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THIS SAFETY ALERT SYMBOL INDICATES IMPORTANT SAFETY MESSAGES IN THIS MANUAL. WHEN YOU SEE THIS SYMBOL, CAREFULLY READ THE MESSAGE THAT FOLLOWS AND BE ALERT TO THE POSSIBILITY OF PERSONAL INJURY OR DEATH.

CAUTION: To prevent eye injuries, wear safety glasses when servicing this machine.

CAUTION: Do not service machine with engine running. If necessary to make checks with engine running, have one man stay at the controls while the other makes the check.

CAUTION: When servicing the machine, tag mark ignition switch to alert other operators and prevent accidental start-ups.

CAUTION: Before starting engine make sure all operating controls are in NEUTRAL.

CAUTION: Never leave engine running when machine is unattended.

CAUTION: Keep hands, feet and loose clothing away from moving parts when machine is operating.

CAUTION: To avoid personal injury, keep hands clear of turntable ring gear while turntable is being rotated.

CAUTION: Never smoke while refueling, servicing the fuel system or working with batteries.

CAUTION: To prevent injury from burns always use a non-flammable solvent for cleaning component parts. DO NOT use gasoline or other flammable substances.

CAUTION: Keep fire extinguishers and first aid kit handy and know how to use them.

CAUTION: POISON/DANGER: BATTERY ACID CAUSES SEVERE BURNS. BATTERIES CONTAIN SULFURIC ACID. Avoid contact with skin, eyes, or clothing.
Anti-dote: EXTERNAL: flush with water. INTERNAL: drink large quantities of water or milk. Follow with Milk of Magnesia, beaten egg or vegetable oil. Call physician immediately. EYES: Flush with water for 15 minutes and get prompt medical attention. KEEP OUT OF REACH OF CHILDREN.

CAUTION: Batteries produce explosive gases. Keep flames, sparks and cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries.

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LUBRICANTS

It is not the policy of DROTT Manufacturing to publish lists of approved lubricants or to guarantee lubricant performance. The responsibility for the quality of any lubricant rests solely with the Distributor or Manufacturer.

In various paragraphs of this manual, you will find the statement "Use (lubricant brand name) or functional equivalent". This statement does not constitute an unconditional guarantee of the performance of the brand of oil mentioned; it is intended only as a guide to the type of lubricant recommended for a given application.

HYDRAULIC SYSTEM OPERATING PRESSURES

VALVE/CIRCUIT	PRESSURE SETTING psi	kPa
Main Reliefs	2,500	17,200
Steering	2,000	13,790
Swing Port Relief	2,050	14,134
Crowd	2,050	14,134
Winch	2,050	14,134

VALVE/CIRCUIT	PRESSURE SETTING psi	kPa
Swing Cushion	1,900	13,100
Hoist Counterbalance	Not Adjustable	
Crowd Counterbalance	Not Adjustable	
Winch Counterbalance	250	1,723
Winch Brake	180	1,241
Free Fall Flow Divider	550	3,792

ENGINE SPECIFICATIONS

ENGINE MODEL	LOW RPM	HIGH RPM	GOV RPM	H.P.	*STALL RPM
Detroit Diesel 6V53	600	2545	2400	180	2000
Case 504BD7	600	2420	2200	180	2000

*Engine-Converter Stall

TIRE PRESSURES

The correct tire inflation pressures are:

Working Condition	Tire Size	Ply	Pressure psi	kPa
Roading	23:50 X 25	20	50	345
	26:50 X 25	20	45	310
Driving over Rough Terrain	23:50 X 25	20	55	380
	26:50 X 25	20	50	345
Maximum Pressure Working on Rubber	23:50 X 25	20	70	485
	26:50 X 25	20	55	380

The following definitions apply to the above chart:

1. ROADING THE CRUZ-CRANE means moving it from job to job or around the job at fast speeds.

IMPORTANT: When roading the Cruz-Crane, stop it for one-half hour and allow the tires to cool off after either:

a. Two hours of travel time or
b. Fifty miles of travel distance.

If the tires are not allowed to cool, premature failure of the tire can happen.

2. DRIVING OVER ROUGH TERRAIN means moving over terrain at low speeds. (Speeds of less than five miles per hour).

3. WORKING ON RUBBER means working the Cruz-Crane from a staticnary or creep position without the outriggers being set.

For overall use of the Cruz-Crane, Drott Manufacturing recommends that tire pressures be maintained for roading the Cruz-Crane. If pressures are increased for other working conditions, they must be reduced to roading pressures prior to roading the Cruz-Crane.

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PREVENTIVE MAINTENANCE SCHEDULE

END OF FIRST DAY OR 10 HOURS

Engine	Refer to Engine Manufacturer's literature
Hydraulic In-Line Filters	Replace paper element and clean screen

END OF 1ST WEEK OR 50 HOURS

Turntable Capscrews	Check for proper torque

DAILY OR EVERY 10 HOURS

Engine Crankcase	Check level and fill
Radiator	Check coolant level and fill
Hydraulic Reservoir	Check fluid level and fill, check for leaks
Outriggers	Clean dirt from channels
Fuel Tank	Fill at end of shift to prevent condensation
Operator's Cab	Clean
Turntable Open Gear	Lubricate
Tires	Check pressures and inflate
Air Reservoir and Air System	Drain at end of each shift, check for leaks
Safety Devices	Check operation
Reeving	Check operation; inspect clamps and connections
Controls	Check operation

WEEKLY OR EVERY 50 HOURS

Engine	Refer to Engine Manufacturer's literature
Planetary Wheel Hubs	Check oil level and fill
Differentials	Check oil level and fill
Batteries	Check electrolyte level and fill
Fuel Tank	Clean breather
Transmission, Torque Converter	Check fluid level and fill. Lubricate center swivel shift linkage
Engine Air Cleaner	Remove dust from collector
Radiator	Check radiator fins for obstructions
Swing Gearbox	Check oil level and fill
Accelerator Master Cylinder	Check fluid level and fill
Lube Fittings	Grease (See Pictorial Listing)
Outriggers and Boom	Lubricate with STP or functional equivalent

