

1989 Mazda RX-7 Factory Service Manual

This Online/PC version of the Manual has been brought to you by “Scott 89t2” and www.1300cc.com

Thanks to those who are hosting it for me.



Some parts of the manual may be hard to read or see on the screen, but if you print the pages out it's perfect. Well except for the crookedness ☺.

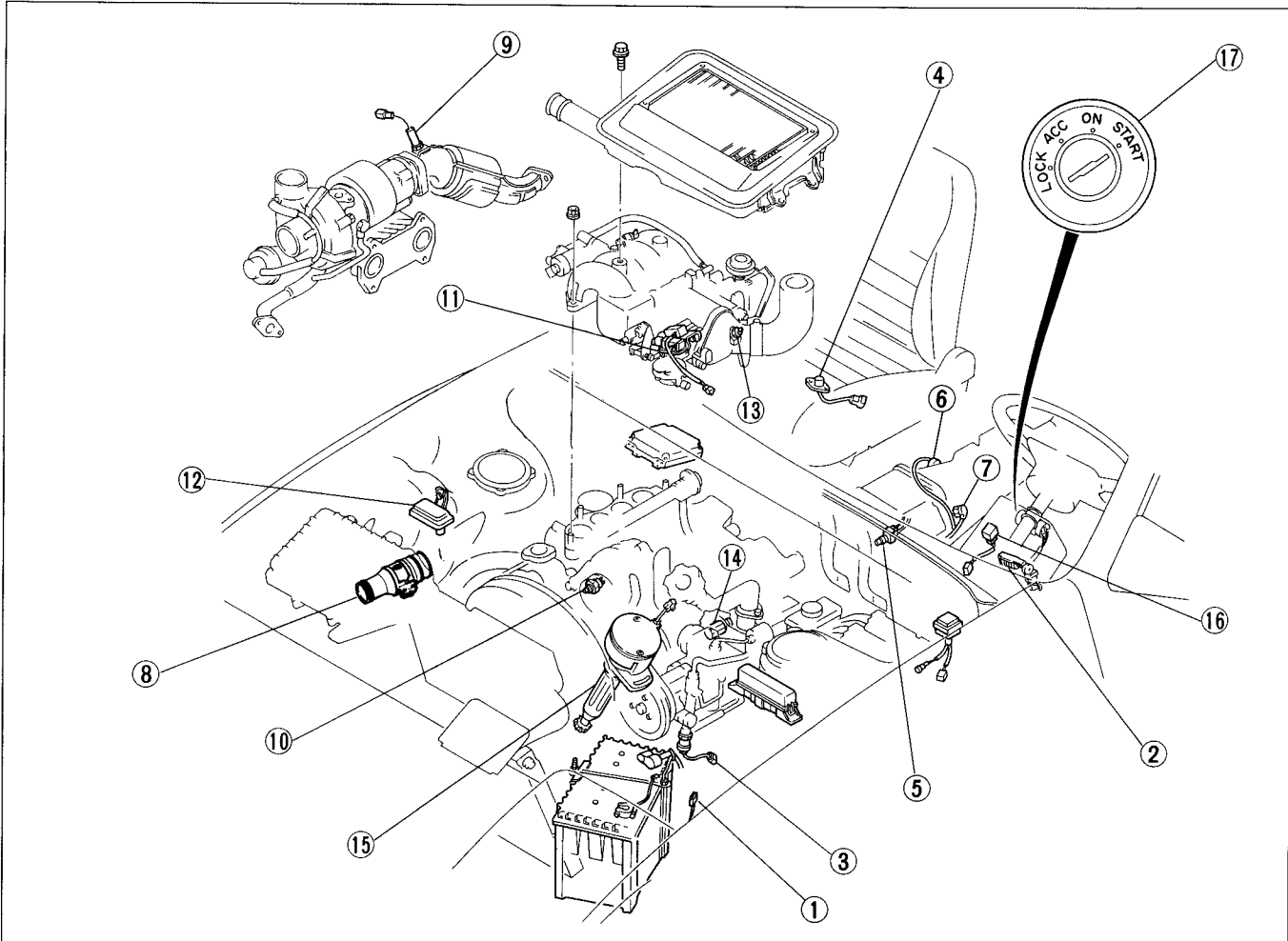
***Terms of Use:** This online/PC copy of the manual is only to be used and in your possession if you already own the printed version. It is for backup purposes only in case yours (or part of) is lost or damaged. If you downloaded this manual by mistake, Please Remove it from your possession. I also take no responsibility for what you do to yourself or your car while you use this manual.

FUEL AND EMISSION CONTROL SYSTEMS (TURBO)

INDEX	F2- 2	SECONDARY AIR INJECTION	
INPUT DEVICES	F2- 2	CONTROL SYSTEM	F2-57
OUTPUT DEVICES	F2- 3	DESCRIPTION	F2-57
FUEL DEVICES	F2- 4	TROUBLESHOOTING	F2-57
EXHAUST DEVICES	F2- 5	PREPARATION	F2-58
OUTLINE	F2- 6	SYSTEM INSPECTION	F2-58
SYSTEM DIAGRAM	F2- 6	SOLENOID VALVE (RELIEF)	F2-59
VACUUM HOSE ROUTING DIAGRAM	F2- 7	SOLENOID VALVE (SWITCH)	F2-60
WIRING DIAGRAM	F2- 8	SPLIT AIR SOLENOID VALVE	F2-60
SPECIFICATIONS	F2- 9	PORT AIR SOLENOID VALVE	F2-60
COMPONENT DESCRIPTIONS	F2-10	AIR PUMP	F2-61
TROUBLESHOOTING GUIDE	F2-12	AIR PUMP DRIVE BELT	F2-61
TROUBLESHOOTING PROCEDURE	F2-12	CHECK VALVE (IN INTAKE MANIFOLD)	F2-62
ENGINE TUNE-UP	F2-14	CHECK VALVE (INTAKE MANIFOLD TO	
BASIC INSPECTION	F2-14	CATALYTIC CONVERTER)	F2-62
ADJUSTMENT	F2-15	AIR CONTROL VALVE (ACV)	F2-63
SELF-DIAGNOSIS FUNCTION	F2-17	CRANKCASE AND EVAPORATIVE	
DESCRIPTION	F2-17	EMISSION CONTROL SYSTEM	F2-65
PREPARATION	F2-18	DESCRIPTION	F2-65
MULTIFUNCTION CODE NUMBER	F2-18	SYSTEM INSPECTION	F2-65
SWITCH MONITOR FUNCTION	F2-32	CHECK-AND-CUT VALVE	F2-65
INTAKE AIR SYSTEM	F2-34	CHARCOAL CANISTER	F2-66
COMPONENT PARTS	F2-34	PURGE CONTROL VALVE	F2-66
THROTTLE BODY	F2-35	CHECK VALVE	F2-66
ACCELERATOR CABLE	F2-37	DECELERATION CONTROL SYSTEM	F2-67
IDLE SPEED CONTROL (ISC) SYSTEM	F2-38	DESCRIPTION	F2-67
DESCRIPTION	F2-38	TROUBLESHOOTING	F2-68
TROUBLESHOOTING	F2-38	DASHPOT	F2-68
SYSTEM INSPECTION	F2-39	ANTI-AFTERBURN VALVE	F2-69
SOLENOID VALVE (BAC)	F2-39	CATALYTIC CONVERTER SYSTEM	F2-70
SOLENOID VALVE		DESCRIPTION	F2-70
(ACCELERATED WARM-UP SYSTEM)	F2-39	CATALYTIC CONVERTER	F2-70
SOLENOID VALVE (AIR SUPPLY VALVE)	F2-39	A/C CUT-OUT CONTROL SYSTEM	F2-71
TURBOCHARGER CONTROL SYSTEM	F2-40	DESCRIPTION	F2-71
DESCRIPTION	F2-40	TROUBLESHOOTING	F2-71
PREPARATION	F2-40	SYSTEM INSPECTION	F2-71
TROUBLESHOOTING	F2-40	KNOCK CONTROL SYSTEM	F2-72
DUTY SOLENOID VALVE (TURBO BOOST		SYSTEM INSPECTION	F2-72
PRESSURE CONTROL)	F2-41	CONTROL SYSTEM	F2-73
TURBOCHARGER	F2-41	STRUCTURAL VIEW	F2-73
WASTEGATE VALVE	F2-43	RELATIONSHIP CHART	F2-74
AIR BYPASS VALVE	F2-43	TROUBLESHOOTING	F2-76
FUEL SYSTEM	F2-44	PREPARATION	F2-76
DESCRIPTION	F2-44	ENGINE CONTROL UNIT	F2-76
TROUBLESHOOTING	F2-45	AIRFLOW METER	F2-80
PRECAUTION	F2-45	INTAKE AIR THERMOSENSOR (ENGINE)	F2-80
SYSTEM OPERATION	F2-46	WATER THERMOSENSOR	F2-81
FUEL TANK	F2-47	THROTTLE SENSOR	F2-81
FUEL PUMP	F2-48	OXYGEN SENSOR	F2-81
PRESSURE REGULATOR	F2-49	KNOCK SENSOR	F2-82
INJECTOR	F2-50	PRESSURE SENSOR	F2-82
FUEL PUMP CONTROL SYSTEM	F2-53	HEAT HAZARD SENSOR	F2-83
CIRCUIT OPENING RELAY	F2-53	MAIN RELAY	F2-83
PRESSURE REGULATOR CONTROL (PRC)		NEUTRAL SWITCH	F2-84
SYSTEM	F2-54	CLUTCH SWITCH	F2-84
DESCRIPTION	F2-54	POWER STEERING PRESSURE SWITCH	F2-84
SYSTEM OPERATION	F2-54	BACK-UP LIGHT AND 5TH SWITCH	F2-84
TROUBLESHOOTING	F2-54	MILEAGE SENSOR (No.1 AND No.2)	F2-84
SOLENOID VALVE (PRC)	F2-54	SUB-ZERO STARTING ASSIST DEVICE	
EXHAUST SYSTEM	F2-55	(EXCEPT FOR CALIFORNIA)	F2-85
COMPONENT PARTS	F2-55	SUB-ZERO STARTING ASSIST DEVICE	F2-85
OUTLINE OF EMISSION CONTROL SYSTEM	F2-56	SUB-ZERO STARTING ASSIST FLUID	F2-85
DESCRIPTION	F2-56	OIL THERMO UNIT	F2-85

INDEX

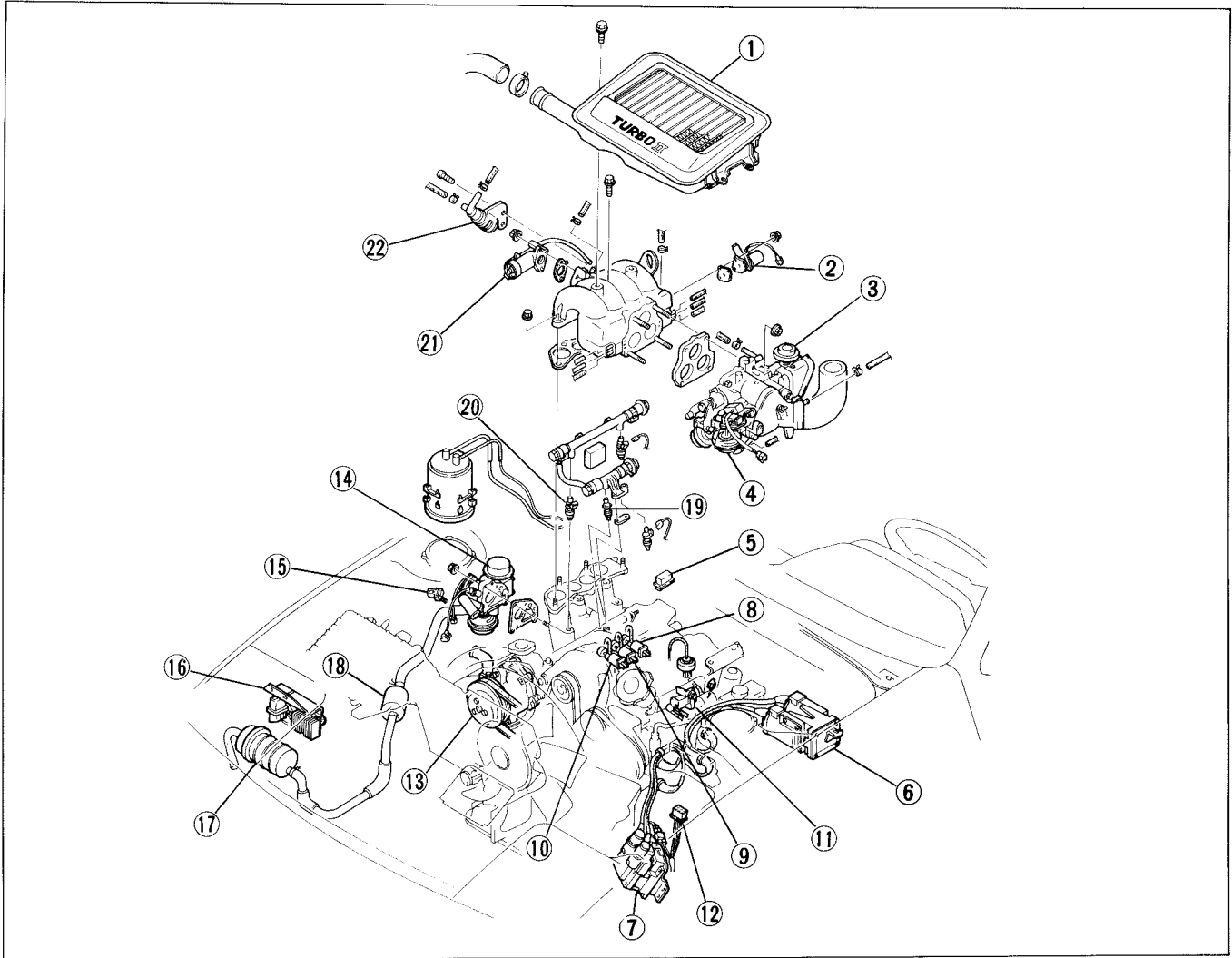
INPUT DEVICES



97U0F2-002

- | | |
|--------------------------------------|------------|
| 1. Test connector (Green: 1-pin) | |
| 2. Mileage sensor (No.1 and No.2) | |
| Replacement..... | page T-41 |
| 3. P/S pressure switch | |
| Inspection | page F2-84 |
| 4. Heat hazard sensor | |
| Inspection (warning system) | |
| Removal..... | page F2-83 |
| Installation..... | page F2-83 |
| Inspection | page F2-83 |
| 5. Clutch switch | |
| Inspection | page F2-84 |
| 6. Neutral switch | |
| Inspection | page F2-84 |
| 7. Back-up light and 5th switch | |
| Inspection | page F2-84 |
| 8. Airflow meter | |
| (Include intake air thermosensor) | |
| Removal and Installation..... | page F2-80 |
| Inspection | page F2-80 |
| 9. Oxygen sensor | |
| Inspection | page F2-81 |
| Inspection of sensitivity | page F2-82 |
| Replacement..... | page F2-82 |
| 10. Water thermosensor | |
| Inspection | page F2-81 |
| 11. Throttle sensor | |
| (Full range and narrow range) | |
| Inspection | page F2-81 |
| 12. Pressure sensor | |
| Inspection | page F2-82 |
| 13. Intake air thermosensor (Engine) | |
| Inspection | page F2-80 |
| 14. Knock sensor | |
| System inspection..... | page F2-72 |
| Removal and Installation..... | page F2-82 |
| 15. Crank angle sensor | |
| Inspection..... | page G-32 |
| Removal and Installation..... | page G-32 |
| 16. Circuit opening relay | |
| Inspection | page F2-53 |
| 17. Ignition switch | |
| Inspection | page T-17 |
| Removal and Installation..... | page T-17 |

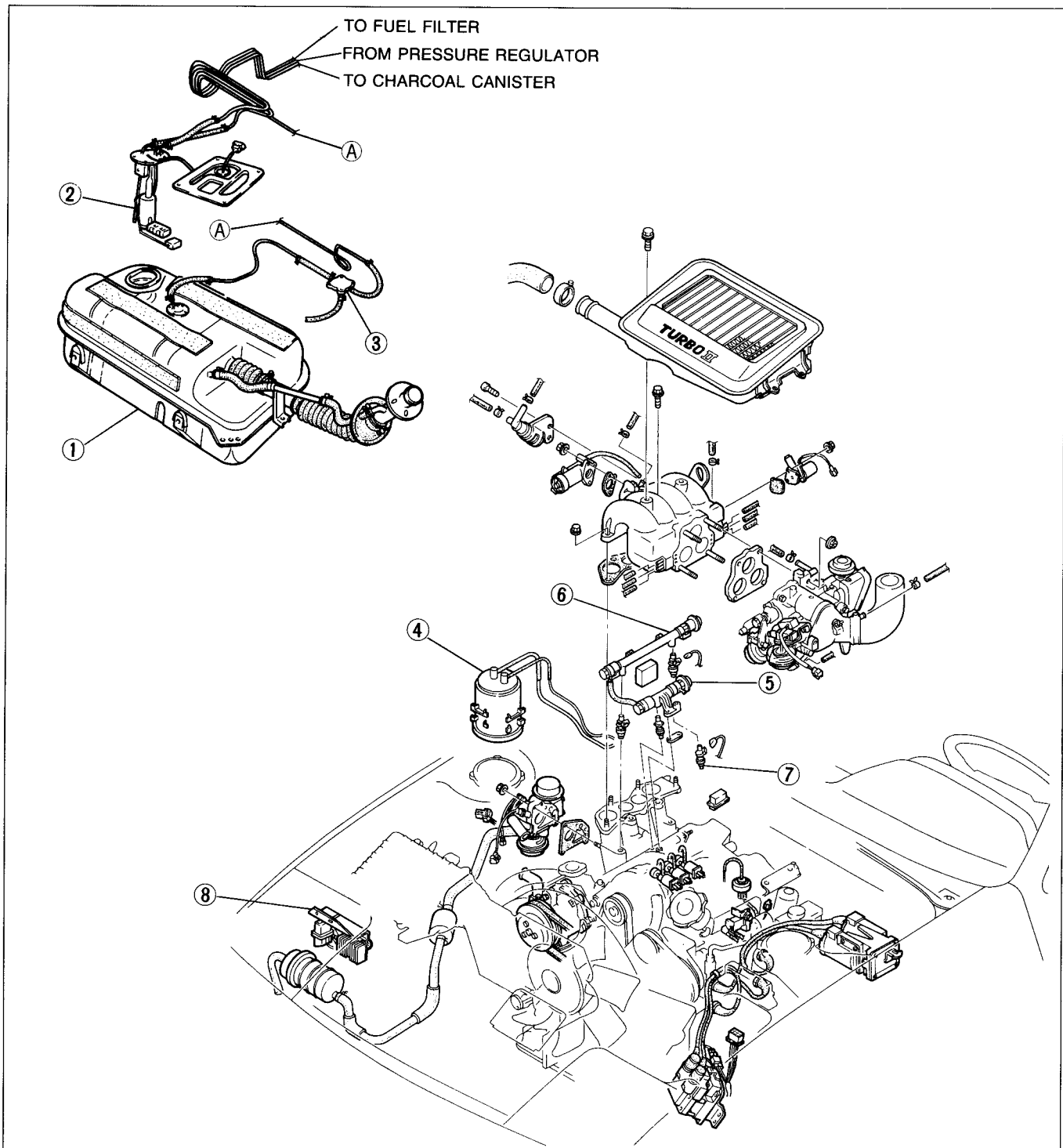
OUTPUT DEVICES



97U0F2-003

- | | |
|---|------------|
| 1. Intercooler | |
| 2. Solenoid valve (Air supply valve) | |
| Inspection | page F2-39 |
| 3. Dashpot | |
| Inspection | page F2-68 |
| Adjustment | page F2-68 |
| 4. Double throttle diaphragm | |
| 5. A/C relay | |
| Inspection | page U-67 |
| 6. Ignition coil (Trailing) | |
| Refer to Section G | |
| 7. Ignition coil (Leading) | |
| Refer to Section G | |
| 8. Solenoid valve (Relief) | |
| Inspection | page F2-59 |
| 9. Solenoid valve (PRC) | |
| Inspection | page F2-54 |
| 10. Solenoid valve (Switch) | |
| Inspection | page F2-60 |
| 11. Duty solenoid valve | |
| (Turbo boost pressure control) | |
| Inspection | page F2-41 |
| 12. Check connector | |
| (Self-diagnosis checker (Green: 6-pin)) | |
| 13. Air pump | |
| Inspection | page F2-61 |
| Removal and Installation..... | page F2-61 |
| 14. Air control valve (ACV) | |
| Removal and Installation..... | page F2-64 |
| Inspection | page F2-63 |
| 15. Check connector (Fuel pump (Yellow: 2-pin)) | |
| 16. Fuel pump resistor relay | |
| Inspection | page F2-53 |
| 17. Relief silencer | |
| 18. Air chamber | |
| 19. Injector (Primary) | |
| Removal..... | page F2-50 |
| Installation | page F2-51 |
| Inspection | page F2-52 |
| 20. Injector (Secondary) | |
| Removal..... | page F2-50 |
| Installation | page F2-51 |
| Inspection | page F2-52 |
| 21. Solenoid valve (Bypass air control) | |
| Inspection | page F2-39 |
| 22. Solenoid valve (Accelerated warm-up system) | |
| Inspection | page F2-39 |

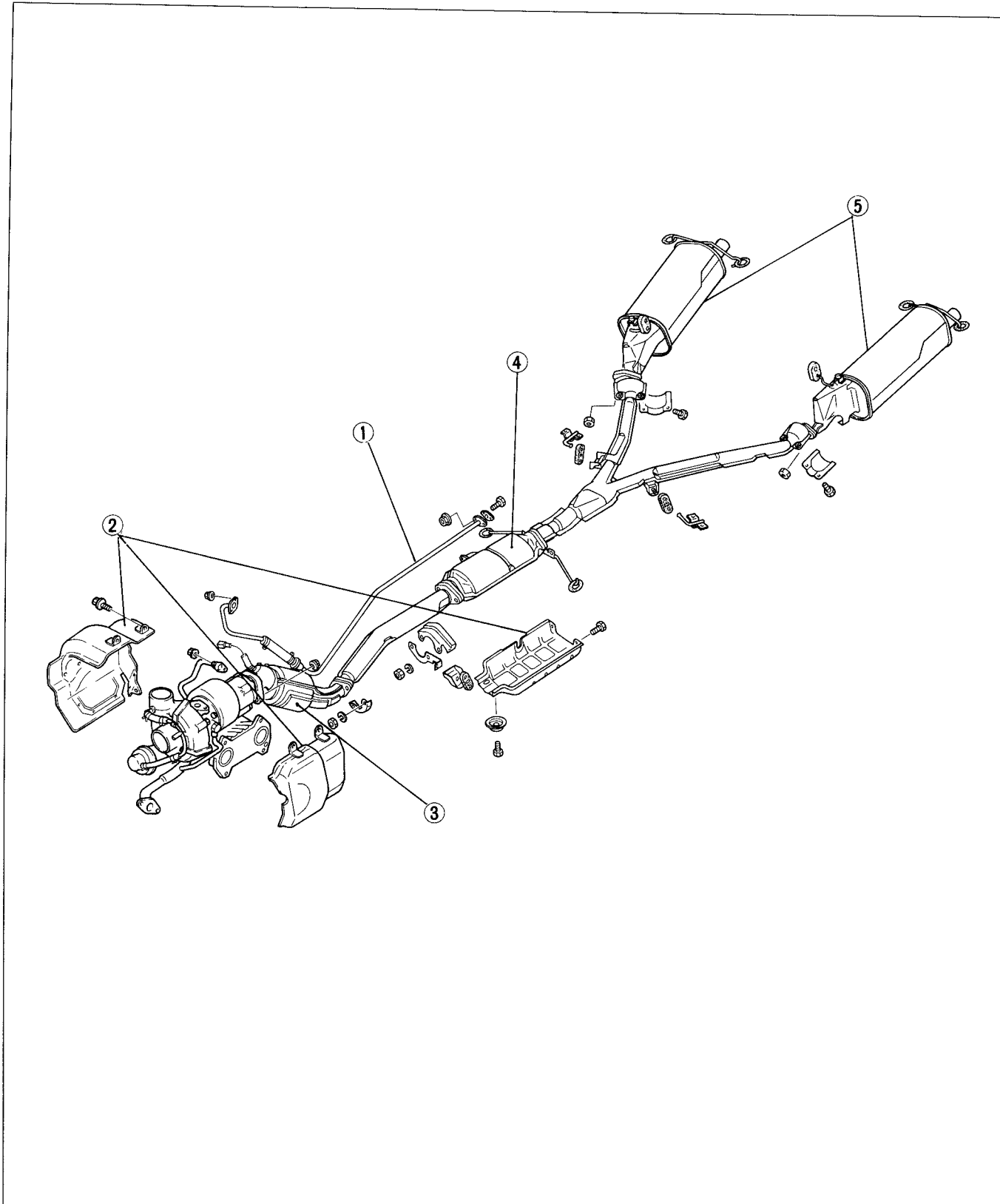
FUEL DEVICES



97U0F2-004

- | | |
|--|------------|
| 1. Fuel tank | |
| Removal and Installation..... | page F2-47 |
| Inspection | page F2-47 |
| 2. Fuel pump | |
| Inspection | page F2-48 |
| Removal and Installation..... | page F2-49 |
| 3. Check-and-cut valve | |
| Inspection | page F2-65 |
| Removal and Installation..... | page F2-66 |
| 4. Charcoal canister | |
| Inspection | page F2-66 |
| 5. Pulsation damper (with delivery pipe) | |
| 6. Pressure regulator (with delivery pipe) | |
| Inspection | page F2-49 |
| 7. Injector | |
| Removal and Installation | page F2-50 |
| Inspection | page F2-52 |
| 8. Fuel pump resistor relay | |
| Inspection | page F2-53 |

EXHAUST DEVICES



97U0F2-005

Exhaust devices

Removal and Installation..... page F2-55

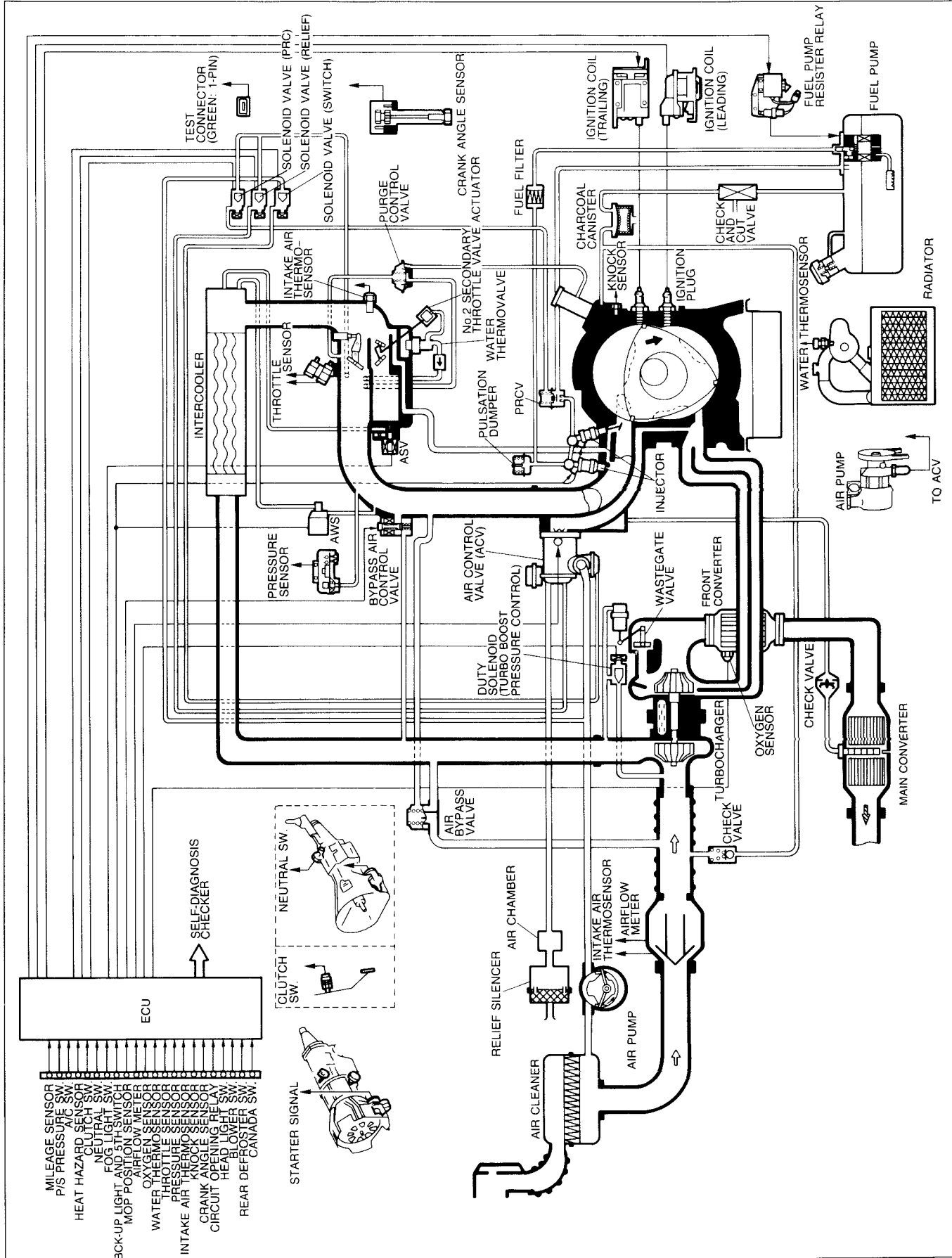
Inspection page F2-55

- 1. Split air pipe
- 2. Insulator covers
- 3. Front converter

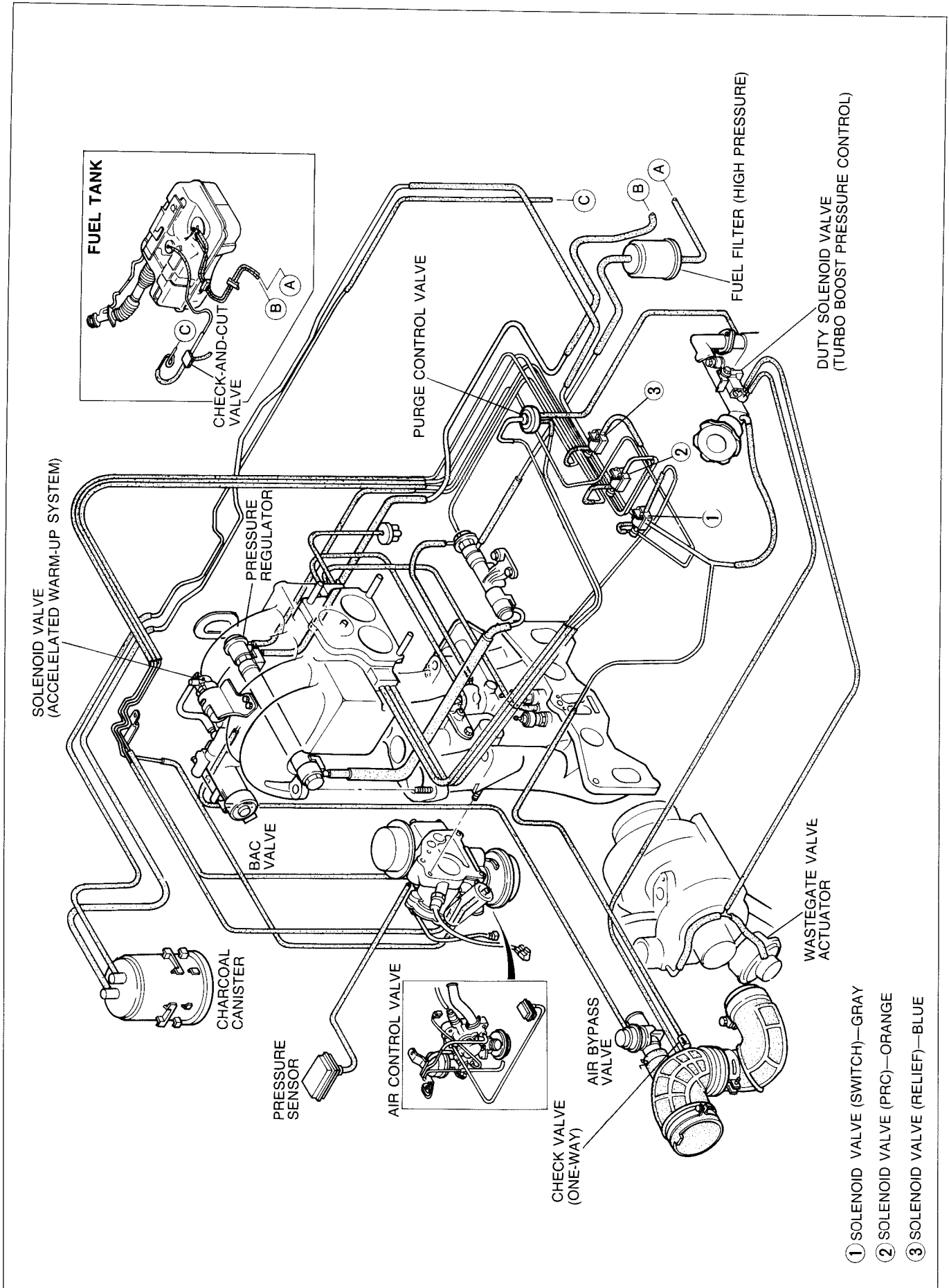
- 4. Main converter
- 5. Main silencer

OUTLINE

SYSTEM DIAGRAM

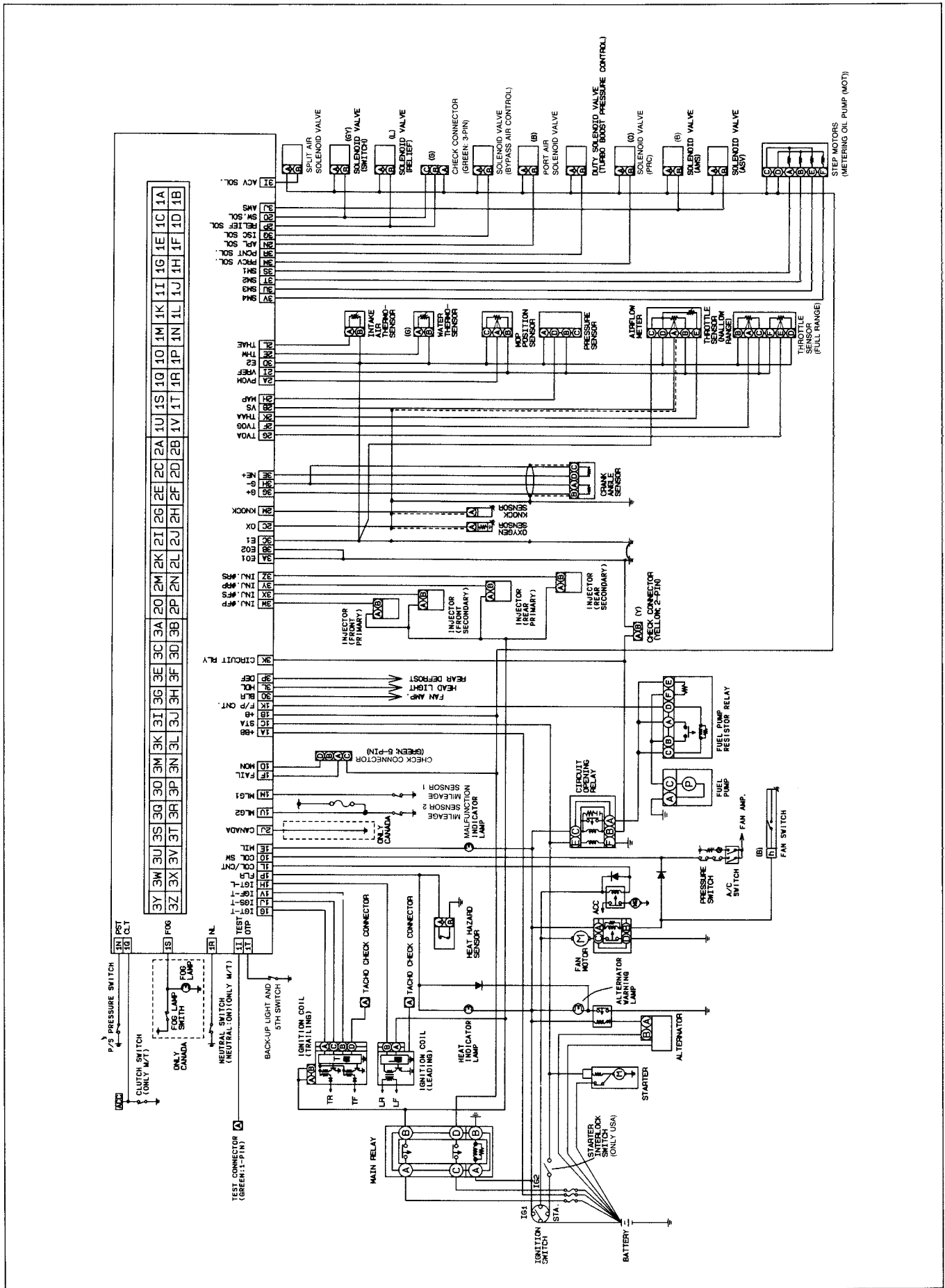


VACUUM HOSE ROUTING DIAGRAM



- ① SOLENOID VALVE (SWITCH)—GRAY
- ② SOLENOID VALVE (PRC)—ORANGE
- ③ SOLENOID VALVE (RELIEF)—BLUE

WIRING DIAGRAM



SPECIFICATIONS

Item		Model	13B Turbocharged engine
Idle speed (Test connector grounded)		rpm	750 ± 25
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)	55—65 (131—149) or more
Dashpot	Adjustment (Throttle sensor (narrow range) resistance (A)—(B)) kΩ		1.8—3.8
Turbocharger	Type		Water cooled
	Boost pressure	kPa (kg/cm ² , psi)	57.0 (0.58, 8.25)
	Lubrication		Engine oil
Waste gate valve			Incorporated with turbocharger
Fuel tank	Capacity	liters (US gal, Imp gal)	70 (18.5, 15.4)
Fuel filter	Type	Low pressure	Nylon 6 (164 & 45 mesh)
		High pressure	Filter paper
Pressure regulator	Type		Diaphragm
	Regulated pressure kPa (kg/cm ² , psi)		235—275 (2.4—2.8, 34.1—39.8)
Fuel pump	Type		Impeller (in-tank)
	Output pressure kPa (kg/cm ² , psi)		490—637 (5.0—6.5, 71.1—92.4)
Injector (Primary and Secondary)	Drive		Voltage drive
	Injection volume cc (cu in)/15 sec		133—142 (8.1—8.7)
Heat hazard sensor	Operation temperature °C (°F)		105—115 (221—239)
Main silencer	Capacity cc (cu in)		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	800
Anti-afterburn valve	Operating time sec		1.60—2.20
Intercooler	Type		Air cooled

97U0F2-009

COMPONENT DESCRIPTIONS

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 primary injector hole	
Air Bypass Valve	Reduces sound of intake air from turbocharger relieved through air flow meter during deceleration	
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
Airflow 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	
Check Valve	Supplies the blowby gas and evaporative emission gas into the turbocharger when the intake manifold vacuum becomes positive pressure	For evaporative emission control system
Charcoal Canister	Stores fuel tank fumes when engine stops	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	
Duty Solenoid Valve (Turbo boost pressure control)	Controls turbo boost pressure	
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. Amount of intake air 3. Engine coolant temperature 4. Throttle opening 5. Intake manifold pressure 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. Knocking signal 14. Initial set signal 15. Position of transmission gear 16. Metering oil pump (MOP) position signal 17. Electric load (E/L) condition <p>18. Mileage</p> <p>Controls operation of the following:</p> <ol style="list-style-type: none"> 1. Fuel injection system 2. Ignition control system 	<p>Crank angle sensor Airflow meter Water thermosensor Throttle sensors Pressure sensor Oxygen (O₂) sensor Neutral switch and clutch switch Intake air thermosensor Heat hazard sensor A/C switch Starter switch Atmospheric pressure sensor Knock sensor and knock control unit Test connector (Green: 1-pin) Back-up light and 5th switch MOP position sensor Headlight switch, Blower switch, Rear defroster switch, Fog light switch Mileage sensor (No.1 and No.2)</p>

Component	Function	Remarks
Engine Control Unit (Cont'd)	3. ISC system 4. Pressure regulator control system 5. Secondary air injection control system 6. Turbo boost pressure control 7. Fuel pump control system	
Fast Idle System	Opens primary throttle valve slightly at idle	Only when engine is cold
Fuel Filter	Filters fuel	
Fuel Pump	Provides fuel to injectors	Operates while engine is running Installed in fuel tank
Fuel Pump Resistor Relay	Controls voltage for fuel pump	
Heat Hazard Sensor	Detects floor temperature; sends signal to control unit	Heat hazard sensor turned ON; relieves secondary air
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 airflow meter and intake air pipe Thermistor
Intercooler	Prevents increase of intake air temperature	Air cooled type
Knock Sensor	Detects engine knock; sends signal to engine control unit	
Mileage Sensor (No.1 and No.2)	Detects vehicle mileage; sends signal to control unit	Above 20,000 miles (34,000 km); mileage sensor No.1 is ON Below 600 miles (1,000 km); mileage sensor No.2 is ON
Oxygen Sensor	Detects O ₂ concentration; sends signal to control unit	Zirconia ceramic and platinum coating
Pressure Regulator	Adjusts fuel pressure supplied to injectors	
Pulsation Damper	Absorbs fuel pulsations	
Pressure sensor	Detects intake manifold pressure, sends signal to control unit	
Purge Control Valve	Regulates evaporative fumes from fuel tank and canister to intake manifold	
Solenoid Valve (Bypass air control)	Supplies bypass air into dynamic chamber	Controlled by duty signal from control unit
Solenoid Valve (PRC)	Shuts vacuum passage between dynamic chamber and pressure regulator	Only when engine hot Orange
Solenoid Valve (Switch)	Controls switching valve of the air control valve	Gray
Solenoid Valve (Relief)	Controls relief valve	Blue
Solenoid Valve (AWS)	Controls accelerated warm-up system (AWS)	
Solenoid Valve (Air supply valve)	Supplies bypass air into dynamic chamber	During AWS operation
Split Air Solenoid Valve	Control split air	
Test Connector (Green: 1-pin)	Sends initial set signal to control unit	During adjustment of idle speed, ignition timing and knock system; connector grounded
Throttle Body	Controls intake air quantity	
Throttle Sensors	Detects primary throttle valve opening angle; sends signal to control unit	
Turbocharger	Pressurizes intake air utilizing exhaust gas flow	Twin-scroll turbocharger
Wastegate Valve	Controls amount of exhaust gas bypassing exhaust turbine to control intake air boost pressure	
Water Thermosensor	Detects engine coolant temperature; sends signal to control unit	Thermistor

97U0F2-010

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 F2–17.)
- 2nd:** Check other switches with the **SST**. (Refer to page F2–32.)
- 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	Step motor (Metering oil pump)
03	Crank angle sensor (G-signal)	30	Split air solenoid valve
05	Knock sensor	31	Solenoid valve (Relief)
08	Airflow meter (AFM)	32	Solenoid valve (Switching)
09	Water thermosensor	33	Port air solenoid valve
10	Intake air thermosensor (AFM)	34	Solenoid valve (Bypass air control (BAC))
11	Intake air thermosensor (Engine)	38	Solenoid valve (Accelerated warm-up system (AWS) and Air supply valve (ASV))
12	Throttle sensor (Full range)	42	Solenoid valve (Waste gate control)
13	Pressure sensor	51	Fuel pump resistor relay
14	Atmospheric pressure sensor (Built in ECU)	71	Injector (Front secondary)
15	Oxygen sensor	73	Injector (Rear secondary)
17	Feedback system		
18	Throttle sensor (Narrow range)		
20	Metering oil pump position sensor		
27	Metering oil pump		
37	Metering oil pump		

97U0F2-011

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.

