THIS MANUAL INCLUDES FOLLOWING SECTIONS

SECTION	CONTENTS
6	Engine Diagnosis
6A	Engine Mechanical
6B	Engine Cooling
6C	Engine Fuel
6D1	Engine Electrical
6D2	Ignition System
6D3	Starting and Charging System
6E	Driveability and Emissions
6F	Engine Exhaust
6G	Engine Lubrication
6H	Engine Speed Control System
6J	Induction

3.Trouble in Fuel System

Condition	Possible cause	Correction
Starting motor turns over and spark occurs but engine does not start.	Fuel tank empty	Fill
	Water in fuel system	Clean
	Fuel filter clogged	Replace filter
	Fuel pipe clogged	Clean or replace
	Fuel pump defective	Replace
	Fuel pump circuit open	Correct or replace
	Evaporative Emission Control system circuit clogged	Correct or replace
	Multiport Fuel Injection System faulty	Refer to "Electronic Fuel Injection" section

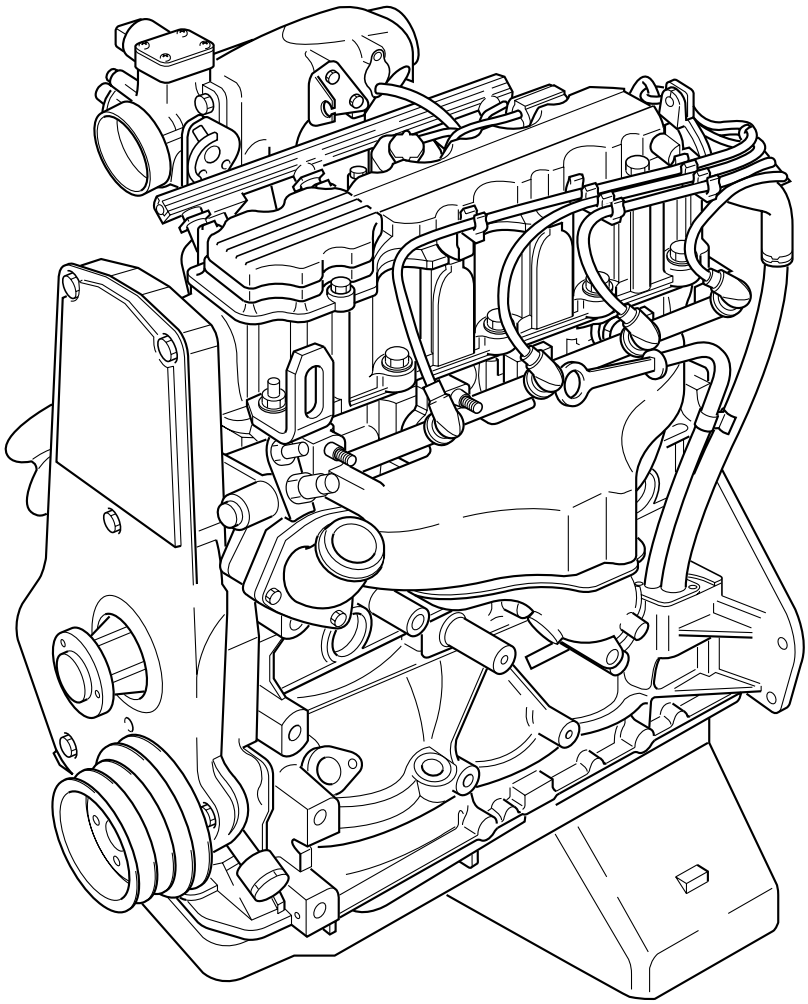
4.Engine Lacks Compression

Condition	Possible cause	Correction
Engine lacks compression	Spark plug loosely fitted or spark plug gasket defective	Tighten to specified torque or replace gasket
	Valve timing incorrect	Adjust
	Cylinder head gasket defective	Replace gasket
	Valve incorrectly seated	Lap valve
	Valve stem seized	Replace valve and valve guide
	Valve spring weakened	Replace
	Cylinder or piston rings worn	Overhaul engine
	Piston ring seized	Overhaul engine.

Engine Compression Test Procedure

1. Start and run the engine until the engine reaches normal operating temperature.
2. Turn the engine off.
3. Remove all the spark plugs.
4. Remove ignition coil fuse (15A) and disable the ignition system.
5. Remove the fuel pump relay from the relay and fuse box.
6. Engage the starter and check that the cranking speed is approximately 300 rpm.
7. Install cylinder compression gauge into spark plug hole.
8. With the throttle valve opened fully, keep the starter engaged until the compression gauge needle reaches the maximum level. Note the reading.
9. Repeat the test with each cylinder.
   The pressure difference between the individual cylinders should not exceed 100kPa (14.5 psi).

