REFRIGERANT COMPONENTS

ALL SERIES

WARNING: IF EQUIPPED WITH AIR CUSHION RESTRAINT SYSTEM, DO NOT ATTEMPT ANY ADJUSTMENT, REPAIR OR REMOVAL OF ANY PORTION OF THE AIR CONDITIONING SYSTEM WHICH WOULD REQUIRE REMOVAL OR DISCONNECTING OF ANY COMPONENT OF THE AIR CUSHION RESTRAINT SYSTEM UNTIL THE DISCONNECTION PROCEDURE IS COMPLETED. THIS PROCEDURE MUST BE FOLLOWED TO PREVENT ACCIDENTAL DEPLOYMENT OF THE SYSTEM WHICH COULD RESULT IN PERSONAL INJURY AND/OR DAMAGE TO THE SYSTEM'S COMPONENTS.

A.C.R.S. DISCONNECTION PROCEDURE

1. Turn ignition switch to "LOCK" position. Disconnect the negative battery cable from the battery and tape end.

CONTENTS

CONTENTS (Cont'd.)

DESCRIPTION AND OPERATION

DESCRIPTION OF AIR CONDITIONING COMPONENTS

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.

Pressure Relief Valve - The purpose of the pressure 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.

Magnetic Clutch and Pulley Assembly - The magnetic clutch and pulley assembly (see Figure 9B-1) 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.

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.

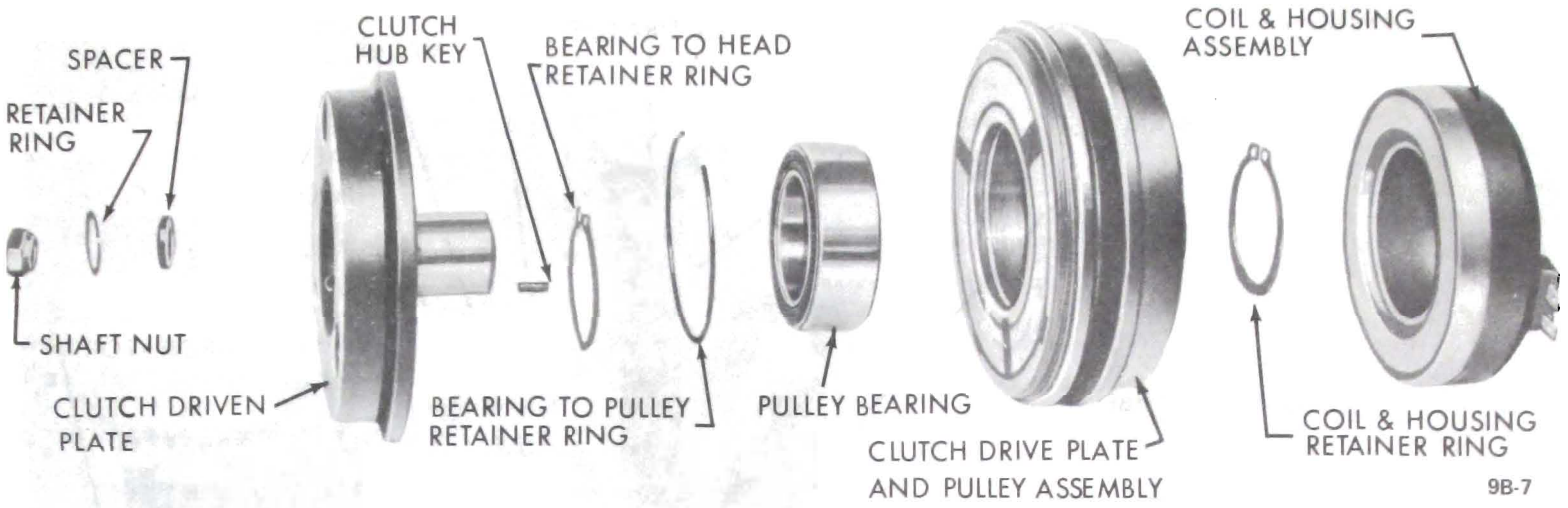


Figure 9B-1 Magnetic Clutch and Pulley Assembly

Receiver - Dehydrator - X Series

The receiver-dehydrator is mounted on the right inner fender. 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 9B-2) 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.

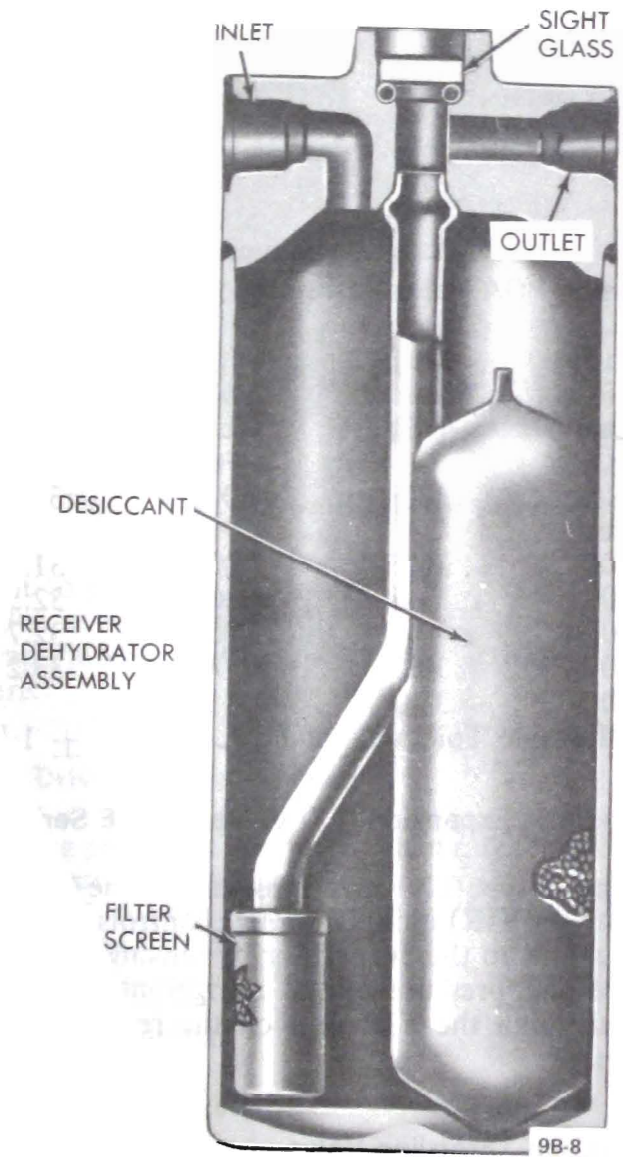


Figure 9B-2 Receiver - Dehydrator Assembly - X Series

Expansion Valve - X Series

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.

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.

POA Valve - X Series

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 9B-4).

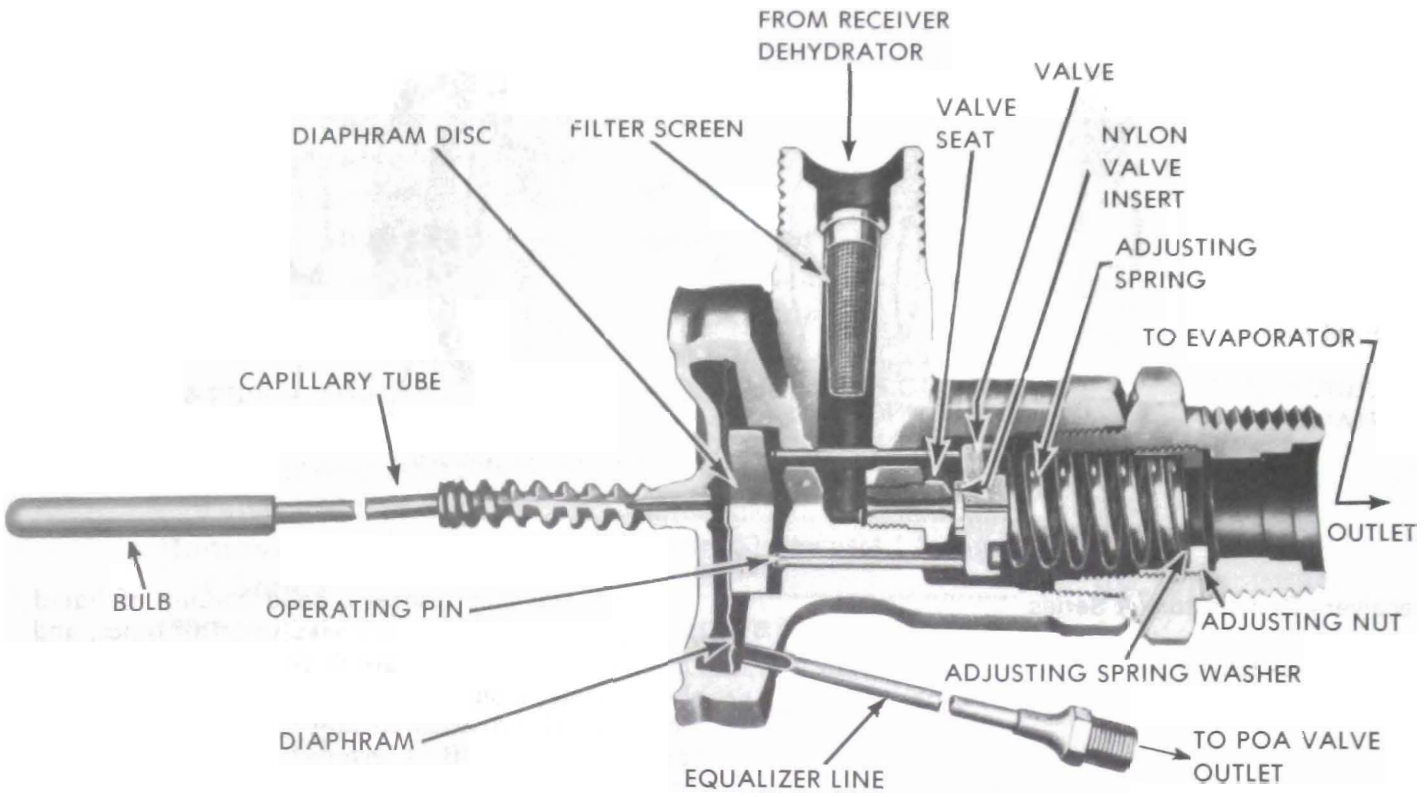


Figure 9B-3 Expansion Valve - X Series

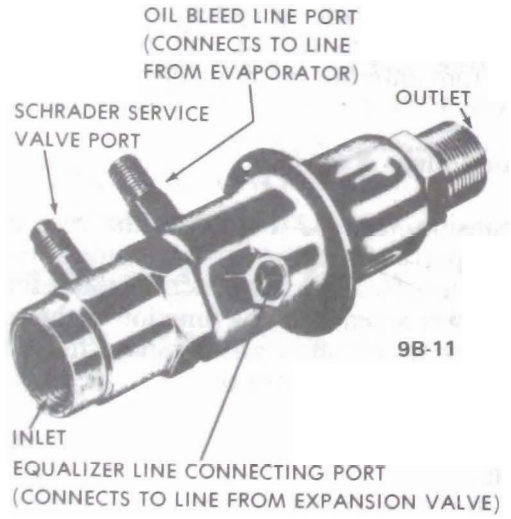


Figure 9B-4 Pilot Operated Absolute - Suction Throttling Valve (POA Valve) - X Series

Construction of the Valves-In-Receiver Assembly (V.I.R.) A-B-C-E Series

The Valves-In-Receiver (VIR) Assembly, Figure 9B-5, combines the thermostatic expansion valve, POA suction throttling valve, receiver-dehydrator and sight glass into one integral unit. It is mounted adjacent to the evaporator.

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 $\pm$ 1 PSI

Thermostatic Expansion (TX) Valve A-B-C-E Series

The capsule type TX valve is located in the Valves-In-Receiver (VIR) unit. This valve controls the flow of refrigerant to the evaporator by sensing the temperature and pressure of the refrigerant gas as it passes through the VIR unit on the return to the compressor.

POA Suction Throttling Valve

The capsule type POA suction throttling valve is located in the Valves-In-Receiver (VIR) unit adja-

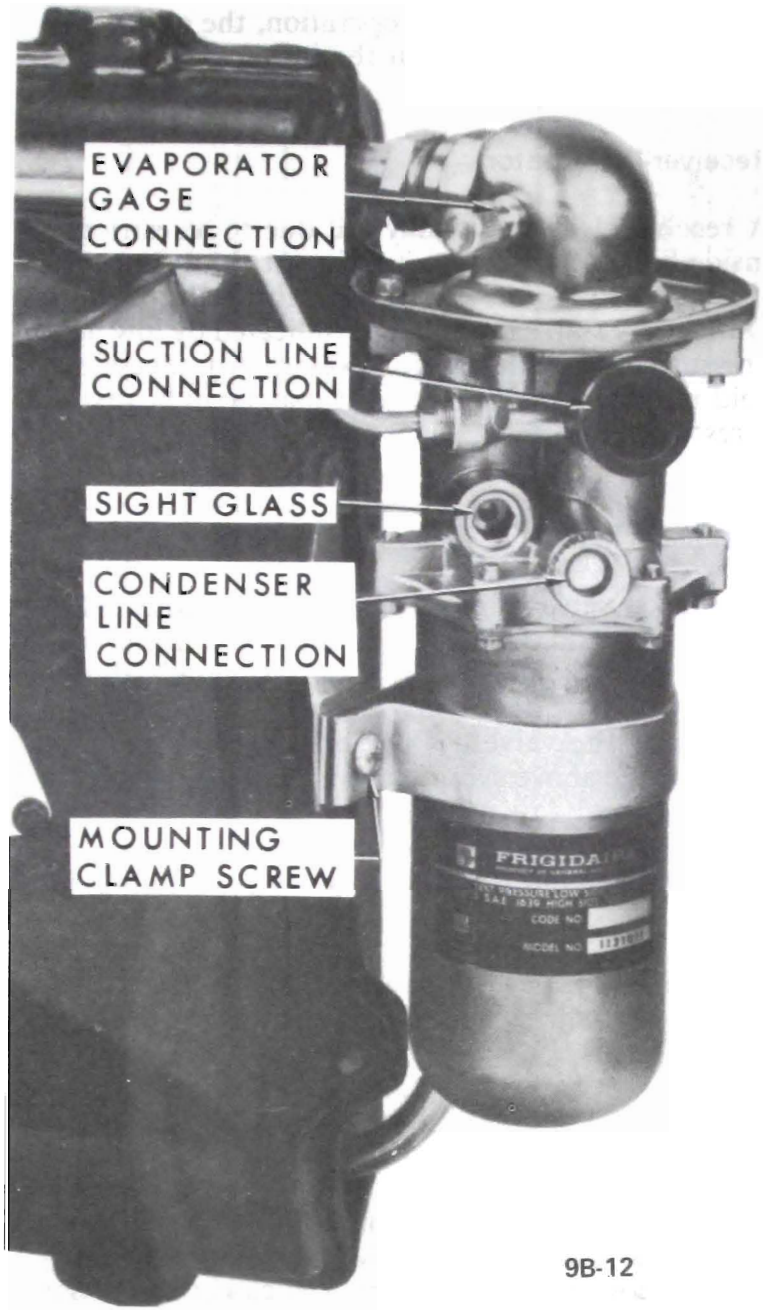


Figure 9B-5 Valves-In-Receiver Assembly

cent to the TX valve capsule. The function of this valve is to control the flow of refrigerant from the evaporator to maintain a constant evaporator pressure.

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.

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 9B-6. A schematic electrical diagram of the system circuiting is shown in Figure 9B-7.

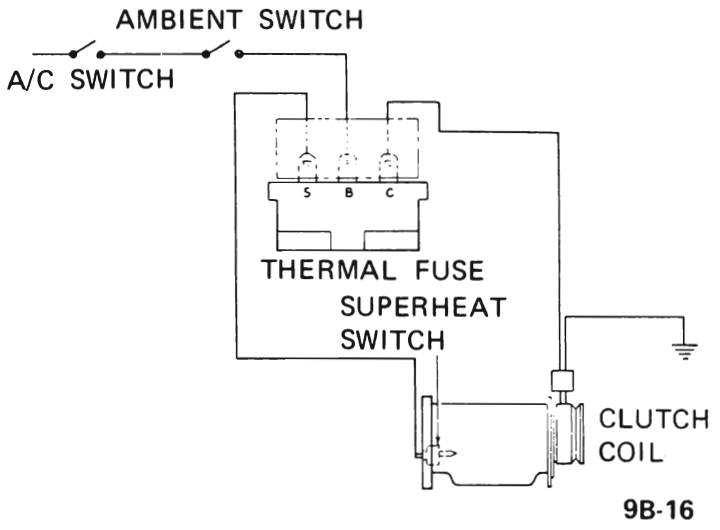


Figure 9B-6 Wiring Circuit Diagram - Superheat Shutoff System

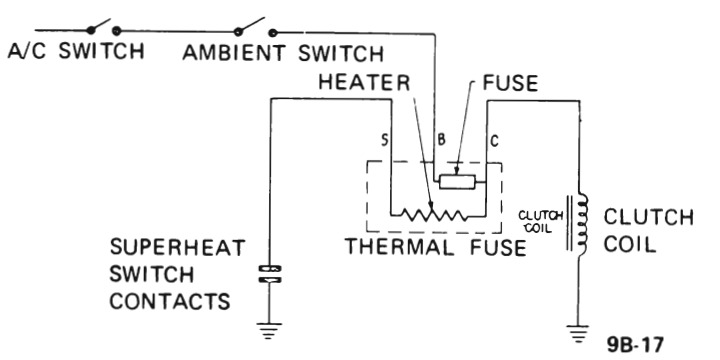


Figure 9B-7 Schematic - Superheat Shutoff System

DIAGNOSIS

GENERAL INFORMATION

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

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.

When the air conditioning system has not been used for several months or the vehicle has been stored for a long period of time, the oil in the compressor is drained away from the surfaces of the pistons and axial plate. This can result in increased internal friction to the extent the compressor drive belt will slip as evidence by the screeching sound during initial compressor operation.

If the compressor clutch does not have any visual signs of overheating or mechanical damage, the following procedure is recommended to determine if the compressor is satisfactory:

1. With the engine off, disconnect the electrical connector at the clutch, or remove thermal limiter.

2. Manually rotate the compressor hub two or three turns counterclockwise, as viewed looking at the clutch from front of vehicle. This is opposite of its normal rotation. If the hub is not free to rotate by hand, a spanner type wrench (J-9403) should be used.

3. a. If compressor hub rotates, reverse the direction (clockwise) for two or three turns.

b. Check and tighten belt to specification for model being inspected.

c. Reconnect the electrical connection at compressor clutch or thermal limiter.

d. Start engine and operate at approximately 2,000 RPM, position control for compressor operation and run for at least one minute to determine system cool-down capability. If air condition system is functioning properly, the compressor is satisfactory.

4. If compressor hub will not rotate in Step 2 above, the compressor should be removed and repaired.

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.

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.

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.

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 - "X" Series. A less common cause of the above symptom is a clogged inlet screen - "X" Series.

The capillary line and temperature bulb for the expansion valve are eliminated with the VIR System, as the power element or diaphragm end of the expansion valve capsule is exposed directly to the refrigerant before entering the VIR unit from the outlet of the evaporator.

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.

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.

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.

REFRIGERATION DIAGNOSIS CHART – VIR VALVES-IN-RECEIVER SYSTEM

Observe refrigeration system in areas listed below while engine operates at 2,000 RPM with control lever in "HI" and temperature dial at 65 on automatic climate control systems. On regular A/C systems, set control lever in A/C position and temperature lever in "cold" position and fan switch in "HI" position. All windows should be open and hood should be up. Blower motor should be disconnected when required in chart.

OBSERVED OPERATING CONDITIONS							
Outlet Air Temp.	Sight Glass	Head Pressure at Ambient Temperature	Evaporator Pressure	Evaporator Outlet Pipe Temperature	Oil Bleed Line Temperature	System Condition	System Correction
		70° 80° 90° 100°					
40 – 50°	Clear	160 # to 200# 190 # to 230# 220# to 260 # 250# to 290#	28-32 PSIG	Cold	Warm	Normal	
No Air Flow	Clear	Lower than Normal	Maintains Pressure	Cold	Gets Cold	With Blower Lead Off	
Warm	Foamy or Bubbly †	Lower than Normal	Normal to Low	Warm	Cold	Refrigerant Charge Low *	Find Leak Repair and Recharge
Warm	Foamy or Bubbly	Low	Normal to Low	Cool or Warm	Cool or Warm	VIR Liquid Pickup Tube Screen Partially Plugged *	Clean Screen and System as Required Change Desiccant and Recharge
Warm	Clear	Very Low	Very Low	Warm	Warm	Refrigerant Charge Lost *	Find Leak, Repair, Change Desiccant and Recharge ††
Normal	Clear	High	Normal	Cold	Warm	Refrigerant Overcharge Blows Relief Valve on Hot Days	Recharge to the Specified Charge
Warm	Clear	Low	Low	Warm	Cold	Expansion Valve Diaphragm * Discharged **	Replace Expansion Valve Capsule
Warm	Foamy or Bubbly	Low	High	Warm	Warm	Vacuum Loss in POA Capsule Bellows or Valve Piston Stuck Closed *	Replace POA Valve Capsule
Cold Evaporator May Ice Up Affecting Air Flow	Clear	Low	Normal to Low	Cold	Warm	POA Valve Stuck * Open ***	Replace POA Valve Capsule
Warm	Clear	Normal	High	Cool to Warm	Cool or Warm	POA Valve Setting Too High	Replace POA Valve Capsule

* – Superheat Switch May Close and Thermal Fuse Link Open to Shut Off the Compressor.

** – Allow the System to Warm Up and Equalize Before Repeating the Test. If the Condition Doesn't Recur the System has Excess Moisture Causing Ice to Form in the Valve. Discharge the System, Replace the Bag of Desiccant, Evacuate the System for 30 Minutes and Recharge.

*** – Goes to Low Pressure or Vacuum with Blower Lead Disconnected.

† – May Be Bubbly or Vapor Clear with Blower Disconnected.

†† – Change Desiccant Only If System Has Been Opened or Receiver Shell Requires Removal for Repair.

4B9B22

Figure 9B-15 VIR System Refrigeration Diagnosis Chart

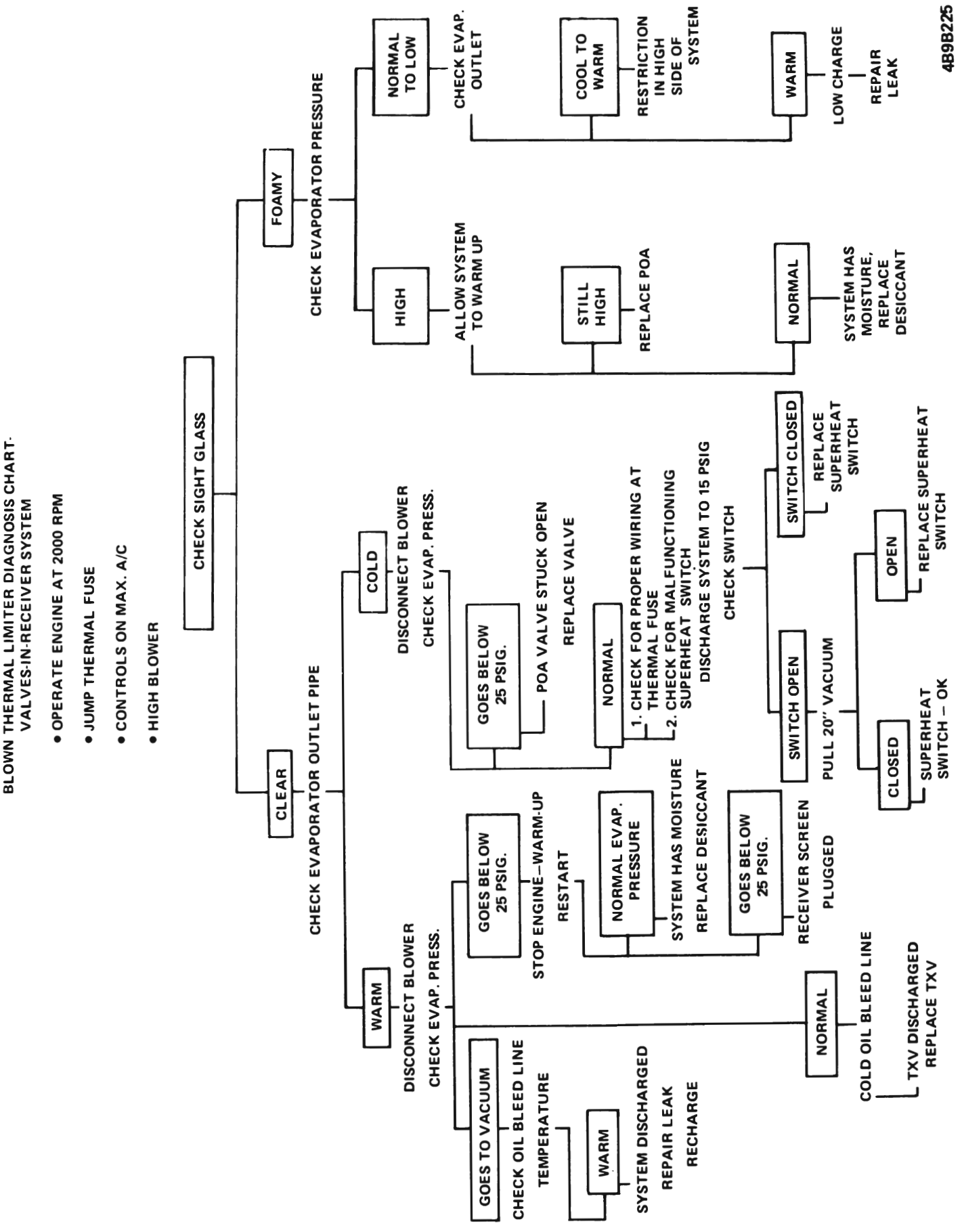


Figure 9B-16 Blown Thermal Limiter Diagnosis Chart - V.I.R. System

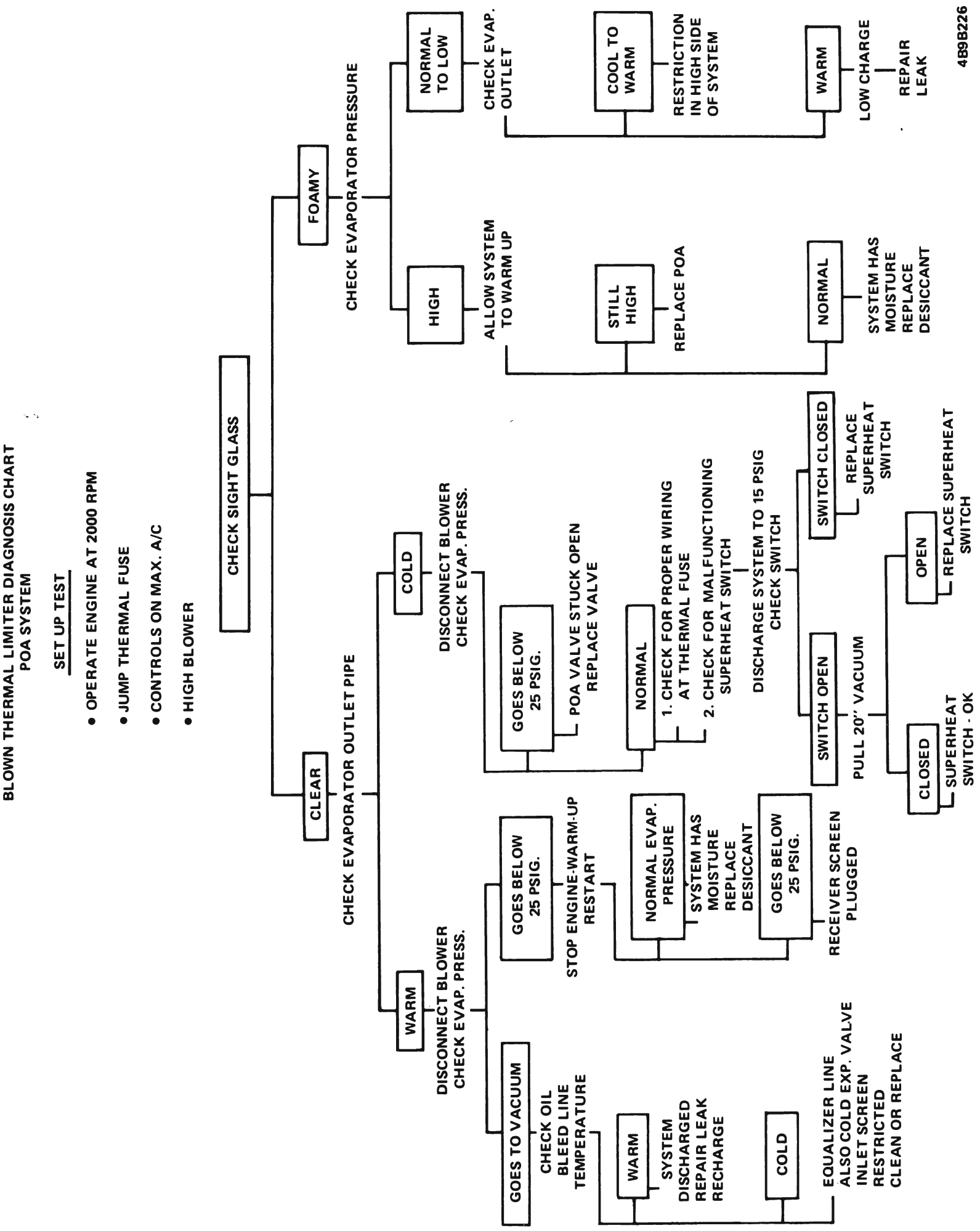


Figure 9B-17 Blown Thermal Limiter Diagnosis Chart - POA System

SERIES	AMBIENT TEMP. °F.	EVAPORATOR PRESSURE P.S.I.G. AT VIR	COMPRESSOR HEAD PRESSURE P.S.I.G.	OUTLET TEMP. °F.	
				LEFT	RIGHT
"A"	80	28 - 30	200 - 245	40 - 45	40 - 45
	90	28 - 30	240 - 280	45 - 49	45 - 49
	100	28 - 30	260 - 320	48 - 52	48 - 52
	110	28 - 30	300 - 340	51 - 55	51 - 55
"B" "C" "E"	70	28 - 30	160 - 190	37 - 41	37 - 41
	80	28 - 30	180 - 230	41 - 45	41 - 45
	90	28 - 31	200 - 270	44 - 50	44 - 50
	100	28 - 30	235 - 275	46 - 52	46 - 52
	110	29 - 32	280 - 340	48 - 54	48 - 54

THE LOWER OUTLET TEMPERATURES CAN BE ACHIEVED ON DRY DAYS, AND THE HIGHER ON HUMID DAYS.

4B9B88

Figure 9B-18 Air Conditioner Functional Test Table - A-B-C-E Series

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

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. X series, 1 1/4 lb. A-B-C-E series, should be added as a reserve. In no case should the system be overcharged.

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.

The location of the VIR unit makes it vulnerable to accumulating road, engine oil and dirt, expecially since it has moisture condensing on its exterior surface when the system is operating.

Refrigerant acts as a carrier for the A/C system oil and past practice has always been to look for an oil show around a fitting or component if a leak was suspected. If the A/C system is low on refrigerant, do not misdiagnose the VIR unit as leaking by the presence of such dirt and oil.

The diagnosis chart in Figure 9B-15 will aid in troubleshooting the VIR Valves-In-Receiver system.

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 BREATHE FUMES RESULTING FROM BURNING OF REFRIGERANT GAS. THESE FUMES ARE EXTREMELY POSIONOUS.

When leak testing the POA valve, "X" Series, 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 "X" Series.

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.

FUNCTIONAL TESTING SYSTEM "X" SERIES

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-23575), and gage adapters (J-5420) to air conditioning system as shown in Figure 9B-20.

3. Close doors, open windows and hood of the car.

4. Set temperature lever to max position and fan to "HI", Air Control lever in "A/C".

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.

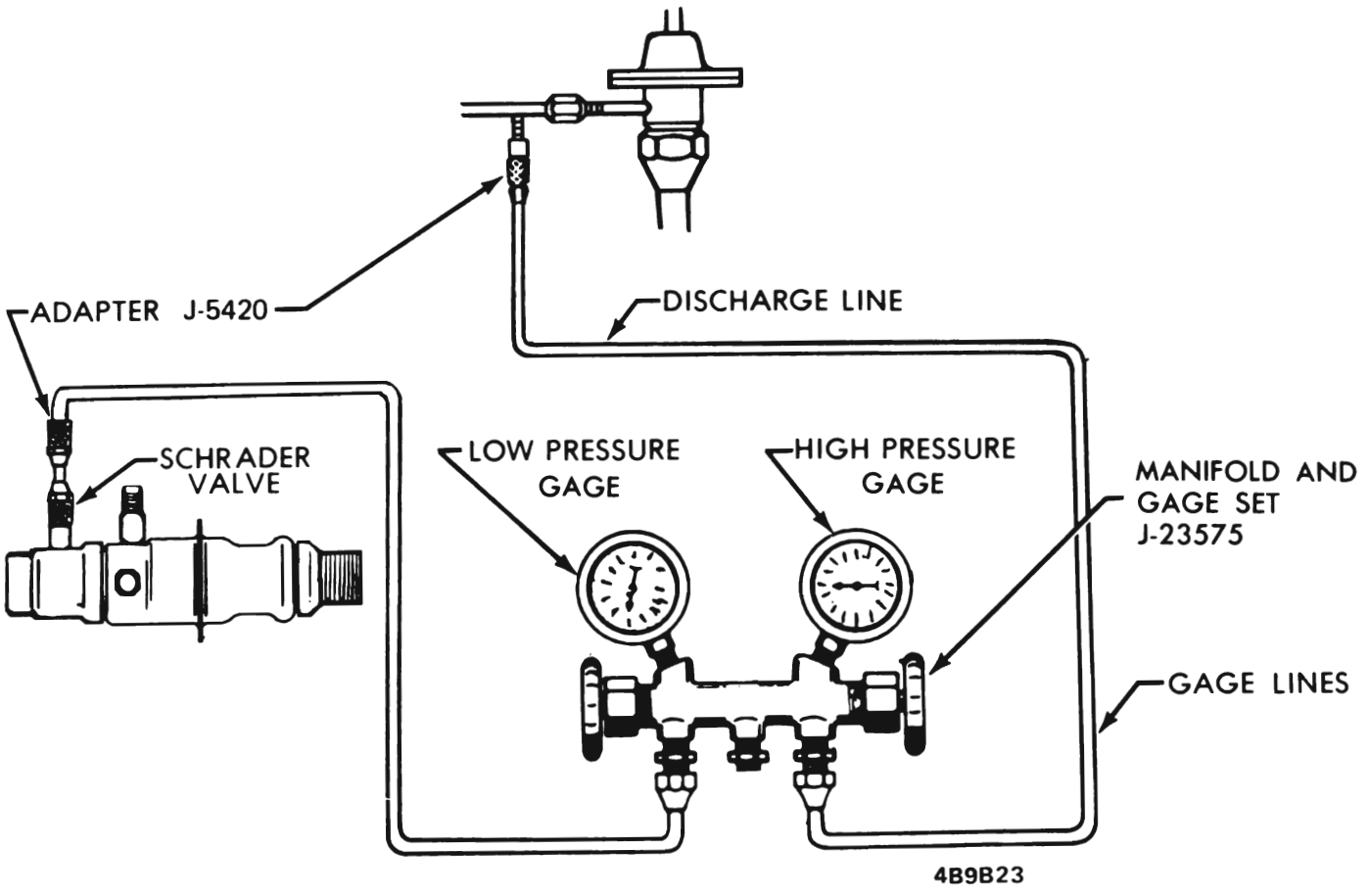


Figure 9B-20 Functional Test Set-Up - X Series

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 the Functional Test Table (see Figure 9B-21).

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, "A/C" selector lever setting, and "LO" blower.

d. If evaporator pressure is 30 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 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 psi, change the expansion valve. If expansion pressure remains at 30 psi, install a new receiver dehydrator.

HEATER-AIR CONDITIONER REFRIGERANT CIRCUIT

TROUBLE DIAGNOSIS GUIDE - "X" SERIES

Insufficient Cooling (Check Air Flow)

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

Discharge Air - Normal Temp Check for air leaks

TEST CONDITIONS:

Hood . . . . . Raised
Front Windows . . . . . Open
A/C Control Panel

Select Lever . . . . . A/C Mode

Fan Switch . . . . . HI

Temperature Lever . . . . . Full Cold

Nozzles and Air Outlets . . . . . Open
Engine Speed . . . . . 2000 RPM

TEST READINGS:

Ambient Air in Degrees F. (In Auxiliary Fan Air Blast Ahead of Condenser)	70°		80°		90°		100°		110°	
Air Quality	Arid	Humid	Arid	Humid	Arid	Humid	Arid	Humid	Arid	Humid
*Average Compressor Head Pressure in PSI	163 to 187	193 to 217	193 to 217	223 to 247	223 to 247	263 to 287	258 to 282	313 to 337	298 to 322	373 to 397
Average Evaporator Pressure **PSI AT SEA LEVEL	27.5 to 29.5	28.5 to 30.5	28 to 30	29 to 31	28 to 30	30 to 32	28 to 30	33 to 35	28.5 to 30.5	37.5 to 39.5
Center Outlet Temperature in Degrees F.	38° to 42°	41° to 45°	39° to 43°	43° to 47°	40° to 44°	47° to 51°	41° to 45°	52° to 56°	43° to 47°	59° to 63°

*NOTE: These pressures are for engine with engine fan clutch engaged. With fan clutch disengaged, pressures generally are 25-35 psi higher than shown here.

