Outlet End Cover

Remove the regenerative valve, Figure 99, by removing the plug (18), spring (19), and poppet (20).

Remove the back pressure relief valve, Figure 99, by removing the acorn nut, and jam nut (1). Back out the adjusting screw (2) and remove the spring (4) and poppet (5) from the bore.

Remove the backpressure unload valve, Figure 99 by removing the acorn nut, and jam nut (16). Back out the adjusting screw (14) and remove the spring (12) and poppet (19).

C. INSPECTION

Before inspecting the components of the lift control valve, clean all parts in a suitable solvent and thoroughly flush all passages in the valve sections and end covers. Dry the parts with compressed air.

Spools and Valve Sections

1. Inspect the spools, Figure 98 and the spool bores in the valve sections for scratches, wear, and damaged lands. If the spools or bores are worn, badly scratched, or the lands are damaged, a complete new section must be installed as the spools are matched to the bores. Reconditioning is not recommended because special machining and test stand facilities are required.

2. Check the centering springs for "set" by visually comparing the length to a new spring. Install new springs if necessary.

3. Check the backup seals for wear or damage. Install new seals where required.

4. Install new O-Rings.

System Relief Valve and Circuit Relief Valves

The system relief valve and circuit relief valves are serviced as individual parts or as assemblies. The assembled units are pre-set for pressure; however, they should be tested upon installation. Inspect the parts and replace the components needed unless there is a general worn appearance throughout the valve.

Check to make sure that the piston, poppet, and sleeve poppet each move freely within the body and return to the normal extended position. With a small soft rod, depress the sleeve poppet fully into the body. When the rod is quickly removed, the sleeve poppet should snap back to the extended position. Repeat this procedure for the poppet and piston. If any of these fail to snap back to the extended position, disassemble the valve and:

1. Check all O-Rings and back-up rings for wear, damage, or swelling. Mating parts must move freely with the O-Rings and back-up rings installed.
2. Inspect the inside of the sleeve poppet for evidence of wear caused by the poppet O-Ring and back-up ring. A slight groove will cause the poppet to stick open when operating under pressure, yet the poppet may move freely when depressed by hand.

3. Inspect the ground seating surface of the piston for scores or excessive wear. The piston should be free of scores and abrasions.

4. Inspect the pilot poppet seat in the plug and the seats on the pilot poppet. These seats should show a complete seating surface.

5. Visually check the springs for "set" by comparing their lengths to new springs. Install new springs if necessary.

Check Valves

Check valve malfunctioning is usually the result of foreign material lodging between the seat and the poppet.

1. Examine the seat surface for dirt or metal particles. Check the seating surfaces for nicks or scratches.

2. Minor nicks and scratches can be removed by using a fine lapping compound. Care must be exercised to prevent lapping compound from entering and remaining in the valve body.

Regenerative Valve and Backpressure Valve

Malfunctioning of the regenerative valve usually is the result of foreign material lodging between the seat and poppet.

1. Examine the seat surface for dirt or metal particles. Check the seating surface for nicks or scratches.

2. Minor scratches and nicks can be removed using a fine lapping compound. Exercise care to prevent lapping compound from entering and remaining in the valve end cover.

3. Remove the O-Ring from the backpressure poppet and install a new O-Ring.

4. Install new O-Rings on the valve plugs.

Backpressure Relief and Unload Valves

1. Inspect the seats for nicks and scratches. Minor nicks and scratches can be removed with a fine lapping compound; however, care must be exercised to prevent lapping compound from entering and remaining in the end cover.

2. Check the springs for "set" by visually comparing them to new springs. Install new springs if necessary.

D. ASSEMBLY

System Relief Valve and Circuit Relief Valves

Refer to Figure 96 and proceed as follows:

1. Install a new O-Ring on the poppet (4), and install the poppet in the sleeve (3).

2. Install the piston (5) into the poppet (4).

3. Install a new O-Ring on the plug (7) and install the spring (6) into the plug. One end of the spring has a larger O.D. and should be placed into the plug.

4. Assemble the sleeve and plug and install the assembly into the cap (2).

5. Insert the pilot poppet (8) and spring (9) into the plug and install the adjusting screw (10), washer (11), jam nut (12) and acorn nut (13).

NOTE: The system relief valve and circuit relief valves must be pressure checked and adjusted upon installation. Refer to Chapter 4, Section 2, for procedures.

6. Install a new O-Ring on the cap and secure the assembly into the valve body.

Spools

1. Lubricate the spool with a light coat of hydraulic oil and position the O-Ring, wiper, and retainer plate on the spring end of the spool.

2. Install the centering spring and caps and secure the retaining screw so that the screw will not loosen during operation.
NOTE: Apply 2 drops of loctite, Ford part number 251152, to the retaining screw threads and torque to specification, page 129.

3. Insert the eye end of the spool into the valve body. DO NOT force the spool through the bore. A slight twisting motion will relieve binding. Before the spool is inserted completely, start the O-Ring and wiper into the valve body recess.

4. With the O-Ring and wiper fully inserted in the valve body, insert the spool fully into the bore and position the seal plate at the spring end of the spool.

5. Position the O-Ring and wiper over the eye end of the spool and insert them into the recess in the valve body. Secure the seal plate at the eye end with the screws previously removed.

6. Install the cap at the spring end and secure it with the screws previously removed.

Regenerative Valve and Backpressure Valve

Install the poppet into the outlet and cover. Install the spring, O-Ring and plug. Tighten the plug securely.

Backpressure Relief and Unload Valves

Insert the poppet and spring into the end cover. Install the adjusting screw, washers, jam nut, and acorn nut. Turn the unload valve adjusting screw inward until it "bottoms."

NOTE: Upon installation, the backpressure relief and unload valves must be pressure checked and adjusted. Refer to Chapter 4, Section 2, for procedures.

Section Assembly

1. Install a nut on one end of each tie rod and insert the tie rods into the inlet end cover.

2. Install a new O-Ring on the inlet end cover and place the actuating valve section onto the tie rods and seat it on the inlet end cover, Figure 100.

