Chapter 6 Emissions control systems

Contents

1 General information

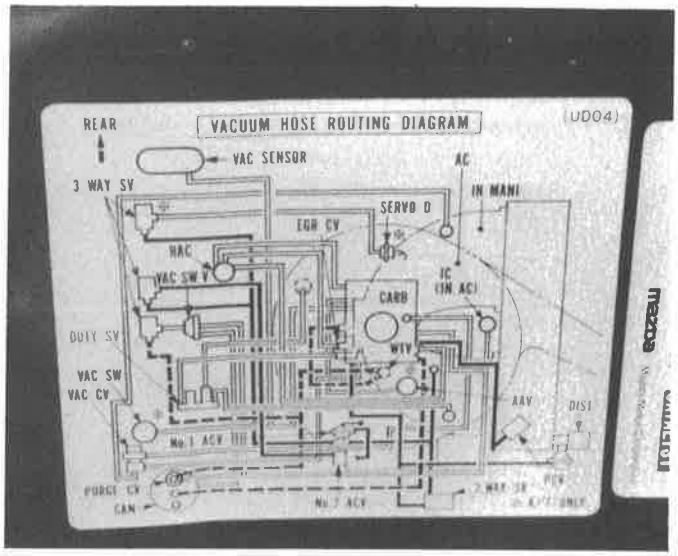
Refer to illustrations 1.5a, 1.5b, 1.7a and 1.7b

As smog standards have become more stringent, the emissions control systems developed to meet these requirements have not only become increasingly more diverse and complex, but are now designed as integral parts of the operation of the engine. Where once the anti-pollution devices used were installed as peripheral "add-on" components, the present systems work closely with such other systems as the fuel, ignition and exhaust systems. All vital engine operations are controlled by the emissions control system.

Because of this close integration of systems, disconnecting or not maintaining the emissions control systems, besides being illegal, can adversely affect engine performance and life, as well as fuel economy.

This is not to say that the emissions systems are particularly difficult for the home mechanic to maintain and service. You can perform general operational checks, and do most (if not all) of the regular maintenance easily and quickly at home with common tune-up and hand tools. **Note:** *The most frequent cause of emissions problems is simply a loose or broken vacuum hose or wire, so always check hoses, wires and connectors before performing major repairs.*

1.5a A typical Vehicle Emissions Control Information (VECI) label



1.5b A typical vacuum hose routing schematic

While the end result from the various emissions systems is to reduce the output of pollutants into the air (namely hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx), the various systems function independently toward this goal. This is the way in which this Chapter is divided.

Note: *Always refer to the Vehicle Emission Control Information (VECI) label* **(see illustration)** *for specific information regarding emissions components on your vehicle. Similarly, always use the vacuum hose routing diagram* **(see illustration)** *as the final word regarding hose routing for your particular vehicle.*

Malfunction indicator light (Federal vehicles only)

Some model years are equipped with a malfunction indicator light which comes on at 60,000 miles and 80,000 miles to indicate maintenance of the emission control system is required. When the light comes on, the emission system must be inspected and its components adjusted, repaired or replaced as necessary.

To reset the malfunction indicator light, locate the connector under the dash **(see illustration)** and switch the connectors as shown **(see illustration)**. Reverse the connection again at 80,000 miles.

2 Positive Crankcase Ventilation (PCV) system

Refer to illustrations 2.2, 2.7, 2.8a and 2.8b

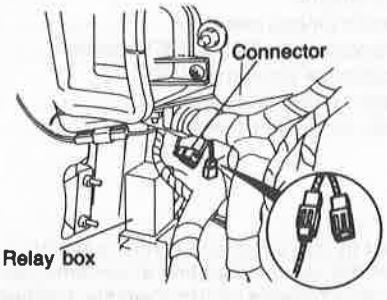
Description

1 The Positive Crankcase Ventilation (PCV) system reduces hydrocarbon emissions by circulating fresh air through the crankcase. This air combines with blow-by gases, or gases blown past the piston rings during compression, and the combination is then sucked into the intake manifold to be reburned.

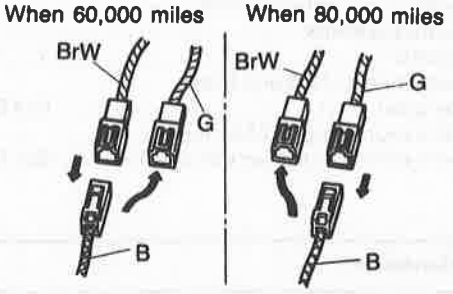
2 The system consists of one air pipe running from the air cleaner to the rocker arm cover, a one-way PCV valve located in the intake manifold and a second air pipe running from the crankcase to the PCV valve **(see illustration)**.

3 During partial throttle operation of the engine, the vacuum created in the intake manifold is great enough to suck the gases from the crankcase, through the PCV valve and into the manifold. The PCV valve allows the gases to enter the manifold but will not allow them to pass in the other direction.

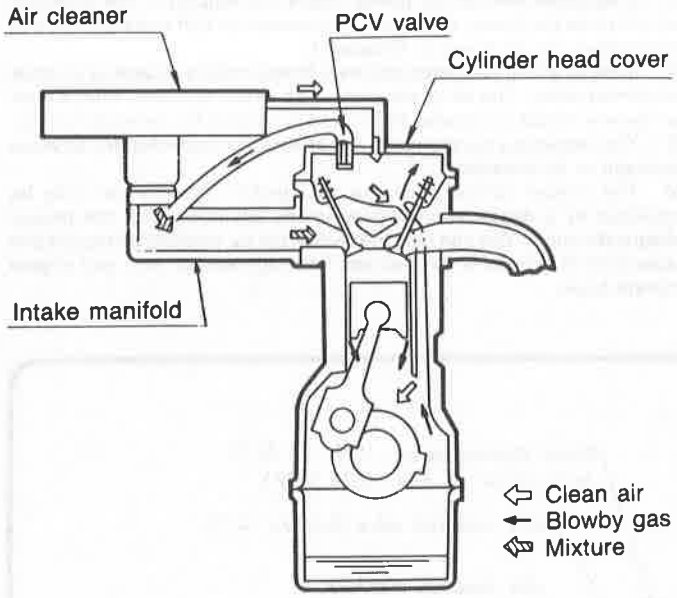
4 The ventilating air is drawn into the rocker arm cover from the air



1.7a The Malfunction Indicator Light (MIL) is located under the dash near the relay box



1.7b When the MIL flashes the first time at 60,000 miles, switch the connectors as shown; when it flashes the second time at 80,000 miles, reverse the connectors again as shown



2.2 A typical Positive Crankcase Ventilation (PCV) system

cleaner and then into the crankcase.

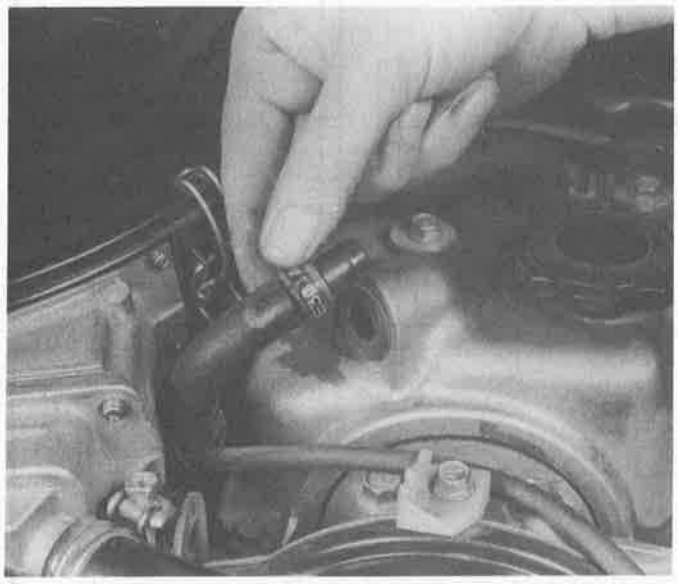
5 Under full throttle operation, the vacuum in the intake manifold is not great enough to suck the gases in. Under this condition, the blow-by gases flow backwards into the rocker arm cover, through the air tube and into the air cleaner, where they are carried into the intake manifold in the normal air intake flow.

