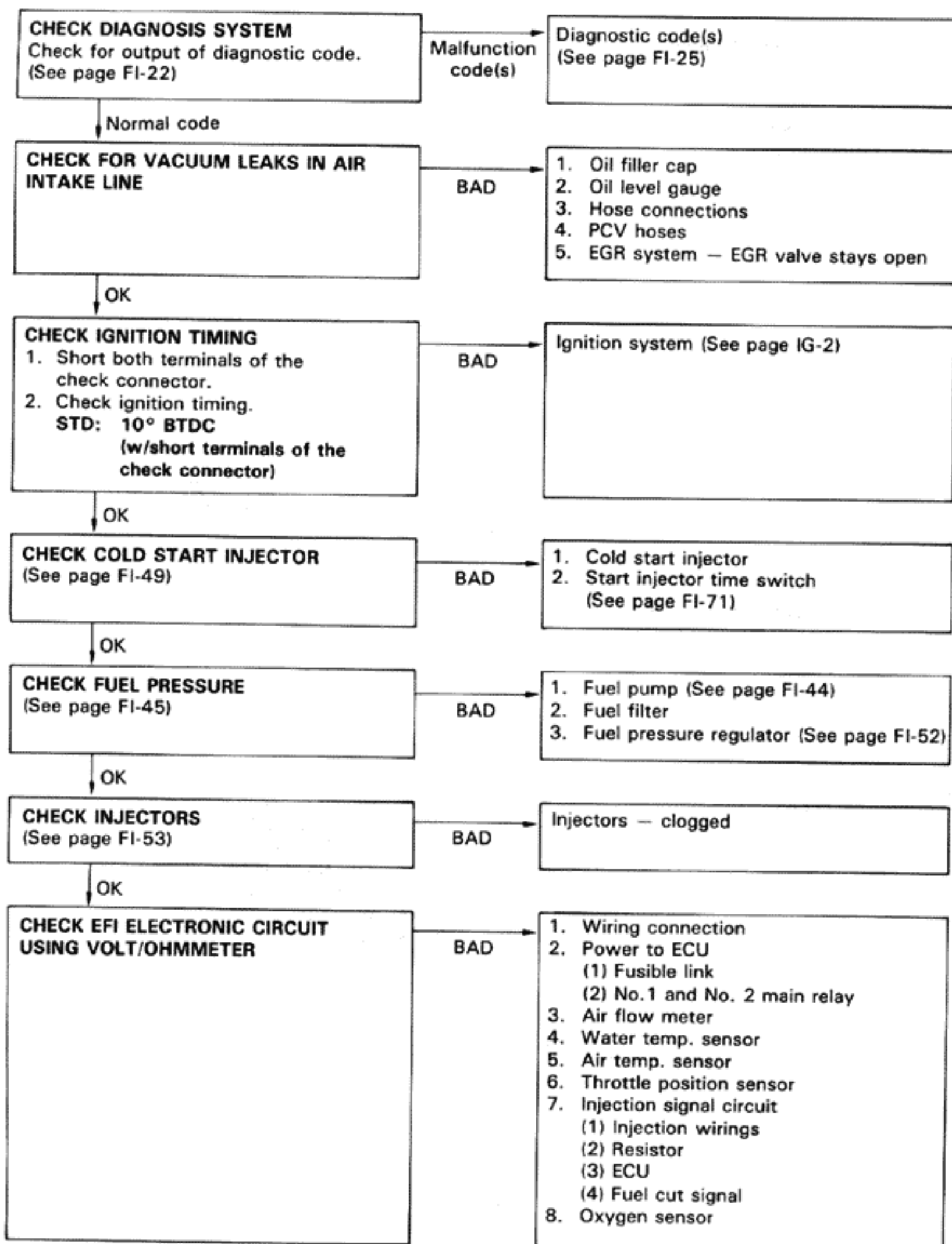
BAD

1. Wiring connection
2. Power to ECU
 - (1) Fusible link
 - (2) No. 1 and No. 2 main relay
3. Air flow meter
4. Water temp. sensor
5. Injection signal circuit
 - (1) Injector wiring
 - (2) Resistor
 - (3) ECU

SYMPTOM — HIGH ENGINE IDLE SPEED (NO DROP)

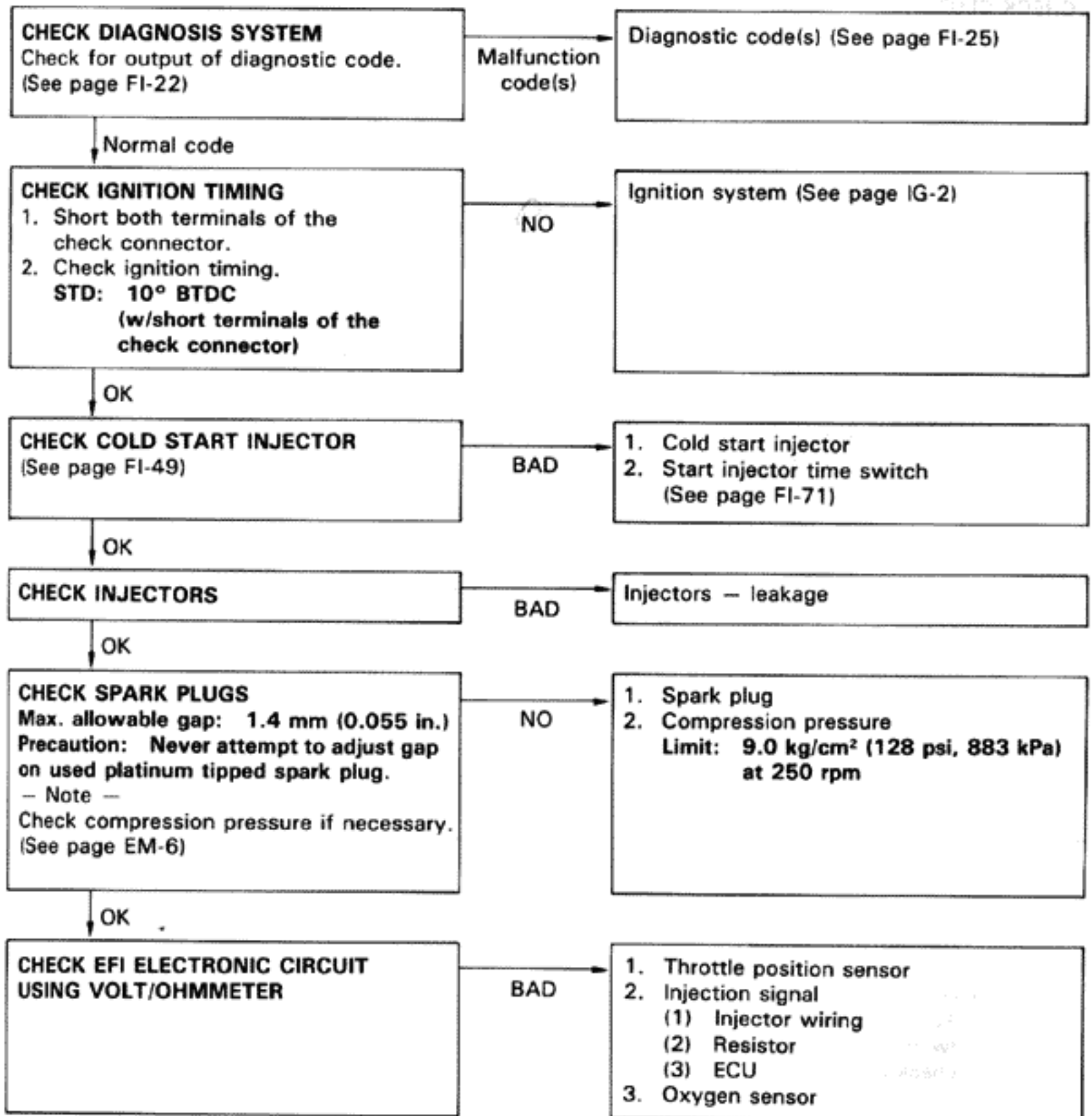


SYMPTOM — ENGINE BACKFIRES-Lean Fuel Mixture

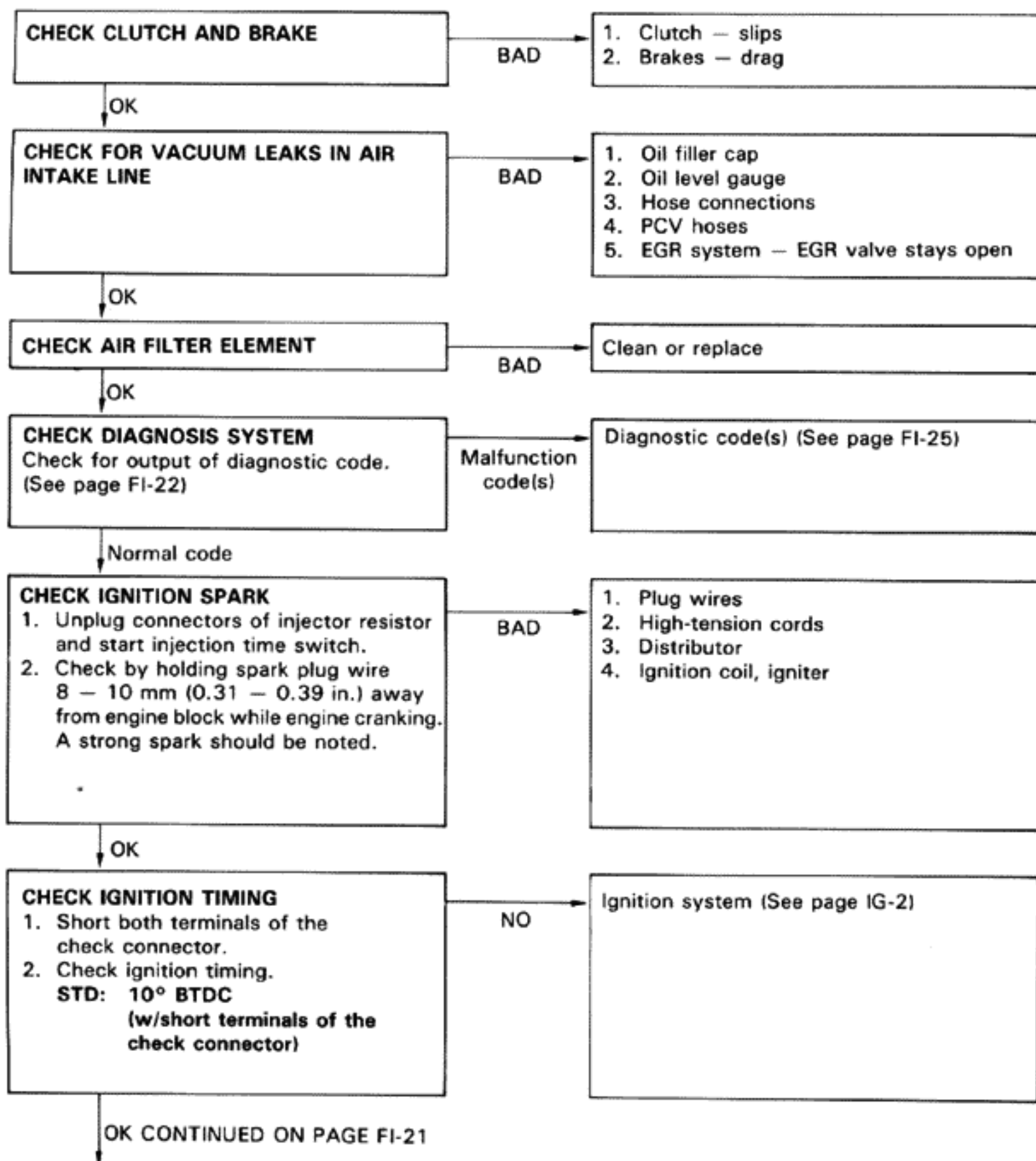


SYMPTOM — MUFFLER EXPLOSION (AFTER FIRE)

-Rich Fuel Mixture-Misfire



SYMPTOM — ENGINE HESITATES AND/OR POOR ACCELERATION



OK CONTINUED FROM PAGE FI-20

CHECK FUEL PRESSURE

(See page FI-45)

BAD

1. Fuel pump (See page FI-44)
2. Fuel filter
3. Fuel pressure regulator (See page FI-52)

OK

CHECK INJECTORS

(See page FI-53)

BAD

Injection condition

OK

CHECK SPARK PLUGS

Max. allowable gap: 1.4 mm (0.055 in.)
Precaution: Never attempt to adjust gap
on used platinum tipped spark plug.

— Note —

Check compression pressure if necessary.
(See page EM-6)

NO

1. Spark plug
2. Compression pressure
Limit: 9.0 kg/cm² (128 psi, 883 kPa)
at 250 rpm

OK

**CHECK EFI ELECTRONIC CIRCUIT
USING VOLT/OHMMETER**

BAD

1. Wiring connection
2. Power to ECU
(1) Fusible link
(2) No. 1 and No. 2 main relay
3. Air flow meter
4. Water temp. sensor
5. Air temp. sensor
6. Throttle position sensor
7. Injection signal circuit
(1) Injector wirings
(2) Resistor
(3) ECU

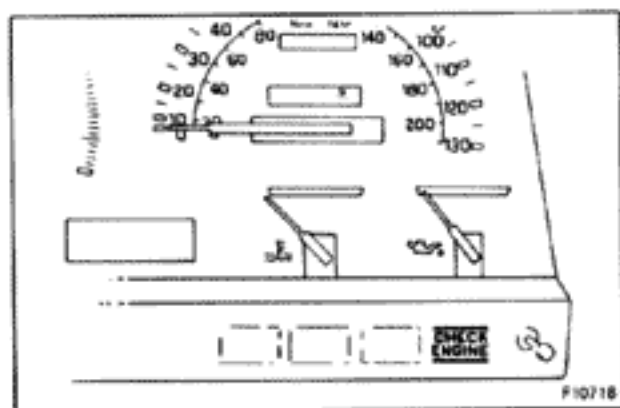
DIAGNOSIS SYSTEM

Description

The ECU contains a built-in self-diagnosis system by which troubles with the engine signal network are detected and a "CHECK ENGINE" warning light on the instrument panel flashes (Code Nos. 12, 13, 14, 21, 22, 31, 32, 42, 52 and 53).

A "CHECK ENGINE" warning light on the instrument panel informs the driver that a malfunction has been detected. The light goes out automatically when the malfunction has been cleared.

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.



"CHECK ENGINE" WARNING LIGHT CHECK

1. The "CHECK ENGINE" warning light will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the "CHECK ENGINE" warning light should go out.

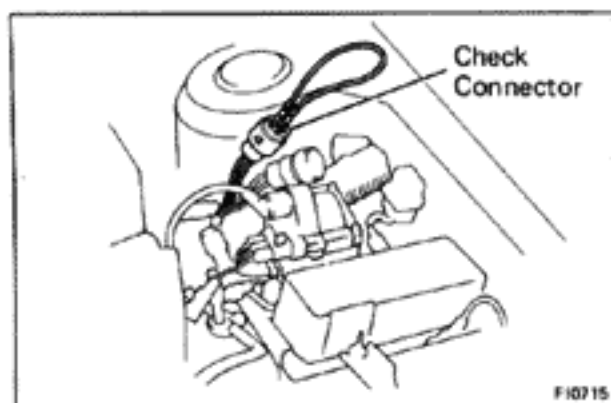
If the light remains on, the diagnosis system has detected a malfunction in the system.

OUTPUT OF DIAGNOSTIC CODES

Initial Conditions

- Battery voltage above 11 volts.
- Throttle valve fully closed (throttle position sensor IDL points closed).
- Transmission in P or N range.
- Air conditioner switch OFF.
- Engine at normal operating temperature.

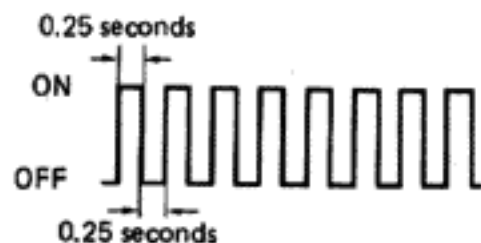
1. Turn the ignition switch to ON. Do not start the engine.
2. Using a sub-wire, short terminals of the check connector.



CHECK ENGINE

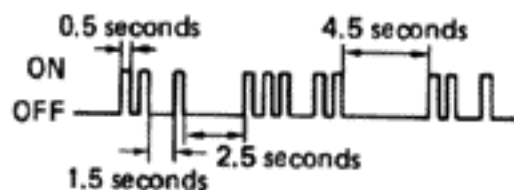
F10636

No malfunction



AT0716

Code No. 21 and No. 32



F10624

3. Read the diagnostic code as indicated by the number of flashes of the "CHECK ENGINE" warning light.

Diagnostic code

- (a) If system is operating normally (no malfunction), the light will blink once every 0.25 seconds.

- (b) In event of a malfunction, the light will blink once every 0.5 seconds. The first number of blinks will equal the first digit of a 2-digit diagnostic code. After a 1.5 second pause, the 2nd number of blinks will equal the 2nd number of a 2-digit diagnostic code. If there are two or more codes, there will be a 2.5 seconds pause between each.

NOTE : In event of a number of troubles codes, indication will begin from the smaller value and continue to the larger in order.

4. After the diagnosis check, remove the sub-wire from the check connector.

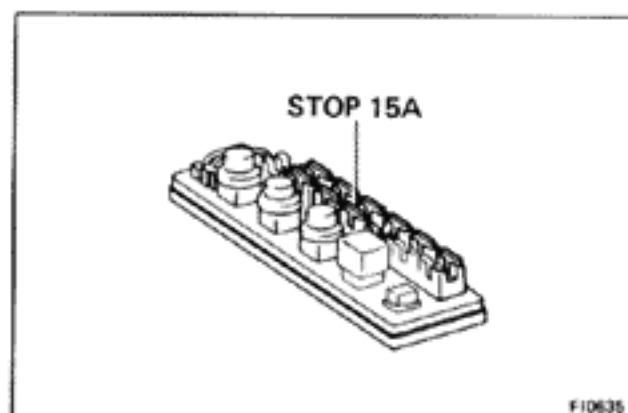
Cancelling out diagnostic code

- (a) After repair of the trouble area, the diagnostic code retained in memory by the ECU must be cancelled out by removing the STOP fuse (15A) 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:

- Cancellation can also be done by removing the battery negative (—) terminal, but in this case other memory systems (radio ETR, clock, etc.) will also be cancelled out.
 - If the diagnostic code is not cancelled out, it will be retained by the ECU and appear along with a new code in event of future trouble.
 - 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.
- (b) After cancellation, perform a road test, if necessary, confirm that a "normal" code 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.



DIAGNOSIS INDICATION

- (1) Including "Normal", the ECU is programmed with the following 16 diagnostic codes.
- (2) When 2 or more codes are indicated, the lowest number (code) will appear first.
However, no other code will appear along with code No. 11.
- (3) All detected diagnostic codes, except 51 and 53, will be retained in memory by the ECU from the time of detection until cancelled out.
- (4) Once the malfunction is cleared, the "CHECK ENGINE" warning light on the instrument panel will go out but the diagnostic code(s) remain stored in ECU memory (except for code 51).

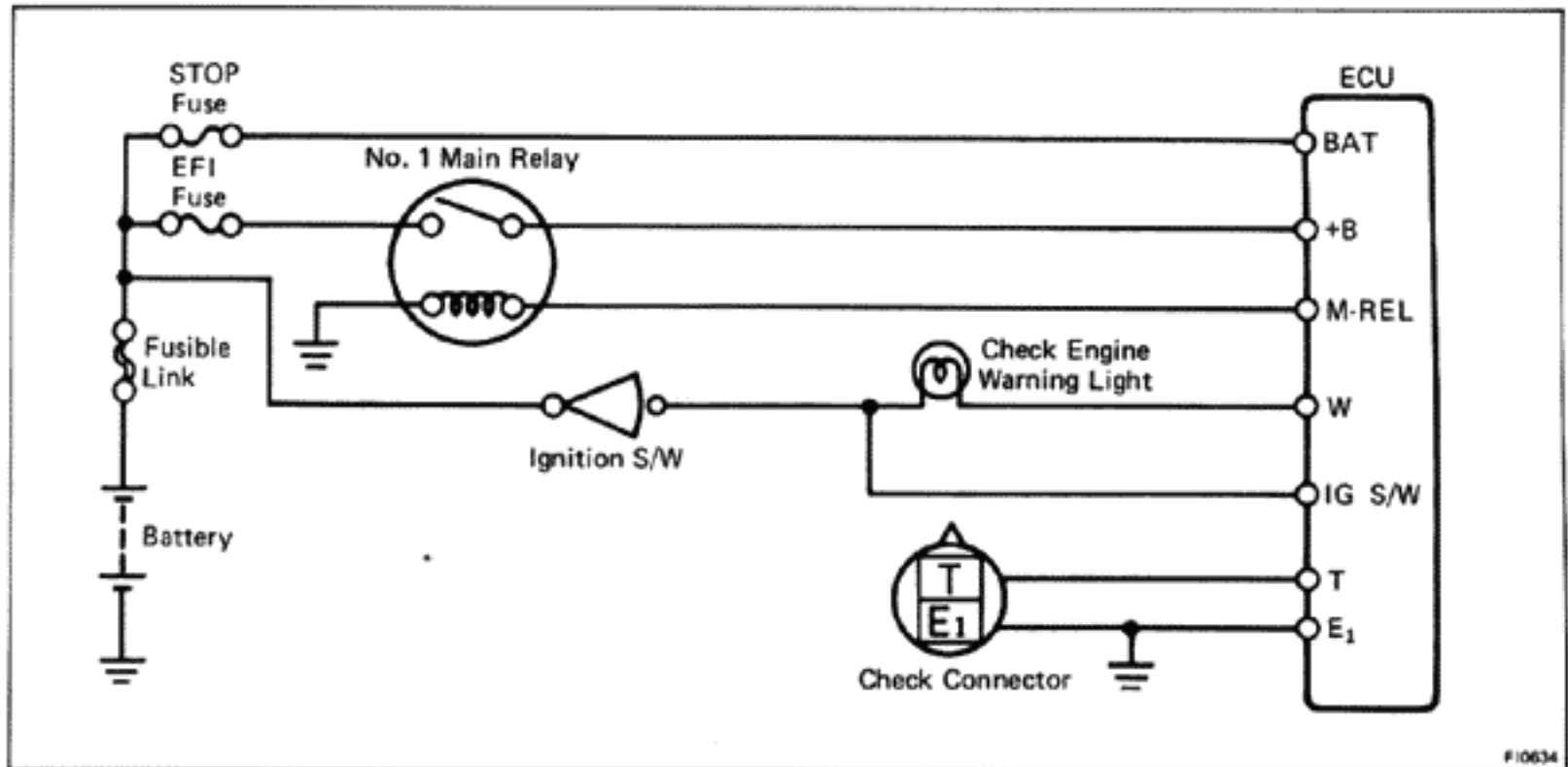
Code No.	Light Pattern	Code No.	Light Pattern
—	ON OFF 	31	
11		32	
12		41	
13		42	
14		43	
21		51	
22		52	
23		53	

DIAGNOSTIC CODES

Code No.	System	Diagnosis	Trouble Area	See page
	Normal	This appears when none of the other codes (11 thru 51) are identified.		
11	ECU (+ B)	Wire severence, however slight, in + B (ECU).	1. Main relay circuit 2. Main relay 3. ECU	FI-32
12	RPM Signal	No Ne, G signal to ECU within several seconds after engine is cranked.	1. Distributor circuit 2. Distributor 3. Starter signal circuit 4. ECU	IG-7
13	RPM Signal	No Ne signal to ECU within several seconds after engine reaches 1,000 rpm.	Same as 12, above.	
14	Ignition Signal	No signal from igniter six times in succession	1. Igniter circuit (+B, IGt, IGf) 2. Igniter 3. ECU	FI-42
21	Oxygen Sensor Signal	Oxygen sensor gives a lean signal for several seconds even when coolant temperature is above 50°C (122°F) and engine is running under high load conditions above 1,500 rpm.	1. Oxygen sensor circuit 2. Oxygen sensor 3. ECU	FI-73

Code No.	System	Diagnosis	Trouble Area	See page
22	Water Temp. Sensor Signal	Open or short circuit in coolant temp. sensor signal.	1. Water temp. sensor circuit 2. Water temp. sensor 3. ECU	FI-72
23	Intake Air Temp. Sensor Signal	Open or short circuit in intake air temp. sensor.	1. Intake air temp. sensor circuit 2. Intake air temp. sensor 3. ECU	FI-38
31	Air Flow Meter Signal	Open circuit in Vc signal or Vs and E2 short circuited when idle points are closed.	1. Air flow meter circuit 2. Air flow meter 3. ECU	FI-37
32	Air Flow Meter Signal	Open circuit in E2 or Vc and Vs short circuited.	Same as 31, above.	FI-37
41	Throttle Position Sensor Signal	Open or short circuit in throttle position sensor signal.	1. Throttle position sensor circuit 2. Throttle position sensor 3. ECU	FI-35
42	Vehicle Speed Sensor Signal	(A/T): Signal informing ECU that vehicle speed is 2.0 km/h or less has been input ECU for 5 seconds with engine running at 2,500 rpm or more and shift lever is in other than N or P range. (M/T): Signal informing ECU that vehicle speed is 2.0 km/h or less has been input ECU for 5 seconds with engine running at 2,500 rpm or more.	1. Vehicle speed sensor circuit 2. Vehicle speed sensor 3. Torque converter slipping 4. ECU	
43	Starter Signal (+ B)	No STA signal to ECU when engine is running over 800 rpm.	1. Main relay circuit 2. IG switch circuit (starter) 3. IG switch 4. ECU	FI-40
51	Switch Signal	Neutral start switch OFF or air conditioner switch ON during diagnostic check.	1. Neutral start S/W 2. Air con. S/W 3. ECU	
52	Knock Sensor Signal	Open or short circuit in knock sensor.	1. Knock sensor circuit 2. Knock sensor 3. ECU	
53	Knock Sensor Signal	Faulty ECU. (KNOCK CPU)	ECU	

INSPECTION OF DIAGNOSIS CIRCUIT



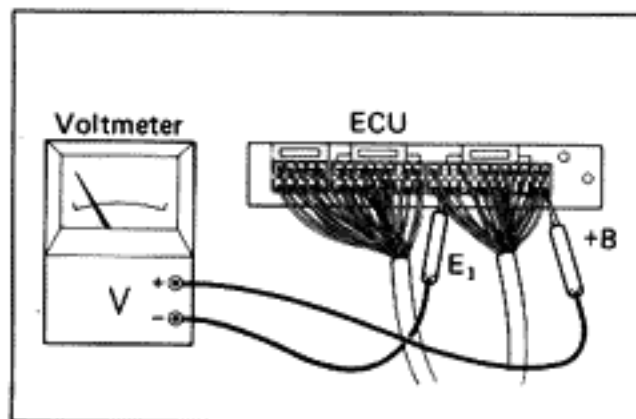
F10634

1. Does CHECK ENG. warning light come on when ignition switch is at ON?
 - YES → System Normal
 - NO → Does CHECK ENG. light come on when ECU terminal W is grounded to the body?
 - YES → Check wiring between ECU terminal E₁ and body ground
 - OK → Try another ECU
 - BAD → Repair or replace
 - NO → Check bulb, fuse and wiring between ECU and ignition switch.
 - BAD → Repair or replace
2. Does CHECK ENG. warning light go OFF when engine is started?
 - YES → System Normal
 - NO → Check wiring between ECU and CHECK ENG. warning light.
 - BAD → Repair
 - OK → Is there diagnosis code output when service connector is short circuited?
 - NO → Try another ECU
 - YES → Does CHECK ENG. warning light go out after repair according to malfunction code?
 - NO → Further repair required
 - YES → System OK → Cancel out Diagnostic code

TROUBLESHOOTING WITH VOLT/OHMMETER

PREPARATION FOR TROUBLESHOOTING

1. Remove the glove box door and glove box.
2. Remove the ECU with wire harness.



EFI SYSTEM CHECK PROCEDURE

NOTE:

1. The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.
2. Perform all voltage measurement with the connectors connected.
3. Verify that the battery voltage is 11V or above when the ignition switch is ON.

Using a voltmeter, measure the voltage at each terminal of the wiring connector.

NOTE: If there is any problem, see TROUBLESHOOTING FOR EFI ELECTRONIC CIRCUIT WITH VOLT/ OHMMETER.

Connectors of ECU

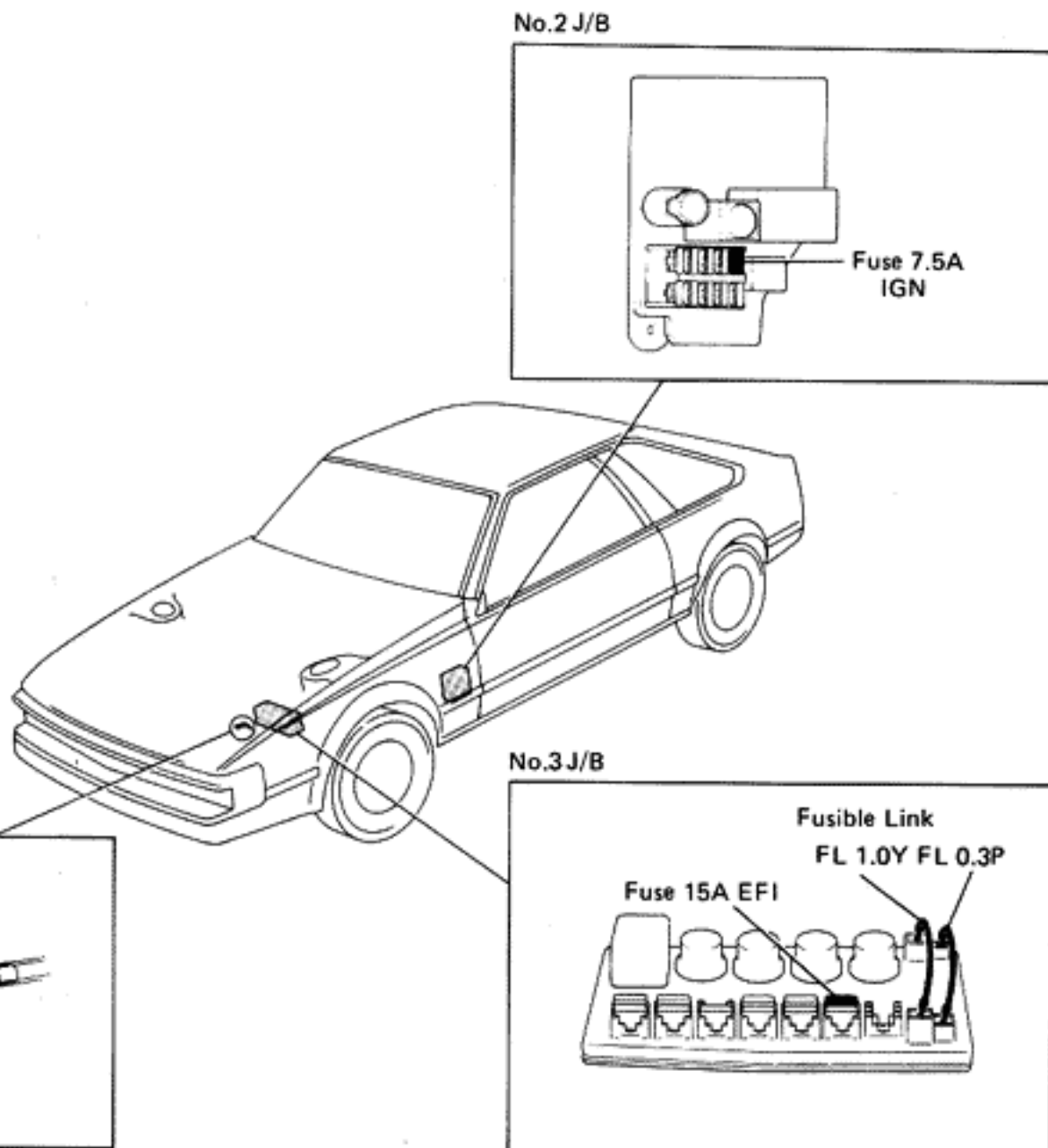
Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	ENGINE GROUND	G⊖	ENGINE REVOLUTION SENSOR	A/C	A/C MAGNET SWITCH
E02	ENGINE GROUND	Vf	CHECK CONNECTOR	SPD	SPEEDOMETER
No.10	INJECTOR	G	ENGINE REVOLUTION SENSOR	W	WARNING LIGHT
No.20	INJECTOR	T	CHECK CONNECTOR	THA	AIR TEMP. SENSOR
STA	STARTER SWITCH	VTA	THROTTLE SWITCH	Vs	AIR FLOW METER
IGt	IGNITER	Ne	ENGINE REVOLUTION SENSOR	Vc	AIR FLOW METER
EGR	EGR VSV	IDL	THROTTLE SWITCH	BAT	BATTERY +B
E1	ENGINE GROUND	KNK	KNOCK SENSOR	IG S/W	IGNITION SWITCH
N/C	NEUTRAL START SWITCH (A/T)	IGf	IGNITER	+B	MAIN RELAY
	CLUTCH SWITCH (M/T)	Ox	OXYGEN SENSOR	TCD	ECT COMPUTER
ISC1	ISC MOTOR NO.1 COIL	THW	WATER TEMP. SENSOR	OIL	OIL PRESSURE SWITCH
ISC2	ISC MOTOR NO.2 COIL	E2	SENSOR EARTH	L1	ECT COMPUTER
ISC3	ISC MOTOR NO.3 COIL	E1	ENGINE GROUND	L2	ECT COMPUTER
ISC4	ISC MOTOR NO.4 COIL	M-REL	MAIN RELAY COIL	L3	ECT COMPUTER

E01	No.10	STA	EGR	N/C	ISC1	ISC2	G⊖		G	Ne		IGf	THW	L1	L2	L3	M-REL		SPD		THA	Vs	Vc	BAT	IG S/W
E02	No.20	IGt	E1		ISC3	ISC4	Vf	T	VTA	IDL	KNK	Ox	E2	E2	E1	TCD		A/C	W	OIL				+B	+B

TROUBLESHOOTING FOR EFI ELECTRONIC CIRCUIT WITH VOLT/OHMMETER

NOTE: Because the following troubleshooting procedures are designed for inspection of each separate system, the actual troubleshooting procedure may vary somewhat. However, please refer to these procedures and perform actual troubleshooting, conforming to the inspection methods described in this manual.

