

# Engine Diagnosis

## Hard Starting

### 1. Starting Motor Does Not Turn Over

#### Trouble Shooting Procedure

Turn on headlights and starter switch.

Condition	Possible cause	Correction
Headlights go out or dim considerably	Battery run down or under charged	Recharge or replace battery
	Terminals poorly connected	Clean battery posts and terminals and connect properly
	Starting motor coil circuit shorted	Overhaul or replace
	Starting motor defective	Overhaul or replace

### 2. Ignition Trouble - Starting Motor Turns Over But Engine Does Not Start

#### Spark Test

Disconnect a high tension cable from any spark plug. Connect the spark plug tester (use commercially available tool), crank the engine, and check if a spark is generated in the spark plug tester. Before cranking the engine, make sure that the spark plug tester is properly grounded. To avoid electrical shock, do not touch the high tension cable while the engine is running.

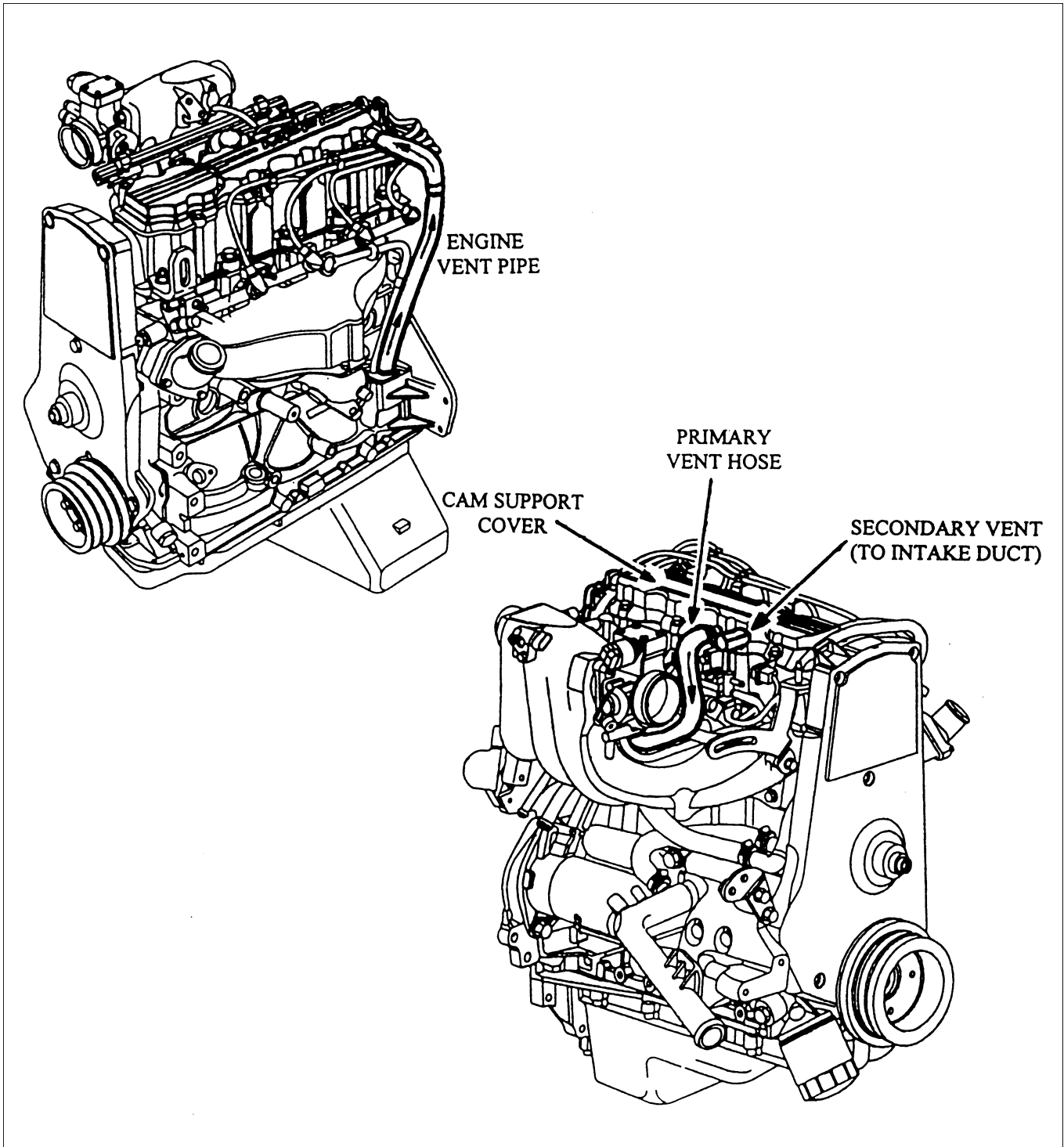
Condition	Possible cause	Correction
Spark jumps across gap	Spark plug defective	Clean, adjust spark gap or replace
	Spark plug wire in correct	Connect properly or replace
	Ignition timing incorrect	Refer to Ignition System
	Fuel not reaching fuel injector(s) or engine	Refer to item 3 (Trouble in fuel system)
	Valve timing incorrect	Adjust
	Engine lacks compression	Refer to item 4 (Engine lacks compression)
No sparking takes place	Ignition coil disconnected or broken	Connect properly or replace
	Electronic Ignition System with module	Replace
	Poor connections in engine harness	Correct
	Engine Control Module cable disconnected or defective	Correct or replace

## 6-6 ENGINE DIAGNOSIS (C24SE)

### Hesitation

Condition	Possible cause	Correction
Hesitation on acceleration	Throttle Position Sensor adjustment incorrect	Replace throttle valve assembly
	Throttle Position Sensor circuit open or shorted	Correct or replace
	Excessive play in accelerator linkage	Adjust or replace
	Manifold Absolute Pressure (MAP) Sensor circuit open or shorted	Correct or replace
	MAP Sensor defective	Replace
	Intake Air Temperature (IAT) Sensor circuit open or shorted	Correct or replace
	Knock Sensor (KS) Circuit open or shorted	Correct or replace
	KS defective	Replace
	KS Module circuits open or shorted	Correct or replace
	KS Module defective	Replace
	IAT Sensor defective	Replace
Hesitation at high speeds (Fuel pressure too low)	Fuel tank strainer clogged	Clean or replace
	Fuel pipe clogged	Clean or replace
	Fuel filter clogged	Replace
	Defective fuel pump system	Check and replace
	Fuel Pressure Control Valve leaking	Replace
Hesitation at high speeds (Fuel injector not working normally)	Power supply or ground circuit for Multiport Fuel Injection System shorted or open	Check and correct or replace
	Cable of Multiport Fuel Injection System disconnected or defective	Correct or replace
Hesitation at high speeds	Engine Control Module defective	Replace
	Throttle Position Sensor circuit open or shorted	Correct or replace
	Throttle Position Sensor defective	Replace
	Engine Coolant Temperature Sensor circuit open or shorted	Correct or replace
	Engine Coolant Temperature Sensor defective	Replace
	MAP Sensor cable open or shorted	Correct or replace
	MAP Sensor defective	Replace
	IAT Sensor circuit open or shorted	Correct or replace
	IAT Sensor defective	Replace
	KS Circuit open or shorted	Correct or replace
	KS defective	Replace
	KS Module circuit open or shorted	Correct or replace
	KS Module defective	Replace
	Throttle valve not wide opened	Check and correct or replace
	Air Cleaner Filter clogged	Replace filter element
Power supply voltage too low	Check and correct or replace	