3. Install the check valve and spring and a new O-Ring as shown.

4. Install the other two valve sections and outlet end cover in the same manner.

5. Install the remaining nuts on the tie rods, tightening them to the specified torque.

Figure 100

Lift Control Valve Disassembly

1. Tie Rods
2. Check Valve Spring
3. O-Ring
4. Inlet End Cover

E. INSTALLATION

1. With the assistance of another person, or hoist, and with the use of a sling; lower the valve into position so the valve-to-support bracket attaching bolts, nuts, and washers can be installed.

2. Starting at one side of the valve, connect the tubing to the valve.

3. Connect the crossover tube and lift supply hose, Figure 93 to their respective fittings.

4. Connect the control arms to the spools by installing the clevis pins and cotter pins.
5. Check the system for leaks and purge air from the system by operating the backhoe through several complete cycles.

NOTE: If service was performed on the system relief valve, any of the circuit relief valves, backpressure relief valve, or backpressure unload valve, the pressures must be checked and adjusted as described in Chapter 4, Section 2.

6. Check the hydraulic oil level in the reservoir. If necessary, add oil until the level reaches the full mark on the dipstick.

7. Install the rear deck plate.

MAIN CONTROL VALVE
(CURRENT PRODUCTION)

Removal and installation of the current lift control valve Figure 101, is identical to the prior lift control valve. Removal is covered on page 60 steps 1 through 7. Installation is covered on page 65 steps 1 through 7.

The prior lift valve and the current lift valve are similar in appearance however components are not interchangeable. The current lift valve, except for end covers, is similar to the series 765 backhoe control valve. The main and circuit relief valves are the same as on the series 765 backhoes, however pressure settings are different.

CAUTION: Make sure that the backhoe structural components are properly supported to prevent slipping when the hydraulic lines and hoses are disconnected. Remove pressure in the system by actuating the control levers several times with the engine off.

---

DISASSEMBLY

Since the spools are selectively fitted to their respective sections, they are not serviced separately. If a spool or valve section requires replacement, the complete valve section assembly must be replaced. All other parts are serviced individually. The system and circuit relief valves are serviced as assemblies.

Due to the close tolerances between the valve spools and their respective valve sections, it is important that the spools and sections be kept in order so that the spools can be installed in their original bores during assembly. Equally important is the installation of plugs in ports of the valve body to prevent the entry of dirt and foreign material.

The valve body should be cleaned externally with a suitable solvent before disassembly.

1. Remove a nut from either end of each tie rod, Figure 102. If possible, it would be desirable to remove the nuts from the outlet end cover end of the tie rods, as shown.

---

Figure 101
1. Cross-over Tube
2. Supply Tube
3. Return Oil Tube

Figure 102
Lift Control Valve — Current
1. Tie Rod Nuts
2. Outlet End Cover
3. Inlet End Cover
2. Separate the control valve by removing one section at a time beginning with the outlet end cover. After removing each section, remove the check valve spring (2), and poppet (3), Figure 103 and the O-Ring (5). Place the sections on a clean surface. Take note of the order in which the sections are removed.

**Figure 103**
Check Valve — Exploded View

1. Valve Section  
2. Check Valve Spring  
3. Check Valve  
4. Inlet End Cover  
5. O-Ring

**Figure 104**
Lift Control Valve

1. Main Relief Valve  
2. Locknut  
3. Inlet End Cover  
4. Crowd Cylinder Section  
5. Lift Cylinder Section  
6. Bucket Cylinder Section  
7. Power Beyond Port

**Valve Sections**

All of the valve sections are basically identical in construction. Note that the sections are stacked identically for the four lever control model and two lever control model, see Figure 104.

**Inlet End Cover**

1. Remove the system relief valve, Figure 104 by grasping the largest hex with an appropriate wrench and unscrewing.

2. Loosen the locknut (18) Figure 105, and remove the adjusting cap (9). Remove the adjusting plug (8), shims (if used), spring (7), and pilot poppet (16). Separate the fitting (6) from the body (10) and remove the sleeve spring (14). Remove the sleeve poppet (2) from the body and remove the spring (4). Remove the piston (13); and poppet (3) from the sleeve poppet.

**Circuit Relief Valves**

The crowd cylinder, lift cylinder and bucket cylinder piston ends and rod ends are equipped with circuit relief valves, see Figure 106. The circuit relief valves and main relief valve are identical except for pressure settings. For disassembly of the circuit relief valves, refer to the inlet end cover section Figure 105.

**NOTE:** Before removing the circuit relief valves, they should be tagged and identified as to which section and end they are installed in.
Valve Spools

All control valve spools are removed from the valve body, centering spring end first and contain basically the same components.

IMPORTANT: Always mark the valve section as to which end receives the spool eye. Because the spool is round, it may be inserted into either end of the valve body. Installing the spool in the wrong end of the bore should be avoided, as the spool and bore acquire a definite wear pattern.
Outlet End Cover

1. Remove the regenerative check valve, Figure 108 by removing the plug (1), and spring and poppet (2).

2. Remove the backpressure unload valve assembly (7), Figure 108.

3. Disassemble the backpressure unload valve, Figure 61, by removing the plug (12), shim(s) (11), spring (10), poppet rod (9), and poppet (8).

4. Remove the backpressure valve (18), Figure 108, by removing the plug (20), spring (19). Remove the O-ring (13) from the backpressure valve bore in the outlet end cover.

NOTE: For easy removal of the backpressure valve, thread a 8-32 screw (1) into the outer hole on the end of the valve (2) a couple of turns, then pulling the assembly out, as shown in Figure 109.

5. Remove the backpressure relief valve, Figure 108, by removing the plug and O-ring (14), shim(s) (15), spring (16), and poppet (17).

6. Remove the other two plugs and O-rings in the outlet end cover so that it can be thoroughly cleaned.
C. Inspection

Before inspecting parts, they should be cleaned in a suitable solvent. Also, thoroughly flush all passages in the valve sections and end covers. Dry the parts with compressed air.

