

SECTION 1B

A/C COMPRESSORS

CONTENTS

Axial Six Cylinder Compressor	1B-1
Radial Four Cylinder Compressor	1B-22
Leak Testing	1B-33

AXIAL SIX-CYLINDER COMPRESSOR

For Compressor REMOVAL AND INSTALLATION, refer to the ON CAR SERVICE Section of this Service Manual.

For all Axial Six Cylinder compressor applications, the compressor mechanism is basically the same. Actual differences between compressors are found in their mounting brackets, pulleys, connector assemblies and compressor capacities, none of which will affect the following Overhaul Procedures.

MINOR REPAIR PROCEDURES

The following operations to the Compressor Clutch Plate and Hub, Pulley and Bearing, and Coil Housing are covered as "Minor" because they may be performed WITHOUT FIRST PURGING THE SYSTEM OR REMOVING THE COMPRESSOR from the vehicle.

The Compressor Shaft Seal assembly and Pressure Relief Valve may also be serviced WITHOUT REMOVING THE COMPRESSOR from the vehicle but these operations are covered later in this section as "Major Repair Procedures" because the system MUST FIRST BE PURGED of Refrigerant.

Illustrations used in describing these operations show the compressor removed from the vehicle only to more clearly illustrate the various operations.

When servicing the compressor, remove only the necessary components that preliminary diagnosis indicates are in need of service. Refer to Fig. 1 and Fig. 2 for information relative to parts nomenclature and location.

Removal and installation of external compressor components and disassembly and assembly of internal components must be performed on a clean workbench. **The work area, tools, and parts must be kept clean at all times.** Parts Tray J-9402 (see Fig. 33) should be used for all parts being removed, as well as for replacement parts.

Although certain service operations can be performed without completely removing the compressor from the vehicle, the operations described herein are based on bench over-haul with the compressor removed from the vehicle. They have been prepared in sequence in order of accessibility of the components.

Pad fender/skirt and secure compressor near top of fender skirt with wire, rope, etc.

CAUTION: Do not kink or place excessive tension on lines or hoses.

When a compressor is removed from the vehicle for servicing, the amount of oil remaining in the compressor should be drained and measured. This oil should then

be discarded and new 525 viscosity refrigerant oil added to the compressor.

CLUTCH PLATE AND HUB ASSEMBLY

Remove

1. Place Holding Fixture J-9396 in a vise and clamp the compressor in the Holding Fixture.

2. Keep clutch hub from turning with Clutch Hub Holder J-25030 or J-9403, and remove locknut from end of shaft using Thin Wall Socket J-9399 (Fig. 3).

CAUTION: To avoid internal damage to the compressor, **DO NOT DRIVE OR POUND** on the Clutch Plate and Hub assembly OR on the end of the shaft. If proper tools to remove and replace clutch parts are not used, it is possible to disturb the position of the axial plate (keyed to the main shaft), resulting in compressor damage and seal leakage due to shifting of the crankshaft.

3. Thread Clutch Plate and Hub assembly Remover J-9401 into hub. Hold body of Remover with a wrench and tighten center screw to remove Clutch Plate and Hub assembly (Fig. 4).

4. Remove square drive key from shaft or drive plate hub.

5. Remove hub spacer retainer ring using Snap-Ring Pliers J-5403(#21), and then remove hub spacer (Fig. 5).

6. Inspect driven plate for cracks or stresses in the drive surface. Do not replace driven plate for a scoring condition. (Fig. 6).

If the frictional surface shows signs of damage due to excessive heat, the clutch plate and hub and pulley and bearing should be replaced. Check further for the underlying cause of the damage (i.e. low coil voltage - coil should draw 3.2 amps at 12 volts) or binding of the compressor internal mechanism, clutch air gap too wide, broken drive plate to hub asm. springs, etc.

Replace

1. Insert the square drive key into the hub of driven plate; allow it to project approximately 3/16" out of the keyway.

2. Line up the key in the hub with keyway in the shaft (Fig. 7).

3. Position the Drive Plate Installer J-9480-1 on the threaded end of the shaft. The Spacer J-9480-2 should be in place **under** the hex nut on the tool. This tool has a left hand thread on the body. (Fig. 8).

4. Press the driven plate onto the shaft until there is approximately 3/32" space between the frictional faces of the clutch drive plate and pulley.

CAUTION: Make certain key remains in place when pressing hub on shaft.

A ZERO thrust race is approximately 3/32" thick and

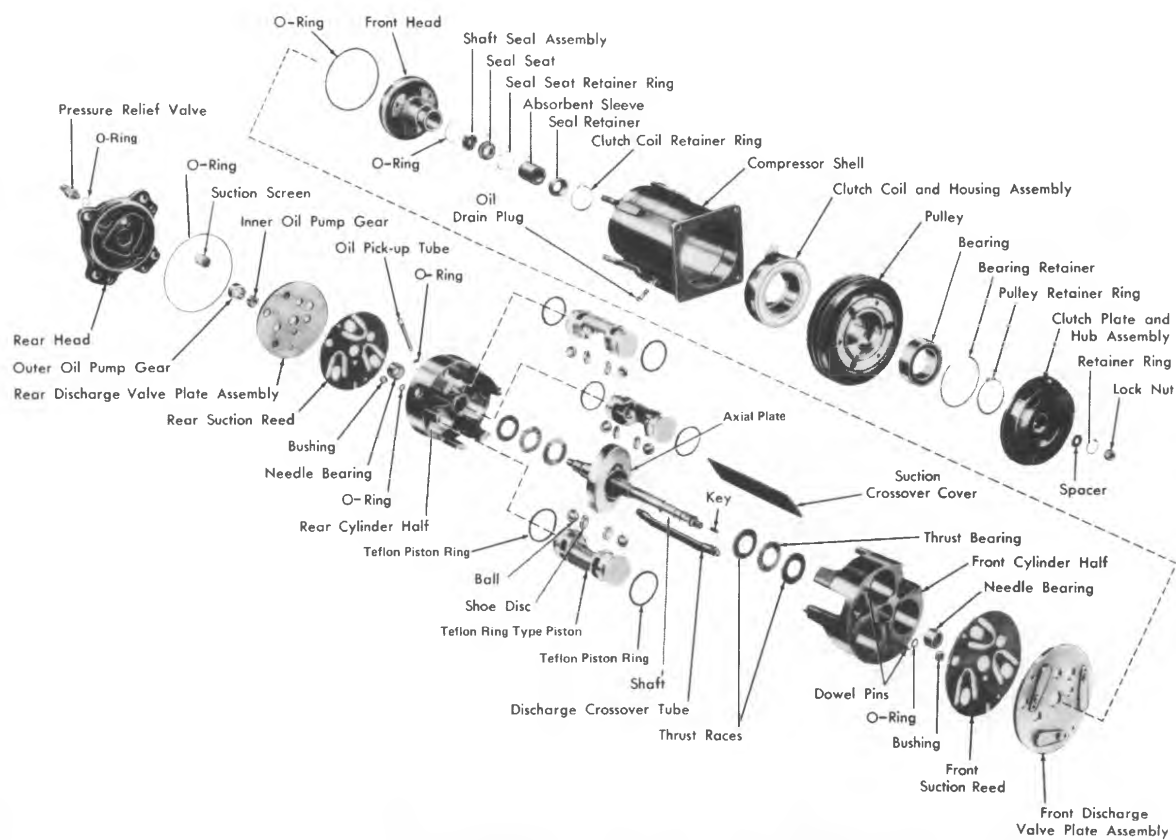


Fig. 1-Exploded View of A-6 Compressor

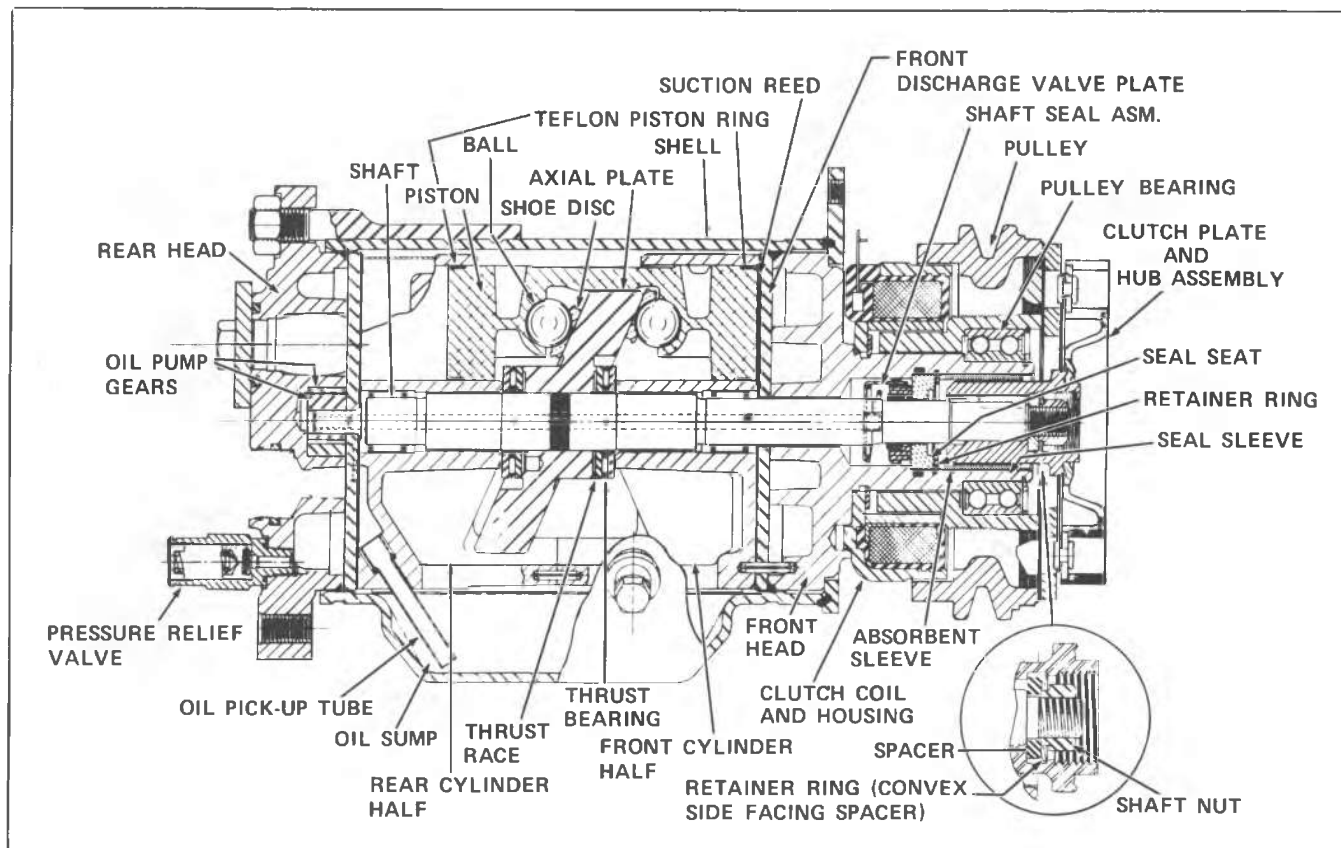


Fig. 2--A-6 Compressor Cross Section

may be used to roughly gage this operation. Use Clutch Hub Holder J-25030 or J-9403 to hold clutch plate and hub if necessary.

5. Install the hub spacer and, using Snap-Ring Pliers J-5403 (#21), install the retainer ring (see installed Retainer Ring in inset of Fig. 2), with convex side of ring facing spacer.

6. Use Thin-Wall Socket J-9399 and Clutch Hub Holder J-25030 or J-9403 to install a new shaft locknut **with shoulder or circular projection on the locknut facing towards retainer ring**. Tighten the nut to 14-26 lb. ft. torque. Air gap between the frictional faces should now be .022" to .057" (Fig. 9). If not, check for

mispositioned key or shaft.

7. The pulley should now rotate freely.

8. Operate the refrigeration system under MAXimum load conditions and engine speed at 2000 RPM. Rapidly cycle the clutch by turning the air conditioning on-and-off at least 15 times at approximately one second intervals to burnish the mating parts of the clutch.

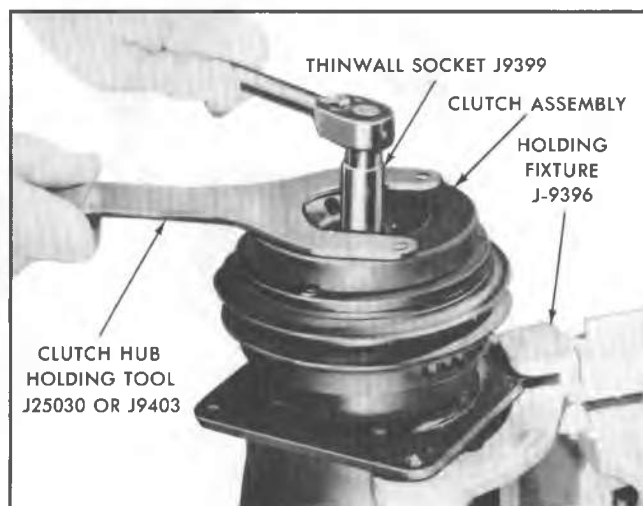


Fig. 3--Removing Shaft Lock Nut



Fig. 4--Removing Clutch Plate and Hub Assembly

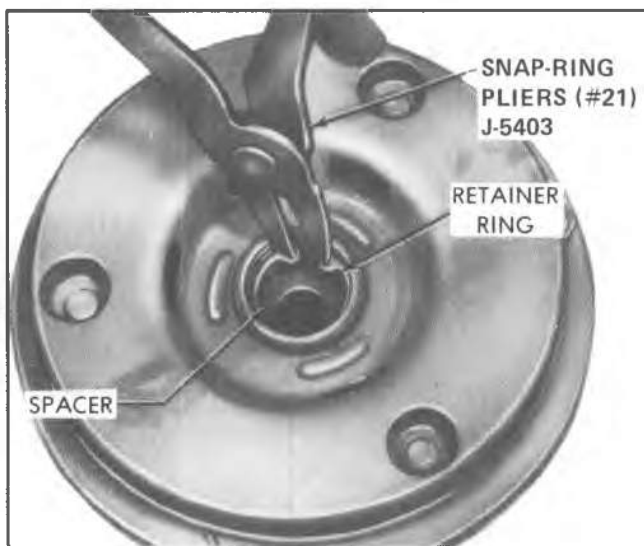


Fig. 5--Removing or Installing Retainer Ring in A-6 Clutch Drive Plate

PULLEY AND BEARING ASSEMBLY

Remove

1. Remove clutch plate and hub assembly as described in "Compressor Clutch Plate and Hub Asm." Removal procedure.

2. Remove pulley retainer ring using Snap-Ring Pliers J-6435 (#26), Fig. 10.

3. Pry out absorbent sleeve retainer, and remove absorbent sleeve from compressor neck.

4. Place Puller Pilot J-9395 over end of compressor shaft.

CAUTION: It is important that Puller Pilot J-9395 be used to prevent internal damage to compressor when removing pulley. Under no circumstances should Puller be used DIRECTLY against drilled end of shaft.

5. Remove Pulley and Bearing Assembly using Pulley Puller J-8433 (Fig. 11).

Inspection

Check the appearance of the pulley and bearing assembly. See Fig. 6. The frictional surfaces of the pulley and bearing assembly should be cleaned with a suitable solvent before reinstallation.

Replace

1. If original pulley and bearing assembly is to be reinstalled, wipe frictional surface of pulley clean. If frictional surface of pulley shows any indication of damage due to overheating, the pulley and bearing should be replaced.

2. Check bearing for brinelling, excessive looseness, noise, and lubricant leakage. If any of these conditions exist, bearing should be replaced. See "Compressor Pulley Bearing" Replacement Procedure.

3. Press or tap pulley and bearing assembly on neck of compressor until it seats, using Pulley and Bearing Installer J-9481 with Universal Handle J-8092 (Fig. 12). The Installer will apply force to inner race of bearing and prevent damage to bearing.

4. Check pulley for binding or roughness. Pulley should rotate freely.

5. Install retainer ring, using Snap Ring Pliers J-6435 (#26).

6. Install absorbent sleeve in compressor neck.

7. Install absorbent sleeve retainer in neck of compressor. Using sleeve from Seal Seat Remover-Installer J-23128, install retainer so that outer edge is recessed 1/32" from compressor neck face.

8. Install clutch plate and hub assembly as described in "Compressor Clutch Plate and Hub Asm." Replacement Procedure.

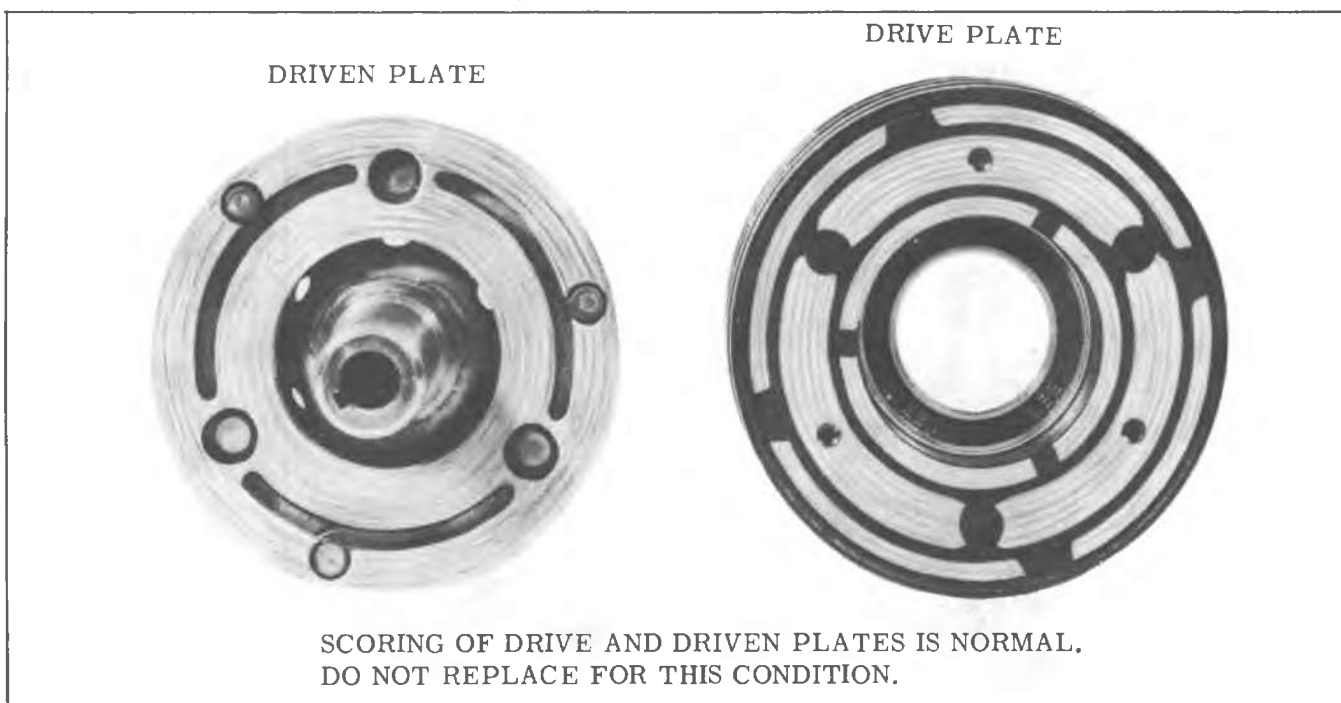


Fig. 6--Clutch Driven Plate and Drive Plate

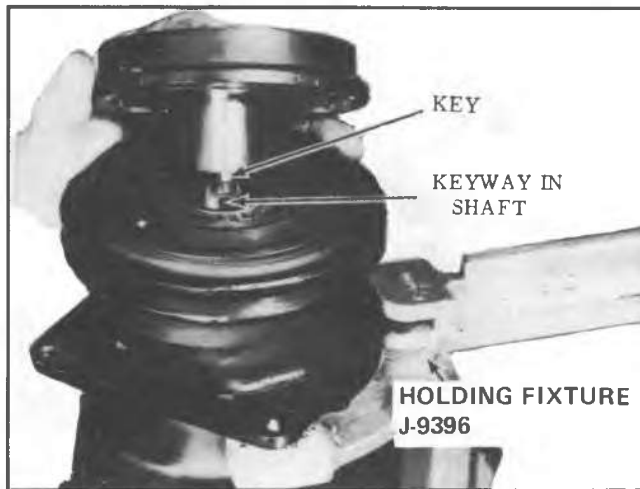


Fig. 7--Aligning Drive Plate Key

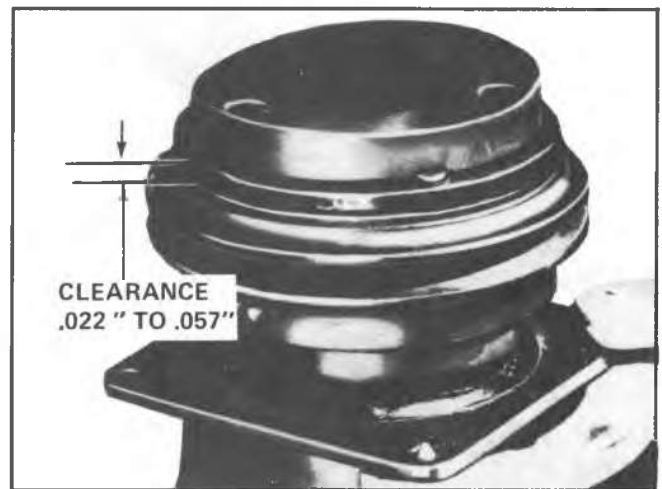


Fig. 9--Checking Air Gap

PULLEY BEARING

Remove

1. Remove clutch plate and hub assembly as described in "Compressor Clutch Plate and Hub Asm." Removal procedure.

2. Remove pulley and bearing assembly as described in "Compressor Pulley and Bearing Asm." Removal procedure.

3. Remove pulley bearing retainer ring with a small screwdriver or pointed tool (Fig. 13).

4. Place pulley and bearing assembly on inverted Support Block J-21352 and, using Pulley Bearing Remover J-9398 with Universal Handle J-8092, drive Bearing assembly out of pulley (Fig. 14).