For example, it is better to first make a simple check of the fuses, fusible links and connecting condition of the connectors before making your inspection according to the procedures listed.

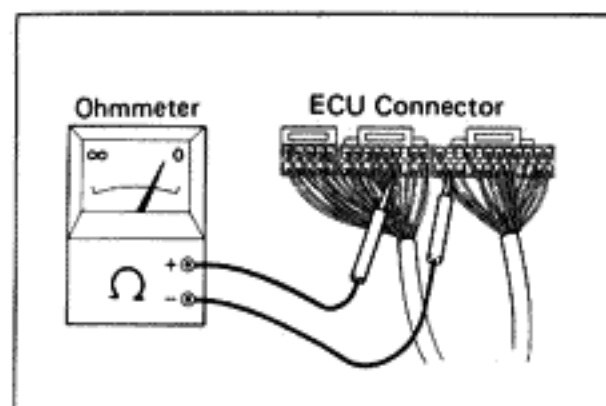


VOLTAGES AT ECU WIRING CONNECTORS

No.	Terminals	Condition		STD Voltage	See page
1	BAT — E ₁	—		10 — 14	FI-32
	+B — E ₁		—		FI-33
	IG S/W — E ₁				
	M-REL — E ₁				
2	IDL — E ₂	IG S/W ON	Throttle valve open	4 — 6	FI-35
	V _c — E ₂		—	4 — 6	FI-36
	VTA — E ₂		Throttle valve fully closed	0.1 — 1.0	
			Throttle valve fully opened	4 — 5	
3	V _c — E ₂		—	4 — 6	FI-37
	V _s — E ₂		Measuring plate fully closed	4 — 5	FI-38
			Measuring plate fully open	0.02 — 0.08	
			Idling		
		3,000 rpm		0.3 — 1.0	
	THA — E ₂	IG S/W ON	Intake air temperature 20°C (68°F)	1 — 2	FI-38
4	THW — E ₂		Coolant temperature 80°C (176°F)	0.1 — 0.5	FI-39
5	STA — E ₁	IG S/W ST position		6 — 12	FI-40
6	No. 10 No. 20 — E ₁	IG S/W ON	—	9 — 14	FI-41
7	IGt — E ₁	Cranking or Idling		0.7 — 1.0	FI-42
8	ISC ₁ } — E ₁ ISC ₄	IG S/W ON	—	9 — 14	FI-43
	2 — 3 secs, after engine off		9 — 14		

INSPECTION OF WIRING CONNECTOR LINE**MEASURE RESISTANCE OF ECU****CAUTION:**

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



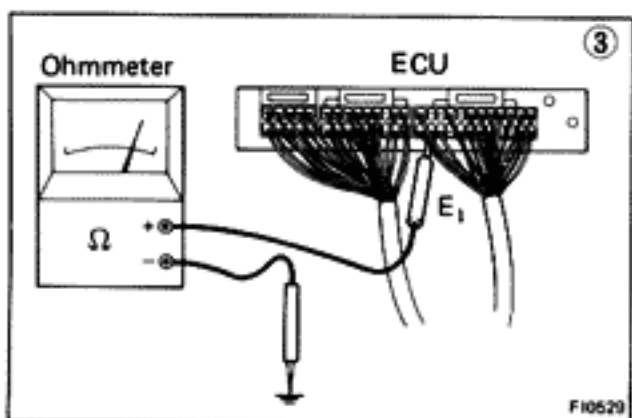
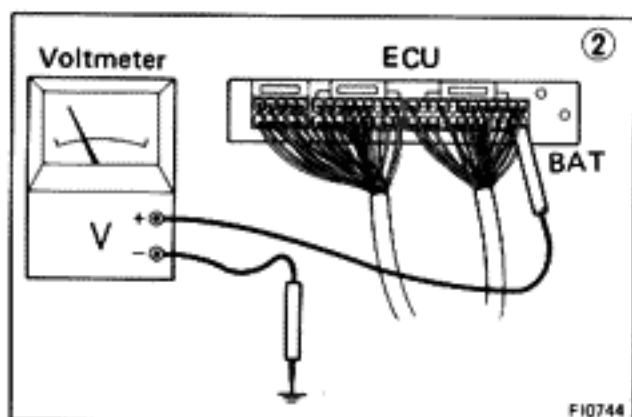
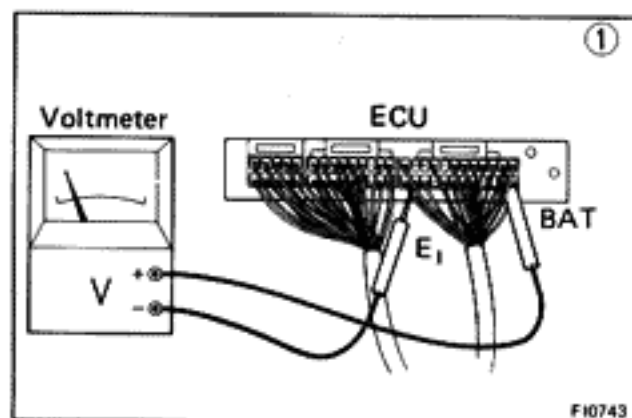
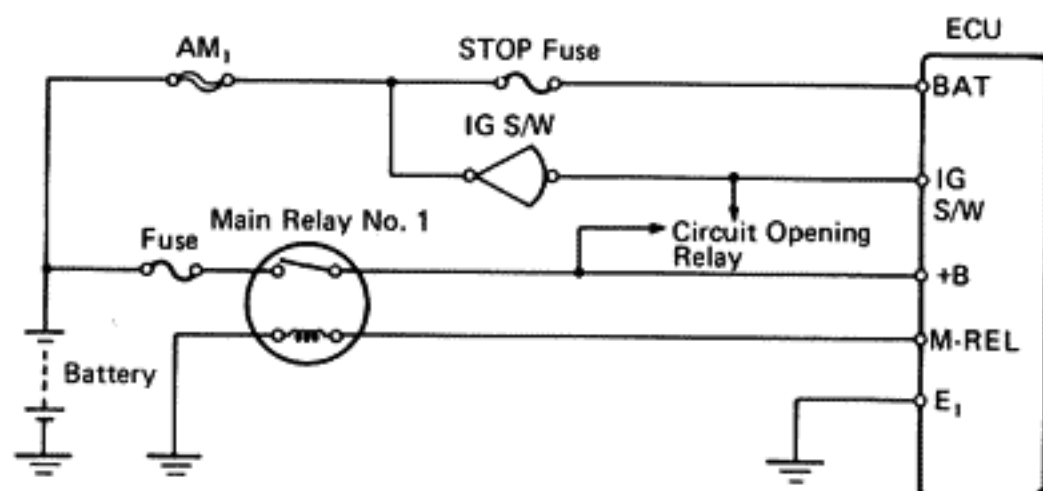
Using an ohmmeter, check the resistance between each terminal of the wiring connector.

- Remove the glove box.
- Disconnect the wiring connectors from the ECU.
- Measure the resistance between each terminal of the wiring connectors.

Resistances at ECU Wiring Connectors

Terminals	Condition	Resistance (Ω)
IDL — E ₂	Throttle valve open	∞
	Throttle valve fully closed	0 — 100 Ω
VTA — E ₂	Throttle valve fully opened	3,300 — 10,000
	Throttle valve fully closed	200 — 800
V _c — E ₂	Disconnect air flow meter connector	3,000 — 7,000
	Disconnect throttle position sensor connector	200 — 400
V _s — E ₂	Measuring plate fully closed	20 — 400
	Measuring plate fully opened	20 — 1,000
THA — E ₂	Intake air temperature 20°C (68°F)	2,000 — 3,000
G — G $\ominus$	—	140 — 180
Ne — G $\ominus$	—	140 — 180
ISC ₁ , ISC ₂ ISC ₃ , ISC ₄ — +B	—	10 — 30

No.	Terminals	Trouble	Condition	STD Voltage
1	BAT — E ₁	No voltage	—	10 — 14
	+B — E ₁	No voltage	Ignition switch ON	10 — 14
	IG S/W — E ₁	No voltage	Ignition switch ON	10 — 14
	M-REL — E ₁	No voltage	Ignition switch ON	10 — 14



• BAT ↔ E₁

① There is no voltage between ECU terminals BAT and E₁.

② Check that there is voltage between ECU terminal BAT and body ground.

NO

OK

③ Check wiring between ECU terminal E₁ and body ground.

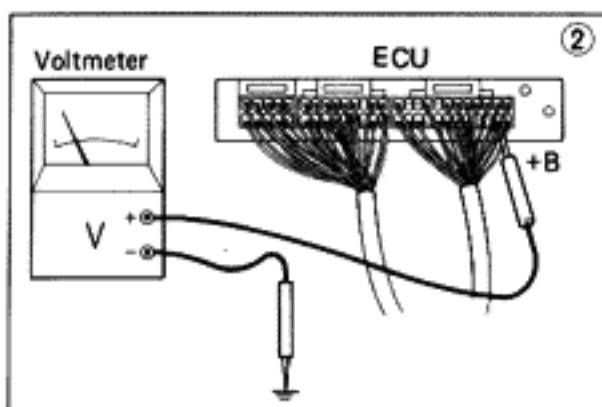
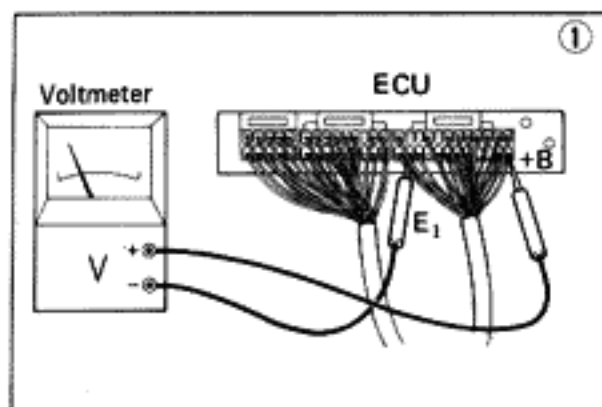
BAD

Repair or replace

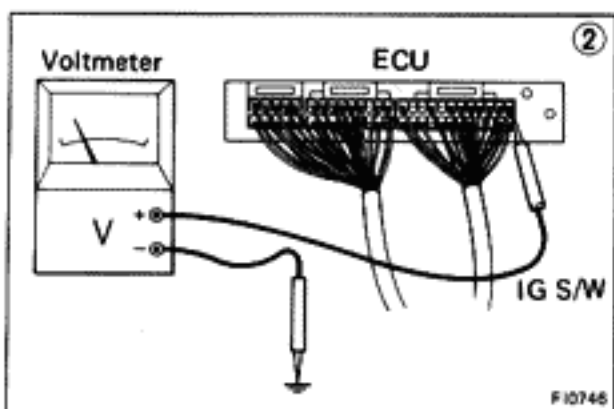
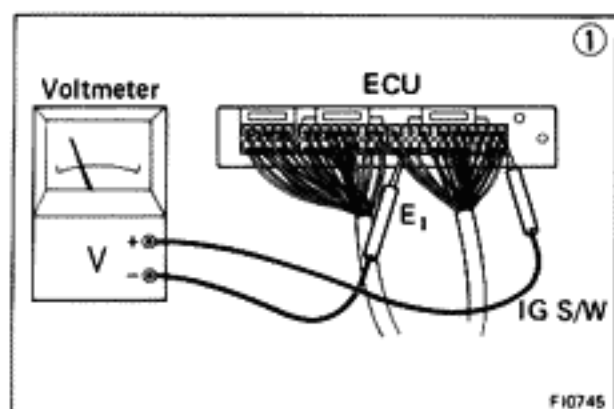
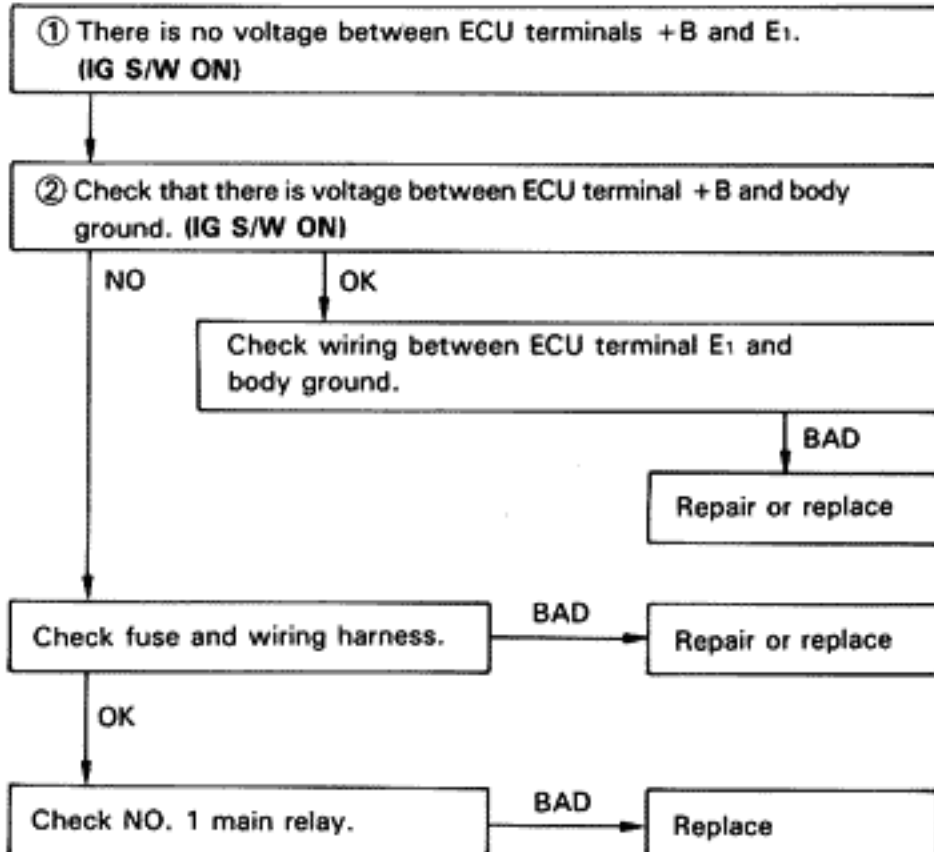
Check fuse, fusible links and wiring harness.

NO

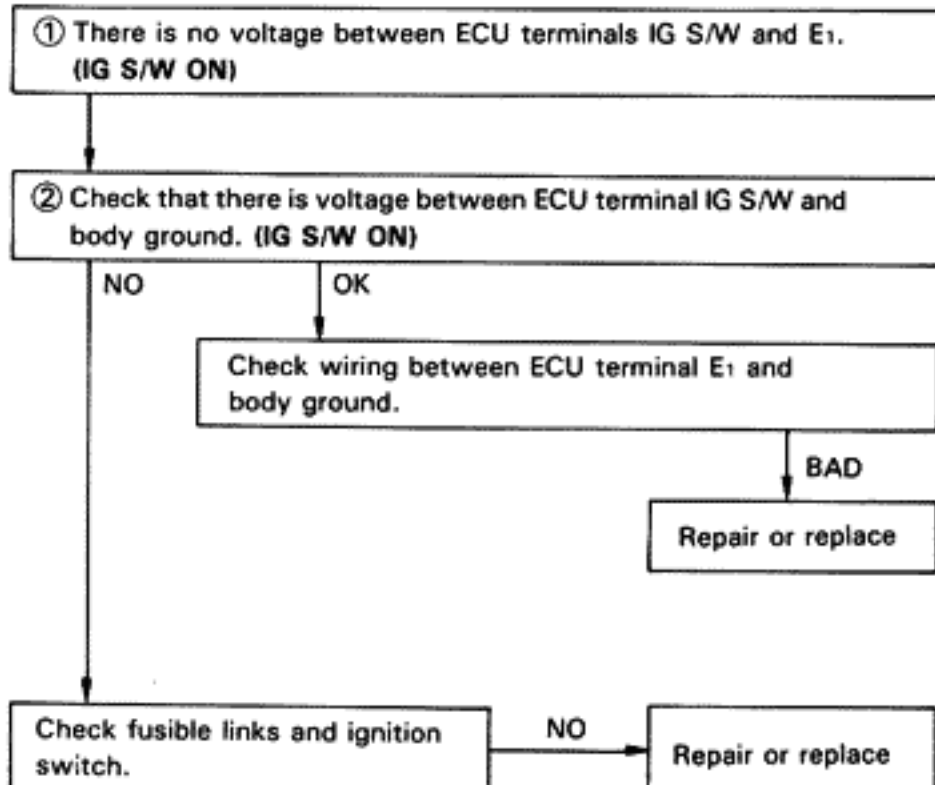
Repair

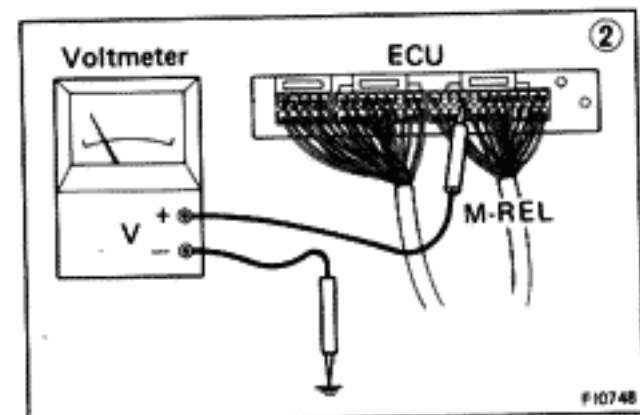
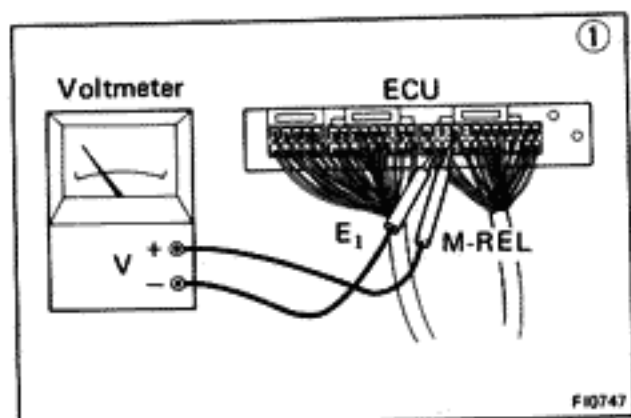


• +B ↔ E₁



• IG S/W ↔ E₁





• M-REL ↔ E₁

① There is no voltage between ECU terminals M-REL and E₁.
(IG S/W ON)

② Check that there is voltage between ECU terminal M-REL and
body ground. (IG S/W ON)

NO

OK

Check wiring between ECU terminal E₁ and
body ground.

BAD

Repair or replace

Check NO. 1 main relay and
wiring harness.

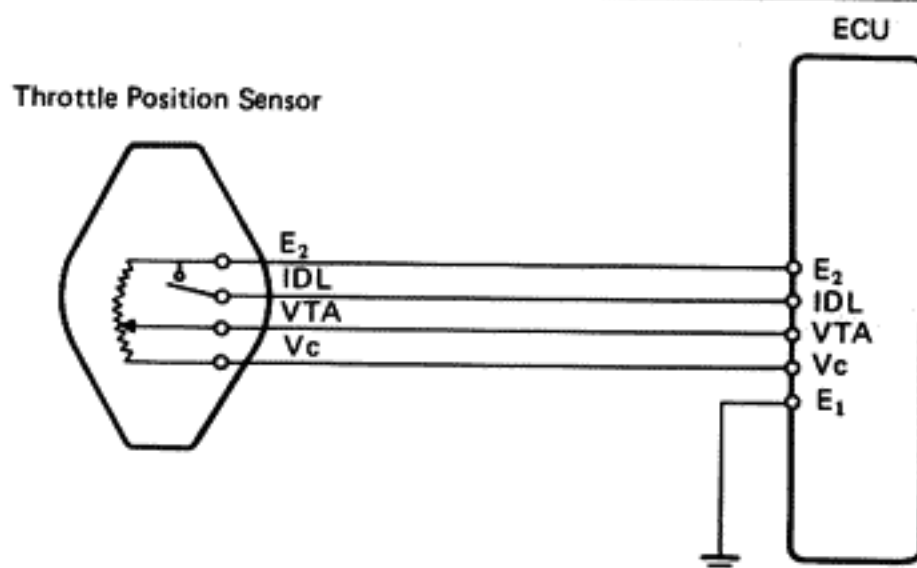
BAD

Replace

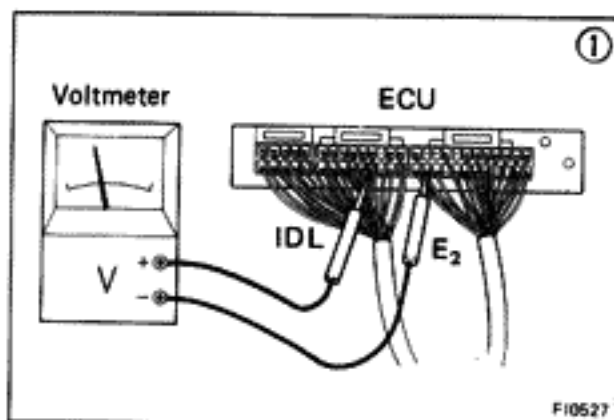
OK

Try another ECU.

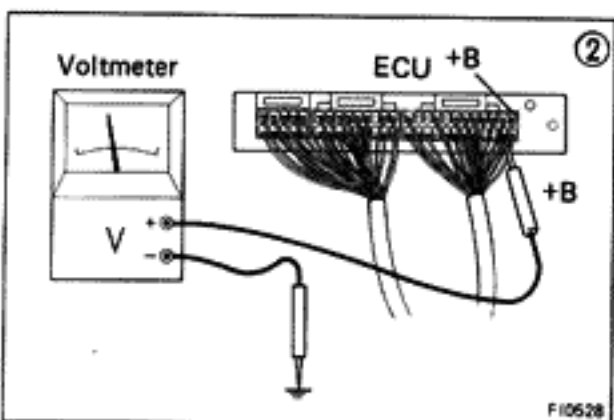
No.	Terminals	Trouble	Condition		STD voltage
2	IDL — E ₂	No voltage	Ignition switch ON	Throttle valve open	4 — 6
	VTA — E ₂			Throttle valve fully closed	0.1 — 1.0
	Vc — E ₂			Throttle valve fully open	4 — 5
				—	4 — 6



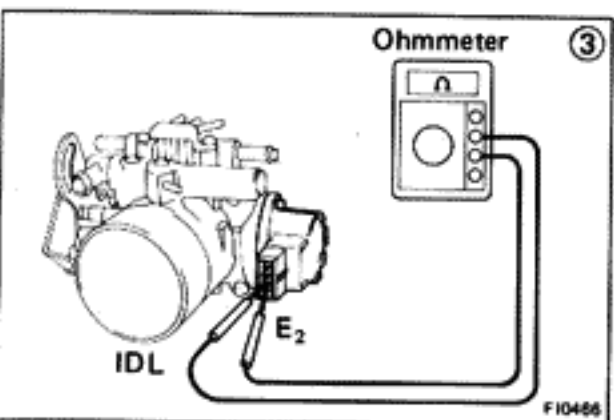
F10485



F10527



F10528



F10486

• IDL ↔ E₂

① There is no voltage between ECU terminals IDL and E₂. (IG S/W ON) (Throttle valve open)

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

NO

OK

Check wiring between ECU terminal E₁ and body ground.

BAD

Repair or replace

Refer to No. 1.

BAD

Repair or replace

OK

③ Check throttle position sensor.

BAD

Repair or replace throttle position sensor.

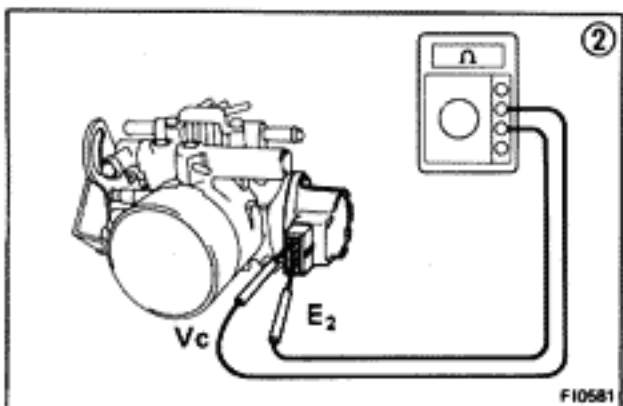
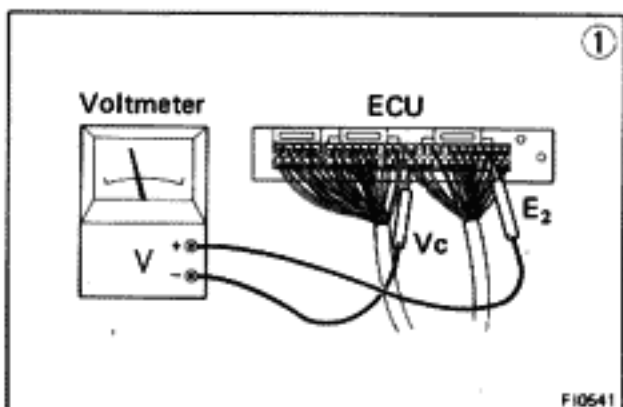
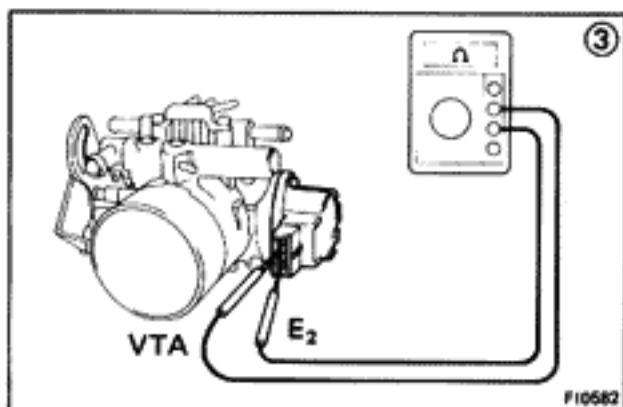
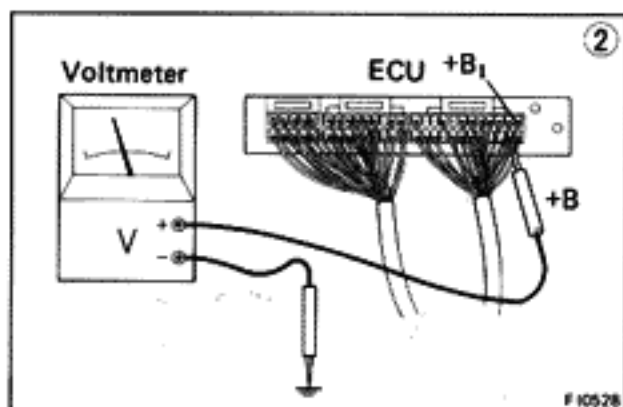
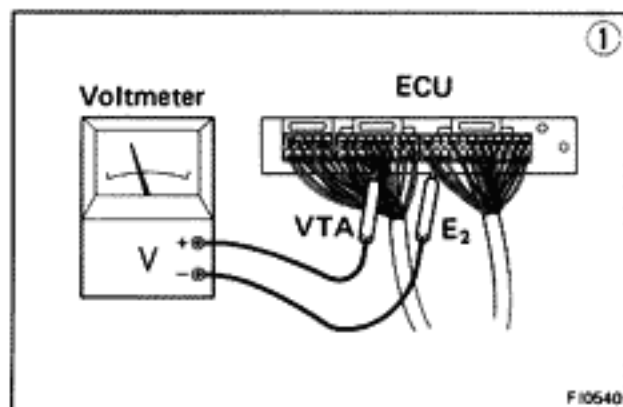
OK

Check wiring between ECU and throttle position sensor.

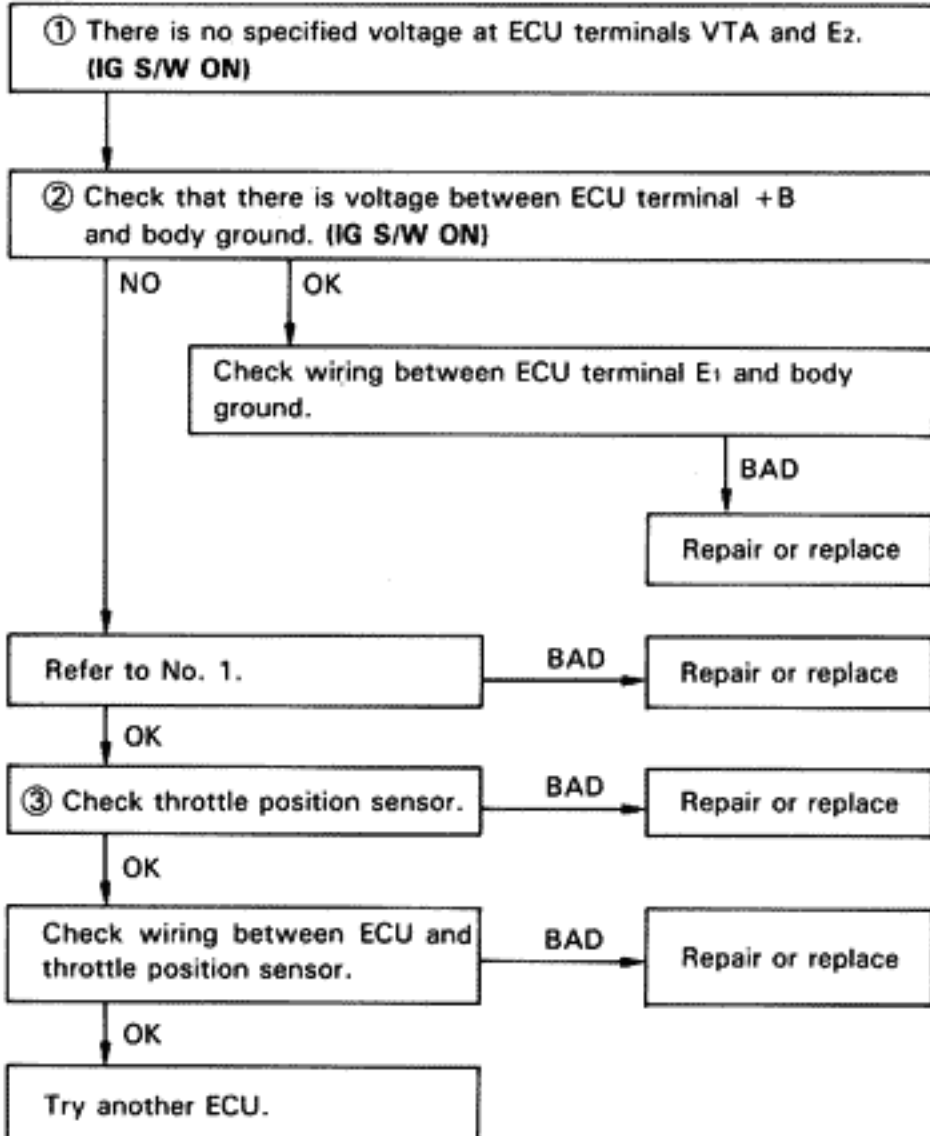
OK

Try another ECU.

