Chapter Four
Emission Controls and Fuel System

Emission Controls

There are three types of automotive pollutants; crankcase fumes, exhaust gases and gasoline evaporation. The equipment that is used to limit these pollutants is commonly called emission control equipment.

CRANKCASE EMISSION CONTROLS

The crankcase emission control equipment consists of a positive crankcase ventilation valve (PCV), a closed or open oil filler cap and hoses to connect this equipment.

When the engine is running, a small portion of the gases which are formed in the combustion chamber during combustion leak by the piston rings and enter the crankcase. Since these gases are under pressure they tend to escape from the crankcase and enter into the atmosphere. If these gases were allowed to remain in the crankcase for any length of time, they would contaminate the engine oil and cause sludge to build up. If the gases are allowed to escape into the atmosphere, they would pollute the air, as they contain unburned hydrocarbons. The crankcase emission control equipment recycles these gases back into the engine combustion chamber where they are burned.

Crankcase gases are recycled in the following manner: while the engine is running, clean filtered air is drawn into the crankcase through the carburetor air filter and then through a hose leading to the rocker cover. As the air passes through the crankcase it picks up the combustion gases and carries them out of the crankcase, up through the PCV valve and into the intake manifold. After they enter the intake manifold they are drawn into the combustion chamber and burned.

The most critical component in the system is the PCV valve. This vacuum controlled valve regulates the amount of gases which are recycled into the combustion chamber. At low engine speeds the valve is partially closed, limiting the flow of gases into the intake manifold. As engine speed increases, the valve opens to admit greater quantities of the gases into the intake manifold. If the valve should become blocked or plugged, the gases will be prevented from escaping from the crankcases by the normal route. Since these gases are under pressure, they will find their own way out of the crankcase. This alternate route is usually a weak oil seal or gasket in the engine. As the gas escapes by the gasket, it also creates an oil leak. Besides causing oil

leaks, a clogged PCV valve also allows these gases to remain in the crankcase for an extended period of time, promoting the formation of sludge in the engine.

The above explanation and the troubleshooting procedure which follows applies to all engines with PCV systems.

Testing

Check the PCV system hoses and connections, to see that there are no leaks; then replace or tighten, as necessary.

To check the valve, remove it and blow through both of its ends. When blowing from the side which goes toward the intake manifold, very little air should pass through it. When blowing from the crankcase (valve cover) side, air should pass through freely.

Replace the valve with a new one, if the valve fails to function as outlined.

NOTE: *Do not attempt to clean or adjust the valve; replace it with a new one.*

Removal and Installation

To remove the PCV valve, simply loosen the hose clamps and remove the valve from the manifold-to-crankcase hose. Install the PCV valve in the reverse order of removal.

EVAPORATIVE EMISSION CONTROL SYSTEM

When raw fuel evaporates, the vapors contain hydrocarbons. To prevent these nasties from escaping into the atmosphere, the fuel evaporative emission control system was designed.

The system consists of a sealed fuel tank with a fuel and vapor separator, a carbon-filled vapor storage canister, a vacuum switching valve and hoses used to connect these components (in the above order) leading from the gas tank to the intake manifold.

In operation, the vapor formed in the fuel tank passes through the separator and enters into the charcoal canister. The charcoal absorbs the fuel vapor and stores it in the canister. When a predetermined speed is reached and there is sufficient vacuum present in the intake manifold, the vacuum switching valve opens. This allows the stored fuel vapor, along with fresh air, to be routed into the intake manifold and combustion chamber.

Inspection and Service

The fuel and vapor lines, hoses, pipes and connections should be in good condition with no signs of leakage.

Clean and inspect the storage canister for damage every 12,000 miles. Replace the canister every five years.

Inspect the fuel vapor check valve every year and replace it every two years or 24,000 miles.

Removal and Installation

Removal and installation of the various evaporative emission control system components consists of disconnecting the hoses, loosening retaining screws, and removing the part which is to be replaced or checked. Install in the reverse order. When replacing hose, make sure that it is fuel and vapor-resistant.

EXHAUST EMISSION CONTROL

Air Injection System

The air injection system controls exhaust emissions by burning the hydrocarbons and carbon monoxide in the exhaust ports of the cylinder head.

Air is pumped into the exhaust ports near each exhaust valve. The oxygen in the air plus the heat of the exhaust gases causes further combustion of the gases.

Air drawn from the carburetor air cleaner into the air pump is pressurized and routed through the air by-pass valve, check valve, the air injection manifold, and finally, into the air injection nozzles and the exhaust ports.

When the carburetor throttle plates are suddenly closed (deceleration), there is a sudden overly-rich air/fuel mixture present in the intake manifold, which will cause more hydrocarbons and carbon monoxide in the exhaust manifold. To prevent backfiring during deceleration, the air by-pass valve routes the air coming from the air pump into the intake manifold during deceleration, leaning out the mixture in the intake manifold.

