

# **Emissions Control System**

<b>GENERAL .....</b>	<b>EC -2</b>
<b>CRANKCASE EMISSION CONTROL SYSTEM .....</b>	<b>EC -14</b>
<b>EVAPORATIVE EMISSION CONTROL SYSTEM .....</b>	<b>EC -18</b>
<b>EXHAUST EMISSION CONTROL SYSTEM .....</b>	<b>EC -22</b>

**GENERAL**

EEJB0010

**SPECIFICATIONS**

Components	Function	Remarks
Crankcase Emission System Positive crankcase ventilation (PCV) valve	HC reduction	Variable flow rate type
Evaporative Emission System EVAP Canister EVAP Canister Purge Solenoid Valve	HC reduction	Duty control solenoid valve
Exhaust Emission System MFI system (air-fuel mixture control device) Three-way catalytic converter Exhaust gas recirculation system [2.4 I4 only] EGR valve MAP sensor	CO, HC, NOx reduction CO, HC, NOx reduction NOx reduction EGR Monitoring	Heated oxygen sensor feedback type Monolithic type Single type Electric pressure type

EVAP : Evaporative Emission

**SERVICE STANDARD**

EVAP Canister Purge Solenoid Valve Coil current	0.45A or below (at 12V)
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**TIGHTENING TORQUE**

Item	Nm	kg·cm	lb·ft
Positive crankcase ventilation valve	8-12	80-120	6-9

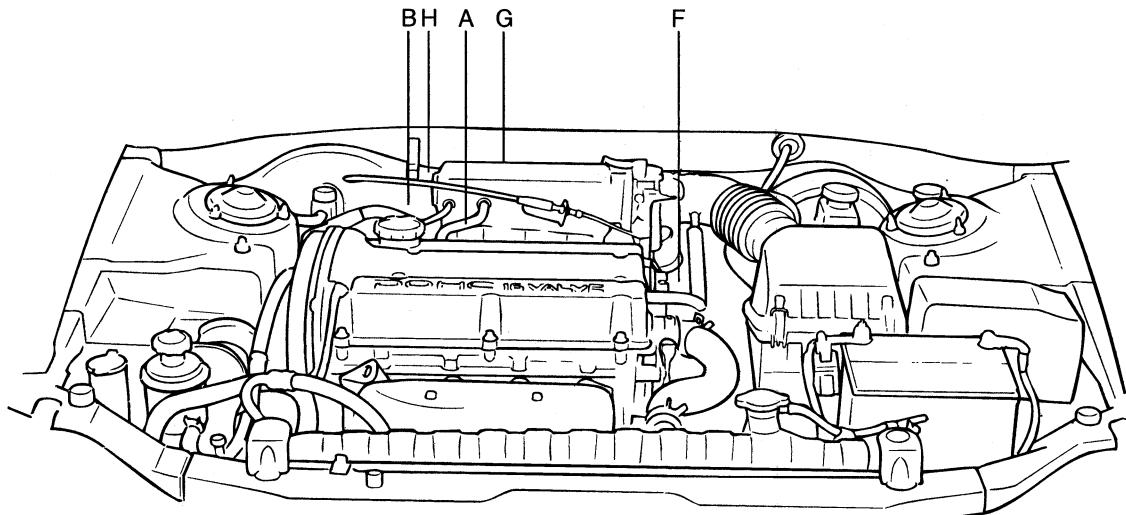
**TROUBLESHOOTING**

Symptom	Probable cause	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged EGR valve does not close Malfunction of the EVAP Canister Purge Solenoid Valve	Repair or replace Repair or replace Repair or replace
Rough idle or engine stalls	Vacuum hose disconnected or damaged EGR valve does not close Malfunction of the PCV valve Malfunction of the EVAP Canister Purge System	Repair or replace Repair or replace Replace Check the system; if there is a problem, check its component parts
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system
Poor fuel mileage	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts

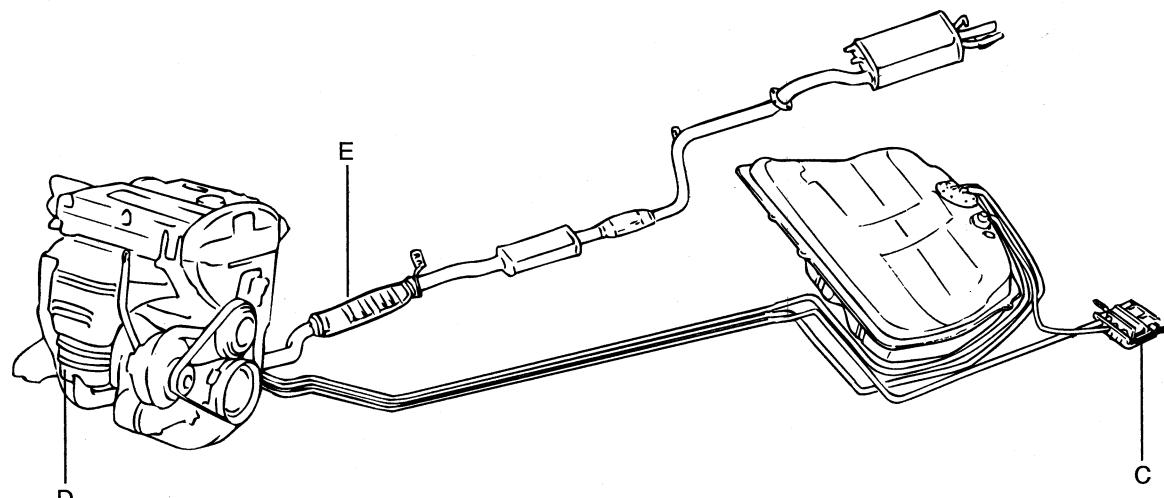
## EMISSION CONTROLS LOCATION

EEJB0050

[2.4 I4]



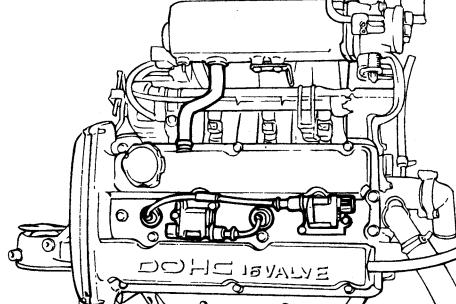
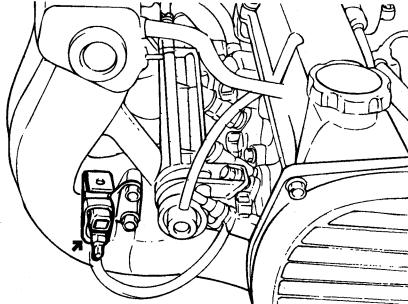
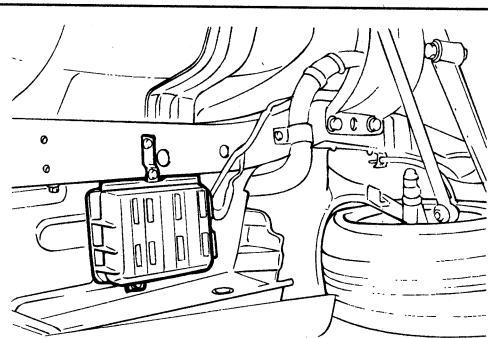
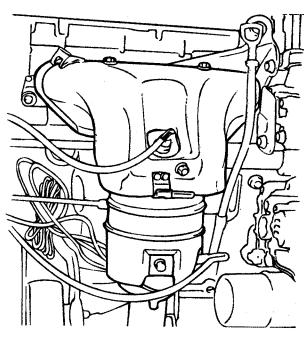
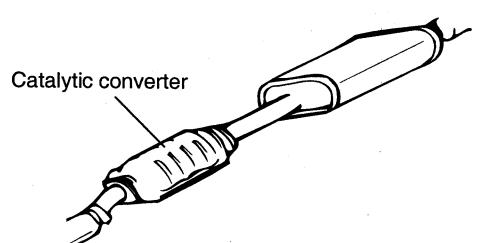
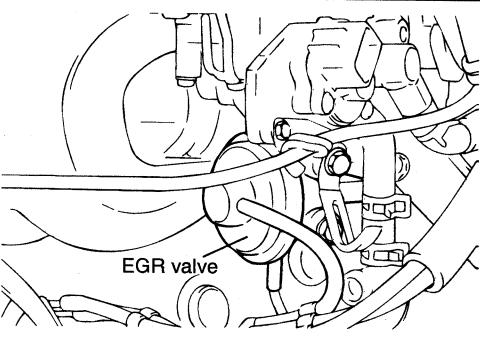
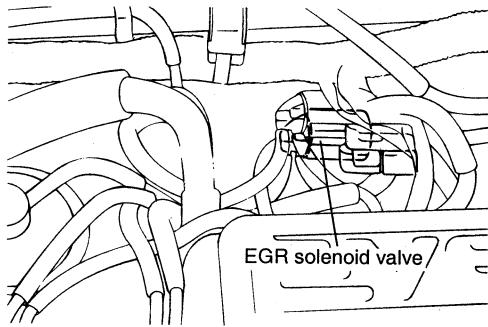
EEA9005A



EEA9005B

- A. PCV Valve
- B. EVAP Canister Purge Solenoid Valve
- C. EVAP Canister
- D. Manifold-mounted catalytic converter (MCC)
- E. Under-vehicle catalytic converter (UCC)
- F. EGR valve
- G. EGR solenoid valve
- H. Manifold absolute pressure (MAP) sensor (for EGR monitoring)

