1975-79 EXHAUST EMISSION SYSTEMS
General Motors Exhaust Gas Recirculation

DESCRIPTION

Exhaust Gas Recirculation (EGR) is used on all Light Duty emissions models to reduce oxides of nitrogen (NOx) emissions. This process is accomplished by lowering the combustion temperatures of burning gases. Recirculated metered amounts of exhaust gases introduced into the intake manifold dilutes the air/fuel mixture and lowers combustion temperature.

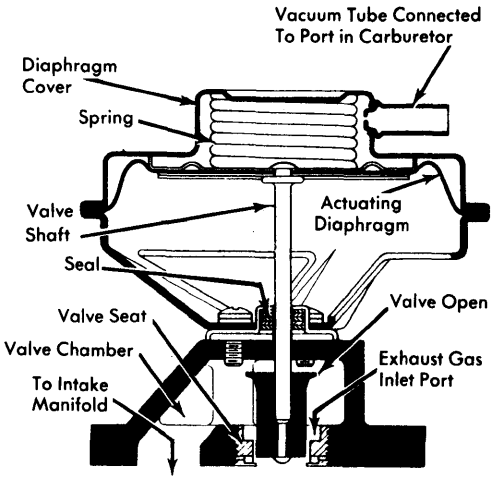
EGR valves used on all 1975-76, and 1977-78 Federal models are either single or dual diaphragm type. 1977-78 California and High Altitude models, and all 1979 models use a single diaphragm or backpressure modulated EGR system.

The backpressure modulated system regulates the timed vacuum according to the exhaust backpressure level. A special control valve within the EGR valve housing acts as a pressure regulator.

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. EGR starts to open above 2 in. Hg and is fully open with more than 8.5 in. Hg of vacuum applied. At idle and wide open throttle, ported vacuum is low and the valve is closed. At part throttle, ported vacuum is high and the valve is open for exhaust gas recirculation. *See Fig. 1.*



Courtesy of General Motors Corp.

Fig. 1: Cutaway View of Ported EGR Valve

DUAL DIAPHRAGM EGR SYSTEM

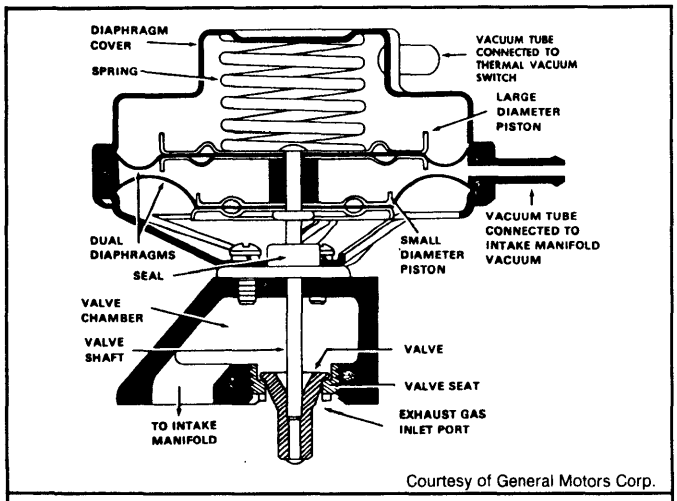
The dual diaphragm EGR valve is controlled by ported vacuum acting on top diaphragm, and intake manifold vacuum acting on lower diaphragm. When vehicle is at light cruise, intake manifold is high, overcoming ported vacuum and keeping EGR valve closed. Under heavy engine load conditions, intake manifold vacuum drops, allowing ported vacuum to lift diaphragm and provide EGR operation. *See Fig. 2.*

BACKPRESSURE EGR SYSTEM

There are 2 types of backpressure EGR valves used by General Motors. A positive backpressure EGR valve (used on Federal V8 models) and a negative backpressure EGR valve (used on some 6-cylinder and most California V8 models).

