580F LOADER BACKHOE

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C. E. Div. 9-66415
April 1976

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FUEL, FLUIDS AND LUBRICANTS

COMPONENT	CAPACITY Metric	CAPACITY Imperial (U.S.)	SPECIFICATION
Fuel tank	83 liters	18.3 gallons (22 gallons)	
Engine crankcase oil With filter change Without filter change	7.6 liters 6.6 liters	6.7 quarts (8 quarts) 5.8 quarts (7 quarts)	Engine oil: Case HDM Oil (CD Commercial class D) Above 0° C (32° F) . . . . . SAE 30 -12° to 10° C (10° to 50° F) . SAE 20W Below 0° C (32° F) . . . . . SAE 10W
Hydraulic system Total (with backhoe) Reservoir refill with filter change Reservoir refill without change	83 liters 67.4 liters 66.6 liters	18.3 gallons (22 gallons) 14.8 gallons (17.8 gallons) 14.7 gallons (17.6 gallons)	Case TCH Fluid Alternate oils Engine oil - SD - Service class D or CA - Commercial class A Above 0° C (32° F) . . . . SAE 10W Below 0° C (32° F) . . . . SAE 5W or Type C-2 Transmission and hydraulic fluid such as Tenneco Hytrans Fluid.
Power Shuttle/Torque Converter refill	7.6 liters	6.7 quarts (8 quarts)	Case TCH Fluid
Transaxle (Power shuttle) (Mech. shuttle)	14 liters 21 liters	12.5 quarts (15 quarts) 18.7 quarts (22.5 quarts)	Case TFD Fluid
Final drives	3.4 liters	3.0 quarts (3.6 quarts)	Mobil 422 Oil
Cooling system	17 liters	3.8 gallons (4.5 gallons)	Ethylene glycol type antifreeze and water should be mixed for prevailing temperatures. Follow manufacturer's specifications.
Power steering system Total system Reservoir refill	2.6 liters 1.0 liter	2.3 quarts (2.1 quarts) 1.0 quart (1.2 quarts)	Case TCH Fluid
Batteries	As required		Add colorless, odorless drinking water.
Grease fittings	As required		No. 2 moly-disulfide grease.
Wheel bearings	As required		No. 2 wheel bearing grease.
Brake master cylinders	As required		DOT 3 brake fluid

Rocker Shaft

Diameter	18.99-19.02 mm (0.798-0.799 inch)
Bush bore reamed in position	19.05-19.06 mm (0.7520-0.7525 inch)

Crankshaft

Main journal diameter	
Standard size	63.487-63.474 mm (2.4995-2.4970 inches)
Undersize 0.254 mm (0.010 inch)	63.233-63.220 mm (2.4895-2.4890 inches)
Undersize 0.508 mm (0.020 inch)	62.979-62.966 mm (2.4795-2.4790 inches)
Undersize 0.762 mm (0.030 inch)	62.725-62.712 mm (2.4695-2.4690 inches)

When regrinding crankshaft it is important that the original journal fillet radius be maintained. It is also important that the surface of the radius is as smooth as the surface of the journal and that the radius is smoothly blended into both surfaces. A fillet that is incorrect, roughly finished or not smoothly blended, weakens a shaft and may cause fatigue failure during service.

Big-end journal diameter	
Standard size	60.29-60.28 mm (2.3135-2.3130 inches)
Undersize 0.254 mm (0.010 inch)	60.04-60.03 mm (2.3635-2.3630 inches)
Undersize 0.508 mm (0.020 inch)	59.78-59.77 mm (2.3535-2.3530 inches)
Undersize 0.762 mm (0.030 inch)	59.52-59.51 mm (2.3435-2.3430 inches)
Center journal width	
Standard size	54.00-53.95 mm (2.126-2.124 inches)
Oversize 0.254 mm (0.010 inch)	54.254-54.204 mm (2.136-2.134 inches)
Oversize 1.016 mm (0.040 inch)	55.270-55.220 mm (2.166-2.164 inches)
Bearing fillet radius	4.06-3.81 mm (0.16-0.15 inch)
Big-end bearing clearance	0.038-0.063 mm (0.0015-0.0025 inch)
Main bearing clearance	0.051-0.102 mm (0.002-0.004 inch)
End play of crankshaft	0.051-0.258 mm (0.002-0.015 inch)
Thrust washer thickness	
Standard	2.3114-2.3622 mm (0.091-0.093 inch)
Oversize 0.127 mm (0.005 inch)	2.4384-2.4892 mm (0.096-0.098 inch)
Oversize 0.508 mm (0.020 inch)	2.8194-2.8702 mm (0.111-0.113 inch)

Connecting Rod Alignment

Maximum out of parallel	0.0127 mm/cm (0.0005 inch/inch)
Maximum twist	0.0127 mm/cm (0.0005 inch/inch)
Maximum weight variation in set of four rods	7 gm (0.25 oz.)

Fuel System

Injector setting pressure	17 157 kPa (2488.5 psi)
Injection pump timing (static)	17°

Injection pump timing mark: Pump flange and engine mounting flange are marked, and correct pump timing is obtained when these marks are in alignment. The pump flange mark is 66° from keyway in pump shaft at point of injection.

Injection pump timing adjustment: Elongated holes in the injection pump mounting flange permit the pump body to be rotated when the three securing nuts are released.

Section 2025

ENGINE BLOCK ASSEMBLIES

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CRANKSHAFT AND BEARINGS

If crankshaft bearings or rod bearings are not to be replaced they must be tagged and reinstalled on the same journal or connecting rod that they were removed from.

Bearing caps and shells are very accurately machined and no attempt should be made to file a bearing cap or scrape a bearing. Connecting-rod caps must only be used with their original connecting rod, and main bearing caps must only be fitted in their original position.

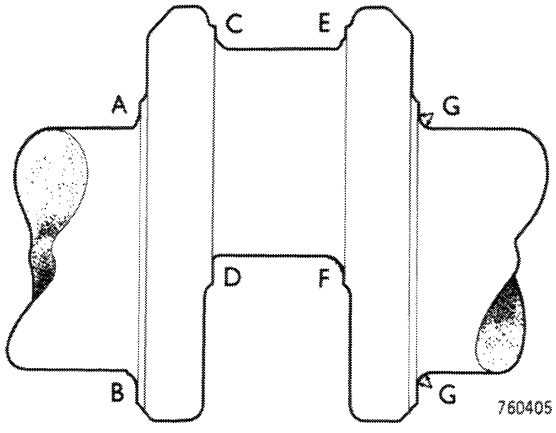
Crankshaft Regrinding

If the crankshaft journals are scored, or worn, the shaft should be reground to 0.254, 0.508 or 0.762 mm (0.010, 0.020 or 0.030 inch) undersize and appropriate undersize bearings fitted. Regrind center journal thrust faces to 0.254 or 1.016 mm (0.010 or 0.040 inch) oversize. See Section 2015.

When regrinding crankshaft it is important that the original bearing fillet radius is maintained. It is also important that the surface of the radius is as smooth as the surface of the journal, and the radius is smoothly blended into both surfaces. A fillet that is incorrectly radiused, roughly finished or not smoothly blended, weakens a shaft and may cause fatigue failure during service, Figure 14.

Crankshaft Rear Oil Seal

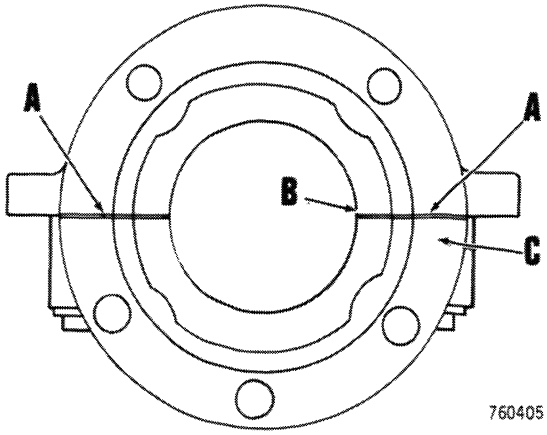
Crankshaft rear bearing is sealed by an oil retainer bolted to both cap and block. Retainer is in two halves and fitted with asbestos packings which make positive contact with crankshaft. Worn or damaged packings should be renewed. Remove old packings and clean out retainer grooves. Apply adhesive to one of the packings to prevent it turning during service, then press packings carefully into retainer grooves. Roll packings into position with a smooth bar then trim ends so that they protrude 0.762 mm (0.030 inch) above retainer face and press corners into a chamfer, so that they will not spread out between retainer faces. Clamp retainer on a 66.54 mm (2.620 inch) diameter mandrel to press packings into position and check that halves of retainer seat squarely together, Figure 15.



Incorrect:
- A. No Radius
- B. Radius not smoothly Blended
- C. Radius too Large
- D. Radius too Small
- E. Radius too Small
- F. Radius Roughly Finished

Correct:
- G. Correct Radius Smoothly Finished and Correctly Blended

Figure 14 - Crankshaft Journal Fillet Radius



- A. Check that Allen Screws have Sufficient Clearance to Permit Both Halves to be in Line
- B. Ensure that Ends of Packings do not c cause gap Between Halves of Retainer
- C. Check Mounting face for Distortion and if Necessary Correct by Filing

Figure 15 - Crankshaft Rear Oil Seal

Section 2051

AIR CLEANER

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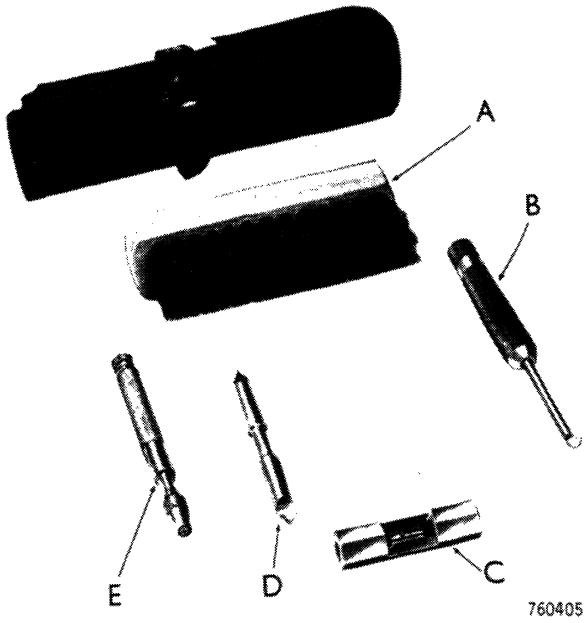
GENERAL INFORMATION

The performance of a diesel engine depends on several factors. One of the most important of these factors is the fuel system. The fuel system must be serviced carefully and every precaution taken to assure that the fuel is clean. Dirt and dust, particularly the very fine dust readily carried in the air and in suspension in the fuel tank can cause rapid and extensive damage to the injection pump and injectors. This results in bad starting, loss of power and expensive repairs.

The importance of clean fuel storage and the precautions to be taken to prevent fuel contamination when refueling must be impressed on the operator.

Care should also be exercised in the workshop. The bench used for servicing fuel injection equipment should be situated in a well lighted and separate part of the workshop. If possible an insulated and dust proof room should be provided in which the servicing equipment can be permanently installed.

Special equipment is required and the minimum essentials consist of the following: Two safety containers--one filled with solvent for soaking dirty nozzles and the other filled with test oil, or clean diesel fuel, for assembly of cleaned components. A nozzle bench plate, which should be screwed to the bench with the jig end overhanging, so that an injector can be slackened or tightened. A nozzle setting outfit should also be securely bolted to the bench with a suitable canister to collect the spray and protect the operator against accidental contact with the spray. The flushing device used in conjunction with the setting outfit is essential. The nozzle cleaning kit, Figure 1, includes a probing tool but not needles: correct diameter needles can be obtained separately as required.



A. Brass Wire Brush
B. Nozzle Body Groove Scraper
C. Nozzle Plunger Cleaner
D. Nozzle Body Seat Scraper
E. Probing Needle Holder

Figure 1 - C.A.V. Nozzle Cleaning Kit

Section 3052

FUEL TANK AND

THROTTLE AND FUEL SHUTOFF

ADJUSTMENTS

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HYDRAULIC DIAGRAMS

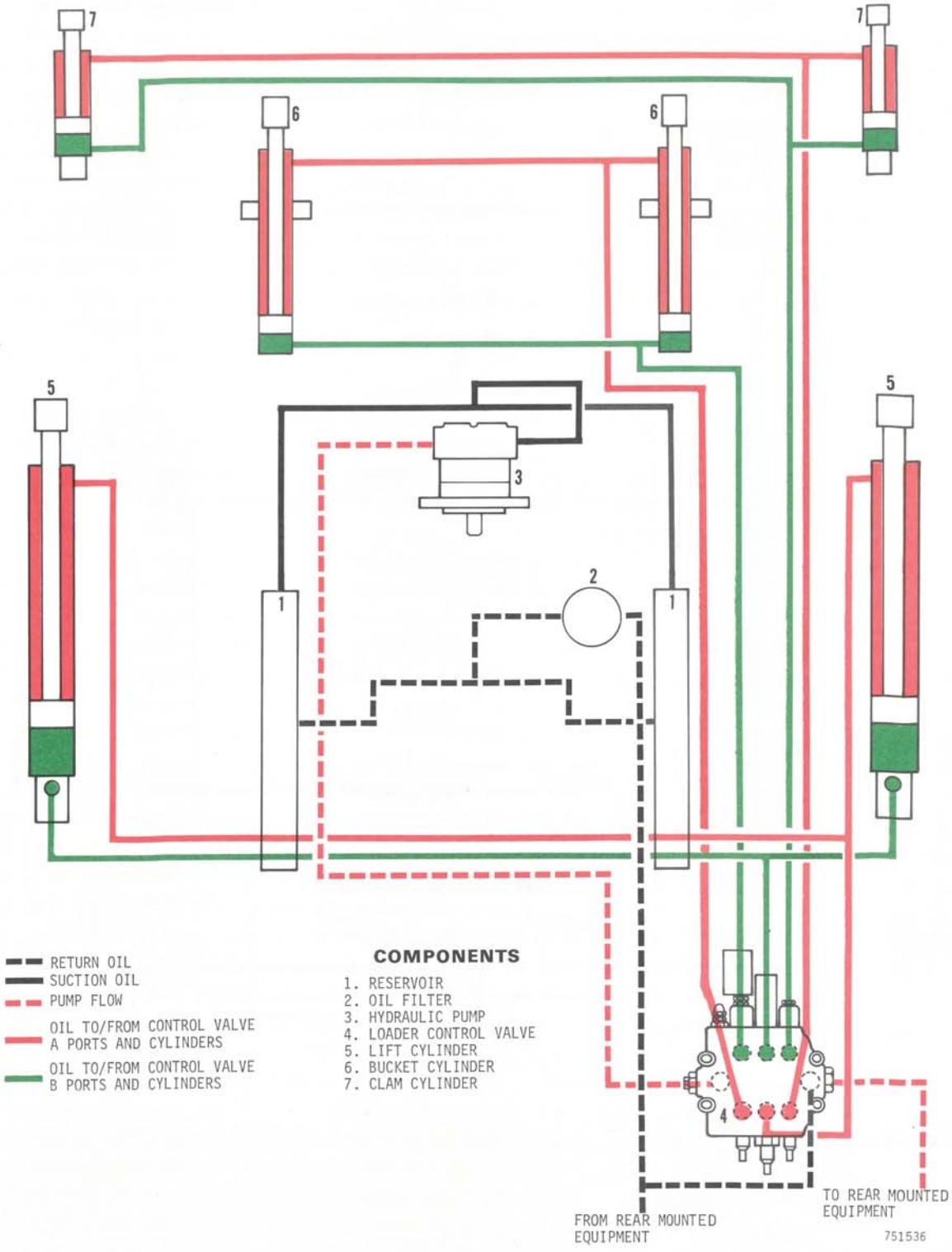

Figure 1 - Loader Hydraulic Diagram

Problem: Poor Operation of All Circuits

When all circuits perform unsatisfactorily, a worn pump is the most common cause. However, before removing the pump, make the checks listed below.

