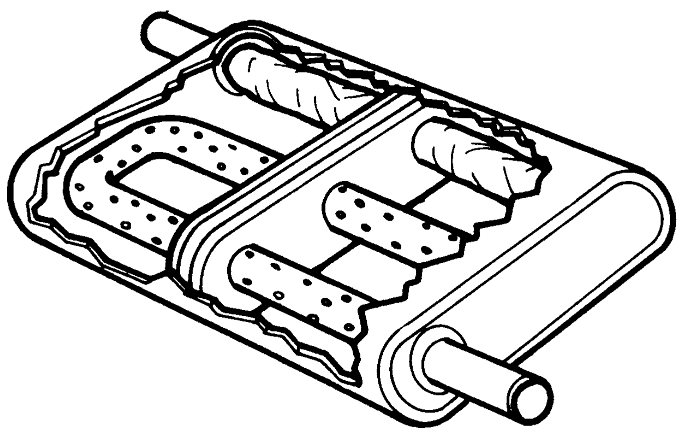
HOW - TO
THE EXHAUST SYSTEM



Tool And Material Checklist

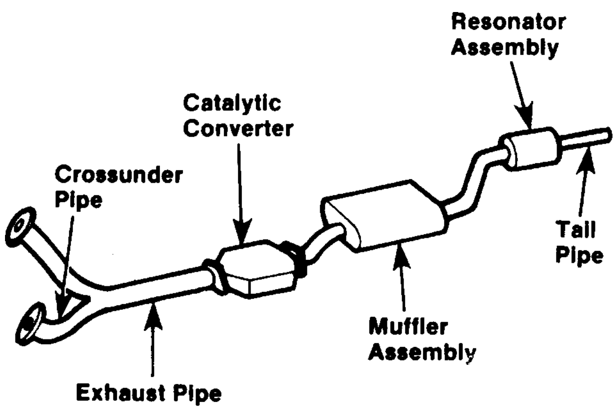
- ☐ Jack and Jack Stands
- ☐ Creeper
- ☐ Screwdriver
- ☐ Rag
- ☐ Ratchet
- ☐ Wrench
- ☐ Vacuum Gauge
- ☐ Tachometer
- ☐ Blocks
- ☐ Carburetor Choke Cleaner
- ☐ Ball Peen Hammer
- ☐ Clamps
- ☐ Safety glasses or googles

** This How-To Guide is designed as a general overview of a vehicle repair procedure. You should always refer to a service manual designed for your vehicle for detailed instructions. Parts Plus assumes no liability for an incorrect procedure.*

Though a relatively simple part of your car, the exhaust system is very important when it comes to preventive maintenance. Leaks must be discovered and promptly ¢repaired, because carbon monoxide can be fatal if allowed to enter the passenger compartment. This booklet contains testing and repair procedures you can do yourself to keep your car's exhaust system in good condition.

COMPONENTS

The exhaust system begins with manifolds on the engine and ends with the tail pipe. Basically, it includes an exhaust manifold, heat riser, exhaust pipe, catalytic converter, muffler, resonator (optional), and tail pipe. Following is a closer look at



Typical exhaust system

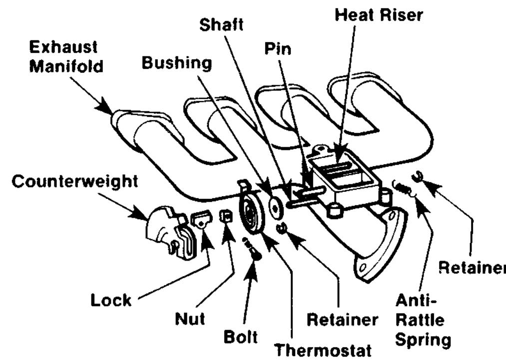
each component.

EXHAUST MANIFOLD

The exhaust manifold collects the burned gases as they are expelled from the engine cylinders and directs them to the exhaust pipe.

HEAT RISER

A heat riser is a valve, often located between the exhaust manifold and exhaust pipe that routes a small amount of the exhaust gases to the heat stove located in the intake manifold. These exhaust gases provide



Heat riser location

the heat source for the stove, which is responsible for helping to vaporize the air/fuel mixture passing through the intake manifold.

