GMC MOTOR HOME SERVICE

SECTION 6T
EMISSION CONTROL SYSTEMS

Contents of this section are listed below:

POSITIVE CRANKCASE VENTILATION (P.C.V.)

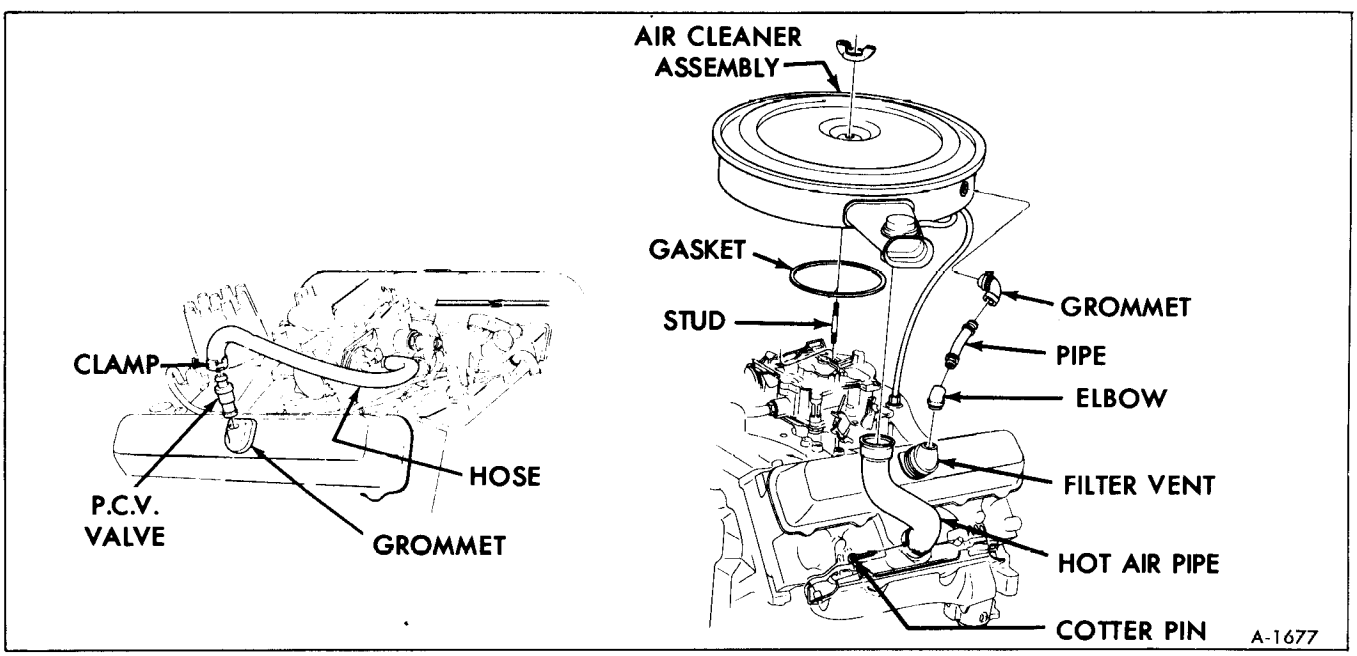

Figure 1–Positivie Crankcase Ventilation System

DESCRIPTION (FIGURE 1)

At idle or normal road speeds, intake manifold vacuum causes fresh air to be drawn through the engine air filter, then to the left valve cover where it joins with the crankcase vapors. This mixture is then drawn through the P.C.V. valve to the base of the carburetor where the vapors are mixed with normal fuel air mixture and burned.

When the engine is running either at idle or the vehicle is traveling at normal speeds, intake manifold vacuum is sufficient to draw crankcase vapors caused by engine blow-by through the spring loaded P.C.V. valve.

At high road speeds or heavy acceleration, the engine blow-by is increased and at the same time, intake manifold vacuum decreased. When this occurs, there is a reverse action, crankcase vapors released through the crankcase filter are returned back into the intake manifold through the carburetor. When operating the engine under zero vacuum or a manifold pressure condition such as a backfire or during engine cranking, the check valve is closed by spring tension to prevent fuel vapor from entering the crankcase. The valve is also closed under wide-open throttle condition but since this is for a very short duration of time, no irregularity will exist.