CHECK	DETAILED INSTRUCTIONS
1. Oil level.	1. Check the hydraulic oil level and add oil as rquired. See page 4002-10.
2. Oil filter.	2. Change the hydraulic oil filter.
3. Check pump intake line.	3. Check the intake line between the pump and the hydraulic reservoir for a loose connection, damaged or loose fittings and lines.
4. Check setting of main relief valve.	4. See page 4002-32 in this section for main relief checks and adjustments.
5. Check for contaminated oil.	5. Operate the engine for a short period of time to circulate the hydraulic oil. Take an oil sample and look for the following signs. a. Feel the oil with your fingers. See if the oil is gritty or contains any particles large enough to be felt. b. Milky color oil is a sign of water in the oil. c. Foam is a sign that air is entering the system. d. The system has overheated severely if the oil is dark, thick or smells scorched. If the oil is found to contaminated, the oil must be replaced and the filter changed. See Flushing the Hydraulic System on page 4002-11. After replacing the oil, check pump output with a flowmeter to determine how much damage, if any, the pump has sustained from the bad oil.
6. Check pump output with flowmeter.	6. Test procedure is in this section starting on page 4002-20. If pump output is not at least 70% of the specification, repair or replace the pump.

adjusted or leaking secondary relief valve for the circuit with the low reading or piston packing if loss was in Roll-back. Remove the relief valve, disassemble and check for worn parts. Install relief valve and check pressure setting as instructed in this section.

5. If check and/or repairs to this point have failed to correct or locate the source of the problem, a badly worn spool and/or spool bore is the probable cause. Remove control valve, disassemble and check for excessive wear.

Test No. 4 - Backhoe Circuits

1. Connect flowmeter into circuit as illustrated in Figure 10 (same as Test No. 2).

2. With the engine running at 2000 r/min (rpm) move the boom control lever to the Up position. Hold control lever in place and close flowmeter load valve. When the piston rod stops moving, close load valve until pressure gauge indicates 12 410 kPa (1800 psi) and adjust throttle as required to maintain the specified engine speed. Then observe flow gauge and record the reading. Repeat this test with the control lever in the Down position with the flowmeter load valve adjusted 4136 kPa (600 psi).

3. Check the bucket circuits with the control lever in the Load and Dump positions at 12 410 kPa (1800 psi) with the engine running at 2000 r/min (rpm). If test results in both positions were not the same or very close to the pump output at the same pressure, refer to steps 3 and 4 under Interpreting Test Results. At least one bucket circuit must be in good condition to effectively check the stabilizer circuits.

4. Use one of the following procedures to check the stabilizer circuit, depending on whether you are working with a side shift or axial backhoe:

   a. Side shift backhoe: Check both stabilizer cylinders in the Raise and Lower positions at 12 410 kPa (1800 psi) with the engine running at 1800 r/min (rpm). If test results in both positions were not the same or very close to the pump output at the same pressure, refer to steps 3 and 4 under Interpreting Test Results.

   b. Axial Backhoe: Check both stabilizer cylinders in the Lower position at 12 410 kPa (1800 psi) with the engine running at 2000 r/min (rpm). When the stabilizer piston rod stops moving, move the bucket control lever to the Load or Dump Position, whichever circuit is good. Hold both levers in place for remainder of this test. The spools in the stabilizer control valve are a random fit in the spool bores which results in higher spool leakage than in valves with select fit spools. When a spool is actuated oil leaks past the spool to the open center passage. Therefore, the reason for actuating the bucket spool is to stop the flow of oil through the open center passage. This excess leakage could be interpreted as cylinder leakage if the bucket spool was not actuated. When the piston rod is completely retracted, packing leakage is difficult to detect because the piston is seated against the closed of the cylinder.

5. Check the dipper and and swing circuits in both directions at 12 410 kPa (1800 psi) with the engine running at 1800 r/min (rpm).

6. With the engine running at 800 r/min (rpm) hold the boom control lever in the Down position and close the flowmeter load valve. When the flow reading drops to zero or very close to zero, observe the pressure gauge and record the reading. This is the setting of the secondary relief valve at the A port of the boom section (axial backhoe) or B port (side shift backhoe).

Section 4005

HYDRAULIC PUMP

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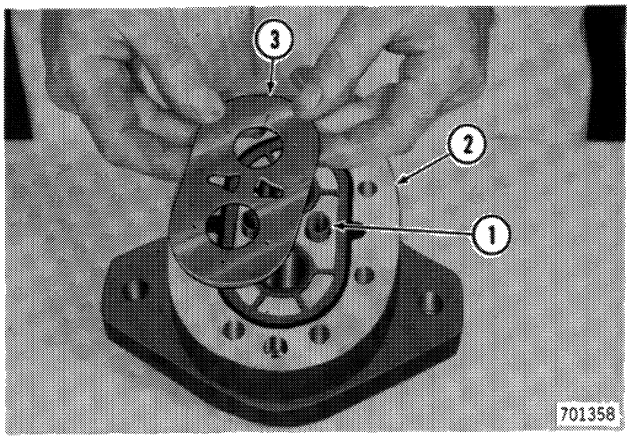
3. Install new diaphragm (wear plate) with the bronze side up. It must fit inside of the rim on the diaphragm seal. Make sure coils of the springs are not wedged between diaphragm and front cover. Figure 16.

4. On the port end cover, install the thrust plate (wear plate) with bronze side toward the gears. Side with cutaway must be on the suction side of the pump, Figure 17. This plate fits inside the gear plate when gear plate is seated on rear cover.



1. Spring
2. Drive End Cover
3. Diaphragm

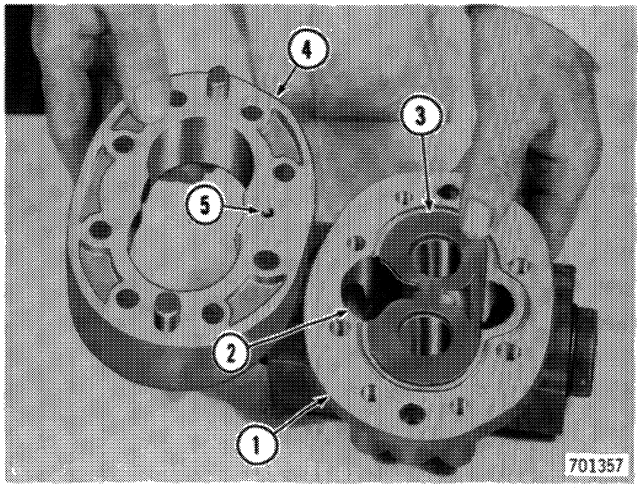
Figure 16 - Front Cover and Diaphragm

5. Notice that the gear plate has two half moon cavities on one side. Also the small hole drilled in one of the cavities. Install gear plate on port end cover with half moon cavities toward end cover and drilled hole on the outlet (pressure) side, Figure 17.

6. Lubricate gears with a clean hydraulic oil and install gears in port end cover.

7. Install drive end cover over gears. Install cap screws and torque evenly to specification on page 4005-6.

8. Install seal protector (sleeve, tape, etc.) on pump shaft. Carefully install seal



1. Port End Cover
2. Suction Side
3. Thrust Plate
4. Gear Plate
5. Hole - Must Be on Outlet Side

Figure 17 - Port End Cover and Gear Plate

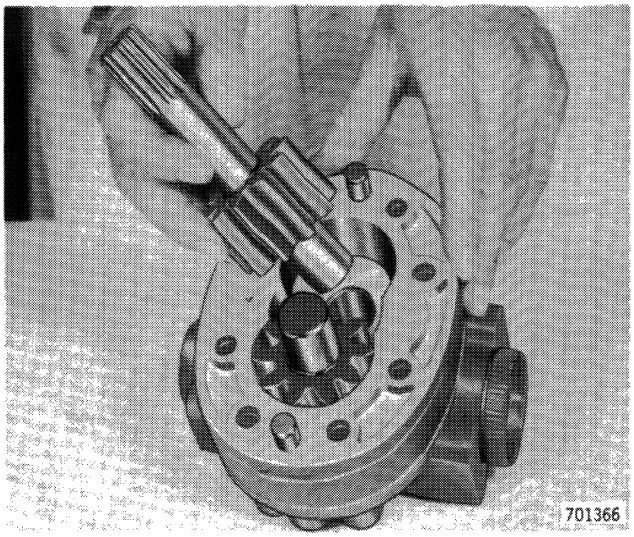


Figure 18 – Installing Gears

over the shaft. Use a 33 mm (1-5/16") O.D. seal driver and hammer, tap the seal into drive end cover until seated against shoulder in seal bore.

9. Use a suitable tool and rotate the pump shaft 10 revolutions. Pump should be almost free enough to rotate shaft by hand. If not, disassemble pump to find the cause of the bind.

GENERAL

The loader control valve is a two spool (three spool with clam bucket and spool located on the outlet side of the lift spool) open center, series parallel valve. The parallel passages are the return passages at the top and bottom of the valve, Figure 2. In this valve all oil is directed to the cylinders being actuated. If more than one spool is actuated, the spool closest to the inlet port receives the oil. Example: When the bucket spool is actuated, no oil is available at the lift or clam spool until the bucket spool is returned to Neutral. The same would be true of the clam spool if the lift spool were actuated.

The valve contains two outlet ports, one connecting the work port return passages to the reservoir return line and the open center outlet which contains a power beyond fitting.

The power beyond fitting permits the installation of rear mounted hydraulics without additional valves to control oil flow. It also permits the use of the main relief valve to protect the backhoe hydraulic system from excessive pressure. However, only one system can be operated at one time--actuating a loader control valve spool blocks oil flow to the rear mounted hydraulic system.

An adjustable, pilot operated main relief valve at the control valve inlet prevents excessive pressure in the hydraulic system whenever a spool is actuated.

Load check valves between the work ports and the spools prevent reverse flow of oil between the cylinders and the control valve as a spool is moved into a power position.

Secondary relief valves are connected to the A and B ports of the bucket spool to protect the circuits when a cylinder is forced to move with the spool in Neutral.

Control valve operation is discussed and illustrated on pages 4007-6 through 4007-10.

With the loader control valve spools in neutral, oil flows straight through the open center passage and the power beyond fitting to the rear mounted hydraulics control valve(s) to the reservoir.

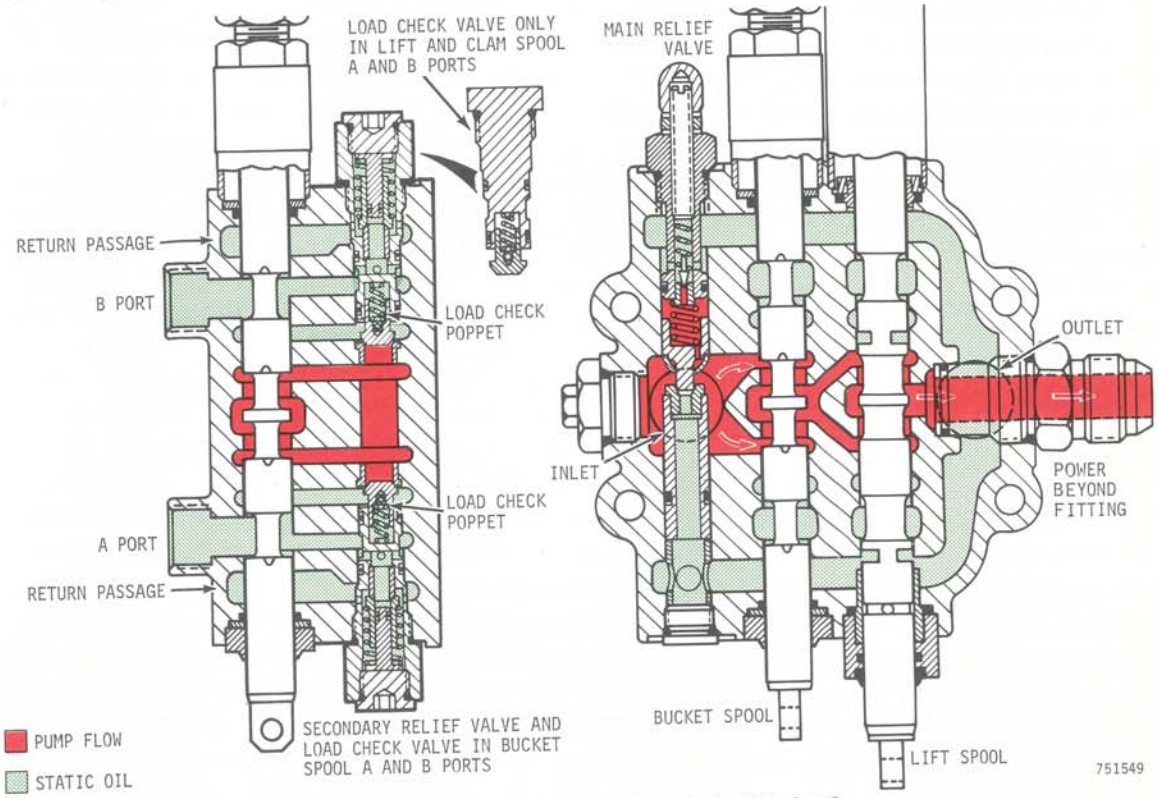


Figure 2 - Oil Flow - Spools in Neutral

Secondary Relief Valve

A secondary relief valve is located at the A and B ports of the bucket spool.

1. Remove the relief valve assembly from the valve body.

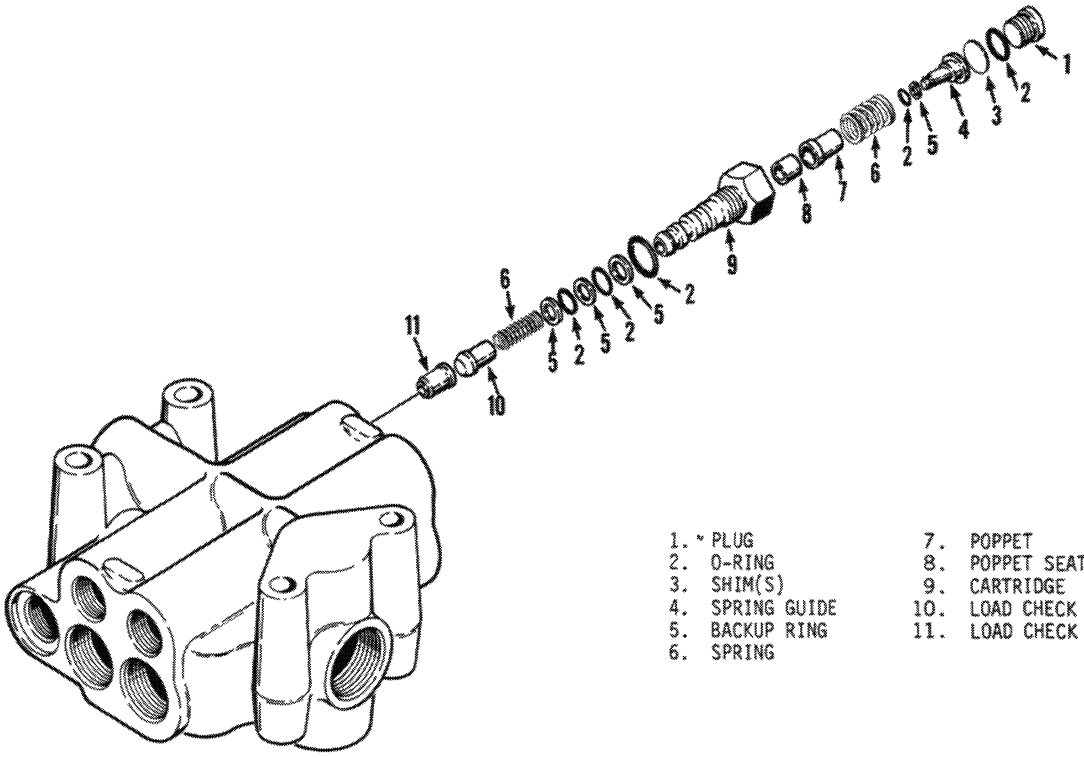
2. Remove the spring and load check poppet from the valve bore. If both check poppets are removed, keep them separate so they will be installed in the proper bore. Do not remove the poppet seat unless it is to be replaced.

