PART THREE—BODY

SECTION III—AIR CONDITIONING

1. AIR CONDITIONING

A new combined Heater and Air Conditioning Unit, as shown in Figure 2, has been developed for the Plymouth cars. The unit is located under the dash area and provides temperature control for all-weather driving.

Temperature control is obtained through a reheating process. For summer operation, the air is dehumidified and cooled as it passes through the evaporator coil and then reheated, by the heater core, to a temperature that is selected by the driver. The amount of heat added to the air as it passes through the heater core is controlled by the flow of hot water through the core and is regulated by a modulating valve. This reheat type of temperature control gives maximum dehumidification with any cooling.

During the heating cycle, outside air is introduced into the system through a permanently open vent in the top of the cowl section, as shown in Figure 1. Fresh air is drawn through both the cooling and heating coils by the centrifugal blower, as shown in Figure 3. The air heated by the heating coil, is then forced into the duct for distribution.

The cooling cycle is similar except that the air may be brought from the outside or it may be recirculated through the recirculating door, as shown in Figure 4. The controls are so arranged that the recirculating feature is only employed when maximum cooling is required.

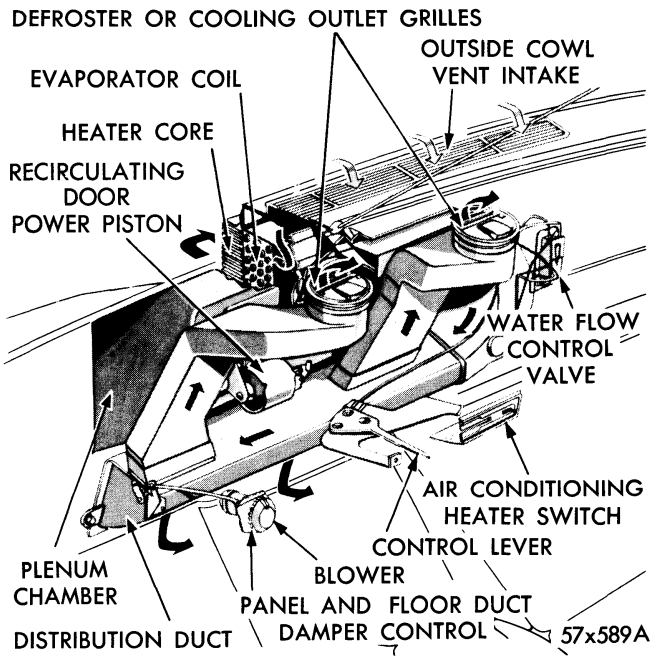


Figure 1—Heater-Air Conditioning Passenger Compartment Installation

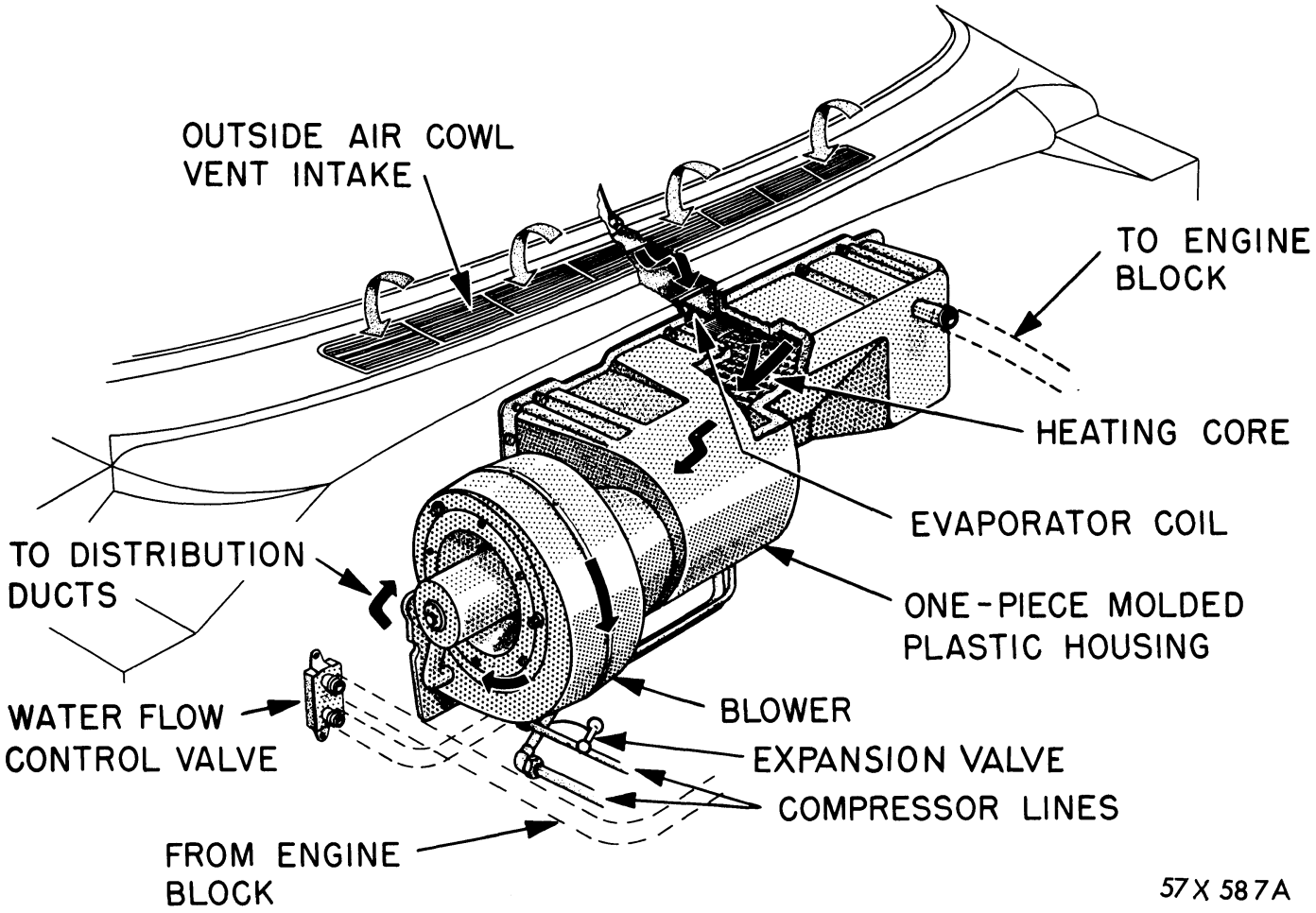


Figure 2—Heater-Air Conditioning Engine Compartment Installation

OPERATING CONTROLS

The controls for the heater-air conditioner are partially power actuated. The main control lever operates the water temperature valve through a control cable; the fresh air and recirculating door (through two electric switches), solenoid valve, and power piston assembly, as shown in Figure 5.

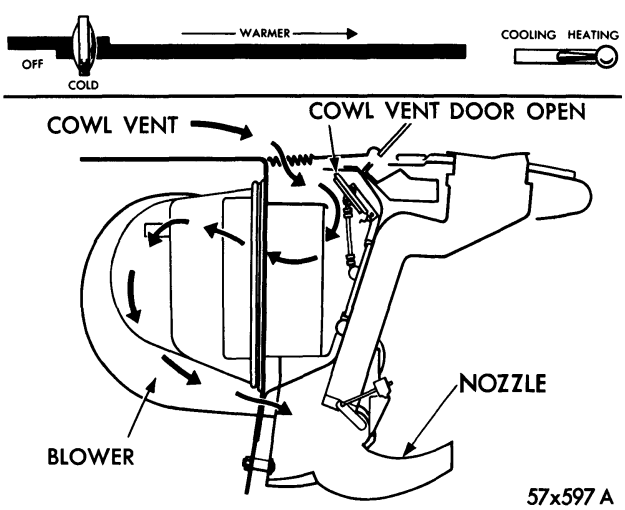


Figure 3—Blower Motor and Vent Door Operation Door Open

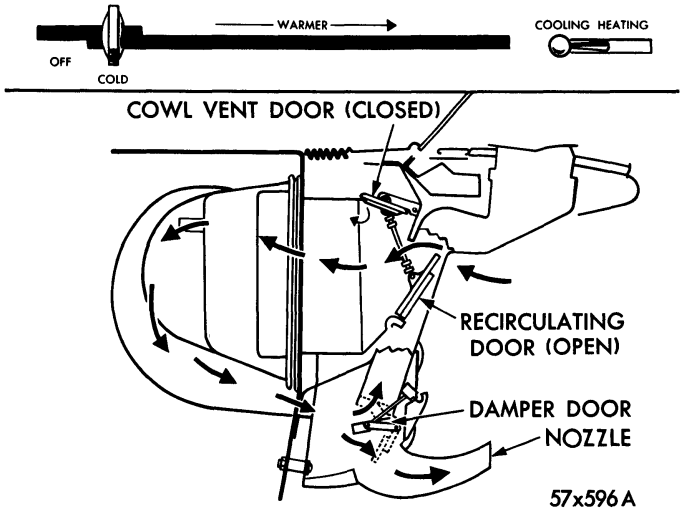


Figure 4—Blower Motor and Vent Door Operation Door Closed

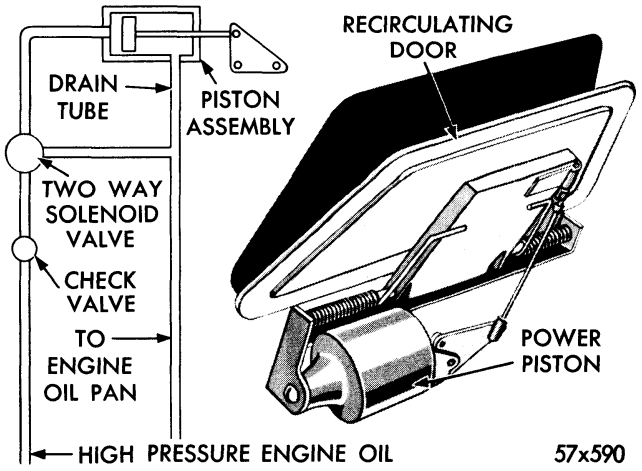


Figure 5—Power Piston and Recirculating Door Operation

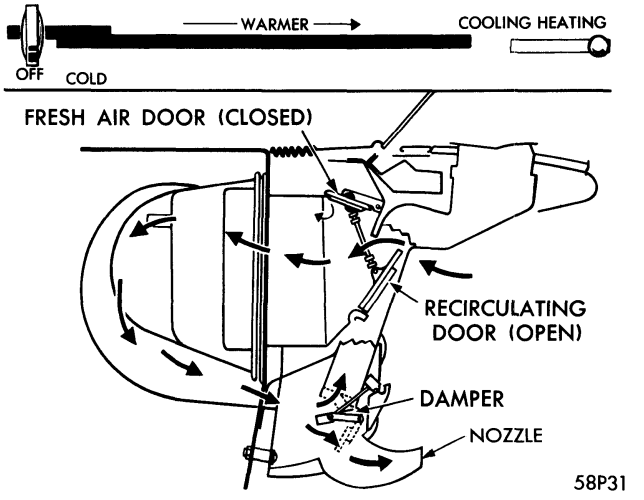


Figure 6—Recirculating and Fresh Air Door Operation

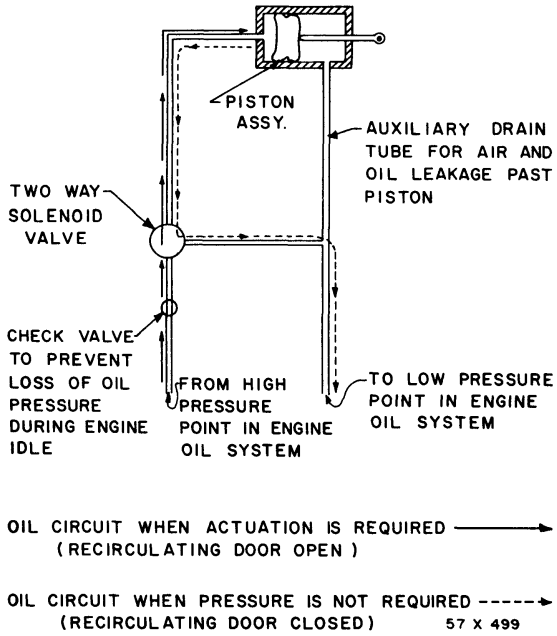


Figure 7—Power Piston Hydraulic Circuit

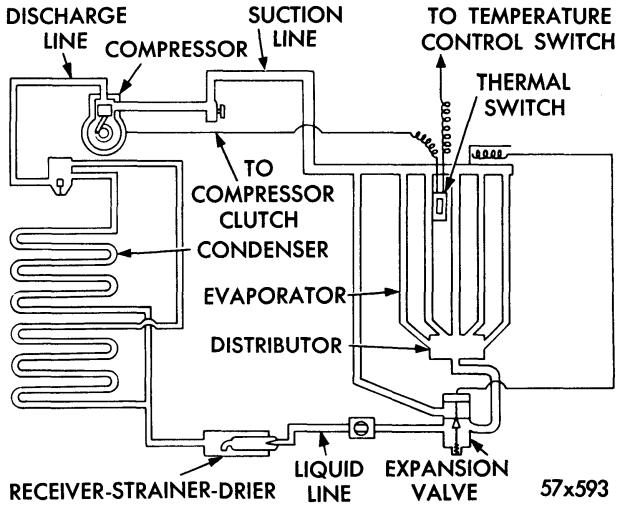


Figure 8—Heater-Air Conditioning (Schematic)

When the solenoid valve is energized, it permits engine oil pressure to act on the power piston, closing the cowl vent fresh air door and opening the recirculating door. Figure 6, shows fresh air and recirculating doors. Figure 7, shows schematic diagram of hydraulic circuit for operating the power piston.

Two separate control knobs are located on the instrument panel. The knob marked "B" is used to control the blower motor speed. Three speeds are available through the selection of wire taps in the motor fields. The first position of the knob is "off," the second position is "low," the third position is "medium" and the last position is "high." Positions are obtained by turning the knob in a clockwise direction.

The knob marked "D" controls the positioning of the distribution duct damper, and is used to proportion the air distribution between the instrument panel grilles and the distributor duct nozzle.

The toggle switch, with positions marked "Cooling" and "Heating," permits the energizing of the compressor clutch circuit and the resistance coil of the water temperature control valve. This action occurs when the toggle switch is in the "Cooling" position. When the switch is in the "Heating" position, it insures that these circuits will not be energized. The main control lever must be in some position other than "Off" to permit the closing of the clutch and coil circuits by the toggle switch. The position of the toggle switch effects the operation of recirculating door.