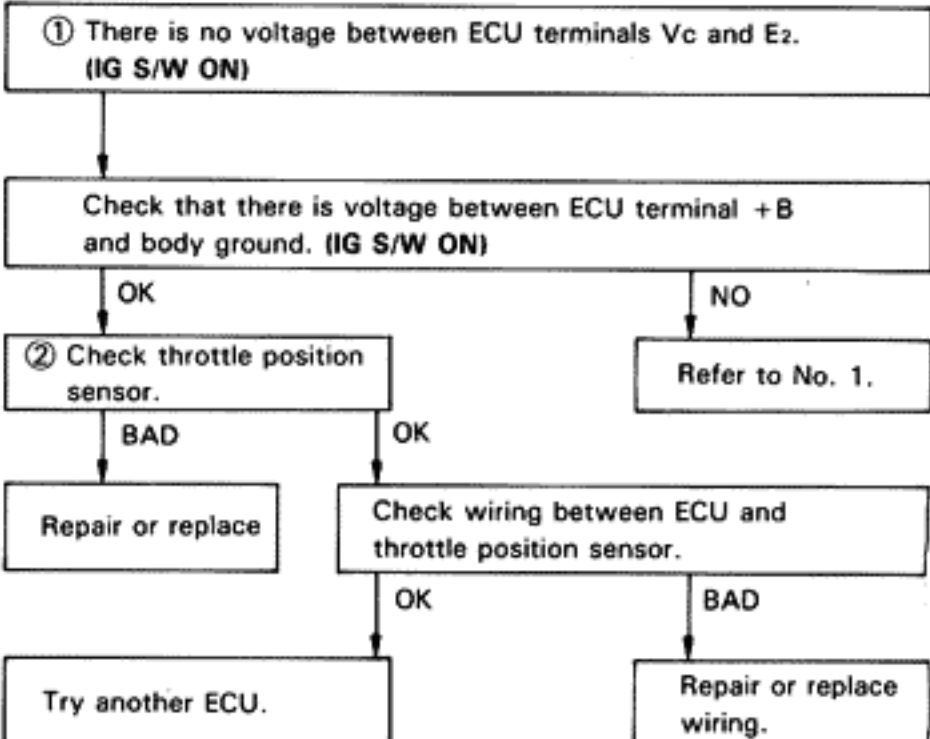
BAD



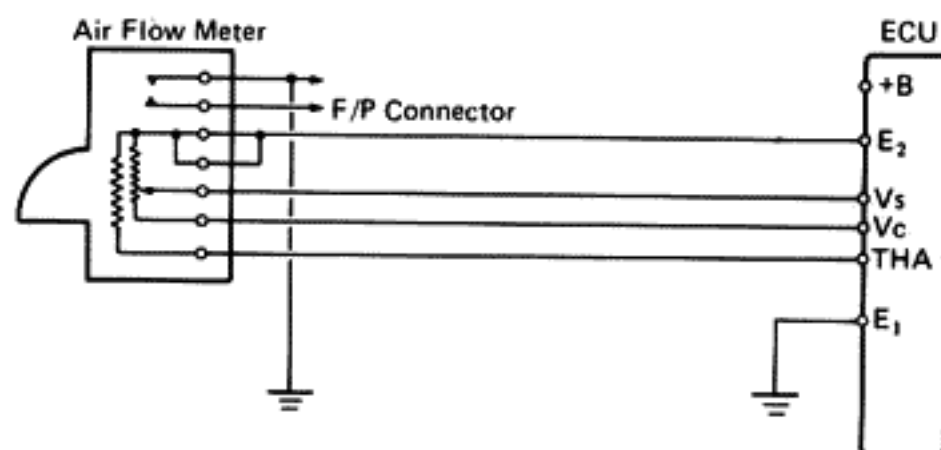
• VTA ↔ E2



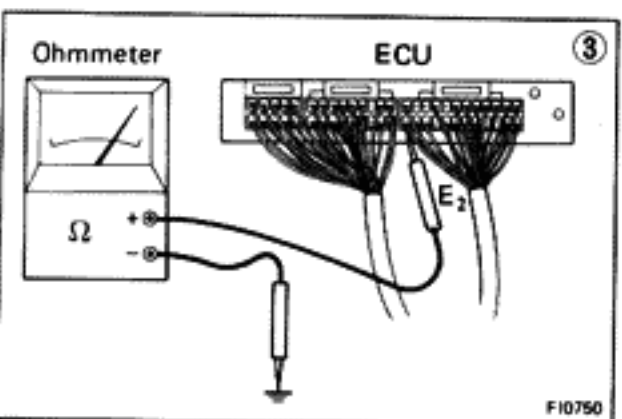
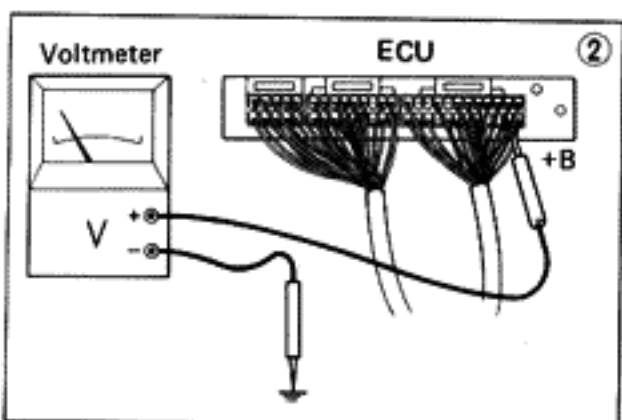
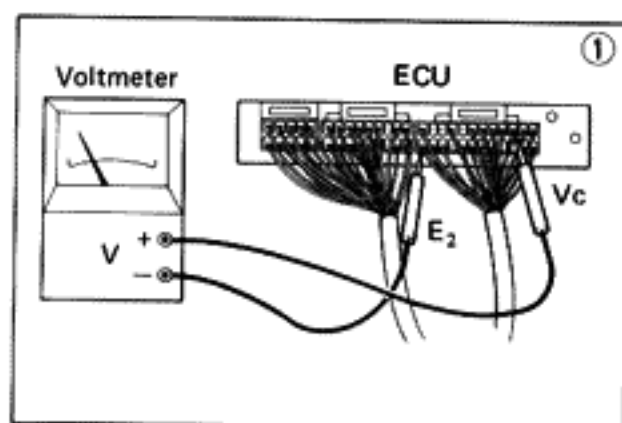
• Vc ↔ E2



No.	Terminal	Trouble	Condition		STD Voltage
3	Vc — E ₂	No voltage	Ignition S/W ON	—	4 — 6 V
	Vs — E ₂			Measuring plate fully closed	4 — 5 V
	Vs — E ₂			Measuring plate fully open	0.02 — 0.08 V
	Vs — E ₂		Idling	—	2 — 4 V
	Vs — E ₂		3,000 rpm	—	0.3 — 1.0 V
	THA — E ₂		IG S/W ON	Intake air temperature 20°C (68°F)	1 — 2 V



FI0749



FI0750

• Vc ↔ E₂

① There is no voltage between ECU terminals Vc and E₂. (IG S/W ON)

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

NO

OK

③ Check wiring between ECU terminal E₂ and body ground.

BAD

Repair or replace

Refer to No. 1.

BAD

Repair or replace

OK

Check air flow meter.

BAD

Repair or replace

OK

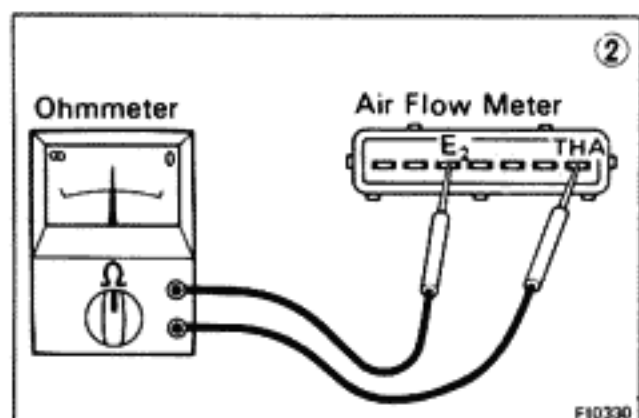
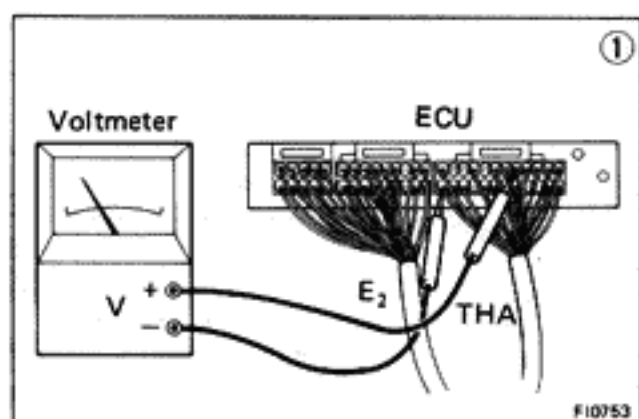
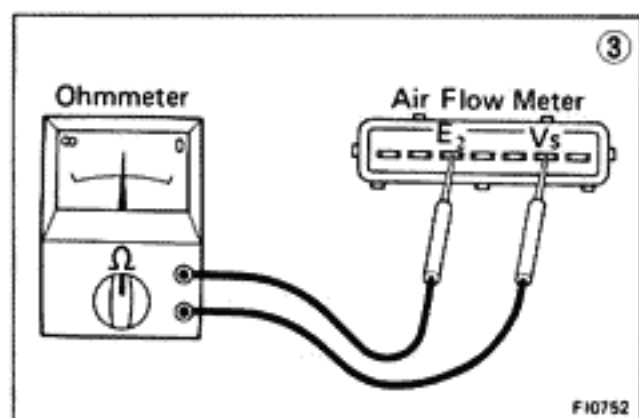
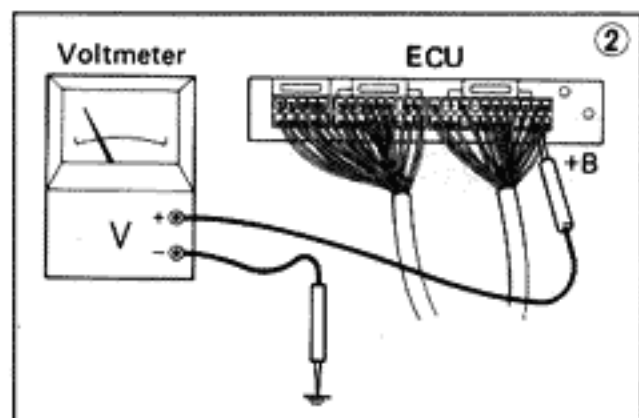
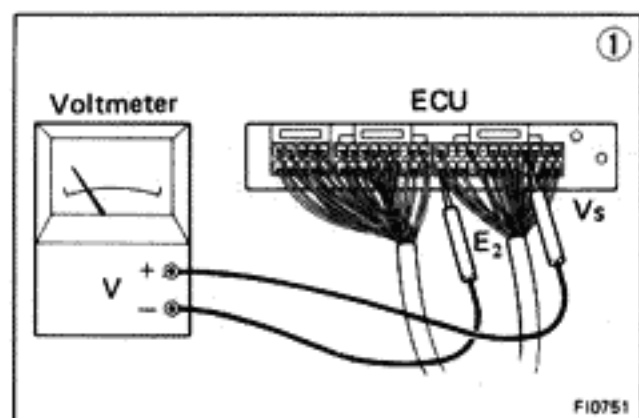
Check wiring between ECU and air flow meter.

BAD

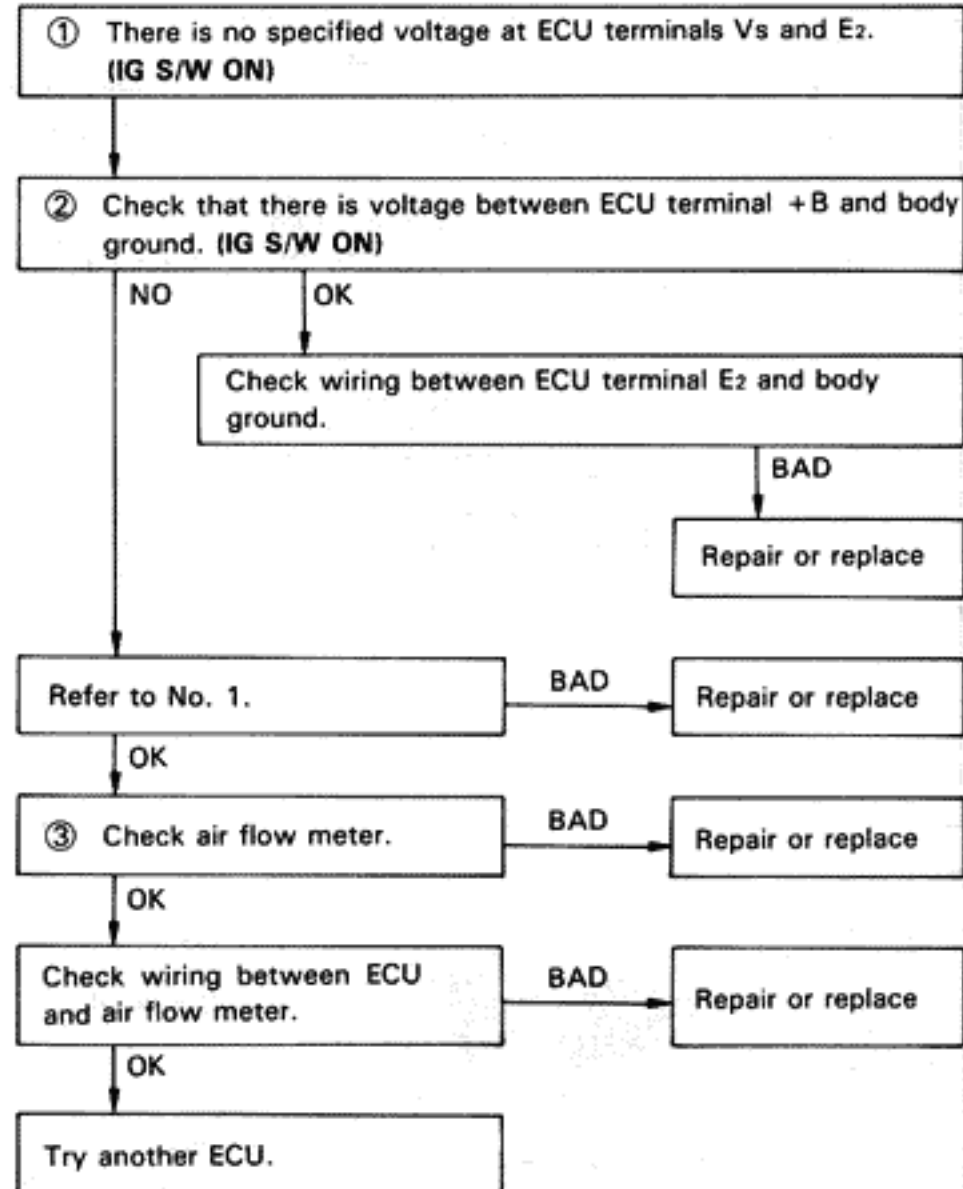
Repair or replace

OK

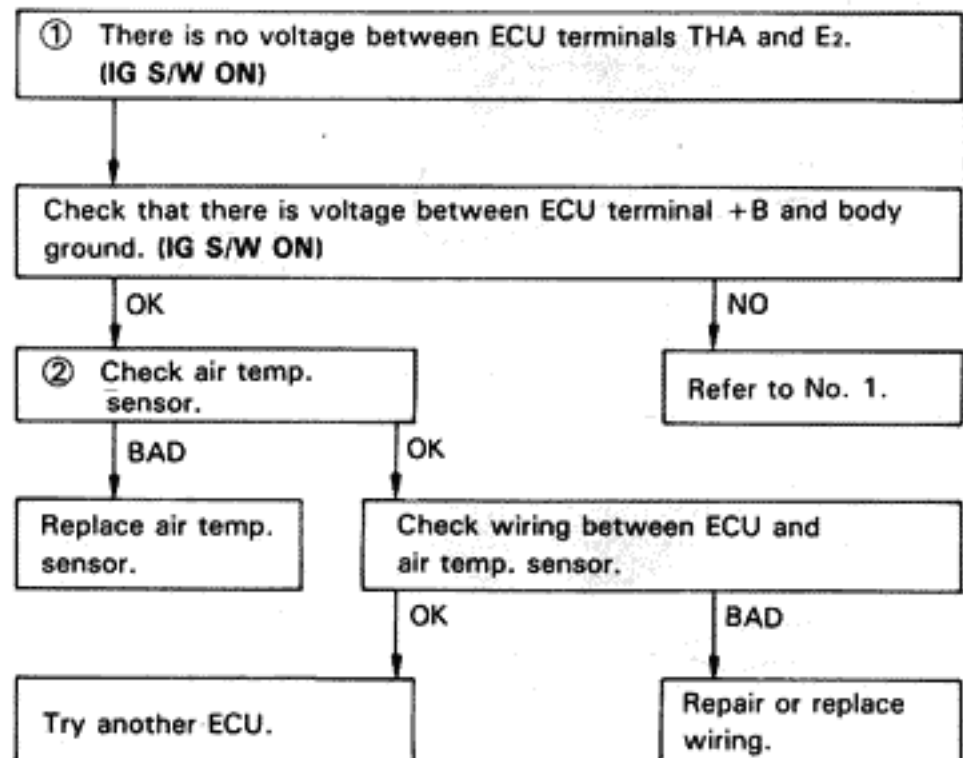
Try another ECU.



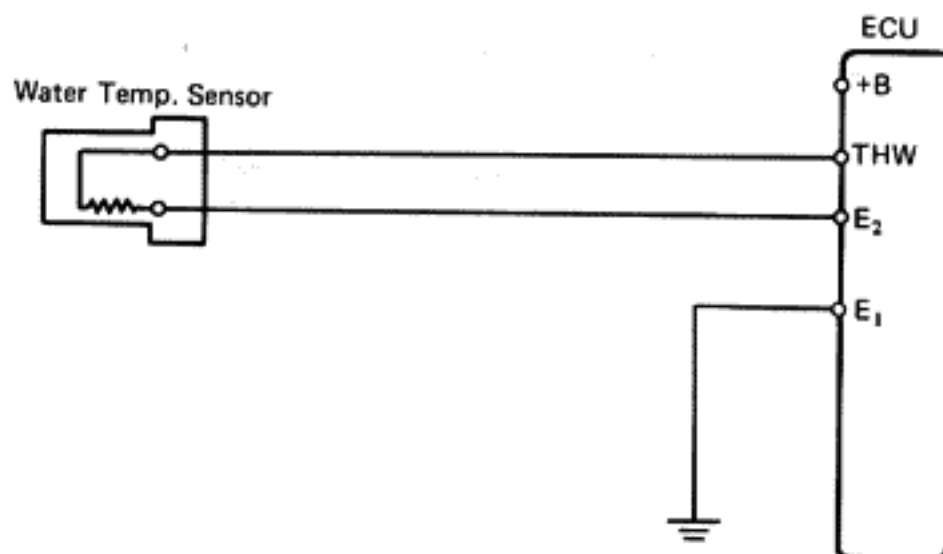
• $V_s \leftrightarrow E_2$



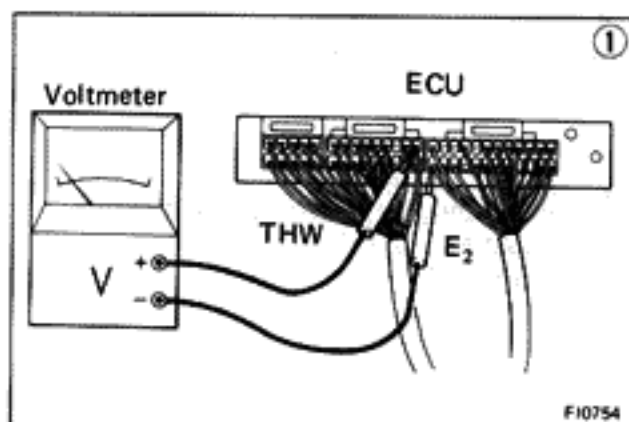
• $THA \leftrightarrow E_2$



No.	Terminals	Trouble	Condition		STD Voltage
4	THW — E ₂	No voltage	Ignition switch ON	Coolant temperature 80°C (176°F)	0.1 — 0.5 V



FI0331



① There is no voltage between ECU terminals THW and E₂. (IG S/W ON)

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

OK

NO

③ Check water temp. sensor.

BAD

OK

Replace water temp. sensor.

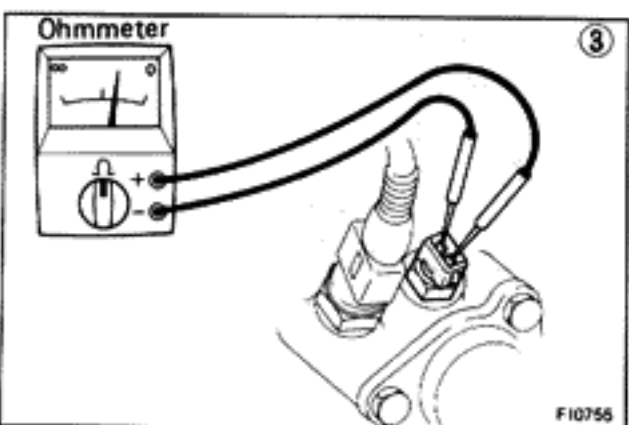
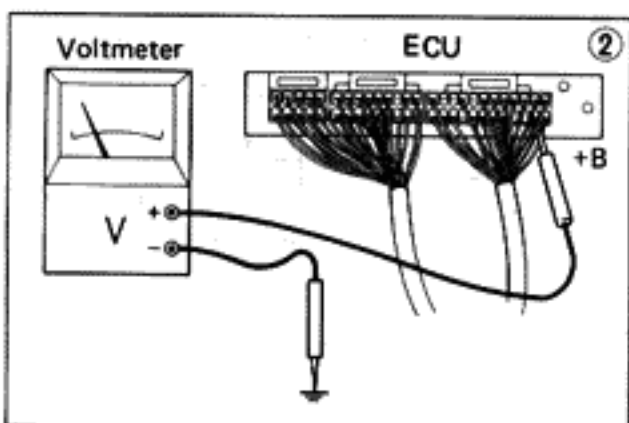
Check wiring between ECU and water temp. sensor.

OK

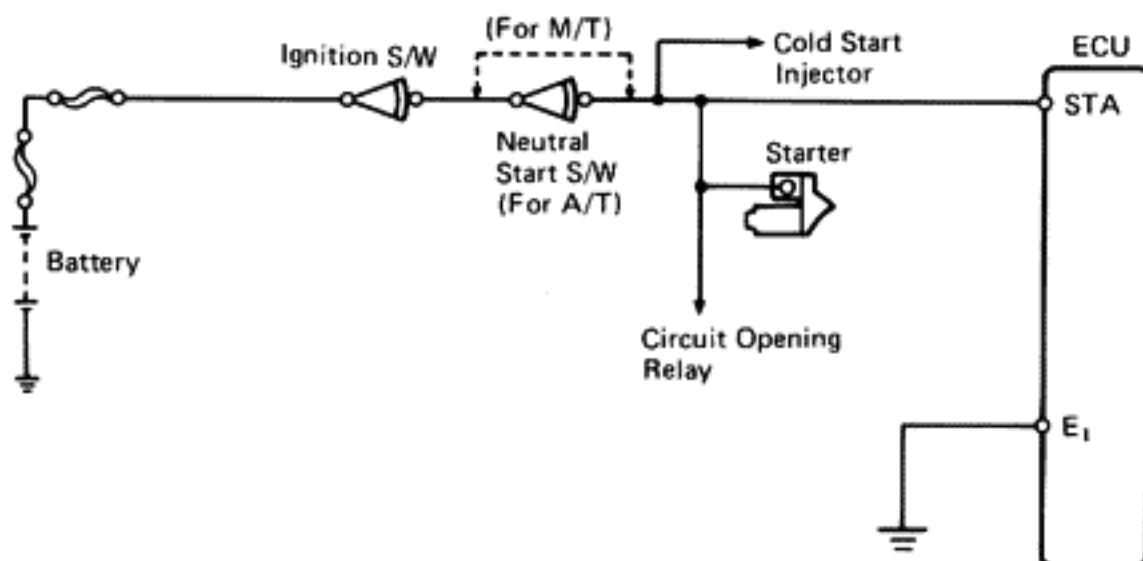
BAD

Try another ECU.

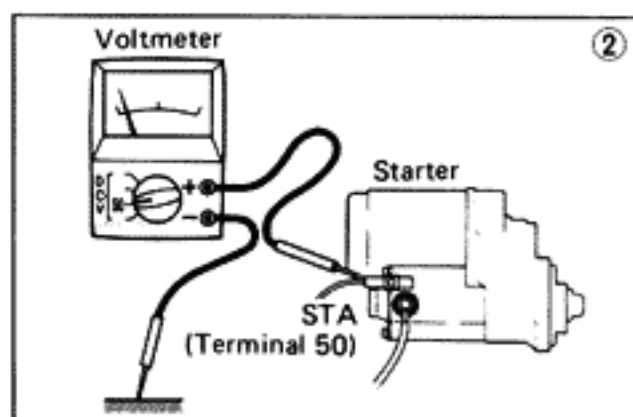
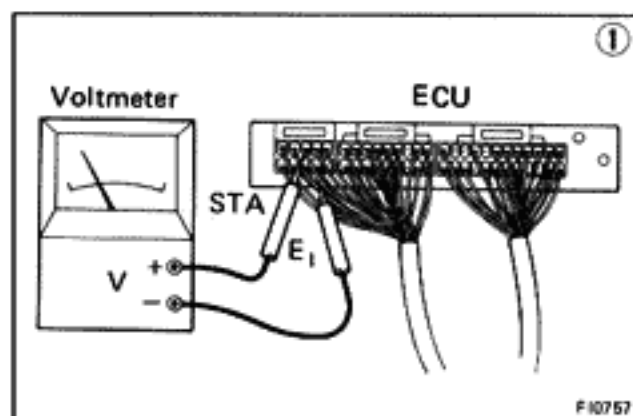
Repair or replace wiring.



No.	Terminals	Trouble	Condition	STD Voltage
5	STA — E ₁	No voltage	Ignition switch ST position	6 — 12 V



F10756



① There is no voltage between ECU terminals STA and E₁.
(IG S/W ST)

Check starter operation.

OK

Check wiring between ECU and starter terminal 50.

OK

BAD

Repair or replace

Check wiring between ECU terminal E₁ and body ground.

BAD

Repair or replace

Check fusible link, battery, wiring and ignition switch.

BAD

Repair or replace

OK

② Check that there is voltage at STA (50) terminal of starter.
(IG S/W ST) STD voltage: 9 — 11 V

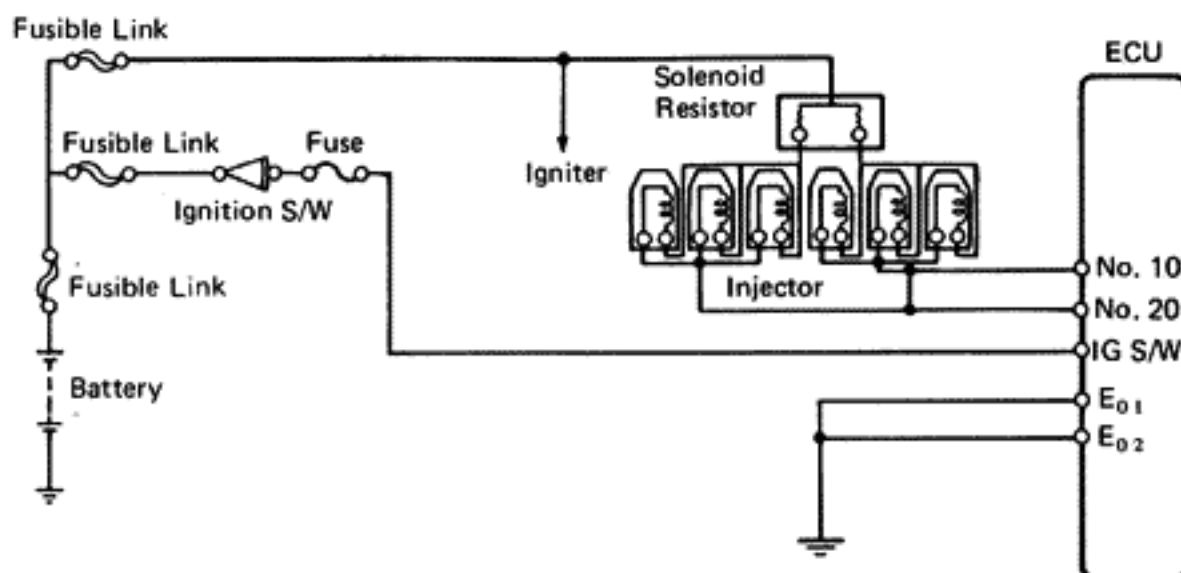
OK

Check starter.

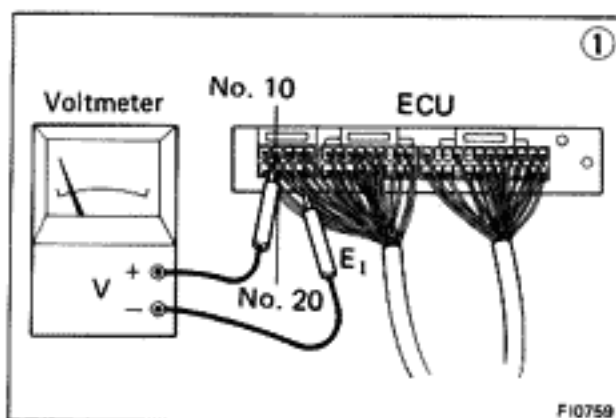
NO

Check wiring between ignition switch ST terminal and starter STA (50) terminal.

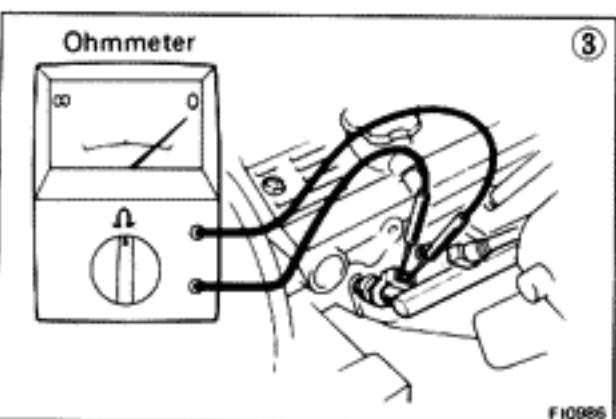
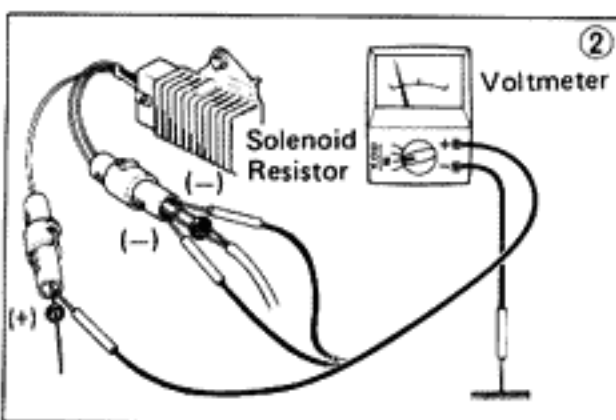
No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 — E ₁ No. 20 — E ₁	No voltage	Ignition switch ON	9 — 14V



F10758



F10759



F10986

① There is no voltage between ECU terminal No. 10 and/or No. 20 and E₀₁ or E₀₂. (IG S/W ON)

② Check that there is specified voltage between resistor terminal (+) and body ground. **STD voltage: 10 — 13V**

OK

NO

Check fuse, fusible link and ignition switch.

BAD

Repair or replace

OK

Check main relay No. 2.

BAD

Replace

OK

Check wiring between resistor and battery.

BAD

Repair or replace

② Check that there is specified voltage between resistor terminal (—) and body ground. **STD voltage: 10 — 13V**

OK

BAD

③ Check resistance of magnetic coil in the each injector. **STD resistance: 1.5 — 3.0Ω**

Replace resistor.

OK

BAD

Check wiring between ECU and injector.

Replace injector.

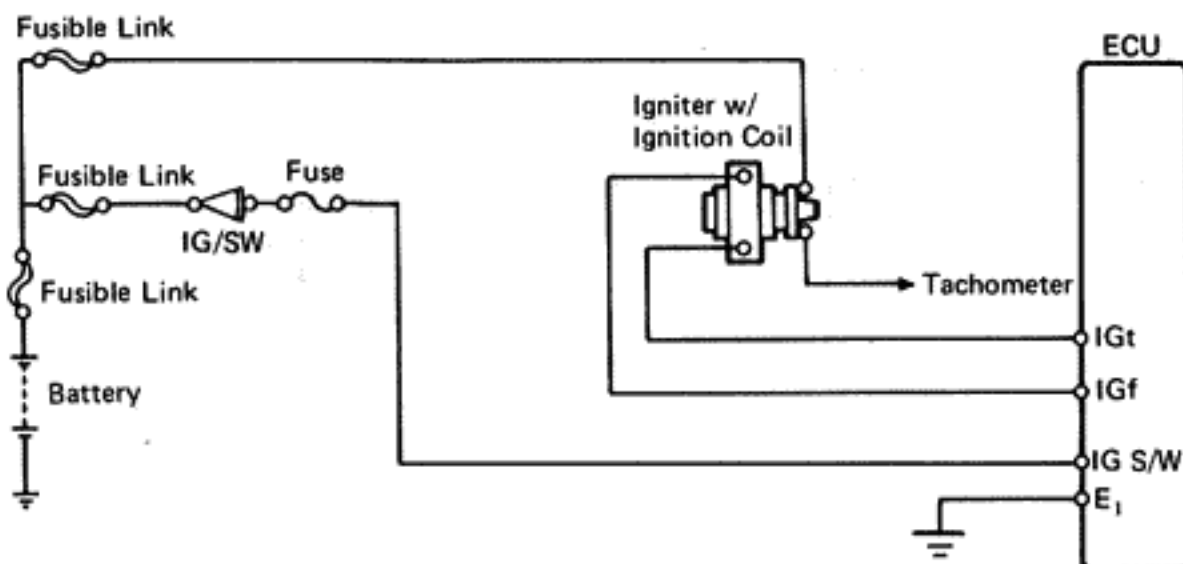
OK

BAD

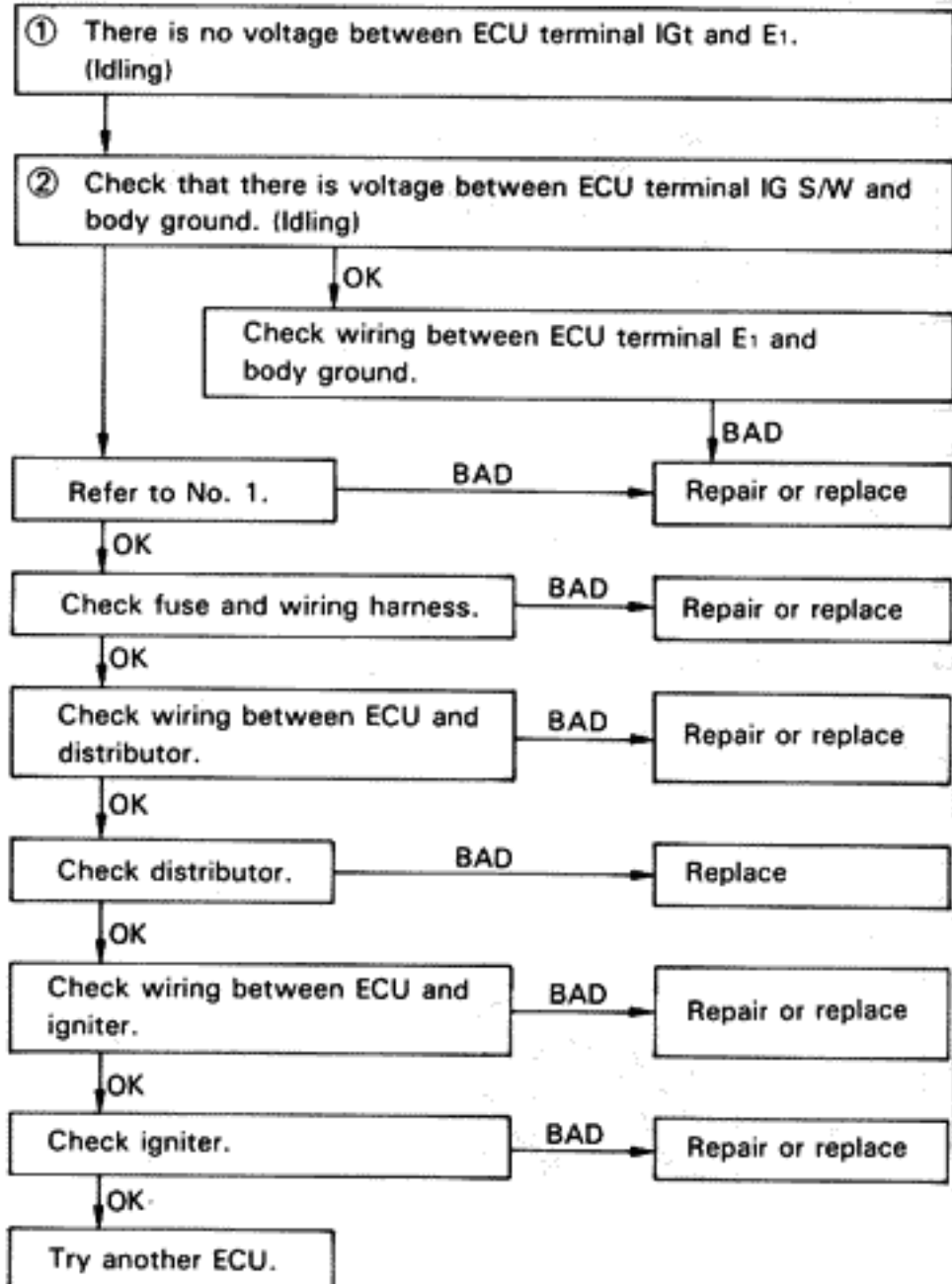
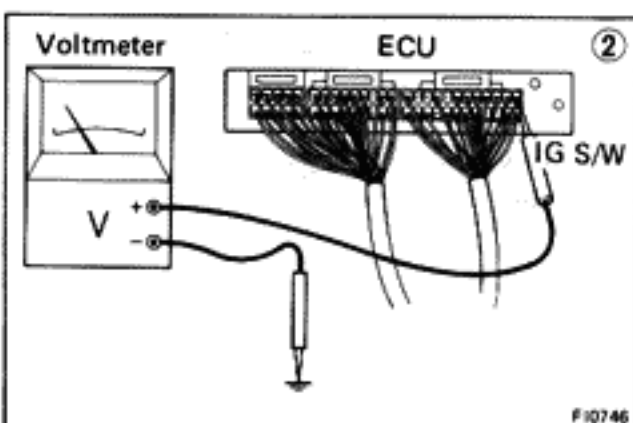
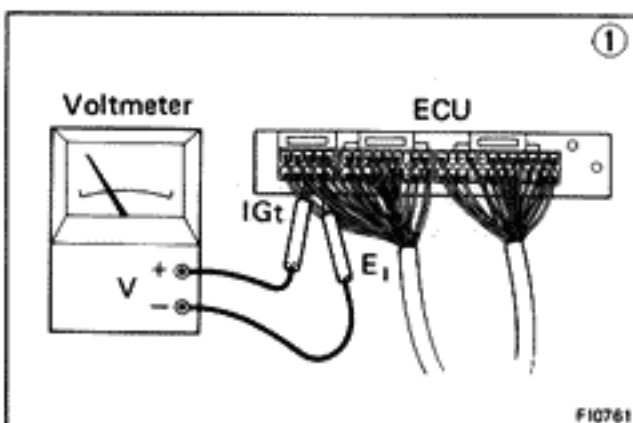
Try another ECU.

