Section XVII

CHRYSLER HEATER-AIR CONDITIONING SYSTEM

CONTENTS

DATA AND SPECIFICATIONS

COMPRESSOR

	Airtemp
Location	Right Cylinder
Type	2 cyl.
Bore	2 5/16 inch
Stroke	1 1/8 inch
Displacement	9.45 inch
Type Valve	Reed Type
Speed (Depends on axle ratio and tire size)	Approx. 1250 r.p.m. at 25 m.p.h.
Oil Capacity (MOPAR Refrigerant Oil; 300 Saybolt)	12 ounces
Clutch	Rotating Coil
Muffler	In Compressor Discharge Line

CONDENSER

Location	Front of Radiator

RECEIVER STRAINER-DRIER

Type	Cylindrical Steel Container
Location	Front of Front Radiator Yoke

REFRIGERANT

Refrigerant	Freon 12 or Genetron 12
Total Charge	3 pounds

EVAPORATOR

Location	Cowl Panel

BLOWERS

Type	Centrifugal
Location	In Heater Unit
Capacity	250 to 300 cubic feet of air per minute at high speed
Current Draw	Approximately 10 amps

SPECIAL TOOLS

Tool Number	Tool Name
C-3354	TESTING OUTFIT—Consisting of one manifold complete with two valves; one 30 x 300 lbs. compound gauge; and one 600 lbs. pressure gauge. (Use with C-3365 and C-3366 Test Hoses.)
C-3355	GOGGLES—Safety (Pair).
C-3356	THERMOMETER SET—Two in separate pocket cases. (Calibrated from 0° to 220° F.)
C-3444	TORCH—Leak Detector—Includes extra tank of liquid petroleum fluid.
C-3358	WRENCH—Flare Nut—Open End Box Type 7/8″ and 1 1/8″ (two per set).
C-3361	WRENCH—Ratchet Special Refrigeration Type—1/4″ sq. Drive with 3/16″ sq. and 1/2″ Hex. in Handle.
C-3372	PUMP—Refrigeration Vacuum (Pump charged with 75 Vis. Ref. Oil).
C-3128	PLIERS—Drive Pulley Seal Retainer Snap Ring.
C-3420	ADAPTOR—Freon Cylinder Valve to Test Hose.
C-3421	CLIP—Set of two—Attaching Thermometer to Tube.
C-3363	WRENCH SET—Flare Nut—Open End Box Type 3/4″ and 1″ Openings (two per set).
C-3365	HOSE—Test with End Plugs—4 Feet Long (set of two) (use with C-3354).
C-3366	HOSE—Test with End Plugs—8 Feet Long (use with C-3354).
C-3362	BENDER SET—For 1/4″, 5/16″, 3/8″, 7/16″, 1/2″ and 5/8″ Tubes.
C-804	TOOL—Tube Flaring.
C-3478	CUTTER—Tube.
C-3429	SCALE—Freon Weighing.
C-744	TEST LAMP.
C-3473	SEAT PULLER and installing tool.
SP-2922	COMPRESSOR CAPACITY TEST VENT CAP.

Section XVII
CHRYSLER HEATER-AIR CONDITIONING SYSTEM

A completely new combined Heater and Air conditioning unit (Fig. 1) has been developed for the 1957 Chrysler cars. The new unit is located in the dash area and provides temperature control for all-weather driving.

Temperature control in the 1957 Air Conditioner is secured 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 reheat added to the air as it passes through the heater core is controlled by metering hot water through the heater core. The flow of hot water is regulated by a modulating valve. A reheat type temperature control gives dehumidification even when minimum cooling is desired.

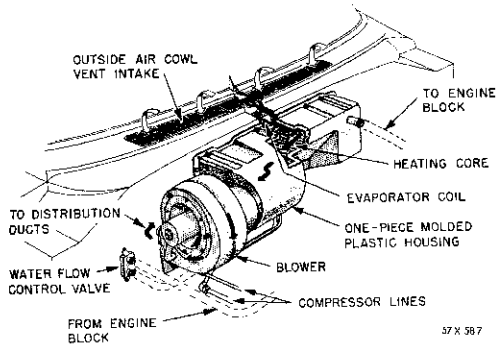


Fig. 1—Heater-Air Conditioning (Schematic Drawing Passenger Compartment Installation)

During the heating cycle, outside air is introduced into system through a permanently open vent in the top of cowl section (Fig. 2). Passing through the open fresh air door, air is drawn through both the cooling and heating coils by the Centrifugal Blower (Fig. 3). The air, heated by the heating coil, is then forced into the distribution duct for temperature distribution.

The cooling cycle is quite similar except that air may be brought from the outside or it may be recirculated through the recirculating door (Fig. 4). The controls are so arranged that the recirculation feature is only employed when maximum cooling capacity is required.

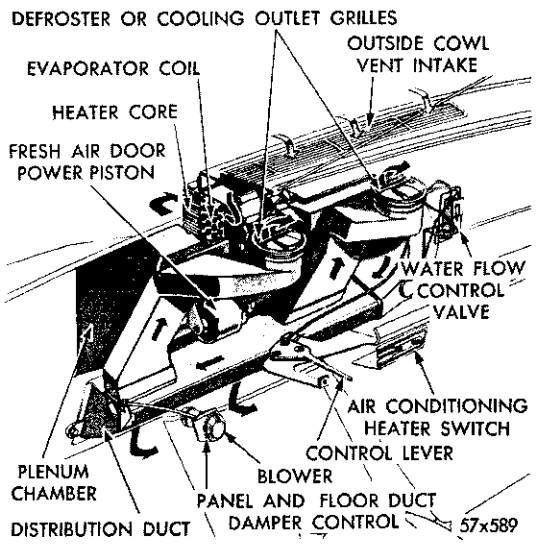


Fig. 2—Heater-Air Conditioning (Schematic Drawing Engine Compartment Installation)

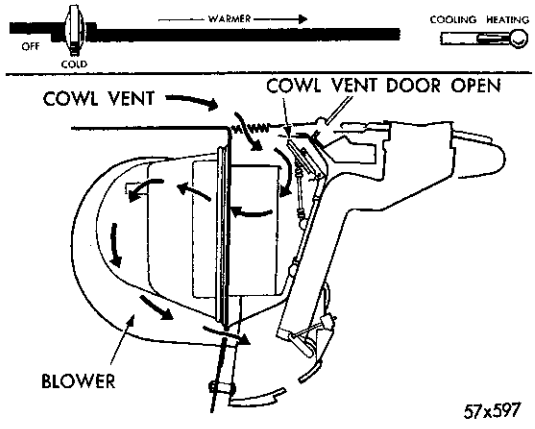


Fig. 3—Blower Motor and Vent Door (Schematic Drawing)

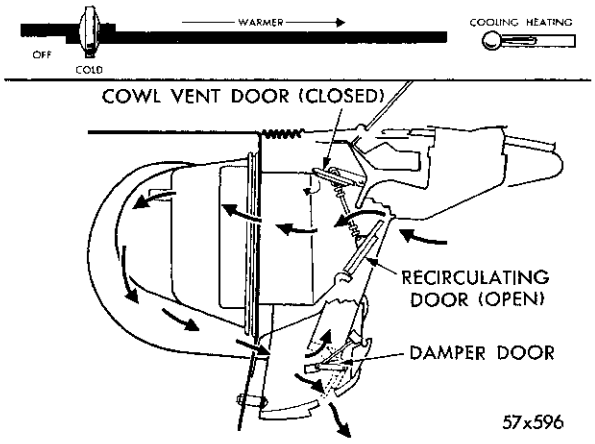


Fig. 4—Recirculating and Damper Door

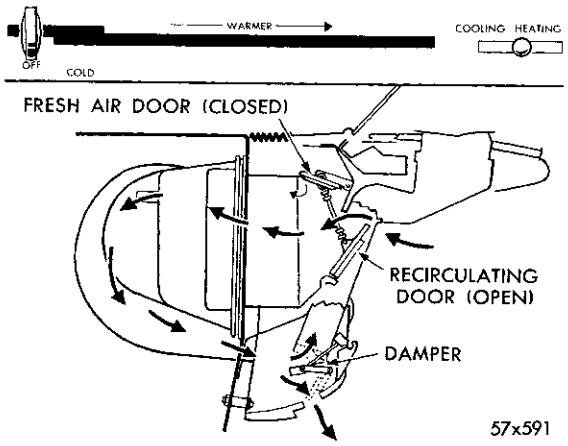


Fig. 6—Recirculating and Fresh Air Door

1. OPERATING CONTROLS

The controls for the heater-air conditioner are partially power actuated.

The main control lever, operating through a cable, operates the water temperature valve and also the fresh air and recirculating door through two electric switches, the solenoid valve, and power piston assembly (Fig. 5). 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 hydraulic circuit for operating the power piston.

Figure 8 illustrates the dampers used in controlling the system, and control components that are mounted on the instrument panel.

