SECTION 11-C AIR CONDITIONER

CONTENTS OF SECTION 11-C

11-11 SPECIFICATIONS

a. Tightening Specifications

Part	Location	Torque-Ft. Lbs.
Nut	Drive Plate Hub to Compressor Shaft	14-16
Nut	Compressor Rear Head to Shell	19-23

For compressor mounting bracket bolts and nuts see Figures 11-100, 11-101 and 11-102.

b. Compressor Specifications

Type	Six Cylinder Axial Opposed
Make	Frigidaire
Effective Displacement - (cu in.)	10.8
Oil	Frigidaire 525 viscosity
Oil Content (New)	10-1/2 oz. Fluid
Internal Clearances	See Figure 11-36
Air gap between clutch drive plate and pulley	.022" to .057"
Clutch Type	Magnetic
Belt Tension	See Figures 2-65 and 2-66

c. Miscellaneous

Refrigerant	Freon 12, Ucon 12, Genetron 12, Isotron 12
System Capacity (Fully Charged)	2-1/2 lbs.
Evaporator Location	Under center of Instrument Panel
Blower Motor Fuse	20 Amp located on Fuse Block
Relay Number	1116959
Type of Temperature Control	Suction Throttle Valve

11-12 DESCRIPTION AND OPERATION OF AIR CONDITIONER SYSTEM

NOTE: The heater and ventilation systems are the same as on non-air conditioner cars which are described in Section 11-B and are completely separate from air conditioner.

The Buick Cool Pack-type air conditioner is available on 4000, 4100 and 4300 Series as optional equipment. The air conditioner is entirely independent of the heater and ventilation systems.

The compressor, condenser and receiver-dehydrator are located in the engine compartment. See Figure 11-21 and 11-22. The evaporator assembly which includes the controls for the air conditioner is centrally located under the instrument panel. The air conditioner blower is located under the right side of instrument panel. Duct work located at air intake of blower permits outside air to be drawn into the air system to be mixed with car interior air. There are three main air outlets, one located in evaporator assembly and one located at each end of instrument panel.

Metal Tube Outside Diameter	Thread and Fitting Size	Steel Tubing Torque Lb.-Ft.	Aluminum or Copper Tubing Torque Lb.-Ft.	Nominal Torque Wrench Span
1/4	7/16	10-15	5-7	5/8
3/8	5/8	30-35	11-13	3/4
1/2	3/4	30-35	11-13	7/8
5/8	7/8	30-35	18-21	1 1/16
3/4	1 1/16	30-35	23-28	1 1/4

If a connection is made with steel to aluminum or copper, use torques for aluminum. In other words, use the lower torque specification.

Use steel torques only when both ends of connection are steel.

Figure 11-20—Pipe and Hose Connection Torque Chart

A radiator with greater fin area and a larger fan to increase cooling system efficiency are included on all cars equipped with factory installed air conditioner. Also a fan clutch is used.

Air conditioning equipped cars have the fuel vapor by-pass system. This consists of a special fuel filter and fuel return lines which allow a constant flow of fuel from gas tank to filter and back to tank. This reduces the possibility of vapor lock when operating in extreme hot weather.

Any service work that requires loosening a pipe connection should be performed only by qualified service personnel who have attended either Buick or other automotive air conditioner training schools. Whenever a hose or pipe is disconnected from any unit, refrigerant will escape. Any work involving the handling of refrigerants requires special equipment and a knowledge of its proper use.

The air conditioner uses shrader valve fittings instead of shut-off service valves; therefore, whenever a part is removed that is in the refrigeration circuit or a line disconnected, the refrigerant must be discharged from system as described in Paragraph 11-16.

a. Description of Components

NOTE: See par. 11-13 for description of compressor.

1. Hoses and Pipes. The connecting hoses are made from a high temperature, high pressure synthetic rubber with double cord reinforcements. All hose and pipe ends are fitted with O-ring fittings.

A muffler is located in compressor discharge line to reduce the characteristic pumping sounds of the compressor.

The shrader service valves are located in the lines and in the suction throttle valve as shown in Figures 11-27, 11-106 and 11-107.

2. Condenser. The condenser is similar to the ordinary car radiator but is designed to withstand much higher pressures. The condenser is constructed out of aluminum for less weight and is mounted in front of the radiator so that it receives a high volume of air. Air passing over the condenser cools the hot high pressure refrigerant gas, causing it to condense into high pressure liquid refrigerant.

3. Receiver-dehydrator. The receiver-dehydrator is located at the right front of engine compartment. A liquid indicator or sight glass is an integral part of the outlet pipe of the receiver-dehydrator. The sight glass provides a quick way at temperatures higher than 70° F. of determining whether or not the refrigerant charge is sufficient, the sight glass is designed and located so that a shortage of refrigerant at the receiver outlet will be indicated by the appearance of bubbles or foam underneath the glass when the compressor is operating.

CAUTION: Continuous bubbles may appear in a properly charged system on a cool day. With low temperature surrounding air this bubbling may be considered normal.

The purpose of the receiver part of assembly is to insure a solid column of liquid refrigerant to the thermostatic expansion valve at all times, provided the system is properly charged. The dehydrator part of assembly is to absorb any moisture that might be present in system after assembly. Also, it traps foreign material which may have entered system during assembly.

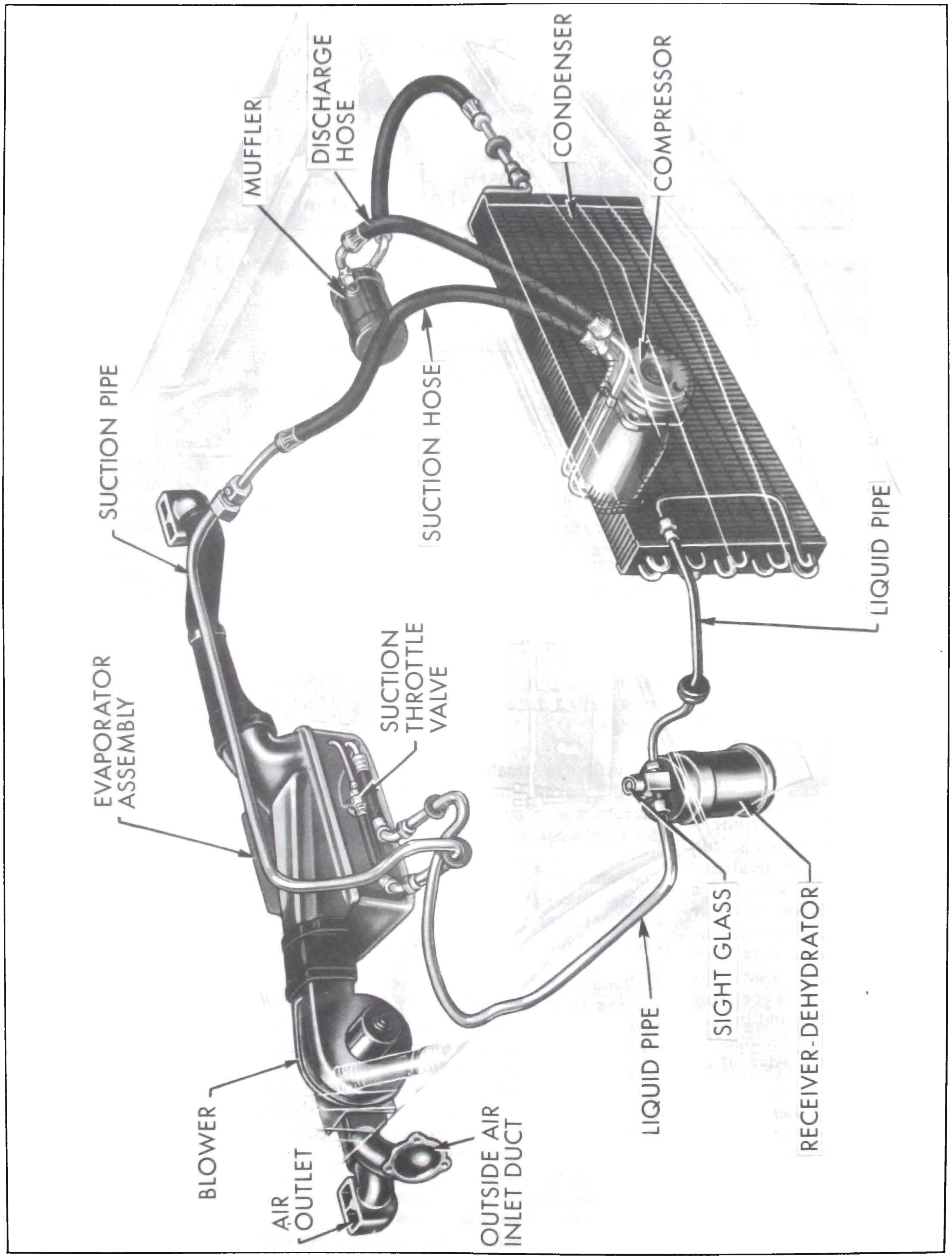

Figure 11-21—Air Conditioner Installation - V-8 Engine

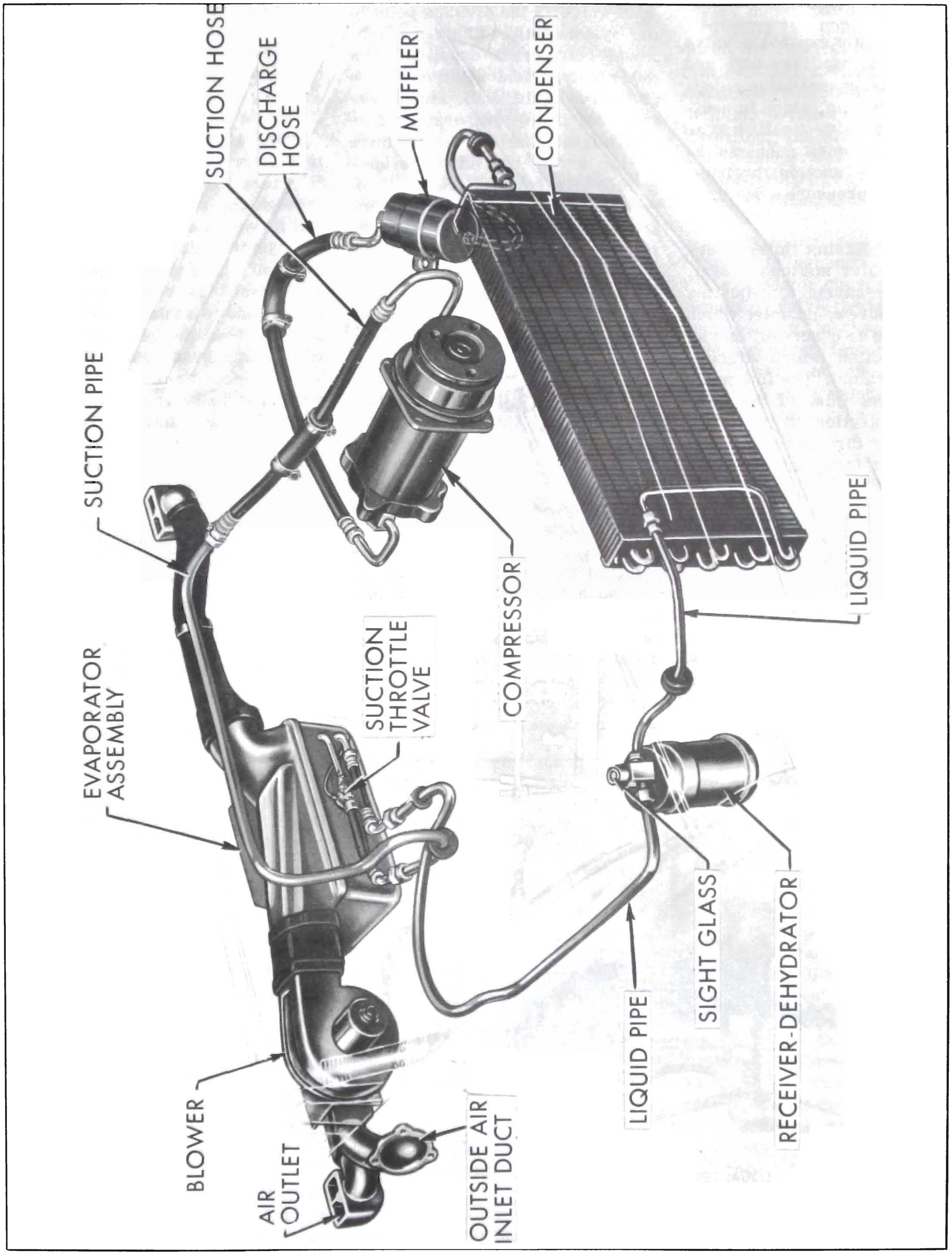

Figure 11-22—Air Conditioner Installation - V-6 Engine

4. Thermostatic Expansion Valve.

The thermostatic expansion valve consists of a capillary bulb and tube which is connected to an operating diaphragm (which is sealed within the valve itself) and an equalizer line which connects the valve with the suction throttling valves outlet pressure. See Figure 11-23.

The valve contains three operating pins, valve stationary seat, valve, valve carriage, adjusting spring and screw, an inlet which has a fine mesh screen, and an outlet connection (which attaches to the evaporator). The fine mesh screen at the inlet of the valve provides protection to the valve by preventing dirt and other foreign material from entering the valve.

While this valve is located at the inlet of the evaporator, the thermo bulb is attached to the evaporator outlet pipe.

The purpose of the thermostatic expansion valve is to regulate the flow of liquid refrigerant into the evaporator automatically in accordance to the requirements of the evaporator.

This valve is the dividing point in the system between high pressure liquid refrigerant supplied from the receiver and relatively low pressure liquid and gaseous refrigerant in the evaporator. It is so designed that the temperature of the refrigerant at the evaporator outlet must have 6° F. of superheat before more refrigerant is allowed to enter the evaporator. Superheat is an increase in temperature of the gaseous refrigerant above the temperature at which the refrigerant vaporized.

A capillary tube filled with carbon dioxide and the equalizer line provide the temperature regulation of the expansion valve. This capillary tube is fastened to the low pressure refrigerant pipe coming out of the evaporator so that it communicates the temperature of the refrigerant at this point to the expansion valve. If the superheat at the outlet decreases below 6°F., the expansion valve will automatically reduce the amount of refrigerant entering the evaporator, thus reducing the amount of cooling. If the superheat increases, the expansion valve will automatically allow more refrigerant to enter the evaporator, thus increasing the cooling.

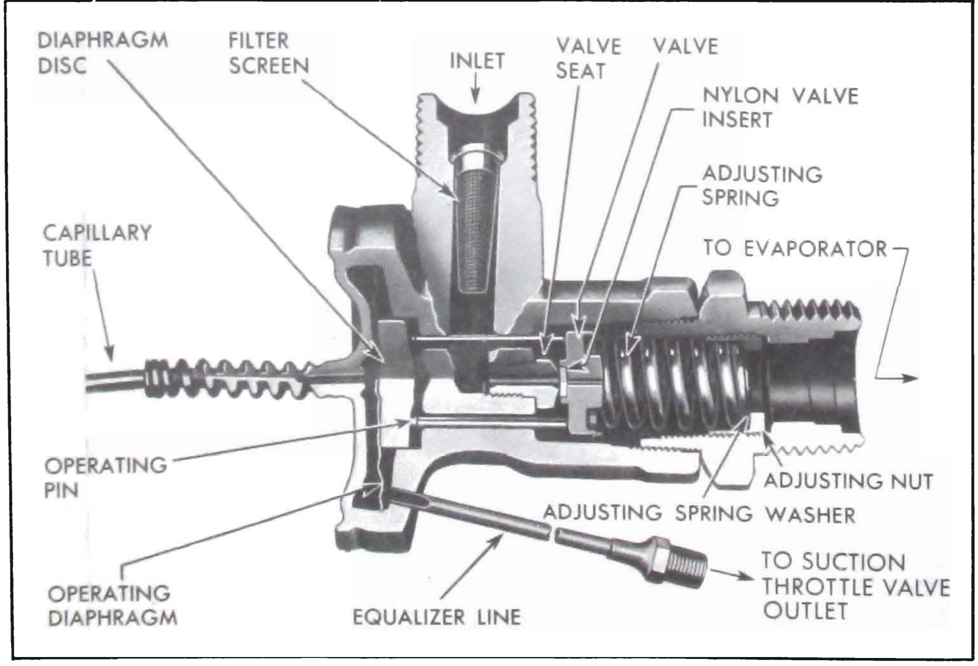

Figure 11-23—Thermostatic Expansion Valve

It is the temperature of the air passing over the evaporator core that determines the amount of refrigerant that will enter and pass through the evaporator. When the air is very warm, the heat transfer from the air to the refrigerant is great and a greater quantity of refrigerant is required to cool the air and to achieve the proper superheat on the refrigerant gas leaving the evaporator. When the air passing over the evaporator is cool, the heat transfer is small and a lesser quantity of refrigerant is required to cool the air and to achieve the proper superheat on the refrigerant gas leaving the evaporator.

A mechanical adjusting nut located within the valve is provided to regulate the amount of refrigerant flow through the valve and moves the spring seat to increase or decrease the tension on the valve carriage spring. By varying the tension on this spring, it is possible to regulate the point at which the valve begins to open or close, thereby regulating refrigerant flow into the evaporator. As this adjustment feature is inside the valve, no external adjustment is possible. All valves are preset at the time of manufacture.

Since the evaporator outlet pressure is proportionate to the amount of heat (superheat) picked up by the refrigerant gas in passing through the evaporator, it can be seen that adjusting spring tension which works against capillary pressure and equalizer line pressure controls the volume of refrigerant entering the evaporator as signaled by the temperature and pressure in the evaporator outlet pipe.

When the air conditioning system has not been operating, all pressures within the thermostatic expansion valve assembly will have equalized at the ambient (surrounding air) temperature, thus the pressure above and below the operating diaphragm and at the inlet and outlet side of the valve will be equal. (Pressure under the diaphragm is evaporator pressure. It reaches this area by means of clearance around the operating pins in the valve body which connects the area under the diaphragm with the evaporator pressure area.) While pressures in the expansion valve are almost equal, the addition of the valve adjusting spring pressure behind the valve will hold the valve over to close the valve orifice.

When the air conditioning system first begins to operate, the compressor will immediately begin to draw refrigerant from the low pressure lines, equalizer tube and evaporator, lowering the pressure in the evaporator and in the area under the operating diaphragm. As the pressure in this area decreases, the pressure above the diaphragm exerted by the carbon dioxide in the capillary tube will overcome spring pressure and push the diaphragm against the operating pins, which in turn will force the valve off its seat.

Refrigerant will then pass through the expansion valve into the evaporator where it will boil at a temperature corresponding to the pressure in the evaporator. This will begin cooling the air passing over the evaporator, and also, it will begin to cool the evaporator outlet pipe.

As the evaporator outlet pipe cools, the pressure of the carbon dioxide in the capillary tube (contacting this outlet pipe) decreases, exerting less force on the operating diaphragm.

The valve adjusting spring is calibrated so that the pressure of the refrigerant in the evaporator outlet pipe and equalizer line to the valve plus the spring force, will equal the force above the operating diaphragm when the temperature of the refrigerant in the evaporator outlet is 6°F. above the temperature of the refrigerant entering the evaporator. In other words, the refrigerant should remain in the evaporator long enough to completely vaporize and then warm (superheat) 6°F.

If the temperature differential begins to go below 6°F. (outlet pipe becoming too cold), carbon dioxide pressure in the capillary tube and area above the diaphragm decreases, allowing the valve adjusting spring to move the valve towards its seat, closing off the flow of refrigerant past the valve.

If the temperature differential begins to go above 6°F. (outlet pipe too warm), the pressure in the capillary tube and area above the operating diaphragm will increase, pushing this diaphragm against the operating pins to open the valve further, admitting more refrigerant to the evaporator.

The equalizer line joins the expansion valve to the suction throttle valve outlet so that this pressure will be imposed on the expansion valve diaphragm, thus, over-riding its normal control of liquid refrigerant. As the compressor capacity becomes greater than the evaporator load, the drop in compressor suction line pressure forces the expansion valve to flood liquid through the evaporator and suction throttle valve, thus preventing the compressor suction pressure from dropping below a predetermined pressure.

The equalizer line is used primarily to prevent prolonged and constant operation of the compressor in vacuum conditions. This operation is considered undesirable both from a noise angle and from possibility of subjecting the compressor to reduced oil return. Second considerations for having the external equalized expansion valve is to maintain a full evaporator during throttling, and also guard against non-condensibles entering the system especially through loosened fittings.

5. Evaporator Assembly. The evaporator assembly consists of the evaporator core, thermostatic expansion valve, the blower switch and resistor, mechanism for outside air valve, temperature control lever and the center air outlet. All these parts are enclosed in a plastic housing assembly located under the center of the instrument panel. See Figure 11-24. The case has provisions for two drain hoses, for an air inlet duct from blower and for the ducts to each of the air outlets located under each end of instrument panel.

The evaporator core is aluminum tube and fin and is of serpentine tube construction.

The evaporator is actually the device which cools and dehumidifies the air. High pressure liquid refrigerant flows through the orifice in the thermostatic expansion valve into the low pressure area of the evaporator. This regulated flow of refrigerant boils immediately. Heat from the core surface is lost to the boiling and vaporizing refrigerant which is cooler than the core, thereby cooling the core. The heat in the air passing over the evaporator is lost to the cooler surface of the core, thereby cooling the air. As the process of heat loss from the air to the evaporator core surface is taking place, any moisture (humidity) in the air condenses on the outside surface of the evaporator core and is drained off as water, through drain tubes and onto the road.

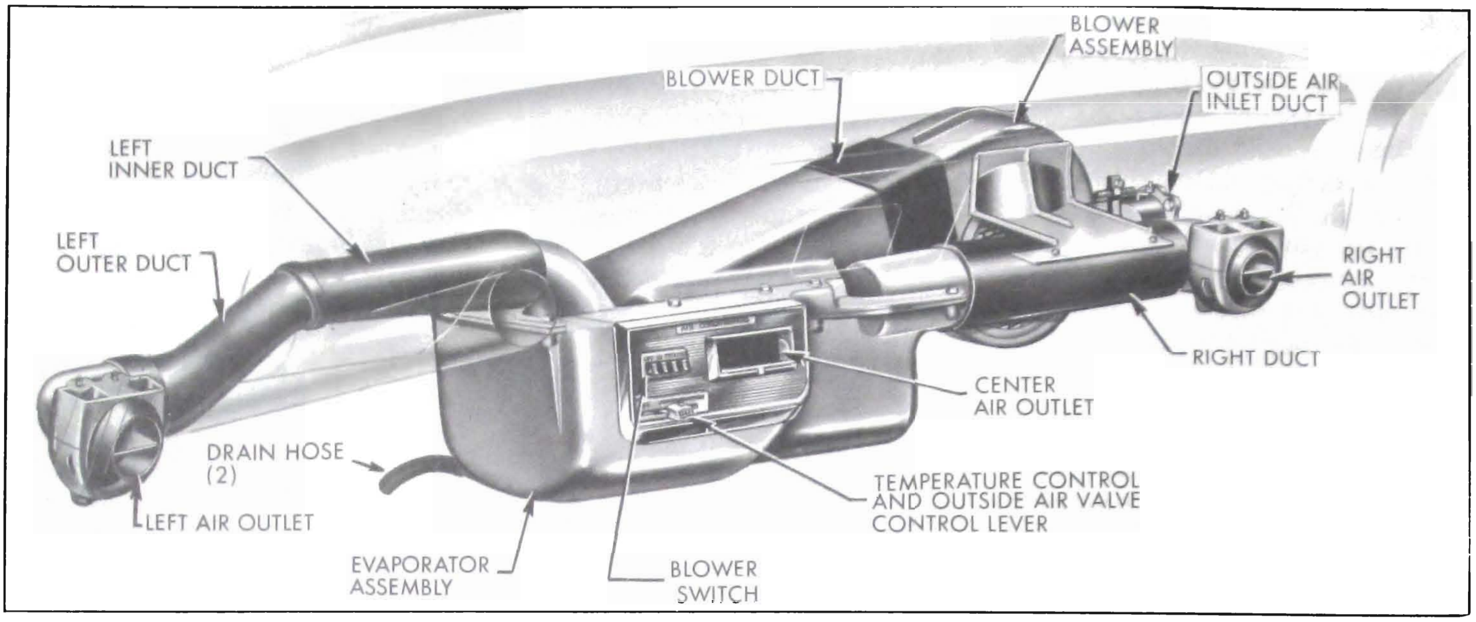

Figure 11-24—Evaporator Assembly and Air Outlets

Since Refrigerant-12 will boil at 21.7°F. below zero at atmospheric pressure while water freezes at 32°F., it becomes obvious that the temperature in the evaporator must be controlled so that the water collecting on the core surface will not freeze in the fins of the core and block off the air passages. In order to control the temperature, it is necessary to control the amount of refrigerant entering the core and the pressure inside the evaporator.

To obtain maximum cooling, the refrigerant must remain in the core long enough to completely vaporize and then superheat a minimum of 6°F. If too much or too little refrigerant is present in the core, then maximum cooling efficiency is lost. A thermostatic expansion valve, in conjunction with the suction throttle valve is used to provide this necessary refrigerant volume control.

The tube and fin coils used in the evaporator are very long. This length, in combination with the relatively small inner diameter, causes the pressure of the refrigerant to decrease as it passes through the coils.

Because of this pressure drop, the pressure at the core inlet is greater than the pressure at the outlet. Also, the outlet pressure is allowed to fall below 30 psi (the pressure at which refrigerant will boil at 32°F.) without the danger of water freezing on the core surface, provided, the blower is always turned on when the air conditioner is being operated. This low pressure control is possible since the drop in inlet pressure, caused by the length of the tubes, is gradual with only a very small portion of the tube end maintaining pressures below 30 psi. The average temperature of entire evaporator core is at or above 32°F. as long as there is air flow through the core.

6. Suction Throttle Valve

The suction throttle valve (STV) which is located at the back side of the evaporator, controls the evaporator pressure and in turn the evaporator air outlet temperature. See Figure 11-26. Also, the STV prevents freezing of the condensation on the evaporator core surface. The manually operated STV consists of a valve body, piston, piston diaphragm, retainer cup, cover, inner and outer control springs, control lever, helper springs and actuating pin. See Figure 11-27.

The flow of low pressure vapor from the evaporator to the compressor is determined and controlled by the position of the piston in the valve body. The position of the piston is determined by the balance of the forces that are applied to the piston diaphragm. These forces consist of the refrigerant vapor pressure returning from the evaporator on one side versus the spring tension of the outer spring plus the inner spring depending on the position of the control lever on the other side.

When the STV is set at maximum cooling ("cold" lever on evaporator case at extreme right) the control lever on the valve is positioned so that the actuating pin is not compressing the inner spring in the valve cover. The larger outer spring is the only control on the amount of evaporator pressure it takes to move the piston and diaphragm. The full flow of low pressure refrigerant vapor is being returned to the compressor to permit it to exert its full capacity on the

REFRIGERANT-12
PRESSURE-TEMPERATURE RELATIONSHIP

The table below indicates the pressure of Refrigerant-12 at various temperatures. For instance, a drum of Refrigerant at a temperature of 80°F. will have a pressure of 84.1 psi. If it is heated to 125°F. the pressure will increase to 167.5 psi. It also can be used conversely to determine the temperature at which Refrigerant-12 boils under various pressures. For example, at a pressure of 30.1 psi, Refrigerant boils at 32°F.

TEMP. (°F.)	PRESSURE (PSIG)	TEMP. (°F.)	PRESSURE (PSIG)
-21.7	0 (atmospheric pressure)	55	52.0
		60	57.7
-20	2.4	65	63.7
-10	4.5	70	70.1
- 5	6.8	75	76.9
0	9.2	80	84.1
5	11.8	85	91.7
10	14.7	90	99.6
15	17.7	95	108.1
20	21.1	100	116.9
25	24.6	105	126.2
30	28.5	110	136.0
32	30.1	115	146.5
35	32.6	120	157.1
40	37.0	125	167.5
45	41.7	130	179.0
50	46.7	140	204.5

Figure 11-25—Pressure-Temperature Relationship of Refrigerant-12

evaporator and produce maximum cooling. The outer spring is set so that evaporator pressure will not go below a predetermined minimum, therefore some throttling of the refrigerant vapor will occur to prevent evaporator icing. The adjustment for maximum cooling is accomplished by changing the position of the adjusting screw with J-9505 spanner wrench. Turning this screw into the valve cover increases the outer spring force which applies a greater force to the diaphragm and piston. This in turn causes the evaporator pressure to raise or increase. Turning this screw out of the cover, reduces the load on the outer spring and causes the evaporator pressure to lower or decrease.

If a higher outlet temperature is desired, the "Cold" lever is moved from the extreme right position. This moves the control lever on the valve, which positions the actuating pin against the inner spring located in the cover. The inner spring applies an additional force against the piston diaphragm to provide a higher evaporator pressure which reduces cooling. The force of the inner spring is varied, according to the setting of the "Cold" lever on the evaporator case which controls the position of the actuating pin in the cover. The minimum cooling adjustment has been set by the position of the threaded stem of the actuating pin in the plastic adjusting nut. This should not be changed, except in a case of where a valve is overhauled.

