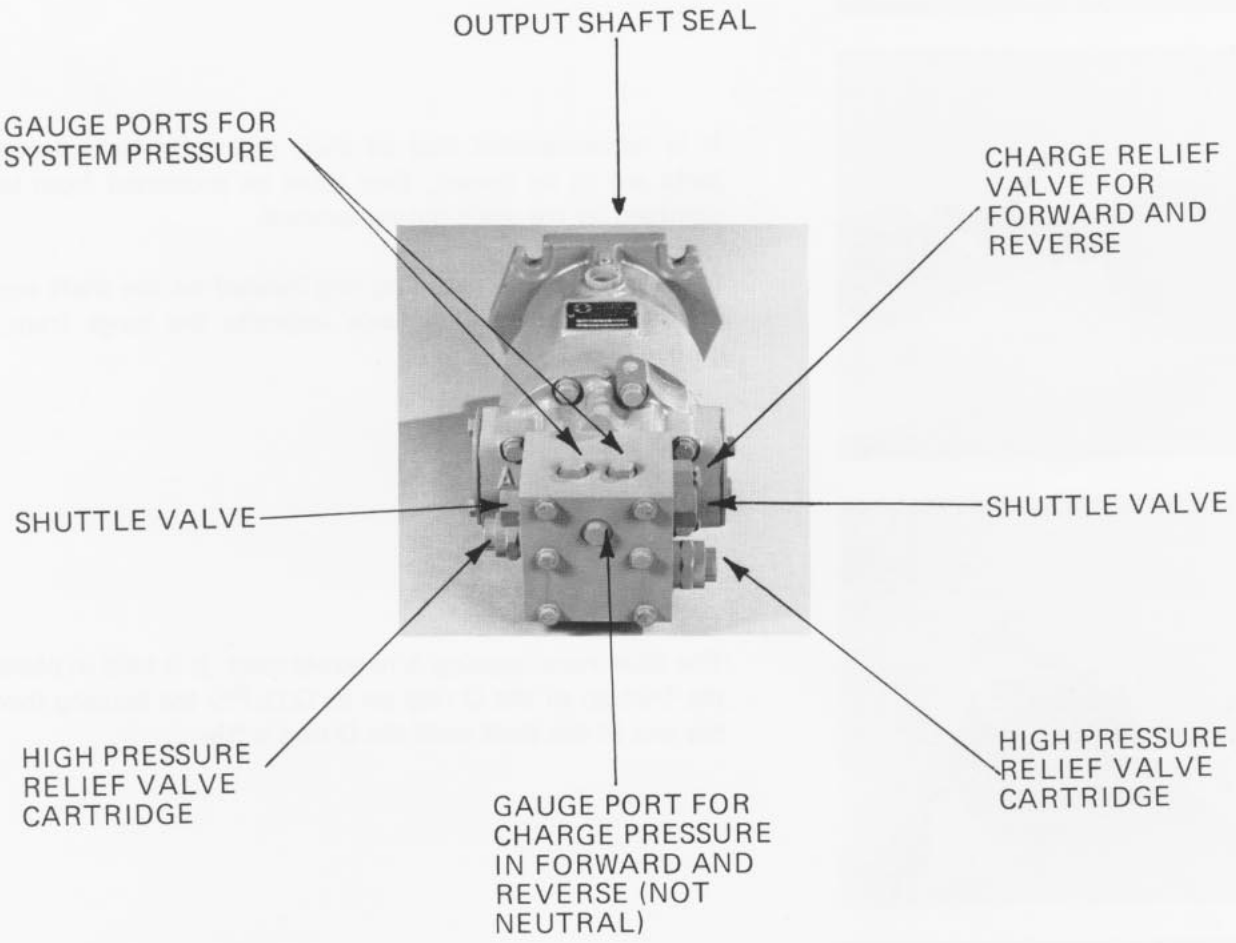
MINOR REPAIRS, FIXED DISPLACEMENT MOTOR

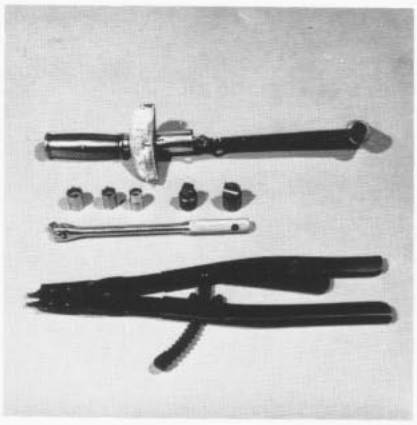
The areas of repair indicated may be serviced, following the procedures in this manual, without voiding the warranty.

Installation torque values for cap screws are given in the table at the end of this manual.



NOTE: SYSTEM PRESSURE GAUGE PORT IS LOCATED ON SIDE OPPOSITE THE CORRESPONDING HIGH PRESSURE RELIEF VALVE CARTRIDGE.

MINOR REPAIRS, FIXED DISPLACEMENT MOTOR

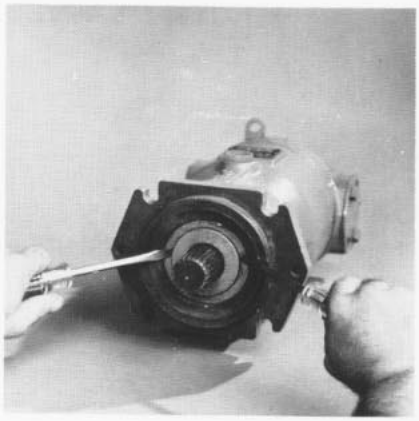


Special Tools
Certain tools are required that are not normally carried. These are as follows.

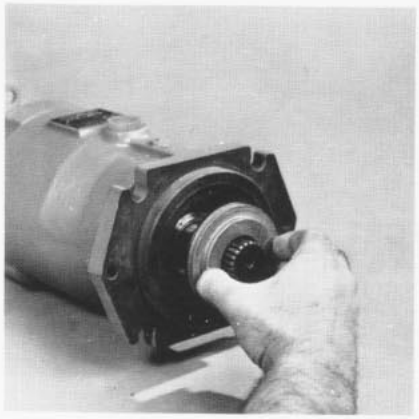
1. Truarc Retaining Ring Pliers (#7)
2. Torque Wrench

It is recommended that all shaft seal parts be replaced. If parts are to be reused, they must be protected from being damaged by the shaft during removal.

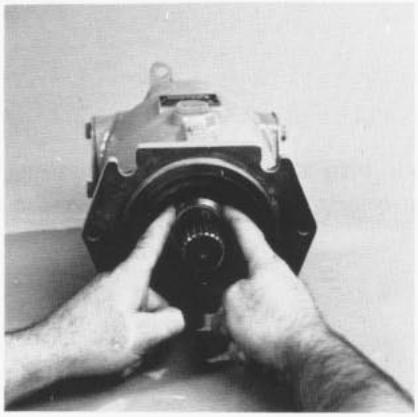
Remove the large retaining ring located on the shaft end of the motor. Remove the side opposite the tangs from the groove first.



The aluminum housing is removed next. It is held in place by the friction of the O-ring on its O.D. Pry the housing toward the end of the shaft until the O-ring is free.

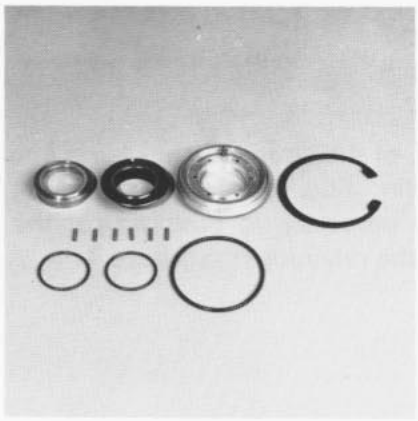


Remove the housing from the shaft. This part is actually an assembly that is being held together by the friction of an internal O-ring. It will normally remain assembled until physically separated.

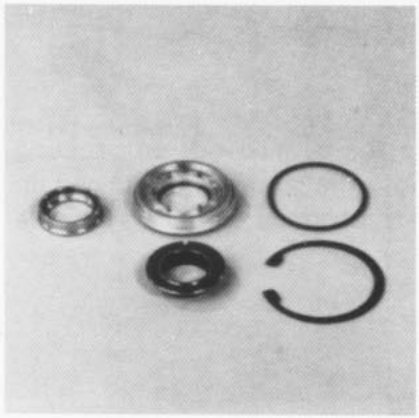


The bronze sealing ring is also held in place by internal O-ring friction. Work this part free and carefully slide over the shaft.

> CAUTION
>
> This part is easily damaged and care must be exercised when handling.



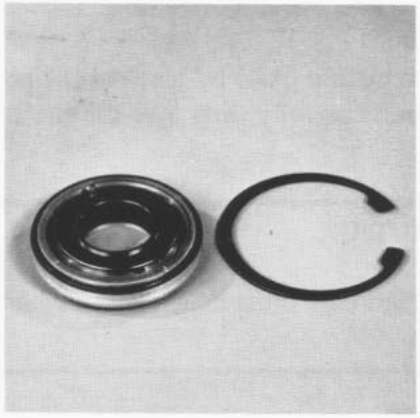
All of the shaft seal parts, which are included in the Shaft Seal Kit, have now been removed. Each part should be inspected separately if the seal is to be reused. It is recommended that this entire shaft seal be replaced.



Prior to assembly, place one O-ring in the I.D. of the bronze sealing ring and one O-ring in the I.D. of the aluminum housing. Place the six (6) or more springs in the cavities in the housing. Care must be used to protect the parts from damage by the shaft during assembly.

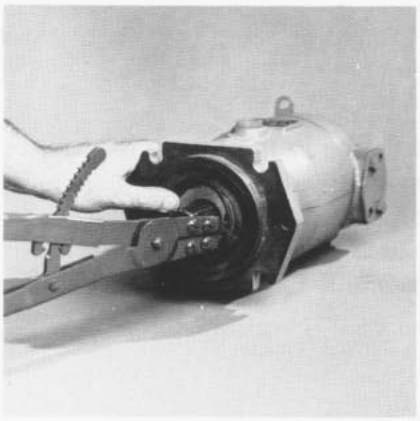
Before installing any shaft seal parts, wrap the shaft with a protective covering to protect parts from damage. Then slide the sealing ring over the shaft and onto the shaft pilot diameter with the O-ring facing the motor. Work the ring into place using hard force only.

MINOR REPAIRS, FIXED DISPLACEMENT MOTOR

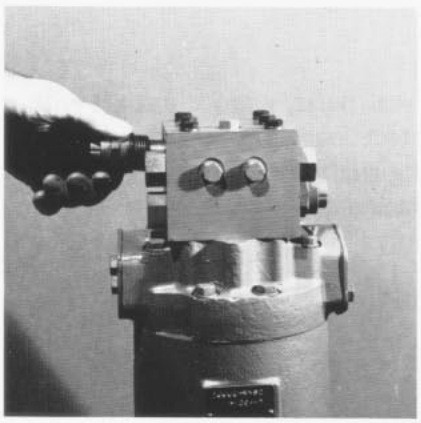


Insert the stationary seal pilot into the aluminum housing, locating the notch in the stationary seal over the pin in the housing.

Install the O-ring on the O.D. of the housing then slide it into place against the bronze sealing ring. Since this is a spring loaded assembly, it may be necessary to push against the aluminum housing to expose the retaining ring groove.

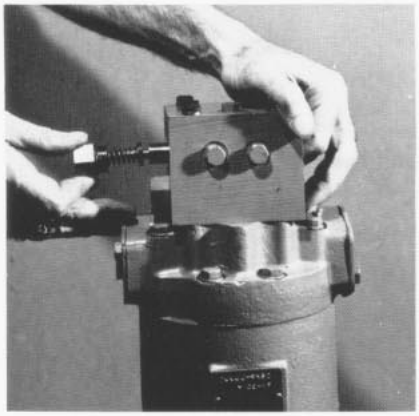


Install the retaining ring with the beveled side out, putting the side opposite the tangs into the groove first. Be certain that the retaining ring has snapped into its groove completely.

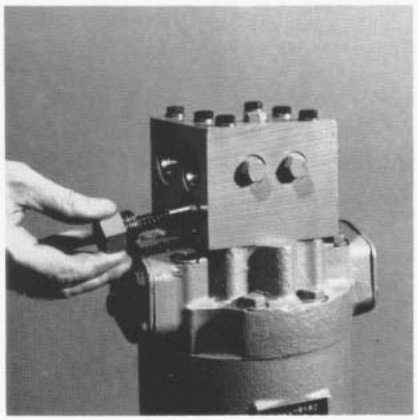


The High Pressure Relief Valves are cartridges that are removed by unscrewing them from the manifold. These valves are factory set and the first two (2) numbers of the pressure setting are stamped on the end of the valve. These valves are interchangeable and can be installed in either side of the manifold, providing the pressure settings are the same.

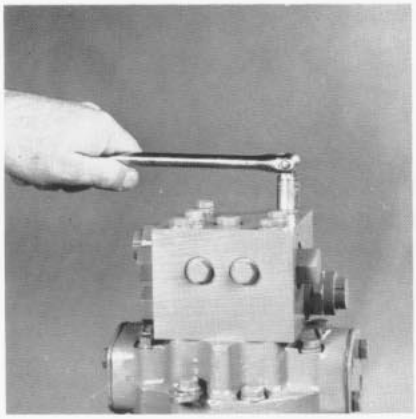
MINOR REPAIRS, FIXED DISPLACEMENT MOTOR



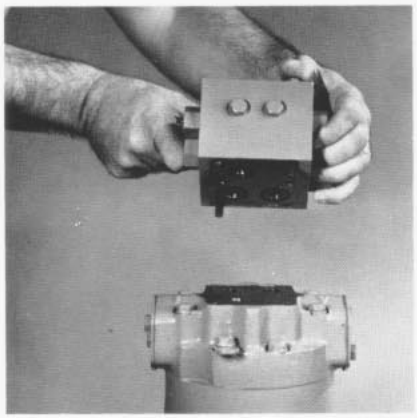
To repair the Shuttle Valve, remove both hex. plugs, springs, washers and spool from the manifold. These parts are interchangeable and can be installed on either side of the manifold. The spool and manifold are a select fit and must be replaced together. To install, slide the spool into the bore, place a washer on each end, then slide both springs in place. Install the hex. plugs and tighten.