Check

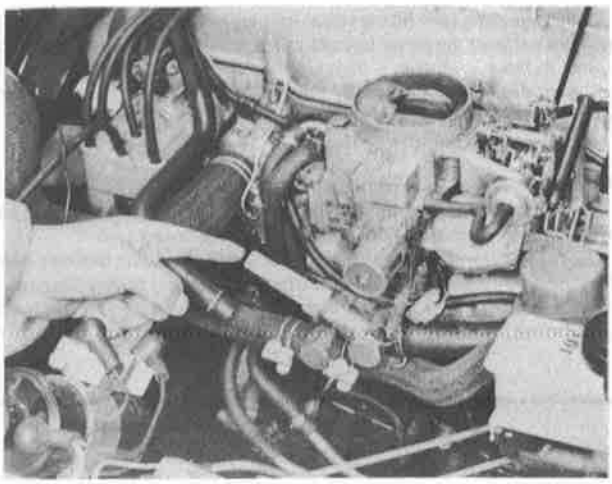
6 Warm up the engine to normal operating temperature and run it at idle.

7 On older vehicles:

a) Disconnect the ventilation hose from the PCV valve (on the intake manifold next to the carburetor).



2.8a Removing the PCV valve and hose from the cylinder head



2.7 To check the PCV valve on an older vehicle, detach the ventilation hose from the valve and, with the engine idling, plug the end of the valve with your finger – if the clicking sound of the valve is audible or if the engine speed drops below idle speed, the valve is okay

b) With the engine idling, plug the inlet of the valve with your finger **(see illustration)**. If the clicking sound of the valve is audible or if the engine speed becomes slightly lower than the idling speed, the valve is okay.

8 On newer vehicles:

a) Detach the PCV valve and the ventilation hose from the cylinder head cover **(see illustration)**.

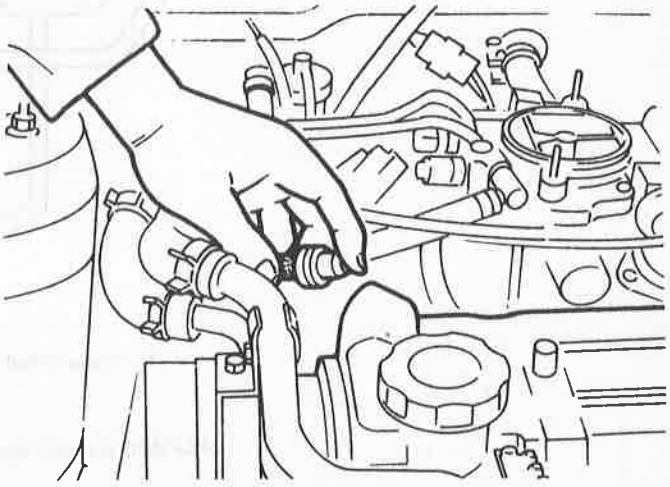
b) Plug the PCV valve opening with your finger **(see illustration)** and verify that the engine speed drops. If it does, the PCV valve is working properly. If it doesn't, replace the PCV valve.

3 Air injection system

Description

Refer to illustrations 3.2a and 3.2b

1 The air injection system (AIS) supplies secondary air into the exhaust system to burn CO and HC in the exhaust gas and to control the 02 signal for the emission control unit.

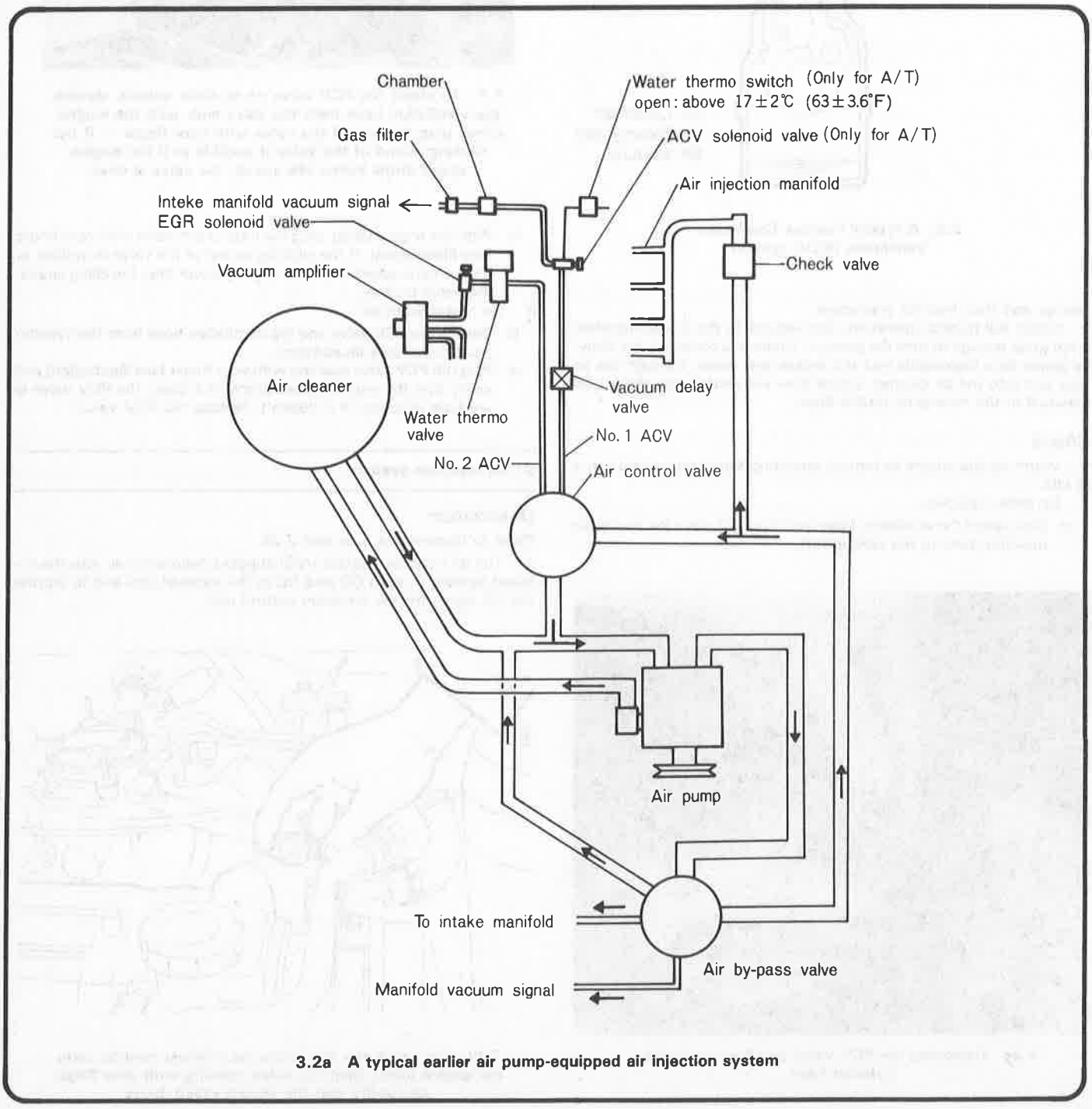


2.8b To check the PCV valve on a newer vehicle, with the engine idling, plug the valve opening with your finger and verify that the engine speed drops

