MAZDA PISTON ENGINE AIR INJECTION

GLC
626
B2000 (Calif.)

NOTE – *Federal B2000 models use a reed valve-type air induction system. See appropriate article in this section.*

DESCRIPTION

The air pump air injection system is designed to reduce hydrocarbon (HC) and carbon monoxide (CO) content of exhaust gases by injecting a controlled amount of compressed air into the exhaust manifold.

System components and application vary among models. Components of system are a belt-driven air pump with integral relief valve, air control valve with 2 relief valves, air switching valve (except B2000), 2 water thermo valves (1 on B2000; 1 water thermo valve and 1 water thermo switch on 626), vacuum delay valve, check valve (except B2000), secondary air check valve, 3-way solenoid valve, air injection nozzle (626 and B2000), catalytic converters (1 on B2000) and various hoses and piping. A heat hazard warning system is used on GLC Wagon and 626 models to prevent exhaust system overheating.

OPERATION

Air is drawn from clean side of air cleaner by air pump and directed under pressure to air control valve. The No. 1 relief valve of air control valve diverts part of air pump air back to air pump when engine is operating under heavy load conditions. The No. 2 relief valve of air control valve regulates the amount of air injected, based upon intake manifold vacuum and coolant temperature. The air switching valve of air control valve (if equipped) directs fresh air from air pump either "upstream" to exhaust ports and/or "downstream" to catalytic converter according to intake manifold vacuum and coolant temperature.

The air injection system contains thermo valves, delay valves, check valves and vehicle speed sensors to control and protect the air injection system. These additional components ensure fresh air is directed at the correct time and at the correct place (exhaust manifold, air cleaner, catalytic converter).

NOTE – *See "Mazda Piston Engine Vacuum Diagrams" article in this section for diagram of air injection system used by model application.*

TESTING

AIR PUMP

1) Start engine and run until normal operating temperature is reached. Check all hoses and connections for possible leaks. Replace as necessary and/or tighten connections.

2) Listen for excessive noise at air pump. Replace air pump if noise is excessive. Check drive belt tension. Disconnect hose from air pump outlet and attach a suitable pressure gauge. See *Fig. 1*.

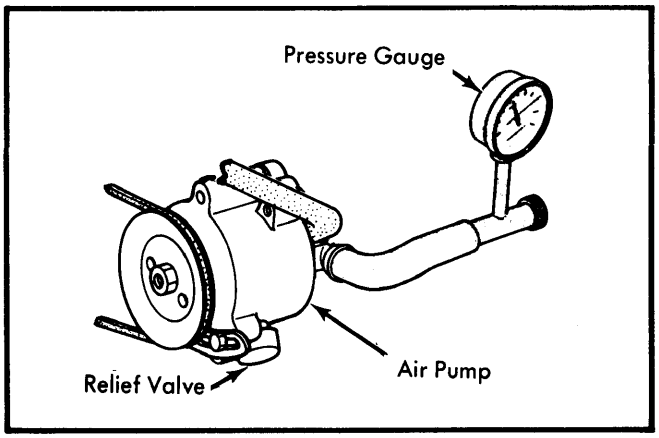

Fig. 1 Checking Air Pump Pressure Output

3) Connect tachometer to engine and run engine at 1500 RPM. Note pressure reading. Pump must show a pressure of at least 0.6 psi (.04 kg/cm²) for GLC and 1.0 psi (.07 kg/cm²) for all other models. If less, replace air pump.

RELIEF VALVE

B2000 & 626 Models – Run engine at idle speed. Disconnect air pump-to-air cleaner return line at air cleaner. Place finger over return line. At idle, no air should be felt. Increase engine speed to 4500 RPM. Air should be felt at return line. If relief valve does not respond as outlined, replace air pump assembly.

All Other Models – Run engine at idle speed. Hold hand under air pump; no air should be felt. Increase engine speed to 4000 RPM. Hold hand under air pump; air should be felt. If relief valve does not respond as outlined, replace air pump assembly.