To repair the Charge Relief Valve, remove the hex. plug, spring and poppet. Remove the shims from the counterbore of the hex. plug. Do not alter these shims unless new parts are used, in which case the valve must be re-shimmed to the proper setting. To re-install, insert the poppet, spring and plug, being certain the shims are in place.

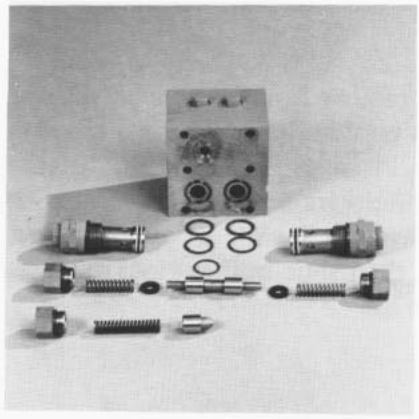


The valve manifold assembly can be removed from the motor and replaced in its entirety. The following procedure shows removal of the entire manifold from the Motor before performing further disassembly.



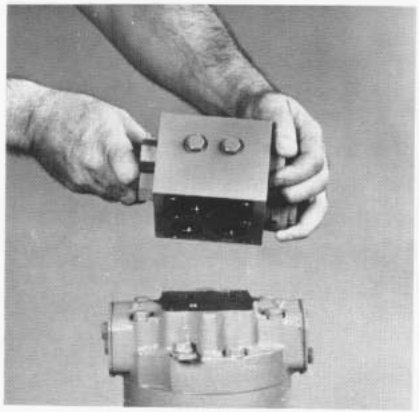
Remove the six (6) hex. cap screws and lift the manifold off the motor end cap. The three (3) ports are sealed with O-rings and the two (2) adjacent ports also have back-up rings on top of the O-rings. These are rectangular in cross section and slightly cupped on one side where they mate with the O-rings.

MINOR REPAIRS, FIXED DISPLACEMENT MOTOR

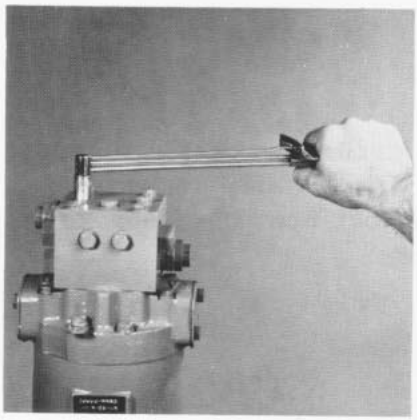


The manifold assembly contains the following valves.

- High Pressure Relief Valve Cartridges
- Shuttle Valve
- Charge Relief Valve



The O-ring (and orifice, if used) should be placed in the port with the full counterbore. The square cut rings fit in the ports with the machined grooves.



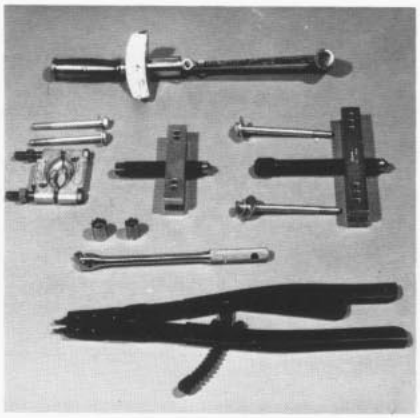
When installing the manifold on the end cap be certain the seal rings are properly installed and do not slip out of the grooves.

MAJOR REPAIRS, FIXED DISPLACEMENT MOTOR

The procedures on the following pages are for complete disassembly and re-assembly of the unit. The equipment manufacturer should be consulted regarding any effect such repairs may have on warranty.

Cleanliness is the primary means of insuring satisfactory transmission life, either on new or repaired units. Cleaning parts by using a solvent wash and air drying is adequate, providing clean solvent is used. As with any precision equipment, the internal mechanism and related items must be kept free of chemical and particulate contaminants.

MAJOR REPAIRS, FIXED DISPLACEMENT MOTOR



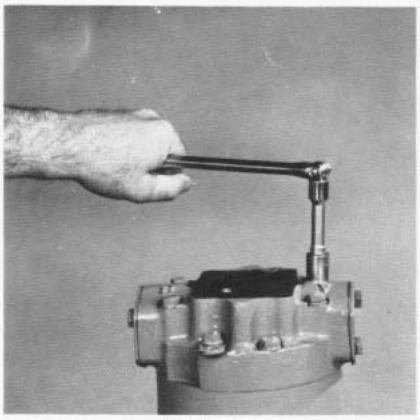
Special Tools
Certain tools are required that are not normally carried which are as follows.

1. Waldes Truarc # 7 Retaining Ring Pliers
2. Torque Wrench
3. Tapered Bearing Puller
   Ref. Snap On Part Numbers
   Puller Bar CG350
   20-23- Series: Separator CJ950
   24-27 Series: Separator CJ951

Remove the shaft seal as outlined under Minor repair procedures. The shaft seal must be removed before end cap screws are loosened to prevent the seal being damaged.

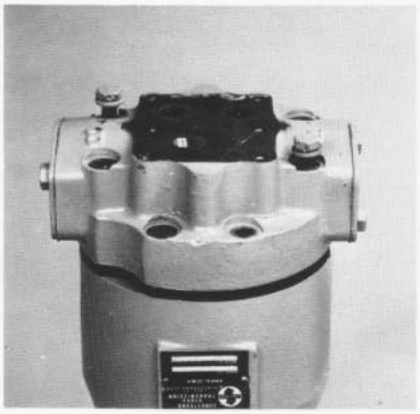
CAUTION

The end cap screws should not be loosened until the shaft seal has been removed.



Remove the valve manifold assembly as outlined under Minor repair procedures.

Remove all but two (2) of the hex. head screws holding the end cap to the housing. Make sure the two remaining screws are opposing each other.

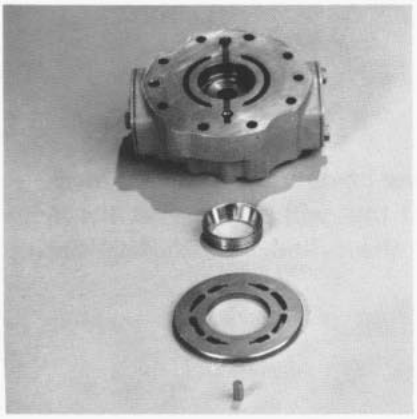


There is an internal spring loading on the end cap and as the last two (2) screws are loosened, it should begin to separate from the housing. Loosen these screws alternately until the end cap has fully separated from the housing, then remove the screws entirely.

The end cap can now be lifted off the motor; however, be certain that the valve plate does not fall and become damaged. If the valve plate tends to lift off with the end cap, hold it in place on the end cap and remove both parts together. If the valve plate remains on the bearing plate, remove it at this time.

CAUTION

All surfaces exposed are critical and caution must be used to avoid damage.

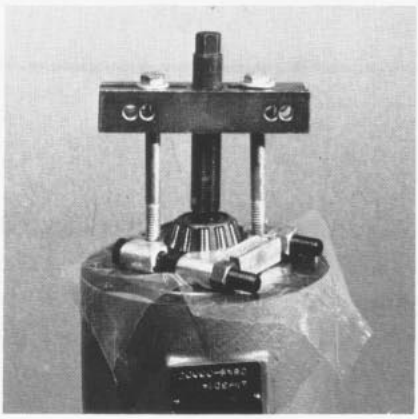


The end cap is actually an assembly consisting of a tapered bearing race which is a slip fit in the end cap and the valve plate locating pin. These parts should be removed from the end cap. There may or may not be a shim located under the bearing race which should be removed.

Remove the bronze bearing plate and pilot ring from the cylinder block.

If the pilot ring remains with the bearing plate, remove it at this time.

Note that the valve plate has four (4) tapered slots, two (2) at the top and two (2) at the bottom. These four (4) slots identify it as a motor valve plate and it is not interchangeable with the pump valve plate.



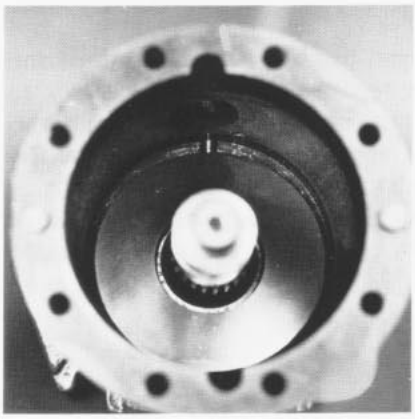
The tapered bearing must now be removed from the shaft. A bearing puller should be used that will pull against the inner race of the bearing. Protect the cylinder block face during this operation.

After removal of the bearing, slip the spacer out of the bore in the cylinder block.

Place the motor in a horizontal position. Slide the cylinder block assembly off the shaft while holding the external end of the shaft.

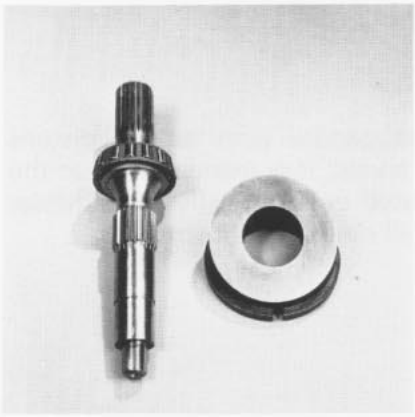
MAJOR REPAIRS, FIXED DISPLACEMENT MOTOR

The cylinder block assembly usually comes out in one piece; however, some of the parts can separate. This does not present a problem as these parts can be reassembled later.



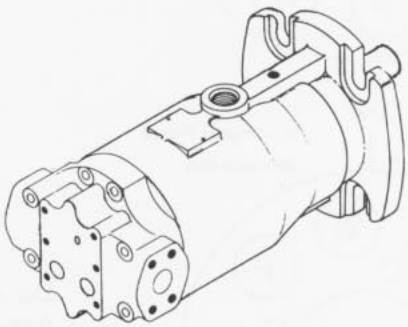
The swashplate has a notch which locates over a pin in the housing to prevent improper assembly; however, mark the housing for proper orientation of the swashplate during reassembly.

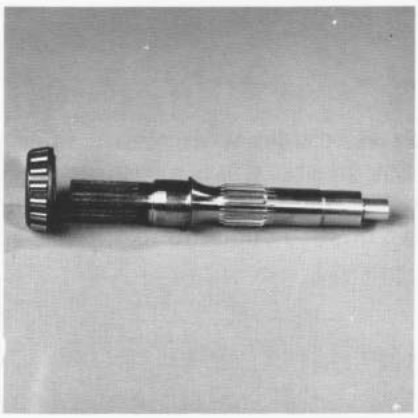
The fixed swashplate and shaft assembly can now be removed by grasping the shaft and lifting both parts out of the housing.



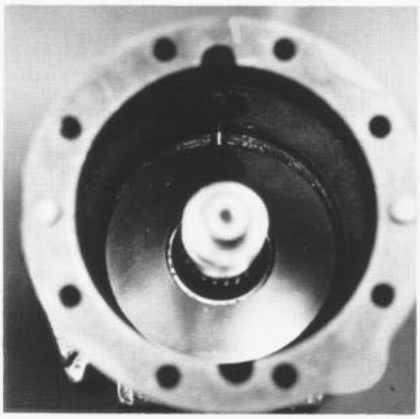
The tapered bearing can be pressed off the shaft if required. Be careful not to damage the seal diameter of the shaft while removing the bearing. The bearing race is press fit in the housing. If any of these parts are replaced, the shaft end play must be checked.

Drive Shaft
Bearings
End Cap
Housing

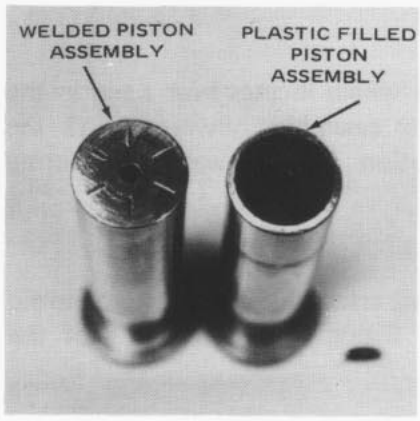




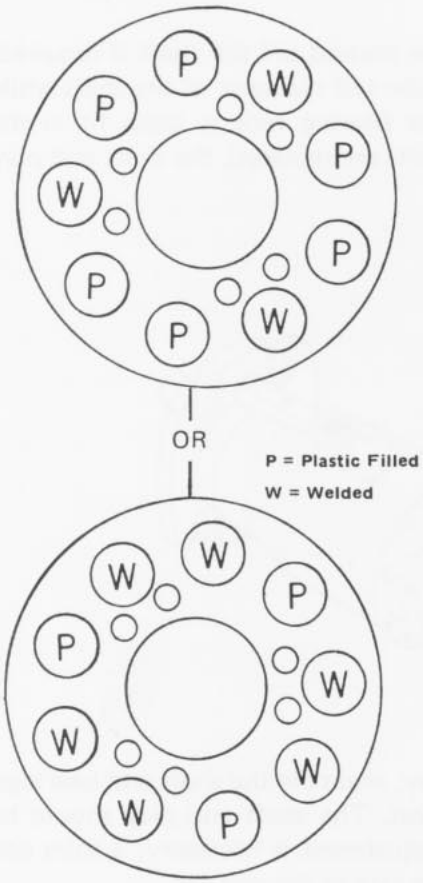
To check the shaft end play, assemble the shaft and bearings, housing, end cap and gasket. The shaft end play should be from .006" to .016". If adjustment is necessary, a shim can be placed under the bearing race in the end cap.



Place the fixed swashplate over the shaft-bearing assembly and place into housing locating the notch in the swashplate on the pin in the housing.
Prior to reassembly of the cylinder block, inspect the pistons for contamination or excessively worn slipper pads. Replace any pistons that are found to be defective.

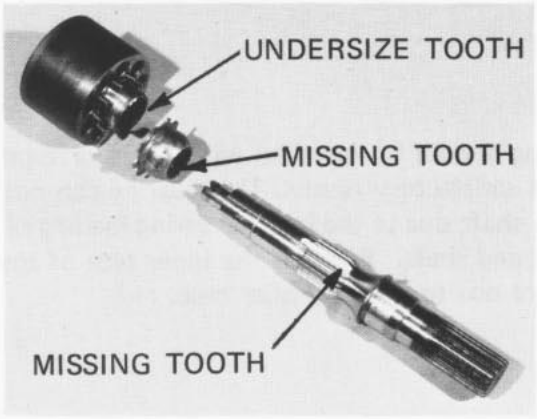


Two types of pistons have been used in 20 Series pumps and motors. Prior to any piston replacement it is necessary to check the construction of all pistons in the cylinder to determine if they are the welded steel or plastic filled type. Replacement of plastic filled pistons with welded pistons may be accomplished by following the procedure outlined below. Plastic filled pistons may not be used to replace welded piston assemblies.

