Manitowoc 18000

Operator Manual
Luffing Jib Attachment

Grove Manitowoc National Crane Potain

Manitowoc

OPERATOR MANUAL

This manual has been prepared for and is considered part of -

18000

Luffing Jib Model Number

18005Ref

Luffing Jib Serial Number

This Manual is divided into the following sections:

NOTICE

The serial number of the crane and applicable attachments (i.e. luffing jib, MAX-ER®) is the only method your Manitowoc dealer or the Manitowoc Crane Care Lattice Team has of providing you with correct parts and service information.

The serial number is located on a crane identification plate attached to the operator's cab and each attachment. Refer to the Nameplate and Decal Assembly Drawing in Section 2 of this manual for the exact location of the crane identification plate.

Always furnish serial number of crane and its attachments when ordering parts or discussing service problems with your Manitowoc dealer or the Manitowoc Crane Care Lattice Team.

⚠ WARNING

To prevent death or serious injury:

- Avoid unsafe operation and maintenance.

  Crane and attachments must be operated and maintained by trained and experienced personnel. Manitowoc is not responsible for qualifying these personnel.
- Do not operate or work on crane or attachments without first reading and understanding instructions contained in Operator Information Manual and Service Manual supplied with crane and applicable attachments.
- Store Operator Information Manual and Service Manual in operator's cab.

  If Operator Information Manual or Service Manual is missing from cab, contact your Manitowoc dealer for a new one.

Published 10-14-15, Control # 033-16

THE ORIGINAL LANGUAGE OF THIS PUBLICATION IS ENGLISH

See end of this manual for Alphabetical Index

SECTION 1
INTRODUCTION

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 1
INTRODUCTION

CRANE DATA

See the end of this section for crane data specific to your crane:

- Basic Specifications
- EC Declaration (if applicable)

CRANE/ATTACHMENT IDENTIFICATION

An identification plate is attached to the outside of the operator's cab (see Figure 1-1) and to the attachments (such as luffing jibs, MAX-ER's, and Ringers) available for this crane.

The crane or attachment model and serial number are etched into the plate.

For the exact location of the identification plates on your crane and attachments, refer to the Nameplates and Decals Drawing in Section 2 of this manual.

CHANGE OF OWNERSHIP REGISTRATION

If you are the new owner of a Manitowoc crane, please register it with Manitowoc Crane Care so we can contact you if the need arises.

1. Go to ***www.manitowoccranes.com***
2. Go to Service > Manitowoc Crane Care > Service Information > Change of Ownership Form.
3. Complete the form.

MANITOWOC DEALER

For questions about this manual or the 18000 crane, contact your Manitowoc dealer. If you do not know the contact information for your dealer, locate the Manitowoc dealer nearest you, as follows:

1. Go to ***www.manitowoccranes.com***
2. Go to Dealer Locator.
3. Follow the on-screen prompts to locate your Manitowoc dealer.

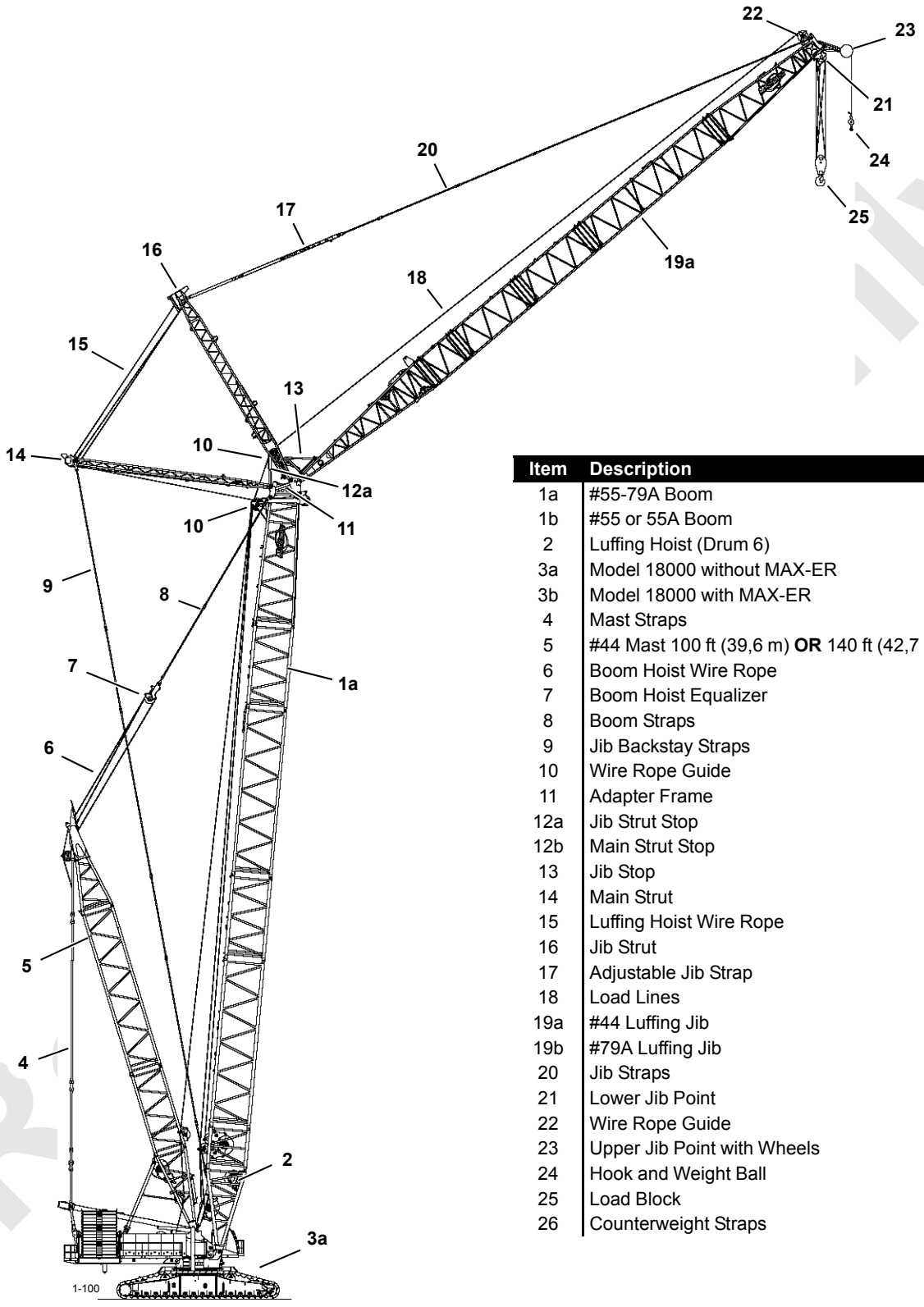
CRANE ORIENTATION

The terms RIGHT, LEFT, FRONT, REAR used in this manual refer to operator's right, left, front, and rear sides when seated in the operator's cab looking forward.

- Operator's cab is at front of upperworks.
- Crawler motors are at rear of lowerworks.
- Crawler pin handles on carbody are at front of lowerworks.

FIGURE 1-1

IDENTIFICATION AND LOCATION OF COMPONENTS



Item	Description
1a	#55-79A Boom
1b	#55 or 55A Boom
2	Luffing Hoist (Drum 6)
3a	Model 18000 without MAX-ER
3b	Model 18000 with MAX-ER
4	Mast Straps
5	#44 Mast 100 ft (39,6 m) **OR** 140 ft (42,7 m)
6	Boom Hoist Wire Rope
7	Boom Hoist Equalizer
8	Boom Straps
9	Jib Backstay Straps
10	Wire Rope Guide
11	Adapter Frame
12a	Jib Strut Stop
12b	Main Strut Stop
13	Jib Stop
14	Main Strut
15	Luffing Hoist Wire Rope
16	Jib Strut
17	Adjustable Jib Strap
18	Load Lines
19a	#44 Luffing Jib
19b	#79A Luffing Jib
20	Jib Straps
21	Lower Jib Point
22	Wire Rope Guide
23	Upper Jib Point with Wheels
24	Hook and Weight Ball
25	Load Block
26	Counterweight Straps

FIGURE 1-2

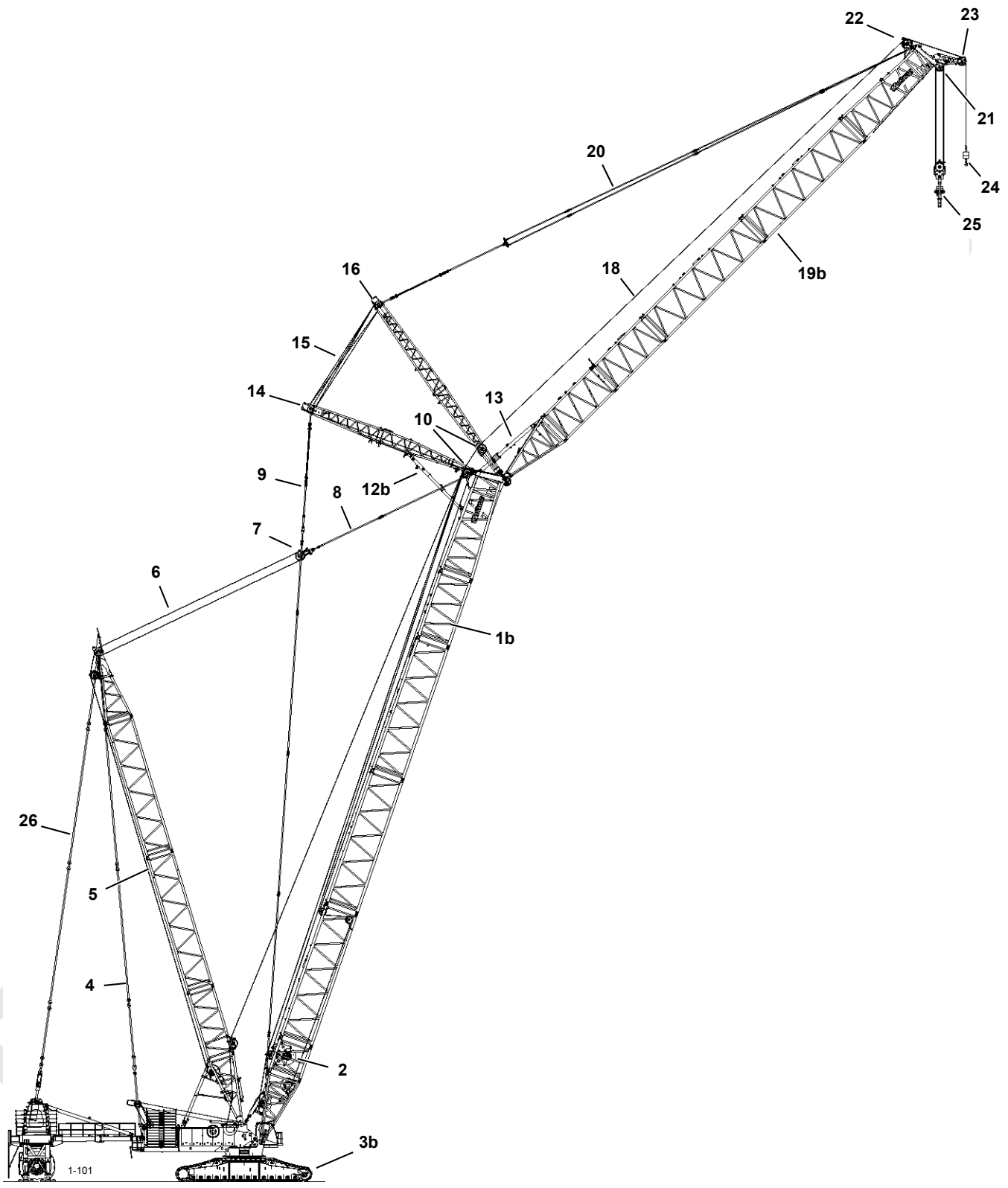
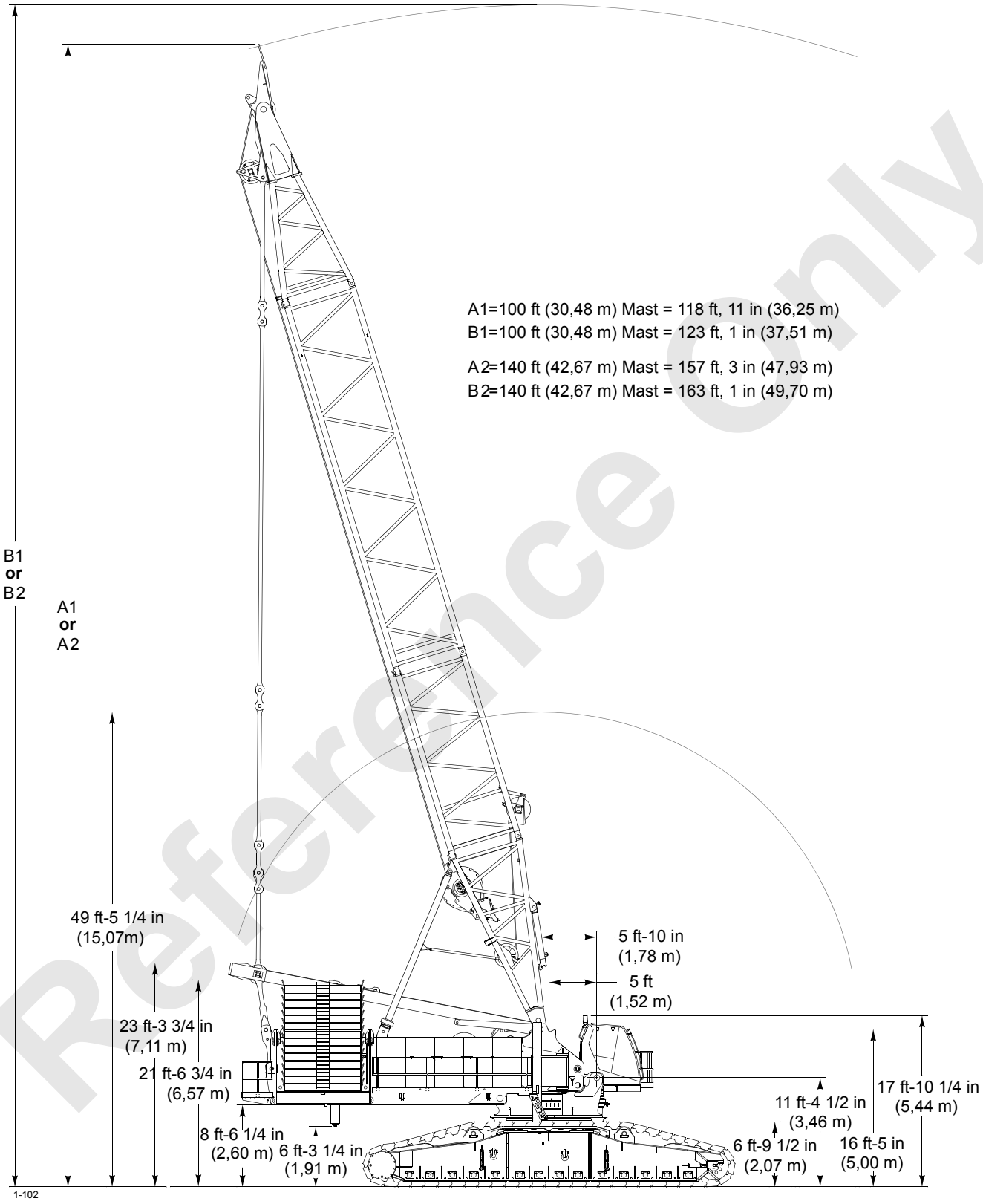


FIGURE 1-2 continued

OUTLINE DIMENSIONS



Outline Dimensions Continued on Next Page

FIGURE 1-3

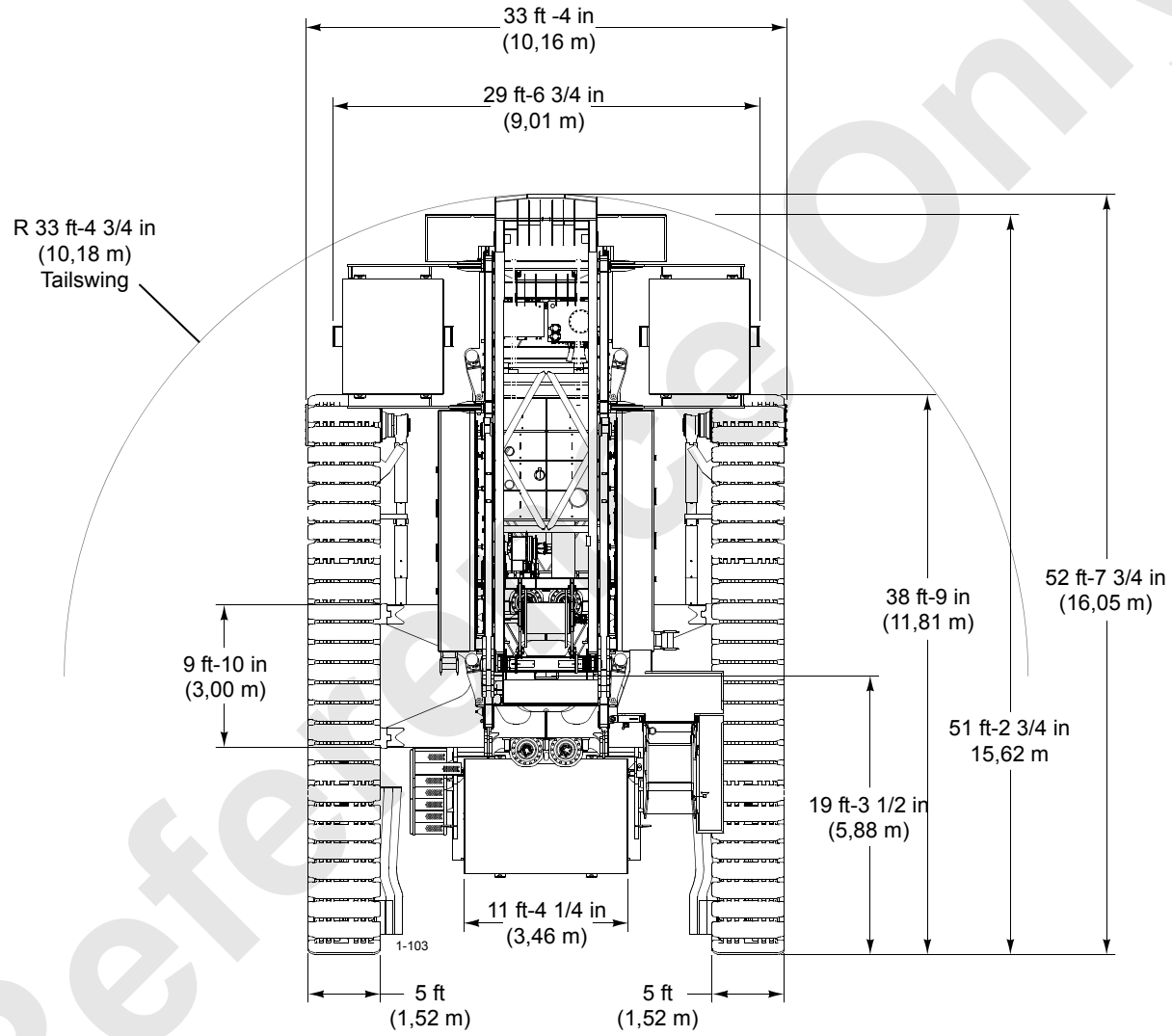


FIGURE 1-3 continued

CRANE WEIGHTS

Description	Weight Pounds	Weight Kilograms
LIFTCRANE:		
Upperworks and lowerworks complete, 4 swing drives, counterweight, 30 ft (9,1 m) live mast, backhitch, 100 ft (30,5 m) No. 56 Mast, mast stops, 30 USt (27 t) hook and weight ball, boom stops and load lines (includes self-erect and MAX-ER prep)		
When equipped with fully rigged 120 ft (36,6 m) Boom No. 55-79A, standard upper boom point, and 500 USt (454 t) block	1,478,930	670 831
When equipped with fully rigged 120 ft (36,6 m) Boom No. 55 or No. 55A, heavy duty upper boom point, and 661 USt (600 t) block	1,513,720	686 611
UPPERWORKS REAR MACHINERY MODULE:		
Rotating bed rear section with pin pullers, upperworks jacking system, 30 ft (9,1 m) live mast, mast hoist with mast hoist line, Cummins QXF15 power plant, hydraulic reservoir (full), fuel tank (1/2 full) and operators cab (drum 3 and catwalks removed)	104,435	47 370
Upperworks jacking system removed	88,335	40 068
ADAPTER FRAME WITH CARBODY:		
Rotating bed adapter frame with bearing turntable, 4 swing drives and carbody (includes MAX-ER prep)	95,900	43 499
MAST NO. 56 BUTT/TOP SHIPPING PACKAGE:		
20 ft (6,1 m) mast butt, boom hoist drum with rope, boom hoist drum guide rollers, wire rope guide sheave, mast stops, mast butt supports, boom equalizer, 20 ft (6,1 m) mast top with sheaves and straps (includes MAX-ER prep)	57,800	26 217
BOOM NO. 55 BUTT SHIPPING PACKAGE:		
20 ft (6,1 m) boom butt, load hoist drum with rope, luffing drum with rope, rigging winch with rope, cable reel, boom stops and boom hinge pin-pullers	57,875	26 251
BOOM NO. 55 - 10 ft (3,0m) INSERT SHIPPING PACKAGE:		
10 ft (3,0 m) insert, load hoist drum with rope and wire rope guide	35,960	16 311
CRAWLERS:		
38 ft 9 in (11 811 mm) crawler assembly (each) with drive and 60 in (1 524 mm) treads	88,255	40 031
COUNTERWEIGHT - UPPER:		
Tray (each)	12,050	5 465
Counterweight (28 total) (each)	18,000	8 164
Rear catwalk with railings	1,290	585
Total upperworks counterweight	528,000	239 496
COUNTERWEIGHT - LOWER:		
Counterweight tray (each)	28,000	12 700
Counterweight (each) (6 total - 3 front, 3 rear)	44,000	19 958
Stairway (each)	250	113
Total lowerworks counterweight	320,000	145 149
30 ft (9,1 m) LIVE MAST:		
30 ft (9,1 m) mast with straps	9,660	4 381
MACHINE OPTIONS:		
Drum 3 assembly (whip line without rope)	5,250	2 381
Upperworks jacking system	14,700	6 667
Swing drive assemblies (each)	1,765	800
Rotating bed alignment pendants (each)	65	29
LOWERWORKS OPTIONS:		
Carbody pedestals with pads (each)	410	185
MAST NO. 56:		
20 ft (6,1 m) mast butt with boom hoist drum with rope and guide sheave	33,905	15 379
20 ft (6,1 m) mast top with sheaves, wire rope guide and straps	20,485	9 291
40 ft (12,2 m) insert with straps	13,940	6 323
20 ft (6,1 m) insert with straps	8,490	3 850

