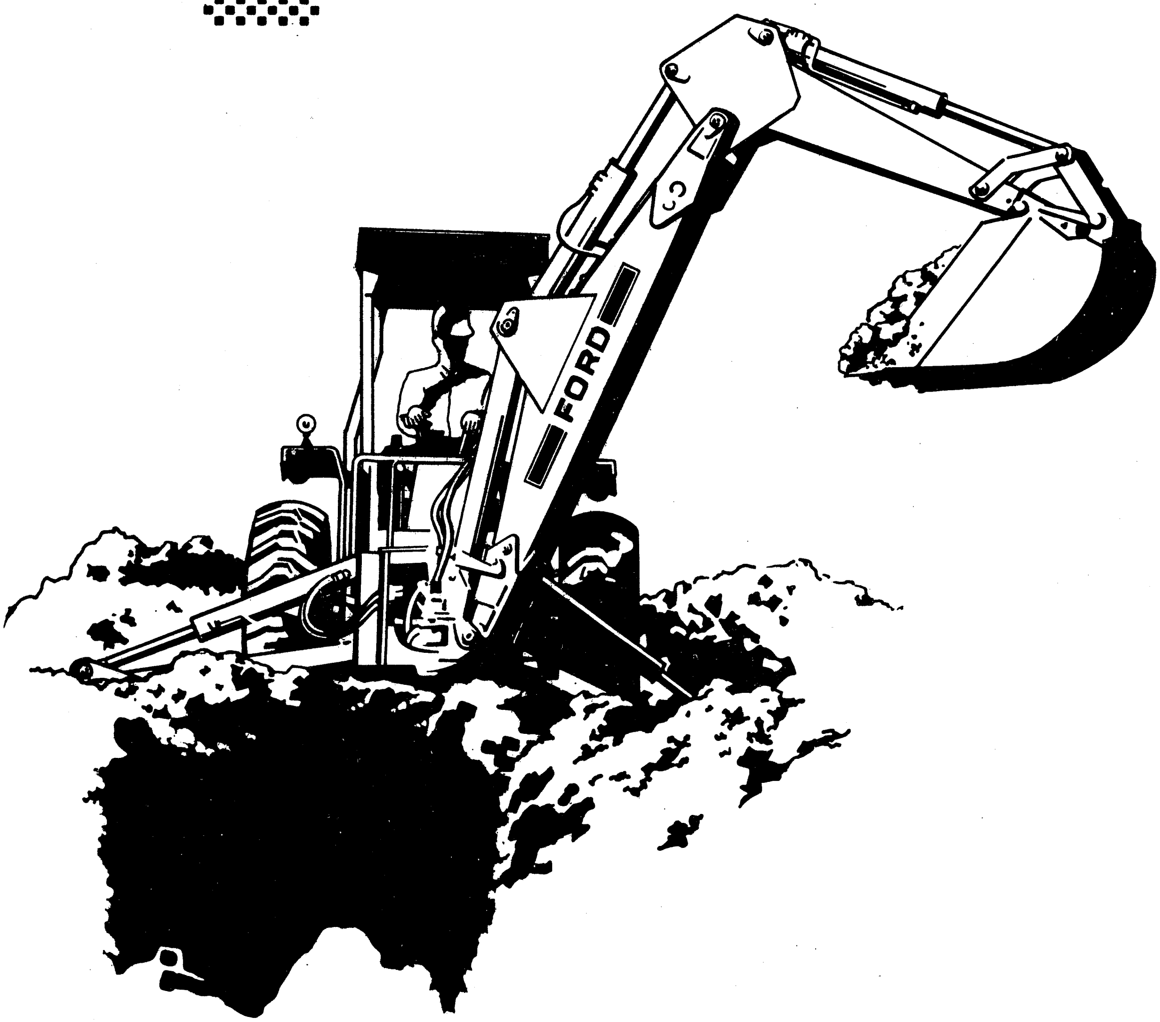
INDUSTRIAL EQUIPMENT

FORD

Series 765

Backhoe



REPAIR MANUAL

Reprinted

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FOREWORD

This manual contains service procedures for the Series 765 Ford Industrial Backhoe, models 19-801 thru 19-808. Detailed information is given on Description and Operation, Trouble Shooting, Tests and Adjustments, Maintenance, Lubrication and Specifications.

Installation of the basic backhoes, the attaching kits, and the hydraulic kits are not covered in this publication. Refer to the appropriate operating and assembly manuals for installation information.

Each backhoe is similar in construction and identical in operation; there are, however, variances in dimensions and specifications. Particular attention should be given to the correct model identification when ordering parts or when servicing the unit.

The service procedures in this manual are the most apparent, practical, and efficient methods; however, a procedure may not prove to be the most desireable in all situations. Alternate methods are sometimes required, depending upon the tools and equipment available.

Reference to direction in the operation and servicing of the backhoe is made as viewed from the backhoe seat. When ordering parts, left and right are reversed and referenced as facing in the direction of tractor travel.

Keep this manual with your other service material so that it will be readily avaliable when required.

SERVICE DEPARTMENT
FORD TRACTOR OPERATIONS
FORD MOTOR COMPANY

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DESCRIPTION AND OPERATION

The Ford 765 Backhoe consists of a mainframe, swing post, cylinders, boom, dipstick, hoses and tubing, control valves and controls, bucket, and attaching hardware. Refer to Figure 1 for location of the components. Hydraulic power for the backhoe is supplied by a hydraulic pump mounted on the tractor.

All dimensions of the backhoe are measured in metrics. This include bolts, nuts, washers, pivot pins, structural components and cylinders. However, tubing, hose connections and control valve components are of standard size.

PUMP

The hydraulic pump is driven by the tractor engine crankshaft. Information covering pump service procedures is explained in the appropriate Loader Service Manual.

MAINFRAME

The mainframe is of welded construction. Internally it houses the swing cylinder and main control valve. Externally it supports the control tower, stabilizers, and the swing post. The swing post and stabilizers are secured by means of pins.

The front of the mainframe is open, which allows access to the main control valve, system and circuit relief valves, and hose connections. The swing cylinders can be removed from the front of the mainframe without removing the unit from the tractor.

Access panels are located on the top of the mainframe to permit access to the control valve tubes, hoses, and valves. The main control valve can also be removed from the mainframe by removing the access panels and control tower.

STABILIZERS

Stabilizers are attached to the lower right and left side of the backhoe mainframe to level the unit and maintain stability during operation. Stabilizer spread is 10 feet (304.8 cm) while working, and 7 feet 1 inch (215.9 cm) in transport. Each stabilizer is controlled by a cylinder which is actuated by a control lever.

Pads, attached to the stabilizer ends, support the backhoe and provide stability. A variety of pads are available for various ground requirements.

In transport, the stabilizers are secured by chains to prevent them from lowering as a result of cylinder leakdown.

SWING POST

The swing post is a one-piece casting incorporating replaceable bushings and bushing seals at the lift cylinder pivot point.

The swing cylinder rod ends are attached to the swing post by means of pins.

BOOM

The boom frame is of reinforced welded tapered box construction. It supports the tubing for the crowd, bucket, and extendible dipstick cylinders. It also supports the rod end of the lift cylinder and the piston end of the crowd cylinder at a common attaching point. The boom also utilizes replaceable bushings and bushing seals at the swing post-to-boom pivot.

DIPSTICKS

Both the standard and extendible dipsticks are of reinforced welded tapered and box type construction, respectively. They both support the bucket cylinder and the rod end of the crowd cylinder. In addition, they utilize replaceable bushings and bushing seals at the boom-to-dipstick pivot and at the bucket and bucket idler link pivots.

The extendible dipstick increases the digging depth capability. This is accomplished by using telescoping components controlled by a cylinder housed in the components. The cylinder is controlled by a foot pedal on the operator's platform next to the control tower. Also, the telescoping components utilize replaceable wear plates.

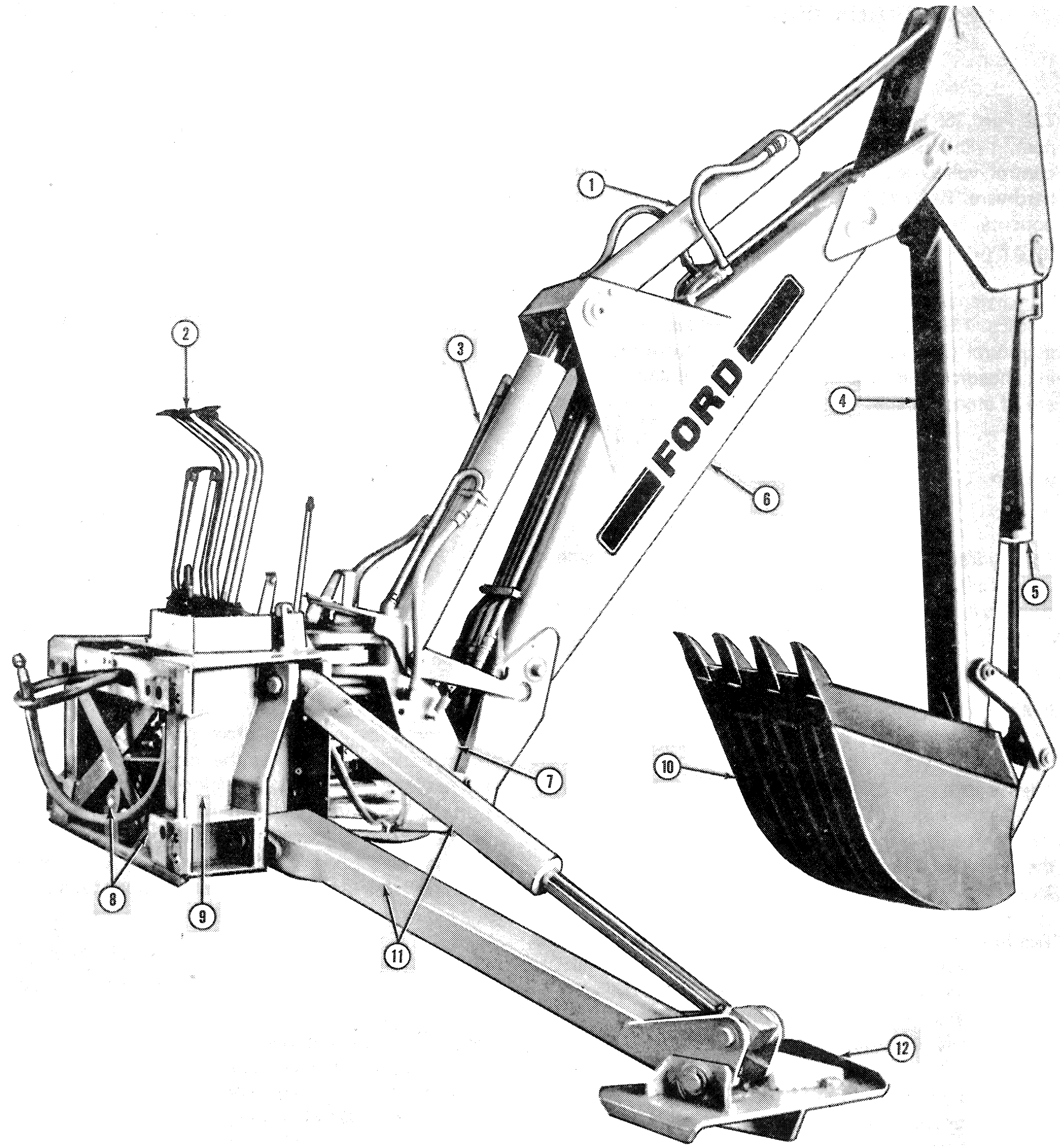

Figure 1
Backhoe Components

1. Crowd Cylinder
2. Controls — Four Lever
3. Lift Cylinder
4. Dipstick
5. Bucket Cylinder
6. Boom
7. Swing Post
8. Swing Cylinder
9. Mainframe
10. Bucket
11. Stabilizer and Stabilizer Cylinder
12. Stabilizer Pad — Standard

BUCKETS

Buckets are of welded construction with replaceable bushings in the pivot pin locations. Repositioning the bucket link permits maximum bucket curl for straight wall digging or maximum bucket power.

CYLINDERS

All cylinders are double acting and are honed for concentricity and finish. The piston rods are high-tensile, die drawn steel, hardened, ground, polished, and chrome plated.

Cylinder piston packings are of the chevron-type. The rod packings are of the chevron type also, but incorporate a urethane "U" seal. The packing gland supports and retains the rod packing, bearing sleeve, rod wiper, and gland O-ring and backup ring.

