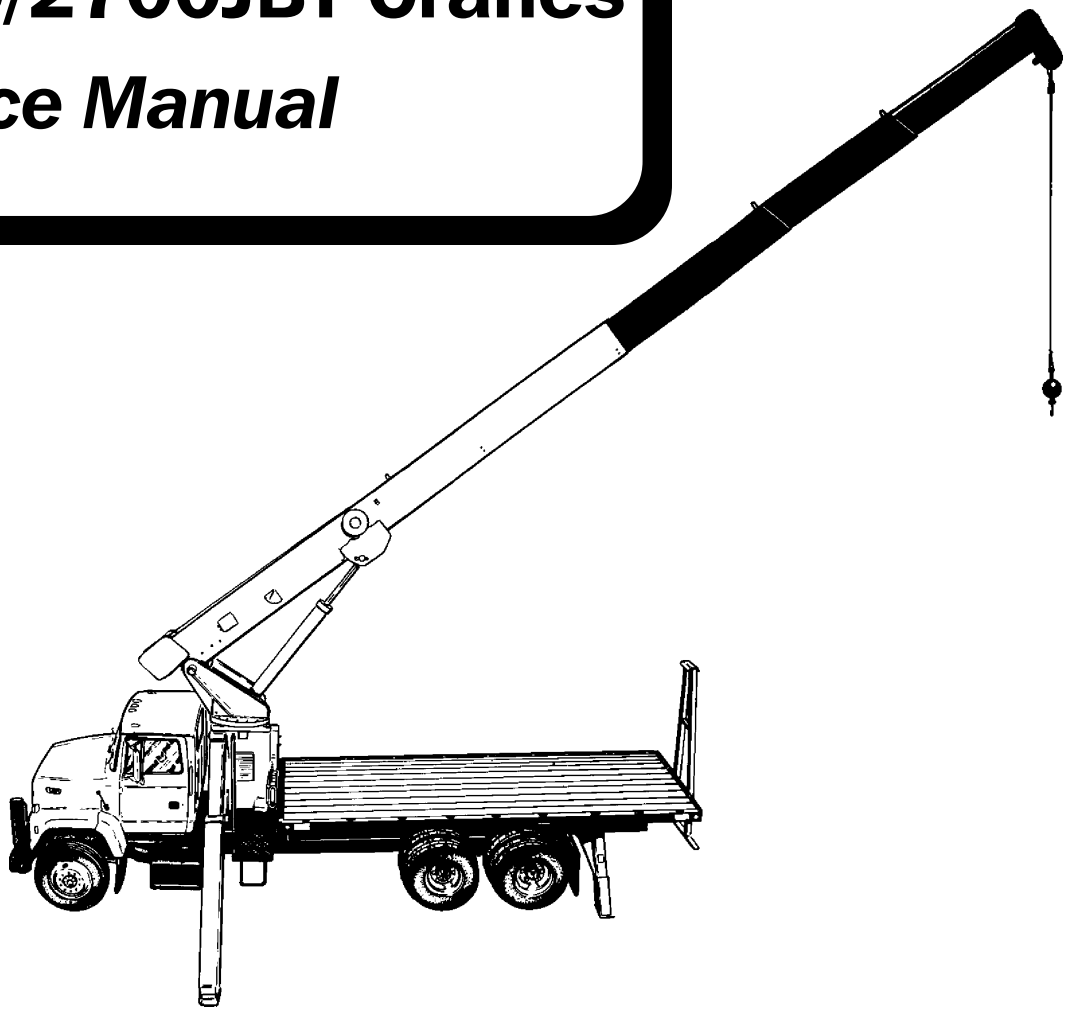
USTC™
Incorporated
A Manitowoc Company

2500/2700JBT Cranes
Service Manual



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FORWARD

The purpose of this manual is to provide the customer with the operating procedures essential for the promotion of safe and proper machine operation for its intended purpose. It is important to over-stress proper usage. All information in this manual should be **READ** and **UNDERSTOOD** before any attempt is made to operate the machine.

SINCE THE MANUFACTURER HAS NO DIRECT CONTROL OVER MACHINE APPLICATION AND OPERATION, CONFORMANCE WITH GOOD SAFETY PRACTICE IN THIS AREA IS THE RESPONSIBILITY OF THE USER AND HIS OPERATING PERSONNEL.

ALL PROCEDURES HEREIN ARE BASED ON THE USE OF THE MACHINE UNDER PROPER OPERATING CONDITIONS, WITH NO DEVIATIONS FROM THE ORIGINAL DESIGN. ALTERATION AND/OR MODIFICATION OF THE MACHINE IS STRICTLY FORBIDDEN WITHOUT WRITTEN APPROVAL FROM USTC, INC.

REMEMBER, EQUIPMENT IS ONLY AS SAFE AS THOSE WHO OPERATE IT!

Since safety of personnel and proper use of the machine are of primary concern, statements are used throughout this manual to emphasize certain areas. The following definitions indicate how a statement will appear in this manual.

Whenever this symbol is seen in this manual or on the machine, personnel safety is a concern. Take time to read and understand these statements!

DANGER: INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

WARNING: INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.

CAUTION: INDICATES A POTENTIALLY HAZARDOUS SITUATIONS WHICH, IF NOT AVOIDED, MAY RESULT IN MINOR OR MODERATE INJURY. IT MAY ALSO BE USED TO ALERT AGAINST UNSAFE PRACTICES.

IMPORTANT: Indicates a situation which may cause machine damage if not correctly followed.

Note: Provides information which may be of special interest.

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TABLE LIST

GENERAL

This section contains the general safety precautions which must be observed during maintenance of the crane It is of utmost importance that maintenance personnel pay strict attention to these warnings and precautions to avoid possible injury to themselves or others or damage to the equipment. A maintenance program must be established by a qualified person and must be followed to ensure that the machine is safe to operate.

⚠WARNING: MODIFICATION OF MACHINE WITHOUT CERTIFICATION BY A RESPONSIBLE AUTHORITY THAT THE MACHINE IS AT LEAST AS SAFE AS ORIGINALLY MANUFACTURED IS A SAFETY VIOLATION.

The specific precautions to be observed during machine maintenance are inserted at the appropriate point in the manual. These precautions are those that apply when servicing hydraulic and larger machine component parts.

The safety of the maintenance and operating personnel must be the first consideration when engaging in the maintenance of equipment.

Always be conscious of weight. Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

⚠WARNING: SINCE MACHINE MANUFACTURER HAS NO DIRECT CONTROL OVER FIELD INSPECTION AND MAINTENANCE, SAFETY IN THIS AREA IS THE RESPONSIBILITY OF THE OWNER/ OPERATOR.

HYDRAULIC SYSTEM SAFETY

It should be particularly noted that the machine's hydraulic systems operate at extremely high and potentially dangerous pressures. Every effort should be made to relieve any system pressure prior to disconnecting or removing any portion of the system.

Relieve system pressure by moving the boom control levers several times with the engine stopped and ignition on to direct any line pressure back into the return line and to the reservoir. Pressure feed lines to system components can then be disconnected with minimal fluid loss.

MAINTENANCE

⚠WARNING: FAILURE TO COMPLY WITH SAFETY PRECAUTIONS LISTED IN THIS SECTION MAY RESULT IN MACHINE DAMAGE, PERSONNEL INJURY OR DEATH AND IS A SAFETY VIOLATION.

- NO SMOKING IS MANDATORY. NEVER REFUEL DURING ELECTRICAL STORMS. ENSURE THAT FUEL CAP IS CLOSED AND SECURE AT ALL OTHER TIMES.
- REMOVE ALL RINGS, WATCHES AND JEWELRY WHEN PERFORMING ANY MAINTENANCE.
- DO NOT WEAR LONG HAIR UNRESTRAINED OR LOOSE FITTING CLOTHING AND NECKTIES WHICH ARE APT TO BECOME CAUGHT ON OR ENTANGLED IN EQUIPMENT.
- OBSERVE AND OBEY ALL WARNINGS AND CAUTIONS ON MACHINE AND IN SERVICE MANUAL.
- KEEP OIL, GREASE, WATER, ETC., OFF STANDING SURFACES AND HAND HOLDS.
- USE CAUTION WHEN CHECKING A HOT, PRESSURIZED COOLANT SYSTEM.
- NEVER WORK UNDER AN ELEVATED BOOM UNTIL BOOM HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING.
- BEFORE MAKING ADJUSTMENTS, LUBRICATING OR PERFORMING ANY OTHER MAINTENANCE, SHUT OFF THE ENGINE.
- BATTERY SHOULD ALWAYS BE DISCONNECTED DURING REPLACEMENT OF ELECTRICAL COMPONENTS.
- KEEP ALL SUPPORT EQUIPMENT AND ATTACHMENTS STOWED IN THEIR PROPER PLACE.
- USE ONLY APPROVED, NONFLAMMABLE CLEANING SOLVENTS.

COMPONENT DATA

Hoist

Manufacturer ..... Braden
Model PD12C
Type ..... Hydraulic Drive Planetary
Drum Diameter ..... 9.75 in. (247.6 mm)
Drum Length ..... 13.57 in. (344.7 mm)
Flange Diameter ..... 16.38 in. (416.1 mm)
Brake ..... Integral Multi-Disc
Maximum Rope Capacity ..... 400 ft. (121.9 m)
Rope Diameter ..... 9/16 in. (14.3 mm)

Gear Reduction Hub

Manufacturer ..... Eskridge
Type ..... Double Reduction Planetary
Ratio 36:1
Number of Teeth 16
Pitch Diameter ..... 4 in. (101.6 mm
Outside Diameter ..... 4.40 (111.8 mm)

Swing Brake

Manufacturer ..... Eskridge
Type ..... Spring Applied; Hydraulic Release
Release Pressure ..... 170 psi (11.73 bar)
Holding Torque ..... 2400 lb-in. (271 Nm)

Swing Motor

Manufacturer ..... White
Type ..... Gear
Displacement ..... 6.0 in^3 (98.3 cm^3)
Maximum Pressure ..... 1750 psi (120.8 bar)
Maximum Flow ..... 13 gpm (49.2 L/min)

Swing Bearing

Manufacturer ..... PSL
Type ..... Internal Tooth, Ball
Ball Bearing Circle ..... 29.96 in. (761.0 mm)
Ball Diameter ..... 1.37 in. (35 mm)
Bolt Torque 472 lb-ft. (640 Nm) w/Loc-Wel Patch Dry

Control Valve

Manufacturer ..... Commercial Intertech
Type ..... Dual Inlet, Open-Center
Sections 7

Hoist Valve

Manufacturer ..... Commercial Intertech
Type ..... Open-Center
Sections 1

Hydraulic Pump

Manufacturer ..... Commercial Intertech
Type ..... 3-Section Gear
Rated Pump Speed ..... 2400 rpm
1st Section Flow ..... 39 gpm (148 L/min)
2nd Section Flow ..... 24 gpm (91 L/min)
3rd Section Flow ..... 8 gpm (30 L/min)

Hydraulic Filter

Type ..... Inline Return
Filtration ..... 10 Micron Nominal
Flow Rating ..... 60 gpm (227 L/min)

Hydraulic Tank

Manufacturer ..... USTC
Type ..... All Steel with Lockable Cap
Capacity ..... 90 gal (341 L)

BOOM SPECIFICATIONS

Manufacturer ..... Manitowoc Boom Trucks
Type ..... 4-Section Proportional Telescope
Retracted Length ..... 29 ft. (8.84 m)
Extended Length ..... 94 ft. (28.65 m)
Boom Elevation ..... -8° to 80°
Extend Cable Type ..... 5/8 in. RRL
Outer-Mid Length ..... 609 in. (15.47 m)
Fly Length ..... 626 in. (15.90 m)
Retract Cable Type ..... RRL
Outer-Mid Retract ..... 5/16 in. dia. 345 in. (8.76 m)
Fly Retract ..... 3/8 in. dia. 349 in. (8.86 m)

Jibs (Optional)

Non-Extendable Length ..... 26 ft. (7.92 m)
Extendable Length ..... 26-46 ft. (7.92-14.02 m)

OUTRIGGERS AND STABILIZERS

A-Frame Outriggers

Extended Width (Pin to Pin) ... 258.00 in. (6553 mm)
Overall Stowed Width ..... 95.6 in. (2228 mm)
Extension per side ..... 90.0 in. (2286 mm)
Pad Dimensions ... 17.63 x 11.50 in. (447 x 292 mm)
Below Ground Penetration ..... 8.00 in. (203 mm)

Out-and-Down Stabilizers

Extended Width (Jack Centerline) 164.8 in. (4.23 m)
Overall Stowed Width ..... 96 in. (2438 mm)
Extension per side ..... 38 in. (965.2 mm)
Pad Diameter ..... 14 in. (356 mm)
Below Ground Penetration ..... 12.31 in. (320 mm)

CYLINDERS

Telescope

Bore ..... 6.00 in. (152 mm)
Stroke ..... 261.00 in. (6629 mm)
Rod Diameter ..... 4.97 in. (126 mm)
Nut Torque ..... Weld-On

Lift

Bore ..... 8.00 in. (203 mm)
Stroke ..... 58.44 in. (1484 mm)
Rod Diameter ..... 4.00 in. (102 mm)
Nut Torque ..... 1900-2400 lb-ft. (2576-3254 Nm)

A-Frame Outrigger

Bore ..... 4.00 in. (102 mm)
Stroke ..... 56.13 in. (1426 mm)
Rod Diameter ..... 2.75 in. (70 mm)
Nut Torque ..... 1125-1375 lb-ft. (1525-1864 Nm)

Out-and-Down Stabilizer Extend

Bore ..... 2.00 in. (51 mm)
Stroke ..... 76.00 in. (1930 mm)
Rod Diameter ..... 1.25 in. (32 mm)
Nut Torque ..... 50 lb-ft. (68 Nm)

Out-and-Down Stabilizer Jack

Bore ..... 5.00 in. (127 mm)
Stroke ..... 22.25 in. (565 mm)
Rod Diameter ..... 3.50 in. (89 mm)
Nut Torque ..... 1600-2000 lb-ft. (2169-2712 Nm)

PRESSURE SETTINGS

Main Relief+ ..... 3500 psi (241.3 bar)
Lift Up ..... 3500 psi (241.3 bar)
Lift Down ..... 3500 psi (241.3 bar)
Telescope In+ ..... 2500 psi (172.3 bar)
Telescope Out+ ..... 3300 psi (227.5 bar)
Outriggers ..... 3500 psi (241.3 bar)
Stabilizers ..... 3500 psi (241.3 bar)
Swing+ ..... 2100 psi (144.8 bar)
Hoist+ ..... 3200 psi (220.6 bar)
Burst-of-Speed+ ..... 2000 psi (137.9 bar)

+ Adjustable Relief Valve

CAPACITIES

Hydraulic Tank ..... 90 gal (340 L)
Hoist (94 ft. Boom) ..... 3.5 qt. (3.3 L)
Gear Reducer Hub ..... 1.25 qt. (1.2 L)

PERFORMANCE DATA

Hoist Performance

IMPORTANT: Line pull ratings are based on hoist capabilities. Refer to Hoist Specification Decal on machine to determine permissible line pull of wire rope.

⚠CAUTION: MINIMUM OF 5 WRAPS TO REMAIN ON DRUM AT ALL TIMES.

IMPORTANT: Non-swivel hookblock must be used with low rotation wire rope.

Functional Speed Specifications

LIFT UP – Lowest to Maximum Elevation _____sec.	
Minimum:	30 sec.
Maximum:	40 sec.
LIFT DOWN – Maximum to Minimum Elevation ____ sec.	
Minimum:	25 sec.
Maximum:	35 sec.
TELESCOPE OUT – Retracted to Fully Extended __ sec.	
Minimum:	70 sec.
Maximum:	95 sec.
TELESCOPE IN – Extended to Fully Retracted __ sec.	
Minimum:	70 sec.
Maximum:	100 sec.
SWING LEFT 360° – Boom 60° Elevation _____ sec.	
Minimum:	40 sec.
Maximum:	50 sec.
SWING RIGHT 360° – Boom 60° Elevation _____ sec.	
Minimum:	40 sec.
Maximum:	50 sec.
HOIST UP – Boom 60° Elevation _____ sec.	
Minimum:	30 sec.
Maximum:	45 sec.
HOIST DOWN – Boom 60° Elevation _____ sec.	
Minimum:	30 sec.
Maximum:	45 sec.

WEIGHTS

94 ft. Boom ..... 9500 lbs. (4309 kg)
Hoist ..... 470 lbs. (213 kg)
Lift Cylinder ..... 804 lbs. (365 kg)
Pedestal ..... 1925 lbs. (873 kg)
Turntable Assembly ..... 1300 lbs. (590 kg)
26 ft. Jib ..... 975 lbs. (442 kg)
26-46 ft. Jib ..... 1500 lbs. (680 kg)

Table 1-1. Torque Chart

				VALUES FOR ZINC PLATED FASTENERS ONLY									
				SAE GRADE 5 BOLTS & GRADE 2 NUTS					SAE GRADE 8 BOLTS & GRADE 8 NUTS, & SOCKET HEAD CAP SCREWS				
SIZE	TPI	BOLT DIA (IN)	TENSILE STRESS AREA (IN†)	CLAMP LOAD (LB)	TORQUE DRY OR LOCTITE 263 (LB_f-IN)	TORQUE LUBE (LB_f-IN)	TORQUE LOCTITE 262 (LB_f-IN)	TORQUE LOCTITE 242 OR 271 (LB_f-IN)	CLAMP LOAD (LB)	TORQUE DRY OR LOCTITE 263 (LB_f-IN)	TORQUE LUB (LB_f-IN)	TORQUE LOCTITE 262 (LB_f-IN)	TORQUE LOCTITE 242 OR 271 (LB_f-IN)
4	40	0.1120	0.00604	380	8	6			540	12	9		
	48	0.1120	0.00661	420	9	7			600	13	10		
6	32	0.1380	0.00909	580	16	12			820	23	17		
	40	0.1380	0.01015	610	18	13			920	25	19		
8	32	0.1640	0.01400	900	30	22			1260	41	31		
	36	0.1640	0.01474	940	31	23			1320	43	32		
10	24	0.1900	0.01750	1120	43	32			1580	60	45		
	32	0.1900	0.02000	1285	49	36			1800	68	51		
1/4	20	0.2500	0.0318	2020	96	75		105	2860	144	108		160
	28	0.2500	0.0364	2320	120	86		135	3280	168	120		185
					(LB_f-FT)	(LB_f-FT)	(LB_f-FT)	(LB_f-FT)	(LB_f-FT)	(LB_f-FT)	(LB_f-FT)	(LB_f-FT)	(LB_f-FT)
5/16	18	0.3125	0.0524	3340	17	13	16	19	4720	25	18	22	30
	24	0.3125	0.0580	3700	19	14	17	21	5220	25	20	25	30
3/8	16	0.3750	0.0775	4940	30	23	28	35	7000	45	35	40	50
	24	0.3750	0.0878	5600	35	25	32	40	7900	50	35	45	55
7/16	14	0.4375	0.1063	6800	50	35	45	55	9550	70	55	63	80
	20	0.4375	0.1187	7550	55	40	50	60	10700	80	60	70	90
1/2	13	0.5000	0.1419	9050	75	55	68	85	12750	110	80	96	120
	20	0.5000	0.1599	10700	90	65	80	100	14400	120	90	108	135
9/16	12	0.5625	0.1820	11600	110	80	98	120	16400	150	110	139	165
	18	0.5625	0.2030	12950	120	90	109	135	18250	170	130	154	190
5/8	11	0.6250	0.2260	14400	150	110	135	165	20350	220	170	180	240
	18	0.6250	0.2560	16300	170	130	153	190	23000	240	180	204	265
3/4	10	0.7500	0.3340	21300	260	200	240	285	30100	380	280	301	420
	16	0.7500	0.3730	23800	300	220	268	330	33600	420	320	336	465
7/8	9	0.8750	0.4620	29400	430	320	386	475	41600	600	460	485	660
	14	0.8750	0.5090	32400	470	350	425	520	45800	660	500	534	725
1	8	1.0000	0.6060	38600	640	480	579	675	51500	900	680	687	990
	12	1.0000	0.6630	42200	700	530	633	735	59700	1000	740	796	1100
1 1/8	7	1.1250	0.7630	42300	800	600	714	840	68700	1280	960	1030	1400
	12	1.1250	0.8560	47500	880	660	802	925	77000	1440	1080	1155	1575
1 1/4	7	1.2500	0.9690	53800	1120	840	1009	1175	87200	1820	1360	1453	2000
	12	1.2500	1.0730	59600	1240	920	1118	1300	96600	2000	1500	1610	2200
1 3/8	6	1.3750	1.1550	64100	1460	1100	1322	1525	104000	2380	1780	1907	2625
	12	1.3750	1.3150	73000	1680	1260	1506	1750	118100	2720	2040	2165	3000
1 1/2	6	1.5000	1.4050	78000	1940	1460	1755	2025	126500	3160	2360	2530	3475
	12	1.5000	1.5800	87700	2200	1640	1974	2300	142200	3560	2660	2844	3925

Note: These torque values do not apply to cadmium plated fasteners.

				SOCKET HEAD SCREWS					
				UNBRAKO 1960 SERIES SOCKET HEAD				KERR-LAKESIDE SOCKET HEAD	
SIZE	TPI	BOLT DIA (IN)	TENSILE STRESS AREA (IN†)	CLAMP LOAD (LB)	TORQUE AS RECEIVED w/o LOC-WEL PATCH (LB_f-FT)	TORQUE AS RECEIVED w/ LOC-WEL PATCH (LB_f-FT)	TORQUE LOCTITE 262 (LB_f-IN)	TORQUE LUBRICATED w/ LOC-WEL PATCH (LB_f-FT)	TORQUE DRY w/ LOC-WEL PATCH (LB_f-FT)
4	40	0.1120	0.00604						
	48	0.1120	0.00661						
6	32	0.1380	0.00909						
	40	0.1380	0.01015						
8	32	0.1640	0.01400						
	36	0.1640	0.01474						
10	24	0.1900	0.01750						
	32	0.1900	0.02000						
1/4	20	0.2500	0.0318	3180	13	14			
	28	0.2500	0.0364	3640	14	15			
5/16	18	0.3125	0.0524	5240	25	28	22	21	25
	24	0.3125	0.0580	5800	27	30	25	24	32
3/8	16	0.3750	0.0775	7750	45	50	40	38	50
	24	0.3750	0.0878	8780	50	55	45	43	55
7/16	14	0.4375	0.1063	10630	70	77	63	61	81
	20	0.4375	0.1187	11870	75	82	66	66	91
1/2	13	0.5000	0.1419	14190	110	120	96	93	124
	20	0.5000	0.1599	15990	115	127	105	105	140
9/16	12	0.5625	0.1820	18200	155	170	145		
	18	0.5625	0.2030	20300	165	182	150		
5/8	11	0.6250	0.2260	22600	210	231	170	178	236
	18	0.6250	0.2560	25600	220	242	190	203	270
3/4	10	0.7500	0.3340	33400	365	400	290	317	423
	16	0.7500	0.3730	37300	400	440	320	354	472
7/8	9	0.8750	0.4620	46200	585	645	480	512	682
	14	0.8750	0.5090	50900	635	700	510	563	751
1	8	1.0000	0.6060	60600	865	950	660	775	1022
	12	1.0000	0.6630	66300	915	1000	730	839	1118
1 1/8	7	1.1250	0.7630	76300	1240	1365	1000	1065	1448
	12	1.1250	0.8560	85600	1380	1520	1110	1203	1531
1 1/4	7	1.2500	0.9690	96900	1750	1925	1400	1535	2047
	12	1.2500	1.0730	107300	1880	2070	1510	1689	2265
1 3/8	6	1.3750	1.1550	115500	2320	2550	1860	2011	2681
	12	1.3750	1.3150	131500	2440	2685	1940	2295	3060
1 1/2	6	1.5000	1.4050	140500	3040	3345	2430	2672	3562
	12	1.5000	1.5800	158000	3270	3600	2610	2995	3994

Note: These torque values do not apply to cadmium plated fasteners.

MACHINE INSPECTION REQUIREMENTS

It should be noted that Occupational Safety and Health Administration (OSHA) regulations state that all cranes of the type covered by this manual be inspected and maintained on a regular, daily basis in accordance with recommendations made by the equipment manufacturer. In addition, a thorough annual inspection must be performed and a complete record of the inspection dates and results be maintained. These legal requirements are from OSHA Regulations 29CFR Parts 1910.180 and 1926.550. They are also specified in American National Standards Institute (ANSI) standard B30.5-1994 - Safety Code For Cranes, Derricks, Hoists, Jacks and Slings.

USTC, Inc. recommends that inspection procedures outlined in this and other manuals pertaining to this unit be followed and that a written record be maintained and available for review by Department of Labor personnel should the need arise. Further requirements are dependent upon state and local ordinances which govern the particular area in which the equipment operates.

⚠ WARNING: DO NOT MODIFY IN ANY WAY OR USE UNAUTHORIZED PARTS ON THE MACHINE WITHOUT THE EXPRESS WRITTEN CONSENT OF USTC, INC.

PREPARATION FOR USE

To ensure that the equipment is ready for operation at all times, it should be inspected systematically so that defects may be discovered and corrected before any result in serious damage or failure. Defects discovered during operation should be noted for future correction to be made as soon as operation has ceased. Stop operation immediately when a deficiency is noted which would damage equipment if operation were continued.

All visual inspections necessary to keep the unit in a state of operational readiness is the responsibility of management personnel. Most requirements are relatively simple, involving common sense coupled with a series of visual inspection guidelines.

⚠ WARNING: SINCE THE MACHINE MANUFACTURER HAS NO CONTROL OVER THE FIELD INSPECTION AND MAINTENANCE, SAFETY IN THIS AREA IS THE RESPONSIBILITY OF THE OWNER/OPERATOR.

LUBRICATION

The lubrication points to be covered periodically are illustrated and defined in Figure 2-1.

USTC, Inc. recommends using high quality hydraulic oil, such as AW68. If operating in cold climates, AW46 may be substituted.

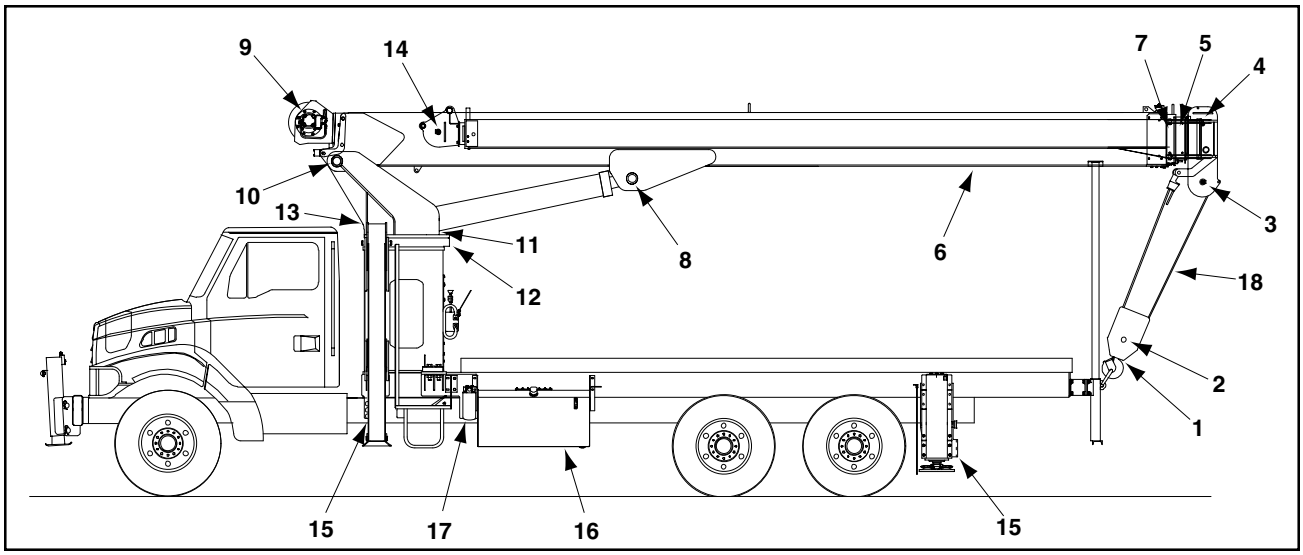


Figure 2-1. Lubrication Points

TABLE 2-1. Lubrication Points and Intervals

INDEX NO.	DESCRIPTION	LUBRICANT	HOURS	FITTINGS	NOTES
1	Hook Bearing	MPG	50	1	
2	Hookblock Sheave	MPG	50	1	
3	Lower Boom Nose Sheaves	MPG	50	1	
4	Upper Boom Nose Sheave	MPG	50	1	
5	Fly Extend Cable Sheave	MPG	50	1	Align holes in mid and fly.
6	Boom Assembly	MPG	500		Extend boom. Brush on wear pad travel area.
7	Fly Cable Retract Sheave	MPG	50	2	Align access hole in base boom.
8	Boom Pivot Bushing	MPG	50	2	
9	Hoist Oil Level – Check w/ boom at 0° by using the large oil level plug located in center of support.	Note A	100/1000		Change oil after first 100 hours and every 1000 hrs. thereafter.
10	Upper Lift Cylinder Pin	MPG	50	1	
11	Lower Lift Cylinder Pin	MPG	50	1	
12	Swing Bearing Pinion and Swing Bearing Teeth	MPG	50 500	2	Apply MPG, rotate turntable 90° and return, reapply MPG and rotate 90° in opposite direction.
13	Swing Gear Box	EPGL	250/1000		Change oil after first 250 hrs. and every 1000 hrs. thereafter. Oil level to be 1 1/2" from top of hub.
14	Jib Sheave (Optional)	MPG	50		
15	Outrigger/Stabilizer Wear Pads	MPG	500		Extend beam. Brush on wear pad travel area.
16	Hydraulic Oil Reservoir	HO	10/2000		Check level every 10 hrs. Change oil annually.
17	Hydraulic Oil Filter		50/250		Change filters after first 50 hrs. and every 250 hrs thereafter.
18	Hoist Wire Rope	PL	100		Brush on.
NS	Platform Pivot (Optional)	MPG	200	2	
NS	Platform Door Hinges	MPG	200	2	
NS	LMI Dynamometer (If Equipped)	MPG	50	2	

NS Not Shown
A Use Texaco® Meropa 150 or Equivalent

OPERATOR'S DAILY CHECKLIST

This paragraph provides a listing of those inspection procedures which must be performed before placing the unit in operation each day. Careful attention should be paid during actual operation of the unit to observe any conditions which might occur between regular inspections that could possibly be a safety hazard.

Proper inspection of the crane is also of extreme importance and reference must be made to the appropriate vehicle components.

⚠WARNING: DO NOT OPERATE MACHINE UNTIL CORRECTIVE MEASURES HAVE BEEN TAKEN AND ALL MALFUNCTIONS HAVE BEEN CORRECTED.

1. Visually inspect machine for loose or missing parts, foreign objects, hydraulic leaks from lines or components and structural damage.
2. Ensure that tires are inflated to the proper pressure. Refer to tire sidewall or contact tire manufacturer for proper tire inflation pressure.
3. With all systems shut down and machine in stowed or travel position, check oil level in hydraulic fluid reservoir. If necessary, fill to FULL mark on tank sight gauge.

Note: On new or recently overhauled machines or after changing hydraulic oil, operate all systems a minimum of two complete cycles and recheck oil in reservoir.

⚠CAUTION: NEVER HANDLE CABLES OR WIRE ROPE WITH BARE HANDS. BROKEN OR FRAYED STRANDS CAN CAUSE SEVERE CUTS. ALWAYS WEAR PROTECTIVE GLOVES IF IT IS NECESSARY TO HANDLE CABLE OR WIRE ROPE.

4. Inspect cable for defects as follows:
   a. Corrosion.
   b. More than one broken wire in any one strand.
   c. More than one broken wire near an attach fitting.
   d. Excessive wear or broken wires in cable sections under sheaves where cable travel is limited.
   e. Evidence of noticeable reduction in original cable diameter after allowance for normal stretch and diameter reductions of newly rigged cable.
   f. Excessive abrasion, scrubbing and peeling of outer wires, pitting, deformation, kinking, bird caging or other damage resulting in physical changes to the cable structure.
   g. Cracked, bent, worn or improperly installed wedge socket.
5. Inspect hook for security of attachment, proper swivel lubrication and for nicks, cracks, gouges, deformation or evidence of any other damage. Check for proper operation of hook safety latch.
6. Inspect the hookblock for security of attachments, proper lubrication and for nicks, cracks, gouges, deformation or evidence of any other damage.
7. Check wedge socket for proper size and proper cable installation.
8. Ensure all components requiring lubrication are serviced as necessary (i.e., wear pads, wire rope, sheaves, etc.).
9. Ensure that all control placards are located adjacent to the corresponding control device, and safety, warning and instruction placards are securely attached and legible.
10. Inspect steps, handholds, deck, operator platform and controls to ensure they are free of oil, grease, mud, water, debris and foreign objects (tools, material, rags, etc.). Check entire machine for debris which may interfere with operation.
11. Using all applicable safety precautions start engine and, with PTO engaged, check indicator on top of hydraulic filter mounted adjacent to oil tank for condition of element. Change element as required.
12. With the unit operating and before starting actual job site applications, inspect the following;
    a. Smooth and proper operation of all crane and outrigger functions. Check that Outrigger-in-Motion Alarm system is working properly.
    b. Check that boom and jib cable sheaves rotate freely and ensure that they are in good condition.
    c. Inspect all control levers, switches and accelerator pedal for proper installation and operation.
    d. Check for proper operation of all lights and reflectors.

e. Check anti-two-block device for proper operation. The hookblock must stop when it contacts the anti-two-block counterweight while winching up or telescoping out. Telescope out, hoist up and boom down must not function when in an anti-two-block condition.

f. Check anti-two-block device for proper operation. The load handling device must stop when it contacts the anti-two-block counterweight while hoisting up or telescoping out.

g. If equipped with Overload Audio/Visual Warning or Overload Cut-off, test the system by activating the toggle switch labeled "Capacity Alert Test Switch" located on the console. When the test switch is activated, the warning light must flash, the warning horn sound and the following crane controls must be disabled: Hoist Up, Telescope Out, Boom Up, and Boom Down.

   Next, lift and hold the "Override Switch for Lift Up Only" and attempt to lift the boom from its current position. If the boom elevates, the system is working properly.

⚠WARNING DAMAGE TO EQUIPMENT OR PERSONNEL MAY OCCUR IF THE FOLLOWING IS NOT ADHERED TO.

Note: The overload warning, overload cut-off and the LMI systems are an operational aid only and shall not be a substitute for good operator judgement, experience, and use of safe crane operating procedures. The responsibility for the safe crane operation shall remain with the crane operator who shall ensure that all warnings and instructions supplied are fully understood and observed.

h. If equipped with an LMI, refer to the manufacturers operation manual for daily and pre-operational checks to be performed. The manual is supplied with the crane and should be kept with the crane at all times.

PERIODIC INSPECTION

Note: This machine requires annual inspections by an authorized dealer. A decal, located on the turntable behind the cab affords a place to record (stamp) inspection dates. Notify dealer if inspection is overdue.

The crane must be thoroughly inspected periodically so as to detect in a timely manner the possibility of damaged or improperly installed parts. Frequency of inspection will to a large extent depend upon crane activity and severity of service but under no circumstances should the interval for the below listed inspections exceed one month. These inspections should also include those listed in the Daily Inspection Checklist.

