SPECIFICATIONS

ENGINE

Model	Detroit Diesel 6V-53	Case 504 BDT
Type	Diesel, 2 cycle	Diesel, 4 cycle
Number of Cylinders	6	6
Bore and Stroke	3.87 in. (98.4 mm) x 4.5 in. (114.3 mm)	4.62 in. (117 mm) x 5 in. (127 m)
Displacement	318 cu. in. (5 211 cm^3)	504 cu. in. (8 259 cm^3)
Horsepower at Gov. Speed	180 (134 kW)	180 (134 kW)
Governed Speed	2400 RPM	2200RPM
Maximum Torque	446 lb-ft (605 Nm) at 1500 RPM	476 lb-ft (645.4 Nm) at 1500 RPM
Compression Ratio	21:1	15.8:1
Air Cleaner	Dry type	Dry type
Fan Size and Type	26 in. (660 mm) Blower, R.H. rotation	22 in. (559 mm) Blower, L.H. rotation

TORQUE CONVERTER

Model C-273.5
Type ..... Gear drive off rear of engine

TRANSMISSION

Model R-28621-12
Type ..... Full Power Shift

Gear Ratio	High	Low
First	4.30:1	10.4:1
Second	2.275:1	5.5:1
Third	0.832:1	2.01:1

AXLES, FRONT AND REAR

Type ..... Planetary Drive and Steering
Ratio 22.2:1

TIRES

Size ..... 26.5 x 25
Ply Rating ..... 20 Ply
Width ..... 26.85 in. (682 mm)
Diameter ..... 68.8 in. (1.75 m)

WHEEL BRAKES

Type ..... Drum type, cam actuated
Brake Shoe Size ..... 20¼ x 5 in. (514 x 127 mm)
Lining Area ..... 230 sq. in. (1 484 m^3) per wheel
Actuator ..... Full air for foot brake, spring brake for park/emergency brake
Location ..... All four wheels

OUTRIGGERS

Type ..... Hydraulic
Construction ..... Welded Box
Pad Size ..... 18 x 24 in. (457 x 610 mm)

TURNTABLE ROTATION 360°

Turntable Bearing ..... Single Race, 54 in. (1.37 m) diameter with internal gear
Drive Mechanism ..... Hydraulic motor and spur gear reduction
Brake ..... Disc brake on input to swing gearbox, hydraulically actuated with mechanical override
Turntable Lock ... Mechanical stop, front and rear of chassis

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MAINTENANCE CHART

Ref.	Component/System	Daily - 10 Hours	Weekly - 50 Hours	2 Weeks - 100 Hours	Monthly - 250 Hours	2 Months - 500 Hours	6 Months - 1500 Hours	12 Months - 3000 Hours	Service/Check	Instruction
1	ENGINE	X							Check oil, remove water from fuel filter(s)	See engine manual
				X					Change oil and filters	See engine manual
2	COOLING SYSTEM	X							Check coolant level	See page 18
					X				Check tension on fan belts	See engine manual
						X			Add corrosion inhibitor, clean radiator core	See engine manual
							X		Flush system, fill with recommended coolant	See engine manual
3	AIR CLEANER			X					Clean or replace element	See page 17
4	TORQUE CONVERTER and TRANSMISSION		X						Check fluid level	See page 25
					X				Replace filter	See page 26
						X			Change oil, clean sump screen	See page 26
5	FUEL TANK	X							Fill at end of shift to prevent condensation	See page 11
6	DIFFERENTIALS		X						Check oil level	See page 32
							X		Change oil, clean magnetic plug and breather	See page 32
7	WHEEL PLANETARIES		X						Check oil level	See page 32
							X		Change oil	See page 32
8	WHEELS and TIRES	X							Check tire pressure, look for cracks or damage	See page 33
			X						Check torque on wheel studs	See page 33
9	OUTRIGGERS	X							Clean mud and dirt from channels	
10	GREASE FITTINGS		X						Apply lubrication	See page 14
11	AIR SYSTEM			X					Check automatic drain valve	See page 62
				X					Replace filter on inlet to compressor	See page 61
								X	Disassemble, clean and inspect compressor	See page 61
12	HYDRAULIC SYSTEM	X							Check oil level	See page 87
						X			Replace in-line filters	See page 88
							X		Change oil, clean tank and screens	See page 88
13	BATTERIES			X					Check electrolyte level, specific gravity	See page 75
						X			Clean battery posts and connections	See page 75
14	TURNTABLE BEARING	X							Apply lubrication on ring gear	See page 38
			X						Apply grease to bearing race	See page 14
				X					Check torque on bearing bolts	See page 38
15	SWING GEARBOX		X						Check oil level	See page 38
							X		Change oil, clean breather	See page 38
16	BOOM SLIDES		X						Apply lubricant	See page 40
17	ACCELERATOR		X						Check fluid level in master cylinder	See page 20
18	WINCH(ES) and WIRE ROPE	X							Check cable clamps and connections	See page 51
					X				Check wire rope and sheaves	See page 50
							X		Change oil in winch(es)	See page 47
19	BOOM and JIB				X				Check structures for cracks, bends or other damage	See page 40
20	CONTROLS	X							Check for binding, wear, adjustment	
21	STEERING and BRAKES				X				Check operation	See page 33
22	LEVEL, ANGLE, LOAD INDICATOR				X				Check for accuracy, adjustment	See page 42

