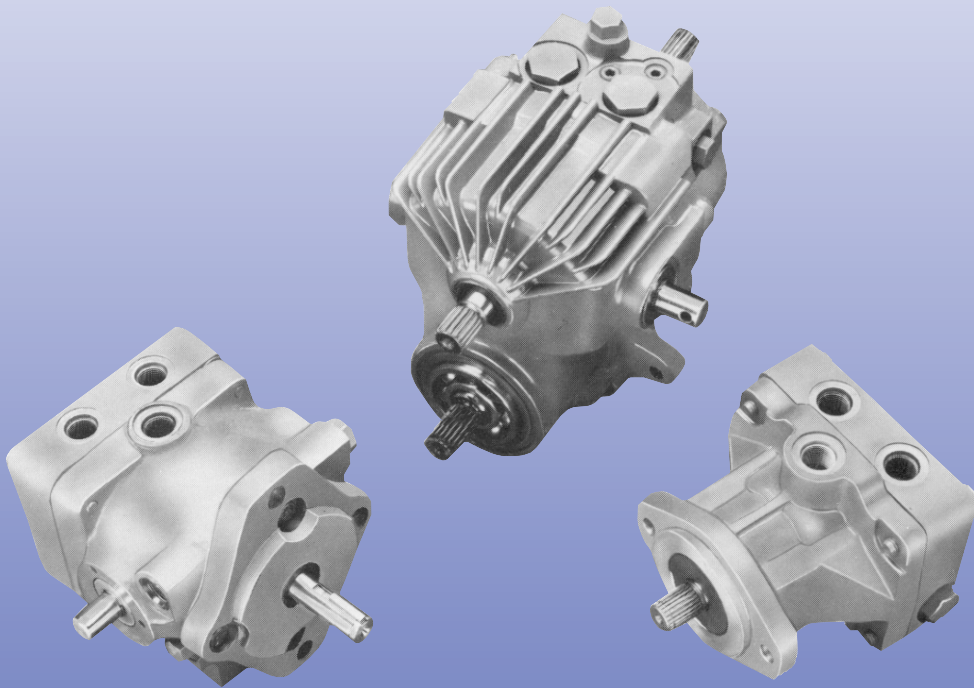




15 Series



Axial Piston

Pumps, Motors and

Transmissions

Repair Manual

INTRODUCTION

The purpose of this manual is to provide the instructions necessary for the Major Repair of the Sauer-Sundstrand 15 Series family of hydrostatic transmissions. These instructions cover the Inline and U type transmissions in addition to the fixed displacement motors, variable displacement pumps, and tandem pumps.

Major repairs are those requiring the removal of the end cap or center section and include complete disassembly of the unit. These repair procedures, when used in conjunction with the publication listed below, provide complete service information for these transmissions. This manual does not cover Minor repairs which are included in the following publication.

BLN-9646; Sauer-Sundstrand Service Manual,
15 Series Hydrostatic Transmissions

Sauer-Sundstrand provides a complete repair service for its products. Contact any Sauer-Sundstrand Authorized Service Center for details.

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 must be kept free of chemical and particulate contamination.

Safety Precautions

- The loss of hydrostatic drive line power in any mode of operation may cause a loss of hydrostatic braking capacity. A braking system, redundant to the hydrostatic transmission must, therefore, be provided which is adequate to stop and/or hold the system should the condition develop.
- Certain service procedures may require the vehicle/machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing them in order to prevent injury to the technician and bystanders.
- Use caution when dealing with hydraulic fluid under pressure. Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury. This fluid may also be hot enough to burn. Serious infection or reactions can develop if proper medical treatment is not administered immediately.
- Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present.

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CONTENTS SUBJECT TO CHANGE
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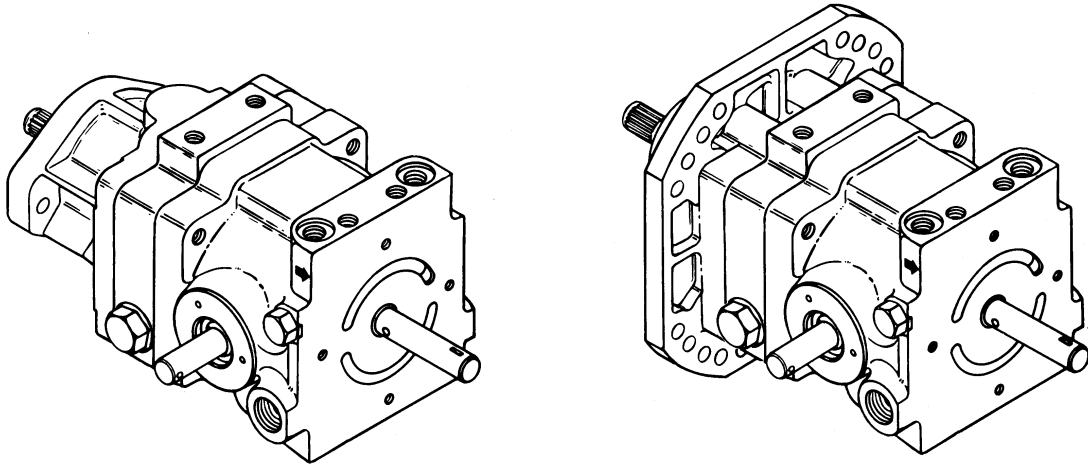
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MAJOR REPAIRS, INLINE TRANSMISSION

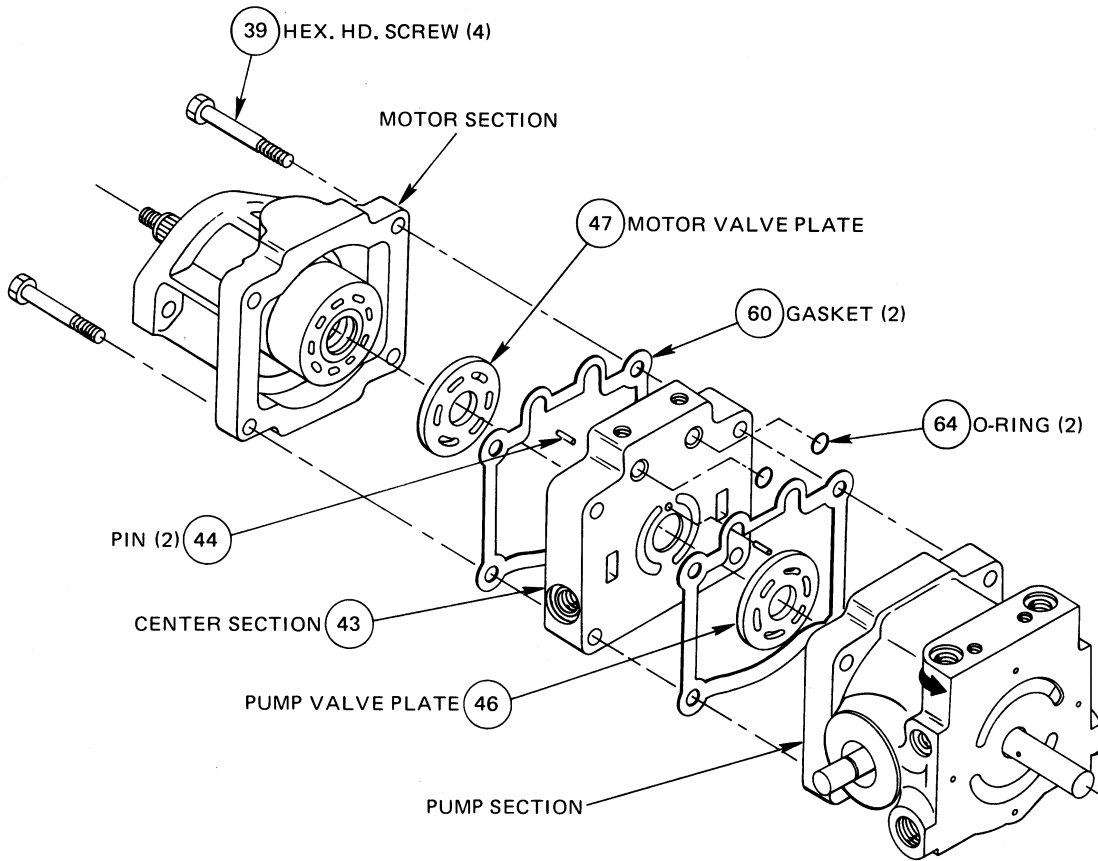
The following procedures are for the Major repair of the inline transmission. These instructions begin with the separation of the three (3) main sections as the procedures for Minor Repairs (Charge Pump Seals, etc.) are not covered in this publication. (ref BLN-9646).



INLINE

There are two (2) mounting configurations for the inline transmission. The SAE, Type A, 2 Bolt is shown on the left and the 4 Bolt type is on the right. Other than appearance, the units are the same. The 2 Bolt type is illustrated in these procedures.

REPAIR PROCEDURE, 15 SERIES, INLINE



Separate into three (3) main sections

It is recommended that the Charge Pump be removed prior to major disassembly (ref Bulletin 9646). When the four (4) hex head screws (39) are loosened, the internal spring loading will cause the unit to separate slightly. Loosen these screws evenly to prevent distortion of parts and do not allow internal parts to fall when separating unit. If separation does not occur as screws are loosened, tap housings with soft hammer until the sections separate.

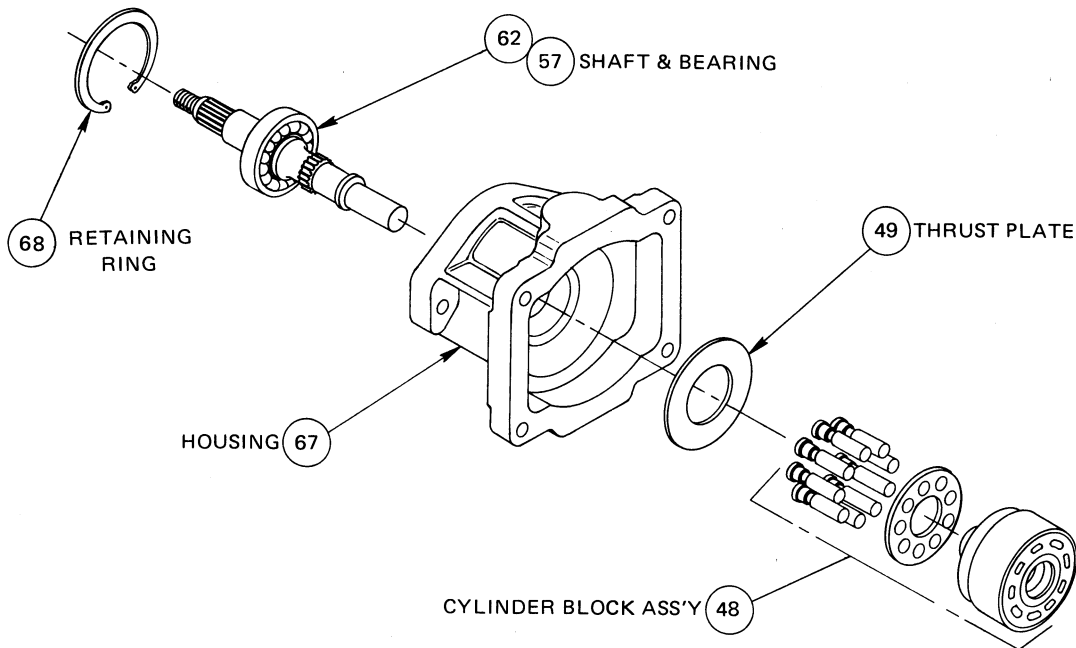
Motor Section

Pull the motor section shaft away from unit. Valve plate (47) tends to remain on center

section, remove it and do not allow it to fall when separating this section. Keep the motor valve plate (47) separate from the pump valve plate (48) as they are not interchangeable. Remove the gasket (60).

Note the orientation of the motor housing (67) to the center section (43). To insure proper assembly scribe a line across the motor housing and center section for an assembly guide.

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

REPAIR PROCEDURE, 15 SERIES, INLINE

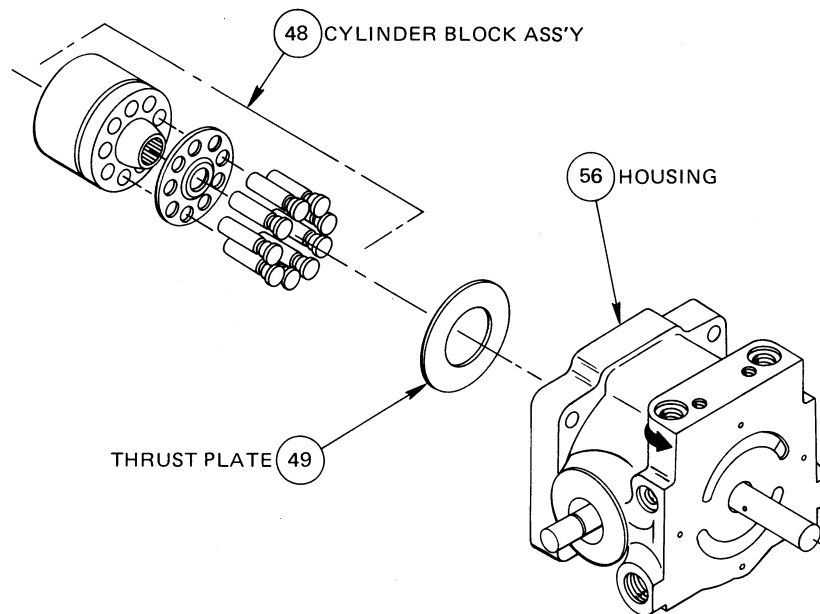
Lift out the cylinder block assembly (48). This is the same for both pump and motor section. The pistons may come out of cylinder block bores. There is no special orientation of piston to bore that needs to be maintained.

Do not attempt to disassemble the spring and other parts from the center bore of the cylinder block. The entire cylinder block assembly (48) should be replaced if any of its components are damaged.

Visually inspect wear surfaces of valve plate, cylinder block and slippers for damage. Check to be sure pistons are free in bores.

Remove thrust plate (49) from counter bore in motor housing (67). Visually inspect both sides for damage and flatness.

The motor shaft (62) and bearing (57) can be pressed out of the motor housing. In some units a retaining ring (68) must be removed prior to removal of shaft and bearing.

REPAIR PROCEDURE, 15 SERIES, INLINE**Pump Section**

Pull pump section away from center section (43). Valve plate (46) usually stays on center section. Remove the valve plate but do not allow it to fall when separating this section. Keep the pump valve plate (46) separate from the motor valve plate (47) as they are not interchangeable.

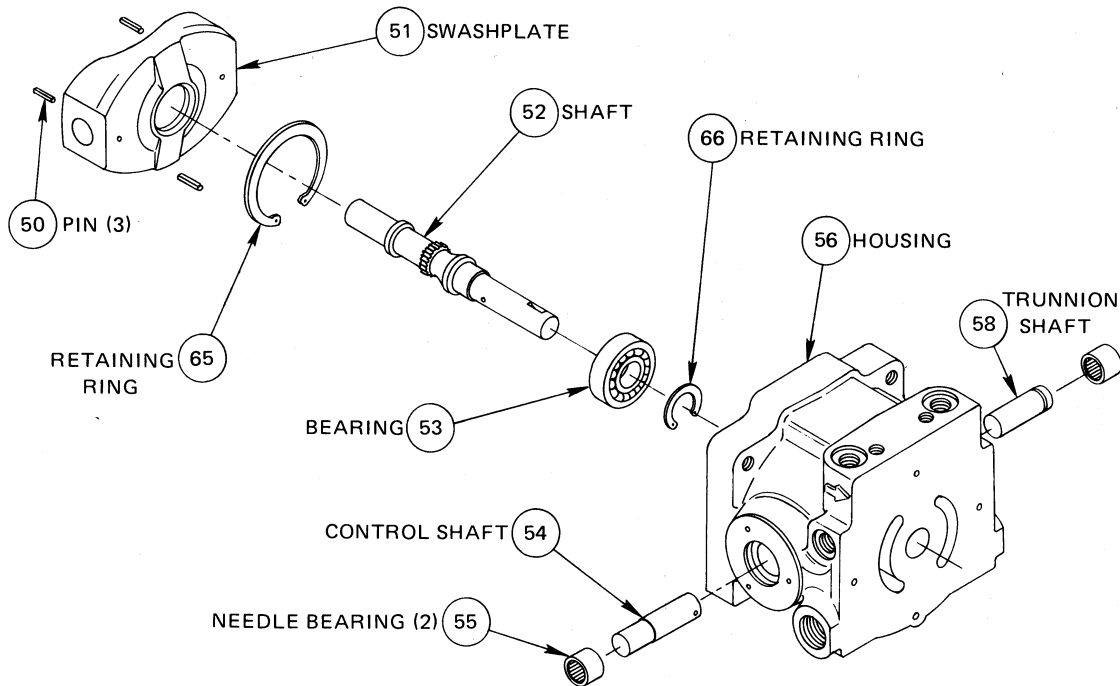
Remove gasket (60)

Lift out the cylinder block assembly (48). This is the same for pump and motor sections. The pistons may come out of the cylinder block. There is no special orientation of piston to bore that needs to be maintained. Do not attempt to disassemble the spring and other parts from the center bore of the cylinder block. The entire cylinder block assembly (48) should be replaced if any of its components are damaged.

Visually inspect wear surfaces of valve plate, cylinder block and slippers for damage. Check to be sure pistons are free in bores.

Remove thrust plate (49) from counterbore in face of swashplate (51). Visually inspect both sides for damage and flatness.

REPAIR PROCEDURE, 15 SERIES, INLINE



Place the pump housing (56) with the large cavity up. Use care not to mar the port face surface.