Description	Weight Pounds	Weight Kilograms
7 ft 1 in (2,2 m) upper backhitch strap (each)	485	219
13 ft 4-1/4 in (4,1 m) lower backhitch strap (each)	615	278
40 ft (12,2 m) backhitch strap (with connector links) (each)	1,805	818
14 ft 8 in (4,5 m) backhitch strap (each)	665	301
Mast stop tube (each) with strut and pins	1,030	467
Mast support (each)	335	151
Wire rope guide (on mast butt for whip line)	490	222
Wire rope guide (on 20 ft [6,1 m] insert for whip line)	600	272
Boom hoist drum without rope	8,110	3 678
BOOM NO. 55-79A:		
20 ft (6,1 m) butt No. 55	18,440	8 364
30 ft (9,1 m) top with straps, upper and lower point and wire rope guide	26,620	12 074
20 ft (6,1 m) insert No. 79 with straps	7,260	3 293
40 ft (12,2 m) insert No. 79 with straps	12,130	5 502
40 ft (12,2 m) transition insert No. 55-79 with links	12,110	5 493
10 ft (3,0 m) insert No. 55	7,680	3 483
20 ft (6,1 m) insert No. 55	10,715	4 860
40 ft (12,2 m) insert No. 55 with sheaves	19,640	8 908
28 ft 2-15/16 in (8,6 m) basic strap (each)	355	161
20 ft (6,1 m) strap (with connector links) (each)	290	131
40 ft (12,2 m) strap (with connector links) (each)	525	238
Links (attached to equalizer) (each set) with pins	95	43
Equalizer with pins	3,675	1 666
Boom stop (each tube)	1,795	814
Drum 1 or 2 assembly (load hoist without rope)	9,970	4 522
BOOM NO. 55 OR NO. 55A:		
20 ft (6,1 m) butt	18,440	8 364
30 ft (9,1 m) top with straps, upper and lower point and wire rope guide	40,700	18 461
10 ft (3,0 m) insert	7,680	3 483
20 ft (6,1 m) insert	10,715	4 860
40 ft (12,2 m) insert	18,485	8 384
40 ft (12,2 m) insert with equalizer rails	19,185	8 702
40 ft (12,2 m) insert (medium)	13,685	6 207
40 ft (12,2 m) insert with sheaves	19,640	8 908
28 ft 2-11/16 in (8,6 m) basic strap (each)	755	342
20 ft (6,1 m) strap (with connector links) (each)	610	276
40 ft (12,2 m) strap (with connector links) (each)	1,120	508
Links (attached to equalizer) (each set) with pins	110	49
Equalizer with pins	3,675	1 666
Boom stop (each tube)	1,795	814
Drum 1 or 2 assembly (load hoist without rope)	9,970	4 522
LUFFING JIB NO. 44:		
40 ft (12,2 m) butt	8,605	3 903
12 ft (3,7 m) lower butt	4,430	2 009
28 ft (8,5 m) upper butt	5,305	2 406
30 ft (9,1 m) top with straps, upper and lower point	14,090	6 391
10 ft (3,0 m) insert No. 44	1,890	857
20 ft (6,1 m) insert No. 44	3,215	1 458
40 ft (12,2 m) insert No. 44	5,420	2 458
Luffing jib adapter	4,600	2 086
31 ft 1-3/16 in (9,5 m) basic strap (each)	400	181
20 ft (6,1 m) strap (with connector links) (each)	290	131
40 ft (12,2 m) strap (with connector links) (each)	525	238
Adjustable strap (each) with pins	1,565	709

Description	Weight Pounds	Kilograms
50 ft (15,2 m) jib strut with guide sheave, luffing sheaves and links	13,285	6 025
47 ft (14,3 m) main strut with luffing sheaves and links	9,425	4 275
Luffing wire rope guide	1,070	485
38 ft 2 in (11,6 m) backstay basic strap (with connector links) (each)	510	231
10 ft (3,0 m) backstay strap (with connector links) (each)	175	79
20 ft (6,1 m) backstay strap (with connector links) (each)	290	131
40 ft (12,2 m) backstay strap (with connector links) (each)	525	238
40 ft (12,2 m) transition backstay strap (with connector links) (each)	525	238
10 ft (3,0 m) No. 55 backstay strap (with connector links) (each)	405	183
20 ft (6,1 m) No. 55 backstay strap (with connector links) (each)	675	306
40 ft (12,2 m) No. 55 backstay strap (with connector links) (each)	1,220	553
Backstay link (attached to boom butt) (each)	115	52
Luffing jib stop assembly	1,850	839
Upper point (single sheave) with rollers	1,220	553
FIXED JIB NO. 79A:		
20 ft (6,1 m) butt No. 79A	10,295	4 669
30 ft (9,1 m) top with double straps, upper (heavy duty) and lower point and wire rope guide	27,780	12 600
20 ft (6,1 m) insert No. 79 with double straps	7,835	3 553
40 ft (12,2 m) insert No. 79 with double straps	13,180	5 978
28 ft 2-15/16 in (8,6 m) basic strap (each)	355	161
20 ft (6,1 m) jib strap with links (each)	290	131
40 ft (12,2 m) jib strap with links (each)	525	238
Equalizing link (each)	375	170
10 ft (3,0 m) strap (with connector links) (each) (20 degree offset)	355	161
7 ft (2,1 m) strap (with connector links) (each)	345	156
4 ft 9 in (1,4 m) strap with pin (each)	195	88
4 ft 9 in (1,4 m) link with pin (set each)	185	83
6 ft 2 in (1,9 m) strap with pin (each)	265	120
Jib stop assembly (each)	1,890	857
Jib hinge pins/link assembly (each)	340	154
29 ft (8,8 m) strut butt	5,325	2 415
21 ft (6,4 m) strut top	4,625	2 097
1 ft 5 in (0,4 m) spreader link with pins	690	312
1 ft 10 in (0,6 m) link with pins (each)	225	102
1 ft 10 in (0,6 m) link (each)	135	61
1 ft 7 in (0,5 m) spreader link with pins (each)	535	242
Adjustable link with pins (each)	585	265
7 ft 4 in (2,2 m) backstay strap (each)	275	124
30 ft (9,1 m) backstay strap with links (each)	865	392
20 ft (6,1 m) backstay strap with links (each)	610	276
40 ft (12,2 m) backstay strap with links (each)	1,120	508
10 ft (3,0 m) backstay strap with links (each)	355	161
1 ft 11-1/2 in (0,6 m) backstay link, pins (each set)	115	52
LUFFING JIB NO. 79A:		
20 ft (6,1 m) butt No. 79A	10,315	4 678
30 ft (9,1 m) top with double straps, upper (heavy duty) and lower point and wire rope guide	27,835	12 625
20 ft (6,1 m) insert No. 79 with double straps	7,835	3 553
20 ft (6,1 m) insert No. 79 without straps	6,700	3 039
40 ft (12,2 m) insert No. 79 with double straps	13,180	5 978
28 ft 2-15/16 in (8,6 m) basic strap (each)	355	161
20 ft (6,1 m) jib strap with links (each)	290	131
40 ft (12,2 m) jib strap with links (each)	525	238
Equalizing link (each)	375	170
8.63 in (0,2 m) link, pins (each set)	85	38

Description	Weight Pounds	Weight Kilograms
17 ft 10-1/2 in (5,4 m) strap (each)	495	224
1 ft 6 in (0,5 m) link (each)	115	52
Spreader with pins	180	81
13 ft 10-1/4 in (4,2 m) strap	850	385
Spreader link, pins	100	45
1 ft 6 in (0,5 m) link (each)	120	54
4 ft 2 in (1,3 m) strap, pin (each)	380	172
Jib hinge pins/link assembly (each)	340	154
Jib stop assembly (each)	2,715	1 231
Automatic jib stop assembly	40	18
30 ft (9,1 m) jib strut top with point sheaves	8,790	3 987
29 ft (8,8 m) jib strut butt with wire rope guide	5,900	2 676
21 ft (6,4 m) main strut top with point sheaves and raising pendant	8,550	3 878
29 ft (8,8 m) main strut butt	5,365	2 433
Main strut stop assembly (each)	1,980	898
8 ft 9-1/4 in (2,7 m) strap (each)	260	117
4 ft (1,2 m) link with pins (each set)	180	81
3 ft 10-1/2 in (14,2 m) adjustable strap (each)	160	72
20 ft (6,1 m) backstay strap with link (each)	610	276
40 ft (12,2 m) backstay strap with link (each)	1,120	508
10 ft (3.0 m) backstay strap with link (each)	360	163
1 ft 11-1/2 in (0,6 m) backstay link with pin (each set)	115	52
Boom dolly with adapter frame, pins	7,800	3 538
BOOM OPTIONS:		
Drum 6 assembly (luffing hoist with rope)	11,615	5 268
Standard upper boom point (single sheave)	1,115	505
Heavy duty upper boom point (single sheave)	1,630	739
25 ft (7,6 m) extended upper boom point with load sensor	10,570	4 794
661 USt (600 t) Load Block	25,100	11 385
500 USt (454 t) load block	24,500	11 113
496 USt (450 t) load block	24,710	11 205
450 USt (408 t) load block	21,300	9 661
350 USt (318 t) load block	17,400	7 892
276 USt (250 t) load block	19,300	8 750
110 USt (100 t) load block	10,260	4 650
100 USt (91 t) load block (self-erect)	3,900	1 769
30 USt (27 t) hook and weight ball	2,800	1 270
15 USt (14 t) hook and weight ball	1,800	816

Description	Weight Pounds	Weight Kilograms
WIRE ROPE:		
Mast hoist		
1,230 ft (375 m) of 22 mm wire rope - 1.80 lb per ft (2,68 kg/m)	2,215	1 004
Boom hoist		
4,370 ft (1 332 m) of 1-1/8 in (28,6 mm) wire rope - 2.60 lb per ft (3,87 kg/m)	11,360	5 152
Luffing Jib Hoist		
1 in (25,4 mm) wire rope - 2.00 lb per ft (2,98 kg/m)		
1,700 ft (518 m) No. 44 Luffing Jib	3,400	1 542
3,100 ft (945 m) No. 79A Luffing Jib	6,200	2 812
Load lines		
32 mm wire rope - 3.74 lb per ft (5,57 kg/m)		
3,700 ft (1 128 m) Drum 1	13,840	6 277
3,400 ft (1 036 m) Drum 2	12,715	5 767
28 mm wire rope - 2.76 lb per ft (4,11 kg/m)		
4,800 ft (1 463 m) Drum 1	13,250	6 010
4,000 ft (1 158 m) Drum 2	11,040	5 007
Whip lines		
28 mm wire rope - 2.76 lb per ft (4,11 kg/m)		
1,900 ft (579 m) Drum 3	5,245	2 379

THIS PAGE INTENTIONALLY LEFT BLANK

ENGLISH AND METRIC CONVERSIONS

Direct Conversion

MULTIPLY (x) known value by conversion factor to obtain equivalent value in desired units. For example, 12 ft is converted to meters (m), as follows:

12 ft x 0.3048 = 3,6576 m

Inverse Conversion

DIVIDE (/) known value by conversion factor to obtain equivalent value in desired units. For example, 3,6576 m is converted to feet, as follows:

3,6576 m / 0.3048 = 12

To Convert	Symbol	Application	To	Symbol	Multiply By
AREA					
Square Inch	in^2	Filter Area Clutch Contact	Square Centimeter	cm^2	6.4516
Square Foot	ft^2	Ground Contact	Square Meter	m^2	0.0929
FORCE					
Pound Force	lb	Pedal Effort	KiloNewton Newton	kN N	0.00445 4.4482
Pound Force	lb	Line Pull	KiloNewton	kN	0.00445
Pound Force Per Inch	lb/in.	Spring Force	Newton per millimeter	Nmm	0.1751
Pound Force Per Foot	lb/ft		Newton per meter	Nm	14.5939
LENGTH					
Inch	in.	Adjustments	Millimeter	mm	25.4000
Foot	ft	Outline Dimensions	Meter	m	0.3048
Mile	miles	Travel Distance	Kilometer	km	1.6093
POWER					
Horsepower	hp	Engine	Kilowatt	kW	0.7457
PRESSURE					
Pound/Sq. In.	psi	Hydraulic & Air	Bar		0.0689
TEMPERATURE					
Degrees Fahrenheit	°F	Oil, Air, Etc.	Degrees Centigrade	°C	°F - 32 / 1.8
Degrees Centigrade	°C		Degrees Fahrenheit	°F	°C x 1.8 + 32
TORQUE					
Inch Pound	in lb	Bolt Torque	Newton Meter	Nm	0.1129
Foot Pound	ft lb		Newton Meter	Nm	1.3558
VELOCITY					
Miles Per Hour	mph	Vehicle Speed	Kilometers Per Hour	km/h	1.6093
Miles Per Hour	mph	Wind Speed	Meters Per Second	m/s	0.4470
Feet Per Minute	fpm	Line Speed	Meters Per Minute	m/min	0.3048
VOLUME					
Cubic Yard	yd^3	Bucket Capacity	Cubic Meter	m^3	0.7646
Cubic Foot	ft^3		Cubic Meter	m^3	0.0283
Cubic Inch	in^3	Pump Displacement	Cubic Centimeter	cm^3	16.3871

To Convert	Symbol	Application	To	Symbol	Multiply By
VOLUME (LIQUID)					
Ounce	oz	Fluid Capacities	Milliliter	mL	29.5735
Pint	pt		Liter	L	0.4732
Quart	qt		Liter	L	0.9464
Gallon	gal		Liter	L	3.7854
Gallon Per Minute	gpm	Pump Flow	Liters Per Minute	L/min	3.7854
WEIGHT					
Pound	lb	Unit/Component	Kilogram	kg	0.4536
US Ton (2,000 lb)	USt	Load Ratings	Metric Ton	t	0.9072
US Ton (2,000 lb)	USt		Kilogram	kg	907.1847

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 2
SAFETY INFORMATION

TABLE OF CONTENTS

SECTION 2
SAFETY INFORMATION

WARNING

California Proposition 65

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Battery posts, terminals, and related accessories contain chemical lead and lead compounds, chemicals known to the State of California to cause cancer, birth defects, and other reproductive harm. Wash hands after handling.

California Spark Arrestor

Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrestor may be required. The owner/operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.

CONTINUOUS INNOVATION

Due to continuing product innovation, the information in this manual is subject to change without notice. If you are in doubt about any procedure, contact your Manitowoc dealer or the Manitowoc Crane Care Lattice Team.

NAMEPLATES AND DECALS

See drawing at the end of this section.

SAFETY MESSAGES

General

The importance of safe operation and maintenance cannot be over emphasized. Carelessness or neglect on the part of operators, job supervisors and planners, rigging personnel, and job site workers can result in their death or injury and costly damage to the crane and property.

To alert personnel to hazardous operating practices and maintenance procedures, safety messages are used throughout the manual. Each safety message contains a safety alert symbol and a signal word to identify the hazard's degree of seriousness.

Safety Alert Symbol

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. ***Obey all safety messages that follow this symbol to avoid possible death or injury***.

Signal Words

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

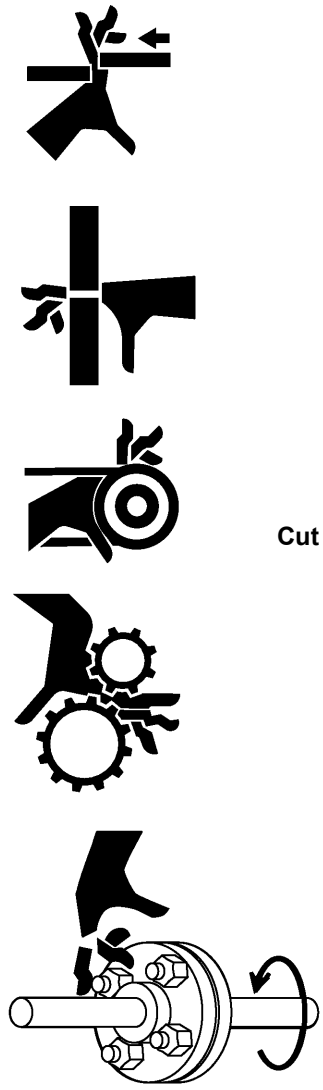
CAUTION

Without the safety alert symbol, identifies potential hazards that could result in property damage.

NOTE: Highlights operation or maintenance procedures.

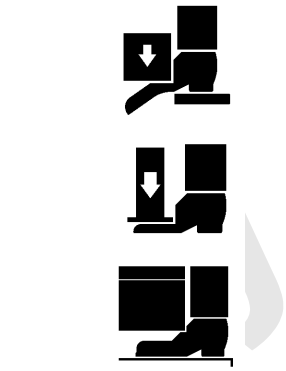
Symbol Identification

The symbols used in the safety and information signs and nameplates on this crane are identified in Figure 2-1.

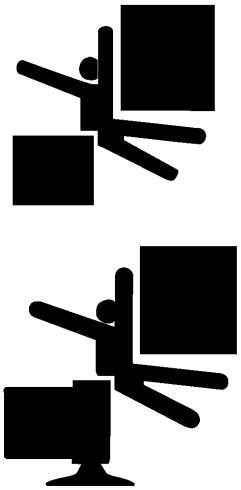


Cut or Crush Hazards

Cut Hazard



Crush Hazards

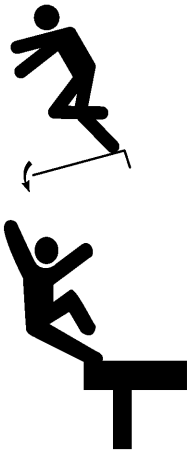


Electrocution Hazard

Explosion Hazard

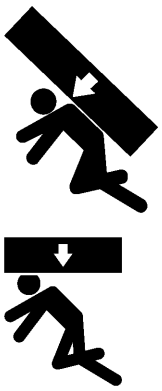
Fall Hazard

FIGURE 2-1



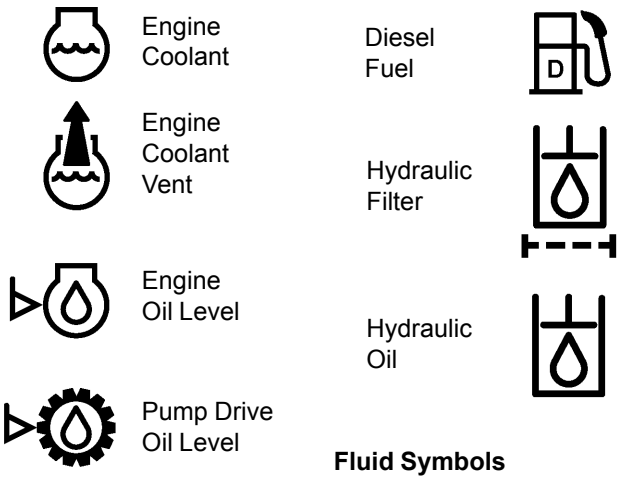
Fall Hazards

Falling Boom Hazards (Crush Hazard)



Falling Load Hazards (Crush Hazard)

Fire Extinguisher



Fluid Symbols

Flying Object Hazards

Overhead Obstruction Hazard

Power Line Hazard (Electrocution)

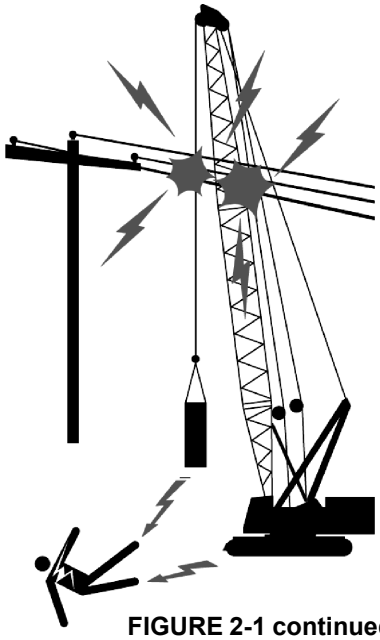
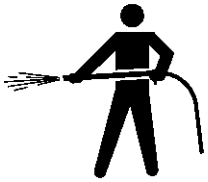


FIGURE 2-1 continued

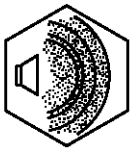
Personal Fall Protection



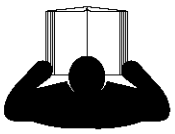
Pressure Cleaning

Pressure Release Hazard

Sound Power Level



Read Manual



Tire Pressure

FIGURE 2-1 continued

SAFETY AND INFORMATION SIGNS

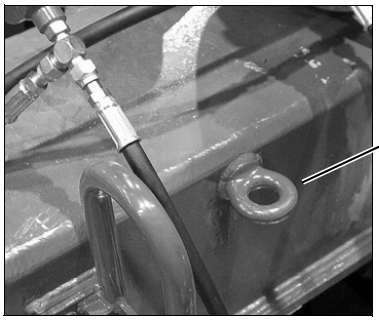
Maintaining Signs

The crane owner/user shall make sure that all signs are legible and installed at the proper locations on the crane. If a sign has been defaced or removed, it must be replaced immediately. See Nameplates and Decals Drawing in this section for the installation locations of signs.

Ordering Signs

Order replacement signs from your Manitowoc dealer.

When ordering a sign, give the crane model number, the serial number, and the name and part number of the sign.