P.C.V. SYSTEM TESTING

The CT-3 tester is an extremely sensitive vacuum-pressure gauge designed to accurately indicate the small amount of vacuum or pressure in the system. The tester is also used to test the P.C.V. valve after it has been removed.

INSTRUCTIONS FOR TESTING P.C.V. VALVE

1. Disconnect P.C.V. valve from crankcase – leave valve connected to hose.

2. Adjust tester selector knob to "E".

3. Connect hose to tester body and vent valve adapter CT-18.

4. With engine at operating temperature, at idle and transmission in "PARK," hold the vent valve adapter CT-18 against the crankcase end of the vent valve.

5. Hold the tester upright and look directly into the test window and observe the color. Be sure the adapter is firmly sealed against the valve, there are no leaks and hose is not kinked.

6. An all "GREEN" window reading indicates valve is OK. Any "YELLOW" showing indicates the valve needs replacing.

INSTRUCTIONS FOR TESTING COMPLETE SYSTEM

1. Remove oil dipstick and plug hole with dipstick hole plug CT-12 (part of CT-3 tester).

2. Remove tube from elbow at air cleaner and plug tube with CT-11.

3. Adjust tester selector knob to "K".

4. Connect hose to tester body and tester adapter CT-14

5. Remove oil filler cap and place tester adapter CT-14 into opening.

6. With engine at operating temperature, running at idle and transmission in "PARK," hold tester upright and look directly into tester window and note the color, it should be green. If not, be sure there are no leaks and hose is not kinked. Refer to P.C.V. Diagnosis Chart for other items to look for.

P.C.V. DIAGNOSIS CHART (USING CT-3 TESTER)

WINDOW READING	PROBABLE CAUSE	CORRECTION
GREEN	System Satisfactory. Vent valve partially plugged. Blow-by close to capacity of valve.	Check Valve.

P.C.V. DIAGNOSIS CHART (USING CT-3 TESTER)

WINDOW READING	PROBABLE CAUSE	CORRECTION
YELLOW	Tester hose kinked or blocked. Crankcase not sealed properly. Tester "selector knob" set incorrectly. Vent-valve partially plugged. Slight kink in CT-3 tester hose.	Reposition or clean hose. Check tester plugs and other seal-off points. Check setting. Check vent valve. Reposition tester hose.
YELLOW-GREEN	Slight engine blow-by. Crankcase not sealed properly. Tester "selector knob" set incorrectly. Vent-valve partially or fully plugged.	Check vent valve. Check tester plugs and other seal-off points. Check setting. Check vent valve.
RED-YELLOW	Engine blow-by exceeds valve capacity. Rubber vent hose collapsed or plugged.	Engine overhaul indicated. Clean or replace hose.
RED	Vent-valve plugged. Vent-valve stuck at engine off position. Rubber vent hose collapsed or plugged. Extreme engine blow-by.	Check vent valve. Check vent valve. Replace hose. Engine requires major overhaul.

CONTROLLED COMBUSTION SYSTEM (C.C.S.)

A Controlled Combustion System is standard equipment on the engine. The Controlled Combustion System consists of an air cleaner assembly which includes a temperature sensor, vacuum motor, control damper assembly and connecting vacuum hoses. The motor is controlled by the temperature sensor. The vacuum motor operates the air control damper assembly to control the flow of pre-heated and non pre-heated air. The pre-heated air is obtained from the hot air pipe and shroud on the exhaust manifold.

PURPOSE

At underhood temperatures below 79 degrees F. the Control Combustion System directs heated air into the air cleaner. This system provides the most desirable emission control throughout the operating range of the engine and results in improved fuel economy, improved engine warm-up and eliminates tendency for ice to form in the carburetor.

