

1989 Mazda RX-7 Factory Service Manual

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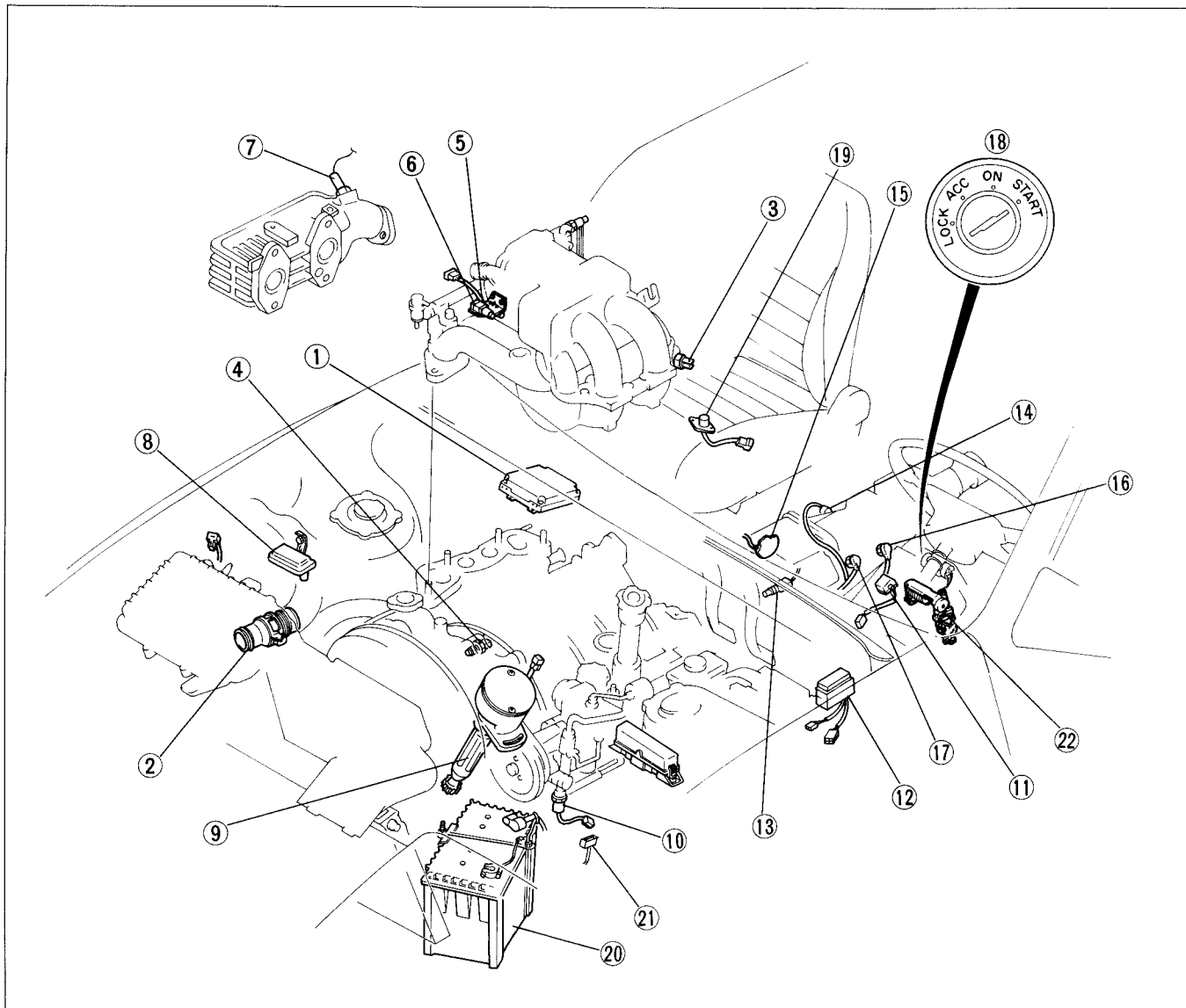
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FUEL AND EMISSION CONTROL SYSTEMS (NON TURBO)

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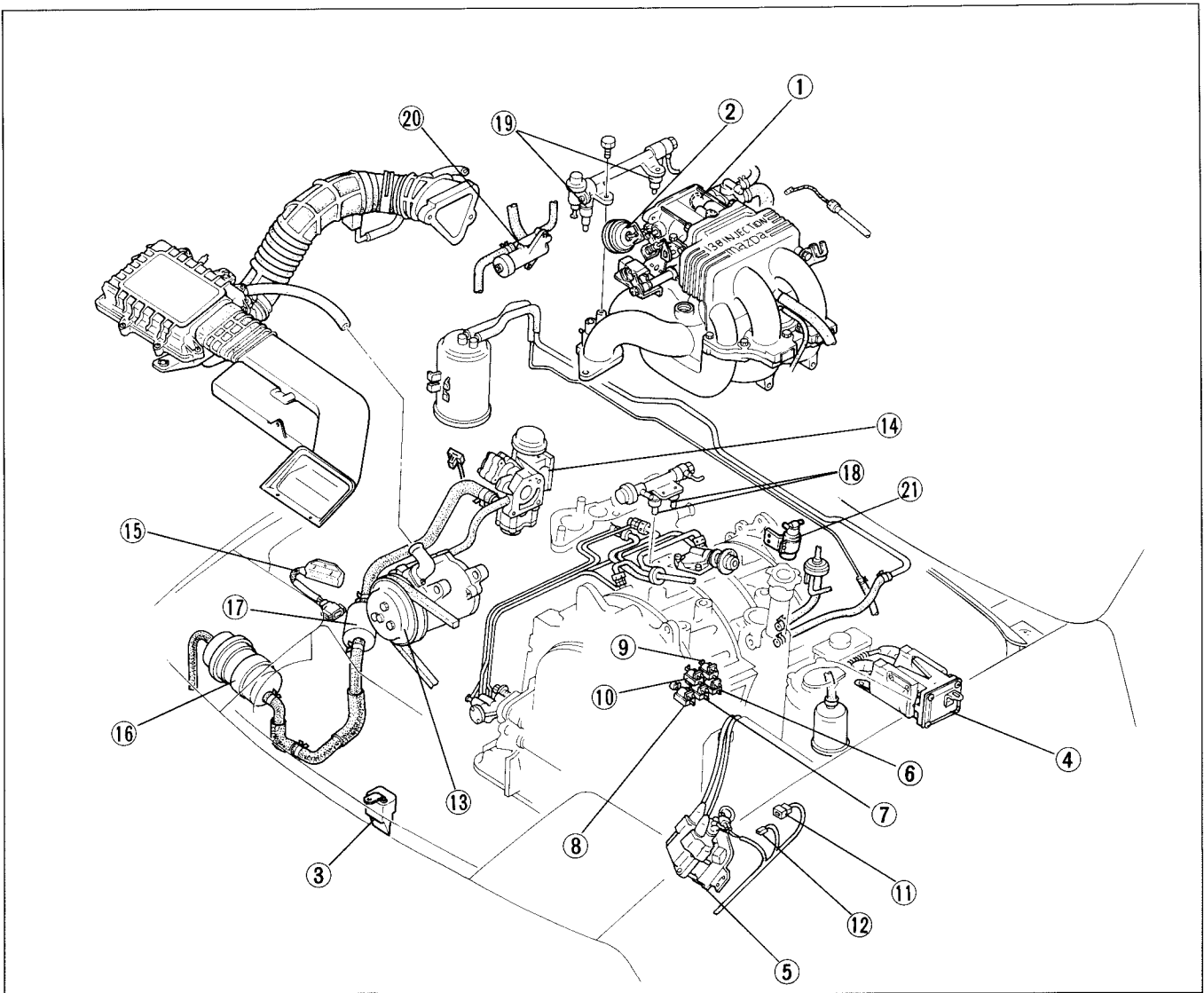
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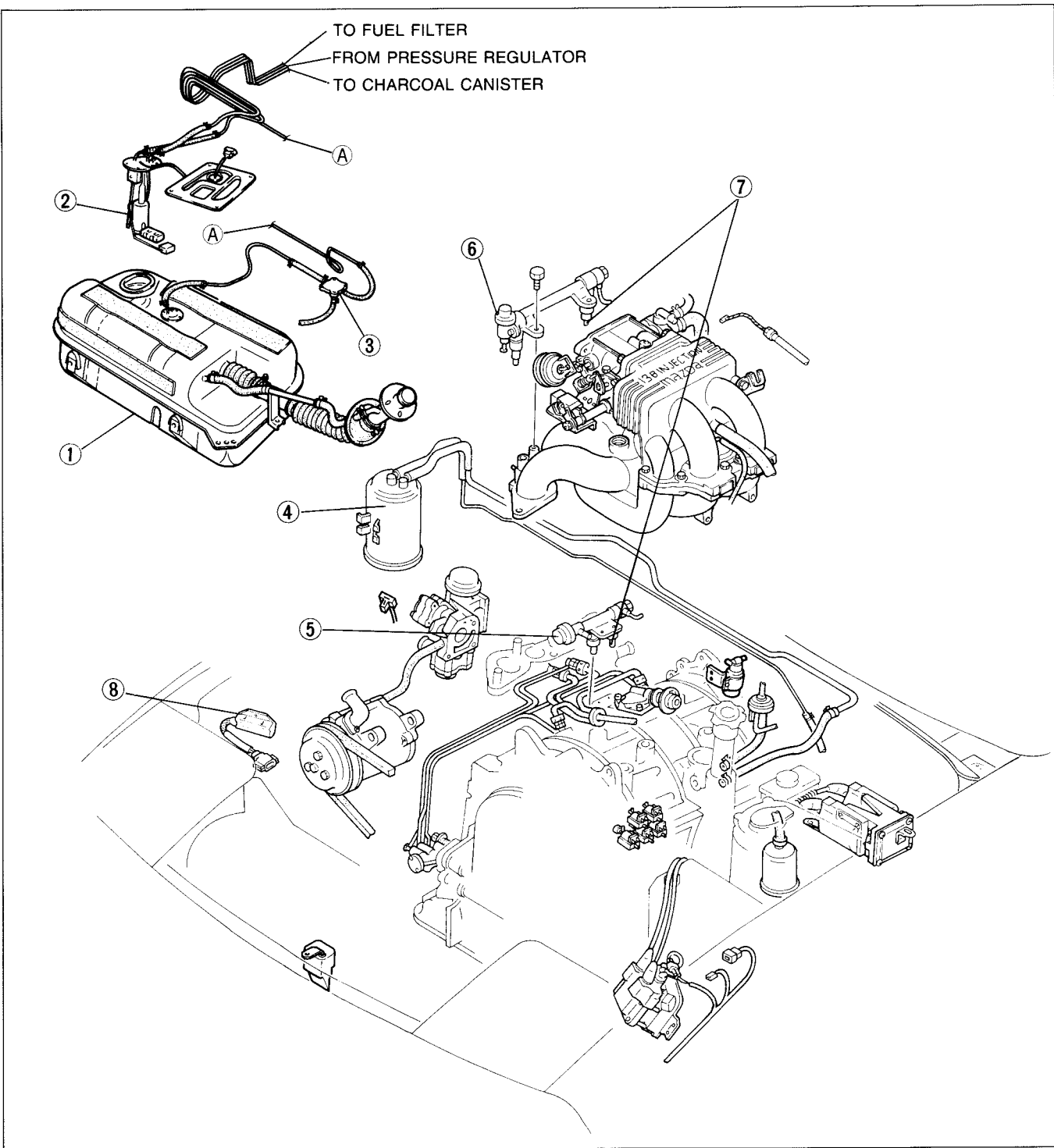
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FUEL DEVICES

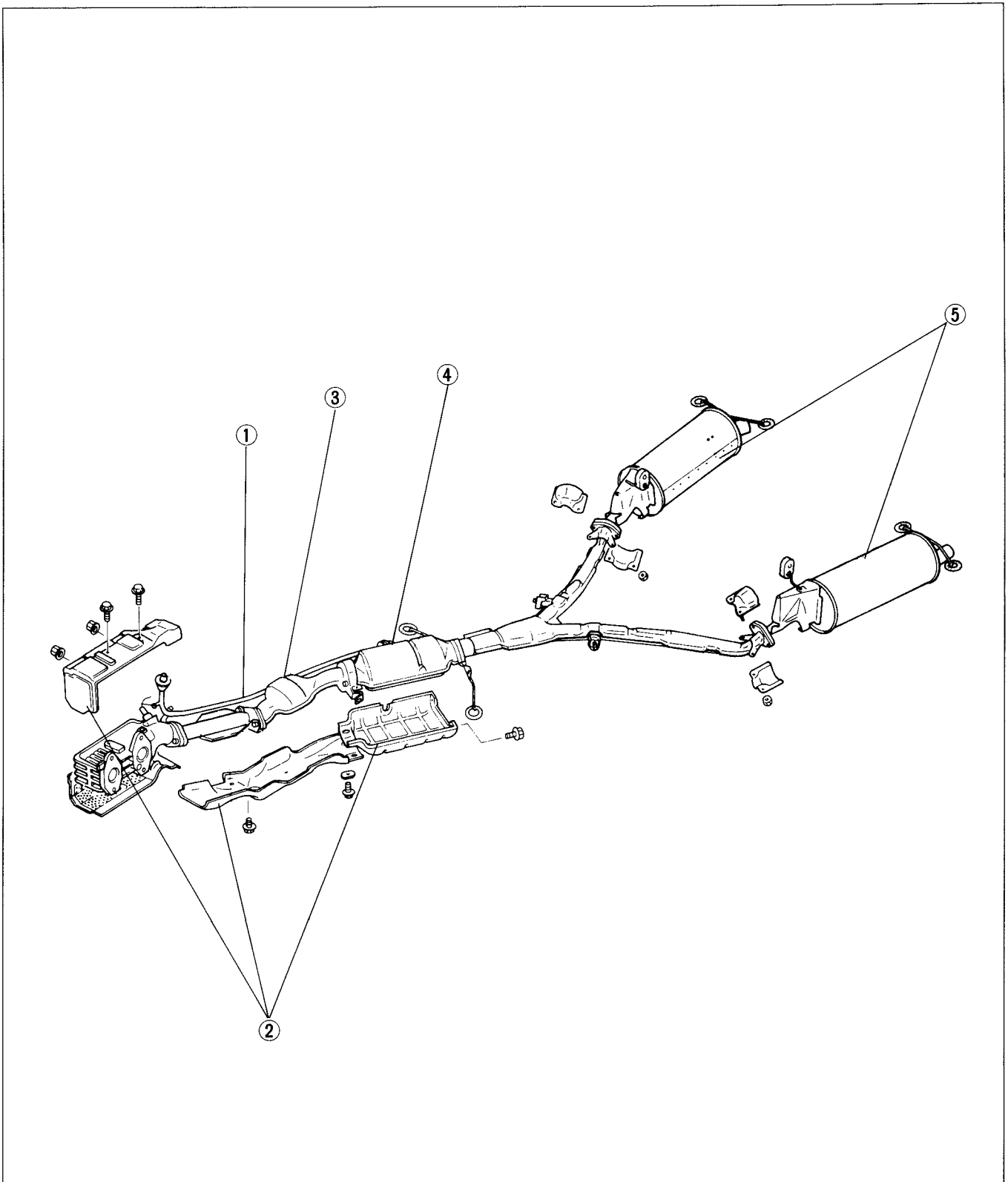


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Exhaust devices

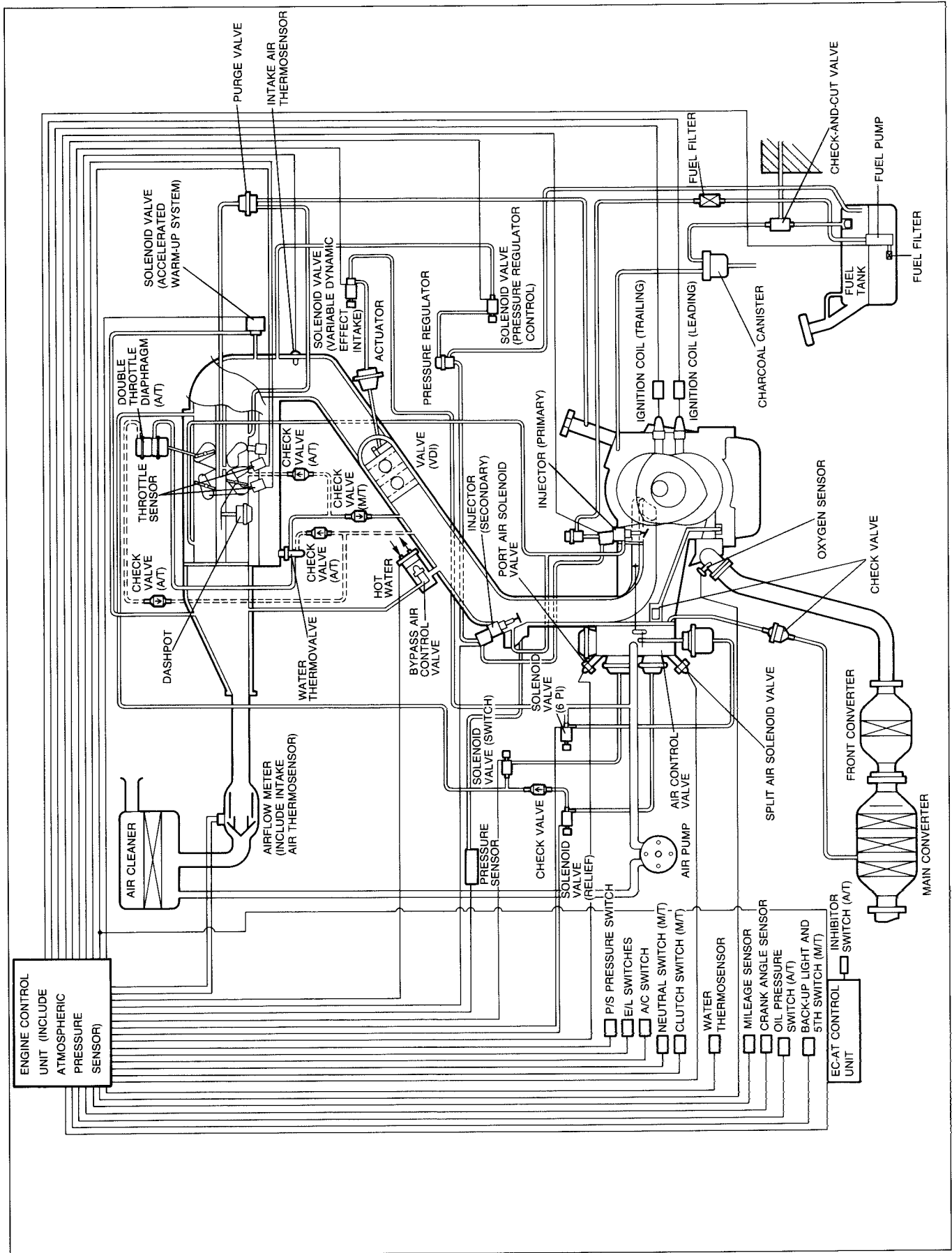
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- 1. Split air pipe
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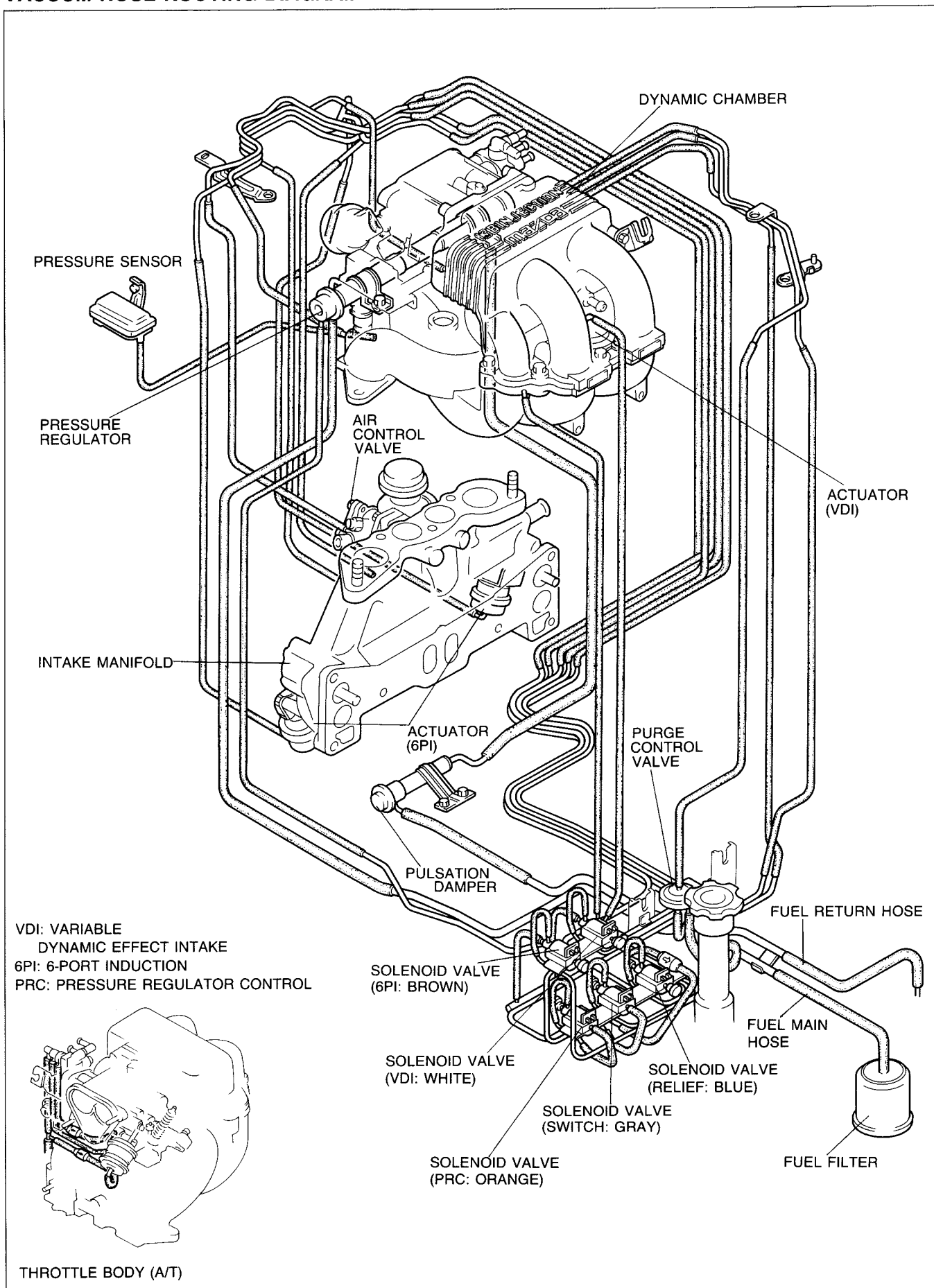
- 4. Main converter
- 5. Main silencer

OUTLINE

SYSTEM DIAGRAM

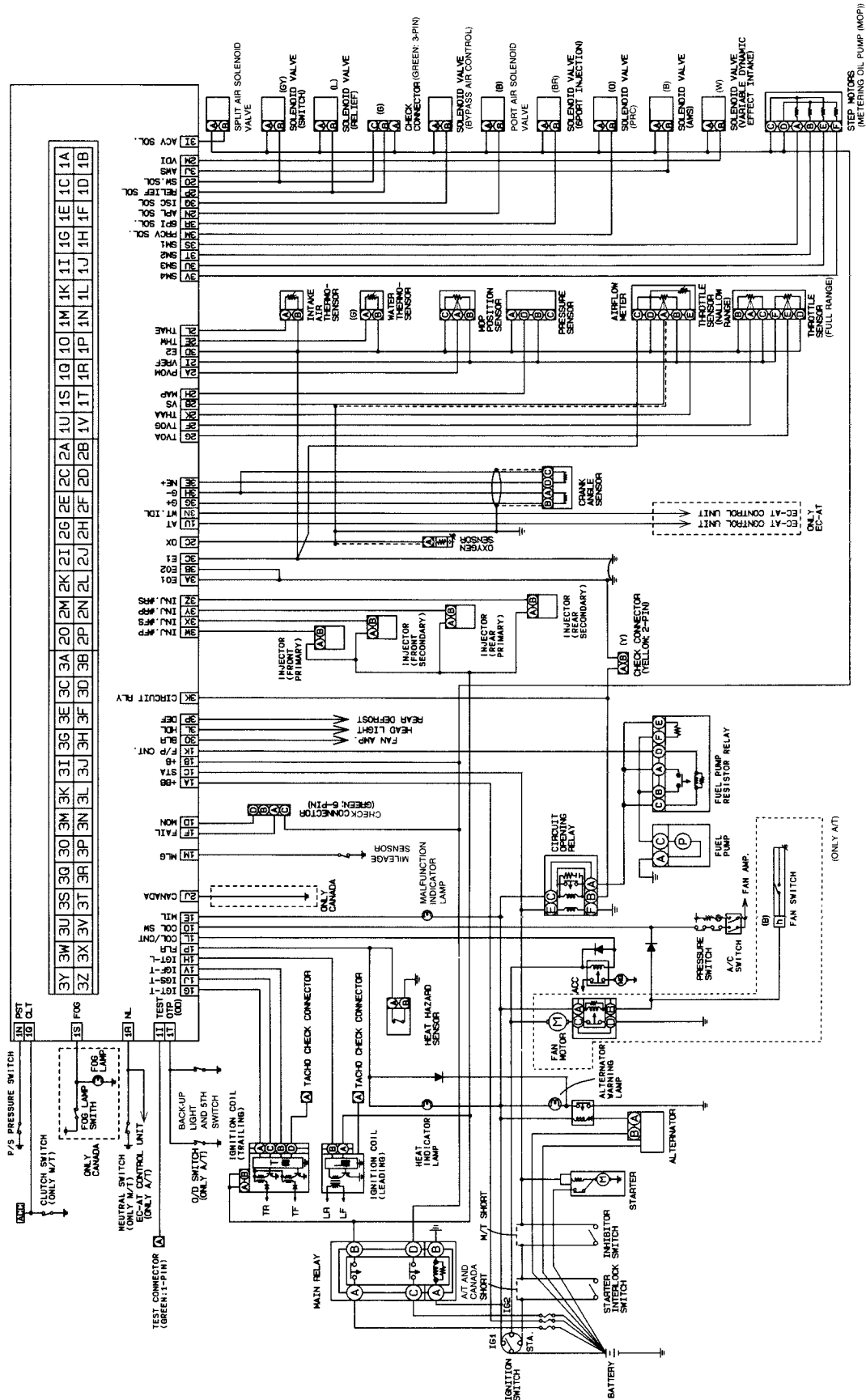


VACUUM HOSE ROUTING DIAGRAM



F1 OUTLINE

WIRING DIAGRAM



SPECIFICATIONS

Item		Model	13B EGI engine
Idle speed (Test connector grounded)		rpm	750 ± 25 (for A/T...N Range)
Air cleaner	Element type		Long life wet
Throttle body	Type		Horizontal — draft (2 stage — 3 barrel)
	Throat diameter	Primary mm (in)	45 (1.772)
		Secondary mm (in)	45 (1.772) x 2
	Water thermovalve	Operation temp. °C (°F)	M/T: 67—77 (153—171) or more A/T: 60—70 (140—158) or more
Dashpot	Adjustment speed	rpm	2,700—3,100
Fuel tank	Capacity	liters (US gal, Imp gal)	70 (18.5, 15.4)
Fuel filter	Low pressure		Nylon 6 (164 and 45 mesh)
	High pressure		Filter paper
Pressure regulator	Type		Diaphragm
	Regulated pressure		kPa (kg/cm ² , psi)
Fuel pump	Type		Impeller (intank)
	Outlet pressure	kPa (kg/cm ² , psi)	441—588 (4.5—6.0, 64.0—85.3)
Injector (Primary and Secondary)	Drive		Voltage drive
	Injection volume	cc (cu in)/15 sec.	111—118 (6.8—7.2)
Heat hazard sensor	Operation temperature	°C (°F)	105—115 (221—239)
Main silencer	Capacity	cc (cu in)	M/T: 10,300 (628.3) x 2, A/T: 12,000 (732) x 2
Ignition timing (Test connector grounded)			Leading: 5° ± 1° ATDC Trailing: 20° ± 2° ATDC
Distribution	Type		Control unit
Spark advance	Type		Control unit
Idle-up system	A/C	rpm	M/T: 875 A/T: 800
	"D" range	rpm	750 (at warm engine)
Anti-afterburn valve	Operation time	sec.	M/T: 1.60—2.20 A/T: 0.52—0.92

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F1 OUTLINE

COMPONENT DESCRIPTION

Component	Function	Remarks
Accelerated Warm-up System (AWS)	Supplies bypass air into dynamic chamber	Controlled by duty signal from control unit
Anti Afterburn Valve	Supplies fresh air into rear port during deceleration	Included in air control valve
Air Bleed Socket	Supplies fresh air into injector hole	
Air Cleaner	Filters air into throttle chamber	
Air Control Valve	Directs air to one of three locations; exhaust port, main converter or relief air silencer	Consists of 3 valves; Relief valve Switching valve Anti afterburn valve
Air Flow Meter	Detects amount of intake air; sends signal to control unit	
Atmospheric Pressure Sensor	Detects atmospheric pressure; sends signal to control unit	Built in ECU
Air Pump	Supplies secondary air to air control valve	
Catalytic Converter	Reduces HC, CO and NOx	
Charcoal Canister	Stores gas tank fumes when engine stopped	Vented to atmosphere through charcoal and filter
Check-and-cut Valve	Controls pressure in fuel tank	
Coil with Igniter	Generates high voltage	Leading; ignite simultaneously Trailing; ignite individually
Crank Angle Sensor	Detects eccentric shaft angle at 30° intervals and front rotor position; sends signal to control unit	
Dashpot	Gradually closes throttle valve during deceleration	
Double Throttle System	Gradually opens the No. 2 secondary throttle valve when No. 1 secondary throttle valve suddenly opens	
Dynamic Chamber	Connects front and rear ports	Primary and secondary separated
Engine Control Unit	<p>Detects the following:</p> <ol style="list-style-type: none"> 1. Engine speed 2. Intake air amount 3. Engine coolant temperature 4. Throttle opening 5. Intake manifold vacuum 6. O₂ concentration 7. In-gear condition 8. Intake air temperature 9. Floor temperature 10. A/C operation 11. Cranking signal 12. Atmospheric pressure 13. Initial set signal 14. Position of transmission gear 15. P/S operation 16. Metering oil pump (MOP) position signal 17. Electric load (E/L) condition 18. Mileage <p>Controls operation of the following:</p> <ol style="list-style-type: none"> 1. Fuel injection system 2. Ignition control system 3. ISC system 4. Pressure regulator control system 5. Secondary air injection control system 6. Variable dynamic effect intake (VDI) system 7. 6-port induction (6PI) system 	<p>Crank angle sensor Air flow meter Water thermosensor Throttle sensors Pressure sensor Oxygen (O₂) sensor Neutral switch and clutch switch (Inhibitor switch) Intake air thermosensor Heat hazard sensor A/C switch Starter switch Atmospheric pressure sensor Test connector (Green: 1-pin) Back-up light and 5th switch, oil pressure switch P/S switch MOP position sensor Headlight switch, Blower switch, Rear defroster switch, Fog light switch Mileage sensor</p>

Component	Function	Remarks
Fast Idle System	Opens primary throttle valve slightly at idle	Only during cold condition
Fuel Filter	Filters particles from fuel	
Fuel Pump	Provides fuel to injectors	Operates while engine is running Installed in fuel tank
Heat Hazard Sensor	Detects floor temperature; sends signal to control unit	Heat hazard sensor turned ON; relieves secondary air
Initial Set Coupler	Sends initial set signal to control unit	While adjustment of idle speed, idle mixture; coupler is shorted
Injector	Injects fuel into intermediate housing and secondary intake manifold	Controlled by signals from control unit
Intake Air Thermosensor	Detects intake air temperature and temperature into the engine; sends signal to control unit	Located on the air flow meter and air intake pipe Thermistor
Mileage Sensor	Detects vehicle mileage sends signal to control unit	Above 20,000 miles; mileage switch ON
Oxygen (O₂) Sensor	Detects O ₂ concentration; sends signal to control unit	Zirconia ceramic and platinum coating
Pressure Regulator	Adjusts fuel pressure supplied to injectors	
Pressure Sensor	Detects intake manifold pressure sends signal to control unit	
Pulsation Damper	Absorbs fuel pulsation	
Purge Control Valve	Regulates evaporative fumes from gas tank and canister to intake manifold	
Solenoid Valve (BAC)	Supplies bypass air into dynamic chamber	Controlled by duty signal from control unit
Solenoid Valve (Relief)	Controls relief valve	
Solenoid Valve (Switch)	Controls switching valve	
Solenoid Valve (6PI)	Controls auxiliary port valve	
Solenoid Valve (PRC)	Shuts vacuum passage between dynamic chamber and pressure regulator	Only during hot condition Orange
Solenoid Valve (VDI)	Controls variable dynamic effect intake valve	
Test Connector (Green: 1-pin)	Sends initial set signal to control unit	During adjustment of idle speed, ignition timing; connector grounded
Throttle Body	Controls intake air quantity	
Throttle Sensor	Detects primary throttle valve opening angle; sends signal to control unit	
VDI Valve	Change the pressure wave line	
Water Thermo-sensor	Detects engine coolant temperature; sends signal to control unit	Thermistor

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TROUBLESHOOTING GUIDE

This troubleshooting guide shows the malfunction code numbers retrieved by the **SST** and symptoms of various failures. Perform troubleshooting as described below.

TROUBLESHOOTING PROCEDURE

Troubleshooting With SST

Troubleshooting with the **SST** (Self-Diagnosis Checker 49 H018 9A1) is done to quickly determine what system or unit may be at fault.

1st: Check input sensors and output devices with the **SST**. (Refer to page F1-17.)

2nd: Check other switches with the **SST**. (Refer to page F1-32.)

3rd: Check the following items:

- Electrical system : Battery conditions, fuses
- Ignition system : Ignition spark, ignition timing (with test connector grounded)
- Fuel system : Fuel level, fuel leakage, fuel filter, idle speed (with test connector grounded)
- Intake air system : Air cleaner element, vacuum or air leakage, vacuum hose routing, accelerator cable
- Engine : Compression, overheating
- Others : Clutch slippage, brake dragging

4th: Check fuel and emission control systems.

Malfunction Code No.

Code No.	Input device	Code No.	Output device
01	Ignition coil (Trailing side)	25	Solenoid valve (Pressure regulator control (PRC))
02	Crank angle sensor (Ne-signal)	26	Stepping motor (Metering oil pump)
03	Crank angle sensor (G-signal)	30	Split air solenoid valve
08	Airflow meter (AFM)	31	Solenoid valve (Relief)
09	Water thermosensor	32	Solenoid valve (Switch)
10	Intake air thermosensor (AFM)	33	Port air solenoid valve
11	Intake air thermosensor (Engine)	34	Solenoid valve (Bypass air control (BAC))
12	Throttle sensor (Full range)	38	Solenoid valve (Accelerated warm-up system (AWS))
13	Pressure sensor	40	Auxiliary port valve
14	Atmospheric pressure sensor (Built in ECU)	41	Solenoid valve (Variable dynamic effect intake (VDI) control)
15	Oxygen sensor	51	Fuel pump resistor relay
17	Feedback system	71	Injector (Front secondary)
18	Throttle sensor (Narrow range)	73	Injector (Rear secondary)
20	Metering oil pump position sensor		
27	Metering oil pump		
37	Metering oil pump		

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Troubleshooting of Each System

The troubleshooting guide lists the most likely causes to a given symptom. After finding the systems to check, refer to the pages shown for detailed guides.

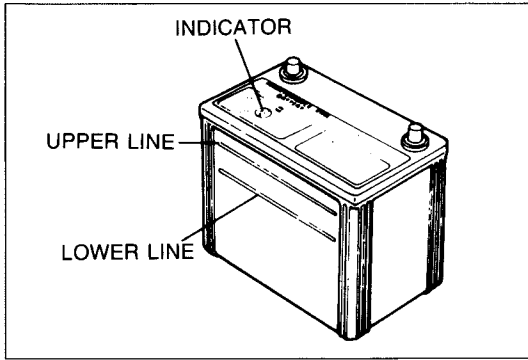
The numbers of the list show the priorities of inspections from the most probable to that with the lowest probability.

These were determined on the following basis:

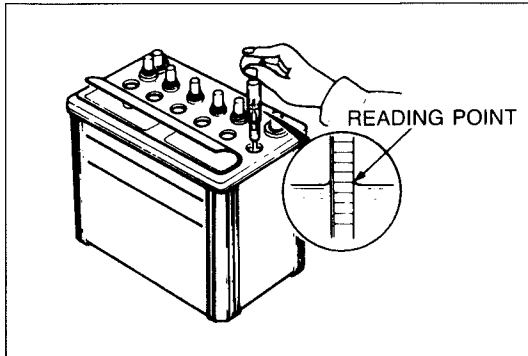
- Ease of inspection
- Most possible system
- Most possible point in system

		Symptom										
		Hard start or No start (Crank OK)	Rough idle	High idle speed (At normal operating temperature)	Engine does not run smoothly (At normal operating temperature)	Engine does not run smoothly (Only when engine is cold)	Engine does not run smoothly (Only when engine is hot)	Lack of power, poor acceleration or hesitation	Afterburn	Runs rough on deceleration	Fails emission test	Knocking
Possible cause	page	Symptom										
INTAKE AIR SYSTEM	F1-34	4	1	2	1	3		1	2		3	
IDLE SPEED CONTROL (ISC) SYSTEM	F1-40		4	1		1	4		5	2	7	
VARIABLE DYNAMIC-EFFECT INTAKE (VDI) SYSTEM	F1-45							3				
6-PORT INDUCTION SYSTEM (6PI)	F1-42		3					2				
FUEL SYSTEM	F1-48	2	5		4	5		5	7	3	6	
PRESSURE REGULATOR CONTROL (PRC) SYSTEM	F1-58	3		4			3					
EXHAUST SYSTEM	F1-59				5	6		7			5	
SECONDARY AIR INJECTION SYSTEM	F1-61	5				7			6		4	
CRANKCASE AND EVAPORATIVE EMISSION CONTROL SYSTEM	F1-69										2	
DECELERATION CONTROL SYSTEM	F1-71					8			4	1	8	
CATALYTIC CONVERTER	F1-73										1	
A/C CUT-OUT CONTROL SYSTEM	F1-74							8				
CONTROL SYSTEM	F1-75	7	6	3	3	2	2	6	3	5	9	2
ELECTRONIC SPARK ADVANCE (ESA) SYSTEM	G-32	1	2		2	4	1	4	1	4	10	1

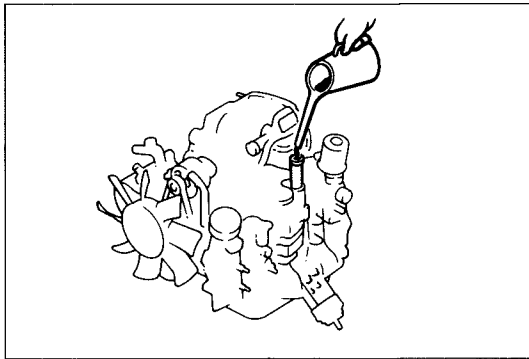
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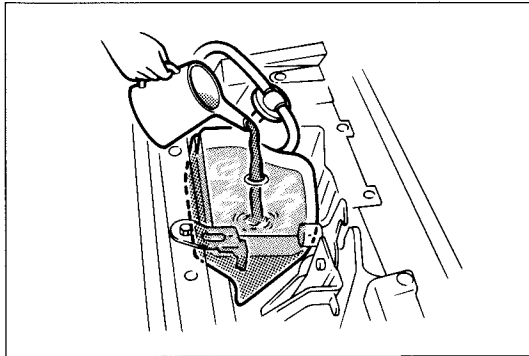
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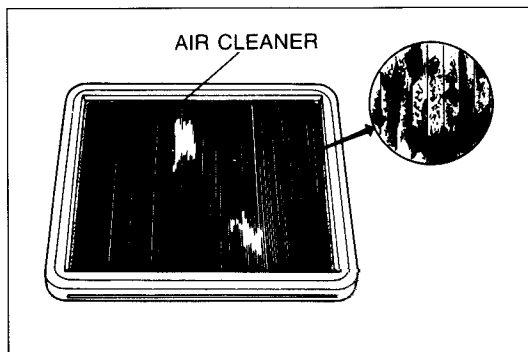
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97U0F2-015



97U0F2-016



97U0F2-017

ENGINE TUNE-UP

BASIC INSPECTION

Tune the engine according to the procedures described below.

Battery

1. Check for corrosion on the terminals and for loose cable connections.
If necessary, clean the clamps and tighten firmly.
2. Check the electrolyte level.
If the level is too low, add distilled water to the "UPPER LEVEL" mark.
3. Check the specific gravity with a hydrometer.
If the specific gravity reading is 1.23 or less, recharge the battery. (Refer to **Section G.**)

Engine Oil

Check the engine oil level and condition with the oil level gauge. Add or change oil, if necessary.

Coolant Level

Warning

Never remove the radiator cap while the engine is hot. Wrap a thick cloth around the cap while carefully removing it.

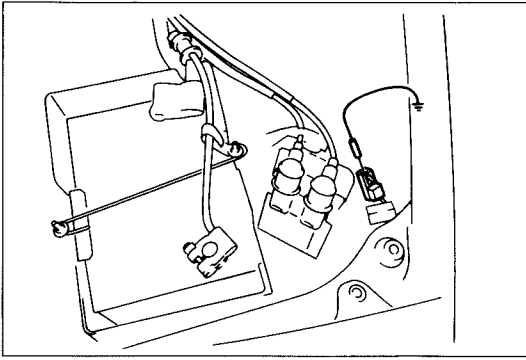
Check that the coolant level is near the radiator inlet port, and that the level in the reserve tank is between the FULL and LOW marks. Add coolant as necessary.

Air Cleaner Element

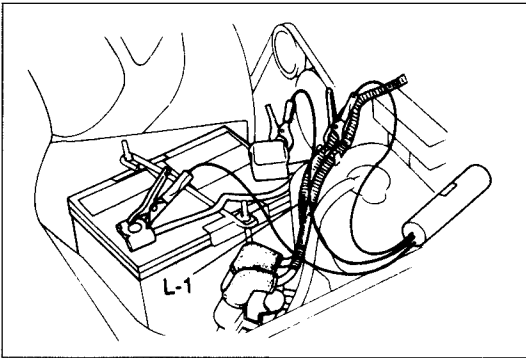
Visually check the air cleaner element for excessive dirt damage or oil. Replace, if necessary.

Caution

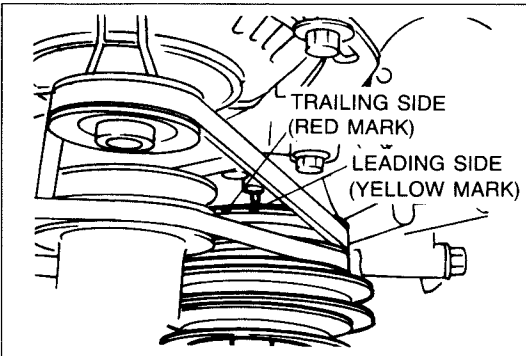
Do not use the compressed air to clean the air cleaner element.



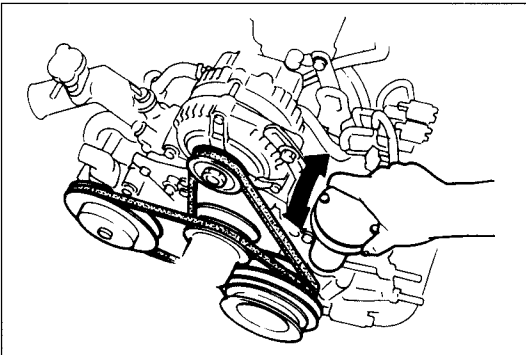
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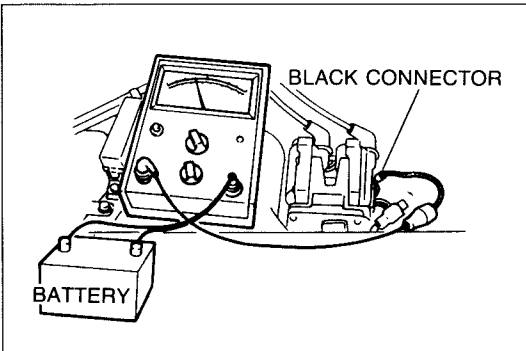
97U0F2-019



97U0F2-213



97U0F2-020



97U0F2-021

ADJUSTMENT

Preparation

1. Warm up the engine and run it at idle.
2. Turn all electric loads OFF.
3. Ground the test connector (Green: 1-pin) to the body with a jumper wire.

Ignition Timing

Warning

When adjusting the ignition timing, keep hands, clothing, hair and tools away from the P/S drive belt.

1. Warm up the engine to normal operating temperature.
2. Turn off all unnecessary electrical loads.
3. Connect a tachometer and check the idle speed.
4. Ground the test connector (Green: 1-pin) to the body with a jumper wire.
5. Connect a timing light to the high-tension lead of the front leading-side.
6. Check that the mark on the pulley is aligned with the indicator pin.
7. Connect the timing light to the high-tension lead of the front trailing-side, and check the timing.

