GENERAL MOTORS EARLY FUEL EVAPORATION (EFE) SYSTEM

DESCRIPTION

Two different types of Early Fuel Evaporation (EFE) systems are used on General Motors engines to provide extra heat to the engine induction system during cold driveaway.

Both the Vacuum Servo type and Electrical Heater type provide rapid heating, resulting in quicker fuel evaporation and more uniform fuel distribution. This also helps reduce choke "on" time by warming the engine faster, reducing the emissions level.

OPERATION

VACUUM SERVO

The Vacuum Servo type system uses a vacuum-operated valve controlled by a Thermal Vacuum Switch (TVS) or Valve (TVV). See *Fig. 1*. During cold engine operation, the system provides an increase in the exhaust gas flow under the intake manifold. Either the TVS or TVV pass vacuum to the EFE valve when the engine coolant temperature is below the calibration value programmed into the ECM or carried by the TVS or TVV.

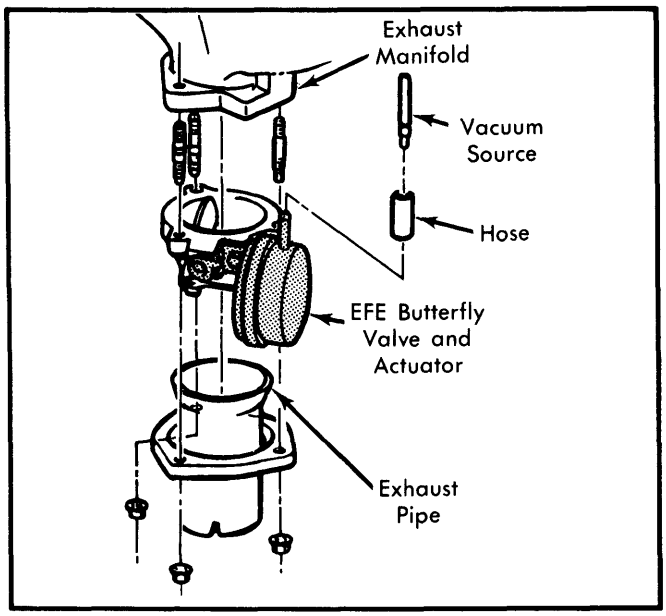

Fig. 1 Vacuum Servo Type EFE System

ELECTRICAL HEATER

The Electrical Heater type system uses a ceramic heater grid under the primary bore of the carburetor as an integral part of the carburetor insulator and gasket. See *Fig. 2*. When engine coolant temperature is below a given calibration value, electrical current is supplied to the heater through an electrical relay, controlled by the ECM. Among the engines using this system are the 1.6L, 1.8L, 2.8L, and 3.8L (VIN 3) engines.

TROUBLE SHOOTING

POOR ENGINE OPERATION DURING WARM-UP

Check for vacuum at EFE valve and check valve operation. Check hose routing. Lubricate, connect, or repair EFE valve linkage. Replace actuator or valve if seized.

POOR OPERATION AFTER WARM-UP

Check EFE actuator and thermal vacuum switch. Replace as necessary. Check actuator linkage for damage or seizure.

NOISY EFE VALVE ACTUATOR

Linkage stop may have failed. Repair if necessary. If valve or shaft is loose, replace actuator or valve.

ENGINE OVERHEATING OR EFE VALVE WON'T OPEN

EFE-TVS not switching or EFE vent in switch is plugged.

NOTE – *For complete vacuum hose routings of EFE system on all General Motors vehicles, see General Motors Vacuum Diagrams in this section.*

TESTING

VACUUM SERVO

Quick Check – **1)** Locate EFE valve and note position of actuator arm. On some V8 engines, EFE valve actuator may be protected by 2-piece metal cover, which must be removed for servicing. Start engine and observe EFE valve. Valve should close when engine is started cold, and actuator arm will be pulled into diaphragm housing.

2) If valve does not close, stop engine and remove hose from EFE valve. Apply at least 10 in. Hg vacuum. Valve should close and remain closed at least 20 seconds without applying additional vacuum. Replace valve if leakdown time is less than 20 seconds.

3) If valve does not close, lubricate with manifold heat valve lubricant. Replace valve if necessary.

4) If valve did not close when vacuum was applied and the valve is not seized, vacuum diaphragm is defective. Replace valve. If valve closed, problem is not in EFE valve. Check for loose, kinked, pinched or plugged hoses or connections. Check EFE-TVS, EFE-TVV or EFE-Solenoids.

System Check – **1)** Check vacuum hoses and connections. Disconnect coolant sensor. Connect vacuum gauge in place of EFE valve. Start engine and note vacuum at idle speed. Do not ground the trouble code test terminal.