POSITIONING CONTROL LEVER

Moving the main control lever from "Off" to "Cold" (No. 2 position), with the toggle switch in "Cooling"

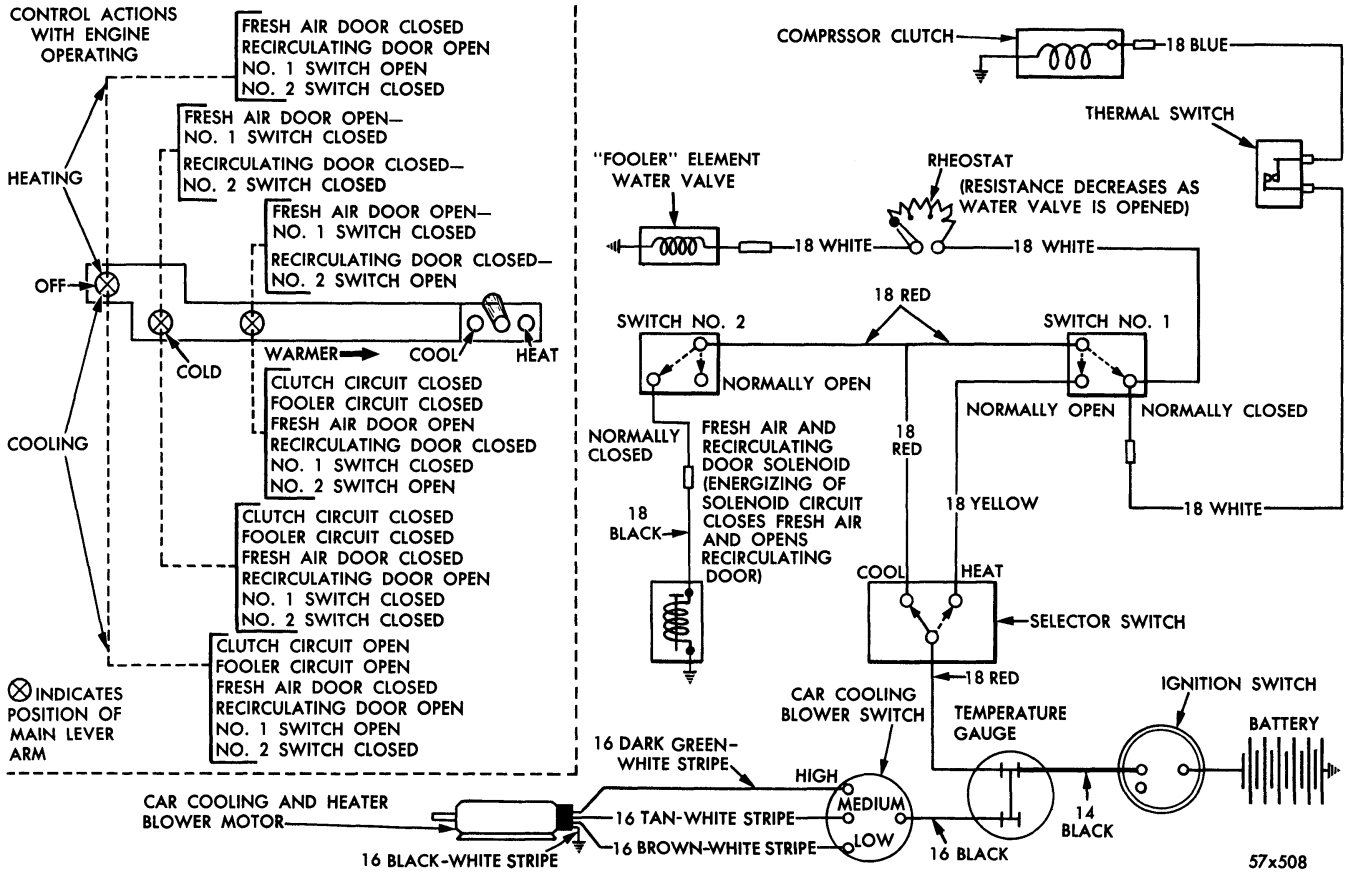


Figure 9—Heater-Air Conditioning Wiring Diagram

position, results in the following sequence of operations.

1. Compressor clutch and water valve heating element is energized. See Figures 8 and 9.

2. Fresh air door closed and recirculating door open resulting in 100% fresh air.

3. Moving the main control lever to the right from the "Cold" (No. 2 position) with toggle switch on "Cooling" position, the following operational sequence will occur:

1. The fresh air door opens and recirculating door closes due to de-energization of the solenoid valve.

2. Full fresh air cooling obtained.

3. Lever mechanism picks up the cable controlling the water temperature control valve and prepares to open the valve.

Moving the main control lever from position No. 3 through "Warmer" to position No. 4 opens the water temperature control valve. At the warmest point in the "Cooling" position, the water valve will allow the heater core to reheat the cooled air to approximately 75°F.

Moving the main control lever from "Off" to "Cold" (No. 2 position) (with toggle switch in "Heating" position) de-energizes the solenoid valve, allowing the recirculating door to close and the fresh air door to open, resulting in fresh air ventilation.

As the main control lever is moved from the "Cold" position to the No. 3 position, with the toggle switch in "Heating" position the lever mechanism picks up the cable controlling the water temperature control valve and prepares to open valve.

Moving the main control lever from position No. 3 through "Warmer" to position No. 4 opens the water temperature control valve. At the warmest point in the "Heating" position, the water valve allows the temperature of the discharge air to reach approximately 130°F.

The fresh air door will always open and the recirculating door will always close when the car engine is stopped. This puts the system in a "safe" position for car washing or parking during a rainstorm.

AIR DISCHARGE AND DISTRIBUTION

Cooled or heated air can be distributed to either the upper or lower level of the car and it can be proportioned between the upper and lower level.

Conditioned air is forced into the car by the blower. The air enters a distribution duct and can be discharged toward the floor of the car through the nozzle, as shown in Figure 10, or it can be forced through two discharge grilles in the top of the instrument panel by means of a damper. In general, the air will be discharged to the

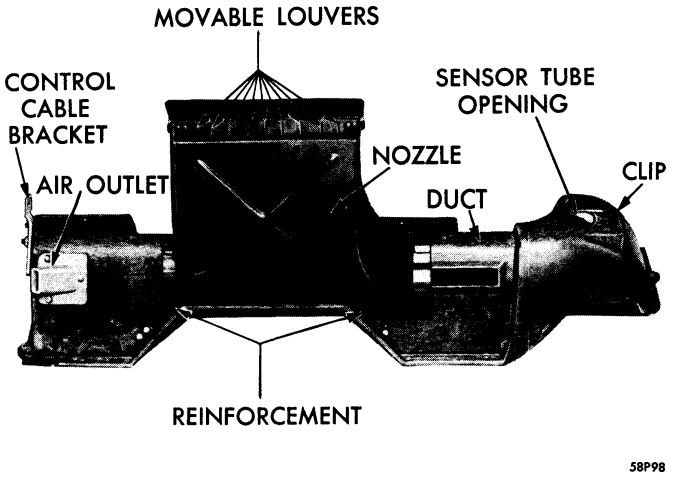


Figure 10—Lower Distribution Duct and Nozzle

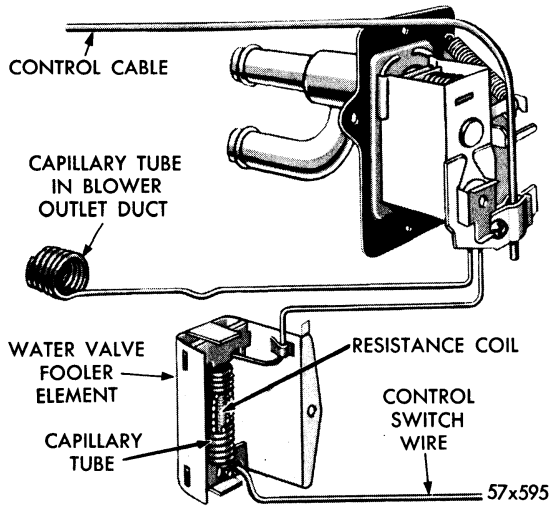


Figure 11—Capillary Tube and Water Valve

lower level for heating, the upper grilles for defrosting and a combination of the openings used for air conditioning.

The discharge grilles, in the top of the instrument panel can be rotated 360°. Also, the grilles have deflectors which can be used to direct air as desired by the occupants.

TEMPERATURE CONTROL

For summer operation, the air is dehumidified and cooled as it passes through the evaporator coil and then reheated, by the heater core, to the desired temperature.

A thermostatic switch is used to prevent the evaporator coil from frosting-over and is installed in the evaporator to sense the fin temperature of the coil. As the temperature of the evaporator fins decreases to a point where frost-over might occur, the thermal switch will break the compressor clutch circuit, stopping refrigeration until the fin temperature increases to a point above the freezing point of water.

The same modulating water valve is used for temperature control for both heating and cooling. The temperature range of the valve is changed by an electric resistance heating coil when cooling is selected by the operator. For the heating cycle, this temperature range will be from about 75°F. to 130°F. The discharge range for Air Conditioning, at summer operation, will be approximately 40°F. This shift in the temperature range is accomplished by the heating of the valve's temperature sensitive secondary capillary tube with a resistance heating coil wound around the second capillary tube. Heating the secondary tube, in effect, "tricks" the primary capillary tube, Figure 11 (located in the distribution duct), by making it appear warmer than the discharge air flowing over it. The valve will then tend to close, thus reducing heating of the air and shifting the temperature to the desired level.

2. INSPECTION AND TESTING OF AIR CONDITIONING SYSTEM

PREPARATION FOR TESTS

Move car into a well ventilated area and shut off engine. Then connect exhaust suction system to tail pipe.

Inspect condenser and radiator for bugs, etc. Remove all obstructions by blowing with compressed air.

RADIATOR

Check radiator pressure cap. A 14 pound pressure cap and a 180°F. thermostat is used in all models.

Check cooling system and add water or anti-freeze to maintain proper level. The cooling system must be protected to a temperature of 20° above zero for summer.

COMPRESSOR BELT

Check compressor belt tension with a 5 pound pull scale in center of longest belt span. Compressor belt deflection (each belt) should be $\frac{3}{16}$ inch for a new belt and $\frac{5}{16}$ inch for used belts. A belt having a minimum of ½ hour engine run is considered a used belt. Always replace both belts. Never run a new belt with an old belt.

BLOWER MOTOR

Check for loose or poor electrical connections, see Figure 9. Check blower switch. Make a blower circulation check by operating the blower on each of its three operating positions: "low," "medium" and "high." Check for change in operation speeds and circulation.

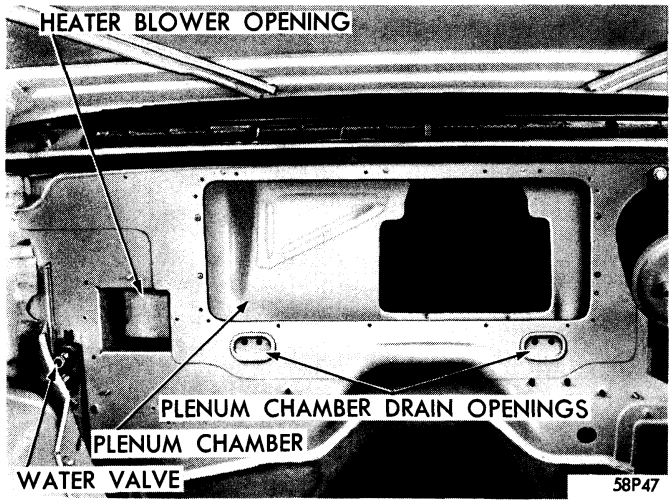


Figure 12—Plenum Chamber and Drain Openings

DRAINS

Check plenum chamber and air conditioner housing drains, Figure 12, for being clear.

COMPRESSOR CAPACITY TEST

To make a compressor capacity test, the system must be isolated from the compressor. In isolating the compressor from the system, a .020" test cap, Tool SP-2922, must be used to measure the amount of air pressure the compressor delivers at a given engine speed.

To make a compressor capacity test with a test cap, proceed as follows: Start engine and operate at 1200 r.p.m. Then, turn blower switch to "High" and temperature control lever to "Cold" position. Open car windows.

Allow engine to operate until engine and compressor are up to normal operating temperature. Stop engine and remove the valve stem protective caps from suction and discharge valves. Use rachet wrench, Tool C-3361A, and back-seat both suction and discharge service valves by turning valves counter clockwise all the way.

Remove service port caps from suction discharge service valve and attach hoses from gauge set manifold, Tool C-3627.

Attach hose from compound gauge, on left of gauge assembly, to the suction service port. Attach hose from right gauge to discharge service port.

Close both right and left hand shut-off valves clockwise on the gauge set manifold. Start engine and with compressor operating, adjust engine speed to exactly 500 r.p.m.

With rachet wrench, Tool C-3361A, rotate valve stem of suction service valve clockwise until valve is completely front-seated. Front seating the valves will cause suction pressure to drop to zero, and from a zero reading to a vacuum reading "pumping down" all of the refrigerant out of the compressor.

With compound gauge reading 20 to 25 inches of vacuum rotate valve stem of discharge service valve clockwise until valve is completely front-seated. Open the right hand shut-off valve counter clockwise on the gauge manifold set. This will allow the small amount of gas trapped between compressor and discharge valve to vent down to zero reading through gauge manifold set center connection hose.

Open left hand shut-off valve on manifold, remove hose from center connection of gauge set. Attach capacity test cap, Tool SP-2922, to center connection of gauge set manifold.

Disconnect manifold hose from suction service valve leaving service port open. Test cap must be absolutely clean before installation on gauge set connection. Wash with solvent and blow dry. Test cap is meter drilled and wire or similiar instrument should never be used to open the vented orifice. If this is done a doubtful gauge reading may result.

Close left hand shut-off valve on manifold while noting the pressure rise reading on high pressure gauge.

Operating engine at exactly 500 r.p.m. the pressure reading on high gauge should read 165 to 185 psi. To make sure reading on gauge is correct, open and close the left hand shut-off valve (on gauge) set several times. If pressure readings rise on gauge and correspond to specified specifications, the compressor is functioning up to specifications. If pressure reading is below specifications and tachometer and gauge is reading accurately, stop engine and check compressor oil level since low oil level will cause a low capacity test reading.

