

1975-79 EXHAUST EMISSION SYSTEMS

Ford Motor Co. Exhaust Gas Recirculation System

DESCRIPTION

NOTE: On 1978-79 Versailles models with Electronic Engine Control I system (EEC I) and some other 1979 models with EEC II use an air pressure-operated EGR system. Refer to appropriate article in the **COMPUTERIZED ENGINE CONTROLS** section for description and operation of this system.

The Exhaust Gas Recirculation (EGR) system 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 (some models) and temperature.

Some 1975-77 models use a venturi vacuum amplifier. This system is used to control EGR operation based on air flowing through the carburetor venturi, not manifold vacuum. See Fig. 4.

Typical systems consist of an EGR valve, a spacer plate on which the valve is mounted (usually under the carburetor), a vacuum amplifier (1975-77 only), a check valve, and a Ported Vacuum Switch (PVS).

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.

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.

Non-Integral Backpressure Transducer Type - Some EGR systems employ a backpressure transducer connected to an adapter between the EGR valve and the intake manifold. The transducer modulates EGR flow by varying the EGR valve vacuum signal according to exhaust backpressure. The pressure is sensed in the cavity of the transducer spacer.

OPERATION

EGR VALVE

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

EGR COOLANT SPARK CONTROL (EGR/CSC)

At cold start, below PVS opening temperature (about 90-100°F), the ported vacuum switch connects carburetor EGR vacuum signal to the distributor through the check valve (by-passing 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.

