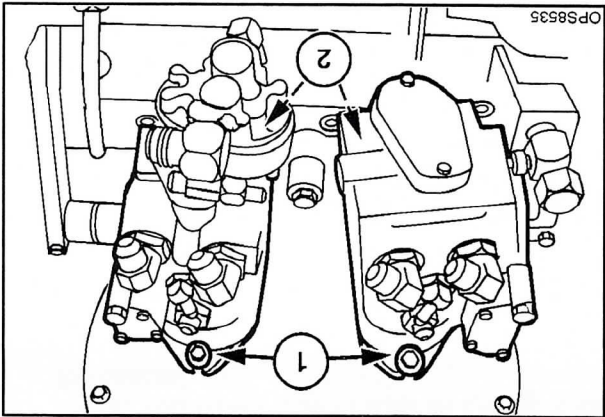
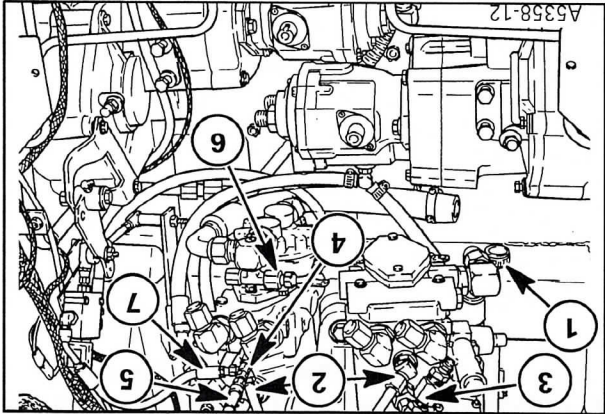


7. Install new O rings on the hydrostatic pump pilot. Support each pump assembly properly and lower them into place. Install the upper pump mounting bolts, 1, and the lower pump mounting bolts, 2. Tighten all the mounting bolts to 101 N·m (75 ft lbs).



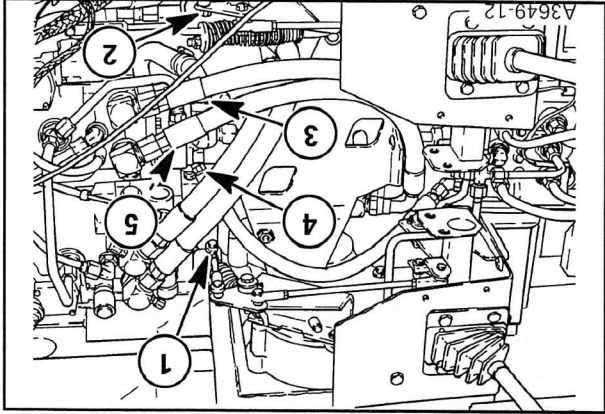
116

8. Connect the charge pump suction line, 1, the charge pressure cross tube, 2, the case drain tube, 3, the charge pressure sender line, 4, and the case drain tube, 5. If equipped, connect the two-speed solenoid valve supply line, 6, and the solenoid valve return line, 7.



117

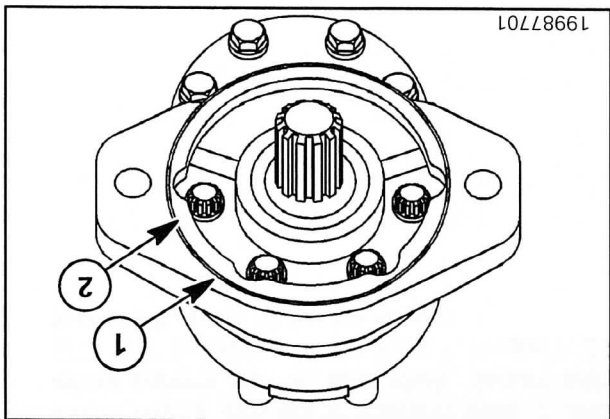
9. Connect the rear control rods, 1 and 2, at the pump control arms. Connect the hydraulic suction hose, 3, the hydraulic high pressure hose, 4. If equipped, connect the two-speed slave cylinder supply hose, 5.



118

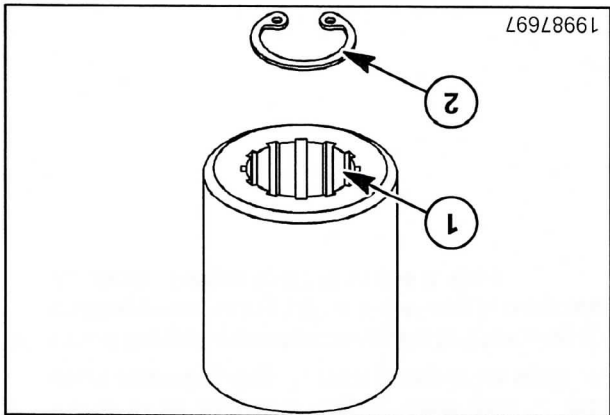
# REINSTALLATION

1. Install a new O ring, 1, on the gear pump pilot. 2. For LS180 skid steers, install the gear pump onto the hydrostatic pump, mating the splines on the input shaft.