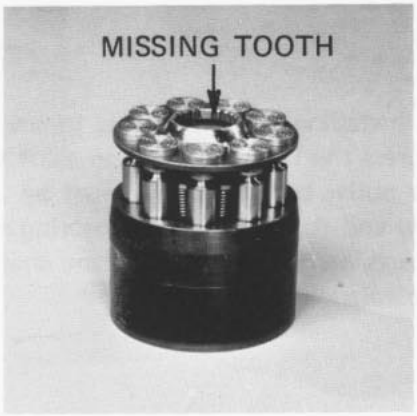


When replacing plastic filled pistons with welded pistons during overhaul or repair of a unit, it is mandatory that the welded pistons be incorporated symmetrically in multiples of three (either three, six, or all nine). See illustrations.

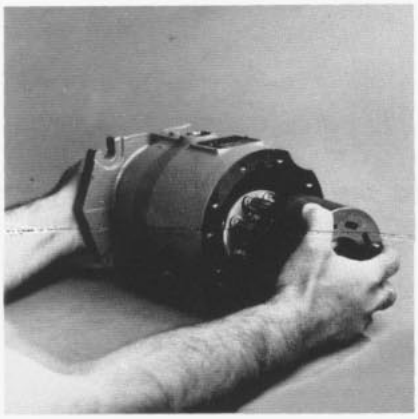
Do not replace welded piston assemblies with plastic filled piston assemblies; however, any plastic filled piston assemblies that you have in inventory can be used to replace existing plastic filled pistons that you may encounter.



To install the cylinder block assembly it is necessary to check the alignment of certain parts. There is no special relationship of pistons to bores, springs, etc. However, the alignment of the ball guide and cylinder block splines is critical. The undersized tooth in the spline of the cylinder block must line up with the missing tooth in the ball guide spline.

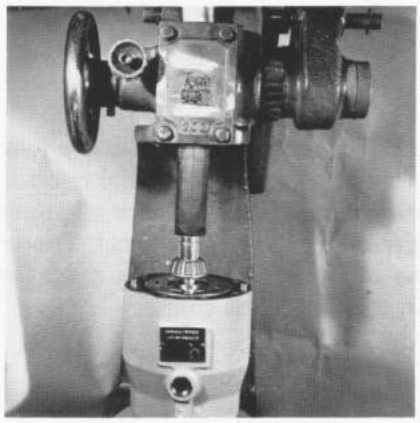


These in turn line up with a missing tooth on the shaft spline. The hole for the bearing plate locating pin in the cylinder block face is in line with the undersize tooth in the cylinder block and provides an assembly guide.

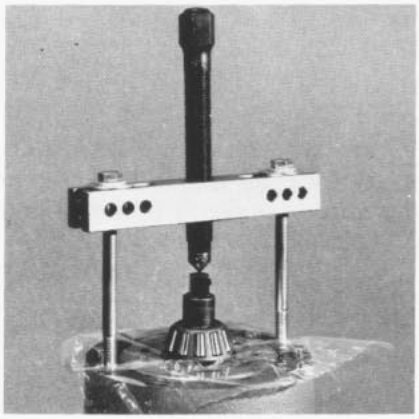


Lubricate the swashplate, slippers, pistons and bores with clean hydraulic oil. Hold the shaft on the external end, align the missing shaft tooth with the missing ball guide tooth using the locating pin hole as a guide. Slide the cylinder block assembly onto shaft and against swashplate face. When properly installed a spring load can be felt when pushing against the cylinder block.

Set the motor vertically and install the spacer in the center bore of the cylinder block.



The tapered bearing should be installed with an arbor type press for the most satisfactory results. This bearing can not be driven onto the shaft due to the internal spring loading of the cylinder block and shaft. Press on the inner race of the bearing and use care not to damage roller cage.

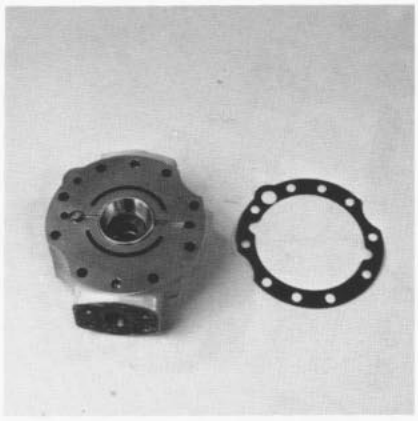


An alternate method of installing this bearing is to use the bearing puller bar and press the bearing onto the shaft with the center screw of the puller bar. A spacer must be used between the center screw and the bearing. The bearing must be pressed on until it rests on the shoulder of the shaft to insure adequate bearing clearance.

Install the pilot ring and the locating pin in the cylinder block.

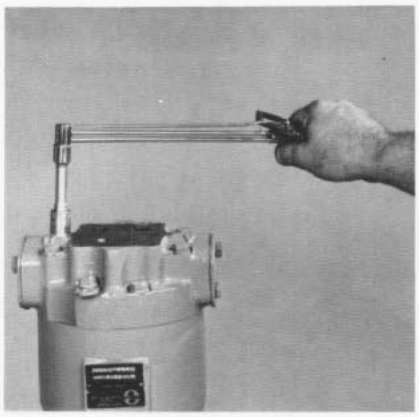
Install the bearing plate so that the milled slot locates over the pin and the pilot ring fits in the center bore of the cylinder block. After installation lubricate the exposed surfaces with clean hydraulic oil.

MAJOR REPAIRS, FIXED DISPLACEMENT MOTOR

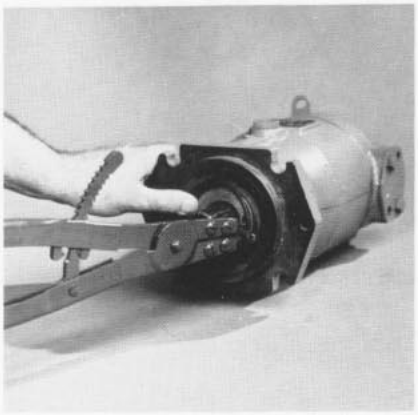


Assemble the bearing race shim (if required) and locating pin in the end cap. Lubricate the end cap face with clean hydraulic oil. Install the valve plate so that the milled slot locates over the pin and the center bore fits over the protruding bearing race. Check the valve plate to be certain it is a motor valve plate (has 4 tapered slots).

Place the end cap gasket on the housing, being certain the locating pins are in place, then install the end cap and valve plate. Hold the valve plate so it does not drop off during assembly. The end cap and gasket will only align with housing mounting holes in one position.



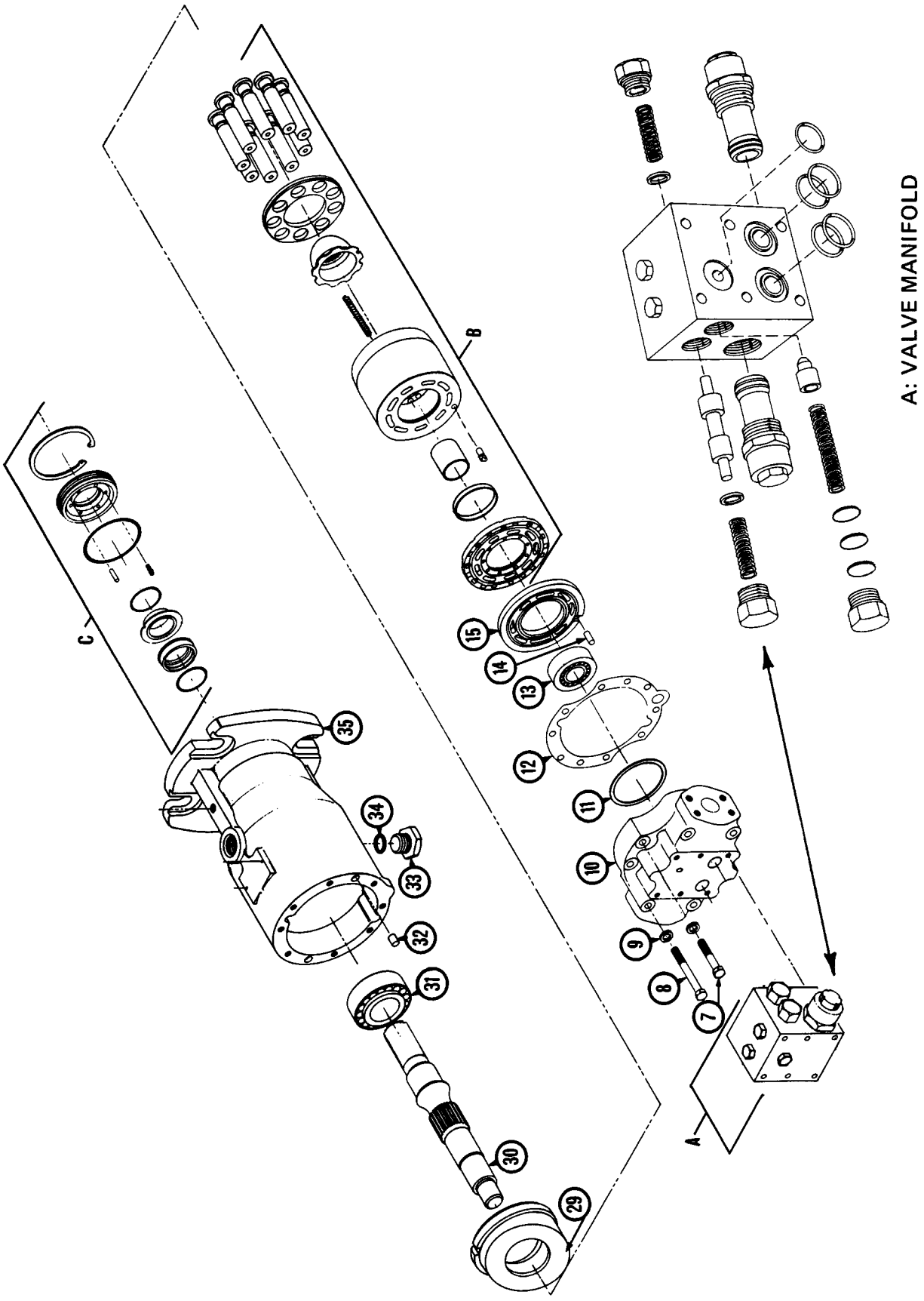
Install two (2) end cap screws and alternately tighten them until the internal spring has compressed far enough for the end cap to rest on the housing. Install the remaining screws.



Install the shaft seal and valve manifold as outlined in the In-Warranty repair procedures.

Fill the motor housing with clean hydraulic oil.

GENERAL PARTS IDENTIFICATION, FIXED DISPLACEMENT MOTOR



GENERAL PARTS IDENTIFICATION, FIXED DISPLACEMENT MOTOR

GENERAL PARTS LIST

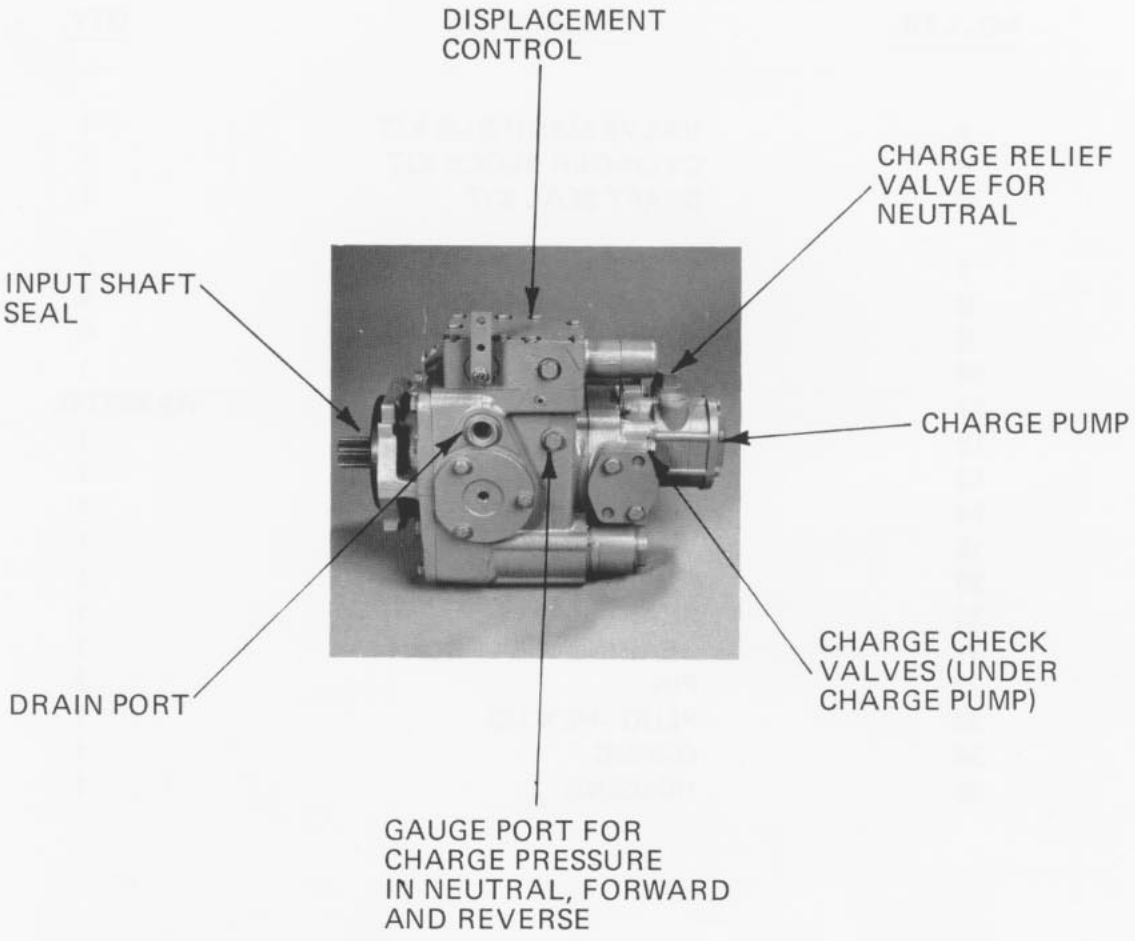
NO./LTR.	DESCRIPTION	QTY.
A	VALVE MANIFOLD KIT	1
B	CYLINDER BLOCK KIT	1
C	SHAFT SEAL KIT	1
7	SCREW-HEX.HD.CAP	4
8	SCREW-HEX.HD.CAP	4
9	WASHER–PLAIN	8
10	END CAP	1
11	SHIM-BEARING	AS REQ'D.
12	GASKET–END CAP	1
13	BEARING KIT–REAR	1
14	PIN–LOCATING	1
15	VALVE PLATE	1
29	SWASHPLATE–FIXED	1
30	SHAFT	1
31	BEARING KIT–FRONT	1
32	PIN	2
33	PLUG–HEX.HD.	1
34	O-RING	1
35	HOUSING	1

This list is for identification of parts only. Specific model and part numbers are necessary to order replacement parts. For part numbers consult the Parts List for the specific model number.

