FORD MOTOR CO. EXHAUST GAS RECIRCULATION

DESCRIPTION

The exhaust gas recirculation system (EGR) is designed to reintroduce small amounts of exhaust gas into the combustion cycle, thus reducing the amounts of NOx emissions. The amount of exhaust gas recycled and the timing of the cycle are controlled by such factors as engine vacuum, exhaust system backpressure and temperature.

Typical systems consist of an EGR valve, a spacer plate on which the valve is mounted (usually under the carburetor), a vacuum amplifier, a check valve, and a ported vacuum switch (PVS).

NOTE – *EEC III engines use an exhaust cooler to reduce the temperature of exhaust flowing through the EGR valve and into the engine.*

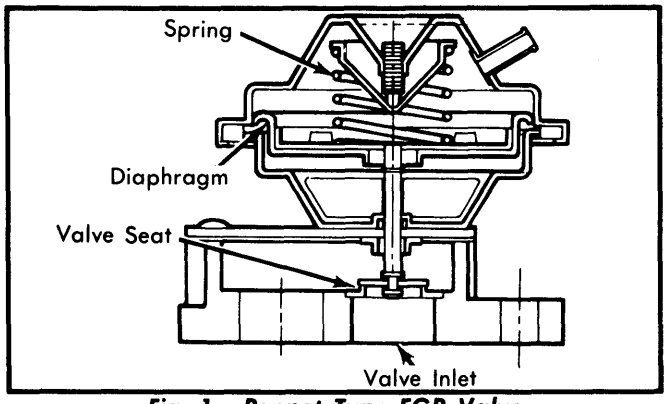

Fig. 1 Poppet Type EGR Valve

OPERATION

EGR VALVE

The EGR valve used with every system is a vacuum-operated valve. When the valve is open, exhaust gas recirculation can occur. When closed, the valve seals off all exhaust gas movement. The following types of valves are used:

Poppet Type – This is a rapid-opening valve. The flow rate through the valve is limited by the size of the valve orifice or the opening in the spacer plate.

Internal Tapered Stem Type – This valve uses a pintle which moves the tapered portion of the valve up and down against the valve seat. Gas flow rate is determined by the amount of movement of the taper off of the seat.

NOTE – *EEC equipped models utilize a pintle position sensor mounted on top of the EGR valve. This provides additional signals to the computer to allow more precise EGR flow.*

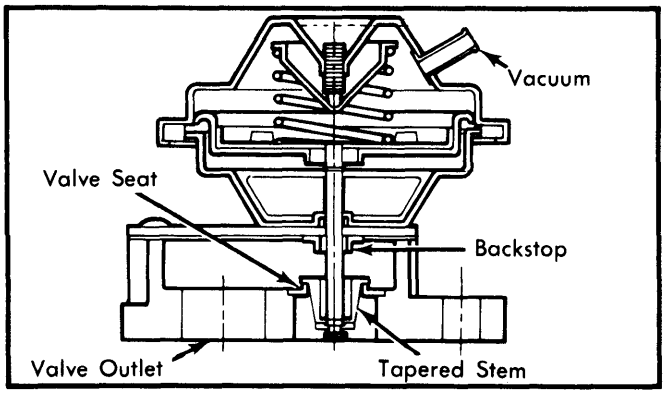

Fig. 2 Internal Tapered Stem Type EGR Valve

Integral Backpressure Transducer Type – This valve combines an exhaust gas backpressure transducer within the diaphragm housing of a typical EGR valve. This device modulates EGR flow by venting the available vacuum in relation to the exhaust backpressure. The backpressure is sensed in the valve between the opening and poppet/tapered stem. Flow rate is dependent on source vacuum, exhaust pressure, control setting and orifice size.

EGR LOAD CONTROL (WOT) VALVE

Controls and closes EGR valve when engine requires maximum power at or near wide open throttle (WOT). Senses venturi vacuum at a predetermined level and causes valve to close or to open when engine load is reduced from WOT.