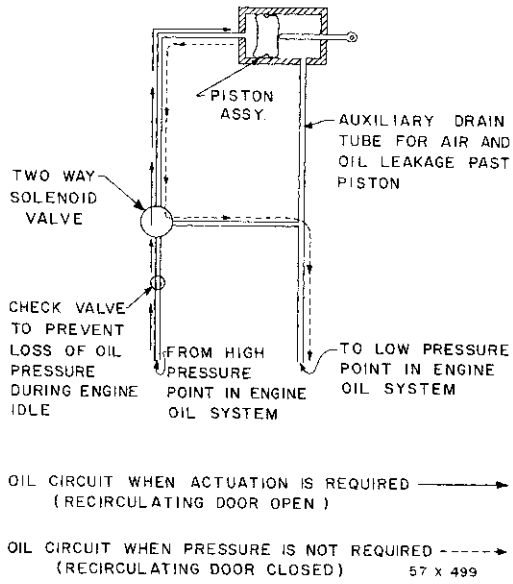


Fig. 7—Hydraulic Circuit for Power Piston

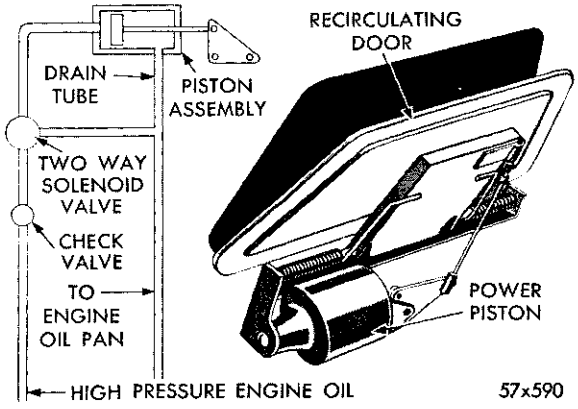


Fig. 5—Power Piston and Recirculating Door

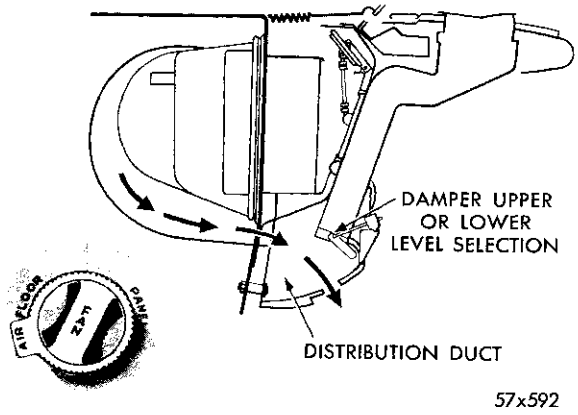


Fig. 8—Distributing Duct and Control Components

The fresh air door and the recirculating door are linked together in such a manner that when one is closed the other is open.

The two air flow control dials are mounted on concentric shafts. The inner "Blower" switch controls the speed of the blower motor. Three speeds are available through the selection of wire taps in the motor fields.

The outer dial marked "Air" controls the positioning of distribution duct damper, and is used to proportion the air distribution between the instrument panel grilles and the distributor duct slots. The control is lettered "Up" and "Down" with arrows indicating the proper rotation for panel or floor discharge.

The toggle switch with positions marked "Cooling" and "Heating" permits the energizing of the compressr clutch circuit and the resistance coil of the water temperature control valve. This action occurs when the switch is placed in the "Cooling" position. In the "Heating" position, it insures that these circuits will not be energized. It should be noted that 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 also has a bearing on the fresh air door and recirculating door.

2. POSITIONING CONTROL LEVER

a. Moving the main control lever from "Off" to "Cold" (No. 2) position, with the toggle switch in "Cooling" position, the following sequence of operation will result:

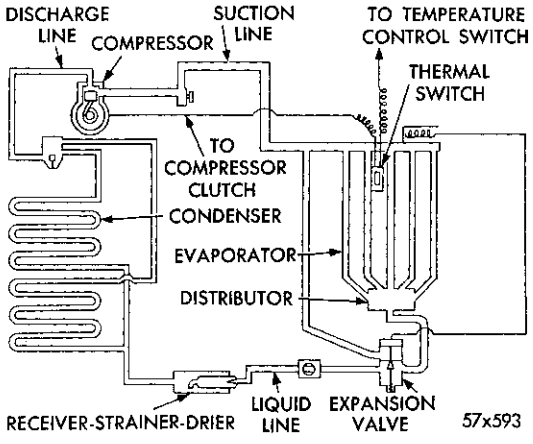


Fig. 9—Heater Air Conditioning (Schematic of Components)

1. Compressor clutch and water valve heating element will be energized (Figs. 9 and 10).
2. Hot water shut off to heater core.
3. Fresh air door closed and recirculating door open resulting in 80% recirculation air, 20% fresh air.
4. Maximum cooling will be obtained.

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

1. The fresh air door opens and recirculating door closes de-energizing 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.
4. Hot water shut off to heater core.

c. Moving the main control lever from No. 3 position through "Warmer" to No. 4 position 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.

d. Moving the main control lever from "Off" to "Cold" or No. 2 position, (Fig. 6) with toggle switch in "Heating" position.

1. De-energizes the solenoid valve, allowing the recirculating door to close and the fresh air door to open.
2. Hot water shut off to heater core.
3. Total fresh air ventilation obtainable, proportioned as desired through instrument panel grilles and distributor duct slots.

e. As the main control lever is moved from the "Cold, No. 2 position to No. 3 position, with the toggle switch in "Heating" position:

1. Lever mechanism picks up the cable controlling the water temperature control valve and prepares to open valve.
2. Hot water shut off to heater core.
3. Total fresh air ventilation is obtainable.

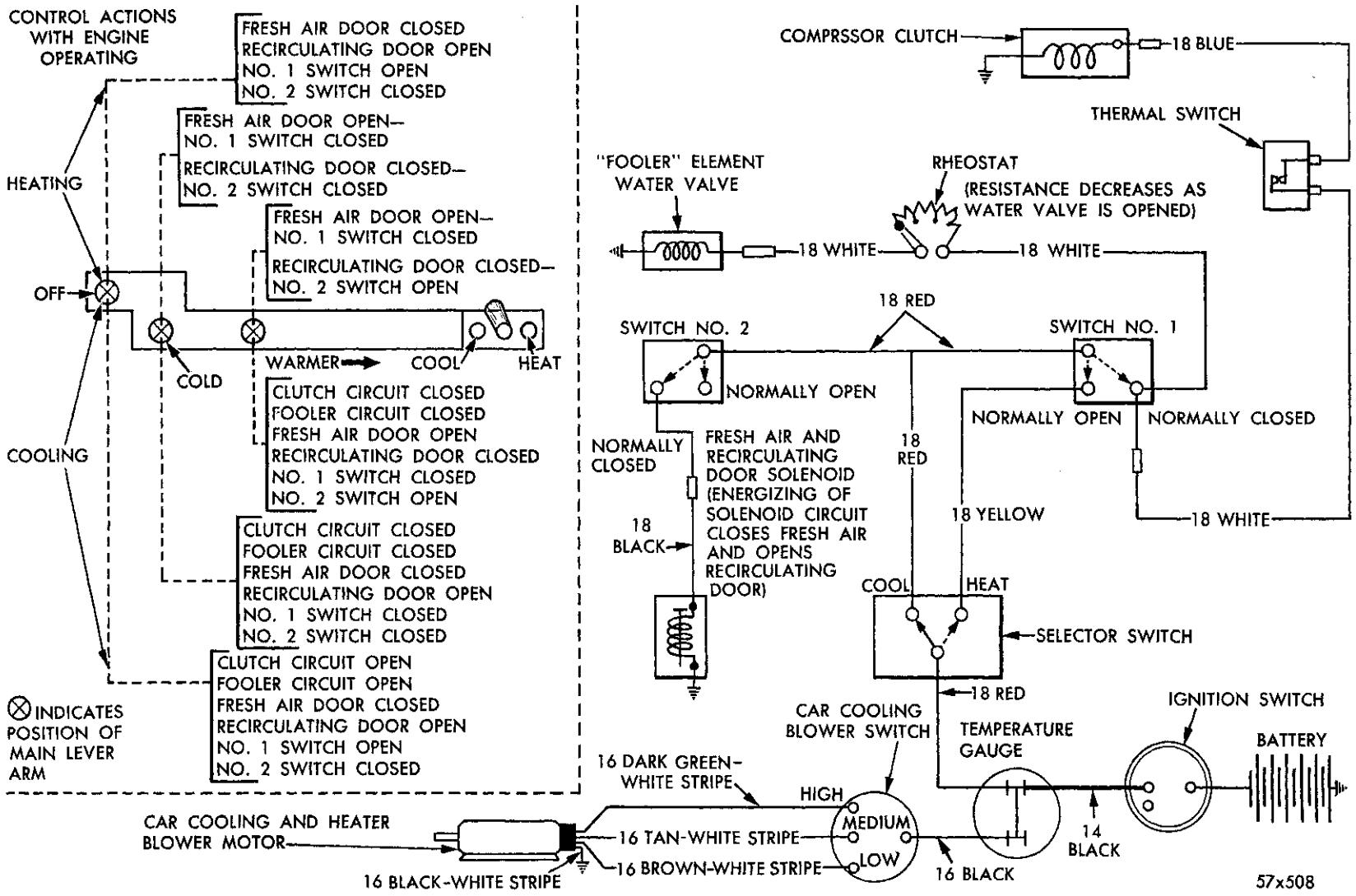


Fig. 10—Wiring Diagram (Heater-Air Conditioning)

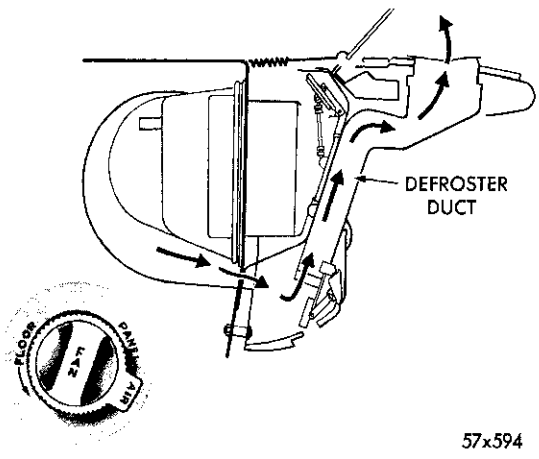


Fig. 11—Defroster Duct (Schematic Drawing)

f. Moving the main control lever from No. 3 position through "Warmer" to No. 4 position 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 car engine is stopped. This puts the system in a "safe" position for car washing, parking during a rainstorm, etc.