SPECIAL MAINTENANCE

AFTER FIRST DAY OR 10 HOURS

Hydraulic Oil Filters ..... Replace filters in the hydraulic lines

AFTER FIRST 20 HOURS

Engine ..... Change oil and filters, see engine manual

Alternator and Fan Belts ..... Check Tension

AFTER FIRST WEEK OR 50 HOURS

Turntable Bearing ..... Check torque on bearing bolts

AFTER FIRST 2 MONTHS OR 500 HOURS

BRADEN Winch(es) ..... Change oil, flush with kerosene

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If accelerator performance does not return to normal, or if the engine does not reach full rpm when the accelerator pedal is fully actuated:

1. Check to make sure there are not leaks in the accelerator system. Look for dark spots or fluid around the master cylinder, lock valve, slave cylinders, swivel, and all connections.

2. Fill the master cylinder with clean brake fluid, free of air bubbles.Use only the correct type of fluid as specified (see Component Capacities).

3. If you use a pressure bleeder, install the correct adapter on the master cylinder opening. Then connect the pressure bleeder to the adapter. Fill the pressure bleeder with the correct fluid (see above). Apply air pressure (20 psi [140 kPa] max).

NOTE

If a pressure bleeder is not available push and hold the accelerator pedal to put pressure on the system.

4. Install a clear plastic hose over the bleeder screw of the slave cylinder on the engine (see figure 29). Put the other end of the hose into a jar or clean container.

5. Loosen the bleeder screw on the slave cylinder until fluid starts to flow. (You will see the air coming out of the system in the form of air bubbles).

6. When air bubbles can no longer be seen coming from the system, tighten the bleeder screw.

7. Release air pressure from the pressure bleeder. Remove pressure bleeder and adapter.

TROUBLESHOOTING GUIDE - ENGINE

PROBLEM	POSSIBLE CAUSE	REMEDY
Loss of Power	1. Restriction in the air cleaner 2. Engine needs service	1. Clean or replace the element 2. See engine manual
Overheating	1. Low coolant level 2. Restriction in cooling system or radiator 3. Loose or broken fan belts 4. Low oil in crankcase 5. Bad thermostat 6. Bad water pump	1. Add coolant, check for leaks 2. Flush system, clean radiator 3. Tighten or replace fan belts 4. Add oil, see engine manual 5. Replace, see engine manual 6. Replace water pump
Engine does not reach full rpm	1. Low fluid in accelerator master cylinder 2. Accelerator linkage not correctly adjusted 3. Engine needs service	1. Add fluid, check for leaks 2. Adjust linkage 3. See engine manual
Accelerator lock does not engage	1. Electrical circuit to solenoid valve is open 2. Bad solenoid valve 3. Restriction in linkage	1. Check for voltage at solenoid valve when accelerator lock switch is in "ON" position 2. Clean or replace 3. Check and correct
Accelerator lock will not keep engine at selected rpm	1. Air in hydraulic line 2. External leakage in accelerator hydraulic linkage 3. Internal leakage in slave cylinders or solenoid valve	1. Remove air at slave cylinder on engine 2. Check and correct 3. Repair or replacement of cylinders or valve

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SECTION 3
THE AIR SYSTEM

GENERAL DESCRIPTION

The pneumatic system operates the air brake system and the range shift for the transmission.

The system includes the compressor, reservoir, control valves, air swivel, actuators and connecting lines.