In the event that the engine should backfire in the exhaust manifold, the check valve at the air injection manifold will close and block the reverse flow of

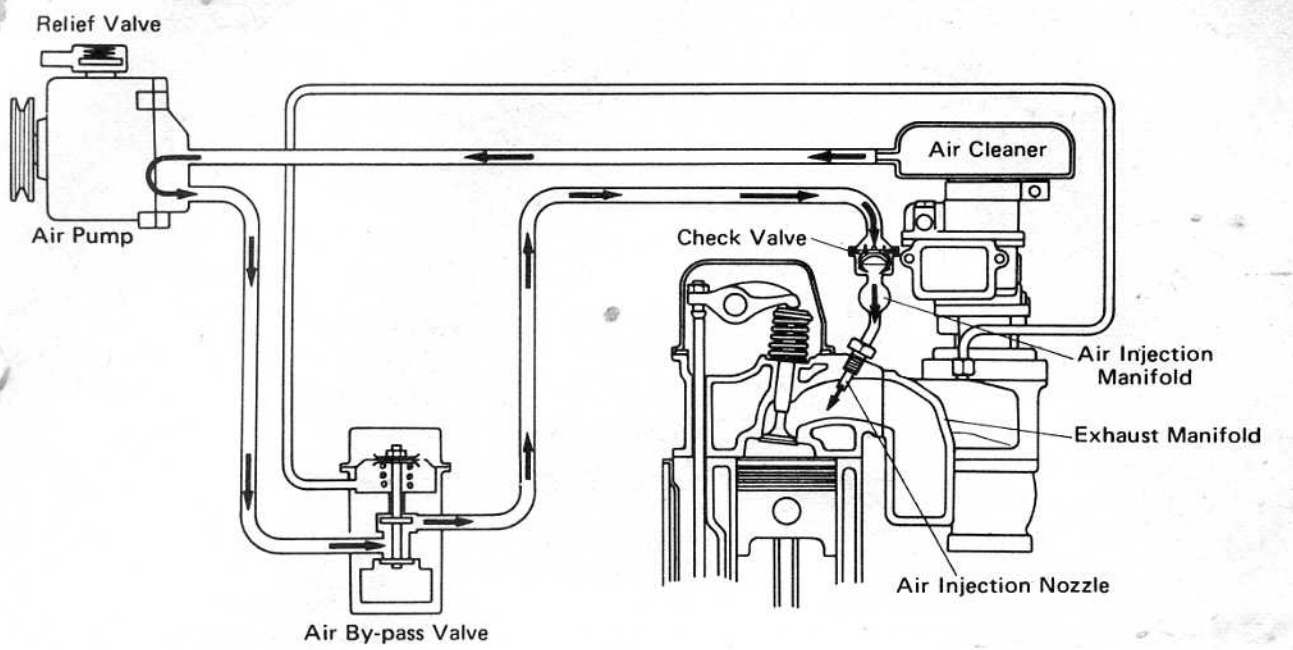

Diagram of the Air Injection Reactor (AIR) system used in 1973–75—except California

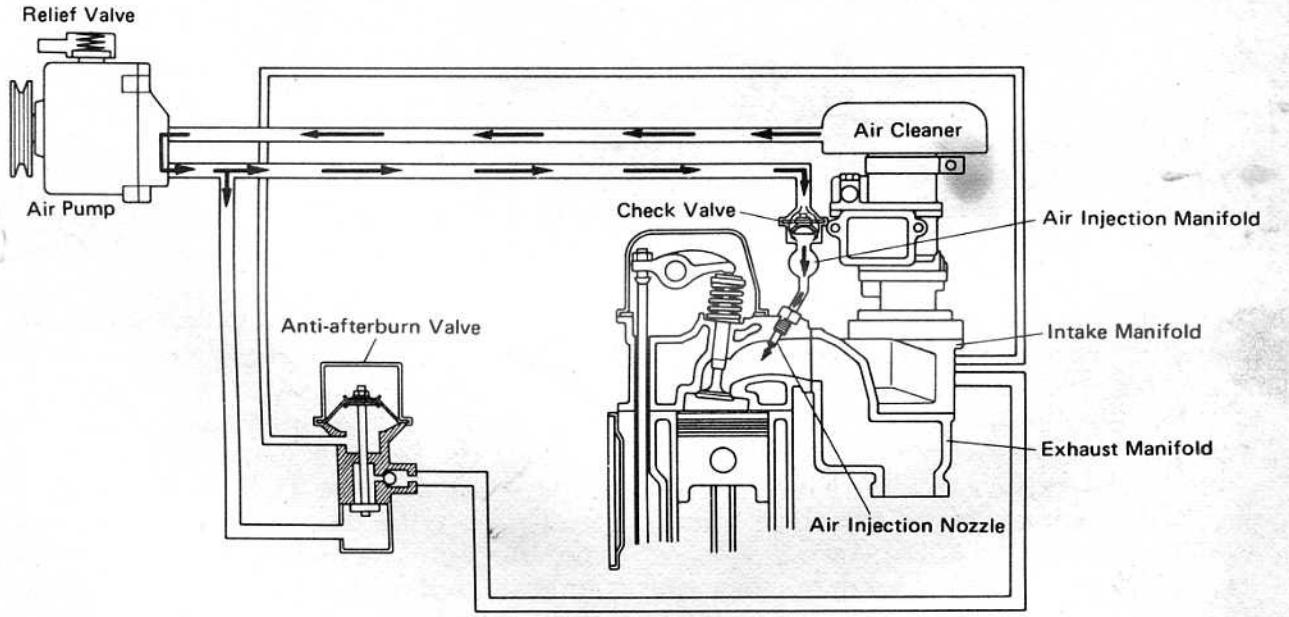

Diagram of the Air Injection Reactor (AIR) system used in 1974–75—California

air, preventing possible damage to the air pump.

Throttle Positioner

The throttle positioner system is designed to stop the throttle valve, when it is suddenly closed during deceleration, at a position which will leave the throttle valve open slightly more than at idle. This will allow more air to be drawn into the intake manifold to alleviate the overly-rich air/fuel mixture present during deceleration. This promotes better combustion and lower hydrocarbon emissions.

The system incorporates a speed sensor, which senses vehicle speed, an electrical computer, a vacuum switching valve (VSV), and a vacuum diaphragm-operated throttle positioner with an adjusting screw.

When the vehicle speed reaches the On range, the computer closes an electrical circuit leading to the vacuum switching valve. The flow of electrical current to the VSV causes atmospheric