EVERY 2 WEEKS OR 100 HOURS

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

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TROUBLESHOOTING GUIDE — ENGINE

PROBLEM	POSSIBLE CAUSE	REMEDY
A. Engine lacks power	1. Clogged air cleaner	1. Remove and clean or replace element, check dust collector
	2. Engine needs tune-up	2. See engine manual
B. Engine overheats	1. Insufficient coolant	1. Check coolant level
	2. Insufficient lubricating oil	2. Add oil, see engine manual
	3. Radiator air passages clogged	3. Clean radiator fins
	4. Loose or broken fan belt	4. Check fan belt. See engine manual for adjustment or replacement
	5. Defective thermostat or water pump	5. Replace, see engine manual
C. Engine does not develop full rpm	1. Low fluid in accelerator master cylinder	1. Check, refill if necessary
	2. Accelerator linkage out of adjustment	2. Adjust linkage to governor
	3. Engine needs tune-up	3. See engine manual
D. Engine responds sluggishly when accelerator pedal is depressed	1. Air in hydraulic linkage	1. Bleed accelerator system
	2. Worn or defective master or slave cylinder	2. Disassemble and repair or replace item found defective
	3. Defective fuel system	3. See engine manual
E. Engine won't start	1. Faulty cranking system	1. See engine manual and Electrical System section of this manual
	2. Faulty fuel system	2. See engine manual
	3. Emergency shut-off pulled (Detroit Diesel)	3. Reset

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2. Torque Converter, Transmission and Shift Linkage

GENERAL DESCRIPTION

The transmission and torque converter function together and share a common hydraulic system. The torque converter is mounted on the rear of the engine, see Figure 25. It serves as a pump drive for the main hydraulic pump and the power steering pump as well as the converter charging pump. The three pump drive gears are arranged in a semi-circle within the converter housing and are meshed with the Impeller Hub Gear, which rotates with the engine flywheel (see Figure 25). Driving torque is transmitted directly from the engine to the pump drives, with no power multiplication. The torque converter is linked to the input shaft of the remote mounted transmission by means of a driveshaft.

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DISASSEMBLY AND REPAIR

Component Listing:

1. **Accelerator Master Cylinder**
2. **Accelerator Slave Cylinder**
3. **Torque Converter**
4. **Transmission**
5. **Torque Convert Regulator Valve**
6. **Differential**
7. **Planetary Drive**
8. **Wheel Brakes**
9. **Steering Linkage**
10. **Backup Alarm**
11. **Swing Brake**
12. **Swing Gearbox**
13. **Turntable Bearing**
14. **Center Swivel**
15. **Boom**
16. **Winches**
17. **Heater**

Cleaning Instructions

NOTE

The following cleaning instructions cover all components prior to removal and disassembly, as well as after disassembly.

COMPLETE ASSEMBLIES

Completely assembled components may be steam cleaned on the outside only, to facilitate initial removal and disassembly, providing all openings and breathers are closed or plugged to prevent possibility of water entering the component.

ROUGH PARTS

Rough parts such as housings, castings, etc., may be cleaned in hot solution tanks with mild alkali solutions, providing these parts do not have ground or polished surfaces. The parts should remain in the tank long enough to be thoroughly cleaned and heated. This will aid the evaporation of rinse water. The parts should be thoroughly rinsed after cleaning to remove all traces of alkali.

RUBBER PARTS

Clean rubber parts by washing in clean denatured alcohol or brake fluid only.

CAUTION: Clean rubber parts by washing in clean denatured alcohol or brake fluid. DO NOT use mineral base cleaning solvents such as acetone or paint thinner on any rubber parts. If a mineral base solvent is used, the rubber will start to deteriorate and continue to deteriorate after the part is put back into service. The continued deterioration of the rubber could cause the part to fail.

FINISHED OR MACHINED PARTS

Parts having ground or polished surfaces such as gears, bearings, shafts and collars, should be cleaned in a non-flammable solvent.

CAUTION: To prevent injury from burns always use a non-flammable solvent for cleaning component parts. DO NOT use gasoline or other flammable substances.