Ignition timing:

Leading: $5^{\circ} \pm 1^{\circ}$ ATDC (Yellow)

Trailing: $20^{\circ} \pm 2^{\circ}$ ATDC (Red)

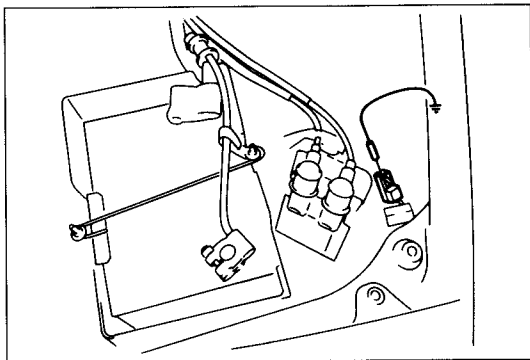
8. If necessary, turn the crank angle sensor to adjust.

Idle Speed

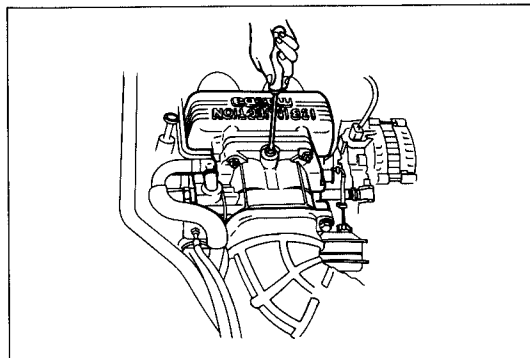
Note

- a) To check or adjust idle speed, connect a tachometer to the check connector at the trailing side coil with igniter.
- b) If the tachometer does not function correctly on the trailing side coil with igniter, reconnect to the leading side coil with igniter (Black connector).
- c) If using an inductive (Secondary pickup) type tachometer, connect it only at the trailing side high-tension leads. If connected on the leading side coil with igniter, it will function incorrectly.

F1 ENGINE TUNE-UP



97U0F2-022



97U0F1-013

1. Ground the test connector (Green: 1-pin).

2. Check the throttle sensor.
(Refer to page F1-83.)

3. Remove the blind cap from the BAC valve and adjust the idle speed by turning the air adjust screw.

Idle speed: 750 ± 25 rpm

4. Install the blind cap and disconnect the jumper wire from the test connector.

Caution

Make certain the jumper wire is removed.

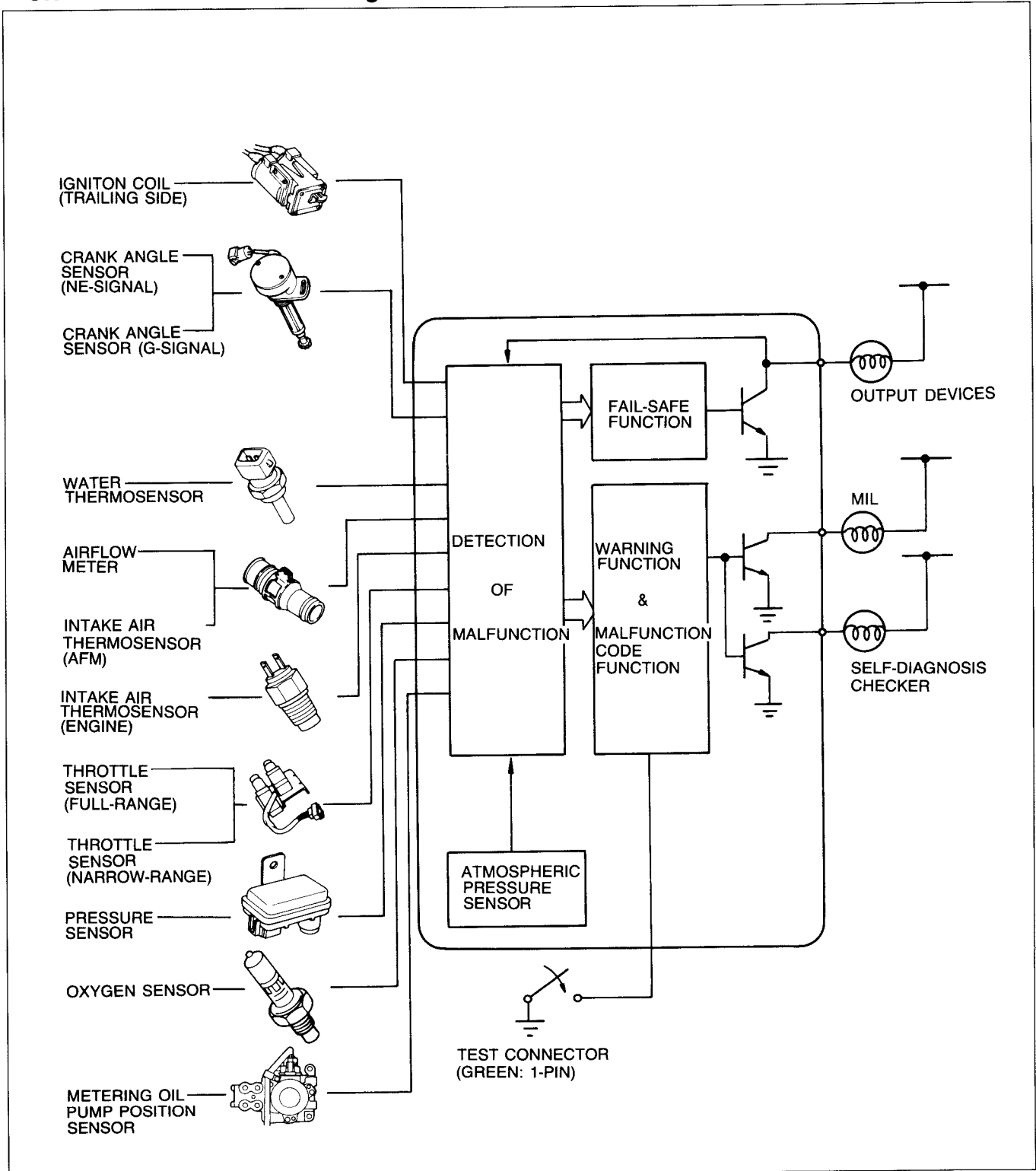
SELF-DIAGNOSIS FUNCTION

DESCRIPTION

When troubles are suspected in the main input devices or output devices, check for the cause with the **SST**. Failures of individual input and output devices are indicated and retrieved from the control unit as malfunction code numbers.

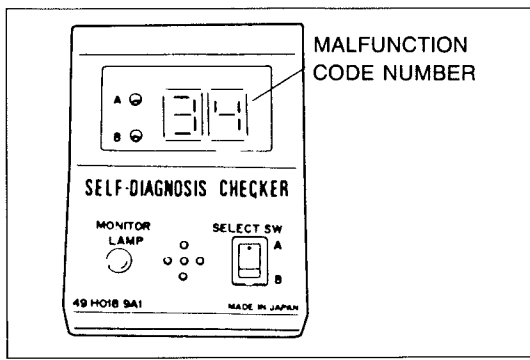
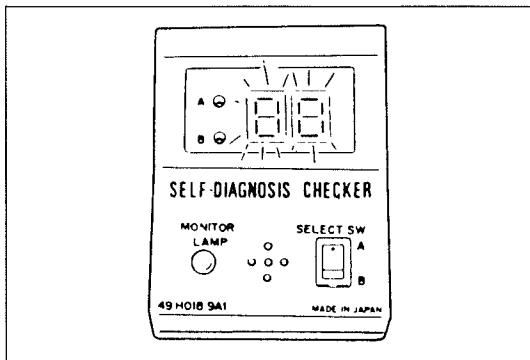
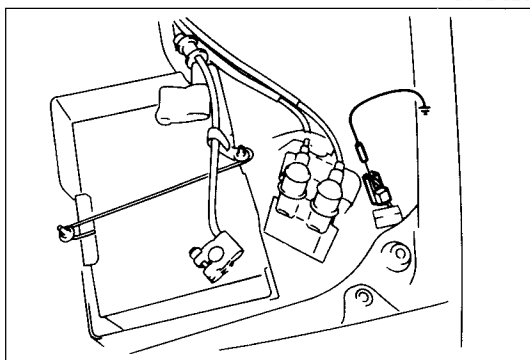
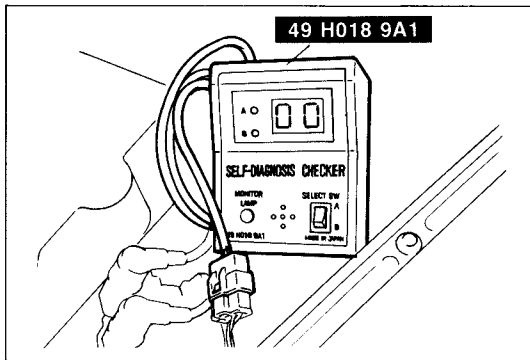
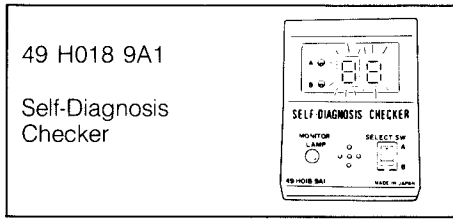
Note

The control unit constantly checks for malfunction of the input devices. It checks for malfunction of output devices only during a 3-second period after the ignition switch has been turned ON while the test connector is grounded.



F1 SELF-DIAGNOSIS FUNCTION

PREPARATION SST



MALFUNCTION CODE NUMBER

Inspection Procedure

1. Warm up the engine to normal operating temperature and stop it.
2. Connect the **SST** to the check connector (Green: 6-pin) and the negative battery terminal.
Set the select switch to position **A**.
3. Connect a jumper wire between the test connector (Green: 1-pin) and a body ground.
4. Turn the ignition switch ON.
5. Check that **88** flashes on the digital display and the buzzer sounds for **3 sec.** after turning the ignition switch ON.
6. If **88** does not flash, check the check connector wiring.
7. If **88** flashes and the buzzer sounds continuously for more than **20 sec.**, check for a short circuit between the engine control unit (1F) terminal and check connector (Green: 6-pin). And check the engine control unit (3X) and (3Z) terminal voltage. (Refer to page F1-81.) Replace the engine control unit if necessary and perform Step 4 again.
8. Check for any malfunction code numbers.
9. Start the engine and check for further malfunction code numbers.
10. If a malfunction code number is indicated, check for the cause of the problem. (Refer to page F1-12.)

Note

Cancel the malfunction code numbers by performing the after-repair procedure following repairs. (Refer to page F1-31.)

Troubleshooting

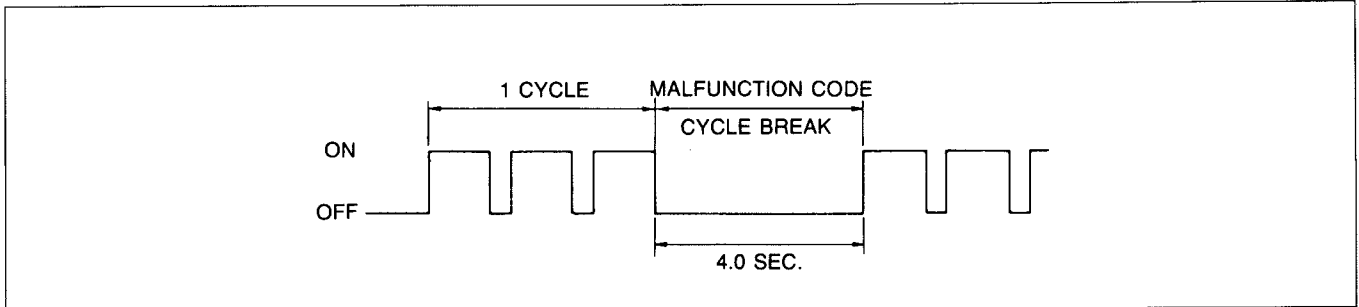
Principle of code cycle

Malfunction codes are determined as below by use of the MIL and Self-Diagnosis Checker.

97U0F2-030

1. Malfunction code cycle break

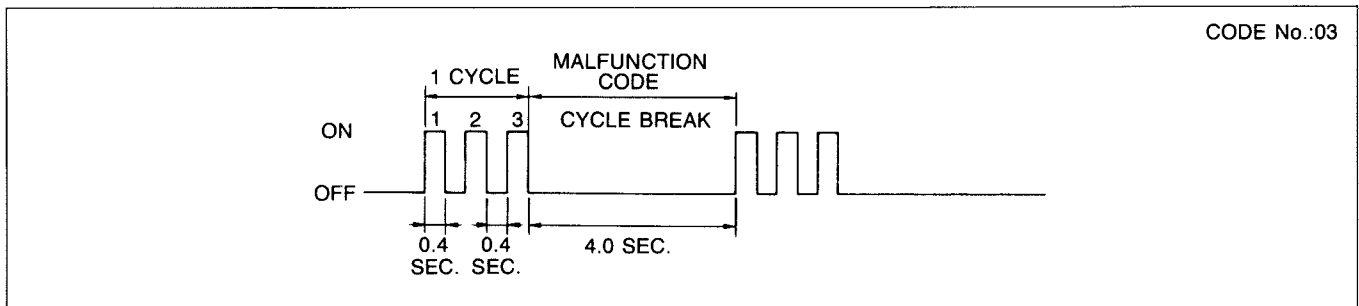
The time between malfunction code cycles is 4.0 sec. (the time the MIL and checker buzzer are off).



9MU0F1-543

2. Second digit of malfunction code (ones position)

The digit in the ones position of the malfunction code represents the number of times the MIL and buzzer are on 0.4 sec. during one cycle.



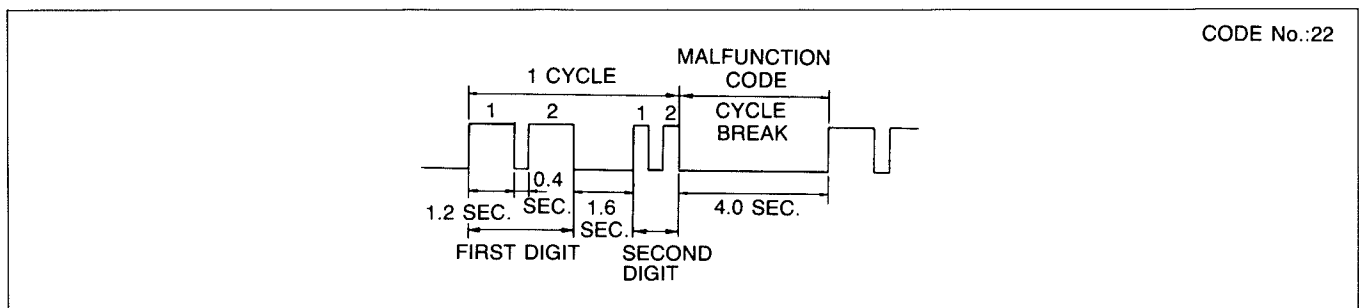
CODE No.:03

89U04X-565

3. First digit of malfunction code (tens position)

The digit in the tens position of the malfunction code represents the number of times the MIL and buzzer are on 1.2 sec. during one cycle.

The MIL and buzzer are off for 1.6 sec. between the long and short pulses.



CODE No.:22

89U04X-566

F1 SELF-DIAGNOSIS FUNCTION

Code number

Caution

- a) If there is more than one failure present, the lowest number malfunction code is displayed first, the subsequent malfunction codes appear in order.
- b) After repairing all failures, turn the ignition switch OFF, disconnect the negative battery cable for at least 5 seconds to erase the malfunction code memory.

Input devices

Code No.	Input devices	Malfunction	Fail-safe function	Output signal pattern (Self-Diagnosis Checker or MIL)
01	Ignition coil (Trailing side)	Malfunction of spark plug broken wire, short circuit	Trailing-side ignition pulse cut	
02	Crank angle sensor (Ne signal)	Broken wire, short circuit	Fuel injection and ignition cut	
03	Crank angle sensor (G signal)	Broken wire, short circuit	Fuel injection and ignition cut	
08	Airflow meter (AFM)	Broken wire, short circuit	Basic fuel injection amount and ignition timing fixed	
09	Water thermosensor	Broken wire, short circuit	Coolant temp. input fixed at 80°C (176°F)	
10	Intake air thermosensor (AFM)	Broken wire, short circuit	Intake air temp. input fixed at 20°C (68°F)	
11	Intake air thermosensor (Engine)	Broken wire, short circuit	Intake air temp. input fixed at 20°C (68°F)	
12	Throttle sensor (Full range)	Broken wire, short circuit	Throttle valve opening angle input signal fixed at 20% open	
13	Pressure sensor (Intake manifold pressure)	Broken wire, short circuit	Intake manifold pressure input signal fixed at 760 mmHg (29.9 inHg)	
14	Atmospheric pressure sensor (ATP)	Malfunctioning ECU	Atmospheric pressure input signal fixed at 760 mmHg (29.9 inHg)	
15	Oxygen sensor	Oxygen sensor output remains below 0.55V 80 sec. after F/B system operation beginning	Feedback system canceled (For EGI)	
17	Feedback system	Oxygen sensor output remains 0.55V 10 sec. after F/B system operation beginning	Feedback system canceled (For EGI)	
18	Throttle sensor (Narrow range)	Broken wire, short circuit	Throttle valve opening angle input signal fixed at full open	
20	Metering oil pump position sensor	Broken wire, short circuit	MOP fixed smallest open Basic fuel injection amount and ignition timing fixed	
27	Metering oil pump (MOP)	Malfunctioning MOP, step motors, broken wire, short circuit, or malfunctioning ECU	MOP fixed smallest open Basic fuel injection amount and ignition timing fixed	
37	Metering oil pump (MOP)	Malfunction MOP, step motors, broken wire, short circuit, malfunctioning ECU, alternator or battery	Basic fuel injection amount and ignition timing fixed	

97U0F1-015

Output devices

Code No.	Output devices	Output signal pattern (Self-Diagnosis Checker or MIL)
25	Solenoid valve (Pressure regulator control (PRC))	
26	Step motor (Metering oil pump)	
30	Split air solenoid valve	
31	Solenoid valve (Relief)	
32	Solenoid valve (Switch)	
33	Port air solenoid valve	
34	Solenoid valve (Bypass air control (BAC))	
38	Solenoid valve (Accelerated warm-up system (AWS))	
40	Auxiliary port valve	
41	Solenoid valve (Variable dynamic effect intake control (VDI))	
51	Fuel pump resistor relay	
71	Injector (Front secondary)	
73	Injector (Rear secondary)	

97U0F1-016

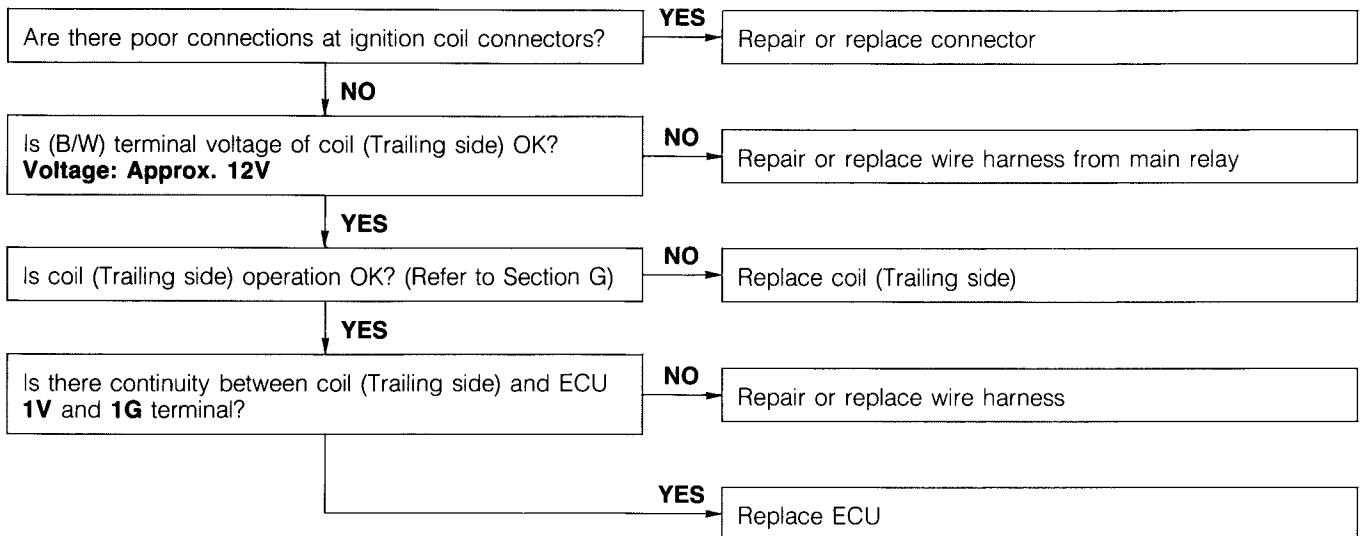
F1 SELF-DIAGNOSIS FUNCTION

Troubleshooting chart

If a malfunction code number is shown on the **SST**, check by using the following chart and the wiring diagram.

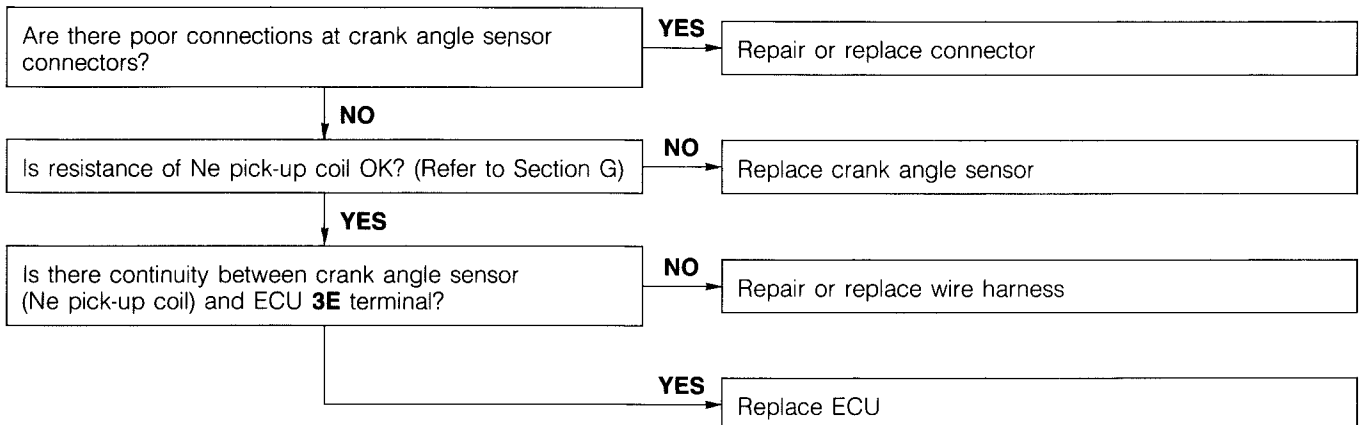
Input device

No.1 Code (Ignition coil (Trailing side))



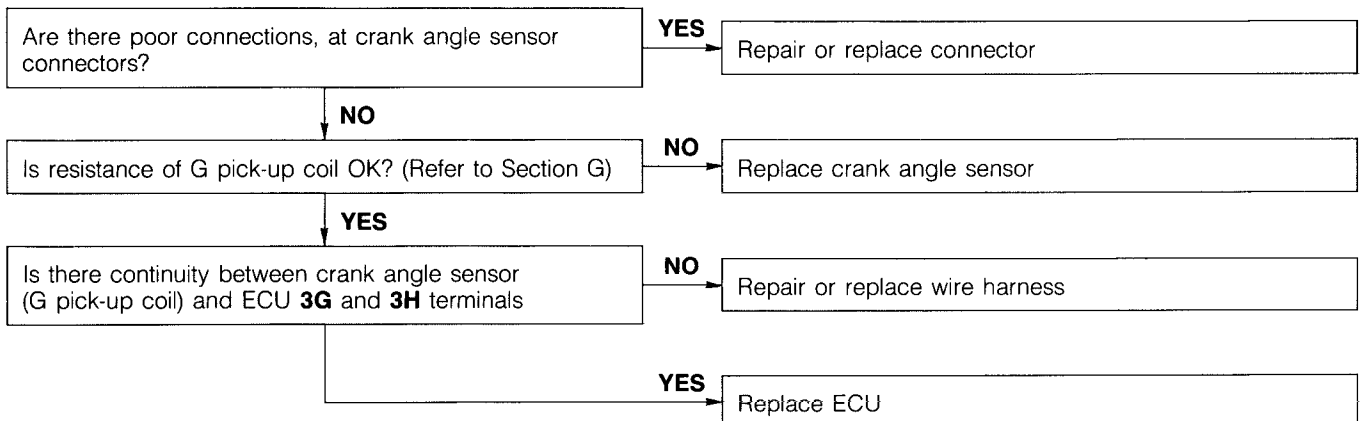
97U0F2-033

No.2 Code (Crank angle sensor (Ne signal))



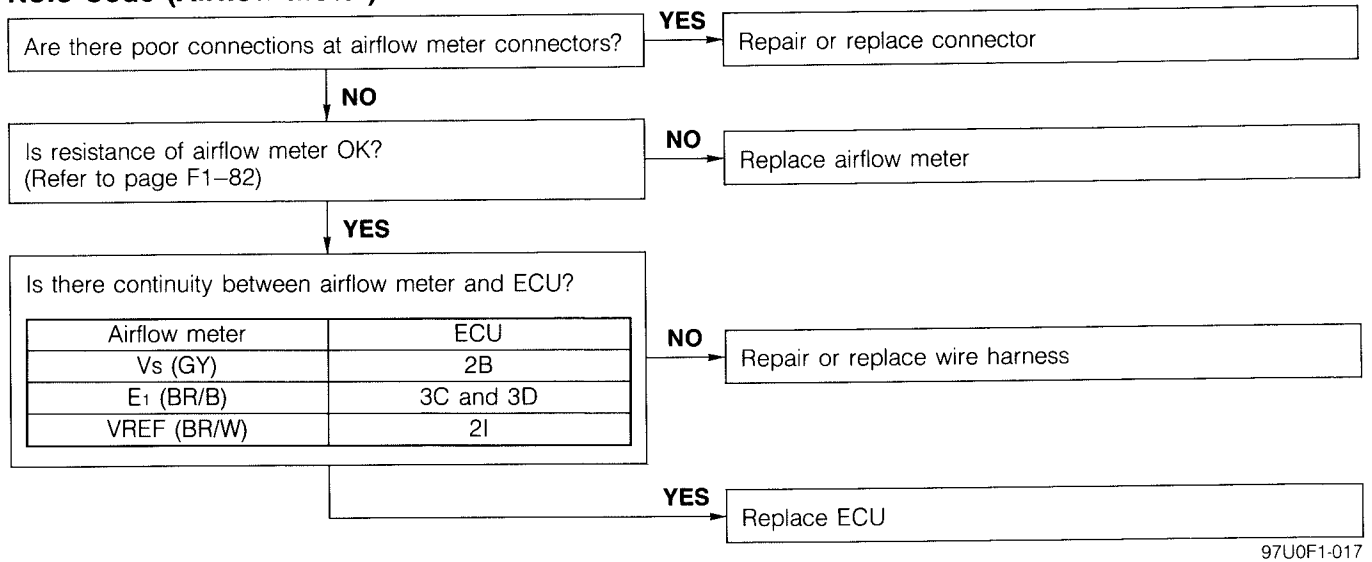
97U0F2-034

No.3 Code (Crank angle sensor (G signal))

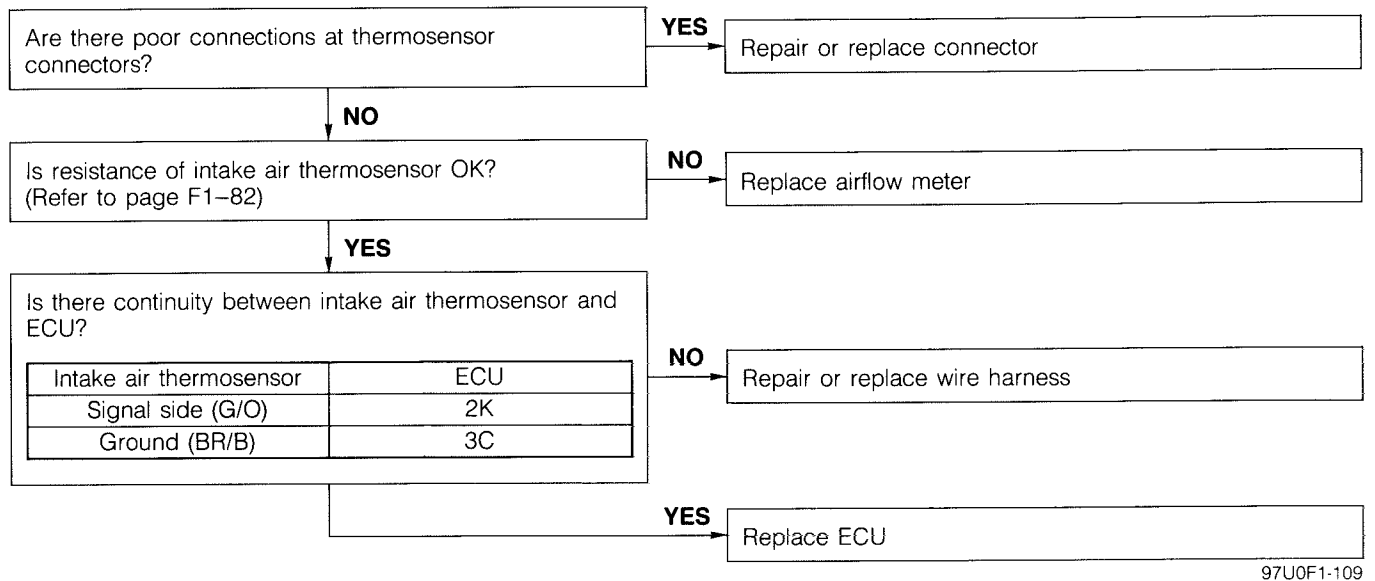


97U0F2-035

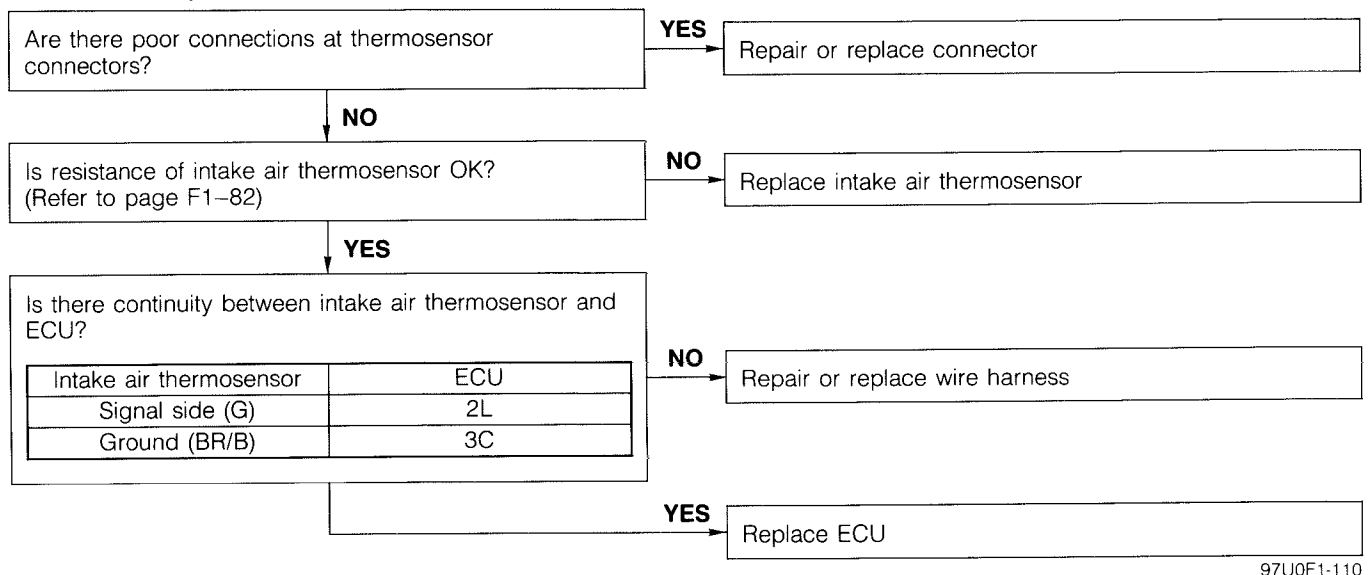
No.8 Code (Airflow meter)



No.10 Code (Intake air thermosensor (AFM))

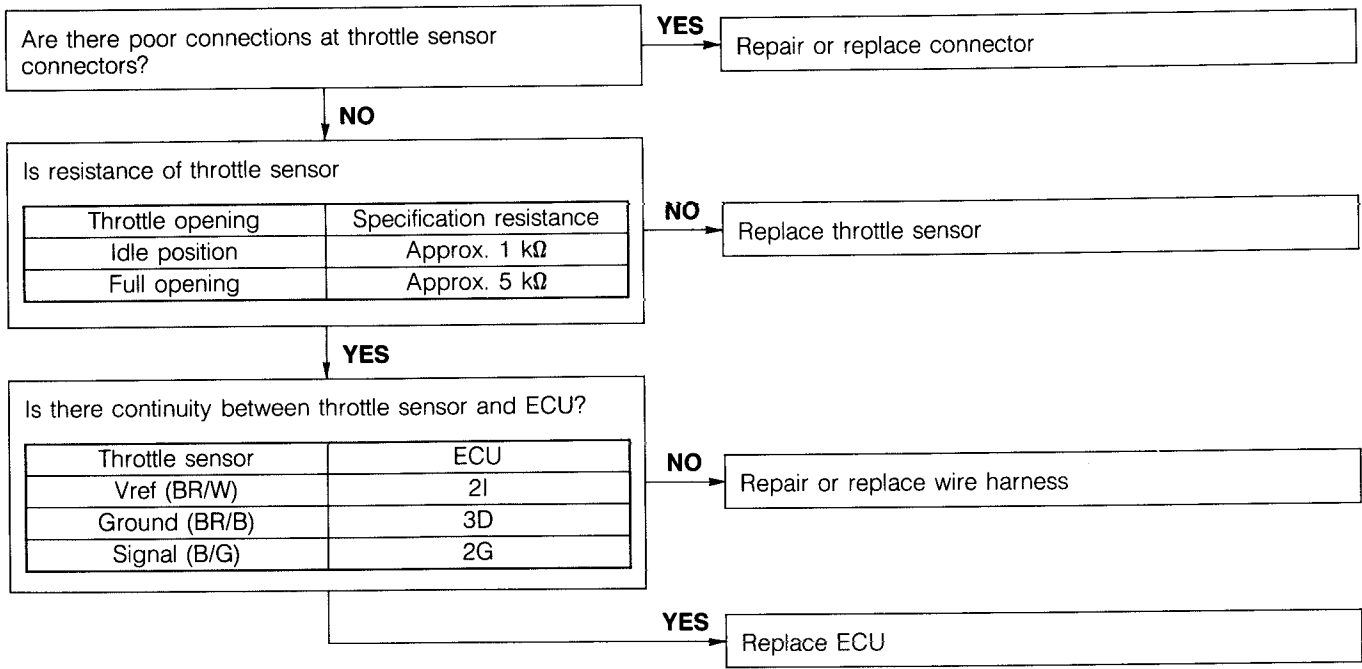


No.11 Code (Intake air thermosensor (Engine))



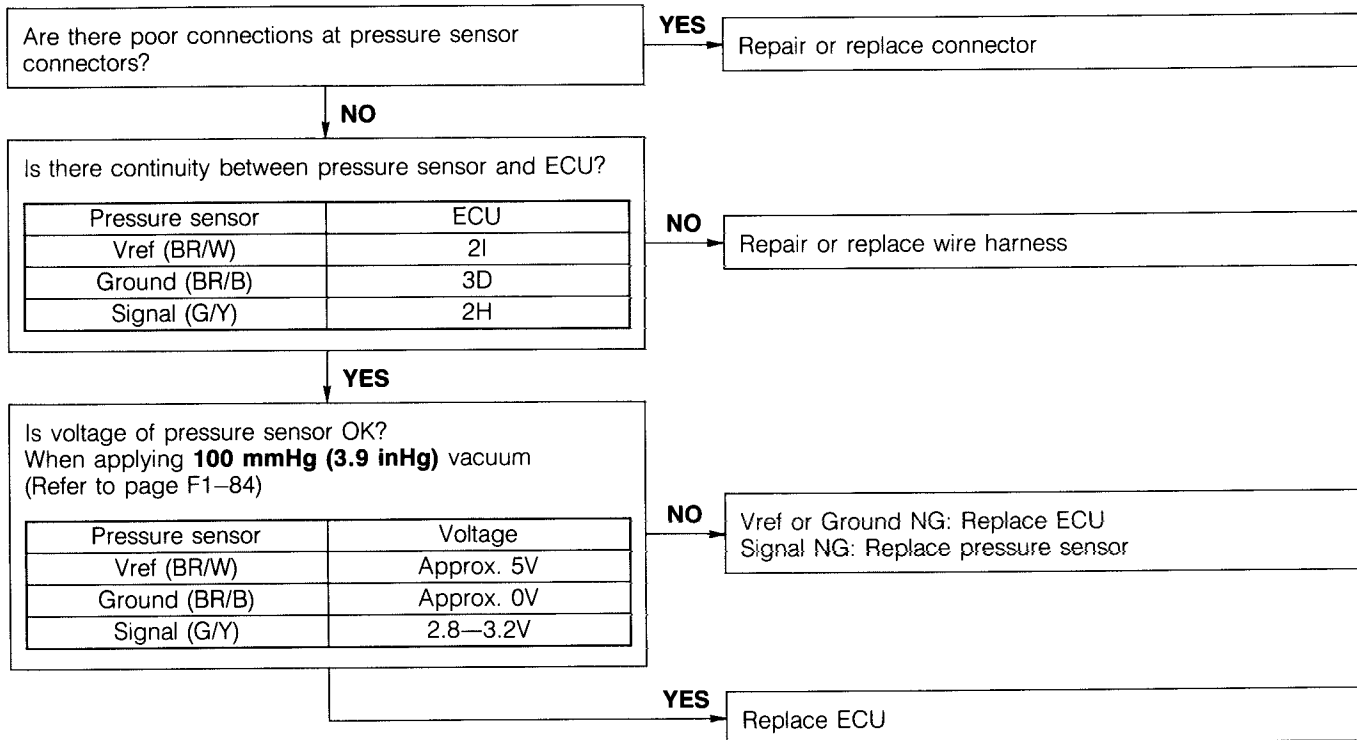
F1 SELF-DIAGNOSIS FUNCTION

No.12 Code (Throttle sensor (Full range))



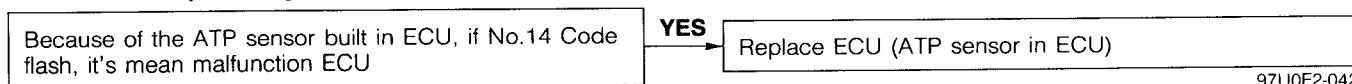
97U0F1-018

No.13 Code (Pressure sensor)



97U0F1-019

No.14 Code (Atmospheric pressure (ATP) sensor)

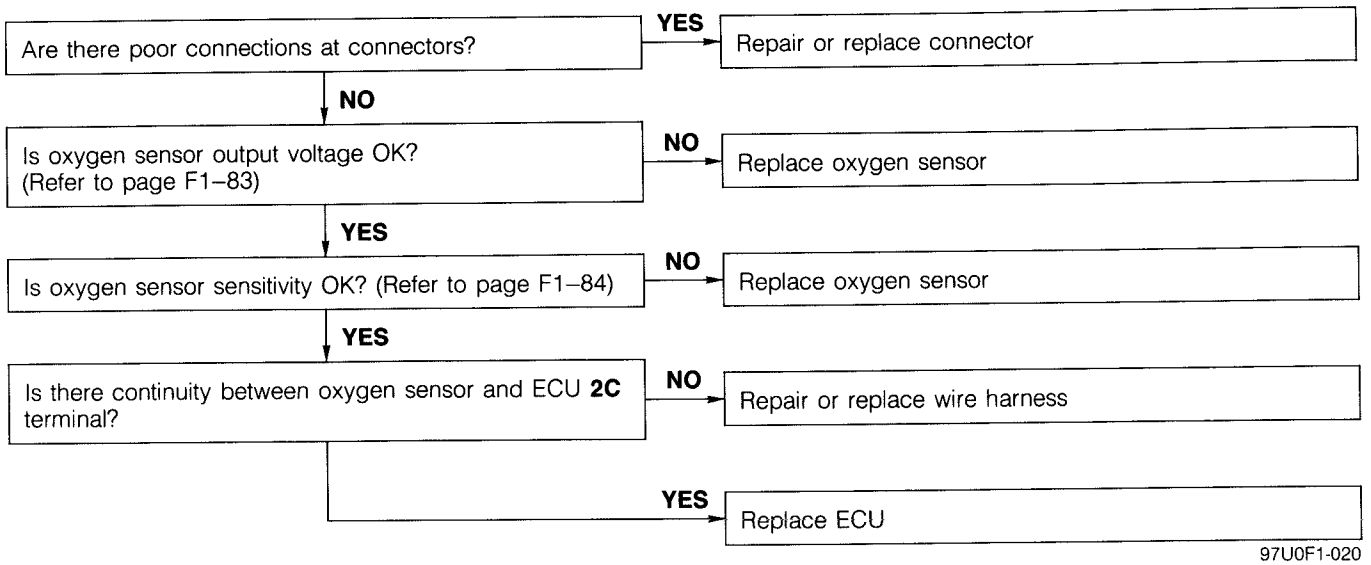


97U0F2-042

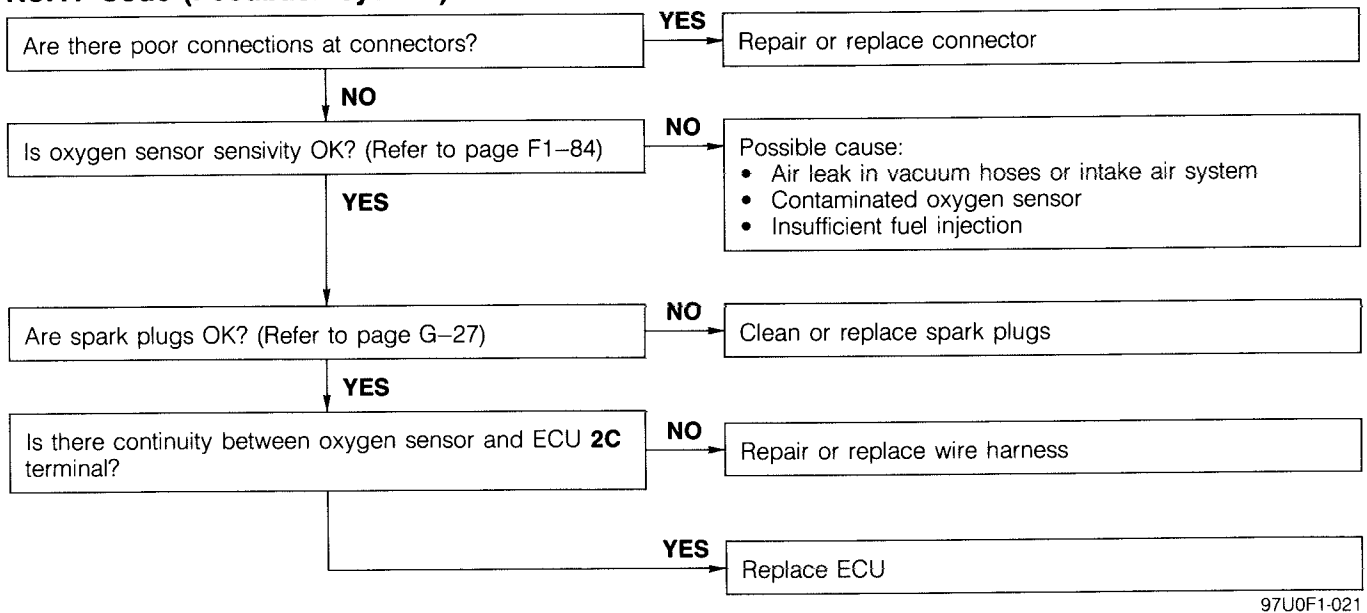
No.15 Code (Oxygen sensor)

Note

If malfunction codes No.15 and 17 are both present, perform the checking procedure for malfunction Code No.17 first.