Cylinder pivot and anchor points utilize bushings and bushing seals which retain grease and keep out dirt and water.

The piston and gland packings, Figure 2, are positioned so the lips (vee) face toward the pressurized oil under cylinder power loading conditions. As the cylinder pressure increases, the lips of the chevrons are forced outward to the inner wall of the cylinder barrel, and toward the rod surface. This action provides for a more positive seal against oil transferring from the high pressure side to the low pressure side of the packing. The double-acting packings on all cylinder pistons, except stabilizers, face in opposite directions so as to face high pressure in either direction of piston travel. This is essential, as the cylinders exert force in both directions of travel. Figure 2 illustrates cross section views of the cylinder types.

The swing cylinders employ two connecting hoses at the piston end of the cylinders. These hoses connect the swing cylinders together to permit oil flow between the cylinders and are also part of the swing cushioning system.

MAIN CONTROL VALVE

The main control valve is a stack-type assembly consisting of six sections when a standard dipstick is used and seven sections when the extendible dipstick feature is used. In either case, the sections contain spring centered, manually operated control spools which direct high pressure pump oil to the individual cylinder circuits. Each circuit contains a spring loaded check valve to check the flow from either cylinder port to the valve pressure passage. The check valves are located between each section and not externally accessible unless the sections are separated. Also, each section except the two stabilizer sections, contains adjustable circuit relief valves to protect their respective cylinders against pressure overloading during actual digging operations. Variable flow restrictor valves are used at the swing cylinder ports. Also, the lift cylinder rod end circuit uses a variable flow restrictor, except it is located at the rod end cylinder port. Refer to page 10 for a description of the variable flow restrictors.

The main control valve is also equipped with an inlet end cover and an outlet end cover. The inlet end cover contains the inlet port and the system relief valve. The outlet end cover contains the return oil port which returns low pressure oil to the reservoir, and the power-beyond port which supplies high pressure oil to the loader circuit. Therefore, all pumped oil is routed to the backhoe main control valve before it reaches the loader circuit. The outlet end cover also houses the backpressure relief valve, the backpressure valve, the unload valve, and the regenerative check valve.

INLET END COVER: The inlet end cover directs oil through internal ports to the valve spools and high pressure passages. It also contains a return oil passage which returns oil to sump, through the valves and outlet end cover, when the system relief valve relieves excessive pressure. The system relief valve is housed in the inlet end cover. It functions and is constructed the same as the circuit relief valves.

OUTLET END COVER: The outlet end cover contains four poppet-type valves. They are the regenerative check valve, backpressure valve, backpressure relief valve and the unload valve. See Figure 3. The valves are not externally adjustable.

These four valves operate only when a backhoe cylinder is being moved and return oil is being exhausted from the cylinder. The conditions under which the cylinder may be operated will determine which of the valves will function. The conditions are:

1. A "fast-drop" condition where the system pressure becomes less than sump pressure — Regenerative Check Valve.

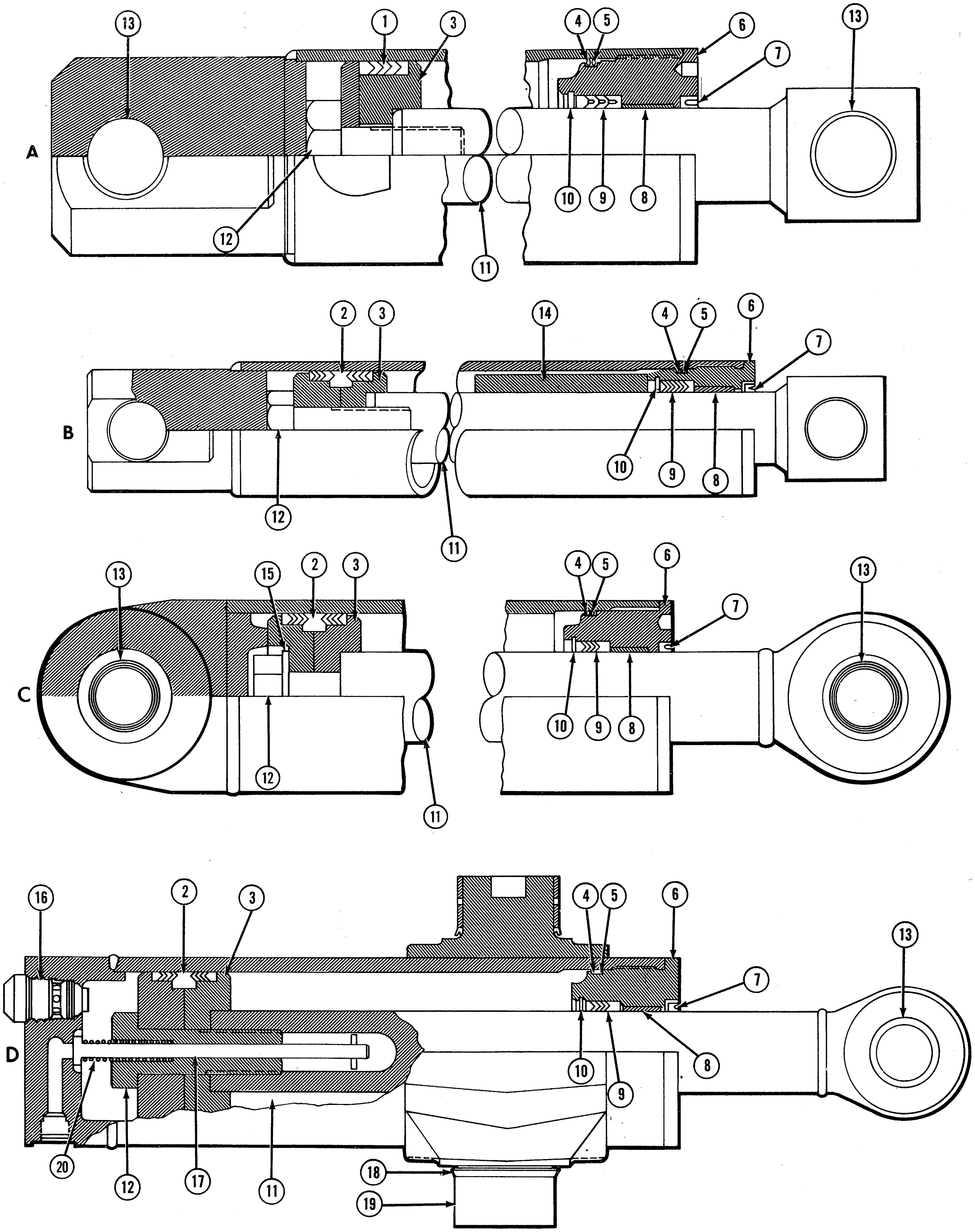
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Figure 2

Figure 2
Cylinder Components

A. Stabilizer Cylinder
B. Extendible Dipstick Cylinder
C. Lift, Crowd, and Bucket Cylinders
D. Swing Cylinders
1. Single Piston Packing
2. Double Piston Packing
3. Piston
4. O-Ring
5. Back-Up Ring
6. Gland
7. Rod Wiper
8. Bearing
9. Single Rod Packing
10. Retainer Ring
11. Rod
12. Piston Retaining Bolt
13. Seal and Bushing
14. Spacer
15. Washer
16. Cushion Valve
17. Deleration Rod
18. Seal
19. Bushing
20. Spring

2. A "no-load or light load" condition where the system pressure is less than 900 psi (62 bar), but greater than sump pressure — Backpressure and Backpressure Relief Valves.

3. A "medium or heavy loaded" condition where the system pressure is 900 psi (62 bar) greater than sump pressure — Unload and Backpressure Valves.

The operation of the four valves and how they are affected by the above conditions is explained in the following paragraphs. Refer to Figure 3.

NOTE: *The regenerative check valve, for illustration purposes, is not shown in its normal mounting position. Normally, it enters the cover from the side not shown.*

The regenerative valve (1) poppet is held in position by a light spring. It unseats when return oil pressure in passage (A) is greater than high pressure oil in passage (C). This additional oil supplements the oil supplied by the pump to prevent a "void" from occurring during a "fast drop" condition. For example, rapidly lowering the boom when the bucket is full, will force oil out of the rod end of the cylinder faster than the pump can supply oil to the piston end, and will form a void if additional oil is not available to supplement pump oil.

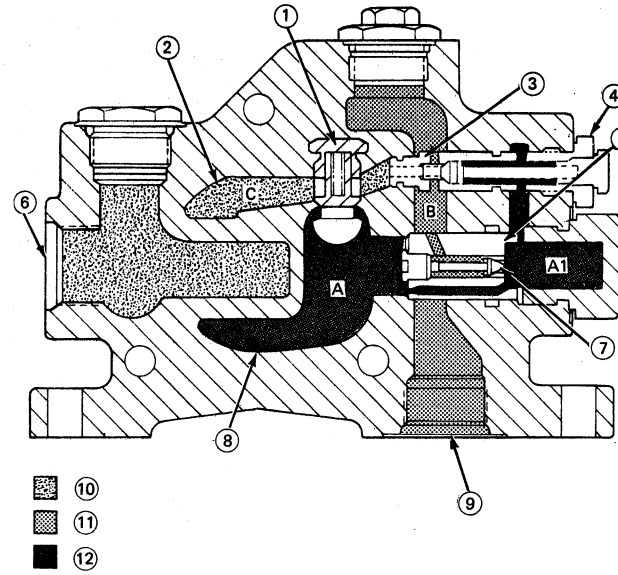

Figure 3
Outlet End Cover Components and Oil Flow

1. Regenerative Check Valve
2. High Pressure Passage
3. Piston
4. Unload Valve
5. Backpressure Valve
6. Power Beyond Port
7. Backpressure Relief Valve
8. Return Oil Passage
9. Sump Port
10. Pump Pressure
11. Return-to-Sump
12. Metered Flow

The backpressure relief valve (7) is a simple pilot operated relief valve. It functions when the pressure in the return oil passage (A) is approximately 250 psi greater than the pressure in the sump oil passage (B). Note the orifice through the backpressure valve that connects passage (A) to (A1). It is a pilot passage used for the backpressure relief valve to sense pressure. When the relief valve opens, the backpressure valve (5) is pushed, against spring pressure, by the pressure in passage (A) due to the lack of pressure in passage (A1) and permits oil to flow from passage (A) to passage (B) which returns oil to sump.

Last of all is the unload valve (4). When oil pressure in the high pressure passage (C) is approximately 900 psi higher than sump oil pressure in passage (B), the unload valve opens and relieves the pressure behind the backpressure valve in passage (A1). The backpressure valve is pushed against its spring from return oil pressure in passage (A) allowing the oil in passage (A) to return to sump through passage (B). There is no exchange of oil between the high pressure passage (C) and the sump oil passage (B). The unload valve piston (3) is used to sense high pressure oil, and when high enough, slides to the right opening the seat, permitting return oil to flow to sump.

NEUTRAL-OPEN CENTER: Figure 4 illustrates the lift circuit valve section in the "neutral" condition. However, all other circuit sections have the same internal passages. Oil enters the control valve section through the inlet port in the inlet end cover. This pump oil, Figure 4, is diverted in the inlet end cover to the open center passages (A), (B), and (C) and also to the high pressure passage (D). The high pressure passage goes through all the valve sections and ends at the regenerative check valve in the outlet end cover. Oil flow in the opposite direction (from the outlet end cover) is possibly due to the regenerative feature which is covered on page 5. As long as the spools remain in the neutral position, oil in the high pressure passage (D) is static, but at the same pressure as system pressure.

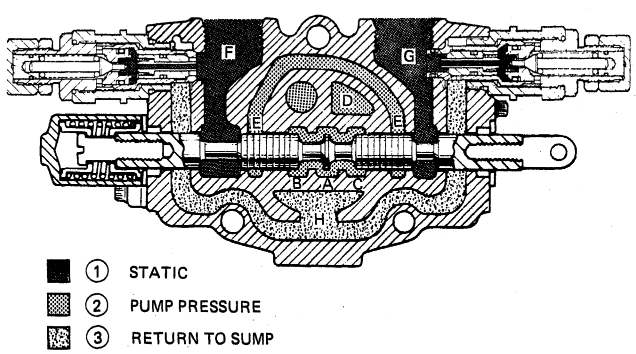

Figure 4
Lift Control Valve — Neutral
1. Static Oil
2. Pump Pressure
3. Return-to-Sump

The oil flowing through the open center passages (A), (B), and (C) continue through each valve section and to the outlet end cover. It leaves the control valve through the power-beyond port in the outlet end cover.

