1975-79 EXHAUST EMISSION SYSTEMS
International Harvester EGR System

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.

1975-78 Federal and High altitude models use a Thermal Vacuum Switch (TVS) and ported EGR valve. 1975-76 California models use a vacuum amplifier and vacuum reservoir in addition to the TVS and ported EGR valve. 1977-78 California models use a TVS and dual diaphragm EGR system. All 1979 models use a TVS and a positive backpressure type EGR valve system.

OPERATION

THERMAL VACUUM SWITCH (TVS)

The Thermal Vacuum Switch (TVS) prevents vacuum from reaching the EGR valve until engine coolant is warm. Light Duty vehicle (Bronze colored TVS) models are calibrated at 85°F. Heavy Duty models (Violet colored TVS) are calibrated at 115°F. Below these temperature values, no vacuum is passed through TVS.

Some 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.

PORTED VACUUM EGR SYSTEM

The EGR valve is lifted, allowing EGR flow, when carburetor ported vacuum is above 2 in. Hg vacuum. When ported vacuum reaches 8 in. Hg vacuum, EGR should be completely open. *See Fig. 1.*

VACUUM AMPLIFIED EGR SYSTEM

This system controls EGR flow by using carburetor venturi vacuum signal to a vacuum amplifier. The vacuum amplifier operates the EGR valve by applying intake manifold vacuum to the EGR valve when signaled by venturi vacuum. *See Fig. 2.*

DUAL DIAPHRAGM EGR VALVE

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 condition, intake manifold vacuum drops, allowing ported vacuum to lift diaphragm and provide EGR operation.

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 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. *See Fig. 3.*

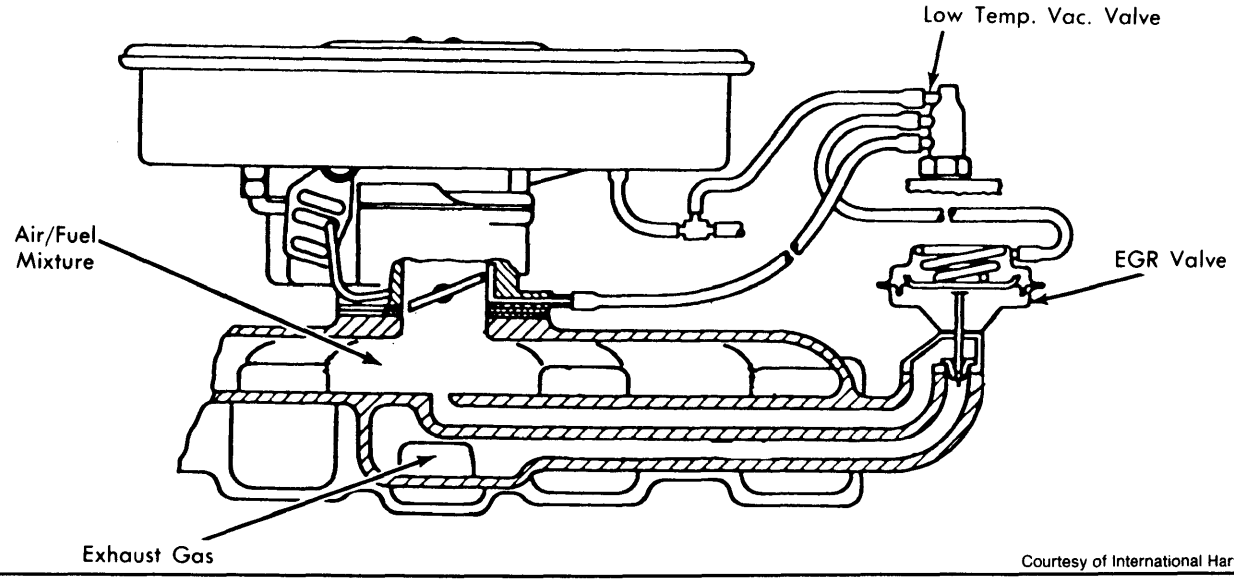
Vacuum is applied to the EGR valve assembly from carburetor ported vacuum. During idle, no vacuum is present. During off-idle operation, ported vacuum increases and is applied to the vacuum chamber through a restriction in the EGR vacuum inlet port.