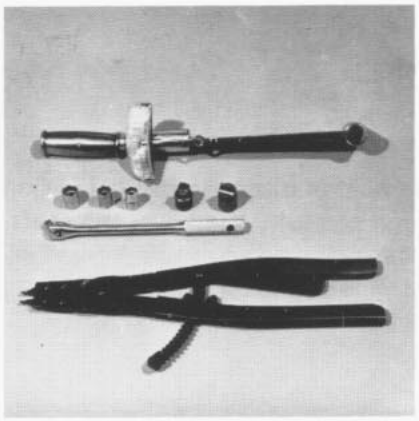
MINOR REPAIRS, VARIABLE DISPLACEMENT PUMP

The areas of repair indicated may be serviced, following the procedures in this manual, without voiding the warranty.

Installation torque values for cap screws and other parts are given in the table at the end of this manual.

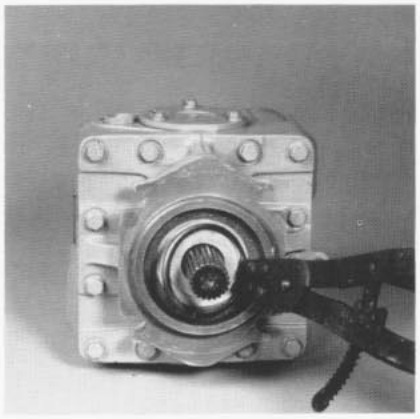


MINOR REPAIRS, VARIABLE DISPLACEMENT PUMP



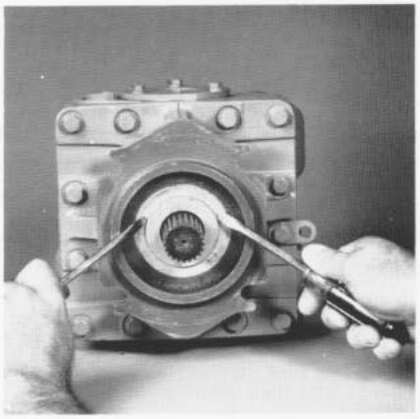
Special Tools
Certain tools are required that are not normally carried which are as follows.

1. Traurc Retaining Ring Pliers (#7)
2. Drag Link Socket (Modified for slot in check valves)
3. Torque Wrench



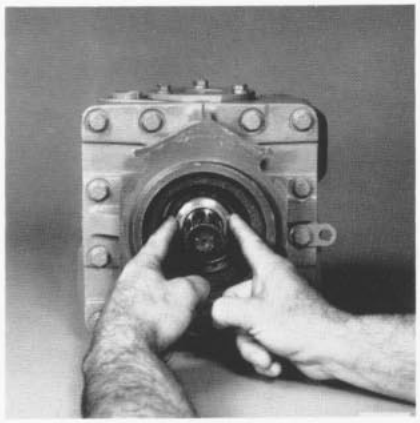
It is recommended that all shaft seal parts be replaced. If parts are to be reused, they must be protected from being damaged by the shaft during removal.

Remove the large retaining ring located on the shaft end of the pump. Remove the side opposite the tangs from the groove first.

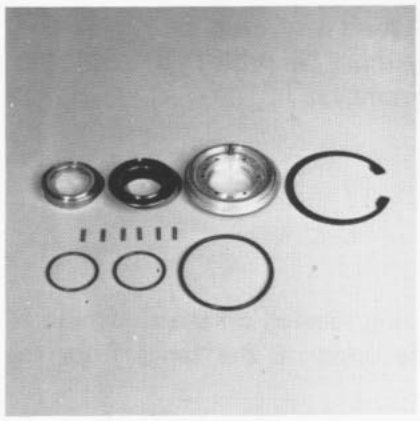


The aluminum housing is removed next. It is held in place by the friction of the O-ring on its O.D. Pry the housing toward the end of the shaft until the O-ring is free.

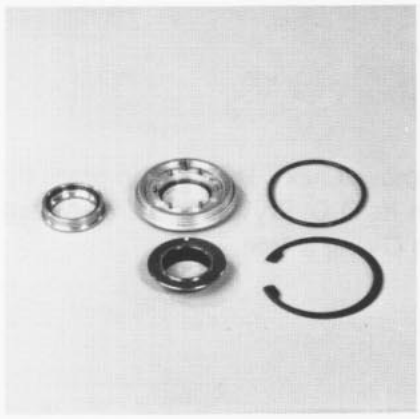
Remove the housing from the shaft. This part is actually an assembly that is being held together by the friction of an internal O-ring. It will normally remain assembled until physically separated.



The bronze sealing ring is also held in place by internal O-ring friction. Work this part free and carefully slide over the shaft.



All of the shaft seal parts, which are included in the Shaft Seal Kit, have now been removed. Each part should be inspected separately if the seal is to be reused. It is recommended that this entire shaft seal be replaced.



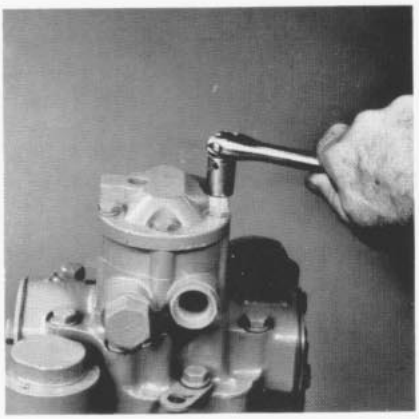
Prior to assembly, place one O-ring in the I.D. of the bronze sealing ring and one O-ring in the I.D. of the aluminum housing. Place the six (6) or more springs in the cavities in the housing. Care must be used to protect the parts from damage by the shaft during assembly.

Before installing any shaft seal parts wrap the shaft with a protective covering to protect all parts from damage. Then slide the sealing ring over the shaft and onto the shaft pilot diameter with the O-ring facing the pump. Work the ring into place using hand force only.

Insert the stationary seal pilot into the aluminum housing, locating the notch in the stationary seal over the pin in the housing.

Install the O-ring on the O.D. of the housing then slide it into place against the bronze sealing ring. Since this is a spring loaded assembly, it may be necessary to push against the aluminum housing to expose the retaining ring groove.

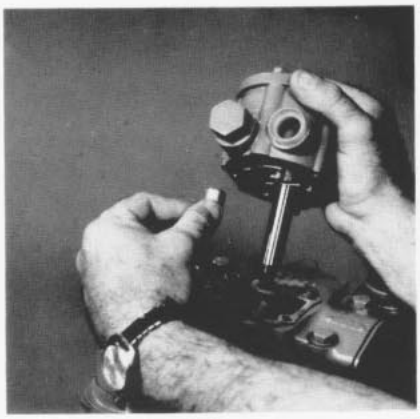
Install the retaining ring with the beveled side out, putting the side opposite the tangs into the groove first. Be certain that the retaining ring has snapped into its groove completely.



To remove the charge pump, loosen the four (4) cap screws that form a rectangular pattern on the rear of the charge pump. **Do not remove the screws at the top and bottom as these hold the segments of the charge pump together.**

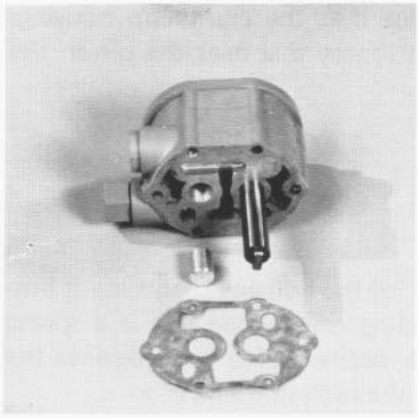
CAUTION

Protect exposed surfaces and ports to prevent damage and parts falling into main pump.

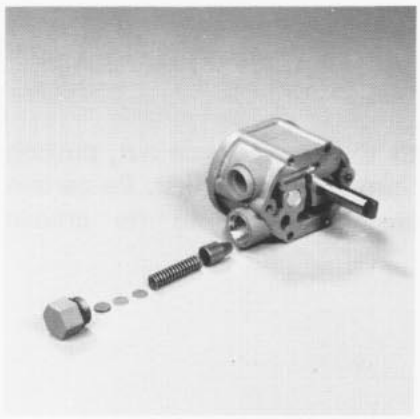


Before removing the charge pump, mark its housing and the main pump end cap to insure proper orientation when re-assembling.

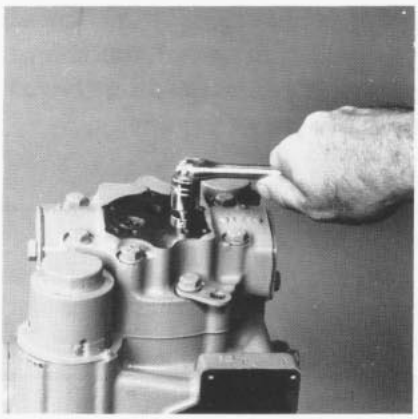
The charge pump lifts straight off the main pump. There is a spacer in the idler shaft bore that can slip out as the pump is removed; be certain to control this spacer so it can not fall into the main pump.



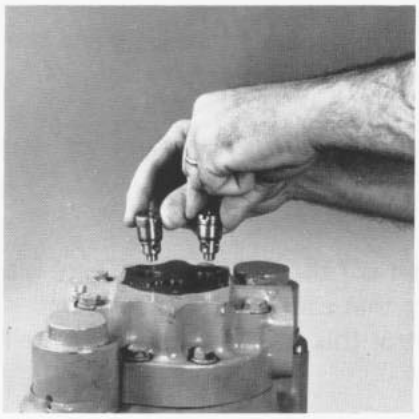
There is a gasket between the charge pump and end cap that should be replaced.



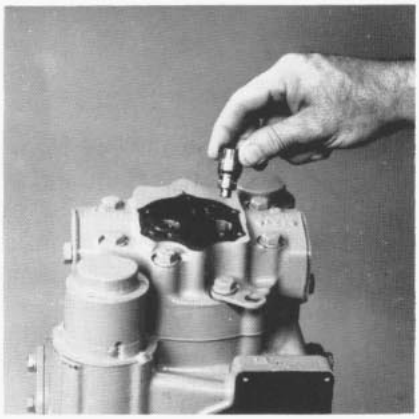
The charge relief valve can be inspected by removing the hex. plug, spring and poppet. Remove the shims from the counterbore of the hex. plug. Do not alter these shims unless new parts are used, in which case the valve must be re-shimmed to the proper setting.



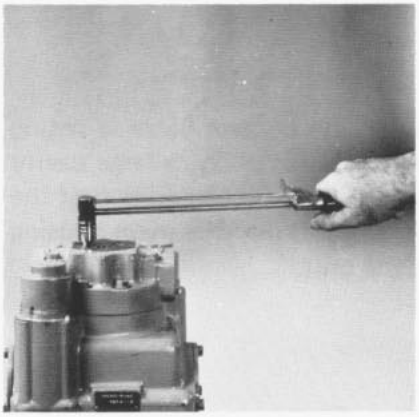
The removal of the charge check valves requires the use of a drag link socket.



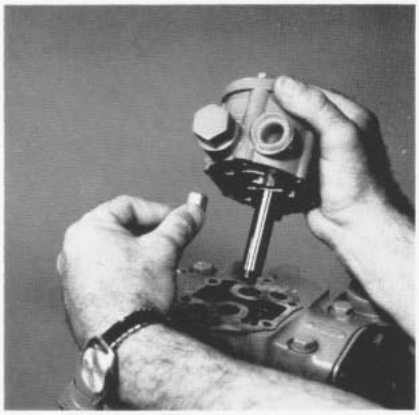
These check valves are cartridges and are interchangeable with each other. It is suggested that these check valves be replaced in pairs.



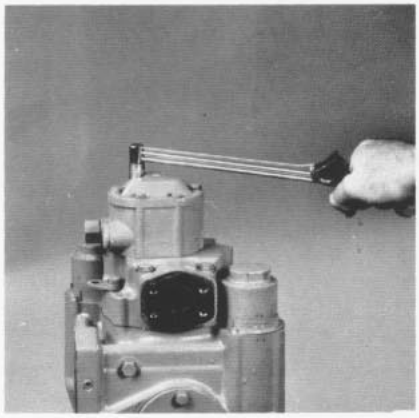
Use caution when installing these valves to prevent damage to the O-ring on the cartridge as it is inserted past the threads. Lubricate O-rings before installation.



After assembly be certain these valves are below the surface of the end cap. (Torque values are specified at the end of this manual).

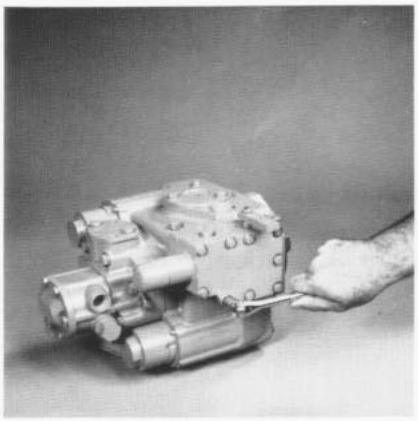


When replacing the charge pump, align the gasket so that the small relief valve port is open and not blocked by the gasket. Rotate the charge pump shaft so it aligns approximately with the slot in the end of the pump drive shaft. Hold the idler spacer in place and install the charge pump onto the end cap. Rotate the charge pump until the tang and slot engage and the pump is solidly on the end cap. As the charge pump is installed make sure the alignment roll pin is engaged in the charge pump and pump end cap.