DRYING

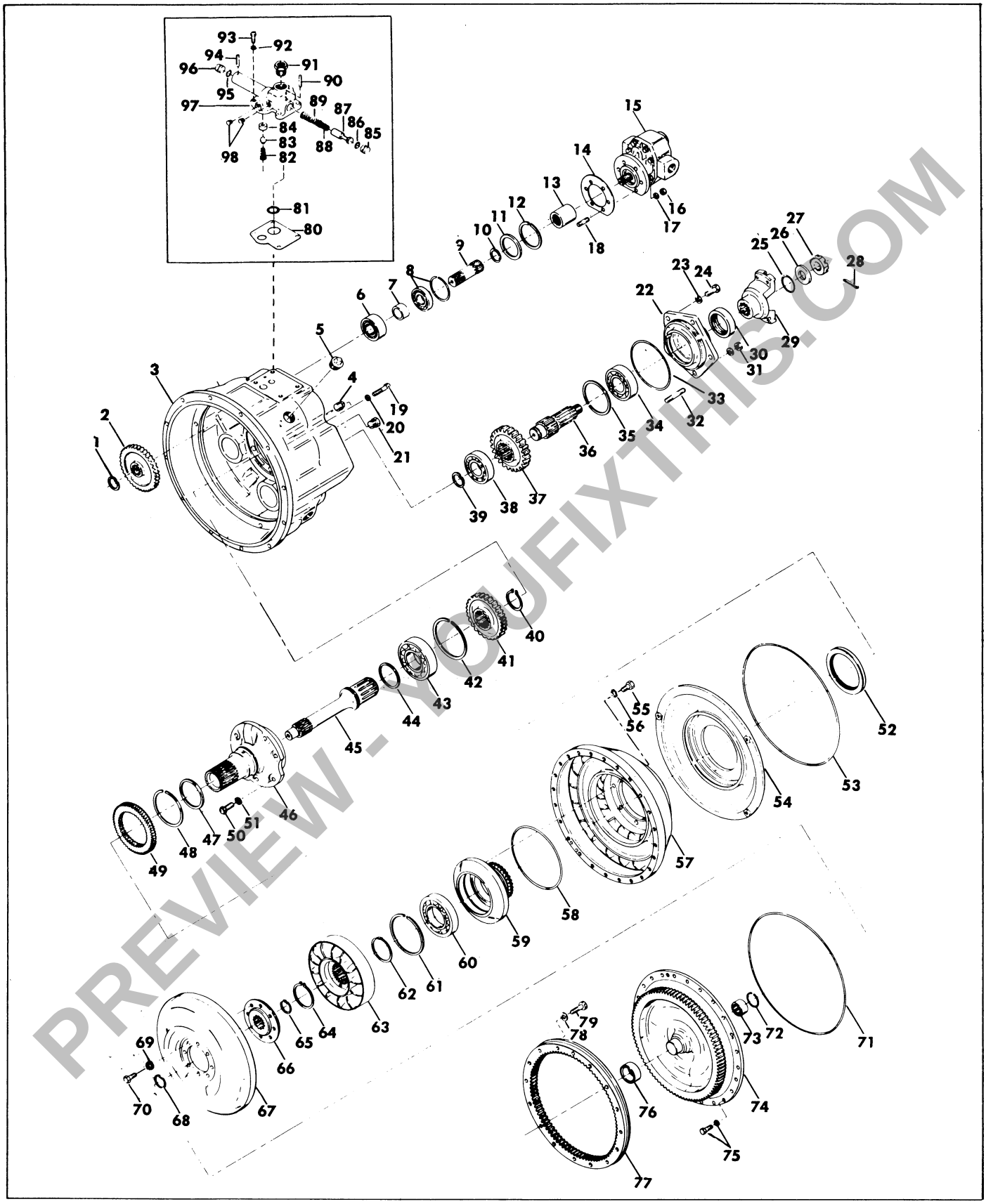
All parts cleaned must be thoroughly dried immediately by using moisture-free compressed air or soft lintless absorbent wiping rags, free of abrasive materials such as metal filings, contaminated oil or lapping compound. Bearings may be dried using compressed air provided air is directed across the bearings to avoid spinning. Do not spin bearings when drying. Bearings may be rotated slowly by hand to speed the drying process.

CORROSION PREVENTION

Parts that have been cleaned, dried, inspected and are to be immediately reassembled should be coated with light oil to prevent corrosion. If these parts are to be stored for any length of time, they should be treated with a good RUST PREVENTIVE and wrapped in special paper or other material to prevent corrosion.

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Figure 63. Torque Converter

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PARTS LISTING FOR FIGURE 63

1. Pump Drive Gear Snap Ring (Qty of 3)
2. Pump Drive Gear (Qty of 3)
3. Converter Housing
4. Pipe Plug (Qty of 4)
5. Pipe Plug
6. Pump Drive Shaft Bearing (Qty of 3)
7. Pump Drive Shaft Spacer (Qty of 3)
8. Pump Drive Shaft Bearing and Snap Ring (Qty of 3)
9. Pump Drive Shaft (Qty of 3)
10. Pump Drive Shaft Snap Ring (Qty of 3)
11. Pump Shaft Washer (Qty of 3)
12. Pump Shaft Snap Ring (Qty of 3)
13. Charging Pump Sleeve
14. Charging Pump Mounting Gasket
15. Converter Charging Pump
16. Pump Mounting Stud Nut
17. Pump Mounting Stud Lockwasher
18. Pump Mounting Stud
19. Oil Baffle Mounting Capscrew
20. Oil Baffle Mounting Lockwasher
21. Pipe Plug
22. Bearing Retainer
23. Bearing Retainer Lockwasher
24. Bearing Retainer Mounting Capscrew
25. Output Shaft "O" Ring
26. Output Shaft Washer
27. Output Shaft Nut
28. Output Shaft Cotter Pin
29. Companion Flange
30. Bearing Retainer Oil Seal
31. Bearing Retainer Stud Nut
32. Bearing Retainer Stud
33. Bearing Retainer "O" Ring
34. Output Shaft Rear Bearing
35. Output Shaft Bearing Snap Ring
36. Output Shaft
37. Output Shaft Gear
38. Output Shaft Front Bearing
39. Bearing Snap Ring
40. Output Gear Snap Ring
41. Turbine Shaft Gear
42. Turbine Shaft Snap Ring
43. Turbine Shaft Bearing
44. Turbine Shaft Piston Ring
45. Turbine Shaft
46. Stator Support and Sleeve Assembly
47. Stator Support Piston Ring
48. Impeller Hub Gear Snap Ring
49. Impeller Hub Gear
50. Stator Support Mounting Capscrew
51. Stator Support Lockwasher
52. Oil Baffle Oil Seal
53. Oil Baffle "O" Ring
54. Oil Baffle
55. Impeller to Hub Mounting Capscrew
56. Impeller to Hub Lockwasher
57. Impeller
58. Impeller Hub "O" Ring
59. Impeller Hub
60. Impeller Hub Bearing
61. Impeller Bearing Snap Ring
62. Reaction Member Spacer
63. Reaction Member
64. Reaction Member Snap Ring
65. Turbine Shaft Snap Ring
66. Turbine Hub
67. Turbine
68. Turbine Shaft Snap Ring
69. Turbine to Hub Washer
70. Turbine to Hub Mounting Capscrew
71. Oil Baffle "O" Ring
72. Impeller Cover Bearing Snap Ring
73. Impeller Cover Bearing
74. Impeller Cover
75. Impeller Cover to Impeller Mounting Capscrew
76. Impeller Cover Sleeve
77. Flywheel Ring Gear
78. Ring Gear Flat Washer
79. Ring Gear to Flywheel Mounting Capscrew
80. Regulator Valve to Housing Gasket
81. Regulator Valve to Housing "O" Ring
82. Safety Valve Spring
83. Safety Valve Plunger
84. Safety Valve Seat
85. Valve Stop
86. Valve Stop "O" Ring
87. Valve Piston
88. Valve Spring - Inner
89. Valve Spring - Outer
90. Valve Stop Roll Pin
91. Adaptor
92. Regulator Valve to Housing Lockwasher
93. Regulator Valve to Housing Screw
94. Valve Stop Roll Pin
95. Valve Stop "O" Ring
96. Valve Stop
97. Regulating Valve Assembly
98. Valve Housing Pipe Plug