EEJB005A

A. PCV valve	B. EVAP Canister Purge Solenoid Valve
 EEA9005C	 EEA9005D
C. EVAP. Canister	D. Catalytic Converter (MCC)
 EEA9005E	 MCC
E. Catalytic Converter (UCC)	F. EGR valve
 Catalytic converter	 EGR valve
G. EGR solenoid valve	
 EGR solenoid valve	

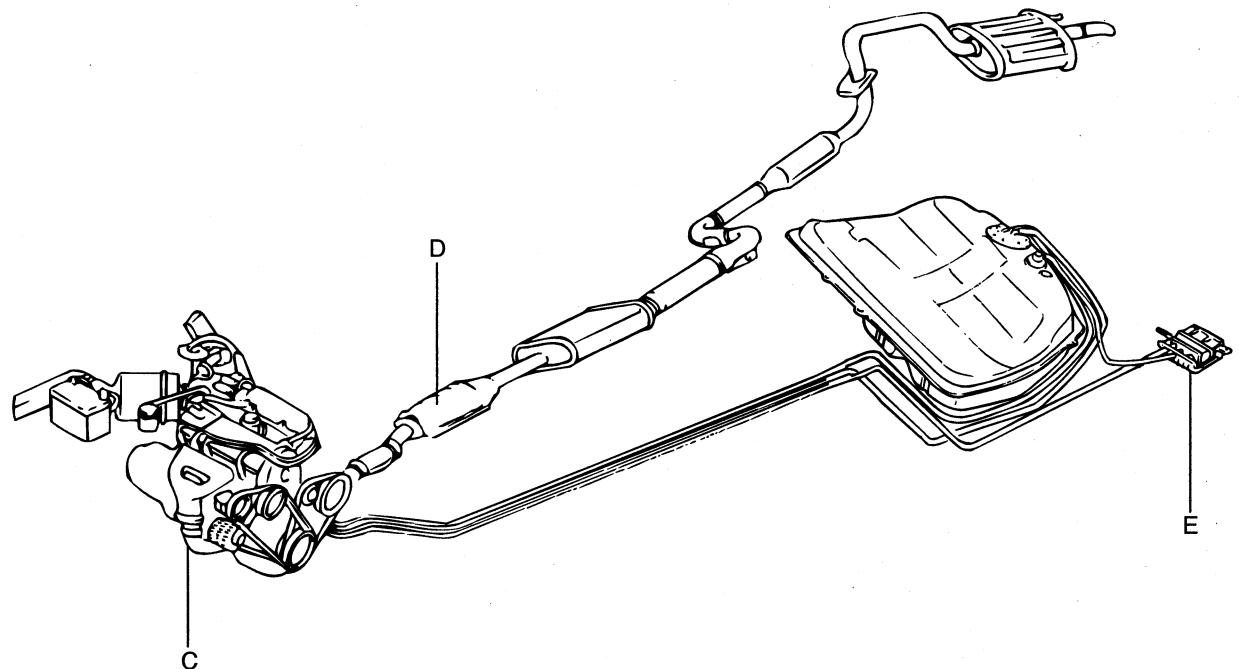
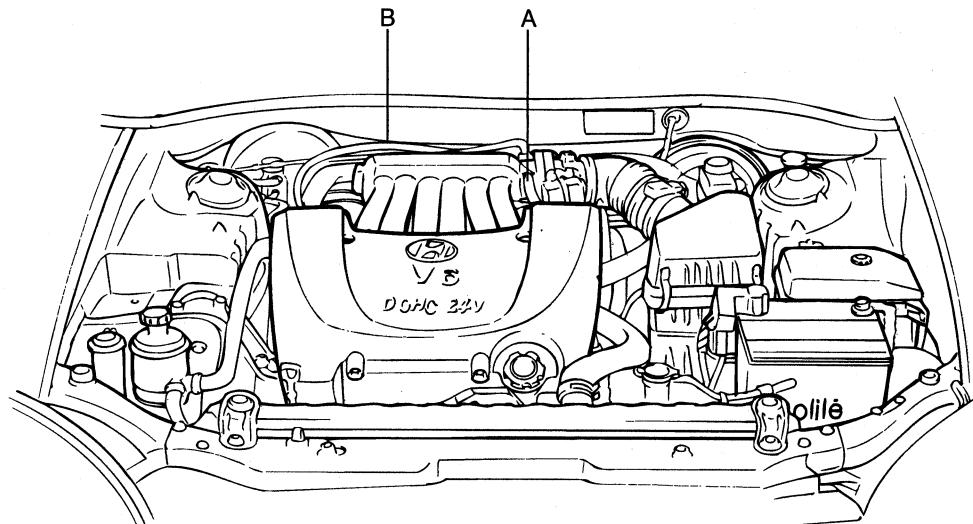
S5EC002D

S5EC500G

## EMISSION CONTROLS LOCATION

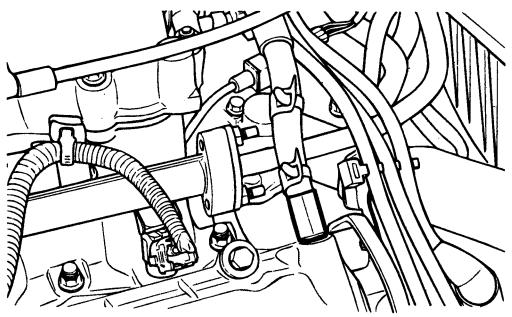
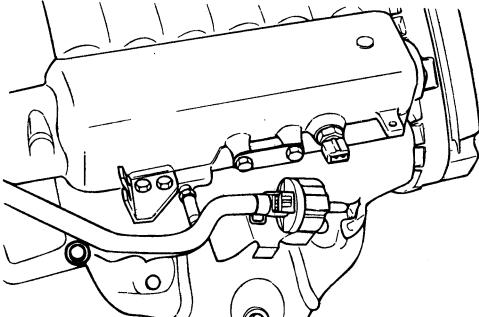
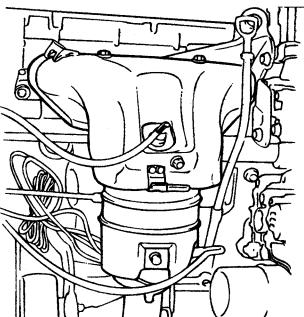
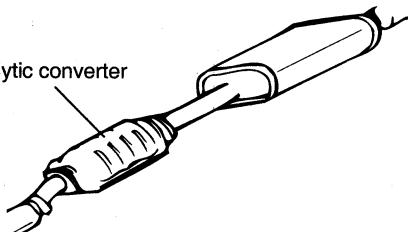
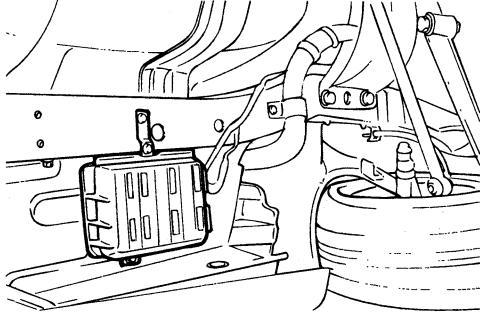
EEJB0060

[2.7 V6]



- A. PCV Valve
- B. EVAP Canister Purge Solenoid Valve
- C. Manifold-mounted catalytic converter (MCC)
- D. Under-vehicle catalytic converter (UCC)
- E. EVAP Canister