NOTE – *Air pump is serviced as complete assembly only.*

AIR CONTROL VALVE

B2000 Models – 1) Warm engine to normal operating temperature. Stop engine and disconnect outlet hose from bottom of air control valve. Start engine and run at idle speed. Disconnect vacuum hose from No. 1 relief valve. Air should be discharged from outlet port. Reconnect vacuum hose; air should not be discharged from outlet port.

2) Disconnect and plug No. 2 relief valve vacuum hose from air control valve. Using a "T" fitting and additional tubing, install "T" between inlet manifold and evaporative shutter valve. Connect additional tubing to "T" and No. 2 relief valve so inlet manifold vacuum is applied directly to No. 2 relief valve. Air should be discharged from air control valve outlet port.

3) Disconnect and plug vacuum hose at No. 2 relief valve. Air should not be discharged from air control valve outlet port. If air control valve does not respond as described, replace air control valve.

MAZDA PISTON ENGINE AIR INJECTION (Cont.)

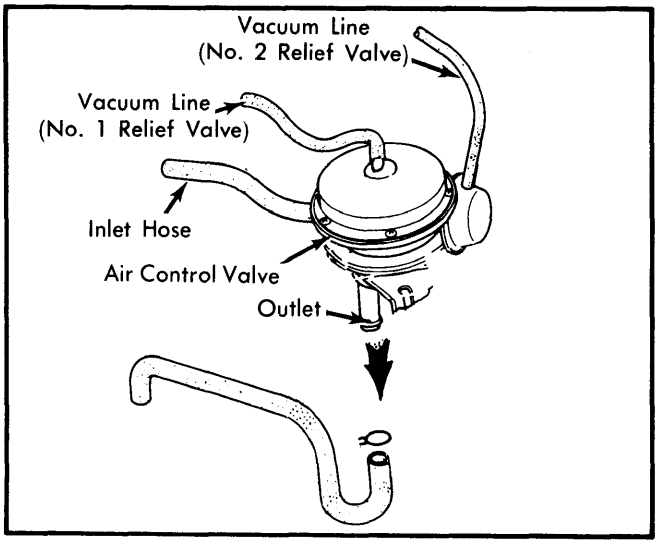

Fig. 2 Testing Mazda B2000 Air Control Valve

All Other Models – 1) Warm engine to normal operating temperature. Stop engine and disconnect air pump-to-air control valve hose at air control valve. Start engine and run at idle speed. Disconnect outlet hose from air control valve. Disconnect vacuum sensing tubes from No. 1 and No. 2 relief valves (No. 1 relief valve only on 626). Air should be discharged at air control valve outlet port.

2) On 626 models, reconnect vacuum sensing tube to No. 1 relief valve. On all others, connect No. 1 relief valve directly to inlet manifold vacuum with additional tubing. Air should not be discharged from air control valve outlet port.

3) On 626 models, disconnect No. 2 relief valve-to-vacuum pipe hose at vacuum pipe. Disconnect No. 1 relief valve-to-intake manifold hose at air control valve and install "T" fitting. Connect additional tubing between "T" fitting and No. 1 relief valve. Connect No. 2 relief valve-to-vacuum pipe hose to "T" fitting. Air should be discharged at air control valve outlet port. Disconnect and plug vacuum sensing tube from No. 2 relief valve. Air should not be discharged from air control valve outlet port.

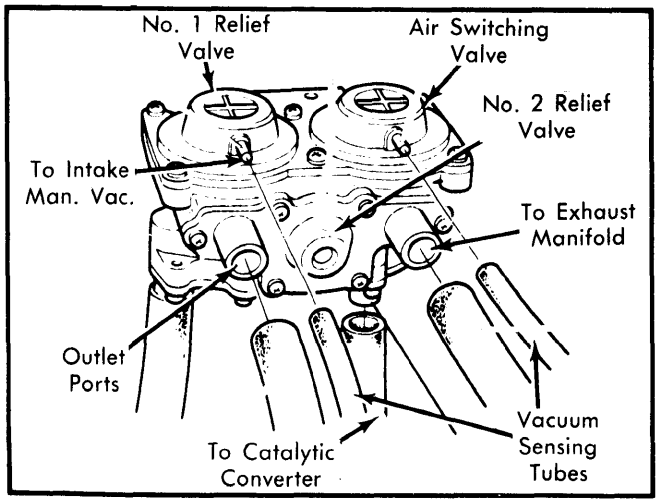

Fig. 3 Air Control Valve (Exc. B2000)

4) On all other models, connect No. 2 relief valve directly to inlet manifold vacuum with additional tubing (No. 1 relief valve still connected to inlet manifold vacuum). Air should be discharged from air control valve outlet port.

