MERCEDES-BENZ AIR INJECTION SYSTEM

280 Series
450 Series

DESCRIPTION

All 1980 Mercedes-Benz gasoline engines are fuel injected, using a Lambda sensor feedback system to reduce emissions. The air injection systems now are designed to alter the exhaust gas oxygen level and "force" the electronic control unit to alter air-/fuel ratios. This helps the engine to idle smoothly and run well during warm-up. System components differ according to model, as listed.

280 Series – Air injection components include an air pump, relief valve, diverter valve, air filter, check valve, delay valve, 2 thermal vacuum valves, and connecting hoses. The air is injected through ports in the cylinder head.

450 Series – The system is composed of an aspirator valve, air shut-off valve, vacuum line to ported vacuum, connecting hoses, and injection ports in cylinder head. This system is referred to as "pulse-air".

OPERATION

PULSE-AIR SYSTEM

When the engine is idling, fresh air is drawn from the air cleaner through the air shut-off valve and the aspirator valve. Exhaust pulses cause a vacuum behind the aspirator valve which draws in this fresh air. The air is injected behind the exhaust valves in the cylinder head.

The fresh air combines with the exhaust mixture and passes through the primary catalyst. The oxygen sensor measures this exhaust gas mixture and reads the mixture as "lean" since there is more air than should normally be present. The electronic control unit richens the mixture to compensate, which enables the engine to run smoothly at idle.

When the throttle is moved off idle, vacuum is present at the signal port, which closes the air shut-off valve. Since additional air is no longer present, the control unit leans the mixture to the proper ratio.

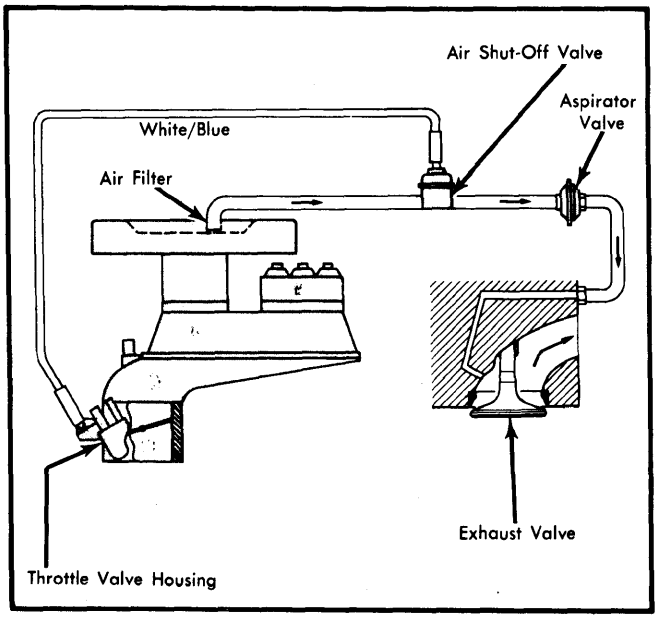

Fig. 1 Pulse-Air Injection System Schematic

AIR PUMP SYSTEM

The air pump system injects fresh air when the engine is warming up. Two thermal vacuum valves are used to control the air injection period, which begins when coolant is above 62°F (17°C) and ends when coolant reaches 122°F (50°C). During this period, air passes from the air pump through the relief valve, diverter valve, check valve, and into the cylinder head.

When engine coolant is above or below the air injection range, air is diverted through the diverter valve to atmosphere. An air filter muffles the sound of the air escaping.

When coolant is below 62°F (17°C), the first thermal valve is closed and no vacuum reaches the diverter valve. Air is vented to atmosphere. When the first valve opens, vacuum passes through to open the diverter valve and direct air to the cylinder head. When the second thermal valve opens at 122°F (50°C), the vacuum is bled to atmosphere at the air intake. The diverter valve once again vents air pressure.

As in the pulse-air system, the air alters the ratio measured by the exhaust gas sensor. The electronic control unit richens the air/fuel ratio to compensate, and enables the engine to run smoothly during warm-up.

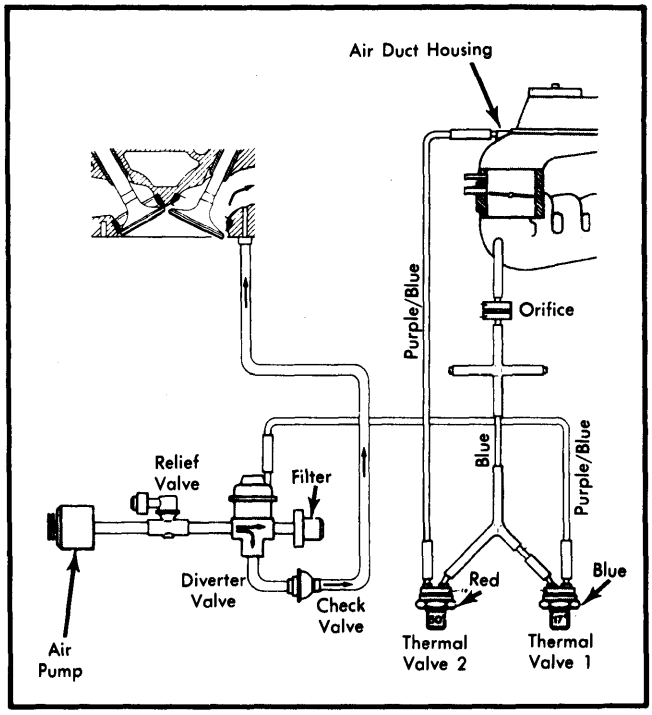

Fig. 2 Air Pump System Schematic

TESTING

PULSE-AIR SYSTEM

1) Run engine at idle and disconnect hose between air cleaner and air shut-off valve. A suction sound must be heard at air shut-off side. If not, check for vacuum at blue hose to air shut-off valve.

MERCEDES-BENZ AIR INJECTION SYSTEM (Cont.)

2) If no vacuum, clean out vacuum port on throttle housing. If vacuum is present, remove air shut-off valve. If suction is now heard, replace air shut-off valve. If not, replace aspirator valve.

AIR PUMP SYSTEM

NOTE – *A special tester is necessary to accurately measure the electronic control unit operation. The following tests can be made to determine if air injection system is working properly.*

1) Warm engine to normal operating temperature and allow to idle. Air should be escaping from filter near diverter valve. Remove purple/blue hose from air duct and plug end with finger. Air should be injected and not escape from diverter valve. Reconnect hose.

2) Disconnect "Y" fitting from both thermal vacuum valves and check for vacuum at both sides of "Y". If not, clean hoses, "Y", orifice, and vacuum port.

3) Check that both thermal valves are open and air passes through freely. If not, replace. If diverter valve is not operating correctly and all other connections are good, replace it.