Replace

1. Install new bearing in pulley using Pulley and Bearing Installer J-9481 with Universal Handle J-8092 (Fig. 15). The Installer will apply the force to the outer race of the bearing.

CAUTION: DO NOT CLEAN NEW BEARING ASSEMBLY WITH ANY TYPE OF SOLVENT. Bearing is supplied with correct lubricant when assembled and requires no other lubricant at any time.

2. Install bearing retainer ring, making certain that it is properly seated in ring groove.



Fig. 8--Installing Drive Plate

3. Install pulley and bearing assembly as described in "Compressor Pulley and Bearing Asm." Replacement procedure.

4. Install clutch plate and hub assembly as described in "Compressor Clutch Plate and Hub Asm." Replacement procedure.

CLUTCH COIL AND HOUSING ASSEMBLY

Remove

1. Remove clutch plate and hub assembly as described in "Compressor Clutch Plate and Hub Asm." Removal procedure.

2. Remove pulley and bearing assembly as described in "Compressor Pulley and Bearing Asm." Removal procedure.

3. **Note position of terminals on coil housing and scribe location on compressor front head casting.**

4. Remove coil housing retaining ring using Snap-Ring Pliers J-6435 (#26) (Fig. 16).

5. Lift Coil and Housing assembly off compressor.

Replace

1. Position coil and housing assembly on compressor front head casting so that electrical terminals line up with marks previously scribed on compressor (Fig. 17).

2. Align locating extrusions on coil housing with holes

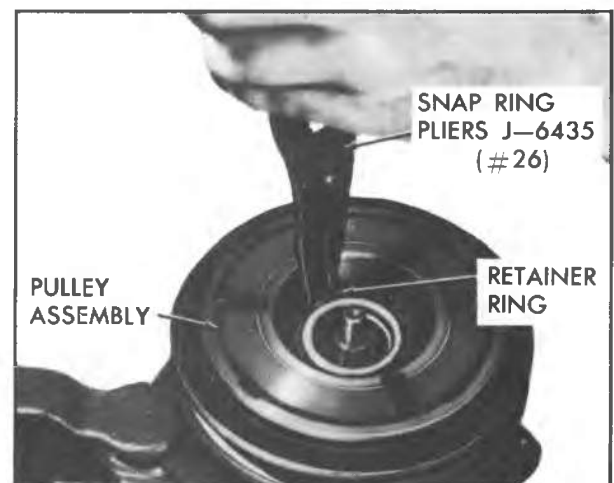


Fig. 10--Removing Pulley Retainer Ring

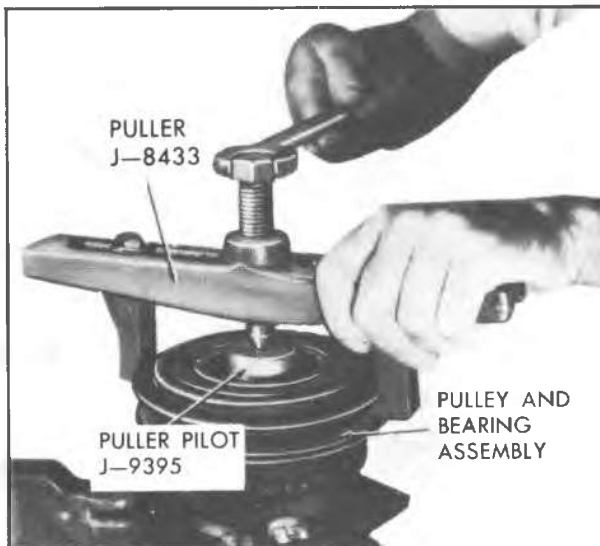


Fig. 11--Removing Pulley and Bearing Assembly

in front head casting.

3. Install coil housing retainer ring **with flat side of ring facing coil**, using Snap-Ring Pliers J-6435 (#26).

4. Install pulley and bearing assembly as described in "Compressor Pulley and Bearing Asm." Replacement procedure.

5. Install clutch plate and hub assembly as described in "Compressor Clutch Plate and Hub Asm." Replacement Procedure.

MAJOR A-6 COMPRESSOR REPAIR PROCEDURES

Service repair procedures to the Compressor Shaft Seal, Pressure Relief Valve and Superheat Switch, if so equipped, or disassembly of the Internal Compressor Mechanism are considered **"MAJOR" SINCE THE REFRIGERATION SYSTEM MUST BE COMPLETELY PURGED OF REFRIGERANT** before proceeding, and/or because major internal operating and sealing components of the compressor are being disassembled and serviced.

A clean workbench, preferably covered with a sheet of clean paper, orderliness in the work area and a place for all parts being removed and

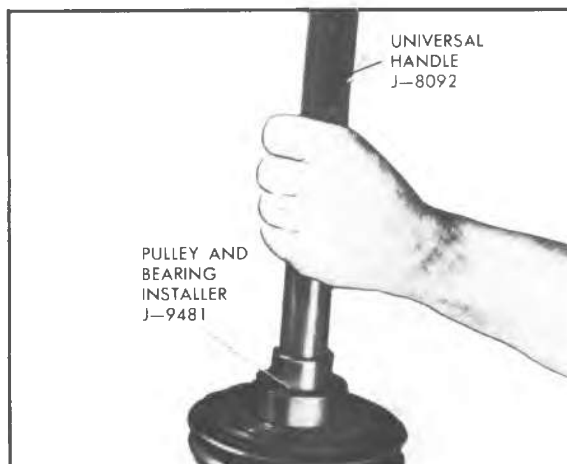


Fig. 12--Installing Pulley and Bearing Assembly

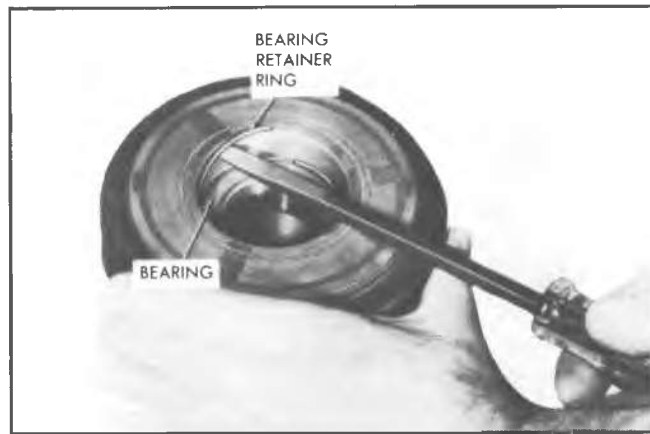


Fig. 13--Removing Pulley and Bearing Retainer Ring

replaced is of great importance, as is the use of the proper, clean service tools. Any attempt to use make-shift or inadequate equipment may result in damage and/or improper compressor operation.

These procedures are based on the use of the proper service tools and the condition that an adequate stock of service parts is available.

All parts required for servicing are protected by a preservation process and packaged in a manner which will eliminate the necessity of cleaning, washing or flushing of the parts. The parts can be used in the mechanism assembly just as they are removed from the service package.

Piston shoe discs and shaft thrust races will be identified by "number" on the parts themselves for reference to determine their size and dimension (see Fig. 41).

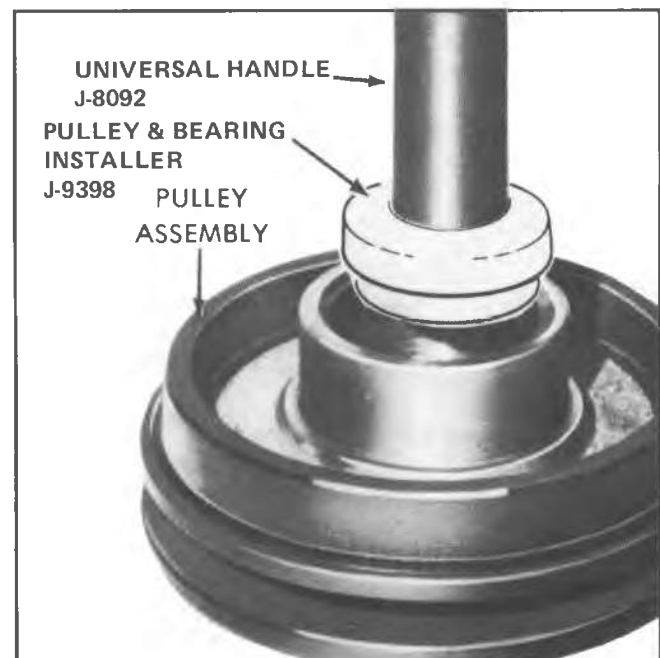


Fig. 14--Removing Bearing from Pulley Assembly

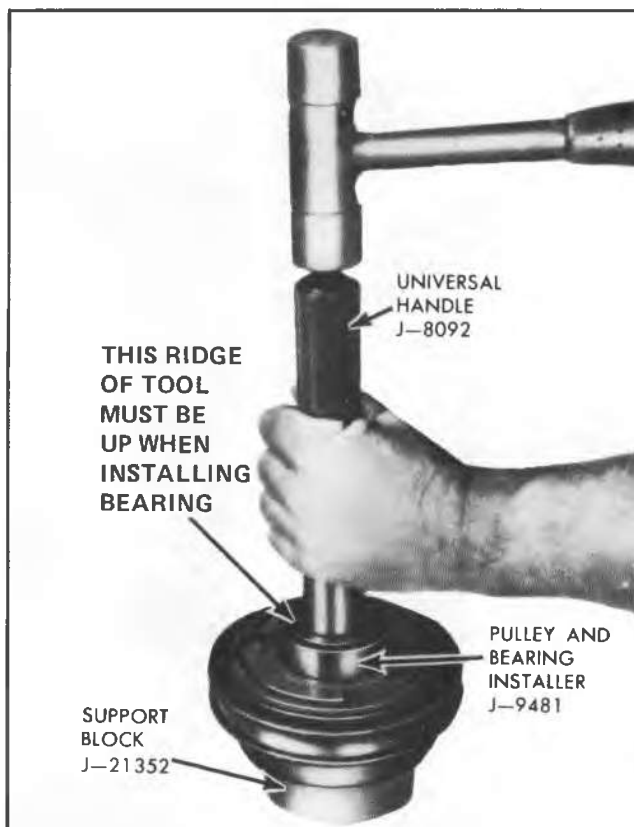


Fig. 15--Installing Bearing on Pulley



Fig. 17--Installing Coil Housing

SHAFT SEAL

Seal Leak Detection

A SHAFT SEAL SHOULD NOT BE CHANGED BECAUSE OF AN OIL-LINE ON THE HOOD INSULATOR. The seal is designed to seep some oil for lubrication purposes. Only change a shaft seal when a leak is detected by the following procedure.

When refrigerant system components other than the compressor are replaced, the compressor must be removed and oil drained from the compressor if oil was sprayed in large amounts due to leaks or a broken shaft seal.

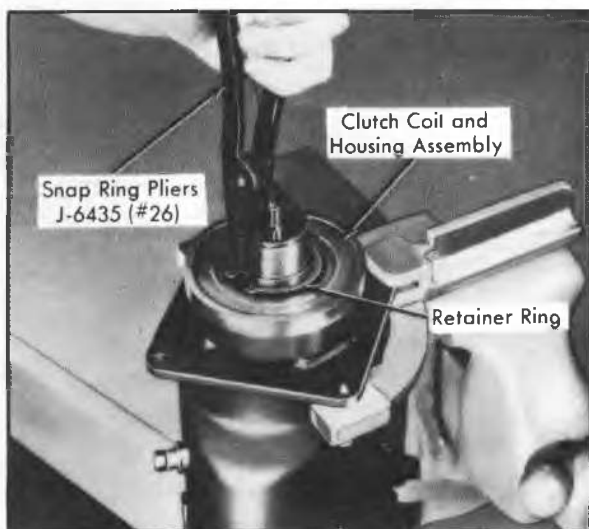


Fig. 16--Removing Coil Housing Retainer Ring

Compressor shaft seals, unless replaced during a compressor overhaul, are to be replaced only on the basis of actual refrigerant leakage as determined by test with leak detector.

WHEN REPLACING THE SHAFT SEAL ASSEMBLY, even if the compressor remains on the vehicle during the operation, IT WILL BE NECESSARY TO PURGE THE SYSTEM OF REFRIGERANT as outlined earlier in the Service Manual.

Remove

1. After first purging the system of refrigerant, remove the clutch plate and hub assembly and shaft key as described in "Compressor Clutch Plate and Hub Asm." Removal procedure.

2. Pry out the sleeve retainer and remove the absorbent sleeve. Remove the shaft seal seat retaining ring, using Snap-Ring Pliers J-5403 (#21). See Fig. 18.

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

4. Place Seal Protector J-22974 over the end of the shaft to prevent chipping the ceramic seat. Fully engage the knurled tangs of Seal Seat Remover-Installer J-23128 into the recessed portion of the seal seat by turning the handle **clockwise**. Lift the seat from the compressor with a rotary motion (Fig. 19).

CAUTION: DO NOT tighten the handle with a wrench or pliers; however, the handle must be hand-tightened securely to remove the seat.

5. With Seal Protector J-22974 still over the end of the shaft, engage the tabs on the seal assembly with the tangs

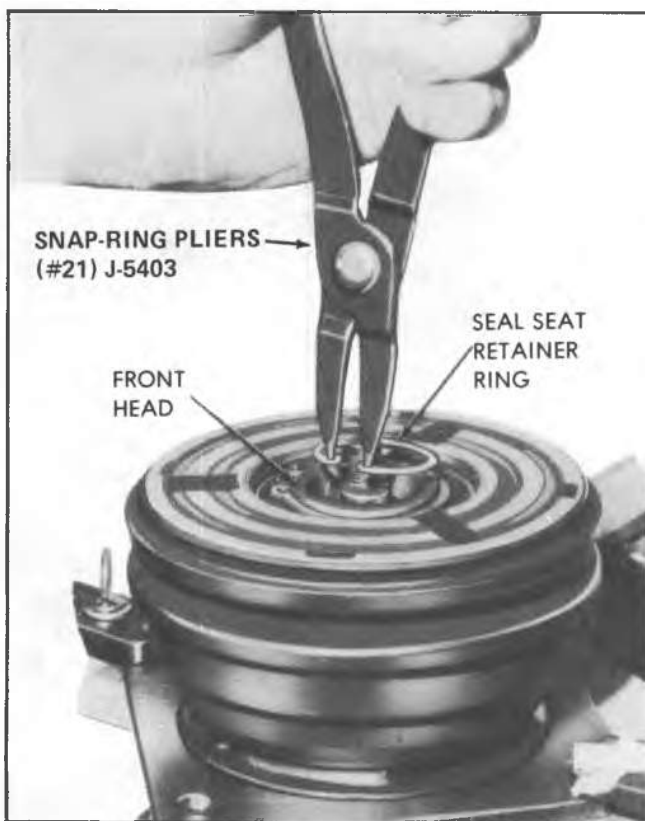


Fig. 18—Removing or Installing Shaft Seal Seat Retaining Ring

on Seal Installer J-9392 by twisting the tool **clockwise**, while **pressing the tool down**. Then lift the seal assembly out (see Fig. 20).

6. Remove the seal seat O-ring from the compressor neck using O-Ring Remover J-9533 (See Fig. 19).

7. Recheck the shaft and inside of the compressor neck for dirt or foreign material and be sure these areas are perfectly clean before installing new parts.

Inspection

SEALS SHOULD NOT BE REUSED. ALWAYS USE A NEW SEAL KIT ON REBUILD. Be extremely careful that the face of the seal to be installed is not scratched or damaged in any way. Make sure that the seal seat and seal are free of lint and dirt that could damage the seal surface or prevent sealing.

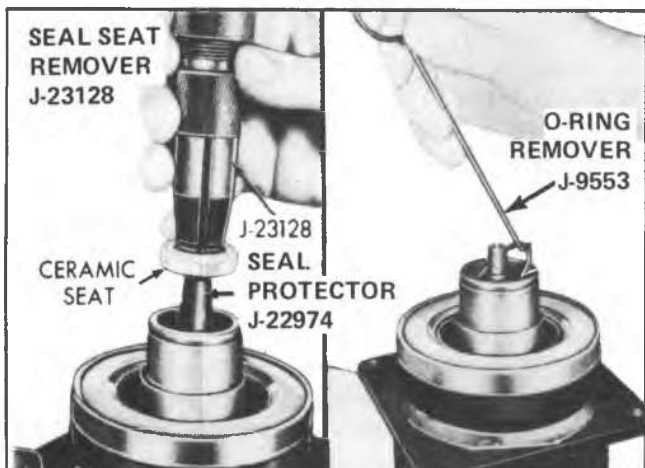


Fig. 19—Removing Shaft Seal Seat and O-Ring

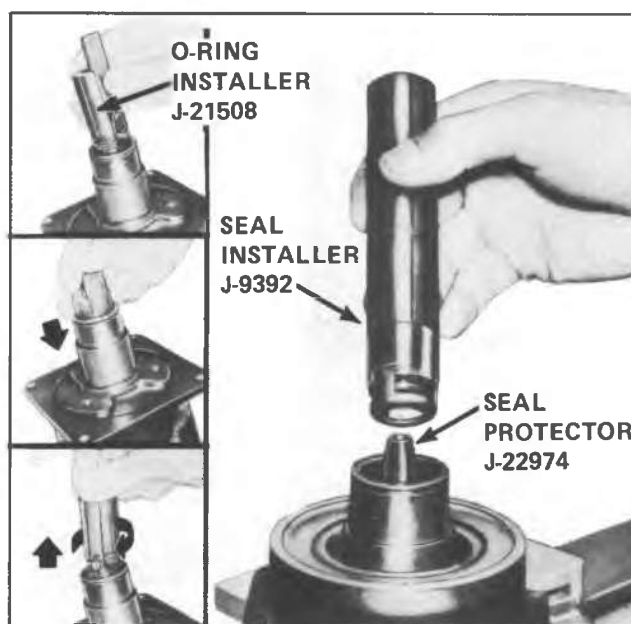


Fig. 20—Replacing Seal and O-Ring

Replace

1. Coat new seal seat O-ring with clean 525 viscosity refrigerant oil and install in compressor neck, **making certain it is installed in bottom groove** (Fig. 20 and Fig. 21). Top groove is for retainer ring. Use O-Ring Installer J-21508.

2. Coat the O-ring and seal face of the new seal assembly with clean 525 viscosity refrigerant oil. Carefully mount the seal assembly to Seal Installer J-9392 by engaging the tabs of the seal with the tangs of the tool (Fig. 20).

3. Place Seal Protector J-22974 (Fig. 20) 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.

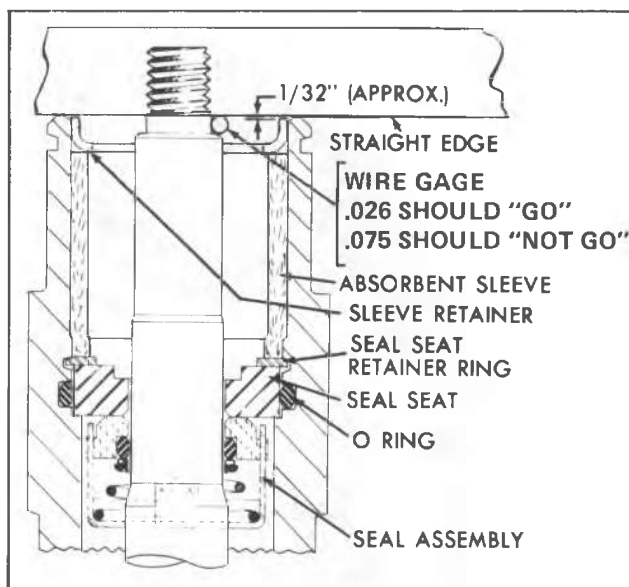


Fig. 21—Compressor Shaft and Seal

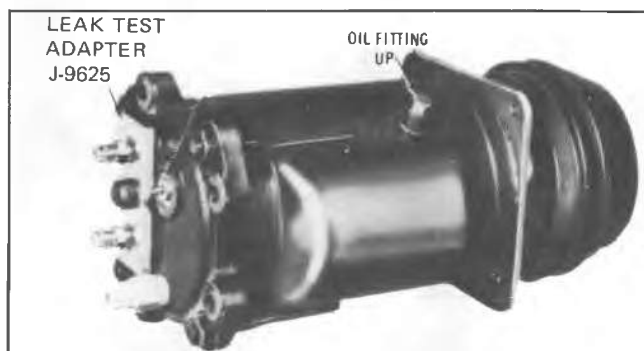


Fig. 22--Leak Testing A-6 Compressor

4. Coat the seal face of the new seal seat with clean 525 viscosity refrigerant oil. Mount the seal seat on Seal Seat Remover-Installer J-23128 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. Remove Seal Protector J-22974 from the end of the shaft (see Fig. 19).

5. Install the new seal seat retainer ring **with its flat side against the seal seat**, using Snap-Ring Pliers J-5403 (#21). See Fig. 18. Use the sleeve from Seal Seat Remover-Installer J-23128 (Fig. 19) to press in on the seal seat retainer ring so that it snaps into its groove.