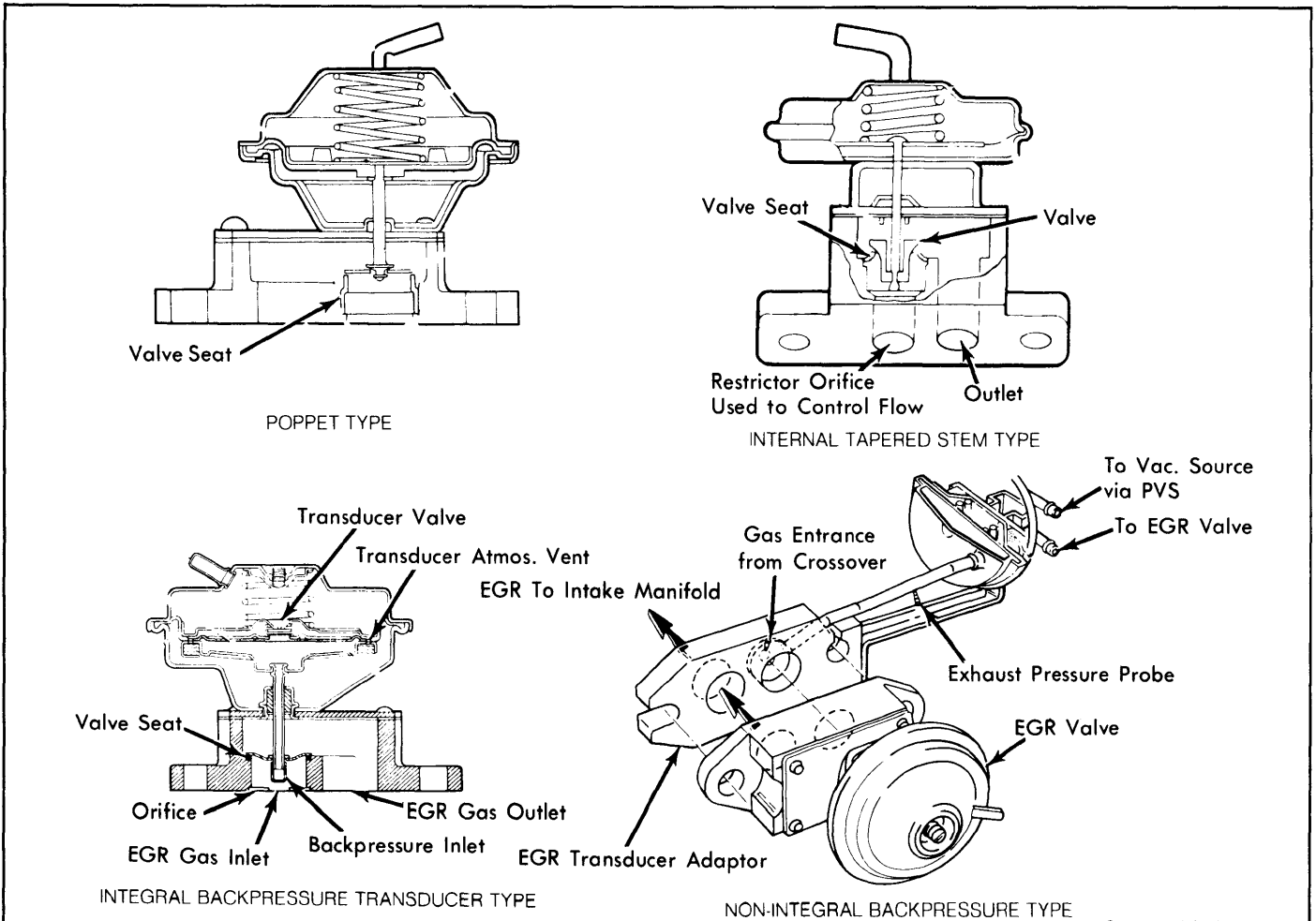


Fig. 1: View of 4 Types of EGR Valves

Courtesy of Ford Motor Co.

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Ford Motor Co. Exhaust Gas Recirculation System (Cont.)