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TORQUE IN (LB-FT)
BOLTS, CAPSCREWS, STUDS AND NUTS
(For use with Clark Transmission only)

Grade 5 Identification, 3 Radial Dashes 120° Apart on Head of Bolt



Grade 5

LUBRICATED OR PLATED

Grade 8 Identification, 6 Radial Dashes 60° Apart on Head of Bolt



Grade 8

NOMINAL THREAD SIZE	Grade 5 FINE THREADS	Grade 5 COARSE THREADS	Grade 8 FINE THREADS	Grade 8 COARSE THREADS
3/8	26-29	23-25	37-41	33-36
7/17	41-45	37-41	58-64	52-57
1/2	64-70	57-63	90-99	80-88
9/16	91-100	82-90	128-141	115-127

Conversion Factor: LB-Ft x 1.355818 = Nm

Assemble Forward and 2nd Clutch:

1. Install new clutch piston inner and outer sealing rings.
2. Insert clutch piston in clutch drum. Take care not to damage sealing rings.
3. Install clutch piston return spring, spring retainer and retainer snap ring (items 104 thru 106, Figure 69).
4. Insert one steel disc.
5. Install one bronze disc. Alternate steel and bronze discs until the proper amount of discs are installed. First disc next to the piston is steel, last disc installed in bronze.
6. Install end plate and retainer ring.
7. Install clutch driven gear inner bearing (107).
8. Install clutch driven gear (110) into clutch drum. Align splines on clutch gear with internal teeth of bronze discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all bronze discs.
9. Install driven gear outer bearing (112) and secure with front bearing locating ring (43).
10. Install front bearing (115).

NOTE

The ring snap groove in front bearing must be down.

11. Install front bearing retaining ring (116).
12. Install clutch shaft oil sealing rings (117). Grease rings to facilitate reassembly into front housings.

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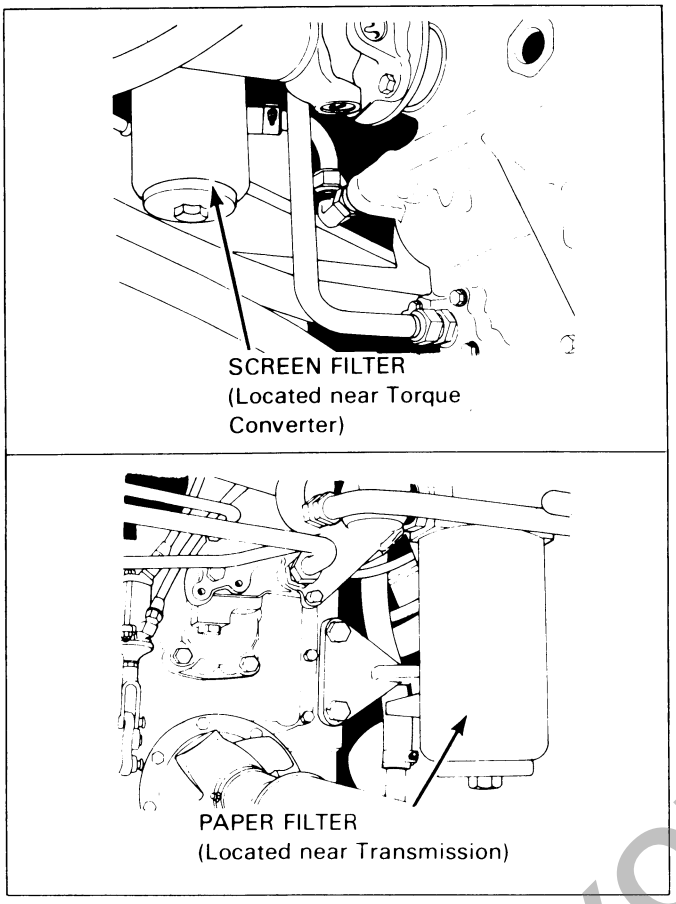


Figure 166. Location of In-line Filters

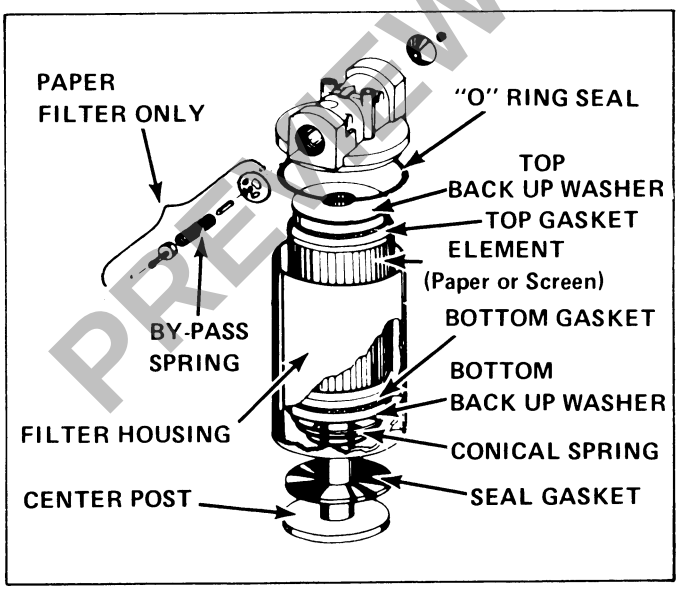


Figure 167. In-line Filter, Exploded View

5. Obtain new Paper filter and reassemble the filters. Make sure center post has a gasket seal. The gasket, bottom of housing and center post flange must be free of oil and grease.