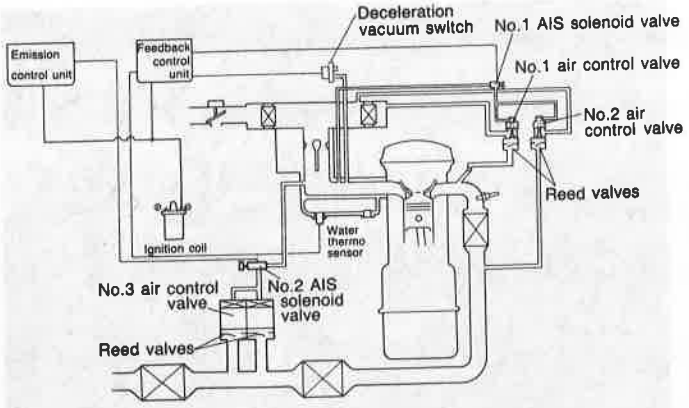
2 Earlier systems **(see illustration)** employ an air pump which pumps air into the exhaust via an air bypass valve controlled by intake manifold vacuum. In later systems, a passive system was introduced and the pump was eliminated. In 1988, the system was placed under computer control **(see illustration)**.

Check

3 If a fault is suspected in this system, the home mechanic can perform a number of inspection and repair procedures.
4 The first check should be of all rubber vacuum and air delivery hoses in the system. Inspect carefully for cracks, splitting or any damage to these hoses and insure that all are securely connected at each end.
5 All hoses, if defective, can easily be replaced, but always use replacement hose of the same type and size.
6 If equipped with an air pump, check the tension of the drivebelt which turns the pump. Additional information on belt replacement and tensioning can be found in Chapter 1.
7 If the air pump has failed internally it may make a squealing or other abnormal noise. The air pump cannot be easily repaired, thus a new or factory-rebuilt pump should be used to replace the defective pump.
8 The remaining components can be visually inspected for obvious damage or deterioration.
9 The overall operation of the air injection system can only be checked by a dealer service department equipped with the proper diagnostic tools. You can help the technician by carefully noting engine operation at various engine speeds (idle/high speed, etc.) and engine temperature.



3.2a A typical earlier air pump-equipped air injection system



3.2b The electronically controlled air injection system used on 1988 and later models

Replacement

Air pump

10 Disconnect the inlet and outlet hoses from the air pump.
11 Remove the strap bolt and disengage the air pump drive belt.
12 Remove the air pump mounting bolt and nut and remove the pump.
13 Installation is the reverse of removal. Be sure to adjust the belt tension (see Chapter 1).

Check valve

14 Disconnect the air hose from the check valve.
15 Unscrew and remove the check valve from the air injection manifold.
16 Install the check valve.
17 Connect the check valve inlet hose.

Air injection manifold

18 Remove the check valve (see above).
19 Loosen the nuts attaching the air injection manifold to the air injection nozzles, then remove the manifold.
20 Installation is the reverse of removal.

Air injection nozzle

21 Remove the air injection manifold (see above).
22 Remove the hot air duct from the exhaust manifold.
23 Loosen and remove the air injection nozzle from the exhaust manifold. **Note:** *If necessary, remove the exhaust manifold and lightly tap out the air injection nozzle with a plastic hammer.*
24 Installation is the reverse of removal.

Air control valve

25 Disconnect the vacuum sensing tubes from the air control valve.
26 Disconnect the air hoses from the air control valve.
27 Remove the air control valve attaching bolts and remove the air control valve.
28 Installation is the reverse of removal.

Reed valve

29 Disconnect the air hose from the reed valve.
30 Loosen and remove the reed valve from the air pipe.
31 Installation is the reverse of removal.

Air pipe

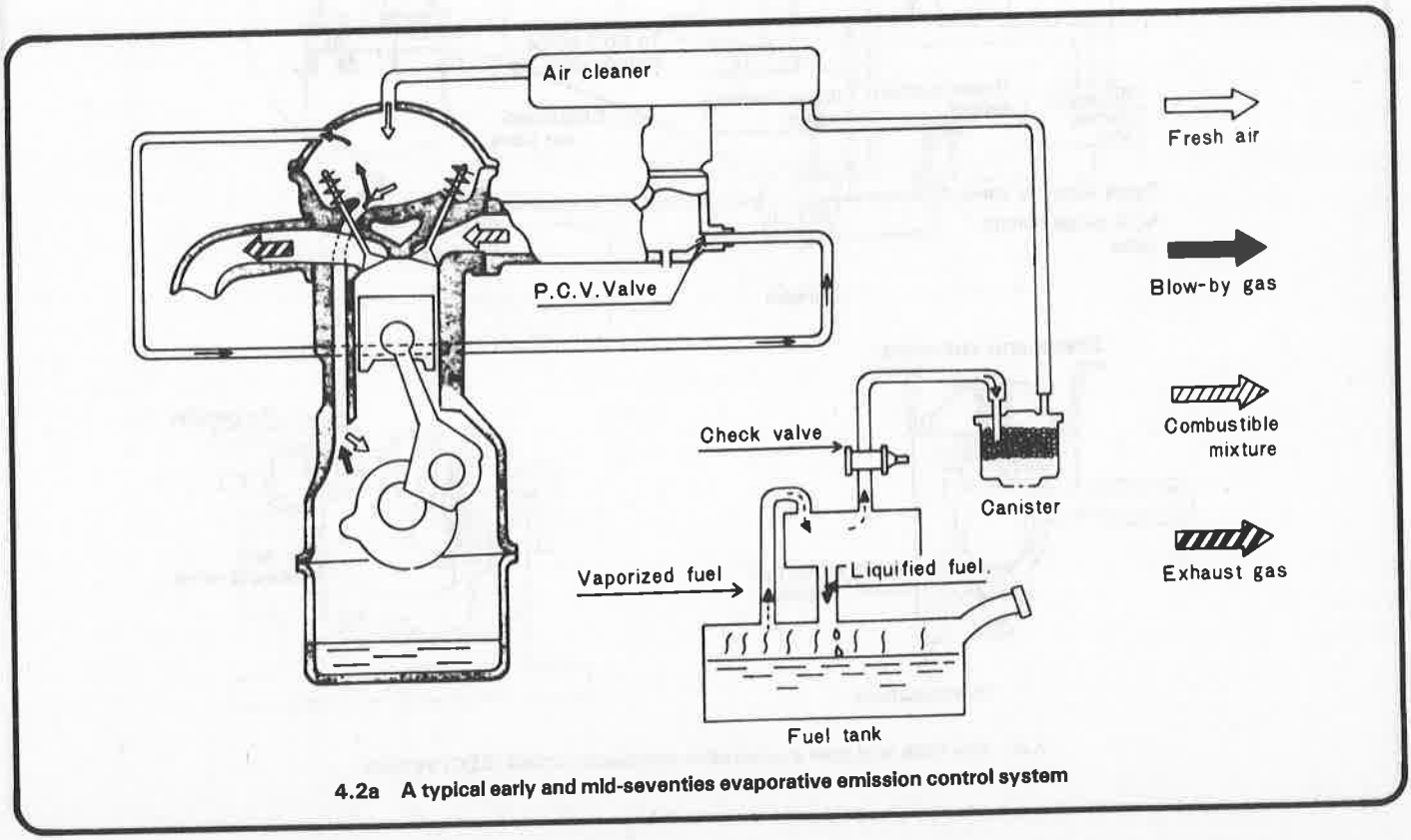
32 Remove the reed valve.
33 Loosen the nut attaching the air pipe to the bolt connector, then remove the air pipe.
34 Installation is the reverse of removal.