The appropriate truck manual should be consulted for those inspection procedures which pertain to the carrier and the recommendations of the manufacturer must be strictly adhered to.

1. Inspect crane for any signs of deformation, damage and attaching hardware for security and missing items. Particular attention should be paid to areas of high potential stress, such as crane/truck frame attach points and outriggers.
2. Inspect outrigger assemblies for evidence of leakage and security, pressure lines for evidence of abnormal chafing.
3. Inspect power-take-off assemblies for security, wear and damage.
4. Inspect main hydraulic pumps and lines for damage, evidence of leakage and security of attachment.
5. Check hydraulic fluid reservoir and lines for damage, evidence of leakage and security of attachment. Check filter indicators for element condition. Clean or replace elements as necessary.
6. Check control levers in cab and linkage under operator platform for visible damage, loose or missing parts and proper lubrication. Assure that levers function properly.
7. Check control switches at outrigger control station and in cab for visible damage, loose or missing parts, security, electrical connections for corrosion and tightness, and wiring for proper routing. Assure that switches function properly.

8. Check instruments in truck cab for damage and security of installation. Check PTO knob and cable and indicator light for damage and security.
9. Inspect Load Capacity Charts, Hook Height Chart, Area of Operation Chart and corresponding Lifting Notes, decals and Instruction Chart for legibility and security.
10. Check batteries for damage, loose or missing cell caps, security and condition of cable connections and hold down brackets, and electrolyte for proper level. Add only clean distilled water as necessary.

⚠WARNING: DO NOT USE AN OPEN FLAME TO PROVIDE ILLUMINATION FOR BATTERY CHECKS. GASES GIVEN OFF BY BATTERY ARE EXPLOSIVE AND THEREFORE POTENTIALLY DANGEROUS TO PERSONNEL.

⚠WARNING: ALWAYS WEAR APPROPRIATE EYE PROTECTION WHEN SERVICING BATTERIES.

11. Check integral swing gear, bearing bolts and nuts for damage and proper torque, uneven wear patterns, correct lubrication, and proper meshing of torque hub pinion gear.
12. Inspect turntable and pedestal for obvious damage such as cracked welds, loose or missing hardware.
13. Check lift cylinder and hydraulic lines for damage, evidence of leakage and security of attachment.
14. Check boom pivot bushing for evidence of correct lubrication and shaft retainers for damage and security. Lubricate as necessary.
15. Check hoist for damage, evidence of leakage and security of attachment. Check for correct lay of cable on drum. Check hydraulic lines to hoist for damage, evidence of leakage and security of attachment. Check cable attachment to hoist drum.
16. Inspect hydraulic/electric swivel assembly for obstructions, damage and security of attachment. Check for pinched wires or hoses and leakage.
17. Check telescope cylinder and lines for damage, evidence of leakage and security of attachment.
18. Check boom structure for damage, missing or loose parts, hardware and security of attachment.
19. Check visible wear pads for damage, excessive wear and security of attachment.
20. Check jib extension for structural damage, security of attachment and evidence of sheave lubrication.
21. Check boom nose sheaves for damage, security of attachment, evidence of lubrication and correct cable seating in sheave grooves.
22. Check all cable guards and guides for damage and security of attachments.
23. Check anti-two-block device and any load monitoring hardware, if equipped, for damage and security of attachments.
24. Check jib stowage pins an extendable jib pin for security of attachment.
25. Check hookblock sheave(s) for damage, correct routing of cable around sheave grooves and evidence of proper lubrication at sheaves and hook swivel.
26. Check hook for damage, security of attachment and correct hook latch operation.
27. Check lift cylinder boom attach pivot points for evidence of lubrication.
28. Check boom rest for damage and security.
29. Check that all components requiring lubrication are serviced as necessary.
30. Check that no unauthorized modifications have been made to machine.
31. Check platform, if equipped, for damage, security of attachment, and functionality, if equipped. See Platform Safety Manual for further information.

GENERAL

This section contains troubleshooting information to be used for locating and correcting most of the operating problems which may develop in the crane. If a problem should develop which is not presented in this section of which is not corrected by listed corrective actions, technically qualified guidance should be obtained before proceeding with any maintenance.

Troubleshooting and maintenance information pertaining to the truck, rear axle, suspension and drive train components are contained in the applicable maintenance manual

TROUBLESHOOTING INFORMATION

The troubleshooting procedures applicable to the crane are listed and defined in Tables 3-1 through 3-5. As an aid to table use, the crane is divided into five major groups or systems, each covered within a separate section in this section. These groups or systems are as follows: boom assembly, pedestal, chassis, hydraulic system and electrical system.

Each malfunction or trouble within an individual group or system is followed by a listing of probable causes which will enable determination of the applicable remedial action. The probable causes and the remedial actions should, where possible, be checked in the order listed in the tables.

It should be noted that there is no substitute for a thorough knowledge of the equipment and related system Reference should be made to the applicable maintenance portion of the manual for instructions pertaining to the remedies listed in the troubleshooting tables.

It should be recognized that the majority of the problems arising in the crane will be centered in the hydraulic and electrical systems. For this reason, every effort has been made to ensure that all likely malfunctions in these areas are given the fullest possible treatment. In the remaining crane systems, only those malfunctions which are symptomatic of greater problems or which have more than one probable cause and remedy are included. This means that problems for which the probable cause and remedy may be immediately obvious are not listed in this section.

Table 3-1. Boom Assembly

TROUBLE	PROBABLE CAUSE	REMEDY
Fly or outer-mid section(s) will not extend or retract.	Broken extend or retract cable for fly and outer-mid section.	Replace applicable cables.
	Broken cable anchor weldment.	Replace anchor weldment.
	Broken telescope cylinder or inner/outer-mid section sheaves or sheave attach pins.	Replace applicable sheaves or attach pins.
Extension and retraction of fly or outer-mid section is erratic.	Extend or retract cables require adjustment.	Adjust cables.
	Cable nylon collar locking nuts or threaded end of cable stripped, causing excessive cable slack.	Replace nuts and applicable cables. Adjust cable systems.
	Cable sheave bushings defective as a result of cable overtightening.	Replace and lubricate sheaves.
	Lack of lubricant on fly or outer-mid section (85 and 94 ft. booms) or cable sheaves.	Lubricate as required.
	Wear pads out of adjustment or worn.	Adjust or replace pads.
	Fly or outer-mid section distorted.	Repair or replace sections.
Hoist cable movement erratic.	Insufficient lubricant on boom nose sheaves.	Lubricate sheaves (refer to Lubrication Chart).
	Wire rope broken or bird-caged.	Replace wire rope.
	Wire rope binding or incorrectly positioned on sheaves.	Check and align hoist and correctly position wire rope over sheaves.
Jib attach pins will not install.	Boom retract and extend cables out of adjustment.	Adjust boom cables.
	Attach pins damaged.	Replace attach pin.
	Boom nose lugs damaged.	Repair or replace lugs.
	Jib attach lugs damaged.	Repair or replace jib.
	Jib stowage attach bracket out of adjustment.	Adjust bracket.
Boom angle indicator inoperative.	Defective bearing.	Lubricate or replace bearing as necessary.
Boom raises and lowers noisily and erratically.	Upper lift cylinder pin damaged or worn.	Replace lift cylinder pin.
	Boom pivot pin or bushings damaged or worn.	Replace pivot pin or bushings.

Table 3-2. Pedestal

TROUBLE	PROBABLE CAUSE	REMEDY
Control valve spool sticking.	Dirt in oil causing excessive temperature buildup.	Change oil using recommended viscosity and flush system.
	Incorrect valve mounting causing warping of the unit.	Loosen valve and check mounting. Replace mounting if bent.
	Valve spool scored.	Remove valve and repair or replace.
	Return spring weak or broken.	Remove valve and repair or replace.
	Relief valve malfunctioning causing excessive pressure within valve.	Check pressure delivery to and from valve and repair or replace.
	Control rod or lever binding.	Repair or replace control rod or lever.
Control valve leaking.	Dirt or other foreign material under seal.	Remove and repair valve.
	Valve spool scored.	Remove valve and repair or replace.
	Excessive back pressure caused by restricted return line to reservoir.	Remove line and clear obstruction or replace line.
	Damaged valve seals.	Remove valve and repair or replace.
Turntable swing motion erratic.	Swing bearing attaching hardware loose or missing.	Replace all bearing bolts and torque properly.
	Swing bearing worn or requires lubrication.	Replace swing bearing or lubricate bearing.
Turntable coasts with control lever in neutral.	Flow control valve dirty or out of adjustment.	Clean flow control valve and adjust open to increase brake action.
Turntable stops abruptly when control lever is moved to neutral.	Flow control valve out of adjustment.	Adjust flow control valve closed as necessary to apply brake slowly.

Table 3-3. Chassis Components

TROUBLE	PROBABLE CAUSE	REMEDY
PTO jumping out of gear.	Shift rail poppet spring broken.	Replace poppet spring.
	Shift rail poppet notch worn.	Replace shift rail.
	Shift fork sprung or loose on shift rail.	Replace shift fork or tighten set screw in shift fork.
	Gear teeth worn.	Replace worn gears.
	Gears not shifted fully in mesh.	Check shift linkage for proper adjustments.
	Shift linkage too short.	Adjust shift linkage to permit full shift.
Noisy PTO.	Improper number of gaskets.	Check backlash and refer to setting the backlash.
	Gears worn and pitted.	Replace worn gears.
	Bearings worn due to high loads or chips.	Reduce load. Replace worn and rough bearings and change oil.
Oil leaking from PTO.	Oil seal failure.	Replace worn seal.
	Broken gaskets.	Replace gasket(s).
	Crack or hole in housing.	Replace housing.
Hydraulic pump noisy.	Air entering system through a broken hydraulic suction line or fitting.	Check suction side of hydraulic system for defects and repair.
	Air bubbles in oil caused by depleted reservoir oil level.	Add oil.
	Contaminated oil filters.	Replace oil filter.
	Worn or chipped pump gears.	Repair or replace pump.
	Worn or broken pump drive shaft.	Replace pump drive shaft.
No oil delivery from pump.	Low hydraulic oil level.	Add oil.
	Restricted or broken suction line.	Remove line and clear obstruction or replace.
	Worn or chipped pump gears.	Repair or replace pump.
	Worn or broken pump drive shaft.	Replace pump drive shaft.

Table 3-4. Hydraulic Components

TROUBLE	PROBABLE CAUSE	REMEDY
Outrigger will not extend.	Control rod or lever broken or disconnected.	Replace switch.
	Low hydraulic oil level.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump.	Repair or replace pump.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Hydraulic lines incorrectly connected to outrigger control valve.	Connect hydraulic lines properly.
	Hydraulic lines incorrectly connected to cylinder.	Connect hydraulic lines properly.
	Outrigger holding valve stuck in closed position.	Repair or replace holding valve.
	Relief valve in control valve set too low.	Adjust or replace relief valve.
	Malfunctioning outrigger valve.	Repair or replace outrigger control valves.
Outrigger will not retract.	Holding valve stuck in closed position.	Clean or replace holding valve.
	Control rod or lever broken or disconnected.	Repair or replace control rod or lever.
	Low hydraulic oil level.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump.	Repair or replace pump.
	Hydraulic lines incorrectly connected to outrigger control valve.	Connect hydraulic lines properly.
	Hydraulic lines incorrectly connected to cylinder.	Connect hydraulic lines properly.
	Malfunctioning crossover valve.	Repair or replace crossover valve.
	Malfunctioning outrigger valve.	Repair or replace outrigger control valves.
	Excessive oil leak past piston seal.	Repair or replace cylinder.
	Relief valve in control valve set too low.	Adjust or replace relief valve.

Table 3-4. Hydraulic Components (continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Outrigger cylinder retracts during crane operation.	Low hydraulic oil level.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump.	Repair or replace pump.
	Worn valve spool.	Check pressure delivery from control valve and repair or replace valve.
Cylinders extend or retract erratically.	Low hydraulic oil level.	Add oil.
	Restricted or broken hydraulic line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump.	Repair or replace pump.
	Control cable broken, kinked or disconnected.	Repair or replace control cable.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Check valve in hoist sticking in closed position.	Repair or replace sticking valve.
	Hoist drive motor defective.	Repair or replace hoist motor.
	Hoist brake not releasing.	Disassemble hoist and check for pressure of pilot pressure at hoist brake. Repair, as necessary.
	Return relief valve in hoist stuck in closed position.	Disassemble hoist and repair or replace valve.
	Hoist primary drive assembly damaged.	Disassemble hoist and repair or replace primary drive.
	Relief valve in hoist control valve inlet section set too low.	Adjust or replace relief valve.
Hoist will not lower load or load handling device.	Load capacity exceeded.	Reduce load. Refer to Load Capacity Chart.
	Anti-two-block valve closed.	Repair or replace anti-two-block.
	Low hydraulic oil level.	Add oil.
	Restricted or broken hydraulic line.	Remove line and clear obstruction or replace lines.
	Malfunctioning hydraulic pump section.	Repair or replace pump.
	Control cable broken, kinked or disconnected.	Repair or replace control cable.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.

Table 3-4. Hydraulic Components (continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Hoist will not raise load or load handling device.	Hoist drive motor defective.	Repair or replace hoist motor.
	Check valve in hoist sticking in closed position.	Repair or replace sticking valve.
	Return relief valve in hoist stuck in closed position.	Disassemble hoist and repair or replace relief valve.
	Hoist primary drive assembly damaged.	Disassemble hoist and repair replace primary drive.
	Relief valve in hoist control valve inlet section set too low.	Adjust or replace relief valve.
	Hoist brake clutch defective.	Disassemble hoist and repair or replace clutch.
	Uneven hoist mounting.	Check hoist for correct mounting.
Hoist will not raise load or load handling device (continued).	Excessive back pressure at hoist motor manifold.	Check hoist counterbalance valves and repair.
	Hoist brake defective.	Disassemble hoist and repair or replace brake.
	Hoist control valve spool stuck in open position.	Clean or replace valve section.
Hoist lowers load with control lever in neutral.	Relief valve in hoist control valve opening and closing.	Clean or replace relief valve.
	Hoist friction brake intermittently engaging and releasing.	Disassemble hoist and repair or replace brake system.
	Anti-two-block valve not opening completely.	Repair or replace anti-two-block solenoid valve.
Hoist chatters while raising or lowering load.	Load capacity exceeded.	Reduce load. Refer to Load Capacity Chart.
Boom will not elevate.	Hydraulic oil level low.	Add oil.
	Restricted or broken hydraulic line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump.	Repair or replace pump.
	Control cable broken, kinked or disconnected.	Repair or replace control cable.
	Check valve in lift control valve inlet stuck in closed position.	Clean or replace sticking valve.
	Worn control valve spool.	Check pressure delivery to valve and clean or replace section.
	Main relief valve spool too low.	Adjust or replace relief valve.
	Holding valve in lift cylinder stuck in closed position.	Clean or replace defective valve.
	Excessive oil leak past lift cylinder piston seal.	Repair or replace cylinder.

Table 3-4. Hydraulic Components (continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Boom will not lower.	Hydraulic oil level low.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump section.	Repair or replace pump.
	Control cable broken, kinked or disconnected.	Repair or replace control cable.
	Check valve in control valve section inlet stuck in closed position.	Repair or replace check valve.
	Excessive oil leak past cylinder piston seal.	Repair or replace cylinder.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Hydraulic lines incorrectly connected at control valve.	Connect hydraulic lines properly.
	Holding valve in lift cylinder stuck in closed position.	Check for presence of pilot pressure at return valve and repair or replace.
Boom raises and lowers erratically.	Hydraulic oil level low.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump section.	Repair or replace pump.
	Excessive oil leak past lift cylinder piston seal.	Repair or replace cylinder.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Boom pivot pin seized or otherwise damaged.	Replace pivot pin and bushings.
	Malfunctioning holding valve on cylinder.	Replace holding valve.
Boom lowers with control lever in neutral.	Defective cylinder packing.	Repair or replace cylinder.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Malfunctioning holding valve on cylinder.	Replace holding valve.

Table 3-4. Hydraulic Components (continued)

TROUBLE	PROBABLE CAUSE	REMEDY
No turntable swing in either direction.	Hydraulic oil level low.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump section.	Repair or replace pump.
	Control cable broken, kinked or disconnected.	Repair or replace control cable.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Malfunctioning swing motor.	Repair or replace motor.
	Malfunctioning swing brake.	Repair or replace swing brake.
	Malfunctioning drive hub.	Repair or replace drive hub.
	Relief valve in control valve inlet set too low.	Adjust or replace relief valve.
Turntable swings in only one direction.	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Foreign object wedged in swing gear teeth.	Remove obstruction and check for damage. Repair as necessary.
	Malfunctioning counterbalance valve.	Replace counterbalance valve.
Swing motion erratic.	Hydraulic oil level low.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump.	Repair or replace pump.
	Worn or broken teeth on drive hub pinion or swing bearing gears.	Replace pinion gear or swing bearing.
	Malfunctioning swing motor.	Repair or replace motor.
	Malfunctioning swing brake.	Repair or replace swing brake.
	Malfunctioning counterbalance valve.	Replace counterbalance valve.

Table 3-4. Hydraulic Components (continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Swing motor operation slow.	Hydraulic oil level low.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump.	Repair or replace pump.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Worn or defective swing motor.	Repair or replace motor.
	Swing circuit relief vale set too low.	Adjust or replace relief valve.
Boom will not telescope out.	Check valve in telescope section stuck in closed position.	Repair or replace sticking valve.
	Control cable broken, kinked or disconnected.	Repair or replace control cable.
	Hydraulic oil level low.	Add oil.
	Malfunctioning hydraulic pump.	Repair or replace pump.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Hydraulic lines incorrectly connected at control valve.	Connect hydraulic lines properly.
	Excessive oil leaking past cylinder piston seal.	Repair or replace cylinder.
	Check valve in telescope cylinder stuck in closed position.	Repair or replace valve.
	Main relief valve set too low.	Adjust or replace relief valve.
	Anti-two-block valve defective or switch stuck.	Replace valve or switch.
Boom will not telescope in.	Check valve in telescope section stuck in closed position.	Repair or replace sticking valve.
	Control cable broken, kinked or disconnected.	Repair or replace control cable.
	Hydraulic oil level low.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump.	Repair or replace pump.
	Excessive oil leak past cylinder piston seal.	Repair or replace cylinder.

Table 3-4. Hydraulic Components (continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Boom will not telescope in (continued).	Worn control valve.	Check pressure delivery from control valve and repair or replace valve.
	Hydraulic lines incorrectly connected at control valve.	Connect hydraulic lines properly.
	Holding valve in telescope cylinder stuck in open position.	Check for presence of pilot pressure at return valve and repair or replace.
	Relief valve in telescope section of control valve set too low.	Adjust or replace relief valve.
Boom retracts with control lever in neutral.	Malfunctioning holding valve.	Remove and repair telescope cylinder.
	Defective cylinder packing.	Remove and repair cylinder.
	Worn control valve spool.	Repair or replace valve section.
Boom telescoping action erratic.	Hydraulic oil level low.	Add oil.
	Restricted or broken supply line.	Remove line and clear obstruction or replace line.
	Malfunctioning hydraulic pump section.	Repair or replace pump.
	Worn control valve spool.	Check pressure delivery from control valve and repair or replace valve.
	Extend and retract cables require adjustment.	Adjust cables.
	Cable nylon collar locking nuts or threaded end of cables stripped.	Replace nuts and applicable cables. Adjust cables.
	Cable sheave bushings defective because of cable overtightening.	Replace sheaves and lubricate. Adjust cables.
	Lack of lubricant on boom sections.	Lubricate boom sections.
	Wear pads out of adjustment or worn.	Adjust or replace wear pads.
	One or more boom sections distorted.	Repair or replace boom sections.

Table 3-5. Electrical System

TROUBLE	PROBABLE CAUSE	REMEDY
Warning horn inoperative.	Fuse in horn circuit blown.	Determine cause of circuit overload or short and correct before replace fuse.
	Malfunctioning horn button switch or loose terminal connections.	Check switch for correct operation with test meter. Replace or repair as necessary.
	Malfunctioning horn.	Check for defective horn with test meter. Replace as necessary.
	Relay in ground electrical box defective.	Replace relay.

GENERAL

This manual covers the 94 ft. boom which is mounted on 2500JBT and 2700JBT cranes. The boom consists of four sections, a telescope cylinder inside of the boom and the hoist. For the purposes of this manual the lift cylinder is also to be considered part of the boom.

The boom must be maintained properly to provide long life and proper operation. Wear pads are consumable items which must be adjusted through shims or replaced when necessary. Cables inside the boom will stretch and require adjustment.

The wire rope or hoist cable must be wrapped properly on the hoist.

CABLE INSPECTION PROCEDURES

All cables must be inspected on a daily basis. In addition to the daily inspection a qualified person should do a complete and thorough inspection annually or every 2000 hours, whichever occurs first.

⚠CAUTION: WEAR GLOVES TO PROTECT HANDS WHEN HANDLING CABLE.

The periodic inspection shall cover the entire length of cable. The inspection frequency shall be based on such factors as expected cable life as determined by experience with similar installations, severity of environment, percentage of capacity lifts, frequency rates of operation, and exposure to shock loads. Inspection should be more frequent as cables approach the end of their useful lives.

Only the surface wires of the cable require inspection. Do not attempt to open the cable. Any deterioration resulting in an appreciable loss of original strength, such as described below, shall be noted, and then a determination made if further use would constitute a hazard.

No precise rules can be given for determination of the exact time for replacement of the cables. This depends largely on good judgment by a qualified person evaluating the cable.

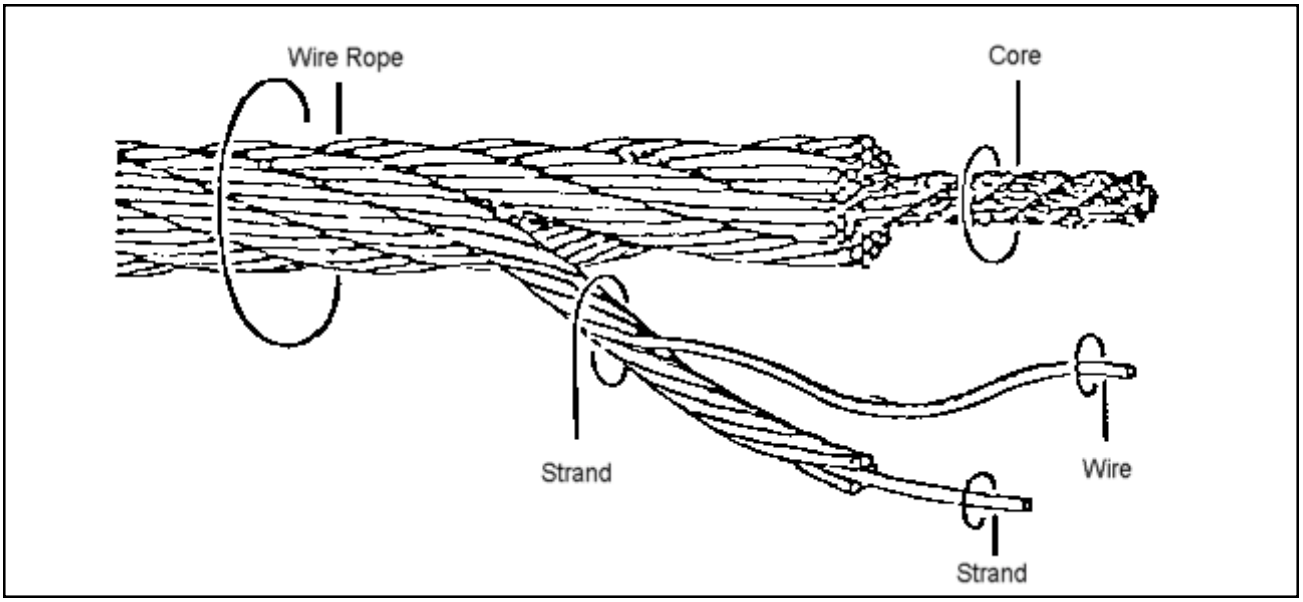


Figure 4-1. Wire Rope Components

The American National Standard for crane safety (ANSI B30.5b-1991) states:

Conditions such as the following shall be sufficient reason for questioning continual use of the (cable) or increasing the frequency of inspection:

1. In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay.

2. One outer wire broken at the point of contact with the core of the rope which has worked its way out of the rope structure and protrudes or loops out from the rope structure. Additional inspection of this section is required.

3. Wear of one-third the original diameter of outside individual wires.

4. Kinking, crushing, bird-caging or any other damage resulting in distortion of the rope structure.

5. Evidence of any heat damage from any cause.

6. Reductions from nominal diameter of more than;

a. 1/64 in. (0.4 mm) for diameters up to and including 5/16 in. (8.0 mm);

b. 1/32 in. (0.8 mm) for cable diameters of 3/8 in. (9.5 mm) to and including 1/2 in. (13.0 mm).

c. 3/64 in. (1.2 mm) for diameters 9/16 in. (14.5 mm) to and including 3/4 in. (19.0 mm).

Note: A good indicator of stretched extend/retract cables is if the adjusting nuts are bottomed out. If no adjustment remains the cables have stretched and need replacement.

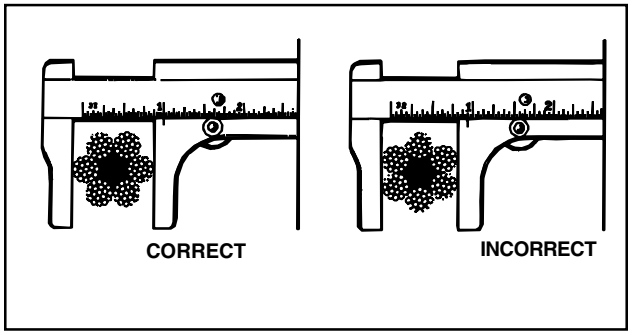


Figure 4-2. Measuring Wire Rope

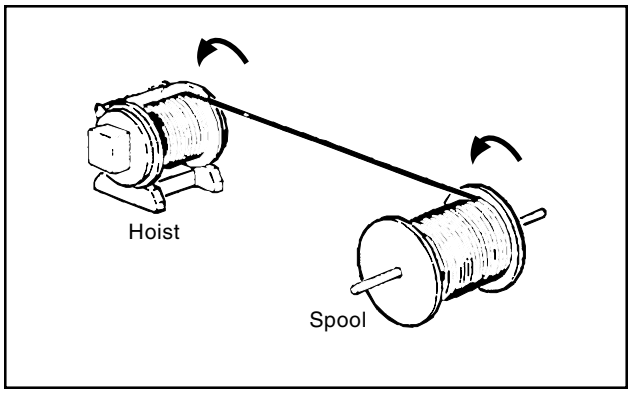


Figure 4-3. Hoist Cable Spooling

Also, check for cracked, bent, worn, severely corroded, or improperly installed cable ends.

Inspect sheave grooves for excessive wear.

IMPORTANT: To establish a basis for judging the proper time for cable replacement, a dated cable condition report from each periodic inspection shall be kept on file. Per ANSI specifications, replacement parts shall have a strength rating at least as great as the original any deviation from the original must be specified by the manufacturer, a wire ripe manufacturer or a qualified person.

Note: Cable must be spooled onto hoist in same direction as removal from spool.

HOIST CABLE

Installation and Attachment Procedure

1. From top of spool route cable over top idler sheave.
2. Continue routing cable along base boom and anchor to hoist drum.
3. Keeping cable tight as possible, operate hoist and spool cable onto drum using a brass mallet to assure cable wraps properly.
4. If using multi-part line, properly reeve cable through sheave wheels of boom nose and hook-block assembly.
5. Attach cable to wedge socket. Attach wedge socket assembly to attaching link on bottom of boom nose.

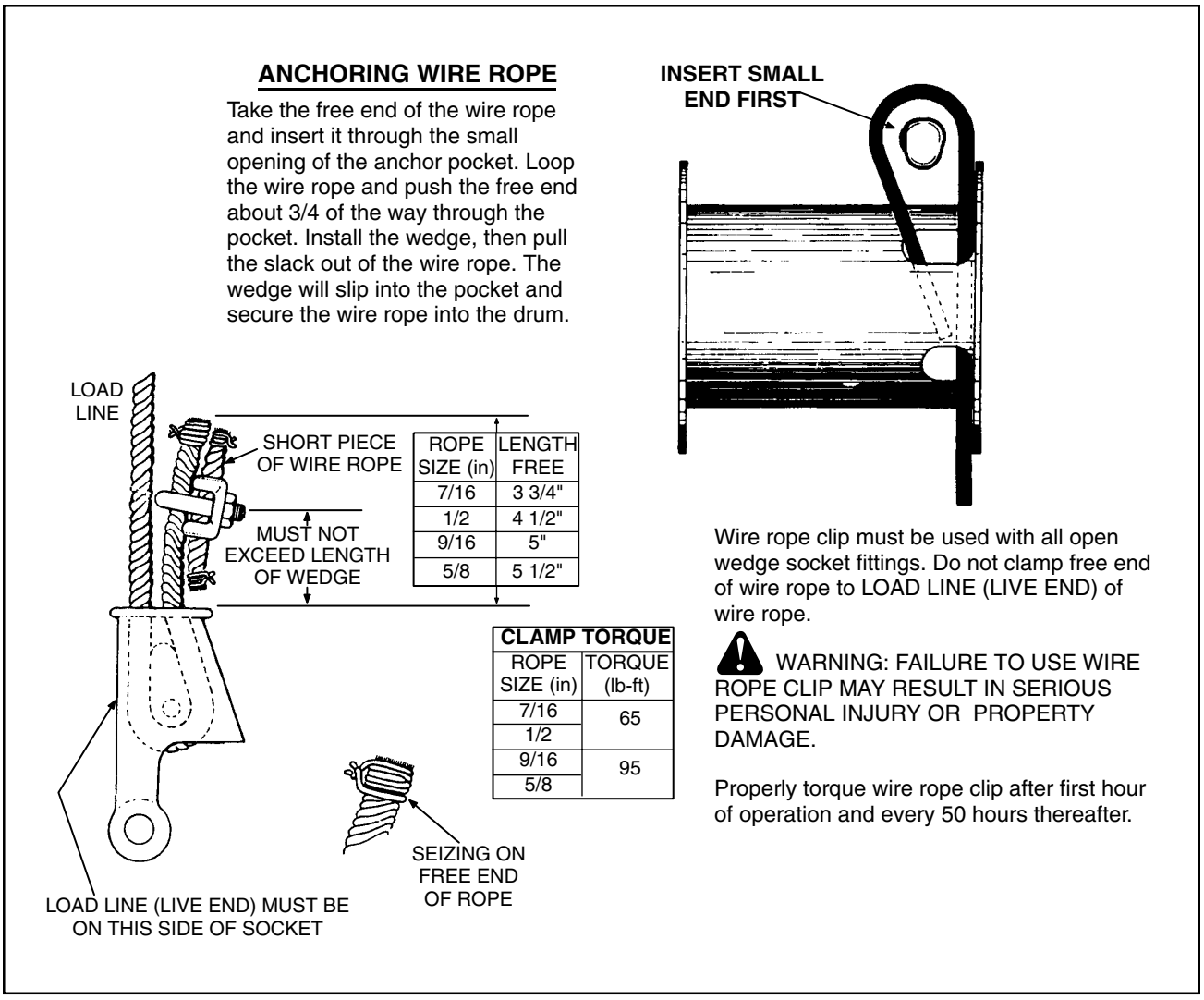


Figure 4-4. Cable Socket and Wedge Installation

Break-In Procedure

A new wire rope requires careful installation and proper break-in. Initial operation should include several run-throughs of the normal operational cycle under light load (1000 lbs.) and at reduced speed. During this trial operation, a very close watch should be kept on all working parts, sheaves, drums, and rollers to make certain that the wire ripe runs freely, and without any possible obstruction. This procedure allows the component parts of the new rope to make a gradual adjustment to the actual operating conditions.

CABLE REEVING

In addition to reeving the cable from boom nose to hook block, the standard hookblock converts from a headache ball to either a single sheave or two sheave hookblock. The single sheave hookblock is capable of handling up to three-part line and the two sheave hookblock is capable of four-part line.

The number of parts of line determines the lift capacity of the hoist. The crane is capable of handling from 1 to 6 parts-of-line. To obtain the maximum amount of permissible rope pull multiple parts-of-line must be run. See the Permissible (Main) Rope Pull section of the Load Capacity Chart for different ratings for each configuration.

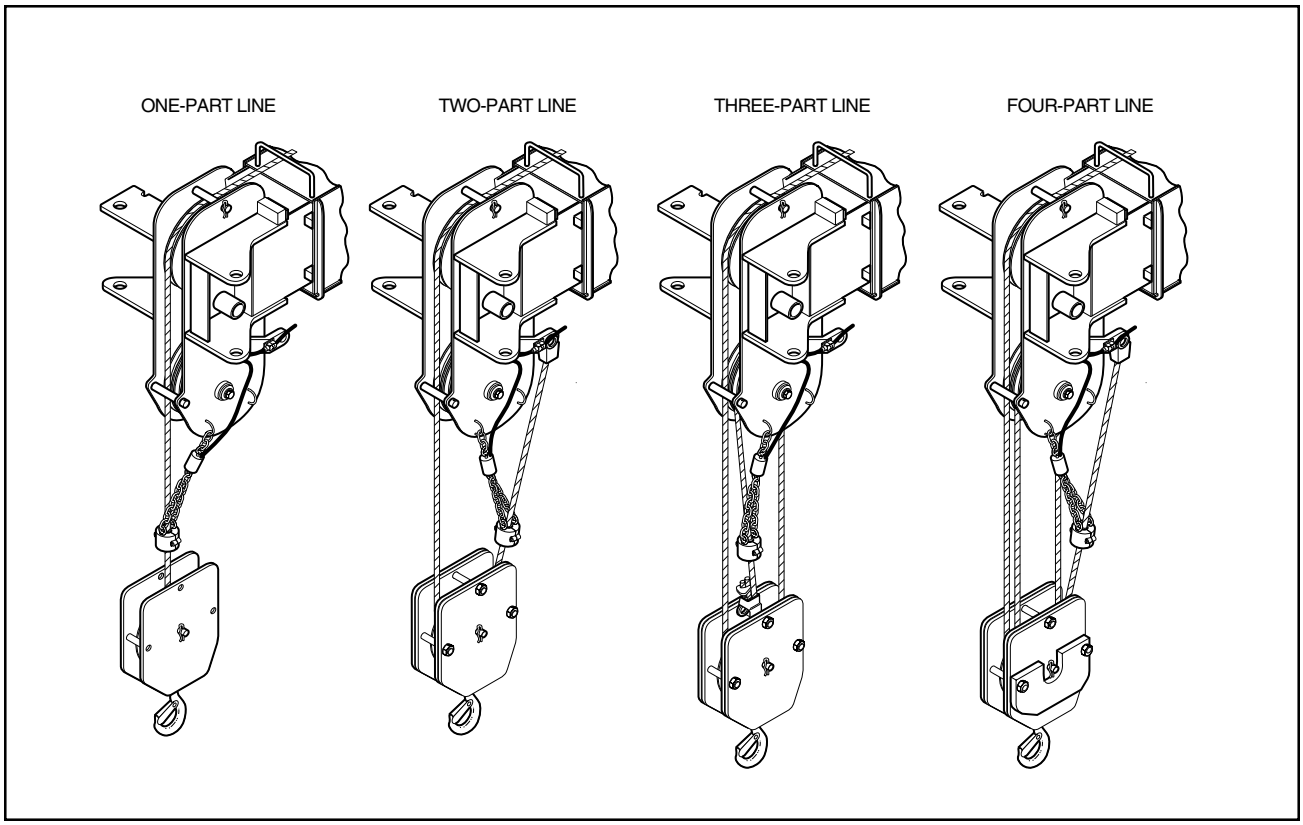


Figure 4-5. Cable Reeving

The following sections define how to reeve the wire rope for the different parts of line assuming the appropriately sized hookblock is installed with the correct number and size of sheaves.