The purpose of the small buffer spring located in the adjusting screw end of the cover is to hold the internal parts in the cover in their proper position. Any force exerted by this spring on the operation of the valve is negligible.

The manual operated STV has two external coil springs to compensate for the force of the inner spring and reduces the effort required by the bowden wire when it is desired to change the valve setting. These springs are called "helper" springs and are usually attached to the outer notches on the control lever. Additional inner notches are provided should it be necessary to increase the compensation.

The STV has a low pressure gauge fitting used for checking evaporator pressure when performing the functional test on the air conditioner system or when adjusting the STV. Also the valve has a fitting which connects STV outlet pressure to the expansion valve's equalizer line.

When the suction throttle valve is set at maximum cooling, the evaporator pressure is allowed to go to a minimum of approximately 23 psi (at 900 feet elevation). If pressure is allowed to go any lower, icing of the evaporator may occur.

When the suction throttle valve is set at minimum cooling, the

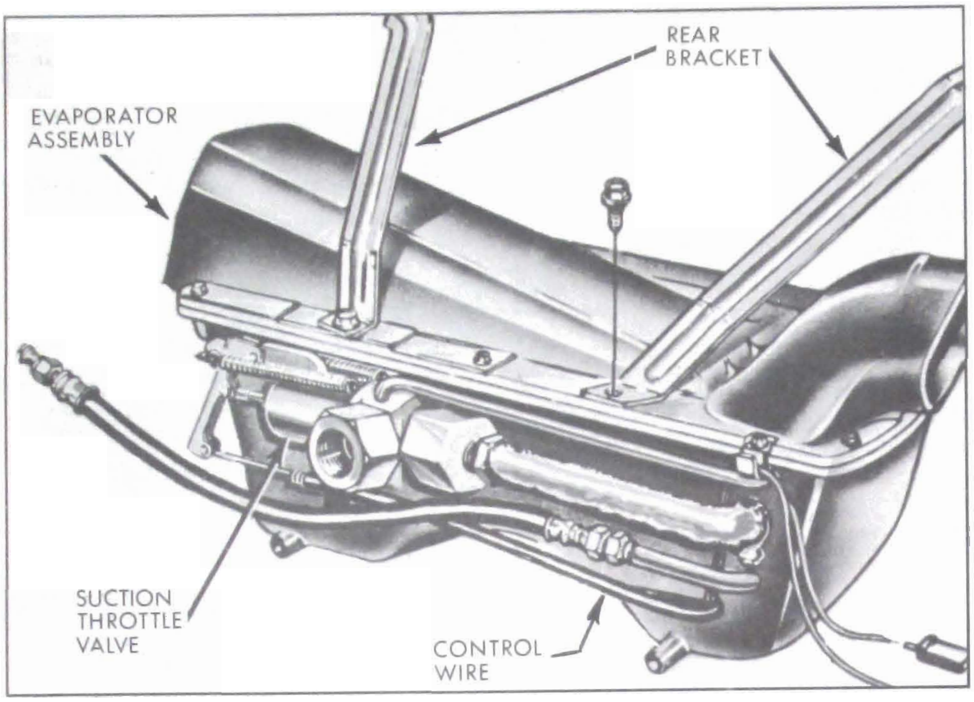

Figure 11-26—Location of Suction Throttle Valve

which extends through cowl side panel, just above right ventilator. See Figure 11-105. This duct which is provided with an outside air valve that is controlled by the "cold" control lever on evaporator case, allows outside air to be drawn into air conditioner air system. When the "cold" lever is moved from the extreme left position, the outside air valve is fully opened to outside air.

There are three main air outlets. A center outlet located in the evaporator case which may be shut off, and two ball-type outlets, one at each end of instrument panel which may be adjusted in any given direction. Also a group of small holes in the ducts from evaporator provide front floor cooling. Air flow through the air conditioner when blower

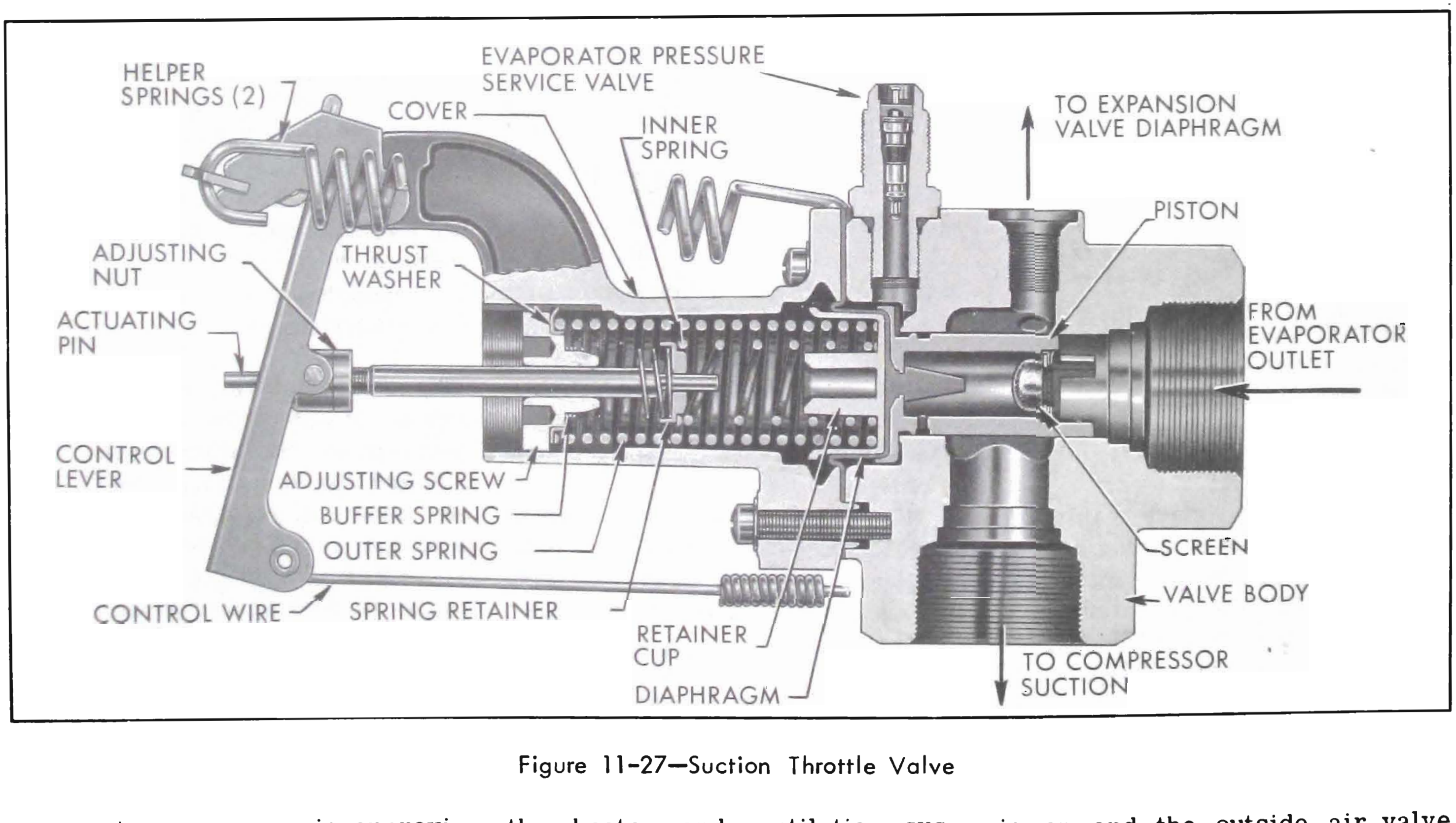

Figure 11-27—Suction Throttle Valve

evaporator pressure is approximately 50 psi (at 900 feet elevation).

7. Air Distribution System. The air conditioner air distribution system is entirely separate from the heater and ventilation systems. The air conditioner blower is located under the right side of instrument panel. See Figure 11-28. The blower air inlet is open to the car interior. Located at blower inlet is a duct is on and the outside air valve is open, is shown in Figure 11-28.

8. Controls. The air conditioner controls which are located in the evaporator case consist of four push buttons and a lever. See

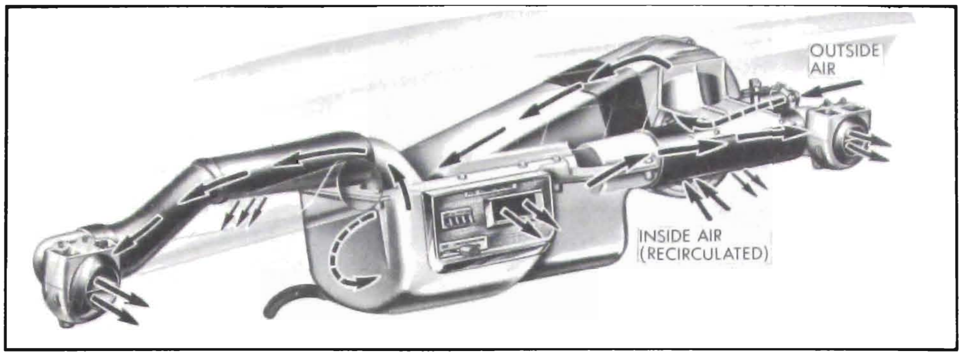

Figure 11-28—Air Flow

Figure 11-29. The push buttons provide an "OFF" and three blower speeds, low, medium and high. When the low, medium or high button is depressed, an electrical circuit is completed to the clutch of the compressor. The lever labeled "COLD" operates the outside air valve and determines the evaporator discharge air temperature. This lever is connected to the suction throttle valve and the outside air valve by control wires. When the "COLD" lever is at the extreme left, the suction throttle valve is set for minimum cooling and the outside air valve is closed. Moving the lever to the right fully opens the outside air valve and sets the suction throttle valve to increase cooling or lower the outlet air temperature.

When the "Cool" lever is at the extreme right, the suction throttle valve is set for maximum cooling. To operate the air conditioner, the "Lo", "Med" or "Hi" button on evaporator case must be depressed. This turns blower and compressor on. Desired air outlet temperature is obtained by the "Cold" lever on the evaporator case.

It is not necessary to turn the air conditioner off when cranking engine. When the ignition switch is turned to the start position, the accessory terminal of the ignition switch is cut out. This prevents operations of the accessories connected through the ignition switch while starting the engine. Thus, the starting motor does not have to turn the compressor while cranking the engine because there is no current to the air conditioning electrical system.

b. Operation of Air Conditioner Controls

To place air conditioner in operation for maximum cooling:

1. Make sure heater and ventilation systems are off. Close all car windows.

2. Depress "Hi" button on evaporator case. See Figure 11-29. This turns blower on high speed and starts compressor.

3. Move "COLD" control lever to extreme right (Maximum cooling) position. (This positions the suction throttle valve and fully opens outside air valve.)

4. When desired car interior temperature has been reached, it may be necessary to reduce

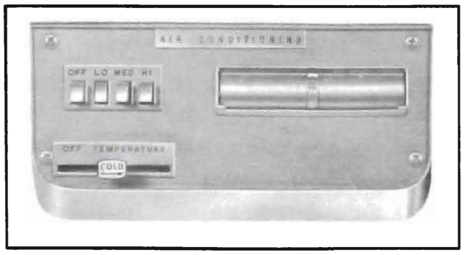

Figure 11-29—Air Conditioner Controls

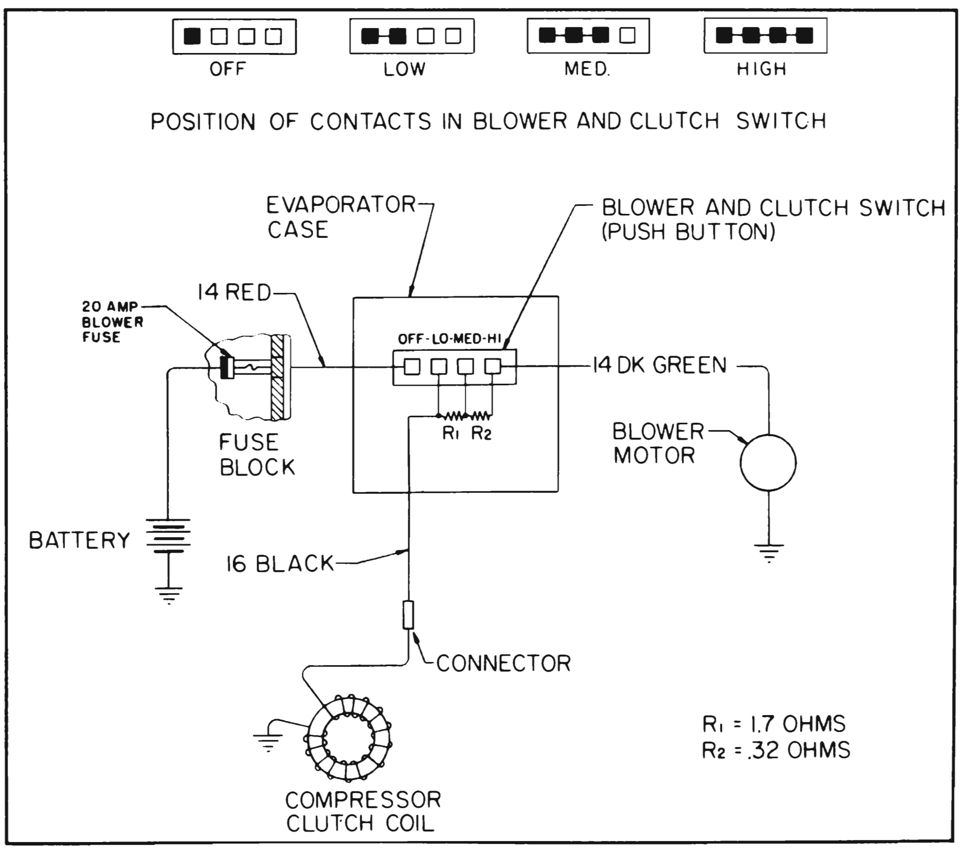

Figure 11-30—Air Conditioner Wiring Circuit Schematic

blower speed to maintain temperature at a satisfactory level by pushing either medium or low button.

It also may be desirable to reposition "COLD" control lever.

It is not necessary to turn air conditioner off when cranking engine.

Operate air conditioner for a few minutes several times a month during the winter months or when it has not been in operation for a period of time. This will lubricate the compressor seal and prevent possible loss of refrigerant.

c. Operation of Air Conditioner Refrigeration Circuit

Cool refrigerant 12 gas is drawn into the compressor from the evaporator and pumped from the compressor to the condenser under high pressure. See Figure 11-31. This high pressure gas will also have a high temperature as a result of being subjected to compression. As this gas passes through the condenser, the high pressure, high temperature gas rejects its heat to the outside air as the air passes over the surfaces of the condenser. The cooling of the gas causes it to condense into liquid refrigerant. The liquid refrigerant, still under high pressure passes from the bottom of the condenser into the receiver-dehydrator. The receiver acts as a reservoir for the liquid.

The liquid refrigerant flows from receiver-dehydrator to the thermostatic expansion valve. The thermostatic expansion valve meters the high pressure refrigerant flow into the evaporator. Since the pressure in the evaporator is relatively low, the refrigerant immediately begins to boil. As the refrigerant passes through the evaporator, it continues to boil, drawing heat from the surface of the evaporator core warmed by the air passing over the surfaces of evaporator core. In addition to the warm air passing over the evaporator rejecting its heat to the cooler surfaces of the evaporator core, any moisture in the air condenses on the cool surfaces of the core, resulting in cool dehydrated air entering inside the car. By the time the gas leaves the evaporator, it has completely vaporized and is slightly superheated. Superheat is an increase in temperature of the gaseous refrigerant above the temperature at which the refrigerant vaporized.

The pressure in the evaporator is controlled by the suction throttle valve as described in subparagraph a, item number 6.

Refrigerant vapor passing through the evaporator, flows through the suction throttle valve and is returned to the compressor where the refrigeration cycle is repeated.

11-13 DESCRIPTION AND OPERATION OF AIR CONDITIONER COMPRESSOR

Two air conditioner compressor assemblies are used, one for the V-6 engine installation and the other for the V-8 engine installation. The only difference between these compressors is the rear heads. Different rear heads are required due to the attachment of the compressor to the engine. See Figure 11-34. The V-6 engine compressor is located at the upper left front side of the engine and the V-8 engine compressor is located at the lower left front side of the engine. See Figures 11-21 and 11-22. The compressors are driven by only one belt and belt adjustment is obtained by moving the compressor on its pivot bolts.

The compressor is of basic double action piston design. Three horizontal double acting pistons make up a six-cylinder compressor, and are mounted axially around the compressor shaft to operate in a front and rear cylinder assembly. These pistons operate in a 1-1/2" bore, have a 1-1/8" stroke and are actuated by a swash plate pressed on the compressor crankshaft. See Figure 11-32.

Reed-type suction and discharge valves are mounted in a valve plate between the cylinder assembly and the head at each end of the compressor. The ends are connected with each other by gas-tight passage ways which direct refrigerant gas to a common output.

a. Suction Reed Valves and Discharge Valve Plates

A three-reed suction valve disc is assembled to both the front and rear cylinder heads. See Figure 11-33. These reeds open when the pistons are on the intake portion of their stroke to allow the low pressure vapor to flow into the cylinders.

When the pistons reverse and are on the compression portion of their stroke, the reed valves close against their seats to prevent the high pressure vapor being forced back into the low side of the system.

There are two discharge valve plate assemblies, each having three reeds and retainers positioned to direct the high pressure vapor from the cylinders into the outer annular cavities of the front and rear head castings. When the piston has completed its compression stroke and reverses to the suction stroke, the high pressure vapor in the discharge cavity causes the reeds to close, thus maintaining the differential of pressure between the high and low pressure areas.

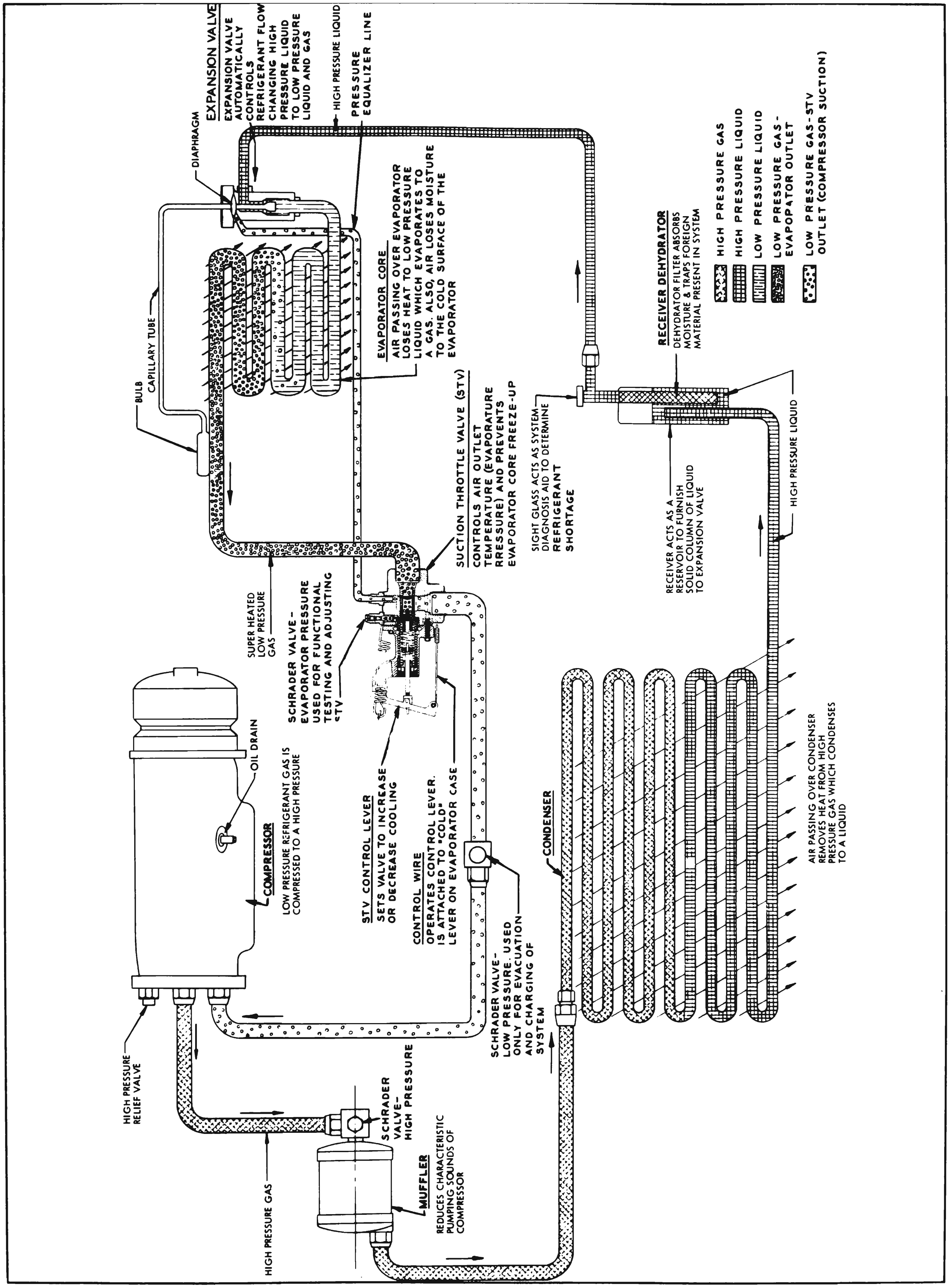

Figure 11-31—Air Conditioner Refrigeration Circuit

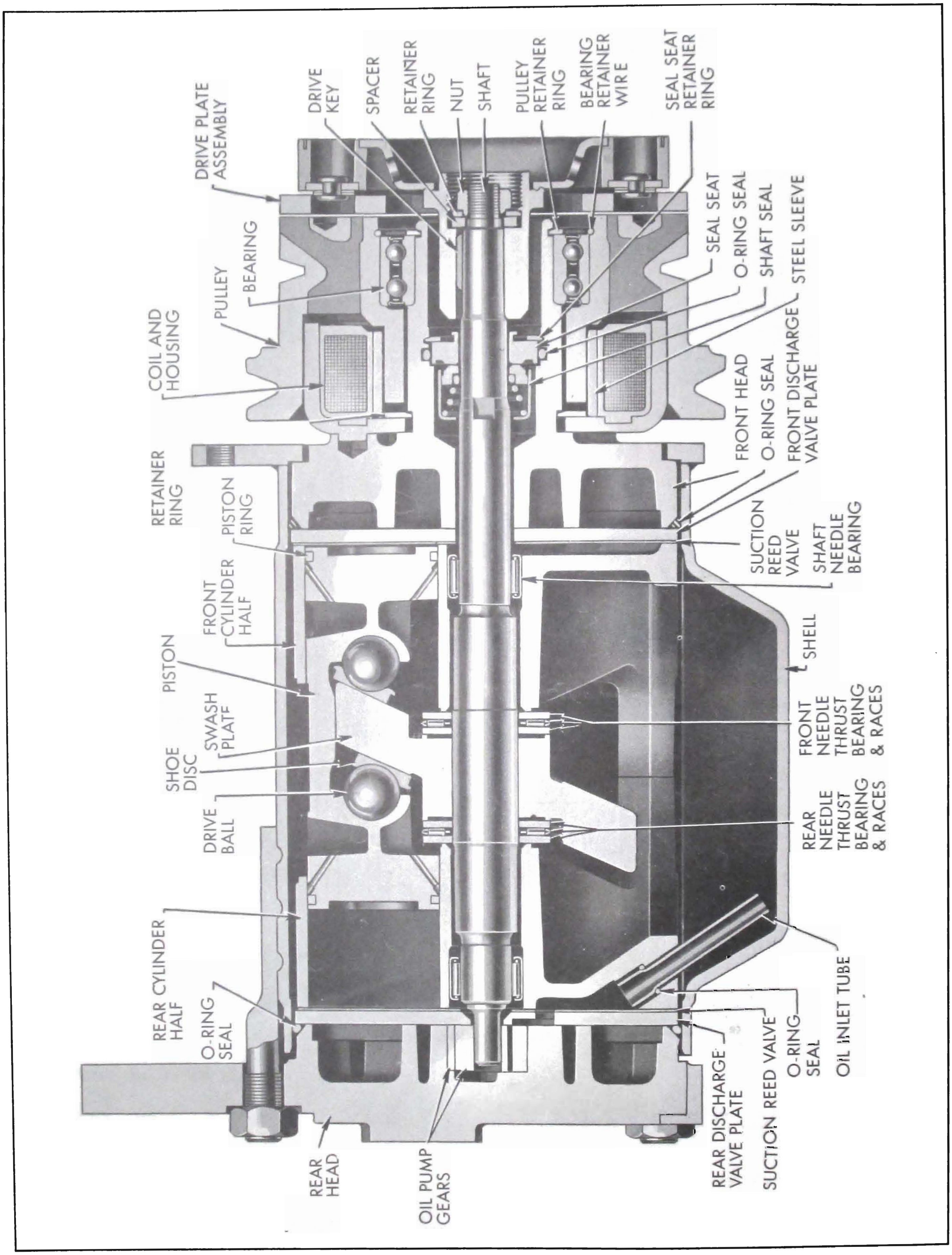

Figure 11-32—Sectional View of Compressor

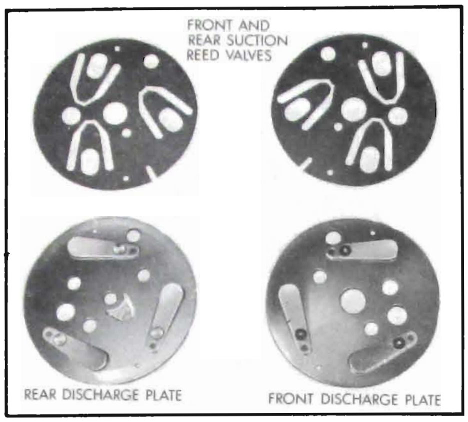

Figure 11-33—Suction and Discharge Valves

b. Cylinder Heads

Each cylinder head contains suction and discharge cavities. In addition, the rear head contains an oil pump cavity in the center of the suction cavity to house the oil pump gears (which are driven by the compressor main shaft). See Figure 11-34. The suction cavity is in the center and indexes with the suction reeds. The discharge cavity is around the outside and indexes with the discharge reeds.

These cavities are sealed from each other with a teflon seal molded onto the cylinder head. The discharge cavity is sealed from the outside of the compressor by an O-ring seal which rests in a chamfered relief in the cylinder head and compresses against the compressor body.

Both cylinder heads are connected with each other; the suction cavities by a flat suction crossover "cover," the discharge cavity by a tube pressed into each head. (Service discharge crossover tube assemblies are sealed with O-rings and spacers.)

c. Oil Pump

An oil pump mounted at the rear of the compressor picks up oil from the bottom of the compressor and pumps it to the internal

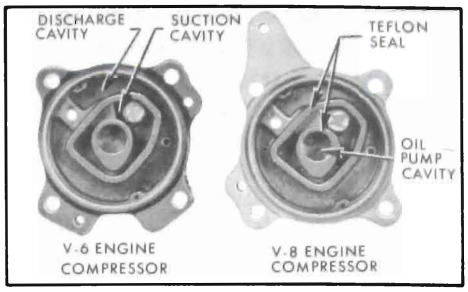

Figure 11-34—Compressor Rear Heads

parts. The inner gear has a "D" shaped hole in the center which fits over a matching "D" flat on the rear of the main shaft. The outer driven gear has internal gear teeth which mesh with the external teeth on the inner (drive) gear.

d. Main Shaft

The compressor main shaft is driven by the pulley when the coil is energized. It extends through the compressor front head, to the compressor rear head and drives the oil pump in the rear head. The shaft is supported by a needle roller bearing located in the front half of the cylinder and a similar needle roller bearing in the rear half of the cylinder.

A 3/16" diameter oil passage extends from the rear oil pump cavity to the shaft seal cavity. Four 5/64" diameter holes are drilled at 90° to the main oil passage. These drilled passages direct oil under pump pressure to the shaft seal surfaces, thrust bearings, and shaft-cylinder bearings. See Figure 11-35.

e. Thrust Bearings and Races

Two needle thrust bearings are seated around the shaft and are located near the center of the compressor. These bearings have rollers placed radially in their housing. Each bearing is "sandwiched" between two steel thrust

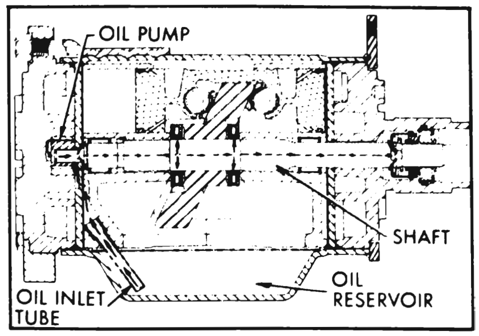

Figure 11-35—Oil Flow in Compressor

races, and this combination of three pieces is placed between the shoulders of the swash plate and the shoulders of the cylinder hubs on the front and rear halves of the cylinder.

