1500/1800/2000 Cruz Crane

Service Manual

S406169M3

CASE

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Look for this symbol which points out important safety precautions. It means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!



Never smoke while refuelling, servicing the fuel system, or working with batteries.



Always use a non-flammable solvent for cleaning component parts. Avoid gasoline or other flammable substances.



Storage batteries give off highly explosive hydrogen gas when being charged. Keep them away from sparks and open flames.



If battery electrolyte contacts skin or clothing, flush immediately and thoroughly with water.



Whenever servicing the machine, always tag mark the ignition switch to alert other operators and prevent accidental start-ups.



Keep hands, feet and loose clothing away from fan belts, fans, pulleys and drive shafts when engine is running.



Keep working area as clean as possible at all times. To prevent slips and falls, wipe up oil spills immediately.



When working on the hydraulic system or air system, be sure to relieve all pressure in the lines by working the controls back and forth several times before removing component.



Always deflate tires before removing them from the machine for servicing. Tires can come apart with an explosive force if not handled properly.



When servicing the cooling system, be sure to relieve pressure in the system by carefully turning the radiator cap to its first position before removing it completely.



When removing major components such as the boom or turntable, ensure that they are properly slung and adequately secured.

Never remove any part of the swing mechanism before adequately blocking the turntable to prevent it from swinging.

THINK SAFETY FIRST!

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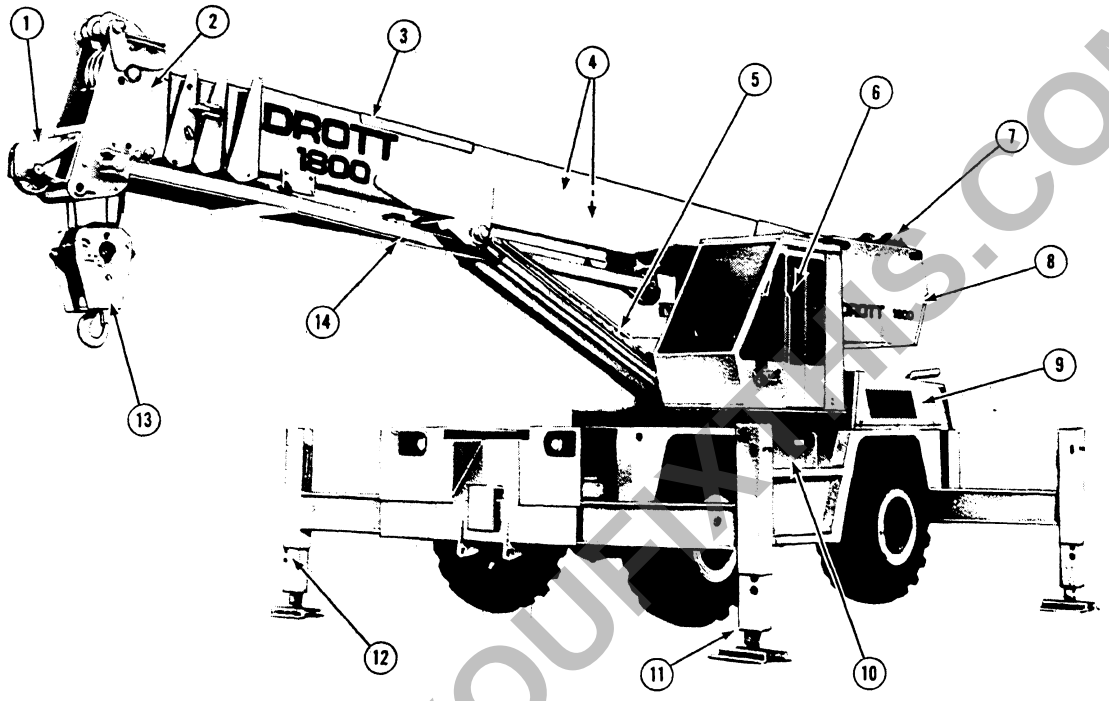


