BACKHOE FOR 644 AND 646 LOADERS HYDRAULIC SYSTEM

Service Manual No. 9-50741

J I Case
A Tenneco Company

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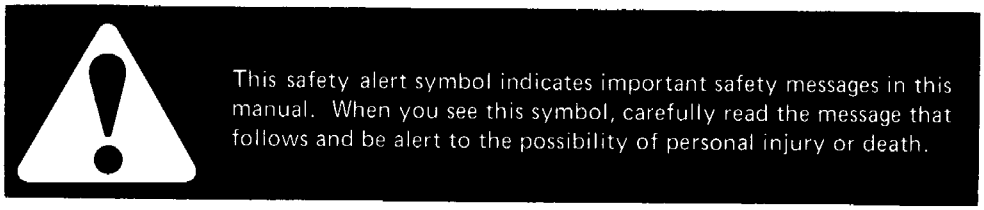


SPECIFICATIONS

BACKHOE HYDRAULIC SYSTEM SPECIFICATIONS

(As Mounted on Model 644 and 646 Loaders)

PUMP SPECIFICATIONS

LOADER MODEL	PUMP	GPM O PSI (0 k Pa) 3600 RPM	GPM 0 PSI (0 k Pa) 3000 RPM	GPM 1500 PSI (10 340 k Pa) 3000 RPM
644	C 19743	9.5 GPM (36 1/min)	8.0 GPM (30 1/min)	7.2 GPM (27 1/min)
646	C 20122	8.5 GPM (32 1/min)	7.0 GPM (26 1/min)	6.5 GPM (24 1/min)

RELIEF VALVE SPECIFICATIONS

Main Relief Valve - 2,000 PSI (13 790 k Pa)

Circuit (Secondary) Relief Valves

Boom — Both Ports 3,000 PSI (20 684 k Pa)

Crowd — Upper Port 3,000 PSI (20 684 k Pa)
Lower Port Plugged

Swing — in cylinder end 2,000 PSI (13 790 k Pa)

FLOW RESTRICTORS

Boom — Upper Port .136" (3.45 mm)

Swing — Both Ports .093" (2.36 mm)

CYLINDERS

BACKHOE

Boom, dipper and bucket (1 each) . . . . . .3" dia. x 15" stroke, 1-1/2" rod
(76 mm dia. x 381 mm stroke - 38 mm rod)

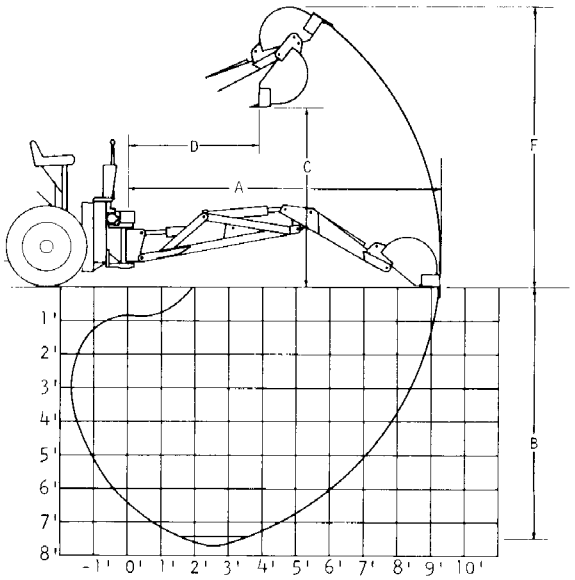
Swing - special double end . . . . . 2-3/4" dia. x 8" stroke, 2-3/4" piston
(70 mm dia. x 203 mm stroke - 70 mm piston)

Stabilizer (2) . . . . . .1-3/4" dia. x 12" stroke, 1" rod
(44 mm dia. x 305 mm stroke - 25 mm rod)

BACKHOE CONTROL VALVE

Make . . . . . .Cessna
Model 30006-AC

Type . . . . . Sectional, six spool



OPERATING DATA

	*Overall reach - from Loader rear axle centerline	14'0" (4267 mm)
A	*Digging radius - from swing pivot	9'3" (2819 mm)
B	*Digging depth -	7'5" (2261 mm)
C	Loading height	5'3-3/4" (1619 mm)
D	Loading reach	51-1/2" (1308 mm)
	*Swing arc	178°
	*Bucket rotation	143°
	*Stabilizer spread - operation position	35-1/2" (902 mm)
	transport position	35-1/2" (902 mm)
	*Clearance height	5'3-3/4" (1619 mm)
	*Digging force - bucket cylinder	5295 lbs. (2402 kg)
	*Digging force - dipper cylinder	1997 lbs. (906 kg)
	*Leveling angle - maximum grade on which the backhoe will make a vertical cut	12°

DIMENSIONS

E	*Maximum transport height	68" (1727 mm)
F	Overall height maximum	8'4-1/2" (2553 mm)
	Overall length - transport	15'7" (4750 mm)
	Overall width - at loader tires (high flotation)	47" (1193 mm)
	Ground clearance - at backhoe	5" (127 mm)

OPERATING WEIGHTS

*Backhoe with 644	2400 lbs. (1087 kg)
*Backhoe with 646	2460 lbs. (1114 kg)

BACKHOE BUCKETS

CAPACITIES

Width Inch (mm)	Type	Heaped Cu. Ft.	Heaped (m^3)	Struck Cu. Ft.	Struck (m^3)	Weight Lbs.	Weight (kg)
12" (305)	Trenching	1.25	(0.035)	1.0	(0.028)	82	(37)
16" (406)	Trenching	2.0	(0.057)	1.625	(0.046)	90	(41)
20" (508)	Trenching	2.875	(0.081)	2.25	(0.064)	107	(49)
24" (610)	Trenching	3.5	(0.099)	2.75	(0.078)	119	(54)
12" (305)	Bellhole	1.25	(0.035)	1.0	(0.028)	80	(36)
18" (457)	Bellhole	1.75	(0.050)	1.375	(0.039)	107	(49)
22" (559)	Bellhole	2.875	(0.081)	2.25	(0.064)	120	(54)

* Specifications that conform to ICED definitions.

OPERATION OF BACKHOE CONTROL VALVE

The Backhoe Control Valve is a stack type construction valve rated at 2500 PSI (17 235 k Pa) and 15 GPM (56.7l) flow. The valve consists of a port plate (inlet plate), 6 working sections and an end plate (outlet plate). The oil passages connecting the sections are sealed between the sections with o-rings. The sections are held together with long tie bolts which run through all the sections.

NEUTRAL FLOW

When all the valve spools are in the neutral or centered position, the oil enters the inlet port in the port plate. From there it is directed to the zig-zag (open-center) passage of the valve sections. The oil from the zig-zag (open-center) passage collects in the end plate and flows out the return port to the reservoir.

The open-center passage is referred to as the zig-zag passage in this valve because of the way the oil passes through each work section. Oil enters the top half of the center passage and exits the bottom half of the center passage in each work section and thus zig-zags through each section.

PRESSURIZED FLOW

When any valve spool is in the "IN" or "OUT" position, the neutral flow through the zig-zag passage is blocked at that particular spool. The pump flow is then diverted to the deadline (parallel) passage where the oil flow is stopped by the end plate. The only path left for the oil to follow is through the lift check and then to the open work port.

LIFT CHECK

The purpose of the lift check is to prevent the oil in the work port from returning to the pressure inlet passage in the control valve.

The lift check is primarily useful when you are trying to "slow raise" a heavy load. When the spool is "cracked" the pressurized oil in the cylinder will try to backflow into the inlet passage of the control valve and drop the load.

With a lift check in the system, the oil is prevented from returning to the inlet passage of the control valve through the lift check.

When the valve spool is in neutral, the oil from the pump enters the port plate of the control valve and passes through the zig-zag (open-center) passage and on to the return port. As the spool is moved "IN" or "OUT," the oil in the zig-zag (open-center) passage is gradually cut off. As it is cut off, the inlet oil from the pump is pressurized. The pressurized oil in the deadline (parallel) passage unseats the lift check plunger and causes the load to raise.

If a lift check was not used in the system, the oil from the work port would have flowed backwards, out the "cracked" spool, into the valve inlet passage and on through the zig-zag (open-center) passage to the tank. This would have happened before the zig-zag (open-center) passage was cut off and before the pump supply oil pressurized enough to equalize the backflow pressure and lift the load.

The lift check also prevents interaction between actuated spools. For example, if there were no lift checks and two loads were being raised simultaneously, the heavier of the two loads would fall and the oil from that cylinder would flow into the lighter loaded cylinder and increase its lifting speed. With lift checks in the system the oil is prevented from backflowing into the other circuit.

SYSTEM RELIEF

The purpose of the system relief valve, located in the inlet plate of the control valve, is to limit the maximum operating pressure of the control valve. The oil from the pump enters the inlet port of the control valve and if a spool is not actuated, the oil passes through the zig-zag (open-center) and on to the reservoir.