4 Evaporative Emission Control (EEC) system

Description

Refer to illustrations 4.2a, 4.2b and 4.4

1 The Evaporative Emission Control (EEC) system stores the fuel vapor generated in the fuel tank and carburetor when the engine is stopped. When the engine is started, the stored fuel vapors are drawn into the intake manifold and burned.
2 Older, non-electronic systems **(see illustration)** are relatively simple:
a) Vapors from the fuel tank are routed into a condenser tank where they condense back to liquid form and drain into the fuel tank.



4.2a A typical early and mid-seventies evaporative emission control system

b) When the engine is operating, those fuel vapors which have not condensed are routed through a carbon canister and into the air cleaner to be drawn into the engine.
c) The carbon canister, located in the engine compartment **(see illustration)**, absorbs and stores fuel vapors until they can be burned.
d) A one-way check valve, located in the line between the condenser tank and the canister, allows fuel vapors to flow to the canister when heat causes the pressure of the vapors in the fuel tank to rise.

3 Later versions of the non-electronic system eliminated the condenser tank. Refer to the Vehicle Emission Control Information (VECI) label to determine whether your system is equipped with a condenser tank.

4 The latest version of the EEC system **(see illustration)**, while generally similar in operation to the systems described above, is more complex because it uses system control devices which are operated by the emission control unit:

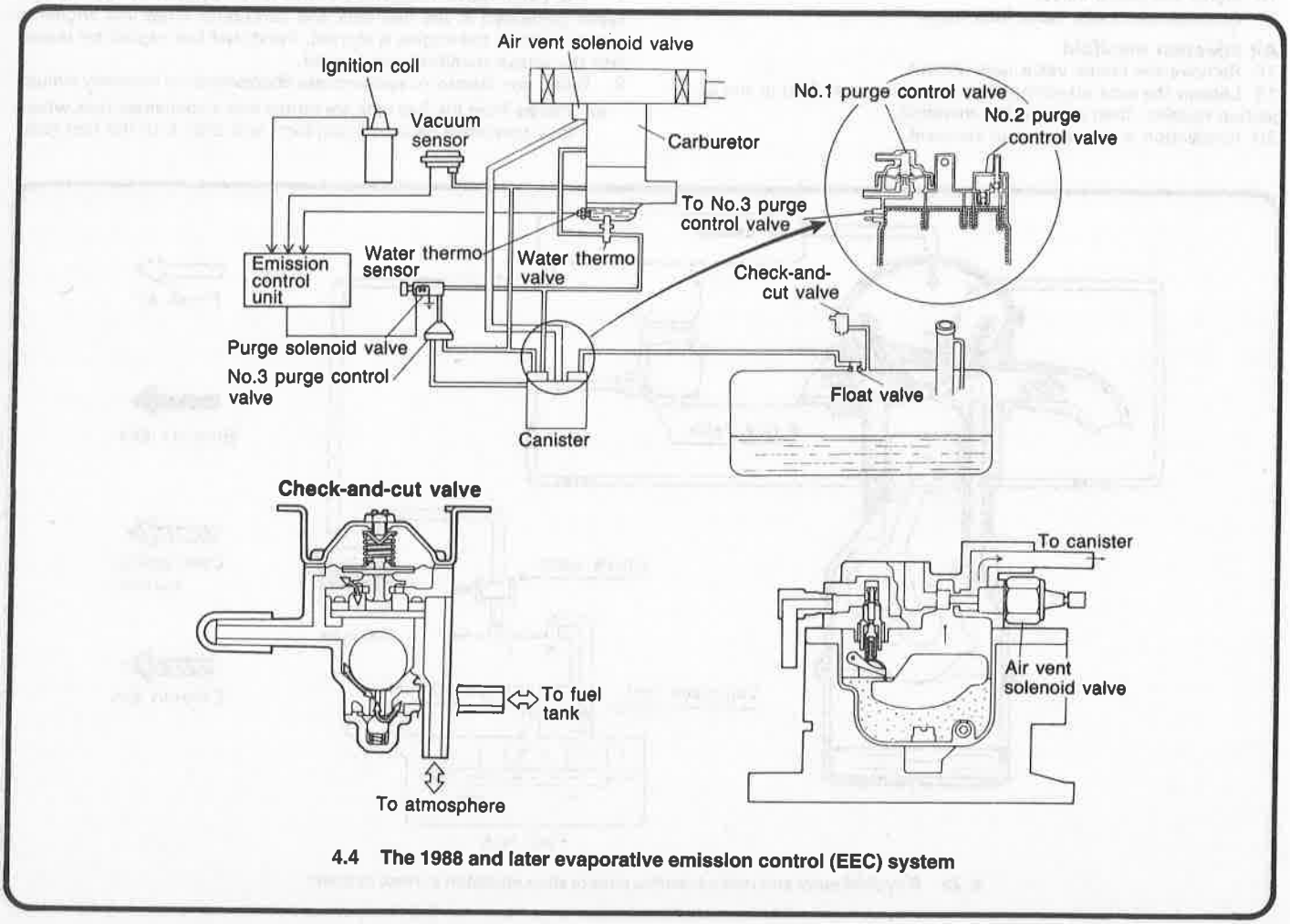
a) The water thermo valve opens the vacuum passage to the No. 1 and No. 3 purge control valves.
b) The No. 2 purge control valve is a two-way check valve and the No. 1 purge control valve opens the fuel vapor passage between the canister and the intake manifold when the purge solenoid is on. Both valves are in the canister.
c) The No. 3 purge control valve opens the fuel vapor passage between the canister and the intake manifold when the purge solenoid is on on.
d) Port vacuum is applied to the No. 1 purge control valve while the engine is running and to the No. 3 purge control valve during running or heavy-load driving.
e) The check-and-cut valve vents vapors to the atmosphere if the evaporative hoses become clogged. It also prevents fuel leakage if the vehicle overturns.

4.2b The charcoal cannister is located next to the battery and can be identified by the many vacuum hoses attached to it

Check

System (all vehicles through 1987 models)

5 Inspect the filler cap, fuel tank, fuel lines, condenser tank (if equipped), check valve and canister for leaks. Make sure that there are no loose connections and that all components are in good condi-



4.4 The 1988 and later evaporative emission control (EEC) system

tion. Inspect all hoses and tubes for deterioration, cracks and holes. Consult the VECI label to determine the hose and fuel line routing on your vehicle and the location of all components.