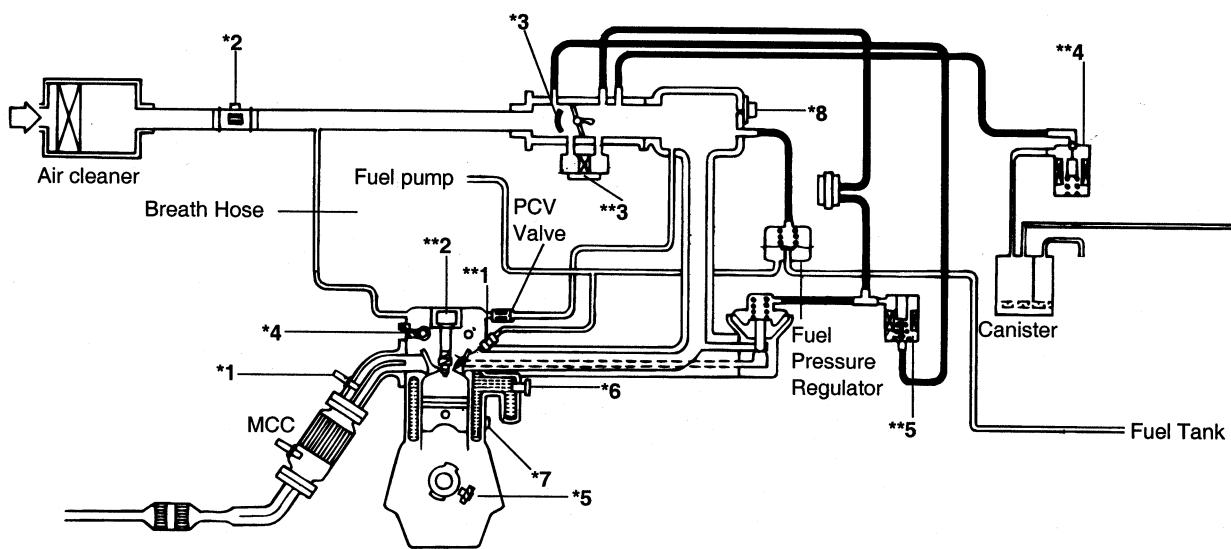
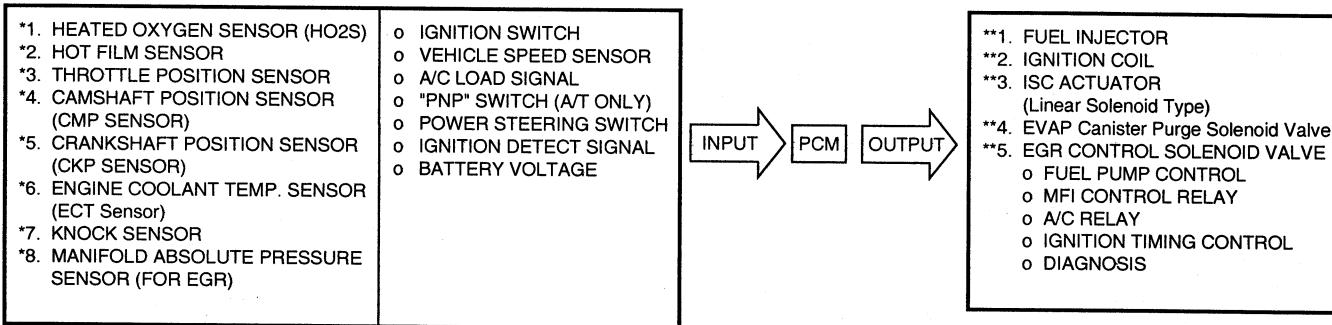
EEJB006A

A. PCV valve	B. EVAP Canister Purge Solenoid Valve
	
	KFW4002A
	KFW5011A
C. Catalytic Converter (MCC)	D. Catalytic Converter (UCC)
	
MCC	Catalytic converter
EEA9005G	EEA9005F
E. Evap. Canister	
	
EEA9005E	

## SCHEMATIC DRAWING (2.4 I4)

EEJB073A

## [UNLEADED, OBD-II]



PCM : Powertrain Control Module

EVAP : Evaporative Emission

MCC : Manifold Catalytic Converter

UCC : Under floor Catalytic Converter

## SCHEMATIC DRAWING (2.4 I4)

EEJB0074

[UNLEADED]

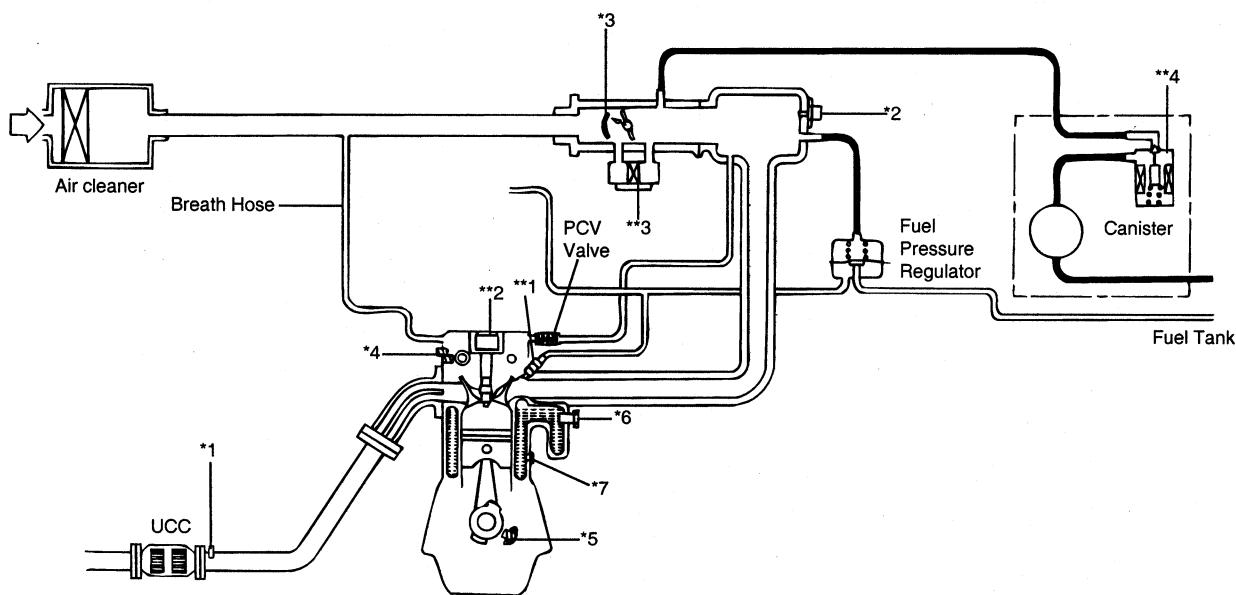
- \*1. HEATER OXYGEN SENSOR (HO2S)
- \*2. MAP & IAT SENSOR
- \*3. THROTTLE POSITION SENSOR (With Idle Switch)
- \*4. CAMSHAFT POSITION SENSOR (CMP SENSOR)
- \*5. CRANKSHAFT POSITION SENSOR (CKP SENSOR)
- \*6. ENGINE COOLANT TEMP. SENSOR (ECT Sensor)
- \*7. KNOCK SENSOR

- o IGNITION SWITCH
- o VEHICLE SPEED SENSOR
- o COOLER LOAD SIGNAL
- o "PNP" SWITCH (AT ONLY)
- o POWER STEERING SWITCH
- o IGNITION DETECT SIGNAL
- o BATTERY VOLTAGE



- \*\*1. FUEL INJECTOR
- \*\*2. IGNITION COIL
- \*\*3. ISC MOTOR (Linear Solenoid Type)
- \*\*4. EVAP Canister Purge Solenoid Valve

  - o FUEL PUMP CONTROL
  - o MFI CONTROL RELAY
  - o COOLER RELAY
  - o IGNITION TIMING CONTROL
  - o DIAGNOSIS



ECM : Engine Control Module

EVAP : Evaporative Emission

UCC : Under floor Catalytic Converter

## SCHEMATIC DRAWING (2.4 14)

EEJB0075

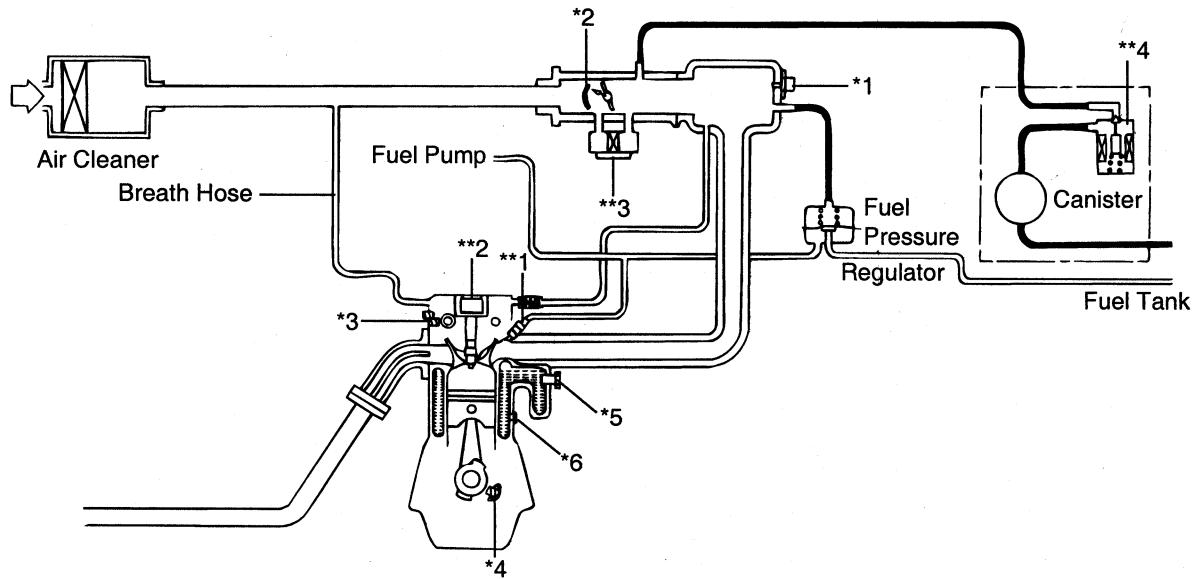
**[LEADED]**

- \*1. MAP & IAT SENSOR
- \*2. THROTTLE POSITION SENSOR (With Idle Switch)
- \*3. CAMSHAFT POSITION SENSOR (CMP SENSOR)
- \*4. CAMSHAFT POSITION SENSOR (CKP SENSOR)
- \*5. ENGINE COOLANT TEMP. SENSOR (ECT SENSOR)
- \*6. KNOCK SENSOR

- IGNITION SWITCH
- VEHICLE SPEED SENSOR
- COOLER LOAD SIGNAL
- "PNP" SWITCH (A/T ONLY)
- POWER STEERING SWITCH
- IGNITION DETECT SIGNAL
- BATTERY VOLTAGE
- VARIABLE REGISTER