If a spool is actuated, the oil flow from the pump is diverted into a work port and on to the cylinder. If the cylinder has little or no resistance, it merely extends and requires very little oil pressure. If the cylinder meets a resistance, the cylinder will extend but requires more oil pressure to operate it. If the cylinder reaches the end of its stroke, or meets a resistance that requires more oil pressure to move it than the relief valve pressure setting, the oil will not flow into the cylinder; instead, the relief valve will open and allow the oil flow from the pump to enter the return passage and return to the reservoir. The oil flow from the pump is still pressurized to the relief valve setting until the spool is returned to neutral. The relief valve will then close and the oil will again pass through the zig-zag (open-center) passage.

VALVE WORKING SECTIONS

A four-way valve section is used to actuate a double acting cylinder in both directions.

When the spool is in the "NEUTRAL" position, the pump oil flows through the interconnecting zig-zag (open-center) passage and on to the return port. Both work ports are blocked.

When the spool is in the "IN" position, the zig-zag (open-center) passage is closed by the spool lands, therefore, the oil from the deadline (parallel) passage unseats the lift check and flows through the pressure loop to port "A" to the cylinder. Port "B" is open to tank.

When the spool is in the "OUT" position, the zig-zag (open-center) passage is closed by the spool lands, therefore, the oil from the deadline (parallel) passage unseats the lift check and flows through the pressure loop to port "B" to the cylinder. Port "A" is open to tank.

CIRCUIT RELIEF VALVES USED IN BOOM AND DIPPER SECTIONS

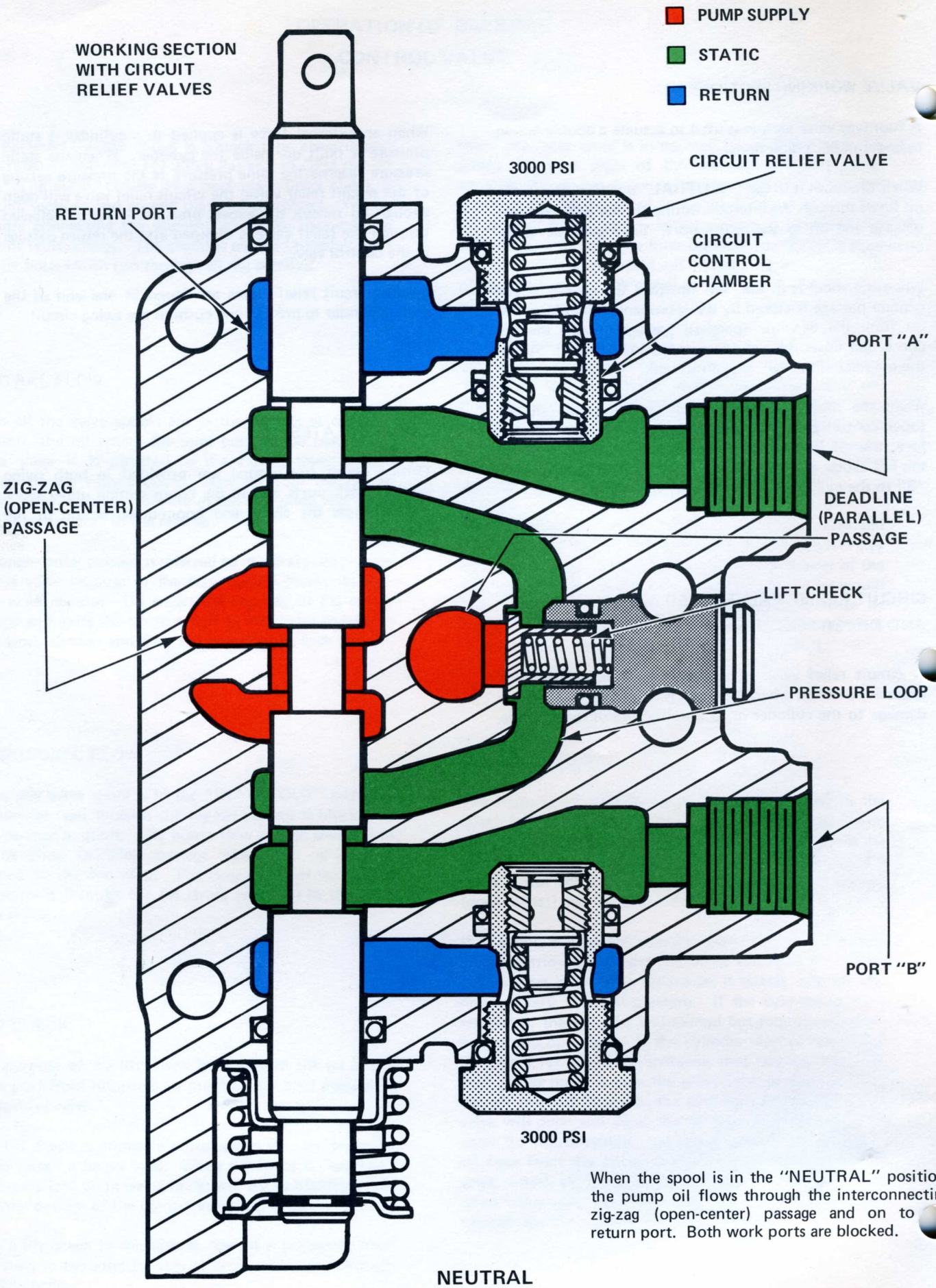
A circuit relief valve is used to relieve a work port of excessive pressure when the spool is in neutral and prevent damage to the cylinder or to the structure of the machine.

When an external force is applied to a cylinder, a static pressure is built up inside the cylinder. When the static pressure reaches the same pressure as the pressure setting of the circuit relief valve, the circuit relief valve will open enough to relieve the excess pressure. The oil relieved through the relief valve is dumped into the return passage in the control valve.

Similar circuit relief valves are found in one end of the swing cylinder to protect and cushion the swing circuit.

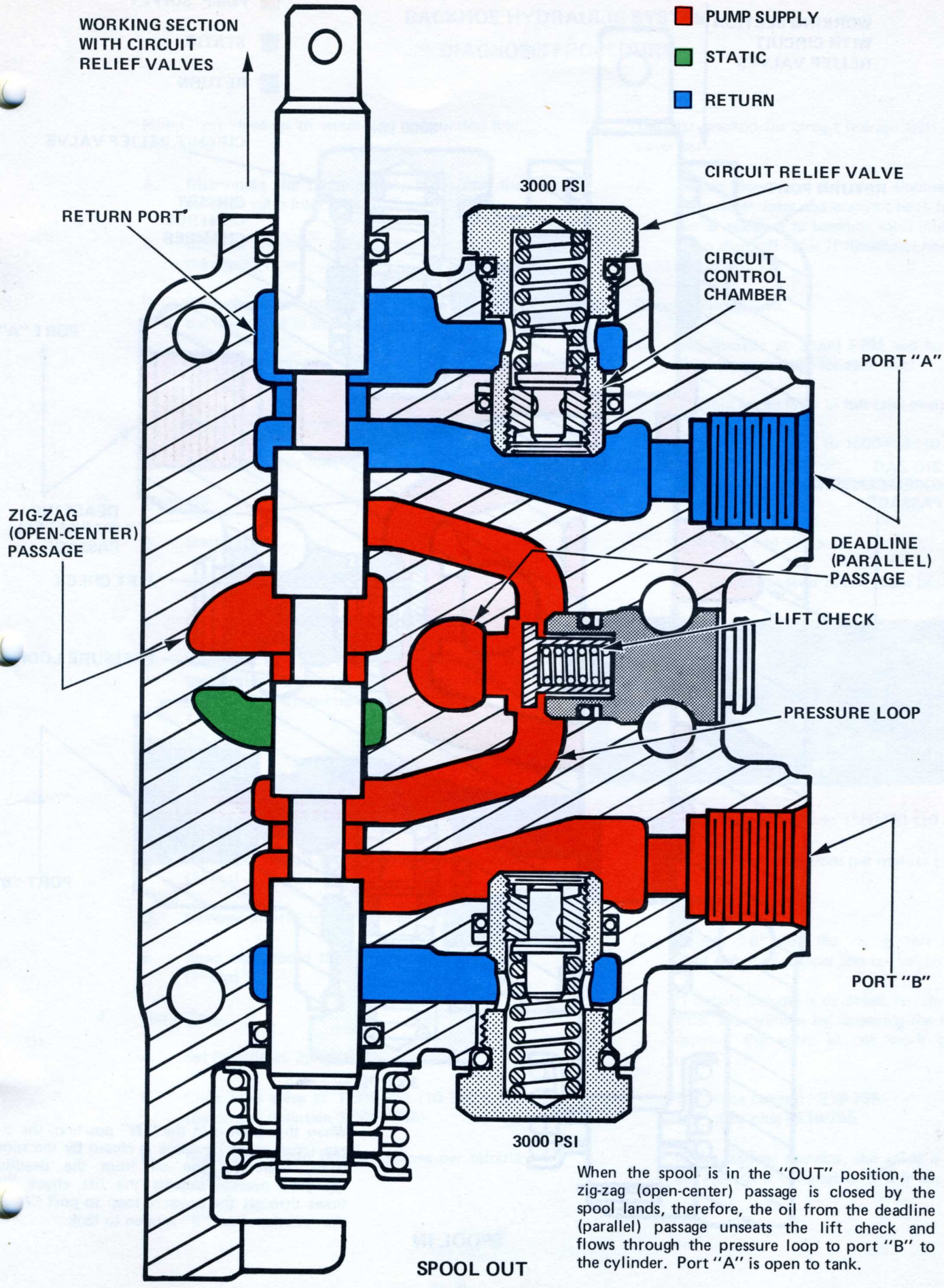
ORIFICE PLATES

Orifice plates (restrictors) are provided in both swing section work ports and in the boom section upper work port to slow the swing and boom-down action of the backhoe.