Oil in the cylinder ports (F) and (G) is static as it is trapped between the cylinder and control valve spool as long as the spool remains in the neutral position.

Oil in the return oil passage (H) is residual oil discharged from the spool circuit relief valves, system relief valve, or backhoe cylinders.

SPOOL OPERATION: Figure 5 illustrates the lift circuit valve in the "raise" condition. Other sections are similar.

Oil entering the control valve exerts equal pressure in the high pressure passage (D) and the open center passage (A), (B), (C). When the spool is positioned to raise the boom (moved to the left as shown in Figure 5), flow is restricted through the open center. The pumped oil, tending to follow the path of least resistance, diverts to the high pressure passage (D) where it unseats the check valve and flows into passage (E), around the spool into port (G) and on to the rod end of the lift cylinder. As a result, oil is forced from the piston end of the lift cylinder into port (F) of the control valve where it flows around the spool and into the return oil passage (H). The return oil flows through passage (H) to the outlet end cover. When the return oil reaches the outlet end cover, it will contact the four regenerative valves which interact to prevent a moving cylinder from voiding by using return oil for regeneration as required. If the control valve spool is moved to the opposite position, a reversal of the oil flow takes place. The check valve closes when oil flow stops.

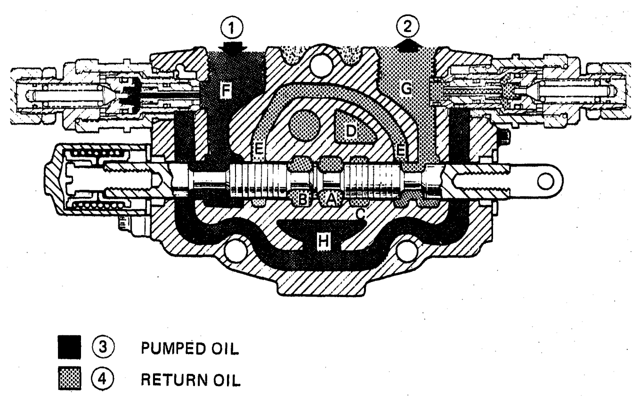

Figure 5
Lift Control Valve — Raise
1. From Lift Cylinder Piston End
2. To Lift Cylinder Rod End
3. Pump Oil
4. Return Oil

CYLINDER CIRCUIT CHECK VALVE: The spring loaded check valve (3), Figure 6, prevents the cylinders from dropping under load. The check valve functions when the spool is initially moved from the neutral position and before the pump has time to build sufficient pressure to overcome the external load.

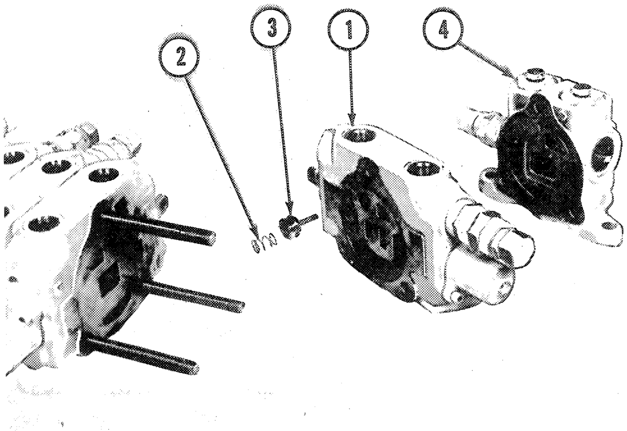

Figure 6
Check Valve — Exploded View
1. Valve Section
2. Check Valve Spring
3. Check Valve
4. Inlet End Cover
5. O-Ring

CONTROLLED FEATHERING ACTION: The spool in each section is designed to provide controlled oil flow to the cylinders. Each land has four small notches. As the spool is moved, the notches meter a small amount of oil, slowly pressurizing the system before the entire land uncovers the passage and allows full flow. Easing the spool through its first stage of travel provides the pinpoint movement needed for accurate control.

CIRCUIT RELIEF VALVES: There are two different style circuit relief valves used in the main control valve, as shown in Figure 7. The one on the right is used in the lift rod end circuit. Note the length of the sleeve poppet (6) and also the addition of an O-ring (5) and back-up ring (4) for better sealing during a craning operation. The circuit relief valve on the left is common in construction to all other circuit relief valves and the system relief valve. Note that it has a tapered sleeve poppet with no sealing rings. This construction allows the sleeve poppet to move off its seat during cavitation.

Circuit relief valves are used at both ends of the lift circuit, both ends of the swing circuit, rod end of the bucket circuit, piston end of the crowd circuit, and the piston end of the extendible dipstick circuit. These circuits listed above are subjected to externally caused

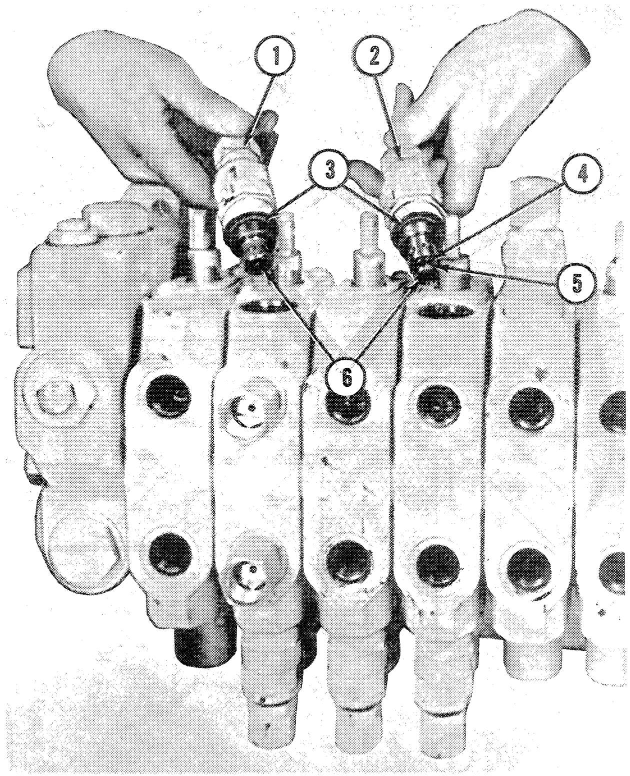

Figure 7
Circuit Relief Valve Types
1. Circuit Relief Valve — All Except Lift Rod End
2. Circuit Relief Valve — Lift Rod End
3. O-Ring
4. Back-Up Ring
5. O-Ring
6. Sleeve Poppet

high pressures during normal operation. The circuit relief valves function to limit the pressure which is allowed to build in these circuits during operation. The valves are positioned between the cylinder port and the return passage in the control valve.

High pressure cylinder oil enters the relief valve through the end of the hollow piston (2), Figure 8. This oil acts against the pilot valve (6) and the bottom end of the poppet (5). When the pressure at the cylinder port exceeds the force exerted by the pilot valve spring (4), the pilot valve is unseated, and oil flows around the outside of the sleeve poppet (1) and to the low pressure return.

Oil flowing from behind the poppet (5), due to the opening of the pilot valve, lowers the pressure in that area, and allows the piston (2) to move and seat against the pilot valve. This shuts off oil flow to the area behind the poppet so that pressure in that area re-

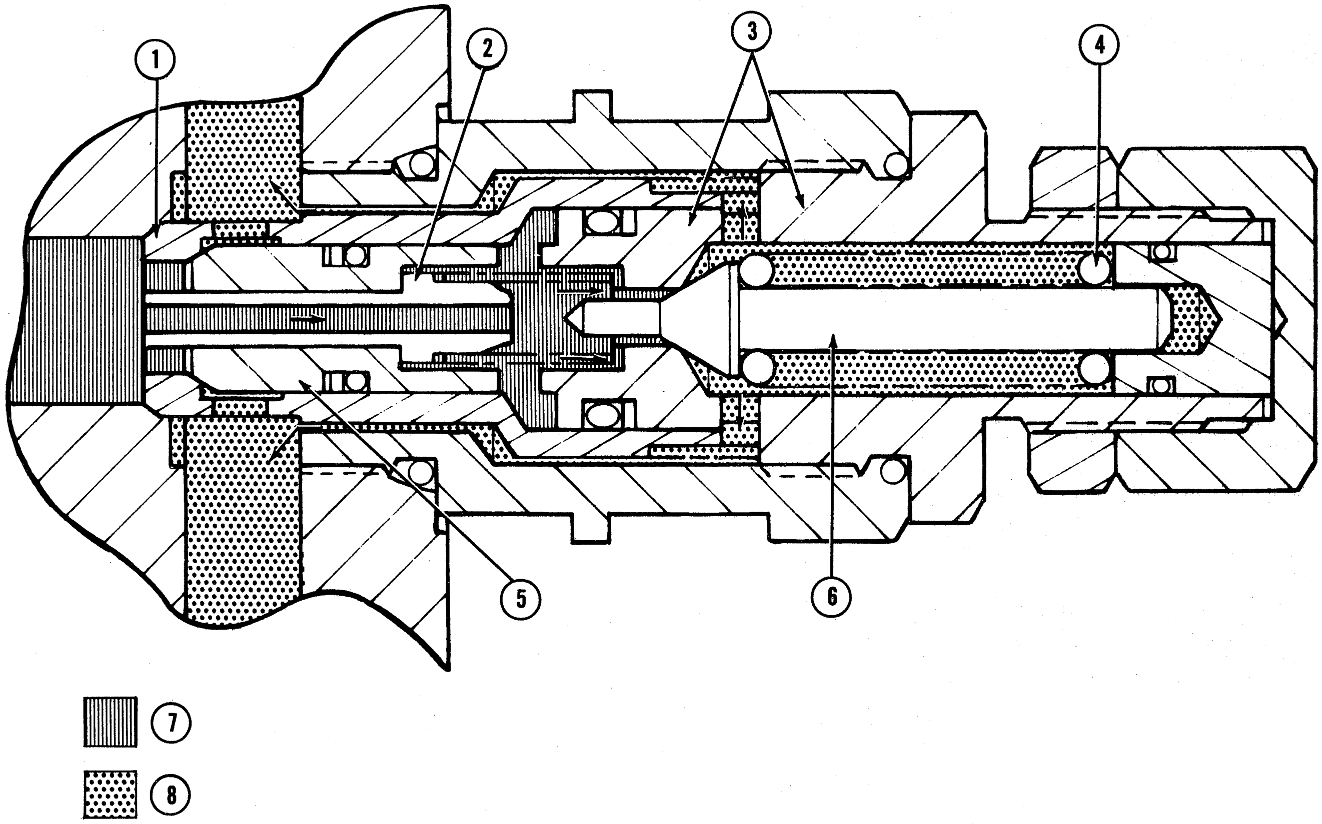

Figure 8
Circuit Relief Valve Operation

1. Sleeve Poppet
2. Piston
3. Fitting
4. Spring
5. Poppet
6. Pilot Valve
7. High Pressure
8. Sump Oil

mains low. The higher cylinder port pressure forces the poppet (5) and sleeve poppet (1) off its seat, relieving the high pressure oil to sump.

NOTE: *The circuit relief valve described above is common to all circuit relief and system relief valves except the lift rod end circuit relief valve. However, it too, functions in the same manner except that the sleeve poppet (1) uses an O-ring and back-up ring for sealing and not the tapered seat; therefore, it is not free to move.*

VARIABLE FLOW RESTRICTORS

Variable flow restrictors are used in both the lift and swing circuits. The valve contains a loose fitting restrictor plate (2), Figure 9, which is free to slide in its bore. One side of the plate is flat and the other side has a slot in it. When oil is flowing against the flat side, the plate slides off its flat seat and allows unrestricted oil flow. When oil flows in the opposite direction, the plate seats on its surface causing a restriction of oil. The amount of restriction is dependent upon the size of the orifice in the plate. The size is stamped on the restrictor plate and indicates the orifice diameter in sixty-fourths of an inch.

The lift circuit uses a variable restrictor at the lift cylinder rod port to restrict oil out of the rod end when the cylinder is externally loaded. This prevents a possible void in the piston end of the cylinder by allowing the pump to fill the piston end as rapidly as oil is being exhausted from the rod end. A number "14" plate is used on 15 ft. (4.6 m) is backhoes equipped with an extendible dipstick and 12 and 14 ft. (3.7 and 4.3 m) backhoes with a standard dipstick. A number "16" plate is used on 15 ft. (4.6 m) backhoes with a standard dipstick.