GENERAL DESCRIPTION



Engine Cleanliness And Care

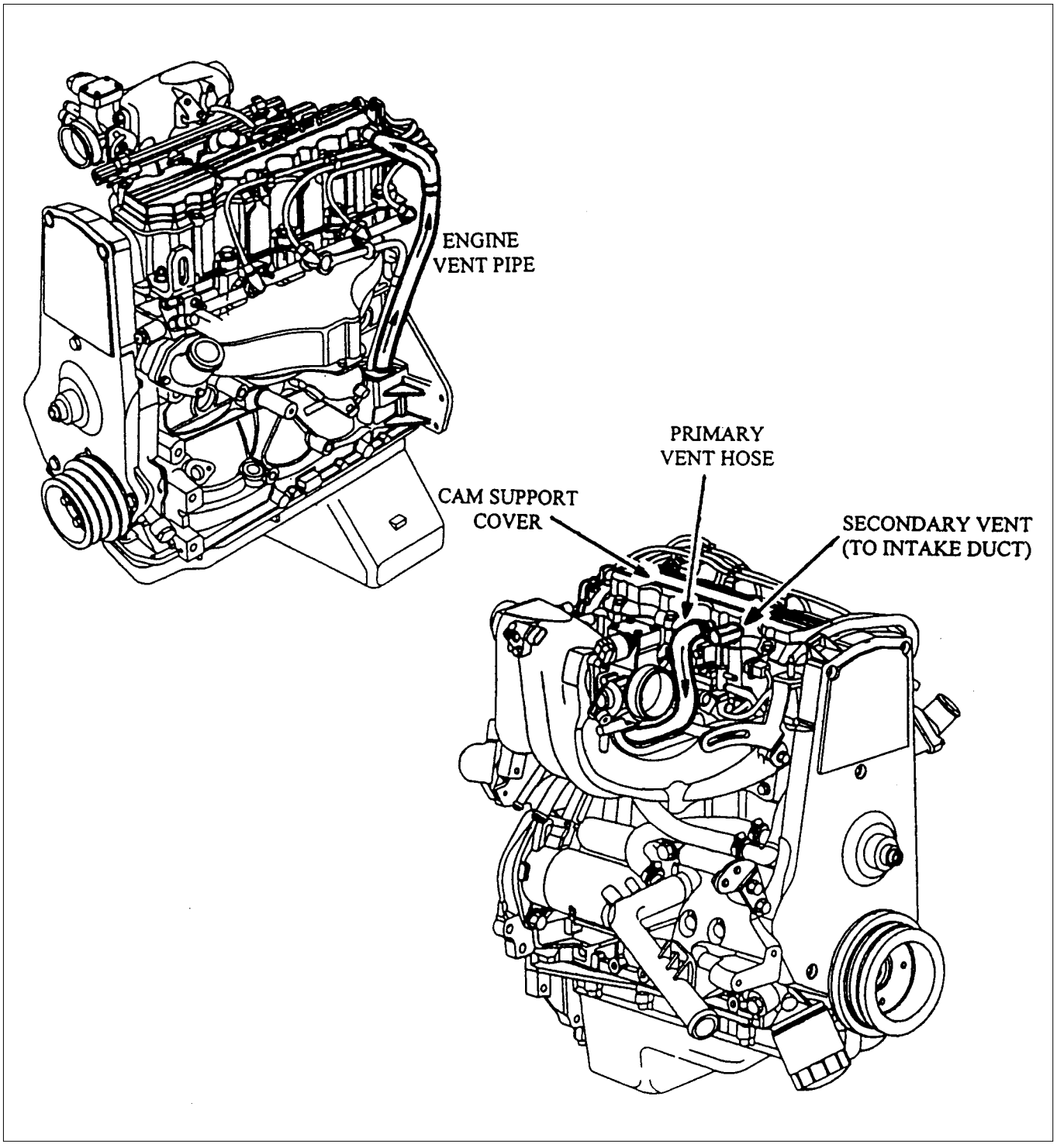
An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousandths of a millimeter (ten thousandths of an inch). Accordingly, when any internal engine parts are serviced, care and cleanliness are important. Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to all friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.
- At the time of installation, they should be installed in the same locations and with the same mating surfaced as when removed.
- Battery cables should be disconnected before any major work is performed on the engine. Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- The four cylinders of this engine are identified by numbers; cylinders 1, 2, 3 and 4, as counted from crankshaft pulley.

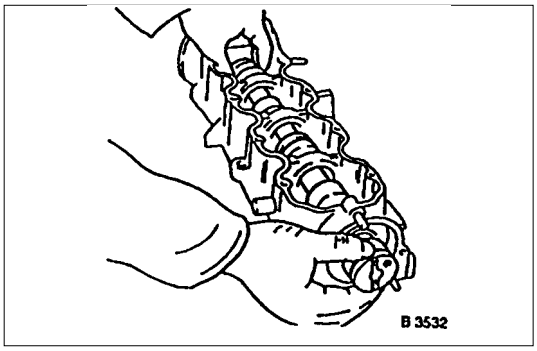
General Information on Engine Service

The following information on engine service should be noted carefully, as it is important in preventing damage and

CRANKCASE VENTILATION SYSTEM



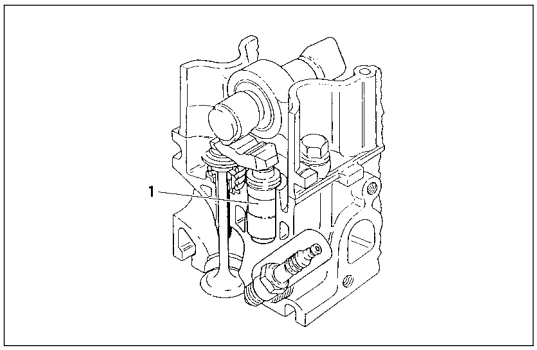
The Engine Ventilation System passes crankcase vapours, via the Engine Vent Pipe, to the Cam Support Cover, where separation of oil and exhaust gases occur. The oil drains into the Cylinder Head, via the Camshaft Support. The gases pass through the Primary and Secondary Vent Hoses to the intake system, and are consumed during the combustion process.



Inspection

All parts, if necessary replace.

When replacing camshaft, always replace all cam followers.