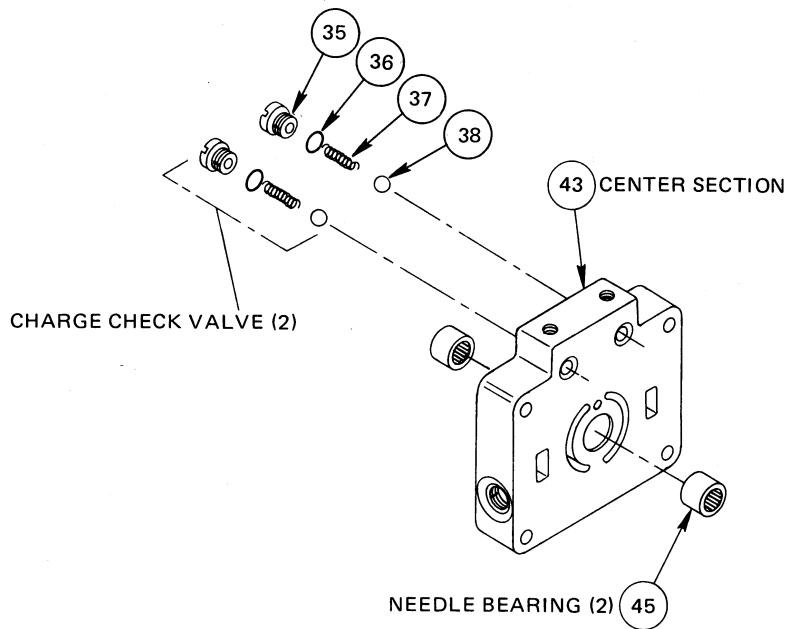
Using a 3/16 diameter drift punch, drive spring pins (50) out of trunnion and control shafts (54 & 58). The pump housing is provided with a cast recess so that the pins can be driven free of trunnion and control shafts (54 & 58).

Drive control shaft (54) out of swashplate bore toward outside of housing. Once clear of swashplate bore, the shaft can be removed easily. Repeat to remove trunnion shaft (58). The swashplate (51) is then removed from the pump housing (56).

Remove retaining ring (65) from housing then press out shaft and bearing assembly (52, 53 & 66). The bearing (53) can be removed from shaft (52), if necessary, after removing retaining ring (66).

Inspect the needle bearings (55). If replacement is required press out the old bearings.

REPAIR PROCEDURE, 15 SERIES, INLINE

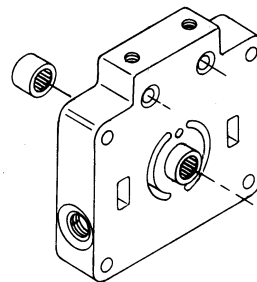


Center Section

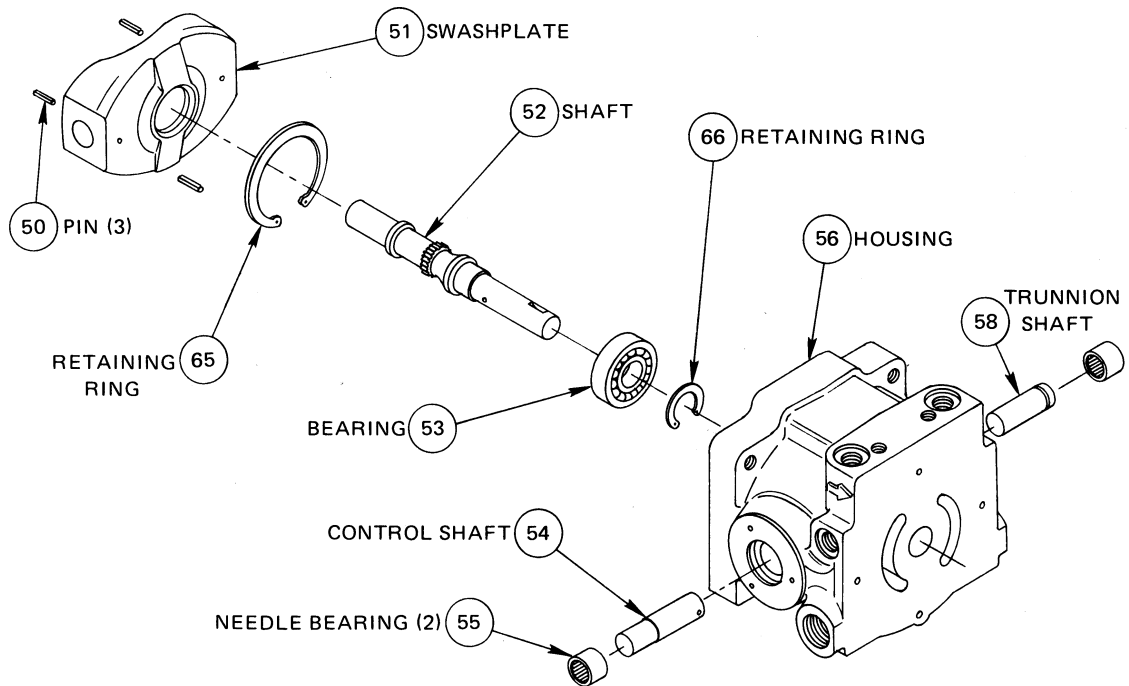
Remove slotted plugs (35) located on the motor side of the center section (43). Remove springs (37) and balls (38) from bores in center section. The parts from these two check valves are interchangeable. Replace parts as required and reinstall into center section.

Visually inspect needle bearings (45) and replace if necessary by pressing out of center section.

When replacing needle bearings (45), press into center section leaving 3/32 to 1/8 inch of bearing protruding beyond face. The valve plates pilot on these bearings.



REPAIR PROCEDURE, 15 SERIES, INLINE



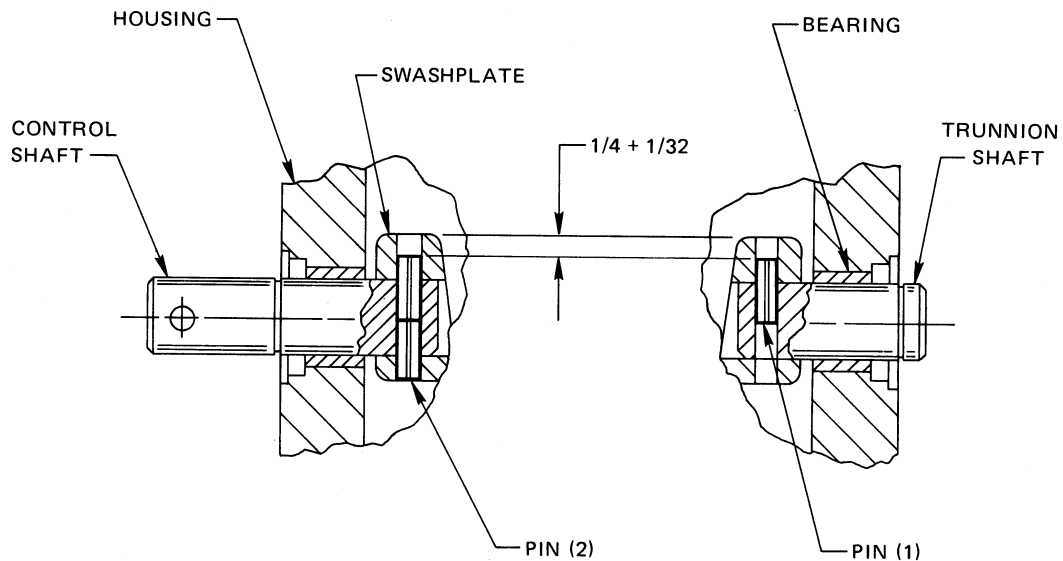
Pump Section

Assemble shaft (52), bearing (53) and retaining ring (66) then press into housing (56). Install retaining ring (65) in groove in housing.

Place housing (56) with large cavity up. Use care not to mar the port face surface.

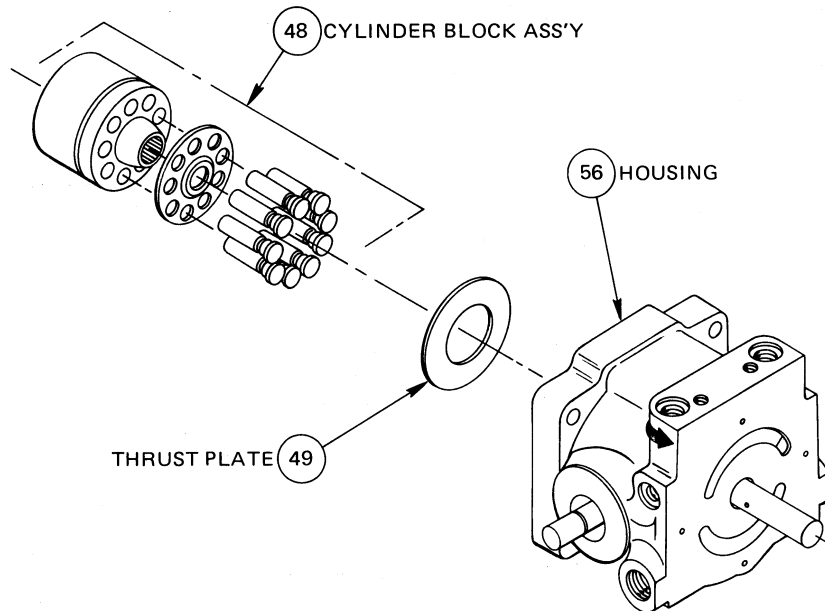
Press needle bearings (55) into each side of housing until flush to 1/64 inch below counterbore for lip seals.

Place swashplate (51) into housing with counterbore for thrust plate up. Install control and trunnion shafts (54 & 58) being certain control shaft is on proper side. Align holes in swashplate and shafts.

REPAIR PROCEDURE, 15 SERIES, INLINE

Install new pins (50) through swashplate (51) and shafts (54 & 58). Use two (2) pins on control shaft, installing first pin until second pin can be started, then driving in both pins together until the last pin is 1/4 inch below swashplate.

Install one (1) pin in the trunnion shaft, driving it in until it is 1/4 inch below the swashplate. The swashplate should swing freely in the pump housing to 15° each side of center.

REPAIR PROCEDURE, 15 SERIES, INLINE

Lubricate thrust plate (49) with clean hydraulic oil and insert in counterbore of swashplate.

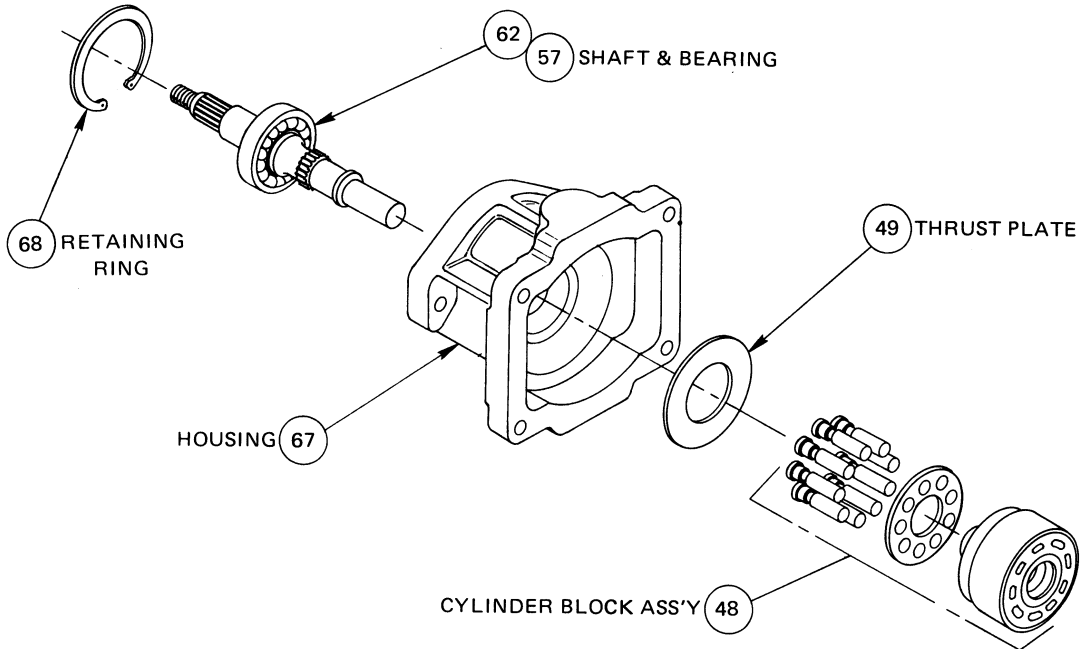
Assemble cylinder block parts if necessary and lubricate with clean hydraulic oil. There is no special orientation of piston to bore that needs to be maintained.

Place the housing assembly in a horizontal position.

Slide cylinder block assembly (48) over shaft and engage spline. Be certain that pistons and thrust plate remain in place. When properly installed a slight spring tension can be felt when pushing on cylinder block.

Lubricate exposed face of cylinder block with clean hydraulic oil.

REPAIR PROCEDURE, 15 SERIES, INLINE



Motor Section

Press shaft (62) and bearing (57) together, then press into housing (67). Install retaining ring (68), if used.

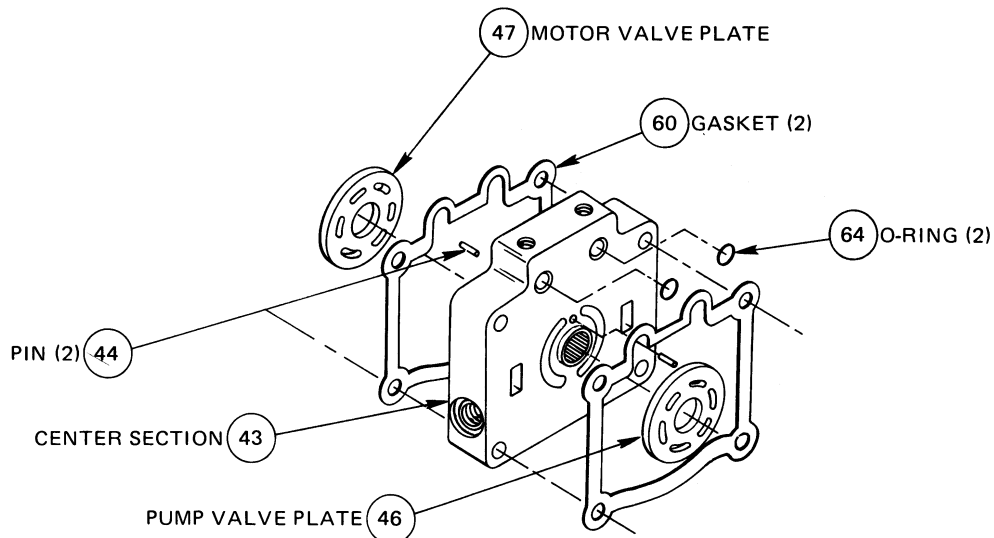
Lubricate thrust plate (49) and insert in counterbore of housing (67).

Assemble cylinder block parts if necessary and lubricate with clean hydraulic oil. There is no special orientation of piston to bore that needs to be maintained.

Place the housing assembly in a horizontal position.

Slide cylinder block assembly (48) over shaft and engage spline. Be certain that pistons and thrust plate remain in place. When properly installed a slight spring tension can be felt when pushing on cylinder block.

Lubricate exposed surface of cylinder block with clean hydraulic oil.

REPAIR PROCEDURE, 15 SERIES, INLINE**Center Section**

Properly orient the center section (43) to the pump section. The side with the two (2) O-rings (64) goes toward the pump section and align with the mating holes in the pump housing (56).

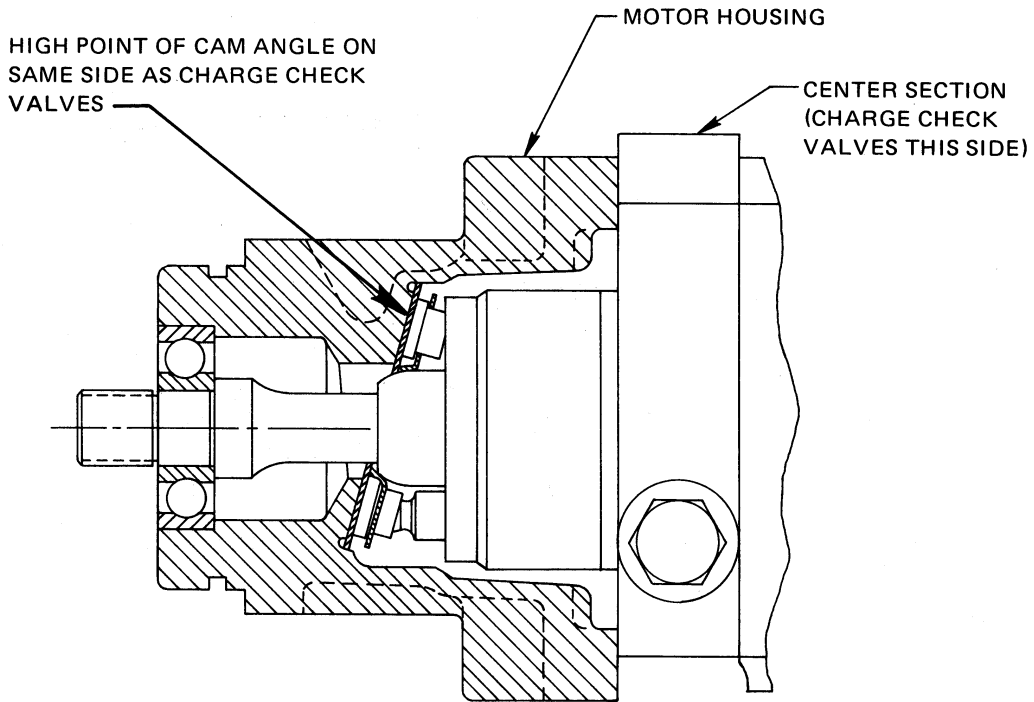
Insert locating pin (44) into pump side of center section (43). Lubricate the slotted side of the pump valve plate (46) and slip it over locating pin and protruding needle bearing (45).