Figure 1. Nomenclature

NOMENCLATURE

1. AUXILIARY HEAD
2. BOOM HEAD
3. BOOM (Retracted)
4. CROWD CYLINDERS LOCATION
5. HOIST CYLINDERS
6. OPERATOR'S CAB
7. WINCH LOCATION
8. COUNTERWEIGHT LOCATION
9. ENGINE COMPARTMENT
10. HYDRAULIC RESERVOIR LOCATION (Fuel Tank on Opposite Side)
11. OUTRIGGER
12. OUTRIGGER PIN
13. HOOK BLOCK
14. A-FRAME JIB (Stowed Position)

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COMPONENT CAPACITIES

Item	Lubricants/Fluid	Capacity
Engine Crankcase	See Engine Manufacturer's Manual	
Engine Cooling System	½ ethylene glycol base anti-freeze, ½ water	8½ gallons - (32 litres)
Fuel Tank	Diesel Fuel	50 gallons - (189 litres)
Transmission Torque Converter	DROTT DHF or Type "A" Trans. Fluid	8½ gallons - (32 litres)
Differentials	EP 80-90 gearlube	4½ gallons - (17 litres)
Planetary Hub	EP 80-90 gearlube	1 gallon ea. - (3.8 litres)
Master Brake Cylinder	Type "A" Brake Fluid - must meet or exceed SAE spec J-1703E	Approx. 1 pint (.47 litres)
Accelerator Master Cylinder		
Swing Gearbox	SAE 30W oil	11 pints - (6.5 litres)
Turntable Open Gear	Spray-on open gear lubricant such as Mobiltac E, Texaco Crater Compound or functional equivalent	Apply liberal amount - Rotate turntable so pinion helps spread lube
Complete Hydraulic System	DROTT DHF Fluid or alternate (See page 7)	95 gallons - (360 litres)
Hydraulic Reservoir		70 gallons - (265 litres)
Boom Sections	STP or functional equivalent	
Gearmatic Model 23 Winch Final Drive Assembly	SAE 90 Gearlube	3½ pints - (1.7 litres)
Braden Model PD 10-75 Winch	SAE 90 Gearlube	5½ pints (2.5 litres)

TIRE PRESSURES

Tire Size	Roading the Crane	Driving Over Rough Terrain	Working on Rubber (Maximum Pressure)
16:00 x 24 16 ply	55 psi (380 kPa)	65 psi (450 kPa)	80 psi (550 kPa)
20.5 x 25 20 ply	55 psi (380 kPa)	65 psi (450 kPa)	80 psi (550 kPa)

NOTE: For overall use of the Crane, roading pressure is recommended. If pressures are increased for other working conditions, they must be reduced to roading pressure prior to roading the Crane.

HYDRAULIC SYSTEM OPERATING PRESSURES

VALVE/CIRCUIT	PRESSURE SETTING
Main Reliefs	2500 psi (17 200 kPa)
Steering System Relief	2000 psi (13 800 kPa)
Swing Port Reliefs	2050 psi (14 100 kPa)
Swing Cushion Relief	1900 psi (13 100 kPa)
Hoist (thru Main Relief)	2500 psi (17 200 kPa)
Winch (thru Main Relief)	2500 psi (17 200 kPa)

VALVE/CIRCUIT	PRESSURE SETTING
Outriggers (thru Main Relief)	2500 psi (17 200 kPa)
Crowd (thru Main Relief)	2500 psi (17 200 kPa)
Hoist Counterbalance	400 psi (2800 kPa)
Crowd Counterbalance	400 psi (2800 kPa)
Braden Winch Counterbalance	250 psi (1700 kPa)
Braden Winch Brake	180 psi (1200 kPa)

NOTE: Counterbalance Valve Settings (cracking pressures) are listed for reference purposes only. Do NOT adjust these valves. For adjustment procedures: Main Relief, see page 134; Port Reliefs, see page 148; Steering Relief, see page 142; Swing Cushion, see page 147.