Add oil to compressor (if necessary) and recheck the compressor for capacity test readings. If compressor pressure is below the prescribed specifications the compressor valve plate assembly should be replaced.

After replacing valve plate on compressor (if necessary) make a capacity test to again determine compressor pressure capacity. If compressor (with oil level corrected, and valve plates replaced) does not come up to specified pressure, remove suction service valve from compressor.

Inspect suction screen (located in opening under valve) and see that it is clean, and that gasket is properly seated. If screen is clean and gasket is not damaged, and compression test does not come up to specifications, the compressor should be replaced. When replacing compressor, an adjustment must be made to compensate for oil remaining in system. Check and correct oil level in compressor (2" to 2½" dipstick measurement), ⅛" drill rod should be satisfactory.

Start engine and run for approximately 15 minutes and check oil level again. Add or subtract to maintain specified limit. Remove compressor test vent cap from

NOTE

On early 1957 production a tecumseh compressor was used and the oil level should be ¾" to 1".

manifold and wrap cap in clean cloth to protect orifice from dirt and grit.

Open right hand shut-off valve on manifold gauge set. Close left hand shutoff valve. Connect suction hose to service port of suction service port.

With engine running at 500 r.p.m. and compressor engaged, "pump down" the compressor by bleeding the air out of compressor through manifold gauge center connection. When 25 to 28 reading is indicated on vacuum gauge, turn suction service valve a fraction of a turn counter clockwise for a few seconds and then front-seat the valve. This will allow small amount of gas accumulated in suction line to flow into compressor and crankcase, mixing with and to be absorbed by the oil. This operation will also cause the gas to flow through the compressor's cylinder and out through the manifold gauge center connection.

Probe the gauge center connection with tip of finger. If probing with finger at connection indicates no more gas is flowing, close right hand valve on manifold gauge set.

Stop engine and turn both suction and discharge service valves counter clockwise until they are completely back-seated. After back-seating each valve, turn (each valve) one turn clockwise to operating test position.

After completion of test, turn both suction and discharge service valves counter clockwise until they are fully back-seated. Open both hand shut-off valves on manifold to release pressure on manifold gauge hoses. Disconnect and remove hoses from both service valves, then replace valve stem and service port caps and both service valves. Adjust fan belt and check both cylinder head to compressor attaching bolts for tightness.

3. PRECAUTIONS TO OBSERVE IN HANDLING THE REFRIGERANT

When properly used, refrigerant is harmless. A few simple precautions, however, should be observed to guard against injuries or sickness that might occur when refrigerant is improperly handled.

CAUTION

Do not discharge refrigerant in area where an open flame is present. The refrigerant normally is non-poisonous. A concentration of gas in a live flame, however, will produce a poisonous gas. Splashing refrigerant on bright metal or chrome should also be avoided because the gas will tarnish bright metal.

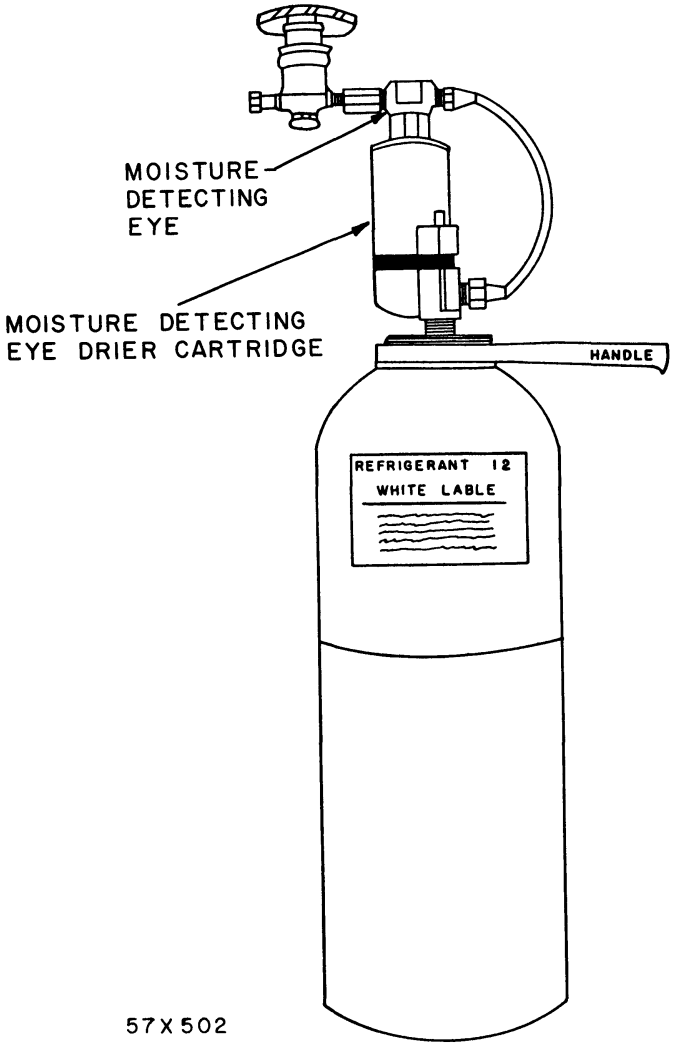


Figure 13—Refrigerant Tank Detecting Eye and Drier Cartridge

CAUTION

Do not expose eyes to liquid. Do not rub eyes if splash of refrigerant hits them. Apply cold water immediately to area of eye to gradually raise the temperature above freezing point. The use of antiseptic oil is helpful since oil forms a protective film over eye ball until medical aid can be obtained. Warning: Safety Goggles, C-3355, should be worn to protect the eyes.

Use care to prevent moisture entering system. It is imperative (when sweeping or charging the system) that the refrigerant be passed through a Drier and Dry-Eye assembly before the refrigerant enters the Air Conditioning System. (See Figure 13 for methods of attaching Dry-Eye and Drier to tank assembly.) To avoid moisture and free water entering the system, use only sealed and unopened charging refrigerant tanks.

4. INSTALLING GAUGE SET MANIFOLD

Remove valve stem protective caps from compressor discharge and suction service valves. Using Tool C-3361A, make sure both valves are completely back-seated (counter clockwise). The normal operating position is when valve is rotated in a counter clockwise direction. This position also isolates service valve ports from stem pressure.

Remove protective cap from both discharge and suction service port fittings. Install a test hose from 600 pound gauge fitting on Tool C-3627 to discharge service valve port fitting. Install a test hose from 30 pound compound gauge fitting on Tool C-3627 to suction service valve port fitting.

Turn both valve handles of gauge set Tool C-3627, clockwise as far as they will go. This will completely seat valves and isolate gauge set manifold center outlet from test hoses. To admit pressure to gauges, rotate valve stems of both suction and discharge service valves one turn, clockwise.

5. TESTING FOR LEAKS WITH LEAK DETECTOR

When system is found to be low in refrigerant (or following repairs on system that necessitated opening of connection) it is necessary to test for leaks and tighten connections, or to make repairs as they are required before system is charged and put in operation. If system has been charged, for making repairs, or to eliminate moisture, system must be evacuated before partially charging to test for a leak.

Partially charge system with refrigerant and proceed as follows: This is necessary only where supply in system is very low, or when system has been evacuated. Tool C-3569 (Test Torch) uses petroleum gas and does not require generating to light. Just turn valve on, light it, and adjust to small flame.

Move leak detector sniffer tube over all connections. When leak is found flame in burner will turn bright green. Move detector tube around connection to determine magnitude of leak. If larger leak is found, color of flame will turn from bright green to bright purple. If leak is found at flared connection, try tightening connection, using two wrenches. If leak cannot be eliminated by tightening, system must be discharged, connection or flare reseated or replaced, system evacuated and again partially charged, and re-tested. If no leaks are found, add to partial charge until system is properly charged.

6. CHECKING REFRIGERANT BY SIGHT GLASS METHOD

In some cases, it may be necessary to add refrigerant (without weighing refrigerant) to the system.

Follow the steps in "Installing Gauge Set Manifold" and "Charging System" but eliminate those steps involving scale.

Start engine and operate at 1200 r.p.m. Turn blower control switch to "high" position and temperature switch to "Cold." Now rotate both suction and discharge service valves one turn (clockwise). Where discharge gauge hand fluctuates (when engine is running), close discharge valve slowly (counter clockwise) until gauge hand steadies. Charge through drier.

Install drier, as shown in Figure 13. Open tank valve one turn. Open suction valve on gauge manifold slightly (counter clockwise). Control refrigerant entering system with this valve. Do not allow suction pressure to exceed 60 psi.

Carefully watch sight glass. Close gauge manifold valve (clockwise) the moment sight glass is clear of bubbles. Stopping flow of refrigerant into system as soon as sight glass is clear, free of bubbles, is important. Too much refrigerant in system can cause damage.

Operate system for five minutes and again observe sight glass for presence of bubbles. If there is still evidence of bubbles, continue to carefully charge until sight glass is clear, and repeat five minutes run. Where no bubbles are present after five minutes of operation, charge system with an additional charge of refrigerant for 19 seconds.

Close tank valve and loosen hose connection at tank to gradually release gas from hose. Disconnect hose after gas has escaped. Back seat suction and discharge service valves (counter clockwise). Now remove gauge manifold and install service valve and service port protective caps.

7. DISCHARGING THE SYSTEM

Install gauge set manifold, Tool C-3627. Using Tool C-3361A, be sure both discharge and suction valves are fully back-seated (counter clockwise). Connect an eight foot test hose to gauge set manifold center fitting. Insert the free end of an eight foot hose into exhaust suction system and turn exhaust system blower on. Expelling the gas into the exhaust system is recommended safety precaution. Open discharge and suction service valves one turn.

Turn manifold gauge set discharge hand valve a fraction of a turn counter clockwise to allow gas to escape. Opening manifold discharge hand valve too much in order to more quickly discharge system will draw compressor lubricant off with the gas. As pressure on manifold discharge gauge drops near zero, open manifold suction valve. If brazing or some similar repair is to be made on system, leave system open to atmospheric pressure. After service work has been completed, system must be evacuated, partially charged, and leak tested before final charge.

8. EVACUATING AND SWEEPING SYSTEM

Whenever system has been open to atmosphere, it is absolutely essential that system be evacuated and swept with refrigerant to remove all air and moisture. To evacuate and sweep the system, proceed as follows:

Connect gauge set manifold, Tool C-3627, to compressor and condenser service valves. Discharge system (if not previously discharged). Be sure the pressure has dropped to zero before attaching hose to vacuum pump.

Connect an eight foot test hose to center fitting of gauge set manifold and to connection on vacuum pump, Tool C-3652. Open both discharge and suction service valves about one turn, rotating both valve stems clockwise.

Open both gauge set manifold hand valves (turn counter clockwise). Start vacuum pump and observe compound gauge. Operate pump until gauge registers 26 to 28 inches of vacuum. Continue evacuating at 26 to 28 inches for five minutes. Failure to obtain 26 to 28 inches of vacuum indicates a leak in the system. Close both gauge set manifold hand valves (clockwise). Turn off vacuum pump and remove long hose from pump. Charge system with refrigerant gas.

Start engine and adjust speed to 1200 r.p.m. Turn Blower control to "High" and temperature control to "Cold." Operate in this manner for five minutes and test for leaks. Discharge system to sweep out any remaining moisture, and again with 2¾ pounds of refrigerant.

9. MOISTURE IN AIR CONDITIONING SYSTEM

Moisture is directly or indirectly the cause of many failures in air conditioning systems. Moisture can be classified as visible and invisible. Visible moisture, such as rain, clouds, steam, etc., can be seen. Invisible moisture is water vapor which cannot be seen with the eye. It is in all solids, liquids and gases. It is in the air, and the varying amount is expressed in terms of relative humidity. Withdrawal of refrigerant from a system that is experiencing freeze-ups at the expansion valve, does not ordinarily reveal visible liquid water in the refrigerant, it is there, however, in quantities sufficient to stop refrigeration.

Moisture may enter the air conditioning system in the following manner: System left open during repair. Condensation in tubing, leaky seal caps, wet driers, unsealed charging hose or manifolds. Use of wet oil or refrigerant from improper handling. Charging system without drier.

In order to be certain the moisture content of "Refrigerant 12" is kept out of the freeze-up range, acid producing and corrosion range, the moisture content should not exceed 10 PPM. The progressive result of moisture in excess of 10 PPM in "Refrigerant 12" is as follows:

"Refrigerant 12" plus excess moisture equals freeze-ups at expansion valve. "Refrigerant 12" plus excess moisture equals acid (Hydrochloric and Hydrofluoric). Acid plus metals and refrigerant oil equals corrosive sludge.

Corrosive sludge plus expansion valves equals sticky or stuck valves. Corrosive sludge plus screen and strainers equal plugged screens and strainers. Corrosive sludge plus compressor reed equals corroded and leaky valves.

REMOVING MOISTURE FROM TANK

Refrigerants such as "Refrigerant 12" are known as auto-driers. In a closed container, moisture tends to leave the liquid and concentrate in the vapor. A full tank of "Refrigerant 12" when received from the manufacturer, is as "dry" of moisture as the manufacturer can produce it. Yet it will still contain from 6 to 10 PPM moisture in the liquid phase. At room temperature, "Refrigerant 12" in the vapor phase (refrigerant gas above the liquid in a tank) can hold as much as seven times the amount of moisture as it does in the liquid phase.

This means that starting with a full tank of "Refrigerant 12" containing 6 to 10 PPM moisture in the liquid phase, the vapor above the liquid can contain 42 to 70 PPM. As this vapor leaves the tank and is charged into the Air Conditioning System, the moisture enters the system with the vapor. As more and more refrigerant vapor leaves the tank, more and more liquid refrigerant boils into a vapor and the vapor can extract a 7 to 1 ratio of moisture from the liquid remaining in the tank. By the time this full tank of "Refrigerant 12" is down to above half full of liquid, the remaining half tank of the refrigerant, liquid and vapor will be very dry, as all of the moisture originally contained in the full tank of liquid has been extracted by the vapor and charged into the Air Conditioning System.

CAUTION

Always insist on delivery of refrigerant in unopened tanks. Do not accept tanks refilled by anyone other than the manufacturer, because of the possibility of the tank containing free water.

For these reasons it is imperative (when charging a system) to pass the refrigerant vapor through an efficient drier before it enters the Air Conditioning System.