3. Disassemble the relief valve.

   a. Remove plug and shim(s) from the cartridge.

   b. Remove the spring guide, spring and poppet from the cartridge.

   c. Do not remove the poppet seat unless it is to be replaced.



1. PLUG
2. O-RING
3. SHIM(S)
4. SPRING GUIDE
5. BACKUP RING
6. SPRING
7. POPPET
8. POPPET SEAT
9. CARTRIDGE
10. LOAD CHECK POPPET
11. LOAD CHECK POPPET SEAT

Figure 13 - Secondary Relief Valve

Section 4090

HYDRAULIC CYLINDERS

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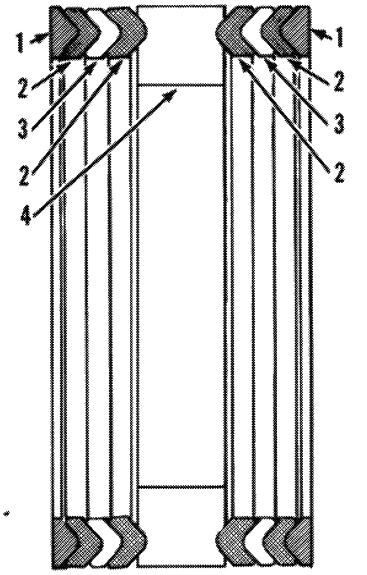
5. Place the spacer or steel ball in bolt hole in piston rod and place piston assembly on rod.

6. Place washer on piston bolt. Install restrictor pin in piston bolt, tapered end first, and place spring on pin. Screw bolt as assembled into piston rod and torque to 949-1017 N m (700-750 foot-pounds).

7. Secure cylinder tube in a vise and throughly lubricate the cylinder wall and piston packing with clean hydraulic oil. Install the piston straight into the tube. After the piston has started into the smooth portion of the tube, screw gland into tube but do not tighten. The piston rod can now be worked farther into the tube with a rod through the rod eye or a soft hammer.



1. END RING 3. NEOPRENE RING
2. NYLON RING 4. CENTER RING

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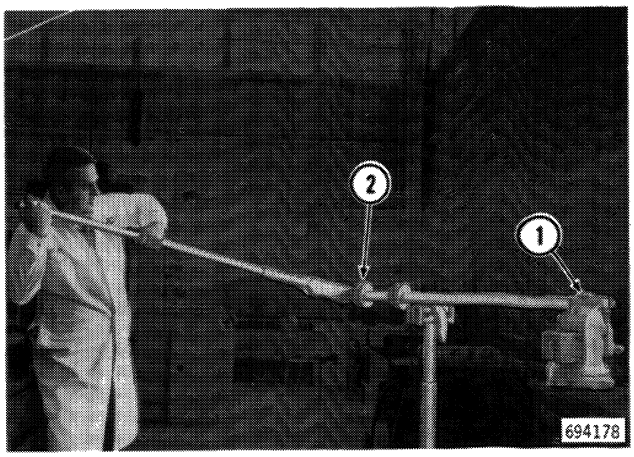
Figure 9 - Vee Ring Installation

8. Torque the gland until the self-tapping screw holes in the gland and cylinder line up. Gland torque should be between 135 and 271 N m (100-200 foot-pounds).

NOTE: If a new gland or tube is being used, drill a new hold for the self-tapping screw after the gland has been torqued to 135-271 N m (100-200 foot-pounds). Using a 3.7338 mm (No. 26) drill, drill the hole half in the gland and half in the cylinder approximately 8 mm (5/16") deep. Do not drill in line with the spanner wrench holes.



1. Clamp Across Rod Eye
2. Torque to Specification on page 4090-3

Figure 10 - Torquing Piston Bolt

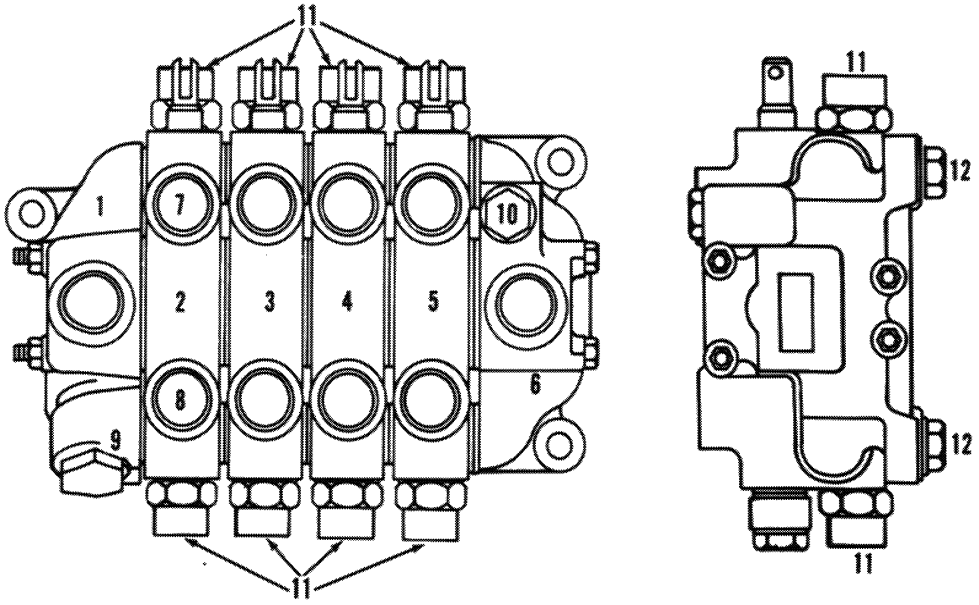
9. If the relief valve with a Allen head plug was disassembled, refer to Figure 8 and assemble valve. If parts were satisfactory and jarring stops were noted during operation, remove one or two shims. If stop was extremely spongy, add one or two shims.

10. Install relief valve in closed end of cylinder. Be sure new O-rings and back-up ring have been installed on the valve body.

11. Install flow restrictor in port in closed end of cylinder. Restrictor must be installed small end first. Then install the 90° elbow.

NOTE: Two different restrictors are used and can be identified by the diameter of the restrictor hole:

With Extendahoe . . . . . 3.17 mm (.125")
Without Extendahoe . . . 3.96 mm (.156")



1. OUTLET SECTION
2. BOOM SECTION
3. DIPPER SECTION
4. BUCKET SECTION
5. SWING SECTION
6. INLET SECTION
7. A PORT
8. B PORT
9. REGENERATION SPOOL
10. REGENERATION CHECK VALVE
11. SECONDARY RELIEF VALVE
12. ANTICAVITATION VALVE

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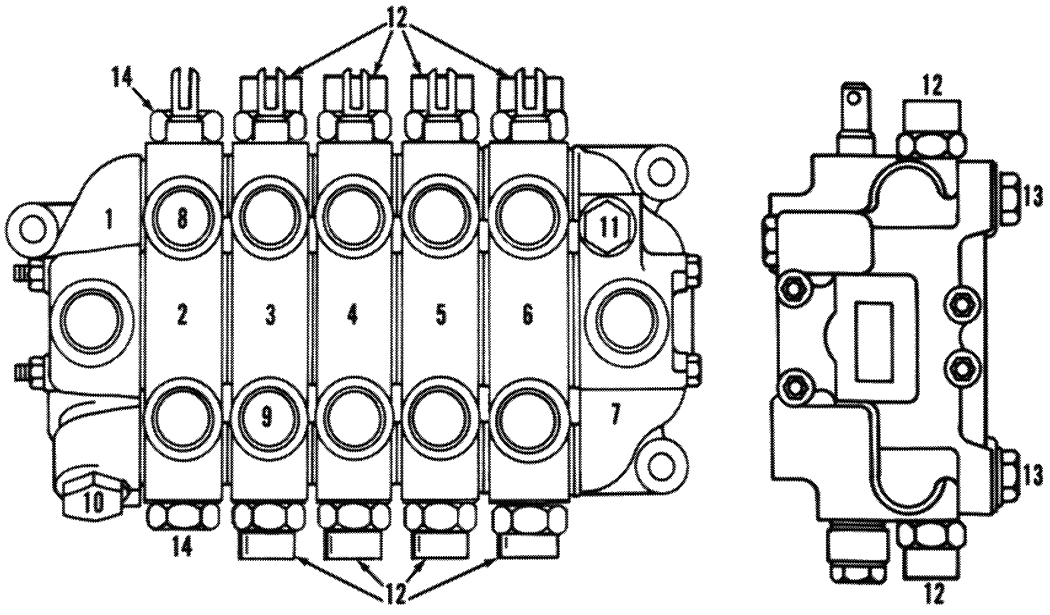
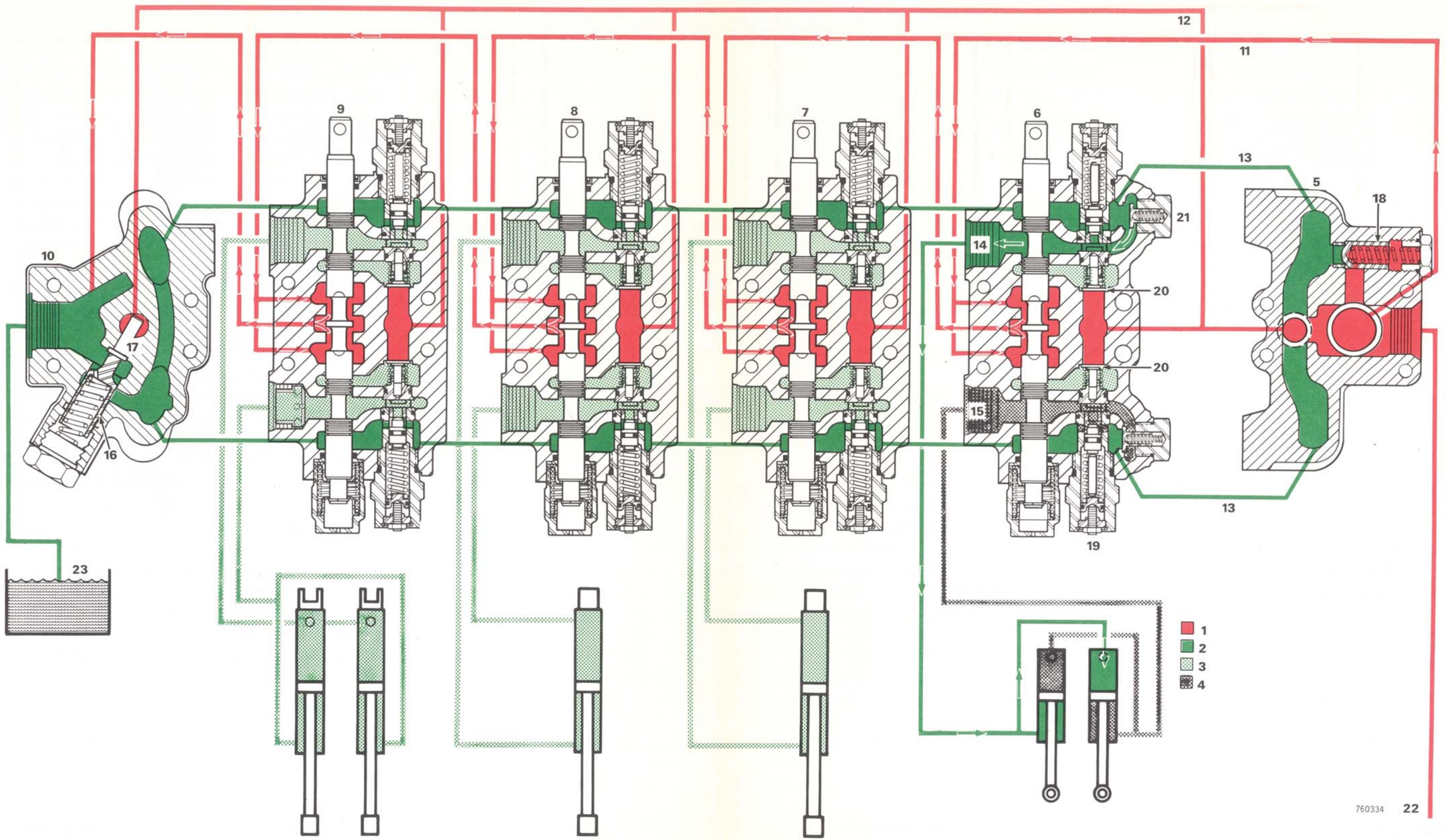
Figure 3 - Four-Spool Control Valve for Axial Backhoe Without Extendahoe



1. OUTLET SECTION
2. EXTENSION SECTION
3. BOOM SECTION
4. DIPPER SECTION
5. BUCKET SECTION
6. SWING SECTION
7. INLET SECTION
8. A PORT
9. B PORT
10. REGENERATION SPOOL
11. REGENERATION CHECK VALVE
12. SECONDARY RELIEF VALVE
13. ANTICAVITATION VALVE
14. PLUG

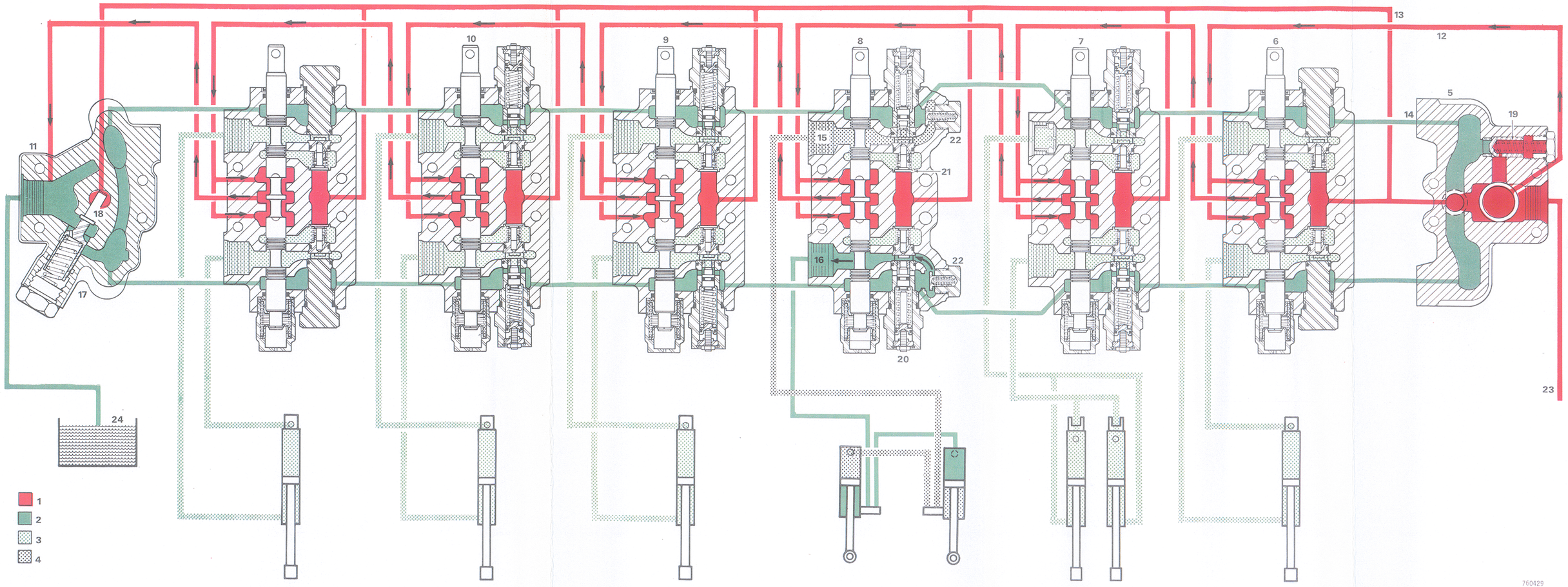
751595

Figure 4 - Five-Spool Control Valve for Axial Backhoe with Extendahoe



1. PUMP FLOW
2. RETURN OIL
3. STATIC OIL
4. OIL DISPLACED FROM SWING CYLINDERS
5. INLET
6. SWING
7. BUCKET
8. DIPPER
9. BOOM
10. OUTLET
11. OPEN CENTER PASSAGE (INTERNAL)
12. PARALLEL PASSAGE (INTERNAL)
13. RETURN PASSAGE
14. A PORT
15. B PORT
16. REGENERATION SPOOL
17. REGENERATION SENSING PISTON
18. REGENERATION CHECK VALVE
19. SECONDARY RELIEF VALVE OPEN
20. LOAD CHECK VALVE OPEN
21. ANTICAVITATION VALVE
22. FROM PUMP VIA LOADER CONTROL VALVE AND STABILIZER CONTROL VALVE
23. RESERVOIR