The pump valve plate (46) has two (2) vee notches (the motor valve plate (47) has four (4) vee notches).

Insert locating pin (44) into the motor side of center section. Lubricate the slotted side of the motor valve plate (47) and slip it over locating pin and protruding needle bearing (45).

Insert O-rings (64) and place gasket (60) on each side of center section. A small amount of oil will hold these parts in place.

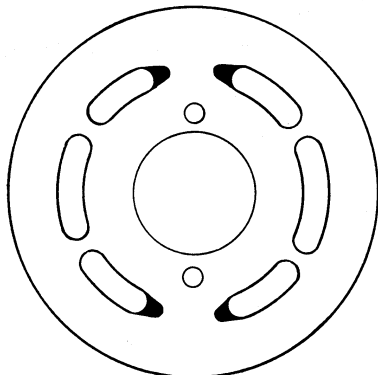
REPAIR PROCEDURE, 15 SERIES, INLINE



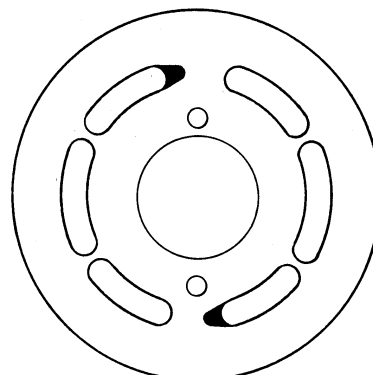
NOTE:

MOTOR HOUSING CAN BE ASSEMBLED TO CENTER SECTION 180° FROM POSITION SHOWN. REFER TO PREVIOUSLY SCRIBED LINES OR SPECIFIC TRANSMISSION DATA FOR PROPER ORIENTATION

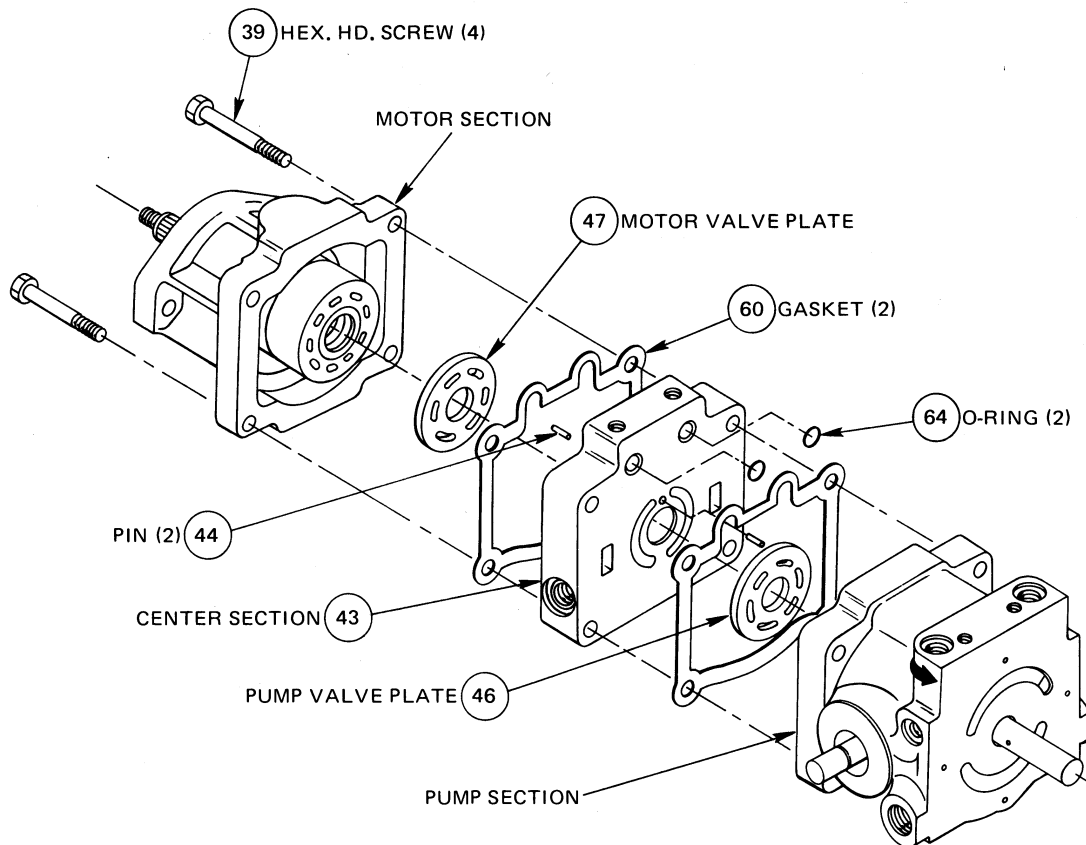
VALVE PLATES



MOTOR



PUMP

REPAIR PROCEDURE, 15 SERIES, INLINE**Assemble Three (3) Sections**

Place center section (43) onto pump section being careful that valve plate (46) and cylinder block assembly (48) remain in place.

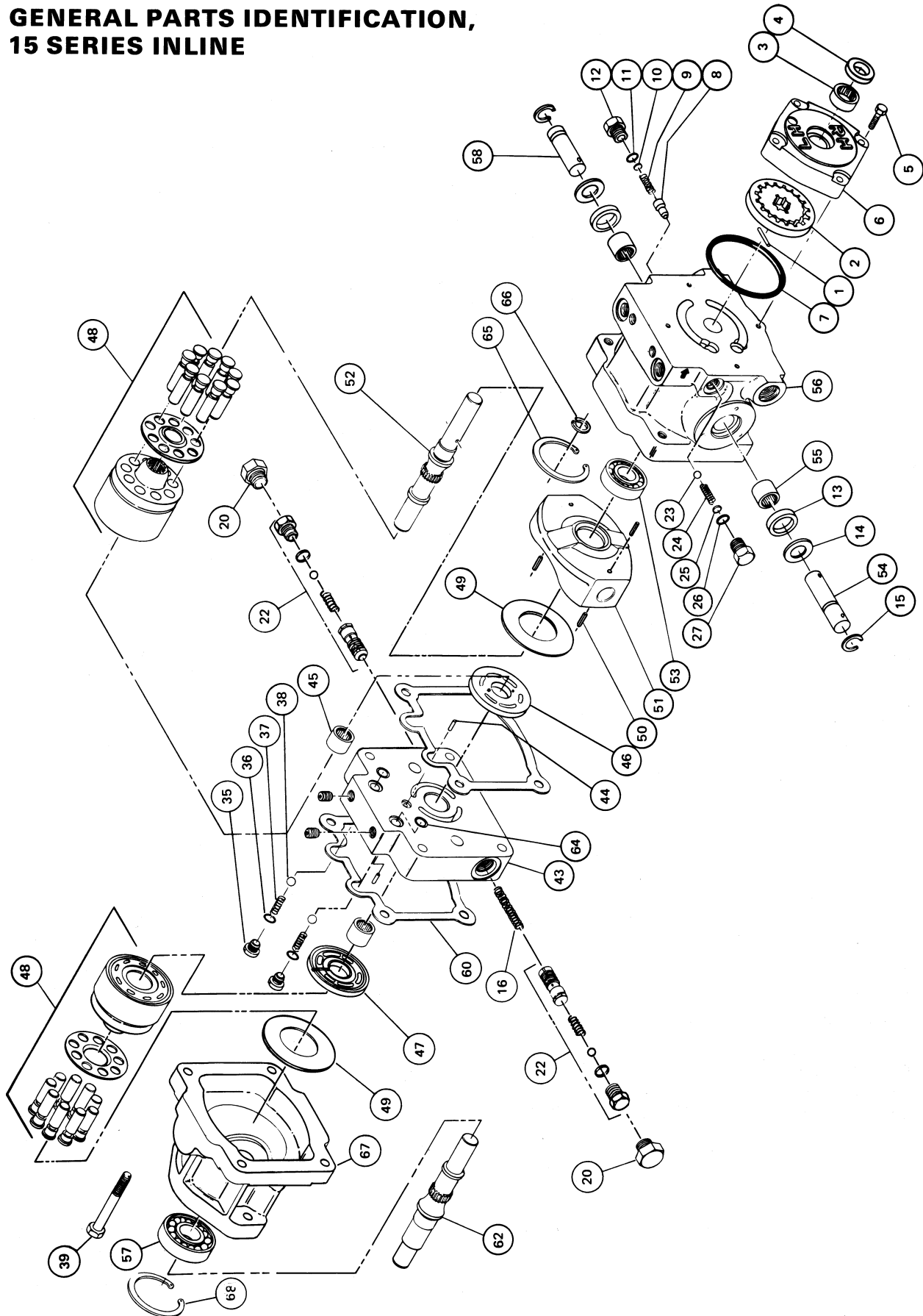
Properly orient the motor housing (67) to the center section. Refer to previously scribed lines for assembly guide or refer to specific transmission data for proper orientation.

Place the motor section on to the center section (43) being careful that the valve plate (47) and cylinder block assembly (48) remain in place.

Insert four (4) hex. head screws (30). Tighten these screws equally and pull the three (3) sections together completely. Torque screws (1) to 27-37 foot lbs. Check for proper internal assembly by slowly rotating pump, motor and control shafts while tightening these screws.

The remaining components (charge pump, charge relief valve, seals, etc) can now be assembled per Bulletin 9646.

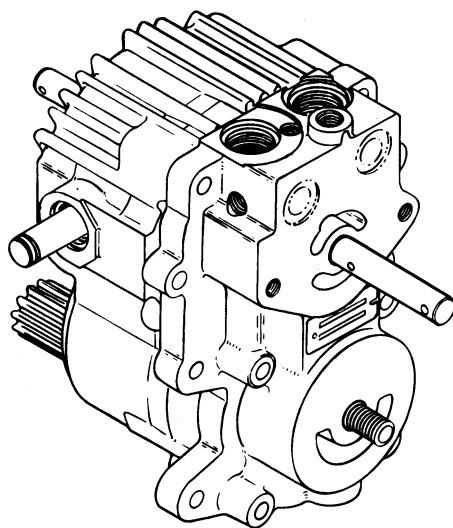
**GENERAL PARTS IDENTIFICATION,
15 SERIES INLINE**



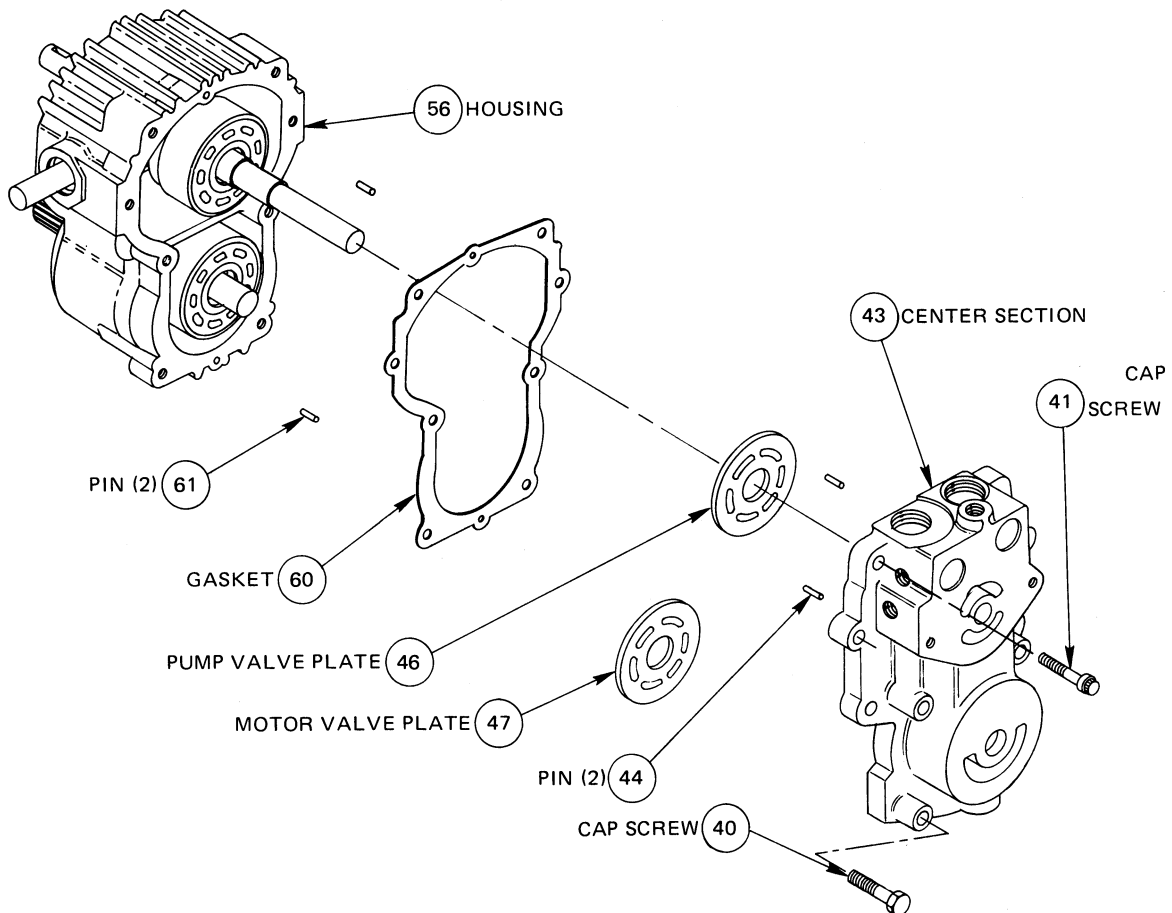
GENERAL PARTS IDENTIFICATION, 15 SERIES INLINE

NO.	DESCRIPTION	QTY	NO.	DESCRIPTION	QTY
1	Pin-Drive	1	38	Ball	2
2	Gerotor Ass'y	1	39	Hex. Head Cap Screw	4
3	Needle Bearing	1	43	Center Section	1
4	Lip Seal	1	44	Headless Str. Pin	2
5	Hex Head Cap Screw	4	45	Needle Bearing	2
6	Charge Pump Housing	1	46	Valve Plate-Pump	1
7	"O" Ring	1	47	Valve Plate-Motor	1
8	Poppet-Imp. Relief Valve	1	48	Cyl Block Kit	2
9	IMP Relief Valve Spring	1	49	Thrust Plate	2
10	Shim Pack	1	50	Coiled Spring Pin	3
11	"O" Ring	1	51	Swashplate	1
12	Hex Head Plug	1	52	Pump Shaft	1
13	Lip Seal	1	53	Ball Bearing	1
14	Washer	2	54	Control Shaft	1
15	Retaining Ring	2	55	Needle Bearing	2
16	Acceleration Spring	1	56	Pump Housing	1
20	Hex Head Plug	2	57	Ball Bearing	1
22	Acceleration Valve	2	58	Trunnion Shaft	1
23	Ball	1	60	Gasket	2
24	Chg Rel Valve Spring	1	62	Motor Shaft	1
25	Shim Pack	A/R	64	"O" Ring	2
26	"O" Ring	1	65	Retaining Ring	1
27	Hex Head Plug	1	66	Retaining Ring	2
35	Check Valve Plug	2	67	Motor Housing	1
36	"O" Ring	2	68	Retaining Ring	1
37	Check Valve Spring	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.

MAJOR REPAIRS, U TYPE TRANSMISSION

The following procedures are for the Major repair of the U type transmission. These instructions begin with the removal of the center section as the procedure for Minor repairs. (Charge Pump, Seals, etc.) are not covered in this publication. (ref Bulletin 9646).

REPAIR PROCEDURE, 15 SERIES, U TYPE

Prior to major disassembly, the Charge Pump must be removed (ref. Bulletin 9646).

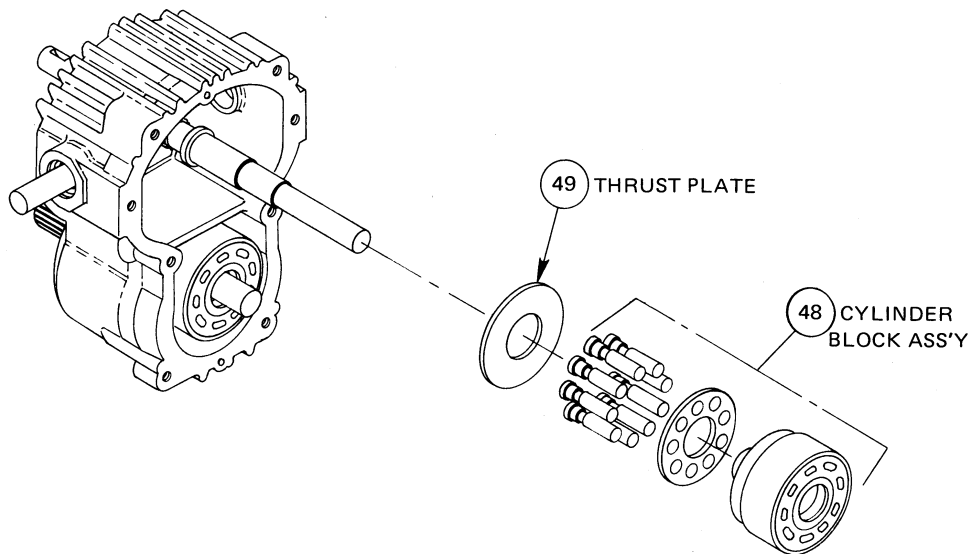
Place the transmission with the shafts in a vertical position. Remove cap screws (40 & 41) from center section (43) and lift center section off transmission. Do not allow internal parts to fall when removing center section.

If valve plates (46 & 47) remain on center section, remove them. Keep the motor valve plate (47) separate from the pump valve plate (46) as they are not interchangeable. If the valve plates remain on the cylinder block, remove them at this time.

Remove gasket (60), valve plate pins (44) and locating pins (61).