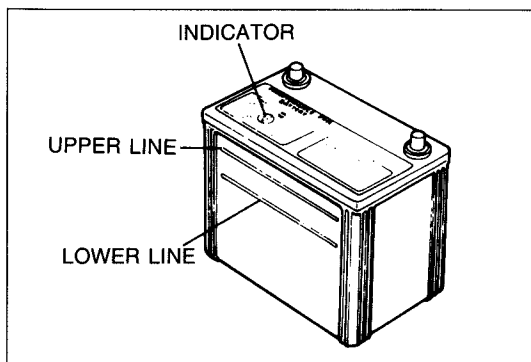
The numbers of the list show the priorities of inspections from the most probable to that with the lowest probability.

These were determined on the following basis:

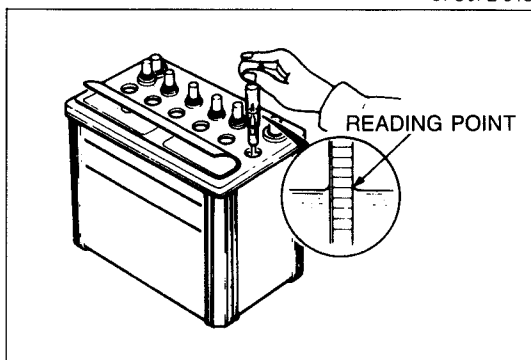
- Ease of inspection
- Most possible system
- Most possible point in system

Possible cause	Symptom	page										
		Hard start or No start	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
INTAKE AIR SYSTEM	F2-34	5	1	2	1	3		1	2		3	
TURBOCHARGER CONTROL SYSTEM	F2-40							7				
IDLE SPEED CONTROL (ISC) SYSTEM	F2-38	4	2	1	5	1	3		5	2	7	
FUEL SYSTEM	F2-44	2	3		4	5	4	2	6	3	6	
PRESSURE REGULATOR CONTROL (PRC) SYSTEM	F2-54	3		4								
EXHAUST SYSTEM	F2-55					6		5	8		5	
SECONDARY AIR INJECTION SYSTEM	F2-57					7			7		4	
CRANKCASE AND EVAPORATIVE EMISSION CONTROL SYSTEM	F2-65	7									2	
DECELERATION CONTROL SYSTEM	F2-67				6				4	1	8	
CATALYTIC CONVERTER	F2-70										1	
A/C CUT-OUT CONTROL SYSTEM	F2-71											
KNOCK CONTROL SYSTEM	F2-72							6				1
CONTROL SYSTEM	F2-73	6	4	3	3	2	2	4	3	4	9	3
ELECTRONIC SPARK ADVANCE (ESA) SYSTEM	G-32	1	5		2	4	1	3	1	5	10	2

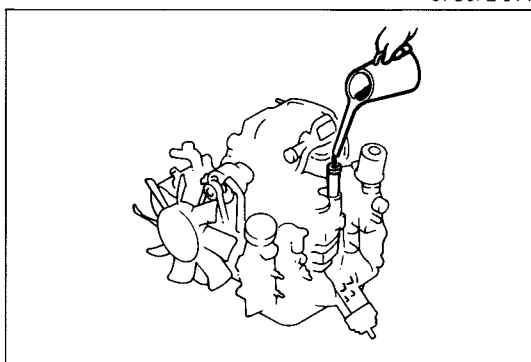
97U0F2-012



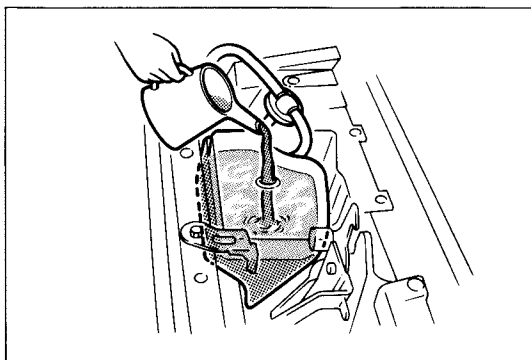
97U0F2-013



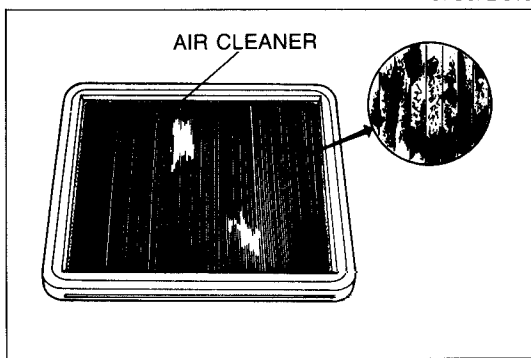
97U0F2-014



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.

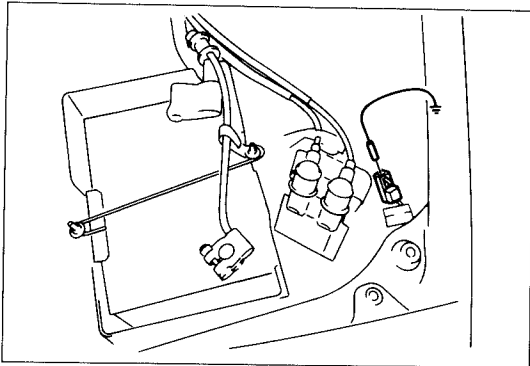
Check that the coolant level is near the radiator inlet port, and that the level in the reserve tank is between the FULL and LOW marks. Add coolant as necessary.

Air Cleaner Element

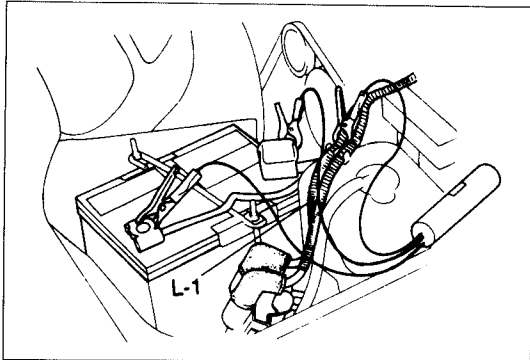
Visually check the air cleaner element for excessive dirt damage or oil. Replace, if necessary.

Caution

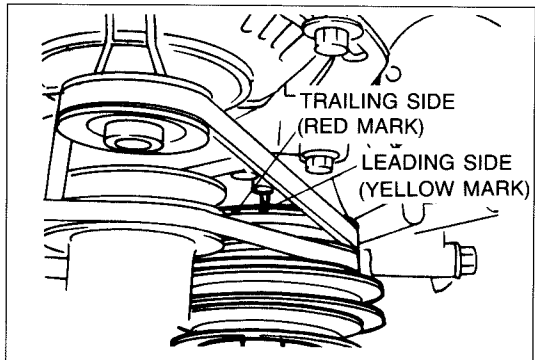
Do not use the compressed air to clean the air cleaner element.



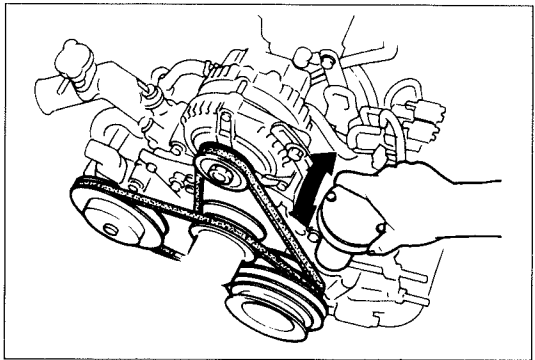
97U0F2-018



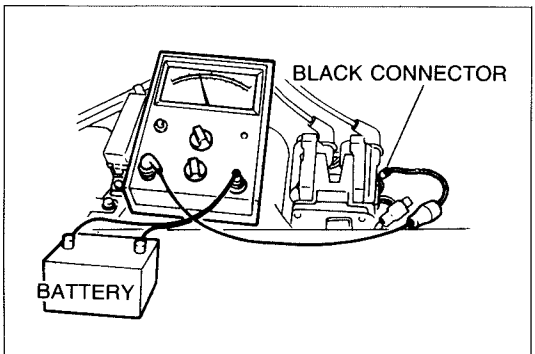
97U0F2-019



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)

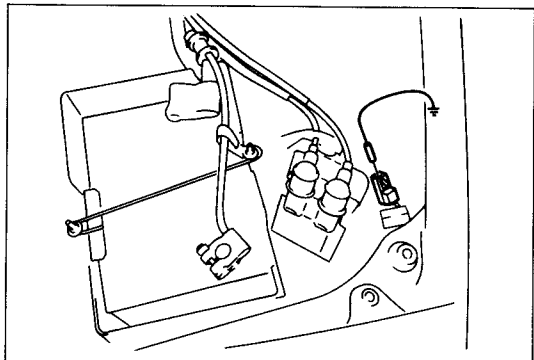
Trailing: $20^\circ \pm 2^\circ$ ATDC (Red)

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

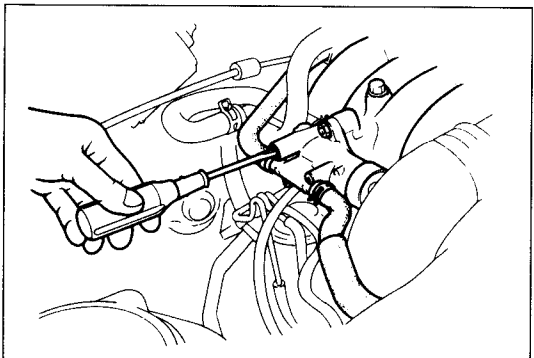
Idle Speed

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.



97U0F2-022



97U0F2-023

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

2. Check the throttle sensor.

(Refer to page F2-81.)

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.

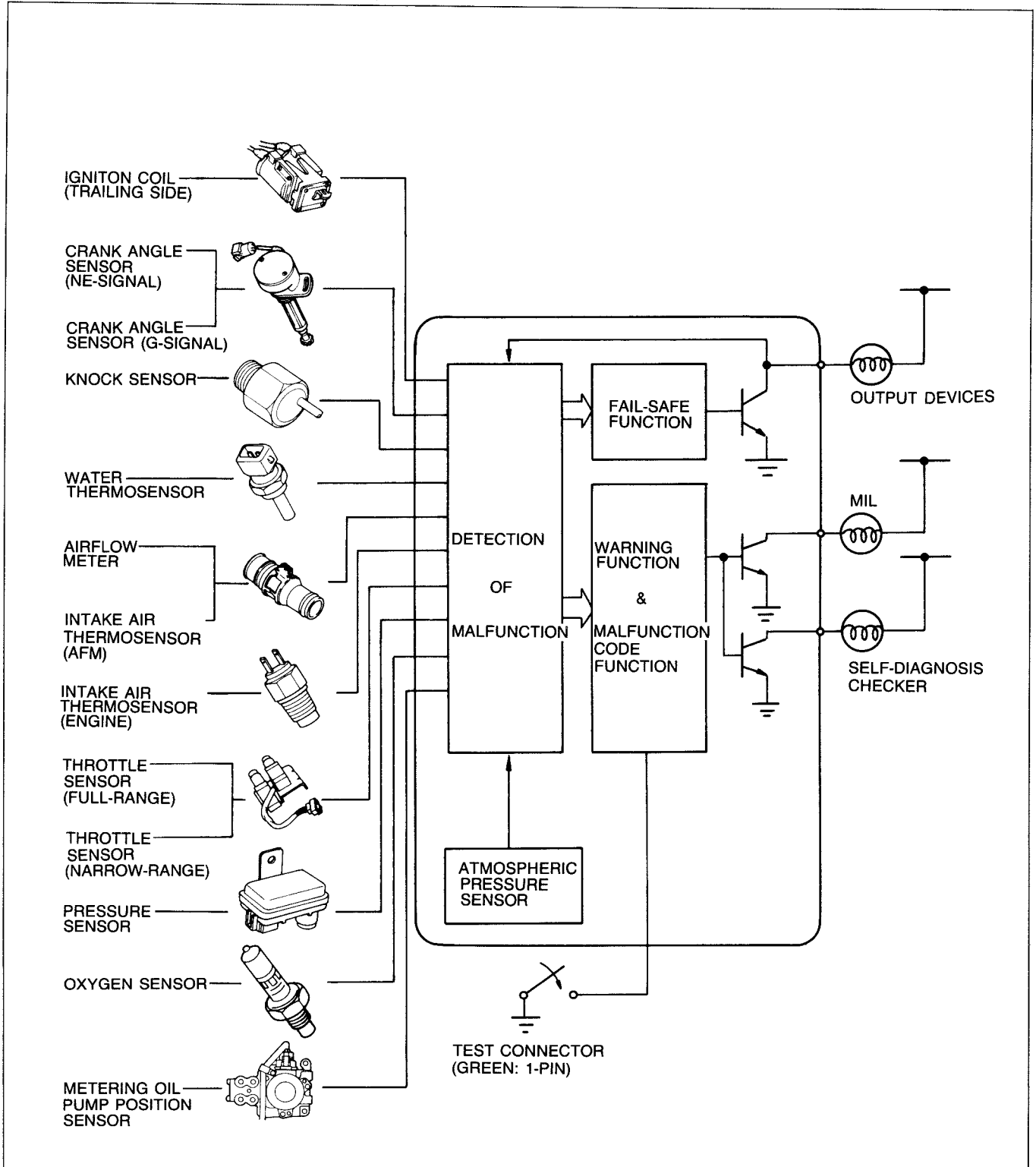
SELF-DIAGNOSIS FUNCTION

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.

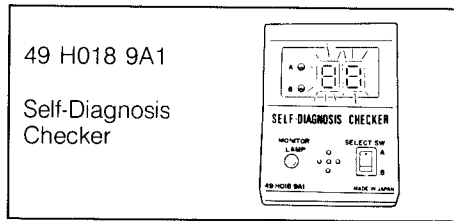
Note

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.

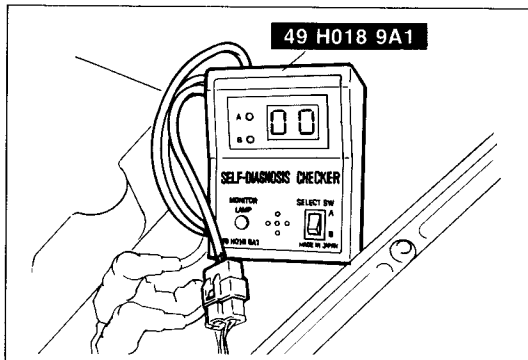


F2 SELF-DIAGNOSIS FUNCTION

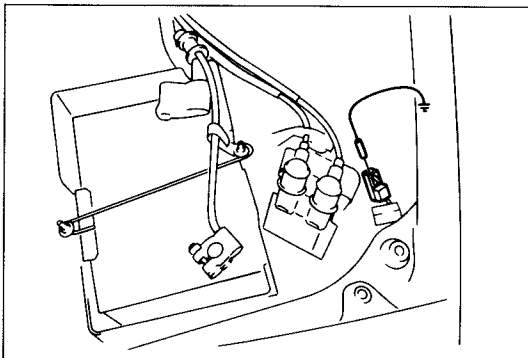
PREPARATION SST



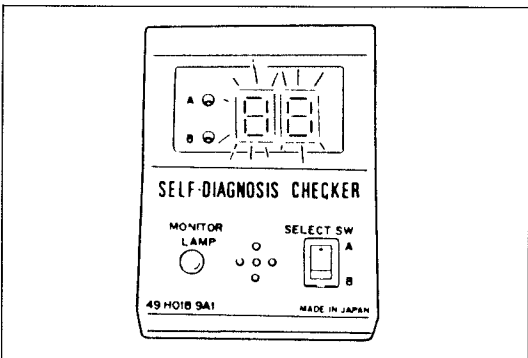
97U0F2-025



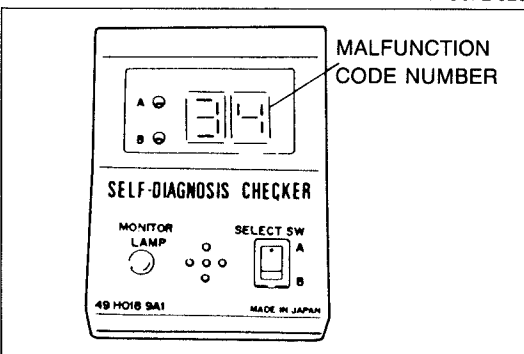
97U0F2-026



97U0F2-027



97U0F2-028



97U0F2-029

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 F2-79.) 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 F2-12.)

Note

Cancel the malfunction code numbers by performing the after-repair procedure following repairs. (Refer to page F2-31.)

Troubleshooting

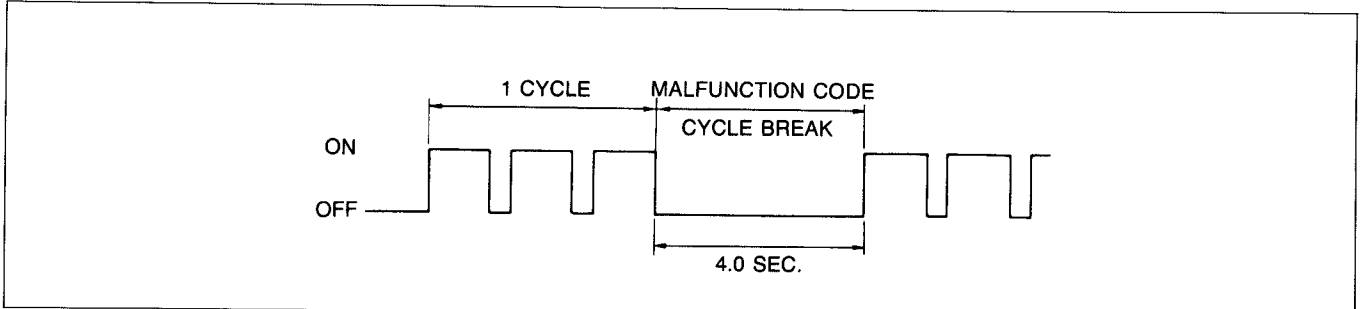
Principle of code cycle

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

97U0F2-030

1. Malfunction code cycle break

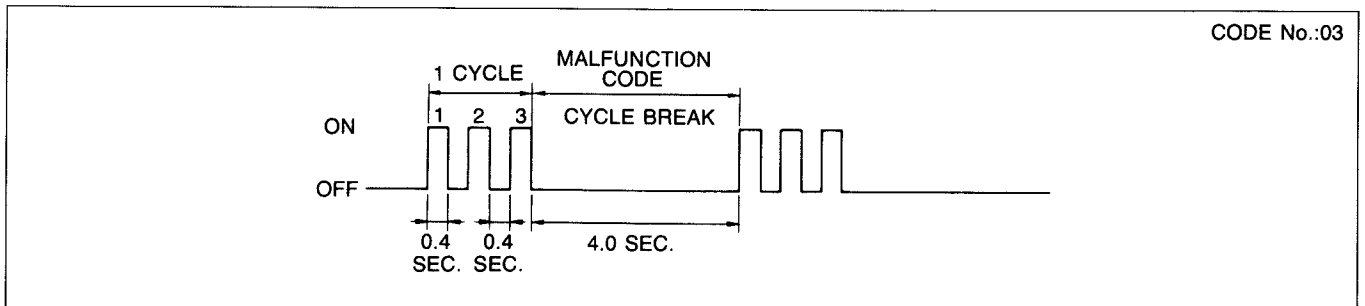
The time between malfunction code cycles is 4.0 sec. (the time the MIL and checker buzzer are off).



89U0F1-543

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.

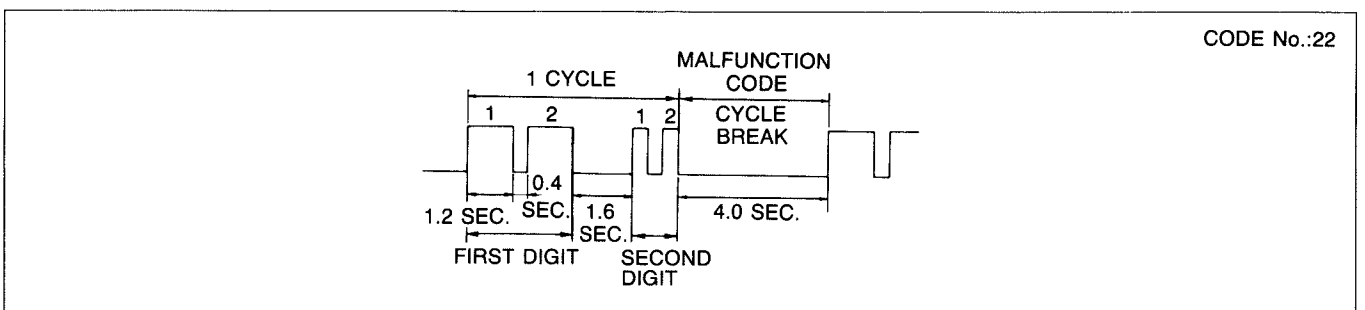


89U04X-565

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.



89U04X-566

















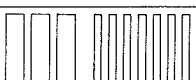
F2 SELF-DIAGNOSIS FUNCTION

Code number

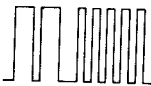






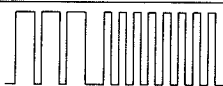

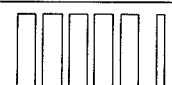


Caution

- 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	
05	Knock sensor	Broken wire, short circuit	Ignition timing fixed	
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	

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) and air supply valve (ASV))	
42	Duty solenoid (Turbo boost pressure control)	
51	Fuel pump resistor relay	
71	Injector (Front secondary)	
73	Injector (Rear secondary)	

97U0F2-032

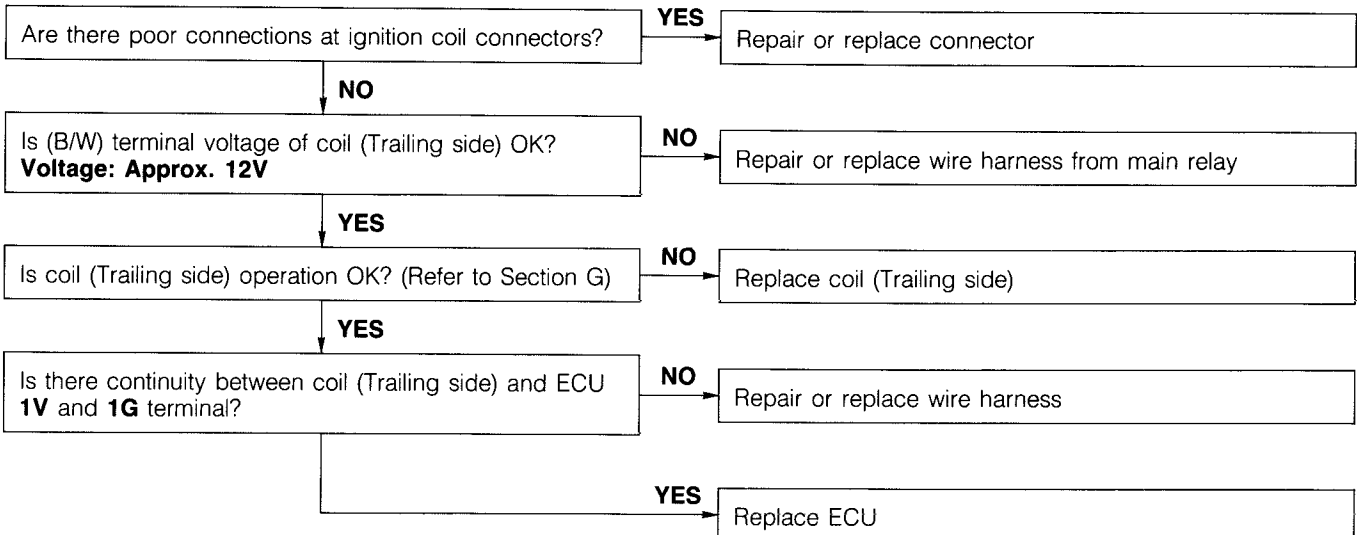
F2 SELF-DIAGNOSIS FUNCTION

Troubleshooting chart

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

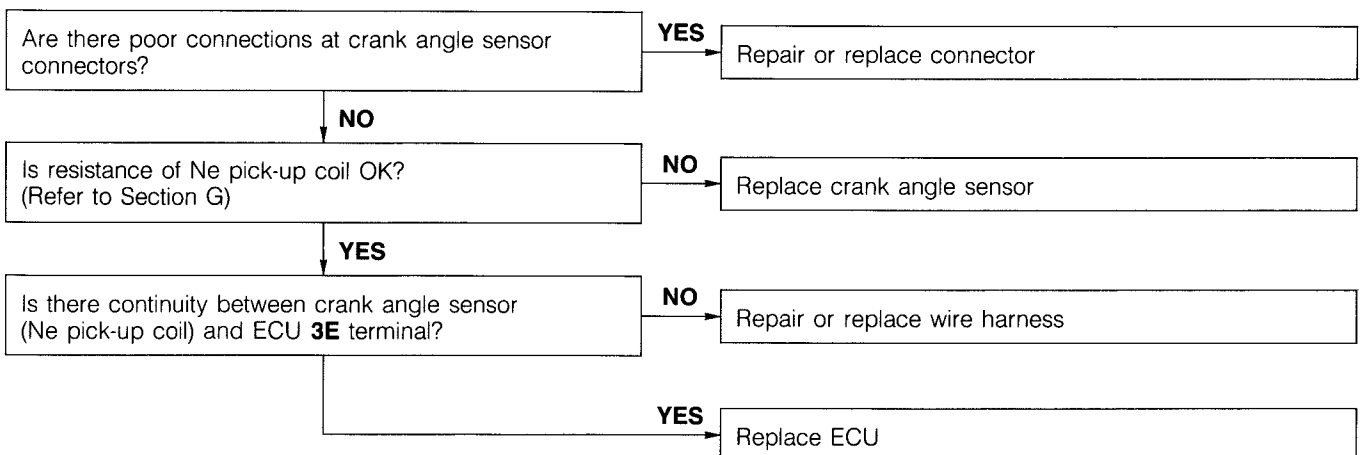
Input device

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



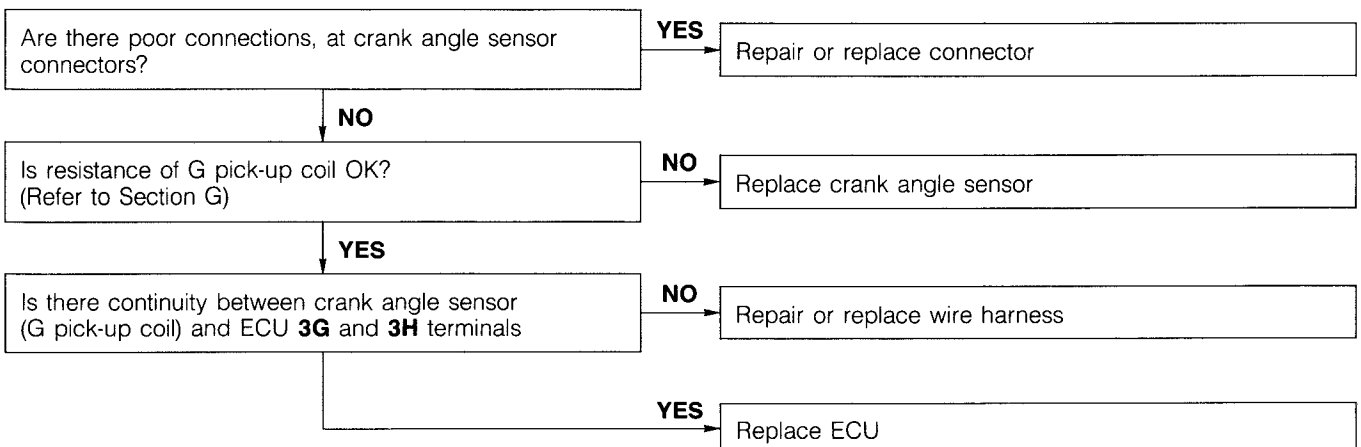
97U0F2-033

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



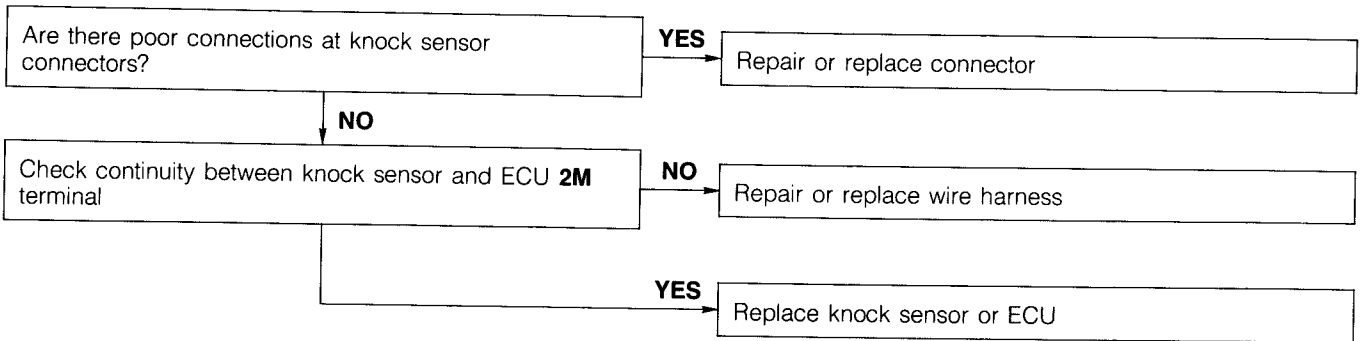
97U0F2-034

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



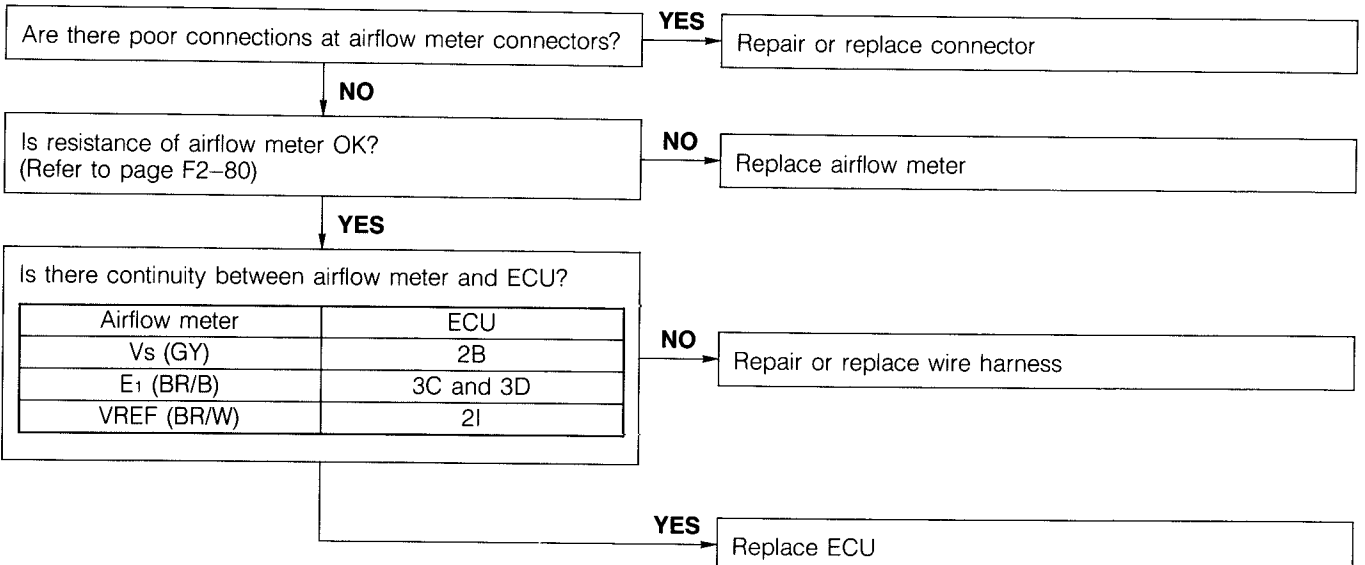
97U0F2-035

No.5 Code (Knock sensor)



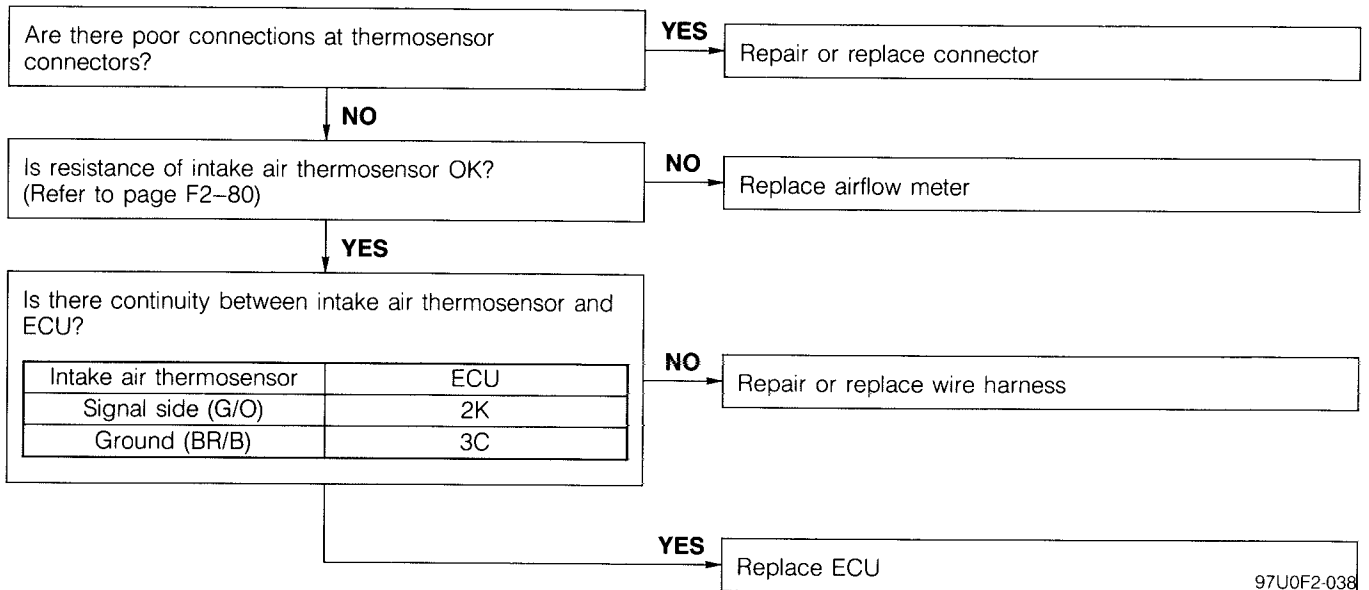
97U0F2-036

No.8 Code (Airflow meter)