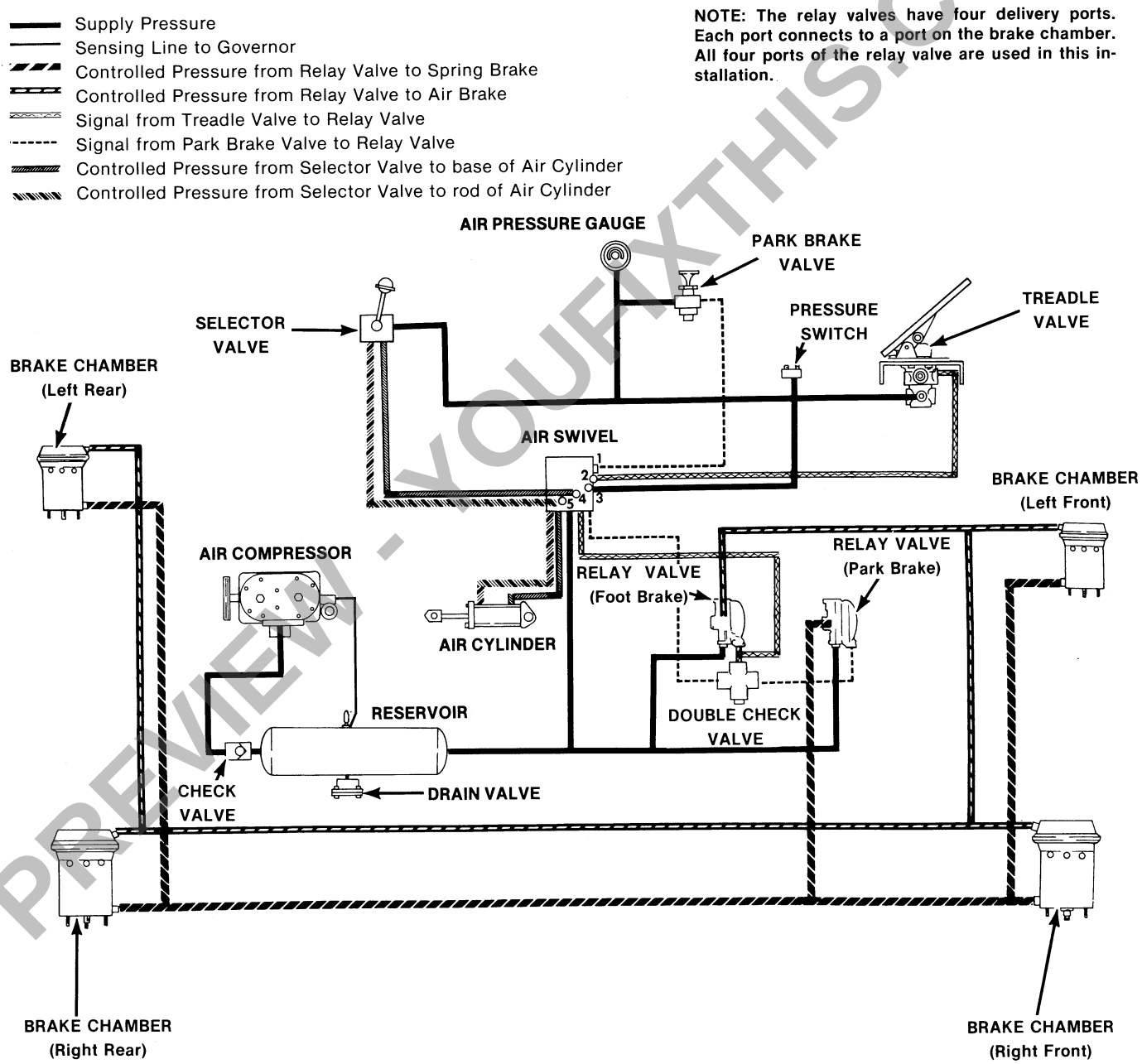


Figure 84. Air System

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OUTRIGGER CONTROL CIRCUIT

A series of relays is used to give selection for control of the outriggers. Relays 1 CR and 2 CR have six sets of contacts each. The remaining relays, 3 CR through 18 CR, have only one set of contacts. Each set of contacts has a normally open terminal and a normally closed terminal. When the coil of the relay is energized, the normally open contacts are closed and the normally closed contacts are opened.

The normally closed contacts of relays 1 CR and 2 CR are used to connect the upper and lower circuits of the Cold Start Kit and the lights and gauges in the steering console. With this arrangement, it is possible to use the same rings in the Collector Ring for two different functions.

Power to the switches for the outriggers comes across the key switch. The main switch and the two rocker switches are connected to the key switch through a 10 amp circuit breaker. The remaining two switches are connected to the key switch through a 5 amp circuit breaker.