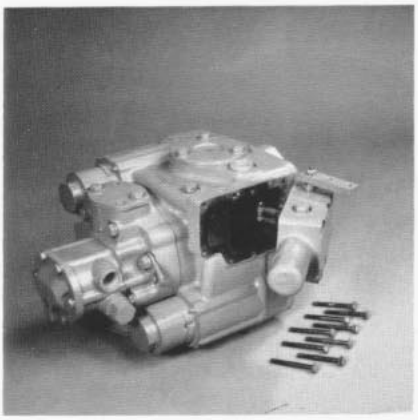


Install the four (4) hex. cap screws and tighten. Do not tighten the two screws on the top and bottom of the charge pump end cap.

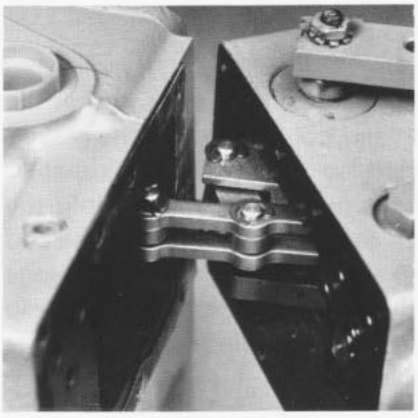
MINOR REPAIRS, VARIABLE DISPLACEMENT PUMP



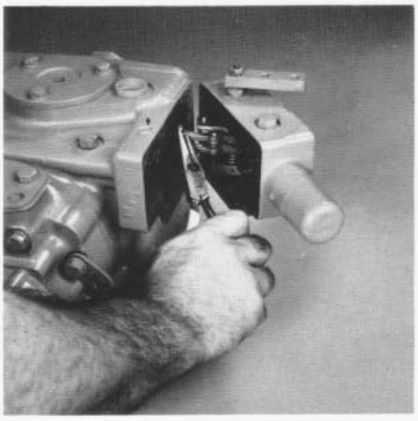
Remove the hex. cap screws and swing the control away from the pump housing. This area is sealed with both O-rings and a gasket.



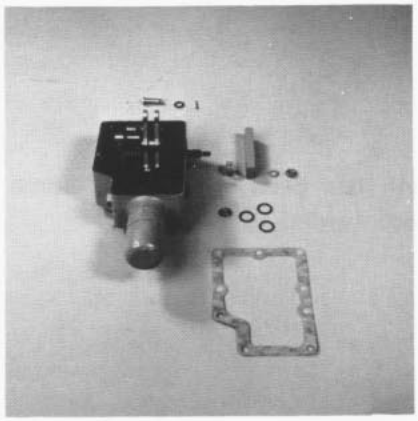
Caution must be exercised after the control valve is swung away from the pump housing since this opens a large cavity into the housing. Also during removal and installation of the control link pin, parts can be dropped into the main housing requiring total disassembly of the unit.



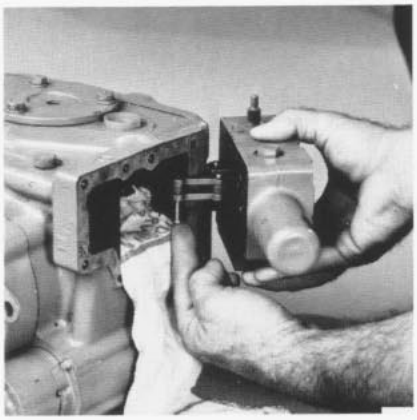
Swing the control away from the housing as far as it will go to expose the cotter pin.



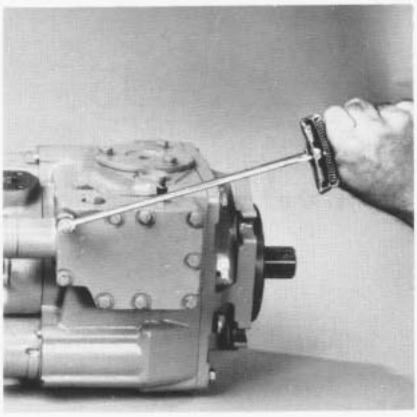
Remove the cotter pin, washer and connecting pin. It is suggested that a piece of wire be inserted through the eye of the cotter pin so the pin can easily be retrieved if it falls into the pump.



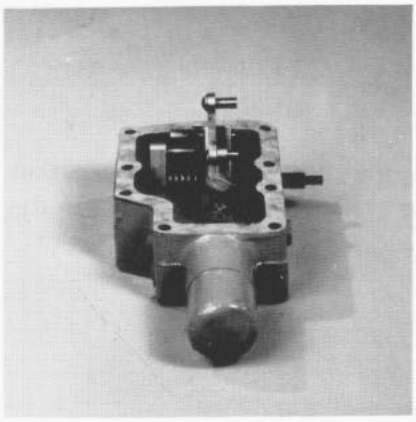
In preparation for reinstalling the control, place a new gasket on the housing, and place the orifice plate and O-rings in the control.



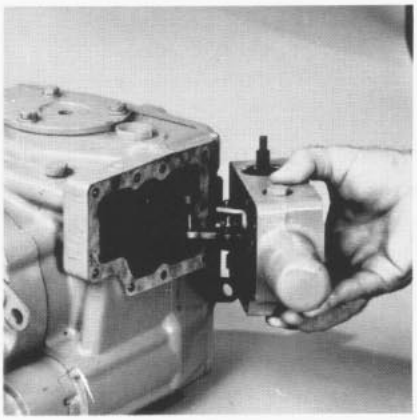
Install the connecting pin through the control linkage and the feedback link on the swashplate with the headed side toward the center of the pump. Use caution not to drop parts into the pump housing.



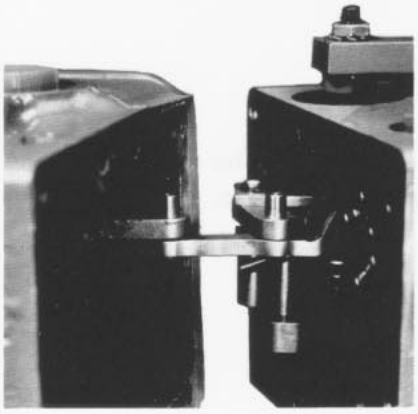
Swing the control into place against the housing, being certain the orifice and O-rings are in place, then install cap screws.



The displacement control link has been redesigned. Some units will use this new one piece welded design.



Engage the pin on the control link in the mating hole in the small link attached to the swashplate.



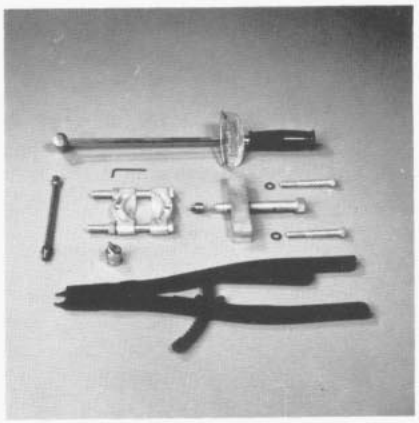
Slide the pin all the way into the swashplate link and then swing the control into place against the housing as previously described.

MAJOR REPAIRS, VARIABLE DISPLACEMENT PUMP

The procedures on the following pages are for complete disassembly and re-assembly of the unit. The equipment manufacturer should be consulted regarding any effect such repairs may have on warranty.

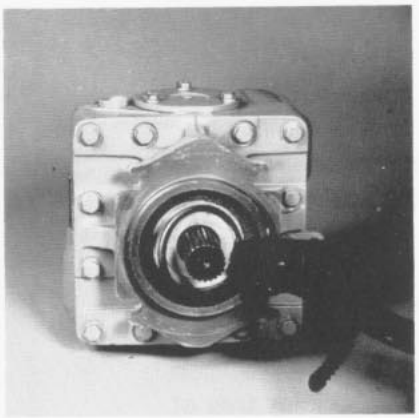
Cleanliness is the primary means of insuring satisfactory transmission life, either on new or repaired units. Cleaning parts by using a solvent wash and air drying is adequate, providing clean solvent is used. As with any precision equipment, the internal mechanism and related items must be kept free of chemical and particulate contaminants.

MAJOR REPAIRS, VARIABLE DISPLACEMENT PUMP



Special Tools
Certain tools are required that are not normally carried which are as follows:

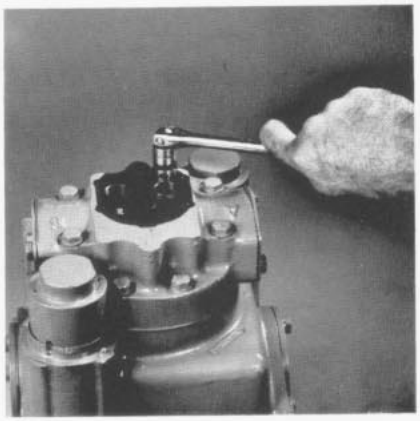
1. Waldes Truarc #7 Retaining Ring Pliers
2. Drag Link Socket
3. 12 Point, 3/16 Socket
4. Torque Wrench
5. Tapered Bearing Puller
   Ref. Snap on Part Numbers
   Puller Bar CG350
   20-23 Series: Separator CJ950
   24-27 Series: Separator CJ 951



Remove the shaft seal as outlined under Minor repair procedures. The shaft seal must be removed before the end cap screws are loosened to prevent the seal being damaged.

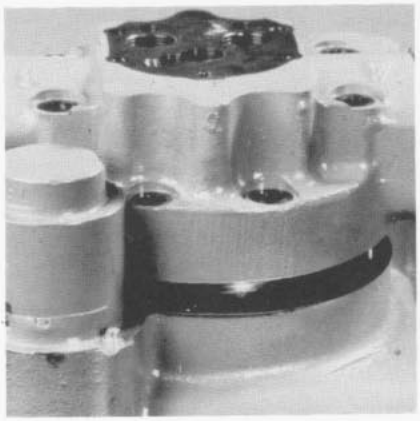
CAUTION

The end cap screws should not be loosened until the shaft seal has been removed.



Remove charge pump and control valve as outlined under Minor repair procedures.

Remove all but two (2) of the hex. cap screws holding the end cap to the housing. Make sure the two remaining screws are opposing each other.

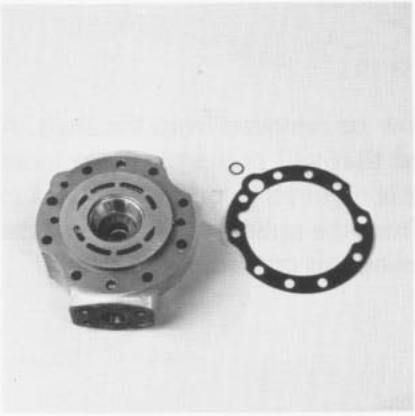


There is an internal spring loading on the end cap and as the last two (2) screws are loosened, it should begin to separate from the housing. Loosen these screws alternately until the end cap has fully separated from the housing, then remove the screws entirely.

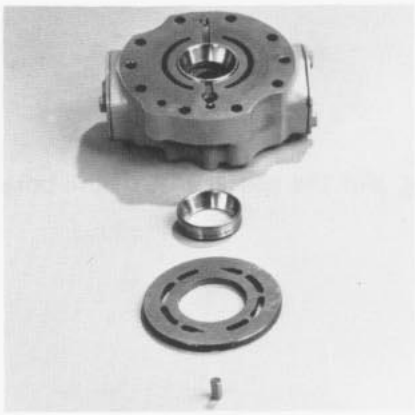
The end cap can now be lifted off the pump; however, be certain that the valve plate does not fall and become damaged. If the valve plate tends to lift off with the end cap, hold it in place on the end cap and remove both parts together. If the valve plate remains on the bearing plate, remove it at this time.

CAUTION

All surfaces exposed are critical and caution must be used to avoid damage.



Note that the end cap is sealed to the housing with both a gasket and an O-ring.

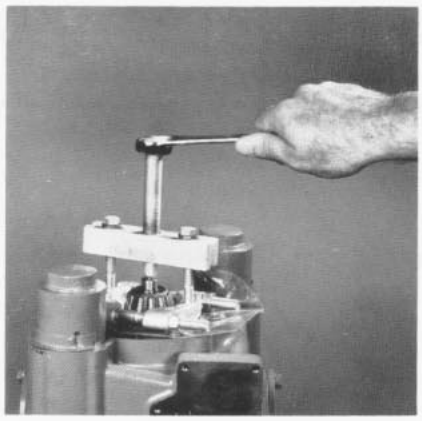


The end cap is actually an assembly consisting of a tapered bearing race which is a slip fit in the end cap and the valve plate locating pin. These parts should be removed from the end cap. There may or may not be a shim located under the bearing race which should be removed.

The pump valve plate has two (2) tapered slots, one (1) at the top and one (1) at the bottom of the plate. These slots are on opposite ports for different shaft rotations.

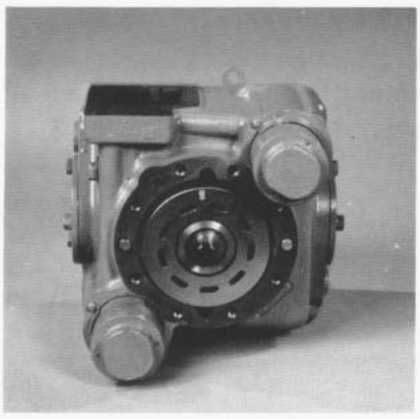
The valve plate on the left in the picture is for Left Hand (CCW) rotation. The valve plate on the right is for Right Hand (CW) rotation.

Remove the bronze bearing plate and the pilot ring from the cylinder block. If the pilot ring remains with the bearing plate, remove it at this time.

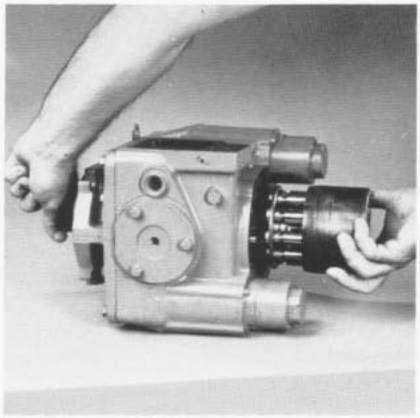


The tapered bearing must now be removed from the shaft. A bearing puller should be used that will pull against the inner race of the bearing. A spacer is required to protect the slot in the end of the pump shaft from the puller screw. Protect the face of the cylinder block during this operation.

After removal of the bearing, slip the spacer out of the bore in the cylinder block.