3. AIR DISCHARGE AND DISTRIBUTION

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

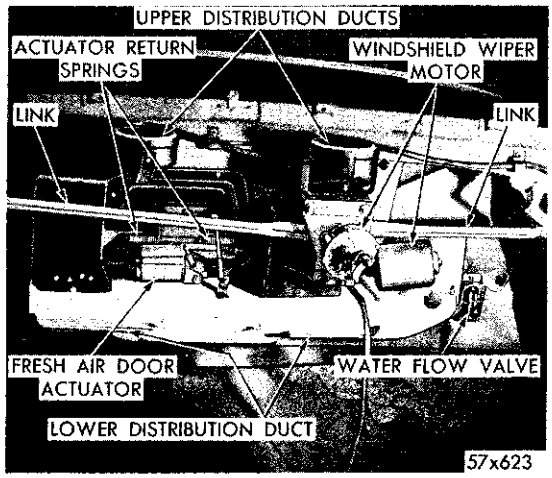


Fig. 12—Distributor Duct Installed

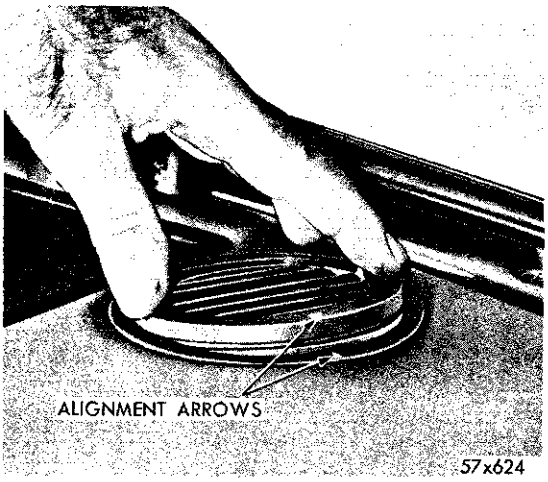


Fig. 13—Discharge Grille

Conditioned air is forced into the car by the blower that is mounted to dash. The air enters a distribution duct and can either be discharged toward the floor of car through slots in the distribution duct or it can be forced up to two discharge grilles in the top of instrument panel by means of a damper. In general, the air will be discharged to the lower level for heating and through upper grilles for defrosting (Figs. 11 and 12) and air conditioning.

The discharge grilles in the top of the instrument panel (Fig. 13) can be rotated through a full circle. The grilles, also have hinged deflectors which can be used to direct air up along the roof or directly at the occupants of the front seat.

4. TEMPERATURE CONTROL

For summer operation, the air will be dehumidified and cooled as it passes through the

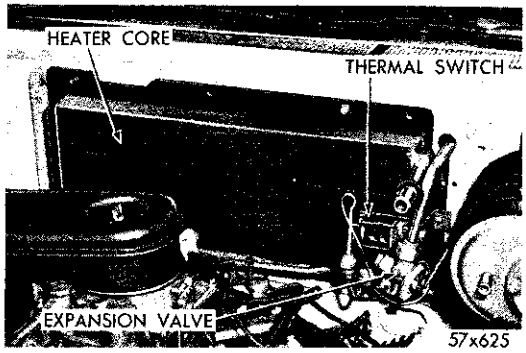


Fig. 14—Thermal Switch Installed

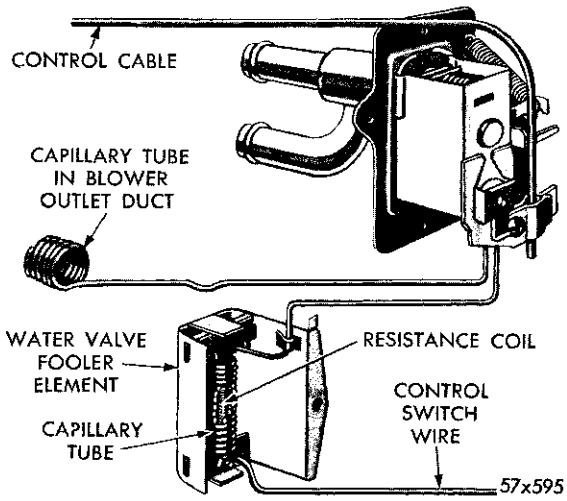


Fig. 15—Capillary Tube and Water Valve

evaporator coil and then reheated by the heater core to a temperature that is selected by the operator. The amount of reheat added to the air as it passes through the heater core is controlled by metering hot water through the heater core. The flow of hot water is regulated by a modulating valve. A reheat type temperature control gives dehumidification even when minimum cooling is desired.

A thermostatic switch is used to prevent evaporator coil from frosting over. The thermal switch is installed in the evaporator to sense the fin temperature of the coil. As temperature of evaporator fins decreases to a point where frost-over might occur, the thermal switch (Fig. 14) will break the compressor clutch circuit, stopping refrigeration until 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 operator. The valve is designed to control the discharge air temperature. For the heating cycle this temperature range will be from about 75 to 130° F. The discharge range for the Air Conditioning or summer operation will be approximately 40 to 75° F. This shift in temperature range is accomplished by the heating of the valve's temperature sensitive secondary capillary tube with resistance heating coil which is wound around the secondary capillary tube. Heating the secondary tube, in effect, "tricks" the primary capillary tube, (Fig. 15) 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 reheating the air less and shifting the temperature to the desired cooler level.

5. INSPECTION AND TESTING OF COMPLETE AIR CONDITIONING SYSTEM

a. Preparation for Tests

Move car into a well ventilated area and shut off engine. Connect exhaust suction system to tail pipe. Inspect condenser and radiator for bugs, etc., and blow out from side opposite entrance with compressed air.

b. 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 should be protected to a temperature of 20° above zero for summer (lower for winter).

c. 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 5/16 inch deflection for new belt and 3/8 inch for used belts.

NOTE: A belt having a minimum of ½ hour engine run is considered a used belt.

CAUTION

Always replace both belts. Never run a new belt with an old belt. Check compressor brackets and bracket attaching bolts for being tight.

d. Blower Motor

Check for loose or poor electrical connections. 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 operational speeds, and circulation.

e. Drains

Check plenum chamber and air conditioner housing drains (Fig. 16) for being clear.

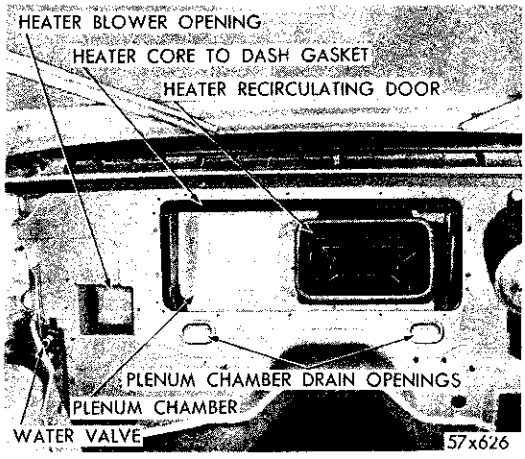


Fig. 16—Plenum Chamber and Drain Openings

6. 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-2022 must be used to measure the amount of air pressure compressor delivers at given engine speed.

To make a compressor capacity test with a test cap, proceed as follows: Start engine, operate at 1200 r.p.m. 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 ratchet wrench, Tool C-3361 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-3354 (Fig. 17). 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 gauge set manifold.

Start engine and with compressor operating, adjust engine speed to exactly 500 r.p.m. With ratchet wrench, Tool C-3361 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 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 right hand shut-off valve (counter-clockwise) on the gauge manifold set.

NOTE: 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.

CAUTION

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 similar 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 noticing the pressure rise reading on high pressure gauge.

Operating engine at exactly 500 r.p.m. the pressure reading on high gauge should read 190 to 210 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.

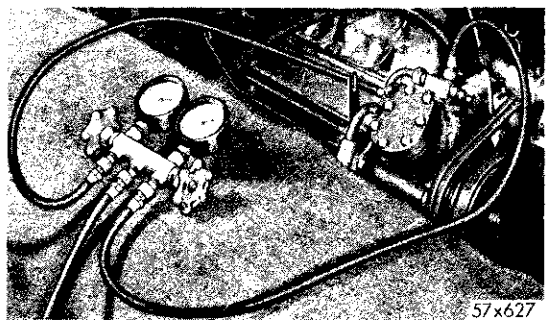


Fig. 17—Gauge Set Installed (Tool C-3354)

NOTE: If pressure reading is below specifications and tachometer and gauge is reading accurately, stop engine and check the compressor oil level since low oil level will cause a lower 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 with oil level at 2 inches at dip stick, the compressor valve plate assembly on both banks of compressor should be replaced.

After replacing valve plates on compressor, make a capacity test to again determine compressor pressure capacity. If compressor with oil level is 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 gasket properly seated. If screen is clean, gasket not damaged, and compression test does not come up to specifications, the compressor should be replaced.

NOTE: When replacing compressor, an adjustment must be made to compensate for the oil remaining in system. Check and correct oil level in compressor to 2 inches (dipstick measurement). 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 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 shut-off 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.