CAUTION

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

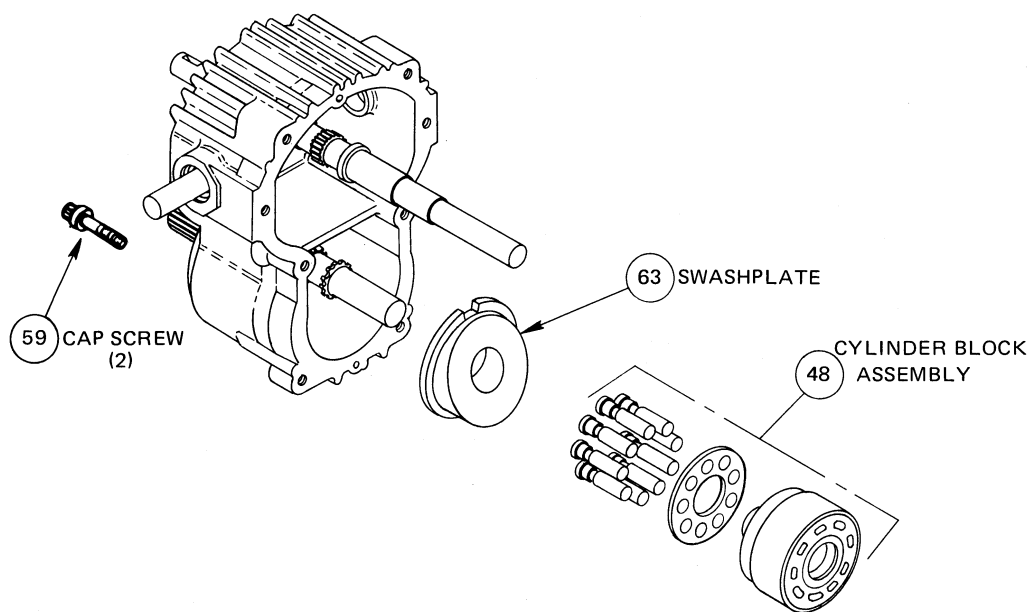
REPAIR PROCEDURE, 15 SERIES, U TYPE

Lift out the pump (upper) cylinder block assembly (48). This is the same for both pump and motor. The pistons may come out of the cylinder bores, however, there is no special orientation of piston to bore that needs to be maintained.

Do not attempt to disassemble the spring and other parts from the center bore of the cylinder block. The entire assembly (48) should be replaced if any of its components are damaged.

Visually inspect wear surfaces of valve plate, cylinder block and slippers for damage. Check to be sure pistons are free in bores.

Remove thrust plate (49) from counterbore in swashplate (51). Visually inspect both sides for damage and flatness.

REPAIR PROCEDURE, 15 SERIES, U TYPE

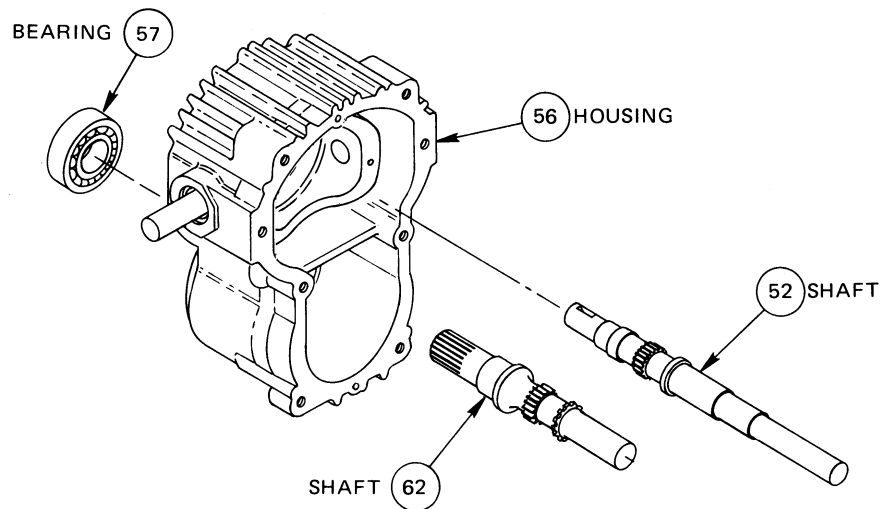
Lift out the motor (lower) cylinder block assembly (48). This is the same for both pump and motor. The pistons may come out of the cylinder bores, however, there is no special orientation of pistons to bore that needs to be maintained.

Do not attempt to disassemble the spring and other parts from the center bore of the cylinder block. The entire assembly (48) should be replaced if any of its components are damaged.

Visually inspect wear surfaces of valve plate, cylinder block and slippers for damage. Check to be sure pistons are free in bores.

Remove two (2) cap screws (59) then remove fixed swashplate (63) from counterbore in housing (56). Visually inspect wear surface for damage.

REPAIR PROCEDURE, 15 SERIES, U TYPE

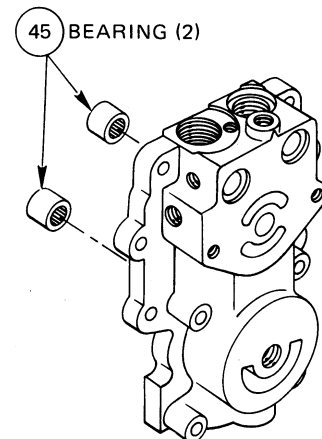


The pump shaft (52) and motor shaft (62) can be removed by pressing them out through the large cavity of housing (56).

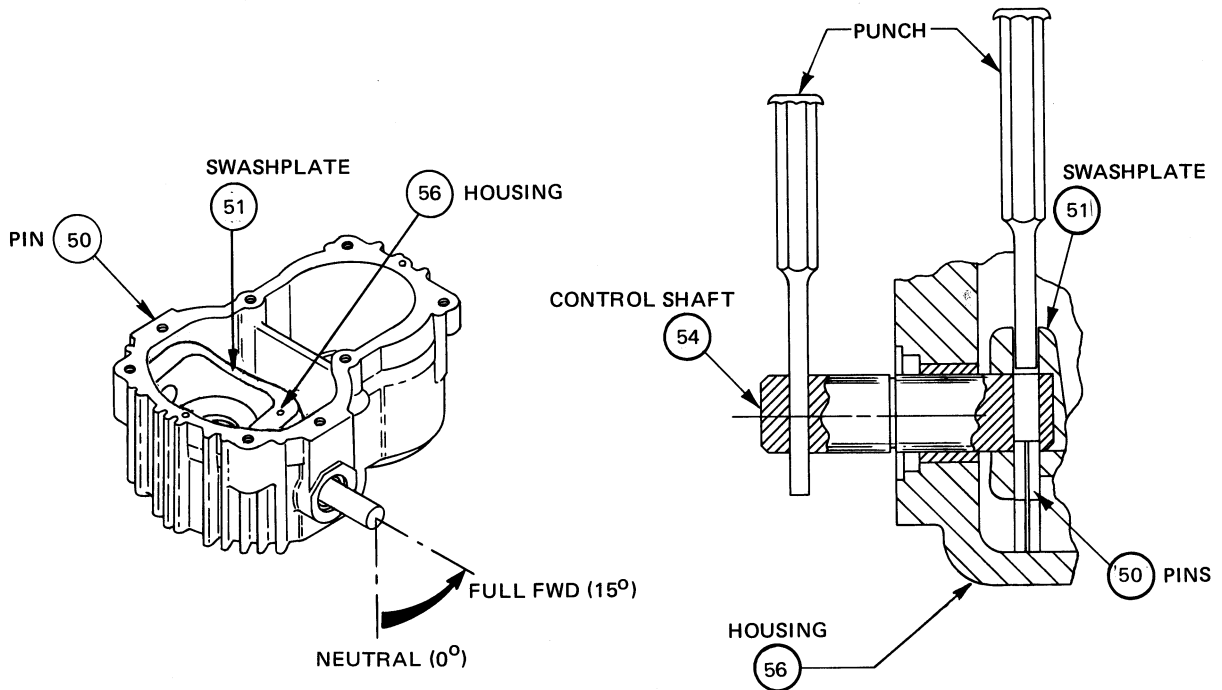
The motor shaft bearing (57) is removed by pressing out toward the front of housing. Replace bearing (57) if necessary.

Visually inspect needle bearings (45) and replace if necessary by pressing them out of center section.

When replacing bearings (45), press into center section leaving 3/32 to 1/8 inch of bearing protruding beyond face. The valve plates pilot on these bearings.



REPAIR PROCEDURE, 15 SERIES, U TYPE



Place housing (56) with large cavity up. Use care not to damage housing. Place a 3/16 dia punch in the control shaft (54) and tilt the swashplate (51) to its full angle (15°, full fwd).

Use a second 3/16 dia punch and drive out the single pin (50) in the trunnion shaft (58) until it hits the housing.

CAUTION

Do not continue to drive the pin or the housing will be damaged.

Drive both pins (50) out of the control shaft (54) until the first pin contacts the housing. Twist the swashplate (control shaft) back toward neutral and the first pin and the pin on trunnion shaft side should fall into the housing.

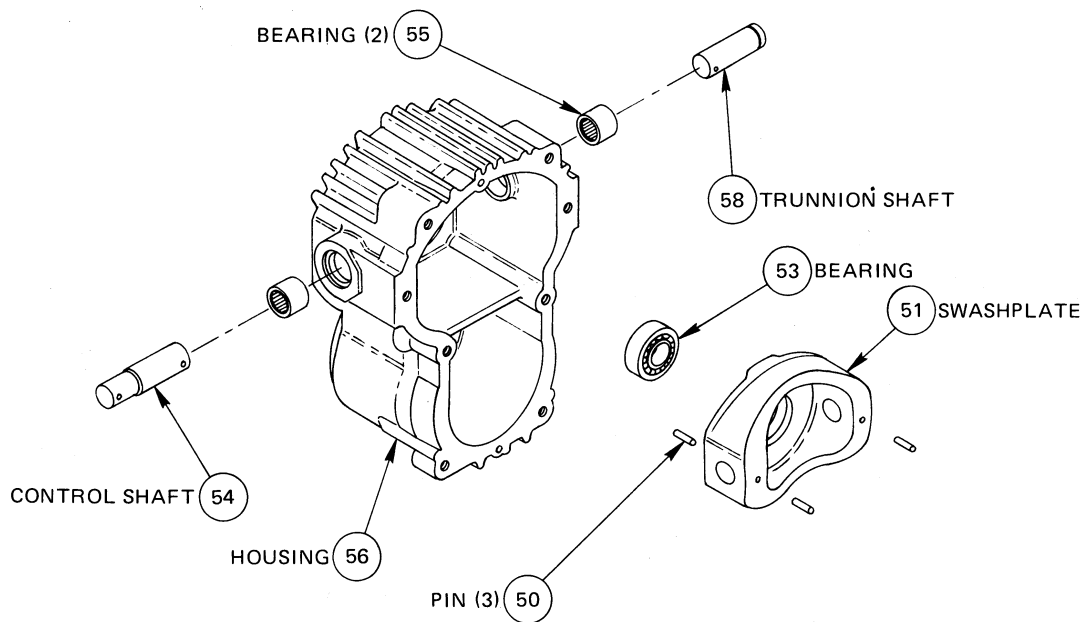
Tilt the swashplate back to its full angle (15°) and drive the second pin out of the control shaft until it hits the housing.

Note the orientation of swashplate in housing and mark parts accordingly to insure proper assembly.

CAUTION

In some units the swashplate angle is restricted in one direction (7-1/2° in reverse).

REPAIR PROCEDURE, 15 SERIES, U TYPE



Drive control shaft (54) out of swashplate bore toward outside of housing. Remove trunnion shaft (58) in the same manner. The swashplate (51) can be removed from the housing (56).

Inspect needle bearing (55) and remove by pressing toward outside of housing if replacement is necessary.

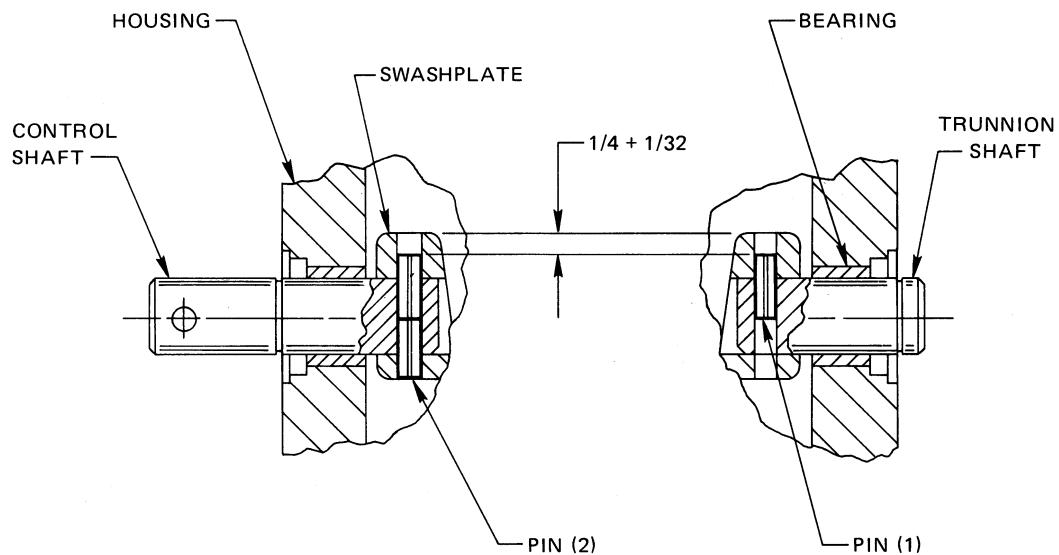
The pump shaft bearing (53) can be removed and replaced if necessary.

Place swashplate (51) into housing with

counterbore for thrust plate up. Refer to previously made assembly marks to insure proper orientation of swashplate in housing. Install control and trunnion shafts (54 & 58) being certain control shaft is on proper side. Align holes in swashplate and shafts.

Press shaft bearing (53) into housing (56).

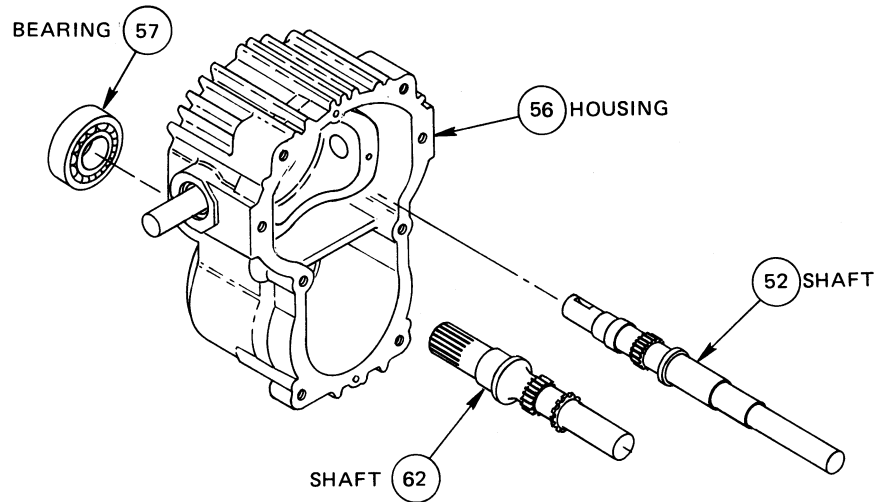
Press needle bearings (55) into each side of housing until flush to 1/64 inch below counterbore for lip seals.

REPAIR PROCEDURE, 15 SERIES, U TYPE

Install new pins (50) through swashplate (51) and shafts (54 & 58). Use two (2) pins on control shaft, installing first pin until second pin can be started, then driving in both pins together until the last pin is $1/4$ inch below swashplate.

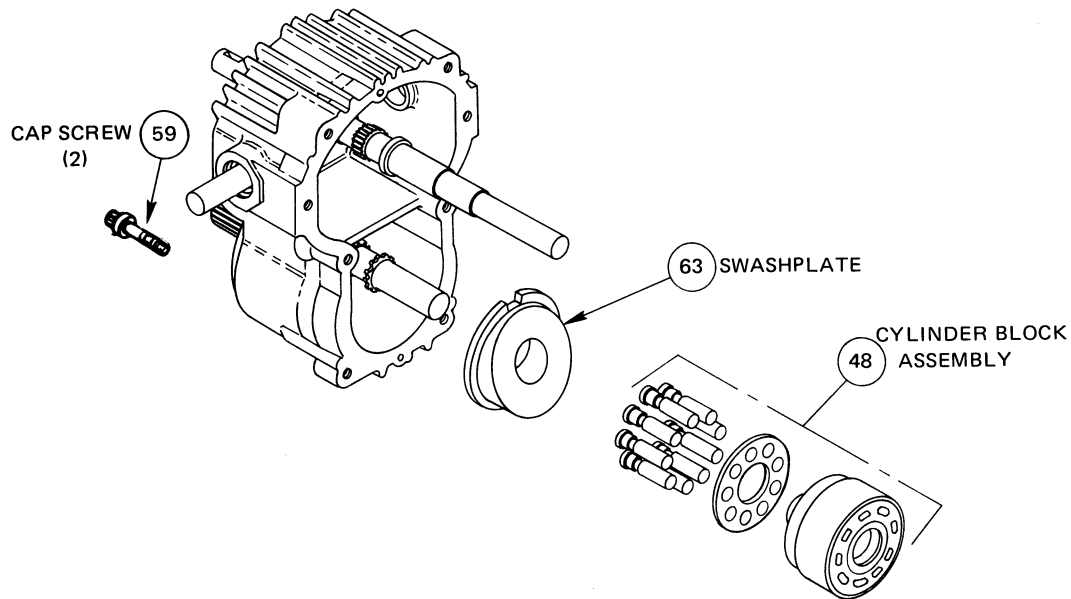
Install one (1) pin in the trunnion shaft, driving it in until it is $1/4$ inch below the swashplate. The swashplate should swing freely in the pump housing to 15° each side of center. In some units the swashplate angle is restricted to $7-1/2^{\circ}$ in one direction.