P1951

Anchor for personnel fall-protection equipment:
– 4 Places Front of Rotating Bed
– 3 Places on Engine Covers
– 3 Places on Rear of Rotating Bed (under mast)
– 2 Places Each Upper Counterweight Tray

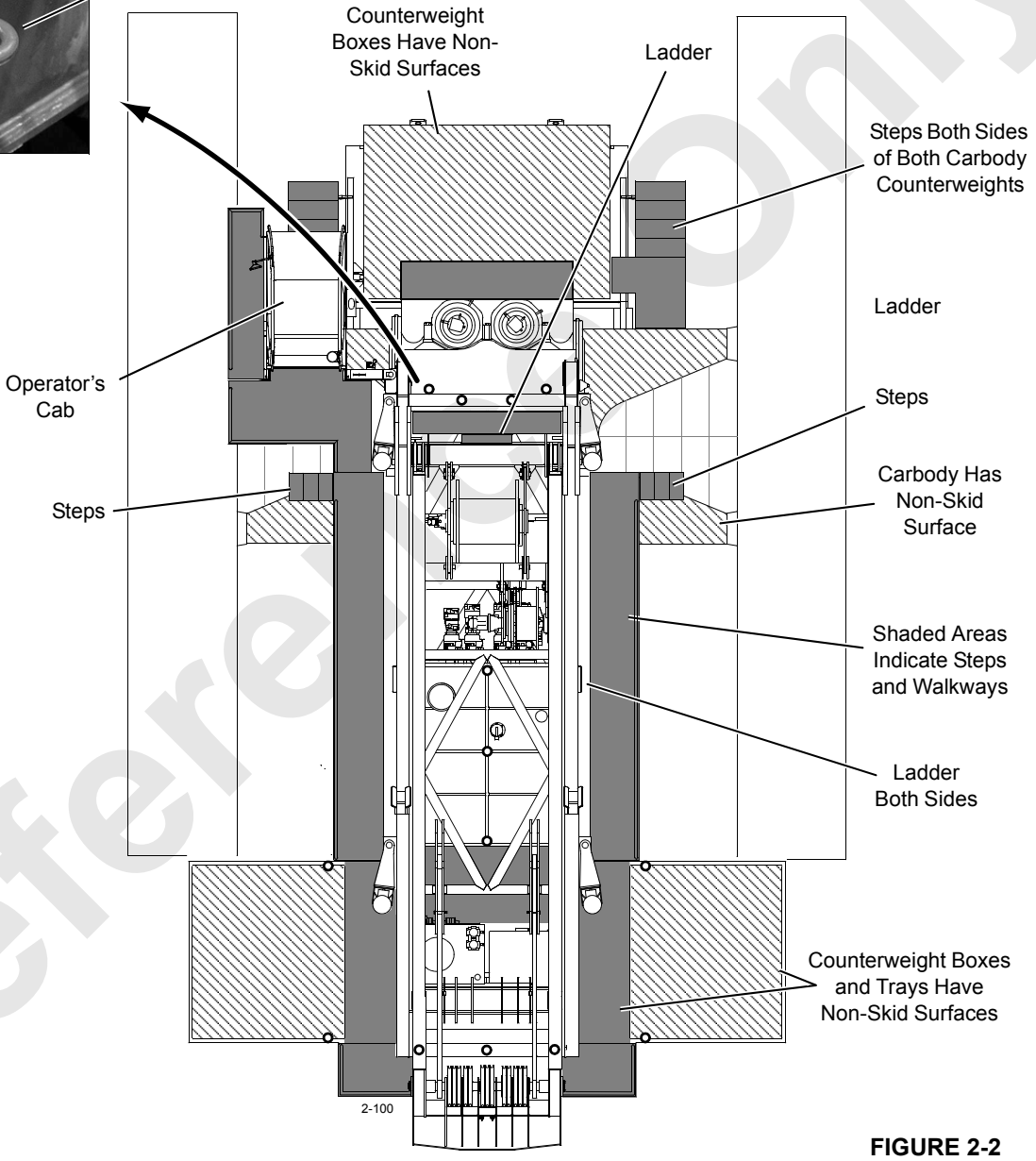


FIGURE 2-2

CRANE ACCESS POINTS

DANGER

Crush Hazard!

Upperworks can swing into and crush personnel climbing on or off crane.

Moving crawlers can crush personnel climbing on or off crane.

To prevent death or serious injury:

- Barricade all accessible areas to crane so personnel cannot be struck or crushed when upperworks is swung.
- Do not climb onto or off crane while upperworks is being swung or crane is being traveled.
- Signal operator for permission to climb onto/off crane.
- Operator: do not swing or travel while personnel are climbing onto or off crane. Stop swing and travel motions. Apply swing brake and turn on travel park.
- Operator: Always sound horn to alert personnel before you swing or travel.
- If equipped, automatic alarms will sound to alert personnel when the crane is swung or traveled.

  If the swing and travel alarms are not operating properly, they must be repaired as soon as possible. Until they are repaired, the operator shall alert personnel to crane movement using the horn on the control console.

Take necessary precautions. to prevent slipping and/or falling off the crane during assembly, disassembly, maintenance, or other work. ***Falling from any height could result in serious injury or death.***

Manitowoc has provided steps, ladders, catwalks, and platforms at the locations shown in Figure 2-2.

The owner/user shall provide workers with approved ladders or aerial work platform to access those areas of the crane, mast, and boom that cannot be reached from the ground or from steps, ladders, catwalks, and platforms provided by Manitowoc.

Adhere to local, state, and federal regulations for handling personnel and for personnel fall protection.

- Access points must be kept clear to prevent personal injury and unsafe operation of crane. Store clothing and other personal belongings so they do not interfere with controls in operator's cab or with operation of crane.
- Do not allow ground personnel to store their personal belongings (clothing, lunch boxes, water coolers, and the like) on the crane.

  This practice will prevent ground personnel from being crushed or electrocuted when they attempt to access personal belongings stored on the crane.
- Tools, oil cans, spare parts, and other necessary equipment must be stored in tool boxes or other appropriate locations. Do not allow these items to lie around loose in operator's cab or on steps, ladders, catwalks, and platforms.
- To reduce the risk of slipping, non-skid material (sand in paint) has been applied to painted walkways and platforms. However, walkways and platforms can be slippery when wet and when oil or grease is spilled on them. ***Keep walkways and platforms clean and dry to prevent slipping on them.*** When non-skid material wears out, reapply it.
- Wear shoes with a highly slip-resistant sole material. Clean any mud or debris from shoes before entering the crane cab or climbing onto crane. A shoe that is not clean might slip off a control pedal during operation.
- Do not make modifications or additions to the crane's access systems that have not been evaluated and approved by Manitowoc.
- Do not use top of mast, boom, or jib as walkways unless they have catwalks.

NOTE: Catwalks (walkways) are available from Manitowoc for the boom and luffing jib sections.

Two ladders, stored in insert next to boom butt or 40 foot insert, are available for boom assembly and disassembly. See Boom Ladder Assembly in Section 4 of this manual for instructions.

Getting On or Off Crane

Personnel getting on and off crane shall do so only at steps or ladders provided and only ***while crane is parked***.

Never climb onto or off a moving crane. ***Climb onto and off crane only when it is parked and only with operator's permission.***

When personnel use ladders to get on or off the crane, their hands shall be free of any objects. Objects which cannot be carried in pockets or tool belts must be lifted into place with a hand line or hoist.

PERSONNEL FALL-PROTECTION ANCHORS

Manitowoc has provided fourteen anchors on the upperworks (see Figure 2-2) to which workers can attach their personnel fall-protection equipment.

WARNING

Fall Hazard!

Anchors are designed to handle only one person at a time.

Dot use anchors for lifting or pulling loads.

OPERATOR MANUAL/CAPACITY CHART STORAGE

General

Manitowoc provides the following manuals and other important literature with your crane and attachment (Luffing Jib, etc.):

- Operator Manual (Serial Numbered)
  Contains safety information, crane specifications, assembly/erection procedures, operating instructions, lubrication and maintenance checks.
- Parts Manual (Serial Numbered)
  Contains illustrations and part numbers of replaceable parts.
- Capacity Chart Manual (Serial Numbered)
  Contains lifting capacities and related information (wire rope specifications, drum and lagging information, etc.)
- Maintenance Checks and Lube Guide
  Contains lists of maintenance checks and lube services and their prescribed intervals.
- Rated Capacity Indicator/Limiter Operation
  Contains load capacity operation and calibration procedures.
- Service Manual (Serial Numbered)
  Contains theory of operation, maintenance procedures, crane and wire rope inspection procedures, troubleshooting information, and shop procedures.

The manuals which must be retained in the operator's cab (Operator Manual, Capacity Charts, Maintenance Checks and Lube Guide, and RCL Operation) are supplied in an OPERATOR INFORMATION binder. A separate binder is provided for the crane and each applicable attachment.

The Operator Manual and Capacity Charts are stamped with the serial number of the crane or attachment. The serial number on the manuals and capacity charts must match the serial number of the crane and attachment in use. ***Using any other manual or capacity chart is prohibited.***

- The crane model and serial number are located on the Crane Identification Plate on the crane cab.
- The model and serial number of the attachment (other than standard boom) are located on the Crane Identification Plate on the attachment.

If the serial numbers of your manuals and capacity charts do not match the serial numbers of the crane or attachment, contact your Manitowoc dealer for the proper manual or capacity charts.

Do not operate crane or attachment if proper Capacity Chart is not in cab.

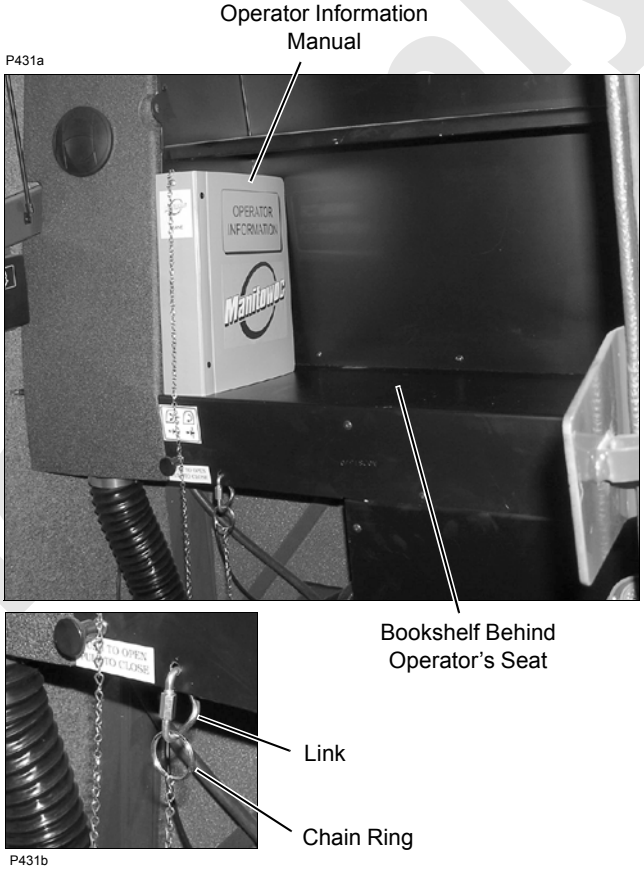


FIGURE 2-3

Storing Manuals

Store the Operator Information Manuals for the crane and each applicable attachment on the bookshelf in the operator's cab (Figure 2-3).

Attach the chain from the manual in use to the link behind the operator's seat.

Keep all other manuals provided with the crane in the crane owner's/user's office so they are readily available when needed.

SAFE OPERATING PRACTICES

General

The importance of safe operation cannot be over emphasized. Carelessness and neglect on the part of operators, supervisors and planners, rigging personnel and job site personnel can result in their death or injury and costly damage to the crane or property.

The safety information in this publication is intended only as a guide to assist qualified operators, supervisors and planners, rigging personnel, and job site personnel in safe operation. Manitowoc cannot foresee all hazards that will arise in the field, therefore, ***safety remains responsibility of crane operators and owner***.

Local, state, and other governmental agencies may require stricter operating practices. When a conflict in practices exists, follow the strictest practice.

Read Operator Manual

Safe and efficient assembly, disassembly, and operation of this crane requires that it be maintained in proper working order and that its operators and maintenance personnel be familiar with the crane's functions and capabilities.

The Operator Manual supplied with and considered part of your crane shall be read and completely understood by each person responsible for assembly, disassembly, operation, and maintenance of the crane.

The Operator Manual shall be read to personnel who cannot read or understand English or other language into which the manual is translated.

Because of a program of continuing improvement in product design, Manitowoc reserves the right to change the information and specifications contained in the Operator Manual at any time without notice. If you have any questions regarding the crane or its Operator Manual, please contact your Manitowoc dealer.

Operator Qualifications

The crane must be operated only by the following ***qualified*** personnel:

1. Designated operators
2. Trainees under direct supervision of a designated operator
3. Supervisors, inspectors, and maintenance or test personnel when necessary in performance of their duties. Operation of the crane by these personnel shall be limited to the crane functions needed to perform the inspection or to verify the crane's performance after maintenance procedures.

No personnel shall be allowed to climb onto crane or enter crane cab unless performance of their duties requires them to do so, and then only with knowledge of operator or other qualified person.

Qualified person is defined as one who by reason of training and experience is thoroughly familiar with crane operations and the hazards involved. Such a person shall meet the operator qualifications specified in Occupational Safety and Health Administration (OSHA) Regulations (United States Federal Law), in ASME B30.5 American National Standard, or in any other applicable federal, state, or local laws.

Operator training and qualification is crane owner's responsibility.

NOTE: The regulations and standards mentioned above and later in this section can be obtained from:

US DOL/OSHA Rules and Regulations are available by mail from the Superintendent of Documents, PO Box 371954, Pittsburgh, PA, 15250-7954 or by:

- Phone 202-512-1899
- Fax 202-512-2250
- Online at www.osha.gov.

ASME (formerly ANSI) B30 Series American National Standards are available by mail from the ASME, 22 Law Drive, Fairfield, New Jersey, 07004-2900 or by:

- Phone US & Canada 800-843-2763
- Phone Mexico 95-800-843-2763
- Phone Universal 973-882-1167
- Fax 973-882-1717 or 973-882-5155
- E-mail infocentral@asme.org.

Operator Conduct

1. The operator shall not engage in any practice which diverts his/her attention while operating the crane.
2. The operator shall not operate the crane when he/she is physically or mentally unfit.
3. The operator shall be responsible for all operations under his/her direct control. When safety of an operation is in doubt, the operator shall stop the crane's functions in a controlled manner. Lift operations must resume only after safety concerns have been addressed or the continuation of crane operations is directed by the lift supervisor.
4. The operator shall be thoroughly familiar with operation of crane and its proper care. If adjustments or repairs are necessary or if there are known defects that impair safe

operation, the crane must not be operated until unsafe conditions have been corrected.

5. If there is a warning sign at the start controls, the operator shall not start the engine until the warning sign has been removed by the person who installed it.

6. Before starting the engine, the operator shall make sure that:

   a. All daily inspection and maintenance services have been performed.

   b. All controls are in off the position and all brakes and locking devices are applied or engaged.

   c. All personnel are clear of the crane. Deploy a swing radius barrier.

WARNING

Safety devices and operational aids such as rated capacity indicator or limiter, boom and jib angle indicator or limiter, anti-two-block device, level indicator, swing limiter, proximity device, etc., may be installed on your crane. Such devices are to be used only as ***AIDS TO ASSIST OPERATOR***, their presence on crane in no way substitutes for or lessens requirement that operator knowledge, experience, and judgment are required to ensure safe operation of crane.

Crane must not be loaded beyond applicable static or dynamic ratings given in Capacity Chart for crane.

- See Size of Load later in this section.
- For a description of each safety device and operational aid, see Safety Devices and Operational Aids in this section and Section 3 of this manual.

7. The operator shall test all controls, limits, and communication systems at the start of each shift. Any defects found must be corrected before operation is begun.

8. The operator shall not start crane movement if the load or designated signal person is not within his/her range of vision or communication.

9. The operator shall understand and respond to signals from the person directing the lift or from the designated signal person. When a signal person or crane follower is not required, the operator is responsible for the lift. ***Operator shall obey a stop signal at all times, no matter who gives it***.

10. The operator shall verify that the Capacity Chart being used is the correct one for the cranes configuration (boom length, load line reeving, counterweight, etc.).

11. The operator shall verify that:

   a. All attachments are properly assembled and attached to the crane according to the rigging drawings called for in the Capacity Chart.

   b. The counterweight — to include applicable auxiliary counterweight — is in place and of proper weight. ***Maximum required counterweight must not be exceeded***.

WARNING

Moving Load/Tipping Crane Hazard!

Changing weather conditions including but not limited to: wind, ice or snow accumulation, precipitation, flooding, lightning, etc. should be considered when determining the location and configuration of a crane when it will be left unattended.

12. The operator shall perform the following operations before leaving the operator's cab for any reason:

   a. Park crane and position upperworks so crane does not interfere with operation of other equipment.

   b. Apply travel and swing brakes or locking devices.

   c. Land any attached load.

   d. Lower the boom onto blocking at ground level or onto a boom rest if possible.

      If the boom cannot be lowered, as determined by a qualified designated person, it must be securely fastened from movement by wind or other outside forces (see Wind Conditions in Capacity Chart Manual).

NOTE: The designated person shall be familiar with the job site limitations, the crane configuration, and the expected weather conditions.

   e. Move all controls to off.

   f. Apply all drum brakes and pawls.

   g. Disengage the master clutch, if equipped.

   h. Stop the engine.

NOTE: Also read Unattended Crane instructions in Section 3 of the Crane Operator Manual.

13. The operator shall perform the following operations if power or a control function fails during operation:

   a. Land all suspended loads, if possible, under brake or power control.

   b. Apply all brakes and locking devices.

   c. Move all controls to off.

14. If the crane will be operated at night, the operator shall make sure that there is sufficient lighting for safe operation. The load and landing area must be illuminated.

15. The operator shall not operate the crane during periods of bad weather if his/her ability to see the load or the signal person is impaired by darkness, fog, rain, snow, and the like.

Do not operate the crane with a snow or ice covered boom. The extra weight may cause overload, tipping, or structural damage.

Never operate the crane during an electrical thunderstorm.

When a local weather storm warning exists (including electrical thunderstorm), stop operation and secure the crane. See step 12 under Operator Conduct topic.

NOTE: DO NOT depend on grounding. Grounding of a crane affords little or no protection from electrical hazards. The effectiveness of grounding is limited by the size of the conductor (wire) used, condition of the ground, the magnitude of voltage and current present, and numerous other factors.

16. Wind can cause the crane to tip or the boom and other attachments to collapse. The operator or qualified person directing the lift shall compensate for the effect of wind on the load and boom by reducing ratings, reducing operating speeds, or a combination of both.

Unless otherwise specified in the Capacity Chart, or Operator Manual, stop operation under the following wind conditions:

a. If the wind causes the load to swing forward past the allowable operating radius or sideways past either boom hinge pin, land the load and apply the drum brakes.

b. If the wind exceeds 35 mph (56 km), land all loads and apply the drum brakes, lower the boom onto blocking at ground level or otherwise restrain it, and apply the swing and travel brakes and/or locks.

NOTE: ***"Land load"*** means to set it down on a firm uniformly supporting surface.

17. Booms, jibs, or masts which are being assembled or disassembled on the ground (with or without support of boom rigging) must be securely blocked to prevent the boom, jib, or mast sections from dropping.

Workers shall not go under boom, jib, or mast sections when removing connecting pins or bolts.

18. Each outrigger must be visible to the operator or the signal person during extension and retraction.

Handling Load

Size of Load

1. The crane must not be loaded beyond the applicable static or dynamic ratings given in the Capacity Chart for the crane configuration.

NOTE: Capacity charts for Manitowoc cranes show the total weight of freely suspended loads for various boom and jib lengths and operating radii.

"Freely suspended load" is a load that is hanging free with no direct external force applied except by the crane's load-line reeving.

To determine the actual weight of the load which can be lifted at a given radius (working load), the operator shall deduct the weight of certain lifting equipment from the total weight given in the chart. See the specific Capacity Chart for your crane for a list of lifting equipment which must be deducted.

The operator's judgment shall be used to further reduce total the load to allow for the dynamic effects of swinging, hoisting, or lowering, and adverse weather conditions to include wind.

2. The operator or other designated person directing the lift shall verify that the weight of load is within the static or dynamic rating for radius at which load will be lifted.

Verified weights and measured radii must take priority over RCI/RCL readings.

Attaching Load

1. Attach the hook to the load with slings, or other suitable rigging. Each hook must have a latch that is in proper working order. ***Hook latches must not be wired open***.

a. Inspect each hook and latch before using.

b. Never use a hook or latch that is distorted or bent.

c. Make sure spring will force the latch against the tip of the hook.

d. Make sure the hook supports the load. The latch must never support the load. Latches are only intended to retain loose slings under slack conditions.

2. Only use slings and other rigging that are in safe operating condition and have a rating equal to or greater than the load to be lifted.

3. Do not wrap the load line around the load.

4. Use suitable protection between slings and any sharp edges on the load. When synthetic slings are used, the synthetic sling manufacturer's instructions, limitations, specifications, and recommendations must be followed.

5. Secure unused legs of a multi-leg sling before handling a load with one leg of sling.

Lifting/Moving Load

1. Before lifting or moving a load, the operator or qualified person directing the lift shall make the following checks:

a. Crane has a firm, uniformly supporting foundation under all crawlers. Unless otherwise specified in the Capacity Chart, the foundation must be *level to within 1%* — 1ft (0,3 m) rise or fall in 100 ft (30,5 m) distance.

When such a surface is not available, it must be provided with timbers, cribbing, or other structural members to distribute the load such that the allowable bearing capacity of the underlying member is not exceeded.

For ground bearing data go to: www.manitowoccranes.com/site/EN/groundbearingpressure.aspx.

b. The load is secured and properly balanced in the slings or the lifting device before lifting the load more than 3 to 6 in (76 to 152 mm).

c. The lift and swing paths are clear of personnel and obstructions.

d. The load is free to be lifted.

e. The load line is not kinked or otherwise damaged.

f. Multiple part load lines are not twisted around each other in such a manner that the lines will not separate when the load is lifted.

g. The hook is brought over the load in a manner that will minimize twisting or swinging.

h. The load line and the boom hoist rope are properly spooled on the drums and seated in the sheaves.

i. The load drum brakes are in proper working order.