NOTE: 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 be in 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. Replace valve stem and service port caps and both service valves. Adjust fan belt. Check both cylinder head to compressor attaching bolts for tightness.

7. PRECAUTIONS TO OBSERVE IN HANDLING REFRIGERANT

WARNING

Safety Goggles, C-3355, should be worn to protect the eyes.

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.

a. Precaution

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.

b. Precaution

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 gas will tarnish bright metal.

c. Precaution

Do not leave charging tanks uncapped. Always

replace cap after using charging tanks. A charging tank is shipped equipped with a heavy, protective cap which is used to protect valve and safety plug from damage. To avoid moisture getting into system, charging tanks should not be opened to the atmosphere.

CAUTION

Use care to avoid 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 18 for methods of attaching "Dry-Eye" and "Drier" to tank assembly.

8. INSTALLING GAUGE SET MANIFOLD

Remove valve stem protective caps from compressor discharge and suction service valves. Using Tool C-3361, 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 system pressure.

Remove protective caps from both discharge and suction service port caps. Install four-foot test hose from 600 pound gauge fitting on Tool C-3354 to discharge service valve port fitting. Install the other four-foot test hose from 300 pound compound gauge fitting on Tool C-3354 to suction service valve port fitting. Turn both valve handles of gauge set, Tool C-3354 (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 gauges, rotate valve stems of both suction and discharge service valves one turn, (clock-wise).

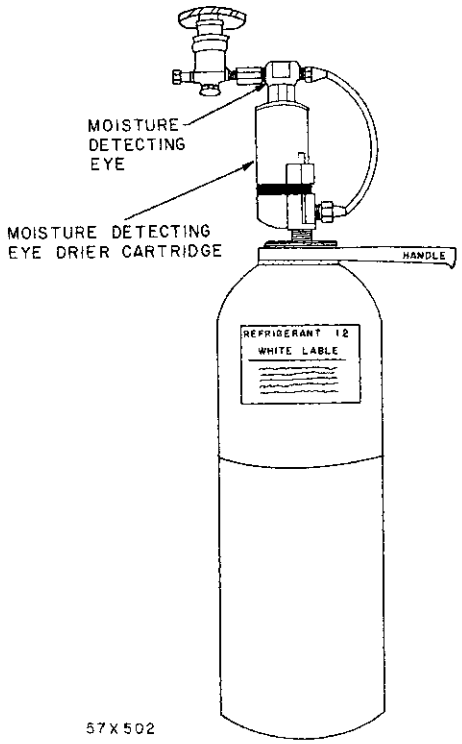


Fig. 18—Refrigerant Tank, Detecting Eye, Drier Cartridge (Schematic View)

9. TESTING FOR LEAKS WITH 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 required before system is charged and put in operation. If system has been discharged for making repairs or to eliminate moisture, system must be evacuated before partially charging to test for a leak.

Partially charge system with refrigerant, as outlined in Paragraph 10, and proceed as follows: (This is necessary only where supply in system is very low, or when system has been evacuated).

The Tool C-3444 (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.

NOTE: 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 re-seated or replaced, system evacuated and again partially charged, and re-tested. If no leaks are found, add to partial charge until system contains three pounds.

10. CHECKING REFRIGERANT BY SIGHT GLASS METHOD

In some cases, it may be necessary to add refrigerant to system to provide cooling without weighing, as is normally required.

Follow preliminary steps, "Installing Gauge Set Manifold", Paragraph 8, and Charging System 16, 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". 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. Refer to Figure 17 and install drier as indicated.

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, (Fig. 19). Close gauge manifold suction 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 minute run. Where no bubbles are present after five minutes of operation, charge system with an additional charge of refrigerant for 10 seconds.

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

11. DISCHARGING THE SYSTEM

Install gauge set manifold Tool C-3354. Using Tool C-3361, be sure both discharge and suction service valves are fully backseated (counter-clockwise). Connect eight-foot test hose to gauge set manifold center fitting. Insert free end of eight-foot hose into exhaust suction system and turn exhaust blower on.

NOTE: Expelling the gas into the exhaust system is a recommended safety precaution.

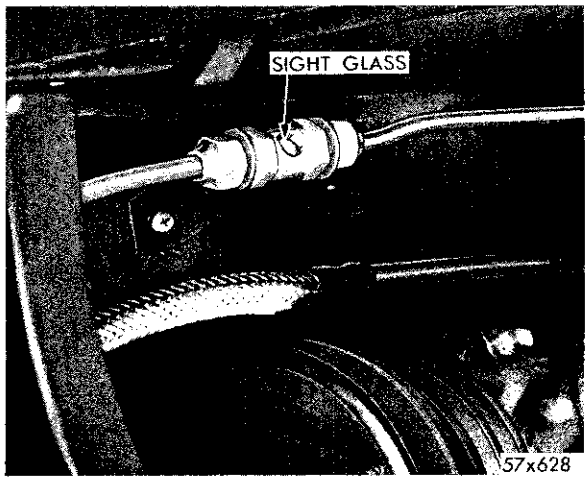


Fig. 19—Sight Glass Installed

Open discharge and suction service valves one turn. Crack 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 hand valve.

NOTE: 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.

12. 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. Connect gauge set manifold, Tool C-3354, to compressor and condenser service valves. Discharge system (if not previously discharged), as outlined in Paragraph 11.

CAUTION

Be sure the pressure has dropped to zero before attaching hose to vacuum pump.

Connect eight-foot test hose to center fitting of gauge set manifold and to connection on vacuum pump (Tool C-3372). 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 would indicate a leak in system. Close both gauge set manifold hand valves (clockwise). Turn off vacuum pump and remove long test hose from pump. Charge system with refrigerant gas, as outlined in Paragraph 16.

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 evacuate system at 26 to 28 inches of vacuum for 10 minutes. Recharge system with three pounds of refrigerant.

13. MOISTURE IN AIR CONDITIONING SYSTEM

Moisture in automotive air conditioning systems is directly or indirectly the real cause of many failures in air conditioning systems. Basically, 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. This water vapor is everywhere—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 refrigerant, yet it is there in quantities sufficiently to stop refrigeration.

Moisture may enter the air conditioning system in following manner:

a. System left open during repair.

b. Condensation in tubing, leaky seal caps, wet driers, unsealed charging hose or manifolds.

c. Use of wet oil or refrigerant from improper field handling.

d. Charging system without drier.

The measurement of moisture content in a refrigerant is expressed in "Parts Per Million" (PPM). This can be illustrated by saying that one drop of water, in one million drops of water is one part per million. It can also be further illustrated by stating that one drop of water raises the moisture content of 25 pounds of "Refrigerant 12" about 5 (PPM), or 1 pound of "R-12" about 125 (PPM).

In order to be certain the moisture content of a "Refrigerant 12" Air Conditioning 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 moisture equals freeze-ups at expansion valve.

Refrigerant 12 plus moisture equals acid (Hydrochloric & Hydrofluoric).

Acid plus metals and refrigerant oil equals corrosive sludge.

Corrosive sludge plus expansion valves equals sticky or stuck valves.

Corrosive sludge plus screens and strainers equal plugged screens and strainers.

Corrosive sludge plus compressor reed valves equals corroded leaky valves.

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 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 amount of moisture as it does in liquid phase.

This means 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 the full tank of "Refrigerant 12" is down to about half full, the remaining half tank of refrigerant liquid and vapor will be very dry, as all of the moisture originally con-

tained in the full tank of liquid has been extracted by 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 the above reasons it becomes imperative when charging a system, to pass the refrigerant vapor through an efficient drier before it enters the system. 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 18 for method of attaching "Drier" and "Dry-Eye" to tank assembly. Refer to "Charging The System, Paragraph 16, for use of "Drier" and 'Dry-Eye" equipment to eliminate moisture from system.

NOTE: Drier cartridges are available in 8, 12, 20 and 30 cubic inches. A 12 cubic inch cartridge is recommended for use with refrigerant tank. On receival, make sure cartridge is sealed with white plastic seal cap. This cap is used to seal moisture from drier cartridge.

Used drier cartridges can be re-activated when saturated with moisture provided refrigerant containing 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 cartridge to cool, reseal with plastic cap and gasket, store in a dry area (at room temperature). To charge system refer to Paragraph 16.

14. CHECKING SYSTEM FOR MOISTURE

With tubing coil, sight glass, moisture detecting eye and cap made up into an assembly, as shown in Figure 20, 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, as shown in Figure 20.

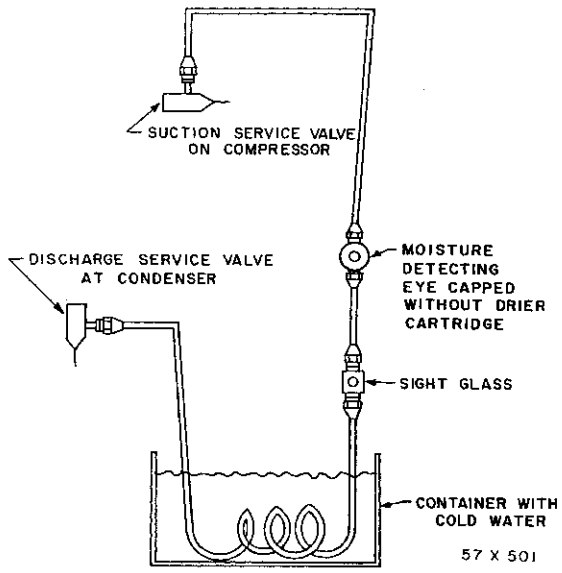


Fig. 20—Moisture Detecting Eye (Schematic Drawing)

Fill the container with cold water to allow for submersion of coil in water, as shown in Figure 20. 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 to 1200 r.p.m. Open car windows and move the operating lever to "Cold" position, and blower switch to "High".