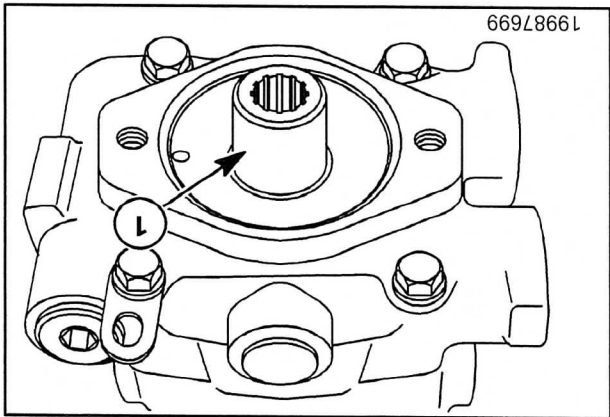
110

2. LS190 skid steers only - Install the snap ring, 1, into the groove in the center of the coupler, 2. Make sure the snap ring is secure inside the coupler.



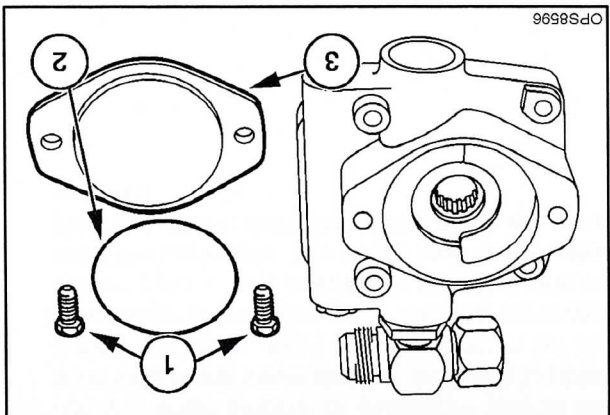
111

3. LS190 skid steers only - Install the coupler, 1, on the hydrostatic pump shaft.



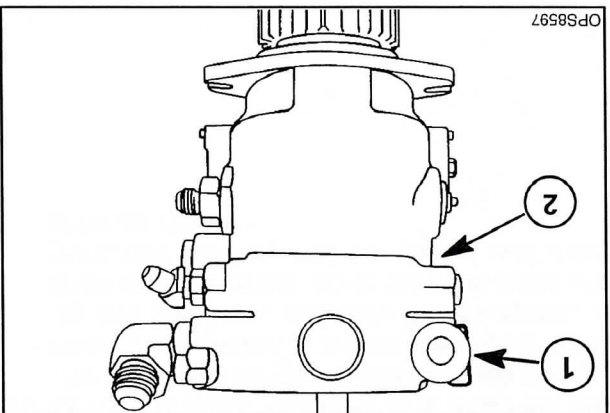
112

23. Install cover plate, 3, new O ring, 2, and attaching bolts, 1. Torque bolts to 37 - 42 N·m (27 - 31 ft lbs.).
24. Retain the backplate and charge pump adaptor (when used) with four cap screws. Torque to 37 - 42 N·m (27 - 31 ft lbs.).



105

**NOTE:** When the backplate assembly, 1, is in place, and prior to inserting bolts, a small gap (approx. 1/8") will be noticed between the pump housing gasket and backplate at 2. This is normal. Tightening the bolts brings the housing against the rotating group spring, resulting in an internal spring load to the valve plate and slippers. After torquing the retaining bolts, the shaft should turn easily with a pair of 8" pliers. The shaft should have some rolling resistance but should not be tight (locked down) or rotate easily. If it is locked down or rotates freely, the pump is assembled incorrectly and requires teardown and reassembly.



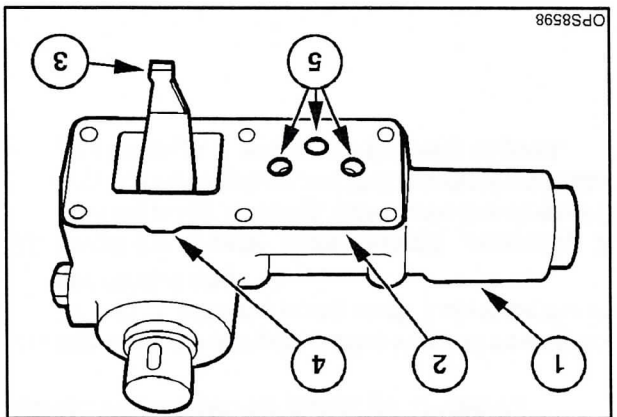
106

25. Install the servo control assembly, 1, and new servo control gasket, 2, onto the pump housing, making sure the feedback link, 3, aligns with the small groove in the servo piston.
- NOTE:** Make sure the tabs, 4, on both the servo control housing, 1, and gasket, 2, are aligned. Also note the position of the gasket over the control ports, 5.

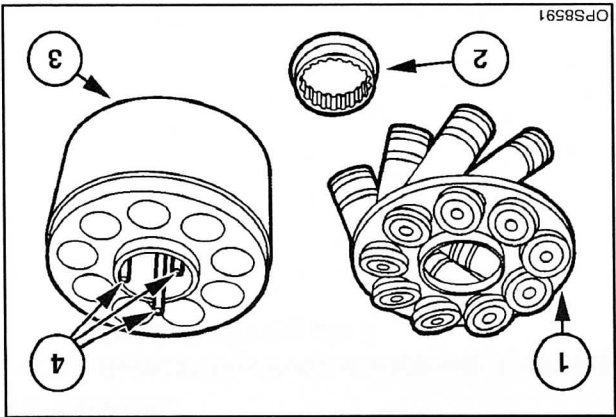
26. Retain the servo control assembly with six (6) socket head cap screws. Torque to 5 - 8 N·m (4 - 6 ft lbs.).
27. Install new O rings on all pump plugs. Install plugs into pump housing. Torque to the following specs:

- 3/4" Plugs: 28 - 32 N·m (21 - 24 ft. lbs.)
- 1-1/4" Plugs: 54 - 61 N·m (40 - 45 ft. lbs.)