Spools and Valve Sections

1. Inspect the spools and the spool bores in the valve sections for scratches, wear, and damaged land. If the spools are badly scored, worn, or the lands are damaged, a complete new section must be installed as the spools are matched to the bores. Reconditioning is not recommended because special machining and test stand facilities are required.

2. Check the centering springs for "set" by visually comparing the length to a new spring. Install new springs if necessary.

3. Check the spool wiper seals for wear or damage. Install new seals where required.

4. Install new O-rings.

System and Circuit Relief Valves

The system and circuit relief valves are serviced as assemblies. The assembled units are pre-set for pressure; however, they should be pressure tested after installation on the unit. External O-rings and backup rings are serviced individually.

Check to make sure that the piston, poppet, and sleeve poppet each move freely within the body and return to the normal extended position.

With a small soft rod, depress the sleeve poppet fully into the body. When the rod is quickly removed, the sleeve poppet should snap back to the extended position. Repeat this procedure for the poppet and piston. If any of these fail to snap back to the extended position, disassemble the valve, Figures 105.

1. Check all O-rings and back-up rings for wear, damage, or swelling. Mating parts must move freely with the O-rings and back-up rings installed.

2. Inspect the inside of the sleeve poppet for evidence of wear caused by the poppet O-ring and back-up ring. A slight groove may cause the poppet to stick open when operating under pressure, yet the poppet may move freely when depressed by hand.

3. Inspect the ground seating surface of the piston for nicks or excessive wear. The piston should be free of nicks and abrasion.
4. Inspect the pilot poppet seat in the poppet fitting and the seats on the pilot poppet. These seats should indicate a complete seating surface.

5. Visually check the springs for "set" by comparing their lengths to new springs.

Check Valves

Check valve malfunctioning is usually the result of foreign material lodging between the seat and check valve. The spring may also be damaged. Refer to Figure 103.

1. Examine the seat surface for dirt or metal particles. Check the seating surfaces for nicks or scratches.

2. Minor nicks and scratches can be removed by using a fine lapping compound. Care must be exercised to prevent lapping compound from entering and remaining in the valve body.

Regenerative Check Valve

Malfunctioning of the regenerative check valve usually is the result of foreign material lodging between the seat and poppet. Refer to Figure 108.

1. Examine the seating surfaces for dirt and metal particles, nicks or scratches.

2. Minor scratches and nicks can be removed by using a fine lapping compound. Exercise care to prevent lapping compound from entering and remaining in the outlet end cover.

3. Install a new O-ring on the valve plug.

Backpressure and Backpressure Relief Valves:

Refer to Figure 108.

1. Inspect the seats for nicks and scratches. Minor nicks and scratches can be removed with a fine lapping compound; however, care must be exercised to prevent lapping compound from entering and remaining in the outlet end cover.

2. Check the backpressure valve and its bore for scratches, wear, and a groove worn by the O-ring. Replace if necessary.

3. Check the springs for "set" by visually comparing them to new springs. Install new springs if necessary.

4. Remove the backpressure valve O-rings from the bore in the outlet end cover. Replace all O-rings with new ones.

Backpressure Unload Valve

NOTE: Individual parts, except for external O-rings and seals, are not serviced. The valves are serviced as pre-set assemblies.

1. Inspect the seats for nicks and scratches. Minor nicks and scratches can be removed with a fine lapping compound; however, care must be exercised to prevent lapping compound from entering and remaining in the outlet end cover.

2. Check the spring for "set" by visually comparing them to new springs.

3. Remove all O-rings and the back-up ring. Replace with new parts.

D. ASSEMBLY

System and Circuit Relief Valves

NOTE: Individual parts, except for external O-rings and seals, are not serviced. The valves are serviced as pre-set assemblies.

Refer to Figure 105 and proceed as follows:

1. Install an O-ring (12) and a new back-up ring (11) on the poppet (3) and install the poppet in the sleeve (2), tapered end first. The back-up ring should be nearest the tapered end as shown.

2. Install the piston (13) into the poppet (3).

3. Install an back-up ring, O-ring and another back-up ring on the small end of the poppet fitting (6) and an O-ring on the large threaded diameter. Install the spring (4) into the fitting. One end of the spring has a larger O.D. and should be placed into the fitting.

4. Place the spring (14) on the sleeve and assemble the sleeve and fitting. Install the assembly into the body (10) and tighten 75 lbs. ft. (102 Nm).
5. Insert the pilot poppet (16) and spring (7) into the fitting.

6. Install an O-ring (17) on the adjusting plug (8). Assemble the locknut (18) on the fitting end and insert the adjusting plug and secure with the adjusting cap (9).

7. Install a new O-ring on the end of the circuit relief valve and install in the valve body. Tighten to 75 lbs. ft. (102 Nm).

NOTE: The system and circuit relief valves must be pressure checked and adjusted. Refer to page 100 for procedures.

Spools

Refer to Figure 107.

1. Lubricate the spool (4) with a light coat of M2C-48A hydraulic oil.

2. Insert the eye end of the spool into the valve body. DO NOT force the spool through the bore. A slight twisting motion will relieve binding.

NOTE: The valve body has the letters “A” and “B” cast or stamped on one side near the high pressure ports. The “A” port will be on top of the “B” port when reassembled. Therefore, the “A” port is closest to the spool eye end and “B” is closest to the spool centering spring end.

3. Install a new O-ring (13), spool wiper (12), and then the seal plate (3) on the centering spring end of the spool.

4. Install the centering spring (11) and spring seats (2) and secure with the retaining bolt (10). Tighten to 48 lbs. in. (5.4 Nm).

NOTE: Apply 2 drops of Loctite Ford part number 251152 to the retaining screw threads before installing.

5. With the O-ring and wiper fully seated in the valve body, position the seal plate on the seals and install the cap (1). Secure with the two screws.

