GENERAL MOTORS AIR INJECTION REACTOR SYSTEM

NOTE – *A Pulse Air (PAIR) Injection system is also used on some General Motors models. See "General Motors Pulse Air Injection System" article in this section.*

DESCRIPTION

The Air Injection Reactor (A.I.R.) system is used to reduce HC and CO by injecting air into the exhaust ports, which induces further burning of the exhaust gases. Single valve systems will direct air from the air pump to either the exhaust ports (during cold warm-up), or divert it to the air cleaner or atmosphere (in closed loop and on deceleration). The integral valve and 2-valve systems add air switching functions to those of single valve systems. This system is used with the dual bed converter emission control system. The air switching function will divert air flow either to the exhaust ports or between the catalytic converter beds when the catalytic converter is up to operating temperature and the emission system switches to "closed loop".

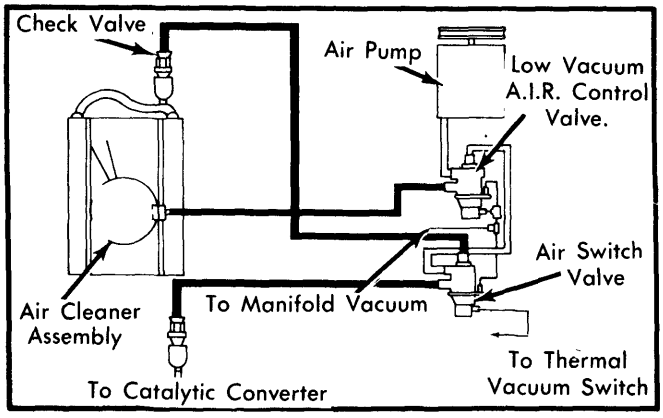

Fig. 1 Typical Air Management System (Cadillac Shown, Others Similar)

OPERATION

AIR PUMP

Intake air passes through the centrifugal filter at front of pump. Air is delivered to injection manifold by hoses and tubing.

DECELERATION VALVE

This valve is used on some 2.8L (173") V6 engines to prevent backfiring in the exhaust system during deceleration. Valve is normally closed, but opens when sudden deceleration increases vacuum to point of overcoming internal spring pressure. This allows additional air into the intake manifold to prevent overly rich mixtures from entering combustion chambers. Air trapped in chamber above vacuum diaphragm will bleed at a calibrated rate through the delay valve portion of the integral "Check and Delay Valve", reducing vacuum acting on diaphragm. When vacuum load on diaphragm and spring load are equal, valve assembly closes, shutting off air to intake manifold.

DIVERTER VALVE

This valve is also used to prevent backfire in the exhaust system during sudden deceleration. The valve senses sudden increase in the intake manifold vacuum causing the valve to open, allowing air from the pump to pass through the valve and silencer to atmosphere. A pressure relief valve controls pressure within the system by diverting excess pump output (at higher engine speeds) to the atmosphere through the silencer.

CHECK VALVE

The check valve prevents backflow of exhaust gas into the air distribution system. The valve prevents backflow when air pump bypasses at high speed and loads, or in case the air pump malfunctions.

ELECTRIC AIR CONTROL VALVE

This valve combines 3 separate functions into a single valve. It provides normal diverter valve function, pressure relief by diverting air to the engine air cleaner when system pressure exceeds a predetermined value, and by utilizing a solenoid the valve can be electronically controlled to divert air under any desired operating mode. When the solenoid is energized, the valve will perform like a standard diverter valve; and de-energized the solenoid causes air to divert during all operating modes.

ELECTRIC AIR SWITCHING VALVE

The air switching valve is a spring biased 2-way valve that is located in series between the air control valve and the exhaust system. When the solenoid is de-energized, a vacuum is applied to the diaphragm chamber to provide air flow to the exhaust ports. When the solenoid is energized, vacuum to the diaphragm chamber is blocked and the chamber is vented to the atmosphere. This allows the spring to open the port to the catalytic converter and close the port to the engine.