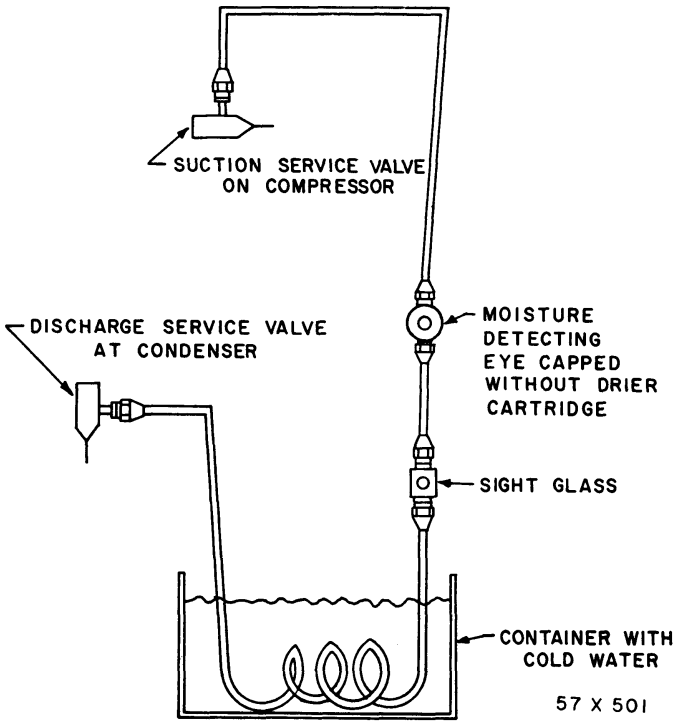


Figure 14—Moisture Detecting Eye

If this precaution is not taken, as much moisture may be induced back into the system as was removed during evacuation and sweeping. See Figure 13 for method of attaching Drier and Dry-Eye to tank assembly. Refer to "Charging System," for use of Drier and Dry-Eye equipment to eliminate moisture from system. Drier cartridges are available in 8, 12, 20 and 30 cubic inches. A 12 cubic inch cartridge is recommended for use with refrigerant tank. Make sure cartridge is sealed with white plastic seal cap when received. This cap is used to seal moisture from drier cartridge.

Used drier cartridges can be re-activated when saturated with moisture, provided refrigerant oil has not flowed through the drier, by unsealing the cartridge and placing it in a heated oven for a given number of hours. For example, if the cartridge is placed in a 300 degree oven, it should remain there for 2 hours, 1½ hours in a 400 degree oven, or 1 hour in a 500 degree oven, etc. After heating, allow the cartridge to cool, reseal with plastic cap and gasket, store in a dry area (at room temperature).

CHECKING SYSTEM FOR MOISTURE

With tubing coil, sight glass, moisture detecting eye and cap made up into an assembly, as shown in Figure 15, remove valve stem caps from suction and discharge service valves, back-seat and fully open (counter clockwise) both valves. Remove caps from valve service ports and attach tubing and flare fitting assembly to the valve service ports.

Fill the container with cold water to allow for submersion of coil in water, as shown in Figure 14. Turn valve stem of discharge service valve two turns, clockwise. Purge air from tubing by slowly loosening up the tubing nut at suction service valve. After all the air has been bled from tubing, retighten nut. Test all connections for leaks. Start engine and adjust engine speed at 1200 r.p.m. Open car windows and move the Air Conditioning operating level to "Cold" position, and blower switch to "High."

Slowly turn the valve stem of the suction service valve two full turns, and check sight glass, for flow of refrigerant liquid through glass. After approximately 15 to 20 minutes of engine operation (with liquid flowing through the moisture detecting eye) if the dot of the eye still shows pink, excessive moisture is present in system.

If system is "Dry" or contains a minimum of moisture, the dot of eye will slowly change to light blue indicating the system contains 10 to 20 PPM of moisture. When dry eye shows a dark blue the same color as corresponds to the dot on eye, it is indicative that system contains less than 5 PPM of moisture and is now ready for safe, satisfactory Air Conditioning operation. If moisture detecting eye shows pink, excessive moisture is present. Light blue will indicate the system is border line, and moisture content should be lowered.

To remove the moisture detecting eye and tubing assembly, proceed as follows: With air conditioning system operating, back-seat first the discharge service valve, and then suction service valve counter clockwise and stop engine. Remove tubing coil, sight glass, moisture detecting eye and cap assembly from suction and discharge service valves. Install protective flare plugs in end of tubing fitting to keep moisture and other foreign matter from entering tubing.

CORRECTING A WET AIR CONDITIONING SYSTEM (WITHOUT DISCHARGING SYSTEM)

With tubing, 30 cubic inch drier cartridge and detecting eye made up into an assembly, see Figure 15, proceed as follows:

Remove valve stem caps from section and discharge service valves and fully back-seat (counter clockwise) both valves. Remove caps from valve service ports. Now remove flare plugs from tubing and drier cartridge assembly and attach flare nuts or tubing to service nuts of tubing to service valves, see Figure 15. Elevate drier and cartridge assembly above compressor height to facilitate absorption.

Turn valve stem of discharge service valve two turns clockwise, and slowly loosen tubing nut at suction service port. Purge air from tubing and drier. Retighten tubing nut after purging air. Test all connections for leaks and correct if needed.

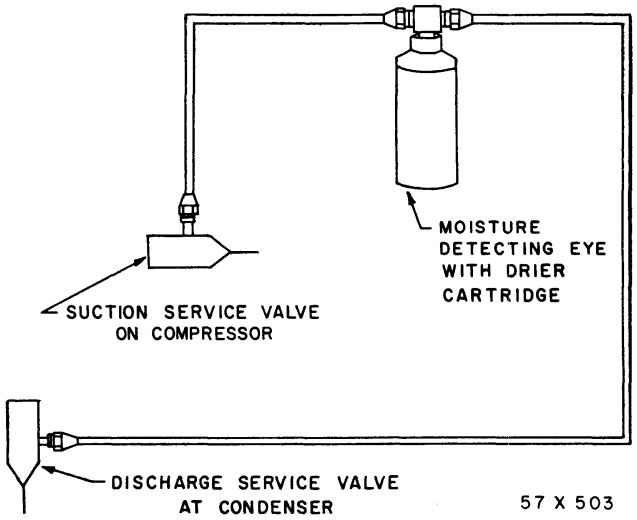


Figure 15—Moisture Detecting Eye and Drier Cartridge Installation

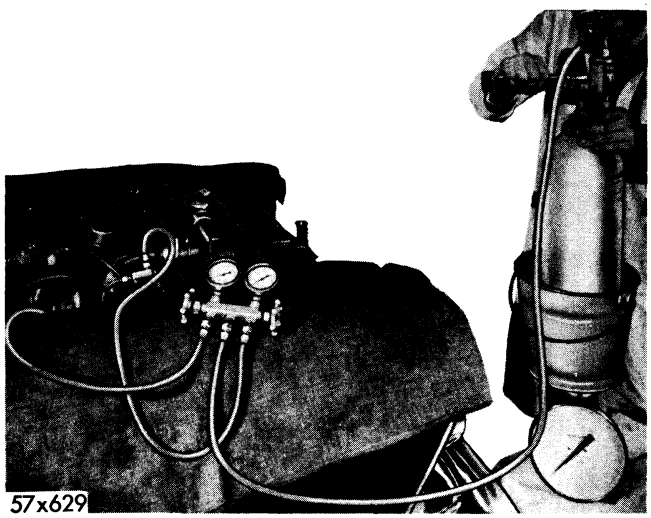


Figure 16—Charging the System

Turn valve stem of suction service valve two turns clockwise. With the vehicle located in an area where the air conditioning system can maintain room temperature, allow vehicle to set for approximately 24 hours, or for sufficient time to allow the drier to absorb sufficient moisture.

When detecting eye has turned a deep blue, matching the comparison color dot on the dry eye unit, the system is now sufficiently dry to permit satisfactory air conditioning operation.

The chemical action, involving a change from a moisture-laden refrigerant is as follows: The drier absorbs moisture from the refrigerant vapor. The vapor in turn absorbs moisture from the liquid refrigerant. In this conversion process, if the drier cartridge is allowed to remain in system long enough, it will also partially reactivate or dry-out the system's saturated drier.

To remove the drier cartridge, dry eye and tubing from compressor proceed as follows: Back-seat discharge and suction service valve stems (counter clockwise). Remove tubing, and drier cartridge assembly from suction and discharge service valves. Replace service port caps.

Install flare plugs in tubing ends to seal out moisture. Tighten all connections securely, and check compressor belts for correct tension.

10. CHARGING THE SYSTEM (USING MOISTURE DETECTING EYE WITH DRIER CARTRIDGE)

Assemble moisture detecting eye and drier cartridge to refrigerant tank. See Figure 13. Make sure the arrow located on "Dry-Eye" unit points in direction of flow from tank.

Close refrigerant shut-off valve and open refrigerant valve. Purge air from drier by opening refrigerant tank shut-off valve for a few seconds. Install ¼ inch cap on outer end of valve and tighten cap securely. Test all connections with a leak detector torch to make sure all connections are tight.

Open refrigerant tank valve and allow moisture detecting eye and tank assembly to be at rest, permitting the drier to absorb any excessive moisture that may be present in refrigerant liquid. Moisture detecting eye should change to a deep blue before attempting to charge or add refrigerant to the system. Otherwise replace drier.

When Dry-Eye and Drier Cartridge assembly is coupled to a refrigerant tank for the absorption of moisture the window of the moisture detecting eye will show a color dot indication, such as pink, if the refrigerant vapor in the charging tank is above 30 PPM of moisture. As the Drier Cartridge absorbs the excessive moisture content of the refrigerant, the moisture detecting eye will gradually change to a light blue, indicating a lower moisture content (10 to 20 PPM). The eye will change to a deeper blue as the vapor content is reduced. Refrigerant with a 5 PPM moisture content can be considered safe to use in the air conditioning system.

Connect an eight foot test hose to the center fitting of gauge manifold and to connection of refrigerant tank, see Figure 16. Be sure both gauge manifold valves are fully closed (clockwise).

Open both discharge and suction service valves one turn, clockwise, if not previously done. If discharge gauge hand fluctuates when engine is running, close discharge valve slowly (counter clockwise) until gauge hand steadies. Use "Charge through Drier". See Figure 16, and install drier, as indicated.

Open valve on tank one turn and loosen the eight foot test hose at gauge manifold. Leave connection

loose for about a second to purge air from hose. Start engine and operate at 1200 r.p.m. with blower control set to "High" and temperature control set at "Cold."

Set tank upright in pail of warm water. The temperature of warm water must not exceed 125 degrees F. Set pail and tank on scale, Tool C-3429, and weigh assembly. Make note of combined weight. It is absolutely essential that accurate scale, such as Tool C-3429, be used. Both scales are not accurate below 100 pounds.

Open suction valve on gauge manifold slightly (counter clockwise). Control refrigerant entering system with this valve. Do not allow suction pressure to exceed 60 psi. Be sure both discharge and suction pressure service valves are open about one turn, clockwise. Carefully water scale and shut tank valve off when system has absorbed 2¾ pounds. If partial charge is desired for testing leaks, charge system with refrigerant gas charge until 100 pounds pressure is reached on discharge pressure gauge.

Close suction valve on gauge manifold clockwise. To disconnect tank, loosen eight-foot test hose, allow refrigerant in hose to escape slowly, and remove hose from tank.

11. TESTING THERMAL SWITCH

Move temperature control lever to "Cold" position. The fresh air door should close and recirculation door should open. Turn blower switch to "Low" position; car windows and doors closed. Recheck the outlet air flow to assure blower is on low position.

Observe suction gauge pressure. As evaporator temperature lowers, suction pressure will gradually lower and fluctuate down to between 20 to 10 psi. The thermal switch contacts should be open and de-energize the clutch. When this happens, there will be a slight increase in the engine speed which can be noted by the ear or observed on the tachometer. Also, when the clutch de-energizes, there will be a sharp steady rise in the suction pressure.

Allow the system to continue to operate. The evaporator will warm up thereby closing the thermal switch contacts, which in turn, will re-energize the clutch—and again, when this happens, there will be a slight decrease in engine speed which can be noted by the ear or observed on the tachometer. Also the suction pressure will again start fluctuating to a lower pressure and the cycle will be repeated.

Should the suction pressure fluctuate down below 10 psi. and then release clutch, it is indicated the thermal switch sensing tube is not making a good contact with evaporator fin and coils. Should suction pressure fluctuate down and on into a vacuum without releasing the clutch, it indicates: The thermal switch wires are shorted together. There is moisture in the system. The thermal switch is defective. Check system for moisture. Perform the Overall Performance Test, before making thermal switch wiring or switch connections.

12. TESTING FOR PROPER SUPER HEAT

To test expansion valve for super heat, make sure the air conditioning system is dry and fully charged with "Refrigerant 12." Use a moisture detecting eye to check system for being dry. Make a compressor capacity check and check all the other components for proper working conditions.

Attach thermometer to suction line at compressor end of suction line. Install and insulate thermometer from engine heat. Start engine and adjust speed to 1200 r.p.m. Turn toggle switch to cooling position. Then, place control lever in "Cold" position. This will close fresh air door and open recirculating door.

Turn blower switch to high. Open car windows. Feel the heater water valve to make sure no hot water is flowing through heater core.

After operating engine for 10 minutes to allow system to normalize, take reading of suction gauge pressure, and check thermometer temperature. The method used to determine whether the proper amount of refrigerant is metered into the evaporator coils is to determine the number of degrees of super heat the vapor has absorbed in the coils. The specifications are 8 to 15 degrees super heat. It is calculated for all models as follows: See Chart for determining super heat.

EXAMPLE OF CHART FOR DETERMINING SUPER HEAT

A Observed Suction Pressure at Gauge	B Temperature Relation of Suction Pressure	C Observed Thermometer Temperature at Evaporator	D Super Heat
25 lbs.	26°	36°	10°
30 lbs.	32°	42°	10°
35 lbs.	38°	48°	10°
40 lbs.	43°	53°	10°

NOTE: Subtracting "B" from "C" will equal super heat at "D"

Observe suction pressure at gauge and obtain the nearest temperature corresponding to this pressure from Temperature-Pressure Relation Chart. The temperature difference between the suction pressure temperature relation and the correct temperature should not be less than 8 degrees nor more than 15 degrees super heat.