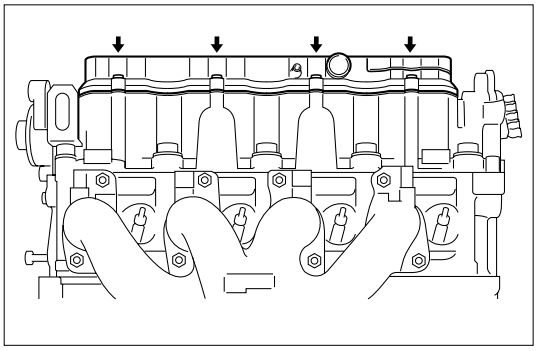
Installation

Insert hydraulic valve lifter (1) in camshaft housing.

Coat sliding surfaces of rocker arm with Mcs, Paste and insert in camshaft housing.

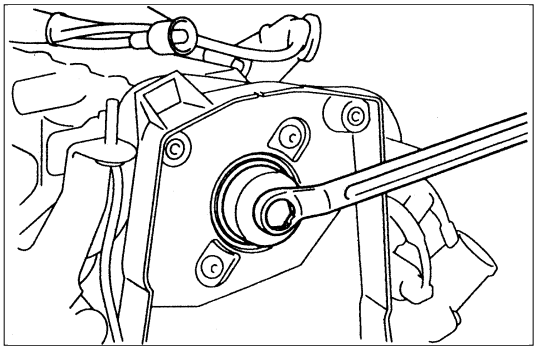
Adjust

Adjustment of the hydraulic valve liters is not required.
Pretension is provided by the design.



Installation

1. Remove 5-8840-0457-0 and install the camshaft housing cover.
2. Insert the spark plug connectors.



Tighten (Torque)

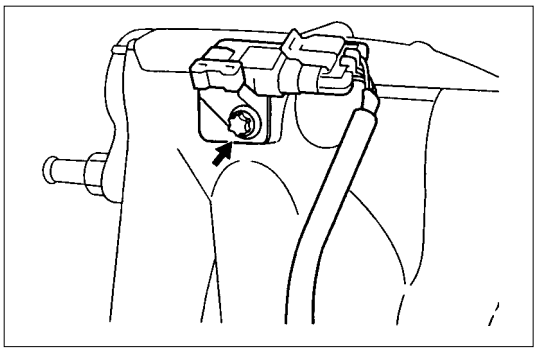
Guide plate to camshaft housing.
Insert camshaft with MoS_2 paste.

Installation

1. Install the front seal ring in camshaft housing with 5-8840-0451-0.
2. Install the camshaft housing rear cover.
3. Install the cylinder head.

FUEL INJECTION SYSTEM

MAP SENSOR

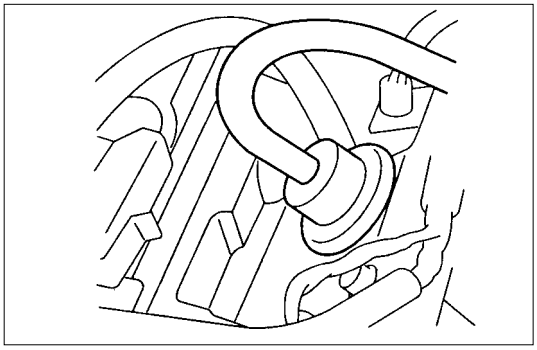


Removal

1. Disconnect the battery cable.
2. Disconnect the electrical connector from the sensor.
3. Remove the mounting bolts securing the sensor to the manifold.
4. Remove the sensor from the intake manifold.

Installation

1. Push MAP sensor into the manifold.
2. Install the mounting bolts and tighten them.
3. Connect electrical connector.
4. Connect the battery cable.



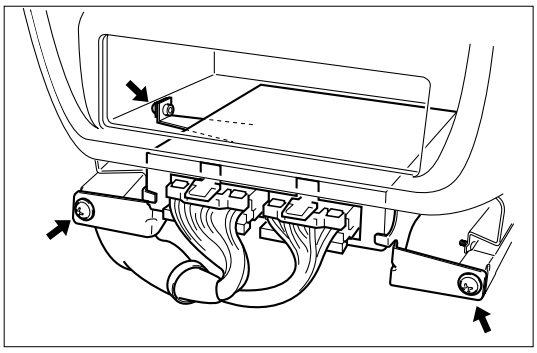
Pressure Regulator

Removal

1. Remove vacuum hose.
2. Remove fuel hoses.
3. Remove pressure regulator.

Installation

1. Install pressure regulator.
2. Install fuel hoses.
3. Install vacuum hoses.



ECM (Engine Control Module)

Removal

1. Remove the center console assembly.
2. Remove the ECM cover.
3. Remove 3 screws for the bracket.
4. Pull ECM out.
5. Disconnect the connectors.