NOTE: Negative backpressure EGR valves are used on models with relatively low backpressure exhaust systems.

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 which exerts a force on the bottom of the control valve diaphragm, opposed by a light spring. A metal deflector plate prevents hot exhaust gases from flowing directly on the diaphragm. *See Fig. 3.*



Courtesy of General Motors Corp.

Fig. 2: Cutaway View of Dual Diaphragm EGR

Vacuum is applied to the EGR valve assembly from carburetor ported vacuum. During idle, no vacuum is present. During off-idle operation, ported vacuum increases and is applied to the vacuum chamber through a restriction in the EGR vacuum inlet port.

When engine load is light, exhaust backpressure is low, allowing EGR vacuum to bleed to atmosphere through EGR control valve orifice. When power demands are made on the engine, exhaust gas backpressure increases. The increased exhaust backpressure closes the EGR control valve vacuum bleed port. Ported vacuum will now open EGR valve for as long as ported vacuum and exhaust backpressure remains high.

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 (low) exhaust backpressure. *See Fig. 4.*

The EGR valve is controlled by negative exhaust backpressure and the carburetor ported vacuum signal. 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.

EGR THERMAL VACUUM SWITCH (TVS)

The EGR TVS closes to prevent EGR operations when engine coolant temperature is below 85°F. This improves cold engine driveability. When coolant temperature rises above 100°F, TVS opens to allow vacuum to be directed to EGR valve.

TESTING

SYSTEM OPERATION

NOTE: For testing backpressure type EGR valves, see EGR VALVE REMOVED (BACKPRESSURE TYPE ONLY) in this article.

1) Ensure TVS does not allow vacuum to EGR valve with engine coolant temperature below 85-100°F. Start and warm engine. Ported vacuum should be present at EGR valve with engine coolant temperature above 85-100°F.

General Motors Exhaust Gas Recirculation (Cont.)