- \*\*1. FUEL INJECTOR
- \*\*2. IGNITION COIL
- \*\*3. ISC MOTOR (Linear Solenoid Type)
- \*\*4. EVAP Canister Purge Solenoid Valve
- FUEL PUMP CONTROL
- MFI CONTROL RELAY
- COOLER RELAY
- IGNITION TIMING CONTROL
- DIAGNOSIS



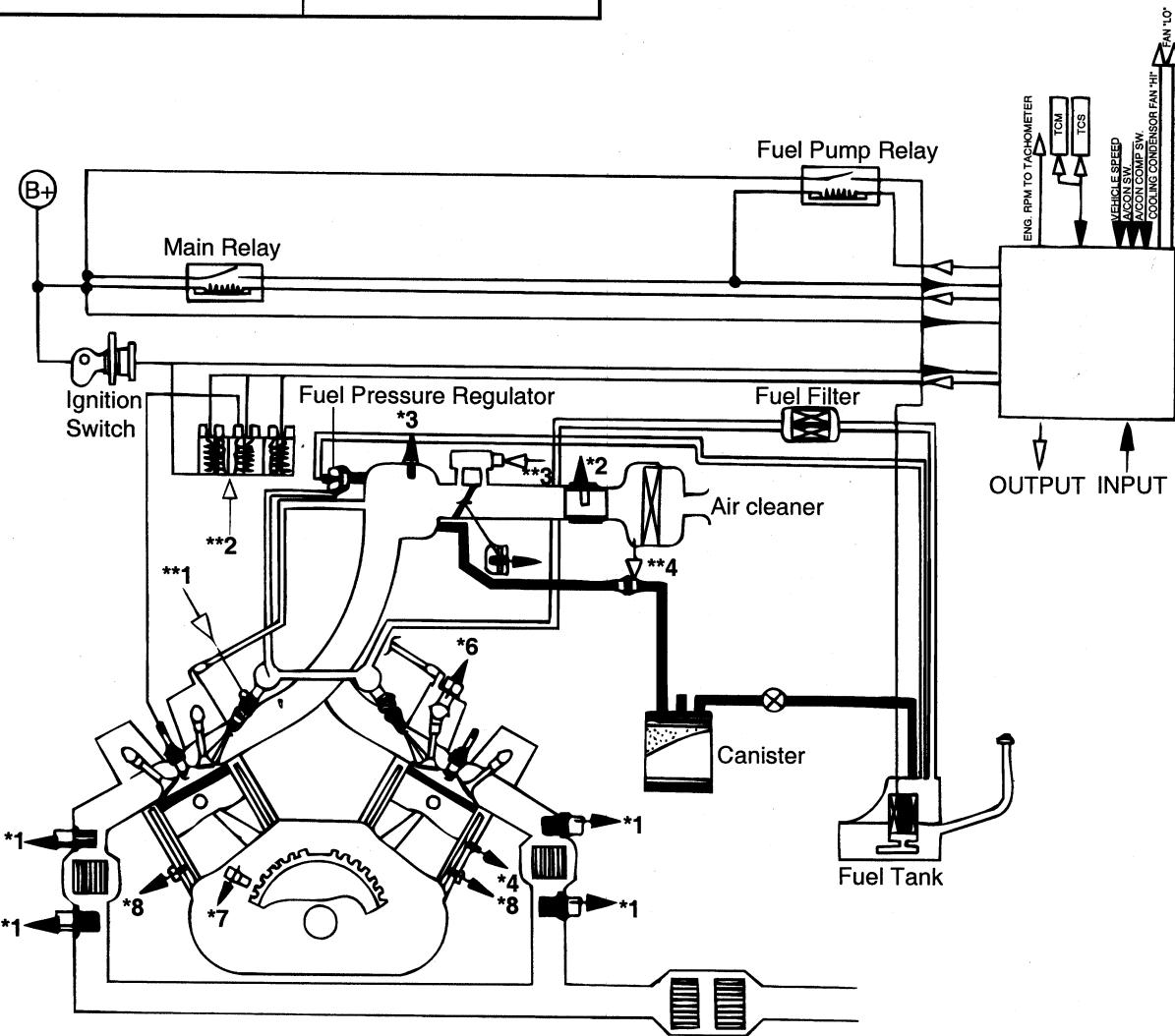
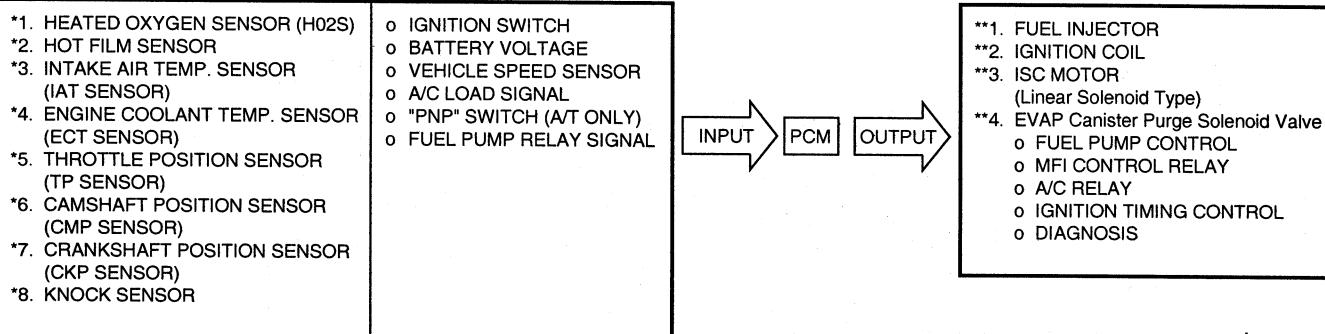
ECM : Engine Control Module

EVAP : Evaporative Emission

## SCHEMATIC DRAWING (2.7 V6)

EEJB093A

## [UNLEADED, OBD-II]



PCM : Powertrain Control Module

EVAP : Evaporative Emission

UCC : Underbody Catalytic Converter

MCC : Manifold Catalytic Converter

## SCHEMATIC DRAWING (2.7 V6)

EEJB0094

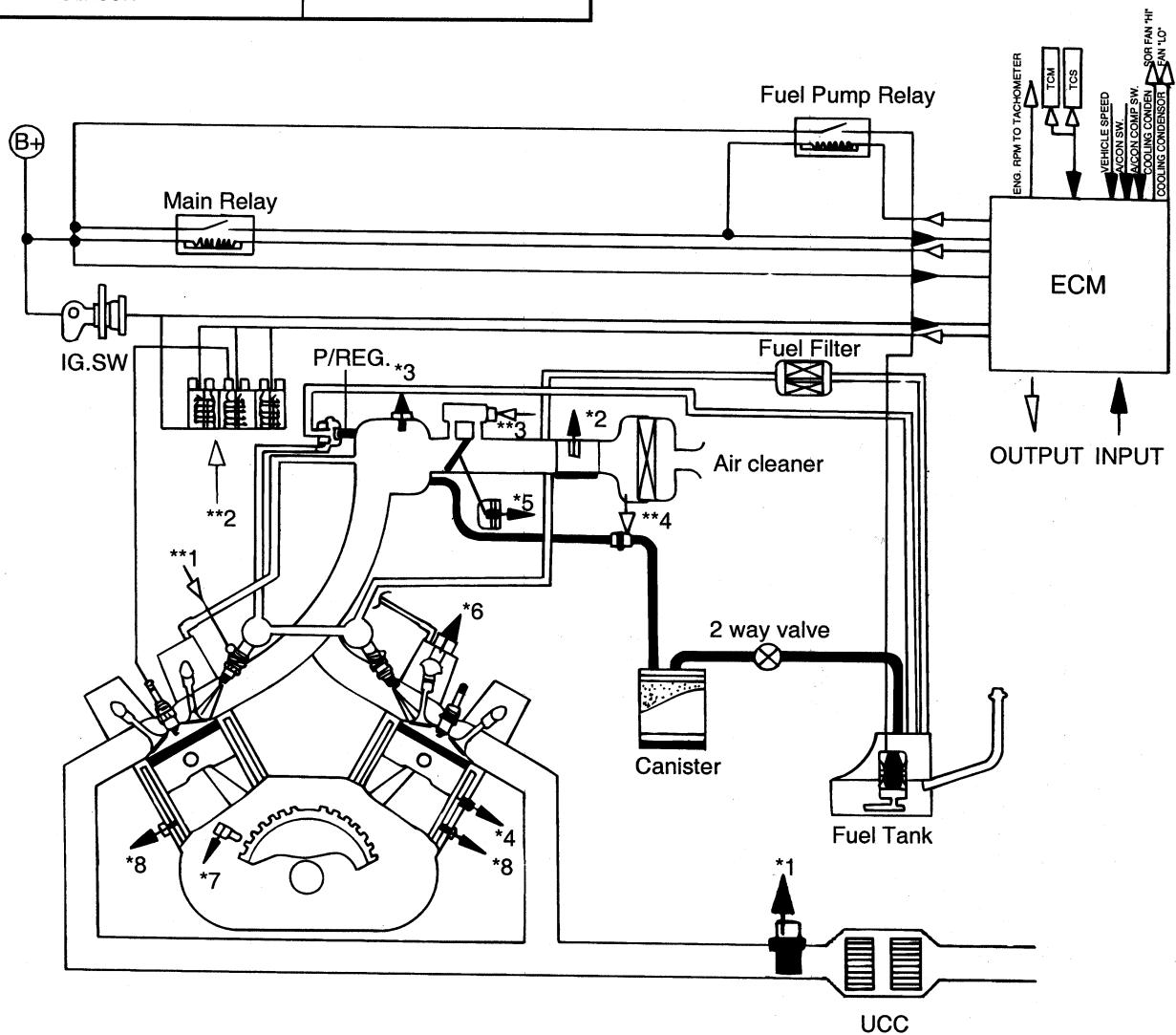
## [UNLEADED]