ENGINE CONVERTER STALL CHART

Engine	Low Idle	High Idle	Governed RPM	Stall RPM
Case 504 BD	725-775	2330-2380	2200	2000
DD 4-71 'N'	600	2450-2475	2400	2000

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PREVENTIVE MAINTENANCE SCHEDULE

DAILY OR EVERY 10 HOURS

Hydraulic Reservoir	Check fluid level and fill
Outriggers	Clean dirt from channels
Tires	Check for proper inflation and inflate
Fuel Tank	Fill at end of shift to prevent condensation
Engine	Check oil and coolant
Operator's Cab	Clean
Air Reservoir	Drain moisture and oil buildup
Turntable Open Gear	Lubricate with spray-on gear lube

WEEKLY OR EVERY 50 HOURS

Planetary Wheel Hubs	Check oil level and fill
Batteries	Check electrolyte level and fill
Differentials	Check oil level and fill
Fuel Tank	Clean breather
Transmission, Torque Converter	Check fluid level and fill
Engine Air Cleaner	Remove dust from collector
Radiator	Check radiator fins for obstructions, coolant specific gravity
Swing Gearbox	Check oil level and fill
Accelerator and Brake Master Cylinder	Check fluid level and fill
General Machine Lubrication	Use Lithium Base EP No. 2 Bearing grease or functional equivalent

EVERY 2 WEEKS OR EVERY 100 HOURS

Engine Air Cleaner	Remove and clean or replace
Air Compressor Strainer	Remove and clean or replace

MONTHLY OR EVERY 250 HOURS

Turntable Capscrews	Retorque
Transmission/Torque Converter	Replace Filter
Swing Brake	Adjust
Service Brake Control Valve	Lubricate lever roller and roller pin with light engine oil

EVERY 2 MONTHS or 500 HOURS

In-Line Hydraulic Filters	Replace paper elements, clean screen-type elements
Engine Air Cleaner	Replace element
Hydraulic Reservoir Breather	Replace element
Air Compressor Filter	Replace element
Transmission/Torque Converter	Drain and refill
BRADEN PD10-75 Winches	Drain, flush with kerosene, and refill after first 2 months. Drain and refill every 6 months thereafter.
Center Swivel Base	Lubricate

SEMIANNUALLY OR EVERY 1500 HOURS

Planetary Wheel Hubs	Drain and refill, clean breather
Battery	Clean connections
Hydraulic Reservoir	Drain and refill; clean breather
Hydraulic Reservoir Screen Filter	Clean
Differentials	Drain and refill, clean breathers
Steering Knuckles	Disassemble, clean and repack
Swing Gearbox	Drain and refill, clean breather

ANNUALLY

GEARMATIC Winch Final Drive Assembly	Drain, inspect and refill
Air Compressor	Disassemble, clean and inspect cylinder head and components

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SECTION 2
THE MECHANICAL SYSTEM

DESCRIPTION, MAINTENANCE AND TROUBLESHOOTING

INTRODUCTION

The Mechanical System includes the complete power train, the turntable bearing and swing mechanism, and those components of the lower and upper structures which are not integral parts of the air, electrical or hydraulic systems. Some of these components will be covered again in later sections, and will be only briefly discussed here.

Components Listing:

1. **Engine and Related Items**
2. **Torque Converter, Transmission and Shifting Linkage**
3. **Axles and Oscillation Lockout**
4. **The Turntable Swing**
5. **Boom Group**

1. Engine and Related Items

ENGINE MAINTENANCE AND SERVICE

Engine maintenance is covered in the separate engine manual which accompanies each machine. Refer to the engine manual for specifications, maintenance tune-ups and governor adjustments.

For major servicing and overhaul, contact your nearest engine distributor. The Case engine is serviced through DROTT Distributors. The GMC engine is serviced through Detroit Diesel Distributors.

ENGINE COOLING SYSTEM

To ensure correct engine operating temperatures, the entire cooling system should be inspected regularly and serviced at the prescribed intervals.

When shipped from the factory, the cooling system on the CRUZ-CRANE is filled with a permanent type antifreeze solution of 1/2 water and 1/2 ethylene glycol base. Any high boiling point type antifreeze marketed today will work equally well. However, sealant type antifreeze should be avoided.

NOTE

Antifreeze with sealer additives is not recommended for use with the Detriot Diesel engine, due to plugging problems which can develop throughout the cooling system.

Corrosion Inhibitors

A non-chromate type inhibitor is recommended for use with either water or the ethylene glycol base solution to retard rust and scale buildup within the cooling system. Borates, nitrates and nitrites are acceptable corrosion inhibitors. Do not use chromates or soluble oil as corrosion inhibitors.

All corrosion inhibitors, no matter what type being used, dissipate under normal operating conditions, and therefore should be replenished at approximately 500 hour intervals.

