1974-79 EXHAUST EMISSION SYSTEMS
Ford Motor Co. Air Injection System

1979 Fiesta

NOTE: For 1974-78 models, see AIR INJECTION SYSTEMS article in this section.

DESCRIPTION

The Fiesta air injection system is designed to reduce unburned hydrocarbon (HC) and carbon monoxide (CO) emissions. It does this by injecting fresh air into the exhaust ports to further the burning of hot exhaust gases. The air, which is pressurized by the air pump, enters the exhaust port either through an external supply tube or through internally-drilled passages. The system consists of an air pump, a by-pass valve, a vacuum vent valve, exhaust check valve, idle vacuum valve, and vacuum delay valve.

OPERATION

AIR SUPPLY PUMP

The belt driven air pump takes in air from the clean side of the air cleaner, pressurizes it and pumps it along to the engine.

BY-PASS VALVE

During normal operation, intake manifold vacuum positions by-pass valve diaphragm and stem upward to allow air pump air to reach exhaust ports. When manifold vacuum changes (rises with deceleration or drops with acceleration), idle vacuum valve momentarily cuts off vacuum to air by-pass valve. By-pass internal spring pulls stem and diaphragm downward and air pump air is dumped to atmosphere.

In case of sudden pressure buildup in valve, lower portion will unseat to dump part of the pressure while upper portion is also unseated to allow some air to exhaust ports to continue normal air pump system operation.

Some systems are equipped with air by-pass valve with an integral vacuum differential function and vacuum vent valve. When vent is blocked, valve functions as timed by-pass valve to control air flow to exhaust ports. When vent is open to atmospheric pressure and vacuum is applied to source port (4 in. Hg or more), valve goes immediately to dump mode.

VACUUM VENT VALVE

The vacuum vent valve provides the make-up air for the air pump system retard delay valve and air by-pass valve during idle modes to deactivate the air pump system after a controlled period of time.