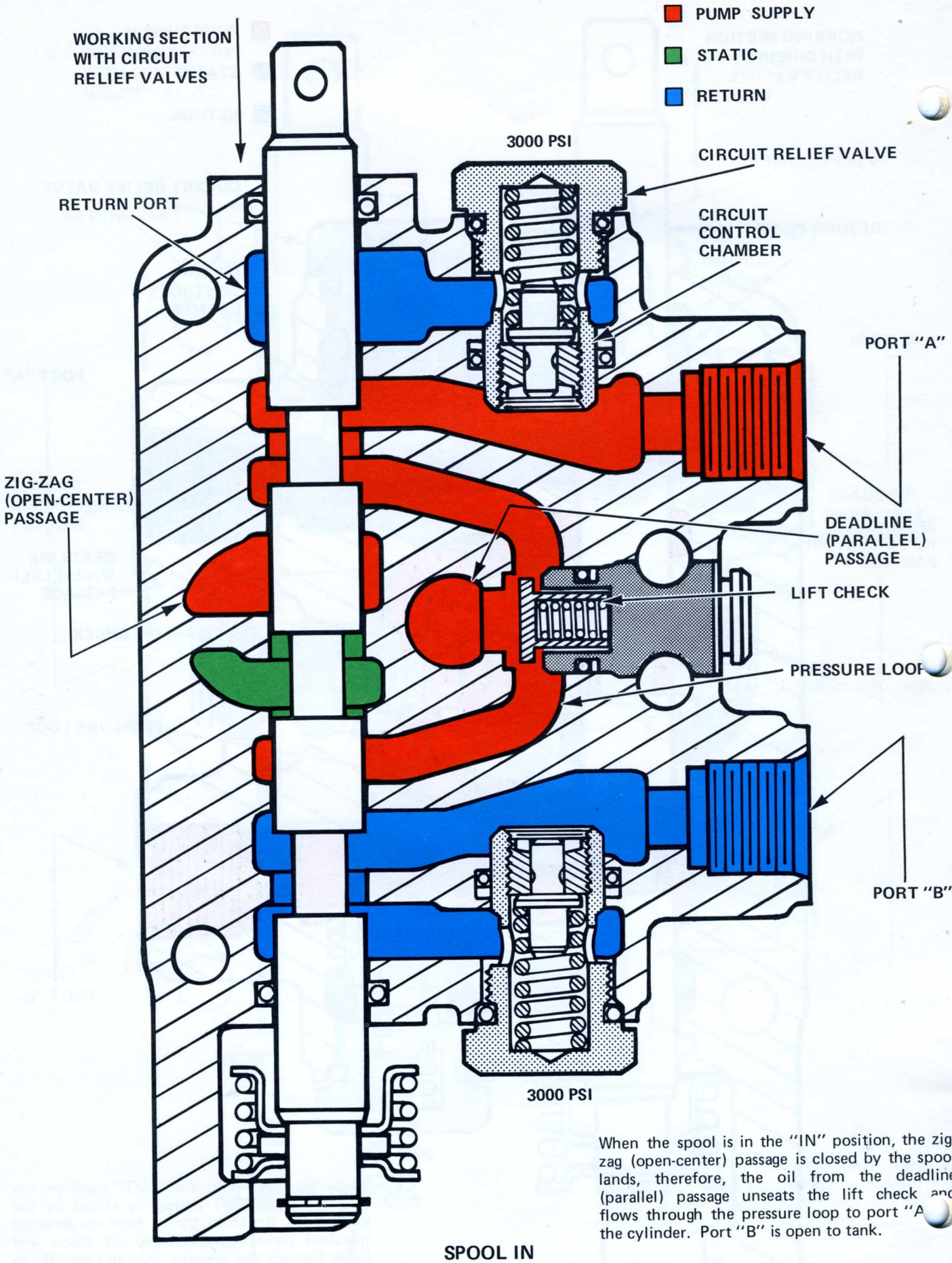
When the spool is in the "NEUTRAL" position, the pump oil flows through the interconnecting zig-zag (open-center) passage and on to return port. Both work ports are blocked.

NEUTRAL



SPOOL OUT

When the spool is in the "OUT" position, the zig-zag (open-center) passage is closed by the spool lands, therefore, the oil from the deadline (parallel) passage unseats the lift check and flows through the pressure loop to port "B" to the cylinder. Port "A" is open to tank.



When the spool is in the "IN" position, the zig-zag (open-center) passage is closed by the spool lands, therefore, the oil from the deadline (parallel) passage unseats the lift check and flows through the pressure loop to port "A" the cylinder. Port "B" is open to tank.

SPOOL IN

BACKHOE HYDRAULIC SYSTEM
DIAGNOSIS PROCEDURE

1. Pump Test Hookup to warm oil, test suction line, test pump

   A. Disconnect the pump supply hose from the backhoe valve inlet tube.

   B. Connect the "in" port of the flowmeter to the supply hose.

   C. Place the return hose from the "out" port of the flowmeter in the tractor reservoir.

   D. Cap the flowmeter "Tee" port (or close shut off valve if flowmeter hookup is so equipped).

   E. Plug the backhoe valve inlet tube (if open).

   F. Open flowmeter load valve.

2. Warm Oil

   A. Start Tractor

   B. Set at 1/2 throttle

   C. Close load valve to 1,000 PSI (6890 k Pa)

   D. Warm oil to 120° F (49° C) (maintain oil temperature between 120° F and 140° F (49° C - 60° C) throughout the test)

3. Suction Line Test

   A. Open tester load valve

   B. Set throttle at 3,000 RPM

   C. Read and record flow in gallons per minute (1/min)

   D. Increase throttle to 3,600 RPM

   E. Read and record flow in gallons per minute (1/min)

4. Pump Test

   A. Set throttle at 3,000 RPM

   B. Close load valve to 1,500 PSI (10 340 k Pa) (Be sure to maintain 3,000 RPM)

   C. Read and record flow in gallons per minute (1/min)

5. Tee test hookup for circuit leakage tests and relief valve test

   A. Uncap flowmeter tee port, unplug backhoe valve inlet tube and connect hose from flowmeter tee port to backhoe valve inlet tube (or open shut off valve if flowmeter hookup is so equipped).

6. Circuit Leakage Test

   A. Set throttle at 3,000 RPM and be sure this RPM is maintained for each test.

   B. 1. Hold boom lever in full raise position

      2. Close load valve to 1500 PSI (10 340 k Pa)

      3. Read and record flow in gallons per minute (1/min)

      4. Open Load Valve

      5. Hold boom lever in full lower position

CAUTION: Extend boom into trench or over loading dock to achieve full cylinder stroke. Attempting to fully extend cylinder on level ground will lift tractor dangerously high and may upset the tractor.

      6. Close load valve to 1500 PSI (10 340 k Pa)

      7. Read flow in gallons per minute (1/min)

      8. Open load valve

   C. Repeat "B" for the swing, left stabilizer, right stabilizer, dipper and bucket circuits.

   D. If circuit leakage is detected, isolate the valve from the cylinder by removing the hoses and capping the valve at the work ports and retest.

      1/2" tube cap nut - 218-755
      1/2" tube plug - 218-755

      If the leakage remains, the valve is faulty; if the leakage is eliminated, it is in the cylinder.

E. If either boom circuit or the dipper (crowd) in circuit shows "valve only" leakage, the secondary relief valve should be isolated from the valve section itself in the following way.

Remove the secondary relief valve cartridge and replace it with an HO 52837 plug being sure the o-ring seals are not damaged. Retest. If the leakage remains, the valve section is faulty; if the leakage is eliminated, it is in the secondary relief valve cartridge which should be replaced.

NOTE: Refer to the following Section for pressure testing secondary relief valves.

F. If all 12 circuits show the same amount of circuit leakage, the problem is in the backhoe valve inlet section or main relief valve.

