SECTION A

REFRIGERANT COMPONENTS

ALL SERIES

CONTENTS

DIVISION I

TROUBLE DIAGNOSIS

13-1 GENERAL INFORMATION

The following is a brief description of the type of symptom each refrigerant component will evidence if a malfunction occurs:

A. Compressor

Compressor malfunction will appear in one of four ways: noise, seizure, leakage, or low discharge pressure.

Resonant compressor noises are not cause for alarm; however, irregular noise or rattles may indicate broken parts or excessive clearances due to wear. To check seizure, de-energize the magnetic clutch and check to see if drive plate can be rotated. If rotation is impossible, compressor is seized. To check for a leak, refer to par. 13-21 sub-paragraph H. Low discharge pressure may be due to a faulty internal seal of the compressor, or a restriction in the compressor.

Low discharge pressure may also be due to an insufficient refrigerant charge or a restriction elsewhere in the system. These possibilities should be checked prior to servicing the compressor. If the compressor is inoperative; but, is not seized, check to see if current is being supplied to the magnetic clutch coil terminals.

B. Condenser

A condenser may malfunction in two ways: it may leak, or it may be restricted. A condenser restriction will result in excessive compressor discharge pressure. If a partial restriction is present, sometimes ice or frost will form immediately after the restriction as the refrigerant expands after passing through the restriction. If air flow through the condenser or radiator is blocked, high discharge pressures will result. During normal condenser operation, the outlet pipe will be slightly cooler than the inlet pipe.

C. Receiver-Dehydrator

A receiver-dehydrator may fail due to a restriction inside body of unit. A restriction at the inlet to the receiver-dehydrator will cause high head pressures. Outlet tube restrictions will be indicated by low head pressures and little or no cooling. An excessively cold receiver-dehydrator outlet may be indicative of a restriction.

D. Expansion Valve

Expansion valve failures usually will be indicated by low suction and discharge pressures, and insufficient evaporator cooling. The failure is generally due to malfunction of the power element and subsequent closing of the valve. A less common cause of the above symptom is a clogged inlet screen.

E. Evaporator

When the evaporator malfunctions, the trouble will show up as inadequate supply of cool air. A partially plugged core due to dirt, a cracked case, or a leaking seal will generally be the cause.

F. POA Valve

If the POA valve is defective, it may cause evaporator pressure (hence air temperature) to be either too high or too low depending on the type of failure. No adjustment is possible on POA valves. If it is determined that a POA valve has failed it should be replaced. See Par. 13-17.

G. Refrigerant Line Restrictions

Restrictions in the refrigerant lines will be indicated as follows:

1. Suction Line - A restricted suction line will cause low suction pressure at the compressor, low discharge pressure and little or no cooling.

2. Discharge Line - A restriction in the discharge line generally will cause the pressure relief valve to open.

3. Liquid Line - A liquid line restriction will be evidenced by low discharge and suction pressure, and insufficient cooling.

H. Use of Receiver-Dehydrator Sight Glass for Diagnosis

At temperatures higher than 70 degrees 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.

13-2 LEAK TESTING SYSTEM

The following two methods are recommended when attempting to locate refrigerant leaks in the system. Loss of refrigerant is always indicative of a leak since refrigerant is not consumed and does not wear out.

1. Open Flame Method - This method utilizes a gas operated torch type leak detector (J-6084). Use of this method is recommended when checking for leaks in confined areas. To perform test, light torch and adjust to obtain a pale blue flame, approximately 3/8 inch in height, in burner.

Explore for leaks by moving end of search tube around suspected area. Check bottom of connections since Refrigerant-12 is heavier than air and will be more apparent at underside of fittings. The flame color will turn yellow-green when a small leak is detected. Large leaks will turn the flame blue or purple.

WARNING: Do not breath fumes resulting from burning of refrigerant gas. These fumes are extremely poisonous.

When leak testing the POA valve, it is necessary to check only the hose coupling ends. When using the propane torch leak detector, no evidence of Refrigerant-12 should be present at the POA valve.

2. Liquid Leak Detectors - This method utilizes a solution which will bubble (soap solution) to signify a gas leak. Use of this method of checking is recommended for locating small leaks.

13-3 FUNCTIONAL TESTING SYSTEM

Functional testing is a measurement of the air conditioner system performance to determine if discharge air temperature, pressure in suction line, and pressure in discharge line are within specific limitations.

To perform functional test proceed as follows:

1. Remove protective caps from Schrader valve located on suction throttle valve and Schrader valve located on compressor discharge port.

2. Interconnect manifold and gage set (J-5725-01), gage charging lines (J-5418) and gage adapters (J 5420) to air conditioning system as shown in Figure 13-1.

3. Open doors and hood of car.

4. Set temperature lever to extreme left position and fan to "MAX" 4D-4F-4G-4H, "HI" 4L-4N-4R-4P-4U-4V- 4Y Series. Selector switch in "REC" 4D-4F-4G-4H, selector lever in "A/C" 4L-4N-4R-4P-4U-4V-4Y Series.

5. Idle engine at 2000 RPM in neutral.

6. Place a high volume industrial type fan in front of radiator grille to insure minimum differential between temperature of air passing through radiator grille and condenser, and temperature of air flow through cowl air inlet and past evaporator core.

7. Measure relative humidity and ambient temperature in immediate vicinity of car to be tested. The temperature obtained at the air outlets will be lower on dry days and higher on humid days.

8. Open all air conditioner outlets and measure temperature at right and left outlets.

9. Compare the actual pressures and temperatures with the pressures and temperatures indicated in Test No. 1 of Funcational Test Table (see Figure 13-79).

If it appears from the test results that either the POA valve or the expansion valve is at fault, the following procedure will help determine which to replace.

a. Check temperature door, make sure the door seals in the cool position, readjust the Bowden cable if necessary.

b. Check air hoses and ducts for proper connections.

c. Check the sight glass for "clear" condition and make sure compressor clutch is engaged.

After these basic visual checks, install evaporator and head pressure gages. Operate the engine at 1500 RPM,

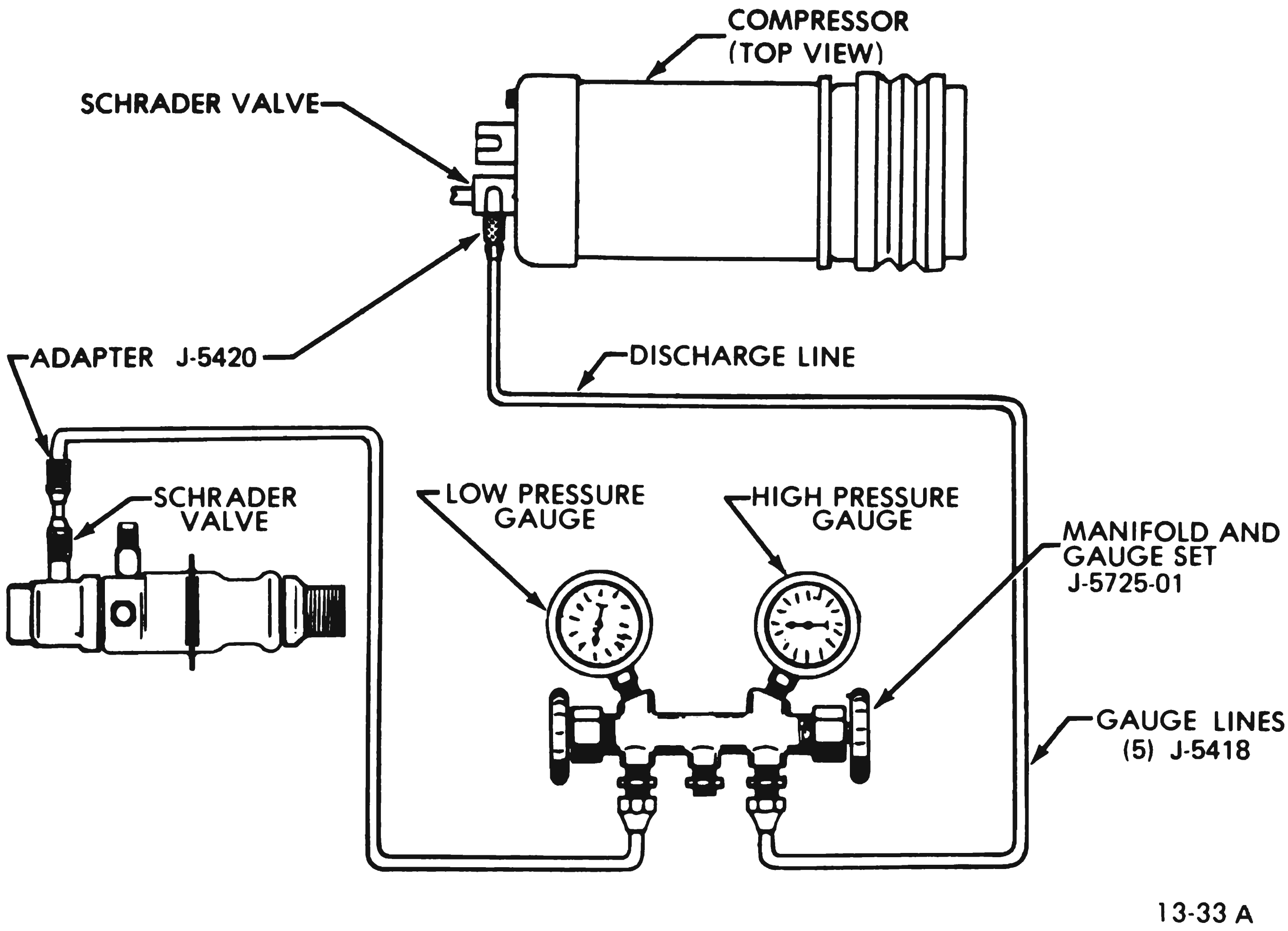


Figure 13-1 Functional Test Set-Up

"REC" control setting and "LO" blower 4D-4F-4G-4H, "A/C" selector lever setting, and "LO" blower 4L-4N-4R-4P-4U-4V-4Y Series.

d. If evaporator pressure is 30 (4D-4F-4G-4H) 31 (4L-4N-4R-4P-4U-4V-4Y) psi or less (and discharge air temperatures are too warm), replace the expansion valve.

e. If evaporator pressure is above 30 psi, even with blower wire disconnected, make sure the expansion valve feeler bulb is clamped tightly to the evaporator outlet pipe and the feeler bulb insulation is in place. If the bulb and insulation are OK, replace the POA valve.

f. If evaporator pressure is 30 (4D-4F-4G-4H) 31 (4L-4N-4R-4P-4U-4V-4Y) psi plus or minus 1 psi (and discharge air temperatures are abnormal), partially cover the condenser to obtain head pressure from 325 psi to 375 psi maximum. If evaporator pressure rises above 30 (4D-4F-4G-4H) 31 (4L-4N-4R-4P-4U-4V-4Y) psi, change the expansion valve. If expansion pressure remains at 30 (4D-4F-4G-4H) 31 (4L-4N-4R-4P-4U-4V-4Y) psi, install a new receiver dehydrator.

13-4 HEATER-AIR CONDITIONER REFRIGERANT CIRCUIT TROUBLE DIAGNOSIS GUIDE

Insufficient Cooling (Check Air Flow)

Normal Air Flow (Inspect system for visual defects. Run functional tests.)

Discharge Air - Normal Temp Check for air leaks through dash, car body, windows, or from heater or ventilators.

Discharge Air - High Temp Check sight glass for foaming and compressor clutch for engagement.

No Compressor Clutch Engagement Check connections at clutch switch, harness connectors, and check clutch switch.

No Foaming Compare evaporator pressure to that on functional test table.

Foaming System is probably low on refrigerant. Check for leaks, repair, evacuate, and charge. If foaming still occurs, check for restriction in Freon lines between condenser and receiver dehydrator.

Evaporator Pressure Normal Compare head pressure to pressure on functional test table.

Evaporator Pressure Low Ice may be forming on evaporator. Low volume of air discharging at A/C outlet after system has been running above idle condition for approximately 15-30 minutes. Discharging air gradually elevating in temperature. Check expansion valve. If valve isn't permitting flow of liquid, this will be indicated by a warm pipe out of the evaporator. This may be caused by: 1) Clogged or plugged inlet screen in the expansion valve; 2) Broken capillary line; or 3) Discharged temperature bulb. If the valve is okay, the pipe out of the evaporator will be cold.

POA valve may be inoperative because of ice formation inside POA due to excessive moisture in refrigerant system. This may be indicated by initially good POA valve temperature control and satisfactory cooling, then situation progressively becomes unsatisfactory with ice forming on evaporator and blocked air output at elevated temperatures. Stop engine, allow system to warm up, restart engine. If system indicates a duplication of okay-to-poor performance, replace POA valve. POA may have too low a setting. Also, replace receiver-dehydrator and evacuate thoroughly.

Evaporator Pressure High Check the expansion valve to determine if thermobulb is making good contact and is properly insulated. Operate engine at 2000 RPM with maximum air conditioning setting. If evaporator pressure remains high, feel suction line. If line feels frosty or extremely cold with relative high ambient conditions, then partially cover the condenser to obtain head pressures from 325 psi to 375 psi maximum. If evaporator pressure rises above 30 psi, change the expansion valve.

Observe operation on functional test to see if pressures and temperatures at start are normal but become progressively higher in pressure and temperature. This may be the result of ice forming inside POA valve due to excessive moisture in the system. Replace receiver-dehydrator and evacuate thoroughly.

If correction is still not affected, malfunction may be the result of a defective POA valve. Replace valve.

Another possibility is a restriction in the suction line (outlet of POA to inlet of compressor).

Also, check if compressor may be the cause due to some internal or external mechanical trouble which prevents reduction of pressure. Check for external troubles, slipping belt, bad clutch and/or pulley, or improper clutch engagement, before investigating the compressor internally.

Head Pressure High Check for the following: Condenser air flow low, air in system, excessive refrigerant in system, restriction in condenser.

Head Pressure Low Restriction in flow of Freon to evaporator, or expansion valve plugged or defective.

Head Pressure Normal Check that temperature air door is in proper position.

Low Air Flow (Check blower operation and evaporator. Check operation of controls.)

Ice Blocking Evaporator Run functional test. If evaporator pressure is low, ice may form on evaporator and reduce air flow.

Evaporator Pressure Low Ice may be forming on evaporator. Low volume of air discharging at A/C outlet after system has been running above idle condition for approximately 15-30 minutes. Discharging air gradually elevating in temperature. Check expansion valve. If valve isn't permitting flow of liquid, this will be indicated by a warm pipe out of the evaporator. This may be caused by: 1) Clogged or plugged inlet screen in the expansion valve; 2) Broken capillary line, or 3) Discharged temperature bulb. If the valve is okay, the pipe out of the evaporator will be cold.

Blower Not Operating Check for the folowing: Fuse blown, blower switch defective, wire broken or loose connection, poor ground connection, or blower motor defective.

Blower Operating Normal Check for the following: Flexible air hose loose, restriction or leakage in air ducts, A/C outlet not opening.

Blown Thermal Fuse

Possible Cause - Low refrigerant charge or totally discharged system.

Correction - Inspect for leaks, repair, evacuate, recharge system, and then replace thermal fuse according to procedures.

Possible Cause - Inoperative expansion valve.

Correction - Replace expansion valve according to normal procedures and then replace the thermal fuse.

Possible Cause - Thermal fuse installed in improper location where temperatures exceed 260 degrees F.

Correction - Install new thermal fuse in proper location.

Possible Cause - Thermal fuse blown during charging.

Correction - Jump connector plug during charging and replace thermal fuse.

Possible Cause - Faulty superheat switch.

Correction - Replace superheat switch according to procedure, recharge system, and replace thermal fuse.

Superheat Heat Switch

Car engine off, lead disconnected from superheat switch terminal.

Check for the following: Continuity between switch housing and ground. (If not grounded, check continuity, switch housing to retainer ring, and retainer ring to rear head.)

Check for the following: Continuity between switch terminal and switch housing. (If no continuity, contacts are open. If continuity exists, contacts are closed.)

Install suction gauge and determine the suction pressure, determine the approximate rear head temperature, and compare conditions noted to Calibration Chart, Figure 13-16. If contacts are not OPEN or CLOSED according to temperature-pressure relations shown, discharge system and remove switch for bench check.

(Switch off of compressor.)

Check for the following: Closed contacts. (Housing to terminal contacts should be open at atmospheric pressure and temperatures below 100 degrees F.)

Check for the following: Closed contacts. (With switch in a hot bath 150 degrees F. or higher, or with sensing tube held in match flame 15-20 seconds.)

If switch contacts are not OPEN or CLOSED per these checks, the switch is defective and must be replaced.

DIVISION II

DESCRIPTION AND OPERATION

13-5 OPERATION OF AIR CONDITIONER PORTION OF SYSTEM

The state of the refrigerant at the inlet port of the compressor is a low pressure gas. The compressor compresses the gas into a high pressure, high temperature gas (See Figure 13-80). Because of the increase in pressure, the heat in the gas has been concentrated and therefore is increased above the ambient (outside air) temperature. This heat in excess above the ambient temperature tends to dissipate itself. A condenser is utilized in the refrigeration circuit to provide a means whereby the heat of the refrigerant can be easily dissipated. The high pressure, high temperature (hot) gas flows through the condenser and is cooled and condensed to a high pressure liquid as it gives up its heat. From the condenser the high pressure liquid flows to the receiver-dehydrator and then to the expansion valve where the pressure is reduced and the liquid is allowed to expand in the evaporator. When the pressure is reduced the refrigerant will successively transform itself from a high pressure liquid to a low pressure liquid, and then to a low pressure gas. As the low pressure liquid expands and becomes a low pressure gas it absorbs heat. To satisfy the refrigerant demand for heat, the air passing over the evaporator gives up heat to the evaporator and in doing so, is cooled.

The low pressure gas returns to the inlet port of the compressor (the original starting point) where the cycle just described repeats itself. Although the foregoing description holds true in actual system operation, it should be qualified insofar as whenever the compressor is running, a portion of the refrigerant remains in a liquid state and consequently there is a certain amount of continuous liquid flow of refrigerant and oil throughout the system at all times during the refrigerating cycle.

13-6 DESCRIPTION OF AIR CONDITIONING COMPONENTS

A. Compressor

The compressor is located on the right side of the engine compartment. The purpose of the unit is to draw the low pressure gas from the evaporator and compress this gas into a high temperature, high pressure gas. This action will result in the refrigerant having a higher temperature than the surrounding air.

The compressor is of basic double action piston design. Three horizontal double acting pistons make up a six cylinder compressor (see Figure 13-81). The pistons operate in 1-1/2 inch bore and have a 1-1/8 inch stroke. A swash plate keyed to the shaft drives the pistons. The shaft is belt driven through a magnetic clutch and pulley arrangement. An oil pump mounted at the rear of the compressor picks up oil from the bottom of the compressor and lubricates the bearings and other internal parts of the compressor.

Reed type valves at each end of the compressor open or close to control the flow of incoming and outgoing refrigerant. Two gas tight passages interconnect chambers of the front and rear heads so that there is one common suction port, and one common discharge port. The internal parts of the compressor function as follows:

1. Suction Valve Reed Discs and Discharge Valve Plates - The two suction valve reed discs and two discharge valve plates (see Figure 13-2) operate in a similar but opposite manner. The discs are composed

of three reeds and function to open when the pistons are on the intake portion of their stroke (downstroke), and close on the compression stroke. The reeds allow low pressure gas to enter the cylinders. The discharge valve plates also have three reeds, however, they function to open when the pistons are on the compression portion of their stroke (upstroke), and close on the intake stroke. High pressure gas exits from the discharge ports in the discharge valve plate. Three retainers riveted directly above the reeds on the valve plate serve to limit the opening of the reeds on the compression stroke.

2. Front and Rear Heads - The front and rear heads (Figure 13-3) serve to channel the refrigerant into and out of the cylinders. The front head is divided into two separate passages and the rear head is divided into three separate passages. The outer passage on both the front and rear heads channels high pressure gas from the discharge valve reeds. The middle passage on both front and rear heads channels low pressure gas to the suction valve plate reeds. The middle passage of the rear head also contains the port opening to the superheat switch cavity. This opening in the rear head permits the superheat switch to be affected by suction gas pressure and suction gas temperature for the operating protection of the compressor. The inner passage on the rear head houses the oil pump inner and outer rotors. A Teflon sealing material is bonded to the sealing surfaces separating the passages in the rear head. "O" rings are used to affect a seal between the mating surfaces of the heads and the shell. The front head suction and discharge passages are connected to the suction and discharge passages of the rear head by a discharge tube and suction passage in the body of the cylinder assembly. A screen located in the suction port of the rear head prevents foreign material from entering the circuit.

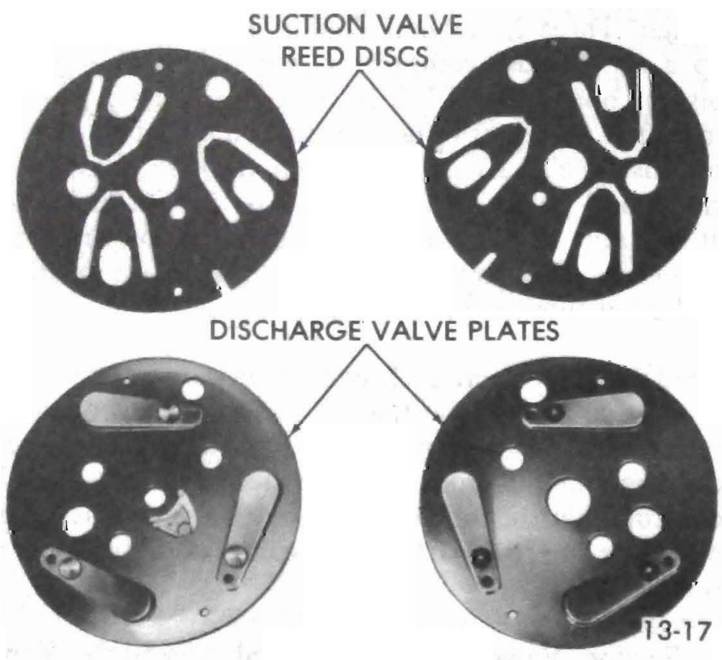


Figure 13-2 Compressor Suction Valve Reed Discs and Discharge Valve Plates

3. Oil Pump - An internal tooth outer rotor and external tooth inner rotor comprise the oil pump. The pump works on the principle of a rotary type pump. Oil is drawn up from oil reservoir in underside of shell through the oil inlet tube (see Figure 13-4) and circulated through the system via a 3/16 inch diameter oil passage through the shaft center and also four 5/64 inch diameter holes drilled perpendicular to the shaft. The inner rotor is driven by the shaft.

4. Shaft and Swash Plate Assembly - The shaft and swash plate assembly (see Figure 13-81) consists of an elliptical plate positioned obliquely to the shaft. As the plate and shaft rotate, the surface of the plate moves to and fro lengthwise relative to the centerline of the shaft. This reciprocating motion is transmitted to the pistons which contact the surface of the swash plate. A woodruff key locks the swash plate onto the shaft. The swash plate and shaft are serviced as an assembly. The shaft is driven by a pulley when the magnetic clutch is energized. A needle thrust bearing and a mainshaft bearing support the shaft horizontally and vertically.

5. Needle Thrust Bearing and Races - Two needle thrust bearings, each "sandwiched" between two races are located on either side of the swash plate hub. The front needle thrust bearing and races provide 0.010" to 0.015" clearance between the top of the pistons and the rear side of the front suction valve reed disc (see Figure 13-5). The rear needle thrust bearings and races provide 0.0005" to 0.0015" clearance between the hub of the swash plate and the rear hub of the rear cylinder. Races of various thicknesses are provided for service replacement to achieve required clearances when rebuilding units.

6. Cylinder Assembly and Pistons - The cylinder assembly (front cylinder and rear cylinder) is serviced only as a matched set. Alignment of the two halves is maintained by two dowel (locater) pins.

The double ended pistons are made of cast aluminum. There are two grooves on each end of the piston. The outer grooves will receive a piston ring. The inner grooves act as oil scraper grooves to collect any excess oil. Two oil return holes are drilled into the scraper grooves and allow oil to drain back into the reservoir.

7. Shoe Discs - The shoe discs are made of bronze and act as a bearing between the ball and the swash plate. An oil circulation hole is provided through the center of each shoe for lubrication purposes. These shoes are of various thicknesses and are provided in 0.0005 inch increments. Ten sizes are available for service replacement. A basic "zero" shoe size is available for preliminary gauging procedures when rebuilding a cylinder assembly.

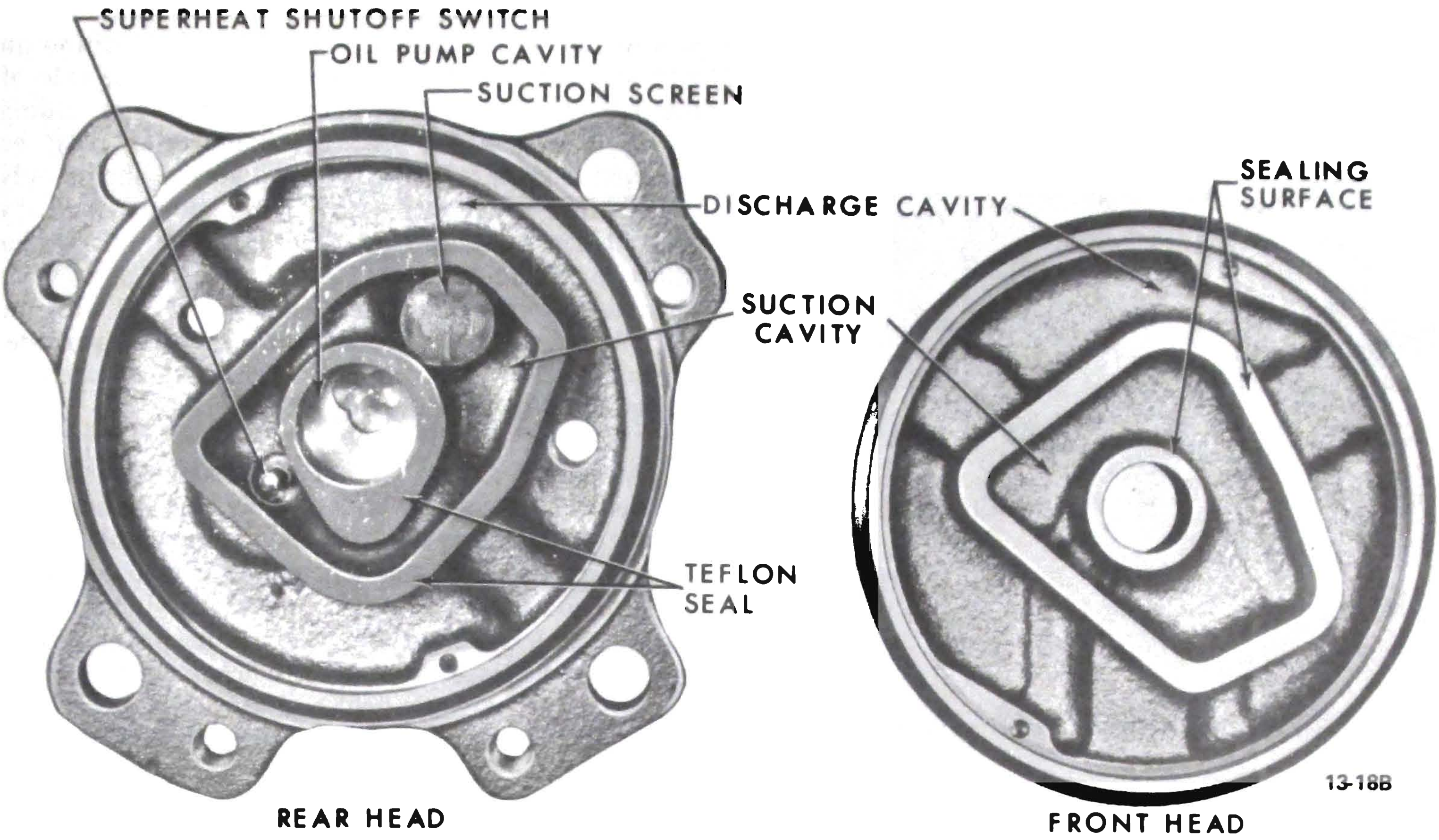


Figure 13-3 Compressor Front and Rear Heads

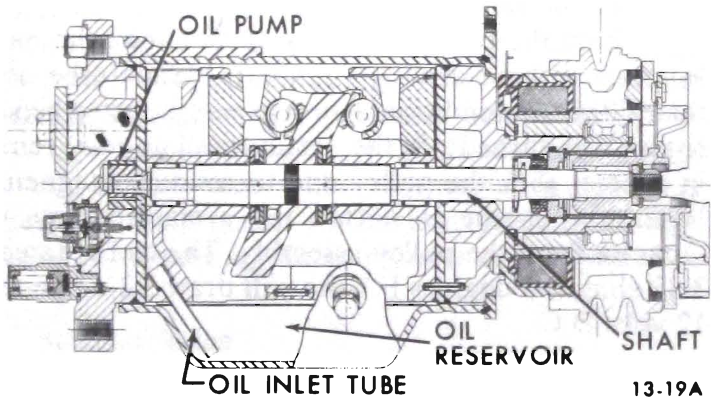


Figure 13-4 Compresor Oil Flow

8. Suction Passage Cover - The suction passage cover fits over a suction passage (see Figure 13-6) in the body of the cylinder assembly. Low pressure vapor flows from the suction port through the suction passage in the cylinder assembly, and into the suction cavity of the front head.

9. Discharge Tube - The discharge tube is used to connect the discharge cavity in the front head with the discharge cavity in the rear head. High pressure vapor discharge is channeled via the tube to the discharge cavity and port. A slightly modified discharge tube is provided to be used as a service replacement (see Figure 13-7). The service replacement tube has a

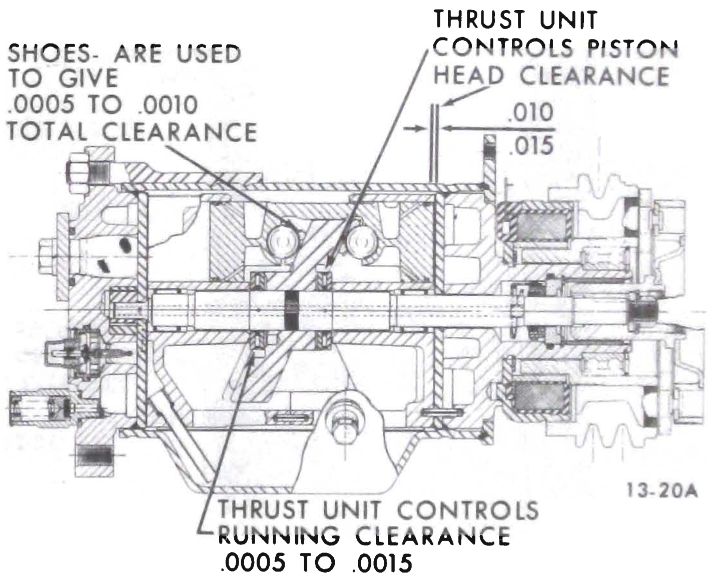


Figure 13-5 Compressor Needle Thrust Bearings and Races

reduced end and a built up shoulder to accommodate an "O" ring and bushing. These added parts achieve the necessary sealing of the high pressure vapor within the compressor.

10. Pressure Relief Valve - The purpose of the pressure

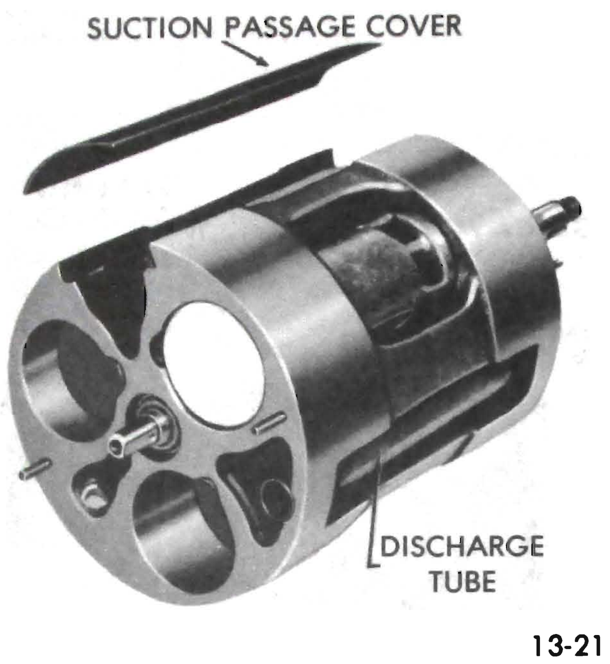


Figure 13-6 Suction Passage and Discharge Tube

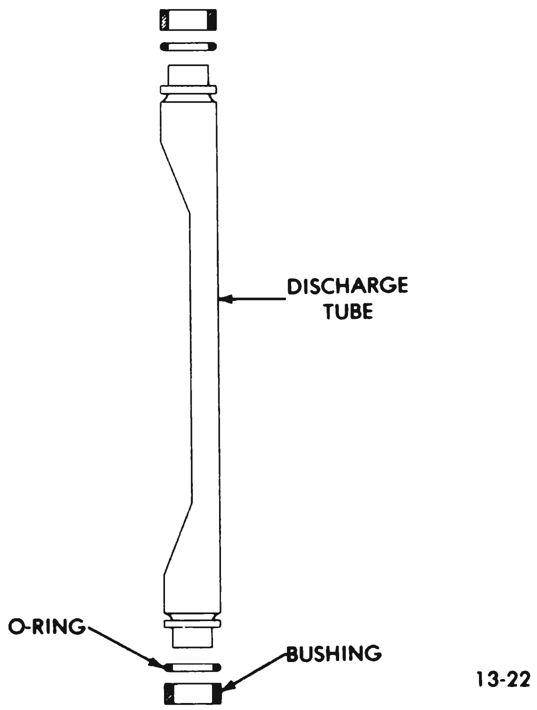


Figure 13-7 Service Replacement Discharge Tube

relief valve is to prevent the discharge pressure from exceeding 440 psi. Opening of the pressure relief valve will be accompanied by a loud popping noise and the ejection of some refrigerant from the valve. If the pressure relief valve is actuated due to excessive pressures in the compressor, the cause of the malfunction should be corrected immediately. The pressure relief valve is located on the rear head of the compressor.

11. Shell and Oil Drain Screw - The shell of the compressor contains a reservoir which furnishes a continuous supply of oil to the moving parts of the compressor. A baffle plate covers the reservoir and is tack-welded to the inside of the shell. In addition an oil drain screw and gasket are located on the side of the reservoir and are provided for draining or adding of oil to system. To add oil, compressor must be removed from car. The necessity to add oil should only be required when the system has ruptured violently and oil has been lost along with refrigerant. Under controlled conditions or slow leak conditions it is possible to loose only a small amount of oil with the refrigerant gas. The serial number, part or model number, and rating of the compressor is stamped on name plates located on top of shell.

12. Magnetic Clutch and Pulley Assembly - The magnetic clutch and pulley assembly (see Figure 13-8) together transmit power from the engine crankshaft to the compressor. The magnetic clutch is actuated when the air conditioning clutch compressor switch and the fan switch located on the instrument panel control assembly are closed. When the switches are closed, the coil sets up a magnetic field and attracts the armature plate (movable element of the clutch driven plate). The armature plate portion of the clutch driven plate moves forward and contacts the friction surface of the pulley assembly, thereby mechanically linking the compressor to the engine. The compressor will operate continuously whenever the air conditioner clutch compressor switch and the fan switch are closed. When one or both of the switches are open the armature plate will be released due to spring tension and move away from the pulley assembly. This allows the pulley to rotate without driving the shaft. It should be noted that if the air conditioner system was in use when the engine was turned off, the armature plate may remain in contact with the pulley due to residual magnetism. When the engine is started the armature plate will separate from the pulley assembly. The coil is rated at 3.85 ohms (85 degrees F.) and will draw 3.2 amperes at 12 volts D.C.