OPERATION (FIGURES 2, 3 & 4)

During engine warm-up with engine compartment temperature at 79 degrees F. the temperature sensor is closed. This allows engine vacuum to be directed to the vacuum motor closing the damper assembly to outside air. With the damper closed, the cool air will flow through the openings at the ends of the shroud where it is heated. The heated air then

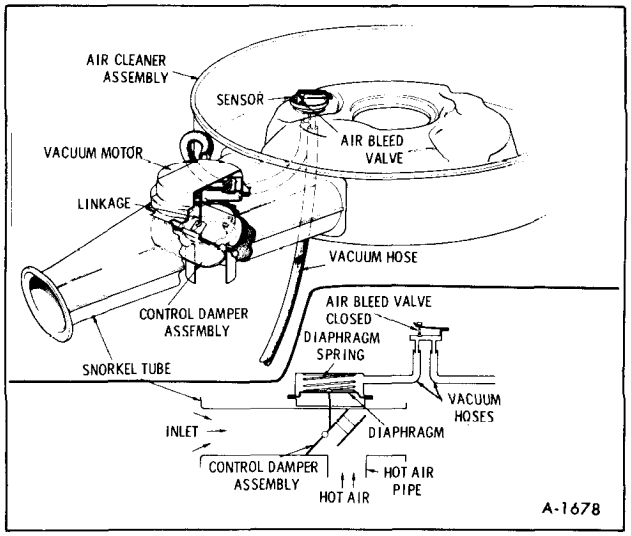

Figure 2–Hot Air Delivery Mode

flows up through the hot air pipe and adapter into the air cleaner. As the temperature inside the air cleaner reaches approximately 123 degrees F. the sensor bleeds off vacuum to the vacuum motor causing the control damper to open allowing underhood air to be mixed with the heated air as needed to keep the air temperature approximately 123 degrees F. if the ambient temperature is 123°F or below.

Under full throttle or below 3 in. Hg. to 7 in. Hg., the vacuum motor will no longer hold the valve open to hot air. The hot air pipe is closed off allowing only outside air to enter the air cleaner.

DIAGNOSIS

VACUUM MOTOR AND DAMPER ASSEMBLY

1. With the engine off, remove air cleaner cover

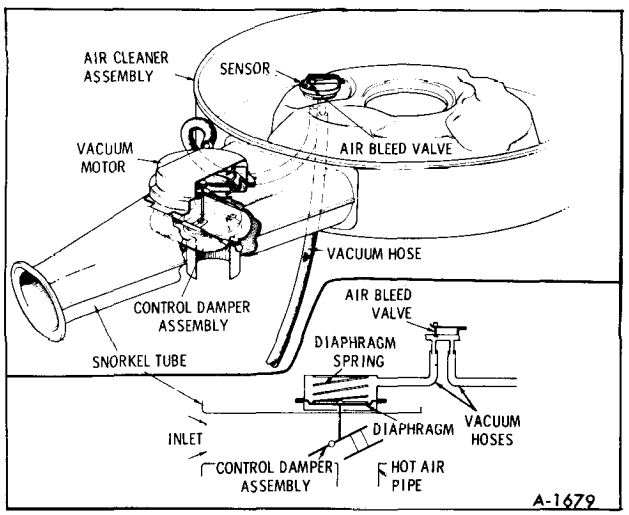

Figure 3–Regulating Mode

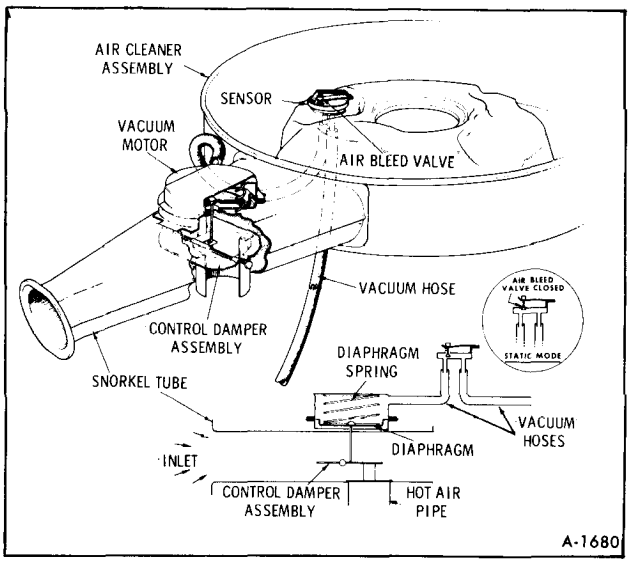

Figure 4–Cold Air Delivery Mode

and tape thermometer J-5421 in air cleaner next to sensor (See figure 5).