The FRONT end combination, consisting of a needle bearing with a selected thrust race on each side, provides the proper head clearance below the top of cylinder and the underside of the suction and discharge valve plates. See Fig. 11-36.

The REAR end combination, consisting of a needle bearing with a selected thrust race on each side, obtains a .0005" to .0015" running clearance between the hub surfaces of the swash plate and the front and rear hubs of the cylinder. See Figure 11-36.

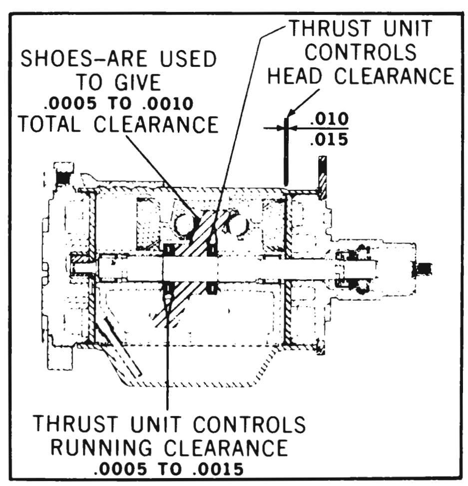

Figure 11-36—Compressor Internal Clearances

f. Cylinder Block and Piston

The cylinder block consists of two halves, front and rear. Three piston bores in each half are line bored as one assembly during production to assure proper alignment and parallelism. After boring, the cylinder block is parted at the center and these faces are ground parallel to the two outer ends of the cylinder.

Alignment and register of the two halves are maintained by two cylindrical locator (roll) pins. It is important that the two halves of the cylinder be kept together to assure correct relationship of parts. Cylinder block assemblies are only serviced in sets (front and rear halves).

The double end pistons are made of cast aluminum, with a "bridge" connecting each end. Each piston has a notch cast in this bridge. This notched end of the piston is to be positioned toward the FRONT end (pulley end) of the compressor. See Figure 11-70. The pistons have a counter-bore of 1 inch diameter by .093" depth in each head on both ends of the piston.

Both ends of the pistons have a groove to receive a piston ring. Two oil return holes are drilled behind the ring groove and extend toward the center area of the piston to allow oil to drain to the compressor oil sump. The piston rings have an oil scraper groove at one edge (to be positioned toward the center of the piston) to wipe any excess oil back into the oil sump (reservoir) through the oil return holes.

A spherical cavity is located in the inside center on each side of the pistons to receive the piston hardened steel drive balls.

g. Shoe Discs

Shoe discs are made of bronze and one side is a flat surface which contacts the surface of the swash plate. The opposite side has a coined concave surface into which is assembled the drive ball.

These shoes are provided in .0005" variations and ten sizes are available for servicing these parts. Included in these ten is a basic ZERO shoe to permit simple gauging operations.

All service shoes will be marked with the shoe size, which will also correspond to the last three digits of the part number.

h. Swash Plate

An angular shaped member (swash plate) is located near the center of the compressor. The swash plate changes the rotating action of the shaft to provide a reciprocating driving force to each of the three pistons. This driving force is applied, through the shoes and balls, to the midpoint of each of the double end pistons. The swash plate has two angular faces ground smooth and parallel to permit smooth sliding of the shoe discs.

The plate is a press fit on to the drive shaft and is positioned by a Woodruff key located in the shaft. The swash plate and shaft are serviced only as an assembly.

i. Suction Cross Over Cover

Since the pistons are double-acting, low pressure vapor from the evaporator must be supplied to both ends of the compressor and pistons.

The inlet (suction) port on the rear head of the compressor is connected by a line to the outlet side of the evaporator. A fine mesh suction screen is located in the low pressure inlet cavity of the rear head. Its purpose is to trap any material (larger than the mesh size) that would damage the compressor mechanism. See Figure 11-37.

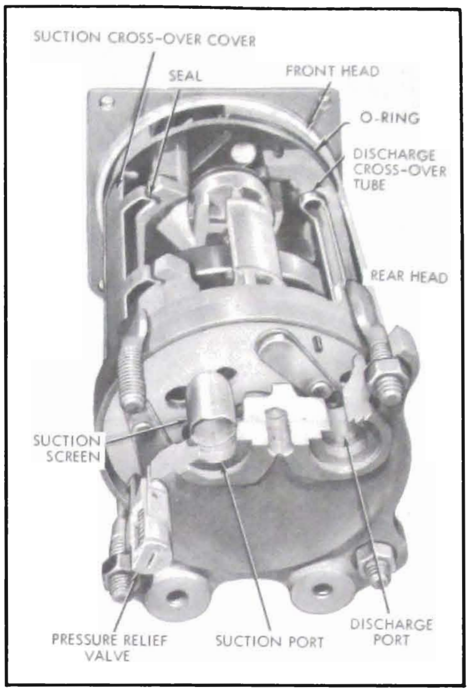

Figure 11-37—Cutaway Compressor - Rear View

A flat rectangular cavity is cast into the outer face of the front and rear cylinders. The edges of this cavity are machined into a "dovetail" shape to retain a rectangular suction cross-over with a neoprene seal around its edges. This cover and seal form a passage for the low pressure vapor to flow from the rear head of the compressor to the front head and thus supply suction refrigerant to the pistons and cylinders at the front of the compressor.

j. Production Type Discharge Cross Over Tube

The double-acting pistons produce high pressure vapor at both ends of the compressor. The outlet (discharge) port for the high pressure vapor is located in the rear head of the compressor. See Figure 11-37.

A discharge vapor tube is used to connect the front head discharge cavity to the rear head discharge cavity. This tube has cylindrical ends that are spun into a hole in the front and rear cylinder head casting to provide a vapor tight joint. The center of this tube has a flattened cross-section to provide clearance between the swash plate and tube.

When the pistons in the front end of the cylinder are on their compression stroke, the high pressure vapor is caused to flow into the discharge cavity in the front head, through the discharge tube and into the rear head discharge cavity. This vapor combines with the high pressure vapor produced by the pistons in the rear cylinder head during their compression stroke and flows out the compressor discharge port.

k. Service Type Discharge Cross-Over Tube

The function and design of the service discharge tube are the same as that for the production type tube with the exception of shouldered sleeves located in both ends of the service tube. See Figure 11-38. These shoulders provide a surface for the O-rings and compression bushings. Since the production discharge tube is vapor sealed to the front and rear cylinder heads by "spinning in" the ends of the tube, equipment to perform this "spin in" operation during service operations would not be economical. Therefore, it should be necessary to separate the cylinder halves during a service operation, a service-type discharge tube should be used when reassembling the mechanism.

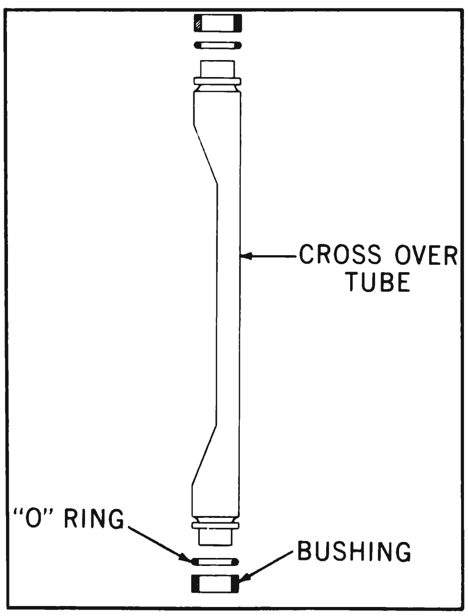

Figure 11-38—Service Type Discharge Cross-Over Tube

l. Pressure Relief Valve

The air conditioner has a high pressure relief valve. See Figure 11-37. If the discharge pressure ever exceeds approximately 440 psi, the relief valve opens automatically to relieve the pressure and closes again when the pressure recedes.

Opening of the relief valve will be accompanied by a loud popping noise, and perhaps the ejection of some oil with the refrigerant. Any condition that causes this valve to open should be corrected immediately.

On compressors used with the V-6 engine the pressure relief valve is located in rear head. See Figure 11-37. On V-8 engine compressor the valve is located in the high pressure line at the muffler.

m. Oil Drain Screw

An oil drain screw is located on the under side of the compressor shell. This screw is used just for draining and adding oil. It is not an oil test outlet as the oil level cannot be checked while the compressor is installed on the engine, due to the design of the compressor. It is not necessary to check compressor oil unless a large amount of oil has been lost. This could happen only with a sudden breaking of a line or some other serious break in system. If there has been a major loss of oil, the compressor should be removed and drained and oil added as outlined under Checking Compressor Oil and Adding Oil, paragraph 11-16, subparagraph 1.

n. Shell

The shell of the compressor has a mounting flange on the front end and four threaded screws welded to the outside at the rear. An oil sump is formed into the bottom of the shell with a baffle plate over the sump on the inside of the shell. The oil drain screw and gasket are in the wall of the shell.

The compressor serial number is located on a plate on top of the compressor. This number should be included in all Product Information Reports, claims or correspondence concerning the compressor. The compressor part number is also shown on the serial number plate.

o. Clutch and Pulley Assembly

The pulley assembly contains an electrically controlled magnetic clutch, permitting the compressor to operate only when refrigerated air is desired.

When the compressor clutch is not engaged, the compressor shaft does not turn, although the pulley is still being turned by the compressor belt.

The clutch armature plate, which is the movable member of the drive plate assembly, is attached to the drive hub through driver springs and is riveted to both members. The hub of this assembly is pressed over the compressor shaft and is aligned with a square drive key located in the keyway of the compressor shaft. This hub and drive plate assembly is retained by a spacer and retainer ring (assembled to the shaft) and is held in place with a lock nut. See Figure 11-39.

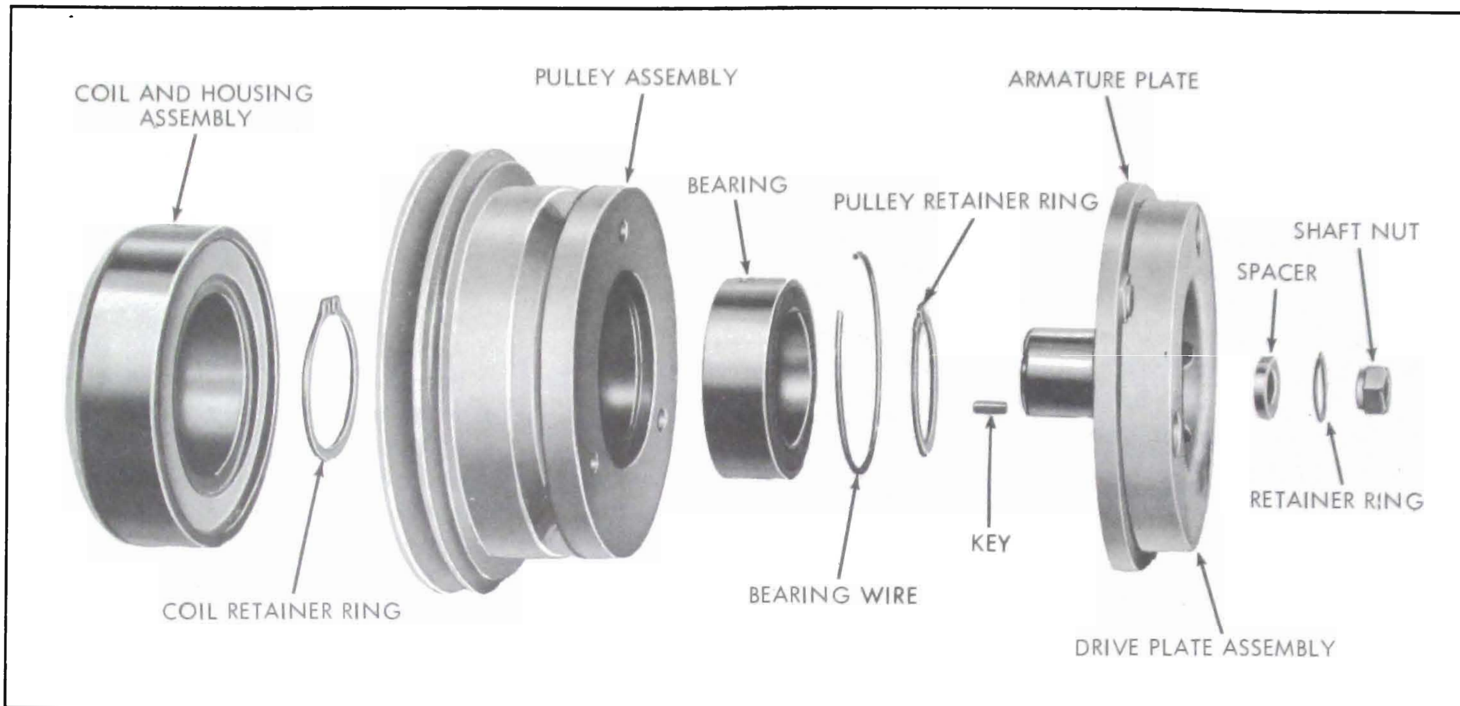

Figure 11-39—Compressor Clutch Assembly

The pulley assembly consists of three parts: (1) pulley rim, (2) power element ring, and (3) pulley hub. These three parts form a final assembly by molding a frictional material between the hub and the rim. A power element rim is embedded in the forward face of the assembly, between the outer rim and the inner hub. See Figure 11-32.

A two-row ball bearing is pressed into the hub of the pulley and held in place by a retainer ring. This pulley and bearing assembly is pressed over the front head of the compressor and held in place by a retainer ring.

The clutch actuating coil is molded into the coil housing with a filled epoxy resin; therefore, the coil and housing are replaceable only as a complete assembly.

The coil has 3.85 ohms resistance at 80°F. (surrounding temperature) and should not demand more than 3.2 amperes at 12 V D.C.

Three protrusions on the rear face of the coil housing fit into alignment holes in the front head of the compressor. When the coil and housing assembly is aligned and engaged with the front head (and indexed with the protrusions), it is secured in place by a retainer ring. If removed, it is important that the coil and housing be reassembled in their original position so that the wiring harness connector may be plugged on the coil terminals.

When the air conditioner controls are set for cooling, current flowing through the coil creates a magnetic force which flows through the pulley to draw the armature plate (forward of the pulley assembly) rearward toward the pulley. As the armature plate moves toward the pulley, it contacts the pulley face (which rotates freely on the hub of the front head).

The design of the clutch and coil is such that maximum magnetic holding force is obtained to magnetically lock the armature plate and pulley together as one unit. Since the armature plate hub is pressed on, and keyed to, the compressor shaft, the compressor shaft will then turn with the pulley.

When the air conditioner controls are turned "OFF" or the temperature control switch points open, the electric circuit to the compressor clutch is opened and the magnetic pull on the clutch no longer exists. The armature plate to armature plate hub actuating springs will then pull the armature plate away from the pulley and the plate loses contact with the pulley. With the clutch released, the pulley rotates freely on its bearing. In this condition, the compressor shaft does not rotate.

It may be noted that if the air conditioning system was in use when the engine was turned off, the armature plate may remain in contact with the pulley, due to residual magnetism. This will cause no trouble, as the armature plate and pulley will separate as soon as the engine is started.

p. Compressor Shaft Seal

A replaceable seal is used at the

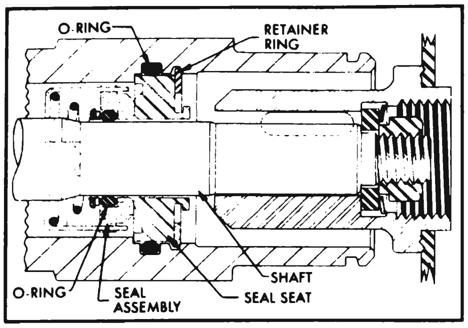

Figure 11-40—Shaft Seal Assembly

front of the compressor to seal the air conditioning system from atmosphere when the compressor is operating or at rest, regardless of pressures in the compressor.

Components of the seal located in the neck of the front head of the compressor are the retaining ring, the small O-ring, the compressor spring-loaded shaft seal, the cast iron seal seat and the large O-ring. See Figure 11-40. The seal indexes with two flats machined on the compressor shaft and turns with the compressor shaft.

A spring in the shaft seal assembly holds the seal against the seal seat which is held stationary in the neck of the compressor front head by a retainer ring.

Because of the constant pressures inside the compressor, this surface must be protected against any damage, such as scratches and nicks (even finger markings may cause surface damage) to prevent oil and/or refrigerant leaks past this seal.

The small O-ring seals between the shaft and the seal, and the large O-ring seals the area between the seal seat and the compressor front head.

Service shaft seal parts are supplied in a complete kit containing all necessary replacement parts.

11-14 COMPRESSOR CLUTCH, COIL AND SHAFT SEAL REMOVAL AND INSTALLATION

All operations listed in this paragraph can be done on the V-6 engine compressor without removing compressor from engine. Also, all service procedures and use of special tools are the same for the V-8 engine and the V-6 engine compressors.

NOTE: If compressor is removed, for the following procedures, firmly clamp holding fixture J-9396 in vise and attach compressor assembly to fixture. See Figure 11-41.

CAUTION: Never stand compressor on pulley end.

a. Clutch Drive Plate Removal

1. Hold the clutch drive plate hub with J-9403 wrench and use J-9399 special thin wall 9/16" socket to remove shaft nut. See Figure 11-41.

2. Screw threaded Hub Puller J-9401 into the drive plate hub. Hold body of tool with a wrench and tighten the center screw to remove drive plate assembly. See Figure 11-42.

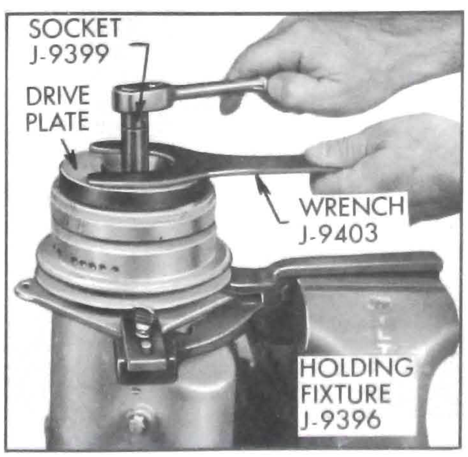

Figure 11-41—Removing Shaft Nut

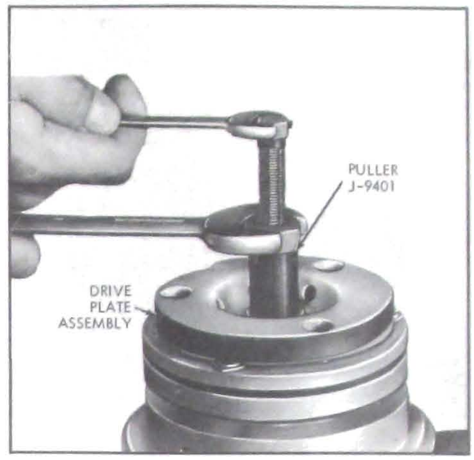

Figure 11-42—Removing Drive Plate Assembly

3. Remove drive plate key from compressor shaft.

4. Remove drive plate assembly retainer ring, using J-5403, No. 21 Truarc pliers. See Figure 11-43. Remove spacer from inside hub of drive plate.

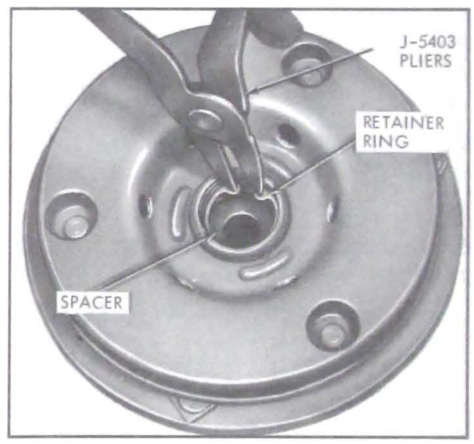

Figure 11-43—Removing Drive Plate Retainer Ring

b. Drive Plate Installation

1. Insert square drive key into hub of drive plate so it projects approximately 3/16" out of end of keyway. See Figure 11-44.

2. Line up key in hub with keyway in shaft and position drive plate on shaft. See Figure 11-44.

3. Place "Free" spacer J-9480-2 on drive plate installer J-9480-1 and thread installer on end of

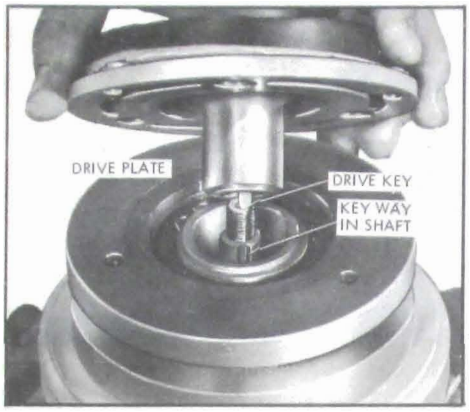

Figure 11-44—Positioning Drive Plate on Shaft

compressor shaft. See Figure 11-45. Press the drive plate on shaft until there is approximately 3/32", (.094) space between the frictional faces of the drive plate and pulley as shown.

4. Remove installer and insert spacer around shaft and inside drive plate hub.

5. Install drive plate assembly retainer ring with flat side of ring facing spacer, using J-5403, No. 21 Truarc pliers.

6. Install a new shaft nut, using J-9399, special thin wall 9/16" socket. Tighten to 15 lb. ft. torque. The air gap between the friction

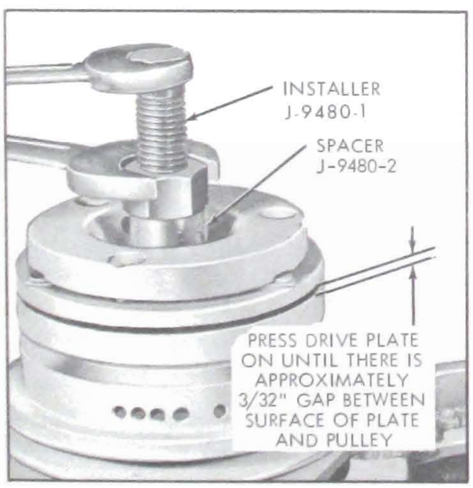

Figure 11-45—Installing Drive Plate Assembly

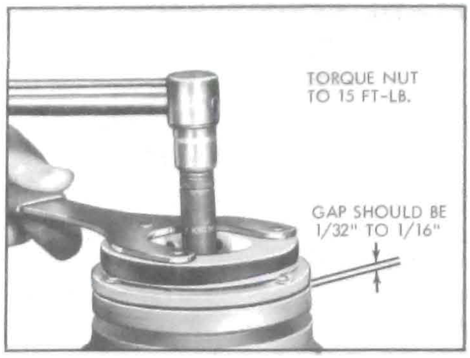

Figure 11-46—Torquing Shaft Nut

faces of the pulley and drive plate should now be between .022" to .057" (1/32" to 1/16") clearance. See Figure 11-46.

c. Pulley and Bearing Removal

1. Remove clutch drive plate. subparagraph a.

2. Remove pulley assembly retainer ring, using J-6435, No. 26 Truarc pliers. See Figure 11-47.

3. Place J-9395 puller pilot over compressor shaft and remove pulley assembly, using J-8433 puller. See Figure 11-48.

IMPORTANT: Puller pilot must be used or force will cause shaft to move in swash plate, resulting in damage to the cylinder mechanism.

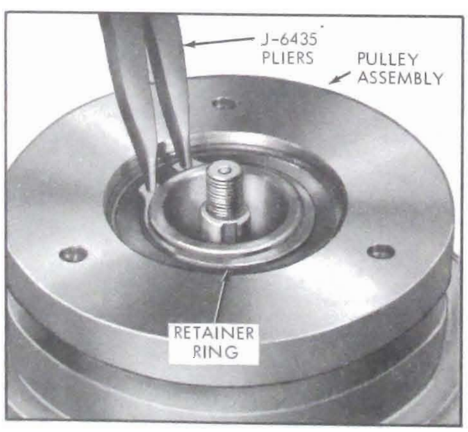

Figure 11-47—Removing Pulley Retainer Ring

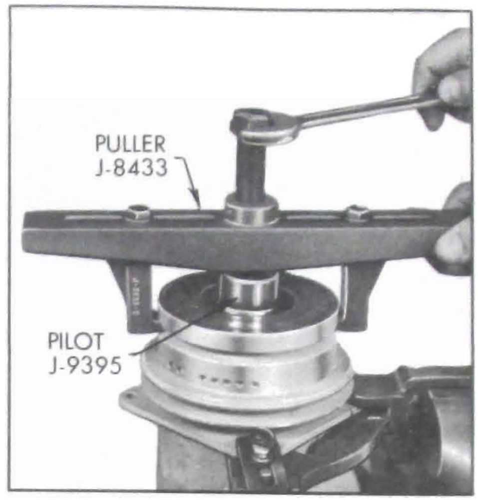

Figure 11-48—Removing Pulley Assembly

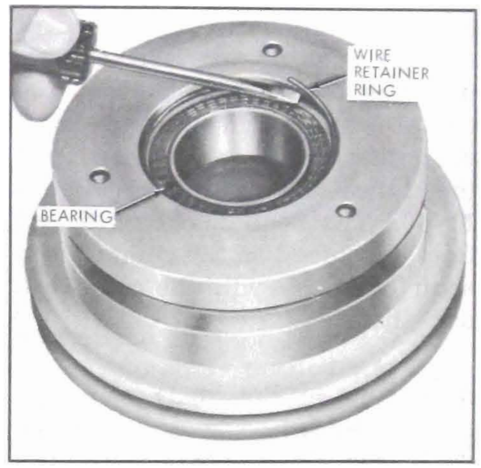

Figure 11-49—Removing Bearing Retainer Wire

NOTE: Do not remove pulley bearing unless it is going to be replaced.

4. Remove pulley bearing wire retainer with a small screwdriver. See Figure 11-49.

5. Remove bearing, using punch or a suitable socket.

d. Pulley and Bearing Installation

If the existing pulley and drive plate and hub assembly are to be reused, clean the drive faces on each part with trichlorethylene,

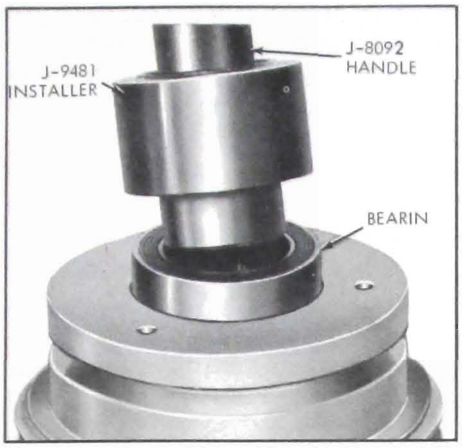

Figure 11-50—Installing Pulley Bearing

alcohol or similar solvent. If these parts show evidence of warpage, due to overheating, they should be replaced.

1. When replacing a new ball bearing assembly into the pulley, use J-9481 pulley bearing installer and drive handle J-8092 as shown. See Figure 11-50.

2. Replace the pulley assembly wire retainer ring in pulley, being sure it is properly seated in its groove.

3. Support bottom of compressor and press or tap the pulley and bearing assembly on the neck of the compressor, using J-9481 installed on J-8092 as shown. See Figure 11-51. Pulley should rotate freely.

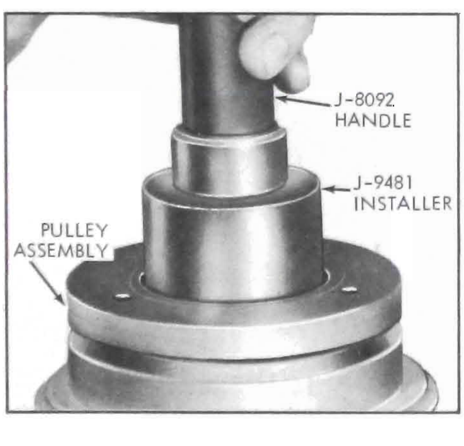

Figure 11-51—Installing Pulley Assembly

4. Install pulley retainer with flat side of retainer toward bearing, using J-6435, No. 26 Truarc pliers.

5. Install drive plate assembly, subparagraph b.

e. Clutch Coil and Housing Removal

1. Remove drive plate assembly. Subparagraph a.

2. Remove pulley and bearing assembly. Subparagraph c.

3. Note position of electrical terminals and scribe location of coil housing terminals on compressor body to insure correct location of terminals when coil is reinstalled.

4. Use J-6435, No. 26 Truarc pliers and remove coil housing retaining ring, then remove coil assembly. See Figure 11-52.

f. Clutch Coil and Housing Installation

1. Position clutch coil on compressor front head casting so electrical terminals are in their proper location as previously scribed on compressor body. Make certain coil is properly seated on dowels.