Single-Part Line Reeving

Note: The following procedure must be followed and used before lifting any load with single-part line.

1. Lower boom to allow access to boom nose upper and lower sheave wheels, and hoist cable retaining pins.
2. Pay out enough hoist cable so end of cable extends beyond boom nose.
3. If not already done, reeve hoist cable through base and mid-boom cable guides on top of boom.
4. Remove upper and lower hoist cable retaining pins on boom nose.
5. Reeve hoist cable through the boom nose over the upper sheave wheel and lower right sheave wheel.
6. If not already done, install cable socket onto the end of the hoist cable.
7. Attach cable socket to the headache ball assembly using the 1-1/4 in. diameter straight pin and secure with clip pins provided. Use center (lower) pin hole of headache ball/hookblock combination in headache ball configuration.
8. Reinstall anti-two-block counterweight around the hoist cable and adjust counterweight chain length to activate cut-off switch before two-blocking occurs.

Two-Part Line Reeving

Note: The following procedure must be followed and used before lifting any load with two-part line.

1. Lower boom to allow access to boom nose.
2. If the headache ball is installed, lower onto the ground or suitable capacity stand. Remove hair pins and straight pin securing cable socket to the headache ball.
3. Remove anti-two-block counterweight from around the hoist cable. Let hang.
4. Configure headache ball/hookblock assembly.

Note: Cable socket does not need to be removed. Lay hoist cable into hookblock single sheave wheel groove before installing sheave wheel into headache ball/hookblock assembly body.

5. Attach cable socket to the lug behind lower sheave wheel on the boom nose using the pin and pin clip provided.
6. Reinstall anti-two-block counterweight around the hoist cable and adjust counterweight chain length to activate cut-off switch before two-blocking occurs.

Three-Part Line Reeving

Note: Reference to right and left is made with the operator facing the controls on the console.

Note: The following procedure must be followed and used before lifting any load with three-part line.

1. Lower boom to allow access to boom nose.
2. Remove anti-two block counterweight from around the hoist cable. Let hang.
3. If the headache ball/hookblock combination is installed, lower to the ground and pay out approximately 25 ft. of cable.

Note: Three-part load line requires the boom head lower sheave wheel position to be configured for double sheave wheel operation.

4. Remove hair pin from the wedge socket pin securing the wedge socket to the boom nose lug or hookblock/headache ball assembly.
5. Remove lower hoist cable retaining pin from the boom nose.
6. The headache ball/hookblock assembly must be configured as a single or double sheave hookblock assembly. The hoist cable can either be reeved through the headache ball/hookblock assembly after removing the open wedge cable socket, as in Step 7, or sheave wheel can be removed from the headache ball/hookblock assembly by removing center sheave wheel pin, spacers and sheave wheel.
7. Remove open wedge cable socket from end of hoist cable, if attached, and reeve hoist cable through boom nose left lower sheave wheel.
8. After reeving cable through boom nose sheave reattach the cable socket to the hoist cable. Attach cable socket to headache ball/hookblock assembly's wedge socket pin hole (at the top center of the block), using the wedge socket pin and hair pin provided.
9. Reinstall lower hoist cable retaining pin in boom nose.
10. Reinstall anti-two-block counterweight around the hoist cable and adjust counterweight chain length to activate cut-off switch before two-blocking occurs.

Four-Part Line Reeving

Note: Reference to right and left is made with the operator facing the controls on the console.

Note: The following procedure must be followed and used before lifting any load with four-part line.

1. Lower boom to allow access to boom nose.
2. Remove anti-two-block counterweight from around the hoist cable, let hang.
3. If the headache ball/hookblock combination is installed, lower to the ground and pay out approximately 25 ft. of cable.

Note: Four-part load line requires the boom head lower sheave wheel position to be configured for double sheave wheel operation.

4. Remove hair pin from the wedge socket pin securing the wedge socket to the boom nose lug or hookblock/headache ball assembly.
5. Remove lower hoist cable retaining pin from the boom nose.
6. The headache ball/hookblock assembly must be configured as a double sheave hookblock assembly. The hoist cable can either be reeved through the headache ball/hookblock assembly with the open wedge cable socket removed, as in Step 7, or hookblock sheave wheels can be removed from the headache ball/hookblock assembly by removing center sheave wheel pin, spacers and sheave wheels.
7. Remove open wedge cable socket from end of hoist cable, if attached, and reeve hoist cable through boom nose left, lower sheave wheel.
8. After reeving cable through boom nose sheave and headache ball/hookblock assembly sheaves, reattach cable socket to the hoist cable. Attach cable socket to boom nose lug wedge socket hole, using the wedge socket pin and hair pin provided.
9. Reinstall lower hoist cable retaining pin in boom nose.
10. Reinstall anti-two-block counterweight around the hoist cable and adjust counterweight chain length to activate cut-off switch before two-blocking occurs.

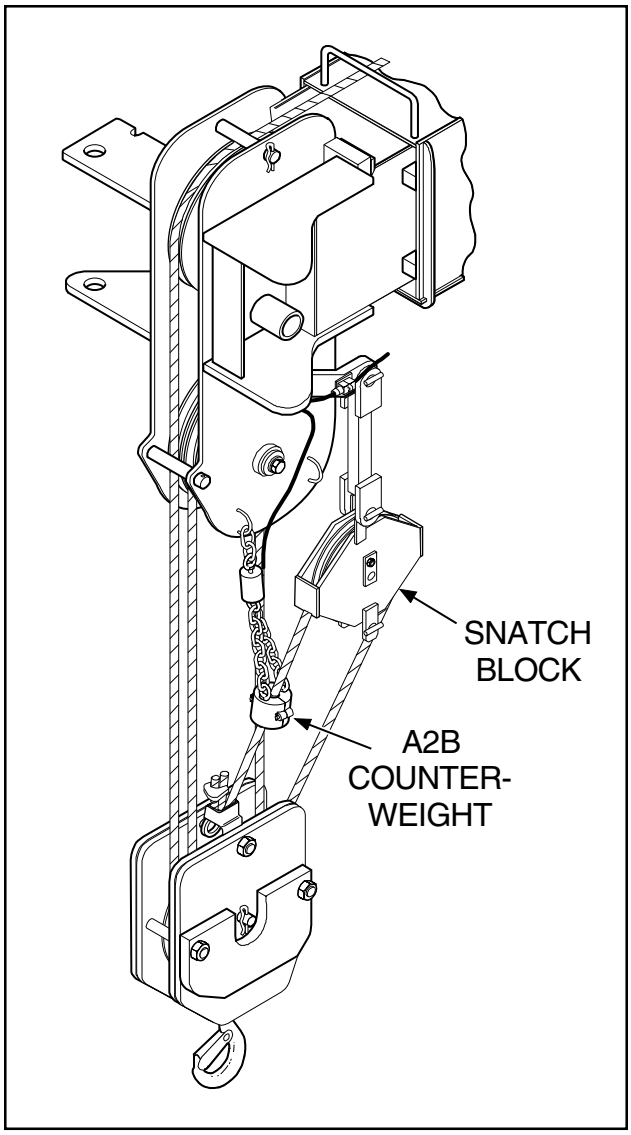


Figure 4-6. Snatch Block

Five and Six-Part Line Reeving

If it is desired to handle higher loads than the four-part lined is rated for, the crane can be equipped with a single sheave snatch block to allow for five and six-part line reeving. The snatch block hangs from the boom nose lug and functions as an additional lower sheave on the boom nose.

Note: Five-part line requires a two-sheave hookblock. Six-part line requires a three-sheave hookblock.

1. Lower boom to allow access to boom nose.
2. Lower installed headache ball, hookblock or other load handling device onto ground or suitable capacity stand. Remove cable socket from the load handling device.
3. Remove anti-two-block counterweight from around hoist cable and let hang.
4. Remove lower hoist cable retainer pin from boom nose.
5. Securely attach snatch block to boom nose lug. Be sure block is oriented properly.
6. Reeve hoist cable through hookblock and lower boom sheaves as if for four-part line. Continue reeving through the snatch block and attach to

the hook block lug (five-part line) or the snatch block lug (six-part line).

7. Reinstall lower hoist cable retaining pin.
8. Reinstall anti-two-block counterweight around hoist cable. It may be necessary to add additional length to the counterweight chain. The counterweight must hang at least 14 in. below the snatch block

   For five-part line install the counterweight on dead end line going to the hook block.

   For six-part line install the counterweight on dead end line going to the snatch block.

WEAR PADS

Wear pads are located at the ends of each boom section. Shim wear pads to allow 1/16 in. gap between wear pad and adjacent surface. Replace wear pads when worn to within 1/8 in. of insert or screw head.

Top and bottom wear pads are located inside each section on the nose end. Vertical clearance is adjusted using the two bottom wear pads and the appropriate amount of shims.

Two top wear pads are located at the pedestal end of the outer sections. Wear pad adjustment is made by adding shims through access holes on the top of the base at the pedestal end.

Side wear pads are also used and are adjustable. On the nose end of each section four nylatron wear pads are placed inside the section (two per side). At the pedestal end of the boom, metal wear pads and shims are welded to the outside of the sections.

Note: When assembling a new boom, it is beneficial to measure the clearance inside each section and install the wear pads at pedestal end before assembling sections.

Side Wear Pads

The side wear pads, in addition to being shimmed to eliminate any gap, must also be adjusted to make the boom extend straight. When the boom is fully extended, the boom must be within 1/2 in. of straight when measured side-to-side.

Fully extend the boom. Attach one end of a string centered on top of the boom at the pedestal end and the other at the nose end. If the boom string does not trace along the center of the boom, add or remove shims under side wear pads at nose end to cause the boom to be straight. If boom curves to the right, remove shims from left side of the section that seems to be causing the bend and reinstall them on the right side. Continue to adjust shims until the boom is straight within 1/2 in.

EXTEND/RETRACT BOOM CABLES

Cable Inspection Procedures

⚠CAUTION: WEAR GLOVES TO PROTECT HANDS WHEN HANDLING CABLE.

Boom extend and retract cables must receive periodic inspections by a qualified person. Inspections should occur annually or every 2000 hours, which ever occurs first, and more often when deemed necessary, based on experience.

In order to inspect the cables the telescope cylinder and fly section must be removed from the boom. The cables can then be removed and the full length examined.

Refer to the Cable Inspection Procedures earlier in this section.

HOIST LAYBACK

⚠WARNING: ENSURE MACHINE IS ON A FIRM AND LEVEL SURFACE.

IMPORTANT: Before adjusting boom extend and retract cables, remove boom stop on top of fly section, just behind boom nose. After cables have been adjusted, fully retract boom, install boom stop and shim as necessary until boom stop is snug against inner-mid or outer-mid section top plate.

1. Using all safety precautions operate crane and properly set outriggers and stabilizers.
2. Lower boom to allow access to boom nose.
3. Extend boom far enough to remove boom stops and shims from fly section just behind boom nose.

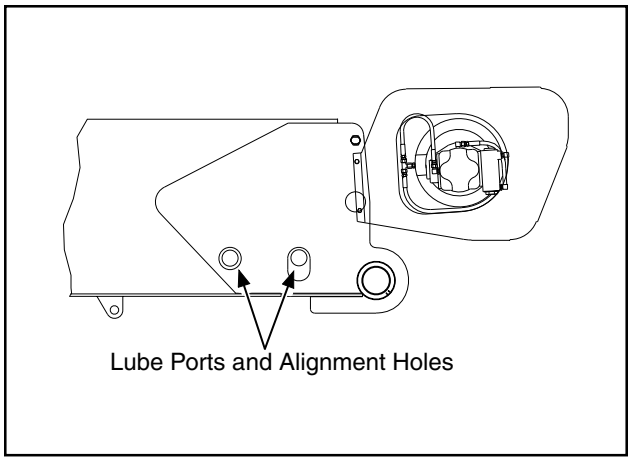


Figure 4-7. Hoist Layback

4. Retract boom to ensure telescope cylinder is fully retracted (bottomed).

Note: Open wedge socket may need to be removed to unreeve cable from around lower boom nose sheave wheels in next step if crane is configured for 3 or 4-part line. If socket is removed it will need to be reinstalled to help lower hoist out of way as in the following steps.

5. With boom still in lowered position, remove headache ball/hook block assembly from hoist cable and unreeve cable from boom nose sheaves. Also remove upper and lower hoist cable retaining pins from boom head.
6. Using all applicable safety precautions, operate the hoist and retract cable onto drum until cable socket on the end of cable is up over the boom nose and next to cable socket attach lug on top of base boom.
7. Using cable socket, pin hoist cable to cable socket attach lug on top of base boom and remove any excess slack in hoist cable.
8. Using all applicable safety precautions, operate crane and move the boom to the horizontal position.
9. Remove upper two bolts on the hoist mount that go through the side plates of base boom.
10. Using all safety precautions start crane and operate hoist lower lever and gradually lower hoist till it comes to rest on the turntable.
11. With hoist in resting position, operate hoist to allow slack in hoist cable to move cable to side out of way.
12. Shut down crane.
13. Reverse process to reinstall the hoist for operation.

⚠WARNING: NEVER OPERATE CRANE WITHOUT PLEXIGLASS SHIELDING IN PLACE.

Extend/Retract Cable Adjustment Procedure

IMPORTANT: If locking nuts bottom out on threaded cable adjustment ends on both the extend and retract cables (no threads remain before adjustment dimension or torque can be obtained) cables are stretched and require replacement.

Always replace cables for each boom section in sets, i.e. all fly and outer-mid section extend cables or all fly and outer-mid section retract cables.

It is acceptable to cut one inch off of cable adjustment stud with an abrasive cutting saw if extend cable stud interferes with hoist mounting plate.

Note: Do not torque retract cable ends on boom nose end of base boom. Torque only extend cables on hoist end of base boom).

The boom has six extend cables and four retract cables. Two extend cables extend the fly section and four extend cables extend the outer-mid section. The outer-mid and fly sections each use two retract cables.

1. Lay back hoist. Refer to procedure earlier in this section.
2. Adjust outer-mid retract cables so lube port holes at pedestal end of the boom line up with grease fittings and all slack is removed from cables.
3. Adjust outer-mid extend cables to remove all slack.

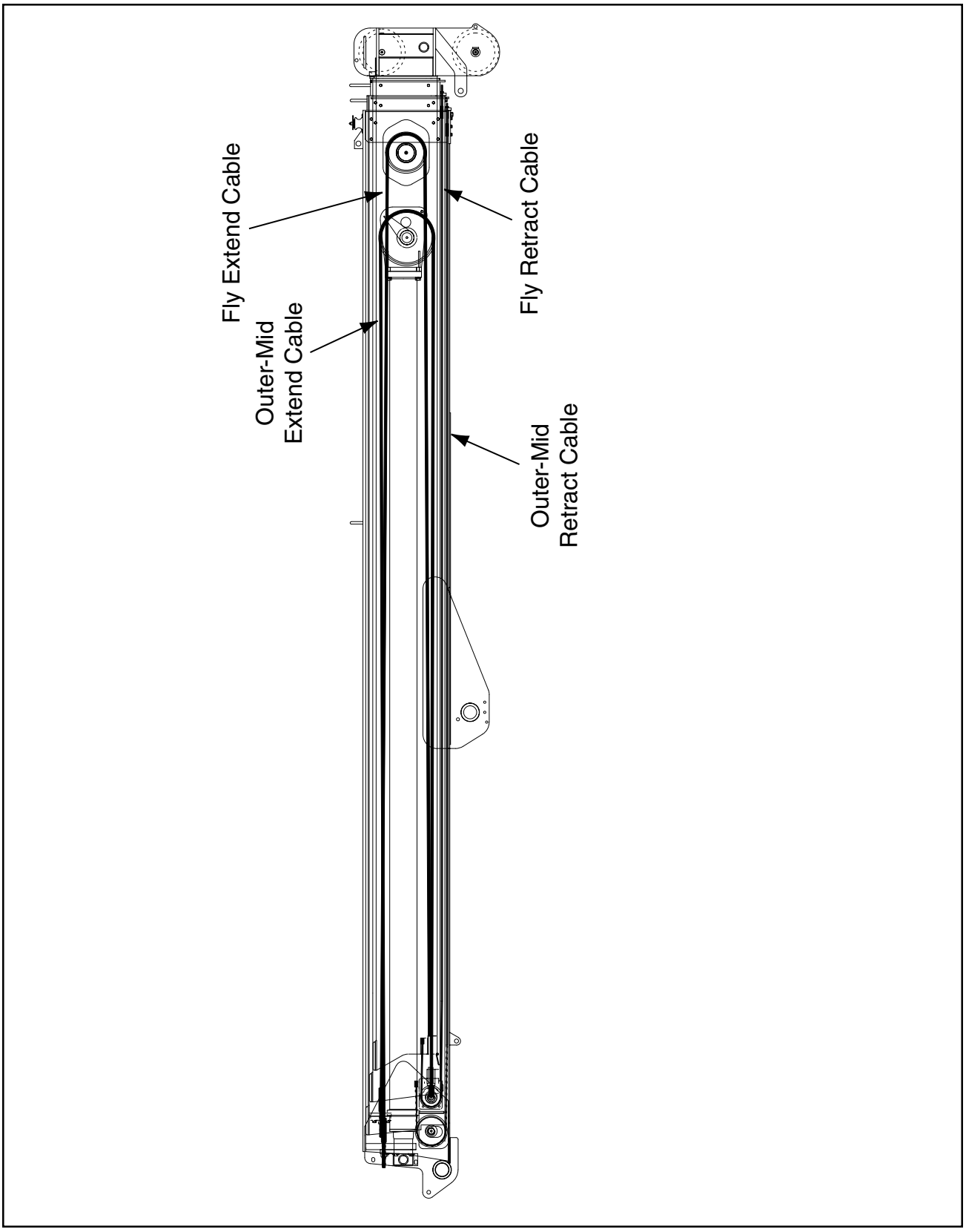


Figure 4-8. Internal Boom Cable Reeving

4. Adjust fly retract cables (outer-mid) to retract fly section and remove all slack from cables.
5. Adjust fly extend cables to remove all slack.
6. Continue to adjust extend and retract cables to obtain a dimension of approximately 6-1/2 in. from the front edge of the outer-mid section to the center of the boom nose upper sheave and to maintain the grease hole alignment.
7. Using all applicable safety precautions, start crane and cycle boom (extend at least three feet). Listen for any cables hitting the inside of a boom section which indicates slack in cables.
8. If the cables are hitting readjust as necessary to maintain conditions until cables do not hit, as established in step above.
9. Repeat steps 7 and 8 as necessary. Extend cable nylon collar adjusting nuts should be torqued to 30 lb-ft. (40.6 Nm) (dry).
10. Install boom stop and shim as necessary so stop is snug against outer-mid section top plate when boom is fully retracted.
11. Check for proper operation of boom.
12. Operate hoist and carefully remove slack in cable, be sure cable is in direct line with cable socket attached to lug on end of base boom.
13. Carefully operate hoist to pivot and raise hoist until mounting plate holes line up with holes in base boom side plates.
14. Install the 3/4"-10UNC x 3-1/2" long, grade 8 bolts, washers, spacers and nuts. Torque to 301 lb-ft. (408 Nm) using Loctite 262.
15. Remove open wedge cable socket from base boom lug and reeve cable for the configuration required, i.e. one part line, two part line, etc. Refer to reeving instructions earlier in this manual.
16. Reinstall hoist.

Extend/Retract Cable Replacement

When the extend cables require replacement and the boom is not scheduled to be completely disassembled, it is possible to attach a wire to one end of the old cable before pulling the cable out. Once the old cable is removed, the new cable can be attached to the wire and threaded through.

To replace the retract cables, the telescope cylinder and fly section must be removed.

To remove the telescope cylinder and fly section, refer to the procedures later in this section.

BOOM ASSEMBLY

When disassembly of the boom is required it should be removed from the truck for easier access to the sections. A crane is required to handle the various sections. Refer to the specifications section for the weight of the boom and components.

Boom Removal

1. Park the truck in an open area. Set the park brake.
2. If boom is equipped with a jib, remove pins and detach jib assembly from boom assembly using suitable lifting equipment.
3. Remove pin attaching hoist cable wedge socket to headache ball/hookblock.
4. Remove cable retainer pins on forward side of boom nose.
5. Using all applicable safety precautions operate hoist to wind all cable onto hoist drum and retract boom fully.
6. Shut down crane systems and turn off truck engine. With ignition on and PTO engaged, cycle all boom functions to relieve any pressure. Turn off truck ignition and disengage PTO.
7. Using suitable lifting equipment, adequately support boom weight along entire length of retracted boom.

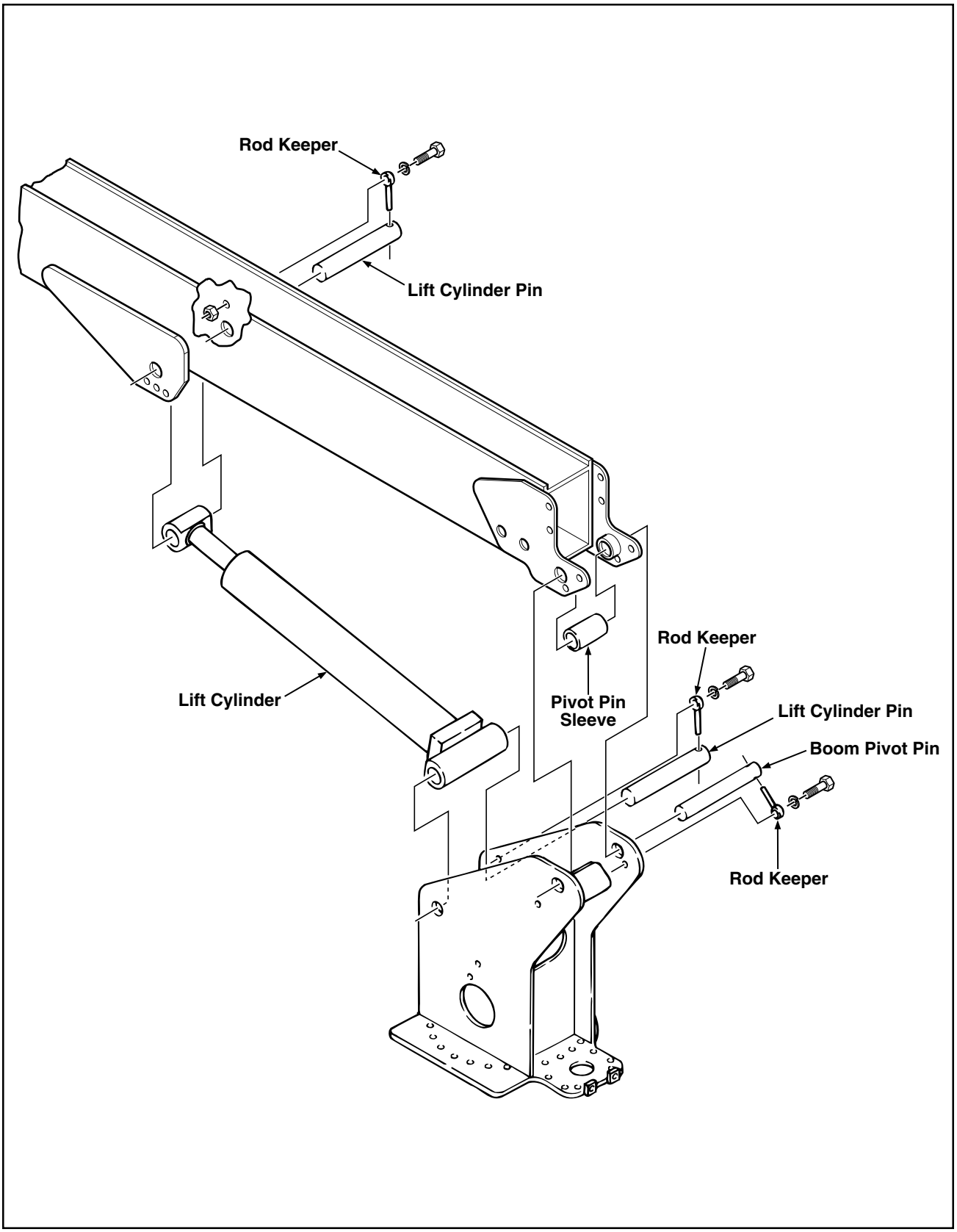


Figure 4-9. Boom Removal

8. With the lift cylinder adequately supported, remove rod keeper and lift cylinder pin from rod end of lift cylinder. Use a brass drift tool, if necessary, to remove pin. Using an adequate lifting device, lay rod end of lift cylinder down on truck bed to provide clearance for boom removal.
9. Tag and disconnect lines to telescope cylinder and hoist. Use suitable containers to retain any residual hydraulic fluid which may leak out. Plug and cap hydraulic lines to prevent additional leakage. Dispose of residual oil in accordance with all federal, state and local laws.
10. With boom assembly adequately supported, remove rod keeper and boom pivot pin and pivot pin sleeve. Use a brass drift tool, if necessary, to remove pin.
11. Carefully lift boom assembly clear of crane and lower to suitable work surface.

Boom Installation

1. Using suitable lifting equipment, position assembled boom on turntable so that boom pivot holes in both boom and turntable are aligned.
2. Insert boom pivot pin through turn table, boom and pivot pin sleeve. Be sure that locating holes in pin are aligned so keeper rod can be attached to holes in turntable. If necessary, gently tap pin into position with a soft-headed mallet. Secure pin with rod keeper and rod keeper to turntable. Torque keeper bolt per Torque Chart.
3. Connect hydraulic lines to hoist and telescope cylinder.
4. Using suitable lifting equipment, raise rod end of lift cylinder to align with mounting holes in boom. It may be necessary to extend or retract lift cylinder using crane hydraulics. Insert pin through boom and lift cylinder. Secure pin with rod keeper. Torque keeper bolt per Torque Chart.

Boom Disassembly

The boom has four sections which extend proportionally using a telescope cylinder connected to each of the sections through a series of extend and retract cables.

Wear pads are provided inside the nose end and on the outside of the pedestal end of each section. Refer to the shimming procedures earlier in this section.

A boom requires complete disassembly for inspections, extend cable replacement or if a section is overloaded and damaged.

1. Using suitable lifting equipment, adequately support hoist assembly. Remove bolts, nuts and washers attaching hoist assembly to rear of base boom section.
2. Using all safety precautions, lift hoist clear of boom assembly and move to suitable supported workstand or bench.
3. Remove telescope cylinder. Refer to telescope cylinder removal procedure.
4. Remove wear pads inside base section at nose end.
5. Pull inner-mid/outer-mid/fly assembly from the base section.
6. Remove nuts and retainer plates securing the fly extend cables.
7. Remove hose clamps on outer-mid retract cables. Remove cable retract mount at nose end.
8. Remove top and side wear pads from inside nose end of inner-mid section.
9. Pull outer-mid/fly assembly from inner-mid section. Be careful not to pinch cables. Remove bottom cable anchor when section has been pulled out approximately six feet.
10. Remove hose clamps on fly retract cables. Remove cable anchor bolt holding fly retract cable and remove anchor block. Note number of shims under each anchor for reinstallation.
11. Remove fly extend cables from each anchor on fly section.

12. Remove top and side wear pads from inside nose end of outer-mid section.
13. Pull fly section from outer-mid section.
14. Inspect each boom section for straightness, rubbing, cracks at welds. Inspect cables per the cable inspection procedure.
15. If necessary, remove boom nose sheave retaining rings and pins. Remove sheaves and inspect sheaves and bushings for damage.

Boom Inspection

- Inspect upper and lower boom nose sheave pins for tapering, ovality and scoring. Ensure that pin surfaces are protected prior to installation. Replace pins as necessary.
- Inspect upper and lower boom nose sheaves for wear, ovality, scoring or other damage. Replace sheaves as necessary.
- Inspect all sheaves (boom nose, extend and retract cables) for excessive groove wear, burrs or other damage. Replace sheaves as necessary.
- Inspect extend and retract cable sheave pins for scoring, tapering, ovality and evidence of correct lubrication. Replace pins as necessary.

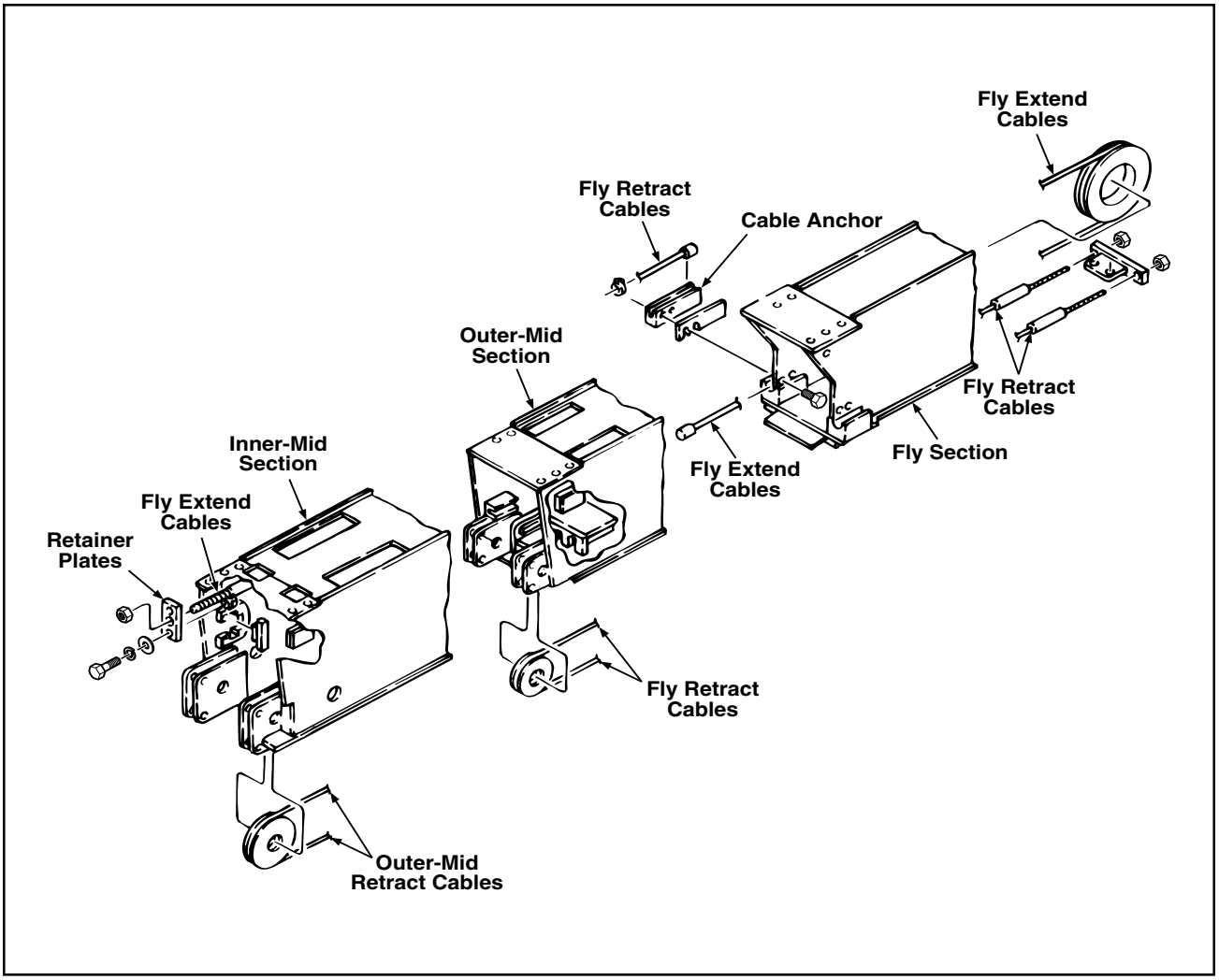


Figure 4-10. Inner-Mid, Outer-Mid and Fly Sections

- Inspect boom pivot pin for wear, scoring or other damage and for tapering or ovality. replace pin as necessary.
- Inspect upper lift cylinder attach pin for tapering, ovality, scoring, wear or other damage. Ensure pin surfaces are protected prior to installation. Replace pin as necessary.
- Inspect extend cable anchor plates for wear of other damage. Replace anchor plates as necessary.
- Inspect inner diameter of boom pivot bushing for scoring, distortion, wear or other damage. Replace bushing as necessary.
- Inspect all wear pads for excessive wear or damage. Replace wear pads when worn to within 1/16 in. of insert.
- Inspect extend and retract cables for stretching, distortion or other damage. Replace components as necessary.
- Inspect all threaded components for damage, including stretching, thread deformation or twisting. Replace as necessary.
- Inspect structural units of boom assembly for bending, cracking, separation of welds or other damage. Replace boom sections as necessary.

Boom Assembly

The boom assembly procedure covers installation of a complete new boom, including new wear pads. Some steps may not be necessary if reusing existing parts. Always shim wear pads correctly after assembly.

⚠WARNING: NEVER ALLOW SECTIONS TO REST ON CABLES WHILE ASSEMBLING. CABLES MAY BE DAMAGED.

1. Measure inside dimension of outer-mid, inner-mid and base sections. Install wear pads and shims to side, top and outside of each section allowing 1/16 in. clearance between inner and outer dimensions of each section.

Note: Mark both ends of the cables to ensure that they do not cross inside of the boom.

2. Place sheaves on pins inside outer-mid section. Attach adjuster end of fly section retract cables to fly section using clamps at the pedestal end. Use mechanic's wire to hold middle of cable in approximate location of sheaves inside outer-mid section. Lay bullet end of extend cables in approximate position at pedestal end.
3. Attach ramp to fly section. Using mechanic's wire, hold ramp up as high as possible. Pull cable ends, top and bottom, in towards center of fly section to prevent catching inner sheaves.
4. Insert fly section into outer-mid section. Be sure ramp stays in position. Remove mechanic's wire holding middle of extend cable before cable is completely inserted. Slide in until approximately 12 in. of retract remains.
5. At the nose end, insert the top wear pad and two bottom wear pads and shims. Shim as necessary to provide 1/16 in. clearance. Be sure to orient wear pads toward outside edge of section.
6. Insert four side wear pads loosely to inside of outer-mid section. Shims will be added after boom is assembled.
7. Attach cable anchor blocks on top of extend cables at pedestal end of fly section. (Do not use lock washers on block bolts due to clearance.) Shim as necessary to center the fly section within the outer-mid section.
8. Install lower retract cable sheaves in outer-mid section. Do not install cotter pins in sheave pins.
9. Loosely attach hose clamp to bullet end of cable. Lay bullet end of retract cable in cable anchor block. Slide hose clamp against anchor block and tighten to prevent cable from coming out of seat.
10. Reeve cable around sheaves and under fly section. Be sure to go over cross bar underneath sheaves. Stretch cable out for the length of section and attach cable mount to adjuster end of cables. Leave cable lay under fly section.
11. Insert fly/outer-mid assembly into inner-mid section. After side wear pads are inside inner-mid section, locate bottom wear pads under assembly to protect retract cables. With ap-

proximately 6 ft. remaining, place retract cable anchor block over cables under assembly. Continue inserting inner-mid until cable anchor block slides into place under fly/outer-mid assembly.