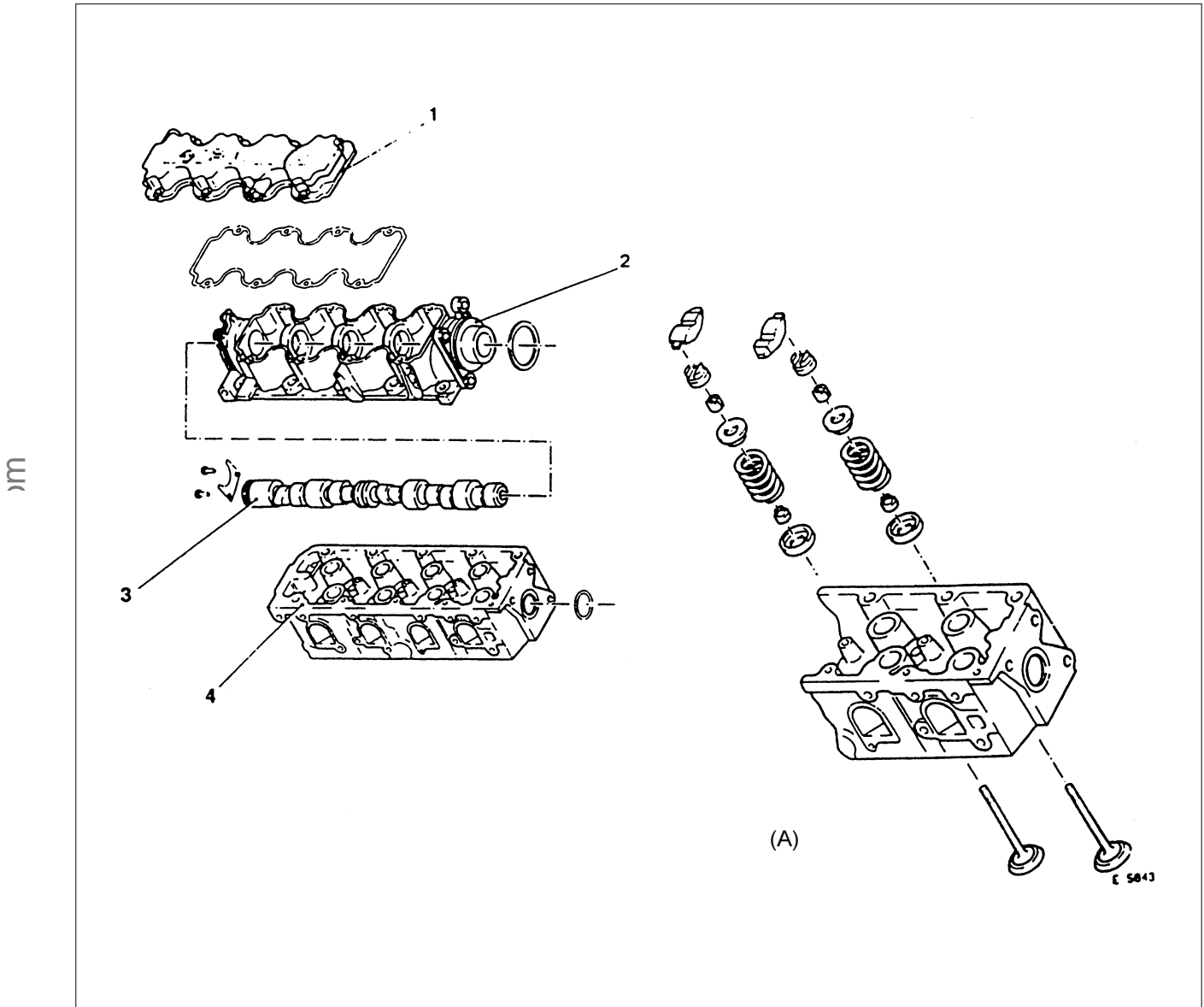
## CRANKCASE VENTILATION SYSTEM



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.

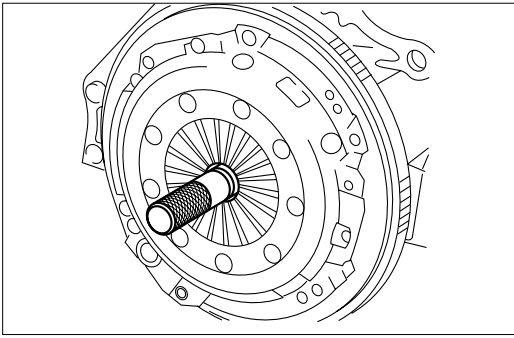
# COMPONENT PARTS

## CYLINDER HEAD



1. Camshaft Housing Cover
2. Camshaft Housing
3. Camshaft
4. Cylinder Head

(A) Valve Drive



### Reassembly

Reassemble clutch assembly.



### Disassembly

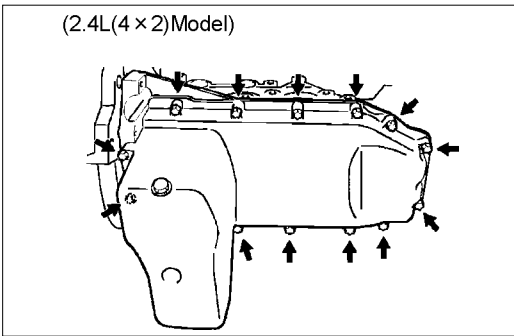
Disassemble clutch assembly to flywheel using 5-8840-2634-0



### Torque Angle-Method

Clutch assembly to flywheel-17.6Nm/1.8 kgf·m.