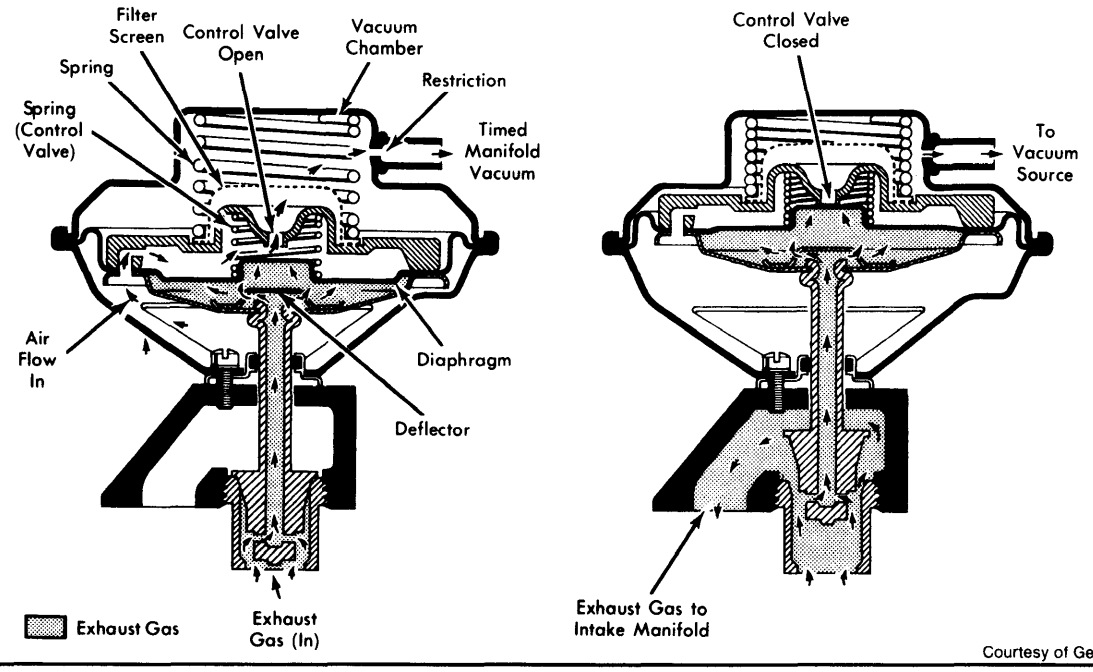


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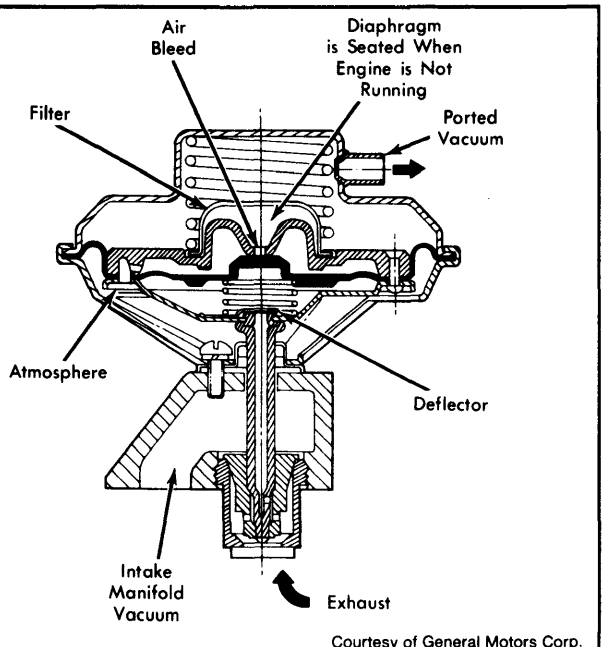
Fig. 3: Cutaway View of Positive Backpressure EGR Valve



Courtesy of General Motors Corp.

Fig. 4: Cutaway View of Negative Transducer Backpressure EGR Valve

2) Disconnect ported vacuum hose at EGR valve. Disconnect and plug intake manifold vacuum hose on dual diaphragm EGR. On all models, connect an external vacuum source to EGR valve. Start engine. Apply a minimum of 5 in. Hg vacuum to EGR valve. Engine should run rough and/or stall. If rough running and/or stalling does not occur, go to next step.

3) Turn off engine. Using external vacuum source, apply 5-7 in. Hg vacuum to EGR valve. Using a gloved finger beneath EGR diaphragm, ensure diaphragm moves up when vacuum is applied. If EGR diaphragm does not move, replace EGR valve.

4) If EGR diaphragm does move, remove EGR valve and check for carbon deposits blocking exhaust flow. Clean carbon deposits (if necessary) and install EGR valve using a new base gasket.

FUNCTIONAL TESTS

EGR Valve Installed (Ported & Negative Backpressure Types) - 1) Check for proper vacuum hose routing. See GENERAL MOTORS VACUUM DIAGRAMS in this section.

2) Hook vacuum gauge between EGR valve and carburetor and check vacuum with engine running at normal operating temperature. With engine at 3000 RPM, there should be at least 5 in. Hg vacuum.

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

4) With engine off, manually depress EGR 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 Only) - 1) Apply constant external vacuum (10 in. Hg or more) to EGR valve signal tube. Valve should not open. If EGR valve does open, control valve is stuck closed and EGR valve must be replaced.

2) With vacuum still applied, apply a stream of air from a low pressure source (15 psi maximum) into the EGR valve exhaust gas intake passage. Valve should open completely. If it does not open at all, control valve is stuck open or exhaust passages are plugged. Replace EGR valve.

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

MAINTENANCE

EGR PASSAGE CLEANING

If inspection of EGR passages in intake manifold indicates excessive build up of carbon deposits, the passages should be cleaned. Care should be taken to ensure that all loose particles are completely removed to prevent clogging the EGR valve.