EXHAUST PIPE

Besides safely transferring the exhaust gases between the exhaust manifold and catalytic converter (or muffler, in earlier model vehicles), the exhaust pipe reduces noise as well.

CATALYTIC CONVERTER

To meet stricter emission control standards, in 1975, manufacturers began to install catalytic converters on domestic automobiles. Located between the exhaust pipe and muffler, this device converts harmful carbon monoxide and hydrocarbons into carbon dioxide and water vapor. Newer converters also change nitrogen oxides into harmless oxygen and nitrogen. By law, these catalytic converters must remain on the vehicle.

MUFFLER

The muffler lowers noise through the use of perforated tubes and baffles that permit the exhaust gases to expand into the area between the tubes and the outer shell of the muffler. This expansion slows and cools the exhaust gas flow, thus reducing noise without obstructing the flow of gases.

RESONATOR

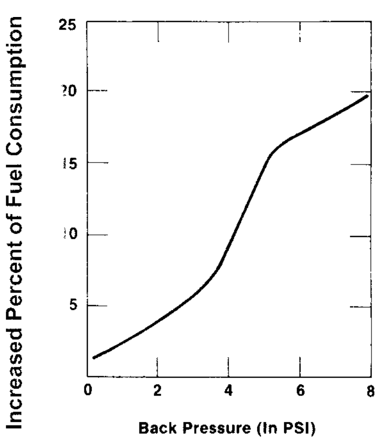
A resonator is nothing more than a secondary muffler designed to reduce noise level even further. It is usually found on a vehicle having a long wheelbase and powered by a high-performance engine. It can be located in front of or behind the muffler.

TAIL PIPE

The tail pipe transfers the exhaust gases from the muffler to the back of the vehicle, where they exit.

EXHAUST NOISE

The most common sign of failure of an exhaust system component is a leak that increases the noise level of the escaping gases. While the noise is distracting, the escaping gas itself is much more dangerous to human beings. Carbon monoxide leaks can cause headache, drowsiness, nausea, unconsciousness, and finally death. Such Peaks can occur:



Fuel consumption increases with an increase in back pressure.

- Between the engine and the exhaust manifold
- Between the exhaust manifold flange and the exhaust pipe
- Between other pipe connections
- In individual components

Exhaust noise can also result from a burned-out or blown-out muffler, a burned-out or rusted-out pipe, a cracked manifold, or a damaged catalytic converter. A vibrating or rattling noise can result from:

- Loose spring or shaft at the heat riser valve
- System components striking the body or chassis
- Broken or loose clamps or brackets
- Loose internal baffle in the muffler or resonator
- Loose heat shield

EXHAUST RESTRICTION

Exhaust restriction is caused when an excessive amount of pressure develops in the system. A certain amount of backpressure is necessary to increase engine performance and service life. However, too much of it can cause mechanical engine failure, such as a burned valve. It can also overheat and contaminate the incoming air/fuel mixture, thus reducing engine power (especially at higher speeds) and increasing fuel consumption.

Causes of exhaust restriction include:

- External damage, such as dents
- Catalytic converter contaminated with leaded fuel
- Muffler or resonator that is corroded or rusted on the inside
- Muffler or resonator with a loose or broken baffle

CHECKING FOR LEAKS

1. Raise the rear of the car after it has been blocked up safely.

2. Use a creeper to get under the car. Jab at all rusted areas in the system with an old screwdriver. If the blade penetrates the metal at any point, that part needs replacing.

NOTE: Whenever you are working under a vehicle, protect your eyes by wearing safety glasses or goggles.

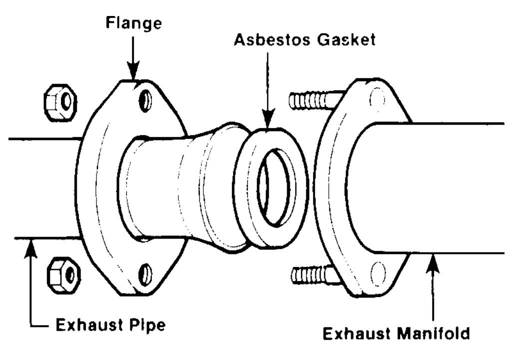
3. Tap on the components with the handle of the screwdriver. A ringing sound indicates that the metal is good. A badly corroded part will give out a dull thud.