**NOTE: Interior pressure of the evaporator is isolated from exterior atmospheric pressure. As a result, the controlling element (vacuum bellows) of the P.O.A. valve is able to operate independently of the effect of atmospheric pressure. However, any gauge used to check the pressure will not be free from the effect of atmospheric pressure. This altitude effect on the gauge must be taken into account when interpreting a reading. As the altitude increases and atmospheric pressure goes down, the pressure reading on the gauge will go up.

The increase noted in the above readings will be approximately .5 psi per 1,000 feet above sea level. For example at 90°F, in an arid climate at 2,000 feet above sea level, evaporator pressures would be 29 to 31 psi.

4B9B227

Figure 9B-21 Air Conditioner Functional Test Table - X Series

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 refrigerant 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 malfunctioned 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 refrigerant to evaporator, or expansion valve plugged or has malfunctioned.

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 following: Fuse blown, blower switch has malfunctioned, wire broken or loose connection, poor ground connection, or blower motor has malfunctioned.

Blower Operating Normal Check for the following: Flexible air hose loose, restriction or leakage in air ducts, A/C outlet not opening, or kick panel air inlet not fully open in Recirc position.

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 - Malfunctioning 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 9B-22. 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.)

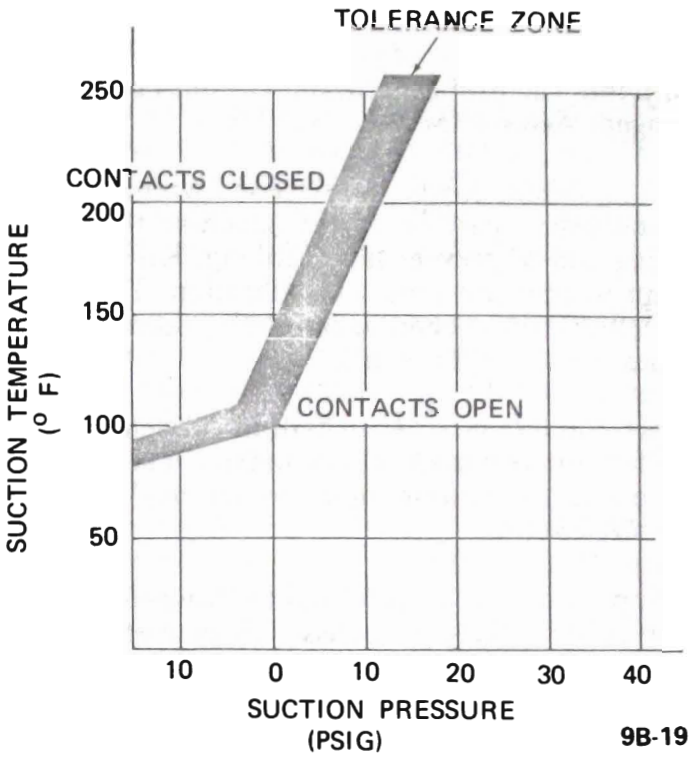


Figure 9B-22 Superheat Switch Operating Characteristics

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

MAINTENANCE AND ADJUSTMENTS

GENERAL SERVICE INFORMATION AND SAFETY PRECAUTIONS

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 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 Specifications).

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

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.

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.

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

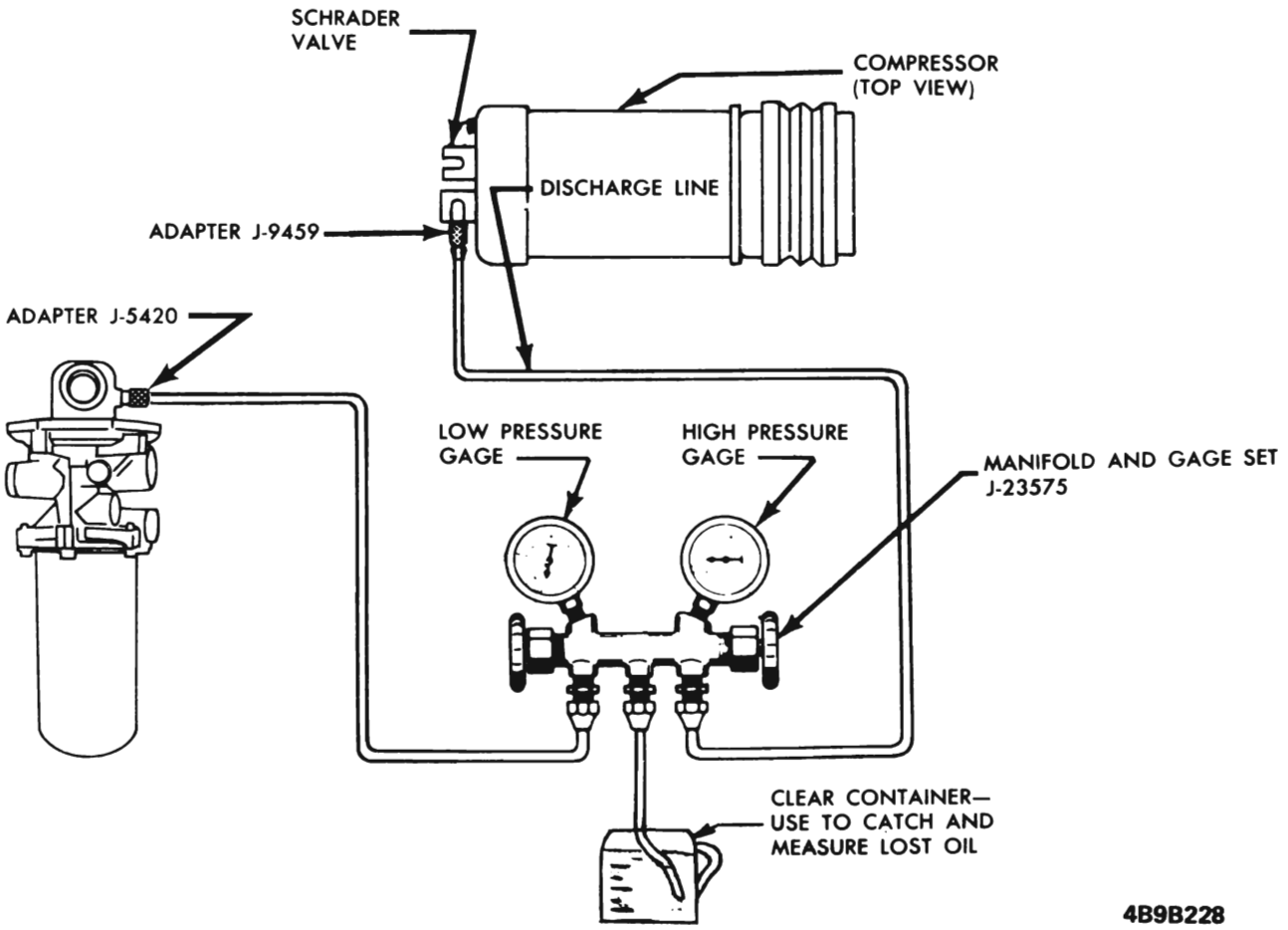


Figure 9B-23 Set Up For Discharging System - A-B-C-E Sereis

and C of connector, if compressor will be required prior to refrigerant system being fully charged. See Figure 9B-6.

Discharging the System (A-B-C-E Series)

1. With the engine stopped, remove the protective caps from the Schrader type valves located on the compressor discharge connector and the Valves- In-Receiver inlet connector shell assembly.

2. Connect the Gauge Set J-23575 with valve adapters J-5420 to the Schrader type valves. See Figure 9B-23.

3. Crack open both high and low pressure gauge valves and allow the refrigerant to escape through the center outlet of the gauge set.

Place the end of the discharge hose into a clean open container to catch any oil discharged with the refrigerant so that the oil quantity may be measured and a like quantity of new oil be added to the system during system recharge. After the system has been completely discharged of refrigerant, any part of the refrigeration system may be serviced.

Discharging the System (X Series)

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-23575) 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 9B-24.

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.

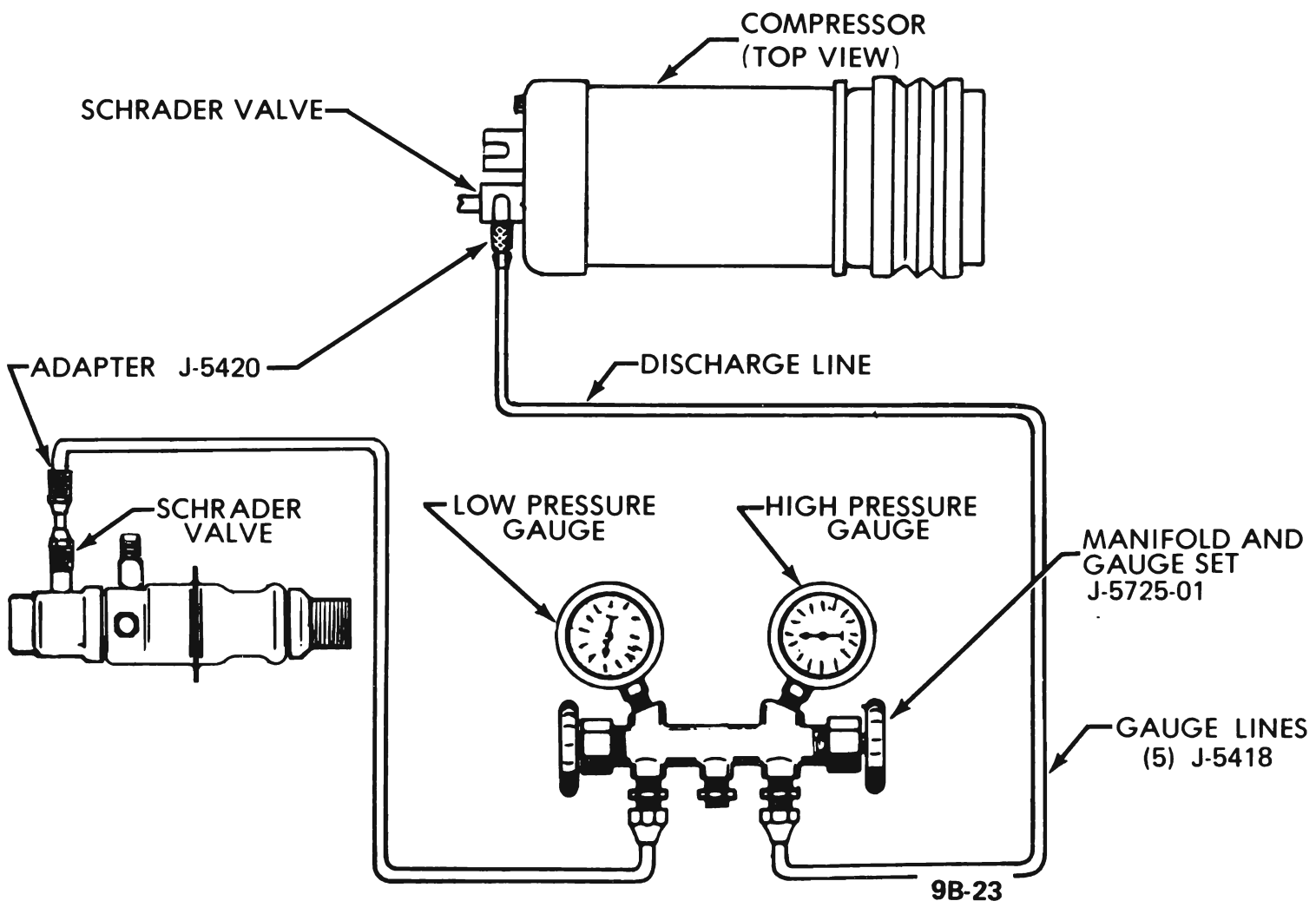


Figure 9B-24 Set-Up for Discharging System - X Series

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.

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 or V.I.R. assembly. 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 schrader fitting to cap tool. See Figure 9B-26.

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)

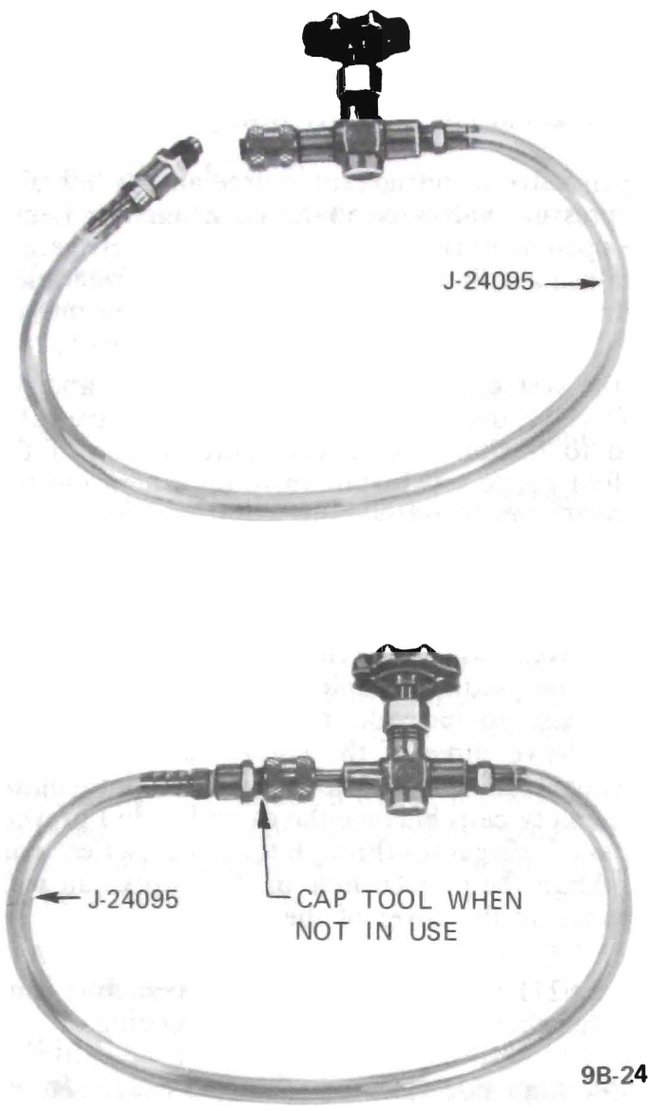


Figure 9B-26 Oil Injector J-24095

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".

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 9B-6.

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. of refrigerant (all series) 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 the air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on the V.I.R. assembly or the 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 a leak detector, check the 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 valve 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 preceding.

5. Close high side valve on manifold gauge set.

WARNING: PRIOR TO STARTING UP ENGINE, THE HIGH SIDE VALVE ON THE CHARGING MANIFOLD MUST BE CLOSED DUE TO EXCESSIVE PRESSURE BUILD-UP WHICH CAN RESULT IN BURSTING OF THE CONTAINER(S) CAUSING SERIOUS INJURY. IF YOU ARE INEXPERIENCED IN THE USE OF THIS PROCEDURE, SEED PROFESSIONAL ASSISTANCE.

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.

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

Charging Station Method

INSTALLING J-23500

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

2. Connect high pressure gauge line to high pressure gauge fitting and low pressure gauge line to low pressure 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 (above 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.

EVACUATING AND CHARGING THE SYSTEM USING J-23500.

1. With charging station connected, as previously described, fully open high and low pressure control valves on station and allow refrigerant gas to escape rapidly from system through the center fitting and hose. (Place end of hose in clean container to collect oil loss due to rapid discharge of system).

2. When hissing ceases, indicating all refrigerant has escaped close high pressure valve by turning valve clockwise. Connect the center fitting hose to the vacuum pump and open the vacuum control valve.

3. With system discharged, 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.

4. 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.

5. 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.

6. 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.

7. Fully open refrigerant control valve and allow all liquid refrigerant to enter the system. When full charge of refrigerant has entered the system, turn off ALL valves.

8. 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.

9. 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 was 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 or V.I.R. assembly and compressor gauge fitting. 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 1-1/4 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.

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 the Oil Replacement Table.

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. to "Flushing the System") and the receiver dehydrator be replaced or desiccant bag in V.I.R. assembly. 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 the Oil Replacement Table.

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.

MAJOR REPAIR

In removing and replacing any part of the refrigeration system the following must be considered and performed as required.

To prevent an unnecessary "blown thermal fuse" in the Low Refrigerant Charge Protector System when evacuating and charging the system, disconnect the thermal limiter connector plug.

1. Discharge the system refrigerant to the atmosphere, see "Discharging the System".

2. Remove and replace the component part according to the appropriate recommended step procedure.

3. Add oil to the system according to the quantity lost during the discharge of the system plus the recommended quantity to be added for the specific component changed. (See the recommendations for checking and adding oil.)

It is recommended that the desiccant bag in the V.I.R. Assembly be changed each time it is necessary to service the system. Do not expose the desiccant bag to the atmosphere any longer than necessary to remove the bag from its shipping container, place it in the receiver shell and immediately install the receiver shell on the valve housing. See Drier Desiccant - Remove and Replace.

4. Evacuate the system according to the System Evacuation Procedure.

5. Charge the system with the proper amount of Refrigerant 12 specified for the refrigerant system.

6. Leak test the refrigerant system, particularly the connections which were disconnected.

SERVICING OF THE REFRIGERATION SYSTEM COMPONENTS

In removing and replacing any part of the refrigeration system the following must be considered and performed as required.

To prevent an unnecessary "blown thermal fuse" in the Low Refrigerant Charge Protector System when evacuating and charging the system, disconnect the thermal limiter connector plug.

1. Discharge the system refrigerant to the atmosphere, see "Discharging the System".

2. Remove and replace the component part according to the appropriate recommended step procedure.

3. Add oil to system according to the quantity lost during the discharge of the system plus the recommended quantity to be added for the specific component changed.

It is recommended that the desiccant bag be changed each time it is necessary to service the VIR unit. Do not expose the desiccant bag to the atmosphere any longer than necessary to remove the bag from its shipping container, place it in the receiver shell and immediately install the receiver shell on the valve housing. See Drier Desiccant - Remove and Replace.

4. Evacuate the system according to the System Evacuation Procedure.

5. Charge the system with the proper amount of Refrigerant 12 specified for the refrigerant system.

6. Leak test the refrigerant system, particularly the connections which were disconnected.

REMOVAL AND INSTALLATION OF VIR ASSEMBLY

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging The System".

While the system is discharging, clean the surface dirt from the exterior surface of the VIR Assembly and the line connection areas. Blow any loose dirt away with an air hose.

2. When the system is completely discharged (high and low sides), loosen and remove the suction line, the liquid line and the liquid bleed line connections from the VIR assembly.

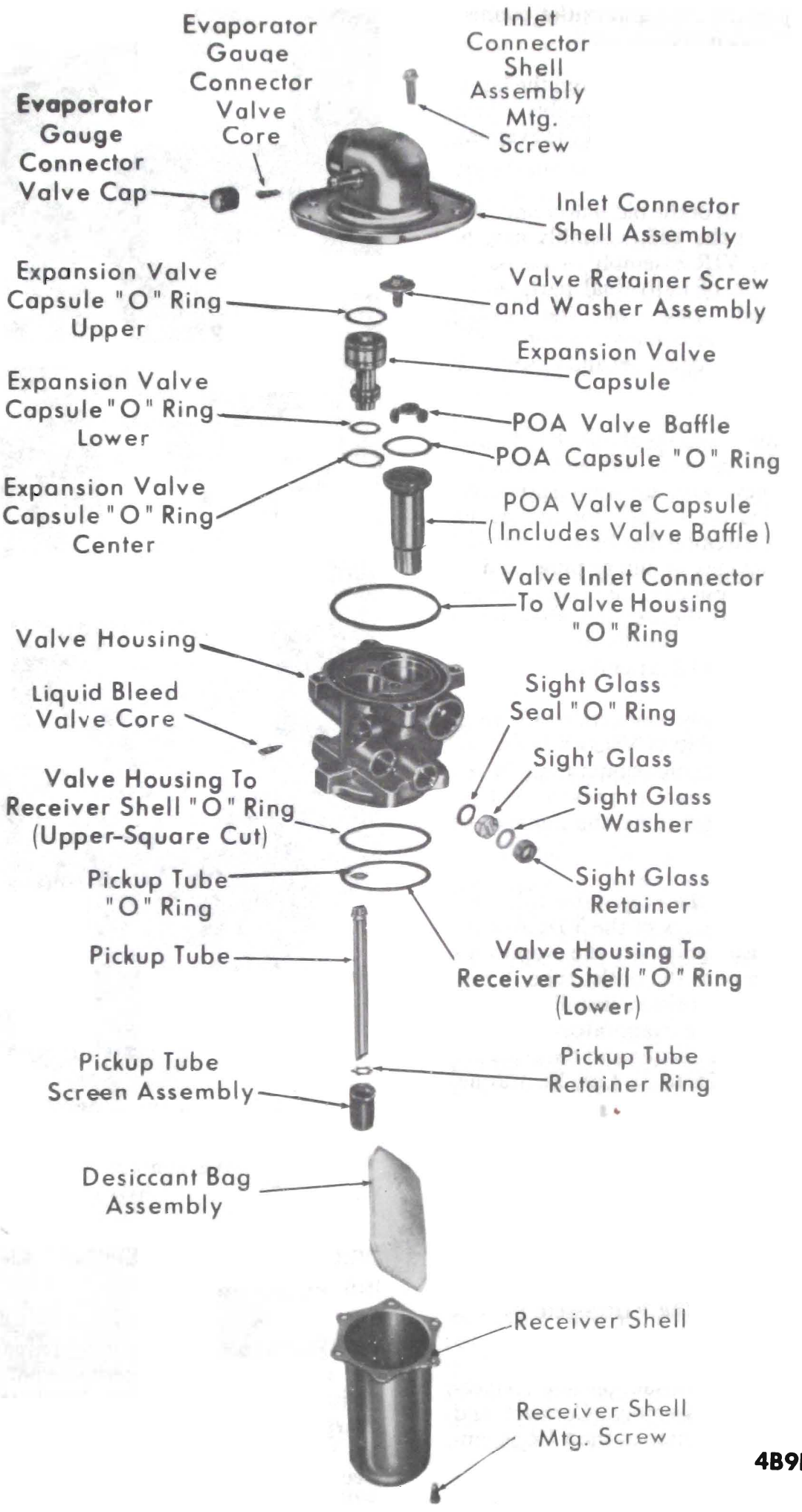


Figure 9B-28 Exploded View - Valves in Receiver Assembly

3. Loosen the evaporator inlet and outlet connection nuts at the VIR assembly.

4. Remove the VIR mounting clamp from the liquid receiver and carefully slide the VIR assembly off the evaporator outlet tube first and then off the evaporator inlet tube.

5. Remove and discard all of the old line connection "O" rings. At this point the VIR assembly may be replaced by a complete VIR assembly or disassembled for the replacement of individual parts as required. An exploded view of the (VIR) Valves-In-Receiver assembly is shown in Figure 9B-28. Refer to Disassembly procedures and observe all warnings.

All line connections and openings should be plugged or sealed to prevent the entry of dirt and moisture into the system. The new VIR assembly should remain capped and sealed until ready for immediate installation. If the VIR assembly has been reoperated the VIR connection openings should be plugged during reassembly and the desiccant bag added to the receiver shell just prior to the receiver shell being assembled to the valve body and the immediate installation of the complete VIR assembly.

6. Lubricate all VIR assembly connection "O" rings liberally with refrigerant oil (525 Viscosity) and install the O-Rings on the connection tubes. When making all connections use care to prevent nicking the "O" rings and cross threading the connection threads. See Figure 9B-30.

7. Remove the plugs from the evaporator inlet and outlet tube connection openings of the VIR Assembly. Assemble the VIR assembly onto the evaporator inlet tube first and then onto the outlet tube. When the assembly is in proper position install the VIR mounting clamp. Tighten the evaporator inlet connection to a 15 to 20 Lbs. Ft. torque and the evaporator outlet connection to a 28 to 33 Lbs. Ft. torque.

8. Remove the plug from the liquid bleed line connection opening of the VIR assembly. Connect and tighten the liquid bleed line connection to the VIR assembly to a 5 to 7 Lbs. Ft. torque.

9. Remove the plug from the liquid line connection opening in the VIR assembly. Connect and tighten the liquid line connection to the VIR assembly to a 11 to 13 Lbs. Ft. torque.

10. Remove the plug from the suction line connection opening in the VIR assembly. Connect and tighten the suction line connection at the VIR assembly to a 28 to 33 Lbs. Ft. torque.

11. Evacuate, leak check and charge the system.

12. Reconnect the thermal limiter connector plug.

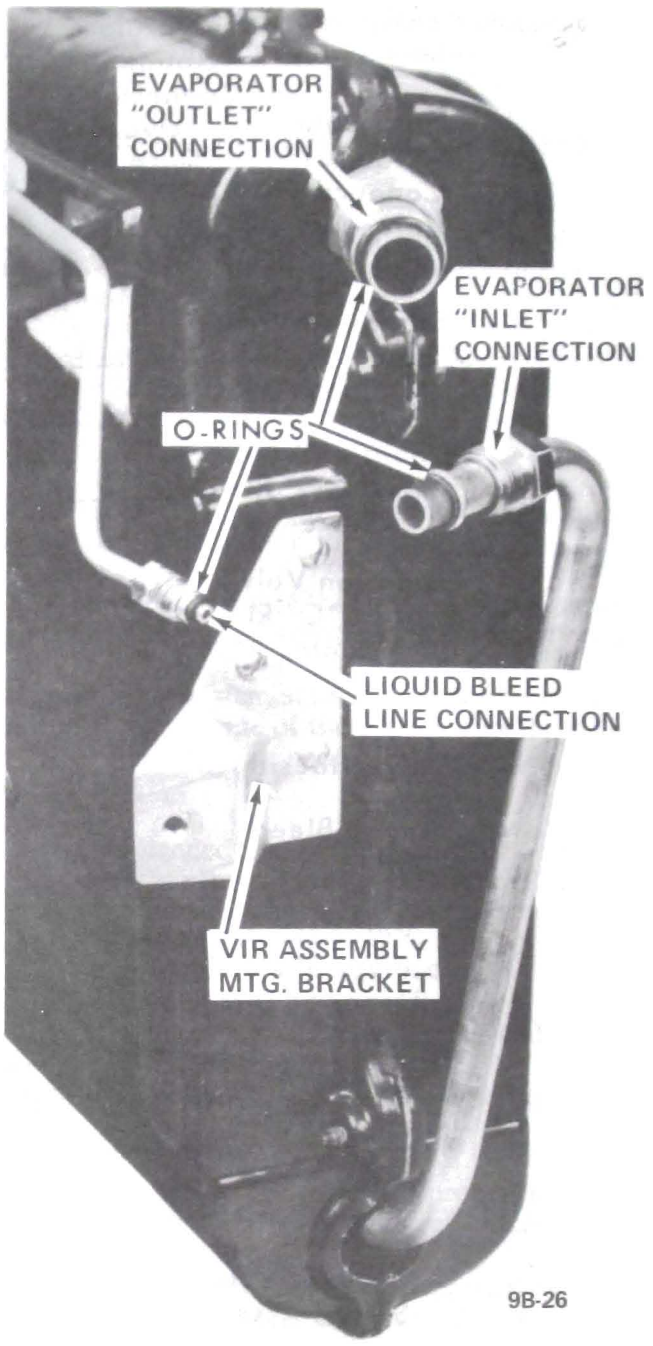


Figure 9B-30 Evaporator Connections to the VIR Assembly

DRIER DESICCANT - REMOVAL AND INSTALLATION

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging, clean the surface dirt from the exterior of the VIR assembly. Use an air hose to blow the area free of loose dirt.

2. When the system is completely discharged, loosen the screws that mount the receiver shell to the

VIR valve housing. Partially remove the screws approximately 3 turns.

WARNING: FOR PERSONAL SAFETY DO NOT REMOVE THE SCREWS ENTIRELY UNTIL STEP 5.

3. Remove the VIR mounting bracket from the receiver.

4. Hold the VIR valve housing and push on the lower end of the receiver to break the seal to the housing.

If the receiver sticks and is hard to cock to one side, use a flat blade screwdriver and carefully pry between the receiver mounting flange and the condenser line connection to free the receiver.

5. Remove the receiver mounting screws and remove the receiver by lowering it downward to clear the liquid pickup tube and filter screen. See Figure 9B-31.

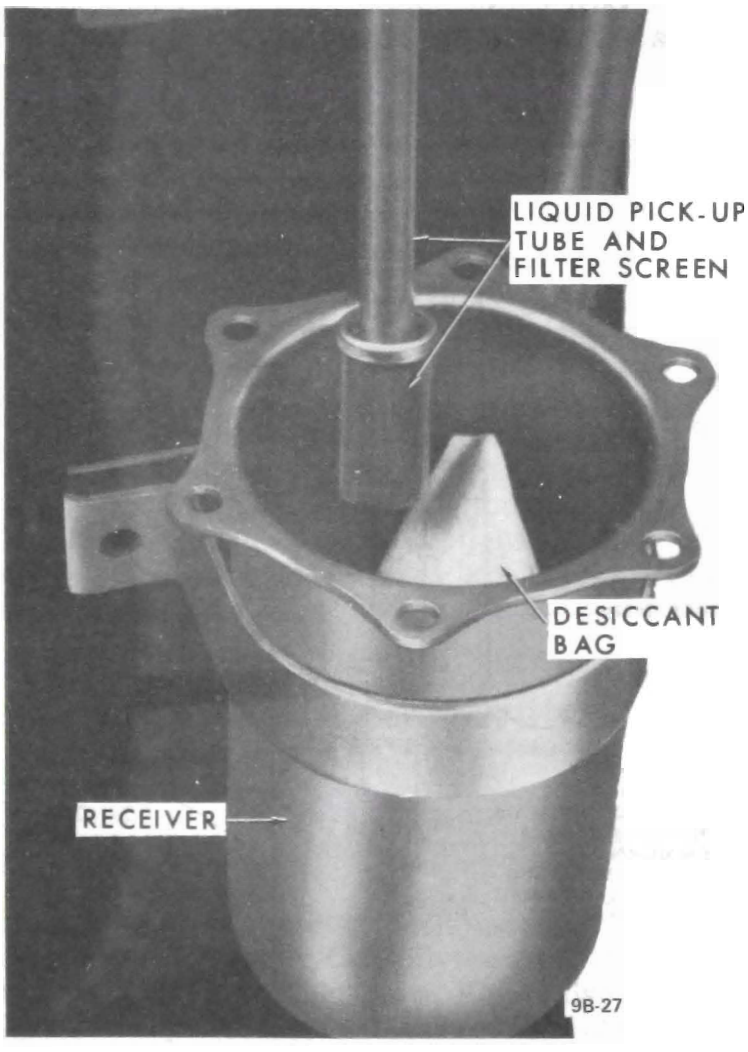


Figure 9B-31 Receiver Shell Removed for Access to Desiccant Bag

6. Discard the bag of old desiccant and the valve housing to receiver shell "O" ring (lower) and valve housing to receiver shell "O" ring (upper-square cut). Wash the liquid pickup tube filter screen and the interior of the receiver with clean solvent as required and blow dry with air.

7. Lubricate the new valve housing to receiver with clean refrigerant oil (525 Viscosity) shell "O" ring (lower) and valve housing to receiver shell "O" ring (upper-square cut) and install the "O" rings to the valve housing.

8. Add a film of oil at the inner top of the receiver to facilitate assembly. Reassemble the filter screen to the liquid pickup tube. Be sure the screen is all the way onto the tube.

9. Add one ounce of new refrigerant oil and a new bag of drier desiccant to the receiver and assemble the receiver to the valve housing. Tighten the receiver mounting screws to 10 Lbs. Ft. torque.

10. Reassemble the VIR mounting bracket to the receiver.

11. Evacuate, leak check and charge the system.

12. Reconnect the thermal limiter connector plug.

THERMOSTATIC EXPANSION (TX) VALVE CAPSULE - REMOVAL AND INSTALLATION

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging, clean the surface dirt from the upper exterior surface of the valve housing and the inlet connector shell assembly. Blow any loose dirt away with an air hose.

2. When the system is completely discharged (high and low sides) loosen the evaporator tube connection at the VIR inlet connector shell assembly.

3. Loosen and remove all the screws that mount the inlet connector shell assembly to the valve housing.

Slip the inlet connector shell assembly off the evaporator tube carefully to avoid damaging either the "O"ring sealing area of the valve housing or scratching the "O" ring sealing surface of the inlet connector shell assembly with the valve capsule retaining screws or the POA valve baffle. Discard both the evaporator outlet tube connection "O" ring. Place the inlet connector shell assembly in a location where the sealing surface of the flange will not be scratched or damaged.

4. Clean the top area of the valve housing of any dirt dislodged from the bottom flange of the inlet connector shell assembly during removal. Blow any loose dirt away with an air hose.

WARNING: BE CERTAIN THAT THE COMPLETE REFRIGERATION SYSTEM IS "TOTALLY DISCHARGED OF REFRIGERANT". ALL PRESSURE MUST BE RELEASED AND THE TX VALVE AND POA VALVE FREED IN THEIR CAVITIES BEFORE REMOVING THE CAPSULE RETAINING SCREW AND WASHER ASSEMBLY IN STEP 8. PERFORM STEPS 5 THROUGH 8 IN SEQUENCE AS FOLLOWS FOR PERSONAL SAFETY.

5. Loosen the TX valve and POA valve capsule retaining screws and remove one of the screw and washer assemblies entirely. See Figure 9B-32.

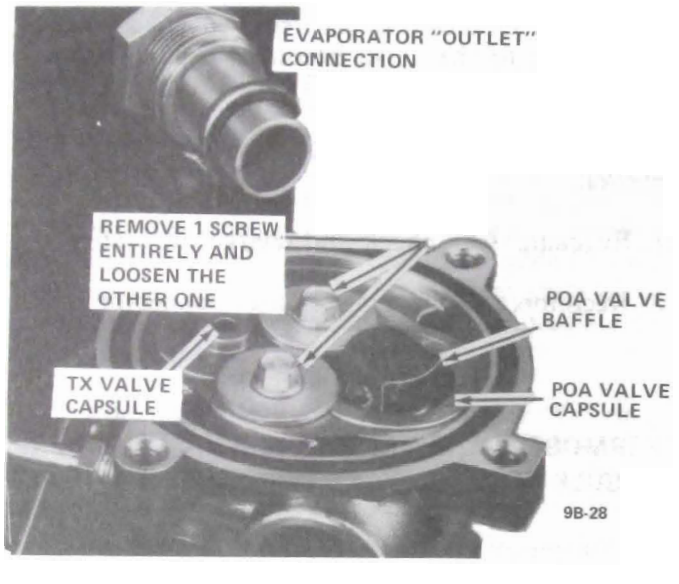


Figure 9B-32 VIR Assembly with Inlet Connector Shell Assembly Removed

6. Attach the TX valve removal tool J-24182-1 to the tapered groove projection on the diaphragm end of the TX valve. See Figure 9B-33.

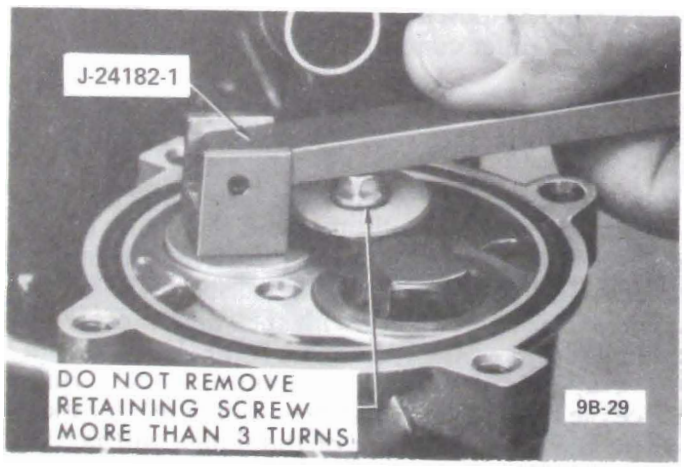


Figure 9B-33 Capsule Removal Tool Attached to TX Valve Capsule

7. Position the handle of the removal tool over the partially removed retaining screw and press down on the tool handle to lift and free the TX valve in its cavity. See Figure 9B-33.

WARNING: THE POA VALVE MUST BE FREED IN ITS CAVITY BEFORE REMOVING THE TX VALVE.

8. When the TX valve lifts free, remove the removal tool, the retaining screw and washer assembly and remove the TX valve capsule.