- \*1. HEATED OXYGEN SENSOR (H02S)
- \*2. HOT FILM SENSOR
- \*3. INTAKE AIR TEMP. SENSOR (IAT SENSOR)
- \*4. ENGINE COOLANT TEMP. SENSOR (ECT SENSOR)
- \*5. THROTTLE POSITION SENSOR (TP SENSOR)
- \*6. CAMSHAFT POSITION SENSOR (CMP SENSOR)
- \*7. CRANKSHAFT POSITION SENSOR (CKP SENSOR)
- \*8. KNOCK SENSOR

- o IGNITION SWITCH
- o BATTERY VOLTAGE
- o VEHICLE SPEED SENSOR
- o COOLER LOAD SIGNAL
- o "PNP" SWITCH (A/T ONLY)
- o FUEL PUMP RELAY SIGNAL



- \*\*1. FUEL INJECTOR
- \*\*2. IGNITION COIL
- \*\*3. ISC MOTOR (Linear Solenoid Type)
- \*\*4. EVAP Canister Purge Solenoid Valve
- o FUEL PUMP CONTROL
- o MFI CONTROL RELAY
- o COOLER RELAY
- o IGNITION TIMING CONTROL
- o DIAGNOSIS



ECM : Engine Control Module

EVAP : Evaporative Emission

UCC : Under floor catalytic converter

## SCHEMATIC DRAWING (2.7 V6)

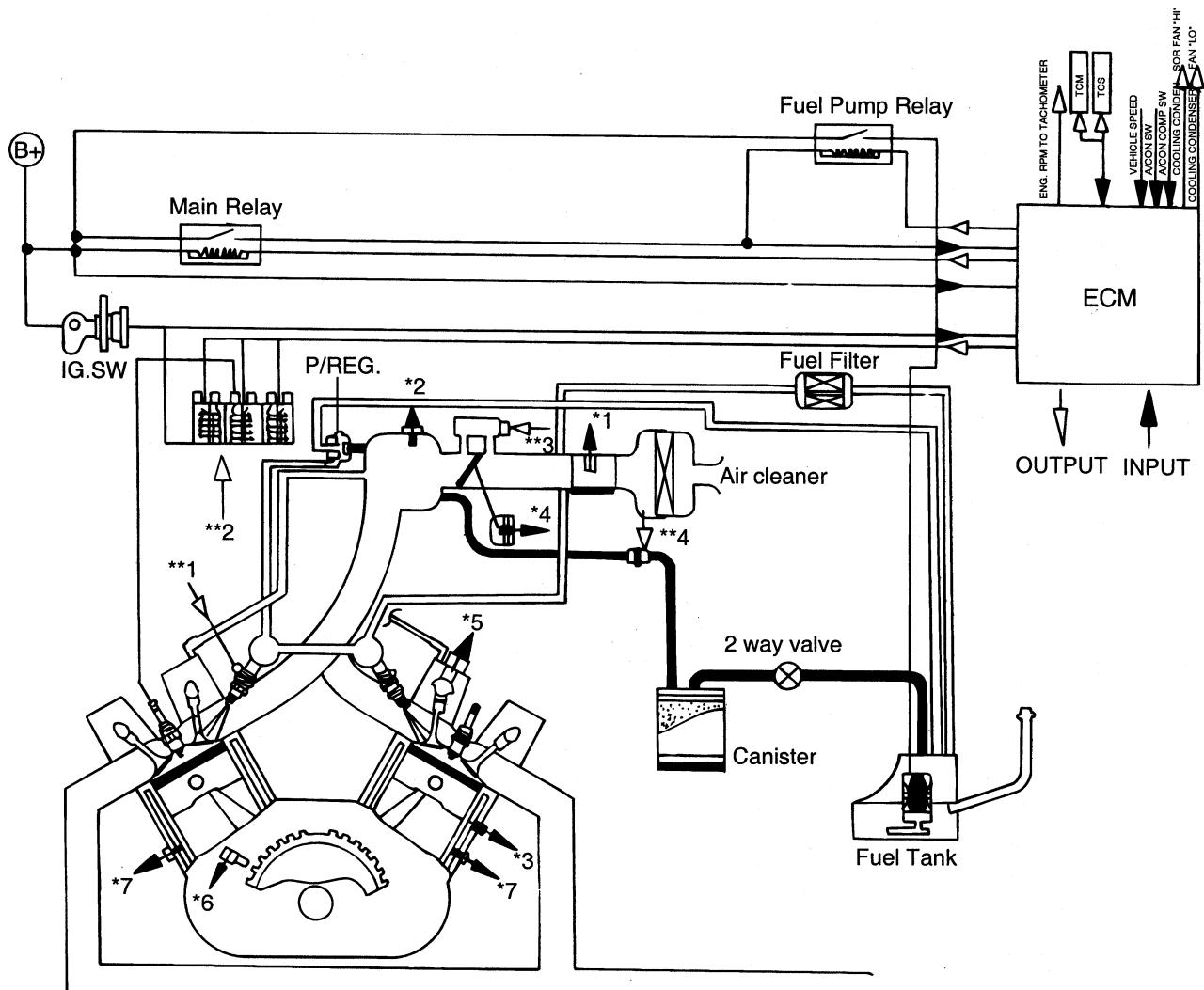
EEJB0095

## [LEADED]

*1. HOT FILM SENSOR	○ IGNITION SWITCH
*2. INTAKE AIR TEMP. SENSOR (IAT SENSOR)	○ BATTERY VOLTAGE
*3. ENGINE COOLANT TEMP. SENSOR (ECT SENSOR)	○ VEHICLE SPEED SENSOR
*4. THROTTLE POSITION SENSOR (TP SENSOR)	○ COOLER LOAD SIGNAL
*5. CAMSHAFT POSITION SENSOR (CMP SENSOR)	○ "PNP" SWITCH (AT ONLY)
*6. CRANKSHAFT POSITION SENSOR (CKP SENSOR)	○ FUEL PUMP RELAY SIGNAL
*7. KNOCK SENSOR	○ VARIABLE REGISTER



**1. FUEL INJECTOR
**2. IGNITION COIL
**3. ISC MOTOR
**4. EVAP Canister Purge Solenoid Valve
○ FUEL PUMP CONTROL
○ MFI CONTROL RELAY
○ COOLER RELAY
○ IGNITION TIMING CONTROL
○ DIAGNOSIS