107



15. Reinstall the pistons and piston plate, 1, and pivot, 2, into the piston block, 3, at the locations they were removed. Check to be sure that the pivot is resting on the loading pins, 4.



100

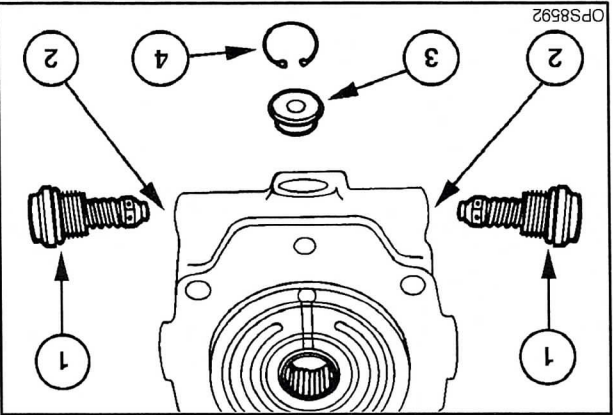
16. With the pump housing resting on its side, insert the piston block assembly into the housing. Rotate the piston block slowly to align the splines and slide together.

**NOTE:** Check to be sure that the camplate is still positioned correctly in the housing and that the piston shoes contact the camplate before proceeding.

**NOTE:** If the rotating group assembly will not easily slide over the splined shaft, DO NOT FORCE. One or more of the three loading pins may be out of their groove or the pin head is not seated properly between the washer and block. Forcing the rotating group may cause pin failure and early transmission failure.

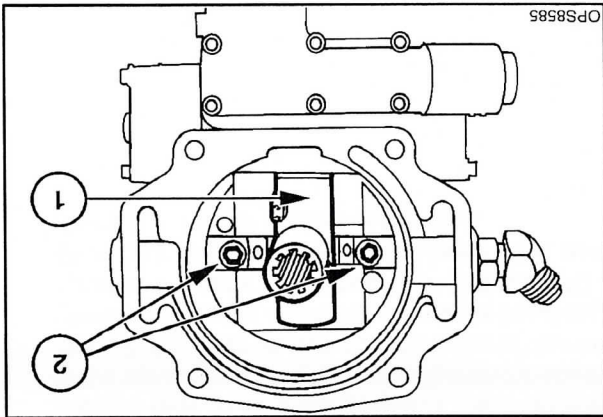
**IMPORTANT:** Make sure all mating surfaces are well lubricated with SAE 10W-30 motor oil to insure proper lubrication for start-up.

17. Install new O rings on the relief valve assemblies, 1, and install the valves at their original positions in the backplate at 2.  
18. Install a new O ring on plug, 3; install plug, and secure with retaining ring, 4.



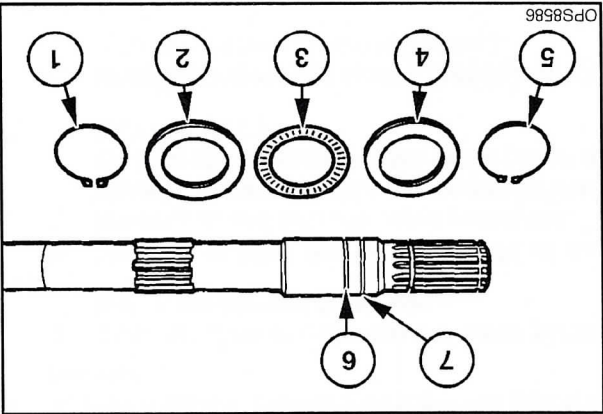
101

10. Press the cradle assembly, 1, into the pump housing making sure that the cradle and dowel bushings are firmly seated. Apply Loctite® 262 to the threads of the cradle assembly retaining bolts, 2, and torque to 34 - 38 N.m (25 - 28 ft. lbs.).



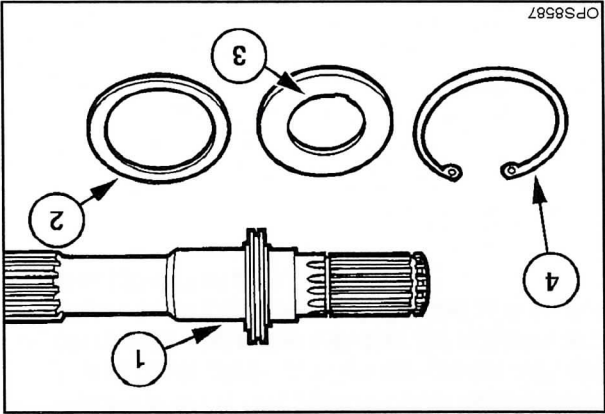
94

11. Reassemble the pump drive shaft bearing assembly by installing retaining ring, 1, in groove, 6. Next install thrust washer, 2; thrust bearing, 3; and second thrust washer, 4. Secure assembly with second retaining ring, 5, in groove, 7.