5) On all models, if air control valve, No. 1 relief valve or No. 2 relief valve do not respond as outlined, replace air control valve assembly.

AIR SWITCHING VALVE (EXC. B2000)

626 Models – 1) Warm engine to normal operating temperature, then run at idle speed. Disconnect air control valve-to-No. 2 check valve hose at air control valve. Disconnect air switching valve-to-vacuum check valve vacuum hose at air control valve. Disconnect air control valve outlet hoses. Air should be discharged from air control valve outlet port under air switching valve.

2) Connect vacuum sensing tube to air switching valve on air control valve. Air should not be discharged from air control valve outlet port. If air switching valve does not respond as outlined, replace air control valve assembly.

All Other Models – 1) Warm engine to normal operating temperature. Stop engine. Disconnect air control valve-to-intake manifold hose (below No. 1 relief valve) and air control valve-to-catalytic converter hose (bottom of air control valve) from air control valve. Disconnect vacuum sensing tubes from No. 1 and No. 2 relief valves. Disconnect and plug vacuum sensing tube from air switching valve diaphragm.

2) Start engine and run at idle speed. Place finger over air control valve outlet ports, air should not be discharged from either port. Using additional tubing, connect intake manifold vacuum directly to air switching valve diaphragm. Air should be discharged from air control valve outlet port (below air switching valve). If air switching valve does not respond as outlined, replace air control valve assembly.

CHECK VALVE

NOTE – *All models except B2000 are equipped with 2 check valves. Testing procedure applies to both types of check valves.*

1) Warm engine until normal operating temperature is reached. Stop engine and disconnect air hose from check valve connector.

2) Slowly increase engine speed to 1500 RPM while holding hand over open connection. Check for exhaust leak from check valve. If exhaust gas escapes, replace check valve.

VACUUM DELAY VALVE

1) Disconnect and remove vacuum delay valve. Connect vacuum gauge to delay valve. Using an additional piece of tubing, connect delay valve directly to intake manifold vacuum. See *Fig. 4*.

2) Start engine and operate at idle speed. Note reading on vacuum gauge at idle. Disconnect manifold vacuum from delay valve. Record time required for vacuum gauge to drop 11.8 in. Hg from reading recorded at idle. If time is not within specifications listed in Vacuum Delay Valve Specifications table, replace vacuum delay valve.

NOTE – *If vacuum delay valve is stamped with an arrow, install with arrow facing intake manifold vacuum source.*

MAZDA PISTON ENGINE AIR INJECTION (Cont.)

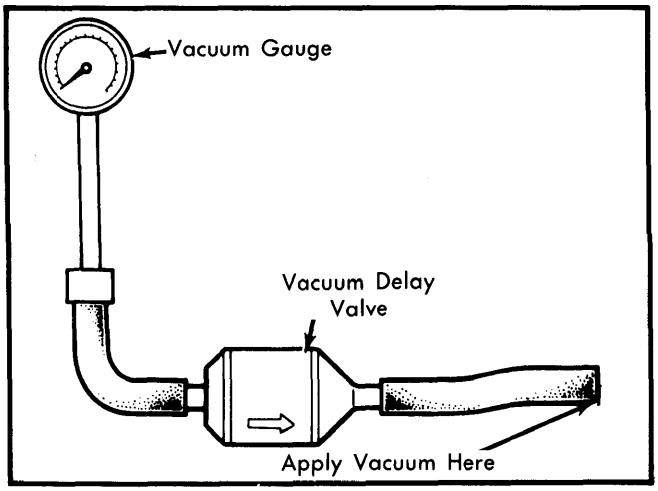

Fig. 4 Testing Vacuum Delay Valve

Vacuum Delay Valve Specifications

Application	Time (Sec.)
GLC	7.5
GLC Wagon	
Man. Trans.	4-6
Auto. Trans.	6-9
626	16-24
B2000	8-12