97U0F2-037

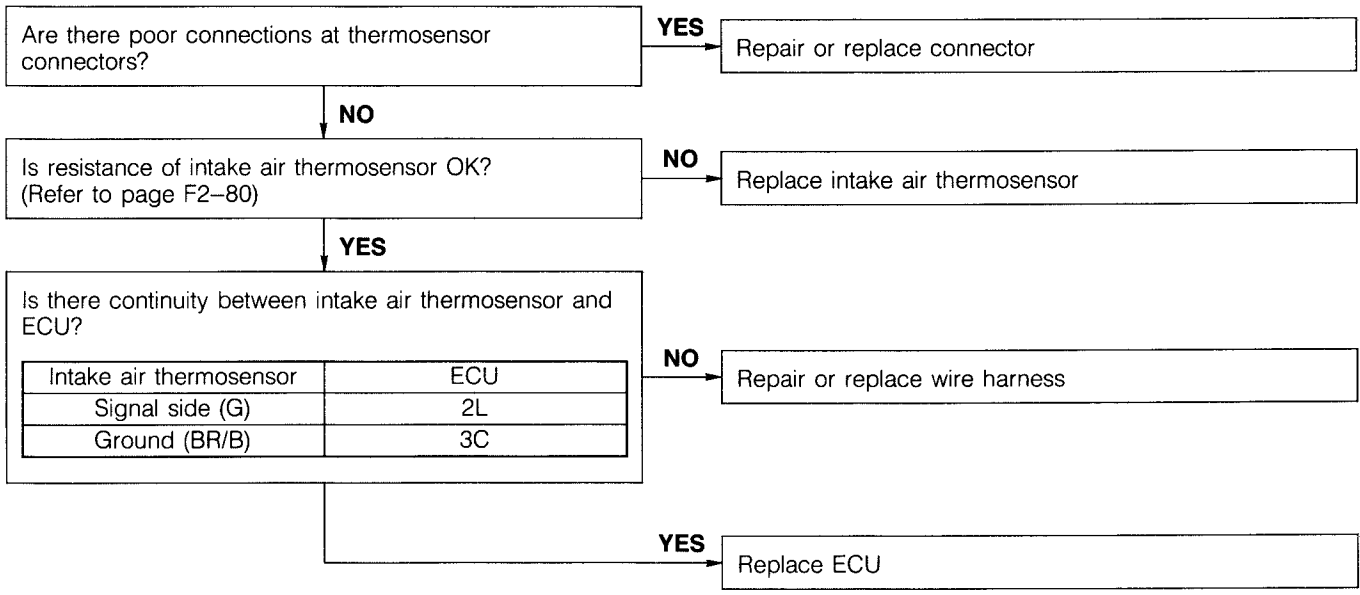
No.10 Code (Intake air thermosensor (AFM))



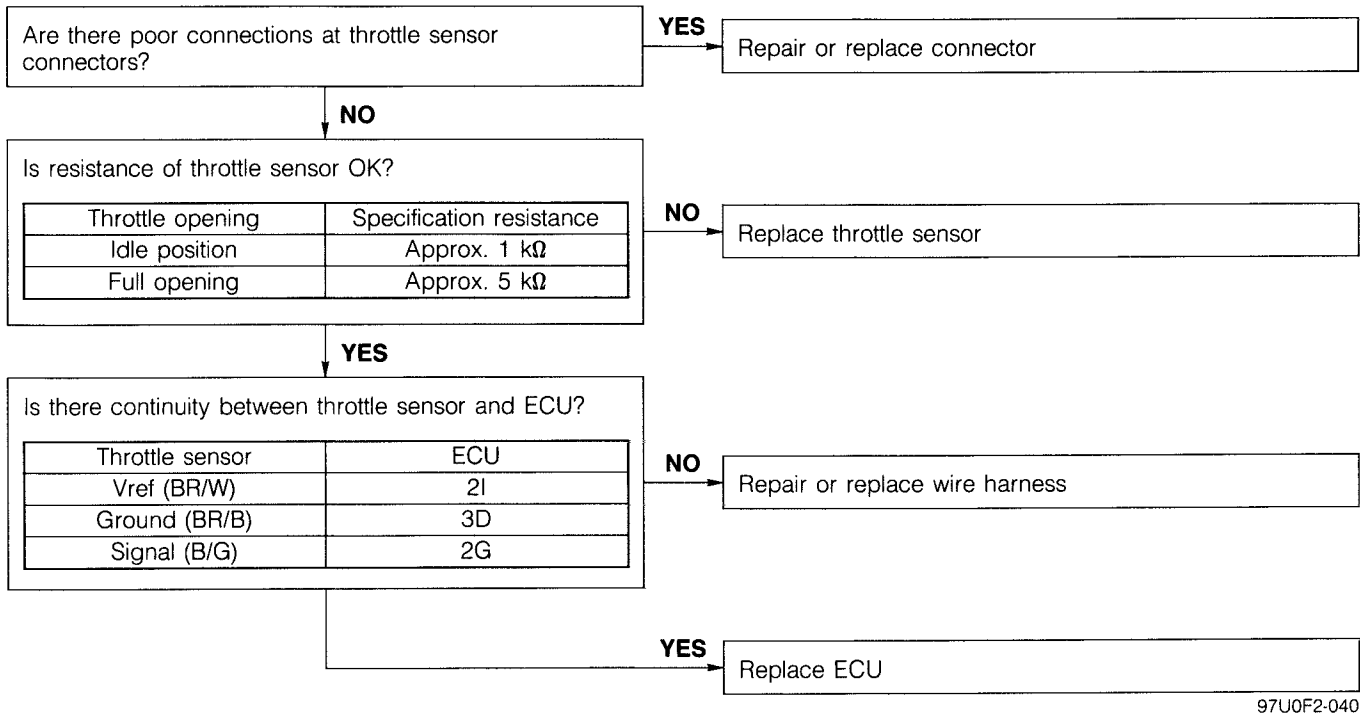
97U0F2-038

F2 SELF-DIAGNOSIS FUNCTION

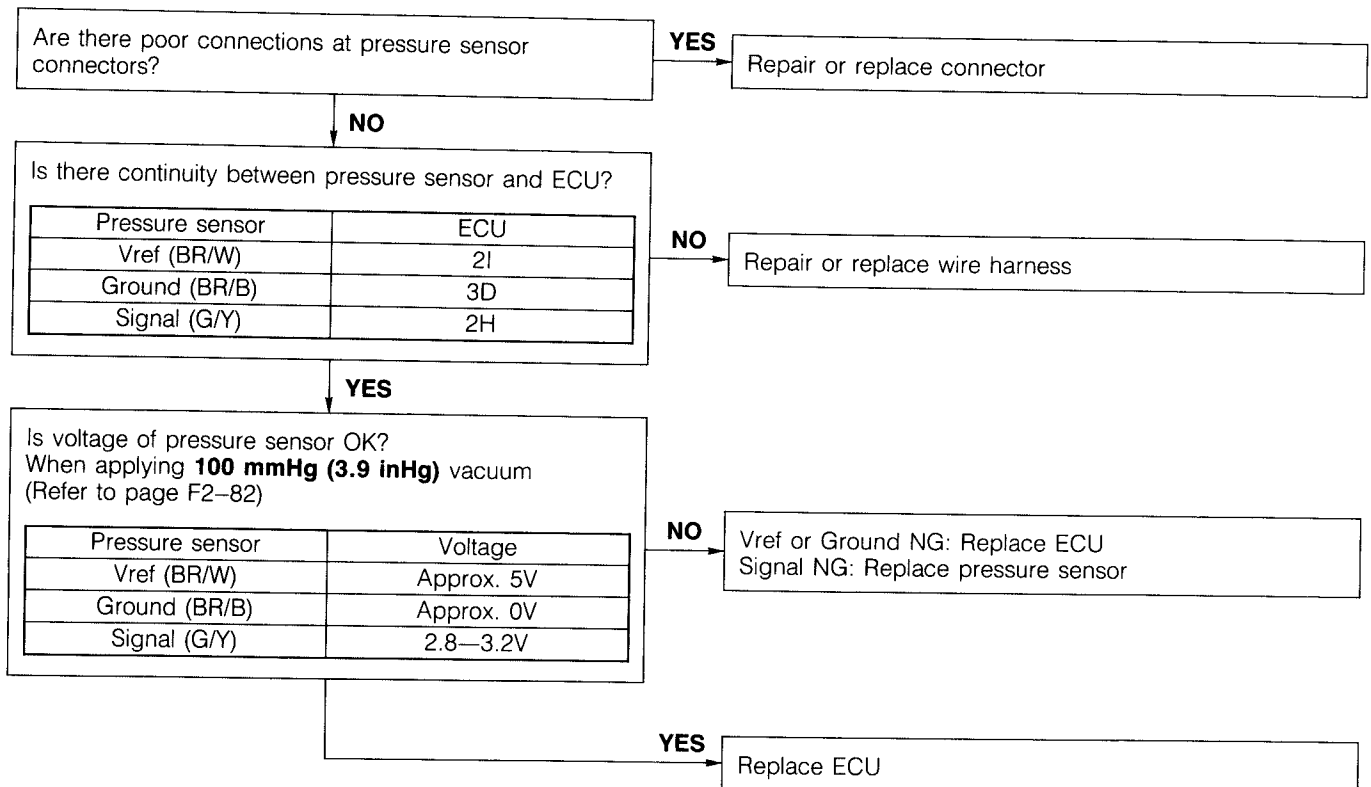
No.11 Code (Intake air thermosensor (Engine))



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

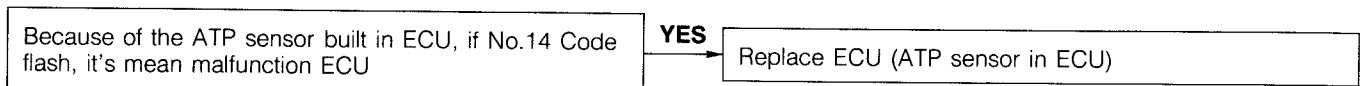


No.13 Code (Pressure sensor)



97U0F2-041

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

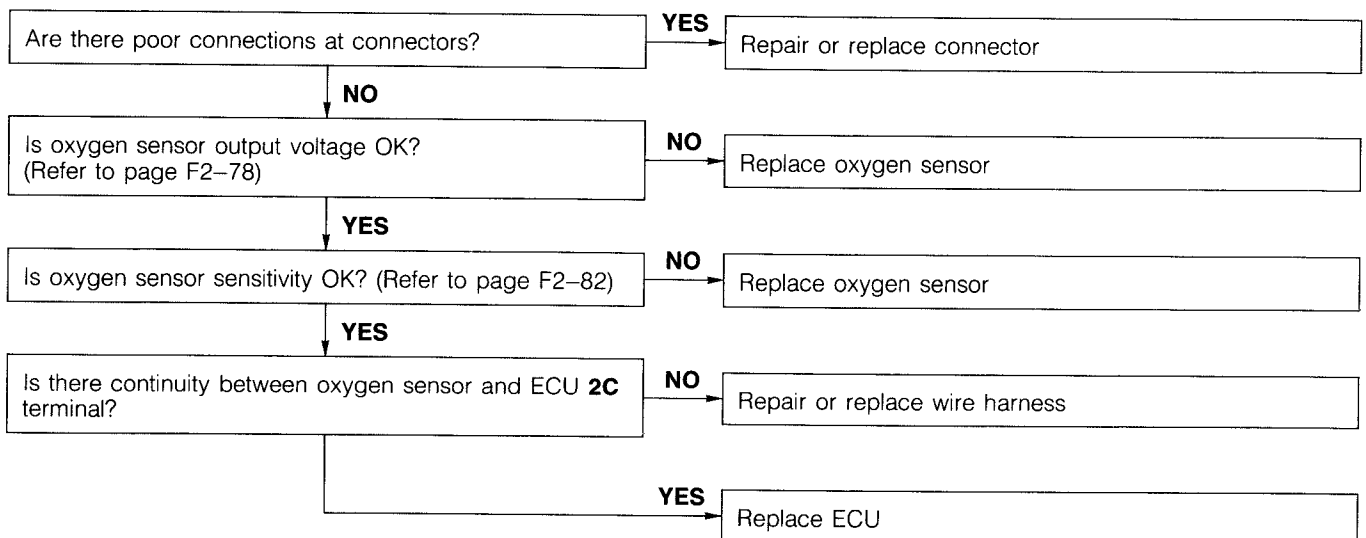


97U0F2-042

No.15 Code (Oxygen sensor)

Note

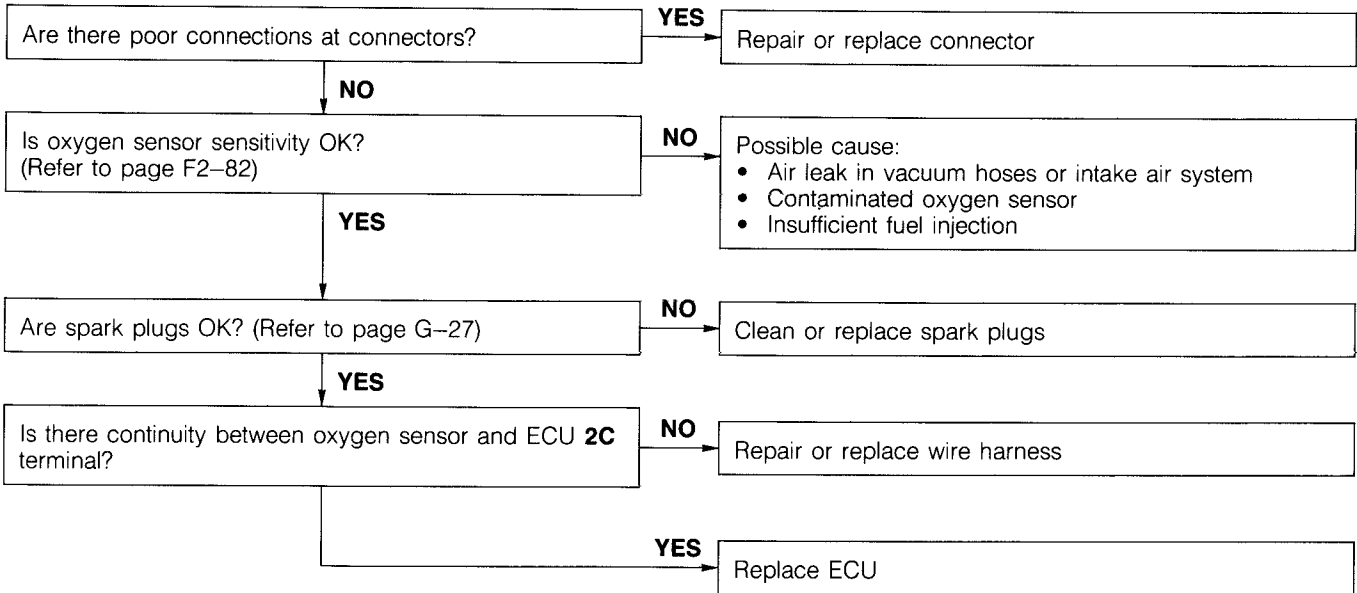
If malfunction codes No.15 and 17 are both present, perform the checking procedure for malfunction Code No.17 first.



97U0F2-043

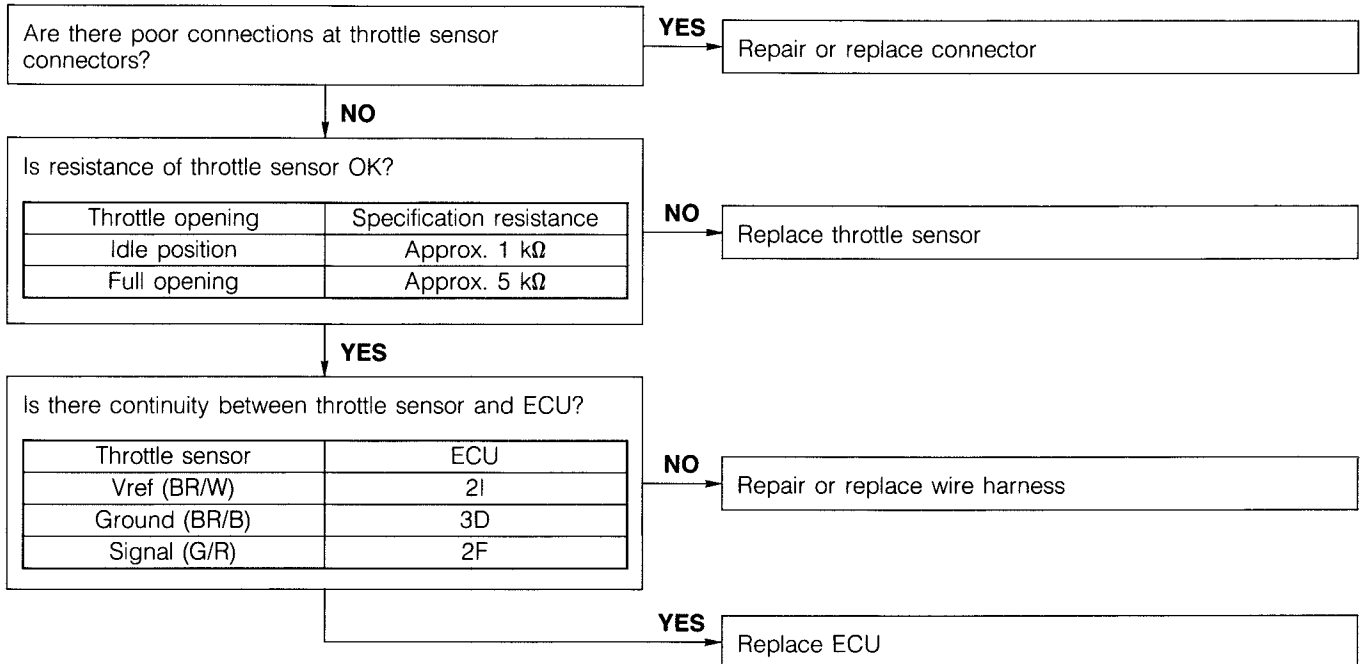
F2 SELF-DIAGNOSIS FUNCTION

No.17 Code (Feedback system)



97U0F2-044

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



97U0F2-045

No.20 Code (Metering oil pump position sensor)

Troubleshooting of this system in Section D

97U0F2-046

No.27 Code (Metering oil pump)

Troubleshooting of this system in Section D

97U0F2-047

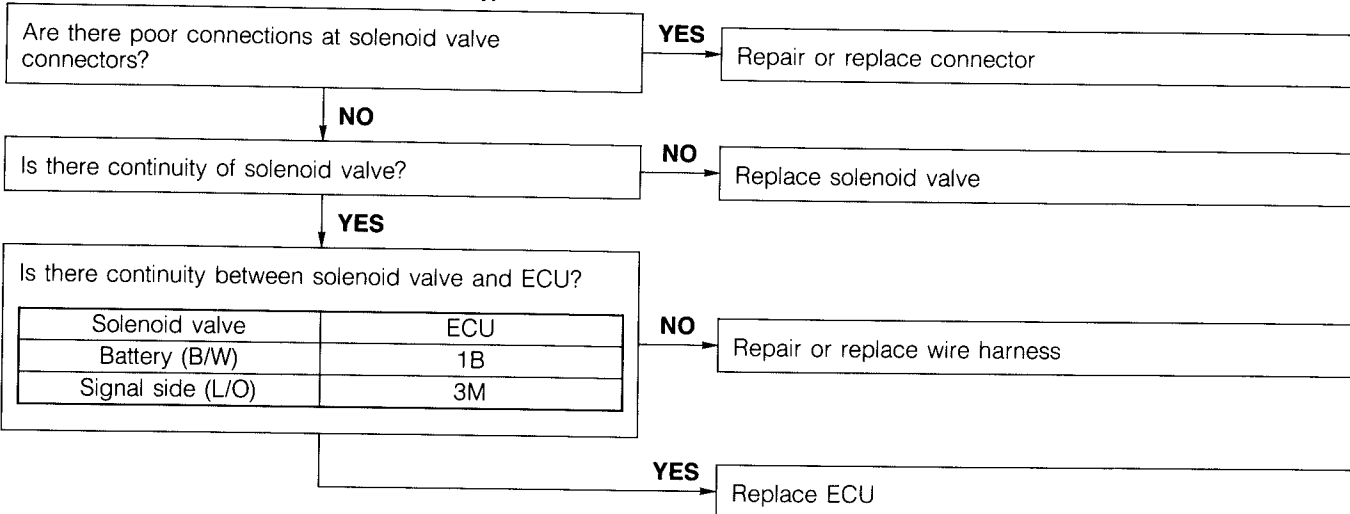
No.37 Code (Metering oil pump)

Troubleshooting of this system in Section D

97U0F2-048

Output device

No.25 Code (Solenoid valve (PRC))



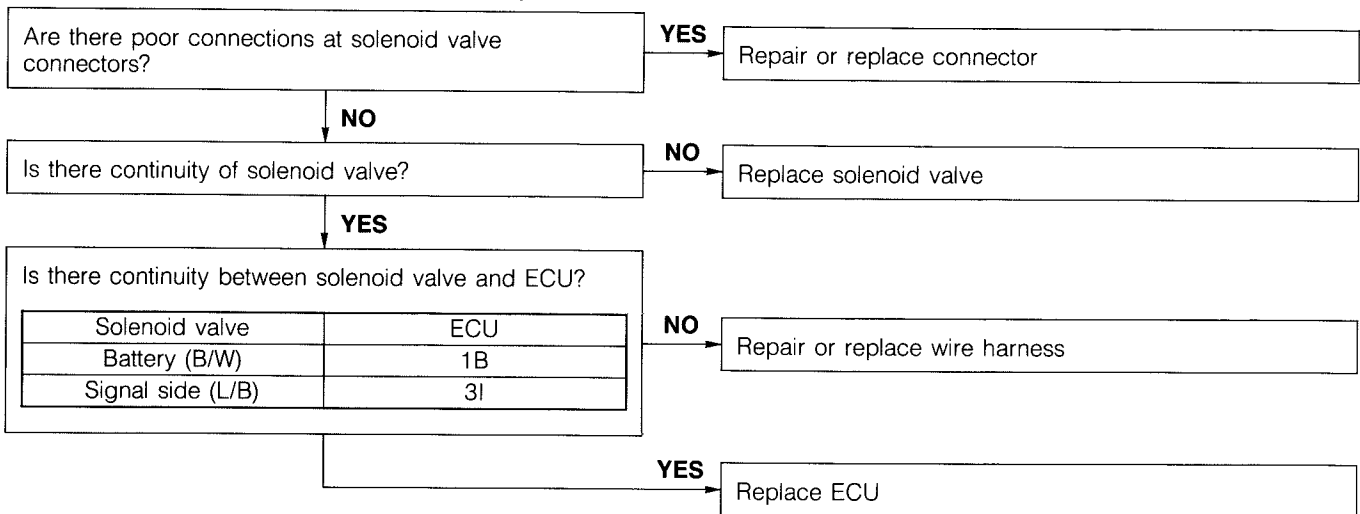
97U0F2-049

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

Troubleshooting of this system in Section D

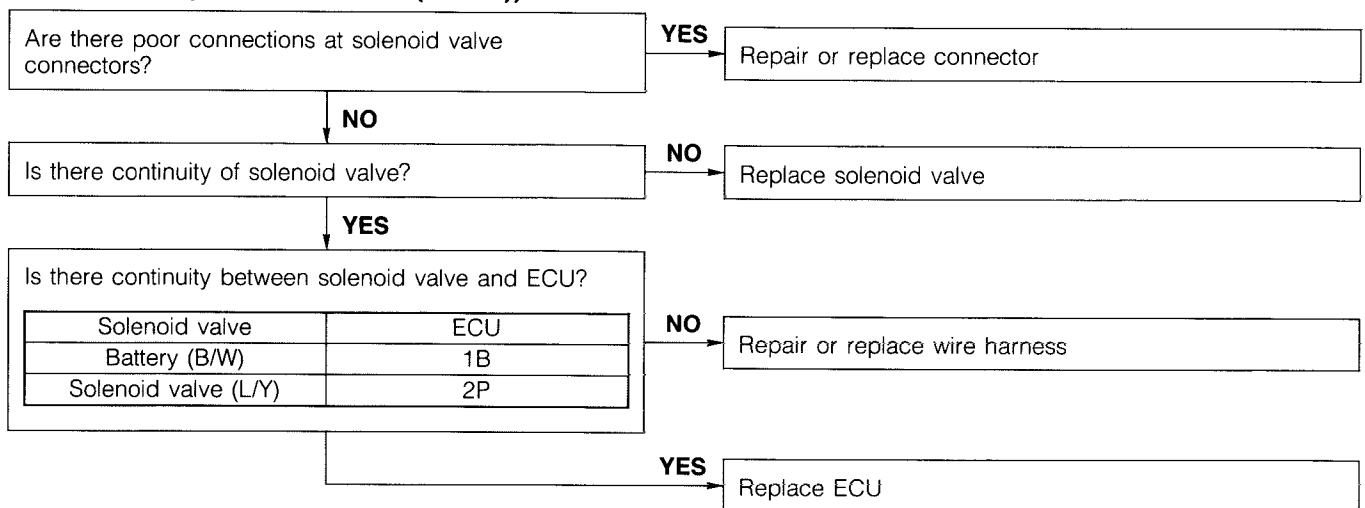
97U0F2-050

No.30 Code (Split air solenoid valve)



97U0F2-051

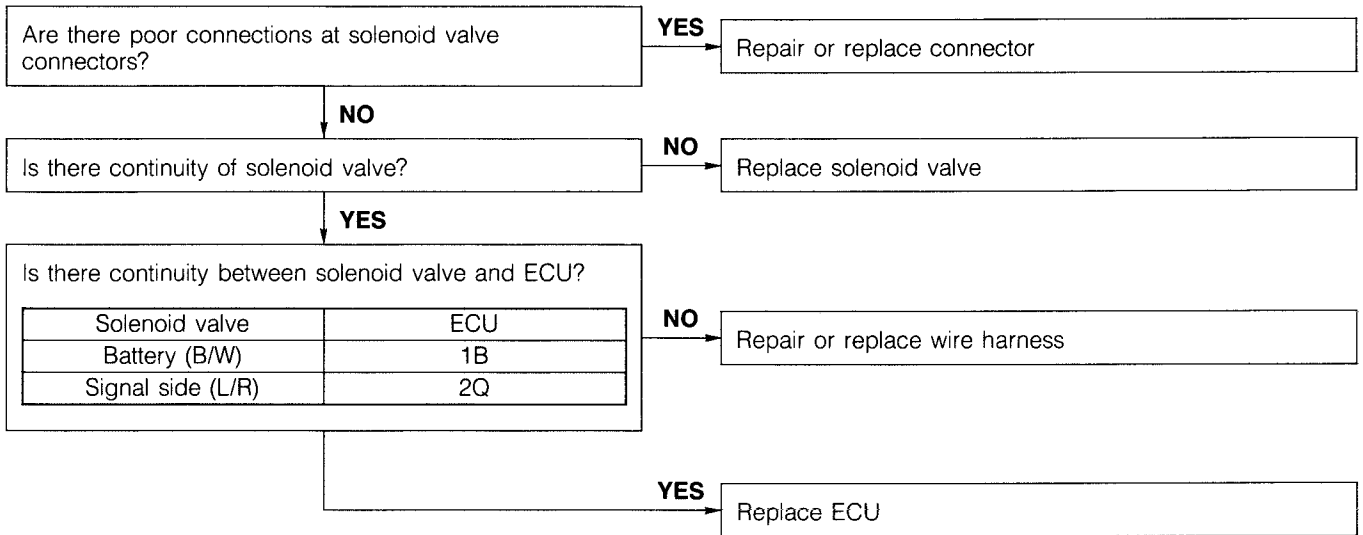
No.31 Code (Solenoid valve (Relief))



97U0F2-052

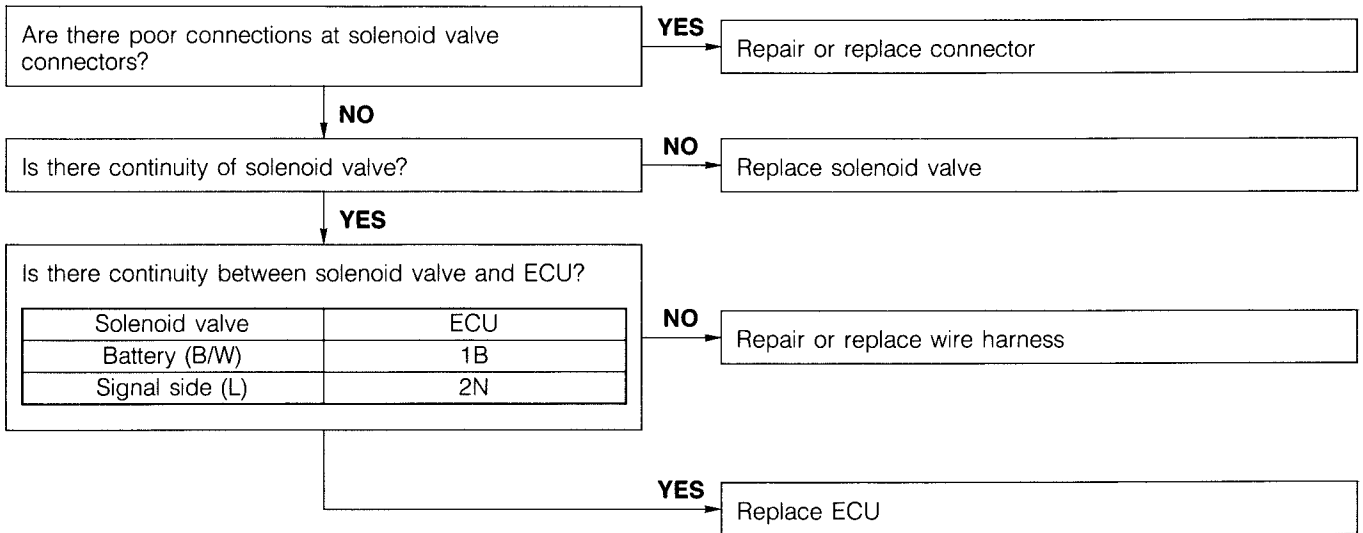
F2 SELF-DIAGNOSIS FUNCTION

No.32 Code (Solenoid valve (Switch))



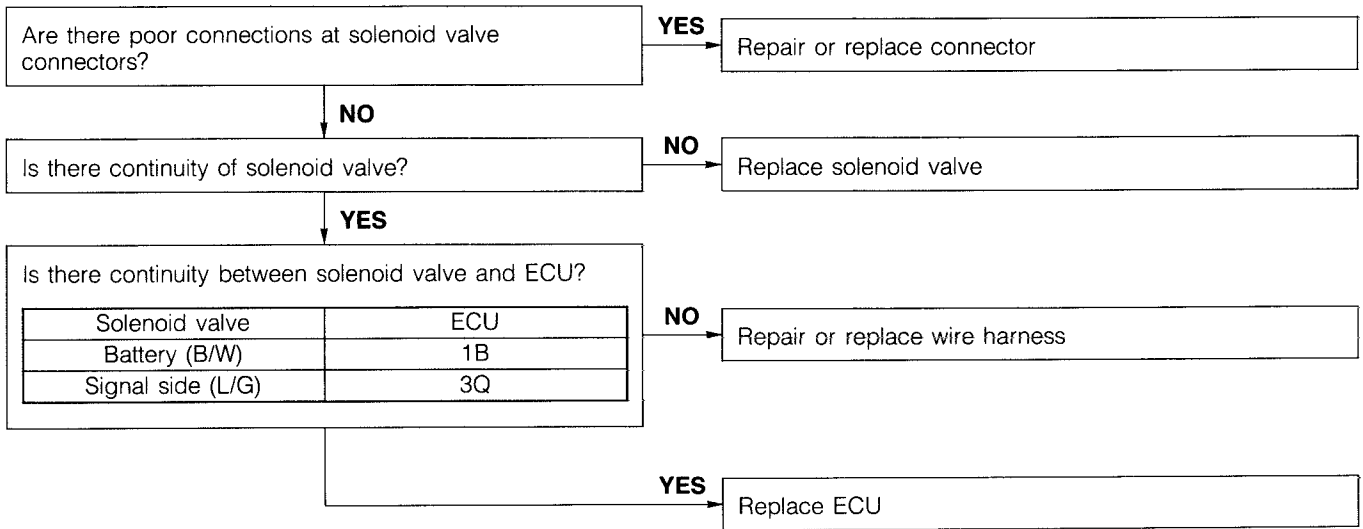
97U0F2-053

No.33 Code (Port air solenoid valve)



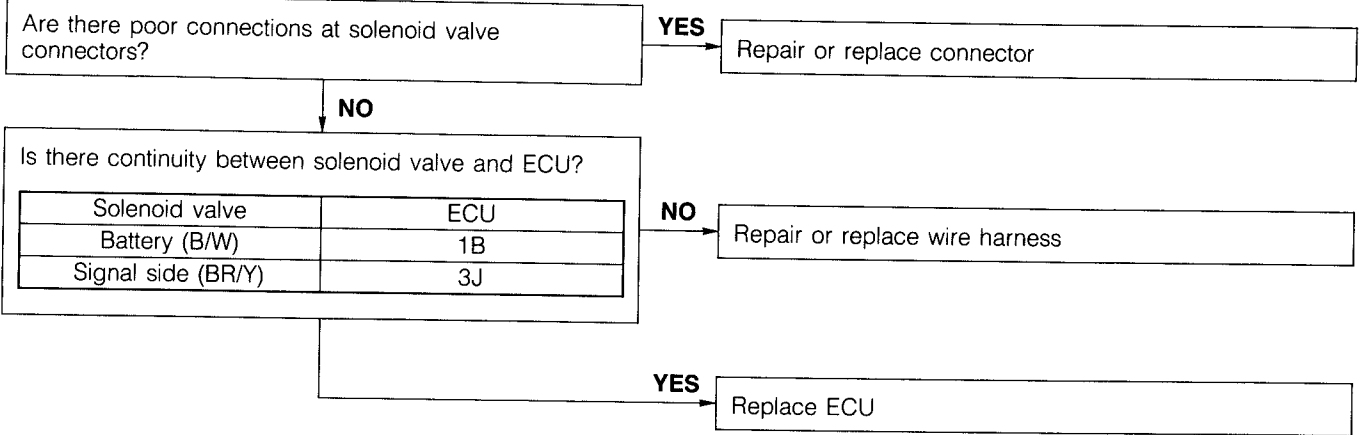
97U0F2-054

No.34 Code (Solenoid valve (BAC))

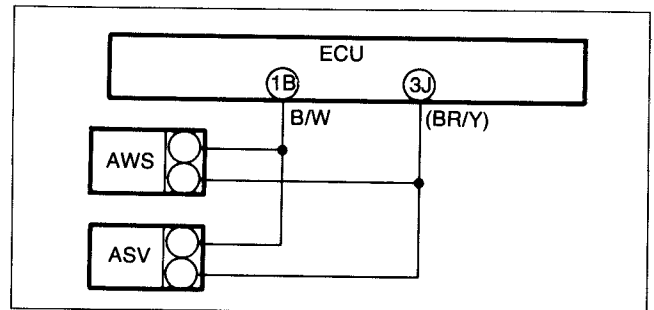


97U0F2-055

No.38 Code (Solenoid valve (AWS and ASV))

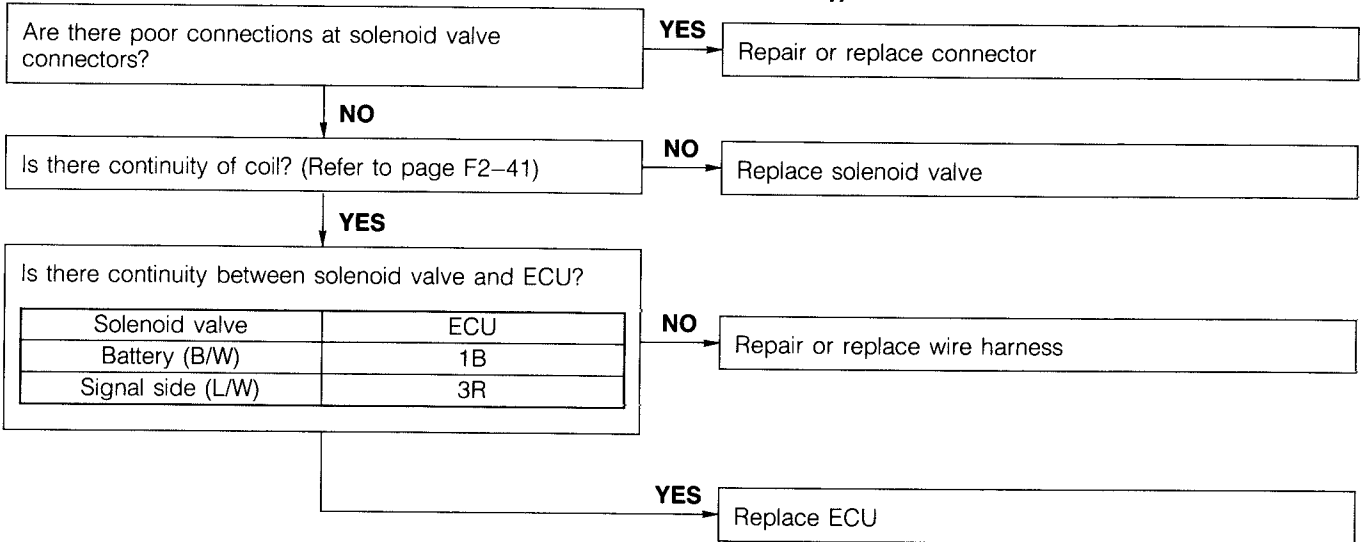


Note
 The AWS and ASV solenoid valves are connected in parallel. (Refer to the figure.)
 If only AWS or ASV circuit is bad code No.38 will not flash.