Scheduled Maintenance

Check coolant level in radiator daily. The coolant level should be within 2" of the top of the filler neck.

WARNING 

When checking coolant level, remove cap slowly to relieve pressure within the system.

If coolant level is consistently low, check for leaks in the radiator or connecting hoses. If no leaks are found, check for the presence of air in the system, possibly caused by a leaky head gasket.

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NOTE

To speed drying process, it is possible to insert damp element into housing and run engine for about ten minutes (away from dust).

To test the element for weak spots, hold a lighted bulb in center of element and check for areas where light shows through with more intensity than rest of element. If spots are found in the element, replace it.

Engine Performance Check

Engine performance will affect the performance of the entire machine. Proper throttle linkage adjustment is essential to obtain the recommended range of engine rpm as shown on page 8.

Maximum governed rpm is determined by running engine at full throttle under minimum load conditions (all controls in neutral).

NOTE

The engine should be warmed to operating temperatures before any performance checks are made.

To check engine rpm, use a strob-tachometer aimed at a chalk mark on the engine crankshaft pulley. Make sure that the RED wire of the strob-tachometer is connected to the POSITIVE (+) or "hot" terminal from the battery, and the BLACK wire to the NEGATIVE (-) or "ground" terminal of the battery. Aim the timing light at chalk mark on engine crankshaft pulley, then adjust strob-tachometer until timing light "stops" chalk mark. Read tachometer.

NOTE

If throttle linkage is suspected of malfunctioning, disconnect it and work engine governor lever by hand. Check engine speeds obtained in this way against speeds obtained with throttle linkage connected.

Throttle Linkage

The throttle linkage consists basically of a master cylinder hydraulically linked to a slave cylinder. The accelerator master cylinder is located below the operators cab. A hydraulic line extends from the master cylinder down through the Center Swivel to a slave cylinder mounted on the engine. The slave cylinder in turn is connected to the governor lever which controls the engine speed.