Recommended Torque Values

	N·m	kgf·m	
Bearing cover to cylinder block	60 [1]	6.1	+40° to 50°
Bracket for alternator to cylinder block	40	4.1	
Bracket for engine damping block to transmission	60 [2]	6.1	
Bracket for engine damping block to engine block	60	6.1	
Bracket for pump/compressor to engine block	40	4.1	
Camshaft housing cover to housing	8	0.8	
Camshaft timing gear to camshaft	45	4.6	
Clamping bracket for alternator to intake manifold	25	2.5	
Clamping bracket to alternator	25	2.5	
Con-rod bearing cap to con-rod	35 [1]	3.5	+45° to 60°
Crankshaft pulley bolts	20	2.0	
Cylinder head to cylinder block	25 [1][2]	2.5	+90° +90° +90°
Engine damping block to engine bracket	8.5	8.7	
Engine damping block to side member	52 [1]	5.3	
Exhaust manifold to cylinder head	22	2.2	

1) Use new bolts
2) Use new locking plates

Recommended Torque Values

	N·m	kgf·m	
Flywheel to crankshaft	65 [1]	6.6	+30° to 45°
Front exhaust pipe to exhaust manifold	25	2.5	
Guide sleeve for pressure bearing to transmission	22	2.2	
Intake manifold to cylinder head	22	2.2	
Lower alternator bracket	25	2.5	
Oil drain plug to oil pan	45	4.6	
Oil intake pipe bracket to cylinder block	6 [2]	0.6	
Oil intake pipe to oil pump	8	0.8	
Oil pan to cylinder block	8 [2][3]	0.8	
Oil pan to cylinder block (vulcanized gasket)	15 [2][3]	1.5	
Oil pressure switch to oil pump	30	3.2	
Pump for power steering (ribbed V-belt) to engine block	30	3.2	
Spark plugs in cylinder head	25	2.5	
Starter support to cylinder block	25	2.5	
Starter to cylinder block - engine side	45	4.6	
Starter to cylinder block - transmission side	75	7.6	
Thermostat housing to cylinder head	15	1.5	
Toothed belt drive gear to crankshaft	130 [1]	13.3	
Toothed belt front cover	4	0.4	
Toothed belt rear cover	6	0.6	
Toothed belt tension roller to oil pump	25	2.5	
Transmission to engine block (M10)	45	4.6	
Transmission to engine block	76	7.7	
Transmission to engine block (M12)	60	6.1	
Water pump to cylinder block	25	2.5	

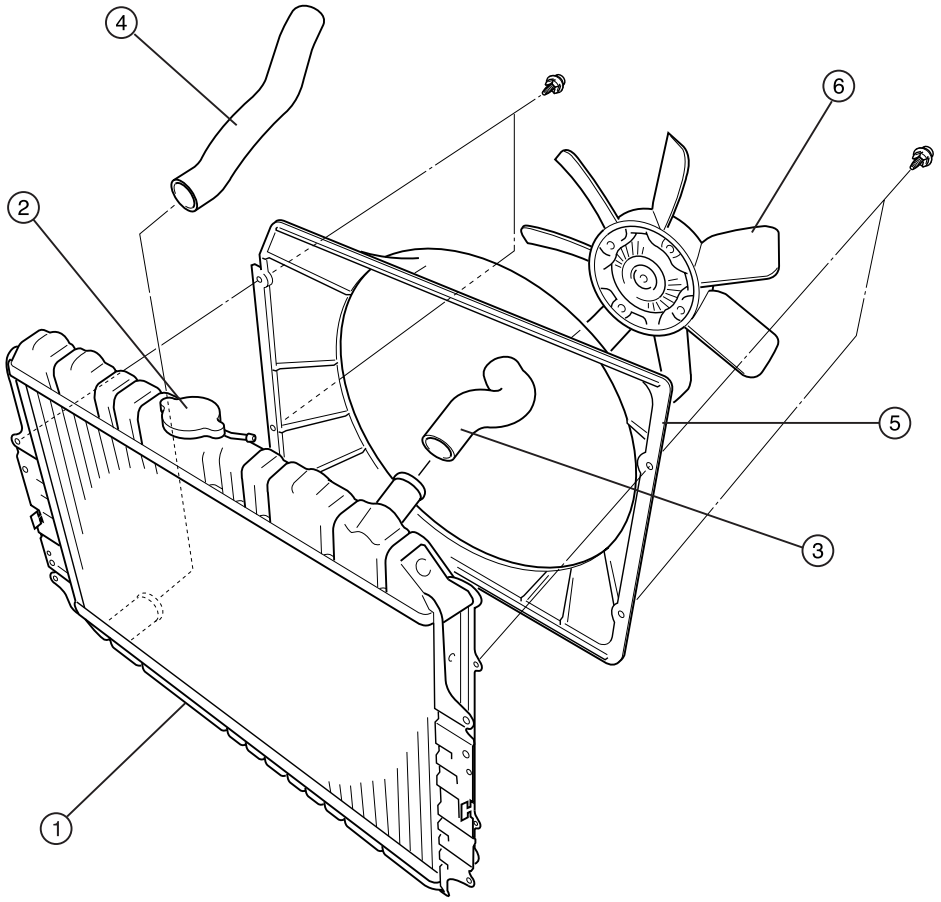
1) Use new bolts
2) Use Locking Compound
3) Maximum installation time - 10 minutes

Diagnosis
Engine Cooling Trouble

Condition	Possible cause	Correction
Engine overheating	Low Engine Coolant level	Replenish
	Thermo mater unit faulty	Replace
	Faulty thermostat	Replace
	Faulty Engine Coolant temperature sensor	Repair or replace
	Clogged radiator	Clean or replace
	Faulty radiator cap	Replace
	Low engine oil level or use of improper engine oil	Replenish or change oil
	Clogged exhaust system	Clean exhaust system or replace faulty parts
	Faulty Throttle Position sensor	Replace throttle valve assembly
	Open or shorted Throttle Position sensor circuit	Repair or replace
	Damaged cylinder head gasket	Replace
	Loosen V-belt tension	Adjust belt tension or replace.
	Collapsed hoses	Replace
	Faulty Fan clutch	Replace
Engine overcooling	Faulty thermostat	Replace
Engine slow to warm-up	Faulty thermostat	Replace
	Thermo unit faulty	Replace