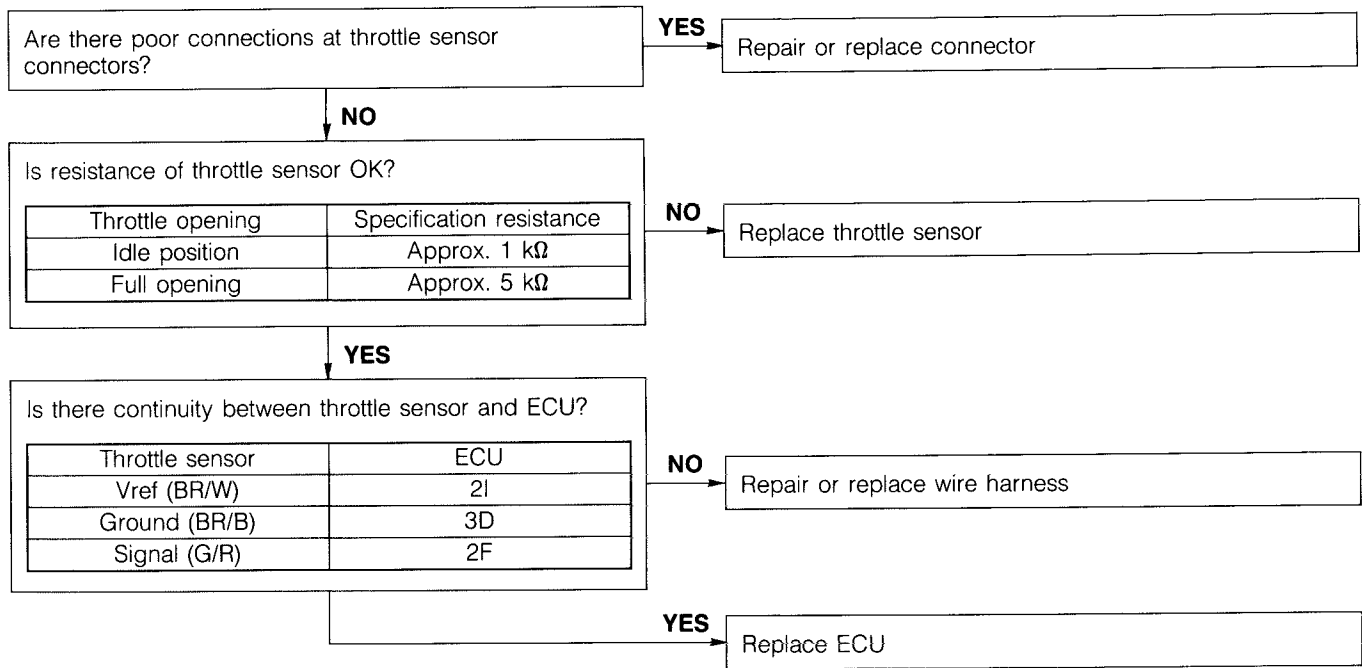


No.17 Code (Feedback system)



F1 SELF-DIAGNOSIS FUNCTION

No.18 Code (Throttle sensor (Narrow range))



97U0F1-022

No.20 Code (Metering oil pump position sensor)

Troubleshooting of this system in Section D

97U0F1-023

No.27 Code (Metering oil pump)

Troubleshooting of this system in Section D

97U0F2-047

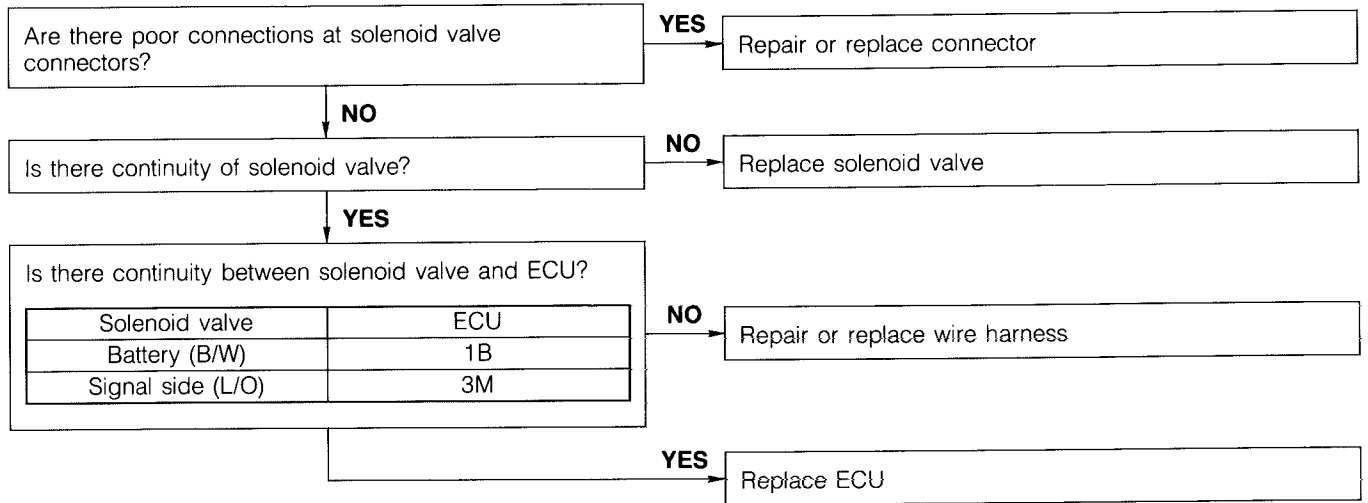
No.37 Code (Metering oil pump)

Troubleshooting of this system in Section D

97U0F2-048

Output device

No.25 Code (Solenoid valve (PRC))



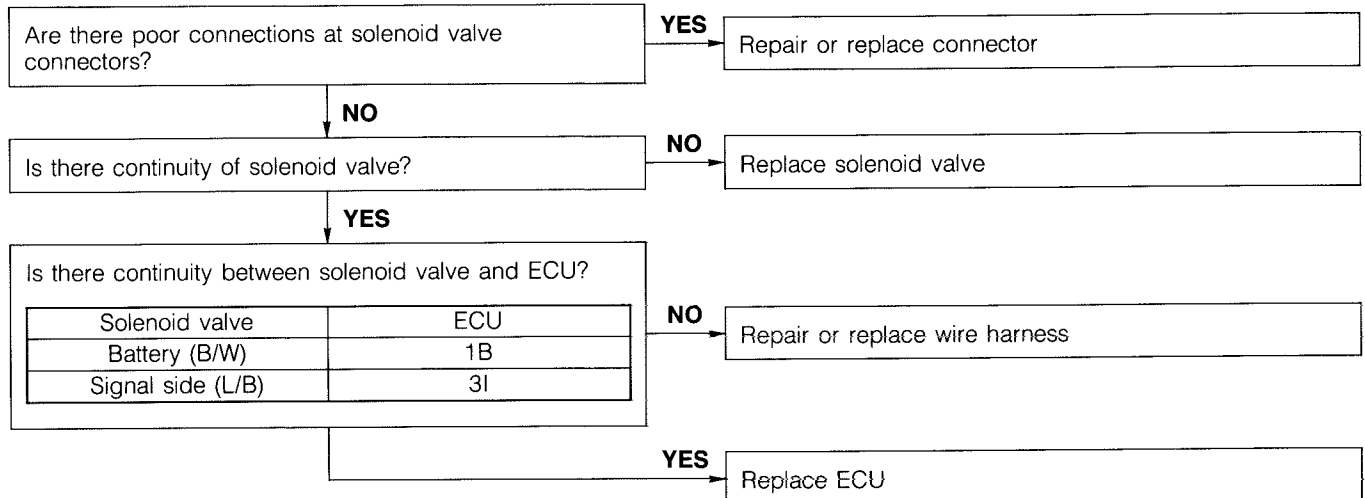
97U0F2-049

No.26 Code (Stepping motor (Metering oil pump))

Troubleshooting of this system in Section D

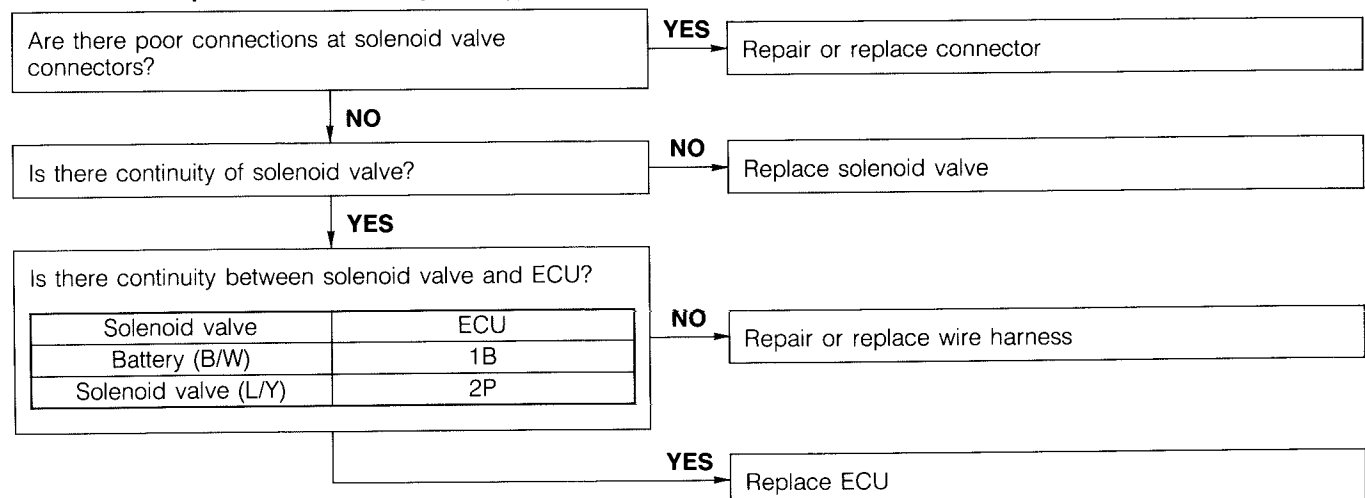
97U0F2-050

No.30 Code (Split air solenoid valve)



97U0F2-051

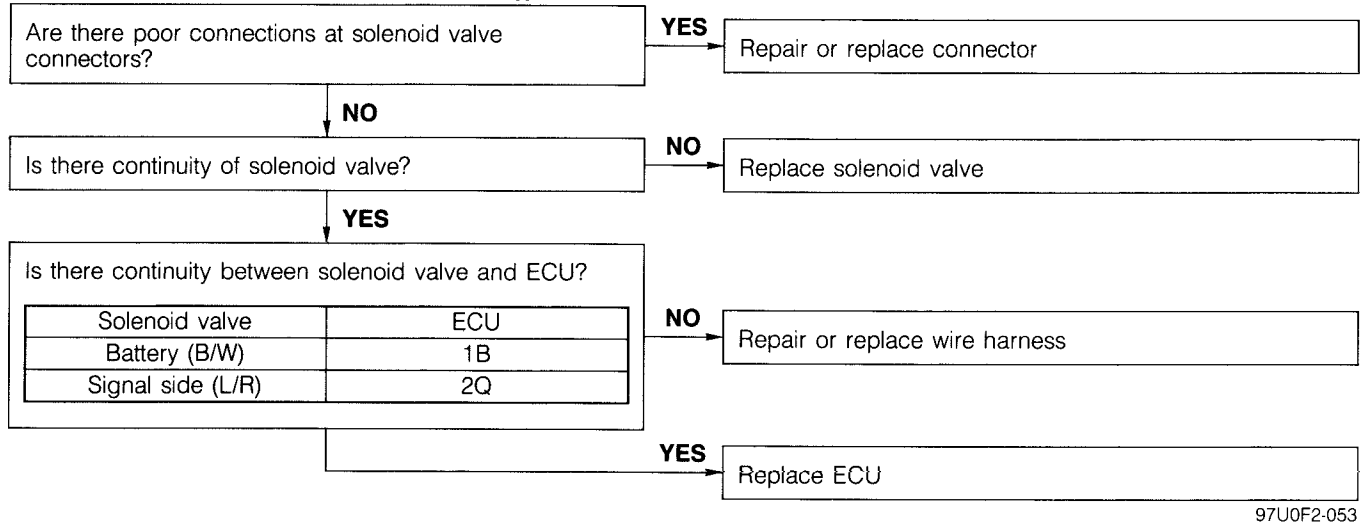
No.31 Code (Solenoid valve (Relief))



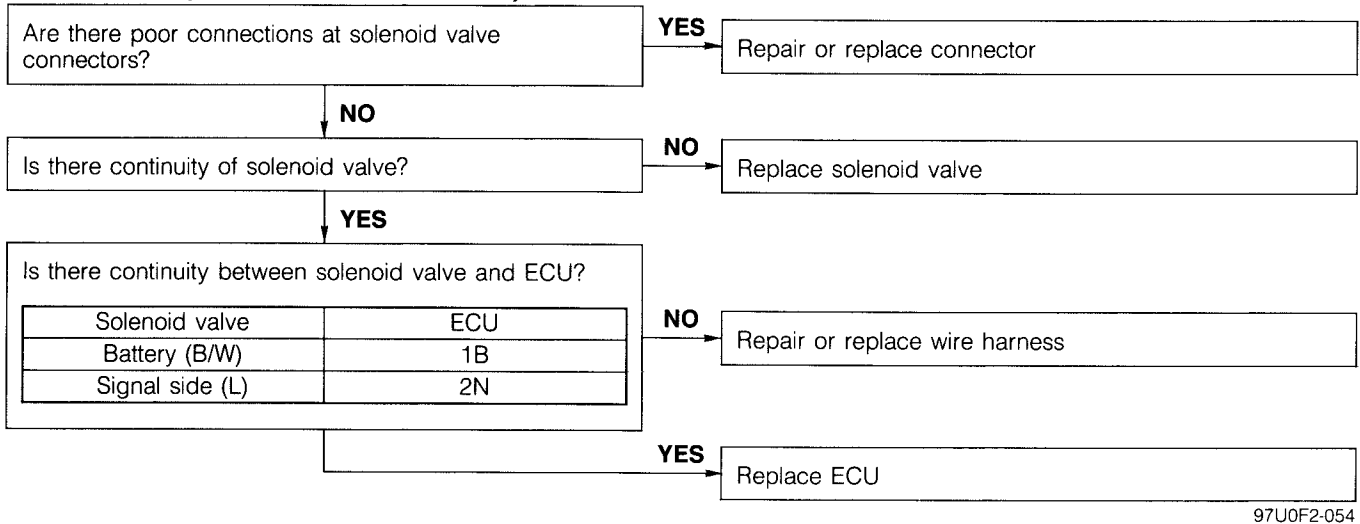
97U0F2-052

F1 SELF-DIAGNOSIS FUNCTION

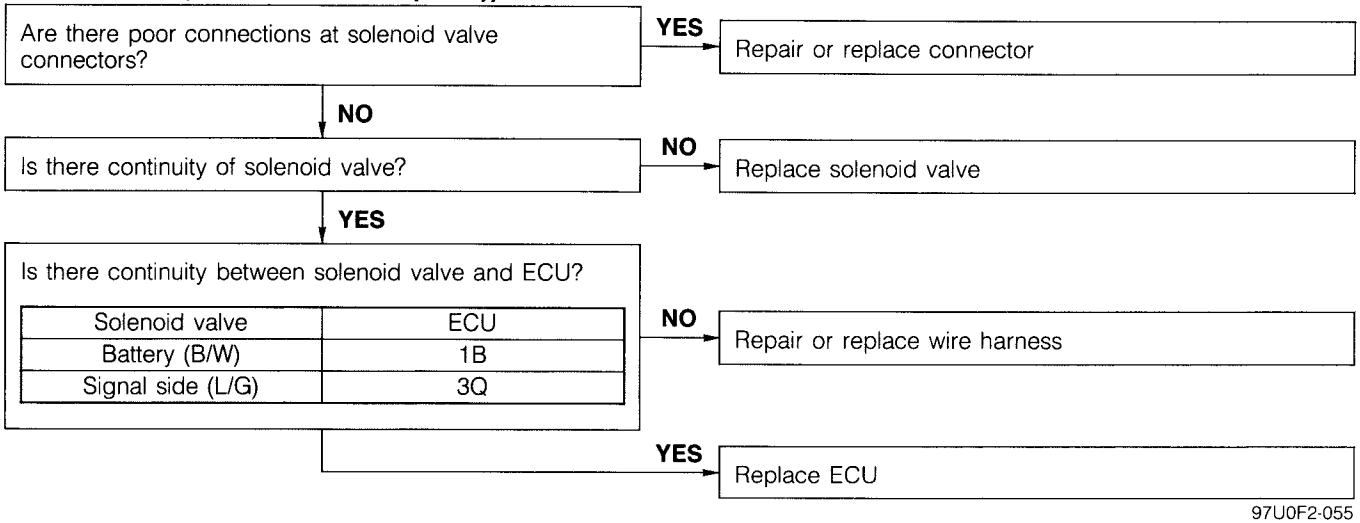
No.32 Code (Solenoid valve (Switch))



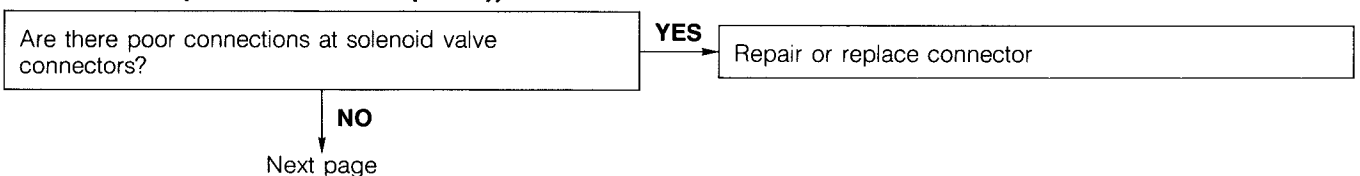
No.33 Code (Port air solenoid valve)



No.34 Code (Solenoid valve (BAC))



No.38 Code (Solenoid valve (AWS))



Cont'd

Is there continuity between solenoid valve and ECU?

Solenoid valve	ECU
Battery (B/W)	1B
Signal side (BR/Y)	3J

NO

Repair or replace wire harness

YES

Replace ECU

97U0F1-024

No.40 Code (Auxiliary port valve)

Are there poor connection at connectors?

YES

Repair or replace connectors

NO

Is there continuity of solenoid valve?
(Refer to page F1-44)

NO

Replace solenoid valve

YES

Is there continuity between solenoid valve and ECU?

Solenoid valve	ECU
Battery (B/W)	1B
Solenoid valve (L/W)	3R

NO

Repair or replace wire harness

YES

Replace ECU

97U0F1-025

No.41 Code (Variable dynamic effect intake)

Are there poor connection at connectors?

YES

Repair or replace connectors

NO

Is there continuity of solenoid valve?
(Refer to page F1-47)

NO

Replace solenoid valve

YES

Is there continuity between solenoid valve and ECU?

Solenoid valve	ECU
Battery (B/W)	1B
Solenoid valve (Y/B)	2M

NO

Repair or replace wire harness

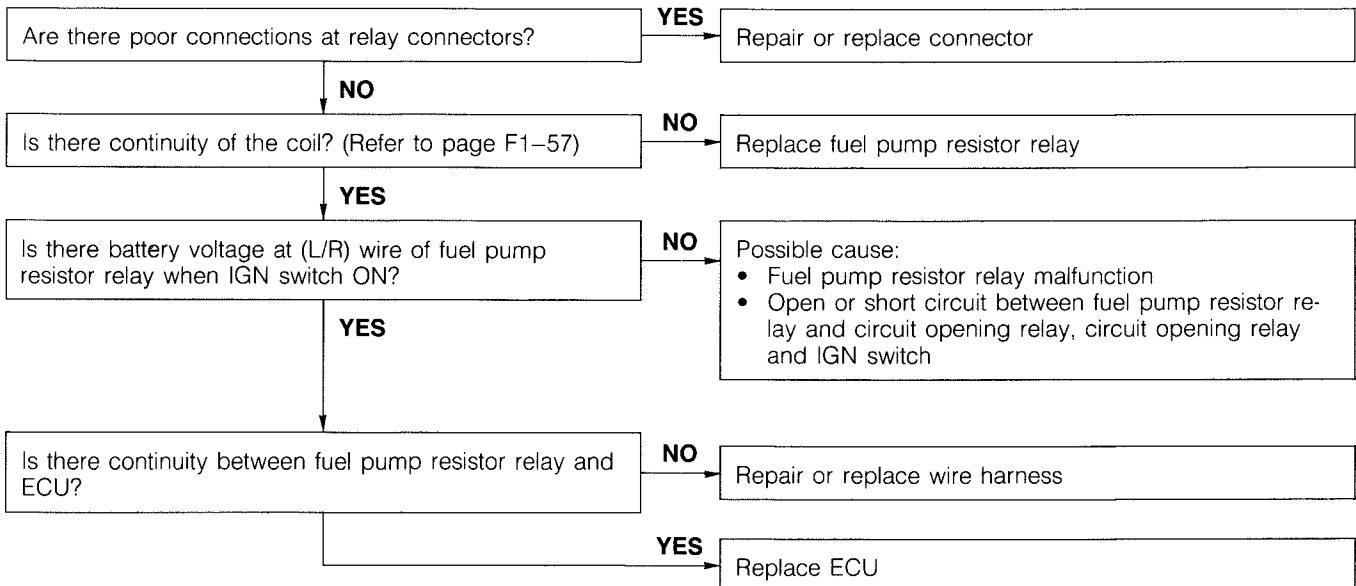
YES

Replace ECU

97U0F1-026

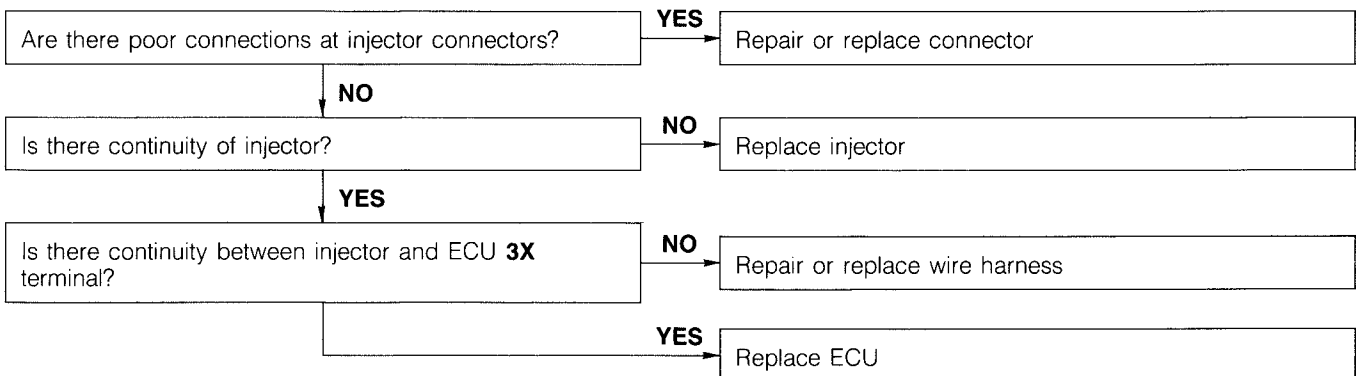
F1 SELF-DIAGNOSIS FUNCTION

No.51 Code (Fuel pump resistor relay)



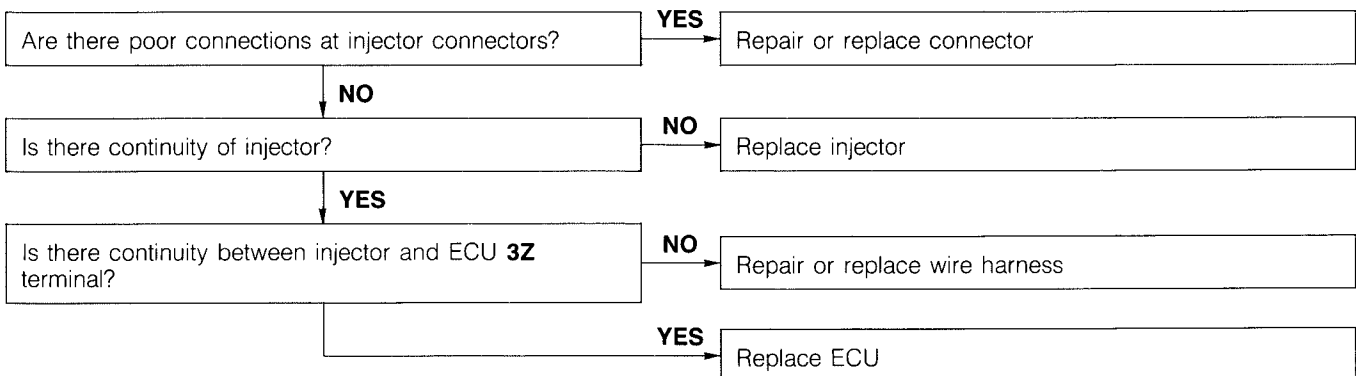
97U0F1-028

No.71 Code (Injector (Front secondary))

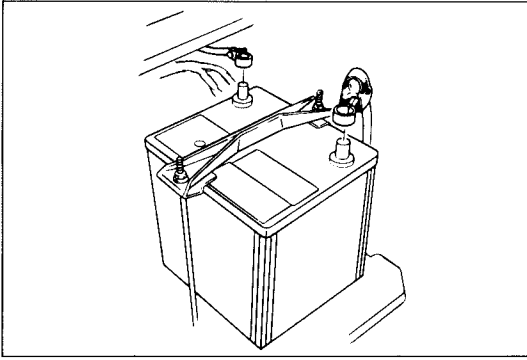


97U0F2-060

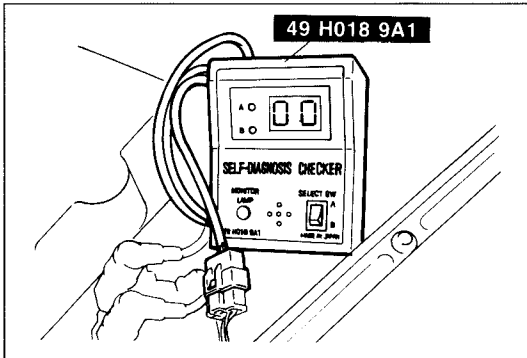
No.73 Code (Injector (Rear secondary))



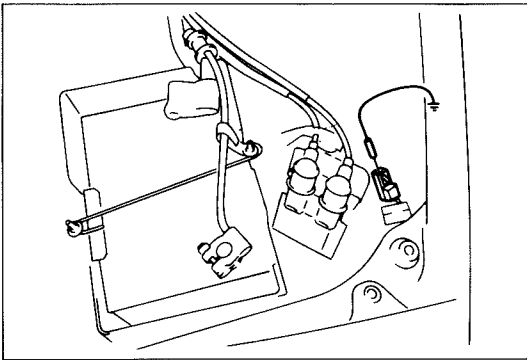
97U0F2-061



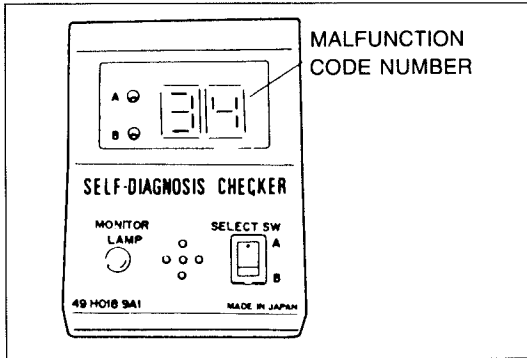
97U0F1-111



89U04X-014



89U04X-015



97U0F2-063

After-repair Procedure

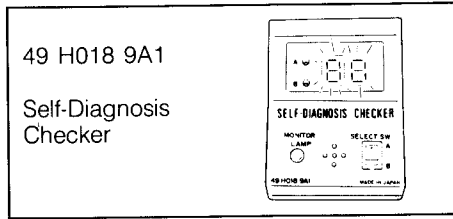
1. Cancel the memory of malfunction code numbers by disconnecting the negative battery cable for at least **5 sec.**; then reconnect the negative battery cable.
2. Connect the **SST** to the check connector (Green: 6-pin).
3. Connect a jumper wire between the test connector (Green: 1-pin) and a ground.
4. Turn the ignition switch ON.
5. Verify that no malfunction code numbers are displayed.
6. Start the engine and again verify that no malfunction code numbers are displayed.

F1 SELF-DIAGNOSIS FUNCTION

SWITCH MONITOR FUNCTION

Preparation

SST

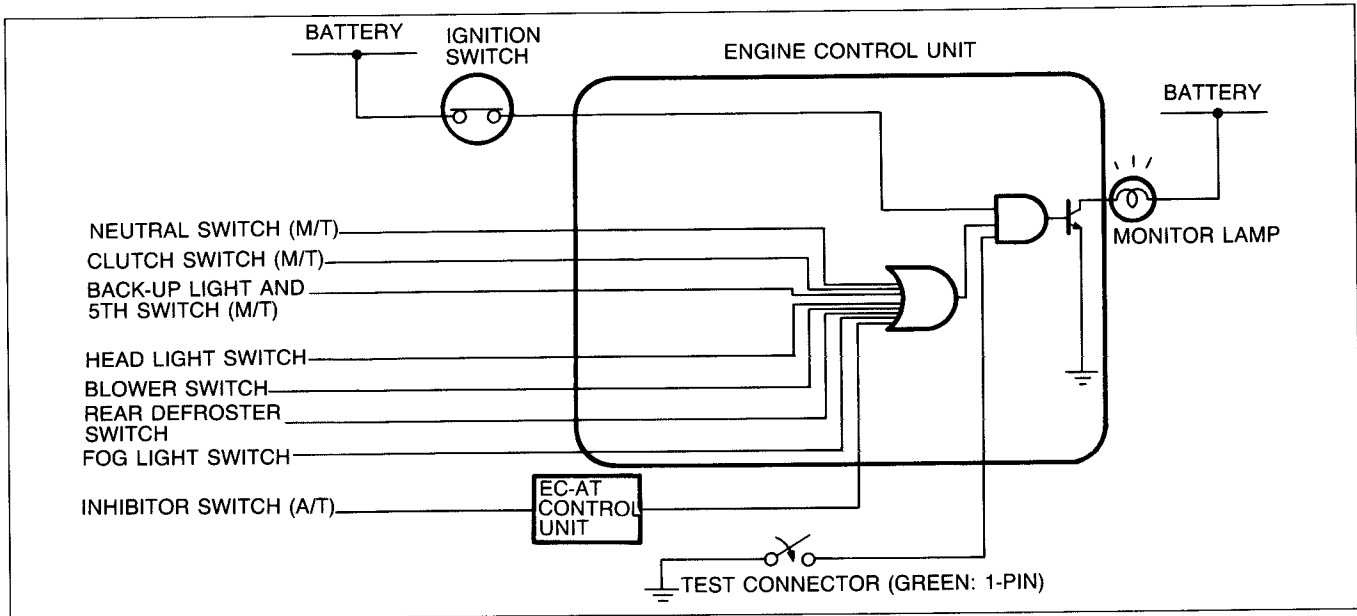


97U0F2-064

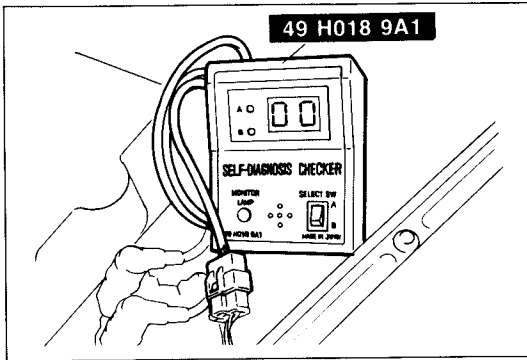
Individual switches can be monitored by the **SST**.

Note

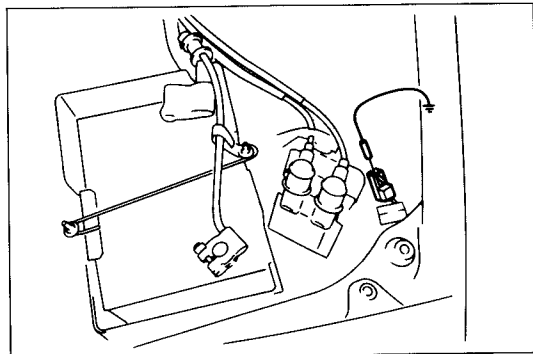
The test connector must be grounded and the ignition switch ON (engine stopped).



97U0F2-065



97U0F2-066



97U0F2-067

Inspection Procedure

1. Warm up the engine to normal operating temperature and stop it.
2. Connect the **SST** to the check connector (Green: 6-pin) and the negative battery terminal.
3. Connect a jumper wire between the test connector (Green: 1-pin) and a ground.
4. Turn the ignition switch ON, then check that the monitor lamp illuminates when each switch is made to function according to the table below.

Caution

- a) When any one of the switches are activated, the monitor lamp will be on.
- b) Do not start the engine.

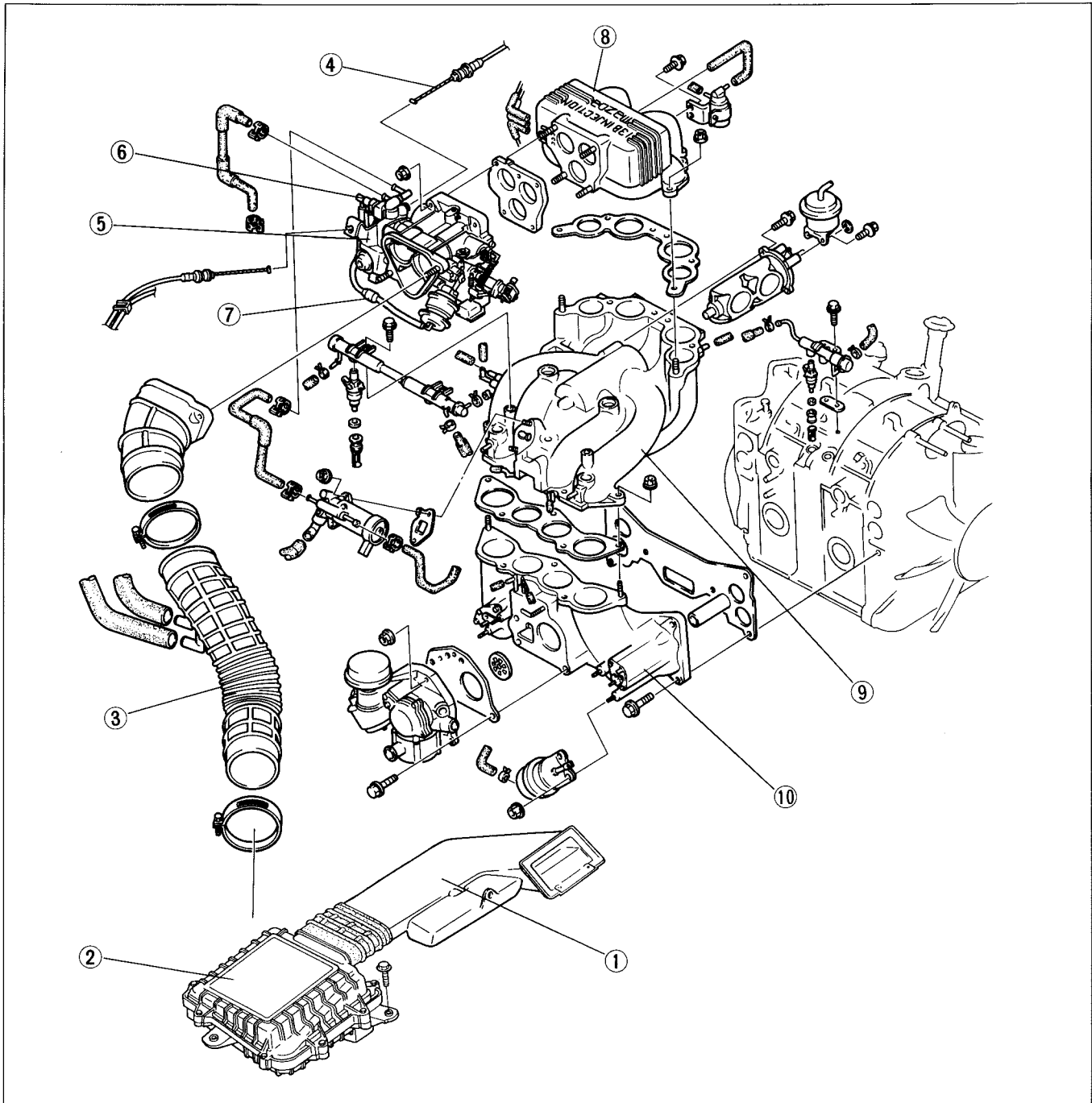
Function Table

Switch	Self-Diagnosis Checker (Monitor lamp)		Possible cause (When incorrect)
	Lamp-ON	Lamp-OFF	
Neutral switch (M/T)	Shift transmission to 1, 2, 3 or 4	Neutral position	<ul style="list-style-type: none"> • Neutral switch malfunction • Open circuit between neutral switch and ECU 1R terminal, neutral switch and ground
Back-up light and 5th switch (M/T)	Shift transmission 5th gear	Neutral position	<ul style="list-style-type: none"> • Back-up light and 5th switch malfunction • Open circuit between Back-up light and 5th switch and ECU 1T terminal, overdrive and ground
Clutch switch (M/T)	Pedal depressed	Pedal released	<ul style="list-style-type: none"> • Clutch switch malfunction • Open circuit between clutch switch and ECU 1Q terminal, clutch switch and ground, clutch switch and ACC circuit
Inhibitor switch (A/T)	Except N and P range	N and P range	<ul style="list-style-type: none"> • Inhibitor switch malfunction (Refer to Section K) • EC-AT control unit malfunction (Refer to Section K) • Open circuit between EC-AT control unit and ECU.
Headlight switch	Switch ON	Switch OFF	<ul style="list-style-type: none"> • Headlight switch malfunction • Open circuit between headlight switch and ECU 3L terminal, headlight switch and battery line
Blower switch	Switch ON (At any fan speed OK)	Switch OFF	<ul style="list-style-type: none"> • Blower switch malfunction • Heater relay malfunction • Heater control unit malfunction • Open circuit between heater control unit and ECU 3O terminal
Rear defroster switch	Switch ON	Switch OFF	<ul style="list-style-type: none"> • Rear defroster switch malfunction • Open circuit between rear defroster switch and ECU 3P terminal, rear defroster switch and ground
Fog light switch (If equipped)	Switch ON (Only equip fog light)	Switch OFF	<ul style="list-style-type: none"> • Fog light switch malfunction • Open circuit between fog light switch and ECU 1S terminal, fog light switch and battery

97U0F1-029

INTAKE AIR SYSTEM

COMPONENT PARTS

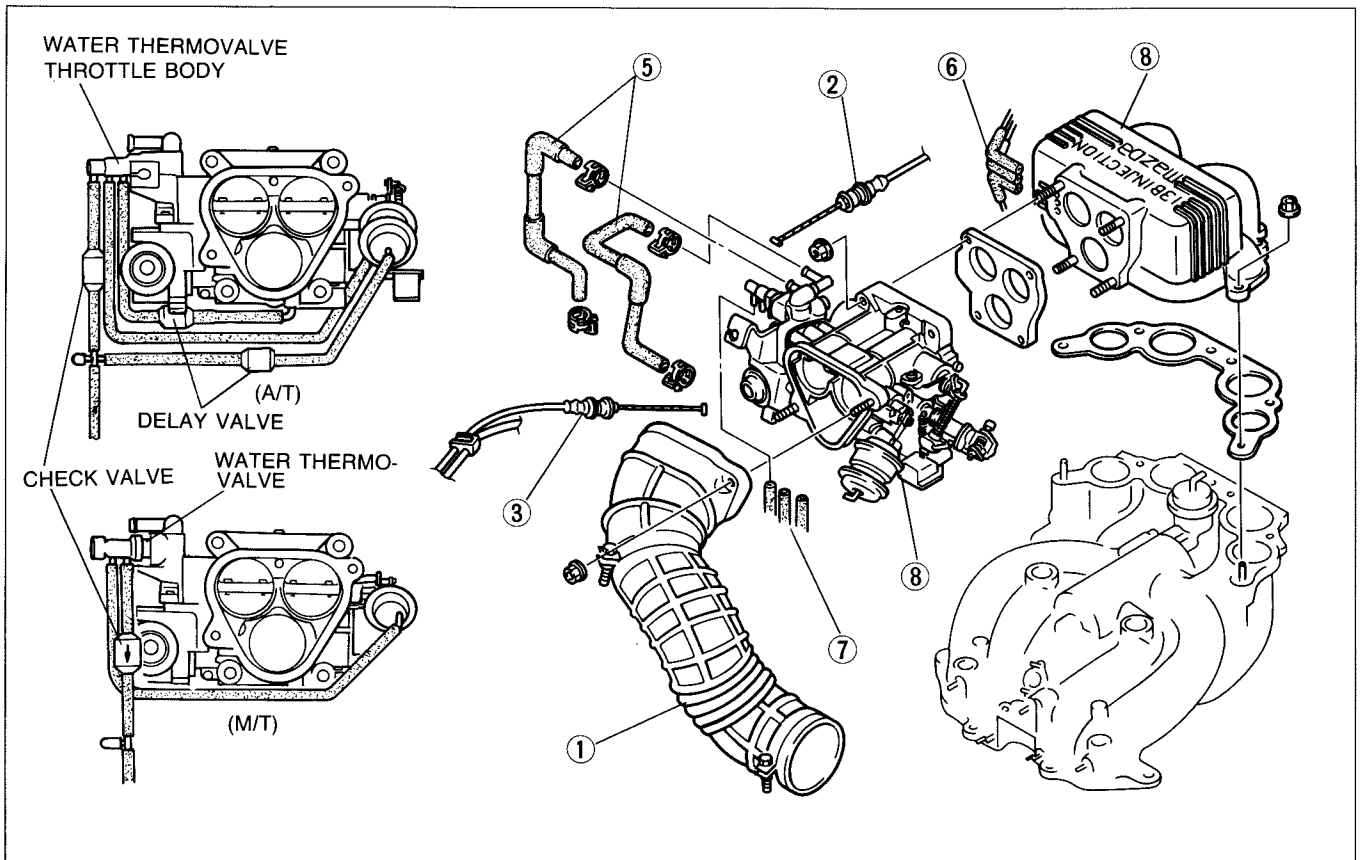


97U0F1-030

Check for air leaks by listening for sucking noises.
Visually check the components for damage and replace if necessary.

- | | |
|--|--|
| 1. Fresh air duct | 6. Water thermovalve |
| 2. Air cleaner | Inspection page F1-37 |
| 3. Air funnel | 7. Check valve |
| 4. Accelerator cable | Inspection page F1-38 |
| Adjustment..... page F1-38 | 8. Dynamic chamber |
| 5. Throttle body | 9. Exten manifold |
| Removal and Installation..... page F1-35 | Removal and Installation |
| Inspection page F1-35 | 10. Intake manifold |
| On-vehicle inspection page F1-36 | Removal and Installation..... page F1-39 |

THROTTLE BODY



97U0F1-031

Removal

1. Drain the engine coolant from the radiator.
2. Remove in the order shown in the figure.

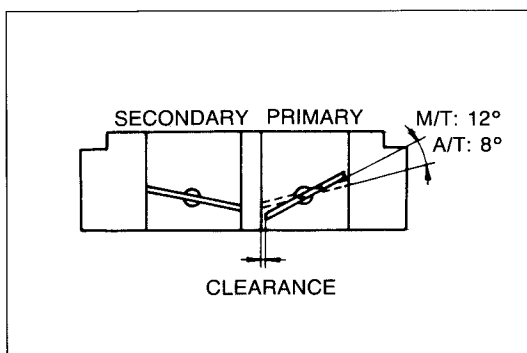
- ① Airfunnel
- ② Accelerator cable
- ③ Cruise control cable (If equipped)
- ④ Connectors
- ⑤ Water hoses
- ⑥ Vacuum tubes
- ⑦ Air hoses
- ⑧ Throttle body, water thermo valve and dynamic chamber

Caution

Cover the intake manifold opening with a clean cloth to prevent dust or dirt from entering after the throttle body and dynamic chamber are removed.

Installation

Install in the reverse order of removal. Tighten all nuts and bolts to the specified torque.