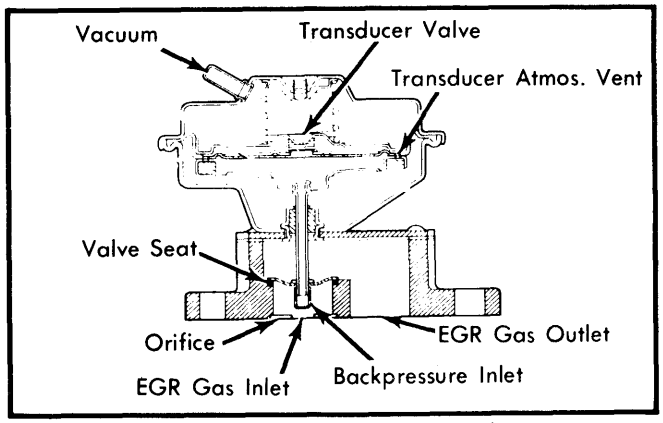

Fig. 3 Integral Backpressure Transducer Type EGR Valve

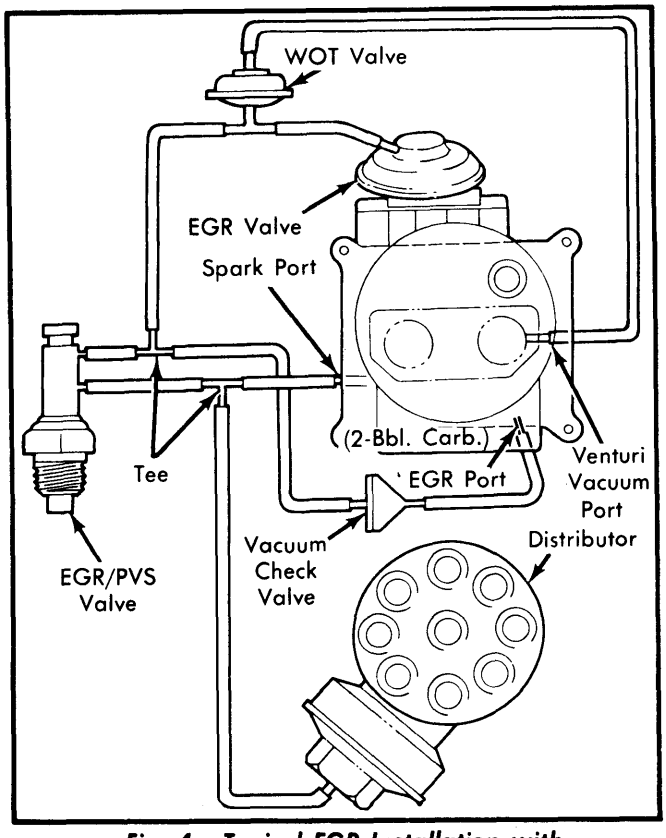

Fig. 4 Typical EGR Installation with Vacuum Load Control (WOT) Valve

FORD MOTOR CO. EXHAUST GAS RECIRCULATION (Cont.)

EGR COOLANT SPARK CONTROL (EGR/CSC)

At cold start, below PVS opening temperature, the ported vacuum switch connects carburetor EGR vacuum signal to the distributor through the check valve (bypassing the spark delay valve). When PVS opening temperature is reached, EGR port vacuum switches from the distributor to the EGR valve. EGR valve operation is controlled by carburetor EGR spark port and spark advance is controlled by the spark vacuum port acting through the cooling PVS and spark delay valve.