7. Main Relief Valve Test

A. Set throttle at 3600 RPM

B. Hold one backhoe circuit in the activated position.

C. Close the load valve gradually

D. Read and record the main relief valve cracking point (when the GPM needle first drops off) and the full open point (load valve closed and GPM (1/min) reading is zero).

E. The main relief valve cartridge is not adjustable and should be removed and cleaned or replaced if below specification.

HAND PUMP TESTING OF THE CIRCUIT (SECONDARY) RELIEF VALVES

Refer to Hydraulic System Specifications for Secondary Relief Valve pressure settings.

Secondary relief valves are located in both boom circuits, in the upper dipper (crowd) circuit and in the right hand end of the swing cylinder piston.

To test the cracking pressure of the secondary relief valve, use the following procedure:

1. Park tractor with the backhoe resting on the ground. Shut off engine.

2. Move all control levers both ways several times to relieve any hydraulic pressure.

3. Unhook the hose leading to the work port of the circuit of the secondary relief valve to be tested and connect the hand pump hose to this work port.

   NOTE: See below for testing swing circuit.

4. Pump the hand pump with a 4,000 PSI gauge teed in and record the cracking pressure.

5. The secondary relief valve cartridges are not adjustable and should be replaced as a unit if the pressure is below specification.

Test the swing cylinder secondary relief valves as follows:

I. Test R. H. Side

   A. Swing backhoe full right.

   B. Shut off engine.

   C. Move lever back and forth several times to relieve hydraulic pressure.

   D. Remove hyd. tube from R. H. cylinder.

   E. Connect hand pump and pressure gauge to R. H. cylinder.

   F. Loosen hyd. tube from left hand cylinder fitting.

   G. Pump hand pump, record cracking pressure.

II. Test L. H. Side

   A. Swing backhoe full left.

   B. Shut off engine.

   C. Move lever back and forth several times to relieve hydraulic pressure.

   D. Remove hyd. tube from L. H. cylinder.

   E. Connect hand pump and pressure gauge to L. H. cylinder.

   F. Loosen hyd. tube from R. H. cylinder fitting.

   G. Pump hand pump, record cracking pressure.

III. Remove swing cylinder and replace secondary relief valve cartridges if the cracking pressures obtained are below specification.

SERVICE INSTRUCTIONS FOR THE BACKHOE CONTROL VALVE

REMOVAL

1. Park backhoe in a clear area where the backhoe may be disabled without interfering with other shop traffic.
2. Extend the dipper, bucket and boom fully.
3. Clean the valve area thoroughly.
4. Tag all hoses before removal to insure proper reassembly.
5. Remove all hoses capping lines and valve ports to prevent dirt entry.
6. Unbolt valve bank from backhoe frame and remove.

DISASSEMBLY

1. Plug all outlets and clean outside of valve thoroughly.
2. Mark working sections to assure proper reassembly.
3. Remove circuit (secondary) relief valves (1) and (2) from working sections if the above are incorporated. (Mark these parts and their respective positions to insure proper location on reassembly.)
4. Push spool down, remove clip ring (3), shallow washer (4), spool spring (5), spacer (6), and deep washer (7).
5. Remove spools (8) from working sections.

   NOTE: Spools and bodies are matched sets. Be sure each spool is identified with the correct body.
6. Remove system relief valve (9) from port (inlet) plate (10).
7. Remove orifice plates (11). Be sure each orifice plate is identified with the correct work port.
8. Remove tie bolts (12) and lockwashers (13).
9. Remove lift check bodies (14), lift check springs (15), and lift check plungers (16).
10. Remove all o-rings and backup washers from all plugs, relief valves and valve bodies.
11. Thoroughly clean all parts.

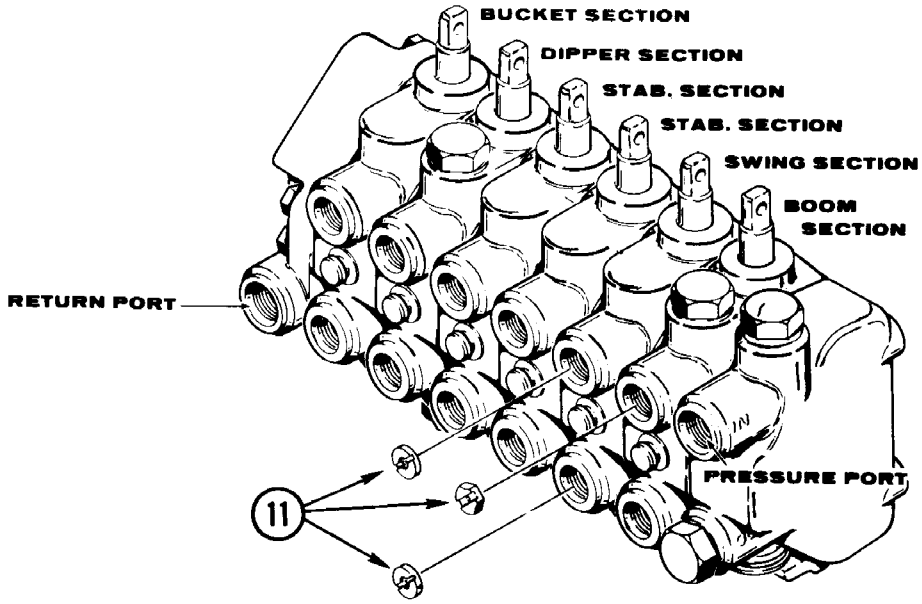
INSPECTION

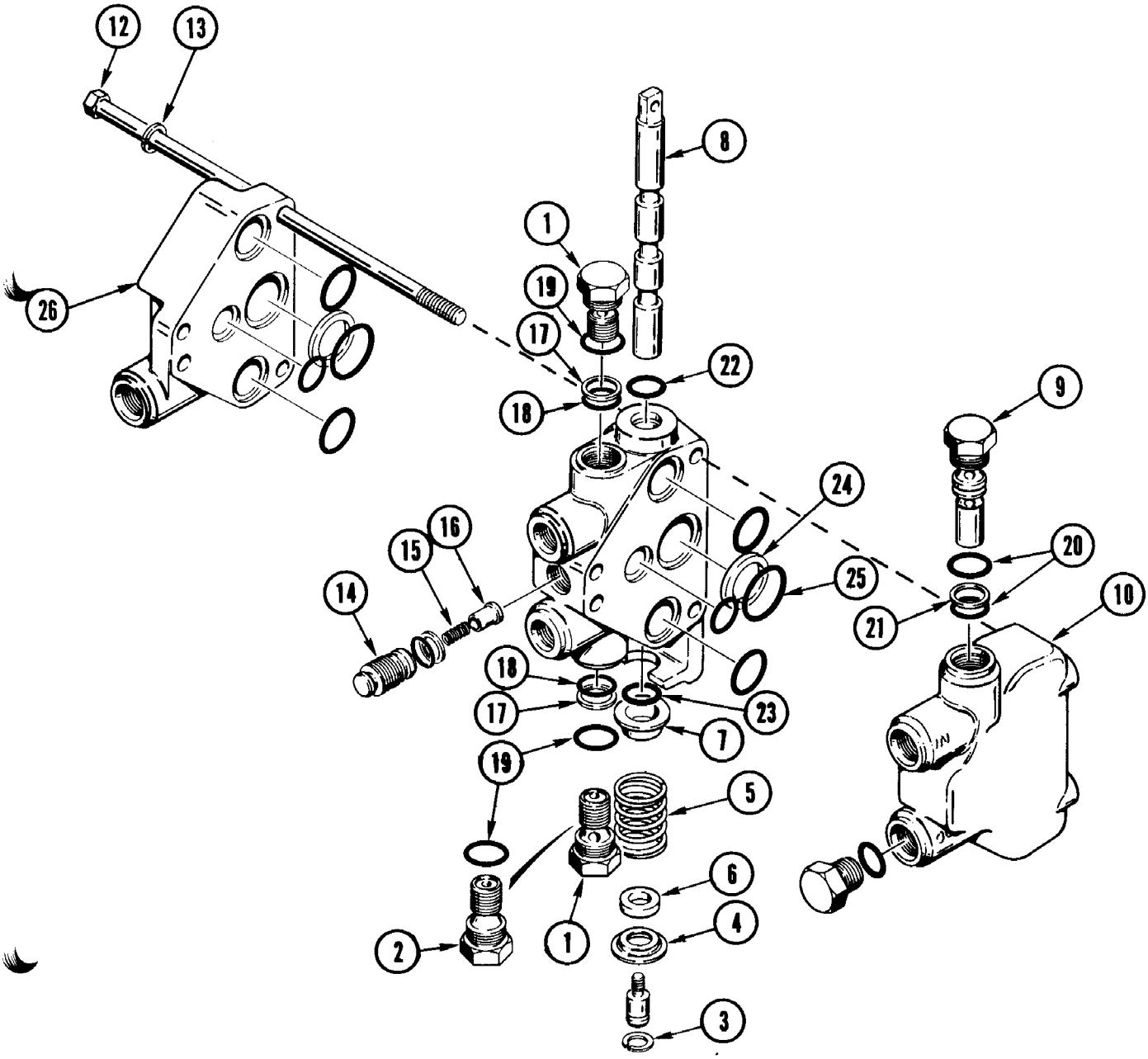
1. Remove nicks and burrs from all parts with very fine emery cloth.
2. Inspect spool and body bore for excessive wear.
3. Inspect spool springs and lift check springs for breakage.
4. Inspection of all o-rings and backup washers is not necessary - these parts should be replaced as new parts and are included in the major seal repair kit available for this valve.
5. Clean system and circuit (secondary) relief valves in solvent and blow out with an air hose. Do not disassemble.