TEMPERATURE AND PRESSURE RELATION CHART FOR (REFRIGERANT 12)

Temp F.	Press. of Refrig.	Temp F.	Press. of Refrig.	Temp F.	Press. of Refrig.	Temp F.	Press. of Refrig.
0	9.1	43	39.7	76	78.3	109	135.1
2	10.1	44	40.7	77	79.2	110	136.0
4	11.2	45	41.7	78	81.1	111	138.0
6	12.3	46	42.6	79	82.5	112	140.1
8	13.4	47	43.6	80	84.0	113	142.1
10	14.6	48	44.6	81	85.5	114	144.2
12	15.8	49	45.6	82	87.0	115	146.3
14	17.1	50	46.6	83	88.5	116	148.4
16	18.3	51	47.8	84	90.1	117	151.2
18	19.7	52	48.7	85	91.7	118	152.7
20	21.0	53	49.8	86	93.2	119	154.9
21	21.7	54	50.9	87	94.8	120	157.1
22	22.4	55	52.0	88	96.4	121	159.3
23	23.1	56	53.1	89	98.0	122	161.5
24	23.8	57	55.4	90	99.6	123	163.8
25	24.6	58	56.6	91	101.3	124	166.1
26	25.3	59	57.1	92	103.0	125	168.4
27	26.1	60	57.7	93	104.6	126	170.7
28	26.8	61	58.9	94	106.3	127	173.1
29	27.6	62	60.0	95	108.1	128	175.4
30	28.4	63	61.3	96	109.8	129	177.8
31	29.2	64	62.5	97	111.5	130	182.2
32	30.0	65	63.7	98	113.3	131	182.6
33	30.9	66	64.9	99	115.1	132	185.1
34	31.7	67	66.2	100	116.9	133	187.6
35	32.5	68	67.5	101	118.8	134	190.1
36	33.4	69	68.8	102	120.6	135	192.6
37	34.3	70	70.1	103	122.4	136	195.2
38	35.1	71	71.4	104	124.3	137	197.8
39	36.0	72	72.8	105	126.2	138	200.0
40	36.9	73	74.2	106	128.1	139	209.2
41	37.9	74	75.5	107	130.0	140	205.5
42	38.8	75	76.9	108	132.1		

13. TESTING ELECTRICAL SWITCHES AND CONTROL CIRCUITS

Using test light, Tool C-744, attach one end of lead to solenoid valve terminal, and the other to ground. Start engine and adjust engine speed to 1200 r.p.m.

Turn toggle switch to "Cool" position. Move air conditioning control lever to "Off" position. With lever located in this position test lamp should light (recirculation door open, fresh air door closed). With control lever to "Cold", position test lamp should light (recirculation door open, fresh air door closed).

With control lever to "Warmer" position, test lamp should not light (recirculation door closed, fresh air door open). Turn toggle switch to "Heat" position and move control lever to "Off" position (test lamp should light)—recirculation door open, fresh air door closed.

Move control lever to "Cold" position (test lamp should not be out)—recirculation door closed, fresh air door open. Move control lever to "Warmer" position (test lamp should be out)—recirculation door closed, fresh air door open. Move control lever back to "Off."

Re-locate test light, attaching one lead to water valve element circuit and the other lead to ground. With toggle switch in "Cold" position and control lever in "Off" position (test lamp should be off).

Move control lever to "Cold" position (test lamp lights dimly). Move control lever to "Warmer" position (test lamp should increase from dim to bright as resistance is decreased in rheostat.

Feel the water valve element. Valve element should go from warm to hot as control lever is moved to the "Warmer" position. Check the three blower motor connections for being tight in connector.

14. PRECAUTIONS TO OBSERVE IN HANDLING TUBING

CLEANLINESS DURING INSTALLATION

A piece of tubing that has been cut, flared and prepared for installation should be clean and dry.

CUTTING AND FLARING

Use Tool C-3478 to cut, eliminate burrs, and ream tubing. The tube should be double-flared with tool. Always inspect flared joint before installation to determine if there are any cracks or blemishes on flare that would cause a possible leak. Copper washers must be used where joint is steel-to-steel, or steel-to-brass. Copper tubing to steel or brass requires no washer. Use refrigerant oil on flared surface connections when installing or repairing leaky tube connections to improve sealing and reduce torque required. Never use any sort of sealing compound between tube flare and male surface. Copper tubing must be attached to car structure.

BRAZING THE JOINTS

Discharge system before using a torch to braze leaking joints. Avoid excessive heat when using an acetylene flame to solder or braze a joint. The usual precautions should be followed before repairing a sweat-type joint, such as cleaning thoroughly, applying sufficient flux, heating to temperature that will cause silver solder to flow freely, and testing joint after making repairs.

The following component parts of compressor are available only for service; compressor unit valve plate assemblies, suction service valve, discharge service valve, cylinder head, gaskets, shaft seal and support brackets. The compressor refrigerant oil may be replaced or corrected to proper level. Any damage to pistons, cylinders, crankshaft or connecting rods, requires replacement of complete compressor assembly.

15. MEASURING COMPRESSOR OIL LEVEL

If the oil level is checked immediately after a long fast trip, the oil level will be lower than normal. Place the air condition operating lever on "Cold", blower "High", toggle switch "Cool", car windows open. Start engine and operate at 1200 r.p.m. for about 10 to 15 minutes to return excessive oil in system to compressor crankcase.

Stop engine and remove protective caps from discharge and suction service valves. Close both valves by turning valve stems clockwise with Tool C-3361A until valves are seated firmly. The engine should never be started with the discharge or suction service valve closed.

Clean area around the compressor filler plug and discharge service valve port cap with solvent and blow dry with compressed air.

Carefully loosen the flare cap fitting of the discharge service valve one-quarter of a turn and gradually release or purge the gas pressure from the compressor. When the pressure in the compressor is completely purged, loosen (do not remove) the oil filler plug on the side of the compressor just enough to allow the gas pressure (if any) in the crankcase to escape.

When the pressure has been released, remove filler plug and use a clean dry plunger type dipstick (⅛ inch round or similar rod) to measure the oil level. The correct oil level is from 2" to 2½". If necessary, add MOPAR Air Conditioning compressor oil (300 Saybolt at 100 degrees F.), as required, or siphon off excess oil, if necessary.

NOTE

On early 1957 production a tecumseh compressor was used and the oil level should be ¾" to 1".

After oil level has been checked and corrected, replace the filler oil plug. To purge air out of the compressor cylinder and crankcase, make sure cap on the discharge valve service port is loosened approximately one-half turn.

Using tool C-3361A, slightly open the suction service valve stem counter clockwise. Let the gas drift slowly through the compressor for about 10 seconds. Tighten cap on the discharge service port. Back-seat both discharge and suction service valves by turning the valve stems counter clockwise. Replace protective caps on the discharge and suction service valves and tighten securely.

16. REMOVAL AND INSTALLATION OF AIR CONDITIONING UNIT

REMOVAL

Should it become necessary to remove the air conditioning unit for servicing, proceed as follows: Drain anti-freeze from radiator. Remove air cleaner. Remove ignition distributor cap and base assembly.

Disconnect upper and lower hot water heater hose from evaporator cover outlet. Disconnect blower motor wires. Remove blower to dash attaching screws, then remove blower and assembly.

Remove evaporator drain connector and hose. Remove air conditioner evaporator cover to dash attaching bolts, and remove cover assembly. Remove Thermal switch leads. Discharge air conditioning system, as outlined. Disconnect suction and liquid line and seal fittings.

Remove the remaining evaporator housing flange to dash screws and remove evaporator by depressing fresh air door with screwdriver as evaporator is rolled out of dash pocket. Whenever the air conditioning unit is removed from car, cooling coil fins should be cleaned and the water outlet drains should be checked for being open before reinstalling.

INSTALLATION

Evacuate, sweep and charge the system as outlined. Check system for leaks. Install blower. Install heater hoses and check fan belt for proper tension and make certain radiator contains sufficient coolant.

17. REMOVAL OF HEATER CORE (WITH EVAPORATOR HOUSING REMOVED)

Remove heater core to evaporator housing attaching screws. Carefully slide core assembly to left and remove core.

18. RECEIVER STRAINER-DRIER

Where the receiver strainer-drier unit is found to be clogged when tested, or where metal particles are found in this system, it is necessary to replace the receiver strainer-drier assembly.

> **CAUTION**
>
> ***Protect eyes with goggles or glasses when disconnecting receiver flare connections to prevent any drops of liquid refrigerant from dropping into the eyes when connections are broken.***

REMOVAL

Discharge system, raise car on hoist. Disconnect flared connections at both ends of receiver. Remove attaching bolt nuts and remove receiver.

INSTALLATION

Position receiver in place, install bolts and nuts and tighten securely. Remove caps and connect flared connector nuts and tighten securely. Charge system with partial charge and test for leaks. Correct any leaks and evacuate system. Then, charge with 2¾ pounds of "Refrigerant 12."

19. REPLACEMENT OF RECEIVER STRAINER-DRIER FUSIBLE PLUG (WITHOUT REMOVAL FROM CAR)

Replacement of damaged fusible plug can be made without removal of unit from bracket assembly. Discharge the system and remove the fusible plug. Apply refrigerant oil to threads of new plug, and install plug in receiver. Tighten to 20 foot-pounds torque. Never replace a damaged fusible plug with a pipe plug.

Evacuate system then charge system with 2¾ pounds of refrigerant.

20. REMOVAL OF EXPANSION VALVE

REMOVAL

Disconnect the ⅜ inch and ½ inch line flare fittings. Use two flare wrenches to loosen or tighten fittings. Remove the valve control bulb. Cap or plug open lines to prevent moisture from entering system.

INSTALLATION

Reinstall expansion valve, control bulb, and equalizer lines in the reverse order of removal. Tighten all connections securely, and sweep and charge system.

21. TESTING EXPANSION VALVE

EQUIPMENT REQUIRED

1. Source of dry air 90 to 250 psi.
2. Moisture detecting eye with drier cartridge (save white plastic cap).
3. Air Conditioning gauge set manifold.
4. Transmission throttle pressure gauge.
5. Compressor capacity test cap with .020 inch bleed hole.
6. Container with ice and water to hold temperature at 32 degrees F. ¼ inch copper tubing and fittings.

TEST PROCEDURE

Direct source of dry air, 90 to 250 psi. through moisture detecting eye with drier cartridge attached to insure against any moist vapors or particles of dirt entering the valve, see Figure 17.

With the left hand shut-off valve on gauge set manifold closed and the right valve open, the right hand gauge will indicate the pressure of the air supplied. Slowly open the left shut-off valve (counter clockwise) until the left gauge indicates 70 psi.

Immerse the expansion valve sensing bulb into the water and ice bath (32 degrees F.). With the expansion valve inlet pressure gauge (left hand gauge) reading 70 psi., the sensing bulb completely submerged in the

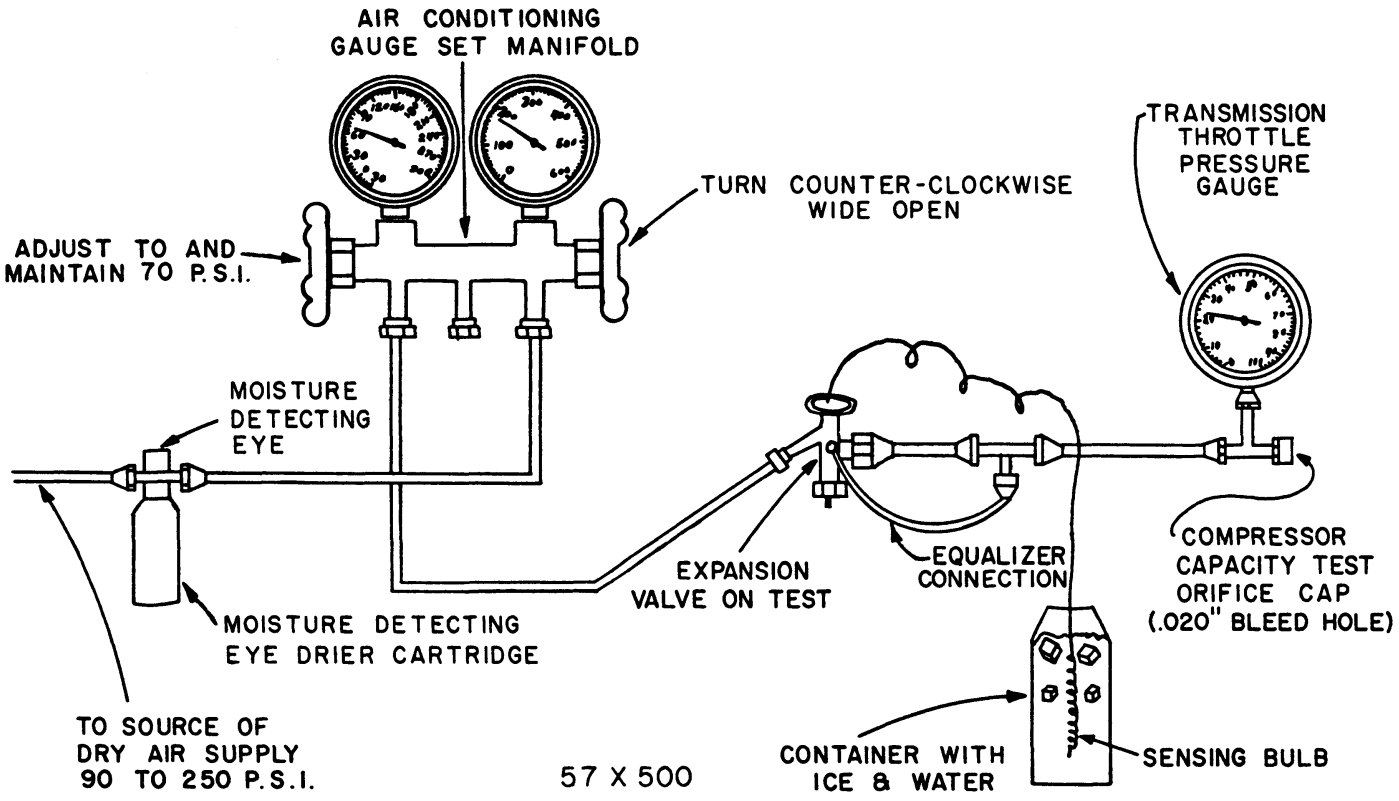


Figure 17—Testing Expansion Valve (Unit Removed from Car)

32 degree F. water bath, and the compressor test cap bleeding off pressure, the outlet pressure gauge should read between 23 and 26 psi.

Remove sensing bulb from water bath and warm bulb in hand. With expansion valve inlet pressure still reading 70 psi. (adjust if necessary), the outlet pressure should rise to a pressure of not less than 53 psi.