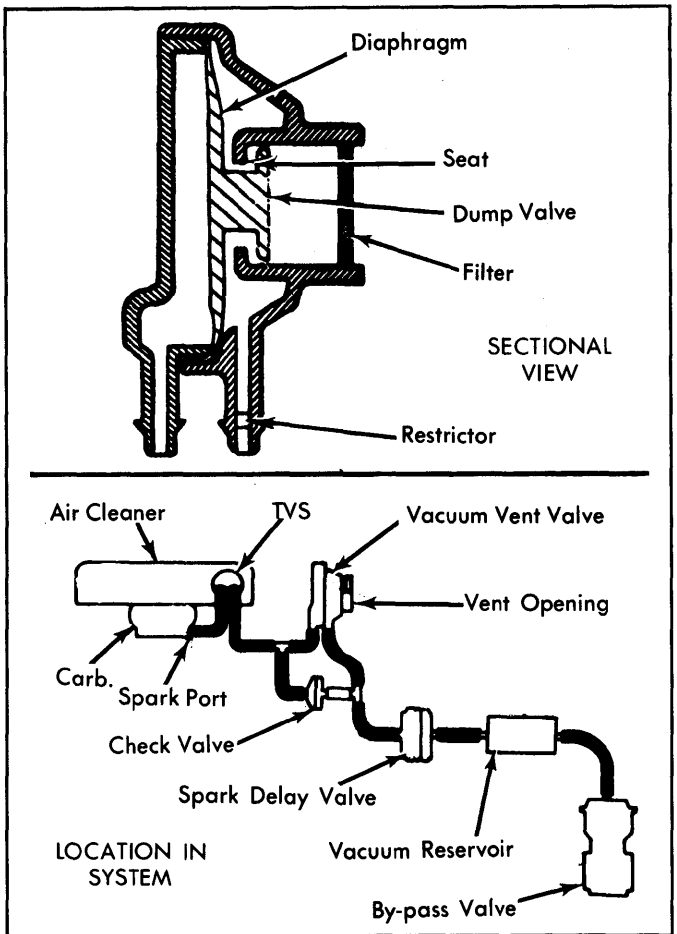

Fig. 2: Construction & Location Of Vacuum Vent Valve

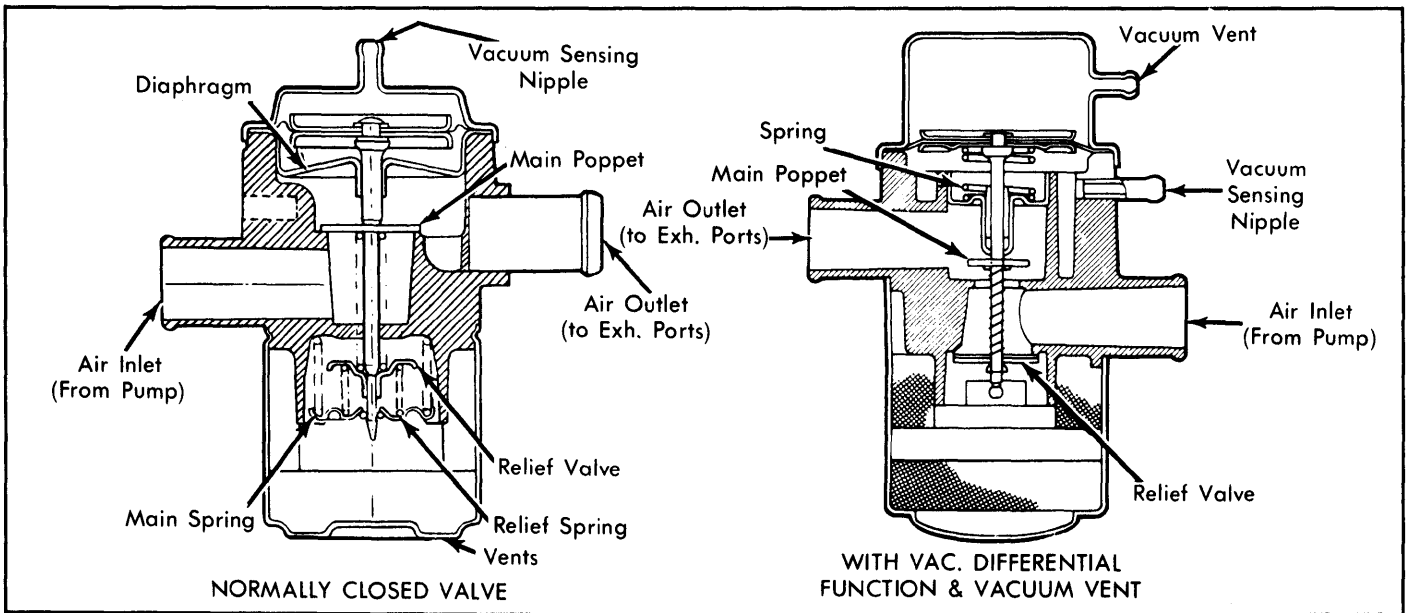

Fig. 1: Sectional Views Of By-Pass Valves

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Application of vacuum from the carburetor to both ports of the vacuum vent valve causes the diaphragm in the valve to initially move left and seat the dump valve. In this position, vacuum is applied to the rest of the system.

During idle, this vacuum application is removed. The diaphragm moves right. The dump valve leaves the seat, opening the vent and allowing air to enter the system to reduce the vacuum previously applied to the retard delay valve.

IDLE VACUUM VALVE

Idle vacuum valve uses carburetor port vacuum to control vacuum vent operation in by-pass valve. Its purpose is to dump air pump air during extended idle (1/2 minute or more). When at idle, carburetor throttle plate is below spark port, so vacuum to idle vacuum valve is zero. This allows idle vacuum valve diaphragm to be up, letting atmospheric pressure enter vents and connect directly to by-pass valve vacuum vent. *See Fig. 3.*

SYSTEMS WITH IDLE VACUUM VALVE & VACUUM DELAY VALVE

This system controls backfire, full-time idle air dump, cold temperature catalyst protection and cold EGR lock-out (Calif. only). The idle vacuum valve uses vacuum from the spark port in the carburetor to control vacuum vent in the by-pass valve. The specific purpose of this valve is to provide dumping of air pump air during extended idle periods.

At normal operating temperature, when the carburetor throttle plate is above the EGR port, vacuum is available to the THERMAL VACUUM SWITCH (TVS) switch (on air cleaner). Above 60°F (16°C), the TVS is open and allows passage of vacuum. Vacuum is now available to operate the EGR valve and is also directed through the vacuum delay valve. Vacuum now enters the idle vacuum valve and closes the atmospheric vent. Manifold vacuum below the by-pass valve diaphragm also enters the chamber above the diaphragm through a calibrated orifice in the diaphragm. Vacuum is now equal on both sides of the by-pass valve diaphragm, the internal pressure relief valve is closed and air from the air pump flows freely to the air manifold. *See Fig. 3.*