Radiator

Radiator and Associated Parts



Legend

1 Radiator
2 Radiator Cap
3 Radiator Upper Hose
4 Radiator Lower Hose
5 Cooling Fan Shroud
6 Cooling Fan

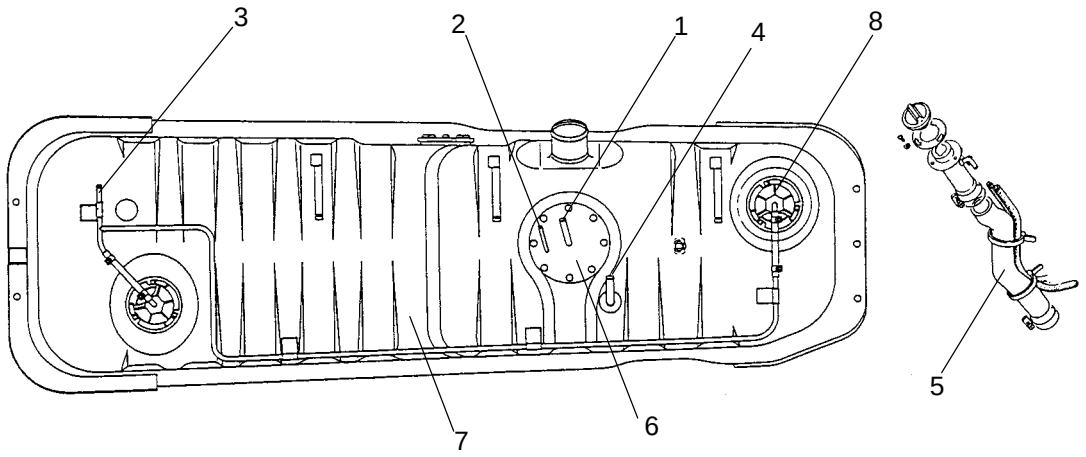
Removal

1. Disconnect battery ground cable.
2. Loosen a drain plug to drain engine coolant (EC).
3. Disconnect radiator inlet hose and outlet hose.
4. Disconnect the reserve tank hose from radiator.
5. Lift out the radiator assembly, taking care not to damage the radiator core.

