THERMOSTATIC AIR CLEANERS – ALL MODELS

DESCRIPTION

All passenger cars use a system for preheating the air entering the carburetor. This device is part of the air cleaner and maintains the air temperature at a point where the carburetor can be calibrated much leaner to reduce hydrocarbon (HC) emissions and also improve warm-up operations and reduce carburetor icing.

System consists of an air cleaner assembly, integral air control door, vacuum control temperature sensor, vacuum motor(s) or thermostatic spring, heat shroud (on exhaust manifold) with heated air tube and vacuum hoses. Some models use additional controls, such as vacuum traps, cold weather modulators, vacuum check and vacuum delay valves.

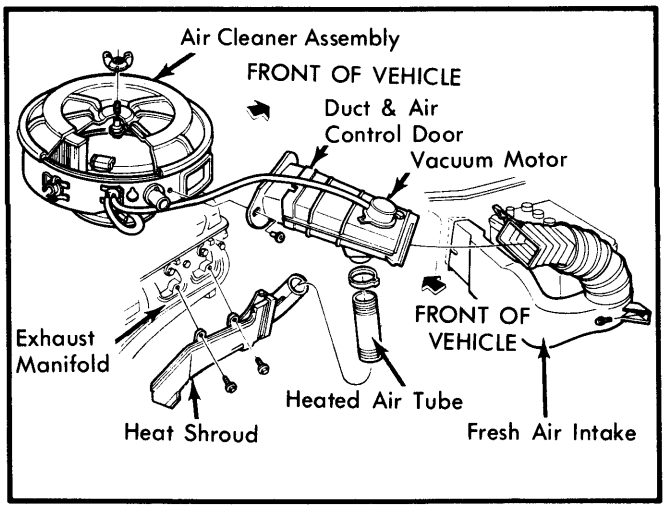

Fig. 1 Thermostatic Air Cleaner Assembly (Ford Shown, Others Similar)

OPERATION

When temperature of air entering air cleaner is less than the setting of temperature sensor, sensor closes to allow engine vacuum to operate vacuum motor which closes damper assembly to outside air. Air is then drawn from around exhaust manifold, through heat shroud and into air cleaner as heated air. As air inside air cleaner warms, sensor valve begins to open. This bleeds off vacuum to vacuum motor. As vacuum to vacuum motor drops, air control door begins to open, allowing outside air to enter air cleaner. When air entering air cleaner reaches a specified temperature, air control door opens completely, closing off heated air coming in from around exhaust manifold.

On American Motors 4.2L (258") 6-Cylinder engines, a vacuum motor controlled trap door is also used to close off the air cleaner when engine is not operating. This prevents fuel vapor from escaping into the atmosphere when engine is not operating.

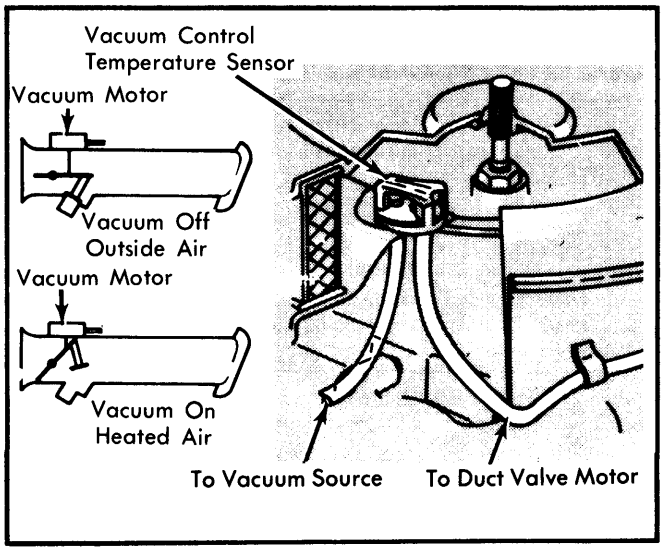

Fig. 2 Thermostatic Air Cleaner Assembly With Temperature Sensor and Vacuum Motor

VACUUM CHECK/DELAY VALVE

A check valve and/or delay valve is used on the thermostatic air cleaner. During cold weather operation, and when under full or hard acceleration, the valve will postpone opening the air control door to outside air. The engine will continue to receive heated air for a short period to improve driveability.