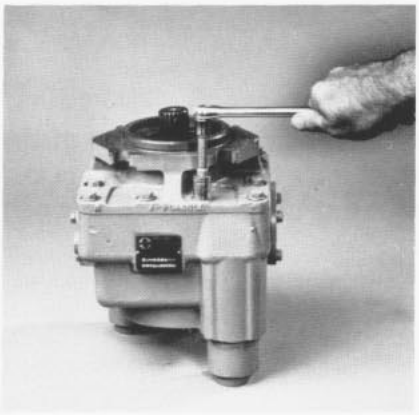


Place the pump horizontally in preparation for removal of the cylinder block assembly

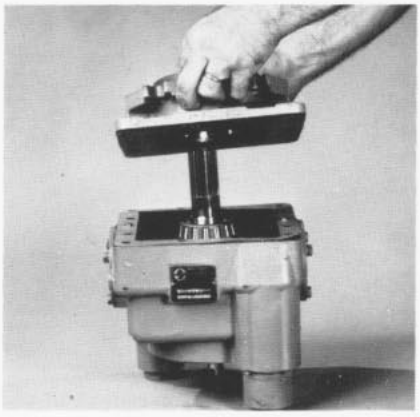


Slide the cylinder block assembly off the shaft while holding the external end of the shaft.

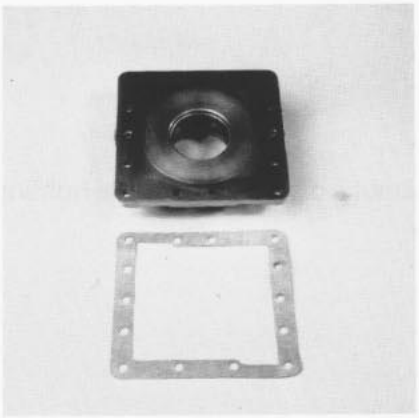
If the cylinder block assembly does not remain together during removal, it can be easily reassembled at a later time.



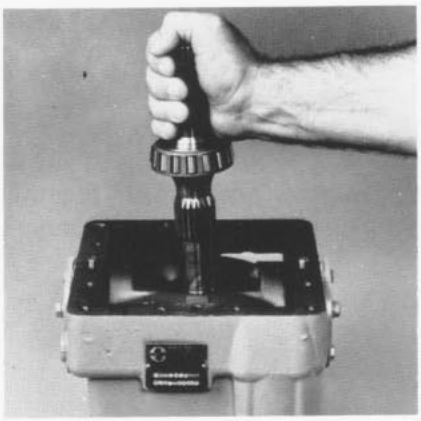
Set the pump on the servo housings and remove the front cover screws.



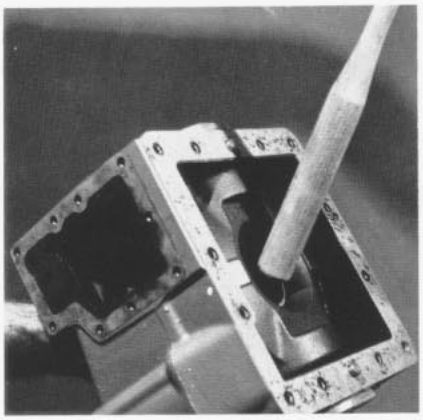
Lift off the front cover and gasket.



The race for the tapered shaft bearing is a press fit in the front cover.

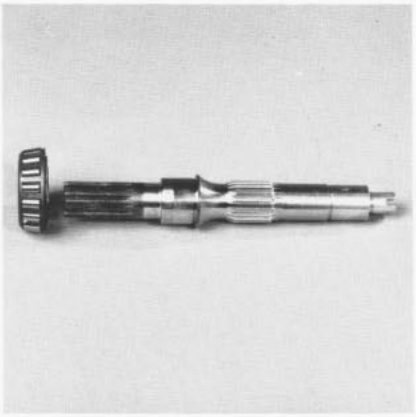


Lift the shaft and bearing out of the center hole of the swashplate.

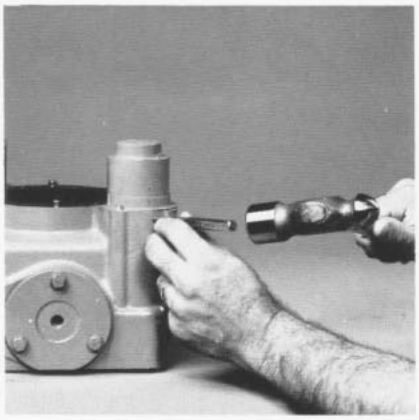


Remove thrust plate from its counterbore in the face of the swashplate. Reach through the center hole in swashplate and push against exposed edge of thrust plate. Do not allow part to fall and become damaged.

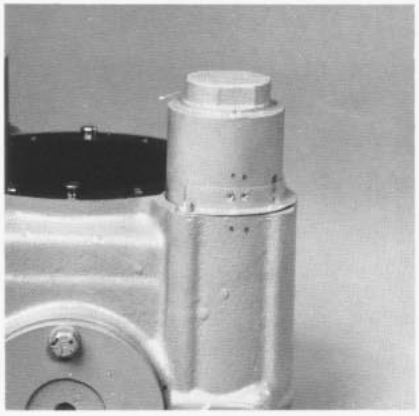
Thrust plate.



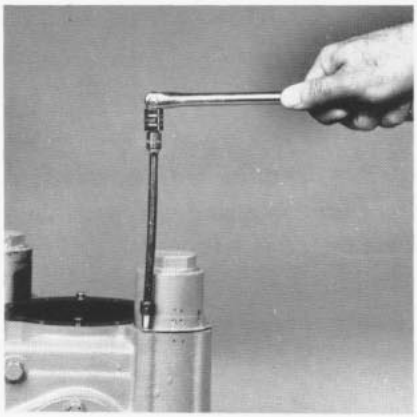
The tapered bearing can be pressed off the shaft if required. Be careful not to damage the seal diameter of the shaft while removing the bearing.



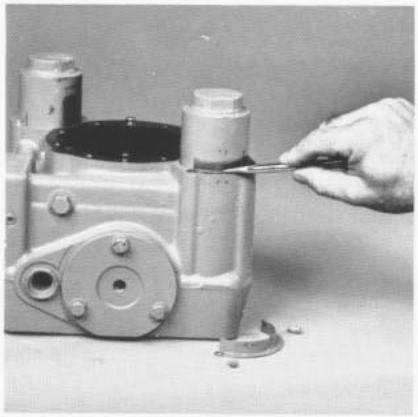
From this point on it is necessary to mark all parts so that neutral (zero swashplate angle) will be retained when the parts are reassembled. The swashplate is held in neutral by springs inside the servo housings. These springs are adjusted by turning the servo housings.



First, mark the servo housing for location to the pump housing. This set of marks should line up to show the rotational position of the servo housing to the pump housing.

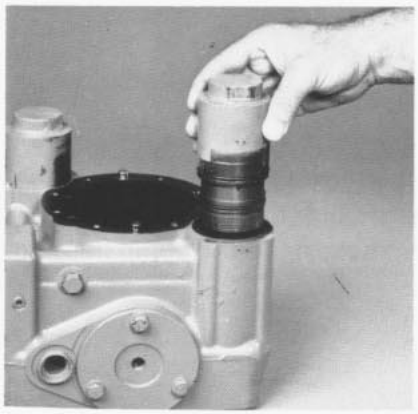


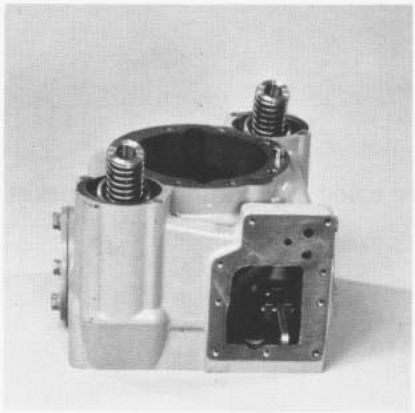
Remove the locking retainers using a 12 point, 3/16 socket for the cap screws.



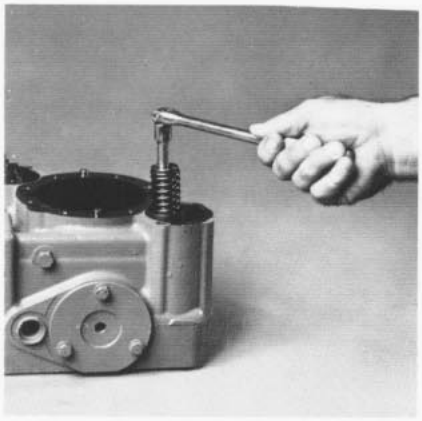
After removing the retainers, scribe a line to mark the height of the servo housing in relation to the pump housing.

Unscrew the servo housings using channellock pliers to grip the flats on top of the housings.

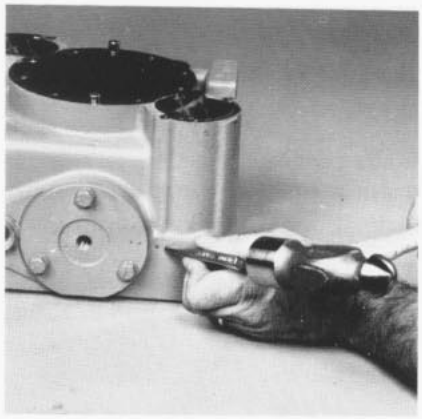




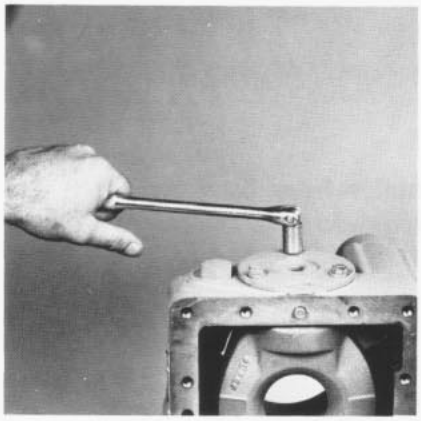
At this time the servo springs should be removed if replacement is necessary as the pump housing will provide a means of leverage when breaking the screws loose.



Do not reuse the screw holding the spring to the servo piston as it has a nylon locking insert that is not effective when reused. These springs should not be removed unless necessary.

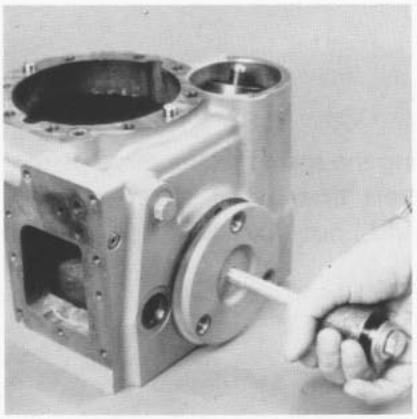


The trunnions should be marked to insure reassembly to the correct side of the housing.

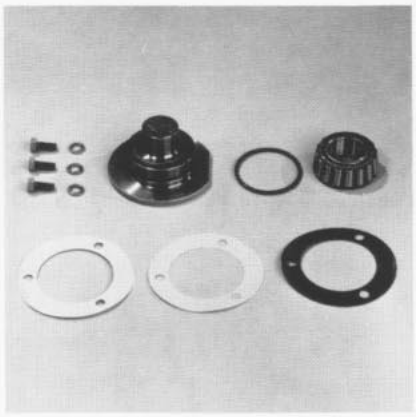


Remove the hex. head screws from each trunnion.

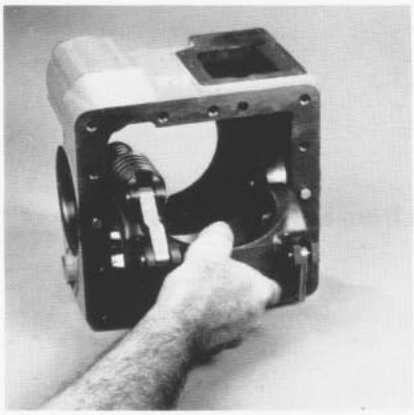
MAJOR REPAIRS, VARIABLE DISPLACEMENT PUMP



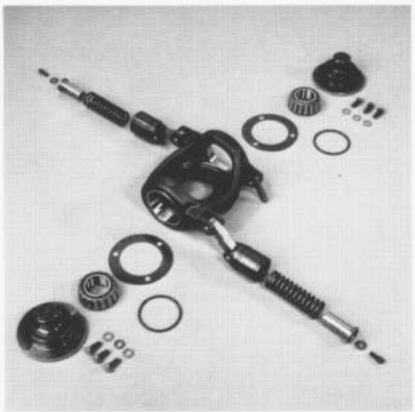
Friction caused by the O-ring on the trunnion may make it necessary to use a slide hammer to pull the trunnion assembly.



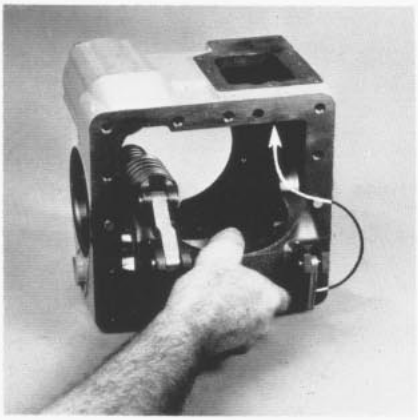
Be certain to keep the plastic shims with the proper trunnion to insure satisfactory bearing adjustment after reassembly.



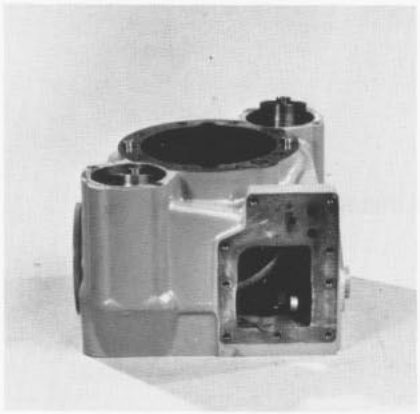
After both trunnion assemblies have been removed, the swashplate assembly can be removed from the pump housing.



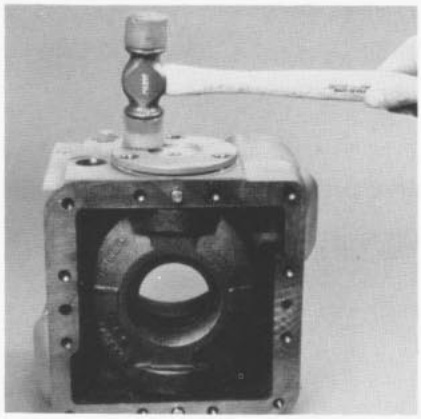
Layout of parts showing swashplate, servo pistons and springs, feedback link and trunnions.