6. Install Compressor Leak Test Fixture J-9625 on rear head of compressor and connect gage charging lines as shown for bench test in Fig. 22 or pressurize SUCTION SIDE of compressor on car with Refrigerant-12 vapor to equalize pressure to the drum pressure. Temporarily install the shaft nut and, with compressor in horizontal position and oil sump down, rotate the compressor shaft in normal direction of rotation several times by hand. Leak test the seal with a Leak Detector. Correct any leak found. Remove and discard the shaft nut.

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

8. Install the new absorbent sleeve by rolling the material into a cylinder, overlapping the ends, and then slipping the sleeve into the compressor neck with the overlap towards the top of the compressor. With a small screwdriver or similar instrument, carefully spread the sleeve until the ends of the sleeve butt at the top vertical centerline.

9. Position the new metal sleeve retainer so that its flange face will be against the front end of the sleeve. Pulley Puller Pilot J-9395 (See Fig. 11) may be used to install the retainer. Press and tap with a mallet, setting the retainer and sleeve into place (retainer should be recessed approximately 1/32" from the face of the compressor neck). See Fig. 21.

10. Reinstall the clutch plate and hub assembly as described in "Compressor Clutch Plate and Hub Asm." Replacement procedure.

Some compressor shaft seal leaks may be the result of mispositioning of the axial plate on the compressor shaft. The mispositioning of the axial plate may be caused by improper procedures used during pulley and driven plate removal, pounding, collisions or dropping the compressor. If the axial plate is mispositioned, the carbon face of the shaft seal assembly may not contact the seal seat and the rear thrust races and bearing may be

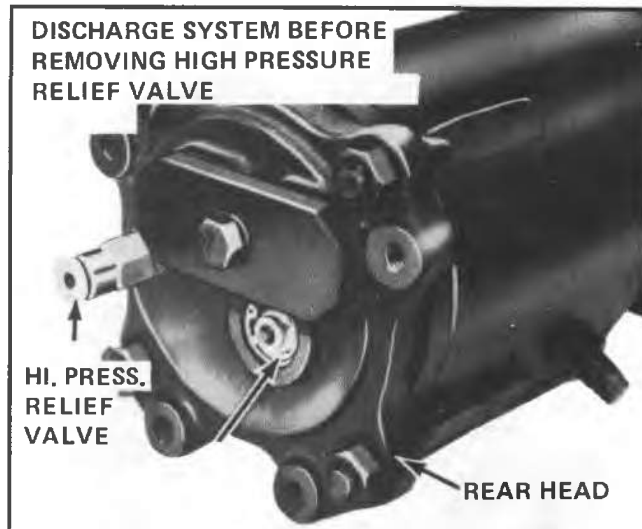


Fig. 23--Hi. Press. Relief Valve Location

damaged.

If there appears to be too much or insufficient air gap between the drive and driven plates, dislocation of the shaft should be suspected. If the carbon seal is not seating against the seal seat, it will not be possible to completely evacuate the system.

To check for proper positioning of the axial plate on the shaft, remove the clutch driven plate and measure the distance between the front head extension and the flat shoulder on the shaft as shown in Fig. 21. To measure this distance, use a wire gage (**the clearance should be between .026" and .075"**). If the shaft has been pushed back in the axial plate (measurement greater than .075"), disassemble the compressor and replace the shaft and axial plate assembly rear thrust races and thrust bearing.

11. Evacuate and charge system.

PRESSURE RELIEF VALVE

When necessary to replace the pressure relief valve, located in the compressor rear head casting, the valve assembly should be removed after **PURGING THE SYSTEM OF REFRIGERANT** and a new valve and gasket installed. The entire system should then be "Evacuated and Recharged." (Fig. 23).

INTERNAL MECHANISM

Service operations to the rear head or internal mechanism of the compressor **should be performed with the compressor removed from the vehicle** to insure that the necessary degree of cleanliness may be maintained. Clean hands, clean tools and a clean bench, preferably covered with clean paper, are of extreme importance.

An inspection should be made of the internal mechanism assembly to determine if any service operations should be performed. A detailed inspection of parts should be made to determine if it is economically feasible to replace them.

Remove

1. Before proceeding with disassembly, wipe exterior surface of compressor clean.

2. All oil in compressor should be drained and measured. Assist draining by positioning compressor with oil drain plug down. **Record the amount of oil drained from the compressor.**

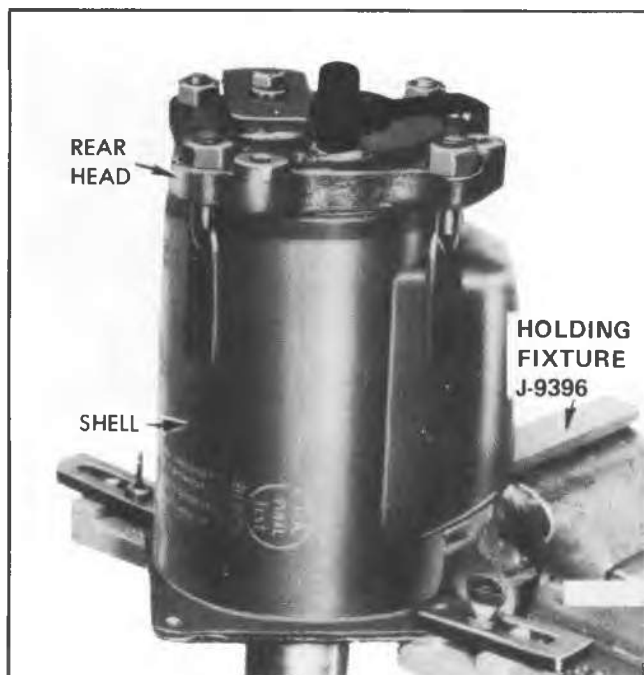


Fig. 24--Compressor Installed in Holding Fixture

3. Invert compressor and Holding Fixture J-9396 with front end of compressor shaft facing downward. (Fig. 24).

Additional oil may leak from compressor at this time. All oil must be drained into a container so that TOTAL amount can be measured. A liquid measuring cup may be used for this purpose. Drained oil should then be discarded.

4. Remove four locknuts from threaded studs on compressor shell and remove rear head. Tap uniformly around rear head if head is binding. (Fig. 24)

5. Wipe excess oil from all sealing surfaces on rear head casting webs, and examine sealing surfaces (Fig. 25). If any damage is observed, the head should be replaced.

6. Remove suction screen and examine for any damage or contamination. Clean or replace if necessary.

7. Paint an identifying mark on exposed face of inner and outer oil pump gears and then remove gears. Identifying marks are to assure that gears, if reused, will be installed

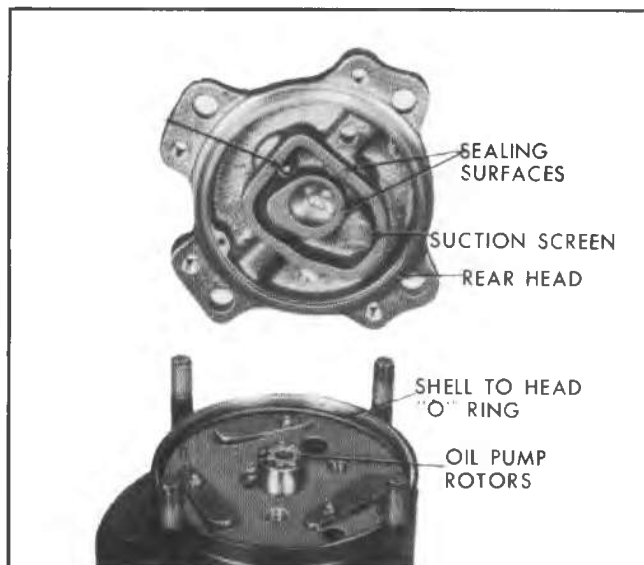


Fig. 25--Rear Head Removal

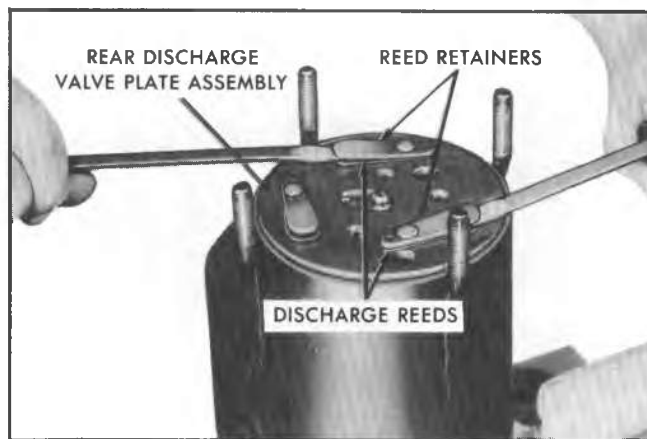


Fig. 26--Removing Rear Discharge Valve Plate

on identical position.

8. Remove and discard rear head to shell O-ring.

9. Carefully remove rear discharge valve plate assembly. Use two small screwdrivers under reed retainers to pry up on assembly (Fig. 26). **Do not position screwdrivers between reeds and reed seats.**

10. Examine valve reeds and seats. Replace entire assembly if any reeds or seats are damaged.

11. Using two small screwdrivers, carefully remove rear suction reed (Fig. 27). **Do not pry up on horseshoe-shaped reed valves.**

12. Examine reeds for damage, and replace if necessary.

13. Using Oil Pick-Up Tube Remover J-5139 (Fig. 28), remove oil pick-up tube. Remove O-ring from oil inlet.

14. Loosen compressor from Holding Fixture J-9396, place Internal Assembly Support Block J-21352 over oil pump end of shaft and, holding Support Block in position with one hand, lift compressor from Holding Fixture with other hand. Invert compressor and position on bench with Internal Assembly Support Block resting on bench.

15. Lift front head and compressor shell assembly up, leaving internal mechanism resting on Internal Assembly Support Block.

CAUTION: To prevent damage to shaft, **DO NOT TAP ON END OF COMPRESSOR SHAFT** to remove internal mechanism. If mechanism will not slide out of compressor shell, tap on front head with a plastic hammer.

16. Rest compressor shell on its side and push front head assembly through compressor shell, **being careful not to damage sealing areas on inner side of front**



Fig. 27--Removing Rear Suction Reed

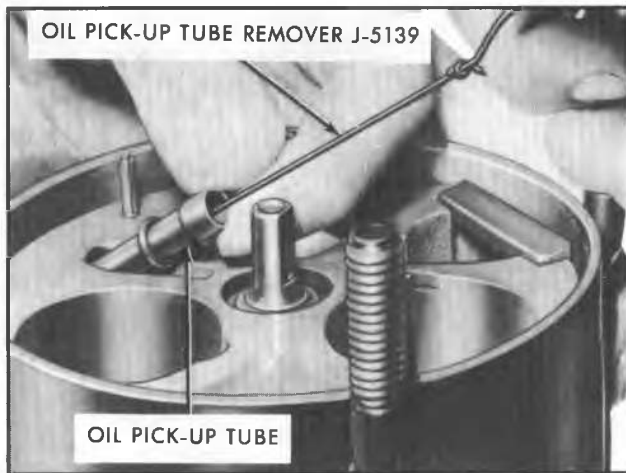


Fig. 28--Removing Oil Pick-Up Tube

head. Discard O-ring.

It may be necessary to tap on outside of front head, using a plastic hammer, to overcome friction of O-ring seal between front head and compressor shell.

17. Wipe excess oil from sealing surfaces on front head casting webs and examine sealing surface. If any surface damage is observed, the head should be replaced.

18. Remove front discharge valve plate assembly and front suction reed plate. Examine reeds and seats. Replace necessary parts.

19. Remove suction cross-over cover by prying with screwdriver between cylinder casting and cover (Fig. 29).

20. Examine internal mechanism for any obvious damage. If internal mechanism has sustained major damage, due to loss of refrigerant or oil, it may be necessary to use the Service internal mechanism Assembly rather than replace individual parts.

INTERNAL MECHANISM

Disassembly

Use Parts Tray J-9402 (Fig. 33) to retain compressor parts during disassembly.

1. Remove internal mechanism from compressor as

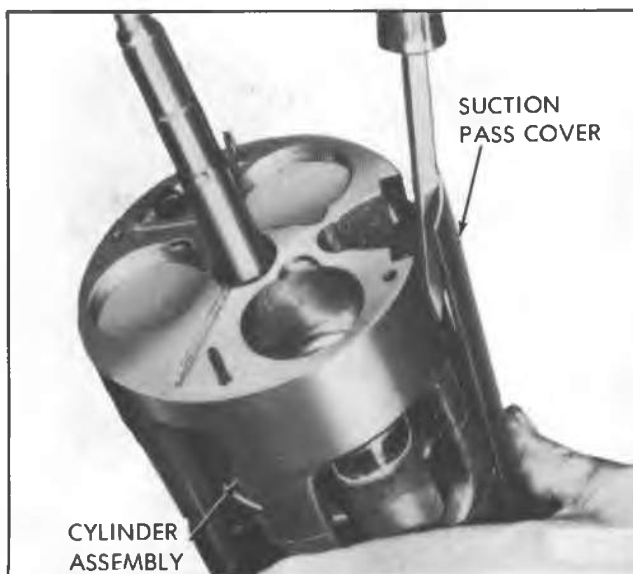


Fig. 29--Removing Suction Cross Over Cover

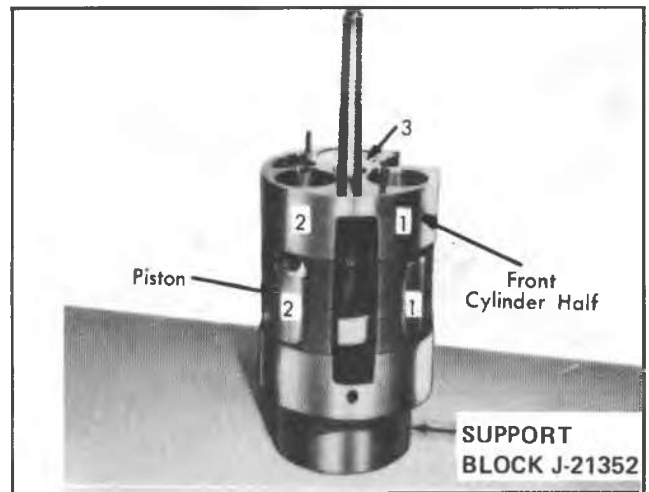


Fig. 30--Numbering Piston and Cylinder Bores

described in "Compressor Internal Mechanism" Removal procedure.

2. Identify by pencil mark, or some other suitable means, each piston numbering them as 1, 2, and 3 (Fig. 30).

Number the piston bores in the front cylinder half in like manner, so that pistons can be replaced in their original locations.

3. Separate cylinder halves, using a wood block and mallet (Fig. 31). Make certain that discharge cross-over tube does not contact axial plate when separating cylinder halves (a new Service discharge cross-over tube will be installed later).

CAUTION: UNDER NO CIRCUMSTANCES SHOULD SHAFT BE STRUCK AT EITHER END in an effort to separate upper and lower cylinder halves because the shaft and the axial plate could be damaged.

4. Carefully remove the rear half of the cylinder from the pistons and set the front cylinder half, with the piston, shaft and axial plate in Compressing Fixture J-9397.

5. Pull up on compressor shaft and remove piston previously identified as No. 1, with balls and shoe discs, from axial plate.

a. **Inspect the Teflon piston rings** for nicks, cuts or metal particles imbedded in exposed ring surface and

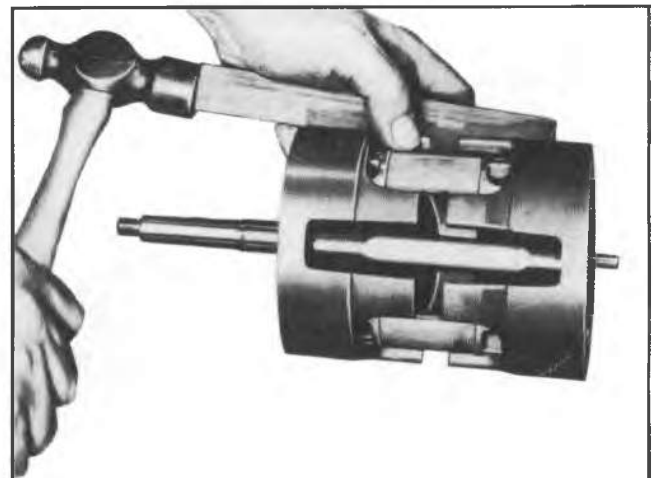


Fig. 31--Separating Cylinder Halves

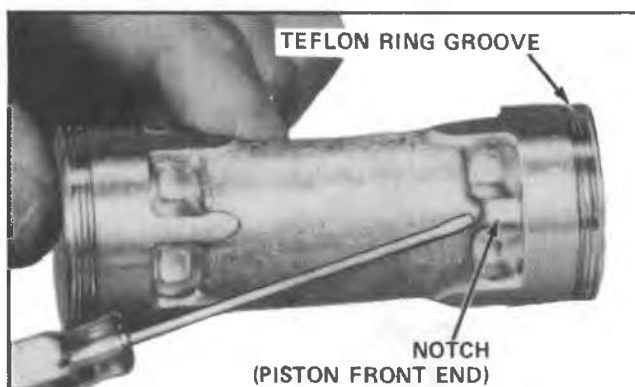


Fig. 32--Notch Identifying Front End of A-6 Piston

replace the piston rings as required if either condition exists. See "Teflon Piston Ring" Replacement procedure.

6. Remove and discard the piston shoe discs.

7. Remove and examine piston balls, and if satisfactory for re-use, place balls in No. 1 compartment of Parts Tray J-9402 (Fig. 33).

8. Place piston in No. 1 compartment of Parts Tray J-9402, with notch in casting web at front end of piston (Fig. 32) into the dimpled groove of Parts Tray compartment.

9. Repeat Steps 5 through 9 for Pistons No. 2 and No. 3.

10. Remove rear combination of thrust races and thrust bearing from shaft. Discard races and bearing.

11. Remove shaft assembly from front cylinder half. If the discharge cross-over tube remained in the front cylinder half, it may be necessary to bend discharge cross-over tube slightly in order to remove shaft.

12. Remove front combination of thrust races and bearing from shaft. Discard races and bearing.

13. Examine surface of axial plate and shaft. Replace **as an assembly**, if necessary.

A certain amount of shoe disc wear on axial plate is normal, as well as some markings indicating load of needle bearings on shaft.

14. Remove discharge cross-over tube from cylinder half, using self-clamping pliers.

This is necessary only on original factory equipment, as ends of the tube are swaged into cylinder halves. The discharge cross-over tube in internal mechanism assemblies that have been **previously** serviced have an O-ring and bushing at **EACH END** of the tube, and can be easily removed by hand (see Fig. 53).

15. Examine piston bores and needle bearings in front

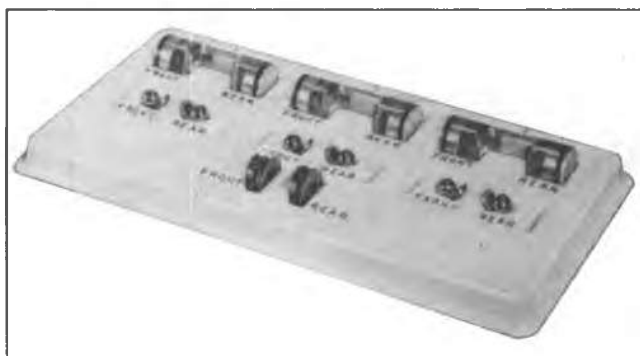


Fig. 33--A-6 Parts Tray

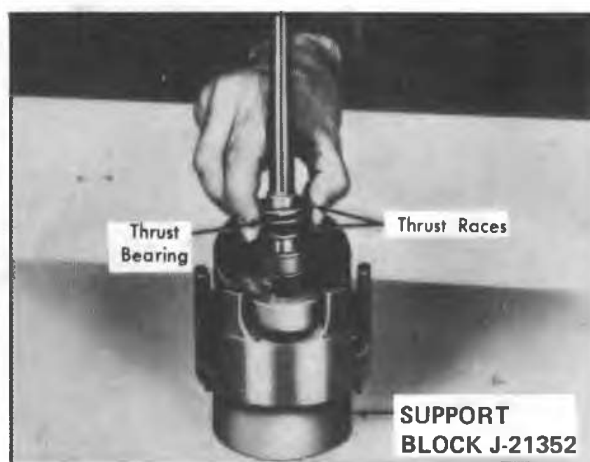


Fig. 34--Removing Front Thrust Races and Bearings

and rear cylinder halves. Replace front and rear cylinders if any cylinder bore is deeply scored or damaged.

16. Needle bearings may be removed if necessary by driving them out with special Thin-Wall Socket J-9399. Insert socket in hub end (inner side) of cylinder head and drive bearing out. To install needle bearing, place cylinder half on Support Block J-21352, and insert bearing in end of cylinder head with bearing **identification marks UP**. Use Needle Bearing Installer J-9432 and drive bearing into cylinder head (Fig. 35), until tool bottoms on the cylinder face.

Two different width needle bearings are used in Production compressors - a 1/2" size and a 5/8" size. **The bearings ARE interchangeable.** Service replacement bearings are all 1/2".

17. Wash all parts to be re-used with trichlorethylene, stoddard solvent, kerosene, or a similar solvent. Air-dry parts using a source of clean, dry air.

Compressor internal components may be identified by referring to Fig. 1 and Fig. 2.