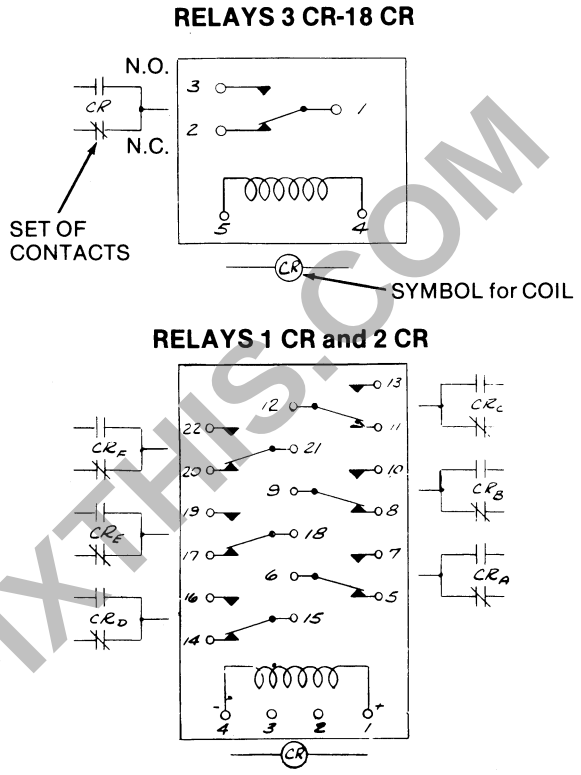


Figure 107. Schematic Diagram of Outrigger Relays

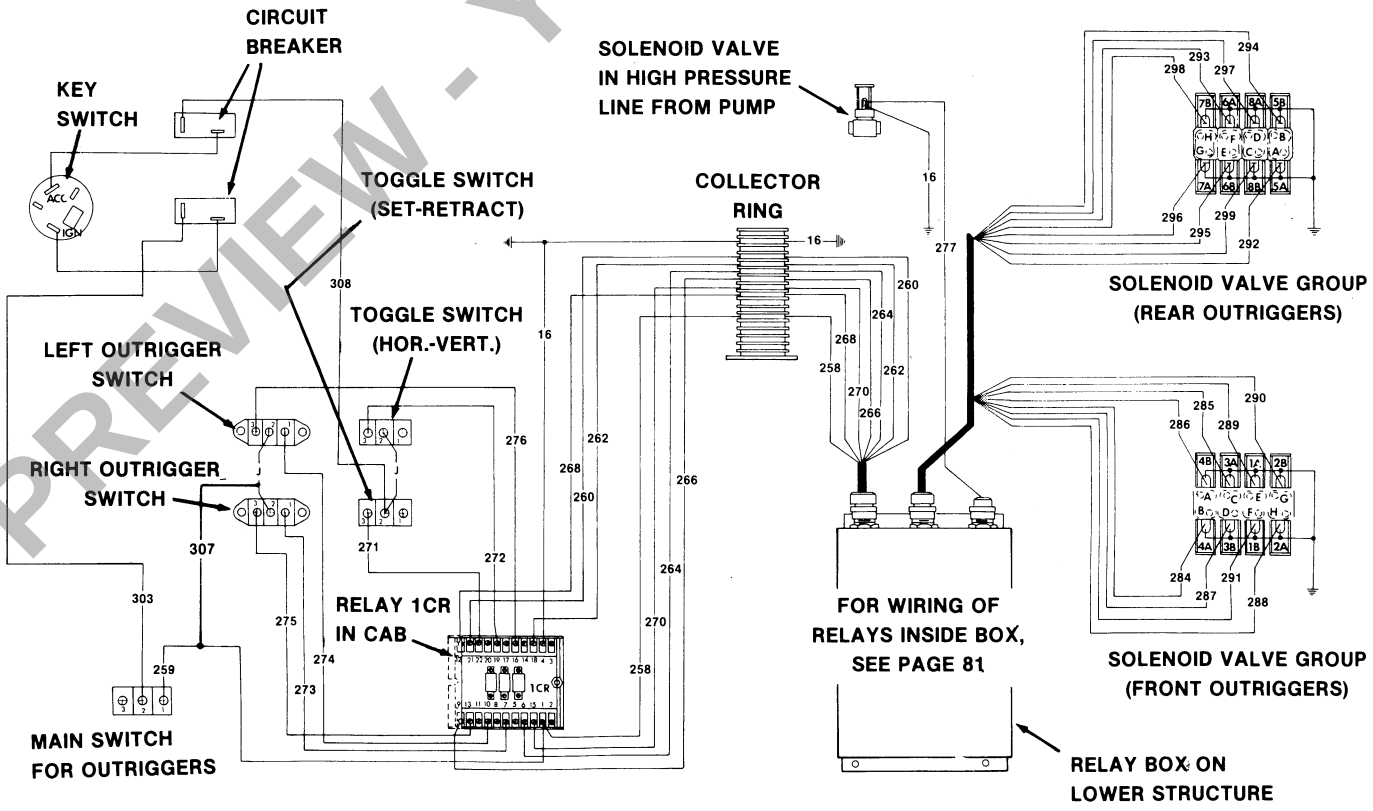


Figure 108. Control Circuits for the Outriggers

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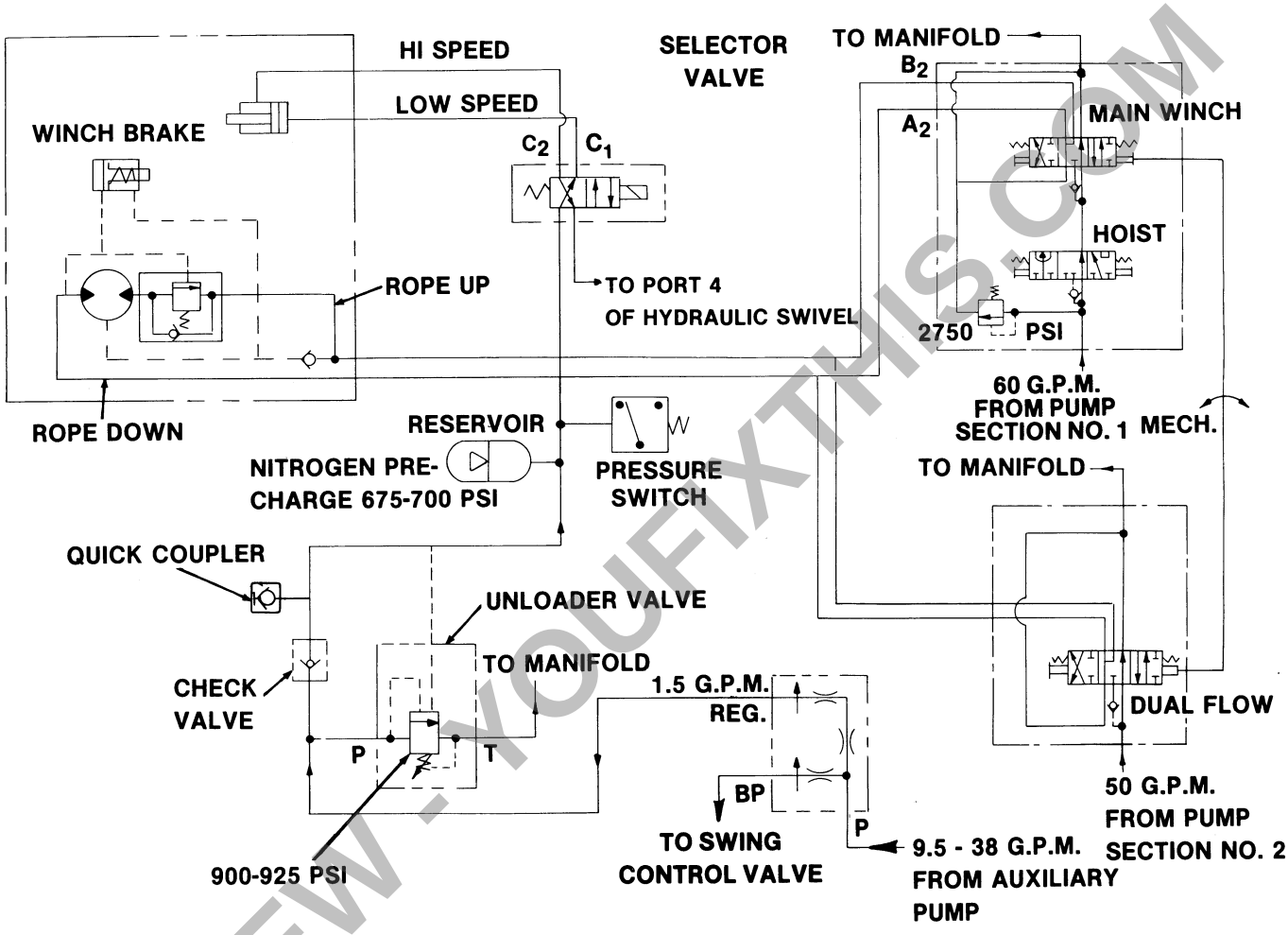


Figure 137. Schematic Diagram of Hydraulic Circuit to Main Winch

In the **lowering** direction of rotation oil is sent to the motor port opposite the brake valve. This oil is also available to the brake valve and the cylinder which fully releases the friction brake. The motor can not rotate until there is enough pressure to open the brake valve. Less pressure is needed to release the friction brake than to open the brake valve. The friction brake fully releases before the brake valve opens. The amount of opening on the brake valve controls the speed of the motor. Stopping the flow of oil to the winch closes the brake valve and stops the motor.

Two-Speed Circuit for Main Winch

This circuit is connected into the auxiliary system. The circuit includes a flow divider, unloader valve, accumulator and selector valve.

The flow divider is connected into the auxiliary system at the inlet to the swing control valve. Approximately 2 gpm (7 L/min) is separated from the auxiliary system and is available to the circuit through a check valve. The check valve helps keep pressure in the circuit.