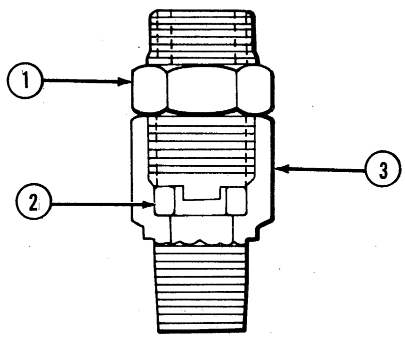

Figure 9
Variable Restrictor — Cutaway View

1. Connector
2. Restrictor Plate — Loose Fitting
3. Body

The swing circuit uses two variable flow restrictors. One is mounted in each port at the swing section of the main control valve. They function to restrict oil flowing into the valve section from the cylinders, but permit free flow to the cylinders. Their purpose is the same as for the lift circuit, but in addition are also used to slow the swing cycle to prevent structural damage due to the momentum of the backhoe components. A number "8" restrictor plate is used in both restrictor valves of the swing circuit when the unit is equipped with an extendible dipstick. A number "9" plate is used when a standard dipstick is incorporated.

NOTE: *Under NO circumstances should the restrictor plates in either the swing or lift circuits be removed, altered, or replaced with different size plates, as it can seriously affect performance and/or the life of the unit.*

SWING CUSHIONING AND DECELERATION

The swing cushioning and deceleration system is complex due to the cylinder end cap porting, the oil flow between cylinders, the interactions between the swing circuit relief valves and the cushioning valves, and the geometry of the swing post and cylinder pivot points. Therefore, a general description of the events that take place in the right swing cylinder during the cushioning and deceleration modes only, will be given. The description will include two conditions, as follows:

1. Swinging partially right, then releasing the control lever.
2. Swinging fully right.

The cushioning valve is of a direct operating type, in that high pressure oil forces the poppet from its seat, then enters the valve area and flows out to lower pressure. The cushioning valve functions as both a cushion and deceleration device. Note that the deceleration rod (2), Figure 10, is spring loaded and begins to function before the cylinder reaches the end of its stroke.

In the first condition, swinging partially right, then releasing the control lever, refer to illustration (A), Figure 10. As the operator actuates the control lever to swing partially right, oil flows into the rod end of the cylinder (port not shown), causing the cylinder to retract. The oil in the piston end flows out port (R) because the cylinder has not retracted far enough for the deceleration rod (2) to cover the port. Oil flowing out port (R) goes to the end cap porting of the left swing cylinder and flows to either the rod end of the left swing cylinder to help prevent voids (cavitation), or back to the control valve and on to sump.

When the operator releases the control lever, the spool returns to neutral and oil is stopped from flowing into the rod end (port not shown) and also out of the piston end through port (R). However, due to the momentum of the backhoe structural components, the cylinder will still want to retract. Therefore, the swing cushioning valve (1) will operate to lessen the shock and prevent structural damage. It functions as follows:

When the pressure in the cylinder exceeds the setting of the valve, the poppet (3), Figure 11, moves to the left, lifting off its seat, allowing oil to flow into the hollow area of the poppet and out port (S) through the radially drilled holes in the valve body (4). Port (S) will allow oil to return to the rod end of the right swing cylinder and the piston end of the left swing cylinder to help prevent voids (cavitations). It may also cause the left swing cylinder cushion valve to function, returning oil to sump through the control valve. This results in a cushioning action by equalization of oil pressure.

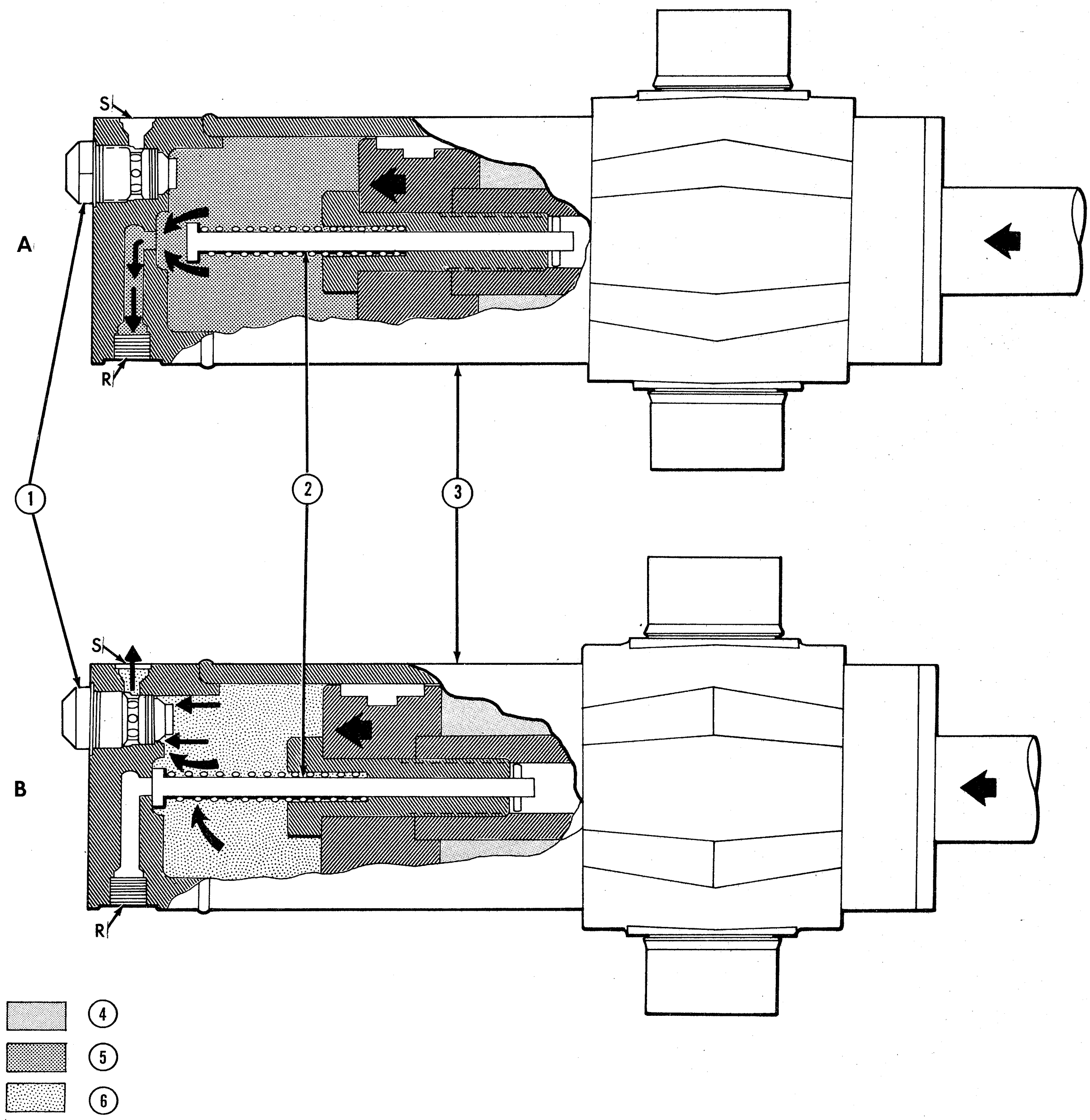

Figure 10
Swing Cylinder Cushioning and Deceleration Operation

1. Cushioning Valve
2. Deceleration Rod
3. Swing Cylinder
4. Pressure From Control Valve
5. To Opposite Swing Cylinder and/or To Control Valve
6. Cushioning Oil

In the second condition, swinging fully right, refer to illustration (B), Figure 10. As the cylinder retracts and nears the end of its stroke, the deceleration rod (2) blocks oil from flowing out port (R) as shown. However, oil is still flowing into the rod end of the cylinder because the operator is holding the control lever in the swing right mode. This causes the pressure in the piston end to increase. As the pressure in the piston end increases and exceeds the setting of the cushioning valve, the poppet (3), Figure 11, moves to the left, lifting off its seat, allowing oil to flow into the hollow area of the poppet and out port (S) through the radially drilled holes in the valve body (4). Port (S) will direct the oil to the piston end of the left swing cylinder and possibly cause its cushioning valve to function, returning oil to sump through the control valve. This results in deceleration, during the last few inches of cylinder retraction, by slowing the flow of oil out of the piston end.

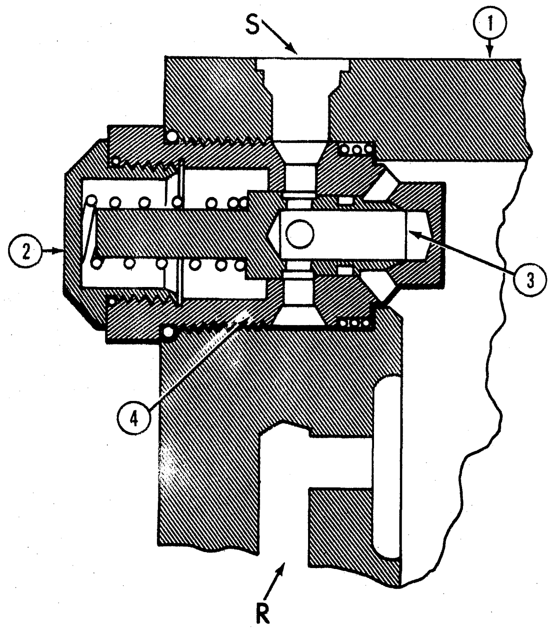

Figure 11
Cushioning Valve Operation

1. Swing Cylinder End Cap
2. Cushioning Valve
3. Poppet
4. Valve Body

TROUBLE SHOOTING

This portion of the repair manual is devoted to trouble shooting Ford 765 Backhoe malfunctions. If trouble shooting is approached in a systematic manner, the malfunction can be diagnosed quickly and accurately. Follow the step-by-step procedures outlined below.

Preliminary Checks

As a first step in the trouble shooting procedure, several preliminary checks should be made. These checks are essential in that once performed they need no longer be considered as a possible cause of the immediate malfunction.

- Check for proper backhoe and loader and/or hydraulic accessory installation.
- Check hydraulic oil level.
- Check for external oil leaks.
- Check for external mechanical damage such as kinked hoses or tubes, damaged cylinders, bent or binding structural members.
- Perform the system relief valve pressure checks and adjust if necessary, as covered on page 19. If the pressures cannot be adjusted to specifications, refer to Trouble Shooting, outlined below.

Trouble Shooting

Having performed the preliminary checks and failing to locate the cause of malfunctioning, the following procedures should be used.

1. If possible, operate the backhoe and make note of the operating characteristics. Cycle each control lever to operate each of the cylinders to both the extended and retracted positions.

2. Compare the operating characteristics observed in Step 1 with the problems listed in the Trouble Shooting Chart.

   EXAMPLE: *"Backhoe lift circuit slow to raise, all other circuit positions work normally.*

Listed in the column under "PROBLEM" in the Trouble Shooting Chart, the malfunction relating to the example problem would be: "Lift fails to operate, is slow, or has loss of power."

- The column labeled "PROBLEM" lists the observed malfunctions when the backhoe or loader is operated.
- The column labeled "POSSIBLE CAUSES" lists all the items in the circuit which could cause the observed malfunction.
- The column labeled "TEST" lists the test which should be used to determine the item causing the observed malfunction.

Refer to the "TEST" column and perform the recommended tests. Proper testing will reduce the time required in locating the cause of the malfunction. Proper testing will also provide a more accurate indication of the malfunction and will save the time of unnecessary disassembly and inspection of all the components in the particular circuit. If adequate test equipment is not available, disassembly and inspection of the items listed under "POSSIBLE CAUSES" must be undertaken.

