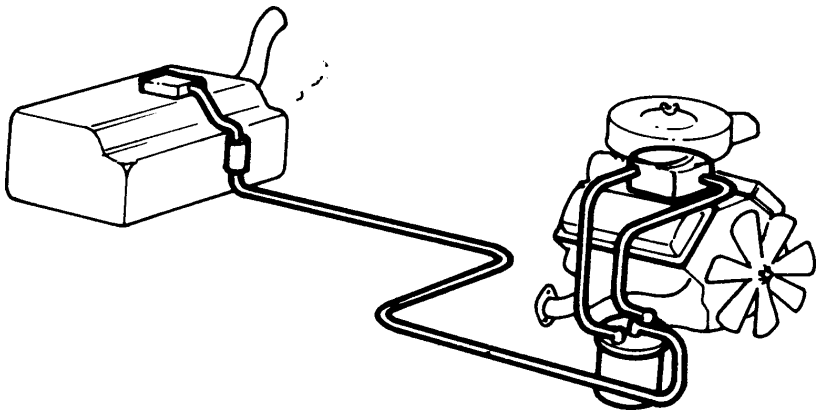
HOW - TO
EMISSION CONTROL BASICS



Tool And Material Checklist

- ☐ Bore Brush
- ☐ Thermometer
- ☐ Portable Vacuum Pump
- ☐ Screwdriver
- ☐ Combination Wrench Set
- ☐ 3/8” Drive Socket Set
- ☐ Tachometer
- ☐ Rag
- ☐ Service Manual
- ☐ Hose
- ☐ Stiff Paper
- ☐ Cleaning Solution
- ☐ Tape
- ☐ Safety Glasses or Goggles

Before beginning any emissions work, check to see what state law requires. Some states require specific emission control systems for all registered cars. Furthermore, some states permit only licensed or qualified auto mechanics to test, service, and repair emission control systems.

NOTE: Always wear safety glasses or goggles whenever doing work of any kind on a running engine.

PCV SYSTEM

The PCV, or positive crankcase ventilation, system relies on intake manifold vacuum to move air through the crankcase when the engine is running. A malfunctioning PCV system can cause:

- Oil contamination (sludge)
- Increased oil consumption
- Contaminant vapors to escape from the dipstick tube, oil filler cap, valve cover gasket areas, and other openings to the crankcase
- Oil to leak at any of the hose or tube connections, around the engine, or into the air filter housing

The PCV system should be checked every 12 months or 12,000 miles, whichever comes first. Make a thorough check of the system as follows:

1. Inspect the hoses. They should not be hard, brittle, or cracked, and the connections should not be loose or sloppy. The PCV system must be airtight to operate efficiently.
2. Replace any deteriorated hoses and fix any loose connections.
3. Start the engine and remove the PCV valve. If the valve is not plugged, a hissing noise will be heard as air passes through it, and a strong vacuum should be felt when a finger is placed over the inlet valve.
4. Reinstall the PCV valve, then remove the breather element. On some cars the breather element is located inside the air cleaner; on others it can be found on the rocker cover.
5. Loosely hold a piece of stiff paper over the opening in the rocker cover. After allowing about 1 minute for the crankcase pressure to decrease, the paper should be sucked against the opening in the rocker cover with noticeable force.
6. Turn off the engine and remove the PCV valve from the rocker cover. Shake it and listen for a clicking noise to indicate that the valve is free.
7. If the system has checked out fine so far, no further service is required; if not, the PCV valve should be replaced and the system rechecked.

NOTE: In the event of problems, install a new PCV valve. Do not clean and reuse the old valve.

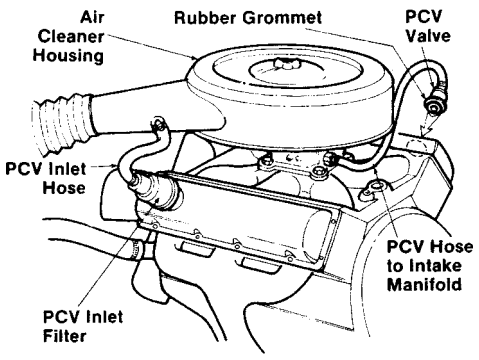
8. With the new PCV valve installed and the engine running, repeat step 5. If the paper is still not sucked against the rocker cover opening, clean out the PCV valve hose and passage in the lower part of the carburetor.
9. To clean the PCV hose, wash it in a cleaning solution such as mineral spirits and use a bore brush to scrub out the interior walls. Never soak a hose in a strong solvent such as carburetor cleaner; this type of solution can swell the hose.