NOTE: If temperature is below 79 degrees F. continue to Step 2. If temperature is above 79 degrees F remove air cleaner and allow to cool to at least 72 degrees F.

2. Install a tee in vacuum line at vacuum motor and connect a vacuum gauge in line.

3. With the engine off, the control damper should be open.

4. Install the cover on air cleaner without the wing nut and start the engine.

5. With engine at idle speed, the control damper should be closed with the ambient temperature at or below 79 degrees F.

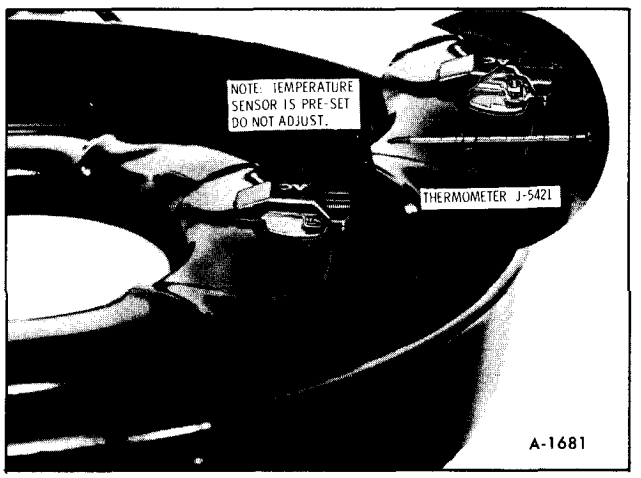

Figure 5–Checking Sensor

6. Using a small mirror observe the control damper snorkel; when it reaches the full open position (outside air), quickly remove cover on air cleaner and record reading on thermometer and vacuum gauge.

SPECIFICATIONS FOR DAMPER OPERATION

Temperature:

79 degrees F. or lower, damper fully closed.

123 degrees F. or higher, damper fully open.

Vacuum:

3 in. hg. of vacuum or lower, damper fully open below 79 degrees F.

7 in. hg. of vacuum or higher, damper fully closed below 79 degrees F.

1. If temperature is within specifications, Controlled Combustion System is functioning properly.

2. If temperature is out of specifications and vacuum is correct, replace sensor.

3. If both temperature and vacuum are within specifications and damper is not operating correctly, replace vacuum motor.

4. If both temperature and vacuum are not within specifications it is an indication that the vacuum motor diaphragm is leaking.

VACUUM MOTOR REPLACEMENT

REMOVAL

1. Remove air cleaner.

2. Disconnect vacuum hose from motor.

3. Drill out the two spot welds initially with a 1/16" drill, then enlarge as required to remove the retaining strap. Do not damage the snorkel tube (See figure 6.).