Figure 12 - Oil Flow, Boom Swinging to Right and Stopping, Axial Backhoe



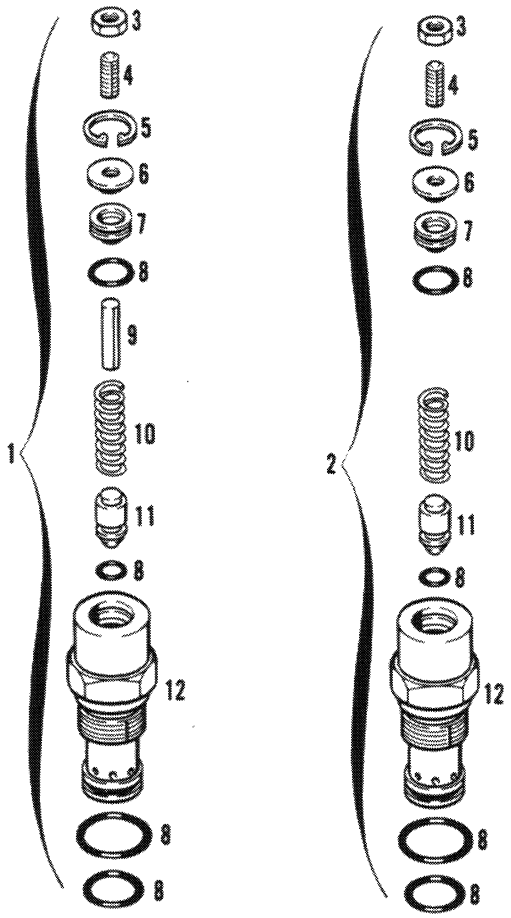
1. PUMP FLOW
2. RETURN OIL
3. STATIC OIL
4. OIL DISPLACED FROM SWING CYLINDERS
5. INLET
6. STABILIZER
7. BOOM
8. SWING
9. DIPPER
10. BUCKET
11. OUTLET
12. OPEN CENTER PASSAGE (INTERNAL)
13. PARALLEL PASSAGE (INTERNAL)
14. RETURN PASSAGE
15. A PORT
16. B PORT
17. REGENERATION SPOOL
18. REGENERATION SENSING PISTON
19. REGENERATION CHECK VALVE
20. SECONDARY RELIEF VALVE OPEN
21. LOAD CHECK VALVE
22. ANTICAVITATION VALVE
23. FROM PUMP VIA LOADER CONTROL VALVE
24. RESERVOIR

Figure 17 - Oil Flow, Boom Swinging to Right and Stopping, Side Shift Backhoe

2. Remove snap ring. Note number of exposed threads on adjusting screw.

3. The remaining parts now can be easily removed. The piston and poppet may be held by the fit of the O-ring.

4. Remove and discard O-rings.



1. USED IN SWING SECTION A AND B PORTS, AND BOOM SECTION A PORT.
2. USED IN BUCKET AND DIPPER SECTION A AND B PORTS, AND BOOM SECTION B PORT
3. LOCK NUT. TORQUE TO 50-80 INCH-POUNDS (5.6-9 N m).
4. ADJUSTING SCREW
5. SNAP RING
6. RETAINER
7. PISTON
8. O-RING
9. STOP PIN
10. SPRING
11. POPPET
12. CARTRIDGE

751601

Figure 25 - Secondary Relief Valves

Inspection

1. Inspect the spring(s) for signs of distortion and cracking. Check spring on a spring tester--if it does not meet specifications on page 4107-3, replace with a new spring.

2. Inspect poppet and its seating surface. If seating surface is damaged, the entire relief valve must be replaced.

Assembly

1. Assemble parts in the order shown in Figure 25. Assemble adjusting screw in approximate position noted during removal.

2. Install cartridge in valve section and torque to 85-115 N m (65-85 foot-pounds).

Checking and Adjusting Pressure Setting

Relief valves can be checked with the control valve on or off the machine. Refer to Section 4002.

NOTE: A nominal setting is stamped on the cartridge. This setting is NOT to be used for those relief valves tested with a hand pump. Specifications and instructions are given in Section 4002.

Installation

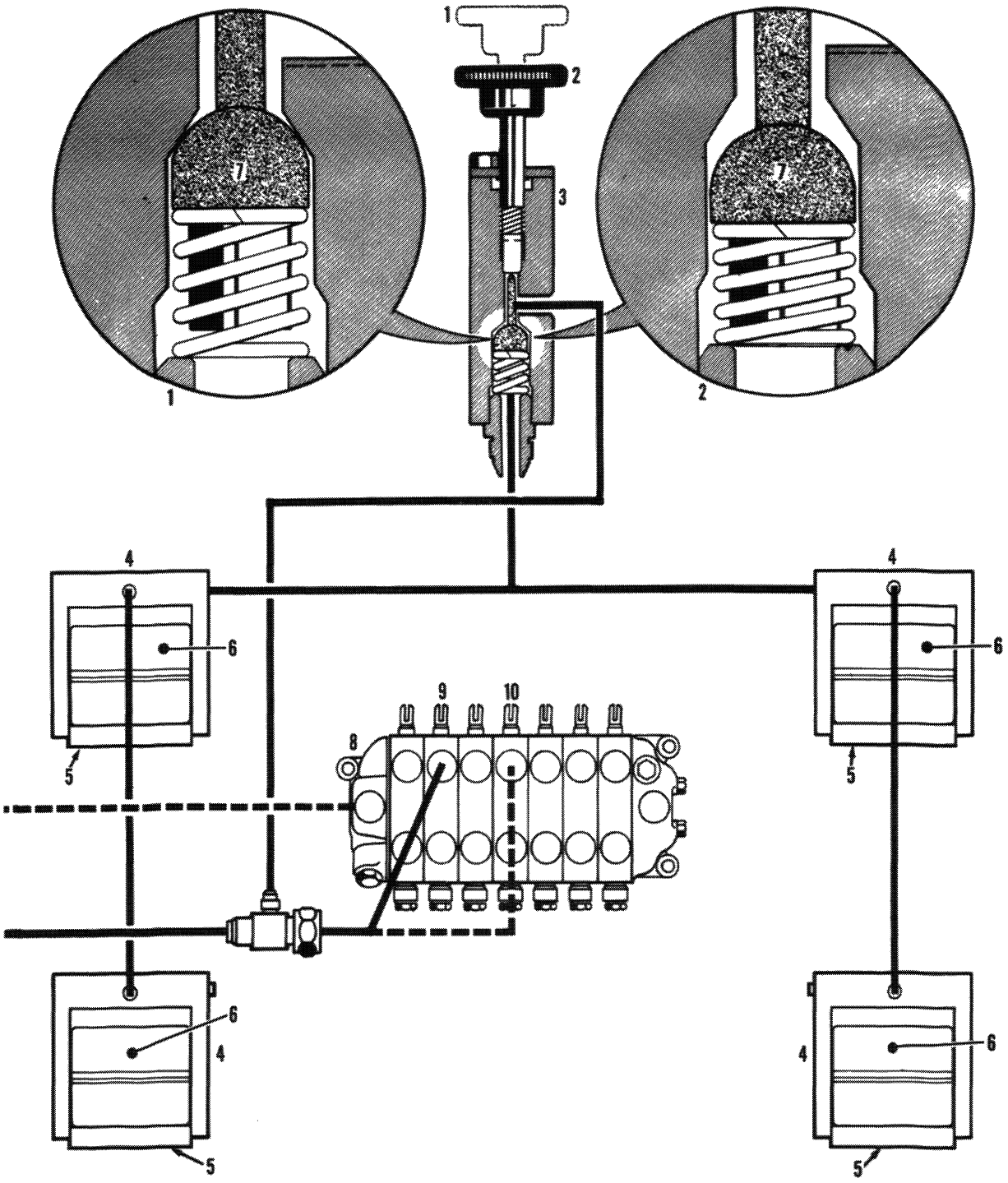
Axial Backhoe

CAUTION: The four-spool valve weighs 43 kg (95 pounds); the five-spool valve weighs 55 kg (120 pounds). Use care when handling the valve to prevent personal injury and damage to the valve. 40-1

1. Position valve against mounting plate and secure in place with bolts, washers and nuts. Be sure flat washers are installed between the valve and mounting plate.

2. Connect control linkage to valve spools.

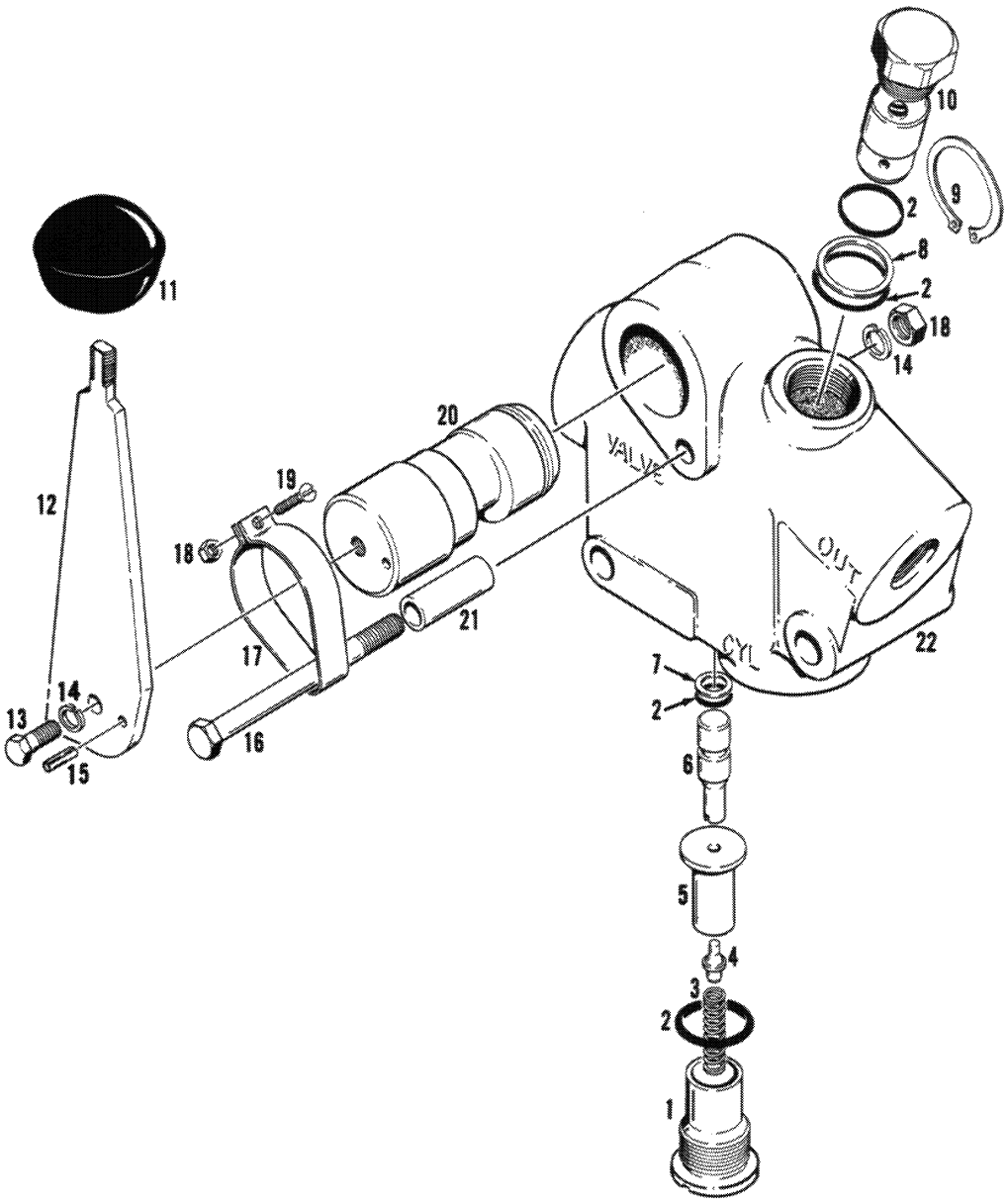
3. Connect hoses and tubes to control valve. If fitting was removed from bottom port in the boom section or a new section was installed, make sure restrictor is



1. LOCK POSITION
2. UNLOCK POSITION
3. CONTROL VALVE
4. LOCKING CYLINDER
5. PISTON PLATE
6. PISTON
7. POPPET
8. BACKHOE CONTROL VALVE
9. BUCKET SECTION WHEN EQUIPPED WITH FOOT SWING CONTROLS
10. BUCKET SECTION WHEN EQUIPPED WITH HAND SWING CONTROLS

760049

Figure 1 - Hydraulic Lock System



1. PLUG
2. O-RING
3. SPRING
4. SPRING SEAT
5. POPPET
6. PLUNGER
7. BACKUP RING
8. RUBBER BACKUP RING
9. SNAP RING
10. RELIEF VALVE
11. KNOB
12. HANDLE
13. CAP SCREW
14. LOCK WASHER
15. PIN
16. BOLT
17. SPRING CLIP
18. NUT
19. SCREW
20. SHAFT
21. SPACER
22. BODY

751576

Figure 6 - Control Valve

SPECIFICATIONS

Wear Specifications

Commutator and commutator ring thickness difference	0.038 mm (.0015") max.
Rotor and stator thickness difference	0.051 mm (.002") max.
Rotor to stator clearance	0.152 mm (.006") max.

Special Torques

Cover cap screws	24-30 N m (18-22 foot-pounds)
End plate cap screws	20-26 N m (15-19 foot-pounds)
Steering wheel nut	43-50 N m (32-37 foot-pounds)

OPERATION

General

The steering control valve consists of three major assemblies; the control section, control valve section and the metering section.

Control Valve Section

The control valve section contains a mechanically actuated linear, open center type spool. The spool is centered in the housing by the torsion bar.

The functions of the control valve section are:

1. Direct oil from the steering pump to the metering section (steering wheel turning) or to the outlet port (steering wheel at rests).