97U0F1-032

Inspection

No.1 secondary throttle valve

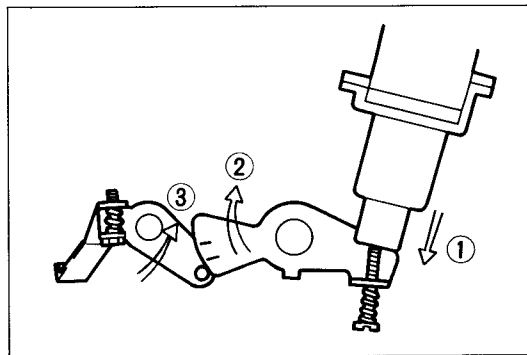
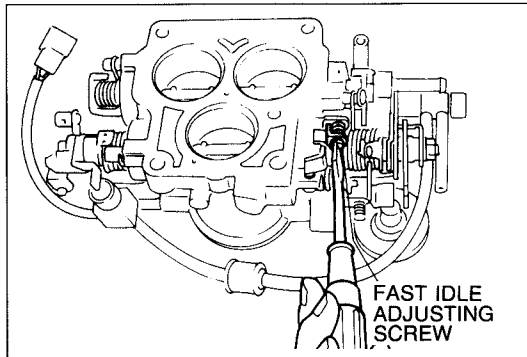
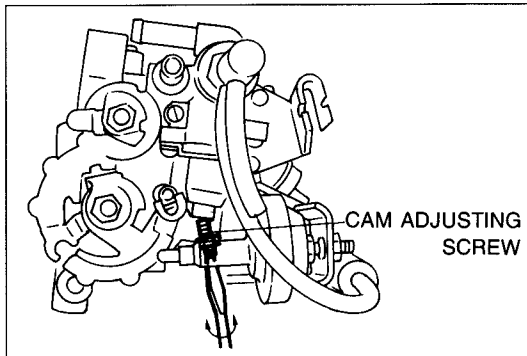
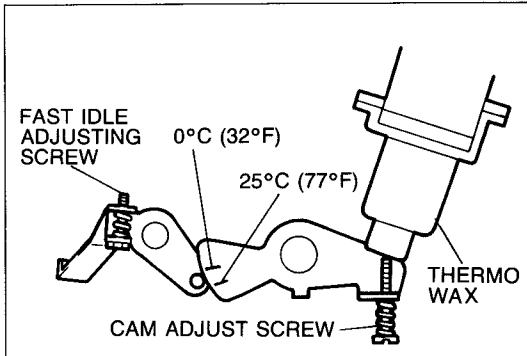
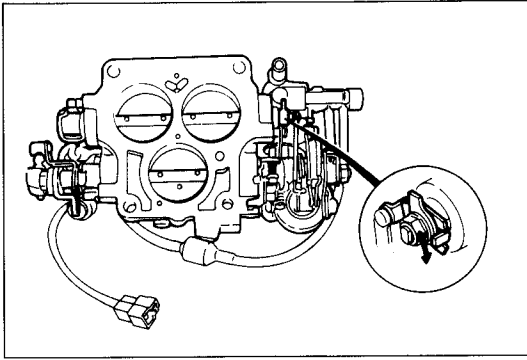
1. Remove the air funnel from the throttle body.
2. Check the clearance between the primary throttle valve and the wall of the throttle bore when the No.1 secondary throttle valve starts to open.

Standard clearance:

M/T: 0.5—0.7mm (0.02—0.03 in)

A/T: 0.8—1.4mm (0.03—0.06 in)

F1 INTAKE AIR SYSTEM



3. If the clearance is not within the specification, bend the tab until the proper clearance is obtained.

Fast idle operation

For this operation to be checked, the vehicle and throttle body must be at **25°C (77°F)**.

1. Check that the matching mark on the fast idle cam is aligned with the center of the cam roller.
2. If the matching mark and the center of the cam roller do not align, turn the cam adjusting screw until proper alignment is obtained.

Note

Fast idle adjustment is unnecessary unless it has been tampered with.

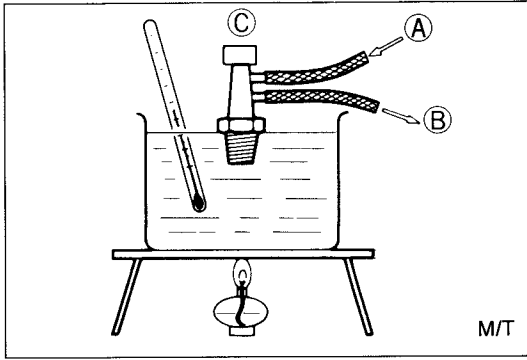
3. With the matching mark aligned, check the clearance between the primary throttle valve and the wall of the throttle bore.

Standard clearance: 0.4—0.5mm (0.016—0.02 in)

4. To adjust, turn the fast idle adjusting screw, if necessary.

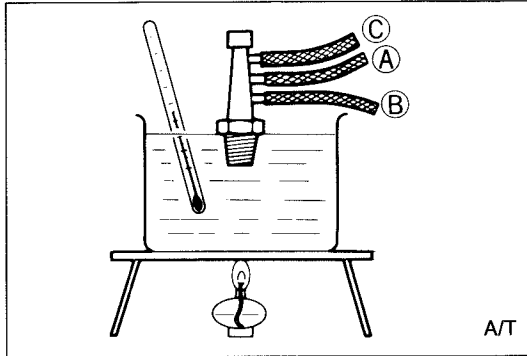
On-vehicle inspection

1. Warm up the engine to operating temperature.
2. Check that the wax rod extends outward fully and the idle cam separates from the roller.



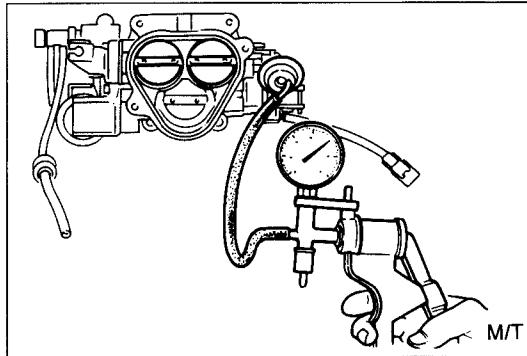
M/T

67U04X-104



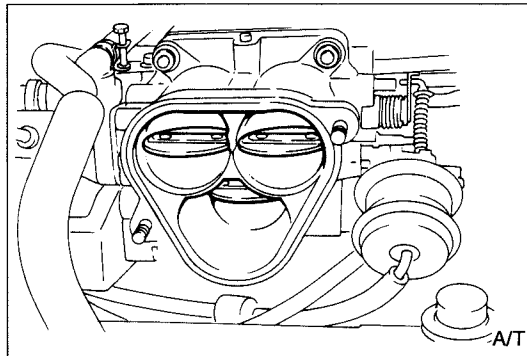
A/T

77U04A-256



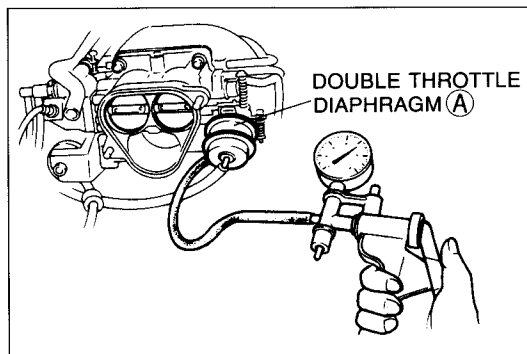
M/T

67U04X-106



A/T

67U04X-107



87U04A-040

Water Thermo Valve Removal

Remove the water thermo valve from the throttle chamber.

Installation

Install in the reverse order of removal.

Inspection

M/T

1. Immerse the water thermo valve in a container.
2. Heat the water gradually and observe the temperature.
3. Blow through port (A) and check the thermo valve operation.

Water temperature	Air passes
Below 77°C (171°F)	From (A) to (B)
Above 77°C (171°F)	From (A) to (C)

A/T

Check the water thermo valve operation the same as for M/T.

Water temperature	Air passes
Below 70°C (158°F)	From (A) to (C)
Above 70°C (158°F)	From (A) to (B)

Double Throttle Diaphragm

M/T

1. Disconnect the vacuum hose from the double throttle diaphragm.
2. Apply at least **200 mmHg (7.87 inHg)** vacuum to the diaphragm.
3. Check that the No. 2 secondary throttle valve is fully closed.

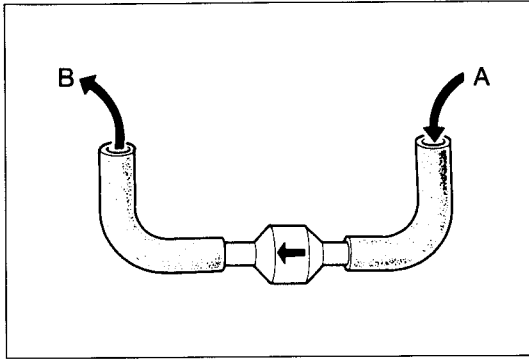
A/T

1. Check that the No.2 secondary throttle valve is fully closed.
2. When the primary throttle valve is fully opened, check that the No.2 secondary throttle valve is fully opened.

3. Disconnect the vacuum hose from the double throttle diaphragm (A).
4. Apply **460 mmHg (18.1 inHg)** vacuum to the No.2 secondary throttle valve diaphragm using a vacuum pump tester.
5. Check the clearance between the No.2 secondary throttle valve and the wall of the throttle bore when the primary throttle valve is fully opened.

Standard clearance: 2.2—3.2mm (0.09—0.13 in)

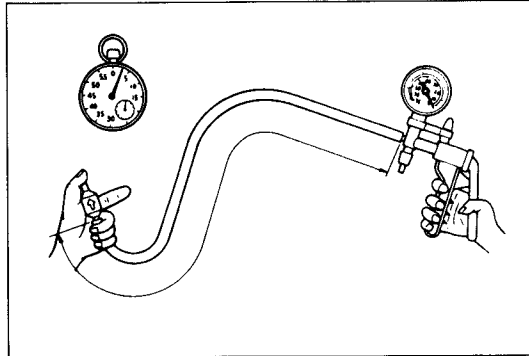
F1 INTAKE AIR SYSTEM



97U0F1-033

Check Valve Inspection

1. Remove the check valve.
2. Blow through (A) and check that air flows from (B).
3. Blow through (B) and check that air does not flow from (A).



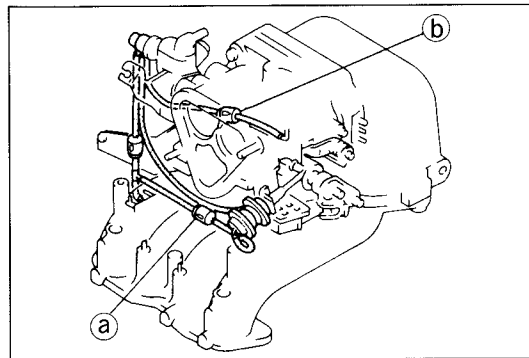
97U0F1-034

Delay Valve Inspection

1. Disconnect the vacuum delay valve.
2. Connect a **1.0 m (3.28 ft)** vacuum hose to a vacuum pump tester.
3. Connect the vacuum delay valve to the hose.

Note

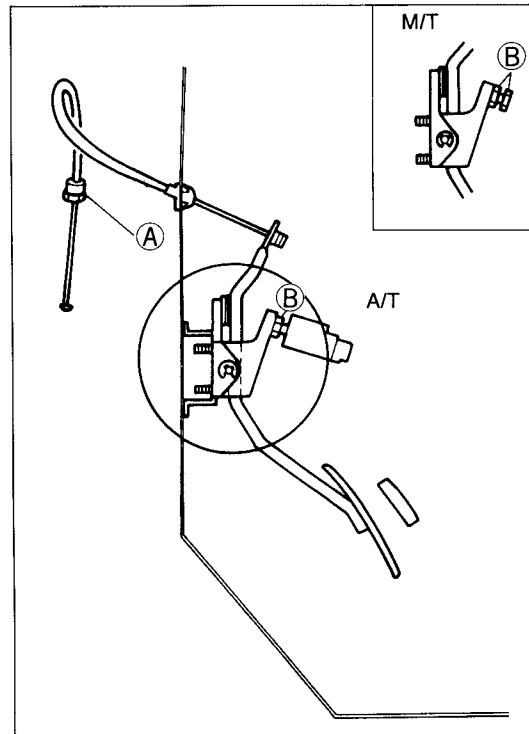
Check that the direction of the vacuum delay valve is as shown.



67U04X-111

4. Block the other side of the vacuum delay valve.
5. Apply at least **500 mmHg (19.7 inHg)** vacuum.
6. Release the vacuum and check the time required for the vacuum reading to decrease to **100 mmHg (3.9 inHg)** from **400 mmHg (15.7 inHg)**.

	Specified time
M/T	9—15 sec
A/T (a)	1.1 sec
A/T (b)	0.4 sec



67U04X-113

ACCELERATOR LINKAGE

Inspection

1. Remove the air funnel
2. Depress the accelerator pedal fully and check that the throttle valves are horizontal (fully open position).
3. Check that the accelerator linkage returns fully and moves freely.

Adjustment

1. Check the free play of the cable at the throttle chamber.

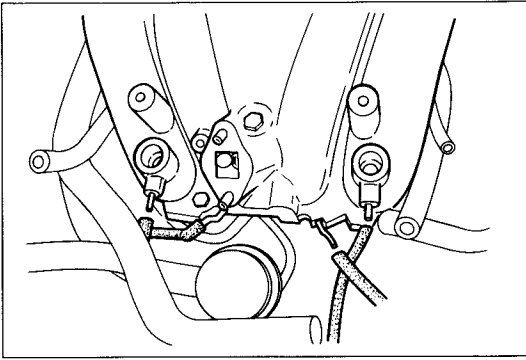
Free play: 1—3mm (0.04—0.12 in)

2. Adjust with nut (A), if not within specifications.

Caution

Check that the fast idle operation is fully cancelled.

3. Check that the throttle valves are fully opened with the accelerator pedal fully depressed.
4. Adjust stopper bolt (B), if necessary.

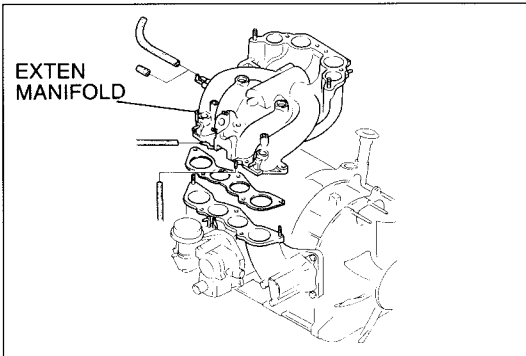


97U0F1-035

EXTEN MANIFOLD

Removal

1. Remove the throttle body along with the dynamic chamber. (Refer to page F1-35.)
2. Remove the BAC valve.
3. Remove the injector (Secondary). (Refer to page F1-54.)
4. Remove the hoses (Air bleed and pressure sensor)



97U0F1-036

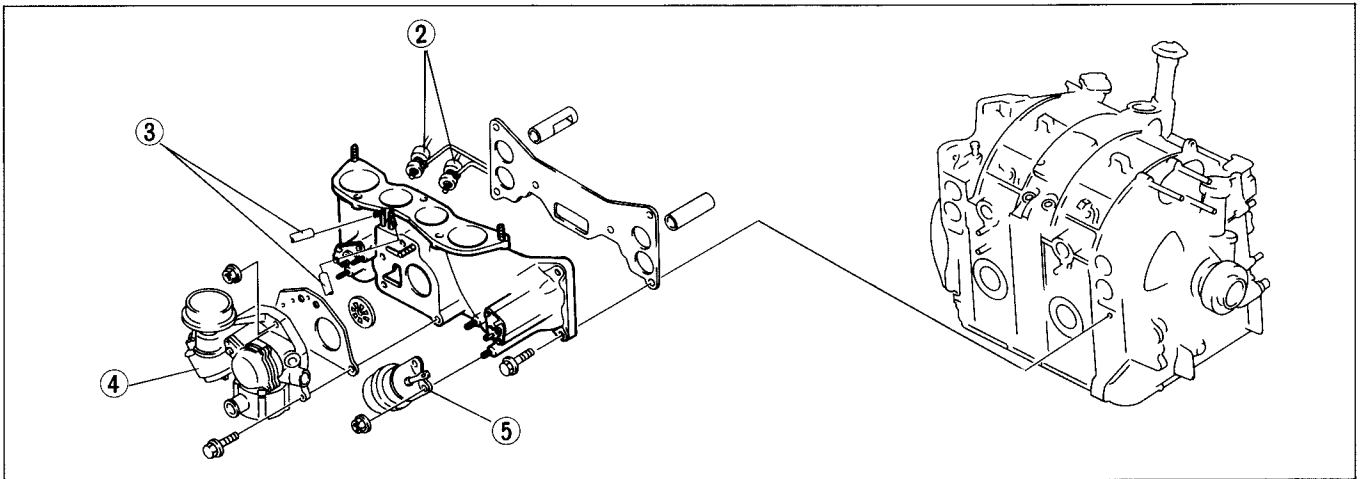
5. Remove the bolts and nuts.
6. Remove the exten manifold.

Installation

Install in the reverse order of removal.

INTAKE MANIFOLD

Removal



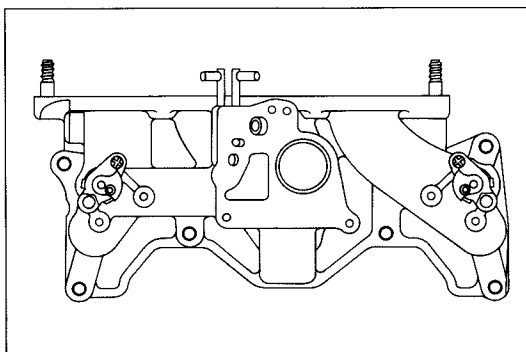
97U0F1-037

Refer to page F1-35.

1. Remove the exten manifold
2. Remove the manifold oil nozzles (Refer to Section D)

3. Remove the vacuum hoses
4. Remove the air control valve (Refer to page F1-68.)
5. Remove the actuator

6. Remove the intake manifold.

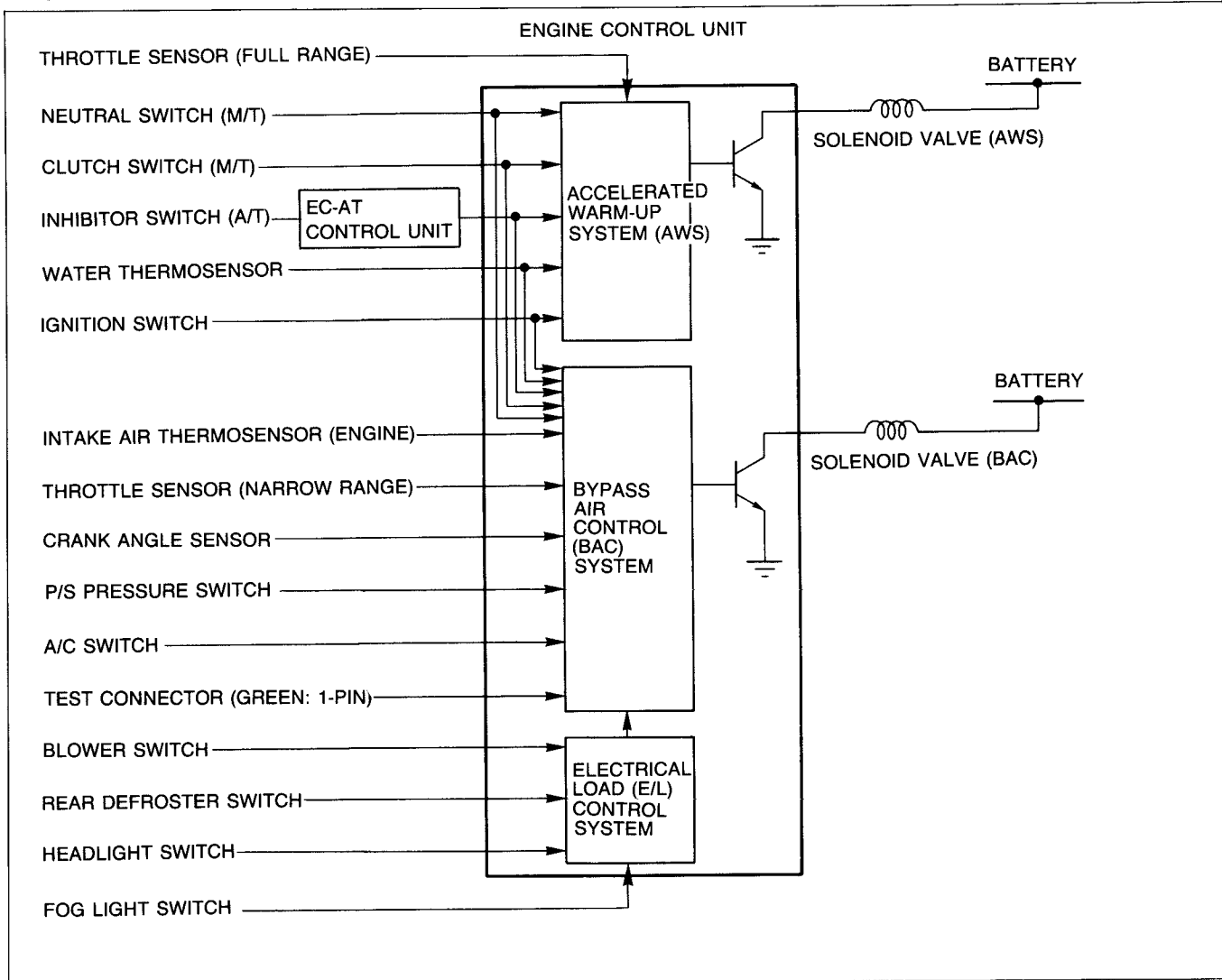


97U0F1-038

F1 IDLE SPEED CONTROL (ISC) SYSTEM

IDLE SPEED CONTROL (ISC) SYSTEM

DESCRIPTION



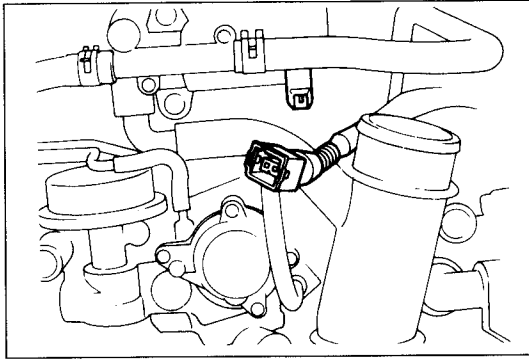
97U0F1-039

TROUBLESHOOTING

Check the condition of the wiring harness and connectors before checking the sensors or switches.

Possible cause	System inspection	Solenoid valve (BAC)	Solenoid valve (AWS)	Engine control unit terminal		
				1B	3J	3Q
Page	F1-41	F1-41	F1-41	F1-79	F1-81	F1-81
Symptom	F1-41	F1-41	F1-41	F1-79	F1-81	F1-81
Hard start or no start (Crank OK)	1	3	4	2	5	2
Rough idle	1	2	4	3	5	3
High idle speed (At normal operating temperature)	1	2	3	5	4	5
Engine does not run smoothly (Only when engine is cold)	1	2	4	3	5	3
Afterburn	1	2	—	3	1	3
Runs rough on deceleration	1	2	—	3	1	3
Fails emission test	1	4	2	3	3	3

97U0F1-040

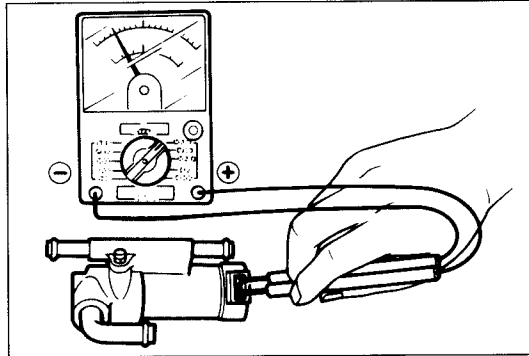


97U0F2-083

SYSTEM INSPECTION

Solenoid Valve (Bypass Air Control (BAC))

1. Warm up the engine and run it at idle.
2. Ground the test connector (Green: 1-pin).
3. Connect a tachometer to the engine.
4. Disconnect the solenoid valve connector.
5. Verify that the engine speed decreases.
6. Reconnect the solenoid valve connector.



97U0F2-084

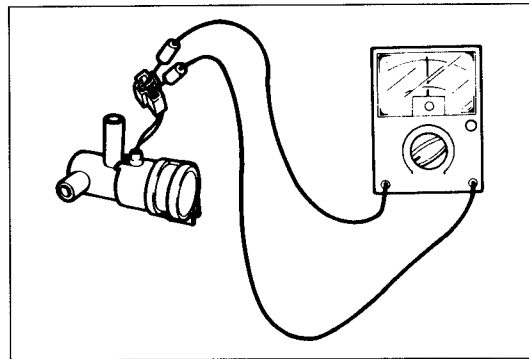
SOLENOID VALVE (BYPASS AIR CONTROL (BAC))

Inspection

1. Disconnect the solenoid valve connector.
2. Measure the solenoid resistance with an ohmmeter.

Resistance: 10.7—12.3Ω

3. Apply 12V and a ground to the terminals of the solenoid valve.
4. Verify that the valve should click when voltage is applied.
5. Replace the valve, if necessary.



97U0F1-112

SOLENOID VALVE (ACCELERATED WARM-UP SYSTEM (AWS))

Inspection

1. Disconnect the air bypass solenoid valve connector.
2. Measure the solenoid valve resistance with an ohmmeter.

Resistance: 9.3—11.3Ω

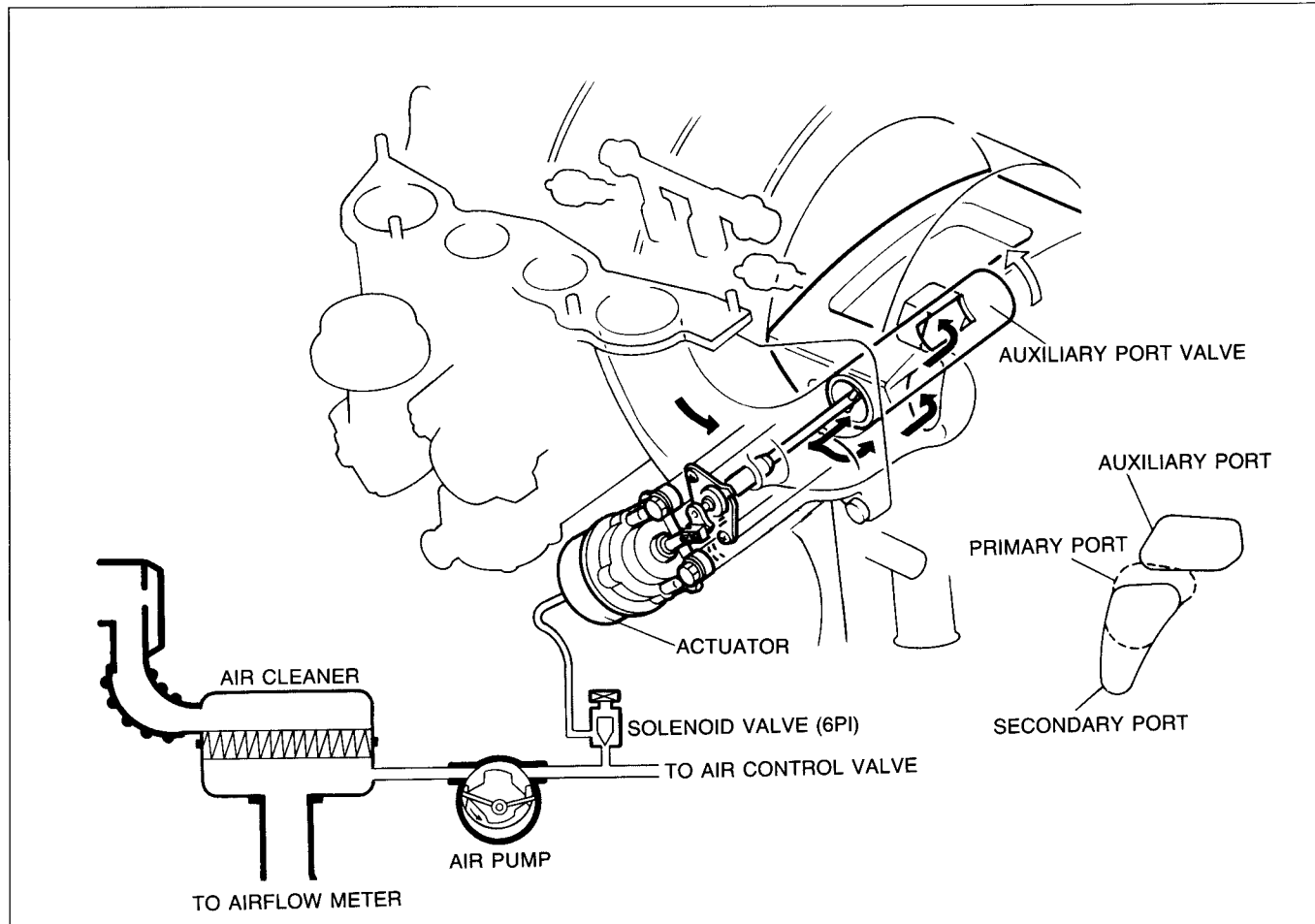
3. Apply 12V and a ground to the terminals of the solenoid valve.
4. Verify that the valve should click when voltage is applied.
5. Replace the valve, if necessary.

F1 6-PORT INDUCTION (6PI) SYSTEM

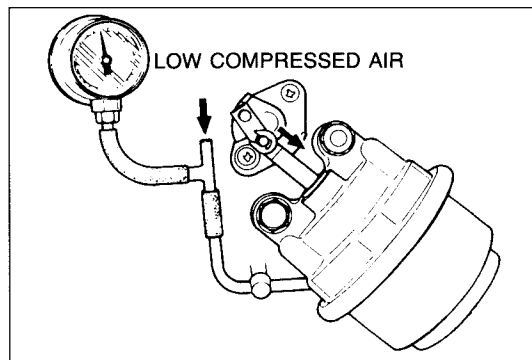
6-PORT INDUCTION (6PI) SYSTEM

DESCRIPTION

The auxiliary port valve is installed at the secondary-auxiliary port, and is connected to the actuator which is activated by the air pump pressure.



97U0F1-041



97U0F1-042

ACTUATOR (6PI)

Inspection

1. Remove the air hose from the actuator and connect a pressure gauge as shown.
2. Apply low pressure compressed air to the actuator and check operation.

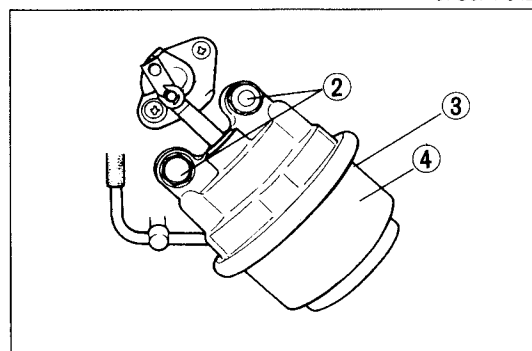
Starting to open: 5.9 kPa (0.060 kg/cm², 0.85 psi)

Fully opened: 9.3 kPa (0.095 kg/cm², 1.4 psi)

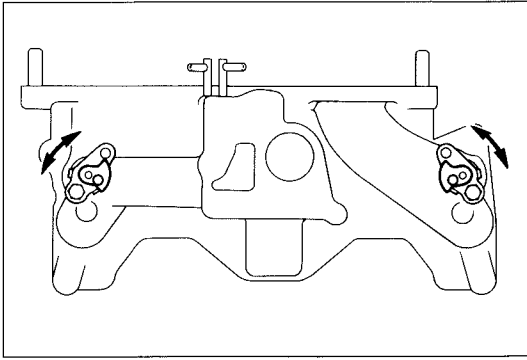
3. Replace the actuator if necessary.

Removal

1. Remove the exten manifold. (Refer to page F1-39.)
2. Remove the actuator attaching nuts.
3. Remove the actuator.



97U0F1-043



97U0F1-044

Installation

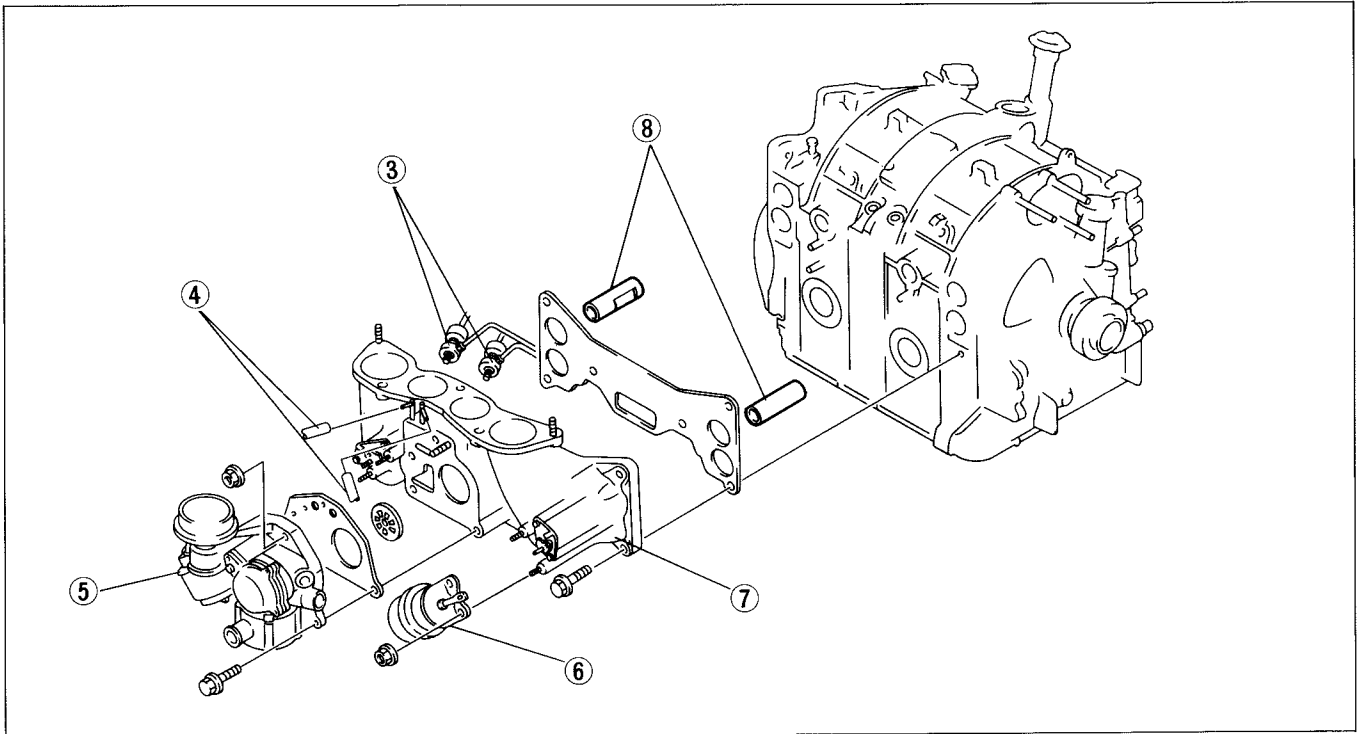
Install in the reverse order of removal.

Caution

Rotate the lever and check that it moves smoothly before installing the actuator.

AUXILIARY PORT VALVE

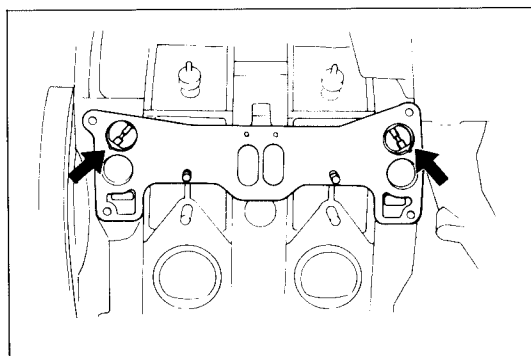
Removal



97U0F1-045

Remove in the order shown in the figure.

- | | |
|--|--|
| 1. Dynamic chamber and throttle body
Removal and Installation..... page F1-35 | 5. Air control valve (Refer to page F1-68) |
| 2. Exten manifold
Removal and Installation..... page F1-39 | 6. Actuator
Removal and Installation..... page F1-42 |
| 3. Manifold oil nozzles (Refer to Section D) | 7. Intake manifold
Removal and Installation..... page F1-39 |
| 4. Vacuum hoses | 8. Auxiliary port valves |



97U0F1-046

Inspection

Check the auxiliary port valves for cracks or damage.

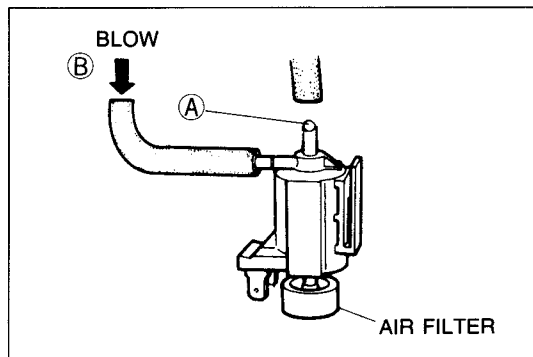
Installation

Install in the reverse order of removal.

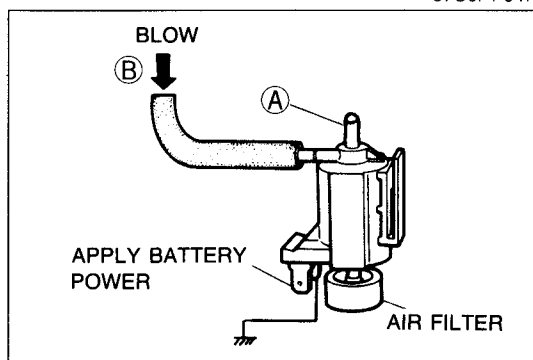
Caution

Install so that the large position of the auxiliary port valve shafts align with the matching mark on the gasket as shown in the figure.

F1 6-PORT INDUCTION (6PI) SYSTEM



97U0F1-047



97U0F1-048

SOLENOID VALVE (6PI)

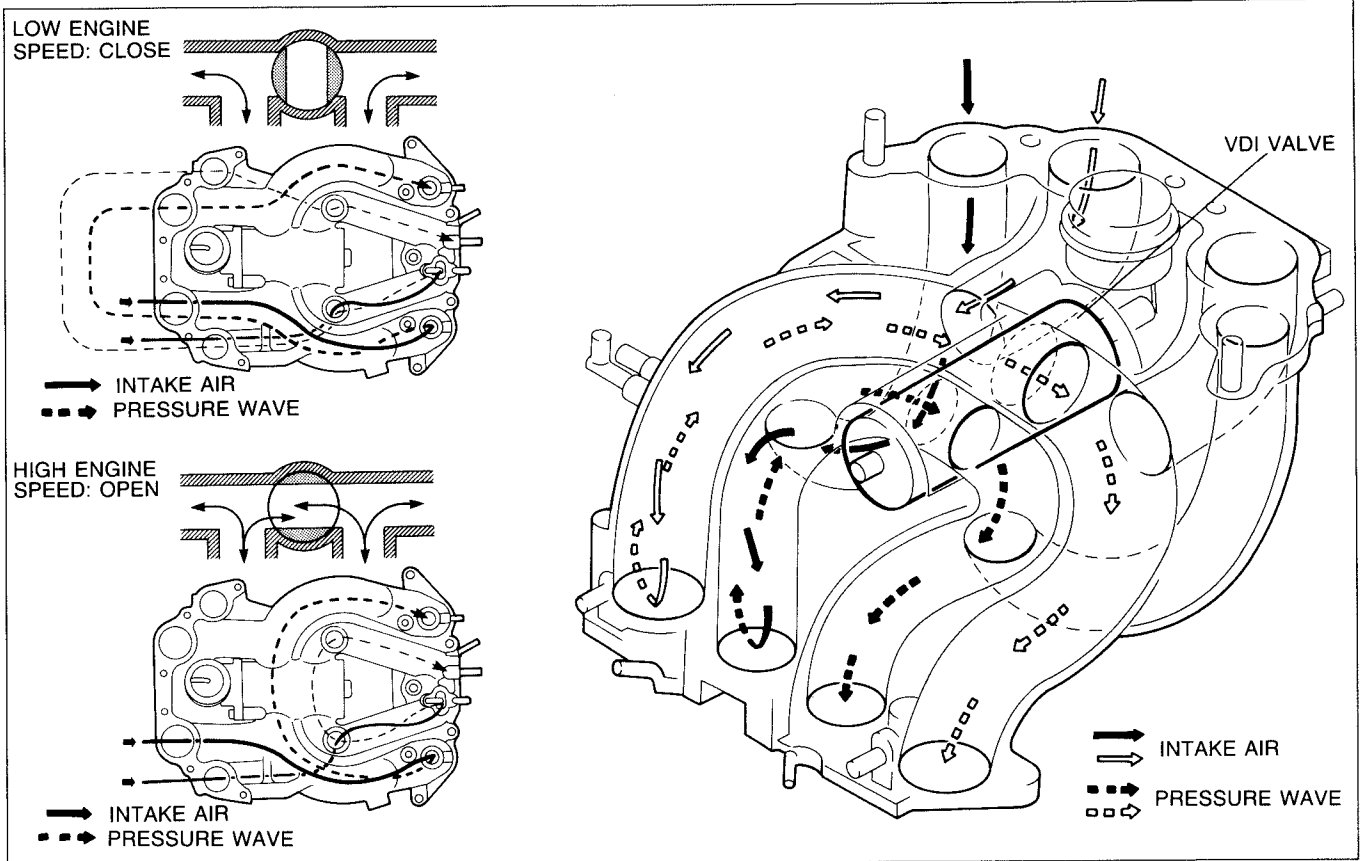
Inspection

1. Disconnect the vacuum hose from the solenoid valve.
2. Blow through the solenoid valve from port (B).
Check that air passes through the valve and flows from the air filter.
3. Disconnect the solenoid valve connector and connect 12V and a ground to the terminals of the solenoid valve.
4. Blow through the solenoid valve from port (B).
Check that air passes through the valve and flows from port (A).

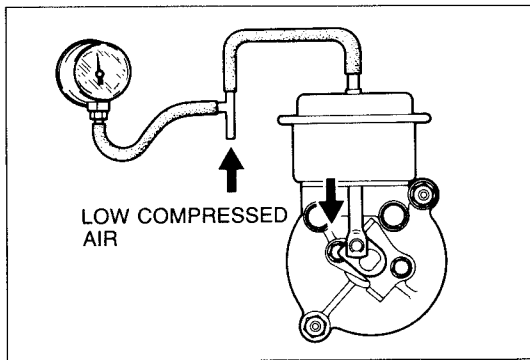
VARIABLE DYNAMIC EFFECT INTAKE (VDI) SYSTEM

DESCRIPTION

During engine operation intake air flows to a port closed by the rotor a pressure wave is created. This pressure wave then goes toward the open intake port, compressing the intake air along the way. At low engine speed, when this extra pressurization is not needed, the VDI valve is closed, causing the pressure wave path to be long. At high engine speed, the VDI valve opens and the pressure wave quickly pressurizes the intake air through the shortened path, forcing the air into the combustion chamber.



97U0F1-049



97U0F1-050

ACTUATOR (VDI)

Inspection

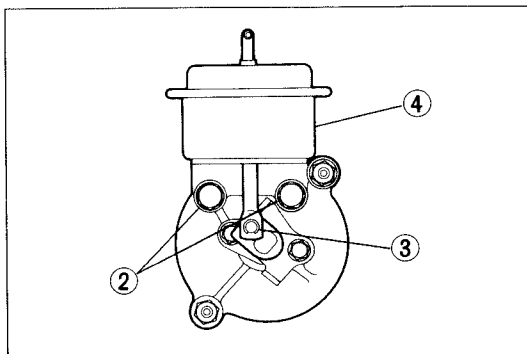
1. Remove the air hose from the actuator and connect a pressure gauge as shown.
2. Apply low pressure compressed air to the actuator and check operation.

Fully opened: 2.0 kPa (0.2 kg/cm², 2.8 psi)

3. Replace the actuator if necessary.

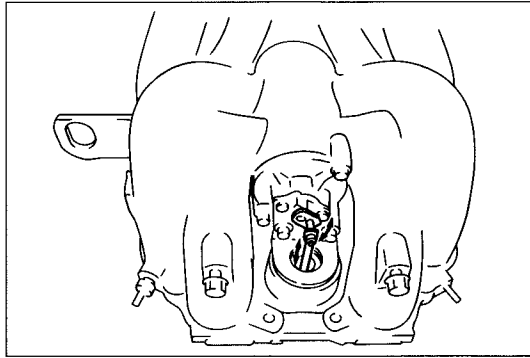
Removal

1. Remove the exten manifold. (Refer to page F1-39.)
2. Remove the actuator attaching nuts.
3. Remove the retaining ring.
4. Remove the actuator.