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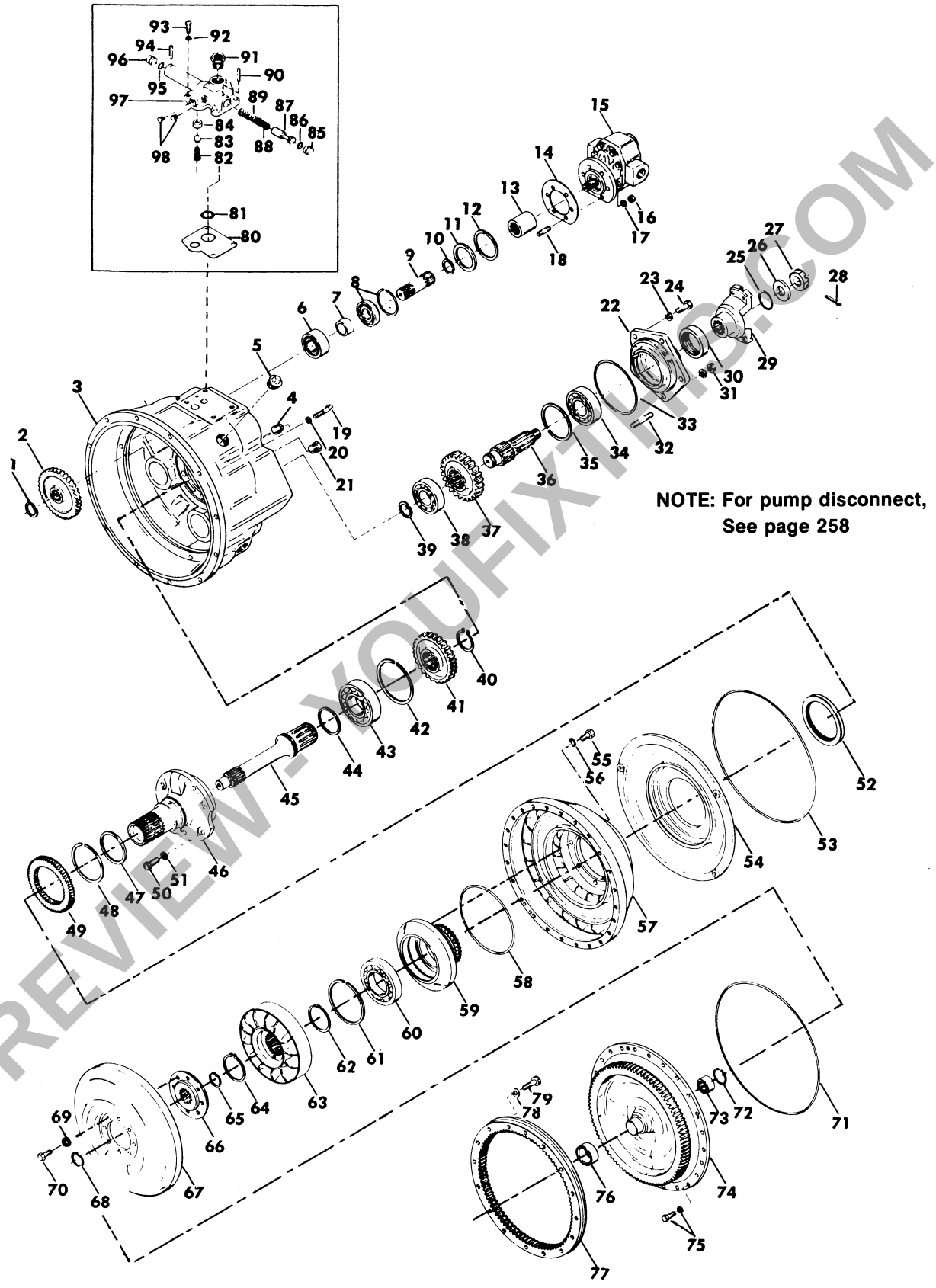


Figure 160. Torque Converter

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PARTS LISTING FOR FIGURE 160

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

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TORQUE SPECIFICATIONS - AXLE			
LOCATION/DESCRIPTION	**DIA.**	**THDS.**	**TORQUE (lb-ft)**
Pinion Bearing Cage to Carrier Capscrews	3/8" 7/16" 1/2" 5/8"	16 14 13 11	30-40 50-65 80-105 130-170
Differential Bearing Cap to Carrier Capscrews	9/16" 5/8" 3/4" 7/8" 7/8"	12 11 10 14 9	116-129 160-180 290-320 375-415 470-520
Gear to Differential Case Bolt Nuts	5/8" 1/2"	18 20	210-270 105-135
Differential Case Capscrews and Nuts (Long & Short)	3/8" 7/16" 1/2" 1/2" 5/8" 5/8"	16 14 13 20 11 18	35-50 60-75 90-120 105-135 185-235 210-270
Planetary Spider Cover Capscrews	7/16" 1/2"	14 13	53-67 81-104
Planetary Spider to Hub Bolts	1/2" 3/4"	13 10	81-104 290-370
Planetary Ring Gear Lock Capscrews	5/16" 3/8" 7/16"	24 16 14	21-27 33-43 53-67
Steering Arm and Steering Bearing Cap Bolts	1/2" 5/8" 3/4" 7/8"	13 11 10 14	81-104 160-205 290-370 510-655
Spindle to Housing Nuts	5/8" 7/8" 1"	18 14 14	185-235 510-655 780-1000
Tie Rod Clamp Bolt	1/2" 5/8"	20 18	92-118 185-235
Brake Drum to Hub Bolts	5/8" 3/4" 7/8"	11 10 14	160-205 290-370 510-655