Slowly turn the valve stem of the suction service valve (clockwise) two full turns, and check sight glass (Fig. 19), for flow of refrigerant liquid through glass. After approximately 15 to 20 minutes of engine operation with liquid flowing through the moisture detecting eye and if the dot of eye 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 10 (PPM) of moisture and is now ready for safe, satisfactory operation.

NOTE: 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.

NOTE: Install protective flare plugs in end of tubing fitting to keep moisture and other foreign matter from entering tubing.

15. CORRECTING A WET AIR CONDITIONING SYSTEM (WITHOUT DISCHARGING SYSTEM)

With tubing and 30 cubic inch drier cartridge and detecting eye made up into an assembly, as shown in Figure 20, proceed as follows: Remove valve stem caps from suction and discharge service valves and fully back-seat (counter-clockwise) both valves. Remove caps from valve service ports. Remove flare plugs from tubing and drier cartridge assembly and attach flare nuts of tubing to service valves, as shown in Figure 20.

NOTE: 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. Turn valve stem of suction service valve two turns (clockwise).

NOTE: 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 to non-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,

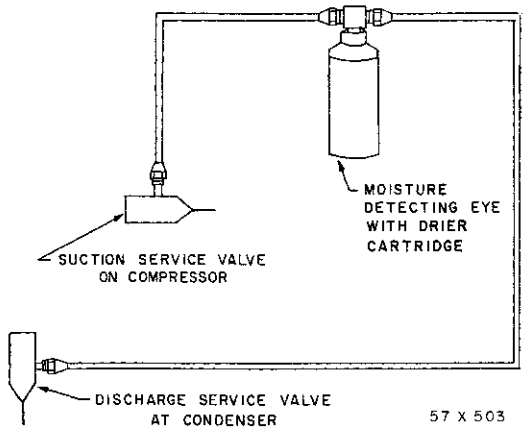


Fig. 21—Moisture Detecting Eye and Drier Cartridge Installation (Schematic Drawing)

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.

16. CHARGING THE SYSTEM

(Using Moisture Detecting Eye With Drier Cartridge)

Refer to Figures 21 and 22 and proceed as follows: Assemble moisture detecting eye and

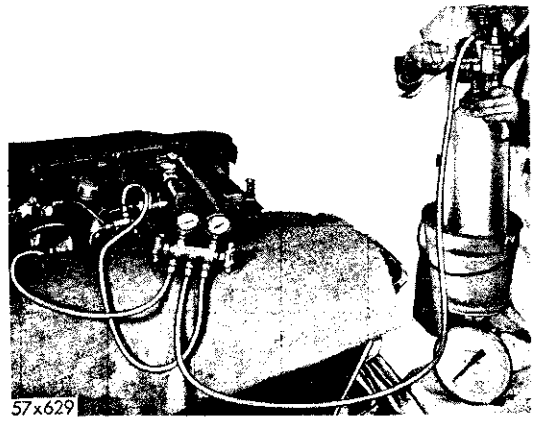


Fig. 22—Charging the System

drier cartridge to refrigerant tank. Make sure the arrow located on "Dry-Eye" unit, points in direction of flow from tank. Close refrigerant shut-off valve and open refrigerant tank 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.

NOTE: 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.

NOTE: Always allow sufficient time for moisture detecting eye to change to a deep blue before attempting to charge or add refrigerant to system.

When Drier and Dry-Eye Cartridge assembly is coupled to a refrigerant tank for the absorbsion 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, to to 20 (PPM). The eye will change to a **deeper blue** as the vapor content is reduced. Refrigerant with a 10 (PPM) moisture content can be considered safe to use in the air conditioning system.

Connect eight-foot test hose to the center fitting of gauge manifold and to connection of refrigerant tank (Fig. 21). 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". Refer to Figure 21 and install drier, as indicated.

Open valve tank one turn and loosen 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.

WARNING

It is absolutely essential that an accurate scale, such as Tool C-3429, be used. Bath scales are not accurate below 100 lbs.

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 watch scale and shut tank valve off when system has absorbed three 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.

17. TESTING THERMAL SWITCH

NOTE: The thermal switch is adjustable. When adjusting the switch, use eccentric slot located on side to adjust in a clockwise direction for "Cold" or (counter-clockwise) direction for "Warm". When midway between "Cold" and 'Warm", the temperature setting will be "Normal", which is the standard factory setting.

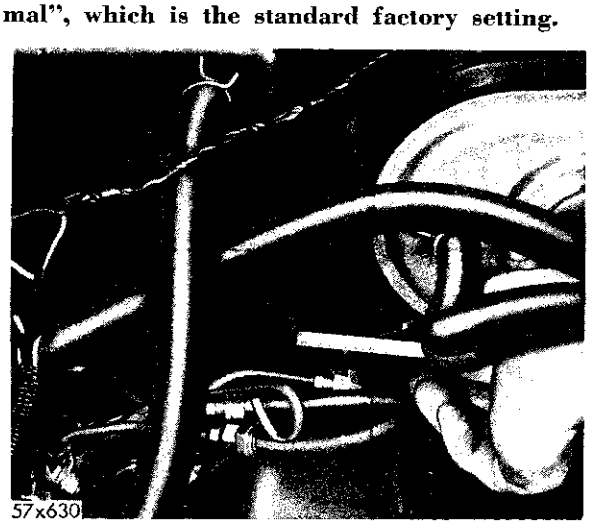


Fig. 23—Checking Thermal Switch

Check air conditioning system for being fully charged. Refer to "Checking Refrigerant by Sight Glass Method". Paragraph 10.

Remove thermometer hole plug from lower left side of evaporator heater housing. To insure a good thermal contact with suction line well, apply coating of about $\frac{1}{16}$ of an inch of non-hardening graphite-aluminum compound to bulb of thermometer.

Insert thermometer bulb through hole in evaporator housing into well of suction line (Fig. 23). With cloth, sponge rubber, or other material, tightly seal the hole opening between thermometer and heater housing. Attach one lead of a test light, Tool C-744, to the compression circuit and the other lead to ground.

Position test light where its function can be observed readily when reading thermometer. Start engine and adjust engine speed to 1200 r.p.m. Place toggle control switch on "Cooling", and move the air conditioning control lever to "Cold". When the controls are located in these positions, the test light should light. Turn the blower switch to "Low". Close all windows and allow thermal switch to cycle a few times, indicated by test light going on and off.

NOTE: Check heater water valve for being cold (no hot water should be flowing through heater core).

Observe test light and thermometer. Cycle the thermal switch a few times. Test light should go out when thermal switch contacts open, and be "ON" when switch closes.

The following specifications will indicate the opening and closing degrees of the thermal switch.

NORMAL		COLD		WARM	
Open	**Close**	**Open**	**Close**	**Open**	**Close**
34°+2°	37°+2°	30°+2°	34°+2°	42°+2°	45°+2°

18. TESTING FOR PROPER SUPER HEAT

To test evaporator expansion valve for super heat, make sure the air conditioning system is fully charged with "Refrigerant 12", and is dry. 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 condition.

Install thermometer in evaporator, as outlined in "Testing Thermal Switch Test", Paragraph 17. Start engine and adjust engine speed to 1200 r.p.m. Turn toggle switch to cooling position. Place control lever in "Cold" position. This will close fresh air door and open recirculation door, allowing sufficient heat from engine to enter fresh air door slots to load the evaporator.

NOTE: To assure sufficient heat from engine compartment entering the fresh air door slots, place a small mat or cardboard over the opening between the hood and the body. This will direct the hot air into the cowl vent.

Turn blower switch to "High". Open car windows. Feel the heater water valve to make sure no hot water is flowing through the heater core. After operating engine for 10 minutes, allow system to normalize. Take reading of suction gauge pressure, and check evaporator thermometer temperature.

NOTE: 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. See Example Chart for Determining super heat.

Observe suction pressure at gauge and obtain the nearest temperature corresponding to this pressure from Temperature-Pressure Relation Chart. From the observed temperature reading on thermometer in evaporator, subtract 5 degrees to compensate for thermometer connection error and suction line pressure drop. The temperature difference between the suction pressure temperature relation and the corrected evaporator temperature should not be less than 8 degrees nor more than 15 degrees super heat.

