FORD EXHAUST GAS RECIRCULATION

DESCRIPTION

The exhaust gas recirculation (EGR) system is used to reduce NOx emissions. This is accomplished by recycling exhaust gases back into the intake manifold, which results in cooler combustion temperatures and controlled NOx emissions.

The EGR system used in Ford vehicles consists of an EGR valve, a vacuum amplifier, a vacuum reservoir, ported vacuum switch (PVS) and connecting lines and hoses.

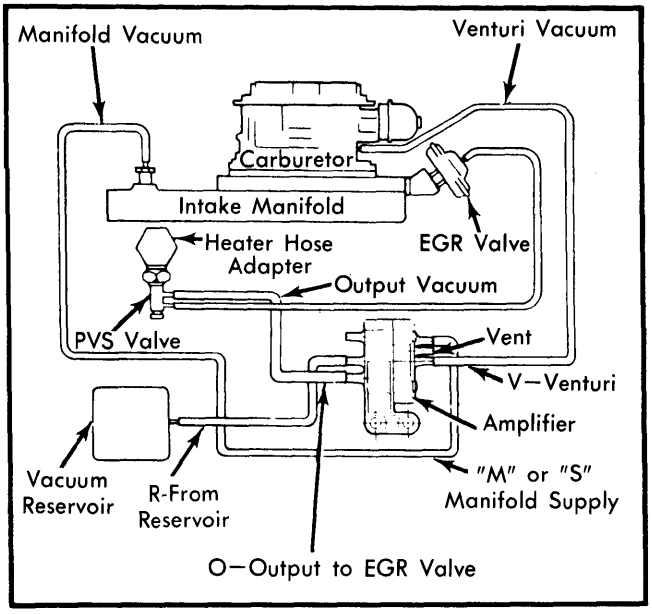

Fig. 1 Typical Ford EGR System Schematic

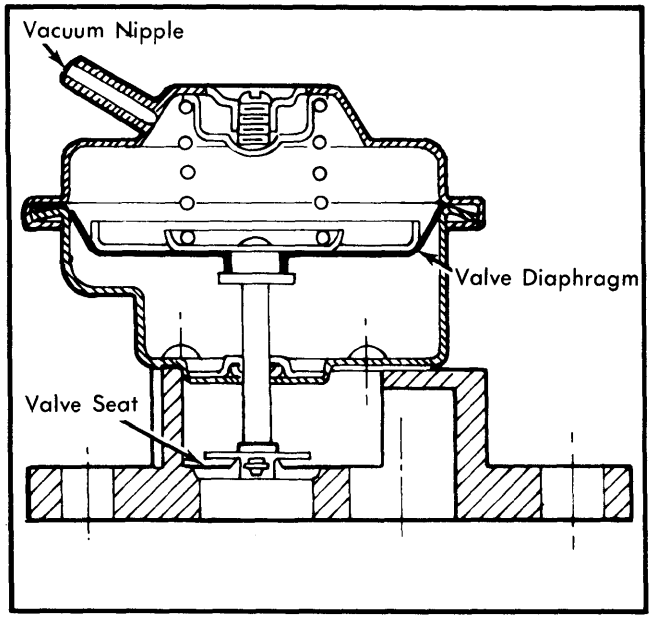

Fig. 2 Sectional View of Typical EGR Valve without Backpressure Transducer

OPERATION

The EGR system is controlled by the EGR valve. When the valve is open, exhaust gas enters the manifold passages. When closed, no gas is allowed to enter the intake manifold. Vacuum signals control the opening and closing of the EGR valve.

Some EGR systems use a Backpressure Transducer to aid in controlling exhaust gas recirculation. This unit senses exhaust gas backpressure and modulates the vacuum signal to the EGR valve in response to the amount of backpressure (this tells the transducer engine operation modes).

Light Duty emissions EGR systems use a backpressure transducer to aid in controlling exhaust gas recirculation. This unit senses exhaust gas backpressure and modulates the vacuum signal to the EGR valve in response to the amount of backpressure. Backpressure is used to provide information on engine operation modes. The backpressure transducer is integral with the EGR valve.