B. Muffler

A muffler is located on the discharge line side of the compressor. The muffler acts to reduce the characteristic pumping sound of the compressor. To further reduce compressor noise transfer through the body to the passenger compartment, a sheet of soft rubber insulation is wrapped around the outside of the muffler.

C. Condenser

The condenser which is made of aluminum is located in front of the radiator so that it receives a high volume of air flow. Air passing over the condenser absorbs the heat from the high pressure gas and causes the refrigerant to condense into a high pressure liquid.

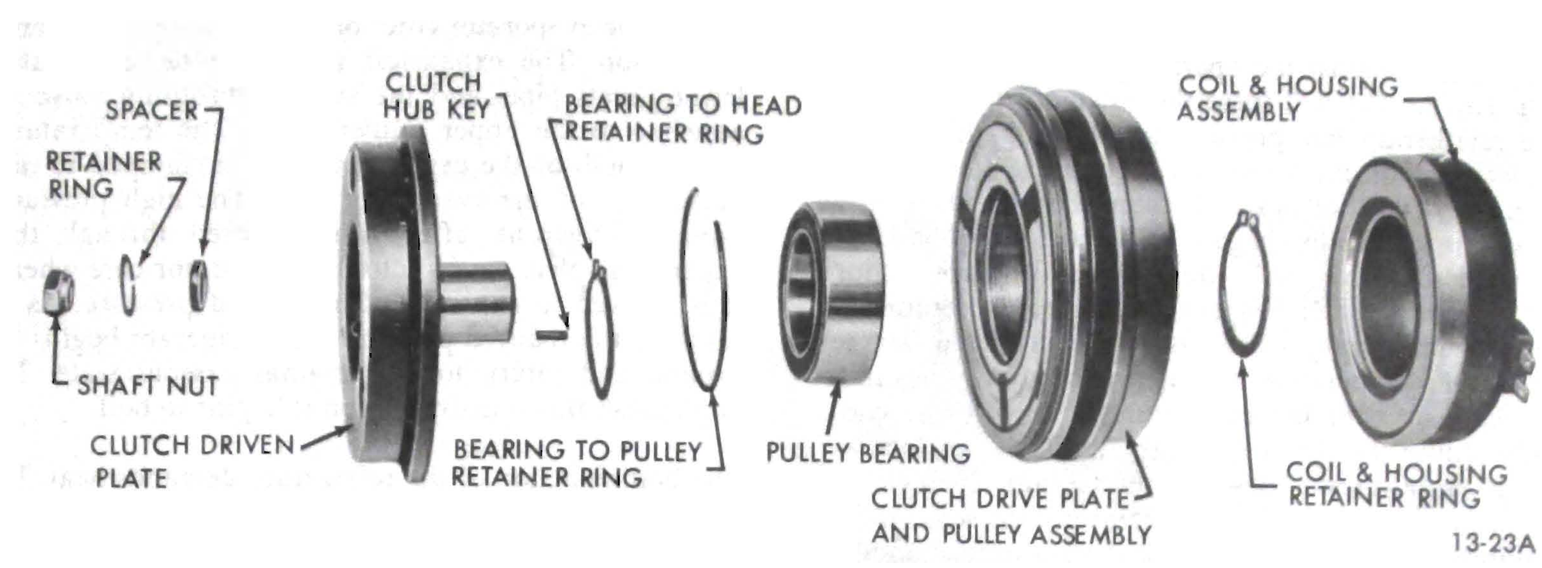


Figure 13-8 Magnetic Clutch and Pulley Assembly

D. Receiver - Dehydrator

The receiver-dehydrator is mounted on the front of the condensor. The purpose of the receiver dehydrator is twofold: the unit insures a solid column of liquid refrigerant to the expansion valve at all times, and also absorbs any moisture in the system that might be present. A bag of desiccant (moisture absorbing material) is provided to absorb moisture. A sight glass (see Figure 13-9) permits visual checking of the refrigerant flow for bubbles or foam. The continuous appearance of bubbles or foam above an ambient temperature of 70 degrees F. usually indicates an inadequate refrigerant charge. Bubbles or foam appearing at ambient temperatures below 70 degrees F. do not necessarily indicate an inadequate charge and may appear even when the system is operating properly. A filter screen in the unit prevents foreign material from entering the remainder of the system.

E. Expansion Valve

The expansion valve is located at the rear of the engine compartment on the passenger side of the car. It is held secure by a bracket which is attached to the plenum blower assembly. The function of the expansion valve is to automatically regulate the flow of refrigerant into the evaporator. The expansion valve is the dividing point in the system between the high and low pressure liquid refrigerant. A temperature sensing bulb is connected by a capillary tube to the expansion valve (see Figure 13-10). The temperature sensing bulb (clamped to the outlet pipe on the evaporator) measures the temperature of the evaporator outlet pipe and transmits the temperature variations to the expansion valve (see Figure 13-10). The capillary tube and bulb are filled with carbon dioxide and sealed to one side of the expansion valve diaphragm.

An increase in temperature will cause the carbon

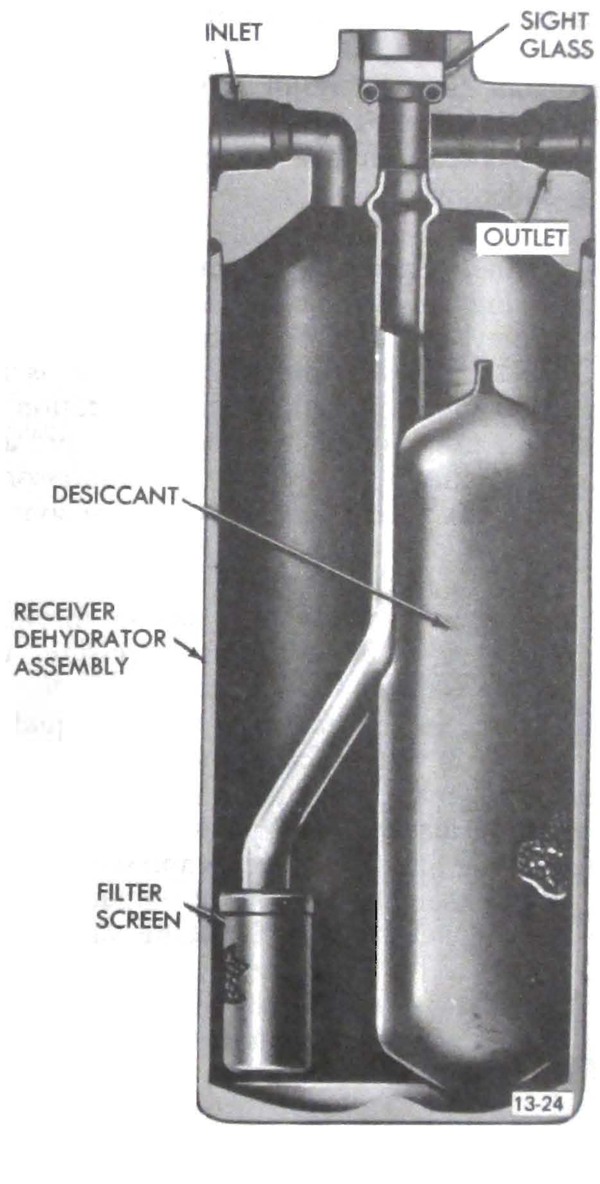


Figure 13-9 Receiver - Dehydrator Assembly

dioxide in the bulb and capillary tube to expand, overcoming the spring pressure and pushing the diaphragm against the operating pins (see Figure 13-10). This in turn will force the valve off its seat. When the refrigerant low pressure gas flowing through the outlet pipe of the evaporator becomes more than 6 degrees higher or warmer than the temperature at which it originally began to vaporize or boil, the expansion valve will automatically allow more refrigerant to enter evaporator. If the temperature of the low pressure gas decreases to less than 6 degrees above the temperature at which it originally began to vaporize or boil, the expansion valve will automatically reduce the flow of refrigerant. Thus, an increase or decrease in the flow of refrigerant through the evaporator will result in an increase or decrease in the cooling by the evaporator. The temperature, humidity and volume of the air passing over the evaporator affects the rate of absorption of heat by the evaporator. As the ambient temperature varies, the frequency which the temperature bulb calls for more or less refrigerant will increase or decrease. 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 maintain the temperature at the evaporator pipe at the predetermined value. Conversely, cool days will result in less heat transfer and thereby require lesser quantities of refrigerant to maintain the predetermined temperature of the evaporator outlet pipe.

An equalizer line connects the expansion valve to the suction throttling valve. The equalizer line is used primarily to prevent prolonged or constant operation of the compressor under conditions where it is not receiving enough refrigerant. This operation is undesirable due to the resultant noise factor, and also due to the possibility of subjecting the compressor to reduced oil return. The equalizer line functions to permit the outlet pressure of the POA valve to be imposed on the diaphragm of the expansion valve. When the outlet pressure of the suction throttling valve drops below a predetermined pressure, this decrease in pressure is also transmitted to the diaphragm of the expansion valve, via the equalizer line. The expansion valve is caused to open and flood refrigerant through the evaporator, thereby resulting in an increase in the evaporator pressure. This action only occurs during times when the compressor capacity becomes greater than the evaporator output with the resultant drop in POA suction throttling valve outlet pressure.

F. Evaporator

The function of the evaporator is to cool and dehumidify the air flow before it enters the passenger compartment. The evaporator assembly consists of an aluminum core enclosed in a reinforced plastic housing. A water drain port is located in the bottom of the housing. Two refrigerant lines are connected to the side of the evaporator core: one at the bottom and one at the top. The expansion valve is attached to the lower (inlet) pipe, and the suction throttling valve is attached to the upper (outlet) pipe. The temperature sensing bulb of the expansion valve is clamped to the outlet pipe of the evaporator core. The high pressure liquid refrigerant, after it is metered through the expansion valve, passes into the evaporator core where it is allowed to expand under reduced pressure. As a result of the reduced pressure the refrigerant begins to expand and return to the original gaseous state. To accomplish this transformation it begins to boil.

The boiling action of the refrigerant demands heat. To satisfy the demand for heat, the air passing over the core gives up heat to the evaporator and is subsequently cooled.

G. POA Valve

The pilot operated absolute suction throttling valve (POA valve) regulates the pressure inside the evaporator and thereby affects the air temperature at the instrument panel outlets (See Figure 13-11). The POA valve has a sealed inner chamber which controls the pressure regulating mechanism of the valve independently of the exterior atmospheric pressure. This design insures that the valve does not change its calibration as the system is operated in various altitudes. It should be remembered; however, that any gage used to check the valve pressure will not be free from the effect of atmospheric pressure. For this reason it might appear that it is the pressure within the valve that is changing. Actually the reverse is true. The pressure within the valve remains unaffected by atmospheric variations, while the gage used to read these pressures is affected by atmospheric pressure. The table shown in Figure 13-12 indicates the gage pressure that should be obtained at various altitudes. If readings are obtained other than these, it is likely that the valve is malfunctioning. The POA valve cannot be disassembled or adjusted. If it is determined that the valve is malfunctioning, it should be replaced.

Figure 13-12 - Table of Altitude-Corrected Gauge Pressure for Evaluating POA Valve Performance

Altitude of Locale (Ft.)	Gauge Pressure (PSI)	Altitude of Locale (Ft.)	Gauge Pressure (PSI)
0 (Sea Level)	28.5	6,000	31.4
1,000	29.0	7,000	31.8
2,000	29.5	8,000	32.3
3,000	30.0	9,000	32.7
4,000	30.5	10,000	33.2
5,000	31.0		

Allowable Tolerance of POA Valve is ± 1 PSI

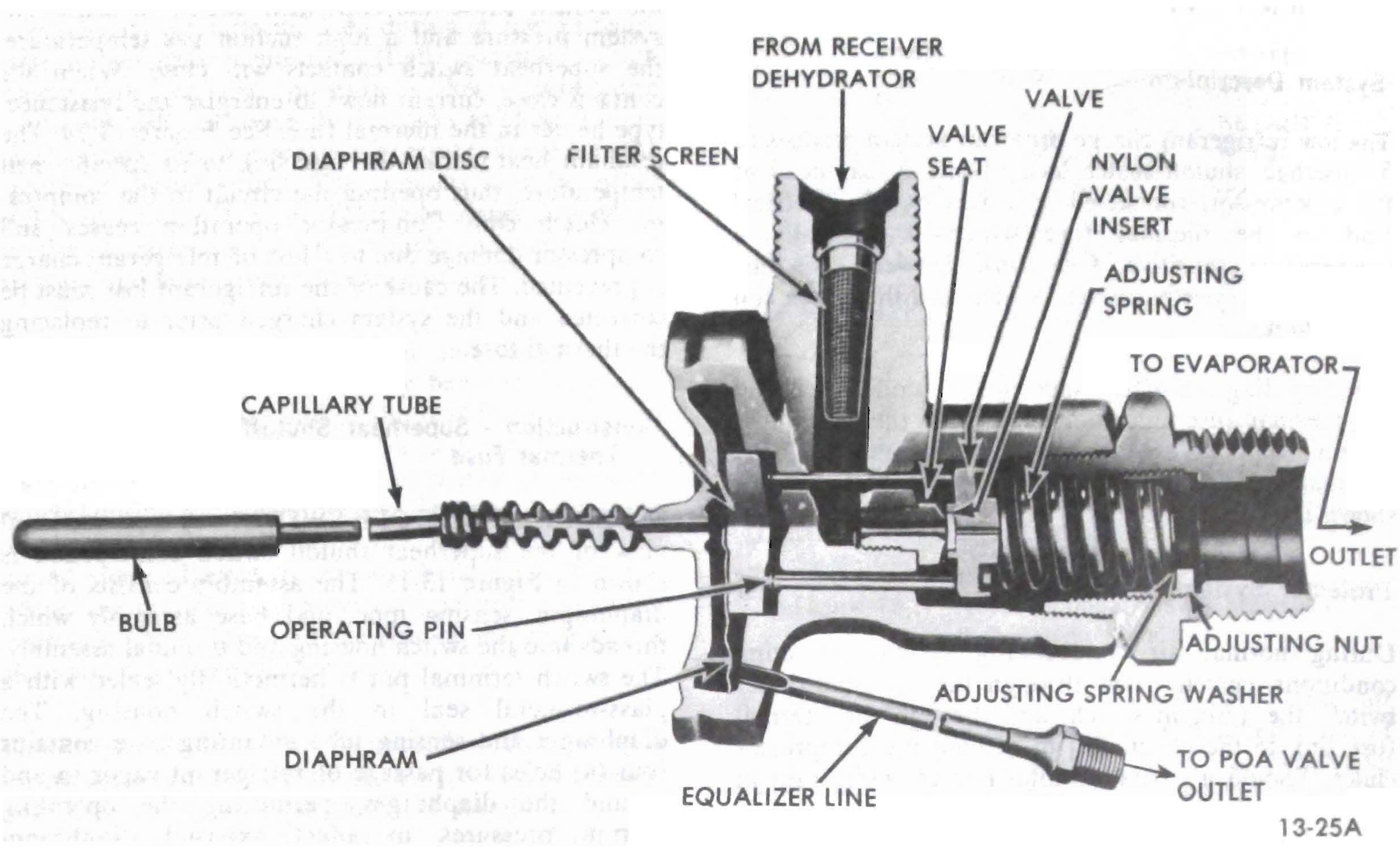


Figure 13-10 Expansion Valve

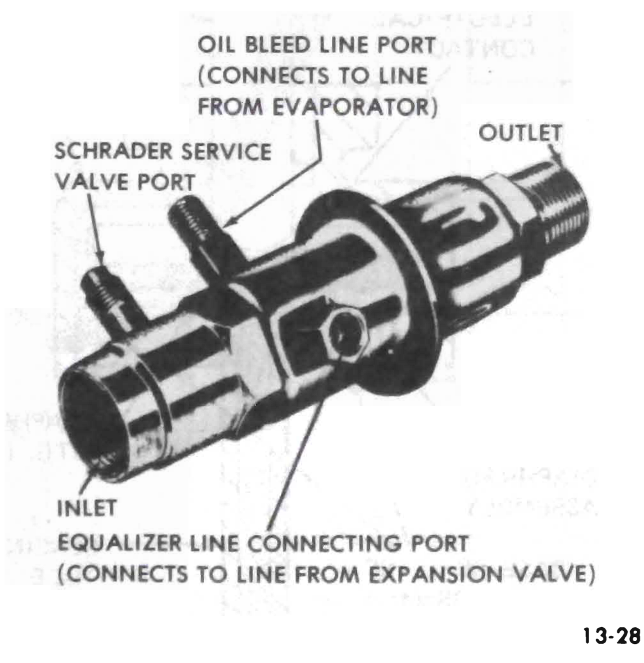


Figure 13-11 Pilot Operated Absolute - Suction Throttling Valve (POA Valve)

H. Fan Drive Clutch Assembly

During periods of operation when radiator discharge air temperature is low (below approximately 150 degrees F.), the fan clutch limits the fan speed to 800-1600 RPM. Under these conditions the clutch is disengaged since a small oil pump gear driven by the separator plate forces the silicone oil into the reservoir between the separator plate and the front cover assembly. Under these conditions also, the passage from this cavity to the clutch area is closed by the coil spring leaf valve. As operating conditions produce a high radiator discharge air temperature (above approximately 150 degrees F.), the temperature sensitive bimetal coil tightens to move the leak valve (attached to the coil) which opens a port in the separator plate. Silicone oil flows into the clutch chamber engaging the clutch and providing a maximum fan speed of approximately 2350 RPM.

The clutch coil is calibrated so that at road load with an ambient temperature of approximately 90 degrees F., the clutch is just at a point of shift between high and low fan speed.

No attempt should be made to disturb the calibration of the engine fan clutch assembly as each assembly is individually calibrated at the time of manufacture.

I. Superheat Switch

System Description

The low refrigerant charge protector system consists of a superheat shutoff switch located in the rear head of the compressor, connected in series by an electrical lead to the thermal fuse which is basically a temperature sensitive fuse link between the air conditioning system ambient switch and the clutch coil connection.

A wiring diagram of the superheat shutoff switch and the thermal fuse interconnected with the associated system components is shown in Figure 13-13. A schematic electrical diagram of the system circuiting is shown in Figure 13-14.

Protector System Operation

During normal air conditioning system operating conditions, current flows through the air conditioner switch, the ambient switch, and through the thermal fuse link to the clutch coil to actuate the compressor clutch. Should a partial or total loss of refrigerant in the system cause the superheat switch to sense low system pressure and a high suction gas temperature, the superheat switch contacts will close. When the contacts close, current flows to energize the resistance-type heater in the thermal fuse. See Figure 13-14. The resultant heat warms the fuse link to its specific melt temperature, thus opening the circuit to the compressor clutch coil. Compressor operation ceases and compressor damage due to a loss of refrigerant charge is prevented. The cause of the refrigerant loss must be corrected and the system charged prior to replacing the thermal fuse.

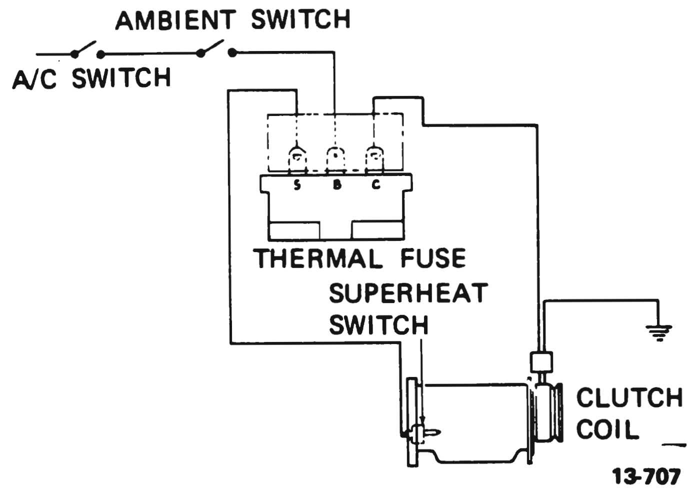


Figure 13-13 Wiring Circuit Diagram - Superheat Shutoff System

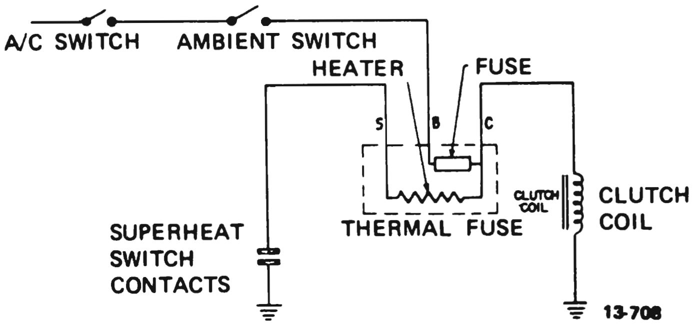


Figure 13-14 Schematic - Superheat Shutoff System

Construction - Superheat Shutoff Switch and Thermal Fuse

SUPERHEAT SHUTOFF SWITCH - A cross sectional view of the superheat shutoff switch construction is shown in Figure 13-15. The assembly consists of the diaphragm, sensing tube, and base assembly which threads into the switch housing and terminal assembly. The switch terminal pin is hermetically sealed with a glass-to-metal seal in the switch housing. The diaphragm and sensing tube mounting base contains four (4) holes for passage of refrigerant vapor in and around the diaphragm, permitting the operating suction pressures to affect external diaphragm assembly pressure. The diaphragm and sensing tube assembly is charged with R-114 refrigerant and the sensing tube protrudes into the suction cavity of the rear compressor head to sense suction gas temperatures. The internal pressure of the diaphragm and sensing tube assembly is affected thermally by the suction gas temperature and the diaphragm affected externally by the suction pressure.

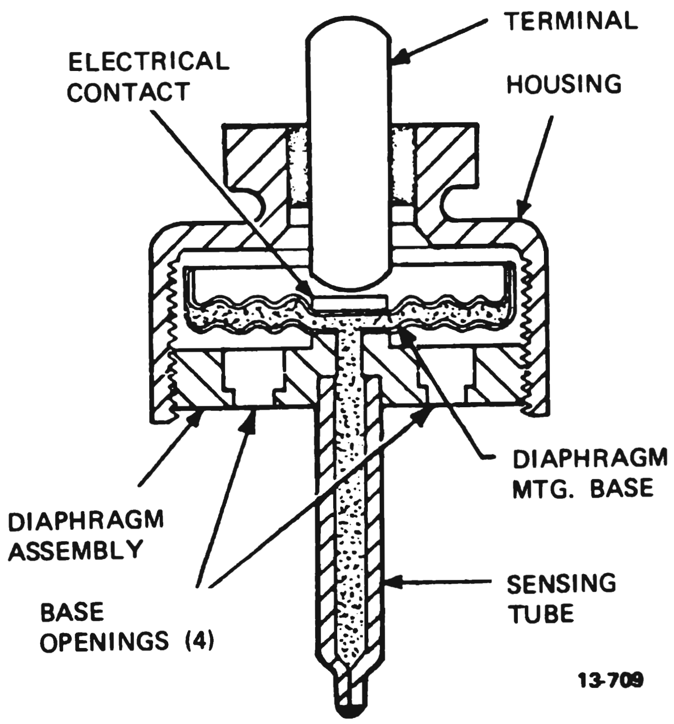
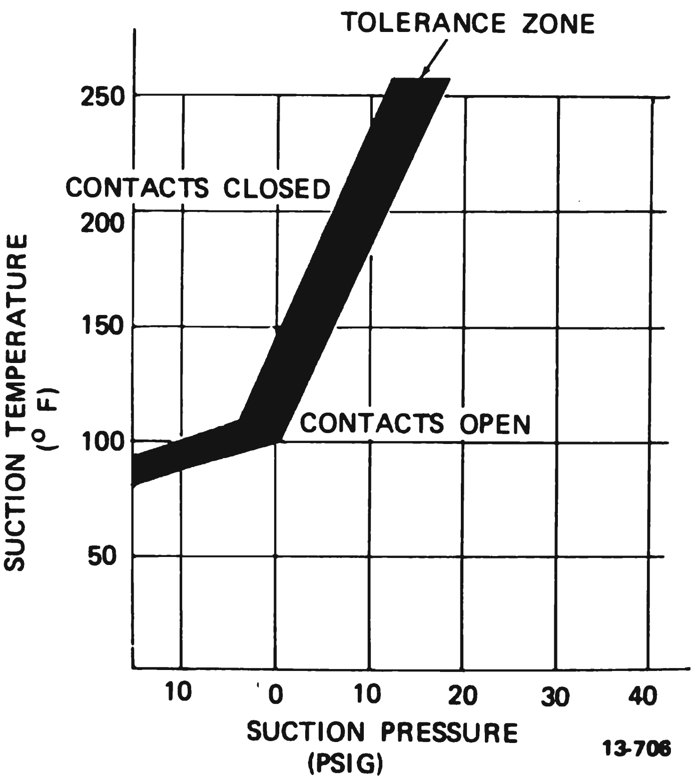


Figure 13-15 Cross Sectional View of the Superheat Shutoff Switch

The electrical contact welded to the diaphragm will only contact the terminal pin during a low pressure high temperature condition. High pressure - high temperature, or low pressure - low temperature conditions will not cause the contacts to close. Figure 13-16 shows the temperature-pressure curve of the superheat shutoff switch. The contacts may be either OPEN or CLOSED in the Tolerance Zone, depending on the characteristics of the switch and accuracy of pressure and temperature readings taken.

The superheat switch is mounted and sealed in the rear head by means of an O ring between the switch housing and the cavity wall of the rear head, as shown in Figure 13-17. A specially-formed retaining ring holds the switch in place and electrically grounds the switch housing to the compressor. The switch retaining ring must be installed with the high point of the curved sides adjacent to the switch housing. The flat side of the retainer ring provides a positive seat in the retaining ring groove and the tips of the ring give a more positive electrical continuity.

THERMAL FUSE - The thermal fuse consists of a temperature sensitive fuse link, a wire-wound resistor, and three (3) spade-type electrical terminals, potted with epoxy in a plastic housing, Figure 13-18. The terminals are positioned for in-line plug-on connection with a wiring harness. The thermal fuse construction provides for a time delay in blowing the fuse link which prevents "blown fuse" nuisance due to momentary switch contact closings during certain transient conditions.



6

Figure 13-16 Superheat Switch Operating Characteristics

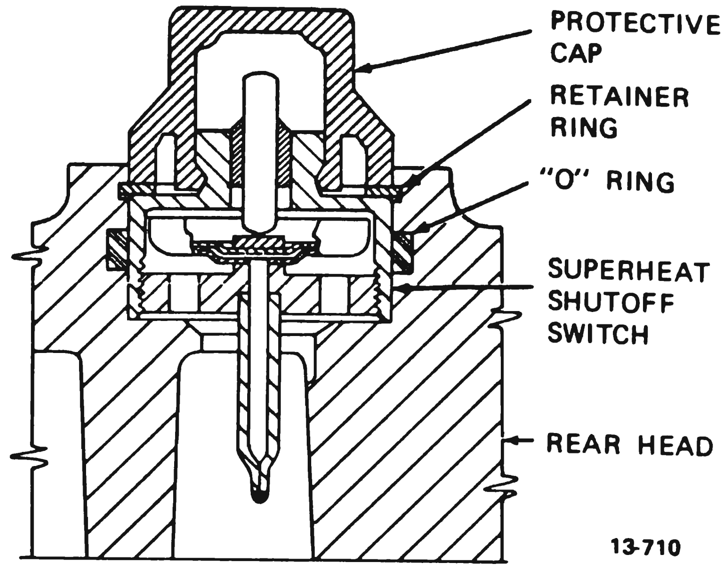


Figure 13-17 Cross Sectional View - Superheat Shutoff Switch in Rear Head

A blown thermal fuse indicates that the air conditioning system is either low or completely out of refrigerant charge, and that the superheat switch and thermal fuse have performed their protective function.

DIVISION III

ADJUSTMENTS AND MINOR SERVICE

13-7 GENERAL SERVICE INFORMATION AND SAFETY PRECAUTIONS

A. General Information

All subassemblies are shipped sealed and dehydrated. They are to remain sealed until just prior to making connections, and should be at room temperature before uncapping. This prevents condensation of moisture from air that enters the system.

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

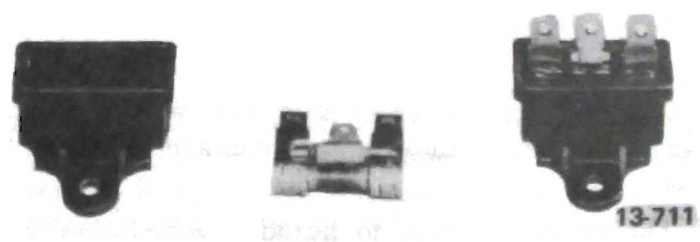


Figure 13-18 Thermal Limiter Detail

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

Do not clean fitting or hoses with solvents because they are contaminants. If dirt, grease or moisture gets inside the pipes or hoses and cannot be removed, the pipe or hose is to be replaced. Use a small amount of clean refrigeration oil on all tube and hose connecting joints, and lubricate the "O" ring gasket with this oil before assembling the joint. The oil will help in effecting a leak-proof joint and assist the "O" ring to slip into the proper location without being cut or damaged. Always use new "O" rings.

When tightening joints, use a second wrench to hold the stationary part of the connection to prevent twisting and to prevent hose kinking. Kinked hoses are apt to transmit noise and vibration. Tighten all connections in accordance with recommended torques (see Division VI, Specifications).

Do not connect receiver-dehydrator assembly until all other connections have been made. This is necessary to insure maximum moisture removal from system.

It is important that air conditioning hoses do not rest on or contact body or chassis sheet metal except where necessary. Because of the high frequency at which the compressor operates, the passenger compartment is susceptible to transfer of noise.

B. Safety Precautions

The following safety precautions should always be followed when servicing refrigerant charged components:

1. Do not leave Refrigerant-12 cylinder uncapped.

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

3. Do not subject cylinder to high temperatures.

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

5. Do not fill cylinder 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 - WEAR SAFETY GOGGLES whenever discharging, charging or leak testing system.

13-8 CHARGING AND DISCHARGING SYSTEM WITH LOW REFRIGERANT CHARGE PROTECTOR SYSTEM

Removal of any part in the refrigerant circuit will require discharging of the entire system.

Disconnect electrical connector from thermal limiter assembly. Insert a jumper wire between terminals B and C of connector, if compressor operation will be required prior to refrigerant system being fully charged. See Figure 13-13.

Discharging the System

1. Remove caps from suction gauge fitting on the P.O.A. valve and discharge valve gauge fitting on the compressor.

2. With both valves on manifold gauge set (J-5725- 04) closed (clockwise), attach manifold to the P.O.A. valve and compressor, using J-5420 valve adapter at suction gauge fitting and J-9459 valve adapter at discharge gauge fitting. See Figure 13-19.

3. Fully open high pressure valve on manifold gauge set to allow escape of refrigerant from system through the manifold gauge set and out the center fitting and hose. (Place end of hose in clean container to collect oil loss due to rapid discharge of system.) 4. When hissing ceases, indicating all refrigerant has escaped, close high pressure valve on manifold gauge set by turning valve clockwise.

Evacuating the System

When the refrigeration system is depressurized and opened for service, some air will enter the lines, regardless of how quickly openings are capped. In order to remove this air and as much as possible of the moisture it contains, the complete system must be evacuated. Evacuating is merely the process of removing all air from the system, thereby creating a vacuum in the system.

Under no circumstances should alcohol be used in the system in an attempt to remove moisture, regardless of the successful use of alcohol in other refrigeration systems.

Preparations for Evacuating Complete System

1. Check the low pressure gauge for proper calibration. With the gauge disconnected from the refrigeration system, be sure that the pointer indicates to the center of zero. Lightly tap gauge a few times to be sure pointer is not sticking. If necessary, calibrate as follows:

a. Remove cover from gauge.

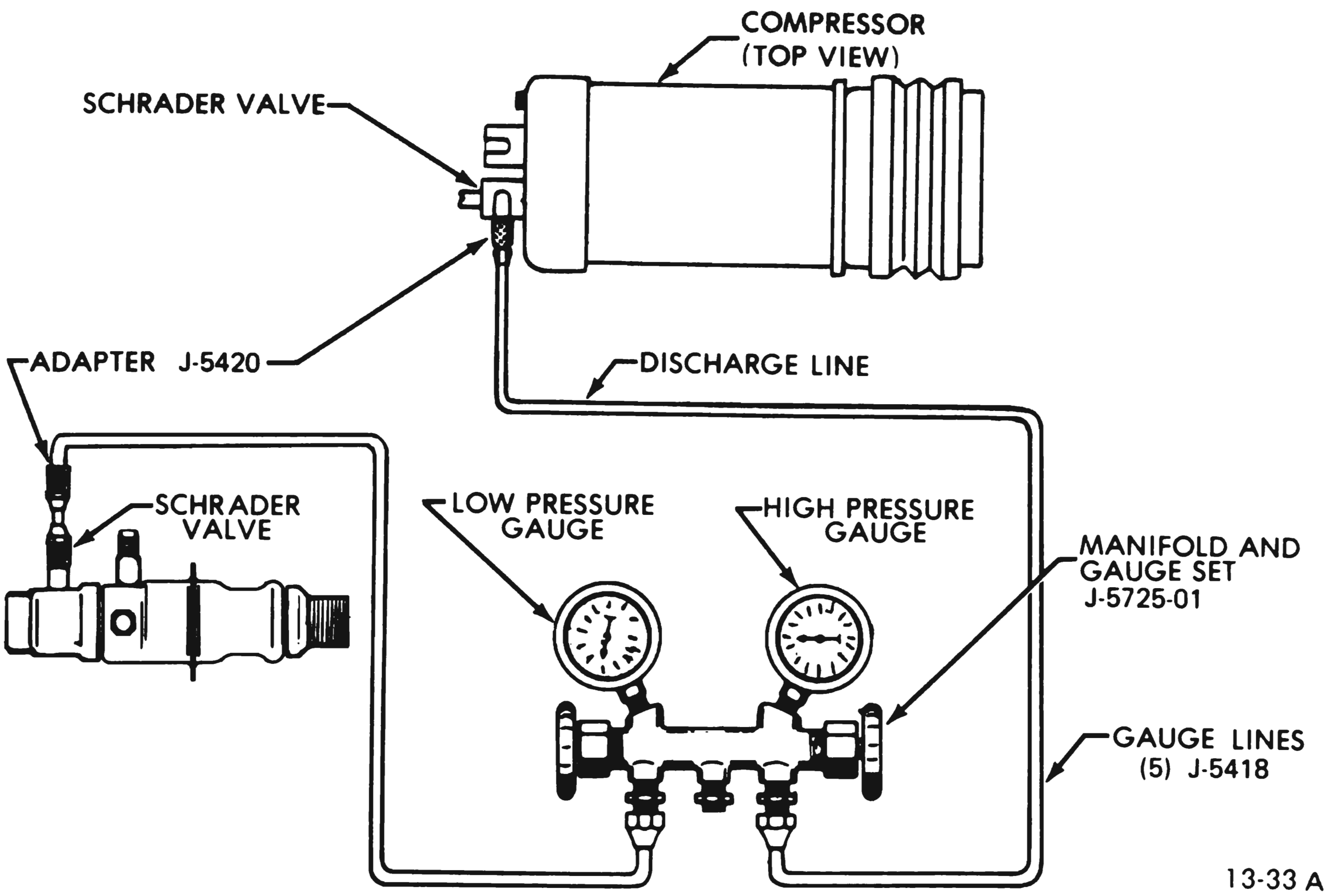


Figure 13-19 Set-Up for Discharging System

b. Holding gauge pointer adjusting screw firmly with one hand, carefully force pointer in the proper direction in proper amount to position pointer through the center of "0" position. Tap gauge a few times to be sure pointer is not sticking. Replace gauge cover.