Repair or replace

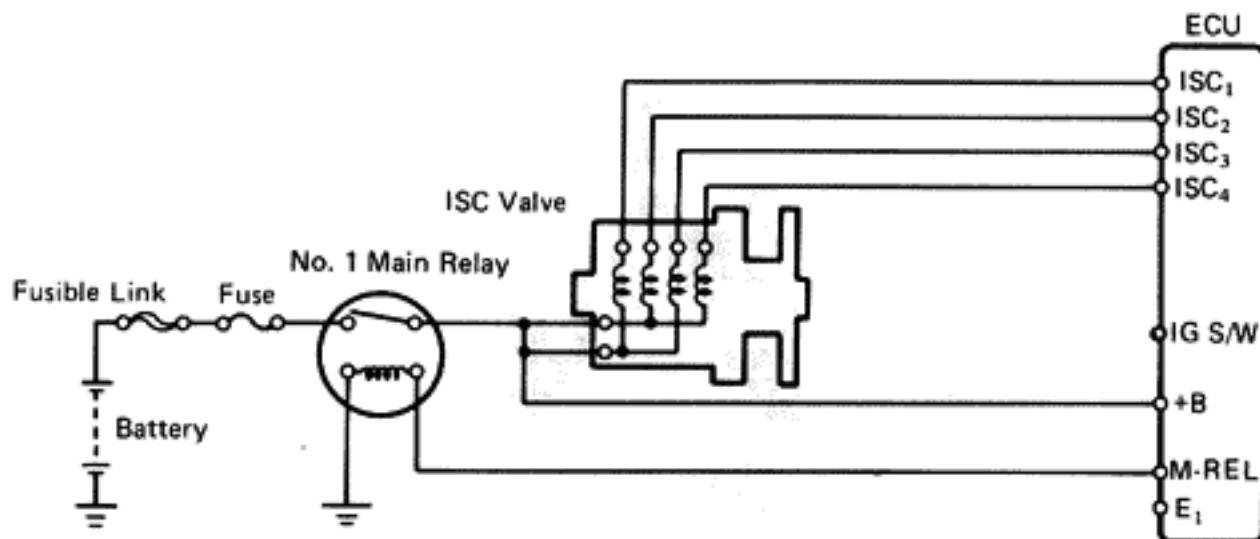
No.	Terminals	Trouble	Condition	STD Voltage
7	IGt — E ₁	No voltage	Cranking or Idling	0.7 — 1.0V



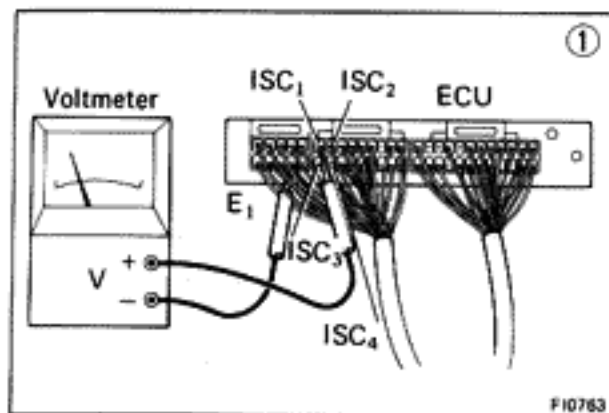
F10760



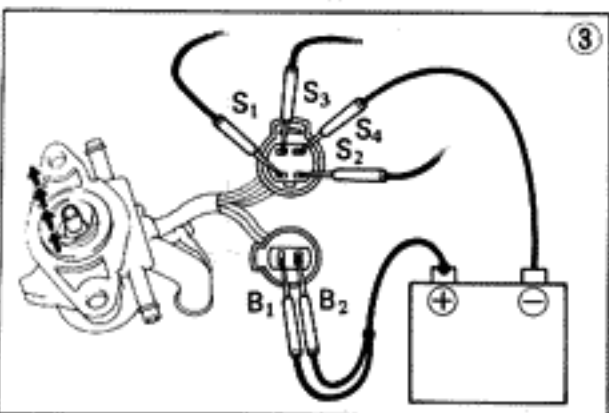
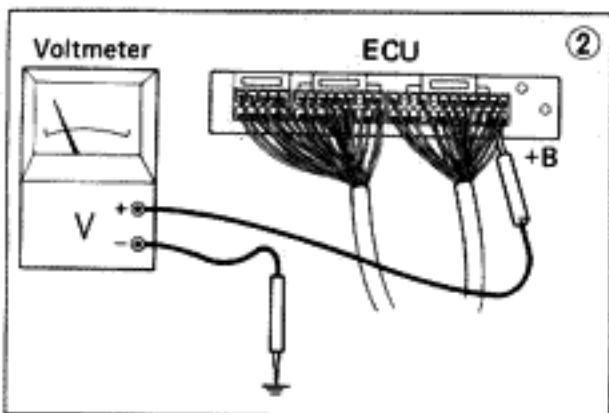
No.	Terminal	Trouble	Condition	STD Voltage
8	ISC ₁ - ISC ₄ - E ₁	No voltage	Ignition switch ON	9 - 14V



F10762



F10763



① There is no voltage between ECU terminals ISC₁ - ISC₄ and E₁. (IG S/W ON)

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

NO

OK

Check wiring between computer terminal E₁ and body ground.

OK

BAD

Try another ECU.

Repair or replace

Refer to No. 1.

NO

Repair or replace

OK

Check wiring between NO. 1 main relay and battery.

BAD

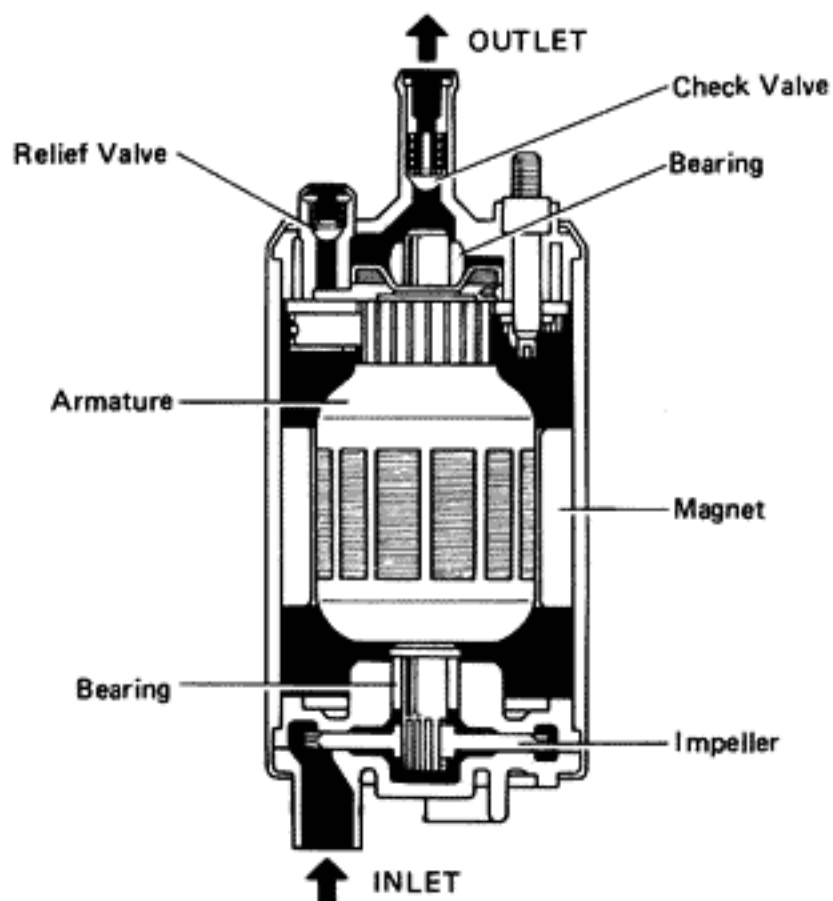
Repair or replace

OK

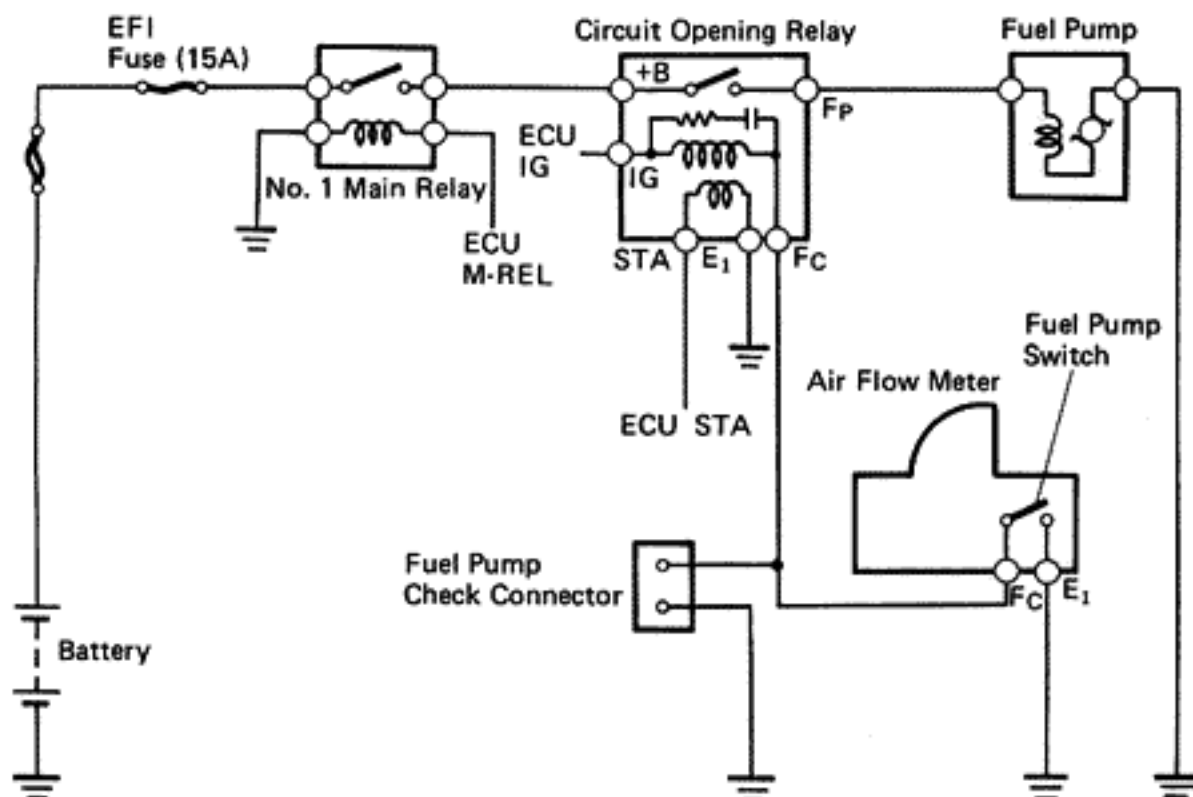
③ Check ISC valve.

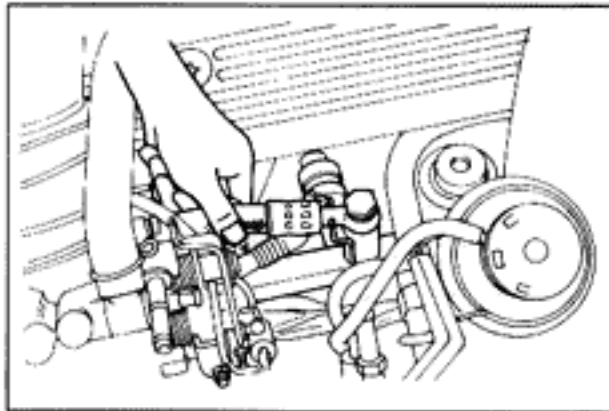
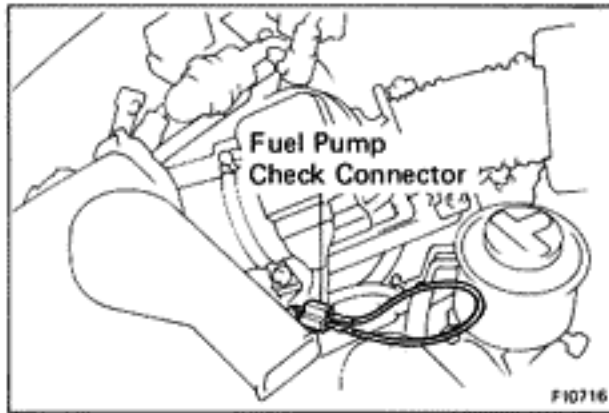
FUEL SYSTEM

Fuel Pump



F 105.30





ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

- (a) Turn on the ignition switch.

NOTE: Do not start the engine.

- (b) Short both terminals of the fuel pump check connector.

- (c) Check that there is a pressure in the hose to the cold start injector.

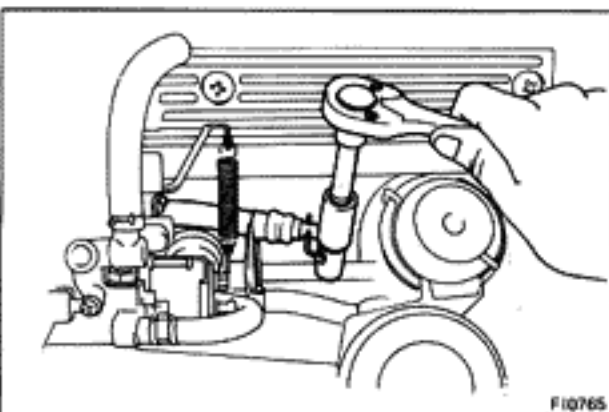
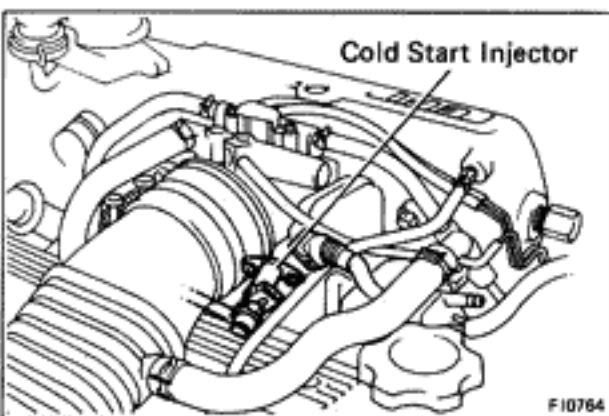
NOTE: At this time, you will hear fuel return noise from the pressure regulator.

- (d) Remove service wire and install the rubber cap to the check terminal.

- (e) Turn off the ignition switch.

If there is no pressure, check the following parts.

- Fusible link
- Fuse (EFI. 15A, IGNITION 7.5A)
- Circuit opening relay
- Fuel pump
- Wiring connections



2. CHECK FUEL PRESSURE

- (a) Check the battery voltage above 12 volts.

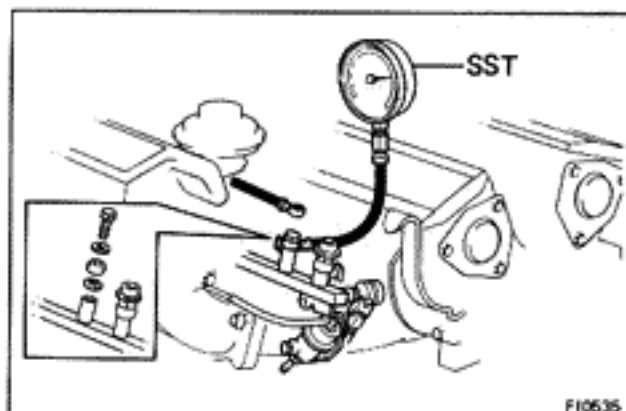
- (b) Disconnect the battery ground cable.

- (c) Disconnect the wiring connector from the cold start injector.

- (d) Put a suitable container or shop towel under rear end of the delivery pipe.

- (e) Slowly loosen the union bolt of the cold start injector hose and remove the bolt and two gaskets from the delivery pipe.

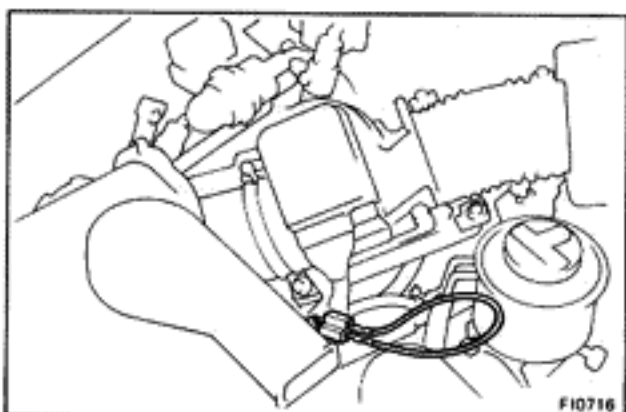
- (f) Drain the fuel in the delivery pipe.



- (g) Install a gasket, SST, another gasket and union bolt to the delivery pipe as shown in the figure.

SST 09268-45011

- (h) Wipe off any splattered gasoline.
(i) Reconnect the battery cable.



- (j) Short both terminals of the fuel pump check connector.

- (k) Turn on the ignition switch.

- (l) Measure the fuel pressure.

Fuel pressure: 2.3 — 2.7 kg/cm²
(33 — 38 psi, 226 — 265 kPa)

If high pressure, replace the pressure regulator.
If low pressure, check the following parts.

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

- (m) Remove the service wire from the service connector.

- (n) Start the engine.

- (o) Disconnect the vacuum sensing hose from the pressure regulator and pinch it off.

- (p) Measure the fuel pressure at idling.

Fuel pressure: 2.3 — 2.7 kg/cm²
(33 — 38 psi, 226 — 265 kPa)

- (q) Reconnect the vacuum sensing hose to the pressure regulator.

- (r) Measure the fuel pressure at idling.

Fuel pressure: 1.9 — 2.2 kg/cm²
(27 — 31 psi, 186 — 216 kPa)

If not pressure, check the vacuum sensing hose and pressure regulator.

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

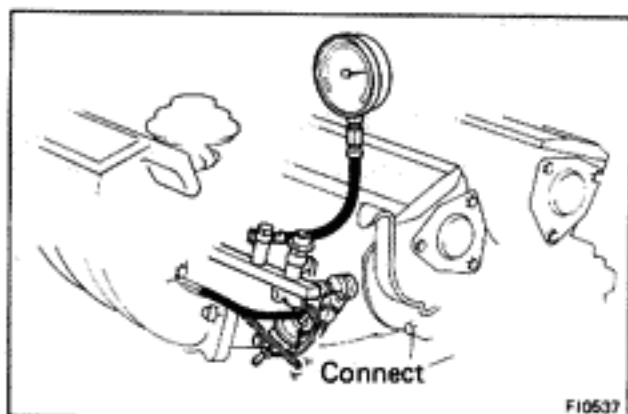
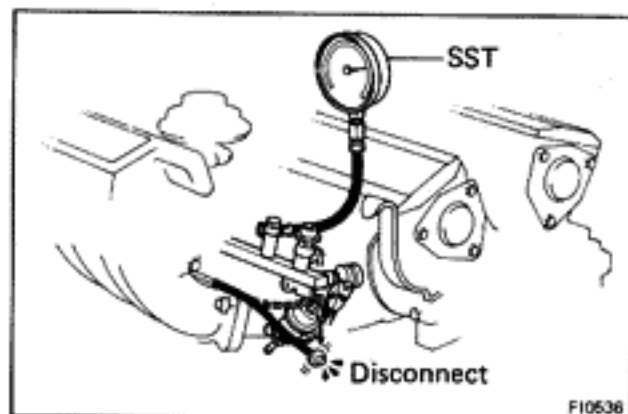
If not within specification, check the fuel pump, pressure regulator and/or injectors.

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

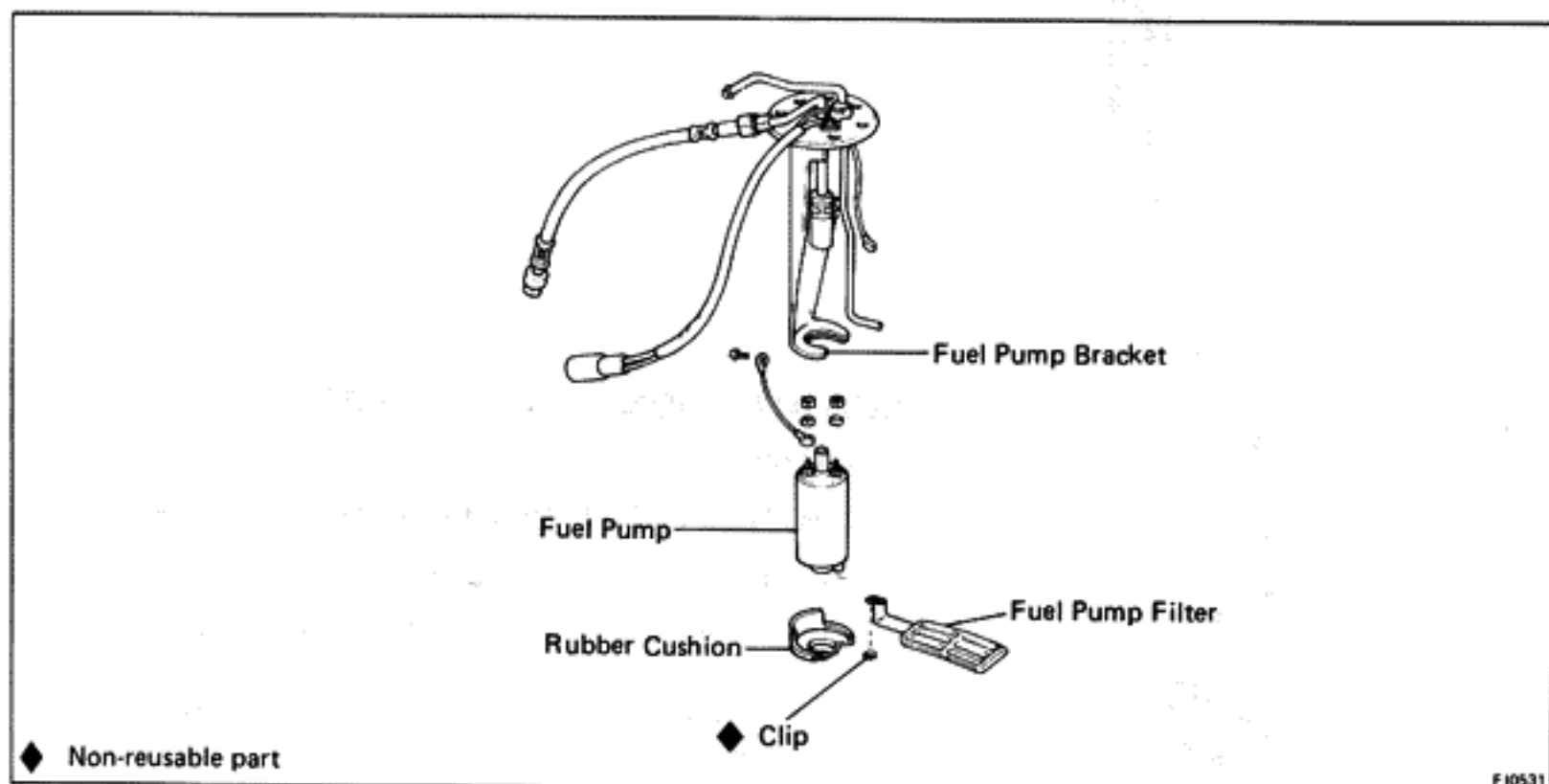
- (u) Using new gaskets, reconnect the cold start injector hose to the delivery pipe.

- (v) Connect the wiring connector to the cold start injector.

- (w) Check for fuel leakage.



REMOVAL OF FUEL PUMP



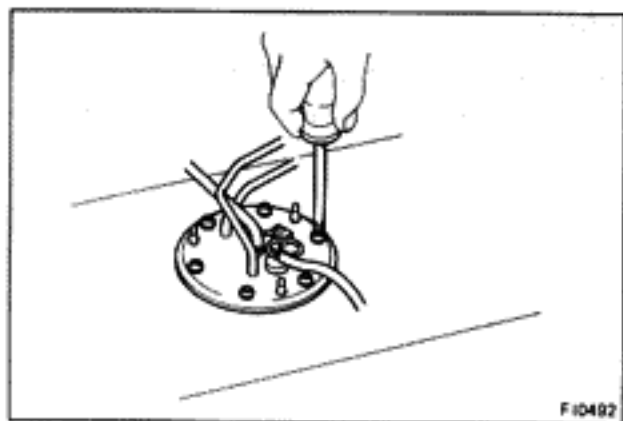
1. DRAIN FUEL FROM FUEL TANK

WARNING: Avoid smoking and open flame when working on the fuel pump.

2. REMOVE FUEL TANK

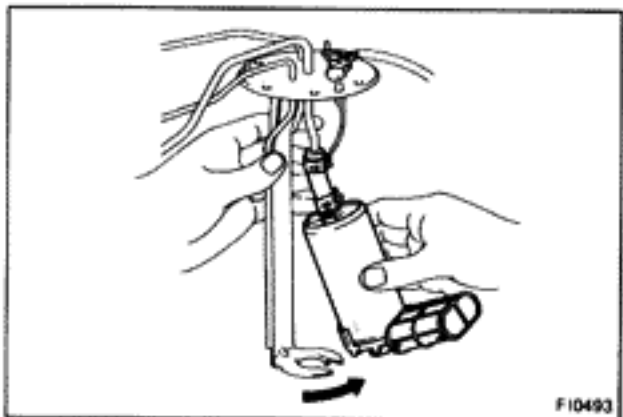
3. REMOVE FUEL PUMP BRACKET FROM FUEL TANK

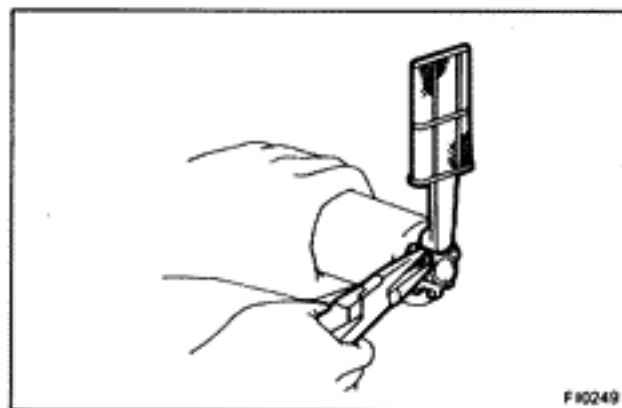
- Remove the bolts.
- Pull out the fuel pump bracket.



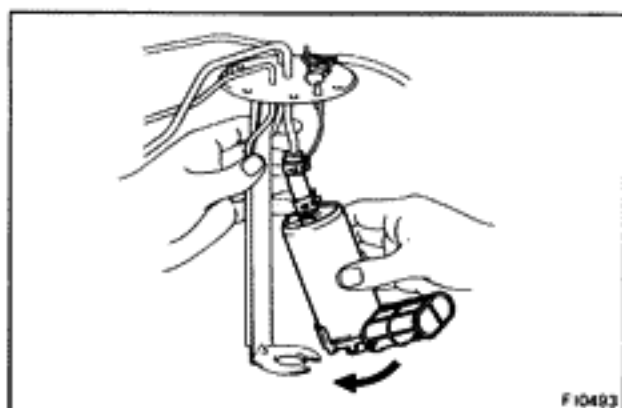
4. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

- Remove the two nuts and disconnect the wires from the fuel pump.
- Pull off the bracket from the lower side of the fuel pump.
- Remove the fuel pump from the fuel hose.



**5. REMOVE FUEL PUMP FILTER FROM FUEL PUMP**

- (a) Remove the rubber cushion.
- (b) Remove the clip and pull out the filter.

**INSTALLATION OF FUEL PUMP**

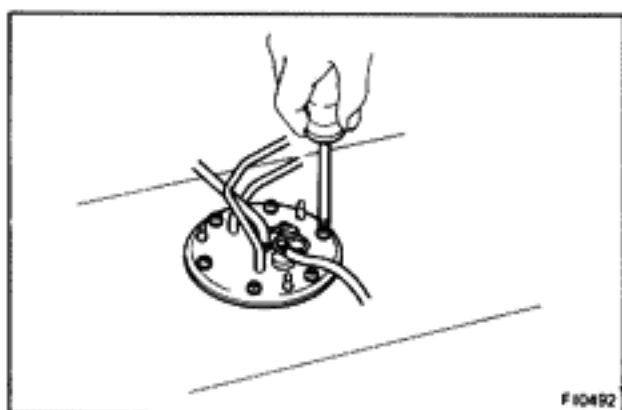
(See page FI-47)

1. INSTALL FUEL PUMP FILTER TO FUEL PUMP**2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET**

- (a) Insert the outlet port of the fuel pump into the fuel hose.
- (b) Install the rubber cushion to the lower side of the fuel pump.
- (c) Push the lower side of the fuel pump, together with the rubber cushion, into the fuel pump bracket.