Conversion Factor: Lb-Ft x 1.355818 = Nm

(For use with Rockwell Axles only)

Torques given apply to parts coated with machine oil; for dry parts increase torques 10%; for parts coated with multi-purpose gear oil decrease torques 10%. Nuts on studs to use same torque as for driving the stud.

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9. Apply red Loctite to the finished surface for the cover. Use enough to make sure you get a good seal on the cover.

10. Install the cover (9). Use a rubber hammer to hit the cover into place. Make sure the bearings are aligned with holes in cover before you hit the cover into position.

11. Install dowels at both ends of cover.

12. Tighten two bolts at either end of the cover first, then tighten the other bolts until the cover is just tight.

13. Hit the three shafts from the bottom of the housing so the grooves for the snap rings removed in step 8 show. Install snap rings on the bearings. Push the shafts down so the snap rings on the bearings are tight against the cover.

14. Install gaskets (6,29) and bearing covers (5,28) on the intermediate and output shafts. Tighten the bolts to a torque of 22 lb-ft (28 Nm).

15. Tighten the 23 bolts around the gearbox cover to a torque of 42 lb-ft (57 Nm).

16. Turn gearbox over. Apply red Loctite to the finished surface for the reducer support (35). Use enough to get a good seal.

17. Install bushing (34) in reducer support. Install reducer support over the output shaft. Tighten the six bolts to a torque of 200 lb-ft (270 Nm).

18. Install the two oil seals (36) on the output shaft. Use an expander over the shaft to fit the seals. If an expander is not available, carefully install the seals over the output shaft and use a screwdriver or similar tool to push the lip of the seal over the splines of the output shaft. Be careful that you do not cause damage to the rubber part of the seal.

19. Install the output pinion (37). Install spacer (39), with bevel toward gearbox, and lock nut (40). For easier tightening, apply lubrication to the threads of the output shaft before you install the lock nut. The nut has a nylon insert. Tighten the nut only until there is a very small space between the spacer and the output pinion.

20. If expansion plugs (16) were removed, apply No. 2 Permatex to the plugs. Use a ball peen hammer to fit the expansion plugs in the housing.

ASSEMBLY OF TYPE 2 GEARBOX (See Figure 188)

1. Apply red Loctite to inner circumference of the spacer ring (47). Press the spacer ring and the inner race of the bearing (46) on the output shaft.

2. Install oil seal (45) in the seal retainer (44). Install bearing outer race (43) in the bearing retainer.

3. Apply red Loctite to surfaces of the oil seal retainer and the bearing retainer.

4. Install the seal retainer and bearing housing on gearbox. Install bolts (49) and tighten to a torque of 200 lb-ft (270 Nm).