6. Install a new O-ring (7) and spool wiper (8) on the eye end of the spool and insert them into the recess in the valve body. Secure with the seal plate (9) and two screws.

Outlet End Cover

1. Install the regenerative check valve poppet and spring (2), Figure 109, in the outlet end cover. Install the plug and O-ring (1). Tighten to 60 lbs. ft. (91 Nm).

![Figure 109](image)

Removing Backpressure Valve Assembly

1. 8-32 Screw
2. Backpressure Valve Assembly
3. Outlet End Cover

2. Install the backpressure relief poppet (17), spring (16), shims (15), if any, and the plug and O-ring (14). Tighten 10 lbs. ft. (14 Nm).

3. Install the O-ring (13) in its groove inside the backpressure valve bore in the outlet end cover.

4. Install the backpressure and relief valve assembly (18) into its bore in the outlet end cover and secure with the spring (19), and O-ring and plug (20). Tighten to 100 lbs. ft. (135 Nm).

5. Install the back-up ring (5) and then the O-ring (4) on the small end of the unload valve body. Install the other two O-rings (6) on the larger O.D.'s.

6. Install the poppet (8), poppet rod (9), spring (10), shim(s) (11), if any, and O-ring and plug (12). Tighten to 15 lbs. ft. (20 Nm).
7. Install the unload valve assembly in the outlet end cover and tighten to 50 lbs. ft. (68 Nm).

**NOTE:** Upon installation, the backpressure relief and unload valves must be pressure checked and replaced if necessary. Refer to page 104.

**Valve Section Assembly**

The valve sections are stacked the same for two lever controls and four lever controls. Make sure to reassemble the valve sections in their proper sequence, inlet end cover, bucket, lift, crowd sections and outlet end cover.

1. Install a nut on one end of each tie rod and insert the tie rods into the inlet end cover.

**NOTE:** The two tie rods (3), Figure 102, have 7/16"-20 thread ends. Tie rod (4) has a 1/2"-20 thread end. Install accordingly.

2. Install a new O-ring on the inlet cover and place the appropriate valve section on the tie rods and seat it on the inlet cover.

3. Install check valve and spring and a new O-ring.

4. Install the other valve sections and outlet cover in the same manner.

5. Install the nuts on the tie rod ends. Tighten the 7/16" tie rods to 50 lbs. ft. (68 Nm) and the 1/2" tie rod to 75 lbs. ft. (102 Nm).

**E. INSTALLATION**

Installing the prior or current valve is the same see page 65, steps 1 through 7 in the proper valve section for installation instructions.

**NOTE:** After installing the control valve, operate the backhoe through several cycles to purge air from the system and check for leaks. Operate the engine at idle speed only.

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**SWING CONTROL VALVE**

(Used with Both Prior and Current Backhoe Control Valves)

**A. REMOVAL**

1. Remove the rear deck plate to gain access to the valve.

2. Make sure the stabilizer pads are resting on the floor so the stabilizers will not drift down when the tubes are disconnected. Then, relieve any pressure that may be in the system by actuating the control levers back several times with the engine stopped.

3. Disconnect the control arms from the valve spools and remove the control arm assembly.

4. Remove the valve to support bracket attaching bolts.

5. Remove the crossover tube return tube, and swing supply hose, Figure 110. Cap all openings.

6. With the assistance of another person, or hoist, support the valve with a sling. Then, starting at one side of the valve, disconnect all tubes and hoses from the valve. Cap the openings. Flared tubing wrenches which have been modified or close clearance work will make hose and tube removal easier.

7. Remove the valve by lifting it out through the top of the frame.

---

**Figure 110**

**Swing Valve**

1. Supply Tube
2. Swing Valve
3. Control Linkage
4. Cross Over Tube
5. Return Tube
6. Attaching Bolts
B. DISASSEMBLY

Because the spools are a select fit in the body of the swing control valve, Figure 111, the spools cannot be serviced separately if a spool, or the body, requires replacement, the complete valve assembly must be replaced. All other parts are serviced separately except that the system relief valve circuit relief valves, and cushioning valves may also be serviced as assemblies.

Cushioning Valve Manifold

The cushioning valve manifold, Figure 111, generally does not require removal other than to gain access to the swing spool check valve. To remove the manifold merely remove the four ferry head attaching screws.

Spools

Because of the close tolerances between the valve spools and body, it is important that the spools and spool locations are identified prior to removal so the spools can be installed in their respective bores during assembly. Equally important is the installation of plugs in the ports of the valve body to prevent the entry of dirt. The body should be cleaned externally with a suitable solvent before disassembly. Refer to Figure 112 and proceed as follows:

1. Remove the top plate (13) from the top of the valve body.
2. Remove the spring cap (2) from the opposite end of the spool.
3. Grasp the spring end of the spool and pull it from the valve body.
4. Clamp the spool eye in a soft-jawed vice and remove the spring retaining screw (3), retainers (4) and (6), and spring (5).
5. Remove the bottom plate (7), wiper (8), and O-Ring (9).
6. Remove the wiper (11) and O-Ring (10) from the recess in the top of the valve body.

Figure 111
Swing Control Valve

1. System Relief Valve
2. Right Stabilizer Spool
3. Left Stabilizer Spool
4. Swing Spool
5. Circuit Relief Valve
6. Check Valve
7. Swing Cushioning
8. Inlet Port
9. Circuit Relief Valve
10. Check Valve

Figure 112
Valve Spool Disassembled

1. Cap Screw
2. Cap
3. Screw
4. Retainer
5. Spring
6. Retainer
7. Plate
8. Wiper
9. O-Ring
10. O-Ring
11. Wiper
12. Spool
13. Plate
14. Screw
System Relief Valve

1. Remove the acorn nut (1), Figure 113, washers (2) and (4), and jam nut (3).

2. Back out the adjusting screw (5) and remove the spring (6) and pilot poppet (7).

3. Remove the plug (8) from the valve body, then remove the spring (12), piston (13), poppet (14), and sleeve (17).

2. Remove the cap (12), Figure 114 from the plug (5) and remove the spacer (11), shims (8) and (9), spring (10), and poppet (6).