REASSEMBLY

1. Thoroughly clean and dry all parts. Metal parts should be lightly oiled prior to assembly.

   NOTE: All o-rings and backup washers should be replaced as new parts.
2. Install backup washers (17) in position in working section "Circuit control chambers." (These are best installed dry).
3. Install o-rings (18) in position in working section "circuit control chambers." (Place o-ring inboard of leather backup washer.)
4. Install o-rings (19) on circuit (secondary) relief valves and plugs.
5. Install o-rings (20) and backup washer (21) on system relief valve.
6. Install backup washer and o-ring on lift check body.
7. Install o-ring (5/8 I.D. x 1/8 W) (22) in upper groove in spool bore. Insert spool from spring end of valve body, push spool in only until it is possible to install the o-ring (5/8 I.C. x 3/32 W.) (23) in its respective (lower) groove. Install washers (4 and 7), spacer (6), and spool centering spring (5) and secure with clip ring(3).
8. Install remaining plugs and relief valves in proper location.
9. Install lift check plunger (16), lift check spring (15), and lift check body (14). Press in lift check body until large radius lines up with the twin holes in working sections.
10. Install orifice plates (11) in correct ports.
11. Lay port (inlet) plate (10) on side on flat surface. Grease o-rings and place in o-ring grooves in port (inlet) plate (10). Place metal washer (24) inside o-ring (25). This washer secures the large o-ring.
12. Place o-rings and washers in remaining sections and stack in proper sequence.
13. Stack end plate (26) on last working section.
14. Install bolts (12) and lockwashers (13) and torque evenly to 20-25 ft. lbs.


BUCKET SECTION
DIPPER SECTION
STAB. SECTION
STAB. SECTION
SWING SECTION
BOOM SECTION
RETURN PORT
PRESSURE PORT
11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TROUBLE SHOOTING CHART

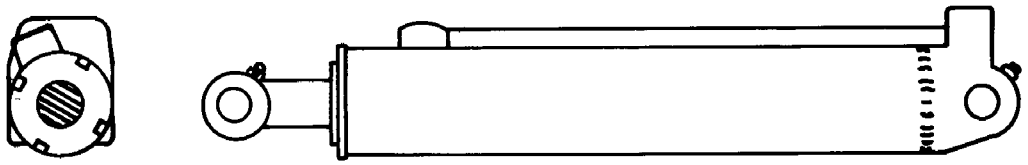
POSSIBLE CAUSE	CORRECTIVE ACTION
LOW SYSTEM PRESSURE	
1. Worn pump, valve or cylinder.	Use flowmeter test procedure to determine component at fault and repair or replace as required.
2. Dirty relief valve screen or partially plugged orifice.	Remove and clean.
3. Worn or stuck relief valve.	Remove relief valve and replace with new assembly.
STICKY VALVE SPOOL	
1. Misaligned control linkage.	Correct alignment.
2. Tie bolts too tight.	Loosen and torque to 20-25 ft. lbs.
3. Foreign matter in spool bore.	Remove spool and clean bore.
EXTERNAL LEAKAGE	
1. Tie bolts too loose.	Torque to 20-25 ft. lbs.
2. Damaged o-rings between sections.	Disassembly valve sections and replace o-rings.
3. Worn o-rings in spool bore.	Remove spool and replace o-rings.
4. Damaged o-rings and backup washers on plugs.	Remove plugs and replace o-rings and backups.
CYLINDER LOWERS WHEN VALVE SPOOL IS IN SLOW RAISE POSITION	
1. Damaged lift check plunger.	Remove lift check body and replace plunger.
2. Foreign matter under lift check plunger.	Remove lift check body and clean plunger and seat.
3. Damaged o-ring on lift check body.	Remove lift check body and replace o-ring and backup washer.
LOAD DROPS WITH SPOOL IN CENTERED POSITION	
1. Damaged cylinder packing.	Replace cylinder packing
2. Line to cylinder leaking.	Tighten fittings or replace hose.
3. Leaky circuit control relief valve.	Remove relief valve and clean with solvent and air pressure. If this does not correct problem, replace with new circuit relief valve.
4. Damaged o-ring in "Circuit control chamber."	Remove assembly in "circuit control chamber" and replace o-rings and backup washer in chamber.
5. Leaking valve spool.	Replace control valve section.

HYDRAULIC CYLINDER SERVICE

A. Boom, Dipper, Bucket Cylinder Identification:

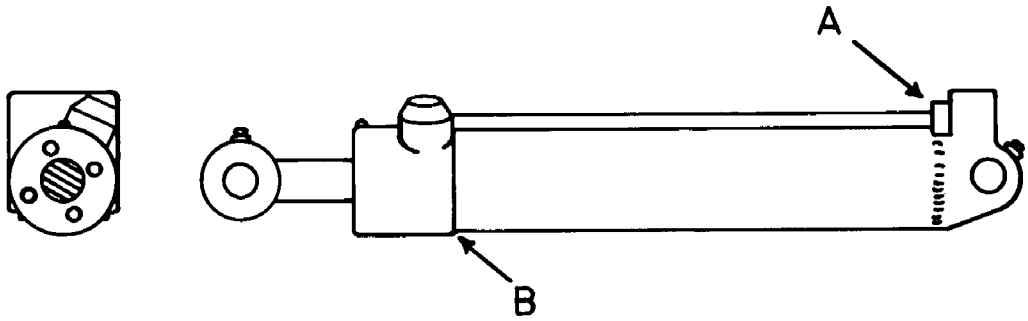
When servicing or ordering replacement parts for the backhoe cylinders, use the illustrations below for proper identification. All cylinders are easily recognized by examining the bearing nut as shown Other prominent features are noted.

All cylinders are interchangeable as complete assem blies for use with boom, dipper and bucket.



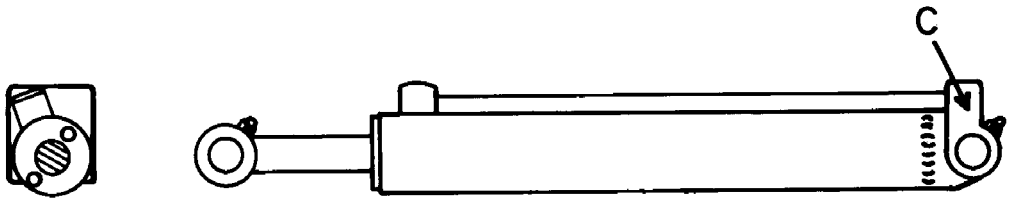
CESSNA 41093-BA ON ROD END OF CYLINDER TUBE

CASE P/N H514109



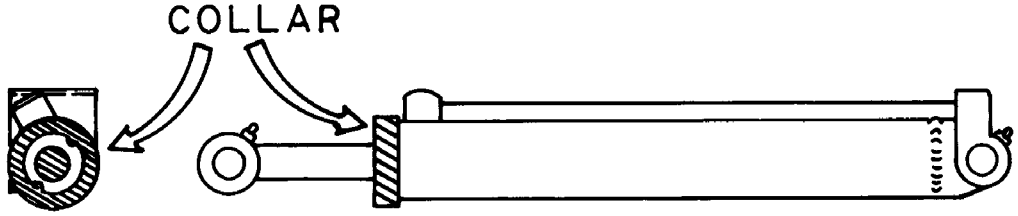
CASE: HOLDING COLLAR AROUND CROSS TUBE AT "A" RAISED COLLAR AT "B"

CASE P/N G34186



LANTEX CAST INTO BARREL AT C. GLAND RETAINE BY RING.

CASE P/N H600841



LANTEX GLAND RETAINED BY THREADED CAP

CASE P/N H607694

DISASSEMBLY

After identification, remove the cylinder gland according to the appropriate instructions below:

NOTE: Always clean cylinder thoroughly before disassembly.