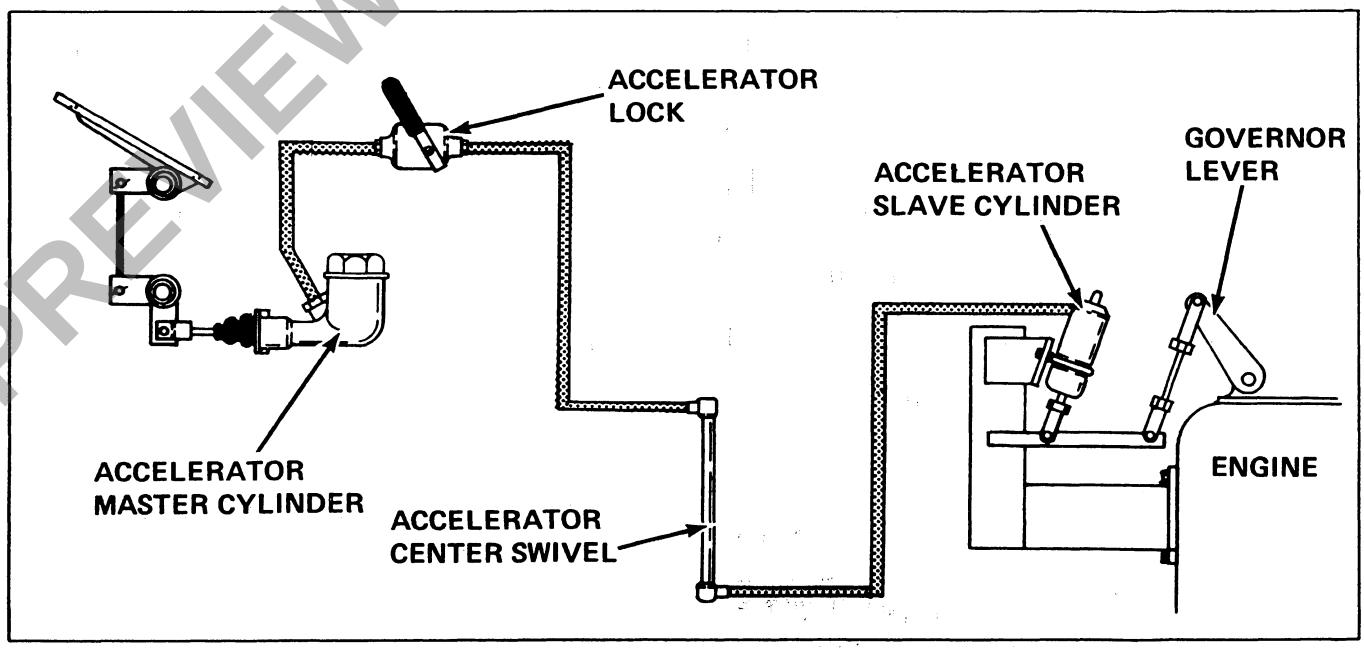


Figure 7. Accelerator Hydraulic Linkage

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Keep a sharp look-out for the two major enemies of wire rope: Corrugated Sheaves and Pinching Sheave Grooves. Use the following maintenance points as guides for inspecting sheaves and sheave grooves.

1. Perodically inspect your sheaves and recondition them. Make sure the sheave runs true and does not wobble on its bearing; keep the groove free from roughness or burrs of any kind; make sure the groove is larger than the wire rope.

2. When buying new sheaves, see that they are made of material that will stand up under the rope pressures encountered and make sure that the grooves are of proper size for the rope.

3. Remember, the longer you delay reconditioning your sheaves, the more you reduce the life of your rope.

In a sheave, groove corrugations are caused by the wire rope, yet the rope will not continue to engage these corrugations (as for example, a chain engages a sprocket). A slight twist of the rope, or a very small change of lay will prevent wire rope from tracking the corrugations. Corrugations in a sheave are an indication either that the sheave is too small or that the material in the sheave is soft.

NOTE

CONTRARY TO POPULAR OPINION, A SHEAVE GROOVE USUALLY WEARS SMALLER, NOT LARGER

Winches and Wire Rope

The CRUZ-CRANE may be equipped with either Gearmatic or Braden Winches, or both. These winches are thoroughly covered in the manuals published by the Winch Manufacturer. Refer to these manuals when maintaining or repairing the winch or winches. Periodically check the winch moorings to ensure they are properly fastened.

Care of Wire Rope

Inspect the full length of the cable weekly for frays and kinks. Keep a written record of cable inspection. Replace the cable whenever the presence of kinks and frays indicate that it is necessary.

Wire ropes, unless otherwise ordered, usually are internally and externally lubricated during fabrication with a material that retains its effectiveness for long periods under normal service conditions. However, under some operating conditions, it is advisable to replenish the original lubrication with periodic applications of a good lubricant for maximum protection to the wire rope and sheaves and to get the most efficient performance. (Refer to Operator's Manual for details on lubrication and inspection of wire rope).

BREAKING IN NEW WIRE ROPE

New cable comes packed in two ways: on a reel and coiled. If the new cable is on a reel, mount the reel on a horizontal shaft and spool the required amount off the rotating reel. If the cable is coiled, uncoil it by rolling the coil along the ground like a hoop.

CAUTION

Any other method of unreaving cable will cause kinking that may ruin the cable. Do not stretch the new cable where it can be run over by heavy vehicles.

The many moving parts of a wire rope must work together. Experience has proven that a short break-in period under light load and slow speeds adjusts the moving parts to each other. This break-in period results in better spooling, more efficient performance and longer wire rope life.

1. Be sure equipment (winches, spools, rollers, sheaves, etc.) are in good repair.

2. Unwind the wire rope from the reel or coil to avoid twisting or kinking.

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3. Torque Converter

Removal

1. Relieve line pressure, then remove and cap or plug all hydraulic lines to prevent dirt from entering the system.

2. Disconnect drive shaft to transmission.

3. Support torque converter with chain fall or hoist and proper sling, then remove converter-to-engine mounting bolts and work converter free. Transfer to clean working area for disassembly.

CAUTION

Cleanliness is an absolute must. Before attempting any repairs, clean the exterior of the unit thoroughly to prevent possibility of dirt and foreign matter entering the system.

Disassembly (Refer to figure 34)

1. Remove hydraulic pumps from rear of converter.

2. Place converter on blocking with impeller end up.

Remove Impeller and Turbine Assembly:

3. Remove the 24 bolts which secure impeller cover to impeller (57). Use two bolts in threaded puller holes (180° apart in impeller cover) to separate impeller cover from impeller.