2. If gauge set is not already connected to P.O.A. valve and compressor, connect as follows:

a. Close hand shut-off valves on gauge set by turning clockwise.

b. Remove caps from gauge fittings on the P.O.A. valve and compressor.

c. Attach valve adapter (J-5420) to end of the hose from the low pressure gauge and connect this adapter fitted hose to suction gauge fitting.

d. Attach valve adapter (J-9459) to end of hose from the high pressure gauge and connect this adapter fitted hose to the discharge fitting.

3. Attach a flexible gauge hose to center fitting of the gauge set and attach the other end of this hose to vacuum pump (J-5428-03).

Evacuating Complete System

1. Turn hand shut-off valve on low pressure gauge of gauge set to full clockwise position.

2. Slowly turn valve on high pressure gauge counterclockwise from full clockwise position, letting any pressure build-up escape completely. Close high pressure valve.

3. Check oil level in vacuum pump and, if necessary, add refrigeration oil. Make sure dust cap on discharge side of pump has been removed.

4. Start the vacuum pump and slowly open low and high pressure sides of manifold gauge set to avoid forcing oil out of refrigeration system and pump. Pressure is now being reduced on both sides of the refrigeration system. If oil is blown from the vacuum pump, it should be refilled to the proper level.

5. Observe low pressure gauge and operate vacuum pump until gauge shows 28-29 inches vacuum. In all evacuating procedures, specifications of 28-29 inches of vacuum is used. This evacuation can only be attained at or near sea level.

For each 1000 feet above sea level where this operation is being performed, the specification should be lowered by one inch of mercury vacuum. At 5000 feet elevation, only 23 inches to 24 inches of vacuum can normally be obtained.

If vacuum cannot be pulled to the minimum specification for the respective altitude, it indicates a leak in the system or gauge connections or a defective vacuum pump. In this case, it will be necessary to check for leaks as described under "Leak Testing Refrigerant System".

When specified vacuum level (28-29 inches at sea level) is obtained, continue to run vacuum pump for ten (10) additional minutes. During these ten (10) minutes:

a. Prepare for charging the system. If using a charging station, fill charging cylinder. If using manifold gauge set, make all preparations for charging system as described under "Disposable Can Method" or "Refrigerant Drum Method".

b. Measure oil loss collected as a result of rapid discharge.

c. Uncap compressor oil injector (J-24095) and open valve. Flush J-24095 with refrigerant, close valve and insert pick-up tube into graduated container of clean refrigerant oil.

d. Connect J-24095 to suction fitting at P.O.A. valve. When valve on J-24095 is opened, the vacuum applied to the discharge side of the system will suck oil into system from container. Therefore, close observation of oil level in the container is necessary.

e. Note level of oil in container. Open valve on J-24095 until oil level in container is reduced by an amount equal to that lost during discharge of system, then shut valve. Take care not to add more oil than was lost.

f. Disconnect J-24095 and attach pick-up tube fitting to schraeder fitting to cap tool. See Figure 13-20.

6. Turn hand shut-off valves at low and high pressure gauges of gauge set to full clockwise position with vacuum pump operating, then stop pump. Carefully check low pressure gauge approximately for two (2) minutes to see that vacuum remains constant. If vacuum reduces, it indicates a leak in the system or gauge connections.

Charging the System

The system should be charged only after being evacuated as outlined in "Evacuating the System".

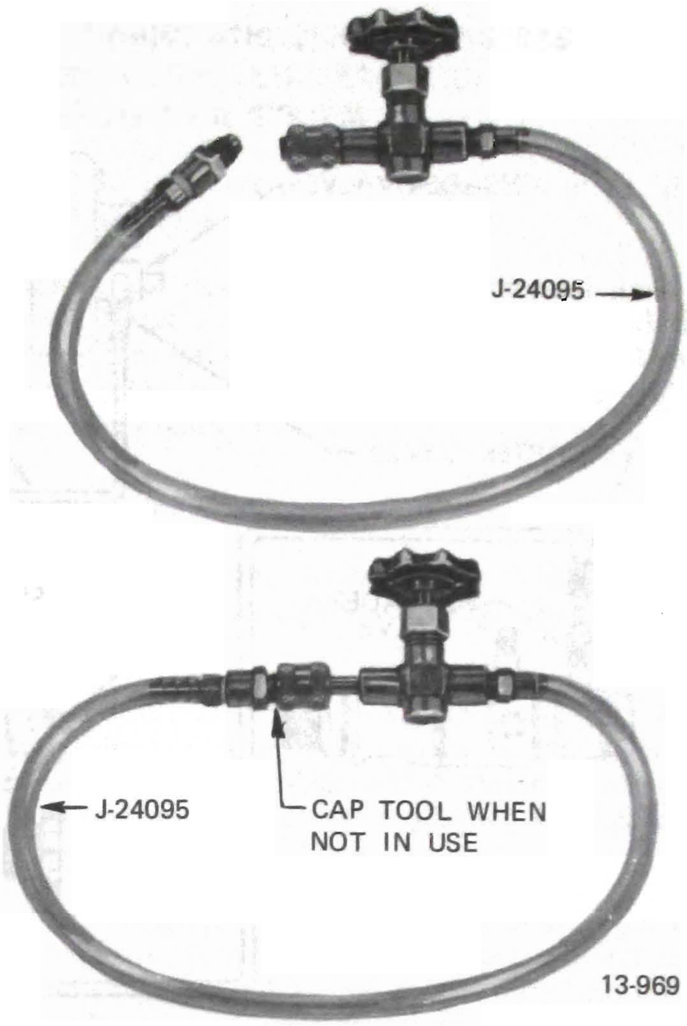


Figure 13-20 Oil Injector J-24095

Disconnect electrical connector from thermal limiter assembly. Insert a jumper wire between terminals B and C of connector, if compressor operation will be required prior to refrigerant system being fully charged. See Figure 13-13.

Refrigerant Drum Method

1. Connect center flexible line of gauge set to refrigerant drum.

2. Place refrigerant drum in a pail of water which has been heated to a maximum of 125 degrees F.

WARNING: *Do not allow temperature of water to exceed 125 degrees F. High temperature will cause excessive pressure and possible softening of fusible safety plugs in the refrigerant drum. It may not be necessary to use hot water if a large drum is used (over approximately 100 lbs.).*

3. Place refrigerant drum (in pail of water) on scales (bathroom or commercial, preferably commercial).

Do not turn refrigerant drum upside down, as this would allow liquid refrigerant to enter compressor which may cause damage.

4. If line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and crack valve on refrigerant drum to blow air from line. Retighten line at center fitting and record exact weight of refrigerant tank in water on the scales.

5. Open valve on refrigerant drum and both valves on gauge set to allow refrigerant to flow into system. Continue charging until the scales show that 3 3/4 lbs. 4D-4F-4G-4H or 4 1/2 lbs. 4L-4N-4R-4P-4U-4V-4Y of refrigerant have been transferred from refrigerant drum to system.

If full charge cannot be obtained, close both valves on gauge set, start engine, and set temperature control lever to full cold position with system in A/C mode. Open low pressure valve on gauge set slowly and leave open until full charge is added.

WARNING: *Observe high pressure gauge while charging with compressor running. Shut off engine if pressure exceeds 435 psi. A large fan placed in front of the car will help reduce excessively high head pressure.*

6. Close both valves on gauge set (high pressure valve will already be closed if charging was completed by running compressor) and close valve on refrigerant drum.

If the engine was used to complete the charge into the system, close valve on refrigerant drum to permit compressor to draw any refrigerant left in the line from the drum to the center fitting of the gauge set, then close the low pressure valve on the gauge set.

7. Operate engine at 2000 RPM with temperature control lever at full cold, blower speed switch on high and system in the A/C position. After ten minutes of operation, observe appearance of refrigerant in receiver-dehydrator. If bubbles are observed, open low pressure gauge valve and valve on refrigerant drum to allow more refrigerant to enter system. Close valve when receiver-dehydrator clears up.

If air inlet temperature is below 70 degrees F. when this check is made, bubbles may appear, even though the proper amount of refrigerant is in the system. Air inlet temperature must be 70 degrees F. or above to make an accurate check.

8. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under "Operational Test".

9. When satisfied that air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on P.O.A. valve and compressor fittings.

WARNING: *A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure gauge fitting at the compressor with a shop cloth before disconnecting the valve from the gauge fitting, to prevent injury to personnel.*

10. Using leak detector, check complete system for leaks.

Disposable Can Method

After having depressurized, repaired (if necessary) and evacuated the refrigerant system, the system may be charged as follows using refrigerant in disposable cans:

1. Obtain five 1 lb. cans or one 12 lb. can of refrigerant.

2. If using 1 lb. cans, mount four cans in J-6272- 02 (multi-opener) or attach J-6271 (single-can opener valve) on one can. If using the 12 lb. disposable can, attach J-23390 (disposable can control valve) on can.

WARNING: *Make sure outlet valve on opener is closed (clockwise) before installing opener.*

a. If the J-6272-02 multi-opener is used, raise locking lever, position four cans of refrigerant and force locking lever down to secure cans and at same time puncture top of can to make it ready for charging.

b. If the J-6271 valve is used, back off the valve from the can top retainer, slip the valve onto the can and turn the valve into retainer until tight. DO NOT open outlet vavle during this operation, as turning the valve into the retainer punctures top of can to make it ready for charging.

3. Connect center flexible line of gauge set to fitting on a can opener valve. If the line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and "crack" valve at can opener (for a second or two) to force air from the line. Retighten line at center fitting.

4. Open valve at refrigerant source and at low and high pressure valves on manifold gauge set. Leave valve open at refrigerant source until all refrigerant (when using 1 lb. can) has entered the refrigeration system or system is fully charged. Close valve on can.

a. If the system is charged using 1 lb. cans and the J-6271 valve, disconnect valve from can. Leave valve closed to flexible line to the center fitting of the manifold gauge set. Install valve on a new and full disposable can of refrigerant.

b. If system is charged using J-6272-02, close the valve of opener after all cans are empty. Release the locking lever and discard the four empty cans. If this tool will be used to complete the charge with additional cans to provide the required refrigerant charge, leave three of the empty cans in positon, locate one full can and lock the lever into place. These empty cans balance the assembly and prevent the loss of refrigerant through the open "series" passage. Align the pierced hole in the empty can with the punch in the cover of the tool.

If the J-6271 valve for single cans is available, complete charging as explained in 4a above.

5. Close valves on manifold gauge set.

6. Operate engine at 2000 RPM with temperature control lever at full cold position and blower speed on high in A/C mode. If air inlet temperature at the condenser is below 70 degrees F. when this check is made, bubbles may appear, even though the proper amount of refrigerant is in the system. Air inlet temperature must be 70 degrees F. or above to make an accurate check.

7. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under "Operational Test".

8. When satisfied that the air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on suction and discharge fittings.

WARNING: *A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure fitting at the compressor with a shop cloth before disconnecting the valve from the gauge fitting to prevent damage or injury to personnel.*

9. Using leak detector, check complete system for leaks.

Charging Station Method

INSTALLING J-8393-02

1. Be certain compressor hand shut-off valves to gauge fittings are closed (counterclockwise).

2. Be certain all valves on charging station are closed.

3. Connect high pressure gauge line to compressor high pressure gauge fitting.

4. Turn high pressure hand shut-off valve one turn clockwise, and high pressure control one turn counterclockwise (open). Crack open low pressure control and allow refrigerant gas to hiss from low pressure gauge line for three seconds, then connect low pressure gauge line to low pressure gauge fitting on P.O.A. valve. (Place J-9459 adapter on hose, then attach adapter to gauge fitting.)

FILLING CHARGING CYLINDER

1. Open control valve on refrigerant container.

2. Open valve on bottom of charging cylinder, allowing refrigerant to enter cylinder.

3. Bleed charging cylinder to valve (behind control panel) only as required to allow refrigerant to enter cylinder. When refrigerant reaches desired charge level, close valve at bottom of charging cylinder and be certain cylinder bleed valve is closed securely.

While filling the cylinder, it will be necessary to close the bleed valve periodically to allow boiling to subside so that refrigerant level in the charging cylinder can be accurately read.

CHARGING THE SYSTEM USING J-8393-02

1. With charging station connected, as previously described, remove low pressure gauge line at P.O.A. valve.

2. Crack open high and low pressure control valves on station and allow refrigerant gas to purge from system. Purge slowly enough so that oil does not escape from system along with refrigerant.

3. When refrigerant flow nearly stops, connect low pressure gauge line to P.O.A. valve.

4. Turn on vacuum pump and open vacuum control valve.

5. With system purged as above, run pump until 26- 28 inches of vacuum is obtained. Continue to run pump for 15 minutes after the system reaches 26-28 inches vacuum.

In all evacuating procedures, the specification of 26-28 inches of mercury vacuum is used. These figures are only attainable at or near sea level. For each 1000 feet above sea level where this operation is being performed, the specifications should be lowered by 1 inch. For example, at 5000 feet elevation, only 21 to 23 inches vacuum can normally be obtained.

6. If 26-28 inches vacuum (corrected to sea level) cannot be obtained, close vacuum control valve and shut off vacuum pump. Open refrigerant control valve and allow some refrigerant to enter system. Locate and repair all leaks.

7. After evacuating for 15 minutes, add 1/2 lb. of refrigerant to system. Purge this 1/2 lb. and re-evacuate for 15 minutes. This second evacuation is to be certain that as much contamination is removed from the system as possible.

8. Only after evacuating as above, system is ready for charging. Note reading on sight glass of charging cylinder. If it does not contain a sufficient amount for a full charge, fill to proper level.

9. Close low pressure valve on charging station. Fully open station refrigerant control valve and allow all liquid refrigerant to enter system. When full charge of refrigerant has entered system, turn off refrigerant control valve and close both hand shut- off valves.

10. If full charge of refrigerant will not enter system, close high pressure control and refrigerant control valves. Start engine and run at low idle with compressor operating. Crack refrigerant control valve and low pressure control on station. Watch low side gauge and keep gauge below 50 psi by regulating refrigerant control valve. Closing valve will lower pressure. This is to prevent liquid refrigerant from reaching the compressor while the compressor is operating. When required charge has entered system, close refrigerant control valve and close low pressure control.

11. System is now charged and should be performance- tested before removing gauges.

Adding Refrigerant

The following procedure should be used in adding small amounts of refrigerant that may have been lost by leaks or while opening system for servicing the compressor. BEFORE ADDING REFRIGERANT TO REPLACE THAT lost by leaks, check for evidence of oil loss and add oil if necessary.

This procedure will only apply if the air inlet temperature is above 70 degrees F. at the condenser.

1. Remove caps from P.O.A. valve and compressor gauge fittings. Attach gauge set to gauge fittings, making sure adapter (J-5420) is between low pressure gauge hose and suction gauge fitting, and J-9459 is between high pressure gauge hose and discharge gauge fitting.

2. Start engine, turn air conditioning temperature control lever to full cold position, blower switch to high speed and system selector lever to the A/C mode. Operate for ten (10) minutes at 2000 RPM to stabilize system.

3. Observe the refrigerant through the sight glass cover of receiver-dehydrator with the system operating, to see if there are any bubbles evident.

a. If no bubbles are evident, then bleed system slowly through the discharge valve until bubbles appear in the receiver-dehydrator. Add 1 lb. of refrigerant as explained under "Charging the System".

b. If bubbles are visible in the receiver-dehydrator with the temperature control lever in the full cold position and the blower at HI speed, it indicates a partial or complete plug in a line, a shortage of refrigerant, or both. Correct condition. Add refrigerant until the sight glass clears, then add another 1 lb. of refrigerant.

4. Attach flexible hose from center fitting of gauge set loosely to refrigerant drum or on disposable can valves. Open high and low pressure valves on the gauge set slightly to purge pressure gauge lines of air. Tighten fitting of refrigerant drum or can when satisfied that all air has been removed from gauge lines. Close (clockwise) both hand shut-off valves or gauge set.

5. Partially charge system.

REFRIGERANT DRUM METHOD:

a. Place pail containing hot water that does not have a temperature exceeding 125 degrees F. on scales, place refrigerant drum in pan containing water, note weight and only open low pressure valve on gauge set.

b. Start engine, move temperature control lever to full cold position and place blower switch on high speed. Operate engine for ten (10) minutes at 2000 RPM to stabilize system.

c. With compressor operating, slowly open valve on refrigerant drum and allow refrigerant to flow into system (through manifold gauge set) until liquid indicator clears up and immediately shut off valve at gauge set or on refrigerant drum. Check weight of refrigerant drum and pail of water. Then slowly open valve on gauge set (or refrigerant drum) and add one more lb. of refrigerant. Note total amount of refrigerant added.

DISPOSABLE CAN METHOD:

a. Make sure the outlet valve on the J-6271 valve is fully clockwise and attach the J-6271 to a 1 lb. can of refrigerant by backing off the valve from the top of the retainer, slipping the valve onto the can and turning the valve into the retainer until tight. DO NOT accidentally open outlet valve during this operation, as turning the valve into the retainer punctures the top of the can to make it ready for charging.

b. Connect center flexible line of gauge set to the fitting on the valve.

c. Start engine, move temperature control lever to full cold position, set blower switch to high speed and system to A/C mode. Operate engine for ten (10) minutes at 2000 RPM to stabilize system.

d. With compressor operating, slowly open valve on refrigerant can and allow refrigerant to flow into system (through manifold gauge set) until liquid indicator clears up and immediately shut off valve at gauge set and on refrigerant can. Check weight of can and valve assembly and record.

e. Add an additional 1 lb. of refrigerant by adding refrigerant from the can just weighed until can is empty.. Attach another can and add refrigerant until can and valve assembly weigh the same as recorded.

6. Close valves at refrigerant drum or can.

7. Test for leaks and make operational check of system.

13-9 ADDING OIL TO THE SYSTEM (MAJOR OVERHAUL)

The oil in the refrigeration system does not remain in the compressor during system operation, but circulates throughout the system. The compressor is initially charged with 10-1/2 oz. of 525 viscosity oil. After system has been in operation the oil content in the compressor will vary depending on the engine RPM and air conditioning load. At higher engine RPM's a lesser amount of oil will be retained in the compressor reservoir. It is important that the total system oil content does not vary from a total of 10-1/2 oz. Excessive oil content will reduce cooling capacity. Inadequate oil content may result in damage to compressor moving parts.

The refrigeration system will not require adding of oil unless there is an oil loss because of a ruptured line, badly leaking compressor seal, replacement of evaporator, compressor, receiver-dehydrator, or loss due to a collision. Oil is generally added to the system via the oil drain hole in the lower side of the compressor for this condition. To add oil to the system via the compressor, the compressor must be removed. If no major loss of oil has occurred and a component (condenser, receiver-dehydrator or evaporator) is removed for servicing, the oil may be added directly to the component. To add oil to a component removed for servicing and when no major loss has occurred, drain and measure oil in component, then replace with a like amount. To add oil to the system when a major loss of oil is evidenced, or when the compressor is being serviced, remove compressor, drain and measure oil, and replace oil amount specified in Figure 13-21.

Figure 13-21 Oil Replacement Table

Condition	Amount of Oil Drained From Compressor	Amount of 525 Oil to Install In Compressor
1. Major loss of oil and a component (condenser, receiver-dehydrator, or evaporator) has to be replaced.	a. More than 4 oz.	a. Amount drained from compressor, plus amount for component being replaced. 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 replacement compressor - no major oil loss.	a. More than 1 1/2 oz.	a. Same amount as drained from compressor being replaced.
	b. Less than 1 1/2 oz.	b. Install 6 oz.
3. Compressor being replaced with a service replacement compressor - major oil loss evident.	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 being rebuilt or repaired - no major oil loss evident.	a. More than 1 1/2 oz.	a. Same amount as drained from compressor, plus 1 oz. additional.
	b. Less than 1 1/2 oz.	b. Install 7 oz.
5. Compressor being rebuilt or repaired - major loss of oil evident.	a. More than 4 oz.	a. Same amount as drained from compressor, plus 1 oz. additional.

If foreign material is noted in oil drained from system or evidence of moisture is obvious in the components removed, it is recommended that the entire system be flushed (ref. par. 13-10) and the receiver- dehydrator be replaced. A full oil charge of 10-1/2 oz. of 525 viscosity refrigeration oil should be replaced in the system. It should be noted that all service replacement compressors will be supplied with 10-1/2 oz. of oil. In most cases it will be necessary to drain oil from service replacement compressor and refill it with amount as specified in Figure 13-21.

13-10 FLUSHING THE SYSTEM

Flushing of the system may involve all the components of the system or individual components in the system. The components may be flushed while mounted in the engine compartment or may be removed for flushing. When a component is not removed, disconnect all refrigerant lines or hoses attached to component. To perform flushing operation, connect a cylinder of refrigerant-12 to the component to be flushed, then invert the cylinder and open the cylinder valve so that the liquid refrigerant pours out and through the component. When liquid Refrigerant-12 reaches atmospheric pressure, it immediately drops to minus 21.7 degrees F. Insure that area immediately surrounding outlet of component is clear of anything that may be damaged by contact because of the sudden drop in temperature.

In all cases where a complete system flushing operation is performed, the receiver-dehydrator and the filter screen on the expansion valve should be replaced. If the evaporator assembly is flushed while installed in the car, the temperature bulb on the evaporator outlet pipe must be disconnected to keep the expansion valve from closing at the inlet source.

It is recommended that dry nitrogen be used as a flushing agent due to the low cost involved. In addition, dry nitrogen will not cause a temperature drop, as in the case of refrigerant-12, which results in thickening of refrigerant oil. Dry nitrogen has the additional advantage of removing moisture from the system.

DIVISION IV

REMOVAL AND INSTALLATION

13-11 REMOVAL AND INSTALLATION OF COMPRESSOR

A. Removal

1. Discharge refrigerant from system (refer to par. 13-8).

2. Remove wire connector from compressor.

3. Remove bolt and plate holding suction and discharge lines into rear head. Disengage both lines from compressor and tape closed openings in both lines and ports in rear head. It is important to seal compressor ports to avoid a loss of refrigeration oil and also to prevent foreign material and moisture from entering compressor.

4. Remove bolts in slots of compressor mounting brace and tilt compressor inward.

5. Remove two bolts holding front and rear adapter plates to compressor mounting bracket and lift out compressor. During removal, maintain the compressor position so that the sump is downward. Do not rotate compressor shaft.

B. Installation

1. Installation is reverse of removal. Torque bolts as specified in Figure 13-88. Insure that compressor has sufficient oil charge.

2. Use new "O" rings when attaching suction and discharge lines.

3. Adjust compressor belt tension to 100 pounds using a reliable belt tension gage.

4. Charge compressor (refer to par. 13-8).

5. Make sure compressor hoses are properly aligned and do not have any direct contact with sheet metal or each other.

13-12 REMOVAL AND INSTALLATION OF MUFFLER

A. Removal

1. Discharge system (refer to Par. 13-8).

2. Disconnect refrigerant lines connected to muffler and tape closed both open ends of refrigerant lines.

B. Installation

1. Install muffler reverse of removal, using new "O" rings coated with No. 525 viscosity oil during installation.

If refrigerant circuit or muffler has been exposed to the atmosphere for any amount of time and moisture may be present in the circuit, flush the muffler or system as necessary (refer to par. 13-10). Install a new receiver-dehydrator in system.

2. Charge the system (refer to Par. 13-8).

13-13 REMOVAL AND INSTALLATION OF CONDENSER RECEIVER-DEHYDRATOR ASSEMBLY

A. Removal

1. Discharge system (refer to Par. 13-8).

2. Disconnect inlet and outlet pipes of condenser receiver dehydrator and tape closed the open ends of refrigerant lines, and also the open ends of the inlet and outlet pipes of the condenser.

3. Remove one bolt securing each cross brace to the upper tie bar and position braces out of way.

4. Remove three screws securing underside of center support and locking mechanism to upper tie bar, one screw securing lower end of center support to lower tie bar, and two nuts securing center support to grille. Then remove center support locking mechanism.

5. Remove screws holding right and left flanges of condenser to radiator support and remove condenser.

B. Installation

1. Install condenser reverse of removal and use new "O" rings during installation. Lubricate "O" rings prior to installation using NO. 525 viscosity oil.

If refrigerant circuit or condenser has been exposed to the atmosphere and moisture may be present in circuit, the system and/or component must be flushed prior to installation (refer to Par. 13-10).

2. Charge the refrigerant circuit (refer to Par. 13- 8).

13-14 REMOVAL AND INSTALLATION OF RECEIVER - DEHYDRATOR

A. Removal

1. Discharge system (refer to Par. 13-8).

2. Remove necessary parts to gain access to receiver-dehydrator.

3. Disconnect refrigerant lines to both ends of receiver-dehydrator and tape closed open ends of refrigerant lines, and also the open ends of the inlet and outlet pipes of the receiver-dehydrator.

4. Remove two screws securing receiver-dehydrator and clamp to support bracket and lift out receiver dehydrator.

B. Installation

1. Install receiver-dehydrator reverse of removal and use new "O" rings during installation. Lubricate O rings with No. 525 viscosity oil prior to installation. If the receiver-dehydrator has been exposed to the atmosphere for any amount of time, (more than 5 minutes) the receiver-dehydrator should be replaced, since the life of dessicant is probably expended.

2. Charge refrigerant circuit (refer to Par. 13-8).

13-15 REMOVAL AND INSTALLATION OF EXPANSION VALVE

A. Removal

1. Discharge system (ref. Par. 13-8) and disconnect expansion valve capillary tube bulb attached to the outlet pipe of the evaporator.

2. Disconnect the equalizer line from the body of valve. Tape closed equalizer line port on POA valve, and also open end of equalizer line.

3. Disconnect inlet and outlet ends of expansion valve from refrigerant lines, and tape closed open ends of refrigerant lines and inlet and outlet ports of expansion valve.

4. Remove outer clamp of bracket securing expansion valve and POA valve to plenum blower and air valve assembly, and remove expansion valve.

B. Installation

1. Install expansion valve reverse of removal, and use new "O" rings during installation. Lubricate "O" rings prior to installation using No. 525 viscosity oil.

If expansion valve or refrigerant lines have been exposed to the atmosphere for any amount of time and moisture may have entered the valve or the system, flush the system and install new receiver-dehydrator or valve as necessary (refer to paragraph 13-10).

2. Charge system (refer to Par. 13-8).

Due to the possible adjustment difficulties involved if the expansion valve is disassembled, disassembly of the valve is not recommended. The valve may be cleaned by submerging it in a bath of trichlorethylene, alcohol, or similar solvent. Dry by blowing filtered compressed air through the outlet port of the valve. The filter screen at the inlet port may be replaced. Remove screen by threading a 10-32 NF screw into old filter screen. With a washer and a nut on the screw arranged to work as a puller screw, hold the body of the screw and turn the nut. Insert the new filter screen into the inlet port and lightly tap screen only enough to seat.

13-16 REMOVAL AND INSTALLATION OF EVAPORATOR

A. Removal

(4D-4F-4G-4H SERIES)

1. Remove right front fender skirt.

2. Discharge refrigerant from system (ref. Par. 13- 8) and disconnect suction line from POA valve and liquid line from expansion valve. Tape closed openings in valve and line.

3. Disconnect resistor connector and remove one screw securing blower motor ground wire to dash.

4. Remove four nuts and six screws securing evaporator-blower assembly to dash. See Figure 13-94. Remove evaporator-blower assembly.

5. Disconnect oil bleed line from POA valve. Peel back black insulation putty around evaporator outlet pipe and remove capillary tube bulb from evaporator outlet pipe.

6. Disconnect POA valve and expansion valve from evaporator outlet and inlet pipes. Tape closed all connection openings.

7. Remove six screws securing right and left halves of evaporator-blower assembly and remove evaporator.

(4L-4N-4R-4P-4U-4V-4Y SERIES)

1. Discharge refrigerant from system (refer to Par. 13-8).

2. Disconnect oil bleed line, equalizer line and suction line from POA valve (See Figure 13-91).

3. Peel back black insulating putty from around evaporator assembly outlet pipe and disconnect expansion valve bulb.

4. Disconnect clips from side of evaporator that secure expansion valve lines in place.

5. From underside of car unscrew nut holding expansion valve to evaporator assembly.

6. Disconnect any vacuum hoses or electrical wires attached to clips along topside of evaporator.

7. From under instrument panel, remove three screws securing bottom side of evaporator to dash.

8. Remove six screws securing evaporator assembly to dash and lift out POA valve and evaporator as an assembly.

9. Tape closed all refrigerant line openings and openings in expansion valve, POA valve, and evaporator assembly.

B. Installation

(ALL SERIES)

1. Reverse removal procedure to install, using new "O" rings on line fittings.

2. Evacuate, charge and leak test system.

13-17 REMOVAL AND INSTALLATION OF POA VALVE

A. Removal

When replacing a POA valve, the serviceman should check the interior of the old valve for corrosion or crystalization of salts. This would indicate excessive moisture in the system. If this condition exists, the receiver-dehydrator should be replaced and the system evacuated for one hour.

1. Discharge system (refer to Par. 13-8).

2. Disconnect evaporator oil bleed line from body of POA valve and tape closed opening on POA valve and also end of oil bleed line.

3. Disconnect equalizer line from the body of the POA valve. Tape closed equalizer line port on body of valve and also end of equalizer line.

4. Disconnect inlet and outlet ends of POA valve from refrigerant lines, and tape closed inlet and outlet ends of valve. Also tape closed both refrigerant lines.

5. Remove screw securing POA valve to bracket and remove POA valve.

B. Installation

1. Install reverse of removal using new "O" rings lubricated with No. 525 viscosity oil.

If POA valve and refrigerant line openings have been exposed excessively to the atmosphere it is recommended that system be flushed out to remove any traces of moisture (refer to Par. 13-10).

2. Charge system (refer to Par. 13-8).

13-18 REMOVAL AND INSTALLATION OF SUPERHEAT SWITCH

A. Removal

1. Completely discharge the air conditioning system according to procedure.

2. After the system is discharged, remove the superheat switch retainer ring, Figure 13-22, using Tool J-5403.

3. Remove the superheat switch from the rear head by pulling at the terminal housing groove with seal seat remover and installer (J-9393).

4. Remove the O ring from the switch cavity in the rear head. Use O ring removal (J-9553).

5. Recheck the superheat switch for closed contacts. See Superheat Switch Check in Diagnosis section. Replace as necessary.

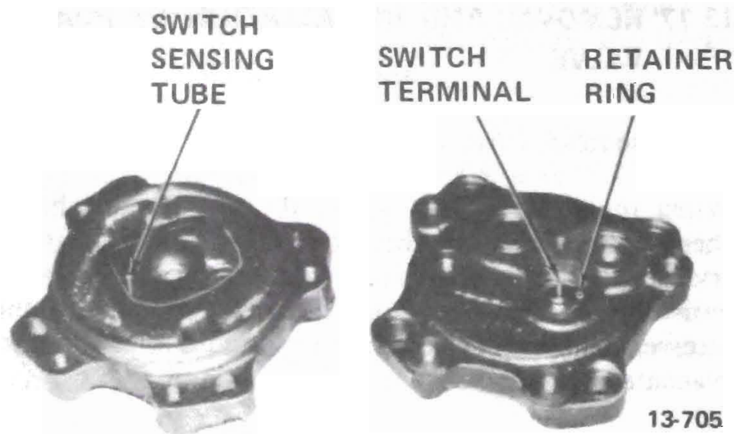


Figure 13-22 Superheat Shutoff Switch Installed in Rear Head

B. Installation

1. Check the superheat switch cavity and O ring groove in the rear head for dirt or foreign material and be sure area is clean before installing the O ring. Install a new O ring in the groove of the superheat switch cavity in the rear head. Lubricate the O ring liberally with 525 viscosity oil before installing.

2. Lubricate the housing of the superheat switch with 525 viscosity oil and insert the switch carefully into the switch cavity until the switch bottoms. The seal seat remover and installer (J-9393) may be used to install the switch.

3. Using internal snap ring pliers (J-5403), install the superheat switch retaining ring with the high point of the curved sides adjacent to the switch housing. Be sure the retainer ring is properly seated in the snap ring groove.

4. Check for electrical continuity between the switch housing and the rear head. Also check for continuity between the switch terminal and switch housing to be sure the contacts are open according to the Calibration Chart, Figure 13-16.

5. Evacuate and recharge the system with refrigerant according to the following special charging procedure:

To prevent the possibility of "blowing" the new thermal fuse during evacuation, charging or analysis of the system, disconnect the connector plug from the thermal fuse and install a jumper between the center terminal (B) and the clutch lead terminal (C) of the connector plug. See Figure 13-13.

6. Evacuate, recharge, and leak check the entire air conditioning system according to normal procedures. Repair any leaks, check and add oil, as required and deemed necessary for proper operation of the system.

7. When the system is operating normally, remove the jumper from the connector plug and reconnect the plug to the thermal fuse.

DIVISION V

OVERHAUL AND MAJOR SERVICE

13-19 DISASSEMBLY AND REASSEMBLY OF CLUTCH DRIVE PLATE AND SHAFT SEAL

It is not necessary to remove the compressor or disconnect refrigerant lines to remove or install clutch parts. However, it is necessary to position the compressor out of the mounting brackets for tool clearance.

A. Disassembly

1. Firmly clamp holding fixture (J-9396) in a vise and attach compressor assembly to fixture (see Figure 13-23).

2. Hold hub of clutch drive plate with wrench (J-9403). Using special thin wall 9/16 inch socket (J-9399) and 3/8 inch drive, remove shaft nut.

3. Install threaded hub puller (J-9401) onto hub of clutch drive plate (see Figure 13-24). Hold body of hub puller with wrench, tighten center screw of hub puller, and lift off clutch drive plate and woodruff key.

4. Using No. 21 Truarc pliers (J-5403) take out retainer ring from hub of clutch drive plate (see Figure 13-25). Lift out spacer.

5. If compressor has an absorbent sleeve in the neck, pry out the sleeve retainer and remove the sleeve. Remove the seal seat retainer ring, using No. 21 Truarc pliers, Tool J-5403, (see Figure 13 26).

6. Thoroughly clean the area inside the compressor neck surrounding the shaft, the exposed portion of the seal seat and the shaft itself of any dirt or foreign material. This is absolutely necessary to prevent any such material from getting into the compressor.