VACUUM TRAP (GENERAL MOTORS VEHICLES ONLY)

Some General Motors vehicles are equipped with a built-in vacuum trap, designed to hold the air control door in the heated air position during full throttle if outside air is below 70°F. The length of time that the air control door is held closed depends on outside air temperature. The vacuum trap can be identified by a check valve in the small orifice leg of the temperature sensor.

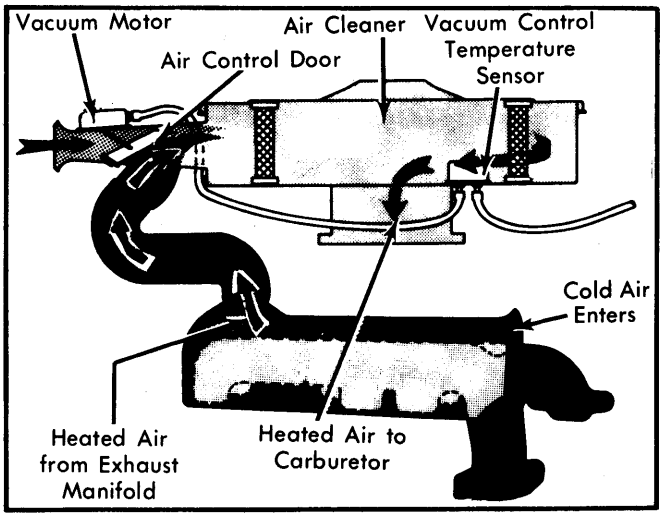

Fig. 3 Thermostatic Air Cleaner Assembly Showing Air Flow into Carburetor

THERMOSTATIC AIR CLEANERS – ALL MODELS (Cont.)

COLD WEATHER MODULATOR (FORD MOTOR CO. ONLY)

Some Ford Motor Co. vehicles have a vacuum modulator located in the air cleaner. During engine operations in cold weather, it prevents the air cleaner duct door from opening to non-heated intake air. When available outside air is above 55°F, the cold weather modulator does not operate.

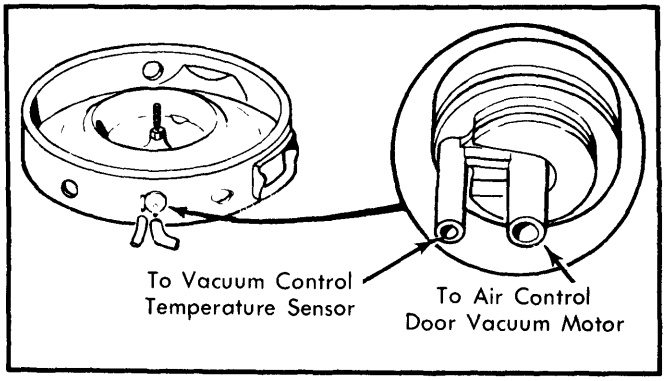

Fig. 4 Cold Weather Modulator (Ford Motor Co. Only)

TESTING

NOTE – *See specifications tables for correct specifications when performing the following tests.*

VACUUM CONTROL TEMPERATURE SENSOR TEST

American Motors Models – **1)** Disconnect vacuum hoses from sensor. Connect suitable vacuum pump and gauge to sensor. Make sure sensor temperature is below 40° F.

2) Apply 14 in. Hg to sensor. With sensor temperature below 40° F, vacuum should be maintained. Heat sensor to above 55° F. Air bleed valve should open and vacuum should decrease to zero. Replace switch if defective.

All Other Models – **1)** Tape a thermometer close to the vacuum control temperature sensor, located inside air cleaner. Leave wing nuts off top of air cleaner so top can be removed quickly to check thermometer while performing tests.

2) With a cold engine, temperature below vacuum control temperature sensor specifications, check air control door in air cleaner. It should be in the fully open position (open to outside air).

3) Start engine and let run. As soon as engine starts, door should go to full heated air position (closed to outside air). Watch air control door. When door reaches full open position (outside air only), quickly take air cleaner top off and read thermometer. Compare thermometer reading with specification. If reading is not to specification, perform vacuum motor test before replacing sensor.

VACUUM MOTOR TEST

1) With engine not running, air cleaner may be removed for this test. Disconnect vacuum hose from vacuum motor.