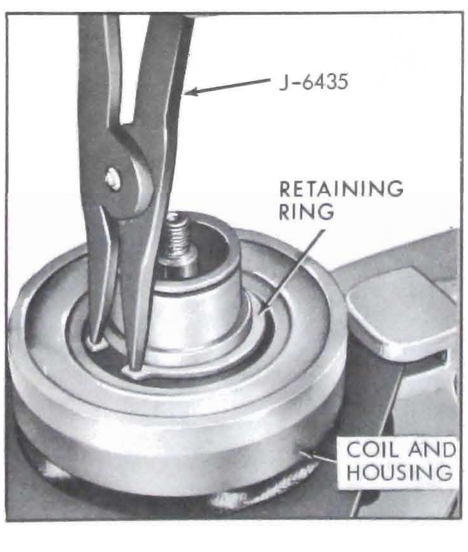

Figure 11-52—Removing Coil and Housing Retaining Ring

2. Replace the coil retainer ring with flat side of ring facing coil, using J-6435, No. 26 Truarc pliers.

3. Install pulley and bearing assembly. Subparagraph d.

4. Install drive plate assembly. Subparagraph b.

g. Shaft Seal Removal

1. Remove drive plate assembly. Subparagraph a.

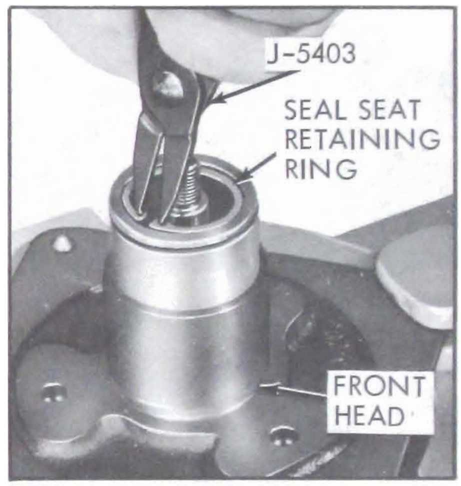

Figure 11-53—Removing Shaft Seal Seat Retaining Ring

2. Remove shaft seal seat retaining ring from inside front head, using J-5403, No. 21 Truarc pliers. See Figure 11-53.

3. Remove shaft seal seat, using J-9393-1 and 2 to grasp flange on seal seat. See Figure 11-54. Pull straight out at end of tool to remove seal seat.

4. Engage tabs on compressor shaft seal assembly with locking tangs on J-9392 seal installer and remover. Press down on tool and twist clockwise to engage seal. Remove seal assembly by pulling straight out from shaft. See Figure 11-55.

5. Remove O-ring from interior of front head casting bore, using

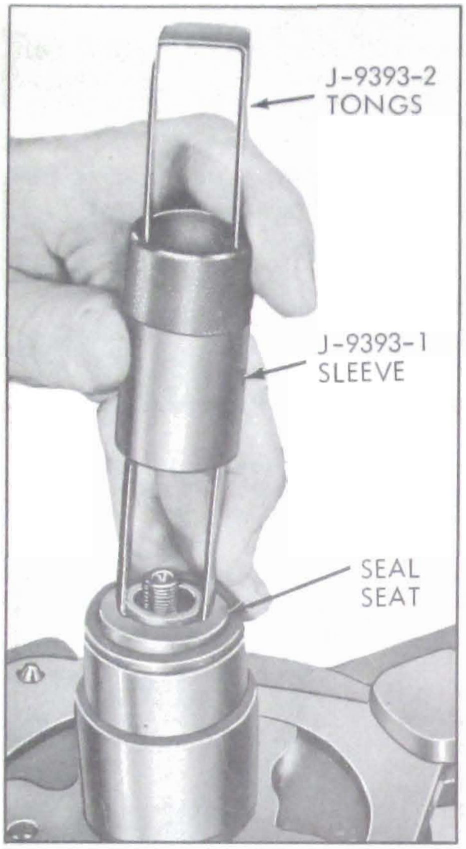

Figure 11-54—Removing Shaft Seal Seat

J-9553 remover. See Figure 11-56.

NOTE: O-ring is located in front head as shown in Figure 11-40 and is difficult to see.

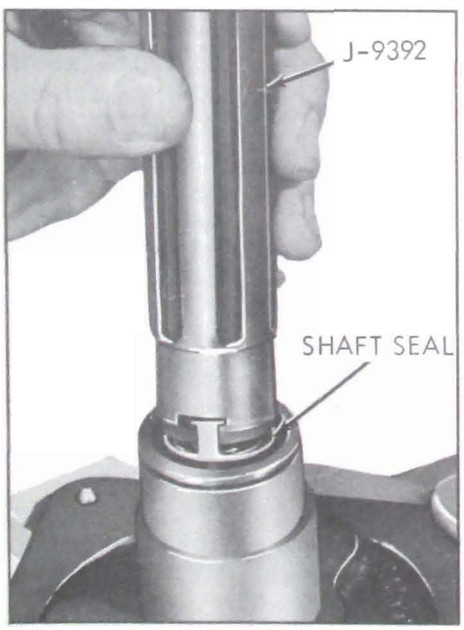

Figure 11-55—Removing Shaft Seal

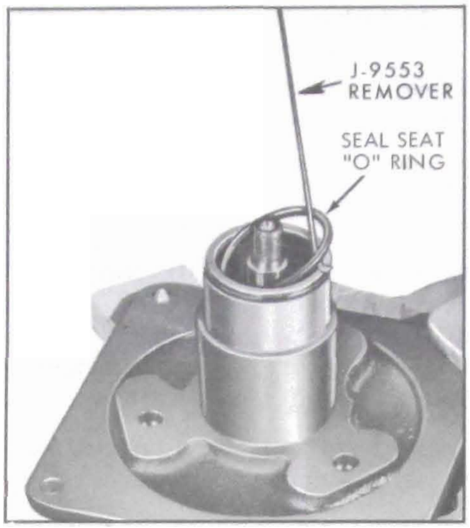

Figure 11-56—Removing Shaft Seal Seat O-Ring

h. Shaft Seal Installation

NOTE: Generously apply 525 compressor oil to seal parts during assembly.

1. Install a new seal seat O-ring in its groove inside front head. Be sure it is not in retaining ring groove. See Figure 11-40.

2. Place shaft seal on J-9392 installer and insert seal on shaft inside front head. Be sure seal is properly seated on shaft. The shaft has two flats provided for the seal.

3. Position seal seat on shaft and use sleeve J-9393-1 to push seat down inside front head. See Figure 11-54.

4. Install seat retaining ring with flat side of ring going toward seat, using J-5403, No. 21 Truarc pliers. If necessary position sleeve J-9393-1 on retaining ring and push down on it to engage ring in its groove.

5. Attach charging line adapter plate, J-9527 on rear of compressor and pressurize suction side of compressor with refrigerant 12 at pressure corresponding to room temperature. Rotate compressor shaft several times. See Figure 11-57. Leak test with leak detector and correct any leaks.

6. Install drive plate assembly. Subparagraph b.

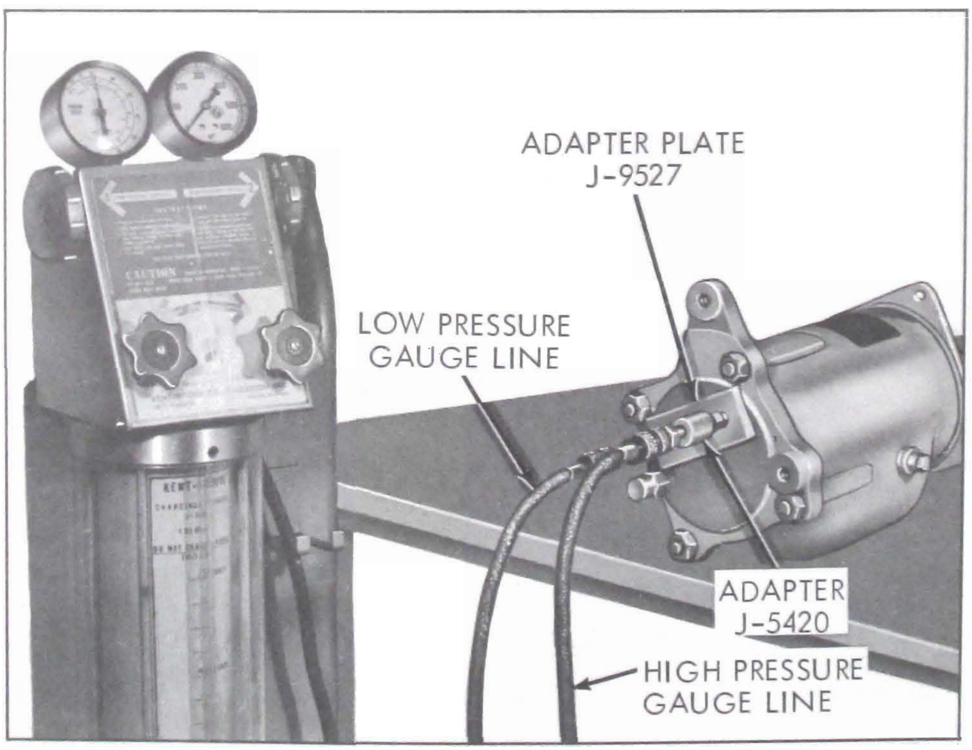

Figure 11-57—Charging Line Adapter Plate

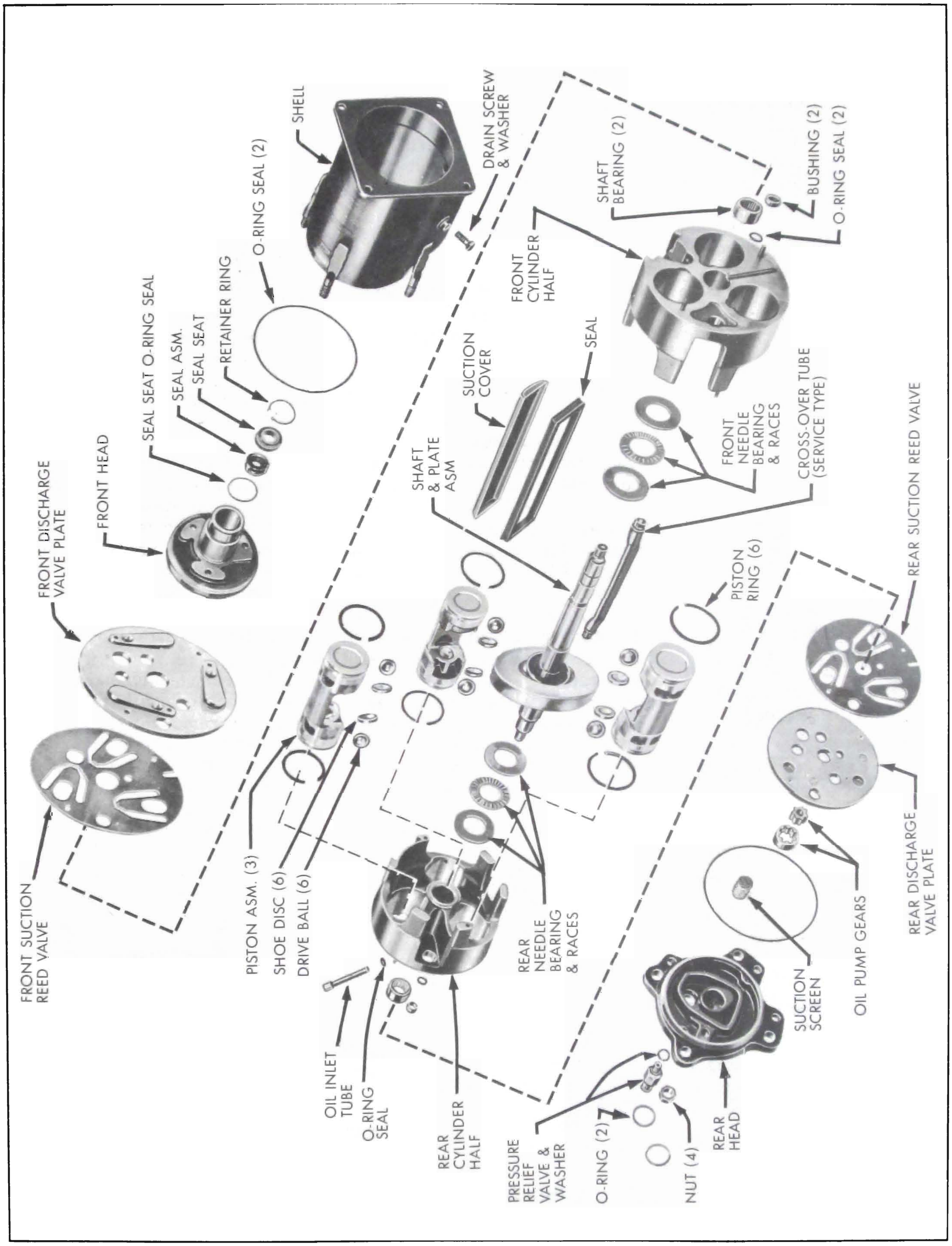

Figure 11-58—Exploded View of V-6 Engine Compressor

11-15 DISASSEMBLY, INSPECTION AND ASSEMBLY OF COMPRESSOR INTERNAL PARTS

IMPORTANT: A clean work bench, orderliness of the work area and a place for all parts being removed and replaced are of great importance. Any attempt to use makeshift or inadequate equipment may result in damage and or improper operation of the compressor.

a. Rear Head and Oil Pump Removal

CAUTION: Under NO circumstances should compressor be placed on the pulley end.

1. Seal compressor fittings opening and openings in compressor rear head.

2. Thoroughly clean exterior of compressor assembly and blow dry with compressed air.

3. Place compressor assembly on clean, dry work bench.

NOTE: If compressor is not going to be disassembled any further than rear head or oil pump, omit Steps 4, 5, 6, 7 and 8.

4. Remove compressor oil drain plug, tilt compressor and drain oil into clean dry container. It may be possible to get only 4 to 6 ozs. of oil from the compressor.

5. Remove clutch drive plate assembly. Paragraph 11-14, subparagraph a.

6. Remove clutch pulley assembly. Paragraph 11-14, subparagraph c.

7. Remove clutch coil and housing. Paragraph 11-14, subparagraph e.

8. Remove shaft seal assembly. Paragraph 11-14, subparagraph g.

9. Attach J-9396 holding fixture to compressor and firmly mount assembly in vise. See Figure 11-59.

10. On compressors used on V-6 Engines, remove compressor pressure relief valve and washer if head or valve is going to be replaced.

11. Remove four lock nuts from threaded studs welded to compressor shell and remove rear head by tapping lightly with plastic mallet.

12. Examine telfon surface on the rear head casting webs. If any damage is observed, the head should be replaced. See Figure 11-60.

13. Remove suction screen and examine for damage or contamination. Clean or replace as necessary.

14. Mark rear side of both oil pump gears with a pencil so that they can be reinstalled in the same position. Remove gears and inspect for damage. Replace both gears if one or both show damage.

15. Remove and discard rear head to compressor shell O-ring seal.

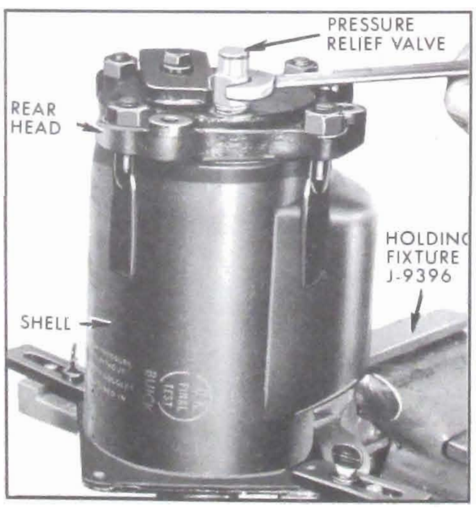

Figure 11-59—Removing Pressure Relief Valve (V-6 Engine Compressor Shown)

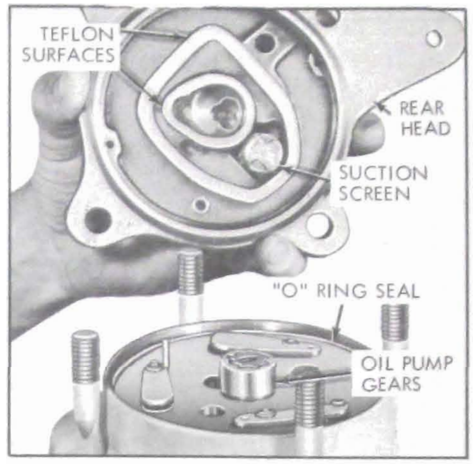

Figure 11-60—Rear Head Teflon Surface

16. Carefully remove rear discharge valve plate assembly by prying up on assembly as shown with screwdrivers and examine discharge valve reeds and seats. See Figure 11-61. Replace entire assembly if excessively scored or if any one of the three reeds is broken or seats are damaged.

17. If rear suction reed valve didn't come out with valve plate, carefully remove reed as shown with two small screwdrivers. See Figure 11-62. Replace reed valve if damaged.

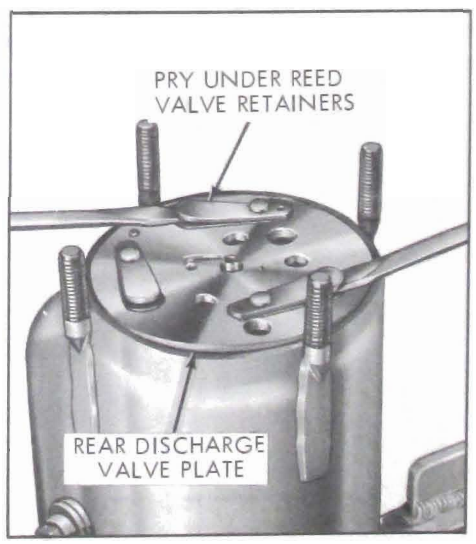

Figure 11-61—Removing Rear Discharge Valve Plate

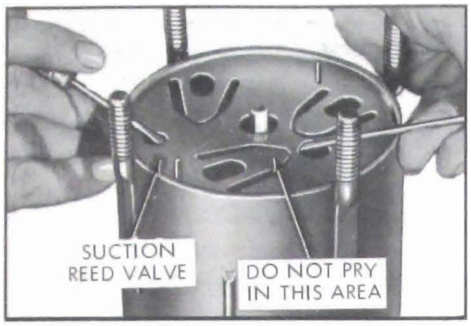

Figure 11-62—Removing Rear Suction Reed

b. Compressor Cylinder Assembly and Front Head Removal

1. Remove oil inlet tube, using J-6586 Remover. See Figure 11-63. If tube O-ring did not come out with tube, remove it from cylinder with small wire.

2. Push on front of compressor shaft to remove cylinder assembly from shell. See Figure 11-64. The cylinder assembly will slide out of shell when shell is inverted.

CAUTION: Do not hammer or use excessive force on end of shaft.

3. If the front discharge valve plate and suction reed valve were removed with cylinder mechanism, remove these parts from shaft before proceeding and examine for damage.

4. Examine cylinder mechanism for any obvious damage.

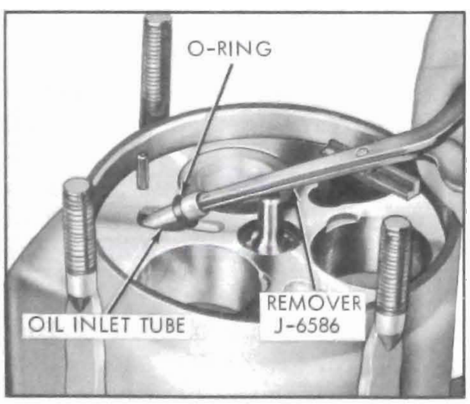

Figure 11-63—Removing Oil Inlet Tube

Figure 11-64—Removing Cylinder Assembly

NOTE: If cylinder mechanism has sustained major damage, due possibly to loss of refrigerant and/or oil, it may be necessary to use the service cylinder assembly rather than replace individual parts.

5. Remove compressor front head, using rubber mallet or wood block to unseat head from shell. See Figure 11-65. Care must be used to protect teflon surface on head from being damaged.

6. Remove and discard front head to shell O-ring seal.

7. Examine teflon sealing surface on front head for damage and/or deep scratches. Replace if necessary. See Figure 11-66.

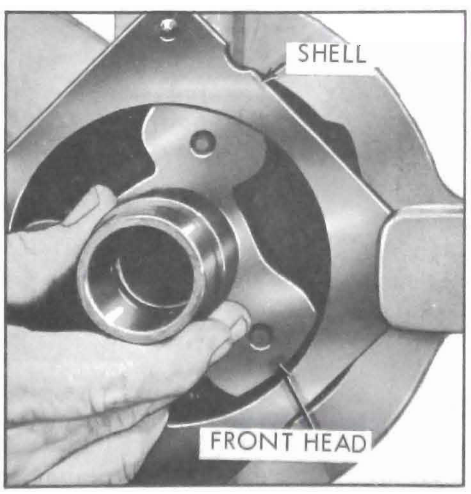

Figure 11-65—Removing Front Head

NOTE: If compressor cylinder assembly is going to be replaced, omit subparagraphs c, d, and e.

c. Disassembly of Compressor Cylinder Assembly

1. Remove suction crossover cover as shown in Figure 11-67 and discard seal on cover.

2. Place cylinder assembly in fixture as shown in Figure 11-68.

3. Number pistons (1, 2 and 3) and their cylinder bores so parts can be replaced in their original locations.

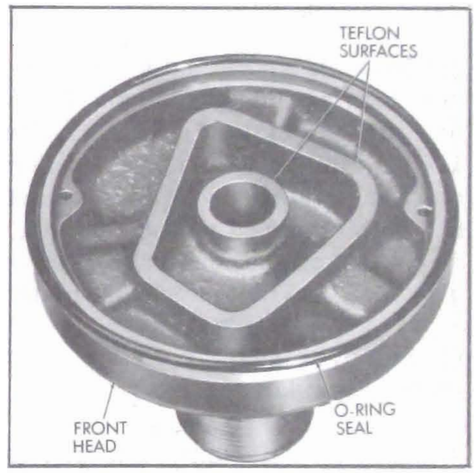

Figure 11-66—Front Head Teflon Sealing Surfaces

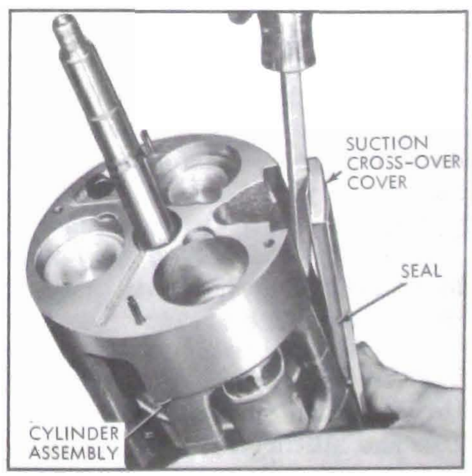

Figure 11-67—Removing Suction Crossover Cover

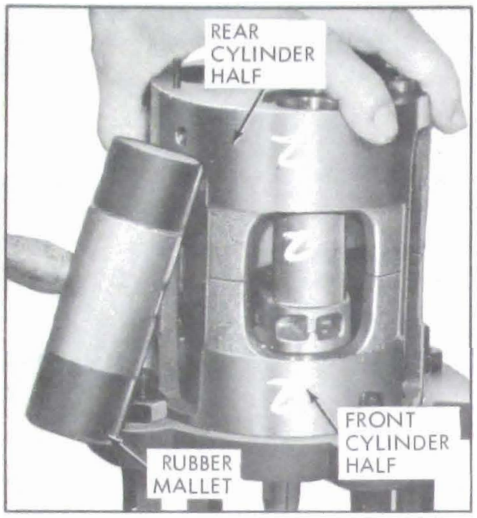

Figure 11-68—Separating Cylinder Halves

4. Obtain clean J-9402 assembly parts tray to retain compressor parts during disassembly.

5. Separate front and rear cylinder halves, using a wood block or rubber mallet. See Figure 11-68. Rotate swash plate so that discharge tube does not contact it. A 9/16" open end wrench may be used on the shaft seal area of shaft to rotate swash plate.

6. Remove rear cylinder half from pistons.

7. Rotate shaft until a piston is at its highest point. Push up on shaft and remove one piston assembly at a time. See Figure 11-69. Place parts in parts tray to keep them separated.

8. Remove piston rings, balls and shoe discs. Discard the shoe dics. Examine piston balls, if satisfactory for reuse, place in parts tray with proper end of piston. The front end of piston has identifying notch in casting web. See Figure 11-70.

9. Remove rear combination of thrust races and thrust bearing. Discard all three pieces.

10. Push on shaft to remove shaft from front half cylinder.

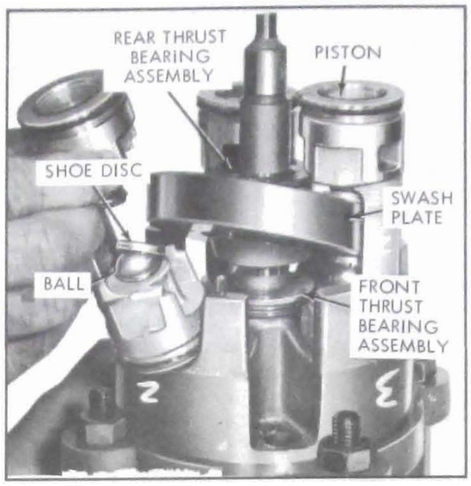

Figure 11-69—Removing Piston Assembly

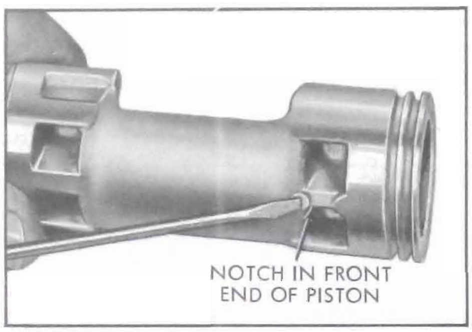

Figure 11-70—Piston Assembly

11. Remove front combination of thrust races and thrust bearing. Discard all three pieces.

12. Remove discharge crossover pipe from cylinder half by twisting it out with suitable pliers or by holding onto it with pliers and tapping on pliers.

13. Examine swash plate surfaces for excessive scoring or damage. If satisfactory, reuse. If necessary, replace main shaft and swash plate assembly.

14. Wash compressor internal parts in a tank of clean trichlorethylene, alcohol or similar solvent. Blow dry all parts, using a source of clean, dry air.

15. Examine the front and rear cylinder halves and replace if cylinder bores are deeply scored or damaged.

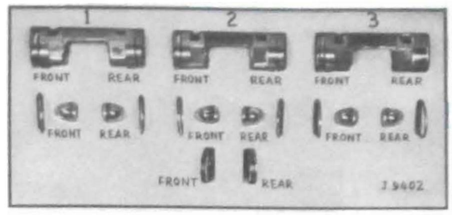

Figure 11-71—Parts Tray J-9402

16. Examine the shaft needle bearings. There is one in each cylinder half. If a bearing is damaged, remove bearing with a suitable socket or punch. Install new bearing with J-9432 so that lettering on bearing is toward outside of cylinder half. See Figure 11-72.

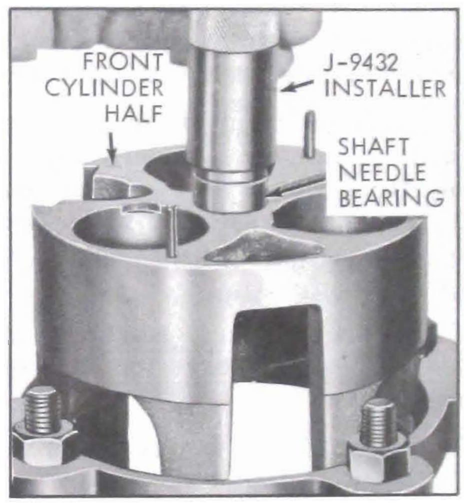

Figure 11-72—Installing Shaft Needle Bearing

d. Adjusting Compressor Shaft End Play and Piston Shoe Disc Clearance

IMPORTANT: The following operations are required when it is practical to replace an internal part or parts of the cylinder assembly. If the complete assembly is replaced, gauging of the shaft end play and shoe disc clearance is not required.

1. Secure four ZERO thrust races, three ZERO shoe discs and two new thrust bearings.

2. Apply clean petroleum jelly to a ZERO thrust race, a new

needle thrust bearing and a second zero thrust race. Assemble this "sandwich" of parts to FRONT end of compressor main shaft.

3. Place FRONT half of cylinder on J-9397 fixture. Insert threaded end of shaft (with front thrust bearing assembly) through front cylinder half and allow thrust race assembly to rest on hub of cylinder. See Figure 11-73.

4. Place a ZERO thrust race, a new thrust bearing and second ZERO thrust washer on REAR of compressor main shaft so it rests on hub of swash plate.

5. Apply a light smear of clean petroleum jelly to ball pockets of each of three pistons.

6. Place balls in piston pockets.

7. Apply a light smear of clean petroleum jelly to cavity of three new ZERO shoe discs.

8. Place a ZERO shoe over each ball in FRONT end of piston. Do not place shoes on piston rear balls.

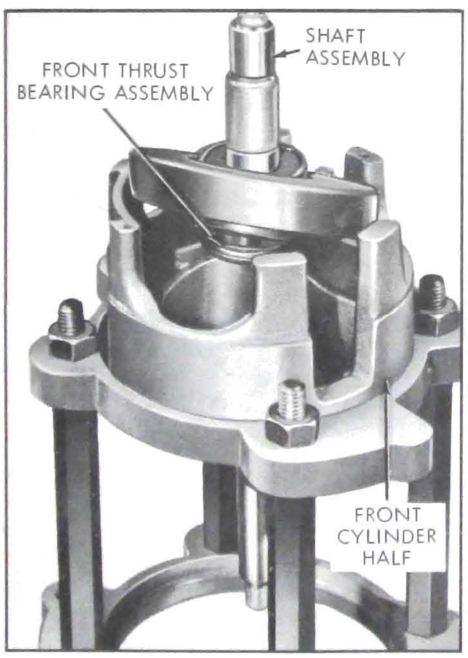

Figure 11-73—Shaft and Bearing Assembly in Front Cylinder Half

NOTE: Do not assemble any piston rings on pistons at this time.