(2.4L(4×2)Model)



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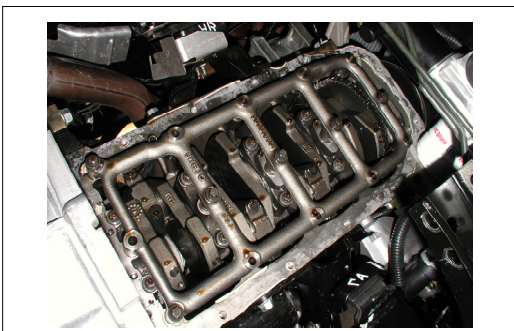
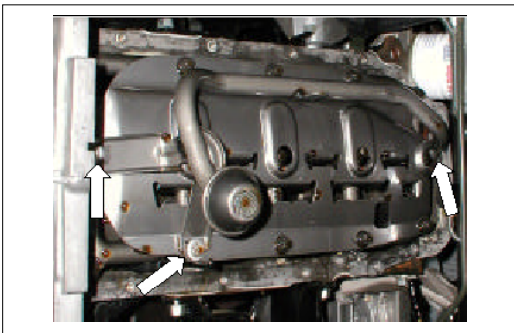
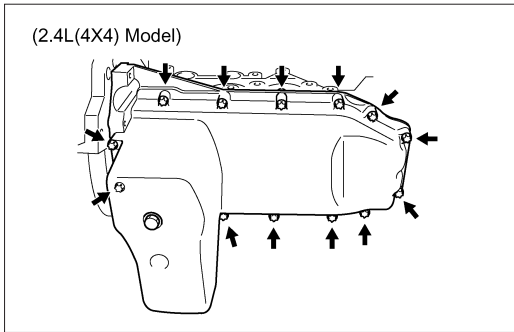


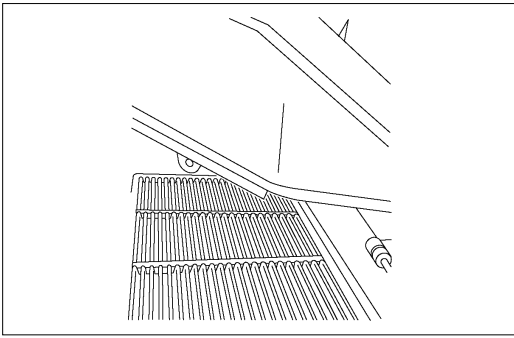
### Oil Pan and Bearing Bridge

#### Removal

1. Remove the crossmember.
2. Shift downward the power steering unit (and front axle [4×4 model only]).
3. Loosen fixing bolts.
4. Remove oil pan from oil pump and cylinder block.
5. Remove oil intake pipe, oil intake pipe bracket, and oil baffle plate.
6. Remove the bearing bridge.

(2.4L(4X4) Model)





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## Air Cleaner Filter



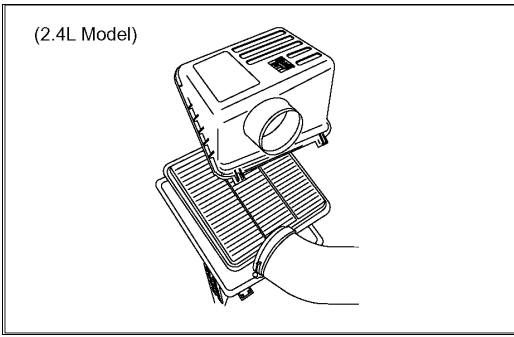
### NOTE:

The air cleaner filter is not damaged with the edge of the air cleaner housing.

## Removal

(2.4L)

1. Remove air cleaner cover and air cleaner element.
2. Remove air intake nose.
3. Remove lower air cleaner.
4. Remove mud guard.
5. Remove front fender cover.
6. Remove outside air intake duct.

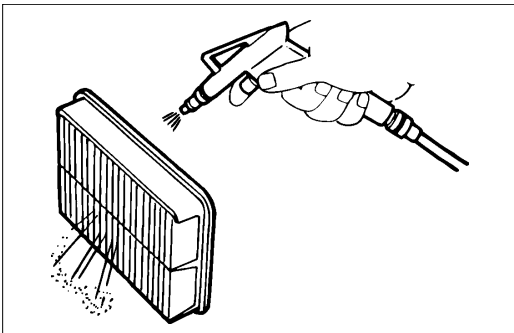


(2.4L Model)



## Inspection

Check the air cleaner filter for damage or dust clogging. Replace if it is damaged, or clean if it is clogged.



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## Cleaning Method

Tap the air cleaner filter gently so as not to damage the paper filter, or clean the element by blowing with compressed air of about 490 kPa (71 psi) from the clean side if it is extremely dirty.



## Installation

(2.4L)

1. Install outside air intake duct.
2. Install front fender cover.
3. Install mud guard.
4. Install lower air cleaner.
5. Install air intake hose.
6. Install air cleaner element and air cleaner cover.

## Draining and Refilling Cooling System

Before draining the cooling system, inspect the system and perform any necessary service to ensure that it is clean, does not leak and is in proper working order. The engine coolant (EC) level should be between the "MIN" and "MAX" lines of reserve tank when the engine is cold. If low, check for leakage and add EC up to the "MAX" line. There should not be any excessive deposit of rust or scales around the radiator cap or radiator filler hole, and the EC should also be free from oil. Replace the EC if excessively dirty.

1. Completely drain the cooling system by opening the drain plug at the bottom of the radiator.
2. Remove the radiator cap.