If the expansion valve sucessfully passes these tests, it may be considered to have proper super-heat setting, a proper pressure limit valve, the rated capacity and that it has not lost its thermal charge. The valve should, therefore, give satisfactory performance. If the expansion valve fails to pass the test procedure, it should be replaced.

NOTE

Be sure the expansion valve thermal bulb is tight in wells, otherwise, the expansion valve will open and a flooding condition will result.

22. REMOVAL AND INSTALLATION OF COMPRESSOR

Discharge the system and remove the suction and discharge line.

CAUTION

Plug or cap all lines as soon as they are disconnected to keep moisture out of the system.

Disconnect magnetic clutch to control unit wire. Remove compressor pulley belts. Remove compressor to bracket attaching bolts and remove compressor.

NOTE

When replacing the compressor, it is imperative that the oil in the compressor be checked to the proper level. For measuring procedures, see page 464.

Replace compressor in the reverse order of removal and adjust fan belt.

23. REMOVING COMPRESSOR CYLINDER HEAD

With gauge set installed rotate discharge and suction service valve stems clockwise until both valves are fully front-seated. Slowly open the discharge gauge

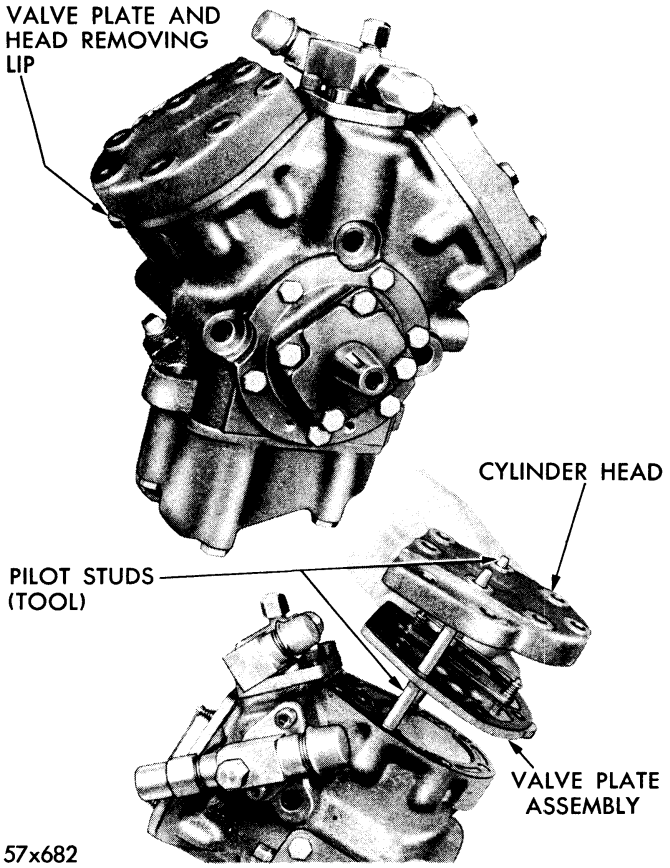


Figure 18—Removing Compressor Head

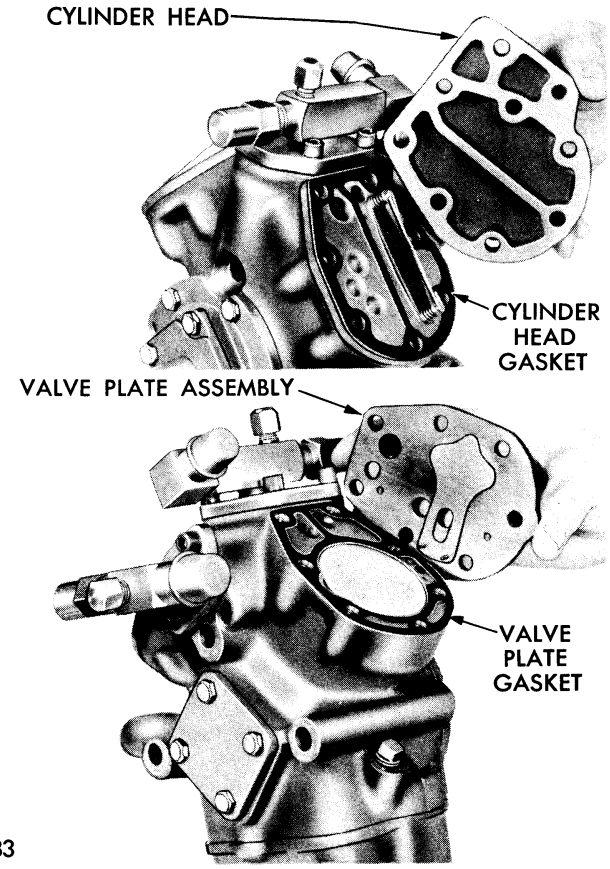


Figure 19—Replacing Head Gasket

hand valve slightly to relieve compressor pressure through the center outlet hose and into an exhaust suction system. When pressure drops to zero on discharge gauge, open suction pressure gauge hand valve.

Remove compressor cylinder head bolts and tap the head off with a brass drift or plastic hammer.

NOTE

Use tab (Figure 18) located at side of cylinder head to tap off head.

If when lifting the cylinder head the valve plate does not separate from head, separate head from plate by using a brass drift to tap against head and plate.

CAUTION

To avoid damaging the finished surfaces, do not tap the plate near the edge of plate or head.

After removal of head, plate, and gaskets, examine valves; if valves are broken and damage extends to cylinder bores, replace compressor. If compressor is not damaged, clean the surfaces of cylinder block, valve plate and head thoroughly. Use care to remove all shreds of old gasket from plate, block and head surfaces, clean attaching stud holes in block. Dip new gaskets in clean refrigerant oil. Handle new gaskets carefully.

NOTE

Both head and valve plate gasket can only be assembled in one position. See Figure 19 for method of correct assembly.

Install cylinder head gasket, valve plate and valve plate gasket and cylinder head. Place assembly on cylinder block and align the assembly to cylinder. Install attaching bolts, tighten each bolt alternately and evenly to 26 foot-pounds torque.

Purge air from compressor by opening the suction service valve (counter clockwise) slowly and loosening the discharge service port cap for a few turns for about 10 seconds. This will allow the gas to drift through the compressor and bleed air from the system. Rotate both discharge and suction service valves (counter clockwise) until they are fully back-seated. Start engine and

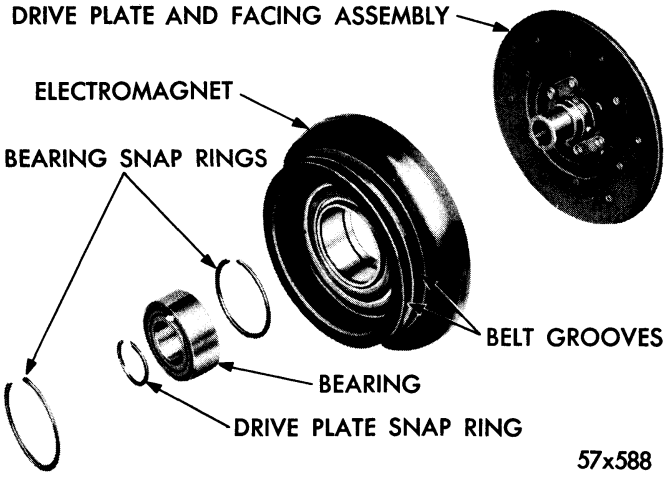


Figure 20—Magnetic Clutch (Disassembled View)

locate control lever on "Cold". Operate engine for five minutes, stop engine, and test for leaks. If there are no leaks and the system is operating satisfactorily, remove gauge set and replace valve caps.

24. SERVICING THE MAGNETIC CLUTCH

Servicing the magnetic clutch assembly is limited to the drive plate, pulley and electromagnet assembly, snap rings, bearing and brush holder assembly.

CAUTION

Do not attempt to remove the electro-magnet coil from the pulley assembly. The coil is held in place by a special adhesive material. Once this bond is broken the coil cannot be re-attached.

TESTING ELECTRO-MAGNET CURRENT DRAW

To test the coil for a short or open circuit, connect an ammeter (0-10 Ampere Scale) in series with a fully charged 12-volt battery and the insulated brush lead. The current draw at 12 volts should be 1.5 to 2 amperes.

REMOVING CLUTCH ASSEMBLY FROM COMPRESSOR

Loosen and remove the belts. Remove the upper right shroud section. Remove special locking bolt and washer from compressor crankshaft at front center of clutch. Do not damage brushes when removing or installing clutch.

While supporting clutch assembly with one hand remove the pulley with 5/8 inch cap screw, screwed into end of clutch shaft.

REMOVING AND INSTALLING DRIVE PLATE

Remove drive plate retaining snap ring hub, see Figure 20, with Tool C-3301. Place suitable sleeve against hub and remove drive plate by tapping against sleeve with a soft hammer.

Inspect springs for loss of tension and (or) cracks, and inspect liner on face of plate. Replace drive plate if liner is worn, springs are weak or broken, or if drive plate is warped. (A sintered iron liner impregnated with fibrous material is bonded to the drive plate).

Start drive plate hub squarely into inner bearing race. Place a brass drift against the drive plate inner hub and tap plate hub into bearing by tapping on brass drift with a hammer while supporting the inside race. Install snap ring on drive plate hub. Use a long feeler that will reach into gap at hub and measure air gap between drive plate and electro-magnet. Air gap should measure .025 to .035 inch. Adjust air gap by turning the three screws on the front face of the drive plate. Adjust all three screws to obtain an evenly spaced air gap.

REMOVING CLUTCH BEARING

Remove drive plate, remove snap ring and grease slinger (at outer race of bearing) from pulley assembly. Tap bearing from pulley assembly. Install bearing and snap ring and drive plate.

INSTALLING CLUTCH ASSEMBLY ON COMPRESSOR

Align key and keyway and push assembly over shaft and key. Install self-locking bolt and washer. Install upper right shroud section. Purge air from the compressor, back-seat both service valves, and tighten oil filler plug.

MAGNETIC CLUTCH CAPACITY TEST

Install gauge manifold to discharge service valve of compressor in order to read discharge or head pressure. Paint a wide white or yellow mark across the shoe and magnetic field of the clutch assembly. Disconnect feed wire from thermal switch to clutch and connect a jumper wire from the clutch wire directly to the battery. Start the engine and idle at 500 rpm with the air conditioning blower on "High." Place a cover over the condenser to raise compressor discharge pressure to 300 psi. Connect an ignition timing light to the ignition coil.

At 300 psi. compressor head pressure and with engine idling at 500 rpm, observe the paint marks. If there is any relative motion between the marks on the clutch shoe and magnetic field, it indicates that the clutch is slipping and should be replaced.

NOTE

Paint marks will become separated when engine is started so only check for relative motion between marks while timing light is in use.

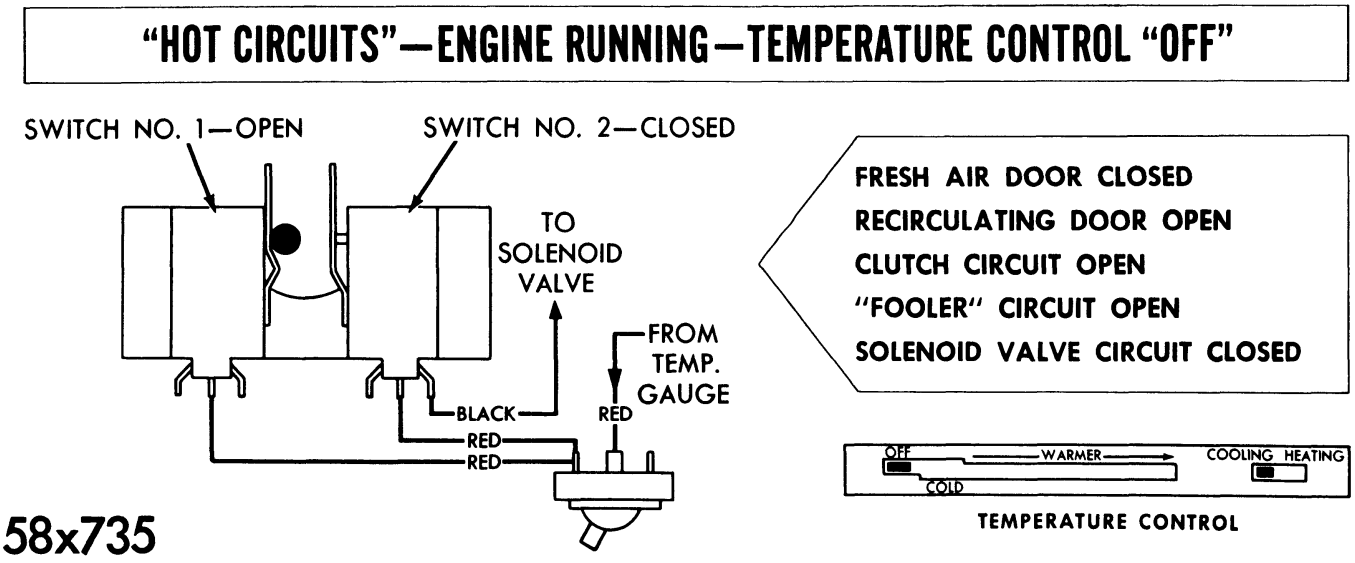


Figure 21—Checking Fresh Air Door Circuit

25. TEST PROCEDURE

The following test procedures is an overall operation and performance test of the Air Conditioning, Heating and Cooling System. The test brings into operation all the mechanical, electrical and chemical components involved in the system and should be performed in the following sequence:

Install gauge manifold set. When gauge set is installed, suction and discharge service valves opened two turns, and no pressure is indicated on gauges, the system is empty and has a leak. Evacuate, charge with sweep test charge, located and correct leak. Evacuate and charge with 2¾ pounds refrigerant 12.

Set temperature control lever to "Off" position and selector switch to "Cooling" position. The temperature control lever is a multiple function lever. Any malfunction will be evident in later test.

Start engine, adjust to 1200 rpm. Check clutch (should be de-energized). If clutch is energized and solenoid valve circuit is open (see wiring diagram), black wire on switch No. 2 and white wire on switch No. 1 are reverse connected at control switch connections.

Check fresh air door. It should be closed and the recirculation door open, see Figure 21. If clutch is energized and solenoid valve circuit is open (see wiring diagram, Figure 9), black wire on switch No. 2 and white wire on switch No. 1 are reverse connected at control switch connections.