THERMO VALVES

No. 1 Valve (Exc. 626 & B2000) – Drain radiator and remove hoses from water thermo valve. Remove water thermo valve from bottom tank of radiator. Connect hoses to valve and place valve in container of water with thermometer. Gradually heat water and note temperature at which air will pass through valve. See *Fig. 5*. If air does not pass through valve as shown in Thermo Valve/Switch Specifications table, replace No. 1 water thermo valve.

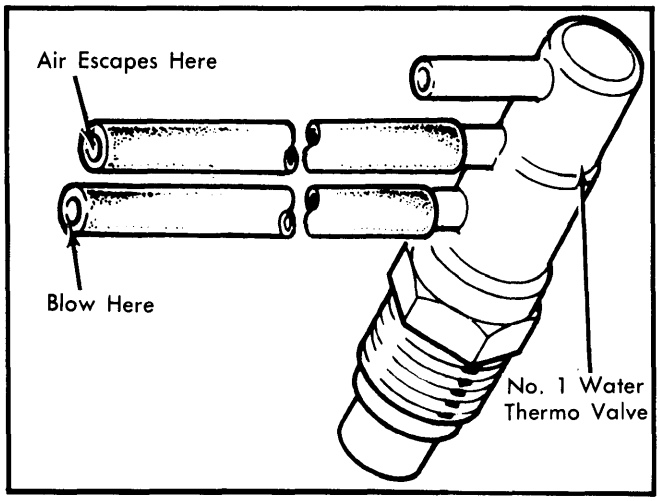

Fig. 5 Hose Connections for Testing No. 1 Water Thermo Valve (GLC and GLC Wagon)

No. 2 Valve (All Models) – Drain radiator until coolant level is below inlet manifold. Remove hoses from thermo valve and remove valve from inlet manifold. Connect hoses to valve and place valve in container of water with thermometer. Gradually heat water and note temperature at which air will not pass through valve. See *Fig. 6*. If air passes through valve before temperature shown in Thermo Valve/Switch Specifications table, replace No. 2 water thermo valve.

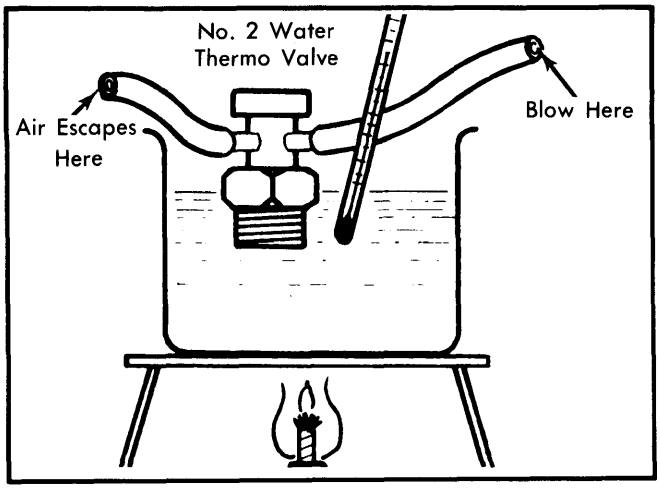

Fig. 6 Testing No. 2 Water Thermo Valve

THERMO SWITCH (626 ONLY)

Drain radiator. Remove electrical connector from thermo switch and remove thermo switch from radiator lower tank. Attach leads to switch terminals and place switch in container of water with thermometer. Connect ohmmeter to switch leads. Gradually heat water and note temperature at which no continuity exists. If temperature is not as specified in Thermo Valve/Switch Specifications table, replace thermo switch.

Thermo Valve/Switch Specifications (Temperature)

Application	No. 1 Valve °F (°C)	No. 2 Valve °F (°C)
GLC	66 (19)	132 (55)
GLC Wagon	70 (21)	138 (59)
626	①	129 (54)
B2000	.....	122 (50)

① – Thermo switch – No continuity between 59-66° F (15-19°C).