THERMOSTATIC AIR CLEANER SYSTEM

In addition to controlling pollution, the thermostatic air cleaner system aids in cold weather starts.

To test the system, proceed as follows:

1. Check the condition of the hoses and connections.
2. Remove the air cleaner.
3. Securely tape a thermometer next to the air cleaner sensor.
4. Replace the air cleaner cover without the wing nut.
5. With the engine off, check the heat control damper door position through the snorkel opening.



Inspection points in a typical PCV system

If this passage is not open, check for binds in the door linkage.

6. Start and idle the engine. With the temperature below 85° F, the door should be up.

7. When the door begins to move down, remove the air cleaner cover and observe the thermometer; it should be between 85° and 115° F. If it is not, check the vacuum motor.

Inspect the vacuum motor as follows:

1. With the engine off, disconnect the vacuum line from the vacuum motor.

2. Connect a portable vacuum pump to the motor.

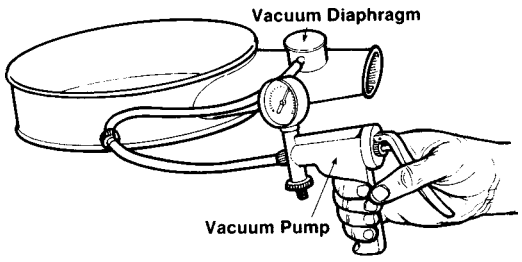
3. Apply 20" of vacuum. The pressure reading should not drop below 10" of vacuum for a full 5 minutes.

4. Bleed off the vacuum pressure.

5. Apply *5"* of vacuum while observing the damper door; it should begin to lift from the bottom of the snorkel.

6. Increase the vacuum to between *9"* and 10". The damper door should now move to the full UP position. If it does not, replace it and recheck.

7. Otherwise, replace the sensor and recheck.



Testing the vacuum motor diaphragm with a vacuum pump

To replace the vacuum motor:

1. Remove the air cleaner assembly.

2. Disconnect the vacuum hose from the vacuum motor.

3. Tip the motor slightly forward to disengage the lock and rotate it counterclockwise.

NOTE: Some motors are fastened by rivets which must be drilled out.

4. Unhook the motor's rod from the damper door.

5. Check the damper door for freedom of movement.

6. Insert the new motor's rod into the damper door.

7. Position the motor assembly tongs into the proper openings. Turn the motor clockwise until the lock engages firmly.

8. Reinstall the air cleaner.

9. Retest the operation of the damper door, making sure it opens at the correct temperature.

To replace the sensor:

1. Remove the air cleaner assembly.

2. Turn the assembly upside down and remove the hoses from the sensor.

3. Remove the sensor's retaining clips.

4. Turn the air cleaner right side up and remove the sensor and gasket.

5. Install the new sensor, gasket, and retaining clips.

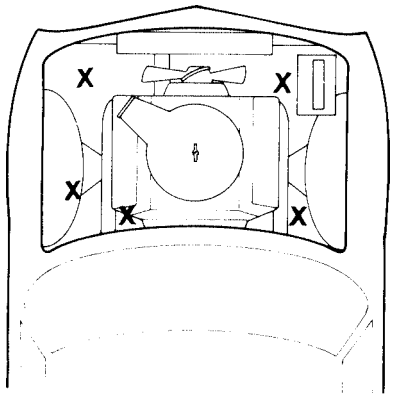
6. Reinstall the air cleaner and attach all hoses.

FUEL EVAPORATION CONTROL SYSTEM

This system prevents fuel vapors from escaping through the fuel tank or carburetor, thus improving gas mileage. The charcoal canister absorbs vapors from the fuel tank and carburetor when the engine is not running; when the engine is started these vapors are drawn into the engine and burned.

To check the system, proceed as follows:

1. Locate the charcoal canister. It is usually black plastic or round metal and is found on the inner fender pan close to the radiator.



