GENERAL MOTORS EARLY FUEL EVAPORATION (EFE) SYSTEM

DESCRIPTION

Two Early Fuel Evaporation (EFE) systems are used to provide heat to the engine induction system during cold driveaway. Engines may be equipped with either the Vacuum Servo type or the Electrical Heater type.

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.

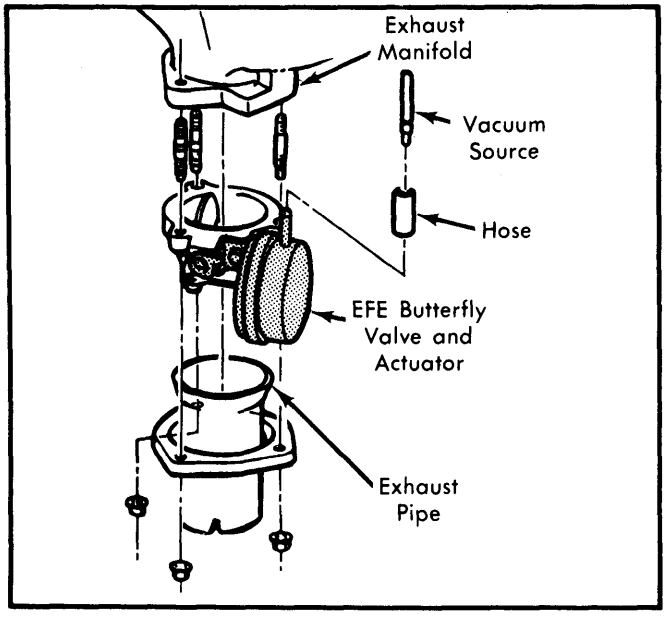

Fig. 1 Vacuum Servo Type EFE System

ELECTRICAL HEATER

The Electrical Heater 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 value, electrical current is supplied to the heater through an electrical relay controlled by the ECM.

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

Before performing EFE valve test, allow vehicle engine temperature to cool to below 105°F (40°C).

Quick Check — 1) Locate EFE valve and note position of actuator arm. On some V8 engines, EFE valve actuator arm is protected by 2-piece metal cover, which must be removed and then replaced when servicing is completed. Valve should close when engine is started cold. Actuator link will be pulled into diaphragm housing.

2) If valve does not close, stop engine and remove hose from EFE valve. Apply external vacuum source of at least 10" Hg. Valve should close and remain closed at least 20 seconds without applying additional vacuum. Replace valve if leak-down 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 valve is not seized, vacuum diaphragm is defective. Replace EFE 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.

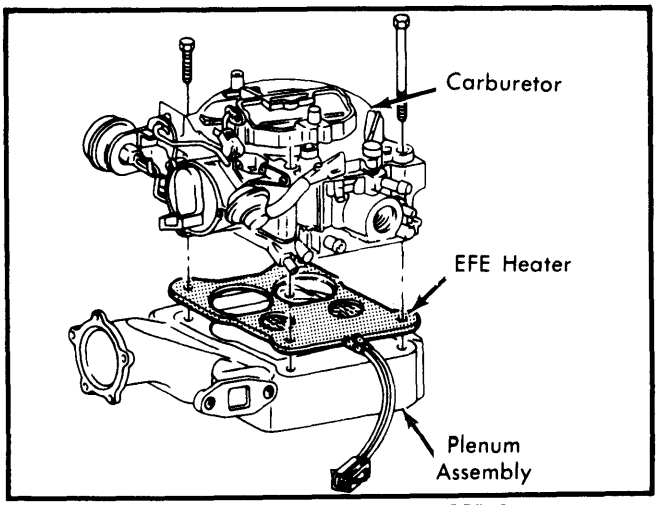

Fig. 2 Electrical Heater Type EFE System

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

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

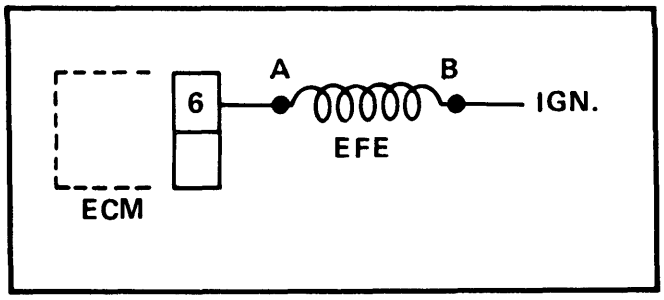

Fig. 3 EFE Vacuum Servo Wiring Diagram

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 grounded wire to ECM terminal "B". If wire is not grounded, ECM 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

NOTE – *Instructions apply to all General Motors cars equipped with electric heaters except 3.8L turbos.*

1) With engine stopped and ignition switch on, disconnect connector at heater. Connect test lamp between harness connector terminals, ground test terminal and check test lamp.

2) If lamp does not light, proceed to step **4)**. If lamp lights, remove ground from test terminal. If lamp now lights, 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 removing ground from test terminal, disconnect wire from terminal "B" at relay. If lamp lights, replace relay. If lamp does not light, check for grounded wire from relay terminal "B" to ECM terminal "6". If not grounded, replace ECM.

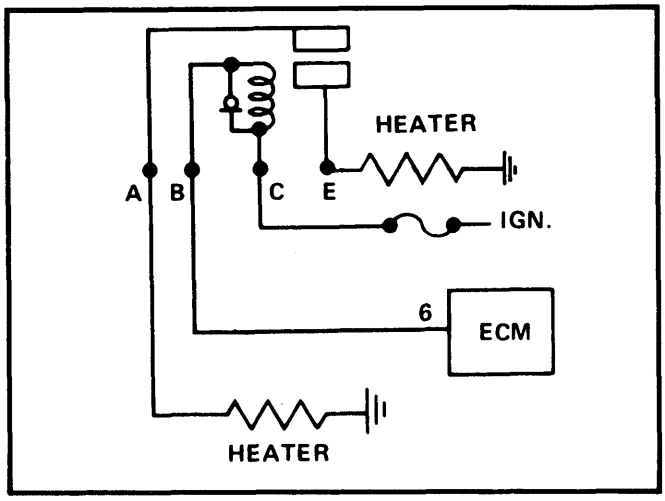

Fig. 4 EFE Electrical Heater Wiring Diagram

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 "6". Check resistance of relay coil. If under 20 ohms, replace relay and ECM. If 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 terminals "A" and "E" to ground. If lamp now lights on 1 terminal, repair open in wire from relay to heater connector. (Or ground wire on 2-wire heater.) If lamp failed to light, repair open from relay terminal "A" to ignition on Chevette and T1000 models. On 2.8L V6 and 1.8L it may be either "A" or "E", depending on which terminal is connected to the ignition.

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 repair open in circuit to relay terminal "C". If lamp lights replace relay.