9. Using "O" ring removal tool J-9553, remove the "O" ring from the TX valve cavity. Wipe the TX valve cavity clean with a clean lint free cloth, if any residue is visible.

10. Lubricate the three TX valve "O" rings and TX valve cavity with clean refrigerant oil (525 viscosity).

11. Install the new TX valve "O" ring to the TX valve cavity. The center "O" ring seals between bottom of expansion valve capsule and casting cavity, not around equalizer groove. Carefully install the new TX valve capsule in the valve cavity and press into place by hand. See Figure 9B-34.

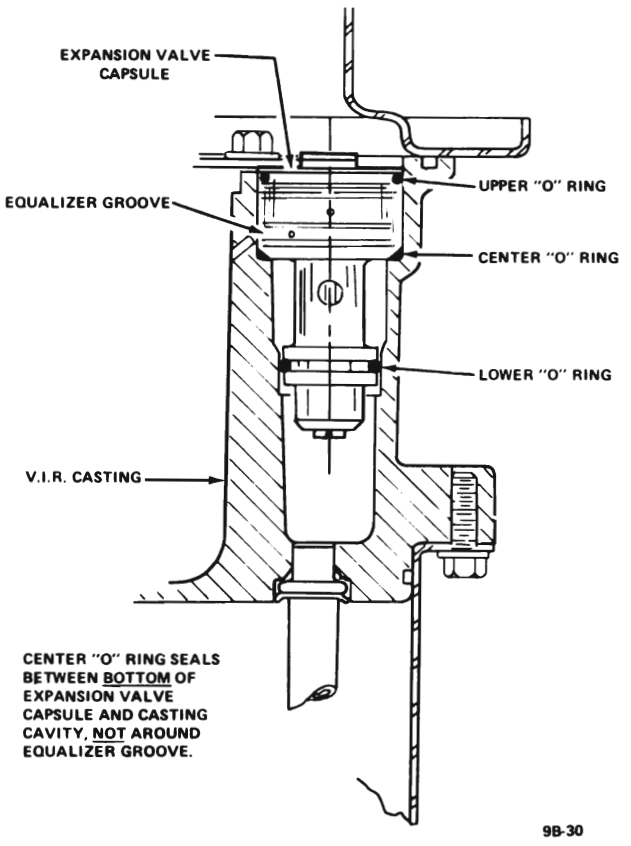


Figure 9B-34 Location of Upper and Lower "O" Rings on TX Valve

12. Reinstall the two valve retaining screw and washer assemblies and tighten to 5-7 Lbs. Ft. torque.

13. Clean the entire bottom flange surface of the inlet connector shell assembly to be free of all dirt. Inspect

the "O" ring sealing area of the flange for any scratches that could result in a leak.

14. Apply clean refrigerant oil to the new valve housing to inlet connector shell assembly "O" ring and the new evaporator outlet tube to VIR inlet connector shell assembly "O" ring. Carefully install the VIR inlet connector shell assembly onto the evaporator outlet tube and start the thread of the nut into the connector of the VIR inlet connector shell assembly but do not tighten.

Use care in moving the inlet connector shell assembly across the top of the VIR valve housing to prevent scratching the flange sealing surface.

15. Position the inlet connector shell assembly over the valve housing and install the mounting screws. Tighten the screws to 10 Lbs. Ft. torque.

16. Tighten the evaporator outlet tube connection nut at the VIR inlet connector shell assembly to 28 to 33 Lbs. Ft. torque.

17. Replace the desiccant bag. See "Drier Desiccant - REMOVAL AND INSTALLATION".

18. Evacuate leak check and charge the system.

19. Reconnect the thermal limiter connector plug.

POA Valve Capsule - Removal and Installation

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging clean the surface dirt from the upper exterior surface of the valve housing and inlet connector shell assembly. Blow any loose dirt away with an air hose.

2. When the system is completely discharged (high and low sides) loosen the evaporator tube connection at the VIR inlet connector shell assembly.

3. Loosen and remove all the screws that mount the inlet connector shell assembly to the valve housing.

Slip the inlet connector shell assembly off the evaporator outlet tube carefully to avoid damaging either the "O" ring sealing area of the valve housing or scratching the "O" ring sealing surface of the inlet connector shell assembly with the valve retaining screws or the POA valve baffle.

4. Place the inlet connector shell assembly in a location where the sealing surface of the flange will not be scratched or damaged. Discard both the evaporator outlet tube connection "O" ring and the inlet connector shell assembly to valve housing "O" ring.

5. Clean the top area of the valve housing of any dirt dislodged from the bottom flange of the inlet connector shell assembly during removal. Blow any loose dirt away with an air hose.

6. Loosen the TX valve and POA valve capsule retaining screw and washer assemblies and partially remove one of the screw and washer assembly 3 turns. Remove the other screw and washer assembly entirely. See Figure 9B-35.

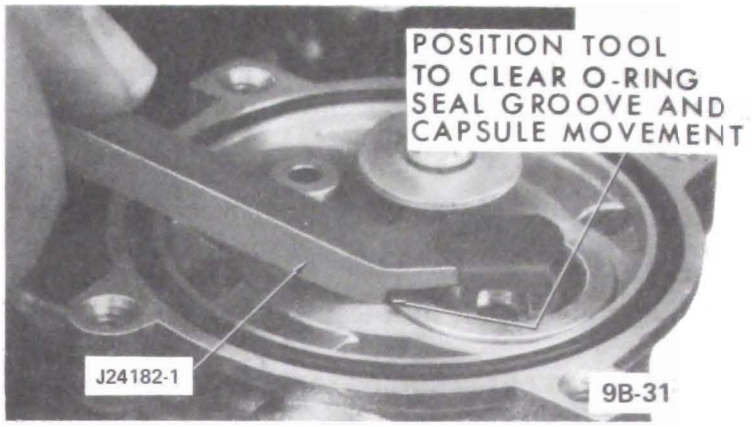


Figure 9B-35 Removing POA Valve Capsule with Removal Tool

WARNING: BE CERTAIN THAT THE COMPLETE REFRIGERATION SYSTEM IS "TOTALLY DISCHARGED OF REFRIGERANT". ALL PRESSURE MUST BE RELEASED AND THE POA VALVE AND TX VALVE FREED IN THEIR CAVITIES BEFORE REMOVING THE CAPSULE RETAINING SCREW AND WASHER ASSEMBLY IN STEP 9. FOR PERSONAL SAFETY AND TO ENSURE THAT THE PRESSURE IN THE RECEIVER AND INLET SIDE OF THE TX VALVE IS RELEASED, PERFORM STEPS 1 THROUGH 4 of "DRIER DISICCANT - REMOVE AND INSTALL" BEFORE REMOVING THE RETAINING SCREW AND WASHER ASSEMBLY.

7. Insert the POA valve capsule removal tool J24182-1 into the valve baffle of the POA valve, Figure 9B-35, so that the step edge of the tool clears the edge of the POA valve capsule.

Position the fulcrum heel of the removal tool away from the "O" ring sealing area to prevent damaging the "O" ring groove of the valve housing.

8. Keep the tool firmly engaged with the valve baffle while pressing down on the handle of the removal tool to free the POA valve capsule in the cavity.

WARNING: THE TX VALVE MUST BE FREED IN ITS CAVITY BEFORE REMOVING THE POA VALVE.

9. When the POA valve capsule breaks free, remove the removal tool, the retaining screw and washer assembly and remove the POA valve capsule.

10. Wipe the POA valve cavity and mounting flange recess clean, using a clean lint free cloth if residue is visible.

11. Lubricate the new POA valve capsule "O" ring and the POA valve cavity mounting flange recess area with clean refrigerant oil (525 Viscosity).

12. Install the new "O" ring on the new POA valve capsule and carefully install the POA valve capsule in the valve cavity. Press into place by hand.

13. Reinstall the two valve capsule retaining screw and washer assemblies and tighten to 5 to 7 Lbs. Ft. torque.

14. Clean the entire bottom flange surface of the inlet connector shell assembly to be free of all dirt. Inspect the "O" ring sealing area of the flange for any scratches that could result in a leak.

15. Apply clean refrigerant oil to the new valve housing to inlet connector shell assembly "O" ring and the new evaporator outlet tube to VIR inlet connector shell assembly "O" ring. Carefully install the VIR inlet connector shell assembly onto the evaporator outlet tube and start the thread of the nut into the connector of the VIR inlet connector shell assembly but do not tighten.

16. Position the inlet connector shell assembly over the valve housing and install the mounting screws. Tighten the screws to 10 Ft. torque.

17. Tighten the evaporator outlet tube connection nut at the VIR inlet connector shell assembly to 28 to 33 Lbs. Ft. torque.

18. Complete the "Drier Desiccant - Remove and Replace".

19. Evacuate, leak check and charge the system.

20. Reconnect the thermal limiter connector plug.

HOUSING VIR VALVE - REMOVAL AND INSTALLATION

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging, clean the surface dirt from the exterior of the VIR assembly, particularly in the area of the external connections. Use an air hose to blow the line connection areas free of any loose dirt.

2. When the system is completely discharged, loosen all line connections to the VIR assembly.

3. Remove the VIR assembly mounting bracket screw and carefully disconnect each line from the VIR and remove the VIR assembly. Plug or cap all refrigerant lines and openings to prevent entry of dirt and moisture to the evaporator, compressor and condenser lines. Discard all external connection "O" rings.

4. Remove the inlet connector shell assembly mounting screws and remove the inlet connector shell assembly. Discard the inlet connector shell assembly to valve housing "O" ring.

5. Remove one of the two valve capsule retaining screw and washer assemblies. Loosen the other screw and washer assembly and partially remove 3 turns.

6. Using Tool J24182-1, lift the TX valve capsule free in its cavity, Figure 9B-33.

7. Remove the remaining screw and washer assembly and the TX valve capsule. Remove and discard the three TX valve "O" rings (two from the TX valve capsule and one from the TX valve cavity in the valve housing).

8. Using Tool J24182-1, lift the POA valve capsule free in its cavity and remove the capsule, Figure 9B-35. Remove and discard the POA valve capsule "O" ring.

9. Remove the receiver shell mounting screws and remove the receiver shell. Discard the receiver shell to valve housing O-Ring (lower) and valve housing to receiver shell "O" Ring (upper square cut) and the desiccant bag. Clean the receiver shell and liquid pickup tube screen as required before reassembling.

10. Using a small screwdriver blade, or similar tool, raise each tang of the pickup tube retainer ring a little at a time, moving around the retainer in a circular manner until the retainer ring is free of the valve housing opening, Figure 9B-36.

11. Remove the pickup tube and discard the pickup tube retainer and O-Ring.

12. Reassemble the VIR using the new valve housing and all new O-Rings according to the following procedure.

The new valve housing contains the liquid bleed valve core and sight glass assembly. These parts are factory assembled into the housing and torqued in place. Check to be sure the new valve assembly is free of lint or dirt in all cavities and connections. Clean with solvent if necessary and blow dry with air.

13. Place the new valve housing upside down on a clean flat surface. Install a new O-Ring and pickup tube retainer on the pickup tube. Lubricate the O-Ring with clean 525 Viscosity oil.

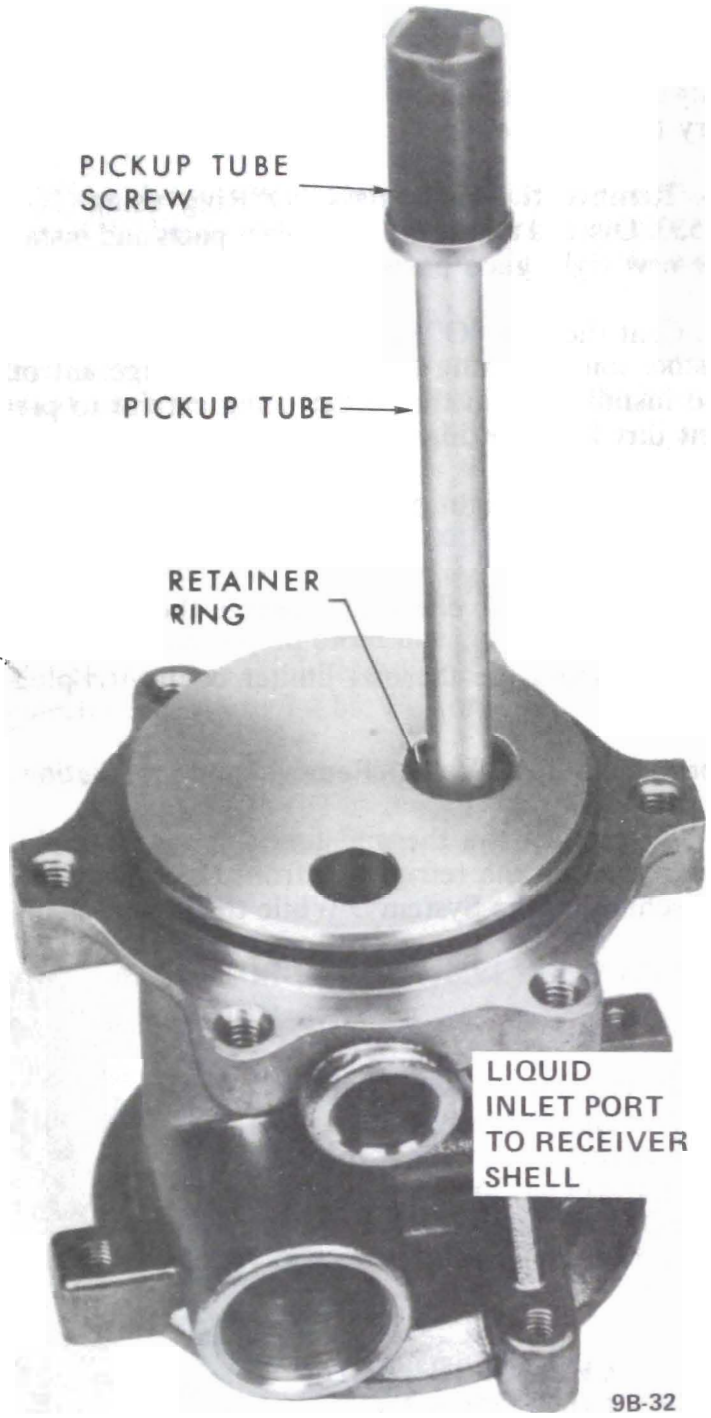


Figure 9B-36 Pick-Up Tube Assembly to Valve Housing

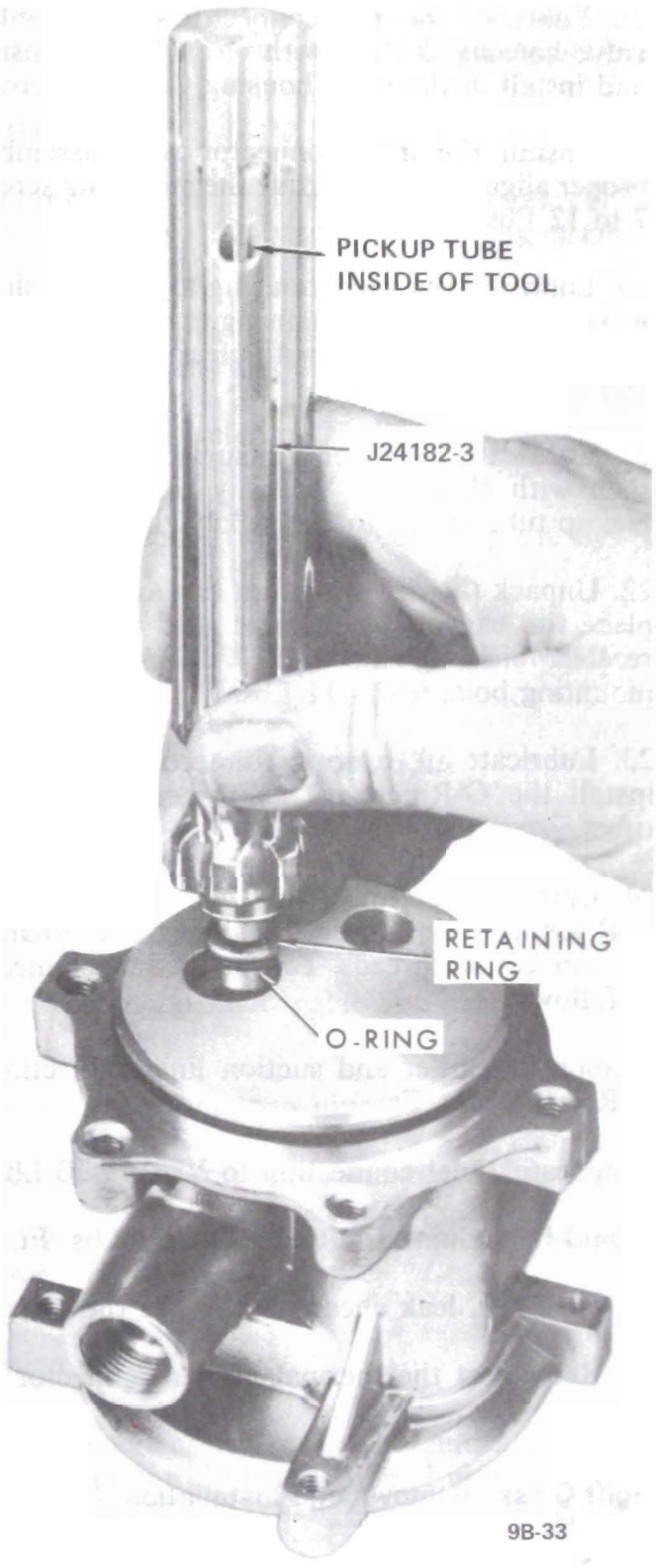


Figure 9B-37 Installing Pick-Up Tube with Retaining Ring Installing Tool

14. Using tool J24182-3, install the pickup tube into the valve housing. Be sure the tube is bottomed in the opening and the tool vertically in line before seating the tube retainer in place. Visually check the seating of the retainer ring tangs and that no tang fractured during the installation. See Figures 9B-36 and 9B-37.

15. Lubricate the top of the POA valve capsule cavity of the valve housing and the new POA valve capsule O-Ring with clean 525 Viscosity oil and install the POA valve in its cavity in the valve housing. Thumb or hand press into place.

16. Lubricate the TX valve cavity of the valve housing and the new TX valve capsule O-Rings with clean 525 Viscosity oil. Install the upper and lower O-Rings to the capsule and the center O-Ring in the TX valve capsule cavity of the valve housing. The center "O" Ring seals between the bottom of the expansion valve capsule and casting cavity, not around equalizer groove. See Figure 9B-34.

17. Install the TX valve capsule and thumb or hand press into place. Install both capsule retaining screw and washer assemblies and torque to 5 to 7 Lbs. Ft. torque.

18. Lubricate the inlet connector shell assembly to valve housing O-Ring with clean 525 Viscosity oil and install in the valve housing O-Ring groove.

19. Install the inlet connector shell assembly in proper alignment and torque the mounting screws to 7 to 12 Lbs. Ft. torque.

20. Lubricate the valve housing to receiver shell O-Ring (lower) and valve housing to receiver shell "O" ring (upper square cut) with clean 525 Viscosity oil and install the O rings.

21. Lubricate the inner top surface of the receiver shell with clean 525 Viscosity oil and install the pickup tube screen to the pickup tube.

22. Unpack the new desiccant bag and immediately place the bag in the receiver shell and install the receiver shell to the valve housing. Torque the mounting bolts to 7 - 12 Lbs. Ft. torque.

23. Lubricate all external connection O-Rings and install the O-Rings on the respective connection tubes.

24. Carefully reconnect the tubes and lines to the VIR assembly to prevent damaging the O-Rings or the connection threads. Torque the line connections as follows:

Evaporator outlet and suction line connections to VIR 28-33 Lbs. Ft.

Evaporator inlet connection to VIR 15-20 Lbs. Ft.

Liquid line connection to VIR 11-13 Lbs. Ft.

25. Evacuate, leak check and charge the system.

26. Reconnect the thermal limiter connector plug.

Sight Glass - Removal and Installation

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is being discharged, clean the surface dirt from the exterior of the valve housing in the vicinity of the sight glass. Use an air hose to blow the area free of loose dirt.

2. When the system is completely discharged remove the sight glass retaining nut by using a 7/16" male hex drive tool or allen wrench.

3. Hold a finger in the sight glass opening to lightly hold the glass. Slightly pressurize the system with refrigerant vapor to eject the glass and force it out of the opening. It may be necessary to shift the finger pressure from side to side to guide the glass out of the opening but only a very minimum of refrigerant pressure is necessary to expel the glass.

4. Remove the sight glass "O"Ring using Tool J9533. Discard all the old sight glass parts and install the new sight glass parts kit.

5. Coat the new "O"Ring, sight glass, nylon thrust washer and retaining nut with clean refrigerant oil and install them in that order being careful to prevent dirt from getting on the parts.

6. Tighten the sight glass nut to 20 to 25 Lbs. In. torque.

7. Evacuate, leak check and charge the system.

8. Reconnect the thermal limiter connector plug.

Core Liquid Bleed Valve - Removal and Installation

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is dis-

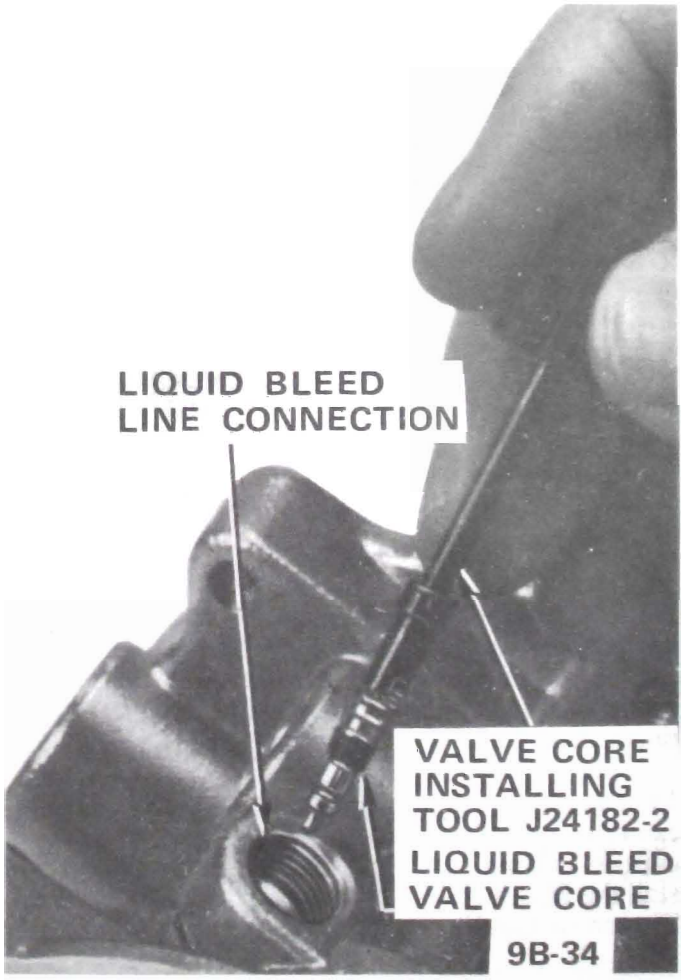


Figure 9B-38 Installing or Removing Liquid Bleed Valve Core with Tool J-24182-2

charging clean the surface dirt from the exterior of the VIR assembly in the area of the liquid bleed line connection. Use an air hose to blow the line connection area of any loose dirt.

2. When the system is completely discharged, disconnect the liquid bleed line, remove and replace the bleed valve core using tool J24182-2. Discard the old valve core. See Figure 9B-38.

When tightening the new valve core, turn the core inward until the core threads just start to tighten. Note the position of the tool and rotate the tool an additional travel of 180 degrees to approximate a setting of 24-36 ounce inches of torque. The proper valve core is 6551178 and is different from the evaporator gage core.

3. Install a new liquid bleed line connector O-Ring and reconnect the liquid bleed line. Torque the line connection to a 5 to 7 Lbs. Ft. torque.

4. Evacuate, leak check and charge the system.

5. Reconnect the thermal limiter connector plug.

CORE EVAPORATOR GAUGE VALVE - REMOVAL AND INSTALLATION

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging, clean the surface dirt from the exterior of the VIR assembly in the area of the Evaporator Gage connector. Use an air hose to blow the area free of any loose dirt.

2. When the system is completely discharged, disconnect the gage line from the connector. Remove and replace the valve core using tool J24182-2. Discard the old valve core.

When tightening the valve core, turn the core inward until the core threads just start to tighten. Note the position of the tool and rotate the tool an additional travel of 180 degrees to approximate a setting of 24-36 ounce inches of torque. The proper valve core is 1138041 and is different from the liquid bleed core.

3. Evacuate leak check and charge the system.

4. Reconnect the thermal limiter connector plug.

REMOVAL AND INSTALLATION OF MUFFLER

Removal

1. Discharge system (refer to "Discharging the System").

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

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 "Flushing the System". Install a new receiver-dehydrator in system.

2. Charge the system (refer to "Charging the System").

REMOVAL AND INSTALLATION OF CONDENSER X- SERIES

Removal

1. Disconnect thermal limiter and discharge system (refer to "Discharging the System").

2. Remove right and left front end panel fillers.

3. Disconnect hood latch cable and remove hood latch.

4. Remove upper radiator support.

5. Disconnect refrigerant lines and cap all openings.

6. Remove condenser attaching screws and remove condenser.

Installation

1. Install the condenser in 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 "Flushing the System").

2. Charge system (refer to "Charging the System").

3. Connect the thermal limiter.

REMOVAL AND INSTALLATION OF CONDENSER ASSEMBLY B-C-E SERIES

1. Discharge the system (refer to "Discharging the System").

2. While the system is discharging remove the upper radiator mounting screws and panel.

3. Remove the upper condenser mounting bolts and bracket on each side of the upper tie bar so that the refrigerant pipes on the condenser will clear the upper tie bar when removing the condenser.

4. Disconnect the inlet and outlet pipes and tape closed the open ends; also tape closed the open ends of the refrigerant lines. Remove the condenser.

5. Install the condenser in reverse of the removal procedure using new O-rings during installation. Lubricate O-rings prior to instllation, using No. 525 Viscosity Refrigerant Oil.

If the refrigerant hoses or the condenser has been exposed to the atmosphere and moisture may be present, the desiccant bag should be changed and the system and/or condenser flushed prior to installation (refer to "Flushing the System").

6. Charge the system (refer to "Charging the System").

REMOVAL AND INSTALLATION OF RECEIVER - DEHYDRATOR - X SERIES

Removal

1. Disconnect thermal limiter and discharge the system (ref. to "Discharging the System").

2. Disconnect battery cables and remove the battery.

3. Remove the receiver mounting bracket screws.

4. Disconnect receiver inlet and outlet fittings and remove receiver-dehydrator assembly.

5. Separate receiver-dehydrator from brackets.

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 system (refer to "Charging the System").

REMOVAL AND INSTALLATION EXPANSION VALVE - X SERIES

Removal

1. Disconnect thermal limiter connector and depressurize system.

2. Loosen retaining clamp screws and remove thermo bulb from insulation at evaporator outlet.

3. Disconnect equalizer line at POA valve.

4. Disconnect inlet and outlet fittings and remove valve.

5. If valve is not immediately replaced, cap openings to prevent entry of dirt and moisture.

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 "Flushing the System").

2. Charge system (refer to "Charging the System") connect thermal limiter.

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.

REMOVAL AND INSTALLATION OF EVAPORATOR - X SERIES

1. Disconnect thermal limiter and depressurize refrigerant system.

2. Disconnect oil bleed line and equalizer line at POA valve.

3. Disconnect evaporator outlet fitting at POA valve and evaporator inlet fitting at expansion valve and cap all openings.

4. Remove thermo bulb from evaporator outlet line.

5. Disconnect all electrical connections at evaporator case.

6. Remove all screws and nuts retaining left half of evaporator case to right half of case and to dash.

7. Disconnect and remove expansion valve.

8. Pull left half of evaporator case outward and upward from core, being careful not to damage core.

9. Remove core retaining screws and remove core.

10. Add three fluid ounces of clean refrigerant oil to new core.

11. Replace core by reversing steps 1 through 9. Use new O-ring seals coated with clean refrigerant oil.

12. Evacuate, leak check and charge refrigerant system. Connect thermal limiter.

REMOVAL AND INSTALLATION OF EVAPORATOR A-B-C-E SERIES

Removal

(A Series)

1. Discharge the refrigerant from the system. (ref to "Discharging The System").

2. Disconnect the battery.

3. Disconnect all evaporator-blower case attaching wiring including the blower motor ground wire to dash. See Figure 9B- .

4. Remove V.I.R. assembly (refer to V.I.R. assembly remove and replace).

5. Remove all the attaching screws and stamped nuts from the evaporator-blower case. See Figure 9B- .

6. Remove the evaporator-blower assembly from the engine compartment.

7. Remove the screws that secure the evaporator-blower assembly halves together and remove the evaporator.

8. Tape closed all refrigerant line openings.

9. Reverse the removal procedures to install using new "O" rings on line fittings.

10. Evacuate, charge and leak test system.

(B-C-E Series)

1. Discharge refrigerant from system (refer to "Discharging the System").

2. Disconnect blower motor, resistor and ambient switch electrical connectors.

3. Remove V.I.R. Assembly (refer to V.I.R. Assembly - Remove and Replace).

4. Loosen the bolts holding the case to the bulkhead so the case can be rotated to clear the studs through the bulkhead.

5. Remove the screws securing the 2 sections of the case and remove the inboard half.

6. Remove the evaporator core.

7. Tape closed all refrigerant line openings.

Installation

(ALL SERIES)

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

2. Evacuate, charge and leak test system.

REMOVAL AND INSTALLATION OF POA VALVE - X SERIES

Removal

1. Disconnect thermal limiter and depressurize system.

2. Disconnect oil bleed fitting.

3. Disconnect equalizer fitting.

4. Disconnect inlet and outlet fittings.

5. Remove valve from bracket. If valve is not immediately replaced, cap openings to prevent entry of dirt and moisture.

6. Replace by reversing above procedure, using new O-ring seals coated with clean refrigerant oil.

7. Evacuate, leak check and charge refrigerant system. Connect limiter.

REMOVAL AND INSTALLATION OF SUPERHEAT SWITCH

Removal

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

2. After the system is discharged, remove the superheat switch retainer ring, Figure 9B-40, using Tool J-5403.

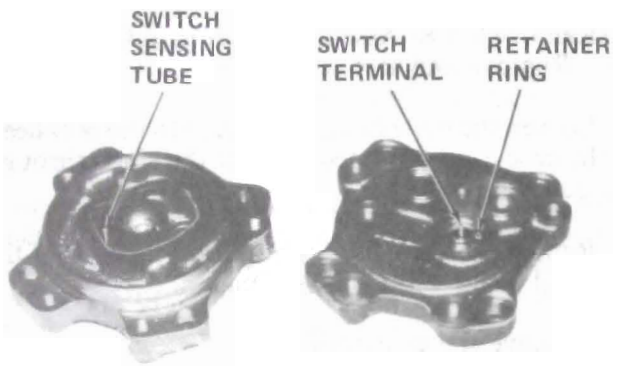


Figure 9B-40 Superheat Shutoff Switch Installed in Rear Head

3. Remove the superheat switch from the rear head by pulling at the terminal housing groove with seal seat remover and installer (J-9392).

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.

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-9392) 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 9B-22.

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 9B-6.

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.

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.

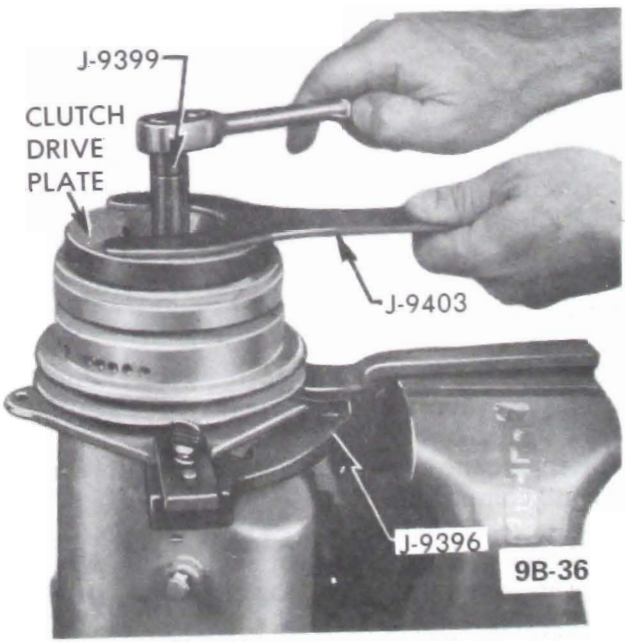


Figure 9B-41 Removing or Installing Shaft Nut

Disassembly

1. Firmly clamp holding fixture (J-9396) in a vise and attach compressor assembly to fixture (see Figure 9B-41).

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 9B-42). Hold body of hub puller with wrench, tighten center screw of hub puller, and lift off clutch drive plate and woodruff key.

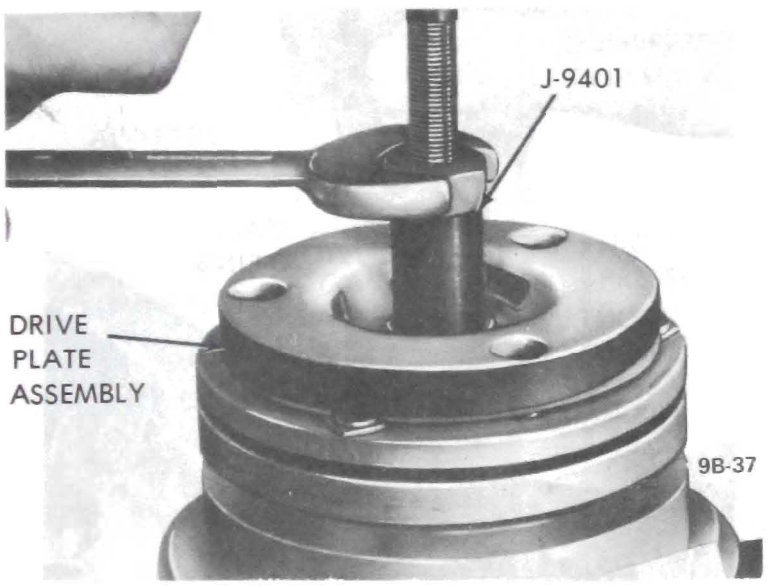


Figure 9B-42 Removing Clutch Drive Plate

4. Using No. 21 Truarc pliers (J-5403) take out retainer ring from hub of clutch drive plate (see Figure 9B-43). Lift out spacer.

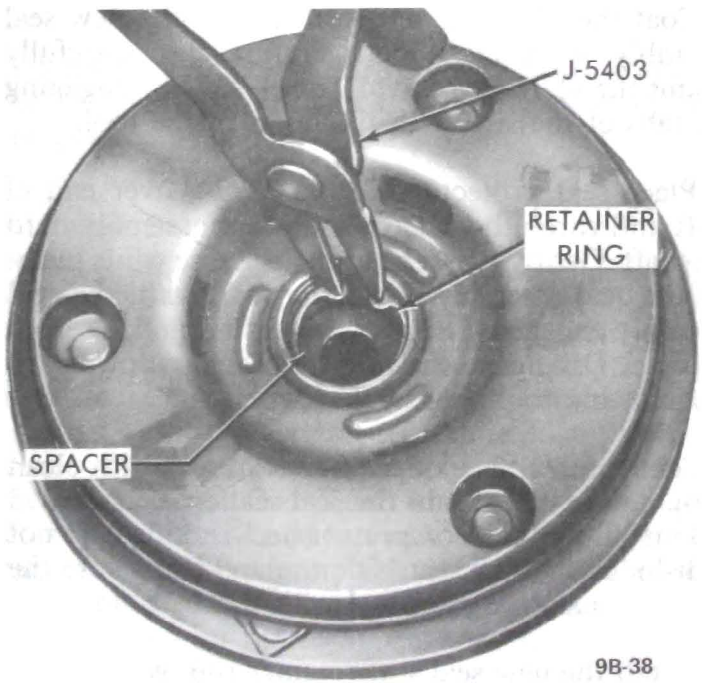


Figure 9B-43 - Removing or Installing Retainer Ring in Clutch Drive Plate

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 9B-44).