System (1988 and later models)

Refer to illustrations 4.8, 4.12 and 4.17

6 Inspect the system as described in Step 5 above.
7 Warm up the engine and run it at idle.
8 Disconnect vacuum hose (A) from the No. 1 purge control valve **(see illustration)** and connect a vacuum gauge to the disconnected hose.
9 Increase the engine speed to 2500 rpm and verify that the gauge indicates more than 5.9 in Hg vacuum.
10 It it doesn't, check the water thermo valve (see below).
11 Reconnect hose (A) to the No. 1 purge control valve.
12 Disconnect vacuum hose (B) from the canister and connect a vacuum gauge to the disconnected hose **(see illustration)**.
13 Verify that there is vacuum when the engine speed exceeds 1400 rpm.
14 If no vacuum is evident, check the purge solenoid valve and the No. 3 purge control valve. If they both check out, have the 1V terminal of the emission control unit checked (do not attempt to check it at home without the proper testing equipment or you could damage the control unit).
15 Reconnect hose (B) to the canister.
16 Disconnect the evaporation hose from the evaporation pipe.
17 Connect a vacuum pump to the evaporation pipe **(see illustration)**.
18 Operate the vacuum pump and verify that no vacuum is held.
19 If it is, test the check-and-cut valve and evaporation pipe for clogging.

Canister

20 Inspect the canister for any leakage of the active carbon. Tap the canister. No abnormal sound should be audible.

Check valve (early systems)

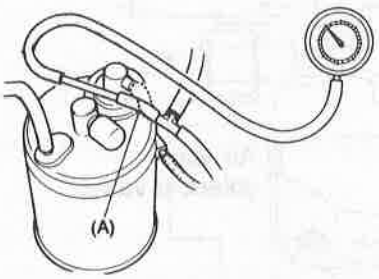
Refer to illustration 4.22

21 Remove the check valve **(see illustration 4.45)**, which is located in the tube between the intake manifold and canister.
22 Using a short section of vacuum hose of appropriate diameter, install a pressure/vacuum pump tester or a pressure gauge to one end of the check valve and plug the other end with your finger **(see illustration)**.
23 Pump, or blow, at least 0.57 psi of air into the check valve. Then apply a vacuum. The valve should vent when either the pressure or vacuum is applied. If it doesn't vent both ways, replace it.

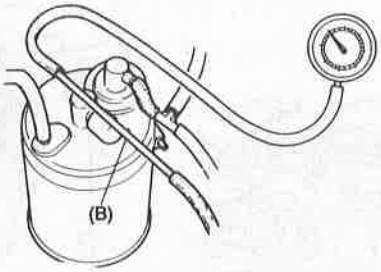
Purge control valve (1980 California vehicles and all 1981 thru 1984 vehicles)

Refer to illustration 4.24

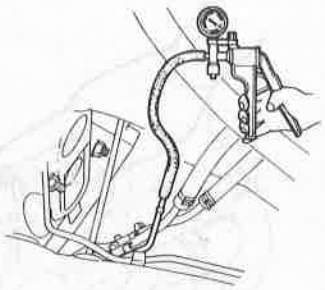
24 Disconnect the vacuum sensing tube (A) from the purge control valve port (E) **(see illustration)**.
25 Disconnect the evaporative hose (B) from the purge control valve port (D) and plug the hose.
26 Start the engine and run it at idle.
27 Connect a suitable hose (C) to port (D).
28 Try to blow through the valve by blowing into hose (C). Air should not pass through the valve.
29 Remove the plug from evaporative hose (B) and connect hose (B) to valve port (E).
30 Again, blow through the valve by blowing into hose (C). This time, air should pass through the valve.



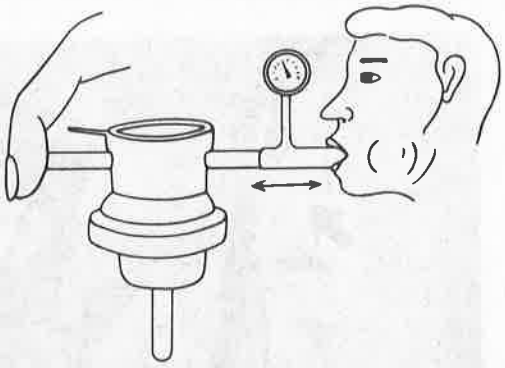
4.8 Disconnect vacuum hose (A) from the No. 1 purge control valve and connect a vacuum gauge to the disconnected hose



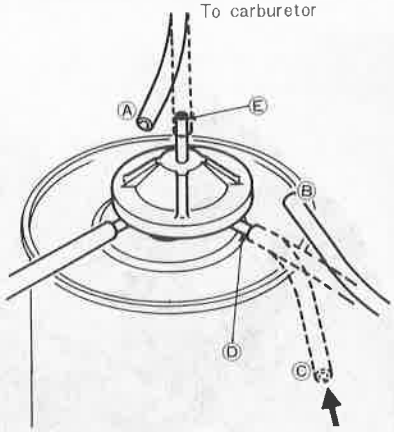
4.12 Disconnect vacuum hose (B) from the canister and connect a vacuum gauge to the disconnected hose



4.17 Disconnect the evaporation hose from the evaporation pipe and connect a vacuum pump to the evaporation pipe



4.22 To test the check valve in earlier EEC systems, connect an air pressure gauge (shown) or a pressure/vacuum pump tester, place your finger over the other pipe, and blow, or pump, air into the valve, then apply a vacuum – the valve should vent when either the pressure or vacuum is applied

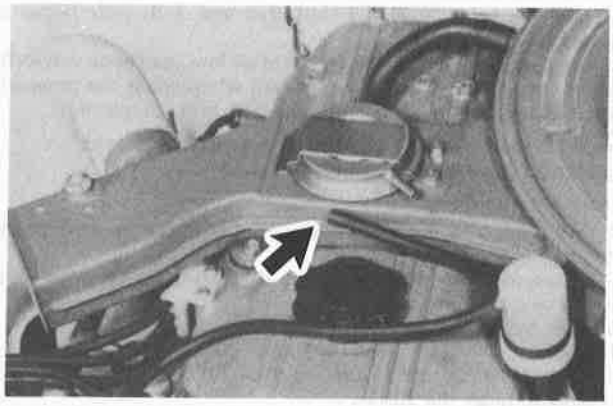


4.24 Checking the purge control valve

Evaporative shutter valve (1981 thru 1984 vehicles)

Refer to illustration 4.35

31 Start the engine and warm to operating temperature.
32 Run the engine at normal idle speed.
33 Remove the air cleaner element (see Chapter 1).
34 Make sure that the evaporative shutter valve opens fully.
35 Disconnect the vacuum sensing tube from the vacuum diaphragm **(see illustration)**. Make sure that the evaporative shutter valve closes fully.



4.35 To check the evaporative shutter valve, start the engine, run it at idle, remove the air cleaner element, make sure the shutter valve opens fully, disconnect the sensing tube (arrow) from the vacuum diaphragm and make sure that the evaporative shutter valve closes fully

Air vent solenoid valve (1986 and later vehicles)

Refer to illustration 4.37

36 Remove the air cleaner (see Chapter 4).
37 Touch the air vent solenoid valve on the carburetor **(see illustration)**.
38 Turn the ignition switch on and off. If there is a clicking noise, the air vent solenoid valve is working properly.

Replacement

Condenser tank (early systems)

Refer to illustration 4.40

39 Raise the vehicle and support it with stands.
40 Locate the tank **(see illustration)**.
41 Disconnect the hoses from the condenser tank.
42 Remove the tank mounting bolts and remove the tank.
43 Installation is the reverse of removal.