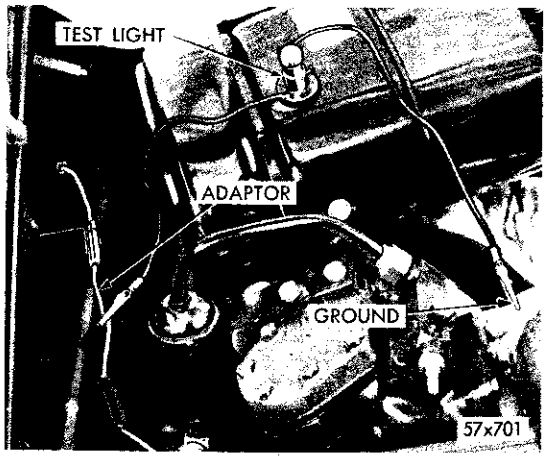
EXAMPLE OF CHART FOR DETERMINING SUPER HEAT

A Observed Suction Pressure at Gauge	B Temperature Relation of Suction Pressure	C Observed Thermometer Temperature at Evaporator	D Corrected Evaporator Thermometer Temperature, 5 Degrees Subtracted	E Super Heat
25 lbs.	26°	41°	36°	10°
30 lbs.	32°	47°	42°	10°
35 lbs.	38°	53°	48°	10°
40 lbs.	43°	58°	53°	10°

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

TEMPERATURE AND PRESSURE RELATION CHART FOR REFRIGERANT (FREON 12 OR GENETRON 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		



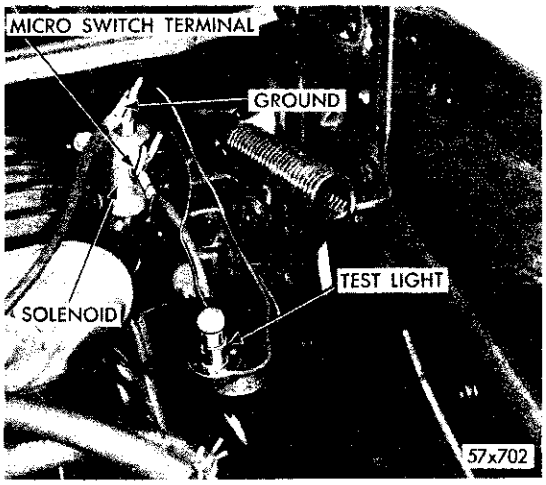


Fig. 24—Testing Control Circuits

19. TESTING ELECTRICAL SWITCHES AND CONTROL CIRCUITS

Refer to Figure 24 and proceed as follows: With test light, Tool C-744, located on windshield, 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).

Then 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 now 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" position. 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 light 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 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. Tighten if necessary.

20. PRECAUTIONS TO OBSERVE IN HANDLING TUBING

a. Cleanliness During Installation

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

b. 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.

NOTE: Copper washers must be used where joint is steel-to-steel, steel-to-brass or brass-to brass. Copper 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.

c. Securing the Tubing

Copper tubing must be attached to car structure. A flexible connector (vibration elimina-

tor) has been placed on the condenser side of compressor to guard against breakage at that point.

d. 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.

Only the following component parts of compressor are available for service: compressor unit valve plate assemblies, suction service valve, discharge service valve, cylinder head, gaskets, muffler assemblies, 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.

21. MEASURING COMPRESSOR OIL LEVEL

NOTE: If the oil level is checked immediately after a long, fast trip, the oil level will be slightly lower than normal.

Locate 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 minutes to return any 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-3361 until valves are seated firmly.

NOTE: 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 ¼ inch 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 compressor is completely purged, loosen (do not remove) the oil filler plug on side of compressor just enough to allow gas pressure (if any) in crankcase to escape.

When pressure has been released, remove filler plug and use a clean dry plunger type dipstick (⅛ inch round or similar rod) to measure oil level.

The correct oil level is from 2 to 2½ inches. Add MOPAR air conditioning compressor oil (300 Saybolt at 100 degrees F.), as required, or siphon off excess oil if necessary. 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-3361, slightly open the suction service valve stem (counter-clockwise). Let gas drift slowly through 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.

22. REMOVAL AND INSTALLATION OF AIR CONDITIONING UNIT

a. Removal

From inside the passenger compartment, remove the hydraulic actuator piston, bracket, and operating linkage.

From the engine compartment, drain antifreeze from radiator. Remove air cleaner. Remove ignition distributor cap and base assembly, if necessary. Disconnect upper and lower hot water heater hose from evaporator cover outlet. Disconnect blower and wires from Acro connector. Remove blower to dash attaching bolts, including blower motor ground wire to dash, and remove blower and assembly. Remove air conditioner evaporator cover to dash attaching bolts, and remove cover assembly. (Fig. 25.)

Remove thermal switch leads. "Discharge the System", as outlined in Paragraph 11. Disconnect suction and liquid line. Remove remaining evaporator housing flange to dash screws and remove evaporator by depressing fresh air door with screw driver as evaporator is rolled out of dash pocket.

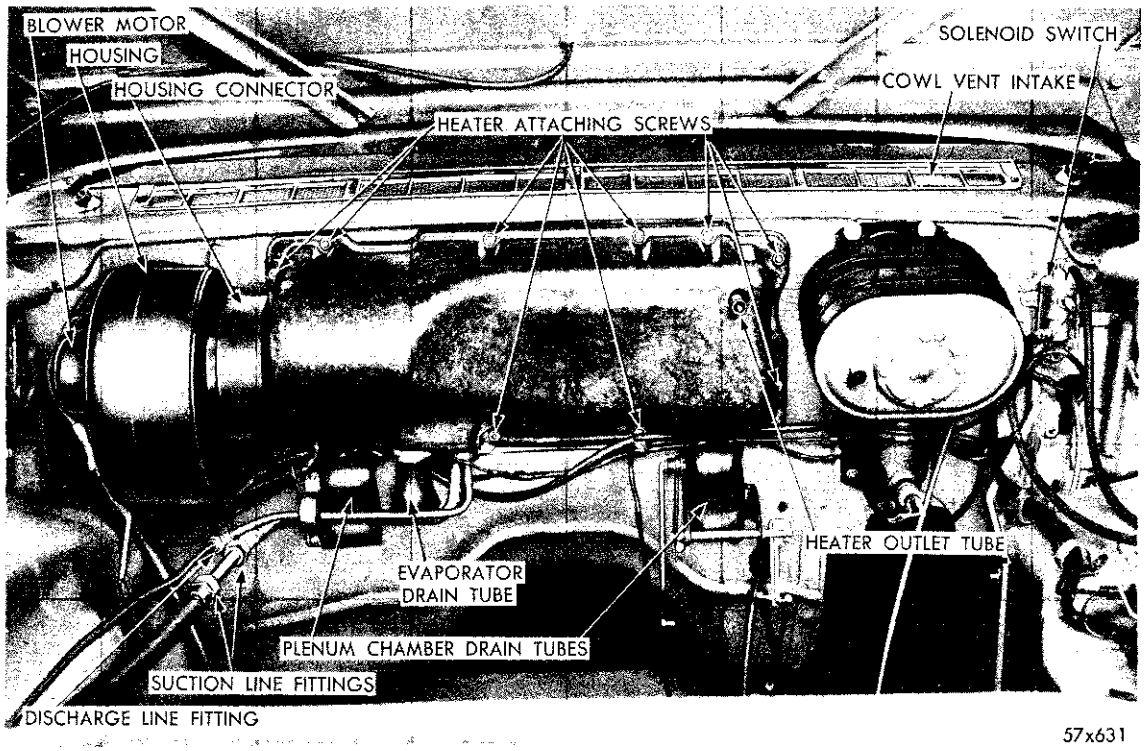


Fig. 25—Heater-Air Conditioning Unit Installed

NOTE: 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.

b. Installation

Install unit in the reverse order of removal. Evacuate, sweep and charge system, as indicated in Paragraphs 12 and 16. Install blower and heater hoses. Check system for leaks, the fan belt for proper tension and make certain radiator contains sufficient coolant.

23. REMOVAL OF HEATER CORE

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

CAUTION

Use care when removing core to avoid damaging equalizer lines.

24. REPLACEMENT OF RECEIVER STRAINER-DRIER (Fig. 26).

Wherever the receiver strainer-drier unit is plugged and has to be removed from car, proceed as follows:

a. Removal

Discharge the system, as outlined in Paragraph 11.

CAUTION

Protect eyes with goggles before disconnecting receiver flare connections.

Disconnect flared connections at both ends

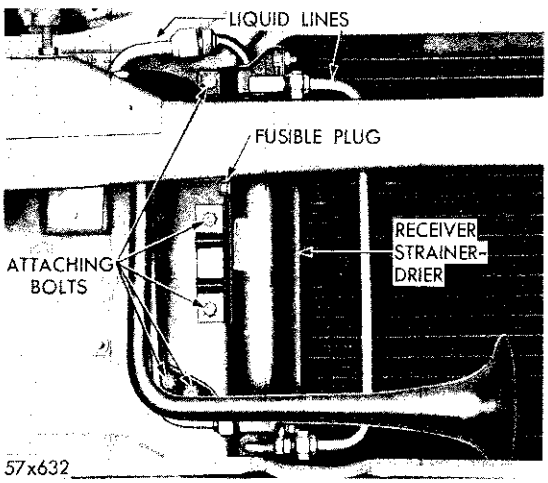


Fig. 26—Receiver Drier Installed

of receiver. Remove attaching bolt nuts from bracket and remove receiver. Cap open lines if new receiver is not to be installed immediately. Leave caps on connectors until ready to install.

b. Installation

Position receiver in place, install bracket attaching bolts, and tighten nuts securely. Remove caps, connect flared connector nuts and tighten securely. Charge system with partial charge and test for leaks. Correct any leaks and evacuate system, as outlined in Paragraph 12. Charge with three pounds of refrigerant, as outlined in Paragraph 16.

25. REPLACEMENT OF RECEIVER STRAINER-DRIER FUSIBLE PLUG (Without Removal From Car) (Fig. 26)

Replacement of damaged fusible plug can be made without removal of unit from bracket assembly. Discharge the system and remove the old 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, as outlined in Paragraph 12. Charge system with three pounds of refrigerant, as outlined in Paragraph 16.

26. REMOVAL AND INSTALLATION OF EXPANSION VALVE

a. Removal

Disconnect the ⅜ inch and ½ inch line flare fittings.

NOTE: Use two flare wrenches to loosen or tighten fittings. Remove the valve control bulb.

CAUTION

Cap or plug open lines to prevent moisture from entering system.

b. Testing Expansion Valve (Equipment Required) (Fig. 27)

Source of dry air 90 to 250 psi.

Moisture detecting eye with drier cartridge (save white plastic cap).