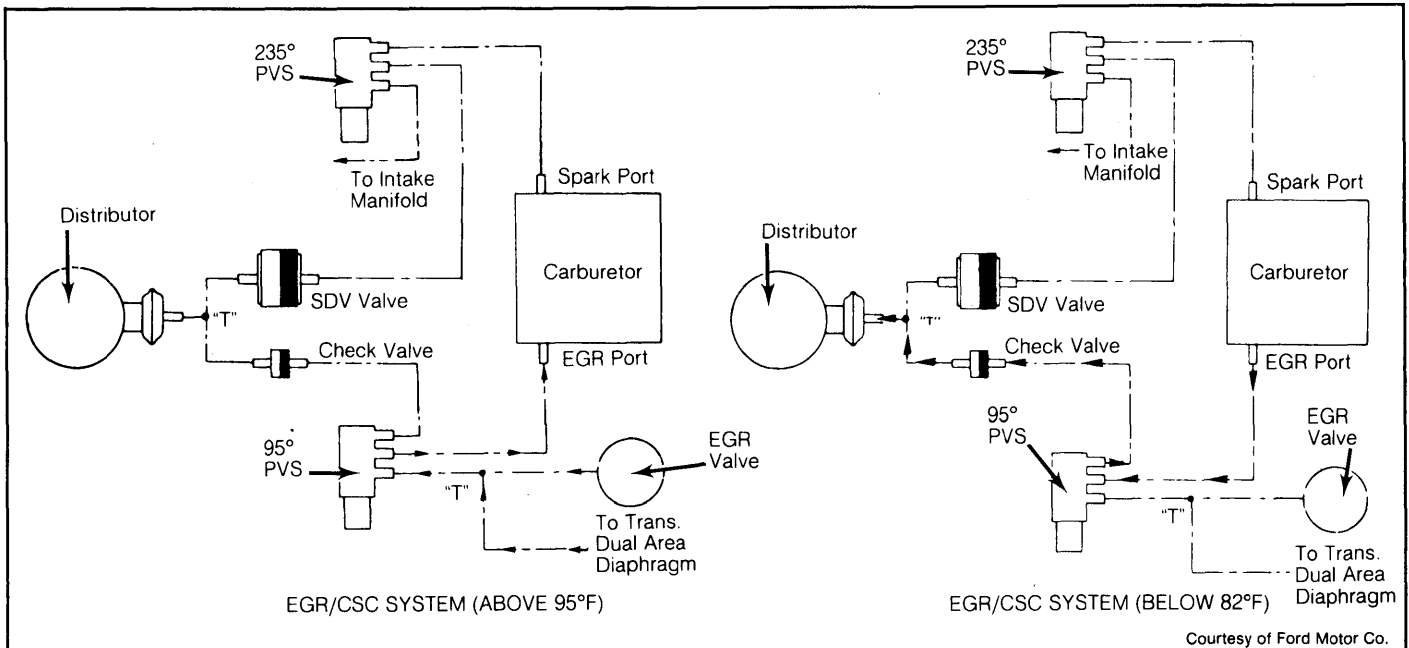


Fig. 2: 1975-77 EGR/CSC System

VENTURI VACUUM AMPLIFIER

In the EGR system, a weak vacuum signal is sensed at the throat of the carburetor and made into a stronger vacuum signal by the venturi vacuum amplifier. The amplifier controls EGR operation by amplifying a very weak vacuum signal created at the lower part of the venturi. The vacuum amplifier also receives a manifold vacuum signal.

The amplifier compares the 2 signals and operates the EGR valve when venturi vacuum signal of .5-3.0 in. Hg is present. If intake manifold vacuum drops to the same amount of venturi vacuum (as during wide open throttle), amplifier will close EGR valve.

WIDE-OPEN THROTTLE (WOT) LOAD CONTROL VALVE

This device is used on some 1978-79 models. It closes EGR valve when engine is under heavy load operation. When vacuum signals from EGR ported and intake manifold are similar (as during wide open throttle) the WOT diverts EGR source vacuum to the atmosphere.

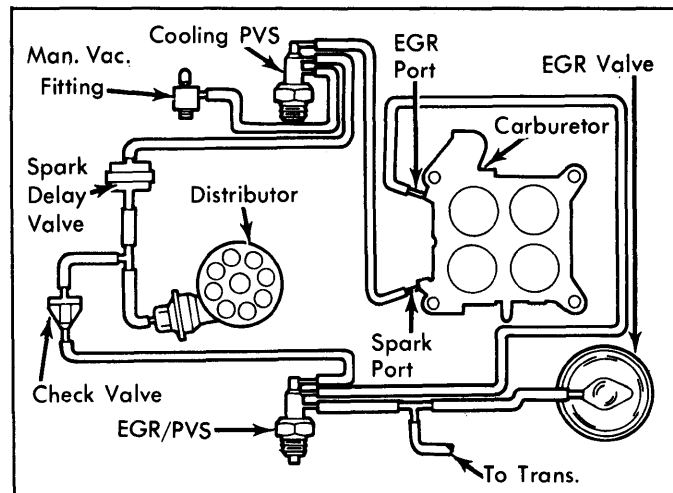


Fig. 3: 1978-79 EGR/CSC System

TESTING

EGR SYSTEM (ON VEHICLE)

Remote BPS Type - Check all vacuum hoses to make sure they are open and in good condition. Remove EGR vacuum supply hose from EGR valve and install a vacuum hose from EGR valve to an external gauge (with .10 in. Hg graduations) with a variable vacuum source of 10 in. Hg capacity.

- 1) Start engine and stabilize temperature. Gradually apply vacuum to EGR valve, while observing movement of EGR valve stem. Valve stem should be seen to move with 1/2-1 in. Hg. If valve does not start to open, replace it.
- 2) With engine off, apply 8 in. Hg to EGR valve, vacuum should hold for a minimum of 30 seconds. Replace EGR valve if it does not meet specifications.
- 3) With engine at idle, apply at least 8 in. Hg vacuum to EGR valve. Valve stem should move to full extent of its travel and engine idle should roughen, RPM should drop or engine stall. If idle quality does not change, there is something plugging EGR system. Clean system and repeat test.
- 4) Restart engine and stabilize temperature. If engine idle quality is not acceptable, EGR valve may not be sealing properly. If this condition is encountered, install a new EGR valve and gasket.
- 5) Recheck idle condition. If there is no improvement, problem is elsewhere, replace original EGR valve and check other components of system.

Integral BPS Type - 1) Remove air cleaner and position so TVS switch vacuum hoses are left connected. Inspect EGR vacuum hose routing for proper connection. See VACUUM DIAGRAMS at end of the FORD MOTOR CO. EMISSIONS section.