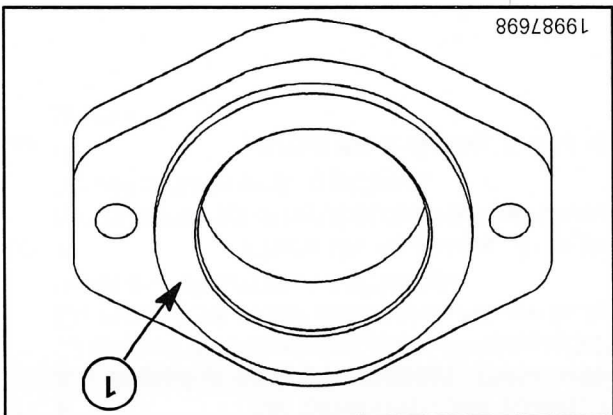
95

12. Install the shaft and bearing assembly, 1, into the pump housing. Install washer, 2, and new shaft seal, 3. Seat seal into position with a seal driver and secure with retaining ring, 4.



96

LS190 skid steers only - Inspect the mating areas, 1, of the spacer for chips or scores that could cause a leak. Replace if necessary.



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## REASSEMBLY

1. Use a suitable solvent to thoroughly clean all parts. Lay the parts on a clean cardboard and air dry.

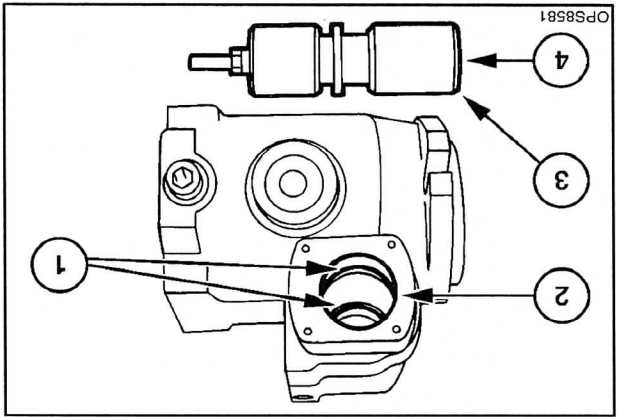
**IMPORTANT:** Due to tight tolerances and finish of internal pump surfaces, it is very important to maintain absolute cleanliness during reassembly.

2. Use clean SAE 10W-30 oil to lubricate all moving parts as they are being reassembled. Fill the transmission cases with oil through the case drain hole after completing assembly of the component.

**IMPORTANT:** Lubrication of the pump components during assembly is required to ensure lubrication oil for start-up.

3. Install the new O rings, seals, gaskets, and retaining rings provided with the repair kit.

4. If required and not done during inspection, install new needle bearings in the pump housing and backplate. Installation details are shown in the inspection area.
5. Install two new seal sub-assemblies, 1, into the servo piston housing at 2.
6. Install the servo piston assembly, 3, into the right hand side of the housing by inserting end, 4, first. Roughly center the piston in the housing.



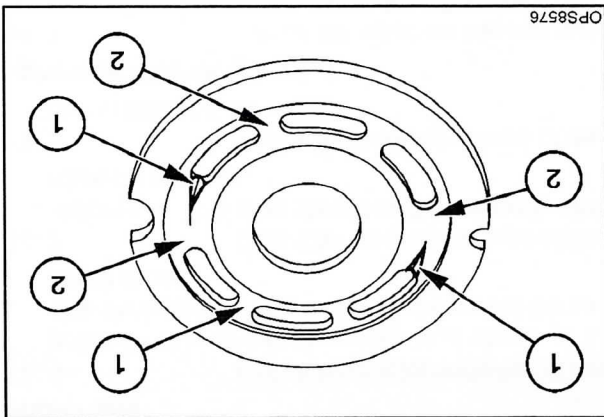
90

### Replaceable Bearing Plate

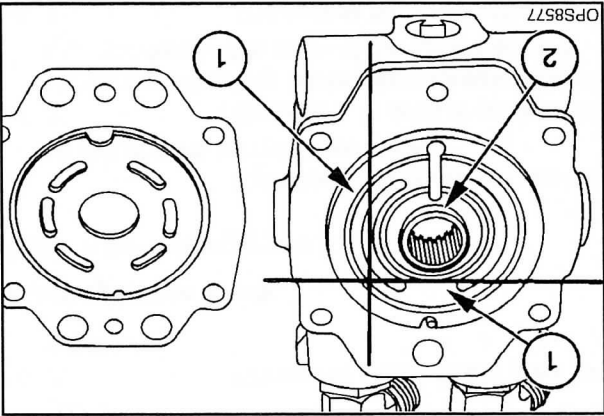
23. 1. Check for flatness.
24. 2. Check for scratches on the brass side of the plate, extending outward across the area where the raised area of the piston block contacts the plate at 1.
25. 3. Check for scratches between the kidney ports at 2.