Fig. 35--Installing Needle Bearing

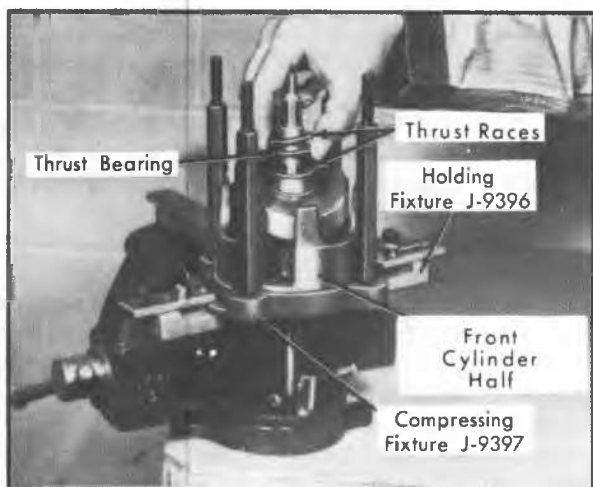


Fig. 36--Installing Rear Thrust Races and Bearings

INTERNAL MECHANISM

Gaging Operation

1. Install Compressing Fixture J-9397 on Holding Fixture J-9396 in vise. Place front cylinder half in Compressing Fixture, flat side down. Front cylinder half has long slot extending out from shaft hole.

2. Secure from Service parts stock **four ZERO** thrust races and **three ZERO** shoe discs.

3. Install a ZERO thrust race, thrust bearing, and a second ZERO thrust race on front end of compressor shaft. Lubricate races and bearing with petrolatum.

4. Insert threaded end of shaft through needle bearing in front cylinder half, and allow thrust race and bearing assembly to rest on hub of cylinder.

5. Now install a ZERO thrust race on rear end of compressor shaft (Fig. 36), so that it rests on hub of axial plate. Then install thrust bearing and a second ZERO thrust race. Lubricate races and bearing with petrolatum.

6. Lubricate ball pockets of the No. 1 Piston with 525 viscosity refrigerant oil and place a ball in each socket. Use balls previously removed if they are to be re-used.

7. Lubricate cavity of a ZERO shoe disc with 525 viscosity refrigerant oil and place shoe disc over ball in **front end** of piston (Fig. 37). **Front end of piston has an identifying notch in casting web** (Fig. 32).

CAUTION: Exercise care in handling the Piston and Ring Assembly, particularly during assembly into and removal from the cylinder bores to prevent damage to the Teflon piston rings.

Shoe discs should not be installed on rear of piston during following "Gaging" operation.

8. Rotate shaft and axial plate until high point of axial plate is over the No. 1 Piston cylinder bore.

9. Lift shaft assembly up and hold front thrust race and bearing assembly against axial plate hub.

10. Position piston over No. 1 cylinder bore (notched end of piston being on bottom and piston straddling axial plate) and lower the shaft to allow piston to drop into its bore (Fig. 38).

11. Repeat Steps 6 through 10 for Pistons No. 2 and No. 3.

12. Install rear cylinder half on pistons, aligning cylinder with discharge cross-over tube hole in front cylinder. Tap into place using a plastic mallet or piece of

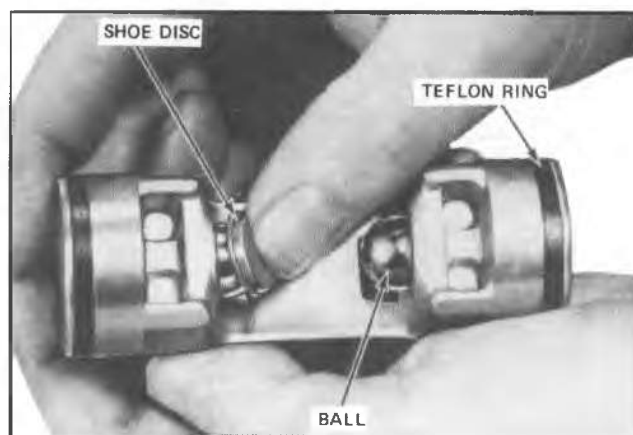


Fig. 37--Installing FRONT Shoe Disc

clean wood and hammer (Fig. 39).

13. Position discharge cross-over tube opening between a pair of Compressing Fixture bolts to permit access for feeler gage.

14. Install top plate on Compressing Fixture J-9397. Tighten nuts to 15 lb. ft. torque using a 0-25 lb. ft. torque wrench.

Gaging Procedure (Steps 15 thru 18)

The gaging operations which follow have been worked out on a simple basis to establish and provide necessary running tolerances. Two gaging procedures are necessary.

The first is made to choose the proper size shoe discs to provide, at each piston, a .0016" to .0024" total preload between the seats and the axial plate at the tightest place through the 360-degree rotation of the axial plate at the tightest plate. The bronze shoe discs are provided in .0005" variations, including a basic ZERO shoe.

The second, performed at the rear shaft thrust bearing and race pack, is designed to obtain .0025" to .0030" preload between the hub surfaces of the axial plate and the front and rear hubs of the cylinder. A total of 14 steel thrust races, including a basic ZERO race, are provided in increments of .0005" thickness to provide the required fit.

Feeler Gage Set J-9564 or J-9661-01 may be used for gaging proper shoe disc size. Feeler Gage Set J-9564-01 or

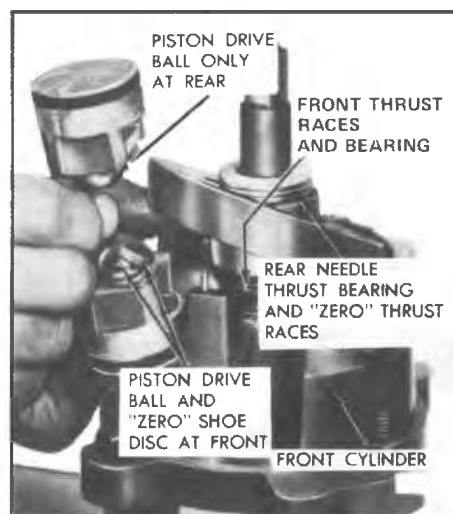


Fig. 38--Installing Piston During Gaging Operation

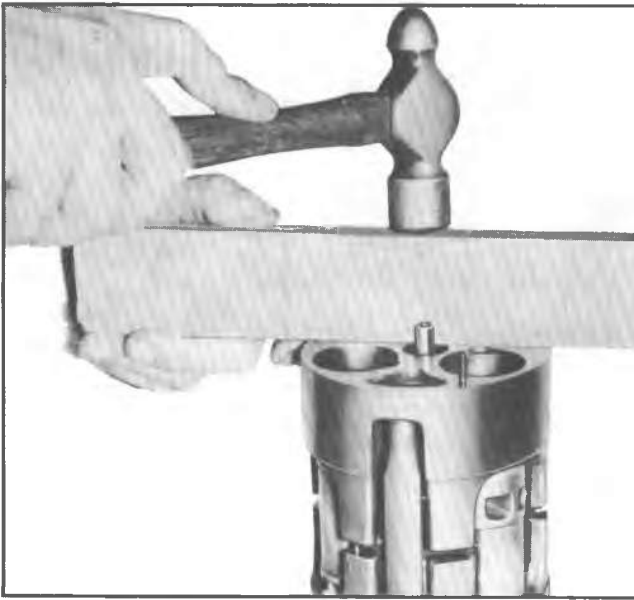


Fig. 39--Assembling Cylinder Halves

Dial Indicator Set J-8001-3 may be used to determine proper thrust race size.

PROPER SELECTION OF THRUST RACES AND BALL SEATS IS OF EXTREME IMPORTANCE.

15. Measure clearance between rear ball of No. 1 Piston and axial plate, in following manner:

a. Select a suitable combination of well-oiled Feeler Gage leaves to fit snugly between ball and axial plate.

b. Attach a spring scale, reading in 1-ounce increments, to the feeler gage. A distributor point checking scale or Spring Scale J-544 may be used.

c. Pull on Spring Scale to slide Feeler Gage stock out from between ball and axial plate, and note reading on Spring Scale as Feeler Gage is removed (Fig. 40). **Reading should be between 4 and 8 ounces.**

d. If reading in Step c. above is under 4 OR over 8 ounces, reduce or increase thickness of Feeler Gage leaves and repeat Steps a. through c. above until a reading of 4 to

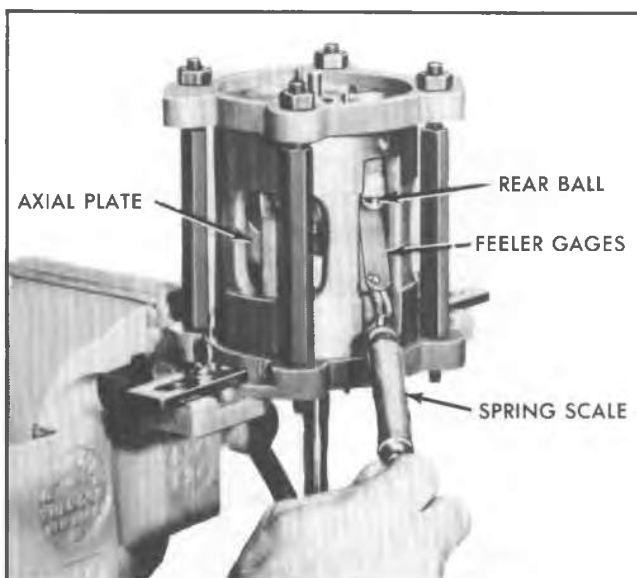


Fig. 40--Gaging Rear Piston Ball

8 ounces is obtained. Record clearance between ball and axial plate that results in the 4 to 8-ounce pull on Spring Scale.

16. Now rotate shaft 120° and repeat Step 15 between same ball and axial plate. Record this measurement.

If shaft is hard to rotate, install shaft nut onto shaft and turn shaft with wrench.

17. Rotate shaft another 120° and again repeat Step 15 between these same parts and record measurements.

18. Select a "numbered" shoe disc corresponding to minimum feeler gage reading recorded in the three checks above. (See example in Fig. 42). Place shoe discs in Parts Tray J-9402 compartment corresponding to Piston No. 1 and rear ball pocket position.

Shoe discs are provided in .0005" (one-half thousandths) variations. There are a total of 11 sizes available for field servicing. All shoe discs are marked with the shoe size, which corresponds to the last three digits of the piece part number. (See Shoe Disc size Chart in Fig. 41 above.)

Once a proper selection of the shoe has been made, THE MATCHED COMBINATION OF SHOE DISC TO REAR BALL AND SPHERICAL CAVITY IN PISTON MUST BE KEPT IN PROPER RELATIONSHIP during disassembly after gaging operation, and during final assembly of internal mechanism.

19. Repeat in detail the same gaging procedure outlined in Steps 15 through 18 for Piston No. 2 and No. 3.

20. Mount Dial Indicator J-8001-3 on edge of Compressing Fixture J-9397 with Clamp J-8001-1 and Sleeve J-8001-2 (Fig. 43). Position Dial Indicator on rear end of shaft and adjust to "zero".

Apply full hand-force at end of mainshaft a few times before reading clearance. This will help squeeze the oil out from/between mating parts. Push upward and record measurement. Dial Indicator increments are .001"; therefore, reading must be estimated to nearest .0005".

An alternate method of selecting a proper race is to use Gage Set J-9661-01, selecting a suitable feeler gage leaf until the result is a 4 to 8 ounce pull on the scale between the rear thrust bearing and upper (or outer rear) thrust race (Fig. 44). If the pull is just less than 4 ounces, add .0005" to the thickness of the feeler stock used to measure the clearance. If the pull on the scale reads just over 8 ounces, then subtract .0005" from the thickness of the feeler stock. **Select a race TWO (2) FULL SIZES LARGER than feeler gage thickness** (If feeler gage is .007", select a No. 9 or 090 race).

21. **Select a thrust race with a "number" corresponding to TWO (2) FULL SIZES LARGER than Dial Indicator or feeler gage measurement of the amount of end play shown.** (If measurement is .007", select a No. 9 or 090 race). **Place thrust race in right-hand slot at bottom center of Parts Tray J-9402.**

Fifteen (15) thrust races are provided in increments of .0005" (one-half thousandths) thickness and one ZERO gage thickness, providing a total of 16 sizes available for field service. Thrust races are identified on the part by their thickness in thousandths, in excess of the thickness of the ZERO thrust race.

This "number" also corresponds to the last three digits of the piece part number. See Thrust Race size Chart in Fig. 41.

SHOE DISC			THRUST BEARING RACE		
PART NO. ENDING IN	IDENTIFICATION STAMP	MIN. FEELER GAGE READING	PART NO. ENDING IN	IDENTIFICATION STAMP	DIAL INDICATOR READING
000	0	.0000	000	0	.0000
175	17-1/2	.0175	050	5	.0050
180	18	.0180	055	5-1/2	.0055
185	18-1/2	.0185	060	6	.0060
190	19	.0190	065	6-1/2	.0065
195	19-1/2	.0195	070	7	.0070
200	20	.0200	075	7-1/2	.0075
205	20-1/2	.0205	080	8	.0080
210	21	.0210	085	8-1/2	.0085
215	21-1/2	.0215	090	9	.0090
220	22	.0220	095	9-1/2	.0095
			100	10	.0100
			105	10-1/2	.0105
			110	11	.0110
			115	11-1/2	.0115
			120	12	.0120

Fig. 41--Available A-6 Service Shoes and Thrust Races

22. Remove nuts from top plate of Compressing Fixture J-9397, and remove top plate.

23. Separate cylinder halves while unit is in Fixture. It may be necessary to use a wood block and mallet.

24. **Remove rear cylinder half and carefully remove one piston at a time from axial plate and front cylinder half. DO NOT LOSE THE RELATIONSHIP of the front ball and shoe disc and rear ball. Transfer each piston, ball, and shoe disc to its proper place in Parts Tray J-9402.**

25. **Remove rear outer ZERO thrust race from shaft and install thrust race just selected.**

The ZERO thrust race may be put aside for re-use in additional gaging or rebuilding operations.

A-6 Teflon Piston Ring Replacement

The Teflon piston ring installing, sizing and gaging tools are shown in Fig. 95.

1. Remove the old piston rings by **CAREFULLY** slicing through the ring with a knife or sharp instrument, holding the blade almost flat with the piston surface. Be careful not to damage the aluminum piston OR piston groove in cutting to remove the ring.

WARNING: Exercise personal care in cutting the piston ring for removal.

	POSITION 1	POSITION 2	POSITION 3	SELECT AND USE SHOE NO.
PISTON NO. 1	.019"	.0195"	.019"	19
PISTON NO. 2	.020"	.020"	.020"	20
PISTON NO. 3	.021"	.021"	.022"	21

Fig. 42--Selection of Proper A-6 Shoe Disc

2. Clean the piston and piston ring grooves with a recommended cleaning solvent and blow the piston dry with dry air (Trichlorethylene, stoddard solvent, kerosene, or equivalent).

3. Set the piston on end on a clean, flat surface and install the Ring Installer Guide J-24608-2 on the end of the piston (Fig. 45).

4. Install a Teflon ring on the Ring Installer Guide J-24605-2 as shown in Fig. 45, **with the dished or dull-side down and glossy-side up.**

5. Push the Ring Installer J-24608-5 down over the Installer Guide J-24608-2 to install the Teflon ring in the piston ring groove (Figs. 46 and 47). If the Teflon ring is slightly off position in the ring groove, it can be positioned into place by fingernail or blunt-edged tool that will not damage the piston.

The Ring Installer J-24608-5 will retain the Installer Guide J-24608-2 internally when the Teflon ring is installed on the piston. Remove the Installer Guide from the Ring Installer and **DO NOT STORE THE INSTALLER GUIDE IN THE RING INSTALLER, as the Ring**

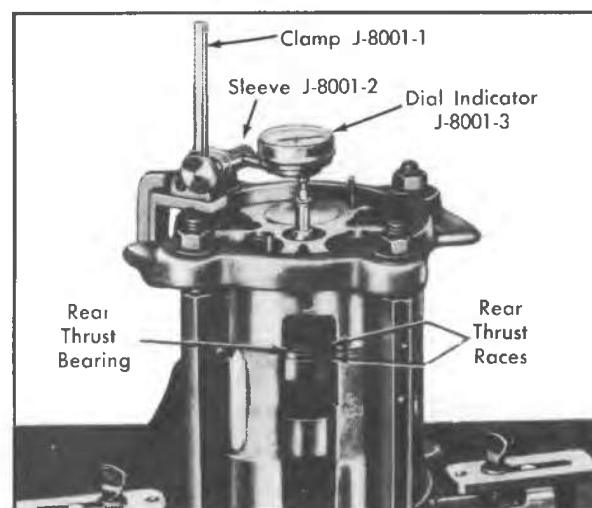


Fig. 43--Gaging Rear Thrust Race

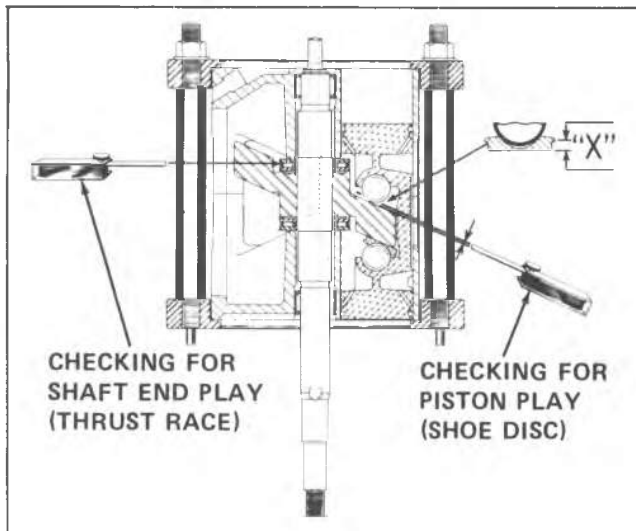


Fig. 44--Checking Piston and Shaft End Play

Installer Segment Retainer O-Ring J-24608-3 will be stretched and possibly weakened during storage. This could result in the O-Ring J-24608-3 not holding the Ring Installer segments tight enough to the Installer Guide J-24608-2 to properly install the Teflon ring on the piston.

6. Lubricate the piston ring area with 525 viscosity refrigerant oil and rotate the Piston and Ring Assembly into the Ring Sizer J-24608-6 **at a slight angle** (Fig. 48). Rotate the piston, while pushing inward, until the piston is inserted against the center stop of the Ring Sizer J-23608-6.

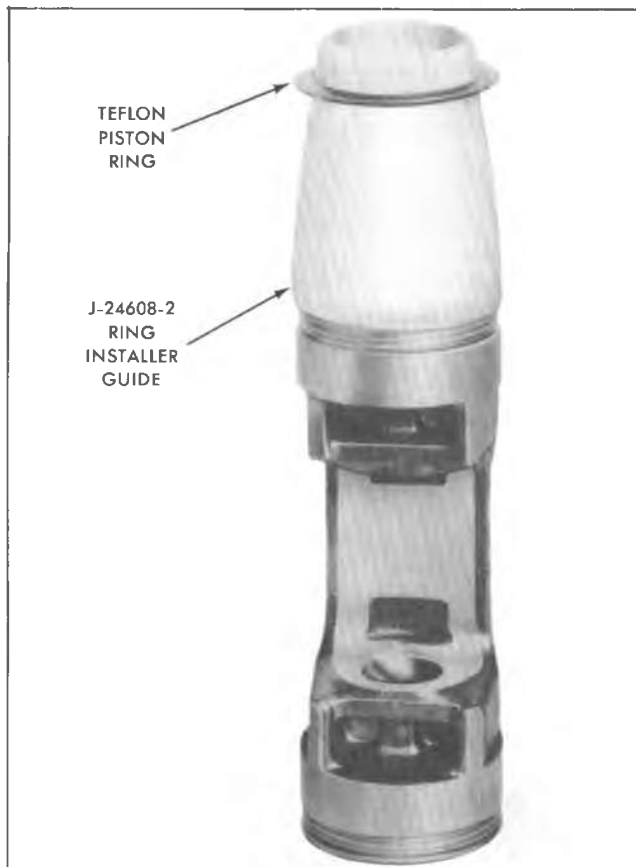


Fig. 45--Teflon Piston Ring Positioned on Ring Installer Guide

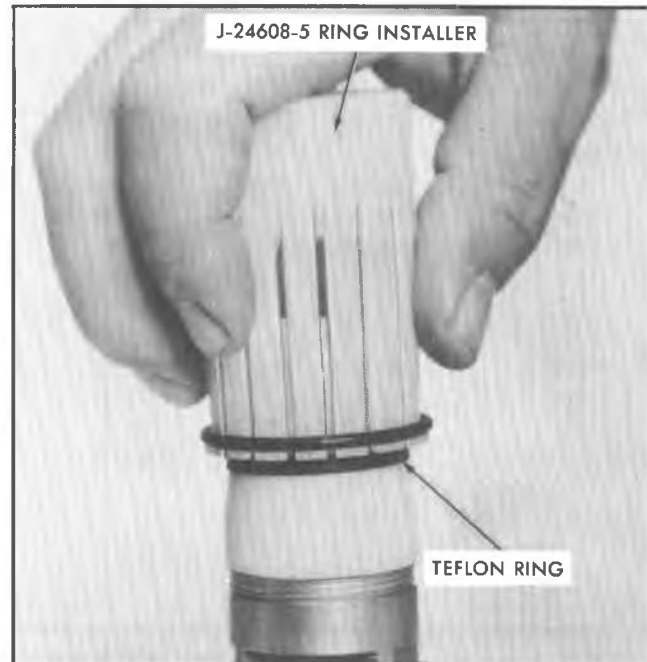


Fig. 46--Installing Teflon Piston Ring

CAUTION: *DO NOT push the Piston and Ring Assembly into the Ring Sizer J-24608-6 without proper positioning and rotating as described above, as the ends of the needle bearings of the Ring Sizer may damage the end of the piston.*

7. Rotate the Piston and Ring Assembly in the Ring Sizer J-24608-6 several **COMPLETE** turns, until the Assembly rotates relatively free in the Ring Sizer (Fig. 48).