The operator shall test the load drum brakes each time a load approaching the rated load is handled. Lift the load 3 to 6 in (76 to 152 mm) and fully apply the brakes — *load must not lower through applied brakes.*

j. Unused load drums are parked (working and parking brakes applied; if equipped, drum pawls engaged).

k. All personnel are clear of the swing radius of the crane's counterweight.

2. While lifting or moving the load, the operator shall take the following precautions:

a. Accelerate and decelerate the load smoothly to avoid excessive stress on the crane boom and machinery.

b. Avoid sudden starts and stops while swinging. Keep the swing speed under control to prevent the load from swinging out beyond the radius at which the load can be handled and to minimize the pendulum action of the load.

c. Sound the signal horn before swinging and intermittently while swinging, especially when approaching personnel.

If equipped, the automatic swing alarm will sound when the crane is swung.

d. Use taglines or other restraints to control the load when necessary.

e. Do not exceed any swing limitations (areas of operation) given in the Capacity Chart.

f. Do not allow the load, the boom, or any other part of the crane to contact obstructions.

g. Do not use the crane to drag a load.

h. Do not hoist, lower, or swing the load while personnel are on the load or the hook. See Personnel Handling in this section.

i. Avoid carrying the load over personnel. Loads which are suspended must be blocked or cribbed before personnel are allowed to work under or between them.

j. Before lifting a load which requires the use of outriggers (or anytime outriggers are used), fully extend the outrigger beams and jacks so the truck tires do not bear any load.

Securely fasten the outrigger jack pads or floats to jacks and set them on a flat, firm surface that will support the load placed on the pads or floats. Do not set the jack pads or floats in holes, on rocky ground, or on extremely soft ground.

When dictated by ground conditions, install wood blocking or steel plates under the jack pads or floats to properly distribute the loading on the supporting surface.

Wood blocking or steel plates used under the jack pads or floats must be:

- Free of defects
- Strong enough to prevent crushing, bending, or shear failure
- Of sufficient thickness, width, and length to completely support the jack pad or float, transmit the load to the supporting surface, and

prevent shifting, toppling, or excessive settlement under load

k. Fully retract and lock the jacks and the outrigger beams so they cannot extend when not in use.

l. Operate with extreme caution when using two or more cranes to lift the same load.

One designated person shall be responsible for operation when two or more cranes are used to lift same load. The designated person shall analyze the lift and instruct all personnel involved in proper rigging and positioning of the load and all movements to be made. Decisions such as the necessity to reduce crane ratings, load position, boom position, ground support, and speed of movements shall be in accordance with the designated person's decision.

m. Do not lower the load or the boom to a point where less than three full wraps of wire rope are remaining on the respective drum (or as otherwise indicated in local, state, or federal regulations).

n. Engage the boom hoist pawl when operating with the boom at a fixed radius.

o. Engage the luffing hoist pawl when operating with the luffing jib at a fixed radius.

3. While traveling, the operator shall take the following precautions:

a. Sound the signal horn before traveling and intermittently while traveling, especially when approaching personnel.

If equipped, the automatic travel alarm will sound when the crane is traveled.

b. Carry the boom in-line with the lowerworks and facing the direction of travel.

c. Do not position the boom so high that it could bounce over backwards whether traveling with or without load.

d. Secure the rotating bed against rotation except:

- When operating with a MAX-ER® attachment
- When it is necessary to negotiate a turn, and then only when the operator is seated at controls or the boom is supported on a dolly

e. Lash or otherwise restrain unused hooks so they cannot swing freely.

4. Before traveling with a load, the operator shall take the following additional precautions:

a. A designated person shall be responsible for operation. Decisions such as the necessity to reduce crane ratings, load position, boom position, ground support, and speed of movements shall be in accordance with the designated person's decision.

b. Maintain specified tire pressures (truck cranes).

c. Avoid sudden starts and stops. Use taglines or other restraints to control the position of the load.

Multiple Load Line Operation

WARNING

Avoid Over Load and Side Load Damage to Crane

Manitowoc highly recommends that you contact your Manitowoc dealer for lift planning assistance and approval.

Multiple load line operation is becoming common practice for applications like panel tilt-up, pile tilt-up, pile driving, rolling fabricated sections, etc. The multiple lines may be on a common shaft (each with different parts of line) or on multiple shafts (lower boom point and upper point, boom point and fixed jib point, etc).

Manitowoc authorizes multiple load line operation for those applications requiring it, provided the following steps are performed:

1. The qualified lift planner and the crane operator shall read and become thoroughly familiar with the appropriate Capacity Charts and Wire Rope Specification Charts.

2. The lift planner and the crane operator shall make sure the total load does not exceed the rated capacity given in the Capacity Chart and Wire Rope Specification Chart for given boom point or jib point, whichever is less.

EXAMPLE: If one load line is lifting from the jib point, the proper jib chart applies.

3. The crane must be thoroughly inspected by a qualified person prior to setup.

4. The crane must be thoroughly inspected for load line interference caused by routing and reeving of multiple load lines. If interference is found, it must be eliminated.

5. For cranes produced before 2003, Rated Capacity Indicators/Limiters were not required by ASME B30.5 for non-personnel lifting.

To aid the operator in staying within the crane's Capacity Chart with the total applied load, Manitowoc recommends that its cranes be equipped with Rated Capacity Indicators/Limiters to monitor the load on each load line.

Operator is still responsible for knowing load and radius whether or not crane is equipped with load indicator(s).

6. Manitowoc recommends that each load line be equipped with an anti two-block device.
7. Manitowoc's Capacity Charts are based on freely suspended loads. To prevent side load damage to the boom, the jib, and the sheaves:
   - The load lines must hang as close to vertical as possible to minimize side and forward loads.

     The distance between the load points and the hook points must be a minimum of three times the horizontal distance between the hook point on the load being lifted.
   - The load must remain centered on the boom and jib point shafts unless special lift approval is granted by Manitowoc.
   - The load lines should be located over the load's center of gravity as it is supported on a trailer, a barge, or the ground.
8. The crane operator shall be familiar with the operational characteristic of the crane as it relates to multiple drum operation (simultaneous operation, same or opposite direction, or individual operation).
9. When using tandem drums, the maximum operating layers may be limited depending on whether the crane was initially designed for tandem drum operation or not.
10. Load shift when lifting with two hooks may be more unpredictable than typical one hook lifting.

Holding Load

When a load is suspended, the operator shall take the following precautions:

1. Not leave his/her position at the controls
2. Not allow personnel to stand or pass under the load.
3. Move all controls to off, apply all drum brakes, engage the boom hoist pawl, and apply the swing and travel brakes or locks

SIGNALS

1. Continuous communication shall be maintained between the operator and the signal person during all crane movements. If communication is disrupted, ***operator shall stop all crane movements***.
2. Signals to the operator shall be in accordance with the standard signals shown in Section 3, unless communications equipment (telephone, radio, etc.) is used.
3. All signals shall be easily understood by the operator at all times. The operator shall not respond to any signal which is not clearly understood.
4. For operations not covered in the standard signals, or for special situations or emergencies, additional signals may be required. In those cases, the signals used shall be agreed upon in advance by the operator and the signal person. The signals used shall not conflict with or have potential to be confused with the standard signals.
5. When it is necessary to give instructions to the operator (other than those established by the signal system), all crane motions shall be stopped.
6. The signal person shall:
   a. Be tested by a designated person and show that he or she has a basic understanding of crane operations and limitations, to include boom deflection.
   b. Be thoroughly familiar with the standard hand signals and voice signals if used.
   c. Be positioned in clear view of the operator. The signal person's position should give him or her a clear view of the load, the crane, and the operating area.
   d. Direct the load so it does not pass over personnel.
   e. Keep unnecessary personnel out of the crane's operating area.
7. When moving the crane, the following audible signals shall be used:
   a. STOP - one short audible signal.
   b. GO AHEAD - two short audible signals.
   c. BACK UP - three short audible signals.

SAFETY DEVICES

WARNING

Do not operate crane unless all safety devices listed in this section are in proper working order.

- If a safety device stops working properly during operation, the operator shall safely stop operation.
- If any safety device listed in this section is not in proper working order, the safety device must be taken out of service and crane operation must not resume until the safety device is again working properly.
- Alternative measures are not permitted to be used for a faulty safety device.
- Always tag-out any faulty safety device and place a warning tag in the cab stating that the crane is out of service and must not be used.

Manitowoc provides the following safety devices on its cranes.

1. Horn activated by a switch on the control console in the operator's cab

   If the horn is not working properly, it must be tagged-out or removed, if possible.

2. Crane level indicator: either electronic (viewable in crane's electronic display) or mechanical (viewable from operator's cab seat). If the crane level indicator is not working properly, it must be tagged-out or removed, if possible.
3. Cranes operating on a barge require: a trim indicator, a swing brake, and a wind direction indicator if the wind is a factor (supplied by crane owner or user).
4. Boom stops, both physical and automatic

   If a boom stop is damaged or not working properly, it must be tagged-out or removed if possible.

5. Jib stops, both physical and automatic (for fixed jib and luffing jib)

   If a jib stop is damaged or not working properly, it must be tagged-out or removed, if possible.

6. Pedal locks for all foot-operated brakes (if applicable)

   If a pedal lock is damaged or not working properly, it must be tagged-out or removed if possible.

7. An integral holding device or check valve on each jacking cylinder

OPERATIONAL AIDS

WARNING

Do not operate crane unless all applicable operational aids listed in this section are in proper working order, except:

- Where an operational aid is being repaired
- The crane user implements a specified temporary alternative measure

If an operational aid stops working properly during operation, the operator shall safely stop operation until the temporary alternative measures are implemented or the device is again working properly.

Manitowoc provides the following operational aids on its cranes, either as standard equipment or optional equipment. The operational aids are designated as Category 1 or Category 2:

Category 1 Operational Aids

If a Category 1 operational aid is not working properly, it must be repaired no later than 7 calendar days after the deficiency occurs.

Exception: If the crane user documents that he/she has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair must be completed within 7 calendar days of receiving the parts.

1. **Boom or Luffing Jib Angle Limiter**
   (automatic boom or jib stop)

   Temporary alternative measures if inoperative or malfunctioning:

   The qualified person directing the lift shall make sure the maximum boom or jib angle/radius specified in the Capacity Chart for the load being handled is not exceeded. One or more of the following methods must be used:

   a. Measure radius using a tape measure.

   b. Measure the boom angle with a protractor-level on the centerline of boom.

   c. Clearly mark the boom or luffing hoist cable (so it can easily be seen by the operator) at a point that gives the operator sufficient time to stop the boom or jib within the minimum allowable radius.

      In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

d. Clearly mark the boom or luffing hoist cable (so it can easily be seen by a designated signal person) at a point that gives the signal person sufficient time to signal the operator and have the operator stop the boom or jib within the maximum allowable radius.

2. Anti-Two-Block Device

Temporary alternative measures if inoperative or malfunctioning:

The qualified person directing the lift shall establish procedures to furnish equivalent protection. One or more of the following methods must be used:

a. Assign a signal person to signal the operator to stop hoisting when the load is a safe distance from the boom or jib point.

b. Clearly mark the hoist cable (so it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the load a safe distance from the boom or jib point.

NOTE: The temporary alternative measures for the anti-two-block device do not apply when lifting personnel in load line supported baskets. ***Personnel shall not be lifted in load line supported baskets when anti-two-block devices are not functioning properly***.

Category 2 Operational Aids

If a Category 2 operational aid is not working properly, it must be repaired no later than 30 calendar days after the deficiency occurs.

Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 calendar days, the repair must be completed within 7 calendar days of receiving the parts.

1. Rated Capacity Indicator/Limiter

Temporary alternative measures if inoperative or malfunctioning:

The qualified person directing the lift shall establish procedures for determining load weights and shall make sure that the weight of the load does not exceed the crane's rating at the radius where the load is handled.

The weight of the load must be provided to the operator before the lift is made.

2. Boom Angle or **Radius Indicator**

Temporary alternative measures if inoperative or malfunctioning:

a. Refer to the pendulum boom angle indicator on the boom butt (viewable from operator's cab).

b. Measure the boom angle with a protractor-level on the centerline of boom.

c. Measure radius using a tape measure.

3. Jib Angle or **Radius Indicator**

Temporary alternative measures if inoperative or malfunctioning.

a. First, make sure you know the boom angle (see item 2 above).

b. Then, measure radius using a tape measure.

4. Drum Rotation Indicator

Temporary alternative measures if inoperative or malfunctioning:

Mark the drum to indicate its rotation.

If the operator cannot see the drum, add mirrors or remote video cameras and displays so the operator can see the mark.

5. OPTIONAL **Swing Limiter** or **Proximity Device**

Temporary alternative measures if inoperative or malfunctioning:

The qualified person directing the lift shall establish procedures to furnish equivalent protection (for example, assign an additional signal person to observe the distance between the boom or load and job site obstructions to include power lines or to limit the swing sector specified in the Capacity Chart).

6. OPTIONAL **Drum Spooling Limiter** (maximum or minimum bail limit)

Temporary alternative measures if inoperative or malfunctioning:

The qualified person directing the lift, the operator, or a designated signal person shall watch the drum and signal the operator to stop before it is over-spooled (rope does not jump off drum) or before there are less than 3 full wraps of wire rope on the load drum or boom hoist.

7. OPTIONAL **Closed-Circuit Television** (CCTV)

Temporary alternative measures if inoperative or malfunctioning:

A designated signal person shall watch the load, the drums, and the counterweight and provide necessary hand or voice signals to the crane operator.

ASSEMBLING, DISASSEMBLING, OR OPERATING CRANE NEAR ELECTRIC POWER AND TRANSMISSION LINES

Electrocution Hazard

Thoroughly read, understand, and abide by all applicable federal, state, and local regulations regarding operation of cranes near electric power lines or equipment.

United States federal law prohibits the use of cranes closer than 20 ft (6 m) to power sources up to 350 kV and greater distances for higher voltages unless the line's voltage is known [29CFR1910.180 and 29CFR1926.1400].

To avoid death or serious injury, Manitowoc recommends that all parts of crane, boom, and load be kept at least 20 ft (6 m) away from all electrical power lines and equipment less than 350 kV.

NOTE: For detailed guidelines on operating near power lines, refer to the current edition of OSHA 29CFR1926.1400 and ASME B30.5 American National Standard.

WARNING

Electrocution Hazard!

Manitowoc cranes are not equipped with all features required to operate within OSHA 29CFR1926.1408, Table A clearances when the power lines are energized.

1. Keep all personnel and their personal belongings (clothing, water coolers, lunch boxes, etc.) away from the crane if it is being operated near electrical power lines or equipment.
2. Before operating the crane in the vicinity of electrical power lines or equipment, notify the power utility company. Obtain positive and absolute assurance that the power has been turned off.

   The crane is NOT INSULATED. Always consider all parts of the load and the crane as conductors, including the wire rope, pendants or straps, and taglines.

   Most overhead power lines ARE NOT insulated. Treat all overhead power lines as being energized unless you have reliable information to the contrary from the utility company or owner.

   The rules in this section must be followed at all times, even if the electrical power lines or equipment have been de-energized.
3. Crane operation is dangerous when close to an energized electrical power source. Exercise extreme caution and prudent judgement. Operate slowly and cautiously when in the vicinity of power lines.
4. If the load, wire rope, boom, or any portion of the crane contacts or comes too close to an electrical power source, everyone in, on, and around the crane can be seriously injured or killed.

   The safest way to avoid electrocution is to stay away from electrical power lines and electrical power sources.
5. The operator is responsible for alerting all personnel to the dangers associated with electrical power lines and equipment. The crane is not insulated. Do not allow unnecessary personnel in the vicinity of the crane while operating. Permit no one to lean against or touch the crane. Permit no one, including riggers and load handlers, to hold the load, load lines, taglines, or rigging gear.
6. Even if the crane operator is not affected by an electrical contact, others in the area may become seriously injured or killed.
7. It is not always necessary to contact a power line or power source to become electrocuted. Electricity, depending on magnitude, can arc or jump to any part of the load, load line, or crane boom if it comes too close to an electrical power source. Low voltages can also be dangerous.

Set-Up and Operation

1. During crane use, assume that every line is energized ("hot" or "live") and take necessary precautions.
2. Position the crane such that the load, boom, or any part of the crane and its attachments cannot be moved to within 20 ft (6 m) of electrical power lines or equipment. This includes the crane boom and all attachments. Overhead lines tend to blow in the wind, so allow for movement of the overhead lines when determining a safe operating distance.
3. Erect a suitable barricade to physically restrain the crane, all attachments, and the load from entering into an unsafe distance from electrical power lines or equipment.
4. Plan ahead and always plan a safe route before traveling under power lines. A wooden clearance frame should be constructed to ensure sufficient clearance is maintained between crane and power lines.
5. Appoint a reliable and qualified signal person, equipped with a loud signal whistle or horn and voice communication equipment, to warn the operator when any part of the crane or load moves near a power source. This person should have no other duties while the crane is working.

6. Taglines should always be made of non-conductive materials. Any tagline that is wet or dirty can conduct electricity.
7. DO NOT store materials under power lines or close to electrical power sources.
8. When operating near transmitter/communication towers where an electrical charge can be induced into the crane or load:
   - The transmitter must be deenergized OR,
   - Tests must be made to determine if an electrical charge will be induced into the crane or load.
   - The crane must be provided an electrical ground.
   - If taglines are used, they must be non-conductive.
   - Every precaution must be taken to dissipate induced voltages. Consult with a qualified RF (radio frequency) Consultant. Also refer to local, state, and federal codes and regulations.

Electrocution Hazard Devices

1. The use of insulated links, insulated boom cages/ guards, proximity warning devices, or mechanical limit stops does not ensure that electrical contact will not occur. Even if codes or regulations require the use of such devices, failure to follow the rules in this section may result in serious injury or death.
2. Be aware that such devices have limitations and you should follow the rules and precautions outlined in this section at all times even if the crane is equipped with these devices.
3. Insulating links installed into the load line afford limited protection from electrocution hazards. Links are limited in their lifting abilities, insulating properties, and other properties that affect their performance. Moisture, dust, dirt, oils, and other contaminants can cause a link to conduct electricity. Due to their capacity ratings, some links are not effective for large cranes and/or high voltages/currents.
4. The only protection that may be afforded by an insulated link is below the link (electrically downstream), provided the link has been kept clean, free of contamination, has not been scratched or damaged, and is periodically tested (just before use) for its dielectric integrity.
5. Boom cages and boom guards afford limited protection from electrocution hazards. They are designed to cover only the boom nose and a small portion of the boom. Performance of boom cages and boom guards is limited by their physical size, insulating characteristics, and operating environment (for example dust, dirt, moisture, etc.). The insulating characteristics of these devices can be compromised if not kept clean, free of contamination, and undamaged.
6. Proximity sensing and warning devices are available in different types. Some use boom point (localized) sensors and others use full boom length sensors. No warning may be given for components, cables, loads, and other attachments located outside of the sensing area. Reliance is placed upon the operator in selecting and properly setting the sensitivity of these devices.
7. Never rely solely on a device to protect you and your fellow workers from danger.

   Some variables to know and understand are:
   - Proximity devices are advertised to detect the existence of electricity and not its distance, quantity, or magnitude.
   - Some proximity devices may detect only alternating current (AC) and not direct current (DC).
   - Some proximity devices detect radio frequency (RF) energy and others do not.
   - Most proximity devices simply provide a signal (audible, visual, or both) for the operator and this signal must not be ignored.
   - Sometimes the sensing portion of the proximity devices becomes confused by complex or differing arrays of power lines and power sources.
8. DO NOT depend on grounding. Grounding of a crane affords little or no protection from electrical hazards. The effectiveness of grounding is limited by the size of the (wire) conductor used, the condition of the ground, the magnitude of the voltage and current present, and numerous other factors.

Electrical Contact

If the crane comes in contact with an energized power source, the operator shall:

1. Stay in the crane cab. DON'T PANIC.
2. Immediately warn PERSONNEL in the vicinity to STAY AWAY.
3. Attempt to move the crane away from the contacted power source using the crane's controls which are likely to remain functional.
4. Stay in the crane until the power company has been contacted and the power source has been de-energized. NO ONE must attempt to come close to the crane or load until the power has been turned off.

   Only as a last resort should an operator attempt to leave the crane upon contacting a power source. If it is absolutely necessary to leave the cab, JUMP COMPLETELY CLEAR OF CRANE. DO NOT STEP OFF. Hop away with both feet together. DO NOT walk or run.

5. Following any contact with an energized electrical source, your Manitowoc dealer must be immediately advised of the incident and consulted on necessary inspections and repairs.

   If the dealer is not immediately available, contact the Manitowoc Crane Care Lattice Team. The crane must not be returned to service until it is thoroughly inspected for any evidence of damage and all damaged parts are repaired or replaced as authorized by Manitowoc or your Manitowoc dealer.

REFUELING

1. When using a portable container to refuel the crane, the container must be a safety-type can equipped with an automatic closing cap and a flame arrester.
2. The engine must be ***stopped*** before refueling crane.
3. Smoking and open flames must be prohibited in refueling area.

FIRE EXTINGUISHERS

1. A portable fire extinguisher with a minimum rating of 10 BC must be installed in operator's or machinery cab of crane.
2. The operator and all maintenance personnel shall be thoroughly familiar with the location, use, and care of the fire extinguisher(s) provided.

ACCIDENTS

If this crane becomes involved in a property damage and/or personal injury accident, immediately contact your Manitowoc dealer or the Product Safety and Reliability Department at the following address:

Manitowoc Cranes
2401 So. 30th St.
Manitowoc, WI 54220

Phone:920-684-6621

Provide a complete description of the accident, including the crane model and serial number.

The crane must not be returned to service until it is thoroughly inspected for any evidence of damage. All damaged parts must be repaired or replaced as authorized by Manitowoc.

SAFE MAINTENANCE PRACTICES

WARNING

Importance of safe maintenance cannot be over emphasized. Carelessness and neglect on part of maintenance personnel can result in their death or injury and costly damage to the crane or property.

Safety information in this publication is intended only as a guide to assist qualified maintenance personnel in safe maintenance. Manitowoc cannot foresee all hazards that will arise in field, therefore, ***safety remains responsibility of maintenance personnel and crane owner.***

Maintenance Instructions

To ensure safe and proper operation of Manitowoc cranes, they must be maintained according to the instructions contained in this manual and in the Service Manual provided with the crane.