### Back Plate

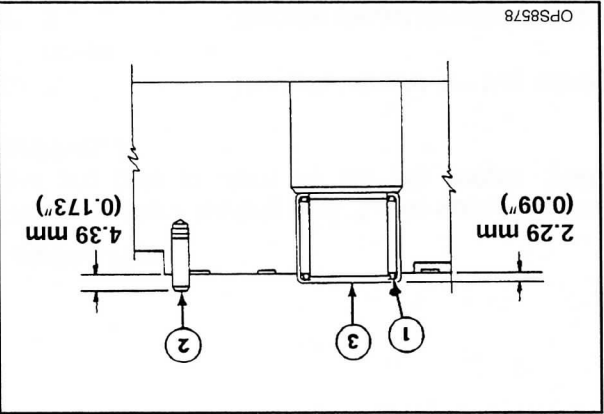
26. 1. Check the back plate for flatness, 1.
27. 2. The back plate needle bearing assembly, 2, is a press fit and should not be loose. Inspect for looseness and wear. Check that all needles are in the cage and move freely.



83



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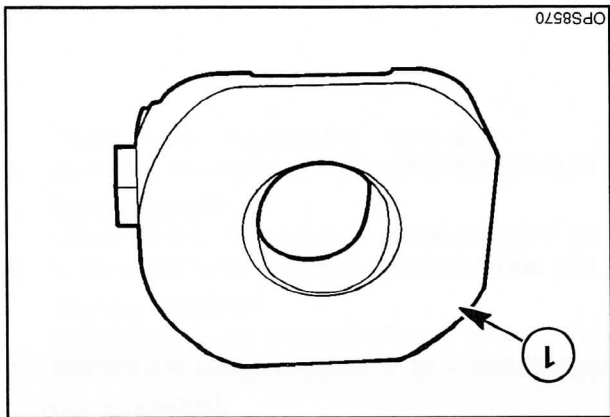


85

28. 3. Verify that the needle bearing, 1, is positioned correctly and to the dimension shown.
29. 4. Remove the needle bearing if any problems are found. Install a new bearing in the housing with the numbered end, 3, toward the valve plate. Install to dimension of 2.29 mm (0.09") above the surface of the back plate as shown. The bearing is used as a pilot for the valve plate.
30. 5. Check the back plate roll pin, 2. If the pin is tight and set to the dimension shown, replacement is not required.

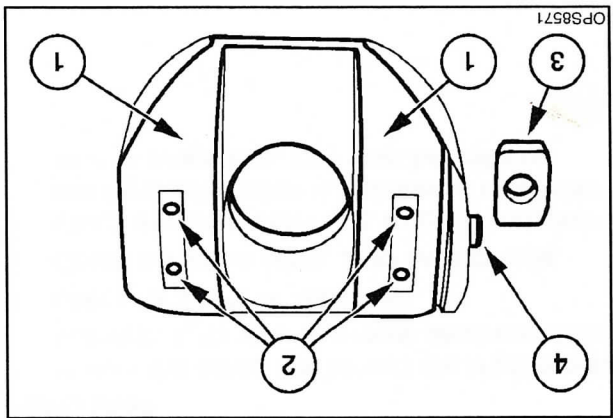
### Camplate

1. Shoes of the pump pistons rotate at high speeds against the camplate surface, 1. The surface must be smooth with no metal flaked away and no scoring. Circular scratches centered on the machined surface are due to contamination. If scratches can be felt with your thumbnail, replace the camplate.
2. Check the camplate surface for smearing. The surface must be smooth and bright with no discoloration or brass color on the flat surface.



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3. Check the camplate bushing surface, 1, for wear and transfer of coating from the cradle bushing. Replace if necessary.
4. Inspect the lubrication ports, 2, for blockage. Clean thoroughly.
5. Inspect the servo piston follower, 3, and aligning pin, 4, for wear.

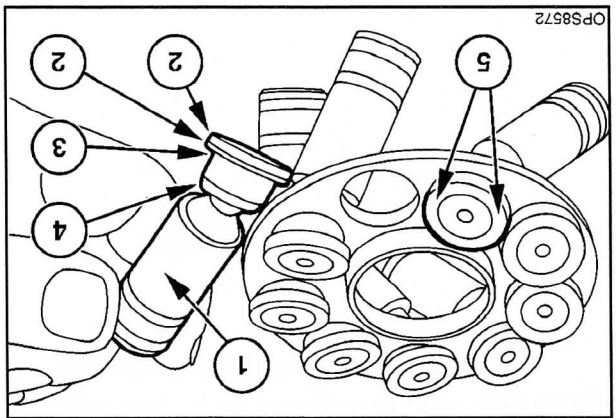


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### Shoe and Piston Assemblies

Replace the rotating group if:

1. The piston skirt area, 1, shows signs of scratches or wear.
2. The edges of the shoes, 2, are worn (shoe roll) from contact with the camplate.
3. There is wear on the underside of the slipper, between the slipper and shoe plate at 3.
4. The shoes have a loose, sloppy fit on the ball end of the piston at 4.
5. The flat surfaces of the shoes, 5, show metal flaking or are deeply scratched. Light or shallow scratches in the shoes will not cause any harm. Do not lap the shoes.