(1) CESSNA #41093BA (ON ROD END OF CYLINDER TUBE)

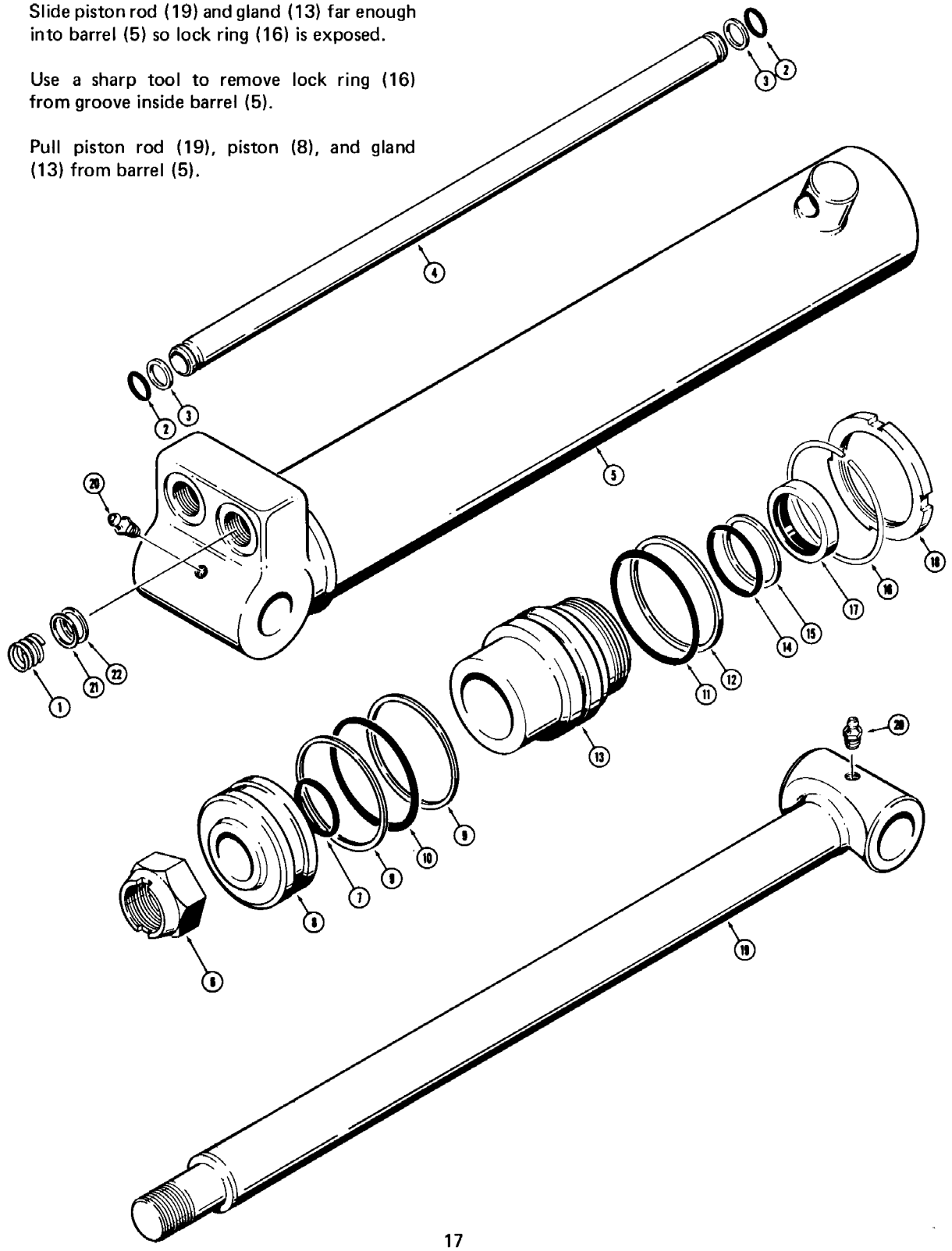
1. Cessna Cylinder

   a. Unscrew ring (19) from cylinder gland (13).

   b. Slide piston rod (19) and gland (13) far enough into barrel (5) so lock ring (16) is exposed.

   c. Use a sharp tool to remove lock ring (16) from groove inside barrel (5).

   d. Pull piston rod (19), piston (8), and gland (13) from barrel (5).



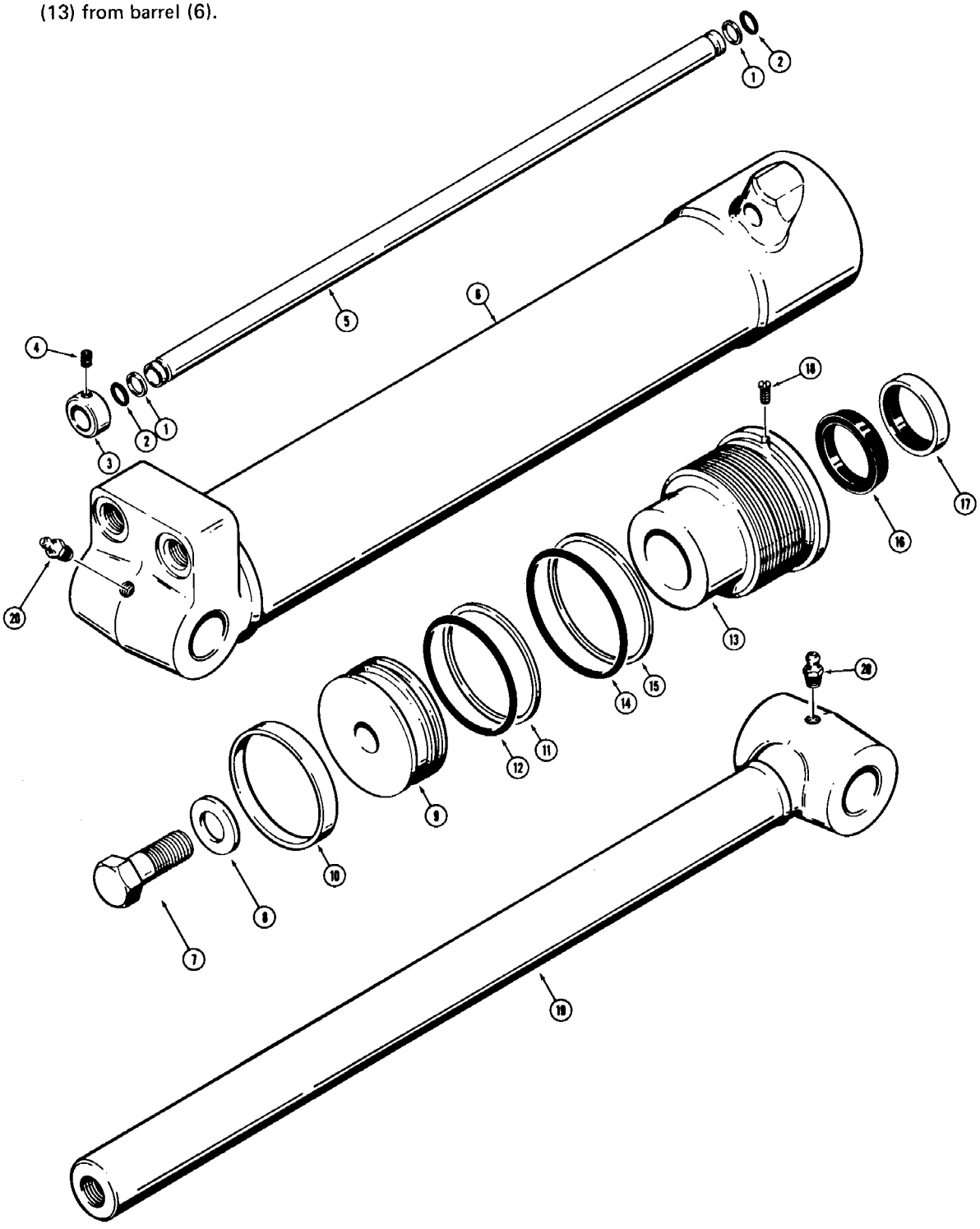
(2) CASE (WITH THREADED GLAND)

2. Case Cylinder

   a. Remove locating screw (18).

   b. Unscrew gland (13) from end of barrel (6).

   c. Pull piston rod (19), piston (9), and gland (13) from barrel (6).



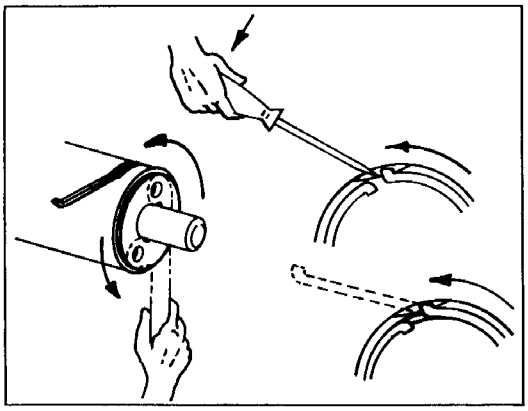
(3) LANTEX (GLAND RETAINED BY LOCK WIRE [RING])

3. Lantex (Gland retained by lock wire (ring))

   a. Insert a sharp tool, such as, a screwdriver, under the lockwire to start it out of the cylinder.

   b. Rotate the gland as illustrated to remove the lock wire. The direction of rotation for removal depends on the direction used in installation.

   c. Pull piston rod (18), piston (9), and gland (13) from barrel (6).