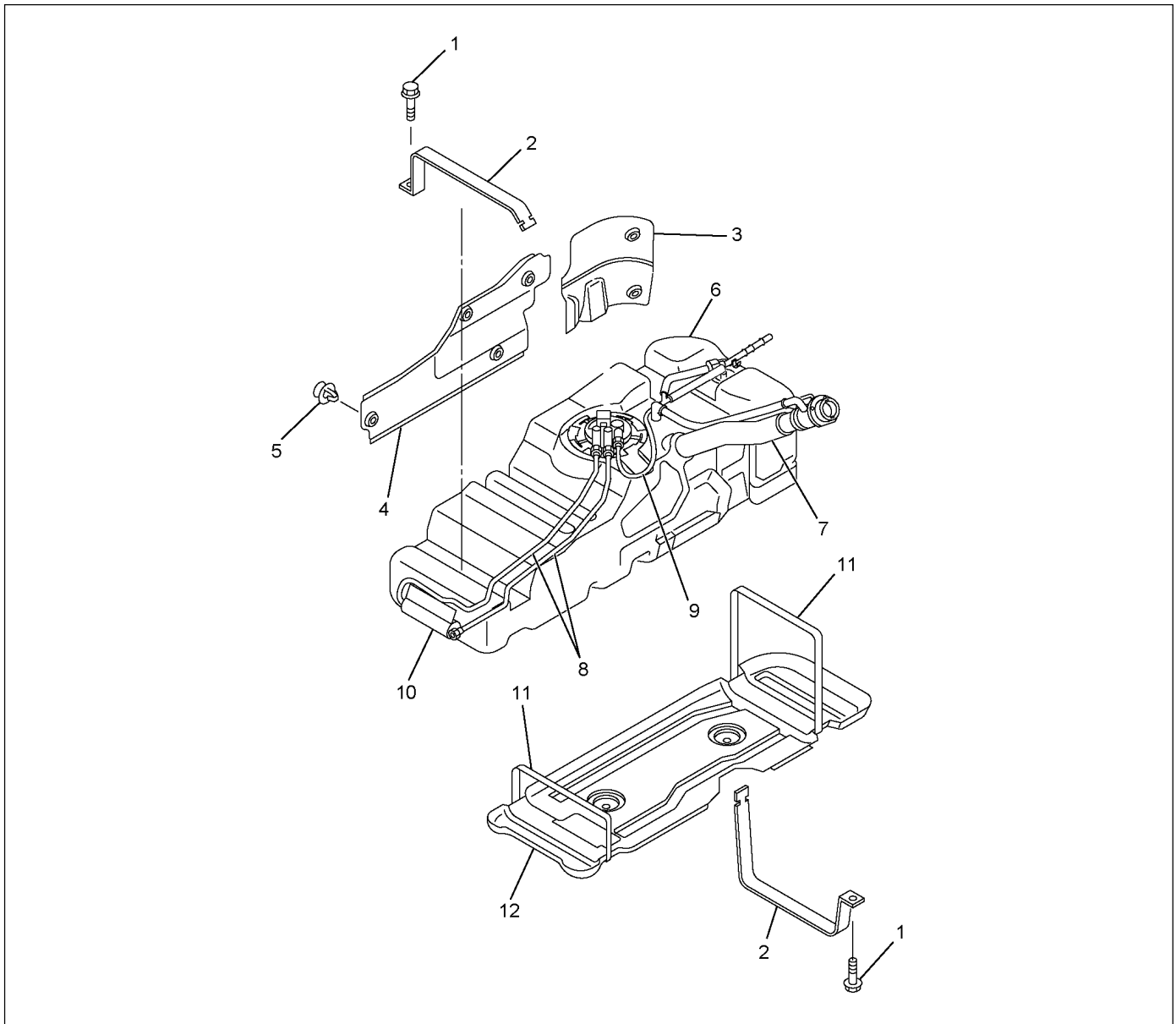


**WARNING: TO AVOID THE DANGER OF BEING BURNED, DO NOT REMOVE THE CAP WHILE THE ENGINE AND RADIATOR ARE STILL HOT. SCALDING FLUID AND STEAM CAN BE BLOWN OUT UNDER PRESSURE.**

3. Disconnect all hoses from the EC reserve tank.  
Scrub and clean the inside of the reserve tank with soap and water. Flush it well with clean water, then drain it. Install the reserve tank and hoses.
4. Refill the cooling system with the EC using a solution that is at least 50 percent antifreeze.
5. Fill the radiator to the base of the filler neck.  
Fill the EC reserve tank to "MAX" line when the engine is cold.
6. Block the drive wheels and firmly apply the parking brake. Shift an automatic transmission to "P" (Park) or a manual transmission to neutral.
7. Remove the radiator cap. Start the engine and warm it up at 2,500 - 3,000 rpm for about 30 minutes.
8. When the air comes out from the radiator filler neck and the EC level has gone down, replenish with the EC. Repeat this procedure until the EC level does not go down. Then stop the engine and install the radiator cap. Let the engine cool down.
9. After the engine has cooled, replenish with EC up to the "MAX" line of the reserve tank.
10. Start the engine. With the engine running at 3,000 rpm, make sure there is no running water sound from the heater core (behind the center console).
11. If the running water sound is heard, repeat steps 8 to 10.

# Fuel Tank

## Fuel Tank and Associated Parts



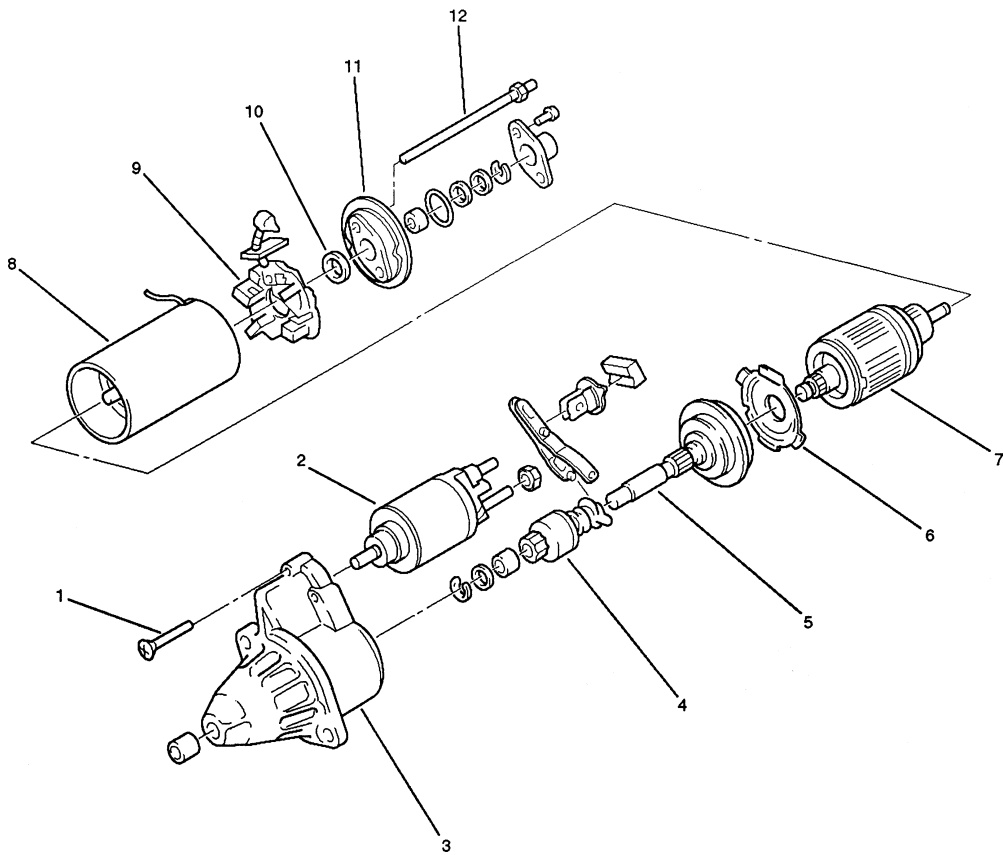
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### Legend