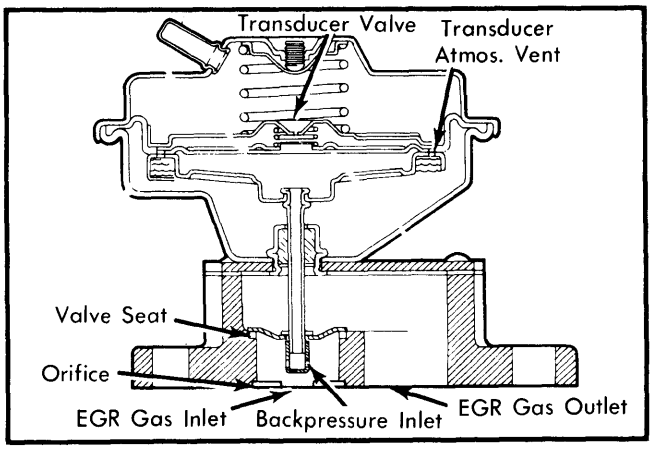

Fig. 3 Integral Type Backpressure Transducer and EGR Valve

TESTING

EGR VALVE WITHOUT BACKPRESSURE TRANSDUCER

NOTE — *This test applies only to EGR systems which DO NOT have backpressure transducer.*

1) Start and run engine to normal operating temperature (to be sure PVS is open).

2) Check all vacuum hoses for proper condition and that they are tightly seated on connectors.

3) Remove vacuum supply hose from EGR valve and plug hose. Attach another vacuum hose to EGR valve and attach a vacuum gauge to hose (preferably one calibrated in 1 in. Hg increments).

4) Gradually apply 8 in. Hg to EGR valve and watch EGR valve stem. At idle, it should take no more than 1 in. Hg to cause stem to move (begin to open). If stem does not start to move, replace EGR valve.

5) Turn engine off and apply 8" Hg to EGR valve and hold it. Vacuum should remain (within 1") for at least 30 seconds. If not, replace EGR valve.

FORD EXHAUST GAS RECIRCULATION (Cont.)

6) Restart engine and idle. Apply 8" Hg to EGR valve. Valve stem should move full length of travel and idle condition will get rough, RPM decrease and possibly stall. If not, EGR is not functioning and system is plugged. Clean as required.

7) Reconnect all hoses to original (normal) positions, restart engine and idle at normal operating temperature. If idle is not acceptable, EGR valve may not be sealing.

8) Install new gasket and adjust curb idle. Recheck idle condition. If no improvement, problem is elsewhere, reinstall original EGR valve and perform other engine diagnosis to seek out problem area.

CARBURETOR EGR PORT

1) Attach vacuum gauge directly to EGR carburetor port, using suitable hose. Start engine and quickly open throttle to about halfway position and close.

2) Observe vacuum gauge for quick rise and fall as throttle is open and closed. If definite vacuum is evident, port is okay. If not, port is clogged and must be cleaned.

EGR VALVE WITH INTEGRAL BACKPRESSURE TRANSDUCER

1) Loosen air cleaner and move aside without disconnecting vacuum hose from thermal vacuum switch on air cleaner housing.

2) Inspect EGR system for proper hose routing, hoses in good condition and all connections tight. *See "Ford Vacuum Diagrams" in this Section.*

3) Check EGR valve assembly for obvious damage, looseness, or exhaust "blowouts" at gaskets. Repair or replace as required.

4) Warm up engine to normal operating temperature. Place transmission in neutral. Slowly open and close throttle and watch valve stem. It should move up, oscillate and move down with throttle movement. If so, system is okay.

5) If unable to see stem movements, open and hold steady throttle at 2000-2500 RPM. Remove and pinch off vacuum hose to EGR valve. Engine speed should increase.

6) If valve operates as described above, the transducer is functioning properly. If not, replace the EGR valve.

7) To test for leakage, remove and cap the EGR valve vacuum hose. Start the engine. If engine idle improves noticeably, check vacuum hose routing, as valve may have vacuum supply at idle.

8) If engine idle does not improve, remove EGR valve. Block EGR passages with a plate. Start engine. If idle quality is still bad, the problem is elsewhere. Reinstall EGR valve. If idle quality improves, replace EGR valve.

PORTED VACUUM SWITCH

PVS with 2 Connections – 1) Detach both vacuum hoses from PVS and connect a vacuum gauge to top port on PVS. Connect other PVS nipple to manifold vacuum or external vacuum supply of at least 10 in. Hg.

2) Start engine and warm up until PVS opening temperature is reached. See *chart*. If no vacuum reading is noted, PVS should be replaced. If vacuum is present, PVS is okay.