3-WAY SOLENOID VALVE (EXC. B2000)

626 – Disconnect vacuum sensing tubes from 3-way solenoid valve and vacuum pipe. Blow through vacuum tube "B" shown in *Fig. 7*. Air should escape through solenoid air filter. Disconnect electrical connector from solenoid and apply battery power to connector as shown in *Fig. 7*. Blow through hose again; air should escape through bottom port. If valve does not respond as outlined, replace 3-way solenoid valve.

MAZDA PISTON ENGINE AIR INJECTION (Cont.)

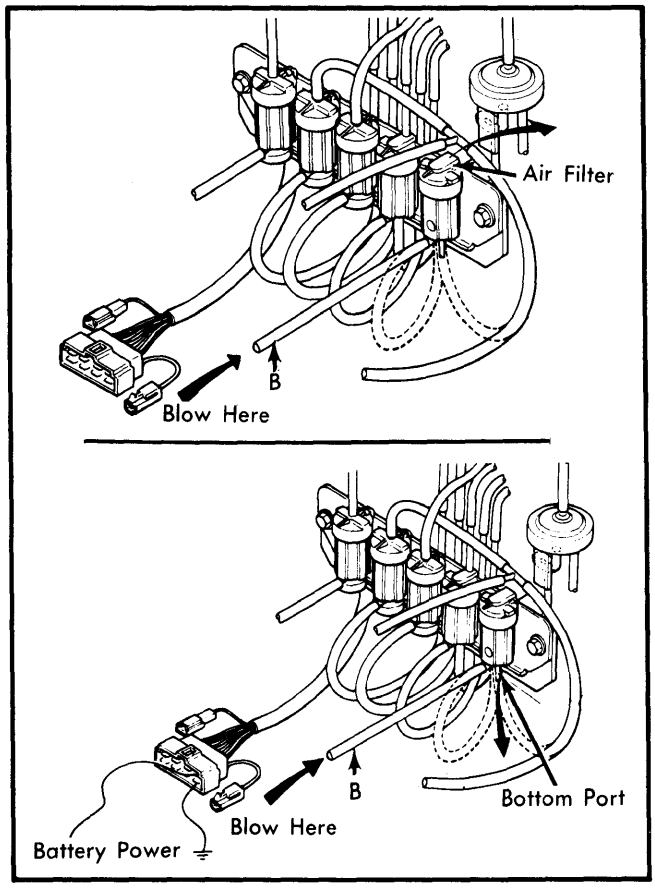

Fig. 7 Testing 3-Way Solenoid Valve on Mazda 626

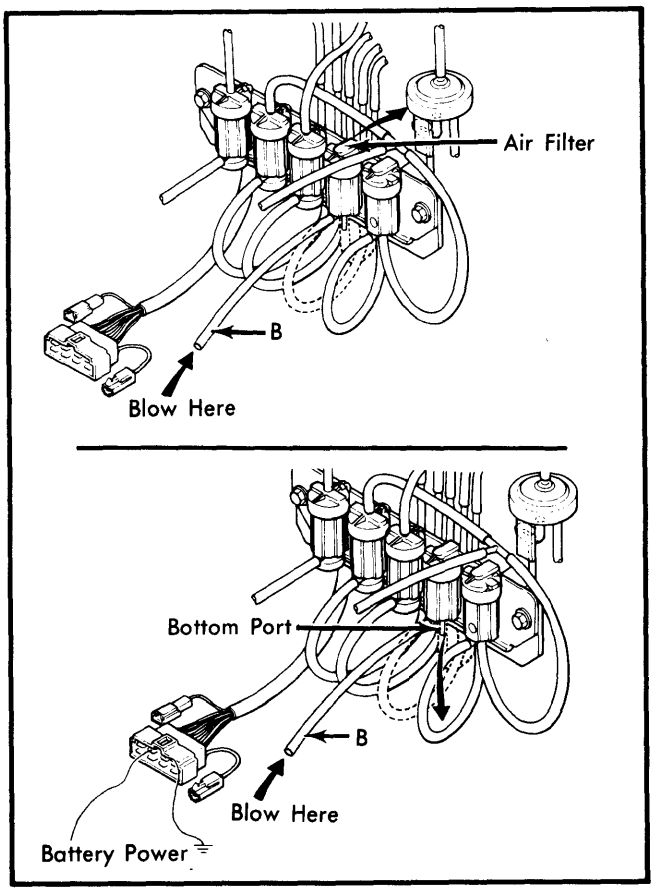

Fig. 8 Testing Mazda 626 Air Switching 3-Way Solenoid Valve

All Other Models – Disconnect Green vacuum sensing tube from No. 2 solenoid valve. Disconnect Yellow vacuum sensing tube from No. 1 water thermo valve. Disconnect electrical connector (Green wire) from solenoid and ground solenoid terminal. Turn ignition on and blow through Yellow tube, air should escape at port. Turn ignition off and blow through hose again, air should escape at solenoid air filter. If valve does not respond as outlined, replace No. 2 solenoid valve.

AIR SWITCHING SOLENOID VALVE (626 ONLY)