- |                      |  |
|----------------------|--|
| (1) Bolt; Fuel Tank  | (7) Fuel Filler Hose                                     |
| (2) Fuel Tank Band   | (8) Fuel Tube/Quick Connector                            |
| (3) Rear Side Shield | (9) Fuel Filter  |
| (4) Side Shield      | (10) Band; Under Shield                                  |
| (5) Retainer         | (11) Under Shield  |
| (6) Fuel Tank        | (12) Evapo Tube / Quick Connector – Only Specified Model |



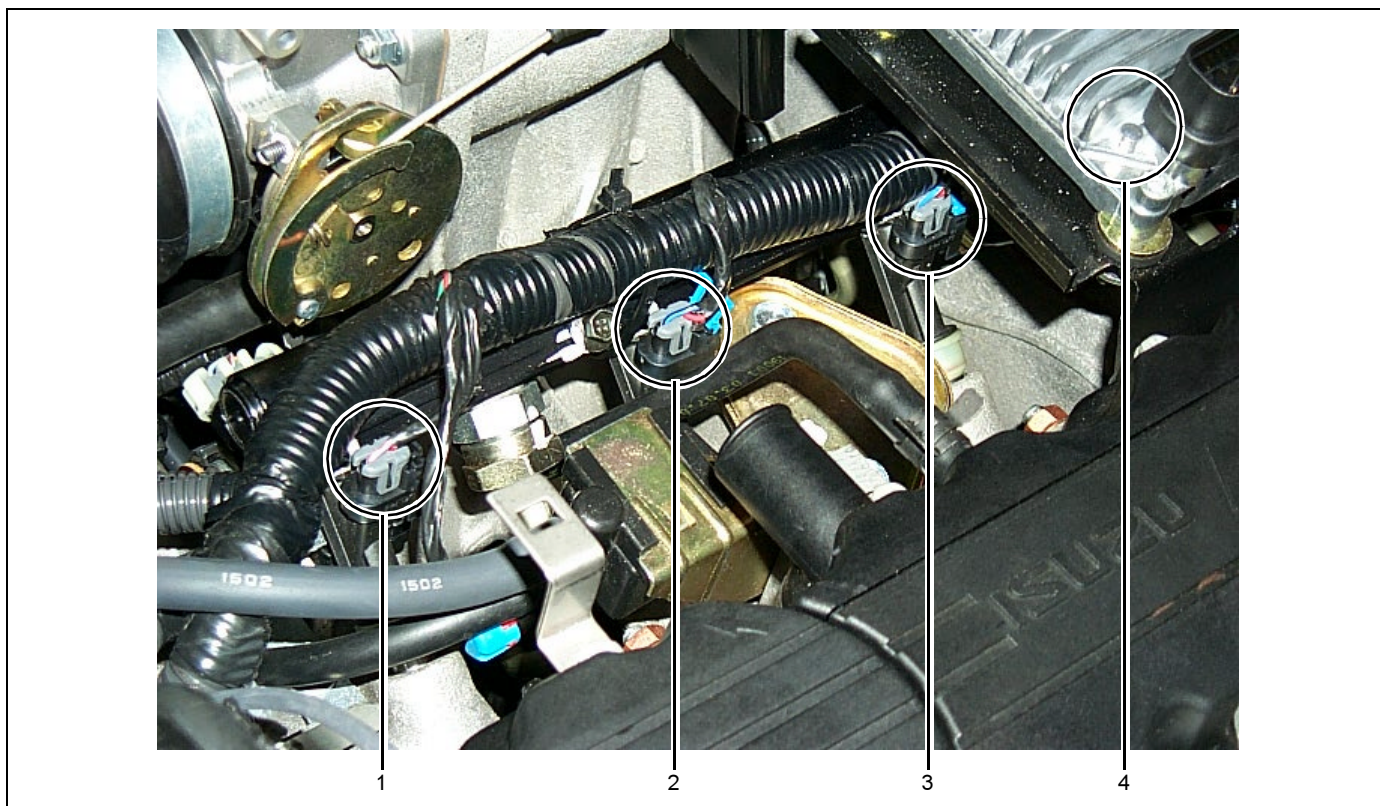
### Disassembled View



#### Legend

- 1 Bolt
- 2 Magnetic Switch
- 3 Gear Case
- 4 Piston
- 5 Piston Shaft
- 6 Center Bracket

- 7 Armature
- 8 Yoke Assembly
- 9 Brush and Brush Holder
- 10 Washer
- 11 Rear Cover
- 12 Through Bolt

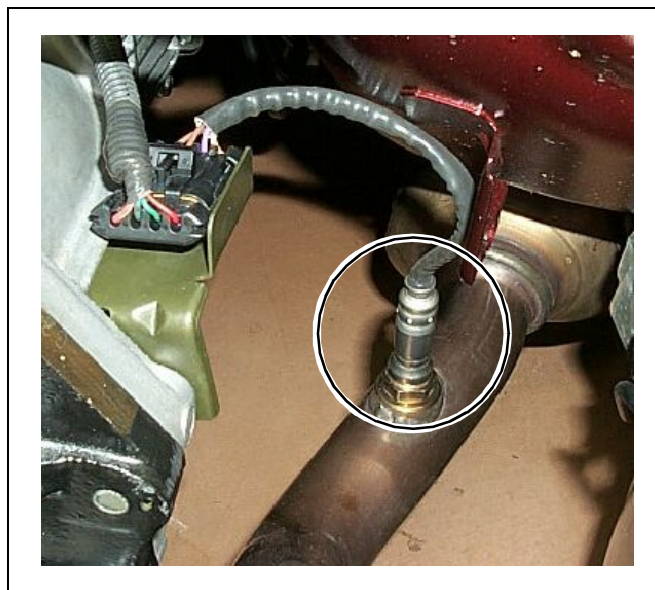


- (1) Injector #1 Cylinder
- (2) Injector #2 Cylinder

- (3) Injector #3 Cylinder
- (4) Injector #4 Cylinder (Under the ECM)



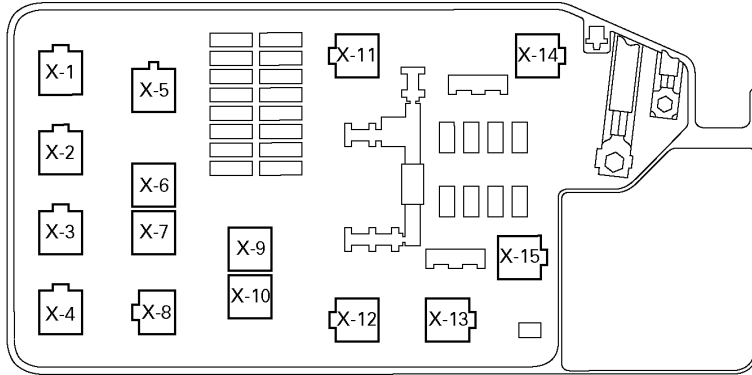
(1) Ignition Coil Module Assembly



(1) Heated Oxygen Sensor (HO2S)