97U0F2-056

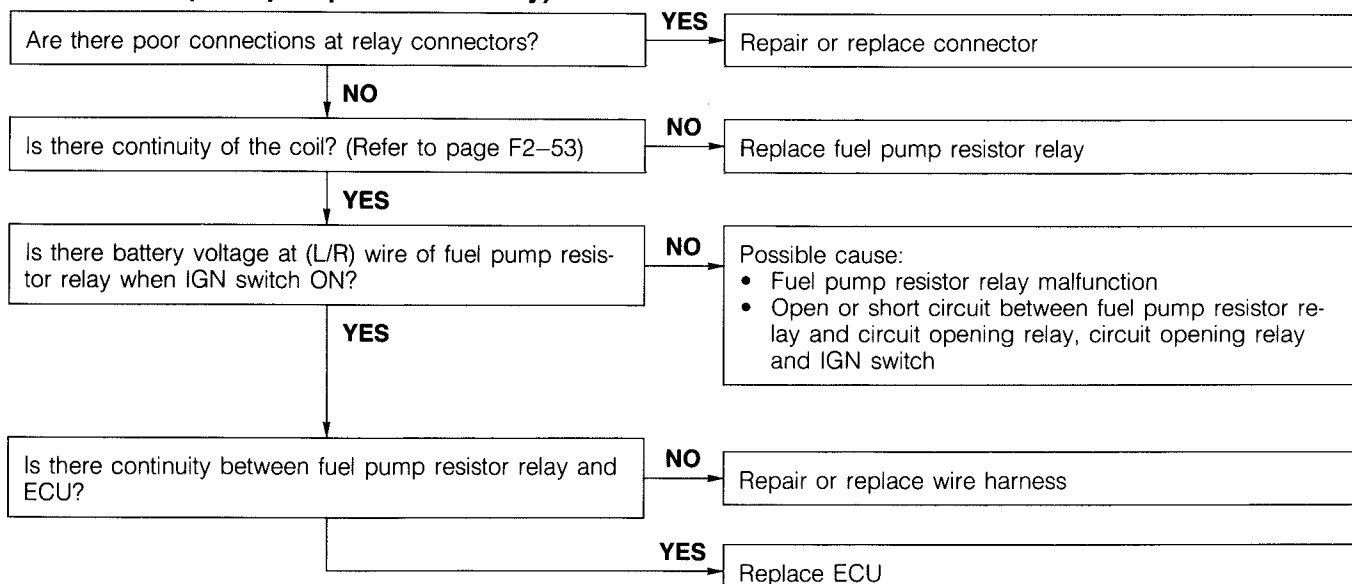
No.42 Code (Duty solenoid (Turbo boost pressure control))



97U0F2-057

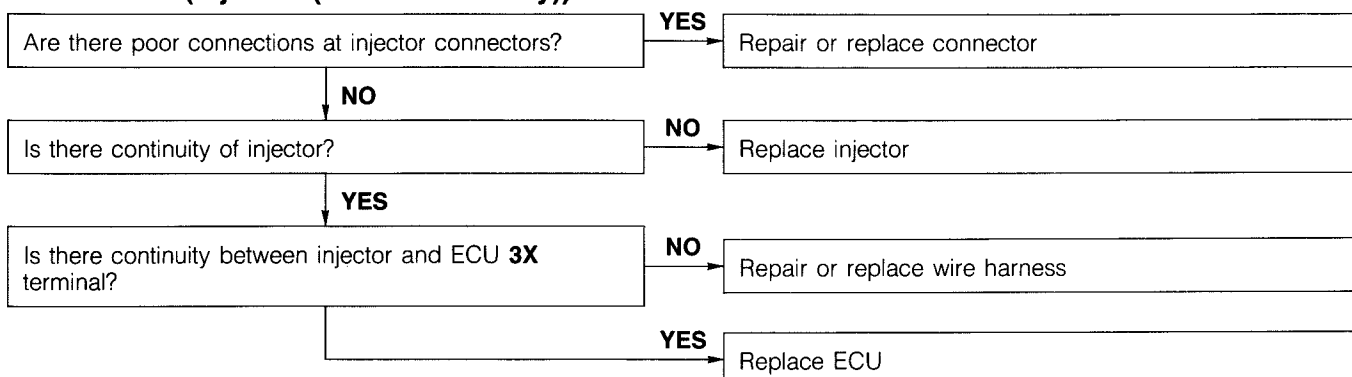
F2 SELF-DIAGNOSIS FUNCTION

No.51 Code (Fuel pump resistor relay)



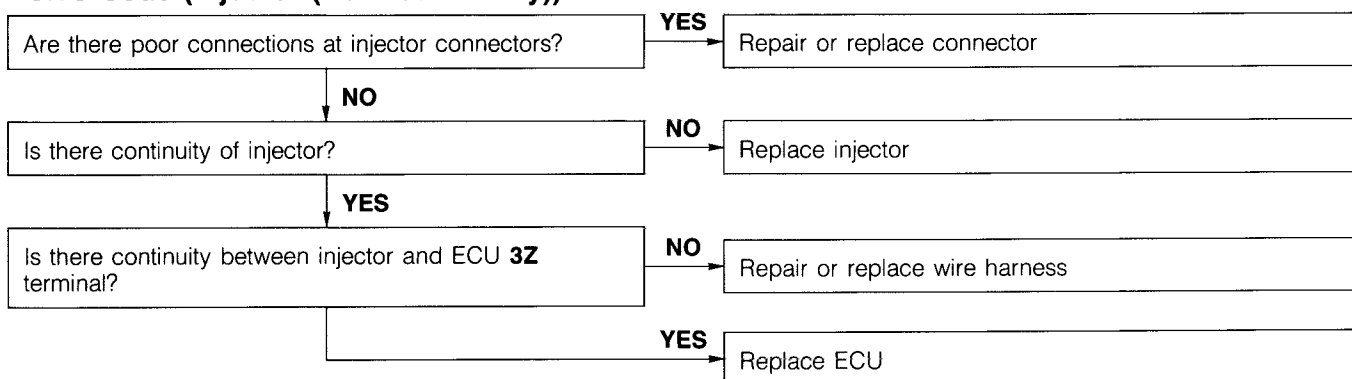
97U0F2-059

No.71 Code (Injector (Front secondary))

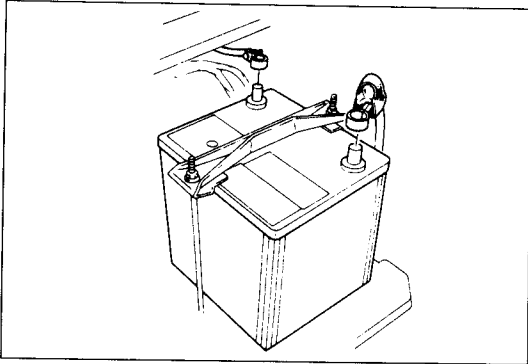


97U0F2-060

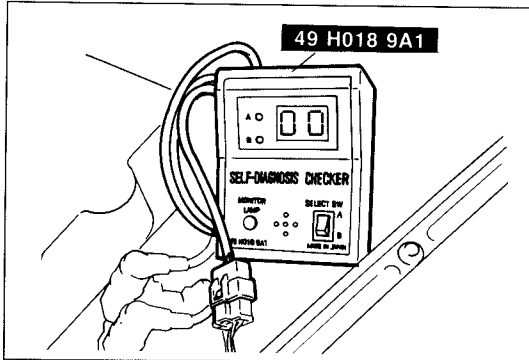
No.73 Code (Injector (Rear secondary))



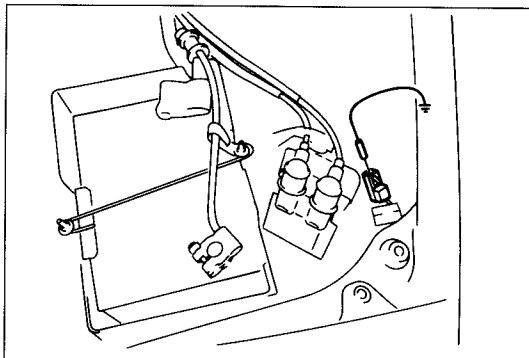
97U0F2-061



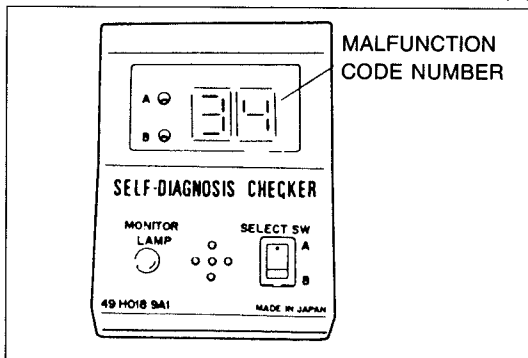
97U0F2-062



89U04X-014



89U04X-015



97U0F2-063

After-repair Procedure

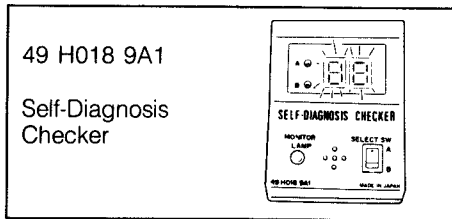
1. Cancel the memory of malfunction code numbers by disconnecting the negative battery cable for at least **5 sec.**; then reconnect the negative battery cable.
2. Connect the **SST** to the check connector (Green: 6-pin).
3. Connect a jumper wire between the test connector (Green: 1-pin) and a ground.
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.

F2 SELF-DIAGNOSIS FUNCTION

SWITCH MONITOR FUNCTION

Preparation

SST

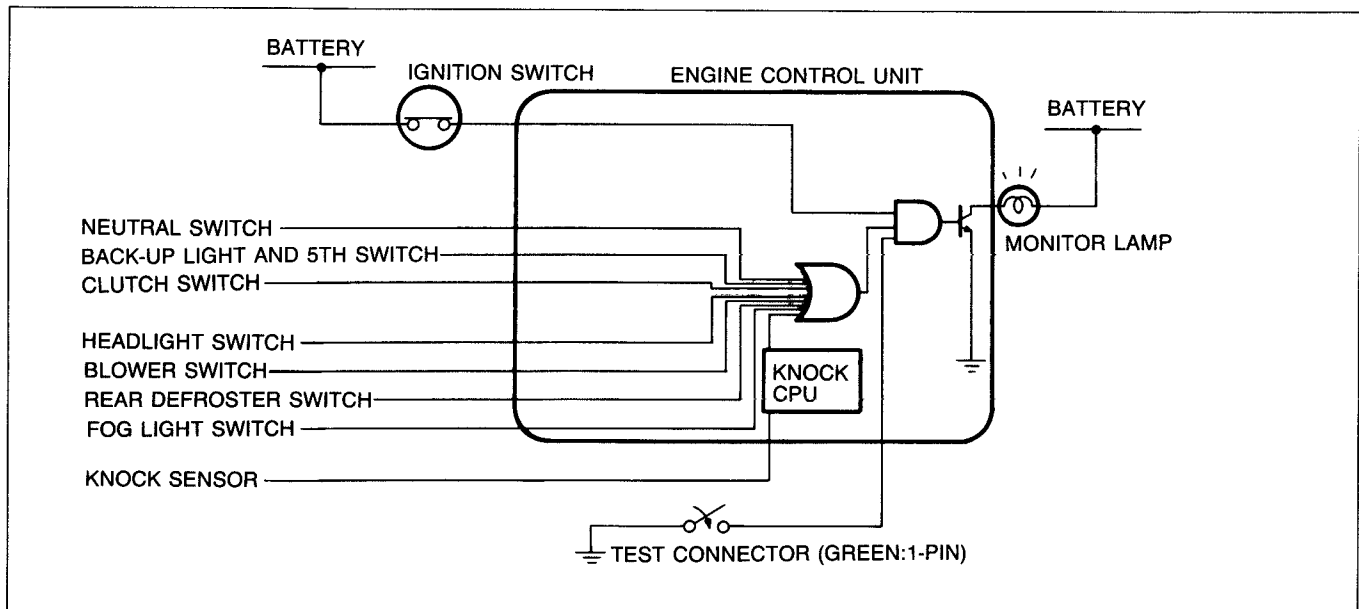


97U0F2-064

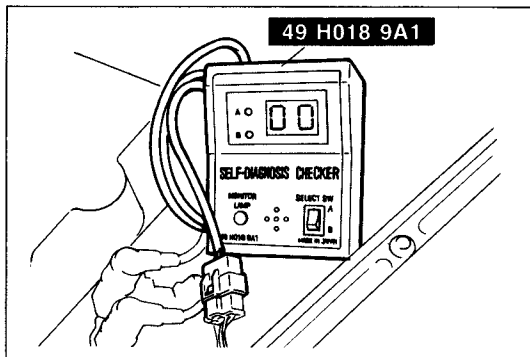
Individual switches can be monitored by the **SST**.

Note

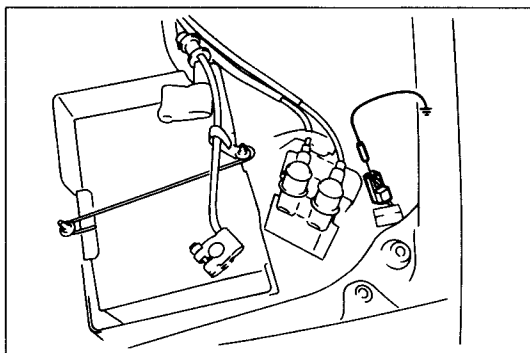
The test connector must be grounded and the ignition switch ON (engine stopped).



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.

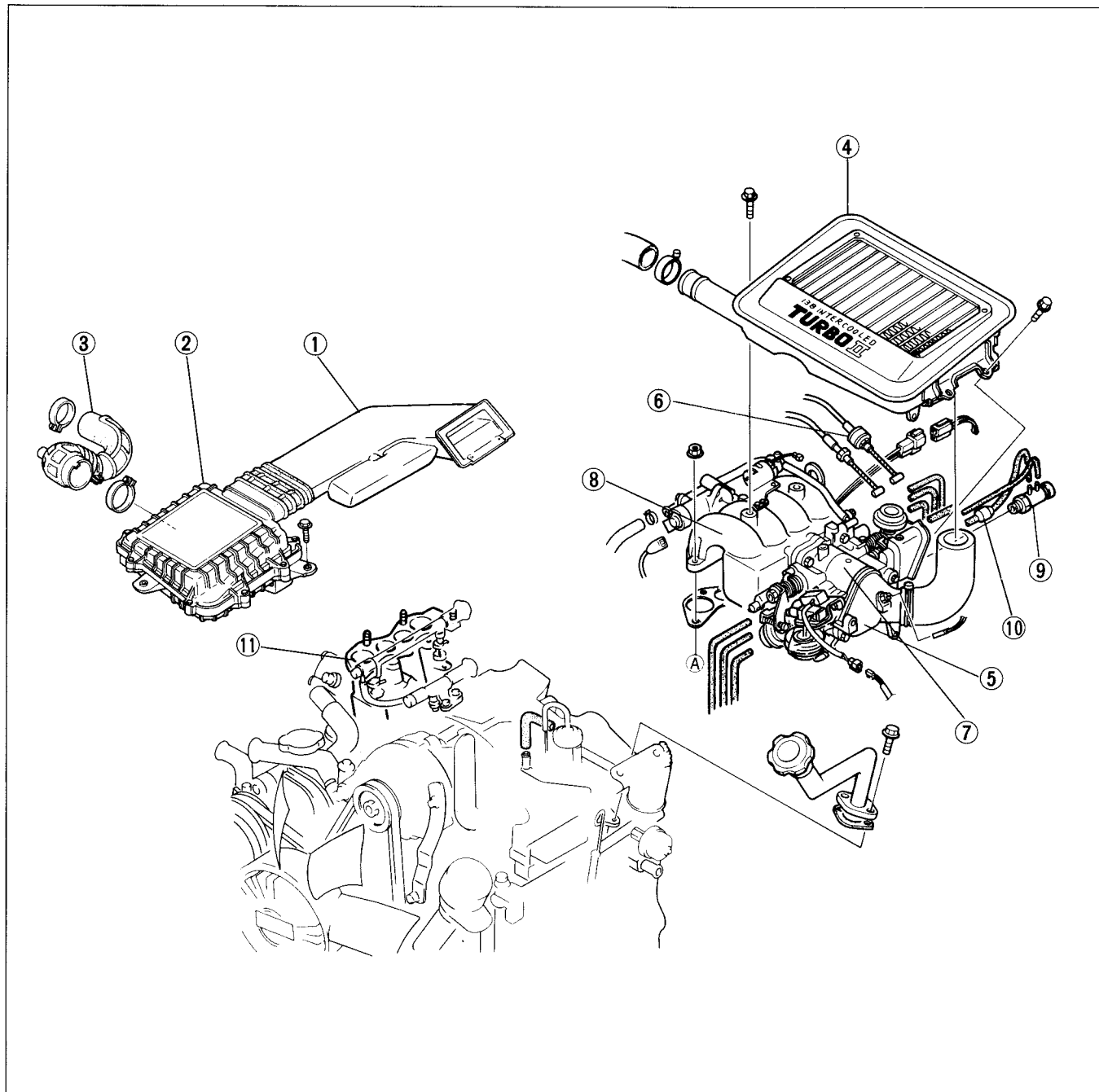
Function Table

Switch	Self-Diagnosis Checker (Monitor lamp)		Possible cause (When incorrect)
	Lamp-ON	Lamp-OFF	
Neutral switch	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	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	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
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
Knock sensor	While knocking: Lamp ON 0.5 sec. (IGN switch ON: hit engine hanger with hammer)	Other	<ul style="list-style-type: none"> • Knock sensor malfunction • Open circuit between knock sensor and ECU 2M terminal

97U0F2-068

INTAKE AIR SYSTEM

COMPONENT PARTS



97U0F2-069

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

- | | |
|----------------------------|--|
| 1. Fresh air duct | 7. Throttle body |
| 2. Air cleaner | Removal and Installation..... page F2-35 |
| 3. Air funnel | Inspection page F2-35 |
| 4. Intercooler | On-vehicle inspection page F2-36 |
| 5. Intake air pipe | 8. Dynamic chamber |
| 6. Accelerator cable | 9. Water thermovalve |
| Adjustment..... page F2-37 | Inspection page F2-36 |
| | 10. Check valve |
| | Inspection page F2-37 |
| | 11. Intake manifold |

THROTTLE BODY

Removal

1. Drain the engine coolant from the radiator.
2. Remove in the order shown in the figure.
 - ① Intercooler
 - ② Oil filler pipe
 - ③ Accelerator cable
 - ④ Cruise control cable (If equipped)
 - ⑤ Connectors
 - ⑥ AWS solenoid valve
 - ⑦ Vacuum tubes
 - ⑧ Water hoses
 - ⑨ Nuts and bolts
 - ⑩ Air intake pipe, throttle body 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.

Inspection

Throttle valve clearance

1. Measure the clearance between the throttle valve and the wall of the primary throttle bore when the secondary throttle valve starts to open.

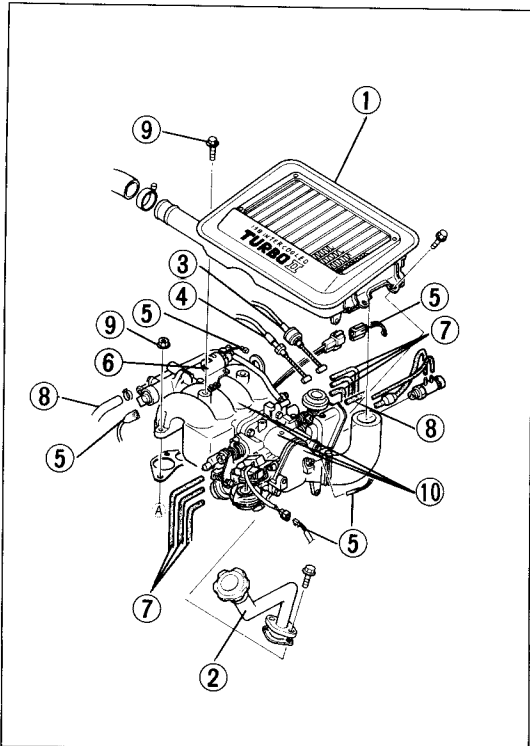
Clearance: 1.1—1.7mm (0.04—0.07 in)

2. If the clearance is not within specification, cam adjusting screw to get the proper clearance is obtained.

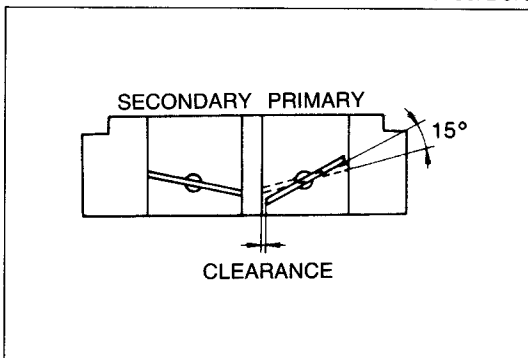
Fast idle operation

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

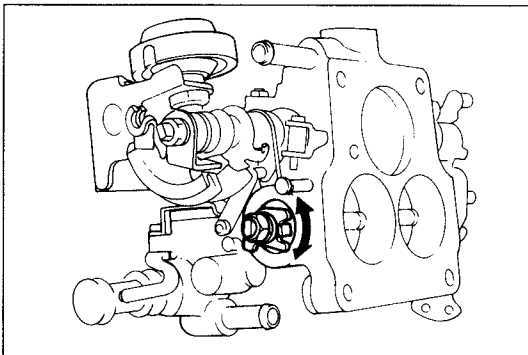
1. Verify that the indicated mark on the fast idle cam is aligned with the center of the cam roller.



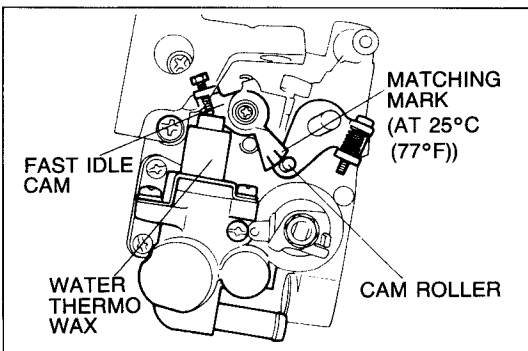
97U0F2-070



97U0F2-071

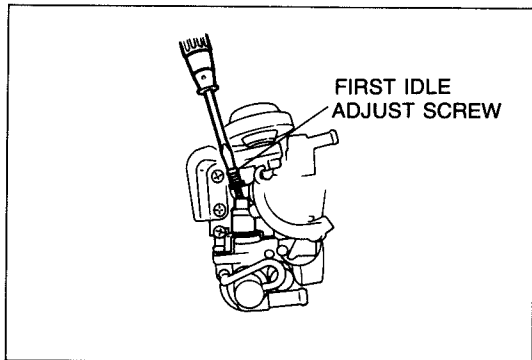


97U0F2-072

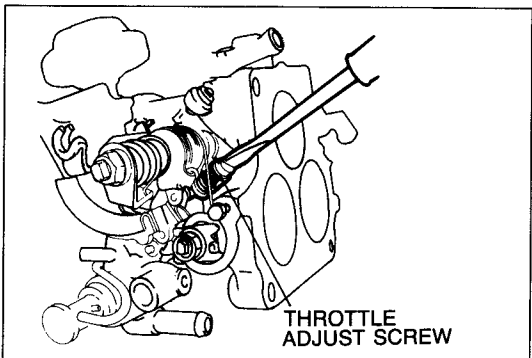


97U0F2-073

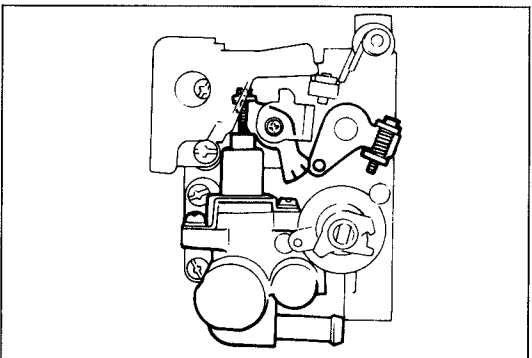
F2 INTAKE AIR SYSTEM



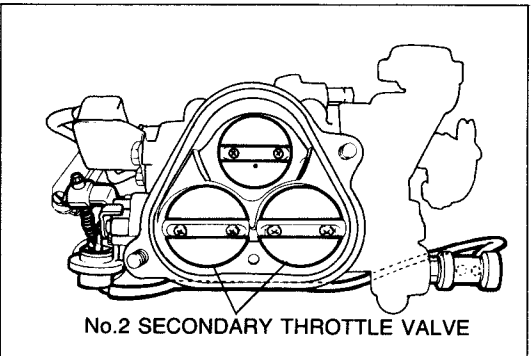
97U0F2-074



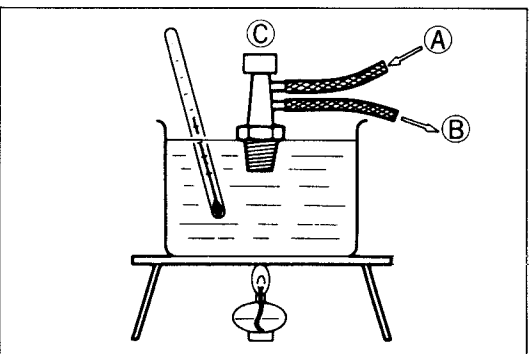
97U0F2-075



97U0F2-076



97U0F2-077



97U0F2-078

- If the mark is not aligned, turn the cam adjusting screw until proper alignment is obtained.

Note

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

- With the mark aligned, measure the clearance between the throttle valve and the wall of the primary throttle bore.

Clearance: 0.4—0.5mm (0.016—0.02 in)

- To adjust, turn the throttle adjust screw, if necessary.

On-vehicle Inspection

- Warm up the engine to operating temperature and stop it.
- Verify that the wax rod extends outward fully and the idle cam separates from the roller.

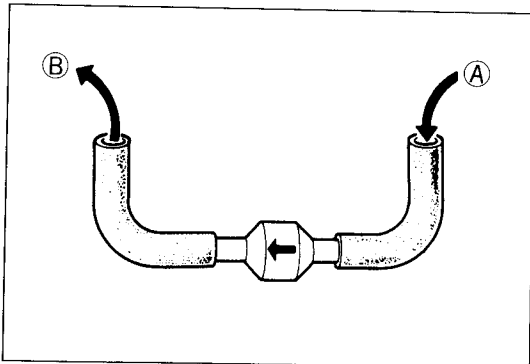
Double throttle valve

Verify that the No.2 secondary throttle valve and linkage move smoothly when the primary throttle valve is fully opened.

Water Thermostatic Valve Inspection

- Immerse the water thermostatic valve in a container.
- Heat the water gradually and observe the temperature.
- Blow through port (A) and check the thermostatic valve operation.

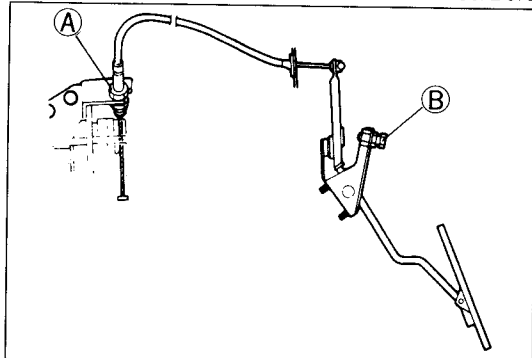
Water temperature	Air passes
Below 60°C (140°F)	From (A) to (B)
Above 60°C (140°F)	From (A) to (C)



97U0F2-079

Check Valve Inspection

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



97U0F2-080

ACCELERATOR CABLE

Adjustment

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

Free play: 1—3mm (0.04—0.12 in)

2. Adjust with nuts (A), if not within specification.

Caution

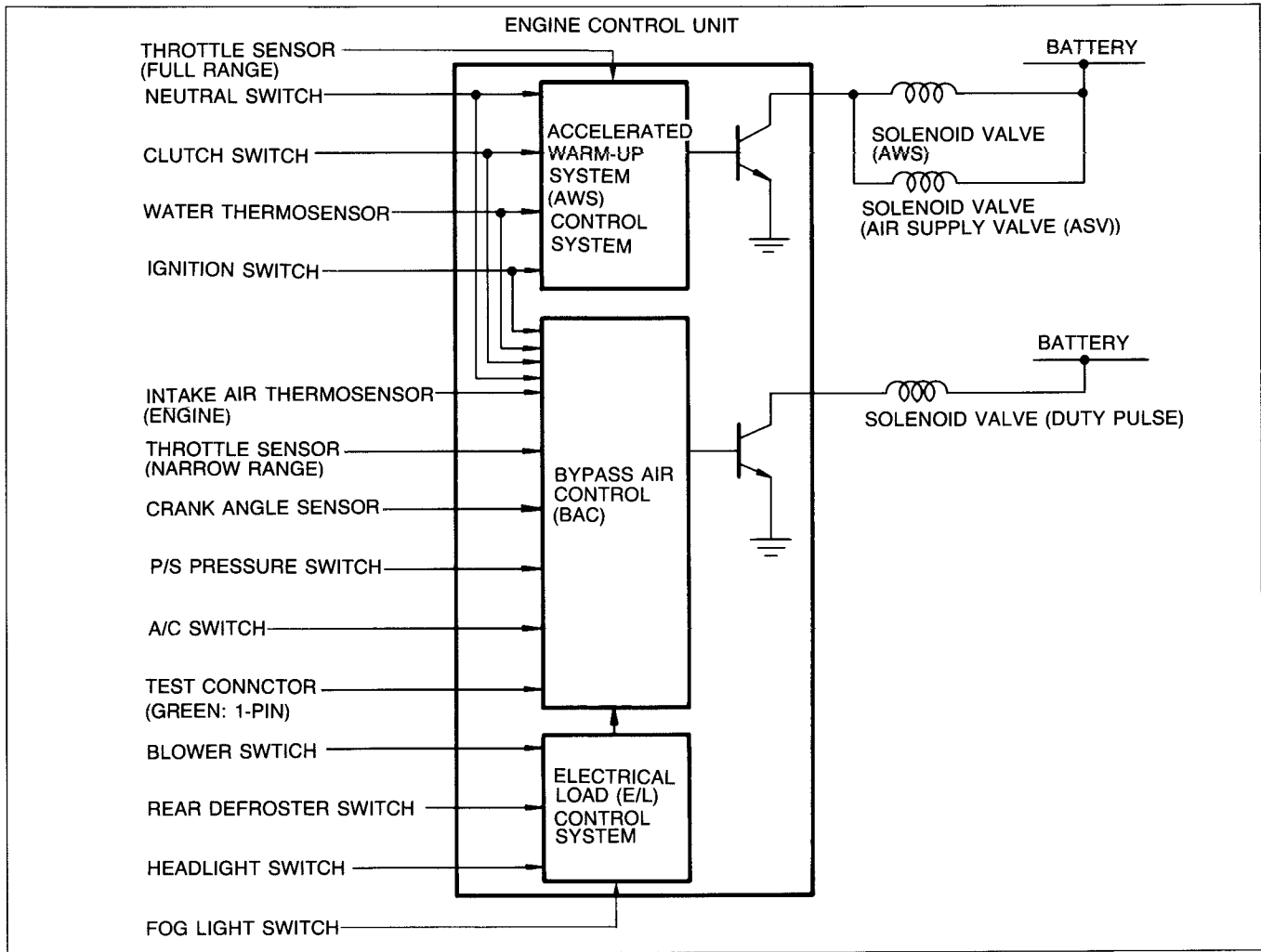
Verify first that the fast idle operation is fully canceled.

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

F2 IDLE SPEED CONTROL (ISC) SYSTEM

IDLE SPEED CONTROL (ISC) SYSTEM

DESCRIPTION



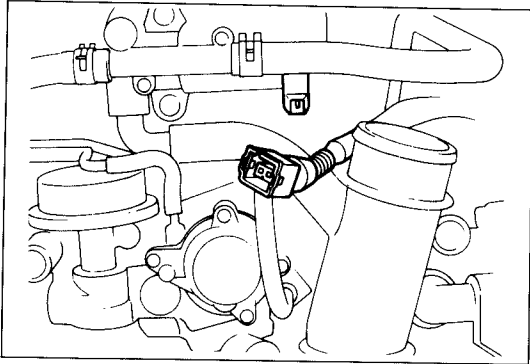
97U0F2-081

TROUBLESHOOTING

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

Symptom	Possible cause Page	System inspection	Solenoid valve (BAC)	Solenoid valve (AWS)	Solenoid valve (ASV)	Engine control unit terminal		
						1B	3J	3Q
						F2-77	F2-79	F2-79
Hard start or No start (Crank OK)		1	3	4	4	2	5	2
Rough idle		1	2	4	4	3	5	3
High idle speed (At normal operating temperature)		1	2	3	3	5	4	5
Engine does not run smoothly (Only when engine is cold)		1	2	4	4	3	5	3
Afterburn		1	2	—	—	3	—	3
Runs rough on deceleration		1	2	—	—	3	—	3
Fails emission test		1	4	2	2	5	3	5

97U0F2-082

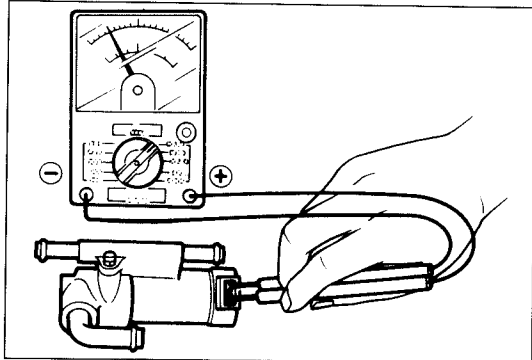


97U0F2-083

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.



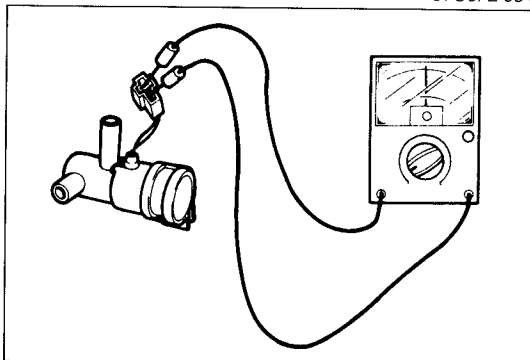
97U0F2-084

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 clicks when voltage is applied.
5. Replace the valve, if necessary.



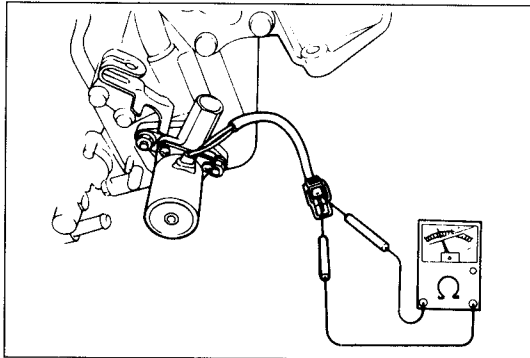
97U0F2-085

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.



97U0F2-086

SOLENOID VALVE (AIR SUPPLY VALVE (ASV)) Inspection

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

Resistance: 16.5—23.5Ω

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 solenoid valve, if necessary.

Caution

Do not tamper with the adjusting screw.

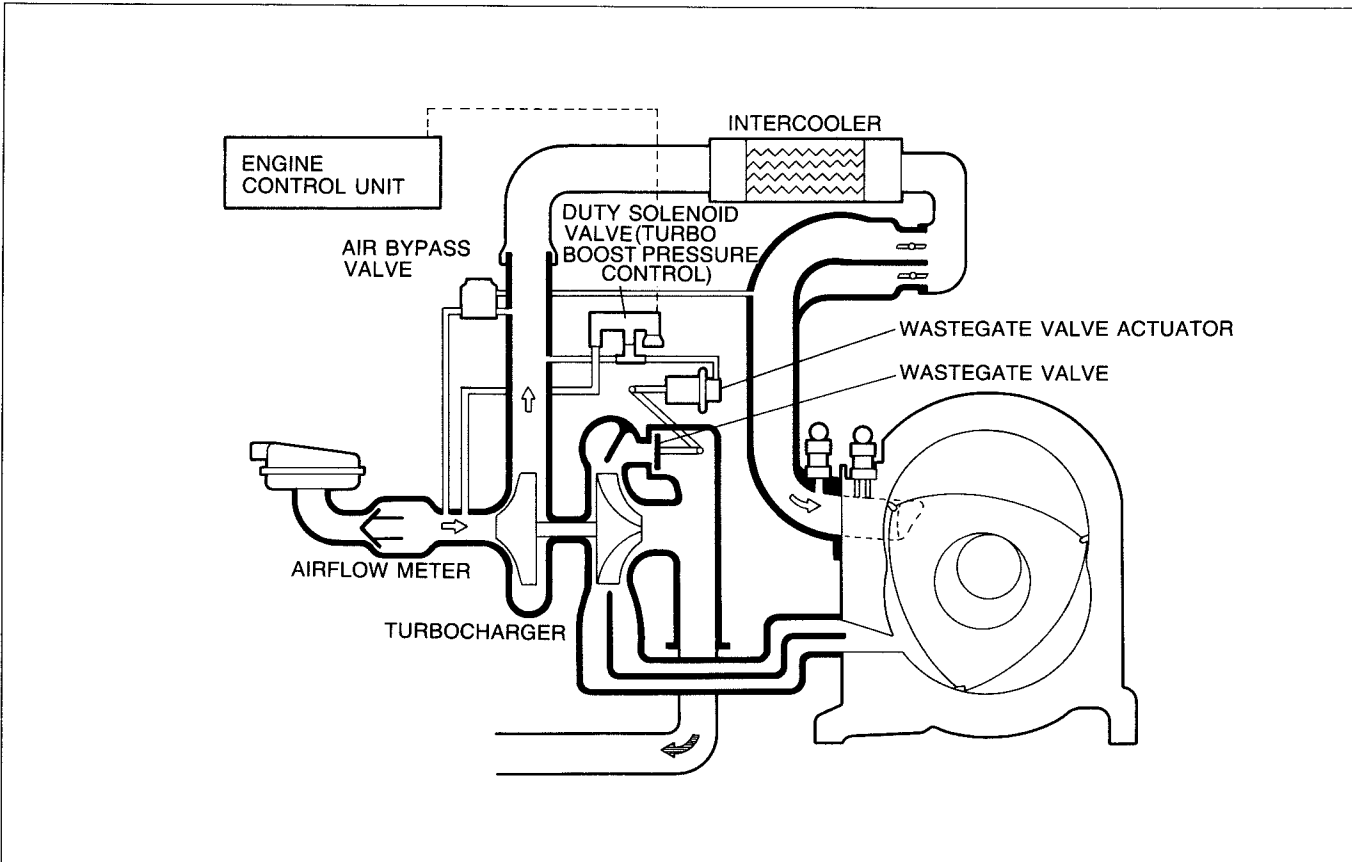
F2 TURBOCHARGER CONTROL SYSTEM

TURBOCHARGER CONTROL SYSTEM

DESCRIPTION

This system utilizes the energy of escaping exhaust gas to pressurize the intake air. This system therefore, supplies more than the normal amount of air into the combustion chamber. As a result of the more fully charged combustion chamber, higher engine output and torque is obtained.

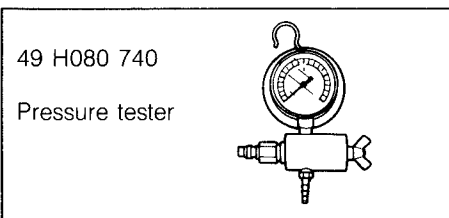
The maximum turbocharger pressure is controlled by the solenoid valve (Turbo boost pressure control) for engine safety.