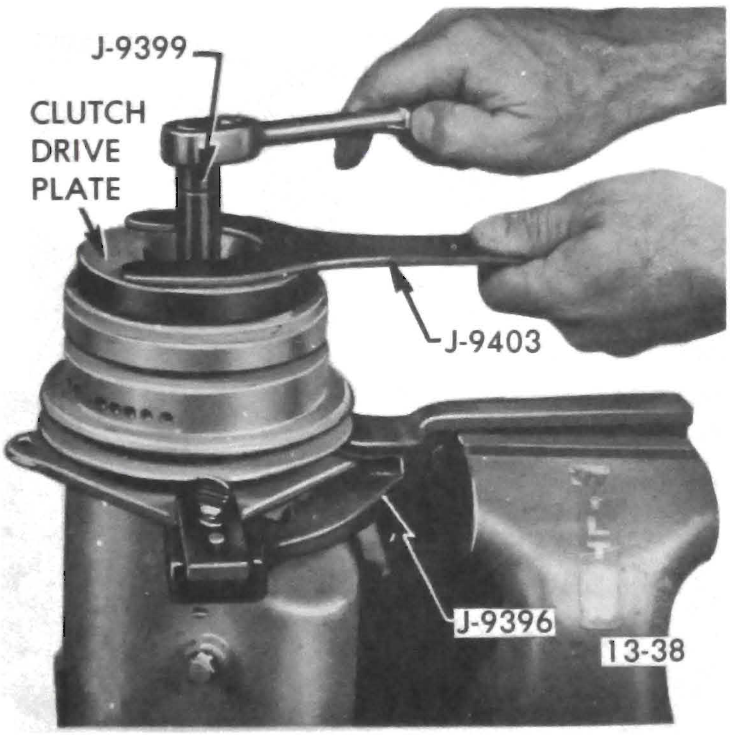


Figure 13-23 Removing or Installing Shaft Nut

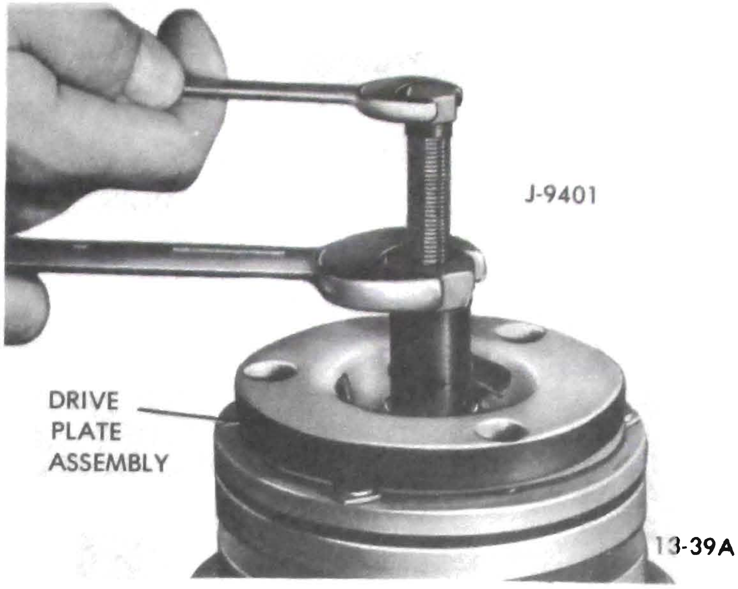


Figure 13-24 Removing Clutch Drive Plate

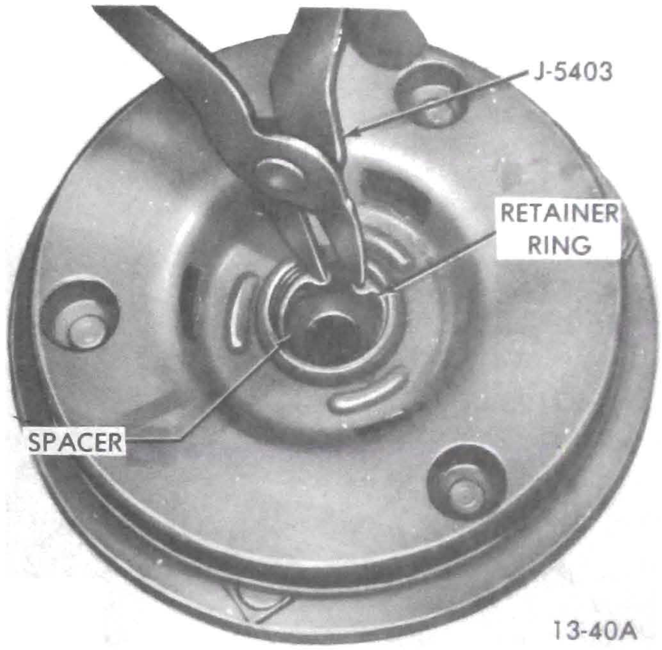


Figure 13-25 - Removing or Installing Retainer Ring in Clutch Drive Plate

7. Remove the seal seat (see Figure 13-27) using Tool J-23128. Insert Tool J-23128 into seal seat and tighten, using a twisting motion remove the seal seat.

8. Remove the seal assembly, using Tool J-9392. Press tool downward on seal while twisting it clockwise to engage the tabs of the seal assembly. Gently but firmly, pull tool straight out (see Figure 13-28).

9. Remove the seal seat "O" ring, using Tool J-9553 (see Figure 13-29).

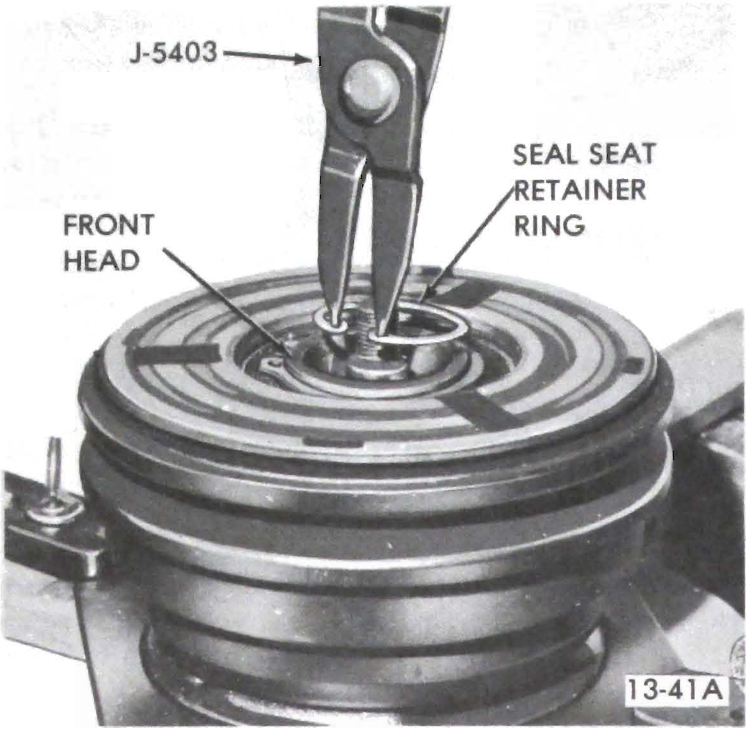


Figure 13-26 Removing or Installing Shaft Seal Seat Retaining Ring

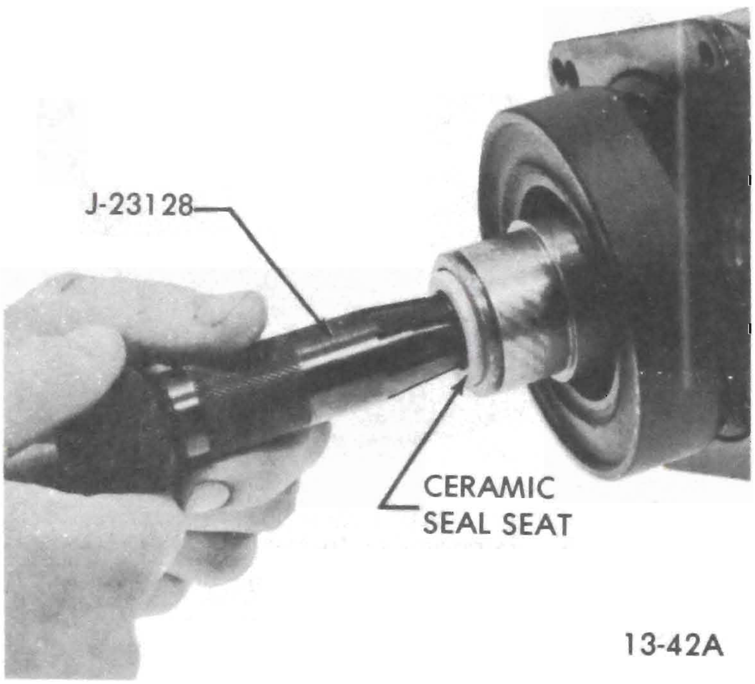


Figure 13-27 Removing or Installing Ceramic Shaft Seal Seat

10. Re-check the inside of the compressor neck and the shaft. Be sure these areas are perfectly clean before installing new parts.

B. Reassembly

1. Coat the new seal seat "O" ring with clean refrigeration oil and install it in its groove in the

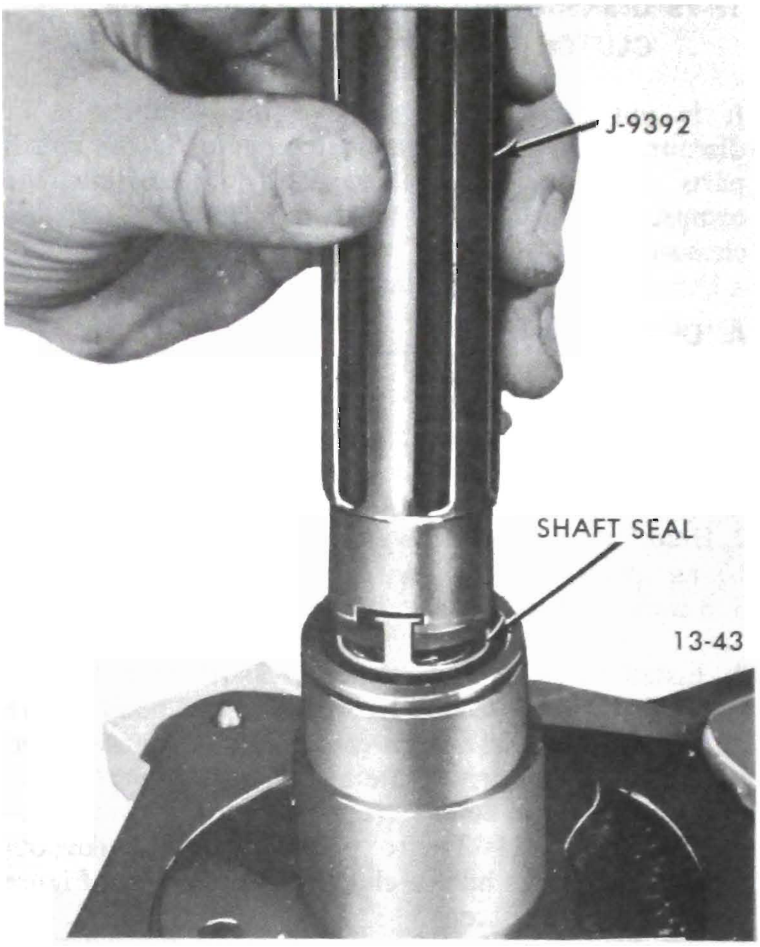


Figure 13-28 Removing or Installing Shaft Seal

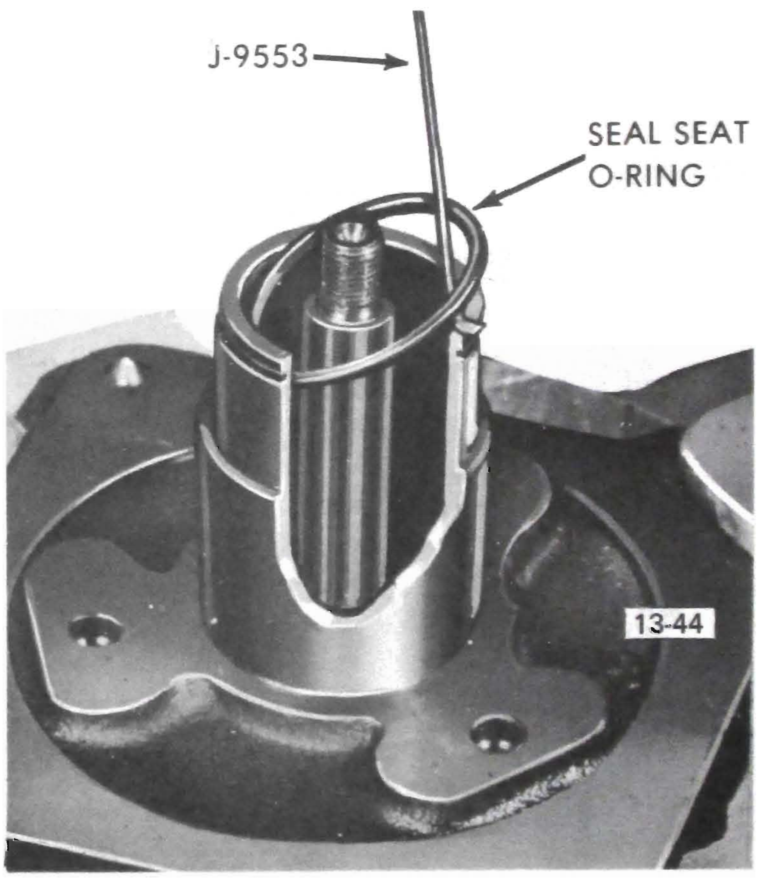


Figure 13-29 Removing Seal Seat O Ring

compressor neck. Tool J-21508 may be used to accomplish this (see Figure 13-30).

2. Coat the "O" ring and seal face of the new seal assembly with clean refrigeration oil. Carefully mount the seal assembly to Tool J-9392 by engaging the tabs of the seal with the tangs of the tool.

3. Place seal protector, Tool J-22974, over end of shaft and carefully slide the new seal assembly onto the shaft. Gently twist the tool clockwise while pushing the seal assembly down the shaft until the seal assembly engages the flats on the shaft and is seated in place. Disengage the tool by pressing downward and twisting tool counterclockwise.

4. Coat the seal face of the new seal seat with clean refrigeration oil. Mount the seal seat on Tool J 9393 and install it in the compressor neck, taking care not to dislodge the seal seat "O" ring and being sure the seal seat makes a good seal with the "O" ring.

5. Install the new seal seat retainer ring with its flat side against the seal seat, using No. 21 Truarc pliers (J-5403). Use the sleeve from Tool J-9393 to press in on the seal seat retainer ring so that it snaps into its groove. Remove seal protector J-22974 from the end of the shaft.

6. Install Compressor Leak Test Fixture (J-9625) on rear head of compressor and connect gage charging lines as shown in Figure 13-31. Pressurize suction side of compressor with Refrigerant-12 vapor to drum pressure. Temporarily install the shaft nut and, with compressor horizontal and oil sump down, rotate the compressor shaft in normal direction of rotation several times by hand. Leak test the seal with a propane torch type leak detector in good condition. Correct any leak found. Remove and discard the shaft nut.

7. Remove any excess oil, resulting from installing the new seal parts, from the shaft and inside the compressor neck.

8. Install the new absorbent sleeve by rolling the material into a cylinder, overlapping the ends, and slipping it into the compressor neck with the overlap at the top of the compressor. Using a small screwdriver or similar instrument, carefully spread the sleeve so that in its final position, the ends butt together at the top vertical centerline. Install the new sleeve retainer so that its flange face will be against the front end of the sleeve. Using the sleeve from Tool J-9393, press and tap with a mallet, setting the retainer and sleeve into place, until the outer edge of the sleeve retainer is recessed approximately 1/32" from the face of the compressor neck.

9. Insert woodruff key into hub of clutch drive plate so that it projects out approximately 3/16 inch (see Figure 13-32) and position clutch drive plate onto shaft.

10. Using drive plate installer (J-9480), screw installer on end of shaft as shown in Figure 13-33. Hold nut and turn bolt until clutch drive plate is pressed within 3/32 inch of the pulley assembly.

11. Reassembly spacer into hub of clutch drive plate.

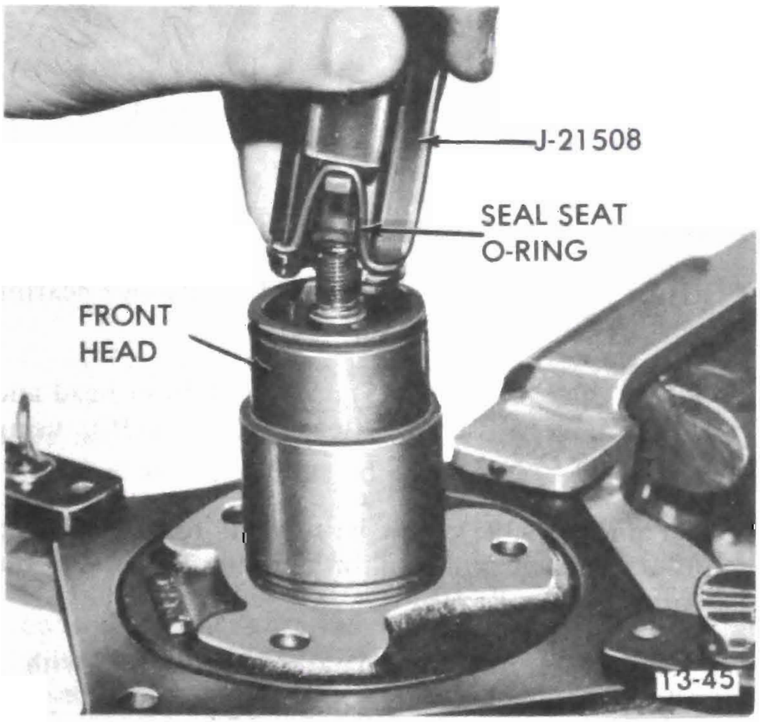


Figure 13-30 Installing Seal Seat O Ring

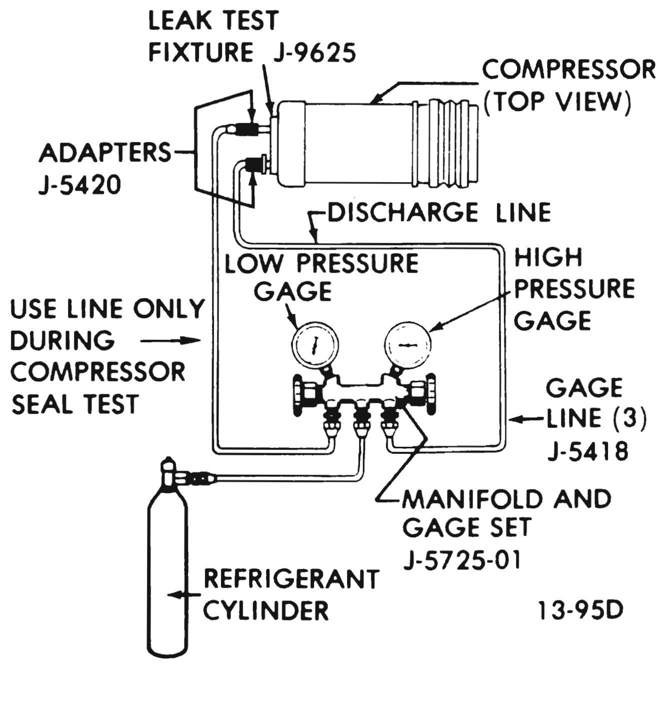


Figure 13-31 Leak Testing Shaft Seal and Seal Seat O Ring

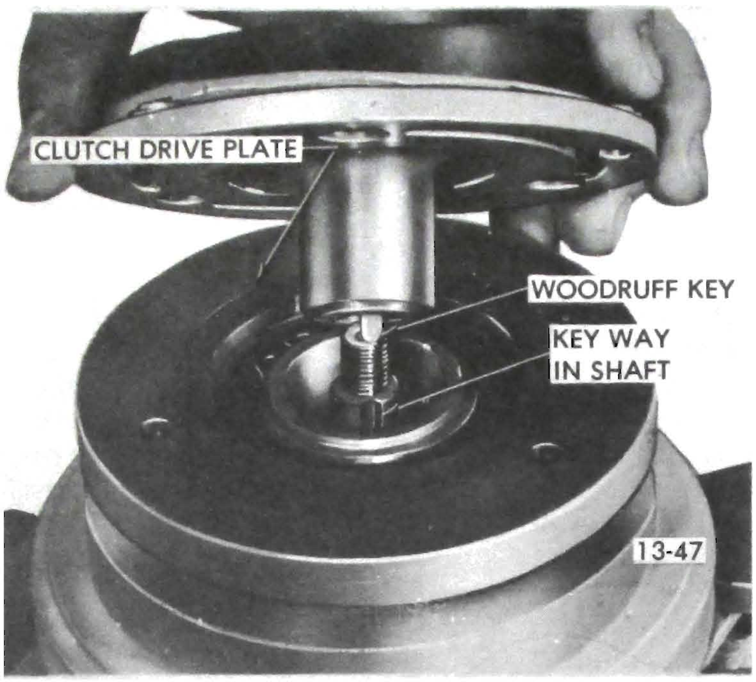


Figure 13-32 Positioning Clutch Drive Plate on Shaft

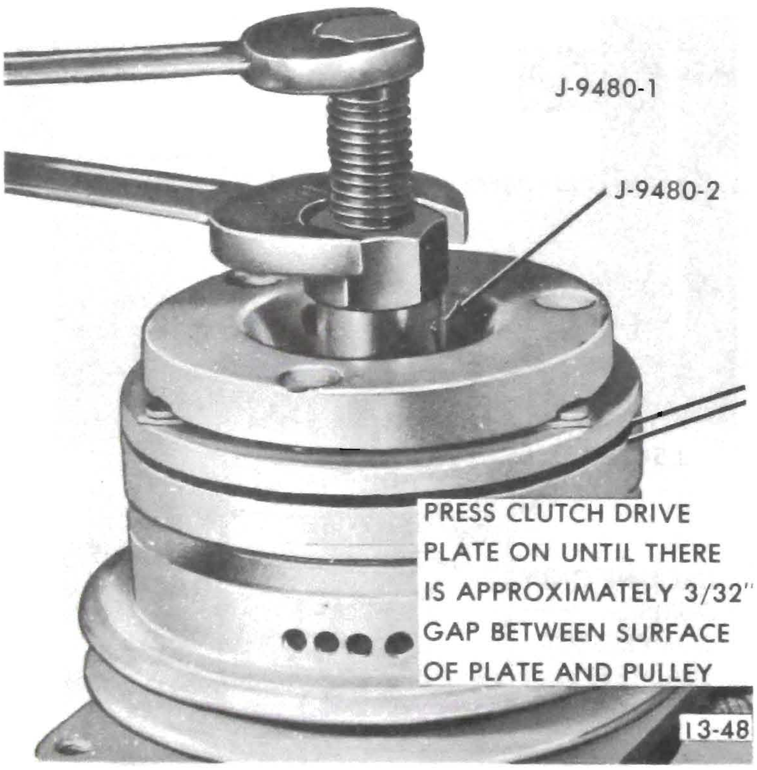


Figure 13-33 Installing Clutch Drive Plate

12. Reassemble retainer ring into hub of clutch drive plate (see Figure 13-25) using No. 21 truarc pliers (J-5403).

13. Thread on new shaft nut using special thin wall 9/16 inch socket (J-9399) and 3/8 inch drive. Hold clutch drive plate secure using Wrench (J-9403) and torque nut to 15 lb. ft. The air gap between the friction surfaces of the pulley assembly and clutch drive plate should be approximately 1/32 to 1/16 inch (see Figure 13-34).

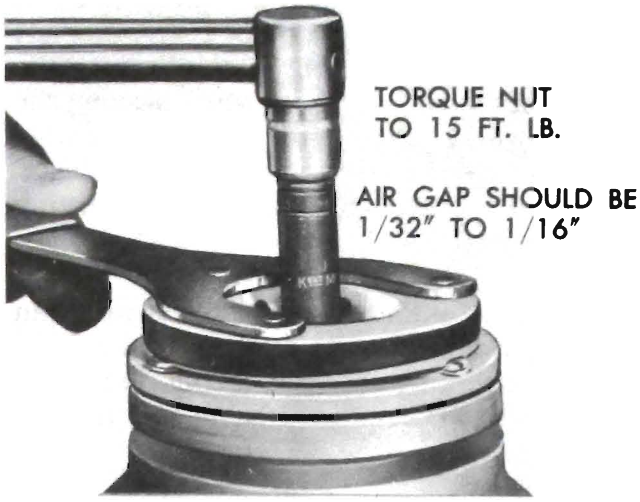


Figure 13-34 Torquing Shaft Nut

13-20 DISASSEMBLY AND REASSEMBLY OF PULLEY ASSEMBLY, AND COIL AND HOUSING ASSEMBLY

It is not necessary to remove the compressor assembly or disconnect refrigerant lines to perform the following operations. However, it is necessary to position the compressor out of the mounting brackets for tool clearance.

A. Disassembly

1. Disassemble clutch drive plate (ref. par. 13-20).

2. Using No. 26 Truarc pliers (J-6435) remove bearing to head retainer ring (see Figure 13-35).

3. Place puller pilot (J-9395) on hub of front head and take off pulley assembly (see Figure 13-36), using pulley puller (J-8433).

Puller pilot (J-9395) must be used. If force is exerted on shaft, damage will result to the internal parts of the compressor.

4. Remove bearing to pulley retaining ring with a small screwdriver (see Figure 13-37).

5. Drive out bearing (see Figure 13-38) by use of puller Pilot (J-9398) and Handle (J-8092).

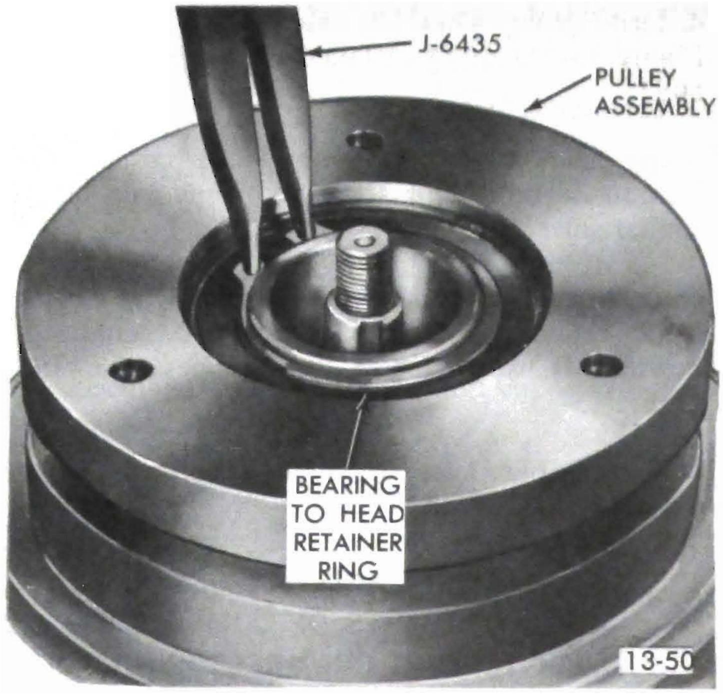


Figure 13-35 Removing or Installing Bearing to Head Retainer Ring

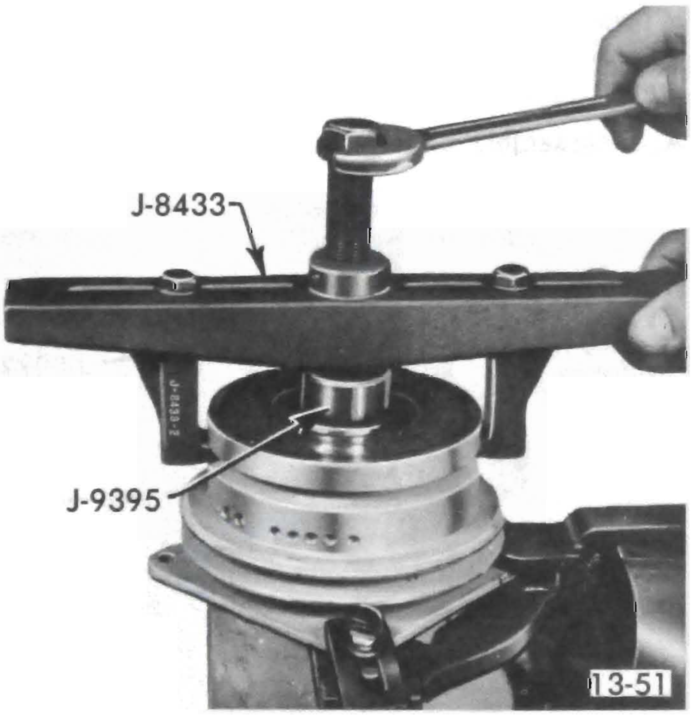


Figure 13-36 Removing Pulley Assembly

Do not take out pulley bearing unless it is going to be replaced as removal may damage bearing.

6. Mark position of coil and housing assembly in relationship to shell of compressor, remove coil and housing retainer ring (see Figure 13-39) using No. 26 truarc pliers (J-6435), and lift out coil and housing assembly.

B. Reassembly

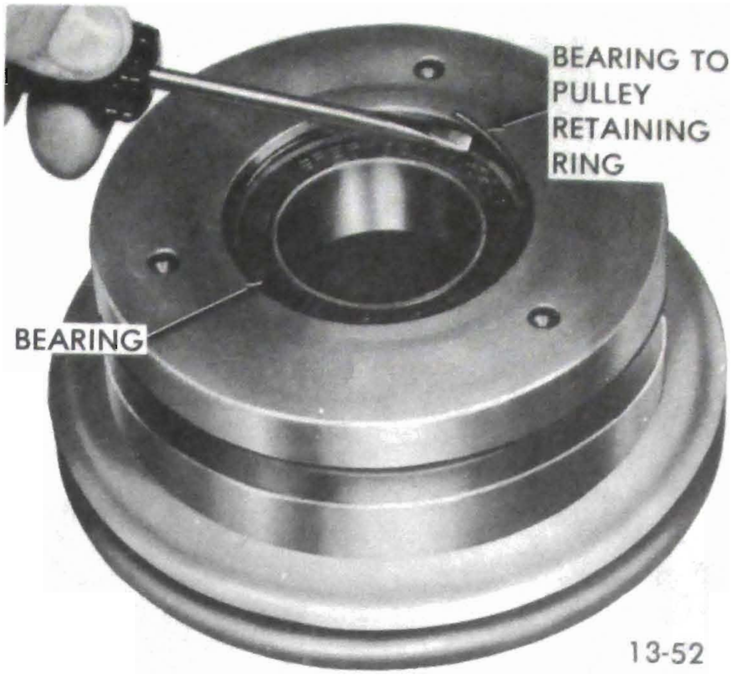


Figure 13-37 Removing Pulley Bearing Retainer

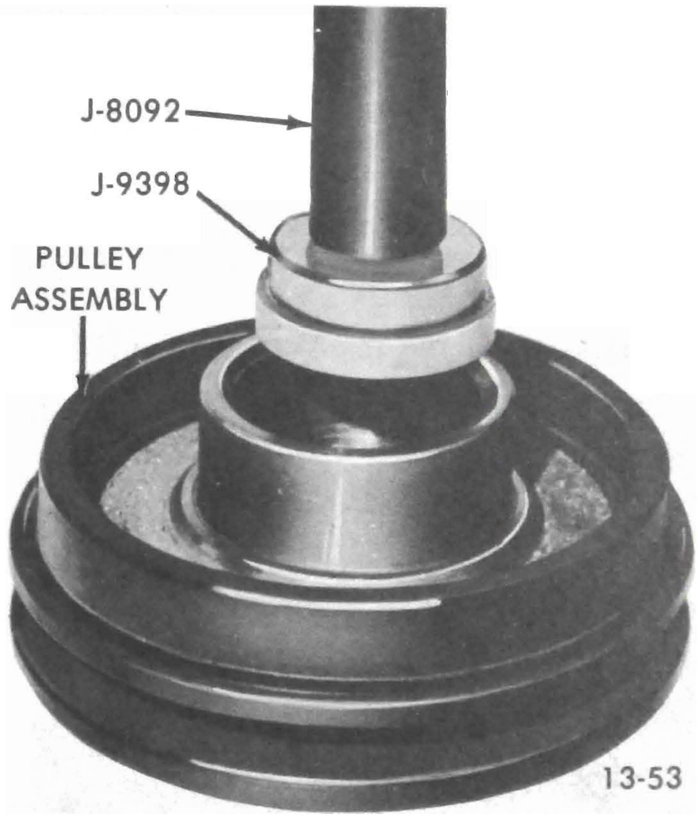


Figure 13-38 Removing Bearing from Pulley Assembly

1. Reassemble coil and housing assembly reverse of disassembly.

2. Drive new bearing into pulley assembly (see Figure 13-40) with installer (J-9481) and handle (J-8092).

Figure 13-39 Removing or Installing Coil and Housing Retainer Ring

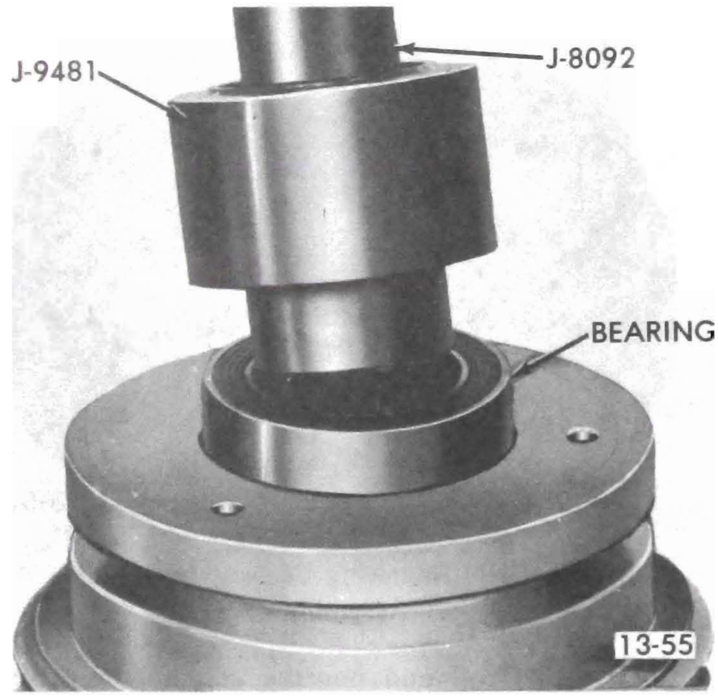


Figure 13-40 Installing Bearing into Pulley Assembly

3. Lock bearing in position with bearing to pulley retainer ring (see Figure 13-36).

4. Drive pulley assembly onto hub of front head (see Figure 13-41) using installer (J-9481) and handle (J-8092).

If the pulley assembly is going to be reused, clean the friction surface with trichlorethylene, alcohol, or a similar solvent.

5. Lock pulley assembly in position with bearing to head retainer ring (flat side of retainer ring downward) using No. 26 Truarc pliers (J-6435). See Figure 13-35.

6. Reassemble clutch drive plate (refer to paragraph 13-19).

13-21 DISASSEMBLY AND REASSEMBLY OF INTERNAL PARTS OF COMPRESSOR AND LEAK TESTING COMPRESSOR

A clean work area and a place for each part removed is required to properly disassemble and reassemble compressor. The internal parts of the compressor must be kept free of dirt or foreign material.

When working with compressor, under no circumstances should compressor be rested on pulley end.