97U0F1-051

F1 VARIABLE DYNAMIC EFFECT INTAKE (VDI) SYSTEM



97U0F1-052

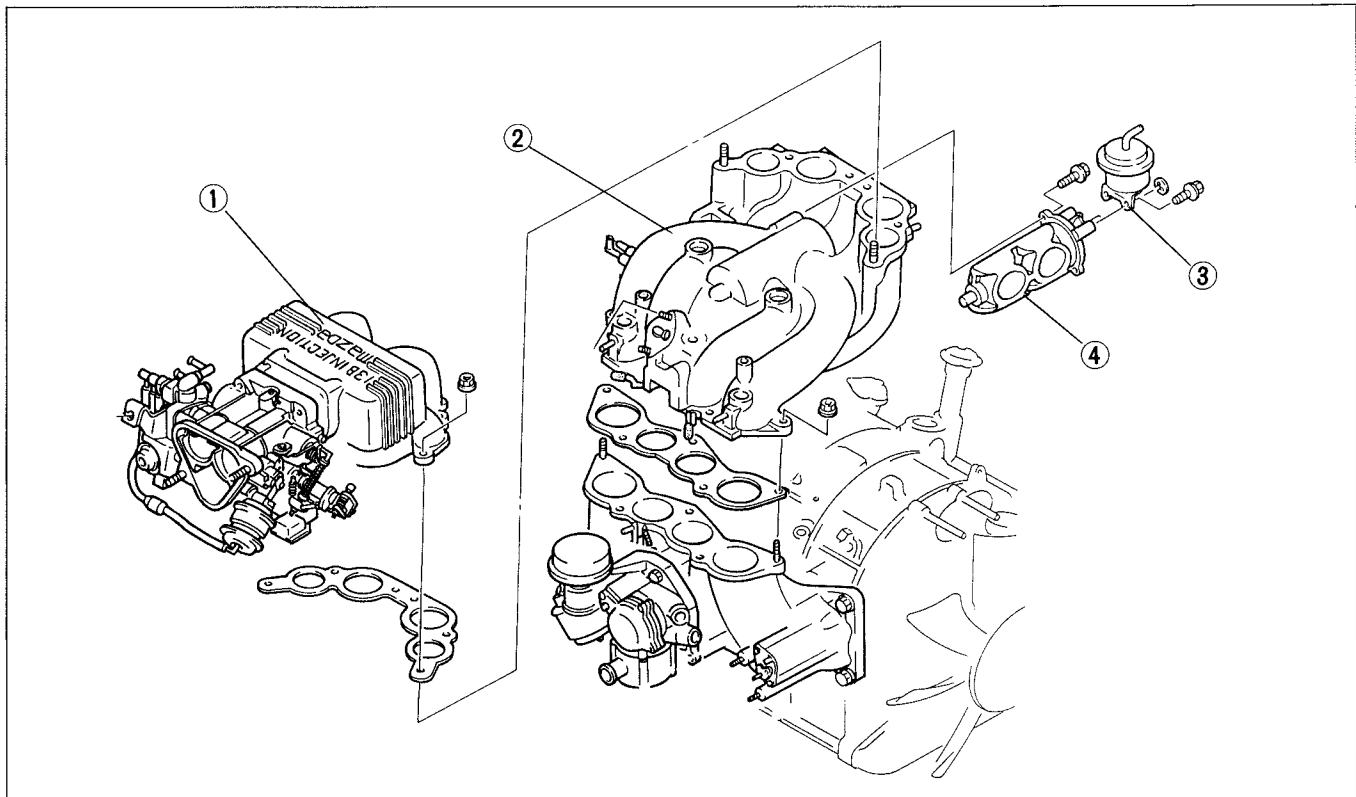
Installation

Install in the reverse order of removal.

Caution

Rotate the lever and check that it moves smoothly before installing the actuator.

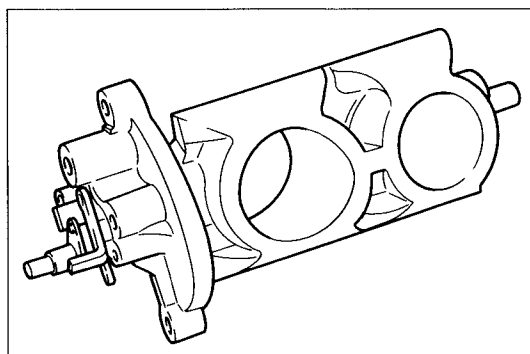
VARIABLE DYNAMIC EFFECT INTAKE (VDI) VALVE Removal



97U0F1-053

Remove in the order shown in the figure.

- | | |
|---|--|
| 1. Dynamic chamber and throttle valve
Removal and Installation..... page F1-35 | 3. Actuator (VDI)
Removal..... page F1-45
Installation..... page F1-43 |
| 2. Exten manifold
Removal and Installation..... page F1-39 | 4. VDI valve |



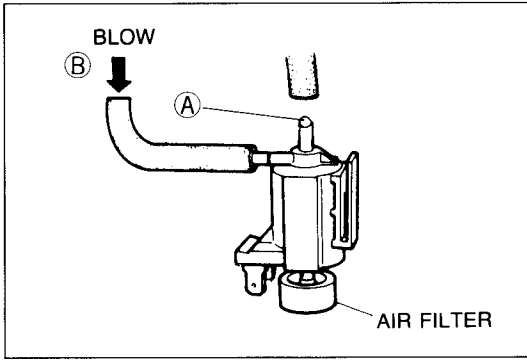
97U0F1-054

Inspection

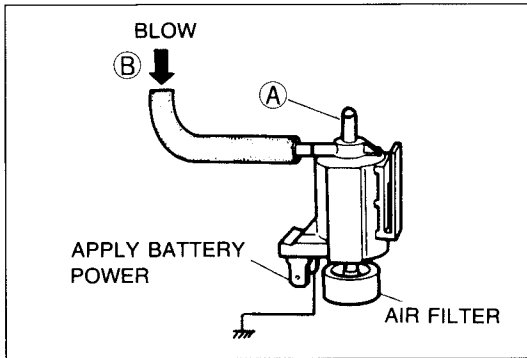
Check the valve for cracks or damage.

Installation

Install in the reverse order of removed.



97U0F1-055



97U0F1-056

SOLENOID VALVE (VDI)

Inspection

1. Disconnect the vacuum hose from the solenoid valve.
2. Blow through the solenoid valve from port (B).
Check that air passes through the valve and flows from the air filter.
3. Disconnect the solenoid valve connector and connect 12V and a ground to the terminals of the solenoid valve.
4. Blow through the solenoid valve from port (B).
Check that air passes through the valve and flows from port (A).

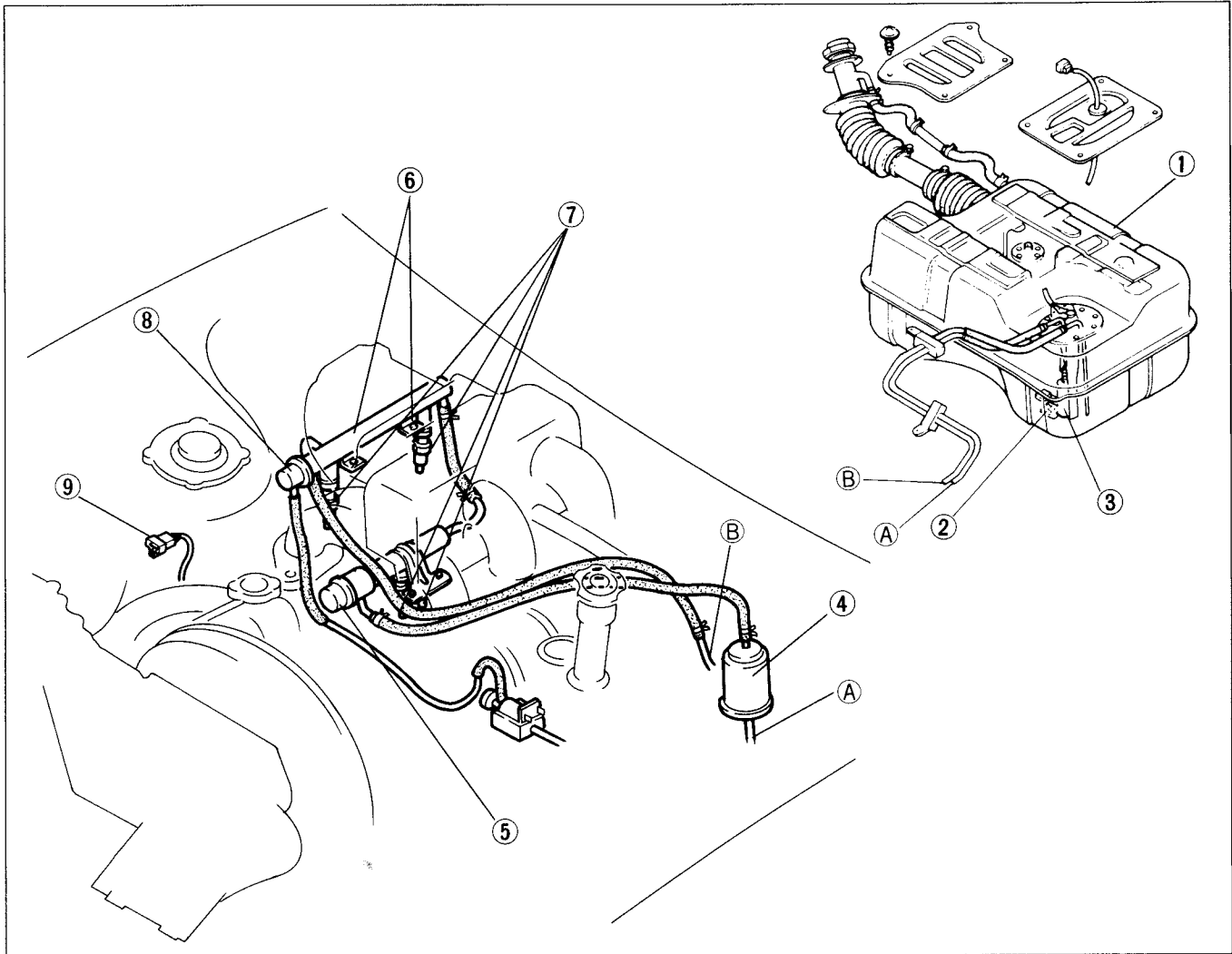
FUEL SYSTEM

DESCRIPTION

This system supplies the fuel necessary for combustion at a constant pressure to the fuel injectors. Fuel is metered and injected into the intake manifold according to the injection control signals from the engine control unit. The system consists of the fuel tank, the fuel pump, the fuel filters, the delivery pipe, the pulsation damper, the pressure regulator, the injectors, and the circuit opening relay.

Dechoke system

To clean out excess fuel in the cylinders, as in the case of engine flooding, no fuel is injected when the accelerator is held fully depressed while cranking the engine.



97U0F1-057

Warning

Before removing the fuel system, release the fuel pressure from the fuel system to eliminate possibly causing injury or fire. (Refer to page F1-49.)

- | | |
|---|--|
| 1. Fuel tank
Removal and Installation..... page F1-51
Inspection page F1-51 | 6. Delivery pipe |
| 2. Fuel filter (Low pressure side) | 7. Injector
Removal..... page F1-54
Installation page F1-55
Inspection page F1-56 |
| 3. Fuel pump
Inspection page F1-52
Removal and Installation..... page F1-53 | 8. Pressure regulator
(Built in secondary delivery pipe) |
| 4. Fuel filter (High pressure side) | 9. Check connector (Yellow: 2-pin) |
| 5. Pulsation damper
(Built in primary delivery pipe) | |

TROUBLESHOOTING

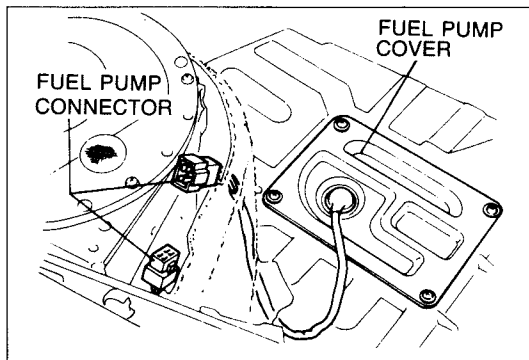
Check the condition of the wiring harness and connectors before checking the sensors or switches.

Possible cause	Fuel pump	Fuel filter	Injector	Hold pressure (Inspection)	Fuel line pressure (Inspection)	Pressure regulator	Pulsation damper	Fuel pump control system	Engine control unit terminal				
									1K	3W	3X	3Y	3Z
Symptom	F1-52	F1-48	F1-54	F1-50	F1-50	F1-53	F1-48	F1-57	F1-79	F1-81	F1-81	F1-81	F1-81
Hard start or no start (Crank OK)	5	6	7	1	2	8		3	4	4	4	4	4
Rough idle	4		1		2		3						
Engine does not run smoothly (At normal operating temp.)	6	4	2		1		5			3	3	3	3
Engine does not run smoothly (When engine is cold)					1					2	2	2	2
Lack of power, poor acceleration or hesitation	2	3	4		1	6				5	5	5	5
Afterburn			1							2	2	2	2
Runs rough on deceleration			1							2	2	2	2
Fails emission test			3		1	2				4	4	4	4

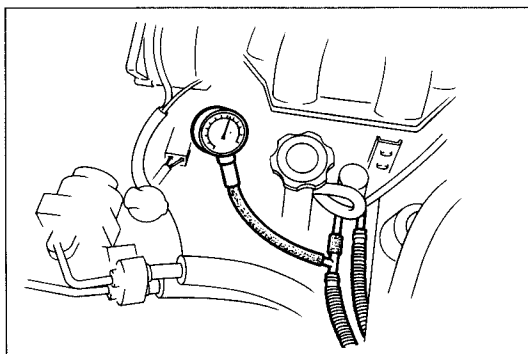
97U0F1-058

Warning

Before release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F1-49.)



97U0F2-099



97U0F2-100

PRECAUTION

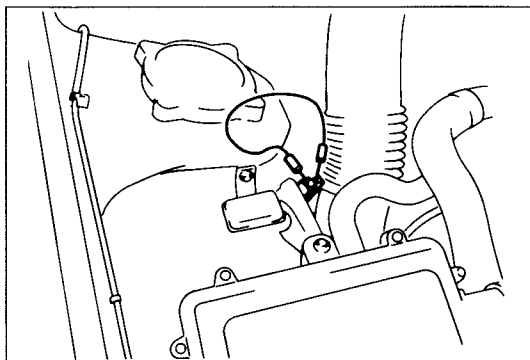
Fuel Pressure Release and Fuel System

Fuel in the fuel system remains under high pressure even when the engine is not running.

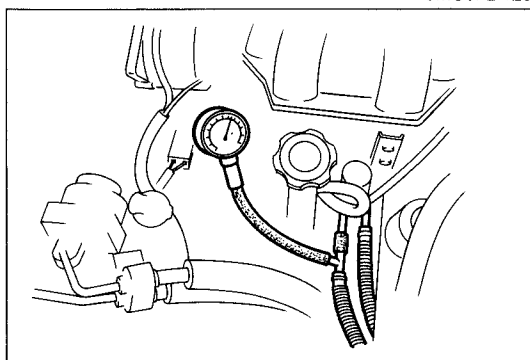
- Before disconnecting any fuel line, release the fuel pressure from the fuel system to reduce the possibility of injury or fire.
 - Start the engine.
 - Disconnect the fuel pump connector.
 - Allow the engine to stall. Turn off the ignition switch.
 - Reconnect the fuel pump connector.
- Use a rag as protection from fuel spray when disconnecting the hoses.
- Plug all disconnected hoses.
- Inspect the fuel system with a suitable pressure gauge.

Caution

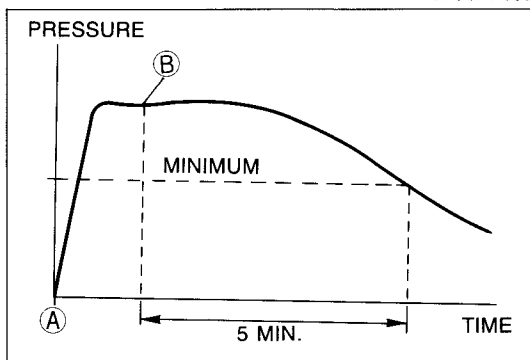
Install hose clamps to secure the fuel pressure gauge to the fuel filter and the fuel main hose to prevent fuel leakage.



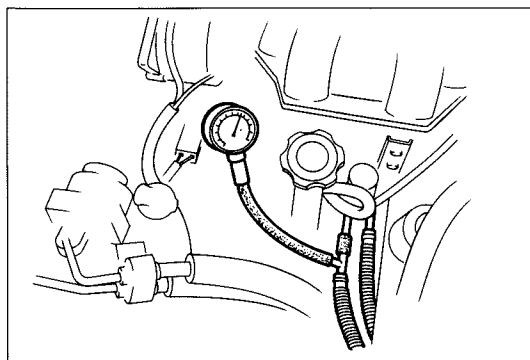
9MU0F2-123



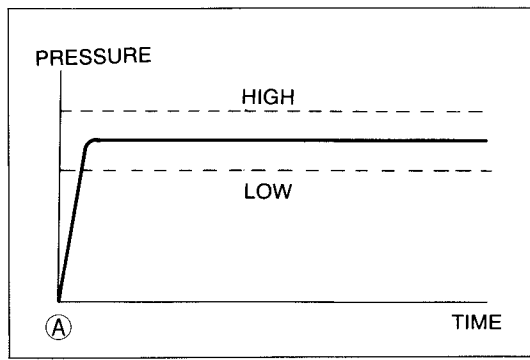
97U0F1-059



97U0F1-060



97U0F2-103



97U0F1-061

Priming Fuel System

After releasing the fuel system pressure for repairs or inspection the system must be primed to avoid excessive cranking when first starting the engine. Follow the steps below.

1. Connect the terminals of the check connector (Yellow: 2-pin) with a jumper wire.
2. Turn the ignition switch ON for **approx. 10 sec.** and check for fuel leaks.
3. Turn the ignition switch OFF and remove the jumper wire.

SYSTEM OPERATION

Warning

Before disconnecting any fuel line, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F1-49.)

Hold Pressure Inspection

1. Release the fuel pressure from the fuel system.
2. Disconnect the negative battery terminal.
3. Install a fuel pressure gauge between the fuel filter and the pulsation damper.
4. Connect the negative battery terminal.
5. Connect the terminals of the check connector (Yellow: 2-pin) with a jumper wire.
6. Turn the ignition switch ON for **10 sec.** to operate the fuel pump (Point A).
7. Turn the ignition switch OFF and disconnect the jumper wire (Point B).
8. Observe the fuel pressure **after 5 min..**

Fuel pressure: More than 128 kPa (1.3 kg/cm², 18 psi)

9. If not as specified, perform the following inspection.
 - Fuel pump hold pressure inspection. (Refer to page F1-52.)
 - Pressure regulator fuel pressure drop. (Refer to page F1-53.)
 - Injector fuel leakage. (Refer to page F1-56.)

Fuel Line Pressure Inspection

1. Release the fuel pressure from the fuel system.
2. Disconnect the negative battery terminal.
3. Install the fuel pressure gauge between the fuel filter and the pulsation damper.
4. Connect the negative battery terminal.
5. Connect the terminals of the check connector (Yellow: 2-pin) with a jumper wire.
6. Turn the ignition switch ON (Point A).
7. Measure the fuel line pressure.

Fuel line pressure:

235—275 kPa (2.4—2.8 kg/cm², 34.1—39.8 psi)

- Pressure low —
- Check for fuel leaks.
 - Substitute a good fuel filter and retest.
 - Check fuel pump maximum pressure. (Refer to page F1-52.)
 - Check the pressure regulator. (Refer to page F1-53.)

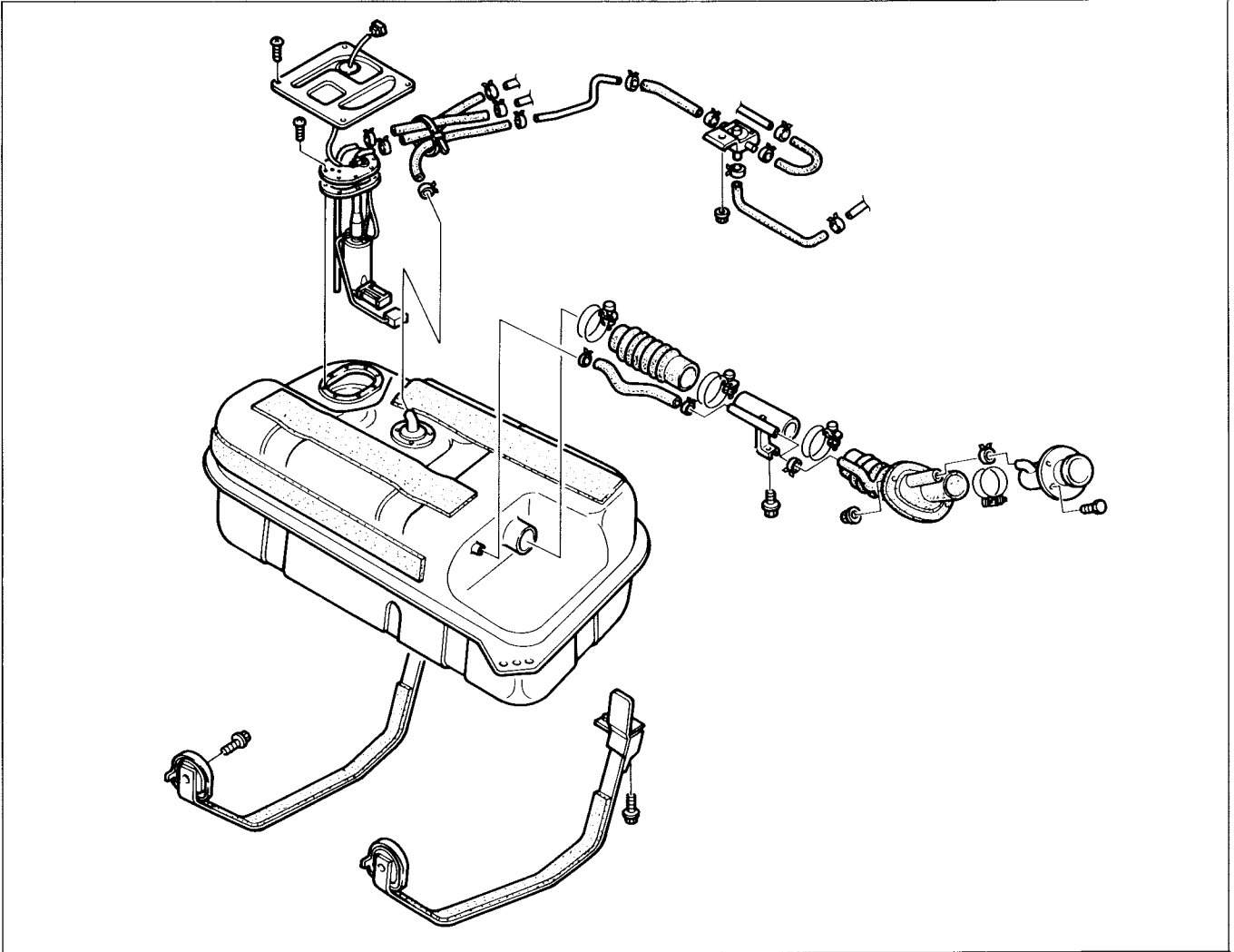
- Pressure high —
- Replace pressure regulator.

FUEL TANK Removal

Warning

- a) Keep sparks cigarettes, and open flames away from fuel tank.
- b) Before repairing the fuel tank, clean it thoroughly with steam to remove all explosive gas.

1. Release the fuel pressure from the fuel system to reduce the possibility of injury or fire.
(Refer to page F1-49.)
2. Drain the fuel from the fuel tank before removing the tank.
3. Remove in the order shown in the figure.



97U0F1-062

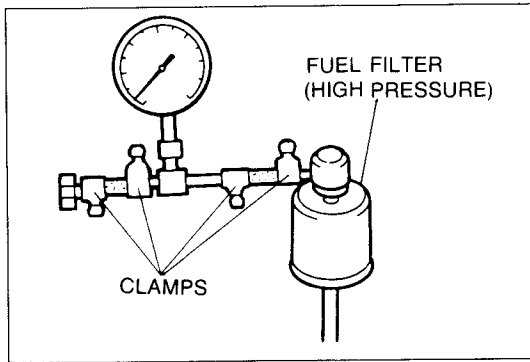
1. Drain the fuel tank.
2. Remove the fuel pump. (Refer to page F1-53.)
3. Disconnect the fuel filler hose from the fuel tank.
4. Raise the rear of the vehicle and support it with stands.
5. Disconnect the evaporation hoses from the fuel tank.
6. Remove the fixing band attaching bolts.
7. Remove the fuel tank.

Inspection

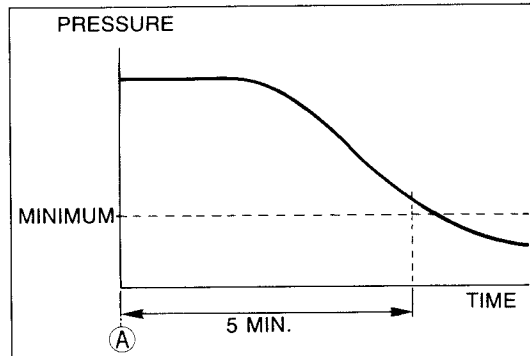
1. Visually check the fuel tank for contamination cracks, or other damage.
2. Replace, if necessary.

Installation

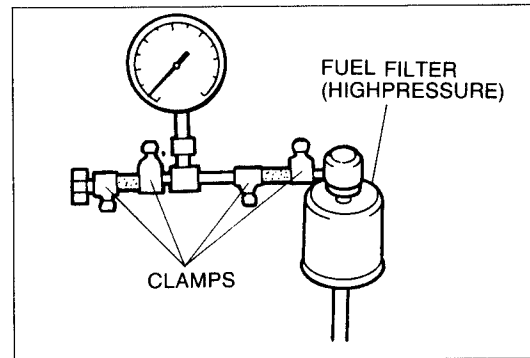
Install in the reverse order of removal.



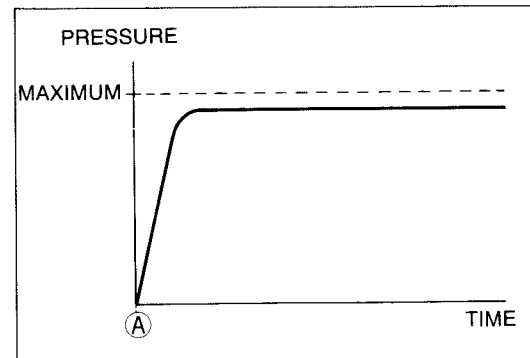
97U0F1-063



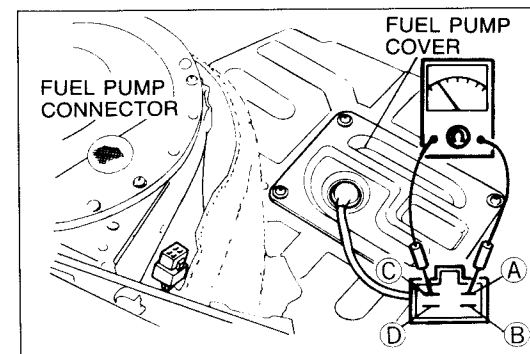
97U0F2-107



97U0F1-064



97U0F2-109



97U0F2-110

FUEL PUMP

Warning

Before removing the fuel pump, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F1-49.)

Inspection

Hold pressure inspection

1. Release the fuel pressure from the fuel system. (Refer to page F1-49.)
2. Disconnect the negative battery terminal.
3. Connect a fuel pressure gauge to the outlet of the fuel filter. Plug the outlet of the fuel pressure gauge as shown. (Install clamps as shown.)
4. Connect the negative battery terminal.
5. Connect the terminal of the check connector (Yellow: 2-pin) with a jumper wire.
6. Turn the ignition switch ON for 10 sec. to operate the fuel pump.
7. Turn the ignition switch OFF and disconnect the jumper wire (Position A).
8. Observe the fuel pressure after 5 min..

Fuel pressure: More than 392 kPa (4.0 kg/cm², 57 psi)

9. If not as specified, replace the fuel pump.

Maximum pressure

1. Release the fuel pressure from the fuel system. (Refer to page F1-49.)
2. Disconnect the negative battery terminal.
3. Install a fuel pressure gauge to the outlet of the fuel filter. Plug the outlet of the fuel pressure gauge as shown. (Install clamps as shown.)
4. Connect the negative battery terminal.
5. Connect the terminals of the check connector (Yellow: 2-pin) with a jumper wire.
6. Turn the ignition switch ON to operate the fuel pump. (Position A).
7. Measure the fuel pump maximum pressure.

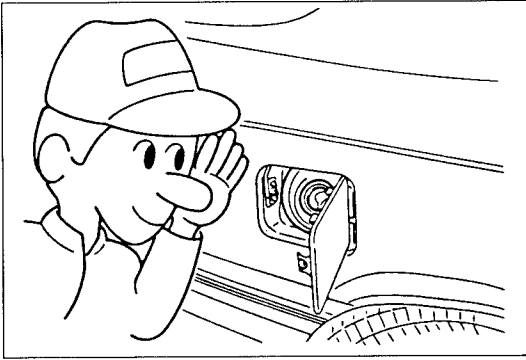
Maximum pressure:

490—637 kPa (5.0—6.5 kg/cm², 71.1—92.4 psi)

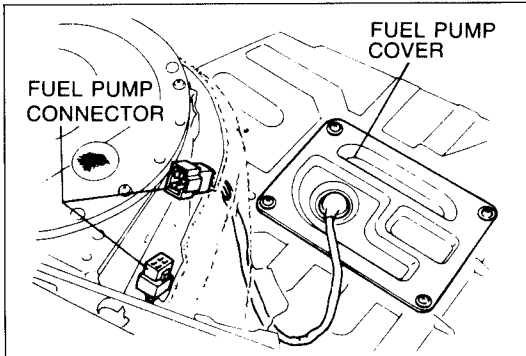
8. Turn the ignition switch OFF and disconnect the jumper wire. If not as specified, replace the fuel pump.

Inspection of continuity

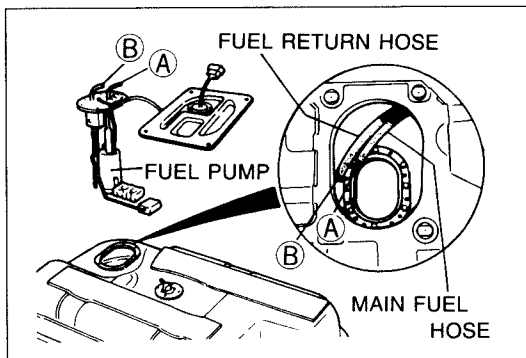
1. Remove the rear mat.
2. Disconnect the fuel pump connector.
3. Check for continuity between terminals A—C.



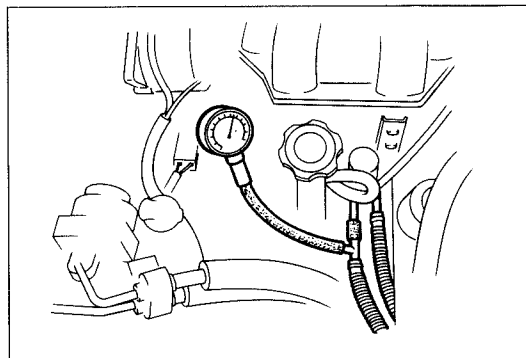
97U0F2-111



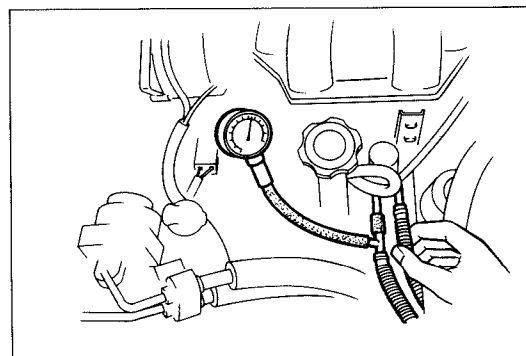
97U0F1-065



97U0F2-113



97U0F1-066



97U0F1-067

Operating sound

1. Connect the terminal of the check connector (Yellow: 2-pin) with a jumper wire.
2. Turn the ignition switch ON to operate the fuel pump.
3. Check at the fuel filler port for operating sound of the fuel pump.

Removal

1. Release the fuel pressure from the fuel system. (Refer to page F1-49.)
2. Lift up the rear mat.
3. Remove the fuel pump cover.
4. Disconnect the fuel pump connector.
5. Disconnect the fuel main hose and the fuel return hose.
6. Remove the fuel pump mounting screws.
7. Remove the fuel pump from the fuel tank.

Installation

Install in the reverse order of removal.

PRESSURE REGULATOR

Inspection

Warning

Before disconnecting any fuel line, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F1-49.)

Only if fuel system pressure drop is not as specified and fuel pump pressure drop is as specified.

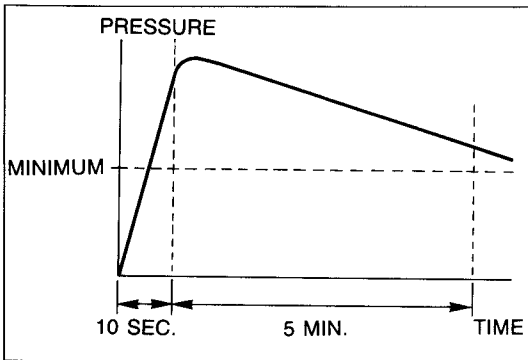
1. Perform the Hold Pressure Inspection (SYSTEM OPERATION), (Refer to page F1-50.)
2. If not as specified, perform the Hold Pressure Inspection (FUEL PUMP), (Refer to page F1-52.)
3. If both are as specified, perform the following inspection.
4. Release the fuel pressure from the fuel system. (Refer to page F1-49.)
5. Disconnect the negative battery terminal.
6. Install the fuel pressure gauge between the fuel filter and the pulsation damper.
7. Connect the negative battery terminal.
8. Start the engine and run it at idle.

Fuel pressure:

186—226 kPa (1.9—2.3 kg/cm², 27—33 psi)

9. Connect the terminals of the check connector (Yellow: 2-pin) with a jumper wire.

F1 FUEL SYSTEM



97UOF2-116

10. Turn the ignition switch ON **for 10 sec.**
11. Pinch the pressure regulator outlet hose as shown, and turn OFF the ignition switch.
12. Observe the fuel pressure after **5 min.**

Fuel pressure: More than 147 kPa (1.5 kg/cm², 21 psi)

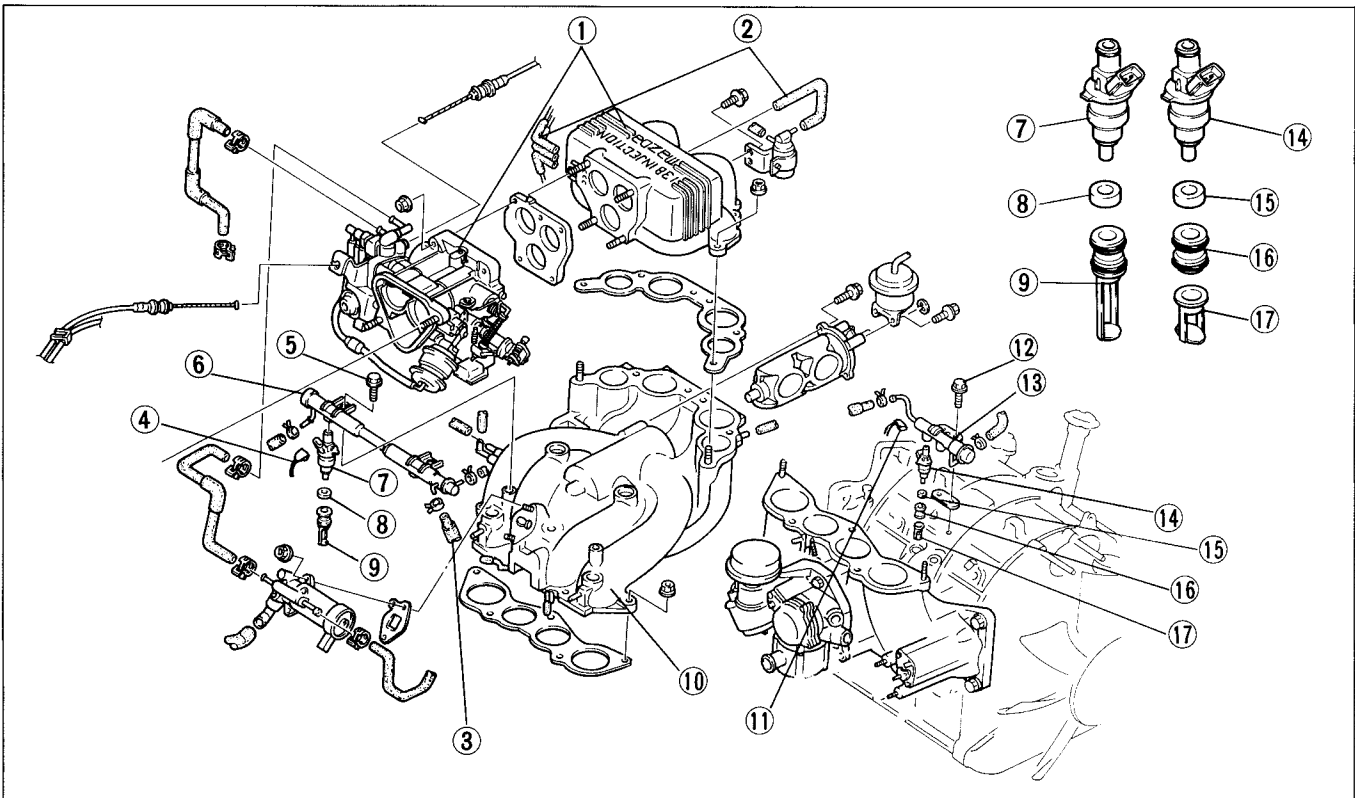
13. If as specified, replace the pressure regulator.

INJECTOR Removal

Warning

Before performing the following procedures, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F1-49.)

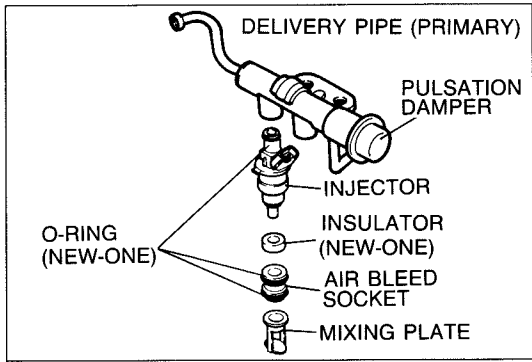
1. Release the fuel pressure from the fuel system. (Refer to page F1-49.)
2. Remove in the order shown in the figure.



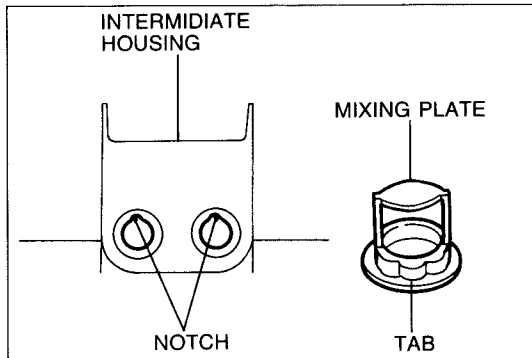
97UOF1-068

1. Throttle body and dynamic chamber
Removal and Installation..... page F1-35
2. Vacuum hose
3. Fuel return hose
4. Connectors (Secondary injectors)
5. Attaching bolts
6. Delivery pipe (Secondary)
7. Injectors (Secondary)
Inspection page F1-56
8. Injector insulators (Secondary)
9. Air bleed sockets (Secondary)

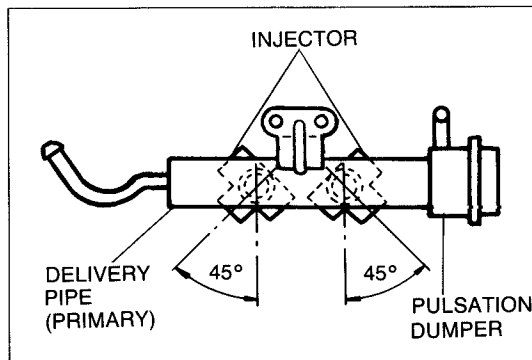
10. Exten manifold
Removal..... page F1-39
11. Connectors (Primary injectors)
12. Attaching bolts (Primary)
13. Delivery pipe (Primary)
14. Injectors (Primary)
Inspection page F1-56
15. Injector insulators (Primary)
16. Air bleed sockets (Primary)
17. Mixing plate



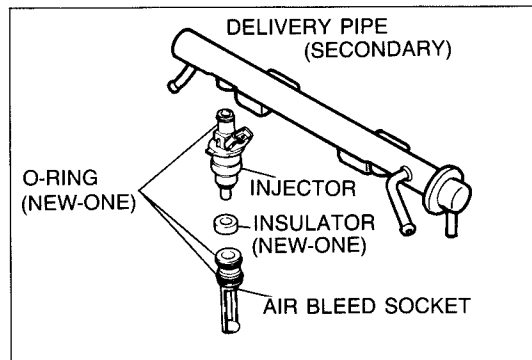
97U0F2-118



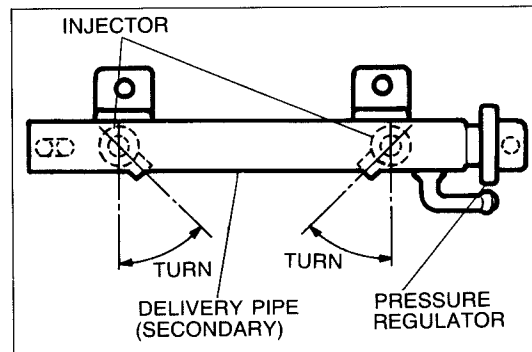
97U0F2-119



97U0F2-120



97U0F2-121



97U0F2-122

Installation

Install the injectors in the reverse order of removal.

Installation note (Priming injectors)

1. Install the parts in the sequence shown in the figure.
2. Use new O-rings and insulators.

Caution

Install the primary injector bewareng folls.

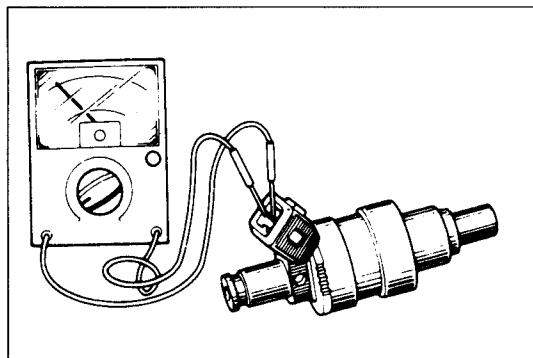
3. Align the tabs of the mixing plate with the notches in the intermediate housing.

4. Align the primary injector as shown.

Installation note (secondary injectors)

1. Install the parts in the order shown.
2. Use new O-rings and insulators.

3. Align the secondary injectors as shown in the figure.



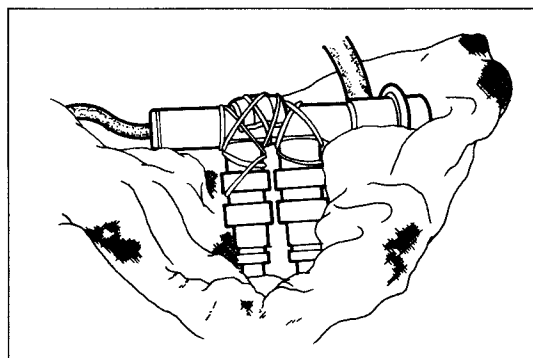
97U0F2-123

Inspection

Resistance inspection

1. Remove the throttle body and dynamic chamber.
2. Disconnect the injector connectors.
3. Measure injector resistance.

Resistance: 12—16 Ω



97U0F2-124

Leakage inspection

Caution

Affix the injectors firmly to the delivery pipe so that no movement is possible.

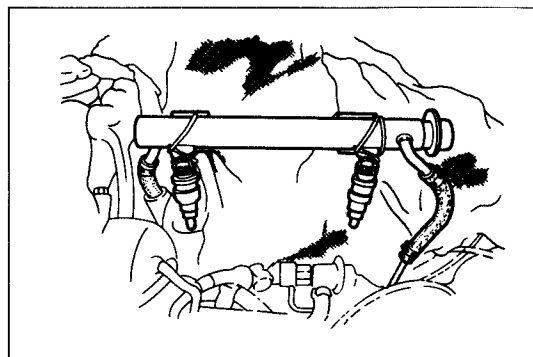
Warning

Be extremely careful when working with fuel. Always work away from sparkes and open flames, and wrap with a rag as shown.

1. Remove the injectors, delivery pipe, and fuel hoses.
2. Affix the injectors to the delive pipe with wire.
3. Connect the terminals of the fuel pump check connector (Yellow: 2-pin) with a jumper wire. Turn ON the ignition switch.
4. Verify that fuel does not leak from the injector nozzles.

Note

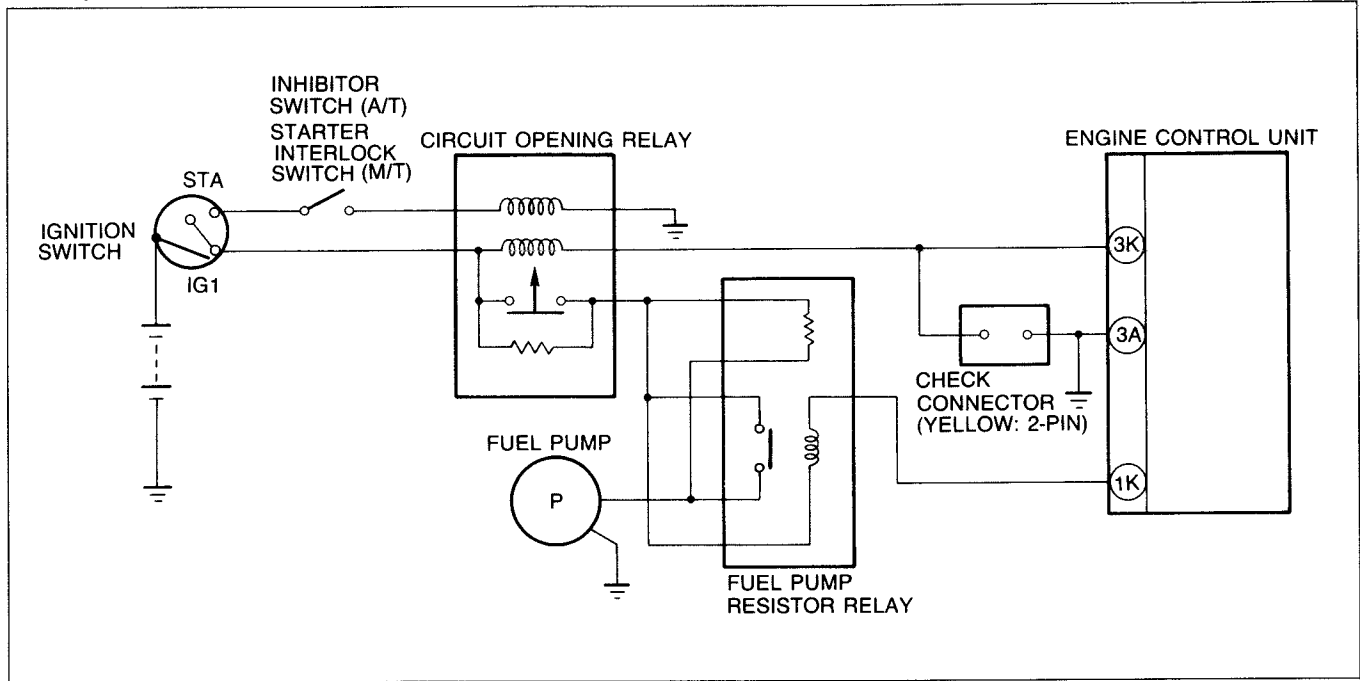
After 5 min. a very slight amount of fuel leakage from the injector is acceptable.