97U0F2-087

PREPARATION

SST



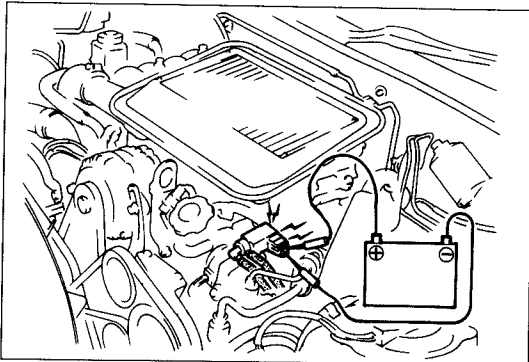
97U0F2-088

TROUBLESHOOTING

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

Possible cause Page	Turbo-charger	Air bypass valve	Inter-cooler	Boost pressure	Duty solenoid valve (Turbo boost pressure control)	Waste-gate valve actuator	Engine control unit terminal	
							1B	3R
Symptom	F2-41	F2-43	F2-34	F2-41	F2-41	F2-43	F2-77	F2-79
Engine does not run smoothly (At normal operating temp.)	1	3	2					
Lack of power, poor acceleration or hesitation	5		6	1	2	3	4	4

97U0F2-089



97U0F2-090

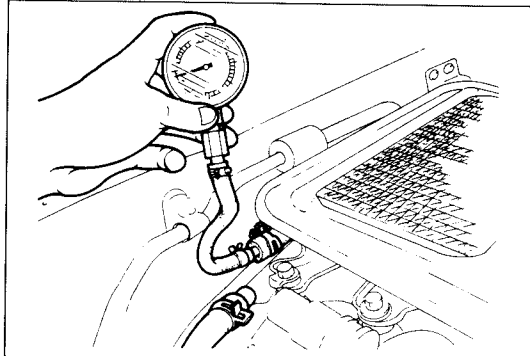
DUTY SOLENOID (TURBO BOOST PRESSURE CONTROL)

Inspection

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

Resistance: 30—34Ω

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



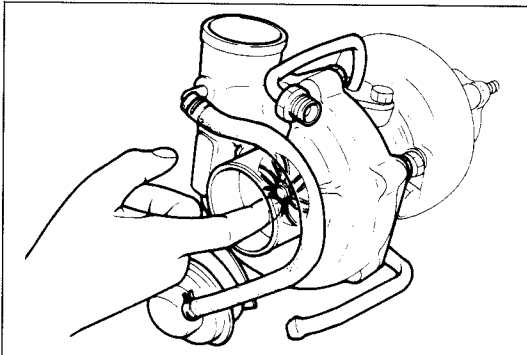
97U0F2-091

TURBOCHARGER

Inspection of Boost Pressure

1. Disconnect the air hose (Intercooler to solenoid valve (AWS)) at the intercooler.
2. Connect the pressure gauge as shown.
3. Plug the hose (Duty solenoid side).
4. Warm up the engine.
5. Measure the boost pressure while suddenly increasing the engine speed.

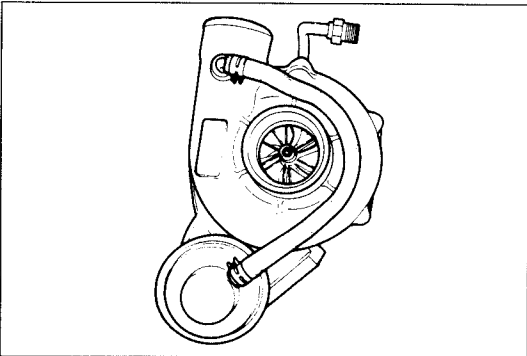
Boost pressure: Approx. 4,000 rpm: boost begins
Above approx. 5,000 rpm: More than
4.8 kPa (0.049 kg/cm², 0.7 psi)



97U0F2-092

Inspection of Turbine Rotor Assembly

1. Allow the engine to cool.
2. Disconnect the negative battery cable.
3. Remove the air funnel.
4. Check that the rotor assembly turns smoothly.
5. If there is excessive load or noise, replace the turbocharger.



97U0F2-093

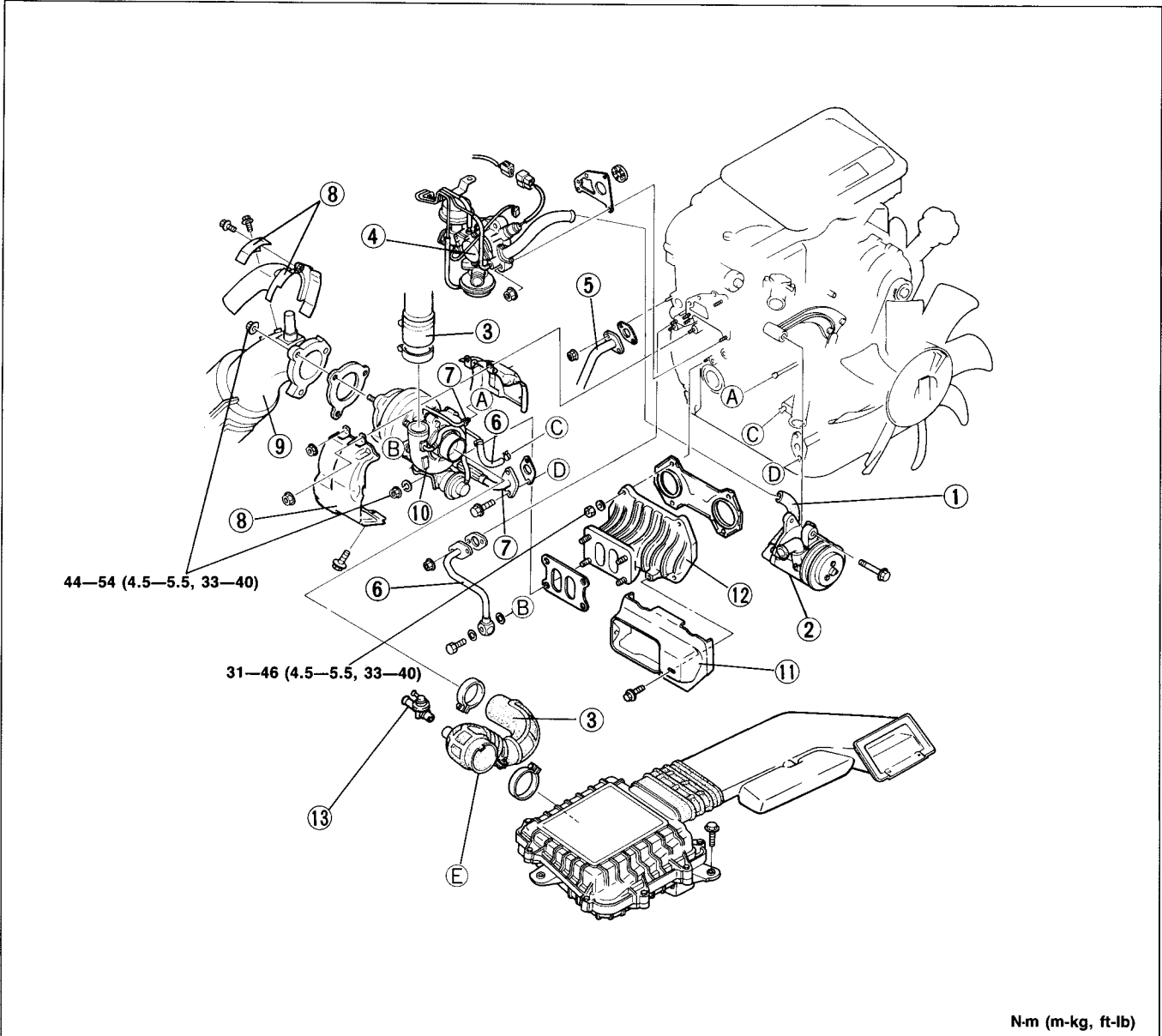
Inspection of Compressor Wheel Deflection

1. Allow the engine to cool.
2. Disconnect the negative battery cable.
3. Remove the air funnel.
4. Check if the turbine wheel touches the compressor housing while turning.
5. If the turbine wheel touches the housing, replace the turbocharger.

F2 TURBOCHARGER CONTROL SYSTEM

Removal

1. Remove the lower cover and drain the engine coolant from the radiator.
2. Remove in the order shown in the figure.



97U0F2-094

- | | |
|------------------------------|--|
| 1. Air hoses | 7. Oil pipes |
| 2. Air pump | 8. Insulator covers (Bolts: 4 Nuts: 4) |
| 3. Air funnel and air hose | 9. Front converter |
| 4. Air control valve | 10. Turbocharger |
| 5. Split air pipe | 11. Insulator covers |
| 6. Water hose and water pipe | 12. Exhaust manifold and actuator |
| | 13. Air bypass valve |

Note

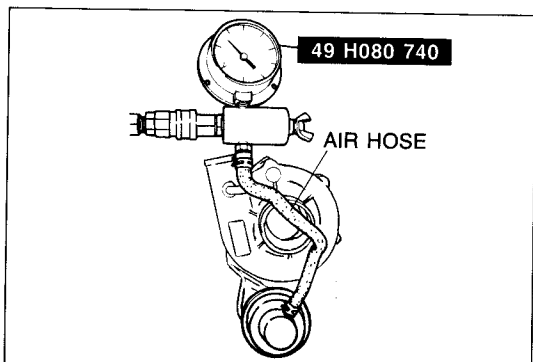
Before removing the air pump, remove air hose (E) from the airflow meter.

Installation

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

Note

After tightening the turbocharger mounting nuts to the specified torque, bend the edges of the retainer plate against them to prevent them from loosening.



97U0F2-095

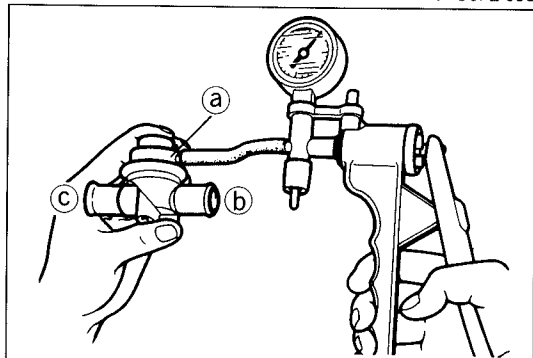
WASTEGATE VALVE

Inspection of Wastegate Valve Actuator

1. Allow the engine to cool.
2. Disconnect the air hose and attach it to the **SST** as shown.
3. Adjust the compressed air pressure to **69 kPa (0.7 kg/cm², 10 psi)**.
4. Verify that the rod moves when applying and releasing air pressure.

Caution

Do not apply compressed air higher than 98 kPa (1.0 kg/cm², 14 psi).



97U0F2-096

AIR BYPASS VALVE

Inspection

1. Remove the air bypass valve.
2. Connect a vacuum pump tester to port **(a)** of the valve.
3. Apply vacuum and check that the air flows through the valve from port **(b)** port to **(c)** at **300 mmHg (11.8 inHg)** the vacuum.
4. Replace it, if necessary.

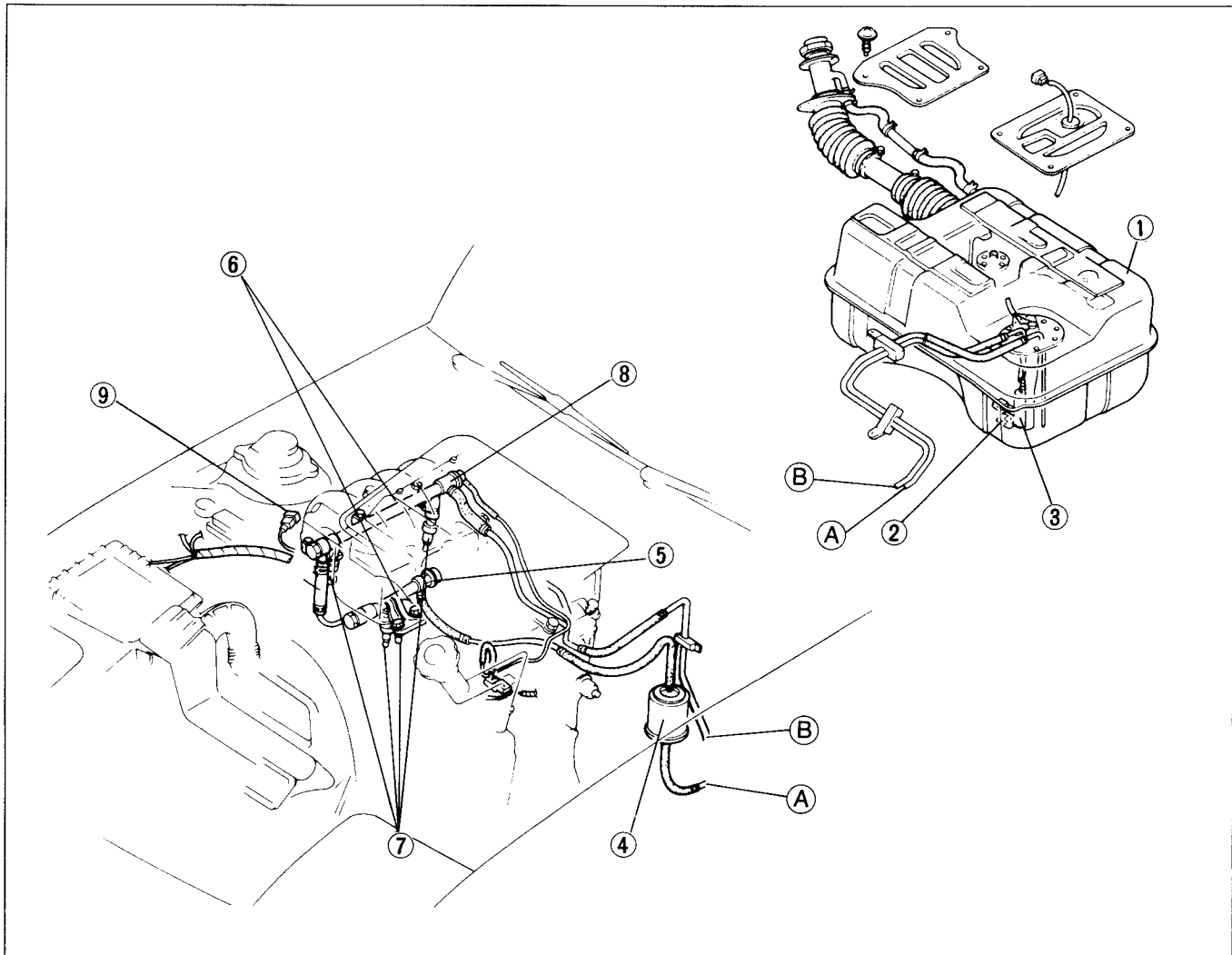
FUEL SYSTEM

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 pedal is held fully depressed while cranking the engine.



97U0F2-097

Warning

Before removing the fuel system, release the fuel pressure from the fuel system to eliminate possibly causing injury or fire. (Refer to page F2-46.)

- | | |
|---|--|
| 1. Fuel tank
Removal and Installation..... page F2-47
Inspection page F2-47 | 5. Pulsation damper
(Built in primary delivery pipe) |
| 2. Fuel filter (Low pressure side) | 6. Delivery pipe |
| 3. Fuel pump
Inspection page F2-48
Removal and Installation..... page F2-49 | 7. Injector
Removal..... page F2-50
Installation page F2-51
Inspection page F2-52 |
| 4. Fuel filter (High pressure side) | 8. Pressure regulator
(Built in secondary delivery pipe) |
| | 9. Check connector (Yellow: 2-pin) |

TROUBLESHOOTING

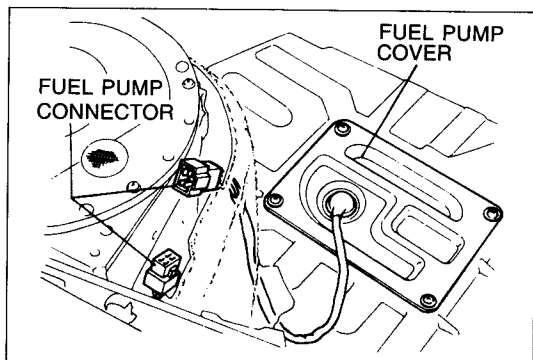
Check the condition of the wiring harness and connectors before checking the sensors or switches.

Possible cause Page	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	F2-48	F2-44	F2-50	F2-46	F2-46	F2-49	F2-44	F2-53	F2-77	F2-79	F2-79	F2-79	F2-79
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

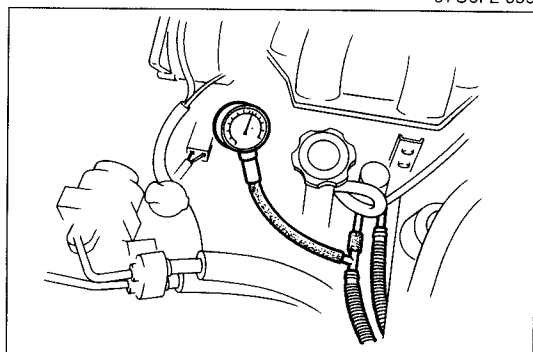
97U0F2-098

Warning

Before release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F2-46.)



97U0F2-099



97U0F2-100

PRECAUTION

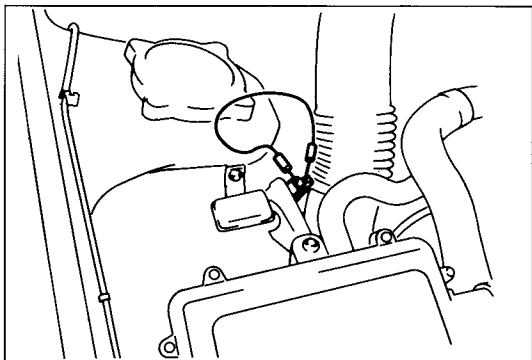
Fuel Pressure Release and Fuel System

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

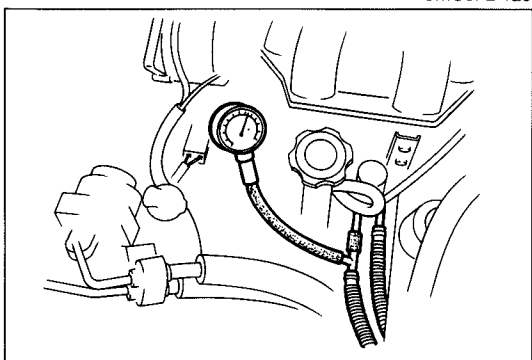
- a) Before disconnecting any fuel line, release the fuel pressure from the fuel system to reduce the possibility of injury or fire.
 1. Start the engine.
 2. Disconnect the fuel pump connector.
 3. Allow the engine to stall. Turn off the ignition switch.
 4. Reconnect the fuel pump connector.
- b) Use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

Caution

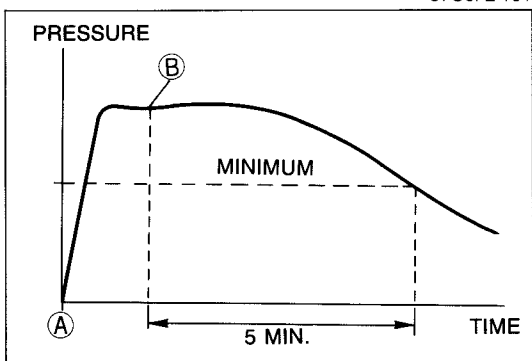
Install hose clamps to secure the fuel pressure gauge to the fuel filter and the fuel main hose to prevent fuel leakage.



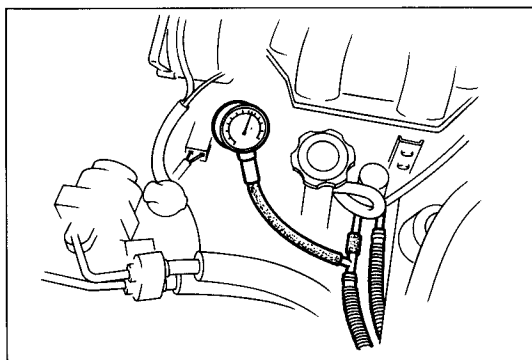
9MU0F2-123



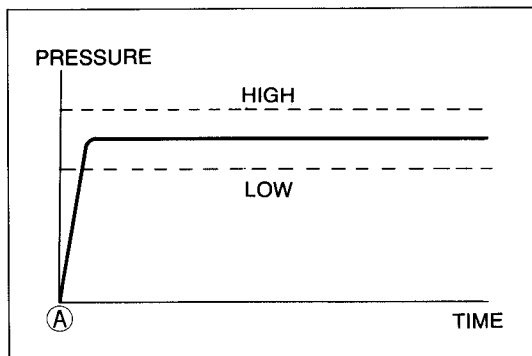
97U0F2-101



97U0F2-102



97U0F2-103



97U0F2-104

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 F2-46.)

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 F2-48.)
 - Pressure regulator fuel pressure drop. (Refer to page F2-49.)
 - Injector fuel leakage. (Refer to page F2-52.)

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)

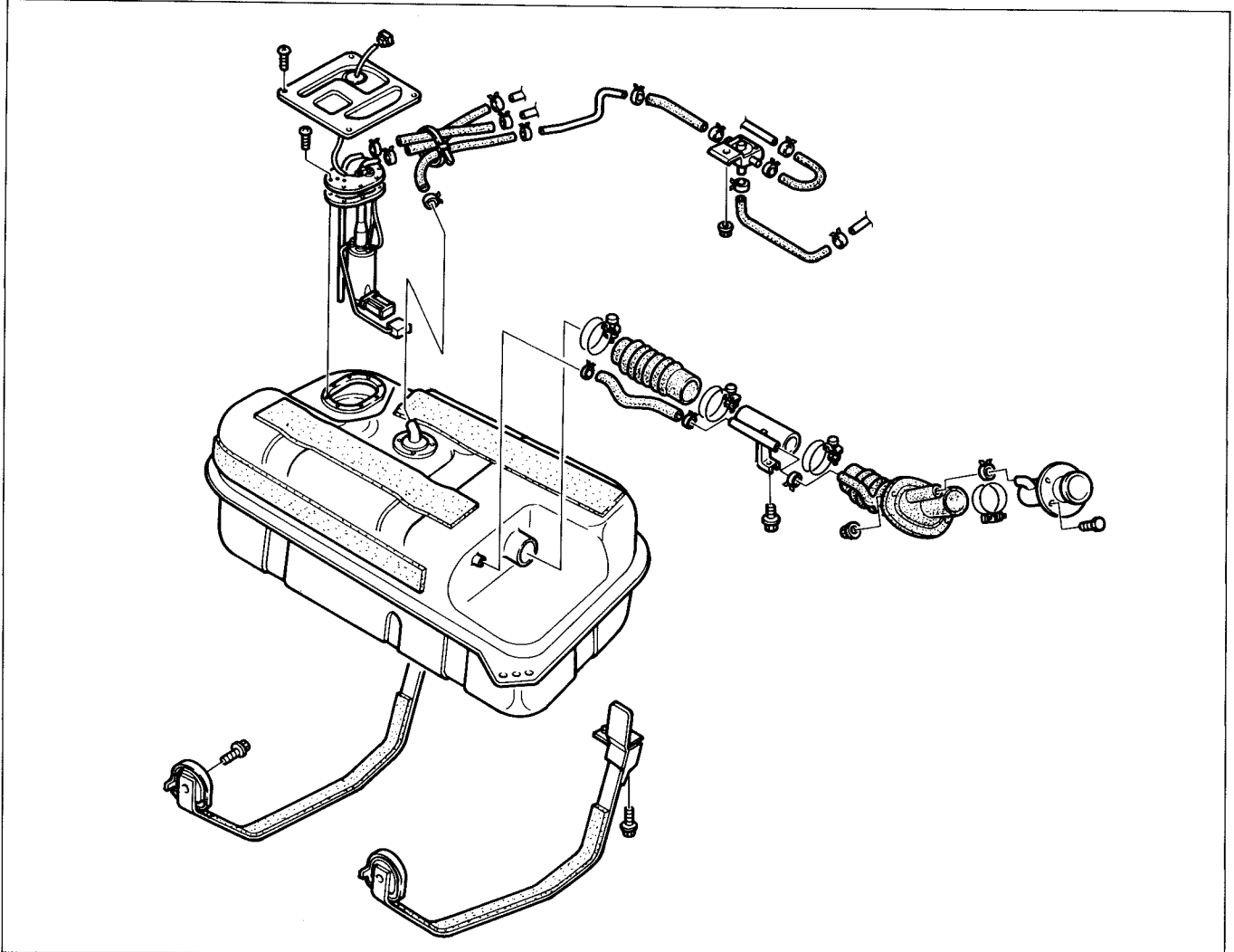
- Pressure low —
- Check for fuel leaks.
 - Substitute a good fuel filter and retest.
 - Check fuel pump maximum pressure. (Refer to page F2-48.)
 - Check the pressure regulator. (Refer to page F1-49.)
- Pressure high —
- Replace pressure regulator.

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 F2-46.)
2. Drain the fuel from the fuel tank before removing the tank.
3. Remove in the order shown in the figure.



97U0F2-105

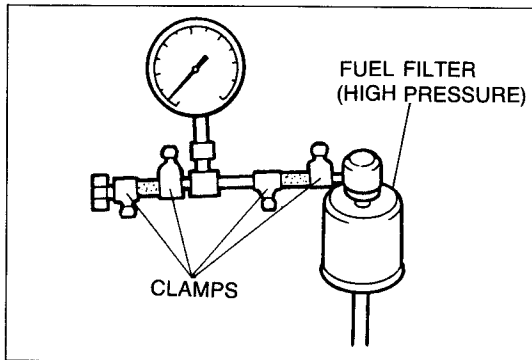
1. Drain the fuel tank.
2. Remove the fuel pump. (Refer to page F2-49.)
3. Disconnect the fuel filler hose from the fuel tank.
4. Raise the rear of the vehicle and support it with stands.
5. Disconnect the evaporation hoses from the fuel tank.
6. Remove the fixing band attaching bolts.
7. Remove the fuel tank.

Inspection

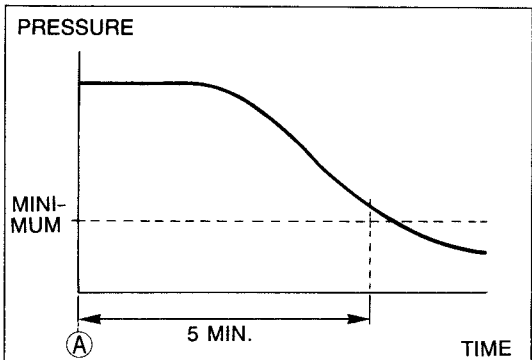
1. Visually check the fuel tank for contamination cracks, or other damage.
2. Replace, if necessary.

Installation

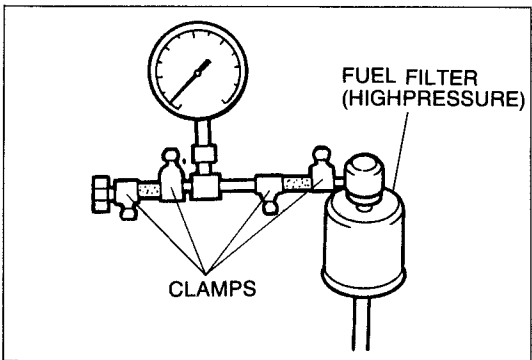
Install in the reverse order of removal.



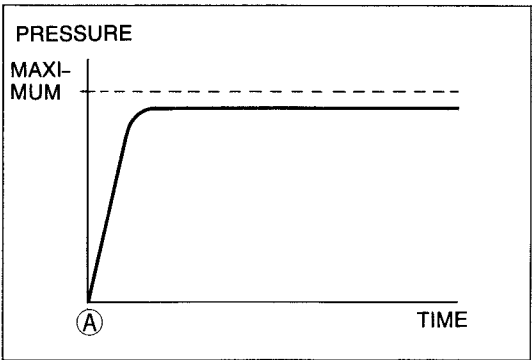
97U0F2-106



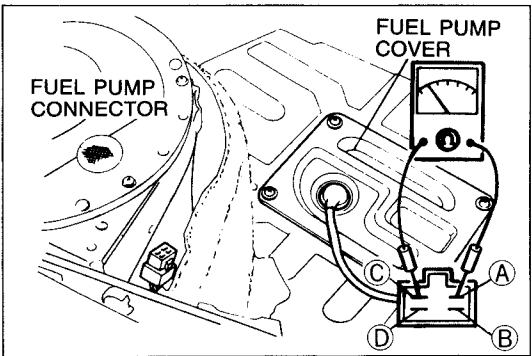
97U0F2-107



97U0F2-108



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 F2-46.)

Inspection

Hold pressure inspection

1. Release the fuel pressure from the fuel system. (Refer to page F2-46.)
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 F2-46.)
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.

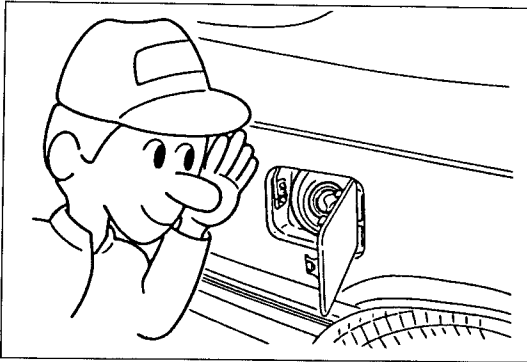
Maximum pressure:

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

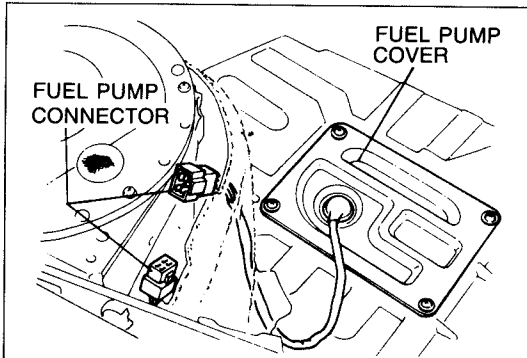
1. Remove the rear mat.
2. Disconnect the fuel pump connector.
3. Check for continuity between terminals **A—C**.



97U0F2-111

Operating sound

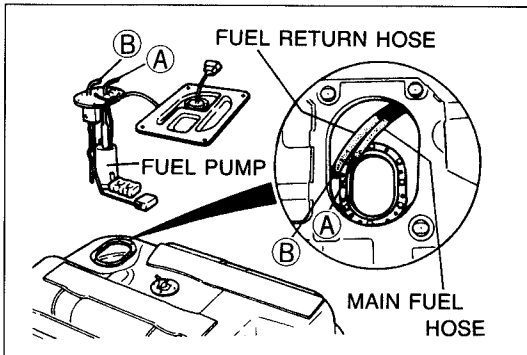
1. Connect the terminal of the check connector (Yellow: 2-pin) with a jumper wire.
2. Turn the ignition switch ON to operate the fuel pump.
3. Check at the fuel filler port for operating sound of the fuel pump.



97U0F2-112

Removal

1. Release the fuel pressure from the fuel system. (Refer to page F2-46.)
2. Lift up the rear mat.
3. Remove the fuel pump cover.
4. Disconnect the fuel pump connector.



97U0F2-113

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

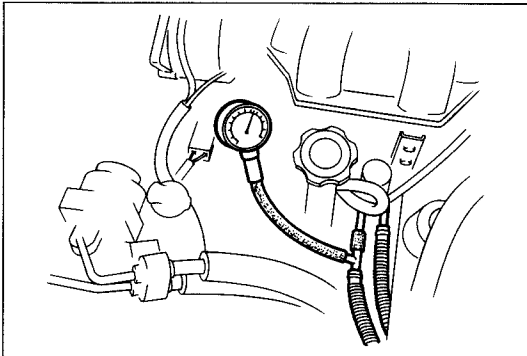
Install in the reverse order of removal.

PRESSURE REGULATOR

Inspection

Warning

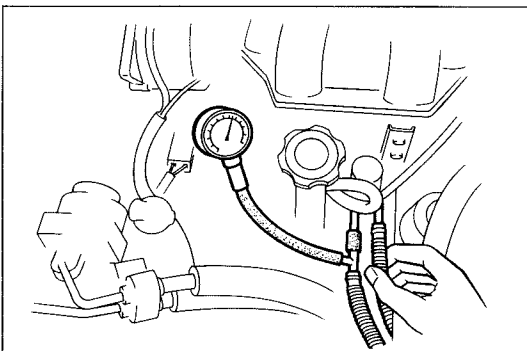
Before disconnecting any fuel line, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F2-46.)



97U0F2-114

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 INSPECTION), (Refer to page F2-46.)
2. If not as specified, perform the Hold Pressure Inspection (FUEL PUMP), (Refer to page F2-48.)
3. If both are as specified, perform the following inspection.



97U0F2-115

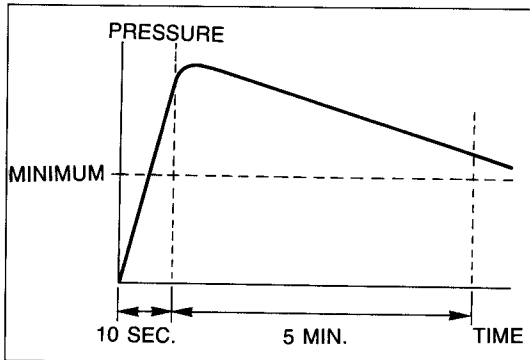
4. Release the fuel pressure from the fuel system. (Refer to page F2-46.)
5. Disconnect the negative battery terminal.
6. Install the fuel pressure gauge between the fuel filter and the pulsation damper.
7. Connect the negative battery terminal.
8. Start the engine and run it at idle.

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.

F2 FUEL SYSTEM



97U0F2-116

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)

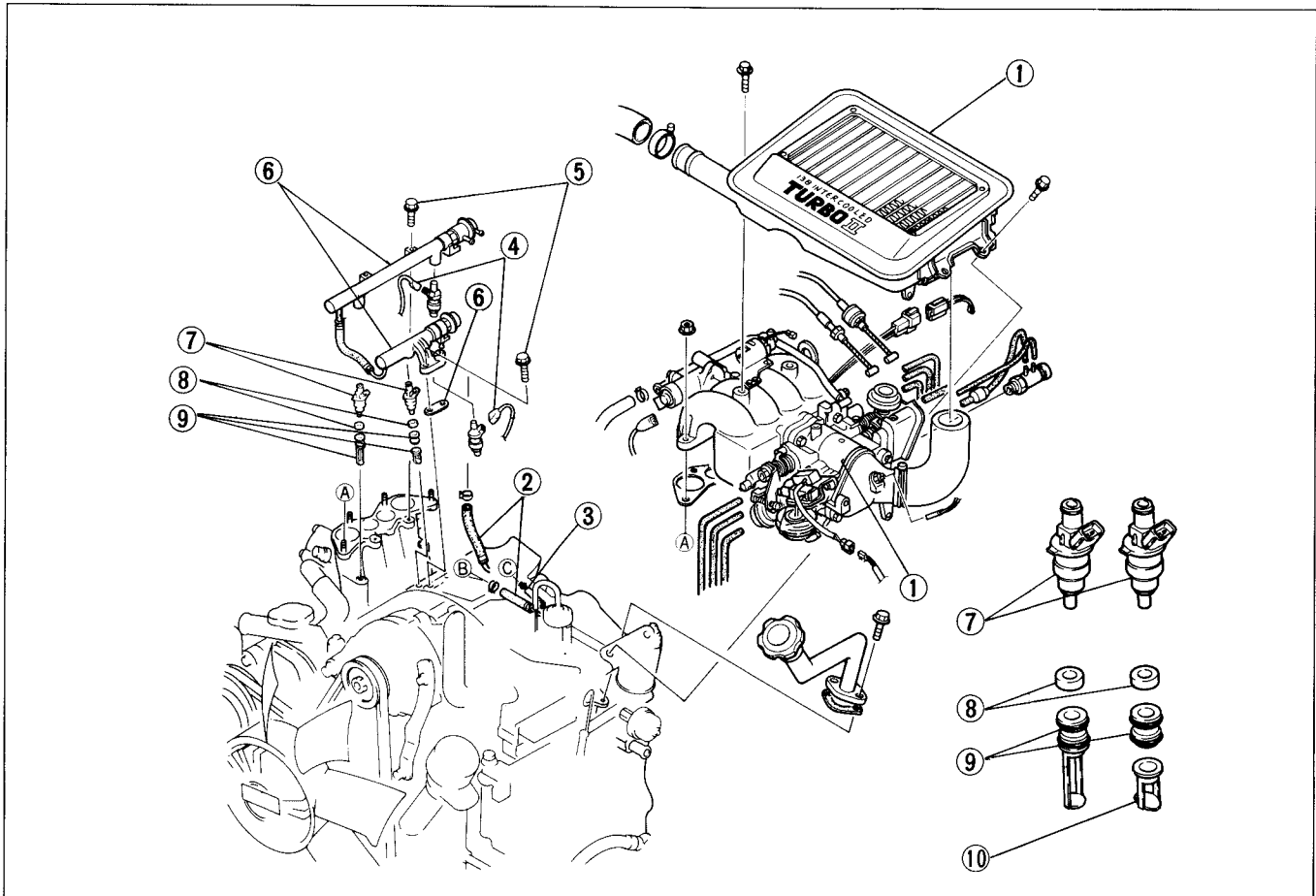
13. If as specified, replace the pressure regulator.

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 F2-46.)

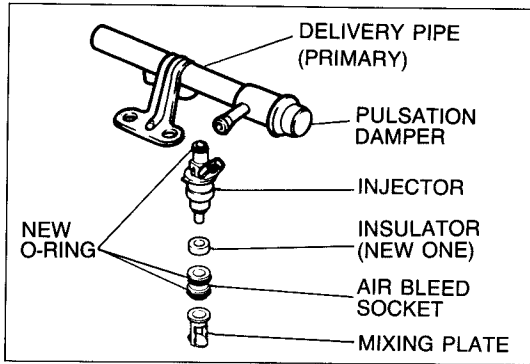
1. Release the fuel pressure from the fuel system. (Refer to page F2-46.)
2. Remove in the order shown in the figure.



