

# 1975-79 EXHAUST EMISSION SYSTEMS

## Ford Motor Co. Exhaust Gas Recirculation

### DESCRIPTION

Exhaust Gas Recirculation (EGR) allows a predetermined amount of exhaust gases to recirculate and dilute air/fuel mixture. This diluting of air/fuel mixture reduces peak combustion temperature, reducing formation of oxides of nitrogen (NOx).

The EGR system consists of an EGR valve (with integral backpressure transducer on Light Duty emissions models), a vacuum amplifier, vacuum reservoir, Ported Vacuum Switch (PVS) and connecting lines and hoses.

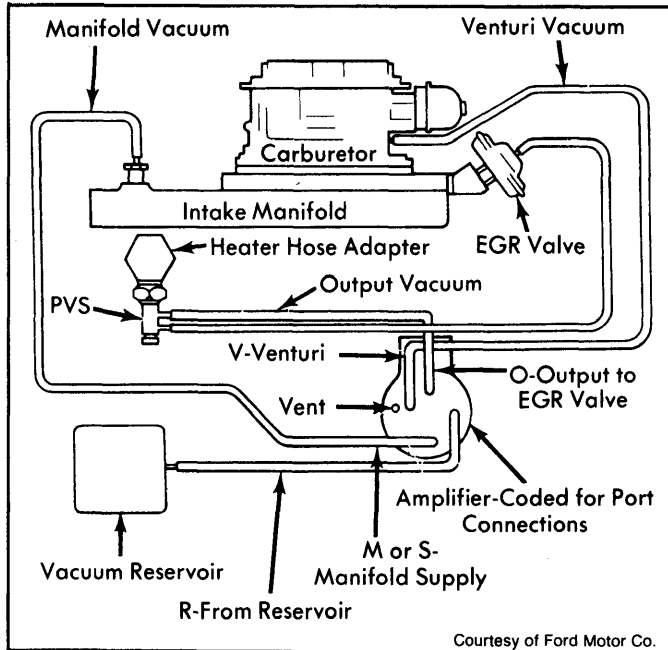


Fig. 1: Typical Ford Motor Co. EGR System Schematic

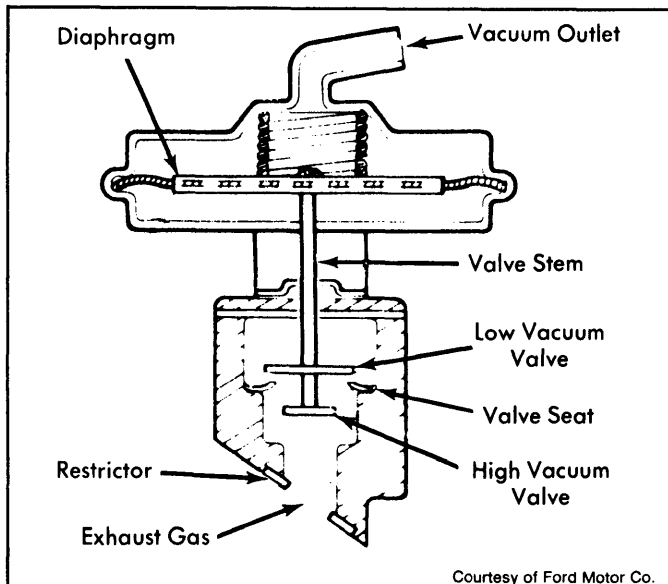


Fig. 2: Sectional View of Typical EGR Valve Without Backpressure Transducer

### OPERATION

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

Some Light Duty emission EGR systems use a backpressure transducer (integral in EGR valve) to aid in controlling exhaust gas recirculation. This unit senses exhaust gas backpressure and modulates the vacuum signal to the EGR valve.

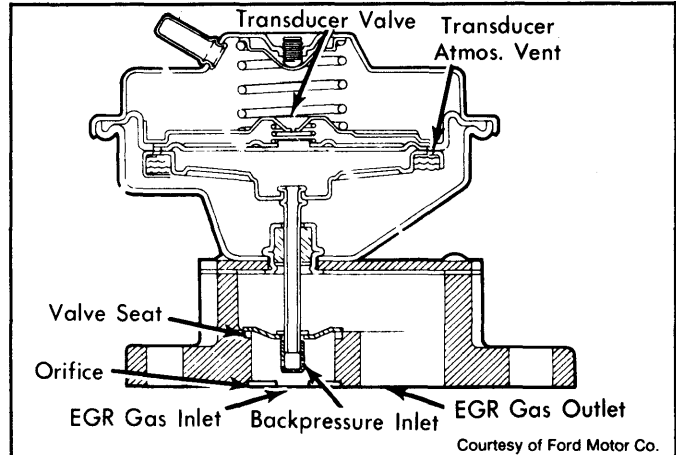


Fig. 3: Integral Type Backpressure Transducer & EGR Valve

### TESTING

#### EGR VALVE WITHOUT BACKPRESSURE TRANSDUCER

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

**Heavy Duty Emissions** - 1) Check all vacuum hoses for proper condition and tightly seated connections. Start and run engine to normal operating temperature. Ensure PVS is open.