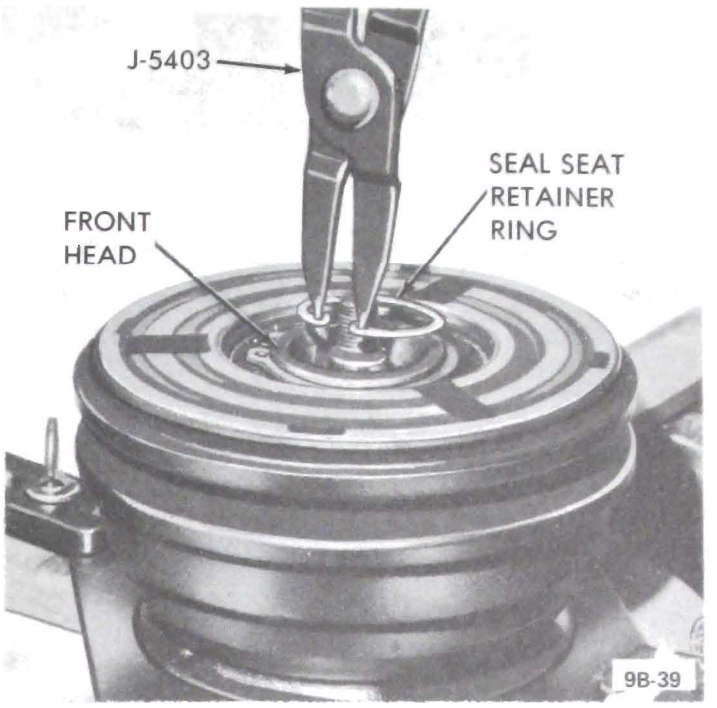


Figure 9B-44 Removing or Installing Shaft Seal Seat Retaining Ring

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.

7. Remove the seal seat (see Figure 9B-46) using Tool J-23128. Insert Tool J-23128 into seal seat and tighten, using a twisting motion remove the seal seat.

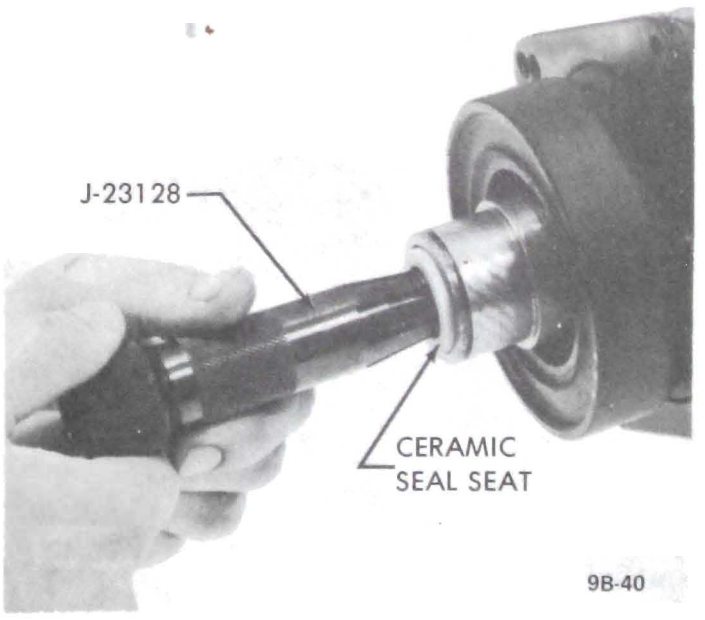


Figure 9B-46 Removing or Installing Ceramic Shaft Seal Seat

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 9B-47).

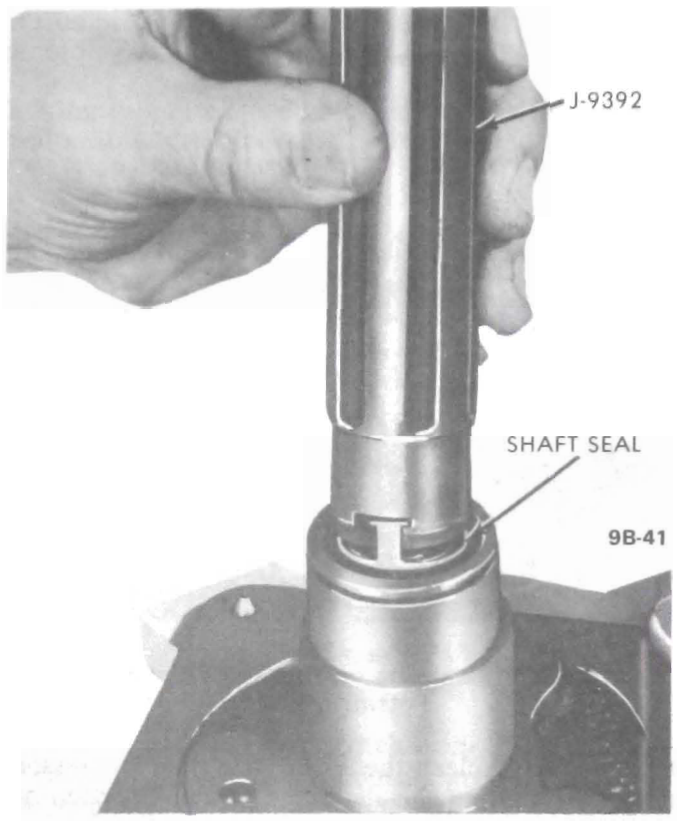


Figure 9B-47 Removing or Installing Shaft Seal

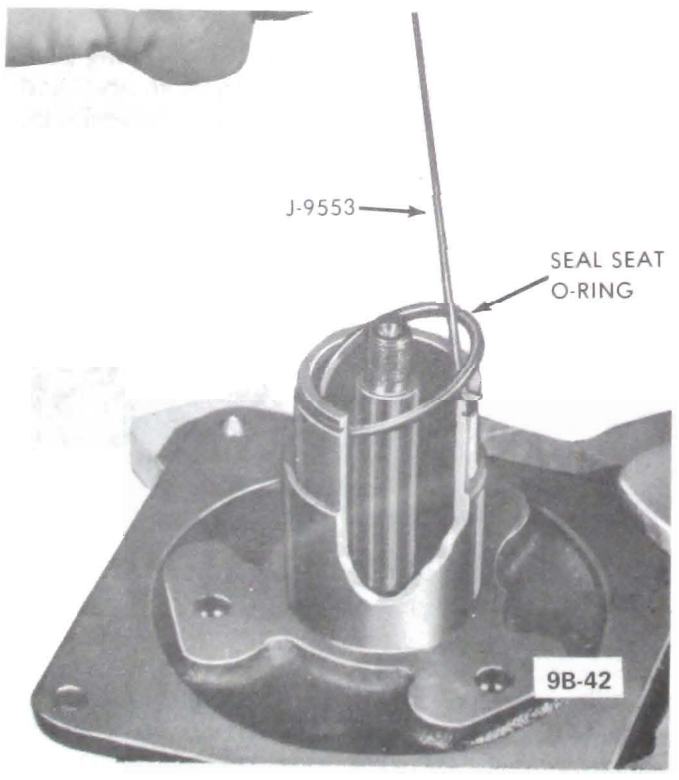


Figure 9B-48 Removing Seal Seat O Ring

9. Remove the seal seat "O" ring, using Tool J- 9553 (see Figure 9B-48).

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

Reassembly

1. Coat the new seal seat "O" ring with clean refrigeration oil and install it in its groove in the compressor neck. Tool J-21508 may be used to accomplish this (see Figure 9B-50).

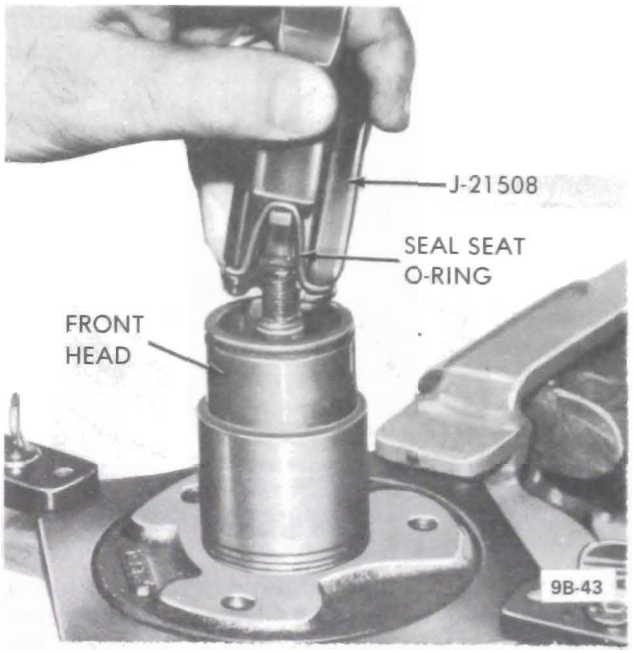


Figure 9B-50 Installing Seal Seat O Ring

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 9B-51. 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.

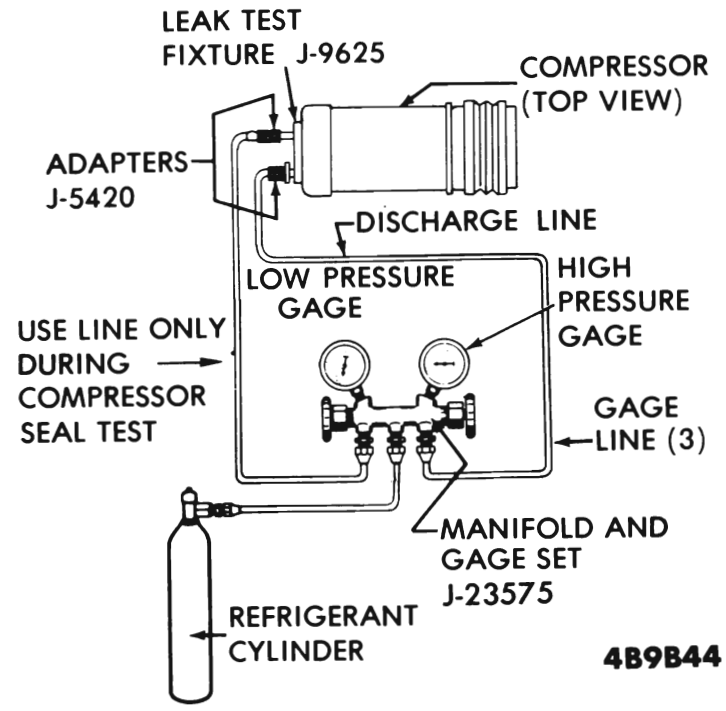


Figure 9B-51 Leak Testing Shaft Seal and Seal Seat O Ring

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 9B-52) and position clutch drive plate onto shaft.

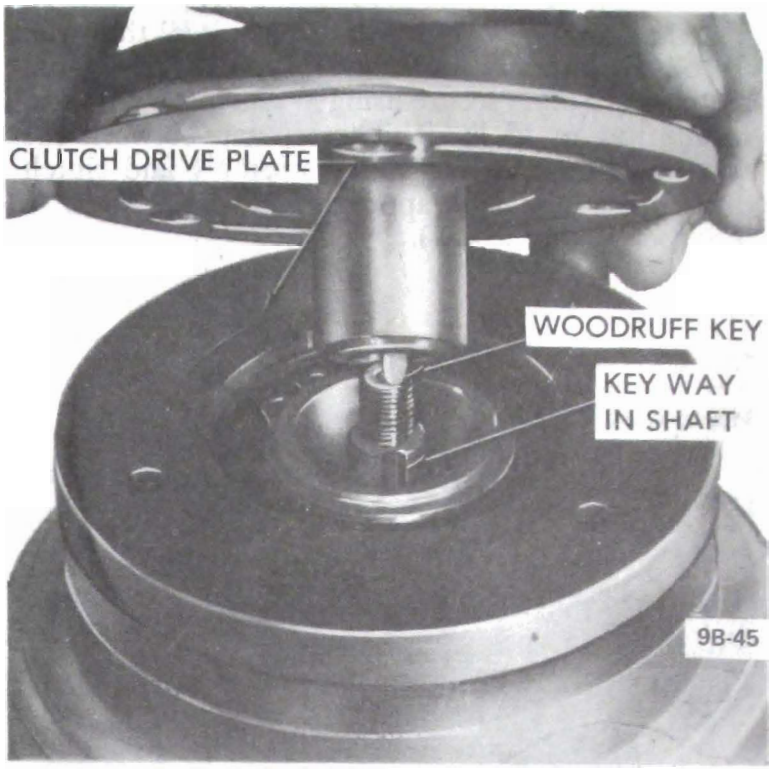


Figure 9B-52 Positioning Clutch Drive Plate on Shaft

10. Using drive plate installer (J-9480), screw installer on end of shaft as shown in Figure 9B-53. Hold nut and turn bolt until clutch drive plate is pressed within 3/32 inch of the pulley assembly.

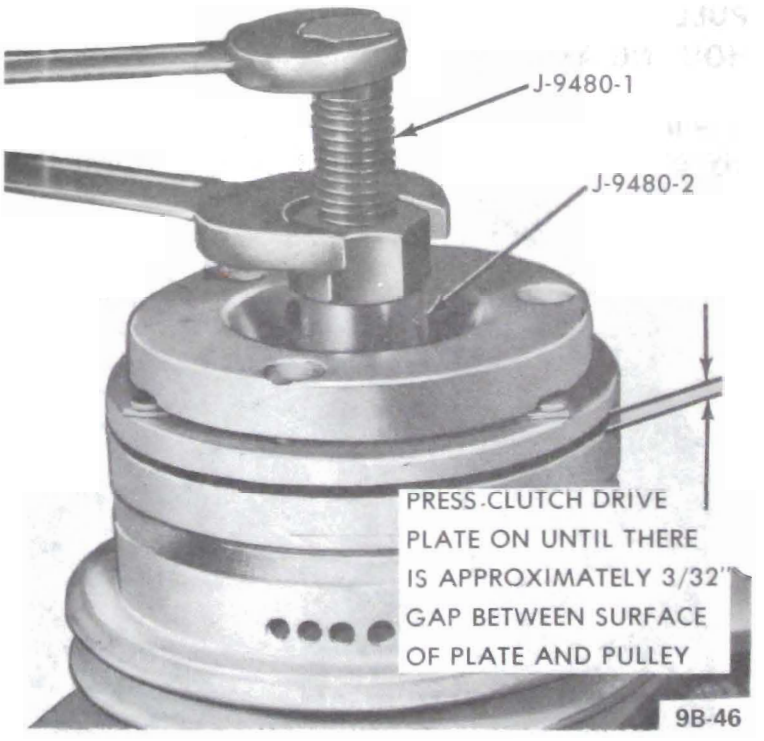


Figure 9B-53 Installing Clutch Drive Plate

11. Reassemble spacer into hub of clutch drive plate.

12. Reassemble retainer ring into hub of clutch drive

plate (see Figure 9B-43) 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 9B-54).

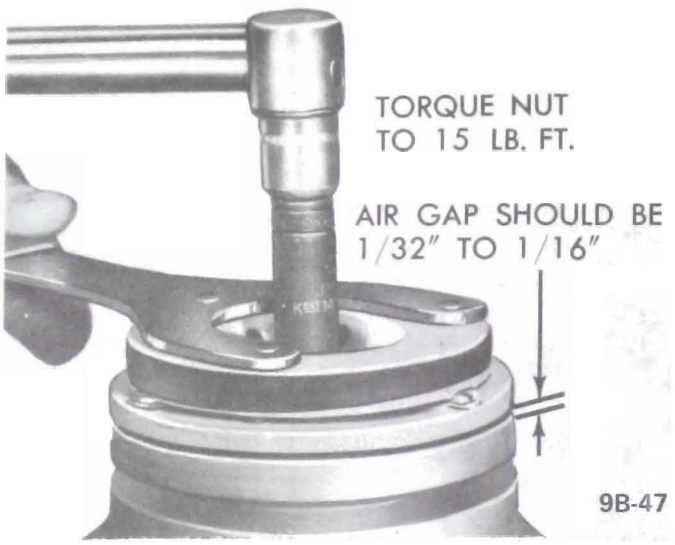


Figure 9B-54 Torquing Shaft Nut

DISASSEMBLY AND REASSEMBLY OF PULLEY ASSEMBLY, 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.

Disassembly

1. Disassemble clutch drive plate (ref. to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal").

2. Using No. 26 Truarc pliers (J-6435) remove bearing to head retainer ring (see Figure 9B-55).

3. Place puller pilot (J-9395) on hub of front head and take off pulley assembly (see Figure 9B-56), using pulley puller (J-8433).

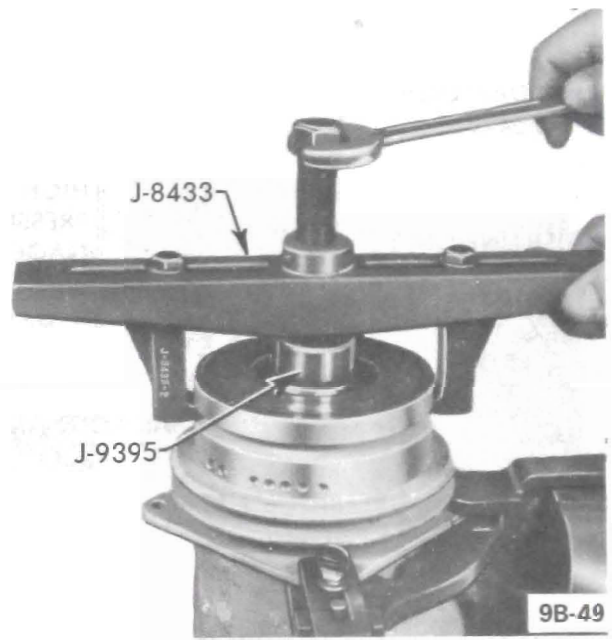


Figure 9B-56 Removing Pulley Assembly

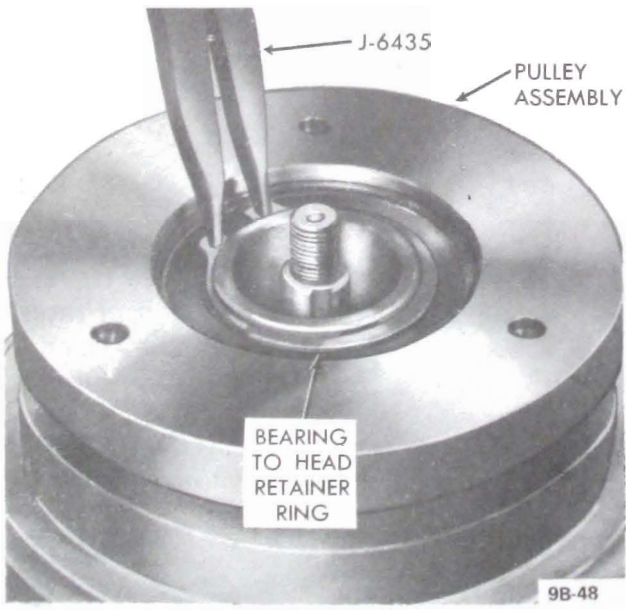


Figure 9B-55 Removing or Installing Bearing to Head Retainer Ring

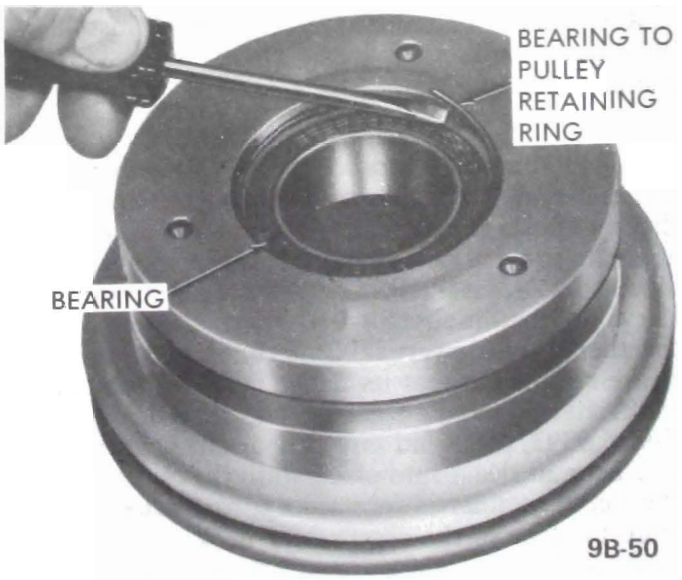


Figure 9B-57 Removing Pulley Bearing Retainer

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 9B-57).

5. Drive out bearing (see Figure 9B-58) by use of puller Pilot (J-9398) and Handle (J-8092).

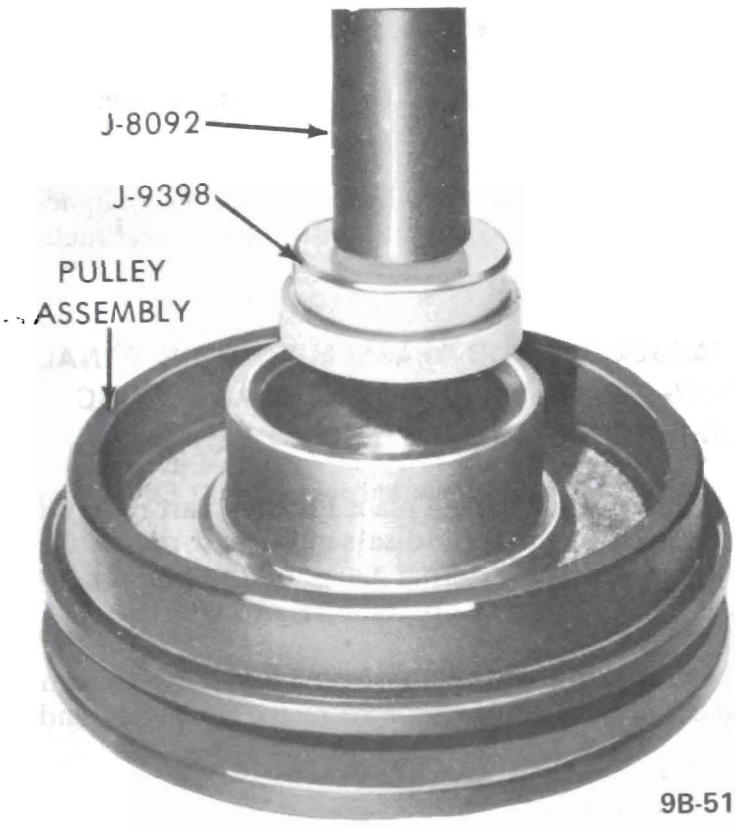


Figure 9B-58 Removing Bearing from Pulley Assembly

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 9B-60) using No. 26 truarc pliers (J-6435), and lift out coil and housing assembly.

Reassembly

1. Reassemble coil and housing assembly reverse of disassembly.

2. Drive new bearing into pulley assembly (see Figure 9B-61) with installer (J-9481) and handle (J-8092).

3. Lock bearing in position with bearing to pulley retainer ring (see Figure 9B-57).

4. Drive pulley assembly onto hub of front head (see Figure 9B-62) using installer (J-9481) and handle (J-8092).

Figure 9B-60 Removing or Installing Coil and Housing Retainer Ring

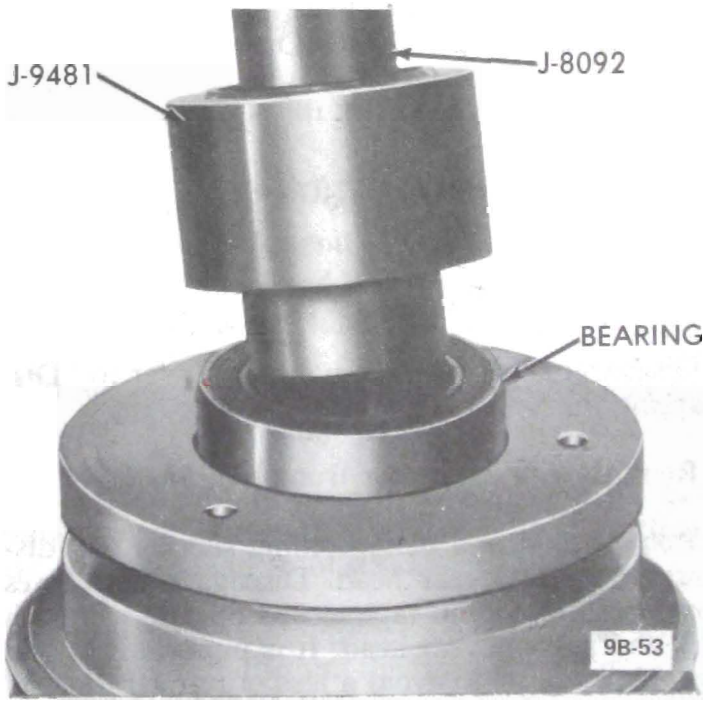


Figure 9B-61 Installing Bearing into Pulley Assembly

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 9B-55.

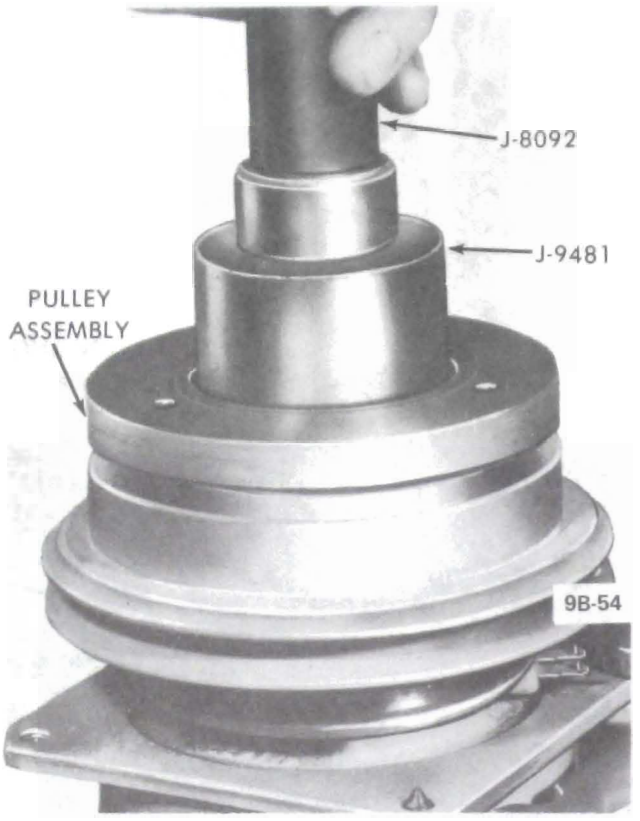


Figure 9B-62 Installing Pulley Assembly

6. Reassemble clutch drive plate (refer to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal").

REMOVAL AND INSTALLATION OF COMPRESSOR

Removal

1. Discharge refrigerant from system (refer to "Discharging the System").

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.

Installation

1. Installation is reverse of removal. Torque bolts as specified in "SPECIFICATIONS". 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 "Charging the System").

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

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.

Disassembly of Rear Head, Oil Pump, Rear 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. to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal").

2. Disassemble pulley assembly, and coil and housing assembly (ref. "Disassembly and Reassembly of Pulley Assembly, and Coil and Housing Assembly ").

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 9B-63.

6. Unscrew and discard four lock nuts from rear of compressor, and lift off rear head by tapping it with

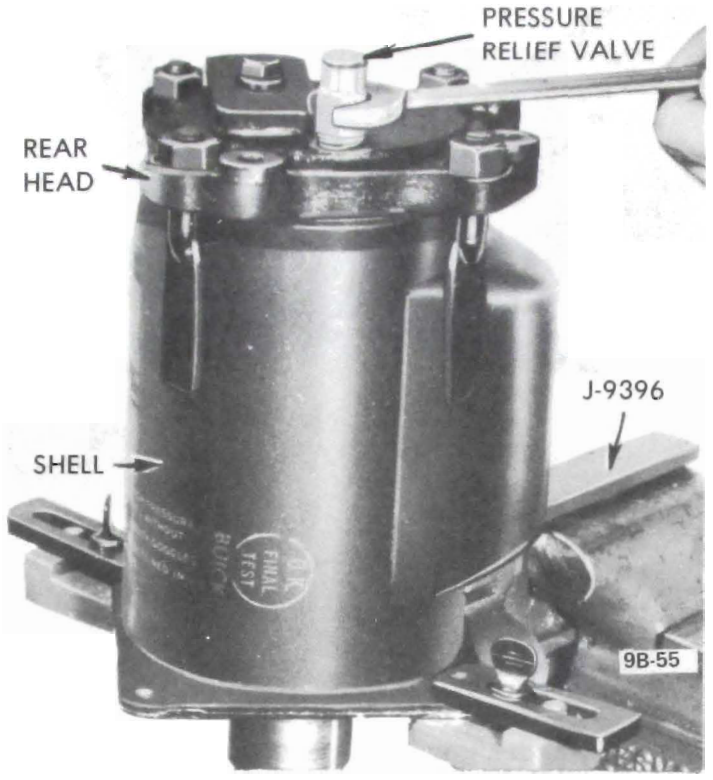


Figure 9B-63 Compressor Installed in Holding Fixture

a mallet. If sealing surface is damaged (see Figure 9B-64), replace rear head. Clean or replace suction screen as necessary.

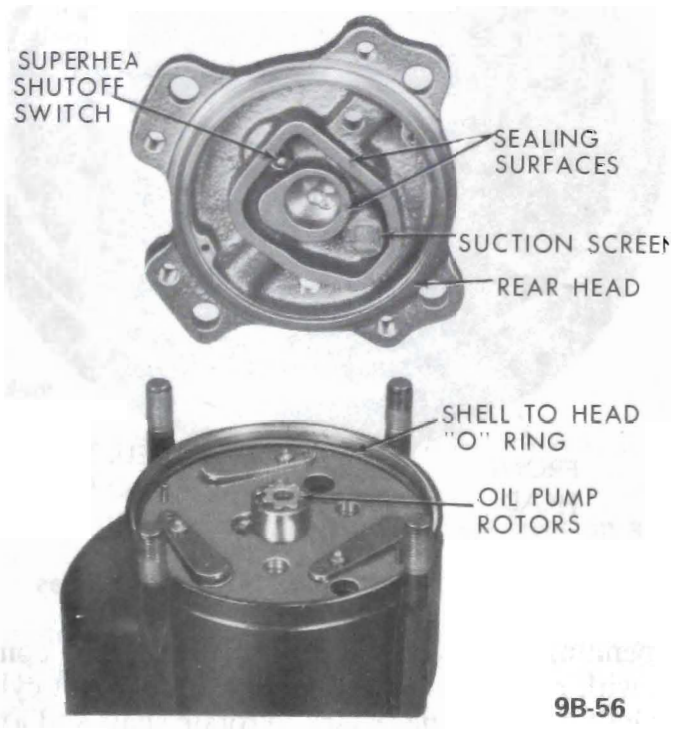


Figure 9B-64 Rear Head Removal

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.

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 9B-65 and 9B-66). Check both pieces and replace as necessary.

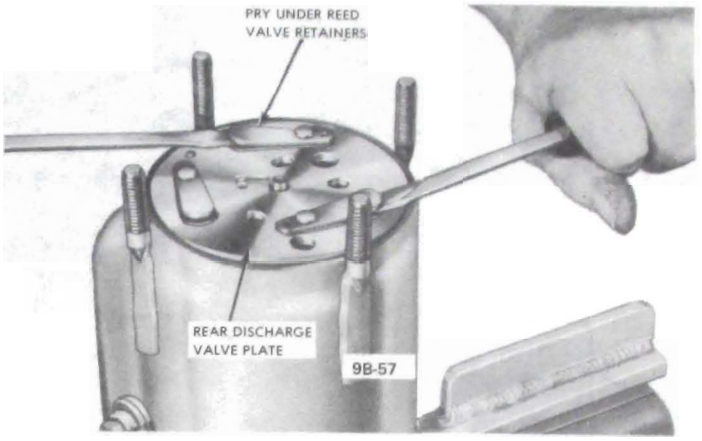


Figure 9B-65 Removing Rear Discharge Valve Plate

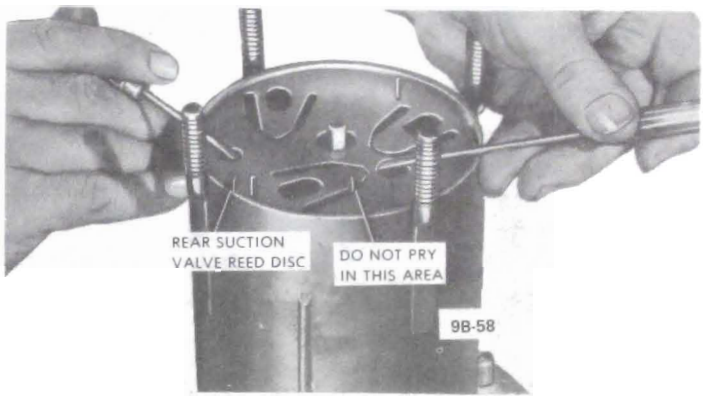


Figure 9B-66 Removing Rear Suction Valve Reed Disc

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

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 9B-67) and oil inlet tube "O" ring using Remover (J-6586).

2. Push shaft upward from front head and lift out cylinder assembly (see Figure 9B-68), 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

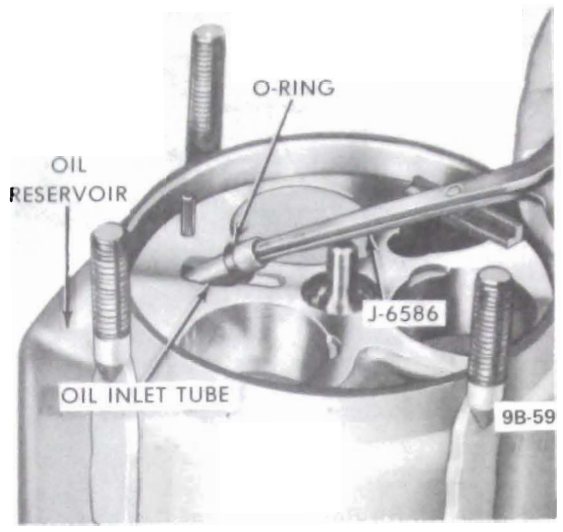


Figure 9B-67 Removing Oil Inlet Tube

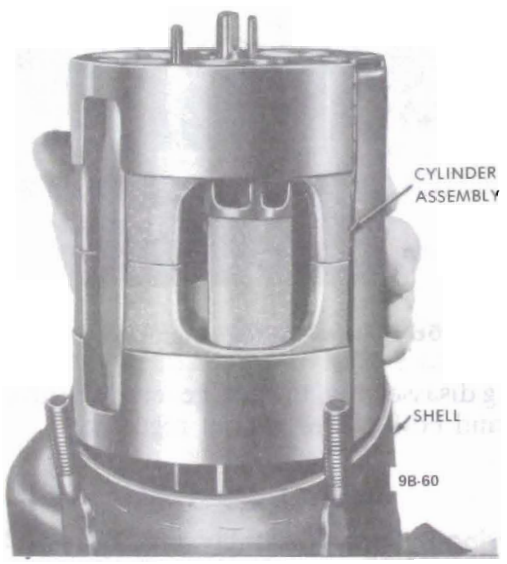


Figure 9B-68 Removing Internal Cylinder Assembly

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 9B-70). Discard "O" ring.

If sealing surfaces of front head (see Figure 9B- 71) are damaged, replace front head.

Disassembly of Cylinder Assembly

1. Pry off suction pass cover using screwdriver (see Figure 9B-72).

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 9B-73), 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.

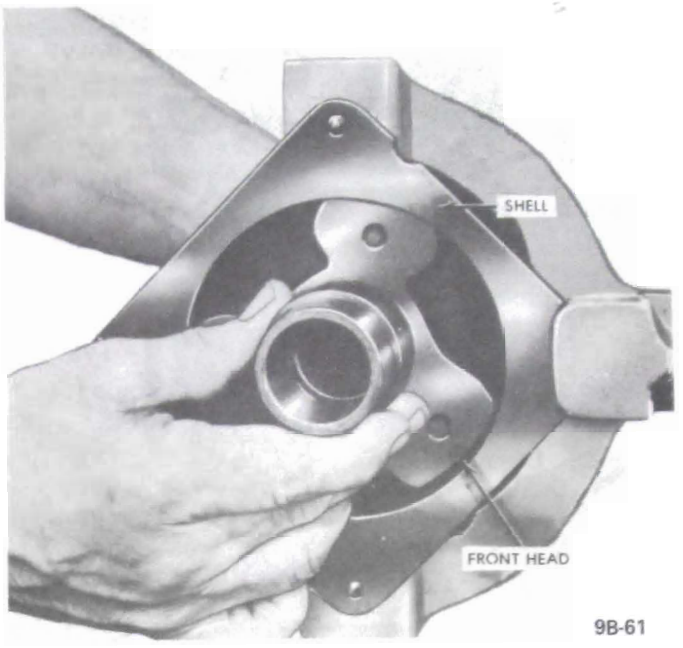


Figure 9B-70 Removing Front Head

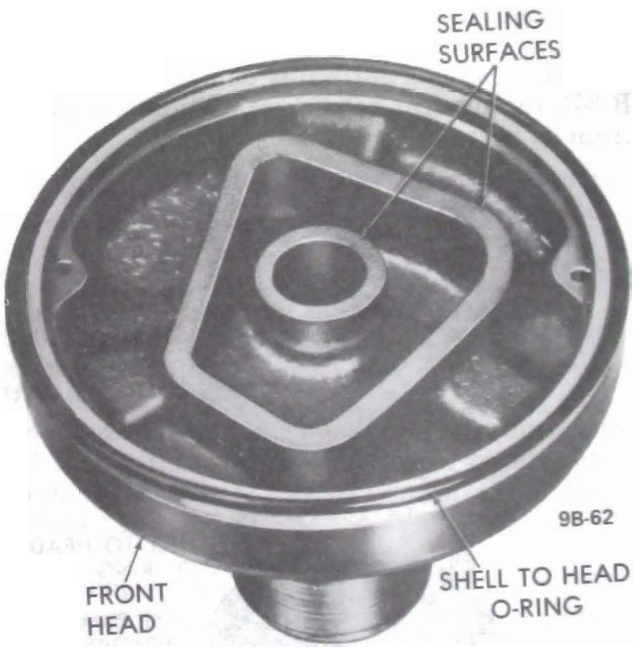


Figure 9B-71 Front Head Sealing Surfaces

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 axial plate assembly (using 9/16 inch opened wrench on shaft seal portion of shaft) to achieve necessary clearance.