Crane maintenance and repair must be performed by qualified personnel. These personnel shall ***read Operator Manual and Service Manual before attempting any maintenance procedure***. If there is any question regarding maintenance procedures or specifications, contact your Manitowoc dealer for assistance.

Qualified person is defined as one who by reason of training and experience is thoroughly familiar with the crane's operation and required maintenance as well as the hazards involved in performing these tasks.

Training and qualification of maintenance and repair personnel are crane owner's responsibility.

Safe Maintenance Practices

1. Perform the following steps (as applicable) before starting a maintenance procedure:
   - **a.** Park the crane where it will not interfere with other equipment or operations.
   - **b.** Lower all loads to the ground or otherwise secure them against movement.
   - **c.** Lower the boom onto blocking at ground level, if possible, or otherwise secure the boom against dropping.
   - **d.** Move all controls to off and secure all functions against movement by applying or engaging all brakes, pawls, or other locking devices.
   - **e.** Stop the engine and render the starting means inoperative.

f. Place a warning sign at the start controls alerting other personnel that crane is being serviced and the engine must not be started. ***Do not remove sign until it is safe to return crane to service.***

2. Do not attempt to maintain or repair any part of the crane while the engine is running, unless absolutely necessary.

If the engine must be run, keep your clothing and all parts of your body away from moving parts. ***Maintain constant verbal communication between person at controls and person performing maintenance or repair procedure***.

3. Wear clothing that is relatively tight and belted.

4. Wear appropriate eye protection and approved hard hat.

5. Never climb onto or off a moving crane. ***Climb onto and off crane only when it is parked and only with operator's permission***.

Use *both hands* and handrails, steps and ladders provided to climb onto and off the crane.

Lift tools and other equipment which cannot be carried in pockets or tool belts onto and off the crane with hand lines or hoists.

6. The boom and gantry are not intended as ladders. Do not attempt to climb lattice work of the boom or gantry to get to maintenance points. If the boom or gantry is not equipped with an approved ladder, lower them before performing maintenance or repair procedures.

7. Do not remove cylinders until the working unit has been securely restrained against movement.

8. Pinch points are impossible to eliminate, watch for them closely.

9. Pressurized air, coolant, and hydraulic oil can cause serious injury. Make sure all air, coolant, and hydraulic lines, fittings, and components are tight and serviceable.

Do not use your hands to check for air, coolant or hydraulic oil leaks:

- Use a soap and water solution to check for air leaks (apply to fittings and lines and watch for bubbles).
- Use a piece of cardboard or wood to check for coolant and hydraulic oil leaks.

10. Relieve pressure before disconnecting air, coolant, and hydraulic lines and fittings.

11. Do not remove the radiator cap while the coolant is hot or under pressure. Stop the engine, wait until the pressure drops and the coolant cools, then slowly remove the cap.

12. Avoid battery explosion: do not smoke while performing battery maintenance or short across battery terminals to check its charge.

13. Read the safety information in the battery manufacturer's instructions before attempting to charge a battery.

14. Avoid battery acid contact with skin and eyes. If contact occurs, flush the area with water and immediately consult a doctor.

15. Stop the engine before refueling crane.

16. Do not smoke or allow open flames in refueling area.

17. Use a safety-type can with an automatic closing cap and flame arrestor for refueling.

18. Hydraulic oil can also be flammable. Do not smoke or allow open flames in the area when filling hydraulic tanks.

19. Never handle wire rope with bare hands. Always wear heavy-duty gloves to prevent being cut by broken wires.

20. Use extreme care when handling coiled pendants. Stored energy can cause the coiled pendants to uncoil quickly with considerable force.

21. When inflating tires, use a tire cage, a clip-on inflator, and an extension hose which permits standing well away from the tire.

22. Only use cleaning solvents which are non-volatile and non-flammable.

23. Do not attempt to lift heavy components by hand. Use a hoist, jacks, or blocking to lift components.

24. Use care while welding or burning on the crane. Cover all hoses and components with non-flammable shields or blankets to prevent a fire or other damage.

25. To prevent damage to crane parts (bearings, cylinders, swivels, slewing ring, computers, etc.), perform the following steps ***before welding on crane***:

- Disconnect all cables from batteries.
- Disconnect output cables at engine junction box.
- Attach the ground cable from the welder directly to the part being welded and as close to the weld as possible.

Do not weld on the engine or engine mounted parts (per engine manufacturer).

26. Disconnect and lock the power supply switch before attempting to service high voltage electrical components and before entering tight areas (such as carbody openings) containing high voltage components.

27. When assembling and disassembling booms, jibs, or masts on the ground (with or without support of boom

rigging pendants or straps), securely block each section to provide adequate support and alignment.

Do not go under boom, jib, or mast sections while connecting bolts or pins are being removed.

28. Unless authorized in writing by Manitowoc, do not alter the crane in any way that affects the crane's performance (to include welding, cutting, or burning of structural members or changing pressures and flows of air/hydraulic components). Doing so will invalidate all warranties and Capacity Charts and make the crane owner/user liable for any resultant accidents.

29. ***Keep crane clean.*** Accumulations of dirt, grease, oil, rags, paper, and other waste will not only interfere with safe operation and maintenance but also create a fire hazard.

30. Store tools, oil cans, spare parts, and other necessary equipment in tool boxes. Do not allow these items to lie around loose in the operator's cab or on walkways and stairs.

31. Do not store flammable materials on the crane.

32. Do not return the crane to service at completion of maintenance or repair procedures until all guards and covers have been reinstalled, trapped air has been bled from hydraulic systems, safety devices have been reactivated, and all maintenance equipment has been removed.

33. Perform a function check to ensure proper operation at the completion of maintenance or repair.

ENVIRONMENTAL PROTECTION

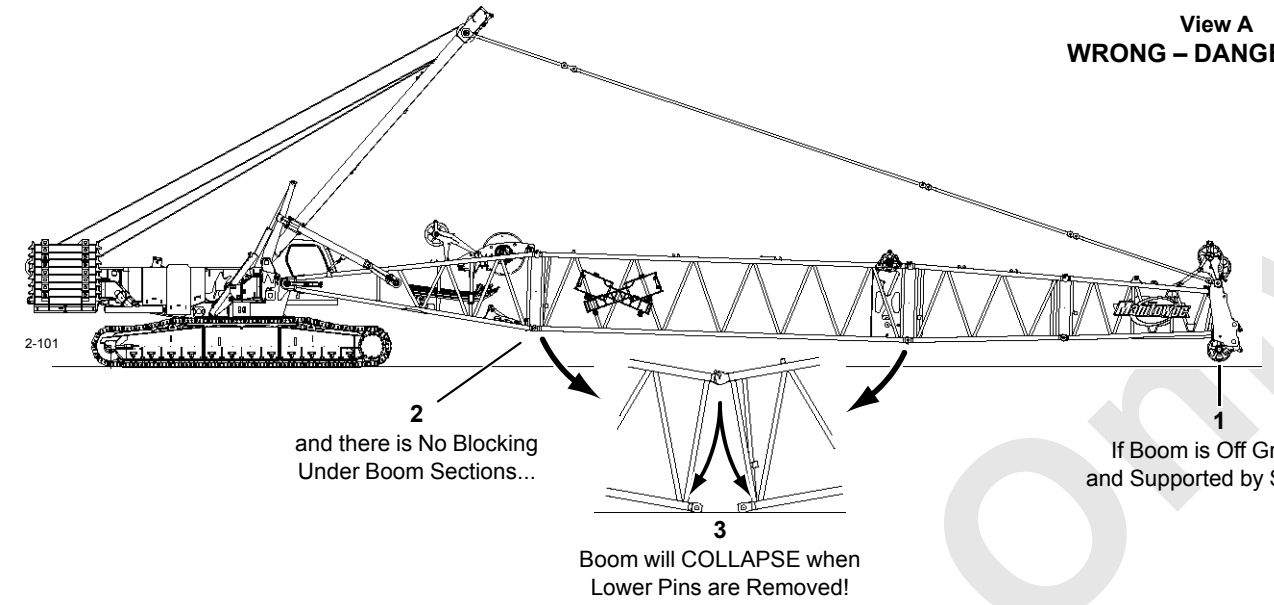
Dispose of waste properly! Improperly disposing of waste can threaten the environment.

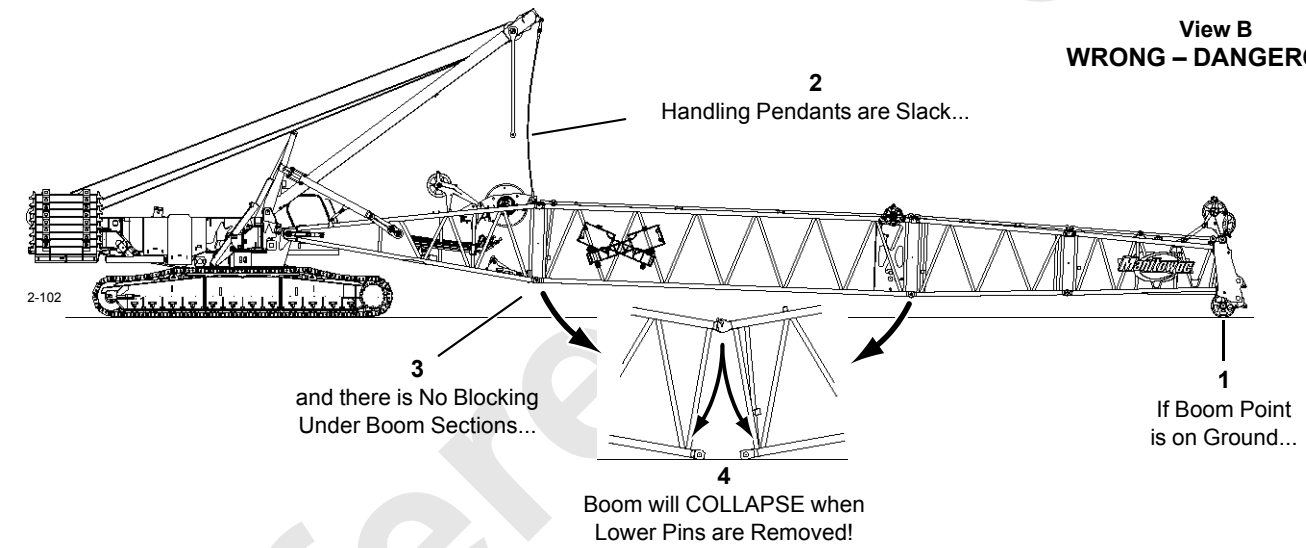
Potentially harmful waste used in Manitowoc cranes includes — but is not limited to — oil, fuel, grease, coolant, air conditioning refrigerant, filters, batteries, and cloths which have come into contact with these environmentally harmful substances.

Handle and dispose of waste according to local, state, and federal environmental regulations.

When filling and draining crane components: do not pour waste fluids onto the ground, down any drain, or into any source of water.

- Always drain waste fluids into leak proof containers that are clearly marked with what they contain.
- Always fill or add fluids with a funnel or a filling pump.
- Immediately wipe up any spills.





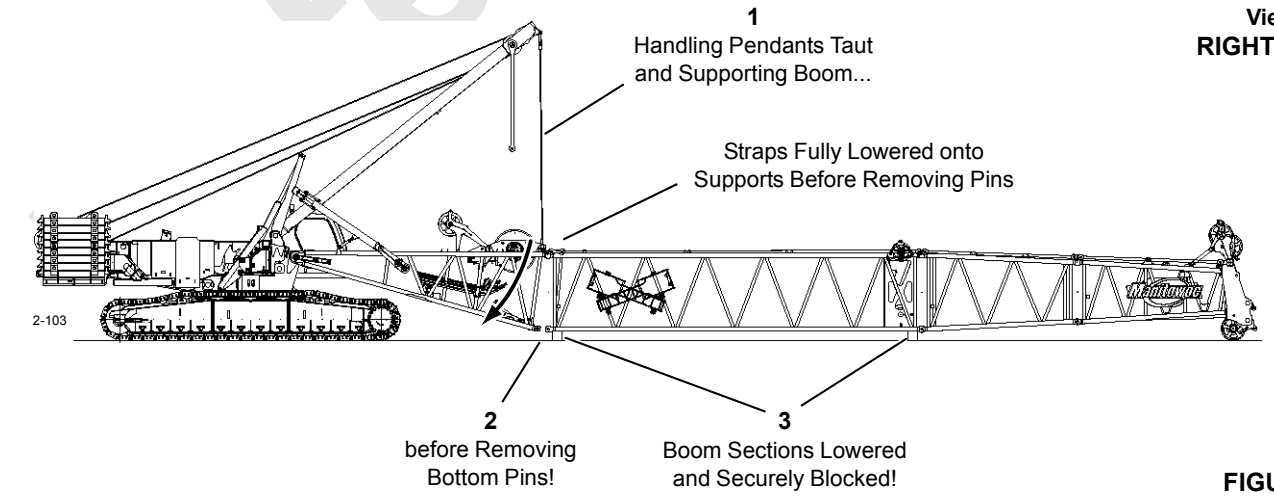


FIGURE 2-4

BOOM DISASSEMBLY SAFETY

NOTE: The term “boom” used in the following instructions applies to all lattice attachments (fixed jib, luffing jib, mast, etc.)

DANGER!

Collapsing Boom Hazard!

Prevent death or serious injury when disassembling boom sections — read and adhere to the following instructions.

Safe handling of lattice booms during disassembly is a primary concern for preventing serious or fatal injuries. A boom can collapse during disassembly if workers fail to observe safe working practices.

Accidents during boom disassembly usually result from one of three primary causes:

- Workers are not familiar with equipment or are not properly trained.
- Disassembly area is not suitable.
- Safe procedures are overlooked because not enough time is allocated for the task.

General

Safety decals (Figure 2-5) are placed near the connectors on the boom sections as shown on the Boom Disassembly Decal Drawing at the end of this section.

Workers involved with boom disassembly shall be trained and experienced in the operation and disassembly of construction cranes. Everyone shall read and understand these instructions, the information in the Boom Assembly Drawing, and the instructions in Section 4 of this manual before beginning disassembly. Anyone who has a question should ask for an explanation. ***One worker who does not fully understand or fails to follow correct procedures can endanger other workers.***

Location

Select a suitable location for boom disassembly. It must be firm, level, and be free of obstructions. It should have enough open space to accommodate the crane, the length of boom, and – if required – movement of an assist crane or other equipment. If possible, secure the area to keep unauthorized personnel and vehicles away.

Pin Removal

When removing pins from boom sections, stand clear of pins being removed. Even though the boom is resting on blocking, individual pin connections may still be under load. Pins can be ejected forcefully if the boom has any pressure on it or if the boom is not supported properly.

FIGURE 2-5

Disassembly Precaution

Always block boom sections so they are securely supported and cannot shift or move suddenly when pins are removed. If there is any doubt about a boom disassembly procedure, ***block tightly under boom sections before removing any pin***.

DANGER

Collapsing Boom Hazard!

Boom can collapse or shift violently when pins are removed. To avoid death or serious injury:

- Do not remove bottom connecting pins from any boom section when boom is supported by straps as shown in Figure 2-4, View A.
- Do not remove strap connecting pins until straps are fully lowered into supports as shown in Figure 2-4, View C.
- Do not remove bottom connecting pins from any boom section when boom point is resting on ground and handling pendants are slack as shown in Figure 2-4, View B.
- Never work or stand inside boom unless it is lowered and securely blocked as shown in Figure 2-4, View C.
- Do not stand or walk on top of boom unless it has walkways.

DANGER

Falling Boom Hazard!

Crane can tip or boom can collapse if excess boom is cantilevered. Never cantilever more boom than allowed in rigging drawings or capacity charts.

PERSONNEL HANDLING POLICY

In 1998, the American Society of Mechanical Engineers issued a new American National Standard entitled, Personnel Lifting Systems, ASME B30.23-1998. This standard provides, ***"lifting and lowering of personnel using ASME B30 Standard hoisting equipment shall be undertaken only in circumstances when it is not possible to accomplish the task by less hazardous means. Unless all of the applicable requirements of this volume are met, the lifting or lowering of personnel using ASME B30 Standard equipment is prohibited."***

The ASME Standards recognize that mobile and locomotive cranes are primarily designed and intended for handling materials and not personnel. The ASME Standards have a retrofit statement that applies to existing cranes after the standards go into effect. It is not the intent of the standards to require retrofitting of existing equipment. If an item is being modified, the performance requirement must be reviewed relative to the current standard.

This new standard is consistent with the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) regulations for Construction that state, in 29CFR1926.1431(a): ***The use of a crane or derrick to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the work site, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous or is not possible because of structural design or work site conditions.***

Use of a Manitowoc crane to handle personnel is acceptable provided:

- The crane user shall comply with the manufacturer's specifications and limitations for lifting accessories (hooks, slings, personnel platforms, etc.).
- The requirements of the applicable national, state and local regulations and safety codes are met.
- A determination has been made that use of a crane to handle personnel is the least hazardous means to perform the work.
- The crane operator shall be qualified to operate the specific type of hoisting equipment used in the personnel lift.
- The crane operator shall remain in the crane cab at all times when personnel are off the ground.
- The crane operator and occupants have been instructed in the recognized hazards of personnel platform lifts.
- The crane is in proper working order.
- Load and boom hoist drum brakes, swing brakes, and locking devices such as pawls and dogs must be engaged when the occupied personnel platform is in a stationary position.
- The crane must be equipped with a boom angle indicator that is visible to the crane operator.
- The crane must be equipped with boom hoist limiting device.
- If the luffing jib is used for hoisting personnel, the crane must be equipped with a luffing jib angle indicator that is visible to the crane operator.
- If the luffing jib is used for hoisting personnel, the crane must be equipped with a luffing hoist limiting device.
- The crane is equipped with a positive acting device which prevents contact between the load block or overhaul ball and the boom tip (anti-two-block device).

  For friction cranes, this implies the addition of spring applied brakes activated by the anti-two-block device. The load line hoist drum must have a system or device on the power train, other than the load hoist brake, which regulates the lowering rate of speed of the hoist mechanism (controlled load lowering).

  Free fall of the hoist line is prohibited.
- The crane's Operator Manual is in the crane's cab, readily accessible to the operator.
- The crane's load Capacity Chart is affixed inside the crane cab, readily accessible to the operator. The total weight of the loaded personnel platform and related rigging must not exceed 50 percent of the rated capacity for the radius and configuration of the crane.
- The crane is uniformly level within one percent of level grade and located on a firm footing. Some Capacity Charts require more stringent levelness criteria.

  Cranes with outriggers or stabilizers must have them all extended and locked. All outriggers or stabilizers must be extended equally in accordance with the Capacity Charts and operating procedures.
- Handling personnel from a platform suspended by wire rope from a luffing jib is acceptable, but only when it is not possible to accomplish the task using a less hazardous means. The crane user and operator shall take into account hazards that may be present when using a luffing jib.
- Direct attachment of a personnel platform to a luffing jib is prohibited.
- The platform meets the requirements as prescribed by applicable standards and regulations.
- Applicable personal protection equipment is provided (such as, personal fall-protection system, etc.).

- For wire rope suspended platforms, the crane is equipped with a hook latch that can be closed and locked, eliminating the throat opening.
- The platform is properly attached and secure.
- Personnel platforms must not be used in winds exceeding 20 mph (9 m/s) at the hoisted platform height or in electric storms, snow, ice, sleet, or other adverse weather conditions which could affect the safety of personnel.
- Hoisting personnel within 20 ft (6 m) of a power line that is up to 350 kV or within 50 ft (15 m) of a power line that is over 350 kV is PROHIBITTED, except for work covered in OSHA 29CFR1926 subpart V.

For operation outside the United States, the requirements of the applicable national, state and local regulations and safety codes must be met. This may include, in addition to the above:

- Automatic brakes such that when the equipment operating controls are released, the motions are brought to rest.
- A holding device (such as a load hold check valve) must be provided in the hydraulic or pneumatic systems to prevent uncontrolled movement of the hoisting equipment in the case of a system failure.

Manitowoc offers upgrade packages for friction controlled models to install anti-two-block, dead man control, and automatic hoist system control requirements to satisfy other codes and standards.

Manitowoc recommends that cranes be properly maintained, regularly inspected, and repaired as necessary. All safety signs must be in place and legible. We also urge Manitowoc crane owners to upgrade their cranes with rated capacity indicator/limiter systems for all lifting operations.

If you have any questions about this subject or other product safety matters relating to the operation and use of a Manitowoc crane, please contact your Manitowoc dealer or the Product Safety and Reliability Department at the following address:

Manitowoc Cranes
2401 So. 30th St.
Manitowoc, WI 54220

Phone:920-684-6621

PEDESTAL/BARGE MOUNTED CRANES

WARNING

Overload Hazard!

A pedestal mounted crane will not tip to indicate to operator that crane's capacity has been exceeded. When capacity of a pedestal mounted crane is exceeded, hook rollers or other structural components may break, before load lines fail, causing crane to separate from pedestal.

For this reason, great care must be taken to operate a pedestal mounted crane within its rated capacity.

Careful planning is required before a crane can be operated on a barge. Crane user shall verify that barge is capable of limiting crane list and/or dynamics to maximum allowable specified in Capacity Charts. If specified crane list and/or dynamic conditions are exceeded, crane's capacity may be exceeded. This could cause hook rollers or other structural components to break, causing crane to separate from pedestal.

WARNING

Crane owner/user shall verify that method used to fasten or restrain crane to foundation, barge, ship or floating platform is strong enough, under all operating conditions, to prevent crane from breaking off foundation or moving on barge.

Manitowoc does not permit use of a truck crane on a barge, ship or floating platform.

Pedestal Mounted Crane

Also see ASME publication B30.8-2004, Floating Cranes and Derricks.

Definition

A pedestal mounted crane is a crane which is securely fastened to a foundation, barge, ship, or floating platform so the crane is restrained from tipping.