REPAIR PROCEDURE, 15 SERIES, U TYPE



Press pump shaft (52) into bearing (53) already assembled in housing.

Press bearing (57) into housing. Then press motor shaft (62) into bearing.

REPAIR PROCEDURE, 15 SERIES, U TYPE

Install fixed swashplate (63) into counterbore of housing (56). Orient swashplate so that notch is at top and high point of cam angle is toward the bottom and install screws (59).

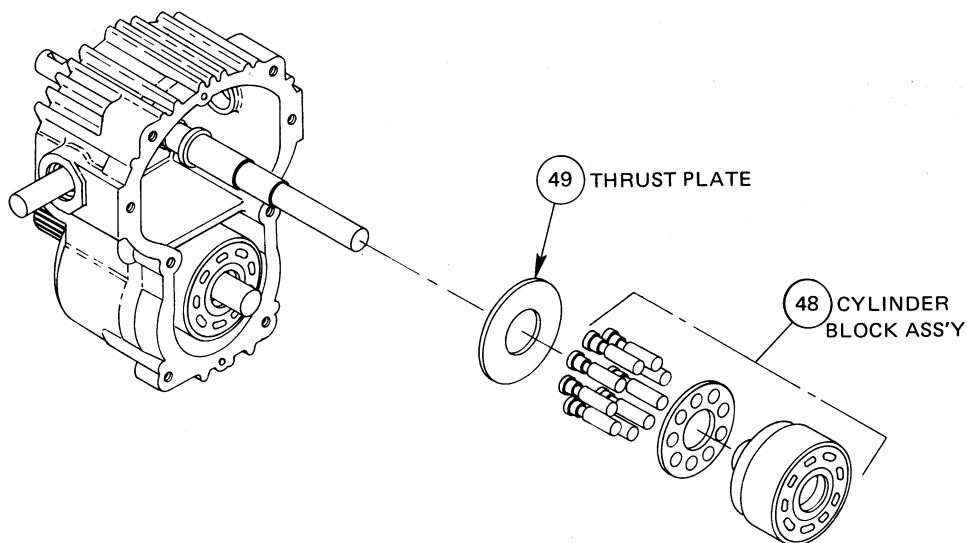
Assemble cylinder block parts if necessary and lubricate with clean hydraulic oil. There is no special orientation of piston to bore that needs to be maintained.

Place the housing assembly in a horizontal position.

Slide cylinder block assembly (48) over shaft and engage spline. Be certain that pistons and thrust plate remain in place. When properly installed a slight spring tension can be felt when pushing on cylinder block.

Lubricate exposed face of cylinder block with clean hydraulic oil.

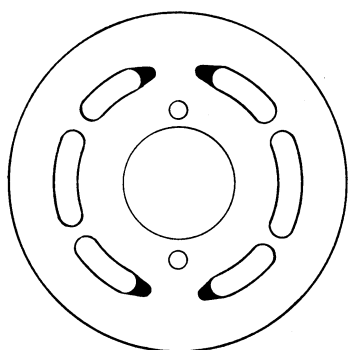
REPAIR PROCEDURE, 15 SERIES, U TYPE



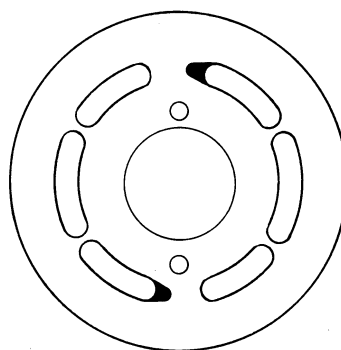
Lubricate thrust plate (49) and insert in counterbore of swashplate.

Install cylinder block assembly (48) using procedure from previous page.

VALVE PLATES

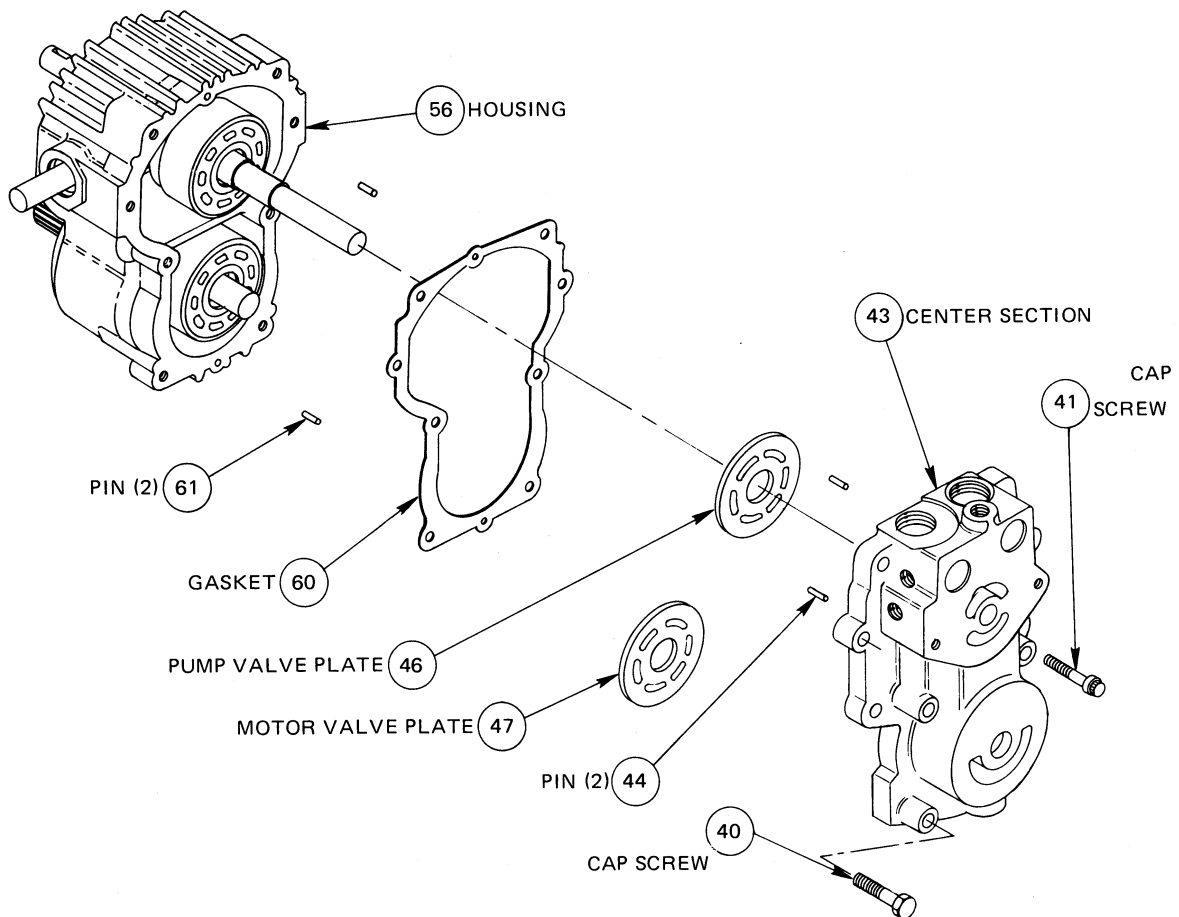


MOTOR



PUMP

REPAIR PROCEDURE, 15 SERIES, U TYPE



Insert locating pin (44) into pump portion (upper) of center section (43). Lubricate the slotted side of the pump valve plate (46) and slip it over locating pin (44) and protruding needle bearing (45).

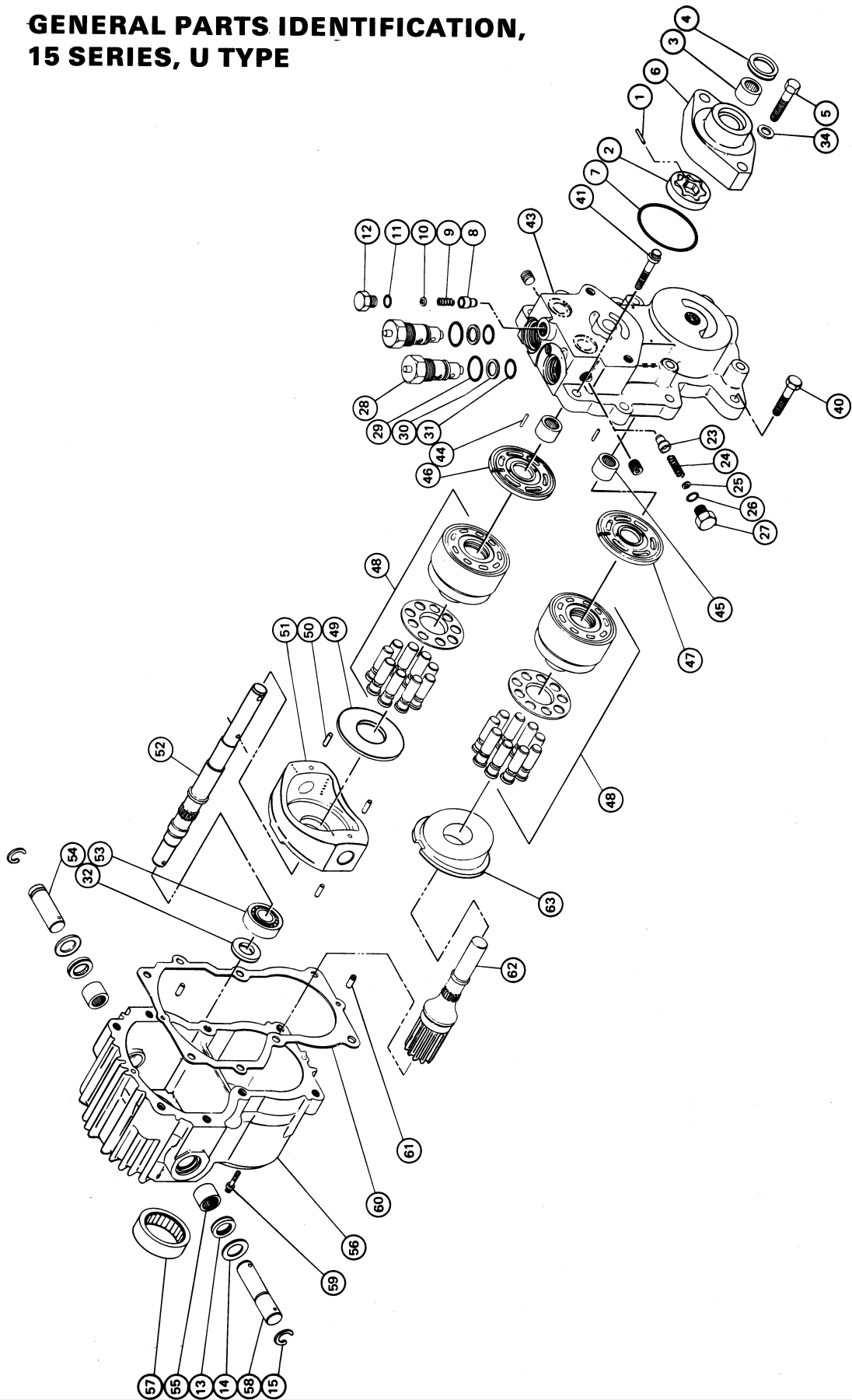
The pump valve plate (46) has two (2) vee notches. The motor valve plate (47) has four (4) vee notches.

Insert locating pin (44) into the motor portion (lower) of center section (43). Lubricate the slotted side of the motor valve plate (47) and slip over locating pin (44) and protruding needle bearing (45).

Place gasket (60) on center section using a small amount of oil to hold it in place. Place center section onto housing being careful that valve plates and cylinder block assemblies remain in place. Insert cap screws (40 & 41) and torque to 25-30 ft. lbs. Check for proper internal assembly by slowly rotating pump, motor and control shafts while tightening these screws.

The remaining components (charge check valves, charge relief valve, etc.) can now be assembled per Bulletin 9646.

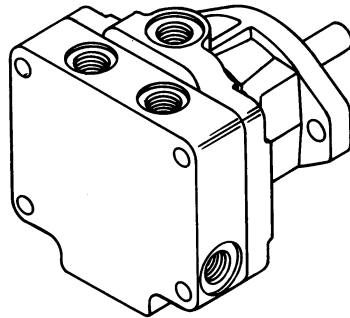
**GENERAL PARTS IDENTIFICATION,
15 SERIES, U TYPE**



GENERAL PARTS IDENTIFICATION, 15 SERIES, U TYPE

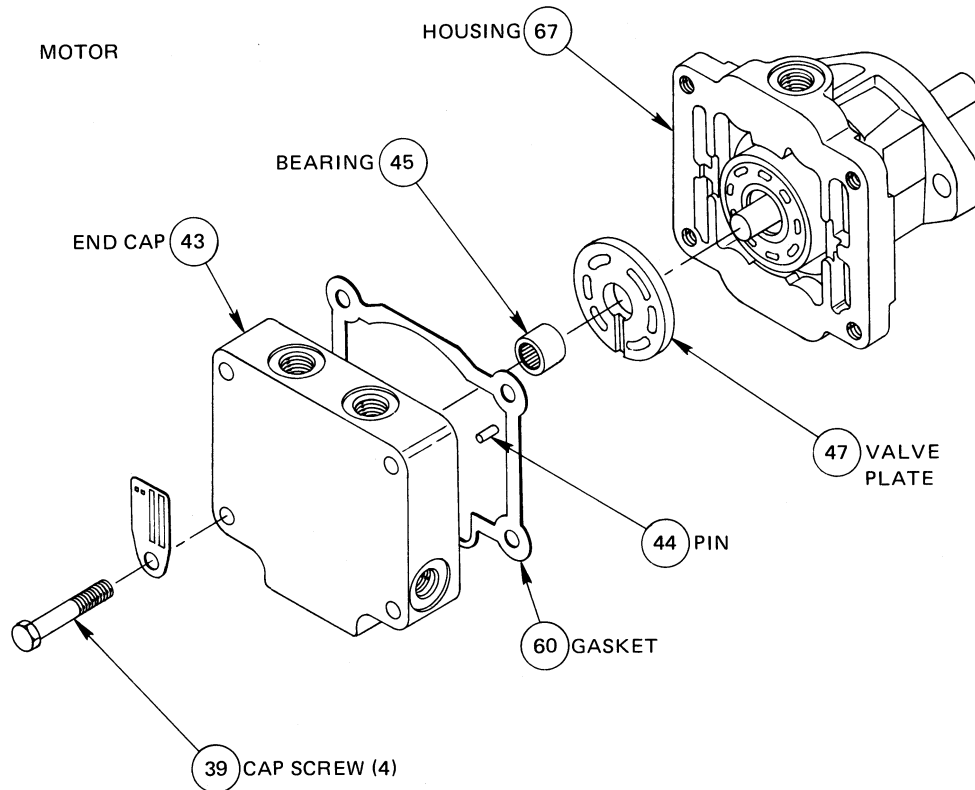
NO.	DESCRIPTION	QTY
1	Pin - Drive	1
2	Charge Pump (Gerotor)	1
3	Bearing	1
4	Seal - Lip	1
5	Screw - Hex. Head	2
6	Housing - Charge Pump	1
7	O-Ring	1
8	Cone - Implement Relief	1
9	Spring - Implement Relief	1
10	Shims	A/R
11	O-Ring	1
12	Plug-Hex. Head	1
13	Seal - Lip	2
14	Washer	2
15	Retaining Ring	2
23	Cone - Charge Relief	1
24	Spring - Charge Relief	1
25	Shims	A/R
26	O-Ring	1
27	Plug-Hex. Head	1
28	Valve Assembly	2
29	O-Ring	2
30	Back Up Ring	2
31	O-Ring	2
34	Washer	2
40	Screw - Hex. Head	4
41	Screw - 12 Pt. Cap	2
43	Center Section	1
44	Pin - Locating	2
45	Bearing	2
46	Valve Plate - Pump	1
47	Valve Plate - Motor	1
48	Cylinder Block Kit	2
49	Thrust Plate	1
50	Spring Pin	3
51	Swashplate - Variable	1
52	Shaft - Pump	1
53	Bearing Input	1
54	Shaft - Control	1
55	Bearing	2
56	Housing	1
57	Bearing - Output	1
58	Shaft - Trunnion	1
59	Screw - 12 Pt. Cap	2
60	Gasket	1
61	Pin	2
62	Shaft - Output	1
63	Swashplate - Fixed	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.

MAJOR REPAIRS, FIXED DISPLACEMENT MOTOR

The following procedures are for the Major repair of the Fixed Displacement motor. These instructions begin with the removal of the end cap as the procedures for Minor repairs (Charge Pump, Seals, etc.) are not covered in this publication (ref. Bulletin 9646).

REPAIR PROCEDURE, 15 SERIES, SPLIT



When the four (4) cap screws (39) are loosened, the internal spring loading will cause the end cap (43) to separate slightly. Loosen these screws evenly to prevent distortion of parts. If separation does not occur as screws are loosened, tap end cap with soft hammer until parts separate.

The end cap (43) can now be removed from the motor, however, be certain that the valve plate (47) does not fall and become damaged. If the valve plate tends to lift off with the end cap (43), hold it in place on the end cap and remove both parts together. If the valve plate remains on the cylinder block, remove it at this time.