12. At the nose end, insert the top wear pad and two bottom wear pads and shims. Shim as necessary to provide 1/16 in. clearance. Be sure to orient wear pads toward outside edge of section.
13. Insert four side wear pads loosely to inside of inner-mid section. Shims will be added after boom is assembled.
14. Install lower retract cable sheaves in inner-mid section. Do not install cotter pins in sheave pins.
15. Loosely attach hose clamp to bullet end of cable. Lay bullet end of retract cable in grooves inside outer-mid section above retract cable sheaves. Tighten hose clamp against anchor block to prevent cable from coming out of groove.
16. Reeve cable around sheaves and under assembly. Stretch cable out length of boom assembly and attach retainer plate to adjuster ends of cable.
17. Remove mechanics wire securing extend cables and fly section ramp. Attach fly extend cables to inner-mid using cable anchor bars and nylon lock nuts. Cable anchor bars must be oriented so cable is in center of cutout in section weldment.
18. Apply anti-sieze compound to extend cable adjustment threads. Remove slack from retract cables, keeping both cables even.
19. Insert boom assembly into base section. As soon as side plates are inside the base section, place the bottom wear pads under the boom assembly to protect the cables. Continue inserting boom assembly to within 1 ft. of completion.
20. At the nose end, insert the top wear pad and two bottom wear pads and shims. Attach cable guide assembly to top of base section (opposite top wear pad). Shim bottom wear pads as necessary to provide 1/16 in. clearance. Be sure to orient bottom wear pads toward outside edge of section.
21. Insert four side wear pads loosely to inside of base section. Shims will be added after boom is assembled.
22. Install lower boom nose sheaves. Use vaseline to hold spacer in place between sheaves. Insert pin through sheaves and secure with tube spacer, bolt and hardened washer.
23. Insert upper boom nose sheave assembly with spacers on each side. Insert pin through sheave assembly and secure with cotter pin.
24. Insert telescope cylinder according to Telescope Cylinder Installation procedure.
25. Attach hydraulic lines to telescope cylinder. Install retract cable retainer plate to cylinder with pin. Secure with retaining rings on each side.
26. Using hydraulic power, retract telescope cylinder until retainer plate is seated against cylinder mounting bar inside base section. Secure retainer plate with six socket head bolts. Tighten per Torque Chart.
27. Apply anti-sieze to extend cable threads. Secure with nylon insert lock nuts. Remove slack from cables, tightening lock nuts evenly. Torque lock nuts to 40 lb-ft. with cables even.
28. Rotate cable so that flats at base of threads are horizontal. Attach bars on top and bottom of cables using five bolts to prevent cable rotation.
29. Adjust cables using standard cable adjustment procedure.
29. Shim side wear pads of each section using standard wear pads dimensions. Use string to straight line boom.

⚠WARNING: SINCE MACHINE MANUFACTURER HAS NO DIRECT CONTROL OVER FIELD INSPECTION AND MAINTENANCE, SAFETY IN THIS AREA IS THE RESPONSIBILITY OF THE OWNER/ OPERATOR.

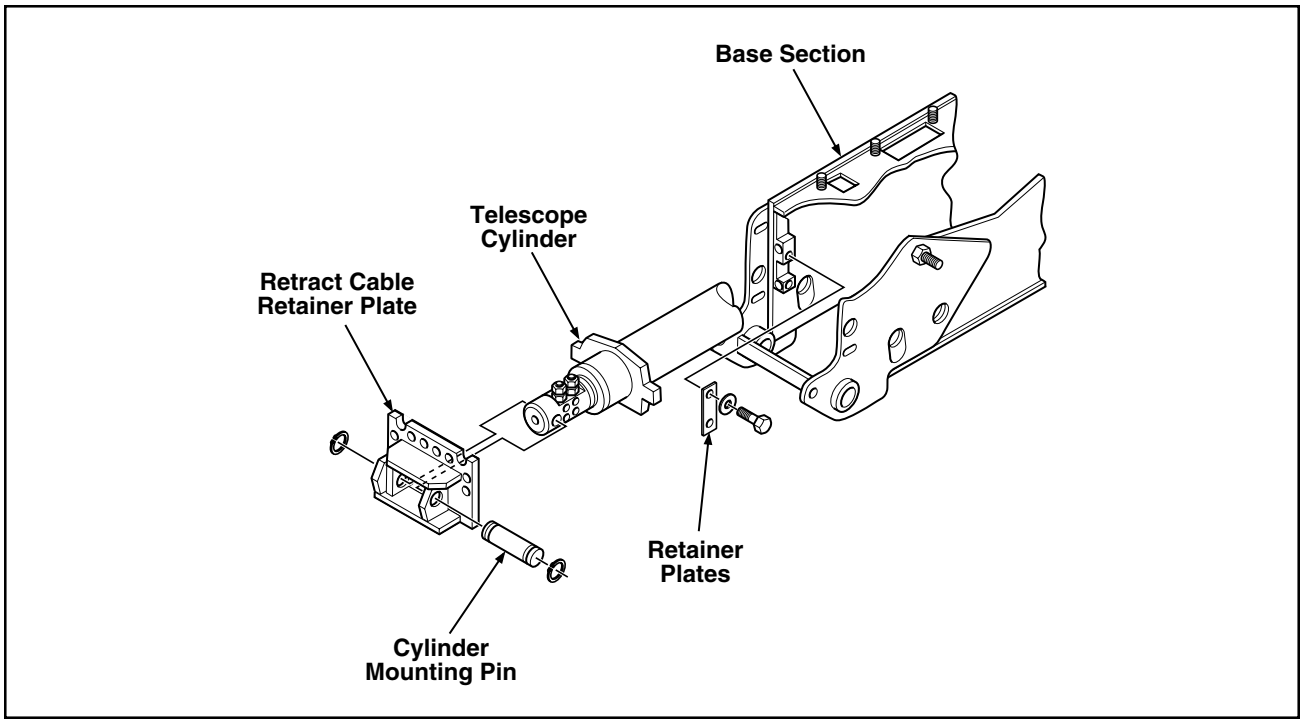


Figure 4-11. Telescope Cylinder

TELESCOPE CYLINDER

The telescope cylinder is located in the boom. Through several sets of cables the cylinder extends and retracts each of the boom sections proportionally. When extending the barrel end of the cylinder moves with the rod end pinned to the pedestal end of the boom base section.

The cylinder is double-acting with cartridge-style holding valve located in the port block. Because the barrel end extends the port block is located on the rod end of the cylinder rather than the butt end.

Removal

Removal of the cylinder requires the hoist to be laid back. The boom can remain mounted on the truck or removed.

If boom remains mounted, use all applicable precautions to prevent dropping the cylinder or slipping of maintenance personnel.

1. Park truck in a location with adequate room for extending cylinder out back of boom (approximately 25 ft.). Set Park Brake.
2. Lay back hoist. Refer to hoist layback procedure.
3. Evenly remove four nylon insert lock nuts from extend cables.

Note: If a single nut is removed completely with tension on any remaining cables, the "free" cable will retract into boom and completely boom disassembly will be required.

4. Remove six socket head bolts which secure the cable retainer block to the base section.
5. Using truck hydraulics, extend cylinder approximately 2 ft. This will extend the rod end of the cylinder with the cable retainer block to provide access to hoses connections. It may be necessary to lift cylinder to extend trunnion ears through retainer blocks inside base section.
6. Disconnect hydraulic hoses and cap hoses and cylinder ports.
7. Remove retaining ring and pin securing cable retainer block to rod end of cylinder.
8. Remove cotter pins on four lower retract cable sheaves and push sheave pins back flush with

inside of retract cable sheave holders to provide clearance for cylinder.

9. Using an adequate lifting device, such as an overhead crane, pull telescope cylinder approximately 6 in. Raise cylinder up and remove lower cable retainer block.

⚠CAUTION: WHEN USING SLING TO LIFT CYLINDER, USE BLOCKS TO PREVENT PINCHING AND DEFORMATION OF CABLE. WHEN REPOSITIONING SLING, USE BLOCKING TO PREVENT LAYING CYLINDER ON CABLES.

10. Wire tie extend cable ends to cylinder and pull cylinder and retract cables from boom assembly.

11. Set cylinder assembly on supports.

Installation

1. If not already done, attach hydraulic power source to telescope cylinder ports and extend cable approximately 2 ft. Position cylinder so that cable retaining tabs are up.

Note: Mark both ends of the cables to ensure that they do not cross inside of the boom.

2. Lay four extend cables though sheave holder plates on telescope cylinder. Bullet ends should lay down under cylinder and adjuster threads are on top. Tabs provided on the cylinder are for retaining the cables on top of cylinder. Number both ends of each extend cable (1, 2, 3, 4) to prevent crisscrossing cables after cylinder is installed.

3. Install sheave and sheave pin in nose end (but end) of cylinder. Each cable must be placed in the appropriate sheave groove (1, 2, 3, 4). Secure sheave pin with retaining ring. When in place, insert cable retainer pin through sheave pin tear drop and sheave plates. If new installation, weld bar stock on each side of tear drop to prevent turning of sheave pin.

4. Install cylinder and retract cables inside boom assembly. Be sure cylinder sheaves stay vertical (no twisting) as cylinder is inserted into boom assembly.

⚠CAUTION: WHEN USING SLING TO LIFT CYLINDER, USE BLOCKS TO PREVENT PINCHING AND DEFORMATION OF CABLE. WHEN REPOSITIONING SLING, USE BLOCKING TO PREVENT LAYING CYLINDER ON CABLES.

5. When telescope cylinder is approximately six feet from being completely in boom assembly, place lower retract cable retainer over cables making sure cables are properly oriented (1, 2, 3, 4). Lower retract sheave pins must be flush to allow clearance for the lower retract cable retainer.

6. Align cylinder ears in grooves inside inner-mid section. Cylinder must be positioned completely into grooves to allow retainer blocks to be placed. Secure retainer blocks with retainer plates.

7. Secure each of the lower retract cable sheaves with a cotter pin.

8. Attach cable anchor plate to base section and insert adjuster ends of the four extend cables. Use nylon lock nut and adjust cables according to the cable adjustment procedure.

FLY SECTION

When cable inspection and replacement is necessary the fly section can be removed without complete disassembly of the boom. Removal of the fly section provides access to the fly section extend cables and sheaves for inspection or replacement.

Removal

1. Park truck in an open area with suitable clearance. It is recommended that the boom is removed from the truck to provide accessibility to components. Refer to the boom removal procedure earlier in this section.

   If suitable lifting equipment is available, the fly section may be removed with the boom installed on the truck.

2. Remove the telescope cylinder. Refer to the telescope cylinder removal procedure earlier in this section.

3. Remove extend (upper) cable nuts from outer-mid section at pedestal end of boom.
4. Loosen hose clamps on fly section retract cables and raise cables. Remove bolts securing cable anchor to outside of fly section. Raise bullet end of fly extend cables.
5. At nose end of boom loosen fly section retract cables and unbolt anchor plate from under outer-mid section.
6. Using suitable equipment, pull fly and outer-mid sections out of inner-mid section approximately one foot to access wear pad bolts at nose end. Remove side and lower wear pads and shims and upper wear pad from inside of outer-mid section at nose end.
7. Using suitable lifting equipment, pull fly section from outer-mid section.
8. Set fly section on suitable supports.
9. Extend cables and sheaves may be removed from inside of outer-mid section as required.

Fly Section Installation

1. Hang extend cables to pedestal end of fly section with mechanics wire (adjuster end at top, bullet end on bottom). Stretch cable out for length of section and support middle of extend cables at nose end using mechanics wire. Several 2 ft. boards laid across top of section will support the cable. Wire tie ramp at pedestal end of section to prevent catching it once inside section.
2. Insert fly section into boom assembly, removing boards and cable supports along the way. Continue until retract cables are inside wear pad locations.
3. Insert side wear pads inside outer-mid section loosely without shims. Install upper and lower wear pads, shimming bottom wear pads to 1/16" clearance. Be sure to orient lower pads toward outside edge of section.
4. Slide remainder of fly section and any other sections completely into base section.
5. Lay extend cables in grooves on outside of fly section. Attach cable anchor blocks on top of extend cables. Shim as necessary to center the fly section within the outer-mid section.
6. Loosely attach hose clamp to bullet end of cable. Lay bullet end of retract cable in cable anchor block. Slide hose clamp against anchor block and tighten to prevent cable from coming out of groove.
7. Install telescope cylinder.

TWO-SPEED HOIST OPERATION

The two-speed hoist is a planetary drive unit with direct hydraulic drive. An integral brake supports one side of the hoist and the other side is supported on a ball bearing.

The two-speed function is achieved by supplying additional hydraulic oil flow to the hoist motor from the hydraulic system. One section of the hydraulic pump supplies 39 gpm at 3200 psi to the hoist motor. The “Burst-of-Speed” valve, when activated, provides an additional 24 gpm to the hoist motor from the second pump section. However, if another function is activated while in Burst-of-Speed mode, the Burst-of-Speed mode is automatically deactivated.

Refer to the Braden PD12C hydraulic winch manual shipped with the crane.

GENERAL

The rotation capability of the crane is also referred to as the swing. A hydraulically-driven gear motor drives a speed reducer gearbox which outputs into a large, internal-tooth ball bearing. The static brake, mounted between the motor and gear reducer, prevents rotation until the swing motor is pressurized.

The swing motor is driven by the end section of the pump with a maximum of 8 gpm.

The swing drive may be removed as a unit from the turntable or components may be removed as necessary starting with the motor, brake, and gear reducer.

An optional swivel assembly provides full 360° rotation of the turntable by allowing hoses and wires to rotate. The top portion of the swivel is a slip ring. The lower portion is a hydraulic swivel.

Recommended rotation speed is one revolution per minute. To attain that speed, the PTO ratio is selected to provide pump output at or near maximum engine speed. If an incorrect PTO is installed, one rpm rotation speed will not be attainable. Refer to the Operating and Safety Manual for information on PTO selection.

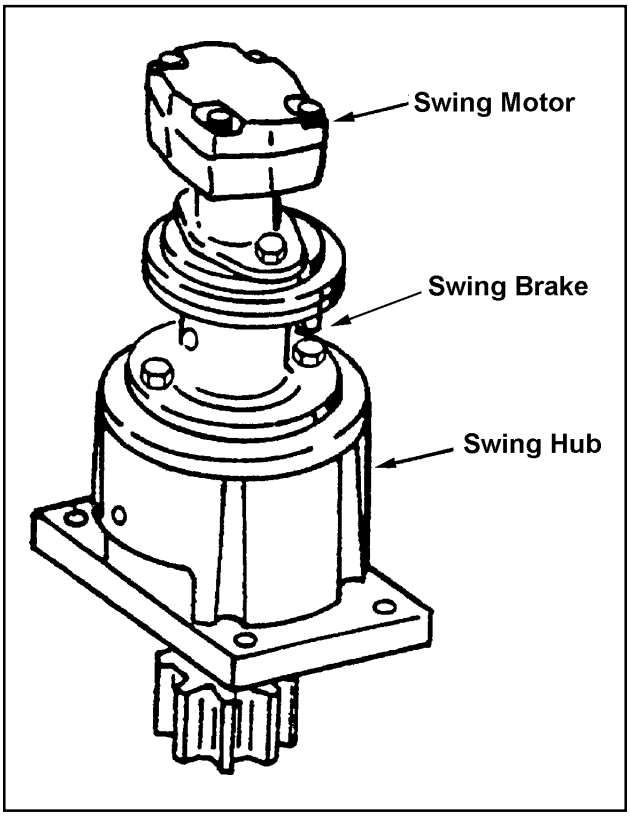


Figure 5-1. Swing Drive Components

COUNTERBALANCE VALVE

A dual counterbalance valve mounted on the inside of the turntable balances the pressure between left and right swing. Without the counterbalance valve the swing motor would drive the pump backwards until the boom stopped rotating.

When one side is pressurized the "off" side recieves a small amount of pressure to prevent cavitation. The counterbalance cartridge maintains the offside pressure at one-third of the pressure side.

If rotation of the crane is jerky or one direction of rotation is faster than the other, the counterbalance valve may be suspect.

⚠WARNING: NEVER OPERATE BOOM WITHOUT OUTRIGGERS SET ON A FIRM SURFACE.

1. Park the machine in an open area and set the outriggers.
2. Place a 4000 psi pressure gauge in each of the hoses going into the counterbalance valve.
3. Using all applicable safety practices, operate the boom and monitor the pressures on each gauge. The higher pressure should be three times that of the lower pressure.
4. If gauge readings are not properly set, replace the counterbalance valve.

SWING MOTOR

The swing motor mounts directly to the swing brake.

A seal kit is available for the swing motor. Refer to the Parts Manual for component information.

SWING BRAKE

The swing brake is a static brake. It is engaged after pressure drops in the swing motor and remains engaged until pressure rises. Compression springs clamp friction disks and hydraulic pressure overcomes the spring load and releases the brake.

Adjustment

A flow control valve is located on the brake inlet line. It meters the flow out of the brake. The brake should engage and stop rotation in one to two seconds.

To adjust, loosen the set screw on flow control valve. If the turntable continues to rotate, turn the adjustment knob counterclockwise. If the turntable stops abruptly (less than one second) turn the adjustment knob clockwise.

After adjusting, tighten the set screw.

Disassembly

⚠CAUTION: DO NOT CLAMP OR OTHERWISE RESTRAIN COVER FROM MOVING WHILE REMOVING COVER BOLTS. HIGH COMPRESSIVE SPRING LOAD WILL CAUSE COVER TO FLY ONCE RELEASED.

1. Loosen four capscrews from the input end of the brake. Alternately unscrew bolts 1/2 turn at a time until all internal spring force is relieved. Remove the cover. Check for broken springs and replace, if necessary.

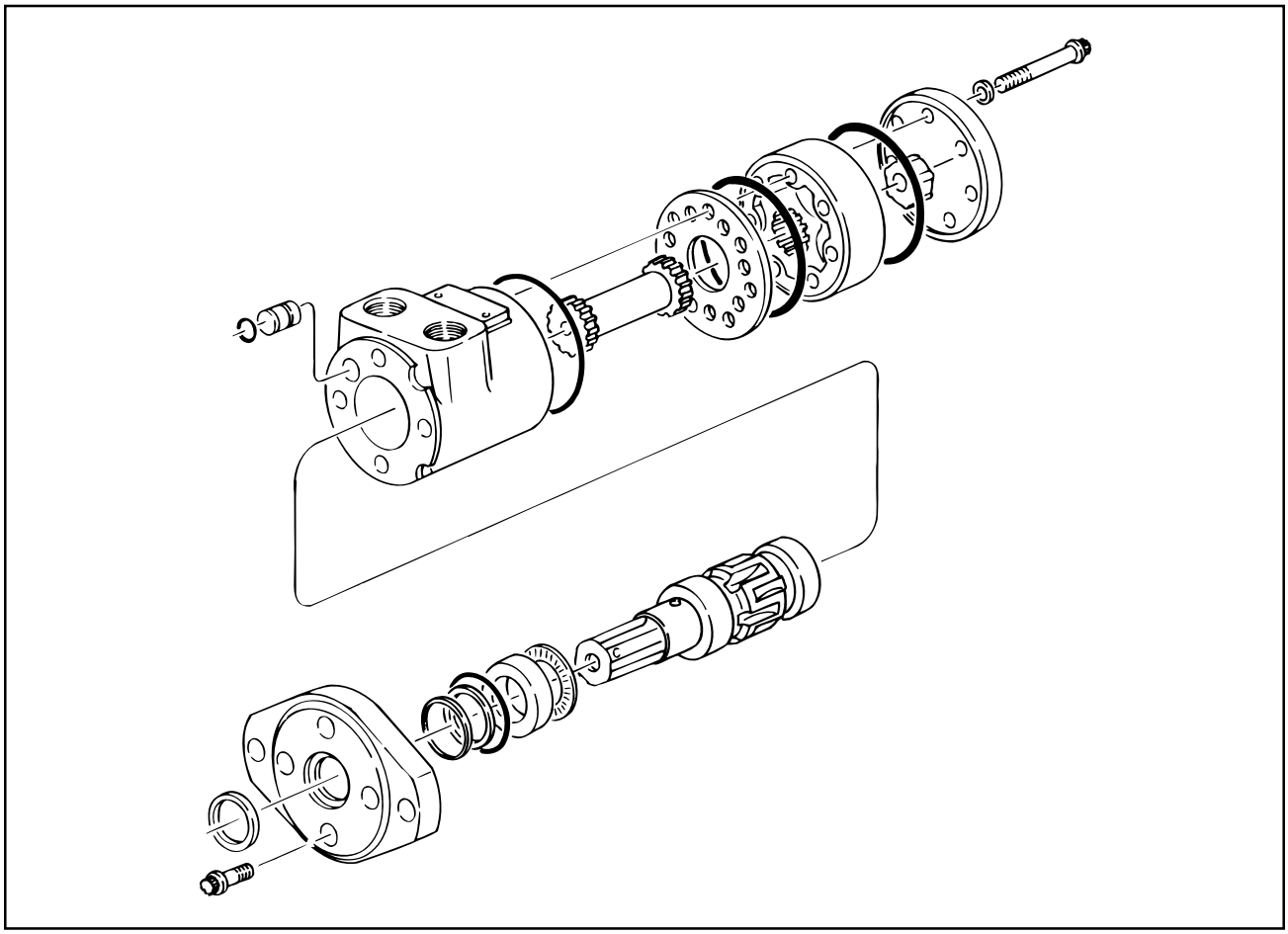


Figure 5-2. Swing Motor Assembly

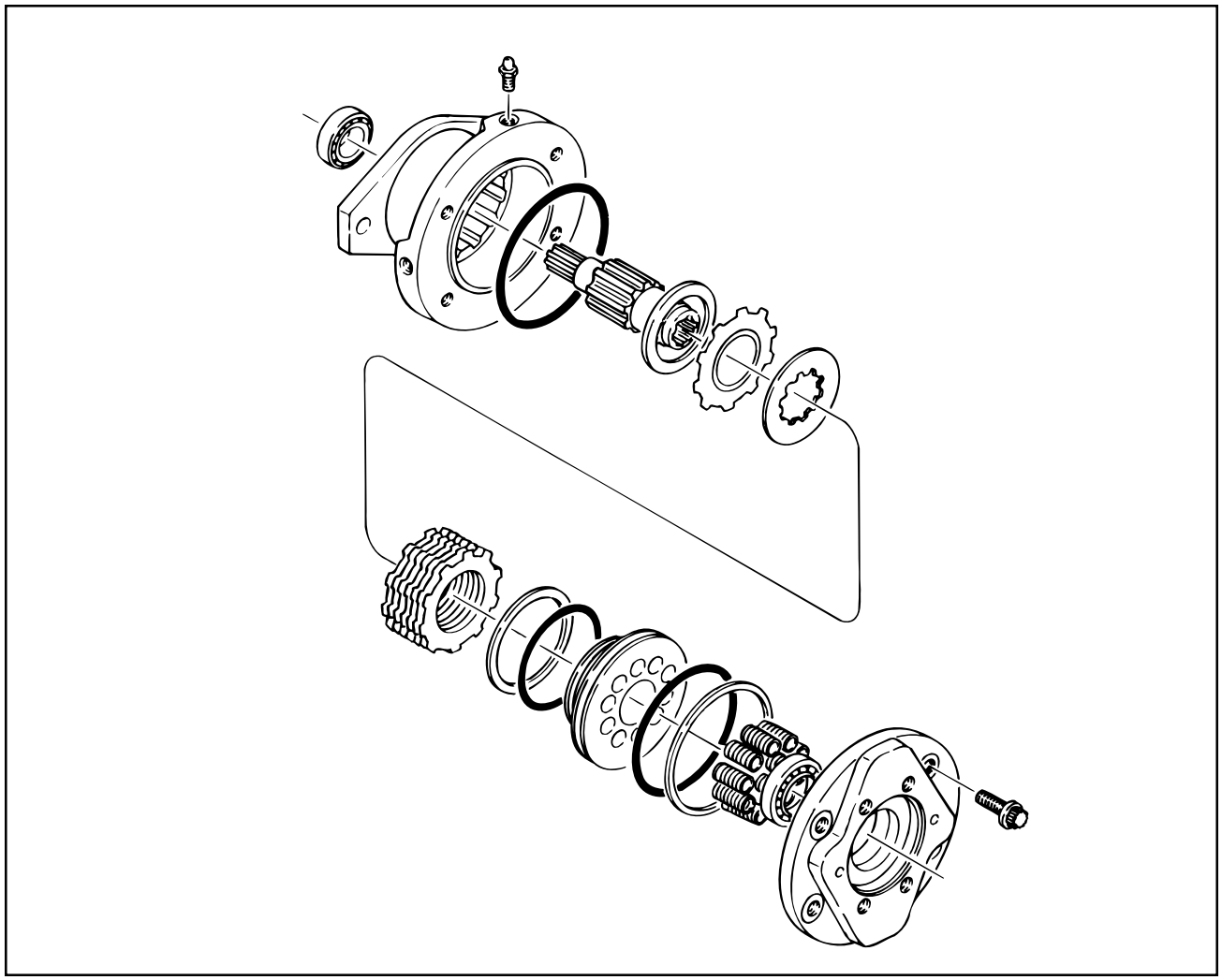


Figure 5-3. Swing Brake Assembly

2. Apply low air pressure (20-30 psi) to the brake release port while holding one hand on top of the piston and springs. The air will force the piston out of the case.
3. Remove friction pack. Friction pack consists of friction discs, seperator plates and spacers. Replace any items that are burned or scored.
4. Remove shaft from brake case by tapping out the output end with a soft hammer.

Installation

Note: Unless otherwise specified, use automatic transmission fluid (ATF) Type F as a lubricant for the swing brake.

1. If removed, install shaft seal and bearing in the case.
2. Install shaft in brake case. Tap shaft into place with a soft hammer.
3. Install friction pack in the brake case. Install spacer first and friction discs and spacers.

Note: Be careful not to contaminate friction surfaces with dirt, grease or fluids other than those specified for the brake.

4. Pour approximately 1 tablespoon of ATF Type F over the friction plates or until the fluid level is even with the top friction plate.
5. If replacing piston o-rings be sure the two o-rings are nearest each other with the two backup rings to the outside.
6. Gently slide piston into case until the large o-ring tuoches the case. Press down firmly on piston with the heel of both hands to squeeze o-rings into the case and seat piston against the friction plates.
7. If removed, insert the ten springs into the piston.
8. Lay the cover gasket on the case and align the holes.
9. Set cover over the input end of the shaft. The bearing should start over the shaft before the cover touches the spring.
10. Start four cover bolts through the cover and gasket and into case by hand. Alternately tighten the cover bolts 1/2 turn at a time until cover is tight against the case. Torque bolts to 110 lb-ft.

IMPORTANT: Either bolt motor to the brake or plug the input pilot in the cover before turning brake upside down or excess fluid will run out.

GEAR REDUCER HUB

The gear reducer transfers power from the motor to the swing bearing. Motor output speed is reduced from 36:1 ratio. Motor output torque is consequently increased by the same ratio.

Hub Disassembly

1. Position reducer over suitable container and remove magnetic drain plugs from cover and case. Allow oil to completely drain. Then re-install drain plugs.
2. Remove cover bolts and lock washers. Carefully remove cover ensuring that mating surfaces are not damaged. Discard o-ring seal.
3. Remove input thrust washer and carefully remove input gear segment. Discard thrust washer.
4. Remove primary carrier assembly together with sun gear. Be careful not to damage gear teeth.
5. Remove and discard bolts retaining bearing retainer plate to output shaft.
6. Place hub in a suitable hydraulic press with the pinion gear portion of the output shaft down and blocks supporting the case.
7. Using a suitable drift, carefully press output shaft from the secondary carrier by applying pressure to the output shaft. Ensure that the output shaft is not damaged.
8. Remove roller bearing cone and oil seal from the output shaft. Discard seal. If applicable, remove shims from output shaft.
9. Carefully lift secondary carrier assembly out of case, ensuring that planet and case gear teeth are not damaged.
10. If necessary, remove roller bearing cone from secondary carrier.
11. If necessary, remove roller beraring cups from hub case, ensuring that bearing surfaces on case are not damaged.

Cleaning and Inspection

1. Thoroughly clean all parts in an approved cleaning solvent.
2. Inspect bearing cups and cones for damage, pitting corrosion or excessive wear. If necessary, replace bearings as a complete set.
3. Inspect bearing mounting surfaces on case, output shaft and secondary carrier. Replace components as necessary.
4. Inspect all geared components for chipped or broken teeth and for excessive or uneven wear patterns.
5. Inspect primary and secondary planet carriers for damage, especially in roll pin and planet pin hole areas. Ensure that gear apertures are not damaged. Replace as necessary.
6. Inspect all planet pins for scoring or other damage. Replace as necessary.

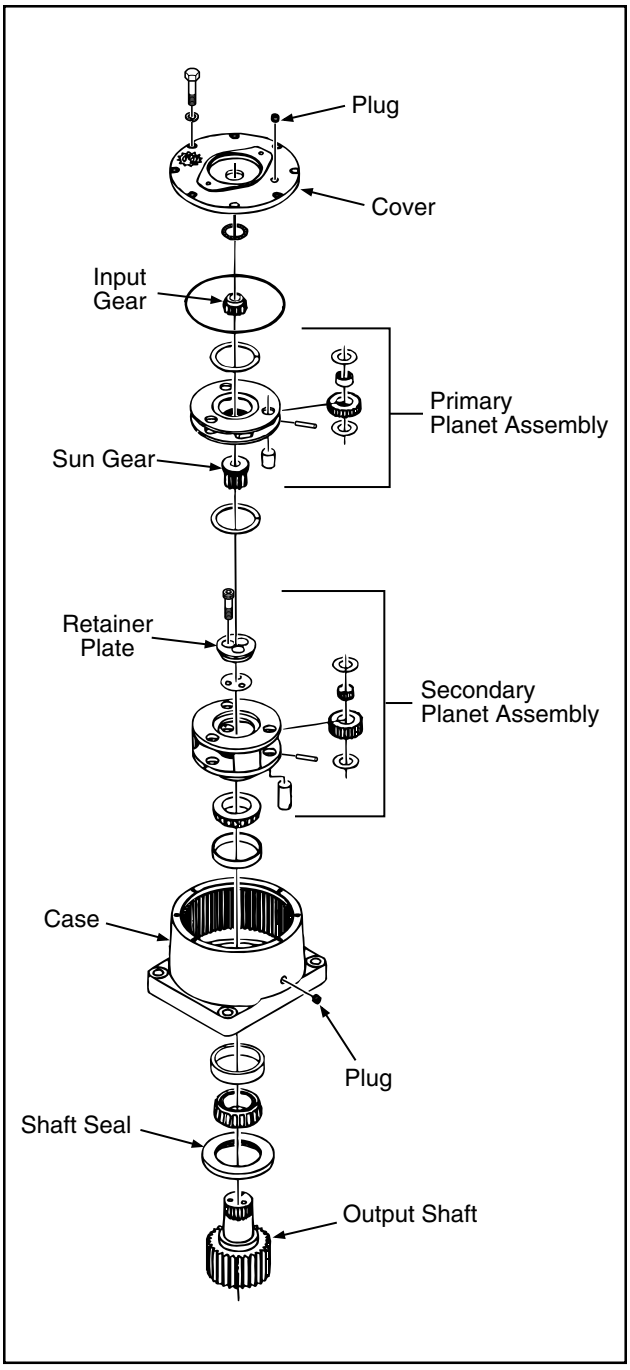


Figure 5-4. Gear Reducer Hub Assembly

7. Inspect all threaded components for damage, including stretching, thread deformation or twisting and ensure that output shaft studs are installed properly with no shank material visible above inner end of shaft.
8. Inspect seal mounting area in case for burrs or sharp edges. Dress applicable surfaces or replace components as necessary.
9. Inspect cover for cracks or other damage and o-ring sealing area for burrs or sharp edges. Dress applicable surfaces or replace cover as necessary.

Carrier Disassembly

Both the primary and secondary carrier assemblies can be disassembled if necessary.

1. Place the primary planet carrier into a suitable hand-operated hydraulic press with the roll pins securing the planet pins to the carrier housing. Place blocks beneath the planet carrier such that they clear the planet pin. Blocks should be approximately six in. high to provide adequate clearance for removeal of the planet pins.
2. Press the planet pin from the carrier. Be sure to protect the pin from damage.
3. Slowly and carefully press the pin from the carrier, shearing the attaching roll pin.
4. Remove the planet gear and washers from the carrier and, if necessary, remove and discard the bearing from the planet gear.
5. Using a suitable punch, gently tap roll pin from planet pin and carrier housing.
6. Repeat steps 1 through 5 for remaining planet gears.

Primary Carrier Assembly

1. Using the press, install bearing into planet gear making sure teh bearing cage is installed squarely.
2. Apply a coating of multi-purpose grease to the planet-mounted bearing rollers and carefully insert planet gear and washers into the carrier gear aperture.
3. Align carrier and gear bearing holes and insert planet pin into carrier with chamfered end of the roll pin on the same side as the carrier hole

4. If necessary, gently tap planet pin into position with a soft mallet, ensuring that roll in holes are aligned and planet gear rotates freely.
5. Position a new roll pin in the carrier hole and drive the pin into the hole until the end of the pin is flush with carrier surface. Again, ensure that planet gear rotates freely.
6. Repeat steps 1 through 5 for the remaining planet gears.

Secondary Carrier Assembly

1. Install the bearing retainer plate into the secondary carrier with the large diameter up.
2. Using the press, install bearing into planet gear, making sure that the bearing cage is installed squarely.
3. Apply a coating of multi-purpose grease to the planet-mounted bearing rollers and carefully insert planet gear and washers into the carrier gear aperture.
4. Align carrier and gear bearing holes and insert planet pin into the carrier with the chamfered end of the roll pin hole on the same side as the carrier roll pin hole.
5. If necessary, gently tap planet pin into position with a soft mallet, ensuring that the rol pin is flush with the carrier surface. Again, ensure that the planet gear rotates freely.
6. Repeat steps 1 through 5 for remaining planet gears.

Hub Assembly

1. Replace shaft seal. Lubricate inner lip of new seal and turn so open side is facing upward. Slide seal down output shaft to gear teeth. It must fit snug over seal diameter on shaft.
2. With large end down, press outer bearing cone onto output shaft. Be sure it is seated properly.
3. Using a suitable press, install upper and lower bearing cups into hub case.
4. Apply a layer of lithium grease to outer bearing cup and surface.
5. Set case assembly over shaft until shaft's outer tapered bearing cone is seated in cases's outer bearing cup.
6. Carefully place shim over shaft making sure the three holes in shim are properly aligned with those on the shaft. Use same number of shims that came out of unit to allow for correct shaft bearing preload.

IMPORTANT: Holes in shaft, retainer plate and shims must be aligned to ensure bolts can be installed correctly.

7. Rotate bearing retainer plate inside secondary carrier assembly so counterbored holes are centered between planet gears.
8. Apply a layer of lithium grease to inner bearing cup and surface.
9. Install inner bearing cone over splined end of output shaft (small end down). Press bearing down slowly until it is just seated against inner bearing cup. With a slight press load still applied, rotate case by hand to ensure that roller bearings are rotating evenly and smoothly.
10. Install secondary carier assembly into case. Rotate seconedary carrier assembly back and forth until planet gear teeth mesh with gear teeth in case. Let carrier assembly down until carrier spline touches output shaft spline. View down through top os secondary carrier assembly thorogh counterbored holes in retainer plate. If needed, align holes in retainer plate directly over holes in shaft and shims.