9. Rotate shaft and swash plate until high point of swash plate is over piston cylinder bore, which had been identified as No. 1. Insert front end of No. 1 piston (notched end) in cylinder bore (toward the front of compressor) and at the same time, place front ball and shoe and rear ball only over swash plate. See Figure 11-74.

IMPORTANT: It is necessary to lift shaft assembly when installing pistons. Hold front thrust bearing pack tightly against swash plate hub while lifting shaft.

10. Repeat this operation for No. 2 and No. 3 pistons. Balls and shoes must adhere to piston during this assembly.

11. Align rear cylinder half casting with bores, suction passage, discharge crossover holes, dowel pins, etc. Tap into place, using a wood block and mallet. See Figure 11-75.

12. Place cylinder assembly in J-9397 compressing fixture with front of compressor shaft pointing up, positioning discharge tube opening between fixture bolts. This will permit access for the

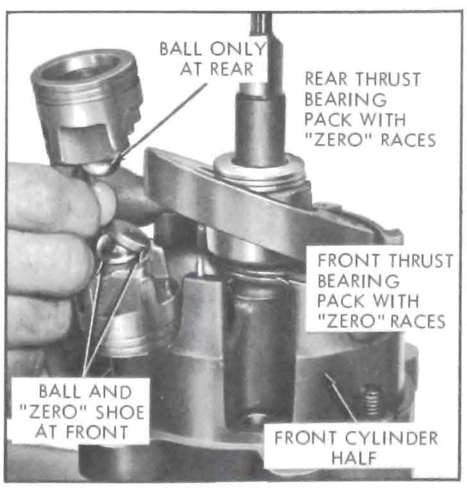

Figure 11-74—Installing Piston Assembly in Cylinder for Gauging

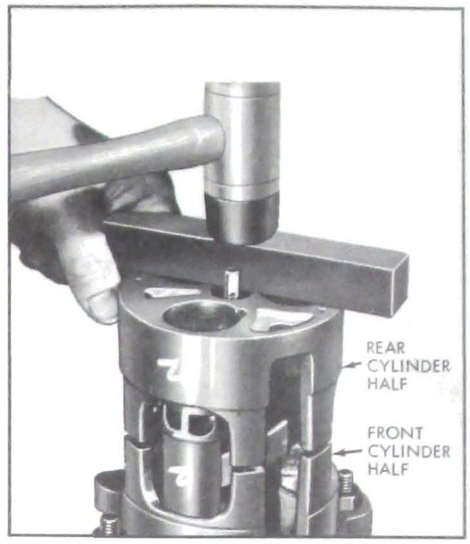

Figure 11-75—Assembling Rear Cylinder Half

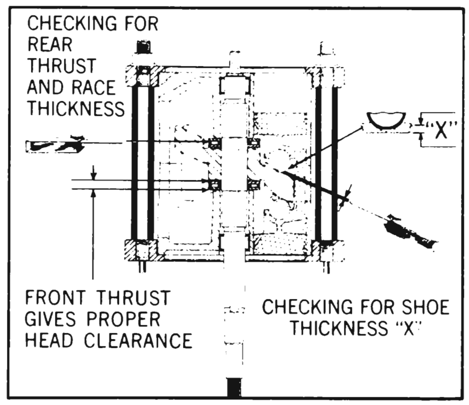

Figure 11-76—Checking Cylinder Clearances

feeler gauge. Assemble fixture head ring and nuts to the cage, tighten nuts evenly to 15 lb. ft. torque.

13. Use a leaf-type feeler gauge to check clearance between REAR ball and swash plate for each piston.

(a) Use a suitable combination of feeler gauge leafs until the combination will result in a satisfactory "feel" between ball and swash plate. See Figure 11-77.

After a suitable combination of feeler gauge leaves have been selected for a satisfactory "feel" between the rear ball and swash plate as instructed in Step (a),

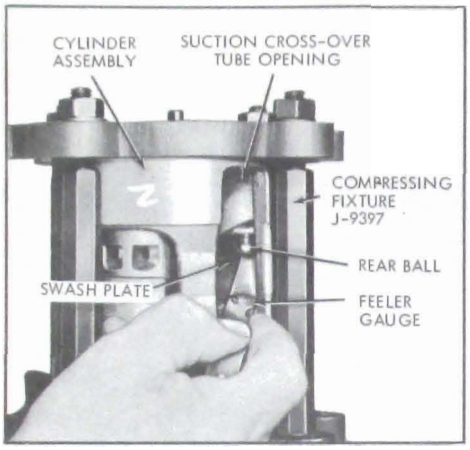

Figure 11-77—Gauging Clearance Between Rear Ball and Swash Plate

attach a spring scale to end of feeler leafs. Spring scale must be calibrated in ounces, such as Generator brush tension scale J-5184 or spring scale used for checking distributor point spring tension. Insert the selected feeler leafs between rear ball and swash plate, then pull straight out on spring scale with a steady, even pull being sure feeler does not bend or kink. See Figure 11-78. Record reading on scale. Spring scale must be read while feeler is moving. If selected feeler is correct size, spring scale will read between 4 and 8 ounces (the higher reading is desired). If reading is not within limits, select the next .0005" smaller or larger feeler leaf and repeat spring scale check until proper reading is obtained. Then proceed with Steps (c), (d), (e), (f) and (g), checking selected feeler leaf drag with spring scale at each location. The cylinder parts and feeler leaves must be very clean and coated with 525 viscosity compressor oil.

NOTE: By using the spring scale to check the selected feeler leafs, a standard may be set up as to the amount of feeler leaf drag required to properly rebuild the compressor. Also, the size of the numbered shoe discs and thrust bearing races for service has been determined by using the spring scale method of checking feeler leaf drag.

(c) Rotate the shaft approximately 120 and make a second check with feeler gauge between same ball and plate.

(d) Rotate shaft again approximately 120° and repeat check with feeler gauge between these same parts.

(e) From this total of three checks between the same ball and swash plate at 120° increments on swash plate, use the minimum feeler gauge reading to select a numbered shoe to correspond to this reading. See Example below.

EXAMPLE:

	Position 1	Position 2	Position 3
Piston #1	.019	.020	.019
Select and use a No. 19 Shoe			
Piston #2	.020	.020	.020
Select and use a No. 20 Shoe			
Piston #3	.021	.020	.021
Select and use a No. 20 Shoe			

SHOE DISC CHART

Service Part Number	Identification No. Stamped on Shoe Disc
6557000	0
6556175	17-1/2
6556180	18
6556185	18-1/2
6556190	19
6556195	19-1/2
6556200	20
6556205	20-1/2
6556210	21
6556215	21-1/2
6556220	22

(f) Mark piston number (1, 2 or 3) on selected shoe package and place in corresponding position in parts tray.

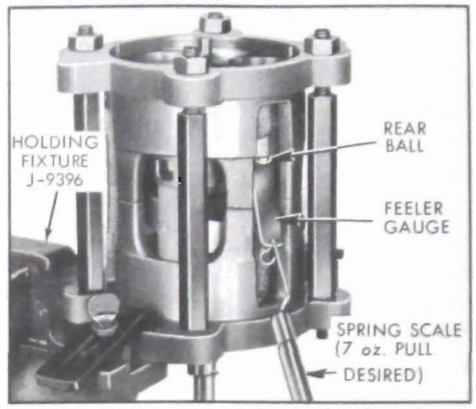

Figure 11-78—Checking Selected Feeler Gauge with Spring Scale

(g) Repeat the above procedure on the other two pistons.

14. The next gauging operation is to determine space between REAR thrust bearing and rear outer thrust race.

(a) Use a suitable combination of feeler gauge leafs to get a satisfactory "feel" between these two parts. See Figure 11-79.

(b) The spring scale method should also be used to check the drag of the feeler leaf that has been selected for clearance between rear thrust bearing and rear outer race. See Figure 11-80. The reading on the spring

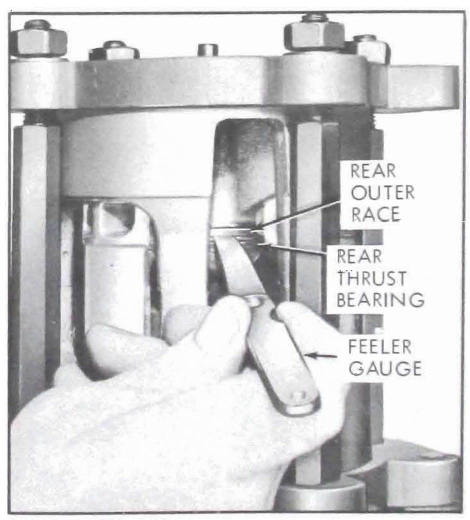

Figure 11-79—Gauging Clearance Between Rear Thrust Bearing and Rear Outer Race

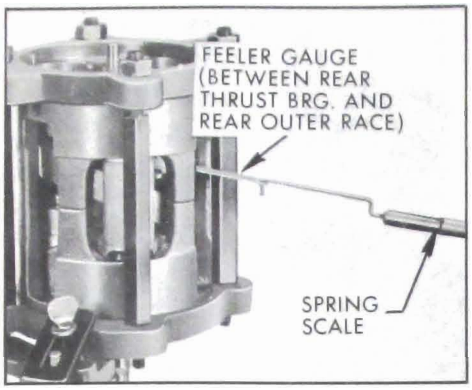

Figure 11-80—Checking Selected Feeler Gauge with Spring Scale

scale when pulling feeler leaf between these parts also should be between 4 and 8 ounces (the higher reading is desired). If reading is not within limits, select the next smaller or larger feeler leaf and repeat spring scale drag check until proper reading is obtained.

(c) Select from stock a numbered thrust race that corresponds to feeler gauge reading. For example, if feeler gauge reading is .009", a race with a number 9 stamped on it should be selected and be installed in place of the rear outer race.

THRUST BEARING RACE CHART

Service Part Number	Identification No. Stamped on Race
6556000	0
6556055	5-1/2
6556060	6
6556065	6-1/2
6556070	7
6556075	7-1/2
6556080	8
6556085	8-1/2
6556090	9
6556095	9-1/2
6556100	10
6556105	10-1/2
6556110	11
6556115	11-1/2
6556120	12

(d) Mark the selected REAR thrust race or place it in the J-9402 assembly parts tray corresponding to its position.

15. Remove cylinder assembly from J-9397 compressing fixture.

16. Separate cylinder halves. (It may be necessary to use a fiber block and mallet.)

17. Remove rear half cylinder.

18. Carefully remove one piston at a time from swash plate and front half cylinder. Do not lose relationship or position of front ball and shoe and rear ball. Transfer each piston, balls and shoe assembly to their proper place in the J-9402 assembly tray.

19. Remove REAR outer ZERO thrust race from shaft and replace it with selected numbered thrust race, determined in Step No. 14. Apply a LIGHT smear of petroleum jelly to thrust races to aid in holding them in place during assembly.

NOTE: This ZERO thrust race may be put aside for re-use in additional gauging and/or rebuild operations.

e. Assembly of Compressor Cylinder Assembly

Be sure to install all new seals and O-rings and to lubricate all the parts generously with 525 compressor oil during assembly.

1. Assemble a piston ring, scraper groove toward the center of piston, to each end of the three pistons.

2. Apply a light smear of petroleum jelly to selected numbered shoes and place them over correct ball in rear of piston.

3. With front and rear thrust bearing assemblies on shaft and shaft installed in front cylinder half, rotate swash plate so high point is above cylinder bore No. 1. Carefully assemble No. 1 piston (complete with ball and ZERO shoe on FRONT end and ball and numbered shoe on REAR end) over swash plate. See Figure 11-81. Position piston rings so that the gap is toward center of cylinder.

Compress and enter piston ring into front half cylinder. Repeat this operation for pistons No. 2 and No. 3. See Figure 11-82.

4. Assemble one end of service discharge crossover tube into hole in front cylinder. See Figure 11-83.

5. Rotate shaft to position pistons in a "stair step" arrangement. See Figure 11-84. Position piston ring gaps toward center of cylinder. Place rear half cylinder over shaft and start pistons into cylinder bores.

(a) Compress piston ring on each piston so as to permit its entrance into cylinder. See Figure 11-85. If ring is not properly compressed when installing rear cylinder half, ring will be broken.

(b) When all three pistons and rings are in their respective cylinders, align end of the discharge crossover tube with hole in rear half cylinder, making sure flattened portion of this tube faces inside of compressor for swash plate clearance.

(c) When satisfied that all parts are in proper alignment tap with a fiber block and mallet to "seat" rear cylinder over locating dowel pins.

6. Generously lubricate all moving parts with clean Frigidaire 525 viscosity oil. Check for free rotation of mechanism.

7. Assemble a new rectangular seal to suction crossover cover.

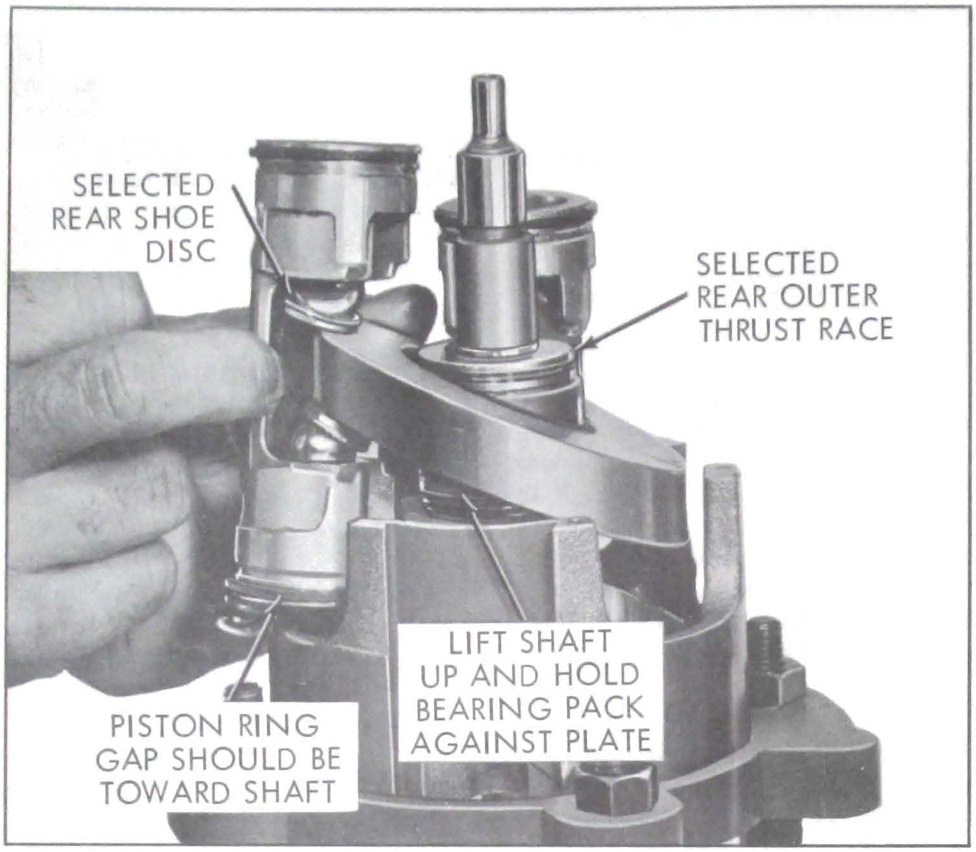

Figure 11-81—Installing Piston Assembly in Cylinder

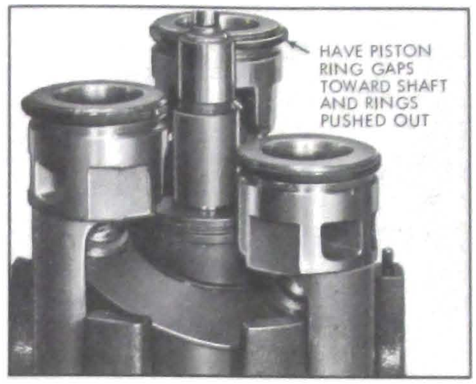

Figure 11-84—Front Cylinder Half Assembly

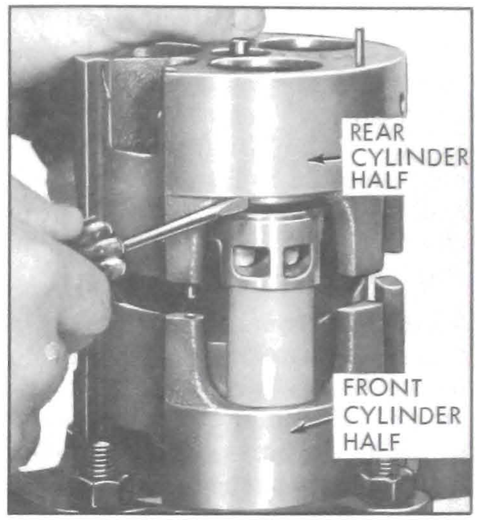

Figure 11-85—Compressing Rear Piston Ring

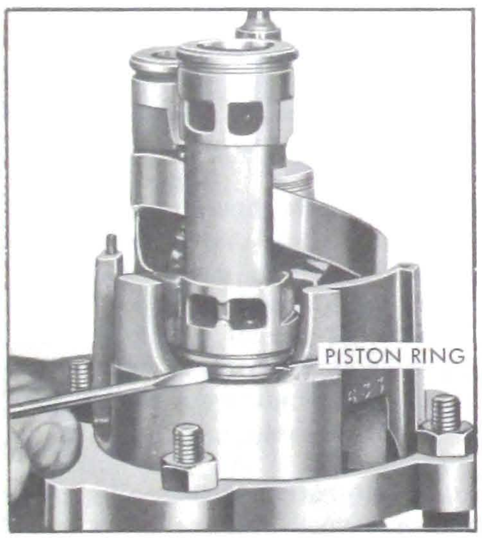

Figure 11-82—Compressing Front Piston Ring

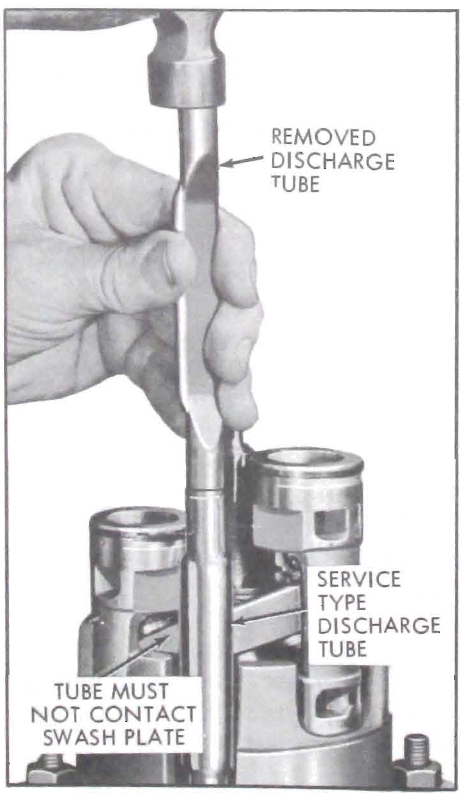

Figure 11-83—Installing Service Type Discharge Tube

(a) Coat seal with clean 525 viscosity oil.

(b) Start one side of seal and cover into "dovetail" slot in the cylinder.

(c) Use J-9433 suction crossover seal installer as a "shoe horn" by placing it between the seal on opposite side and the "dovetail" slot. See Figure 11-86.

(d) Center cover and seal with ends of cylinder faces.

(e) Press down on cover to snap it into place.

(f) Remove J-9433 installer as shown in Figure 11-87.

(g) Examine cover and seal to be sure cover is properly seated and seal is not damaged.

8. If necessary to replace a locator pin, use suitable pliers to remove pin, using care not to damage surface of cylinder. See

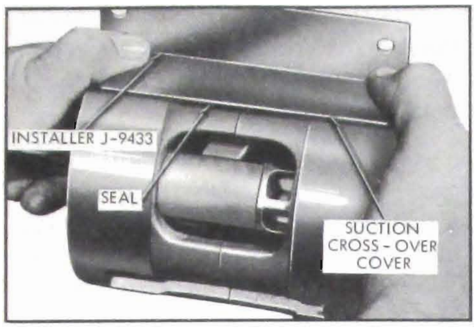

Figure 11-86—Installing Suction Crossover Cover and Seal

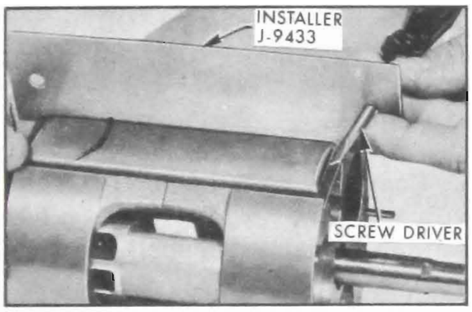

Figure 11-87—Removing Installer J-9433

Figure 11-88. Install new pin, carefully tapping it into place.

f. Front Head and Cylinder Assembly Installation

1. Install discharge crossover tube front O-ring and bushing. See Figure 11-89.

2. Assemble suction reed valve to front end of cylinder. Align dowel pin holes, suction ports and oil return slot. See Figure 11-90.

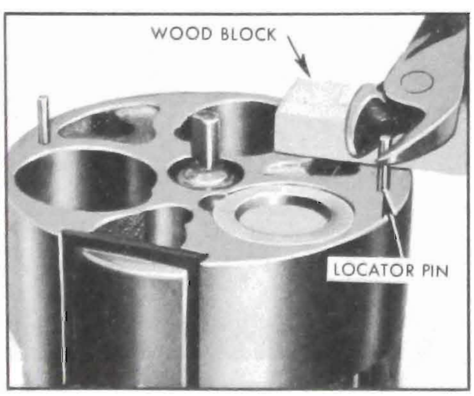

Figure 11-88—Removing Locator Pin

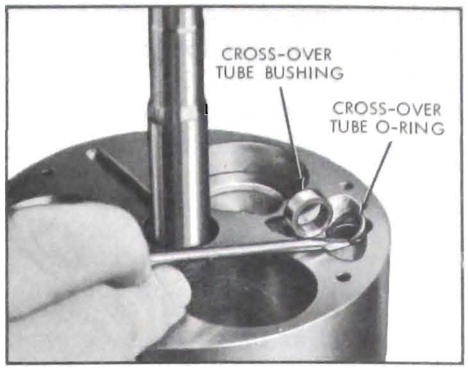

Figure 11-89—Installing Crossover Tube O-Ring

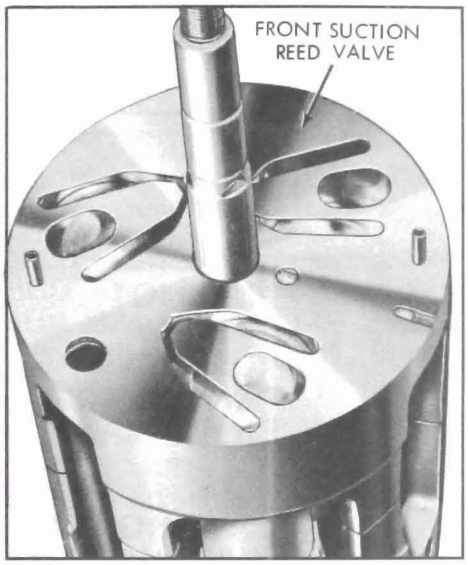

Figure 11-90—Front Suction Reed Valve Installed

3. Assemble front discharge valve plate, aligning holes with dowel pins and proper openings in head. See Figure 11-91.

4. Coat teflon gasket surfaces on webs of compressor front head casting with clean 525 viscosity compressor oil.

5. Examine location of dowel pins and contour of webs and mark dowel location on head with pencil as shown. Rotate so as to position it properly over discharge reed retainers. Use care to avoid damaging teflon surfaces. See Figure 11-91. When in proper alignment, seat on front discharge plate with light mallet taps.

6. Place compressor shell with

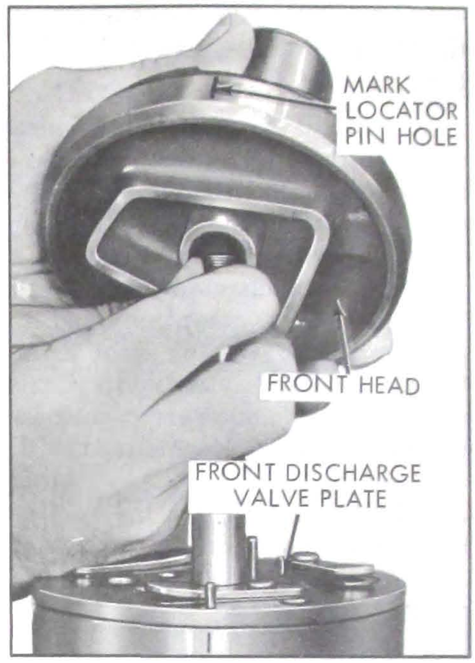

Figure 11-91—Placing Front Head on Cylinder Assembly

J-9396 holding fixture in vise so rear end of shell is up.

7. Install a new head to shell O-ring on shoulder at rear of front head. See Figure 11-92.

Figure 11-92—Cylinder and Front Head Assembly

8. Apply 525 compressor oil on the O-ring and surfaces of the front head.

9. Coat the inside machined surfaces of shell with clean 525 viscosity compressor oil. Line up oil sump with oil intake tube hole and lower mechanism into shell. Extreme care must be used to prevent large O-ring seal from being damaged. Maintain this alignment when lowering mechanism into place. See Figure 11-93.

10. Place O-ring on the oil intake tube, apply oil to cavity and O-ring. Insert tube and O-ring, rotating compressor mechanism as necessary and align tube with hole in the shell baffle. Be sure O-ring and intake tube are properly seated.

11. Install discharge crossover pipe rear O-ring and bushing.

g. Oil Pump and Rear Head Installation

1. Position rear suction reed valve to align with dowel pins, reed tips, and ports in head.

2. Position rear discharge valve assembly to align with dowel pins and ports and slide it into place over locator pins.

3. Assemble the inner oil pump gear over the "D" shaped flat on the shaft. Place outer oil pump gear over inner oil pump gear. If original gears are used, be sure gears are installed in their original positions.

4. Generously oil valve plate around outer edge where large O-ring will be placed. Oil valve reeds, oil pump gears, and area where teflon gasket will contact valve plate.