Disconnect vacuum sensing tubes from 3-way solenoid valve and vacuum pipe. Blow through vacuum tube "B" shown in *Fig. 8;* air should escape through solenoid valve air filter. Start engine and run at 1100-1300 RPM. Blow through vacuum tube again, air should escape through bottom port. If air switching 3-way solenoid valve does not operate as outlined, replace valve.

SPEED SWITCH (EXC. B2000)

626 – Connect voltmeter to Black/White and Green/Yellow wires of electrical connector. *See Fig. 9.* Start engine and slowly increase engine speed. Record speed at which current flows through circuit (speed should be 1100-1300 RPM). Slowly decrease engine speed and note speed at which current stops flowing. Difference between readings should be 100-300 RPM. If not, replace engine speed unit.

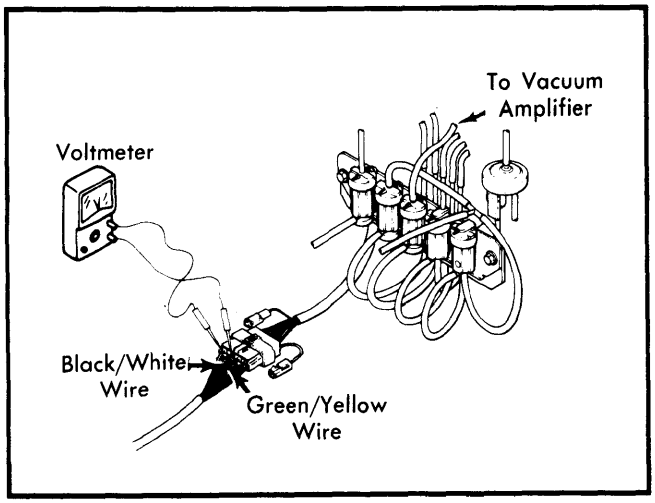

Fig. 9 Testing Mazda 626 Engine Speed Unit

All Other Models – Remove instrument panel from dashboard. Remove speedometer glass and connect test lamp and battery. *See Fig. 10.* When speedometer needle indicates less than 63 MPH, test lamp should glow. When speedometer needle indicates more than 63 MPH, lamp should not glow. If not, replace vehicle speed switch.

MAZDA PISTON ENGINE AIR INJECTION (Cont.)