11. Counterbored holes should be centerd between planet gears. Slowly press secondary carrier assembly down tightly against output shaft.
12. While secondary carrier assembly is under press load (approximately 2 tons), rotate case by hand. If correct number of shims are in unit to give proper shaft bearing preload, torque required to turn case should be 50-80 lb-in.
13. Remove press load from secondarhy carrier. Install bolts and torque to 70-75 lb-ft.
14. Press splined end of sun gear into spline on bottom side of primary carrier.
15. Turn primary carrier assembly over (sun gear down). Install assembly into unit until sun gear teeth mesh with secondary planet gears. Primary carrier assembly will slide down to where primary planet gears touch top of gear teeth in case. Hold inside diameter of carrier and rotate until planet gears line up with case gear teeth. Assembly will drop down.
16. Install input thrust washer over step of input gear. Insert input gear into unit so teeth mesh with primary planet gears.
17. Replace o-ring seal on bottom of cover.
18. Set cover on top of unit and rotate until oil fill hole is in proper orienteation to oil drain hole in case. Install cover bolts and loackwashers. Torque bolts to 32 lb-ft.
19. Ensure magnetic plug is secured in case.
20. Fill unit with 2.5 pints of extreme pressure gear lubricant. Correct oil level will measuer to middle of primary planet gear.
21. Put pipe sealant on magnetic plug and install into oil fill hole in cover.
22. Stick a shaft into input gear and turn by hand to be sure unit runs smoothly and easily.

SWING BEARING

The swing bearing carries all the load from the boom. The bearing is manufactured with a certain clearance which must be maintained to obtain a smooth rotation with low torque requirements. Bearing mounting bolts must also be monitored to ensure safe operation of the crane.

Bolt Replacement, Torque Procedure

⚠WARNING: DO NOT REUSE TURNTABLE BEARING BOLTS. ALWAYS REPLACE ALL BOLTS AND HARDENED WASHERS ANYTIME A BOLT HAS BEEN REMOVED. USE ONLY UNBRAKO LOC-WEL PATCH BOLTS AND SPECIAL HARDENED WASHERS OBTAINED FROM USTC, INC.

IMPORTANT: Re-torque swing bearing bolts after the first 200 hours of operation and then at 500 hour intervals thereafter.

New bearing bolts are required when the bearing is removed, or if bolts are found to be stretched. If bolts are found to be missing, all bolts should be replaced.

The recommended bolts are a special hardness and include a patch with a thread locker. As the bolt is turned into the hole, the patch opens, distributing the correct amount of thread locker on the threads. It is not necessary to lubricate or use any other type of thread locker on the bolts.

To prevent twisting the bearing to one side, the bearing bolts need to be tightened in a specific sequence. Use a torque multiplier to effectively access and torque all bolts.

When new bearing bolts are installed:

1. Insert bolts in holes.
2. Following sequence in Figure 5-5, tighten all bolts to 180 lb-ft. (244 Nm) in sequence.
3. Repeat step 2, tightening to 472 lb-ft. (640 Nm).

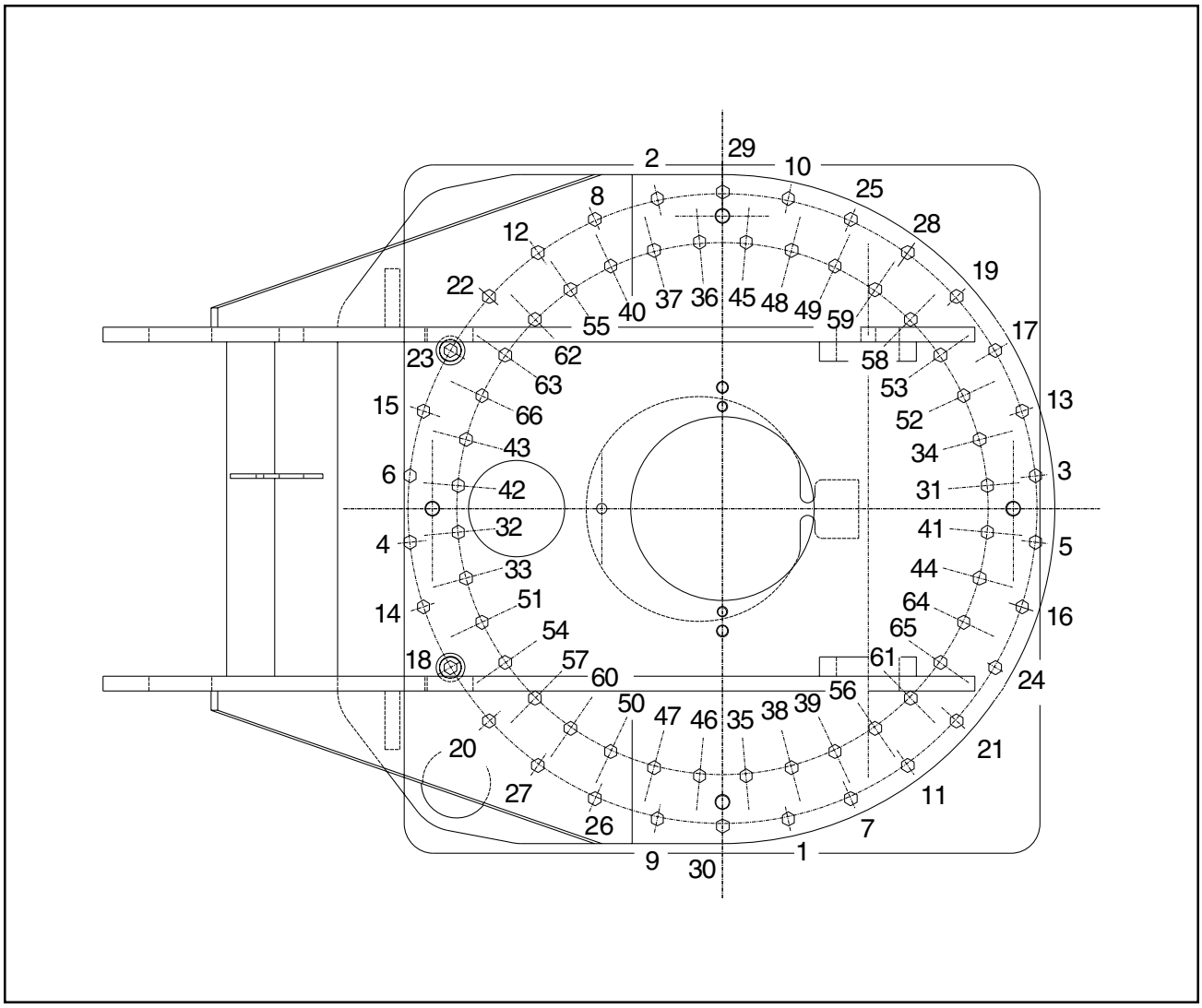


Figure 5-5. Bearing Bolt Tightening Sequence

Swing Bearing Wear Tolerance

As the bearing wears, the clearance will gradually increase. Initially, bearing clearance increases due to smoothing of the surfaces. Clearance will then remain essentially constant for many years if the crane is not overloaded or subject to shock loads.

If the design life of the bearing has been reached, pitting will occur in the contact area of the raceway. Eventually, the number of pittings will increase to a density where material is spalled off the raceway and the bearing becomes non-functional.

Note: The following procedure serves only to illustrate how a relative clearance measurement may be acquired to evaluate the integrity of a swing bearing. The only true method to determine the integrity of the bearing is to compare the original clearance between the inner and outer race (as manufactured) to the current measurement on the bearing in question.

If the condition of the bearing is questionable based on the clearance measurements obtained from the following procedure, the bearing should be

evaluated by the bearing manufacturer to determine on a case by case basis if the bearing requires replacement.

Note: Ensure bearing bolts are properly torqued before taking measurement.

1. Place the crane in an operating position with the outriggers set.
2. With the boom horizontal and fully extended, use a dial indicator to measure and record the distance between the outer race of the swing bearing and pedestal. Measure at the opposite side of the boom.
3. With the boom at horizontal and fully retracted, place a suitable (5 ton) hydraulic jack between the deck and the boom. Raise the boom enough to reverse the load on the swing bearing.
4. At the rear center of the pedestal, measure and record the distance between the swing bearing and pedestal. If the distance is greater than 0.072 in. (1.829 mm), then it may be necessary to replace the bearing. Contact the Service Department for additional instructions regarding the evaluation process.

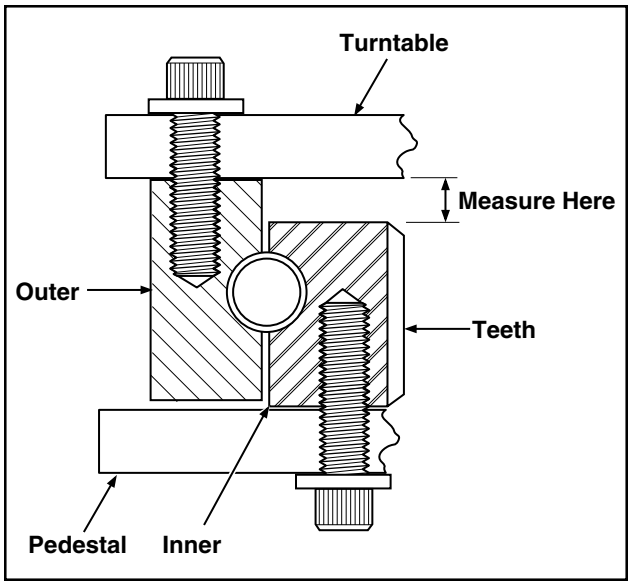


Figure 5-6. Swing Bearing Clearance Measurement

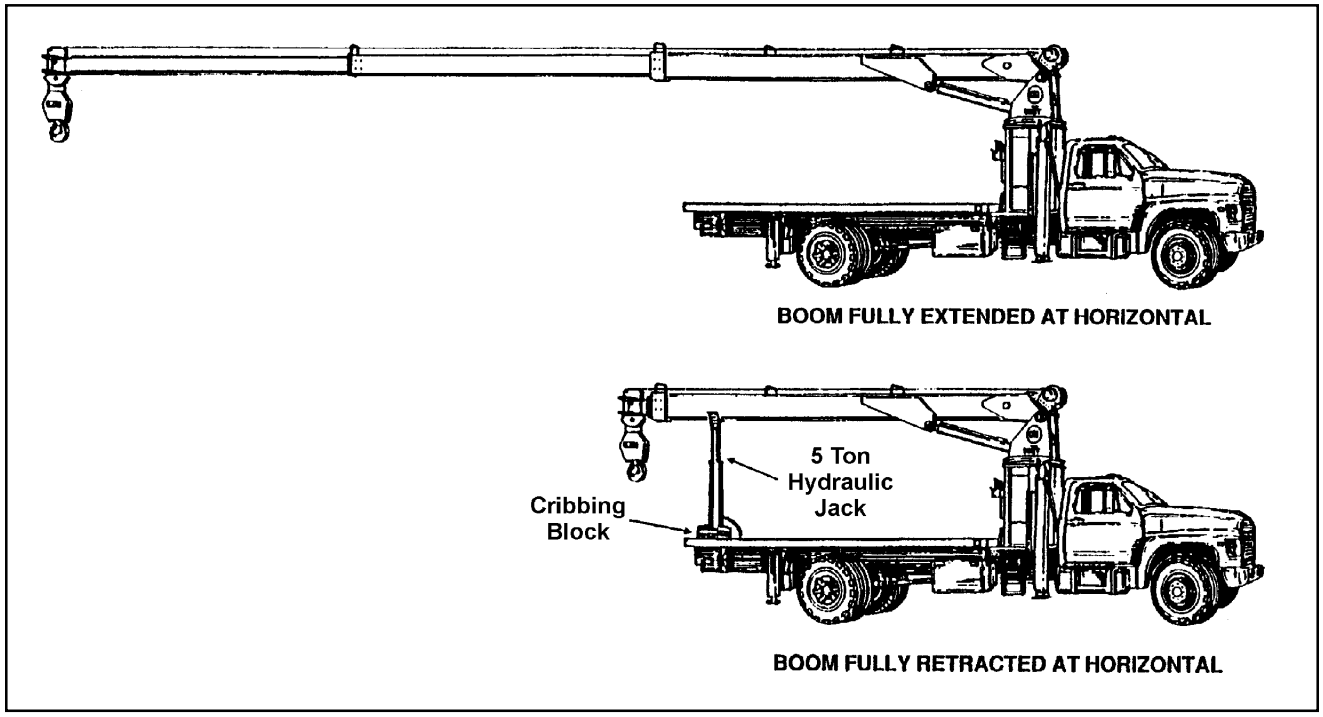


Figure 5-7. Bearing Tolerance Check

GENERAL

The electrical system is an integral part of the machine and should not be tampered or modified in any way.

⚠WARNING: MODIFICATION OF MACHINE WITHOUT CERTIFICATION BY A RESPONSIBLE AUTHORITY THAT THE MACHINE IS AT LEAST AS SAFE AS ORIGINALLY MANUFACTURED IS A SAFETY VIOLATION.

ANTI-TWO-BLOCK SYSTEM OPERATION

The anti-two-block system prevents the hook sheave block from contacting the boom nose with consequent structural and hoist cable damage. The electro-hydraulic system utilizes a single solenoid valve and derives electrical power from the positive (+) terminal of the power relay.

Power is cut to the telescope out and hoist up functions in the event that the sheave block contacts the anti-two-block counterweight suspended on the hoist cable beneath the boom nose.

The normally open (NO) switch, mounted to the boom nose, is held closed by the counterweight. This switch opens when the hookblock comes into contact with and raises the counterweight. The switch opens the circuit to the solenoid valve, thus directing fluid flow back to the tank.

A spring-loaded cable reel, mounted on the side of the base section, permits extension and retraction of the electrical cable. Roller guides prevent damage to

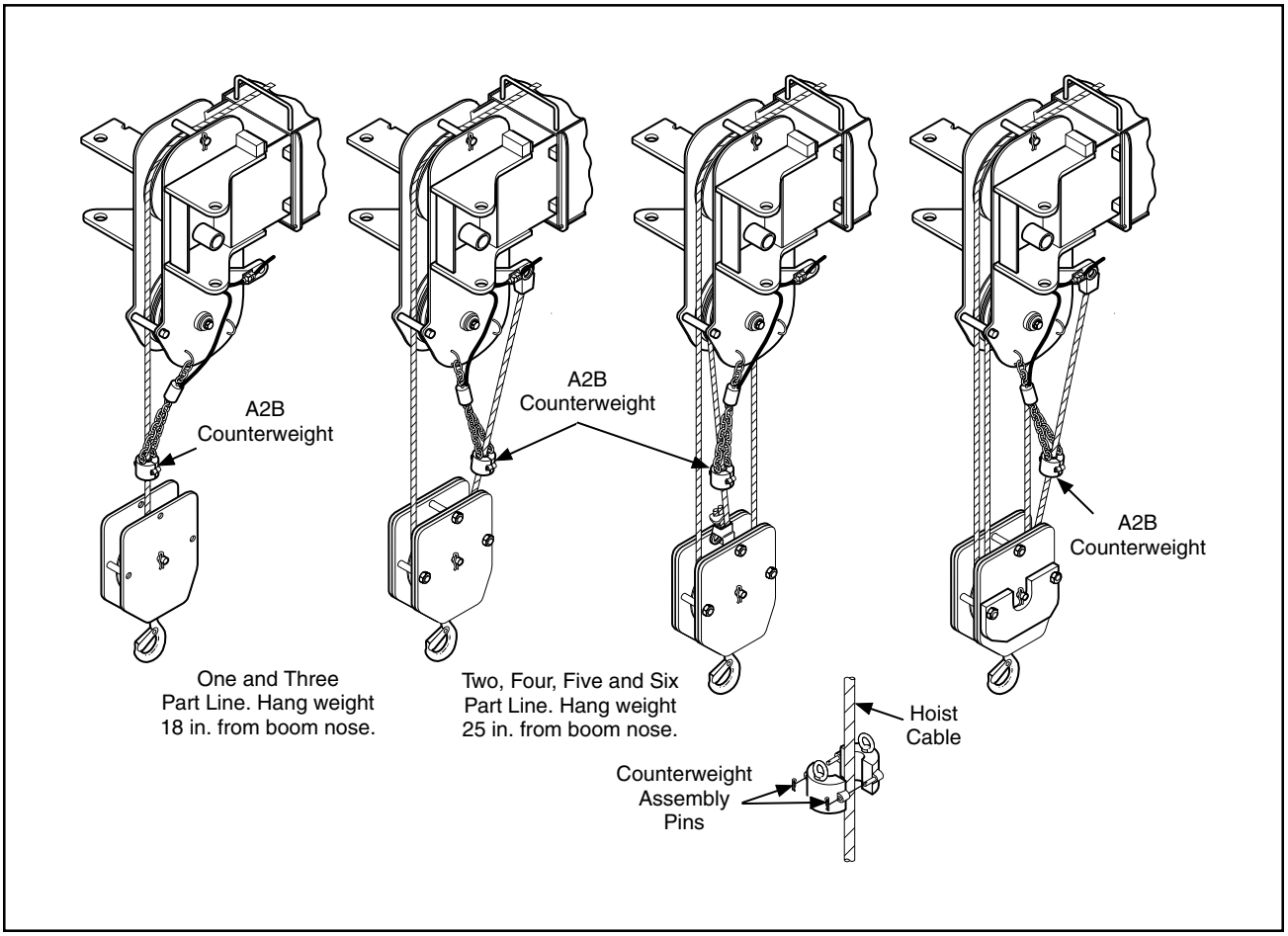


Figure 6-1. Anti-Two-Block Positions

the cable while permitting smooth cable extension and retraction.

The counterweight suspension chain will have to be adjusted according to the number of parts of lines being used.

ELECTRICAL SYSTEM

The electrical system consists of a main electrical box located at the rear of the pedestal. Power enters the crane electrical system from the battery. A power solenoid turns power to the crane functions on and off. Usually, a signal wire from the PTO switch ground operates the power solenoid through a relay. This can vary, depending upon the type of PTO installed.

Stacked terminal strips distribute power between the various components located in the main electrical box.

OVERLOAD SYSTEM

The overload system includes an optional shut-down function on some models. The shut-down function operates by activating a solenoid valve that dumps oil to the reservoir.

The overload system monitors the pressure difference between the extend and retract ports. If the machine is overloaded, the system will not allow the machine to boom down, boom up, telescope out or hoist up. An override switch is provided to allow the boom up function to operate, which may be needed in certain situations.

LOAD MOMENT INDICATOR

Some models may be equipped with an additional Load Moment Indicator (LMI). The LMI provides load information such as load weight, load radius and boom angle. Refer to the LMI documentation for additional information.

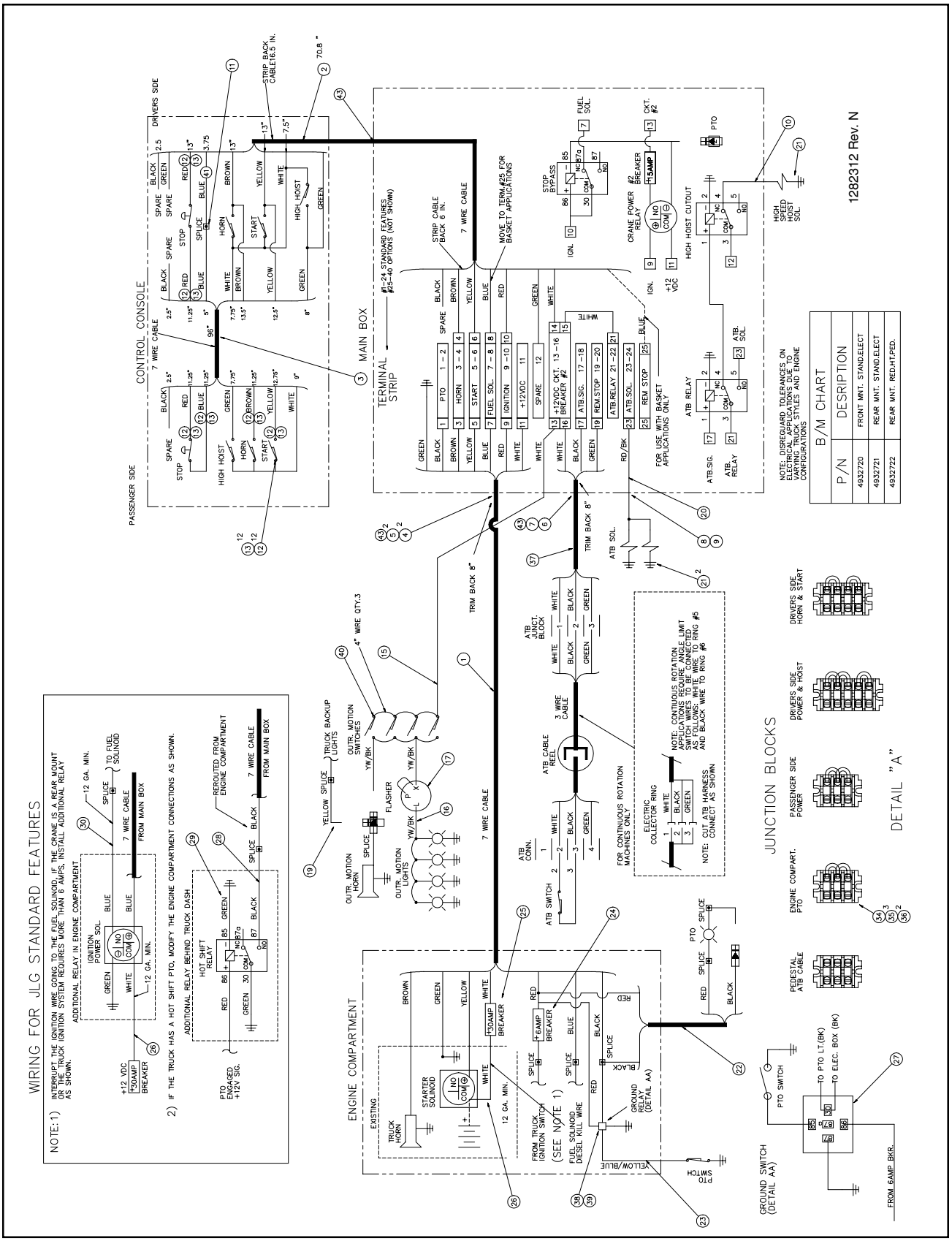


Figure 6-2. Electrical Schematic

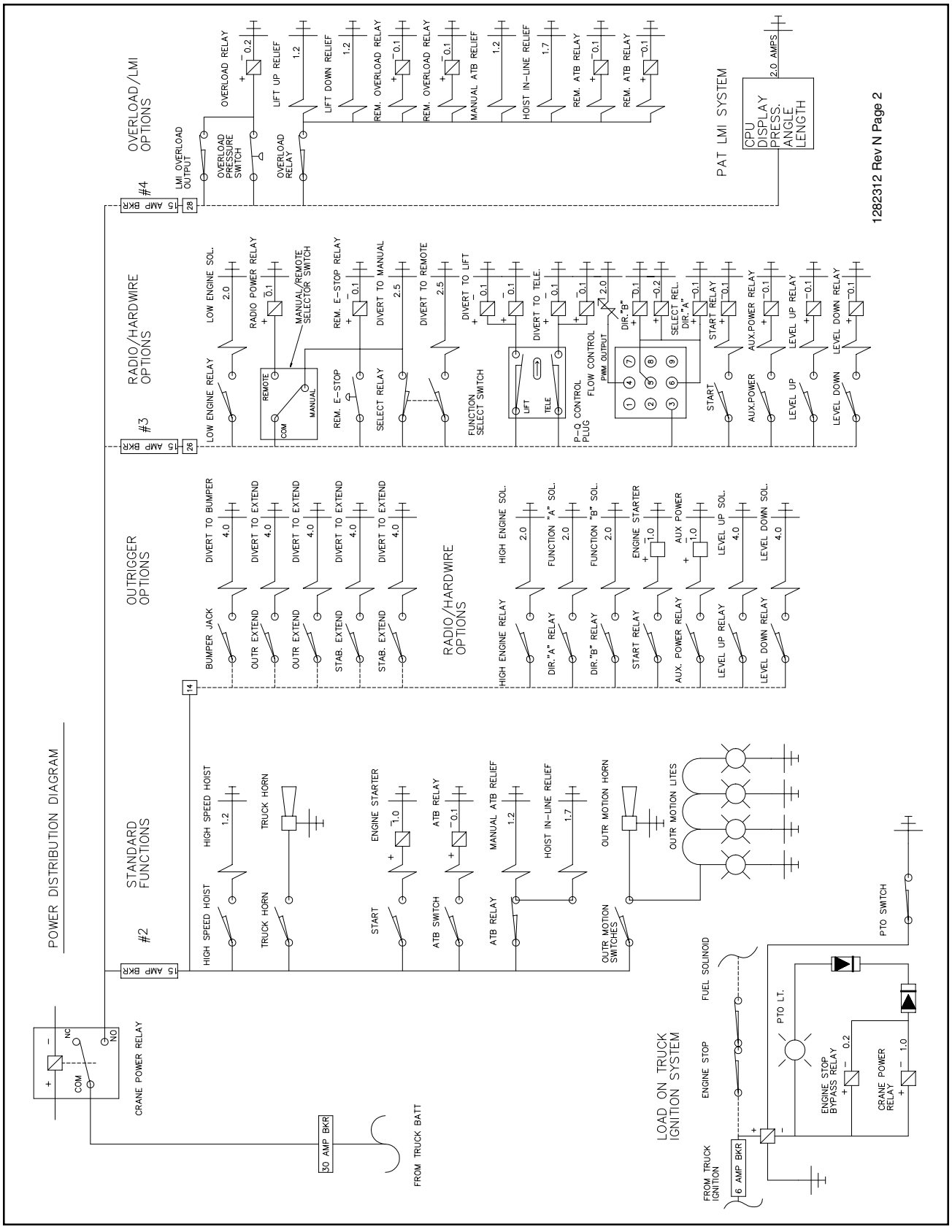


Figure 6-3. Electrical Power Distribution Diagram

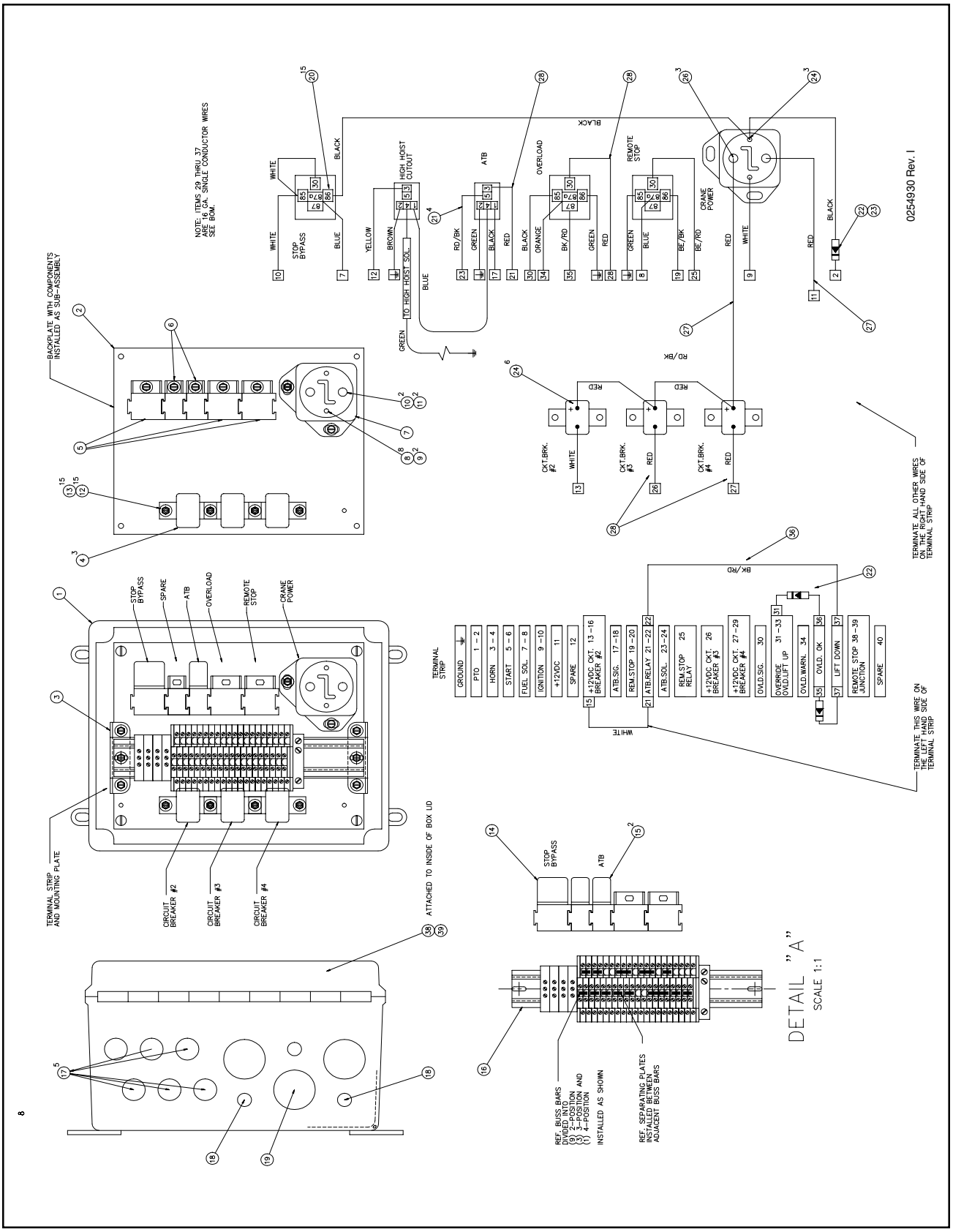
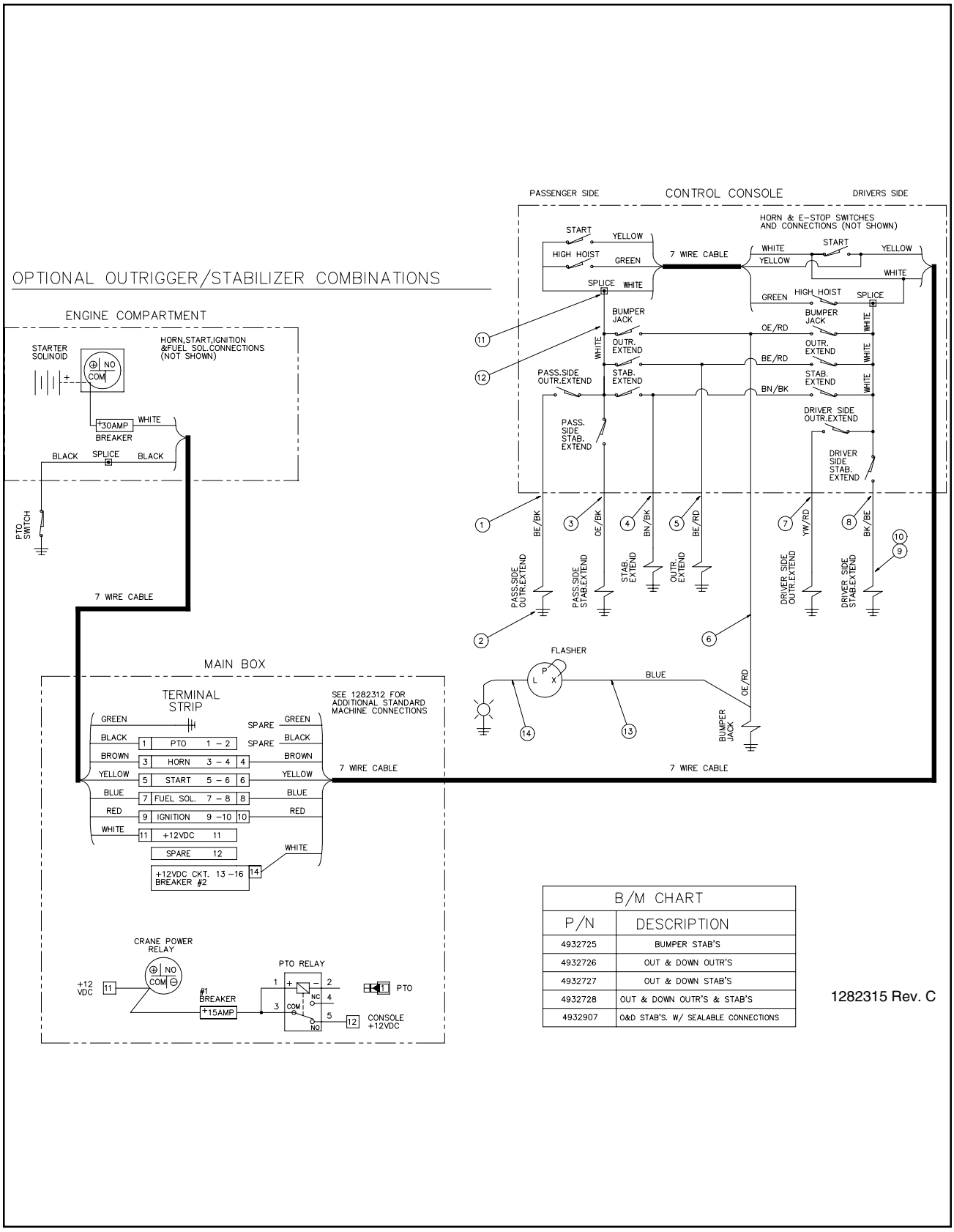


Figure 6-4. Electrical Box Schematic



B/M CHART	
P/N	DESCRIPTION
4932725	BUMPER STAB'S
4932726	OUT & DOWN OUTR'S
4932727	OUT & DOWN STAB'S
4932728	OUT & DOWN OUTR'S & STAB'S
4932907	O&D STAB'S. W/ SEALABLE CONNECTIONS

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Figure 6-5. Outrigger/Stabilizer Schematic