A. Disassembly of Rear Head, Oil Pump, Rear

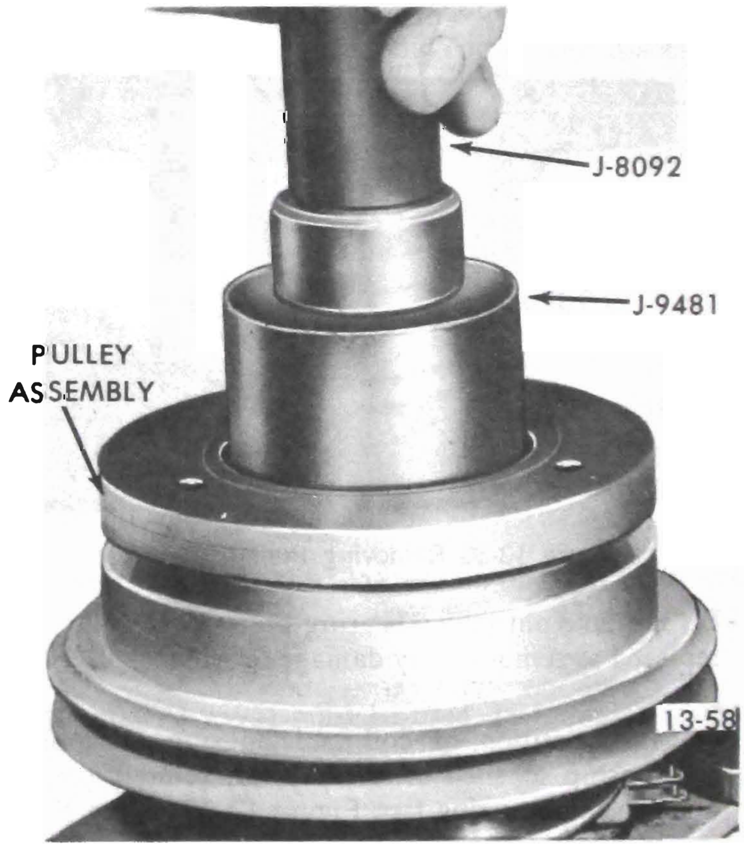


Figure 13-41 Installing Pulley Assembly

Discharge Valve Plate, and Rear Suction Valve Reed Disc

If compressor is not going to be disassembled any further than removal of rear head, oil pump, rear discharge valve plate, or rear suction valve reed disc, omit Steps "1, 2 and 4".

1. Disassemble clutch drive plate and shaft seal (ref. Par. 13-19).

2. Disassemble pulley assembly, and coil and housing assembly (ref. Par. 13-20).

3. Clean surface of compressor shell and dry with compressed air.

4. Remove compressor from holding fixture (J-9396), unscrew drain screw. Drain, measure and record amount of oil in compressor.

5. Reinstall compressor in holding fixture (J-9396) positioned as shown in Figure 13-42.

6. Unscrew and discard four lock nuts from rear of compressor, and lift off rear head by tapping it with a mallet. If Teflon sealing surface is damaged (see Figure 13-43), replace rear head. Clean or replace suction screen as necessary.

7. Pencil mark top side of both oil pump rotors and lift out rotors. Replace both oil pump inner and outer rotors if one or both are damaged or worn.

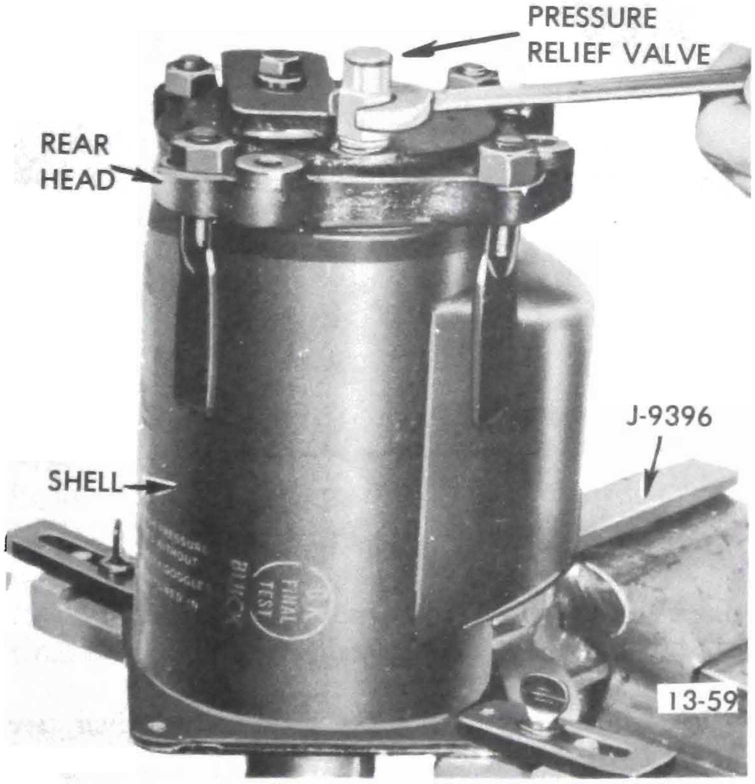


Figure 13-42 Compressor Installed in Holding Fixture

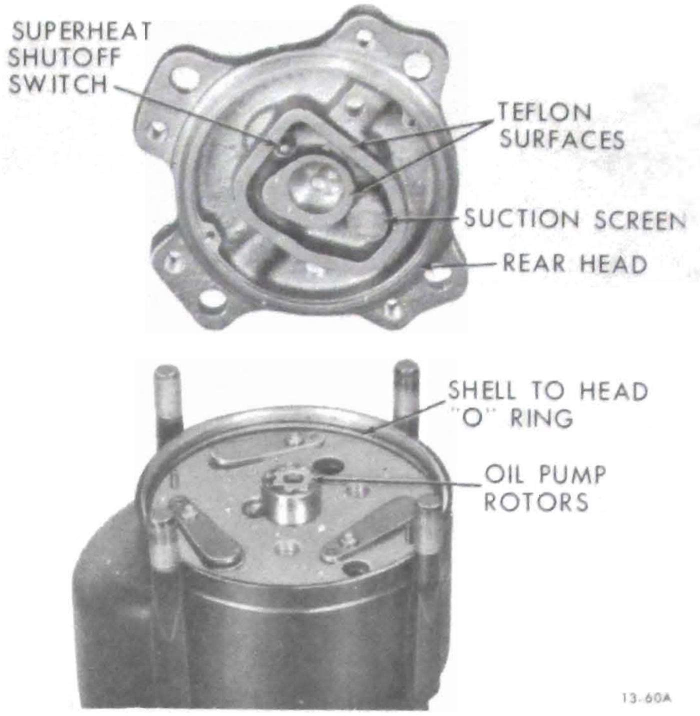


Figure 13-43 Rear Head Removal

8. Take out and discard shell to head "O" ring.

9. Carefully pry out rear discharge valve plate and rear suction valve reed disc with screwdrivers (see Figure 13-44 and 13-45). Check both pieces and replace as necessary.

During disassembly, the disc generally adheres to the plate and both pieces lift out together.

B. Removing Cylinder Assembly, and Disassembly of Front Suction Valve Reed Disc, Front Discharge Valve Plate, and Front Head

1. Pull out oil inlet tube (see Figure 13-46) and oil inlet tube "O" ring using Remover (J-6586).

2. Push shaft upward from front head and lift out

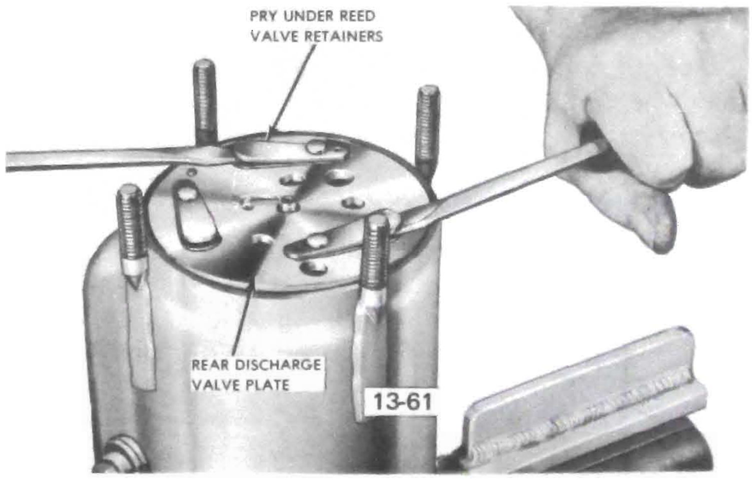


Figure 13-44 Removing Rear Discharge Valve Plate

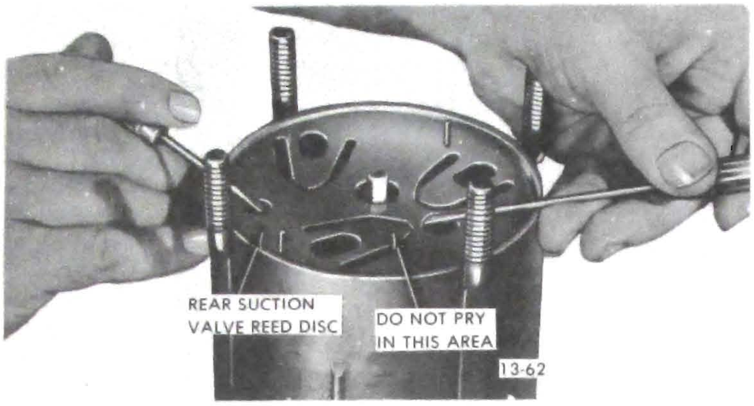


Figure 13-45 Removing Rear Suction Valve Reed Disc

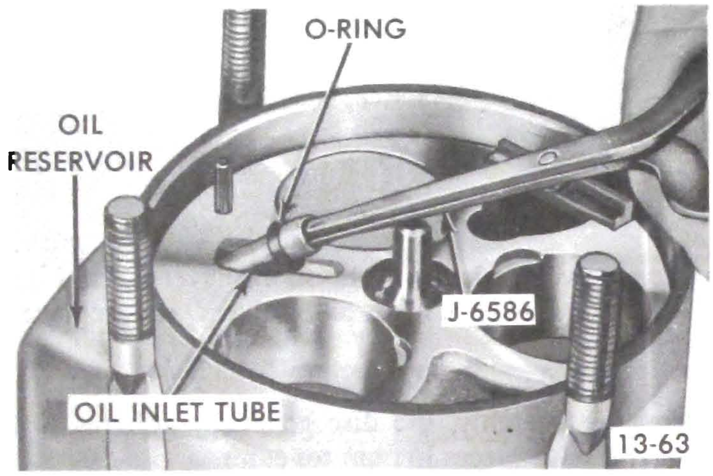


Figure 13-46 Removing Oil Inlet Tube

cylinder assembly (see Figure 13-47), front suction valve reed disc, and front discharge valve plate.

When lifting out the cylinder assembly, the front suction valve reed disc and the front discharge valve plate generally adhere to the cylinder assembly and lift out with it. Check and replace if necessary.

Depending on wear or damage to cylinder assembly, it may be advisable to replace complete cylinder assembly. If service replacement cylinder is used omit following steps and continue on with subparagraph entitled "FINAL REASSEMBLY OF CYLINDER ASSEMBLY".

3. Disassemble front head from shell by tapping front head with a mallet to unseat head, and lifting straight out through rear of shell the front head and shell to head "O" ring (see Figure 13-48). Discard "O" ring.

If sealing surfaces of front head (see Figure 13-49) are damaged, replace front head. There is no Teflon on front head sealing surface.

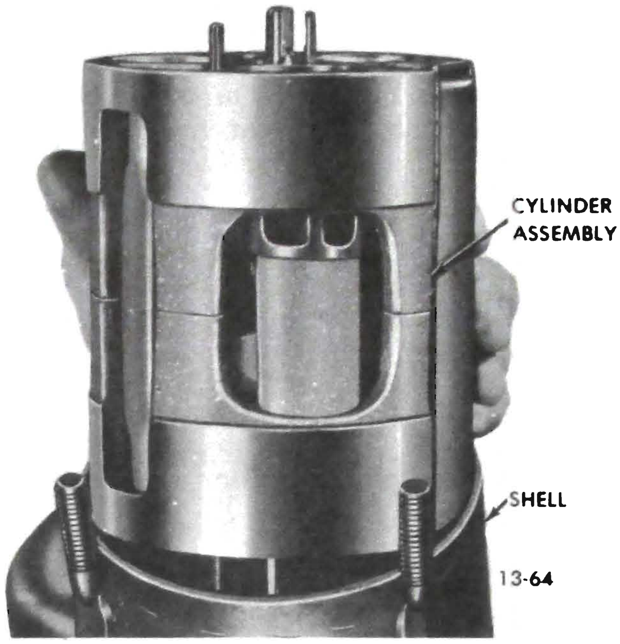


Figure 13-47 Removing Internal Cylinder Assembly

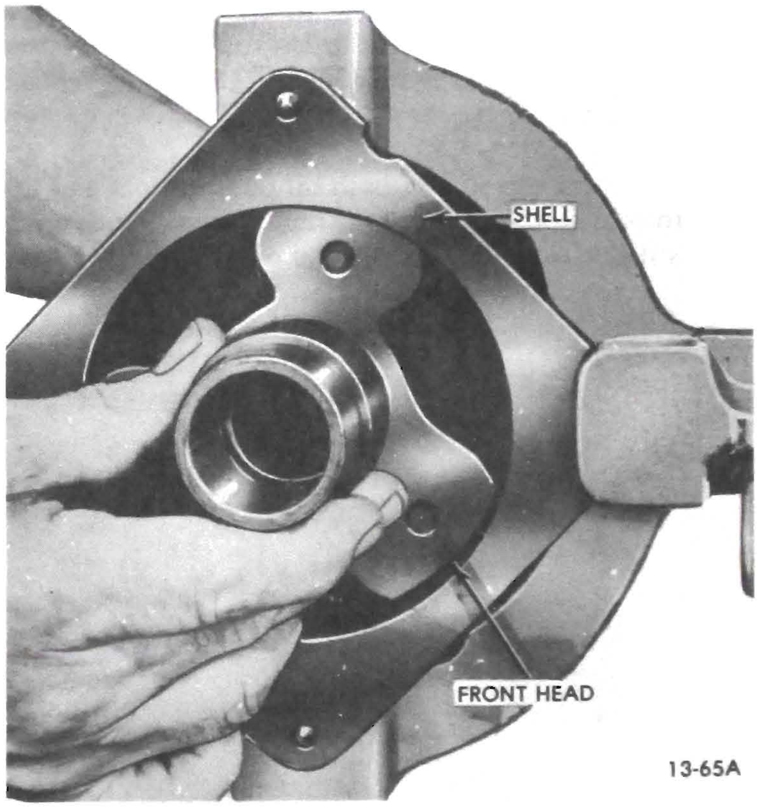


Figure 13-48 Removing Front Head

C. Disassembly of Cylinder Assembly

1. Pry off suction pass cover using screwdriver (see Figure 13-50).

2. Place cylinder assembly (front end downward) on top of compressing fixture (J-9397), number pistons and cylinders "1, 2 and 3" to facilitate reassembly (see

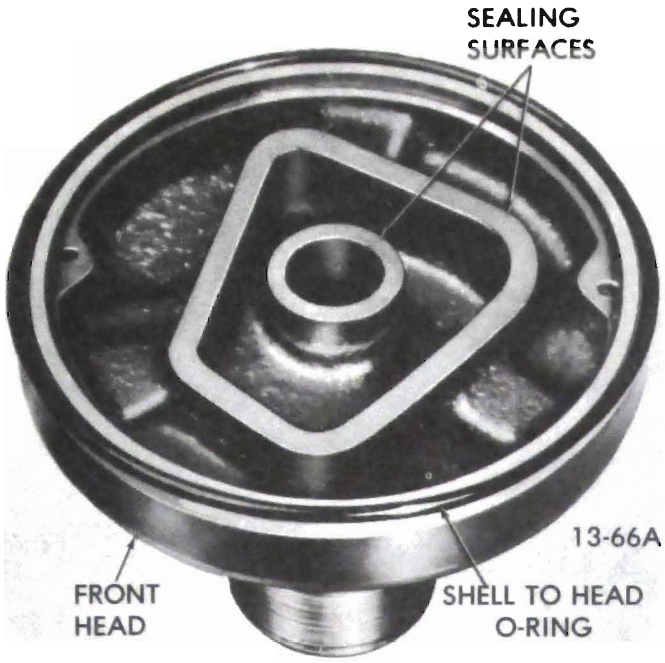


Figure 13-49 Front Head Sealing Surfaces

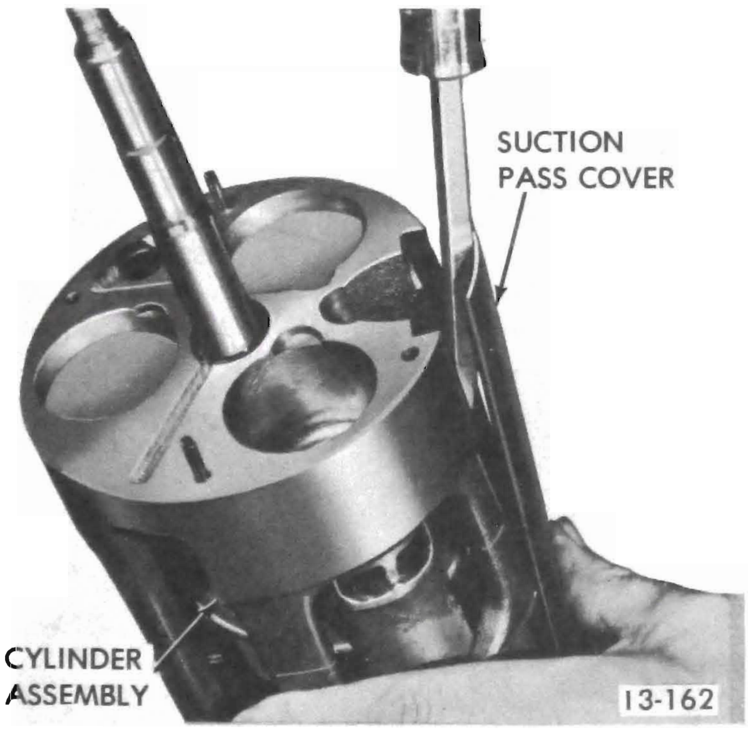


Figure 13-50 Removing Suction Pass Cover

Figure 13-44), and separate cylinder halves using a hard rubber mallet or hammer and wood block.

3. Disassemble rear cylinder half and discharge tube from cylinder assembly and discard discharge tube.

Depending on whether or not discharge tube comes out with rear cylinder half or remains in front cylinder half it may be necessary to rotate shaft and swash plate assembly (using 9/16 inch opened wrench on shaft seal portion of shaft) to achieve necessary clearance.

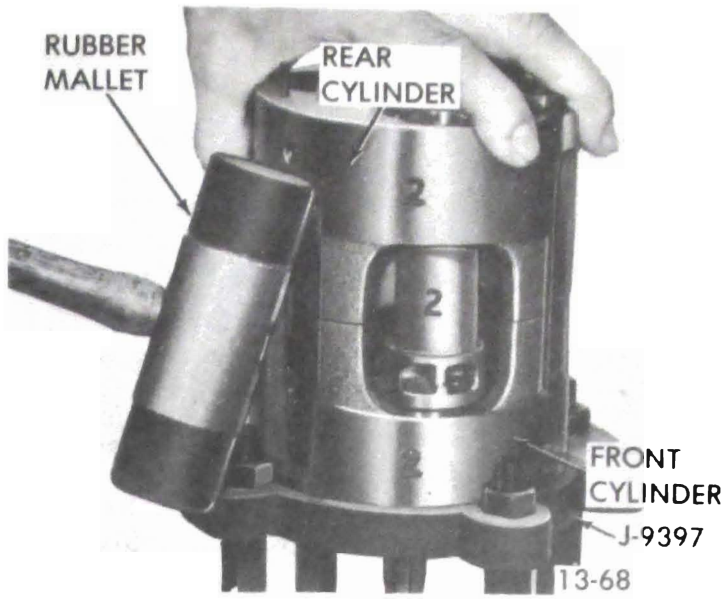


Figure 13-51 Separating Cylinder Halves

4. Carefully disassemble from cylinder assembly (see Figure 13-52) and lay in respective place on parts tray (J-9402) the following: number "1, 2 and 3" pistons, piston drive balls, and piston rings. To disassemble, rotate swash plate until piston is at highest point, raise swash plate approximately 1/2 inch and lift out piston and related parts one at a time. Discard shoe discs and rear needle thrust bearing and races.

Examine piston drive balls and replace if necessary. The front end of the piston may be identified by a recessed notch (see Figure 13-53).

5. Lift out shaft and swash plate assembly and front

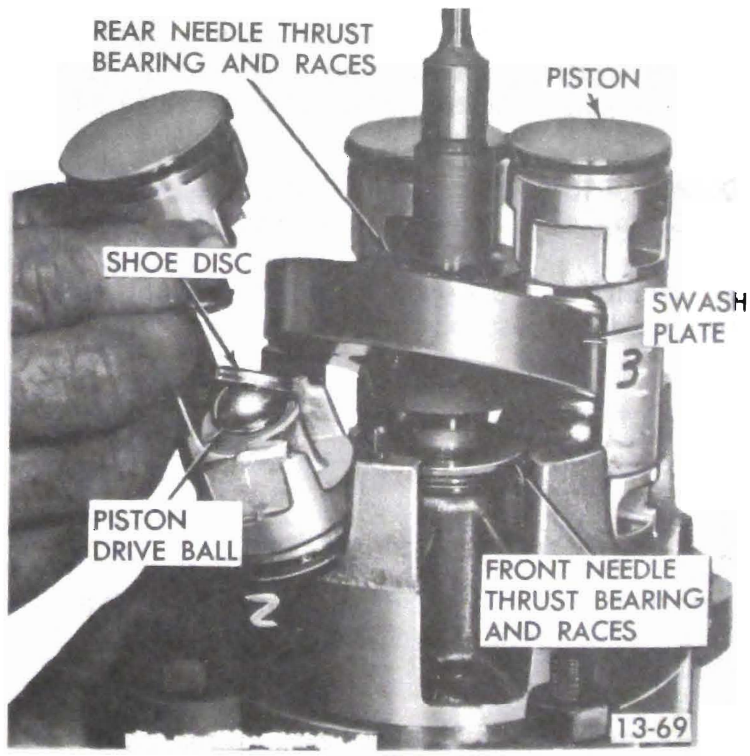


Figure 13-52 Disassembly of Cylinder Assembly

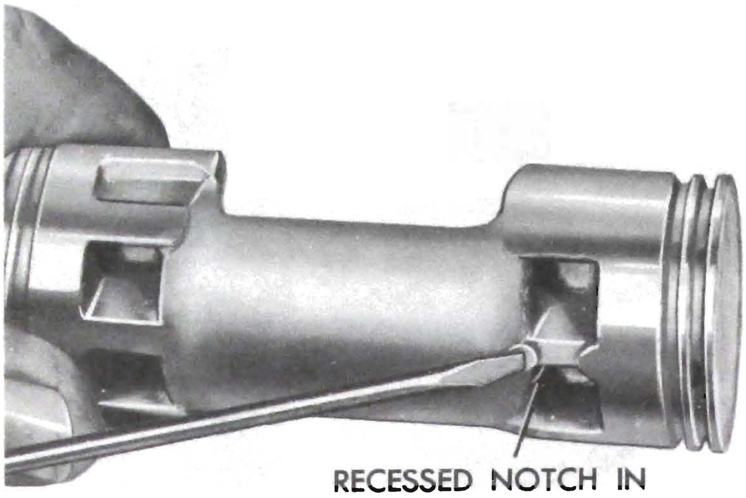


Figure 13-53 Piston Identification

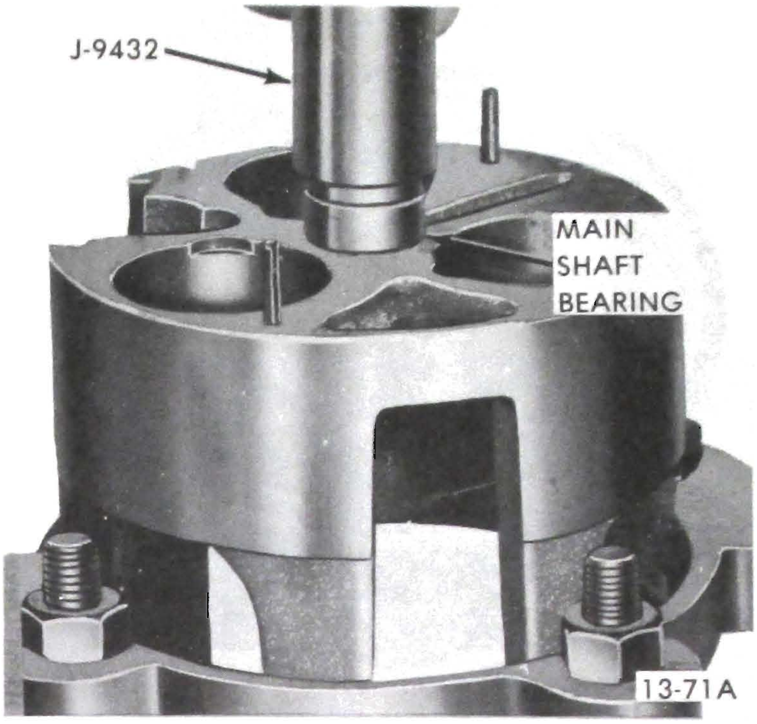


Figure 13-54 Installing Main Shaft Bearing

needle thrust bearing races. Discard front needle thrust bearing and races.

Examine shaft and swash plate assembly and replace as necessary.

6. Wash all salvaged parts of cylinder assembly in bath of trichlorethylene, alcohol, or similar solvent and dry parts with filtered, dry compressed air.

Examine front and rear cylinder halves, front and rear main shaft bearings, and replace as necessary. If bearings are to be replaced, drive out of cylinder halves with suitable socket or punch. Install new bearing (lettering on bearing edge facing outward) using bearing installer (J-9432). See Figure 13-54.

D. Partial Reassembly of Cylinder Assembly, and Gaging of Piston Play and Shaft End Play

1. Obtain from parts stock four "zero" thrust races, two needle thrust bearings, and three "zero" shoe discs.

2. Place front cylinder on top of compressing fixture (J-9397) as shown in Figure 13-55.

3. Generously coat with clean petroleum jelly two "zero" thrust races, and a new needle thrust bearing. Assemble races and bearing to front end of shaft and swash plate assembly and insert assembly into front cylinder (see Figure 13-55.)

4. Assemble two additional "zero" thrust races and a new needle thrust bearing to rear end of shaft and swash plate assembly.

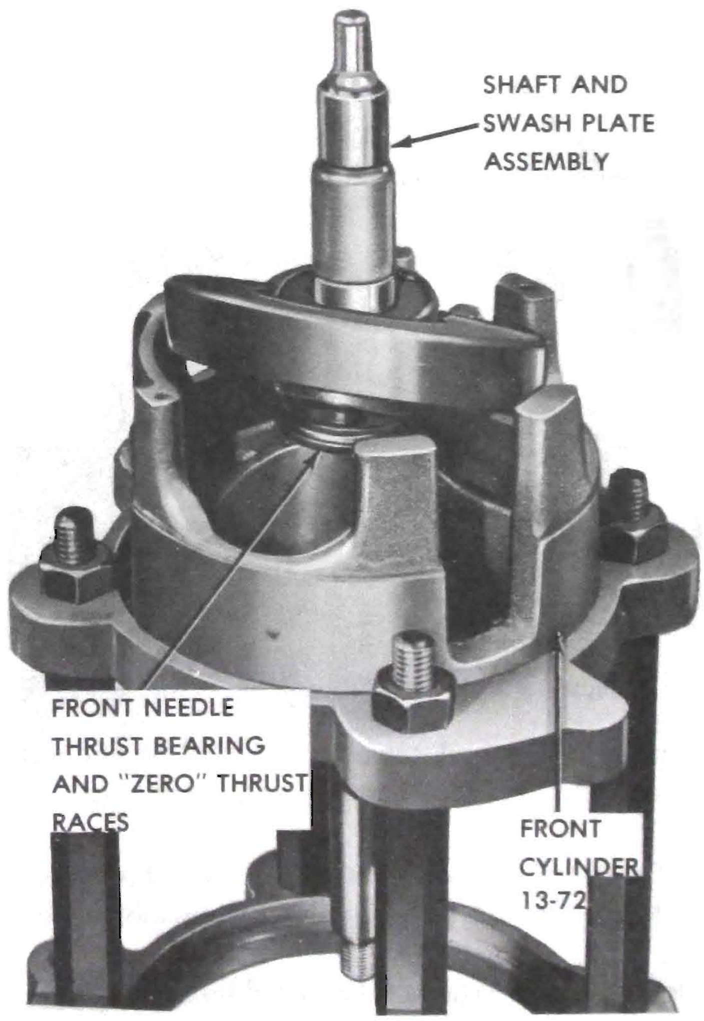


Figure 13-55 Shaft and Front Needle Thrust Bearing in Cylinder Half

5. Lightly coat ball pockets of the three pistons with clean petroleum jelly and place a piston drive ball in each pocket.

6. Lightly coat the three "zero" shoe discs with clean petroleum jelly and place a disc on only the piston drive ball at the front of each piston.

Do not place shoe discs on rear piston drive balls. Do not reassemble piston rings on pistons at this time. Use lubricant in sufficient quantity so that piston drive balls and shoe discs stick to piston.

7. Rotate shaft and swash plate assembly until high point of swash plate is over No. "1" cylinder bore. Position No. "1" piston onto swash plate (see Figure 13-55) and lower the piston and swash plate so the front end (notched end - see Figure 13-56) of the piston enters the cylinder bore.

In order to fit the piston onto the swash plate, the shaft and swash plate assembly must be raised approximately 1/2 inch, and also the front needle thrust bearing and races must be held up against the hub of the swash plate.

8. Repeat preceding step for reassembly of pistons No. "2" and No. "3".

9. Reassemble rear cylinder onto front cylinder using wood block and mallet (see Figure 13-57).

10. Remove cylinder assembly from on top of compressing fixture (J-9397), position assembly inside fixture so that discharge tube opening in cylinder halves is located between fixture legs, and front of cylinder assembly is downward. Install and torque fixture nuts to 15 lb. ft.

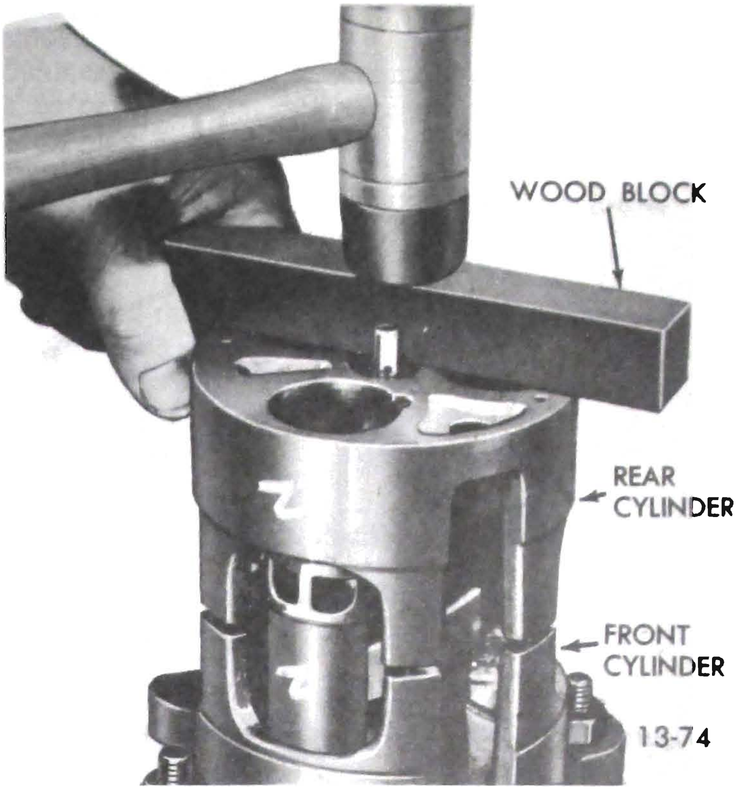


Figure 13-57 Assembling Rear Cylinder Half

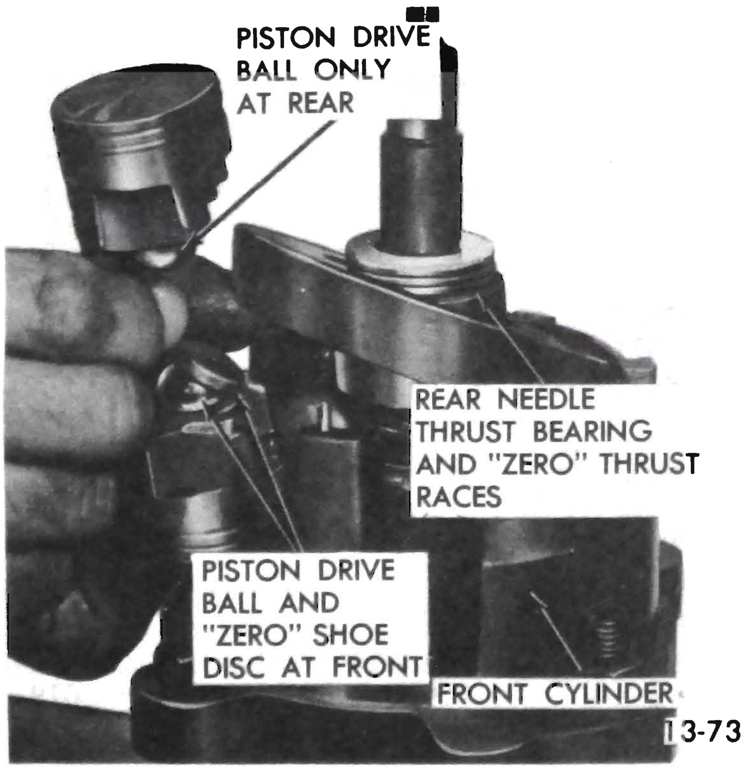


Figure 13-56 Installing Piston into Cylinder Half

11. Gage piston play as follows:

(a) Using a feeler gage, select a leaf or combination of leaves which result in satisfactory "feel" when inserted between rear piston drive ball and swash plate (see Figures 13-58 and 13-59).

(b) Remove selected leaf or leaves from feeler gage and attach end of spring scale that is calibrated in ounces. (A generator brush spring scale (J-5184) or the spring scale for checking distributor point setting may be used for this step).

(c) Reinsert feeler gage leaf or leaves between rear piston drive ball and swash plate and draw leaf or leaves out again, simultaneously measuring "drag" on leaf or leaves (see Figure 13-60). If correct leaf (leaves) has been selected, spring scale will read between 4 to 8 ounces pull (the higher reading is desired). To perform this step correctly, feeler gage leaf (leaves) must be withdrawn straight out with a steady even motion, and all surfaces involved must be coated with No. 525 viscosity oil. Record gage dimension.

Use of the spring scale establishes a standard of measurement of the amount of feeler gage leaf "drag" required.

