# INTERNATIONAL HARVESTER CO.
# EXHAUST GAS RECIRCULATION – GASOLINE ENGINES

## DESCRIPTION

The Exhaust Gas Recirculation (EGR) system is designed to reduce emission of oxides of nitrogen (NOx). This process is accomplished by lowering combustion temperatures of burning gases. Recirculated and metered amounts of exhaust gases are reintroduced into the engine through the intake manifold, where they are mixed with the air/fuel mixture. System consists of a positive back pressure type EGR valve, a thermal vacuum switch (TVS) and a modified intake manifold.

## OPERATION

### POSITIVE BACK PRESSURE EGR VALVE

A small diaphragm control valve inside the EGR valve assembly acts as a pressure regulator. The control valve receives an exhaust back pressure 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.

Vacuum is applied to the EGR valve assembly from the carburetor spark port, to assure no exhaust gas recirculation at idle. During off-idle operation, manifold vacuum is applied to the vacuum chamber through a restriction in the signal tube.

When engine load is light, and back pressure 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 back pressure does not close the control valve, sealing off air flow, there will not be any vacuum built up to open the EGR valve for exhaust gas recirculation.

When power demands are made on the engine, and exhaust gas recirculation is needed, exhaust gas back pressure increases, closing the control valve, thereby shutting off air flow through valve. Vacuum builds up in the vacuum chamber until the spring force holding the EGR valve closed is overcome.

Once the EGR valve opens, the exhaust pressure decreases because some of the exhaust gas is flowing into the intake manifold through the EGR passage. In actual operation, the system will reach a balanced condition providing optimum EGR operation.

Any increase in engine load will momentarily increase the exhaust signal, causing the control valve to close, allowing a stronger vacuum signal. The system will then stabilize at a greater EGR flow.

At maximum engine load, when manifold vacuum is nearly zero, momentarily, there will be no EGR operation. This is because of insufficient vacuum to pull the valve open, even though high exhaust back pressure has closed the control valve.