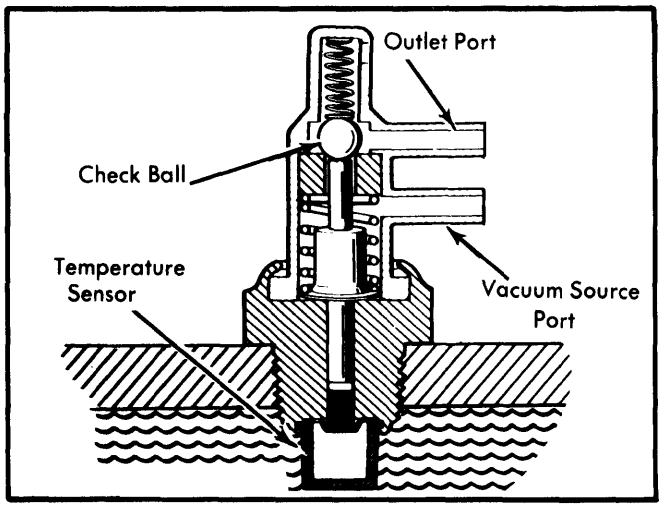

Fig. 4 Sectional View of 2-Port PVS

PVS with 3 Connections – 1) Disconnect EGR vacuum hose from PVS and connect manifold vacuum or external vacuum source to lowest port on PVS.

2) Detach distributor supply hose from center port and attach vacuum gauge to center port.

3) Start engine and warm up until PVS opening temperature is reached. See *chart*. If no vacuum is present, replace PVS. If present, PVS is okay.

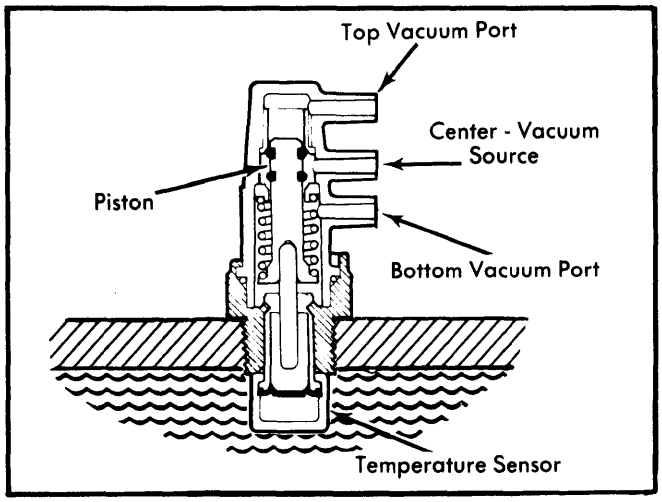

Fig. 5 Sectional View of 3-Port PVS

FORD EXHAUST GAS RECIRCULATION (Cont.)

PVS with 4 Connections – 1) Disconnect vacuum hoses at PVS valve. Connect a vacuum gauge to top port of the PVS. Connect external vacuum source to the second port.

2) Start engine and warm up until PVS opening temperature is reached. See *chart*. If no vacuum, this portion of the PVS is damaged and valve should be replaced. If vacuum, proceed to next step.

3) Connect gauge to the third port and vacuum supply to the bottom port. If vacuum is noted, PVS is okay. If no vacuum, replace PVS.

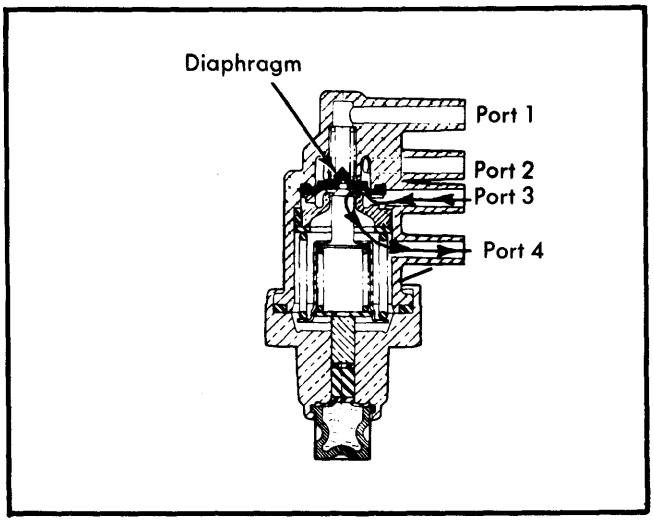

Fig. 6 Sectional View of 4-Port PVS

PVS Opening Temperatures

Color Code	Temp. (°F)
Pink or Natural	Above 90
Black	Above 100
Blue or Plain	Above 133
Yellow or Gray	Above 155