4. To check further, start the engine. Stuff a rag in the tail pipe, and feel around all joints for leaks.

CAUTION: Never run the engine in a closed garage.

5. If any leaks are found, check all connections and clamps for correct size and positioning, as well as any other problems, such as looseness.

6. The manifold itself rarely causes problems. However, the asbestos gasket that seals the manifold to the engine block and the gasket that seals the exhaust pipe to the manifold can fail. A leak in these areas causes a ticking sound when the engine is running. Inspect the gaskets for signs of leakage; check the surrounding areas for a grayish-white deposit blown out of the leak.



Manifold connections to the exhaust pipe

FINDING THE RATTLE

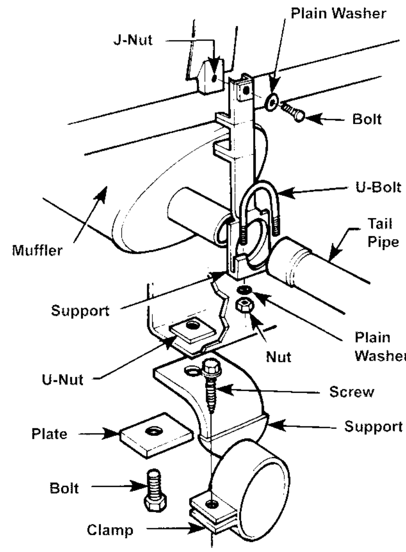
1. When the system is cool, grasp the tail pipe and try to move it up and down and side to side. There should be only slight movement.

2. If the pipe seems wobbly, block the car and raise the rear. Don't forget to use jack stands whenever a vehicle is raised.

3. Roll under on a creeper and check the clamps and hangers that fasten the exhaust system to the underbody. Check for proper alignment.

4. If no problems can be visibly detected, turn on the engine and listen to determine if the noise is generated at the heat riser or at the muffler.

5. If the rattle is coming from the shaft on the heat riser, the entire heat riser must be replaced. If caused by the spring, replace the spring alone.



Inspect all hangers and clamps.

TESTING FOR RESTRICTIONS

To perform this test using a vacuum gauge and tachometer, proceed as follows:

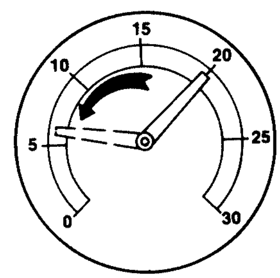
1. Connect the vacuum gauge to an unrestricted port on the intake manifold.

2. Connect the tachometer to the engine, following the manufacturer's recommendations.

3. Start the engine and permit it to reach its normal operating temperature.

4. Slowly accelerate the engine to 2,000 rpm.

5. The vacuum gauge needle should drop slightly, then rise quickly to 3" to 5" of mercury higher than the normal idle vacuum.



Vacuum gauge reading will drop if a restriction exists.

6. Quickly close the throttle. The gauge needle should return to idle as rapidly as it rose.

7. If the needle first reaches a normal reading at idle and at 2,000 rpm, but begins to drop toward zero and then rise slowly to a below normal reading at 2,000 rpm, some restriction exists. Inspect the system for a seized heat riser, a clogged or damaged muffler or catalytic converter, or a damaged or restricted exhaust or tail pipe.

NOTE: Inspect multiple-layer pipes closely. The inner layer can collapse, causing a restriction. In the case of some large displacement engines, it might be necessary to perform this test while actually driving the vehicle until it reaches the speed where the engine loses power.

1. Connect the vacuum gauge to the intake manifold with a long hose so that the gauge itself can be positioned inside the vehicle.

2. Connect the tachometer. Route its wires so that this gauge is also inside the vehicle.

3. Drive the vehicle through the speed where engine performance begins to drop and observe the readings on both gauges.

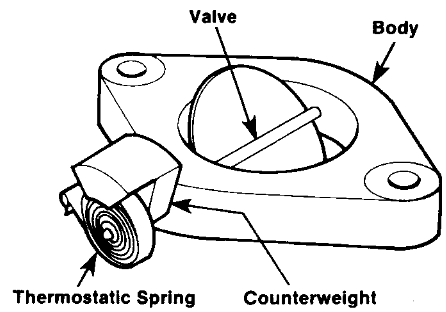
4. If a restriction is present, the tachometer reading should be about the same each time a loss of power occurs. The vacuum gauge needle will react normally at first; as the engine begins to lose power, it will begin to drop off toward zero. The amount of needle movement toward zero depends on the amount of restriction. In some cases, the needle never reaches zero but remains very low until the engine load is reduced.