4. Carefully disassemble from cylinder assembly (see Figure 9B-74) 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 axial plate until piston is at highest point, raise axial plate approximately 1/2 inch and lift out piston and related parts one at a time. Dis-

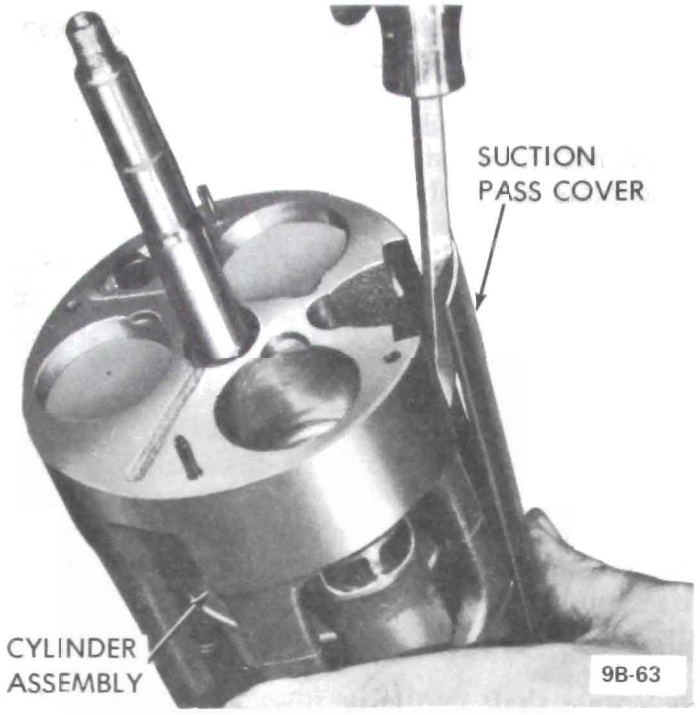


Figure 9B-72 Removing Suction Pass Cover

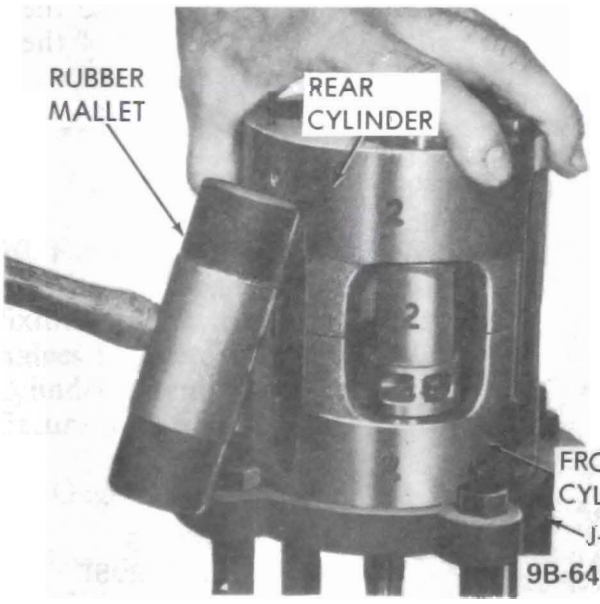


Figure 9B-73 Separating Cylinder Halves

card 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 9B-75).

5. Lift out shaft and axial plate assembly and front needle thrust bearing races. Discard front needle thrust bearing and races.

Examine shaft and axial 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.

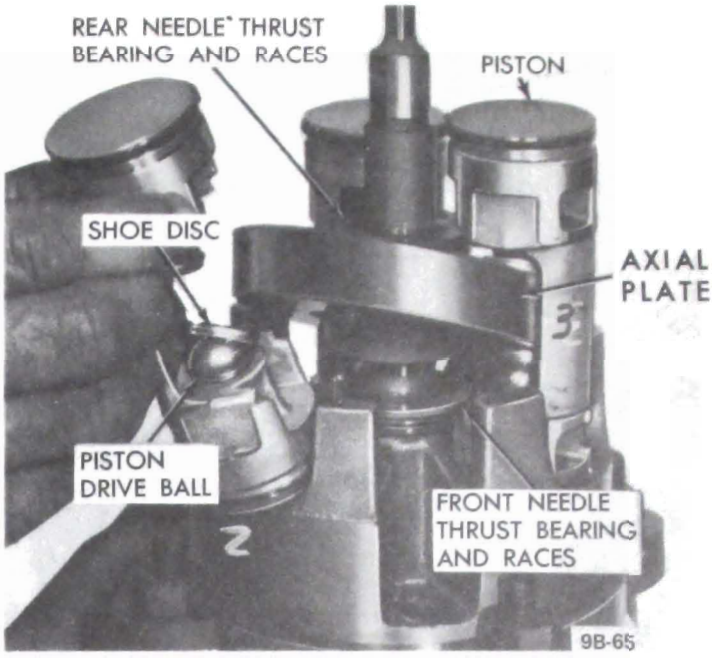


Figure 9B-74 Disassembly of Cylinder Assembly

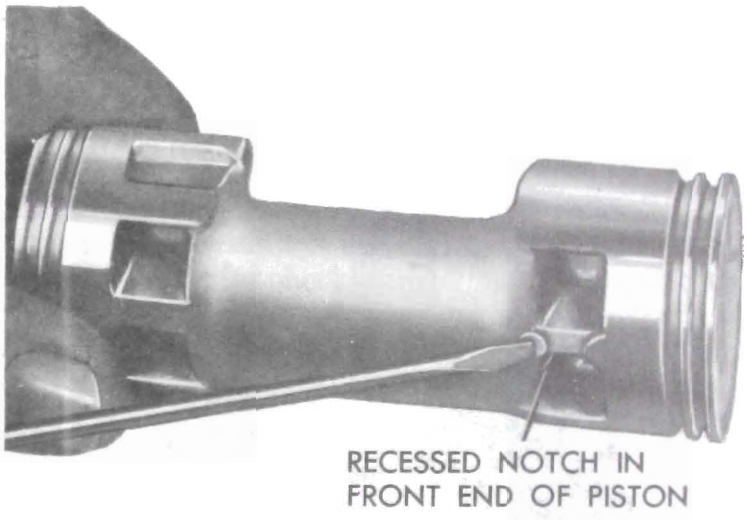


Figure 9B-75 Piston Identification

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 9B-76.

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 9B-77.

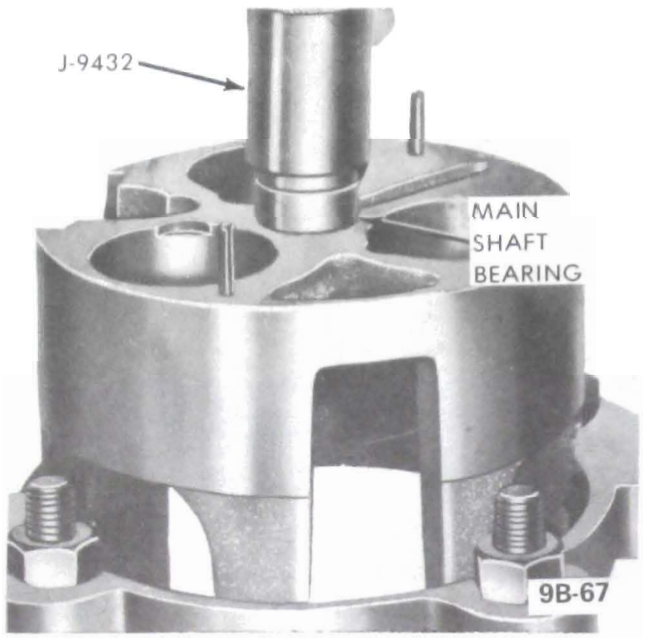


Figure 9B-76 Installing Main Shaft Bearing

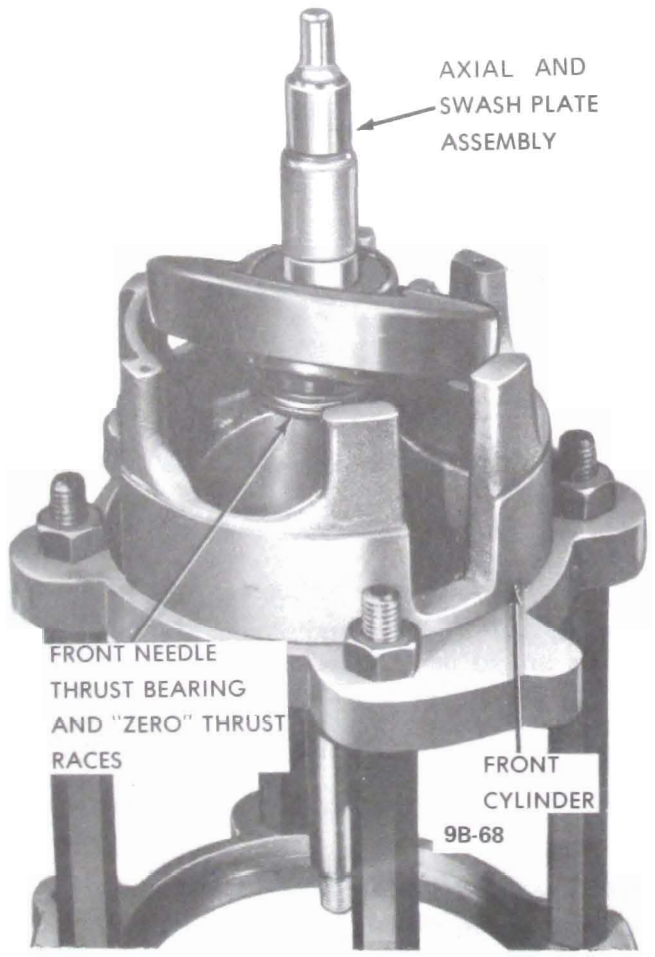


Figure 9B-77 Shaft and Front Needle Thrust Bearing in Cylinder Half

3. Generously coat with clean No. 525 Viscosity Oil two "zero" thrust races, and a new needle thrust bearing. Assemble races and bearing to front end of shaft and axial plate assembly and insert assembly into front cylinder (see Figure 9B-77.)

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

5. Lightly coat ball pockets of the three pistons with clean No. 525 Viscosity Oil and place a piston drive ball in each pocket.

6. Lightly coat the three "zero" shoe discs with clean No. 525 Viscosity Oil 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 axial plate assembly until high point of axial plate is over No. "1" cylinder bore. Position No. "1" piston onto axial plate (see Figure 9B-77) and lower the piston and axial plate so the front end (notched end - see Figure 9B-78) of the piston enters the cylinder bore.

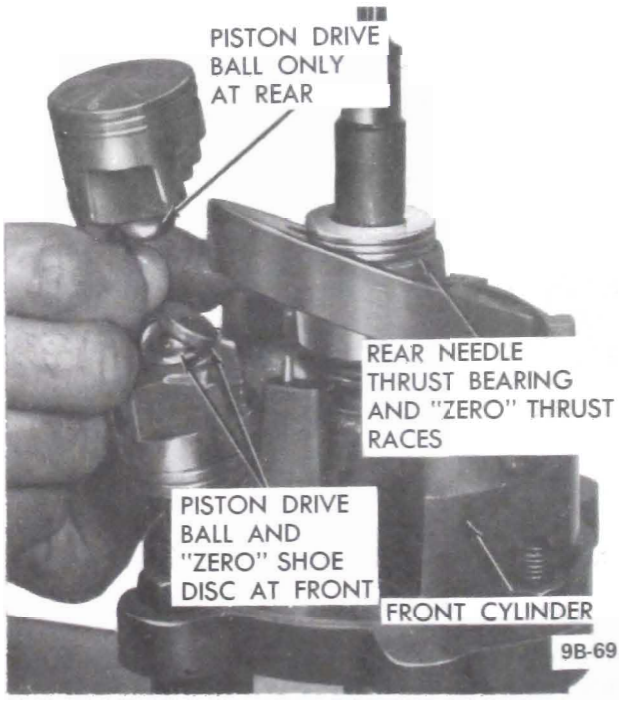


Figure 9B-78 Installing Piston into Cylinder Half

In order to fit the piston onto the axial plate, the shaft and axial 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 axial 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 9B-80).

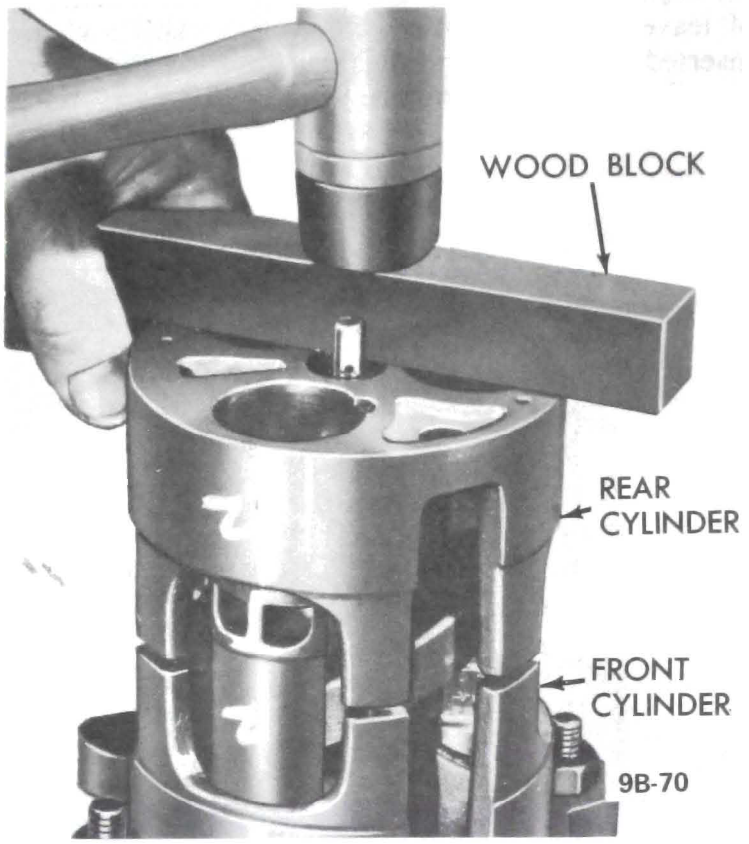


Figure 9B-80 Assembling Rear Cylinder Half

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.

11. Gage piston play as follows:

(a) Using a feeler gage, select a leaf or combination of leaves which result in satisfactory "feel" when

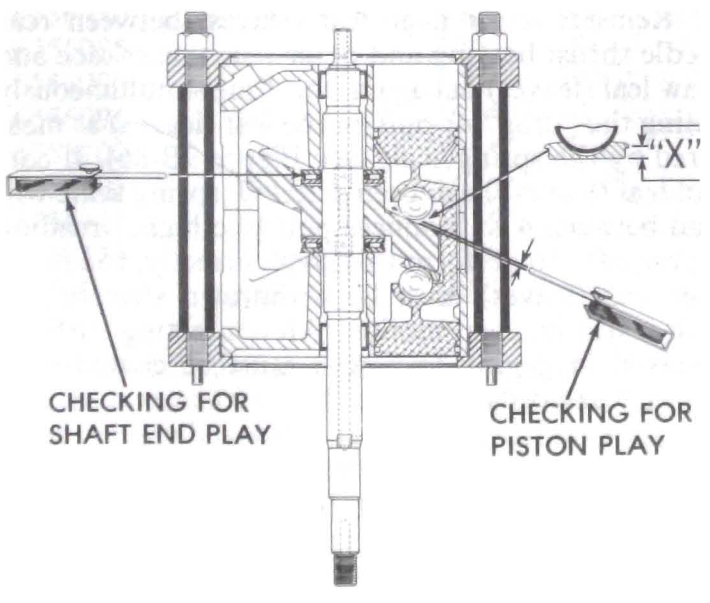


Figure 9B-81 Checking Piston and Shaft End Play

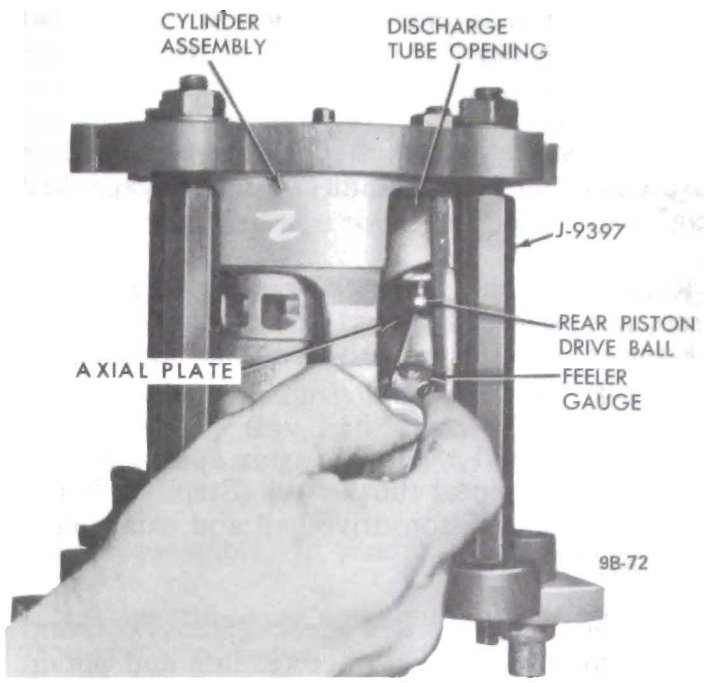


Figure 9B-82 Checking Clearance Between Rear Piston Drive Ball and Axial Plate

inserted between rear piston drive ball and axial plate (see Figures 9B-81 and 9B-82).

(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 axial plate and draw leaf or leaves out again, simultaneously measuring "drag" on leaf or leaves (see Figure 9B-83). 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

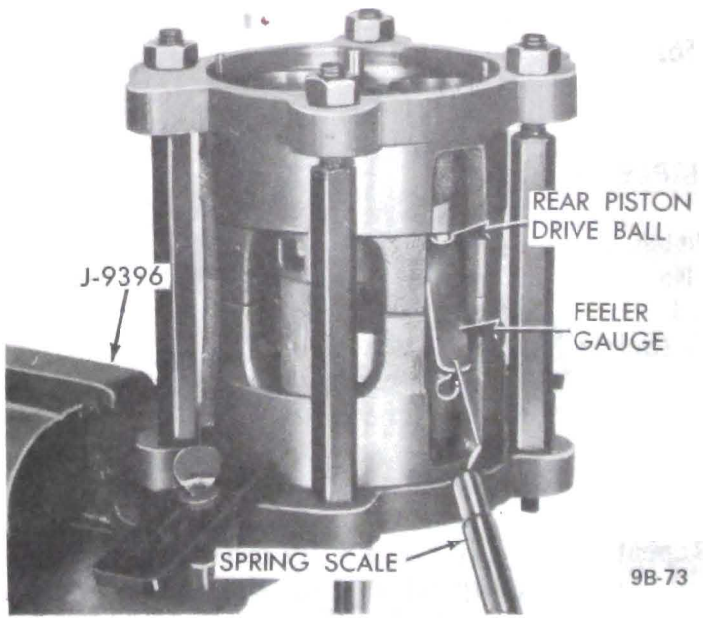


Figure 9B-83 Checking Drag on Selected Feeler Gage Leaf with Spring Scale

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.

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

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

(f) From the three recorded checks (Steps "c, d and e") select minimum feeler gage reading and obtain from stock (ref. Shoe Disc Table 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).

Shoe Disc Table

SERVICE PART NO.	STAMPED SHOE DISC ID NO.
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. 19 - 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 9B-85).

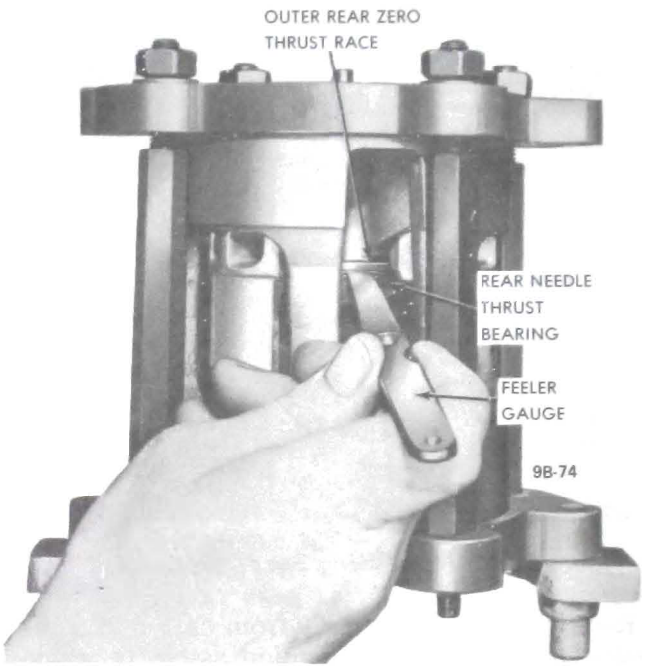


Figure 9B-85 Gaging Clearance Between Rear Needle Thrust Bearing and Outer Rear Thrust Race

(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 9B-86). 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.

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

(d) Select from stock one thrust race (ref. Thrust Race Table for part number of thrust race) corresponding to the feeler gage reading determined in

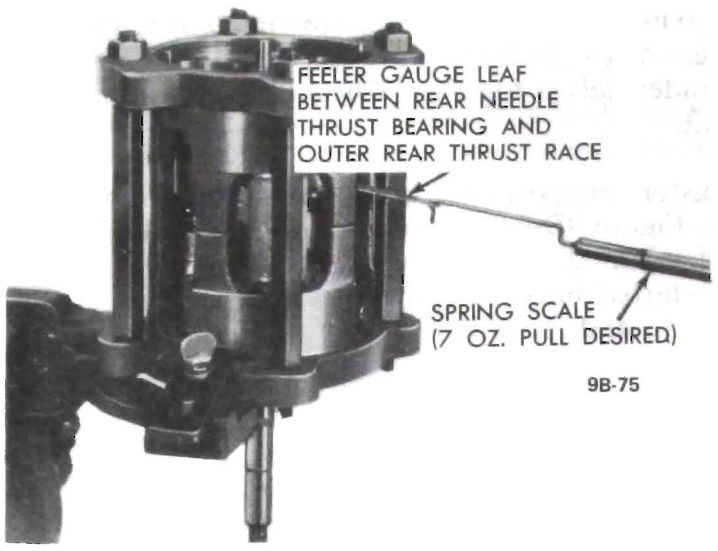


Figure 9B-86 Checking Drag on Selected Feeler Gage Leaf with Spring Scale

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.

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 9B-73) 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 axial plate until piston is at highest point, raise axial plate approximately 1/2 inch and lift out piston and related parts, one at a time.

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 No. 525 Viscosity Oil and assemble onto shaft.

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 axial plate assembly until high point of swash plate is over No. "1" cylinder bore. Position No. "1" piston onto axial plate (see Figure 9B-88) and lower the piston and axial plate so that the front end (notched end) of the piston enters the cylinder bore.

In order to fit the piston onto the axial plate and into the cylinder bore, the axial plate must be raised approximately 1/2 inch, the front needle thrust bearing

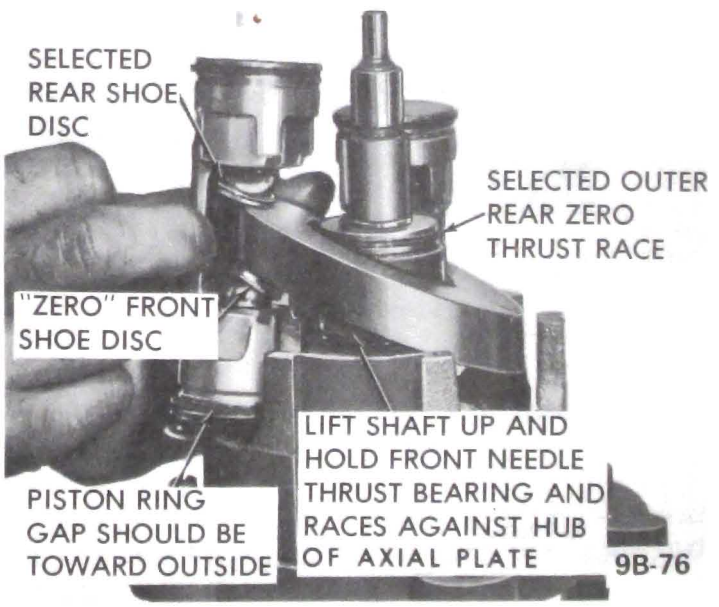


Figure 9B-88 Installing Piston Assembly in Front Cylinder Half

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 9B-93).

8. Assemble both service replacement discharge tube "O" rings and bushings (see Figure 9B-94) onto cylinder assembly.

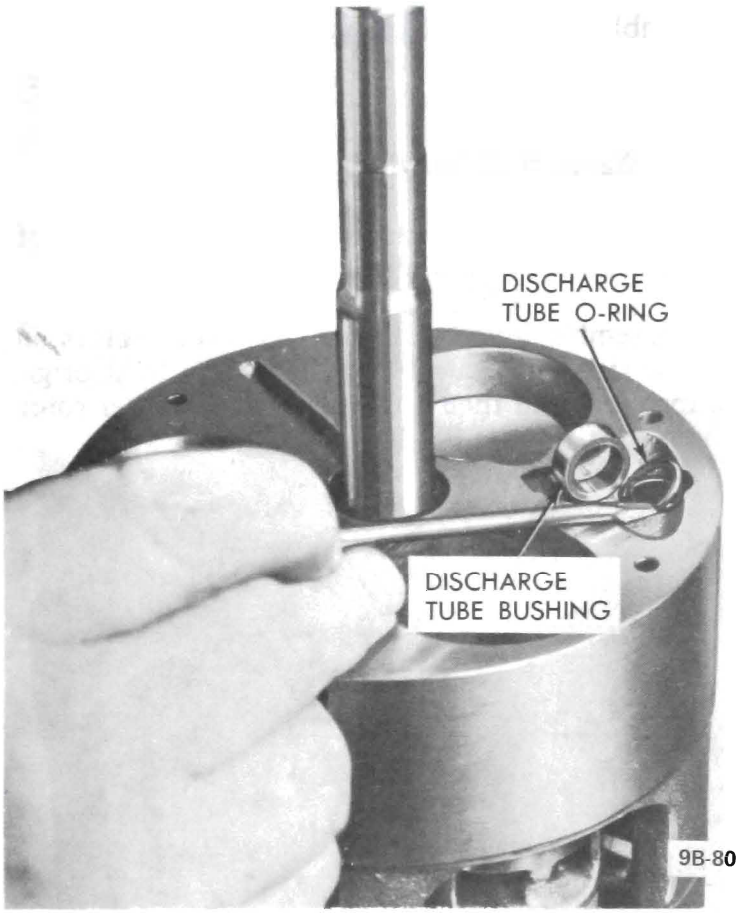


Figure 9B-94 Installing Discharge Tube O Ring and Bushing

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 9B-95).

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 9B-96) with No. 525 viscosity oil.

4. Mark with pencil on side of front head the location of dowel pin holes (see Figure 9B-96), align front head 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 9B-97) and liberally coat "O"

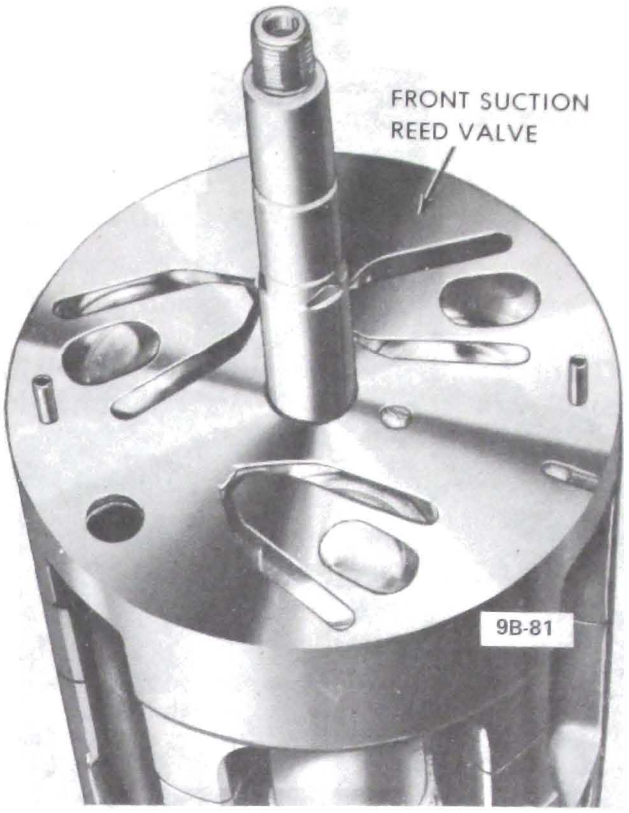


Figure 9B-95 Front Suction Valve Reed Disc Installed

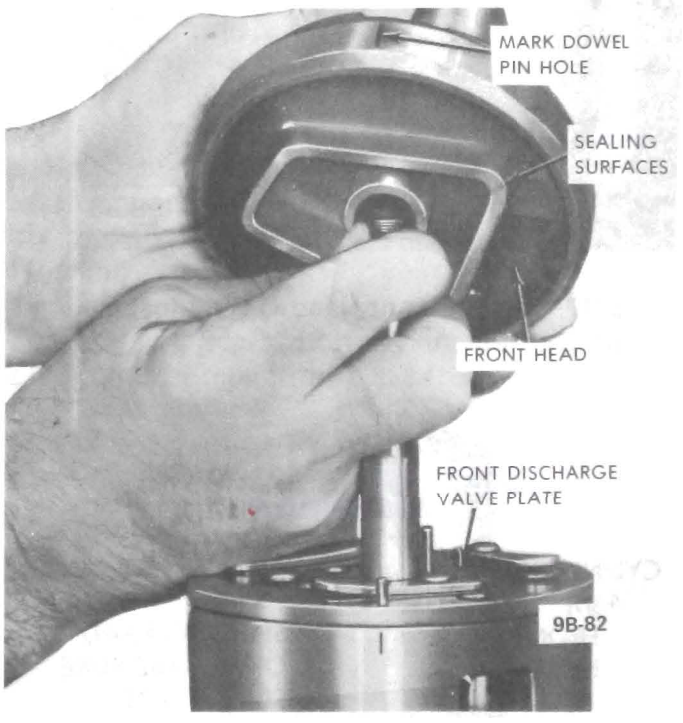


Figure 9B-96 Placing Front Head on Cylinder Assembly

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 9B-98. Extreme care

Figure 9B-97 Shell to Front Head O Ring Installation

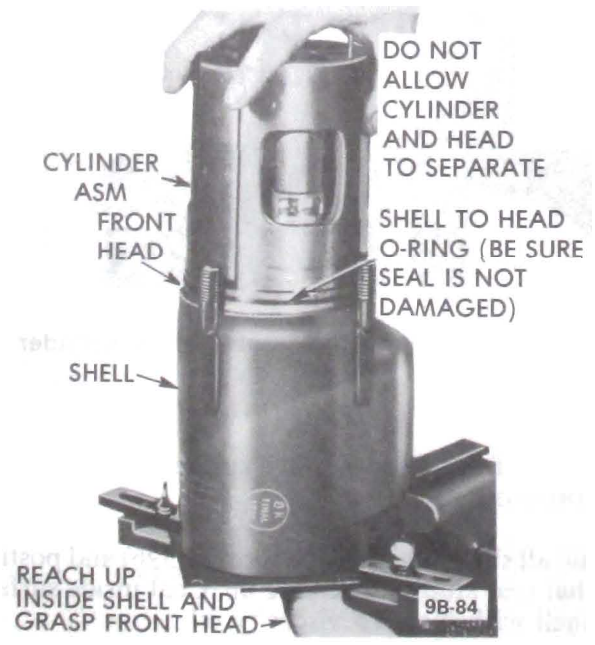


Figure 9B-98 Installing Front Head and Cylinder Assembly in Shell

must be used to prevent shell to head "O" ring seal from being damaged.

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.

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 the sides previously identified are in their original location, and then position oil pump outer rotor as shown in Figure 9B-100.

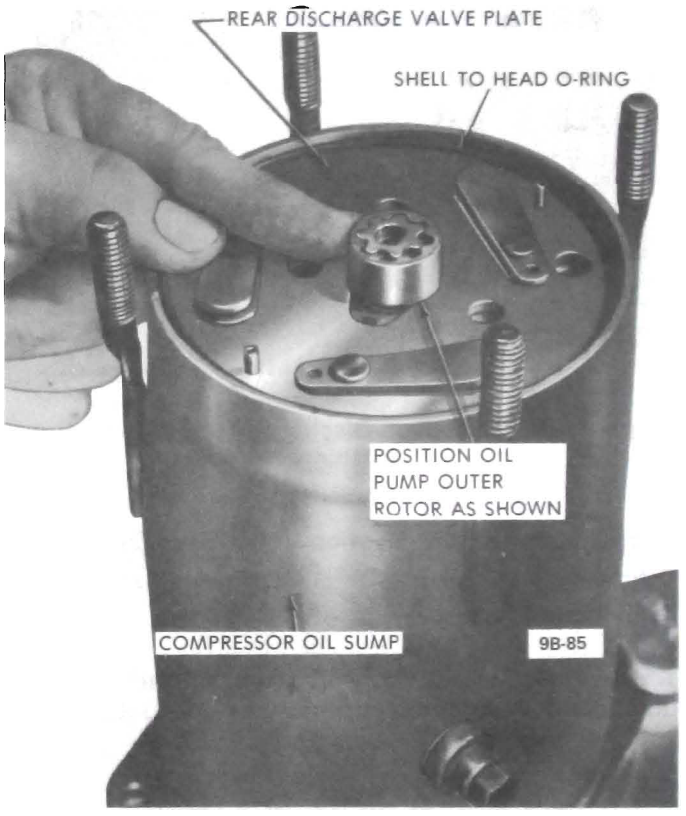


Figure 9B-100 Positioning Oil Pump Outer Rotor

5. Generously coat with No. 525 viscosity oil new shell to head "O" ring and install in shell (see Figure 9B-100).

6. Coat 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 9B-101).

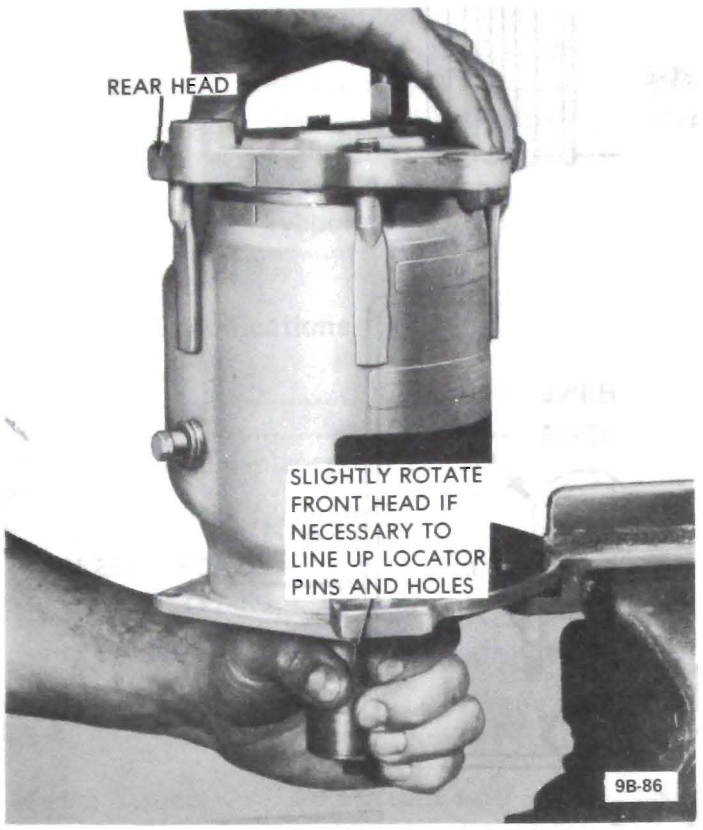


Figure 9B-101 Installing Rear Head

7. Assemble new nuts to threaded shell studs and torque to 20 lb.ft. If pressure relief valve has been 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. Assemble shaft seal onto compressor shaft (ref. to Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal"). Do not reassemble clutch drive plate at this time.

Leak Testing Compressor

1. After the shaft seal pressure test (ref. to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal") has been performed, change the test circuit to the configuration shown in Figure 9B-102.

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.