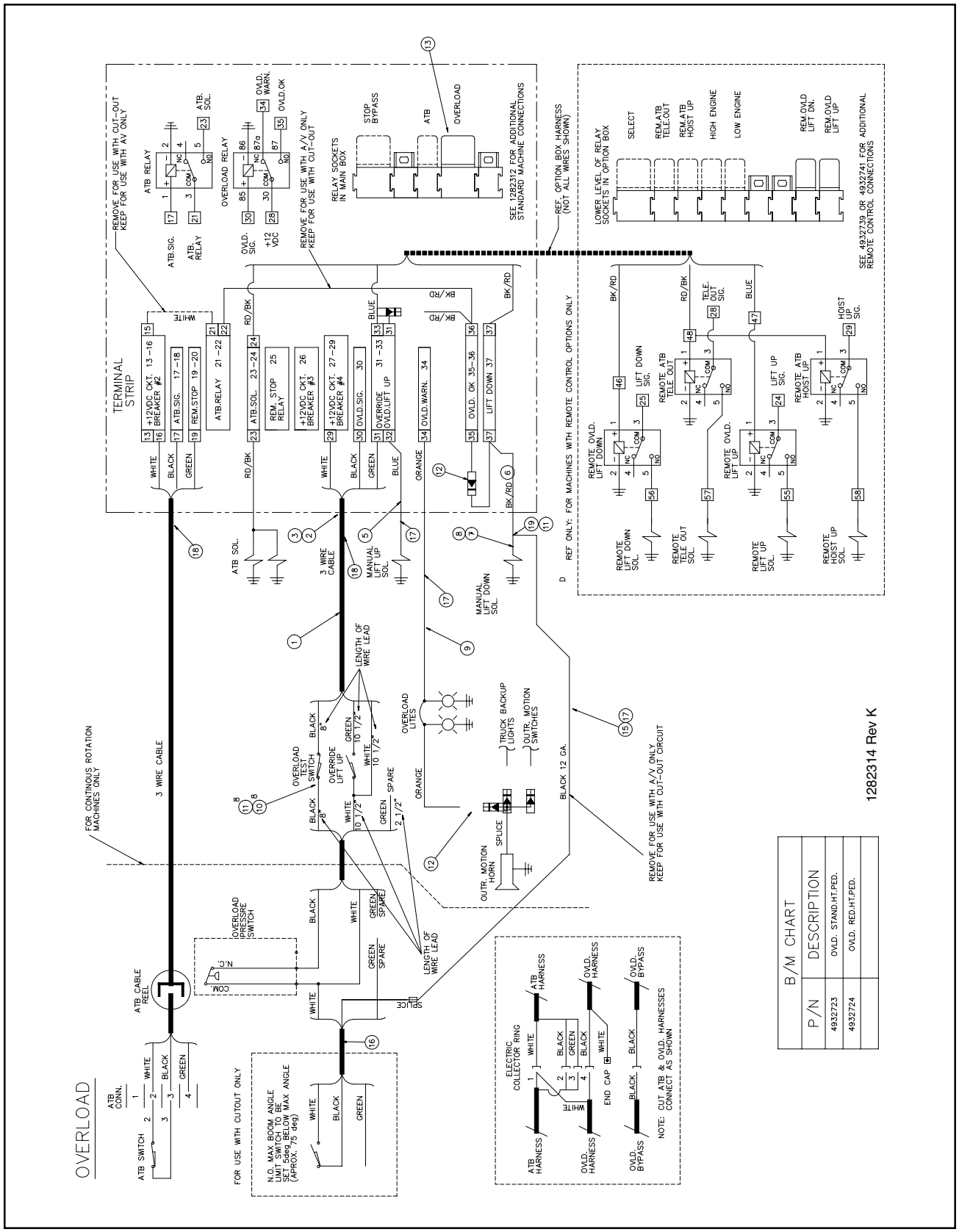

Figure 6-6. Overload Electrical Schematic

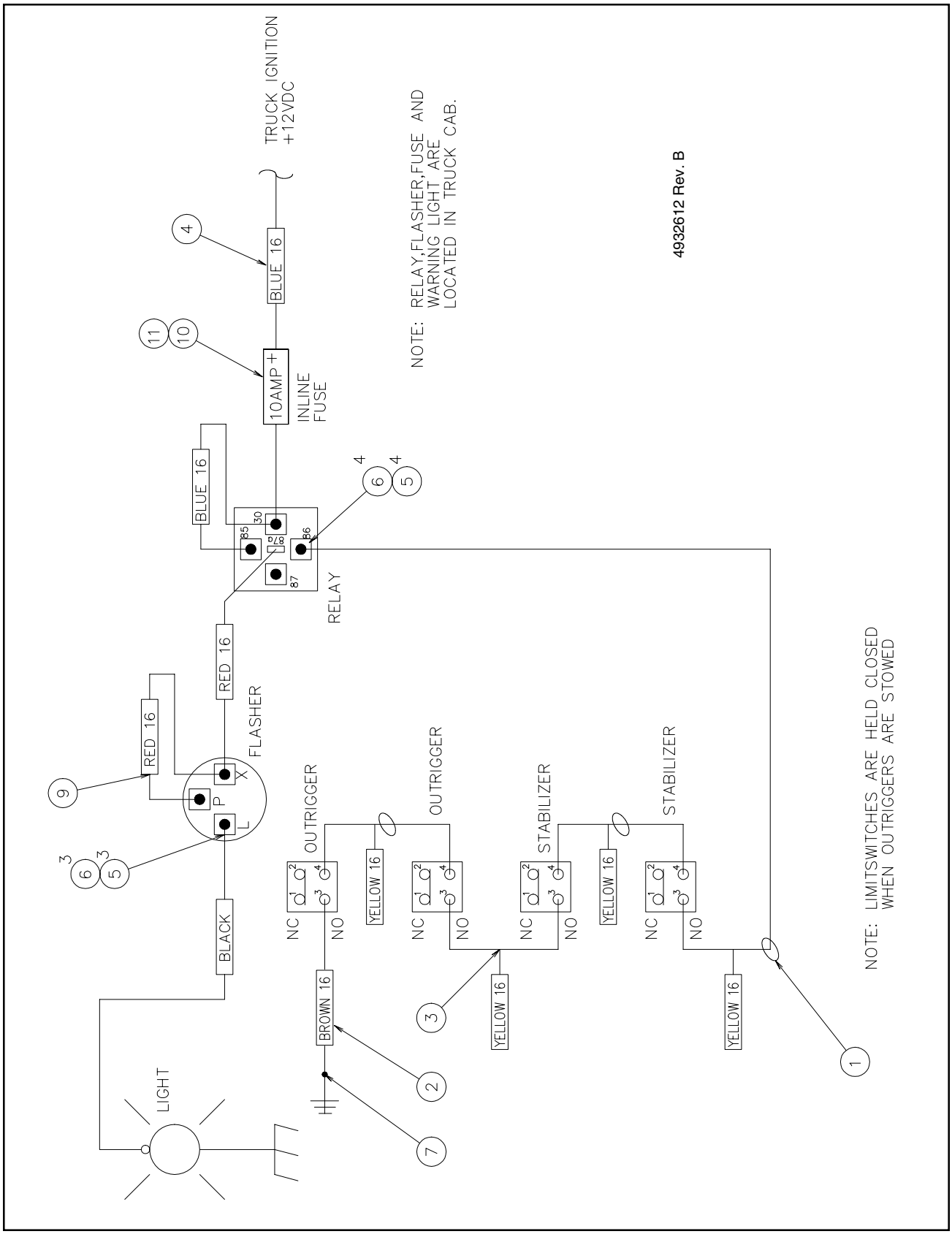

Figure 6-7. Outrigger/Stabilizer Wiring

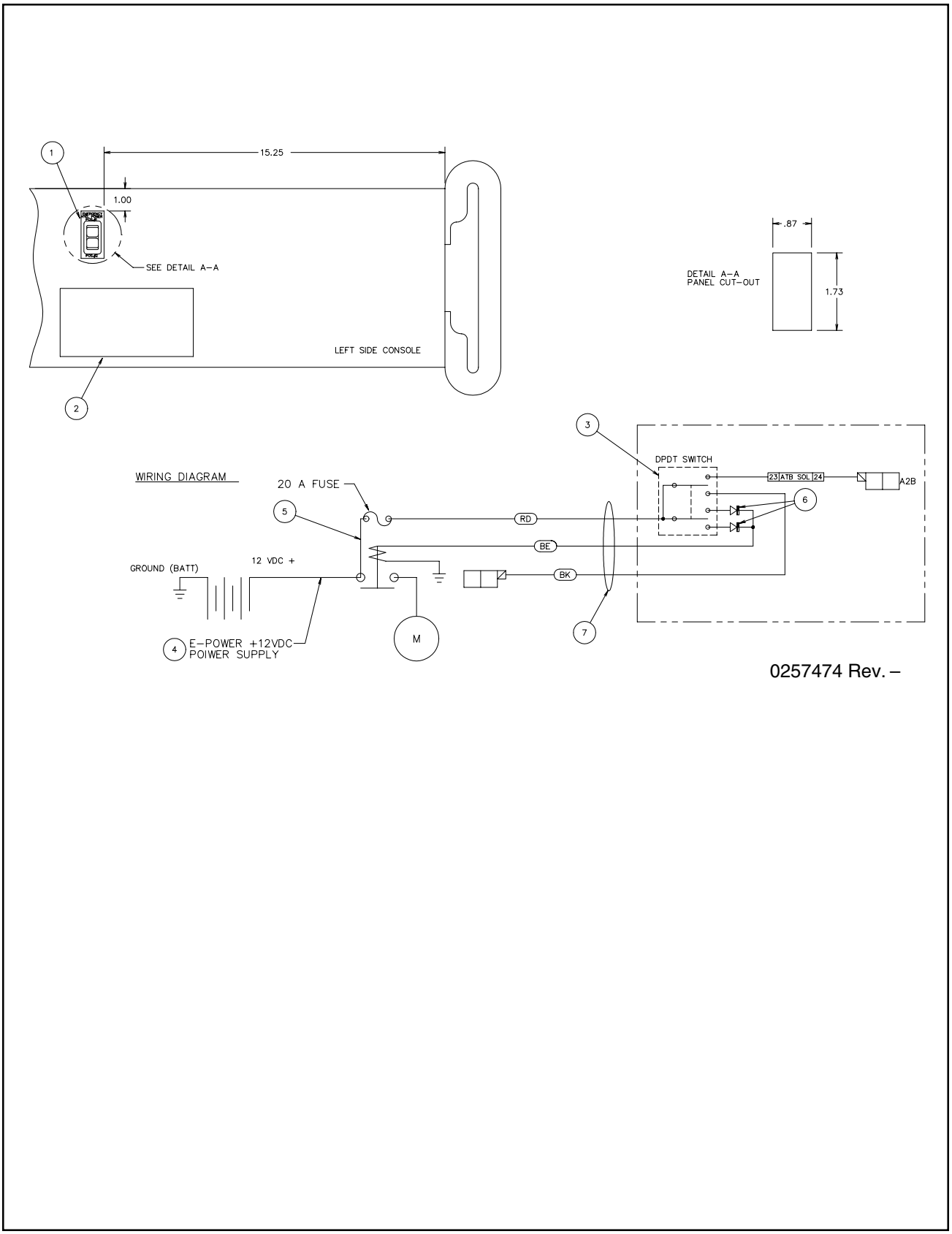

Figure 6-8. Outrigger/Stabilizer Switch Wiring

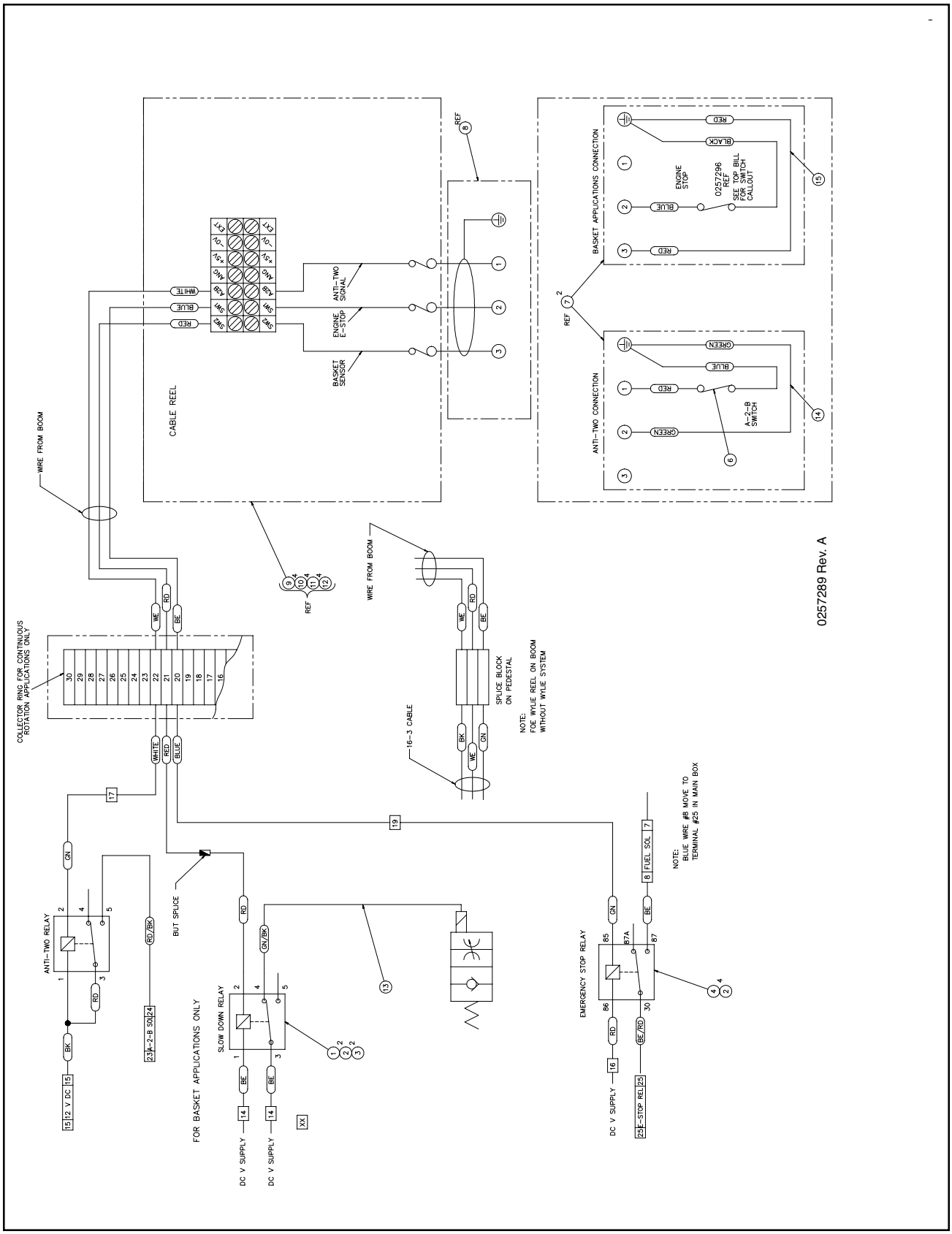

Figure 6-9. A2B with Slow-Down Circuit for Platform Installation Wiring

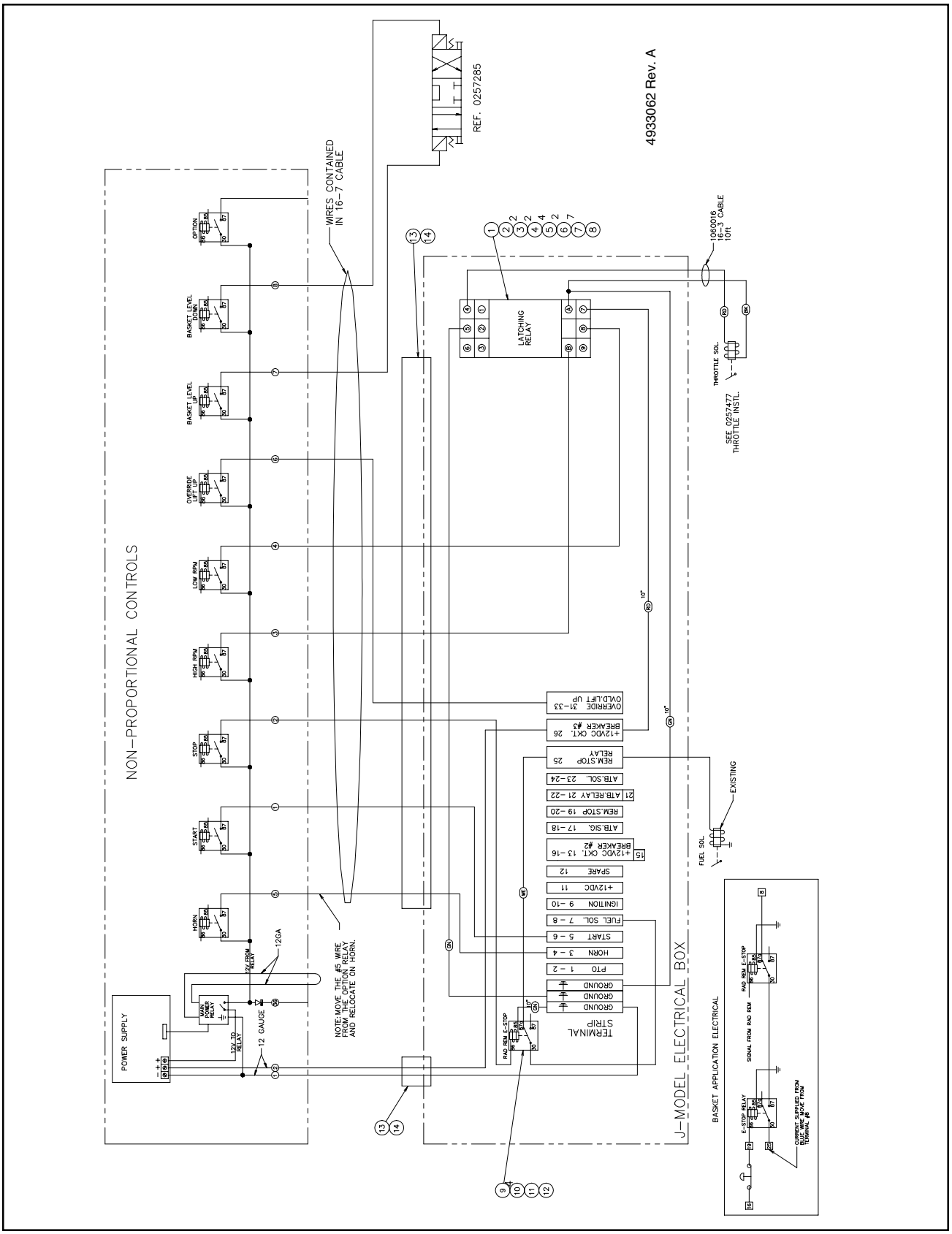

Figure 6-10. Radio Remote Control

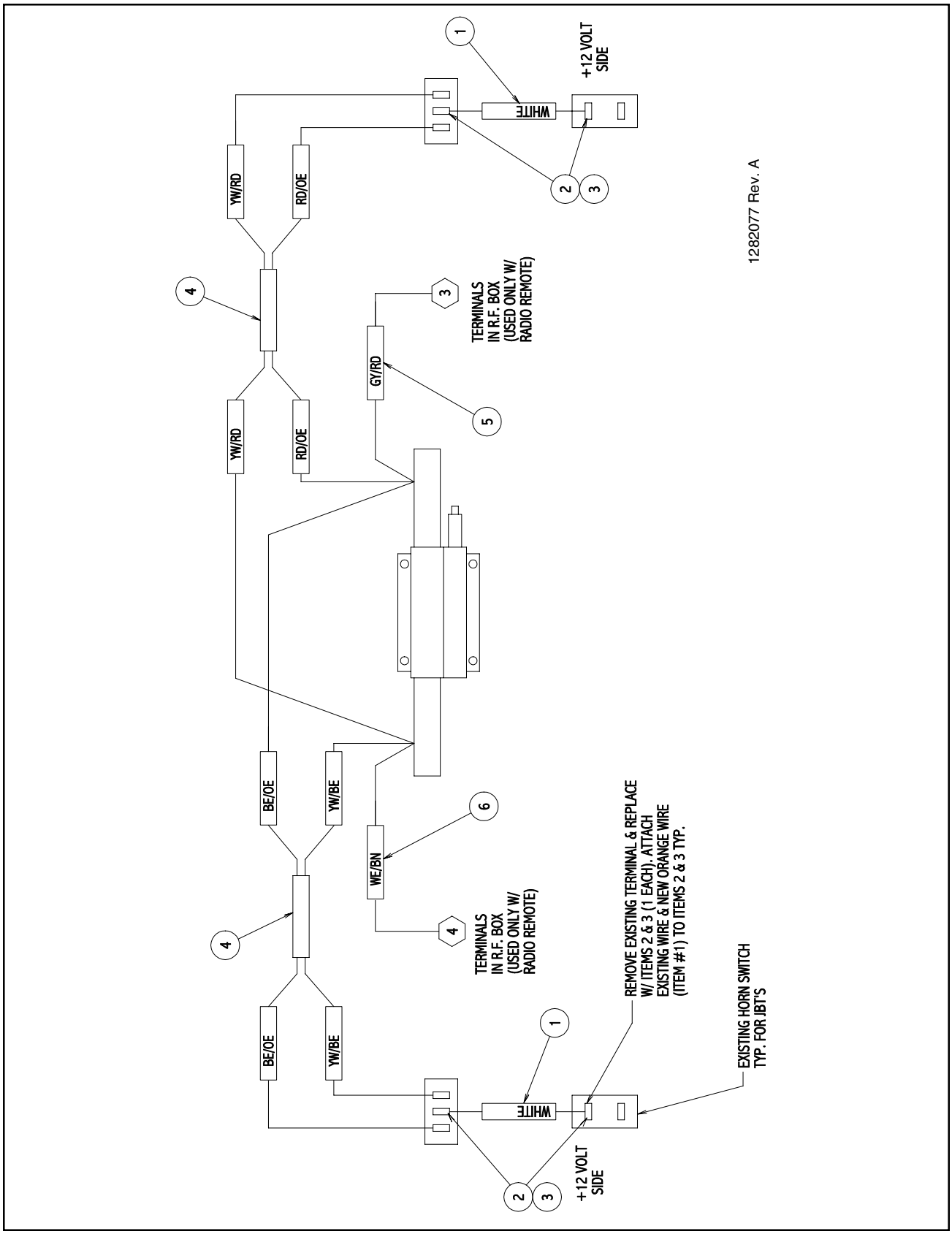

Figure 6-11. Clam Shell

HYDRAULIC SYSTEM SAFETY

It should be particularly noted that the machine's hydraulic systems operate at extremely high and potentially dangerous pressures. Every effort should be made to relieve any system pressure prior to disconnecting or removing any portion of the system.

Relieve system pressure by cycling the applicable control several times with the engine stopped and ignition "on" to direct any line pressure back into the return line to the reservoir. Pressure supply lines to system components can then be disconnected with minimal fluid loss.

⚠WARNING: NEVER CHECK FOR LEAKS USING HANDS. HYDRAULIC FLUID UNDER PRESSURE CAN PENETRATE SKIN. NEVER CHECK FOR LEAKS USING HANDS.

DRIFT TEST

To determine if cylinders are leaking internally, drift tests can be conducted on the telescope and lift cylinders.

Telescope Cylinder

1. Activate hydraulic system, properly set outriggers and stabilizers.

⚠WARNING: BEFORE EXTENDING AND RAISING BOOM, ENSURE THAT AREAS ABOVE AND BELOW BOOM AND HOOK BLOCK, AND AHEAD OF HOOK BLOCK ARE CLEAR OF ALL OBSTRUCTIONS AND PERSONNEL.

2. With boom in the stowed position, move telescope control lever forward until boom extends approximately four feet. Use tape or chalk line to mark outer-mid section at end of base section.
3. Raise boom to maximum elevation (80°).
4. Shut down hydraulic system by disengaging Power-Take-Off (PTO) and turning off truck engine.
5. With engine off, move telescope control lever to retract boom. If boom starts to retract, holding valve is defective and requires replacement.
6. If boom does not retract, complete steps 7 through 10.

⚠CAUTION: HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID THE ENTRY OF CONTAMINANTS INTO THE SYSTEM.

7. Tag and carefully disconnect the hydraulic lines to telescope cylinder. Use a suitable container to retain any residual hydraulic fluid. Immediately cap lines and ports.
8. Leave boom elevated in test position for approximately one hour.

⚠WARNING: BEFORE LOWERING BOOM, ENSURE THAT AREAS BELOW BOOM AND HOOK BLOCK ARE CLEAR OF ALL PERSONNEL AND OBSTRUCTIONS.

9. Start engine and, using truck hydraulics, lower boom to horizontal position.
10. Check boom length against original measurement.

    If boom has retracted more than one inch and oil is leaking around rod-end of telescope cylinder (check with light and inspection mirror), seals are defective. Replace the seals and check the cylinder rod for scoring.

    If boom has retracted and oil is leaking from holding valve, the valve is either improperly adjusted or defective and requires replacement.
11. Connect hydraulic lines to telescope cylinder.

Lift Cylinder

1. Activate hydraulic system and set outriggers and stabilizers.
2. Position boom in horizontal position over rear of truck.

Note: Tape measure or cord should be at least seven (7) feet long for use in this test.

3. Attach tape measure or cord (at least 30 feet long) to bottom of hook block.

⚠WARNING: BEFORE RAISING AND EXTENDING BOOM, ENSURE THAT AREAS ABOVE AND BELOW BOOM AND HOOK BLOCK ARE CLEAR OF ALL OBSTRUCTIONS AND PERSONNEL.

4. Raise boom to a 15° elevation. Fully extend boom.
5. Shut down hydraulic system by disengaging Power-Take-Off (PTO) and turn off truck engine.
6. With engine off, move boom control lever forward.

   If boom starts to lower, holding valve is defective and requires replacement.

   If boom does not lower, complete steps 7 through 10.

⚠CAUTION: HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID ENTRY OF CONTAMINANTS INTO THE SYSTEM.

7. Tag and carefully disconnect hydraulic lines to lift cylinder. Use a suitable container to retain any residual hydraulic fluid. Cap lines and ports.
8. Note position of tape or cord and its position on the ground. Mark as necessary. Leave boom elevated in test position for approximately one hour.
9. Check to see whether boom has lowered more than eight inches.

   If boom has lowered and oil is leaking around rod-end cap of cylinder, seals in cylinder are defective and require replacement.

   If boom has lowered and oil is leaking from the holding valve, the valve is either improperly adjusted or defective and requires replacement.

⚠CAUTION: ENSURE THAT HYDRAULIC LINES ARE CONNECTED PROPERLY.

10. Connect hydraulic lines to lift cylinder.

PRESSURE TESTING

Several relief valves protect against overloading different hydraulic circuits. Each relief valve should be checked when setting up the machine or if lift power seems too high or too low. Refer to the table for specific settings for each relief valve.

Main Relief Valve

The main relief valve protects the lift, telescope out, outrigger and stabilizer circuits.

1. Attach a 0-4000 psi (0-276 bar) pressure gauge to the gauge port at the mid-inlet section of the control valve.

Table 7-1 Pressure Settings

COMPONENT	PRESSURE SETTING PSI (BAR)
MAIN RELIEF HOIST	3200 (220.6)
BURST-OF-SPEED (IN-LINE RELIEF)	2000 (137.9)
MAIN RELIEF VALVE BANK	3500 (241.3)
LIFT UP	3500 (241.3)
LIFT DOWN	3500 (241.3)
TELESCOPE OUT	3300 (227.5)
TELESCOPE IN	2500 (172.3)
SWING	2100 (144.8)
OUTRIGGER	3500 (241.3)
STABILIZER	3500 (241.3)

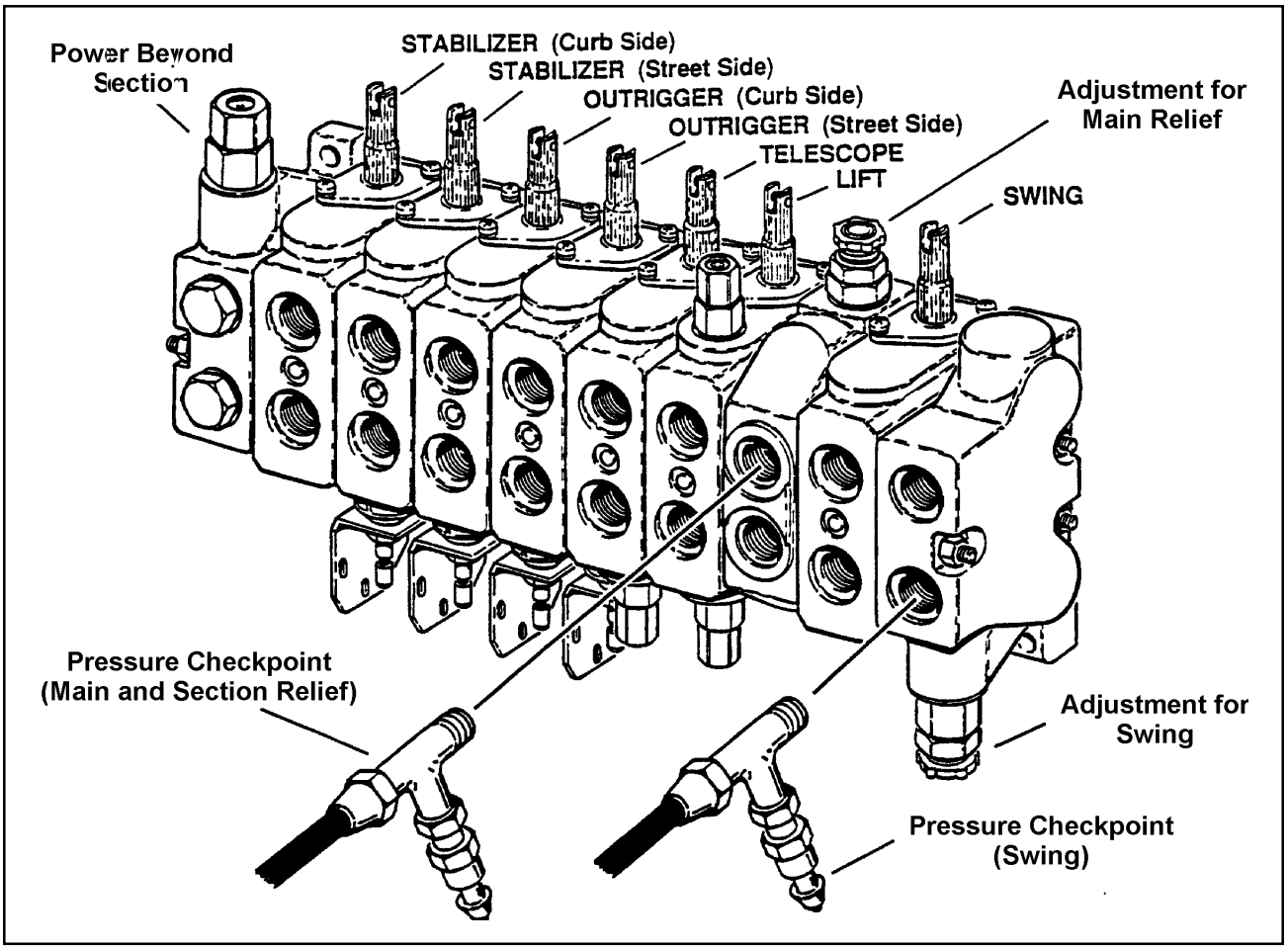

Figure 7-1. Main Control Valve Pressure Relief Test Locations

2. Using all applicable safety practices, start the truck engine, engage the PTO and operate the crane at low engine speed.
3. Completely retract one of the outriggers until the cylinder "bottoms" out and the main relief valve opens. Note the pressure on the gauge. Refer to the table for the proper pressure setting.
4. If the pressure is incorrect, remove the acorn nut or loosen the jam nut on the relief valve cartridge to access the adjustment screw.

   If the pressure is too low, turn the adjustment screw clockwise to increase the pressure setting. If pressure is too high, turn the adjustment screw counterclockwise to decrease the pressure setting.
5. Tighten jam nut while holding the adjusting screw or install the acorn nut.
6. Repeat step 3 to ensure that the pressure setting is correct.

Telescope In Relief Valve

The telescope in function has a separate relief valve on the retract side of the telescope section.

1. Attach a 0-4000 psi (276 bar) pressure gauge to the gauge port at the mid-inlet section of the control valve.
2. Using all applicable safety practices, start the truck engine, engage the PTO and set the outriggers. Operate the crane at low engine speed.
3. Retract the boom until the telescope cylinder "bottoms" out and the relief valve opens. Note the pressure on the gauge. Refer to the table for the proper pressure setting.

4. If the pressure is incorrect, remove the acorn nut or loosen the jam nut on the relief valve cartridge to access the adjustment screw.

   If the pressure is too low, turn the adjustment screw clockwise to increase the pressure setting. If pressure is too high, turn the adjustment screw counterclockwise to decrease the pressure setting.

5. Tighten jam nut while holding the adjusting screw or install the acorn nut.

6. Repeat step 3 to ensure that the pressure setting is correct.

Swing Inlet Relief Valve

The swing section has a separate relief valve in the swing inlet section.

1. Attach a 0-4000 psi (0-276 bar) pressure gauge to the gauge port at the mid-inlet section of the control valve.

2. Remove the hydraulic line to the swing brake and plug the line.

3. Using all applicable safety practices, start the truck engine, engage the PTO and operate the crane at low engine speed.

4. Move the swing control lever in either direction and note the pressure reading on the gauge.

5. If the pressure is incorrect, remove the acorn nut or loosen the jam nut on the relief valve cartridge to access the adjustment screw.

   If the pressure is too low, turn the adjustment screw clockwise to increase the pressure setting. If pressure is too high, turn the adjustment screw counterclockwise to decrease the pressure setting.

6. Tighten jam nut while holding the adjusting screw or install the acorn nut.

7. Repeat step 4 to ensure that the pressure setting is correct.

Hoist Relief Valve

The hoist relief valve is located on the hoist control valve.

1. Attach a 0-4000 psi (0-276 bar) pressure gauge to the gauge port on the hoist control valve inlet.

2. Remove the hydraulic lines to the hoist and plug both lines.

3. Using all applicable safety practices, start the truck engine, engage the PTO and set the outriggers. Operate the crane at low engine speed.

4. Move hoist control valve in either direction and note pressure gauge reading. Refer to the table for the correct pressure setting.

5. If the pressure is incorrect, remove the acorn nut or loosen the jam nut on the relief valve cartridge to access the adjustment screw.

   If the pressure is too low, turn the adjustment screw clockwise to increase the pressure set-

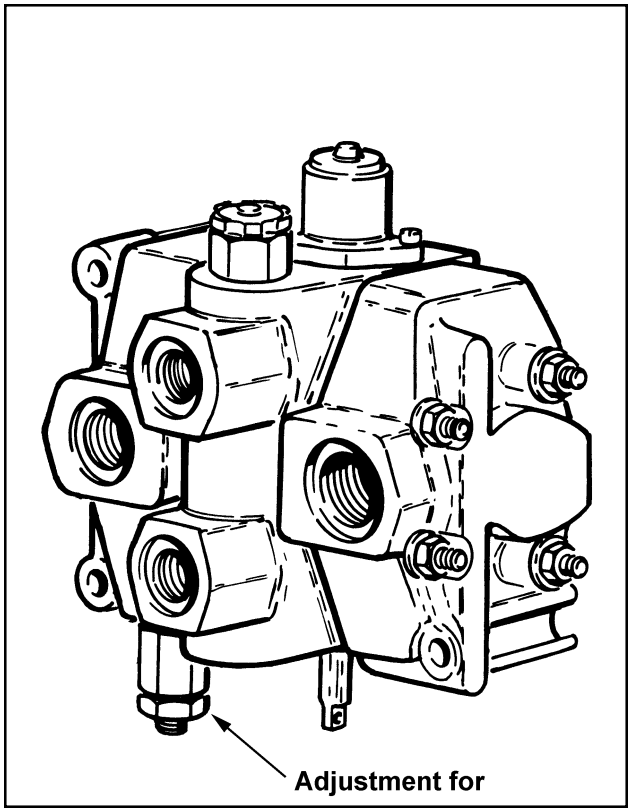

Figure 7-2. Hoist Valve Relief Cartridge

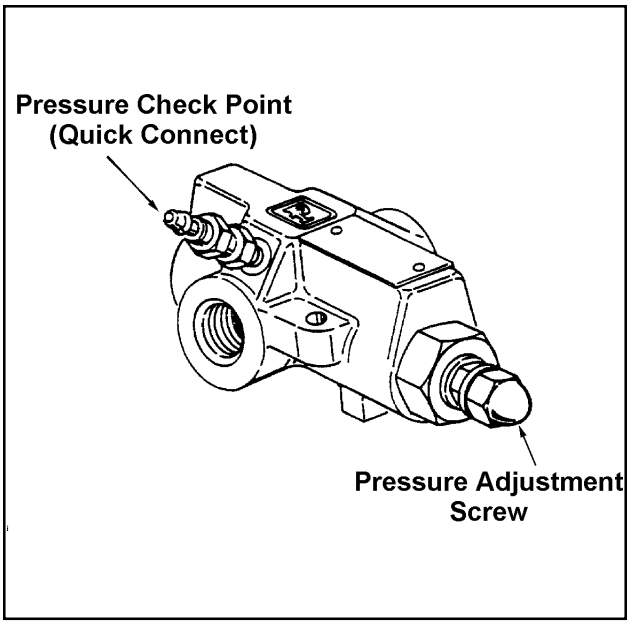

Figure 7-3. In-Line Relief Valve

ting. If pressure is too high, turn the adjustment screw counterclockwise to decrease the pressure setting.