Check Valves

There are five check valves located in the swing control valve as shown in Figure 114 (only two shown). Remove the plug, spring, and poppet.

![CUSHIONING VALVE](image1)

Figure 114

Circuit Relief and Cushioning Valves

1. Back-up Ring
2. O-Ring
3. Back-up Ring
4. O-Ring
5. Plug
6. Poppet
7. Shim
8. Shim
9. Spring
10. O-Ring
11. Plug

C. INSPECTION

Before inspecting the components of the swing control valve, clean all parts in a suitable solvent and thoroughly flush all passages in the valve body. Dry the parts with compressed air.

Spools and Body

1. Inspect the spools, Figure 112 and the spool bores in the valve body for scratches, wear, and damaged lands. If the spools or bores are worn, badly scratched, or the lands are damaged, a complete new control valve must be installed as the spools and valve bodies are matched assemblies. Reconditioning is not recommended because special machining and test stand facilities are required.

Swing Relief Valves and Swing Cushioning Valves

1. Remove the valve assembly from the swing control valve body.
2. Inspect the spool check valves, Figure 111 for nicks or burrs. Remove burrs with fine emery cloth.

3. Check all springs for “set” by comparing them with new springs. Install new springs where necessary.

4. Check the spool wipers for damage. Install new wipers where necessary and install new O-Rings.

**System Relief Valve**

The system relief valve, Figure 113, can be serviced as an assembly or individually. If wear is evident throughout the system relief valve, replace the entire assembly.

1. Inspect the sleeve (17) for damage and wear.

2. Direct a bright light into the sleeve to make sure the small connecting holes are not plugged, or if the poppet seats have been damaged.

3. Insert the poppet, without O-Ring or backup ring, into the sleeve and test for fit. The poppet should fit snugly, without binding, through a complete revolution and the seats should show evidence of sealing.

4. Inspect the ground seating surface of the piston for nicks or excessive wear. The piston should be free of nicks or abrasions.

5. Inspect the pilot poppet seat in the plug and the pilot poppet seats. These seats should show a complete seating surface.

6. Install new O-Ring.

**Circuit Relief Valves and Cushioning Valves**

The two circuit relief valves and the two cushioning valves may be serviced as assemblies or as individual parts. After servicing, the valves must be pressure checked and adjusted as described in Chapter 4, Section 2.

1. Inspect the interior of the plug (5), Figure 114, to determine if the connecting holes are open, or if the poppet seat has been damaged.

2. Inspect the seating surface of the poppet for nicks or excessive wear. The poppet should be free of nicks and abrasions.

3. Check the spring for “set” by comparison to a new spring. Install new springs where necessary.

4. Install new O-Rings.

**Check Valves**

Check valve malfunctioning can generally be traced to foreign material lodging between the seat and poppet, Figure 115.

1. Examine the seat surface for dirt or metal particles. Check the seating surfaces for nicks or scratches.

2. Minor scratches and nicks can be removed using a fine lapping compound. Care must be exercised to prevent lapping compound from entering and remaining in the control valve body.

3. Install new O-Rings on the plugs.

![Figure 115 Check Valve](image)

**Sectional View**

1. Swing Cushioning Valve
2. Poppet
3. Spring
4. O-Ring
5. Plug
6. Check Valve

**D. ASSEMBLY**

**Spools**

1. Lubricate the spools with a light coat of hydraulic oil and position the O-Ring and wiper on the spring end of the spool.
2. Install the centering spring and caps and secure the retaining screw so it will not loosen during operation.

NOTE: Apply 2 drops of loctite 271 to the retaining screw threads and torque to specification, page 129.

3. Insert the eye end of the spool into the valve body. DO NOT FORCE THE SPOOL THROUGH THE BORE. A slight twisting motion will relieve binding. Before the spool is inserted completely, start the O-Ring and wiper into the valve body recess.

4. With the O-Ring and wiper fully inserted into the recess in the valve body, insert the spool fully into the bore and position the seal plate at the spring end of the spool.

5. Position the O-Ring and wiper over the eye end of the spool and locate into the valve body recess. Secure the seal plate at the eye end with the screws previously removed.

6. Install the cap at the spring end and secure with the screws previously removed.

System Relieve Valve

1. Insert the poppet piston, spring, and plug into the sleeve, Figure 113. The spring has a larger O.D. at one end which positions into the plug (8).

2. Lightly lubricate the sleeve and insert the assembly into the valve body bore. Tighten the plug securely to provide a positive seal at the O-Ring on the plug.

3. Insert the pilot poppet and spring in the plug. Install the adjusting screw, washers, jam nut, and acorn nut.

NOTE: The system relieve valve must be pressure checked and adjusted after installation. Refer to Chapter 4, Section 2, for procedure.

Circuit Relief Valves and Cushioning Valves

1. Install the plug into the body. Tighten securely to provide a positive seal at the O-Ring on the plug.

2. Insert the poppet, spring, spacer, shims and cap into the plug. Tighten the plug securely.

NOTE: The cushioning valves and circuit relief valves must be pressure checked and adjusted upon installation. Refer to Chapter 4, Section 2, for procedure.

Check Valves: Install the poppet, spring, and plug into the body. Tighten the plug securely to provide a positive seal at the O-Ring.

Cushioning Valve Manifold

1. Install new O-Rings at the locations shown in Figure 116.

2. Position the manifold on the valve body, taking care to insure that the O-Rings are not dislodged.

3. Install the four ferry head attaching screws, tightening them securely so they will not loosen during operation.

Figure 116
Swing Cushioning Valve Manifold
1. O-Rings

E. INSTALLATION

1. With the assistance of another person, or hoist, and with the use of a sling; lower the valve into position so the valve to support bracket attaching bolts, washers and nuts can be installed.