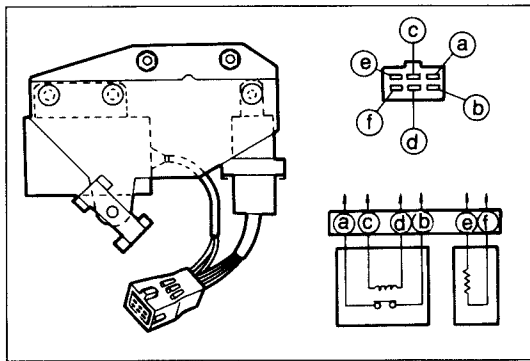
97U0F2-125

FUEL PUMP CONTROL SYSTEM

This system is provided to assure good fuel pump operation.



97U0F2-126



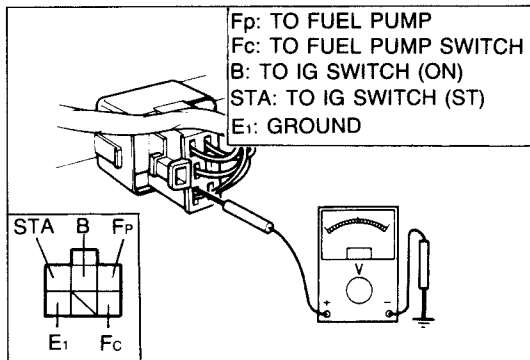
97U0F2-127

Fuel Pump Resistor Relay Inspection

1. Remove the air cleaner and airflow meter.
2. Disconnect the fuel pump resistor relay connector.
3. Check the resistance.

Resistance: a—b 0Ω
 c—d 60—92Ω
 e—f 0.70—0.94Ω

4. Replace the relay, if necessary.

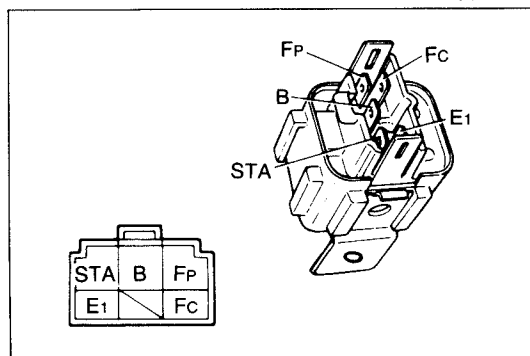


97U0F2-128

CIRCUIT OPENING REPLAY Inspection of Terminal Voltage

1. Measure the voltage between the terminals and a ground with a voltmeter.

Condition	Terminal	Fp	Fc	B	STA	E1
Ignition SW: ON		0V	12V	12V	0V	0V
Measuring plate: open		12V	0V	12V	0V	0V
Ignition SW: ST		12V	0V	12V	12V	0V



97U0F2-129

Inspection of Resistance

1. Measure the resistance between the terminals with an ohmmeter.

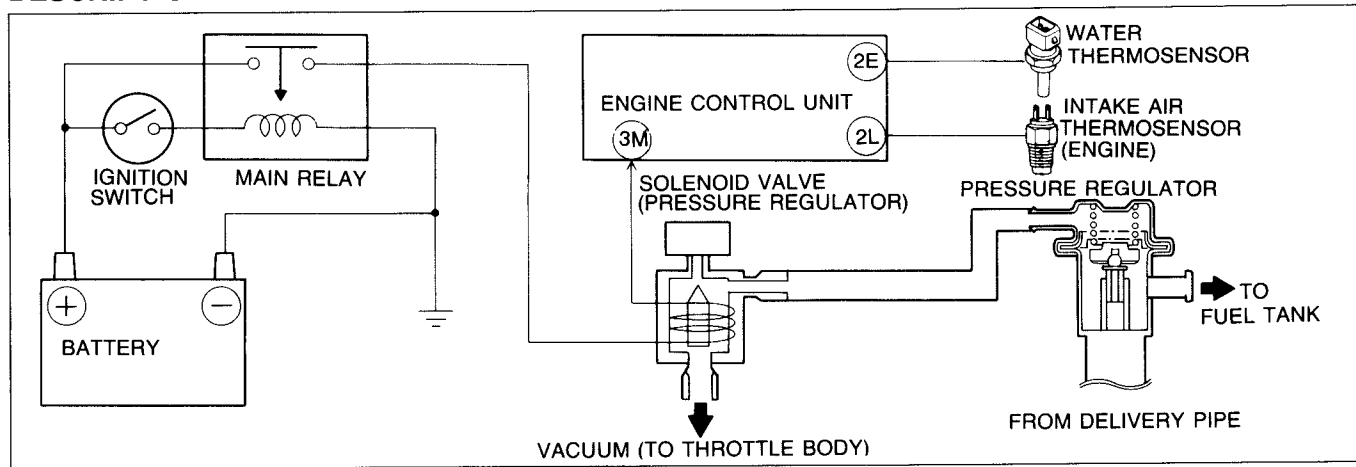
Terminals	Resistance (Ω)
STA ↔ E1	21—43
B ↔ Fc	109—226
B ↔ Fp	∞

2. If the resistance is not within specification, replace the circuit opening relay.

F1 PRESSURE REGULATOR CONTROL (PRC) SYSTEM

PRESSURE REGULATOR CONTROL (PRC) SYSTEM

DESCRIPTION



97U0F1-069

To prevent percolation of the fuel during idle after the engine is restarted, vacuum is cut to the pressure regulator increasing the fuel pressure.

SYSTEM OPERATION

Specified operation time: For above **50 sec.** after cranking (Coolant temperature: Above **65°C**, Intake air temperature (Engine): Above **45°C**)

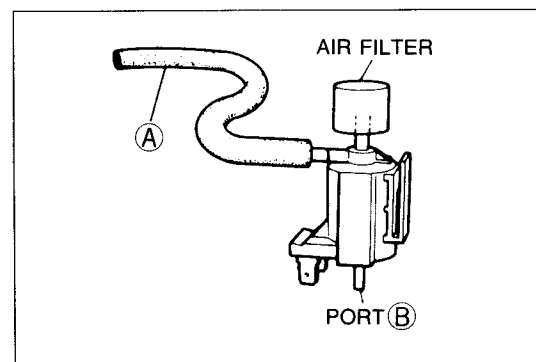
97U0F1-070

TROUBLESHOOTING

Check the condition of the wiring harness and connectors before checking the sensors or switches.

Symptom	Possible cause Page	Solenoid valve (Pressure regulator control) F1-58	Water thermosensor F1-83	Intake air thermosensor (Engine) F1-82	Engine control unit terminal	
					3M F1-81	1B F1-79
Hard start or No start (Crank OK)		1	3	4	2	2
High idle speed (At normal operating temperature)		1	3	4	2	2

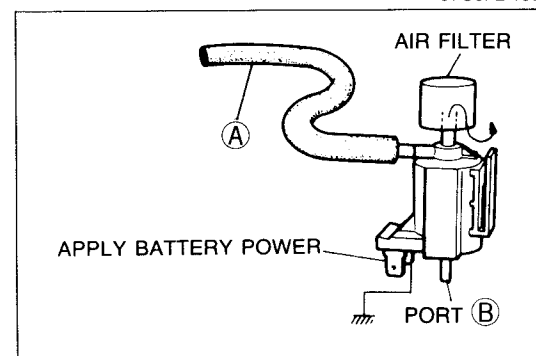
97U0F1-071



97U0F2-133

SOLENOID VALVE (PRESSURE REGULATOR CONTROL) Inspection

1. Disconnect the vacuum hose from the solenoid valve and vacuum pipe.
2. Blow through the solenoid valve from (A).
3. Verify that air flows from port (B).



97U0F2-134

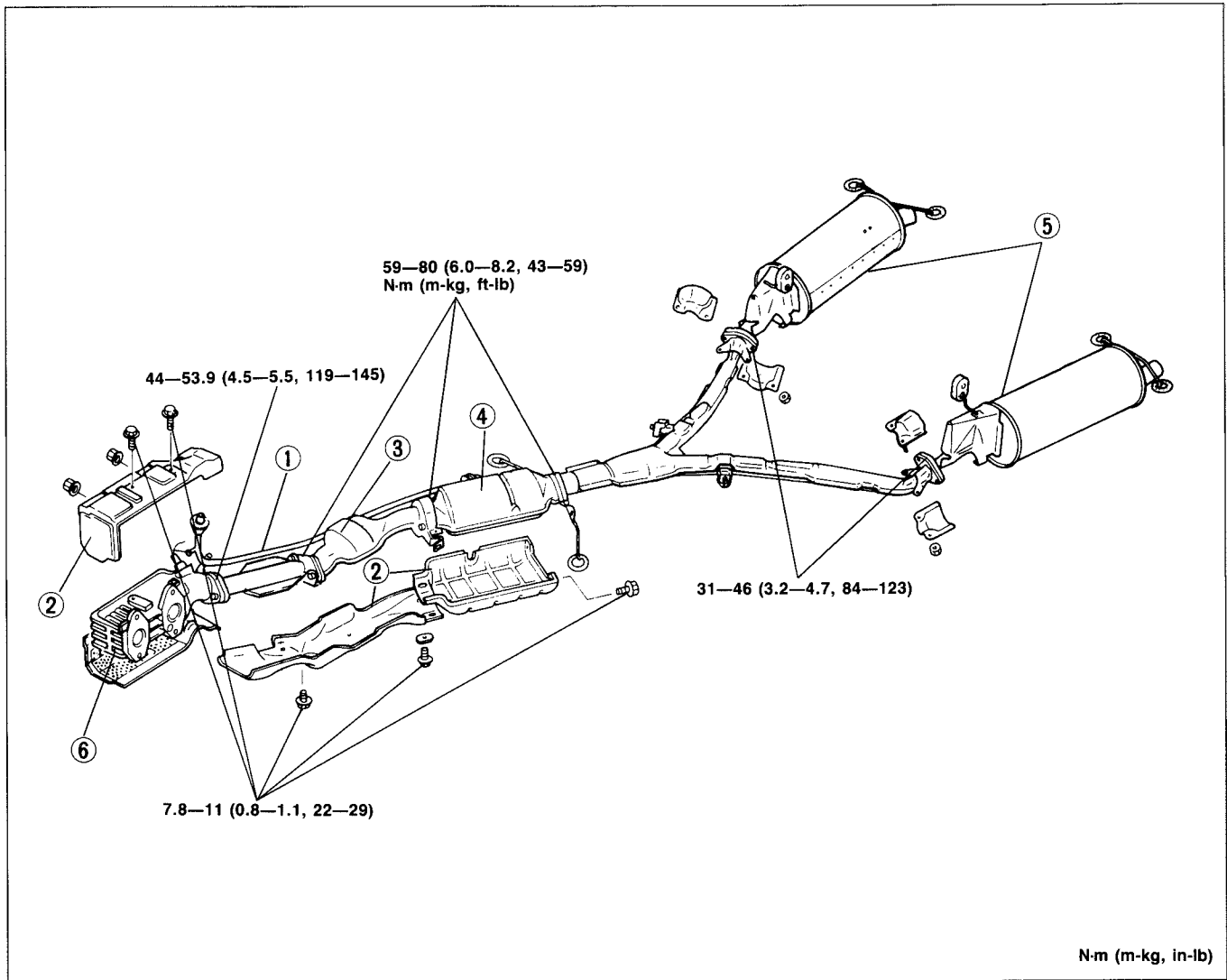
4. Disconnect the solenoid valve connector.
5. Connect 12V and a ground to the terminals of the solenoid valve.
6. Blow through the solenoid valve from the vacuum hose (A).
7. Verify that air flows from the valve air filter.

EXHAUST SYSTEM

COMPONENT PARTS

Removal

Remove in the order shown in the figure.

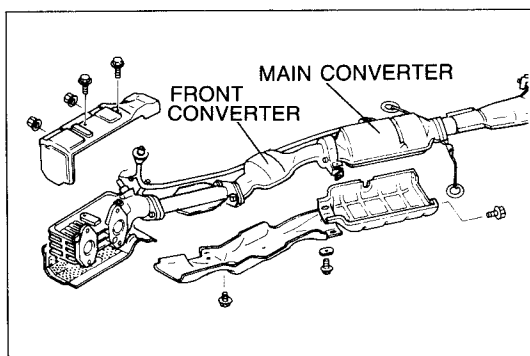


97U0F1-072

- | | |
|---------------------|---------------------|
| 1. Split air pipe | 4. Main converter |
| 2. Insulator covers | 5. Main silencer |
| 3. Front converter | 6. Exhaust manifold |

Installation

Install in the reverse order of removal.
Tighten all nuts and bolts to the specified torques.



97U0F2-136

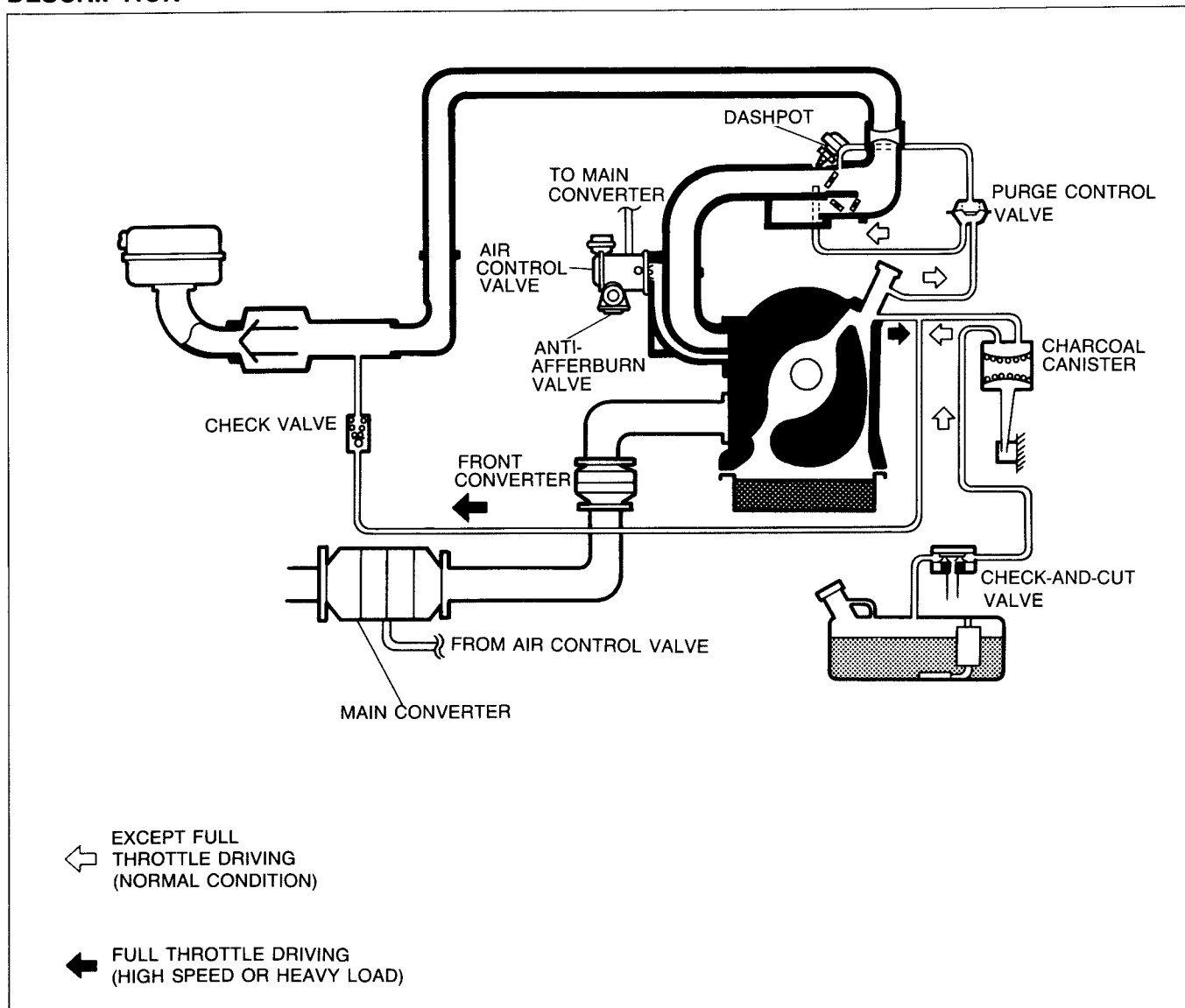
Inspection

1. Visually inspect the front converter and main converters for cracks or other damage.
2. Check the exhaust system connections for tightness.
3. Start the engine and run it at idle.
4. Check for exhaust gas leakage from the exhaust system connections.

F1 OUTLINE OF EMISSION CONTROL SYSTEM

OUTLINE OF EMISSION CONTROL SYSTEM

DESCRIPTION



97U0F1-104

For reduced CO, HC, and NO_x emissions, there are many emission control systems as shown in the figure.

1. Secondary air injection system (Air control valve)

This system is to burn spent exhaust gases by introducing fresh air into the exhaust port or main converter.

2. Crankcase and evaporative emission control system

Evaporative emission control system

This system stores fuel vapors generated in the fuel tank in the canister while the engine is not running. This fuel vapor is stored in the canister until it is drawn into the dynamic chamber and burned when the engine is started.

Crankcase emission control system

When the engine is running at idle, the purge control valve is opened slightly and a small amount of blowby gas is drawn into the dynamic chamber.

At high engine speed or heavy-load condition, the purge control valve is further opened and a larger amount of blowby gas is drawn into the dynamic chamber.

3. Deceleration control system

- Dashpot: To prevent the throttle valves from closing suddenly.
- Fuel cut: To improve the fuel economy and to prevent engine bucking during deceleration.

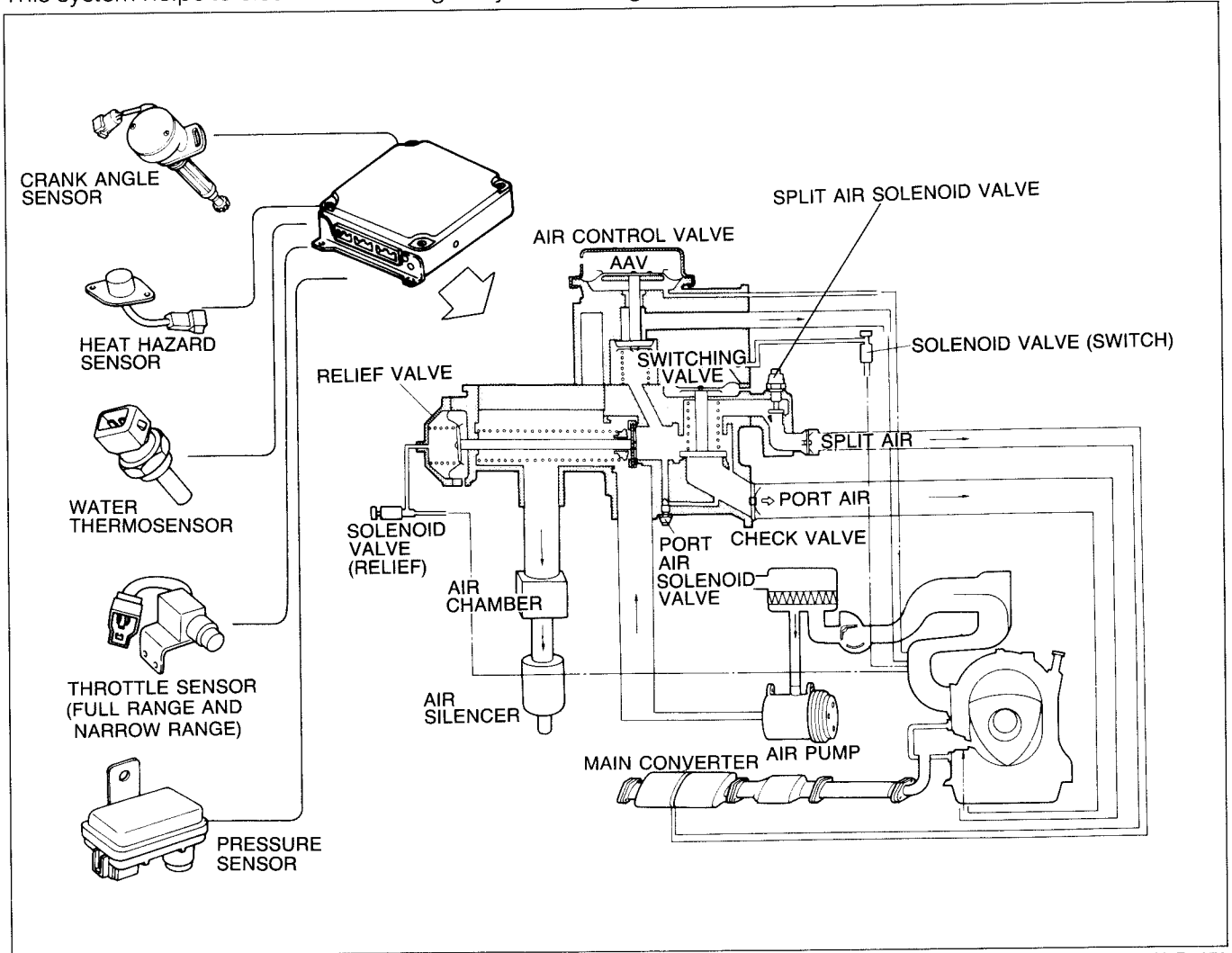
4. Catalytic converter

There are two three-way catalytic converters used to reduce CO, HC and NO_x emissions. They reduce CO and HC through oxidization and NO_x by chemical reaction.

SECONDARY AIR INJECTION CONTROL SYSTEM

DESCRIPTION

This system helps to clean the exhaust gas by introducing fresh air into the exhaust port and main converter.



97U0F1-073

TROUBLESHOOTING

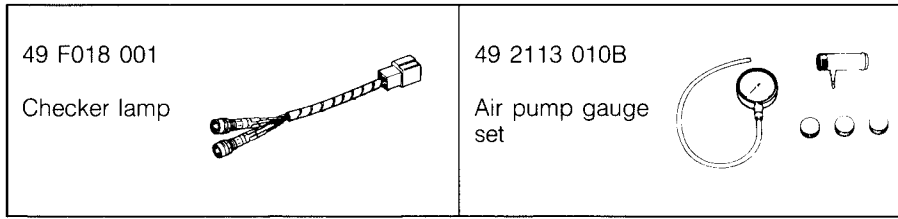
Check the condition of the wiring harness vacuum hoses, and check connectors before checking the sensors or switches.

Possible cause	Page										Engine control unit terminal			
	System inspection	Air pump	Check valves (in intake manifold and in intake manifold to catalytic converter)	Air control valve	Solenoid valve (Switch)	Solenoid valve (Relief)	Heat hazard sensor	Split air solenoid valve	Port air solenoid valve	3I	2O	2P	2N	
	F1-62	F1-65	F1-67	F1-67	F1-63	F1-64	F1-85	F1-65	F1-64	F1-81	F1-80	F1-80	F1-80	
Symptom														
Rough idle	1	3	8	4	5	6	7	—	—	—	2	2	—	
Afterburn	1	3	8	4	5	6	7	—	—	—	2	2	—	
Fails emission test	1	3	10	4	7	8	9	5	6	2	2	2	2	

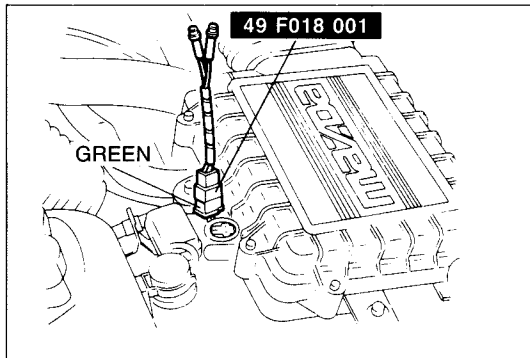
97U0F1-074

F1 SECONDARY AIR INJECTION CONTROL SYSTEM

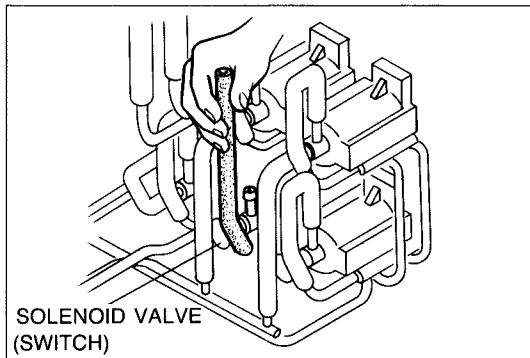
PREPARATION SST



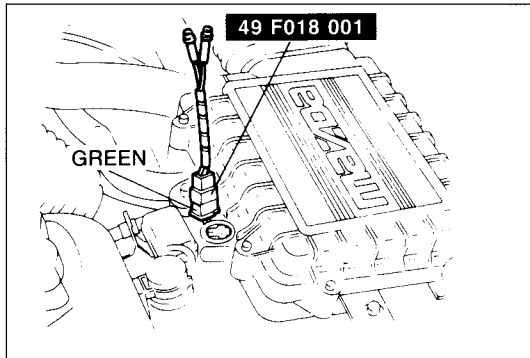
97U0F2-140



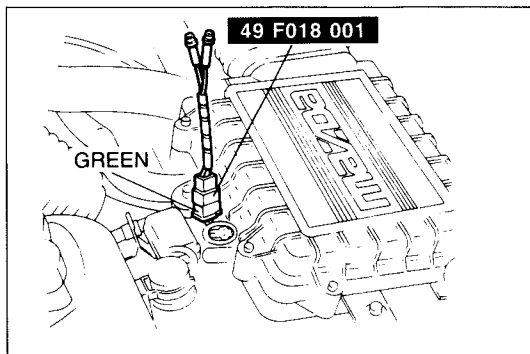
97U0F1-105



97U0F1-075



97U0F1-076



97U0F1-077

SYSTEM INSPECTION Solenoid Valve (Switch)

1. Warm up the engine and run it at idle.
2. Connect a tachometer to the engine.
3. Connect the **SST** to the check connector (Green: 3-pin).

4. Disconnect the vacuum hose (solenoid valve (switch) to air control valve) at the switching solenoid valve.
5. Place a finger over the pipe opening.

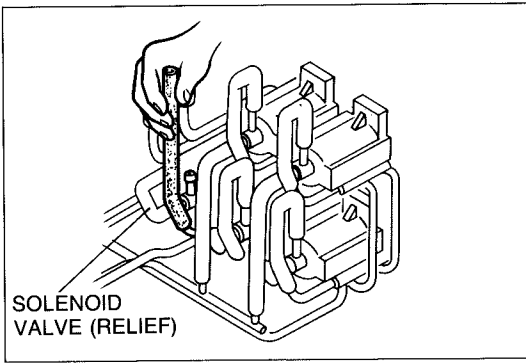
6. Note the operation of the red lamp of the **SST** and the presence or absence of vacuum at that vacuum is felt.

Engine condition	Checker lamp illumination	Sucking air
Idle	Red lamp does not illuminate	Yes
Half throttle	Red lamp illuminate	No

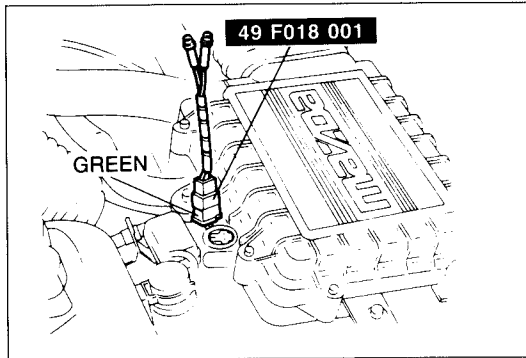
Solenoid Valve (Relief)

1. Warm up the engine and run it at idle.
2. Connect a tachometer to the engine.
3. Connect the **SST** to the check connector (Green: 3-pin).

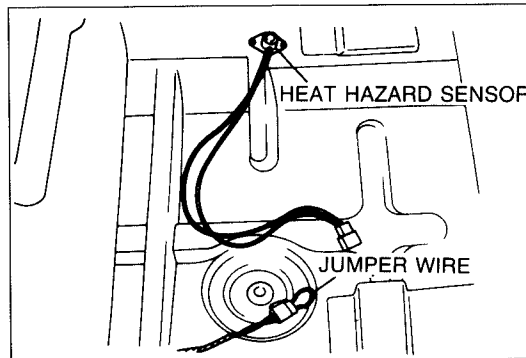
SECONDARY AIR INJECTION CONTROL SYSTEM F1



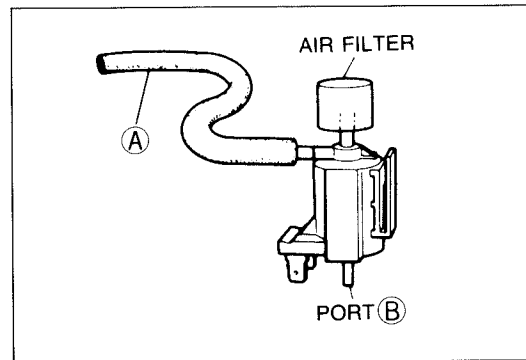
97U0F1-078



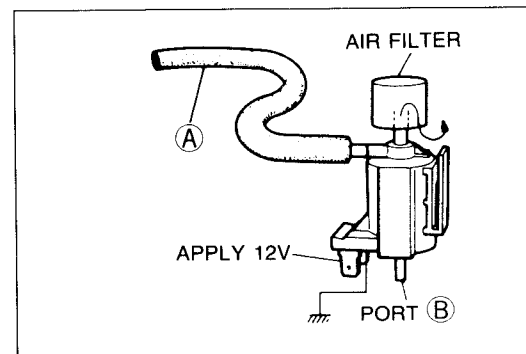
97U0F1-079



97U0F1-080



97U0F1-081



97U0F2-149

4. Disconnect the vacuum hose (Solenoid valve (Relief) to air control valve) at the relief solenoid valve.
5. Place a finger over the pipe opening.

6. Note the operation of the green lamp of the **SST** and the presence or absence of vacuum at that vacuum is felt.

Engine condition	Checker lamp illumination	Sucking air
Idle	Green lamp illuminate	No
Above 3,600 rpm (Except deceleration)	Green lamp does not illuminate	Yes

Note

The checker lamp may turn OFF at approx. 1,200 rpm. This is normal.

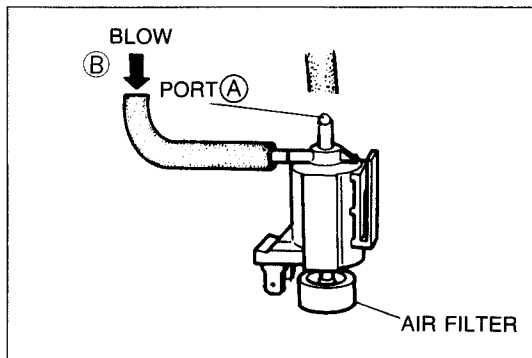
7. Disconnect the heat hazard sensor connector, and connect a jumper wire to the terminals in the connector.
8. Verify that the Green lamp does not illuminate and that air sucks from the port opening at any engine speed.
9. Disconnect the jumper wire and reconnect the heat hazard sensor.
10. Start the engine and gradually increase the rpm. Check that the Green lamp does not illuminate and that air flows from the port opening when the engine speed is **over 1,000—1,200 rpm**.

SOLENOID VALVE (SWITCH)

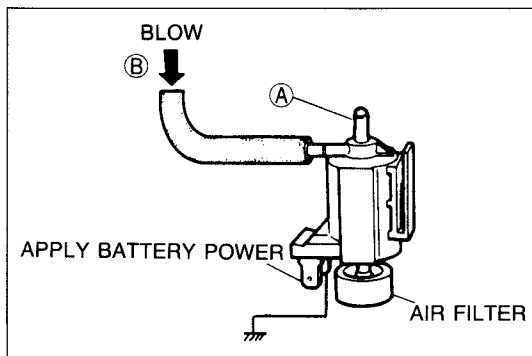
Inspection

1. Disconnect the vacuum hoses from the solenoid valve.
2. Blow through the solenoid valve from port (A).
3. Verify that air passes through the valve and flows from port (B).
4. Disconnect the solenoid valve connector and connect **12V** and a ground to the terminals on the solenoid valve.
5. Blow through the solenoid valve from port (A).
6. Verify that air flows from the air filter.
7. If not as specified, replace the solenoid valve.

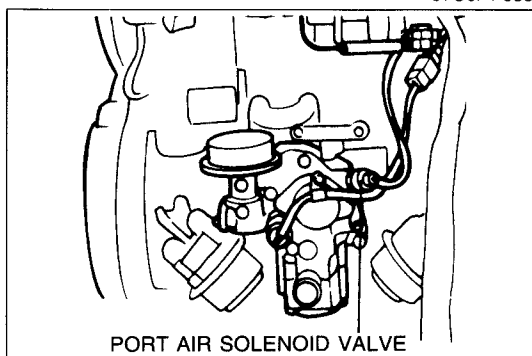
F1 SECONDARY AIR INJECTION CONTROL SYSTEM



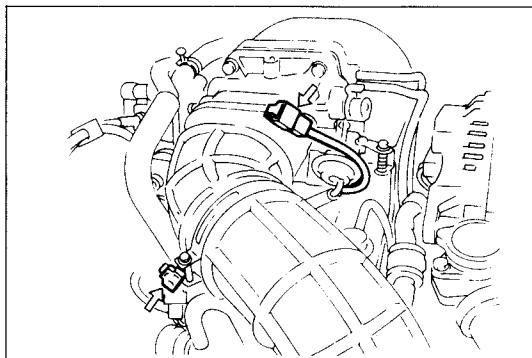
97U0F1-082



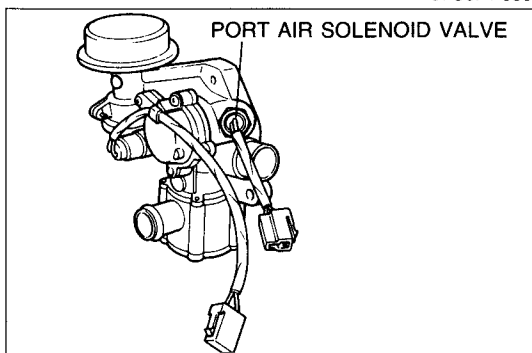
97U0F1-083



97U0F1-084



97U0F1-085



67U04X-080

SOLENOID VALVE (RELIEF)

Inspection

1. Disconnect the vacuum hose from the solenoid valve.
2. Blow through the solenoid valve from port (B).
Check that air passes through the valve and flows from the air filter.
3. Disconnect the solenoid valve connector and connect 12V and a ground to the terminals of the solenoid valve.
4. Blow through the solenoid valve from port (B).
Check that air passes through the solenoid valve and flows from port (A).

PORT AIR SOLENOID VALVE

Inspection

1. Connect a voltmeter to the port air solenoid valve (L) terminal and ground.
2. Start the engine and run it at idle speed.
3. Observe the voltmeter reading.

Voltmeter reading: below 2.5V

4. Half open the throttle valve.
5. Observe the voltmeter reading.

Voltmeter reading: approx. 12V

Note

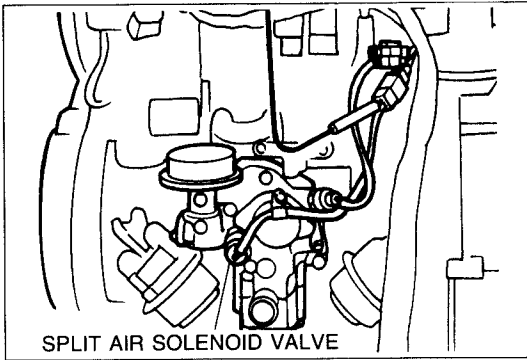
The solenoid valve voltage reading will be a constant below 2.5V (approx.) after the vehicle has accumulated over 20,000 miles.

Removal

1. Disconnect the port air solenoid valve connector.
2. Remove the solenoid valve.

Installation

Install in the reverse order of removal.



97U0F1-086

SPLIT AIR SOLENOID VALVE

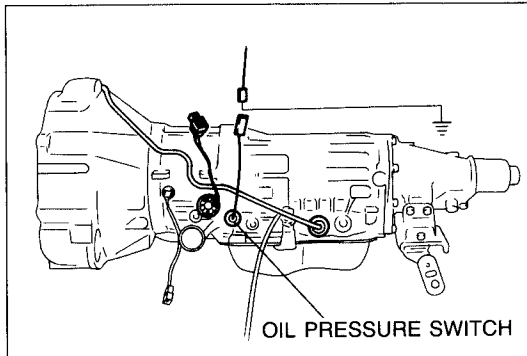
Inspection (M/T)

1. Connect a voltmeter to the split air solenoid valve (L/B) terminal and ground.
2. Turn the ignition switch ON.
3. Shift into 5th gear and observe the voltmeter reading.

Voltage: 5th gear: Below 2.5V
Others : Approx. 12V

Note

Always below 2.5V at high altitude.



97U0F1-087

Inspection (A/T)

1. Disconnect the oil pressure switch and connect a jumper wire between the connector and ground.
2. Connect a voltmeter to the split air solenoid valve (L/B) terminal and ground.
3. Turn the ignition switch ON.
4. Shift into "D" range and observe the voltmeter reading.

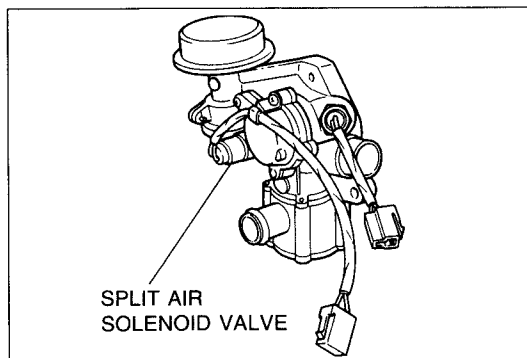
Voltage: D range: Below 2.5V
Others : Approx. 12V

Removal

1. Disconnect the split air solenoid valve connector.
2. Remove the solenoid valve.

Installation

Install in the reverse order of removal.



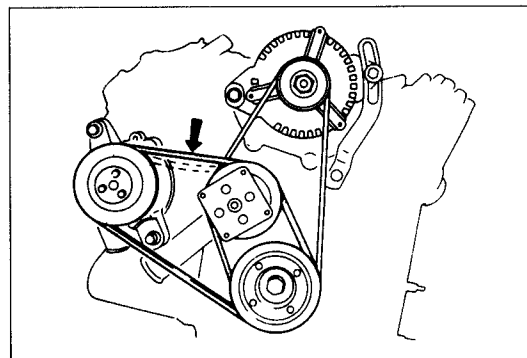
67U04X-077

AIR PUMP

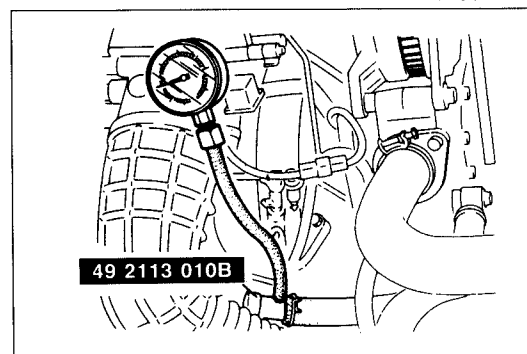
Inspection

1. Warm up the engine to normal operating temperature.
2. Check the hoses and connections for leaks.
3. Check the air pump for noise.
4. Check the air pump drive belt tension.
5. Adjust, repair or replace, if necessary.
6. Disconnect the air hose (air pump—air control valve) at the air control valve.
7. Connect the **air pump gauge set** (49 2113 010B) to the air hose.
8. Connect a tachometer to the engine.
9. Start the engine and run it at idle speed.
10. Observe the pressure reading.
11. Replace the pump if necessary.

Pressure: 11.8 kPa (0.12 kg/cm², 1.7 psi) at idle

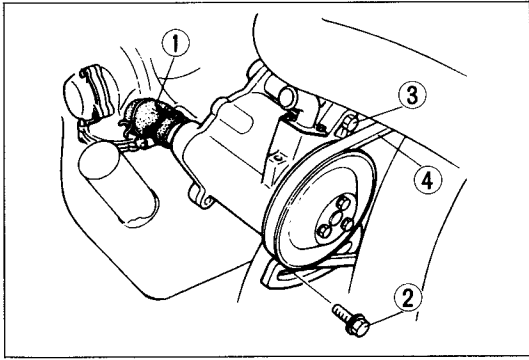


67U04X-042

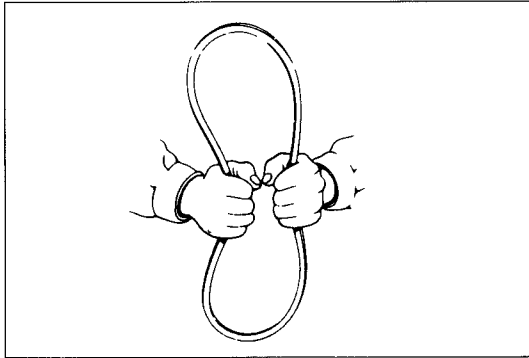


87U04A-031

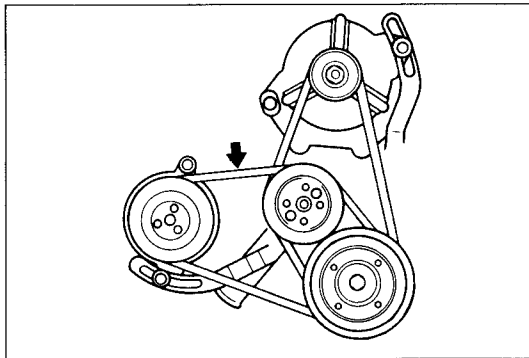
F1 SECONDARY AIR INJECTION CONTROL SYSTEM



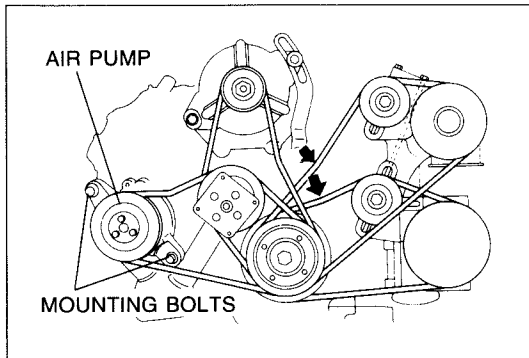
67U04X-044



67U04X-045



97U0F1-088



97U0F1-089

Removal

1. Disconnect the air hose.
2. Remove the air pump strap bolt.
3. Remove the air pump mounting bolt.
4. Remove the air pump drive belt and remove the air pump.

Installation

Install the air pump in the reverse order of removal and adjust the drive belt tension.

AIR PUMP DRIVE BELT

Inspection

1. Check the drive belt for cracks, deterioration or oil contamination.
Replace if necessary.
2. If the belt is noisy, check for loose or misaligned pulleys.

Adjustment

1. Loosen the air pump strap bolt and mounting bolt.
2. Move the air pump closer to or away from the engine until the correct belt tension is obtained.

**Belt tension: 11—13mm (0.43—0.51 in)
when pressed at 98 N (10 kg, 22 lb)**

3. Tighten the bolts.

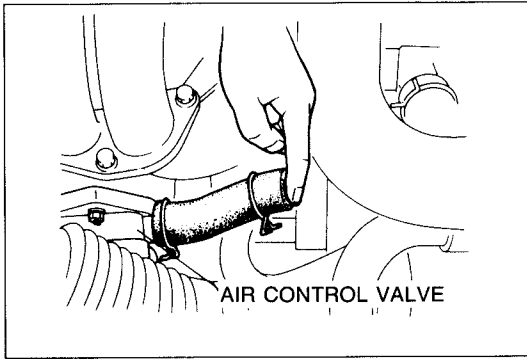
Removal

1. Loosen the A/C and P/S pulley drive belts (if equipped) until the air pump drive belt can be removed.
2. Loosen the air pump strap and mounting bolts, and move the air pump until the drive belt can be removed.