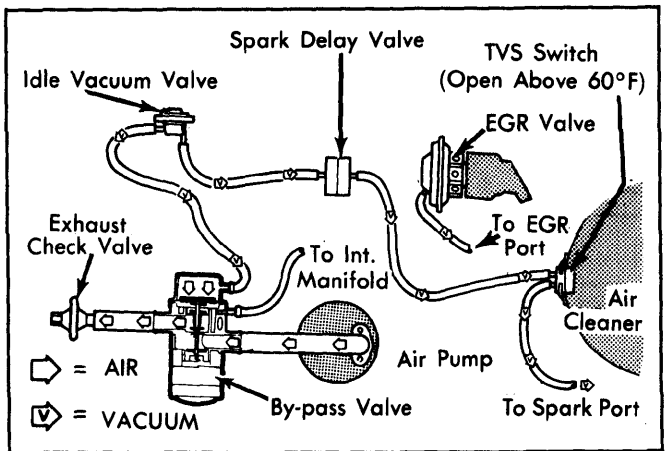

Fig. 3: Air Injection System Air/Vacuum Flow (Engine Warm)

TESTING

AIR PUMP

1) Remove air cleaner. Check all hoses and connections for proper condition. Check air pump belt tension and adjust as necessary.
2) With transmission in Neutral and parking brake set, start and warm engine to normal operating temperature. Stop engine and detach hose(s) from air pump to air by-pass valve at the by-pass valve.
3) Insert Pressure Gauge (T75L-9486-A) into end of hose disconnected from by-pass valve. Clamp pressure gauge in place. Connect tachometer and start engine.
4) Slowly increase engine speed to 1000 RPM while observing pressure gauge. Pressure should be 2.25 psi (15.8 kg/cm²). If air pressure is incorrect, replace air pump and repeat test.

NOTE: If pressure gauge is not available, raise engine speed to 1500 RPM and place hand over open end of hose. Air pressure should be felt and heard.

BY-PASS VALVE

Normally Closed Type Valve - 1) Set transmission in Neutral, apply parking brake, and warm engine to normal operating temperature. Stop engine and remove air by-pass valve-to-manifold check valve hose at the by-pass valve. On models which have "T" fitting, remove both hoses connecting by-pass valve to check valves. Install tachometer engine.
2) Start and accelerate engine to 1500 RPM. Check that air flows from by-pass valve hose connections (feel with hand).
3) Remove vacuum hose from by-pass valve and plug hose. With engine running at 1500 RPM, no air flow should be coming from by-pass valve connection (air flow will be discharged silently through exhaust ports in end of valve silencer cover). If valve does not respond as indicated, replace by-pass valve.
4) Stop engine. Remove plug from vacuum hose. Reinstall vacuum hose on by-pass valve vacuum sensing nipple. Install Pressure Gauge (T75L-9486-A) to by-pass valve outlet, using short piece of hose. If by-pass valve has two outlets, plug one without gauge. If valve has small sensing nipple as one outlet, install gauge on this outlet.
5) Start engine and run at 1000 RPM. Observe pressure produced at test gauge. It should be 2.25 psi (15.8 kg/cm²). If not, replace valve.
Differential Function & Vacuum Vent Type - 1) Warm engine to operating temperature with transmission in Neutral and parking brake set.
2) Stop engine and remove by-pass valve-to-check valve hose at by-pass valve. On "T" connections, remove both hoses connecting by-pass valve to check valves. Cap vacuum vent nipple. Remove or by-pass any restriction devices or vacuum delay valves in vacuum sensing hose. Install tachometer on engine.
3) Start engine and accelerate to 1500 RPM. With hand held over by-pass valve outlet, pinch off vacuum sensing hose to by-pass valve and hold for about 5-8 seconds (this simulates air by-pass cycle).
4) Air flow should be felt and heard to reduce or stop for short period of time, then resume as normal air flow (actual length of time will vary with engine vacuum and length of time hose is pinched off). If this does not occur, replace by-pass valve.
5) Stop engine and remove cap from vacuum vent nipple and leave it open. Start engine and accelerate to 1500 RPM. No air should be felt from by-pass valve outlets. If air comes from outlets, valve must be replaced.
6) Stop engine. Attach hoses to original positions at vacuum sensing nipple and vacuum vent nipple. Attach Pressure Gauge (T75L-9486-A) to by-pass valve outlet and plug second outlet (if equipped). With engine at 1000 RPM, 2.25 psi (15.8 kg/cm²) should be measured at outlet. If not, replace valve.

IDLE VACUUM VALVE

1) Remove idle vacuum valve from connector on by-pass valve. Install a vacuum hose on small nipple of the valve and connect it to a 3-way tee. Connect another leg of the tee to a vacuum gauge, and the remaining tee fitting to the by-pass valve.
2) Connect a vacuum gauge to intake manifold. *See Fig. 4.* Start and warm engine to normal operating temperature.
3) With engine at idle and transmission in neutral, disconnect large hose from large diameter port of idle vacuum valve.
4) Using an external vacuum source, apply 3.5-4.0 in. Hg to large port of valve. Vacuum on gauge at by-pass valve should increase to within 3 in. Hg of intake manifold vacuum. If not, replace idle vacuum valve.
5) Remove external vacuum source. Vacuum gauge reading should drop to 1 in. Hg or less. If not, replace idle vacuum valve.