TROUBLE SHOOTING CHART

Problem	Possible Causes	Test
R or L Swing fails to operate, is slow, or has loss of power.	Piston packings and/or piston O-rings or cylinder walls damaged, and leaking.	Disassemble and inspect.
	Either cushioning valve in swing cylinder end or circuit relief valves in swing valve not seating, set too low or seat is leaking.	Backhoe Swing Cushioning Relief Valve Test, page 27, or Backhoe Swing Circuit Relief Valve Test, page 27.
	Valve spool leakage.	Circuit and Accumulated Leakage "Tee" Test, page 34.
R or L Swing late to decelerate or fails to cushion.	Cushioning valve or swing circuit relief valves not seating, set too low or seat is leaking. Decelerator rod not seating properly.	Backhoe Swing Cushioning or Circuit Relief Valve Test, page 27.
	Internal leakage in backhoe control valve.	Circuit and Accumulated Leakage "Tee" Test, page 34.
R or L Stab. fails to operate, is slow or has loss of power.	Piston packings and/or piston O-rings or cylinder walls.	Cylinder Packing Leakage Test, page 39.
	Valve spool leaking.	Circuit and Accumulated Leakage "Tee" Test, page 34.
Bucket fails to operate, is slow, or has loss of power.	Piston packings and/or piston O-rings or cylinder walls.	Cylinder Packing Leakage Test, page 39.
	Valve spool leakage.	Circuit and Accumulated Leakage "Tee" Test, page 34.
	Bucket circuit relief valve stuck open, set too low, or seat is leaking.	Backhoe Bucket Circuit Relief Valve Test, page 22.
Lift fails to operate, is slow, has loss of power, or not holding.	Piston packing and/or piston O-rings or cylinder walls.	Cylinder Packing Leakage Test, page 39.
	Valve spool leakage.	Circuit and Accumulated Leakage "Tee" Test, page 34.
	Lift circuit relief valve stuck open, set too low, or seat is leaking.	Backhoe Lift Circuit Relief Valve Test, page 23.

Problem	Possible Causes	Test
Crowd fails to operate, is slow, has loss of power, or not holding.	Piston packings and/or piston O-rings or cylinder walls.	Cylinder Packing Leakage Test, page 39.
	Valve spool leakage.	Circuit and Accumulated Leakage "Tee" Test, page 34.
	Crowd circuit relief valve (piston end) stuck open, set too low or seat is leaking.	Crowd Circuit Relief Valve Test, page 25.
Extendible Dipstick fails to operate, is slow, has loss of power, or not holding.	Piston packings and/or piston O-rings or cylinder walls.	Cylinder Packing Leakage Test, page 39.
	Valve spool leakage.	Circuit and Accumulated Leakage "Tee" Test, page 34.
	Extendible dipstick circuit relief valve (piston end) in top of valve body stuck open, set too low or seat is leaking.	Extendible Dipstick Circuit Relief Valve Test, page 26.
All Backhoe Circuits fail to operate, are slow, or have loss of power.	Regenerative check valve poppet in control valve outlet end cover stuck open or seat is leaking.	Back pressure Relief Valve and Unload Valve Test, page 29.
	Hydraulic pump pumping element damaged or worn gears, pocket, or pressure plate. or pressure plate.	Hydraulic Pump Performance Test, page 32.
	System relief valve is stuck open or leaking.	System Relief Test, page 19, or Circuit and Accumulated Leakage "Tee" Test, page 34.
	Back pressure relief valve or unload valve in outlet end cover stuck open or seat is leaking.	Back pressure Relief Valve and Unload Valve Test, page 29.
	Unload valve stuck open.	Back pressure Relief Valve and Unload Valve Test, page 29.

Problem	Possible Causes	Test
All Backhoe Circuits fail to operate, are slow, or have loss of power. (Cont'd.)	Hydraulic pump pumping elements damaged or worn gears, pocket seals, or pressure plates.	Hydraulic Pump Performance Test, page 32.
	Hydraulic pump drive inoperative.	Visual.
	Hydraulic pump assembled incorrectly.	Visual.
	Aeration: Air entering the system at: Inlet tube, pump shaft, fittings fittings or cylinder gland packings.	Hydraulic Pump Performance Test, page 32.
	Cavitation: Restriction in the system at the inlet line; or at the inlet screen in the reservoir.	Visual and/or Hydraulic Pump Performance Test, page 32.
Bucket, Lift, Crowd, Swing, or Extendible Dipstick operates erratically.	Circuit relief valves stuck open.	Backhoe Bucket, Lift, Crowd, or Swing Circuit Relief Valve Tests, page 19.
	System relief valve stuck open (stabilizers also affected).	System Relief Test, page 19, Circuit and Accumulated Leakage "Tee" Test, page 34.
	Cylinder gland packings damaged, causing cavitation.	Visual.
	Back pressure valve stuck open.	Back Pressure Relief Valve and Back Pressure Unload Valve Test, page 29.
Hesitation in one or all Backhoe cylinders when control lever is moved.	Cylinder gland packings damaged.	Visual.
	System relief valve stuck open.	System Relief Test, page 19.
	Check valve poppet in control valve stuck open.	Main Control Valve, Disassembly Steps 1 and 2, page 60.
System noisy.	Worn or damaged pump gears.	Hydraulic Pump Performance Test, page 32.

Problem	Possible Causes	Test
System noisy (Cont'd.)	Aeration: Air entering the system at: suction tube, pump shaft, fittings or cylinder gland packings.	Visual for Foaming and/or Hydraulic Pump Performance Test, page 32.
	Cavitation: Restriction in the system at the inlet line, or at the inlet screen in the reservoir.	Visual and/or Hydraulic Pump Performance Test, page 32.
	Water in system.	Visual for Foaming—Drain and Fill Hydraulic Reservoir.
	System relief valve chatter.	Visual.
	Tubing vibration.	Visual — Check Clamps.
	Cold Hydraulic Oil.	Check Operating Temperature.
Hydraulic Oil exhausts from Breather at the Reservoir.	Reservoir overfilled.	Check Hydraulic Oil Level.
	Aeration: Air entering the system at: suction tube, pump shaft, fittings, or cylinder gland packings.	Visual for Foaming and/or Hydraulic Pump Performance Test, page 32.

SYSTEM RELIEF PRESSURE CHECK

Check the backhoe hydraulic system relief pressure as follows:

1. Remove the 9/16" - 18 UNF plug from the cap plug on the lower left side of the backhoe control valve assembly to install a pressure gauge in the system.
2. Install the pressure gauge, hose assembly, and adaptor from the ND-112-F Tester Kit, as shown in Figure 12.
3. Start the tractor engine and set its speed at 2200 rpm.
4. Sit in the backhoe seat, and when the hydraulic oil is up to operating temperature, actuate the bucket to the end of its stroke and hold in that position. Note the reading, it should read 2450-2600 psi (169-179 bar).

Adjusting Relief Valve Pressure:

1. Loosen the lock nut (3), Figure 12 on the relief valve.
2. Actuate the bucket to the end of its stroke to obtain a pressure reading on the gauge. Hold the bucket control lever to retain a pressure reading.
3. Turn the adjusting cap (1) counterclockwise to decrease the pressure setting and clockwise to increase the pressure setting. When adjusting the relief valve, it must be reset to obtain a relief pressure setting of 2500 psi (172 bar).
4. Hold the adjusting cap in the correct position and tighten the lock nut.
5. Release the bucket lever and shut off the engine.
6. Actuate all backhoe control lever to release any accumulated pressure.
7. Remove the test equipment from the control valve. Install the plug and O-ring and tighten 30 lbs. ft. (40 Nm).

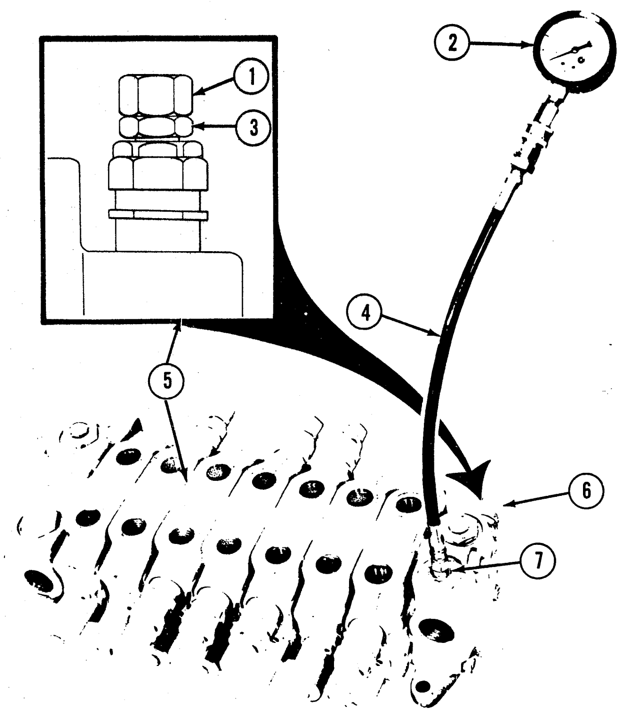

Figure 12
System Relief Pressure Check and Adjustment
1. Adjusting Cap
2. Tool No. D-22, Pressure Gauge
3. Lock Nut
4. Tool No. D-19-HP, Hose Assembly
5. Control Valve
6. System Relief Valve
7. Tool No. D-7, O-Ring Fitting

CIRCUIT RELIEF TESTS

The location of the circuit relief valves are shown in Figures 13 and 14. Note that the valves are stacked differently between the two lever control and four lever control model. When an extendible dipstick is not used, the appropriate valve section is removed from the stacking.

Figure 15 shows a schematic of the circuit relief valve test procedure for the four lever standard dipstick model. The other models use the same test principle, but the valves are stacked differently. Note that we are using the bucket cylinder as a booster. The bucket cylinder ratio between the piston end and the rod end is approximately 2 to 1. By applying system pressure of 2450 psi (169 bar) to the piston end, up to about 4800 psi (331 bar) can be developed at the rod end when the cylinder is extended. This pressure exceeds the circuit relief overload pressures and by directing the flow of oil, as shown, the pressure at which the circuit relief valve relieves can be read at the gauge.

The circuit relief valve Cartridge Identification, Test Pressures, and Reset Pressures are listed below. The Cartridge Identification is stamped on a metal band and wrapped around the valve body. When performing the circuit relief test, the pressure reading should be within the Test Pressure specification. If not, adjust to obtain the Reset Pressure specification and NOT to the Cartridge Identification. The circuit relief tests are performed at 1700 engine RPM and a test flow of 10 gpm. (38 lpm) (8.33 Imp. gpm.).

NOTE: *Circuit relief test equipment provides a 2:1 ratio. Operated at 1700 engine rpm, pump flow will be 20 gpm (76 lpm) and test flow will be 10 gpm (38 lpm).*

Circuit Relief Valve	Cartridge Identification	Test Pressure — PSI (bar)	Reset Pressure — PSI (bar)
Crowd Piston, Std. Dipstick	3500	3450-3750 (238-259)	3550 (245)
Crowd Piston, Ext. Dipstick	2600	2550-2850 (176-197)	2650 (183)
Lift Piston, Std. Dipstick	3500	3450-3750 (238-259)	3550 (245)
Lift Piston, Ext. Dipstick	3000	2950-3250 (203-224)	3050 (210)
Lift Rod	4050	4050-4400 (279-303)	4200 (290)
Bucket Rod	2375	2325-2625 (160-181)	2450 (169)
Swing, both	2500	2400-2700 (165-186)	2500 (172)
Extendible Dipstick Piston	2375	2325-2625 (160-181)	2450 (169)

ADJUSTING AND REPLACING THE CIRCUIT RELIEF VALVE

To adjust the valve:

1. Shut the tractor engine off and relieve the hydraulic pressure by actuating the control levers.
2. Loosen the adjusting cap lock nut (2), Figure 13, on the valve to be adjusted.
3. Screw the adjusting cap "on" to increase the pressure setting, and "off" to decrease the pressure. Do not adjust more than 1/16 of a turn in either direction before rechecking the pressure setting.
4. Tighten the locknut to 45 lb. ft. (61 Nm) and recheck the pressure.

To replace the valve:

1. Shut the tractor engine off and relieve all hydraulic pressure by actuating the control levers.
2. Using the appropriate wrench, grasp the valve on the largest hex, and unscrew.
3. Note the position of O-rings and backup rings. Remove and install new ones.
4. Lightly lubricate the new O-rings. Install the circuit relief valve in the control valve body and tighten 75 lb. ft. (102 Nm).