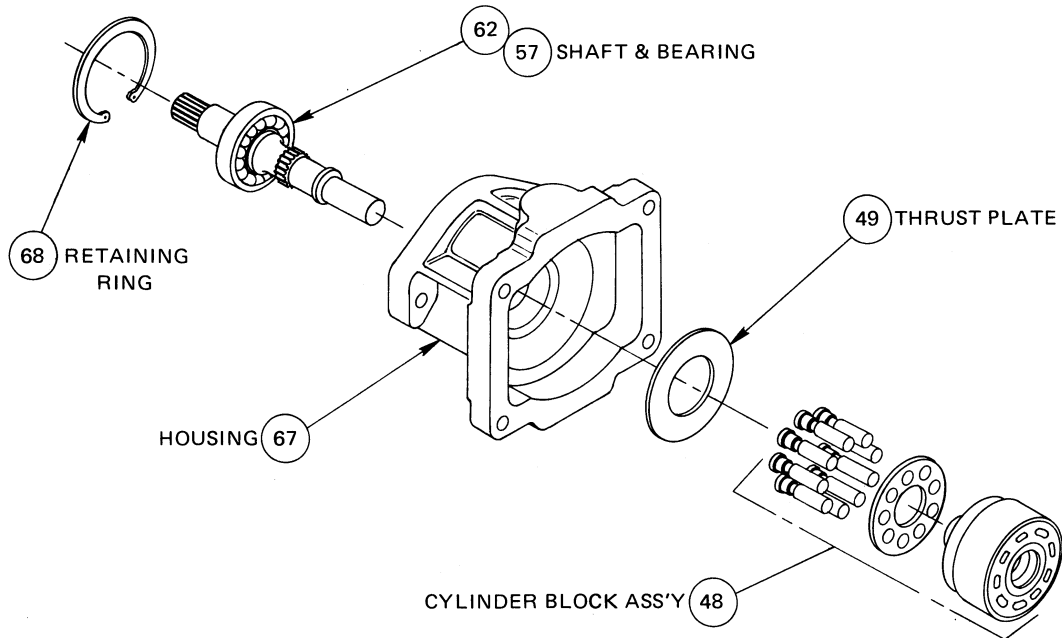
CAUTION

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

The end cap is actually an assembly consisting of a needle bearing which is a press fit in the end cap and the valve plate locating pin (44). Inspect the bearing (45) and remove if replacement is required.

Note the orientation of housing (67) to end cap (43). To insure proper assembly scribe a line across housing and end cap for an assembly guide.

REPAIR PROCEDURE, 15 SERIES, SPLIT



Lift out the cylinder block assembly (48). This is the same for both pump and motor section. The pistons may come out of cylinder block bores. There is no special orientation of piston to bore that needs to be maintained.

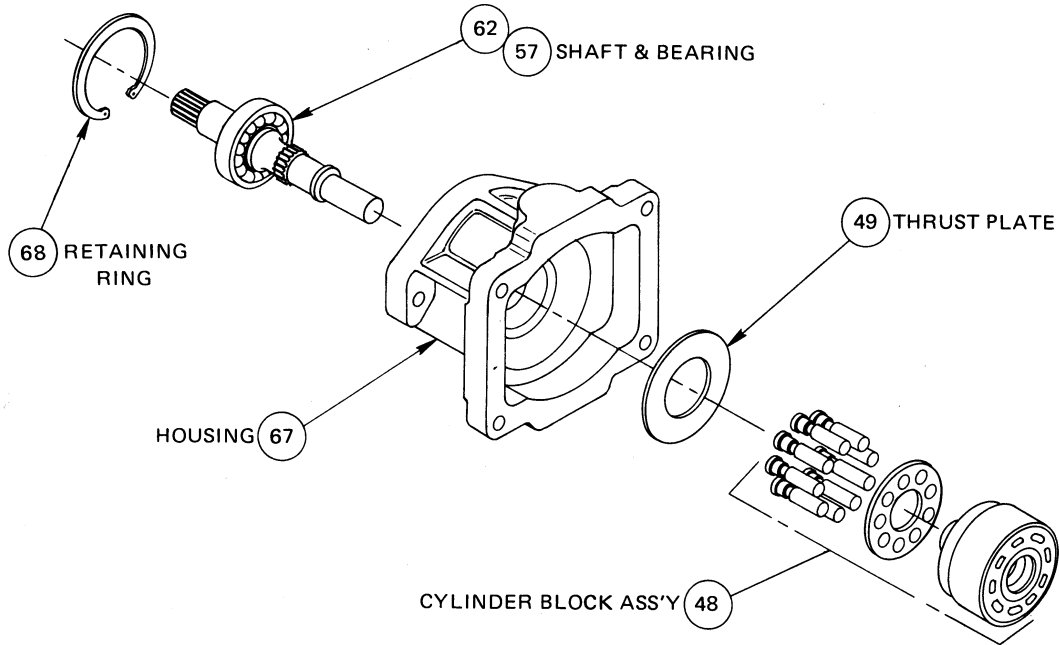
Do not attempt to disassemble the spring and other parts from the center bore of the cylinder block. The entire cylinder block assembly (48) should be replaced if any of its components are damaged.

Visually inspect wear surfaces of valve plate, cylinder block and slippers for damage. Check to be sure pistons are free in bores.

Remove thrust plate (49) from counter bore in motor housing (56). Visually inspect both sides for damage and flatness.

The motor shaft (62) and bearing (57) can be pressed out of the motor housing. In some units a retaining ring (68) must be removed prior to removal of shaft and bearing. The output shaft seal must be removed to expose the retaining ring (ref. Bulletin 9646).

REPAIR PROCEDURE, 15 SERIES, SPLIT



Press shaft (62) and bearing (57) together, then press into housing (56). Install retaining ring (68) if used.

Lubricate thrust plate (49) and insert in counterbore of housing (56).

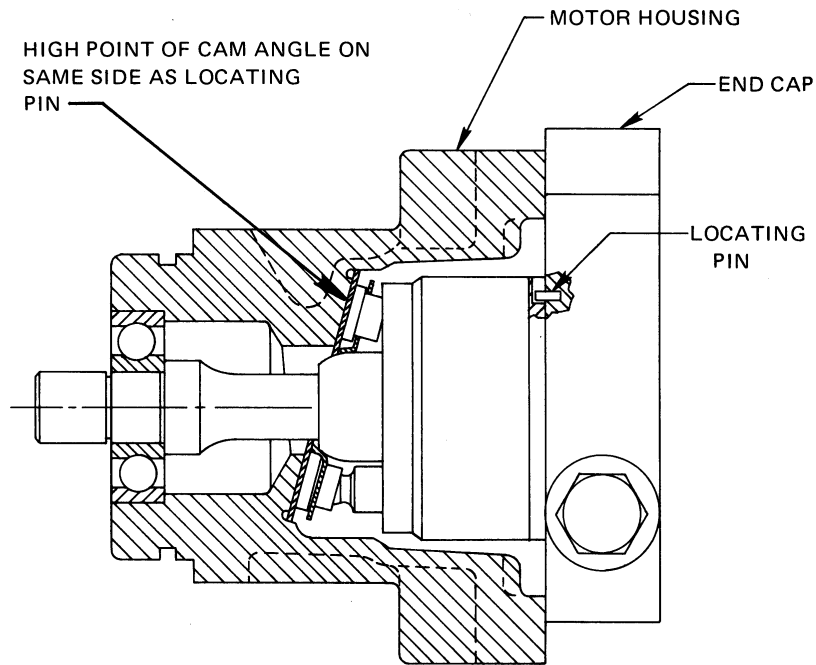
Assemble cylinder block parts if necessary and lubricate with clean hydraulic oil. There is no special orientation of piston to bore that needs to be maintained.

Place the housing assembly in a horizontal position.

Slide cylinder block assembly (48) over shaft and engage spline. Be certain that pistons and thrust plate remain in place. When properly installed a slight spring tension can be felt when pushing on cylinder block.

Lubricate exposed surface of cylinder block with clean hydraulic oil.

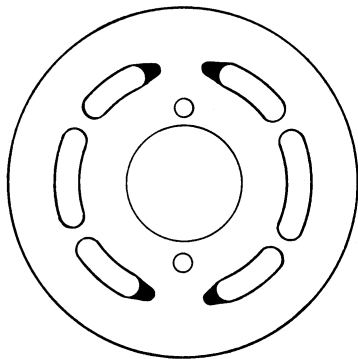
REPAIR PROCEDURE, 15 SERIES, SPLIT



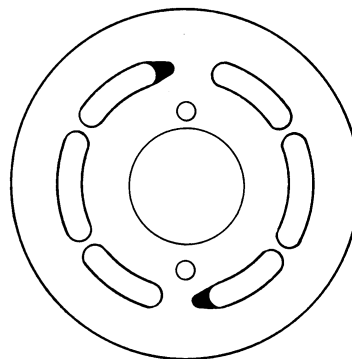
NOTE:

MOTOR HOUSING CAN BE ASSEMBLED TO END CAP 180° FROM POSITION SHOWN. REFER TO PREVIOUSLY SCRIBED LINES OR SPECIFIC TRANSMISSION DATA FOR PROPER ORIENTATION.

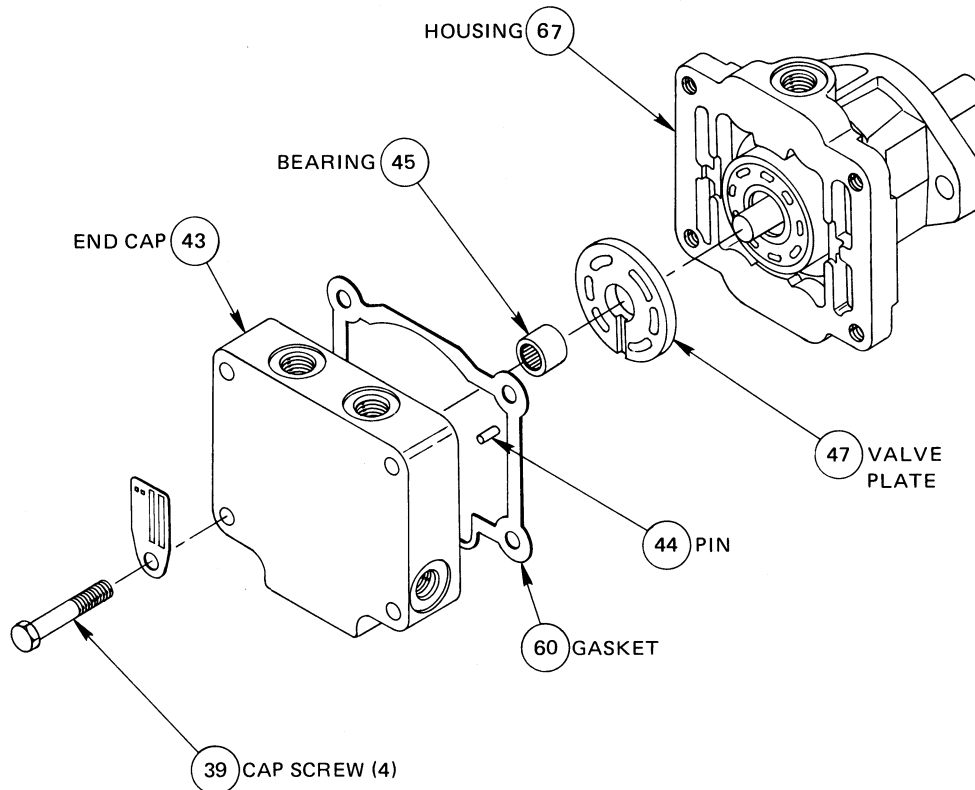
VALVE PLATES



MOTOR



PUMP

REPAIR PROCEDURE, 15 SERIES, SPLIT

Properly orient the end cap (43) and housing (56). Refer to previously scribed lines for assembly guide or refer to specific transmission data for proper orientation.

Press the bearing (45) into end cap (43) leaving 3/32 to 1/8 inch of bearing protruding beyond face. The valve plate (47) pilots on this bearing.

Insert locating pin (44) into end cap. Lubricate the slotted side of the motor valve plate (47) and slip it over the locating pin and protruding bearing.

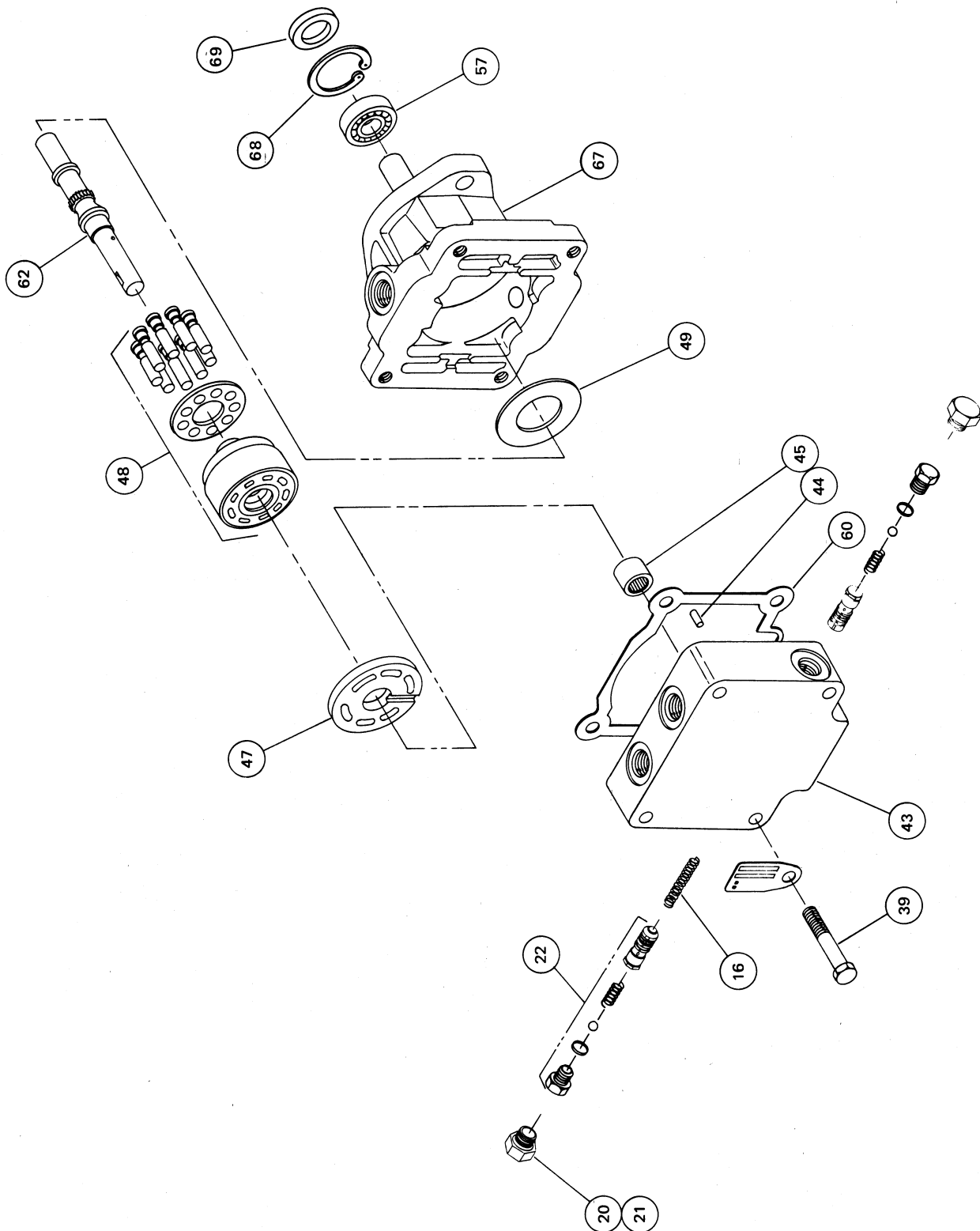
The pump valve plate (47) has four (4) notches.

Place gasket (60) on housing (67), then install end cap and valve plate. Hold the valve plate so it does not drop off during assembly.

Install four (4) screws (39) and tighten alternately until the end cap and housing are pulled completely together. Torque to 27-37 ft. lbs. Check for proper internal assembly by slowly rotating motor's shaft while tightening these screws.

The remaining components (acceleration valves, by-pass valve, etc.) can now be assembled per Bulletin 9646.

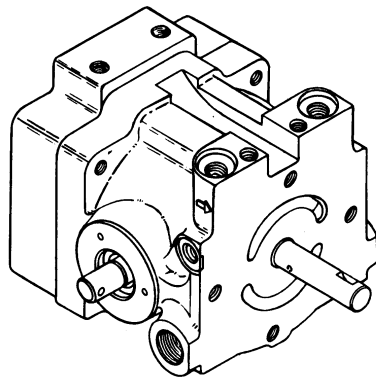
**GENERAL PARTS IDENTIFICATION,
15 SERIES, FIXED DISPLACEMENT MOTOR**



**GENERAL PARTS IDENTIFICATION,
15 SERIES, FIXED DISPLACEMENT MOTOR**

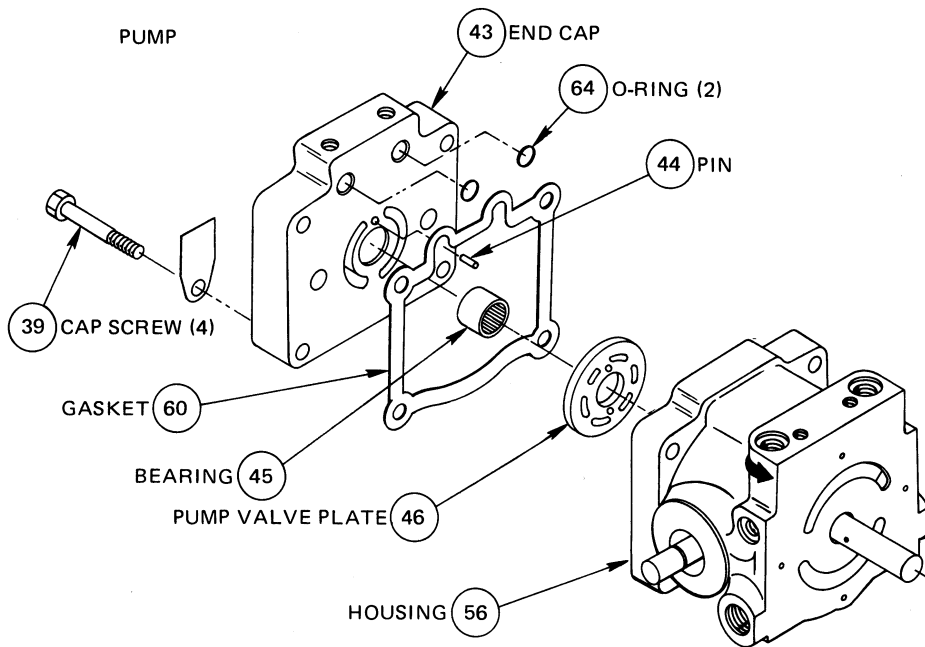
NO.	DESCRIPTION	QTY
16	Spring-Acceleration Valve	1
20	Plug - Hex. Head	2
21	O-Ring	2
22	Acceleration Valve Kit	2
39	Screw - Hex. Head	4
43	End Cap - Motor	1
44	Pin - Locating	1
45	Bearing	1
47	Valve Plate - Motor	1
48	Cylinder Block Kit	1
49	Thrust Plate	1
57	Bearing	1
60	Gasket	1
62	Shaft - Motor	1
67	Housing	1
68	Retaining Ring	1
69	Seal - Lip	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.