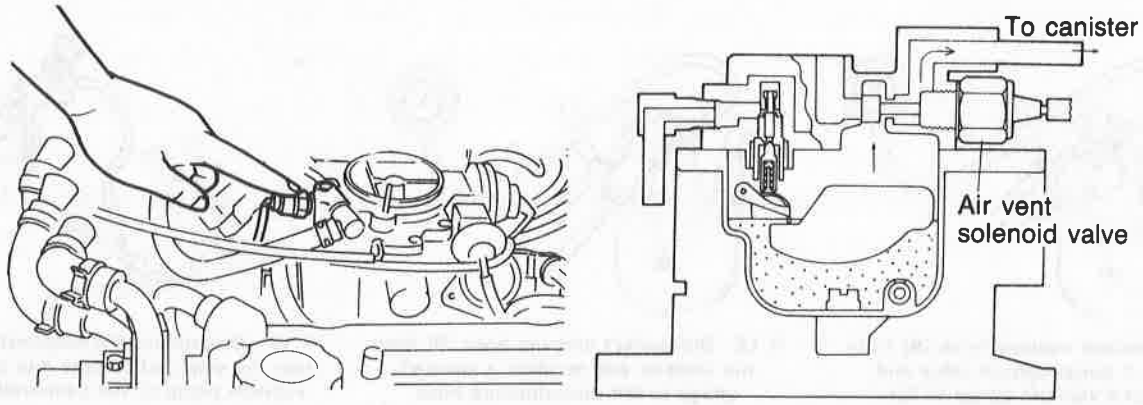
Check valve (early systems)

Refer to illustration 4.45

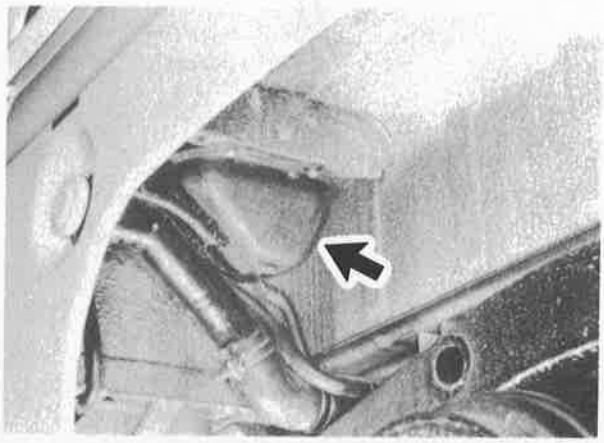
44 Raise the vehicle and support it securely with jackstands.
45 Locate the check valve **(see illustration)**.
46 Disconnect the hoses from the check valve.
47 Remove the bolts securing the check valve and remove the check valve.
48 Installation is the reverse of removal.

Canister

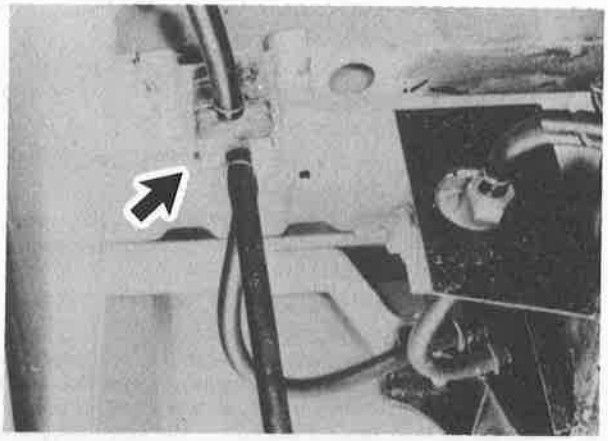
49 Detach the hoses from the canister.
50 Remove the screw holding the canister to the bracket and slip the canister out of the bracket.
51 Installation is the reverse of removal.



4.37 To check the air vent solenoid valve, remove the air cleaner, touch the valve and turn the ignition switch on and off — if you can hear and feel the solenoid valve clicking on and off, it's okay



4.40 The condenser tank (arrow) is located in the right rear wheel well



4.45 The check valve (arrow) used in earlier systems is installed in the hose between the intake manifold and the canister

5 Air intake temperature control system

Refer to illustration 5.2

General description

1 The air temperature control system improves engine efficiency and reduces hydrocarbon emissions during the initial warm-up period of the engine by maintaining a controlled air temperature into the carburetor. Temperature control of the incoming air allows leaner carb and choke calibrations and helps prevent carburetor icing in cold weather.

2 The system **(see illustration)** uses an air control valve located in the snorkel of the air cleaner housing to control the ratio of cold and warm air into the carburetor. This valve is controlled by a vacuum motor which is, in turn, modulated by a temperature sensor in the air cleaner. This sensor closes when the intake air temperature is cold, thus allowing intake manifold vacuum to reach the vacuum motor. When the air is hot, the sensor opens, thus closing off the manifold vacuum.

3 It is during the first few miles of driving (depending on outside temperature) that this system has its greatest effect on engine performance and emissions output. When the engine is cold, the air control valve blocks off the air cleaner inlet snorkel, allowing only warm air from the exhaust manifold to enter the carb. Gradually, as the engine warms up, the valve opens the snorkel passage, increasing the amount of cold air allowed in. Once the engine reaches normal operating temperature, the valve completely opens, allowing only cold, fresh air to enter.

4 Because of this cold-engine-only function, it is important to periodically check this system to prevent poor engine performance when cold, or overheating of the fuel mixture once the engine has reached operating temperatures. If the air cleaner valve sticks in the 'no heat' position, the engine will run poorly, stall and waste gas until it has warmed up on its own. A valve sticking in the 'heat' position causes the engine to run as if it is out of tune due to the constant flow of hot air to the carburetor.

5 With the engine off, note the position of the air control valve inside the air cleaner snorkel. If the vehicle is equipped with an air duct on the end of the snorkel, it will have to be removed prior to this check. If visual access to the valve is difficult, use a mirror. The valve should be down, meaning that all air would flow through the snorkel and none through the exhaust manifold hot-air duct at the underside of the air cleaner housing. Move the control valve. It should be easy to move, but some resistance (from the bimetal spring) should be felt.

6 Now have an assistant start the engine and continue to watch the valve inside the snorkel. With the engine cold and at idle, the valve should close off all air from the snorkel, allowing heated air from the exhaust manifold to enter the air cleaner intake. As the engine warms to operating temperature the valve should move, allowing outside air through the snorkel to be included in the mixture. Eventually, the valve should move down to the point where most of the incoming air is through the snorkel and not the exhaust manifold duct.

7 If the valve did not close off snorkel air when the cold engine was first started, disconnect the vacuum hose at the snorkel vacuum motor and place your thumb over the hose end, checking for vacuum. If there is vacuum going to the motor, check that the valve and link are not frozen or binding in the air cleaner snorkel. Replace the vacuum motor if the hose routing is correct and the valve moves freely.

8 If there was no vacuum going to the motor in the above test, check the hoses to make sure they are not cracked, crimped or disconnected. If the hoses are clear and in good condition, replace the temperature sensor inside the air cleaner housing.