5. Coat new head-to-shell O-ring with oil and place it on valve plate in contact with shell.

6. Place suction screen in rear head if removed.

7. Position the oil pump outer gear as shown in Figure 11-94.

8. Assemble rear head to shell, using care not to damage the teflon sealing surfaces on head.

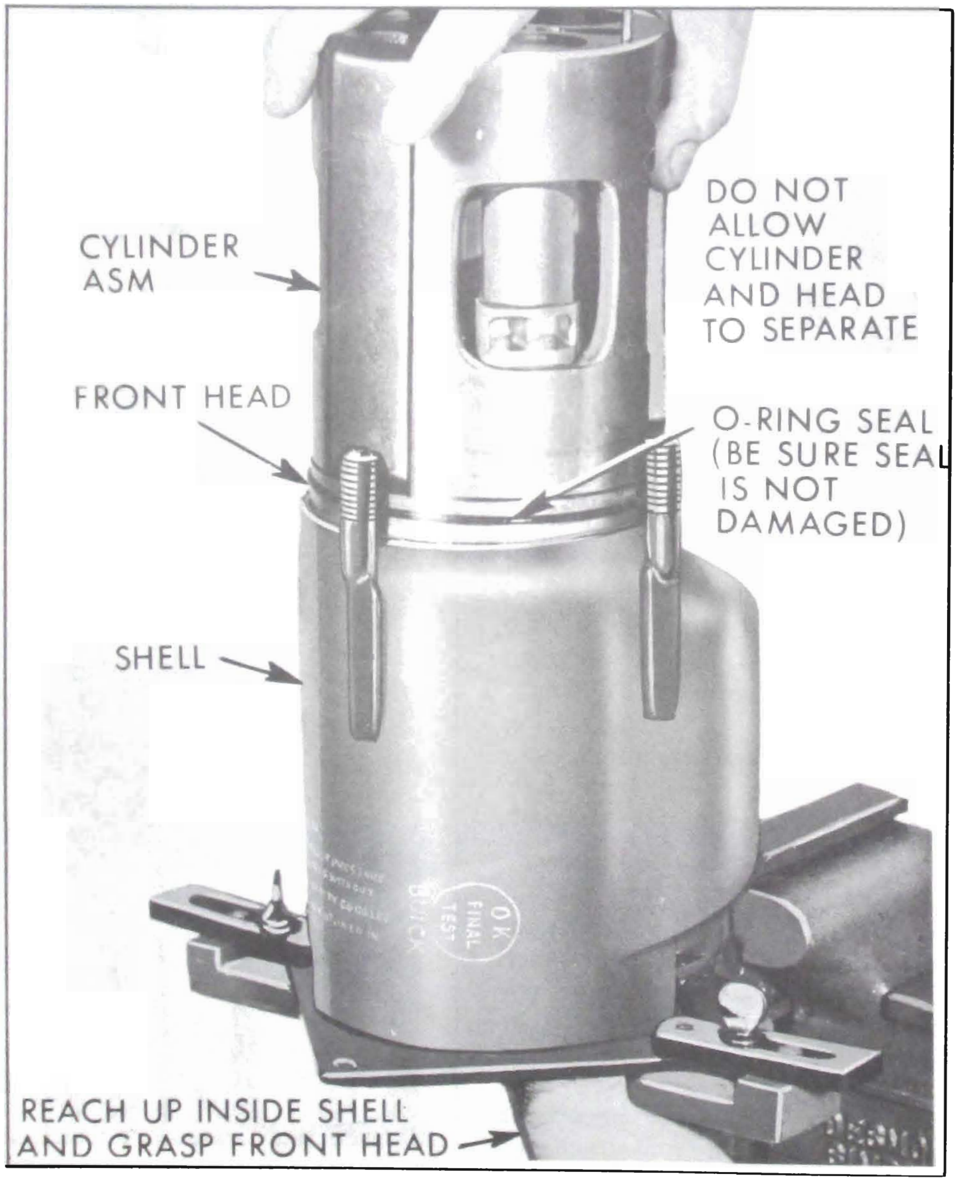

Figure 11-93—Inserting Cylinder Assembly in Shell

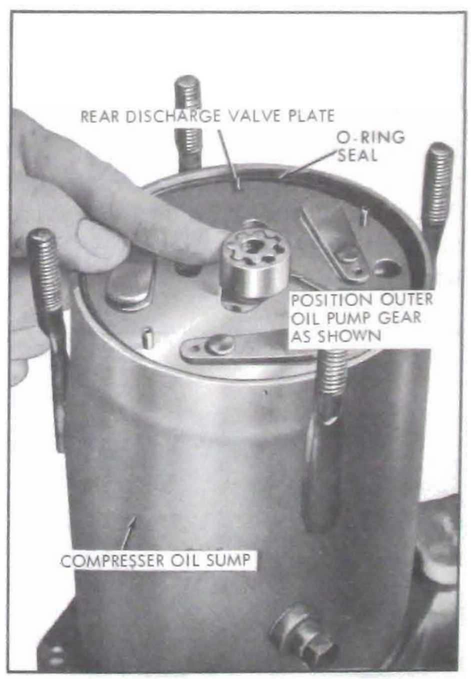

Figure 11-94—Positioning Oil Pump Outer Gear

NOTE: If locator pins do not engage holes in rear head, grasp front head and slightly rotate cylinder assembly. See Figure 11-95.

9. Assemble new nuts to threaded shell studs and tighten to 20 lb. ft. torque.

10. Replace pressure relief valve, if removed, using new copper washer.

11. Place new O-rings on discharge and suction ports in compressor. Assemble charging line Adapter Plate J-9527 to compressor.

12. Invert compressor and compressor holding fixture in vise.

13. Install shaft seal assembly. Paragraph 11-14, subparagraph h.

NOTE: When checking compressor for leaks as instructed in seal installation, it is also recommended to check for internal leaks as follows:

With gauge set attached to compressor as shown, pressurize discharge side of compressor only. If the same pressure is immediately noted on the suction side gauge as on the discharge gauge, it indicates an internal leak such as head teflon sealing surface, discharge crossover tube, head to shell O-ring seal or reed valves. Also observe the reading on the high pressure gauge shut-off valves closed. If gauge reading drops more than 10 pounds in 30 seconds, it indicates an internal leak in compressor.

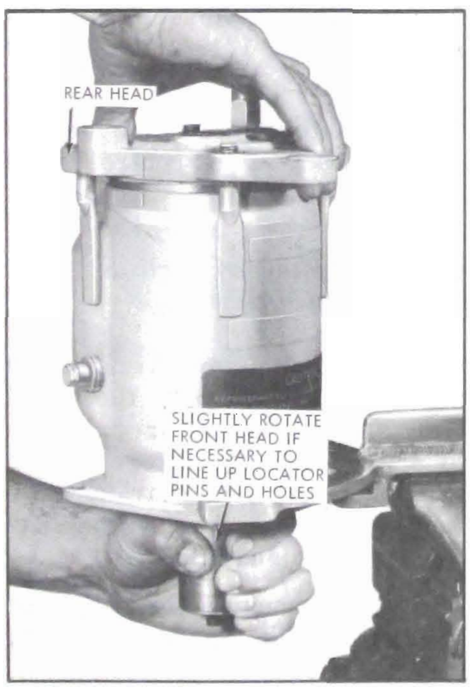

Figure 11-95—Installing Rear Head

14. Depressurize compressor and correct any leaks as necessary.

15. Remove charging line adapter plate from compressor and install end plate.

16. Refer to paragraph 11-16, subparagraph l for amount of 525 compressor oil to install in compressor. The oil is installed through oil drain screw opening.

17. Install compressor clutch coil and coil housing assembly. Paragraph 11-14, subparagraph f.

18. Install compressor pulley and bearing assembly. Paragraph 11-14, subparagraph d.

19. Install compressor clutch drive plate assembly. Paragraph 11-14, subparagraph b.

11-16 SERVICE PROCEDURES

NOTE: See Paragraphs 11-14 and 11-15 for service procedures on compressor assembly.

a. Safety Precautions

The following safety precautions should always be used when servicing the air conditioner refrigeration system.

1. Do not leave drum on Refrigerant 12 uncapped.

2. Do not carry drum in passenger compartment of car.

3. Do not subject drum to high temperature.

4. Do not weld or steam clean on or near system.

5. Do not fill drum completely.

6. Do not discharge vapor into area where flame is exposed or directly into engine air intake.

7. Do not expose eyes to liquid; always wear safety goggles.

b. Installation Precautions

1. All subassemblies are shipped sealed and dehydrated. They are to remain sealed until just prior to making connections.

2. All subassemblies should be at room temperature before uncapping. This prevents condensation of moisture from air that enters the system.

3. All precautions should be taken to prevent damage to fittings or connections. Even minute damage to a connection could cause it to leak.

4. Any fittings with grease or dirt on them should be wiped clean with a cloth dipped in alcohol.

Do not clean fitting or hoses with chlorinated salts as they are contaminants. If dirt, grease or moisture gets inside the pipes and cannot be removed, the pipe is to be replaced.

5. Use a small amount of refrigeration oil on all tube and hose joints and lubricate the O-ring gasket in this oil before assembling the joint as this oil will help in making a leak-proof joint. When tightening joints, use a second wrench to hold the stationary part of the connection to

prevent twisting and to prevent hose kinking as kinked hoses are apt to transmit noise and vibration.

CAUTION: Tighten all connections in accordance with recommended torques. See pipe and hose connection chart, Figure 11-20.

Insufficient torque when tightening can result in loose joints and excessive torque, when over-tightening can result in distorted joint parts and either condition can result in refrigerant leakage.

6. Do not connect receiver dehydrator assembly until all other seals of assemblies have been connected. This is necessary to insure optimum dehydration and maximum moisture protection of the system.

c. Discharging Refrigerant from Air Conditioner System

When a part is removed or disconnected that is in the Air Conditioner refrigeration circuit, the refrigerant must be discharged from system, using the following procedure.

1. Remove protective caps from shrader valve gauge fittings of suction and discharge lines. See Figures 11-106 and 11-107.

2. Using Adapters J-5420, connect charging lines of pressure gauge set and Manifold J-5415 to shrader valves with both valves of manifold closed. See Figure 11-96.

3. Slowly open valves on Manifold and discharge all pressure from system.

CAUTION: Do not open valves too fast as excessive oil will be blown out of system. Place rag over end of discharge service line to prevent oil or liquid refrigerant from spraying on car or person.

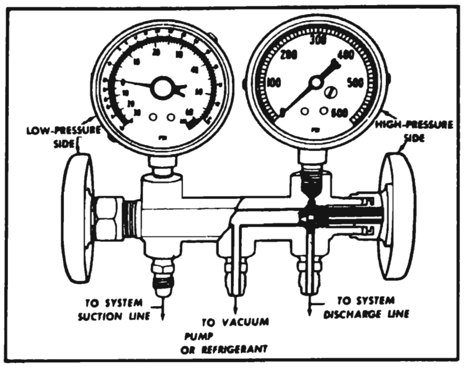

Figure 11-96—J5725-01 Manifold and Gauge Set

d. Removal and Installation of Suction Throttle Valve

1. Discharge refrigerant from system as described in subparagraph c.

2. Disconnect the evaporator assembly from the instrument panel by removing the screws from the front support bracket, the two brace to cowl attaching screws and disconnecting outside air valve bowden wire. See Figure 11-103.

3. Swing the evaporator assembly to one side, disconnect the control wire, equalizer line and suction lines from the valve.

4. Remove the three screws that attach the valve bracket to evaporator case.

5. Install valve by reversing removal procedure, paying attention to the following.

(a) Install new O-rings on line fittings.

(b) The valve must be lubricated through suction line connection at assembly with 525 compressor oil to prevent valve piston from sticking on initial operation.

(c) Adjust the control wire as instructed in subparagraph e and f.

(d) Evacuate and charge system. Leak test valve connections and correct any leaks.

(e) After system has been charged, move "Cold" lever back and forth from one extreme to the other about 12 times with the system operating to normalize the valve diaphragm.

e. Adjustment of Suction Throttle Valve Control Wire

1. Operate the "Cold" lever on evaporator case to be sure cable is not kinked.

2. Position "Cold" lever 1/8" from the extreme right position.

3. Loosen the wire clamp screw on the valve.

4. Position the suction throttle valve control lever so that it is against its stop. See Figure 11-97. Tighten wire clamp.

f. Outside Air Valve Adjustment

To insure outside air valve will be completely closed when air conditioner is not in operation:

1. Loosen valve control wire sheath at outside air valve.

2. Set "COLD" lever on evaporator case 1/16" from off position.

3. Completely close outside air valve and clamp control wire sheath.

g. Adjustment of Suction Throttle Valve

The valve adjustment should be made only after the functional test shows evaporator pressure to be significantly different from the functional test chart and the valve control wire adjustment has been checked and is correct.

1. Be sure suction throttle valve control wire is adjusted properly.

2. Remove the shrader valve cap on the suction throttle valve.

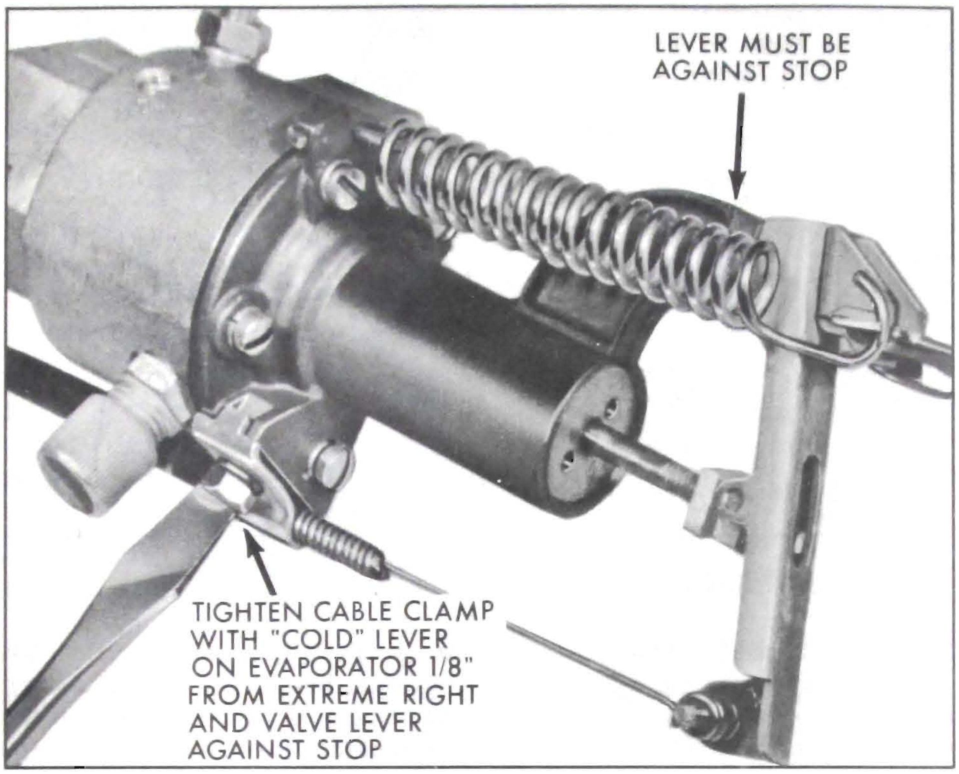

Figure 11-97—Suction Throttle Valve Control Wire Adjustment

3. Purge the gauge and line with refrigerant.

4. Install Adapter J-9459 or J-5440 on low pressure gauge line and with gauge valve closed, connect to suction throttle valve. See Figure 11-98.

5. With engine speed set at 1600 RPM, "Cold" lever set at extreme right and blower "Hi" button depressed, allow system to operate about 3 minutes.

6. Using Spanner Wrench J-9505 to turn valve adjusting screw, adjust evaporator pressure to pressure specified on functional test chart. See Figure 11-98.

Turn screw into valve cover to increase evaporator pressure. Turn screw out of cover to decrease pressure.

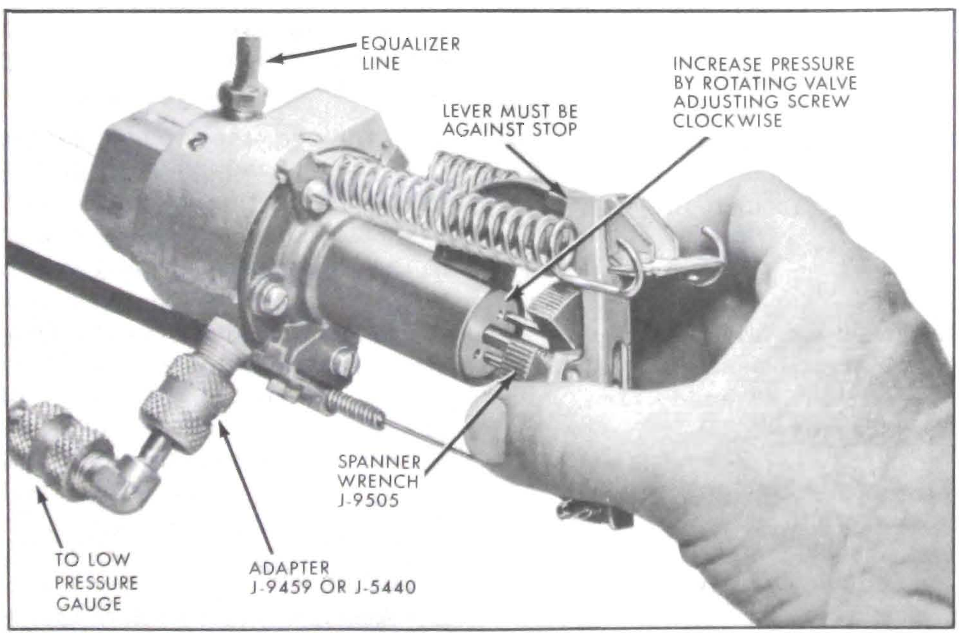

Figure 11-98—Adjusting Suction Throttle Valve

7. After valve has been properly adjusted, check valve operation by moving "Cold" lever from one extreme to the other several times. Evaporator pressure should increase as lever is moved to the left and should be a minimum of 50 psi when lever is at the extreme left position.

h. Disassembly and Assembly of Suction Throttle Valve

If tests indicate suction throttle valve is defective, the valve should be overhauled as follows:

1. Remove bracket from valve. Securely hold the suction throttle valve and unhook the end of the helper springs from the notch in the control lever. See Figure 11-99.

CAUTION: Use care when removing springs.

2. Remove the roll pin from the lever and remove the lever and threaded actuating pin, pulling it free from the center of the adjusting screw.

3. Slowly remove the adjusting screw using Spanner Wrench J-9505.

CAUTION: Care must be used when removing the adjusting screw as the outer spring may pop out if screw is removed too fast and not held securely.

4. Invert the valve to remove all internal springs and retainers.

5. Remove the five screws that retain cover to body of valve and remove cover. It may be necessary to rock the cover back and forth to remove it.

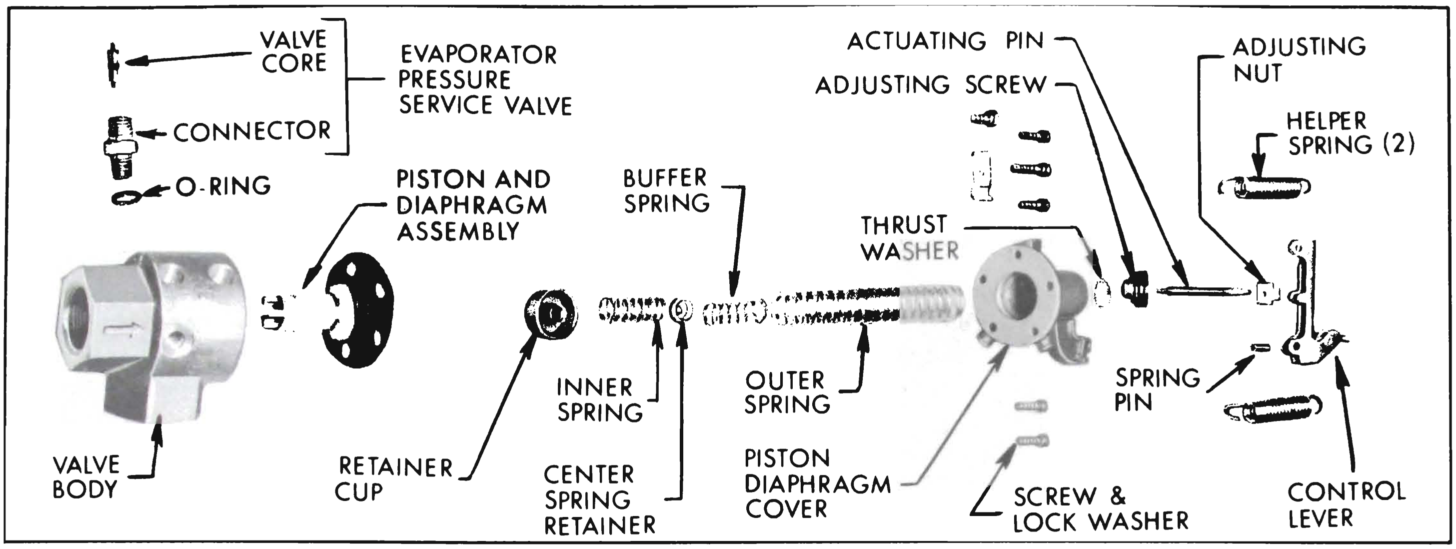

Figure 11-99—Exploded View of Suction Throttle Valve

6. Remove retainer cup from diaphragm. Remove diaphragm and piston assembly. The diaphragm should be handled with care to avoid damage by scuffing, cutting and abrading the rubber and fabric surfaces. The screen and retainer in the lower portion of the piston or the piston diaphragm should not be removed. The screen should be examined for any foreign material or contamination. If necessary clean screen with a volatile solvent. All solvent should be removed from parts after cleaning.

In the event the exterior surface of the piston is damaged such as scored or scratched or nicked, in such a way as to cause it to bind in the bore, piston assembly should be replaced.

NOTE: It is recommended that no attempt be made to scrape, stone or crocus cloth these damaged areas due to the close tolerance that is required in the fitting of the parts for proper operation.

In the event the diaphragm is found to be damaged the piston and diaphragm assembly should be replaced.

If a new diaphragm is used, a very light application of powdered Molykote Type Z should be applied to the upper or fabric surface of the depressed section of the diaphragm where the spring retainer cup will fit into it.

NOTE: The source for the material is:

Alpha-Molykote Corporation,
Stamford, Connecticut.

No other material is recommended.

Examine the body bore surfaces for any surface imperfections, foreign material and any obvious damage that would cause the piston to not operate freely. The body should be replaced if the bore is damaged or if any cross threading or damage has been sustained around the connector ports.

NOTE: There is no identification letter on the valve body for select fitting piston assemblies, as only one piston assembly and valve body are used.

7. Apply a light coat of 525 viscosity oil to the wall of the piston and insert piston assembly into the body of the valve.

8. Assemble the retainer cup to the diaphragm and place the cover in proper location over the diaphragm, being sure the diaphragm holes are in line with the locating protrusions under the cover flange. Start the five screws into the body, but DO NOT TIGHTEN.

9. With the cover and body held loosely in one hand, insert a clean smooth rod, approximately 3/8" in diameter, through the inlet opening so as to contact the screen retainer in the bottom of the piston.

Carefully push the piston into the cover so that the diaphragm positions properly into the cavity of the cover and does not become "pinched" under the flange.

Now remove the rod from the inlet opening and insert it through the upper portion of the cover. It should contact the center post of the cup. Press lightly downward so as to cause the piston to seat against the inner shoulder of the body. While the cup, diaphragm and piston are held down, tighten the five screws to 35 to 40 inch pounds torque.

10. Insert the short, high rate inner spring into the cup over the center post.

11. Assemble the center spring retainer dished side up into the inner spring.

12. Nest the light buffer spring into the retainer.

13. Install the long outer spring into the cover over the two springs.

14. Place the tabbed thrust washer on top of the outer springs. The tab should be directly over the slot in the inner threaded wall of the cover.

15. Place the adjustment screw on top of the thrust washer so the tapped end will enter and engage the buffer spring.

16. Using Spanner Wrench J-9505 press down on adjusting screw and install it in cover approximately ten turns being sure the tab on thrust washer enters slot in cover and that screw engages buffer spring.

17. Insert the actuating pin into the center hole of the adjusting screw, being certain the end of pin enters hole in center retainer.

18. Engage the slots of the plastic nut on the end of the actuating pin between the protrusions or dimples in the control lever.

19. Position the holes in the end of the control lever in alignment with the hole in the curved cover arm. Insert the spring pin into the hole in lever.

20. With the control lever in the full upward position (against its stop in cover), actuating pin should travel downward 3/32" before contact is made with the center spring retainer. This is determined by the feel as the lever is moved downward from the full up position.

21. If the movement or travel of the actuating pin is not to this dimension, make the following adjustment. The upper threaded end of the actuating pin which projects through the plastic nut has two milled flats to provide surface for wrench grip for changing the adjustment. Turning the actuating pin clockwise or downward will decrease the travel before contact. Turning the actuating pin counterclockwise or upward will increase the travel before contact.

22. After the correct travel of the pin has been made, attach one end of the helper springs to the tabs on the cover flange. Attach the other end of the springs into the outside notches of the control lever.

23. Install bracket on valve.

24. Install the suction throttle valve on car and adjust. Subparagraph d and g.

i. Removal and Installation of Compressor—V-8 Engine

1. Discharge refrigerant from system as described in subparagraph c.

2. Disconnect discharge and suction hoses at shrader valves.

3. Disconnect clutch wire from coil terminals on compressor.

4. Cover openings in fittings and ends of hoses.

5. Raise front of car and disconnect front stabilizer bar.

6. Remove the two bolts and nuts that retain compressor adapter to front bracket (oil pump front bracket on power steering cars). See Figures 11-100 and 11-101.

7. Remove bolt that attaches compressor rear brace and compressor rear head to cylinder block.

8. Remove bolt that retains compressor rear head (lower location) to rear brace.

9. Use stabilizer bar as a support for compressor and roll compressor over and remove adapter from compressor front head.

10. Remove belt from compressor pulley, slide stabilizer forward and remove compressor.

NOTE: It may be necessary to remove engine left side filler plate to have sufficient clearance to remove compressor.

IMPORTANT NOTE: Whenever a compressor replacement is being made, the oil in the original compressor should be drained and measured. The new compressor should contain the same amount of new 525 viscosity oil as was drained from the original compressor. This step is necessary as some of the oil from the original compressor remains in the system. The addition of a complete charge of oil, in addition to the oil remaining in the system, would impair the cooling ability of the unit.

CAUTION: If it is evident that the air conditioner has lost a large amount of oil, refer to subparagraph l. for procedure for adding oil to compressor.

11. Install compressor by reversing procedure for removal, paying attention to the following:

(a) Inspect drive belt and pulley groove for conditions that might cause slippage. If belt is cracked, frayed, or oil soaked, or is worn so that it bottoms in pulley groove, replace.

(b) Use new O-rings when attaching hoses.

(c) That bracket spacers are properly installed.

(d) Adjust compressor belt tension. See Figure 2-65.

(e) Evacuate, leak test and charge air conditioner system (par. 11-17).

j. Removal and Installation of Compressor—V-6 Engine

1. Discharge refrigerant from system as described in subparagraph c.

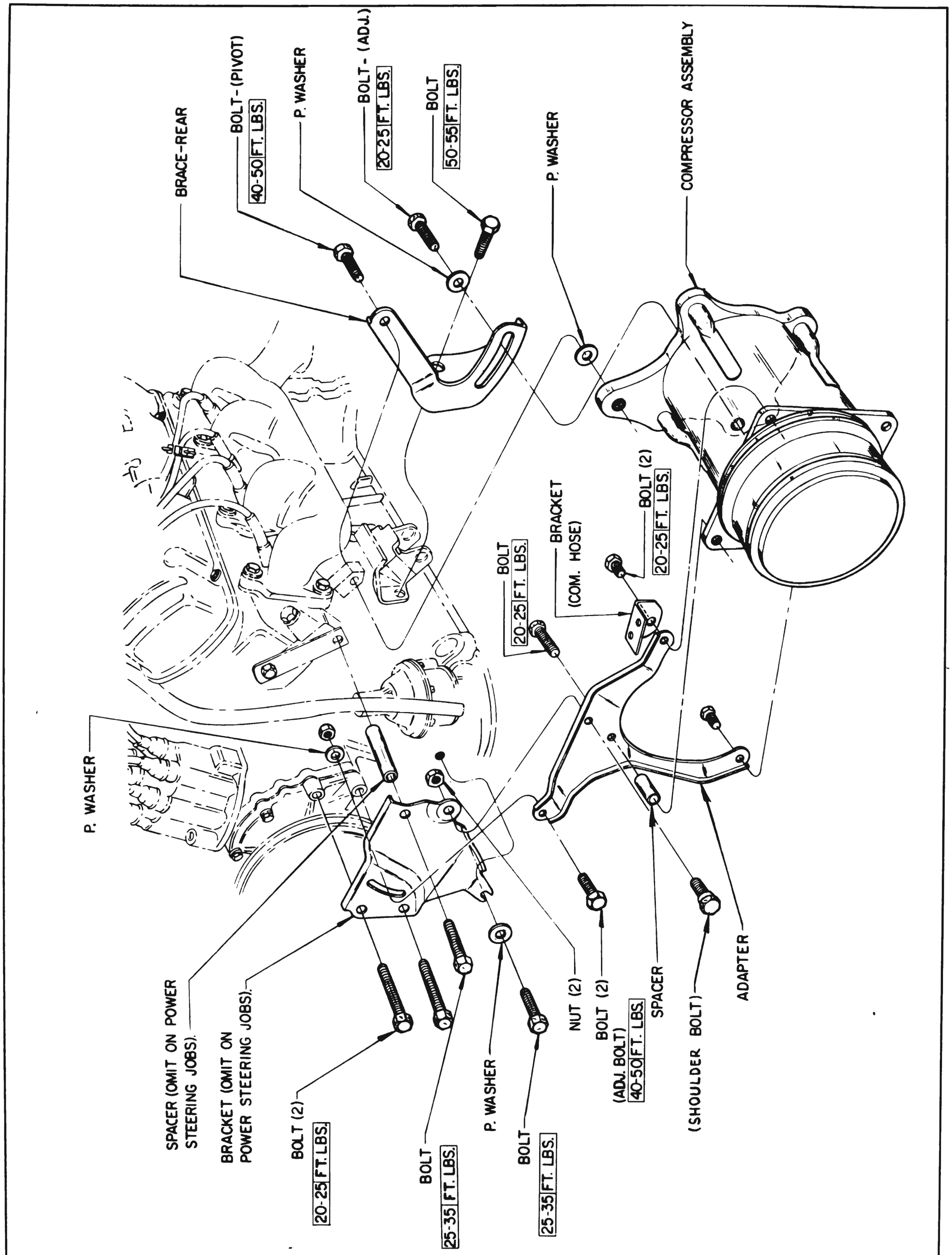

Figure 11-100—Compressor Mounting V-8 Engine

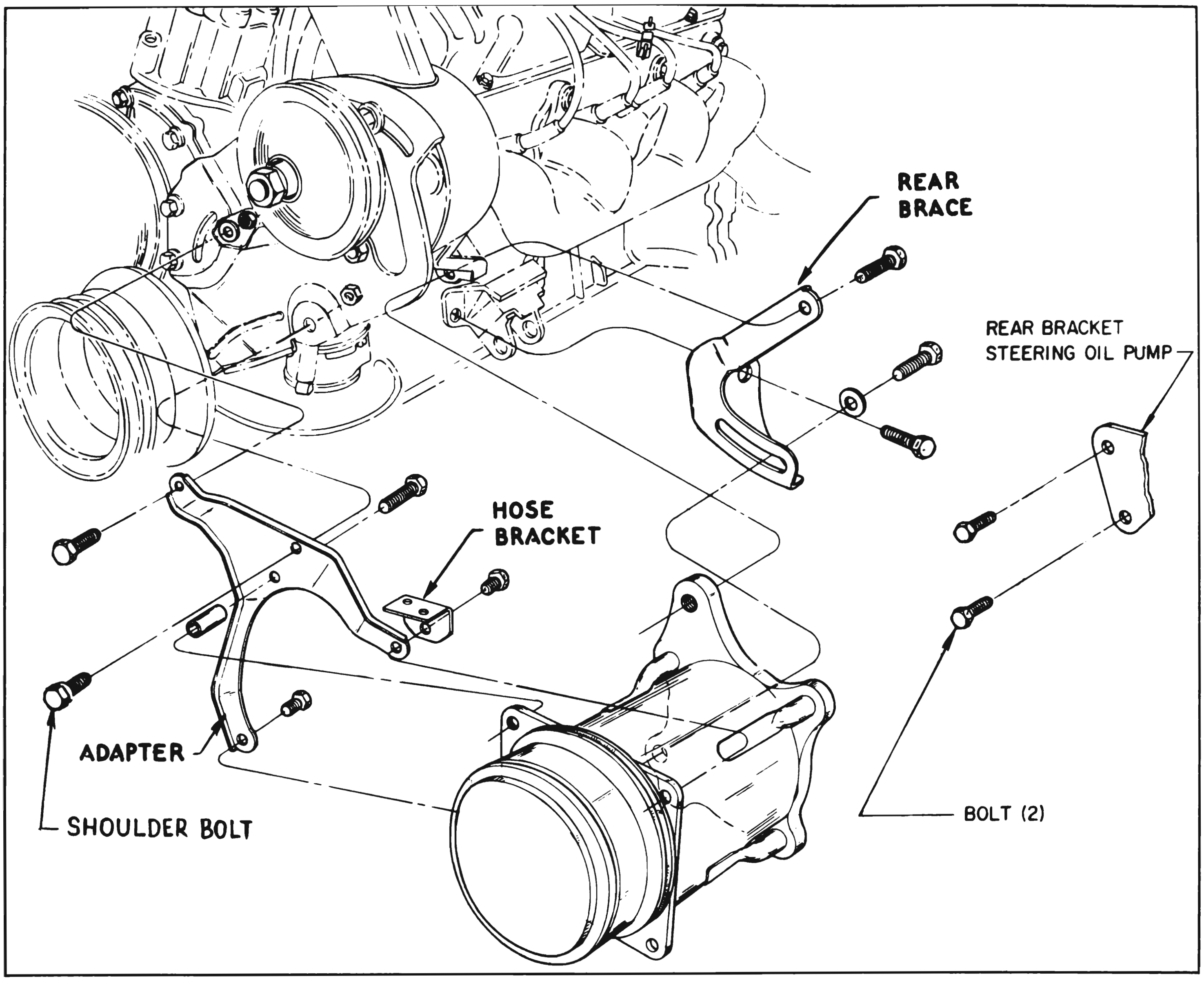

Figure 11-101—Compressor Mounting with Power Steering - V-8 Engine

2. Remove line retaining plate bolt and lockwasher and remove lines from rear of compressor.

3. Cover the openings in lines and compressor with tape to exclude dirt.

4. Disconnect clutch wire from coil terminals on compressor.

5. Remove the two compressor adjustment bolts and the two pivot bolts. See Figure 11-102.

IMPORTANT NOTE: Whenever a compressor replacement is being made, the oil in the original compressor should be drained and measured. The new compressor should contain the same amount of new 525 viscosity oil as was drained from the original compressor. This step is necessary as some of the oil from the original compressor remains in the system. The addition of a complete charge of oil, in addition to the oil remaining in the system, would impair the cooling ability of the unit.