Air Conditioning gauge set manifold.

Transmission throttle pressure gauge.

Compressor capacity test cap with .020 inch bleed hole.

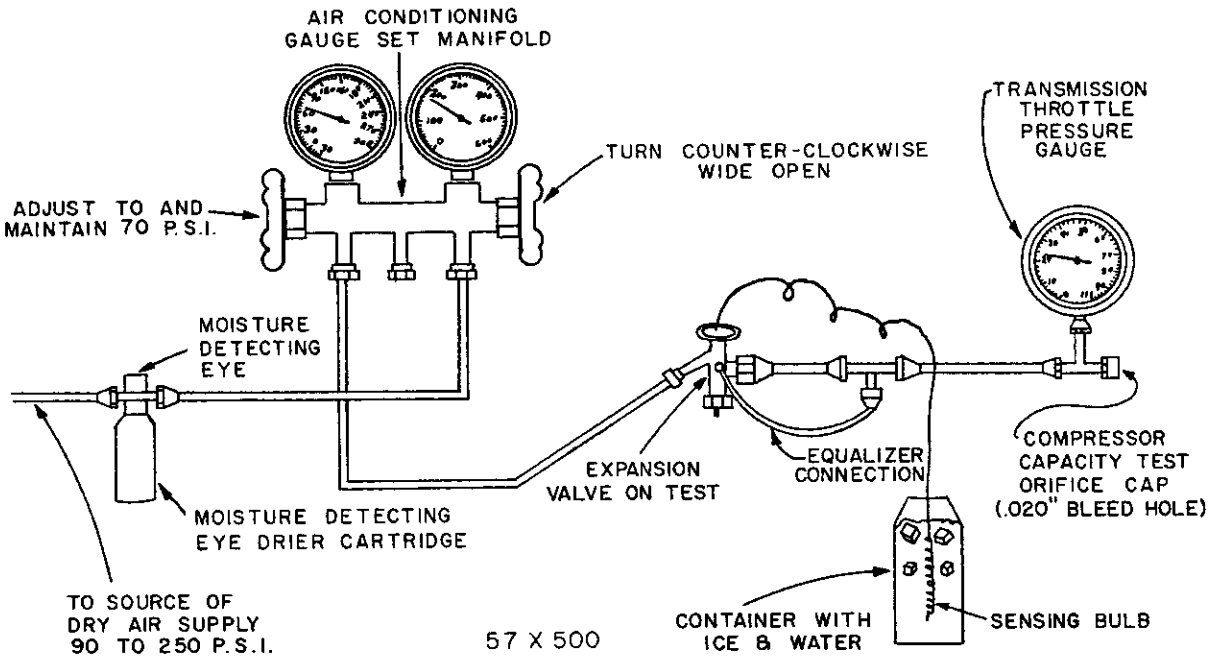


Fig. 27—Testing Expansion Valve (Unit Removed from Car)

Container with ice and water to hold temperature at 32 degrees F. ¼ inch copper tubing and fittings as used in attached drawing (Fig. 27).

c. Test Procedure

1. 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.

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

3. Immerse the expansion valve sensing bulb into the water and ice bath (32 degrees F.).

4. With the expansion valve inlet pressure gauge (left hand gauge) reading 70 psi., the sensing bulb completely submerged in the 32 degree F. water bath, and the compressor test cap bleeding off pressure, the outlet pressure gauge should read between 23 and 26 psi.

5. 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 expansion valve successfully passes these tests, it may be considered to have the 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 expansion valve fails to pass either test No. 4 or No. 5, it should be rejected.

d. Installation

Reinstall expansion valve, control bulb, and equalizer lines in the reverse order of removal. Tighten all connections securely, and sweep and charge system, as indicated in Paragraphs 13 and 17.

27. REMOVAL AND INSTALLATION OF COMPRESSOR (Fig. 28).

Discharge the system, as outlined in Paragraph 11. Remove the suction and discharge lines.

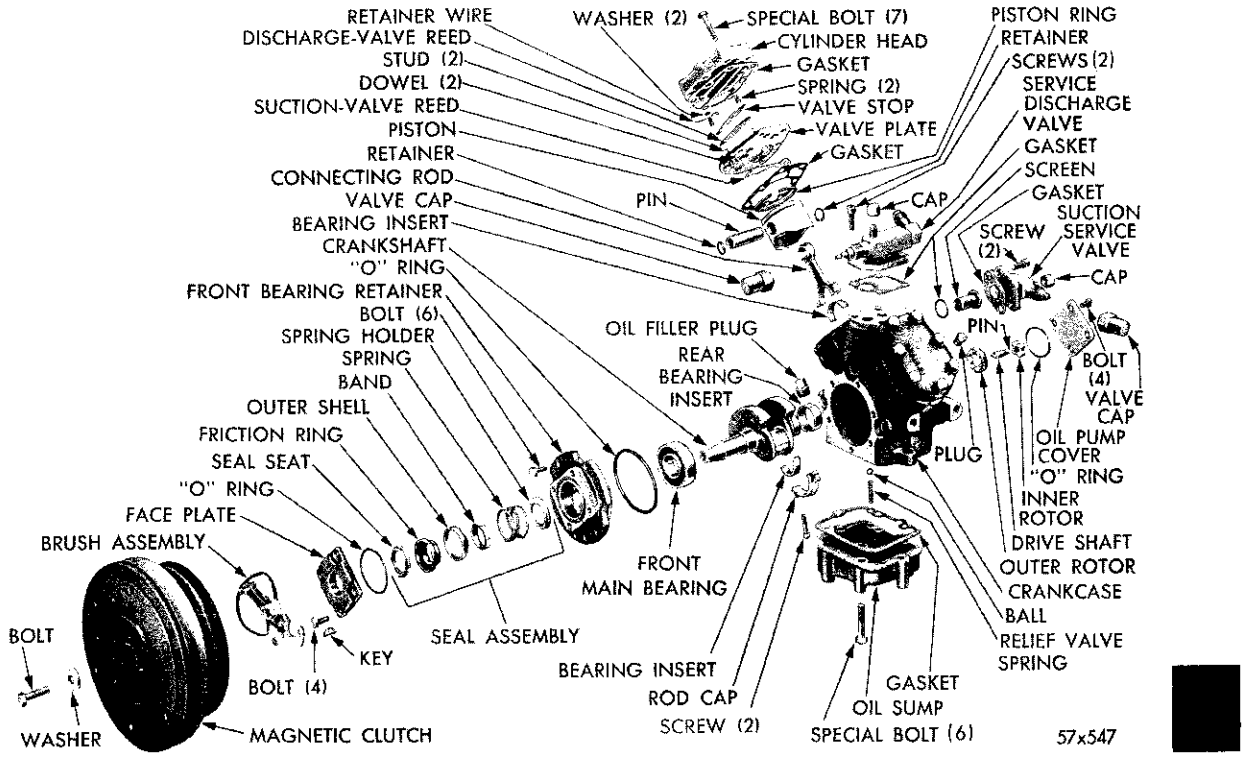


Fig. 28—Disassembled View of Compressor

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 (2 to 2½ inches). Refer to Paragraph 6 for measuring procedures.

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

28. REMOVING COMPRESSOR CYLINDER HEAD

With gauge set installed as indicated in Paragraph 6, rotate discharge and suction service valve stems clockwise until both valves are fully front-seated. Slowly open the discharge gauge 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.

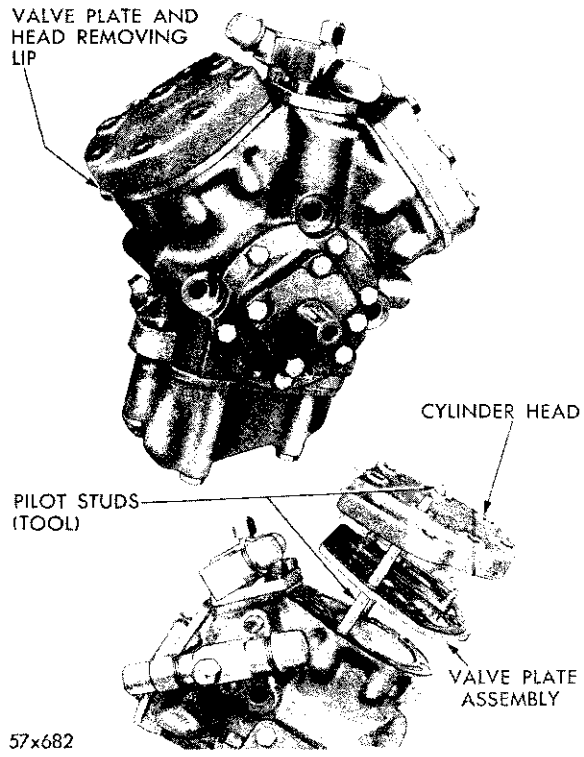


Fig. 29—Removing Compressor Head

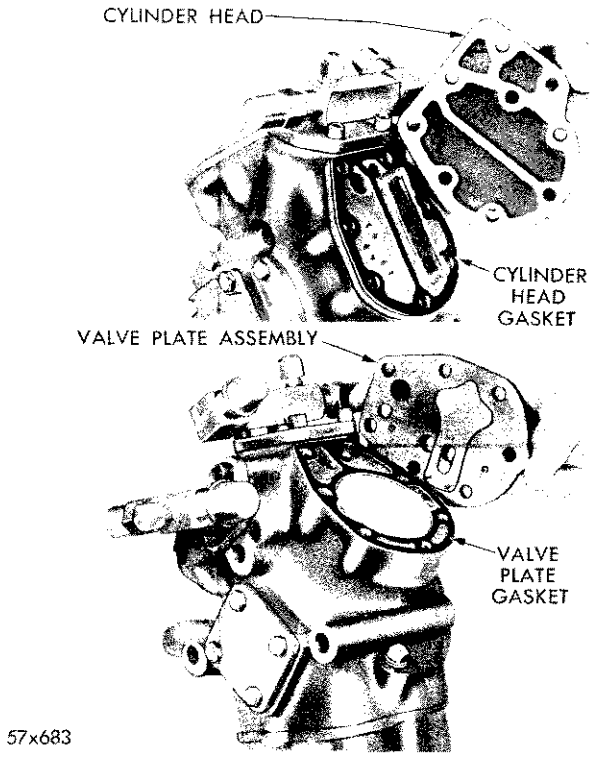


Fig. 30—Replacing Head Gasket

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

NOTE: Use tab (Fig. 29) 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 30 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 the 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 locate control lever on "Cold". Operate engine for five minutes, stop engine, and test for leaks, as outlined in Paragraph 9. If there are no leaks and the system is operating satisfactorily, remove gauge set and replace valve caps.

