

# 1975-79 EXHAUST EMISSION SYSTEMS

## General Motors EGR System

### DESCRIPTION

The Exhaust Gas Recirculation (EGR) system used on General Motors vehicles is designed to reduce emission of Oxides of Nitrogen (NOx). This process is accomplished by lowering combustion temperatures of burning gases by recirculated metered amounts of exhaust gases into the intake manifold where they are mixed with the air/fuel mixture.

There are 2 types of EGR systems; ported and exhaust backpressure modulated. Ported system uses a timed vacuum port in the carburetor to regulate the amount of exhaust gas recirculation.

The backpressure modulated system regulates the timed vacuum according to the exhaust backpressure level. Several types of control sensors are used. These are described under OPERATION.

### OPERATION

#### PORTED EGR SYSTEM

Ported type EGR valve is operated from carburetor vacuum port. It is fully closed with vacuum less than 2 in. Hg. It starts to open above 2 in. Hg and is fully open when more than 8.5 in. Hg vacuum is applied. See Fig. 2.

#### EXTERNAL BACKPRESSURE TRANSDUCER VALVE WITH EGR (BPV/EGR)

Used in some 1975-77 V8 engine applications to modulate EGR to engine load. Exhaust pressure in exhaust pressure probe of BPV moves a diaphragm against spring pressure to seal air bleed when engine load is high, allowing maximum EGR. When engine load decreases, exhaust pressure decreases in exhaust pressure probe. Spring then pushes diaphragm down. Vacuum to EGR valve is then bled through air bleed to reduce vacuum to EGR valve. See Figs. 1 and 3.

#### BACKPRESSURE EGR SYSTEM

On 1978-79 models, 2 types of backpressure EGR valves are used: a Positive Backpressure EGR valve and a Negative Backpressure EGR valve.

**Positive Backpressure EGR Valve** - A small diaphragm control valve inside the EGR valve assembly acts as a pressure regulator. The control valve receives an exhaust backpressure signal through the hollow shaft. Pressure exerts a force on the bottom of the control valve diaphragm, opposed by a light spring.

Vacuum is applied to EGR valve from carburetor spark port. No EGR occurs at idle. During off-idle operation, manifold vacuum is applied to vacuum chamber through a restriction in signal tube.