6. Tighten jam nut while holding the adjusting screw or install the acorn nut.
7. Repeat step 4 to ensure that the pressure setting is correct.

Burst-Of-Speed and Telescope Out Relief Valve

On older models two inline relief valves are used to protect the burst-of-speed and telescope out functions. Newer models use a manifold block valve with cartridges to protect these two circuits.

Test methods are similar for each circuit.

1. Attach a 0-4000 psi (0-276 bar) pressure gauge to the gauge port on inline valves or manifold.

Note: Block valves have gauge ports labelled G-1 for the burst-of-speed circuit and G-2 for the telescope out circuit.

2. For burst-of-speed tests, remove one end of the hydraulic line between the main control valve and the hoist control valve and plug.
3. Using all applicable safety practices, start the truck engine, engage the PTO and set the outriggers. Operate the crane at low engine speed.
4. Operate the appropriate control lever and note the pressure reading on the gauge.

IMPORTANT: For telescope out relief valve testing, be sure the outriggers and stabilizers are set. The boom must be fully extended and "bottomed out" to cause the relief valve to operate.

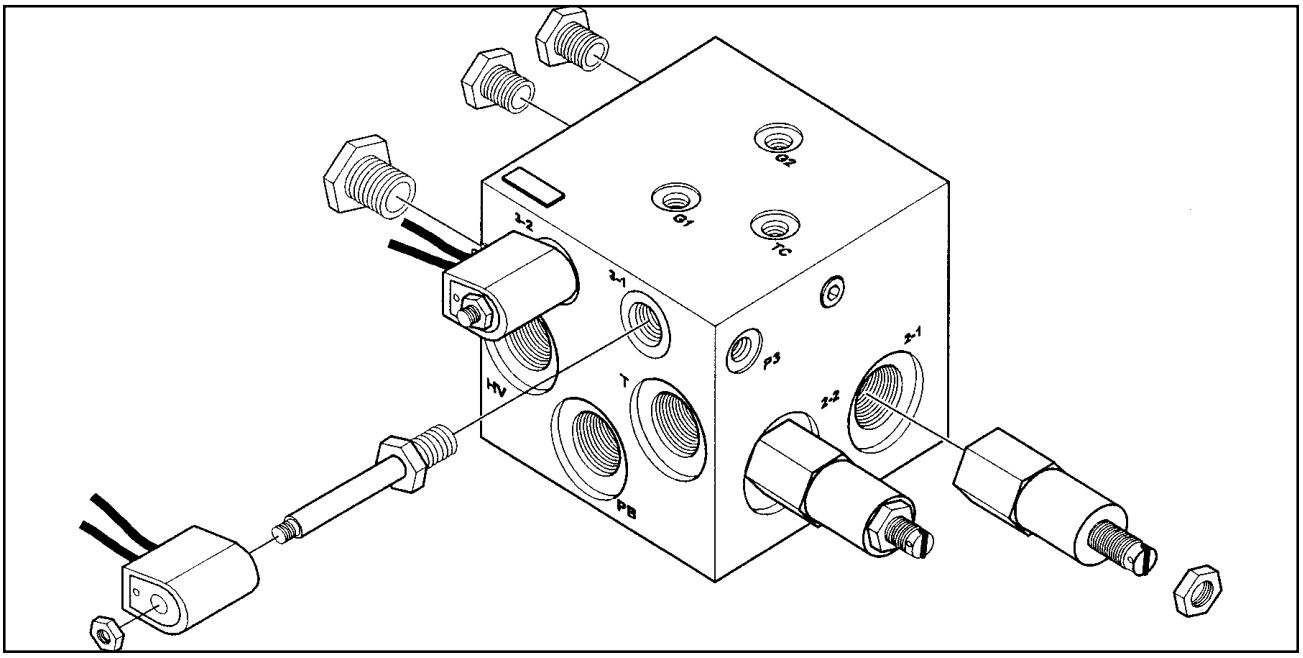

Figure 7-4.Manifold Block Valve

5. If the pressure is incorrect, remove the acorn nut or loosen the jam nut on the relief valve cartridge to access the adjustment screw.

   If the pressure is too low, turn the adjustment screw clockwise to increase the pressure setting. If pressure is too high, turn the adjustment screw counterclockwise to decrease the pressure setting.

6. Tighten jam nut while holding the adjusting screw or install the acorn nut.

7. Repeat step 4 to ensure that the pressure setting is correct.

CYLINDERS

Holding Valves

Each hydraulic cylinder on the crane (except the outrigger extend cylinder) has an integral holding valve to prevent the cylinder from retracting if a line breaks or is accidentally punctured. The holding valves use small orifices which can become clogged if dirt enters the hydraulic system.

Holding valves prevent movement in one direction only, such as retraction. Some applications require holding valves for both directions. When multiple holding valves are used, it is possible to trap oil in the cylinder between the holding valves. To avoid this, do not remove the holding valves when the cylinder is fully extended or retracted.

To remove a holding valve:

1. Loosen the hoses into the cylinder to relieve any pressure.

2. Fit the wrench on the cartridge and cover with a rag to prevent hydraulic spray.

3. Remove the cartridge.

⚠CAUTION: NEVER ADJUST HOLDING VALVES.

Note: Cylinders vary depending upon the application. The procedures described herein are general. If specific questions arise contact the USTC Customer Service Department. If not equipped with cylinder disassembly tools, refer to a specialty hydraulic shop.

IMPORTANT: Perform cylinder disassembly and assembly on a clean work surface in a dirt free environment.

Dissasembly

1. Connect a suitable auxiliary hydraulic power source to the cylinder ports.

⚠WARNING: DO NOT FULLY EXTEND CYLINDER. RETRACT CYLINDER SLIGHTLY TO PREVENT TRAPPING PRESSURE.

2. Operate hydraulic power source and extend cylinder.

3. If applicable, remove holding valve(s) and fittings from cylinder port block. Discard o-rings.

4. Remove bleeder blugs and seal washers from cylinder port block.

5. Secure cylinder barrel in a suitable holding device. Clamp butt end of barrel to prevent distortion and barrel damage.

6. Remove nylon plug, if installed, and set screw from cylinder head cap.

7. Use a spanner wrench to loosen the cylinder head cap. Tap with a hammer, if necessary. Remove head cap from cylinder barrel.

IMPORTANT: Take care not to damage the chrome plating on the rod.

8. Attach a suitable pulling device to the cylinder rod.

IMPORTANT: Extreme care should be taken when removing cylinder rod, head and piston. Avoid pulling rod off-center, which could damage the piston or cylinder barrel surfaces.

9. With barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw complete rod assembly from barrel.

10. Using suitable protection for the rod, clamp cylinder rod in a vise or holding fixture as close to the piston as possible.

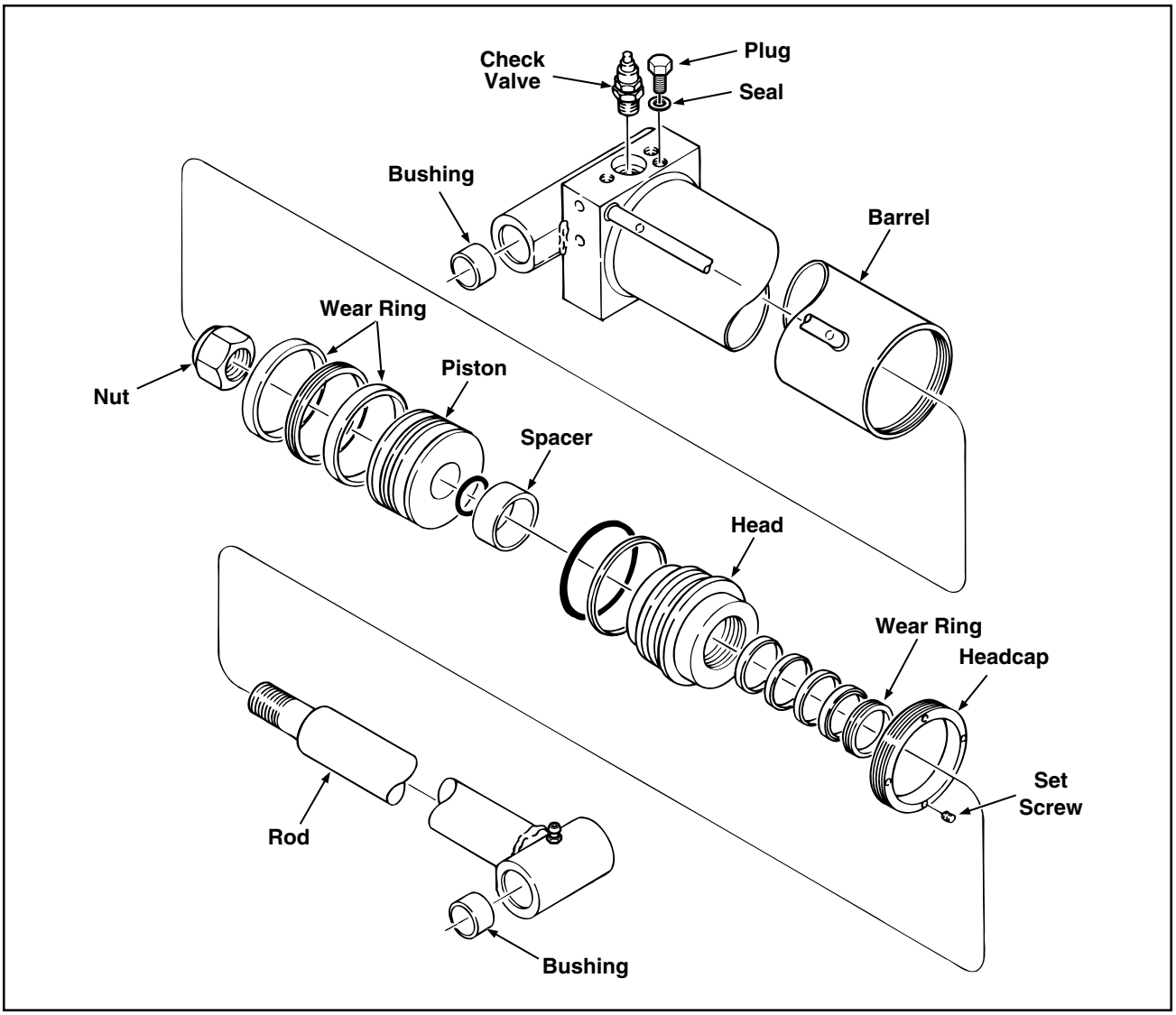

Figure 7-5. Typical Cylinder

11. Remove locknut attaching piston to the rod and remove piston.
12. Remove and discard piston o-ring, seals and wear rings.

Note: Some USTC cylinders use a 3-piece seal on the piston. Others use a standard, 1-piece seal.

13. If applicable, remove spacer from rod.
14. Remove rod from vise.
15. If applicable, remove cylinder head and head cap from rod.
16. Remove and discard head o-ring, back-up ring wear rings rod seal and wiper seal(s).

Cleaning and Inspection

1. Clean all parts thoroughly in an approved, commercial cleaning solvent.
2. Inspect cylinder rod for scoring, tapering, ovality or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod, if necessary.
3. Inspect threaded portion of rod for damage. Dress threads, as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace, if necessary.

5. Inspect threaded portion of barrel for damage. Dress threads, as necessary.
6. Inspect piston surface for damage and scoring and for distortion. Dress piston surface or replace piston, if necessary.
7. Inspect seal and o-ring grooves in piston and head for burrs and sharp edges. Dress applicable surfaces, as necessary.
8. Inspect cylinder head for scoring or other damage and for ovality and tapering. Check inside and outside diameters.
9. Inspect port block fittings and holding valve. Replace, as necessary.
10. Inspect oil ports for blockage or the presence of dirt or other foreign material. Repair, as necessary.

Assembly

Note: Prior to cylinder assembly, ensure that proper seal kit is used. Contact the USTC Customer Service Dept. if unsure.

IMPORTANT: Apply a light film of hydraulic oil to all components prior to assembly.

1. Install grease fitting in cylinder barrel or rod end, as necessary.
2. Install new wiper seal, rod U-cup seal)lips facing up) and wear rings into the applicable cylinder head gland grooves.
3. If applicable, carefully install cylinder head cap and cylinder head on rod, ensuring that wiper, rod seals and wear rings are not damaged or dislodged.
4. If applicable, carefully slide piston spacer on rod.
5. Install a new o-ring in the inner piston diameter groove. Ensure correct orientation.
6. Place the piston on the cylinder rod ensuring that o-ring is not damaged or dislodged.
7. Using suitable protection for the rod, clamp cylinder rod in a vise or holding fixture as close to the piston as possible. Push piston onto rod until it contacts the spacer end and install lock nut. Torque lock nut according to table.
8. Remove the cylinder rod from the holding fixture. install new o-ring and back-up ring in the applicable outside diameter groove of the cylinder head gland.

IMPORTANT: Ensure piston seals are installed properly. Improper seal installation could result in cylinder leakage and improper cylinder operation.

9. Install new seal assembly into the applicable outside diameter groove.
10. Install wear rings in applicable grooves in piston.
11. Position cylinder barrel in a suitable holding fixture.
12. With barrel clamped securely and while adequately supporting the rod, carefully insert piston end into cylinder barrel. Ensure piston wear rings and 3-piece seal assembly are not damaged or dislodged.
13. Continue pushing rod into barrel until the cylinder head cap can be inserted into the cylinder barrel.
14. Install cylinder head cap and secure using a suitable spanner wrench. Keep wrench toward outside of head cap to avoid distorting threads.
15. Install set screw in cylinder head cap.
16. Retract the rod into the barrel fully. Install holding valve(s) and fittings using new o-rings. Torque holding valves according to table.

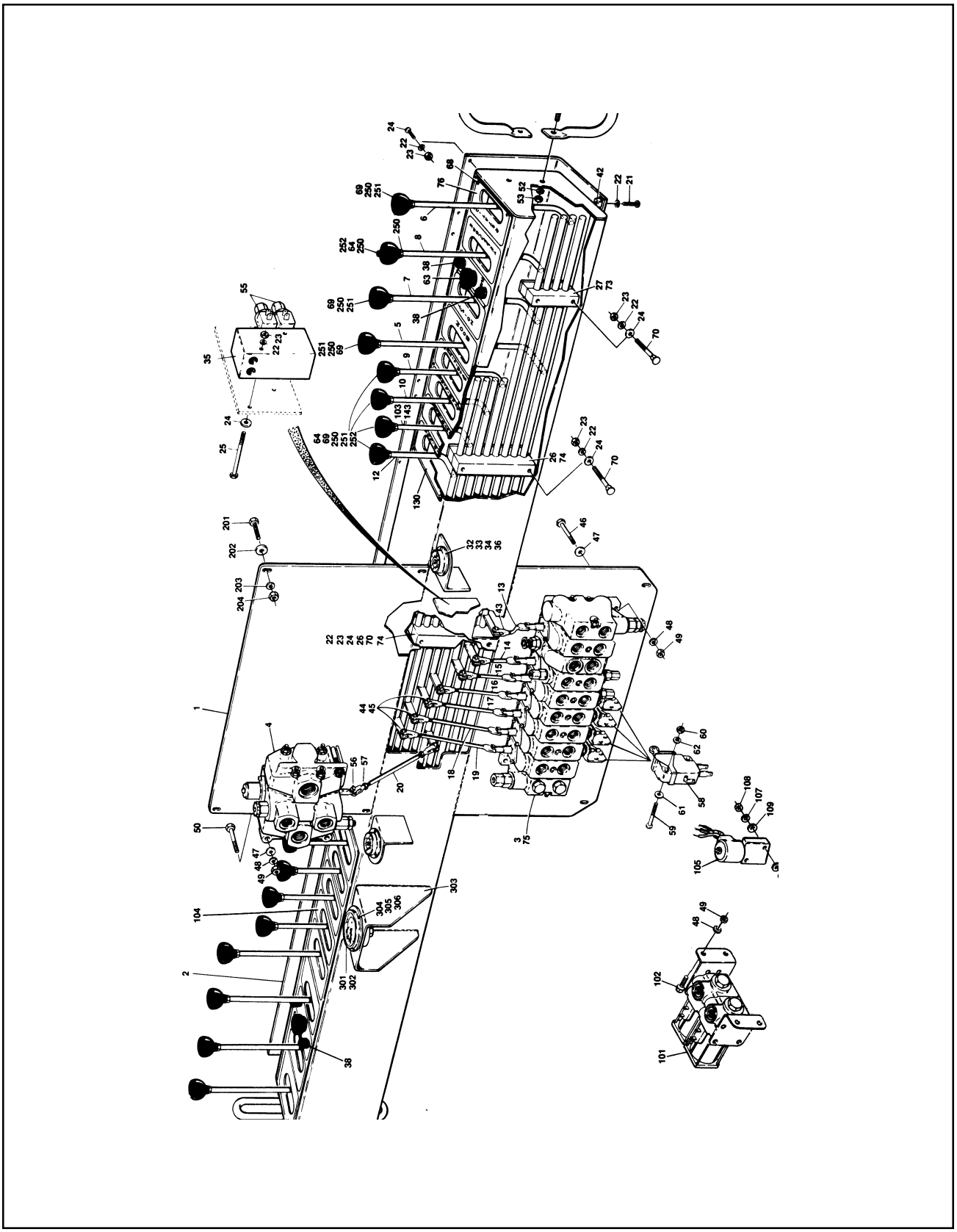

Figure 7-6. Control Valve Linkage

CONTROL VALVE

The main control valve operates the lift, telescope, swing functions and the outrigger functions

The swing section receives oil at the inlet from the small (8 gpm) pump section. The remaining sections receive oil at the mid-inlet from the middle (24 gpm) pump section.

The valve sections are three-position valves. A relief valve cartridge is located in the swing inlet and mid-inlet sections and in the telescope section on the retract side.

On the bottom of each outrigger/stabilizer section is a small switch which activates the outigger/stabilizer-in-motion alarm.

The control valve is located inside the console weldment. Sections are operated through linkages to the control handles.

The control valve can be accessed inside the pedestal through the pedestal side covers for adjustments and hose replacement. If the valve must be replaced or other components require access, the console weldment can be removed. To remove the console weldment, the hoses must be disconnected from the valves mounted on the inside of the console weldment.

IMPORTANT: Always clean area around valve and valve to prevent dirt and contamination from entering hydraulic lines and valve ports.

Always mark hydraulic lines according to port location before disconnecting hoses. Cap or plug hoses to prevent contamination.

When installing the valve and linkages attach the linkages before aligning the control levers. If the console weldment has been removed, adjust the linkages before mounting the console weldment to the pedestal.

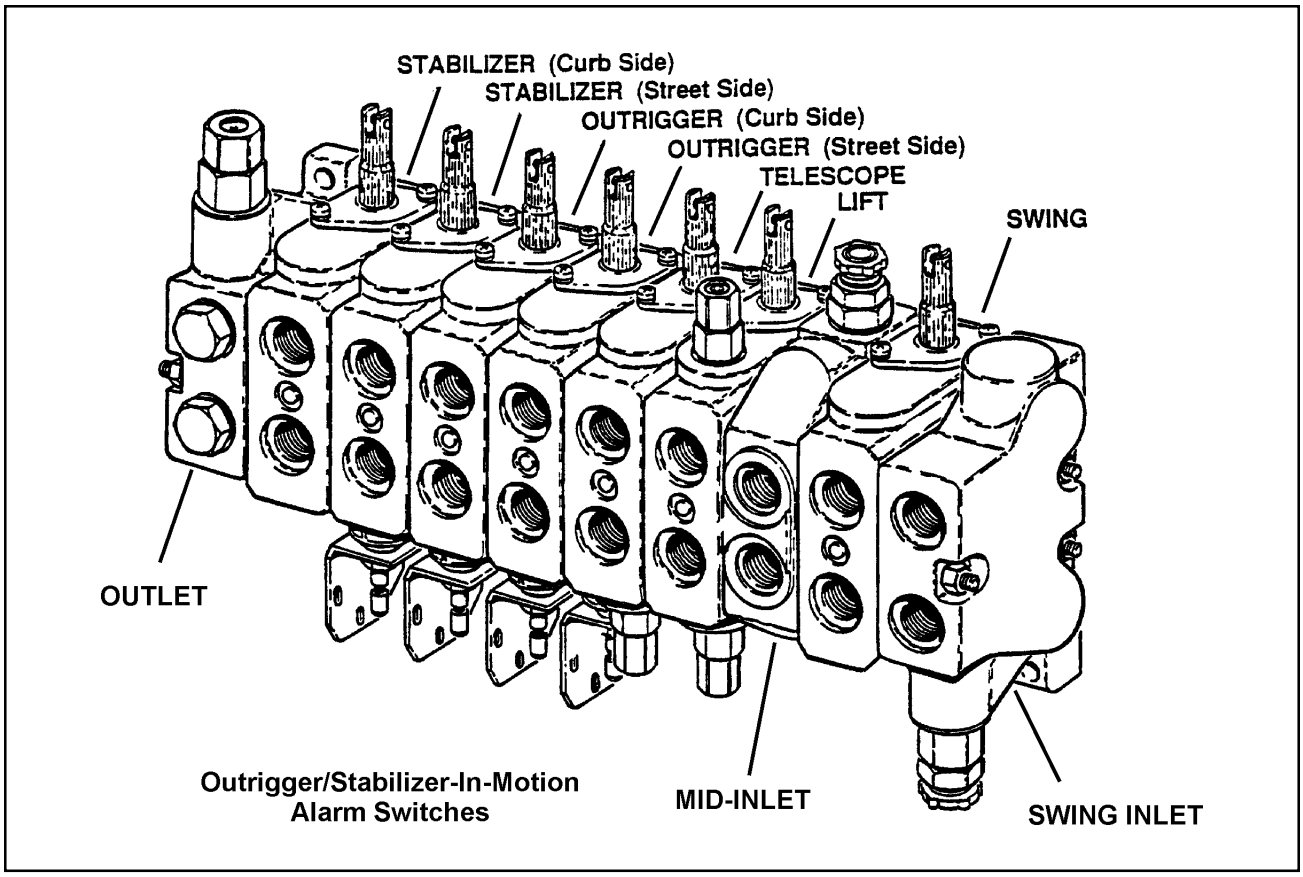

Figure 7-7. Control Valve

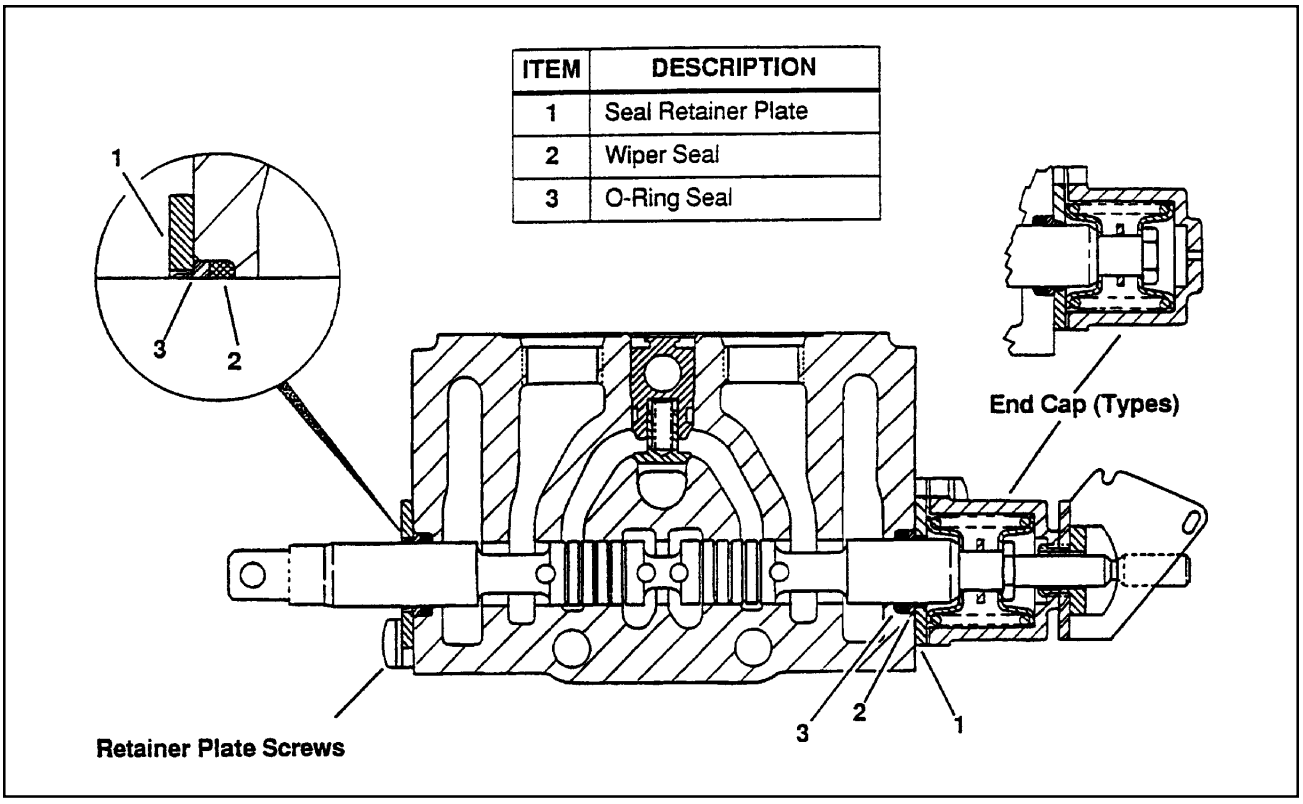

Figure 7-8. Control Valve Section

HOIST VALVE

The hoist valve controls oil flow to the hoist. Oil enters from the third pump section (39 gal) and the power beyond port of the main control valve.

The valve is a sectional valve with one section and inlet and outlet sections. A relief valve cartridge is located on the inlet section.

The hoist valve is located on the inside of the console weldment above the main control valve. The hoist valve can be accessed by removing the side covers from the pedestal.

To remove the valve, disconnect the hoses and the linkage from the valve. Remove the bolts securing the valve to the console weldment.

IMPORTANT: Clean area around valve and valve to prevent dirt and contamination from entering hydraulic lines and valve ports.

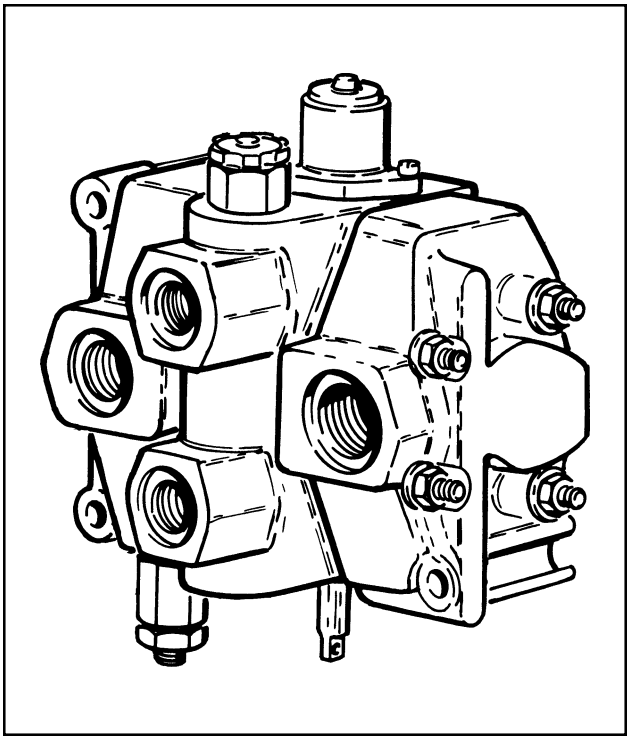

Figure 7-9. Hoist Control Valve

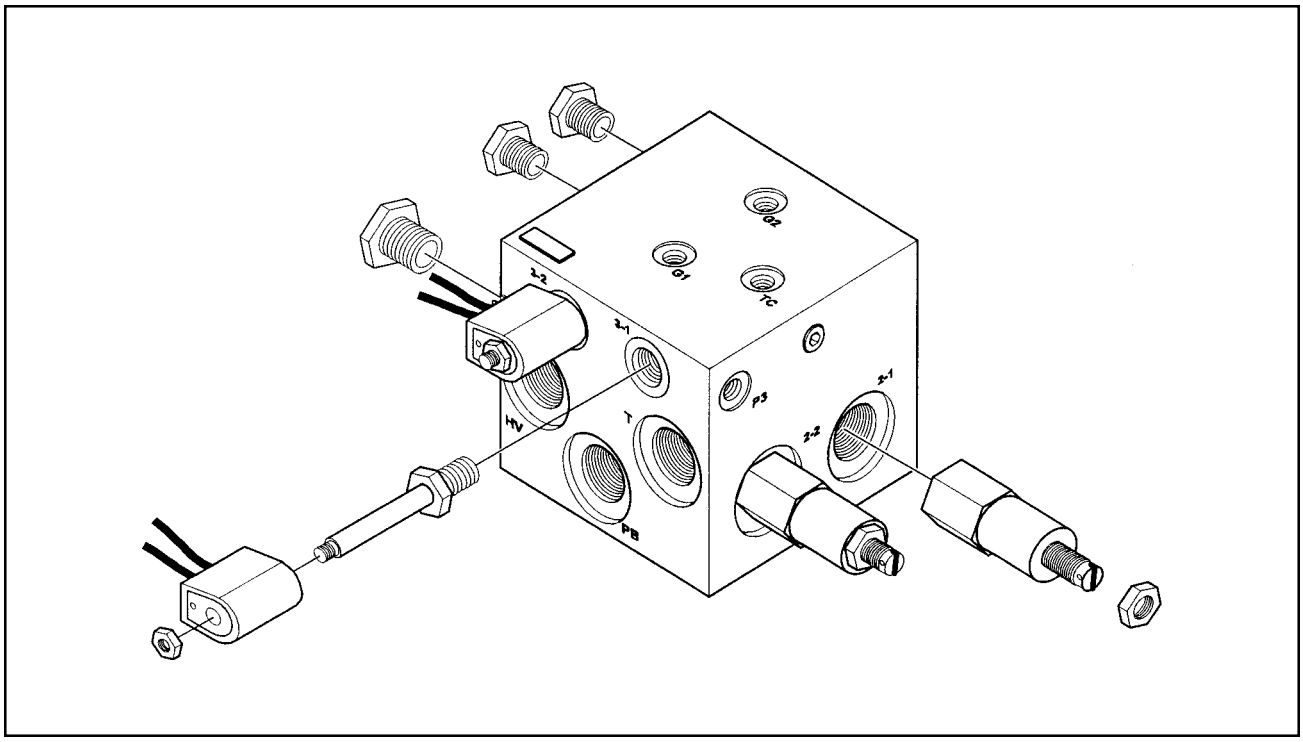

Figure 7-10. Manifold Valve

MANIFOLD VALVE

The manifold valve is a block valve with two solenoid cartridges. It is located on the rear of the turntable.

One solenoid stops operation of the hoist up, boom up, boom down and telescope out functions when the anti-two-block switch is tripped. The other solenoid opens the burst-of-speed circuit, adding an additional 24 gpm to the hoist control valve.

The solenoid valve cartridges can be removed and cleaned, if necessary. Four check valves are also removable for cleaning.

The solenoids are interchangeable. To test one of the solenoids, they can be interchanged if the opposing solenoid is known to be working.

If the solenoid fails but the cartridge is operational, replace the solenoid. When reassembling, be sure the nut is torqued to 12-17 lb-ft. Overtightening can result in distortion of the cartridge and a sticking spool.

HYDRAULIC FILTER

The hydraulic filter is a spin-on, replaceable element in the return line. The element provides 10 micron nominal filtration before the oil is returned into the tank.

The filter is equipped with a gauge which indicates the pressure differential between the entry and exit of the oil into the filter. When the gauge indicates in the red, it should be replaced.

If the element is not replaced and becomes clogged, a bypass opens in the filter head to release unfiltered oil into the tank.

IMPORTANT: Do not operate the crane with a clogged filter.