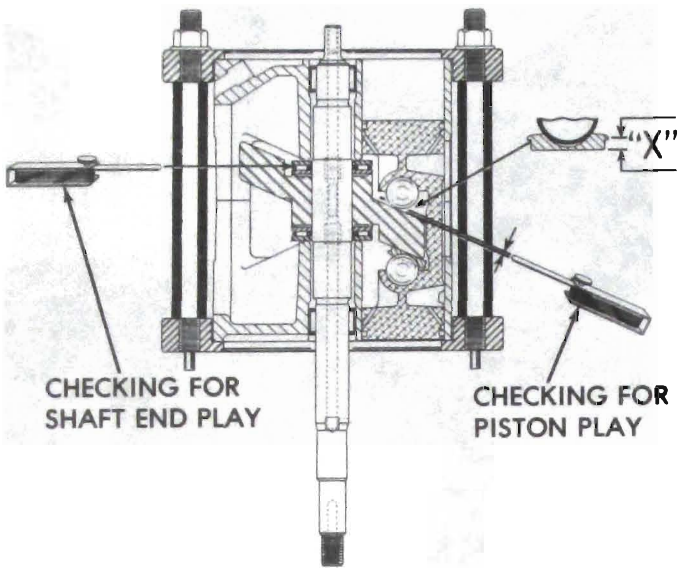


Figure 13-58 Checking Piston and Shaft End Play

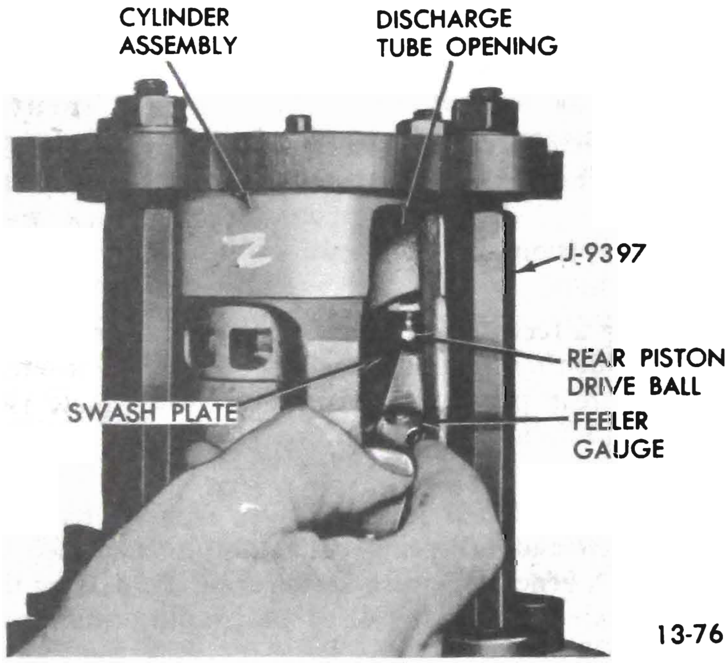


Figure 13-59 Checking Clearance Between Rear Piston Drive Ball and Swash Plate

(d) Rotate the shaft and swash plate assembly 120 degrees and perform a second check (Steps "a, b and c") between same piston drive ball and swash plate. Record gage dimension.

(e) Rotate shaft and swash plate again approximately 120 degrees and repeat third check (Steps "a, b and c") between same piston drive ball and swash plate. Record gage dimension.

(f) From the three recorded checks (Steps "c, d and e") select minimum feeler gage reading and obtain from

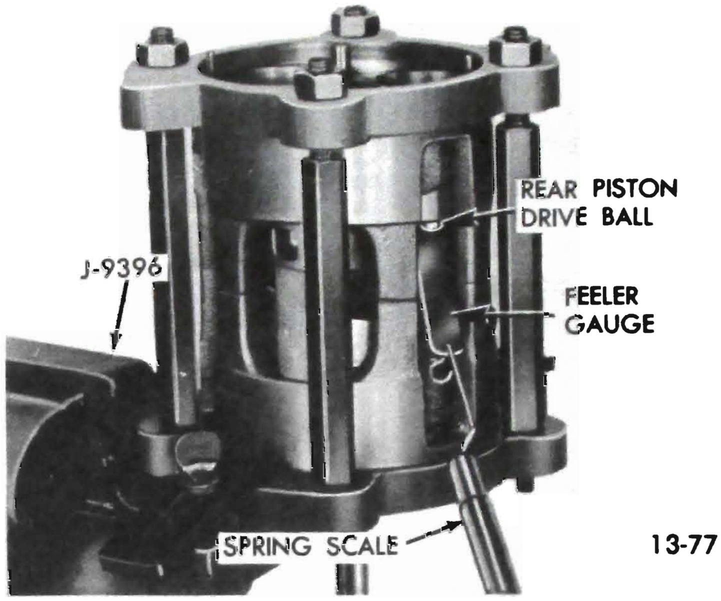


Figure 13-60 Checking Drag on Selected Feeler Gage Leaf with Spring Scale

stock (ref. Figure 13-61 for part number of shoe disc) one shoe disc corresponding to the minimum gage reading (ref. example below). Place shoe disc in respective position on parts tray (J-9402).

Figure 13-61 - Shoe Disc Table

SERVICE PART NO.	ID. NO. STAMPED SHOE DISC
6557000	0 ("Zero" Shoe Disc)
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

EXAMPLE

Piston No.	1st Check	2nd Check	3rd Check
1	.019	.020	.019
(Select No. 19 - Shoe Disc)			
2	.020	.020	.019
(Select No. 20 - Shoe Disc)			
3	.021	.020	.021
(Select No. 20 - Shoe Disc)			

(g) Repeat Steps "c, d, e and f" for other two pistons and obtain two more selected shoe discs for other two pistons. In the rebuilt cylinder assembly, each piston will have one selected shoe disc and one "zero" shoe disc.

12. Gage shaft end play as follows:

(a) Using a feeler gage, select a leaf or combination of leaves which result in satisfactory "feel" when inserted between rear needle thrust bearing and outer rear thrust race (see Figure 13-62).

(b) Remove selected leaf or leaves from feeler gage. Attach to end of spring scale calibrated in ounces. (A generator brush spring scale (J-5184) or the spring scale for checking distributor point setting may be used for this step).

(c) Reinsert feeler gage leaf (leaves) between rear needle thrust bearing and outer rear thrust race and draw leaf (leaves) out again, this time simultaneously noting the "drag" or pull on the leaf (leaves) as measured by the spring scale (see Figure 13-63). If correct leaf (leaves) have been selected, spring scale will read between 4 to 8 ounces pull (the higher reading is desired). To perform this step correctly, the feeler gage leaf (leaves) must be withdrawn straight out with a steady, even motion. All contacting surfaces involved in gaging operation must be coated with No. 525 viscosity oil.

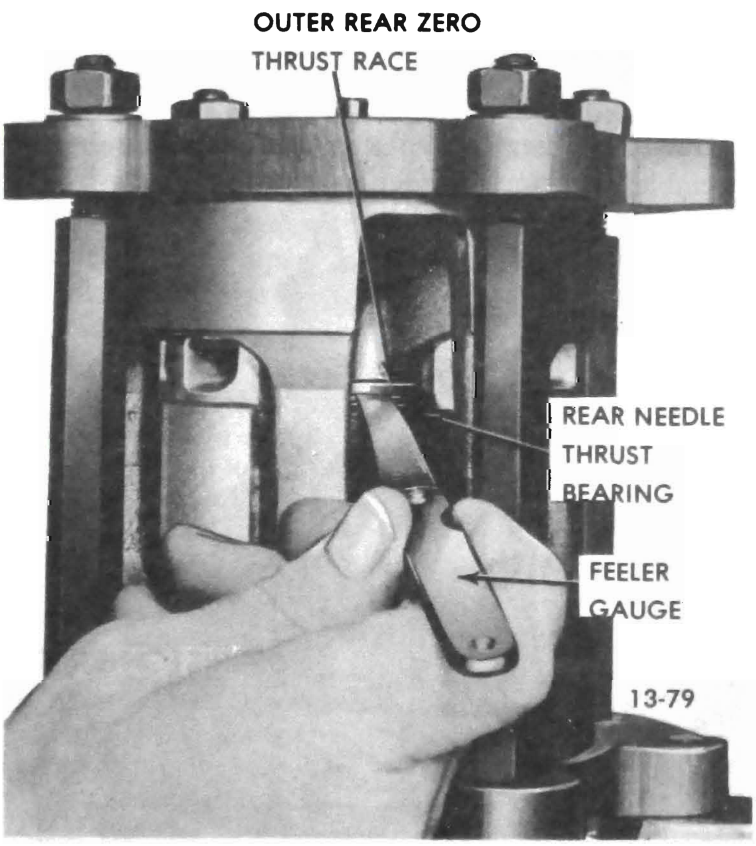


Figure 13-62 Gaging Clearance Between Rear Needle Thrust Bearing and Outer Rear Thrust Race

The measurement for selection of the thrust race needs to be performed at only one place on the shaft and swash plate assembly.

(d) Select from stock one thrust race (ref. Figure 13-64 for part number of thrust race) corresponding to the feeler gage reading determined in Step "c", and place the selected thrust race in the parts tray slot designated for the outer rear thrust race. If, for example a feeler gage reading of 0.009 inch results, a thrust race with a number "9", stamped on it should be selected.

Figure 13-64 - Thrust Race Table

SERVICE PART NO.	ID NO. ON RACE	THICK-NESS
6556000	0	.0920
6556050	5	.0965
6556055	5 1/2	.0970
6556060	6	.0975
6556065	6 1/2	.0980
6556070	7	.0985
6556075	7 1/2	.0990
6556080	8	.0995
6556085	8 1/2	.1000
6556090	9	.1005
6556095	9 1/2	.1010
6556100	10	.1015
6556105	10 1/2	.1020
6556110	11	.1025
6556115	11 1/2	.1030
6556120	12	.1035

The selected thrust race will replace only the "zero" outer rear thrust race. The remaining three "zero" thrust races will remain as part of the cylinder assembly.

13. Remove cylinder assembly from inside compressing fixture (J-9397), place on top of compressing fixture (see Figure 13-51) and disassemble rear cylinder from front cylinder using rubber mallet or hammer and wood block.

14. Carefully disassemble one piston at a time from front cylinder and lay piston, front and rear piston drive balls and front "zero" shoe disc in respective slot of parts tray (J-9402). To disassemble, rotate swash plate until piston is at highest point, raise swash plate approximately 1/2 inch and lift out piston and related parts, one at a time.

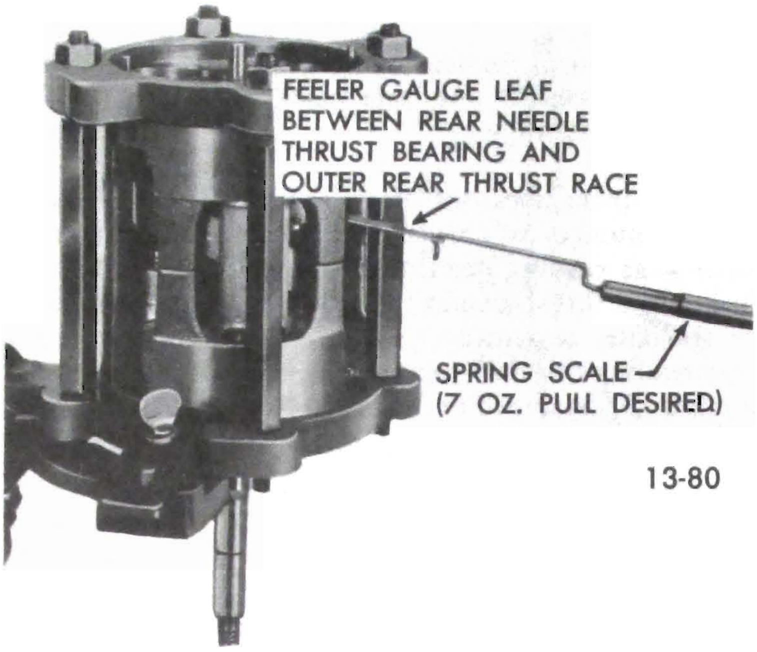


Figure 13-63 Checking Drag on Selected Feeler Gage Leaf with Spring Scale

15. Remove outer rear "zero" thrust race from shaft and set it aside for future gaging procedures.

16. Remove previously selected outer rear thrust race from parts tray, lightly coat with clear petroleum jelly and assemble onto shaft.

E. Final Reassembly of Cylinder Assembly

1. Reassemble piston rings onto pistons (ring scraper groove toward center of piston) and rotate ring so that break or gap in ring can be squeezed together when piston is being inserted into cylinder bore.

2. Reassemble piston drive balls, "zero" and selected shoe discs onto No. "1" piston, and apply clear petroleum jelly to piston pockets and shoe discs so that balls and discs stick to piston. BE SURE to reassemble balls and shoe discs into their specific positions on front and rear of piston.

3. Rotate shaft and swash plate assembly until high point of swash plate is over No. "1" cylinder bore. Position No. "1" piston onto swash plate (see Figure 13-65) and lower the piston and swash plate so that the front end (notched end) of the piston enters the cylinder bore.

In order to fit the piston onto the swash plate and into the cylinder bore, the swash plate must be raised approximately 1/2 inch, the front needle thrust bearing and races must be held up against the hub of the swash plate, and the piston rings must be squeezed together (see Figure 13-66). Lubricate cylinder bore, piston assembly and swash plate with No. 525 viscosity oil to facilitate reassembly.

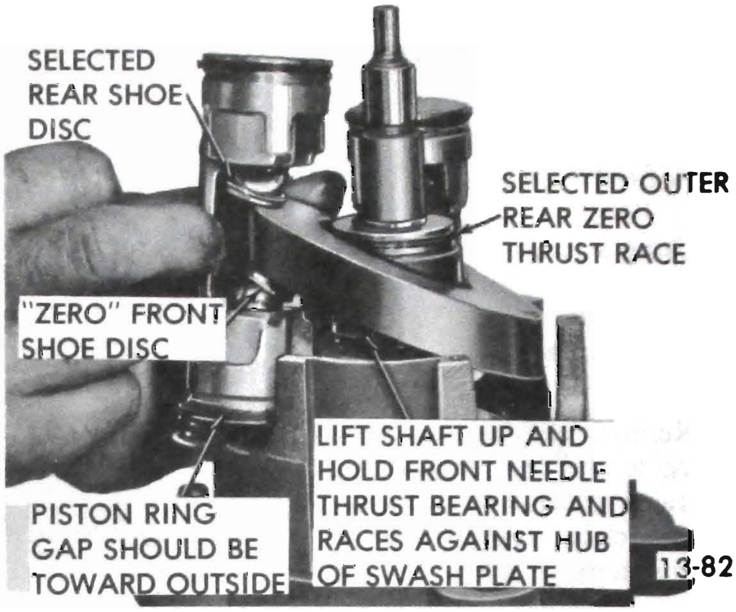


Figure 13-65 Installing Piston Assembly in Front Cylinder Half

4. Repeat procedure in Steps 1 and 2 for installation of No. 2 and No. 3 pistons.

5. Obtain new service replacement discharge tube and assemble into front cylinder (see Figure 13-67).

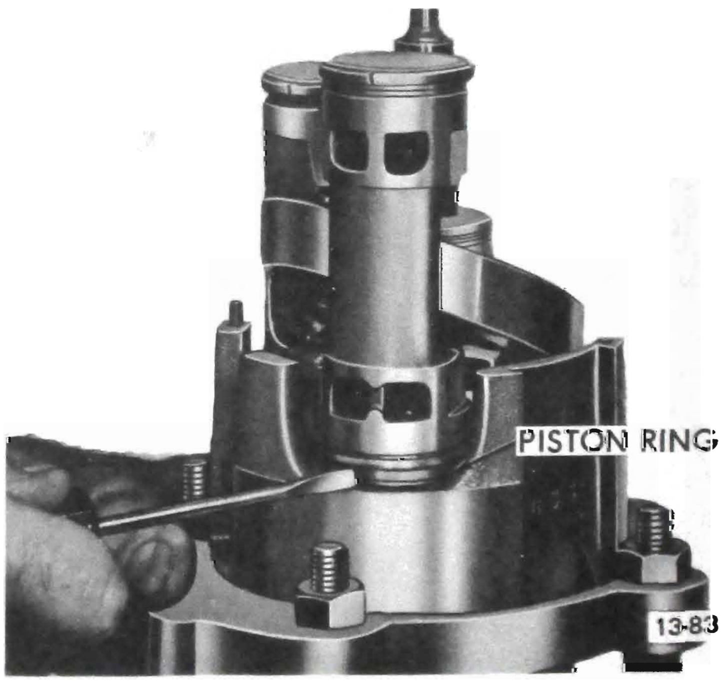


Figure 13-66 Compressing Front Piston Rings

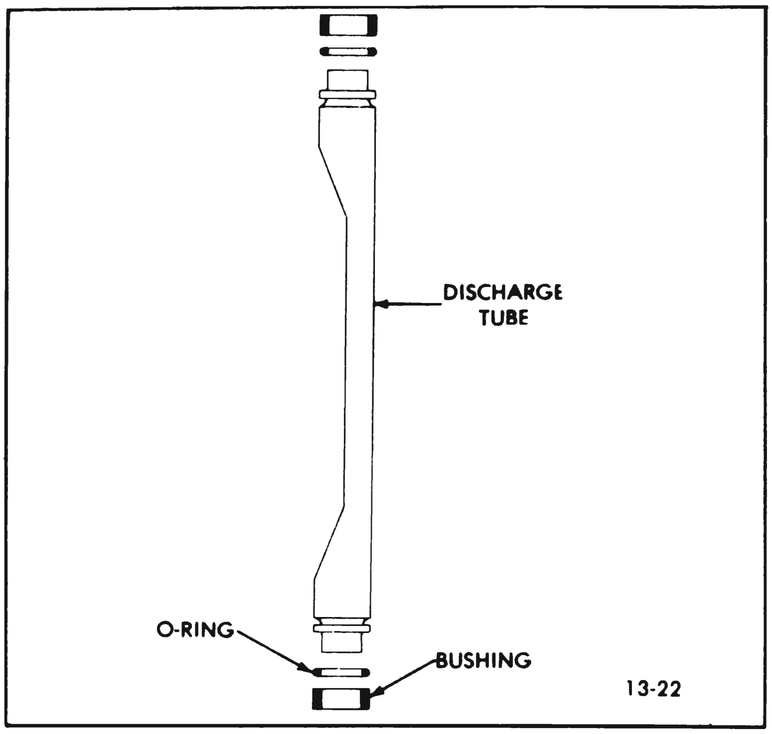


Figure 13-67 Service Replacement Discharge Tube

6. Liberally lubricate cylinder bores of rear cylinder with No. 525 viscosity oil and reassemble rear cylinder onto front cylinder being sure to compress piston rings. Align discharge tube and dowel pins, and tap cylinder halves together. Check for free rotation of shaft.

If pistons are postioned in a "stair-step" arrangement (see Figure 13-68), installation of rear cylinder will be facilitated. In addition once the piston and ring are started into the cylinder, slight rotation of the shaft to and fro will work the ring into the bore.

7. Liberally lubricate with No. 525 viscosity oil, suction pass cover and lips of suction passage in body of cylinder assembly, and reassemble suction pass cover over suction passage (see Figure 13-69).

8. Assemble both service replacement discharge tube "O" rings and bushings (see Figure 13-70) onto cylinder assembly.

F. Reassembly of Front Suction Valve Reed Disc, Front Discharge Valve Plate, Front Head, and Installing of Cylinder Assembly

1. Assemble suction reed valve disc to front of cylinder assembly and align with dowel pins, suction port and discharge port (see Figure 13-71).

2. Assemble front discharge valve plate to front of cylinder assembly and align with dowel pins.

3. Coat sealing surfaces on front head (see Figure 13-72) with No. 525 viscosity oil.

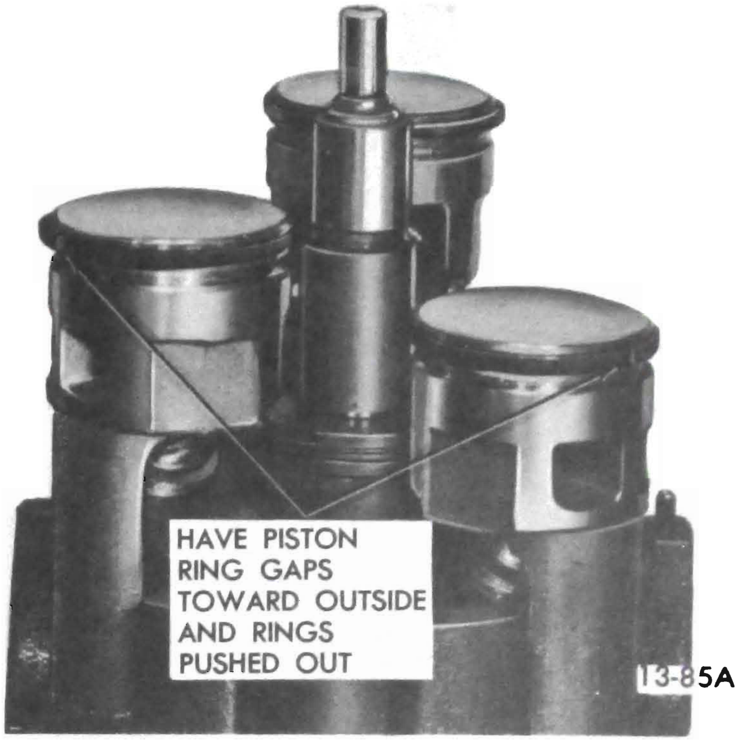


Figure 13-68 Pistons Postioned in Stair-Step Arrangement

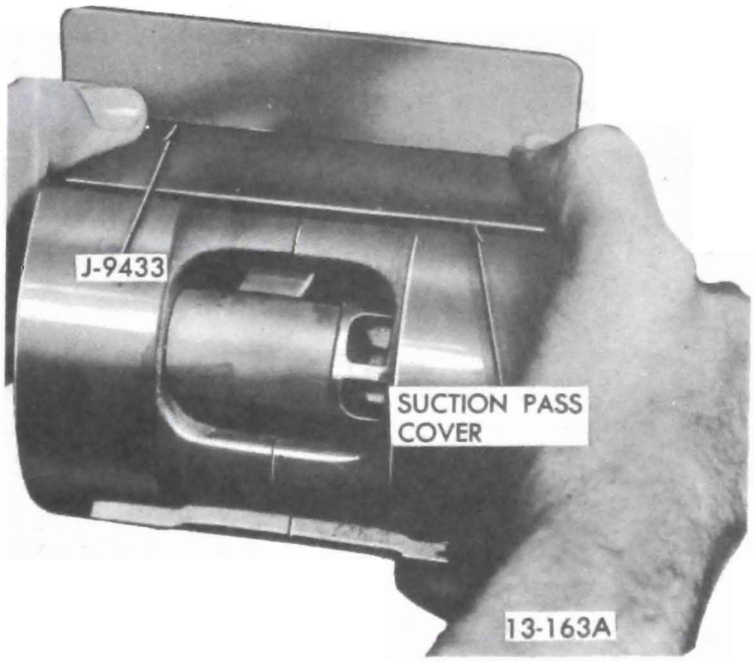


Figure 13-69 Installing Suction Pass Cover

4. Mark with pencil on side of front head the location of dowel pin holes (see Figure 13-72), align front head

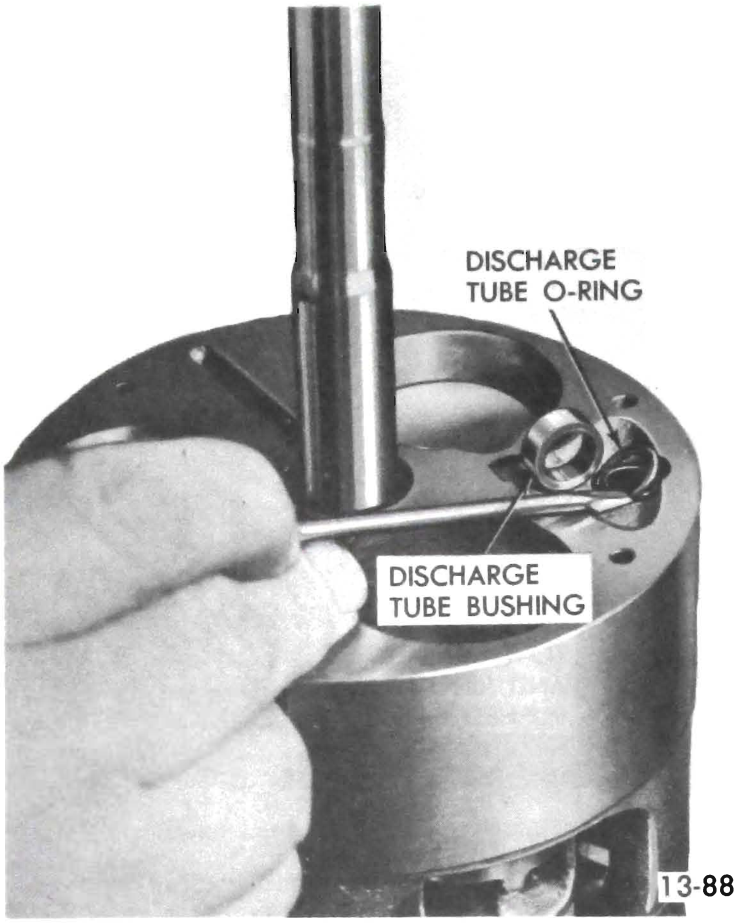


Figure 13-70 Installing Discharge Tube O Ring and Bushing

with dowel pins, and tap head lightly with mallet to seat on cylinder assembly.

5. Place new shell to head "O" ring on shoulder of front head (see Figure 13-73) and liberally coat "O" ring and front head sealing surface with No. 525 viscosity oil.

6. Install shell in holding fixture (J-9396) and postion so that rear studs of shell are up. Coat inside surface of shell with No. 525 viscosity oil.

7. Reassemble, as a unit, cylinder assembly and front head into the shell. See Figure 13-74. Extreme care must be used to prevent shell to head "O" ring seal from being damaged.

G. Reassembly of Rear Suction Valve Reed Disc, Rear Discharge Valve Plate, Oil Pump and Rear Head

1. Rotate the cylinder assembly and front head until the hole for the oil inlet tube in the cylinder assembly is aligned with the reservoir hole in the shell, and reassemble the oil inlet tube and "O" ring.

2. Assemble suction reed valve disc to rear of cylinder assembly and align with dowel pins, suction port, and discharge port of cylinder assembly.

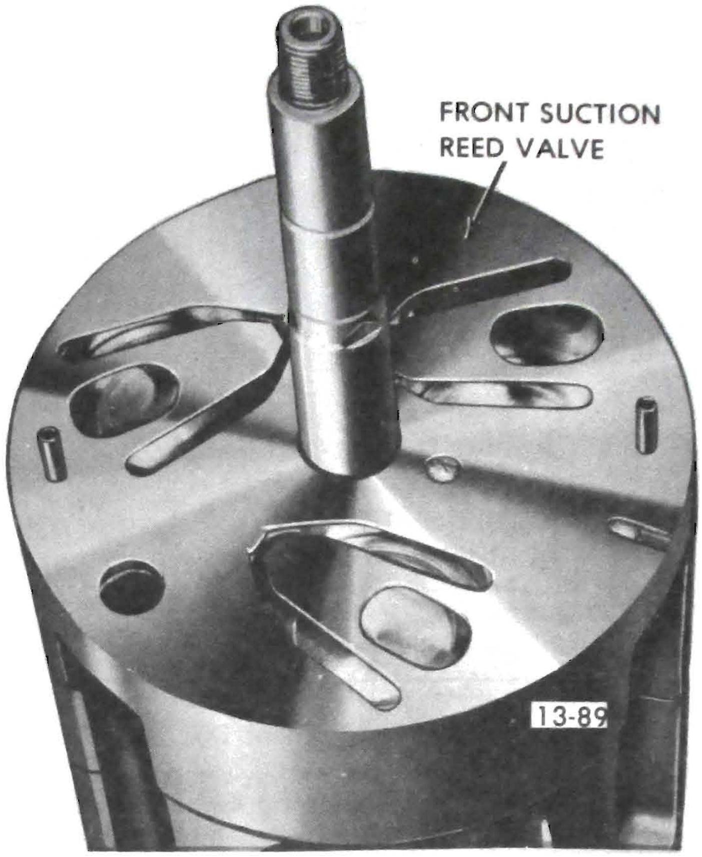


Figure 13-71 Front Suction Valve Reed Disc Installed

Figure 13-72 Placing Front Head on Cylinder Assembly

3. Assemble rear discharge valve plate to rear of cylinder assembly and align with dowel pins.

4. Reassemble inner and outer oil pump rotors so that

Figure 13-73 Shell to Front Head O Ring Installation

the sides previously identified are in their original location, and then position oil pump outer rotor as shown in Figure 13-75.

5. Generously coat with No. 525 viscosity oil new shell to head "O" ring and install in shell (see Figure 13-75).

6. Coat Teflon sealing surface of rear head with No. 525 viscosity oil, mark with pencil on side of rear head the location of the dowel pin holes and reassemble onto compressor.

It may be necessary to reposition oil pump outer rotor slightly in order to install rear head. In addition, if dowel pins do not engage holes in rear head, grasp front head and rotate cylinder assembly slightly (See Figure 13-76).

7. Assemble new nuts to threaded shell studs and torque to 20 lb.ft. If pressure relief valve has been

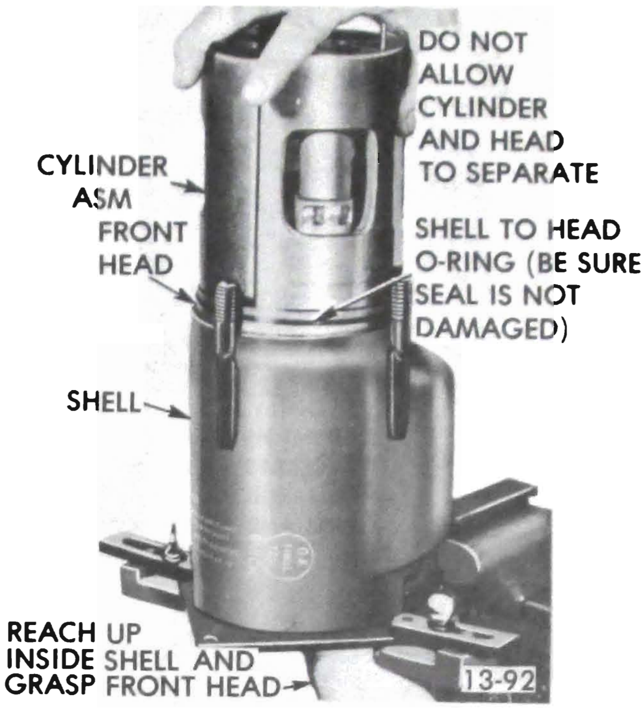


Figure 13-74 Installing Front Head and Cylinder Assembly in Shell

Figure 13-75 Positioning Oil Pump Outer Rotor

Figure 13-76 Installing Rear Head

removed, reassemble using a new pressure relief valve gasket.

8. Reassemble new lubricated suction and discharge "O" rings into suction and discharge ports of rear head.

9. Reassemble shaft seal onto front of shaft and swash plate assembly (ref. Par. 13-19). Do not reassemble clutch drive plate at this time.

H. Leak Testing Compressor

1. After the shaft seal pressure test (ref. Par. 13-19) has been performed, change the test circuit to the configuration shown in Figure 13-77.

2. With hose attached only to high pressure side of Leak Test Fixture J-9625, open high pressure valve to charge high pressure side of compressor. As soon as high pressure gage stabilizes reading, close valve. If high pressure gage drops back immediately when valve is closed, an internal leak is indicated. Correct leak as necessary.

NOTE: *If an internal leak is indicated, the leak may exist about the head sealing surface or Teflon seal, discharge tube, shell to head "O" rings, or suction valve reed discs.*

3. Remove drain screw from shell and add No. 525 viscosity oil as specified in Par. 13-9.

4. Reassemble pulley assembly, and coil and housing assembly onto hub of front head (ref. Par. 13-20).

5. Complete reassembly by installing clutch drive plate onto hub of front head (ref. Par. 13-19). See Figure 13-83 disassembled view of compressor.

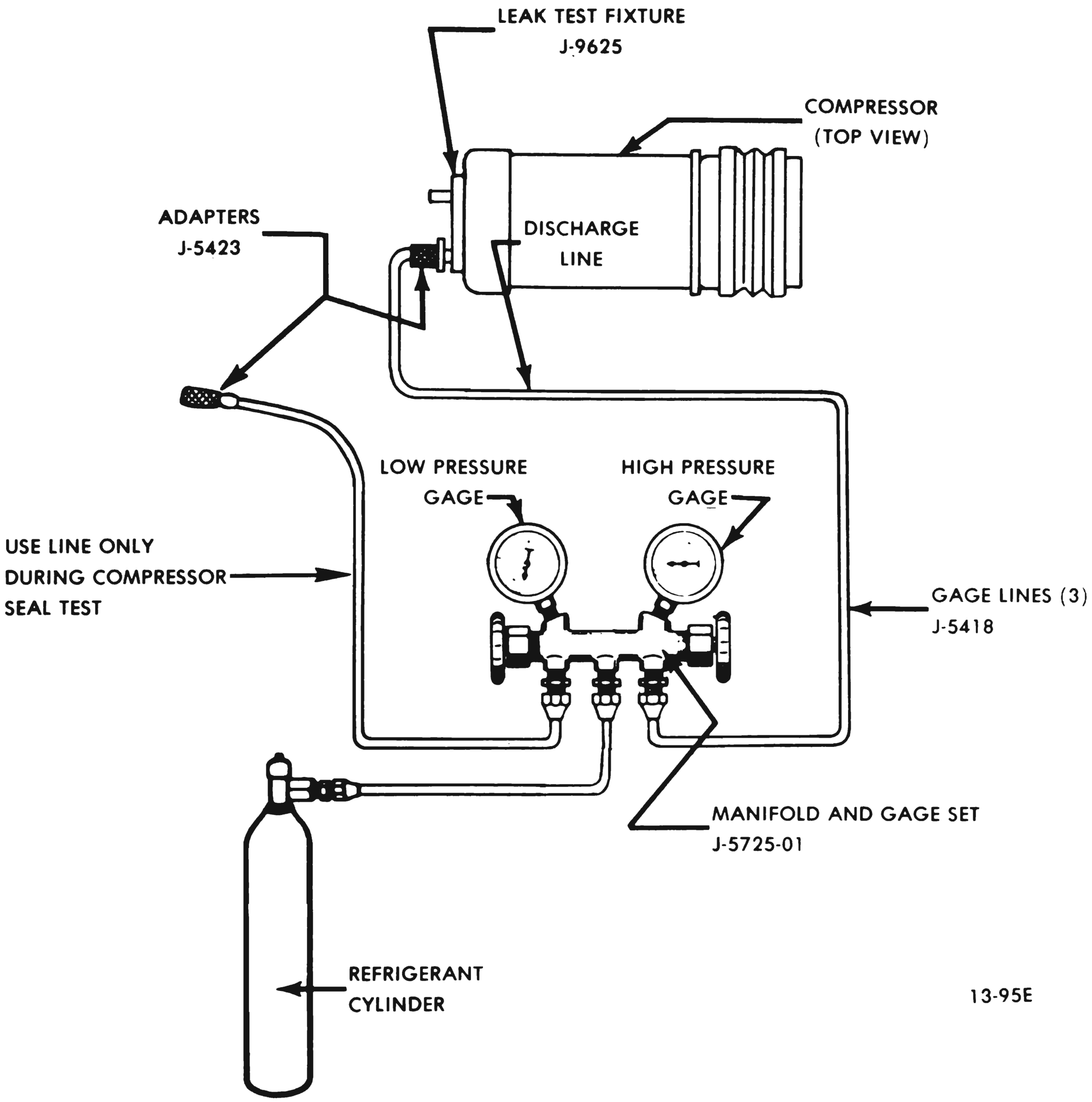


Figure 13-77 Compressor Internal Leak Test

DIVISION VI

SPECIFICATIONS

13-22 SPECIFICATIONS

A. Tightening Specifications

Part	Location	Torque Lb.Ft.
Nut	Drive Plate Nut to Compressor Shaft	15
Nut	Rear Head to Shell	21
Cap	Schrader Service Valve	5

B. Compressor Specifications

Type	Six Cylinder Axial Opposed
Make	Frigidaire
Effective Displacement (Cu.In.)	12.6
Oil	525 Viscosity
Oil Content (New)	10 1/2 Fl.Oz.
Air Gap Between Clutch Drive Plate and Pulley	0.022 to 0.057 In.
Clutch Type	Magnetic
Belt Tension	100 Lbs.

Pipe and Hose Connection Torque Chart

Metal Tube Outside Dia.	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
5/8	7/8	30-35	21-27	1 1/16
3/4	1 1/16	30-35	28-33	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.