3. INSTALL FUEL PUMP BRACKET

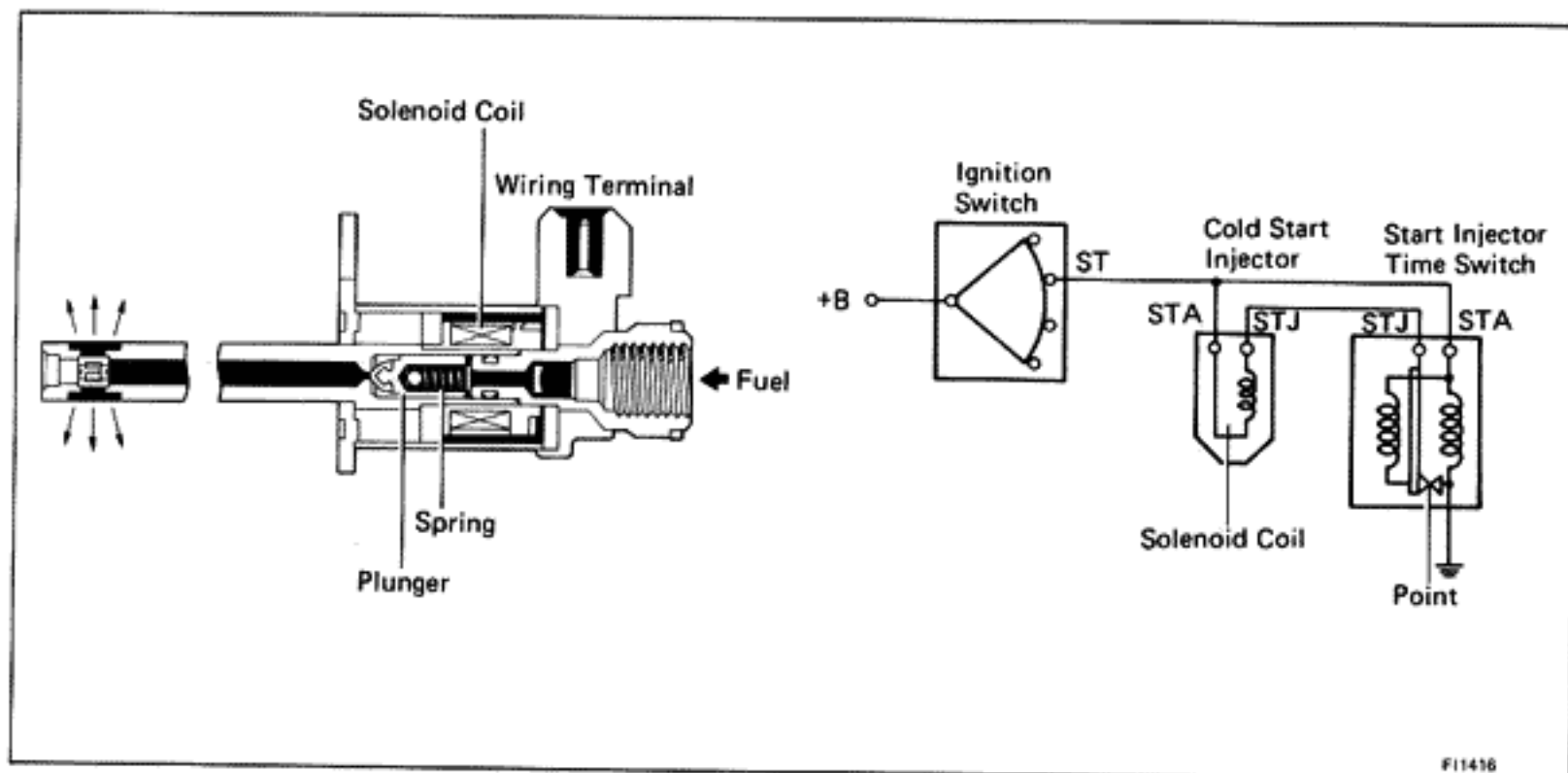
- (a) Place the bracket with a new gasket on the fuel tank.
- (b) Install and tighten the screws.

**4. INSTALL FUEL TANK**

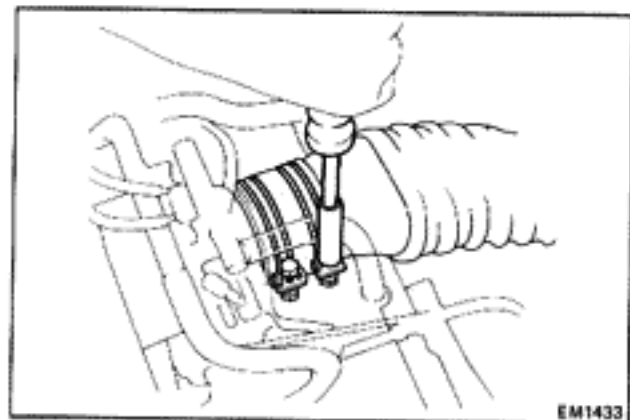
When installing the fuel tank, refer to FI-58 for the installation position of the protector and hose and the tightening torque.

After installation, check for leaks.

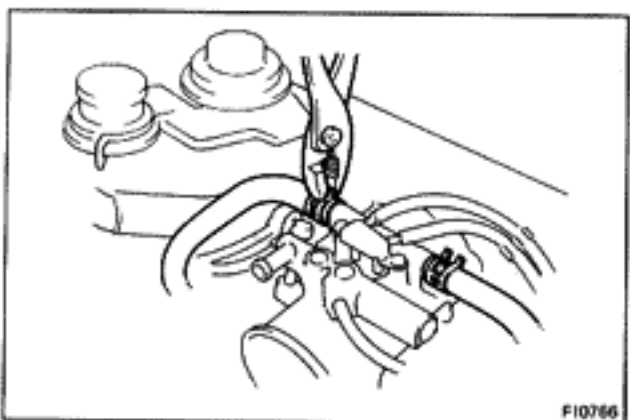
Cold Start Injector



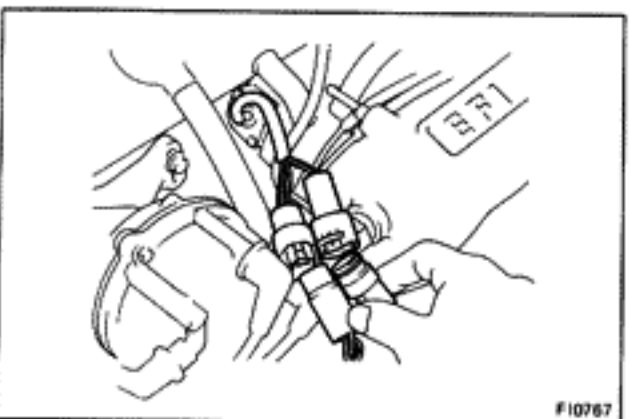
FI1436



EM1433



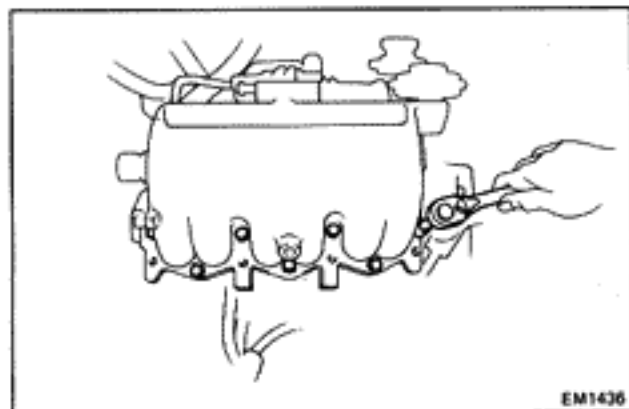
FI0766



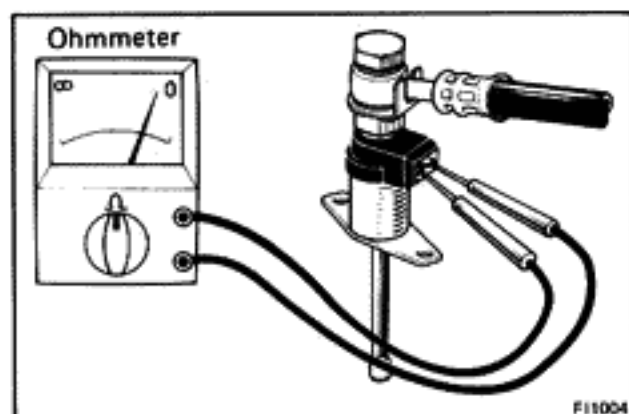
FI0767

REMOVAL OF COLD START INJECTOR

1. DRAIN COOLANT
2. REMOVE AIR INTAKE CONNECTOR
3. DISCONNECT FOLLOWING HOSES:
 - (a) No. 1 water by-pass hose from the ISC valve body.
 - (b) No. 2 water by-pass hose from the throttle body.
 - (c) Air valve hose from ISC valve body.
 - (d) PCV hose from the throttle body.
 - (e) Brake booster vacuum hose from the air intake chamber.
 - (f) Actuator vacuum hose from the air intake chamber.
 - (g) Label and disconnect emission control hoses from the throttle body and air intake chamber that allow removal of vacuum pipe subassembly.
4. DISCONNECT ACCELERATOR LINKAGE AND CABLE FROM THROTTLE BODY
5. DISCONNECT FOLLOWING WIRES:
 - (a) Cold start injector wire
 - (b) Throttle position sensor wire
 - (c) Two ISC valve connectors
 - (d) VSV wire connector
6. REMOVE AIR INTAKE CHAMBER STAY
7. REMOVE VACUUM PIPE SUBASSEMBLY



8. LOOSEN EGR PIPE CONNECTING NUT
9. DISCONNECT COLD START FUEL HOSE FROM DELIVERY PIPE
10. REMOVE AIR INTAKE CHAMBER
11. REMOVE COLD START INJECTOR FROM AIR INTAKE CHAMBER



INSPECTION OF COLD START INJECTOR

1. MEASURE RESISTANCE OF COLD START INJECTOR

Using an ohmmeter, check the resistance of the injector.

Resistance: 3 — 5 Ω

2. CHECK INJECTION OF COLD START INJECTOR

(a) Install the gasket, SST (two unions), another gaskets and two union bolts to the delivery pipe and injector.

(b) Connect the SST (hose) from the unions.

SST 09268-41045

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

SST 09842-30050

NOTE: Position the injector as far away from the battery as possible.

(d) Put a container under the injector.

(e) Turn on the ignition switch.

NOTE: Do not start the engine.

(f) Short both terminals of the fuel pump check connector with a service wire.

(g) Connect the test probes of the SST to the battery and check that the fuel spray is as shown.

SST 09842-30050

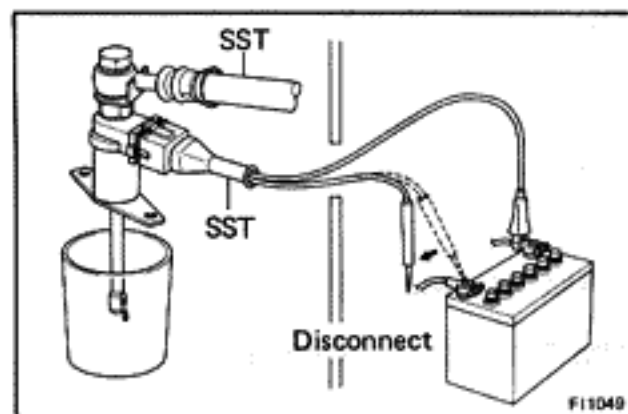
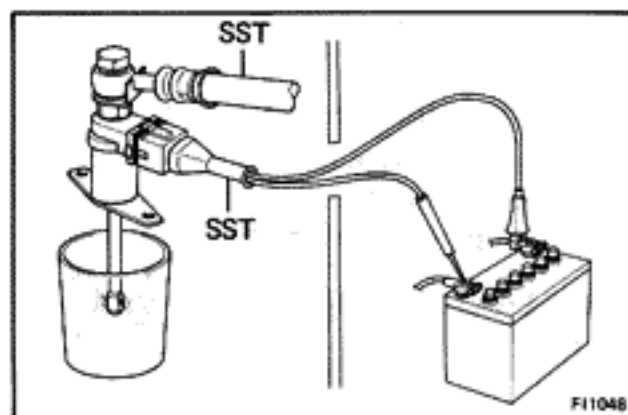
NOTE: Perform this check within the shortest possible time.

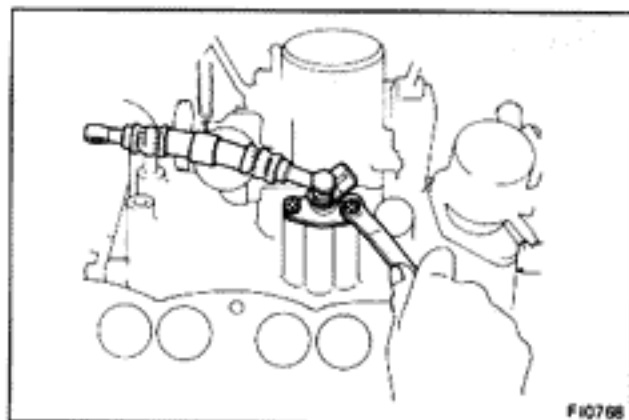
(h) Disconnect the test probes from the battery and check that fuel does not leak from the injector.

Fuel drop: Less than one drop of fuel per minute

(i) After checking, restore the following to the previous state.

- Fuel pump check connector
- Ignition switch
- SST
- Cold start injector
- Injector wiring





F10766

INSTALLATION OF COLD START INJECTOR

1. INSTALL COLD START INJECTOR

Place the new gasket and install the cold start injector and two bolts.

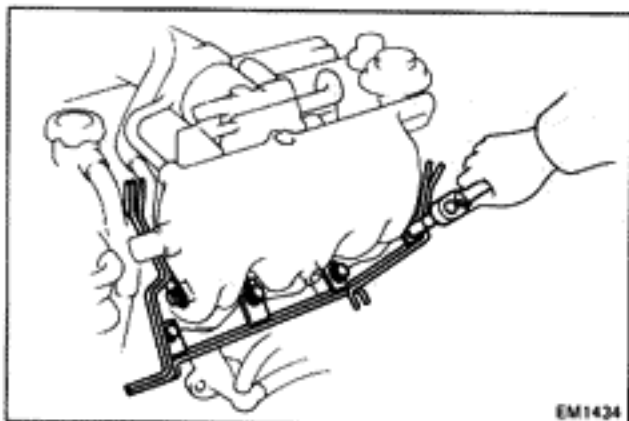
2. INSTALL AIR INTAKE CHAMBER

3. CONNECT COLD START FUEL HOSE TO DELIVERY PIPE

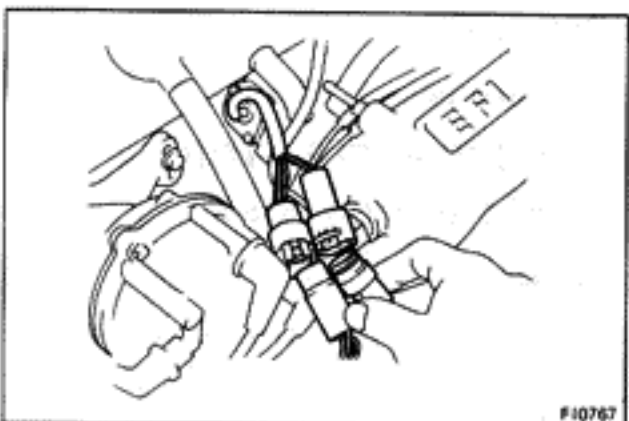
4. TIGHTEN EGR PIPE CONNECTING NUT

5. INSTALL VACUUM PIPE SUBASSEMBLY

6. INSTALL AIR INTAKE CHAMBER STAY



EM1434

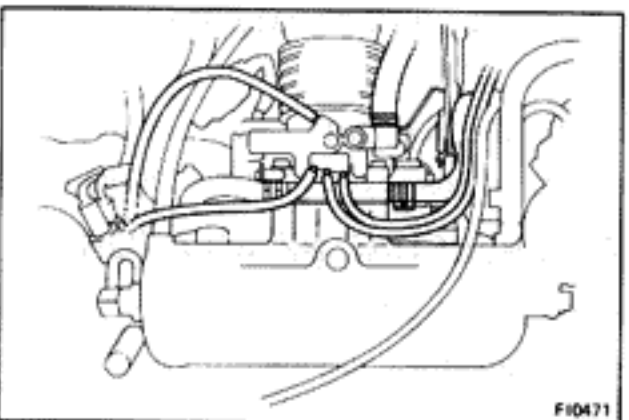


F10767

7. CONNECT FOLLOWING WIRES:

- (a) VSV wire connector
- (b) Two ISV valve connectors
- (c) Throttle position sensor wire
- (d) Cold start injector wire

8. CONNECT ACCELERATOR LINKAGE AND CABLE FROM THROTTLE BODY



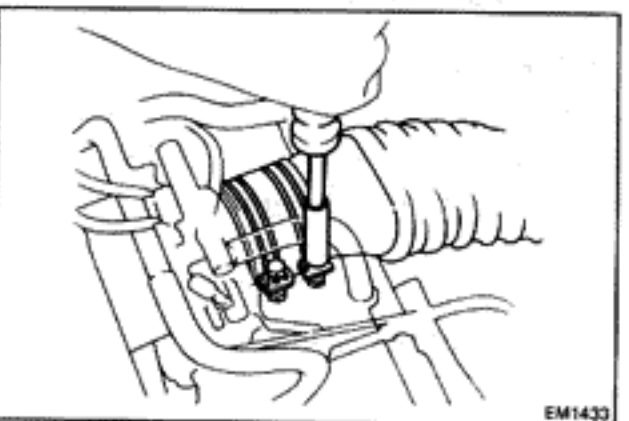
F10471

9. CONNECT FOLLOWING HOSES:

- (a) Connect the emission control hoses to the throttle body and air intake chamber etc.
- (b) Actuator vacuum hose to the air intake chamber
- (c) Brake booster vacuum hose to the air intake chamber
- (d) PCV hose to the throttle body
- (e) Air valve hose to the ISC valve body
- (f) No. 1 water by-pass hose to the ISC valve body
- (g) No. 2 water by-pass hose to the throttle body

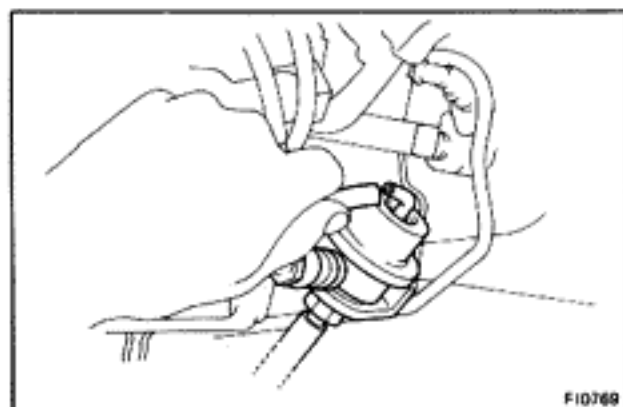
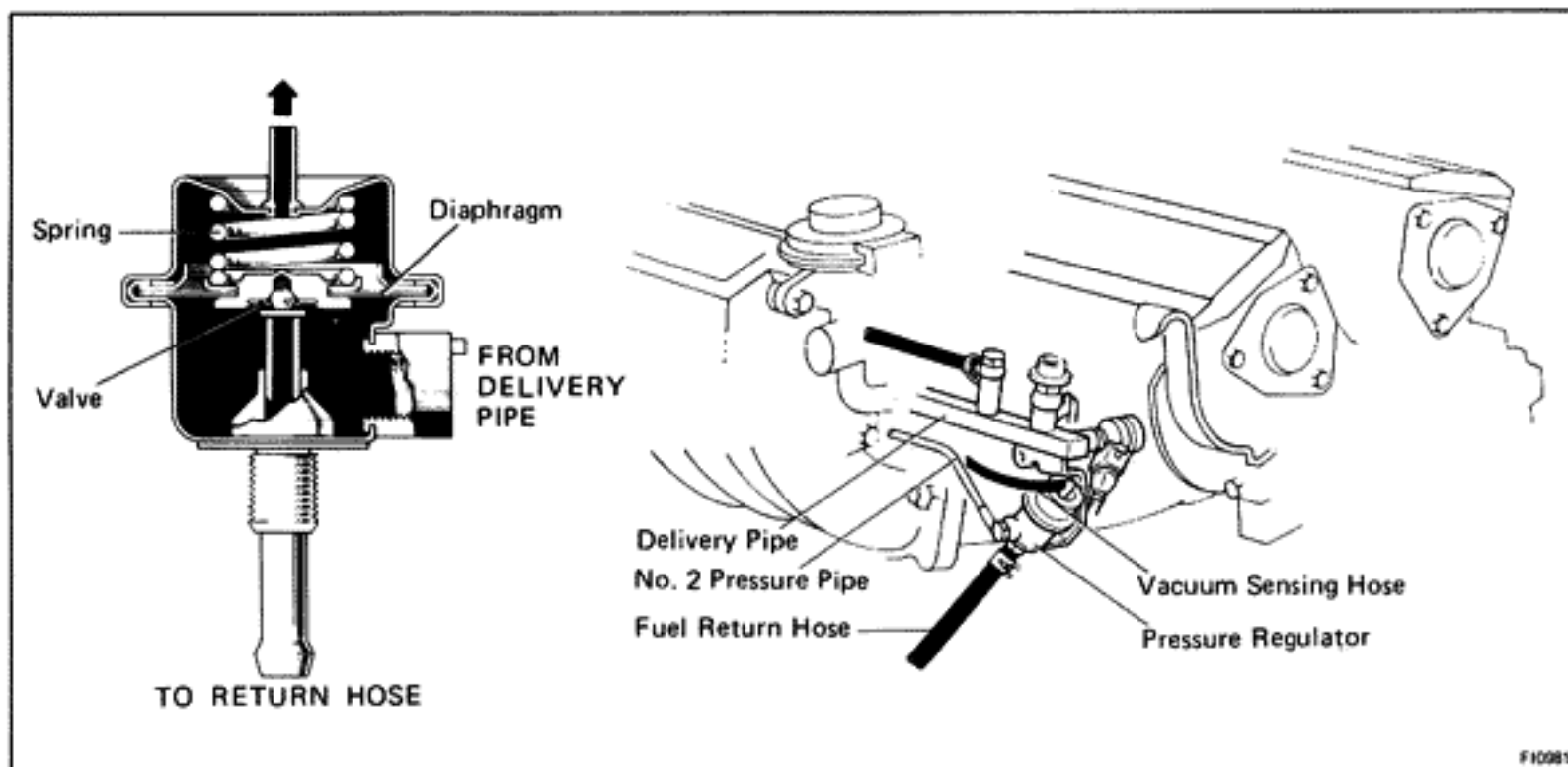
10. INSTALL AIR INTAKE CONNECTOR

11. FILL WITH COOLANT



EM1433

Pressure Regulator

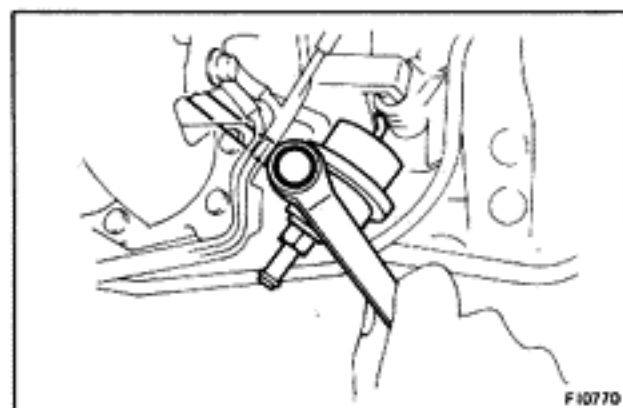


ON-VEHICLE INSPECTION

CHECK FUEL PRESSURE (See page FI-45)

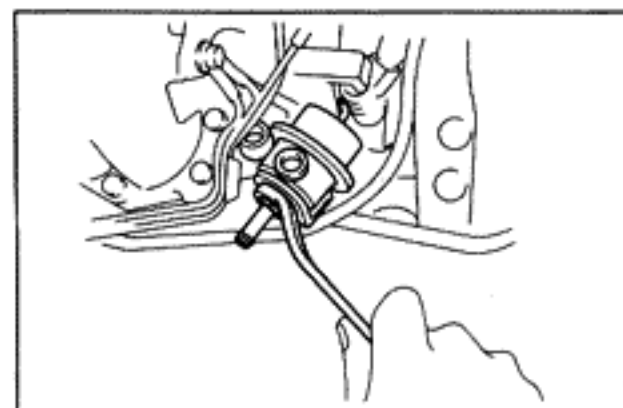
REMOVAL OF PRESSURE REGULATOR

1. **DISCONNECT VACUUM SENSING HOSE**
2. **DISCONNECT FUEL HOSE**
 - (a) Put a suitable container or shop towel under the pressure regulator.
 - (b) Disconnect the fuel hose from the pressure regulator.
3. **DISCONNECT NO. 2 FUEL PIPE FROM PRESSURE REGULATOR**
4. **REMOVE PRESSURE REGULATOR**
Remove the lock nut, and remove the pressure regulator.

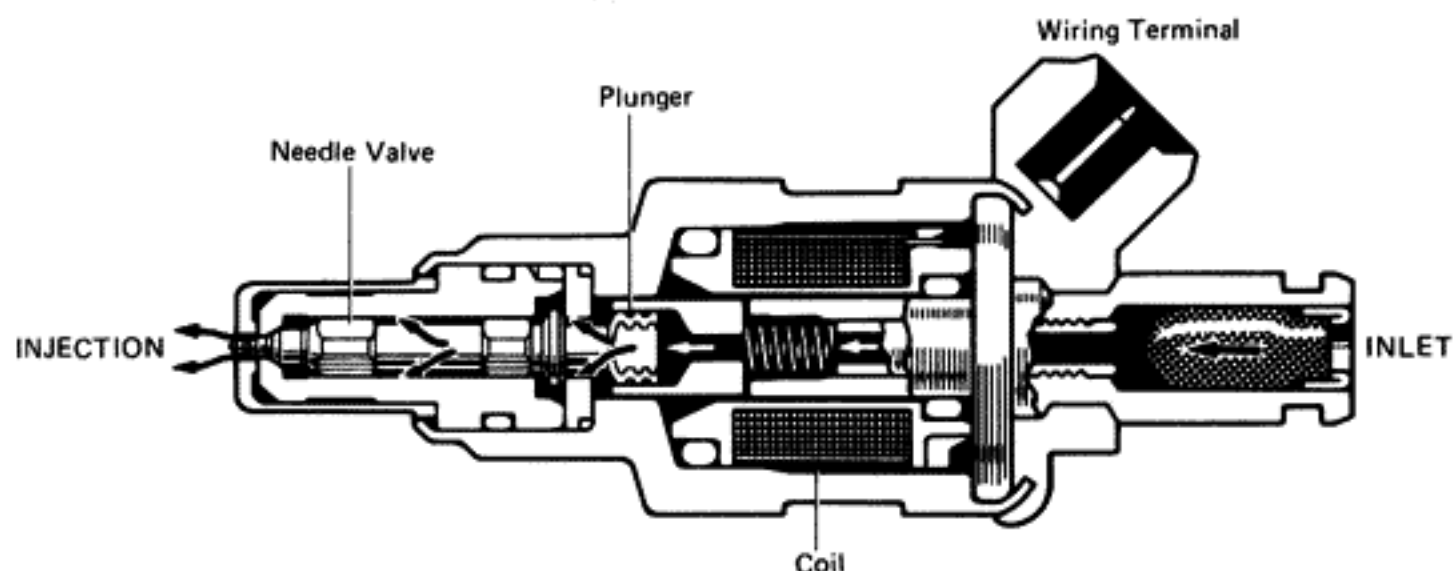


INSTALLATION OF PRESSURE REGULATOR

1. **INSTALL PRESSURE REGULATOR**
Install the pressure regulator and lock nut.
Torque the lock nut.
Torque: 400 kg-cm (29 ft-lb, 39 N·m)
2. **CONNECT NO. 2 FUEL PIPE**
Install a new gasket, pipe, another gasket and union bolt to the pressure regulator. Torque the union bolt.
Torque: 300 kg-cm (22 ft-lb, 30 N·m)
3. **CONNECT FUEL HOSE**
4. **CONNECT VACUUM SENSING HOSE**

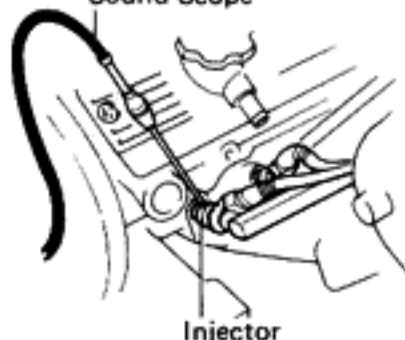


Injector



F10498

Sound Scope



Injector

F11005

Injector



F11006

ON-VEHICLE INSPECTION

1. CHECK INJECTOR OPERATION

Check operating sound from the 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 your finger.

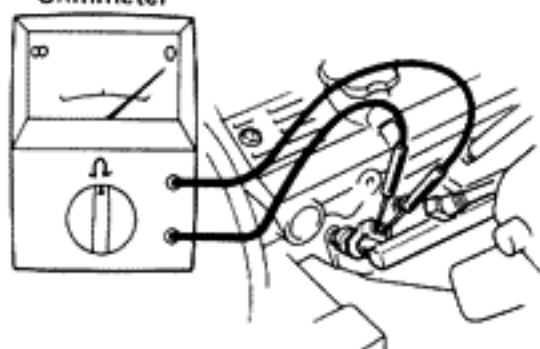
If no sound or an unusual sound is heard, check the wiring connector, injector, resistor or injection signal from computer.

2. MEASURE RESISTANCE OF INJECTOR

- (a) Disconnect the wiring connector from the injector.
- (b) Using an ohmmeter, check the continuity of both terminals.

Resistance: 1.5 — 3.0 Ω

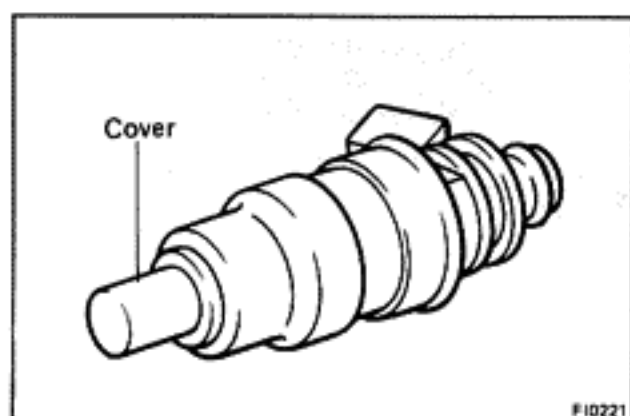
Ohmmeter



F10986

REMOVAL OF INJECTOR

1. REMOVE AIR INTAKE CHAMBER
(See steps 1 to 10 on pages FI-49 to 50)
2. REMOVE DISTRIBUTOR
3. REMOVE NO.1 FUEL PIPE
4. DISCONNECT AND REMOVE WIRING HARNESS

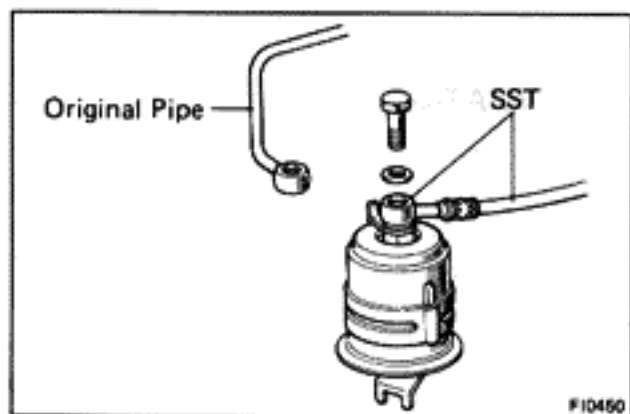


5. REMOVE DELIVERY PIPE WITH INJECTORS

- (a) Remove the four bolts, and then remove the delivery pipe with injectors.

NOTE:

- When removing the delivery pipe, be careful not to drop the injectors.
 - Do not remove the injector cover.
- (b) Remove the six insulators from the intake manifold.



INSPECTION OF INJECTOR

1. TEST INJECTION OF INJECTORS

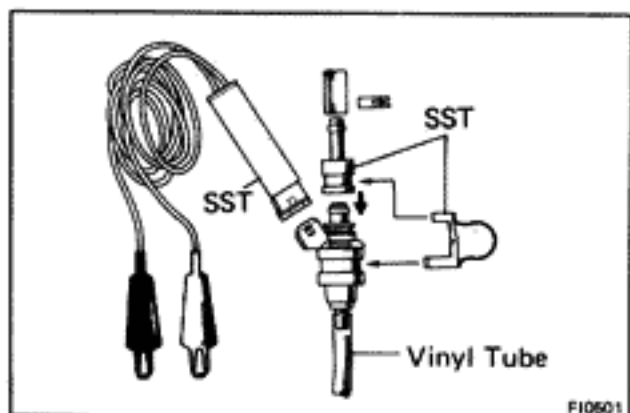
CAUTION: Keep clear of sparks during the test.

- (a) Connect the SST to the fuel filter outlet.

SST 09268-41045

- (b) Connect the SST to the pressure regulator and the injector.

SST 09268-41045



- (c) Hold the injector and hose with SST.

SST 09842-30020

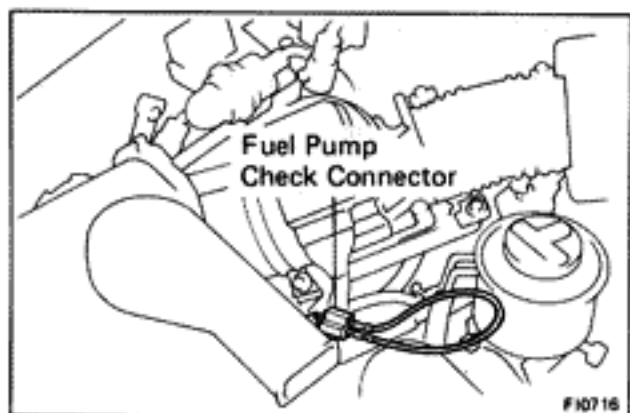
- (d) Put the injector into the graduated cylinder.

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

- (e) Connect the ground cable to the battery.

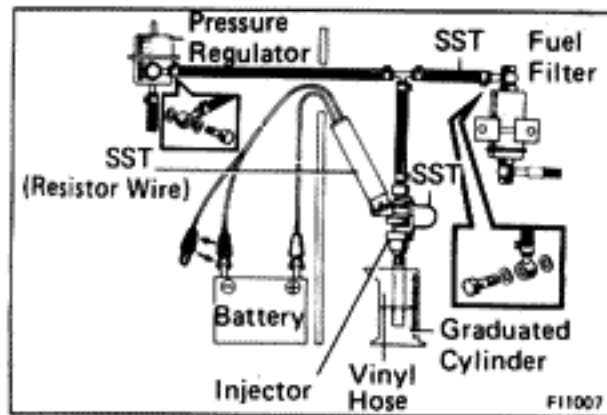
- (f) Turn the ignition switch ON.

NOTE: Do not start the engine.



- (g) Using a service wire, short both terminals of the fuel pump check connector.

NOTE: The fuel pump will operate.



- (h) Connect the SST to the battery for 15 seconds and measure the injection volume with a graduated cylinder.