2. Receive oil from the metering section and direct it to the steering cylinders.

3. Direct return oil from the cylinders to the outlet.

Metering Section

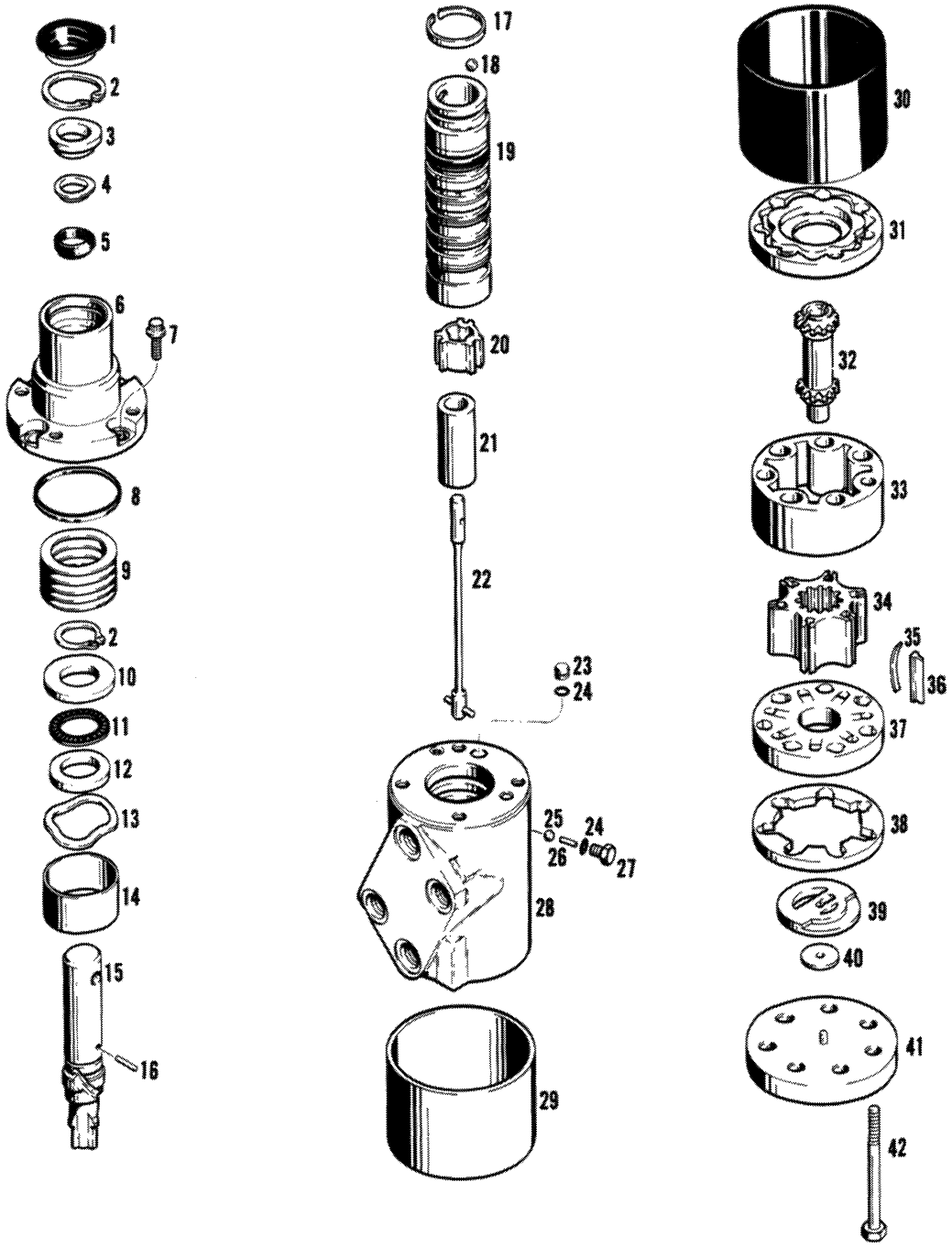
The metering section consists of the gerotor (rotor and stator), commutator, commutator ring and manifold.

Due to design, it is impractical to present an illustration that would clearly show the flow of oil through the metering section.

The function of the commutator, commutator ring and manifold is to direct the flow of oil between the gerotor and control valve section. The commutator turns in unison with the steering wheel and rotor.

Controlling oil flow to the cylinders is the primary function of the gerotor. The gerotor consists of the stator (gear ring) and rotor (gears). The rotor has six lobes and the stator seven lobes. The rotor has one less lobe to form the pockets required to permit oil flow through the complete valve assembly. When the steering wheel is being turned, the rotor and commutator also turn, admitting oil to three expanding pockets, and discharging oil from three contracting (shrinking) pockets. The seventh pocket is inactive as it changes from discharging oil to admitting oil.

If the engine stops, and the steering wheel is turned, the gerotor then functions as a pump to permit continued steering of the machine. However, with a dead engine, steering effort is greatly increased. In case of a power failure the machine should be brought to a stop as quickly as possible.



1. DIRT SEAL
2. SNAP RING
3. SEAL SPACER
4. SEAL RING
5. SEAL
6. COVER
7. CAP SCREW
8. O-RING
9. SHIMS
10. LARGE O.D. THRUST WASHER
11. THRUST BEARING
12. SMALL O.D. THRUST WASHER
13. WAVE SPRING
14. SPACER
15. INPUT SHAFT
16. PIN
17. BALL RETAINER
18. ACTUATOR BALL
19. SPOOL
20. DRIVE RING
21. SPACER
22. TORSION BAR
23. PLUG
24. O-RING
25. CHECK BALL
26. PIN
27. PLUG
28. BODY
29. RETAINER
30. SEAL
31. SPACER
32. DRIVE LINK
33. STATOR
34. ROTOR
35. SPRING(6)
36. VANE (6)
37. MANIFOLD
38. COMMUTATOR RING
39. COMMUTATOR
40. WASHER
41. END PLATE
42. CAP SCREW (7)

751589

Figure 14

Section 5021

FRONT AXLE

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SPECIFICATIONS

Oil temperature for test purposes	Temperature gauge needle in middle of green zone on gauge.
Pump (main line) pressure	
Engine at low idle and oil at specified temperature	448 kPa (65 psi) minimum in Neutral
Engine at 2000 rpm (r/min) and oil at specified temperature	896 kPa (130 psi) minimum in Neutral
Torque converter out (cooling circuit) pressure	206 kPa (30 psi) or less, engine at 2000 r/min (rpm)
Specified oil	Case TCH Fluid
Alternate oil	Dexron or automatic transmission oil type A, suffix A
Shuttle oil capacity	2.1 liters (2-1/4 U.S. quarts)
Torque converter capacity	5.2 liters (5-1/2 U.S. quarts)
Total system capacity (approx.)	8 liters (8-1/2 U.S. quarts)
Service specifications	Refer to Section 6210.

MAINTENANCE

Oil Level Check

The oil should be checked after every 50 hours of operation or once a week, whichever occurs first.

The oil level must be checked with the oil at operating temperature.

Park the machine on a level surface and apply the parking brake, place transmission in 4th gear and shuttle in Neutral. The dipstick has an expandable rubber plug. Turn handle counterclockwise several turns and remove the dipstick. With the engine running at low idle and the dipstick pushed all the way in, the oil should be between the L and F marks on the dipstick. Add oil whenever the oil level is at the L mark or lower.

Oil Drain

The oil must be drained and the filter screen cleaned after every 1000 hours of operation or once a year, whichever occurs first. If time permits, warm oil to operating temperature before draining.

Park machine on a level surface and apply the parking brake. Remove plug from bottom of flywheel/converter housing. If the converter drain plug is not visible, turn engine over as required to position plug over opening. Then remove converter and shuttle drain plugs and drain the oil.

Remove breather on top of shuttle housing. Remove shuttle oil pan and remove the filter screen. The screen is held in place by the fit of an O-ring. Clean these parts in cleaning solvent and dry with compressed air. Check the condition of the O-ring and pan gasket and replace parts as required.

Install O-ring of filter screen tube and install screen. Place gasket on oil pan and install pan, and drain plugs in pan and converter. Install plug in bottom of flywheel/converter housing.

Filling Power Shuttle and Torque Converter

NOTE: Do not deviate from this procedure or costly and unnecessary damage may result.

1. Have on hand 7.5 liters (8 U.S. quarts) of Case TCH Fluid.
2. Add 2.8 liters (3 U.S. quarts) to the shuttle. Have the remaining oil ready to add to the shuttle.
3. Start engine and run at low idle and immediately add the remaining oil.
4. Shift the shuttle to Forward and Reverse to fill the clutch cylinders and all internal passages.
5. When the oil is at operating temperature, check oil level and add oil as required.

Pressure Indication	Possible Cause and Repair
High converter out (cooling circuit) pressure.	A pressure reading considerably higher than specified is an indication of a restriction in the oil cooling circuit. Remove oil cooler, connecting hoses and tubes and check for restriction.
Low converter out (cooling circuit) pressure in Neutral.	A slightly low pressure reading is of little concern. However, the pressure will drop as pump volume falls because of wear. If the reading is extremely low and pump (main line) pressure is as specified, it indicates a damaged converter and replacement of the converter.
Low converter out (cooling circuit) pressure with Forward or Reverse clutch applied.	A considerably low pressure reading with a clutch applied in comparison to converter out pressure in Neutral indicates a clutch circuit problem. At the same time, Test No. 2 should also show low pressure and clutch circuit problem.

15. Remove the clutch spring, Figure 11, and front pressure plate retaining ring, Figure 12, from ring gear. Remove front pressure plate, clutch discs and rear pressure plate. Then remove rear pressure plate retaining ring.

Figure 12

16. Unlock the two large diameter sealing rings on the input shaft. Use a suitable pair of pliers and remove the sealing rings, Figure 13. Then remove Teflon rings from opposite end of shaft.

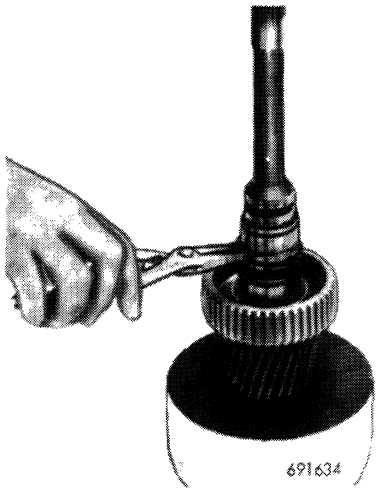


Figure 13

17. Remove the forward clutch hub retaining ring, Figure 15. Place shaft assembly in press with long end of shaft up and press shaft out of hub. Then remove Woodruff key from shaft.

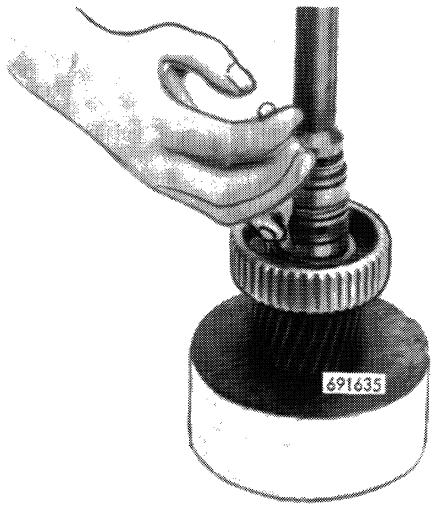


Figure 14

18. Attach a suitable tool to the output flange and remove flange retaining nut. Then remove flange from output shaft.

19. Pull pinion cage/output shaft assembly from shuttle case. If necessary, use a soft hammer and tap end of shaft to aid in removal.

20. DO NOT disassemble the pinion cage unless inspection reveals badly worn or damaged parts and a lathe and qualified machinist are available for oil collector ring installation. The oil collector ring must be spin formed to the pinion cage and be leak proof. If disassembly is necessary:

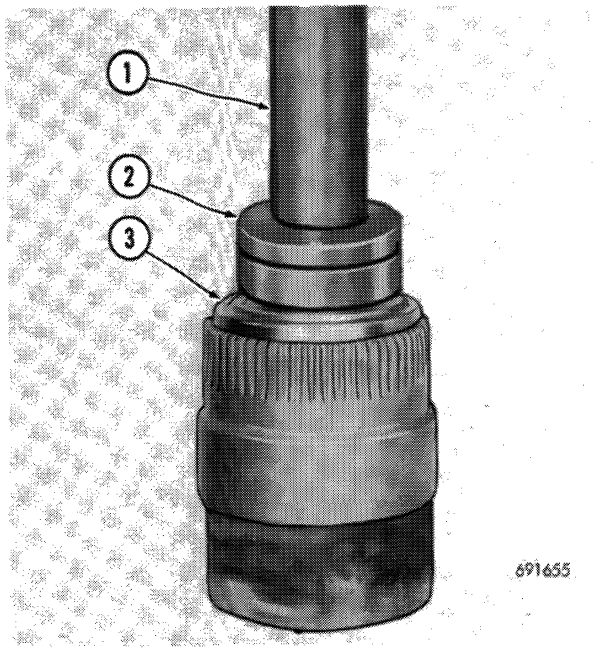
    a. Remove oil collector ring from rear of pinion cage. Damage to the ring from removal will prevent using the ring again.

    b. Remove the pinion shaft retaining pins. Then press the pinion shafts out of pinion cage. There are forty-eight needle bearings and three spacers for each pinion.

    c. Remove pinion gears and thrust washers from pinion cage. Keep mating gears and thrust washers together if they are to be used again.

20. Lubricate the cylinder wall and hub with clean oil. Start piston squarely into cylinder and push into cylinder until it bottoms, Figure 32. The piston can be pressed into the cylinder if desired.

21. Install clutch cylinder in ring gear with piston toward clutch spring. Then place ring gear assembly in a press and press cylinder into ring gear until snap ring groove is visible, Figure 33.



1. Press 2. Driver
3. Forward Clutch Assembly

Figure 33

22. With the ring gear assembly in the press install the clutch cylinder retaining ring. Make sure the proper snap ring is installed. This ring measures 1.88-1.98 mm (.074-.078") thick and has a free diameter of 149.2mm (5-7/8").

23. Place the ring gear on a fixture that will support the ring gear without contacting the cylinder hub. Place ring gear and support in press and lightly compress the clutch discs against the front pressure plate, Figure 35.

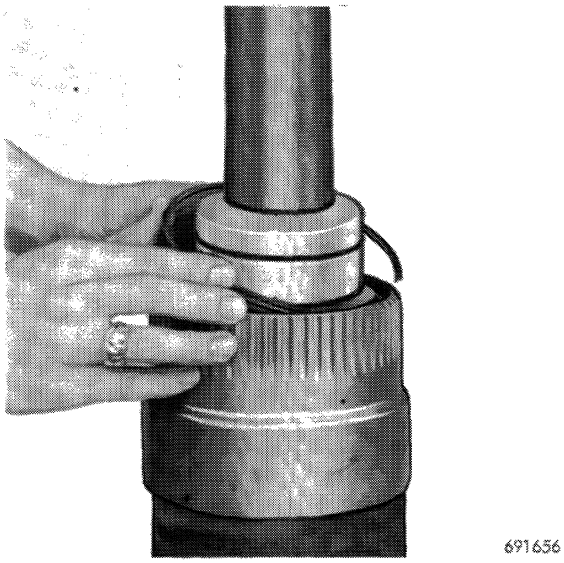


Figure 34

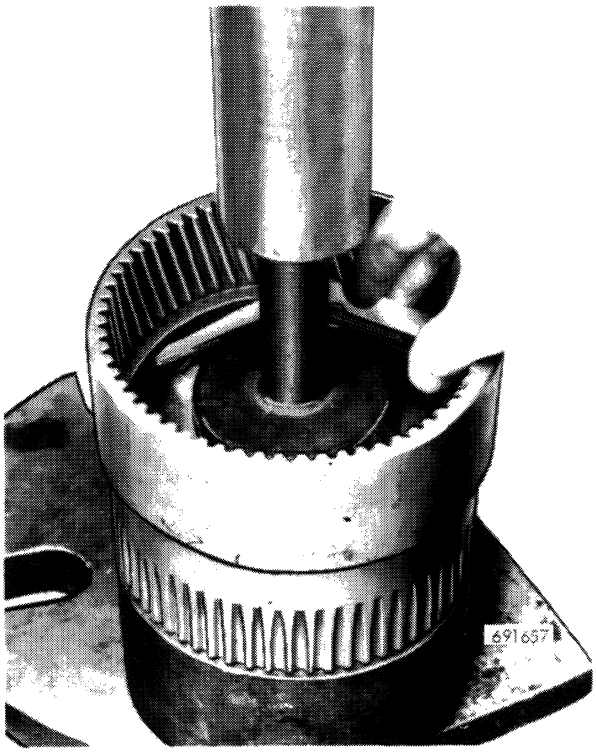


Figure 35

TORQUE CONVERTER

Should it be necessary to service the torque converter, the complete converter must be replaced. Replacement is necessary because the welded construction of the converter prevents replacement of internal parts.