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 remain high.

TESTING

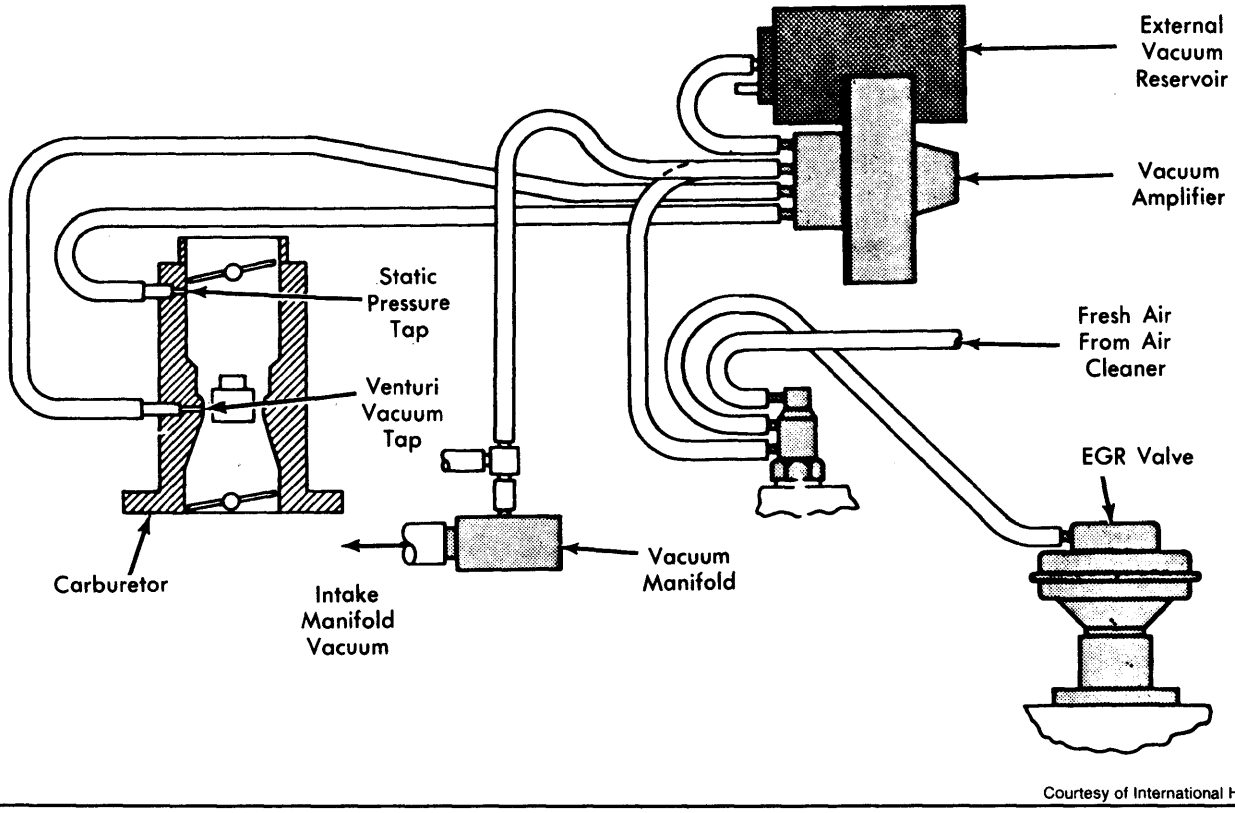
FUNCTIONAL TESTS

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 left.
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.