4. Remove motor retaining strap.

5. Lift up motor, cocking it to one side to unhook the motor linkage at the control damper assembly.

INSTALLATION

1. Drill a 7/64' hole in snorkel tube at point "A" as shown in Figure 6.

2. Insert vacuum motor linkage into control damper assembly.

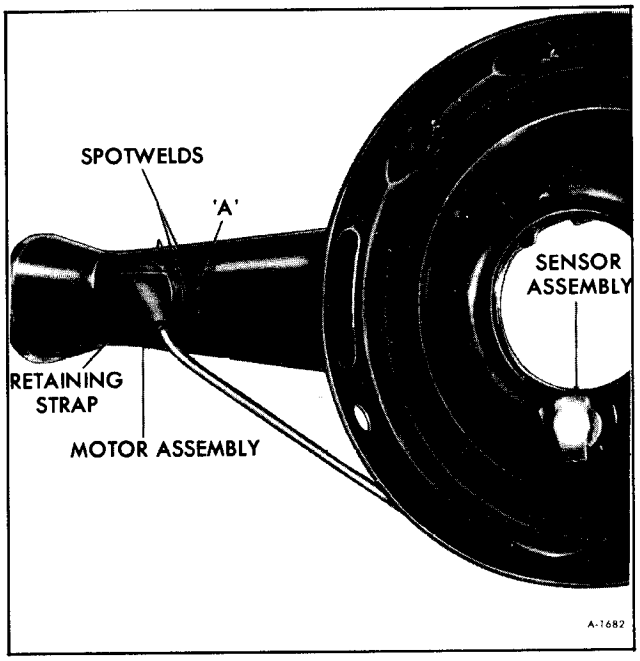

Figure 6–Air Cleaner Spot Welds

3. Use the motor retaining strap and sheet metal screw provided in the motor service package to secure the retaining strap and motor to the snorkel tube.

4. Make sure the screw does not interfere with the operation of the damper assembly. Shorten screw if required.

5. Connect vacuum hose to motor and install air cleaner.

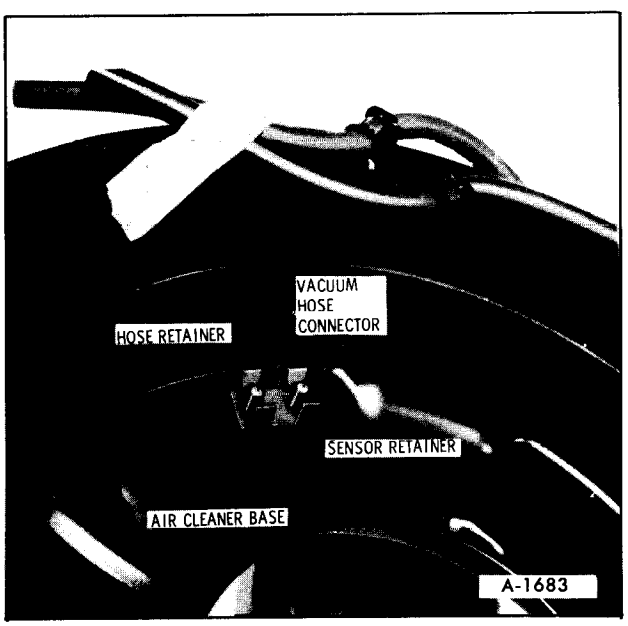

Figure 7–Sensor Retainer

SENSOR REPLACEMENT

REMOVAL

1. Remove air cleaner.

2. Detach hoses at sensor.

3. Pry up tabs on sensor retaining clip and remove clip and sensor from air cleaner. Note position of sensor for installation (See figure 7).

INSTALLATION

1. Install sensor and gasket assembly in original position.

2. Press retainer clip on hose connectors.

3. Connect vacuum hoses and install air cleaner on engine.

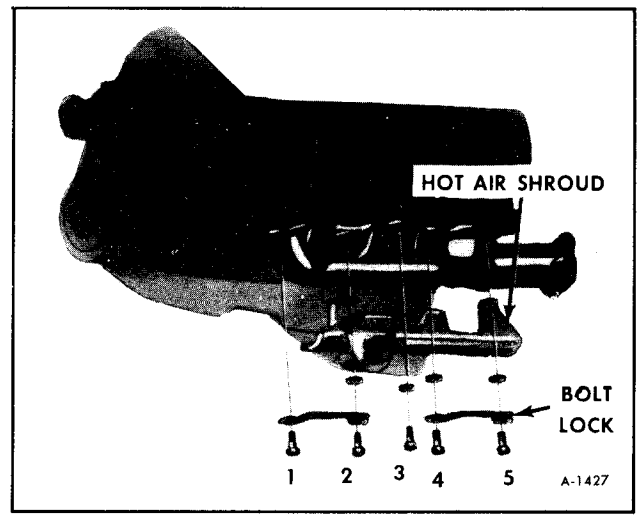

Figure 8–Hot Air Shroud

EXHAUST MANIFOLD SHROUD

Exhaust manifold hot air shroud is shown in Figure 8. Refer to Section 6A for replacement procedures.