Charcoal canister locations

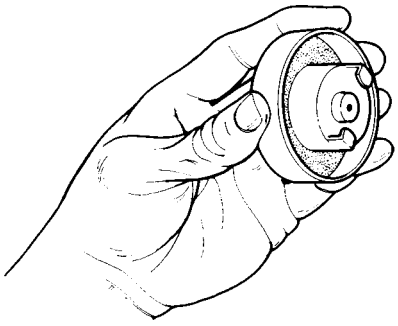
2. Check the canister hoses for cracks, hardness, brittleness, rub marks, and loose connections.

3. Remove the canister from the holder. Turn it over and remove and discard the fiberglass filter.

4. Install the new filter; be careful not to tear it.

5. Replace the canister in the holder. Keep in mind that metal canisters have no filter.

6. Check the rubber gasket on the gas tank filler cap. If it is cracked or pieces are missing, replace the cap.

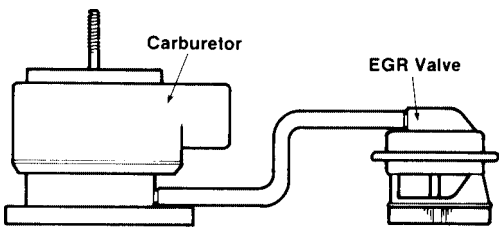


Checking the rubber gasket on the gas tank filler cap

EGR SYSTEM

The EGR, or exhaust gas re-circulation, system is responsible for reducing nitrogen oxide emissions. It can cause roughness if it operates during idle, wide-open throttle, cold starts, or warm-up. The EGR system can also cause spark knock if it fails to operate when the engine is hot.

NOTE: There are many different EGR systems. If the one on your car is different from the ones shown, consult the service manual.



EGR system A

SYSTEM A TEST

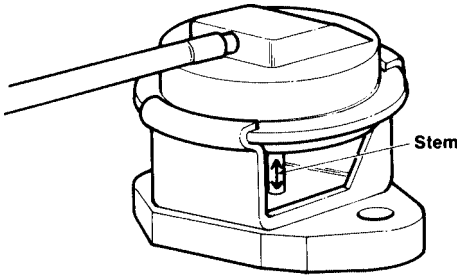
1. Inspect all vacuum hoses and connectors. Replace any worn hoses and repair any loose or leaking connections.

2. Mark the position of the EGR valve stem with the engine shut off.

3. Watch the stem while a helper starts the car and lets it idle. The stem should remain in the same position.

CAUTION: Work in a well-ventilated area and keep your hands clear of belts, fan blades, and other moving parts.

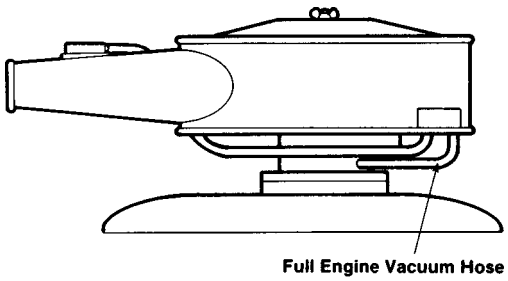
4. Continue watching the stem as the engine speed is slowly increased. If the stem begins to move up as speed increases, the system is working. (Do not run the engine above 2500 rpm.)



Observing EGR valve stem movement

5. If the valve does not open as the engine speed increases, disconnect the hose from the EGR valve. Let the engine idle.

6. Disconnect the hose from the temperature sensor that runs to the carburetor; this is an alternate vacuum source.



An alternate vacuum source

7. Connect this hose to the EGR valve, using a longer hose if needed. If the car begins to run roughly or stalls, the EGR valve is working correctly, so instead check for a clogged passage or hose. If the car runs the same, the EGR valve must be cleaned or replaced.

8. Remember to reconnect all hosesproperly.

SYSTEM B TEST

1. Start with a cold engine and disconnect the vacuum hose from the EGR valve.

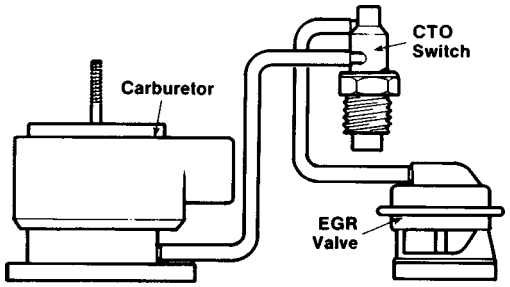
2. Start the engine and slowly increase the speed to about 2000 to 2500 rpm.