2. Install the swing supply hose, return tube, and crossover tube, Figure 111.

3. Starting at one side of the valve, connect all remaining tubes and hoses to the valve.

4. Connect the control arms to the spools with the clevis pins and cotter pins.
5. Check the system for leaks and purge air from the system by operating the backhoe through several complete cycles.

6. Check the hydraulic oil level in the reservoir. If necessary, add oil until level with the full mark on the dipstick.

**NOTE:** If service was performed on the system relief valve, cushioning valves, or circuit relief valves, the pressures must be checked and adjusted. Refer to Chapter 4, Section 2, for procedure.

7. Install the rear deck plate.

**Loader Control Valve**

The loader control valve is bolted to the right side of the loader-backhoe frame. Figure 117.

Before removing the valve, the bottom of the loader bucket should be resting on the floor and any pressure that may be in the system should be relieved by moving the loader control handle in all directions several times with the engine off. Also, it is suggested that the backhoe bucket and stabilizer pads be resting on the floor. This will prevent the possibility of losing oil at the loader control valve if the backhoe control handles are moved while the return tube is disconnected.

**A. REMOVAL**

1. Remove the side panel to gain access to the valve, Figure 117.

2. Remove the cover plate, then disconnect the control lever from the valve spools by removing the cotter pins and clevis pins, Figure 118.

3. Disconnect the bucket cylinder tubes and lift cylinder tubes, Figure 117 from the valve and elbow. Cap the openings.

4. Disconnect the throttle rod at the bell crank, then disconnect the inlet tube from the control valve.

5. Disconnect the outlet tube from the tee fitting and the power beyond tube. Cap the openings.

6. Remove the valve from the frame by removing the attaching bolts.

7. Remove the outlet tube, elbow, and restrictor from the valve.

**Figure 117**

**Loader Control Valve Installed**

1. Power Beyond
2. Loader Control Valve
3. Bucket Tubing
4. Lift Tubing
5. Throttle Linkage
6. Valve Inlet
7. Cover Plate
8. Inlet Tube
9. Outlet Tube

**Figure 118**

**Loader Control Lever Linkage**

1. Clevis Pins and Cotter Pins
B. DISASSEMBLY

Because the bucket and lift spools (9) and (10), Figure 119, are a select fit in the body sections (3) and (7), they cannot be serviced separately. If a spool or body requires replacement the corresponding body or spool must also be replaced. All parts of the system relief valve (16), Figure 119, can be serviced individually with the exception of the body (22).

To disassemble the loader control valve:

1. Separate the bodies (3) and (7), Figure 119 by removing the thru-bolts.

2. Remove the O-Rings (8) from the lift body (7).

3. Remove the check valves (6) and (4), and the spring (5) from the bodies by removing the poppets (6), Figure 119.

4. Screw the system relief valve (16) from the lift body (7).

5. Remove the bucket spool cap (13), then pull the bucket spool (9), from the body.

6. Remove the screws securing the lift spool cap (13) to the body (7), then pull the cap from the body along with the lift spool (10).

7. Remove the quad rings from both ends of the valve bodies.

Figure 119
Loader Control Valve Exploded View
1. Check Valve 6. O-Rings
2. Lift Section 7. Lift Spool
3. Bucket Section 8. Float Detent
5. Bucket Spool 10. System Relief
SYSTEM RELIEF VALVE

A. DISASSEMBLY

Disassemble the System Relief Valve (16), Figure 119, by removing the relief valve from the loader body. Remove the plug (17) and flat washer (18). Unscrew the adjusting screw (19) fully from the valve body (22). The adjusting screw holds the spring (20) and poppet (21) in the valve body (22). Further disassembly entails pulling the cylinder (24) from the valve body (22) which is held in place by an expansion ring, thus exposing the pin (25), spring (20) and sleeve (23).

NOTE: Figure 121 illustrates a spool clamp procured locally out of aluminum stock. A piece of 1” x 2” x 2” stock with a 5/8” hole drilled through the center and a groove sawed, placed in a vice, provides an adequate tool.

Bucket Spool

Compress the spring (12), Figure 120, then disassemble the spool (11 through 15) by removing the screw (16).

![Figure 120]

Loader Bucket and Lift Spools (Exploded View)

1. Clevis
2. Lift Spool
3. Collar Stop
4. Spring
5. Detent Stop
6. Detent Retainer
7. Snap Ring
8. Detent Bails
9. Clevis
10. Bucket Spool
11. Collar Stop
12. Spring
13. Collar Stop
14. Collar
15. Lock Washer
16. Screw

NOTE: If the clevis (9) is to be removed, clamp the clevis in a vice, use the spool tool, Figure 121. DO NOT GRASP THE SPOOL ON ITS POLISHED SURFACE.

![Figure 121]

Aluminum Spool Clamp

1. Saw Width
2. 7/8 in. Diameter for Swing Spool – 5/8 in. Diameter for the other Spools

Lift Spool

1. Clamp the lift spool clevis (1), Figure 120, in a vice, then pull the cap and detent adapter (5) and (6), from the spool with a jerking motion. Be careful not to lose the detent balls (8), Figure 120.

2. Using a spring compressor as shown in Figure 122, remove the snap ring and detent retainer.

3. Remove the detent stop spring, and collar (3), (4) and (5), Figure 120. Also remove the detent balls (8) if not previously removed.

NOTE: If the clevis (1) is to be removed, clamp the clevis in a vice, using the spool tool, Figure 121. DO NOT GRASP THE SPOOL ON ITS POLISHED SURFACE.

4. Remove the adapter (12), Figure 119, from the cap (13) by removing the jam nut and lock washer (14) and (15).
System Relief Valve

Inspect the poppet seating area in the system relief valve body, Figure 119, for evidence of wear or damage. If the seating area is worn or damaged, the complete system relief valve must be replaced. All other parts can be serviced individually.

Spools

Inspect the lands of the spools (2) and (10), Figure 120 for nicks and burrs, and the polished surface for scratches. Minor distortions can be polished out using fine crocus cloth or emery cloth. If the spools are badly nicked or scratched, they should be replaced. The corresponding body section must also be replaced.