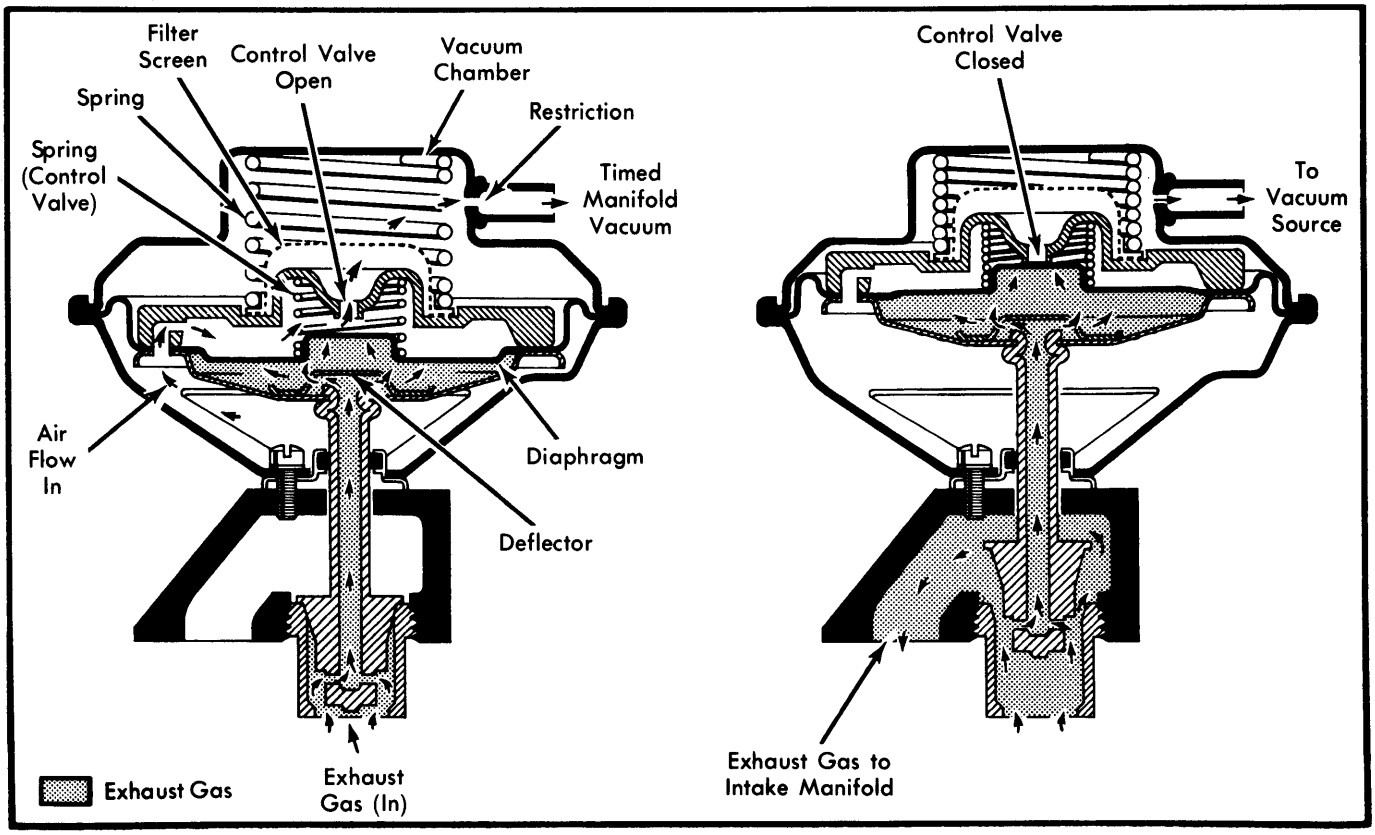


*Fig. 1 Cutaway View of Positive Back Pressure EGR Valve*

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## EXHAUST GAS RECIRCULATION – GASOLINE ENGINES (Cont.)

### THERMAL VACUUM SWITCH (TVS)

The TVS, located between carburetor vacuum source and EGR valve, eliminates EGR operation when engine is cold to improve driveability. When engine coolant temperature is below 85°F, TVS closes to block vacuum to EGR valve and prevent EGR operation. When coolant temperature rises above 85°F, TVS opens to allow vacuum to EGR valve.

V8 engine models have an additional TVS located in left radiator tank and connected in series with the engine TVS. This TVS further improves cold driveability by delaying vacuum to EGR valve until engine thermostat opens. This TVS opens at 45°F, but does not close until radiator coolant temperature drops below 35°F.

### TESTING

### FUNCTIONAL TESTS

**EGR Valve (Installed) – 1)** Connect tachometer and warm engine to normal operating temperature. Set engine speed to fast idle (or high enough to obtain at least 5 in. Hg 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 by at least 150 RPM.

**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 or leaking hose or carburetor port.

**5)** If diaphragm moves with no change in engine RPM, check manifold EGR passages (V8 engine models only) for blockage.

**EGR Valve (Removed) – 1)** Apply external vacuum (10 in. Hg or more) to EGR valve signal tube.

NOTE – *A constant vacuum supply must be used.*

**2)** Valve should not open. If it does, control valve is stuck closed. Clean EGR valve as described under EGR Valve Cleaning in this article.

**3)** 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 at all, control valve is stuck open or exhaust passages are plugged. Clean EGR valve.

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

**Thermal Vacuum Switch (Engine Warm) – 1)** With engine at normal operating temperature, disconnect vacuum hose from EGR valve and install vacuum gauge. On 304" engine, remove hose from carburetor vacuum diaphragm and plug.

**2)** Disconnect EGR vacuum hose from carburetor nipple and connect a vacuum pump or an engine manifold vacuum source to hose.

NOTE – *If carburetor EGR vacuum source also operates other devices, apply vacuum to hose that will eliminate all but EGR system.*

**3)** Vacuum applied to selected hose should be indicated on vacuum gauge. If vacuum does not reach gauge, inspect hoses for proper connection and leaks. If okay, disconnect vacuum line from opposite port of engine TVS and test for vacuum. If vacuum exists, replace engine TVS.

**4)** If no vacuum exists with hose disconnected from engine TVS, perform the same test to opposite port of radiator TVS (V8 engine models only). If vacuum is found, replace radiator TVS. Repeat steps **1)** through **3).**

**Thermal Vacuum Switch (Engine Cold) –** Engine TVS should be closed with coolant below 82°F, and radiator TVS should be closed with coolant below 35°F. Test switches on or off vehicle. Replace if defective.

### MAINTENANCE

### EGR VALVE CLEANING

CAUTION – *Do not wash valve assembly in solvents or degreaser, permanent damage to valve diaphragm may result. Also, sand blasting of the valve is not recommended since this can affect the operation of the valve.*

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

NOTE – *DO NOT place EGR valve in a vise.*

**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.

**4)** Clean mounting surfaces of intake manifold and valve assembly, then using a new gasket, install valve assembly on intake manifold. Tighten attaching bolts and connect vacuum hose.

### EGR PASSAGE CLEANING (V8 ENGINES ONLY)

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.