If an internal leak is indicated, the leak may exist about the head sealing surface, 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 "Adding Oil to the System".

4. Reassemble pulley assembly, and coil and housing assembly onto hub of front head (ref. to "Disassembly and Reassembly of PUlley Assembly, Coil and Housing Assembly").

5. Complete reassembly by installing clutch drive plate onto hub of front head (refer to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal"). See Figure 9B-108 disassembled view of compressor.

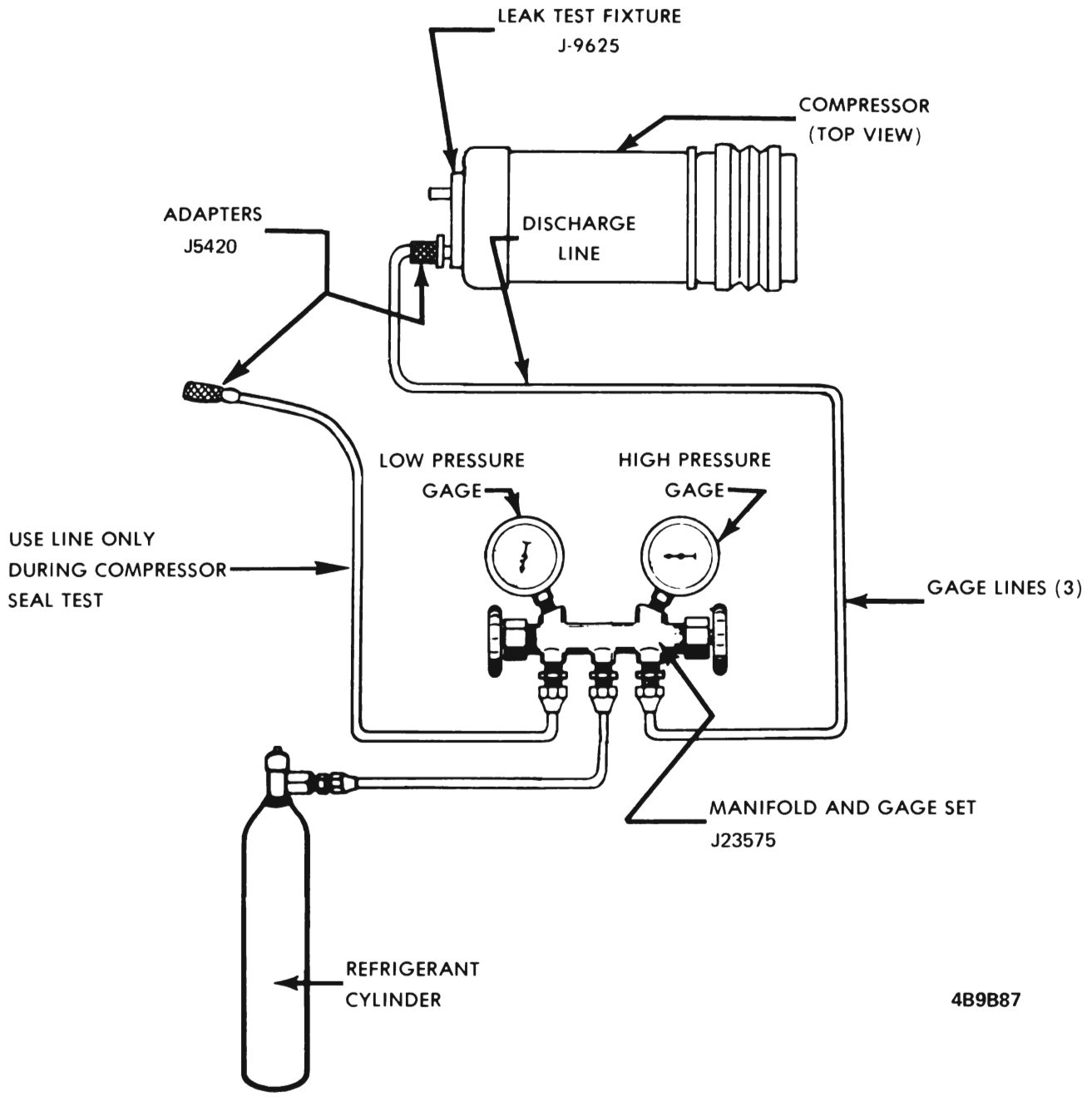


Figure 9B-102 Compressor Internal Leak Test

SPECIFICATIONS

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

Tightening Specifications V.I.R.

Part	Location	Torque Lb. Ft.
Nut	Evaporator Inlet Connection	18
Nut	Evaporator Outlet Connection	31
Nut	Liquid Bleed Line Connection	6
Nut	Liquid Line to VIR	12
Nut	Suction Line to VIR	31
Screw	Receiver Shell Mounting Screws	10
Screw	POA and TX Valves Retaining Screws	6
Screw	Connector Shell Assembly Retaining Screws	10
Nut	Sight Glass Retaining Nut	23 Lb.In.
Valve Core	Liquid Bleed Valve Core	30 Ounce In.
Valve Core	Evaporator Gage Valve Core	30 Ounce In.

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.

General Specifications

Thermostat Opening Temperature (All)	190°
Capacity of Cooling System With Air Conditioner (Quarts)	
X 250 Cu. In.	14
X 350 Cu. In.	17
A 350 Cu. In.	17.6
455 Cu. In.	19.9
B 350 Cu. In.	17.2
B-C-E 455 Cu. In.	21.6
Type of Refrigerant	Refrigerant 12
Refrigerant Capacity (Fully Charged)	
All Series	3.75 Lbs.