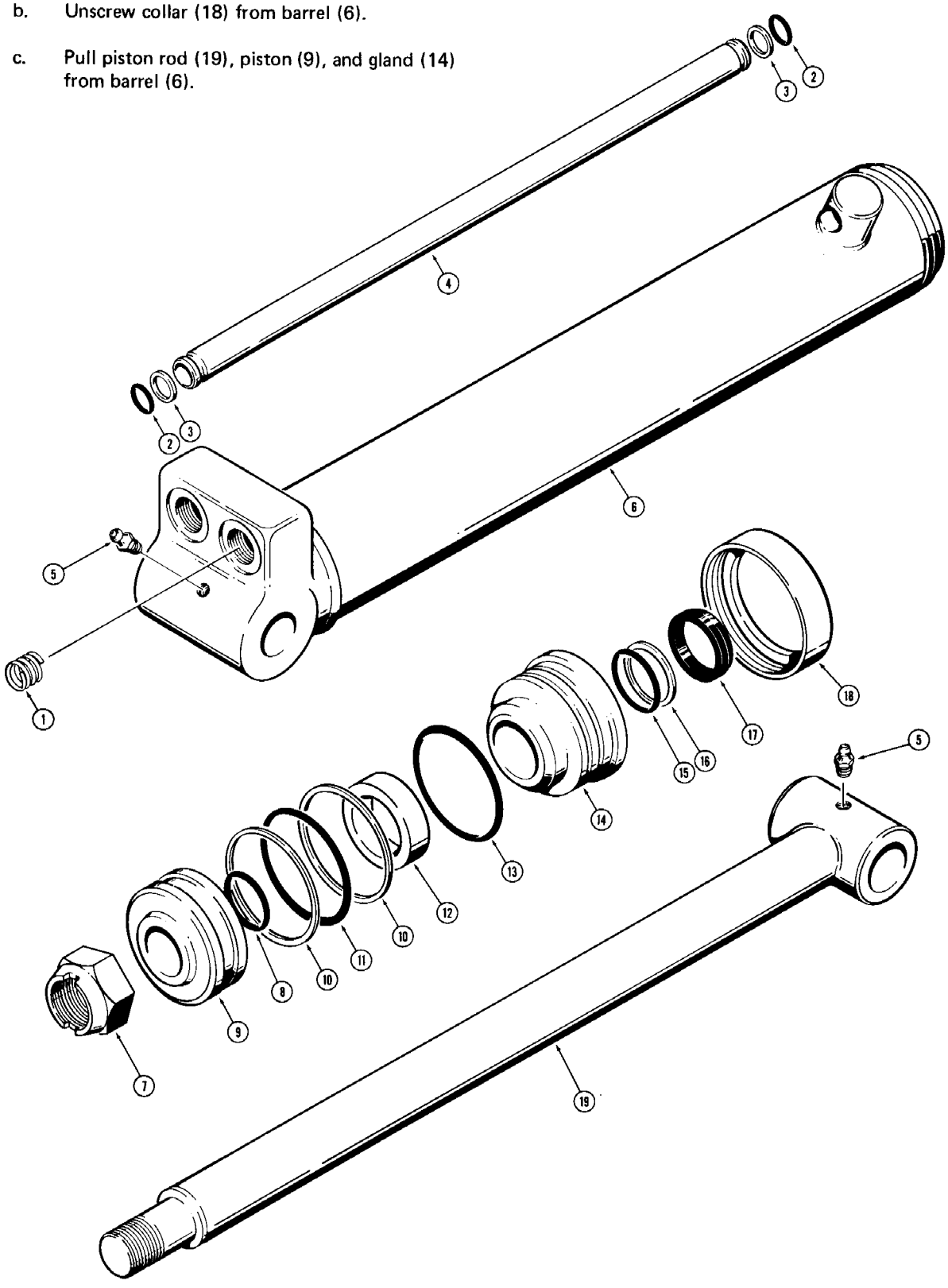
(4) LANTEX (WITH THREADED COLLAR)

4. Lantex (Gland retained by threaded collar)

   a. Remove collar set screw if present.

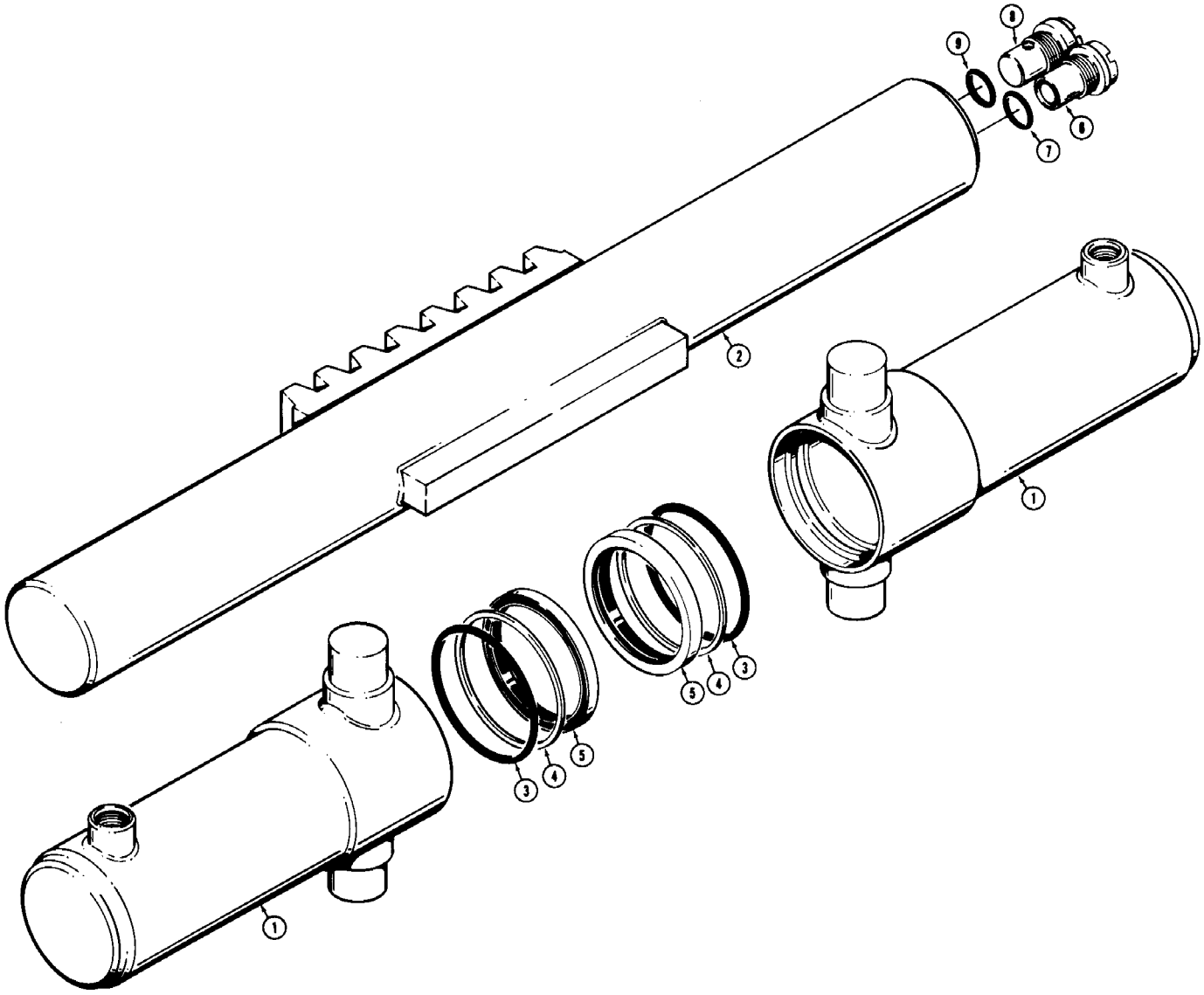
   b. Unscrew collar (18) from barrel (6).

   c. Pull piston rod (19), piston (9), and gland (14) from barrel (6).



5. Swing Cylinder

a. Slide both cylinders barrels (1) from special piston (2).