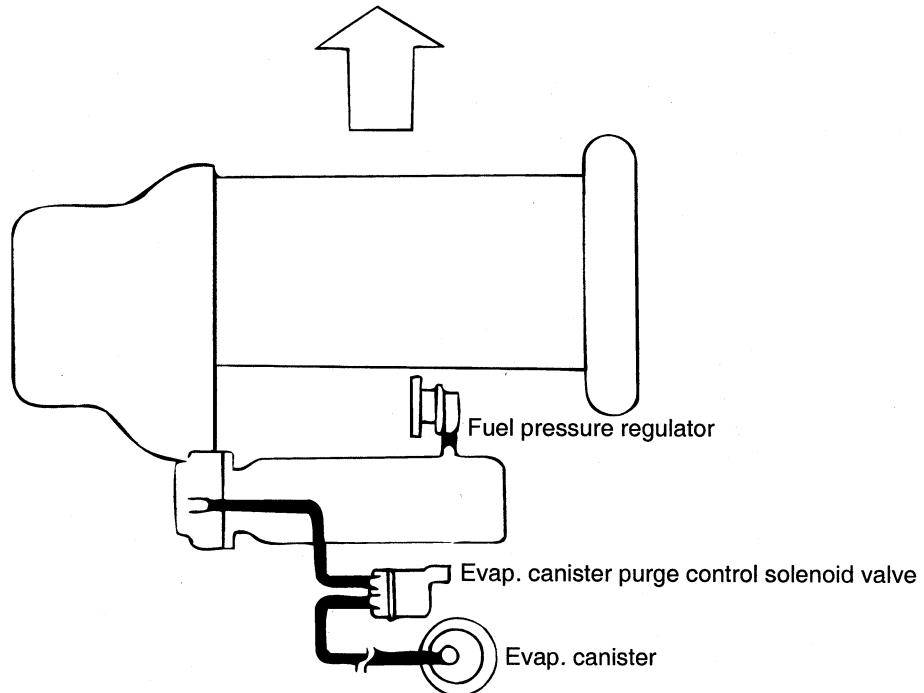
ECM : Engine Control Module

EVAP : Evaporative Emission

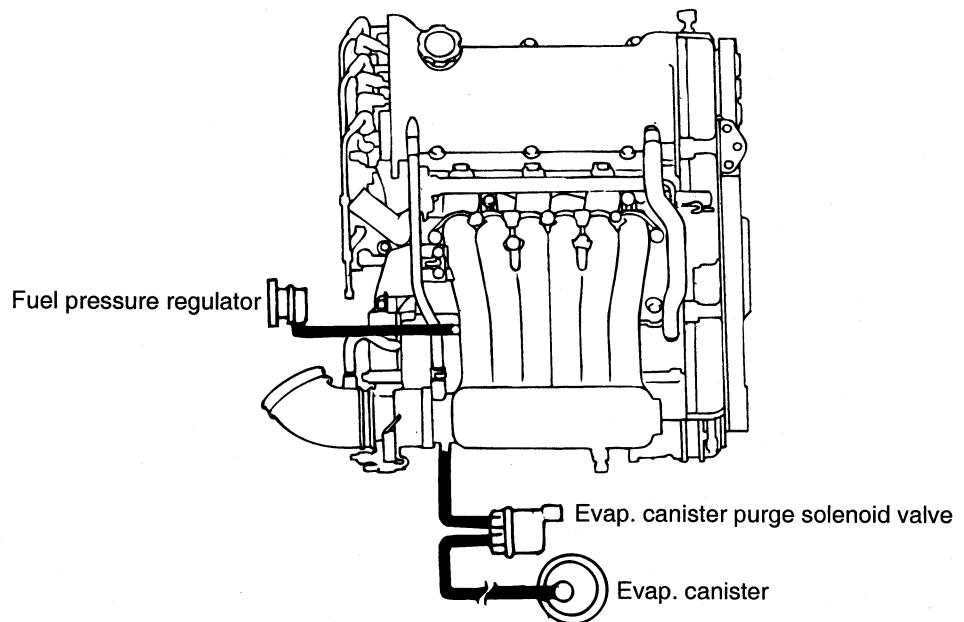
## VACUUM HOSES LAYOUT

EEJB0110

[2.4 I4]



[2.7 V6]



## CRANKCASE EMISSION CONTROL SYSTEM

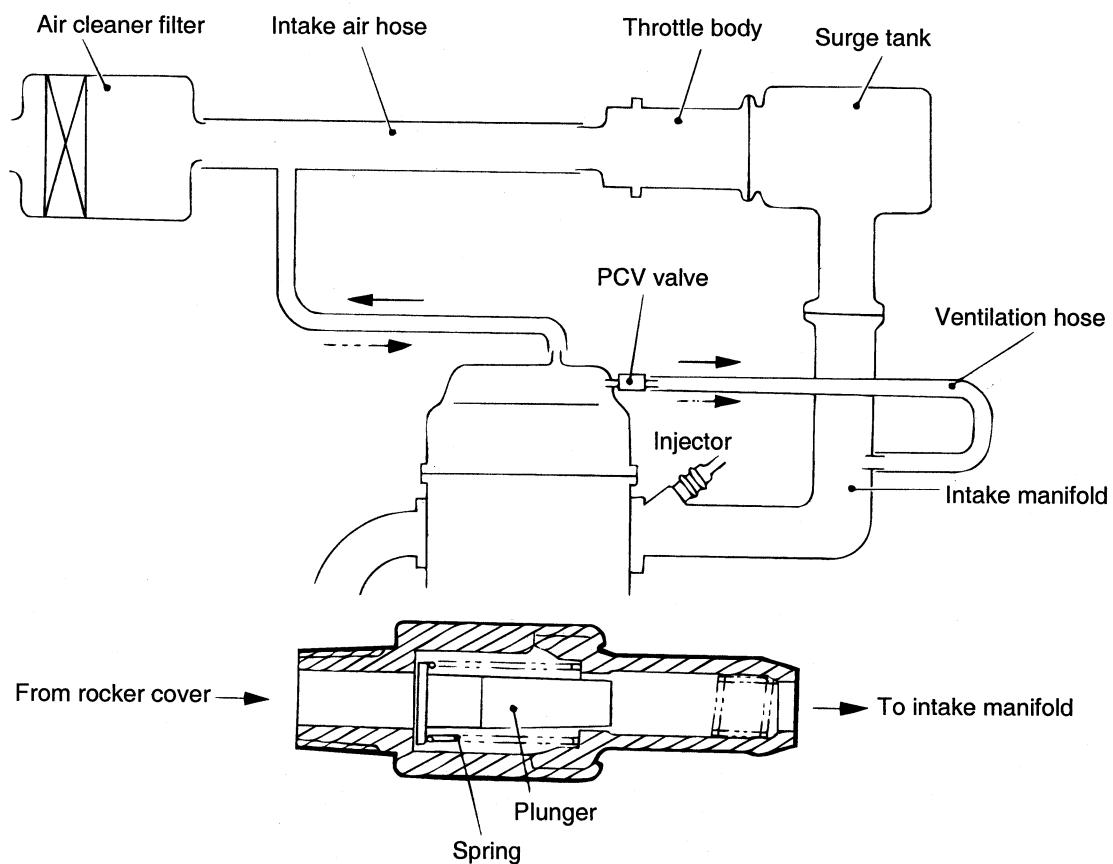
### POSITIVE CRANKCASE VENTILATION

#### (PCV) VALVE

EEJB0120

#### COMPONENTS

[2.4 14]



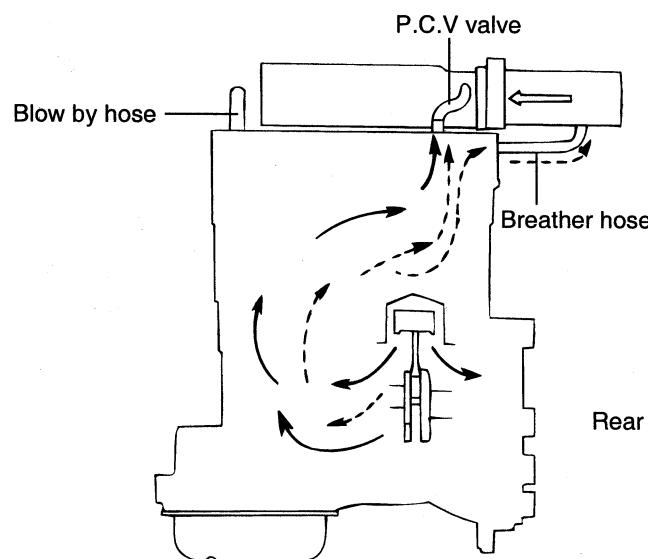
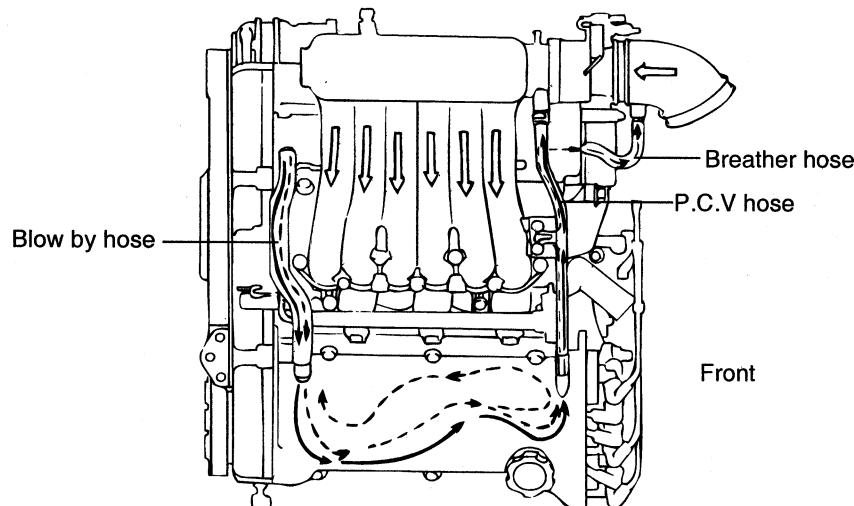
→ Blow-by Gas  
→ Fresh Air

## POSITIVE CRANKCASE VENTILATION

(PCV) VALVE EEHA0130

## COMPONENTS

[2.7 V6]

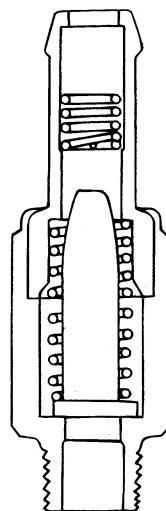


- ← During low load operation
- ← Dashed line: During high load operation
- ← Solid line: Fresh air

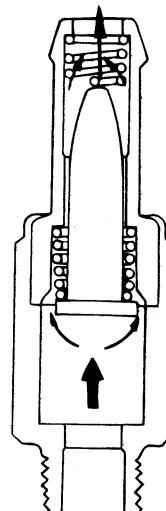
## PCV VALVE OPERATING

EEA90140

Intake manifold side (No vacuum)



Intake manifold side (High vacuum)



Rocker cover side

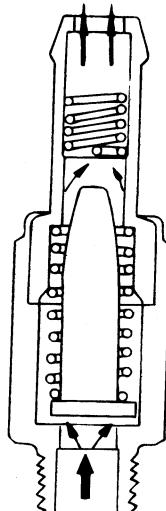
EEA9014A

Rocker cover side

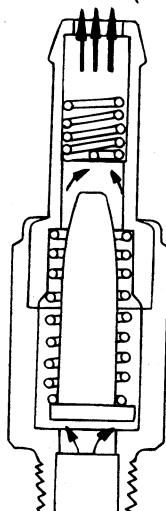
EEA9014B

Engine condition	Not running	Engine condition	Idling or decelerating
PCV valve	Not operating	PCV valve	Fully operating
Vacuum passage	Restricted	Vacuum passage	Small