6. Torque center post to a maximum of 15 lb-ft (20 Nm).

NOTE

The Paper Filter has a by-pass valve at the top of the filter, which allows cold oil or oil at excessively high pressure to pass by the filter and prevent damage to the element. Put the correct element in the correct housing.

Hydraulic Fittings:

Consult the "Torque Chart for Hydraulic Swivel Fittings" in the back of this manual whenever connecting a hydraulic fitting. Use pipe sealing compound or Loctite to seal fittings against leakage (do not let ANY compound get into the system).

Loose connections will waste oil, will lower working pressures, will let dirt into the system, and may admit air which will cause noisy and erratic operation. Air bubbles in the hydraulic oil will destroy the finish of pump, motor and valve parts.

HYDRAULIC SYSTEM FLUSHING PROCEDURE

If the hydraulic system becomes contaminated, from either component failure or dirt, the following procedure should be used to clean the hydraulic system.

1. Completely drain the hydraulic system. Remove and clean the reservoir with steam or solvent. Remove the Reservoir outlet strainer and completely clean the strainer and around the reservoir baffle. MAKE SURE THE RESERVOIR IS CLEAN.

2. Change the hydraulic oil filters. FOR FLUSHING ONLY: replace the 100 mesh screen filter with a paper filter.

3. Remove, disassemble, and clean and/or rebuild the hydraulic pump.

4. Remove, disassemble, and clean all motors and cylinders.

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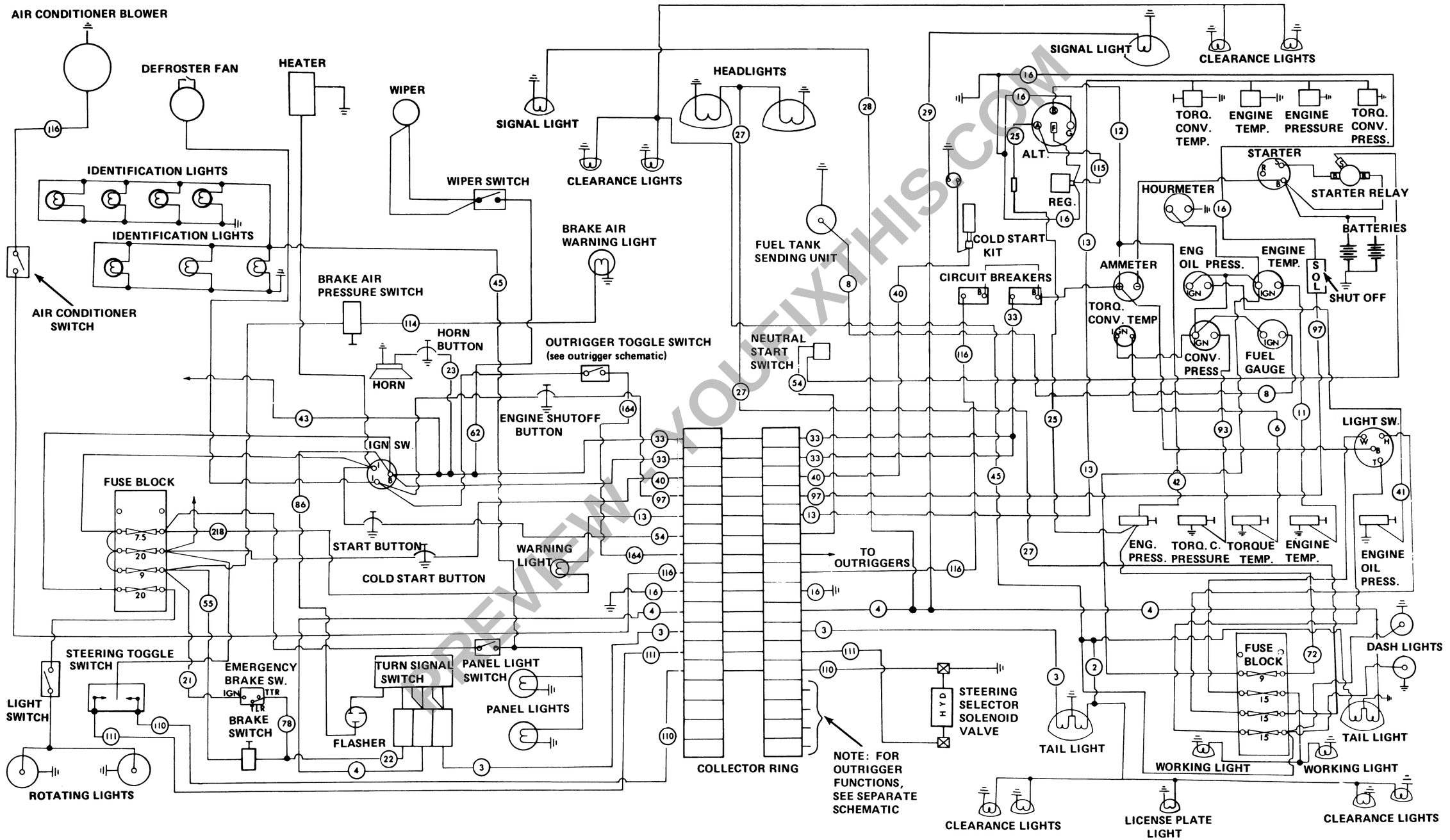


Figure 217. Electrical Schematic

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FREE-FALL OPTION

Braden winches equipped with free-fall have a spring-loaded, hydraulically released multiple disc clutch installed on the final planetary end of the winch. The clutch is controlled by a manually-operated, normally-open hydraulic valve. This valve is located in the mast area and is controlled by the free-fall lever in the Operator's Cab.