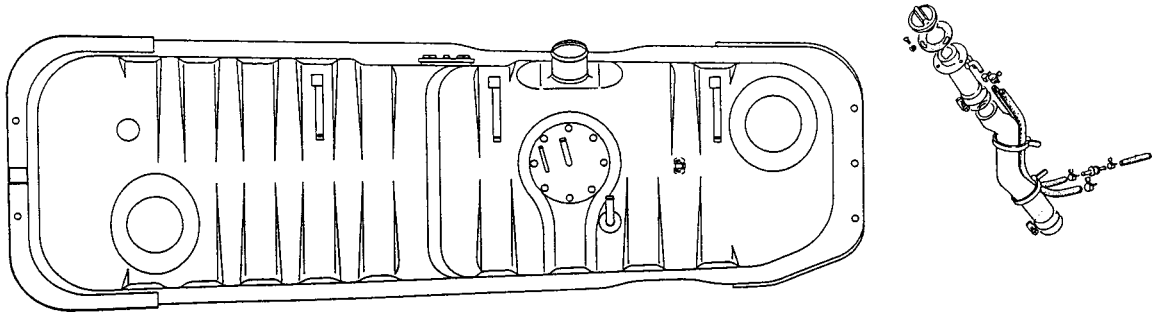
Fuel Tank

Removal and Installation

WITH CANISTER APPLICABLE TO ROLLOVER VALVE



WITH CANISTER & ROLLOVER VALVE

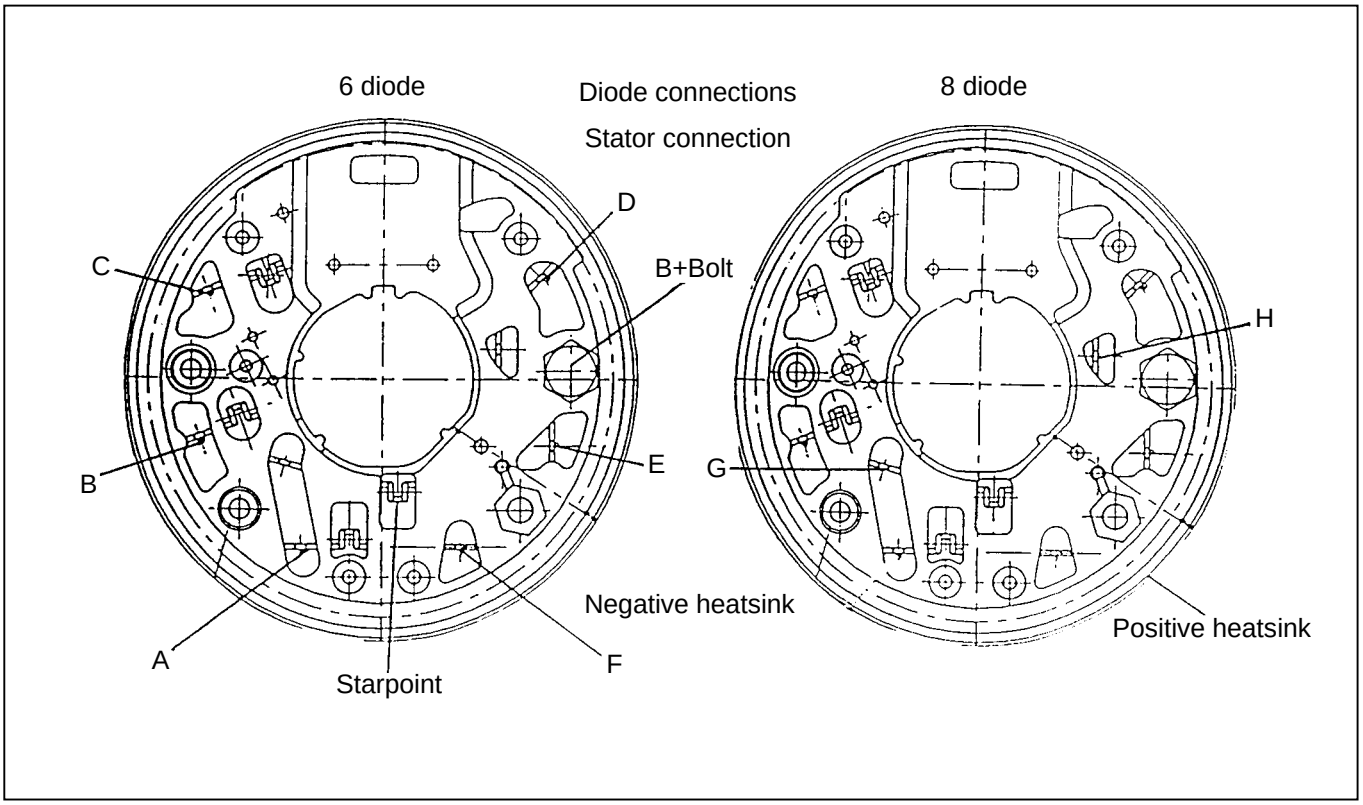


Removal

1. Fuel hose (Delivery)
2. Fuel hose(Return)
3. Evapo fuel hose
4. Breather hose
5. Fuel filler hose
6. Fuel Pump
7. Fuel tank
8. Roll over valve

Installation

To install, follow the removal steps in the reverse order.

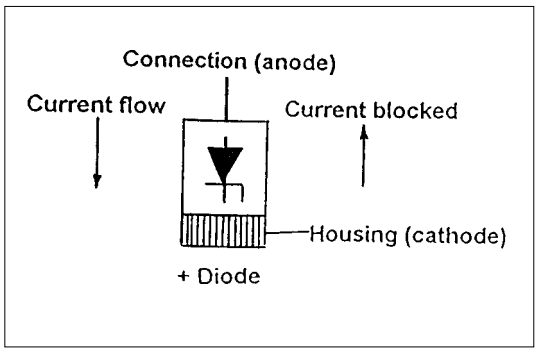


1.1 Power Diodes.

Apply the negative test probe of the diode tester or a multimeter with a diode test feature to the positive heatsink and the positive probe alternatevely to A,B,C, a low resistance reading, or the forward voltage drop across the diode shoud be obtained. Reverse the test probes, a high resistance reading or a higher reverse voltage should be obtained.

Now connect the positive test probe to the negative heatsink and the negative alternatively to D,E,F, a low resistance or forward voltage drop across the diode should be obtained. Reverse the test probes, a high resistance reading or a higher reverse voltage should be obtained.

For 8 diode rectifier plates tests for G and H should be included. When the reverse voltage test is done the applied voltage should be less than 14 volts DC or 12 volts RMS for AC testers.



1.2 Zener Diode

The basic tests in 1.1 should be undertaken first before the diode zener voltage is tested. Diodes are grouped together according to their zener voltag i.e. all diodes within a rectifier must have the same zener voltage.