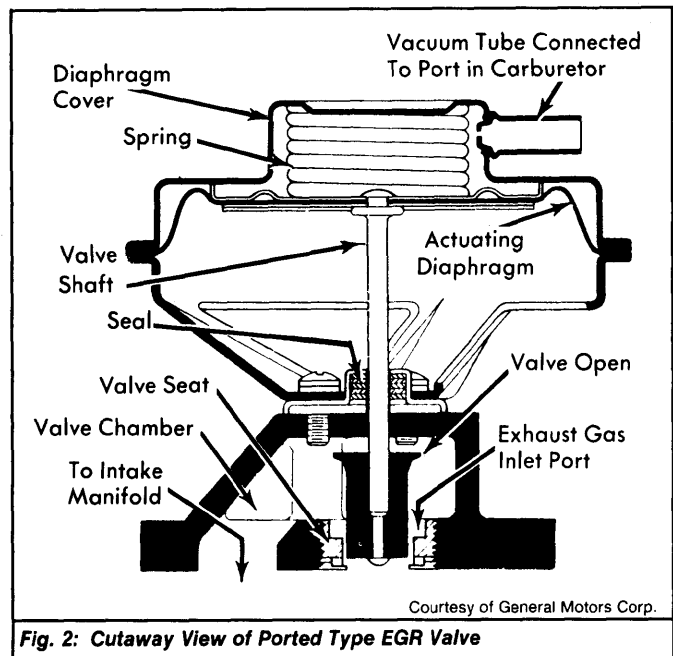


Fig. 2: Cutaway View of Ported Type EGR Valve

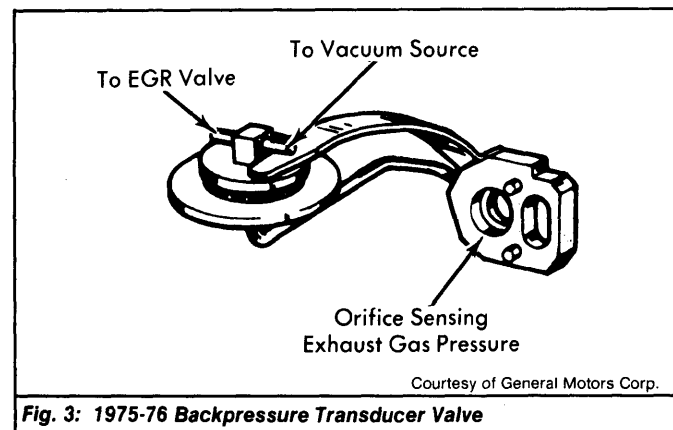


Fig. 3: 1975-76 Backpressure Transducer Valve

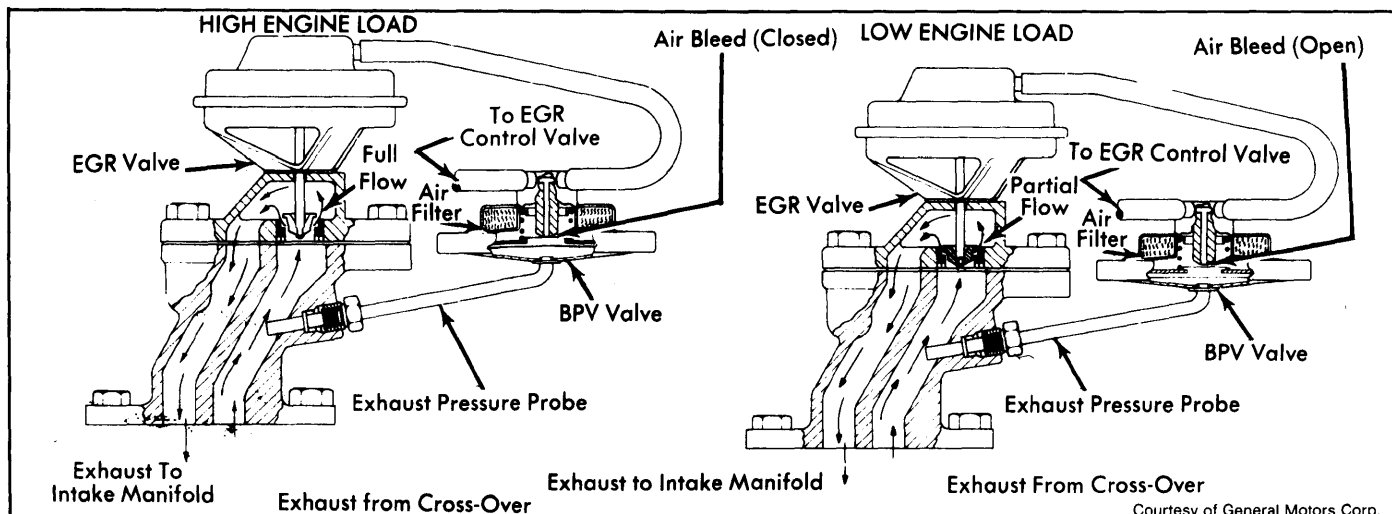
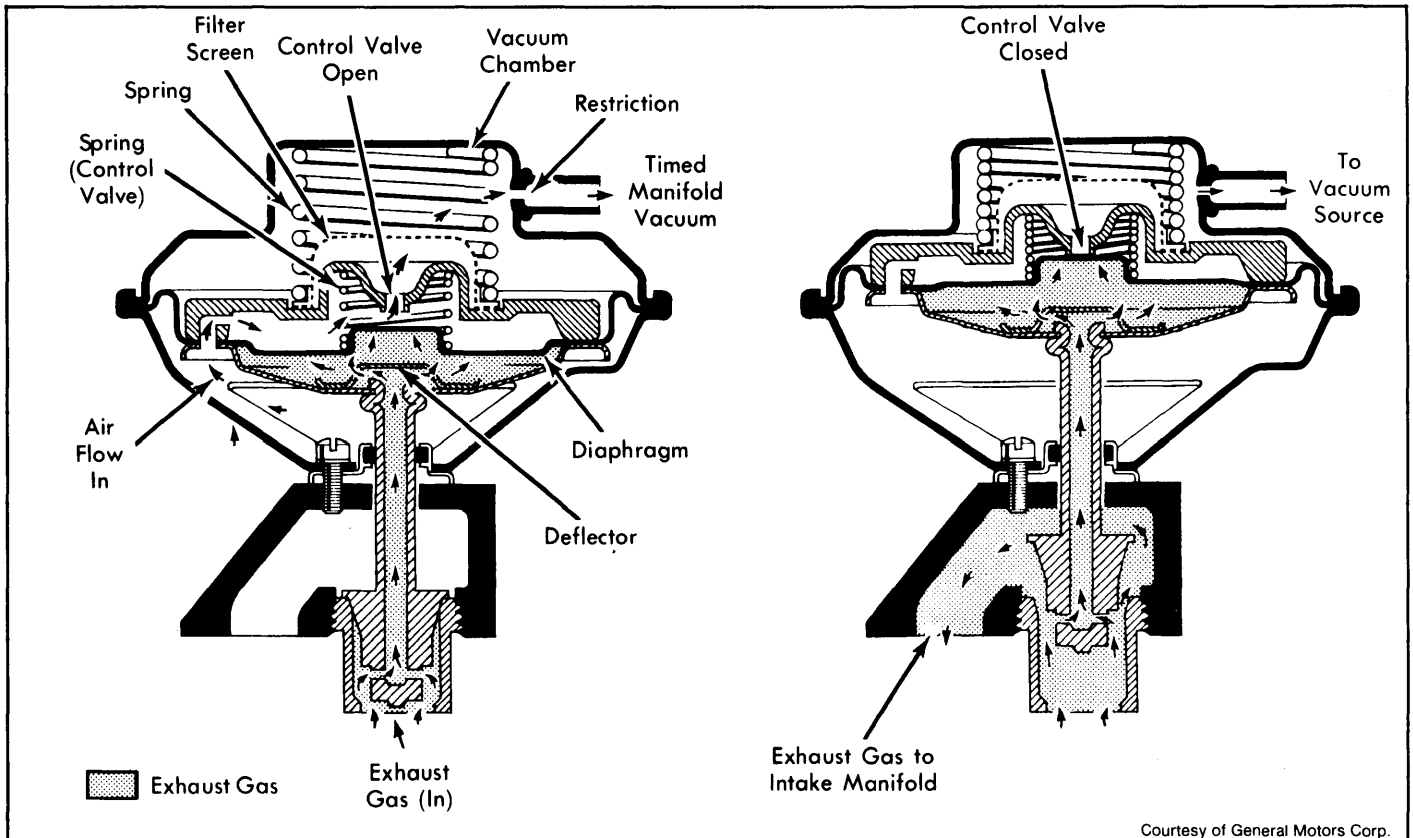