MAJOR REPAIRS, VARIABLE DISPLACEMENT PUMP

The following procedures are for the Major repair of the Variable Displacement pump. These instructions begin with the removal of the end cap as the procedures for Minor repairs (Charge Pump, Seals, etc.) are not covered in this publication (ref. Bulletin 9646).

REPAIR PROCEDURE, 15 SERIES, SPLIT



It is recommended that the Charge Pump be removed prior to major disassembly (ref. Bulletin 9646).

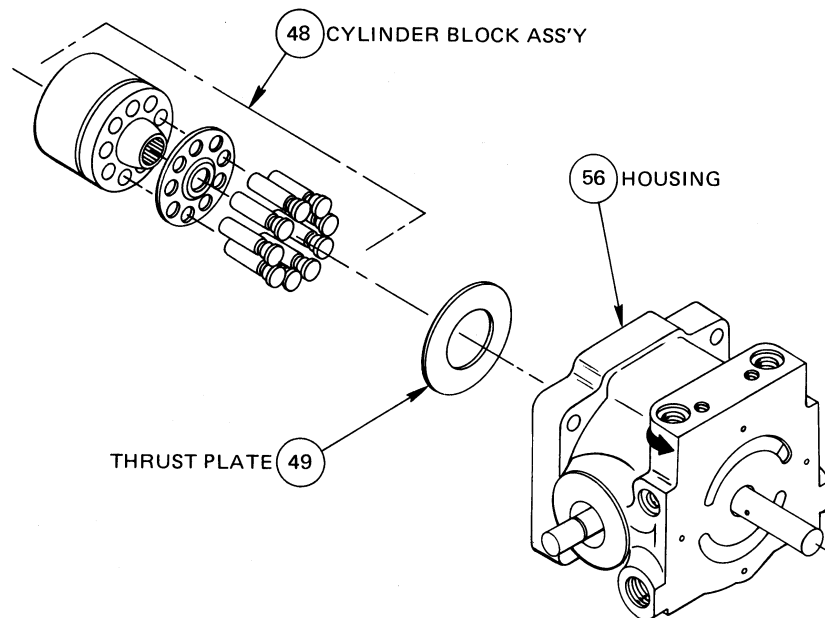
When the four (4) cap screws (39) are loosened, the internal spring loading will cause the end cap (43) to separate slightly. Loosen these screws evenly to prevent distortion of parts. If separation does not occur as screws are loosened, tap end cap with soft hammer until parts separate.

CAUTION

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

The end cap (43) can now be removed from the pump, however, be certain that the valve plate (46) does not fall and become damaged. If the valve plate tends to lift off with the end cap (43), hold it in place on the end cap and remove both parts together. If the valve plate remains on the cylinder block, remove it at this time.

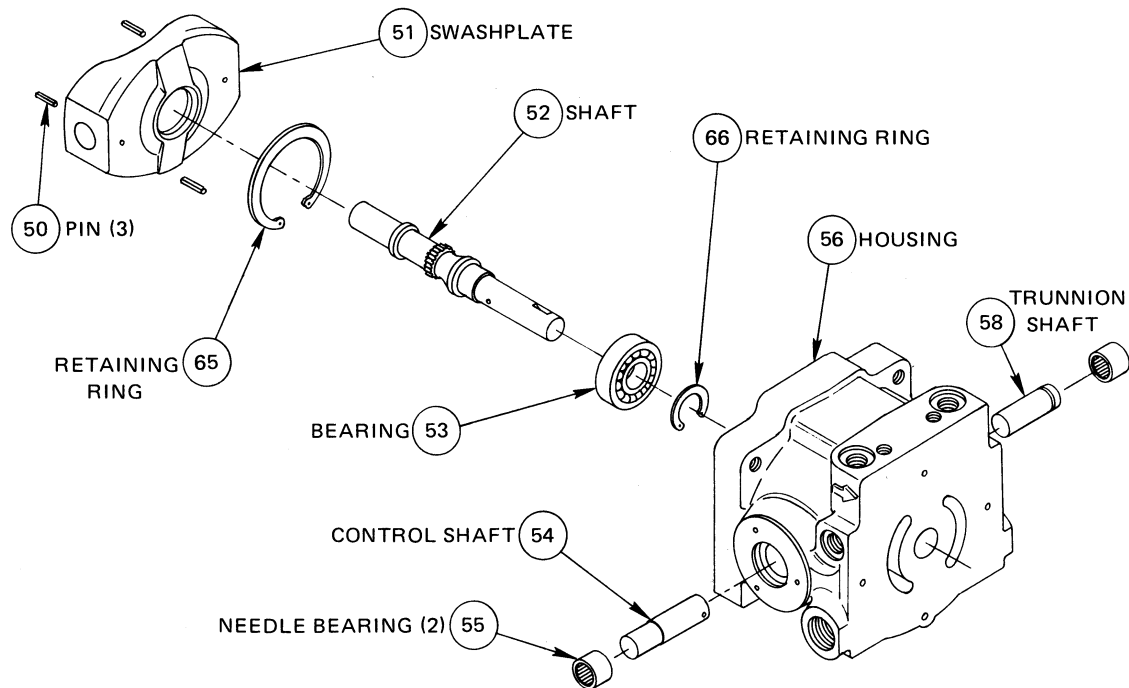
The end cap is actually an assembly consisting of a needle bearing which is a press fit in the end cap and the valve plate locating pin (44). Inspect bearing (45) and remove if replacement is required.

REPAIR PROCEDURE, 15 SERIES, SPLIT

Lift out the cylinder block assembly (48). This is the same for pump and motor sections. The pistons may come out of the cylinder block. There is no special orientation of piston to bore that needs to be maintained. Do not attempt to disassemble the spring and other parts from the center bore of the cylinder block. The entire cylinder block assembly (48) should be replaced if any of its components are damaged.

Visually inspect wear surfaces of valve plate, cylinder block and slippers for damage. Check to be sure pistons are free in bores.

Remove thrust plate (49) from counterbore in face of swashplate (51). Visually inspect both sides for damage and flatness.

REPAIR PROCEDURE, 15 SERIES, SPLIT

Place the pump housing (56) with the large cavity up. Use care not to mar the port face surface.

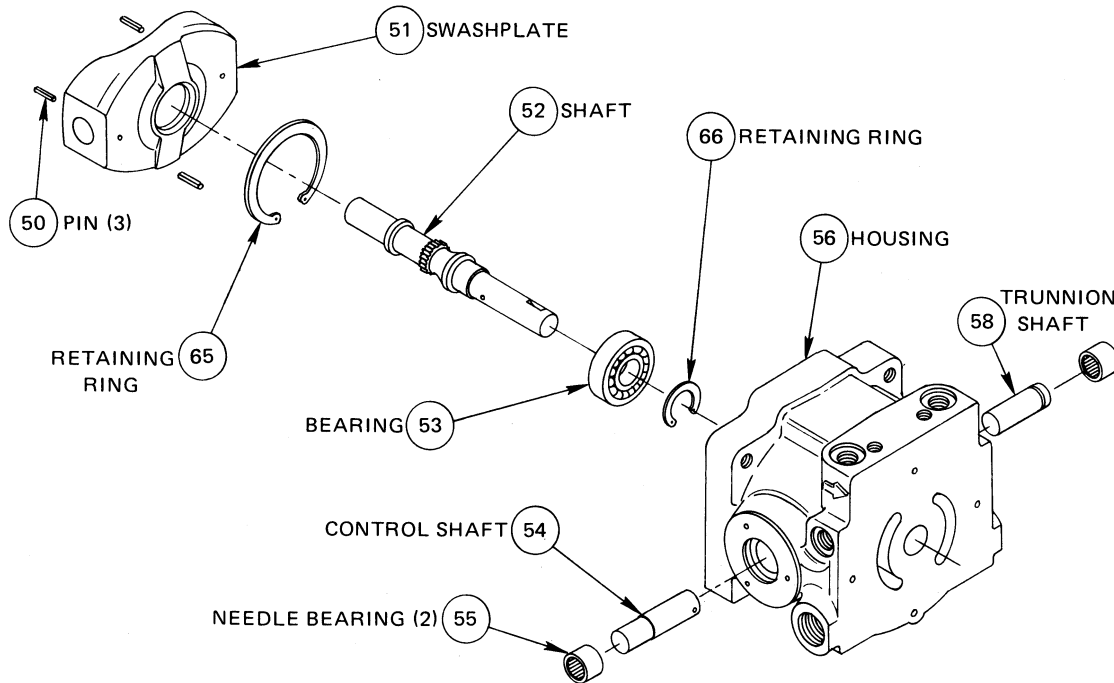
Using a 3/16 diameter drift punch, drive spring pin (50) out of trunnion and control shafts (54 & 58). The pump housing is provided with a cast recess so that the pins can be driven free of trunnion and control shafts (54 & 58).

Drive control shaft (54) out of swashplate bore toward outside of housing. Once clear of swashplate bore, the shaft can be removed easily. Repeat to remove trunnion shaft (58). The swashplate (51) is then removed from the pump housing (56).

Inspect the needle bearings (55). If replacement is required press out the old bearings.

Remove retaining ring (65) from housing, then press out shaft and bearing assembly (52, 53 & 66). The bearing (53) can be removed from shaft (52), if necessary, after removing retaining ring (66).

REPAIR PROCEDURE, 15 SERIES, SPLIT

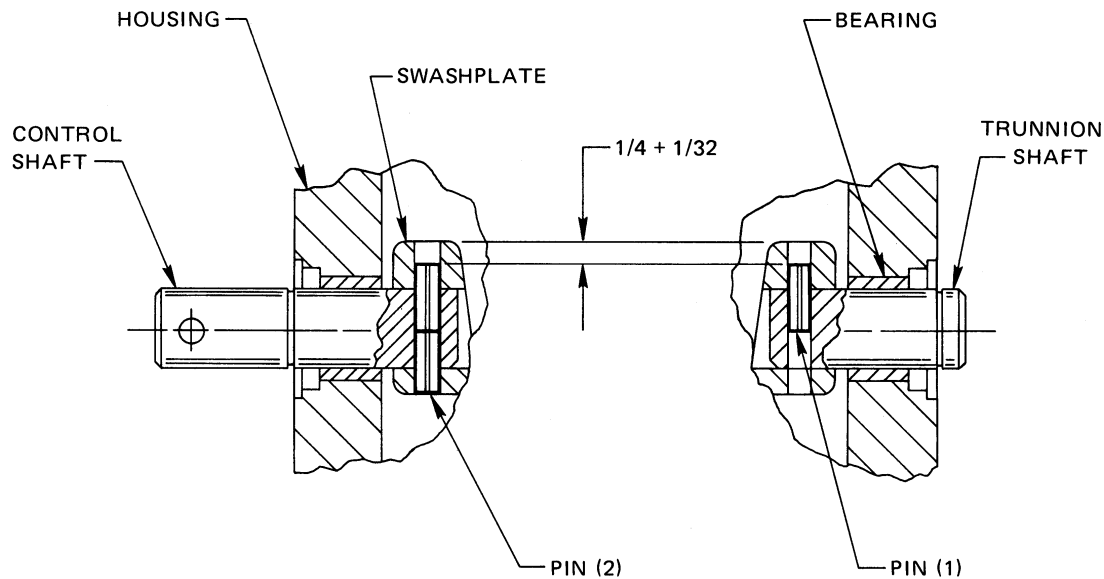


Assemble shaft (52), bearing (53) and retaining ring (66) then press into housing (56). Install retaining ring (65) in groove in housing.

Place housing (56) with large cavity up. Use care not to mar the port face surface.

Press needle bearings (55) into each side of housing until flush to 1/64 inch below counterbore for lip seals.

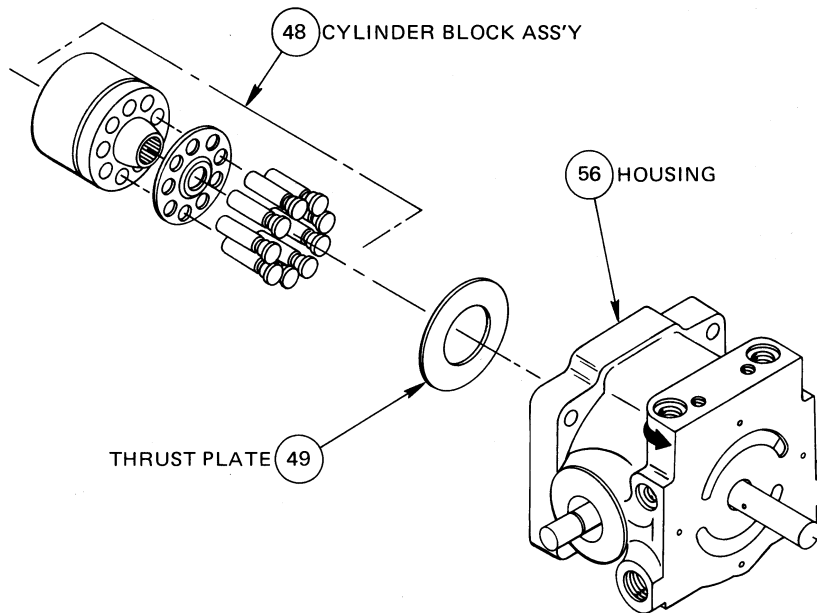
Place swashplate (51) into housing with counterbore for thrust plate up. Install control and trunnion shafts (54 & 58) being certain control shaft is on proper side. Align holes in swashplate and shafts.

REPAIR PROCEDURE, 15 SERIES, SPLIT

Install new pins (50) through swashplate (51) and shaft (54 & 58). Use two (2) pins in control shaft, installing first pin until second pin can be started, then driving in both pins together until the last pin is $1/4$ inch below swashplate.

Install one (1) pin in trunnion shaft, driving it in until it is $1/4$ inch below swashplate.

The swashplate should swing freely in the pump housing to 15° each side of center.

REPAIR PROCEDURE, 15 SERIES, SPLIT

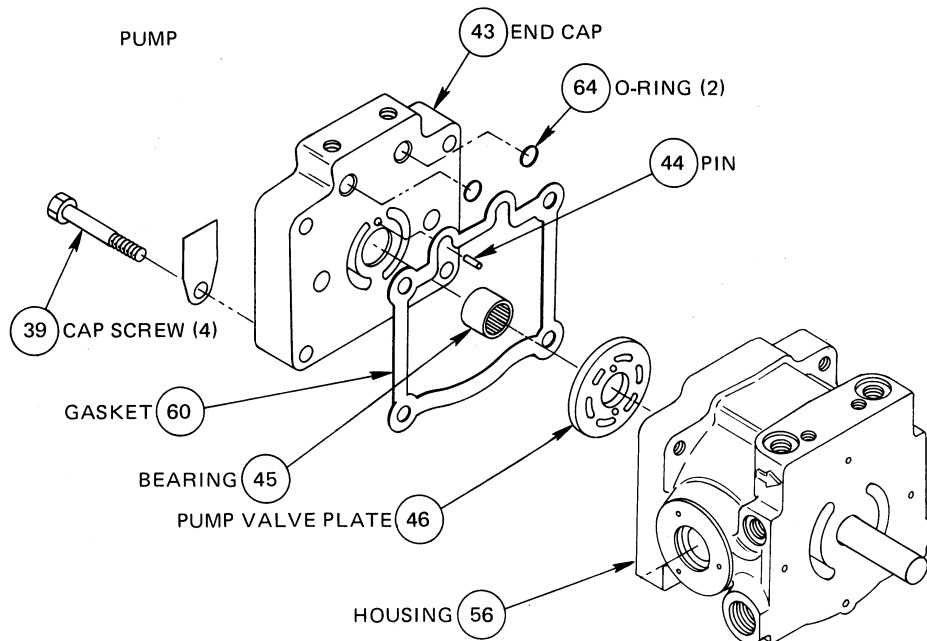
Lubricate thrust plate (49) with clean hydraulic oil and insert in counterbore of swashplate.

Assemble cylinder block parts if necessary and lubricate with clean hydraulic oil. There is no special orientation of piston to bore that needs to be maintained.

Place the housing assembly in a horizontal position.

Slide cylinder block assembly (48) over shaft and engage spline. Be certain that pistons and thrust plate remain in place. When properly installed a slight spring tension can be felt when pushing on cylinder block.

Lubricate exposed face of cylinder block with clean hydraulic oil.

REPAIR PROCEDURE, 15 SERIES, SPLIT

Properly orient the end cap (43) and housing (56). Align the O-rings (64) with the mating holes in the housing.

Press bearing (45) into end cap leaving $3/32$ to $1/8$ inch protruding beyond face. The valve plate (46) pilots on this bearing.

Insert locating pin (44) into end cap. Lubricate the slotted side of the pump valve plate (46) and slip it over the pin and protruding bearing.