2) Remove carburetor EGR port vacuum hose. Connect a vacuum gauge to carburetor port. There should be no vacuum at idle. Raise engine RPM to about 2000. Vacuum gauge should read a minimum of 4 in. Hg.

3) Turn engine off. Remove vacuum supply hose from EGR valve and plug hose. Attach a test vacuum hose with a "T" to EGR valve. Attach a vacuum gauge and external vacuum source to EGR test hose.

4) Gradually apply vacuum to EGR valve and observe EGR valve stem. EGR valve should take no more than 1 in. Hg of vacuum to cause valve stem to move (begin to open). If stem does not start to move, replace EGR valve.

5) Apply 8 in. Hg to EGR valve test hose. Vacuum should not drop more than 1 in. Hg for at least 30 seconds. If not, replace EGR valve.

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

7) Release vacuum. Engine should return to normal idle. If idle remains rough after vacuum is released, check EGR valve for improper sealing and/or defective EGR gasket. Turn engine off and reconnect all hoses to original positions.

#### EGR VALVE WITH BACKPRESSURE TRANSDUCER

**NOTE:** Vacuum to EGR valve with integral or external backpressure transducer will be vented through atmospheric vent if proper exhaust backpressure is not present.

**Light Duty Emissions** - 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. Check EGR valve assembly for

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damage, looseness, or exhaust "blowouts" at gaskets. Repair or replace as required.

3) Start and warm 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.

4) 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.

5) If operation is not as described, return to normal idle. Cap EGR vacuum supply hose. Connect another hose between EGR valve and manifold vacuum source. If engine speed drops or runs rough, EGR valve is operating properly.

6) On engines with external exhaust gas supply tube, improper EGR valve seating can be determined by removing EGR gas supply tube, then plugging both exhaust and intake fittings.

7) Remove and plug vacuum hose from EGR valve. With engine at normal operating temperature, idle should be smooth. If not, check for leakage at spacer or gaskets. Check spacer passages and intake passages. Repeat check. If still unsatisfactory, go to next step.

8) Reinstall external gas supply tube. Install a replacement EGR valve, leaving original hose disconnected and plugged and again installing vacuum line from EGR valve to manifold vacuum source. If engine idle is now smooth, leave this valve on and restore vacuum hose connection. Ensure smooth idle and EGR valve operation.

### PORTED VACUUM SWITCH

**Electric Ported Vacuum Switch** - 1) Electric PVS is used on some pre-1979 models to control air injection for catalytic converter protection. The vacuum part of this PVS operates identical to 3-port PVS. See PVS WITH 3 CONNECTORS (LIGHT DUTY EMISSIONS ONLY) for testing procedures.

2) Two electric PVS valves are used. One with normally open contacts, and one with normally closed contacts. The normally open type will not have continuity across connectors until engine coolant temperature reaches 235°F.

3) The normally closed type will have continuity across connectors until engine coolant temperature reaches 235°F. Using an ohmmeter, verify continuity of electric PVS switch as described.

**PVS With 2 Connections** - 1) Detach both vacuum hoses from the PVS and connect a vacuum gauge to either PVS connector. 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 PVS OPENING TEMPERATURES table. If no vacuum reading is noted, PVS should be replaced. If vacuum is present, PVS is okay.

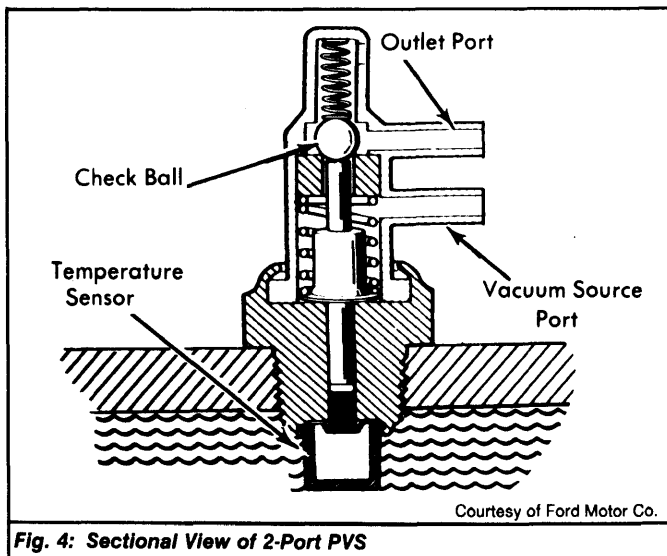


Fig. 4: Sectional View of 2-Port PVS

**PVS With 3 Connectors (Light Duty Emissions)** - 1) Disconnect EGR vacuum hose at carburetor and connect manifold vacuum or external vacuum source to hose. Detach EGR supply hose from EGR valve and attach vacuum gauge to hose.