Fig. 1: 1976-77 Backpressure Transducer (BPV/EGR) Valve

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## General Motors EGR System (Cont.)



**Fig. 4: Cutaway View of Positive Backpressure EGR Valve**

When engine load is light, and backpressure is low, the control valve is open, allowing air to flow from the 6 bleeds in diaphragm plate, through control valve orifice, into the vacuum chamber. The air bleeds off vacuum, decreasing signal trying to open EGR valve. Therefore, if backpressure does not close the control valve, sealing off air flow, there will not be any vacuum open the EGR valve.

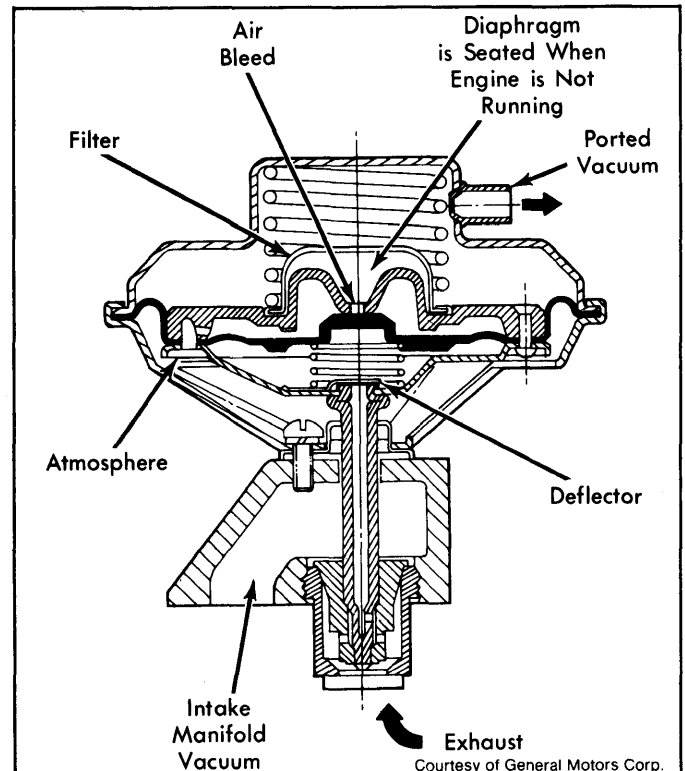
When more power demands are made on the engine, exhaust gas backpressure increases. This closes the control valve, thereby shutting off air flow through valve. Vacuum will open the EGR valve. At maximum engine load, when manifold vacuum is nearly zero, there will be no EGR operation. This is because of insufficient vacuum to pull the valve open, even though high exhaust backpressure has closed the control valve.