Check circuit to solenoid valve with test light. Check water valve fooler circuit with test light, see Figure 22. Circuit should be open. Attach test light across the "Fooler" element circuit. Circuit should be open and light out. Check fooler element ground connection.

CAUTION

Do not allow solenoid valve hot wire to ground, even momentarily will cause a burn out of No. 2 micro-switch if circuit is energized. Check hydraulic circuit for proper connections at solenoid valve. Check power piston and linkage.

CAUTION

Do not allow fooler element hot wire to ground, even momentarily will cause a burn out of No. 1 micro-switch if circuit is energized.

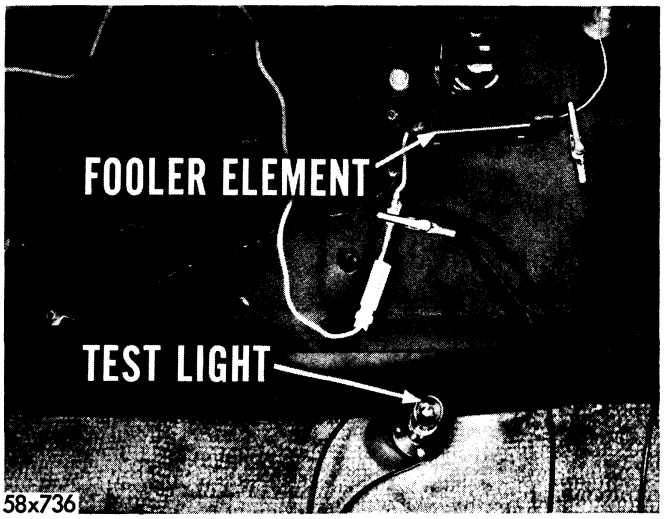


Figure 22—Checking Water Valve Fooler Element Circuit

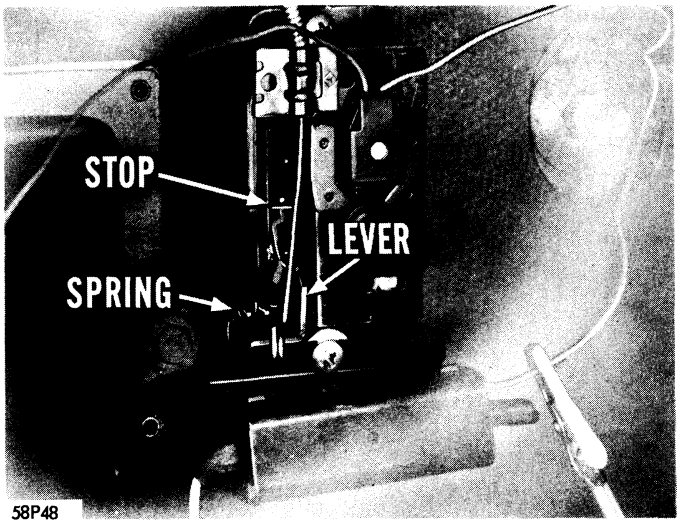


Figure 23—Checking Water Valve Lever

Check water valve lever, see Figure 23. It should be in the "Closed" position, to direct the air up and toward the rear of the car. Check boden cable clip holding cable housing at water valve. Valve lever should be against its stop towards the spring, spring loose. Valve body should remain cold with no water flowing through. Check flow of water through water valve by momentarily disconnecting heater outlet hose at upper left side of heater-evaporator housing.

CAUTION

Remove the radiator cap to relieve pressure before removing heater hose.

Open instrument panel outlet grille doors to full open position, to direct the air up and toward the rear of the car.

Adjust the defroster control to direct all of the air up through the outlet grilles. Check boden cable clips (both ends) holding cable housing.

Operate the blower for the three speeds: "High," "Medium" and "Low." *Leave on "High" position.* Check circuit with test light if proper operation is not present, (see wiring diagram).

Move the temperature control lever to the "Cold" position. Check clutch. It should be energized. Check clutch circuit at clutch with the test light.

CAUTION

Do not allow clutch hot wire to ground, even momentarily will cause a burn out of No. 1 micro-switch if circuit is energized.

Check clutch circuit at clutch (white wire) connector, see Figure 24. If hot, open circuit in thermal switch circuit as indicated. If cold, reach No. 1 micro-switch by hand (switch nearest "Off" position). With the control lever in the "Cold" position, move with fingers, the micro-switch actuating bar toward switch and release several times. A clicking sound should be heard as switch opens and closes contacts. If no clicking should take place, it indicates switch is burned out and must be replaced. If clicking sound takes place, trace circuit through selector switch to the opening in the wiring circuit.

Check fresh air door. It should be closed and the recirculating door open. Check circuit to solenoid valve with test light.

CAUTION

Do not allow solenoid valve hot wire to ground, even momentarily will cause a burn out of No. 2 micro-switch, if circuit is energized.

Check hydraulic circuit for proper connections at solenoid valve. Check piston and linkage.

Check water valve fooler circuit. It should be energized but test light will be dim. If test light remains out, trace open circuit back to rheostat connections on control. Check ground connection (see wiring diagram).

Check water valve lever. It should still be in the closed position and no water flowing through the valve. Check boden cable clip holding cable housing at water valve. Valve lever should be against its stop towards the spring, spring loose.

Valve body should remain cold with no water flowing through. Check flow of water through water valve by monentarily disconnecting heater outlet hose at upper left side of heater-evaporator housing.

Move the temperature control lever about ⅜ of an inch to the right, see Figure 25, of the "Cold" position—just enough to actuate the No. 2 micro-switch, but not enough to move water valve lever.

Check fresh air door. It should be open and recirculation door closed. If recirculation door does not go completely closed, adjust bellcrank to door linkage.

Check water valve lever. It should still be in the closed position, cold and no water flowing through the valve. Check boden cable clip holding cable housing at water valve. Valve lever should be against its stop towards the spring, spring loose.

Valve body should remain cold with no water flowing through. Check flow of water through water valve by momentarily disconnecting heater outlet hose at upper left side of heater-evaporator housing.

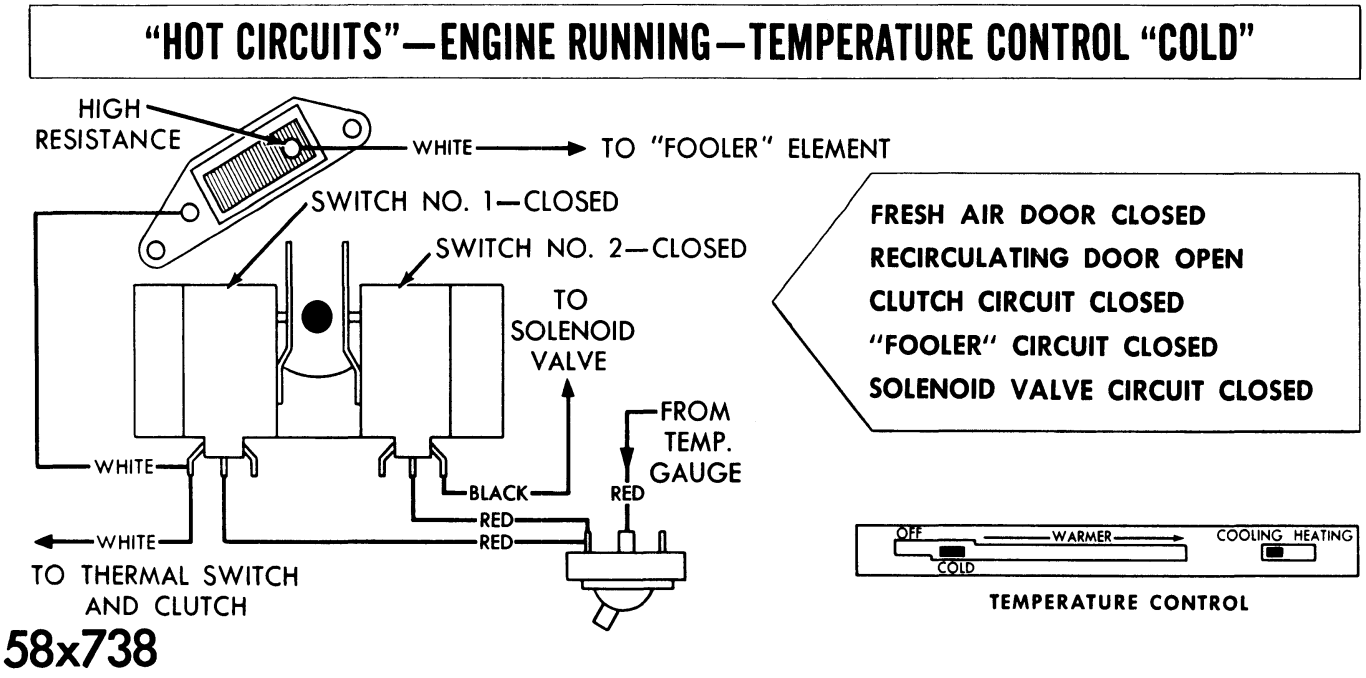


Figure 24—Checking Clutch Circuit

CAUTION

Remove the radiator cap to relieve pressure before removing heater hose.

Check water valve fooler circuit. It should be energized but test light will be dim. If light remains out, trace open circuit back to rheostat connections on control. Check ground connection (see wiring diagram).

Check clutch. It should be energized. Check clutch circuit at clutch with test light.

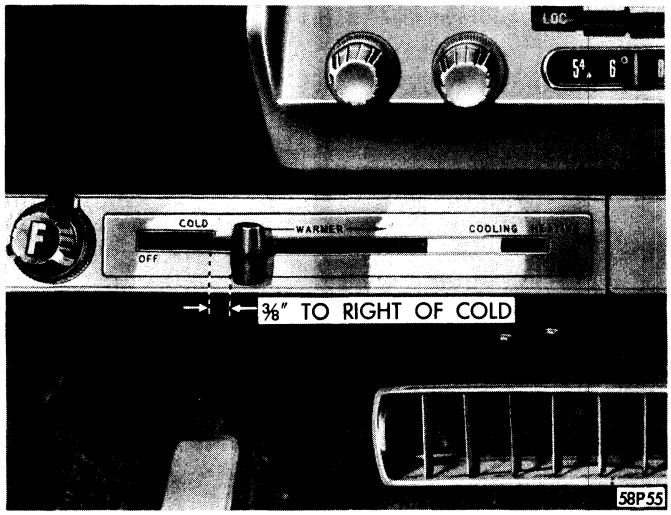


Figure 25—Checking Temperature Control Lever

CAUTION

Do not allow clutch hot wire to ground, even momentarily will cause a burn out of No. 1 micro-switch if circuit is energized.

Check clutch at clutch (white wire) connection. If hot, open circuit in thermal switch circuit as indicated. If cold, reach No. 1 micro-switch by hand (switch nearest "Off" position). With the control lever in the "Cold" position, move with fingers, the micro-switch actuating bar towards switch and release several times. A clicking sound should be heard as switch opens and closes contact. If no clicking sound takes place, it indicates switch is burned out and must be replaced. If clicking sound takes place, trace circuit through selector switch to the opening in the wiring circuit.

Check refrigerant sight glass. It should be clear, solid and free of gas bubbles after the clutch has been engaged for about five minutes. Add enough refrigerant 12 to completely clear sight glass. Check for leaks after this test is completed and correct.

Recheck engine rpm and adjust to 1200 rpm, if necessary, to assure engine is off the fast idle cam.

Arrange gauge set manifold hoses and tachometer wires to the front of the grille so that gauge set and tachometer may be read with the hood closed but not locked. This will allow the under hood temperatures to build up and assure normal operating conditions.

Close hood to prevent the hot air from the engine compartment entering the cowl vent opening. These temperatures are far in excess (160—170) of normal ambient temperatures.

26. THERMAL SWITCH OPERATION TEST

Move temperature control lever to "Cold" position. The fresh air door should close and recirculation door should open. Turn blower switch to "Low" position; car windows and doors closed. Recheck the outlet air flow to assure blower is on low position.

Observe suction gauge pressure. As evaporator temperature lowers, suction pressure will gradually lower and fluctuate down to between 20 to 10 psi. The thermal switch contacts should be open and de-energize the clutch. When this happens, there will be a slight increase in the engine speed which can be noted by the ear or observed on the tachometer. Also, when the clutch de-energizes, there will be a sharp steady rise in the suction pressure.

Allow the system to continue to operate. The evaporator will warm up thereby closing the thermal switch contacts, which in turn, will re-energize the clutch—and again, when this happens, there will be a slight decrease in engine speed which can be noted by the ear or observed on the tachometer. Also the suction pressure will again start fluctuating to a lower pressure and the cycle will be repeated.

Should the suction pressure fluctuate down below 10 psi. and then release clutch, it is indicated the thermal switch sensing tube is not making a good contact with evaporator fin and coils. Should suction pressure fluctuate down and on into a vacuum without releasing the clutch, it indicates; The thermal switch wires are shorted together. There is moisture in the system. The thermal switch is defective. Check system for moisture. Perform the Overall Performance Test, before making thermal switch wiring or switch corrections.

27. OVERALL PERFORMANCE TEST

Move control lever about 3/8 of an inch to the right of the "Cold" position just enough to close No. 2 microswitch but not enough to move the water valve control lever. Turn blower switch to "High" position.

Check water valve control lever to be sure it is still in the "Off" position and the valve is cold. Check boden cable clip holding cable housing at water valve. Valve lever should still be against its stop towards the spring, spring loose.

Valve body should remain cold with no water flowing through. Check flow of water through the water valve by momentarily disconnecting heater outlet hose at upper left side of heater-evaporator housing.

CAUTION

Remove the radiator cap to relieve pressure before removing heater hose.

Check water valve fooler circuit. It should be energized but test light will still be dim. If light remains out, trace open circuit back to rheostat connections on control. Check ground connection (see wiring diagram).

Check recirculating door to be sure it is closed and fresh air door is open. If recirculation door does not go completely closed, adjust bellcrank to door linkage.

All doors and windows must be closed to assimilate the operation of the air conditioning system with 100% fresh air, while being driven at 25 miles per hour.

Place one thermometer on the cowl vent opening near the center. Do not allow the lower end (bulb end) of the thermometer to rest on the metal grille. Place a small piece of wood, such as a pencil, under the body of the thermometer to hold the bulb end suspended in the air stream into the cowl vent. Place a second thermometer in the right hand discharge outlet grille in such a position that thermometer reading can be observed from outside the car. In order to eliminate fictitious reading, make sure the bulb end of the thermometer does not touch the metal grille of the inlet.