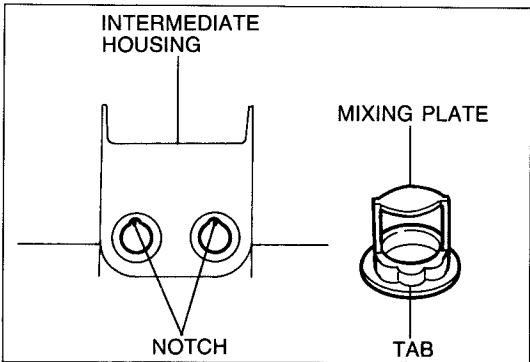
97U0F2-117

1. Intercooler, throttle body and dynamic chamber
Removal..... page F2-35
2. Fuel main hose and fuel return hose
3. Vacuum hose
4. Connectors
5. Attaching bolts

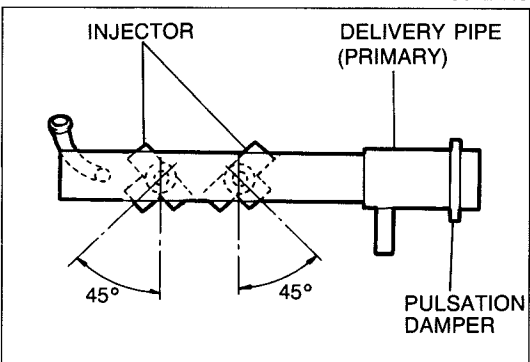
6. Delivery pipes and insulator
Installation..... page F2-51
7. Injectors
Inspection..... page F2-52
8. Injector insulators
9. Air bleed sockets
10. Mixing plate



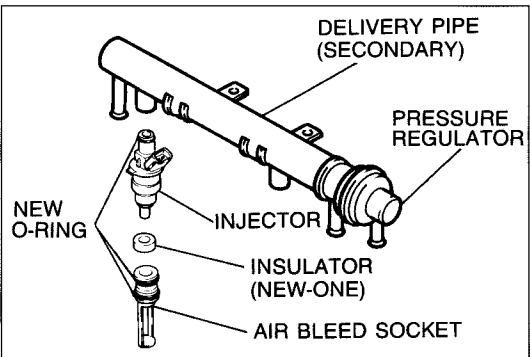
97U0F2-118



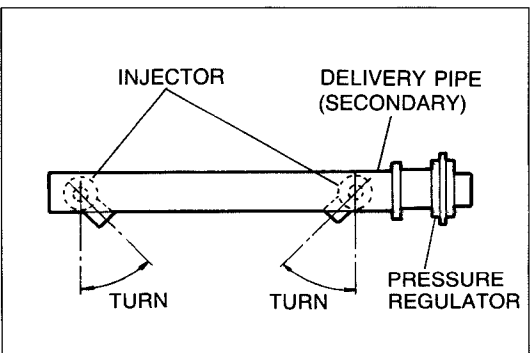
97U0F2-119



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 bewareing folls.

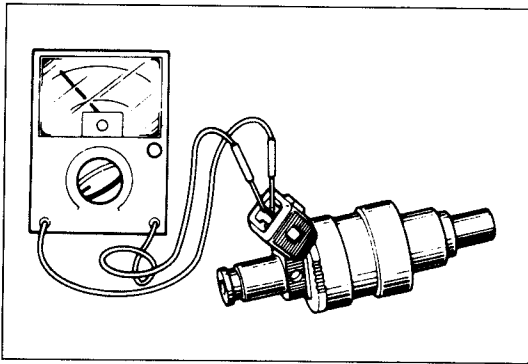
3. Align the tabs of the mixing plate with the notches in the intermediate housing.

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

Leakage inspection

Caution

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

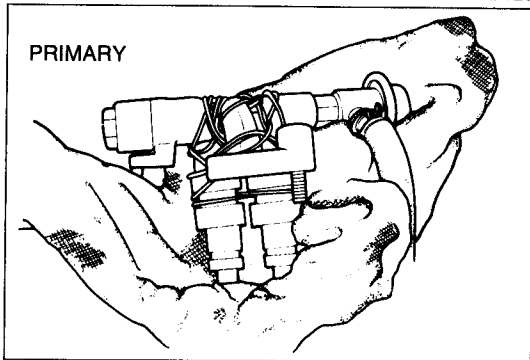
Warning

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

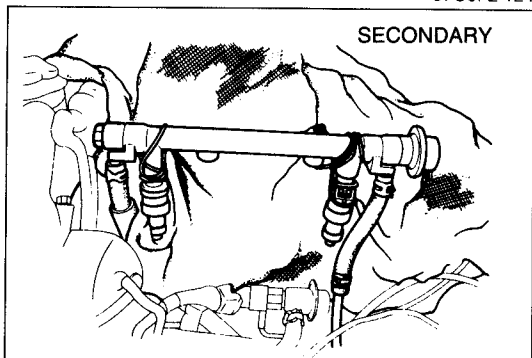
1. Remove the injectors, delivery pipe, and fuel hoses.
2. Affix the injectors to the delive pipe with wire.
3. Connect the terminals of the fuel pump check connector (Yellow: 2-pin) with a jumper wire. Turn ON the ignition switch.
4. Verify that fuel does not leak from the injector nozzles.

Note

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



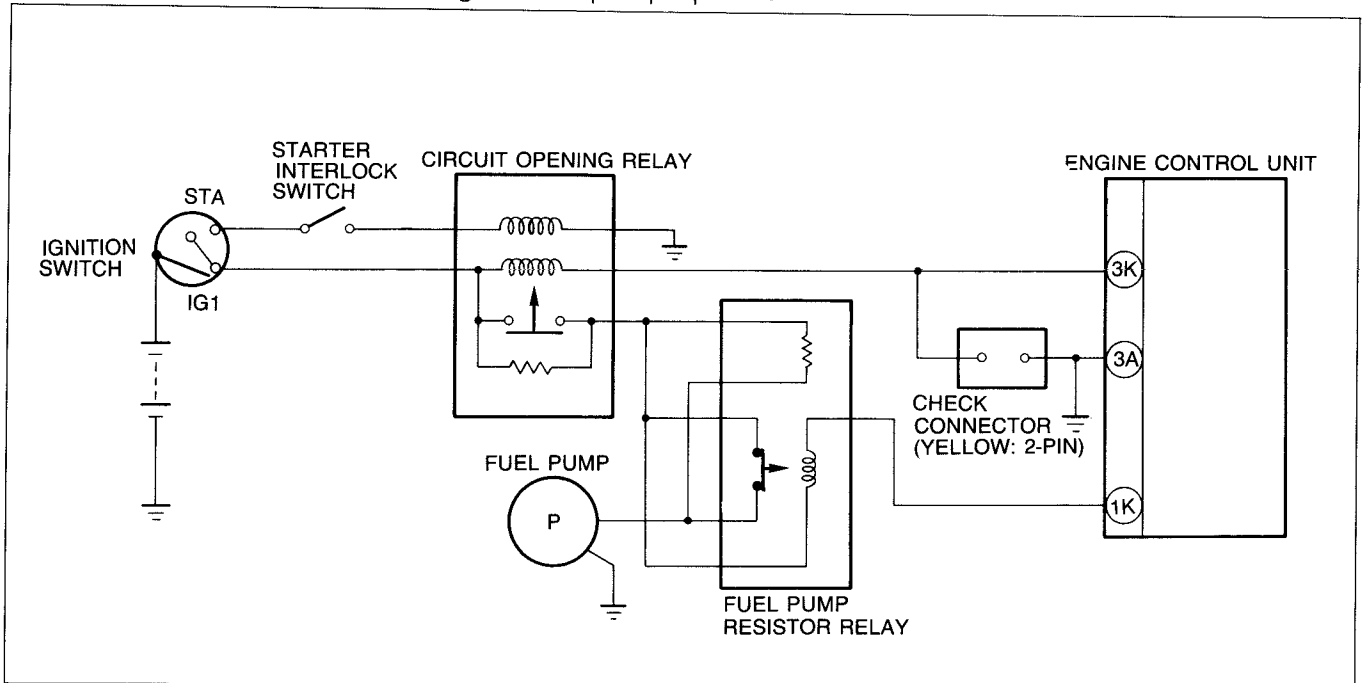
97U0F2-124



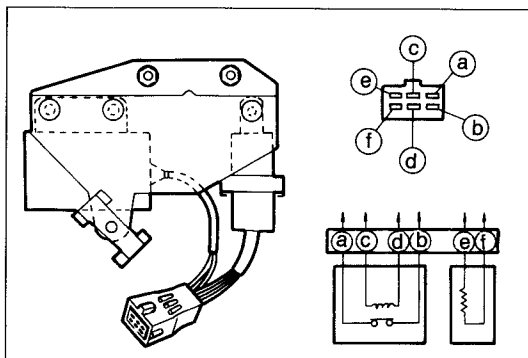
97U0F2-125

FUEL PUMP CONTROL SYSTEM

This system is provided to assure good fuel pump operation.



97U0F2-126



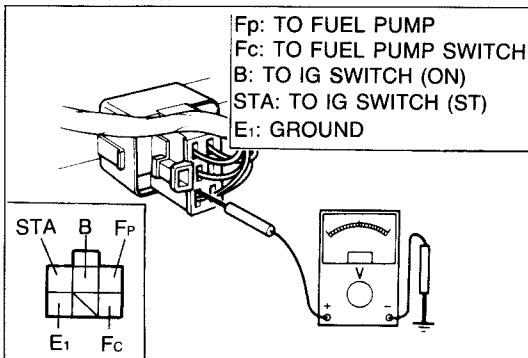
97U0F2-127

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 $60-92\Omega$
 e—f $0.70-0.94\Omega$

4. Replace the relay, if necessary.

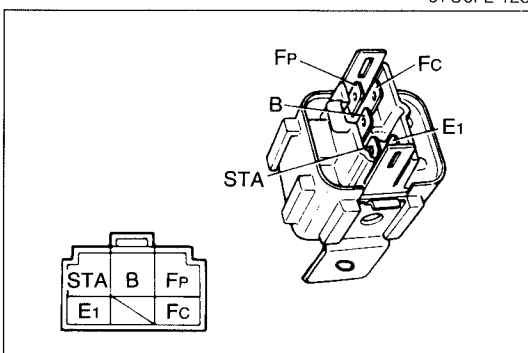


97U0F2-128

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.

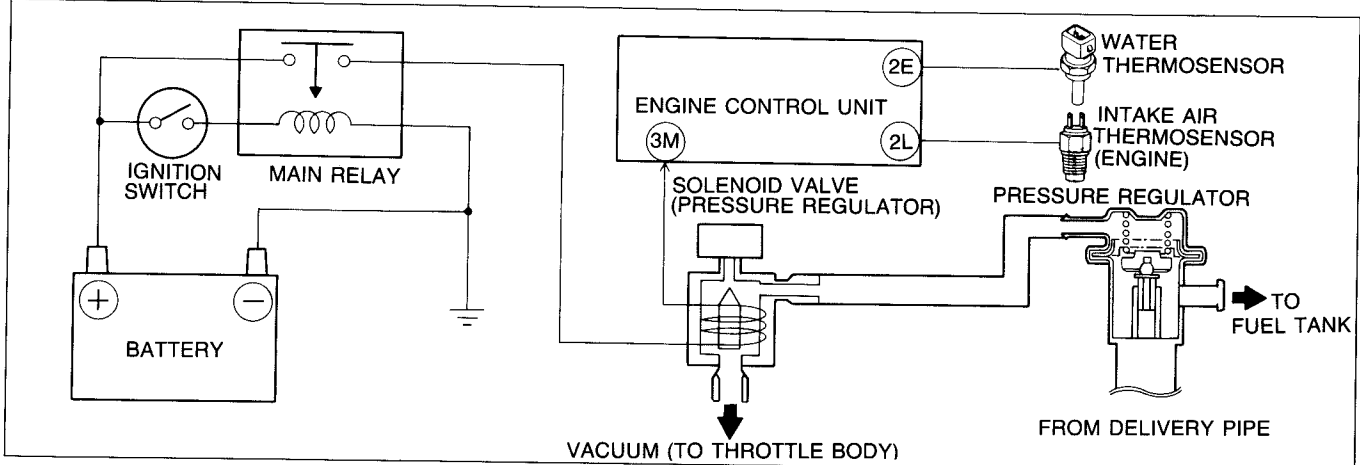
Terminals	Resistance (Ω)
STA \leftrightarrow E1	21—43
B \leftrightarrow Fc	109—226
B \leftrightarrow Fp	∞

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

F2 PRESSURE REGULATOR CONTROL (PRC) SYSTEM

PRESSURE REGULATOR CONTROL (PRC) SYSTEM

DESCRIPTION



97U0F2-130

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 **60°C**)

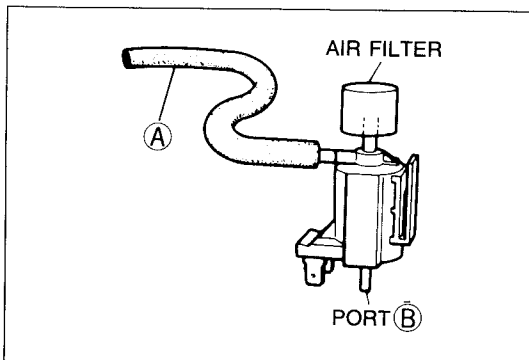
TROUBLESHOOTING

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

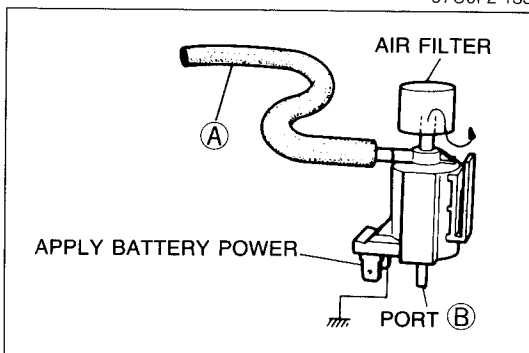
97U0F2-131

Possible cause Page	Solenoid valve (Pressure regulator control) F2-54	Water thermosensor F2-81	Intake air thermosensor F2-80	Engine control unit terminal	
				3R F2-79	1B F2-77
Symptom					
Hard start or No start (Crank OK)	1	3	4	2	2
High idle speed (At normal operating temperature)	1	3	4	2	2

97U0F2-132



97U0F2-133



97U0F2-134

SOLENOID VALVE (PRESSURE REGULATOR CONTROL) Inspection

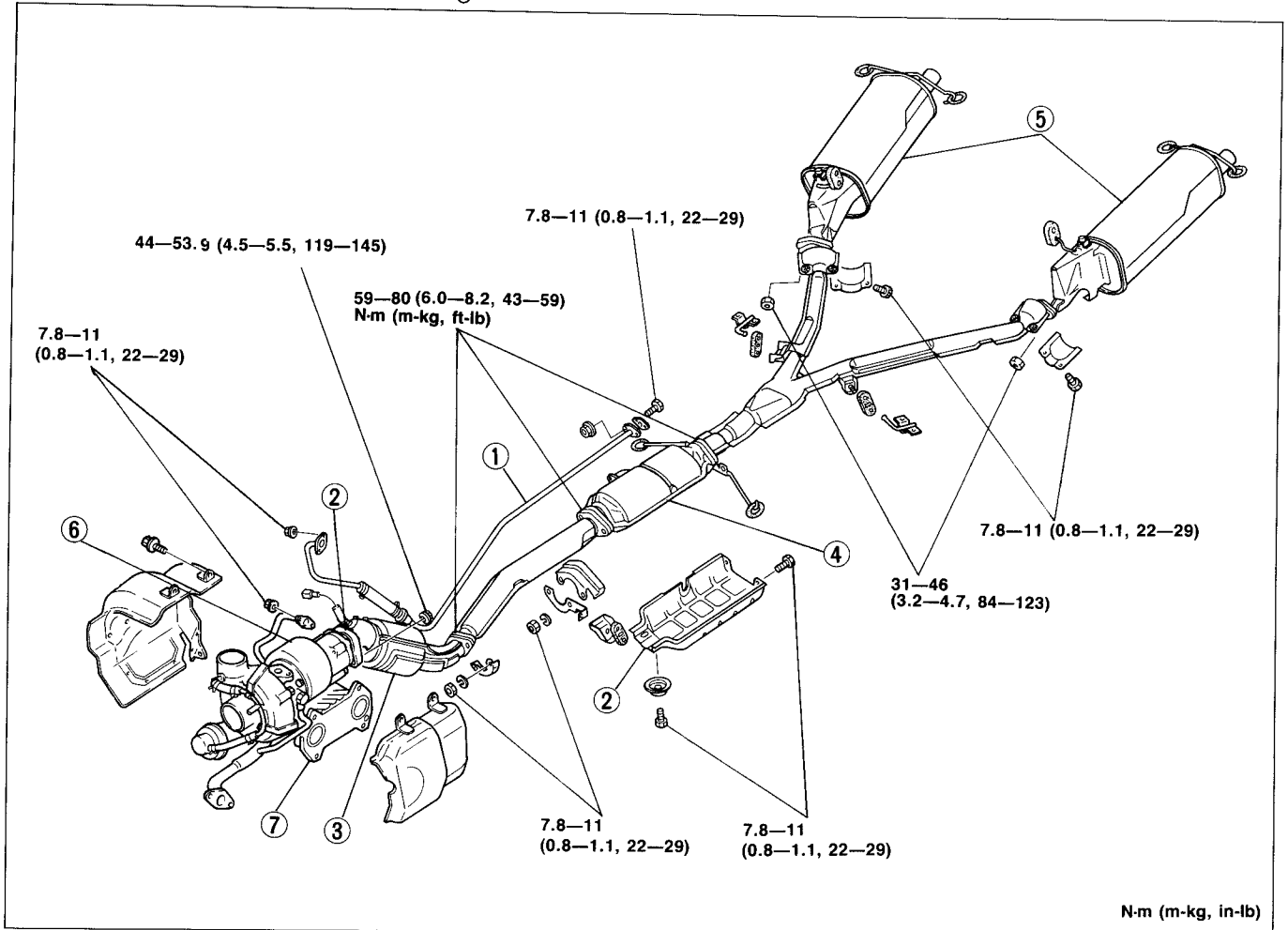
1. Disconnect the vacuum hose from the solenoid valve and vacuum pipe.
2. Blow through the solenoid valve from (A).
3. Verify that air flows from port (B).
4. Disconnect the solenoid valve connector.
5. Connect 12V and a ground to the terminals of the solenoid valve.
6. Blow through the solenoid valve 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.



97U0F2-135

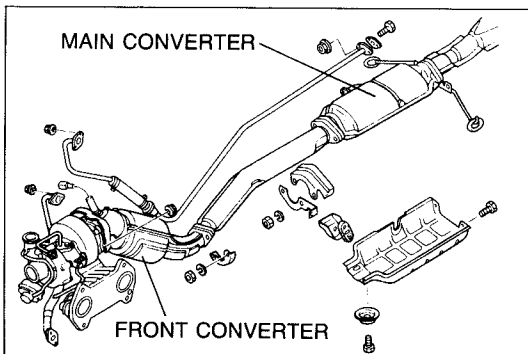
- | | |
|---------------------|---------------------|
| 1. Split air pipe | 5. Main silencer |
| 2. Insulator covers | 6. Turbocharger |
| 3. Front converter | 7. Exhaust manifold |
| 4. Main converter | |

Installation

Install in the reverse order of removal.

Note

Tighten all nuts and bolts to the specified torques.



97U0F2-136

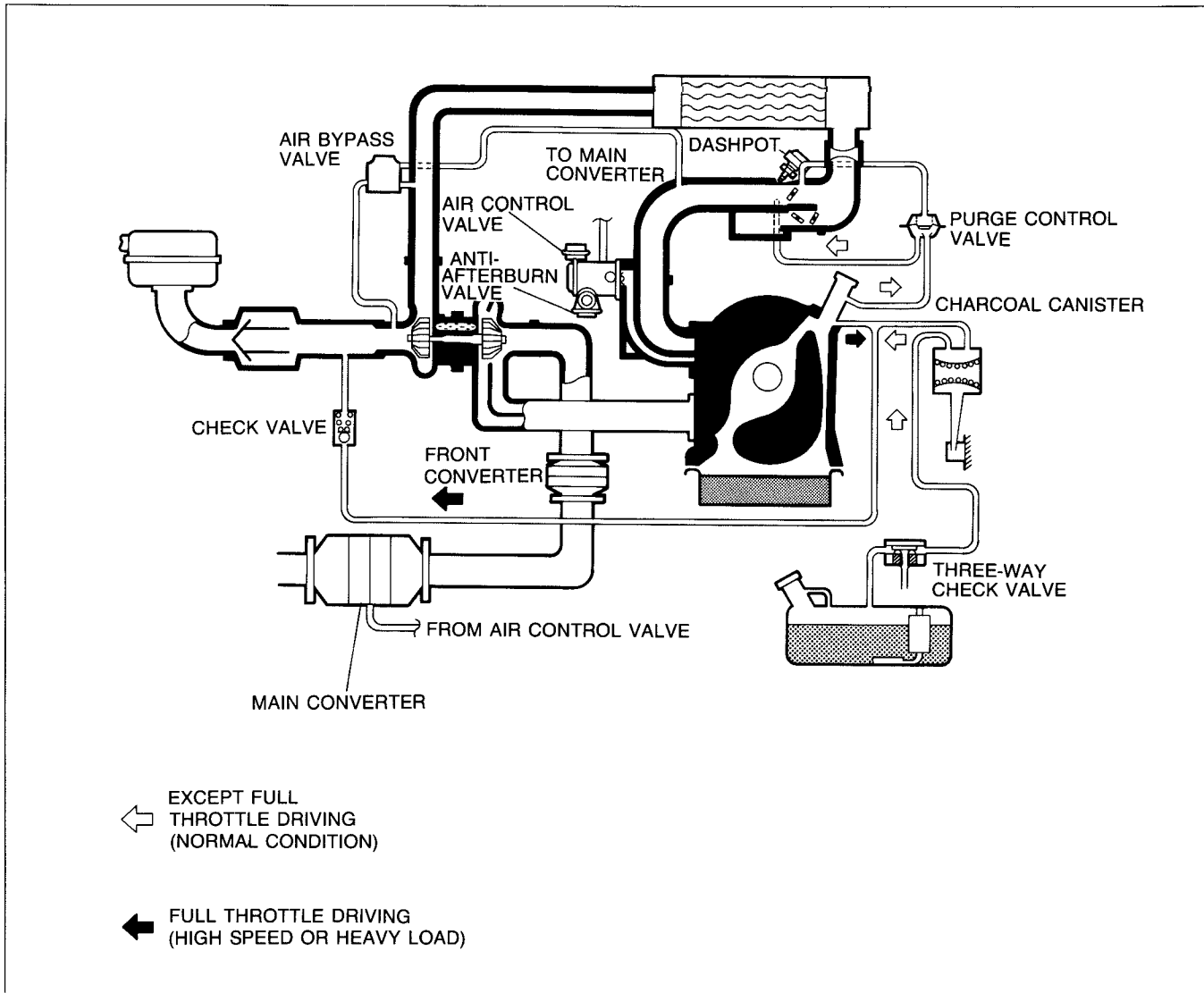
Inspection

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.

F2 OUTLINE OF EMISSION CONTROL SYSTEM

OUTLINE OF EMISSION CONTROL SYSTEM

DESCRIPTION



97U0F2-137

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 blow-by 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 blow-by gas is drawn into the dynamic chamber.

3. Deceleration control system

- Dashpot: To prevent the throttle valves from closing suddenly.
- AIR BYPASS VALVE: To prevent the excessive pressure in the intake air system during deceleration.
- Fuel cut: To improve the fuel economy and to prevent engine bucking during deceleration.

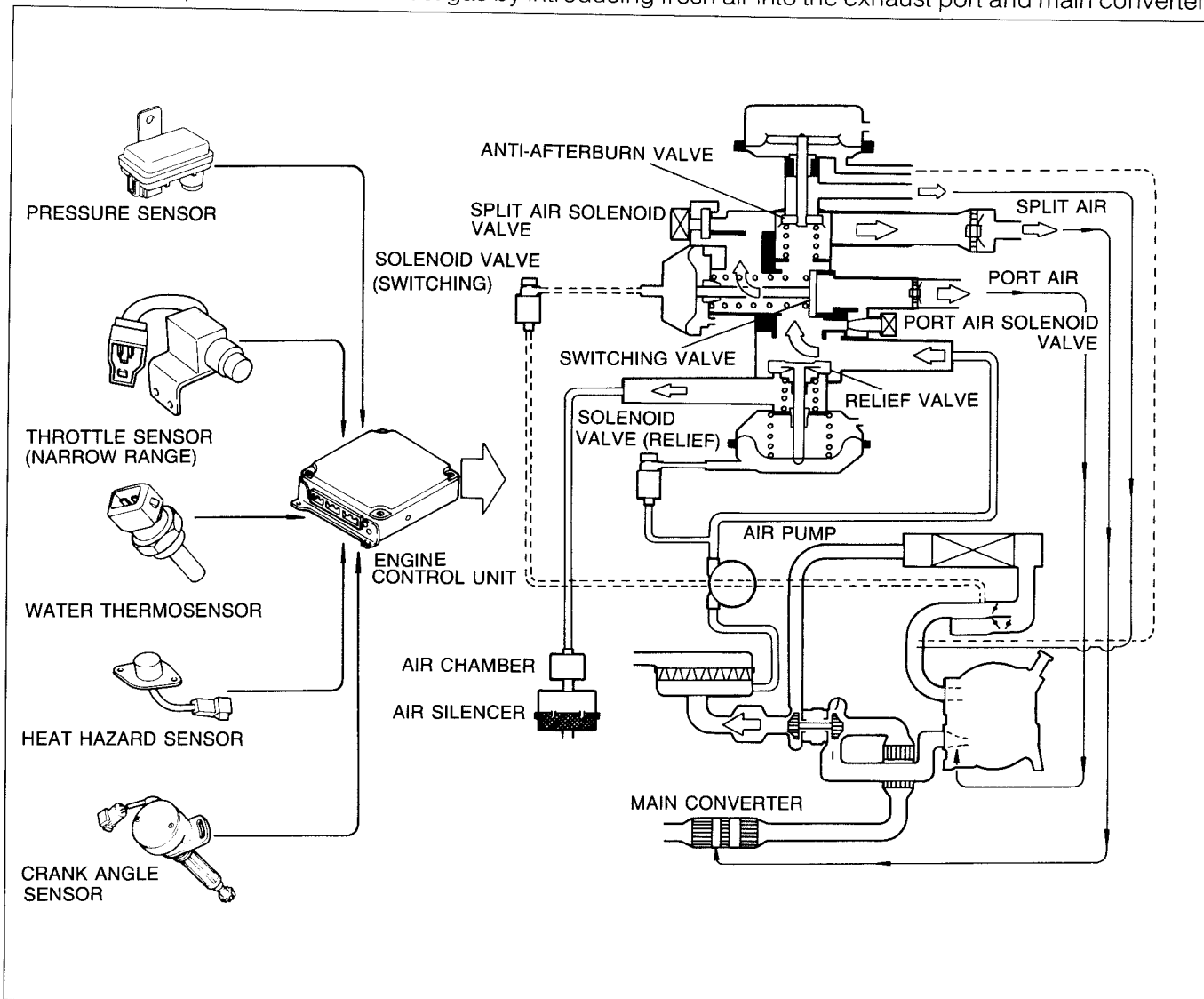
4. Catalytic converter

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.



97U0F2-138

TROUBLESHOOTING

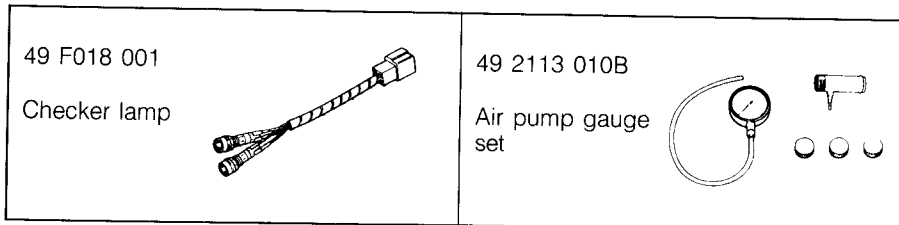
Check the condition of the wiring harness, vacuum hoses, and connectors before checking the sensors or switches.

Possible cause	System inspection	Air pump	Check valves (In intake manifold and 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	Engine control unit terminal			
										3I	2O	2P	2M
Page	F2-58	F2-61	F2-62	F2-63	F2-58	F2-58	F2-83	F2-60	F2-60	F2-79	F2-78	F2-78	F2-78
Symptom	F2-58	F2-61	F2-62	F2-63	F2-58	F2-58	F2-83	F2-60	F2-60	F2-79	F2-78	F2-78	F2-78
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

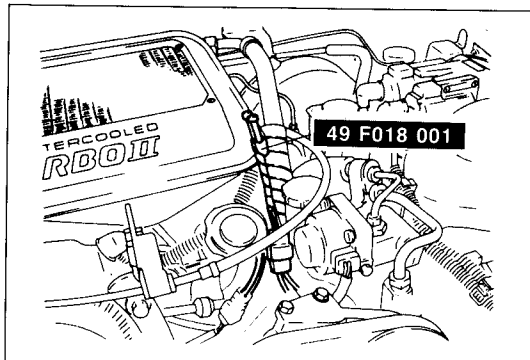
97U0F2-139

F2 SECONDARY AIR INJECTION CONTROL SYSTEM

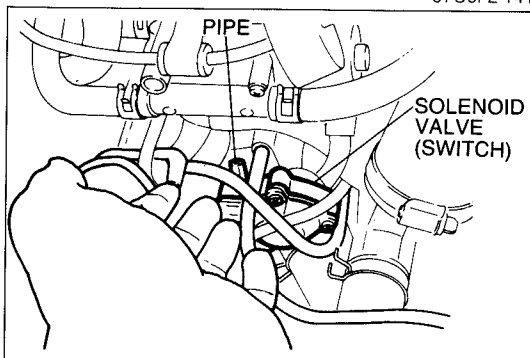
PREPARATION SST



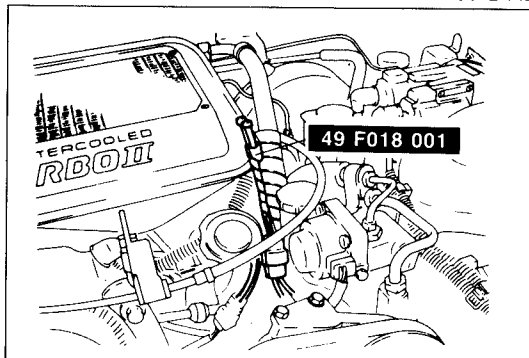
97U0F2-140



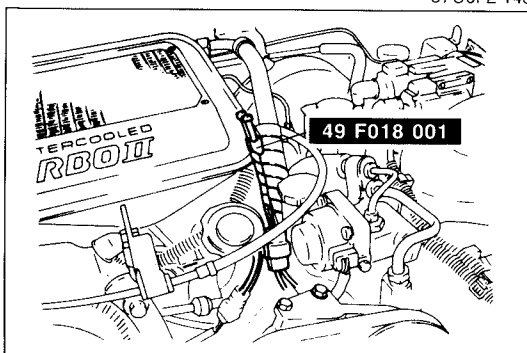
97U0F2-141



97U0F2-142



97U0F2-143



97U0F2-144

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).

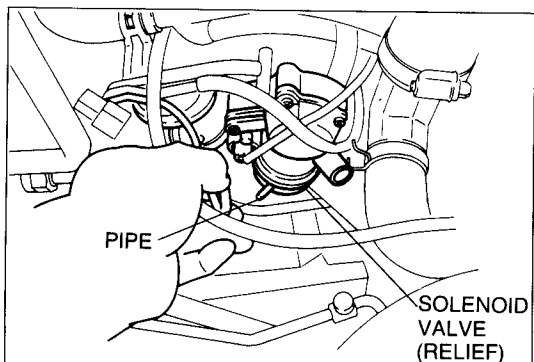
4. Disconnect the vacuum hose (solenoid valve (switch) to air control valve).
5. Place a finger over the pipe opening.

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

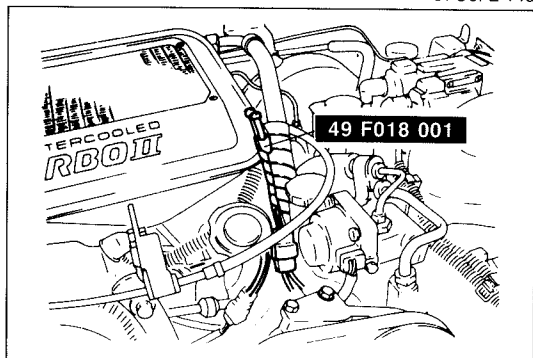
Engine condition	Checker lamp illumination	Vacuum	Remark
Idle	Red lamp does not illuminate	Yes	—
Deceleration			
Half throttle	Red lamp illuminates	No	—

Solenoid Valve (Relief)

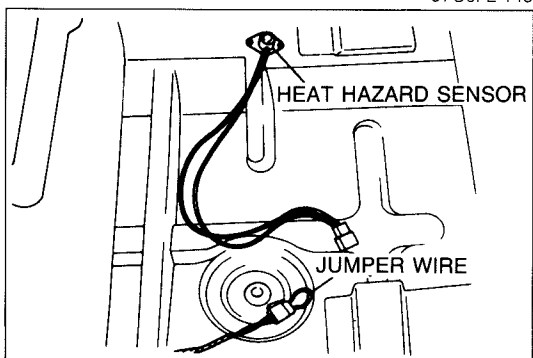
1. Warm up the engine and run it at idle.
2. Connect a tachometer to the engine.
3. Connect the **SST** to the check connector (Green: 3-pin).



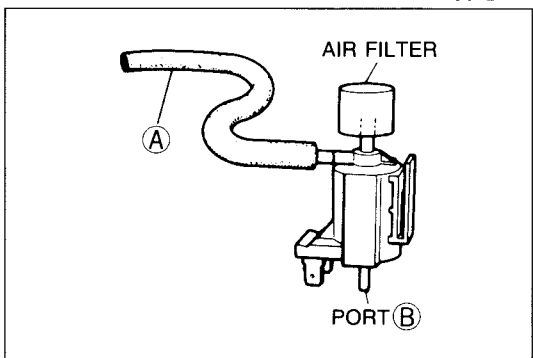
97U0F2-145



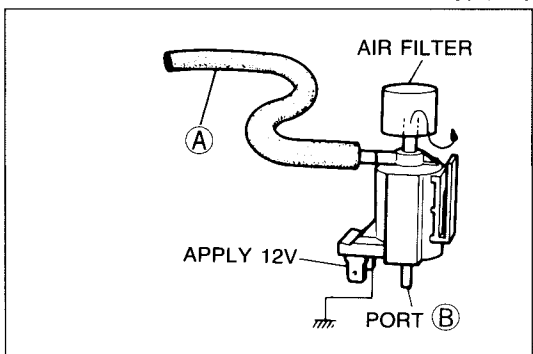
97U0F2-146



97U0F2-147



97U0F2-148



97U0F2-149

4. Disconnect the vacuum hose (solenoid valve (relief) to air control valve) at the air control 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 air output at the pipe.

Engine condition	Checker lamp illumination	Air	Remark
Idle	Green lamp illuminates	No	
Deceleration			
Above 4,000 rpm	Green lamp does not illuminate	Yes	Gradually increase engine speed

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 flows 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 (RELIEF)

Inspection

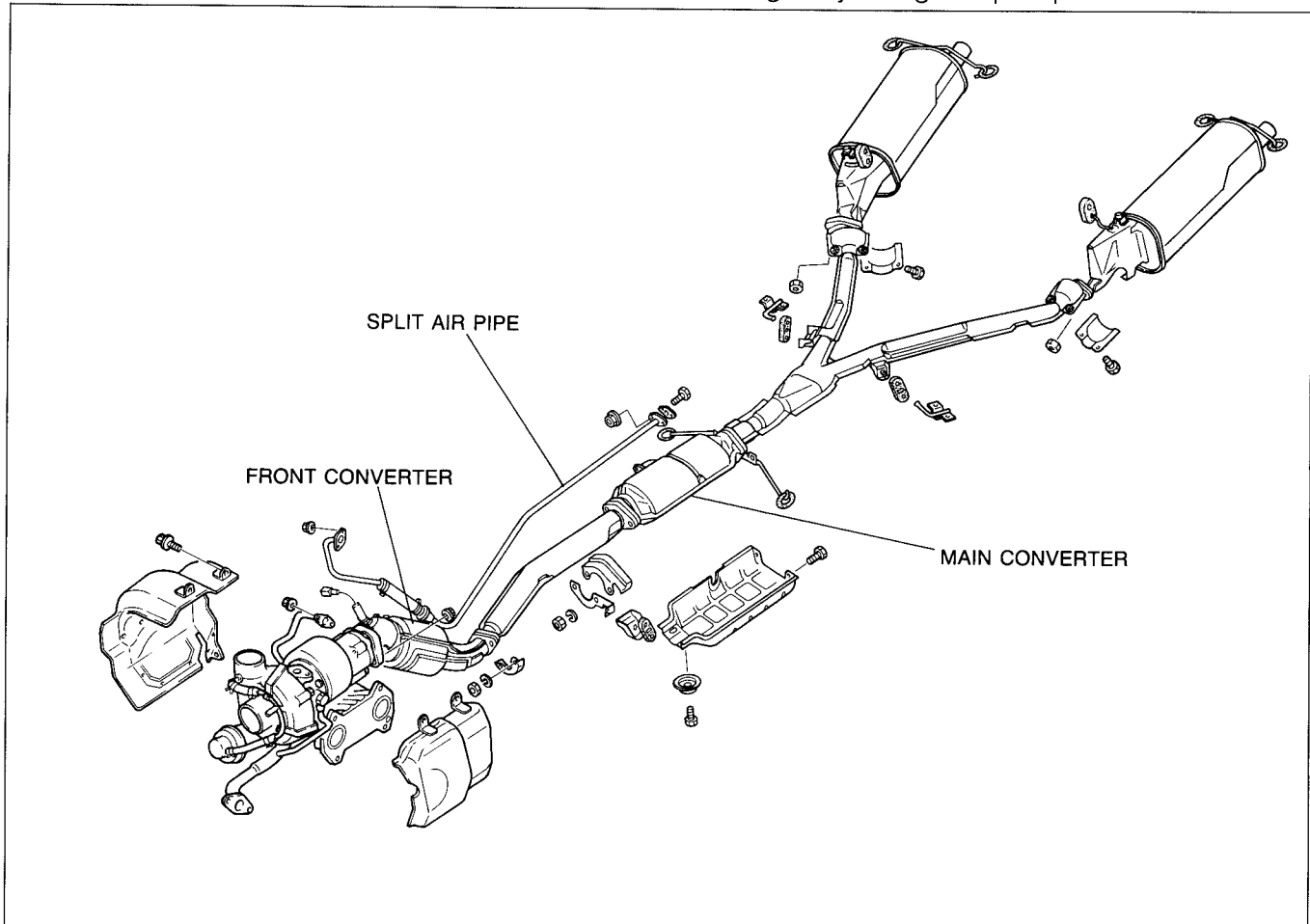
1. Disconnect the vacuum hoses from the solenoid valve.
 2. Blow through the solenoid valve from port (A).
 3. Verify that air passes through the valve and flows from port (B).
-
4. Disconnect the solenoid valve connector and connect **12V** and a ground to the terminals on the solenoid valve.
 5. Blow 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.