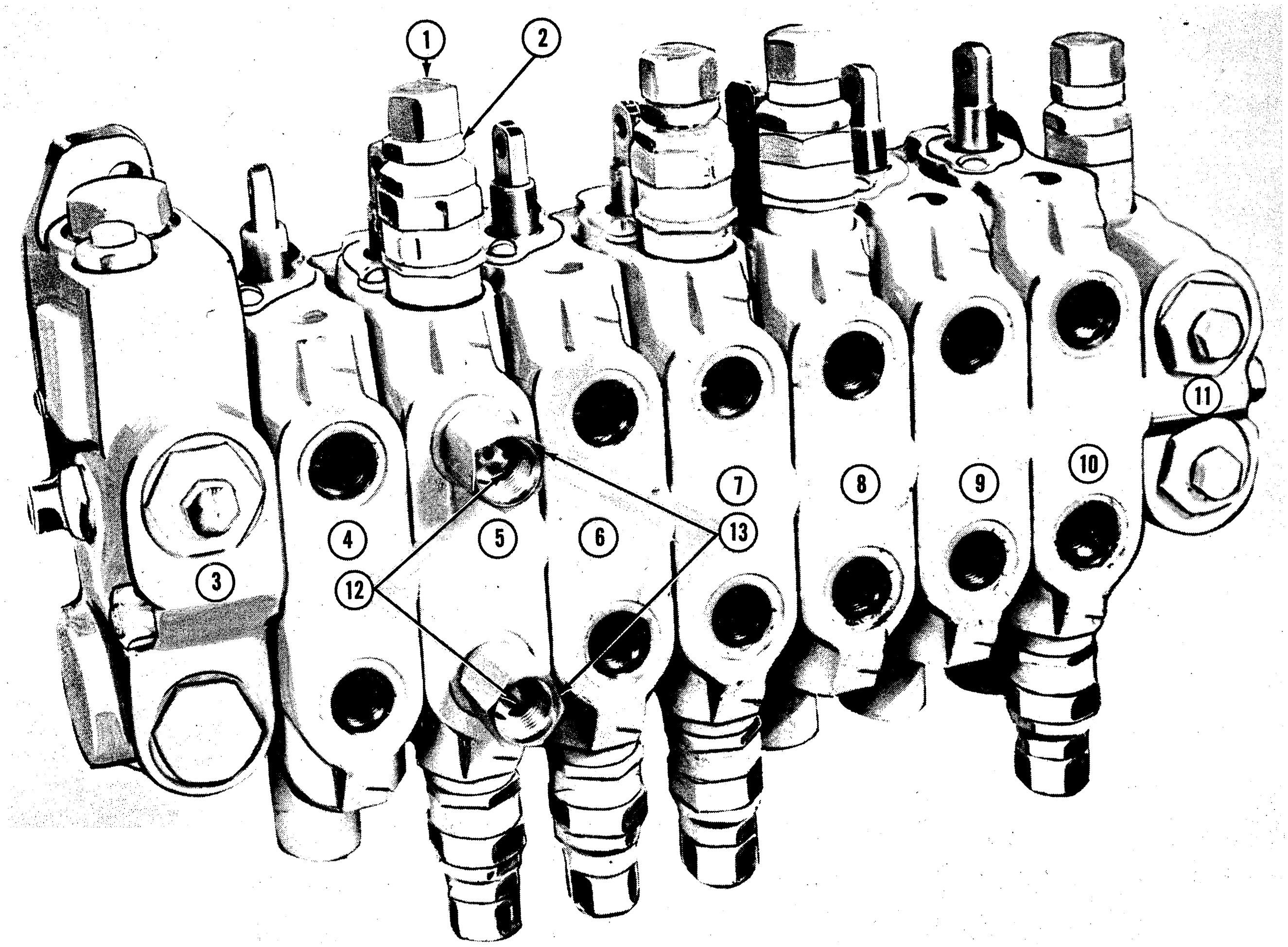

Figure 13

Control Valve Stacking — Four Lever Controls

1. Circuit Relief Valve Adjusting Cap
2. Locknut
3. Outlet End Cover
4. Right Stabilizer Section
5. Swing Section
6. Bucket Section
7. Lift Section
8. Crowd Section
9. Left Stabilizer Section
10. Extendible Dipstick Section
11. Inlet End Cover
12. Restrictor Plates
13. Restrictor Body

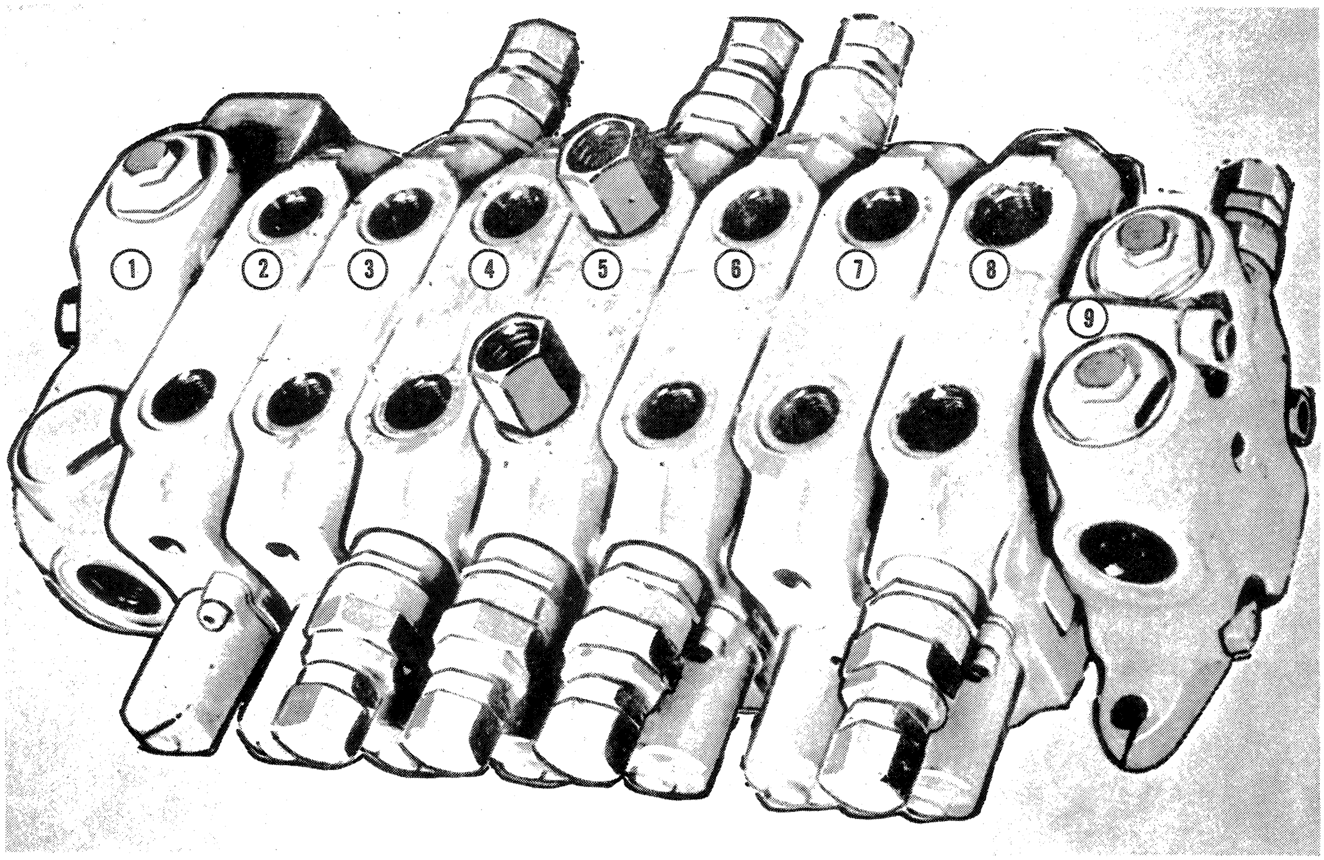

Figure 14
Control Valve Stacking — Two Lever Controls

1. Outlet End Cover
2. Right Stabilizer Section
3. Crowd Section
4. Bucket Section
5. Swing Section
6. Lift Section
7. Left Stabilizer Section
8. Extendible Dipstick Section
9. Inlet End Cover

BUCKET CYLINDER CIRCUIT RELIEF CHECK

Refer to Figure 16. Warm the hydraulic oil to 165° F. (73.8° C.) by operating the backhoe for approximately 15 minutes before installing the test fittings.

1. Position the bucket and dipstick on the ground, stop the engine and relieve pressure within the system by actuating the control levers.
2. Disconnect the rod hose (5), Figure 16, from the bucket cylinder and install a cap (4) on the port on the cylinder. Connect the N1100-HS hose (3) to a N1100-CR2 (7) and CR1 (6) combination and the bucket hose previously disconnected.
3. Install a combination set up of a N1100-CR3 (2) and CR4 (1) to the crowd rod port and hose, as shown in the insert, Figure 16.
4. Attach the N1100-HS hose (3) to the CR4 fitting.
5. Install a 5000 psi (344.7 bar) gauge (9), Tool No. D-22, and hose assembly (8), Tool No. D-19-HP to the CR2 fitting as shown.
6. Start the tractor, increasing the engine speed to 1700 rpm.

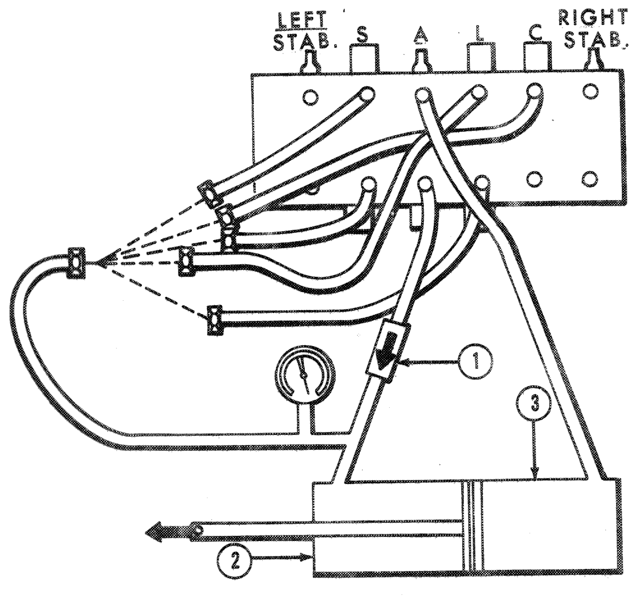

Figure 15
Circuit Relief Pressure Check — Except Bucket Circuit

1. Check Valve
2. 4800 P.S.I. (321 bar)
3. 2400 P.S.I. (160 bar)

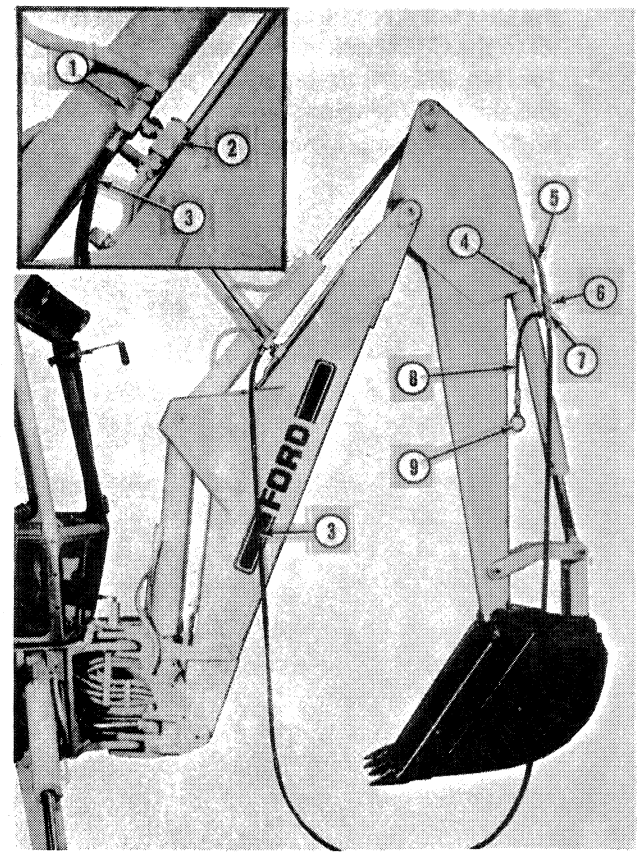

Figure 16
Bucket Circuit Relief Test

1. Noo. No. N-1100-CR4, Tee Fitting
2. Tool No. N-1100-CR3, Check Valve
3. Tool No. N-1100-HS, Hose
4. Cap
5. Bucket Rod Hose
6. Tool No. N-1100-CR1, Adapter
7. Tool No. N-1100-CR2, Tee Fitting
8. Tool No. D-19-HP, Hose Assembly
9. Tool No. D-22, Pressure Gauge

IMPORTANT: *Do not actuate the bucket cylinder control lever.*

7. Actuate the crowd cylinder lever so that the crowd cylinder will extend, thus opening the bucket circuit relief valve at 2325-2625 psi (160-181 bar). Read the gauge as the crowd cylinder functions. If not within specifications, readjust to obtain a reading of 2450 psi (169 bar).