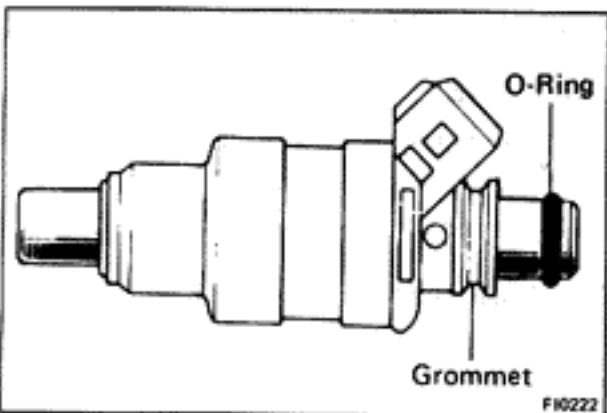
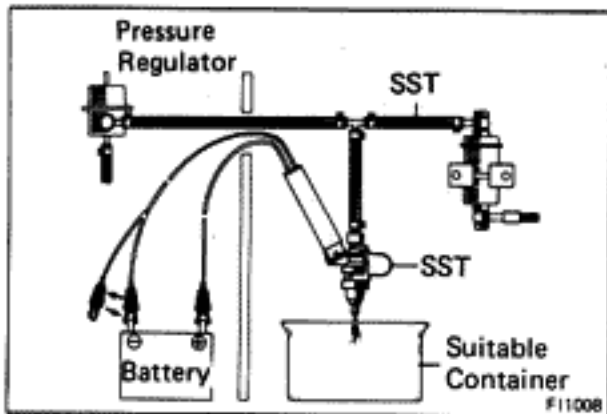
Test each injector two or three times. If not within specified volume, clean or replace.

SST 09842-30020

Volume: 40 — 50 cc/15 sec. (2.4 — 3.1 cu in.)

Difference between each injector: Less than
6 cc (0.37 cu in.)

NOTE: If not within specified volume, clean or replace the injector.

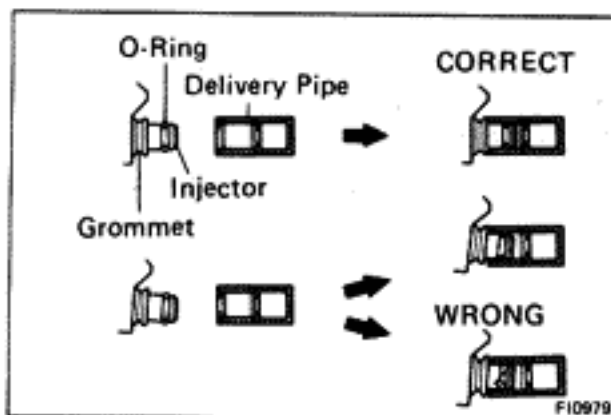


INSTALL OF INJECTORS

1. INSTALL INJECTORS INTO DELIVERY PIPE

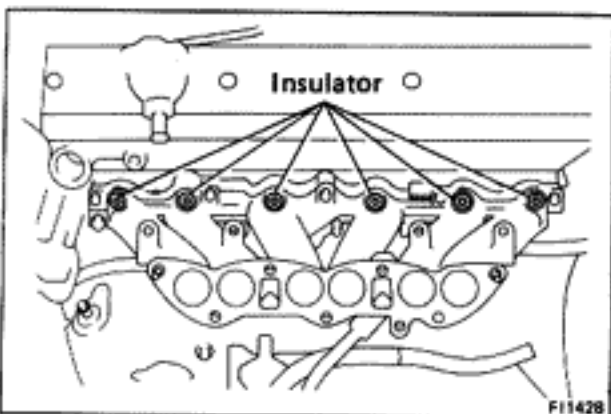
- (a) Install the grommet and a new O-ring to the injector.

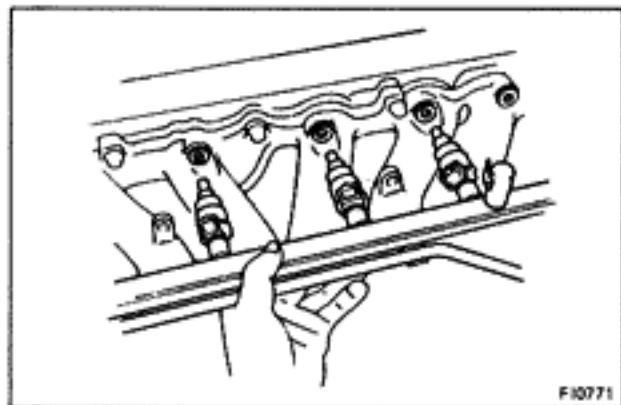
- (b) Apply a thin coat of gasoline to the O-rings and install the injectors into the delivery pipe.



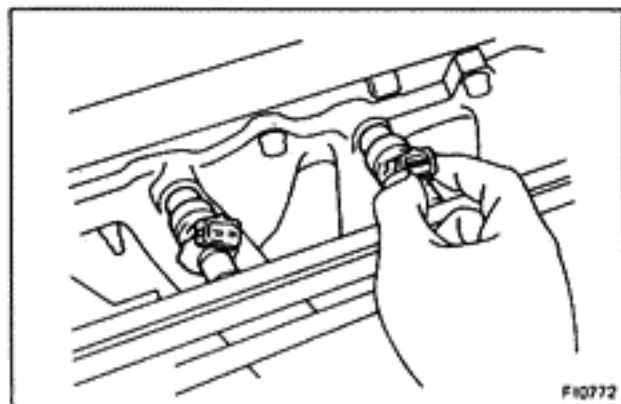
2. INSTALL DELIVERY PIPE WITH INJECTORS

- (a) Install the six insulators into the injector hole of the intake manifold.





- (b) Install the injectors together with the delivery pipe to the manifold.

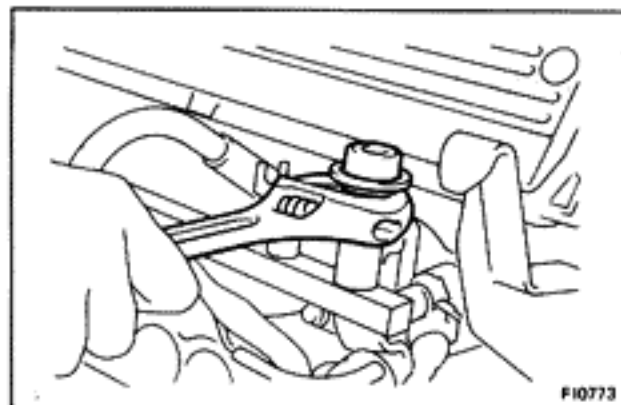


- (c) Make sure that the injectors rotate smoothly.

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

- (d) Install four bolts, torque the bolts.

Torque: 140 kg-cm (10 ft-lb, 14 N·m)

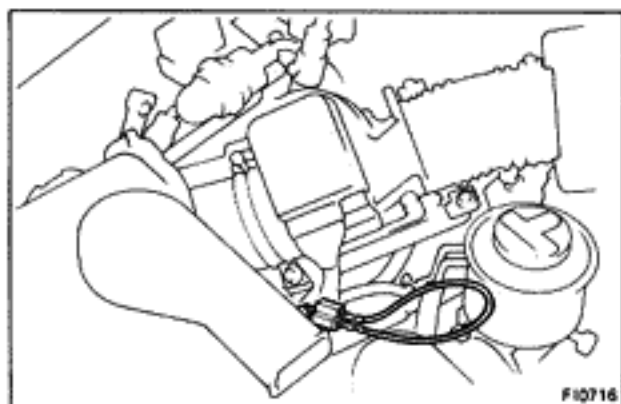


3. CONNECT AND INSTALL WIRING HARNESS

4. INSTALL NO.1 FUEL PIPE

- (a) Finger tighten the pulsation damper and union bolt with new gaskets on the fuel pipe.
(b) Tighten then being careful not to bend the fuel pipe.

5. INSTALL DISTRIBUTOR AND SET TIMING (See page IG-9, 10)

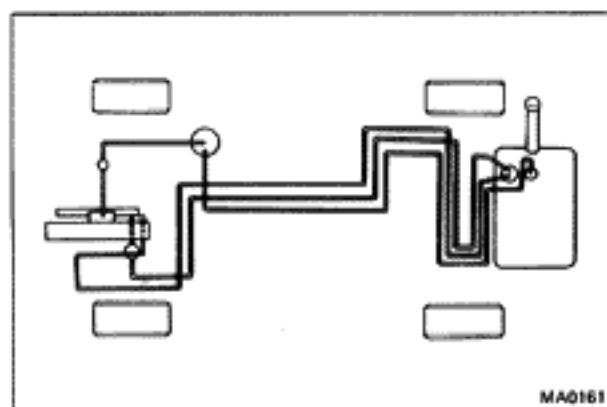
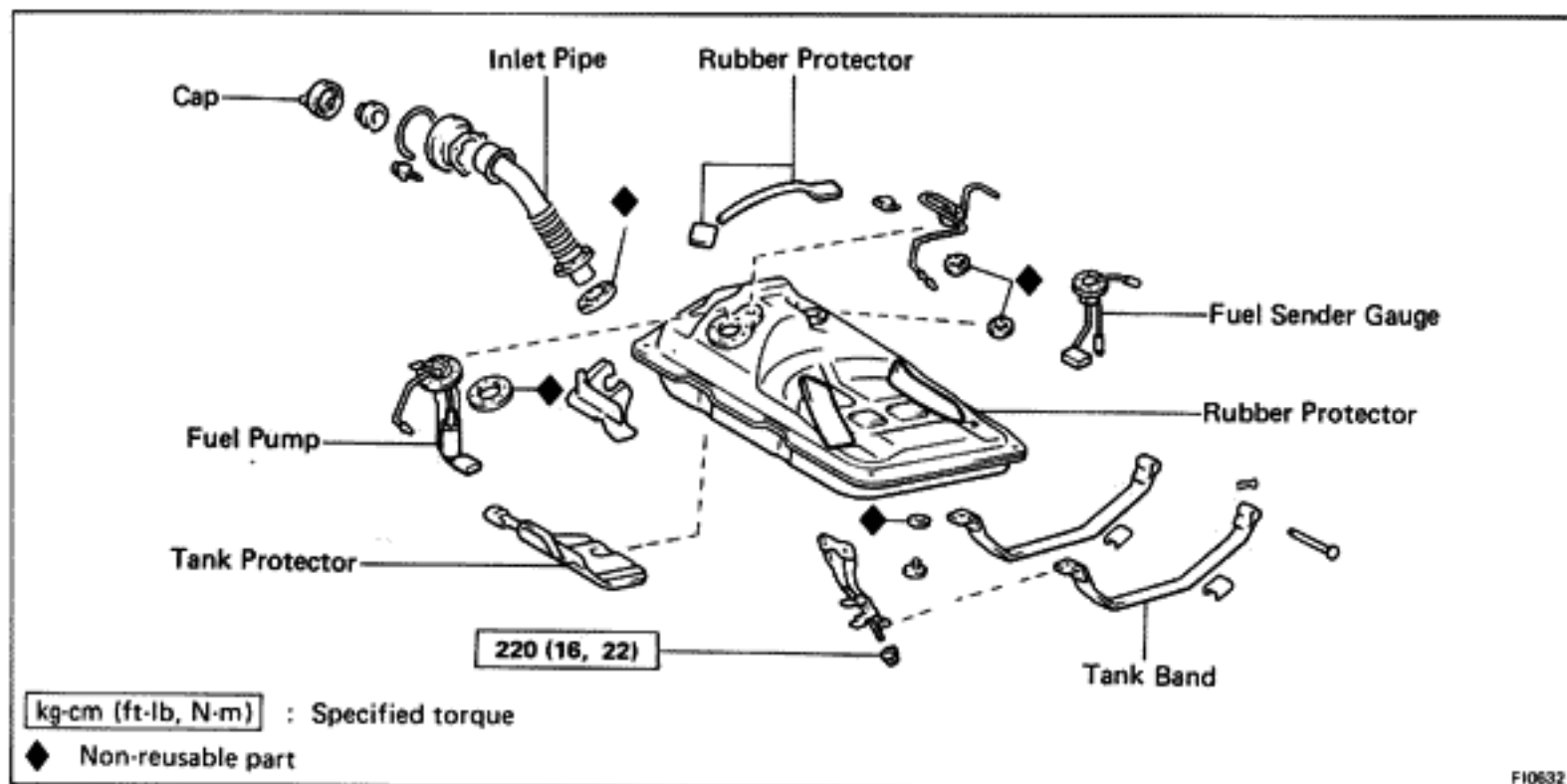


6. INSTALL AIR INTAKE CHAMBER (See steps 2 to 11 on page FI-51)

7. CHECK FOR FUEL LEAKAGE

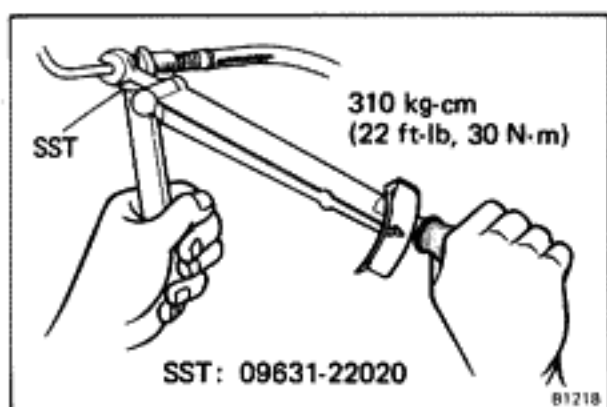
- (a) With the ignition switch ON, use a service wire to short both terminals of the fuel pump check connector.
(b) Check for fuel leakage.
(c) Remove the service wire from the fuel pump check connector.

Fuel Tank and Line



PRECAUTIONS

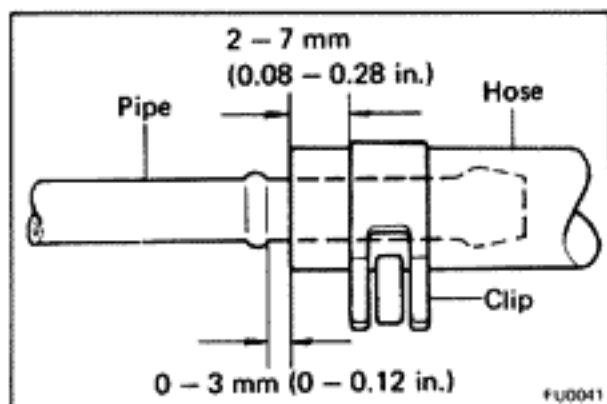
1. Always use new gaskets when replacing the fuel tank or component parts.
2. When re-installing, be sure to include the rubber protectors on the upper surfaces of the fuel tank and tank band.
3. Apply the proper torque to all tightening parts.



INSPECT FUEL LINES AND CONNECTIONS

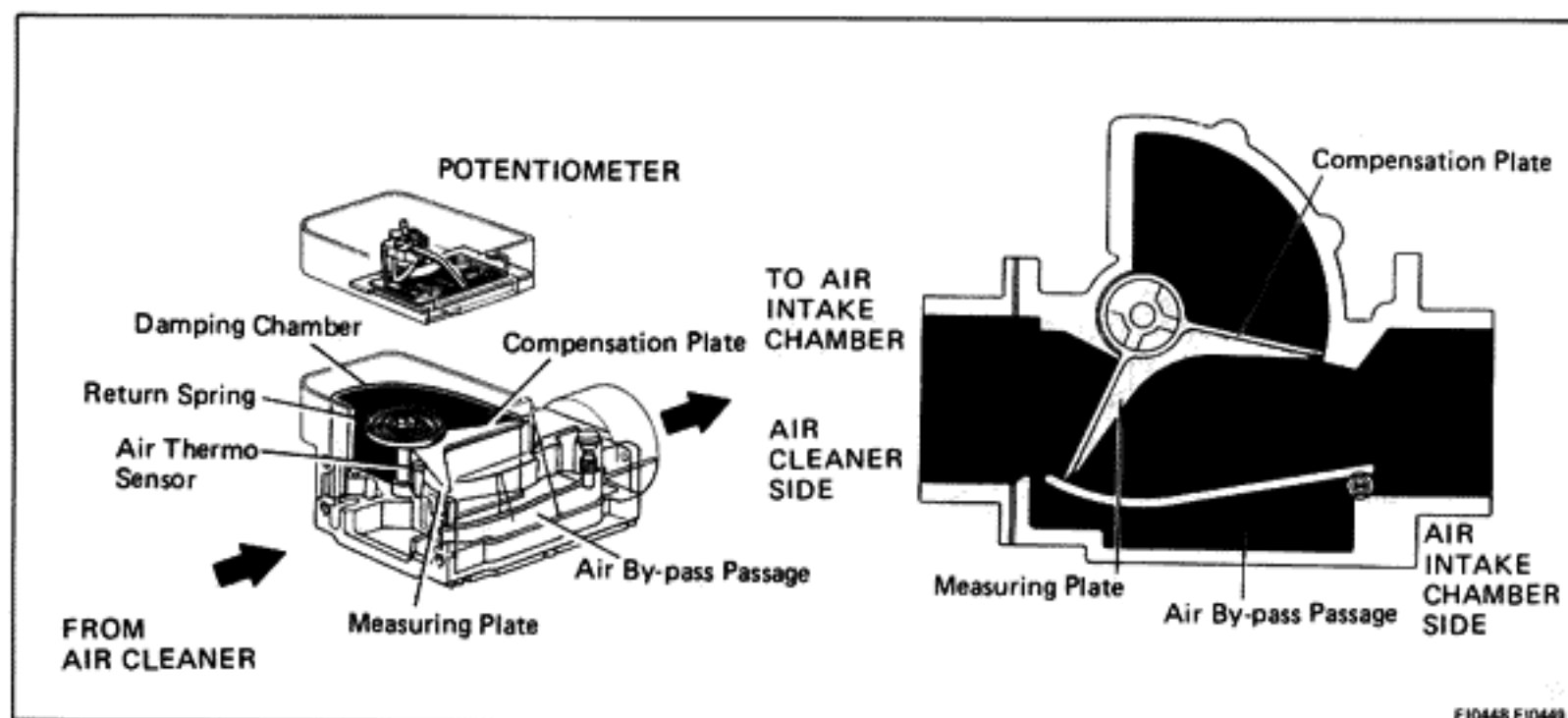
- (a) Inspect the fuel lines for cracks, leakage or connections or deformation.
- (b) Inspect the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
- (c) Inspect the fuel tank for deformation, cracks, fuel leakage or tank band looseness.
- (d) Inspect the inlet pipe for damage or fuel leakage.
- (e) Hose and tube connections are as shown in the illustration.

If problem is found, repair or replace the parts as necessary.

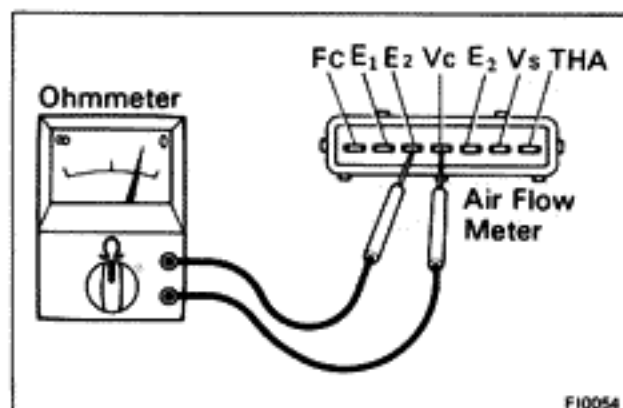


AIR INDUCTION SYSTEM

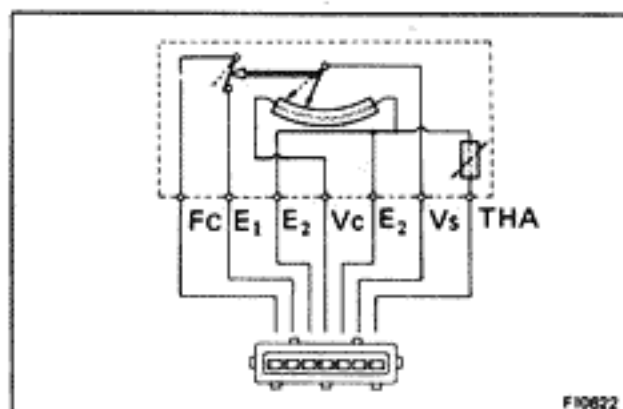
Air Flow Meter



F10448 F10449



F10054



F10622

ON-VEHICLE INSPECTION

MEASURE RESISTANCE OF AIR FLOW METER

- Unplug the wiring connector from the air flow meter.
- Using an ohmmeter, measure the resistance between each terminal.

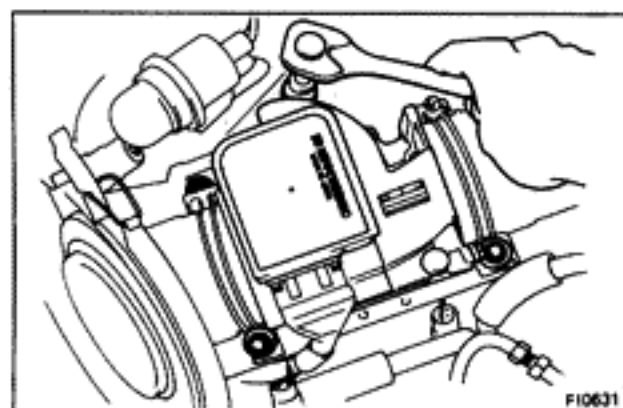
Between terminals	Resistance	Temperature
E2 — Vs	20 — 400 Ω	—
E2 — Vc	200 — 400 Ω	—
E2 — THA	10 — 20 k Ω	-20°C (-4°F)
	4 — 7 k Ω	0°C (32°F)
	2 — 3 k Ω	20°C (68°F)
	0.9 — 1.3 k Ω	40°C (104°F)
	0.4 — 0.7 k Ω	60°C (140°F)
E1 — Fc	Infinity	—

If not within specification, replace the air flow meter.

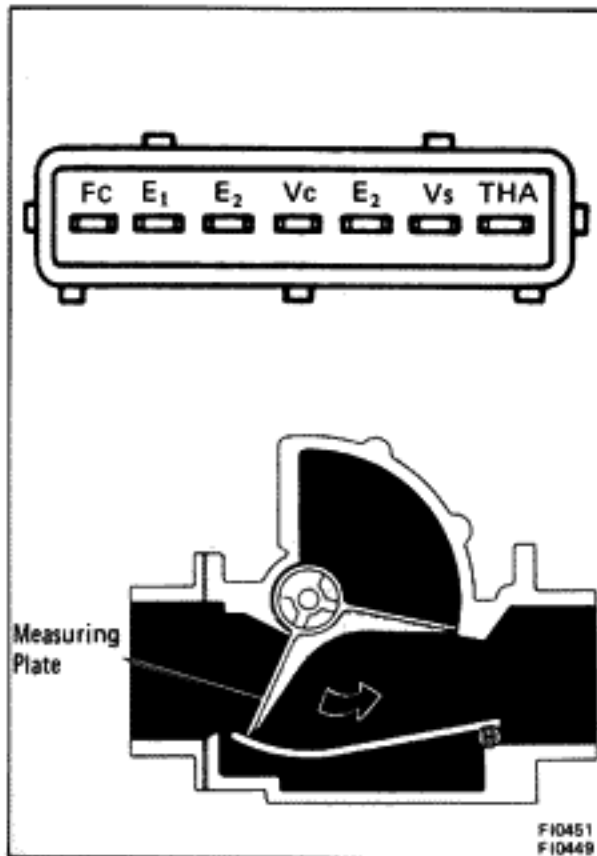
REMOVAL OF AIR FLOW METER

- DISCONNECT NO. 2 AND NO. 3 AIR CLEANER HOSES
- DISCONNECT AIR FLOW METER CONNECTOR
- REMOVE AIR FLOW METER

Remove four nuts and one bolt and air flow meter.



F10631



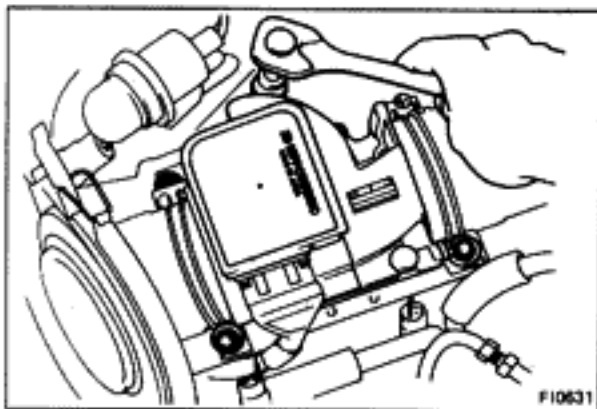
INSPECTION OF AIR FLOW METER

MEASURE RESISTANCE OF AIR FLOW METER

Using an ohmmeter, measure the resistance between each terminal by moving the measuring plate.

Between terminals	Resistance Ω	Measuring plate Opening
E ₁ — F _c	Infinity	Fully closed
	Zero	Other than closed position
E ₂ — V _s	20 — 400	Fully closed
	20 — 1000	Fully closed to fully open position

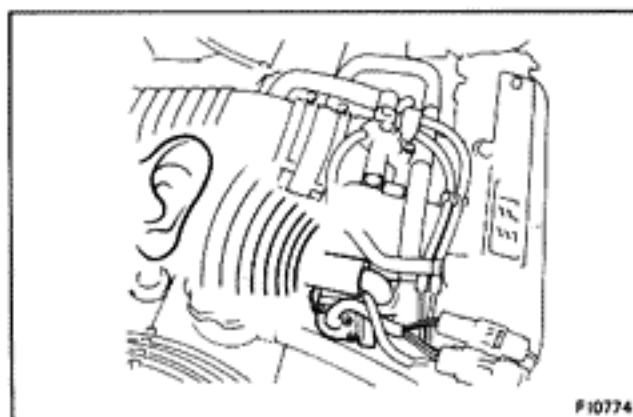
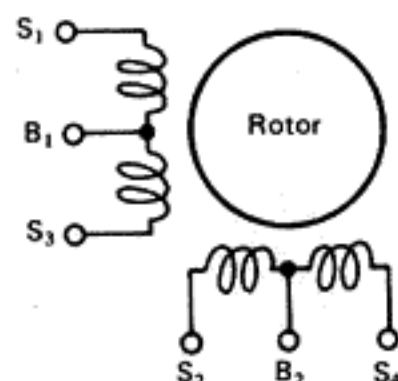
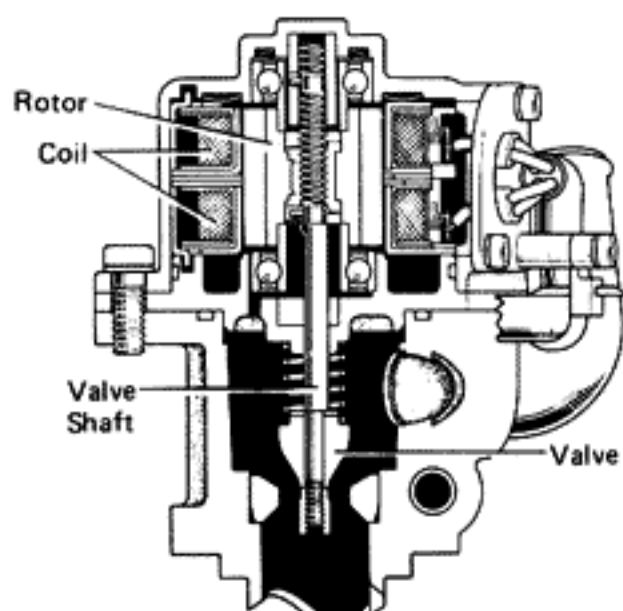
NOTE: Resistance between E₂ and V_s will change in accordance with the measuring plate opening.



INSTALLATION OF AIR FLOW METER

- 1. INSTALL AIR FLOW METER**
Install air flow meter with four nuts and one bolts.
- 2. CONNECT AIR FLOW METER CONNECTOR**
- 3. INSTALL NO. 2 AND NO. 3 AIR CLEANER HOSES**

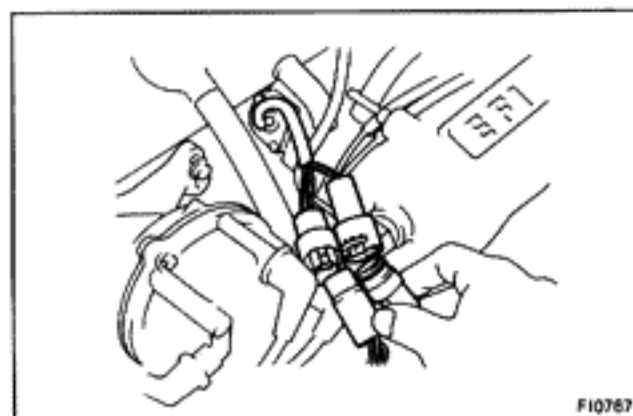
Idle Speed Control (ISC) Valve



F10774

CHECK OPERATING SOUND FROM ISC VALVE

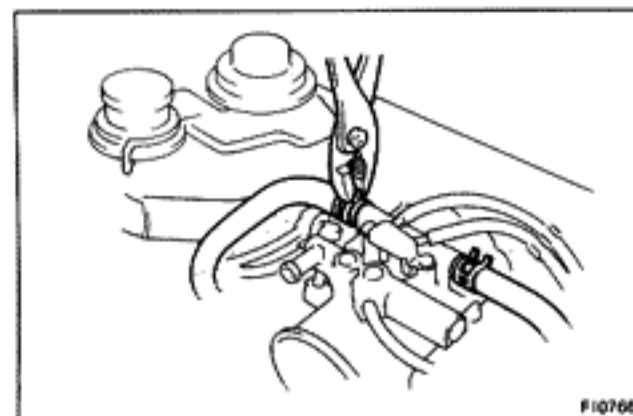
Confirm that there is a clicking sound immediately after stopping the engine.



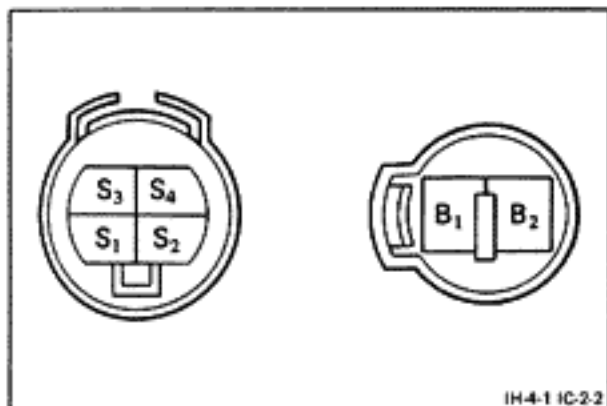
F10767

REMOVAL OF ISC VALVE

1. DRAIN COOLANT
2. DISCONNECT TWO ISC VALVE CONNECTORS
3. DISCONNECT FOLLOWING HOSES FROM ISC VALVE BODY:
 - (a) Two water by-pass hoses
 - (b) Air hoses
4. REMOVE TWO BOLTS AND ISC VALVE BODY



F10768

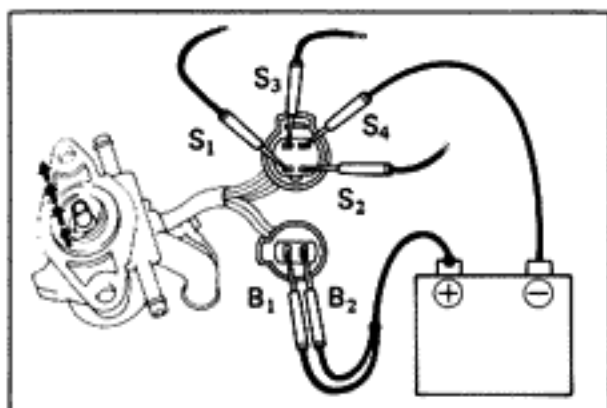


INSPECTION OF ISC VALVE

1. CHECK RESISTANCE OF ISC VALVE

Using an ohmmeter, measure the resistance between terminals $B_1 - S_1$ or S_3 and $B_2 - S_2$ or S_4 .

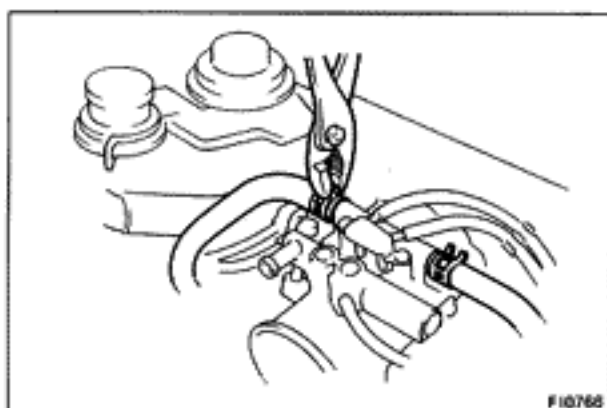
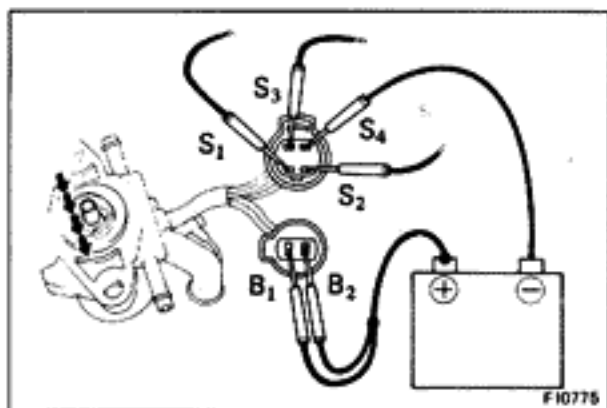
Resistance: $B_1 - S_1$ or S_3 10 – 30 Ω
 $B_2 - S_2$ or S_4 10 – 30 Ω



2. INSPECT OPERATION OF ISC VALVE

(a) Apply battery voltage to terminals B_1 and B_2 and while repeatedly grounding $S_1 - S_2 - S_3 - S_4 - S_1$ in sequence, check that the valve moves toward the closed position.

(b) Apply battery voltage to terminals B_1 and B_2 and while repeatedly grounding $S_4 - S_3 - S_2 - S_1 - S_4$ in sequence, check that the valve moves toward the open position.