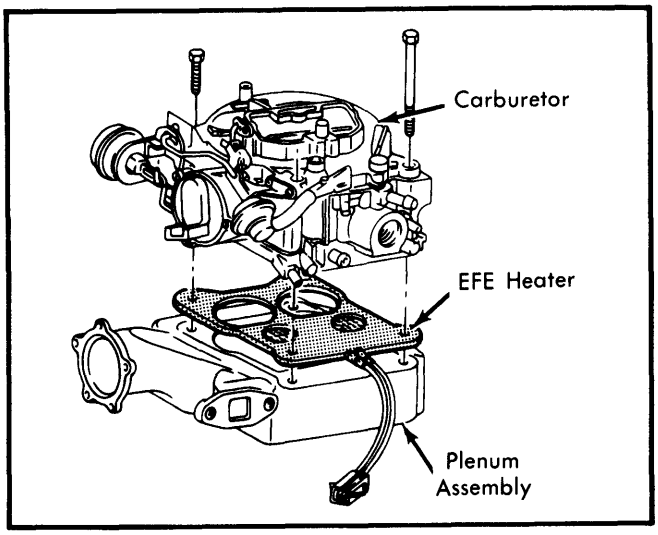

Fig. 2 Electrical Heater Type EFE System

GENERAL MOTORS EARLY FUEL EVAPORATION (EFE) SYSTEM (Cont.)

2) If vacuum is more than 10 in. Hg vacuum, then proceed to step **5)**. If vacuum is less than 10 in. Hg vacuum, stop engine. Disconnect EFE connector and attach 12-volt test lamp to terminals "A" and "B". Turn ignition switch on, ground test terminal and note test lamp.

3) If lamp lights, check vacuum source to solenoid. If OK, then EFE solenoid connection or solenoid is faulty. If lamp does not light, connect test lamp from terminal "B" (Pink wire) to ground. Check test lamp.

4) If lamp does not light, repair open in Pink wire circuit. If lamp lights, check for open in wire to ECM terminal "B". If wire is not open, either ECM or ECM connector is defective.

5) If in step **1)** reading was more than 10 in. Hg vacuum, reconnect coolant sensor and check vacuum. It should drop to zero (0) within 1 minute. If so, proceed to step **7)**. If not, disconnect EFE connector and connect test lamp between terminals "A" and "B". Turn ignition switch on with engine stopped. Note test lamp.

6) If lamp lights, check for grounded wire to ECM terminal "B". If not grounded replace ECM. If lamp does not light, replace EFE solenoid.

7) If in step **5)**, vacuum dropped to zero (0) within 1 minute, stop engine and apply 10 in. Hg vacuum to EFE valve. Listen to valve. If valve moves, proceed to step **8)**. If not and vacuum was over 10 in. Hg, check for restricted line to EFE valve. If line is OK, replace valve. If less than 10 in. Hg, check for leak in line to EFE valve. If line is OK, replace EFE valve.

8) If valve moved in step **7)**, disconnect vacuum connector from solenoid assembly and connect vacuum gauge to hose containing check valve. Vacuum should rise quickly and fall slowly as engine is started and stopped. If not, replace check valve.

ELECTRICAL HEATER

1) With engine running and ignition on, disconnect coolant sensor. Disconnect connector at heater (carburetor). Connect test lamp betweeen harness connector terminals. Check test lamp.

2) If lamp does not light, proceed to step **4)**. If lamp lights, reconnect coolant sensor. If lamp now lights, then proceed to step **3)**. If lamp does not light, check resistance of heater. If more than 2 ohms, replace heater.

3) If lamp lighted after reconnecting coolant sensor in step **2)**, disconnect Dark Green wire at relay. If lamp lights, replace relay. If lamp goes off, check for grounded wire to ECM terminal "T". If none is found, replace ECM.

4) If lamp did not light in step **1)**, ground terminal "B" at relay. If lamp lights, check for open in wire to ECM terminal "T". If wire is OK, replace faulty ECM or ECM connector.

5) If lamp did not light in step **4)** after grounding relay, connect a jumper between relay terminals "A" and "E". If lamp lights, proceed to step **6)**. If lamp does not light, connect test lamp from relay terminal "A" to ground. If lamp now lights, repair open in wire from relay to heater. If lamp failed to light, repair open in Pink wire to ignition terminal "3".

6) If in step **5)** lamp lights after applying jumper to relay terminals, connect jumper wire between relay terminals "A" and "C". If lamp does not light, replace relay. If lamp lights, repair open in harness between terminals "A" and "C".