Operate air conditioning system until an equilibrium condition on the gauges and thermostats has been established. One of the most important factors in making the overall performance test is that the engine must be operated at 1200 rpm. with hood down for a sufficient time to build up to operating temperatures and allow all operating temperatures for a time period.

Read discharge pressure on gauge set. This test should be performed with the discharge pressure of from 190 to 210 psi. Take the necessary steps to bring the discharge pressure within these limits. *To increase the pressure,* restrict the air flow across the condenser by blocking the air flow with cardboard, paper, etc.

190 to 210 pressure are for test purposes only. These pressures change according to ambient temperatures and efficiency of the entire system. If the 190—210 pressures cannot be obtained, refer to Pressure Chart for necessary corrections.

Read the ambient wet bulb temperature. A wet bulb temperature reading can be produced by taking a dry bulb thermometer; wrap six layers of gauze bandage or clean, soft cotton cloth to the thermometer with a piece of string. Attach an 18" to 24" length of twine to the upper end of the thermometer. Dip the wrapped end of the thermometer into ambient temperature water, soaking the wrapping. Using the 18" to 24" of twine, swing the thermometer in a circle for several minutes until the thermometer reaches its lowest reading with

	DRY BULB INLET AIR	WET BULB INLET AIR																																					
		52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
	70	40	40	41	41	41	41	42	43	44	45	46	47	48	49	50	51	52	53	X																				
	71	41	41	41	41	41	41	42	43	44	45	46	47	48	49	50	51	52	53	54	X																			
A	72	41	41	41	41	41	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	X																		
M	73	41	41	41	41	41	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	55	X																	
B	74	41	41	42	42	42	42	42	43	44	45	46	47	48	49	50	51	52	53	54	55	55	56	X																
I	75	41	42	42	42	42	42	42	43	44	45	46	47	48	49	50	51	52	53	54	55	55	56	57	X															
E	76	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	55	56	57	58	X														
N	77	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	55	56	57	58	59	X													
T	78	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	X												
	79	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	X											
I	80	42	42	42	42	42	42	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	X										
N	81	43	43	43	43	43	43	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	X									
L	82	43	43	43	43	43	43	43	44	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	X								
E	83	43	43	43	44	44	44	44	45	45	45	46	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	X							
T	84	44	44	44	44	44	44	44	45	46	46	47	47	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	X						
	85	44	45	45	45	45	45	45	46	46	46	47	48	48	49	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	67	X					
A	86	45	45	45	45	45	45	46	46	47	47	48	48	49	50	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	67	68	X				
I	87	45	46	46	46	46	46	46	47	47	47	48	48	49	50	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	67	68	69	X			
R	88	46	47	47	47	47	47	47	47	48	48	49	49	49	50	50	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	67	68	69	71	X		
	89	46	47	47	47	47	47	47	48	48	48	49	49	49	50	51	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	66	68	69	70	71	72	X	
D	90	X	47	47	47	48	48	48	49	49	49	50	50	50	50	51	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	65	67	68	69	70	71	72	73	X
R	91		X	47	47	48	48	48	49	49	49	50	50	50	50	51	51	52	53	54	55	56	56	57	58	59	60	61	62	63	64	66	67	68	69	70	71	72	73	74
Y	92		X	47	48	48	48	49	49	49	50	50	50	50	51	52	52	52	53	54	55	56	56	57	58	59	60	61	62	63	65	66	67	68	69	70	71	72	73	74
	93		X	47	48	49	49	49	50	50	50	50	50	51	51	52	52	52	53	54	55	56	56	57	58	59	60	61	62	64	65	66	67	68	69	70	71	72	73	74
B	94			X	49	49	49	49	50	50	50	50	51	51	51	52	52	53	53	54	55	56	56	57	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
U	95			X	49	49	49	49	50	50	50	51	51	51	52	52	53	53	53	54	55	56	56	57	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
L	96				X	49	50	51	51	51	51	51	52	52	52	53	53	54	54	55	56	56	56	57	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
B	97				X	49	50	51	51	52	52	52	52	52	52	53	53	54	54	55	56	56	56	57	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
	98					X	51	52	52	52	52	52	52	52	53	53	54	54	54	55	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
T	99					X	51	52	52	53	53	53	53	53	53	54	54	54	54	55	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
E	100						X	53	53	53	54	54	54	54	54	54	54	54	55	55	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
M	101						X	53	53	53	54	54	54	54	54	54	54	54	55	55	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
P	102							X	53	54	54	54	54	54	54	55	55	55	55	56	56	56	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
E	103							X	54	54	54	54	54	55	55	55	55	55	56	56	56	57	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
R	104							X	54	54	55	55	55	55	55	55	56	56	56	56	57	57	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
A	105								X	55	55	55	55	55	55	56	56	56	56	57	57	57	57	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
T	106								X	55	55	55	55	56	56	56	56	56	57	57	57	57	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
U	107								X	55	56	56	56	56	56	56	56	57	57	57	57	57	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
R	108									X	56	56	56	56	56	56	57	57	57	57	57	58	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
E	109									X	56	56	56	56	56	56	57	57	57	57	58	58	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74
	110										X	56	56	56	56	56	57	57	57	58	58	58	58	58	58	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74

EXAMPLE: AMBIENT WET BULB TEMPERATURE = 62°F
AMBIENT DRY BULB TEMPERATURE = 80°F
MAXIMUM DISCHARGE AIR TEMPERATURE = 46°F

the wrapping still wet. It may be necessary to wet and swing the thermometer the second or third time to assure its reading reaching its lowest point. With the wrapping still wet, observe and note this reading.

Observe and note the cowl vent inlet air temperature. Observe and note the instrument panel outlet grille discharge air temperature.

From the performance temperature chart, determine the maximum allowable discharge air temperature for the prevailing wet and dry bulb temperatures. If the car's discharge air temperature is at or below the temperature given on the chart, the cooling system may be deemed to be delivering its rated cooling capacity.

If the discharge air temperature is above the maximum allowable on the chart, a heat penetration into the cooling system through air leaks and/or insulation is indicated.

Move the control lever to the right to about the midway point. Check the water valve fooler circuit. It should be energized and the test light will become brighter. Check the water valve control lever. It should have increased still higher. Move the control lever to the "Off" position. Check the recirculation door. It should be open and fresh air door should be closed. If recirculation door remains closed, attach the yellow wire to the selector switch, (see wiring diagram).

28. CHECKING EVAPORATOR HOUSING FOR AIR LEAK

Remove the blower housing and pour approximately ½ pint of water into the evaporator housing. From inside of car check to see if there is any water leakage.

If necessary, seal the evaporator housing (on the inside of housing) at the point of leakage. After sealing the housing recheck for leaks.

NOTE: Discharge and suction pressures will vary with the ambient temperature and the heat load applied to the evaporator. Normal suction pressure will vary between 25 and 40 psi. Normal discharge pressure at 1200 engine rpm as indicated below:

Ambient Temperature	Discharge Pressure
60° F.	100—150 psi
80° F.	140—190 psi
100° F.	190—240 psi
110° F.	230—280 psi

PRESSURE DIAGNOSIS

1. HIGH DISCHARGE PRESSURE
- *(a)* Too much refrigerant
- *(b)* Air in system
- *(c)* Dirty condenser
- *(d)* High ambient temperature

2. LOW DISCHARGE PRESSURE
- *(a)* Not enough refrigerant
- *(b)* Moisture in system (Expansion valve stuck closed)
- *(c)* Bad compressor reed valves
- *(d)* Expansion valve thermal bult lost charge
- *(e)* Too much oil

3. HIGH SUCTION PRESSURE
- *(a)* Moisture in system (Expansion valve stuck open)
- *(b)* Bad compressor read valves
- *(c)* Expansion valve equalizer tube plugged
- *(d)* Expansion valve thermal bulb loose in coil
- *(e)* Not enough oil

4. LOW SUCTION PRESSURE
- *(a)* Not enough refrigerant
- *(b)* Moisture in system (Expansion valve stuck closed)
- *(c)* Expansion valve thermal bulb lost charge
- *(d)* Restriction in liquid line
- *(e)* Too much oil

V-2 COMPRESSOR (1958)

Location	Right Cylinder
Type	2 cyl. "V" Type
Bore	2 5/16 inch
Stroke	1⅛ inch
Displacement	9.45 cubic inches
Type Valve	Reed Type
Speed (Depends on axle ratio and tire size)	Approx. 1250 r.p.m. at 25 m.p.h.
Oil Capacity (Refrigerant Oil; 300 Saybolt)	12 ounces
Clutch	Rotating Coil
Muffler	In Compressor Discharge Line

SERVICE DIAGNOSIS

No attempt should be made to use the diagnosis information as a method of trouble shooting or spot checking. When properly used (as an aid to the complete test procedure), the diagnosis will be of considerable value to the service man.

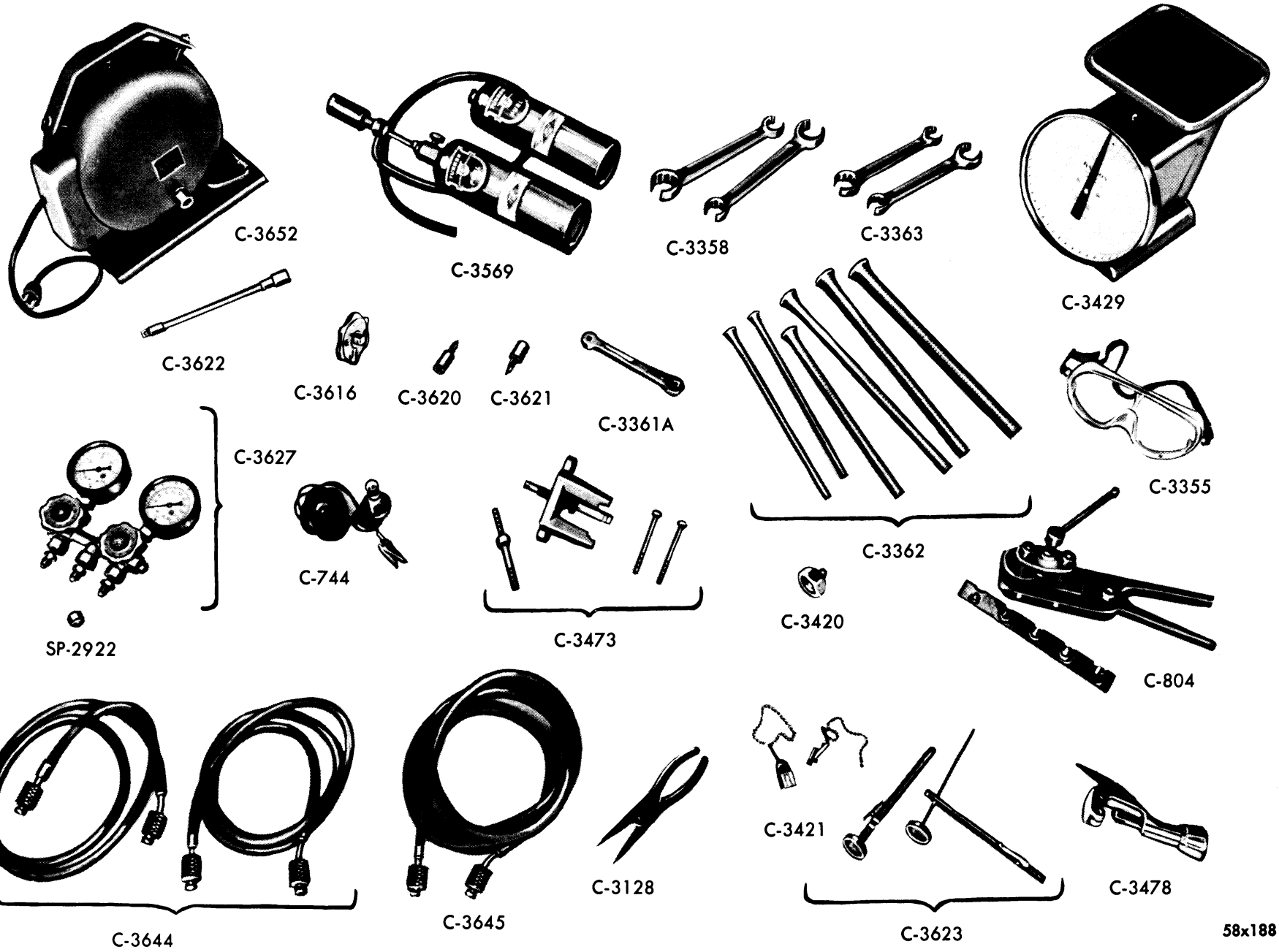
POSSIBLE CAUSES / CONDITIONS	Blower Not Operating	Blowers and Compressor Operating—No Cooling	Blowers Operating—Partial Cooling	Low Suction Pressure And Low Head Pressure	Suction Pressure O.K. And High Head Pressure	Low Suction Pressure—Head Pressure O.K.
Defective Lead Wire (Test circuit with point-to-point voltmeter test)	●					
Defect Motor	●					
Defective Switch (Test with voltmeter, or jump wire) (Check as outlined)	●					
Loose Connections (Test with voltmeter for voltage drop)	●					
Low Refrigerant		●	●	●		
Moisture in System		●	●	●		●
Restriction in Strainer-Drier		●		●		
Kinks in Line		●				
Dirty or Defective Expansion Valve		●				
Leaks in System (See Note No. 1)			●	●		
Compressor Capacity		●	●	●		
Defective Thermal Switch			●			
Condensor Lines Kinked or Obstructed			●			
Condensor Air Passages Obstructed (See Note No. 2)			●		●	
Temperature—Pressure Relation of Refrigerant (Refer to Chart, Page 463)			●			
Kinked liquid line				●		
Air in system (See Note No. 3)					●	
Restricted Receiver-Strainer						●
Super Heat						●
Too much Refrigerant (See Note No. 4)					●	

NOTE No. 1—Where a system has been found to be low on refrigerant or following repairs on the system that necessitated the opening of a connection, it is necessary to test for leaks, as outlined.

NOTE No. 2—Clean air passages, through condensor, with warm water and compressed air applied from engine side of condenser.

NOTE No. 3—Open gauge manifold discharge pressure valve slightly, and leave open for 10 seconds to purge air. Close valve, start engine, and recheck gauge pressure at 1200 r.p.m.

NOTE No. 4—Operate engine at 1200 r.p.m. with blower switch turned to "High". Discharge refrigerant slowly through gauge center fitting until bubbles appear in sight glass. Charge with refrigerant, as outlined.



Special Tools