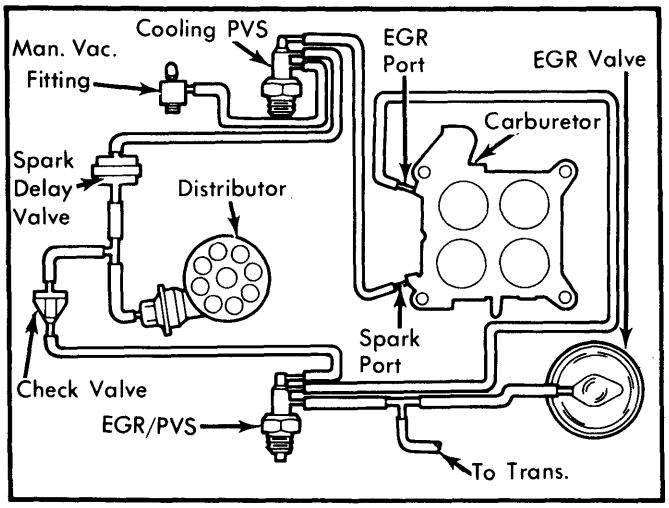

Fig. 5 EGR Coolant Spark Control (EGR/CSC) System

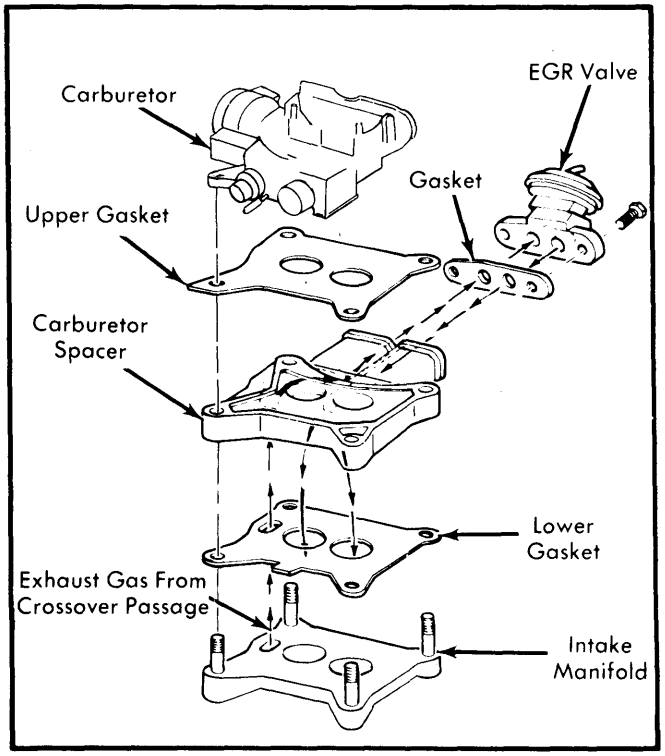

Fig. 6 Spacer Components for EGR Mounting (Typical)

TROUBLE SHOOTING

ROUGH IDLE AND/OR STALLING, ROUGH RUNNING, SURGE, HESTITATION AND POOR PART THROTTLE PERFORMANCE

EGR receiving vacuum due to misrouted hoses. EGR valve not closing fully or stuck open, gasket blown or attachment loose, air bleeds plugged (back pressure type valve). TVS or PVS opening too early during cold engine operation. Vent solenoid stuck closed or EVP sensor worn or damaged (EEC systems only).

ENGINE STALLS ON DECELERATION

EGR valve sticking open or not closing fully.

PART-THROTTLE ENGINE DETONATION

EGR valve stuck closed. Leaky valve diaphragm, vacuum restricted to EGR valve, EGR disconnected. TVS and/or PVS not opening, load control valve venting, EGR passages blocked. Insufficient exhaust back pressure (back pressure type valve only). EVP sensor "O" ring leaking or sensor loose (EEC systems only).

VERY LOW POWER AT FULL THROTTLE

Load control (WOT) valve not venting.

ENGINE HARD TO START, NO START OR STARTS & STALLS

Vacuum at EGR, hoses misrouted. EGR valve stuck open.

POOR FUEL ECONOMY

If EGR related, usually acccompanied by detonation or other symptom of restricted or no EGR flow.

TESTING

EGR SYSTEM (ON VEHICLE)

Ensure that all vacuum hoses are not crimped, cracked or broken and that hose routing is in accordance with the emission decal for each calibration. There should be no vacuum at the EGR valve at idle. If so, recheck for proper hose routing. At normal operating temperature, there should be vacuum to the valve at 3000 to 4000 RPM.

NOTE – *On all EEC equipped vehicles, EGR solenoid function and operation must be verified before performing other tests.*

EGR Solenoid Mechanical Function Check – Disconnect vacuum hose from EGR valve and connect vacuum gauge to hose. Take the engine to 2000-2500 RPM 8 to 10 times and check for vacuum rise above 15 in. Hg and return to zero when throttle is released (hot engine). If vacuum gauge does not return to zero or is inconsistent, solenoids are damaged or worn and must be replaced. If vacuum rises above zero during cold engine operation, solenoids are leaking and must be replaced.

Diaphragm Test (Basic EGR) – Cycle valve full stroke using finger pressure. If valve sticks in either open or closed position

FORD MOTOR CO. EXHAUST GAS RECIRCULATION (Cont.)

or doesn't operate smoothly, replace valve. With engine idling, apply 8 in. Hg vacuum to valve. Stem should move and engine idle should roughen. Trap and hold vacuum. Vacuum should not drop more than 1 in. Hg in 30 seconds.

Diaphragm Test (Integral Backpressure Type) – 1) Cycle valve full stroke with finger pressure. If valve sticks in any position or doesn't operate smoothly, clean or replace valve.

2) Clamp a suitable plug approximately 1/16" less in diameter than inside diameter of tailpipe into end of tailpipe. (A drive socket with drive hole covered may be used.) Idle engine and apply vacuum gradually. Valve stem/diaphragm should move smoothly and engine idle should roughen.

CAUTION – *Do not block tailpipe fully and do not run engine faster than idle or for prolonged periods of time. Be sure to remove plug from tailpipe at end of test. If these precautions are not observed, engine and/or exhaust system damage could occur.*

3) Trap 6 in. Hg vacuum and hold. Vacuum should drop more than 1 in. Hg in 30 seconds. If valve test is satisfactory but engine idle does not roughen during test, clean valve passages. If valve test is not satisfactory, replace EGR valve.

CARBURETOR EGR PORTS

1) Attach a vacuum gauge directly to EGR source on carburetor. With engine running, open throttle quickly to at least 1/2 open position. Avoid overspeeding engine.

2) Observe vacuum gauge for a quick rise and fall as throttle is opened and closed. If vacuum is evident, EGR port is open. If no vacuum is evident, EGR port in carburetor is plugged or restricted and should be cleaned.