EVAPORATION CONTROL SYSTEM

This system is designed to reduce fuel vapor emissions that normally vent to atmosphere from the gasoline tank and carburetor fuel bowl. The air cleaner filter mounted at the bottom of the canister requires replacement at intervals specified in Section 0. All other parts are serviced as outlined in Section 8 of this manual.

THERMAL VACUUM SWITCH (T.V.S.)

DESCRIPTION

The retarded spark setting at idle speeds required for effective emission control makes engines tend to run hotter during idle or low speed conditions.

To protect against overheating, the engine is equipped with a thermostatic vacuum switch (T.V.S.). The temperature-sensitive switch and valve assembly is mounted in the engine cooling jacket near the right front of the engine, see Figure 9, and connected into the vacuum advance system.

OPERATION

When the engine coolant reaches a specified high temperature (216°F.), the valve opens against spring pressure and directs manifold vacuum to the advance mechanism. This advances the spark timing slightly and speeds up the engine. The result is less heat rejected to the coolant together with higher fan

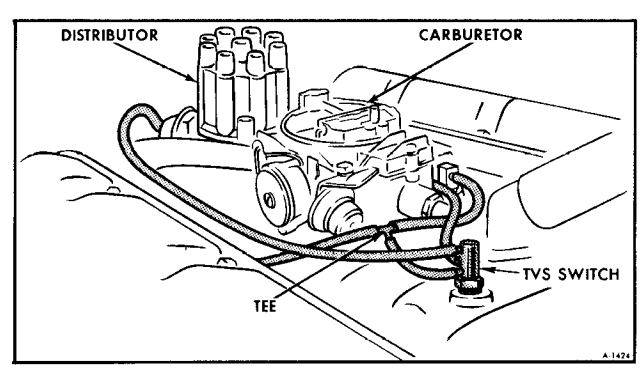

Figure 9–T.V.S. Location

speeds for better cooling action. When the engine has cooled down, the TVS switch moves the valve back to retard spark timing.

VACUUM HOSE ROUTING TO T.V.S. SWITCH (FIGURE 9)

Port "D"	Vacuum hose to the distributor vacuum advance.
Port "C"	Vacuum hose to the carburetor port.
Port "MT"	Vacuum hose to intake manifold elbow.

FUNCTIONAL CHECK

To test the switch function, disconnect the distributor vacuum hose at port "D" of the T.V.S. switch, see Figure 10, connect a vacuum gauge and check for vacuum with the engine idling at normal operating temperature. If more than 5 in. Hg. of vacuum is present and the hoses are connected to the proper ports, check further with instruments designed to test the switch such as BT-7002.

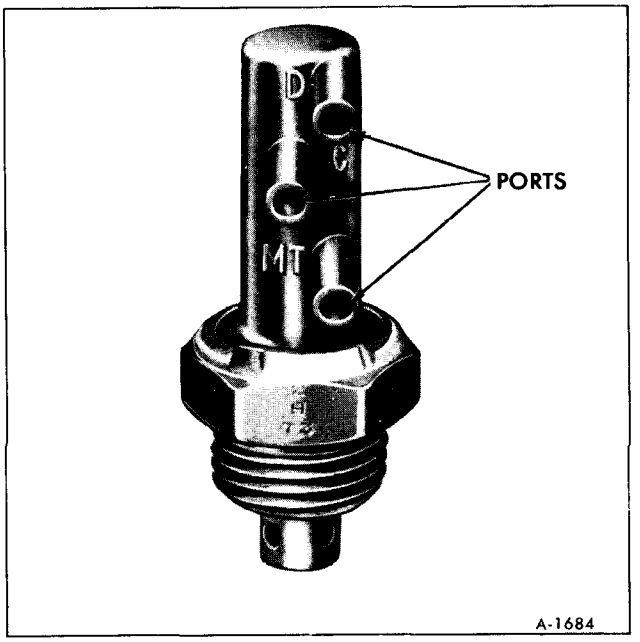

Figure 10–Thermostatic Vacuum Switch

The switch must be installed with a soft setting sealant on the threads.