VENTURI VACUUM AMPLIFIER

NOTE – *Amplifiers have built-in calibrations, and no external adjustments are required. If an amplifier bias test reveals malfunction, replace amplifier. Venturi vacuum amplifier is checked after checking all other basic EGR components.*

1) Remove hose connecting EGR valve to amplifier at EGR valve end and connect vacuum gauge to hose. By-pass EGR delay valve, if so equipped. Disconnect vacuum hose at reservoir and "T" this line to a manifold vacuum source.

2) Start engine and accelerate to 1500 to 2000 RPM, then release throttle to idle speed. Disconnect hose at carburetor venturi. Vacuum should be within ±.3 in. Hg of specified bias value. If specification is zero, vacuum may read up to .5 in. Hg. Replace amplifier if not to specification.

NOTE – *Before performing the following steps, by-pass vacuum solenoid valve or vacuum operated switch, if so equipped.*

3) Accelerate engine to 1500 to 2000 RPM then release throttle to idle speed. If vacuum gauge increased more than 1 in. Hg during acceleration, replace amplifier. Reconnect venturi hose to carburetor. If output vacuum increases more than .5 in. Hg, check idle speed. If idle speed is too high, output vacuum could increase due to increase in venturi vacuum.

4) Accelerate engine to 1500 to 2000 RPM and check vacuum gauge. Vacuum should measure above 4 in. Hg during acceleration and return to specified bias when throttle is released. If vacuum does not return to specified bias, replace amplifier.

5) Connect "R" nipple to manifold vacuum source, "S" nipple to spark port vacuum, "V" nipple to venturi vacuum, and "O" nipple to vacuum gauge. Accelerate engine to 1500 to 2000 RPM and release throttle to idle speed. Remove vacuum hose at carburetor venturi, and check spark port vacuum. If vacuum is greater than 2 in. Hg, amplifier output vacuum could increase. Vacuum gauge reading should be less than .5 in. Hg for all amplifiers. If not to specification, replace amplifier.

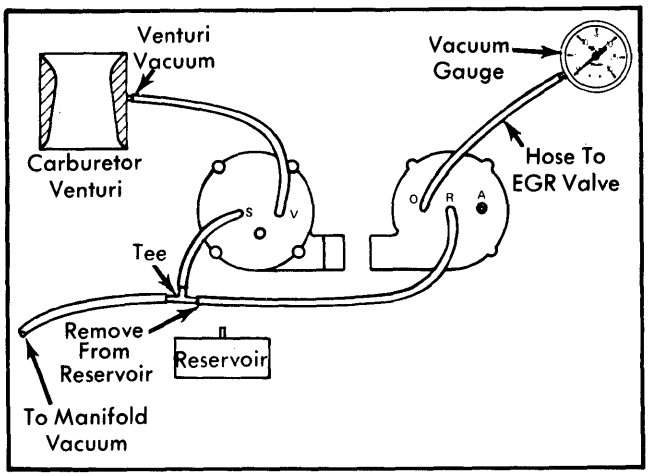

Fig. 7 Testing Venturi Vacuum Amplifier

VACUUM AMPLIFIER RESERVOIR

1) If reservoir does not have an external check valve, disconnect hose to amplifier and connect an external vacuum source to reservoir. Apply 14" Hg to reservoir. Charge reservoir with 14" vacuum. Vacuum should hold, with no more than 1" Hg drop, for at least one minute. If vacuum drops, replace reservoir.

2) If reservoir does have an external check valve, apply an external vacuum source 15 in. Hg to "T" between check valve and reservoir at amplifier side of "T". Vacuum should not vary more than 1 in. Hg for one minute. If vacuum drops, replace reservoir.

3) Remove hose to reservoir "T" and charge reservoir with an external vacuum source of 15 in. Hg. Vacuum should not vary more than 1 in. Hg for one minute. If vacuum varies, replace reservoir. To test check valve, disconnect hose to check valve at "T", and apply an external vacuum source of 15 in. Hg. Vacuum should not vary more than 1 in. Hg for one minute. If vacuum varies more, replace check valve.