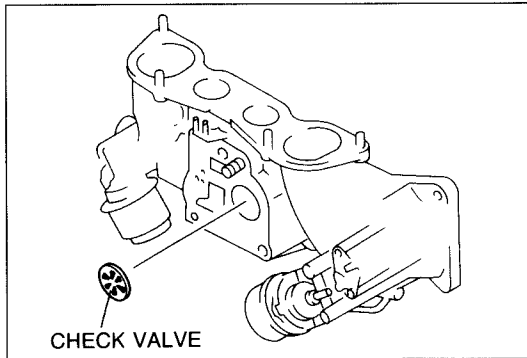
Installation

1. Install a new belt and adjust the belt tension (Refer to "Adjustment").
2. Install the other drive belts and adjust the belt tension.

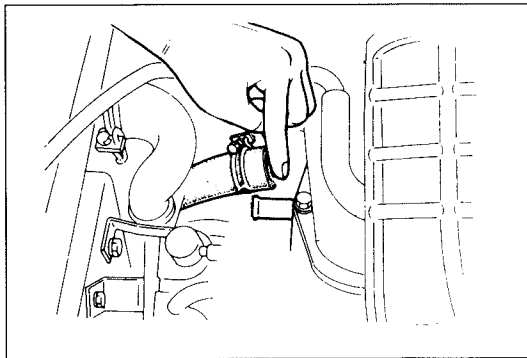
Belt tension:
8—9mm (0.31—0.35 in) — A/C
11—13mm (0.43—0.51 in) — P/S
when pressed at 98 N (10 kg, 22 lb)



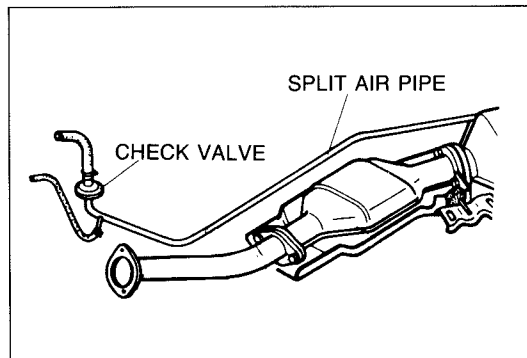
67U04X-048



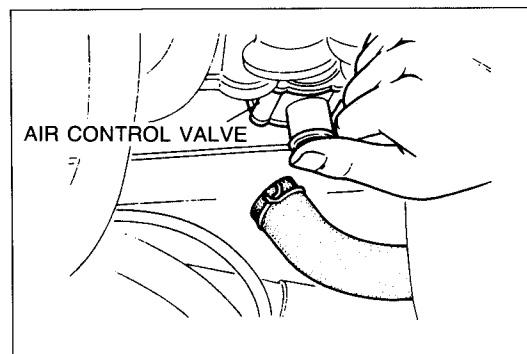
67U04X-049p



67U04X-050



67U04X-051



67U04X-052

CHECK VALVE (IN INTAKE MANIFOLD)

Inspection

1. Disconnect the air hose (air pump to air control valve) at the air pump.
2. Connect a tachometer to the engine.
3. Start the engine and disconnect the connector from the switching solenoid valve.
4. Increase the engine speed to **1,500 rpm** and check for exhaust gas leakage at the air inlet fitting on the air control valve.
5. Replace the check valve if there is exhaust gas leakage.

Removal

1. Remove the air control valve. (Refer to page F1-43.)
2. Remove the gasket and check valve.

Installation

Install the check valve in the reverse order of removal.

CHECK VALVE (INTAKE MANIFOLD TO CATALYTIC CONVERTER)

Inspection

1. Disconnect the air hose (intake manifold to catalytic converter) at the rear of the intake manifold.
2. Connect a tachometer to the engine.
3. Start the engine.
4. Place a finger over the air hose opening.
5. Increase the engine speed to **1,500 rpm** and check for exhaust gas leakage from the air hose opening.
6. Replace the check valve, if there is exhaust gas leakage.

Removal

1. Unfasten the clip and disconnect the air hose from the check valve.
2. Remove the split air pipe attaching bolts and remove the air pipe assembly.

Installation

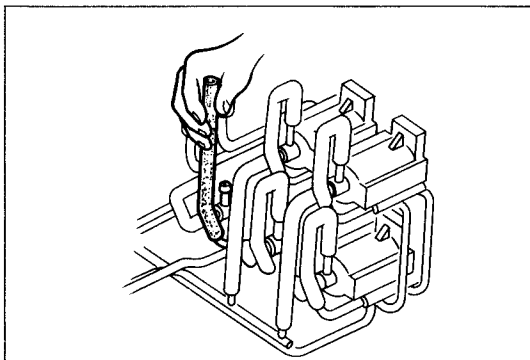
Install the check valve and air pipe assembly in the reverse order of removal.

AIR CONTROL VALVE

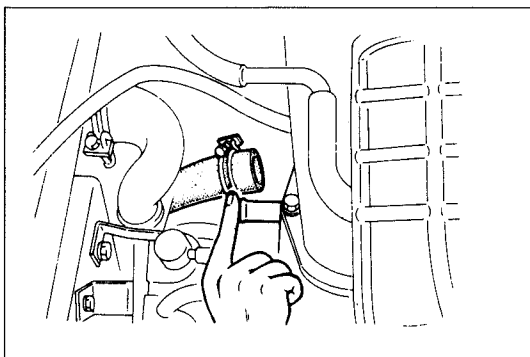
Inspection

1. Warm up the engine to normal operating temperature.
2. Connect a tachometer to the engine.
3. Disconnect the air hose (air silencer to air control valve) at the air control valve.
4. Place a finger over the air control valve outlet.
5. Increase the engine speed and check that air begins to flow out from **1,500 to 2,500 rpm**.

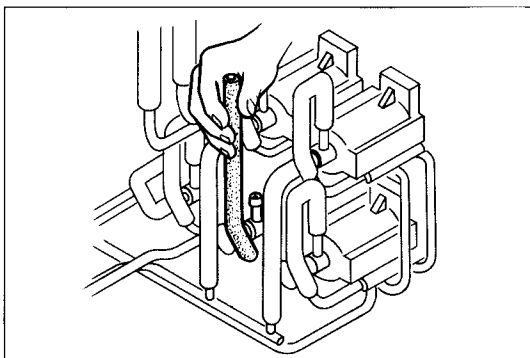
F1 SECONDARY AIR INJECTION CONTROL SYSTEM



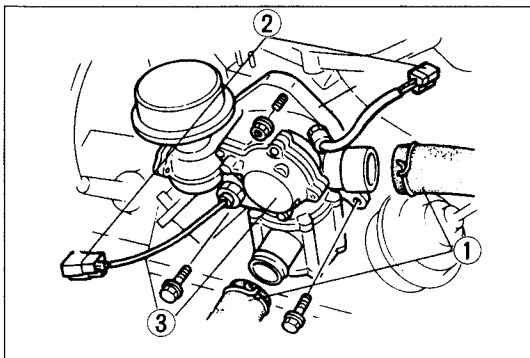
67U04X-053



67U04X-054



67U04X-055



97U0F1-090

6. Run the engine at idle speed.
7. Disconnect the vacuum hose (Solenoid valve (Relief) to air control valve) at the relief solenoid valve.
8. Check that air flows out.
9. Reconnect the vacuum hose and the air hose.

10. Disconnect the split air hose (check valve to intake manifold) at the intake manifold.
11. Place a finger over the port opening.

12. Disconnect the vacuum hose (Solenoid valve (Switch) to air control valve) at the switching solenoid valve.
13. Check that air flows out.
14. Reconnect the vacuum hose and split air hose.
15. Replace the air control valve, if necessary.

Removal

Remove the parts in the numbered sequence as shown in the figure.

1. Air hose
2. Split air solenoid valve and port air solenoid valve connector
3. Air control valve

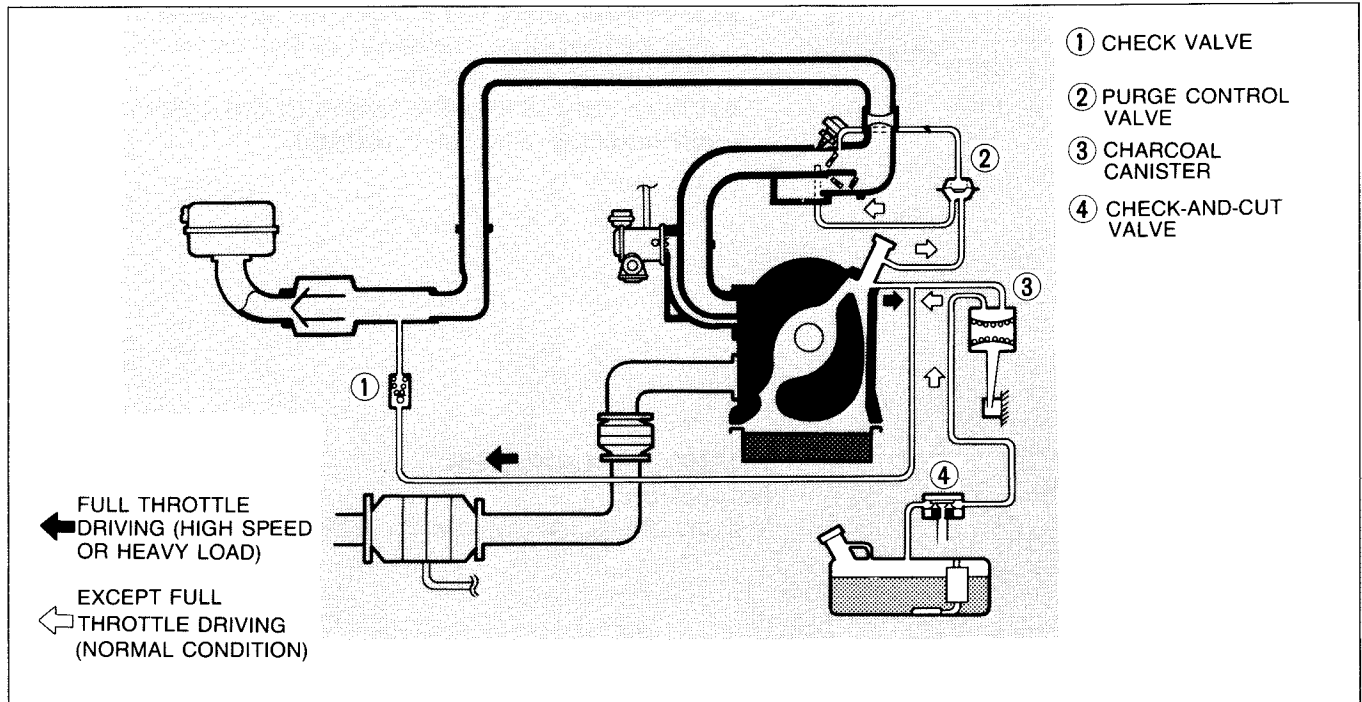
Installation

Install the air control valve in the reverse order of removal.

CRANKCASE AND EVAPORATIVE EMISSION CONTROL SYSTEM

DESCRIPTION

- Evaporative emission control system: This system stores the fuel vapors generated in the fuel tank, in the canister while the engine is not running. The fuel vapor is stored in the canister until it drawn into the dynamic chamber and burned when the engine is started.
- Crankcase emission control system: When the engine is running at idle the purge control valve is opened slightly and a small amount of blowby gas is drawn into the dynamic chamber and burned. At high engine speed or heavy-load condition the purge control valve is further opened and a larger amount of blowby gas is drawn into the dynamic chamber.



97U0F2-161

SYSTEM INSPECTION

Evaporative Line Inspection

1. Disconnect the ventilation hose from the pipe at the canister and connect a vacuum hose pump tester to the pipe.
2. Operate the vacuum pump tester and verify that no vacuum is held.
3. If vacuum is held, check the check-and-cut valve and evaporation pipe for blockage.

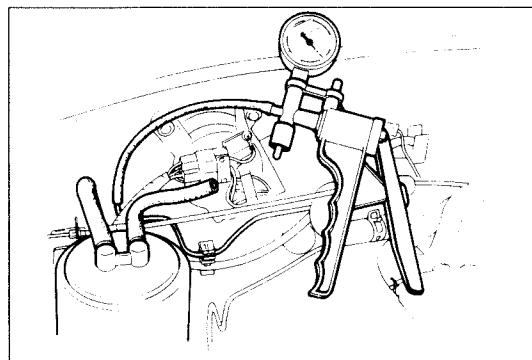
CHECK-AND-CUT VALVE Inspection

1. Remove the check-and-cut valve.

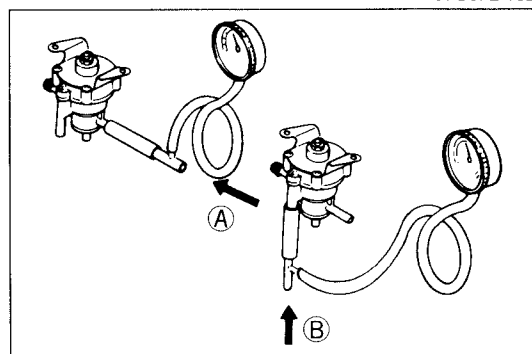
Note

The following checks must be performed with the valve held horizontally.

2. Connect a pressure gauge to the passage that connectors to the fuel tank (A).
3. Blow through the valve with holding horizontally from (A) and check that the valve opens at a pressure of **0.98—4.9 kPa (0.01—0.05 kg/cm², 0.14—0.71 psi)**.
4. Remove the pressure gauge and connect it to the passage to atmosphere.
5. Blow through the valve with holding horizontally from (B) and verify that the valve opens at a pressure of **5.39—6.87 kPa (0.055—0.07 kg/cm², 0.78—1.00 psi)**.

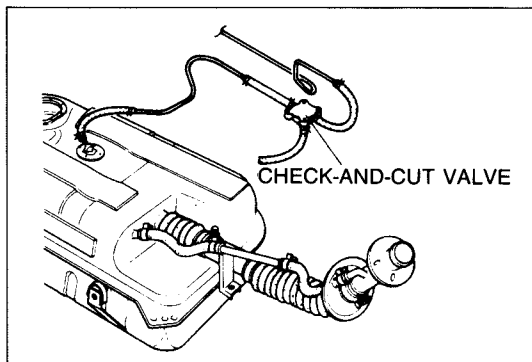


97U0F2-162



97U0F2-163

F1 CRANKCASE AND EVAPORATIVE EMISSION CONTROL SYSTEM



97U0F2-164

Removal

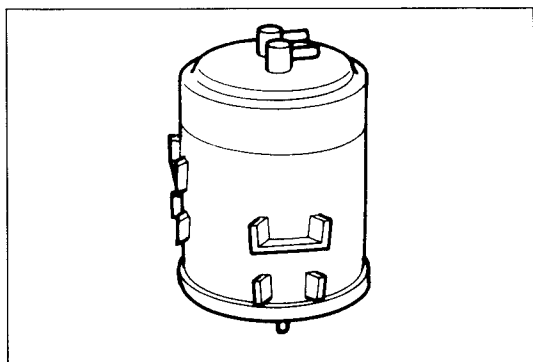
1. Raise the rear of the vehicle and support it with stands.
2. Unfasten the clamps bands and disconnect the evaporative hoses from the check-and-cut valve.
3. Remove the valve.

Installation

Install in the reverse order of removal.

Caution

- a) When installing the check-and-cut valve, fully push the evaporative hoses on to the valve and secure the hoses with bands.
- b) When connecting the hoses to the valve, note the direction of the valve fittings.

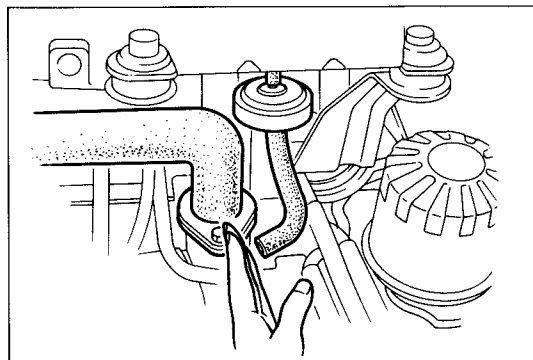


97U0F2-165

CHARCOAL CANISTER

Inspection

Visually check the canister for leakage or damage.

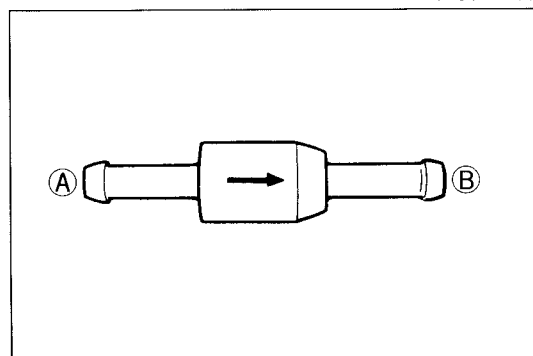


97U0F2-166

PURGE CONTROL VALVE

Inspection

1. Disconnect the hose (purge valve to oil filler pipe) from the purge control valve.
2. Start the engine and run it at idle.
3. Place a finger over the hose opening and verify that vacuum is not felt.
4. Increase the engine speed to **2,000 rpm**; vacuum should be felt.
5. Replace the valve, if necessary.



97U0F2-167

CHECK VALVE

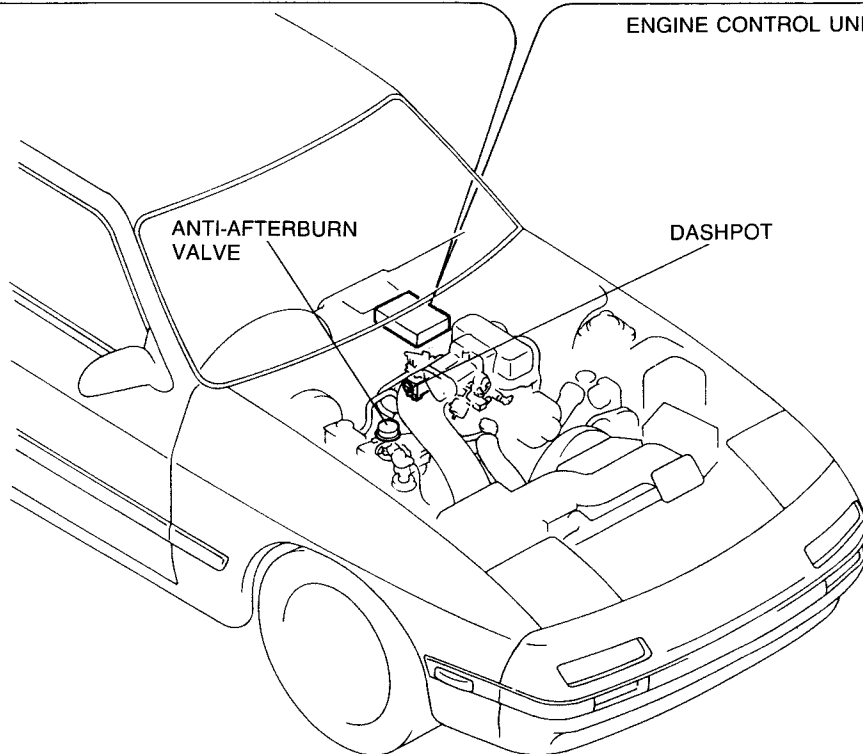
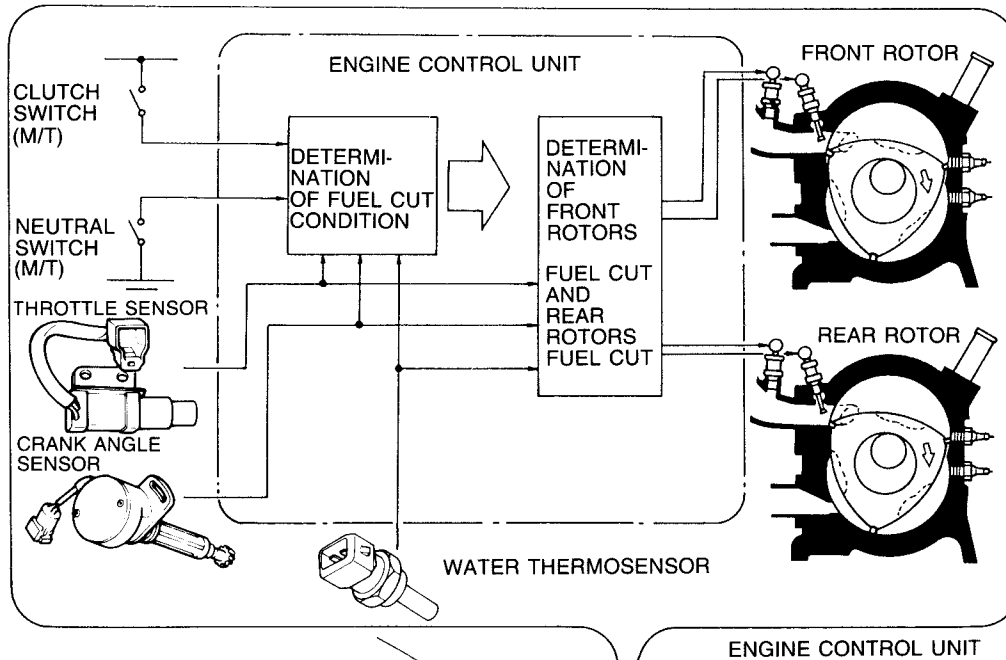
Inspection

1. Remove the check valve.
2. Blow through the check valve from port (A), and check that the air flows from port (B).
3. Blow through the check valve from port (B) and verify that there is no air flow.

DECELERATION CONTROL SYSTEM

DESCRIPTION

- Dashpot : To prevent the throttle valves from closing suddenly.
- Anti-afterburn valve : To prevent afterburn, air is supplied to intake manifold during deceleration.
- Fuel cut control : To improve the fuel economy and to prevent engine bucking during deceleration.



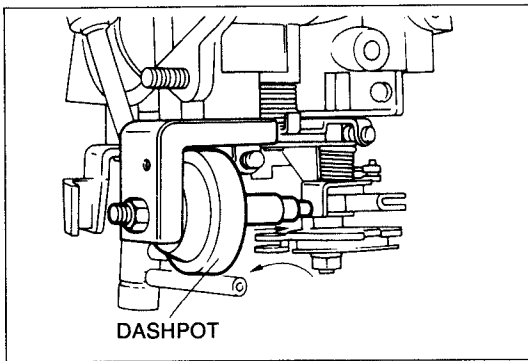
F1 DECELERATION CONTROL SYSTEM

TROUBLESHOOTING

Check the condition of the wiring harness, vacuum hoses and connectors before checking the sensors or switches.

Symptom	Possible cause	
	Dashpot	Anti-afterburn valve
Afterburn	F1-72 2	F1-72 1
Runs rough on deceleration	1	2
Fails emission test	1	2

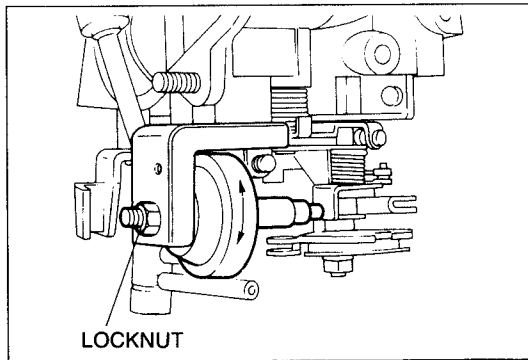
97U0F1-113



67U04X-086

DASHPOT Inspection

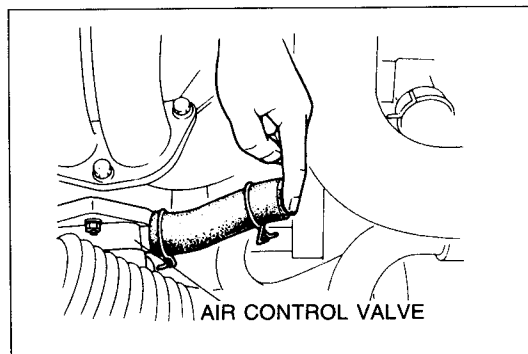
1. Open the throttle valve fully; then push the dashpot rod with a finger and check that the rod goes into the dashpot slowly.
2. Release the rod and check that it comes out quickly.
3. Replace it, if necessary.



67U04X-087

Adjustment

1. Warm up the engine to the normal operating temperature and run it at idle speed.
2. Connect a tachometer to the engine.
3. Increase the engine speed to **3,500 rpm**.
4. Slowly decrease the engine speed and check that the dashpot rod contacts the lever at **2,700—3,100 rpm**.
5. Loosen the locknut and adjust by turning the dashpot, if necessary.



97U0F1-091

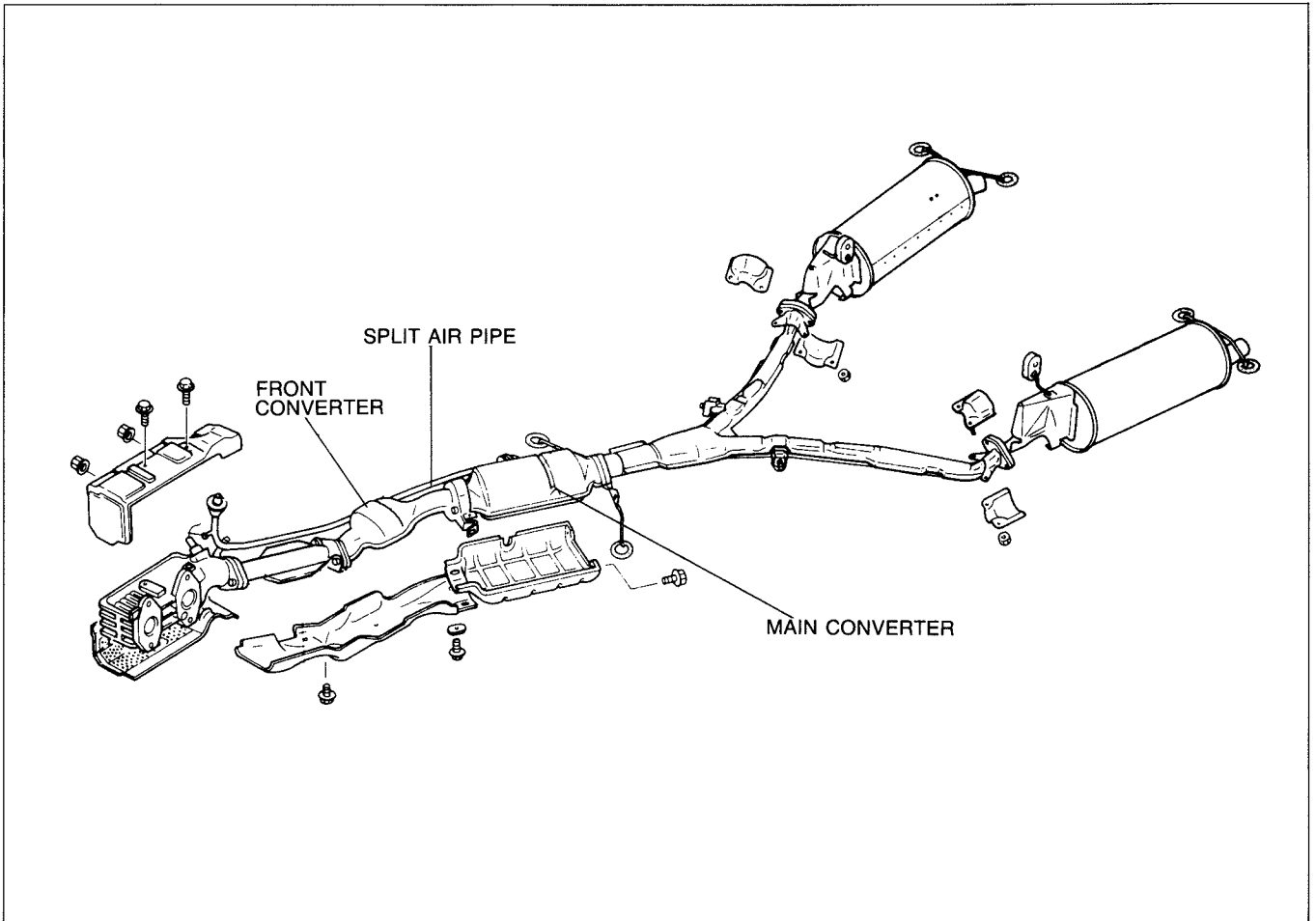
ANTI-AFTERBURN VALVE Inspection

1. Warm up the engine and run it at idle speed.
2. Disconnect the air hose (air control valve to air pump) at the air pump.
3. Place a finger over the air hose opening.
4. Verify that air is not sucked into the air hose at idle speed.
5. Increase the engine speed to more than **3,000 rpm**; then decrease it **rapidly**.
6. Verify that air is sucked into the air hose for a few seconds while decelerating.
7. Replace the air control valve assembly if necessary.

CATALYTIC CONVERTER SYSTEM

DESCRIPTION

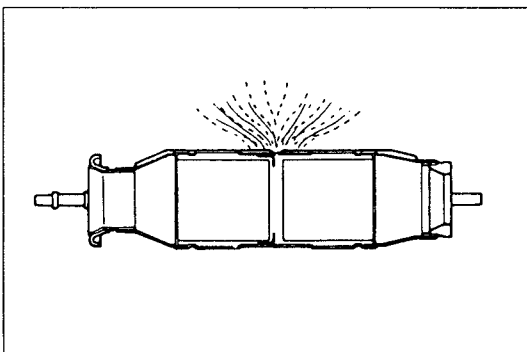
Two three-way catalytic converters are used to reduce CO, HC, and NOx emissions. For efficient operation, the front converter is placed close to the exhaust manifold so that it will heat up quickly and purify exhaust gas efficiently when engine runs at idle. The front converter also protects the main converter from damaged by acting as a phosphorus and lead filter.



97U0F1-092

The catalytic converters reduce CO and HC, emissions through oxidization and NOx emissions by chemical reaction.

Catalytic converter	Type	Active material	Volume cc (cu in)	Reduces
Front converter	Three-way	Platinum and rhodium	400 (24.4)	CO, HC, NOx
Main converter			2,900 (176.9)	



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CATALYTIC CONVERTER (FRONT CONVERTER AND MAIN CONVERTER)

Inspection

1. Check the catalytic converter for deterioration or clogging.
2. Check the insulation covers welded onto the catalytic converter for damage.

Note

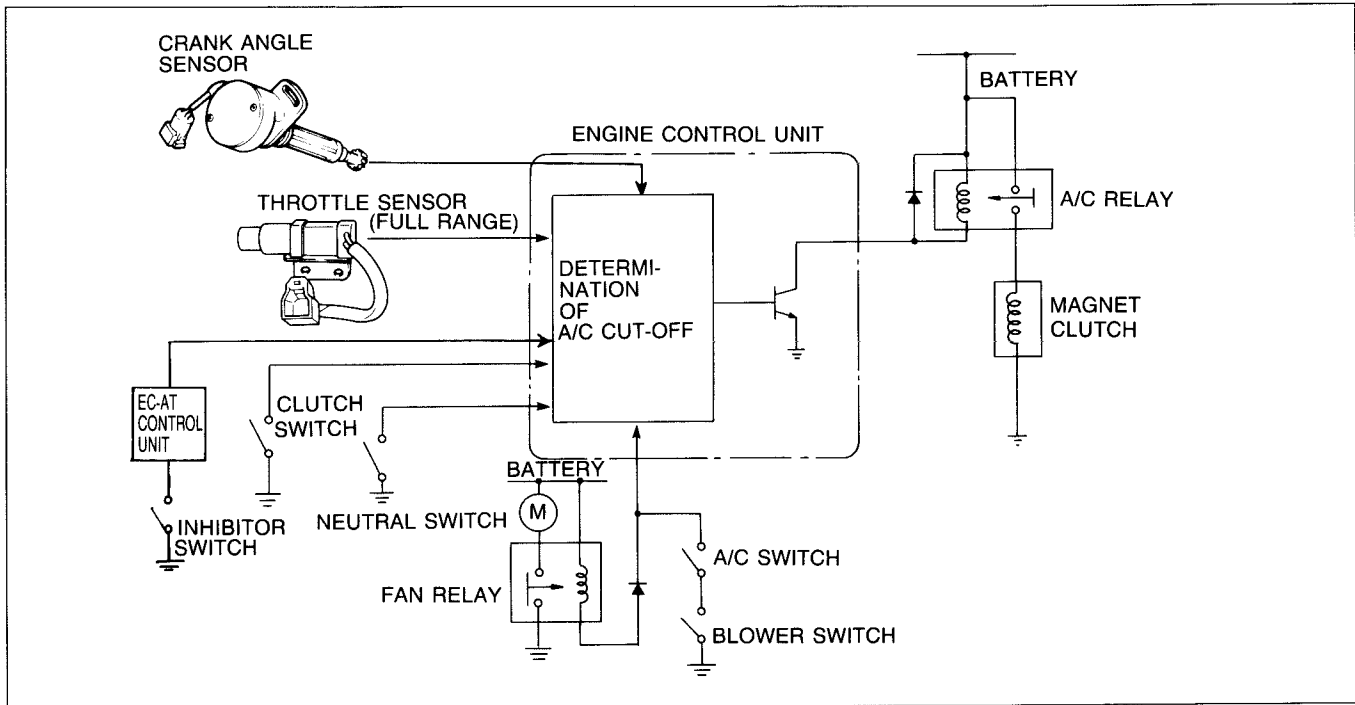
If the insulation cover is touching the catalytic converter housing, excessive heat at the floor will occur.

F1 A/C CUT-OUT CONTROL SYSTEM

A/C CUT-OUT CONTROL SYSTEM

DESCRIPTION

An A/C cut-out system is employed to provide smoother acceleration while the air conditioning is in use.



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Operate Condition

The A/C is cut-off for **approx. 7 sec.** during acceleration when all of the conditions below are met.

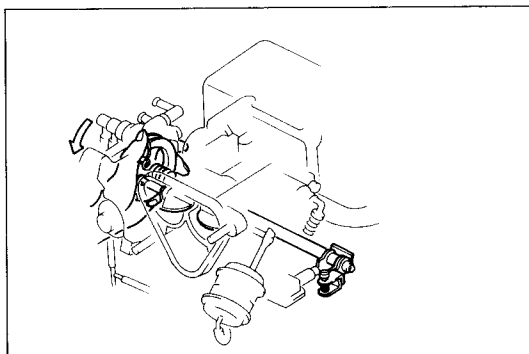
1. A/C switch ON.
2. Blower switch ON.
3. Transmission in gear and clutch pedal released (M/T), in D, S or L range (A/T).
4. Throttle valve opening angle more than 50°. (More than half throttle)

TROUBLESHOOTING

Check the condition of the wiring harness and connectors before checking the sensors or switches.

Possible cause	Throttle sensor (Full range)	Clutch switch	Neutral switch	System inspection	Engine control unit terminals						
					1L	1O	1Q	1R	2G	2I	3D
Page	F1-83	F1-86	F1-86	F1-74	F1-79	F1-79	F1-79	F1-80	F1-80	F1-80	F1-81
Symptom											
Lack of power, poor acceleration or hesitation	3	4	5	1	2	2	2	2	2	2	2

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F1-74

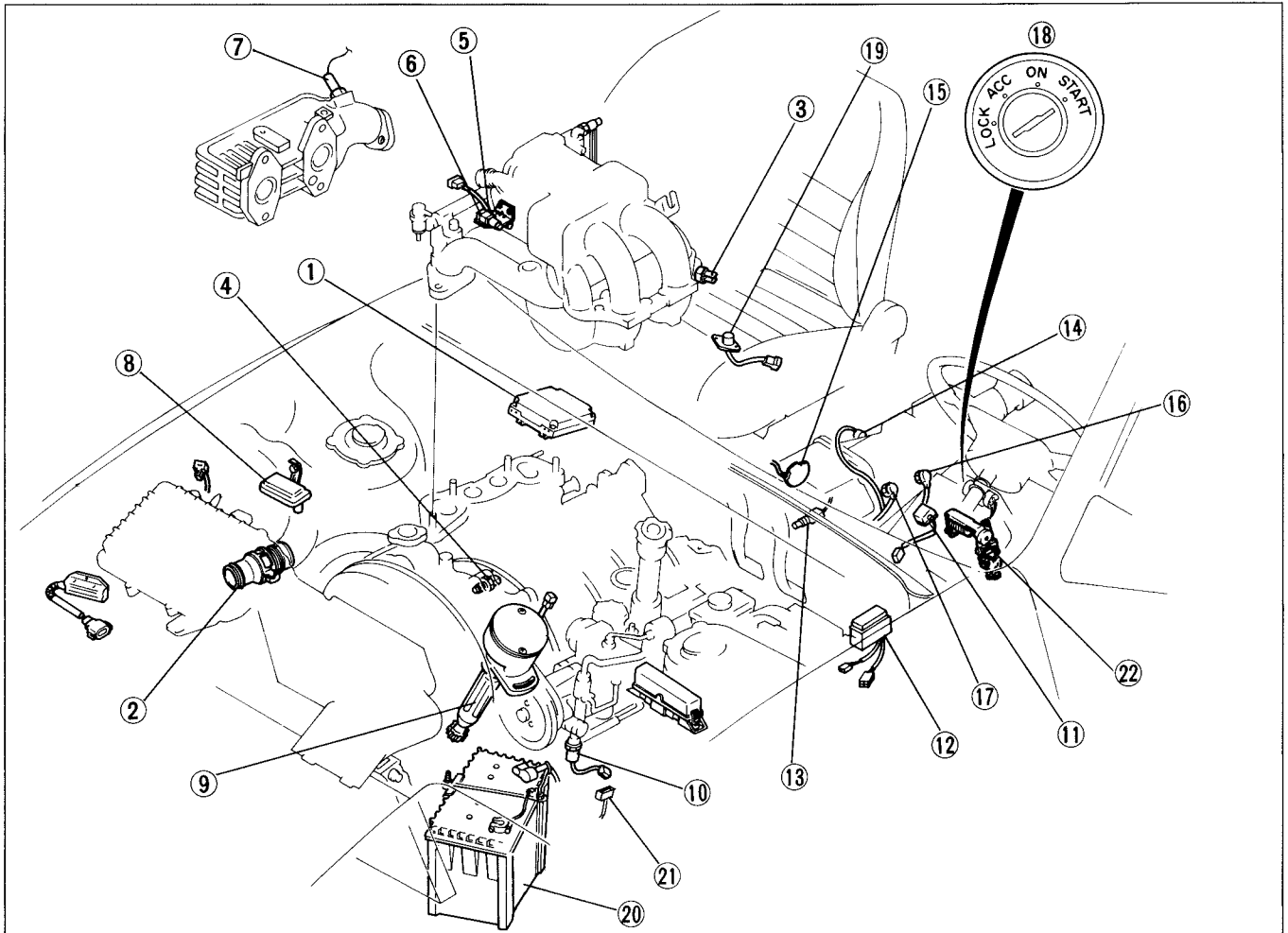
SYSTEM INSPECTION

1. Turn the A/C and blower switches ON.
2. Turn the ignition switch ON (engine not running).
3. Shift the transmission into gear (M/T), in D, S or L range (A/T).
4. Open the throttle valve fully and verify that the magnetic clutch disengages (Click is heard), then reengages after **approx. 7 sec.**
5. If not as specified, check the throttle sensor and engine control unit 1L, 1O, 1Q, 1R, 2G, 2I and 3D terminal voltages.

CONTROL SYSTEM

STRUCTURAL VIEW

Control system consists of the input devices and the engine control unit (ECU). The ECU controls the fuel injection amount, fuel injection pressure, bypass air amount, ignition timing, emission devices operation, metering oil pump operation (Section D), monitor switch function and fail-safe function.



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- | | | |
|---|---|--|
| 1. Engine control unit
Inspection..... page F1-78 | 8. Pressure sensor
Inspection..... page F1-84 | 18. Ignition switch
(Refer to Section T) |
| 2. Airflow meter (Built in intake
air thermostator)
Removal and
Installation page F1-82 | 9. Crank angle sensor
(Refer to Section G) | 19. Heat hazard sensor
Inspection (Warning
System)..... page F1-85 |
| 3. Intake air thermostator
(Engine)
Inspection..... page F1-82 | 10. P/S pressure switch
Inspection..... page F1-86 | Removal and
Installation page F1-85 |
| 4. Water thermostator
Inspection..... page F1-83 | 11. Circuit opening relay
Inspection..... page F1-57 | Inspection..... page F1-85 |
| 5. Throttle sensor
(Narrow range)
Inspection..... page F1-83 | 12. Main relay
Inspection..... page F1-85 | 20. Battery (Refer to Section G) |
| 6. Throttle sensor (Full range)
Inspection..... page F1-83 | 13. Clutch switch (M/T)
Inspection..... page F1-86 | 21. Test connector (Green: 1-pin) |
| 7. Oxygen sensor
Inspection..... page F1-83
Inspection of
sensitivity page F1-84 | 14. Neutral switch (M/T)
Inspection..... page F1-85 | 22. Mileage sensor
Replacement .. page F1-86 |
| | 15. Inhibitor switch (A/T)
(Refer to Section K) | |
| | 16. Back-up light and 5th switch
(M/T)
Inspection..... page F1-86 | |
| | 17. Oil pressure switch (A/T)
Inspection..... page F1-86 | |

F1 CONTROL SYSTEM

RELATIONSHIP CHART Output Devices and Input Devices

TEST CONNECTOR	○	×	×	×	×	×	×	×	×	×	○	×	×	○	○	
IGNITION SWITCH	○	×	○	×	×	×	○	○	○	○	○	×	×	○	○	
POWER STEERING PRESSURE SWITCH	×	×	×	×	×	×	×	×	×	×	○	×	×	○	○	
A/C SWITCH	○	×	×	○	×	×	×	×	×	×	○	×	×	○	○	
FOG LIGHT SWITCH (IF EQUIPPED)	○	×	×	×	×	×	×	×	×	×	○	×	×	○	○	
HEAD LIGHT SWITCH	○	×	×	×	×	×	×	×	×	×	○	×	×	○	○	
BLOWER SWITCH	○	×	×	×	×	×	×	×	×	×	○	×	×	○	○	
REAR DEFROSTER SWITCH	○	×	×	×	×	×	×	×	×	×	○	×	×	○	○	
CLUTCH SWITCH (M/T)	○	×	○	○	×	○	○	○	○	○	○	×	○	○	○	
NEUTRAL SWITCH (M/T)	○	×	○	○	×	○	○	○	○	○	○	×	○	○	○	
EC-AT CONTROL UNIT (A/T) (INHIBITOR SWITCH)	○	×	×	○	×	○	○	○	○	○	○	×	○	○	○	
BACK-UP LIGHT AND 5TH SWITCH (M/T)	×	×	×	×	×	○	○	○	×	×	○	×	×	○	○	
OIL PRESSURE SWITCH (A/T)	○	×	×	×	×	○	○	○	×	×	○	×	×	○	○	
MILEAGE SENSOR	○	×	×	×	○	×	○	×	×	×	×	×	×	○	○	
HEAT HAZARD SENSOR	×	×	×	×	×	×	×	○	×	×	×	×	×	×	×	
OXYGEN SENSOR	○	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
THROTTLE SENSOR (NARROW RANGE)	○	×	○	×	○	×	○	○	×	○	○	×	×	○	○	
THROTTLE SENSOR (FULL RANGE)	○	×	×	○	○	×	×	○	○	×	×	×	×	○	○	
PRESSURE SENSOR	○	×	×	×	○	○	○	○	×	×	×	×	×	○	○	
CRANK ANGLE SENSOR (NE)	○	○	○	○	×	×	○	○	○	×	○	○	○	○	○	
CRANK ANGLE SENSOR (G+, G-)	○	○	○	×	×	×	×	×	×	○	×	×	×	○	○	
WATER THERMOSENSOR	○	×	○	×	×	×	○	○	○	○	○	×	○	○	○	
INTAKE AIR THERMOSENSOR (AFM)	○	×	○	×	×	×	×	×	×	×	×	×	×	×	×	
INTAKE AIR THERMOSENSOR (ENGINE)	○	×	○	×	×	×	×	×	×	○	○	×	×	○	○	
AIRFLOW METER (AFM)	○	×	○	×	×	×	×	×	×	×	×	○	○	○	○	
INPUT DEVICES	OUTPUT DEVICES	FUEL INJECTION AMOUNT	FUEL INJECTION TIMING	FUEL PUMP RESISTOR RELAY	A/C RELAY	PORT AIR SOLENOID VALVE	SPLIT AIR SOLENOID VALVE	SOLENOID VALVE (SWITCH)	SOLENOID VALVE (RELIEF)	SOLENOID VALVE (AWS)	SOLENOID VALVE (PRESSURE REGULATOR)	SOLENOID VALVE (BYPASS AIR CONTROL)	SOLENOID VALVE (VARIABLE DYNAMIC EFFECT INTAKE)	SOLENOID VALVE (6 PORT INJECTION)	IGNITER (TRAILING IGNITION TIMING)	IGNITER (LEADING IGNITION TIMING)

Output Devices

ENGINE CONITION		OUPUT DEVICES							REMARKS	
		CRANKING (WHEN ENGINE IS COLD)	IDLE (DURING WARM-UP)	MEDIUM LOAD		ACCELERATION	HEAVY LOAD	DECELERATION (THROTTLE VALVE FULLY CLOSED)		IDLE (WHEN ENGINE IS WARM)
				COLD	WARM					
FUEL INJECTION AMOUNT	PRIMARY INJECTOR	Rich	Rich	Rich and Lean	Rich and Lean	Rich	Fuel cut	Rich	OFF	Rear side; Above 8,500 rpm; Fuel cut
	SECONDARY INJECTOR	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
FUEL PUMP RESISTOR RELAY		12V drive	9-10V drive	9-10V drive	12V drive	12V drive	9-10V drive	9-10V drive	OFF	Hot start (at idle) 12V drive
A/C RELAY		ON	ON	*1 OFF	*1 OFF	*1 OFF	ON	ON	ON	*1 Only 7 sec.
PORT AIR SOLENOID VALVE		Above 20,000 mile (34,000 km): ON Below 20,000 mile (34,000 km): OFF						ON		
SPRIT AIR SOLENOID VALVE		O/D switch ON or back-up light and 5th switch ON and above 20,000 mile (34,000 km): ON						ON	OFF	Always ON at high altitude
SOLENOID VALVE (SWITCH)		OFF (Port air)	ON (Split air)	ON (Split air)	OFF (Port air)	OFF (Port air)	OFF (Port air)	OFF (Port air)	OFF	
SOLENOID VALVE (RELIEF)		ON (Air injection)	OFF (Relief)	ON (Air injection)	ON (Air injection)	OFF (Relief)	ON (Air injection)	ON (Air injection)	ON	
SOLENOID VALVE (AWS)		ON	For 17 sec. after start; ON	OFF	OFF	OFF	OFF	OFF		
SOLENOID VALVE (PRESSURE REGULATOR)			OFF	OFF	OFF	OFF	After start; *2 ON	After start; *2 ON	ON	*2 For 50 sec.—70 sec.
SOLENOID VALVE (BYPASS AIR CONTROL)		Large quantity of air	Feed back duty	Fixed duty	Fixed duty	Fixed duty	Feed back duty	Feed back duty	Fixed duty	Test connector (Green: 1-pin) ground; Stop the feedback control
SOLENOID VALVE (VARIABLE DYNAMIC EFFECT INTAKE)			OFF	OFF	ON	ON	OFF	OFF		
SOLENOID VALVE (6 PORT INJECTION)			OFF	*3 ON (Above 3,850 rpm)	*3 ON (Above 3,850 rpm)	*3 ON (Above 3,850 rpm)	OFF	OFF		*3 Only load condition
IGNITER (TRAILING IGNITION TIMING)		BTDC 5°	Retard	Advanced	Advanced	Retard	Retard	ATDC 20°	OFF	
IGNITER (LEADING IGNITION TIMING)								ATDC 5°		

F1 CONTROL SYSTEM

TROUBLESHOOTING

Check the condition of the wiring harness and connectors before checking the sensors or switches.