8. Remove the Piston and Ring Assembly, wipe the end of the piston and ring area with a clean cloth and then push the Piston and Ring Assembly into the Ring Gage J-24608-1 (Fig. 49). The piston should go through the Ring Gage with a 6-lb. force or less without lubrication. If not, repeat Steps 6 and 7.

9. Repeat the procedure for the opposite end of the piston.

CAUTION: *DO NOT lay the piston down on a dirty surface where dirt or metal chips might become imbedded in the Teflon ring surface.*

10. Lubricate **BOTH ENDS** of the piston with 525 viscosity refrigerant oil before inserting the piston into the cylinder bore.

CAUTION: *Reasonable care should be exercised in installing the piston into the cylinder bore to prevent damage to the Teflon ring.*

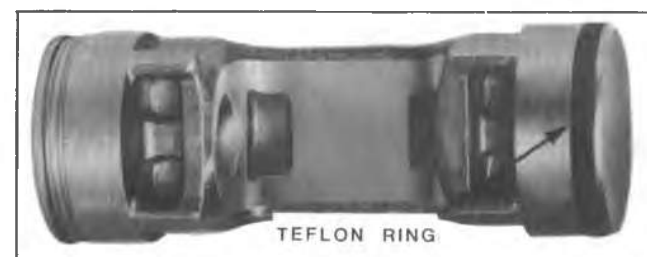


Fig. 47--Teflon A-6 Piston Ring Installed in Piston Groove



Fig. 48--Turning Piston and Ring Asm. into Ring Sizing Tool

A-6 COMPRESSOR INTERNAL MECHANISM

Assembly

After properly performing the "Gaging Procedure", choosing the correct shoe discs and thrust races, and installing any needed Teflon Piston Rings, the cylinder assembly may now be reassembled. Be sure to install all NEW seals and O-rings. All are included in the compressor O-Ring Service Kit.

Assembly procedure is as follows:

1. Support the FRONT half of the cylinder assembly on Compressing Fixture J-9397. Install the shaft and axial plate, threaded end **down**, with its front bearing race pack (ZERO race, bearing NUMBERED race), if this was not already done at the end of the "Gaging Procedure".

2. Apply a light smear of petroleum jelly to the "numbered" shoe discs chosen in the gaging procedure and install all balls and shoe discs in their proper place in the piston assembly.

3. Rotate the axial plate so that the high point is above cylinder bore No. 1. Carefully assemble Piston No. 1, complete with ball and ZERO shoe disc on the **front** AND ball and NUMBERED shoe disc on the **rear**, over the axial plate. Hold front thrust bearing pack tightly against axial plate hub while lifting hub. Insert the Piston Assembly into

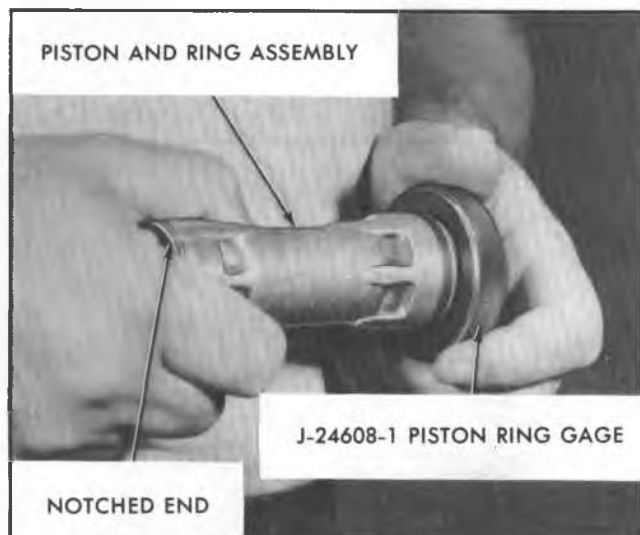


Fig. 49--Gaging Piston Ring Size

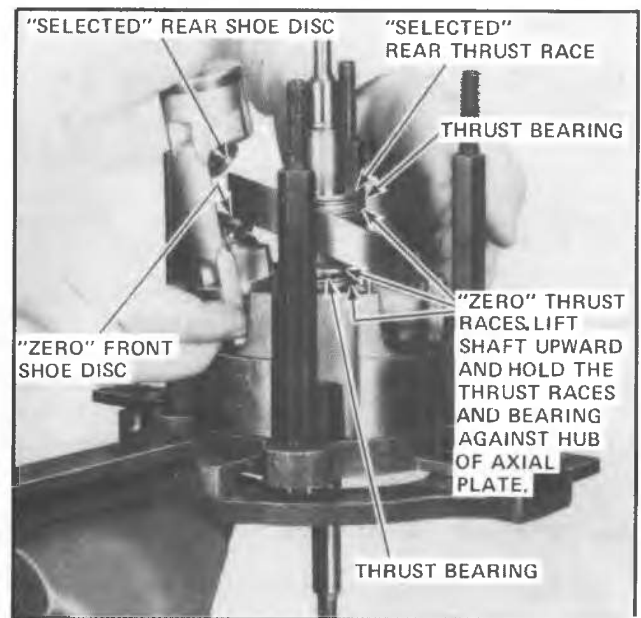


Fig. 50--Installing 1st A-6 Piston Assembly Into Front Cylinder Half

the front cylinder half (Fig. 50).

4. Repeat this operation for Pistons No. 2 and No. 3 (Fig. 51).

5. Without installing any O-rings or bushings, assemble one end of the new Service discharge cross-over tube into the hole in the front cylinder half (Fig. 52 and 53).

Be sure the flattened portion of this tube faces the **inside** of the compressor to allow for axial plate clearance (Fig. 53).

6. Now rotate the shaft to position the pistons in a stair-step arrangement; then **carefully** place the rear cylinder half over the shaft and start the pistons into the cylinder bores (Fig. 54).

7. When all three Piston and Ring assemblies are in their respective cylinders, align the end of the discharge

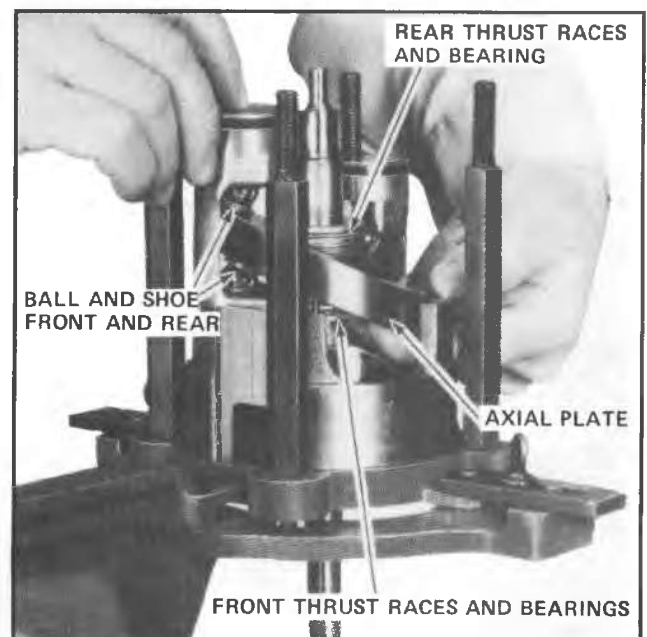


Fig. 51--Installing 2nd A-6 Piston

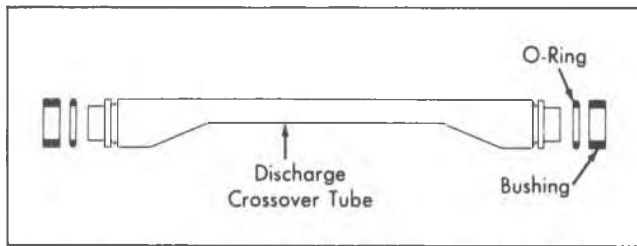


Fig. 52--Service-Type A-6 Discharge Cross-Over Tube

cross-over tube with the hole in the rear half of the cylinder.

8. When all parts are in proper alignment, tap with a clean wood block and mallet to seat the rear half of the cylinder over the locating dowel pins. If necessary, clamp the cylinder in Compressing Fixture J-9397, to complete drawing the cylinder halves together.

9. Generously lubricate all moving parts with clean 525 viscosity refrigerant oil and check for free rotation of the parts.

10. Replace the suction cross-over cover (Fig. 55). Compress the cover as shown to start it into the slot, and then press or carefully tap it in until flush on both ends.

A-6 COMPRESSOR INTERNAL MECHANISM

Re-Install

1. Place internal mechanism on Internal Assembly Support Block J-21352, with **rear-end** of shaft in block hole.

2. Now install new O-ring and bushing on **front-end** of discharge cross-over tube (Fig. 56). The O-ring and bushing are Service parts only for internal mechanisms that have been disassembled in the field (see Fig. 52).

3. Install new dowel pins in front cylinder half, if previously removed.

4. Install front suction reed plate on front cylinder half. Align with dowel pins, suction ports, oil return slot, and discharge cross-over tube (Fig. 57).

5. Install front discharge valve plate assembly, aligning holes with dowel pins and proper openings in front suction reed plate (Fig. 58).

Front discharge plate has a large diameter hole in the center (Fig. 59).

6. Coat sealing surfaces on webs of compressor front head casting with 525 viscosity refrigerant oil.

7. Determine **exact** position of front head casting in

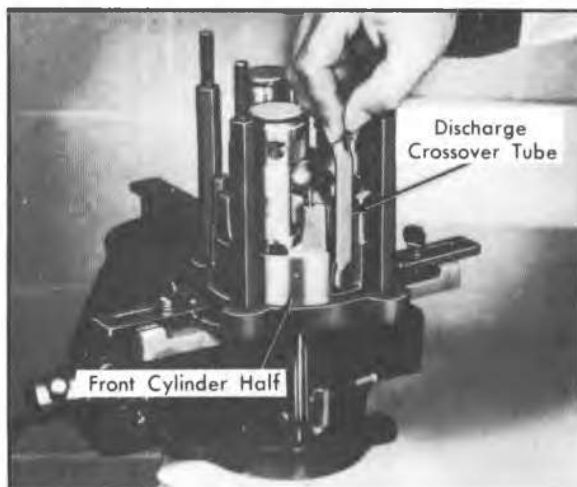


Fig. 53--Installing Discharge Crossover Tube

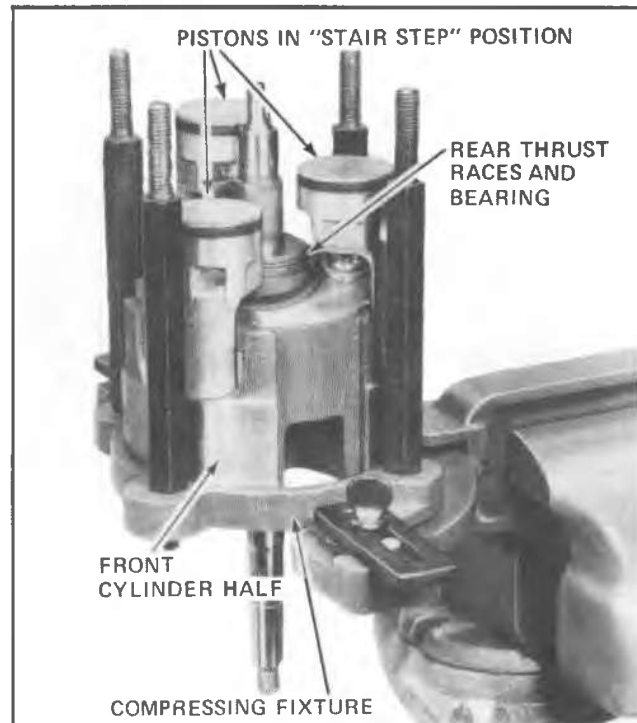


Fig. 54--A-6 Pistons Positioned in Stair-Step Arrangement

relation to dowel pins on internal mechanism. Mark position of dowel pins on sides of front head assembly and on sides of internal mechanism with a grease pencil. Carefully lower front head casting into position (Fig. 61), **making certain that sealing area around center bore of head assembly does not contact shaft** as head assembly is lowered. **Do not rotate head assembly** to line up with dowel pins, as the sealing areas

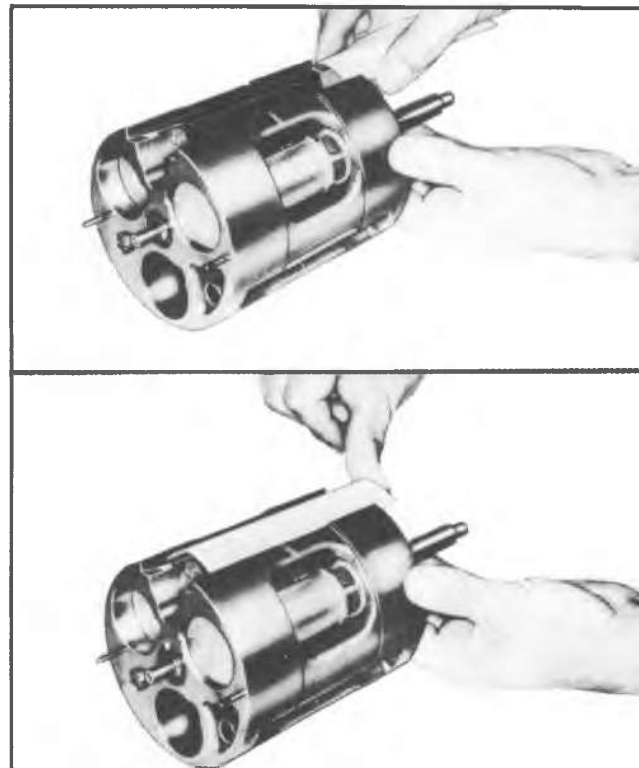


Fig. 55--Installing Suction Cross-over Cover



Fig. 56--Installing O-Ring On Discharge Cross-over Tube

would contact reed retainers.

8. Generously lubricate new O-ring and angled groove at lower edge of front head casting with 525 viscosity refrigerant oil and install new O-ring into groove (Fig. 62).

9. Coat inside machined surfaces of compressor shell with 525 viscosity refrigerant oil and position shell on internal mechanism, resting on O-ring seal.

10. Using flat-side of a small screwdriver, gently position O-ring in around circumference of internal mechanism until compressor shell slides down over internal mechanism. As shell slides down, line up oil sump with oil intake tube hole (Fig. 62).

11. Holding Support Block, invert assembly and place back into Holding Fixture with front end of shaft down.

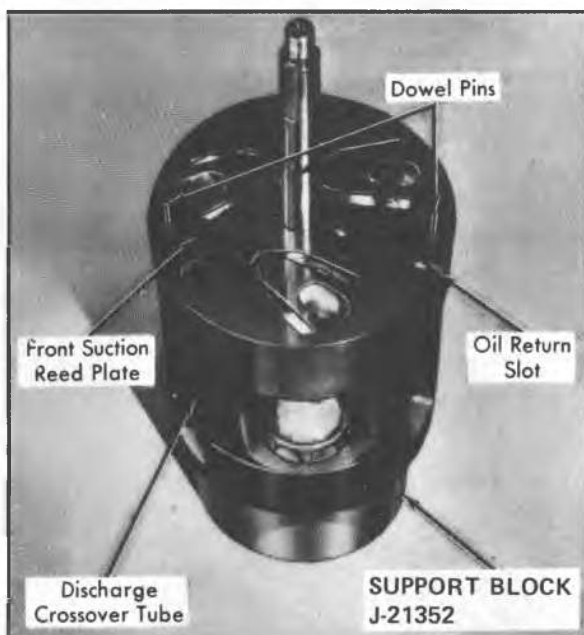


Fig. 57--Installing Front Suction Reed

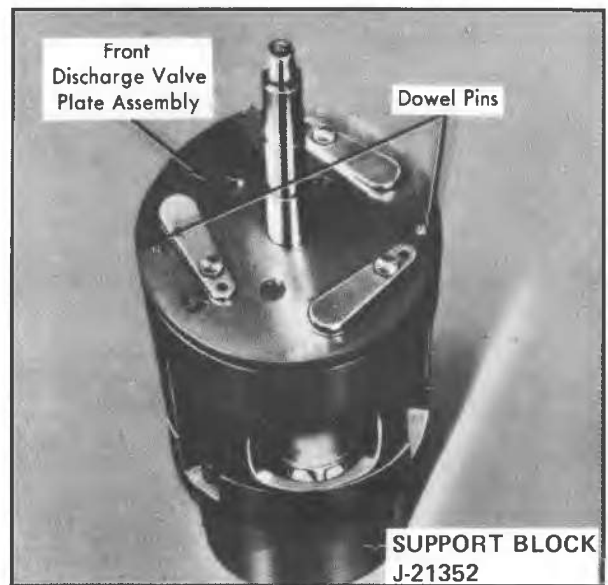


Fig. 58--Installing Front Discharge Valve Plate

Remove Support Block.

12. Install new dowel pins in rear cylinder half, if previously removed.

13. Install new O-ring in oil pick-up tube cavity.

14. Lubricate oil pick-up tube with 525 viscosity refrigerant oil and install into cavity, rotating compressor mechanism to align tube with hole in shell baffle (Fig. 63).

15. Install new O-ring and bushing on **rear-end** of discharge cross-over tube (See Fig. 52).

16. Install rear suction reed over dowel pins, **with slot TOWARDS sump**.

17. Install rear discharge valve plate assembly over dowel pins, **with reed retainers UP**.

18. Position inner oil pump gear over shaft with previously applied identification **mark UP**.

19. Position outer oil pump gear over inner gear with previously applied identification **mark UP** and, when standing facing oil sump, position outer gear so that it meshes with inner gear at the 9-o'clock position, and resulting cavity between gear teeth is then at 3-o'clock position (Fig. 64).

20. Generously oil rear discharge valve plate assembly

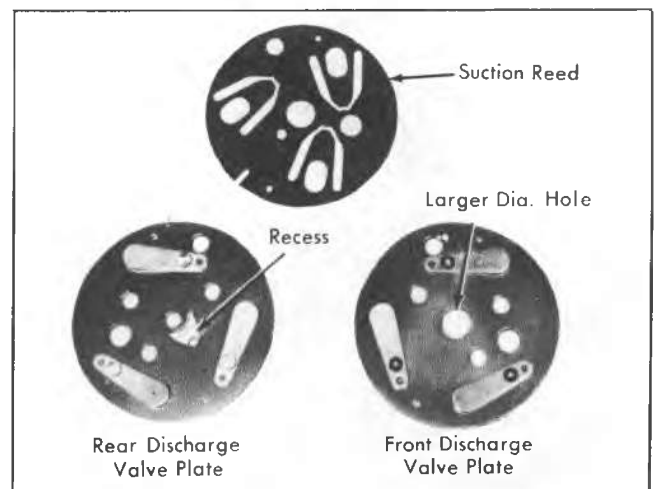


Fig. 59--Front and Rear Discharge Valve Plates



Fig. 60--Installing Front Head Casting

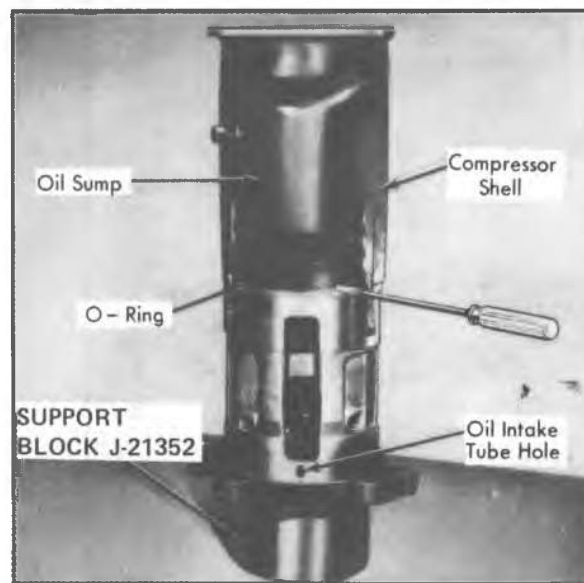


Fig. 62--Installing A-6 Compressor Shell

with 525 viscosity refrigerant oil around outer edge where large diameter O-ring will be placed. Oil the valve reeds, pump gears, and area where sealing surface will contact rear discharge valve plate.

21. Using the 525 oil, lubricate new head to-shell O-ring and install on rear discharge valve plate, in contact with shell (Fig. 65).

22. Install suction screen in rear head casting, using care not to damage screen.

23. Coat sealing surface on webs of compressor rear head casting with 525 viscosity refrigerant oil.

24. Install rear head assembly over studs on compressor shell. **The two lower threaded compressor mounting holes should be in alignment with the compressor sump.**

Make certain that suction screen does not drop out of place when lowering rear head into position (Fig. 66).

If rear head assembly will not slide down over dowels in internal mechanism, twist front head assembly back-and-forth very slightly by-hand until rear head drops over dowel

pins.

25. Install nuts on threaded shell studs and tighten evenly to 19-25 lb. ft. torque using a 0-50 lb. ft. torque wrench.

26. Invert compressor in Holding Fixture and install compressor shaft seal as described in "Compressor Shaft Seal" Replacement procedure.

27. Install compressor clutch coil and housing assembly as described in "Compressor Clutch Coil and Housing Asm." Replacement procedure.

28. Install compressor pulley and bearing assembly as described in "Compressor Pulley and Bearing" Replacement procedure.

29. Install compressor clutch plate and hub assembly as described in "Compressor Clutch Plate and Hub Asm." Replacement procedure.

30. Add required amount of 525 viscosity refrigerant oil. Refer to compressor oil charge, Figure 5 Section 1B, of the 1977 Service Manual.

31. Check for external and internal leaks as described in the "Compressor Leak Testing" procedure at the end of this section.