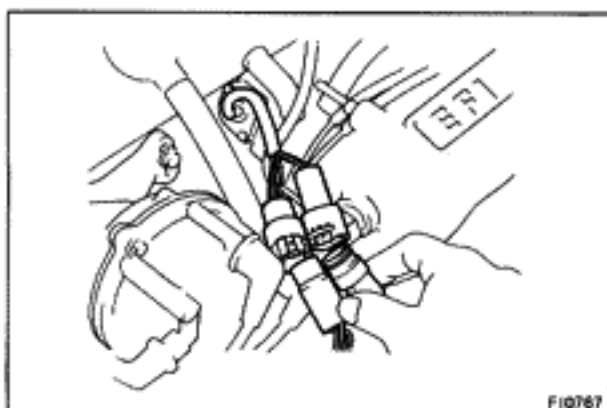


INSTALLATION OF ISC VALVE

1. INSTALL ISC VALVE BODY AND TWO BOLTS

2. CONNECT FOLLOWING HOSES TO ISC VALVE BODY:

- (a) Two air hoses
- (b) Two water by-pass hoses



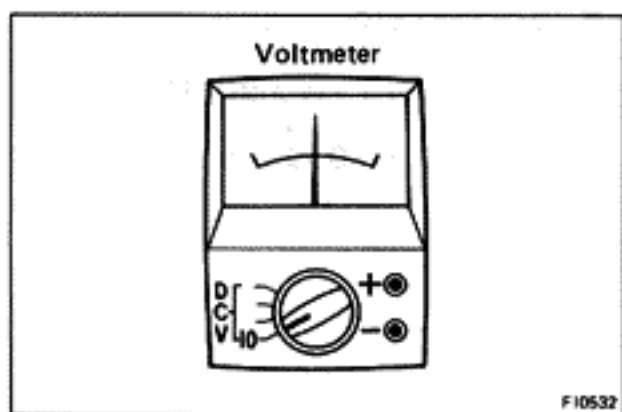
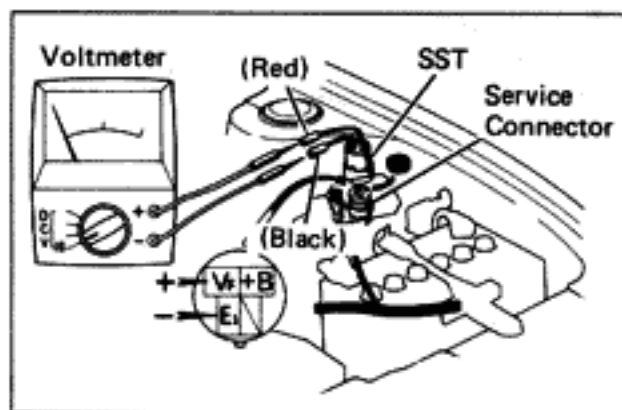
3. CONNECT TWO ISC VALVE CONNECTORS

4. FILL WITH COOLANT

INSPECTION OF IDLE SPEED

1. INITIAL CONDITIONS

- (a) Air cleaner installed
- (b) Normal engine operating temperature
- (c) All pipes and hoses of air intake system connected
- (d) All accessories switched off
- (e) All vacuum lines properly connected (i.e., EGR systems, etc.)
- (f) EFI system wiring connectors fully plugged
- (g) Ignition timing set correctly
- (h) Transmission in N range



F10532

2. CHECK IDLE SPEED

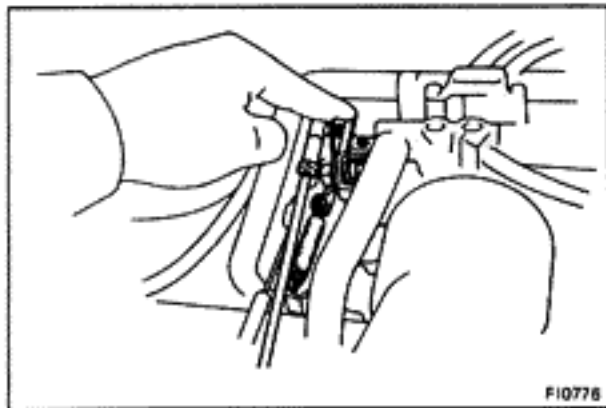
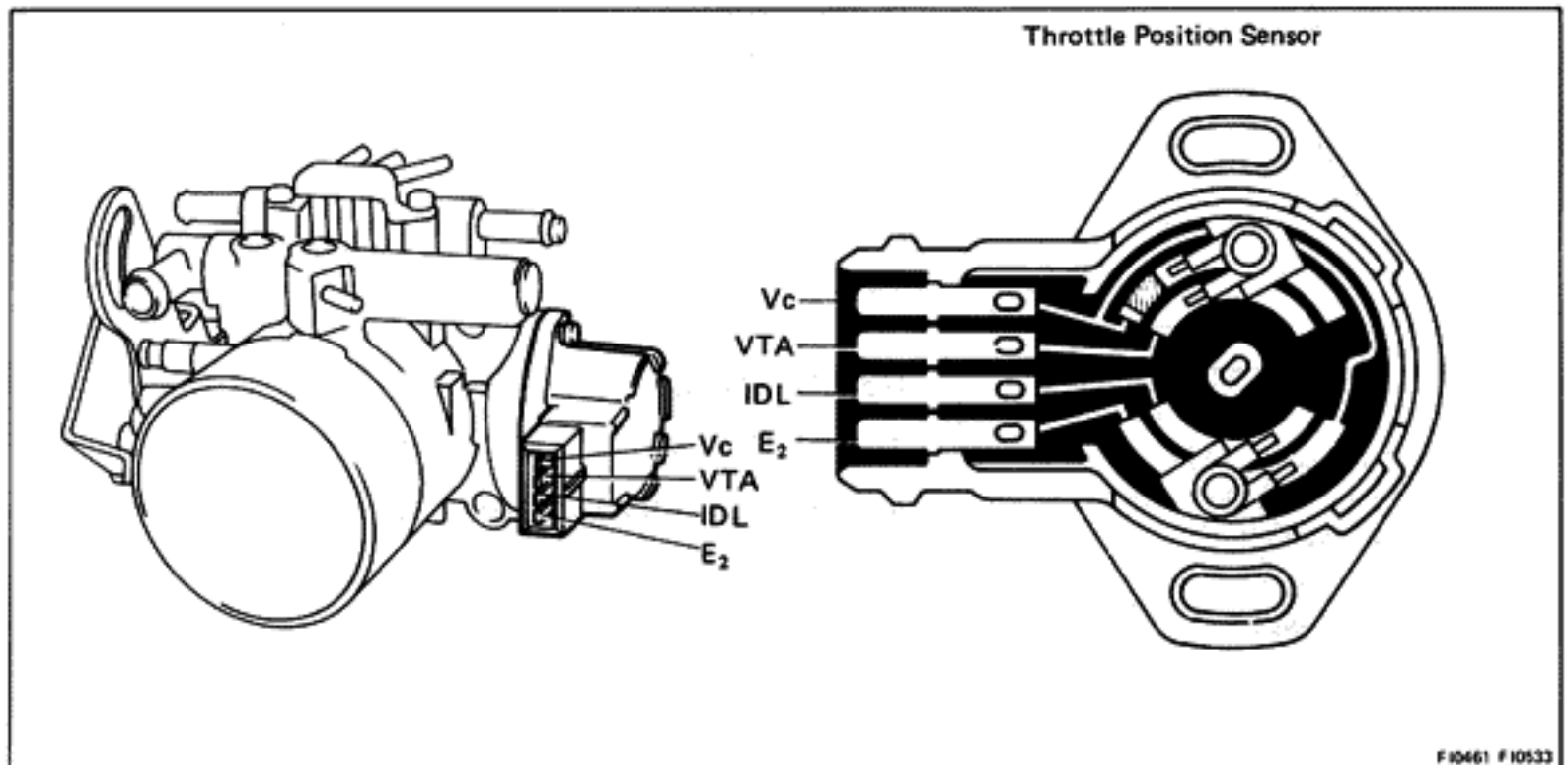
- (a) Remove the rubber cap from the 4-terminal service connector (yellow) and connect an EFI idle adjusting wiring harness (SST) to it.

SST 09842-14010

- (b) Connect positive testing probe to the red wire of the SST and negative testing probe to the black wire.
- (c) Warm up the Ox sensor with the engine at 2,500 rpm for about 2 minutes.
- (d) Maintain the engine speed at 2,500 rpm.
- (e) Check that the needle of the voltmeter fluctuates 8 times or more in 10 seconds.
If not, inspect the EFI system and replace the Oxygen sensor, if necessary.
- (f) With the engine idling, check that the idle rpm is standard.
- (g) With the engine idling, check that the V_F voltage is 2.5 ± 1.25 V. If not, check the intake system for leakage. If no leakage, investigate other areas.

A/C S/W	N range	D range
OFF	650 rpm	600 rpm
ON	900 rpm	750 rpm

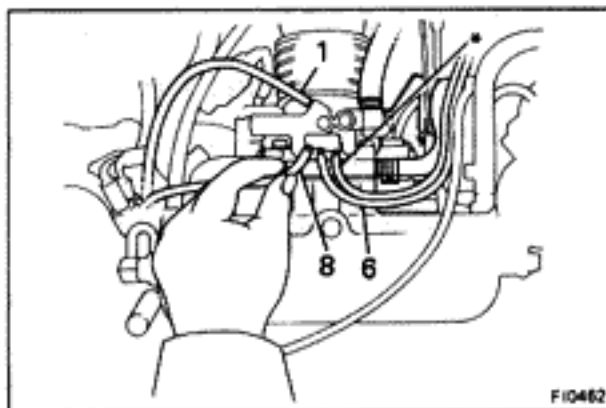
Throttle Body



ON-VEHICLE CHECK

1. CHECK THROTTLE BODY

- (a) Check that the throttle linkage moves smoothly.



- (b) Check the vacuum at each port.

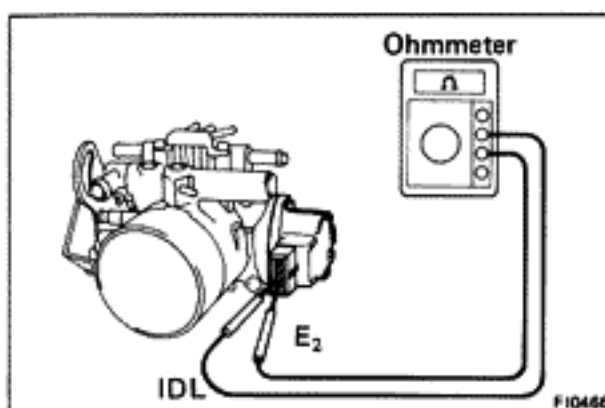
- Start the engine.
- Check the vacuum with your finger.

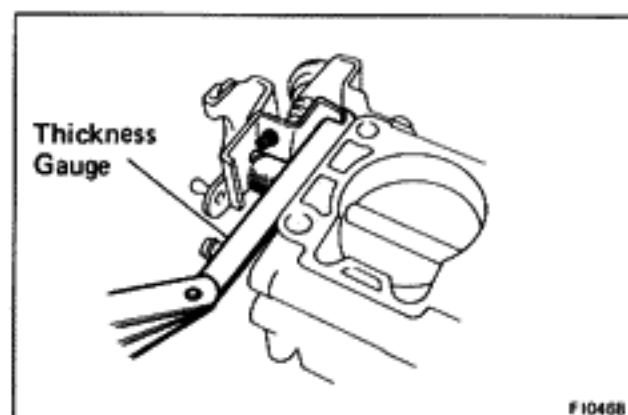
Part No.	At idling	Other than idling
8	No vacuum	Vacuum
*	No vacuum	Vacuum
1	No vacuum	No vacuum
6	No vacuum	Vacuum

2. CHECK THROTTLE POSITION SENSOR

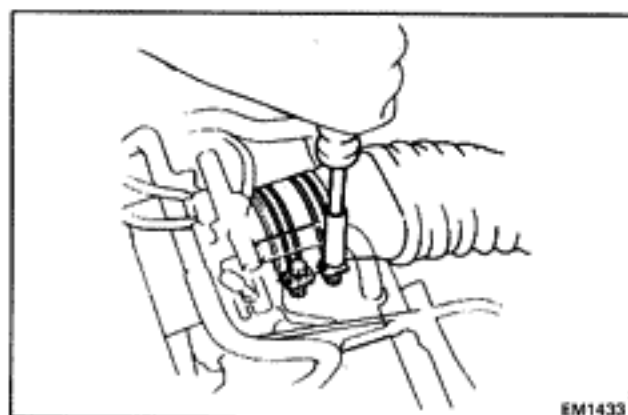
- (a) Check the resistance between the terminals.

- Unplug the connector from the sensor.
- Insert a thickness gauge between the throttle stop screw and stop lever.
- Using an ohmmeter, check the resistance between each terminal.



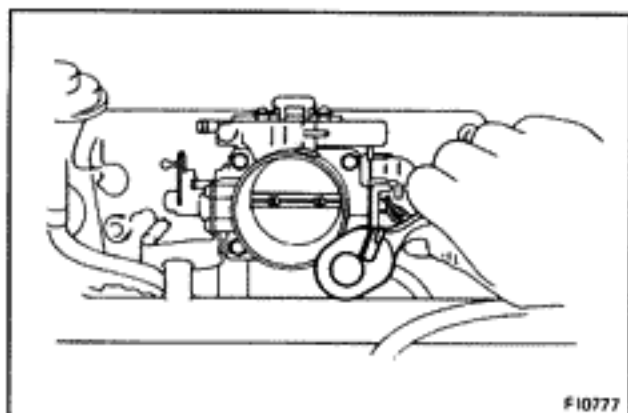


Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA — E ₂	0.2 — 0.8 kΩ
0.50 mm (0.0197 in.)	IDL — E ₂	0 — 100 Ω
0.90 mm (0.0354 in.)	IDL — E ₂	Infinity
Throttle valve fully opened position	VTA — E ₂	3.3 — 10 kΩ
—	V _c — E ₂	3 — 7 kΩ



REMOVAL OF THROTTLE BODY

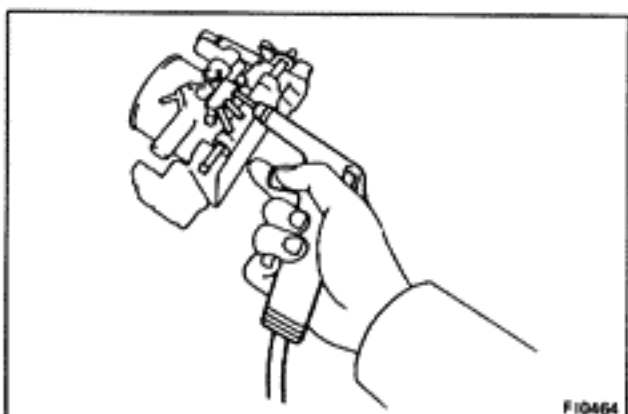
1. REMOVE AIR INTAKE CONNECTOR
2. DRAIN COOLANT FROM THROTTLE BODY
3. DISCONNECT FOLLOWING HOSES:
 - (a) No. 1 and No. 2 water by-pass hoses
 - (b) PCV hose from the throttle body
 - (c) Label and disconnect emission control hoses



4. DISCONNECT THROTTLE SENSOR CONNECTOR

5. REMOVE THROTTLE BODY

Remove the four bolts and remove the throttle body and gasket.



INSPECTION OF THROTTLE BODY

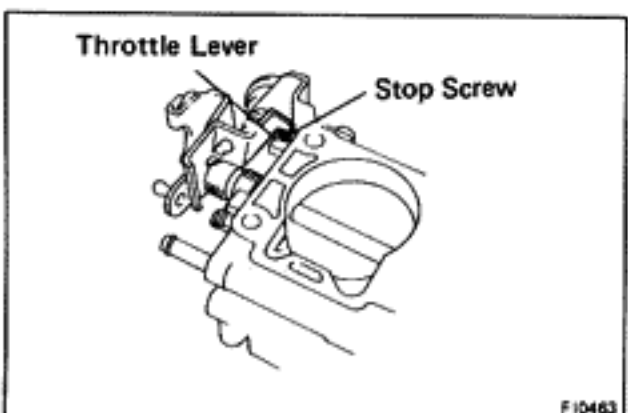
1. CLEAN THROTTLE BODY BEFORE INSPECTION

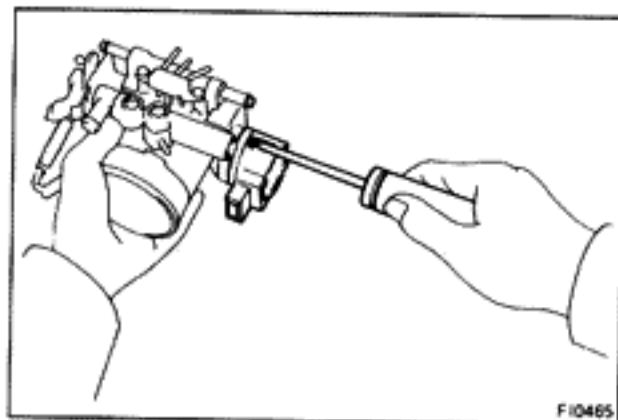
- (a) Wash and clean the cast parts with a soft brush in carburetor cleaner.
- (b) Using compressed air, blow all passages and apertures in the throttle body.

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

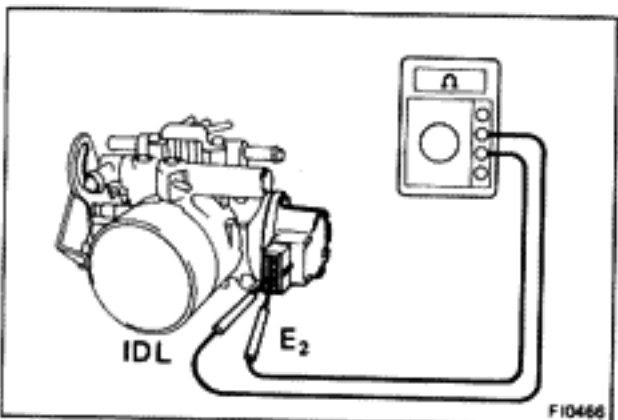
2. CHECK THROTTLE VALVE

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

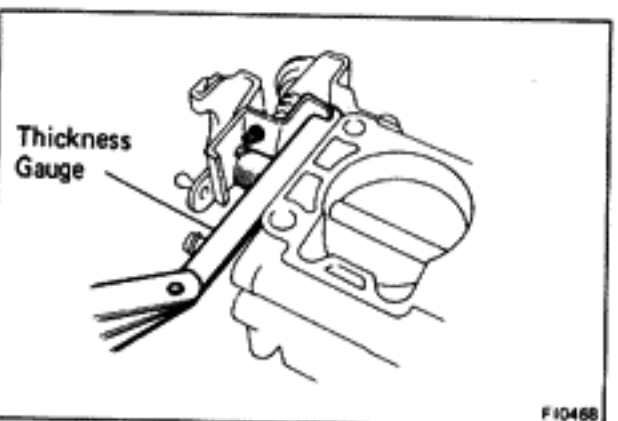




F10465



F10466



F10468

3. ADJUST THROTTLE POSITION SENSOR

- (a) Loosen the two sensor screws.

- (b) Connect the ohmmeter to the throttle position sensor terminals IDL and E₂.

- (c) Insert a thickness gauge (0.50 mm or 0.0197 in.) between the throttle stop screw and lever. Gradually turn the sensor clockwise until the ohmmeter deflects, and secure the sensor with two screws.

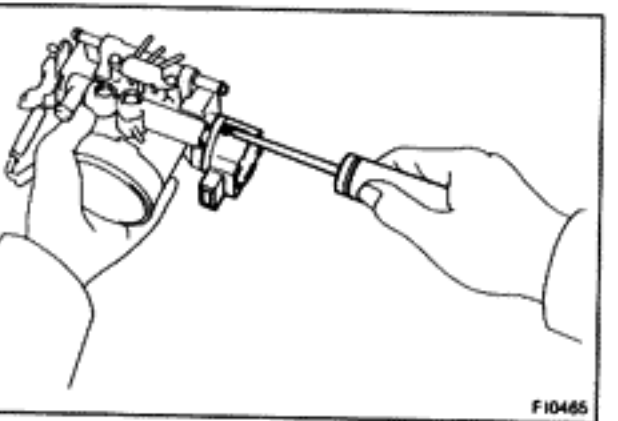
- (d) Using a thickness gauge, recheck the continuity between terminals IDL and E₂.

Clearance between lever and stop screw	Continuity (IDL — E ₂)
0.50 mm (0.0197 in.)	Continuity
0.90 mm (0.0354 in.)	No continuity

REPLACEMENT OF THROTTLE POSITION SENSOR

1. REMOVE THROTTLE POSITION SENSOR

Remove two screws and the sensor from the throttle body.



F10465

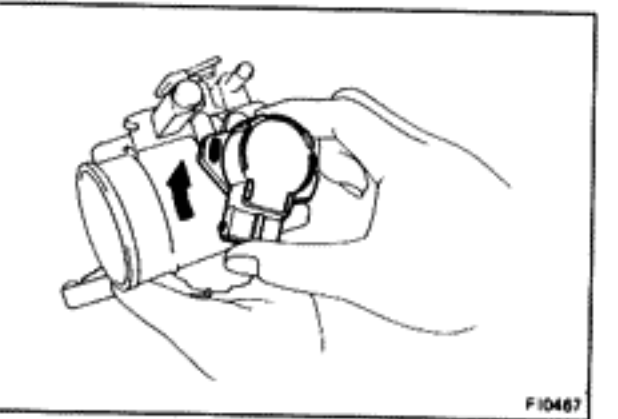
2. INSTALL THROTTLE POSITION SENSOR

- (a) Check that the throttle valve is fully closed.

- (b) Place the sensor on the throttle body as shown in the figure.

- (c) Turn the sensor clockwise, and temporarily install the two screws.

3. ADJUST THROTTLE POSITION SENSOR



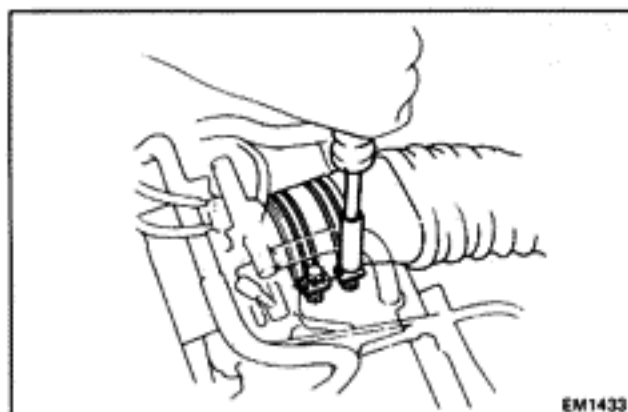
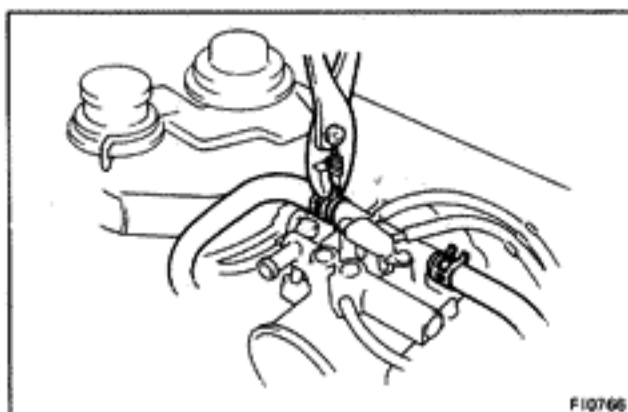
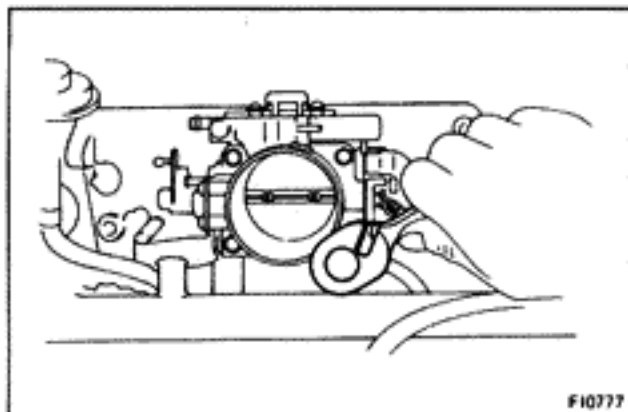
F10467

INSTALLATION OF THROTTLE BODY**1. INSTALL THROTTLE BODY**

Place a new gasket and install the throttle body and four bolts.

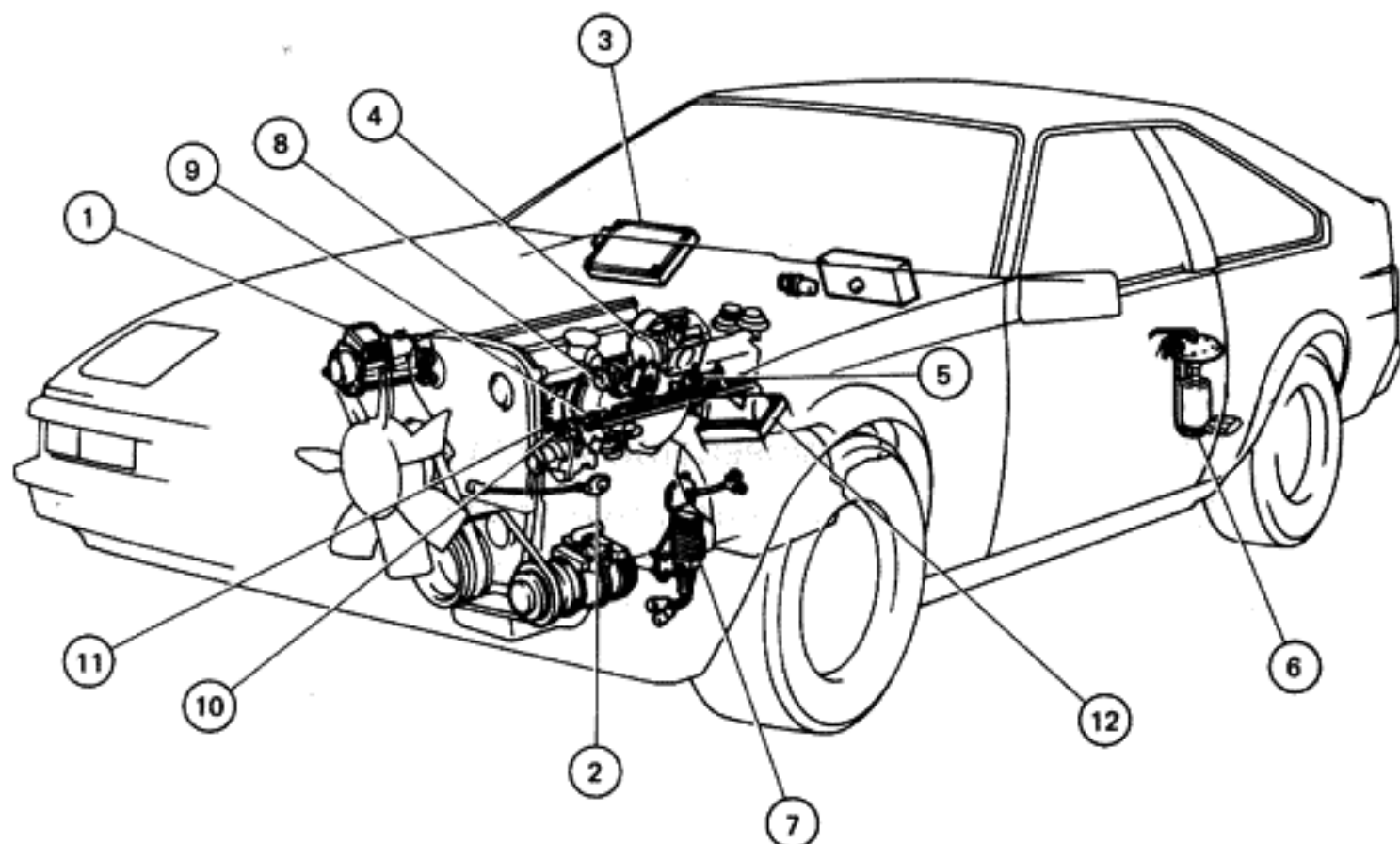
2. CONNECT THROTTLE SENSOR CONNECTOR**3. CONNECT FOLLOWING HOSES:**

- (a) Emission control hoses
- (b) PCV hose to throttle body
- (c) No. 1 and No. 2 water by-pass hoses

4. INSTALL AIR INTAKE CONNECTOR**5. FILL WITH COOLANT**

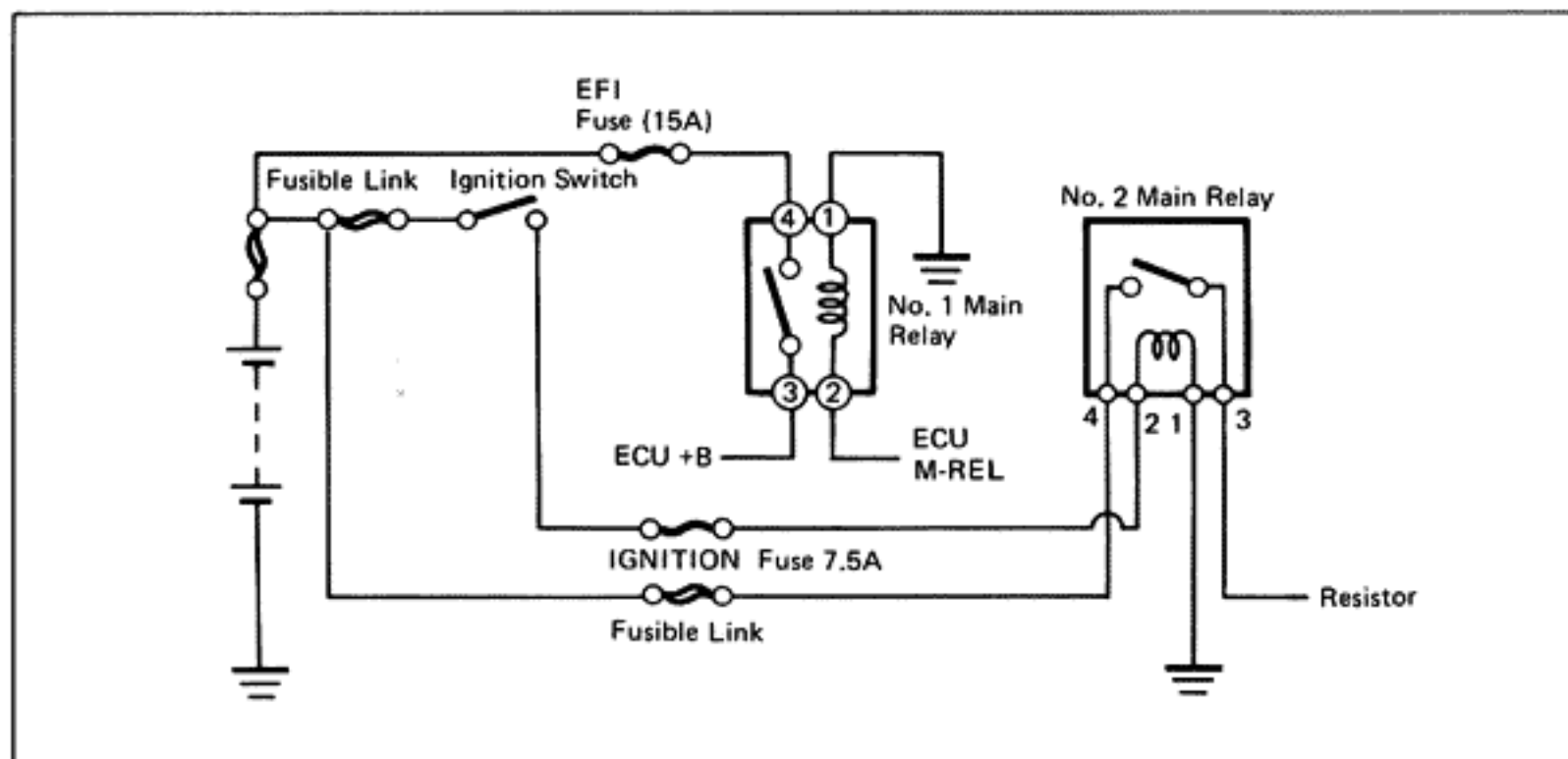
ELECTRONIC CONTROL SYSTEM

Location of Electronic Control Parts



- | | |
|-----------------------------|-------------------------------------|
| 1. Air Flow Meter | 7. Resistor |
| 2. Oxygen Sensor | 8. ISC Valve |
| 3. ECU | 9. Injector |
| 4. Throttle Position Sensor | 10. Water Temp. Sensor |
| 5. Cold Start Injector | 11. Cold Start Injector Time Switch |
| 6. Fuel Pump | 12. Igniter w/Ignition Coil |

Main Relay



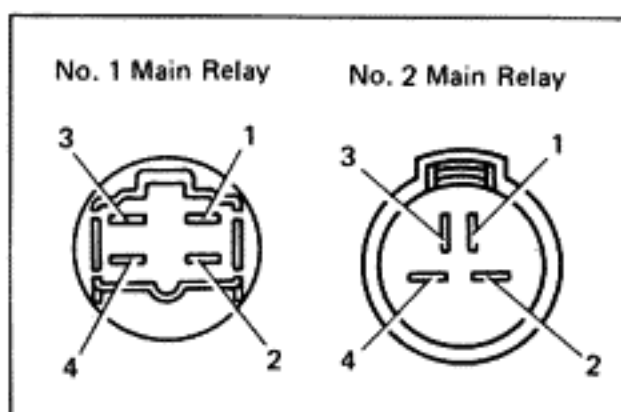
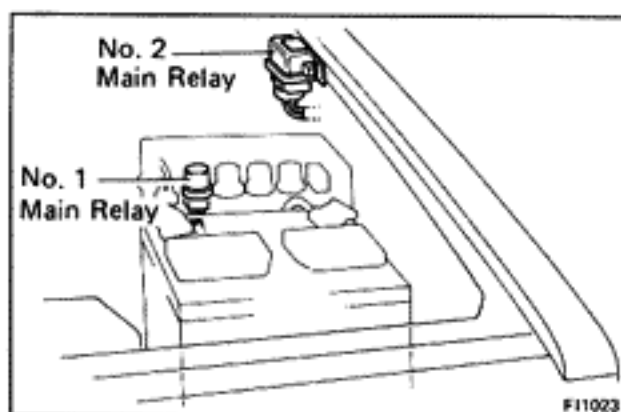
INSPECTION OF MAIN RELAYS

1. CHECK MAIN RELAYS OPERATION

- Turn on the ignition switch.
- At this time an operation noise will occur from the relay.