Possible cause	Page																
	Airflow meter	Intake air thermosensor (Engine)	Throttle sensor (Full and Narrow range)	Oxygen sensor	Pressure sensor	Heat hazard sensor	Main relay	Circuit opening relay	Neutral switch (M/T)	Clutch switch (M/T)	Inhibitor switch (A/T)	Power steering pressure switch	Back-up light and 5th switch (M/T)	Oil pressure switch (A/T)	Water thermosensor	Mileage sensor	Engine control unit terminal
Symptom	F1-82	F1-82	F1-83	F1-83	F1-84	F1-85	F1-85	F1-57	F1-85	F1-86	K Section	F1-86	F1-86	F1-86	F1-83	F1-86	F1-79
Hard start or no start (Crank OK)	7	6	4		5		1	2							3		8
Rough idle	1	4	2						6	7	6				3	8	9
High idle speed (At normal operating temperature)	1		2									4			3		5
Engine does not run smoothly (Only when engine is cold)	1	3				4									2		5
Engine does not run smoothly (Only when engine is hot)	1	3				4									2		5
Lack of power, poor acceleration or hesitation	1		2			9			5	6	5	7	10	10	8	3	11
Afterburn	1		2		5					3		4					6
Fails emission test	2		3	1		4									5		6
Knocking	3	5	4						6	7	6				2		8

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PREPARATION

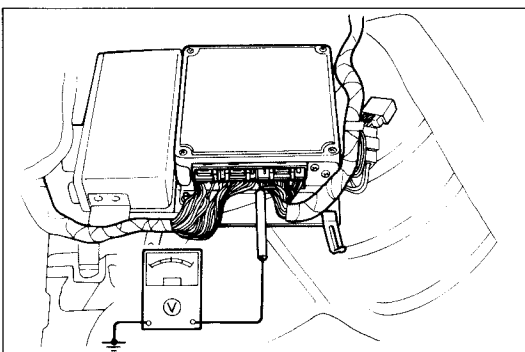
SST

49 H018 9A1

Self-Diagnosis Checker



97U0F2-186



97U0F2-187

ENGINE CONTROL UNIT

Inspection

1. Lift up the floor mat in front of the passenger's seat.
2. Remove the protector cover.
3. Turn the ignition switch ON, and measure the voltage of the terminals with circuit tester.

Caution

- If not indicated under remark, warm up the engine to normal operating temperature before checking the control unit.
- If the proper voltage is not indicated on the voltmeter, check all wiring, connections, and finally, check the indicated component.

Engine control unit terminal (unit side)

Terminal	Input	Output	Connection to	Test condition	Voltage	Remark
1A	○		Battery	Constant	Approx. 12V	Backup
1B	○		Main relay	Ignition switch ON	Approx. 12V	—
				Ignition switch OFF	Approx. 0V	
1C	○		Ignition switch	Ignition switch START (Cranking)	Approx. 12V	—
				Ignition switch ON	Approx. 0V	
				Ignition switch OFF	Approx. 0V	
1D		○	Self-Diagnosis Checker (Monitor lamp)	Test connector grounded For 3 sec. after ignition switch OFF→ON (Lamp illuminates)	Below 6.2V	With Self-Diagnosis checker
				After 3 sec. (Light does not illuminate)	Approx. 12V	
				Test connector grounded at idle	Below 6.2V	
				Test connector not grounded at idle (Monitor lamp ON)	Below 6.2V	
1E		○	Malfunction indicator light (MIL) lamp	For 3 sec. after ignition switch OFF→ON (Lamp illuminates)	Below 4.8V	Test connector grounded
				After 3 sec. (Lamp does not illuminate)	Approx. 12V	
				Lamp illuminates	Below 4.8V	
				Lamp does not illuminates	Approx. 12V	
1F		○	Self-Diagnosis Checker (Malfunction code number)	For 3 sec. after ignition switch OFF→ON (Buzzer sounds)	Below 6.2V	With Self-Diagnosis Checker and test connector grounded
				After 3 sec. (Buzzer does not sound)	Approx. 12V	
				Buzzer sounds	Below 6.2V	
				Buzzer does not sound	Approx. 12V	
1G		○	Ignition coil (Trailing)	Ignition switch ON	Approx. 0V	IGt-T (Ignition timing signal)
				Idle	Approx. 0.8V	
1H		○	Ignition coil (Leading)	Ignition switch ON	Approx. 0V	IGt-L (Ignition timing signal)
				Idle	Approx. 0.8V	
1I	○		Test connector (Green: 1-pin)	Test connector grounded	Approx. 0V	Ignition switch ON
				Test connector not grounded	Approx. 12V	
1J		○	Ignition coil (Trailing)	Ignition switch ON	Approx. 4.4V	IGs-T (Select signal)
				Idle	Approx. 2.2V	
1K		○	Fuel pump resistor relay	Cranking	Approx. 12V	—
				Idle (More than 90 sec. after cranking)	Below 2.0V	
1L		○	A/C relay	A/C switch ON	Below 2.5V	Ignition switch ON Blower switch ON
				A/C switch OFF	Approx. 12V	
1M	○		Mileage sensor	Under 20,000 miles (34,000 km)	Approx. 12V	There is an error more or less
				Over 20,000 miles (34,000 km)	Below 1.5V	
1N	○		Power steering (P/S) pressure switch	Ignition switch ON	Approx. 12V	P/S ON: Turning P/S OFF: Straight ahead
				P/S ON (Idle)	Approx. 0V	
				P/S OFF (Idle)	Approx. 12V	
1O	○		A/C switch	A/C switch ON (Idle)	Below 2.5V	Blower switch ON
				A/C switch OFF (idle)	Approx. 12V	
1P	○		Heat hazard sensor	Ignition switch ON	Below 1.5V	—
				Idle (Floor temp.: Below 110°C (230°F))	Approx. 12V	
				Idle (Floor temp.: Above 110°C (230°F))	Below 1.5V	
1Q	○		Clutch switch (M/T)	Clutch pedal: released	Approx. 12V	Ignition switch ON
				Clutch pedal: depressed	Below 2.0V	

F1 CONTROL SYSTEM

Terminal	Input	Output	Connection to	Test condition	Voltage	Remark
1R	○		Neutral switch (M/T)	Neutral	Below 2.0V	Ignition switch ON
				In gear	Approx. 12V	
	○		EC-AT control unit (Inhibitor signal) (A/T)	N, P range	Below 2.0V	Ignition switch ON
				Others	Approx. 12V	
1S	○		Fog light switch	Fog light ON (Idle)	Approx. 12V	If equipped
				Fog light OFF (Idle)	Approx. 0V	
1T	○		Back-up light and 5th switch (M/T)	5th gear or reverse	Approx. 12V	Ignition switch ON
				1th — 4th gear	Below 2.0V	
	○		Oil pressure switch (A/T)	Overdrive	Below 2.0V	Can not check (Load condition only)
				Others	Approx. 12V	
1U	○		AT switch	A/T	Approx. 0V	Ignition switch ON
				M/T	Approx. 12V	
1V	○		Ignition coil (Trailing)	Ignition switch ON	Below 2.0V	IGf-T (Ignition confirmation signal)
				Idle	Approx. 4.0V	
2A	○		Metering oil pump (MOP) position sensor	Ignition switch OFF	0V	Refer to Section D
				Idle	Approx. 1.0V	
2B	○		Airflow meter (Vs)	Ignition switch ON	Approx. 4.0V	—
				Idle	2.5V—3.5V	
2C	○		Oxygen sensor	Idle	Below 1.0V	—
				Acceleration	0.5V—1.0V	
				Deceleration	0V—0.4V	
2D	—	—	—	—	—	—
2E	○		Water thermosensor	Idle (Engine cold)	0.4V—1.8V	—
				Water temperature; 20°C (68°F)	Approx. 2.4V	
2F	○		Throttle sensor (Narrow range)	Ignition switch ON (Idle position)	Approx. 1.0V	—
				Ignition switch ON (Full throttle)	Approx. 5.0V	
				Idle	Approx. 1.0V	
2G	○		Throttle sensor (Full range)	Ignition switch ON (Idle position)	Approx. 0.8V	—
				Ignition switch ON (Full throttle)	Approx. 4.3V	
				Idle	Approx. 0.8V	
2H	○		Pressure sensor	Vacuum hose disconnected and plugged	3.4V—3.6V	Ignition switch ON
				100 mmHg (3.9 inHg) vacuum applied to pressure sensor	2.8V—3.2V	
2I		○	Sensors	Ignition switch ON	4.5V—5.5V	Vref (Power supply)
				Ignition switch OFF	0V	
2J	○		Ground or open	Canada (Ground)	0V	—
				Except for Canada (Open)	Approx. 12V	
2K	○		Intake air thermosensor (Airflow meter)	Idle (At 20°C (68°F))	2V—3V	—
2L	○		Intake air thermosensor (Engine)	Idle (At 80°C (176°F))	1V—2V	—
2M		○	Solenoid valve (Variable dynamic effect intake control)	Above 5,200 rpm	Below 2.0V	Only while driving
				Below 5,200 rpm	Approx. 12V	—
2N		○	Port air solenoid valve	Idle (Below 20,000 miles (34,000 km))	Approx. 12V	—
				Idle (Above 20,000 miles (34,000 km))	Below 2.0V	
				Engine speed; above 3,000 rpm	Approx. 12V	
2O		○	Solenoid valve (Switch)	Half throttle	Below 2.0V	Ignition switch ON
				Idle	Approx. 12V	
2P		○	Solenoid valve (Relief)	Idle	Below 2.0V	—
				Engine speed; above 3,600 rpm	Approx. 12V	

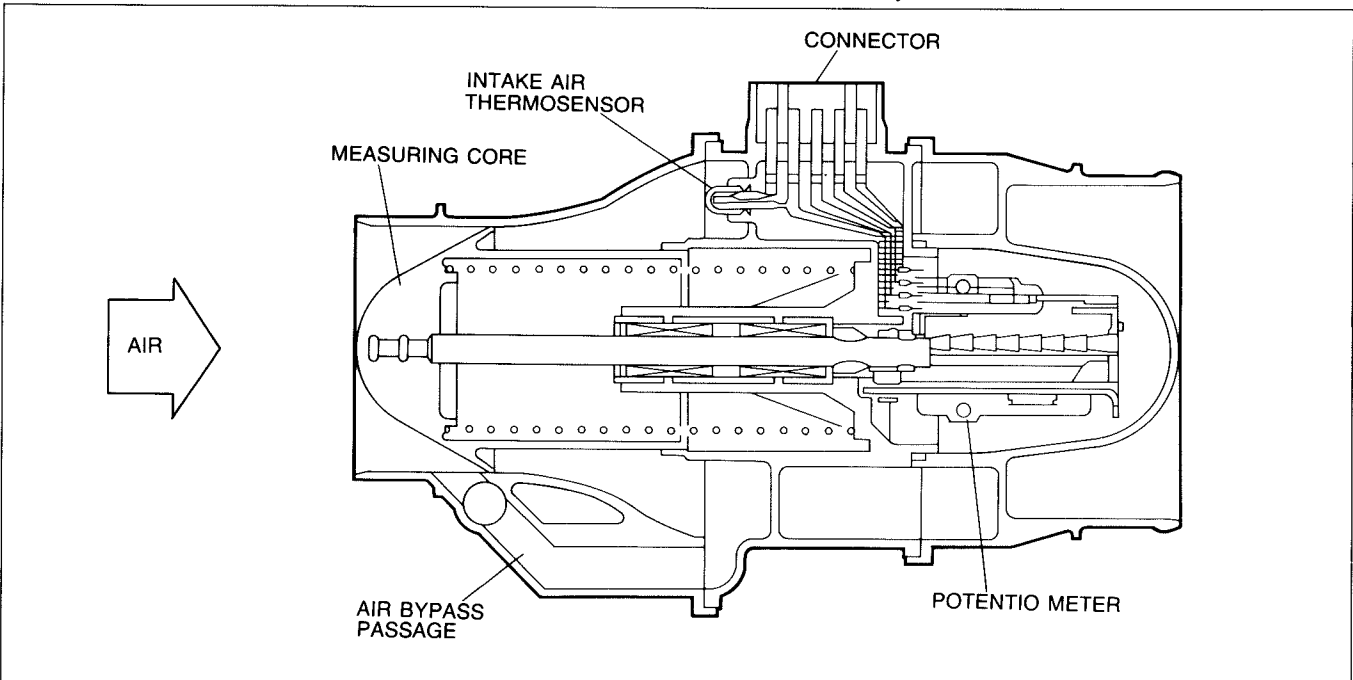
Terminal	Input	Output	Connection to	Test condition	Voltage	Remark
3A	—	—	Ground	Constant	0V	Power
3B	—	—	Ground	Constant	0V	Power
3C	—	—	Ground	Constant	0V	System
3D	—	—	Ground	Constant	0V	Analog
3E	○		Crank angle sensor (Ne)	Ignition switch ON	Below 1.0V	Red
				Idle	Below 1.0V	
3F	—	—	—	—	—	—
3G	○		Crank angle sensor (G +)	Ignition switch ON	Below 1.0V	Black
				Idle	Below 1.0V	
3H	○		Crank angle sensor (G-)	Ignition switch ON	Below 1.0V	White
				Idle	Below 1.0V	
3I		○	Split air solenoid valve	5th gear or reverse	Below 2.5V	Refer to page F1-65
				Others	Approx. 12V	
3J		○	Solenoid valve (Accelerated warm-up system)	Ignition switch OFF	0V	Engine coolant temperature: 15°C (59°F)—35°C (95°F)
				Ignition switch ON	Approx. 12V	
				Idle (Less than 17 sec. after cranking)	Below 2.0V	
				Idle (More than 17 sec. after cranking)	Approx. 12V	
3K		○	Circuit opening relay	Ignition switch OFF	0V	—
				Ignition switch ON	Approx. 12V	
				Idle	Below 2.0V	
3L	○		Headlight switch	Headlight switch ON	Approx. 12V	—
				Headlight switch OFF	0V	
3M		○	Solenoid valve (Pressure regulator control)	Ignition switch ON	Below 2.0V	Hot condition only
				Cranking	Below 2.0V	
				Idle (Less than 20 sec. after cranking)	Below 2.0V	
				Idle (More than 90 sec. after cranking)	Approx. 12V	
3N		○	EC-AT control unit	Idle (After warm-up)	Below 2.0V	
				Others (After warm-up)	Approx. 12V	
3O	○		Blower switch	Blower switch ON	Below 2.0V	—
				Blower switch OFF	Approx. 12V	
3P	○		Rear defroster switch	Rear defroster switch ON	Below 2.0V	—
				Rear defroster switch OFF	Approx. 12V	
3Q		○	Solenoid valve (Bypass air control)	Ignition switch OFF	0V	Duty pulse
				Ignition switch ON	Approx. 8V	
				Idle	Approx. 8V	
3R		○	6-port induction (6PI) system	Above 3,850 rpm	Below 0V	Cannot check (Warm-up and load condition only)
				Below 3,850 rpm	Approx. 12V	
3S		○	Stepping motor (Metering oil pump)	—	—	Can not check with circuit tester (Refer to Section D)
3T						
3U						
3V						
3W		○	Injector (Front primary)	Ignition switch ON	Approx. 12V	Ground time is very short
				Idle	Approx. 12V	
3X		○	Injector (Front secondary)	Ignition switch ON	Approx. 12V	Ground time is very short
				Idle	Approx. 12V	
3Y		○	Injector (Rear primary)	Ignition switch ON	Approx. 12V	Ground time is very short
				Idle	Approx. 12V	
3Z		○	Injector (Rear secondary)	Ignition switch ON	Approx. 12V	Ground time is very short
				Idle	Approx. 12V	

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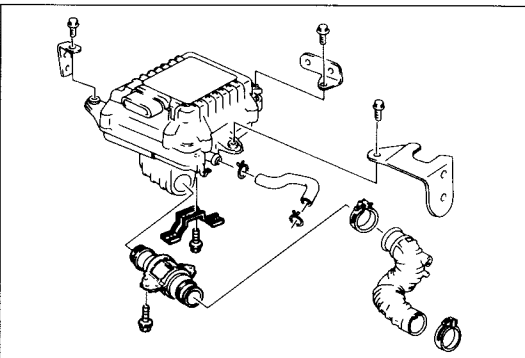
F1 CONTROL SYSTEM

AIRFLOW METER

The sliding type airflow meter is superior to others in that it moves easily and causes minimal air resistance.



97U0F2-189



97U0F2-190

Removal

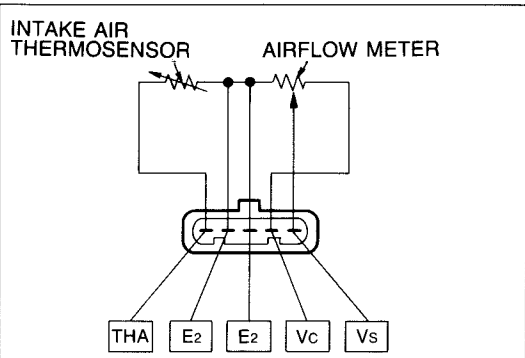
1. Disconnect the airflow meter connector.
2. Remove the air hose to the air pump.
3. Loosen the air funnel bolt.
4. Remove the air cleaner and the airflow meter.
5. Remove the airflow meter.

Installation

Install in the reverse order of removal.

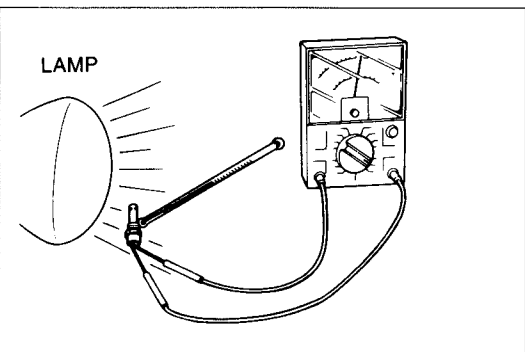
Inspection

1. Check the airflow meter body for cracks or damage.
2. Verify that the measuring plate opens smoothly.
3. Measure the resistance of the airflow meter using a circuit tester.



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Terminal	Resistance (Ω)	
E2 \leftrightarrow Vs	200—1,000 (Closed; 20°C (68°F)) 20— 800 (Open; 20°C (68°F))	
E2 \leftrightarrow Vc	200—400 (Closed \leftrightarrow Open; 20°C (68°F))	
E2 \leftrightarrow THA (Intake air thermosensor)	-20°C (-4°F) 0°C (32°F) 20°C (68°F) 40°C (104°C) 60°C (140°F)	10,000—20,000 4,000— 7,000 2,000— 3,000 900— 1,300 400— 700



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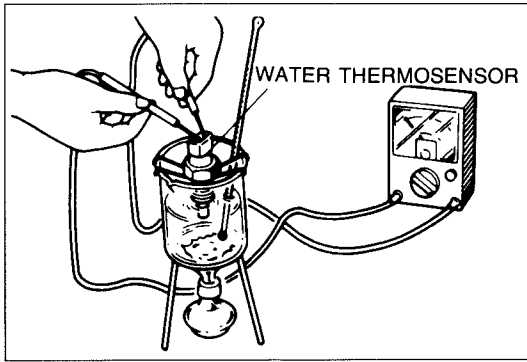
INTAKE AIR THERMOSENSOR (ENGINE)

Inspection

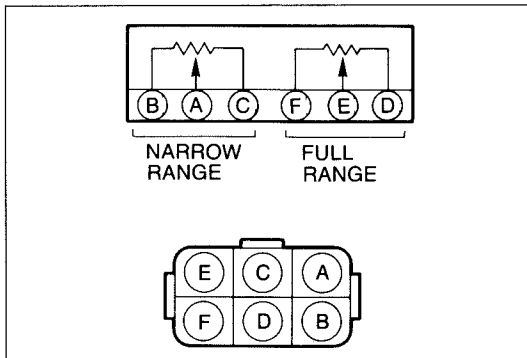
1. Measure resistance of the sensor with an ohmmeter.

Temperature	Resistance
25°C (77°F)	33 \pm 4 k Ω
85°C (185°F)	3.5 \pm 0.4 k Ω

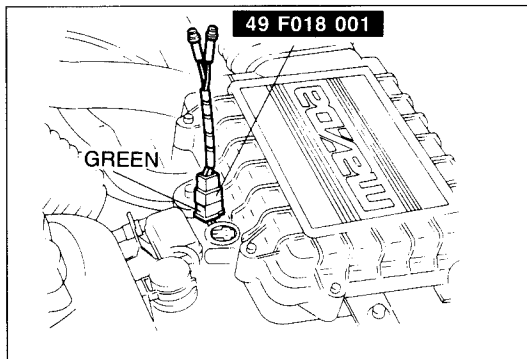
2. Replace the sensor, if necessary.



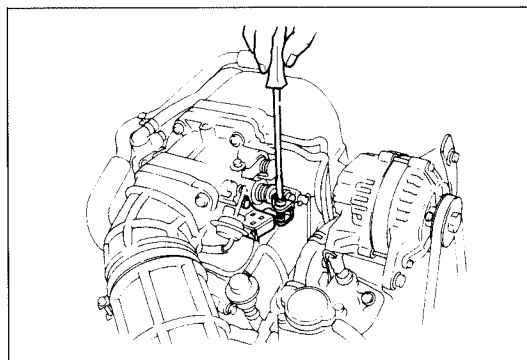
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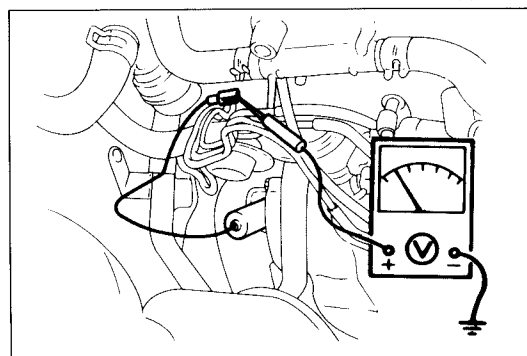
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67U04X-083



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WATER THERMOSENSOR

Inspection

1. Place the water thermosensor in water with a thermometer and heat the water gradually.
2. Measure resistance of the sensor with an ohmmeter.

Water temperature	Resistance
-20°C (-4°F)	16.2 ± 1.6 kΩ
20°C (68°F)	2.5 ± 0.2 kΩ
80°C (176°F)	0.3 ± 0.1 kΩ

3. Replace the sensor, if necessary.

THROTTLE SENSOR

Inspection

1. Disconnect the throttle sensor connector.
2. Measure resistance of the throttle sensors.

	Closed	Full throttle
Narrow range ((A)–(B))	0.8–1.2 kΩ	4.0–6.0 kΩ
Full range ((E)–(D))	0.6–0.9 kΩ	3.4–5.1 kΩ

3. Replace the throttle sensor assembly, if necessary.

Caution

Do not adjust the throttle sensors except when installing a replacement assembly. There is throttle position auto-adjust system in the engine control unit.

Adjustment

1. Warm up the engine, then stop it.
2. Connect the **checker lamp (49 F018 001)** to the check connector (Green: 3-pin).
3. Turn the ignition switch on and check whether one of the lamps illuminates.
4. If both lamps illuminate or if neither does, turn the throttle sensor adjusting screw until one of the lamps illuminates.
 - a) If both lamps illuminate turn the adjusting screw counter-clockwise.
 - b) If both lamps do not illuminate turn the adjusting screw clockwise.
5. Reinstall the cap on the adjusting screw after adjusting.

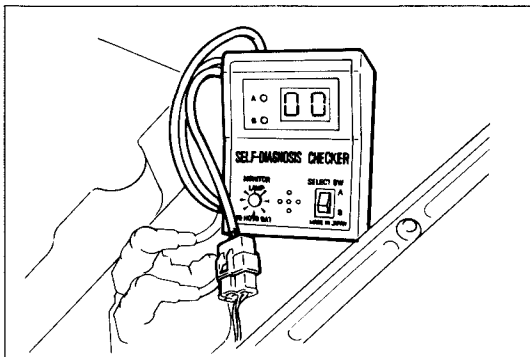
Note:

Do not use excessive pressure on the screw; this may cause incorrect adjustment.

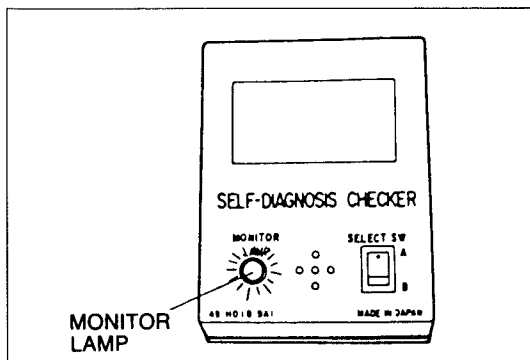
OXYGEN SENSOR

Inspection

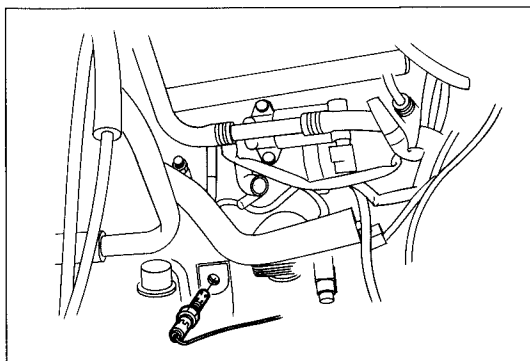
1. Warm up the engine and run it at idle.
2. Disconnect the oxygen sensor connector.
3. Connect a voltmeter between the oxygen sensor and a ground.
4. Accelerate and decelerate the engine suddenly several times. Verify that the voltage is **0.5V–1.0V** during acceleration and **0V–0.4V** during deceleration.
5. If not as specified, replace the oxygen sensor.



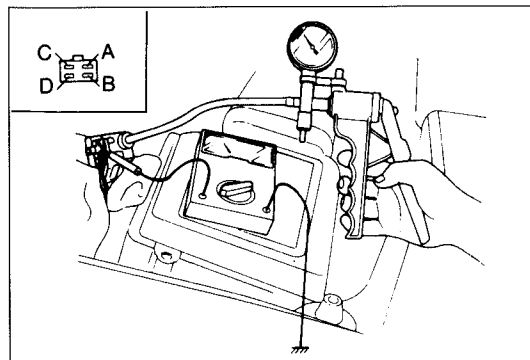
97U0F2-198



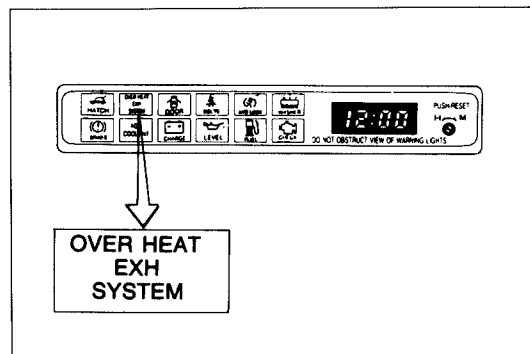
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97U0F1-114



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Inspection of Sensitivity

1. Warm up the engine and run it at idle.
2. Connect the **SST** to the check connector (Green: 6-pin).

Note

Do not ground the test connector (Green: 1-pin) while inspecting the oxygen sensor sensitivity.

3. Increase the engine speed to **2,000—3,000 rpm**, and verify that the monitor lamp flashes **for 10 sec.**

Monitor lamp: Flashes more than 8 times/10 sec.

Replacement

1. Disconnect the oxygen sensor connector.
2. Remove the oxygen sensor and gasket.
3. Install a new oxygen sensor and gasket.

Note

Tighten oxygen sensor to the specified torque.

Specified torque:

29—49 N·m (3—5 m·kg, 22—36 ft·lb)

PRESSURE SENSOR

Inspection

1. Disconnect the vacuum hose from the pressure sensor.
2. Connect a voltmeter to the D terminal of the pressure sensor.
3. Apply **100 mmHg (3.9 inHg)** of vacuum to the pressure sensor.
4. Turn on the ignition switch and check the voltmeter reading.

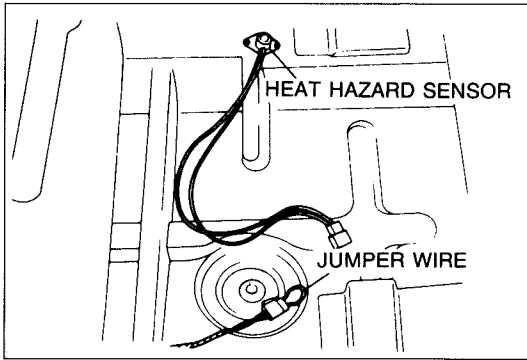
Voltage: 2.8—3.2V at 100 mmHg (3.9 inHg)

5. Replace the pressure sensor if necessary.

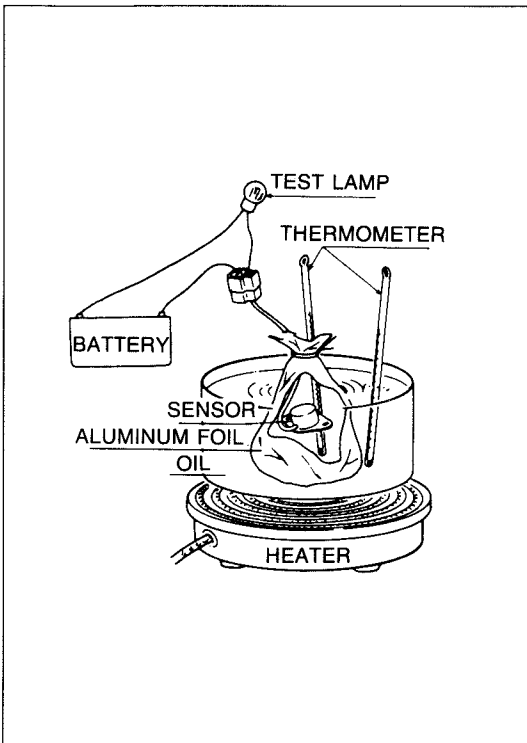
HEAT HAZARD SENSOR

Inspection (Warning system)

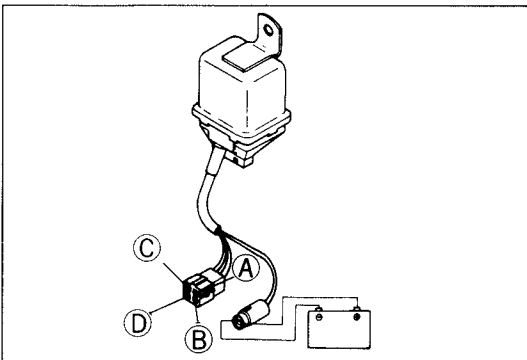
1. Turn the ignition switch ON. Verify that the heat hazard warning lamp illuminates.
2. Start the engine and verify that the warning lamp goes out.



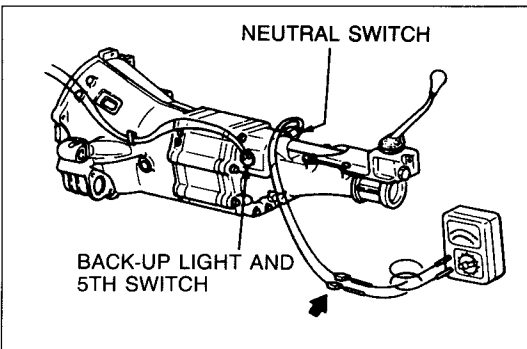
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3. Disconnect the heat hazard sensor connector.
4. Check that the heat hazard warning lamp illuminates on when a jumper wire is connected to the terminals of the sensor connector (harness side).

Removal

1. Remove right front seat.
2. Lift up the floor mat.
3. Disconnect the heat hazard sensor connector and remove the sensor.

Installation

Install in the reverse order of removal.

Inspection

1. Wrap the sensor and a thermometer in aluminum foil and place them in a container of oil.
2. Connect a test lamp and 12V to the terminals of the sensor connector.
3. Gradually heat the oil.
Verify that the test lamp comes on when the temperature in the aluminum foil reaches **105—115°C (221—239°F)**.

Caution

Do not heat the oil to more than 150°C (302°F).

4. Replace the sensor, if necessary.

MAIN RELAY

Inspection

1. Check for a clicking of the main relay when turning the ignition switch ON and OFF.
2. Apply 12V and a ground to the 2-pin connector of the main relay.
3. Check continuity of the relay with an ohmmeter.

Terminal	Operation	12V Not applied	12V Applied
A—B		No continuity	Continuity
C—D			

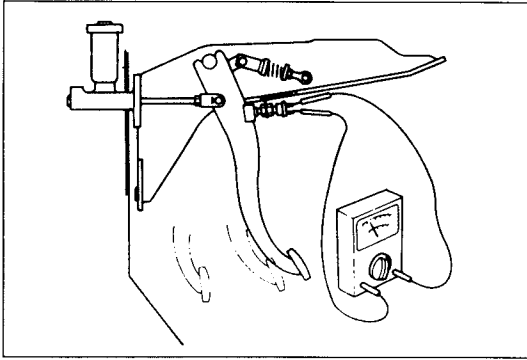
NEUTRAL SWITCH (M/T)

Inspection

1. Disconnect the neutral switch connector.
2. Connect a circuit tester to the switch.
3. Check the continuity.

Transmission	Continuity
In neutral	Yes
In other ranges	No

4. Replace the switch, if necessary.



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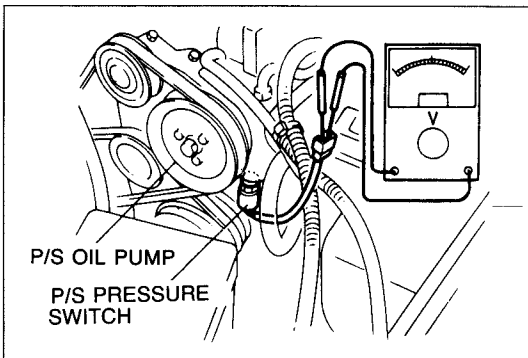
CLUTCH SWITCH (M/T)

Inspection

1. Disconnect the clutch switch connector.
2. Connect a circuit tester to the switch.
3. Check the continuity.

Pedal	Continuity
Depressed	Yes
Released	No

4. Replace the switch, if necessary.



97U0F2-207

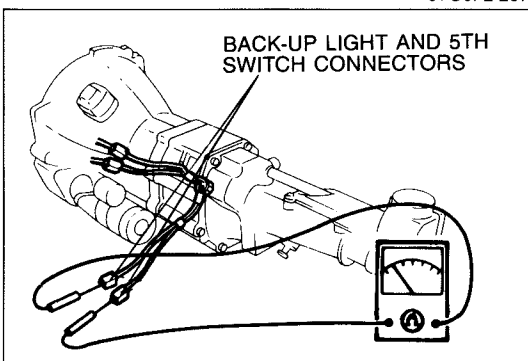
POWER STEERING (P/S) PRESSURE SWITCH

Inspection

1. Start the engine and run it at idle.
2. Disconnect the P/S pressure switch connector.
3. Connect a circuit tester to the switch.
4. Turn the steering wheel either to the right or left, and check the continuity.

Steering wheel	Continuity
Turn	Yes
Straight ahead	No

5. Replace the switch, if necessary.

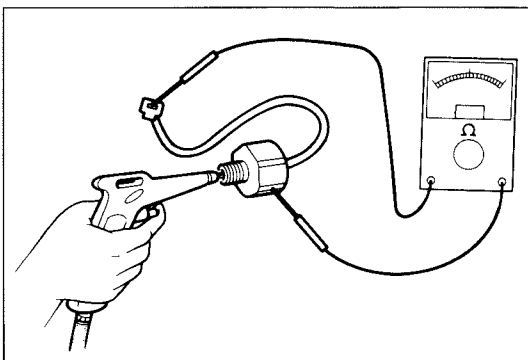


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BACK-UP LIGHT AND 5TH SWITCH (M/T)

Inspection

1. Disconnect the back-up light and 5th switch connectors.
2. Verify that the switch is **open** in neutral and **closed** in 5th gear.
3. Replace the switch, if necessary.



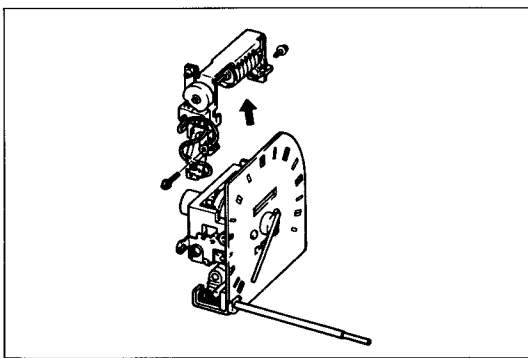
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OIL PRESSURE SWITCH (A/T)

Inspection

1. Remove the oil pressure switch.
2. Add the air pressure as shown in the figure.
3. Check the continuity.

Pressure (kPa (kg/cm ² , psi))	Continuity
Below 49 (0.5, 7.1)	Yes
Above 290 (3.0, 4.3)	No



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MILEAGE SENSOR

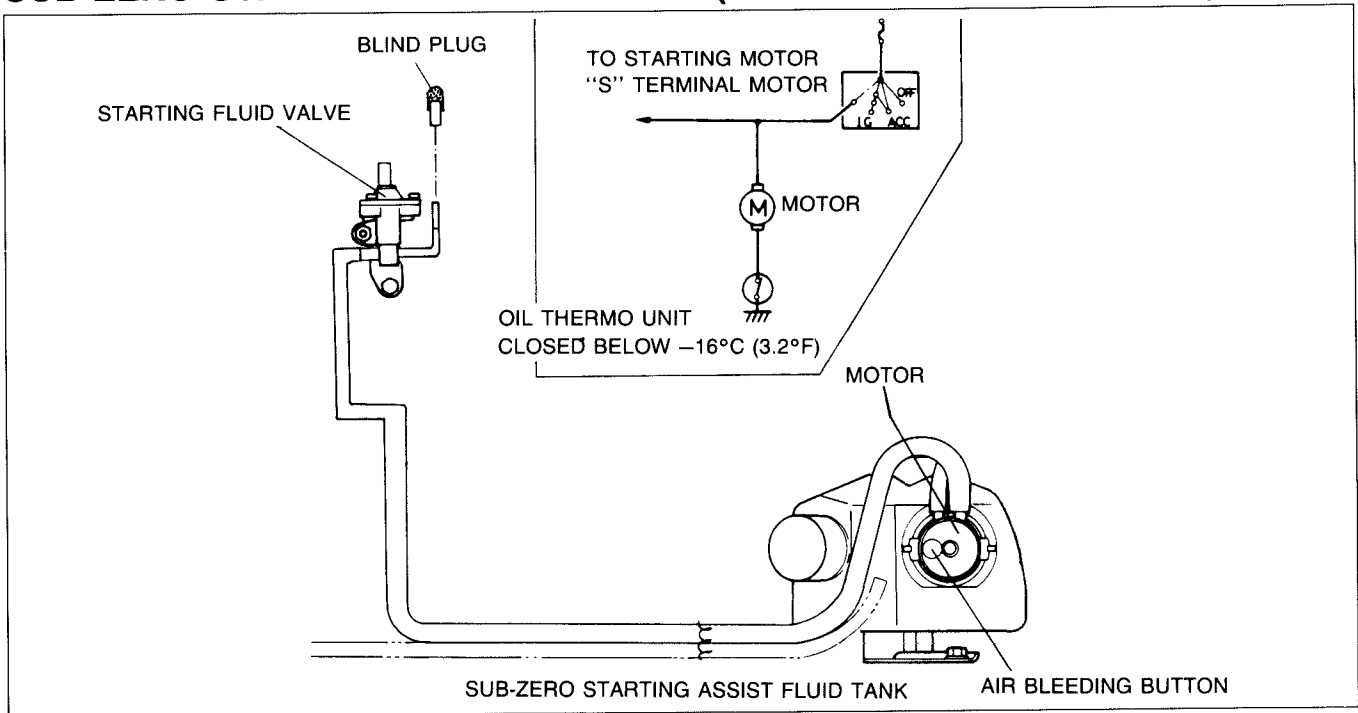
Replacement

1. Remove the speedometer assembly. (Refer to Section T.)
2. Remove the mileage sensor.
3. Install in the reverse order of removal.

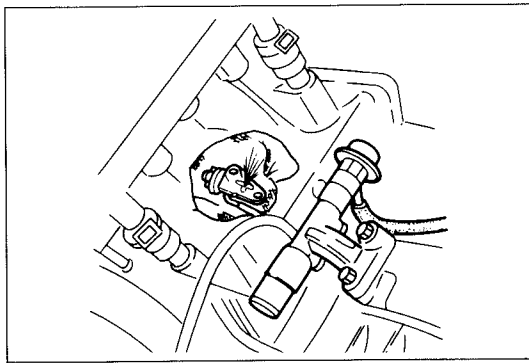
Caution

When replacing the speedometer within 20,000 miles (34,000 km) continue to use the same mileage sensor by transferring it to the new speedometer.

SUB-ZERO STARTING ASSIST DEVICE (EXCEPT FOR CALIFORNIA)



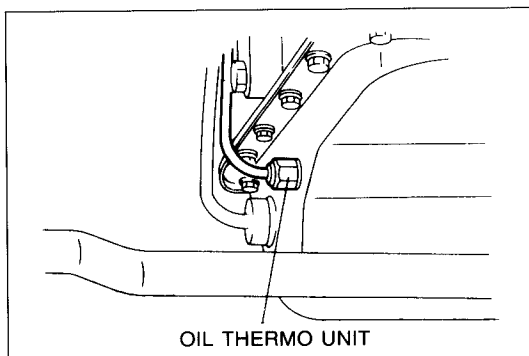
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SUB-ZERO STARTING ASSIST DEVICE Inspection

1. Check that there is sufficient starting assist fluid in the tank, and add if necessary.
2. Disconnect the (S) terminal connector from the starter.
3. Remove the starting fluid valve from the intake manifold.
4. Turn the ignition switch to the "START" position and check that no starting assist fluid is ejected from the valve.
[Ambient temperature: **above -20—12°C (-4°F—10.4°F)**]
5. Disconnect the oil thermo-unit connector on the oil pan and ground the connector.
6. Turn the ignition switch to the "START" position. Push the air bleed button on the tank and check that starting assist fluid is ejected from the valve.



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SUB-ZERO STARTING ASSIST FLUID

The mixture of the starting assist fluid should be **90%** high quality ethylene glycol antifreeze solution and **10%** water.

OIL THERMO-UNIT

Check the oil thermo-unit continuity using a circuit tester.

Ambient temperature	Continuity
Below -16°C (3.2°F)	Yes
Above -16°C (3.2°F)	No