Check the springs (4) and (12), for evidence of set or unnatural bends. To determine if the springs have taken a set, compare their heights against new springs drawn from parts stock. Install new springs if they have taken a set.

D. ASSEMBLY

 Coat all parts with clean hydraulic oil to facilitate assembly and to provide initial lubrication. Always install new O-Rings and quad seals.

System Relief Valve

1. Assembly of the System Relief Valve begins by aligning the parts in order, as per Figure 119, item 10. The pin, spring and sleeve fit within the valve body and cylinder.

   NOTE: Prior to assembly, discard the old O-Rings and install new ones.

2. In the valve body position the poppet spring and adjusting screw. Adjust the valve to the proper setting as outlined in “Pressure Checks”. Install the plug and washer.

3. Install new O-Rings on the body along with the backup washer. Make sure the backup washer is installed behind the O-Ring (farthest away from the small end of the body).

4. Install the assembled valve in the lift body (2), Figure 119.

C. INSPECTION AND REPAIR

The majority of valve failures occur because of dirt and other foreign matter entering the valve, causing marring and erosion. A careful inspection of all valve components is essential for a satisfactory repair. Small marks, scratches, and burrs can be hidden by oil film, therefore it is important to clean each part prior to inspection.

Minor imperfections can be polished out, using fine abrasives such as crocus cloth, emery cloth, or lapping compound. If abrasives are used, make sure that all particles are washed away by thoroughly cleaning the components in a suitable solvent.

Valve Bodies

Inspect the bores in the valve bodies, Figure 119, and the check valve seats for evidence of scoring or other distortion. Pay particular attention to the condition of the highly polished surfaces in the spool bores. If deep scores, casting imperfections, or serious pitting is observed, replace the body section. The matching spool must also be replaced.
Bucket Spool and Body

1. Install the clevis (9), Figure 120 on the bucket spool (10).

2. Install a new quad ring in the top of the bucket spool bore.

3. Insert the spool (10), Figure 120, into the bottom of bucket body, clevis end first, until the spring end of the spool passes the quad ring groove in the bottom of the body.

4. Install a new quad ring in the bottom of the spool bore, then back the spool out through the ring.

5. Place the collar (11), Figure 120, spring (12), collar stop (13), and collar (14), on the end of the spool. Retain the parts by compressing the spring enough to install the lock washer and screw (15) and (16).

6. Install the cap (9), Figure 119, and secure it to the body with the four attaching screws.

7. Install the poppet, spring, and plug.

8. Install the power beyond sleeve and O-Ring in the valve body.

9. Install the detent adapter (8), Figure 119, in the cap (9) and retain it in place by installing the lock washer and hex nut.

10. Place the assembled cap (9) over the assembled lift spool (7) so the adapter starts into the end of the spool, then drive the adapter "through" the detent balls by striking the cap sharply with the palm of the hand.

11. Secure the cap to the body with the four attaching screws.

12. Install new O-Rings (6) in the grooves of the lift body then bolt the two bodies together by installing the thru-bolts. Torque to 20 ft. lbs. (27.1 Nm).

Lift Spool and Body

1. Install the clevis (1), Figure 120, on the lift spool (2).

2. Install a new quad ring in the top of the lift spool bore.

3. Insert the spool (2), Figure 120 into the bottom of the lift body, clevis end first, until the spring end of the spool passes the quad ring groove in the bottom of the body.

4. Install a new quad ring in the bottom of the spool bore, then back the spool out through the ring.

5. Place the collar (3), Figure 120, spring (4), detent stop (5), and detent retainer (6), on the spool.

6. Retain the parts in place by compressing the spring enough to install the snap ring (7).

7. Install the detent balls (8), in the holes of the lift spool. Use petroleum jelly to hold them in place.

8. Connect the outlet tube, Figure 117 to the loader control valve, but do not tighten the fitting. Also, install the restrictor and elbow.

9. Position the valve so the outlet tube can be connected to the tee fitting. Connect the tube, but do not tighten the fitting.

10. Start the inlet tube, power beyond tube, lift cylinder tubes and bucket cylinder tubes on the fittings of the valve, then bolt the valve to the frame.

11. Tighten all fittings.

NOTE: Depending upon the wrenches used to tighten the fittings, it may be necessary to remove the attaching bolts from the surrounding sheet metal so the metal can be tipped back to gain access to the outlet tube fitting at the valve.

12. Connect the throttle rod to the bell crank.

13. Connect the control lever to the valve spools by installing the clevis pins and cotter pins.

NOTE: If service was performed on the system relief valve (1), Figure 119, the system relief pressure must be checked as outlined on page 97.
7. Check the system for leaks and purge air from the system by operating the loader through several complete cycles.

8. Check the hydraulic oil level in the reservoir. If necessary, add oil through the dipstick opening until level with the full mark on the dipstick. The backhoe should be in the transport position and the loader bucket resting on the ground when checking the oil level.

9. Install the sheet metal covers previously removed.

7. HYDRAULIC PUMP

The hydraulic pump is bolted to the transmission housing next to the transmission charging pump directly under the platform forward deck plate, Figure 123. A cutaway view, Figure 108, illustrates the positioning of the pumps inner components.

Before the pump is removed, it is suggested that the loader and backhoe buckets and stabilizer pads be resting on the floor. This will prevent a loss of oil if the control levers are accidentally moved while the tubes are disconnected.

