INTERNATIONAL HARVESTER CO. EXHAUST GAS RECIRCULATION

DESCRIPTION

Exhaust Gas Recirculation (EGR) System is designed to lower burning temperatures of gases in combustion chambers, thereby reducing formation of oxides of nitrogen (NOx). EGR system introduces a metered amount of exhaust gas into intake manifold where it mixes with air/fuel mixture entering combustion chambers. Dilution of air/fuel mixture is regulated by a vacuum operated EGR valve.

OPERATION

NOTE – Two types of EGR systems are used, one for Federal application and one for California application. Systems will be described separately starting with Federal System.

Federal System – 1) EGR valve is controlled by carburetor ported vacuum, which is determined by position of carburetor throttle valve(s). With engine stopped or at idle (negligible port vacuum), EGR valve is held closed by spring pressure. This prevents entry of exhaust gas into intake during starting or idle.

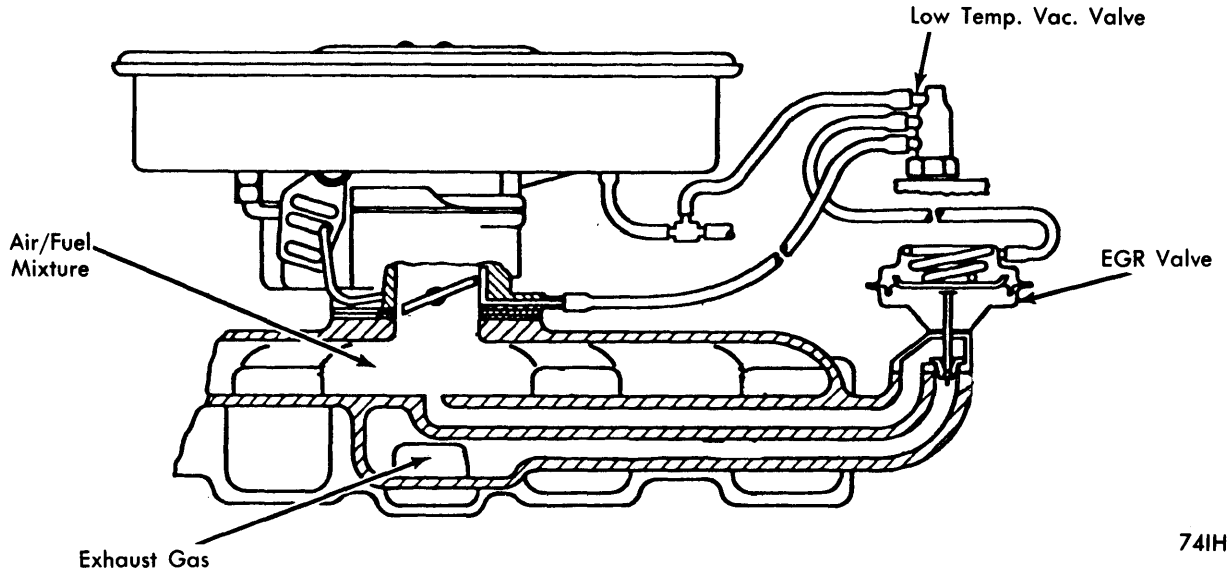
2) As throttle valve is opened (exposing vacuum port slot in throttle bore), port vacuum acting upon EGR valve diaphragm opens valve to allow entry of exhaust gases. Valve is calibrated to start to open at approximately 2 in. Hg and be fully open at 7 in. Hg on light duty 258" 6-cyl., 304", 345", 392" and 400" V8's and heavy duty 258" 6-cyl., 304" and 345" V8's with governors, or 3 in. Hg and fully open at 8 in. Hg on heavy duty 258" 6-cyl., 304" and 345" V8's without governors.

3) A low temperature vacuum control valve located in heater supply hose (6-cyl.) or coolant passage of intake manifold (V8) is used to prevent opening of EGR valve when engine is cold. This valve improves engine driveability until engine reaches normal operating temperatures. Before valve will open temperatures must reach 85°F on light duty 258" 6-cyl., 304", 345" and 393" V8's (bronze color) or 115°F on 400" V8 and heavy duty 258" 6-cyl., 304" and 345" V8's (violet color).

California System – 1) On 258" 6-cyl., 345" and 392" V8's sold in California, a more refined EGR system is used which has two vacuum hoses from carburetor, external vacuum reservoir and a vacuum amplifier which are not used on Federal applications. The venturi vacuum tap is located in smallest inside diameter of carburetor venturi where air flow through carburetor is at its highest velocity. At this point air flow and resulting venturi vacuum are most directly related to engine load at all speeds. The static pressure tap, located in carburetor air horn just below choke valve, which is used to counterbalance venturi vacuum signal during choking.