Removal

1. Remove power shuttle as instructed in this section.
2. Remove all but the two top converter housing to flywheel housing cap screws and lock washers.
3. The converter housing weighs approximately 9 kg (20 pounds). Remove the two remaining cap screws and remove converter housing.
4. Remove the flex plate to flywheel cap screws and flat washers and remove converter.

Installation

1. If the converter or flex plate is being replaced, place converter on bench with converter hub down. Then place flex plate and reinforcing ring on converter and install two opposing cap screws.
2. Install alignment tool, Figure 1, over pilot boss on converter with pins in reinforcing and flex plate. Install the remaining cap screws and torque cap screws to specification on page 6210-3.
3. Attach the converter to the flywheel with cap screws and hardened flat washers. If a washer is to be replaced, refer to parts catalog for the proper part. Do not torque cap screws at this time.

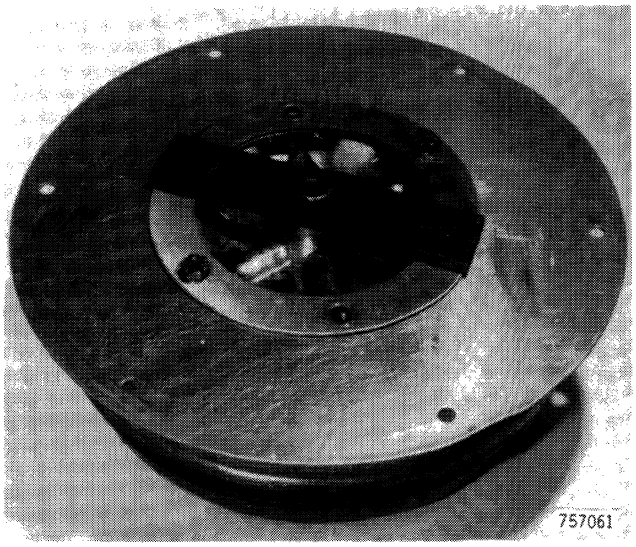
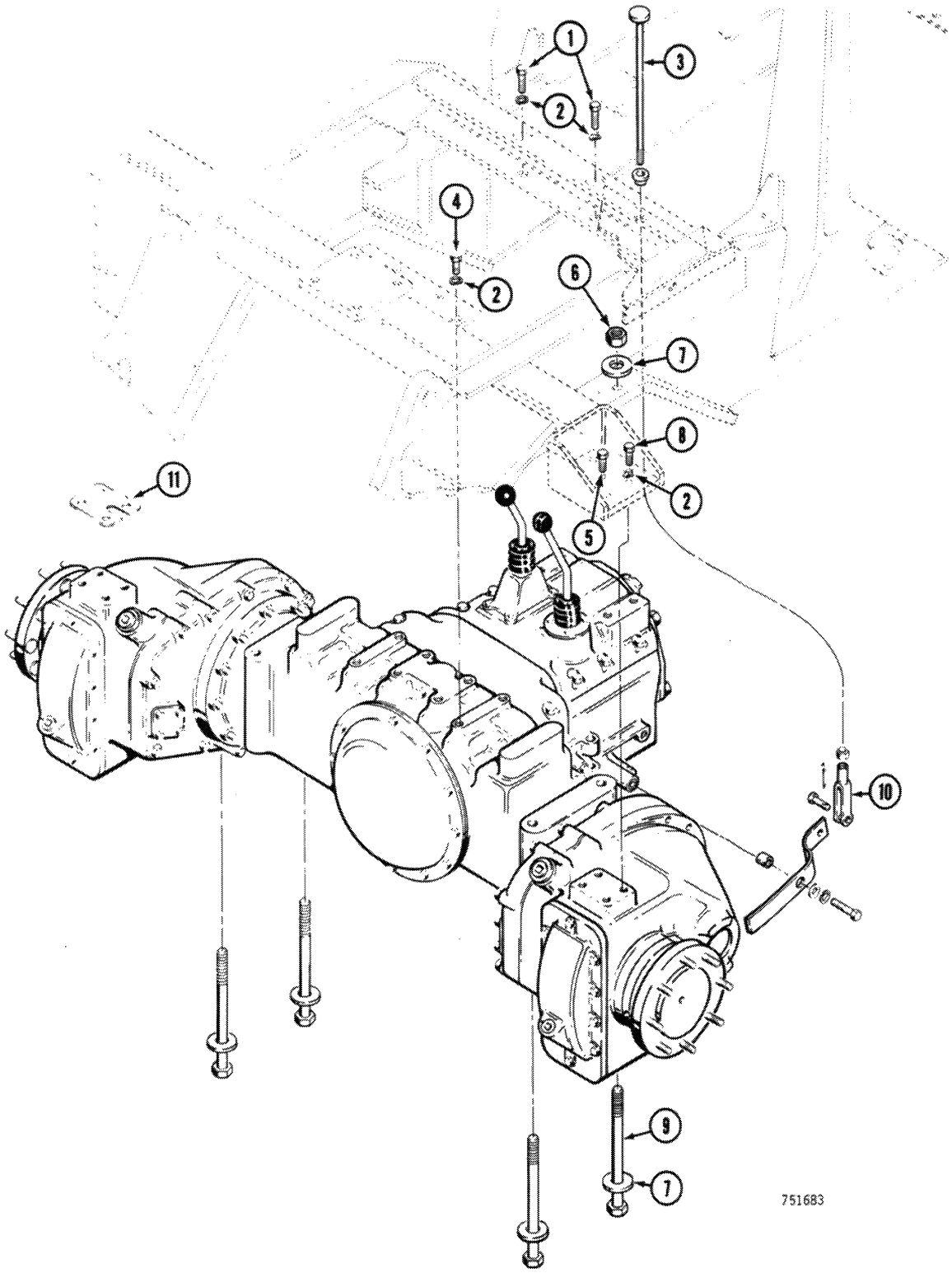


Figure 64

4. The torque converter MUST be centered on the flywheel within .102 mm (.004"). Check converter position using a dial indicator positioned against the converter hub.
5. Position converter housing against flywheel housing and secure in place with cap screws and lock washers.
6. Install shuttle as instructed in this section.



1. CAP SCREW, 5/8" x 1-1/2" (2)
2. LOCK WASHER
3. DIFFERENTIAL LOCK PEDAL
4. CAP SCREW, 1/2" x 1-1/4" (4)
5. JACK CAP SCREW, 1/2" x 1" (1)
6. NUT, 1"
7. HARDENED WASHER
8. CAP SCREW 1/2" x 1-3/4" (4 EACH SIDE)
9. BOLT, 1" x 10-1/2" (2 EACH SIDE)
10. YOKE
11. SHIMS

Figure 2 - Transaxle Installation

Replacing Final Drive Shaft on Machine

Removal

The final drive shaft can be replaced without removing the transaxle or final drive housing. Refer to Figures 5 and 6.

1. Raise rear of tractor and place suitable supports under transaxle.
2. Remove wheel.
3. Drain final drive unit.
4. Remove cover from rear of final drive housing. Lift snap ring from its groove at inner end of drive shaft.
5. Remove bolts attaching oil seal housing to housing (these are accessible through holes in the drive shaft flange). Remove oil seal housing and drive shaft as an assembly. Since the spur gear and inner snap ring remain in the housing as the drive shaft is withdrawn, use a large screwdriver to remove the inner roller bearing off the drive shaft. Otherwise bearing rollers may be pushed out of the case as the bearing is jammed against the spur gear.
6. Remove spur gear, snap ring, and inner bearing from housing.

Removal of Oil Seals and Outer Bearing

1. Remove outer snap ring.
2. Remove set screw from lock ring.

   NOTE: If available, special tool DB8009 should be used to remove the lock ring.

4. Press the drive shaft out of the outer bearing by using two jack screws (use special tool 900207 if available) through holes in the drive shaft flange. A 1/2" BSF tap may be used to clean up the threads, if required. Tighten the jack screws alternately in small amounts.
5. Remove and discard oil seals. Press inner bearing out of oil seal housing.

Assembly of Drive Shaft

1. If the collar was removed, first install the thin O-ring on the shaft, followed by the collar.
2. Install roller bearing in oil seal housing.
3. Press inner oil seal into oil seal housing. Note lip position in Figure 6.
4. Turn over the housing and press outer seal into housing with lip positioned as shown in Figure 6.
5. Pack inside of seals and bearing with No. 2 wheel bearing grease.
6. Push assembled drive shaft into oil seal housing.
7. Hold drive shaft flange in vise and screw locking ring onto shaft.
8. Make sure dirt shield is properly seated, then tighten locking ring (use special tool DB8009 if available) to clamp assembly firmly together. Tighten locking ring so that the set screw hole is over a groove in the splines of the drive shaft.
9. Smear threads of set screw with blue Loctite 242 (Case No. B17422). Install set screw and tighten securely.
10. Install outer snap ring on drive shaft.
11. Install O-ring in groove on oil seal housing.
12. Smear inner bearing with No. 2 wheel bearing grease and install in housing.
13. Place spur gear inside housing and install drive shaft through gear. Install inner snap ring on shaft and enter shaft into bearing.
14. Position oil seal housing so that grease fitting points directly towards rear and install three housing bolts; do not install shims at this time.
15. Tighten housing bolts evenly to push shaft into bearing. When inner bearing is

9. Replace the gearbox housing until flush with the differential housing.

10. Replace the pinion shaft nut (no shims), bearing and spacers until 1.3 mm (0.005") preload is obtained on the bearings (Figure 32).

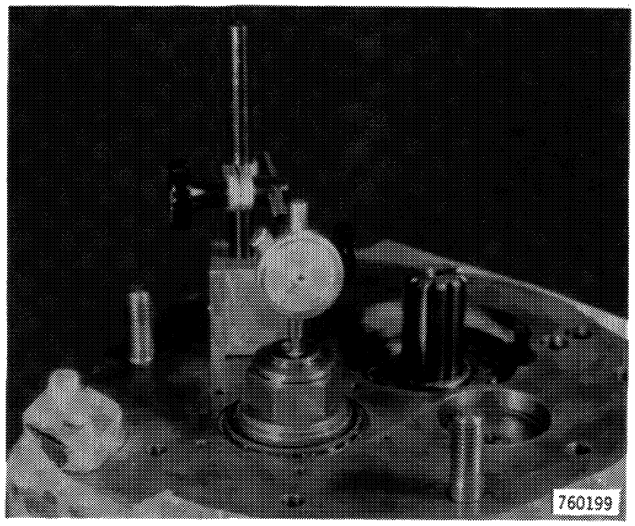


Figure 32

11. Replace three bolts attaching the gearbox housing and differential housing.

12. Reposition the gearbox horizontal.

13. Assemble setting gauge (Service Tool DB8208) Figure 33, by fitting thickest 160.34 mm (6.3125") spacer on tool probe and screwing probe as far as possible into tool mandrel. Mount tool on end plate, fitting dummy bearings in end plate bores and bolting bearing caps in position to hold tool in place. Slide mandrel to bring probe into position and unscrew probe until probe tip makes light contact with rear face of pinion bearing. Tighten locknut to prevent probe turning then recheck that it is making light contact with bearing or trough. Check the correction figure etched on pinion face. If this figure is negative (-) subtract it from 0.030 inch, and if it is positive (+) add it to 0.030 inch. Subtract the resulting figure from the gap between spacer and mandrel - which should be measured with a feeler gauge - to obtain the thickness of shims required to set the pinion in its correct position. Example: if pinion is marked -.007 and gap measures 0.057 inch then 0.030 - 0.007 equals 0.023 inch and shims required are 0.057 - 0.037 equals 0.020 inch. After rechecking the figures, make a note of the shim thickness required and remove tool from end plate. Remove pinion and separate the two end plates. Tap rear bearing track out of end plate bore, fit shims of required thickness in bore, and refit track, tapping it firmly against shims and bearing plate.

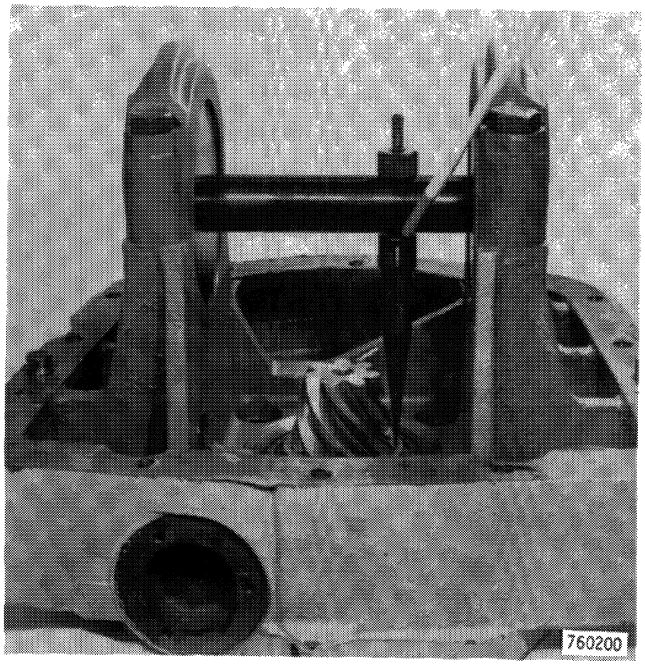


Figure 33

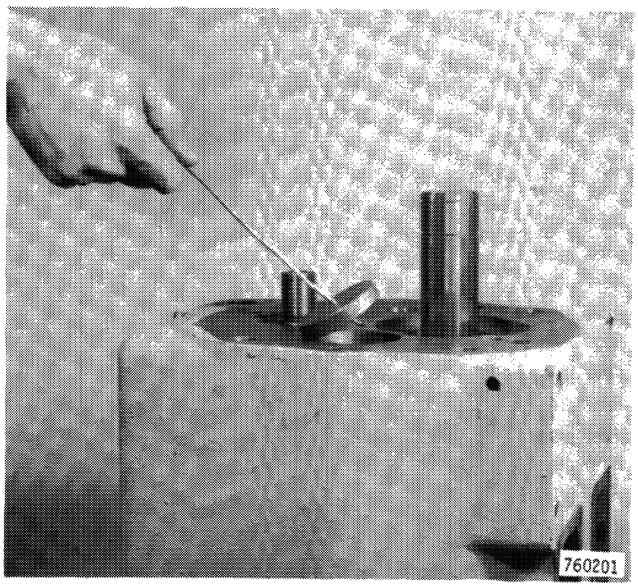


Figure 34

Section 7106

BRAKES

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BRAKE ADJUSTMENT PROCEDURE

Brake adjustment is very important. Brake wear is often uneven causing uneven braking. The self-energizing characteristic of this brake makes accurate and equal brake adjustment mandatory.