![Hydraulic Pump Location](image)

**Figure 123**

Hydraulic Pump Location
1. Hydraulic Pump
2. Transmission Pump
3. Brake

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**A. REMOVAL**

1. Remove the transmission dipstick cover from the platform deck, Figure 124.

2. Remove the forward deck plate from the platform.

3. Remove the foot brake pedals from the shanks.

4. Remove the bolts securing the steering column shroud and remove the shroud.

5. Disconnect the two pump inlet tubes from the pump by loosening the hose clamps securing each.

![Hydraulic Pump Removal](image)

**Figure 124**

Hydraulic Pump Removal
1. Steering Column Shroud
2. Transmission Dipstick Cover
3. Deck Plate

6. Disconnect the high pressure tubes (1), Figure 125, from the pump's right side and push them to the side.

7. Remove the two pump attaching bolts from the transmission housing (4), Figure 125.

8. Withdraw the hydraulic pump from the transmission housing.

**NOTE:** Be sure the splined pump adapter is on the pump shaft.

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B. DISASSEMBLY

1. Place the pump in a vise with the drive shaft end facing downward.

**IMPORTANT:** Do not grip on or near any machined surfaces.

2. Using a hammer and a punch, index mark each of the pump sections to aid in the reassembly procedure, Figure 126.

3. Remove the four attaching bolts from the port end cover, then lift off the cover. If it is necessary to pry the cover loose, use care not to damage the machined surfaces.

4. Lift the gear housing from the pump, Figure 127. If the thrust plate remains in the housing, remove it by gently tapping it with a wooden hammer handle, being careful not to distort the plate.

5. Remove the drive and driven gears, Figure 128, then remove the connecting shaft.

**IMPORTANT:** The drive and driven gears are a matched set. Tag the gears for identification and keep them together.
6. Lift the bearing carrier from the pump then remove the first section gear housing and thrust plate. If necessary gently tap the thrust plate with a wooden block to remove it from the housing being careful not to distort it.

![Figure 128 Gear Set Removal]

7. Remove the drive gear with the shaft and the driven gear, Figure 129.

**IMPORTANT:** The drive gear and driven gear are a matched set. Tag the gears to identify them.

8. Pry the thrust plate from the shaft end cover with a screwdriver or similar tool. Avoid distorting the thrust plate. Remove and discard all rubber pocket seals and gasket seals.

9. Remove the drive shaft seal from the end cover and replace it with a new seal from stock.

10. Using a bearing puller, remove the outboard bearings from the gear housings, Figure 130.

![Figure 129 Drive Shaft Removal]

![Figure 130]

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C. INSPECTION

Most pump failures occur because dirt or other foreign matter enters the hydraulic system causing excessive wear on the pump components.

Gear Housings:

Check for wear, for an excess of .005” on the cut-out necessitates replacement. Place a straight edge across the bore. If a .005” feeler gauge can be slipped under, replace the gear housing as the components wear and the cut-out becomes more pronounced. Excessive cut-out in a short period of time indicates excessive pressure or oil contamination. Check the relief valves and the hydraulic oil to determine the cause.

Gears:

Visually check the gears for scoring, grooving, nicks, fretting or burning of the gear teeth. Inspect the hubs for wear. Replacement is recommended if the wear exceeds .002”. The gears are matched sets and must be replaced accordingly.

Drive Shaft:

Check the drive shaft gears as previously outlined and inspect the shaft itself for wear in the seal areas and at the drive coupling. Replace the shaft if wear in excess of .002” is evident.

Thrust Plates:

Visual inspection can reveal the conditions in which the pump has been operating. Check the center of the thrust plates — Erosion indicates oil contamination. Pitted thrust plates indicates cavitation or oil aeration. Discolored plates means overheating. Replace the thrust plates if the wear exceeds .002”.

Bearings:

Replace the bearings if the gears are replaced. The bearings should fit into the bore with a light press fit.

Seals and Gaskets:

Replace all seals and gaskets when reassembling the pump.

D. ASSEMBLY

1. Install the drive shaft seal in the end cover, Figure 131, using a light pressure to seat the seal.

   ![Figure 131](image)

1. Hydraulic Press
2. Seal
3. End Cover

2. Invert the end cover and secure it in a vice.

3. Press the bearings into the top cover, Figure 132. Only a light amount of pressure is recommended.

4. Insert the pocket seals in their respective slots in the thrust plate and position the thrust plate as shown in Figure 133.

5. Install the drive shaft, Figure 133, (slightly lubricate the shaft for insertion) into the end cover.

6. Place the matched driven gear into the other bearing, meshing the gears with the gears of the drive gear.
NOTE: Make sure the housings have new gaskets securely in place between each section and lubricate the gears with oil.

7. Lower the gear housing into position around the gears, Figure 134.

8. Install the bearing carrier, Figure 135, into position and press the bearings into position on the drive gear end driven gear journals.

9. Place the thrust plate with pocket seals on the bearings as shown in Figure 135.

IMPORTANT: The pocket seals must be in and remain in place for proper pump operation.

10. Insert the coupling shaft, Figure 135, in the drive gear upper shaft.

11. Position the matched gear set as illustrated in Figure 136. Engage the coupling, previously installed, with the splined center of the gear.
12. Position the end cover, aligning the roller bearings with the gear journals, Figure 137, and secure with the tie bolts. Torque the tie bolts, Figure 138, to 200 lbs. ft. (272.0 Nm).

Figure 136
Gear Pump Assembly
1. Bearing Carrier
2. Thrust Plate
3. Pocket Seals (6)
4. Thrust Plate
5. Gear Coupling

Figure 137
Port End Cover Installation
1. Gear Housing
2. Port End Cover

Figure 136
Gear Installation
1. Thrust Plate
2. Drive Gear
3. Driven Gear

Figure 138
Bolt Installation
1. Through-Bolts
E. INSTALLATION

1. With a new gasket in place, position the pump in its mount on the transmission housing, aligning the splined shaft with that of the transmission drive gear and secure the attaching bolts, Figure 125.

2. Connect the high pressure tubes to the right side of the pump with new gaskets in place.

3. Connect the two pump inlet tubes to the left side of the pump and secure with the hose clamps provided, Figure 123.

NOTE: Be certain the connections in steps 2 and 3 are secure.

4. Install the steering column shroud and tighten the bolts securely.

5. Mount the deck plate into position and then the transmission dipstick cover.

6. Attach the foot brake pedals to their respective shafts.