Examples

1. Crane upperworks mounted on a turret (or tub) which is securely fastened to foundation (Figure 2-6).

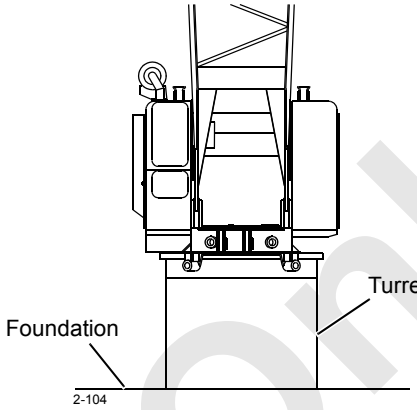
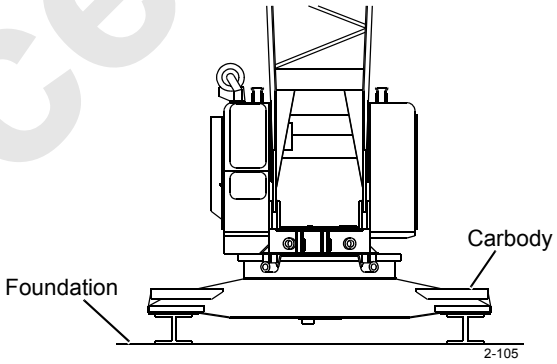


FIGURE 2-6

2. Crane upperworks mounted on a carbody (crawlers removed) which is securely fastened to foundation (Figure 2-7).



NOTE: If bolting carbody to foundation, contact your Manitowoc dealer for recommended bolt pattern and for type and quantity of bolts to be used.

FIGURE 2-7

Barge Mounted Crane

Definition

A barge mounted crane is a crane that is anchored or restrained in a work area of the barge, ship or floating platform and is subjected to tipping forces.

Examples

NOTE: The foundation is the deck of the barge, ship or floating platform.

1. Crawler-mounted crane with carbody anchored with tie-downs to foundation (Figure 2-8).

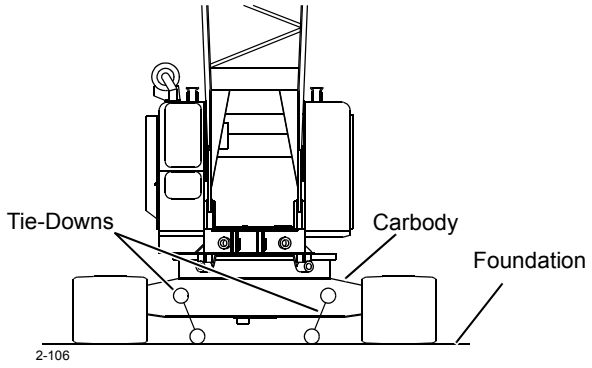
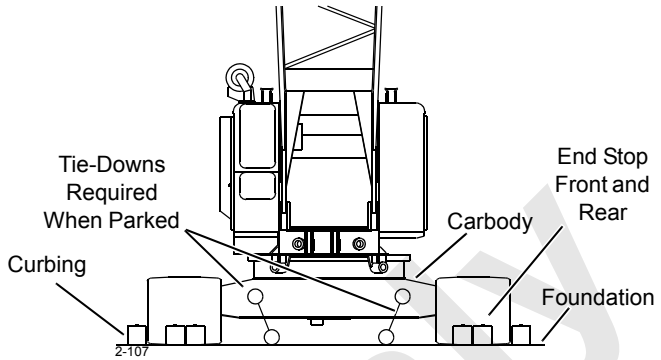


FIGURE 2-8

2. Crawler-mounted crane working on timbered area of barge, ship or floating platform with crawlers restrained by curbing and end stops (Figure 2-9). When not working, crane carbody is anchored with tie-downs to foundation. ***Traveling with load is not permitted***.

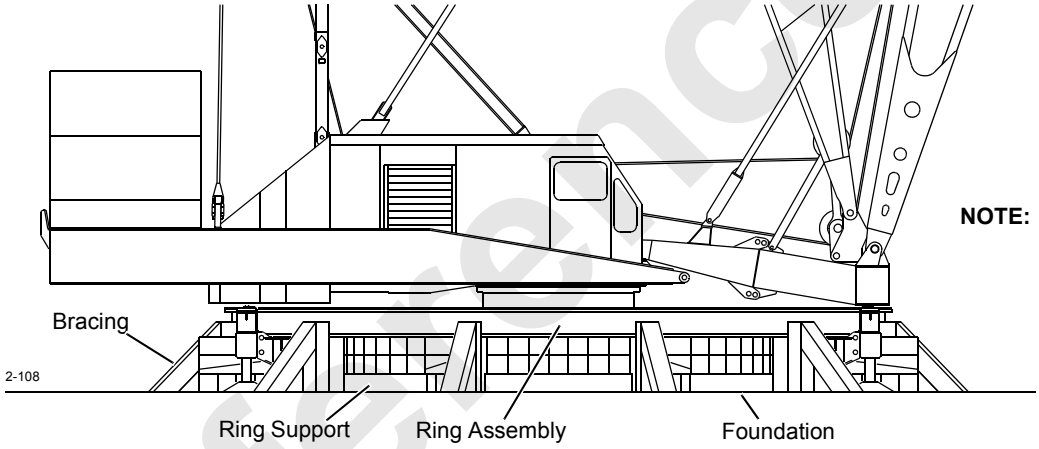


NOTE: Manitowoc does not permit traveling with load.

FIGURE 2-9

3. RINGER® (crawler mounted, carbody mounted) supported on blocking, screw jacks or steel pedestals which are braced and fastened to foundation in such a manner as to prevent movement (Figure 2-10).

4. RINGER (platform mounted) which has ring braced and fastened directly to foundation in such a manner as to prevent movement.



NOTE: Ringers must be equipped with hook rollers on boom and counterweight carriers.

FIGURE 2-10

AXIS		TRANSITIONAL		ROTATIONAL	
SYMBOL	NAME	STATIC	DYNAMIC	STATIC	DYNAMIC
X	Longitudinal		Surge	Heel List	Roll
Y	Vertical		Heave		Yaw
Z	Lateral		Sway	Trim	Pitch

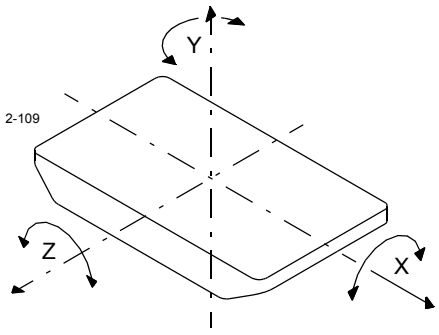


FIGURE 2-11

Capacity Charts

Manitowoc Cranes provides two types of capacity charts for a crane mounted on a barge or other supporting structure under static conditions.

1. A capacity chart based on tipping when crane is anchored only to prevent shifting
2. A capacity chart based on structural competence when crane is securely fastened for use as a pedestal mounted crane

NOTE: Unless otherwise specified on a machine list capacity chart, a "0" degree machine list capacity chart rating applies to machine list ***not to exceed 1/2 degree***. All other machine list ratings – 1°, 2°, and 3° – must NOT be exceeded.

Shock Loading

Definition

Shock loads to the crane can be experienced when the barge is subjected to up and down movement of wave action (referred to as DYNAMICS). Figure 2-11 illustrates the dynamic conditions of the barge which influence crane capacity.

CAUTION

Structural Damage Hazard!

If crane boom or structure is shock loaded during operation, or there is any indication of shock loading, all structural components of crane must be inspected to detect cracks and other damage. Nondestructive test equipment, such as magnetic particle or ultrasonic procedures, is recommended for this inspection.

NOTE: Manitowoc does not allow operation under dynamic conditions.

Operation On Barge

General

Machine list and/or dynamics will be experienced when a crane is operated on a barge, ship or floating platform. Both of these conditions reduce the crane's capacity, and each must be taken into account for safe operation on a barge, ship or floating platform.

WARNING

Tipping Crane Hazard!

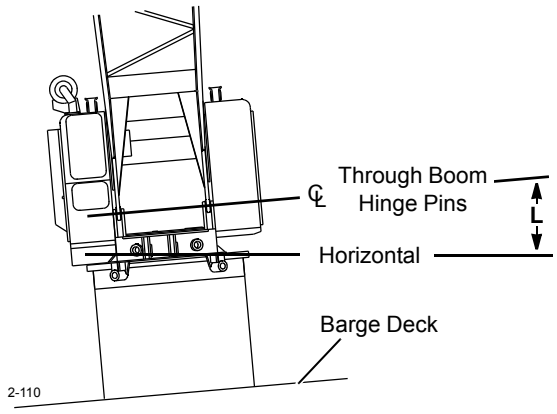
Tie-downs which only prevent crane from shifting as in barge, ship or floating platform mounting, may not provide adequate support when using a capacity chart for pedestal mounting. Before operating a crane on a barge, ship or floating platform, crane user shall verify that correct capacity chart is being used — pedestal mounted, barge mounted, 0°, 1°, 2° or 3° list or dynamic capacity chart.

Failing to use correct capacity chart can result in an accident.

Definitions

1. *Machine List*, as defined by Manitowoc Cranes, is crane's out-of-level condition — from side-to-side — as measured by angle between horizontal and a line drawn through centerline of crane's boom hinge pins (Figure 2-12). This out-of-level condition creates side load and affects crane's lifting capacity.
2. *Barge List* (also referred to as heel or trim) causes swing out of the load and may produce side load. When Manitowoc Cranes provides a capacity chart showing capacities for a 2 degree machine list for example, we are referring to maximum allowable lifting capacity for crane when experiencing an out-of-level condition (side-to-side) of 2 degrees as measured by angle between horizontal and a line drawn through centerline of crane's boom hinge pins.

   Unless otherwise specified on capacity chart, barge list (heel or trim) must not exceed machine list degrees given on the capacity chart.
3. *Barge List and Machine List are not the same.* As machine rotates on barge, barge list (as defined above) will change. Worst machine list condition generally occurs when machine swings over corner of barge, producing maximum side load.



L = Degrees of Machine List (Maximum allowable is specified on Capacity Chart)

FIGURE 2-12

Crane Inspection

To aid in preventing harmful and damaging failure as previously indicated, regular inspection for signs of overloading in the following load bearing components is required. Correct each defect found before placing the crane into service.

- Boom
- Gantry
- Backhitch
- Rotating Frame
- Wire Rope
- Pendants and Straps
- Turntable Bearing

When equipped with hook rollers, it is recommended that each hook roller assembly be inspected daily for any sign of overloading, to include:

- Deformation of roller path
- Proper hook roller adjustment
- Deformation or cracks in hook roller hanger
- Bent hook roller shaft
- Damaged bearings

Transporting Crane on Barge

If it is necessary to transport the crane on a barge, ship or floating platform when dynamic conditions will be experienced, the boom must be lowered onto a cradle (or other support) and the boom, crane upperworks and lowerworks must be secured against movement. If the crane is equipped with a mast, the mast must be securely tied down with guylines. Failing to take these steps can result in shock load or side load damage to the boom and mast.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 3
OPERATING CONTROLS AND PROCEDURES

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 3
OPERATING CONTROLS AND PROCEDURES

THIS SECTION STARTS ON THE NEXT PAGE

STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

The following standard hand signals comply with ASME B30.5-2014.

Table 3-1. Standard Hand Signals for Controlling Crane Operations

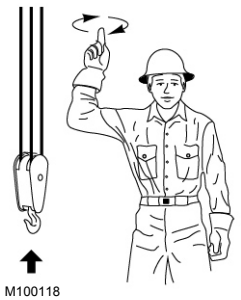
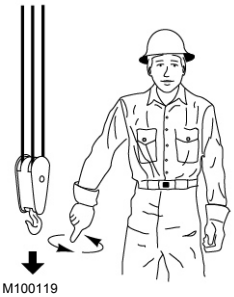
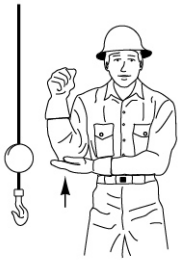
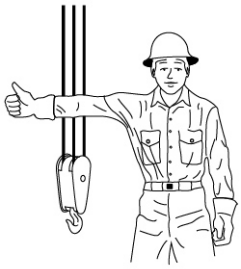
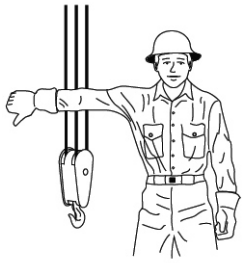
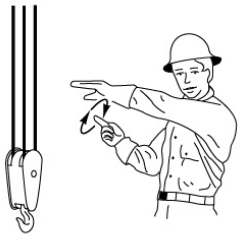
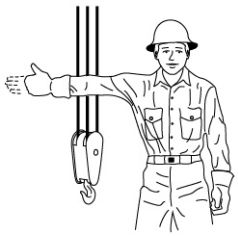
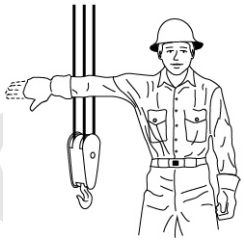
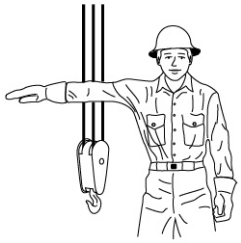
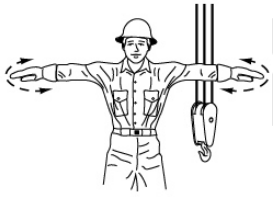
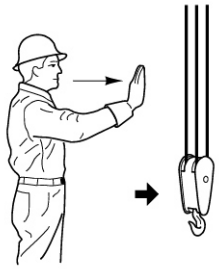
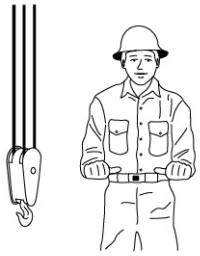
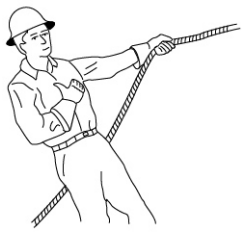
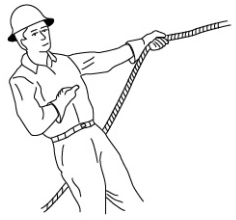
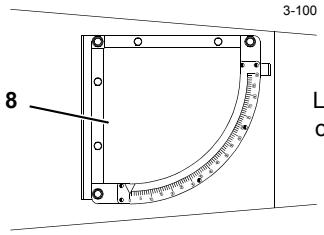
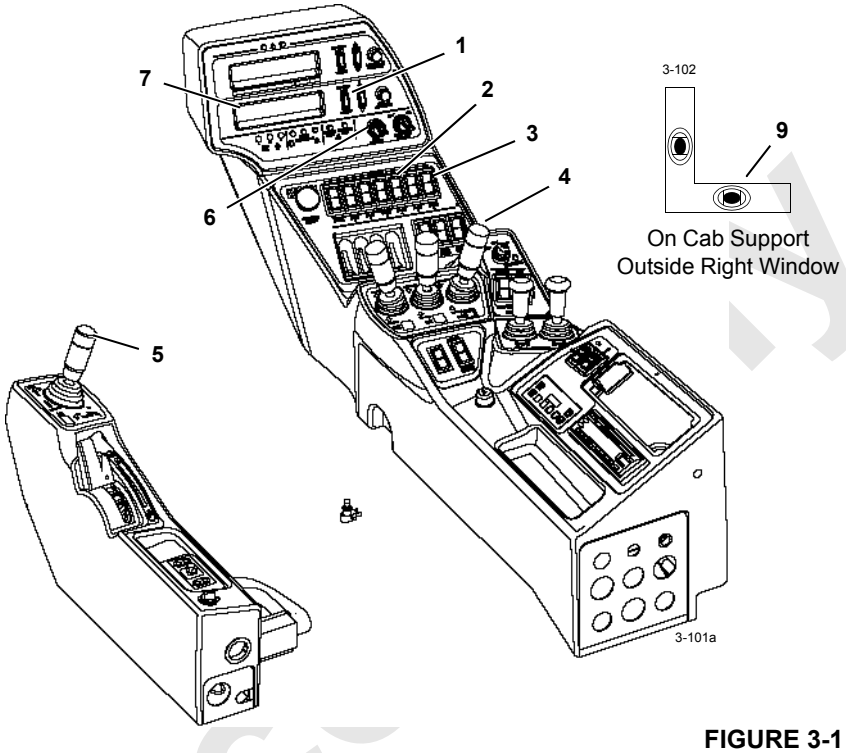
1	2	3	4	5
 M100118	 M100119	 M100120	 M100121	 M100122
6	**7**	**8**	**9**	**10**
 M100123	 M100124	 M100125	 M100126	 M100127
11	**12**	**13**	**14**	**15**
 M100128	 M100129	 M100130	 M100131	 M100132
16	**17**	**18**	**19**	**20**
 M100133	 M100134	 M100135	 M100136	 M100137

Table 3-1. Standard Hand Signals for Controlling Crane Operations

Item	Description
1	**HOIST**—With forearm vertical, forefinger pointing up, move hand in small horizontal circles.
2	**LOWER**—With arm extended downward, forefinger pointing down, move hand in small horizontal circles.
3	**USE MAIN HOIST**—Tap fist on head. Then use regular signals.
4	**USE WHIPLINE** (Auxiliary Hoist)—Tap elbow with one hand. Then use regular signals.
5	**RAISE BOOM**—Arm extended, fingers closed, thumb pointing upward.
6	**LOWER BOOM**—Arm extended, fingers closed, thumb pointing downward.
7	**MOVE SLOWLY**—Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal (hoist slowly shown as an example).
8	**RAISE BOOM & LOWER LOAD**—With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.
9	**LOWER BOOM & RAISE LOAD**—With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.
10	**SWING**—Arm extended, point with finger in direction of swing of boom.
11	**STOP**—Arm extended, palm down, move arm back and forth horizontally.
12	**EMERGENCY STOP**—Both arms extended, palms down, move arms back and forth horizontally.
13	**TRAVEL**—Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.
14	**DOG EVERYTHING**—Clasp hands in front of body.
15	**TRAVEL** (Both Tracks)—Use both fists in front of body, making a circular motion about each other, indicating direction of travel forward or backward. (For Land Cranes Only).
16	**TRAVEL** (One Track)—Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For Land Cranes Only).
17	**EXTEND BOOM** (Telescoping Booms)—Both fists in front of body with thumbs pointing outward.
18	**RETRACT BOOM** (Telescoping Boom)—Both fists in front of body with thumbs pointing toward each other.
19	**EXTEND BOOM** (Telescoping Boom)—One Hand Signal. One fist in front of chest with thumb tapping chest.
20	**RETRACT BOOM** (Telescoping Boom)—One hand signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.

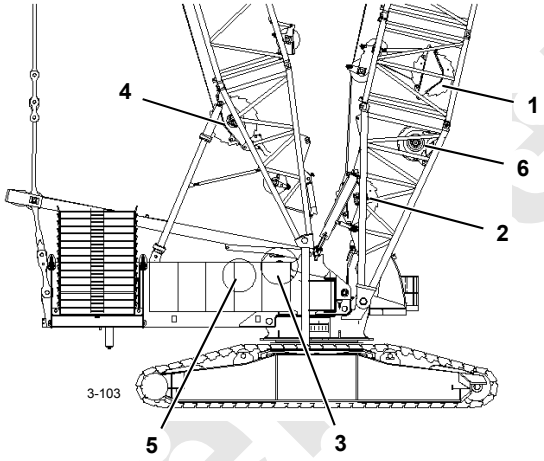




Item	Identification
1	Crane Mode Select/Confirm Switch
2	Drum 4 (Boom Hoist) Park Switch
3	Drum 6 (Luffing Hoist) Park Switch
4	Boom Hoist Control
5	Luffing Hoist and Swing Control
6	Limit Bypass Switch
7	Digital Display
8	Mechanical Boom Angle Indicator
9	Mechanical Level

See Figure 3-2 for drum identification.

FIGURE 3-1



Drum Number	Identification
1	Main Hoist 1 (in boom insert)
2	Main Hoist 2 (in boom butt)
3	Whip Line Hoist
4	Boom Hoist (in mast butt)
5	Mast Hoist
6	Luffing Jib Hoist (in boom butt)

FIGURE 3-2

GENERAL OPERATION

The instructions in this section supplement the operating control instructions in the Crane Operator Manual. This section has two purposes:

- To familiarize *qualified operators* with the location of the controls used for luffing jib operation
- To alert operators to important safety information

WARNING

Prevent death or serious injury to personnel!

Luffing jib attachment must be installed and operated by experienced personnel trained in erection and operation of construction cranes. These personnel shall read, understand, and comply with instructions in this manual, in Crane Operator Manual, and in Luffing Jib Rigging drawings and Capacity Charts.

LUFFING JIB OPERATING CONTROLS

See Figure 3-1 for location of controls

1 – Crane Mode Select/Confirm Switch

See Operating Controls in Section 3 of your Crane Operator Manual for operation of the crane mode switch.

This switch is used to select and confirm the following modes:

- LUFFING JIB mode for normal operation
- LUFFING JIB SETUP mode for crane Serial Number 18001082 and newer. This mode allows the limits listed in Table 3-3 to be bypassed with Limit Bypass Switch (6).
- LJIB STOP mode for extending and retracting the jib stop positioner cylinders during the luffing jib raising and lowering procedures

LUFFING JIB MODE

When the luffing jib mode is selected and confirmed, **LUFFING JIB ON** appears on the display as shown in Figure 3-3. The luffing hoist and boom hoist control handles switch to the locations shown in Figure 3-1.

If equipped with a MAX-ER attachment, the MAX-ER mode must also be selected and confirmed. Once selected and confirmed, the ***M** on the right end of the display indicates that the MAX-ER mode is on (Figure 3-3).

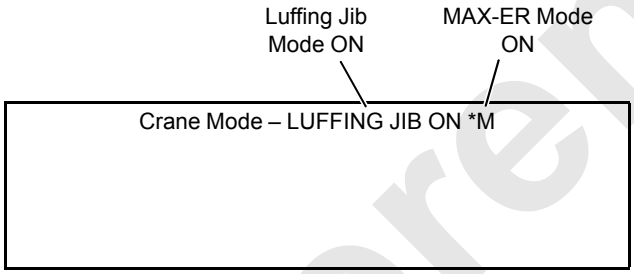


FIGURE 3-3

LUFFING JIB SETUP MODE

When this mode is on, LS appears in the crane mode line of the digital display, as follows:

Crane Mode – LUFFING JIB ON LS

To bypass the limits listed in Table 3-3 for luffing jib setup, proceed as follows:

- Select and confirm luffing jib setup mode.
- Rotate limit bypass switch (6) clockwise and release. The limits will remain bypassed for 10 seconds.
- Move the desired control handle (luffing hoist, boom hoist, load drum) in the required direction. The limits will remain bypassed for as long as the handle is moved in either direction.