CAUTION: If it is evident that the air conditioner has lost a large amount of oil, refer to subparagraph 1 for procedure for adding oil to compressor.

6. Install compressor by reversing procedure for removal, paying attention to the following:

(a) Inspect drive belt and pulley groove for conditions that might cause slippage. If belt is cracked, frayed, or oil soaked, or is worn so that it bottoms in pulley groove, replace.

(b) Use new O-rings when attaching hoses.

(c) Adjust compressor belt tension. See Figure 2-66.

(d) Evacuate, leak test and charge air conditioner system (par. 11-17).

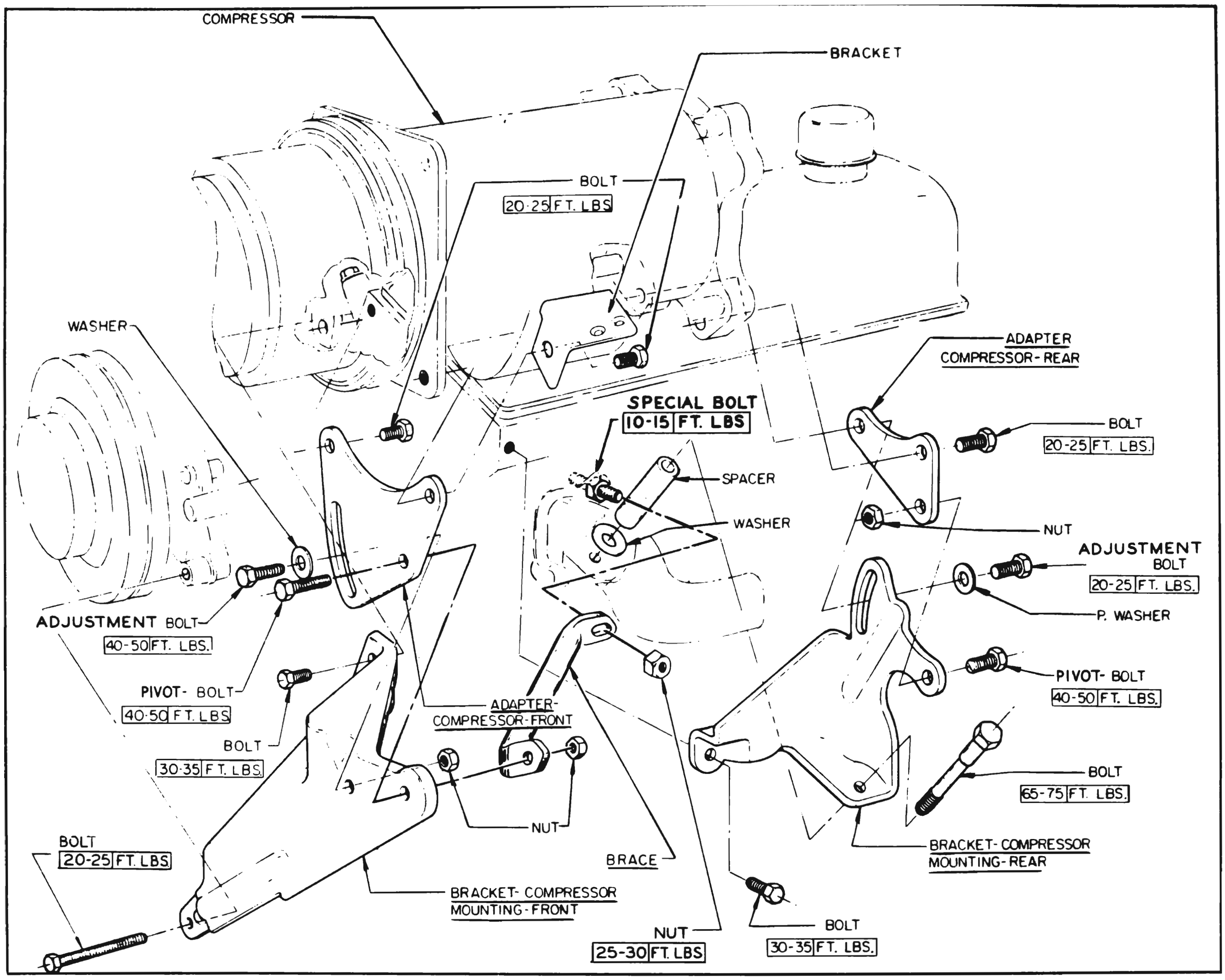

Figure 11-102—Compressor Mounting - V-6 Engine

k. Removal of Evaporator and Air Distribution System Parts

The evaporator assembly may be moved out far enough to service radio without disconnecting refrigerant lines. Blower-compressor switch, center air outlet and "cold" lever are accessible by removing bezel on front of evaporator case.

Figures 11-103 and 11-104 and 11-105 show installation of evaporator assembly, blower, inlet air duct and side outlet, and are to be used as a guide for removing and installing these parts.

To remove thermostatic expansion valve and/or evaporator core proceed as follows:

1. Discharge refrigerant from system as described in subparagraph c.

2. Disconnect the evaporator assembly from the instrument panel by removing the screws from the front support bracket, the two brace to cowl attaching screws and disconnect the outside air valve control wire.

3. Swing the evaporator assembly to one side and disconnect the two refrigerant lines (suction line to suction throttle valve and liquid pipe to liquid hose).

4. Remove the four screws that retain the bezel to the evaporator case.

5. Remove the evaporator upper case by removing the screws that retain it to the lower case.

6. Remove pipe cover from case.

7. Disconnect the evaporator suction line and equalizer line from the suction throttle valve.

8. Carefully lift evaporator core out of lower case. Remove thermostatic expansion valve from evaporator core by removing the valve clamp retaining screw, the valve's capillary bulb retaining clips and disconnecting

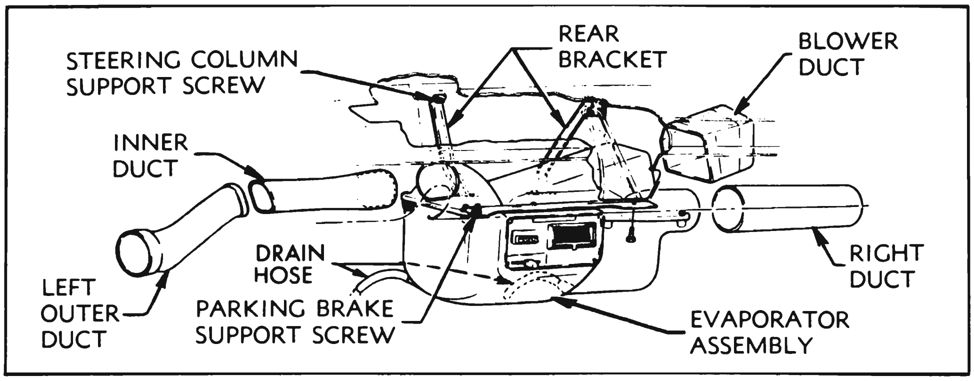

Figure 11-103—Evaporator Assembly Installation

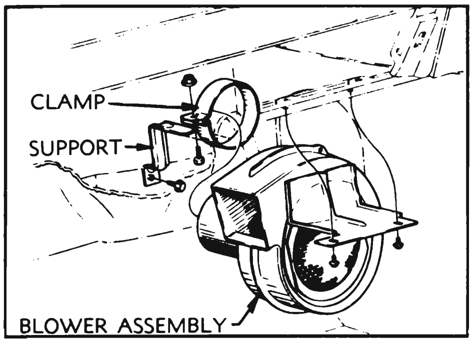

Figure 11-104—Air Conditioner Blower Installation

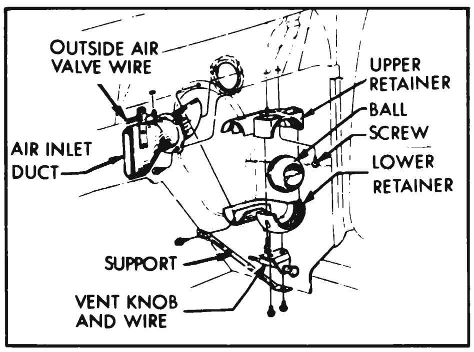

Figure 11-105—Air Inlet Duct and Right Air Outlet Installation

the two refrigerant lines from the valve.

9. Install evaporator and expansion valve assembly in evaporator case by reversing removal procedure, paying attention to the following:

(a) New O-rings are installed on all refrigerant line fittings.

(b) If evaporator core is replaced, be sure all parts are transferred from old core and pour two ounces of 525 compressor oil in new core before installing assembly on car.

(c) The expansion valve's capillary bulb is securely attached to the evaporator suction line.

(d) Heavy body sealer is applied between upper and lower cases to prevent air leaks.

(e) Insulation is reinstalled around evaporator core suction line and end of suction throttle valve.

(f) Evaporator drain hoses are properly installed on case and routed through holes in floor pan.

(g) Evacuate, leak test and charge air conditioner system (par. 11-17).

l. Checking Compressor Oil and Adding Oil

The six cylinder air conditioner compressor is initially charged with 10-1/2 fluid ounces of 525 viscosity Frigidaire Refrigerant oil. After the air conditioner system has been operated, oil circulates throughout the system with the refrigerant. Hence, while the system is running, oil is leaving the compressor with the high pressure gas and is returning to the compressor with the suction gas.

When the air conditioner is operated at around 1000 to 1500 engine RPM's, in the maximum cooling position and blower on high, approximately 4 ounces of oil remains in the compressor, while the rest is distributed in the various air conditioner components. At high engine RPM's, a lesser amount of oil will be retained in the compressor (as little as 2 ounces of oil which is adequate for lubrication of compressor).

The oil balance in the system has been carefully established. It is important in any servicing operation to neither add nor subtract oil which would cause the total oil charge in the system to vary from 10-1/2 fluid ounces. If the total oil charge is less, lubrication of the compressor may not be adequate; if too much oil is in the system, this will reduce the refrigerating capacity of the system. The compressor oil cannot be checked while the compressor is installed on the car.

The oil level in the compressor should not be checked as a matter of course such as is done in the car engine crankcase. The compressor oil level should be questioned only in cases where there is evidence of a major loss of stem oil such as:

1. Broken hose or severe hose fitting leak.

2. Oil sprayed in large amounts under the hood due to a very badly leaking compressor seal.

3. Collision damage to system components.

To check the oil and to determine amount to install in compressor, the compressor must be removed and drained. This same procedure is used to determine amount to install in a replacement compressor or in a compressor that has been disassembled for repair. To drain compressor, remove drain plug and place compressor in a horizontal position with drain plug opening downward. Allow all oil to drain into a container, measure total amount, then discard oil. To determine the amount of oil that should be installed in the compressor if there has been a major loss of oil, when replacing a compressor with a service compressor or when compressor has been disassembled, use the following chart.

IMPORTANT: If oil drained from compressor contains any foreign materials such as chips or there is evidence of moisture in the system, it will be necessary to replace receiver dehydrator and flush the other component parts with refrigerant 12 or dry nitrogen if available. (Subpar. m) The full 10-1/2 oz. of oil should then be added to compressor.

NOTE: The service compressor will also contain 10-1/2 oz. of 525 oil. In most cases, it will be necessary to drain all of the oil from the service compressor, then install oil so it will be the required amount determined by the chart.

During normal service operations where a condenser, receiver or evaporator is replaced with a new unit and where no major loss of oil is involved, add oil to the new unit per item 1 on chart. The oil can be poured directly into the part being replaced.

CONDITION	AMOUNT OF OIL DRAINED FROM COMPRESSOR	AMOUNT OF 525 OIL TO INSTALL IN COMPRESSOR
1. Major loss of oil and a component has to be replaced.	a. More than 4 oz.	a. Amount drained from compressor plus amount for component being replaced as follows: Evaporator - Add 2 oz. Condenser - Add 1 oz. Receiver Dehydrator - Add 1 oz.
	b. Less than 4 oz.	b. Install 6 oz. plus amount for component being replaced as shown above.
2. Compressor being replaced with a service compressor and there wasn't a major loss of oil from the air conditioner system.	a. More than 1-1/2 oz. (See Note)	a. Same amount as drained from compressor being replaced.
	b. Less than 1-1/2 oz.	b. Install 6 oz.
3. Same as Step 2 except there has been a major loss of oil.	a. More than 4 oz.	a. Same amount as drained from compressor being replaced.
	b. Less than 4 oz.	b. Install 6 oz.
4. Compressor has been inoperative and rebuilt and there wasn't a major loss of oil from air conditioner system.	a. More than 1-1/2 oz. (See Note)	a. Same amount as drained from compressor plus 1 oz. additional.
	b. Less than 1-1/2 oz.	b. Install 7 oz.
5. Same as Step 4 except there has been a major loss of oil.	a. More than 4 oz.	a. Same amount as drained from compressor plus 1 oz. additional.
	b. Less than 4 oz.	b. Install 7 oz.

NOTE: If more than 1-1/2 oz. of clean oil was drained from compressor and there is little or no signs of oil being lost from system, install this amount of oil in replacement compressor (plus 1 oz. additional in repaired compressor).

m. Flushing Air Conditioner System

Flushing the air conditioner system can be accomplished by connecting a refrigerant drum to the unit to be flushed, and then turning the drum upside down and opening the drum shut-off valve to pour refrigerant through the unit. The unit should be supported so that the refrigerant passing through it will be directed into an area where a temperature of -21.7°F. will do no damage. When a unit is not removed such as a condenser, disconnect the inlet and outlet lines before flushing it out.

CAUTION: When liquid refrigerant is poured from the drum into an area where atmospheric pressure exists, its temperature will immediately drop to -21.7°F.

In order to keep the expansion valve open when flushing the evaporator with refrigerant, the expansion valve bulb must be detached from the evaporator outlet tube.

In all cases where it is necessary to flush the air conditioner system, the receiver dehydrator should be replaced. Also, the thermostatic expansion valve inlet screen should be cleaned.

Dry nitrogen which is much cheaper than refrigerant if available, is preferred for flushing out the air conditioner system. Nitrogen will not cause the temperature to drop like refrigerant 12 does. The cold temperature makes it difficult to remove the contaminated oil from the unit being flushed. Also, the dry nitrogen will remove moisture from the system.

11-17 EVACUATION, LEAK TESTING AND CHARGING AIR CONDITIONER

NOTE: Tool J-8393 Portable Air Conditioner Service Station is a Kent-Moore unit designed specifically for servicing automobile air conditioners. J-8393 provides a means of measuring refrigerant without the use of scales. The unit also makes it possible to charge a system without heating the refrigerant tank. As complete instructions are printed on the control panel of J-8393 and the instructions differ from those used with conventional equipment, only conventional equipment will be considered in this paragraph.

a. Evacuation and Leak Testing of System

1. Attach gauge lines, adapters and vacuum pump set-up as shown in Figure 11-106 for V-8 engine installation or Figure 11-107 for V-6 engine installation. Discharge any refrigerant that may be in system.

2. Start the vacuum pump, open both valves on gauge set, then slowly open the shut-off valve on the vacuum pump. CAUTION: If valve on the vacuum pump is opened to quickly, oil may be forced out of pump.

3. Operate vacuum pump until at least 28 inches vacuum (at sea level) is registered on the ''Low'' pressure gauge, then continue to run pump for ten minutes.

NOTE: Allowance should be made for elevation when obtaining a vacuum. A vacuum of 28 inches of mercury at or near sea level is required. For higher levels, the required vacuum may be reduced by 1 inch of mercury for each 1000 feet of elevation.

4. If a 28 inch vacuum cannot be obtained, close pump shut-off valve and stop pump, then open the refrigerant-12 cylinder valve to charge the system at cylinder pressure. After closing the cylinder valve, leak test the complete system, including gauge connections and correct any leaks found. Then re-evacuate system.

5. After 28 inches vacuum has been maintained for ten minutes, close the vacuum pump shut-off valve, stop the pump. Observe gauge and if loss of vacuum is 2" or more in 5 minutes, there is a leak in the system and must be corrected.

6. Charge the system with refrigerant-12 at cylinder pressure. Then with refrigerant-12 cylinder valve closed, again evacuate the system with pump at 28 inches of vacuum for ten minutes. This charging and second evacuation are for the purpose of removing any air or moisture that may have entered the system.

7. After maintaining the 28 inches of vacuum for ten minutes, close the vacuum pump shut-off valve and stop the pump. The refrigeration system is now ready for charging.

b. Charging the System

1. With the vacuum pump, refrigerant-12 cylinder and gauge set connected to the compressor as shown in Figure 11-106 or 11-107, place the cylinder in a bucket of hot water which does not exceed 125°F.

CAUTION: Never heat refrigerant cylinder above 125°F as tremendous hydrostatic pressures will develop, capable of rupturing cylinder. When, there is a possibility of overheating cylinder, the cylinder must be opened to a suitable pressure relief mechanism at all times.

2. Place cylinder and bucket on a suitable scale and record the total weight.

3. Open the low pressure valve on the gauge set. (High pressure valve on gauge set closed.)

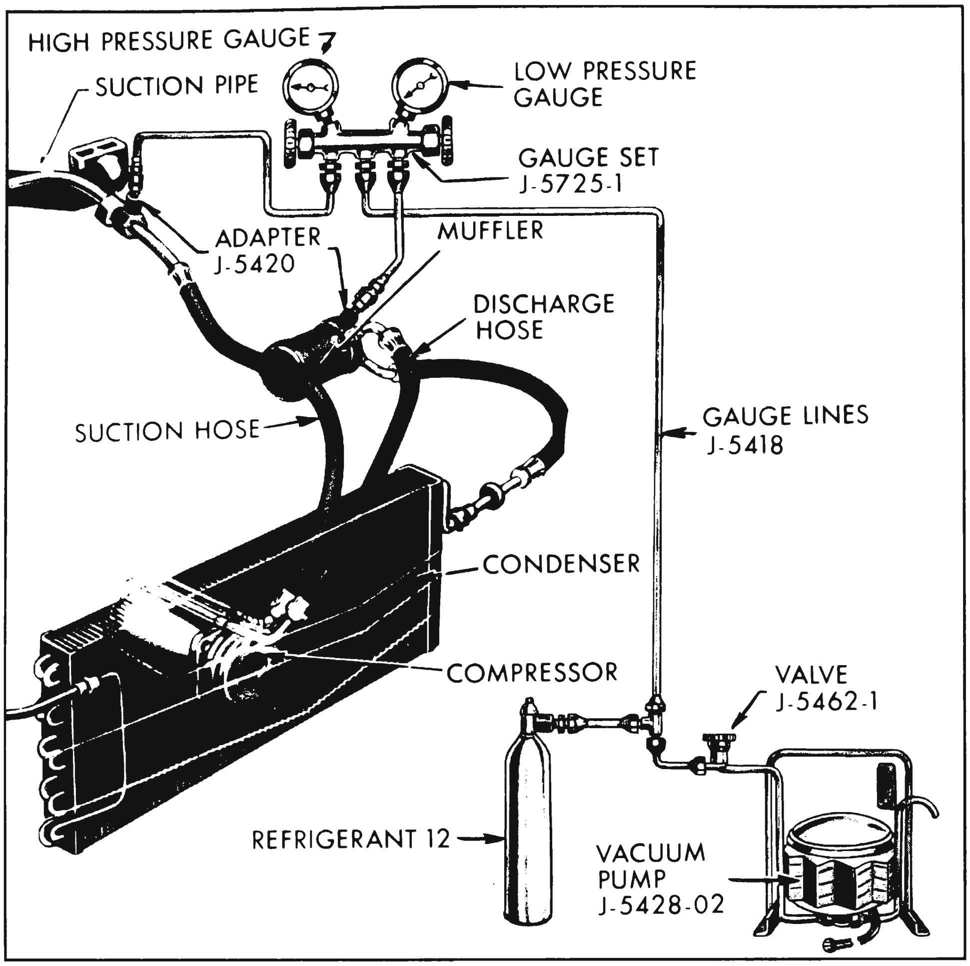

Figure 11-106—Service Hook-Up For Charging Air Conditioner - V-8 Engine Installation

4. Wearing goggles to protect eyes, fully open the refrigerant-12 cylinder valve and allow refrigerant-12 vapor to flow into the refrigerating system.

5. Operate engine and compressor at slow idling speed until a total of 2-1/2 pounds of refrigerant-12 have been charged into the system.

NOTE: It may be necessary to reheat the water in bucket to maintain required pressure.

6. Close both valves on gauge set, close valve on refrigerant-12 cylinder, and remove cylinder from bucket of water.

IMPORTANT: Whenever the refrigeration system is discharged and recharged, it is necessary to move the "Cold" lever back and forth from one extreme to the other approximately 12 times with system operating to normalize the piston diaphragm in the suction throttle valve.

7. Perform functional test. See Figure 11-110.

8. Remove gauge lines and replace protective caps over shrader valve fittings and tighten securely.

11-18 AIR CONDITIONER FUNCTIONAL TEST

In order to determine if the air conditioner system is operating properly and efficiently, it should be functional tested. Functional testing the air conditioner is determining if the discharge air temperature at the air outlet located at right side of the instrument panel, suction pressure and discharge pressure are within the specifications at a particular ambient condition.

To functional test the air conditioner, the low pressure gauge line must be connected to the shrader valve on the suction throttle valve. Adapter J-9459 is used to depress the shrader valve. See Figure 11-98. Figure 11-108 shows the functional test gauge hook-up on V-8 installations and Figure 11-109 on V-6 installations.

11-19 AIR CONDITIONER TROUBLE DIAGNOSIS

a. Inspection of Air Conditioner System

1. Check compressor belt tension. See Figure 2-65 and 2-66.

2. Inspect all connections for presence of oil on any of the refrigerant system parts which could indicate a refrigerant leak. If oil is evident, check for leaks and repair as necessary.

3. Check air outlet hoses for leaks or restrictions.

4. Check outer surfaces of condenser to be sure they are not plugged with dirt, leaves or other foreign material Be sure to check between the condenser and radiator as well as the outer surfaces.

5. Check to insure that evaporator drains are open.

6. Check sight glass as instructed in subparagraph c.

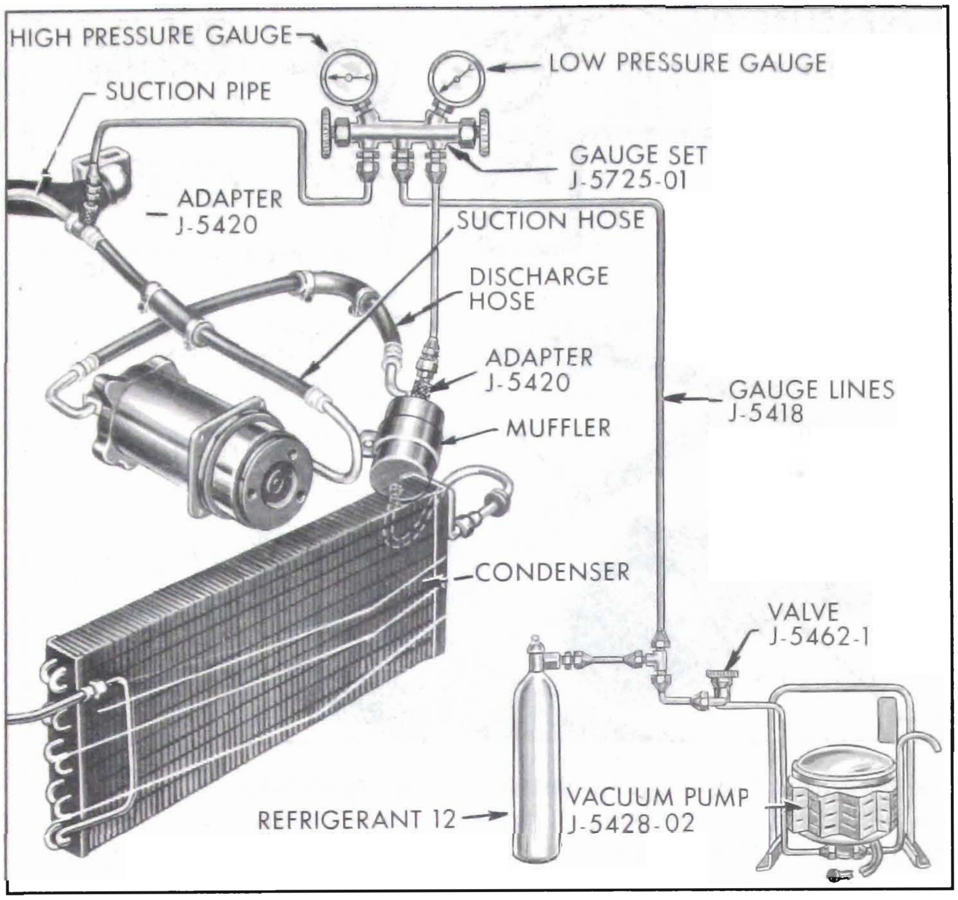

Figure 11-107—Service Hook-Up For Charging Air Conditioner - V-6 Engine Installation

7. Check ambient air temperature and air temperature at right air outlet following instructions on functional test chart. See Figure 11-110. Temperature should correspond with those listed on chart. If temperatures do not compare, attach gauge set (Figure 11-108 and 109) and functional test air conditioner.

b. Diagnosis of Components

Listed below are the air conditioner components and the possible conditions that could be encountered with each unit if defective.