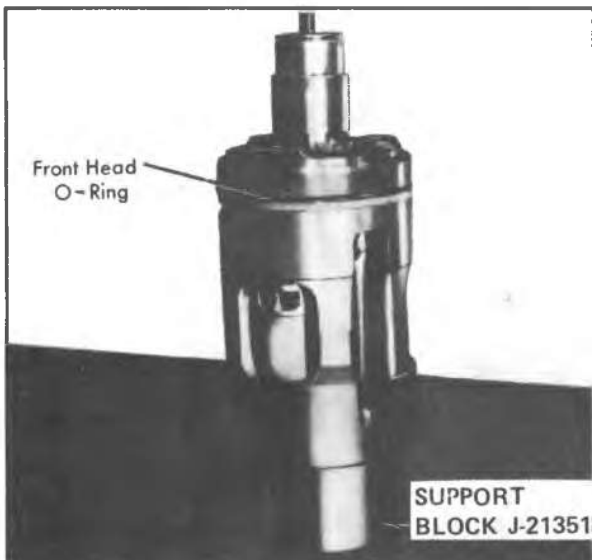


Fig. 61--Front Head O-Ring Installed



Fig. 63--Installing Oil Pick-Up Tube

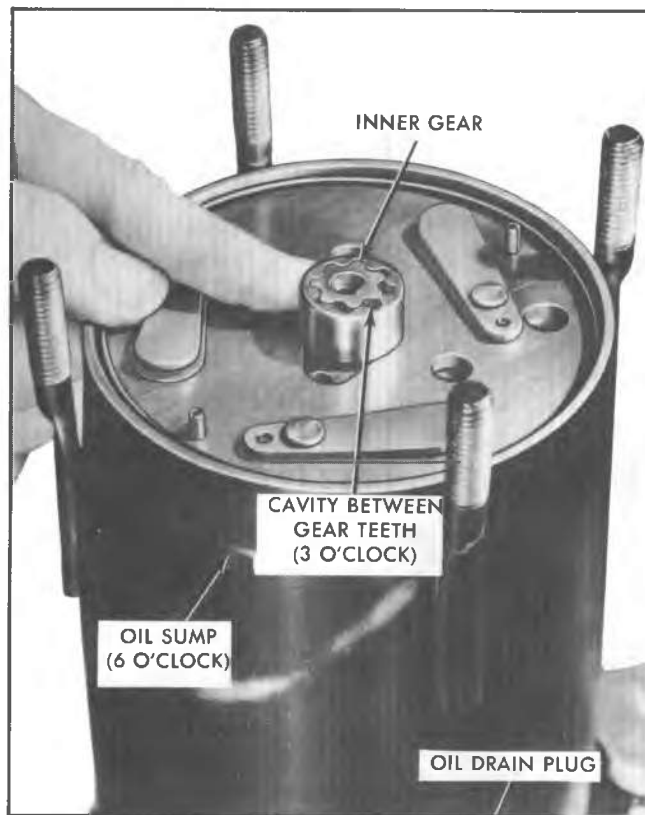


Fig. 64—Positioning Oil Pump Gears

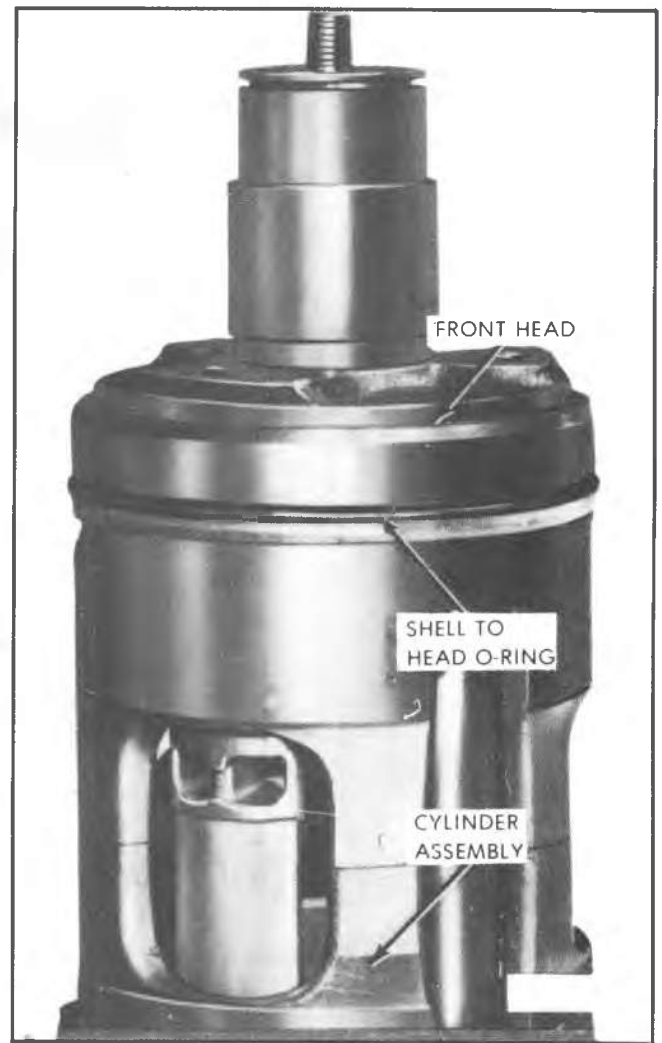


Fig. 65--A-6 Shell-To-Front Head O-Ring Installation

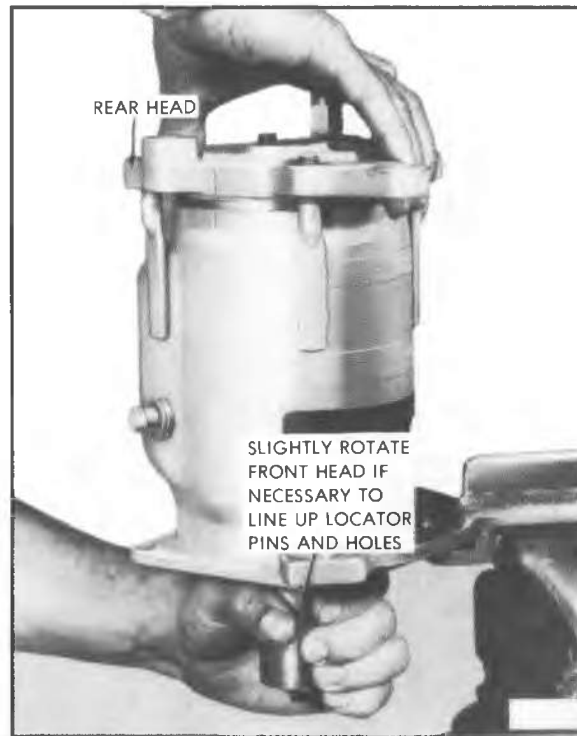


Fig. 66--Installing Rear Head

R4-COMPRESSOR OVERHAUL

GENERAL

When servicing a compressor, it is essential that steps be taken to prevent dirt or foreign material from getting on or into compressor parts and system during disassembly or reassembly of compressor. Clean tools, a clean workbench and a clean work area are very important for proper service. The compressor connection areas and exterior of compressor should be cleaned off as much as possible prior to any "on vehicle" repairs or removing compressor for workbench service. The parts must be kept clean at all times and any parts to be reassembled should be cleaned with clean solvent (trichlorethylene, or stoddard solvent) and dried with dry air. When necessary to use a cloth on any part, it should be of a non-lint producing type. Refer to Figure 67 for the exploded view of the compressor parts and nomenclature.

When a compressor is removed from the vehicle for servicing, the amount of oil remaining in the compressor should be drained through compressor suction-discharge ports and measured. This oil should then be discarded and new oil added to the compressor before compressor is again placed in operation on vehicle. Refer to the Diagnosis Section for compressor oil charge.

If for any reason the R-4 compressor air conditioning hose assembly is removed from the compressor, care must be taken to insure that the hose plate is fully seated to the compressor during re-installation. Should the plate be cocked and the retainer bolt driven, metal flanges in the O-Ring cavities could damage the seal surface of the compressor.

Some service operations can be performed without disturbing the internal mechanism, completely removing the compressor from vehicle or discharging the system.

Among them are replacement of the clutch drive plate and hub assembly, clutch rotor and bearing assembly and clutch coil and pulley rim where "on vehicle" space permits. The system must be discharged, evacuated and charged to replace the compressor shaft seal, and pressure relief valve whether the compressor is removed from vehicle or not. The service operations shown in the following procedure are based on bench overhaul with compressor removed from vehicle.

For those operations possible to be performed with compressor "on the vehicle", the procedure is essentially the same. The procedures are basically in order of the normal sequence of removal for the accessibility of the components.

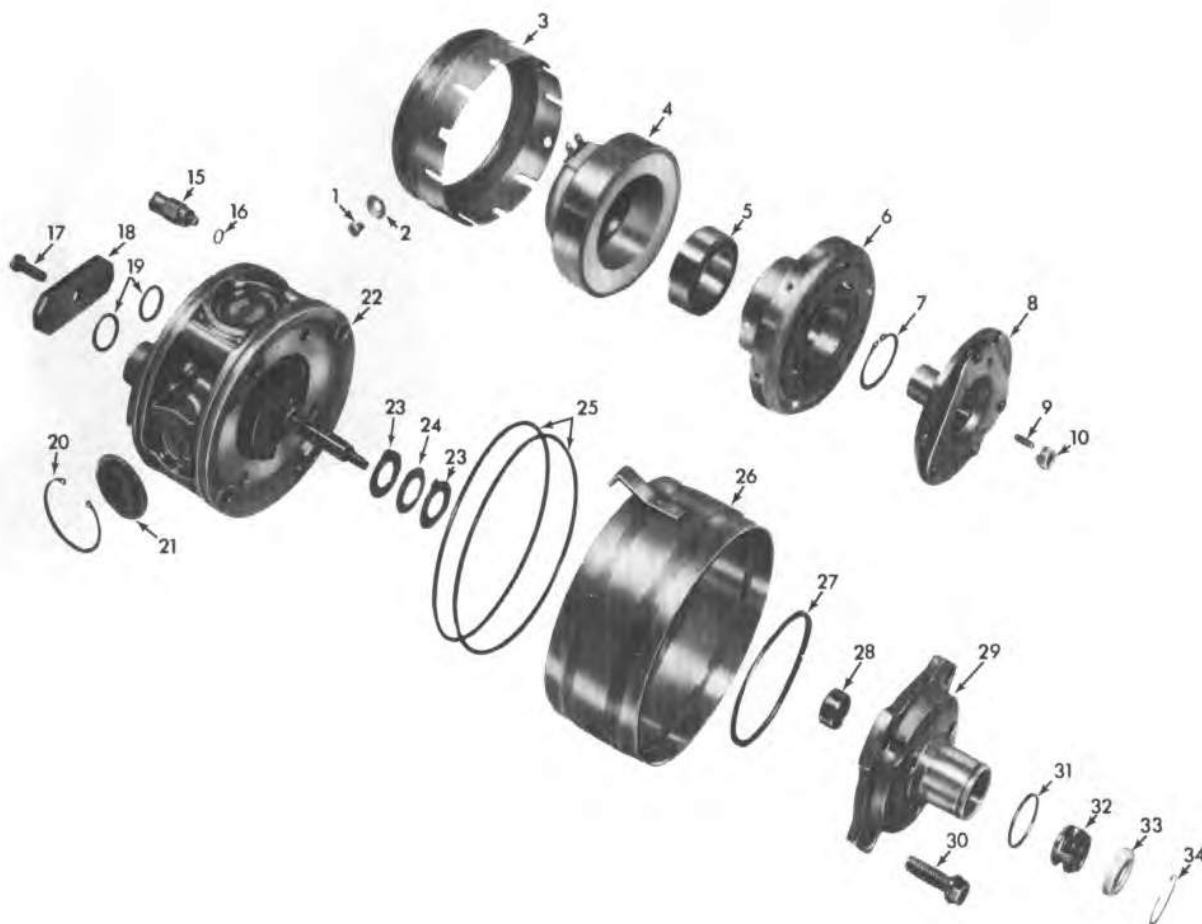
When necessary to adjust the compressor belt tension, DO NOT pry on the compressor shell, lift at square hole on the compressor mounting bracket.

It is recommended that compressor holding fixture J-25008-1 (Fig. 68) be used for all "workbench" procedures to keep the compressor assembly off the workbench and help prevent any possible dirt contamination of parts. The compressor holding fixture may be clamped in a vise with shaft end of compressor in a vertical, horizontal or down position for service, depending on service to be performed.

COMPRESSOR CLUTCH PLATE AND HUB ASSEMBLY

Removal

1. Attach compressor to holding fixture, J-25008-1 (Fig. 68) and clamp fixture in a vise.
2. Keeping clutch hub from turning with clutch hub holding tool J-25030, remove and discard shaft nut using Thin Wall Socket J-9399 (Fig. 69).
3. Thread clutch plate and hub assembly remover



1. Screw
2. Locking Washer
3. Pulley Rim
4. Coil and Housing Assy.
5. Rotor Bearing
6. Rotor and Bearing Assy.
7. Retaining Ring
8. Clutch Drive Assy.
9. Clutch Hub Key
10. Shaft Nut

15. Pressure Relief Valve
16. O-Ring
17. Screw
18. Shipping Plate
19. O-Ring
20. Retaining Ring
21. Valve Plate Assy.
22. Cylinder and Shaft Assy.
23. Thrust Washer

24. Belleville Washer
25. O-Ring
26. Shell Assy.
27. Ring Seal
28. Main Bearing
29. Front Head Assy.
30. Screw and Washer Assy.
31. O-Ring
32. Shaft Seal
33. Seal Seat
34. Retaining Ring

Fig. 67--Radial Four Cylinder Compressor - Exploded View

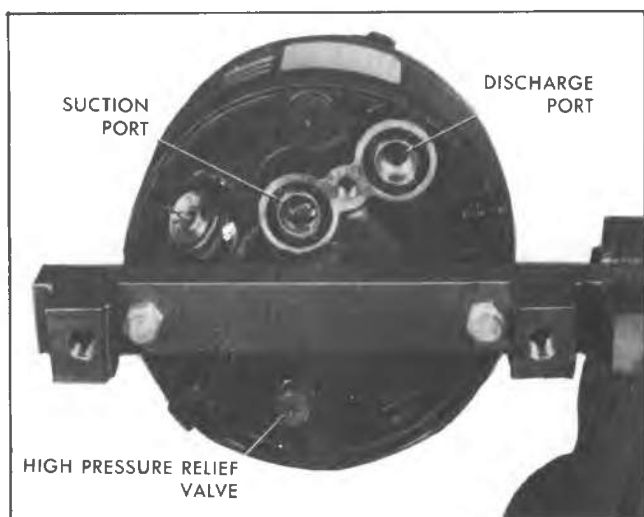


Fig. 68--Installing Holding Fixture

9401 into hub. Hold body of tool with a wrench and turn center screw into J-9401 remover to remove clutch plate and hub assembly (Fig. 70).

4. Remove the shaft key.

Installation

1. Install shaft key into hub key groove (Fig. 71). Allow key to project approximately $3/16$ " out of keyway. Shaft key is curved slightly to provide an interference fit in shaft key groove, to permit key projection without falling out.

2. Be sure frictional surface of clutch plate and clutch rotor are clean before installing clutch plate and hub assembly.

3. Align shaft key with shaft keyway and assemble clutch plate and hub assembly on compressor shaft.

CAUTION: To avoid internal damage to compressor, do not drive or pound on clutch hub or shaft.

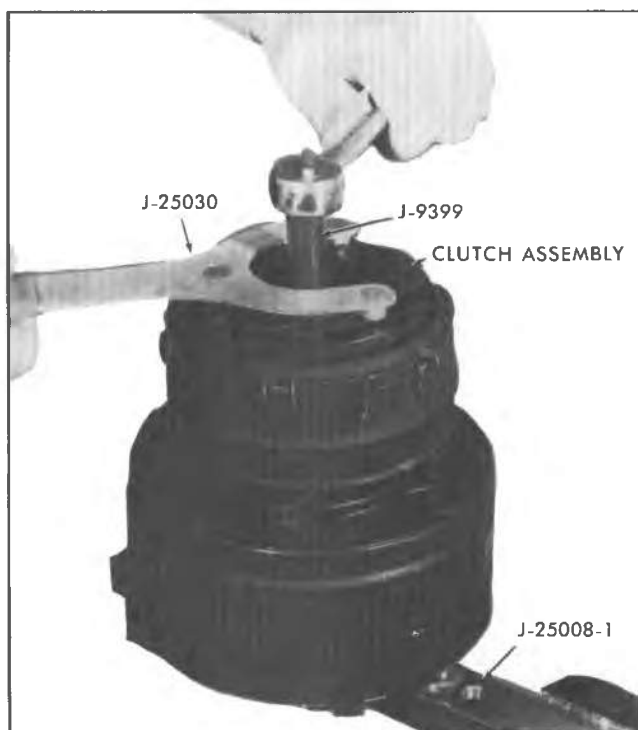


Fig. 69--Removing Shaft Locknut



Fig. 70--Removing Clutch Plate and Hub Assembly

4. Place spacer bearing J-9480-2 on hub and insert end of clutch plate and hub assembly installer J-9480-1 through spacer J-9480-2 and thread tool onto end of compressor shaft (Fig. 72).

5. Hold hex portion of tool body with a wrench and tighten center screw to press hub onto shaft until there is a .020 to .040 inch air gap between the frictional surfaces of clutch plate and clutch rotor (Fig. 72).

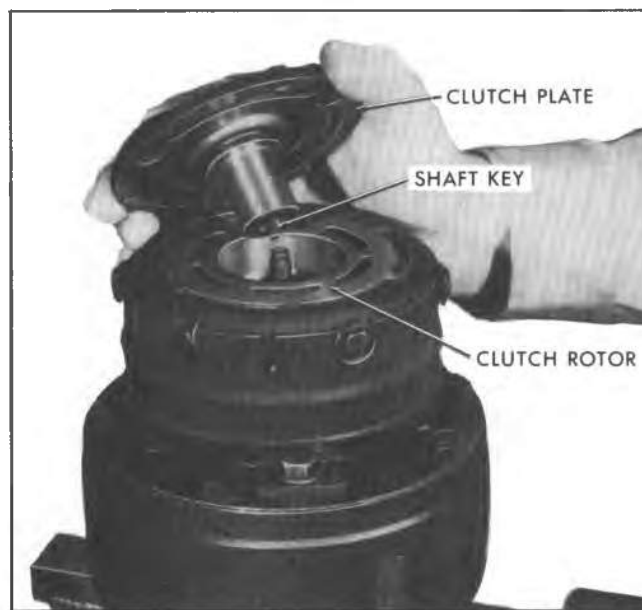


Fig. 71--Installing Shaft Key

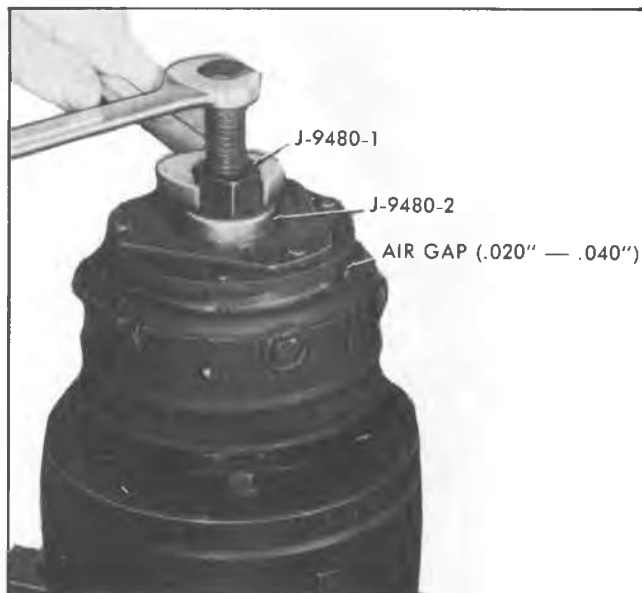


Fig. 72--Installing Clutch Plate and Hub Assembly

6. Install a new shaft nut with the small diameter boss of nut against crankshaft shoulder, using special thin wall socket J-9399. Hold clutch plate and hub assembly with clutch hub holding tool J-25030 and tighten to 8-12 foot pounds torque.

COMPRESSOR SHAFT SEAL ASSEMBLY

Removal

When replacing shaft seal assembly, it will be necessary to discharge the refrigerant from the system before replacing shaft seal assembly or removing compressor from vehicle.

1. Discharge the system and remove clutch plate and hub assembly as described under "Compressor Clutch Plate and Hub Assembly".

2. Remove shaft seal seat retainer ring using snap ring pliers J-5403.

3. Thoroughly clean the inside of compressor neck area surrounding compressor shaft, seal seat and shaft, to remove all dirt and foreign material before removing seal seat.

4. Insert seal seat remover and install tool J-23128 (Fig. 73) over the shaft into the recessed area of seal seat and tighten tool clockwise to securely engage knurled tangs of tool with the seal seat. Remove seal seat with a twisting and pull motion. Discard seat.

5. Insert seal remover and installer J-9392 (Fig. 74) over shaft and engage shaft seal by pressing downward on tool to overcome shaft seal spring pressure and turn tool clockwise to engage seal assembly tabs with tangs of tool. Remove seal assembly by pulling straight out from compressor shaft (Fig. 74). Discard seal.

6. Remove seal seat "O" ring from compressor neck using tool J-9553. Discard "O" ring.

Installation

Inspect the inside of compressor neck and shaft area for any lint, dirt or foreign material and be sure these areas are perfectly clean before installing new seal parts. Be sure seal remover and installer J-9392, seal protector J-22974 and "O" ring installer J-21508 are clean internally and externally. The seal seat "O" ring, shaft seal and seal seat should be dipped in clean 525 Viscosity oil and not handled any more than is absolutely necessary by hand, particularly the mating surfaces. Any dirt or lint on sealing surfaces



Fig. 73--Removing Seal Seat

could cause a seal leak or seal damage.