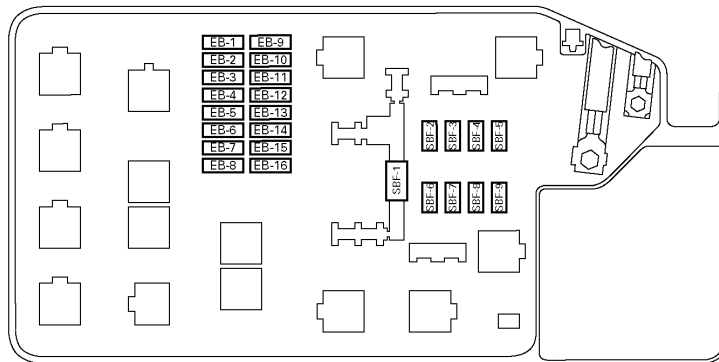
RELAY AND FUSE BOX LOCATION (LHD & RHD)

RELAY & FUSE BOX



RELAY

No.	Relay Name
X-1	RELAY; TAIL LIGHT
X-2	RELAY; FUEL PUMP
X-3	RELAY; HORN
X-4	RELAY; DIMMER
X-5	RELAY; FRT FOG LIGHT (LHD only)
X-6	RELAY; STARTER
X-7	RELAY; COND, FAN
X-8	—
X-9	—
X-10	—
X-11	RELAY; HEATER
X-12	RELAY; HEAD LIGHT
X-13	—
X-14	RELAY; A/C COMP
X-15	RELAY; THERMO



FUSE

NO.	Fuse Name
EB-1	15A ECM
EB-2	—
EB-3	15A FRT FOG
EB-4	15A ACG (S)
EB-5	10A ILLUMI
EB-6	10A TAIL
EB-7	10A H/LIGHT-RH 10A H/LIGHT-RH-LOW
EB-8	10A H/LIGHT-LH 10A H/LIGHT-LH-LOW (LHD only)
EB-9	20A FUEL PUMP
EB-10	10A O <sub>2</sub> SENSOR
EB-11	10A H/LIGHT-RH-HIGH (LHD only)
EB-12	10A H/LIGHT-LH-HIGH (LHD only)
EB-13	10A A/C
EB-14	—
EB-15	10A HORN
EB-16	10A HAZARD

SLOW BLOW FUSE

NO.	Slow Blow Fuse Name	FUSE NO.	Slow Blow Fuse Name
SBF-1	100A MAIN	SBF-6	—
SBF-2	—	SBF-7	—
SBF-3	—	SBF-8	30A BLOWER
SBF-4	20A COND, FAN	SBF-9	50A IG 2
SBF-5	40A IG 1		

## Reading Diagnostic Trouble Codes Using a Tech 2

The procedure for reading diagnostic trouble code(s) is to use a diagnostic Tech2. When reading DTC(s), follow instructions supplied by Tech2 manufacturer.

### Clearing Diagnostic Trouble Codes

To clear Diagnostic Trouble Codes (DTCs), use the Tech2 "clear DTCs" or "clear information" function. When clearing DTCs follow instructions supplied by the Tech2 manufacturer.

## Diagnosis With Tech 2

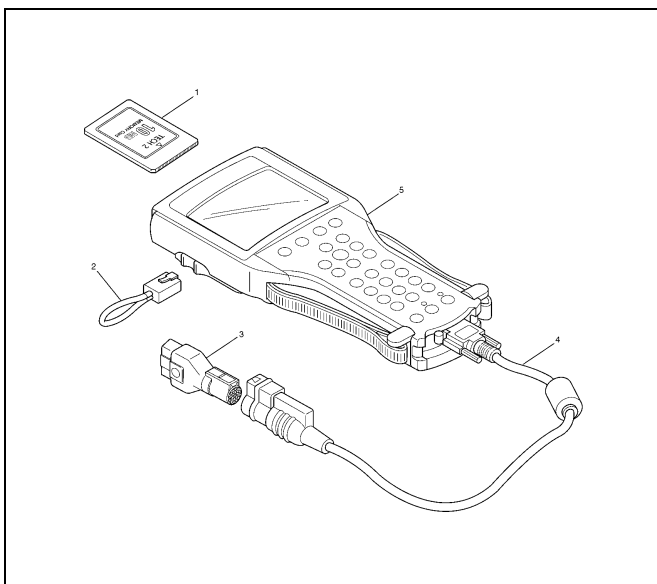
### If no codes are set:

- Refer to **F1: Data Display** and identify the electrical faults that are not indicated by trouble code.
- Refer to **"SYMPTOM DIAGNOSIS"**.

### If codes are set:

1. Record all trouble codes displayed by Tech 2 and check if the codes are intermittent.
2. Clear the codes.
3. Drive the vehicle for a test to reproduce the faulty status.
4. Check trouble codes again using the Tech 2.
5. If no codes are displayed by test driving, the fault is intermittent. In this case, refer to "DIAGNOSIS AIDS".
6. If a code is present, refer to DTC Chart for diagnosis.
7. Check trouble codes again using the Tech 2.

### Tech 2 CONNECTION



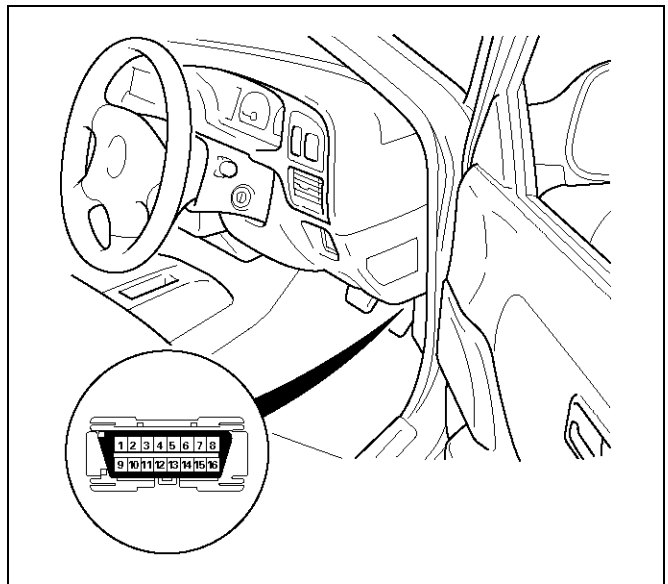
Tech 2 scan tool is used to electrically diagnose the automatic transmission system and to check the system. The Tech 2 enhances the diagnosis efficiency though all the troubleshooting can be done without the Tech 2.