1. Compressor - Compressor malfunction will appear in one of four ways; noise, seizure, leakage, or low discharge pressures.

Even, resonant compressor noises are not cause for excessive alarm; however, irregular noise or rattles are likely to indicate broken parts.

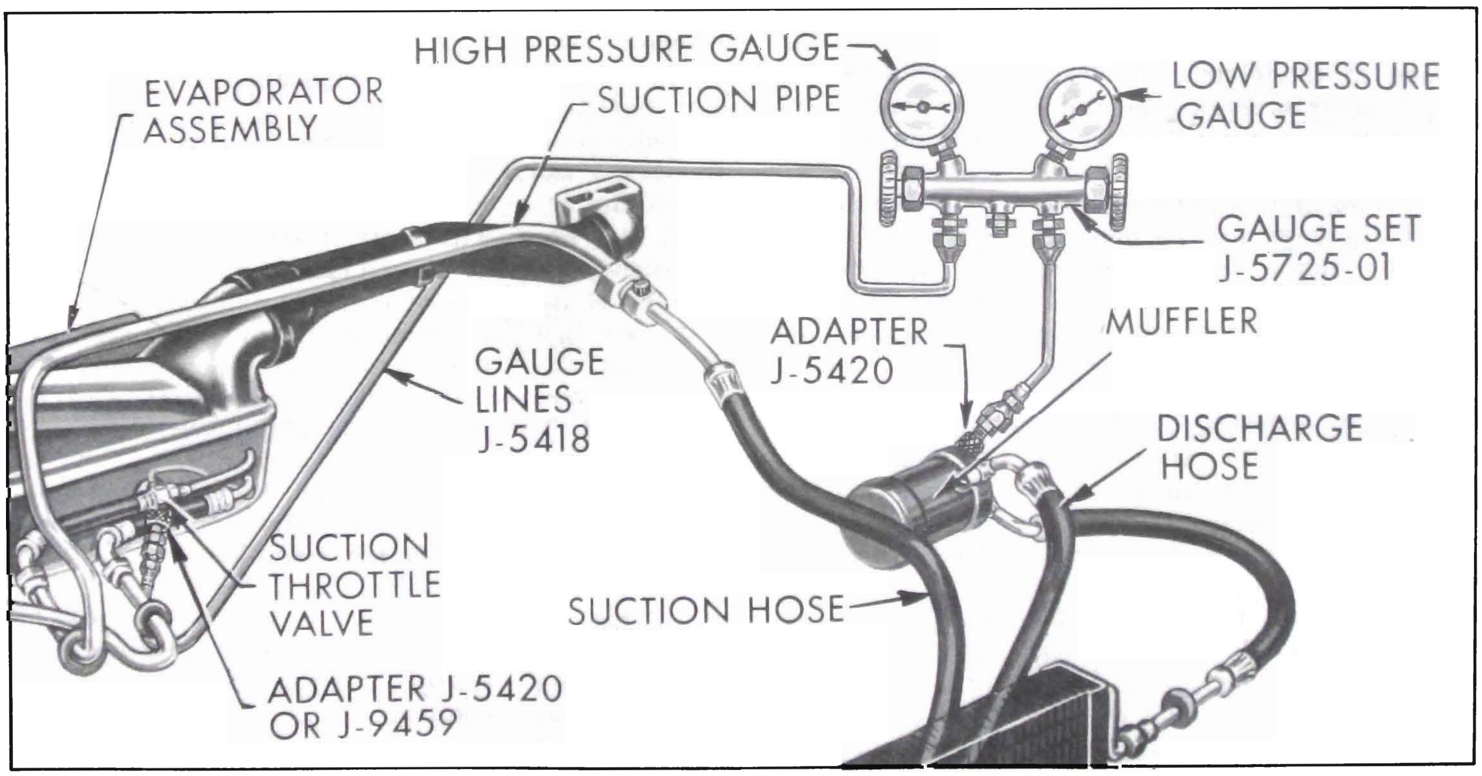

Figure 11-108—Gauge Hook-Up For Functional Testing Air Conditioner - V-8 Engine Installation

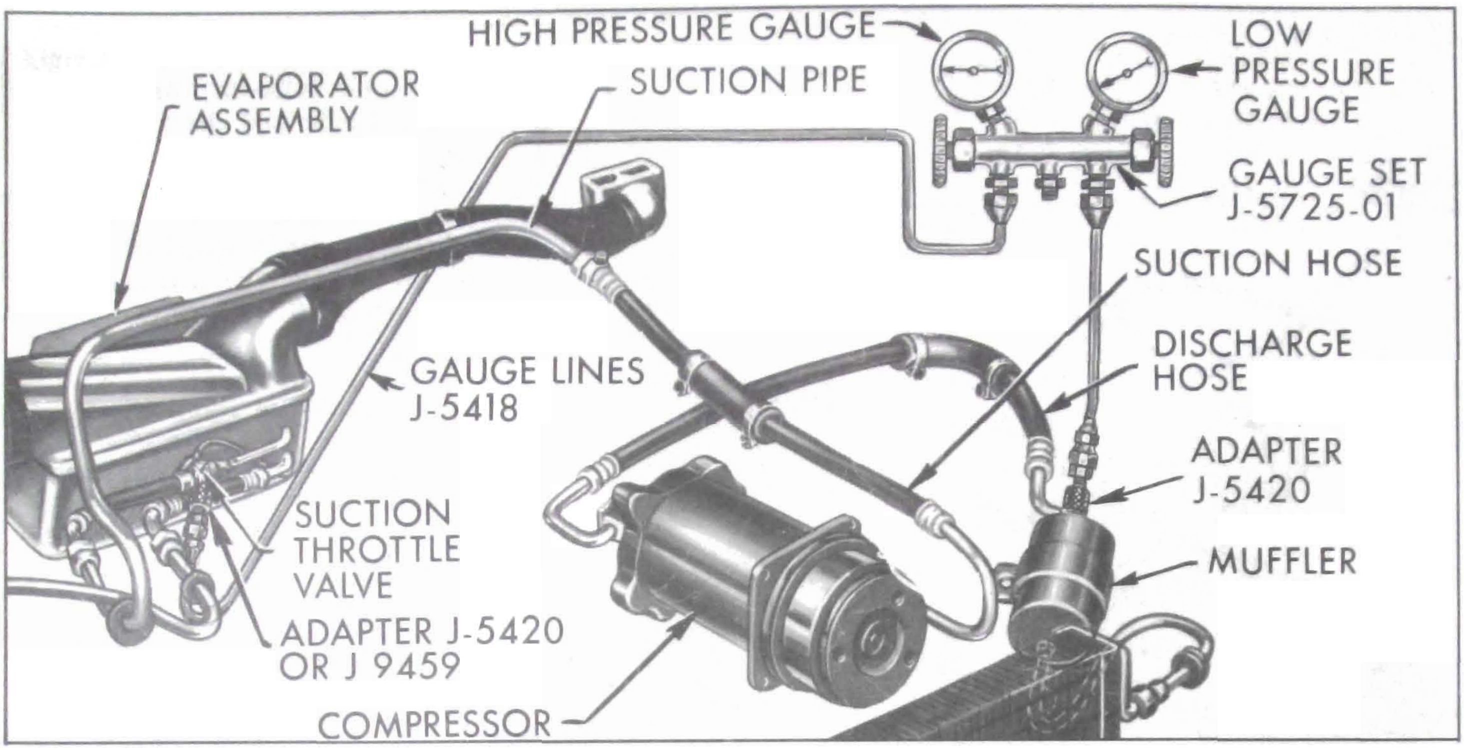

Figure 11-109—Gauge Hook-Up For Functional Testing Air Conditioner - V-6 Engine Installation

Seizure will be indicated by the failure of the compressor to operate, if the clutch is in good operating condition and there is no break in the electrical continuity of the system. Continued operation of a seized or partially seized compressor will result in damage to the clutch. To check for seizer, de-energize the clutch and attempt to rotate the compressor shaft. If the shaft will not turn, the compressor is seized. Leakage will be detected through routine leak detection.

Low discharge pressures may also be caused by insufficient refrigerant or a restriction elsewhere in the system such as in the suction throttle valve. These should be checked out prior to compressor servicing.

2. Compressor Clutch - If the compressor is inoperative, the electrical lead to the clutch should first be checked. If there is current to the clutch and the compressor is not seized, the clutch is defective and should be repaired.

3. Condenser - During operation, the condenser outlet should be cooler than its inlet. There are two types of possible condenser malfunction. The condenser may leak, resulting in loss of refrigeration and low system pressures, or the condenser may have a restriction, resulting in excessive compressor discharge pressures and inadequate cooling. If a restriction occurs and some refrigerant passes the restriction, icing or frost may occur on the external surface of the condenser in the area of the restriction. Also, if the air flow through the condenser is restricted or blocked, high discharge pressures will result. It is important that the external fins of the condenser and radiator core are not plugged with bugs, dirt, etc.

4. Thermostatic Expansion Valve - If malfunction of the valve is suspected, make sure the power element bulb is in proper position, tightly attached, and well insulated from outside air temperatures.

If this valve fails, it usually fails in the power element and the valve remains closed. This will be indicated by low suction and discharge pressures with no cool air being delivered. Also, the inlet screen could be plugged. The screen may be cleaned with liquid refrigerant.

5. Evaporator - Dirt or other foreign matter on the core surface or in the evaporator case will restrict air flow. A cracked or broken case can result in leakage of cold air and can result in insufficient air or warm air delivered to the passenger compartment. The condensation drain tubes should be unrestricted.

6. Refrigerant Lines - Restrictions in the refrigerant lines may be indicated as follows:

Suction line - low suction pressure at compressor, low discharge pressure, little or no cooling.

Discharge line - compressor relief valve opens.

FUNCTIONAL TEST FOR SPECIAL AND SKYLARK SERIES SUCTION THROTTLE VALVE CONTROLLED AIR CONDITIONER

TEST CONDITIONS

1. Doors and hood open.
2. "Cold" lever at maximum cooling position (extreme right) and blower on high.
3. Gauge set connected to high pressure schrader valve at muffler and to low pressure schrader valve on suction throttle valve. Adapters J-5440 or J-9459 must be used on gauge lines to depress schrader valves. See Figure 11-108 and 11-109.
4. Heater and ventilator levers "off".
5. Engine speed at 1600 RPM.
6. Ambient air temperature and per cent relative humidity should be measured in the immediate vicinity of car tested.
7. A fan should be used in front of radiator grille to insure minimum differential between temperature of air passing into condenser through radiator grille and into evaporator through body cowl screen.
8. Test should be conducted in area with 60° or above ambient temperature.

The following table lists ambient temperature, evaporator and head pressures, and right air outlet temperatures that can be expected from a normally-functioning unit. If evaporator pressure is not correct for indicated ambient temperature, adjust suction throttle valve to table. See Par. 11-16, Sub. Par. g.

Ambient Temperature °F.	Suction Pressure PSIG	Compressor Head Pressure PSIG	Right Air Outlet Temperature °F.
60	22-24	105-155	29-33
70	22-24	120-180	30-36
80	22-30	150-225	31-46
90	22-45	190-295	32-61
100	23-49	225-320	35-63
110	35-59	310-375	50-75

NOTE: The lower outlet temperatures should be obtained on dry days and the higher on humid days.

Figure 11-110—Air Conditioner Functional Test Chart

Liquid line - low discharge pressure, low suction pressure, no cooling.

7. Receiver Dehydrator - Leakage of refrigerant indicates a defective unit. The desiccant cannot easily be checked, but if it, or the system has been exposed to outside air for a considerable length of time, the unit should be replaced.

Restrictions in the receiver-dehydrator can also cause system malfunction. If the inlet tube is blocked, it is likely to result in high head pressure. If the outlet tube is blocked, head pressure is likely to be low and there will be little or no cooling.

A restriction may cause the refrigerant to vaporize as it leaves the receiver-dehydrator, making the outlet excessively cold.

8. Suction Throttle Valve - If the STV is defective it may cause evaporator pressure to be too

high (air outlet temperature too warm) or it could cause the evaporator pressure to be too low (air outlet temperature too low which may cause icing of the evaporator core). Also, if the inner spring of the STV is defective, there would be no means of setting the STV to change (increase) the air outlet temperature. Refrigerant leakage of STV may be detected through routine leak detection.

Before servicing the suction throttle, it should be determined that the STV is actually the cause of the complaint by following adjustment procedure in paragraph 11-16, subparagraph g. If evaporator pressure remains too high when checking and adjusting STV, the low pressure gauge line should be attached to the shrader valve located on the compressor suction line at left side of cowl. If compressor suction pressure is also high, compressor or thermostatic expansion valve may be the cause of the trouble.

If tests indicate STV is defective, it should be removed, disassembled and repaired following procedure in paragraph 11-16, subparagraph d and h.

c. Use of Receiver Sight Glass for Diagnosis

At temperatures higher than 70°F., the sight glass may indicate whether the refrigerant charge is sufficient. A shortage of liquid refrigerant is indicated after about five minutes of compressor operation by the appearance of slow-moving bubbles (vapor) or a broken column of refrigerant under the glass. Continuous bubbles may appear in a properly charged system on a cool day. This is a normal situation. If the sight glass is generally clear and performance is satisfactory, occasional bubbles do not indicate refrigerant shortage.

If the sight glass consistently shows foaming or a broken liquid column, it should be observed after partially blocking the air to the condenser. If under this condition the sight glass clears and the performance is otherwise satisfactory, the charge shall be considered adequate.

In all instances where the indications of refrigerant shortage continues, additional refrigerant should be added in 1/4 lb. increments until the sight glass is clear. An additional charge of 1/2 lb. should be added as a reserve.

In no case should the system be overcharged.

d. Trouble Diagnosis

COMPLAINT AND CAUSE	CORRECTION
1. Insufficient Cooling	
(a) Low air flow.	(a) Check blower operation. Check for obstructions at blower screen or in air duct assembly. Check for clogged evaporator. If iced, de-ice core and check adjustment and operation of suction throttle valve. Paragraph 11-16, subparagraph g.
(b) Defective heater temperature control valve.	(b) Check operation of valve. Adjust or replace as necessary.
(c) Heater or ventilator controls not in the "off" position.	(c) Advise operator of correct operation of controls.
NOTE: If none of the above items are cause of complaint of insufficient cooling, perform function test on car. See Figure 11-110. If car does not pass test, see items 2, 3, 4 and 5 on this chart.	
2. Compressor Discharge Pressure Too High	
(a) Engine overheated.	(a) See paragraph 2-13 for possible cause.

d. Trouble Diagnosis— (Cont'd)

COMPLAINT AND CAUSE	CORRECTION
2. Compressor Discharge Pressure Too High (Cont'd)	
(b) Overcharge of refrigerant or air in system.	(b) Systems with excess discharge pressures should be slowly depressurized. (1) If discharge pressure drops rapidly, it indicates air (with possibility of moisture) in the system. When pressure drop levels but still indicates in excess of specifications shown in the functional TEST CHART, slowly bleed system until bubbles appear in the sight glass and stop. Add refrigerant until bubbles clear, then add one-half pound of refrigerant. Recheck operational pressures. If system pressures still remain above specifications and the suction pressure is slightly above normal, then a restriction exists in the high pressure side of the system. (2) If discharge pressure drops slowly, it indicates excessive refrigerant. If pressures drop to specifications and sight glass remains clear, stop depressurizing and recheck operational pressures. If pressures are satisfactory, depressurize until bubbles appear in the sight glass, stop depressurizing, then add one-half pound refrigerant. Recheck operational pressures. (3) If discharge pressure remains high after depressurizing the system, continue depressurizing until bubbles appear in the sight glass. If evaporator pressure also remains high, there is a possibility of a restriction in the high pressure side of the refrigeration system. See also EVAPORATOR PRESSURE TOO HIGH.
(c) Restriction in condenser or receiver-liquid indicator.	(c) Remove parts, inspect, and clean or replace.
(d) Condenser air flow blocked.	(d) Clean condenser and radiator core surfaces as well as the space between the condenser and radiator.
(e) Evaporator suction pressure too high.	(e) See EVAPORATOR PRESSURE TOO HIGH.

d. Trouble Diagnosis— (Cont'd)

COMPLAINT AND CAUSE	CORRECTION
3. Compressor Discharge Pressure Too Low	
(a) Insufficient refrigerant.	(a) Check for presence of bubbles or foam in liquid indicator. If bubbles or foam are noted (after five minutes of operation), check system for leaks, if no leaks found refrigerant should be added until sight glass clears, then add an additional 1/2 lb.
(b) Low suction pressure.	(b) See EVAPORATOR PRESSURE TOO LOW.
(c) Defective compressor and/or broken compressor reed valves.	(c) Repair compressor.
4. Evaporator Pressure Too High	
(This will be accompanied by air outlet temperature at outlet too high.)	
(a) Thermostatic expansion valve capillary tube bulb not tight to evaporator outlet tube.	(a) Check clips for tightness.
(b) Thermostatic expansion valve improperly adjusted or inoperative.	(b) Replace valve.
(c) Suction throttle valve inoperative or adjusted incorrectly.	(c) Check valve control wire as instructed in paragraph 11-16, subparagraph g.
(d) Evaporator core freezing.	(d) Check suction throttle valve, paragraph 11-16, subparagraph g.
5. Evaporator Pressure Too Low	
(a) Thermostatic expansion valve capillary tube broken, inlet screen plugged or valve otherwise failed.	(a) Replace valve or clean inlet screen of valve.
(b) Restriction in system tubes or hoses.	(b) Replace kinked tube or restricted hose.
(c) Suction throttle valve adjusted improperly or defective.	(c) Check operation of STV, paragraph 11-16, subparagraph g. Repair if necessary.

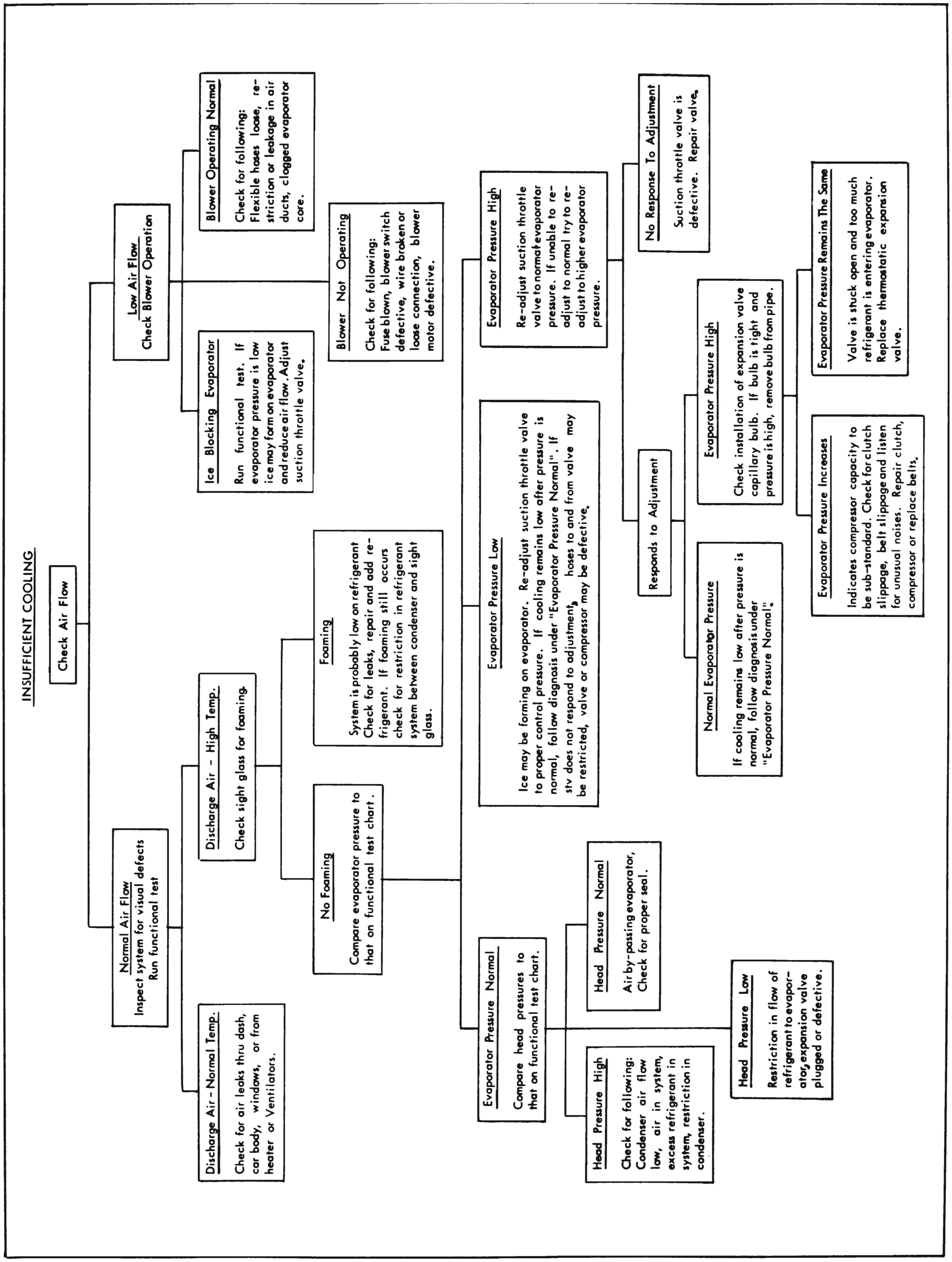

Figure 11-111—Air Conditioner Trouble Diagnosis Chart

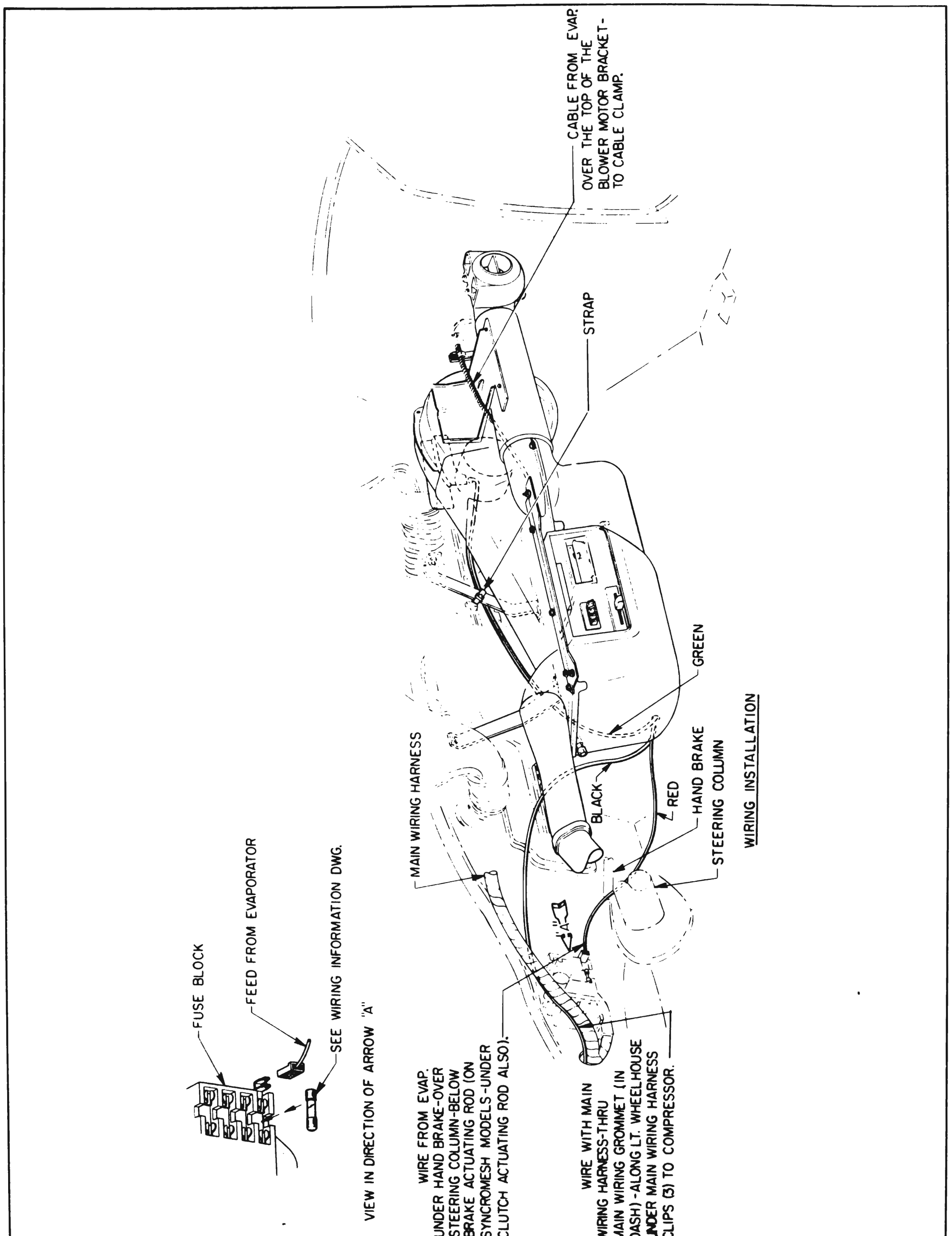

Figure 11-112—Air Conditioner Wiring Installation

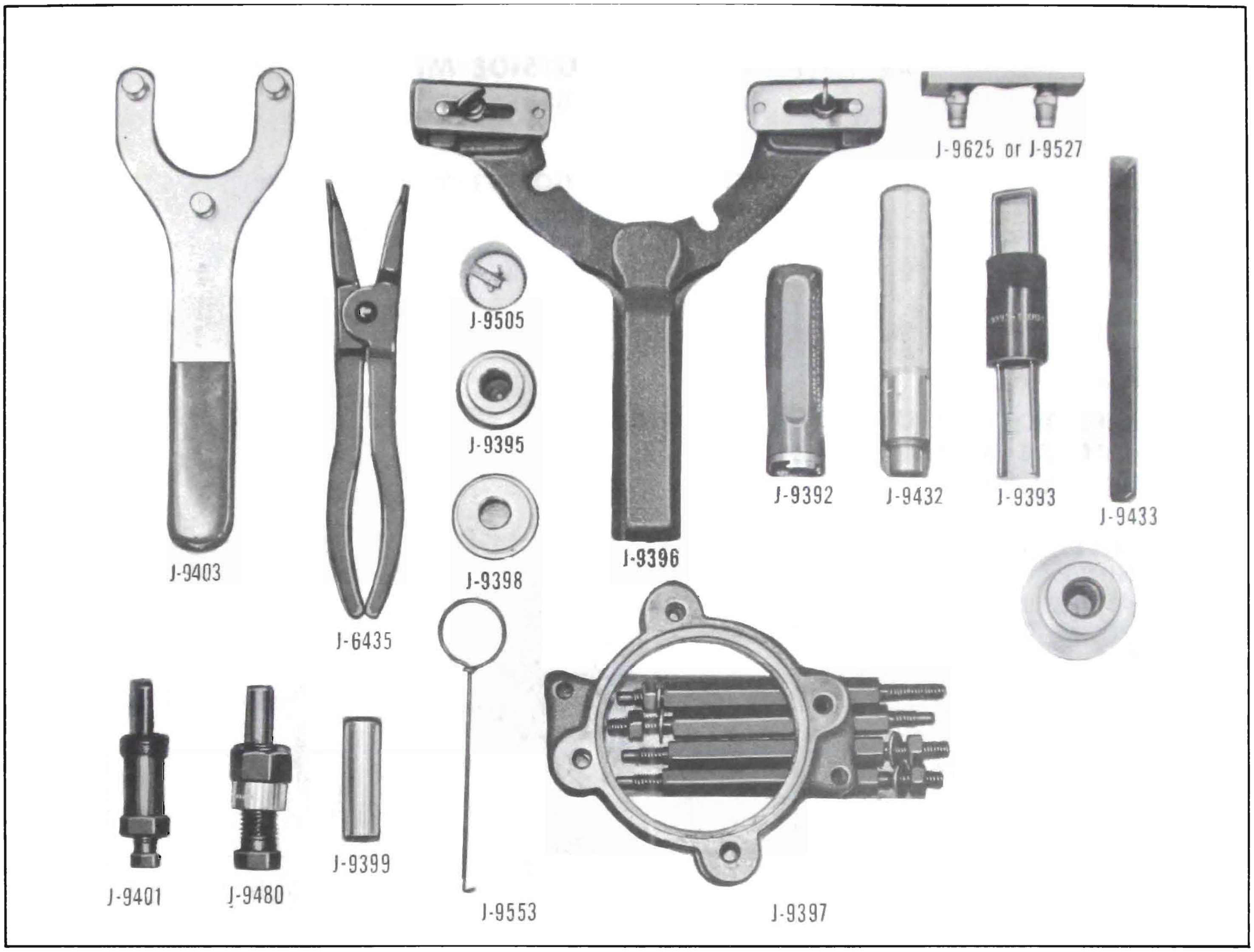

Figure 11-113—Compressor Tools