F2 CATALYTIC CONVERTER SYSTEM

CATALYTIC CONVERTER SYSTEM

DESCRIPTION

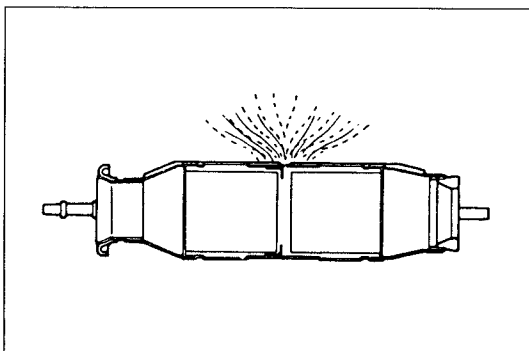
Two three-way catalytic converters are used to reduce CO, HC, and NOx emissions. For efficient operation, the front converter is placed close to the exhaust manifold so that it will heat up quickly and purify exhaust gas efficiently when engine runs at idle. The front converter also protects the main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



97U0F2-174

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	1,100 (67.1)	CO, HC, NOx
Main converter			2,900 (176.9)	



97U0F2-175

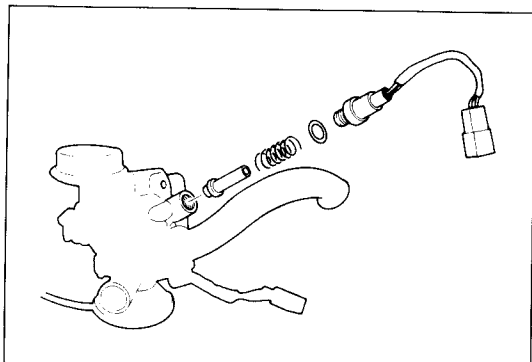
CATALYTIC CONVERTER (FRONT CONVERTER AND MAIN CONVERTER)

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.



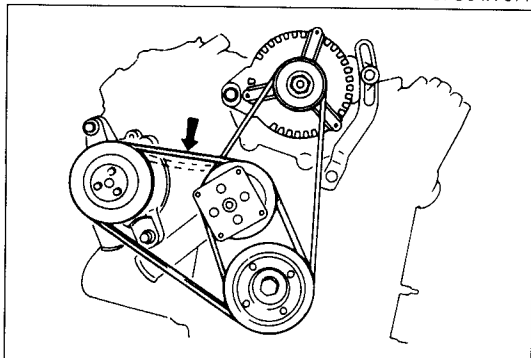
67U04X-077

Removal

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

Installation

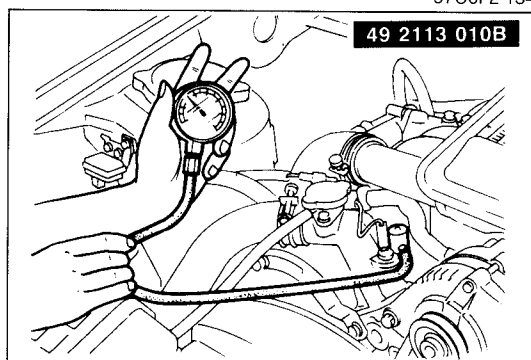
Install in the reverse order of removal.



97U0F2-154

AIR PUMP Inspection

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



97U0F2-155

Pressure:

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

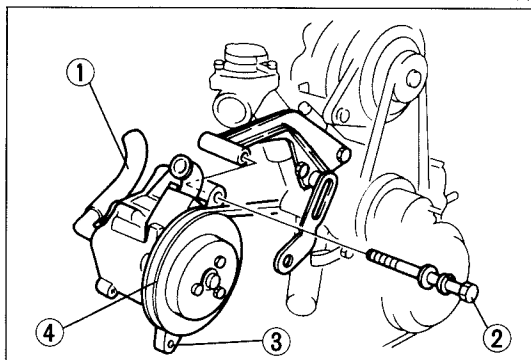
11. Replace the pump, if necessary.

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 in the reverse order of removal. Then adjust the drive belt tension.

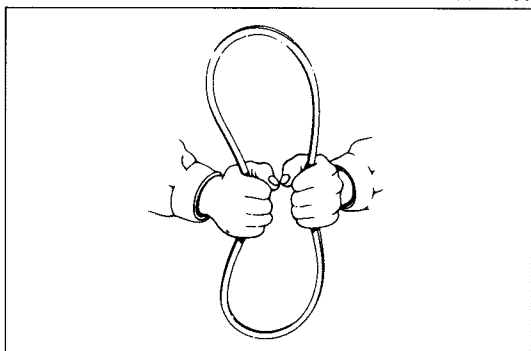


97U0F2-156

AIR PUMP DRIVE BELT

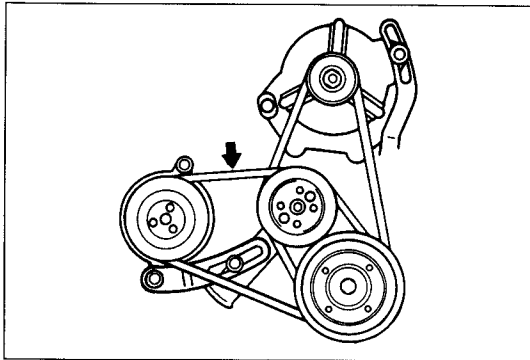
Inspection

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.



67U04X-045

F2 SECONDARY AIR INJECTION CONTROL SYSTEM



97U0F2-157

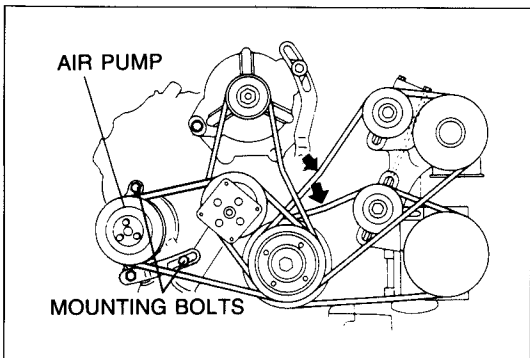
Adjustment

1. Loosen the air pump strap bolt and mounting bolt.
2. Move the air pump until the correct belt tension is obtained.

Belt tension:

11—13mm (0.43—0.51 in)
when pressed at 98.1 N (10 kg, 22 lb)

3. Tighten the bolts.



97U0F2-158

Removal

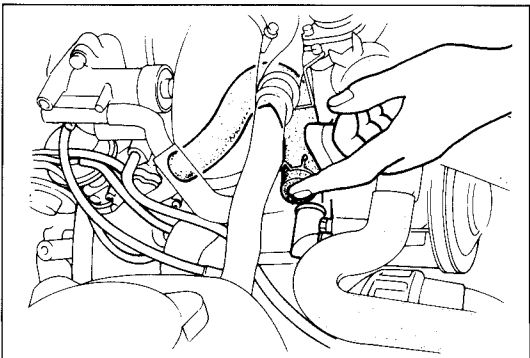
1. Loosen the A/C and P/S pulley drive belts (if equipped).
2. Loosen the air pump strap bolt and mounting bolts, and move the air pump to remove the drive belt.

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)

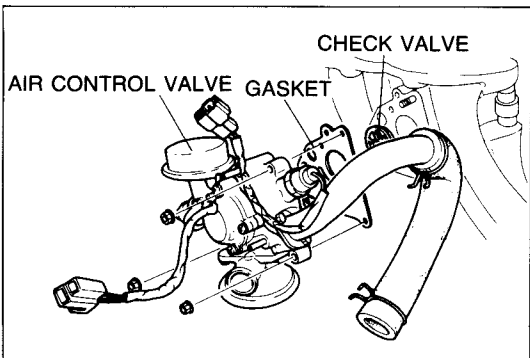


77U04B-109

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.



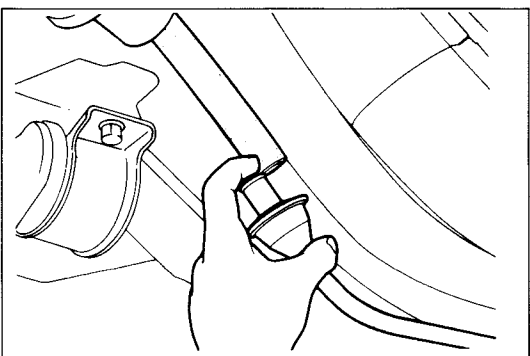
97U0F2-159

Removal

1. Remove the air control valve. (Refer to page F2-64.)
2. Remove the gasket and check valve.

Installation

Install the check valve in the reverse order of removal.

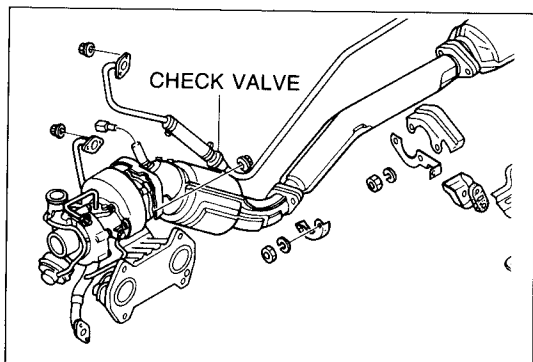


77U04B-095

CHECK VALVE (INTAKE MANIFOLD TO CATALYTIC CONVERTER)

Inspection

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



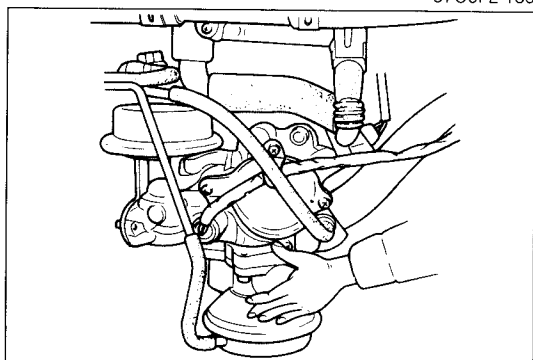
97U0F2-160

Removal

1. 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.



77U04B-219

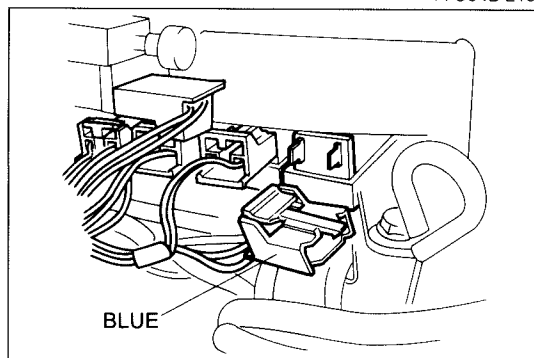
AIR CONTROL VALVE

Inspection

1. Warm up the engine to normal operating temperature.
2. Connect a tachometer to the engine.

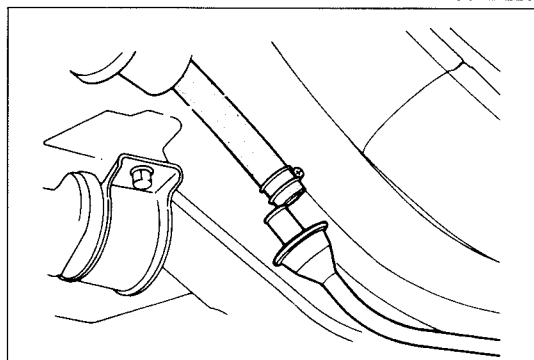
Note

Only for vehicles equipped with ABS, disconnect the air hose and vacuum hose of the air bypass valve from the turbocharger and plug the hoses before disconnecting the air hose (air silencer to air control valve) at the air control valve.



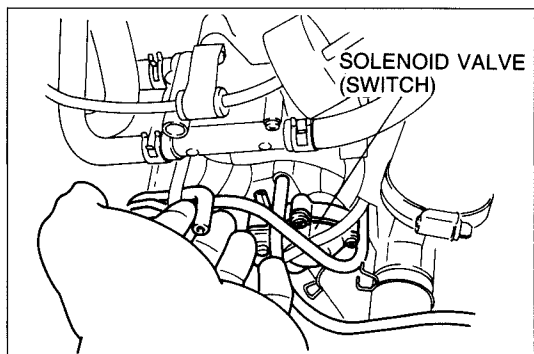
77U04B-220

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. Slowly increase the engine speed and check that air begins to flow out at **3,750 rpm**.
6. Run the engine at idle.
7. Disconnect the relief solenoid valve connector.
8. Check that air flows out at **1,200 rpm** or more.
9. Reconnect the solenoid valve connector.



77U04B-098

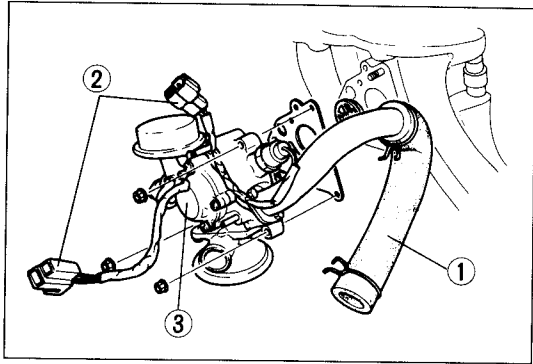
10. Disconnect the split air hose (intake manifold to check valve) at the check valve.
11. Place a finger over the port opening.



77U04B-099

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

F2 SECONDARY AIR INJECTION CONTROL SYSTEM



67U04X-056

Removal

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

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

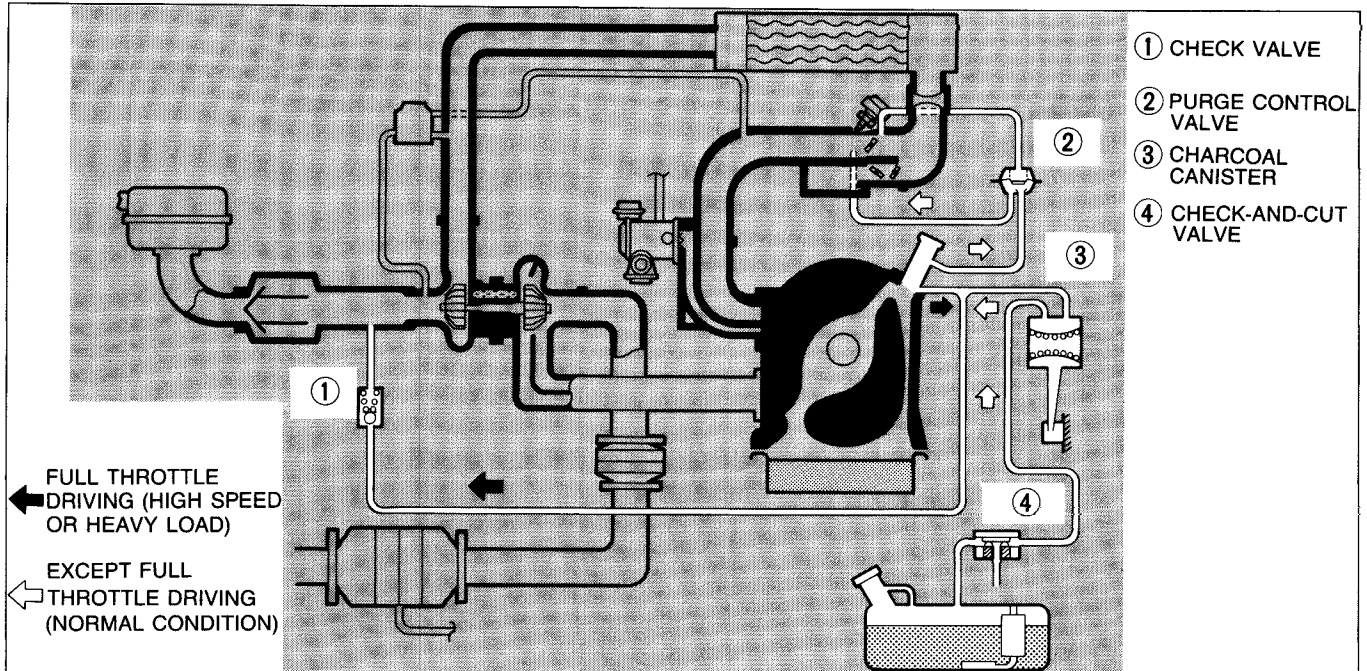
Installation

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 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

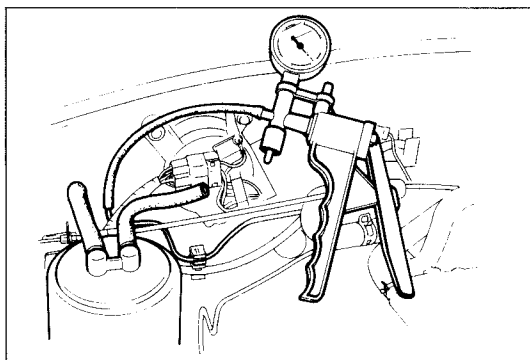
Inspection

1. Remove the check-and-cut valve.

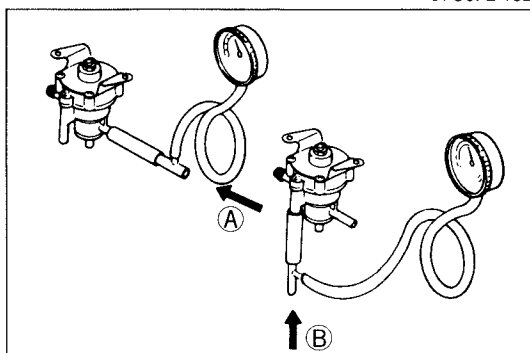
Note

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)**.

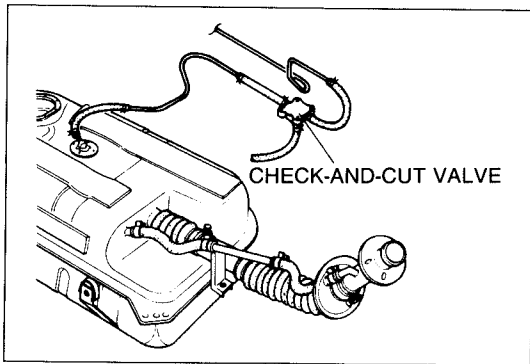


97U0F2-162



97U0F2-163

F2 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.

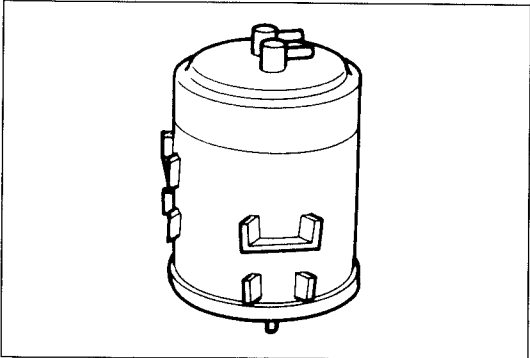
Caution

- 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.

CHARCOAL CANISTER

Inspection

Visually check the canister for leakage or damage.

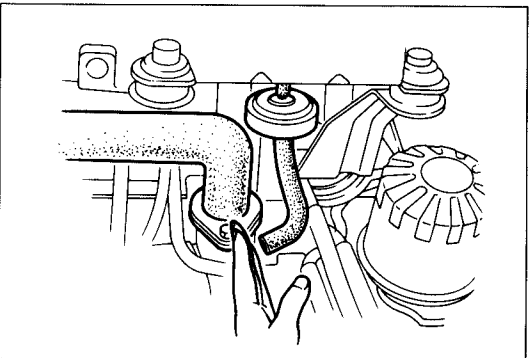


97U0F2-165

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.

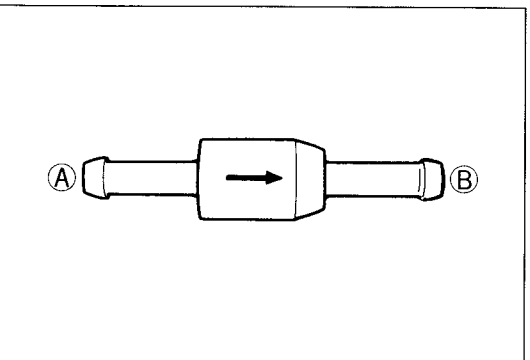


97U0F2-166

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.

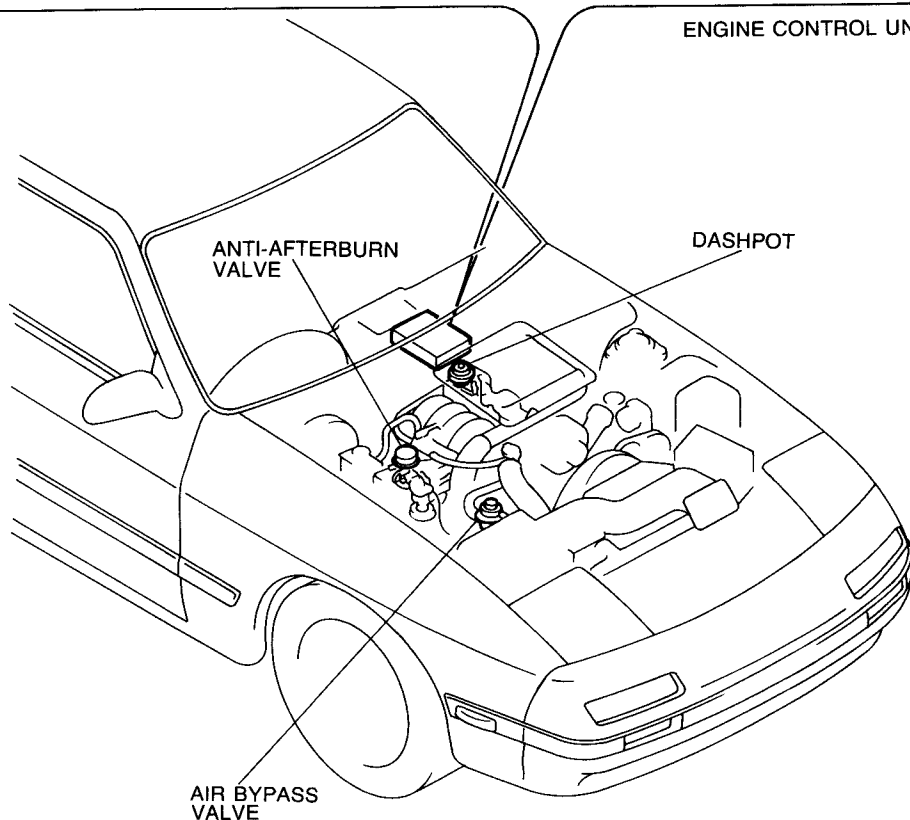
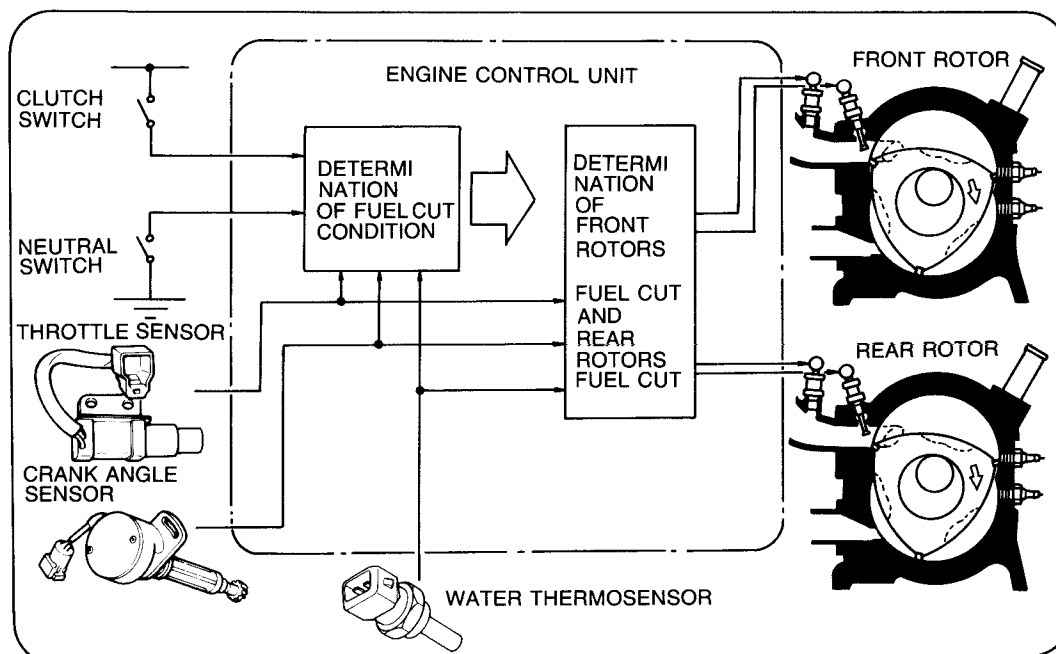


97U0F2-167

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.
- Air bypass valve : Bypasses compressed air from after the turbocharger to before turbocharger during deceleration to prevent noise.



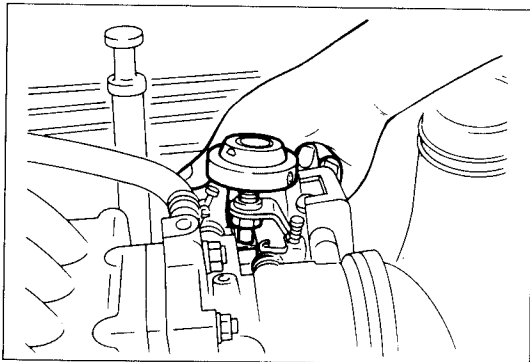
F2 DECELERATION CONTROL SYSTEM

TROUBLESHOOTING

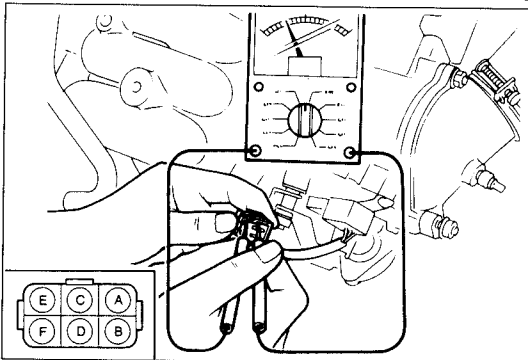
Check the condition of the wiring harness, vacuum hoses and connectors before checking the sensors or switches.

Symptom	Possible cause		
	Dashpot	Anti-afterburn valve	Air bypass valve
	F2-68	F2-69	F2-43
Afterburn	2	1	
Runs rough on deceleration	2	3	1
Fails emission test	1	3	2

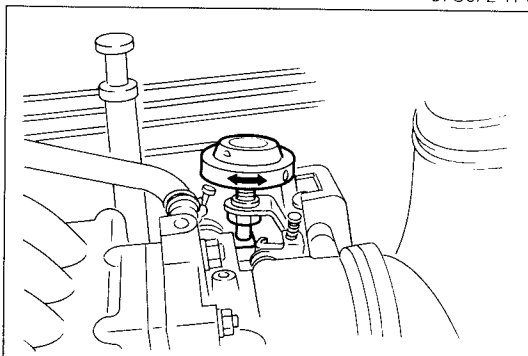
97U0F2-169



97U0F2-170



97U0F2-171



77U04B-117

DASHPOT

Inspection

1. Remove the intercooler. (Refer to page F2-34.)
2. Open the throttle valve fully, then push the dashpot rod with a finger and verify that the rod goes in slowly.
3. Release the rod and verify that it comes out quickly.
4. Replace it, if necessary.
5. Install the intercooler in the reverse order of removal.

Adjustment

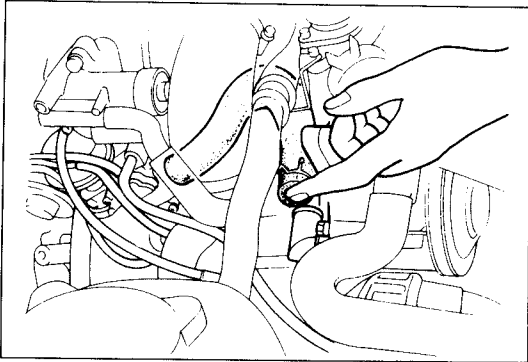
Note

Before adjusting the dashpot, adjust the throttle sensor. (Refer to page F2-81.)

1. Warm up the engine to the normal operating temperature and stop it.
2. Remove the intercooler. (Refer to page F2-34.)
3. Disconnect the throttle sensor connector and connect the circuit tester between (A) terminal and (B) terminal of the sensor.
4. Check the resistance when the dashpot rod separates from the lever.

Resistance: 1.8—3.8 kΩ

5. Loosen the lock nut and adjust by turning the dashpot, if necessary.
6. Install the intercooler in the reverse order of removal.



97U0F2-173

ANTI-AFTERBURN VALVE

Inspection

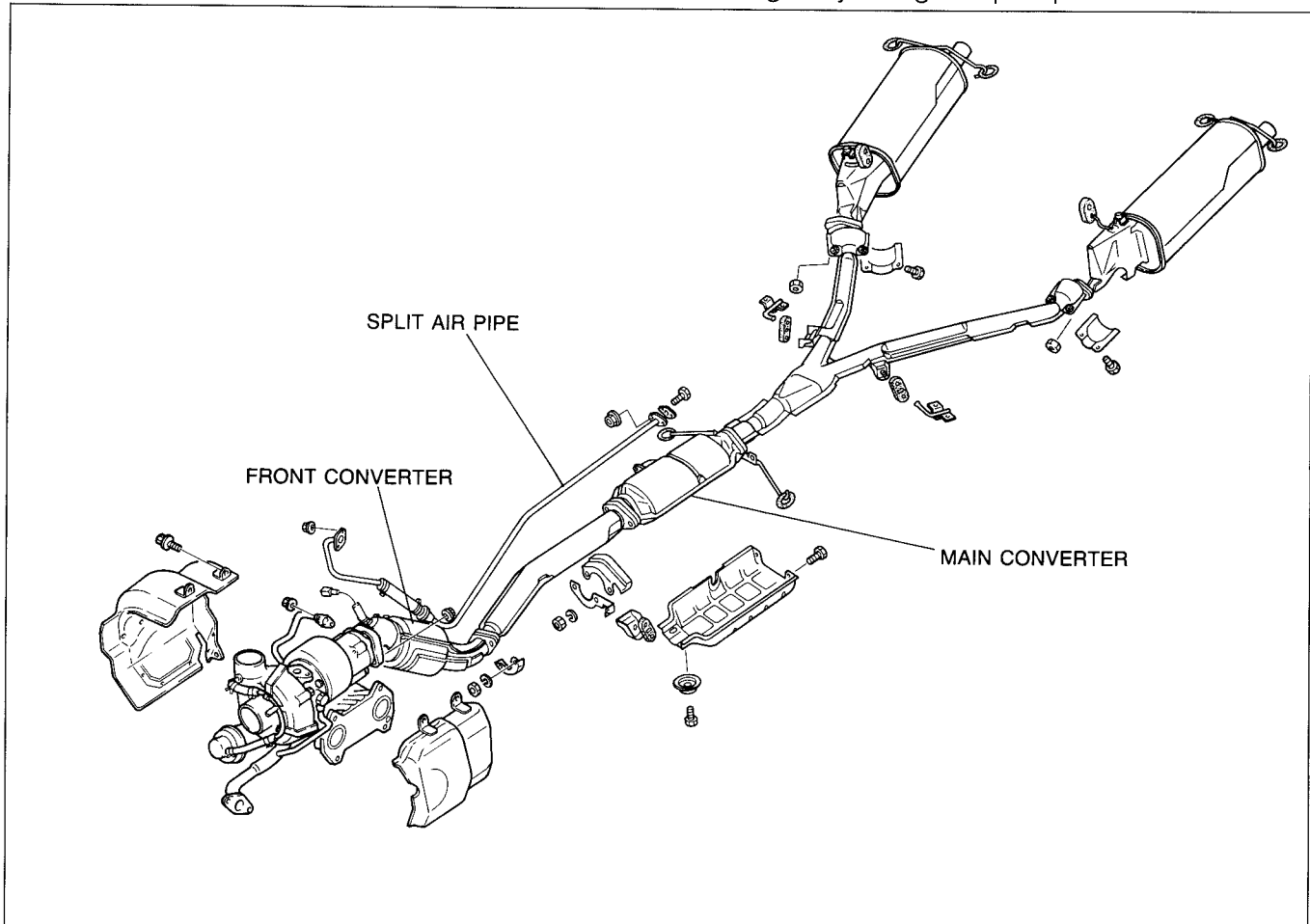
1. Warm up the engine and run it at idle.
2. Disconnect the air hose (air control valve to air pump) from the air pump.
3. Place a finger over the air hose opening.
4. Verify that air is not sucked into the air hose at idle.
5. Increase the engine speed to over **3,000 rpm**, then decrease the engine speed **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.

F2 CATALYTIC CONVERTER SYSTEM

CATALYTIC CONVERTER SYSTEM

DESCRIPTION

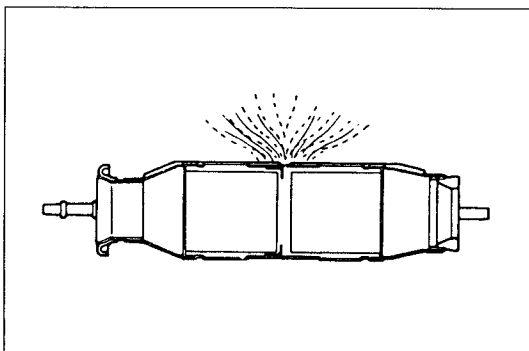
Two three-way catalytic converters are used to reduce CO, HC, and NOx emissions. For efficient operation, the front converter is placed close to the exhaust manifold so that it will heat up quickly and purify exhaust gas efficiently when engine runs at idle. The front converter also protects the main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



97U0F2-174

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	1,100 (67.1)	CO, HC, NOx
Main converter			2,900 (176.9)	



97U0F2-175

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.

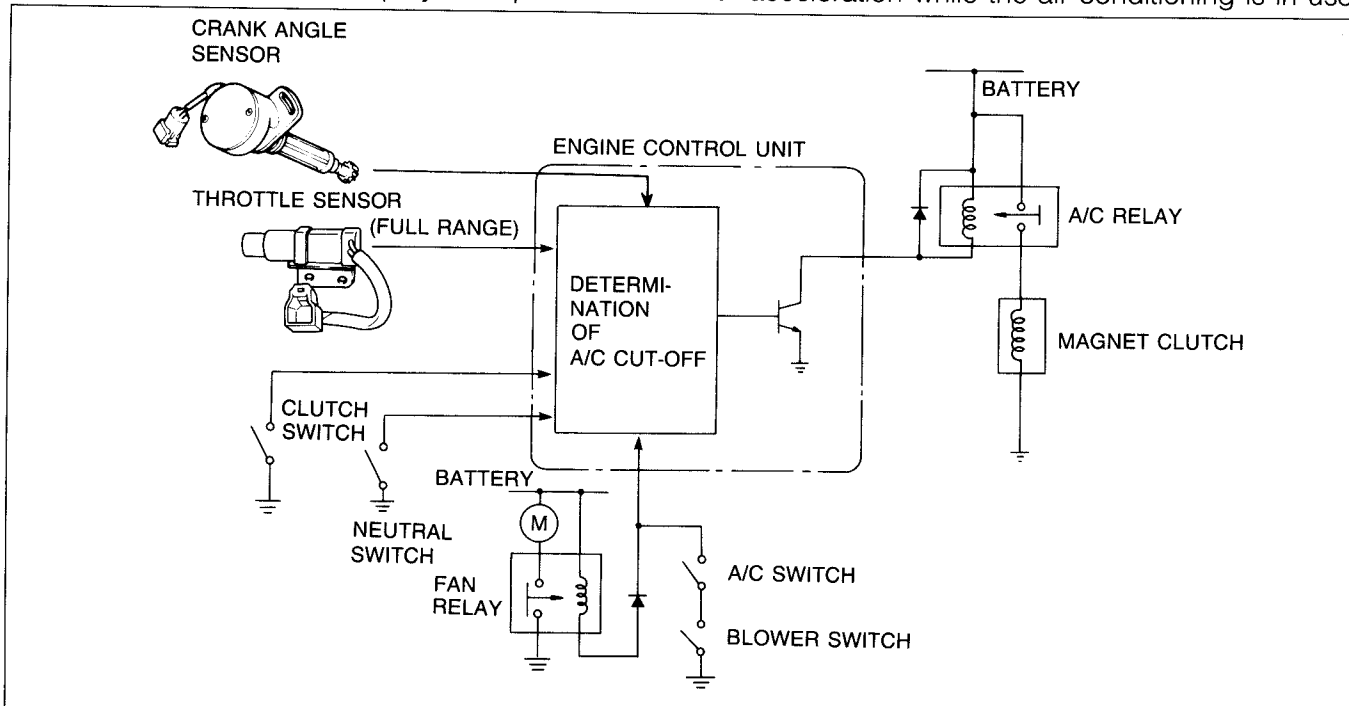
Note

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

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.



97U0F2-176

Operate Condition

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

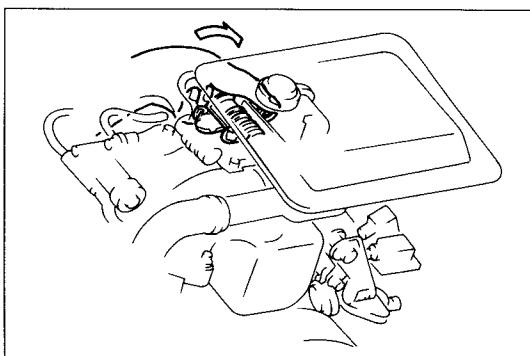
1. A/C switch ON.
2. Blower switch ON.
3. Transmission in gear and clutch pedal released.
4. Throttle valve opening angle more than 50°. (More than half throttle)

TROUBLESHOOTING

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

Possible cause Page	Throttle sensor (Full range)	Clutch switch	Neutral switch	System inspection	Engine control unit terminals						
					1L	1O	1Q	1R	2G	2I	3D
Symptom	F2-81	F2-84	F2-84	F2-71	F2-77	F2-77	F2-77	F2-78	F2-78	F2-78	F2-79
Lack of power, poor acceleration or hesitation	3	4	5	1	2	2	2	2	2	2	2

97U0F2-177

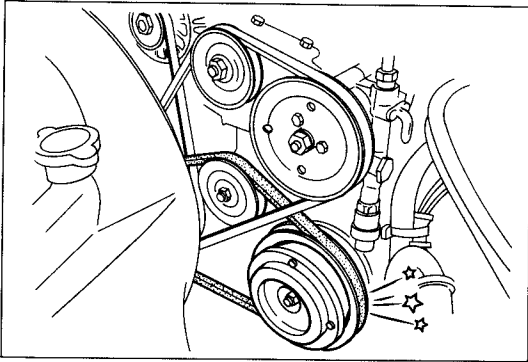


97U0F2-178

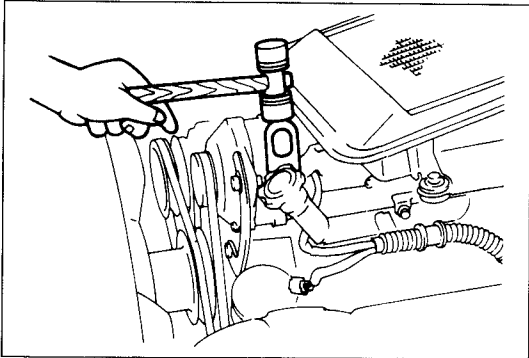
SYSTEM INSPECTION

1. Turn the A/C and blower switches ON.
2. Turn the ignition switch ON (engine not running).
3. Shift the transmission into gear.
4. Open the throttle valve fully and verify that the magnetic clutch disengages (Clicks is heard), then reengages after **approx. 7 sec.**

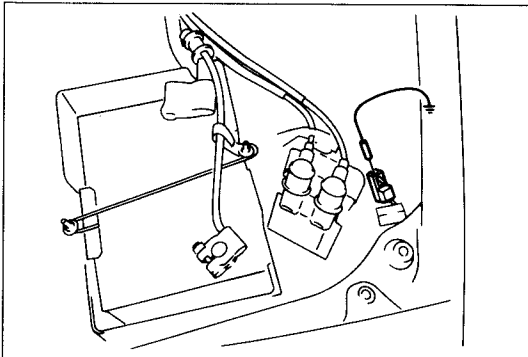
F2 A/C CUT-OUT CONTROL SYSTEM, KNOCK CONTROL SYSTEM



97U0F2-179



97U0F2-180



97U0F2-181

5. If not as specified, check the throttle sensor and engine control unit 1L, 1O, 1Q, 1R, 2G, 2I, and 3D terminal voltages.