The limits will remain bypassed for 10 seconds after the control handle(s) is returned to neutral (off).

LJIB STOP MODE

To operate the #79A jib stop positioner cylinders during luffing jib raising and lowering, proceed as follows:

1. Select proper #79A luffing jib chart in Rated Capacity Indicator/Limiter.
2. Select and confirm luffing jib mode. After confirming this mode, top line of display should read (see Figure 3-4):

   Crane Mode - LUFFING JIB ON

3. To retract jib stop positioner cylinders, select and confirm LJIB STOP mode. After confirming this mode, top line of display should read:

   Crane Mode - LUFFING JIB ON SP

   SP in this line means that jib stop positioner cylinders should be retracting (power applied to solenoid).

4. To extend jib stop positioner cylinders, select and confirm mode LJIB STOP again. After confirming this mode, top line should now read:

   Crane Mode - LUFFING JIB ON

   SP is gone and power is removed from solenoid. Cylinders should extend fully.

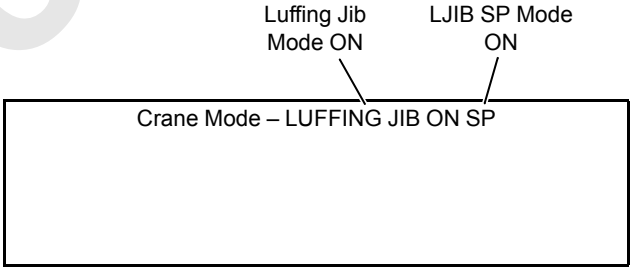


FIGURE 3-4

WARNING

Moving Part Hazard!

If retracted, jib stop positioner cylinders will extend (jib stops rise) when engine is stopped.

2 – Drum 4 (Boom Hoist) Park Switch
3 – Drum 6 (Luffing Hoist) Park Switch
4 – Boom Hoist and Whip Hoist Control
5 – Luffing Hoist and Swing Control

See Operating Controls in Section 3 of Crane Operator Manual for operation of above controls.

THIS PAGE INTENTIONALLY LEFT BLANK

6 – Limit Bypass Switch

This switch bypasses the limits identified in Table 3-2 and Table 3-3.

WARNING

When bypassing a limit, carefully follow instructions under Limit Devices topic in this section.

Insert key. Turn CLOCKWISE and HOLD to BYPASS reached operating limits. This position allows functions to be operated beyond the limits.

RELEASE to ENABLE operating limits. This position allows limits to stop functions in the normal manner. ***Key must be in this position for normal operation. Otherwise, structural damage can occur.***

Remove key to prevent unauthorized operation.

7 – Digital Display

Displays boom angle, luffing jib angle, and boom to luffing jib angle. See Figure 3-5 for identification of each angle:

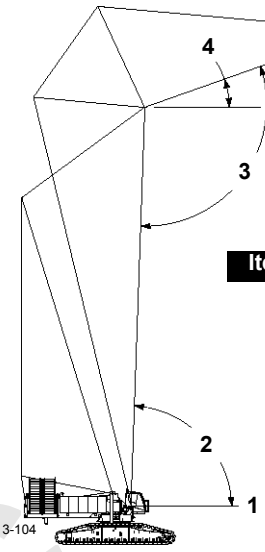
- **Boom Angle** – angle between center line of boom and horizontal. Monitor this angle when raising boom to operating angle.

  Adjust automatic boom stop to proper angle when operating with luffing jib. See Automatic Boom Stop in Section 6 of this manual for the boom stop angles and for the adjustment procedure.

- **Luffing Jib Angle** – angle between center line of jib and horizontal. Monitor this angle when raising and lowering jib during operation.

- **Boom to Luffing Jib Angle** – angle between center line of boom and center line of jib. Monitor this angle when raising boom and jib from ground and lowering boom and jib to ground.

The digital display also displays system faults and operating limits for the luffing hoist and all other crane functions. See Digital Display Readings in the Crane Operator Manual for a complete list of operating conditions, system faults, and operating limits.



Item	Description
1	Horizontal
2	Boom Angle
3	Boom to Luffing Jib Angle
4	Luffing Jib Angle

FIGURE 3-5

8 – Mechanical Boom Angle Indicator

Shows the angle of the boom in degrees above horizontal. The boom and luffing jib angles can also be viewed in display screen.

9 – Mechanical Level

Indicates crane levelness from front to rear and from side to side. Crane levelness can also be viewed in display screen.

Table 3-2 Bypassable Limit Identification — Prior to Crane Serial Number 18001082

Limit	Limit Bypass Switch (D5) (momentary key switch)	
	Non-CE [1]	**CE** [1]
PAST PRODUTION WITH QUADRANT STYLE JIB STOP		
MAX UP 1 (Boom)	Yes or No[1]	No
BLOCK UP (each drum)	Yes	Yes
MIN BAIL (each drum)	Yes	Yes
LOAD MOMENT (RCL/RCI)	Yes	Yes
MAX UP 1 (Luffing Jib)	Yes	Yes
MAX UP 2 (Luffing Jib) [3]	Yes	Yes
MAX DOWN	No	No
CURRENT PRODUTION WITHOUT QUADRANT STYLE JIB STOP		
MAX UP 1 (Boom)	Yes or No [2]	No
BLOCK UP (each drum)	Yes	Yes
MIN BAIL (each drum)	Yes	Yes
LOAD MOMENT (RCL/RCI)	Yes	Yes
MAX UP 1 (Luffing Jib)	Yes	Yes
MAX UP 2 (Luffing Jib)[3]	Yes	Yes
MAX DOWN 1 (Luffing Jib)	Yes	Yes
MAX DOWN 2 (Luffing Jib)	No	No

[1] CE = Cranes that comply with European requirements

[2] The boom up limit cannot be bypassed on current production cranes. To determine if the boom up limit can be bypassed on your crane, perform the test given on page 3-10.

[3] Only when boom is below 50°

Table 3-3 Bypassable Limit Identification — Crane Serial Number 18001082 and Newer

Limit	Limit Bypass Switch (D5) (momentary key switch)		Limit Bypass Switch (D5) (momentary key switch) Luffing Jib Setup Mode On [1]		External Override Switch [2]
	Non-CE [3]	**CE** [3]	**Non-CE** [3]	**CE** [3]	**CE** [3]
MAX UP 1 (Boom)	No	No	No	No	No
BLOCK UP (each drum)	Yes	Yes	Yes	Yes	No
MIN BAIL (each drum)	Yes	Yes	No	No	No
LOAD MOMENT (RCL/RCI)	Yes	Yes [4]	No	No	Yes [5]
MAX UP 1 (Luffing Jib)	Yes	No	Yes	Yes	No
MAX UP 2 (Luffing Jib)	Yes [6]	No	Yes [6]	Yes [6]	No
MAX DOWN 1 (Luffing Jib)	Yes	No	Yes	Yes	No
MAX DOWN 2 (Luffing Jib)	Yes	No	Yes	No	No
MAST TOO FAR FORWARD	Yes	Yes	No	No	No

[1] Use only for rigging

[2] See Rated Capacity Indicator/Limiter Operation Manual.

[3] CE = Cranes that comply with 2010 European requirements

[4] Only while operating between 100% and 110% rated capacity. The speed of the crane functions is limited to 15% of their maximum speed for movements that increase load.

[5] The speed of the crane functions is limited to 15% of their maximum speed for movements that increase load.

[6] Only when boom is below 50°

LUFFING JIB LIMITS

Boom Up Limit

Automatically stops the boom when it is raised to the preset maximum angle shown in Table 3-4.

Table 3-4

Max. Boom Angle	Attachment
83° [1]	#55-79A, #55, or 55A Boom without Luffing Jib
OR	
84° [2]	#55-79A, #55, or 55A Boom without Luffing Jib
When boom up limit ***can be bypassed.*** *	
85°	#44 or #79A Luffing Jib on 140-180 ft (42,7-54,9 m) of Boom
87°	#44 or #79A Luffing Jib on 200-340 ft (61,0 –103,6 m) of Boom
When boom up limit ***cannot be bypassed.*** *	
86°	#44 or #79A Luffing Jib on 140-180 ft (42,7-54,9 m) of Boom
88°	#44 or #79A Luffing Jib on 200-340 ft (61,0 -103,6 m) of Boom

* To determine if the boom up limit on your crane can be bypassed or not, perform Bypass Limit Test given below.

[1] Past cranes with 4-3/4 in (121 mm) long adjusting rod.

[2] Current cranes with 4-1/2 in (114 mm) long adjusting rod.

The boom can be lowered after the limit is contacted.

WARNING

Falling Boom/Jib Hazard!

If you bypass boom up limit for any reason, DO NOT allow physical boom stops to bottom out. Boom butt could be damaged, causing boom and jib to fall over backwards.

Crush Hazard!

Maintain constant communication between operator and assistant during the following steps.

Stay clear of moving parts.

LIMIT BYPASS TEST: Perform the following test to determine if the boom up limit on your crane can be bypassed or not:

1. Lower the boom onto blocking at ground level.
2. Have an assistant push the boom stop rod in to trip the boom up limit switch open (see Section 4 of Service Manual supplied with crane).
3. Rotate limit bypass key (D5) to the bypass position and hold.
4. Try to boom up SLOWLY — do not raise the boom any higher than necessary to perform the test:
   a. If the boom rises, your boom up limit can be bypassed.
   b. If the boom does not rise, your boom up limit cannot be bypassed.
5. The test is complete: release the limit bypass key and the boom stop rod to the normal operating positions.

Block Up Limit

Automatically stops the boom or luffing jib hoist from lowering and the load drums from hoisting if the load contacts a block-up limit switch.

The load on the corresponding drum can be lowered and the boom or luffing jib hoist can be raised after a block-up limit switch is contacted.

The appropriate limit bypass switch must be turned to the bypass position before a load can be hoisted above the limit.

WARNING

Two-Blocking Hazard!

If it is necessary to hoist a load above block-up limit, do so slowly with extreme caution to prevent two-blocking.

Do not hoist load above minimum block clearance given in Range Diagram (see Capacity Chart Manual).

Do not use limit bypass switch to lower boom or luffing jib hoist after block-up limit is contacted; two-blocking could occur, causing load to fall.

Luffing Jib Up Limits

Two luffing jib up limits are provided:

- **MAX UP 1** (past and current maximum working angle): automatically stops the luffing hoist when the boom to luffing jib angle is 168°. This is a programmed limit controlled by angle sensors on the boom and jib.

  The limit bypass switch must be turned to the bypass position to allow the jib to be raised to MAX UP 2 limit.

- **MAX UP 2** (past maximum angle): automatically stops the luffing hoist when the boom to luffing jib angle is 169.2°. This limit is controlled by a limit switch.

- **MAX UP 2** (current maximum angle): automatically stops the luffing hoist when the boom to luffing jib angle is to 169 to 170.5°. This limit is controlled by a limit switch.

  The MAX UP 2 limit (past or current) can be bypassed with the limit bypass switch only when the attachment is lowered to ground (boom below 50°).

The luffing jib can be lowered after either limit is contacted.

NOTE: For Crane Serial Number 18001082 and newer meeting 2010 European Requirements, the luffing jib cannot be lowered after the MAX UP 2 limit is contacted until the limit switch is reset. When the limit is contacted, the screen shown in Figure 3-6 will appear on the digital display.

Once the screen appears, confirm it to reset the limit switch. The luffing jib can then be lowered.

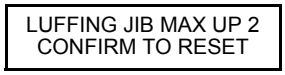


FIGURE 3-6

WARNING

Falling Boom/Jib Hazard!

Proceed slowly when operating the luffing jib above the MAX UP 1 limit.

Do not raise luffing jib above MAX UP 2 limit. Structural damage will occur, possibly causing boom and luffing jib to be pulled over backwards.

Luffing Jib Down Limits

One or two luffing jib down limits stops are provided:

- **MAX DOWN** (past production): automatically stops the luffing hoist when the boom to luffing jib angle is 70°.This limit is controlled by a limit switch and cannot be bypassed.
- **MAX DOWN 1** (current production minimum working angle): automatically stops the luffing hoist when the boom to luffing jib angle is 70°. This is a programmed limit controlled by angle sensors on the boom and jib.

  The limit bypass switch must be turned to the bypass position to allow the jib to be lowered to MAX DOWN 2 limit.
- **MAX DOWN 2** (current production): automatically stops the luffing hoist when the boom to luffing jib angle is 69 to 66°. This limit is controlled by a limit switch.

Refer to Table 3-2 or Table 3-3 to determine if this limit can be bypassed.

The luffing jib can be raised after the limit is contacted.

NOTE: For Crane Serial Number 18001082 and newer meeting 2010 European Requirements, the luffing jib cannot be raised after MAX DOWN 2 limit is contacted until the limit switch is reset. When the limit is contacted, the screen shown in Figure 3-7 will appear on the digital display.

Once the screen appears, confirm it to reset the limit switch. The luffing jib can then be raised.

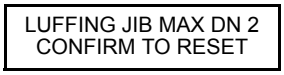


FIGURE 3-7

WARNING

Falling Boom/Jib Hazard!

Do not lower luffing jib below minimum angle given in Luffing Jib Raising Procedure in Capacity Chart Manual. Structural damage can result, possibly causing boom and luffing jib to collapse.

OPERATING PRECAUTIONS

1. Read and comply with instructions in Liftcrane Luffing Jib Capacity Charts provided with luffing jib attachment. Do not operate beyond limits given in capacity charts.

   Make sure proper counterweight is installed on crane and MAX-ER (if equipped).

2. Read and comply with instructions in this manual and in Crane Operator Manual.

3. Read and comply with Maximum Allowable Travel Specifications in Luffing Jib Capacity Chart Manual.

4. Make sure luffing jib attachment is installed properly. Read and comply with instructions in Section 4 of this manual.

5. Do not operate crane, to include raising boom and luffing jib from ground level, if wind exceeds limits given in Capacity Charts. Contact your local weather station for wind velocity.

6. Before raising boom and jib, verify that pressure in jib stop positioner hydraulic system (Figure 3-8) is at proper setting. For detailed instructions, see Section 4 in this manual.

P2143

FIGURE 3-8

7. Before raising boom and jib, verify that pressure in main strut stop cylinders (Figure 3-9) is at the proper setting. For detailed instructions, see Section 4 of this manual. If pressure is not within specified range, contact Manitowoc Service Department for assistance.

P2148

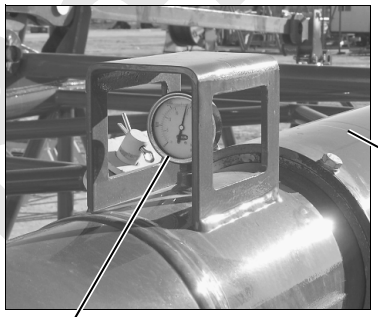


FIGURE 3-9

8. Make sure all safety devices — block-up limits, boom and jib angle indicators, boom and jib stops, rated capacity indicator/limiter — are installed and operating properly. See Section 6 in this manual and The Rated Capacity indicator/Limiter Manual.

   Make sure proper luffing jib capacity chart is selected to turn on luffing jib mode.

9. Raise and lower attachment as instructed in Section 4 of this manual.

10. Perform all operations with crane on a firm, level, uniformly supporting surface. Crane must be level to within 1 ft (0,3 m) in 100 ft (30,5 m).

11. Operate all crane functions slowly and smoothly. Avoid sudden starts and stops which could side load or shock load attachment.

WIND CONDITIONS

WARNING

Tipping Crane Hazard!

Judgment and experience of qualified operators, job planners, and supervisors must be used to compensate for affect of wind on lifted load and boom by reducing ratings or operating speeds, or a combination of both.

Failing to observe this precaution can cause crane to tip or boom and/or jib to collapse. Death or serious injury to personnel can result.

Wind adversely affects lifting capacity and stability. The result could be loss of control over the load and crane, even if the load is within the crane's capacity.

Wind speed (to include wind gusts) must be monitored by job planners and supervisors.

Wind speed at the boom or jib point can be greater than wind speed at ground level. Also be aware that the larger the sail area of the load, the greater the wind's affect on the load.

As a general rule, ratings and operating speeds must be reduced when:

Wind causes load to swing forward past allowable operating radius or sideways past either boom hinge pin.

For wind conditions specific to this crane and its attachments, see the Wind Conditions publication at the end of this section or, if applicable, in the Capacity Charts provided with this crane and its attachments.

SECTION 4
SET-UP AND INSTALLATION

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 4
SETUP AND INSTALLATION

WARNING

Avoid Death or Serious injury!

Read and understand instructions in this section before attempting to install or remove attachment.

Moving Parts/Pinch Points!

Avoid death or crushing injury during crane assembly and disassembly:

- Assembly personnel – take every precaution to prevent injury when working near moving parts.
- Maintain communication between operator and assemblers to avoid accidents.

KEEP UNAUTHORIZED PERSONNEL WELL CLEAR OF CRANE.

Falling Load Hazard!

To prevent lifting equipment from failing and load from dropping, crane owner/user shall verify the following prior to each lift:

- All lifting equipment (shackles, hooks, slings, blocks) has been properly maintained and is safe for use.
- All lifting equipment has a capacity equal to or greater than load to be lifted.

GENERAL SETUP AND INSTALLATION

This section contains installation and removal instructions for the luffing jib attachments available for the Model 18000: #44 and #79A.

For the remainder of this section, luffing jib attachment is referred to as *jib or attachment*.

The instructions in this section assume that the crane, required length of boom and mast, and MAX-ER attachment (if required) are already installed and ready for luffing jib installation.

***For #44 Jib**, the crane must be rigged as follows:*

- #55-79A boom
- 100 ft (30,5 m) mast
- No MAX-ER attachment

***For #79A Jib**, the crane must be rigged as follows:*

- #55 or 55A boom
- 100 ft (30,5 m) mast without MAX-ER attachment
- 140 ft (42,7 m) mast with MAX-ER attachment

The attachment must be installed, operated, and removed by experienced personnel trained in the operation and erection of construction cranes. These personnel shall read, understand, and comply with the instructions in this section, in the Luffing Jib Rigging Drawing, and in the Liftcrane Luffing Jib Capacity Charts provided with the attachment.

Contact your Manitowoc dealer for a detailed explanation of any procedure not fully understood.

The installation/removal area must be firm, level, and free of ground and overhead obstructions.

Level = 1% of grade or 1 ft (0,03 m) in 100 ft (30,5 m).

The area selected must be large enough to accommodate the crane, selected boom and jib length, and movement of an assist crane.

For #44 Jib:

- The maximum combined boom and jib length is 520 ft (158,5 m).
- The minimum boom length for use with the jib is 140 ft (42,7 m). See the capacity chart for boom and jib length limitations.

For #79A Jib:

- The maximum combined boom and jib length is 650 ft (198,1 m).
- The minimum boom length for use with the jib is 160 ft (48,8 m). See the capacity chart for boom and jib length limitations.

To allow movement of aerial work platforms and an assist crane, there must be a minimum of 35 ft (10,7 m) clearance on both sides of the boom and jib.

CRANE ORIENTATION

The terms RIGHT, LEFT, FRONT, REAR used in this section refer to the operator's right, left, front, and rear sides when seated in the operator's cab looking forward with the crawler motors to the rear.

ACCESSING PARTS

Some parts of the crane, boom, and jib cannot be reached from the ground. Take necessary precautions to prevent falling off the crane, boom, or jib during assembly and disassembly. ***Falling from any elevation could result in serious injury or death.***

Owner/user shall provide approved ladders or aerial work platforms so workers can safely access those areas of crane, boom, and jib that cannot be reached from ground.

Adhere to local, state, and federal regulations for handling personnel and for personnel fall protection.

Do not use top of boom or jib as walkways.

Optional boom ladders (stored in boom butt) are available from Manitowoc. If your crane has ladders, see Section 3 in Operator Manual provided with crane.

CRANE WEIGHTS

See Crane Weights in Section 1 of this manual for the weights of the individual boom and jib components.

OPERATING CONTROLS

Become thoroughly familiar with the location and function of all operating controls provided for the crane and attachment. Read and understand the instructions in Section 3 of this manual.

COUNTERWEIGHT REQUIREMENT

See applicable Luffing Jib Capacity Charts and Raising Procedure Charts for counterweight requirements when operating with jib.

WARNING

Tipping Hazard!

Prevent crane from tipping. Do not operate crane until proper counterweight is installed.

BLOCKED CRAWLERS

To prevent crane from tipping or structural damage to attachment, ***all boom and jib combinations must be raised and lowered over blocked crawlers***. See Luffing Jib Capacity Charts and Raising Procedure Charts for blocked crawler requirements. Also see Crawler Blocking Diagram in Luffing Jib Capacity Chart Manual for instructions.

DANGER

Tipping Hazard!

Prevent crane from tipping or structural damage to attachment. Do not attempt to raise or lower boom and jib from or to ground until crawlers are blocked.

RIGGING DRAWINGS

See the end of this section for applicable jib rigging drawings.

The boom and jib components (butts, inserts, tops, pendants, straps) must be assembled in proper sequence according to the rigging drawings.

Two tables are provided on the luffing jib rigging drawing: one table lists the boom sections and backstay pendants required for various boom lengths. The other table lists the boom sections required for various jib lengths. *Make sure proper table is referred to.* Read and comply with insert and pendant notes on the rigging drawing.

LUFFING JIB RAISING PROCEDURE

See the Luffing Jib Capacity Chart Manual for applicable luffing jib raising and lowering procedures.