For information on the free-fall hydraulic circuit, see Hydraulic System section.

GEARMATIC WINCH SCHEDULED MAINTENANCE

On winches not equipped with free-fall, maintain oil in Final Drive Housing to level of fill plug. If low, add SAE 90 transmission oil.

The Primary Drive components and Final Drive on units equipped with free-fall are lubricated and cooled by oil from the Winch motor circuit. No special maintenance is required other than normal hydraulic system maintenance (see HYDRAULIC section).

To prevent excess pressure build-up in the primary housing, a special warm-up procedure is recommended for all start-up. This procedure is ESSENTIAL when ambient temperatures are below +40° F. (5° C).

1. With pump engaged and all hydraulic controls in neutral, run engine at lowest recommended RPM. Allow sufficient time to warm up the system.

2. Operate winch at low speeds, forward and reverse, several times to prime all lines with warm hydraulic oil.

NOTE

Failure to properly warm the hydraulic winch can result in damage to the primary housing or cover and premature seal failure.

Every 12 months or after 500 hours of actual winch operation, the following service procedures should be carried out to help insure safe and trouble-free operation:

1. Drain oil from final drive assembly by removing the end cover. Remove planet hub assembly. On units equipped with free-fall, disassemble the free-fall assembly. (See Disassembly and Repair section.) Inspect all parts per instructions given for these assemblies in Disassembly and Repair section. Reassemble and fill final housing with SAE 90 transmission oil (units without free-fall option only).

2. Drain oil from primary drive housing and disassemble the primary drive assembly. Check all parts according to the inspection instructions given for this assembly in Disassembly and Repair section. Do not disassemble the motor unless it is known to be faulty.

   a) Remove the primary sun gear from the brake hub assembly. Without removing the snap rings, garter springs, and cam locks from the inside diameter of the brake hub, inspect the cam locks for flats at the points where they contact the sun gear. If flats exist on the cam locks, replace them with new parts.

   b) Inspect the sun gear diameter for excessive wear at the bearing and cam lock areas. If the wear at these points is greater than .001 inch (.025mm) on the diameter when compared with the unworn areas, replace the brake hub, cam locks, bearings and sun gear.

   c) Clean out the inside of the primary housing. Reassemble the primary drive assembly. Refill primary housing with same oil as is used in the hydraulic system.

BRADEN WINCH — SCHEDULED MAINTENANCE

Oil level in winch should be checked once a month or every 250 hours, whichever occurs first. *On winches without free-fall,* unwind the wire rope far enough to expose the two pipe plugs in the drum barrel. Then turn winch until one plug is at the highest point on drum. Oil should be level with bottom of lowest plug. *On free-fall winches,* the check plug is located in the end of the shaft support (see Figure 53). Oil should be level with this plug. The vent pipe assembly may be removed to provide an oil fill access for the winch. If low, add SAE 90 worm gear oil.

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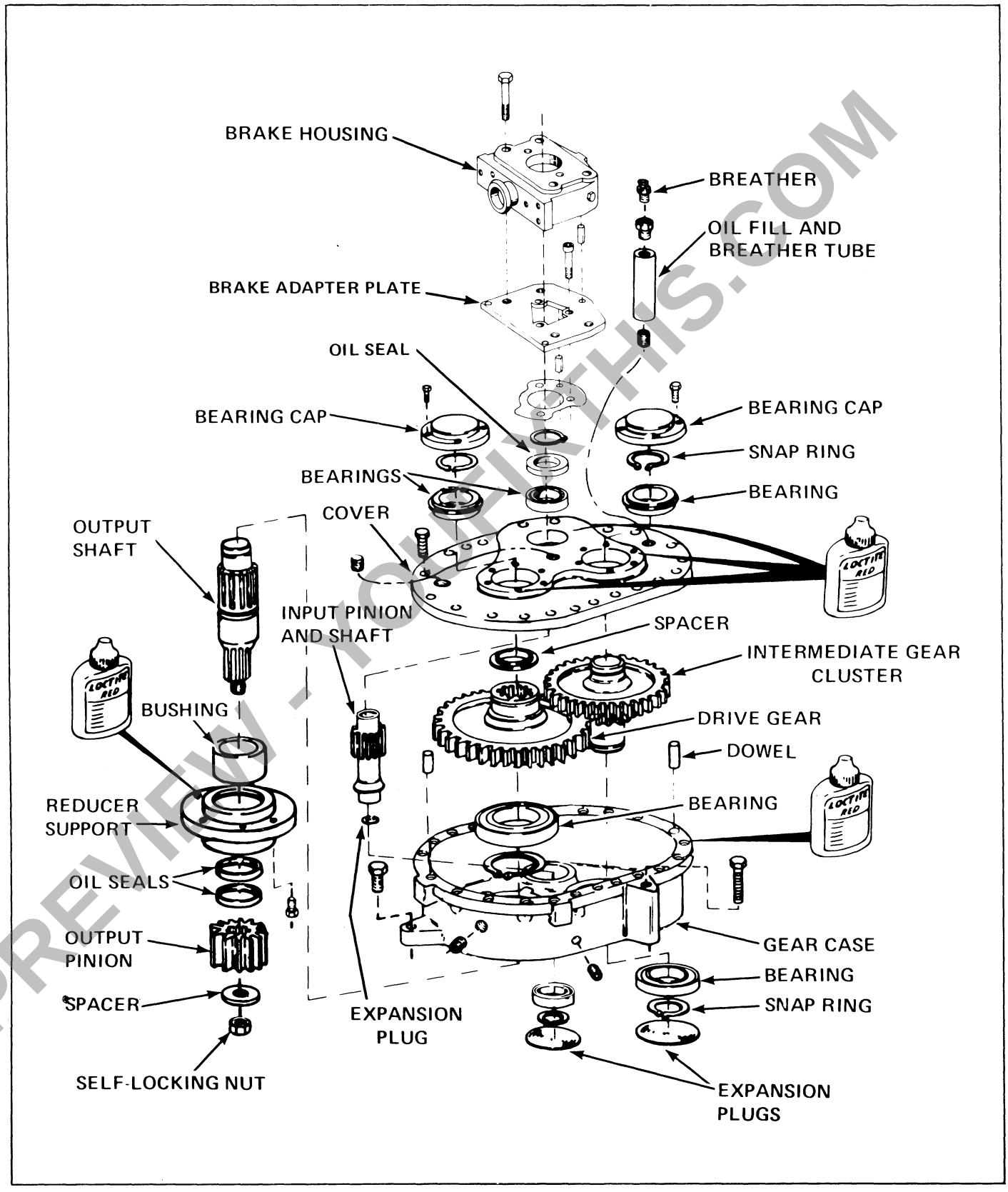