29. SERVICING THE MAGNETIC CLUTCH (Fig. 31)

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.

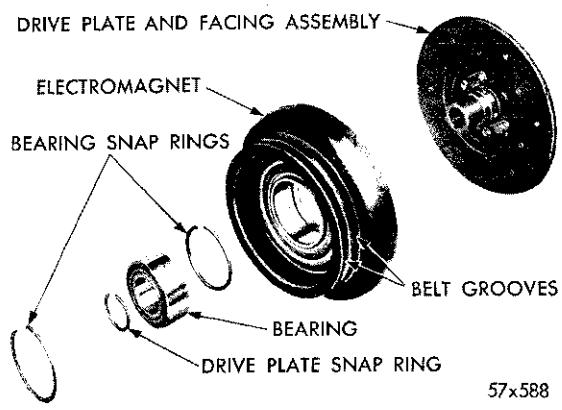


Fig. 31—Magnetic Clutch (Disassembled View)

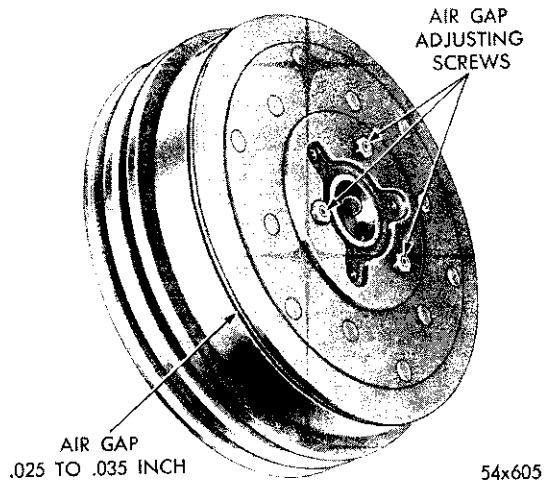


Fig. 32—Air Gap Adjustment

a. 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.

b. 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.

c. Removing and Installing Drive Plate

Remove drive plate retaining snap ring hub (Fig. 31) 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

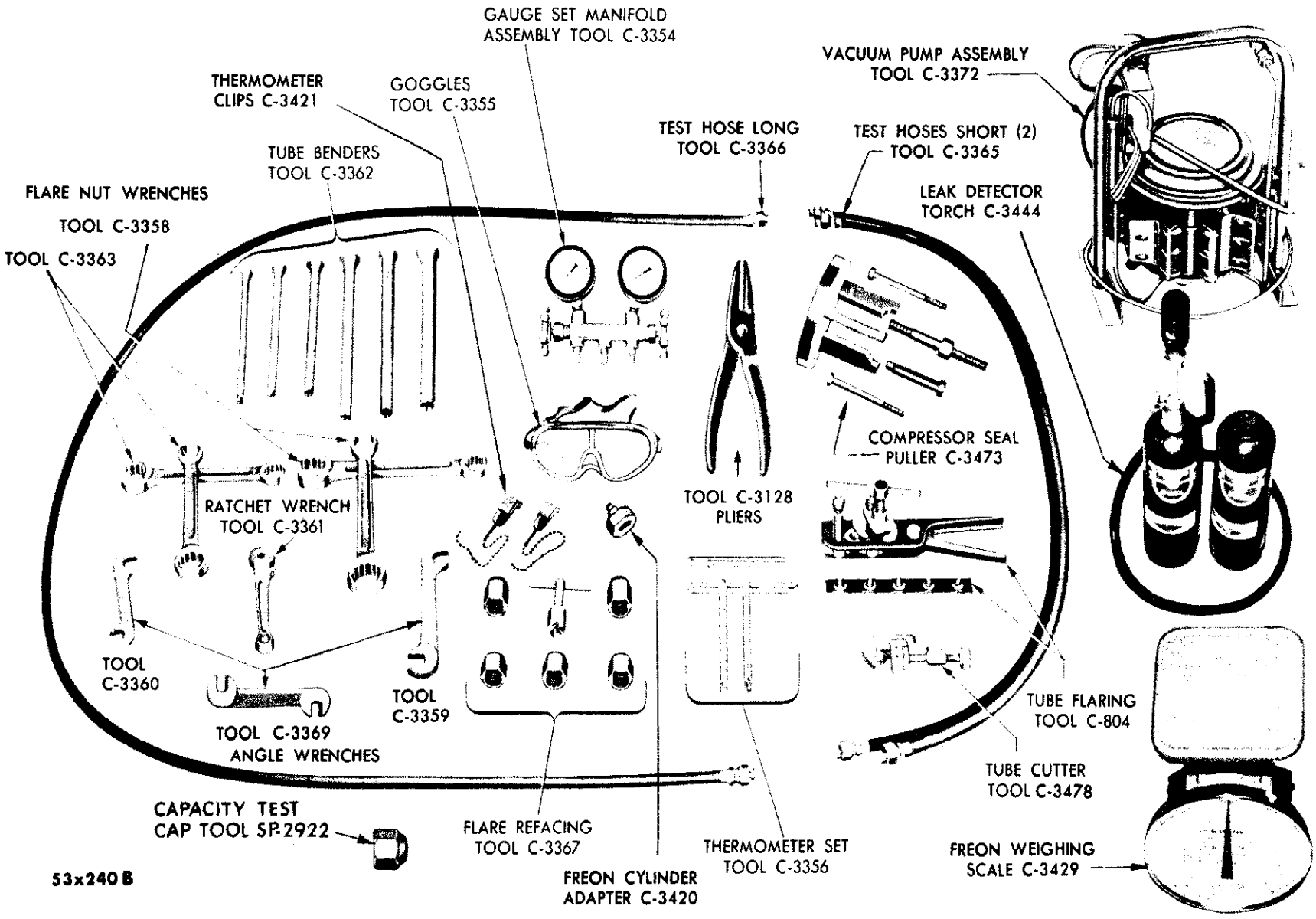


Fig. 33—Special Heater-Air Conditioning Tools

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 (Fig. 32). 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.

d. Removing Clutch Bearing

Remove drive plate, as outlined in Paragraph 29, "c". 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.

e. 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.

For Air Conditioning Service Tools refer to Figure 33.

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.

30. BLOWER NOT OPERATING

a. Test electrical circuit with point-to-point voltmeter test. Replace or repair broken wire.

b. Test motor, and repair or replace.

c. Test switch with voltmeter or jump wire. Replace faulty switch.

d. Test circuit with voltmeter for voltage drop. Clean and tighten all loose connections.

31. BLOWERS AND COMPRESSOR OPERATING—NO COOLING

a. Check for low refrigerant. Recheck system after testing and repairing all leaks.

b. Test for moisture with dry-eye.

c. Test compressor capacity.

d. Test for restriction in strainer-drier, as outlined in Paragraph 24. Inspect lines for kinks.

e. Test expansion valves, as outlined in Paragraph 26. Clean or replace valve.

32. BLOWERS OPERATING—PARTIAL COOLING

a. Check sight glass for indication of low refrigerant. Check for leaks, and charge system.

b. Test for moisture.

c. Test compressor capacity, as outlined in Paragraph 6.

d. Test thermal switch, as outlined in Paragraph 17.

e. Inspect condenser for kinks or obstructions. Clean with air or replace.

f. Clean air passages through condenser with warm water and compressed air applied from side next to engine.

g. Test temperature-pressure relation of refrigerant.

33. LOW SUCTION PRESSURE AND LOW HEAD PRESSURE

a. Check sight glass for indication of low refrigerant. Check for leaks, and charge system.

b. Test for moisture.

c. Test compressor capacity.

d. Test for restricted strainer-drier, as outlined in Paragraph 24. Replace if faulty.

e. Check for kinked liquid line. Replace liquid line if required.

34. SUCTION PRESSURE O. K. AND HIGH HEAD PRESSURE

a. Check for air in system. 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.

b. Check for too much refrigerant. Operate engine at 1200 r.p.m. with blower switch turned to "High". Discharge refrigerant slowly through gauge manifold center fitting until bubbles appear in sight glass. Charge system with refrigerant, as outlined in Paragraph 16.

c. Wash out condenser with warm water and apply compressed air from side next to engine.

35. LOW SUCTION PRESSURE—HEAD PRESSURE O. K.

a. Test for moisture.

b. Test for restricted receiver-strainer.

c. Test super heat.

36. TESTING FOR LEAKS WITH LEAK DETECTOR (For Diagnosis)

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 described in Paragraph 9.