**Negative Transducer Backpressure EGR Valve** - The negative transducer backpressure EGR valve assembly has the same function as the positive backpressure EGR valve. Except, the transducer is designed to allow the valve to open with negative exhaust backpressure.

The flow of the valve is controlled by manifold vacuum, negative exhaust backpressure and the carburetor ported vacuum. The control valve spring in the transducer is placed on the bottom side of the diaphragm.

When the carburetor ported vacuum signal is applied to the main vacuum chamber partially opening the valve, the vacuum signal from the manifold side (reduced by exhaust backpressure) is transmitted up the hollow stem of the valve. This enables the signal to act on the diaphragm, opening the bleed and causing the transducer to modulate providing a specific valve flow. Thus the flow of the valve is a constant percentage of engine air flow.

**Thermal Vacuum Switch** - Switch is located between carburetor EGR vacuum source and EGR valve. Switch valve denies EGR during early part of initial cold driveaway. Once engine coolant



**Fig. 5: Cutaway View of Negative Transducer Backpressure EGR Valve**

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## General Motors EGR System (Cont.)

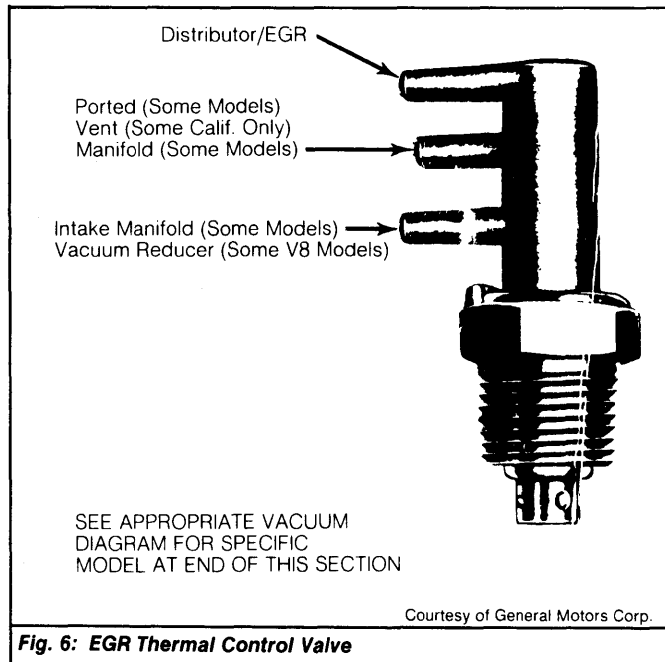
and/or air/fuel mixture temperature (depending on application) reaches a predetermined temperature, switch is opened and EGR signal becomes available. See Fig. 6.

**NOTE: A Thermal Vacuum Switch is not used on 1976 Seville models after Build No. 463462.**

### EGR THERMAL CONTROL VALVE

Some models use a temperature sensitive control valve in vacuum line to EGR valve. Valve is closed below 61°F, blocking vacuum to EGR valve and giving better cold driveability.

The thermal control valve is open above 100°F (1975-77) or 76°F (1978-79), engine temperature allowing EGR ported vacuum to be directed to EGR valve.