Intake manifold side (Moderate vacuum)



Intake manifold side (Low vacuum)



Rocker cover side

EEA9014C

Rocker cover side

EEA9014D

Engine condition	Normal operation	Engine condition	Accelerating and high load
PCV valve	Properly operating	PCV valve	Slightly operating
Vacuum passage	Large	Vacuum passage	Much large

**DISASSEMBLY**

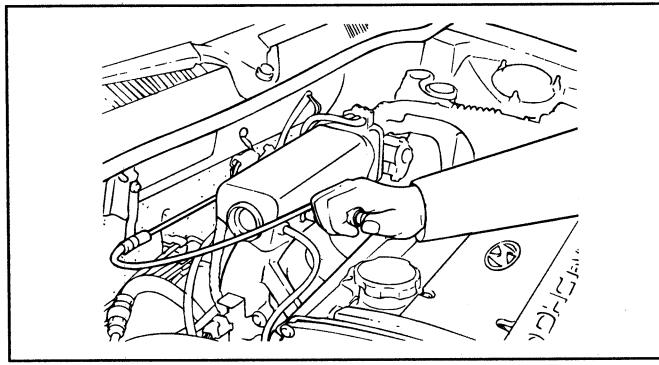
EEA90150

1. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve. Remove the PCV valve from the rocker cover and reconnect it to the ventilation hose.
2. Run the engine at idle and put a finger on the open end of the PCV valve and make sure that intake manifold vacuum is felt.

**NOTE**

**The plunger inside the PCV valve should move back and forth.**

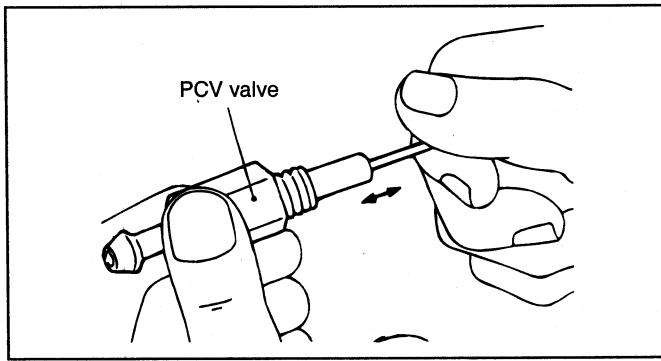
3. If vacuum is not felt, clean the PCV valve and ventilation hose in cleaning solvent, or replace if necessary.



EEA9015A

**INSPECTION**

1. Remove the positive crankcase ventilation valve.
2. Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.
3. If the plunger does not move, the positive crankcase ventilation valve is clogged. Clean or replace it.



EEA9015B

**INSTALLATION**

Install the positive crankcase ventilation valve and tighten to the specified torque.

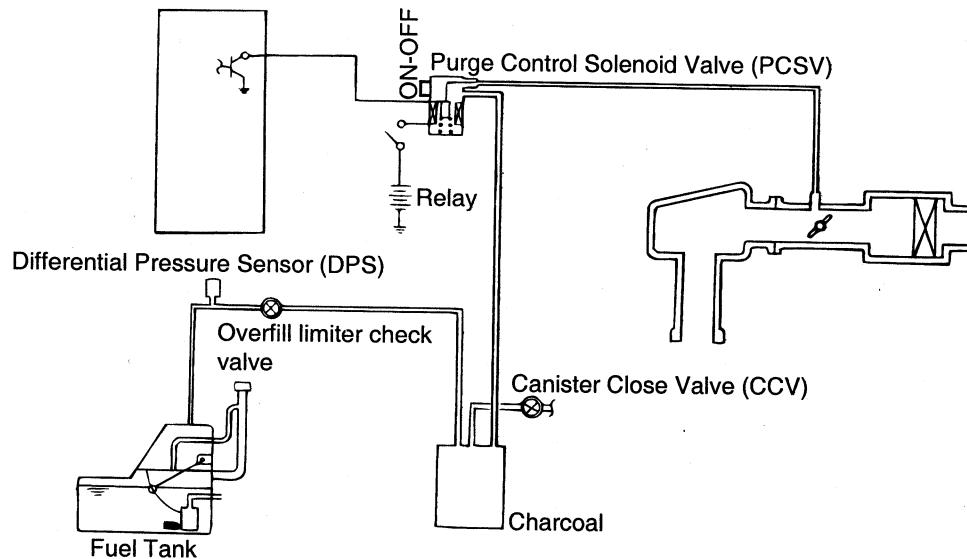
Tightening torque PCV valve : 8-12 Nm(80-120 kg.cm, 6-8 lb.ft)

## EVAPORATIVE EMISSION CONTROL SYSTEM

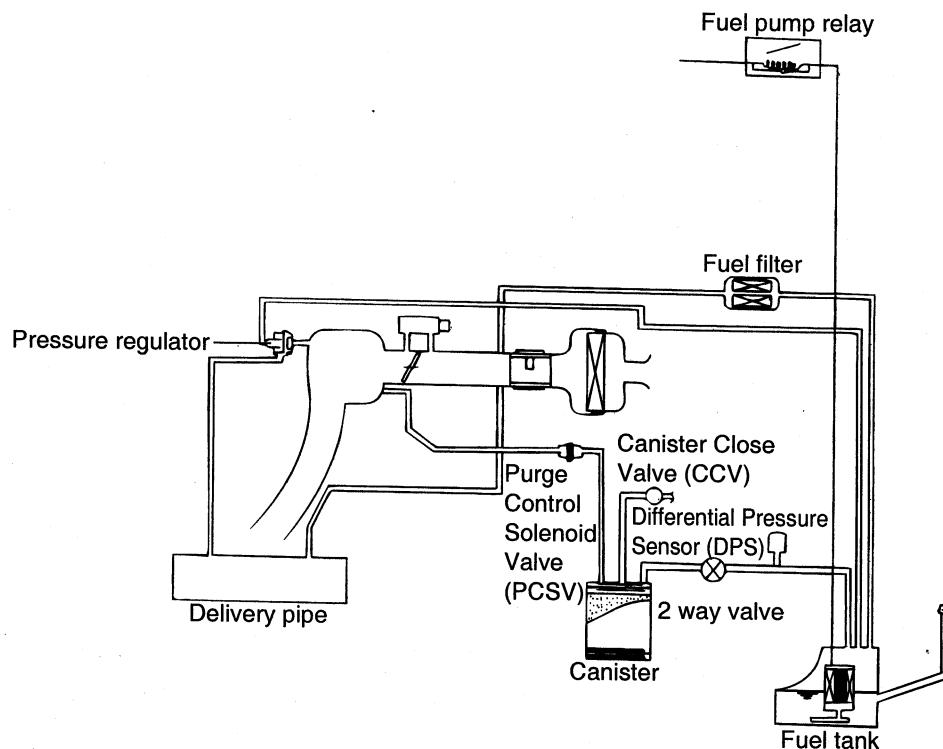
### COMPONENTS

EEJB0180

[2.4 I4]



[2.7 V6]