4. If impeller cover sleeve (76) is to be replaced, pull it off using a suitable puller.

5. If necessary to replace impeller cover bearing (73), remove retainer ring (72) and use small bearing puller.

6. Remove outer turbine hub retainer ring (68).

7. Remove turbine and hub assembly from turbine shaft (45). Remove turbine shaft snap ring (65).

8. Remove bolts and flat washers (70,69) which connect turbine to the turbine hub.

9. Remove reaction member snap ring (64).

10. Remove reaction member (63) from stator support (46). Use threaded holes provided if reaction member is too tight to be removed by hand.

11. Loosen the three oil baffle mounting bolts (19) part way, then tap lightly on each bolt to loosen oil baffle (54) within converter housing. Pull oil baffle and impeller from housing as an assembly.

12. Remove impeller hub gear retainer ring (48). Then remove impeller hub gear (49) and oil baffle (54) from impeller (57).

13. Remove oil baffle, oil seal (52) and "o" ring (53).

NOTE

Oil seal should be removed only if it is to be replaced.

14. Remove the eight capscrews (55) and flat washers (56) which fasten impeller to impeller hub. Separate the impeller hub from impeller and remove hub "o" ring (58).

15. Remove hub bearing retainer ring (61) and press bearing from hub.

Remove Stator Assembly and Pump Drives:

16. Remove oil pump drive gear retaining ring (1) and remove the drive gears from the pump shafts.

NOTE

There are three pump drive gears. All disassemble the same way.

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4. Replace all wear rings, "o" rings, teflon rings and seals at time of overhaul. This includes piston packings, cylinder head packings, rod wiper and seals.

Reassembly

1. Install new rings, wiper and seals in cylinder head. Lubricate rod and cylinder head, then slide head assembly onto rod.

2. Slide spacer onto the rod.

3. Install wear rings and seals on the piston. Install "o" ring and back-up washers on rod assembly (Crowd Cylinder only). Lubricate piston I.D. and slide piston into place on end of rod.

NOTE

Use care when installing teflon rings. The rings should be warmed before installation to aid in assembly.

4. Secure piston with self-locking nut (or nut and setscrew).

5. Lubricate Cylinder bore and piston O.D., then carefully insert piston and rod assembly in cylinder bore. Take care that packings and seals are not damaged during assembly.

6. Thread head gland into cylinder bore and tighten securely.

7. To test piston sealing rings, continue to pump oil into rod end after cylinder is bottomed out. Check for leakage at base end port. There should be no fluid flow from open port.

8. Plug cylinder ports to prevent entry of dirt during installation.

Installation

Installation is basically the reverse of removal. Make sure hoses are properly connected and counterbalance valves installed. After installation cycle cylinders several times. Check for leakage and proper operation before putting machine into use. The Cylinders must be bled of air before placing back into operation.

Bleeding Procedure for Hoist Cylinders: the hoist cylinder rods are hollow and will fill up with fluid during operation. However, air trapped in the rods must be bled to prevent the hoist cylinders from jerking or "bucking" when hoisting down. Bleed cylinder rods BEFORE PLACING THEM BACK ON THE MACHINE.

Use the following procedure:

1. Connect hydraulic lines to cylinder ports. DO NOT ATTACH CYLINDER TO BOOM.

2. Support the cylinder and rod so they will not be damaged during bleeding process.

3. Operate "hoist up" until rod extends completely. When rod is fully extended, open pipe plug in rod end casting (see figure 154) and allow all air to escape. Continue to engage the "hoist up" control until bleeding is completed. When oil starts to flow, close the pipe plug. Repeat the procedure on the opposite cylinder.

When bleeding procedure is completed, connect the cylinders to the boom.

Bleeding Crowd Cylinders: To bleed the Crowd Cylinders, simply lower the boom below the horizontal mark, then cycle the boom in and out several times. Air will exhaust back to tank.

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damage packings while inserting through cylinder threads.

6. Thread gland assembly into bore threads and tighten securely until hole for setscrew lines up. Insert setscrew and tighten securely.