3. If vacuum is felt while the engine is still cold (50° to 60° F), replace the CTO switch.

4. If no vacuum is felt, let the engine warm up, then increase the speed 2000 to 2500 rpm.

5. Vacuum should be felt now. If not, replace the CTO valve.

6. If the CTO switch is working, let the engine idle and perform steps 6, 7, and 8 of the system A test to check the EGR valve.



EGR system B

SYSTEM C TEST

1. Start the engine and let it warm up to its normal operating temperature.

2. Watch the EGR valve stem while a helper quickly increases the engine speed to 2500 rpm. Do not over speed the engine.

3. If the EGR valve stem does not move, go on to the next step. Otherwise, repeat step 2 with the engine cold. If the valve does not move, the system is operating properly. If it does move, replace the CTO switch. **The EGR system should not operate when the engine is cold.**

4. Remove the vacuum hose from the EGR valve.

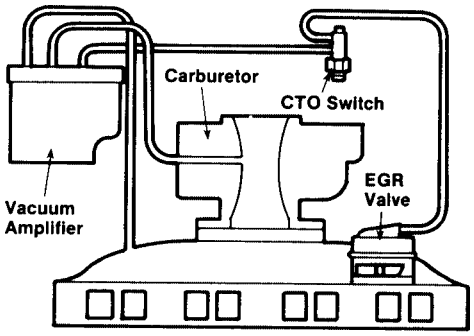
5. Perform steps 6, 7, and 8 of the system A test to check the valve.

6. If the EGR valve is operating correctly, remove the upper vacuum hose from the CTO switch.

7. Increase engine speed 2000 to 2500 rpm.

8. If vacuum is felt at the hose, replace the CTO switch.

9. If no vacuum is felt, the vacuum amplifier is probably defective. Before buying a new one, have a mechanic check it.



EGR system C

SYSTEM D TEST

1. Start with a cold engine and be sure to work in a well-ventilated area.

2. Turn on the engine and have a helper hold a wadded rag over the tail pipe to restrict—not stop—the exhaust flow.

CAUTION: Use a clean rag; solvent- or oil-soaked rags can easily catch fire,

3. Increase the engine speed 2000 to 2500 rpm while observing the EGR valve stem. It should not move while the engine is cold. If it does, replace the CTO switch.

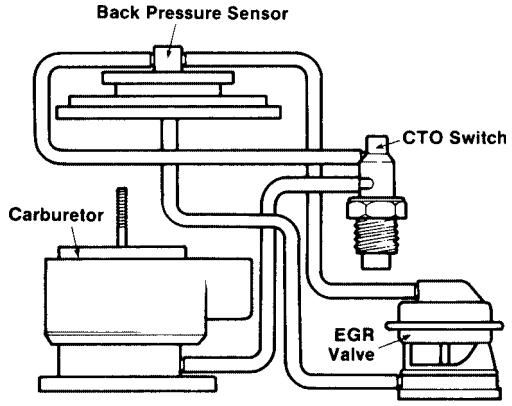
4. Let the engine warm up and repeat steps 2 and 3. The EGR valve should move up.

5. If it does not, check the valve operation by performing steps 6, 7, and 8 of the system A test.

6. If the valve works properly, remove the vacuum hose that runs from the backpressure sensor to the CTO switch at the sensor's end.

7. Increase the engine speed 2000 to 2500 rpm. If no vacuum is felt at the end of the hose, the CTC switch must be replaced.

8. If vacuum is felt, the problem is in the backpressure sensor. Consult the service manual before attempting to fix it.



EGR system D

CATALYTIC CONVERTER

Located between the engine and muffler, the catalytic converter reduces hydrocarbon and carbon monoxide emissions. It does not affect engine performance unless it becomes restricted. However, engine performance does affect how the catalytic converter operates. Make sure the spark plugs are in good condition and that the carburetor is properly adjusted by a qualified mechanic using an HC/CO exhaust analyzer.