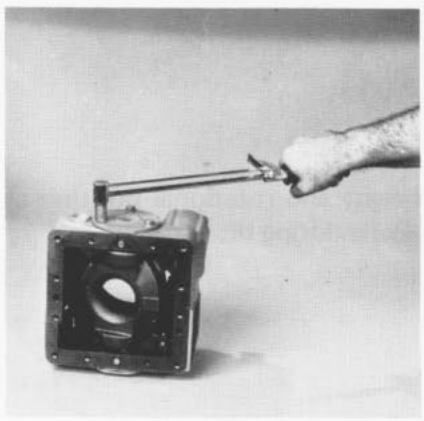
When installing the swashplate assembly into the housing, the feedback link must be laid back along the top of the swashplate so it can be reached through the opening for the control valve.



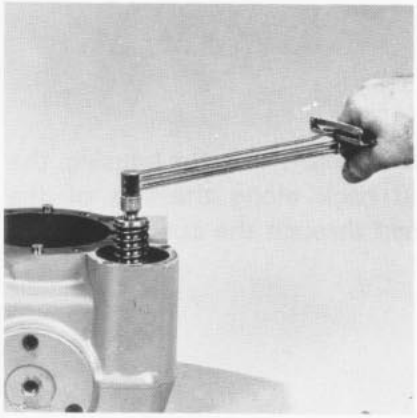
After installing swashplate be certain feedback link is accessible.



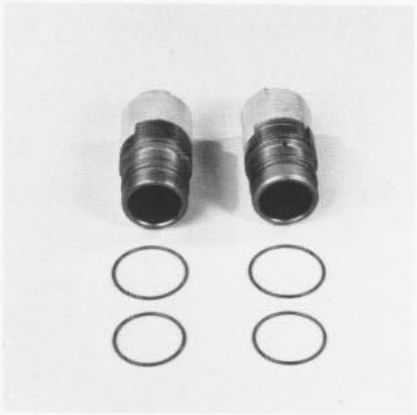
Install the trunnions, checking for proper orientation with the housing and tighten the cap screws. The swashplate should have no sideplay yet rotate freely. If necessary, alter the plastic shims to obtain the proper adjustment.



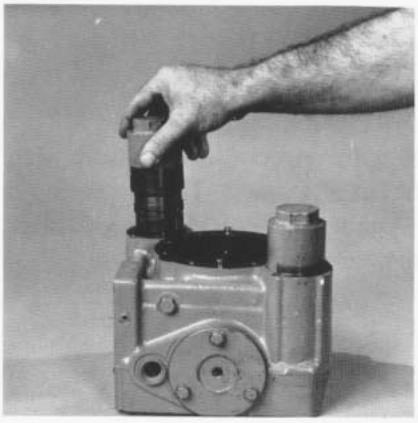
Install and tighten the trunnion cap screws.



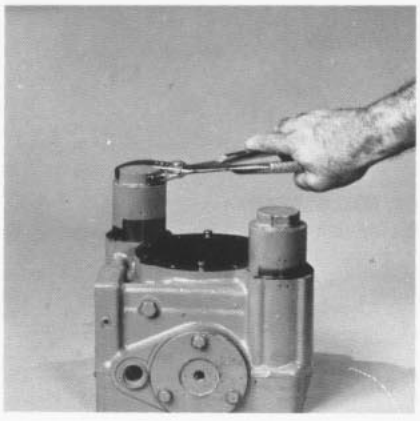
Install the servo springs, if these parts were removed, using new screws.



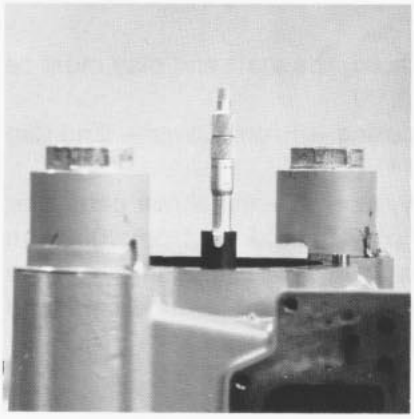
The servo housings should be installed next.



Slide the housing over the servo piston and thread it into the pump housing.

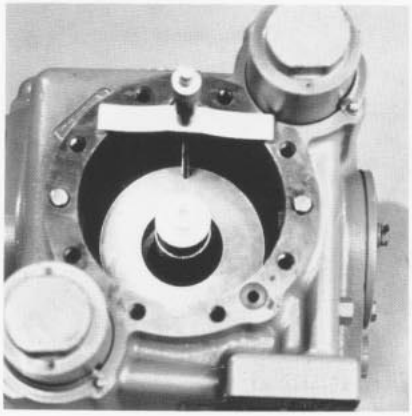


Adjust the housing to the height and rotational position as determined by the markings made during disassembly.



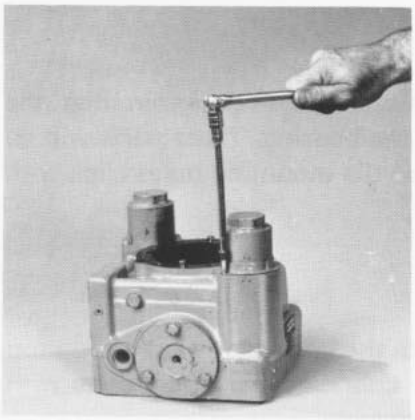
The neutral (zero angle) position of the swashplate must now be checked using a depth micrometer.

The thrust plate must be installed on the swashplate for this measurement. Measure the distance from the end cap mounting face of the pump housing to the face of the thrust plate 90° to the trunnions, at the outer edge of the thrust plate. Take the same measurement at a point 180° (opposite edge of the thrust plate) from the first. These measurements must not vary more than .001" from each other.

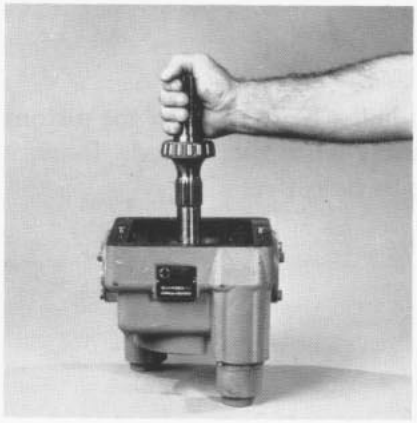


If adjustment is required follow these steps.

a. Back out both servo housings until the spring load is released on the swashplate (check by rocking swashplate).
b. Thread in each housing until spring load just starts to be felt on the swashplate.
c. Check measurements as described previously.
d. Thread each housing farther in until the measurements are within .001" of each other.

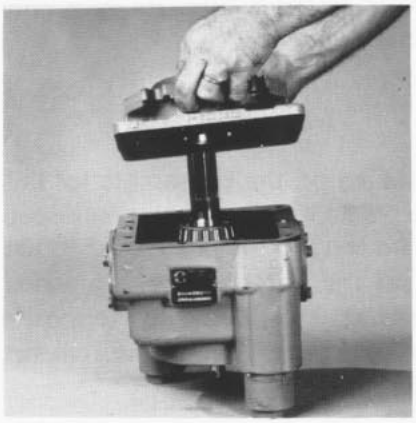


After adjustment has been completed, the retainers can be installed and peened into the locking slot on the housing.



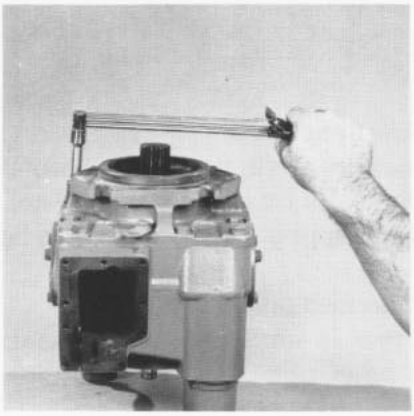
Remove the thrust plate and set the pump on the servo housings.

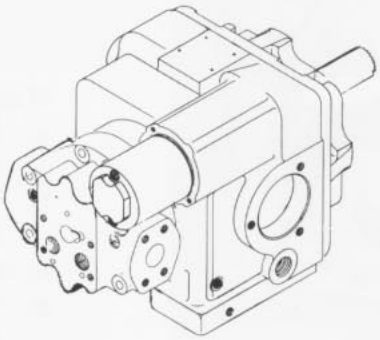
Insert the shaft and bearing assembly through the cast hole in the swashplate, allowing the bearing to rest on the cast leveled edge.

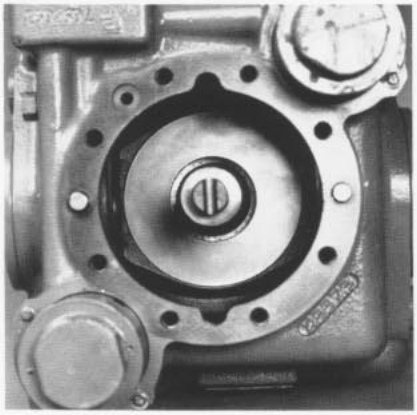


If any of those parts are replaced, the shaft end play must be checked.
Drive Shaft – Bearings – Housing – Front Cover – End Cap

To check the shaft end play, assemble the above parts plus the gaskets. The shaft end play should be from .006" to .016". If adjustment is necessary, a shim can be placed under the bearing race in the end cap. Disassemble these parts and resume reassembly procedure.



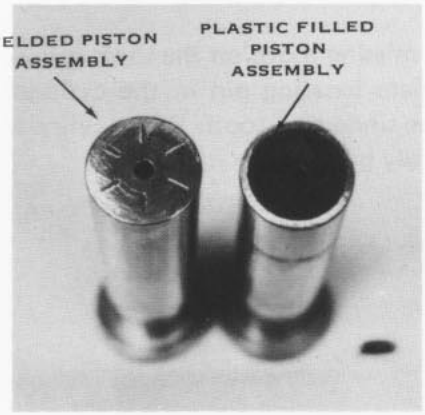




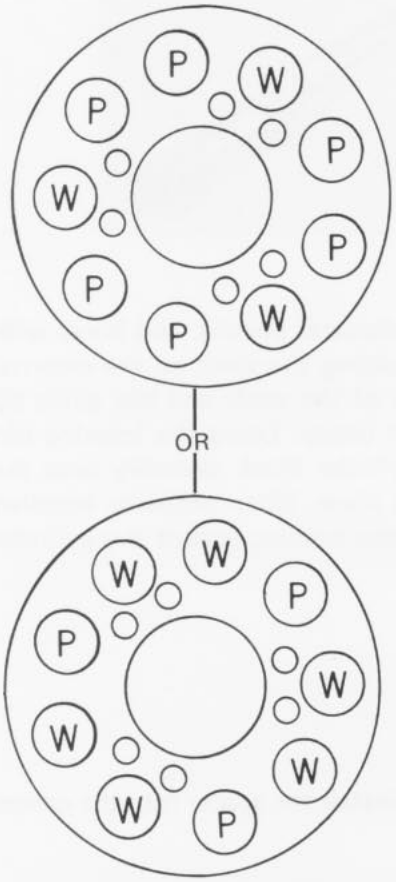
Install the front cover and gasket, being certain that the locating pins are in place in the housing. These parts will go on only one way and have all the mounting holes align with the housing.

Turn the unit on its side with the large control cavity on top and install the thrust plate. Lubricate the thrust plate with clean hydraulic oil prior to assembly.

Prior to reassembly of the cylinder block, inspect the pistons for contamination or excessively worn slipper pads. Replace any pistons that are found to be defective.



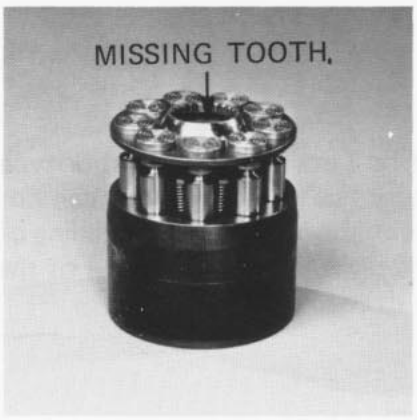
Two types of pistons have been used in 20 Series pumps and motors. Prior to any piston replacement it is necessary to check the construction of all pistons in the cylinder to determine if they are the welded steel or plastic filled type. Replacement of plastic filled pistons with welded pistons may be accomplished by following the procedure outlined below. Plastic filled pistons may not be used to replace welded piston assemblies.



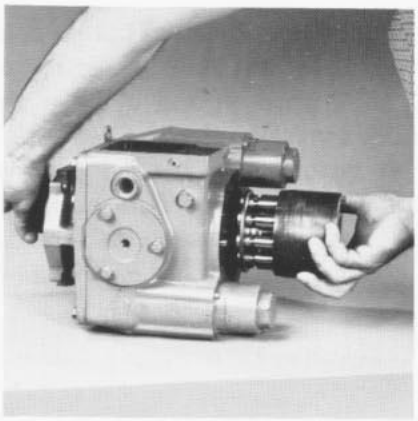
When replacing plastic filled pistons with welded pistons during overhaul or repair of a unit, it is mandatory that the welded pistons be incorporated symmetrically in multiples of three (either three, six, or all nine). See illustrations.

P = Plastic Filled
W = Welded

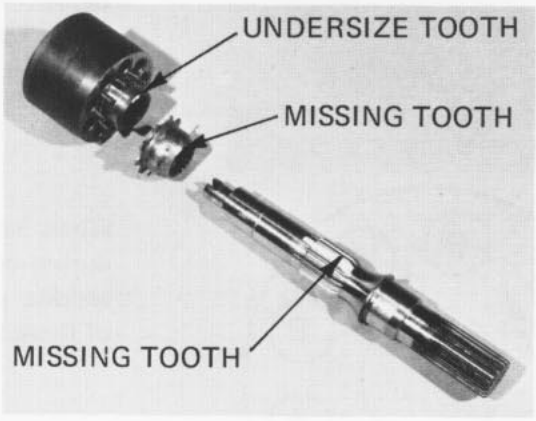
Do not replace welded piston assemblies with plastic filled piston assemblies; however, any plastic filled piston assemblies that you have in inventory can be used to replace existing plastic filled pistons that you may encounter.