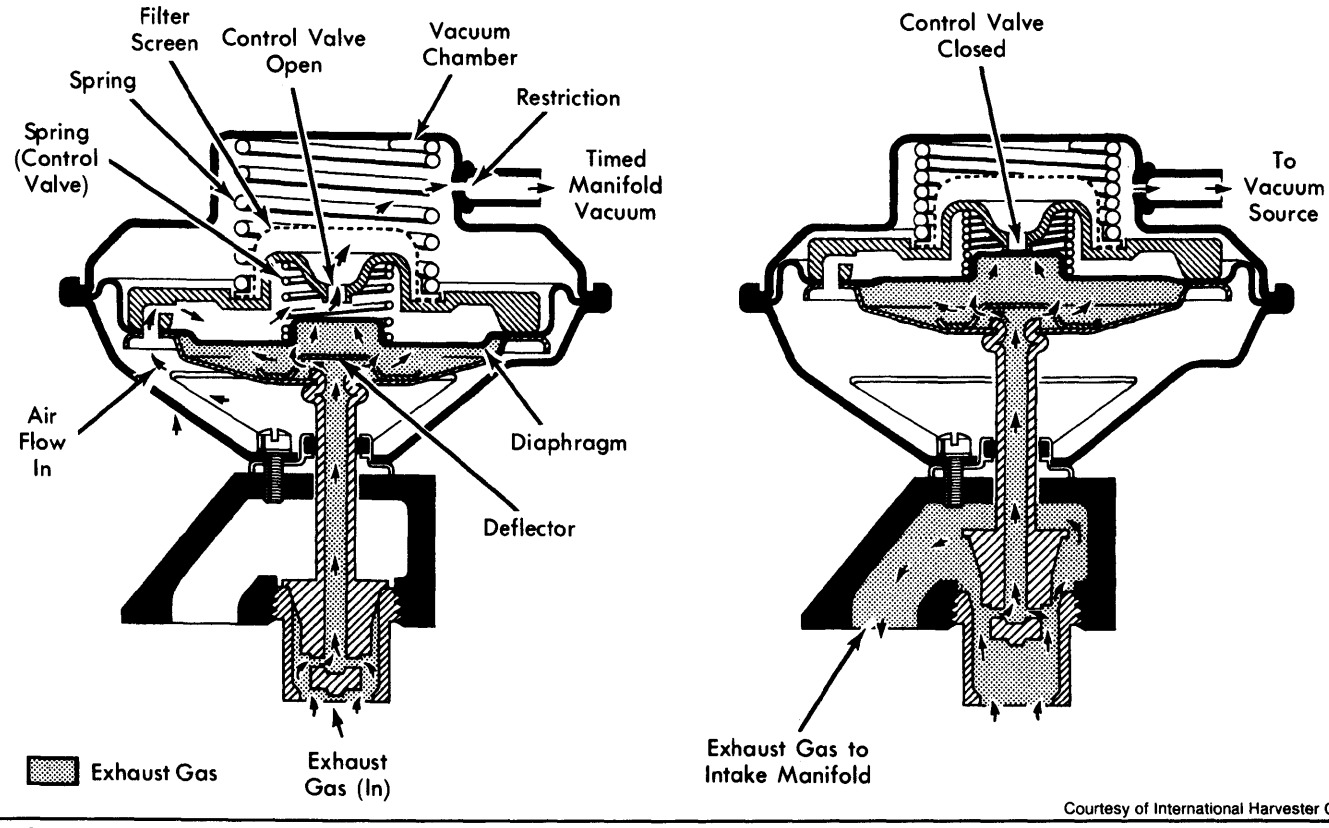
Courtesy of International Harvester Co.

Fig. 1: Ported Vacuum EGR System



Courtesy of International Harvester Co.

Fig. 2: Vacuum Amplified EGR System



Courtesy of International Harvester Co.

Fig. 3: Cutaway View of Positive Backpressure EGR Valve

1975-79 EXHAUST EMISSION SYSTEMS
International Harvester EGR System (Cont.)

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 engines only) for blockage.