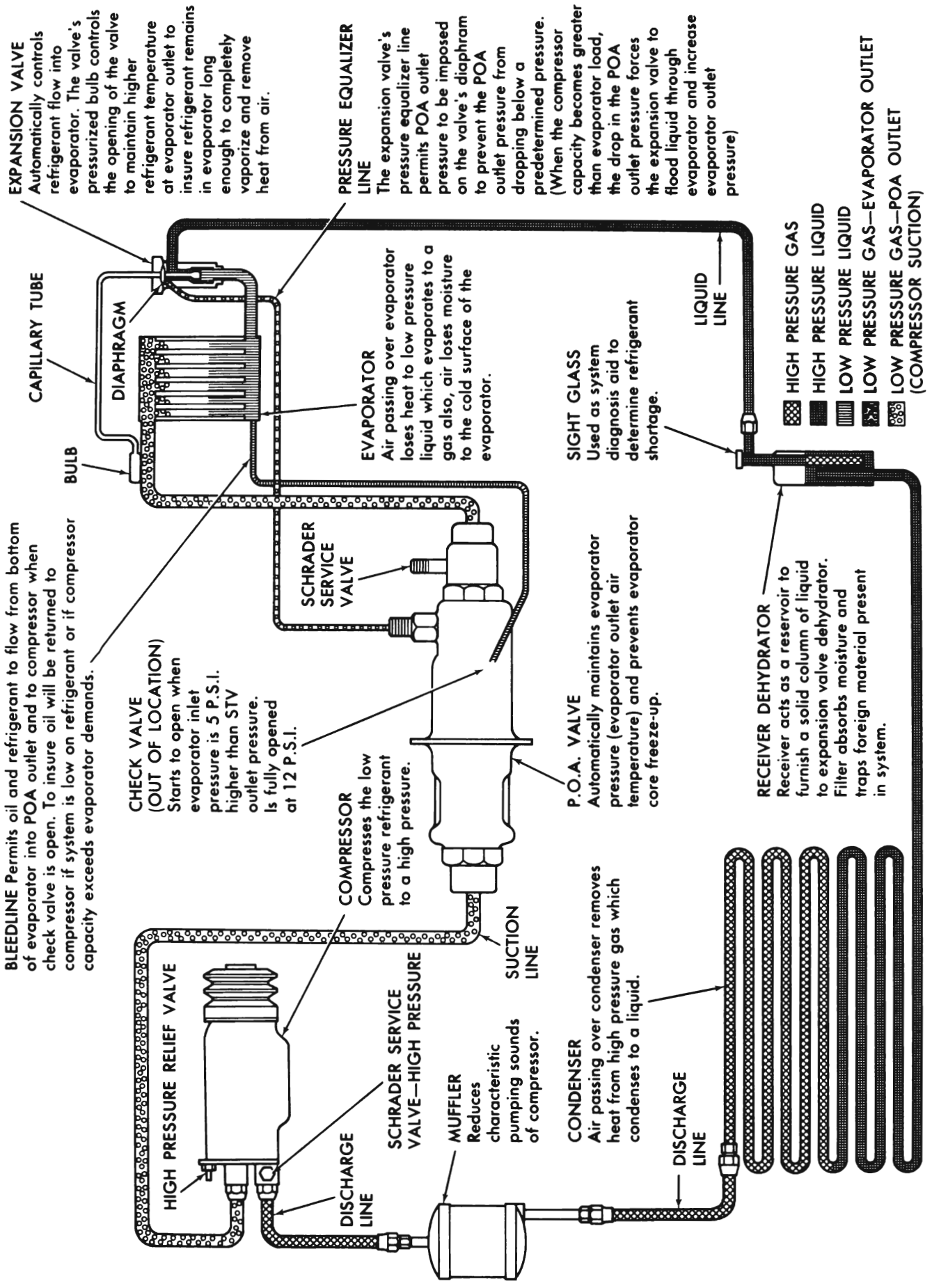


Figure 9B-104 Refrigeration Circuit - X Series

9B-90

VALVES-IN-RECEIVER SYSTEM SCHEMATIC

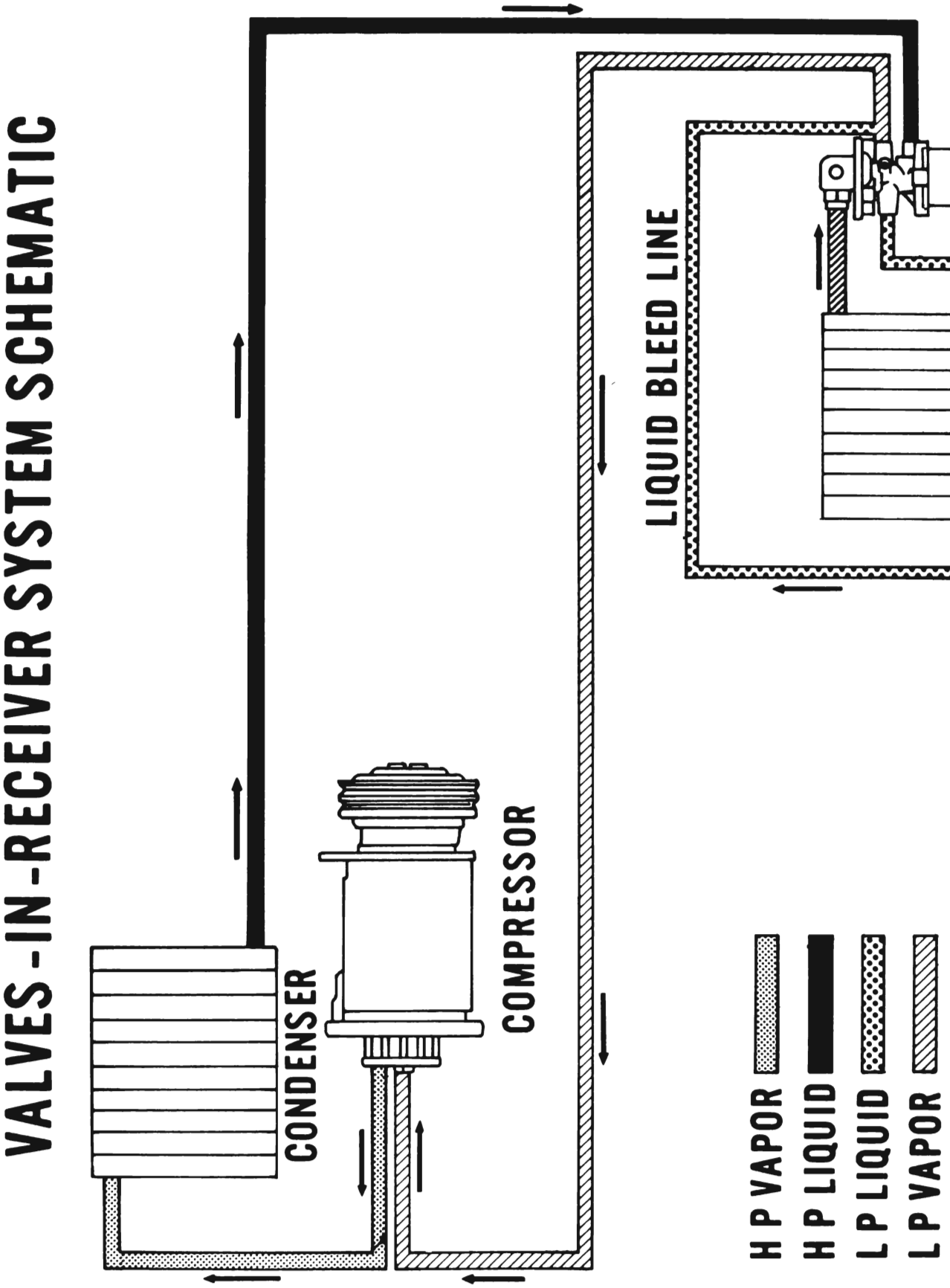


Figure 9B-105 Refrigeration Circuit - A-B-C-E Series

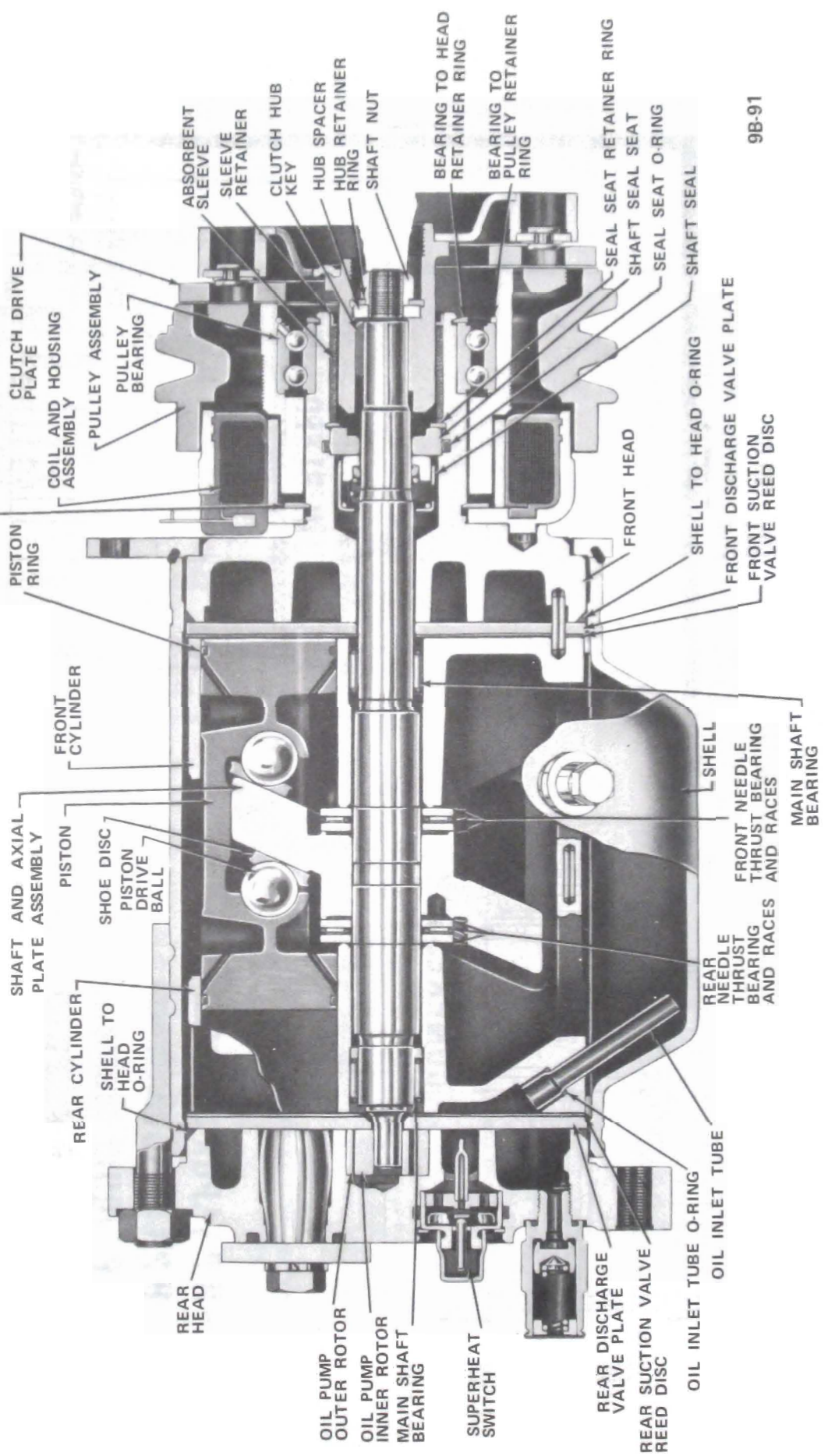


Figure 9B-106 Compressor - Section View

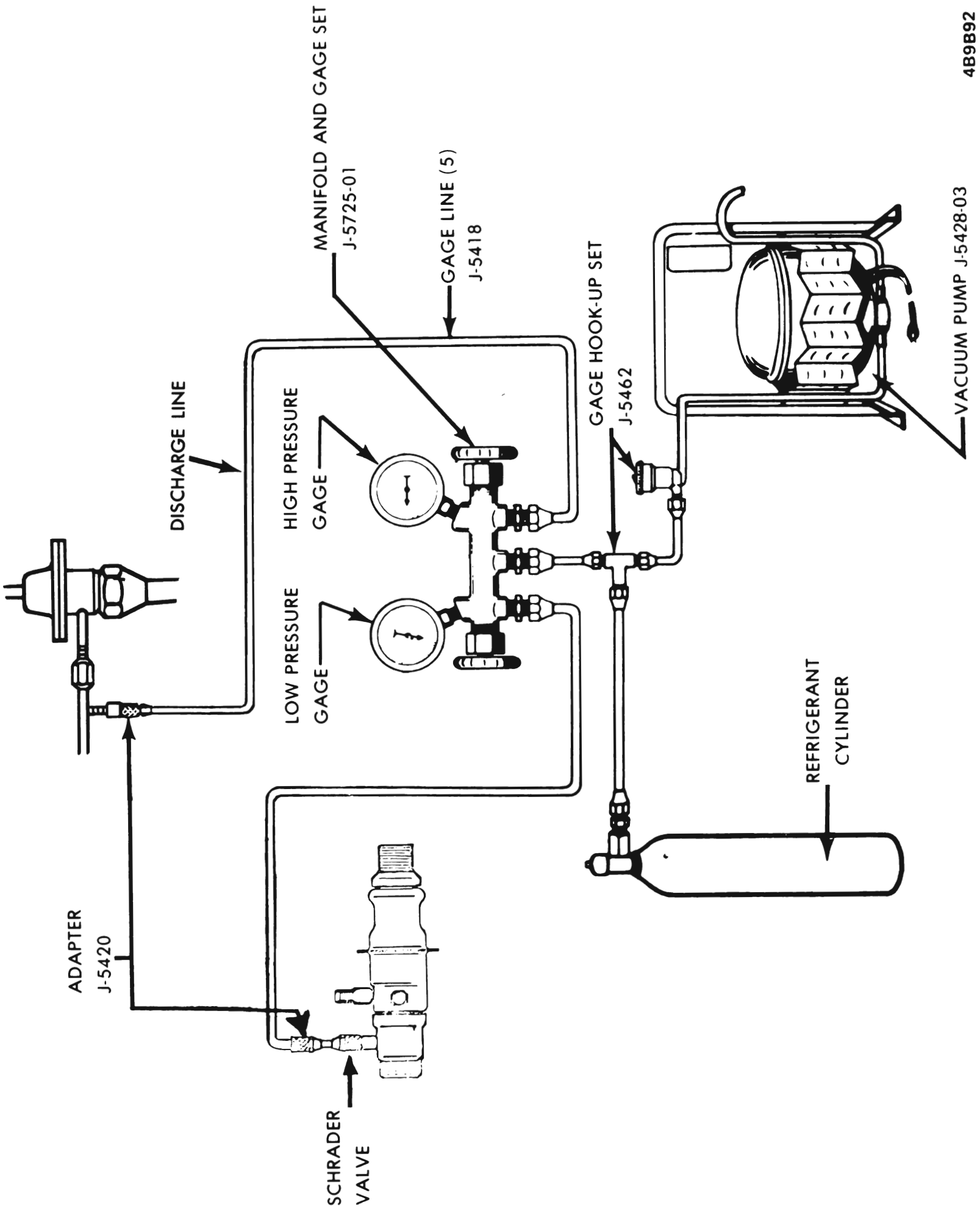


Figure 9B-107 Charging Air Conditioner System X- Series

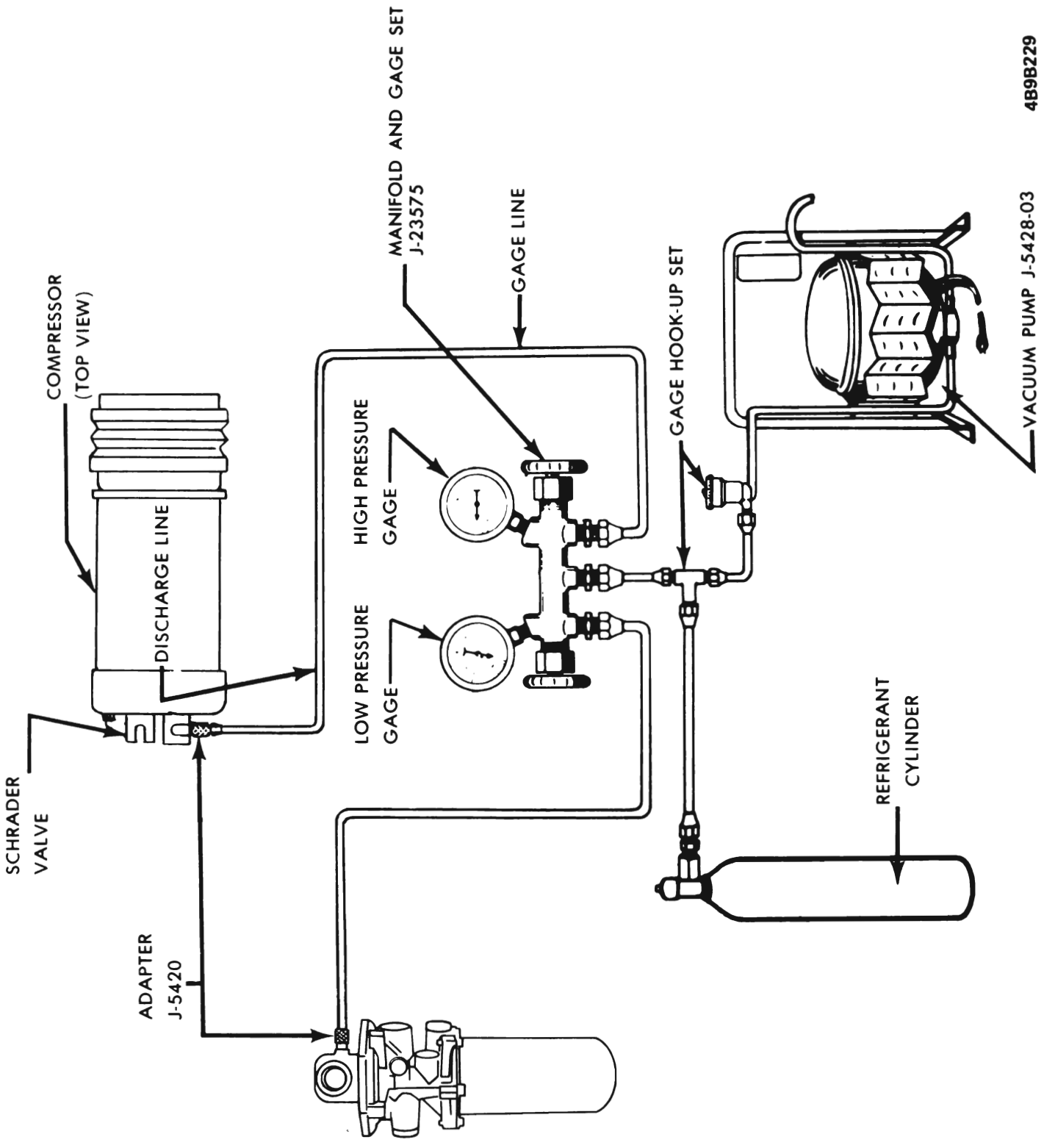


Figure 9B-108 Changing Air Conditioner System - A-B-C-E Series

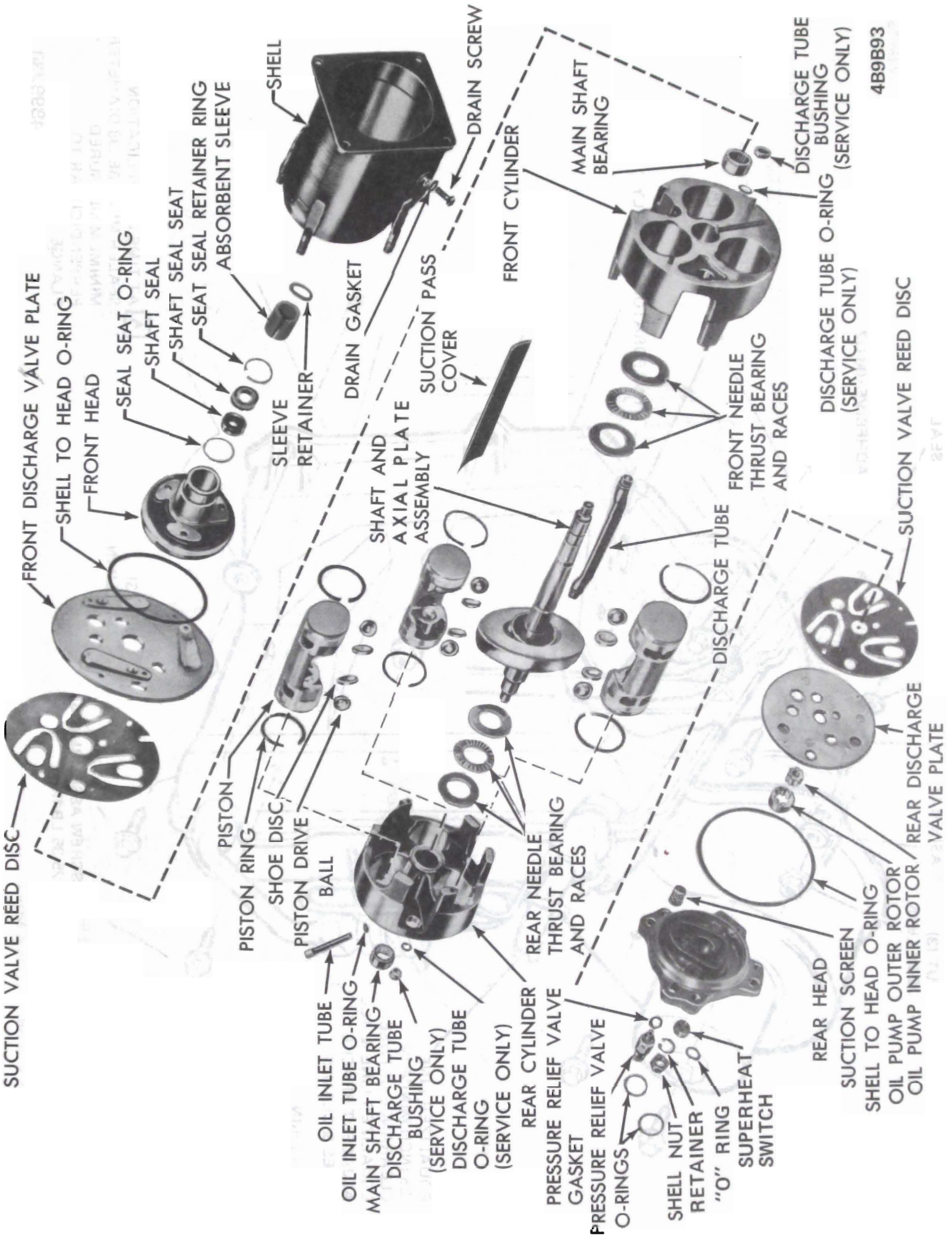


Figure 9B-109 Compressor - Exploded View

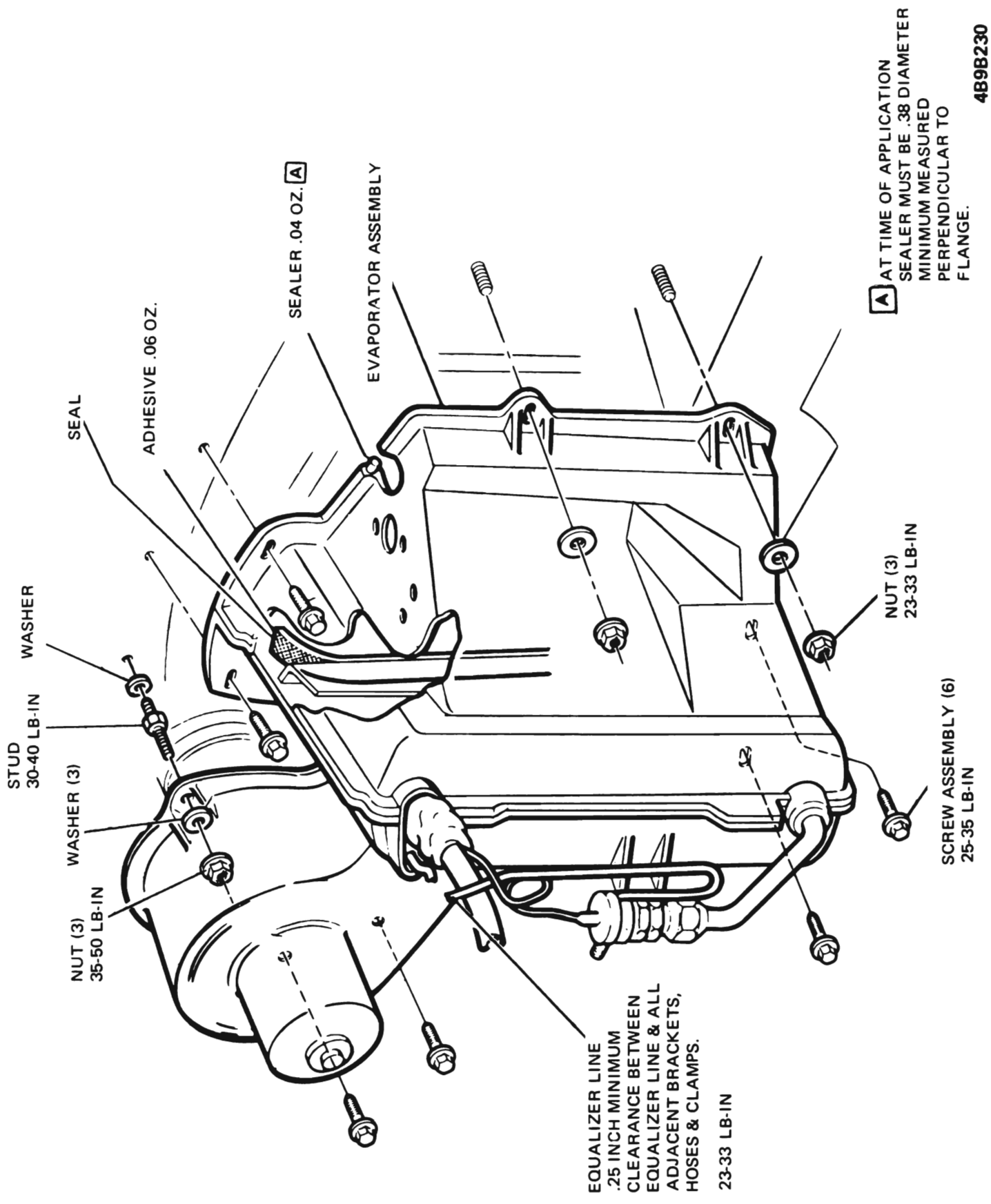


Figure 9B-111 Evaporator Mounting X-Series

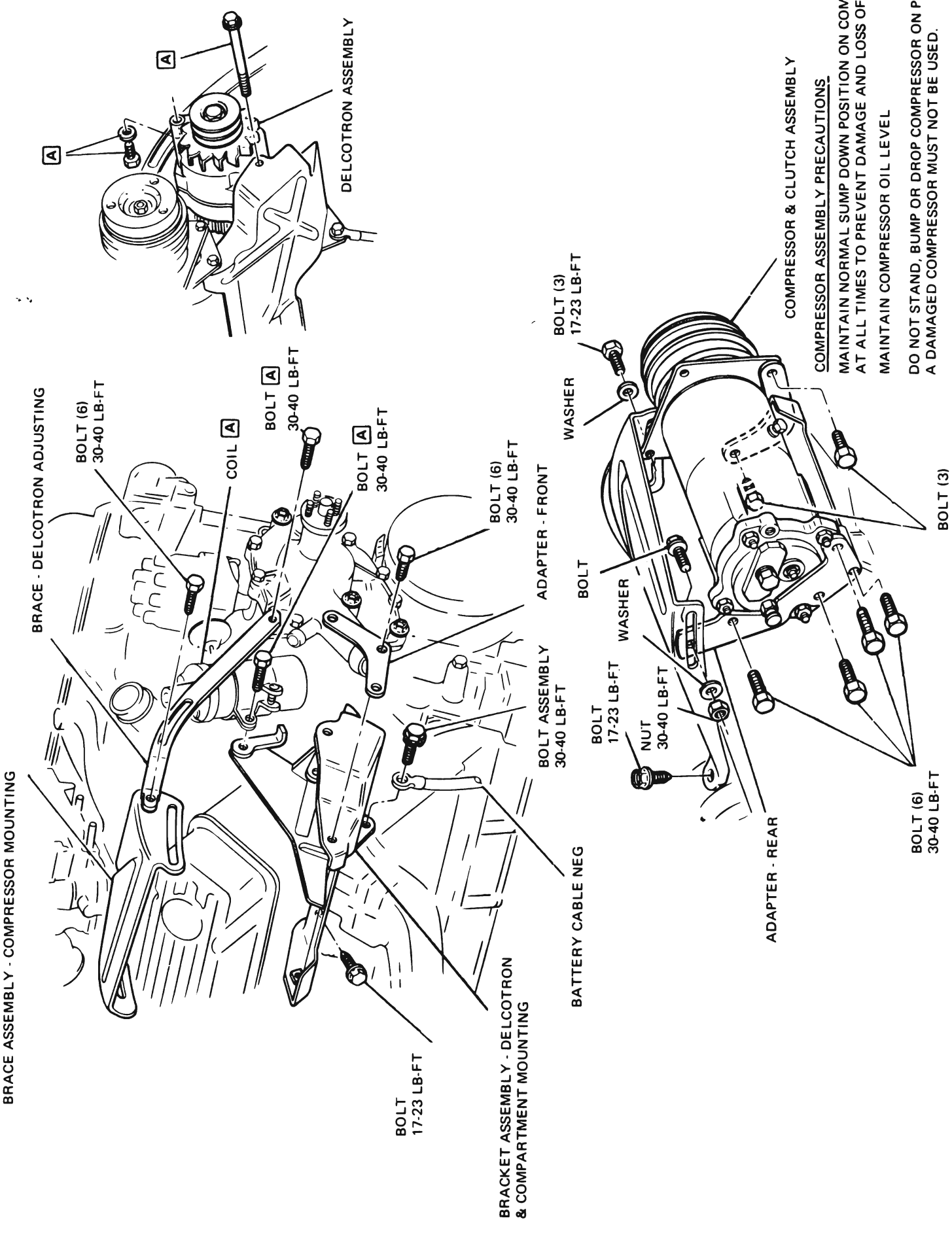


Figure 9B-112 A/C Compressor and Mounting - X Series

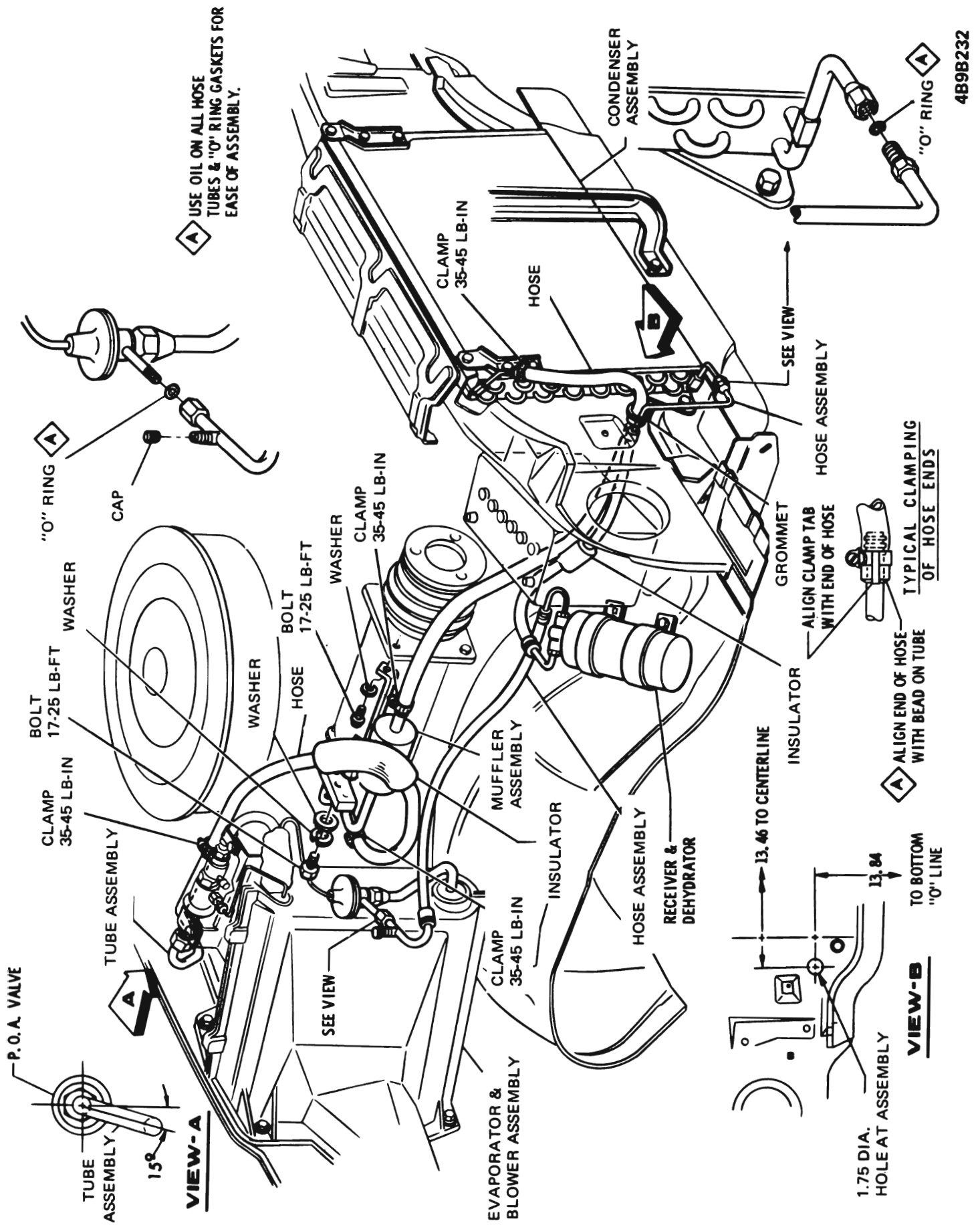


Figure 9B-113 Refrigerant Hoses - X Series

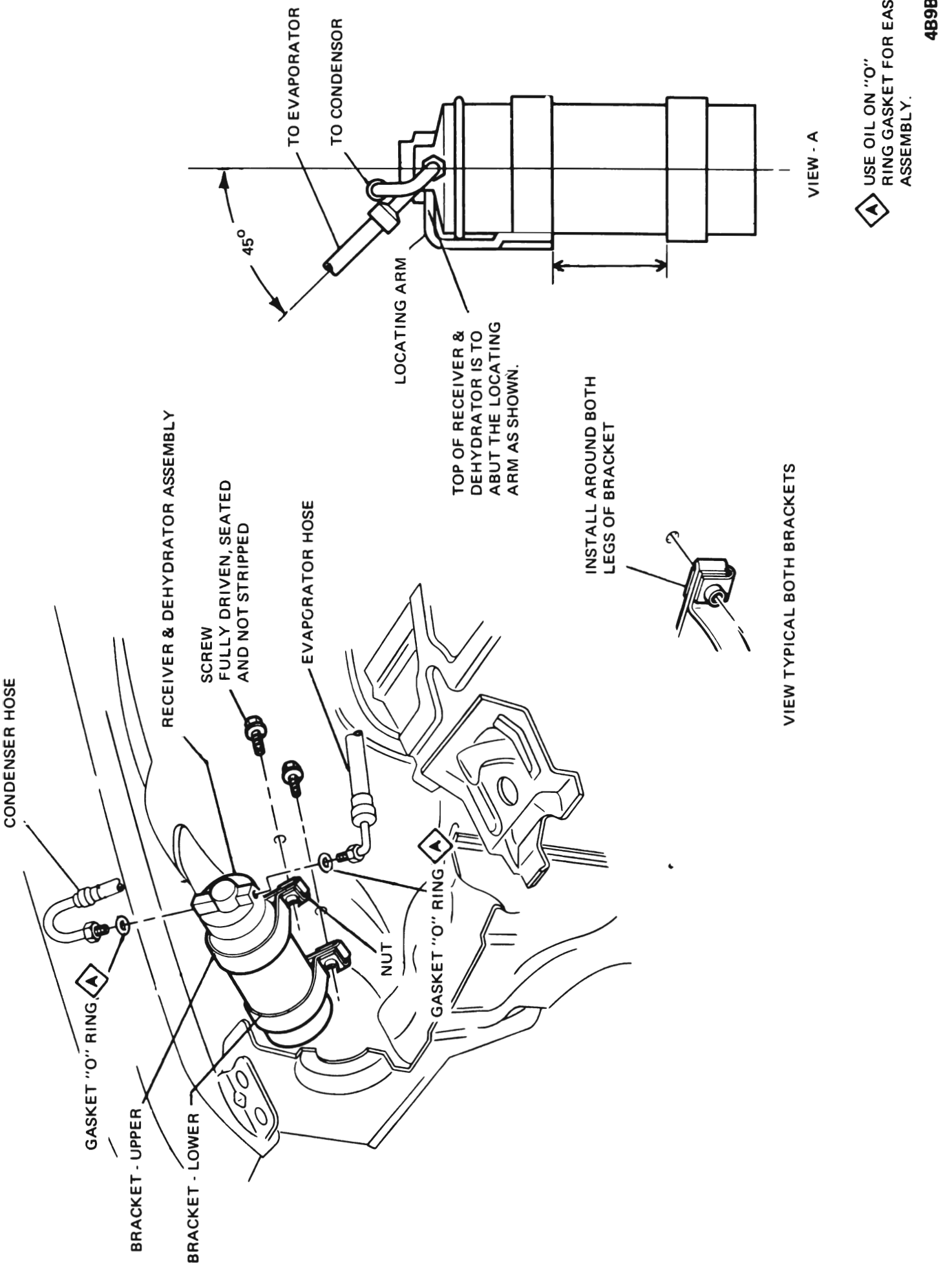


Figure 9B-114 Receiver and Dehydrator - X Series

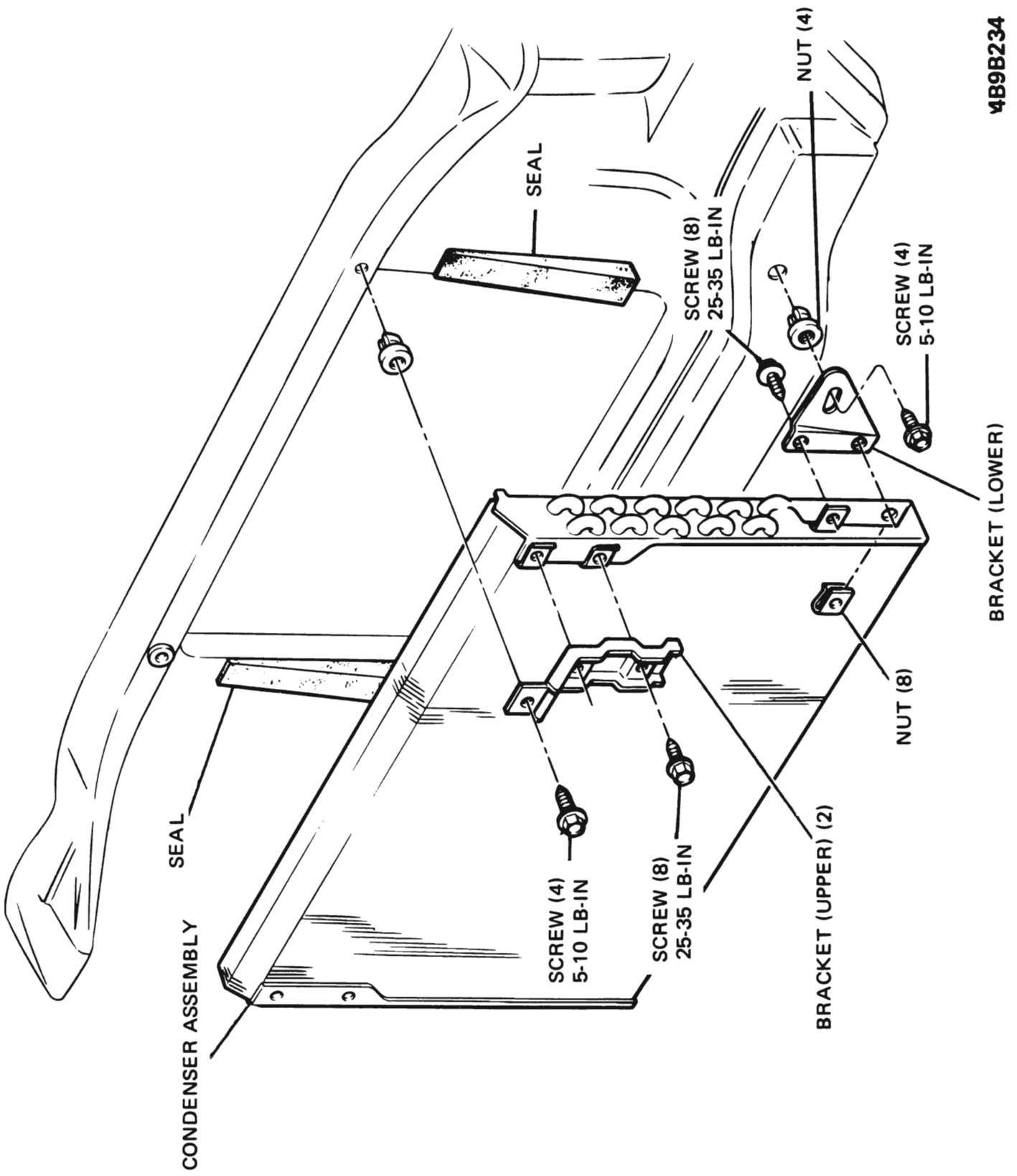


Figure 9B-115 Condenser - X Series

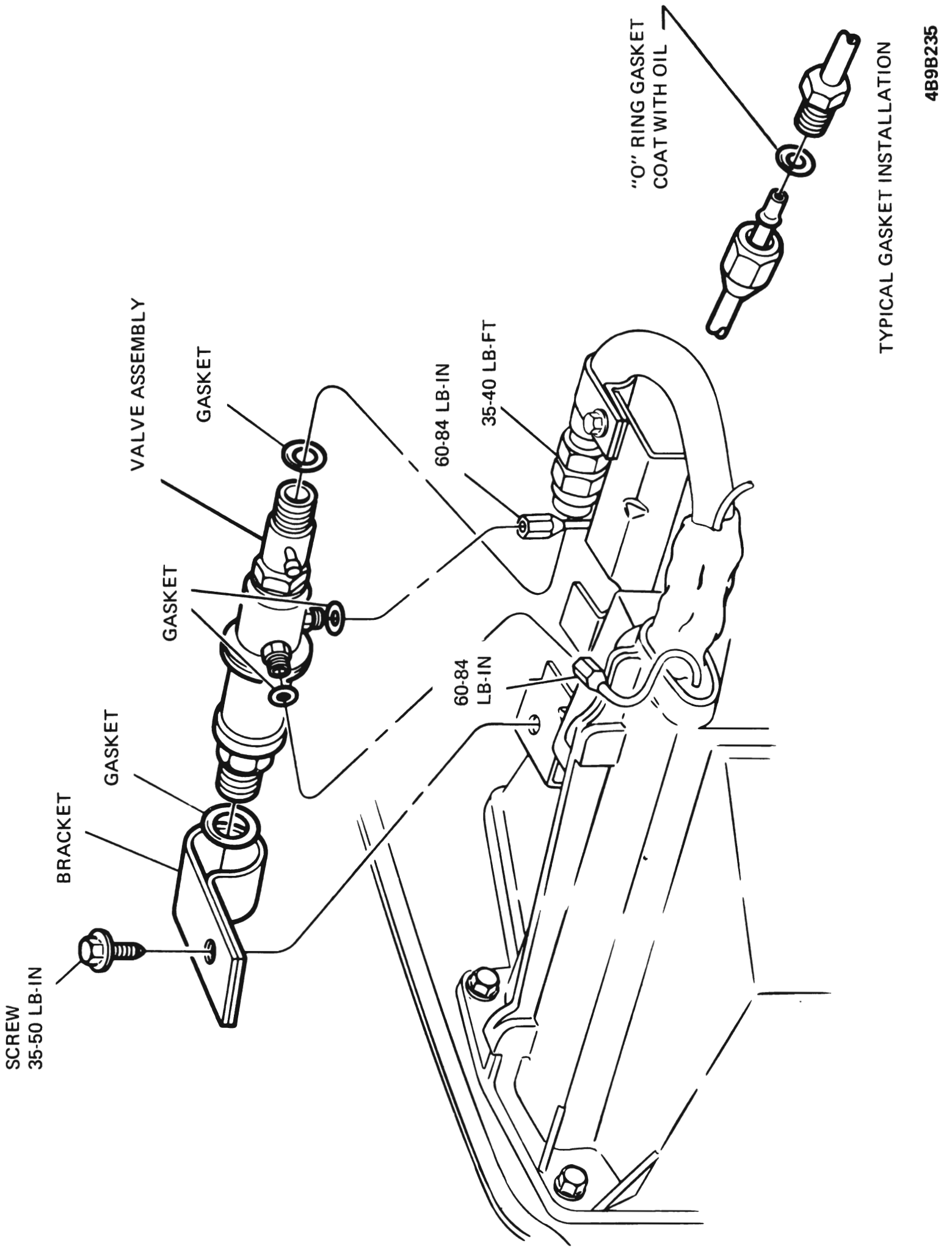


Figure 9B-116 POA Valve - X Series

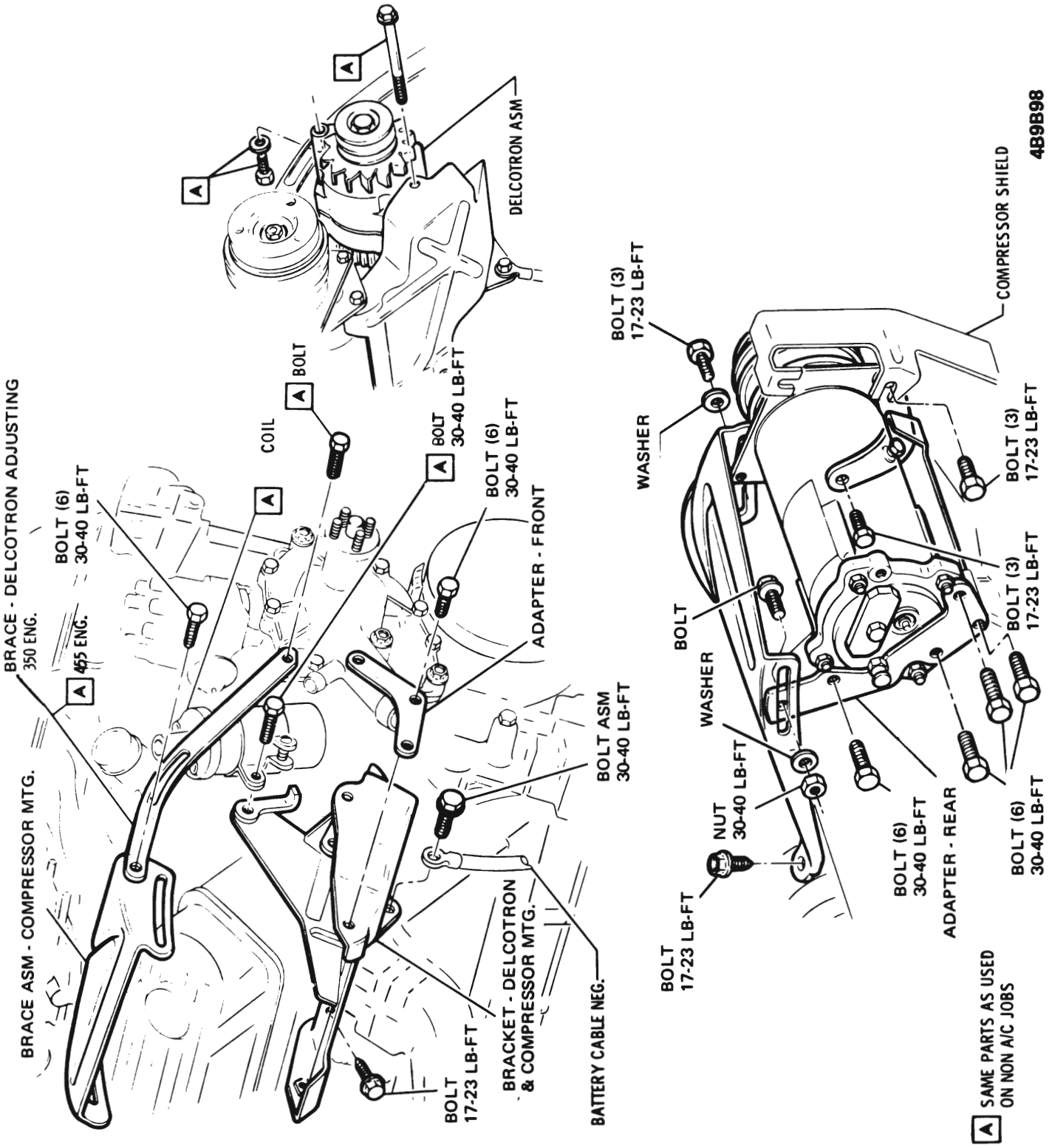


Figure 9B-117 A/C Compressor and Mounting - A-B-C-E Series

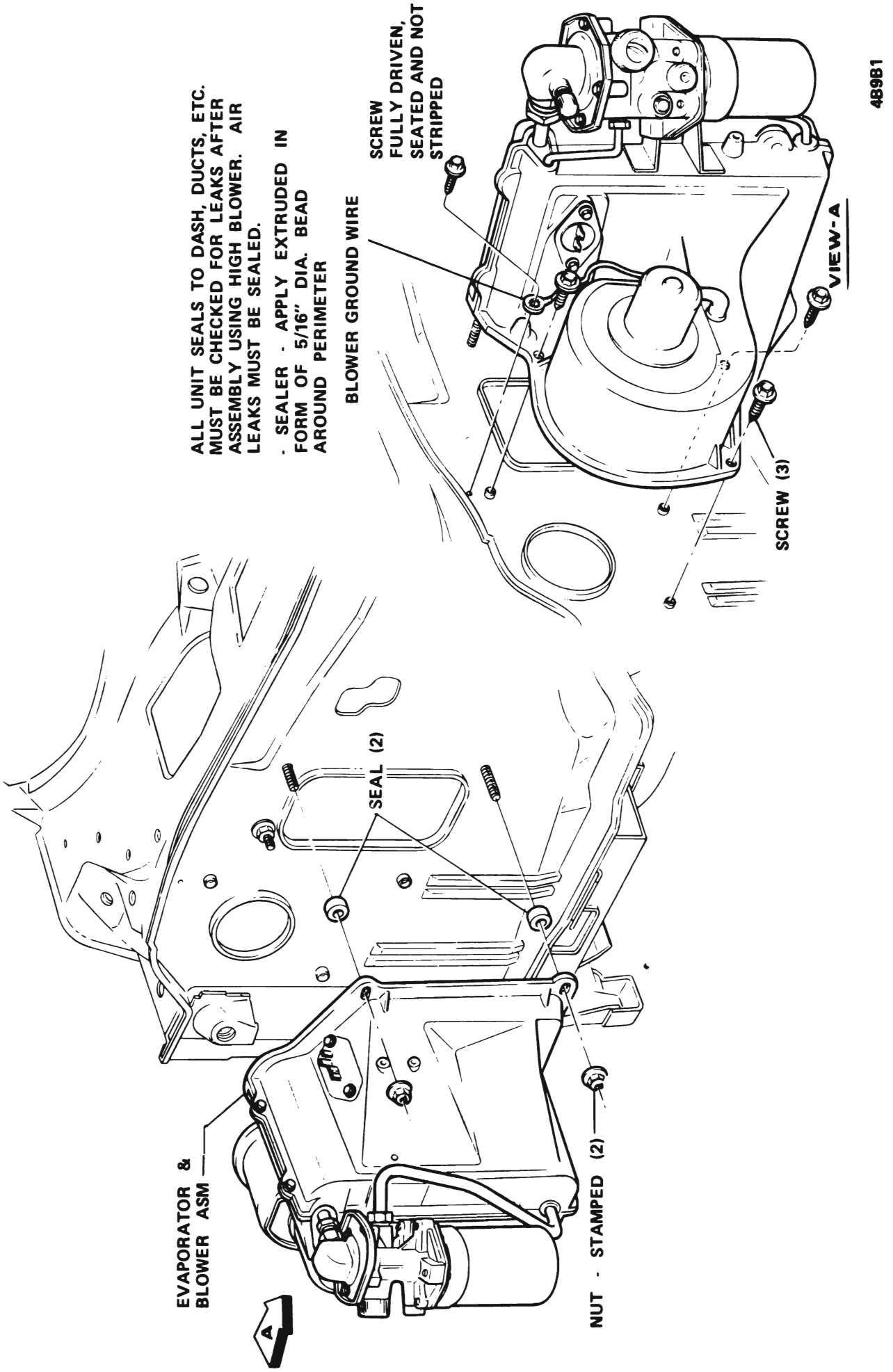


Figure 9B-118 Evaporator and Blower Assembly - A Series

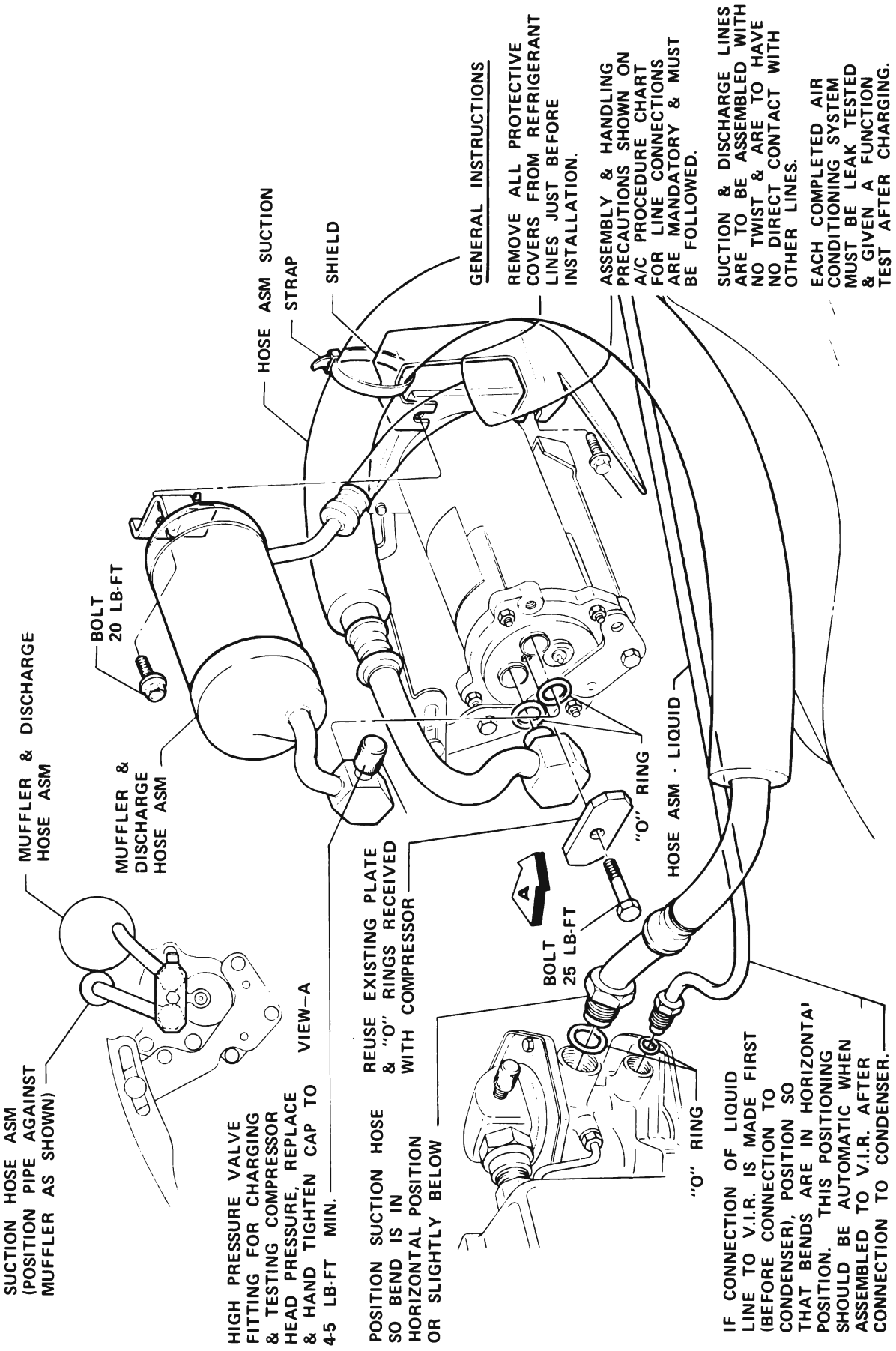


Figure 9B-120 A/C Muffler and Discharge Hose, Liquid and Suction Hose

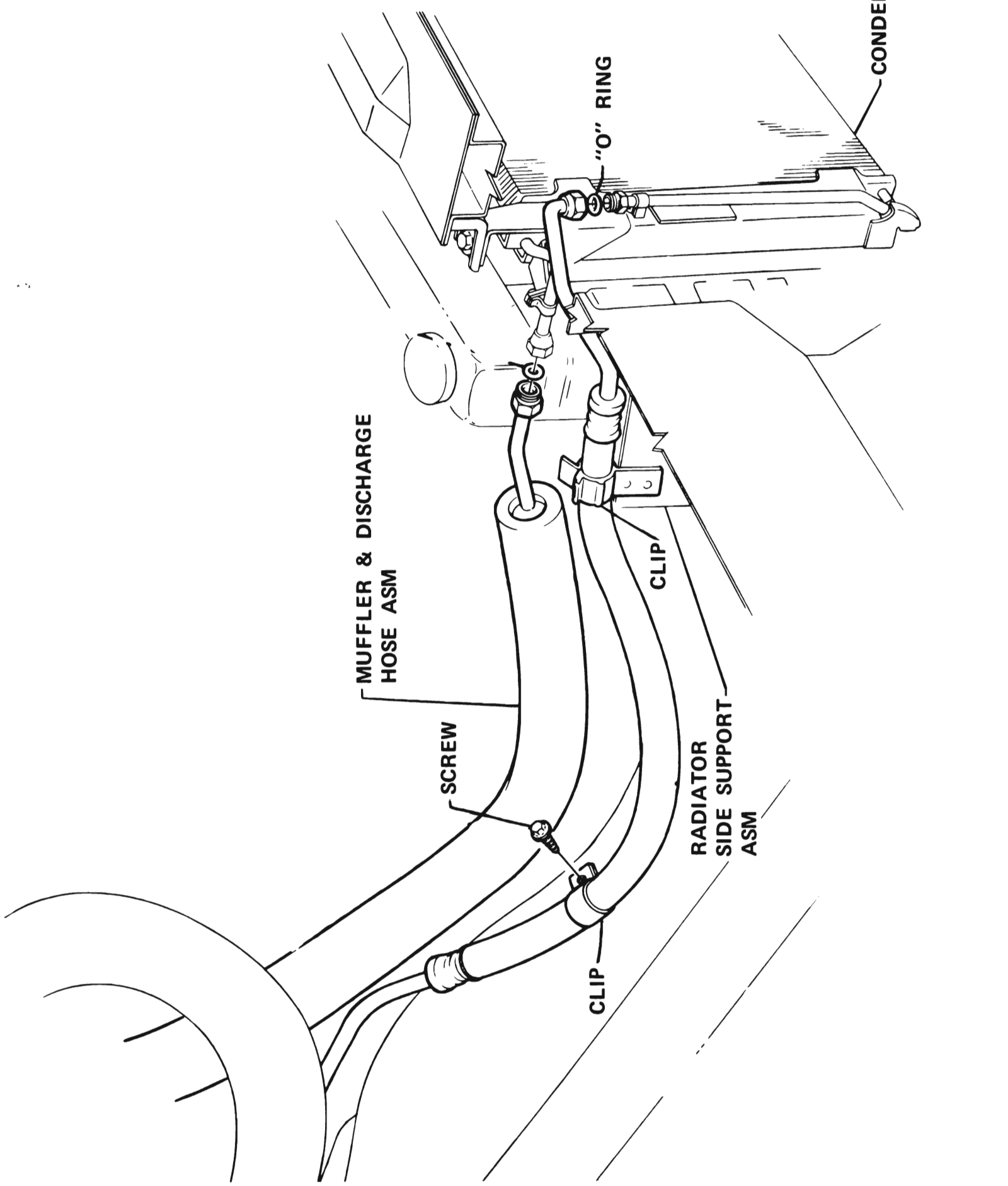


Figure 9B-121 Discharge and Liquid Hose to Condenser - A Series

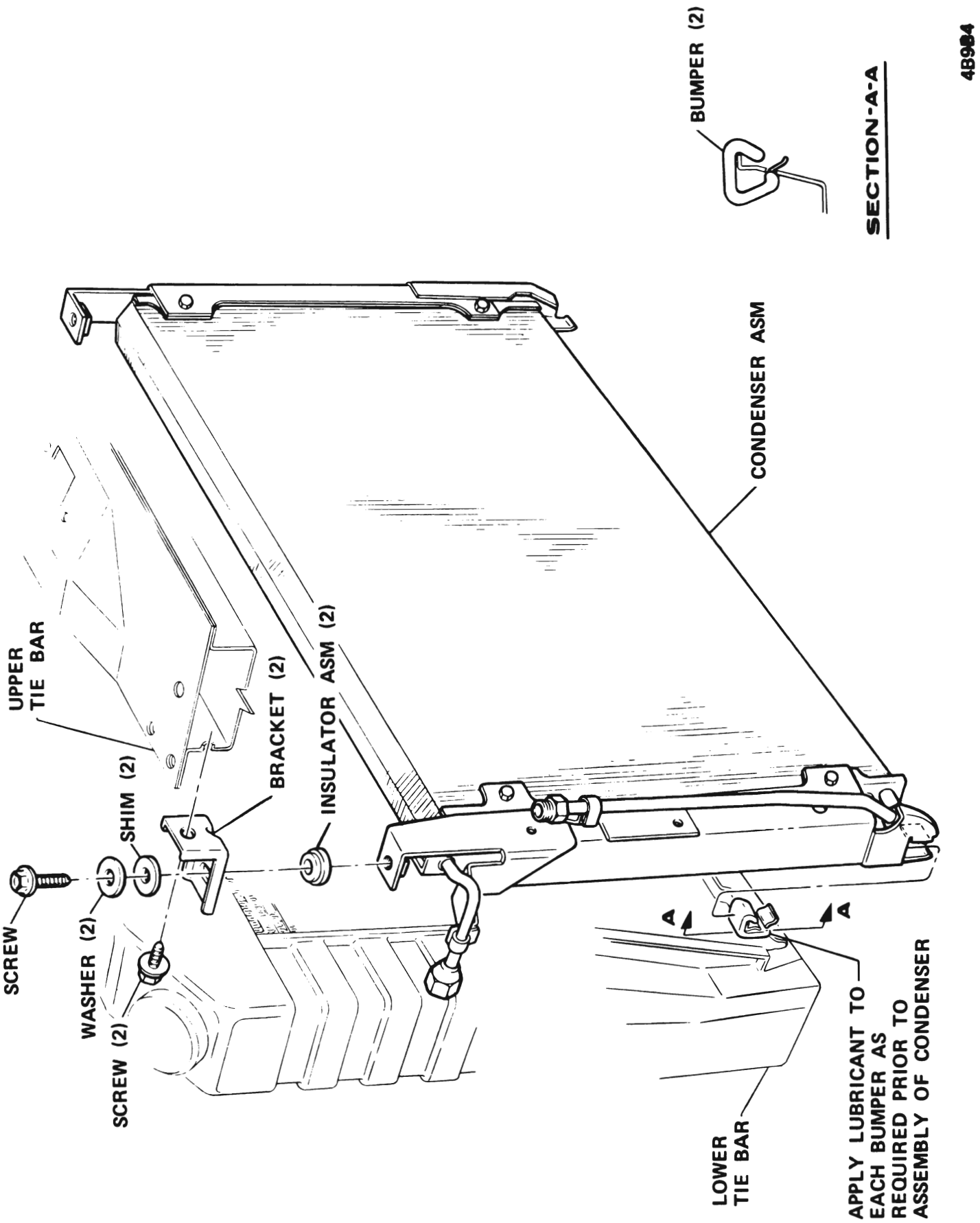


Figure 9B-122 Condenser Mounting - A Series

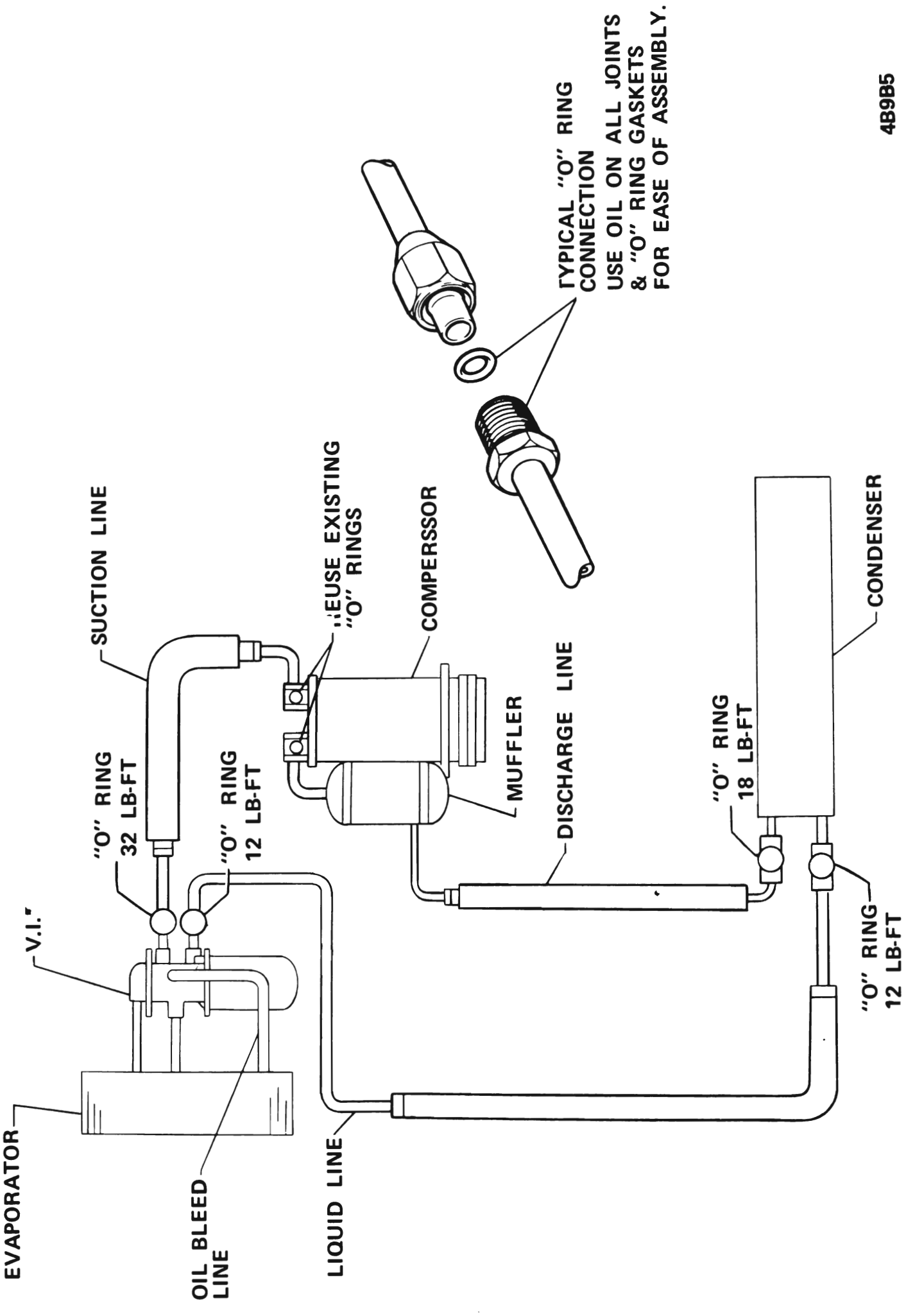


Figure 9B-123 "O" Ring Schematic - A Series

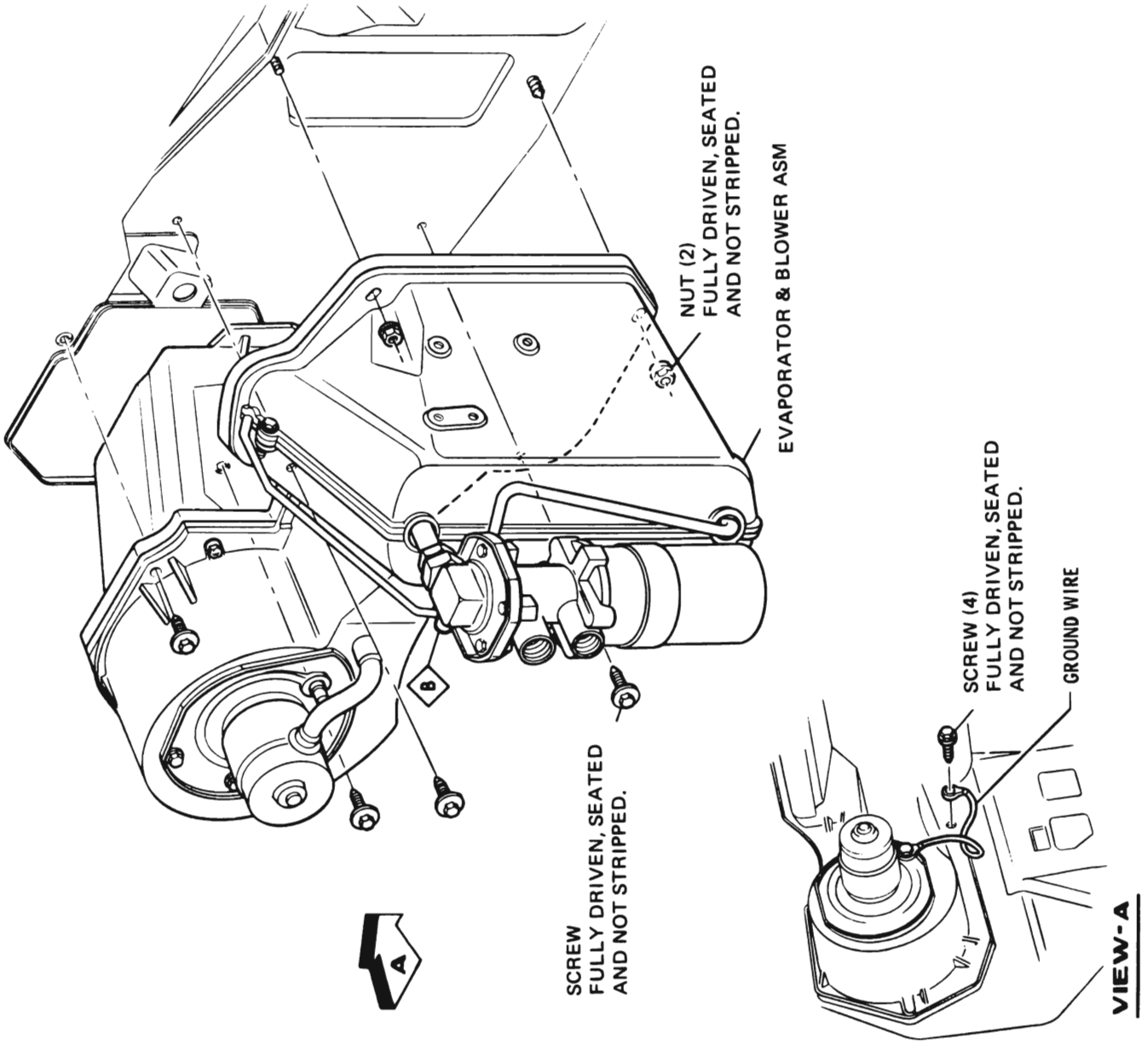


Figure 9B-124 Evaporator and Blower Assembly - B-C-E Series

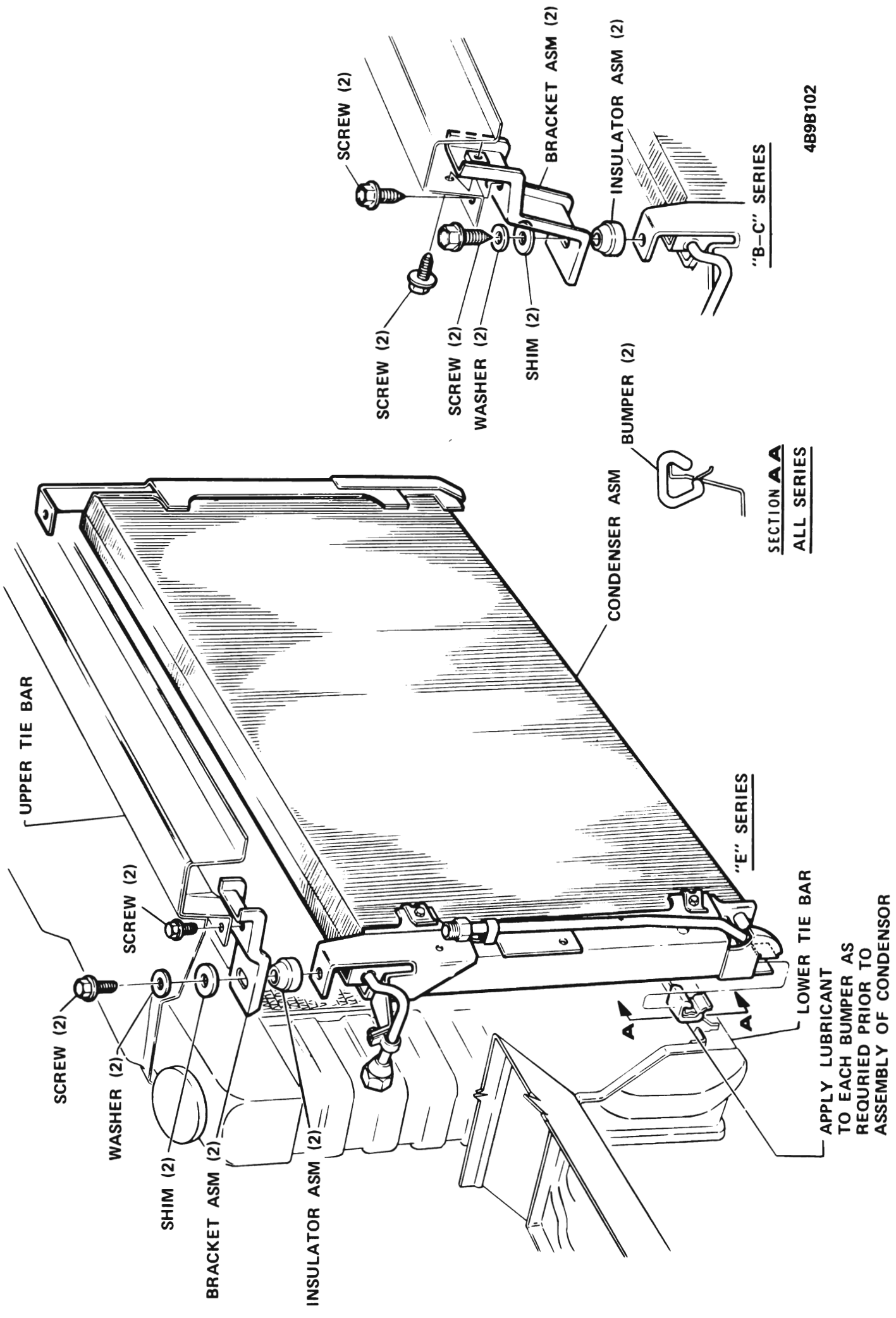


Figure 9B-125 Condenser Assembly Mounting - B-C-E Series

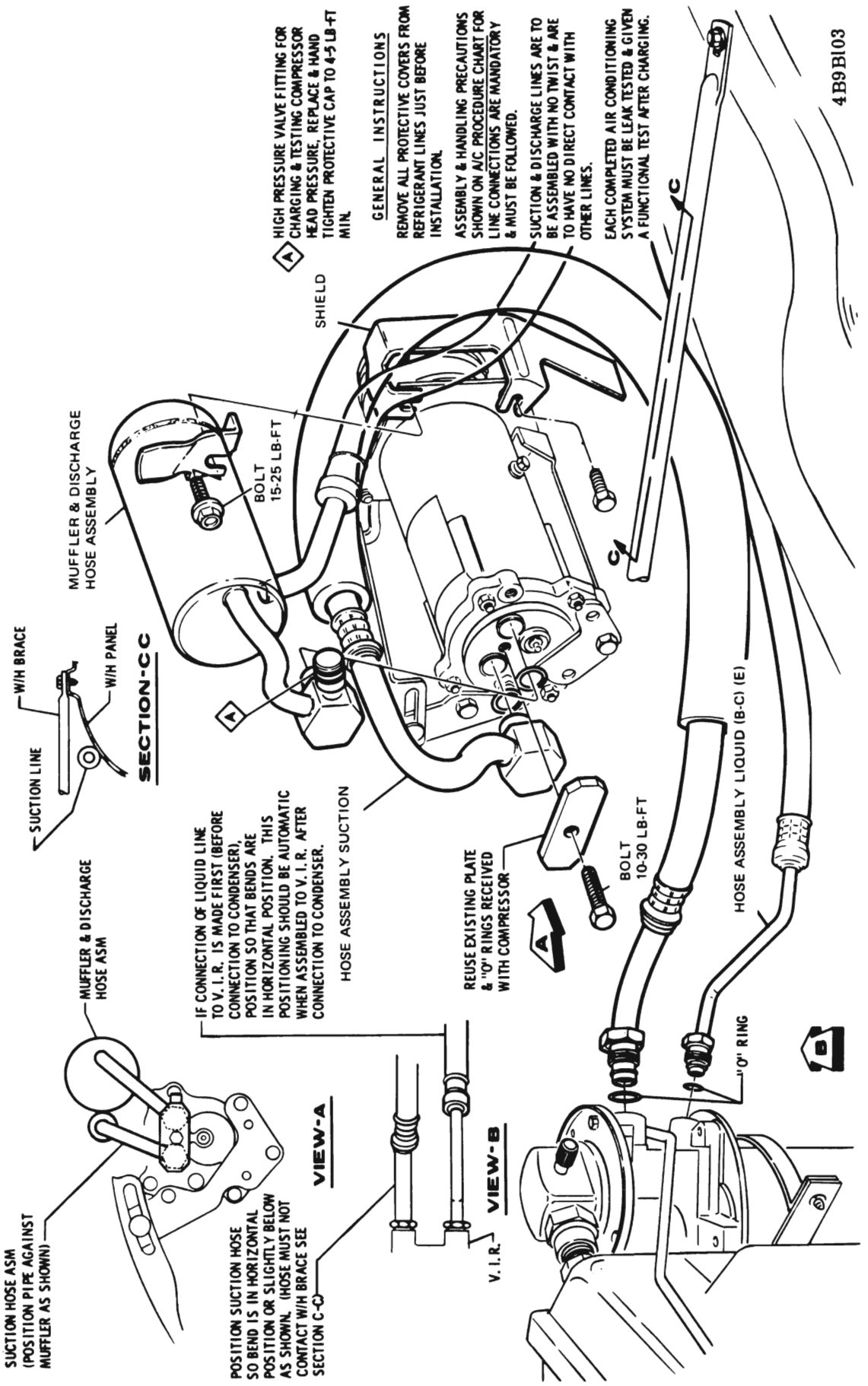


Figure 9B-126 Muffler, Discharge Liquid and Suction hose - B-C-E Series