To adjust the brakes proceed as follows:

1. Park machine on level surface and block in place. Raise rear wheels off of the ground and support in place.

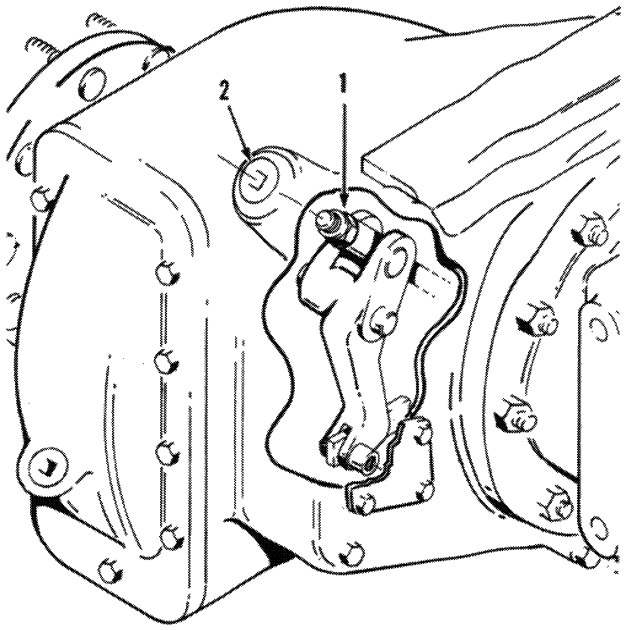
2. Remove plugs from final drive housings, Figure 8.

3. Turn rear wheel by hand, at the same time tighten nut on brake adjusting rod. Tighten nut until wheel can not be turned, Figure 8.

4. Loosen nut 2 turns.

5. Repeat steps 3 and 4 for opposite wheel.

6. Road test machine and check for even braking. Repeat steps 3, 4 and 5 if braking is uneven or brakes heat up and lock.



1. ADJUSTING NUT 2. PLUG 751691

Figure 8 - Brake Adjustment Location

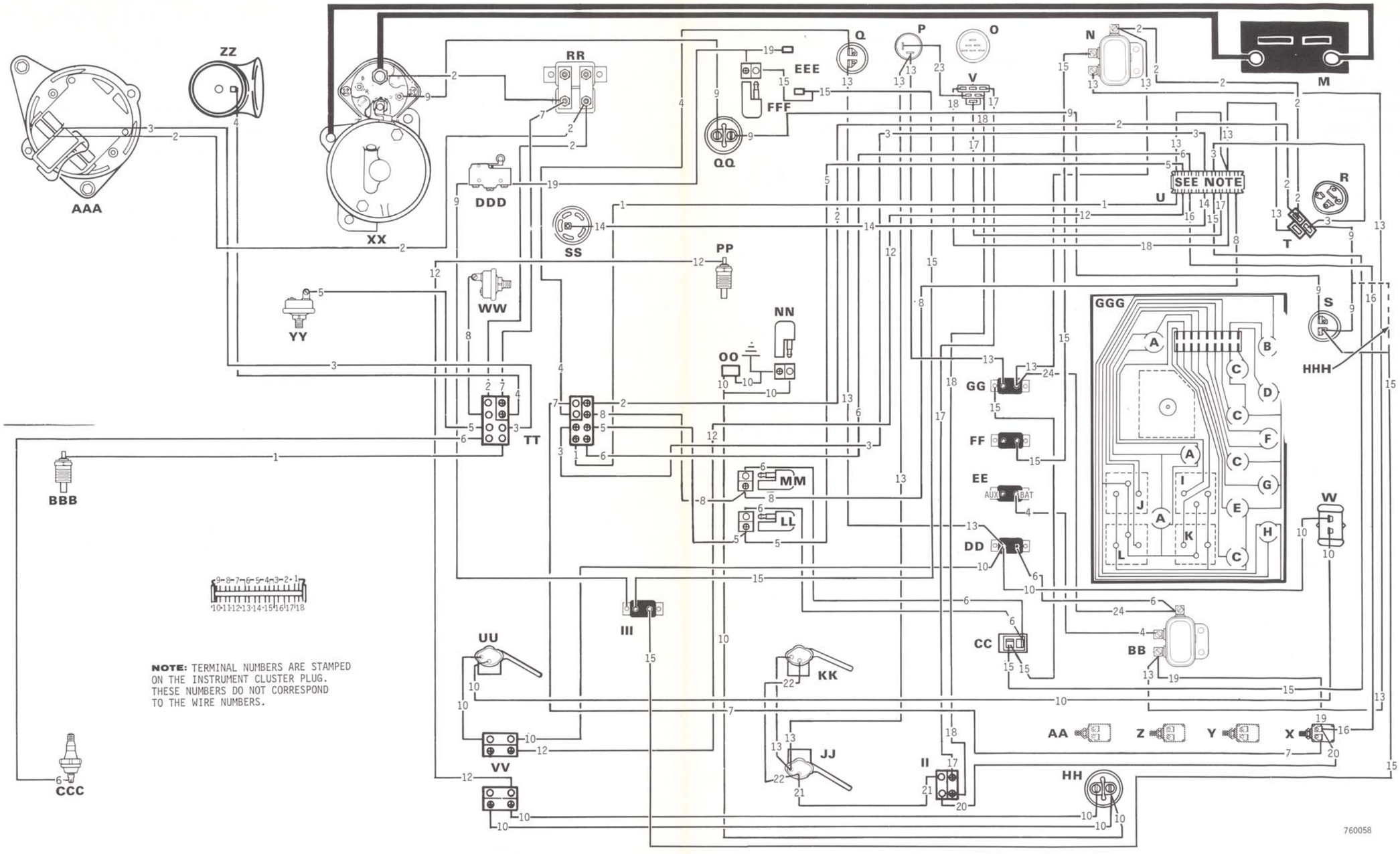


Figure 4 - Wiring Diagram for Late Production Power Shuttle Models

Section 8015

ELECTRICAL ACCESSORIES

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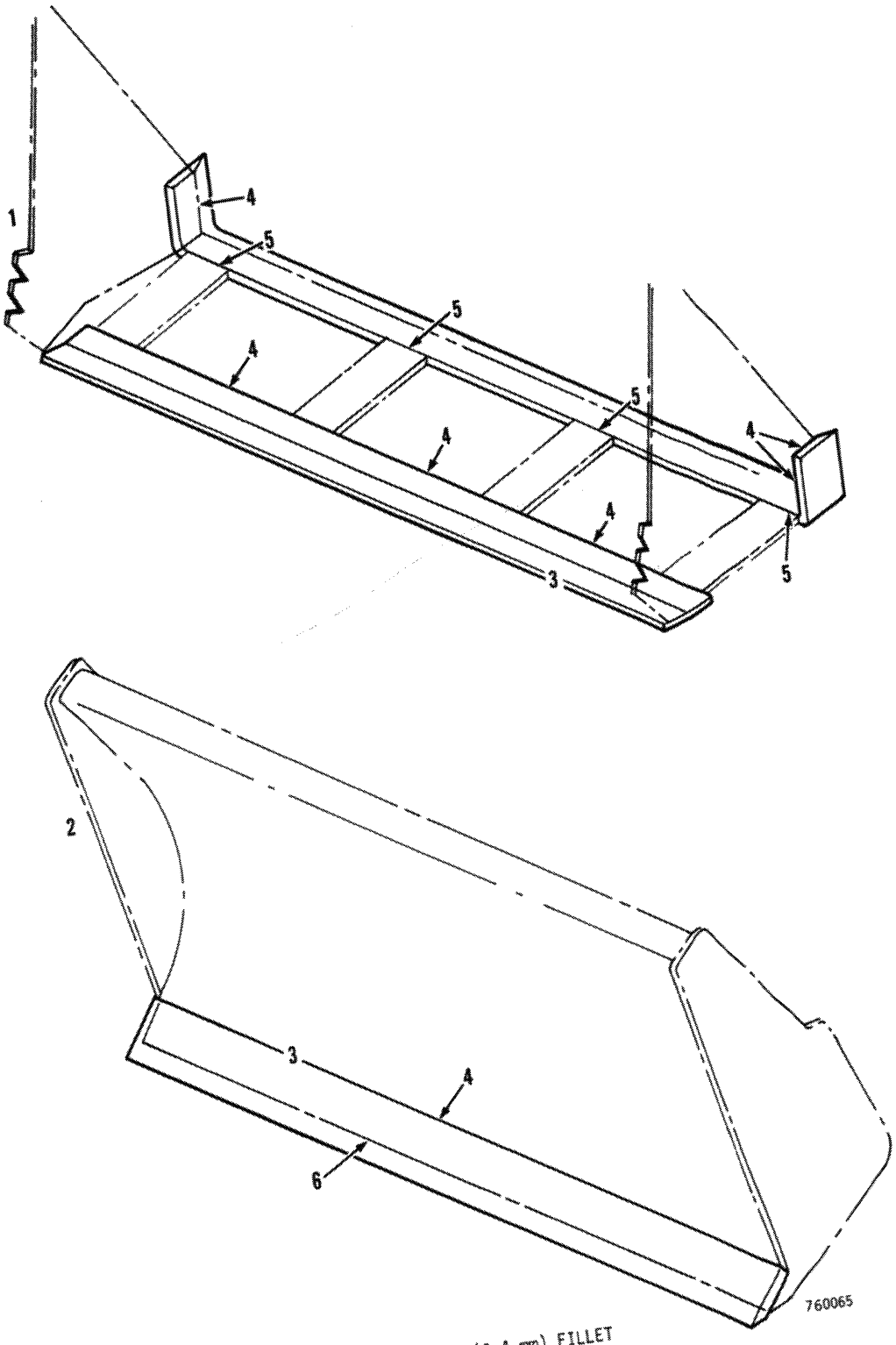
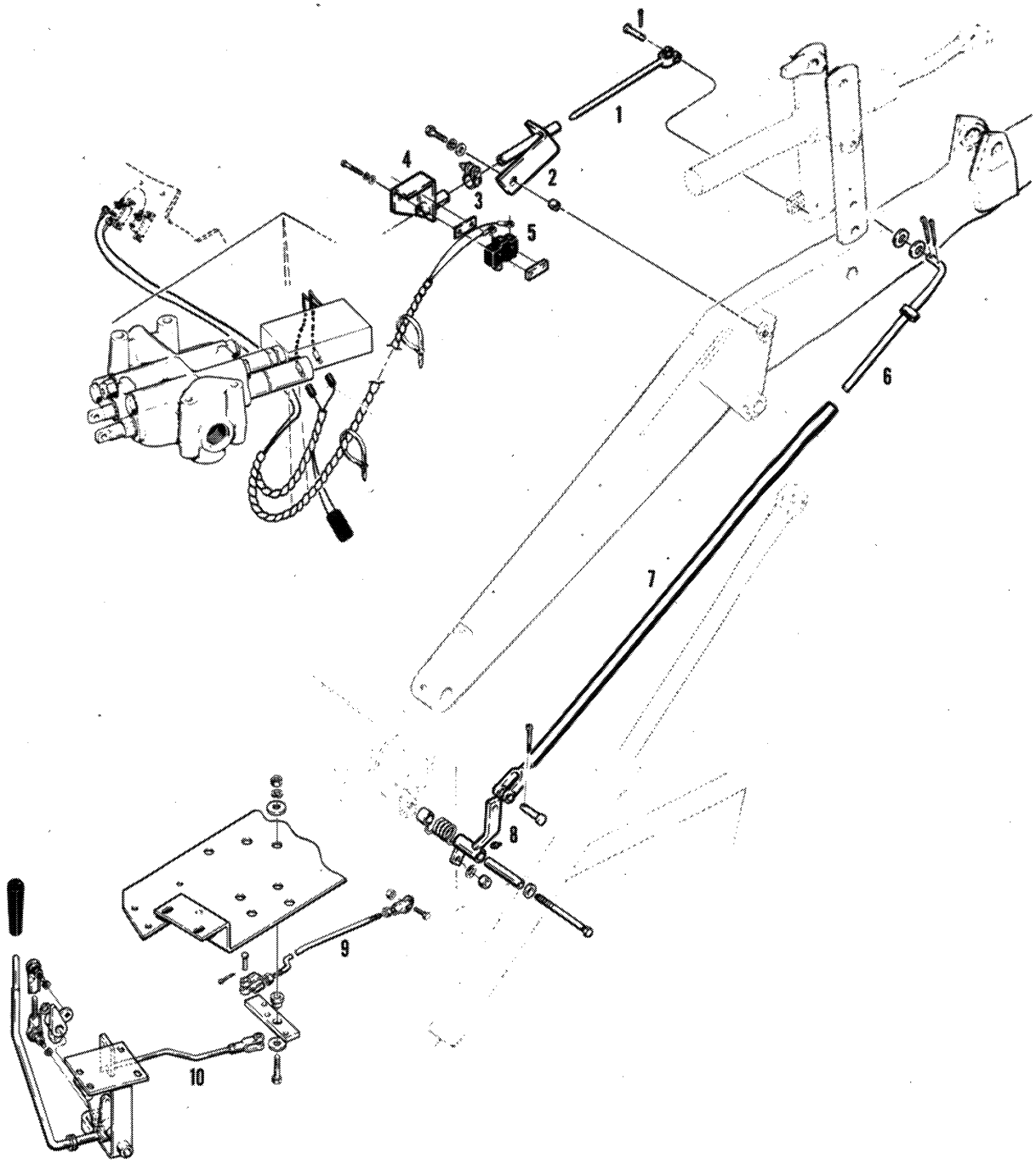


1. CLAM ASSEMBLY
2. BLADE ASSEMBLY
3. CUTTING EDGE
4. 1/4" (6.4 mm) FILLET
5. 1/4" (6.4 mm) BUTT
6. 3/16" (4.8 mm) FILLET

Figure 2 - Cutting Edge Welds



RETURN-TO-DIG PARTS

1. ACTUATOR ROD
2. ROD GUIDE
3. CLAMP
4. SWITCH BRACKET
5. SWITCH

ANTIROLLBACK LINKAGE

6. PUSH ROD
7. ACTUATOR TUBE
8. LINKAGE BELLCRANK
9. INPUT ROD
10. LEVELING ROD

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Figure 12 - Return-to-Dig and Antirollback Linkage

BACKHOE REMOVAL

1. Park the machine on a hard level surface and lower the loader bucket to the ground (floor).

2. Form a tripod with the backhoe as illustrated in Figure 1. Lower the stabilizers until they touch the ground (floor).

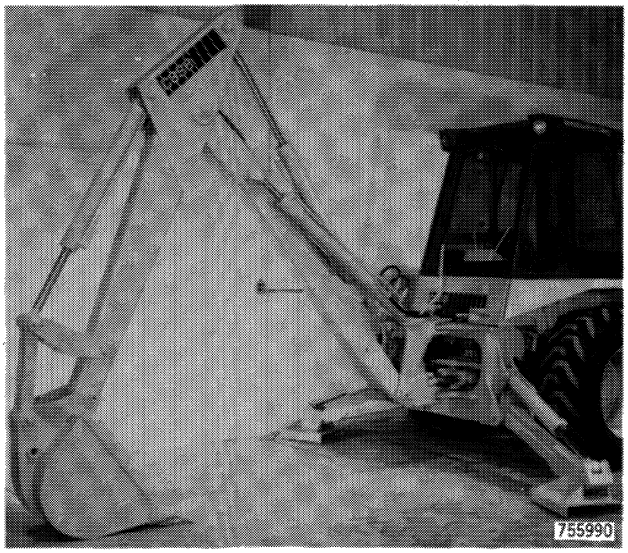


Figure 1

3. At the rear of the machine there are two tension rod assemblies that hold the backhoe in place. Remove the filler plate between the floor plate or remove plugs in filler plate and the backhoe mounting frame to gain access to the upper tie rod nuts, Figure 2.