EGR Valve Removed (Positive Backpressure Type) - 1) Apply a constant external vacuum of 10 in. Hg (or more) to EGR valve signal tube. Valve should not open. If it does, control valve in atmospheric vent is stuck closed. Clean EGR valve as described under EGR VALVE CLEANING in this article.
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 at all, 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, then using a new gasket, install valve on engine. Reconnect vacuum hose.
Thermal Vacuum Swith (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.
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 engines only). If vacuum is found, replace radiator TVS. Repeat steps **1)** through **3)**.
Vacuum Amplifier - 1) Disconnect vacuum amplifier-to-TVS hose and install vacuum gauge in hose. Start engine. No vacuum should be present at idle. If vacuum gauge indicated vacuum, check improperly routed vacuum hoses and correct (if necessary).
2) If vacuum is still present, disconnect carburetor venturi vacuum hose at vacuum amplifier. If venturi vacuum is present at idle, repair carburetor. If no venturi vacuum is present, replace vacuum amplifier.

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 and tap lightly on 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. Using a new gasket, install valve assembly on intake manifold. Tighten attaching bolts and connect vacuum hose.

EGR PASSAGE CLEANING

V8 Engines - 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.

1975-79 EXHAUST EMISSION SYSTEMS
International Harvester Throttle Modulator

1975-78 Models

DESCRIPTION

The throttle modulator system is used to reduce emissions during deceleration. System consists of a vacuum operated throttle modulator, solenoid vacuum valve and an electronic speed sensor. Early models have separate speed sensor and solenoid vacuum valve. Later models have a combined speed sensor/solenoid vacuum valve. *See Figs. 1 and 2.*

OPERATION

The electronic speed sensor is calibrated to electrically ground the solenoid vacuum valve when engine speed is greater than 1850 RPM. When solenoid vacuum valve is grounded, intake manifold vacuum is applied to the throttle modulator. With vacuum applied, modulator shaft extends keeping throttle from returning to complete idle position. Modulator shaft should hold throttle at 1400-1600 RPM during deceleration.

TESTING

THROTTLE MODULATOR

1) With engine off, inspect throttle modulator shaft to ensure shaft is fully retracted. There should be a small clearance (about 1/4") between modulator and throttle linkage.
2) Connect a tachometer to engine. Start engine and observe modulator shaft. Shaft should remain retracted. If shaft extends at idle, vacuum solenoid or speed sensor is faulty. Slowly raise engine speed. Modulator shaft should extend when engine exceeds 1850 RPM.
3) Allow engine RPM to decrease. Modulator shaft should retract when engine drops below 1850 RPM. If throttle modulator does not perform as described, check vacuum supply, vacuum solenoid valve and speed sensor.

VACUUM SOLENOID VALVE

1) Start engine. Disconnect wiring at solenoid valve. Modulator shaft should be retracted. Using jumper wires, apply battery voltage and ground to solenoid terminals.

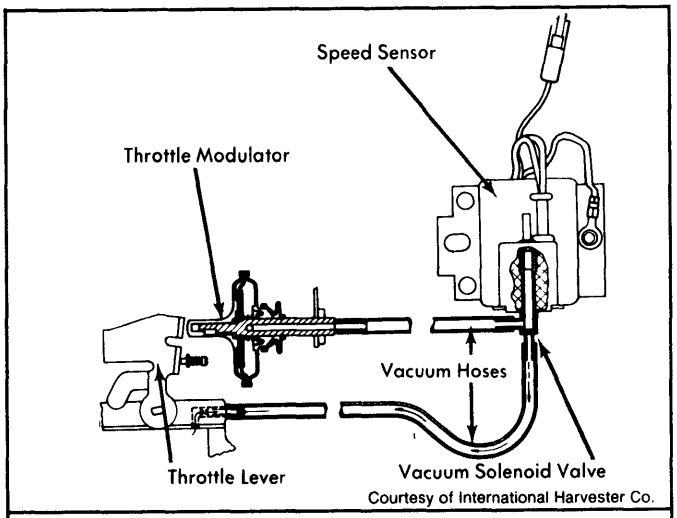


Fig. 1: Late Model Throttle Modulator Components

2) Modulator shaft should extend, holding engine at 1400-1600 RPM. If modulator does not operate properly, replace modulator and retest.