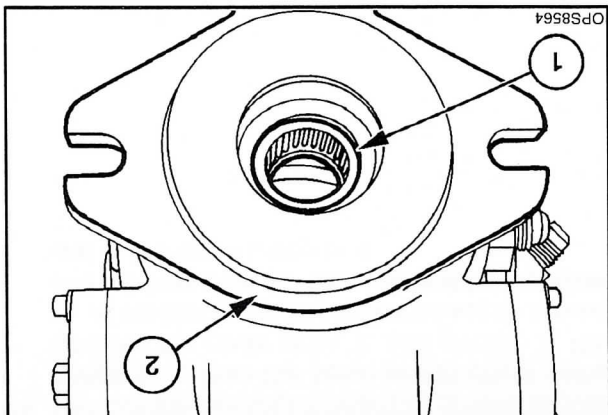
79

# PARTS INSPECTION

Clean all parts in a suitable solvent and air dry.

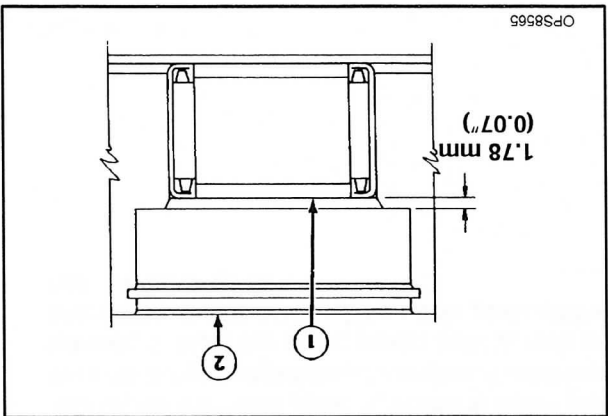
## Pump Housing

1. The shaft needle bearing assembly, 1, in the pump housing, is a press fit, and should not be loose. Inspect for looseness. Check that all needles are in the cage and move freely. Inspect the needles for wear or damage.
2. The bearing is shown with the numbered end, 1, facing out toward the flange end of the housing, facing out toward the flange end of the housing.



71

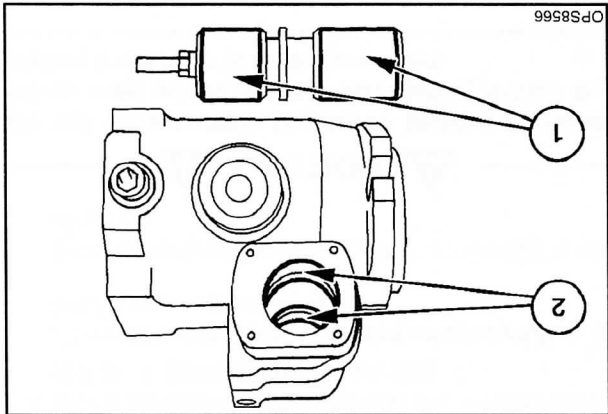
2. Verify that the bearing is positioned correctly and to the dimension shown.
3. Remove the shaft needle bearing assembly if any problems are found. Install a new bearing in the housing with the numbered end, 1, facing out toward the flange end of the housing, 2. Install to the dimension shown.



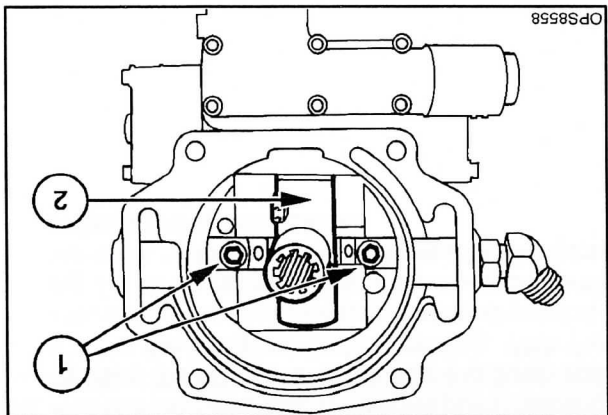
72

## Servo Control and Piston

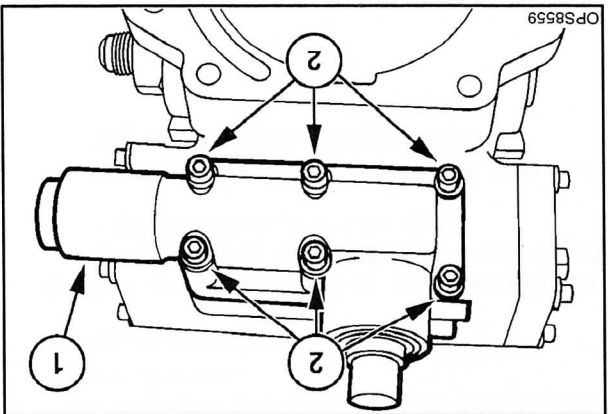
1. Inspect the servo piston, 1, and housing, 2, for scratches. All seals and gaskets should be re-placed at reassembly.



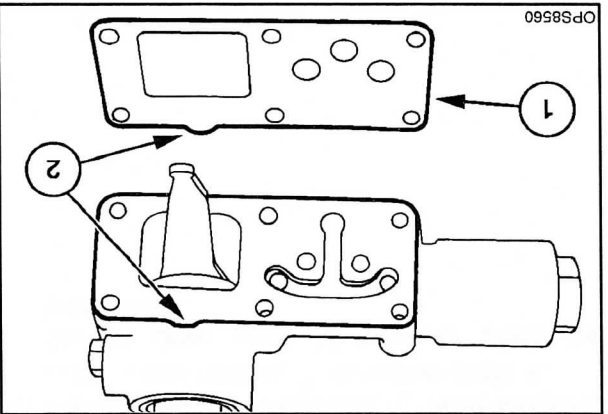
73



13. Remove the cradle assembly attaching bolts, 1, and move the cradle back and forth to release it from the dowel bushings. Remove the cradle assembly, 2.