2) Start engine and warm up until PVS opening temperature is reached. See PVS OPENING TEMPERATURES table. If no vacuum is present, replace PVS. If present, PVS is okay.

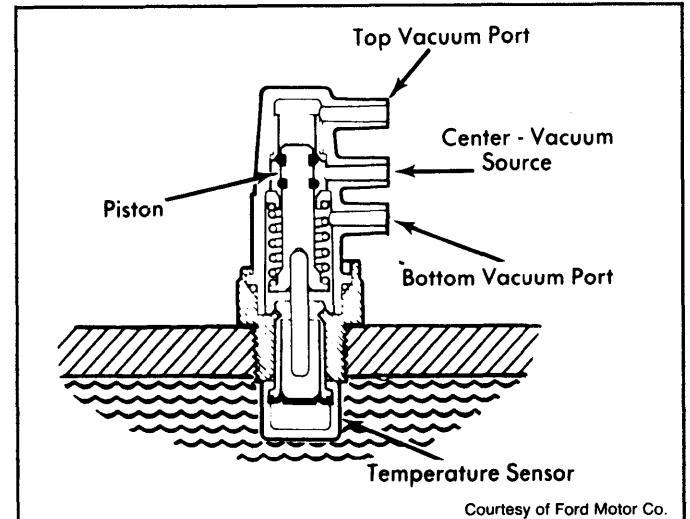


Fig. 5: Sectional View of 3-Port PVS

**PVS With 4 Connectors (Light Duty Emissions)** - 1) Disconnect vacuum hoses at PVS valve. Ensure engine coolant temperature is below PVS opening temperature. See PVS OPENING TEMPERATURES table.

2) Using a vacuum gauge and external vacuum source, check that vacuum flows from port 1 and port 2. No vacuum should flow from port 3 or port 4. See Fig. 6.

3) Start and run engine until engine coolant temperature is above PVS opening temperature. Check that vacuum flows from port 3 and port 4. Vacuum should not flow between port 1 or port 2. If PVS valve fails either test, replace valve and retest.

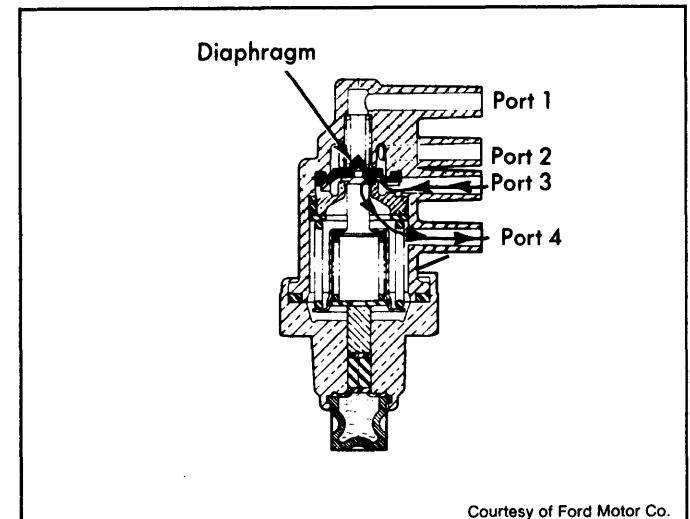


Fig. 6: Sectional View of 4-Port PVS

### PVS OPENING TEMPERATURES

| Color Code          | Temp. (°F) |
|---------------------|------------|
| Pink .....          | Above 90   |
| Black .....         | Above 100  |
| Blue, Natural ..... | Above 133  |
| Yellow, Gray .....  | Above 155  |

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### VENTURI VACUUM AMPLIFIER

Amplifiers have built-in calibrations, and no external adjustments are possible. If an amplifier bias test reveals malfunction, replace amplifier. Venturi vacuum amplifier should be 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 equipped). Disconnect vacuum hose at reservoir and "T" this line to a manifold vacuum source.

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

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

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3) Accelerate engine to 1500-2000 RPM, then release throttle. 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 1500-2000 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. See Fig. 7. Accelerate engine to 1500-2000 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.

### 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 in. Hg to reservoir. Vacuum should hold with no more than 1 in. Hg drop in 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 apply 15 in. Hg of vacuum. 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.