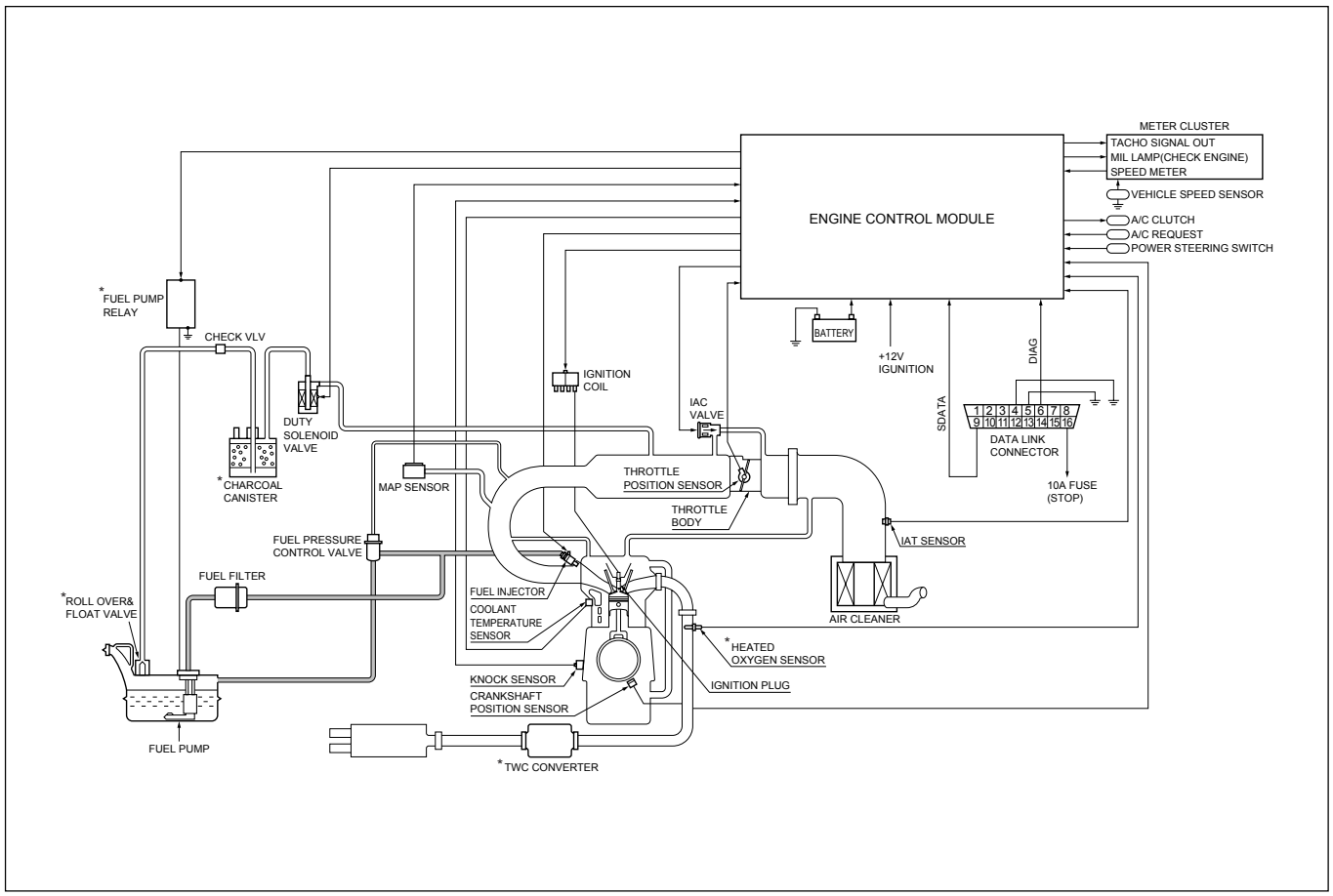
Connect the test probes as for the reverese test listed above i.e. reverse biased apply the test voltage form the zener diode tester (current limited to 5ma) and read to zener breakdown voltage this should be a steady reading and not increase with increased voltage from the tester.

SPECIFICATIONS

Tightening Specifications

Application	N·m	Lb Ft.	Lb In.
Crankshaft Position Sensor Mounting Bolt	9	-	78
Engine Coolant Temperature Sensor	30	22	-
Fuel Pressure Regulator Attaching Screw	6.5	-	60
Fuel Rail Bolts	7	-	75
Heated Oxygen Sensor (If applicable)	5	40	-
Spark Plugs	25	18	-
Throttle Body Mounting Bolts	13	-	120
VSS Retaining Bolt	13	-	120
Intake Manifold to Cylinder Head	22	16	-

EMISSION CONTROL SYSTEM SCHEMATICS



Refer to the matrix for engine specification, page 6A-11 thru 6A-17.

* If equipped.

Getting Started

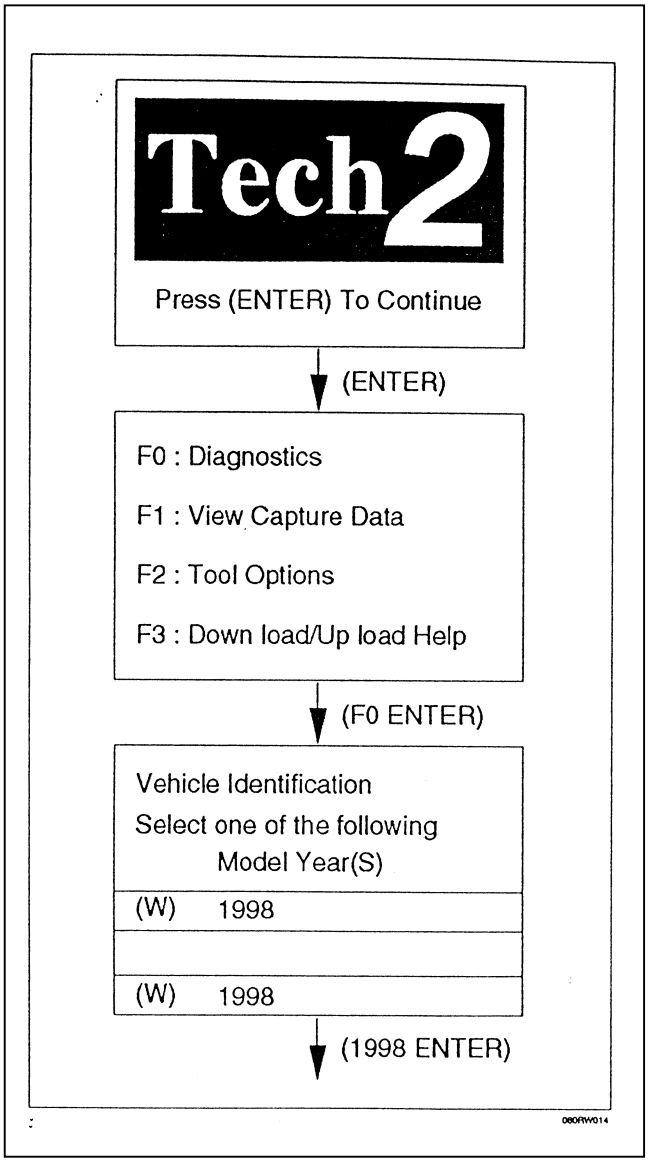
- Before operating the Isuzu PCMCIA card with the Tech 2, the following steps must be performed:

1. The Isuzu 98 System PCMCIA card (1) inserts into the Tech 2 (5)
2. Connect the SAE 16/19 adapter (3) to the DLC cable (4).
3. Connect the DLC cable to the Tech 2 (5)
4. Make sure the vehicle ignition is off.
5. Connect the Tech 2 SAE 16/19 adapter to the vehicle DLC.
6. The vehicle ignition turns on.
7. Verify the Tech 2 power up display.