TESTING THE HEAT RISER

To test a thermostatically controlled heat riser, proceed, as follows:

1. When the engine is cool, push the counterweight down as far as it will go, then release it. The counterweight, shaft, and valve should spring back to the *closed* position. Protect your eyes with safety glasses or goggles while doing this.

2. Start the engine and allow it to warm up as you observe the action of the heat riser. With the engine operating at idle, the counterweight should move slowly downward as the engine warms up.



Thermostatically-controlled heat riser

3. Accelerate the engine occasionally during this period. The counterweight should move down somewhat during acceleration and return to its initial position as you release the throttle.

4. If the heat riser does not function as described, service or replace the valve.

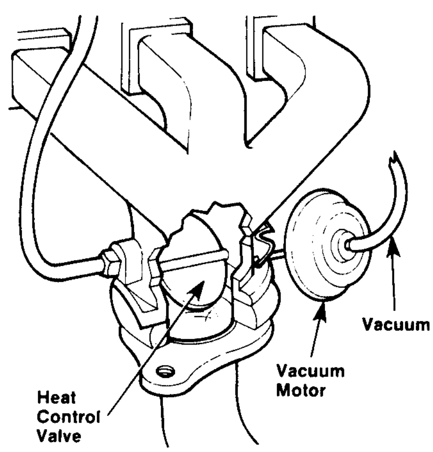
Test a vacuum-controlled heat riser as follows:

1. When the engine is cool, check the position of the heat riser valve. It should be wide open, with the diaphragm plunger extended. If it is not, the valve and shaft are stuck in their casting bore, or the spring behind the diaphragm is broken.

2. Start the engine. The diaphragm plunger should retract, closing the valve.

3. If the valve does not close, either the valve and shaft are stuck open, the vacuum diaphragm in the motor is defective, or the motor is not receiving a signal from the intake manifold.

4. To check for vacuum at the motor, insert the vacuum gauge in the disconnected line at the motor. Before the engine warms up, the gauge should read normal manifold vacuum. If it does not, the oil temperature switch or coolant valve is defective and requires replacement.



Vacuum-controlled heat riser

5. Continue to observe the valve and the vacuum motor until the engine reaches its normal operating temperature. At this point, the spring be hind the diaphragm must push the valve open as the vacuum is cut off to the motor.

6. If the valve does not open at normal operating temperature, check the vacuum at the motor with a vacuum gauge. If the gauge indicates normal vacuum, either the oil temperature switch or coolant valve is defective and requires replacement.

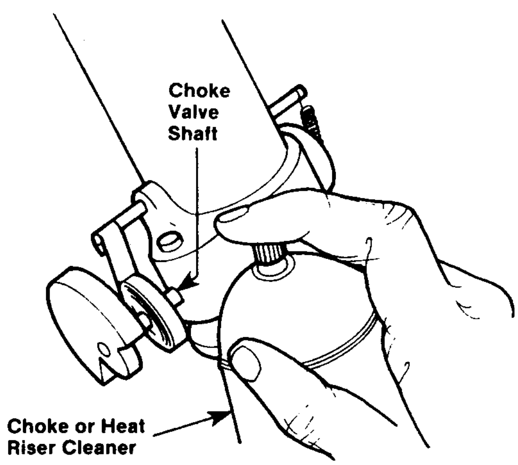
SERVICING THE HEAT RISER

If the heat riser valve shaft sticks in its base in the riser casting, proceed as follows:

1. If the valve uses a vacuum motor, disconnect the diaphragm link from the riser shaft lever.

2. Apply carburetor choke or heat riser cleaner to the ends of the exposed shaft. After a few minutes, this should free the shaft and riser valve.

3. With the counterweight or shaft lever, open and close the heat riser until it is free.



Servicing the heat riser