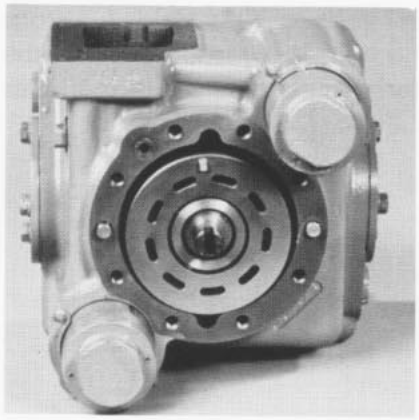


To install the cylinder block assembly, it is necessary to check the alignment of certain parts. There is no special relationship of pistons to bores, springs, etc.. However, the alignment of the ball guide and cylinder block splines is critical. The undersized tooth in the spline of the cylinder block must line up with the missing tooth in the ball guide spline.



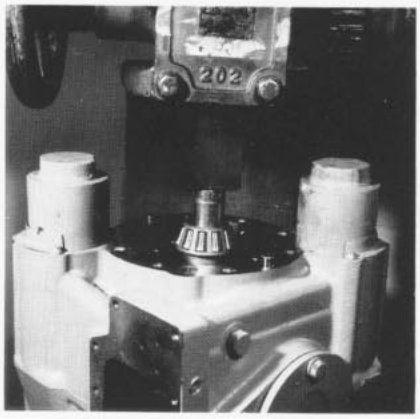
These in turn line up with a missing tooth on the shaft spline. The hole for the bearing plate locating pin in the cylinder block face is in line with the undersize tooth in the cylinder block and provides an assembly guide.



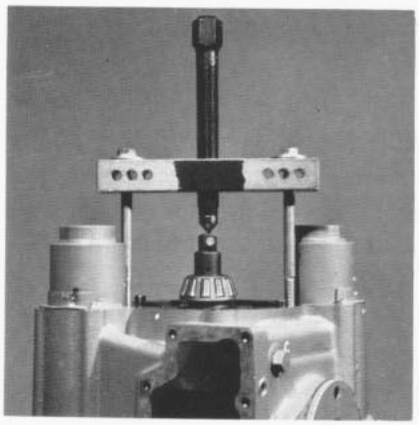


Lubricate the thrust plate, slippers, pistons, and bores with clean hydraulic oil. While holding the shaft on the external end, align the missing tooth of the shaft and ball guide by sighting through the control cavity. Using the locating pin hole as a guide, slide the cylinder block assembly onto the shaft and against the thrust plate. When properly installed a spring load can be felt when pushing against the cylinder block.

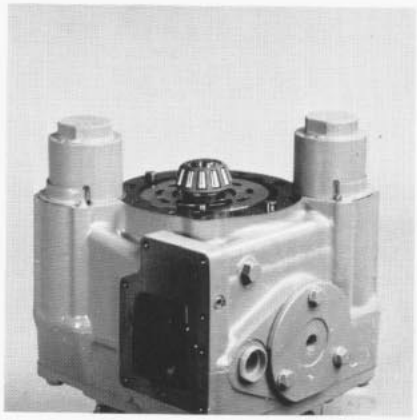
Set the pump vertically and install the spacer into the center bore of the cylinder block.



The tapered bearing should be installed with an arbor type press for the most satisfactory results. This bearing can not be driven onto the shaft due to the internal spring loading of the cylinder block and shaft. Press on the inner race of the bearing and use care not to damage roller cage.



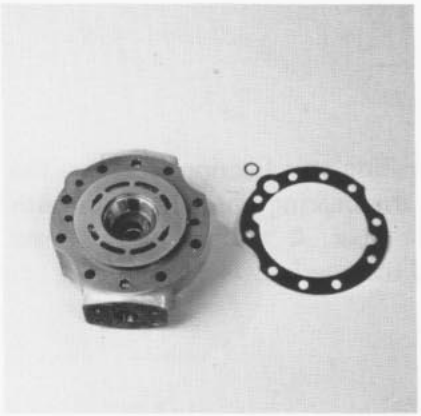
An alternate method of installing this bearing is to use the bearing puller bar and press the bearing onto the shaft with the center screw of the puller bar. A spacer must be used between the center screw and the bearing.



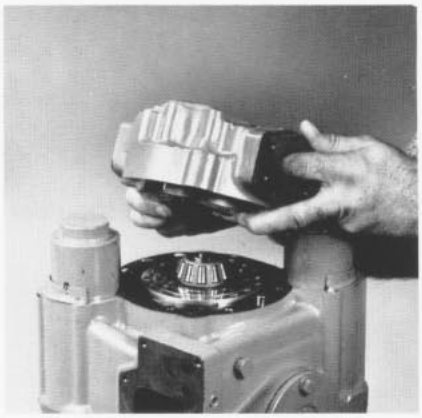
The bearing must be pressed on until it rests on the shoulder of the shaft to insure adequate bearing clearance.

Install the pilot ring in the bearing plate and the locating pin in the cylinder block. Install the bearing plate so that the milled slot locates over the pin and the pilot ring fits in the center bore of the cylinder block. After installation, lubricate the exposed surfaces with clean hydraulic oil.

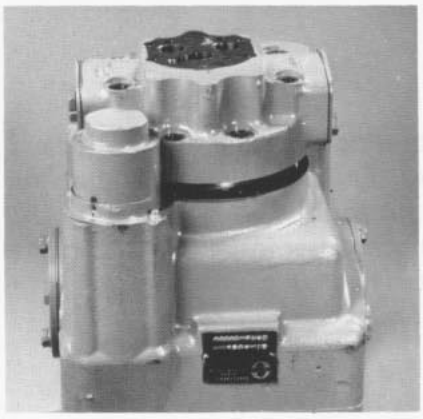
Assemble the bearing race, shim (if required) and locating pin in the end cap. Check the valve plate to be certain it is a pump valve plate (has 2 tapered slots) and that it is for correct rotation (slots point away from direction of rotation).



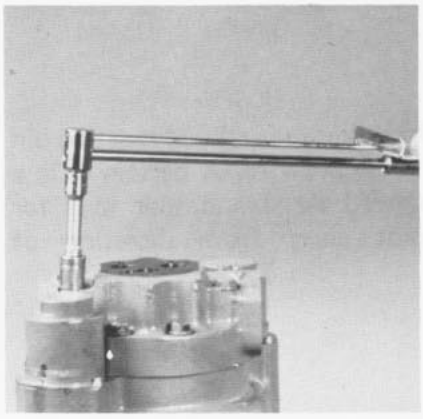
Lubricate the end cap face with clean hydraulic oil. Install the valve plate so that the slot locates over the pin and the center bore fits over the protruding bearing race. Place the end cap gasket on the housing, being certain the locating pins are in place, then install the O-ring in the counter bore in the housing.



Install the end cap and valve plate, holding the valve plate so it does not drop off during assembly.

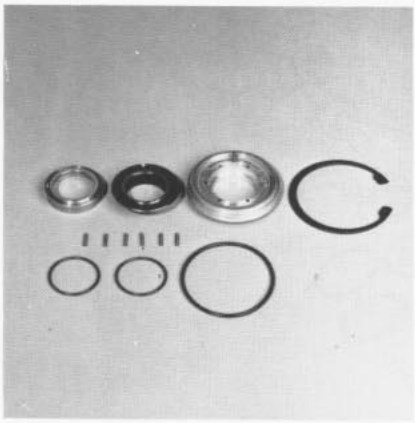


The end cap will align with the housing mounting holes in one position only.



Install two (2) screws and tighten alternately until the internal spring has compressed far enough for the end cap to rest on the housing. Install the remaining cap screws.

MAJOR REPAIRS, VARIABLE DISPLACEMENT PUMP

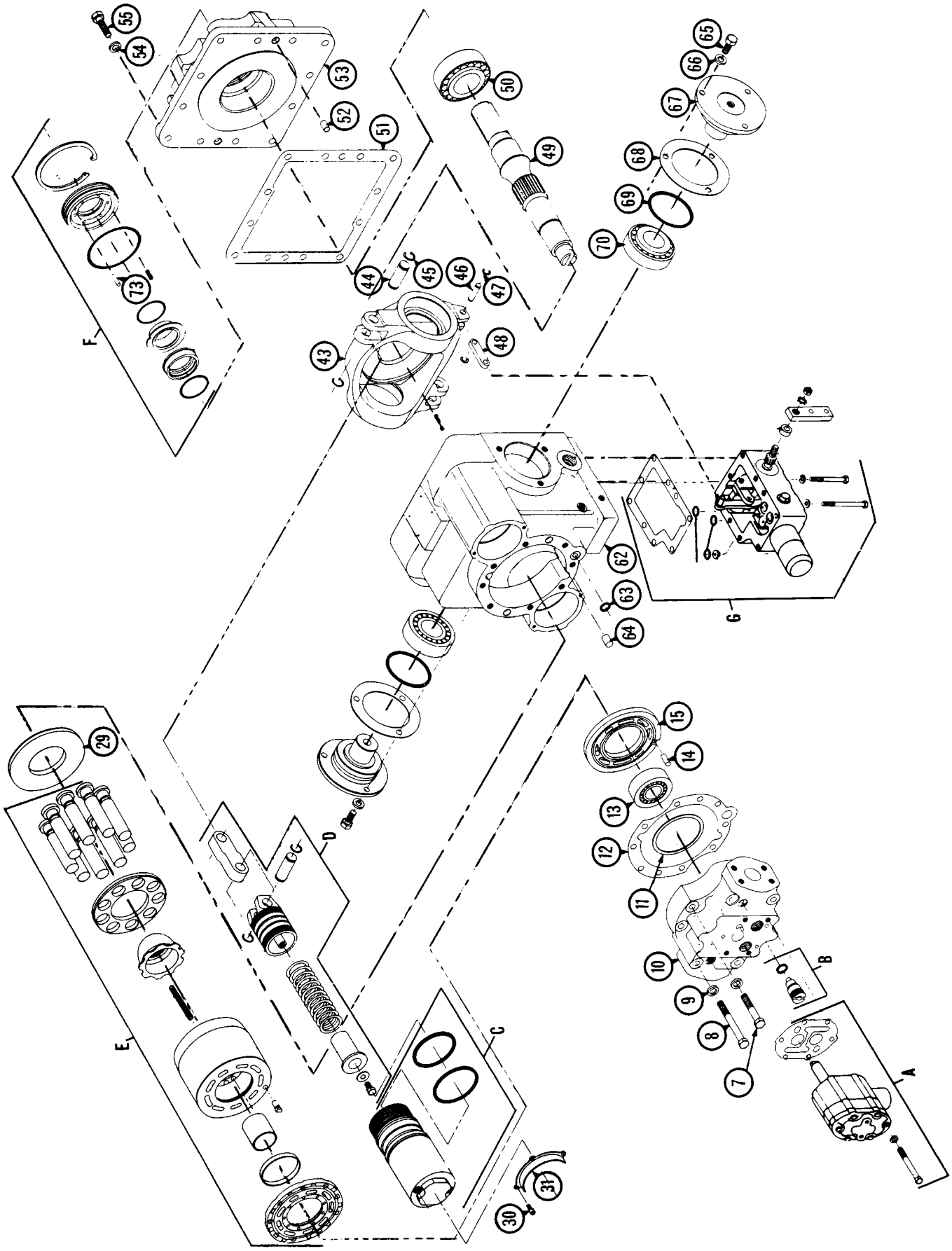


Install the shaft seal as the last step in reassembly of the basic pump.

Install the remaining major assemblies (Control Valve, Check Valves and Charge Pump) as outlined in the Minor repair procedures.

> CAUTION
>
> Fill the pump housing with clean hydraulic oil.

GENERAL PARTS IDENTIFICATION, VARIABLE DISPLACEMENT PUMP



GENERAL PARTS IDENTIFICATION, VARIABLE DISPLACEMENT PUMP

GENERAL PARTS LIST

NO/LTR	DESCRIPTION	QTY.
A	CHARGE PUMP KIT	1
B	CHARGE CHECK VALVE KIT	2
C	SERVO HOUSING KIT	2
D	SERVO PISTON KIT	2
E	CYLINDER BLOCK KIT	1
F	SHAFT SEAL KIT	1
G	DISPLACEMENT CONTROL KIT	1
7	SCREW–HEX.HD.CAP	3
8	SCREW–HEX.HD.CAP	5
9	WASHER–PLAIN	8
10	END CAP	1
11	SHIM–BEARING	AS REQ'D
12	GASKET–END CAP	1
13	BEARING KIT–REAR	1
14	PIN–LOCATING	2
15	VALVE PLATE	1
29	THRUST PLATE	1
30	SCREW	4
31	RETAINER	2
43	SWASHPLATE	1
44	PIN	2
45	RING–RETAINING	4
46	PIN	1
47	RING–RETAINING	2
48	LINK–FEEDBACK	1
49	SHAFT	1
50	BEARING KIT–FRONT	1
51	GASKET–FRONT COVER	1
52	PIN–LOCATING	2
53	FRONT COVER	1
54	WASHER–PLAIN	12
55	SCREW–HEX.HD.CAP	12
65	SCREW–HEX.HD.CAP	6
66	WASHER–PLAIN	6
67	TRUNNION	2
68	SHIMS–TRUNNION	AS REQ'D
69	O-RING	2
70	BEARING KIT–TRUNNION	2

This list is for identification of parts only. Specific model and part numbers are necessary to order replacement parts. For part numbers consult the Parts List for the specific model number.

INSTALLATION TORQUE VALUES

INSTALLATION TORQUE VALUES (FT.LBS.) BY SERIES

MODEL	20	21	22	23	24	25	26	27
VALVE MANIFOLD	16-21	16-21	16-21	16-21	16-21	16-21	16-21	16-21
END CAP	27-37	27-37	27-37	45-54	67-82	134-165	240-290	240-290
CHARGE PUMP	10-11	10-11	10-11	10-11	27-37	27-37	27-37	27-37
DISP. CONTROL	10-11	10-11	10-11	10-11	10-11	10-11	10-11	10-11
CHECK VALVES	30-40	30-40	30-40	30-40	80-90	125*-135	125-135	125-135
FRONT COVER	27-37	30-40	30-40	48-63	72-87	67-82	67-82	67-82
SERVO SPRING	10-11	10-11	10-11	10-11	16-21	16-21	27-37	27-37
TRUNNION	16-21	16-21	27-37	45-54	67-82	134-165	134-165	134-165
HIGH PRESSURE RELIEF VALVE	20-30	20-30	20-30	20-30	20-30	20-30	20-30	20-30

*CERTAIN 25 SERIES PUMPS (DASH NO. 9 OR BELOW) USE SMALLER CHECK VALVES WHICH ARE TORQUED TO 80-90 FT. LBS.