2) When engine is operating at normal curb idle speed, there is zero or negligible carburetor venturi vacuum acting upon vacuum amplifier. With little or no venturi vacuum, amplifier output vacuum is not strong enough to open EGR valve. Valve is held closed by spring pressure, preventing entry of exhaust gas, thereby allowing induction of undiluted air/fuel mixture during idle.

3) When throttle valve is open, carburetor air flow increases as engine and load increases resulting in increased venturi vacuum. Venturi vacuum signal is amplified by vacuum acting on vacuum amplifier. When amplifier output vacuum acting upon EGR valve vacuum diaphragm exceeds approximately 2 in. Hg, EGR valve starts to open allowing exhaust gas to enter intake manifold. When output vacuum exceeds approximately 7 in. Hg, EGR valve is held fully open allowing maximum EGR. Because of vacuum amplifier operation, amount of EGR is proportional to venturi vacuum signal as determined by carburetor air flow. Under moderate accelerations of short duration when engine intake manifold vacuum may momentarily



EXHAUST GAS RECIRCULATION SYSTEM (TYPICAL FEDERAL)

INTERNATIONAL HARVESTER CO. EXHAUST GAS RECIRCULATION (Cont.)

drop below level required to operate EGR valve, vacuum from vacuum amplifier's internal and external vacuum reservoirs maintain vacuum to operate EGR valve.

4) Relief valve in vacuum amplifier allows EGR valve to close for maximum power during long wide open throttle operations. During wide open throttle accelerations of a few seconds duration, EGR valve control is maintained by supply of vacuum in internal and external vacuum reservoirs. During extended wide open throttle accelerations, vacuum to EGR valve is completely removed (bled down) after approximately 10 seconds operation thus removing exhaust gas from air/fuel mixture, permitting maximum power output.

5) At engine coolant temperatures below 85°F, low temperature vacuum control valve is closed preventing operation of EGR valve. When engine coolant temperature is above 85°F, but engine still requires choking to start and run, choke valve will be partically closed restricting carburetor air flow. Under this condition venturi vacuum and static pressure taps will sense approximately same vacuum. With equal or nearly equal vacuum signals at venturi vacuum and static pressure taps, vacuum amplification is reduced, thereby reducing vacuum to EGR valve and permitting valve to close.

TESTING

1) With engine at normal operating temperature, install a tachometer and a vacuum gauge to intake manifold. Attach a second vacuum gauge with a "T" fitting between low temperature vacuum control valve and EGR valve.

2) Start engine and disconnect throttle stop solenoid wire (or depress solenoid plunger) to allow engine to operate at low idle speed. Observe reading on vacuum gauge at EGR valve. Vacuum reading should be less than 1.8 in. Hg. If vacuum reading is greater than 1.8 in. Hg; replace carburetor and recheck vacuum reading (Federal) or replace vacuum amplifier and recheck vacuum reading (Calif.). Shut off engine.