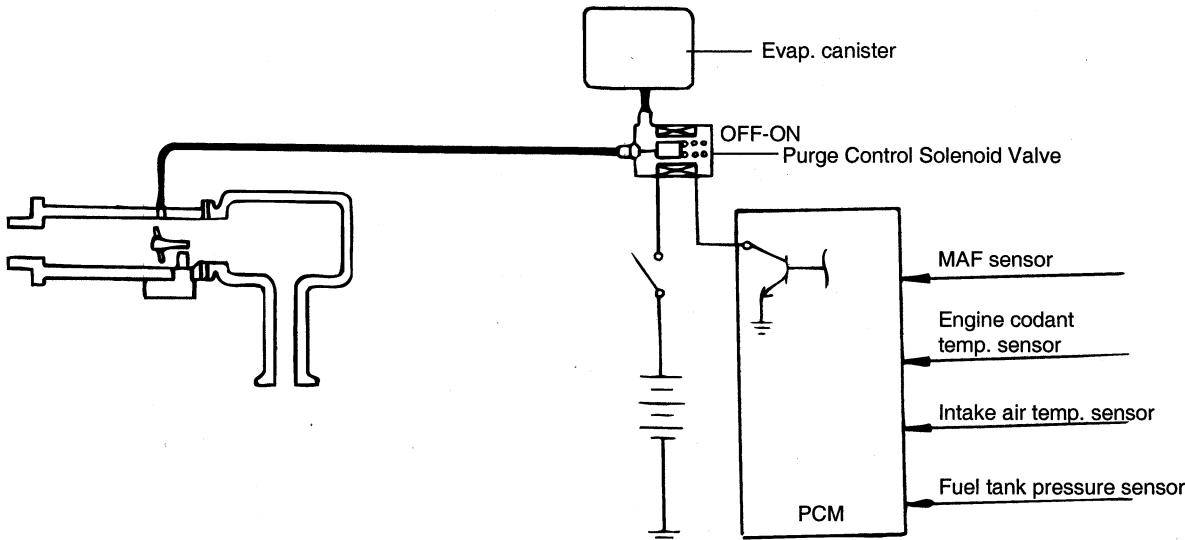
CCV : Canister close valve

DPS : Differential Pressure Sensor

PCSV : Purge Control Solenoid Valve

## EVAPORATIVE (EVAP) CANISTER PURGE SOLENOID VALVE

EEJB0200

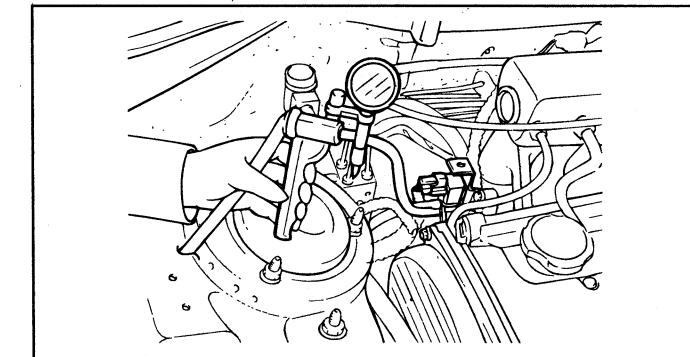


V7EC202A

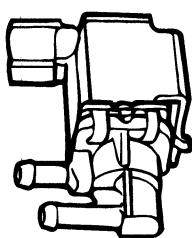
### EVAP CANISTER PURGE CONTROL SOLENOID VALVE

#### NOTE

The Purge Control Solenoid Valve is controlled by the ECM; when the engine coolant temperature is low, and also during idling, the valve closes so that evaporated fuel is not drawn into the surge tank. After the engine warms up during ordinary driving, the valve opens to draw the stored vapors into the surge tank.



EEA902B



EEAA024A

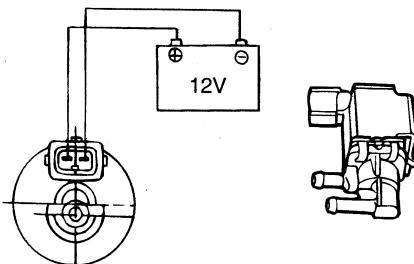
1. Disconnect the vacuum hose (black with red stripe) from the solenoid valve.
2. Detach the harness connector.
3. Connect a vacuum pump to the nipple to which the red-striped vacuum hose was connected.
4. Apply vacuum and check when voltage is applied to the Purge Control Solenoid Valve and when the voltage is disconnected.

#### INSPECTION

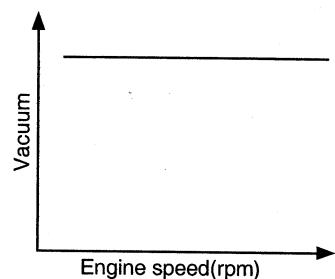
#### NOTE

When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to its original position.

Battery voltage	Normal condition
When applied	Vacuum is released
When disconnected	Vacuum is maintained



EEAA020C

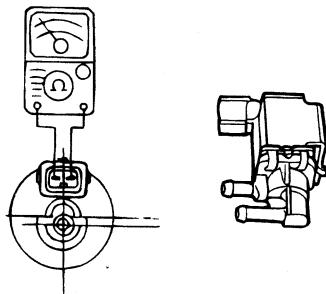


EEA9023B

- Measure the current between the terminals of the solenoid valve.

#### Purge Control Solenoid Valve:

Coil at 20°C (68°F) : 0.45A or below (at 12V)  
Coil resistance : 26Ω [at 20°C (68°F)]

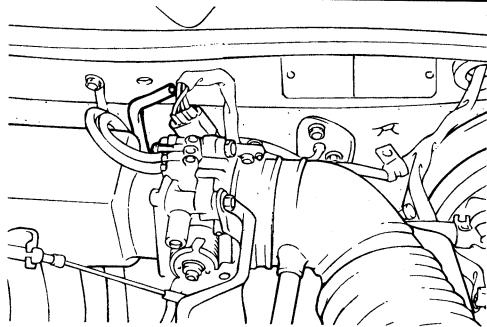


EEAA020D

#### VACUUM HOSE

Engine coolant temperature : 80-95°C (176-205°F)

- Disconnect the vacuum hose from the intake manifold purge hose nipple and connect a hand vacuum pump to the nipple.



EEA9023A

- Start the engine and check that, after raising the engine speed by racing the engine, vacuum remains fairly constant.

#### NOTE

If there is no vacuum created, the intake manifold port may be clogged and require cleaning.

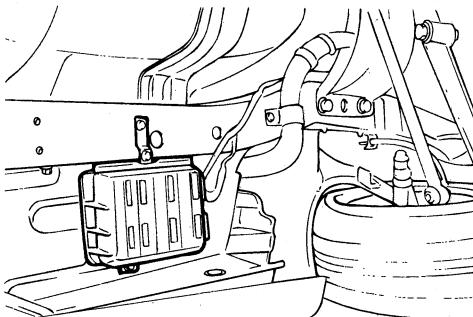
#### EVAPORATIVE (EVAP) CANISTER

EEJB0240

#### CANISTER

Inspect the Canister Close Valve (CCV) and its air filter as shown in the illustration.

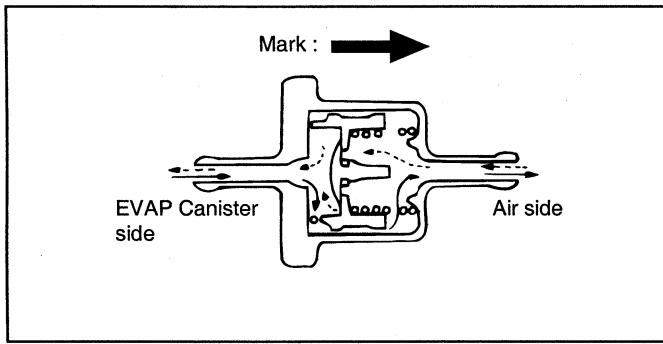
- Look for loose connections, and sharp bends or damage to the fuel vapor lines.
- Look for distortion, cracks or fuel leakage.
- After removing the EVAP Canister, inspect for cracks or damage.



EEA9005E

## TWO-WAY VALVE

1. Inspect that air flows as shown.
2. Check that the valve is connected correctly noting the arrow mark on the valve.



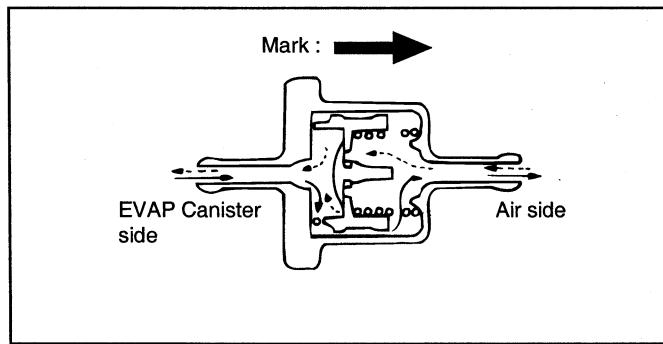
V5EC201D

## OVERFILL LIMITER

### (TWO WAY VALVE)

EEAA0250

To inspect the overfill limiter (two-way valve), refer to the Fuel tank.

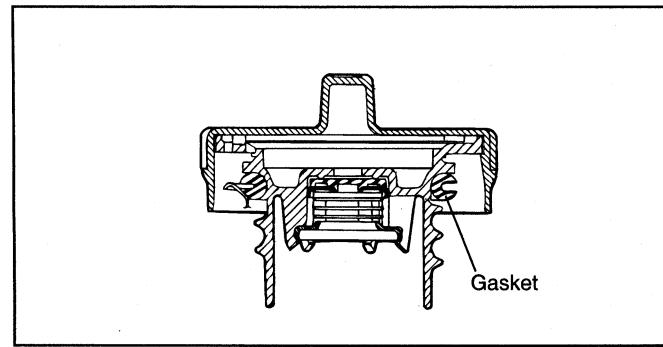


V5EC201D

## FUEL FILLER CAP

EEAA0260

Check the gasket of the fuel filler cap, and the filler cap itself, for damage or deformation. Replace the cap if necessary.



V5EC205A

## EXHAUST EMISSION CONTROL SYSTEM

### VEHICLES WITH CATALYTIC CONVERTER

EEA90270

Exhaust emissions (CO, HC, NOx) are controlled by a combination of engine modifications and the addition of special control components in the fuel.

Modifications to the combustion chamber, intake manifold, camshaft and ignition system form the basic control system. Additional control devices include a catalytic converter and the oxygen sensors which monitor mixture richness.

These systems have been integrated into a highly effective system which controls exhaust emissions while maintaining good driveability and fuel economy.

### AIR/FUEL MIXTURE RATIO CONTROL SYSTEM [MULTIPORT FUEL INJECTION (MFI) SYSTEM]

EEA90280

The MFI system employs the signals from the heated oxygen sensor to activate and control the injector installed in the manifold for each cylinder, precisely regulating the air/ fuel mixture ratio and reducing emissions.

This allows the engine to produce exhaust gases of the proper composition to permit the use of a three-way catalyst. The three-way catalyst is designed to convert the three pollutants (1) hydrocarbons (HC), (2) carbon monoxide (CO), and (3) oxides of nitrogen (NOx) into harmless substances. The two operating modes in the MFI system are as follows:

1. Open loop-air/fuel ratio is controlled by information programmed into the PCM during the manufacturing process.
2. Closed loop-air/fuel ratio varies by the PCM based on information supplied by the heated oxygen sensor.