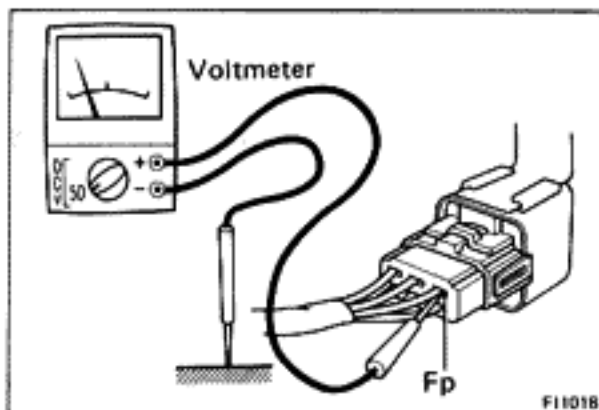
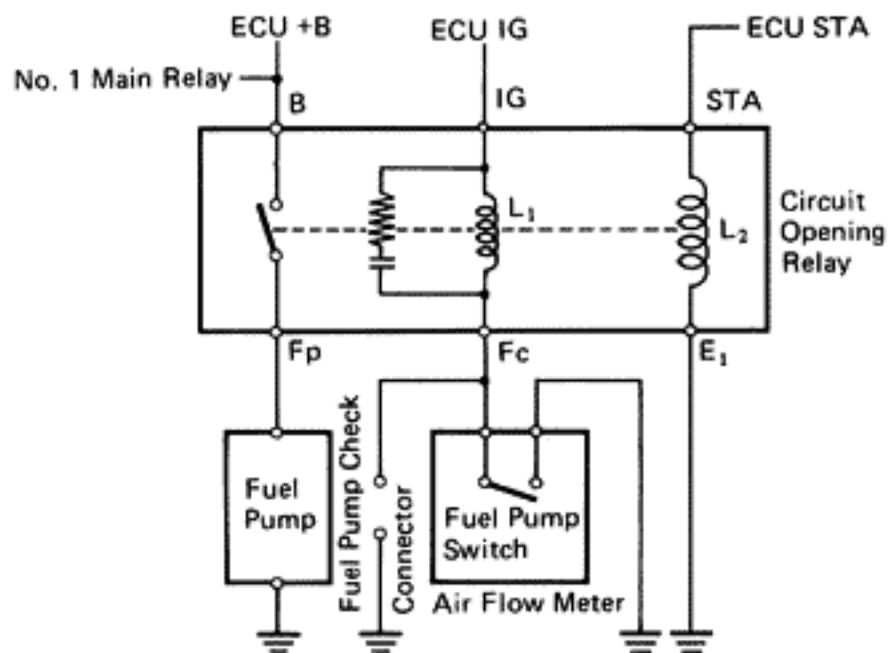
2. MEASURE RESISTANCE OF MAIN RELAYS

- Remove the No. 1 main relay from the relay block. Unplug the connector from the No. 2 main relay.
- Measure the resistance between each terminal.



	Between terminals	Resistance Ω
No. 1 Main Relay	1 - 2	40 - 60
	3 - 4	Infinity
No. 2 Main Relay	1 - 2	60 - 120
	3 - 4	Infinity

Circuit Opening Relay



INSPECTION OF CIRCUIT OPENING RELAY

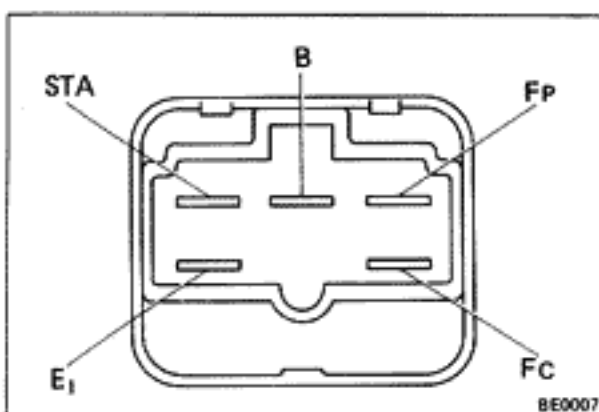
1. CHECK CIRCUIT OPENING RELAY OPERATION

- Remove the left kick panel.
- Using a voltmeter, check that the meter indicates voltage at F_p terminal during engine cranking and running.
- Stop the engine.

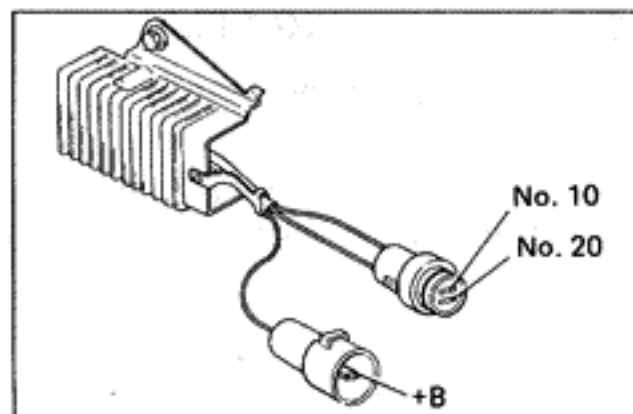
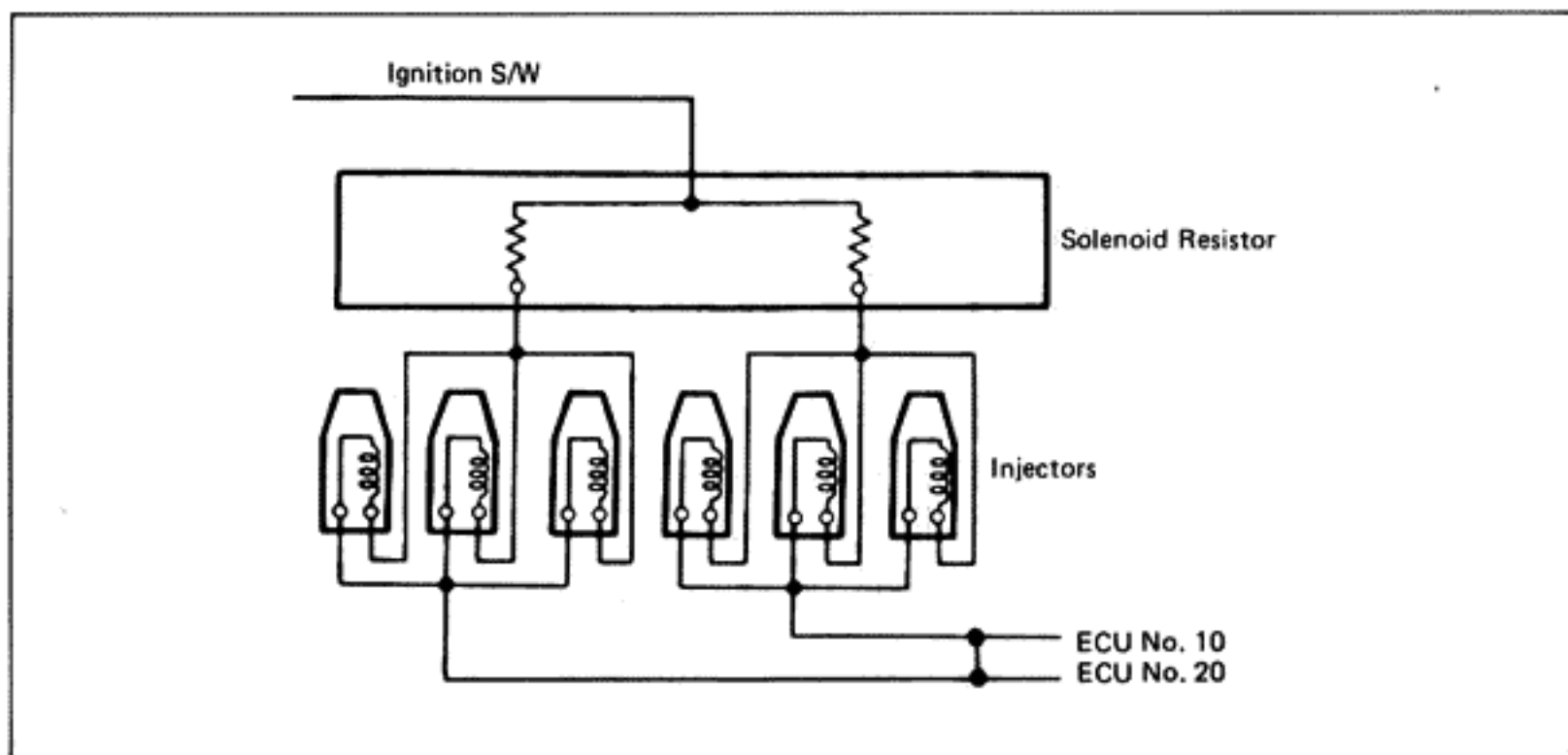
2. MEASURE RESISTANCE OF CIRCUIT OPENING RELAY

- Disconnect the connector.
- Measure the resistance between each terminal.

Between terminals	Resistance (Ω)
STA — E ₁	17 — 25
IG — F _c	88 — 132
+B — F _p	Infinity



Solenoid Resistor



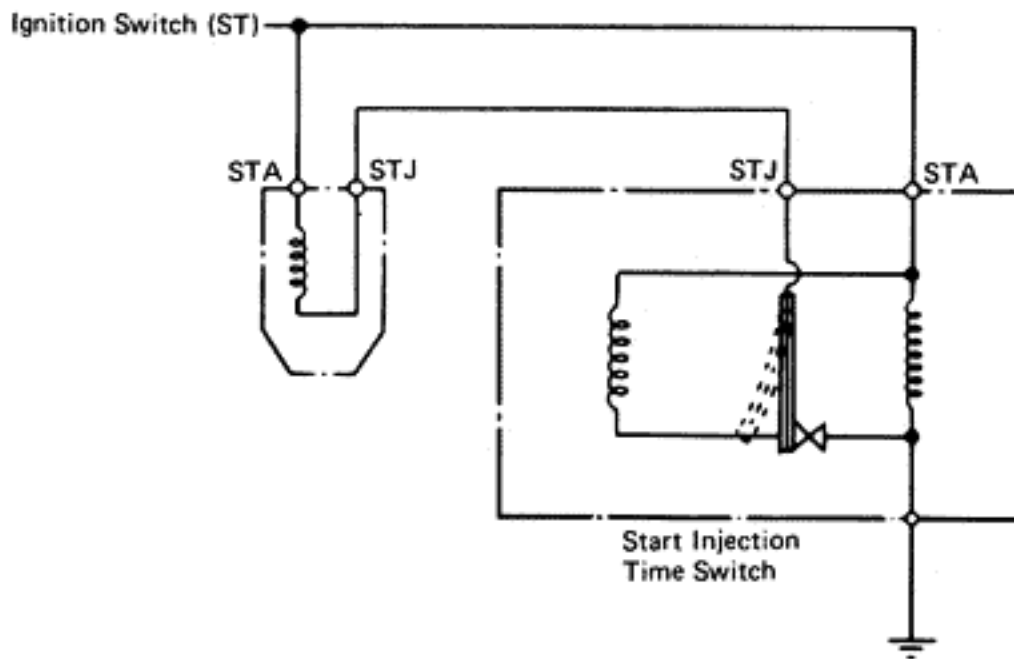
INSPECTION OF SOLENOID RESISTOR

MEASURE RESISTANCE OF SOLENOID RESISTOR

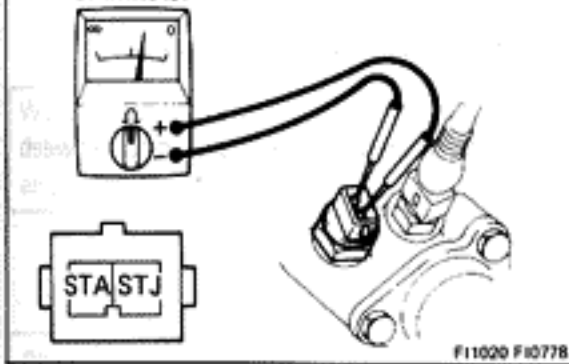
Using an ohmmeter, measure the resistance between +B and other terminals.

Resistance: 2 Ω each

Start Injector Time Switch



Ohmmeter



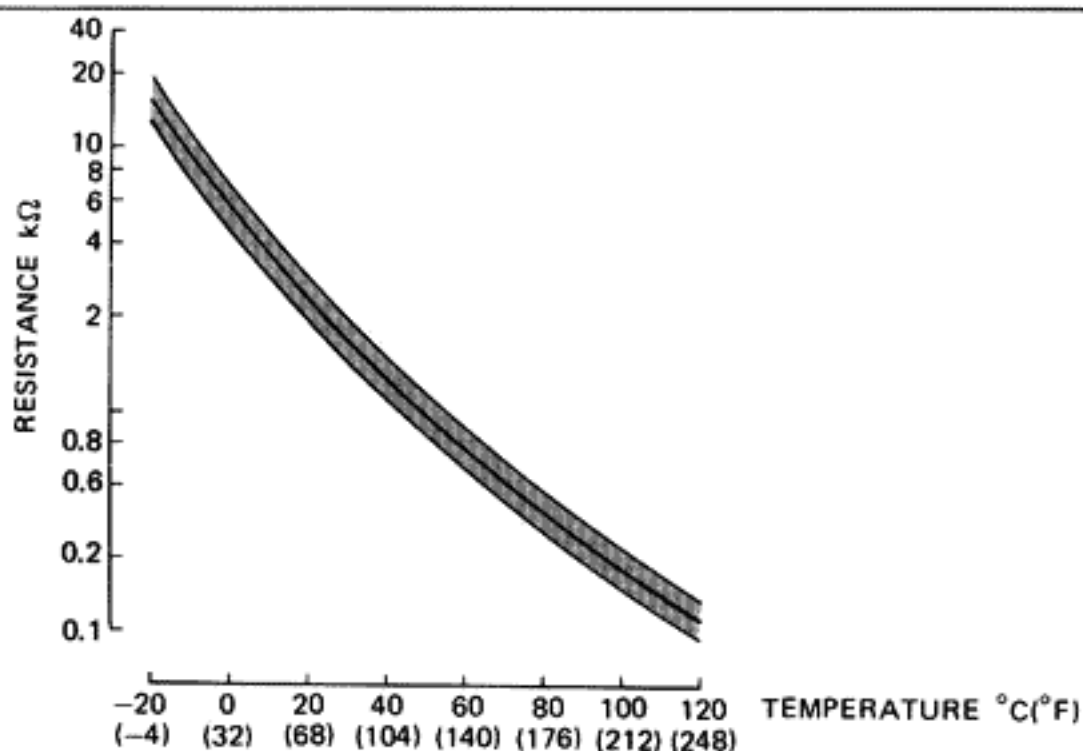
INSPECTION OF START INJECTOR TIME SWITCH

MEASURE RESISTANCE OF START INJECTOR TIME SWITCH

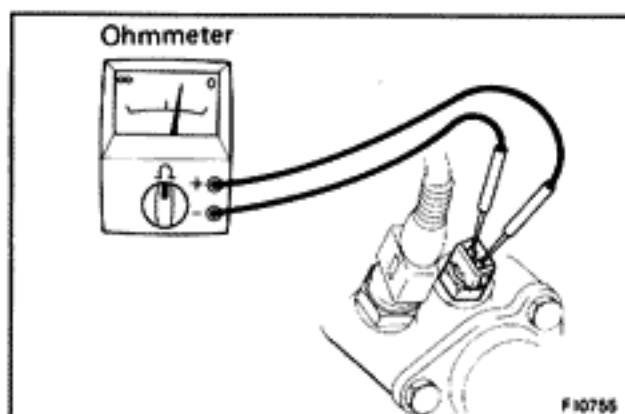
- Disconnect the connector.
- Using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance (Ω)	Coolant temperature
STA — STJ	24 — 40	below 30°C (86°F)
	40 — 60	above 40°C (104°F)
STA — Ground	20 — 80	—

Water Temp. Sensor



F10515

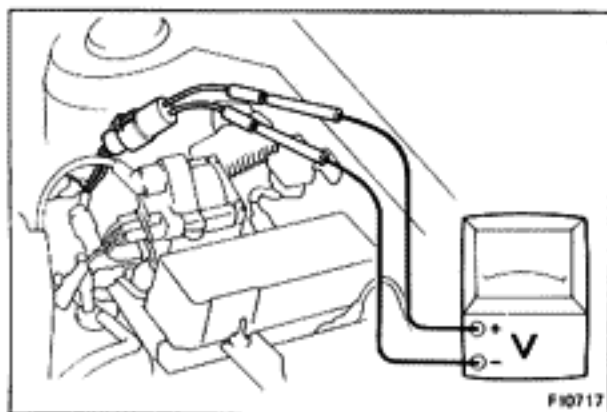


INSPECTION OF WATER TEMP. SENSOR

MEASURE RESISTANCE OF WATER TEMP. SENSOR

- Disconnect the connector.
- Using an ohmmeter, measure the resistance between both terminals.

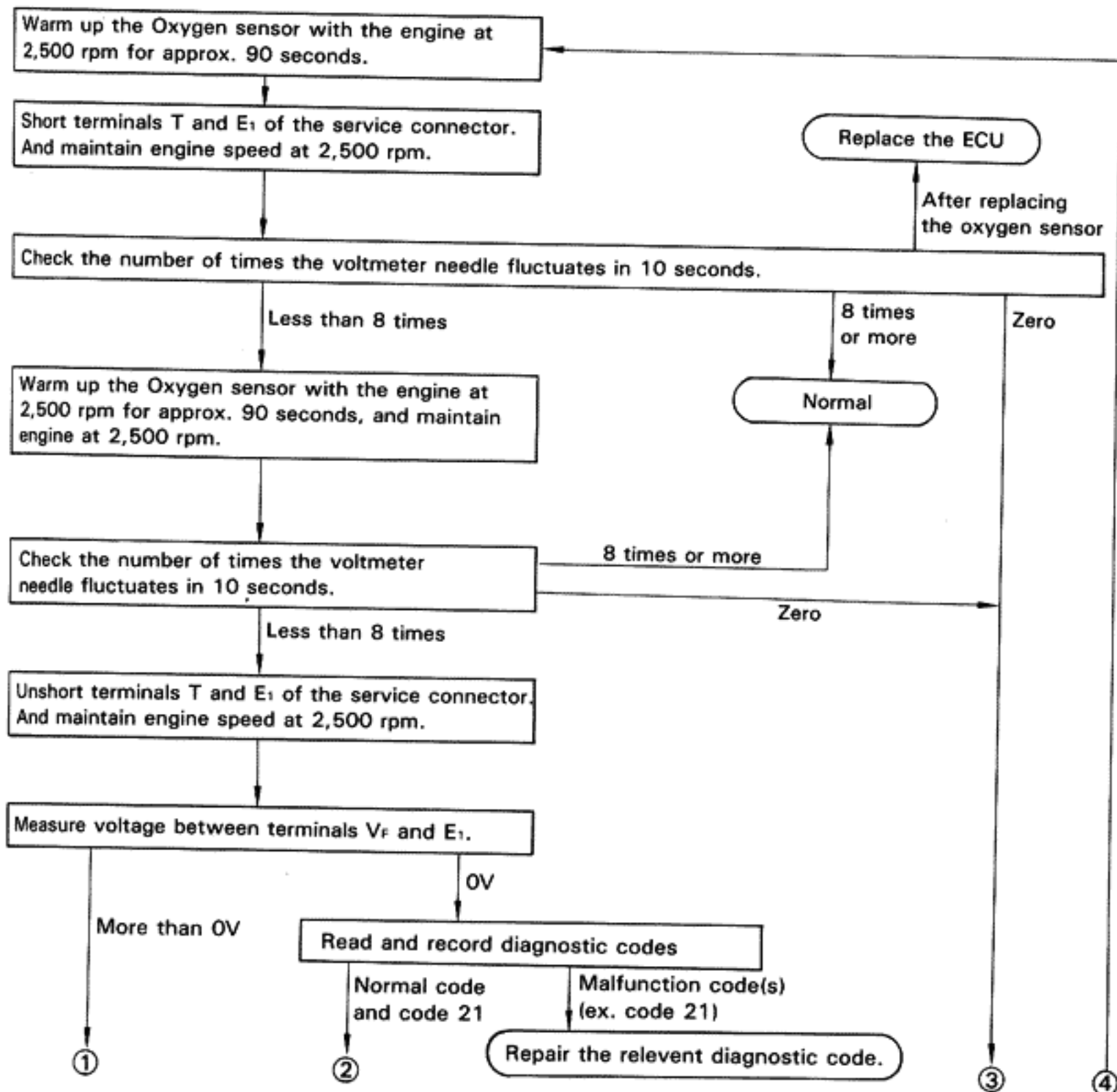
Resistance: Refer to chart.



Oxygen Sensor

INSPECTION OF FEEDBACK VOLTAGE (V_F)

1. Warm up the engine.
2. Connect SST to the engine service connector.
SST 09842-14010
3. Connect the voltmeter to the SST.
4. Warm up the Oxygen sensor with the engine at 2,500 rpm for about 2 minutes.



Electronic Controlled Unit (ECU)

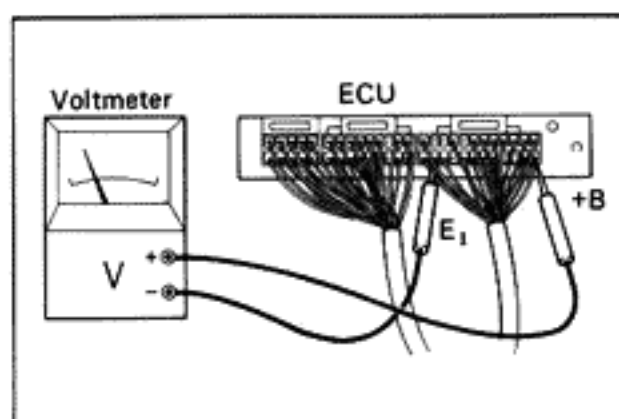
INSPECTION OF ECU

1. MEASURE VOLTAGE OF ECU

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

Check the voltages at the wiring connectors.

- Remove the glove box.
- Turn on the ignition switch.
- Measure the voltage at each terminal.



- NOTE: 1. Perform all voltage measurements with the connectors connected.
2. Verify that the battery voltage is 11V or above when the ignition switch is ON.

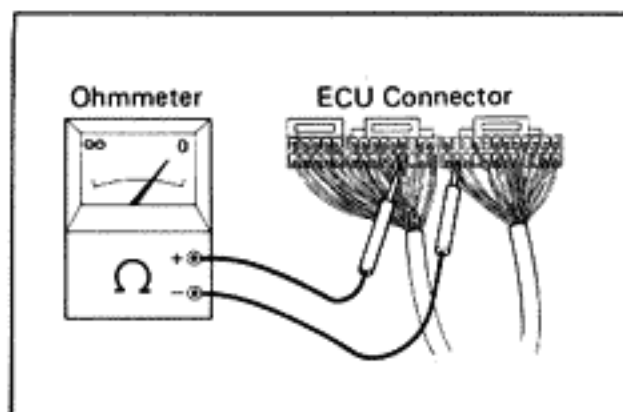
Connectors of ECU

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	ENGINE GROUND	G⊖	ENGINE REVOLUTION SENSOR	A/C	A/C MAGNET SWITCH
E02	ENGINE GROUND	V _F	CHECK CONNECTOR	SPD	SPEEDOMETER
No. 10	INJECTOR	G	ENGINE REVOLUTION SENSOR	W	WARNING LIGHT
No. 20	INJECTOR	T	CHECK CONNECTOR	THA	AIR TEMP. SENSOR
STA	STARTER SWITCH	VTA	THROTTLE SWITCH	V _s	AIR FLOW METER
IGt	IGNITER	Ne	ENGINE REVOLUTION SENSOR	V _c	AIR FLOW METER
EGR	EGR VSV	IDL	THROTTLE SWITCH	BAT	BATTERY +B
E1	ENGINE GROUND	KNK	KNOCK SENSOR	IG S/W	IGNITION SWITCH
N/C	NEUTRAL START SWITCH (A/T)	IGf	IGNITER	+B	MAIN RELAY
	CLUTCH SWITCH (M/T)	Ox	OXYGEN SENSOR	TCD	ECT COMPUTER
ISC1	ISC MOTOR NO. 1 COIL	THW	WATER TEMP. SENSOR	OIL	OIL PRESSURE SWITCH
ISC2	ISC MOTOR NO. 2 COIL	E2	SENSOR EARTH	L1	ECT COMPUTER
ISC3	ISC MOTOR NO. 3 COIL	E1	ENGINE GROUND	L2	ECT COMPUTER
ISC4	ISC MOTOR NO. 4 COIL	M-REL	MAIN RELAY COIL	L3	ECT COMPUTER

E01	No. 10	STA	EGR	N/C	ISC1	ISC2	G⊖		G	Ne		IGf	THW	L1	L2	L3	M-REL		SPD		THA	Vs	Vc	BAT	IG S/W
E02	No. 20	IGt	E1		ISC3	ISC4	V _F	T	VTA	IDL	KNK	Ox	E2	E2	E1	TCD		A/C	W	OIL				+B	+B

Terminals	STD Voltage	Condition	
BAT — E ₁	10 — 14	—	
+B — E ₁		IG S/W ON	—
IG S/W — E ₁			
M-REL — E ₁			
IDL — E ₂	4 — 6	IG S/W ON	Throttle valve open
VTA — E ₂	0.1 — 1.0		Throttle valve fully closed
	4 — 5		Throttle valve fully opened
V _c — E ₂	4 — 6		—
V _s — E ₂	4 — 5		Measuring plate fully closed
	0.02 — 0.08		Measuring plate fully open
	2 — 4		Idling
	0.3 — 1.0		3,000 rpm
THA — E ₂	1 — 2	IG S/W ON	Intake air temperature 20°C (68°F)
THW — E ₁	0.1 — 0.5		Coolant temperature 80°C (176°F)
STA — E ₁	6 — 12	IG S/W ST position	
No. 10 No. 20 — E ₁	9 — 14	IG S/W ON	—
IGt — E ₁	0.7 — 1.0	Cranking or Idling	
ISC ₁ } — E ₁ ISC ₄	9 — 14	IG S/W ON	—
	9 — 14	2 — 3 secs, after engine off	
+B — EGR	10 — 13	IG S/W ON	—
	0	Start engine and warm up oxygen sensor	
N/C — E ₁	0	IG S/W ON	Shift position P or N range (for A/T)
	10 — 14		Ex. P or N range (for A/T)
	0		Clutch pedal not depressed (for M/T)
	10 — 14		Clutch pedal depressed (for M/T)
	9 — 11	Cranking	
T — E ₁	4 — 6	IG S/W ON	Check connector not short
	0		Check connector short

OIL — E ₁	4 — 6	IG S/W ON (Warning light on)	
	0	Start engine (Warning light out)	
A/C — E ₁	10 — 13	IG S/W ON	A/C S/W ON
	0		A/C S/W OFF
V _F — E ₁	0 — 5	Start engine (Throttle valve open)	
W — E ₁	0	IG S/W ON	—
	10 — 13	Start engine	
TCD — E ₁	2 — 3	IG S/W ON	Coolant temperature Less than 35°C (95°F)
	0		Coolant temperature 35 — 60°C (95 — 140°F)
	4 — 6		Coolant temperature More than 60°C (140°F)



2. MEASURE RESISTANCE OF ECU

CAUTION:

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

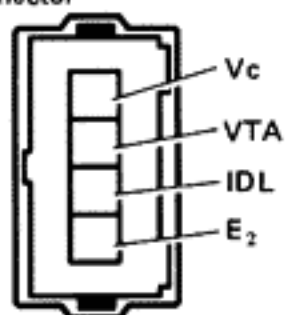
Check the resistance between each terminal of the wiring connector.

- Remove the glove box.
- Unplug the wiring connectors from the ECU.
- Measure the resistance between each terminal of the wiring connectors.

Resistances at ECU Wiring Connectors

Terminals	Condition	Resistance (Ω)
IDL — E ₂	Throttle valve open	∞
	Throttle valve fully closed	0
VTA — E ₂	Throttle valve fully opened	3,300 — 10,000
	Throttle valve fully closed	200 — 800
V _c — E ₂	Disconnect air flow meter connector	3,000 — 7,000
	Disconnect throttle position sensor connector	200 — 400
V _s — E ₂	Measuring plate fully closed	20 — 400
	Measuring plate fully open	20 — 1000
THA — E ₂	Intake air temperature 20°C (68°F)	2,000 — 3,000
G — G ⊖	—	140 — 180
Ne — G ⊖	—	
ISC ₁ , ISC ₂ ISC ₃ , ISC ₄ — +B	—	10 — 30

Wire Connector



J4-1

Fuel Cut RPM

INSPECTION OF FUEL CUT RPM

- Start and warm up the engine.
- Disconnect the throttle position sensor connector from the throttle position sensor.
- Short circuit terminals E₂ and IDL on wire connector side.
- Gradually raise the engine rpm and check that there is fluctuation between the fuel cut and fuel return points.

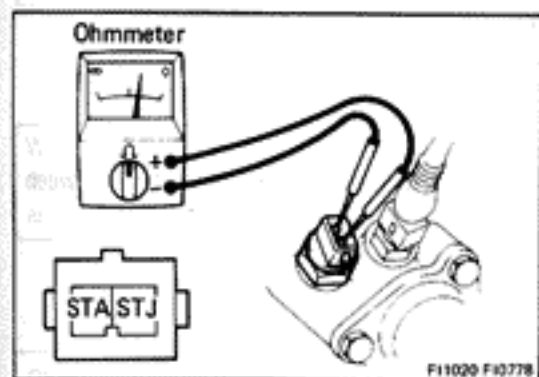
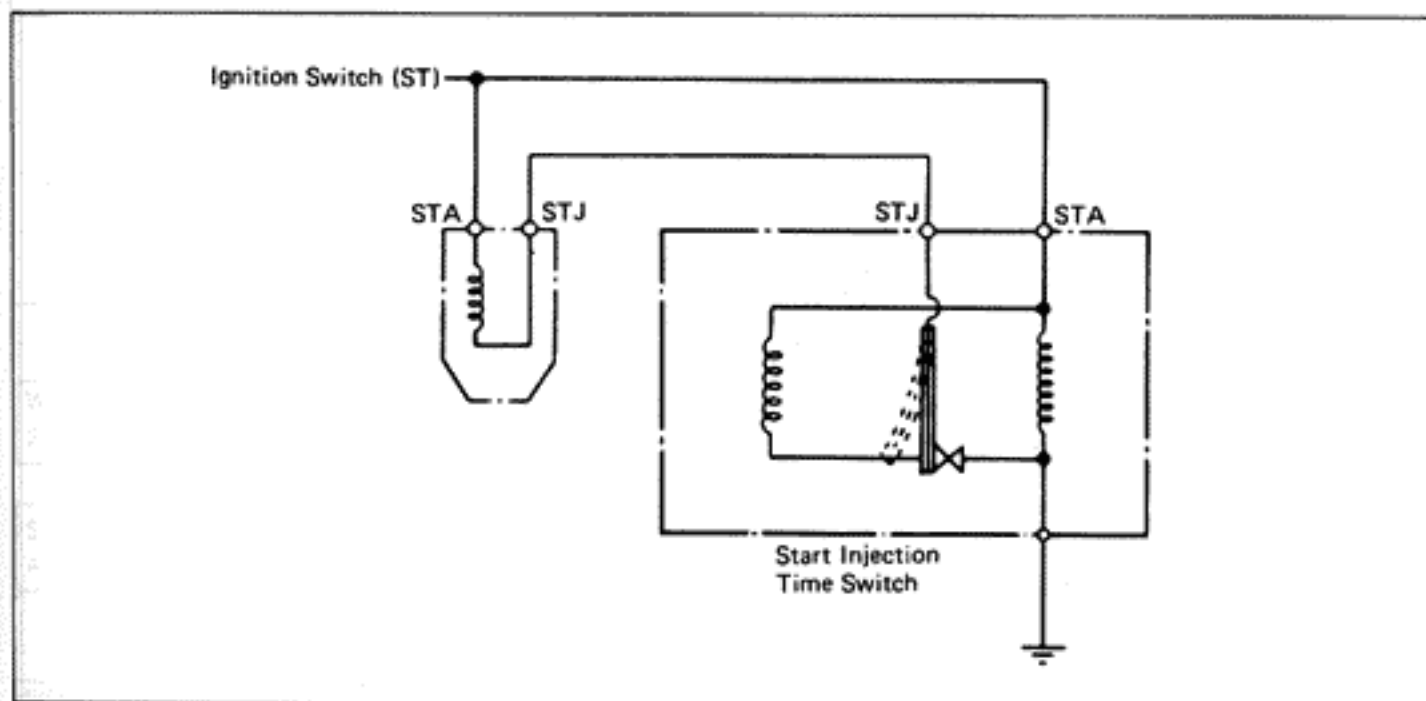
NOTE: The vehicle should be stopped.

Fuel Cut rpm	Fuel Return rpm
1,800 rpm	1,200 rpm



F11142

Start Injector Time Switch



INSPECTION OF START INJECTOR TIME SWITCH

MEASURE RESISTANCE OF START INJECTOR TIME SWITCH

- Disconnect the connector.
- Using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance (Ω)	Coolant temperature
STA — STJ	24 — 40	below 30°C (86°F)
	40 — 60	above 40°C (104°F)
STA — Ground	20 — 80	—