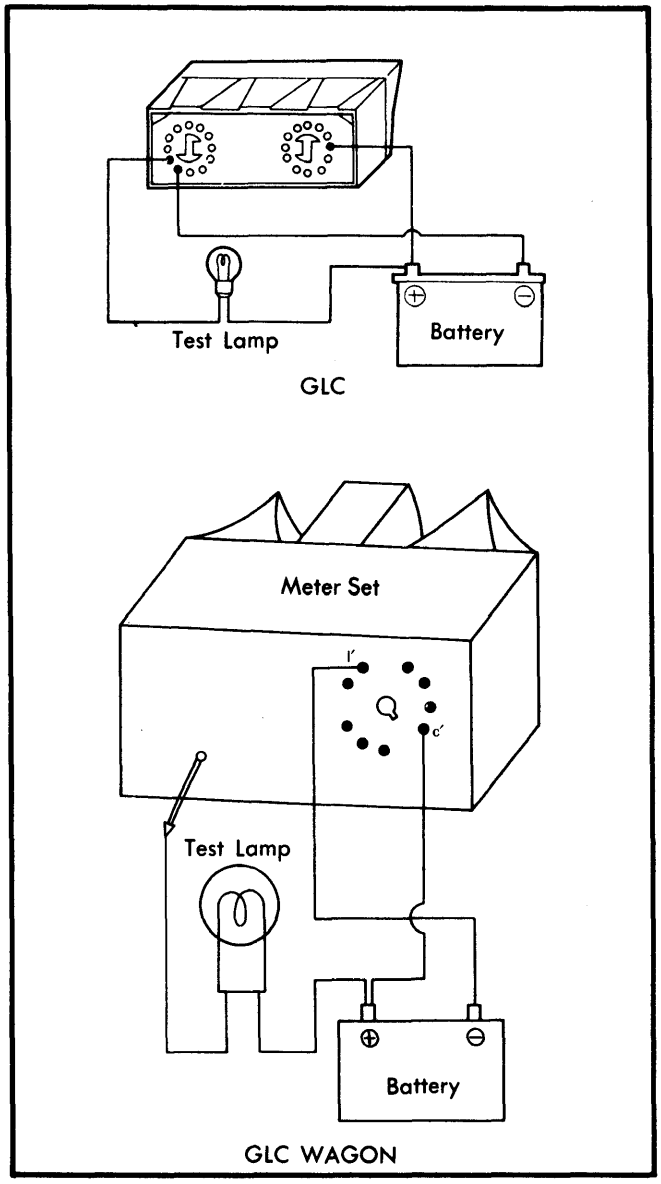

Fig. 10 Testing Vehicle Speed Switch (GLC and GLC Wagon)

HEAT HAZARD SENSOR (GLC WAGON & 626)

1) Turn ignition on. "Overheat Exh. System" warning light should glow. Start engine and warning light should go out. Remove passenger seat and fold back carpeting (scuff plate and floor mat on 626) to expose heat hazard sensor wiring. Disconnect sensor and use a jumper wire to jump terminals of wiring connector; warning lamp should glow.

2) If warning lamp does not respond as outlined, remove and test sensor. Wrap sensor and a thermometer in aluminum foil (electrical connector must be exposed for access). Place sensor and thermometer (wrapped in aluminum foil) in container filled with oil, place a second thermometer in container of oil. See *Fig. 11*. Connect a battery and test lamp to sensor connector as shown in *Fig. 11*.

3) Gradually heat oil. Test lamp should glow when temperature inside aluminum foil reaches 284-320°F (140-160°C). If sensor does not respond as outlined, replace heat hazard sensor.

NOTE – *Do not heat oil above 392°F (200°C).*

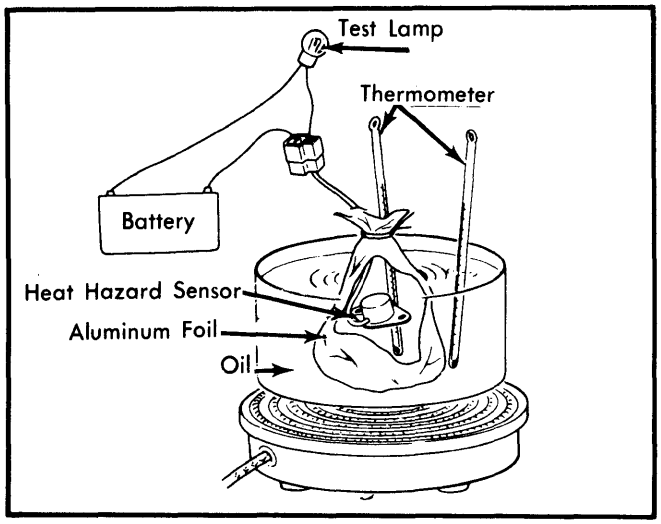

Fig. 11 Testing Heat Hazard Sensor (GLC Wagon and 626)