Replacement

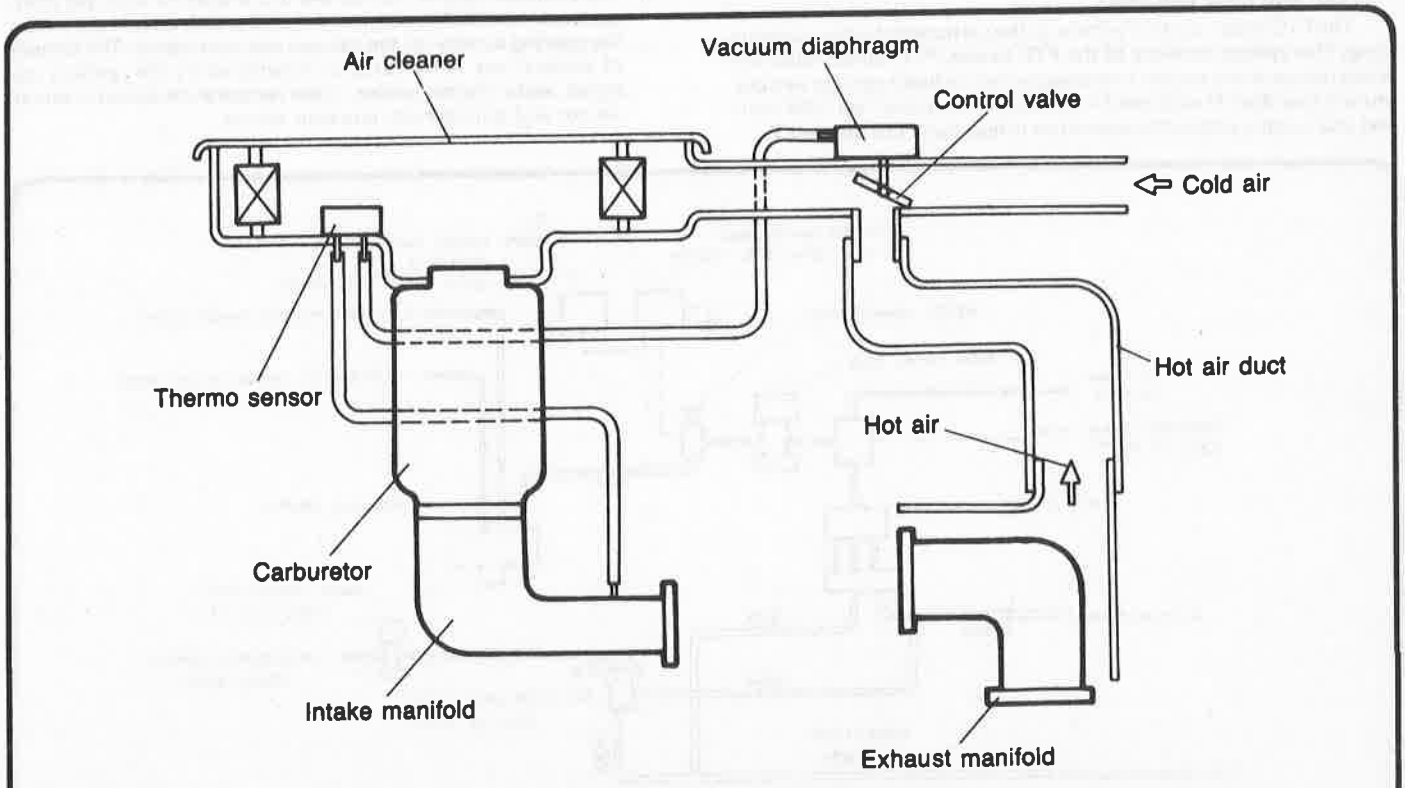
9 Remove the air cleaner assembly.
10 Remove the vacuum motor mounting nuts.
11 Remove the motor.
12 Installation is the reverse of removal.

6 Carburetor control systems

Description

Altitude compensation system (1986 and later vehicles)

1 This system assures an optimum air-fuel ratio at high altitude



5.2 A typical air intake temperature control system

areas and operates at more than 1640 feet above sea level by increasing the amount of air available to the carburetor to prevent overrich air/fuel ratio at high altitudes. The system consists of the high altitude compensator and the carburetor. The high altitude compensator provides additional air bleeds for the primary main and secondary main fuel circuits and supplies additional air into the intake manifold.

Deceleration control system (all vehicles)

2 The deceleration control system reduces HC and CO during deceleration.

3 The 1988 version of this system consists of a slow fuel cut system and a deceleration spark advance system:

a) The slow cut fuel system reduces the fuel flow to decrease HC emissions, to improve fuel economy during deceleration and to cut the fuel flow when the ignition switch is off to prevent run-on.

b) This system advances the ignition timing by controlling the vacuum working on the distributor vacuum diaphragm to reduce HC emissions during deceleration.

Enrichment system (1988 and later vehicles)

4 This system controls the amount of additional fuel fed to the primary system of the carburetor when the engine is cold, during acceleration, when heavy loads are imposed on the engine and during high speed driving.

Hot idle compensation system (1986 and later vehicles)

5 The hot idle system supplies secondary air into the intake manifold to stabilize idle speed when air intake temperature is more than 153-degrees F.

Idle compensation system (1984 vehicles)/Idle-up system (1986 and later vehicles)

6 This system, which is installed on vehicles equipped with an automatic transmission or air conditioning system, raises the idle on those vehicles when either of these systems puts a load on the engine. The system supplies secondary air into the intake manifold to stabilize idle speed when air intake temperature is more than 153-degrees F.

Positive Temperature Coefficient (PTC) heater system (1986 and later vehicles)

7 The PTC heater system warms up the carburetor body to prevent icing. The system consists of the PTC heater, PTC heater relay and water temperature switch. It operates when radiator coolant temperature is less than 41-degrees F (less than 63-degrees F on 1988 models) and engine coolant temperature is less than 153-degrees F.

Vacuum control valve (VCV) systems (1988 and later vehicles)

8 The VCV system prevents fuel from overflowing into the carburetor from the float chamber. While the engine is being driven at full throttle, the float chamber temperature becomes high and may cause fuel in the chamber to bubble and force its way out through the air vent tube and into the carburetor air stream. The VCV system controls float chamber pressure to prevent this bubbling. The vacuum control valve opens the passage from the float chamber to the intake manifold in accordance with the secondary venturi vacuum.

Vacuum switch (1986 vehicles)

9 The vacuum switch improves driveability while driving at high altitudes.

7 Exhaust Gas Recirculation (EGR) system

Refer to illustrations 7.2, 7.3 and 7.9

Description

1 The purpose of the exhaust gas recirculation (EGR) system is to introduce small amounts of exhaust gas into the intake manifold to reduce combustion temperatures and the creation of nitrous oxides (NOx).

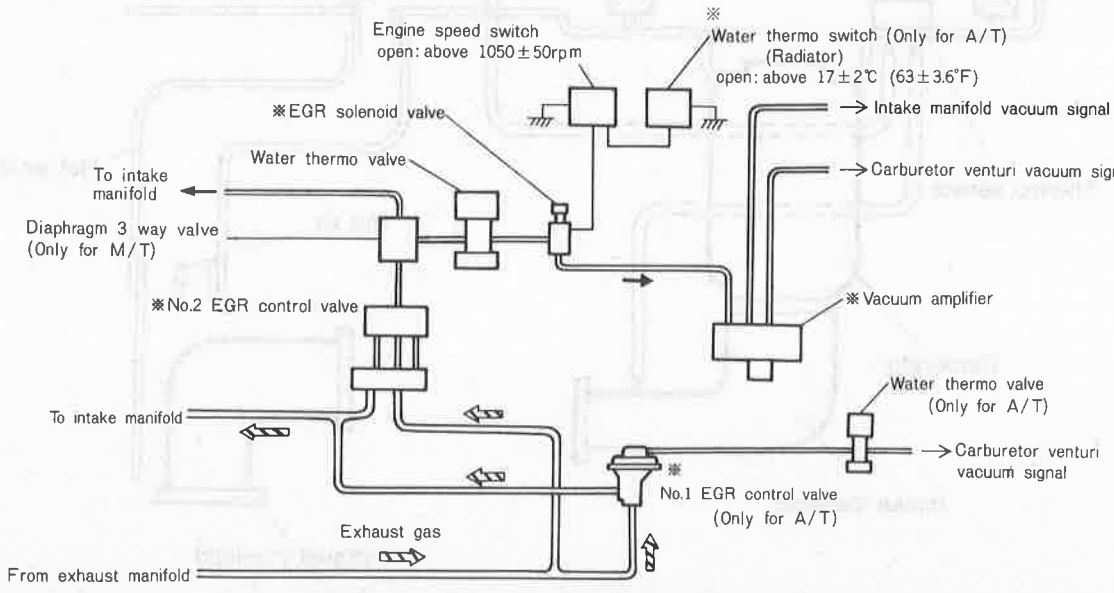
2 Earlier EGR systems **(see illustration)** are controlled by intake manifold vacuum: When the valve is open, a tiny amount of exhaust gas is allowed into the intake manifold; when the valve is closed, no gas is allowed in.