2) Connect an external vacuum pump to vacuum motor. Apply specified vacuum for "Door Fully Closed". *See Air Control Door Opening Vacuum specifications table.*

Vacuum Control Temperature Sensor Specifications

Application	Air Door Closing Temp. (°F)	Air Door Opening Temp. (°F)
American Motors	40	55
Chrysler		
1.7L & 2.2L	50	85
2.6L	85	113
All Other Models	50	100
Ford Motor Co.		
Sensor Color Code		
Brown	75	75
Black or Pink	75	90
Blue or Yellow	75	105
General Motors Corp.		
Buick	77	①123
Cadillac	85	105
Chevrolet		
Citation	77	①123
All Other Models	80	①100
Oldsmobile	77	①123
Pontiac	77	①123

① – ± 20° F.

3) Air control door should remain closed to outside air (open to heated air from shroud around exhaust manifold).

4) Next, apply specified vacuum for Door Fully Open In. Hg, *see Air Control Door Opening Vacuum specifications table.* Air control door should open to outside air (closed to heated air).

5) Apply 20 in. Hg to vacuum motor and pinch off hose. Vacuum should not leak down more than 10 in. Hg in 5 minutes. If vacuum motor fails any of these checks, replace it.

Air Control Door Opening Vacuum

Application	①Door Fully Closed Less Than In. Hg	②Door Fully Open Max. In. Hg
Chrysler Corp.		
4-Cylinder Models	2	4
All Other Models	5.5	8.5
American Motors		
4-Cylinder	.....	7
6-Cylinder	.....	4
Ford Motor Co.	.....	.....
General Motors Corp.		
Buick	.....	7
Cadillac	4-6	③
Chevrolet	.....	7
Oldsmobile	.....	7
Pontiac	.....	7

① – Closed to outside air (heated air position).
② – Closed to heated air (outside air position).
③ – Manifold vacuum.

THERMOSTATIC AIR CLEANERS – ALL MODELS (Cont.)

VACUUM MOTOR TRAP DOOR TEST (AMERICAN MOTORS 4.2L (258") 6-CYL. ONLY)

1) With engine not running, remove air cleaner cover and note position of trap door. It should be closed. Remove trap door vacuum hose at intake manifold and connect suitable vacuum pump.

2) Apply 2 to 4 in. Hg to trap door, it should open. If door does not open, apply vacuum directly to vacuum motor. If door does not open, inspect for binding and/or distortion and adjust as required.

3) Replace vacuum motor if trap door swings freely. If trap door opened when vacuum was directly applied to vacuum motor, check vacuum hose for restriction or leak. Replace as required. If vacuum hose is not defective, remove reverse delay valve and test again.

4) If door opens, test reverse delay valve for proper operation. Reverse delay valve provides approximately 375 seconds delay before allowing trap door to completely close. To test, remove vacuum hose from yellow end of valve and apply 2 to 4 in. Hg to valve.

5) Note time required for atmospheric pressure to pass through valve and eliminate vacuum. If time required to eliminate vacuum is less than 4.5 seconds or more than 13.2 seconds, replace reverse delay valve.

NOTE – *Make sure yellow end of reverse delay valve faces vacuum motor when replaced.*

COLD WEATHER MODULATOR (FORD MOTOR CO. ONLY)

1) On normally open modulators (black, blue or green), cool blue and green modulators to 40° F, and black modulator to 20° F by spraying vacuum control temperature sensor with R-12 refrigerant. On normally closed modulators (yellow), warm vacuum control temperature sensor to above 70° F.

CAUTION – *Do not spray R-12 around a running engine or any other heat source. Heated R-12 vapors will create poisonous phosgene gas. Always perform this step in a well ventilated area.*

2) Connect an external vacuum source between modulator and the vacuum gauge, using a 24" length of ¼" I.D. vacuum hose.

3) Apply a minimum of 16 in. Hg to vacuum motor side of modulator. Modulator must not leak down to less than 5 in. Hg in 30 seconds. If it does, replace the modulator.

4) On normally open modulators (black, blue or green), warm black, blue or green modulators to 80° F. On normally closed modulators (yellow), cool vacuum control temperature sensor with R-12 refrigerant to below 40° F. If vacuum holds at these temperatures, modulator is not functioning properly and must be replaced.