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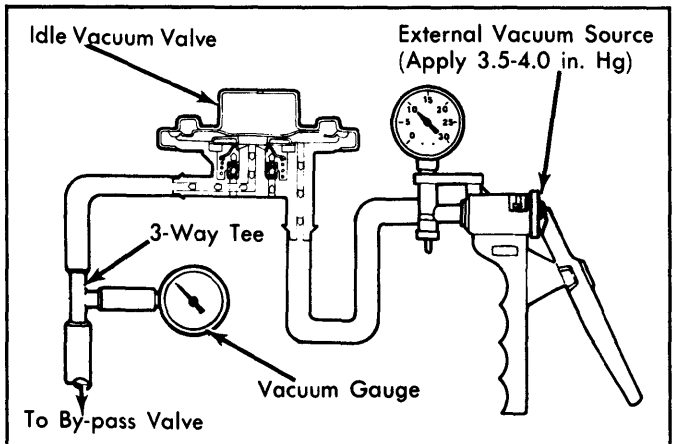

Fig. 4: Testing Idle Vacuum Valve

SPARK DELAY VALVE

1) Remove valve from vacuum line and attach colored end of spark delay valve to an external vacuum source. Using a piece of vacuum tubing, attach white end of valve to a vacuum gauge.
2) Apply 10 in. Hg, using an external vacuum source, and note reading on gauge and time for reading to be reached. Vacuum gauge should read from zero to 8 in. Hg in 2-5 seconds for Brown and White valve or in 9-20 seconds for a Green and White valve.
3) If reading does not reach 8 in. Hg and/or is not within specified time range, replace spark delay valve.

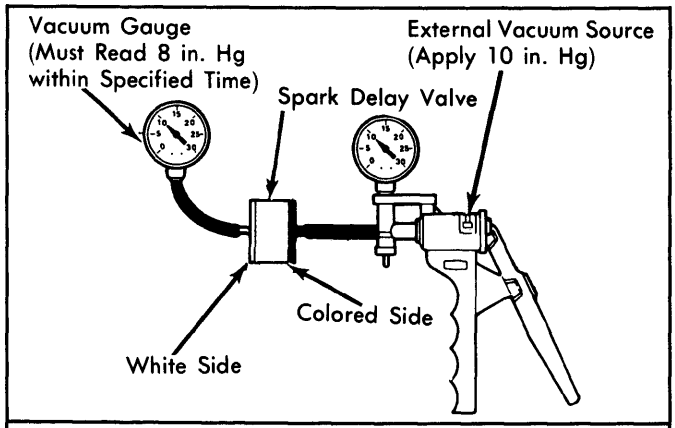

Fig. 5: Testing Spark Delay Valve

THERMAL VACUUM SWITCH (TVS)

1) Remove TVS from air cleaner. Attach small, center nipple to a 24 x 1/4" piece of vacuum tubing which is connected to an external vacuum source. Leave other nipple unattached.
2) Obtain a can of R-12 refrigerant, a safety valve and a suitable piece of refrigerant hose. With safety valve closed, attach R-12 can to valve and hose to valve.

CAUTION: Wear eye protection and make sure area is well-ventilated. When working with R-12, make sure engine is NOT running.

3) Invert R-12 refrigerant can, slowly open can valve, and apply liquid refrigerant to TVS to cool it to 40°F (4°C) or less. Apply 16 in. Hg with external vacuum source and hold. Vacuum level must remain at 10-16 in. Hg for 60 seconds. If not, replace TVS.

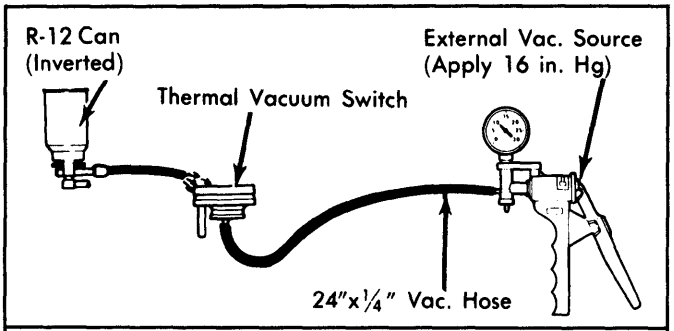

Fig. 6: Testing Thermal Vacuum Switch