TESTING

AIR MANAGEMENT SYSTEM FUNCTIONAL TEST

1) Visually inspect all hoses and connectors for leaks and proper connections and repair as necessary. Check that diverter valve does not route air to air cleaner at part throttle, but does route air to air cleaner on quick deceleration or any time vacuum drops below 3 in. Hg.

2) If not satisfactory, check divert valve system. Air should be diverted to air cleaner for up to 5 seconds after starting engine, then switch to exhaust ports for about 10-60 seconds until system goes to closed loop operation. At this time, air again diverts to air cleaner.

3) Check diverter valve hoses and mounting. If satisfactory, disconnect vacuum hose to main diverter valve diaphragm nipple. Reconnect hose and check for diverter flow for up to 5 seconds. If no divert function, replace diverter valve. If diverter air flows for over 5 seconds, bypass the vacuum delay valve and recheck. If diverter flow is now up to 5 seconds, replace vacuum delay valve. If over 5 seconds, replace diverter valve.

GENERAL MOTORS AIR INJECTION REACTOR SYSTEM (Cont.)

4) To check select valve operation, start engine and run at fast idle. Pulsation should be felt in hose to exhaust ports until system goes closed loop, then it should switch to catalytic converter hose.

CHECK VALVE

1) Inspect check valve whenever working on A.I.R. system. If pump was inoperative and had signs of exhaust gases reaching pump, a failed check valve would be indicated.

2) After detaching valve, blow through it in direction of flow to cylinder head, then attempt to suck back against direction of flow. Replace valve if it allows airflow against direction of flow.

AIR PUMP

1) Accelerate engine to approximately 1500 RPM and observe airflow from hoses. If airflow increases as engine is accelerated, pump is operating satisfactorily. If it does not increase, or is not present, proceed to next step.

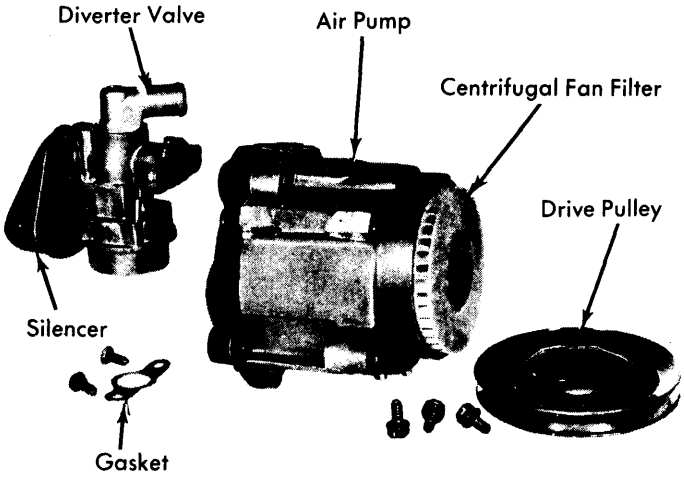

Fig. 2 Typical Air Pump and Components

2) Check for proper pump belt tension, leaky valves, seized pump, or improperly routed or disconnected hoses.

NOTE – *Do not oil air pump. Also note that air pump system is not completely noiseless.*

TROUBLE SHOOTING

EXCESSIVE NOISE

Loose drive belt or seized pump. Leaking hose. Improperly positioned hose. Diverter and/or bypass valve failure. Loose pump mounting. Pump damaged.

NO AIR SUPPLY

Loose drive belt. Leak in hoses or tubing. Diverter or bypass valve failure. Check valve failure. Pump malfunction.

EXHAUST BACKFIRE

Engine not tuned to specifications. Engine vacuum leaks. Faulty diverter or check valve. Electric Air Switching Valve or Air Control Valve not switching air pump discharge to air cleaner on start or quick deceleration.

POOR GAS MILEAGE

Air pump output not shifting to catalytic converter(s) upon signal from TVS. Faulty electrical and/or vacuum circuits.