3 On 1986 thru 1988 models **(see illustration)**, the EGR system is also controlled by engine speed (which is monitored and interpreted by the control unit).

a) The EGR control valve controls the amount of exhaust gas flowing into the intake manifold.

b) The duty solenoid valve consists of a vacuum valve and a vent valve. The vacuum valve opens the vacuum passage to the EGR control valve, and the vent valve vents the vacuum from the vacuum valve to control vacuum according to signals from the emission control unit.

c) The emission control unit senses the amount of EGR gas recirculated by the EGR position sensor on the EGR valve and controls the opening duration of the vacuum and vent valves. The amount of exhaust gas recirculated is determined by the ignition coil signal, water thermo sensor, water temperature sensor, vacuum sensor and atmospheric pressure sensor.



7.2 A typical early model EGR system

Check

4 Due to a number of factors, checking the EGR system on these vehicles by the home mechanic should be limited to simple visual and functional checks as follow.

5 Most problems with this system can be traced to defective vacuum hoses. Carefully inspect all EGR system hoses for splitting or damage and check that they are securely installed at each end.

6 Disconnect each hose (one at a time to prevent confusion) and blow air through the hose to insure there is no blockage.

7 The EGR valve itself will sometimes stick in either the open or closed postion due to hardened deposits.

8 Locate the EGR valve. You will notice that the bottom of the valve has openings, allowing you to see (and feel with your fingers) the diaphragm inside.

9 With the engine cold to prevent burns, use your finger to attempt to move the diaphragm up and down. If it won't move or moves with great difficulty, chances are the valve is defective and should be replaced with a new one **(see illustration)**.

8 Catalytic converter

Description

1 Pre-1984 vehicles are equipped with a single converter located under the vehicle floor pan. Newer vehicles are also equipped with another converter located immediately below the exhaust manifold.

2 The rear converter on all vehicles is a conventional oxidation catalyst. It reduces hydrocarbons (HC) and carbon monoxide (CO).

3 The front converter on newer vehicles is known as a three-way catalyst. It reduces HC, CO and NOx.

Check

4 Because of the special tools required to check catalytic converters, the checking procedure is beyond the scope of the home mechanic. Take the vehicle to a dealer to have it checked by a professional.

5 Whenever the vehicle is raised for any reason, always be sure to inspect the physical condition of the converter(s):

a) Note any dings or dents in the protective heat shield that might impair the performance of the converter(s).
b) Make sure that there is adequate clearance between the converter(s) and the vehicle.
c) Make sure that the flange bolts at either end of the converters are tight. Check the fittings on the air injection pipes attached to the three-way catalyst (if equipped). Make sure they are tight.

Replacement

6 See Chapter 4.

9 Engine control system

Description

1 The engine control system, (called the feedback or "closed loop" system on carburated models) maintains the air-fuel mixture at an ideal ratio of 14.7:1, reduces CO, HC and NOx emissions and minimizes fuel consumption.

2 There are several versions of this system. They include various combinations of the following components: the ignition coil, the ignition switch, the idle switch, the clutch switch, the neutral switch, the vacuum switch, the vacuum sensor, the oxygen sensor, the intake air temperature sensor, the water thermo sensor, the water temperature switch, the throttle sensor, the deceleration vacuum switch, the A/C switch, the air/fuel (A/F) solenoid valve, fuel injection system and the computer control unit.

Carbureted models

3 The B2200 control unit detects engine speed, intake manifold vacuum, coolant temperature, oxygen concentration in the exhaust gas, position of the valve in the EGR control system, etc. It uses this information to control the fuel control system and the EGR control system.

4 The B2600 has two control units for the fuel and emission control system and responds similarly.

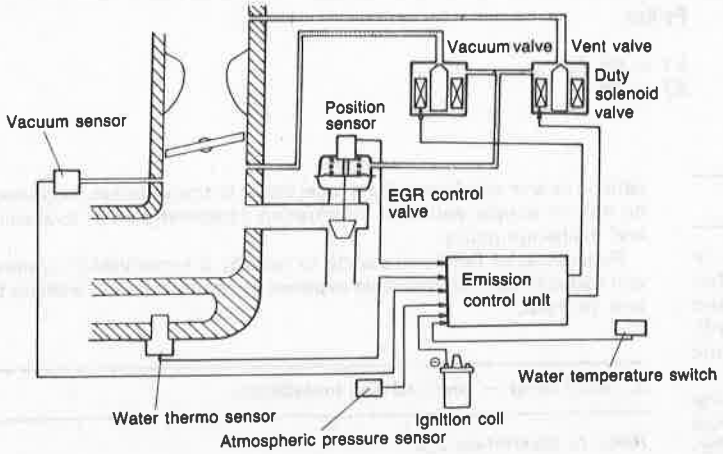
5 The engine control system and control unit(s) regulate the amount of fuel metered through the air/fuel (A/F), or jet mixture, solenoid valve which determines the amount of fuel added to the primary main circuit and air added to the primary slow circuit.

Fuel injected models

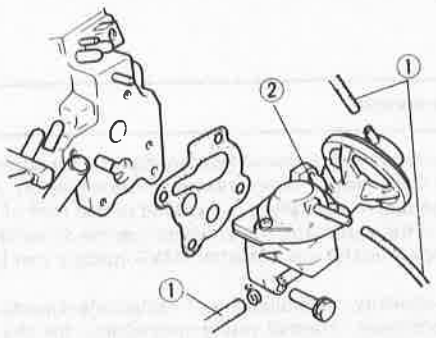
6 On these models, the engine control unit computer (called the EGI) gathers information from relays and sensors located in the engine compartment involved with engine and meters the fuel to the injectors to keep the makeup of the exhaust within certain limits. It can do this more precisely because the design of the fuel injection system allows for better fuel management. The emissions system components on fuel injected models are very similar to those on carbureted models except that many are operated by the EGI. More information on the fuel injection system can be found in Chapter 4.

Check

7 Because of the specialized diagnostic equipment required to check the engine control system, the control unit(s) and the components of the system, testing procedures are beyond the scope of the average home mechanic. This system must be checked and repaired by a professional mechanic.



7.3 The computer controlled EGR system as used on 1988 and later models



7.9 An exploded view of the EGR control valve on the B2600 — note the cut out portion on the bottom which allows access to the diaphragm