Figure 91. Swing Gearbox — Type 1

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SECTION 3

THE AIR SYSTEM

DESCRIPTION, MAINTENANCE AND TROUBLESHOOTING

SYSTEMS LISTING:

1. Air Supply System
2. Brake System
3. HIGH-LOW Range Shift System

INTRODUCTION

The Pneumatic System provides the necessary air pressure to operate the Air Brake System and the Transmission HIGH-LOW range shift Cylinder. The Pneumatic System Schematic can be found on Page 256.

GENERAL DESCRIPTION

The AIR SUPPLY SYSTEM consists of an engine driven Compressor, an In-line Check Valve, and Air Reservoir, Air Swivel and the required valves, lines and tubing.

Air leaves the Compressor, flows through the one-way Check Valve and enters the Reservoir. The Check Valve permits air flow into the Reservoir, but prevents reverse flow back through an inoperative Compressor. The Reservoir stores a sufficient volume of air for several brake applications, should the Compressor fail. From the Reservoir air flows to the brake relay valves and to the Air Swivel. The Air Swivel provides a means of transmitting air flow between the rotating Turntable and the non-rotating lower structure. In the rotating Turntable, the air flow branches off into three Systems — The Service Brake, Parking Brake and HIGH-LOW Range Shifting Systems.

1. Air Supply System

COMPRESSOR

The Air Compressor develops and maintains the air pressure required to operate the various air powered components. The unit is cooled and lubricated by the engine coolant and lubrication systems. A Governor controls air output by unloading the compressor at a predetermined pressure setting. During the downstroke of the compressor piston, a vacuum is created which moves the Inlet Valve off its seat. Air enters the cylinder above the piston. As the piston starts its upward stroke, the Inlet Valve closes and the Discharge Valve opens. Air flows to the Reservoir. A line extends from the Reservoir back to the Compressor Governor. When Reservoir air pressure reaches approximately 110 psi (760 kPa), the Governor opens, permitting compressed air to enter the chamber below the Unloading Valve. This moves the Unloading Valve plunger upward and lifts the Inlet Valves off their seats to prevent any further compression of air. When Reservoir pressure drops to approximately 90 psi (620 kPa), the Governor closes and exhausts the air below the Unloading Valve. The Inlet Valve closes and compression is resumed.

AIR RESERVOIR

The Air Reservoir provides a storage place for compressed air to:

1. Assure an ample supply for braking with the engine running and permit several brake applications after the engine has stopped.
2. To provide a place where the heated, compressed air may cool and oil and water vapors condense.

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HOW THE SYSTEM WORKS

The pump takes oil from the reservoir through the in-line filter and sends it through Swivel Port No. 5 to the "In" port of the Orbitrol. If the steering wheel is not in use (not being turned), the oil continues on through the Orbitrol "Out" port and returns to reservoir through Swivel Port No. 8.

In 2-wheel Steering, when turning right, oil is directed out the Orbitrol "R" port, through Swivel Port No. 6 to the Selector Valve (which is in "neutral" position, stopping flow to rear cylinders), and to the front steering cylinders (rod end of left cylinder, base end of right cylinder), as shown in Figure 174A. Oil from the opposite ends of the cylinders returns through Swivel Port No. 3 to the Orbitrol "L" port and dumps back to reservoir. When turning left, this flow is reversed.

In 4-wheel Steering, the selector valve connects the front and rear cylinder circuits in "straightline" pattern as shown in Figure 174B. Thus the front and rear wheels turn in opposite directions as shown. When turning right, oil is directed out of the Orbitrol "R" port, through Swivel Port No. 6 to the Selector Valve. The Selector Valve is now open, and directs the oil through the Lock Valve to the rear cylinders (rod end of left cylinder, base end of right cylinder). Oil from the opposite end of the rear cylinders is forced back through the Lock and Selector valves to the front cylinders (rod end of left cylinder, base end of right cylinder). Oil from the opposite ends of the front cylinder returns back through Swivel Port No. 3 to the Orbitrol "L" port and is dumped back to reservoir. When turning left, this flow is reversed.

In Crab Steering, the Selector Valve connects the front and rear cylinder circuits in "criss-cross" pattern as shown in Figure 174C. The front and rear wheels turn parallel to one another as shown. When turning right, oil is directed out the Orbitrol "R" port through Swivel Port No. 6 to the Selector Valve. The Selector Valve is now open, and directs the oil through the Lock Valve to the rear cylinders (base end of left cylinder, rod end of right cylinder). Oil from the opposite ends of the rear cylinders is forced back through the Lock and Selector valves to the front steering cylinders (rod end of left cylinder, base end of right cylinder). Oil from the opposite ends of the front cylinders returns through Swivel Port No. 3 to the Orbitrol "L" port and is dumped back to tank.