C. General Specifications

Thermostat Opening Temperature	
V-8 (All)	190°
Capacity of Cooling System With Air Conditioner (Quarts)	
V-8, 350 Cu.In.	16.5
V-8, 455 Cu.In.	19.0
Type of Refrigerant	Refrigerant 12
Refrigerant Capacity (Fully Charged)	
4D-4F-4G-4H Series	3 3/4 Lbs.
4L-4N-4R-4P-4U-4V-4Y Series	4 1/2 Lbs.

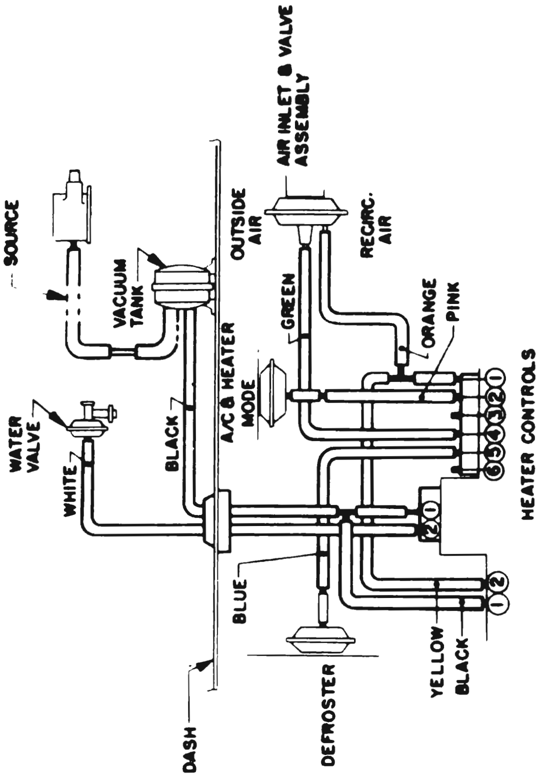
FUNCTIONAL TEST # 1 — Set Engine Idle Speed @ 2000 RPM							
Ambient Temperature (°F)	Evap. Pressure at POA Valve (PSIG)	Compressor Head Pressure (PSIG)		Right A/C Outlet Temp. (°F)		Left A/C Outlet Temp. (°F)	
All Series	All Series	4D, 4H, 4G, 4F Series	4L, 4N, 4R, 4P, 4U, 4V, 4Y Series	4D, 4H, 4G, 4F Series	4L, 4N, 4R, 4P, 4U, 4V, 4Y Series	4D, 4H, 4G, 4F Series	4L, 4N, 4R, 4P, 4U, 4V, 4Y Series
70	28-31	150-225	190-240	39-42	42-46	39-42	42-46
80	28-31	200-245	210-260	40-43	43-48	40-43	43-48
[illegible]	29-32	240-290	240-290	42-45	46-51	43-45	46-51
100	29-32	270-330	280-330	44-47	48-54	45-48	48-54
110	29-35	310-345	320-350	47-52	49-58	47-52	49-58

FUNCTIONAL TEST # 2											
Ambient Temperature (°F)	Relative Humidity	Engine Speed (RPM)		Evap. Pres. at POA Valve (PSIG)		Compressor Head Pres. (PSIG)		Right A/C Outlet Temp. (°F Approx.)		Left A/C Outlet Temp. (°F Approx.)	
All Series	All Series	4D, 4H, 4G, 4F Series	4L, 4N, 4R, 4P, 4U, 4V, 4Y Series	4D, 4H, 4G, 4F Series	4L, 4N, 4R, 4P, 4U, 4V, 4Y Series	4D, 4H, 4G, 4F Series	4L, 4N, 4R, 4P, 4U, 4V, 4Y Series	4D, 4H, 4G, 4F Series	4L, 4N, 4R, 4P, 4U, 4V, 4Y Series	4D, 4H, 4G, 4F Series	4L, 4N, 4R, 4P, 4U, 4V, 4Y Series
90	Low	400	650	35	32	190	211	54	50	52	48
90	High	480	900	35	35	210	249	59	54	57	52
100	Low	550	850	35	35	230	266	55	53	54	52
100	High	570	1220	35	35	235	294	60	55	58	54
110	Low	615	1000	35	35	270	308	58	55	58	54
110	High	940	2000	35	35	320	333	59	60	59	56

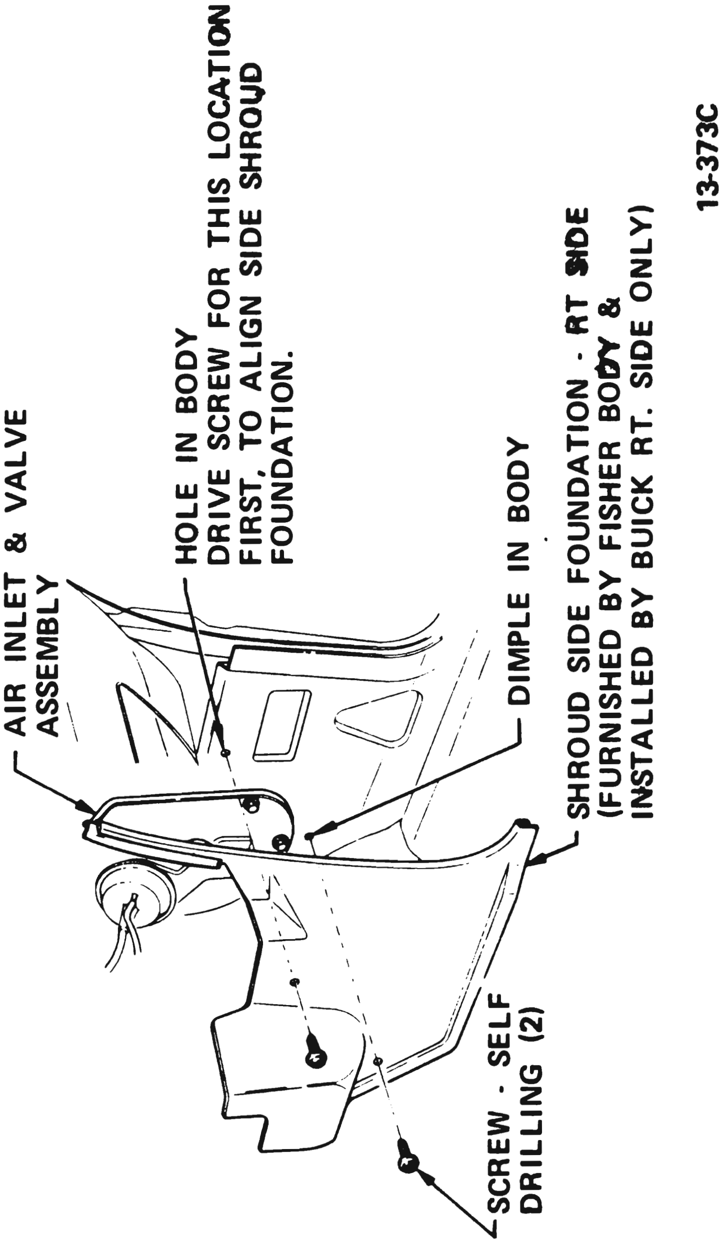
NOTE: Functional test No. 2 is provided as a closer set of specifications designed to determine if the compressor is in fact at fault. Occasionally a system will check out according to the specifications in test No. 1; however, the customer will not be satisfied when car is returned to service. Under these circumstances the problem may be that the compressor is failing under load. Test No. 2 should show an inadequate compressor output if the compressor is malfunctioning.

13-391A

Figure 13-79 Air Conditioner Functional Test Table



VACUUM HOSE CHART



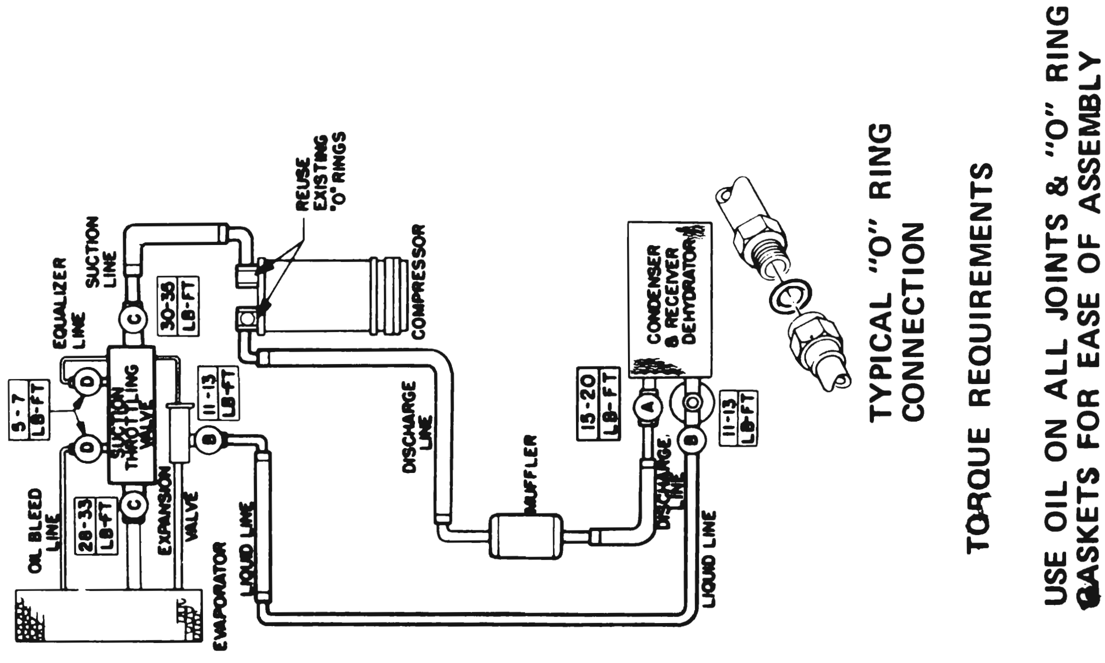


Figure 13-80 Air Conditioner Refrigeration Circuit

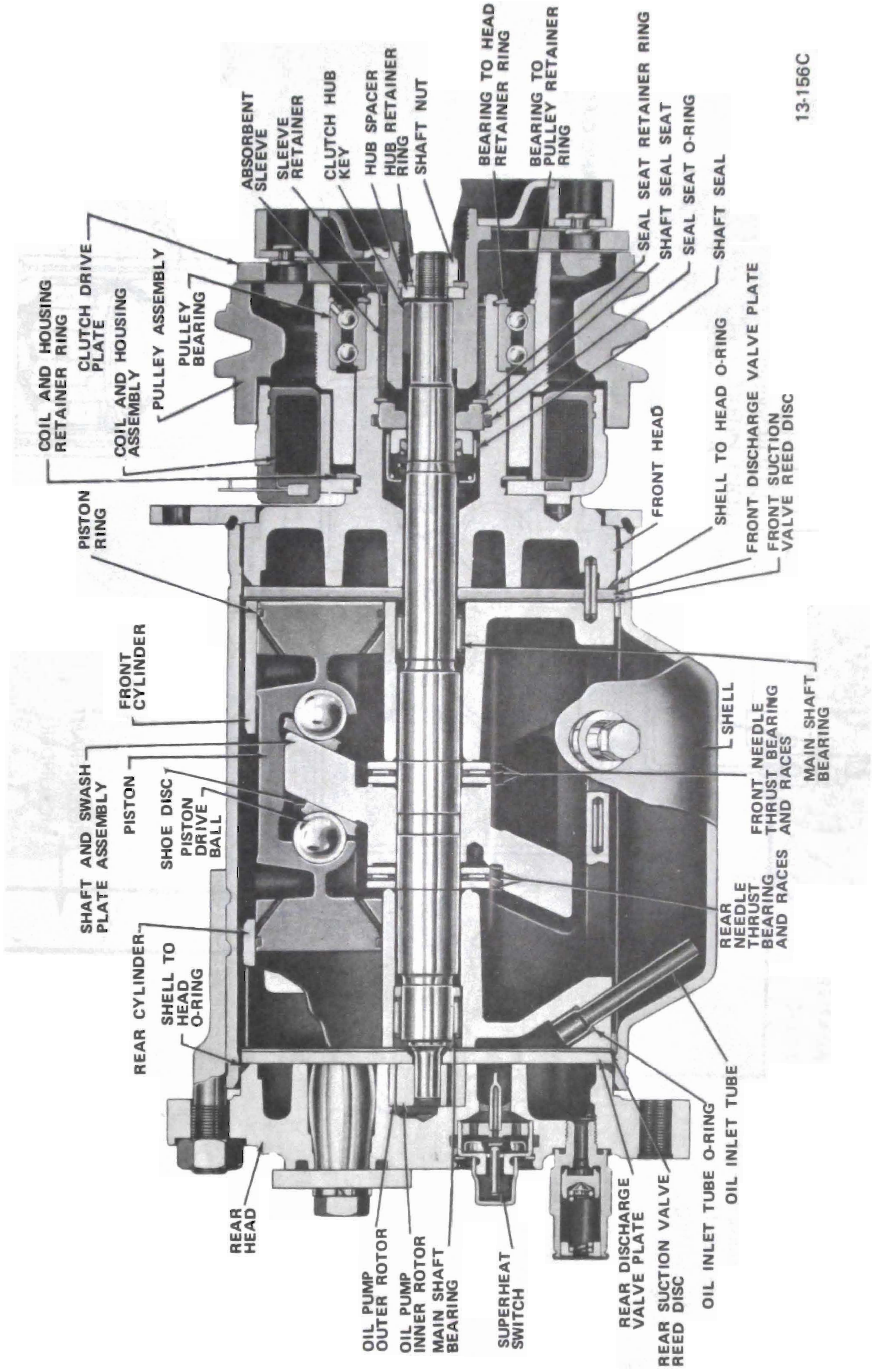


Figure 13-81 Compressor · Section View

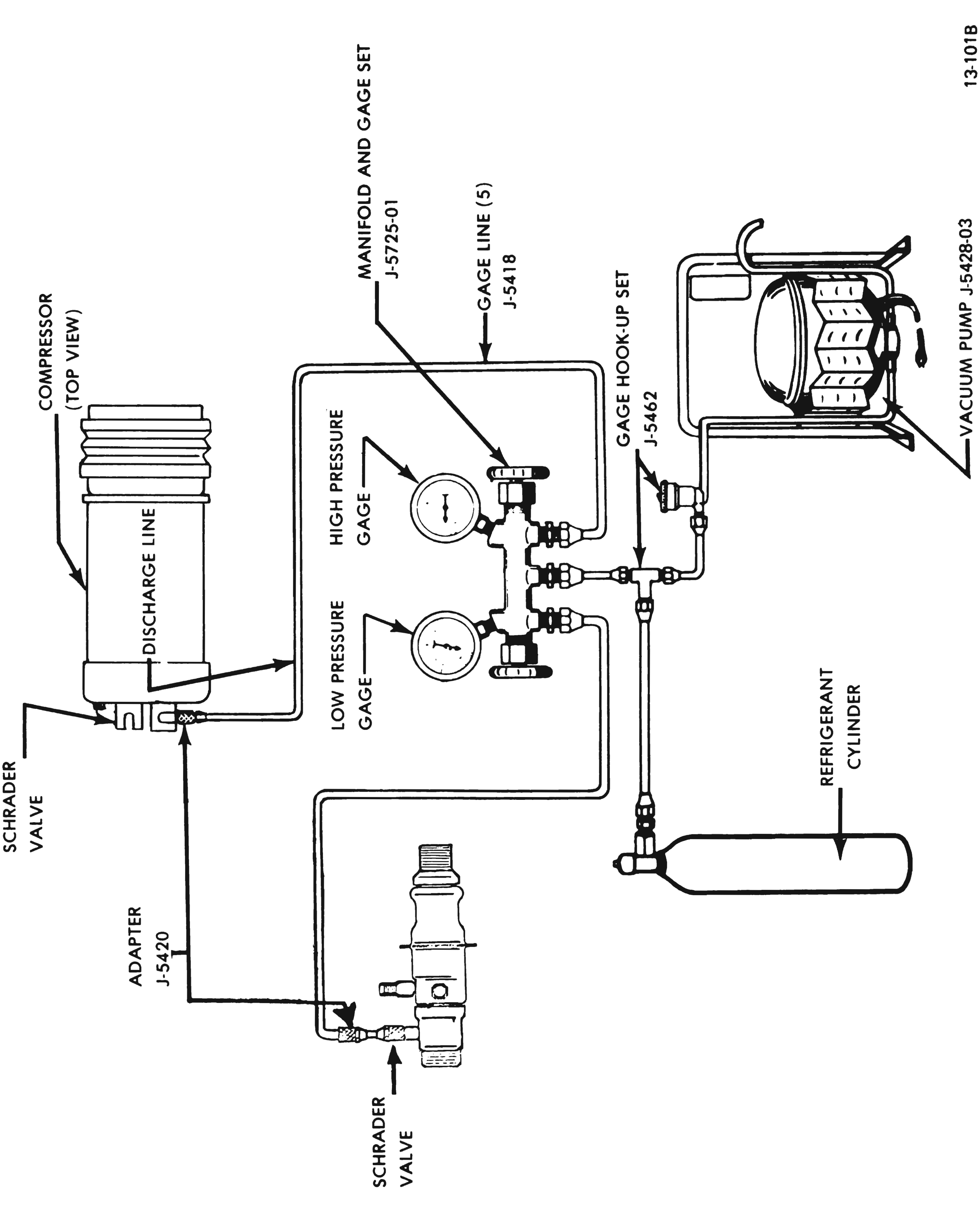


Figure 13-82 Charging Air Conditioner System

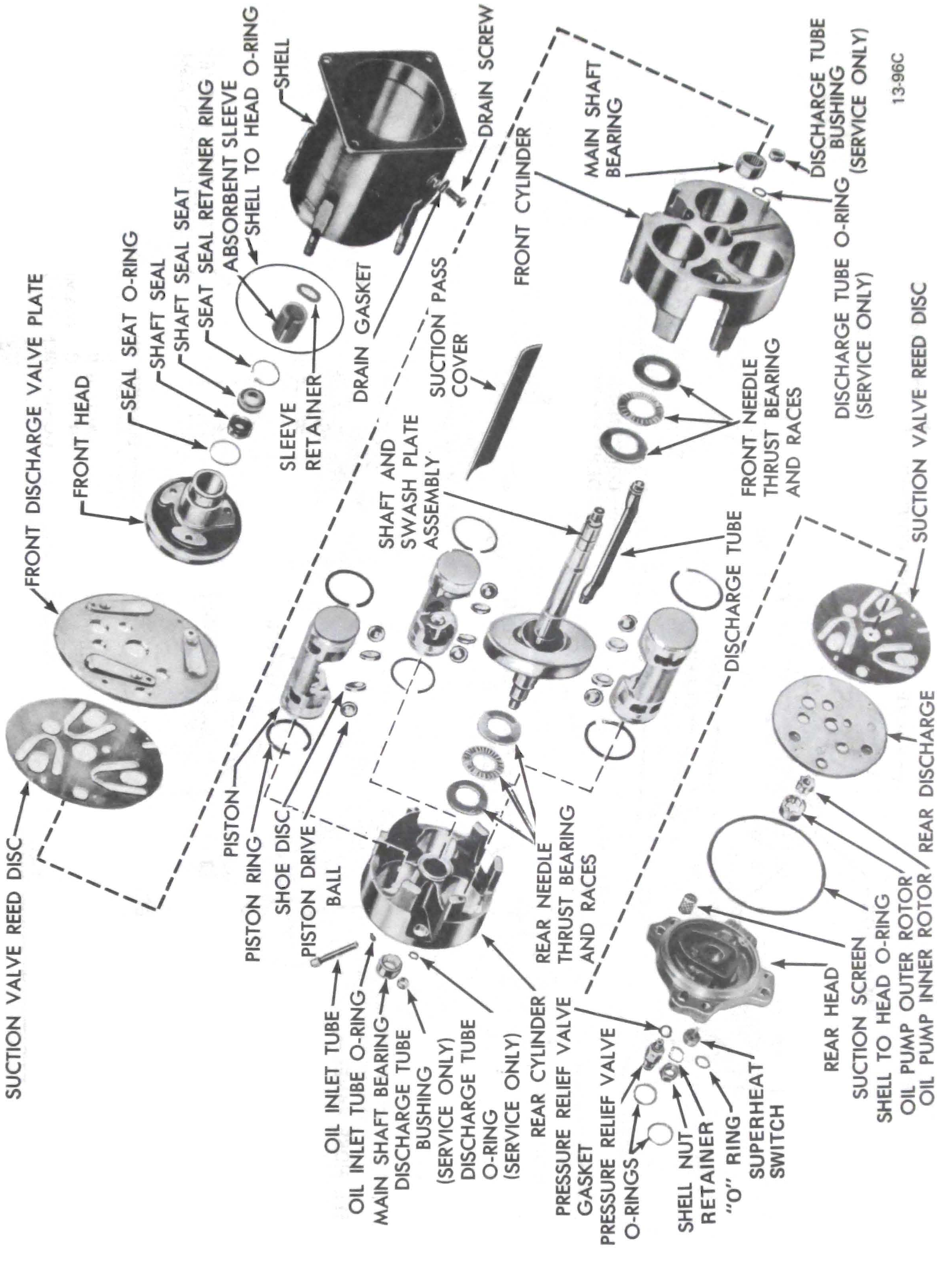


Figure 13-83 Compressor - Exploded View

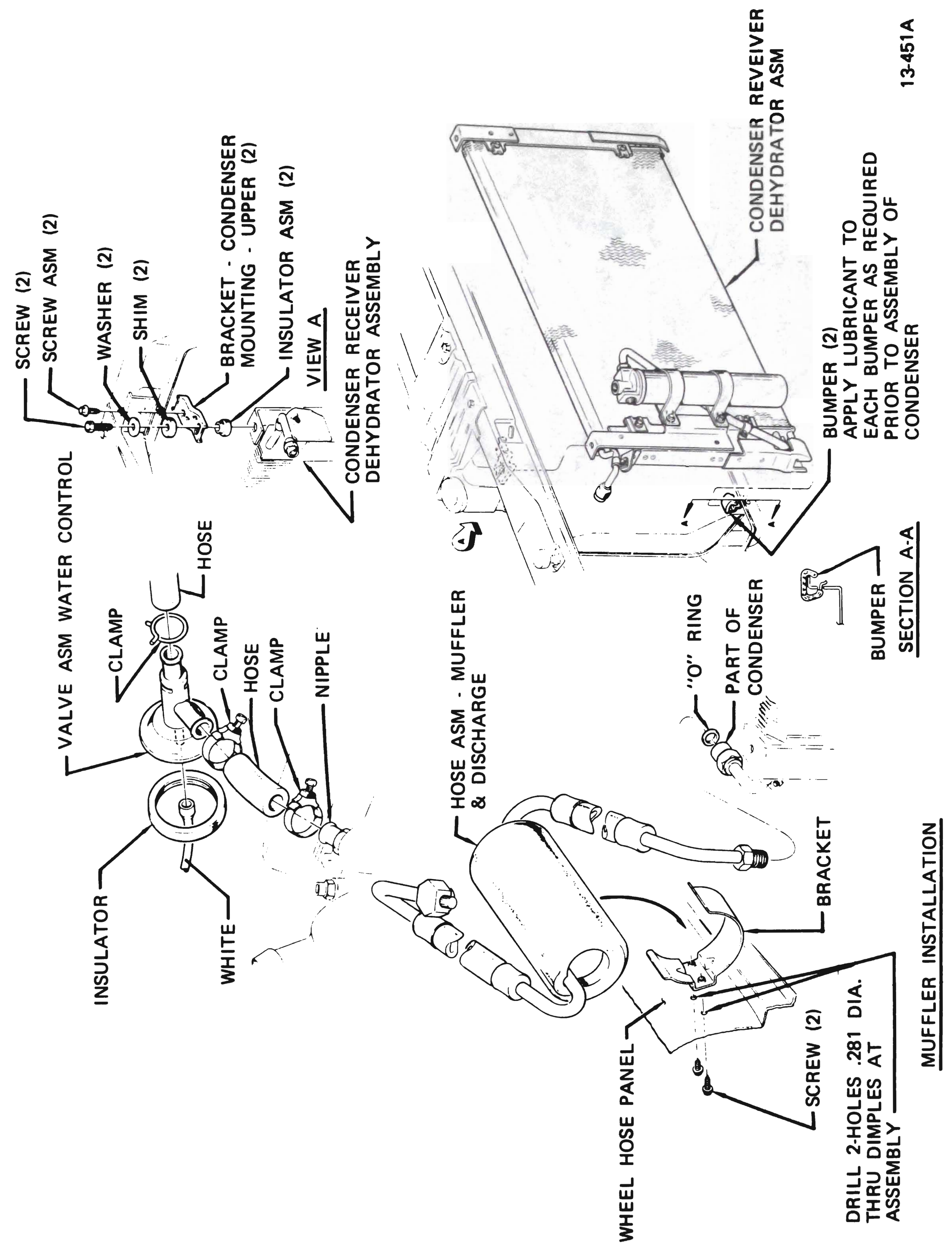


Figure 13-84 4D-4F-4G-4H Series Water Valve, Muffler, and Condenser Assembly

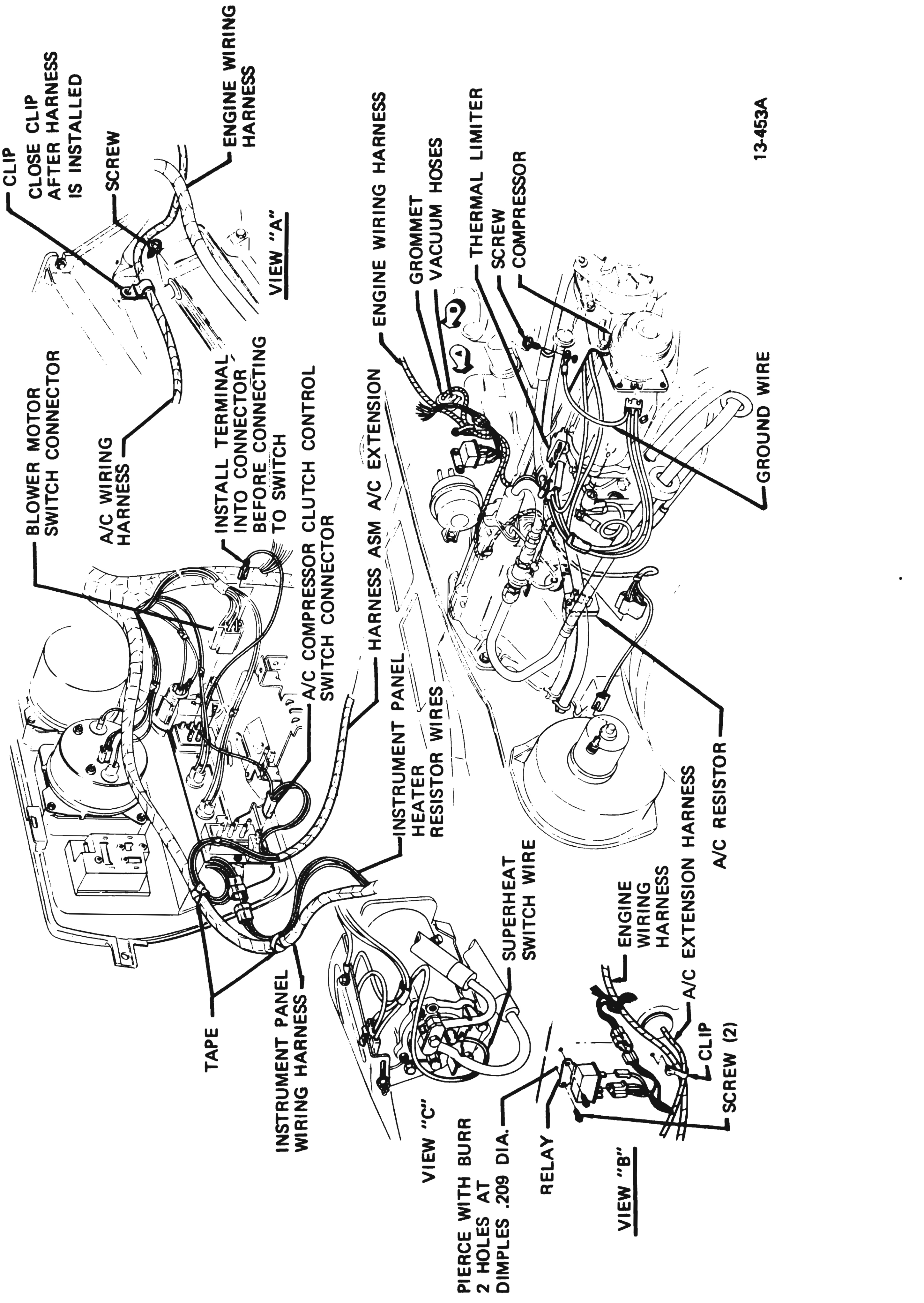


Figure 13-85 4D-4F-4G-4H Wiring - Air Conditioning

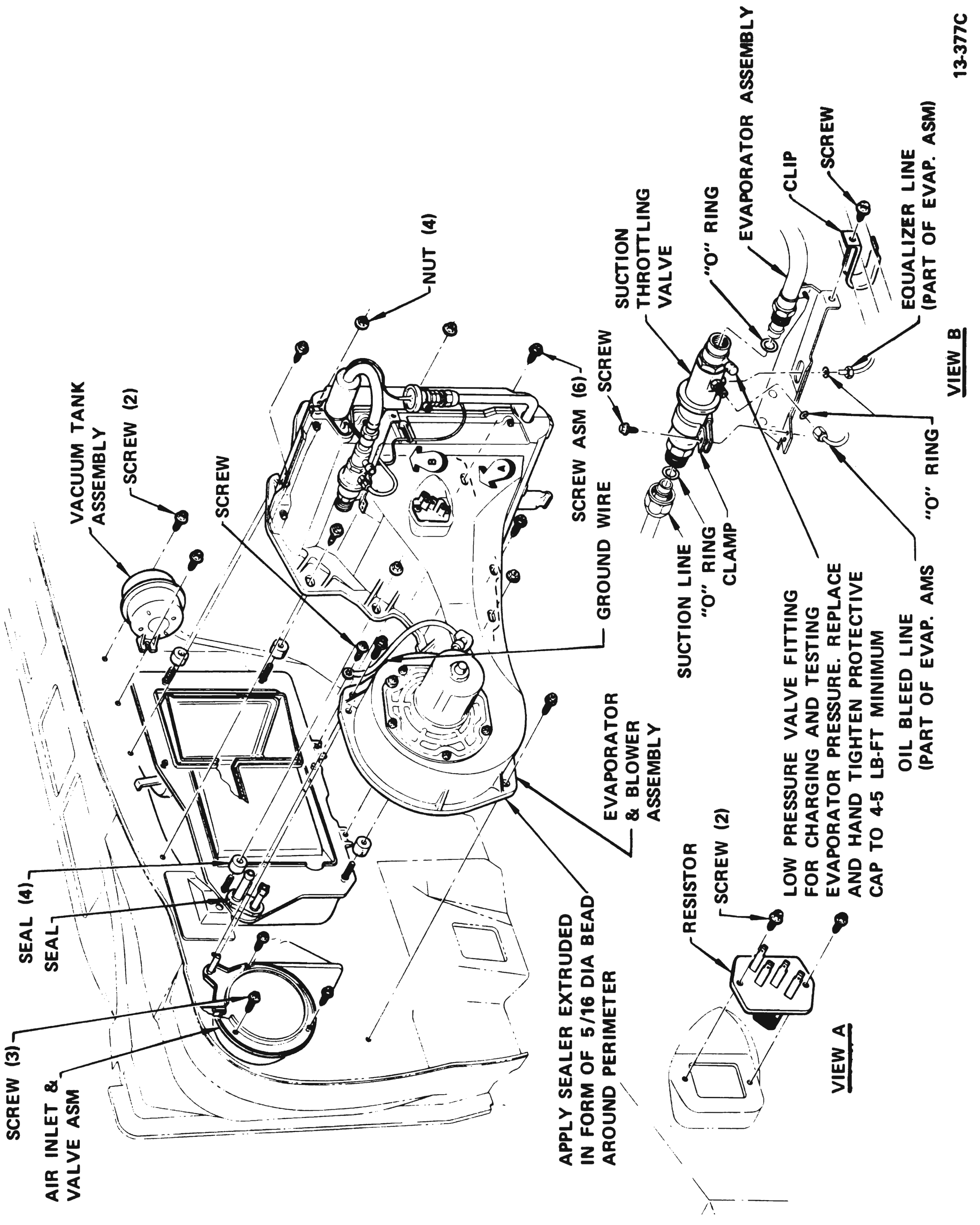


Figure 13-86 Evaporator - Blower Assembly - 4D-4F-4G-4H

SUCTION THROTTLING VALVE

1. THE OPERATION OF THE SCUTION THROTTLING VALVE MUST BE CHECKED DURING FUNCTIONAL TEST'
2. THE SUCTION THROTTLING VALVE WILL BE ADJUSTED AT THE SOURCE, IN THE EVENT SUCTION PRESSURES DO NOT FALL WITHIN THE REQUIRED LIMITS, REPLACE THE VALVE.