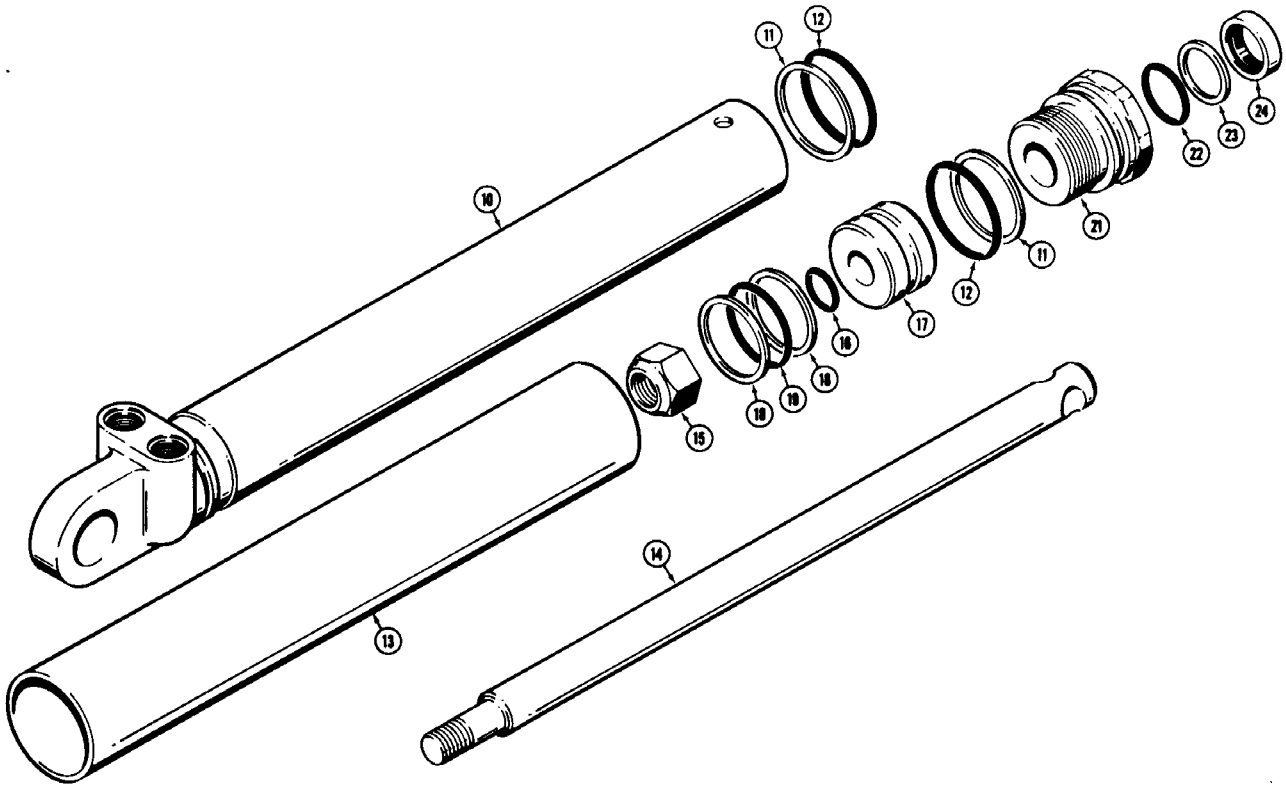


(6) STABILIZER CYLINDER

6. Stabilizer Cylinder

   a. Unscrew gland (21) from tube (10).

   b. Pull piston rod (14), piston (17), and gland (21) from barrel.



INSPECTION

1. Inspect rod and barrel for nicks, burrs, scratches or rust. Slight defects may be removed with fine emery cloth.

2. Inspect piston and barrel for excessive scoring or wear and replace if necessary.

3. Thoroughly clean all cavities and grooves and all parts to be reused.

4. Replace all seals before reassembly.

REASSEMBLY

1. Replace oil seals, o-rings, backup rings, wipers, etc. Be careful not to over stretch seals during reassembly.

2. Lubricate all parts with hydraulic oil to provide easier installation.

3. Reverse disassembly procedure for reassembly.

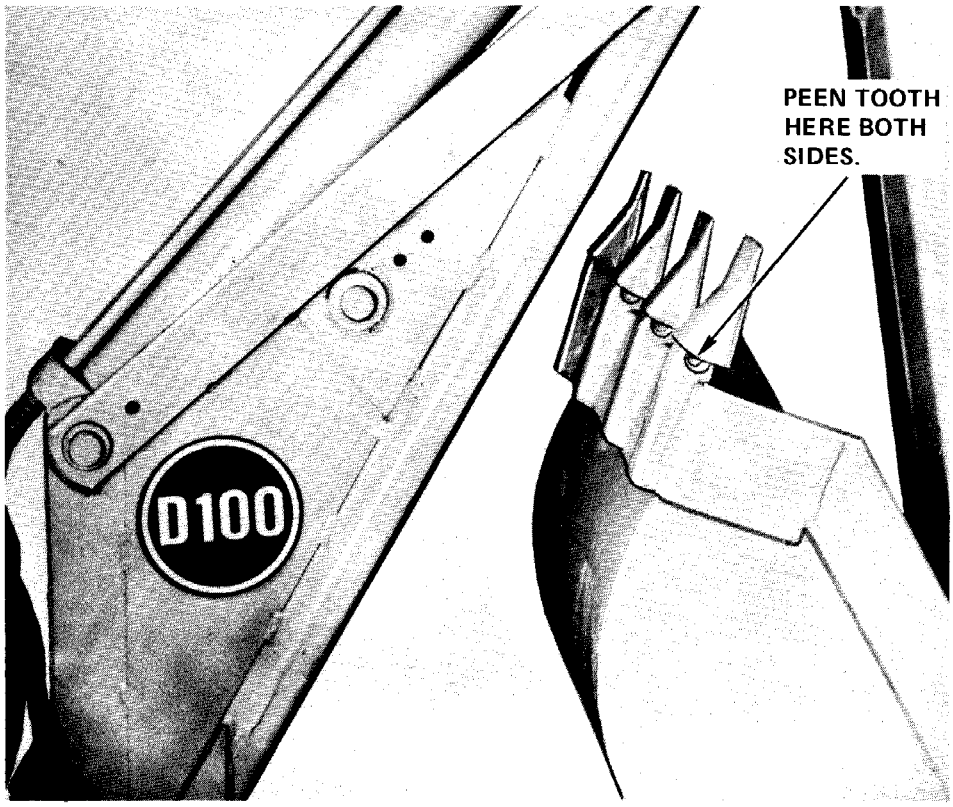
4. An automotive piston ring compressor may be used to compress and install the piston seals in the cylinder barrel.

BUCKET TEETH

The bucket teeth are self-sharpening and will require little or no attention. However, if replacement is necessary, proceed as follows:

1. Place punch at the rear of the tooth and drive off.

2. Slide the new tooth onto the shank. Peen each side of the tooth into the depressions. Be sure the tooth is fully onto the shank.



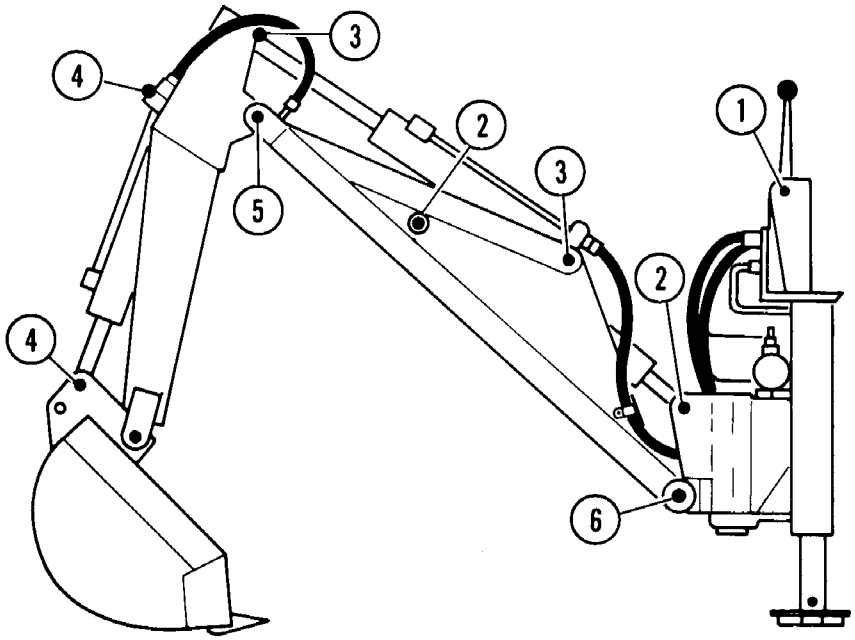
WARNING: When removing or installing Bucket teeth always wear safety glasses.

BACKHOE MAINTENANCE

The backhoe pivot points should be lubricated every 10 hours. If the backhoe is used in severe or abnormal working conditions, reduce the time interval by 1/2. Remove dirt from each grease fitting before applying the grease gun.

All nuts and bolts should be tightened after the first 1/2 hour of operation and at periodic intervals thereafter.

BACKHOE LUBRICATION POINTS



1. Control lever pviots . . . . . (6) one each lever
2. Boom cylinder. . . . . (2) one each end
3. Dipper cylinder . . . . . (2) one each end
4. Bucket cylinder. . . . . (2) one each end
5. Dipper pivot . . . . . (1) one fitting
6. Boom pivot . . . . . (1) one fitting

RECOMMENDED LUBRICANT

Above 32°F. (0°C) . . . . . Multipurpose or #2 lithium-soap base grease
Below 32°F. (0°C) . . . . . Multipurpose or #1 lithium-soap base grease

GMRCC

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