NOTE: *Once the cylinder is fully extended, the system relief valve will function. For the bucket circuit relief, read the gauge with the crowd cylinder in motion.*

8. Shut off the tractor engine and relieve the hydraulic pressures by actuating the control levers.

9. Remove the testing equipment and secure all hoses as they were during normal operations.

CAUTION: *Be sure the oil has had time to cool and the pressure has been reliev-ed before attempting to disconnect the hydraulic lines.*

LIFT CYLINDER CIRCUIT RELIEF TEST

Refer to Figure 17. Warm the hydraulic oil to 165° F. (73.8° C.) by operating the backhoe for approximately 15 minutes before installing the test fittings.

1. Secure the boom in the transport position using the transport boom latch or chains. Stop the engine and relieve pressure within the system by actuating the control levers.

2. Disconnect the bucket cylinder rod hose at the bucket cylinder. Connect the CR3 check valve (5), Figure 18 to the bucket rod hose (2) using

the CR1 adapter (3). Connect the CR4 tee fitting (6) to the CR3 check valve. Connect the hose (1), Tool No. 292454, to the bucket cylinder rod tube and the CR4 fitting as shown. Also, connect the N1100-HS hose (7) to the CR4 fitting.

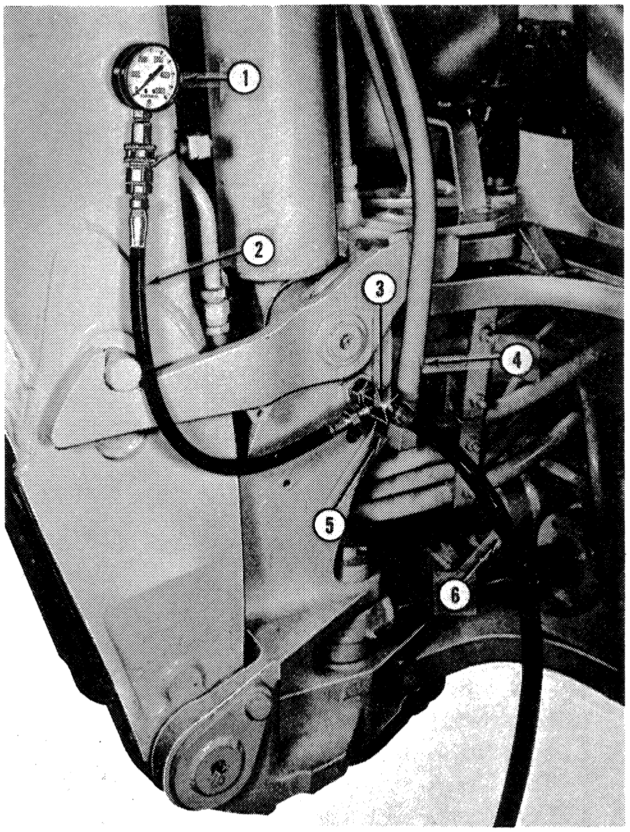

Figure 17
Lift Rod Circuit Relief Test
1. Tool No. D-22, Pressure Gauge
2. Tool No. D-19-HP, Hose Assembly
3. Tool No. N-1100-CR2, Tee Fitting
4. Lift Cylinder Rod Hose
5. Plug 1-1/16" - 12, 37°
6. Tool No. N-1100-HS, Hose

3. Disconnect the lift cylinder rod hose (4), Figure 17, from the swing post fitting and cap as shown. Connect the CR2 fitting (3) to the swing post port and connect the N1100-HS hose (6) to the CR2 fitting.

4. Install a 5000 psi (344.7 bar) gauge (1), Tool No. D-22, and hose assembly (2), Tool No. D-19-HP to the CR2 fitting (3). Securely tighten all fittings.

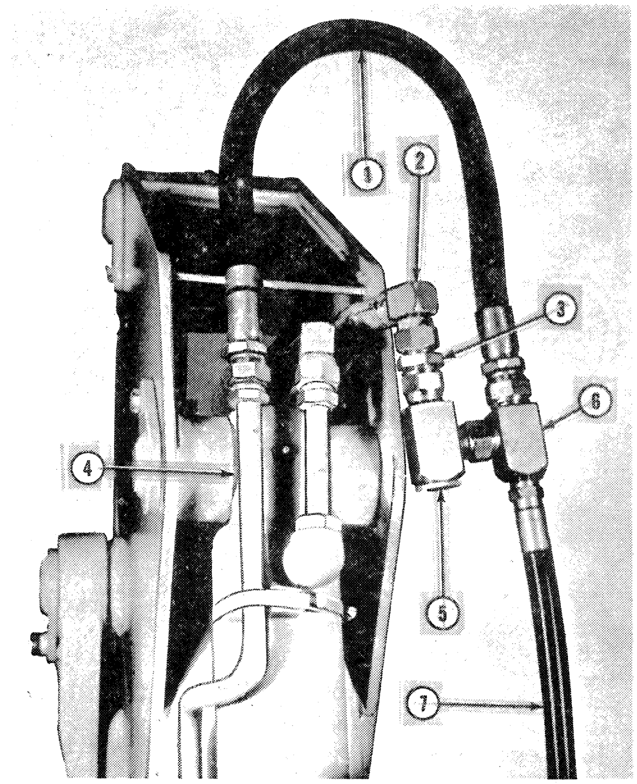

Figure 18
Circuit Relief Test Hook-Up at Bucket Cylinder
1. Tool No. 292454, Hose
2. Bucket Rod Hose
3. Tool No. N-1100-CR1, Adapter
4. Bucket Rod Tube
5. Tool No. N-1100-CR-3, Check Valve
6. Tool No. N-1100-CR4, Tee Fitting

5. Start the engine and set its speed at 1700 rpm, actuate the bucket control lever to extend the bucket cylinder. As the bucket curls, read the gauge.

6. If a reading between 4050-4400 psi (279-303 bar) is not obtained, adjust the rod end circuit relief valve to a setting of 4200 psi (290 bar).

7. Shut the tractor engine off and relieve all pressures by actuating the control levers.

8. Disconnect the CR2 fitting with the hose assembly from the left side of the swing post and connect it to the right side of the swing post to check the left piston end circuit relief as shown in Figure 19.

9. Attach the lift cylinder rod end hose to the port on the right side of the swing post. Cap the piston hose end as shown in Figure 19.

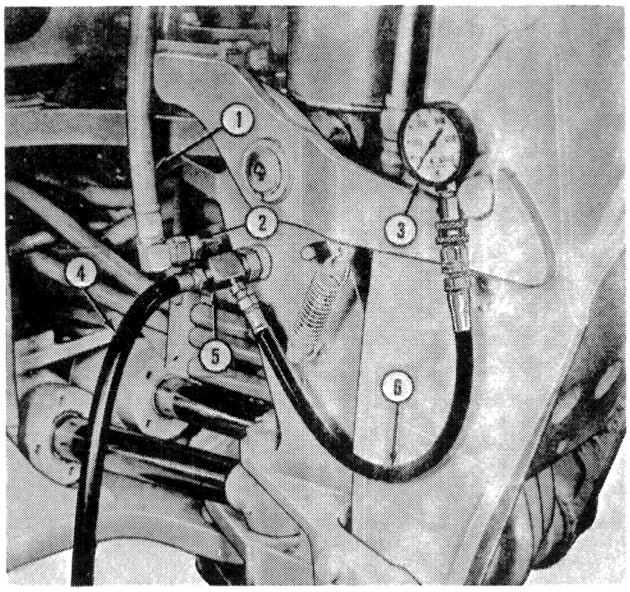

Figure 19
Lift Piston Circuit Relief Test

1. Lift Piston Hose
2. Plug, 1-1/16" - 12, 37°
3. Tool No. D-22, Pressure Gauge
4. Tool No. N-1100-HS, Hose
5. Tool No. N-1100-CR2, Tee Fitting
6. Tool No. D-19-HP, Hose Assembly

10. Start the engine and set its speed at 1700 rpm. Actuate the bucket cylinder control lever to extend the bucket cylinder. As the bucket curls, read the pressure gauge.

11. The standard dipstick model lift cylinder piston end circuit relief valve has a test pressure of 3450-3750 psi (238-259 bar) and a reset pressure of 3550 psi (245 bar). The extendible dipstick model lift cylinder piston end circuit relief valve has a test pressure of 2950-3250 psi (203-224 bar) and a reset pressure of 3050 psi (210 bar). Adjust to the reset pressure, according to the model, if the test pressure is not within specifications.

12. Disconnect the test equipment from the swing post and connect the lift cylinder hose to the fitting on the swing post.

CROWD CYLINDER CIRCUIT RELIEF VALVE CHECK

Refer to Figure 20. Warm the hydraulic oil to 165° F. (73.8° C.) by operating the backhoe for approximately 15 minutes before installing the test fittings.

1. Secure the boom in the transport position using the transport boom latch or chains. Stop the engine and relieve pressure within the system by actuating the control levers.

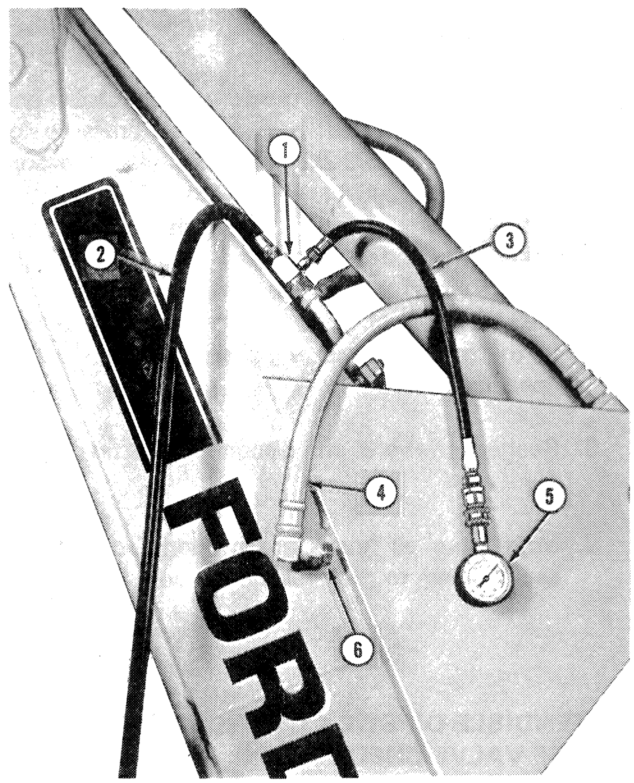

Figure 20
Crowd Piston Circuit Relief Test

1. Tool No. N-1100-CR2, Tee Fitting
2. Tool No. N-1100-HS, Hose
3. Tool No. D-19-HP, Hose Assembly
4. Crowd Piston Hose
5. Tool No. D-22, Pressure Gauge
6. Plug, 1-1/16" - 12, 37°

2. Disconnect the bucket cylinder rod hose at the bucket cylinder. Connect the CR3 check valve (5), Figure 18, to the bucket rod hose (2) using the CR1 adapter (3). Connect the CR4 tee fitting (6) to the CR3 check valve. Connect the hose (1), Tool No. 292454, to the bucket cylinder rod tube and the CR4 fitting as shown. Also, connect the N1100-HS hose (7) to the CR4 fitting.

3. Disconnect the crowd piston hose and cap as shown in Figure 20.

4. Connect the N1100-HS hose (2) to the CR2 fitting (1) and connect the CR2 fitting to the piston port as shown.

5. Install a 5000 psi (344.7 bar) gauge (5), Tool No. D-22, and hose assembly (3), Tool No. D-19-HP to the CR2 fitting. Securely tighten all fittings.

6. Start the engine and set its speed at 1700 rpm. Actuate the bucket control lever to extend the bucket cylinder. As the bucket curls, read the pressure gauge.

7. The standard dipstick crowd cylinder piston end circuit relief valve has a test pressure of 3450-3750 psi (238-259 bar) and a reset pressure of 3550 psi (245 bar). The extendible dipstick model crowd cylinder piston end circuit relief valve has a test pressure of 2550-2850 psi (176-197 bar) and a reset pressure of 2650 psi (183 bar). Adjust to the reset pressure, according to the model, if the test pressure is not within specifications.

8. Recheck the valve and disconnect the test equipment.

9. Make sure all hoses are properly routed and secure them to their respective ports.

EXTENDIBLE DIPSTICK CYLINDER CIRCUIT RELIEF VALVE CHECK

Refer to Figure 21. Warm the hydraulic oil to 165° F. (73.8° C.) by operating the backhoe for approximately 15 minutes before installing the test fittings.