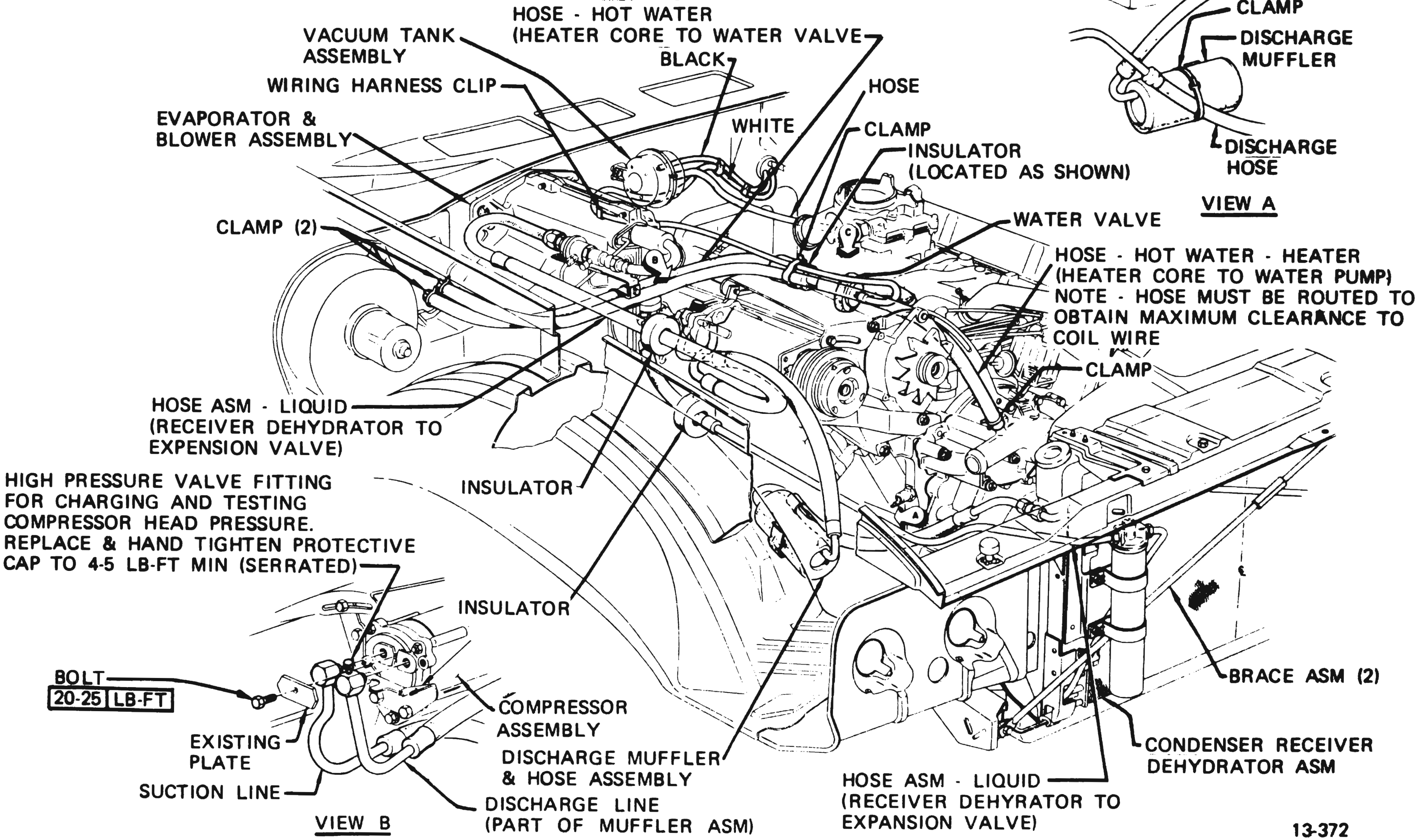
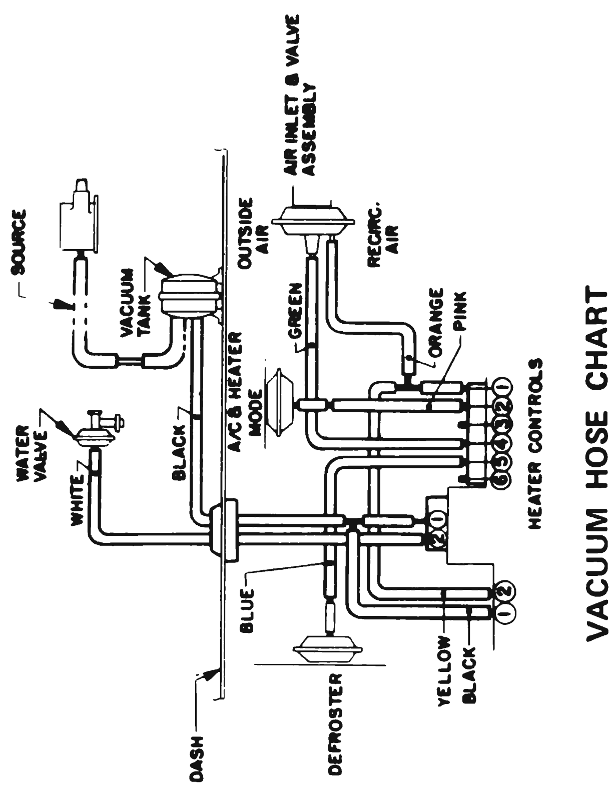
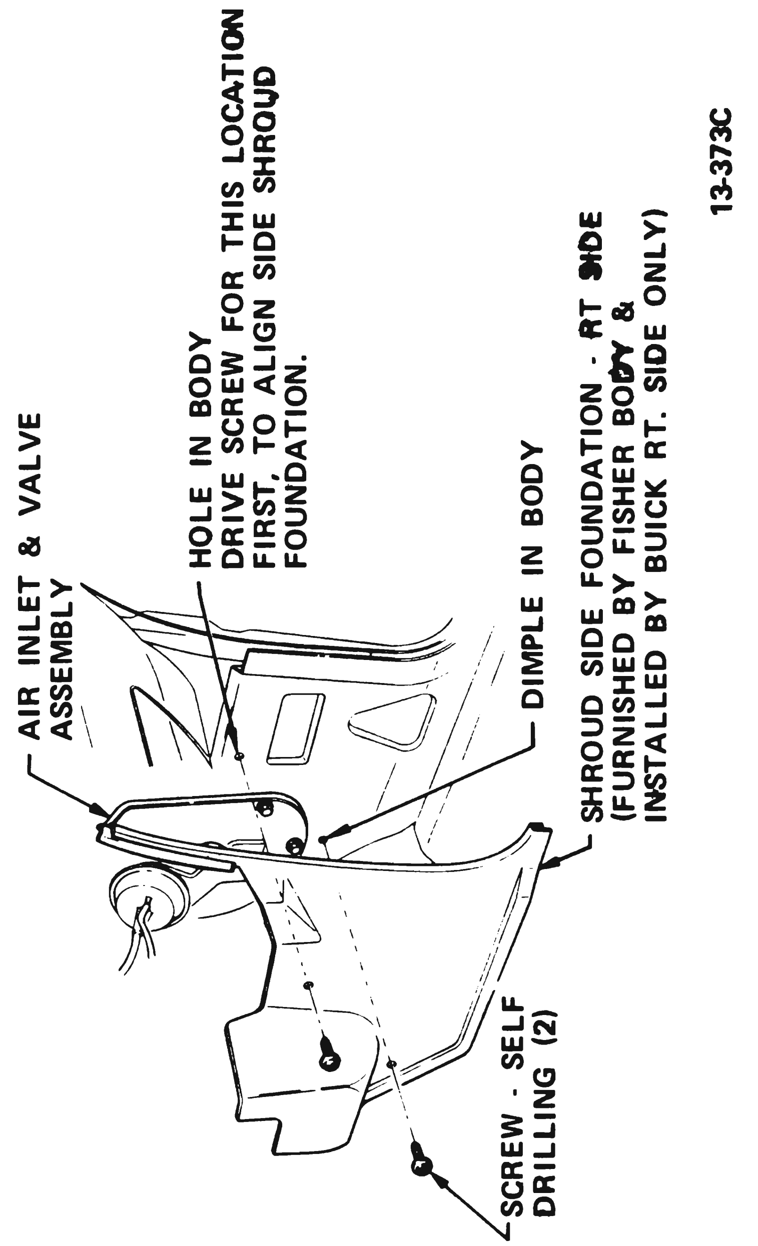


Figure 13-87 4D-4F-4G-4H - 350-455 Cu.In. Engines - Air Conditioning Installation





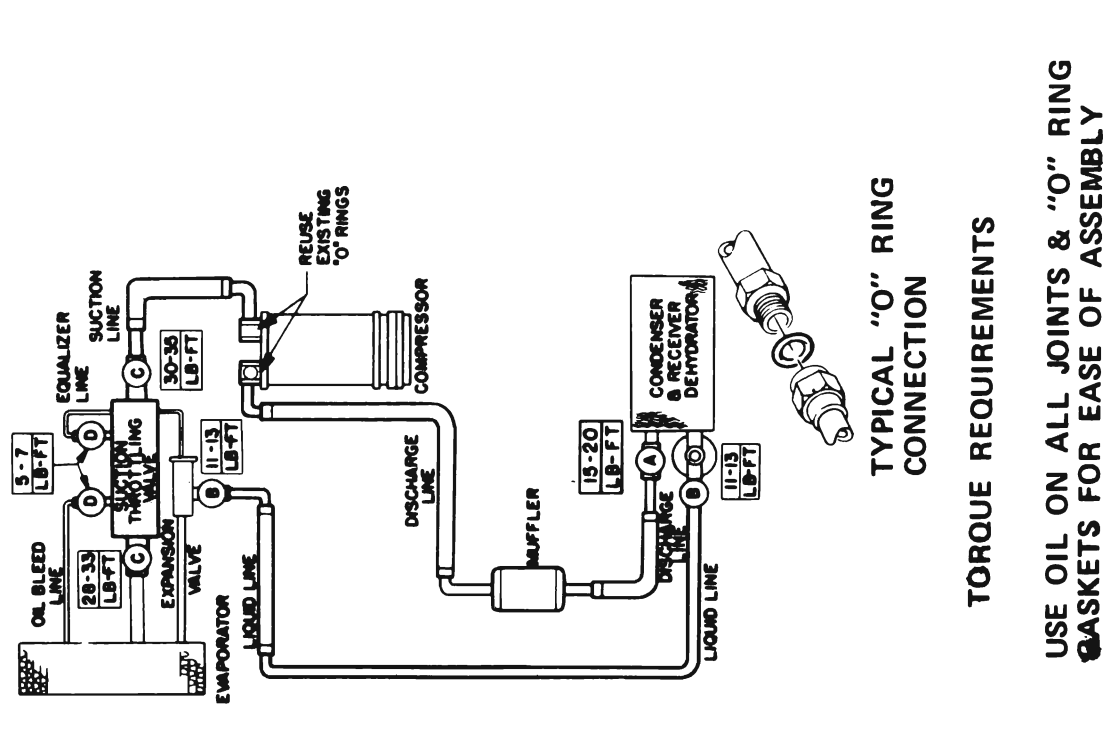


Figure 13-88 Refrigerant Line Torque Requirements and Vacuum Hose Chart - 4D-4F-4G-4H

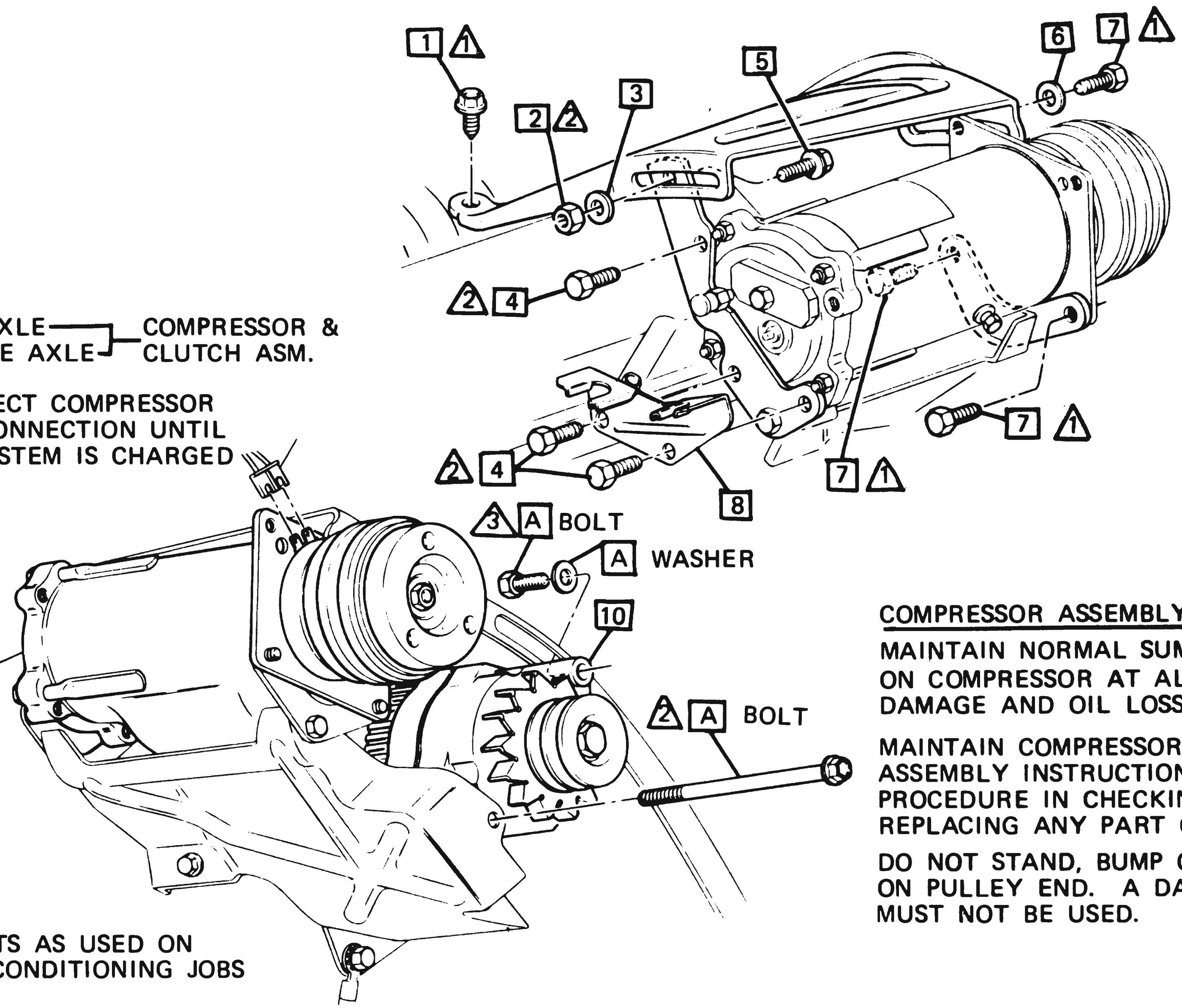


Figure 13-89 Compressor Installation - 350-455 Engine

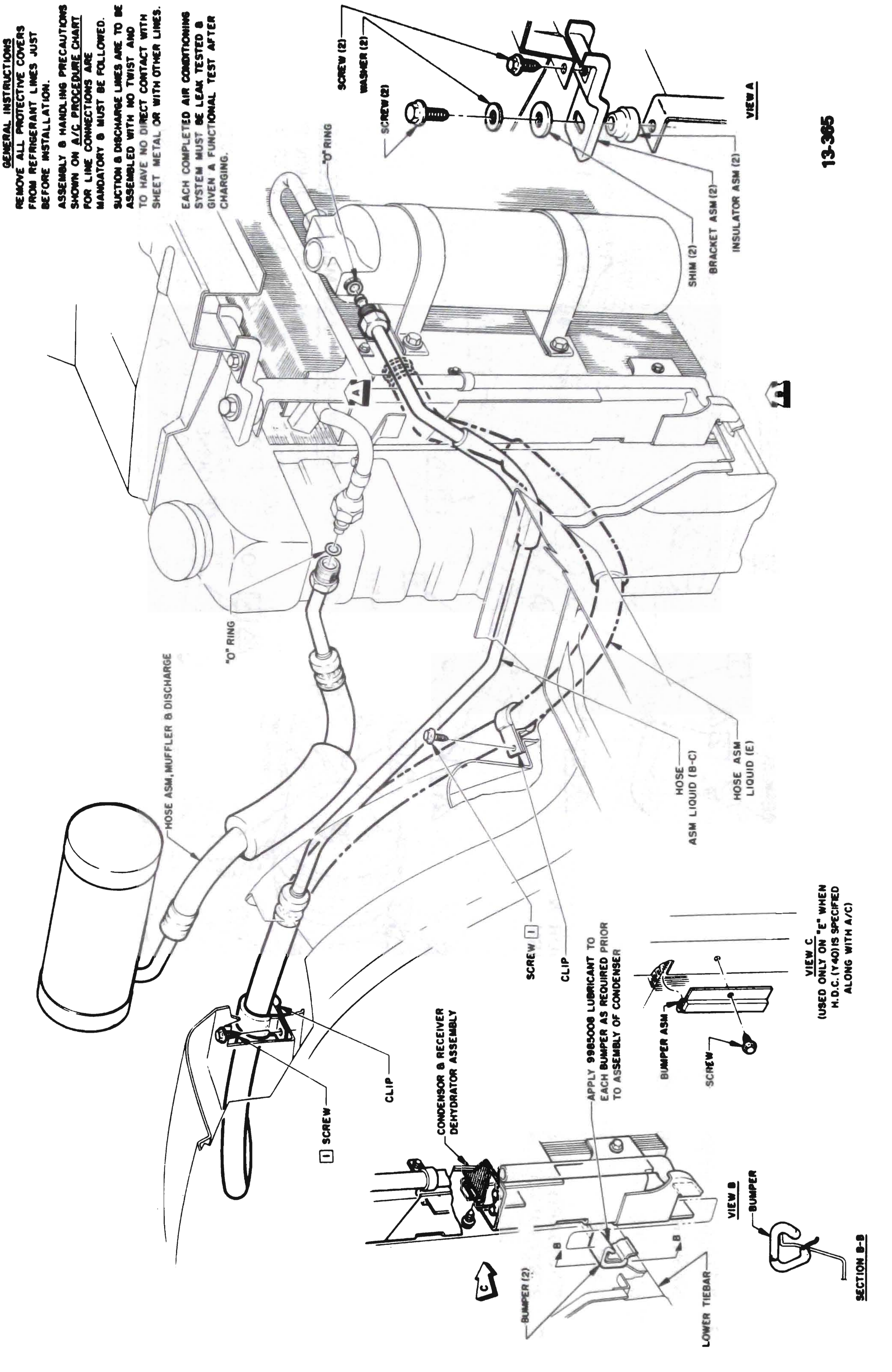


Figure 13-90 4L-4N-4R-4P-4U-4V-4Y Air Conditioning - Manual - Hose Connections to Condenser and Dehydrator

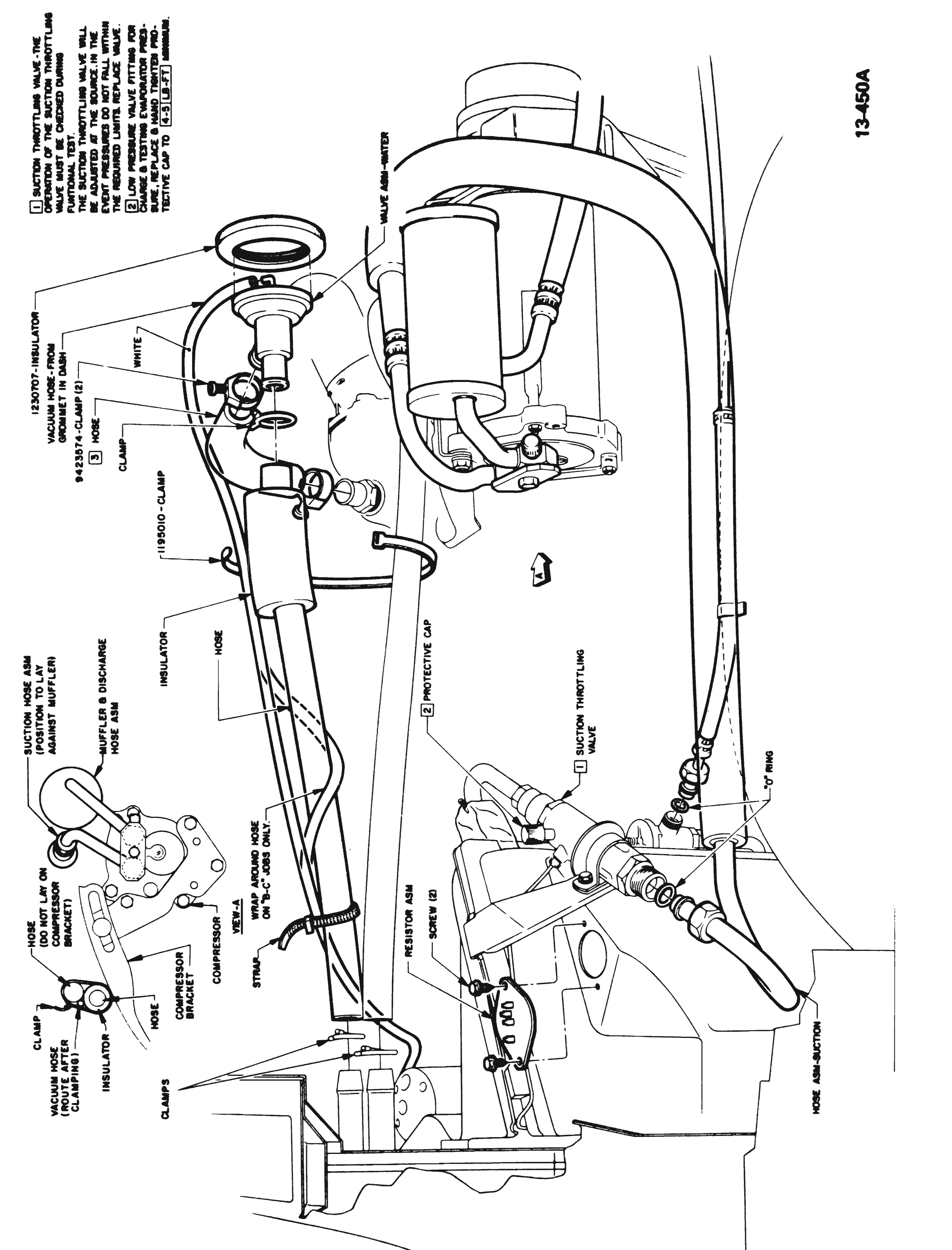


Figure 13-91 4L-4N-4R-4P-4U-4V-4Y Air Conditioning - Manual - Hoses to Compressor, Water Valve and Evaporator

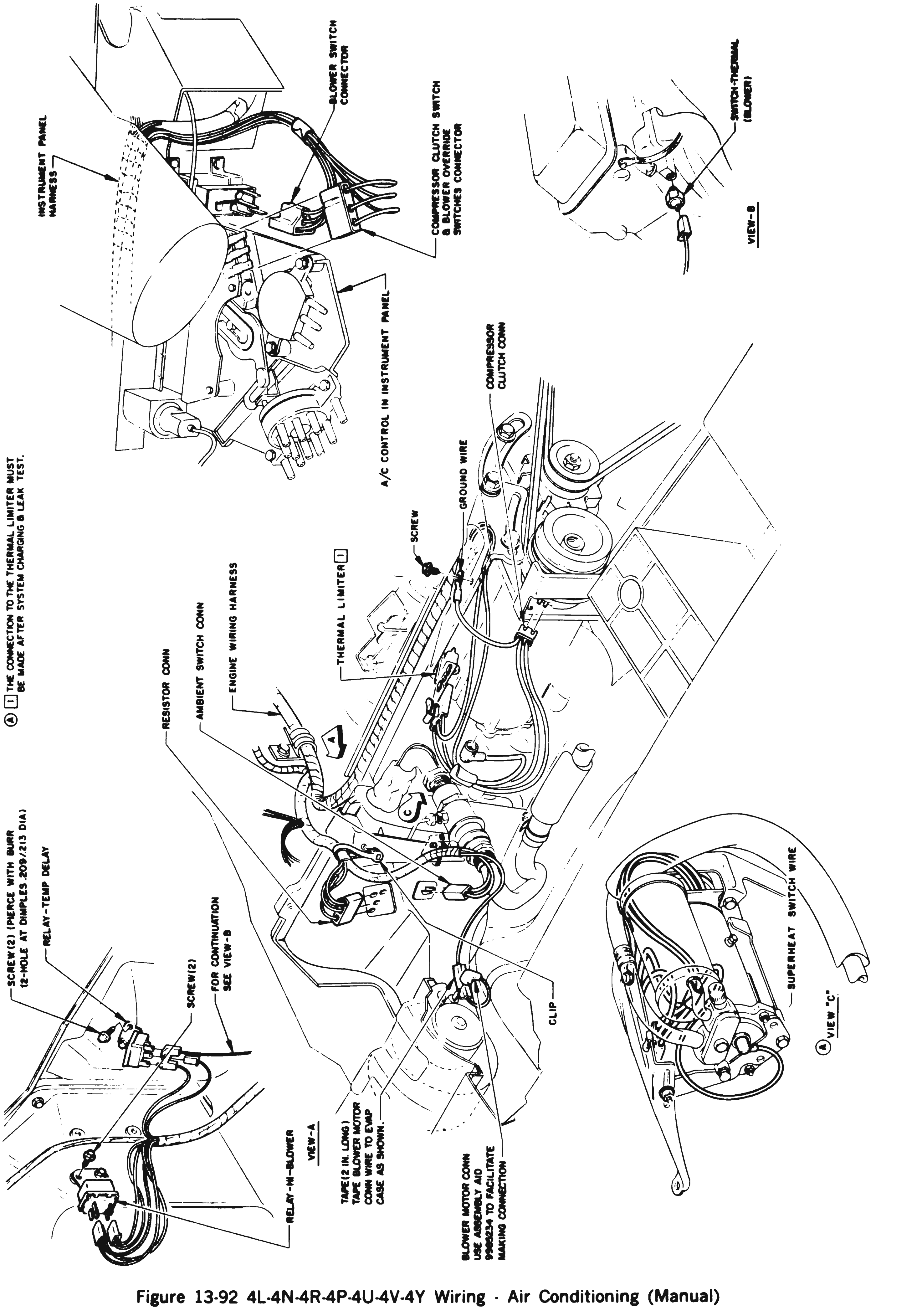


Figure 13-92 4L-4N-4R-4P-4U-4V-4Y Wiring - Air Conditioning (Manual)

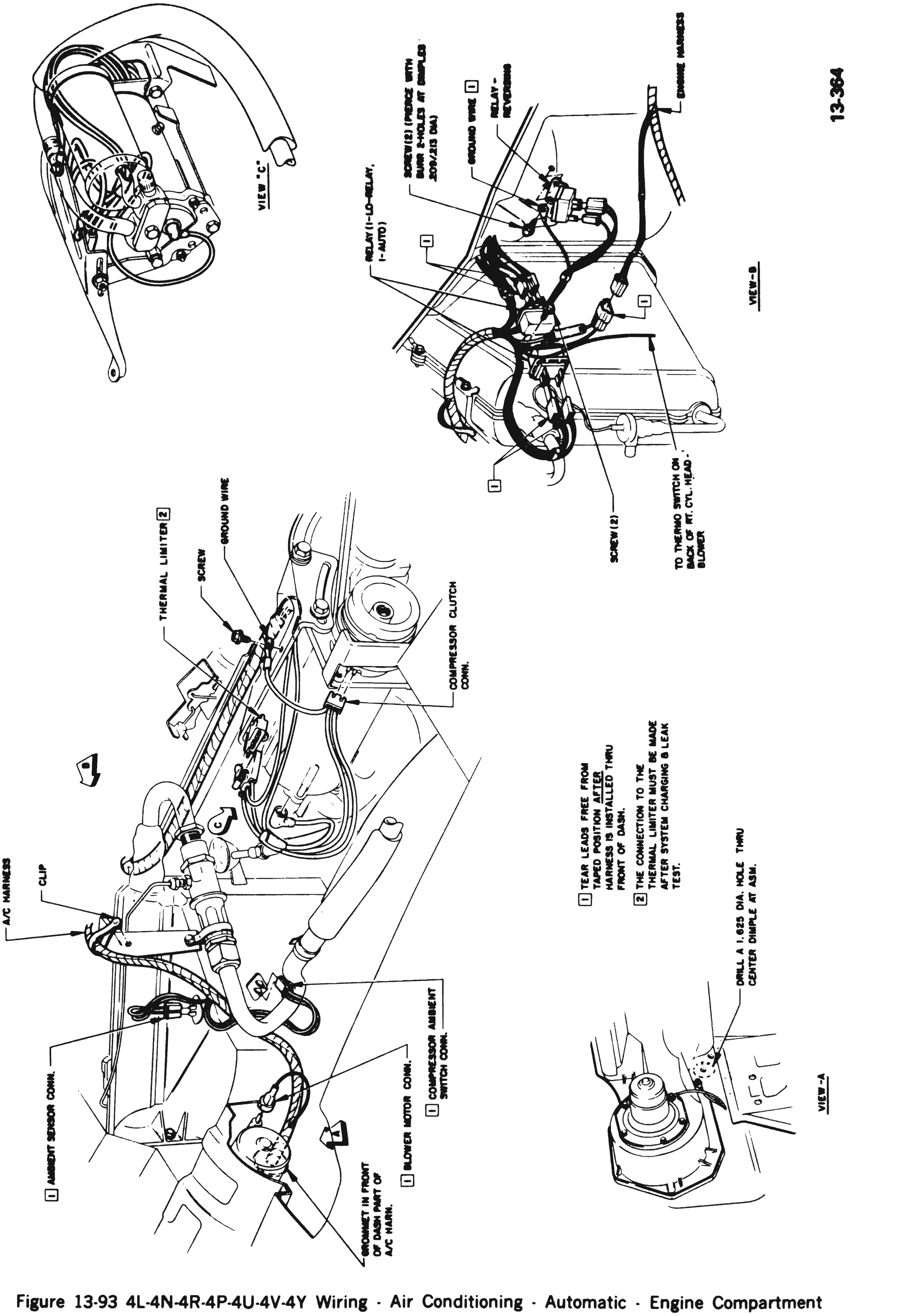


Figure 13-93 4L-4N-4R-4P-4U-4V-4Y Wiring - Air Conditioning - Automatic - Engine Compartment

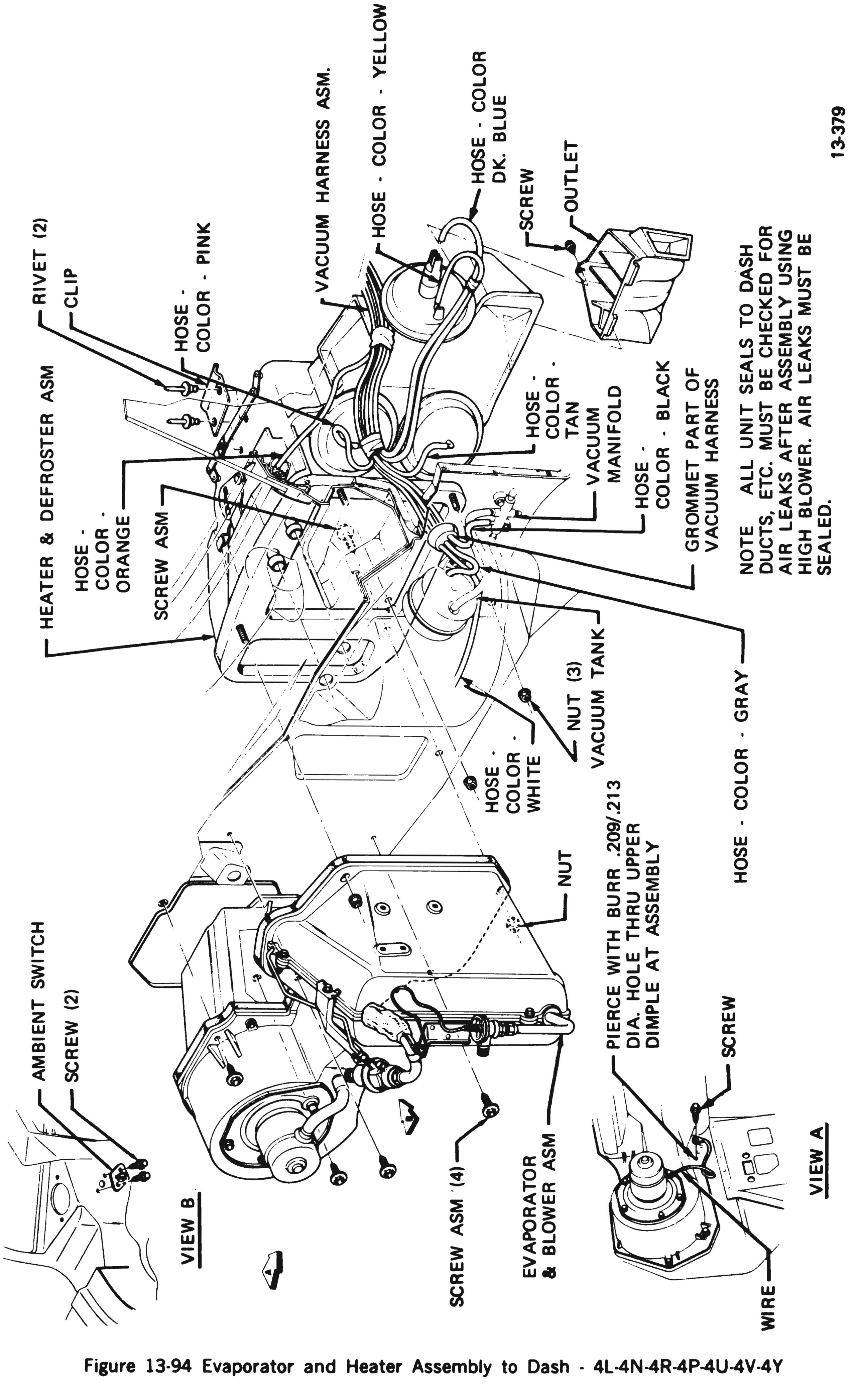


Figure 13-94 Evaporator and Heater Assembly to Dash - 4L-4N-4R-4P-4U-4V-4Y

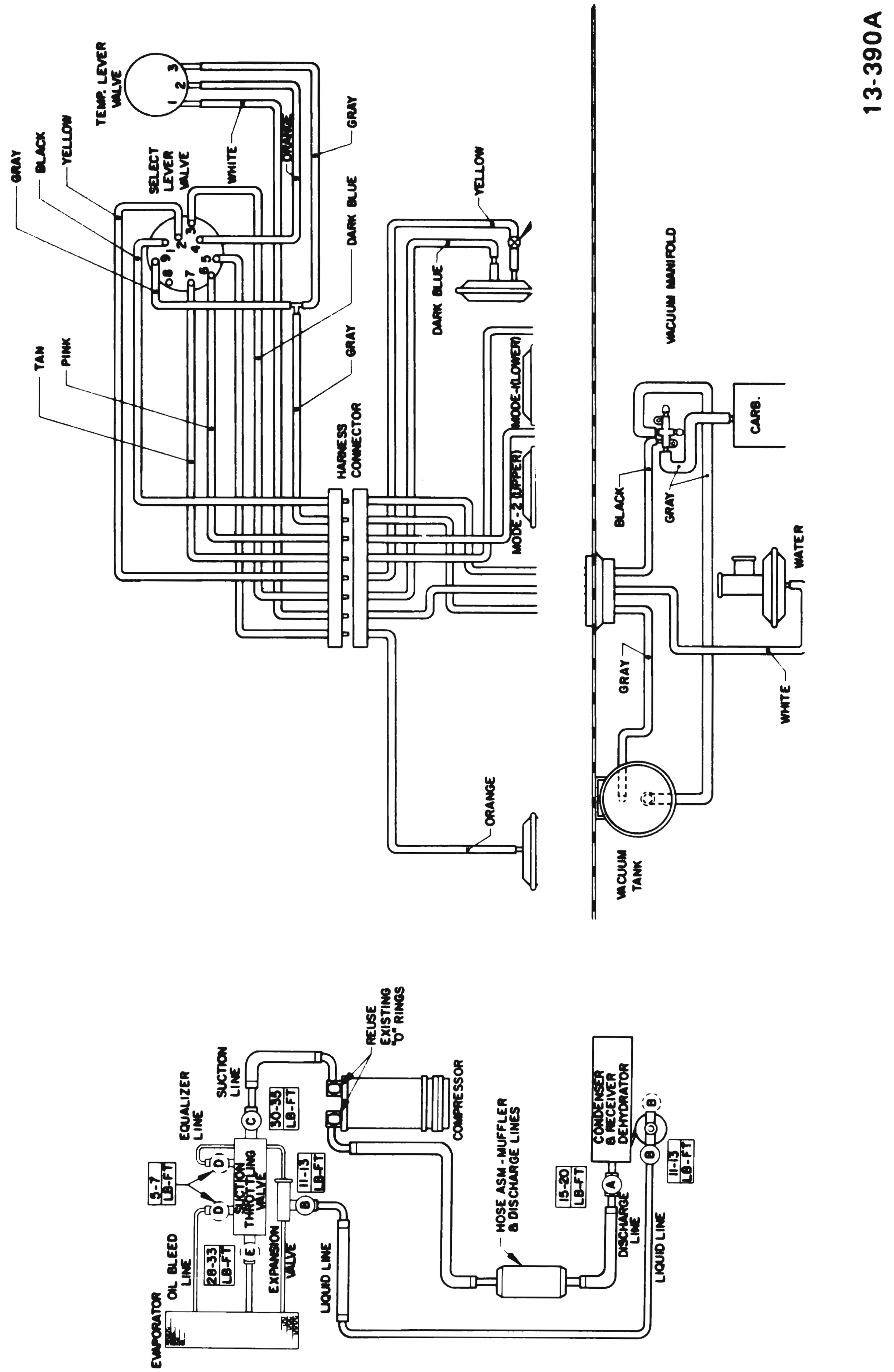


Figure 13-95 Refrigerant Line Installation and Vacuum Hose Chart - 4L-4N-4R-4P-4U-4V-4Y