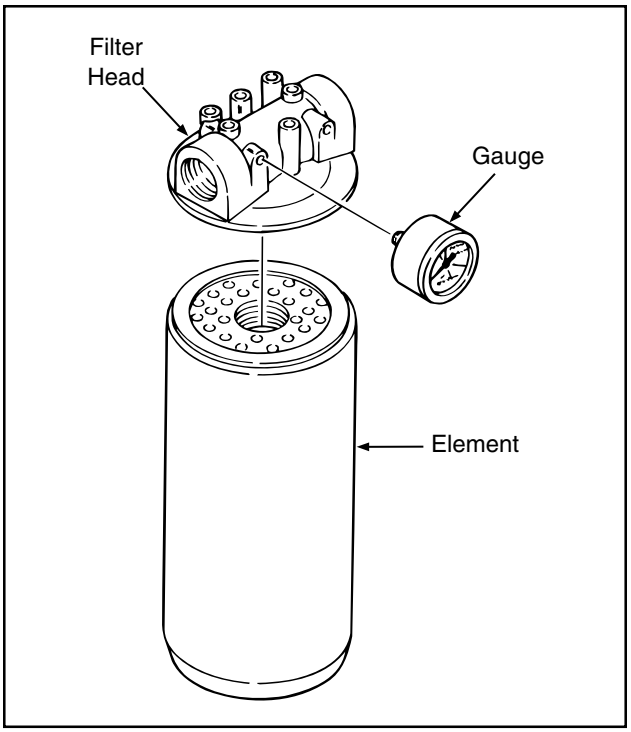

Figure 7-11. Hydraulic Filter

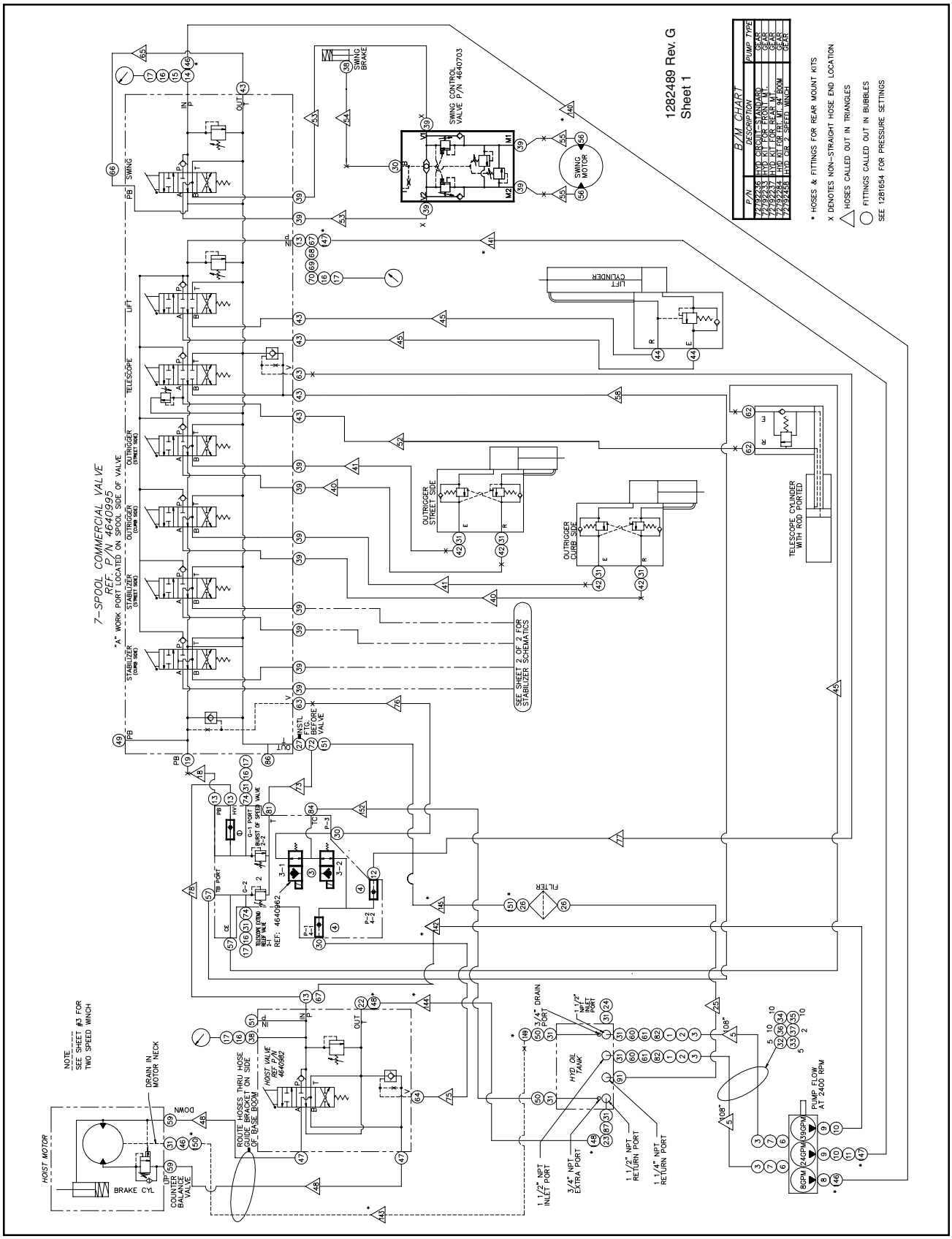

Figure 7-12. Hydraulic Schematic

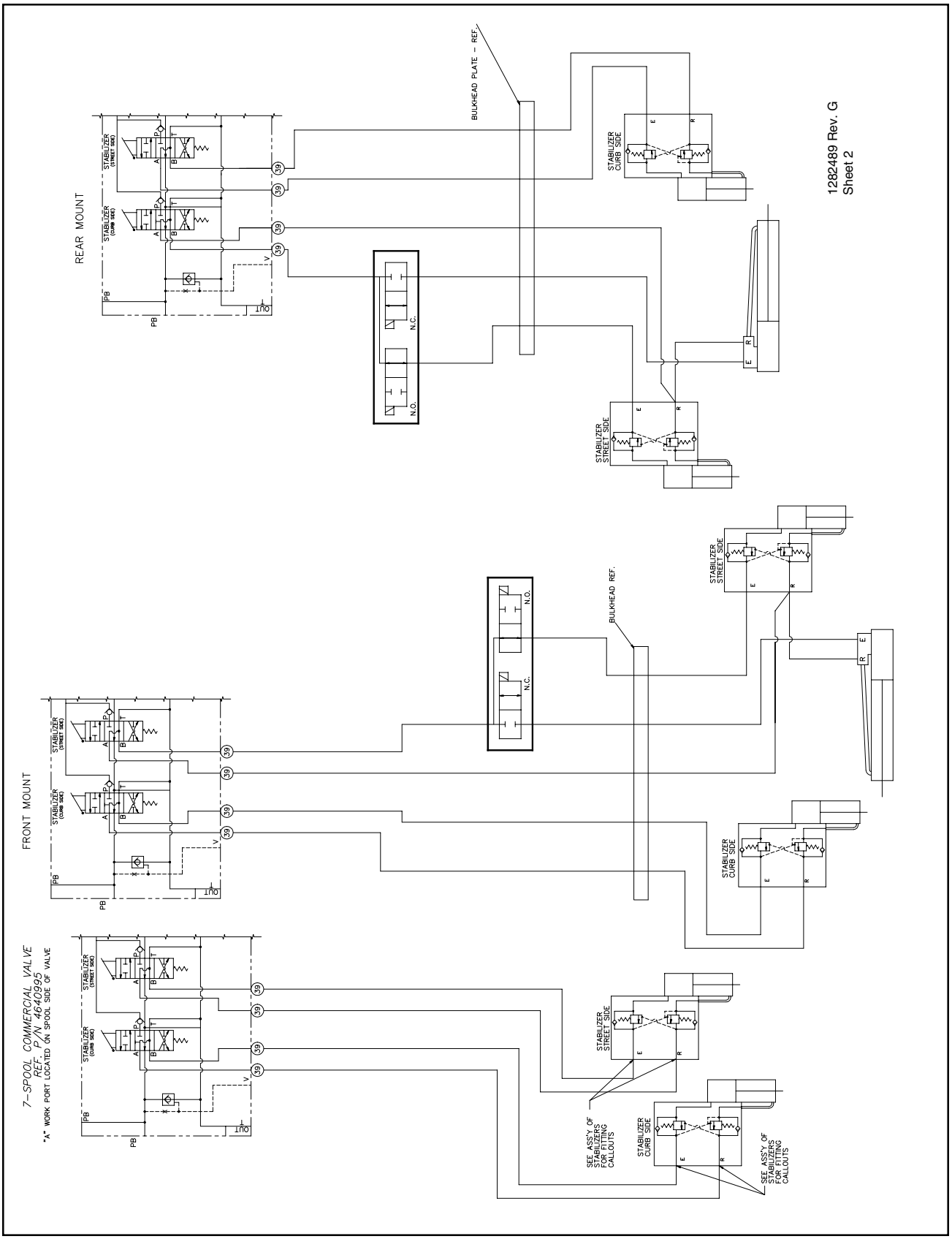

Figure 7-13. Outrigger Schematic

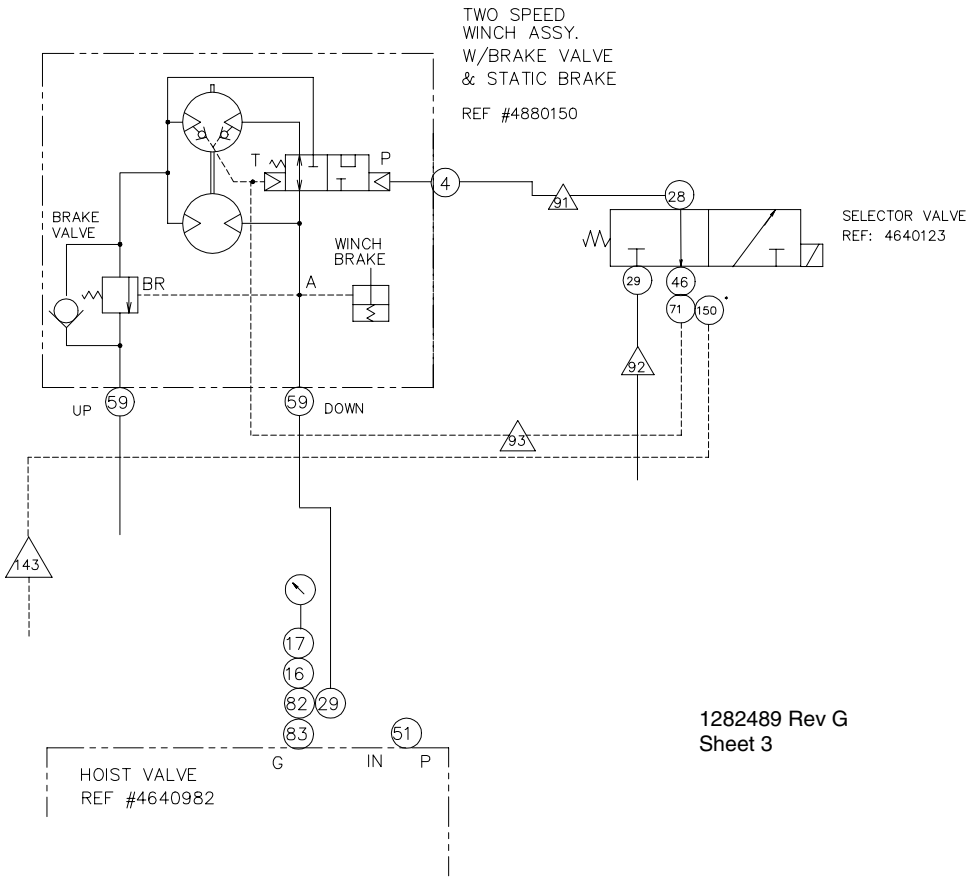

Figure 7-14. Two-Speed Hoist

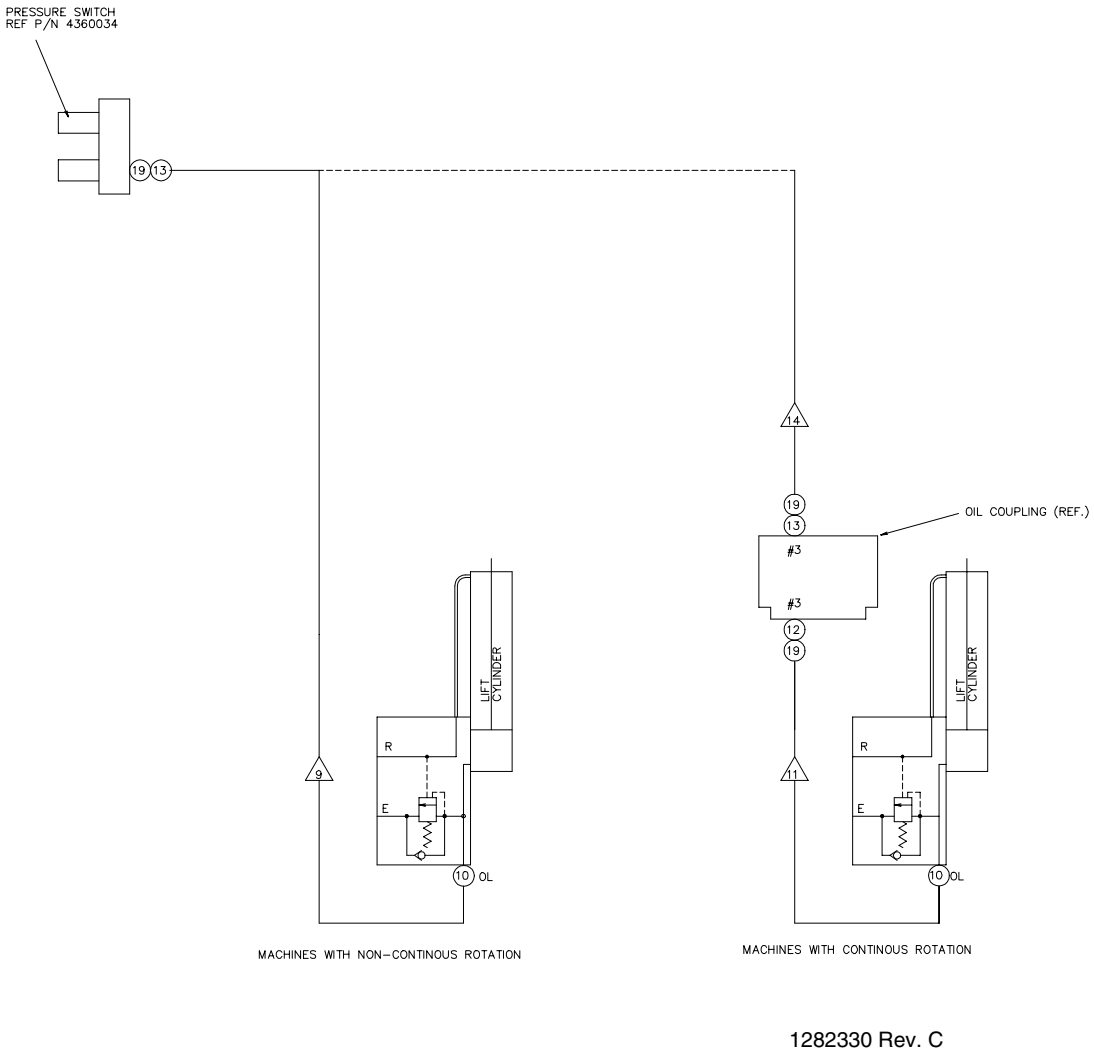

Figure 7-15. Overload

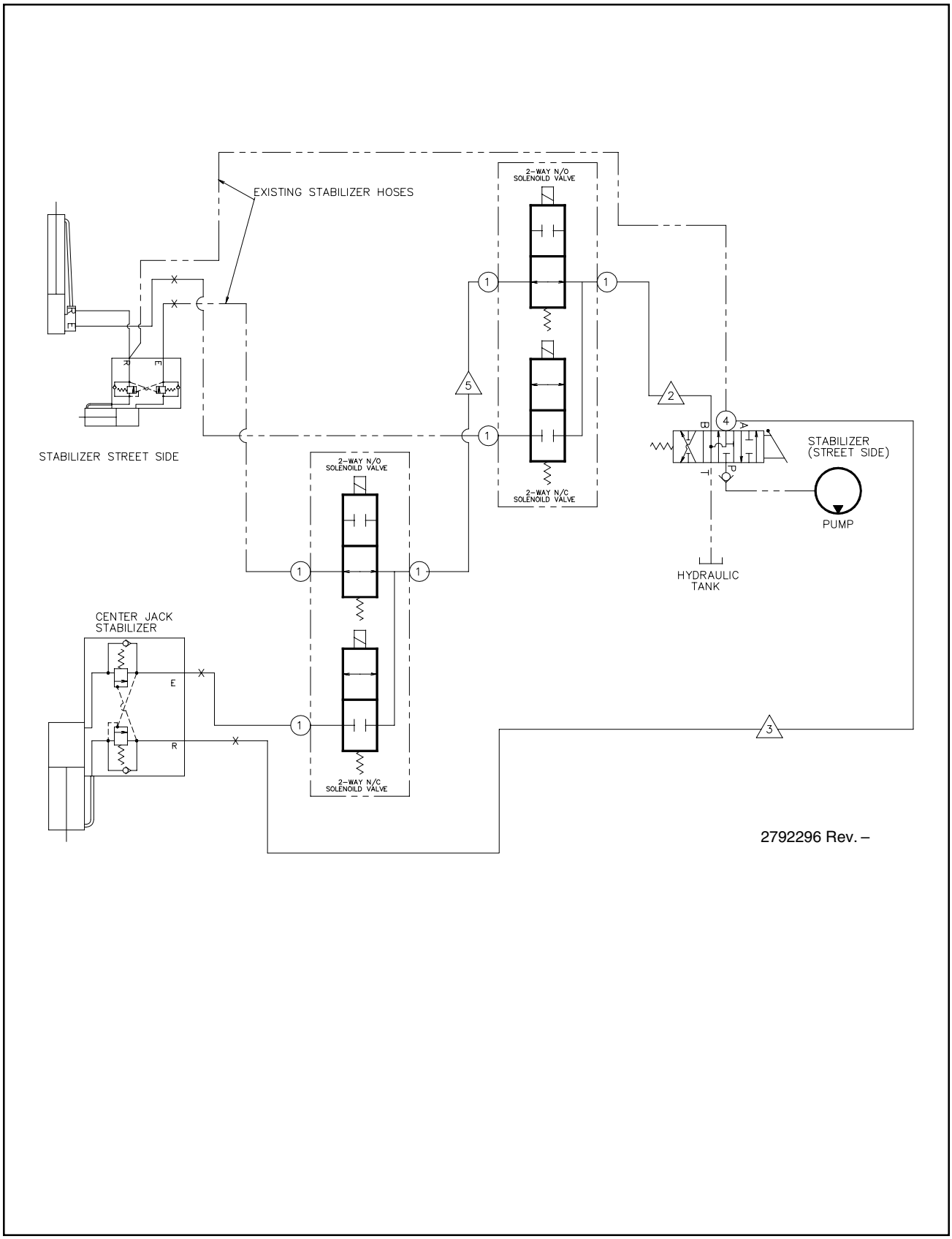

Figure 7-16. Out-and-Down Stabilizers with Center Stabilizer

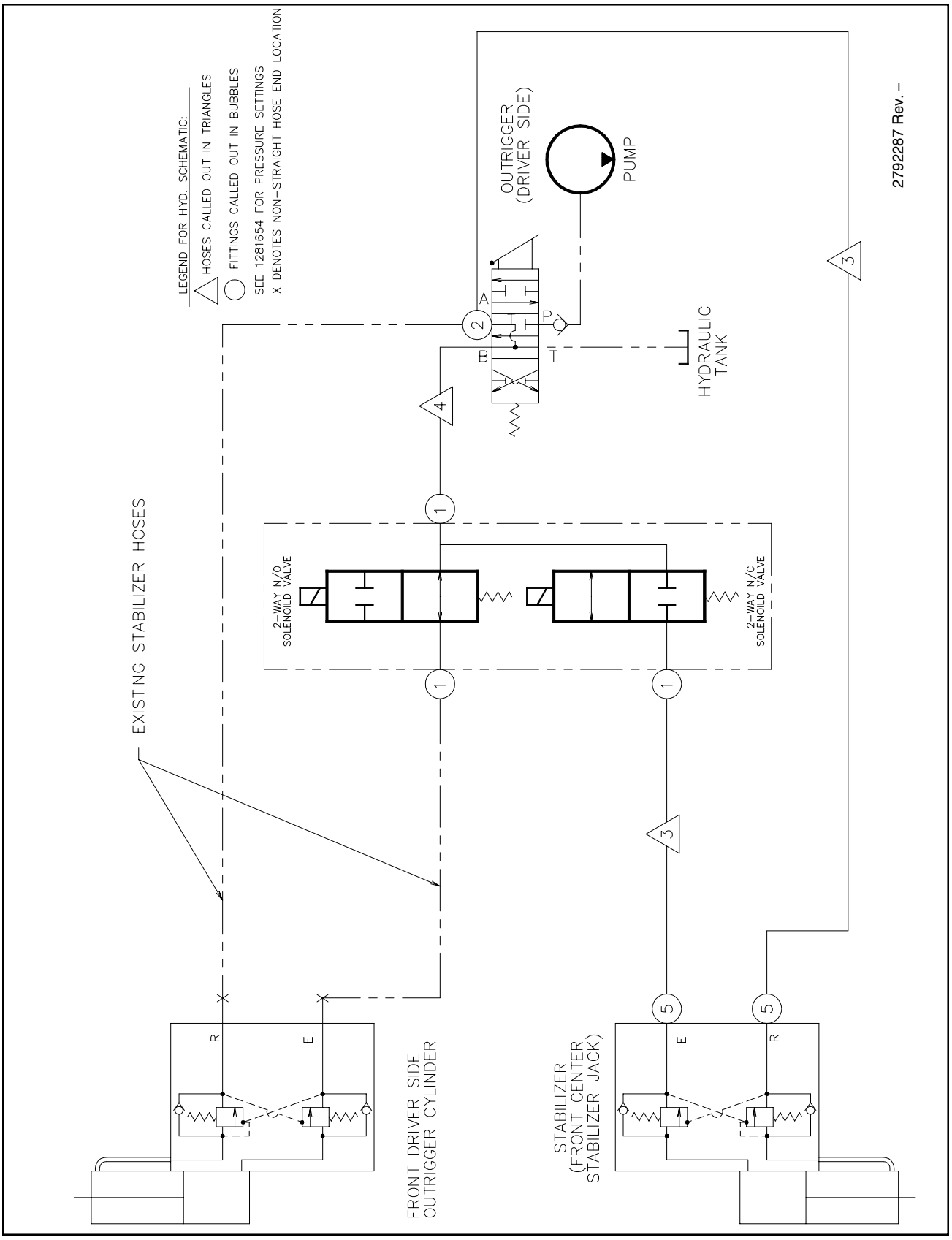

Figure 7-17. Front Center Stabilizer

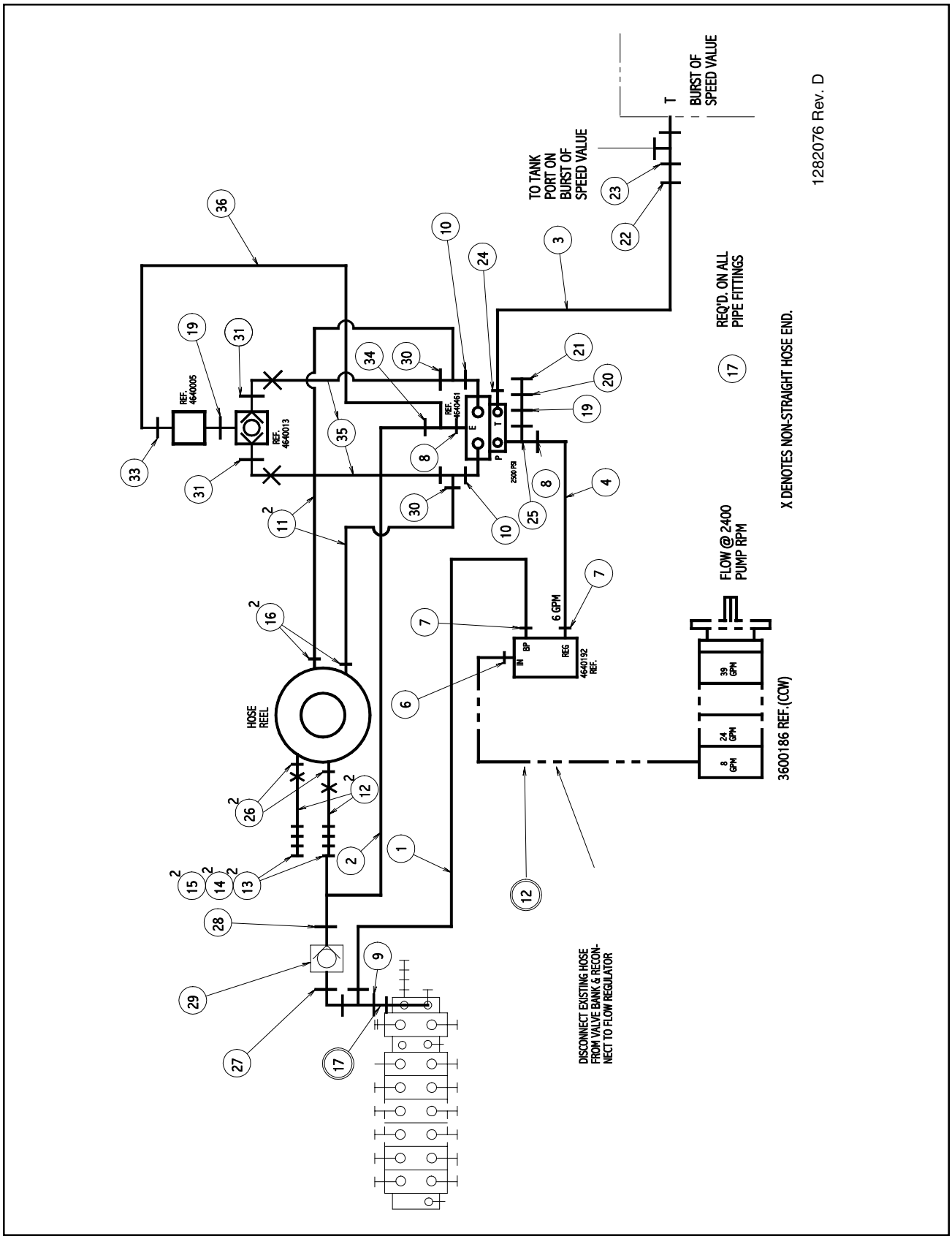

Figure 7-18. Clamshell Circuit

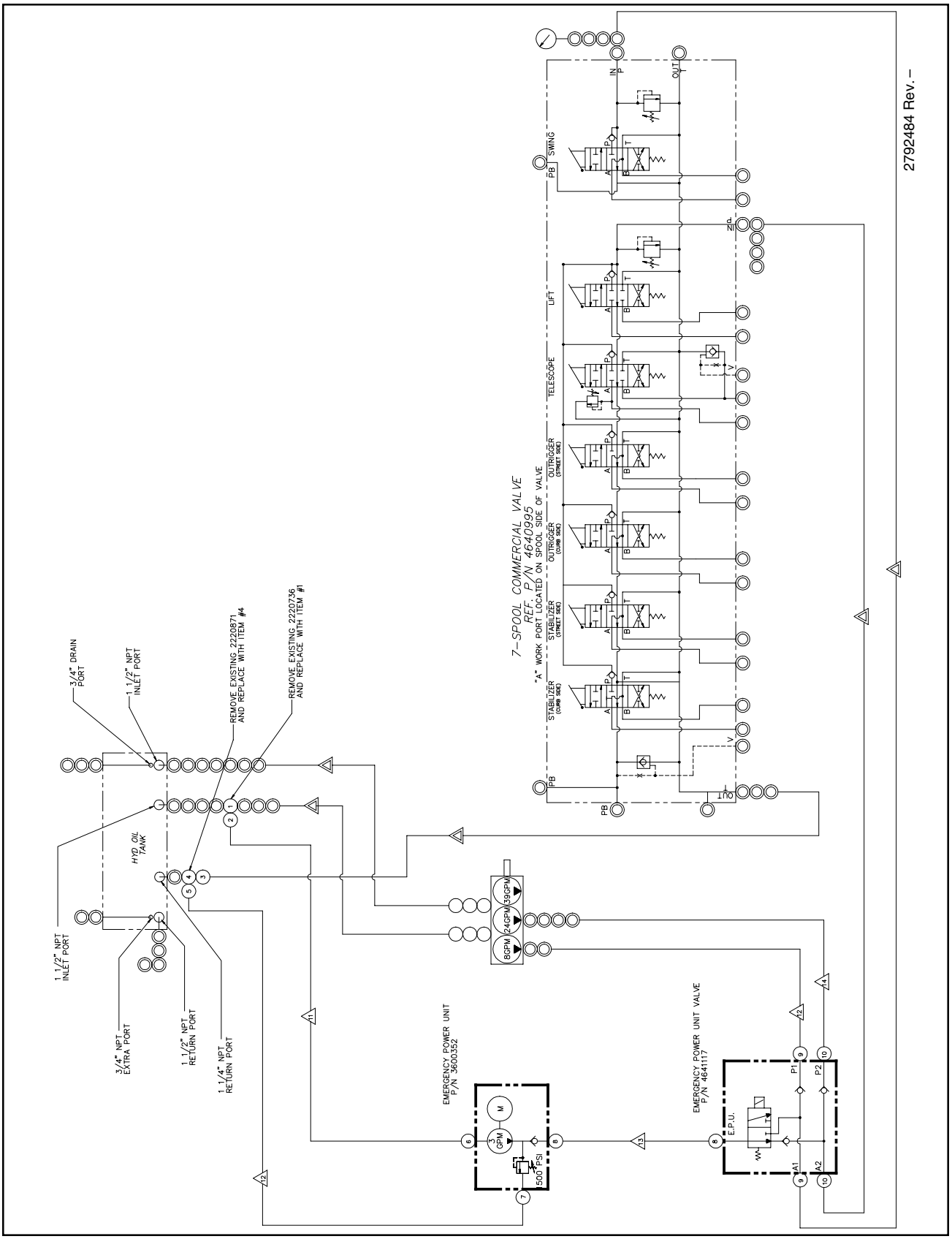

Figure 7-19. Emergency Down

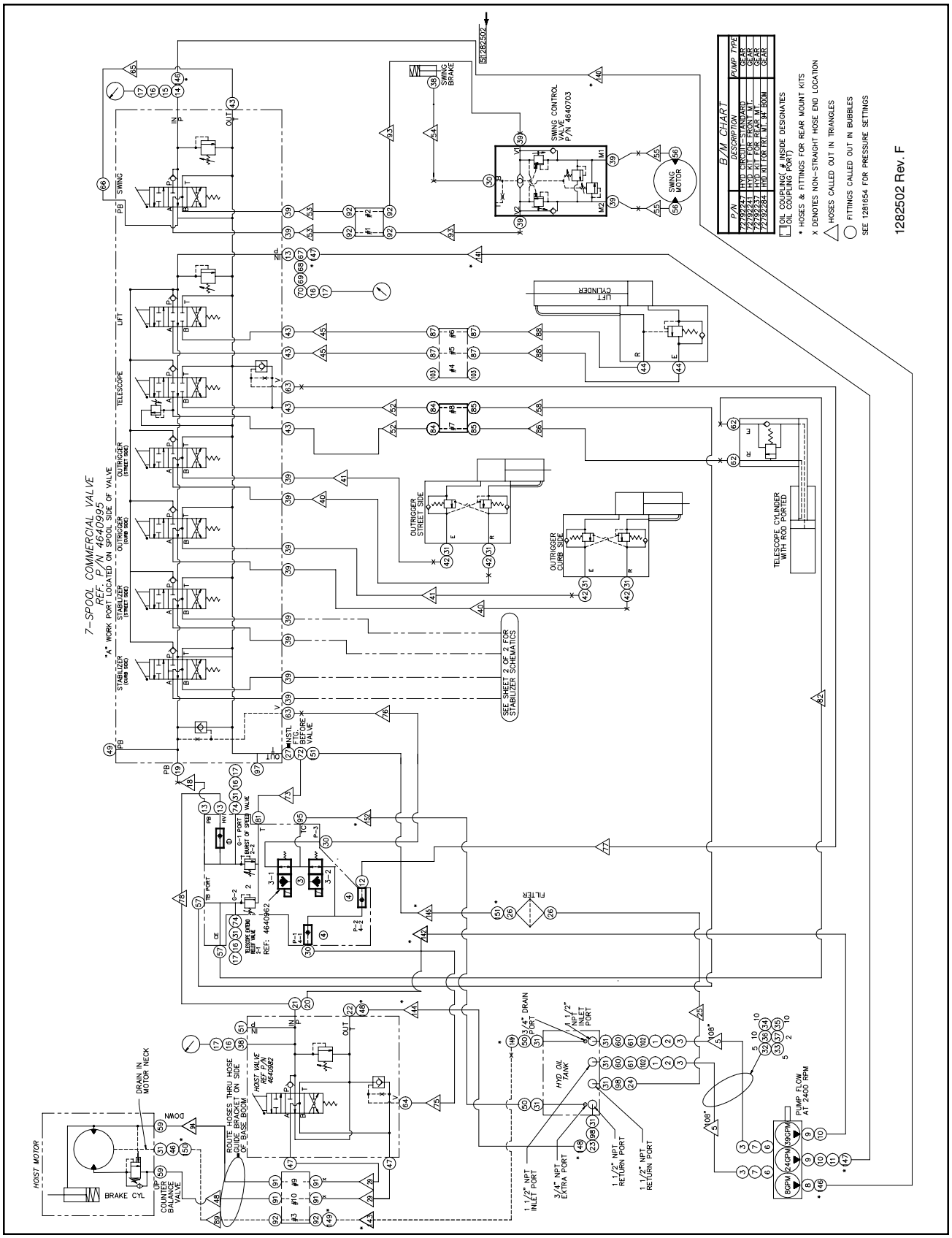

Figure 7-20. Hydraulic Schematic with Continuous Rotation

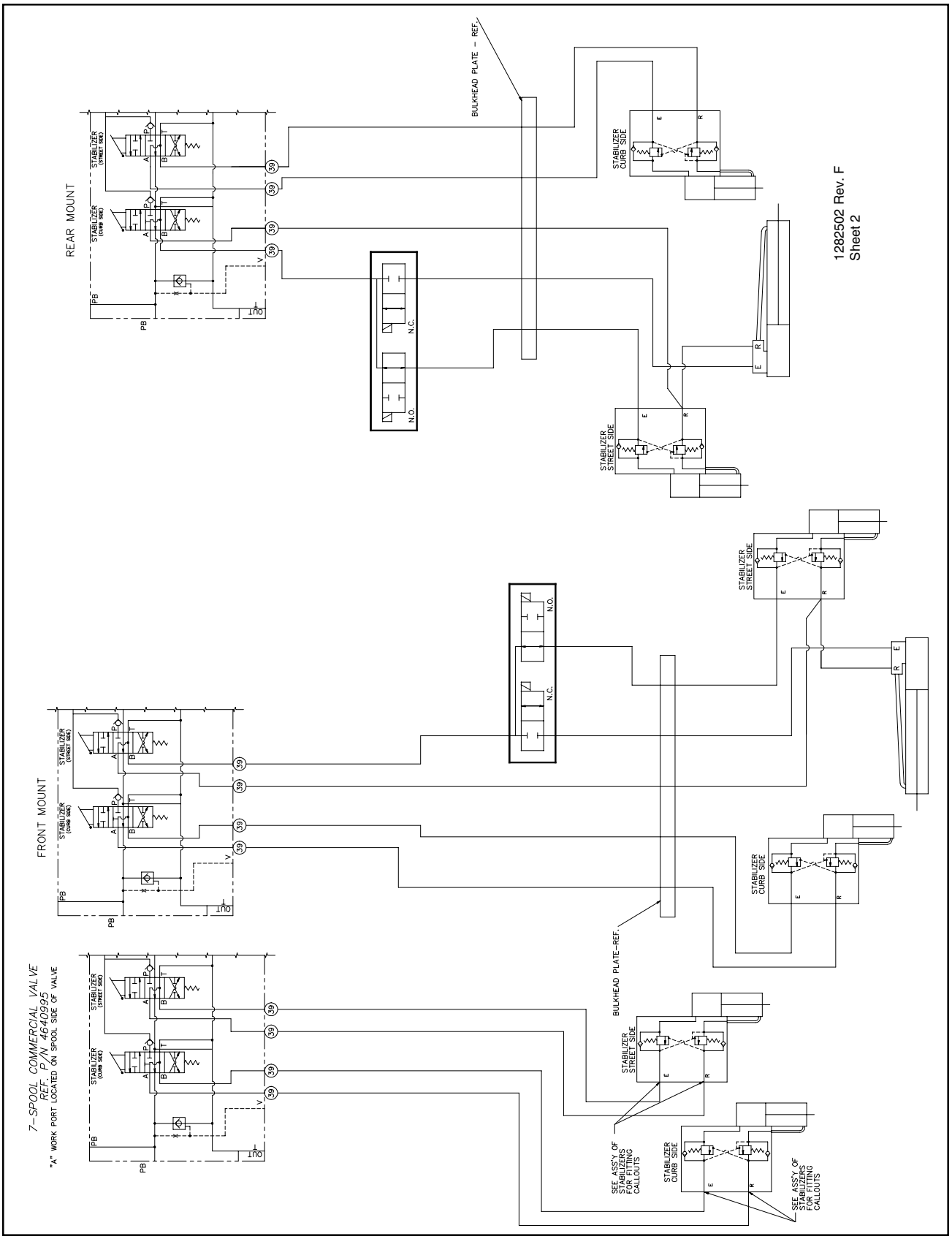

Figure 7-21. Outrigger Hydraulic Schematic with Continuous Rotation