NOTE: The RS232 Loop back connector is only to use for diagnosis of Tech 2 and refer to user guide of the Tech 2.

Operating Procedure

The power up screen is displayed when you power up the tester with the Isuzu systems PCMCIA card. Follow the operating procedure below.



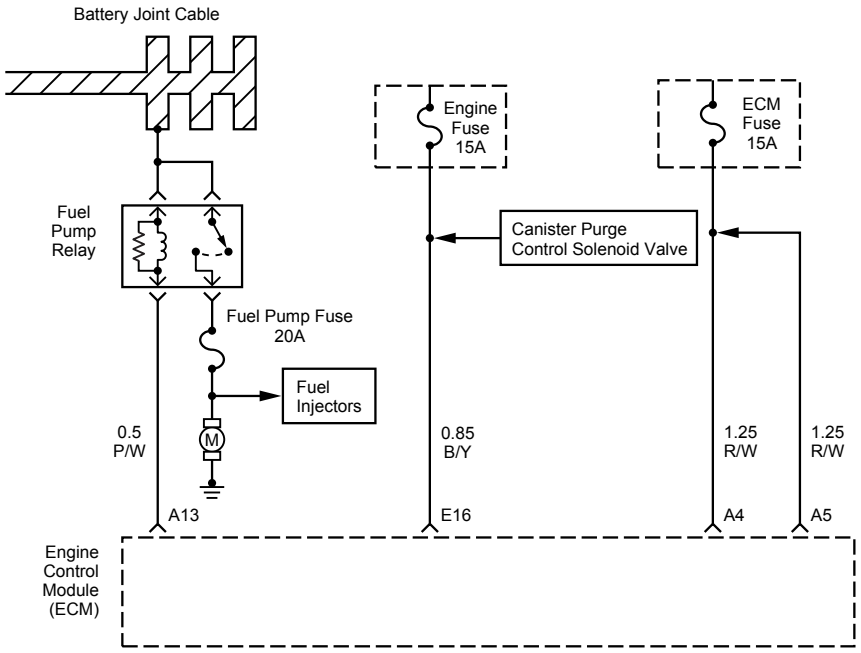
DEFAULT MATRIX TABLE

SERVICE PROCEDURE DEFAULT STRATEGY

A referral strategy has been established to assist the technician with additional information when the cause of the failure cannot be determined. If no problem is found after performing diagnostics, then refer to the default matrix table for further diagnostic information.

Default Matrix Table

Strategy Based Diagnostic Charts	Initial Diagnosis	Default Section(s)
On-Board Diagnostic (OBD) System Check	Vehicle does not enter diagnostics.	Chassis Electrical
On-Board Diagnostic (OBD) System Check	Vehicle enters diagnostics and communicates with the Scan Tool. MIL is ON in diagnostics. Engine does not start and run.	Ignition System Check
On-Board Diagnostic (OBD) System Check	Engine starts and runs, no ECM codes set. Customer complains of vibration.	-
ECM Power and Ground Check	On-Board Diagnostic (OBD) System Check.	Chassis Electrical
ECM Power and Ground Check	On-Board Diagnostic (OBD) System Check. ECM power and ground circuits OK. Data link voltage incorrect.	Chassis Electrical
Symptoms	**Initial Diagnosis**	**Default Section(s)**
Intermittens	1. On-board diagnostic (OBD) system check. 2. Careful visual/physical inspections.	Chassis Electrical
Hard Starts	1. OBD system check. 2. Sensors (ECT, MAP, TP); MAP output chart. 3. Fuel system electrical test, fuel system diagnosis. 4. Ignition system. 5. IAC system check.	Engine Mechanical, Ignition System Check, Exhaust System Diagnosis
Surges and/or Chuggles	1. OBD system check. 2. Heated oxygen sensors (If applicable). 3. Fuel system diagnosis. 4. Ignition system.	Calibration ID "Broadcast Code" /Service Bulletins, Ignition System Check, Generator Output, Exhaust System Diagnosis



FUEL SYSTEM DIAGNOSIS

Circuit Description

When the ignition switch is turned ON, the engine control module (ECM) will turn ON the in-tank fuel pump. The in-tank fuel pump will remain ON as long as the engine is cranking or running and the ECM is receiving 58X crankshaft position pulses. If there are no 58X crankshaft position pulses, the ECM will turn the in-tank fuel pump OFF 2 seconds after the ignition switch is turned ON or 2 seconds after the engine stops running.

The in-tank fuel pump is an electric pump within an integral reservoir. The in-tank fuel pump supplies fuel through an in-line fuel filter to the fuel rail assembly. The fuel pump is designed to provide fuel at a pressure above the pressure needed by the fuel injectors. A fuel pressure regulator, attached to the fuel rail, keeps the fuel available to the fuel injectors at a regulated pressure. Unused fuel is returned to the fuel tank by a separate fuel return line.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Chart.

2. Connect the fuel pressure gauge to the fuel feed line as shown in the fuel system illustration. Wrap a shop towel around the fuel pressure connection in order to absorb any duel leakage that may