### 1. Configuration of Tech 2

- Tech 2 scan tool kit (No. 7000086), Tech 2 scan tool (No. 7000057) and DLC cable (No. 3000095).
- SAE 16/19 adapter (No. 3000098) (3), RS232 loop back connector (No. 3000112) (2) and PCMCIA card (No. 3000117) (1).

### 2. Tech 2 Connection

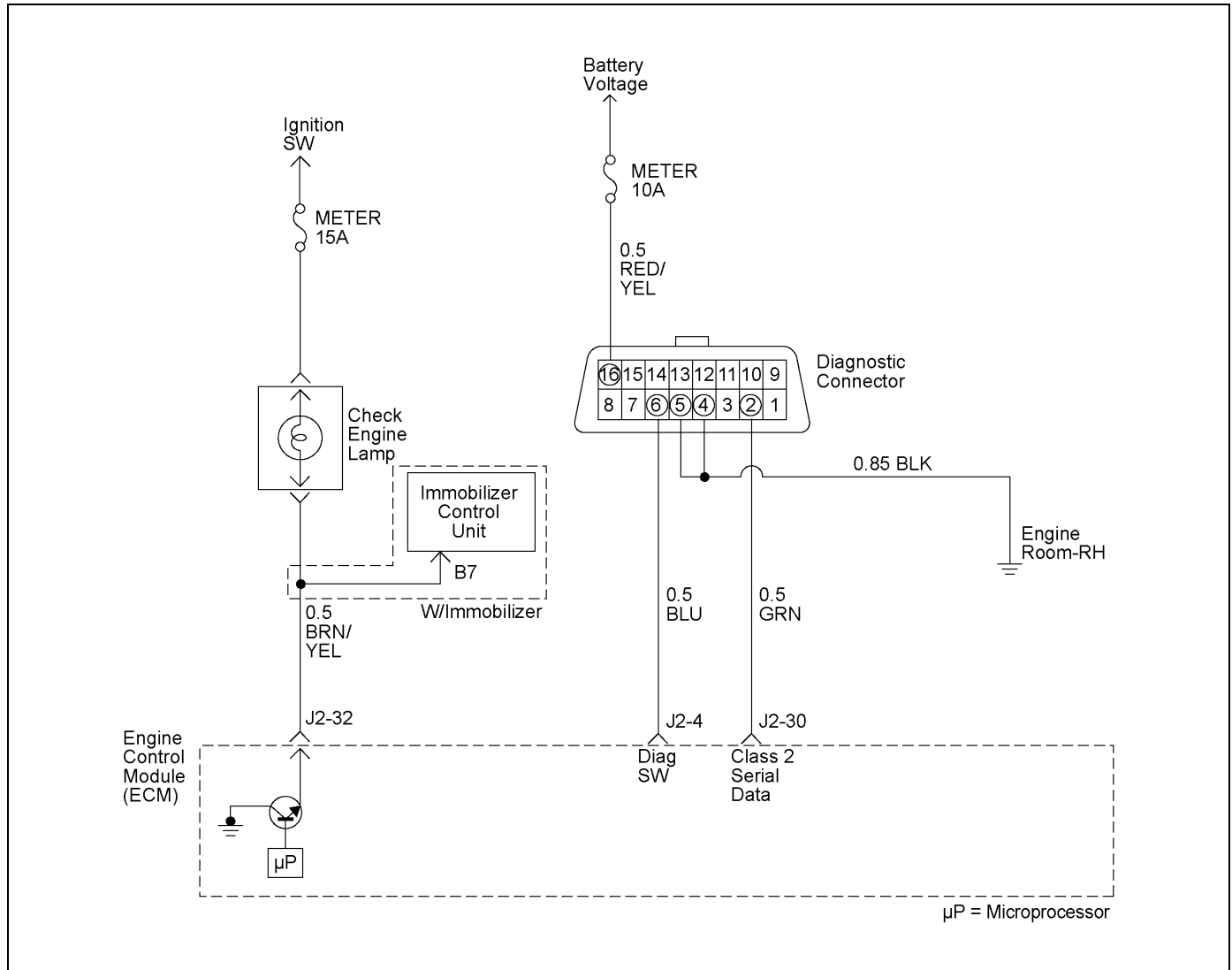
- Check the key switch is turn OFF.
- Insert the PCMCIA card (1) into the Tech 2 (5).
- Connect the SAE 16/19 adapter (3) to the DLC cable (4).
- Connect the DLC cable (4) to the Tech 2 (5).
- Connect the SAE 16/19 adapter (3) to the data link connector of the vehicle.



- Turn the key switch of the vehicle ON and press the "PWR" key of the Tech 2.
- Check the display of the Tech 2.

NOTE: Be sure to check that the power is not supplied to the Tech 2 when attaching or removing the PCMCIA card.

## NO CHECK ENGINE LAMP (MIL)



### Circuit Description

The check engine lamp should be illuminated and steady for about five seconds with the ignition “ON” and the engine stopped. Ignition feed voltage is supplied to the check engine lamp bulb through the meter fuse. The Engine Control Module (ECM) turns the check engine lamp “ON” by grounding the check engine lamp driver circuit.

### Diagnostic Aids

An intermittent check engine lamp may be caused by a poor connection, rubbed-through wire insulation, or a

wire broken inside the insulation. Check for the following items:

- Inspect the ECM harness and connections for improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection, and damaged harness.
- If the engine runs OK, check for a faulty light bulb, an open in the check engine lamp driver circuit, or an open in the instrument cluster ignition feed.
- If the engine cranks but will not run, check for an open ECM ignition or battery feed, or a poor ECM to engine ground.