1. Dip new seal seat "O" ring in clean 525 Viscosity oil and assemble onto "O" ring installer J-21508 (Fig. 75).

2. Insert "O" ring installer J-21508 into the compressor neck until the tool "bottoms". Lower the movable slide of "O" ring installer to release "O" ring into seal seat "O" ring groove. Rotate installer tool to seat "O" ring and remove tool. Inspect the internal neck area for cleanliness and proper "O" ring positioning.

3. Dip new shaft seal "O" ring and seal face in clean 525 Viscosity oil and carefully engage shaft seal assembly with locking tangs of seal remover and installer J-9392 (Fig. 75).



Fig. 74--Removing Shaft Seal



Fig. 75--Installing Seal Seat "O" Ring



Fig. 76--Removing Bearing Retaining Ring

4. Install shaft seal protector J-22974 over the end of compressor shaft and slide shaft seal onto compressor shaft. Slowly turn the tool clockwise while applying light pressure until seal engages the flats of compressor shaft and can be seated into place. Rotate tool J-9392 counterclockwise to disengage from seal tabs and remove tool.

5. Attach ceramic seal seat to the seal seat remover and installer J-23128 and dip ceramic seat in clean 525 viscosity oil to coat seal face and outer surface. Carefully install seat over compressor shaft and seal protector J-22974 and push seat into place with a rotary motion. Remove tools J-23128 and J-22974.

6. Install new seal seat retainer ring with snap ring pliers J-5403.

7. Leak test compressor as described under "Leak Testing the Compressor" and correct any leaks found.

8. Reinstall clutch plate and hub assembly as described under "Compressor Clutch Plate and Hub Assembly".

COMPRESSOR CLUTCH ROTOR & BEARING ASSEMBLY, CLUTCH COIL AND PULLEY RIM

Compressor Clutch Rotor & Bearing

Assembly Removal

1. Remove the clutch plate and hub assembly as described under "Compressor Clutch Plate and Hub Assembly".

2. Remove rotor and bearing assembly retaining ring using snap ring pliers J-6083 (Fig. 76). Mark the location of clutch coil terminals. If clutch rotor and/or rotor bearing only are to be replaced, bend the lockwashers away from pulley rim mounting screws (Fig. 77) and remove the six mounting screws and special lockwashers before proceeding with Step 3. Discard special lockwashers.

3. Install rotor and bearing puller guide J-25031-1 over the end of compressor shaft and seat on the front head of compressor (Fig. 77).

4. Install rotor and bearing puller J-25031-2 down into

rotor until the puller arms engage the recessed edge of rotor hub. Hold puller and arms in place and tighten puller screw against puller guide to remove clutch rotor and assembly parts (Fig. 78). If pulley rim mounting screws and washers were removed in Step 2, only clutch rotor and bearing assembly will be removed for replacement.

The clutch coil and housing assembly is pressed onto front head of compressor with an interference fit and will not be removed unless pulley rim mounting screws are left securely in place and pulley rim pulls coil and housing assembly off with total clutch rotor and pulley rim assembly (Fig. 80).

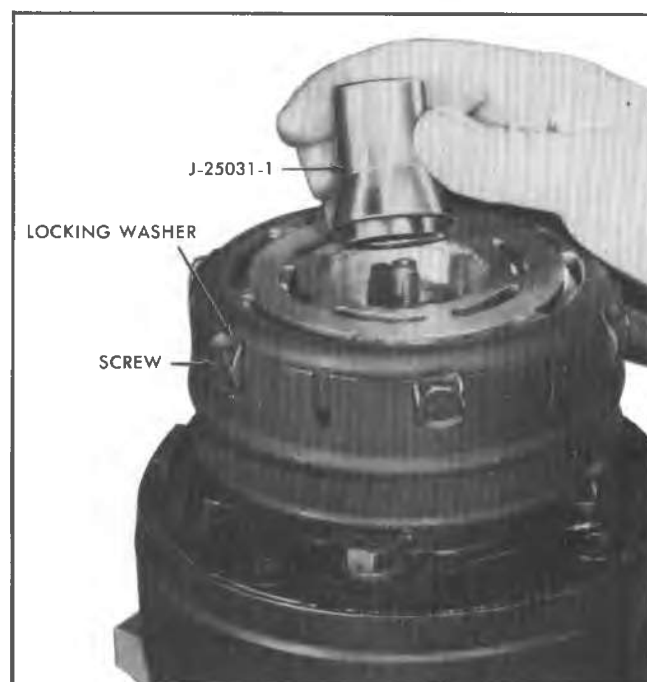


Fig. 77--Installing Rotor and Bearing Puller Guide

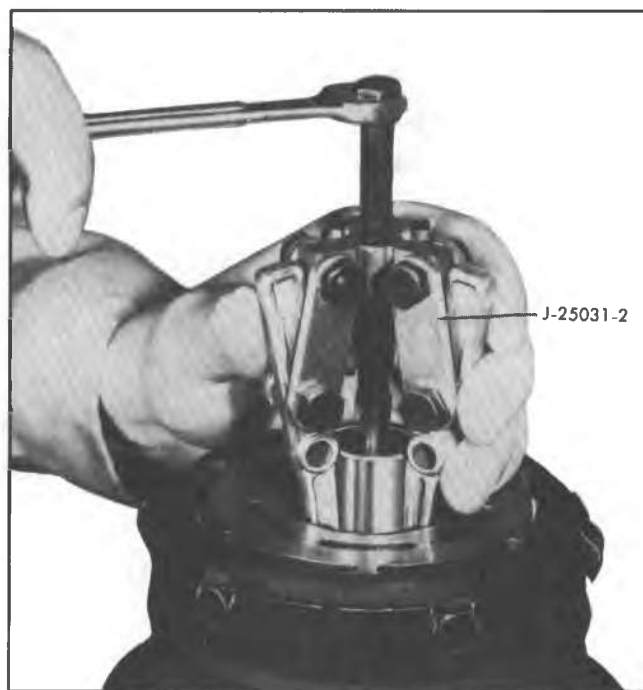


Fig. 78--Installing Rotor and Bearing Puller

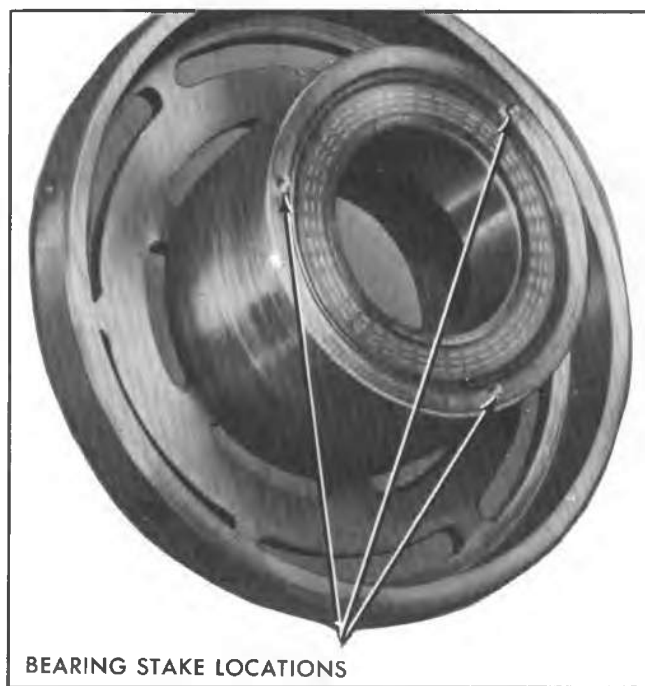


Fig. 80--Bearing Stake Locations

CLUTCH ROTOR BEARING REPLACEMENT

Removal

1. Perform "Compressor Clutch Rotor and Bearing Assembly Removal" and remove the pulley rim mounting screws as described in Step 2.

2. Place rotor and bearing assembly on blocks (Fig. 81) and drive bearing out of rotor hub with rotor bearing remover and rotor assembly installer J-25029. It will not be necessary to remove the staking at the rear of the rotor hub to remove the bearing. See Figure 80.



Fig. 79--Clutch Coil and Housing Assembly

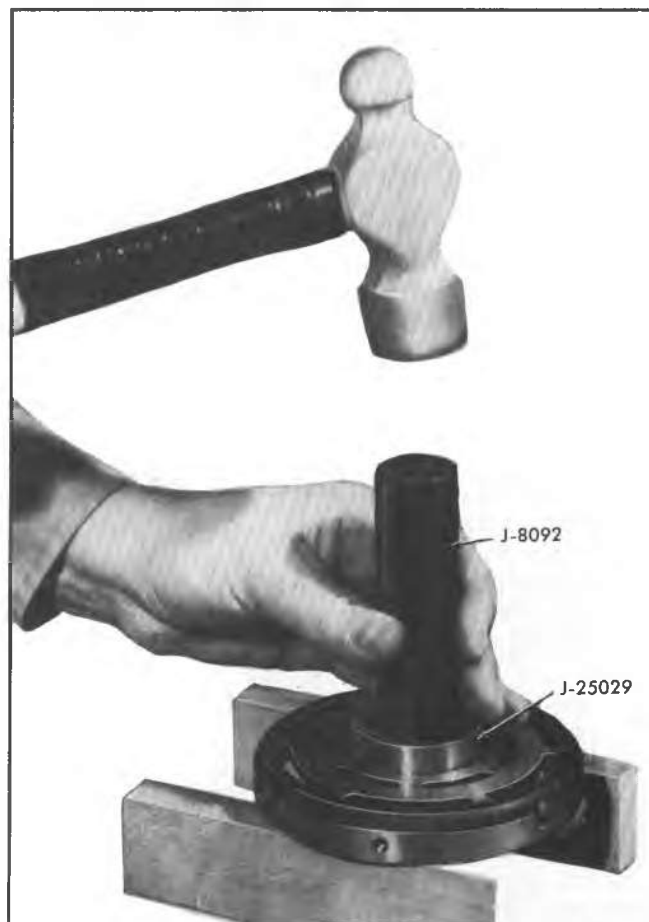


Fig. 81--Removing Clutch Rotor Bearing



Fig. 82--Installing Clutch Rotor Bearing

Installation

1. Place rotor and hub assembly face down on a clean, flat and firm surface (Fig. 82).

2. Align new bearing squarely with hub bore and using pulley and bearing installer J-9481 with Universal Handle J-8092, drive bearing fully into hub. The tool will apply force to outer race of bearing.

3. Stake bearing in place with a 45° angle punch (Fig. 80) but do not stake too deep (.045 - .055 inch) and possibly distort the outer race of bearing. Use new stake locations 120° apart. Do not use old stake locations.

4. Recommended Method

Press rotor and bearing assembly onto the front head of the compressor, using Rotor and Bearing Assembly Installer J-25029 (Fig. 83). The Installer will apply force to the inner race of the rotor bearing when installing the assembly onto the front head.

Alternate method

Reassemble the rotor and bearing assembly to the front head of the compressor using Rotor Bearing Remover and Rotor Assembly Installer J-25029. With Installer assembled to the Universal Handle J-8092 as shown in Fig. 84, force will be applied to the inner race of the bearing when

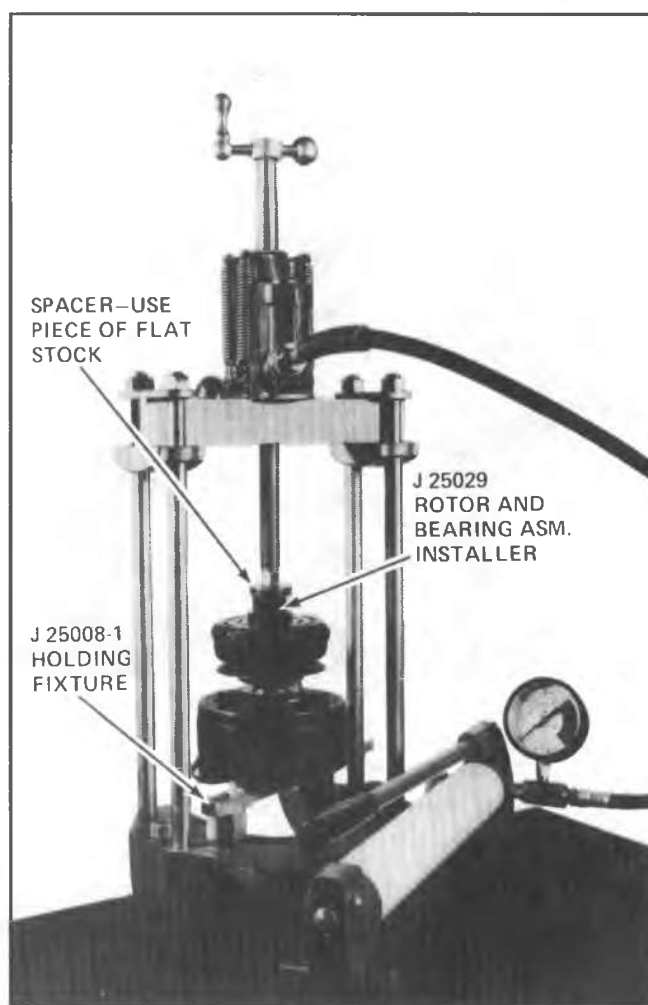


Fig. 83--Installing Rotor and Bearing Assembly

installing the assembly on the front head of the compressor.

5. Install rotor and bearing using Snap Ring Pliers J-6083.

6. Assemble and fully seat pulley rim to clutch rotor and bearing assembly as shown in Figure 84, using Loctite RC-75 or equivalent on screw threads and use new lockwashers. Do not torque mounting screws to final torque limits until pulley rim is checked to be rotating "in line".

7. Tighten pulley rim mounting screws to a 100 inch pounds torque and lock screw heads in place as shown in Figure 83.

8. Assemble clutch plate and hub assembly as described under "Compressor Clutch Plate and Hub Assembly".

CLUTCH COIL AND PULLEY RIM REPLACEMENT

Removal

1. Perform "Compressor Clutch Rotor and Bearing Assembly Removal" but do not loosen or remove pulley rim mounting screws until clutch rotor, coil and pulley rim assembly have been removed from front head in Step 4.

2. Remove pulley rim mounting screws and slide pulley rim off rotor and hub assembly. The pulley rim and clutch coil are replaceable at this point.



Fig. 84--Alternate Installation of R-4 Rotor and Bearing Assembly

Installation

1. Assemble clutch coil, pulley rim and clutch rotor and bearing assembly as shown in Figure 79, using Loctite RC-75 or equivalent on screw threads and using new lockwashers, but do not lock screw heads in place.
2. Place assembly on neck of front head and seat into place using rotor bearing remover and rotor assembly installer J-25029 as shown in Figure 83. Before fully seating the assembly on front head, be sure the clutch coil terminals are in the proper location in relation to compressor and that the three protrusions on the rear of the clutch coil align with the locator holes in front head.
3. Install rotor and bearing assembly retaining ring and reassemble clutch plate and hub assembly.
4. Rotate pulley rim and rotor to be sure pulley rim is rotating "in line" and adjust or replace as required. Tighten pulley rim mounting screws to 100 inch pounds torque and lock screw heads in place.

FRONT HEAD AND MAIN BEARING ASSEMBLY

Removal

1. Remove clutch rotor and bearing assembly but do not loosen or remove pulley rim mounting screws and remove clutch rotor, coil and pulley rim assembly as a total assembly.
2. Remove compressor shaft seal.
3. Remove the four front head mounting screws (Fig. 85) and remove front head assembly and discard seal ring. At this point front head and bearing assembly, front head

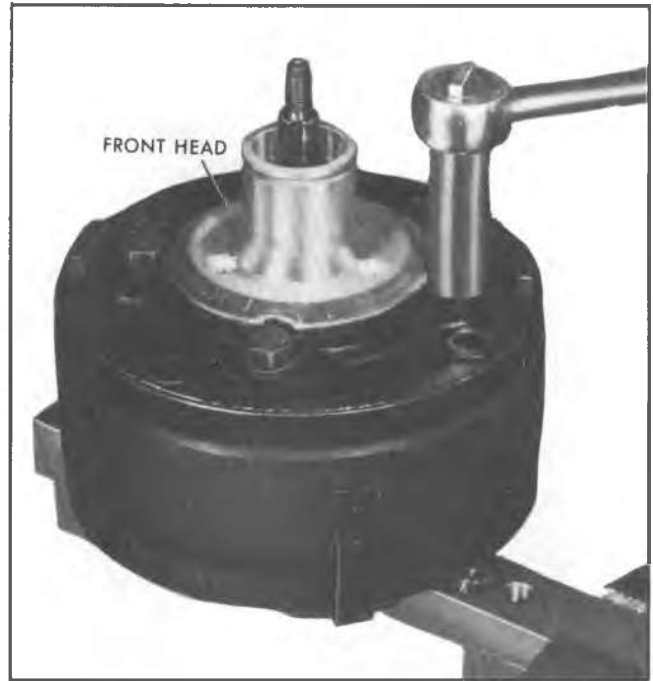


Fig. 85--Remove Front Head Assembly

seal ring (Fig. 86) or the Belleville and thrust washers may be replaced.

Installation

1. Check front head and compressor cylinder area for any dirt or lint and install a new thrust washer kit if required.
2. Dip new front head seal ring in 525 Viscosity oil and install seal in seal groove of front head (Fig. 86).
3. Position oil hole in front head to be "up" when assembled to compressor cylinder to correspond with "up" position of compressor. Install front head on compressor shaft. Be sure seal ring stays in place and front head seats

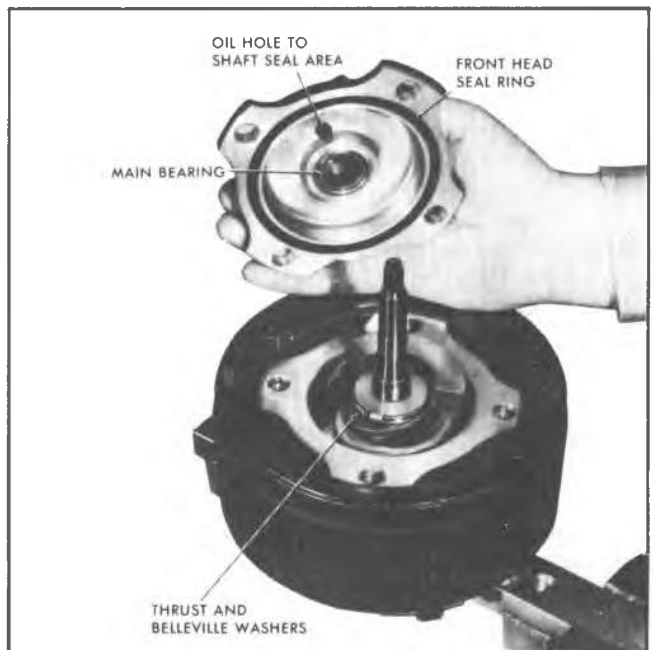


Fig. 86--Installing Front Head

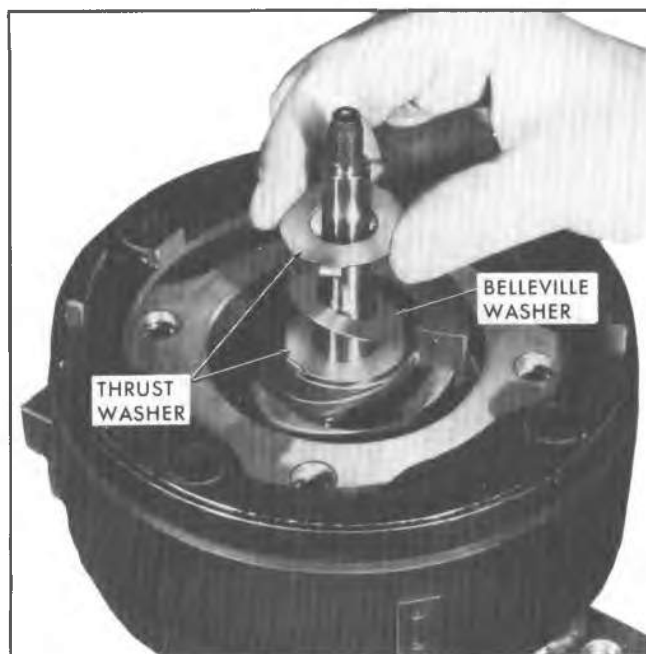


Fig. 87--Replacing Thrust and Belleville Washers

correctly to cylinder. Tighten front head mounting screws to 18-22 foot pounds.

4. Install a new compressor shaft seal.

5. Install clutch rotor and bearing assembly, clutch coil and pulley rim assembly to front head (Fig. 83). Before fully seating the assembly on front head be sure clutch coil terminals are in the proper location in relation to compressor and that the three protrusions on rear of clutch coil align with the locator holes in front head.

6. Install rotor and bearing assembly retaining ring and reassemble clutch plate and hub assembly.

7. Leak test compressor as described under "Leak Testing the Compressor" and correct any leaks found.

THRUST AND BELLEVILLE WASHER REPLACEMENT

1. Remove two thrust and one belleville washer from compressor shaft. Note the assembled position of the washers.

2. Install a new thrust washer on compressor shaft with thrust washer tang pointing up (Fig. 88).

3. Install the new belleville washer on shaft with the high center of the washer up (Fig. 87).

4. Install the remaining thrust washer on shaft with the tang pointing down (Fig. 87).

5. Lubricate the three washers with clean oil (525 Viscosity) and assemble front head to cylinder.

MAIN BEARING REPLACEMENT

Removal

1. Remove front head assembly.

2. Place front head assembly on two blocks (Fig. 88) and using main bearing remover J-24896 drive bearing out of front head.