1. Secure the boom in the transport position using the transport boom latch or chains. Stop the engine and relieve pressure within the system by actuating the control levers.

2. Disconnect the bucket cylinder rod hose at the bucket cylinder. Refer to Figure 18 and install the test equipment. However, the 292454 hose (1) can be eliminated and a N-109 double female swivel used in its place. The backhoe shown in Figure 18 is equipped with a standard dipstick.

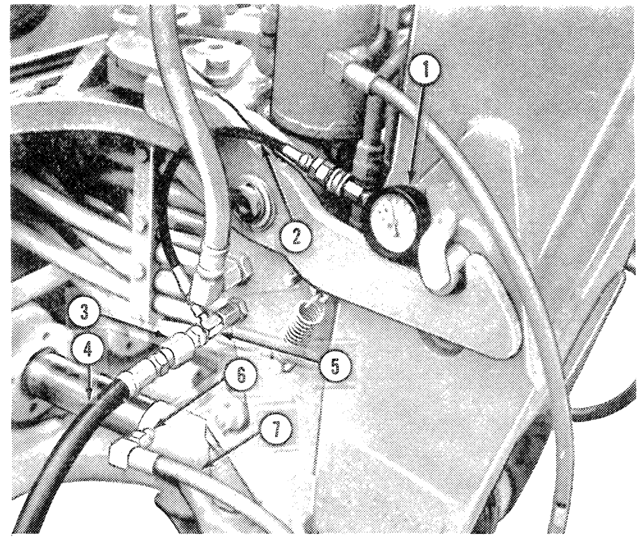

Figure 21
Extendible Dipstick Piston Circuit Relief Test
1. Tool No. D-22, Pressure Gauge
2. Tool No. D-19-HP, Hose Assembly
3. Tool No. N-1100-CR11, Swivel Connector
4. Tool No. N-1100-HS, Hose
5. Tool No. N-1100-W, Run Tee
6. Plug, 3/4" - 16, 37°
7. Extendible Dipstick Piston Hose

3. Disconnect the extendible dipstick cylinder piston hose (7), Figure 21, from the right side of the swing post and cap as shown.

4. Connect the N1100-W fitting (5) to the port on the swing post. Connect the CR11 fitting (3) to the N1100-HS hose (4) then connect the CR11 fitting to the N1100-W fitting as shown.

5. Install a 5000 psi (344.7 bar) gauge (1), Tool No. D-22, and hose assembly (2), Tool No. D-19-HP to the fitting. Securely tighten all fittings.

6. Start the engine and set its speed at 1700 rpm. Actuate the bucket control lever to extend the bucket cylinder. As the bucket curls, read the pressure gauge.

7. If a reading of 2325-2625 psi (160-181 bar) is not obtained, adjust the circuit relief valve to obtain a pressure reading of 2450 psi (169 bar).

8. Disconnect the test equipment and reconnect the hose to the swing post.

SWING CYLINDER CIRCUIT RELIEF VALVE CHECK

Refer to Figure 22. Warm the hydraulic oil to 165° F. (73.8° C.) by operating the backhoe for approximately 15 minutes before installing the test fittings.

1. Secure the boom in the transport position using the transport boom latch or chains. Stop the engine and relieve pressure within the system by actuating the control levers.

2. Disconnect the bucket cylinder rod hose at the bucket cylinder. Connect the CR3 check valve (5), Figure 18, to the bucket rod hose (2) using the CR1 adapter (3). Connect the CR4 tee fitting (6) to the CR3 check valve. Connect the hose (1), Tool No. 292454 to the bucket cylinder rod tube and the CR4 fitting as shown. Also, connect the N1100-HS hose (7) to the CR4 fitting as shown.

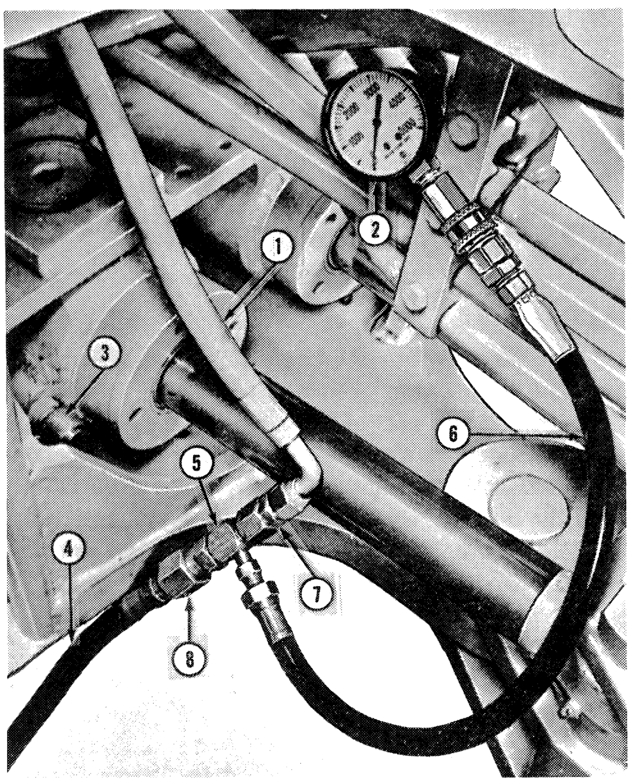

Figure 22
Right Swing Circuit Relief Test

1. Swing Cylinder Hose — From Control Valve
2. Tool No. D-22, Pressure Gauge
3. Cap, 3/4" - 16, 37°
4. Tool No. N-1100-HS, Hose
5. Tool No. N-1100-W, Run Tee
6. Tool No. D-19-HP, Hose Assembly
7. Tool No. 6729, Straight Connector
8. Tool No. N-1100-CR11, Swivel Connector

3. Disconnect the right swing cylinder hose (1), Figure 22, from the swing cylinder port. Install the double male fitting (7), Tool No. 6729, in the swing cylinder hose. Install the CR11 fitting (8) on the end of the N1100-HS hose (4). Connect the N1100-W fitting (5) to the CR11 fitting and attach to the 6729 fitting on the swing cylinder hose, as shown. Install a cap (3) on the swing cylinder tube.

4. Actuate the bucket cylinder control lever to extend the bucket cylinder. As the bucket curls, read the pressure gauge.

5. If the reading is not 2400-2700 psi (165-186 bar), adjust the circuit relief valve to obtain a reading of 2500 psi (172 bar).

6. Stop the engine and relieve all pressure by actuating the control levers.

7. Disconnect the test equipment at the right swing cylinder and attach the swing cylinder hose (1) to the swing cylinder.

8. Connect the equipment to the left swing cylinder hose (2) as shown in Figure 23, in the same manner as for the right swing cylinder, and repeat Steps 4 and 5.

9. Relieve all pressure in the system by actuating the control levers.

10. Disconnect the test equipment and securely install the cylinder hoses to their appropriate ports.

SWING CUSHIONING VALVE TEST

IMPORTANT: *The boom must be held in a stationary position to prevent it from swinging during this test. A suitable method is to move the unit outside, extend the crowd and roll the bucket out so that the teeth are in a vertical position and then lower the boom to sink the bucket teeth in the ground.*

NOTE: *Perform the "Swing Circuit Relief Test" before performing this test.*

Warm the hydraulic oil to 165° F. (73.8° C.) by operating the backhoe for approximately 15 minutes before installing the test equipment.

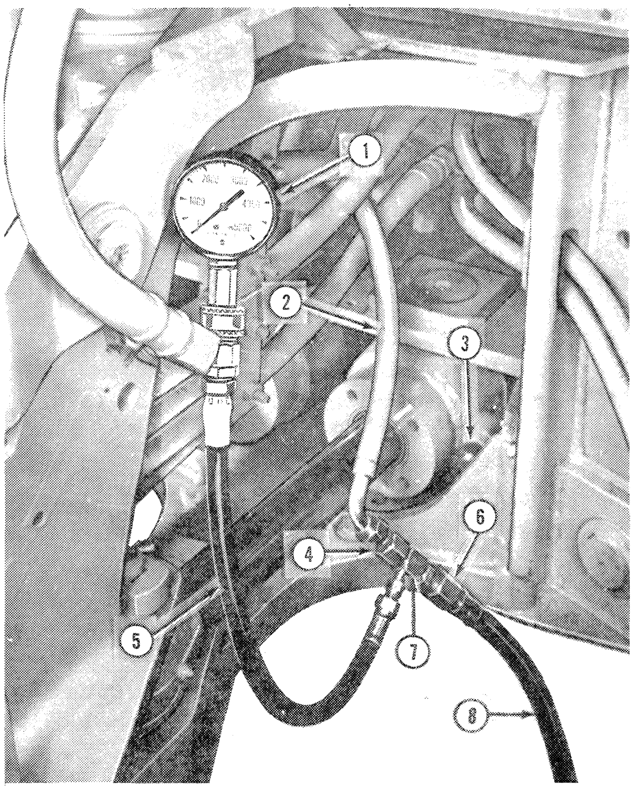

Figure 23
Left Swing Circuit Relief Test

1. Tool No. D-22, Pressure Gauge
2. Swing Cylinder Hose — From Control Valve
3. Cap, 3/4" - 16, 37°
4. Tool No. 6729, Straight Connector
5. Tool No. D-19-HP, Hose Assembly
6. Tool No. N-1100-CR11, Swivel Connector
7. Tool No. N-1100-W, Run Tee
8. Tool No. N-1100-HS, Hose

1. Stop the engine and relieve the pressure within the system by actuating the control levers.

2. Disconnect the bucket cylinder rod hose at the bucket cylinder. Connect the CR3 check valve (5), Figure 18, to the bucket rod hose (2) using the CR1 adapter (3). Connect the CR4 tee fitting (6) to the CR3 check valve. Connect the hose (1), Tool No. 292454, to the bucket cylinder rod tube and the CR4 fitting as shown. Also, connect the N1100-HS hose (7) to the CR4 fitting as shown.

3. Secure the backhoe with the transport locks.

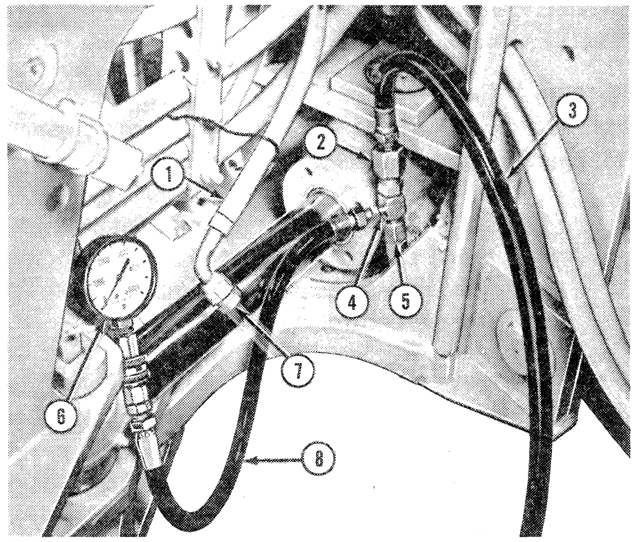

Figure 24
Right Swing Cushion Valve Test — Hook-Up on Left Swing Cylinder

1. Left Swing Cylinder Hose
2. Tool No. N-1100 CR11, Swivel
3. Tool No. N-1100-HS, Hose
4. Tool No. N-1100-W, Run Tee
5. Tool No. 0113, 90° Elbow Swivel
6. Tool No. D-22, Pressure Gauge
7. Plug, 3/4" - 16, 37°
8. Tool No. D-19-HP, Hose Assembly

4. To check the R.H. swing cylinder cushion valve, as viewed from the operator's seat, disconnect the L.H. swing cylinder hose (1), Figure 24, at the rod end port of the L.H. swing cylinder. Cap the hose as shown. Install the elbow (5), Tool No. 0113 and connect the N1100-W fitting)4) to the elbow. Connect the gauge (6) and hose assembly (8) to the fitting (4). Connect the N1100-HS hose (3) to the fittings with the CR11 swivel connector (2).

5. Start the tractor engine and set its speed at 1700 rpm.

CAUTION: *Make certain that no one is standing around the backhoe, especially the swing post area.*

6. Move and hold the swing control lever into the swing left mode. Actuate the bucket control lever and as the bucket curls (cylinder extends), observe the pressure gauge. The gauge should read 2500-2800 psi (172-193 bar). If not at this reading, replace the cushioning valve, Figure 25.