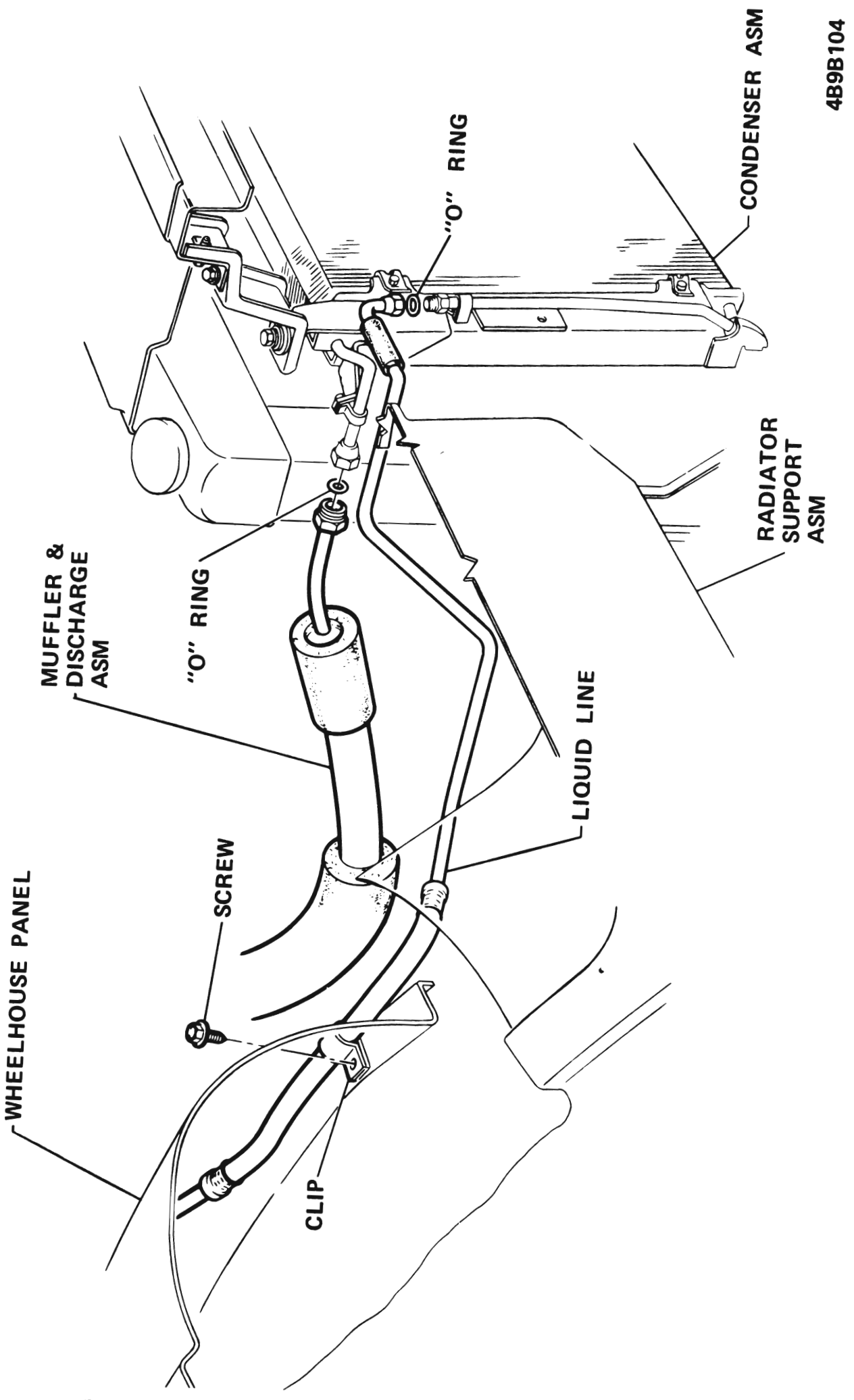


Figure 9B-127 Discharge and Liquid Hose To Condenser - B-C Series

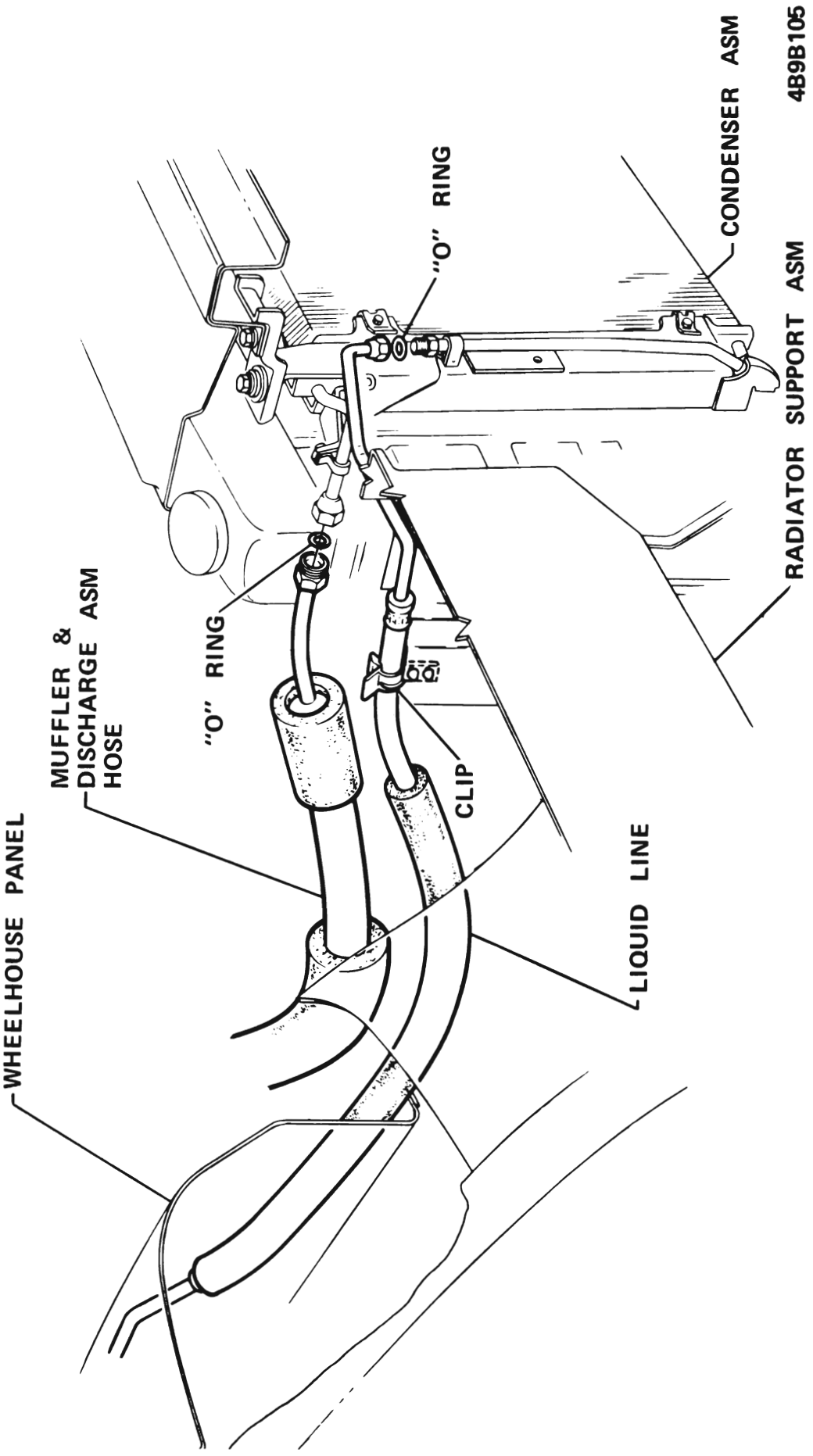


Figure 9B-128 Discharge and Liquid Hose to Condenser - E Series

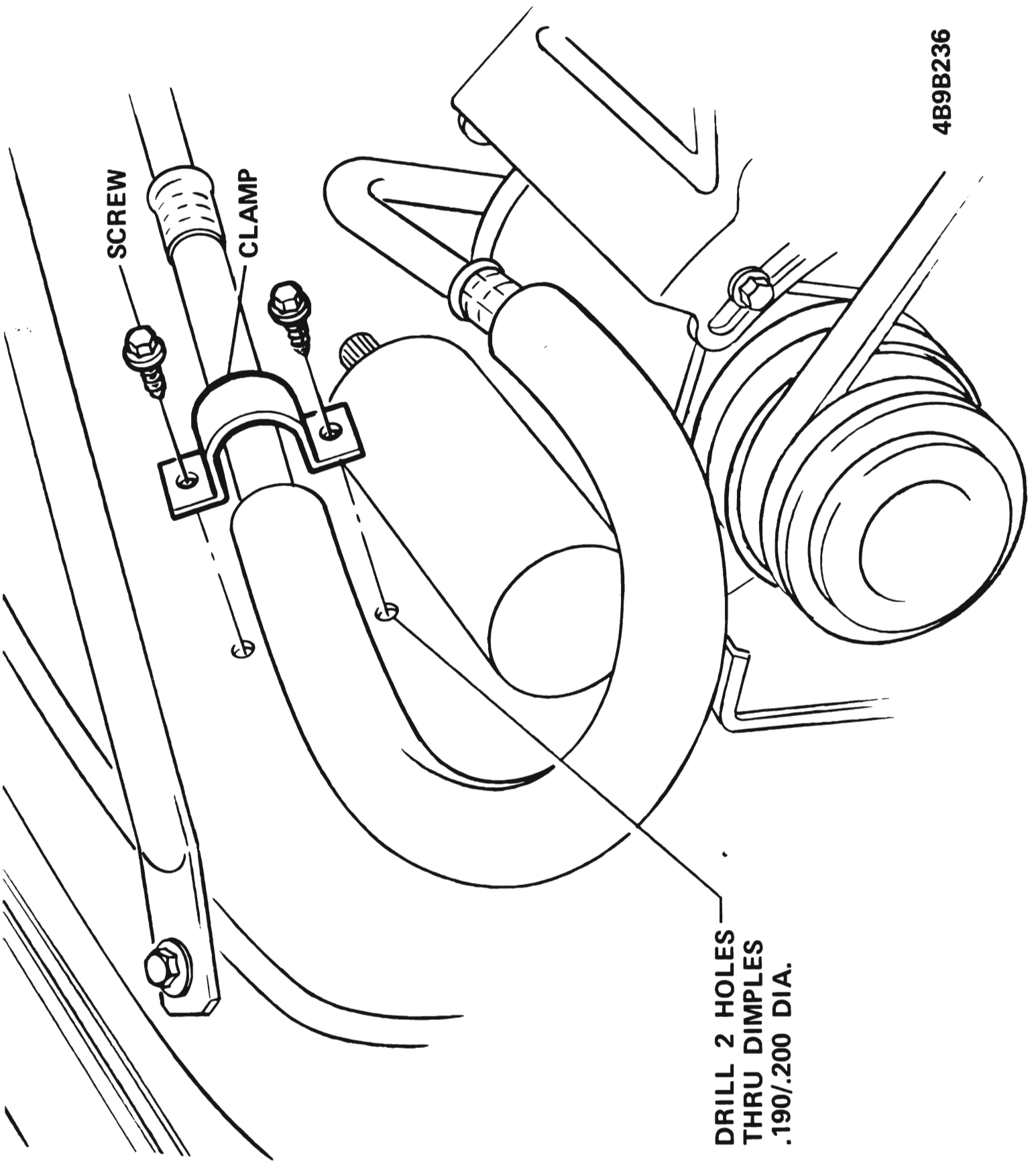


Figure 9B-130 Suction Hose Clamp - B-C-E Series

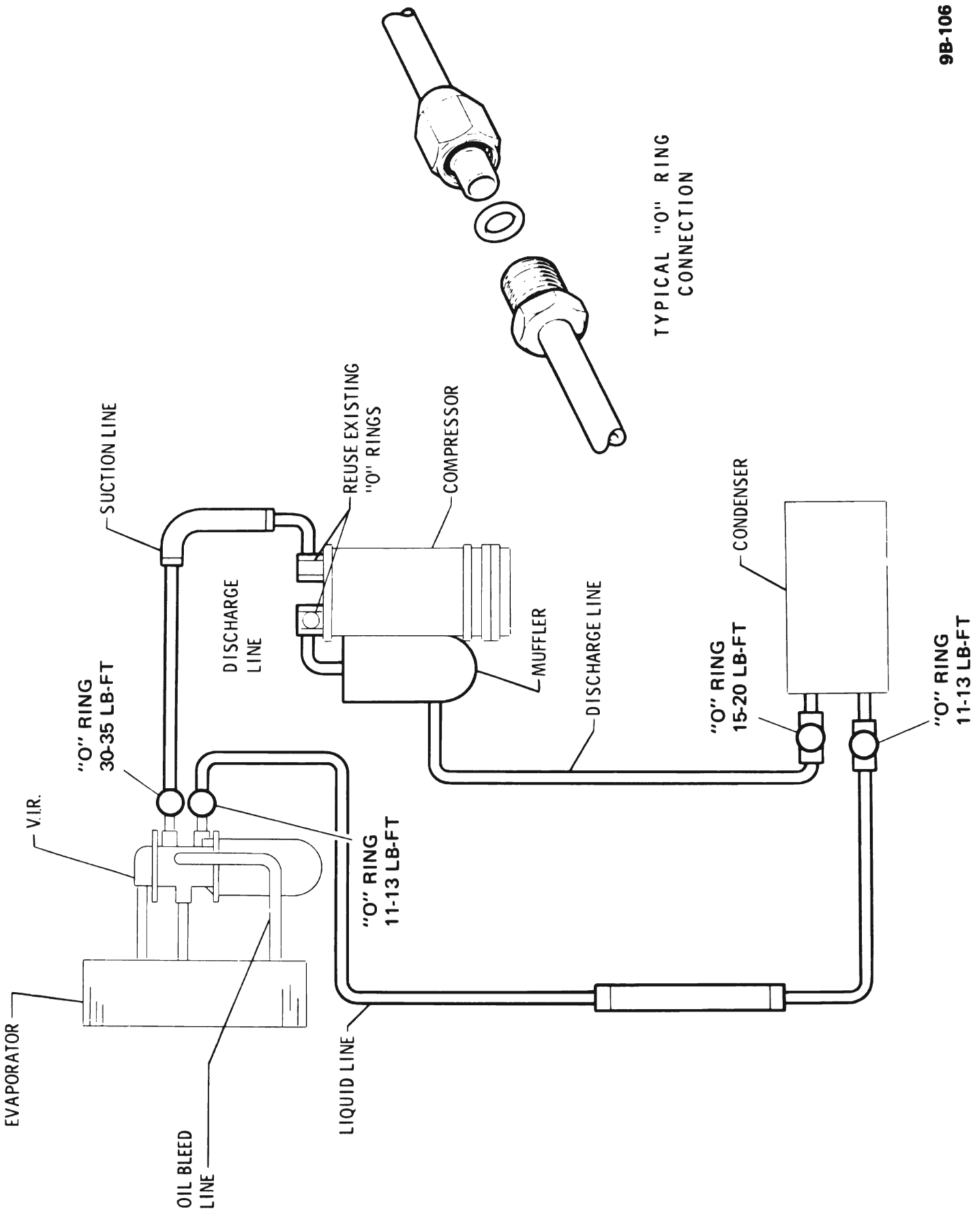
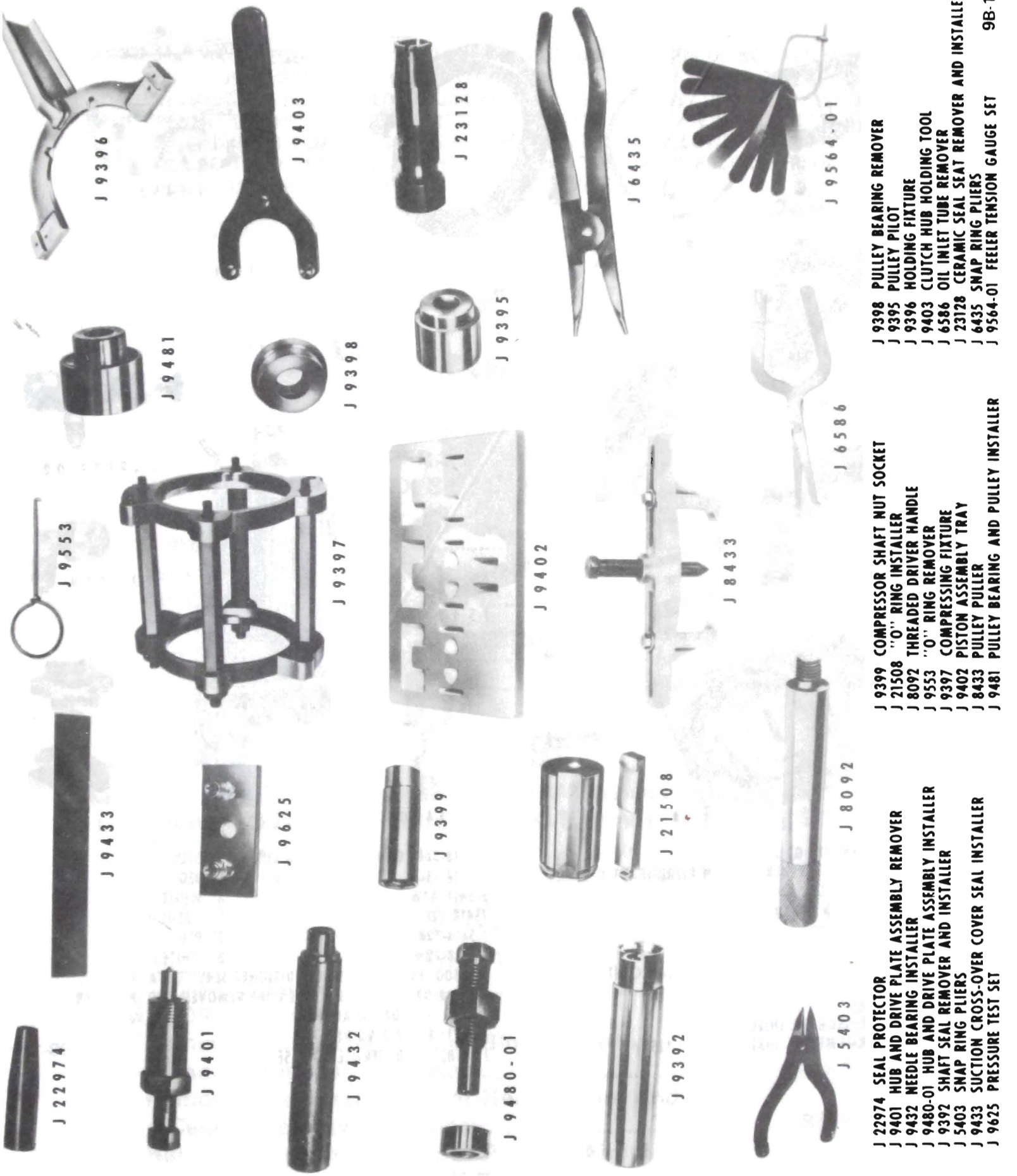


Figure 9B-131 "O" Ring Schematic - B-C-E Series

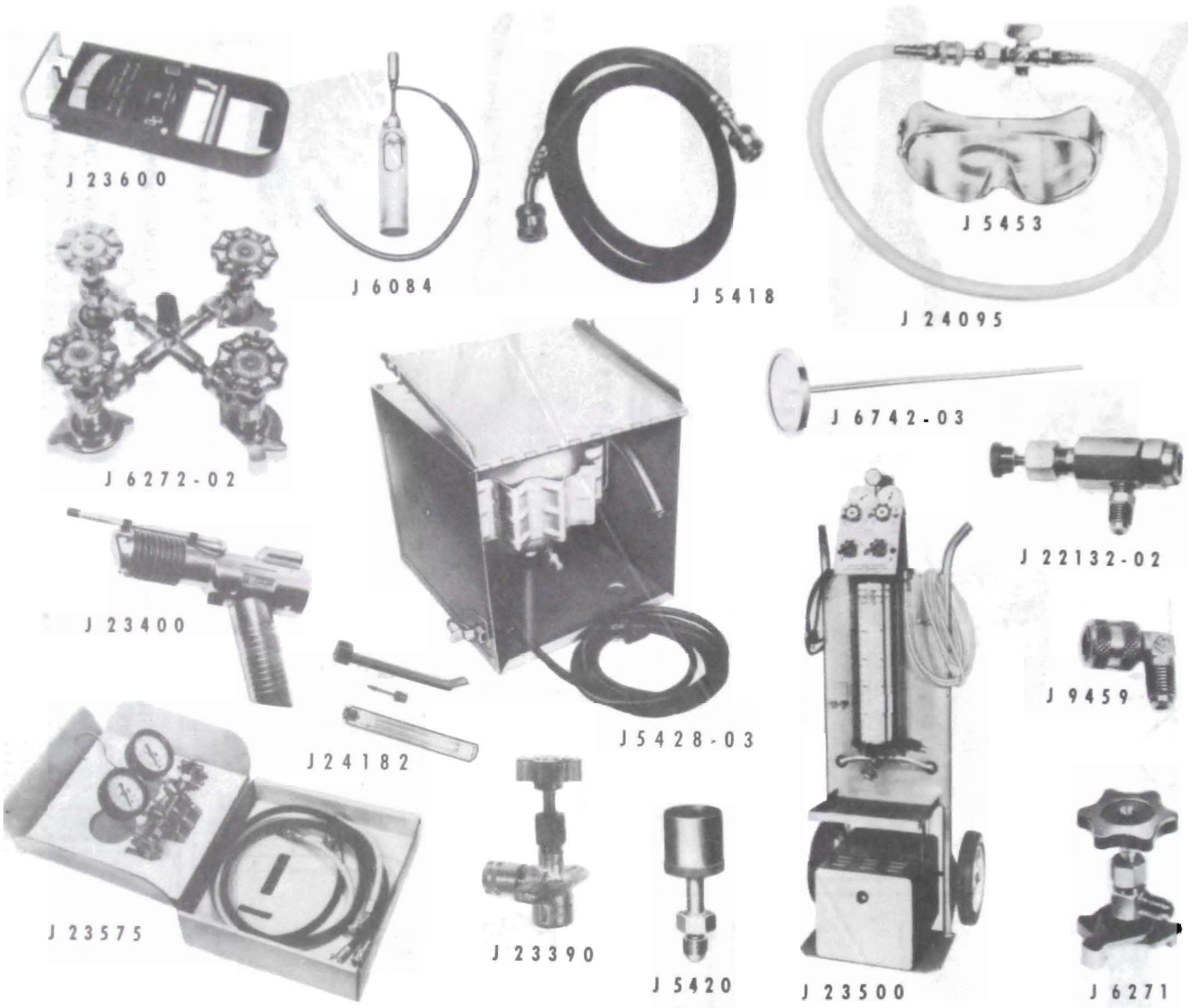


J 9398 PULLEY BEARING REMOVER
J 9395 PULLEY PILOT
J 9396 HOLDING FIXTURE
J 9403 CLUTCH HUB HOLDING TOOL
J 6586 OIL INLET TUBE REMOVER
J 23128 CERAMIC SEAL SEAT REMOVER AND INSTALLER
J 6435 SNAP RING PLIERS
J 9564-01 FEELER TENSION GAUGE SET 9B-109

J 9399 COMPRESSOR SHAFT NUT SOCKET
J 21508 "O" RING INSTALLER
J 8092 THREADED DRIVER HANDLE
J 9553 "O" RING REMOVER
J 9397 COMPRESSING FIXTURE
J 9402 PISTON ASSEMBLY TRAY
J 8433 PULLEY PULLER
J 9481 PULLEY BEARING AND PULLEY INSTALLER

J 22974 SEAL PROTECTOR
J 9401 HUB AND DRIVE PLATE ASSEMBLY REMOVER
J 9432 NEEDLE BEARING INSTALLER
J 9480-01 HUB AND DRIVE PLATE ASSEMBLY INSTALLER
J 9392 SHAFT SEAL REMOVER AND INSTALLER
J 5403 SNAP RING PLIERS
J 9433 SUCTION CROSS-OVER COVER SEAL INSTALLER
J 9625 PRESSURE TEST SET

Figure 9B-132 Special Tools



J 23600 BELT TENSION GAUGE
J 6272-02 #4 MULTI-OPENER - 4 CAN REFRIGERANT OPENER
J 23400 ELECTRONIC LEAK DETECTOR
J 23575 COMPLETE MANIFOLD ASSEMBLY
J 6084 LEAK DETECTOR
J 5428-03 VACUUM PUMP
J 23390 12 LB. DISPOSABLE REFRIGERANT CAN CONTROL VALVE
J 5420 GAUGE ADAPTER
J 5453 GOGGLES
J 24095 COMPRESSOR OIL INJECTOR
J 6742-03 THERMOMETER - DIAL TYPE (25°-125°)

J 5418-36B GAUGE CHARGING LINE - 36" BLUE
J 5418 -36R " " " - 36" RED
J 5418-48W " " " - 48" WHITE
J5418-72B " " " - 72" BLUE
J 5418-72R " " " - 72" RED
J 5418-72W " " " - 72" WHITE
J 23500 PORTABLE AIR CONDITIONER SERVICE STATION
J 22132-02 SCHRADER VALVE CORE REMOVER AND INSTALLER
J 9459 90° GAUGE ADAPTER
J 6271 FITS-ALL VALVE
J 24182 V.I.R. SERVICE TOOL SET

9B-110

Figure 9B-133 Special Tools