SPEED SENSOR

1) Disconnect electrical connector at vacuum solenoid valve. Connect a test light between harness terminals. Connect a tachometer and start engine.
2) Slowly accelerate engine while observing tachometer and test light. Test light should should glow when engine exceeds 1850 RPM. Test light should not glow when engine is below 1850 RPM.
3) If speed sensor does not check okay, check speed sensor wiring. If wiring is okay, replace speed sensor and retest. Late model systems require speed sensor/vacuum solenoid valve unit replacement.

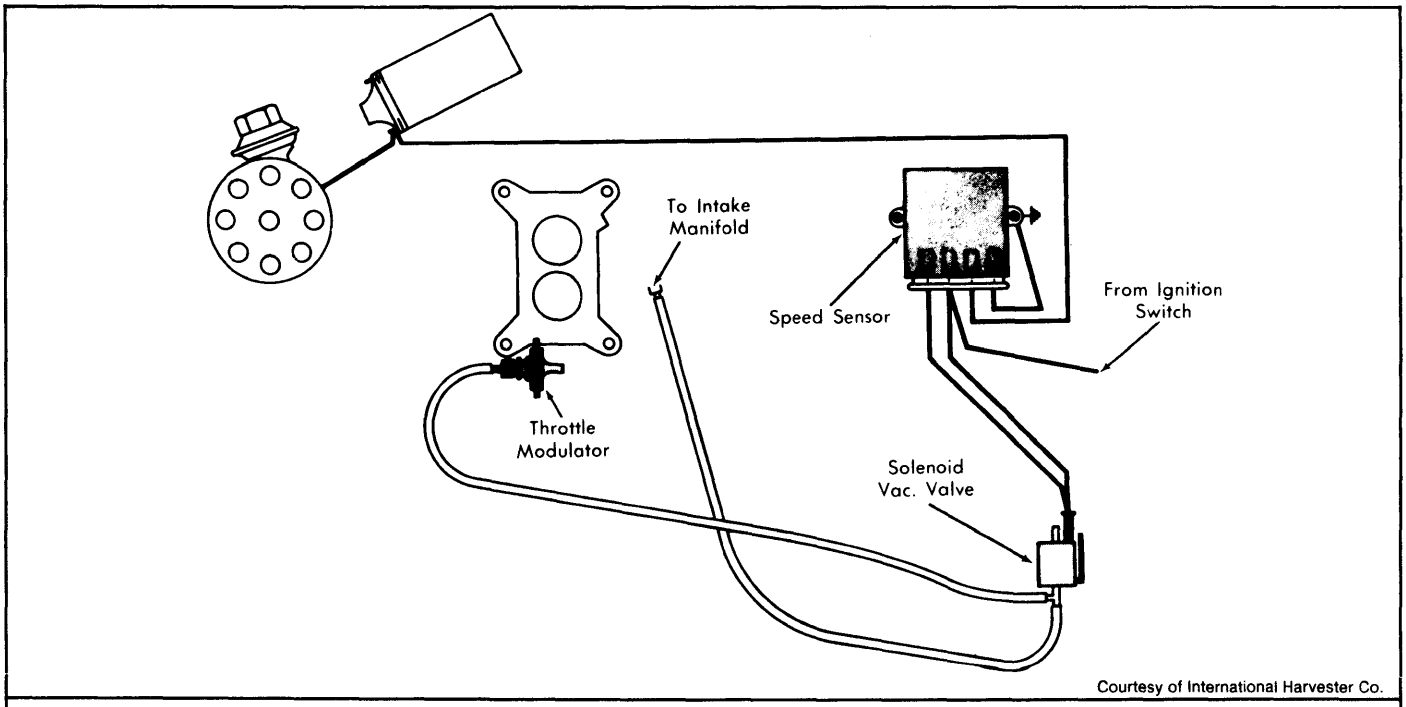


Fig. 1: Early Model Throttle Modulator Components