7. Remove counterbalance valve cartridge and use hand pump to force piston to bottom of case bore. Continue to force fluid into rod end once cylinder is bottomed out to see if packing is holding properly. If cylinder checks out O.K., reinstall valve cartridge, plug rod end port and replace cylinder on machine.

12. Outrigger Solenoid Valves

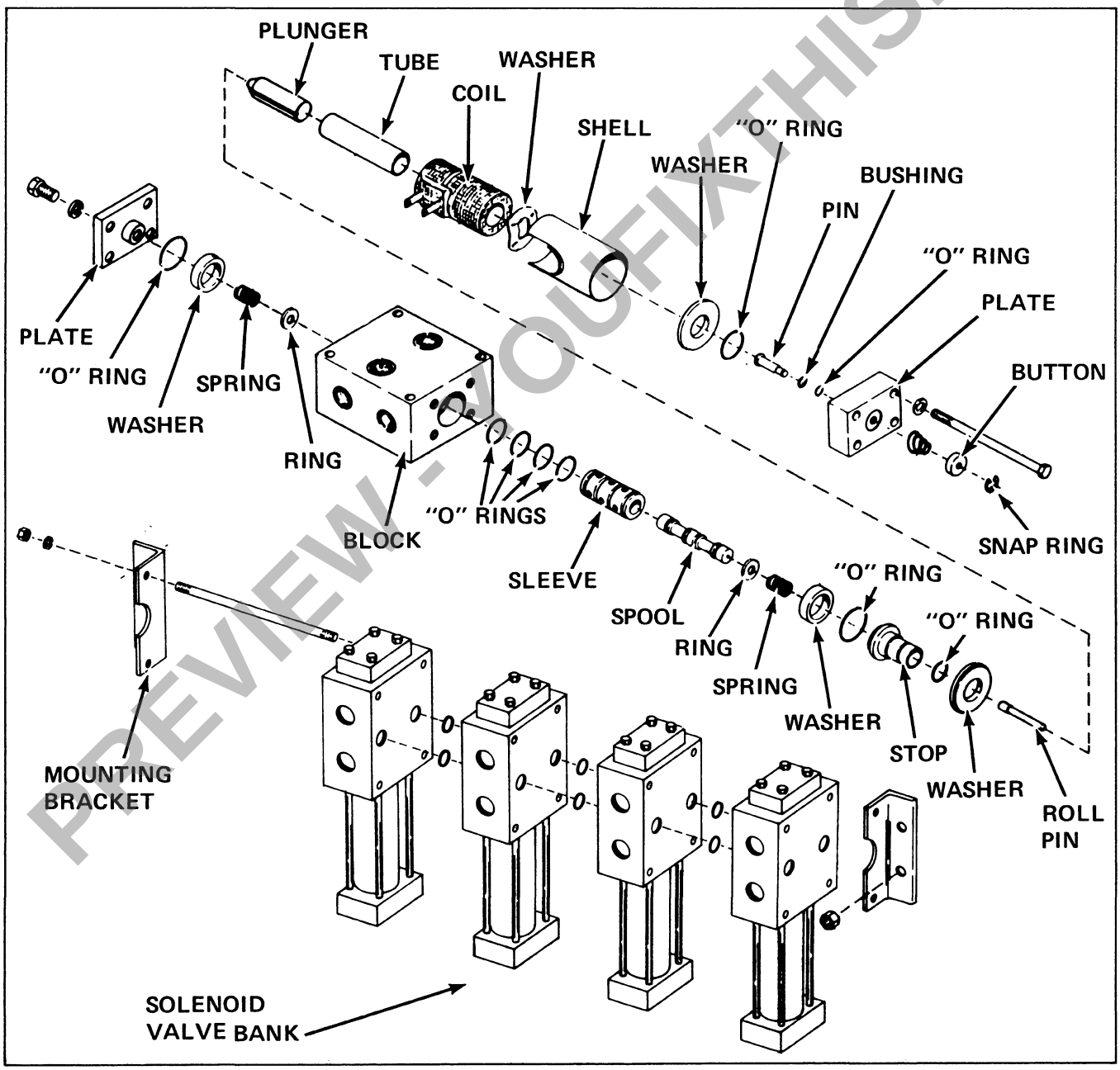


Figure 158. Outrigger Control Valves

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