**Fig. 6: EGR Thermal Control Valve**

**NOTE: For proper hose routing on Thermal Vacuum Switches and Thermal Control valves, see GENERAL MOTORS VACUUM DIAGRAMS at end of in this section.**

## TESTING

### FUNCTIONAL TESTS

**EGR Valve Installed (Exc. Ported & Negative Backpressure Type Valves)** - 1) With engine at normal operating temperature, set engine speed to fast idle (or high enough to obtain at least 5 in. Hg vacuum at EGR valve). Place gloved finger beneath EGR valve so diaphragm movement can be felt.

2) Disconnect vacuum hose from EGR valve and watch for diaphragm movement. Diaphragm should move downward (valve closed) and an increase in engine RPM should be noticed.

3) Reconnect vacuum hose. Diaphragm should move upward (valve open) and engine RPM should decrease.

4) If no diaphragm movement is noticed during test, check for vacuum at hose. If vacuum is present, replace EGR valve. If no vacuum is present, check for plugged hose or carburetor port.

5) If diaphragm moves with no change in engine RPM, check manifold EGR passages for blockage.

**1975-77 BPV/EGR** - 1) Remove air cleaner assembly and plug manifold vacuum fitting. Place air conditioner in "OFF" position (if equipped), block drive wheels. Place auto. trans. in Park (man. trans. in Neutral). Bring engine to normal operating temperature. Place cam follower on high step of fast idle cam.

2) Check vacuum on source (control valve) side of BPV valve using vacuum gauge. Record reading. "T" a vacuum gauge to EGR control side of BPV valve. Vacuum reading observed should be 1.7 to 2.7 in. Hg. Replace BPV valve if not within specification.

3) Remove and plug hose from EGR valve. Vacuum gauge reading should be same as recorded at source (control valve) side of BPV. If reading is not within 2 in. Hg of source vacuum, replace BPV valve. Remove vacuum gauge, install hoses and air cleaner assembly.

**1978-79 EGR Valve Installed (Ported & Negative Backpressure Types)** - 1) Check for proper hose routing. See GENERAL MOTORS VACUUM DIAGRAMS at end of in this section. Check EGR signal tube orifice for obstructions.

2) Hook vacuum gauge between EGR valve and carburetor and check vacuum with engine running at normal operating temperature. There should be at least 5 in. Hg. vacuum

3) Check operation of Thermal Vacuum Switch (TVS) by installing a vacuum gauge inline between TVS and its sources and noting presence of vacuum with engine operating warm.

4) With engine off and valve on or off the vehicle, manually depress valve diaphragm. While depressed, hold finger over source tube and release diaphragm.

5) Check for diaphragm and seat movement. Valve is okay if it takes over 20 seconds for diaphragm to move to seated position. If less, replace EGR valve.

**EGR Valve Removed (Backpressure Type Valve Only)** - 1) Apply contact external vacuum (10 in. Hg or more) to EGR valve signal tube. Valve should not open. If it does, control valve is stuck closed. Clean EGR valve.

2) With vacuum still applied, apply a stream of air from a low pressure source into the EGR valve exhaust gas intake passage. Valve should open completely. If it does not open, control valve is stuck open or exhaust passages are plugged. Clean EGR valve.

3) If EGR valve and control valve are both functioning properly, clean the mounting surfaces and install valve using a new gasket. Reconnect vacuum hose.

## MAINTENANCE

### EGR VALVE CLEANING

**CAUTION: Do not wash valve assembly in solvents or degreaser, permanent damage to valve diaphragm may result.**

1) Remove EGR valve and discard gasket. Hold valve assembly in hand and tap lightly on the sides and end of valve, using a plastic hammer to remove the exhaust deposits from the valve.

2) With a wire wheel, buff the exhaust deposits from mounting surface and around valve. Depress valve diaphragm and look at valve seating area through valve outlet to ensure it is clean.

3) Inspect for exhaust deposits in valve outlet. Remove deposit build up with a screwdriver. Clean mounting surfaces of intake manifold and valve assembly. Install valve assembly using a new gasket.

### EGR PASSAGE CLEANING

If inspection of EGR passages in intake manifold indicates excessive build up of exhaust deposits, the passages should be cleaned. Care should be taken to ensure that all loose particles are completely removed to prevent them from clogging the EGR valve or from being ingested into the engine.