Installation

1. Place front head with neck end down on a flat, solid surface.

2. Align new bearing and bearing installer J-24895 squarely with bearing bore of front head and drive bearing

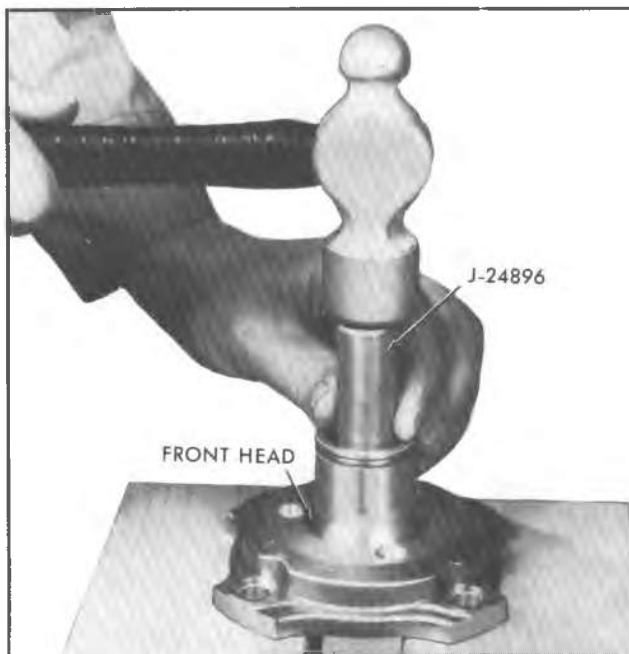


Fig. 88--Removing Main Bearing

into front head (Fig. 89). The tool J-24895 must seat against front head to insert bearing to proper clearance depth.

3. Assemble front head to cylinder and complete the assembly.

COMPRESSOR SHELL, CYLINDER "O"

RING AND VALVE PLATE REPLACEMENT

The clutch plate and hub assembly, the clutch rotor and bearing assembly, the clutch coil and pulley rim must be removed before compressor shell can be removed or replaced. The location of clutch coil terminals should be marked for reference on reassembly. Allow compressor to cool to room temperature before attempting to remove compressor shell as greater force will be required to remove the compressor shell when hot due to metal expansion difference between the aluminum cylinder and steel compressor shell.

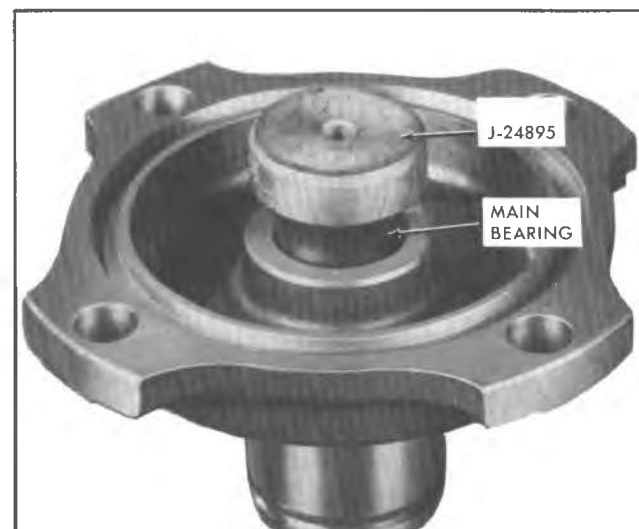


Fig. 89--Installing Main Bearing



Fig. 90--Releasing Retaining Strap

1. Pry shell retaining strap away from cylinder and position the strap high enough to clear cylinder as shell is removed (Fig. 89).

2. Remove compressor holding fixture J-25008-1 and reverse holding fixture step block protrusions engaging compressor shell. Install medium length bolts through holding fixture and thread them into compressor cylinder until the step of the fixture protrusions contact compressor shell, finger tight, both sides (Fig. 91). Check to be sure the step protrusions do not overlap the cylinder but will pass both sides.

3. Using a wrench, alternately tighten each bolt approximately 1/4 turn to push shell free of "O" rings on cylinder.



Fig. 91--Removing Shell Assembly



Fig. 92--Removing Valve Plate

If one screw appears to require more force to turn than the other, immediately turn the other screw to bring the screw threading sequence in step or the shell will be cocked and made more difficult to remove. Normal removal does not require much force on wrench if the screws are kept in step while turning. The shell can be removed by hand as soon as shell is free of shell to cylinder "O" rings. Do not turn screws any further than necessary to release shell.

4. Remove compressor shell, remove holding fixture J-25008-1 from compressor, reverse fixture to again hold compressor by the opposite side using the short length screws.

At this point the valve plate retainer ring may be removed using internal snap ring pliers, J-4245 (Fig. 92) and remove the compressor valve plate (Fig. 93) for replacement or piston inspection.

Installation

1. Remove old cylinder to shell "O" rings and discard. Check compressor assembly and interior of compressor shell to be sure they are free of lint or dirt.

2. Dip a cylinder to shell "O" ring in 525 Viscosity oil and install in rear "O" ring groove of cylinder. Be careful in moving "O" ring across cylinder surface to prevent damaging "O" ring.

3. Dip remaining cylinder to shell "O" ring in oil and install it in front "O" ring groove of cylinder.

4. Place compressor shell on cylinder and rotate retaining strap to its original location (Fig. 91).

5. Attach shell installing fixture J-25008-2 to the holding fixture J-25008-1, using the long bolts and plate washers of tool set.

Align the step projections of shell installing fixture J-25008-2 to contact compressor shell evenly both sides.

6. Push compressor shell as close to "O" ring (Fig. 94) as possible by hand and check for equal alignment of shell around cylinder. Tighten fixture screws finger tight.

7. Using a wrench, alternately tighten each bolt approximately 1/4 turn to push compressor shell over "O"

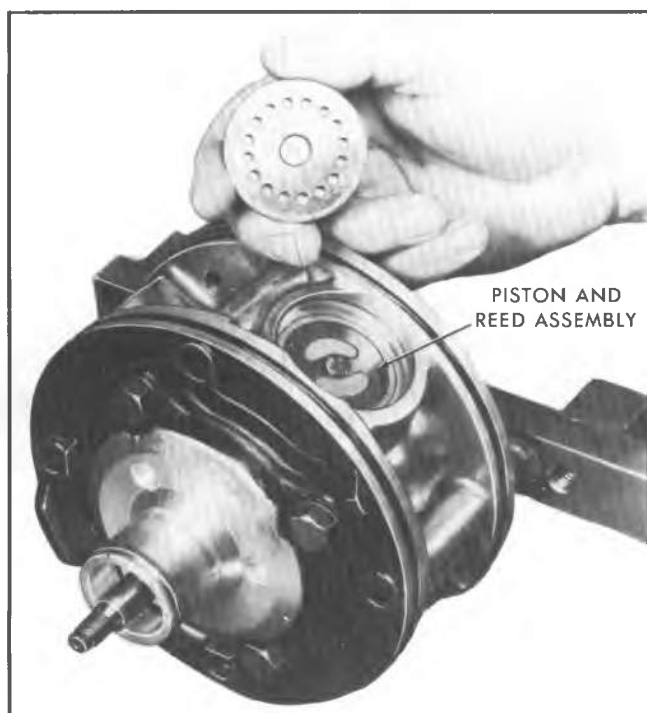


Fig. 93--Inspecting Piston and Reed Assembly

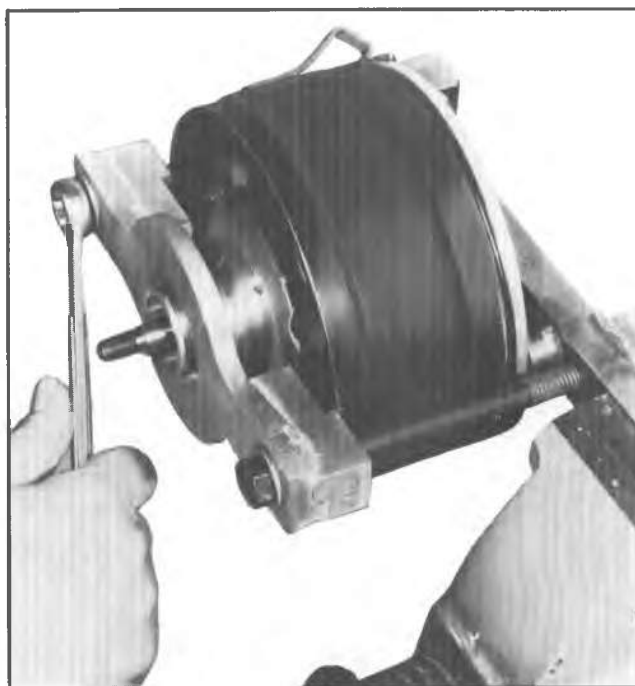


Fig. 94--Installing Shell Assembly

rings and back against shell stop flange at the rear of compressor cylinder.

If one screw appears to require more force to turn than the other, immediately turn the other screw to bring the screw threading sequence in step or the shell will be cocked and made more difficult to install. Normal installation does not require much force on wrench if screws are kept in step while turning.

8. When shell is seated against the stops, bend shell retaining strap down into place by tapping gently with a hammer.

9. Remove shell installing fixture J-25008-2 and leak test compressor.

OIL CHARGE

The radial four cylinder compressor is charged with 6.0 ounces of 525 viscosity oil. During normal operation a certain amount of oil will circulate with the Refrigerant 12 (R-12) in the system.

When necessary to replace a system component it is recommended that oil be added to the system in accordance to the following procedure.

If compressor is operable, idle vehicle for 10 minutes with the A/C controls set for Maximum Cooling and High Blower prior to discharging the system.

Add additional oil as indicated in Diagnosis Section of this Service Manual.

Oil Charge-Compressor Replacement

1. Gravity drain oil from a new compressor.

Position compressor with shaft end "up" and drain compressor suction and discharge ports. The compressor should gravity drain for 10 minutes.

Add additional oil as indicated in Section 1B of the Service Manual.

When necessary to flush system with R-11, drain assembly and blow dry with air prior to the installation of a new compressor. It is not necessary to drain oil from the replacement compressor.

2. The refrigerant 12 (R-12) is to be slowly discharged from the system.

3. Remove original compressor from vehicle, gravity drain the oil from compressor as in Step 1 and determine the amount of oil drained from the original compressor. Refer to the oil usage chart in section 1B of the Service manual for proper amount of oil to be added.

SYSTEM PERFORMANCE EVALUATION

When system performance, efficiency and proper oil charge is in doubt and must be evaluated accurately, it is recommended that the system be flushed with R-11 and the exact oil charge (6 ounces) of 525 viscosity oil be added to the compressor prior to any further checks of the system.

COMPRESSOR LEAK TESTING - EXTERNAL AND INTERNAL

A-6 and R-4 Compressors

Bench-Check Procedure

1. Install Test Plate J-9625 on rear head of compressor.
2. Attach center hose of gage manifold set on Charging Station to a refrigerant drum standing in an upright position and open valve on drum.
3. Connect Charging Station HIGH and LOW pressure lines to corresponding fittings on Test Plate J-9625, using J-5420 Gage Adapters.

NOTE: Suction port of compressor has large internal opening. Discharge port has small internal opening into compressor.

4. Open LOW pressure control, HIGH pressure control and REFRIGERANT control on Charging Station to allow refrigerant vapor to flow into compressor.

5. Using Leak Detector, check for leaks at pressure relief valve, compressor shell to cylinder, compressor front head seal (and also rear head seal and oil charge port on A-6 compressor), and compressor shaft seal. After checking, shut off LOW pressure control and HIGH pressure control on Charging Station.

6. If an external leak is present, perform the necessary corrective measures and recheck for leaks to make certain the leak has been corrected.

7. Loosen the manifold gage hose connections to the Gage Adapters J-5420 connected to the LOW and HIGH sides and allow the vapor pressure to release from the compressor.

8. Disconnect both Gage Adapters J-5420 from the Test Plate J-9625.

9. Rotate the complete compressor assembly (**not the crankshaft or drive plate hub**) slowly several turns to distribute oil to all cylinder and piston areas.

10. Install a shaft nut on the compressor crankshaft if the drive plate and clutch assembly are not installed.

11. Using a box-end wrench or socket and handle, rotate the compressor crankshaft or clutch drive plate on the crankshaft several turns to ensure piston assembly to cylinder wall lubrication.

12. Connect the Charging Station HIGH pressure line or a HIGH pressure gage and Gage Adapter J-5420 to the Test Plate J-9625 HIGH side connector.

13. Attach a Adapter J-5420 to the suction or LOW pressure port of the Test Plate J-9625 to open the schrader-

type valve.

NOTE: Oil will drain out of the compressor suction port adapter if the compressor is positioned with the suction port down.

14. Attach the compressor to the Holding Fixture J-25008-1, (R-4 compressor) and J-9396 (A-6 compressor), and clamp the fixture in a vise so that the compressor can be manually turned with a wrench.

15. Using a wrench, rotate the compressor crankshaft or drive plate hub 10 complete revolutions at a speed of approximately one revolution per second.

NOTE: Turning the compressor at less than one revolution per second can result in a lower pump-up pressure and disqualify a good pumping compressor.

16. Observe the reading on the HIGH pressure gage at the completion of the tenth revolution of the compressor. The pressure reading for a good pumping compressor should be 50 p.s.i. or above for the R-4 and 60 p.s.i. or above for the A-6 compressor. **A pressure reading of less than 45 p.s.i. for the R-4 or 50 p.s.i. for the A-6 would indicate one or more suction and/or discharge valves leaking, an internal leak, or an inoperative valve and the compressor should be disassembled and checked for cause of leak.** Repair as needed, reassemble and repeat the pump-up test. Externally leak test.

17. When the pressure pump-up test is completed, release the air pressure from the HIGH side and remove the Gage Adapters J-5420 and Test Plate J-9625.

18. On the R-4, tilt the compressor so that the compressor suction and discharge ports are down. Drain the oil from the compressor.

On the A-6, remove oil charge screw and drain the oil sump.

19. Allow the compressor to drain for 10 minutes, then charge with the proper amount of oil. The oil may be poured into the suction port.

NOTE: If further assembly or processing is required, a shipping plate or Test Plate J-9625 should be installed to keep out air, dirt and moisture until the compressor is installed.

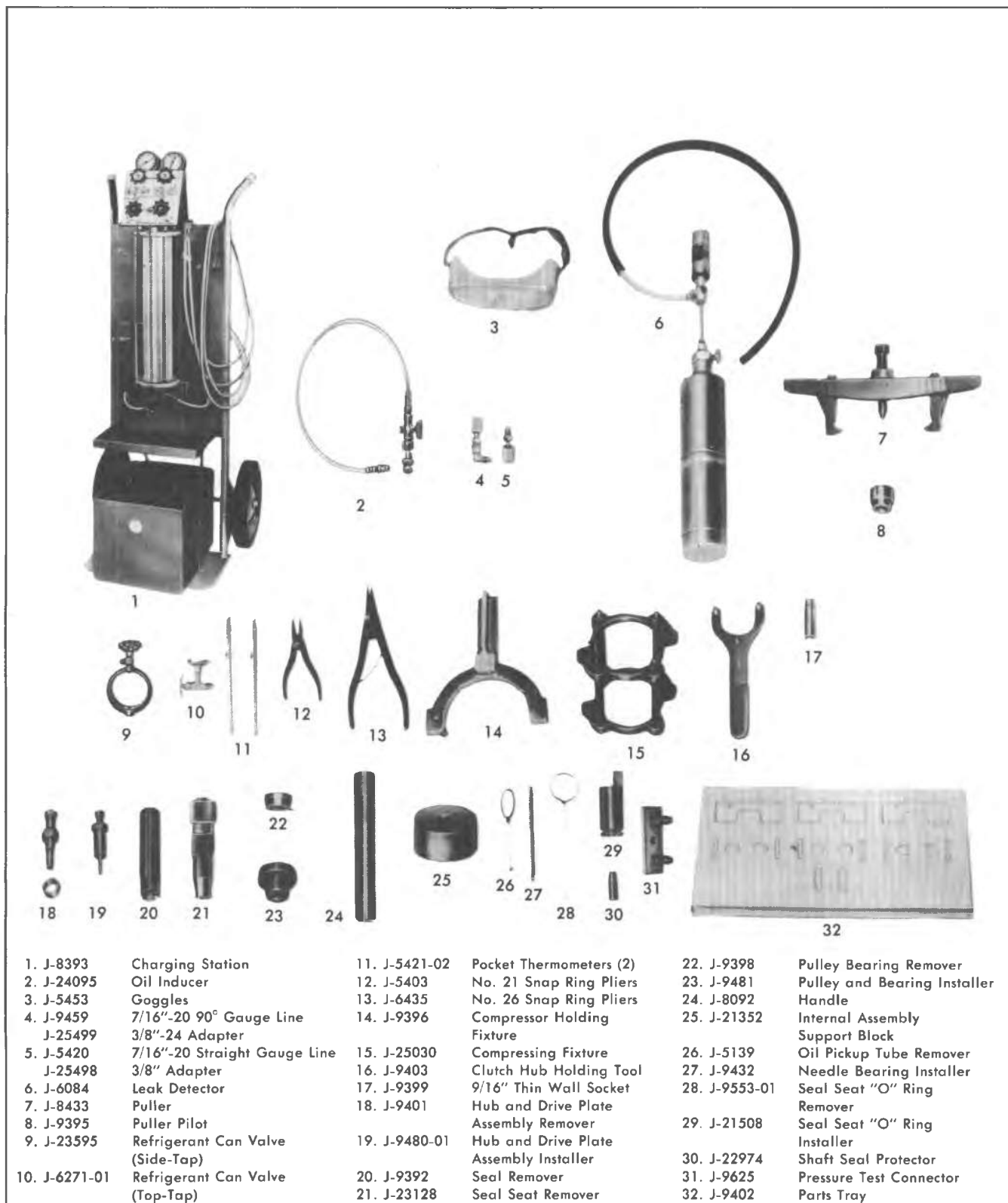


Fig. 95--Special Tools

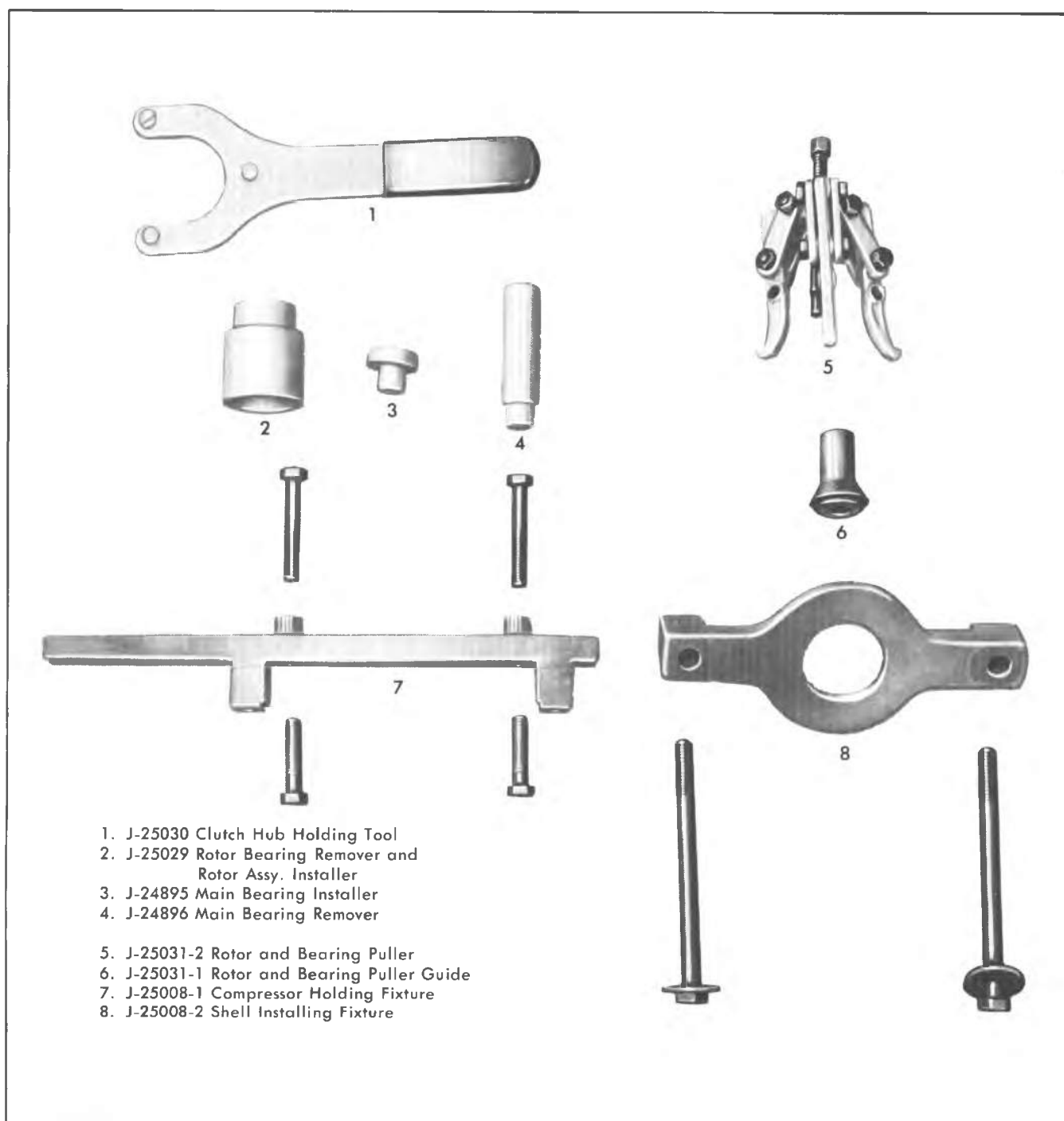


Fig. 96 -Special Tools