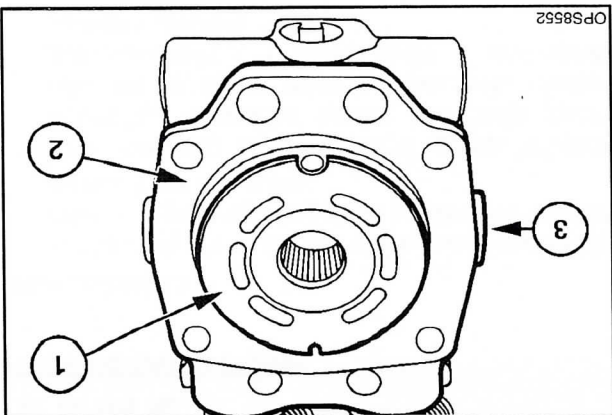


14. Remove the six socket head cap screws, 2, and the manual servo control assembly, 1.



15. Remove the servo control assembly gasket, 1. Note the position of the alignment tab, 2, on both the gasket and the servo control housing, for proper installation of the gasket during reassembly.

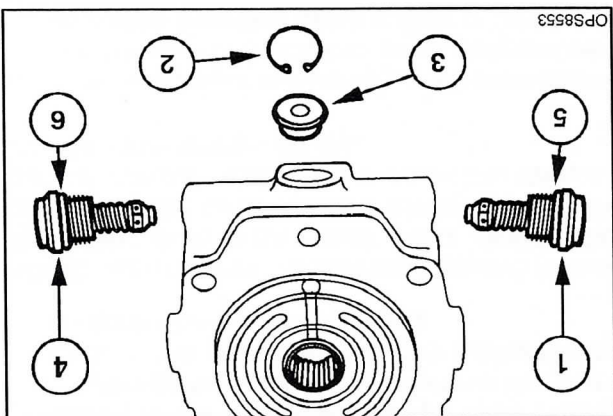
5. Remove valve plate, 1, and housing gasket, 2, from backplate, 3.
- Valve plate may stick to the rotating group in housing when backplate is removed.



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6. Mark the position of the two relief valves to aid in reassembly.

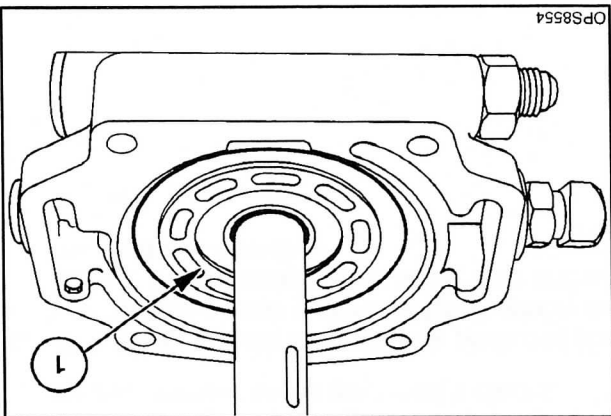
7. Remove the relief valve assemblies, 1 and 4. O-rings, 5 and 6, on the relief valves, should be removed and replaced on reassembly.
8. Remove retaining ring, 2, and plug, 3, from the backplate assembly.



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9. To remove the rotating group, 1, from the housing, set the edge of the housing on a 2 x 4 or 4 x 4 block and tilt the open end of the housing down. Turn the rotating piston block and pull it out as a complete unit without scratching or burring the parts.

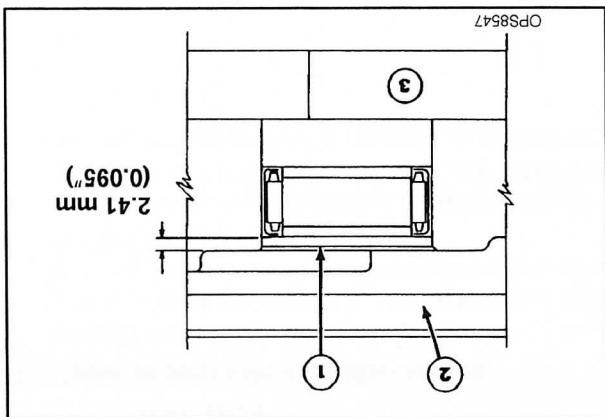
**NOTE:** Keep the rotating group as an assembly at this time.



61

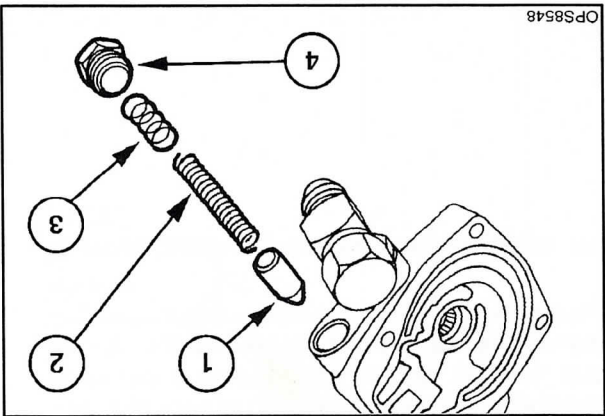
# REASSEMBLY

1. Use a suitable solvent to thoroughly clean all parts. Lay the parts on a clean cardboard and air dry.
2. Use a clean 10W-30 oil to lubricate all moving parts as they are reassembled.
3. If necessary, press a new bearing into the adaptor assembly. The bearing should be installed with the numbered end, 1, facing outward and closest to the mounting flange, 2. The gerotor pocket is located at 3. Install to a dimension of 2.41 mm (0.095").