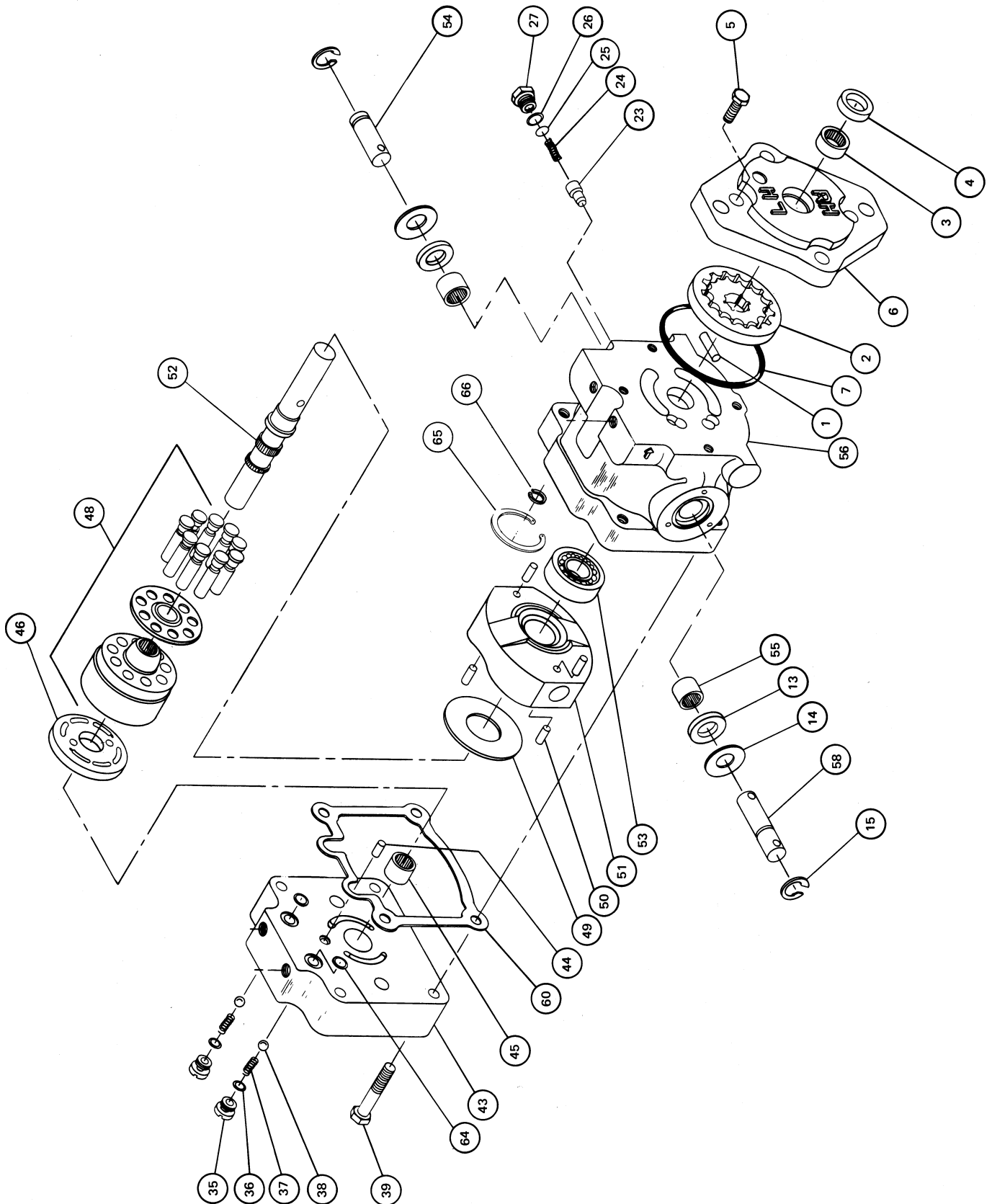
The pump valve plate (46) has two (2) vee notches.

Place the gasket (60) on housing (56) then install end cap and valve plate. Hold the valve plate so it does not drop off during assembly.

Install four (4) screws (39) and tighten alternately until the end cap and housing are pulled completely together. Torque to 27-37 ft. lbs. Check for proper internal assembly by slowly rotating pump and control shafts while tightening these screws.

The remaining components (charge pump, charge relief valve, seals, etc.) can now be assembled per Bulletin 9646.

**GENERAL PARTS IDENTIFICATION,
15 SERIES, VARIABLE DISPLACEMENT PUMP**

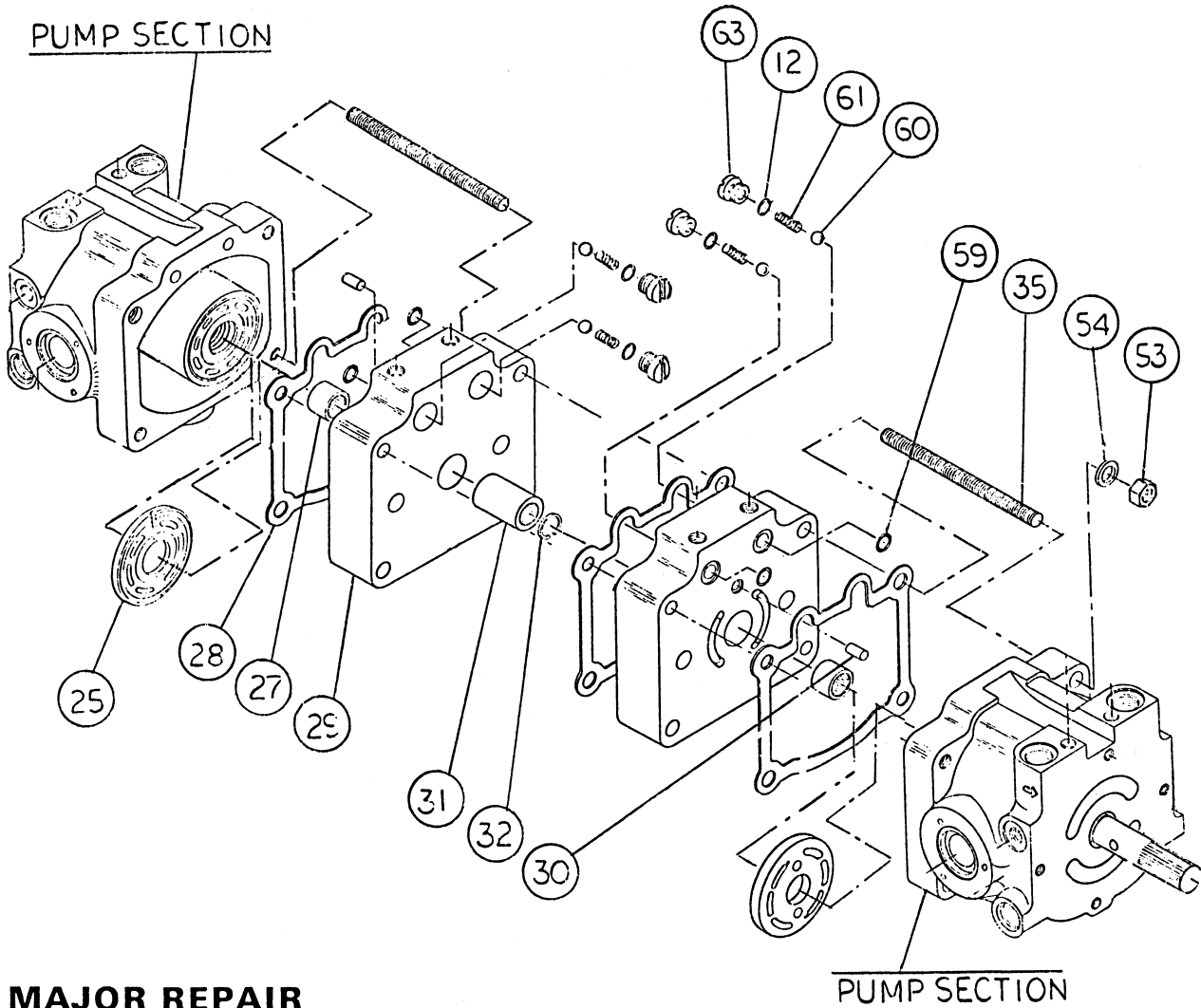


**GENERAL PARTS IDENTIFICATION,
15 SERIES, VARIABLE DISPLACEMENT PUMP**

NO.	DESCRIPTION	QTY
1	Pin-Drive	1
2	Charge Pump (Gerotor)	1
3	Bearing	1
4	Seal - Lip	1
5	Screw - Hex. Head	4
6	Housing - Charge Pump	1
7	O-Ring	1
13	Seal - Lip	2
14	Washer	2
15	Retaining Ring	2
23	Cone - Charge Relief	1
24	Spring - Charge Relief	1
25	Shims	A/R
26	O-Ring	1
27	Plug - Hex Head	1
35	Plug - Slotted Head	2
36	O-Ring	2
37	Spring - Charge Check	2
38	Ball - Charge Check	2
39	Screw - Hex Head	4
43	End Cap - Pump	1
44	Pin-Locating	1
45	Bearing	1
46	Valve Plate - Pump	1
48	Cylinder Block Kit	1
49	Thrust Plate	1
50	Spring Pin	3
51	Swashplate - Variable	1
52	Shaft - Pump	1
53	Bearing	1
54	Shaft - Control	1
56	Housing - Pump	1
58	Shaft - Trunnion	1
60	Gasket	1
64	O-Ring	2
65	Retaining Ring	1
66	Retaining Ring	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.

15 SERIES TANDEM PUMP



MAJOR REPAIR

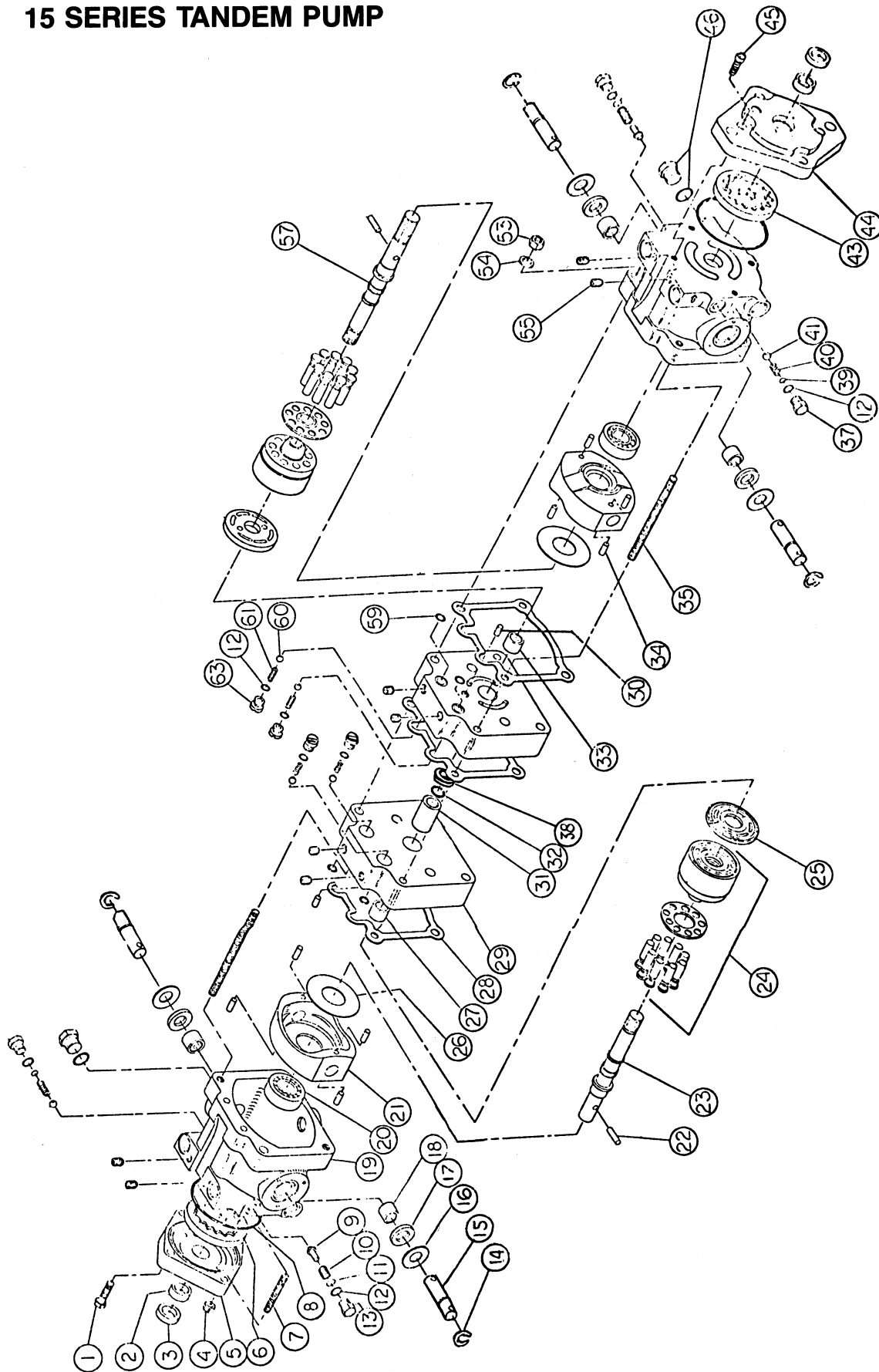
The unit can be separated into two (2) pump sections and two (2) center sections after removal of the nuts (53). Two (2) of these nuts are on each end of the pump. As the sections are separated, two (2) of the studs (35) will remain in the front pump housing and two (2) will remain in the rear housing.

As these nuts are loosened the pump sections should separate due to the internal spring loading.

It may be necessary to tap housing with soft hammer until separation occurs.

After separation, each pump section can be disassembled following the procedures outlines in the Major Repair Section for the Variable Displacement Pump.

15 SERIES TANDEM PUMP



**15 SERIES TANDEM PUMP
GENERAL PARTS IDENTIFICATION**

<u>REF NO</u>	<u>PART DESCRIPTION</u>	<u>QTY</u>
1	SCREW-HEX HD CAP	2
2	BEARING-NEEDLE	2
3	SEAL-LIP	2
4	NUT	2
5	HOUSING-CHG. PUMP	1
7	STUD	2
8	"O" RING	2
9	CONE-REL VALVE	2
10	SPRING-IMP REL	2
11	SHIM PACK	A/R
12	"O" RING	6
13	PLUG-STR. THD. HEX. HD	2
14	RING-RETAINING	4
15	TRUNNION SHAFT	4
16	WASHER	4
17	LIP SEAL	4
18	NEEDLE BEARING	4
19	VAR. HOUSING	2
20	BALL BEARING	2
21	SWASHPLATE-VAR.	2
22	STR. HDLES PIN	2
23	PUMP SHAFT	1
24	CYL BLOCK KIT	2
25	PLATE-VALVE-MOTOR	2
26	THRUST PLATE	2
27	ROLLER BEARING	2
28	GASKET	3
29	END CAP-PUMP	2
30	PIN-STR. HDLS	2
31	COUPLING	1
32	RETAINING RING	1
34	SPRING PIN	8
35	STUD	4
37	PLUG	2
38	INSERT	1
39	SHIM PACK	A/R
40	SPRING-CHG REL VALVE	2
41	BALL	6
43	GEROTOR ASS'Y	2
44	CHG. PUMP HOUSING	1
45	SCREW SOCKET HD. CAP	4
46	PLUG STR. THD HEX	2
53	NUT	4
54	WASHER	4
55	PIPE PLUG	8
57	PUMP SHAFT	1
59	"O" RING	4
61	CHECK VALVE SPRING	4
63	PLUG-CHK VAL	4

For part numbers refer to Parts List for specific Model number.

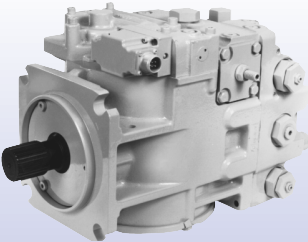
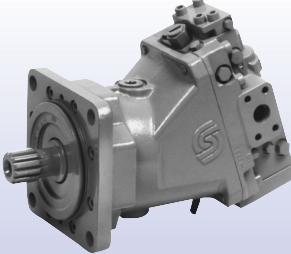
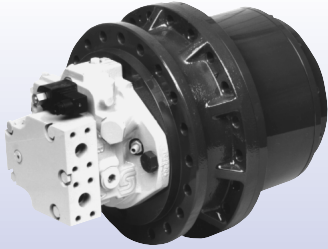
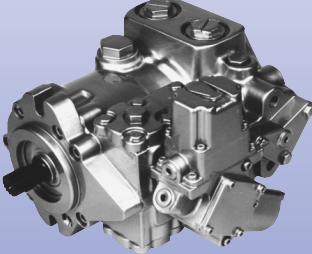
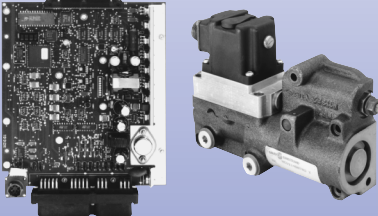
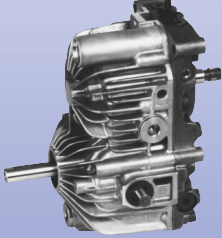
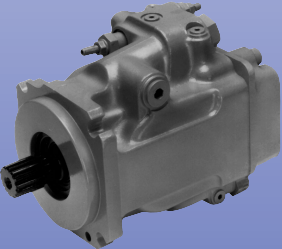
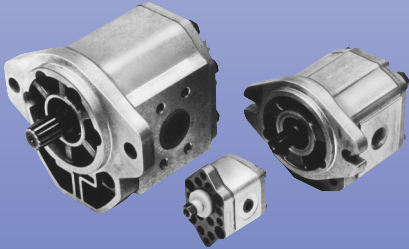
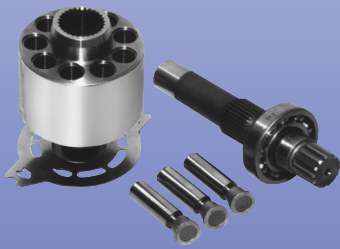
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