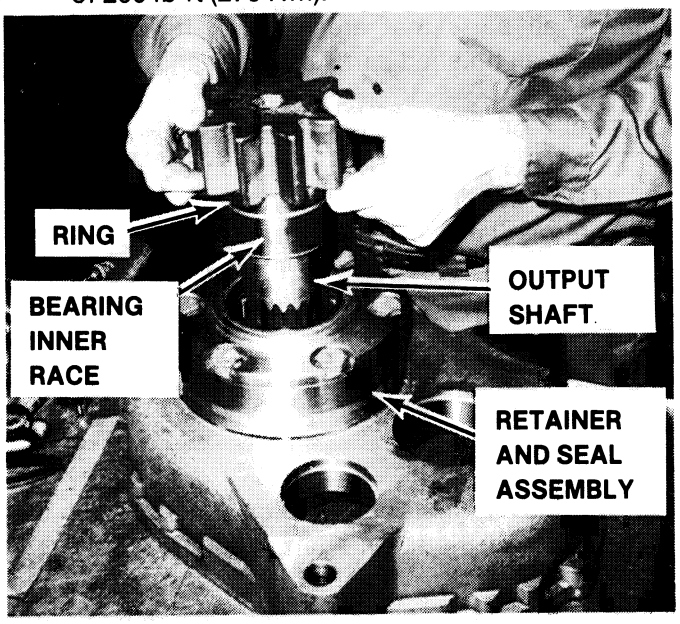


Figure 191. Output Shaft Assembly

5. Install output shaft assembly. Turn gear box over. Install bushing (41) over end of output shaft.

6. Continue with steps 2 and 3 of Type 1 assembly instructions.

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CONTENTS

A

Accelerator 19
Accelerator Lock 20
Accumulator 108
Air Cleaner 17
Air Components
  Brake Chambers 215
  Compressor 61,206
  Governor 211
  Reservoir 62
  Swivel 63,227
  Valves
    Check 62
    Drain, automatic 214
    Foot brake 64,218
    Park brake 66,221
    Range selector 67,224
    Relay 65,222
    Safety 63
Air System 60-69
Alcohol Evaporator Kit 63
Alternator 73
Ammeter 74
Angle Indicator, electric 42
Axles 31,152

B

Battery 74
Boom 40,180
Brake
  Foot 64
  Park 66
  Swing 36,167
Brake Chambers 66,215
Brake Valve 64,218

C

Capacities Chart 11
Center Swivel 39,179
Circuit Breakers 71
Cold Start Kit 77
Collector Ring, electrical 71,228
Cooler - oil, hydraulic 87
Cooler - oil, transmission 23
Cooling System, engine 18
Counterbalance Valves 101
Crossover Relief Valve 103,120
Cylinder block, compressor 208
Cylinders, hydraulic
  Crowd 251,252
  Hoist 250
  Oscillation, axle lockout 255
  Outrigger 253,254
  Steering 255

D

Differential 31,152
Drive, pump 22
Drive shafts 33,165

E

Electrical System 70-84
Engine 16,132

F

Filter - oil, hydraulic 88
Filter - oil, transmission 26
Flowmeter tests 93
Flushing procedure, hydraulic system 89
Free-Fall Winch 110,195
Fuel Tank, capacity 11

G

Gauges 82
Governor 211
Grease Fitting Locations 14

H

Head, compressor 207
Heater 53,78
Hydraulic Circuits
  Crowd 102
  Hoist 100
  Outriggers 112
  Pump
    Auxiliary 111
    Main 92
  Steering 114
  Swing 119
  Winches
    Auxiliary 110
    Free-Fall 110
    Main 106
    Two-Speed 107
Hydraulic Oil Tank 88

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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: When doing any service on the machine, put a tag on the ignition switch or remove the key to prevent operation of the machine.

WARNING: Never disconnect any hydraulic line unless the boom is fully lowered and hydraulic pressure is relieved. To relieve hydraulic pressure, stop the engine and move the hydraulic controls forward and back several times.

CAUTION: ENGINE FAN AND BELTS. To prevent possible serious injury avoid contact with rotating fan and belts.

CAUTION: Be very careful when working with tires. Tires can come apart with explosive force. Never try to disassemble the wheel until all air is released from the tire.

CAUTION: The adjustment procedure for the swing brake requires that the brake be adjusted as the turntable is being rotated. DO NOT stand on the stationary portion of the chassis while making the adjustment; position yourself on the turntable and ride it around.

DANGER: Engine exhaust can cause death. If necessary to start the engine in a closed area, make sure there is enough ventilation.

WARNING: To prevent injury from burns, always use a solvent that is not flammable for cleaning component parts. DO NOT use gasoline or other flammable substances.

WARNING: Never fill the fuel tank near an open flame or while the engine is running. Keep cigarettes away.

CAUTION: When checking coolant, remove radiator cap slowly to relieve pressure in the system. To prevent burns, remove radiator cap only when engine is cool.

WARNING: To prevent eye injury, wear eye protection when doing maintenance on this machine.

CAUTION: Use brake fluid to clean rubber parts. Acetone, paint thinner or other mineral base solvents must not be used on rubber parts. Mineral base solvents will cause damage and possible failure of the part.

CAUTION: Do not reach inside the boom sections unless the engine is stopped and the sections are fastened together to prevent movement.

CAUTION: Never operate the alternator on an open circuit. With no battery or other electrical load on the circuit, high voltage will occur in the alternator. This voltage can cause injury to any person who makes contact with the battery terminal of the alternator.

CAUTION: To prevent accidents and possible personal injury from failure of wire rope, replace the wire rope immediately if any damage is found.

CAUTION: Before lifting any load, check the load chart on the machine. Make sure you will be in the safe load area and that enough parts of line are used for the load.

CAUTION: Clean any oil spills immediatey and keep the work area as clean as possible. A clean area helps prevent accidents.

WARNING: Read the Operator's Manual before operating the machine.

CAUTION: To prevent personal injury, keep your hands away from the swing pinion when the turntable is being rotated.

WARNING: To prevent injury and possible death, keep hands, feet and loose clothing away from moving parts during operation.

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