## No Check Engine Lamp (MIL)

Step	Action	Value(s)	Yes	No
1	Check the “Meter” fuse (15A). If the fuse is burnt out, repair as necessary. Was the problem found?	—	Verify repair	Go to <i>Step 2</i>

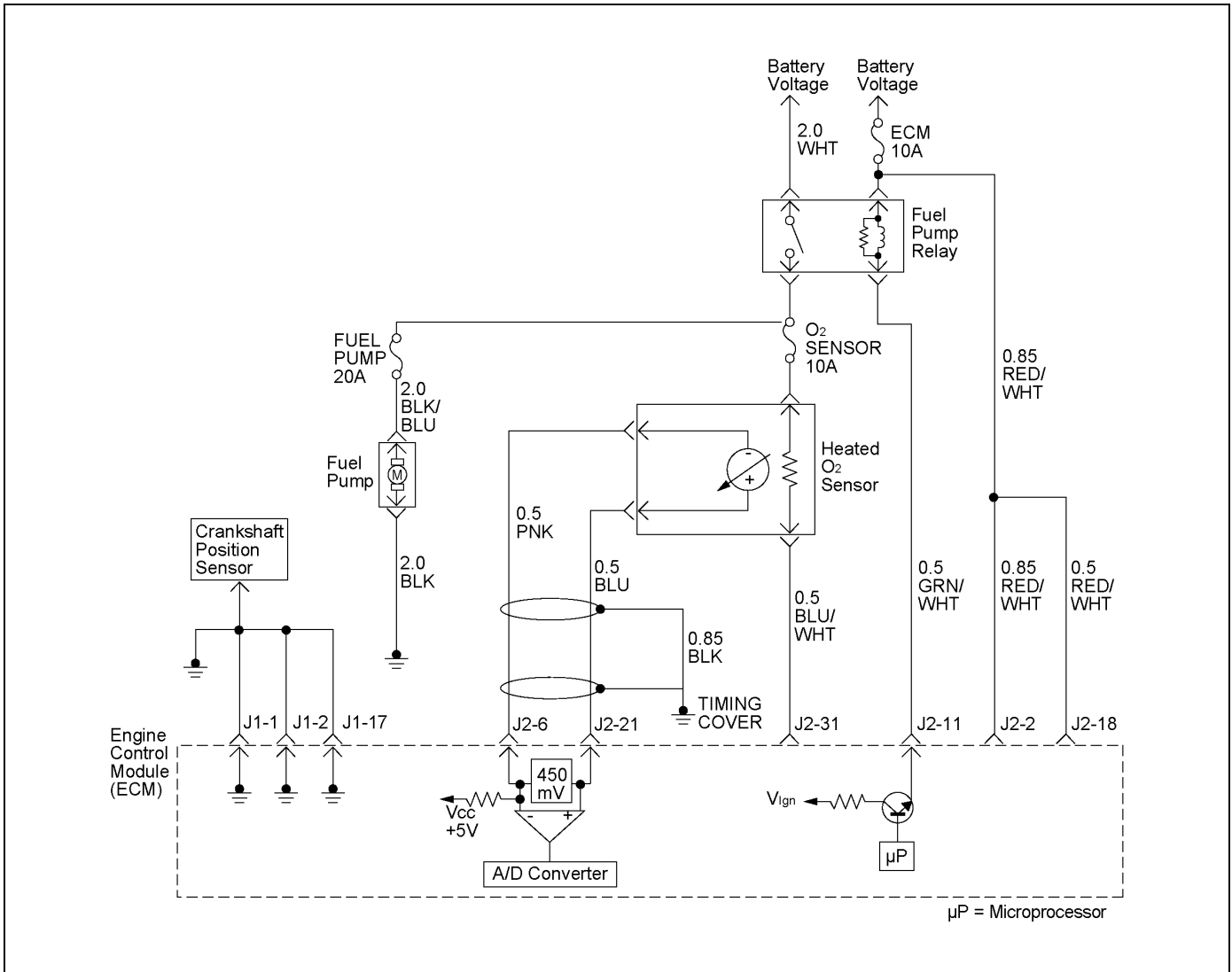
- terminals, and poor terminal-to-wire connection.
- Damaged harness - Inspect the wiring harness for damage, short to ground, short to battery positive, and open circuit. If the harness appears to be OK,

observe the IAT display on the Tech 2 while moving connectors and wiring harnesses related to the IAT sensor. A change in the IAT display will indicate the location of the fault.

### Diagnostic Trouble Code (DTC) P0113 Intake Air Temperature Sensor High Input

Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic (OBD) System Check" performed?	—	Go to Step 2	Go to <i>On Board Diagnostic (OBD) System Check</i>
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select "F0: Read DTC Infor By Priority" in "F0: Diagnostic Trouble Code". Is the DTC P0113 stored as "Present Failure"?	—	Go to Step 3	Refer to <i>Diagnostic Aids</i> and Go to <i>Step 3</i>
3	1. Using the Tech2, ignition "On" and engine "Off". 2. Select "Clear DTC Information" with the Tech2 and clear the DTC information. 3. Operate the vehicle and monitor the "F5: Failed This Ignition" in "F2: DTC Information". Was the DTC P0113 stored in this ignition cycle?	—	Go to Step 4	Refer to <i>Diagnostic Aids</i> and Go to <i>Step 4</i>
4	Check for poor/faulty connection at the IAT sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found?  <div style="text-align: center;"> </div>	—	Verify repair	Go to <i>Step 5</i>
5	Visually check the IAT sensor. Was the problem found?	—	Go to Step 12	Go to <i>Step 6</i>

## DIAGNOSTIC TROUBLE CODE (DTC) P0135 O<sub>2</sub> SENSOR HEATER CIRCUIT (BANK 1 SENSOR 1)



### Condition for setting the DTC and action taken when the DTC sets

Code	Type	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
P0135	A	O <sub>2</sub> Sensor Heater Circuit (Bank 1 Sensor 1)	<ol style="list-style-type: none"> <li>1. No DTC relating to MAP sensor and ECT sensor.</li> <li>2. Engine coolant temperature is more than 60 deg. C.</li> <li>3. Engine run time is longer than 20 seconds.</li> <li>4. MAP sensor output is more than 70kPa.</li> <li>5. O<sub>2</sub> sensor bank 1 heater current more than 10mA.</li> </ol>	No fail-safe function.

### Circuit Description

Heated oxygen sensors are used to minimize the amount of time required for "Closed Loop" fuel control operation and to allow accurate catalyst monitoring. The oxygen sensor heater greatly decreases the amount of time required for fuel control sensors Bank 1 HO<sub>2</sub>S 1 1 to become active. Oxygen sensor heaters are required by catalyst monitor sensors Bank 1 HO<sub>2</sub>S 2 to maintain a sufficiently high temperature which allows accurate exhaust oxygen content readings further from the

engine.

The engine control module (ECM) will run the heater test only after a cold start (determined by engine coolant and intake air temperature at the time of start-up) and only once during an ignition cycle. When the engine is started the ECM will monitor the HO<sub>2</sub>S voltage. When the HO<sub>2</sub>S voltage indicates a sufficiently active sensor, the ECM looks at how much time has elapsed since start-up. If the ECM determines that too much time was required for the Bank 1 HO<sub>2</sub>S 1 to become active, a Diagnostic Trouble Code P0135 will set.