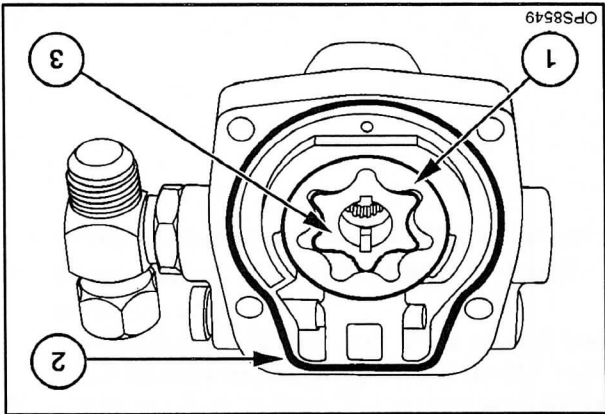
54

4. Install the relief valve poppet, 1, spring, 2, shims, 3, and plug, 4, with new O ring, into the adaptor assembly. Torque the plug to 37 - 41 N·m (27 - 30 ft. lbs.).



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5. Lubricate both a new molded O ring, 2, and the outer gerotor ring, 1; install in adaptor assembly. Upon reassembly to the main pump housing, the inner gerotor ring, 3, and drive key will be installed on the pump shaft prior to installing the charge pump adaptor assembly.
6. The four retaining cap screws are torqued to 37 - 42 N·m (27 - 31 ft. lbs.).

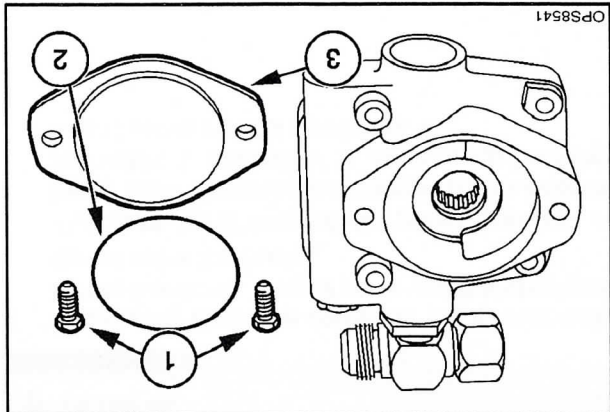


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# HYDROSTATIC CHARGE PUMP

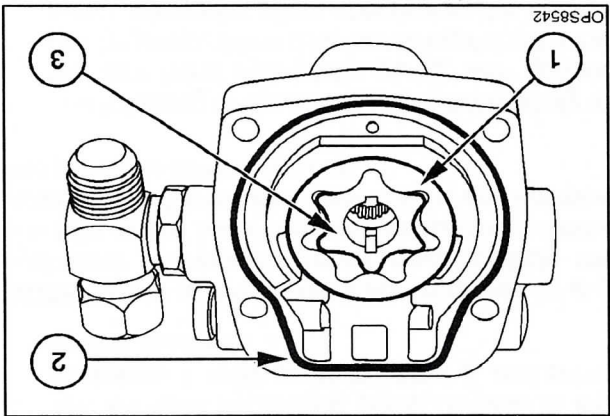
## DISASSEMBLY

1. Thoroughly clean the charge pump to prevent contamination of internal parts.
2. Remove two cap screws, 1, cover plate, 3, and O ring, 2.



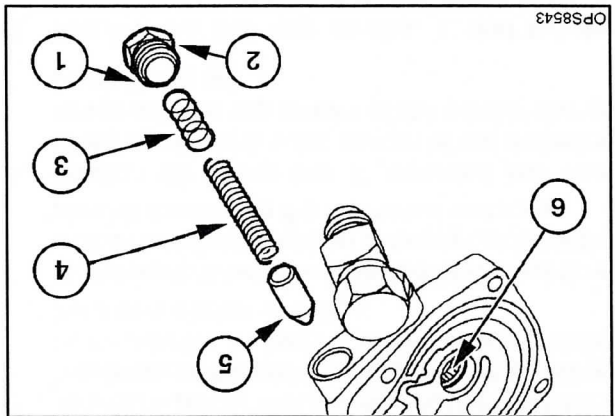
48

3. Remove the inner gerotor ring, 3, the outer gerotor ring, 1, and molded O ring, 2. If the inner gerotor ring, 3, stays on the shaft, remove it and the drive key. If not, remove the drive key and set with the charge pump assembly.



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4. Remove the relief valve assembly which consists of: plug, 1, O ring, 2, shims, 3, spring, 4, and poppet, 5.
5. The needle bearings, 6, are a press fit in the adapter housing. Do not remove at this time unless the bearing is loose in the housing or if there are loose, damaged or missing needles.



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