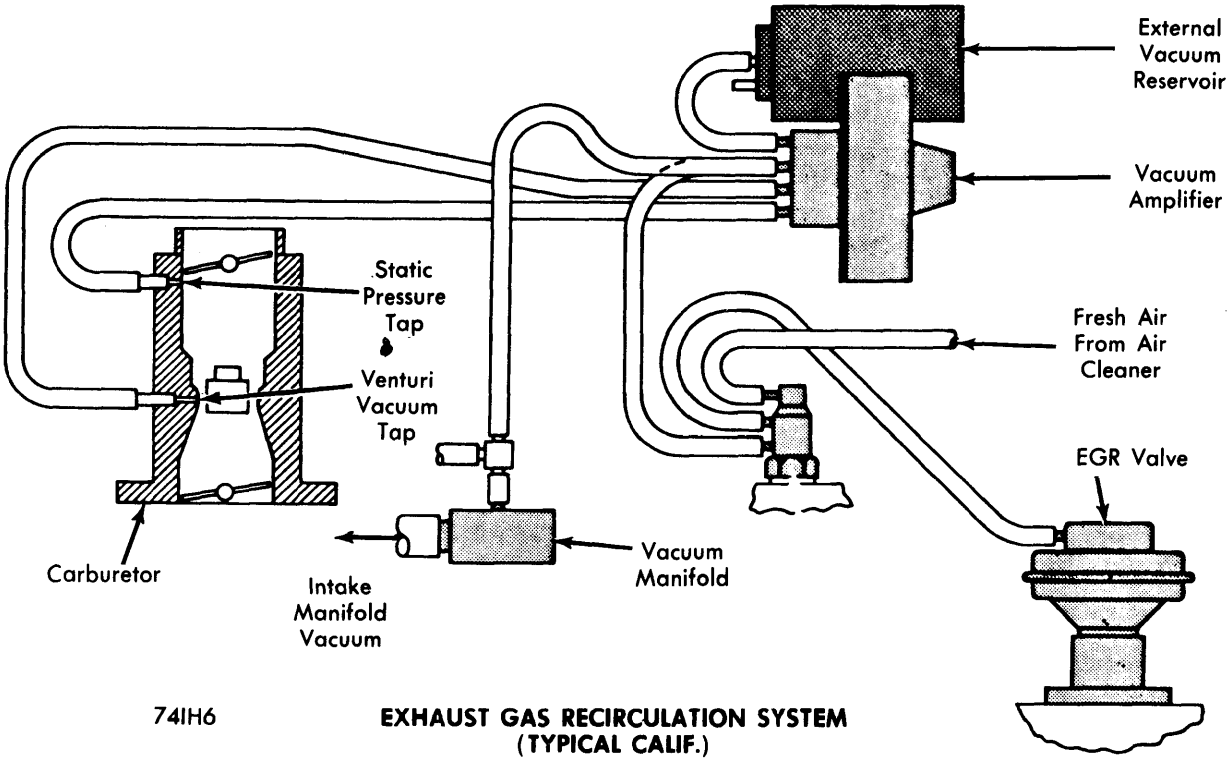
3) Open throttle and move choke valve to full choke position. Holding choke plate closed, close throttle. This will hold fast idle position. Disconnect and plug vacuum hose from EGR valve. Start engine and allow it to stabilize. Observe and record tachometer and intake manifold readings. Reconnect vacuum hose to EGR valve; allow engine speed to stabilize and again observe and record tachometer and intake manifold readings. If engine speed and manifold vacuum drop, EGR system is operating properly. Engine speed should drop at least 100 RPM. If engine speed and intake manifold vacuum reading does not change when hose is reconnected to EGR valve, EGR system is not functioning.

Low Temperature Vacuum Valve – With coolant temperature above 60°F, disconnect hoses from valve and blow through valve. It should pass air through fittings. At temperatures below 60°F, valve will be closed and will not pass air through fittings.

Exhaust Gas Passages – On 258" 6-cyl. engines, remove EGR valve from manifold. Examine and clean of carbon deposits as necessary. On V8 engines, open throttle and inspect exhaust gas ports in floor of intake manifold directly below carburetor. Remove carburetor and clean ports as needed.

EGR Valve – Remove EGR valve from engine and inspect valve for evidence of valve pintel not seating. If pintel does seat due to carbon deposits, clean valve pintel and seat. If after cleaning, valve does not seat, replace EGR valve.

NOTE – Use only exact replacement valve as valves vary with engine applications.



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INTERNATIONAL HARVESTER CO. EXHAUST GAS RECIRCULATION (Cont.)

Using an auxiliary vacuum source, apply 10-12 in. Hg vacuum to EGR vacuum port. As vacuum is applied, valve pintel should move off seat and retract into valve housing until end of pintel is approximately flush with surface of valve housing. Replace valve if it fails test.

Carburetor Signal Vacuum (Federal) – With engine at curb idle speed, disconnect vacuum signal hose from carburetor and cap port. Using an auxiliary vacuum source, apply 5-8 in. Hg vacuum to hose. Engine speed should drop a minimum of 150 RPM. If engine speed changes, clean carburetor vacuum port and repeat system test.

Carburetor Signal Vacuum (Calif.) – With engine at curb idle speed, disconnect venturi vacuum hose from carburetor and cap port. Using an auxiliary vacuum source, apply 1-2 in. Hg vacuum to hose. Engine speed should drop a minimum of 200 RPM or engine may stall. If engine speed does not change, replace vacuum amplifier and repeat this test and system test. If engine speed changes (with vacuum applied to venturi vacuum signal hose), clean carburetor venturi vacuum tap and repeat this test and system test.

Vacuum Amplifier (Calif.) – This test simulates wide open throttle operation. With engine running at fast idle speed, pinch off (clamp) vacuum hoses from vacuum "T" to vacuum amplifier to external vacuum manifold and observe vacuum gauge reading at EGR valve. Vacuum reading should remain steady for at least 20 seconds. If vacuum reading does not hold steady for a minimum of 20 seconds, vacuum amplifier has excessive internal leakage and should be replaced.

MAINTENANCE

EGR system should be inspected and tested every 12,000 miles and EGR valve should be replaced every 24,000 miles on California registered vehicles.