4. Loosen the upper tie rod nut on each side. The nuts are tightened to 610-745 N m (450-550 foot-pounds) and may be difficult to loosen.

5. Remove the upper mounting pin retaining bolts.

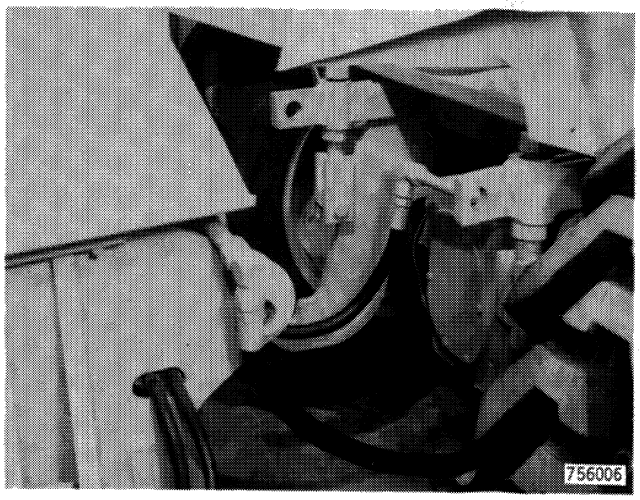


Figure 2

6. Start the engine and run at low idle. Raise or lower the boom and stabilizers as required to remove weight of backhoe from the upper mounting pins and remove the mounting pins.

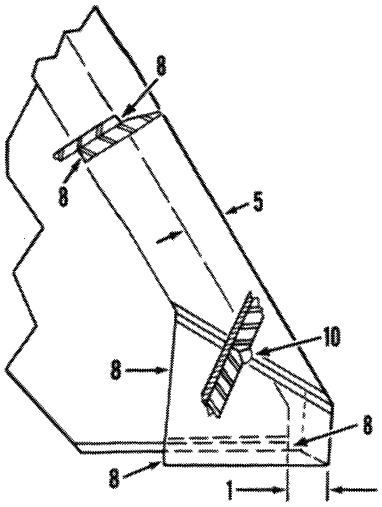
7. If machine is equipped with a cab, proceed as instructed to prevent unnecessary damage to the cab.

   a. Disconnect rear window wiper wiring and raise the rear window.

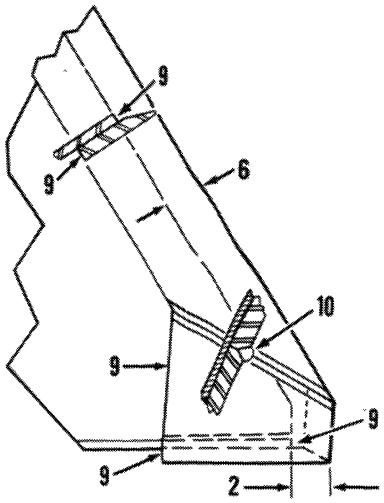
   b. Remove lower panel across rear window opening.

   c. Start engine, run at low idle and raise stabilizers about 300 mm (12") above the ground (floor).

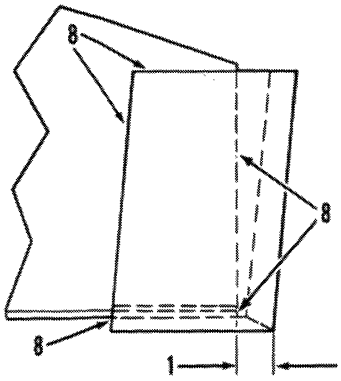
   d. With the engine running at low idle, raise the boom slowly to pivot the



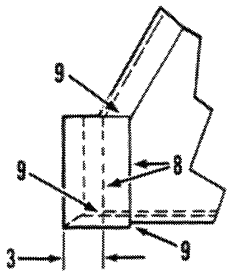
STANDARD TRENCHING BUCKET



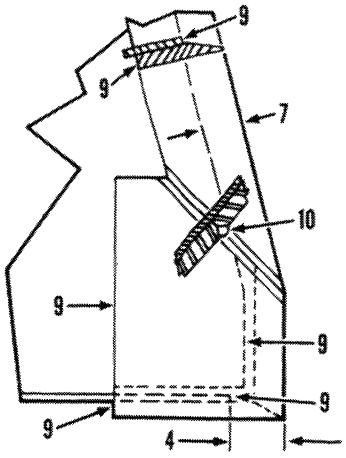
HEAVY DUTY TRENCHING BUCKET



BELLHOLE BUCKET



SHOVEL BUCKET



DITCHING (V) BUCKET

1. 1-7/16" (36.5 mm)
2. 1-7/8" (47.6 mm)
3. 2-3/8" (60.3 mm)
4. 1-1/2" (38.1 mm)
5. 1-3/16" (30.2 mm)
6. 1-7/16" (36.5 mm)
7. 1-5/16" (33.3 mm)
8. 3/16" (4.8 mm) FILLET
9. 1/4" (6.4 mm) FILLET
10. 5/16" (8 mm) TWO PASS WELD

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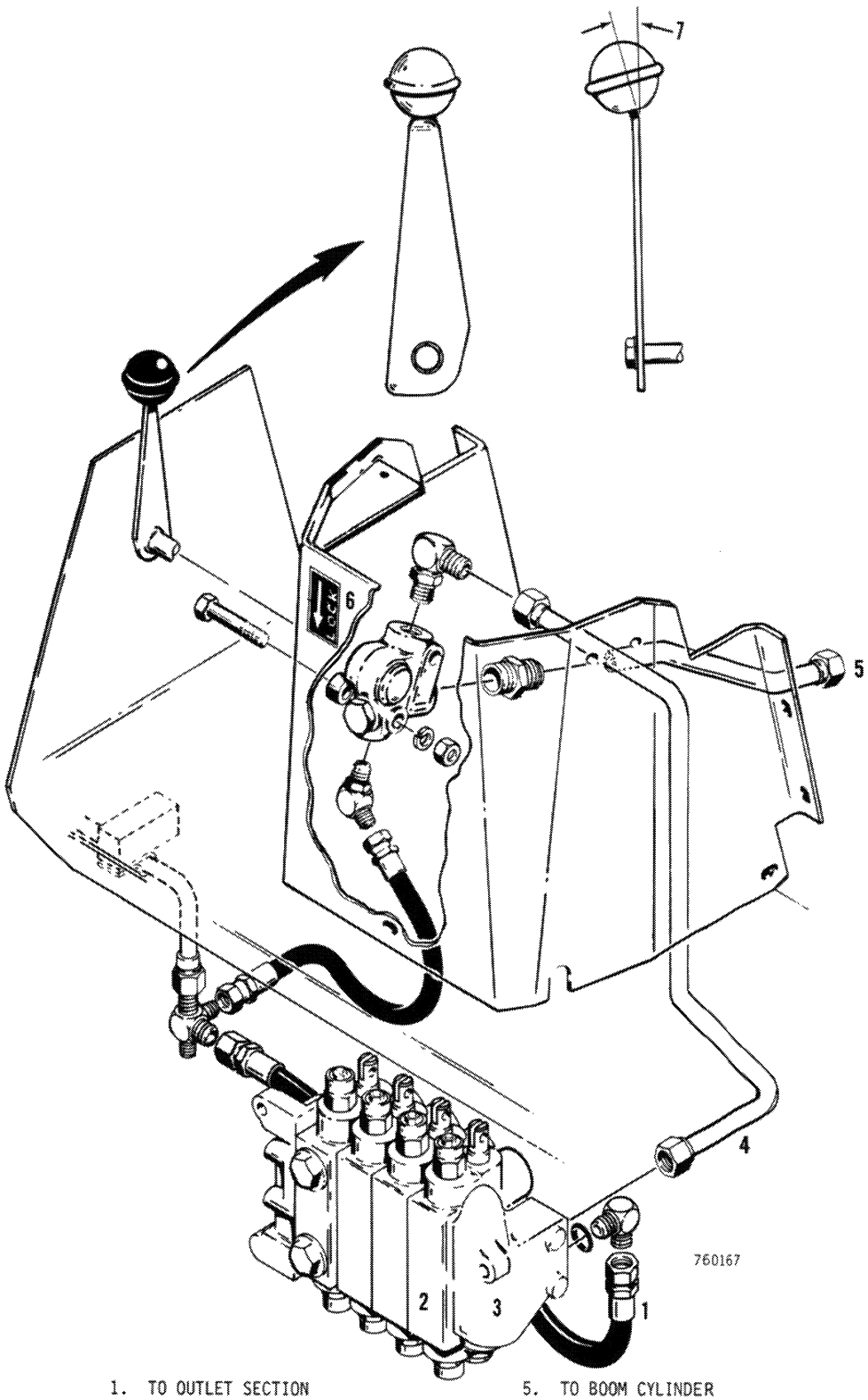
Figure 8 - Cutting Edge Weld Specifications



1. TO OUTLET SECTION
2. BOOM SECTION
3. OUTLET SECTION
4. TO LOWER PORT, BOOM SECTION
5. TO BOOM CYLINDER
6. DECAL LOCATION
7. BEND CONTROL LEVER (NEW) 20° IMMEDIATELY UNDER KNOB

Figure 18 - Boom Lock Installation

6. If the backhoe is equipped with a hydraulically extendable dipper:

   a. Attach a chain hoist to the dipper arm. Them move control lever in both directions to equalize circuit pressure.

   b. Disconnect hoses to the extension cylinder at the tubes secured to the boom and close openings with clean caplugs.

   c. Place a block of wood under the dipper cylinder to provide support when the rod pin is removed. Then remove a snap ring and washer from dipper cylinder rod pivot pin and remove pivot pin.

   d. Remove a snap ring and washer from the dipper arm pivot pin and remove pivot pin.

   e. Lift the dipper away from the boom and lower the dipper arm to the floor.

Boom Removal

1. Remove the bucket and dipper arm as previously instructed.

2. Attach a chain hoist to the dipper cylinder. Then remove the dipper cylinder pivot pin retaining bolt and pivot pin.

3. Remove the hose clamp inside the boom. Then remove the hose guard from the bottom of the boom if equipped with an extendable dipper arm.

   NOTE: As the remaining hoses are disconnected, number each hose and its connecting point to assure proper assembly.

4. Carefully move the dipper cylinder away from the cylinder mounting bracket, and disconnect hoses from cylinder. Close openings with clean caplugs.

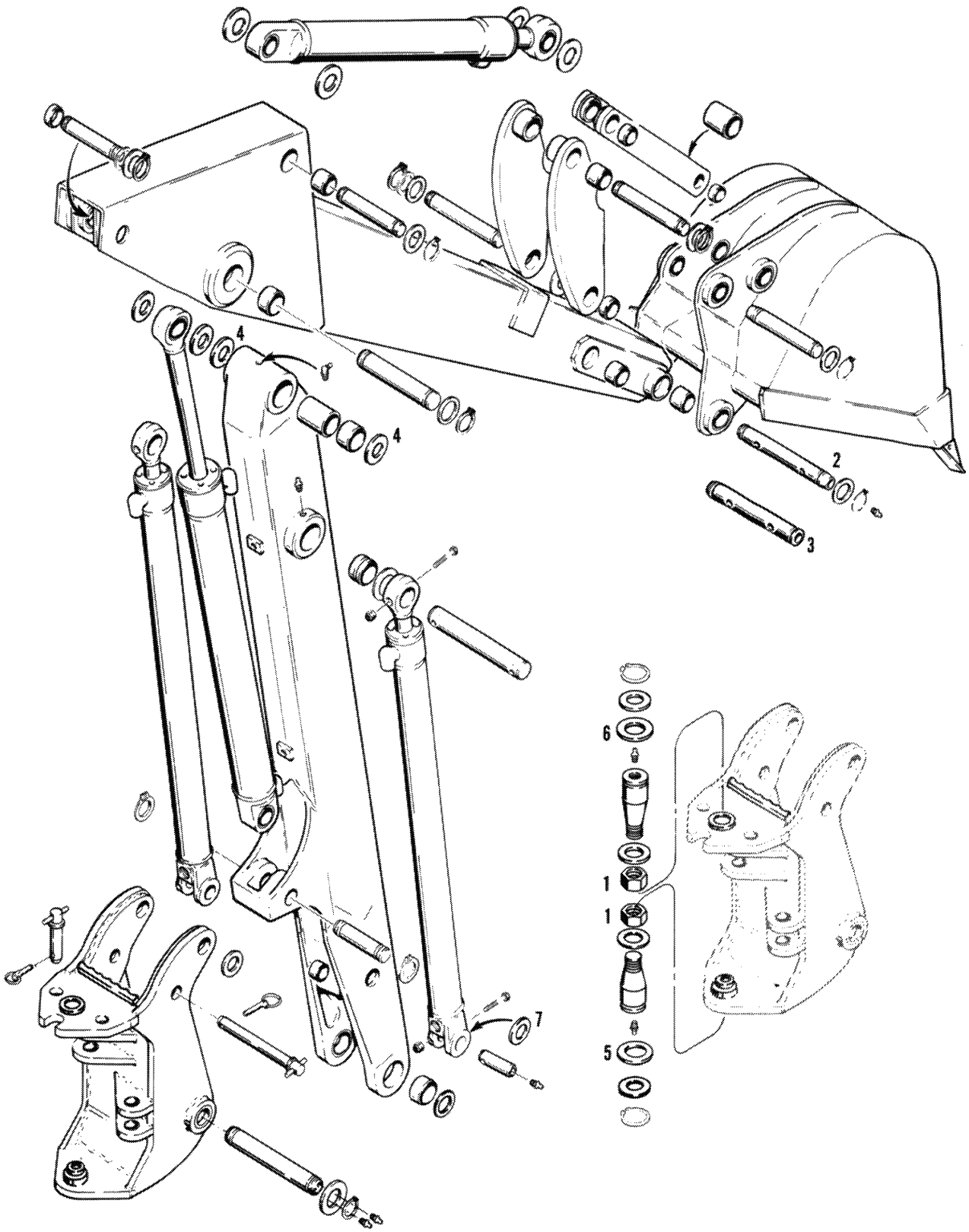
5. Provide suitable support for the boom and move the boom control lever in both directions to equalize circuit pressure.

6. Disconnect hoses from each boom cylinder as required and close openings with clean caplugs. Then remove the pivot pin retaining bolts from each cylinder and rod pivot.

7. Attach a chain hoist to a boom cylinder. Remove the cylinder pivot pin. Then drive the rod eye pivot pin into the rod eye to free rod from pin and lower cylinder to the floor. Repeat for the remaining boom cylinder.

8. Attach a chain hoist to the boom and disconnect the remaining hoses from the boom.

9. Remove snap ring, washer and grease fitting from one end of boom pivot pin. Use a brass driver and drive pin out of boom and swing tower. Then lower boom to floor.



1. TORQUE TO 1085-1355 N m (800-1000 FT-LBS)
2. BUCKET PIN - ALL EXCEPT 305 mm (12") BUCKET
3. 305 mm (12") BUCKET PIN
4. USE AS REQUIRED TO LIMIT DIPPER TO BOOM MOVEMENT TO 1.78 mm (.070") OR LESS
5. BEARING WASHER - INSTALL BETWEEN SWING TOWER AND SLIDING FRAME
6. USE AS REQUIRED BETWEEN SWING TOWER AND SLIDING FRAME TO LIMIT TOWER VERTICAL MOVEMENT TO 2 mm (.080") OR LESS
7. USE BETWEEN BOOM CYLINDER AND OUTSIDE OF SWING TOWER AS REQUIRED; BOTH CYLINDERS

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Figure 14 - Exploded View of Backhoe