- 2) Visually inspect valve for obvious external defects, such as broken diaphragm vacuum nipple. Check for blown out gaskets.
- 3) With engine at normal operating temperature and transmission in Neutral, open and close the throttle. See that the stem and diaphragm moves upward, oscillates, and moves downward when the engine returns to idle. If no movement is detected, open throttle to 2000-2500 RPM and hold at that speed.

CAUTION: Do not exceed 2500 RPM.

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- 1) Remove output hose from amplifier (EGR valve to amplifier hose) and connect hose to a vacuum gauge. Remove reservoir vacuum hose and "tee" it to vacuum source hose.
- 2) Momentarily increase engine speed to 1500-2000 RPM. With engine at idle, remove vacuum hose at carburetor venturi. Vacuum gauge reading should be within .3 in. Hg of bias value. If not, replace amplifier.
- 3) Depress accelerator and release after engine speed has reached 1500-2000 RPM. If vacuum gauge showed an increase of 1 in. Hg or more during acceleration, replace amplifier.
- 4) Connect venturi hose to carburetor. If vacuum gauge increase its reading (more than .5 in. Hg) check idle speed and correct to specifications. Rapidly increase engine speed to 1500-2000 RPM and note vacuum gauge reading. Vacuum should increase to above 4 in. Hg during acceleration and return to specified bias at idle. If not, replace amplifier.

Vacuum Amplifier Bias Rating

Application Color Code/Code No.	Bias Rating ¹ In. Hg
Yellow	
10-0	² 0
10-55
10-1	1.0
10-15	1.5
10-2	2.0
White	
14-0	² 0
14-1	1.0
14-2	2.0
14-3	3.0
Red	
18-0	² 0

¹ - Acceptable reading is \pm .3 in. Hg.
² - Acceptable reading is \pm .5 in. Hg.

- 5) Connect "R" port of vacuum amplifier to manifold, "S" port to spark port vacuum, "V" port to venturi vacuum and "C" port to vacuum gauge. See Fig. 6 or 7. Increase engine RPM to 1500-2000 RPM and allow engine to return to idle.

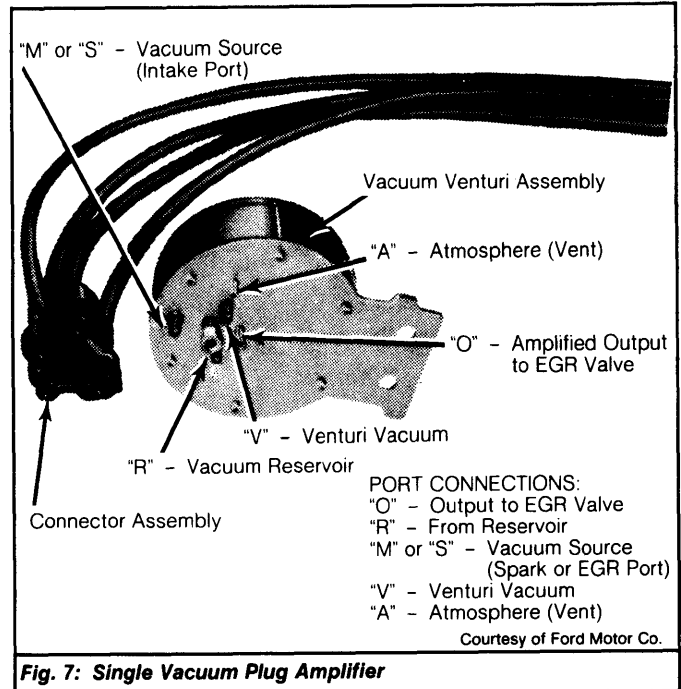


Fig. 7: Single Vacuum Plug Amplifier

- 6) Remove vacuum hose at venturi and check spark port vacuum. High vacuum (more than 2 in. Hg) could increase amplifier output vacuum. Gauge should read less than .5 in. Hg. If not, replace amplifier.

VACUUM RESERVOIR

On vacuum reservoirs without external check valve, apply 14 in. Hg vacuum to reservoir tank fitting. On vacuum reservoirs with external check valve, apply 14 in. Hg vacuum to "T" between check valve and reservoir tank. If vacuum does not hold, replace reservoir.