THE STEERING LOCK VALVE

The function of the Steering Lock Valve is to block off the free flow of fluid between the two rear steering cylinders when front wheel steering is being used. The valve contains two pilot operated check valves which can only be opened by high pressure oil from the Selector Valve. When the Selector Valve is neutral, both check valves remain seated to block the fluid flow. When the Selector Valve is shifted to either extreme, both lock check valves unseat (one by direct flow, the other by pilot pressure from the high pressure side) and allow fluid from the rear portion of the steering circuit to flow through to the front portion of the circuit.

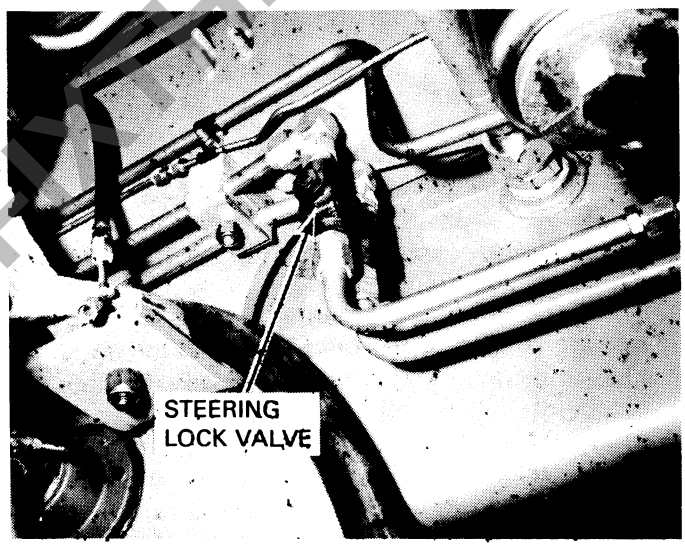


Figure 175. Steering Lock Valve

CHECKING/SETTING STEERING RELIEF PRESSURE

The steering relief valve is set at the factory to relieve at 2000 psi (13 800 kPa). Under normal operation, there will be no need to alter this setting. If, however, the valve is suspected of malfunctioning, it may be tested and adjusted to specifications.

To check Steering Relief Pressure, you will need a pressure gauge capable of reading at least 5000 psi (34 400 kPa).

1. Connect pressure gauge to the steering system quick-connect coupling.

2. Start up the engine and warm the oil.

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Torque values are in foot pounds. Torque values specified are with residual oil remaining on bolts. If special lubricants of high stress ability, such as never-seez compound, graphite and oil, molybdenum, di-sulfide, collodial copper or white lead are used, multiply the torque figures in the chart by the factor .90.

The torque required to seal swivel female fittings or hose couplings to a male connector depends on many variables such as fluid medium, surface finish, etc. The above values are intended only as a guide for the maximum values the fittings may be subjected to.

These values are the recommended torque values for JIC (37° Seat) Swivel nuts either swaged or brazed type. The swivel nuts will normally withstand this torque for a minimum of 15 repeated assemblies.

Conversion Factors:
Lb-Ft x 1.355 818 = Nm
Inch x 25.4 = mm

GRADE 5 GRADE 8 SPECIAL DMC BOLTS

MAXIMUM RECOMMENDED TORQUE VALUES FOR JIC SWIVEL NUT (37° SEAT)

THD. SIZE	SIZE	OD TUBE	LB-FT PRESSURE
7/16-20	.4	1/4	9
1/2-20	.5	5/16	17
9/16-18	.6	3/8	20
3/4-16	.8	1/2	30
7/8-14	.10	5/8	40
1-1/16-12	.12	3/4	85
1-3/16-12	.14	7/8	100
1-5/16-12	.16	1	110
1-5/8-12	.20	1-1/4	150
1-7/8-12	.24	1-1/2	170
2-1/2-12	.32	2	300
	.40	2-1/2	400
	.48	3	500

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EXTENDING/RETRACTING THE BOOM

WARNING: Check load charts for possible tipping condition before extending the boom.

To Crowd OUT, move the Crowd Lever FORWARD, or depress the Crowd Pedal with the Toe (Figure 17, Item 1). Use a smooth, continuous motion until the desired Crowd speed is reached.

IMPORTANT: When extending the boom, always operate the Winch to extend the wire rope. This will prevent double-blocking.

To crowd IN, move the Crowd Lever REARWARD, or depress the Crowd Pedal with the Heel (Figure 17, Item 2).

Boom Sequencing:

The boom sections must extend and retract somewhat equally at all times for proper load distribution to the boom structure. To eliminate the need for the Operator to constantly sequence the boom, the CRUZ-CRANE'S boom is equipped with an automatic sequencing system.

The boom may become out of sequence when working for extended periods in the mid-range of boom extension. If the boom becomes out-of-sequence, simply Crowd all the way OUT to bring it back into sequence. The maximum allowable out-of-sequence limit is shown in Figure 18.

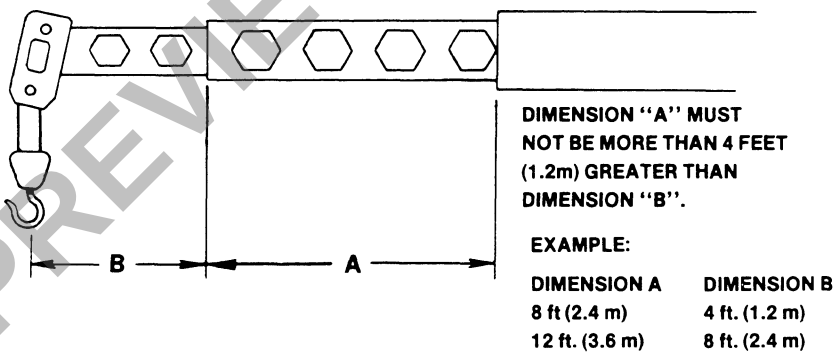


Figure 18. Boom OUT of SEQUENCE Limits

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