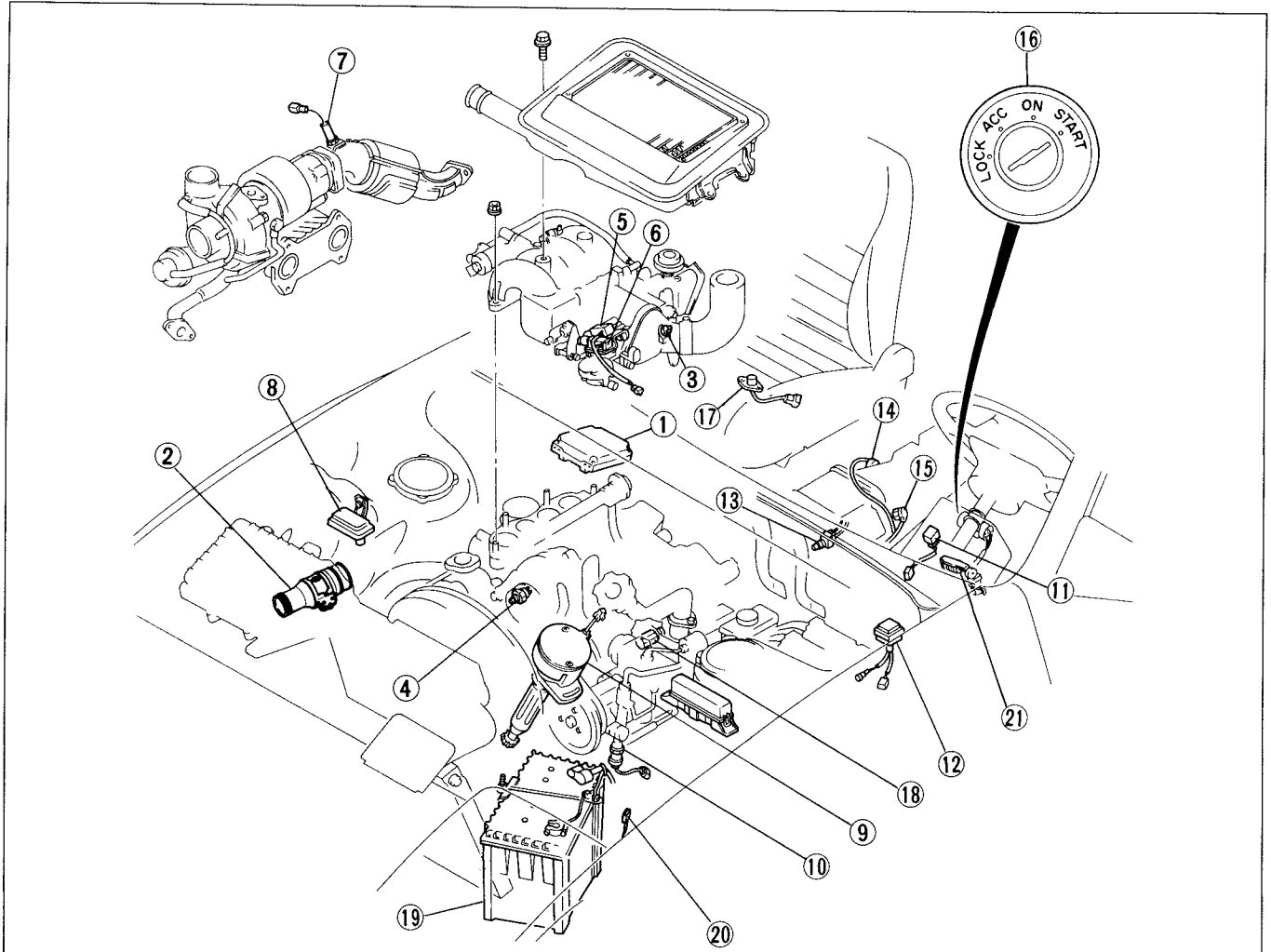
KNOCK CONTROL SYSTEM

SYSTEM INSPECTION

1. Warm up the engine and run it at idle.
2. Connect a timing light to the engine.
3. Tap the engine hanger lightly with a plastic hammer and make sure that the ignition timing does not move.
4. Ground the test connector (Green: 1-pin).
5. Tap the engine hanger lightly with a plastic hammer. Verify that the ignition timing retards.
6. Disconnect the jumper wire from the test connector.
7. Replace the knock sensor, if necessary.
(Refer to page F2-82.)

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, turbocharger boost pressure, emission devices operation, metaling oil pump operation (Section D) monitor switch function, and fail-safe function.



97U0F2-182

- | | | |
|---|---|---|
| 1. Engine control unit
Inspection..... page F2-76 | 7. Oxygen sensor
Inspection..... page F2-81 | 15. Back-up light and 5th switch
Inspection..... page F2-84 |
| 2. Airflow meter (Built in intake
air thermosensor)
Removal and
Installation page F2-80
Inspection..... page F2-80 | 8. Pressure sensor
Inspection..... page F2-82 | 16. Ignition switch
Refer to Section T |
| 3. Intake air thermosensor
(Engine)
Inspection..... page F2-80 | 9. Crank angle sensor
Refer to Section G | 17. Heat hazard sensor
Inspection
(Warning system)
Removal and
Installation page F2-83
Inspection..... page F2-83 |
| 4. Water thermosensor
Inspection..... page F2-81 | 10. P/S pressure switch
Inspection..... page F2-84 | 18. Knock sensor
Removal and
Installation page F2-82 |
| 5. Throttle sensor
(Narrow range)
Inspection..... page F2-81 | 11. Circuit opening relay
Inspection..... page F2-53 | 19. Battery
Refer to Section G |
| 6. Throttle sensor (Full range)
Inspection..... page F2-81 | 12. Main relay
Inspection..... page F2-83 | 20. Test connector (Green: 1-pin) |
| | 13. Clutch switch
Inspection..... page F2-84 | 21. Mileage sensor (No.1 and
No.2) |
| | 14. Neutral switch
Inspection..... page F2-84 | |

F2 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	○	×	○	○	×	×	○	○	○	○	○	×	○	○
NEUTRAL SWITCH	○	×	○	○	×	×	○	○	○	○	○	×	○	○
BACK-UP LIGHT AND 5TH SWITCH	○	×	×	×	×	○	○	○	×	×	○	×	○	○
MILEAGE SENSOR No.1	○	×	×	×	○	×	×	×	×	×	×	×	○	○
MILEAGE SENSOR No.2	○	×	×	×	×	×	×	×	×	×	×	○	○	○
HEAT HAZARD SENSOR	×	×	×	×	×	×	×	○	×	×	×	×	×	×
OXYGEN SENSOR	○	×	×	×	×	×	×	×	×	×	×	×	×	×
THROTTLE SENSOR (NARROW RANGE)	○	×	○	×	×	×	○	○	×	○	○	×	○	○
THROTTLE SENSOR (FULL RANGE)	○	×	×	○	×	×	×	○	○	×	×	○	○	○
PRESSURE SENSOR	○	×	×	×	○	×	○	○	×	×	×	○	○	○
KNOCK 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 AND ASV)														
SOLENOID VALVE (PRESSURE REGULATOR)														
SOLENOID VALVE (BYPASS AIR CONTROL)														
DUTY SOLENOID VALVE (TURBO BOOST PRESSURE)														
IGNITER (TRAILING IGNITION TIMING)														
IGNITER (LEADING IGNITION TIMING)														

Output Devices

ENGINE CONITION		CRANKING (WHEN ENGINE IS COLD)	IDLE (DURING WARM-UP)	MEDIUM LOAD		ACCELERATION	HEAVY LOAD	DECELERATION (THROTTLE VALVE FULLY CLOSED)	IDLE (WHEN ENGINE IS WARM)	IGNITION: ON (NOT ENGINE RUN)	REMARKS
				COLD	WARM						
OUTPUT DEVICES	PRIMARY INJECTOR	Rich	Rich	Rich and Lean	Rich	Fuel cut	Rich	Fuel cut	Rich	OFF	Rear side; Above 8,500 rpm; Fuel cut
	SECONDARY INJECTOR	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
	FUEL PUMP RESISTOR RELAY	12V drive	9-10V drive	9-10V drive	12V drive	9-10V drive	12V drive	9-10V drive	12V drive	OFF	Hot start (at idle) 12V drive
	A/C RELAY	ON	ON	ON	*1OFF	*1OFF	ON	ON	ON		*1Only 7 sec.
	PORT AIR SOLENOID VALVE	Above 20,000 mile (34,000 km); ON Below 20,000 mile (34,000 km); OFF			OFF		OFF	(Above 2,000 mile (34,000 km) ON)			
	SPLIT AIR SOLENOID VALVE			Back-up light and 5th switch ON or high altitude; ON							
	SOLENOID VALVE (SWITCH)	OFF (Port air)	ON (Split air)	ON (Split air)	OFF (Port air)						
	SOLENOID VALVE (RELIEF)	ON (Air injection)	OFF (Relief)	ON (Air injection)	OFF (Relief)	ON (Air injection)	ON (Air injection)			ON	
	SOLENOID VALVE (AWS AND ASV)	ON	For 17 sec. after start; ON		OFF	OFF	OFF				
	SOLENOID VALVE (PRESSURE REGULATOR)				OFF		After start; *2ON			ON	*2For 50 sec.—90 sec.
	SOLENOID VALVE (BYPASS AIR CONTROL)	Large quantity of air	Feed back duty		Fixed duty		Feed back duty			Fixed duty	Test connector (Green: 1-pin) (Green: 1-pin) ground; Stop the feedback control
	DUTY SOLENOID VALVE (TURBO BOOST PRESSURE)				Feed back duty						
	IGNITER (TRAILING IGNITION TIMING)	BTDC 5°	Retard	Advanced (If occurring knocking, retards ignition timing max. 5°)		Retard		ATDC 20°		OFF	Test connector (Green: 1-pin); ON (Only ignition ON; engine does not run) Inspect the knock control system
	IGNITER (LEADING IGNITION TIMING)							ATDC 5°			

F2 CONTROL SYSTEM

TROUBLESHOOTING

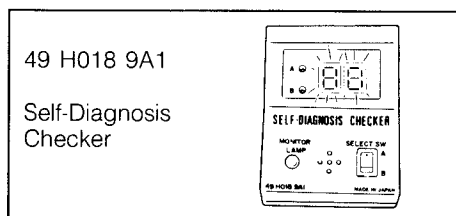
Check the condition of the wiring harness and connectors before checking the sensors or switches.

Possible cause	Page															
	Airflow meter	Intake air thermosensor (Engine)	Throttle sensor (Full and Narrow range)	Oxygen sensor	Knock sensor	Pressure sensor	Heat hazard sensor	Main relay	Circuit opening relay	Neutral switch	Clutch switch	Power steering pressure switch	Back-up light and 5th switch	Water thermosensor	Mileage sensor (No.1 and No.2)	Engine control unit terminal
Symptom	F2-80	F2-80	F2-81	F2-81	F2-72	F2-82	F2-83	F2-83	F2-53	F2-84	F2-84	F2-84	F2-84	F2-81	F2-84	F2-77
Hard start or no start (Crank OK)	7	6	4			5		1	2					3		8
Rough idle	1	4	2		5					6	7			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		4		9			5	6	7	10	8	3	11
Afterburn	1		2			5					3	4				6
Fails emission test	2		3	1			4							5		6
Knocking	3	5	4		1					6	7			2		8

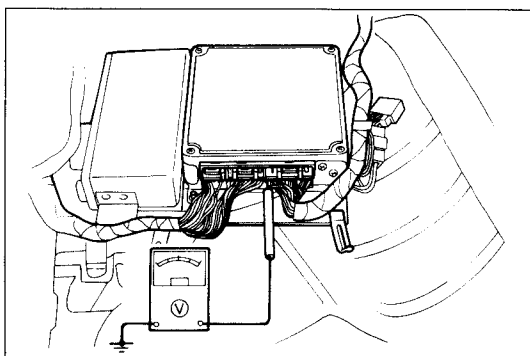
97U0F2-185

PREPARATION

SST



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)

3Y	3W	3U	3S	3Q	3O	3M	3K	3I	3G	3E	3C	3A	2O	2M	2K	2I	2G	2E	2C	2A	1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A
3Z	3X	3V	3T	3R	3P	3N	3L	3J	3H	3F	3D	3B	2P	2N	2L	2J	2H	2F	2D	2B	1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B

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	
				Test connector not grounded at idle (Monitor lamp OFF)	Approx. 12V	
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 illuminate	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 No.1	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	Clutch pedal: released	Approx. 12V	Ignition switch ON
				Clutch pedal: depressed	Below 2.0V	

F2 CONTROL SYSTEM

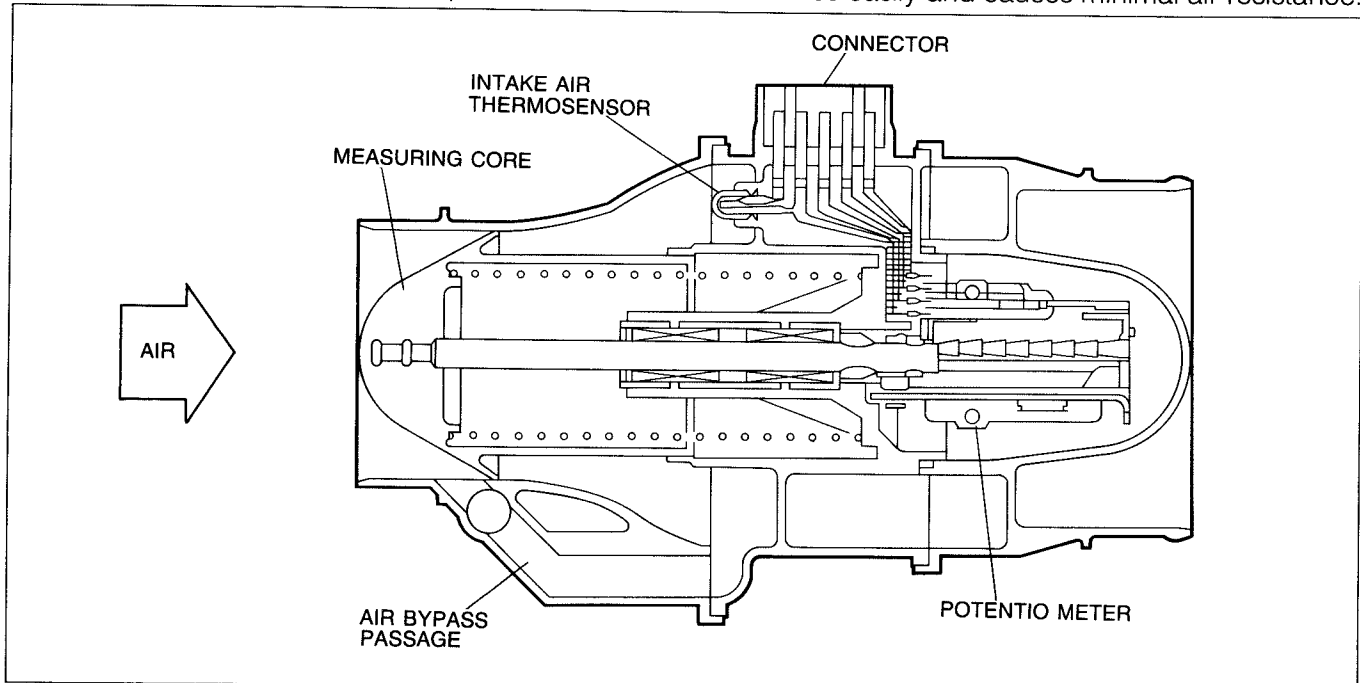
Terminal	Input	Output	Connection to	Test condition	Voltage	Remark
1R	○		Neutral switch	Neutral	Below 2.0V	Ignition switch ON
				In gear	Approx. 12V	
1S	○		Fog light switch	Fog light ON (Idle)	Approx. 12V	If equipped
				Fog light OFF (Idle)	Approx. 0V	
1T	○		Back-up light and 5th switch	5th gear or reverse	Below 2.0V	Ignition switch ON
				1st–4th gear	Approx. 12V	
1U	○		Mileage sensor No.2	Under 600 miles (1,000 km)	Approx. 12V	Small amount of error acceptable
				Over 600 miles (1,000 km)	Below 2.0V	
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	○		Knock sensor	Ignition switch ON	Approx. 0V	Very low voltage at any condition
				Idle	Approx. 0V	
				Knocking	Approx. 0V	
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 3,500 rpm	Approx. 12V	
2O		○	Solenoid valve (Switch)	Idle	Approx. 12V	Ignition switch ON
				Half throttle	Below 2.0V	
2P		○	Solenoid valve (Relief)	Idle	Below 2.0V	—
				Engine speed; above 4,000 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 2.0V	Ignition switch ON
				Others	Approx. 12V	
3J		○	Solenoid valve (Accelerated warm-up system and air supply valve)	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	—
				Cranking	Below 2.0V	
				Idle (Less than 20 sec. after cranking)	Below 2.0V	
				Idle (More than 90 sec. after cranking)	Approx. 12V	
3N	—	—	—	—	—	—
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		○	Duty solenoid valve (Turbo boost pressure control)	Ignition switch OFF	0V	Duty pulse
				Idle	Below 2.0V	
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	

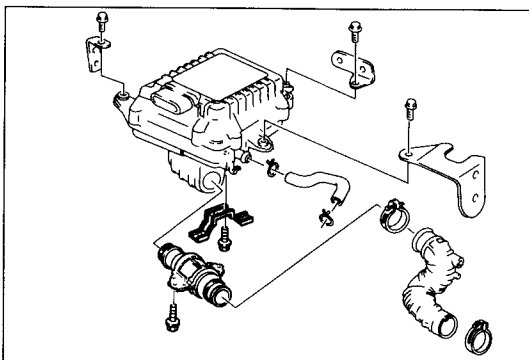
97U0F2-188

AIRFLOW METER

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



97U0F2-189



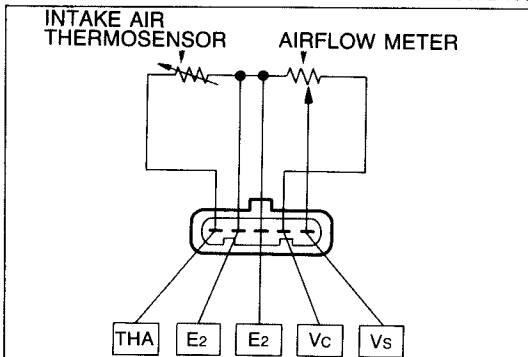
97U0F2-190

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.

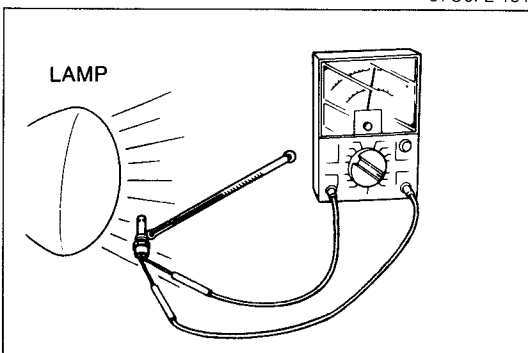


97U0F2-191

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.

Terminal	Resistance (Ω)
$E_2 \leftrightarrow V_s$	200—1,000 (Closed; 20°C (68°F)) 20—800 (Open; 20°C (68°F))
$E_2 \leftrightarrow V_c$	200—400 (Closed \leftrightarrow Open; 20°C (68°F))
$E_2 \leftrightarrow THA$ (Intake air thermosensor)	-20°C (-4°F) 10,000—20,000 0°C (32°F) 4,000— 7,000 20°C (68°F) 2,000— 3,000 40°C (104°F) 900— 1,300 60°C (140°F) 400— 700



97U0F2-193

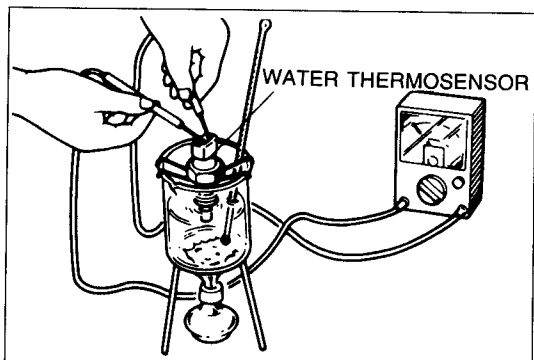
INTAKE AIR THERMOSENSOR (ENGINE)

Inspection

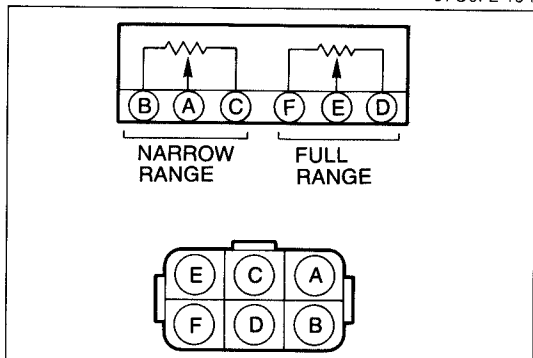
1. Measure resistance of the sensor with an ohmmeter.

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

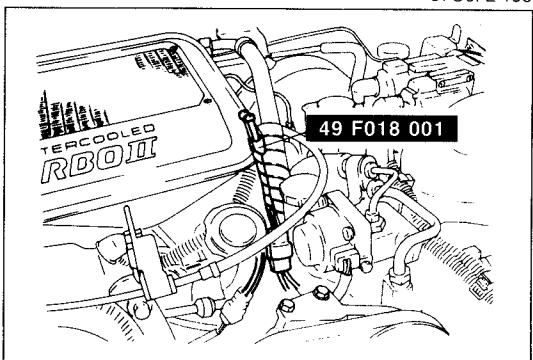
2. Replace the sensor, if necessary.



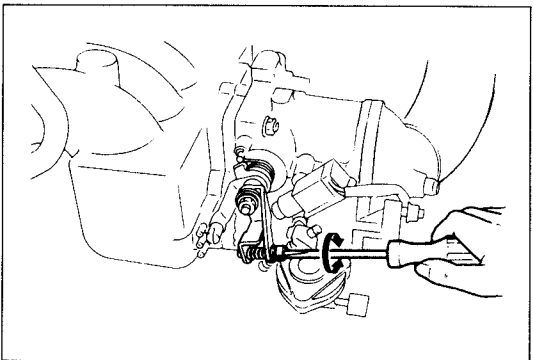
97U0F2-194



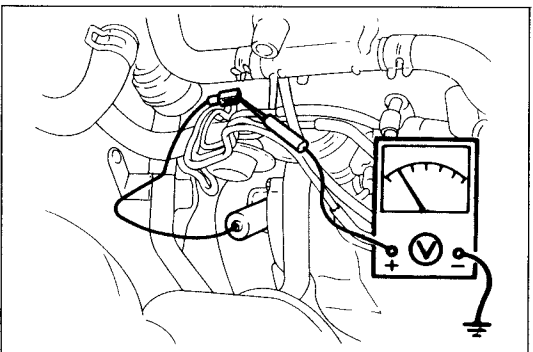
97U0F2-195



97U0F2-196



77U04B-113



97U0F2-197

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. 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 adjust screw until one of the lamps illuminates.
 - a) If both lamps illuminate turn the adjust screw clockwise.
 - b) If both lamps do not illuminate turn the adjust screw counterclockwise.

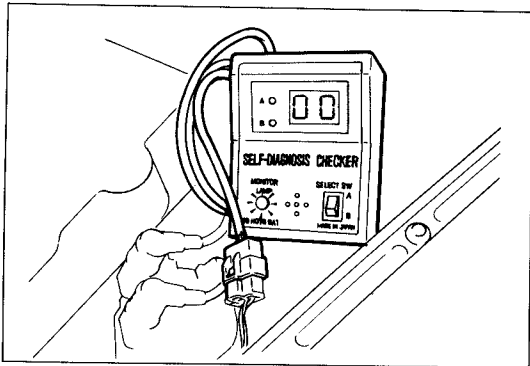
Note

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

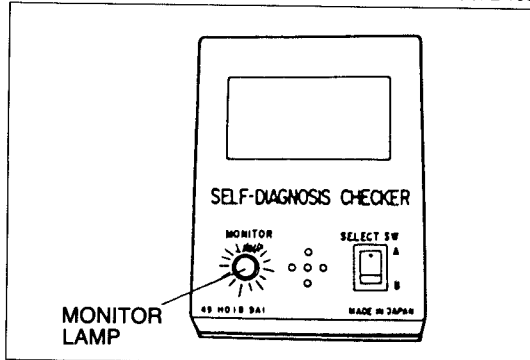
OXYGEN SENSOR

Inspection

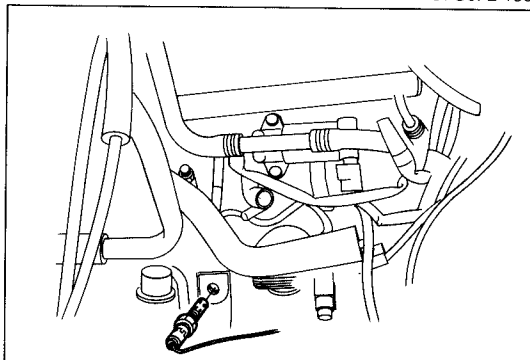
1. Warm up the engine and run it at idle.
2. Disconnect the oxygen sensor connector.
3. Connect a voltmeter between the oxygen sensor and a ground.
4. Accelerate and decelerate the engine suddenly several times. Verify that the voltage is **0.5V—1.0V** during acceleration and **0V—0.4V** during deceleration.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



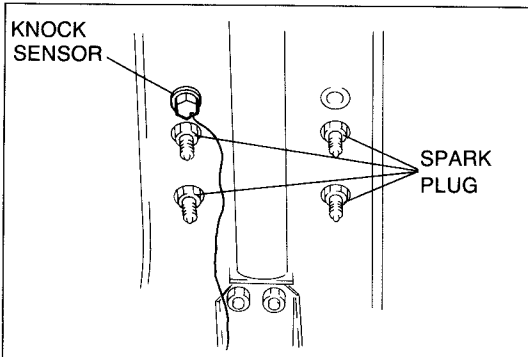
97U0F2-198



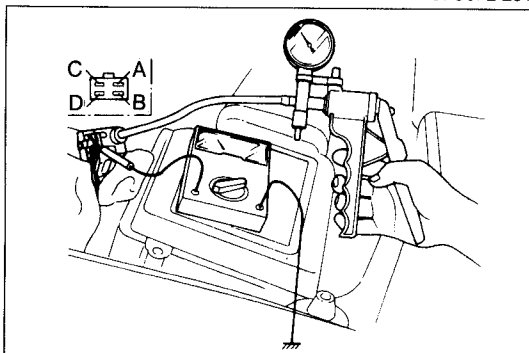
97U0F2-199



97U0F2-200



97U0F2-201



97U0F2-202

Inspection of Sensitivity

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

KNOCK SENSOR

Removal

1. Disconnect the knock sensor connector.
2. Remove the throttle chamber.
3. Remove the knock sensor.

Installation

Install in the reverse order of removal.

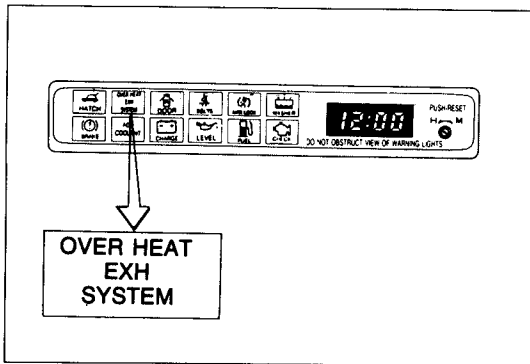
PRESSURE SENSOR

Inspection

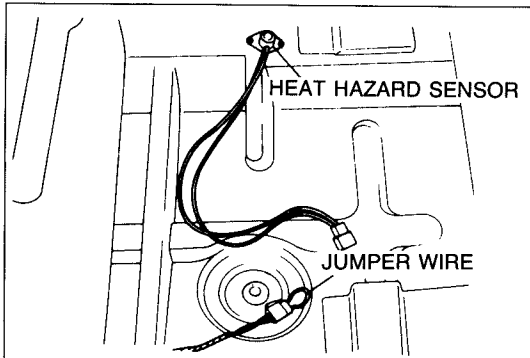
1. Disconnect the vacuum hose from the pressure sensor.
2. Connect a voltmeter to the D terminal of the pressure sensor.
3. Apply **100 mmHg (3.9 inHg)** of vacuum to the pressure sensor.
4. Turn on the ignition switch and check the voltmeter reading.

Voltage: 1.9—2.1V at 100 mmHg (3.9 inHg)

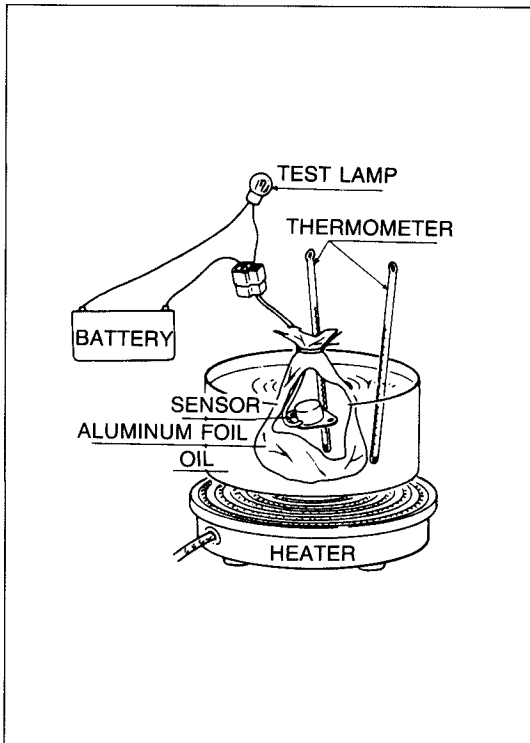
5. Replace the pressure sensor if necessary.



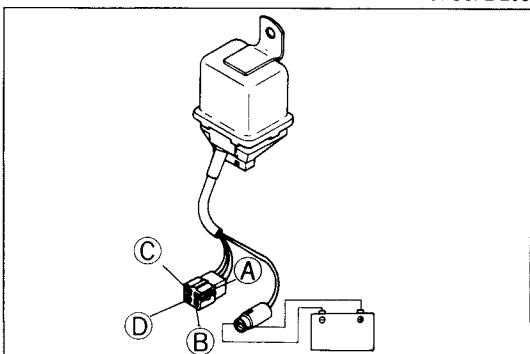
97U0F2-203



97U0F2-204



97U0F2-205



97U0F2-206

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.

3. Disconnect the heat hazard sensor connector.
4. Check that the heat hazard warning lamp illuminates 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).

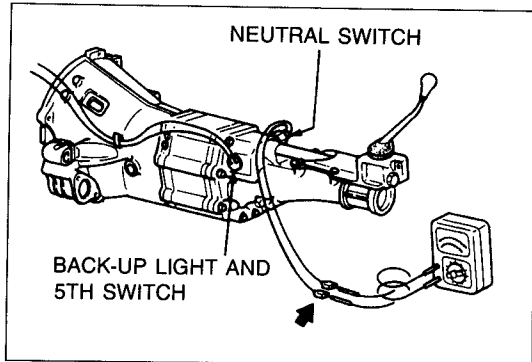
4. Replace the sensor, if necessary.

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)			



77U04B-197

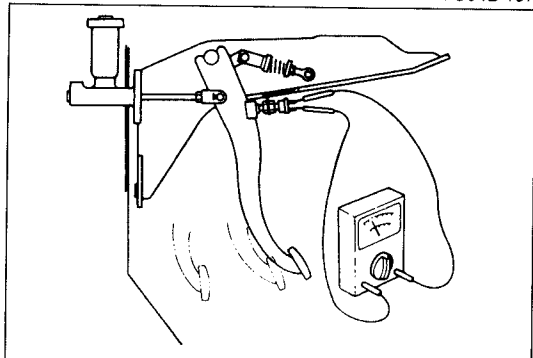
NEUTRAL SWITCH

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.



77U04B-198

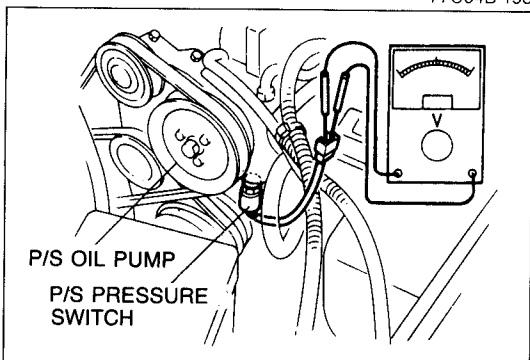
CLUTCH SWITCH

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

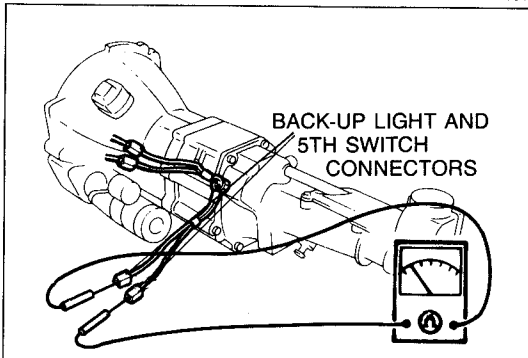
POWER STEERING (P/S) PRESSURE SWITCH

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.

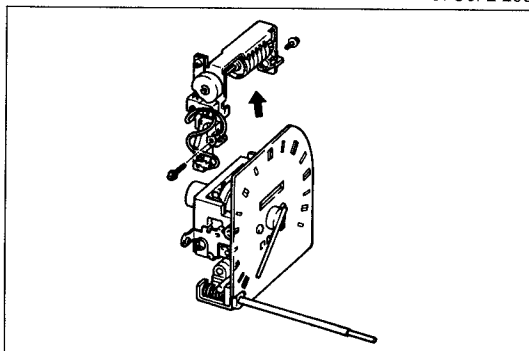


97U0F2-208

BACK-UP LIGHT AND 5TH SWITCH

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.



97U0F2-209

MILEAGE SENSOR (No.1 AND No.2)

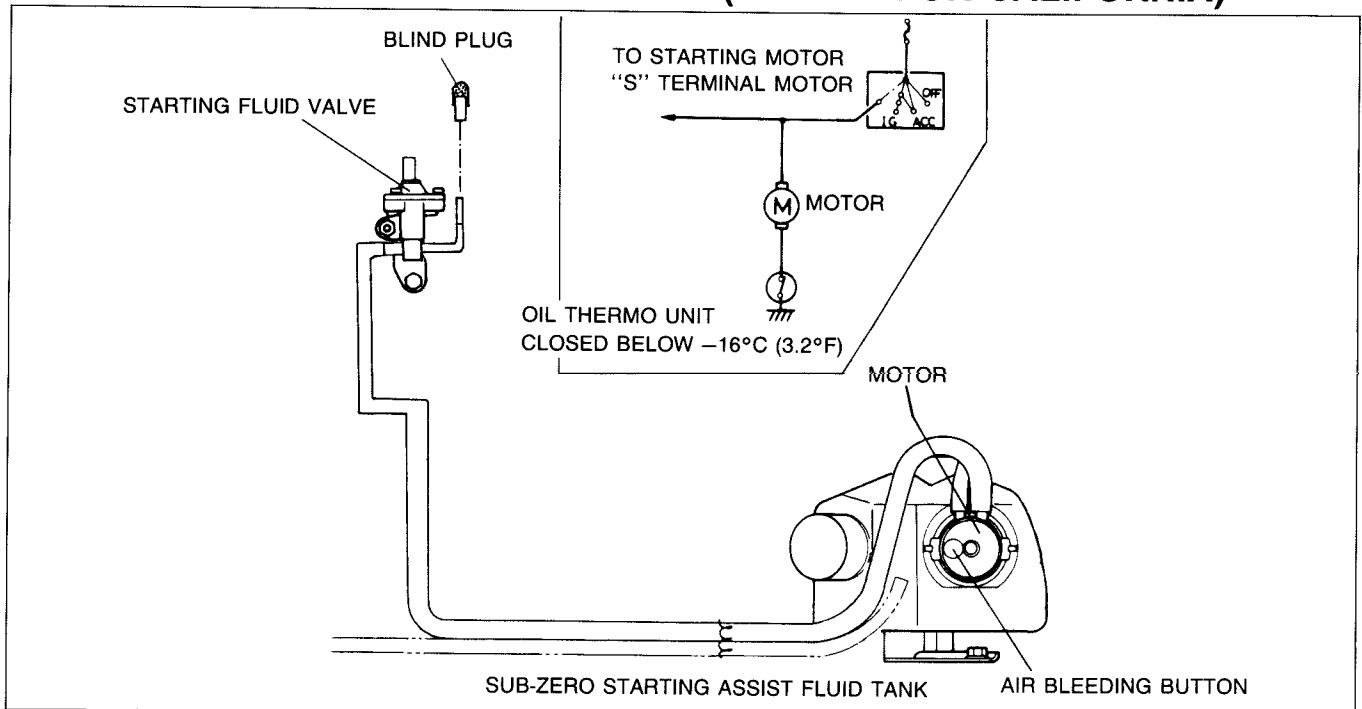
Replacement

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

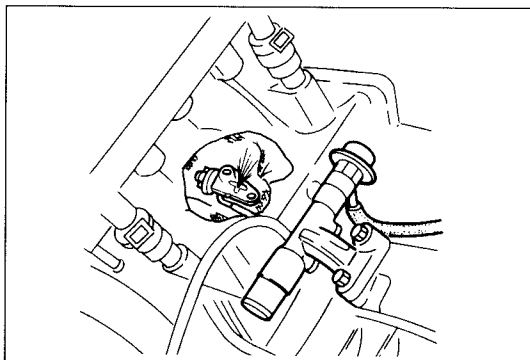
Caution

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)



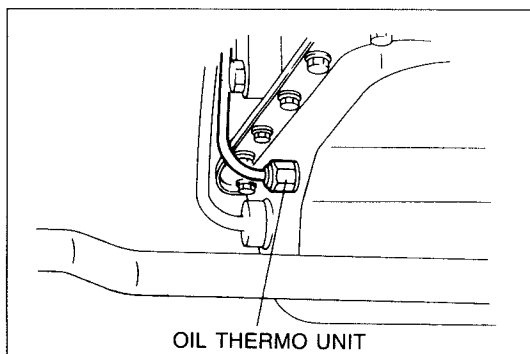
97U0F2-210



97U0F2-211

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 Ⓢ 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.



97U0F2-212

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