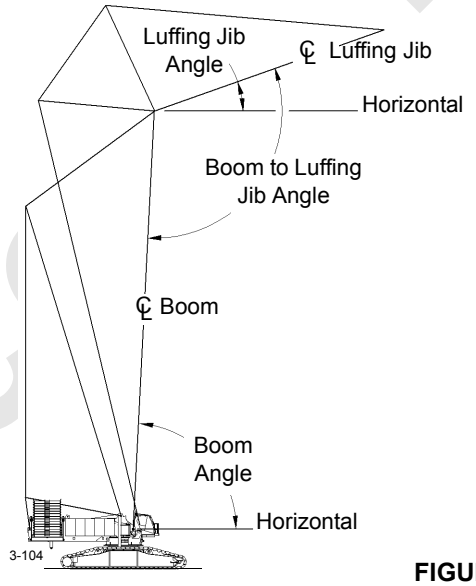


FIGURE 4-1

IDENTIFYING JIB COMPONENTS

Jib sections are marked for proper identification as shown in Figure 4-5, View A (all four chords of each boom or jib section).

Straps and connecting links are marked for proper identification as shown in Figure 4-5, View B.

Pendants (when used) are marked for proper identification as shown in Figure 4-5, View C.

HANDLING COMPONENTS

Handle boom and jib components with care to avoid damaging lacings and chords. *Lift against chords only, never against lacings.*

Nylon slings should be used to handle components. If wire rope or chain slings are used, protective covering (such as sections of rubber tire) must be used between the slings and the component.

CAUTION

Lacing Damage!

- Ensure straps for boom inserts and top remain pinned and secured in the shipping position during handling and transportation unloading, Figure 4-2.

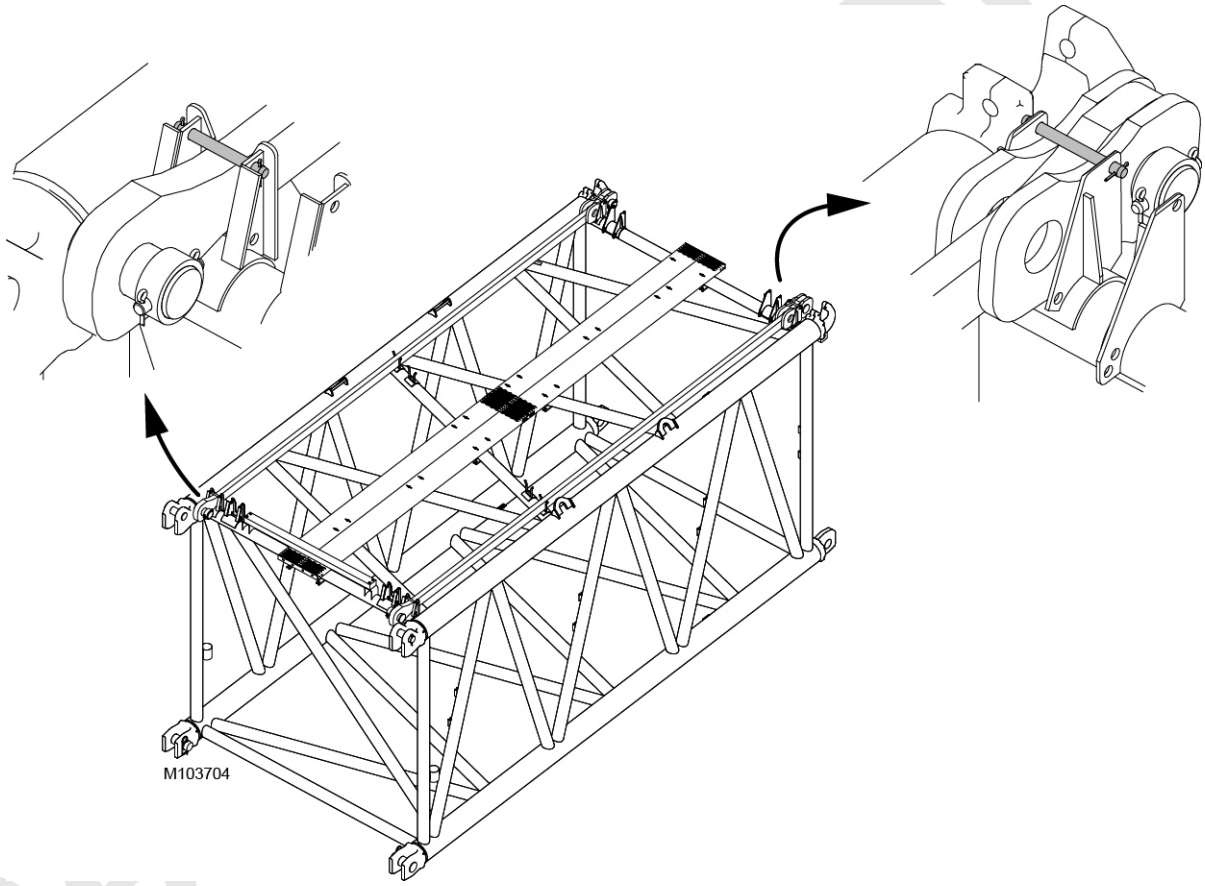


FIGURE 4-2

RETAINING CONNECTING PINS

Connecting pins are retained in various ways:

- Snap pins
- Quick-release pins
- Cotter pins
- Keeper plates with cap screws and lock washers

Do not operate crane until all connecting pins are installed and properly retained.

SHIPPING CRANE COMPONENTS

It is the owner/user's responsibility to ensure the following:

- All trailer loads comply with local, state, and federal transportation requirements.
- ***All crane components are properly blocked and secured so they cannot shift or fall off trailers.***
- To avoid damage to components:

  Use nylon tie-downs to secure components as shown in Figure 4-3, View A.

  If chain tie-downs are used, install protective covering (sections of rubber tire) between chain and component being secured as shown in Figure 4-3, View B.

  When securing boom sections, wrap tie-downs over chords — never over lacings. Keep tie-downs as close to blocking as possible (View A) to prevent bending of chords.

View A

View B

FIGURE 4-3

REMOVABLE LACINGS – #44 JIB

The 20 ft (6,1 m) and standard 40 ft (12,2 m) #44 inserts have removable diagonal lacings. These lacings may be removed to allow for storage of other components during shipping.

If removed, ***removable diagonal lacings must be reinstalled before operating crane***.

1. Thoroughly clean all dirt from mating surfaces between lacings and supports on inserts.
2. Reinstall proper number of removable lacings in each insert with bolts and stop nuts as shown in Figure 4-5.
3. Securely tighten nuts.

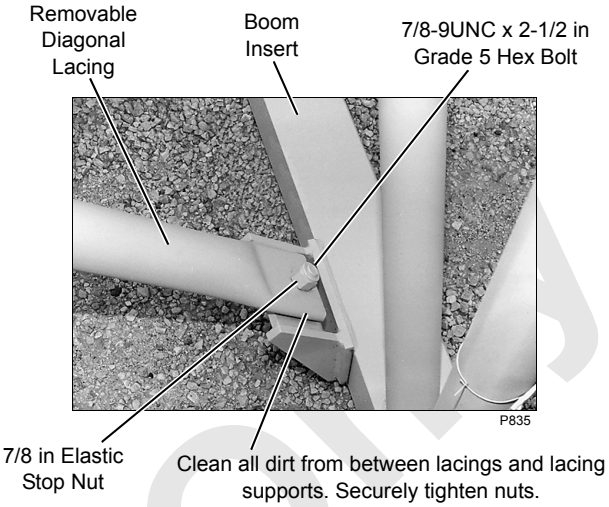


FIGURE 4-4

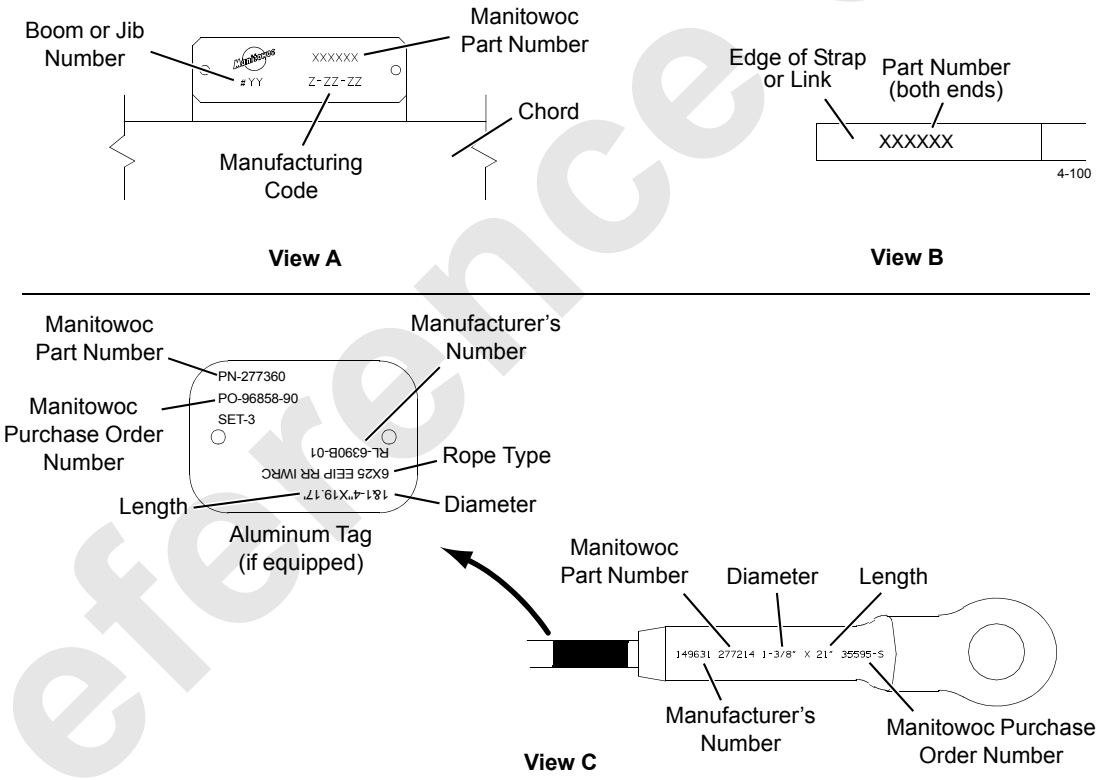


FIGURE 4-5

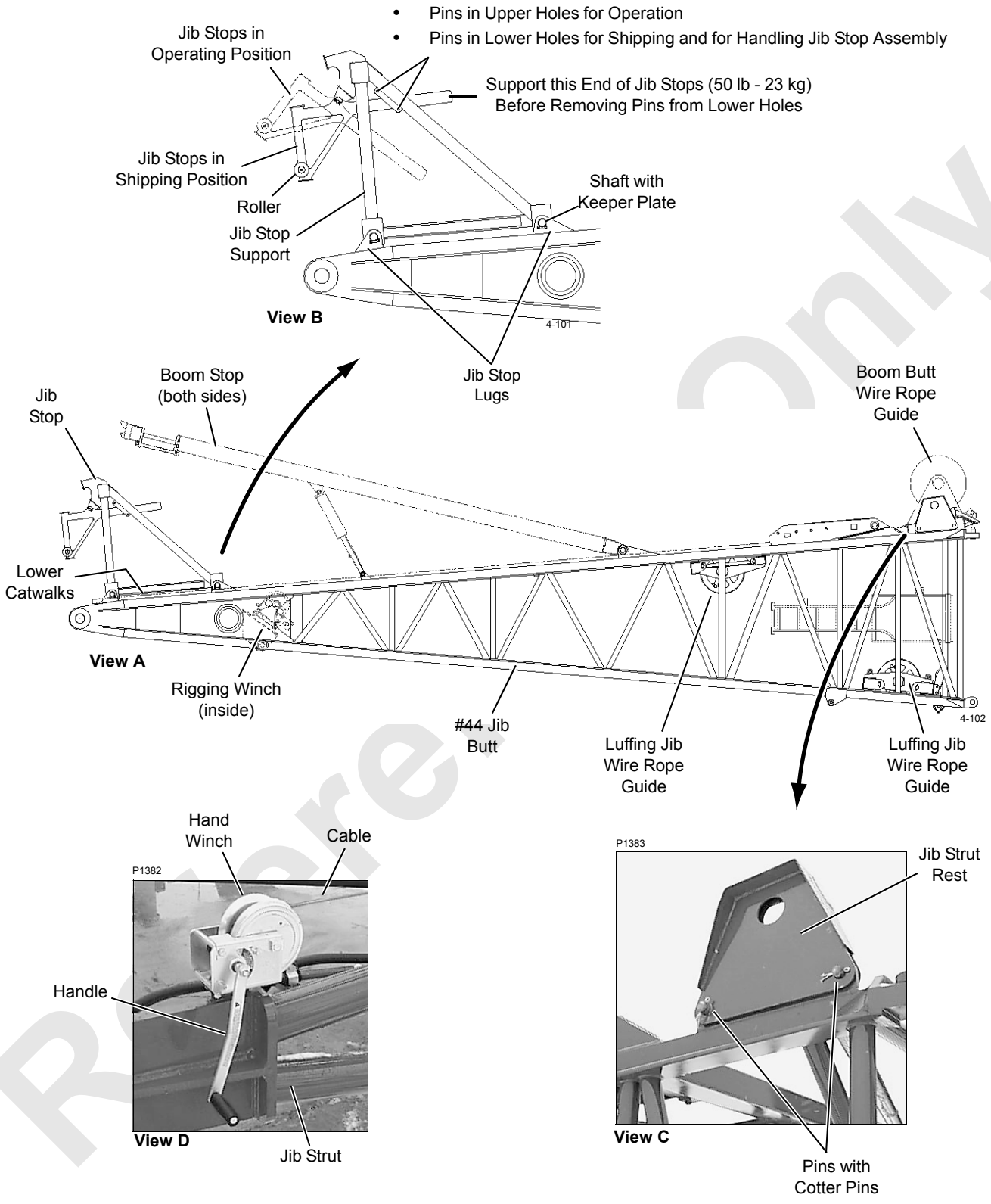

• Pins in Upper Holes for Operation
• Pins in Lower Holes for Shipping and for Handling Jib Stop Assembly
Jib Stops in Operating Position
Support this End of Jib Stops (50 lb - 23 kg) Before Removing Pins from Lower Holes
Jib Stops in Shipping Position
Roller
Jib Stop Support
Shaft with Keeper Plate
View B
4-101
Jib Stop Lugs
Jib Stop
Boom Stop (both sides)
Boom Butt Wire Rope Guide
Lower Catwalks
View A
Rigging Winch (inside)
#44 Jib Butt
Luffing Jib Wire Rope Guide
Luffing Jib Wire Rope Guide
4-102
Hand Winch
Cable
P1382
Handle
View D
Jib Strut
P1383
Jib Strut Rest
View C
Pins with Cotter Pins

FIGURE 4-6

LUFFING JIB RIGGING GUIDE – #44

General

The following installation, raising, lowering, and removal instructions apply to the #44 luffing jib mounted on a #55-79A.

Assist Crane Requirements

Either the Model 18000 or an assist crane can be used to install and remove the jib. If the Model 18000 is used, it must be in the setup configuration (same as when installing counterweights and crawler or assembling boom) – see Crane Assembly in Crane Operator Manual for detailed instructions and capacity limitations.

The jib butt, jib strut, and main strut are shipped from Manitowoc as an assembled unit. The assembly weighs approximately 23,250 lb (10 500 kg) and is the heaviest load to be lifted. ***Size assist crane accordingly.***

Instructions in this section assume an assist crane will be used.

To allow for the set-up of an assist crane, there should be a minimum of 35 ft (10,7 m) clearance on one side of the boom.

Installing #44 Luffing Jib

Lower Boom

1. If specified in raising procedure chart, travel front crawler rollers onto blocking.
2. Swing upperworks slightly to either side and lower load block and weight ball onto ground.
3. Swing boom in-line with crawlers and lower boom point onto blocking approximately 54 in (1,4 m) high as shown in Figure 4-6, View A. This will allow you to assemble jib on blocking approximately 6 in (152 mm) high.

Prepare Boom and Jib

1. Remove load block from boom point.
2. Remove upper boom point, if equipped.
3. Change boom length as necessary to meet job requirements.

   Note that 40 ft (12,2 m) insert with luffing hoist guide sheaves must be installed next to 10 ft (3,1 m) insert which is next to boom butt.
4. Check that all boom inserts and straps are assembled in proper sequence according to rigging drawing.

WARNING

Tipping Hazard!

Crane can tip if step 5 is not performed when required.

5. If specified in raising procedure chart, remove the following items:
   - Lower boom point from #79A boom top
   - Rigging winch and luffing jib wire rope guides from #44 butt
6. Add or remove crane counterweight to comply with applicable capacity chart.
7. Remove boom stops, lower catwalk, and wire rope guide from #44 butt.
8. Modify #44 butt for use as jib butt as shown on modification drawings.
9. Attach jib stop assembly to lugs on jib butt with shafts and keepers plates (Figure 4-6, View B).
   a. Support jib stops at point shown (50 lb - 23 kg).
   b. Remove pins from lower holes and install them in upper holes (operating position).
   c. Lower jib stops to operating position.
10. Pin jib strut rest to lugs on jib butt (Figure 4-6, View C).
11. Attach hand winches to jib strut if necessary (Figure 4-6, View D).
    a. If necessary, install cables and attach to adjustable straps.
    b. Install handles if removed for shipping.

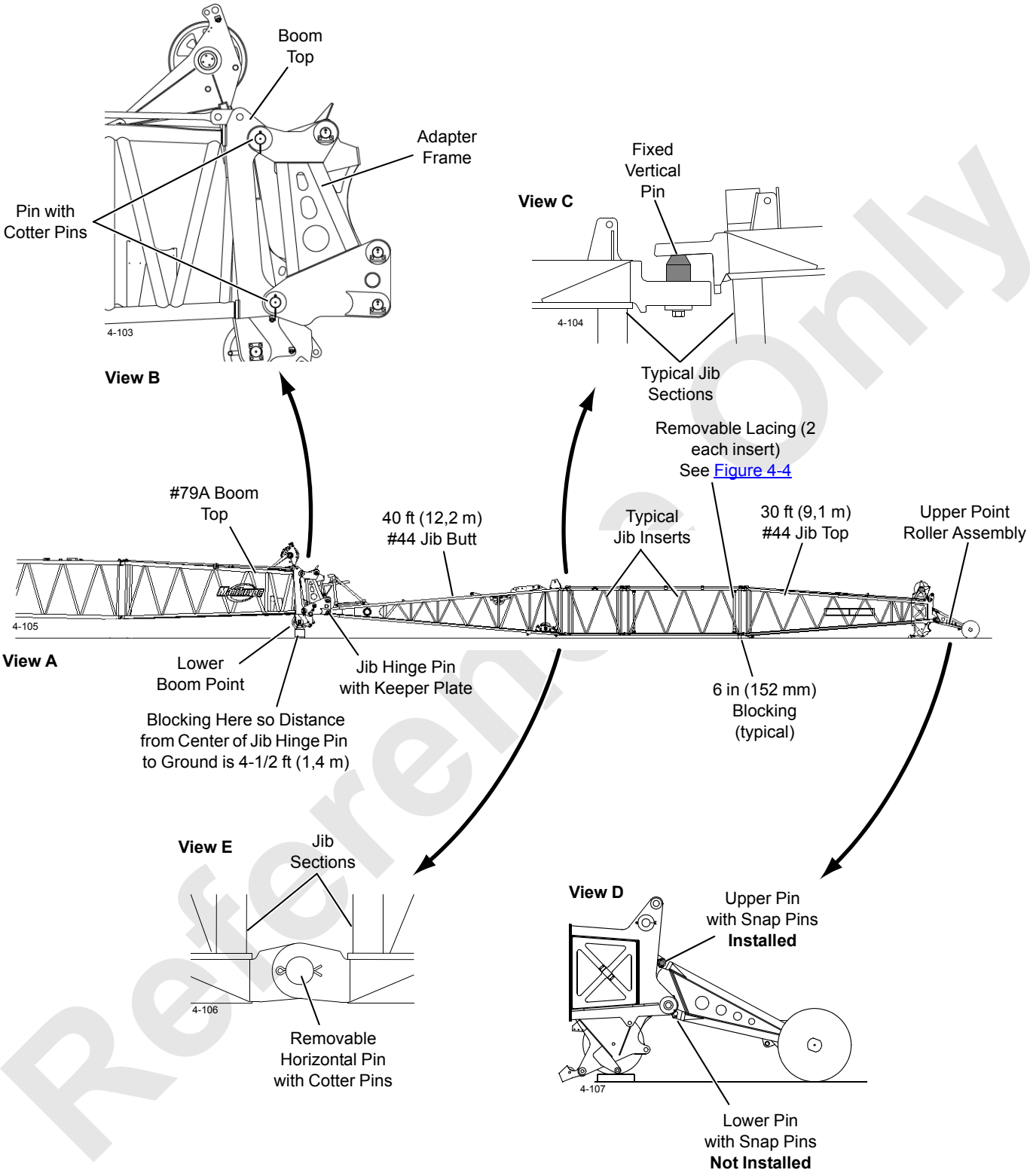


FIGURE 4-7

Install Jib Butt

See Figure 4-7 for the following procedure.

1. Lift jib butt adapter frame into position at end of boom top and pin to boom top lugs (View B).
2. Lift jib butt into position at end of boom top (View A).

   Pin jib butt to lugs on boom top with hinge pins. *Install washers as pins are inserted to reduce jib butt side play to 1/8 in (3 mm).*
3. Lower jib butt onto blocking approximately 6 in (152 mm) high.

Install Jib Inserts and Top

See Figure 4-7 for the following procedure.

1. Determine jib length required for lift to be made.

WARNING

Collapsing Jib Hazard!

Install removable lacings, if removed, before raising jib.

2. Check that removable diagonal lacings are securely fastened to each jib insert (see Removable Lacings – #44 Jib topic and Figure 4-5).
3. Assemble jib inserts *in proper sequence — shortest inserts nearest butt* (see Luffing Jib Assembly Rigging drawing):
   a. Lift insert into position and engage top connector holes in insert with fixed vertical pins in butt as shown in View C.
   b. Lower insert until bottom connector holes are aligned and install removable horizontal pins as shown in View E.
   c. Install blocking approximately 6 in (152 mm) high under top end of insert.
   d. Repeat steps 3a – 3c until all inserts and jib top have been installed.
4. Lift upper point roller assembly into position at end of boom top. Pin top connecting holes in upper point to boom top (View D).

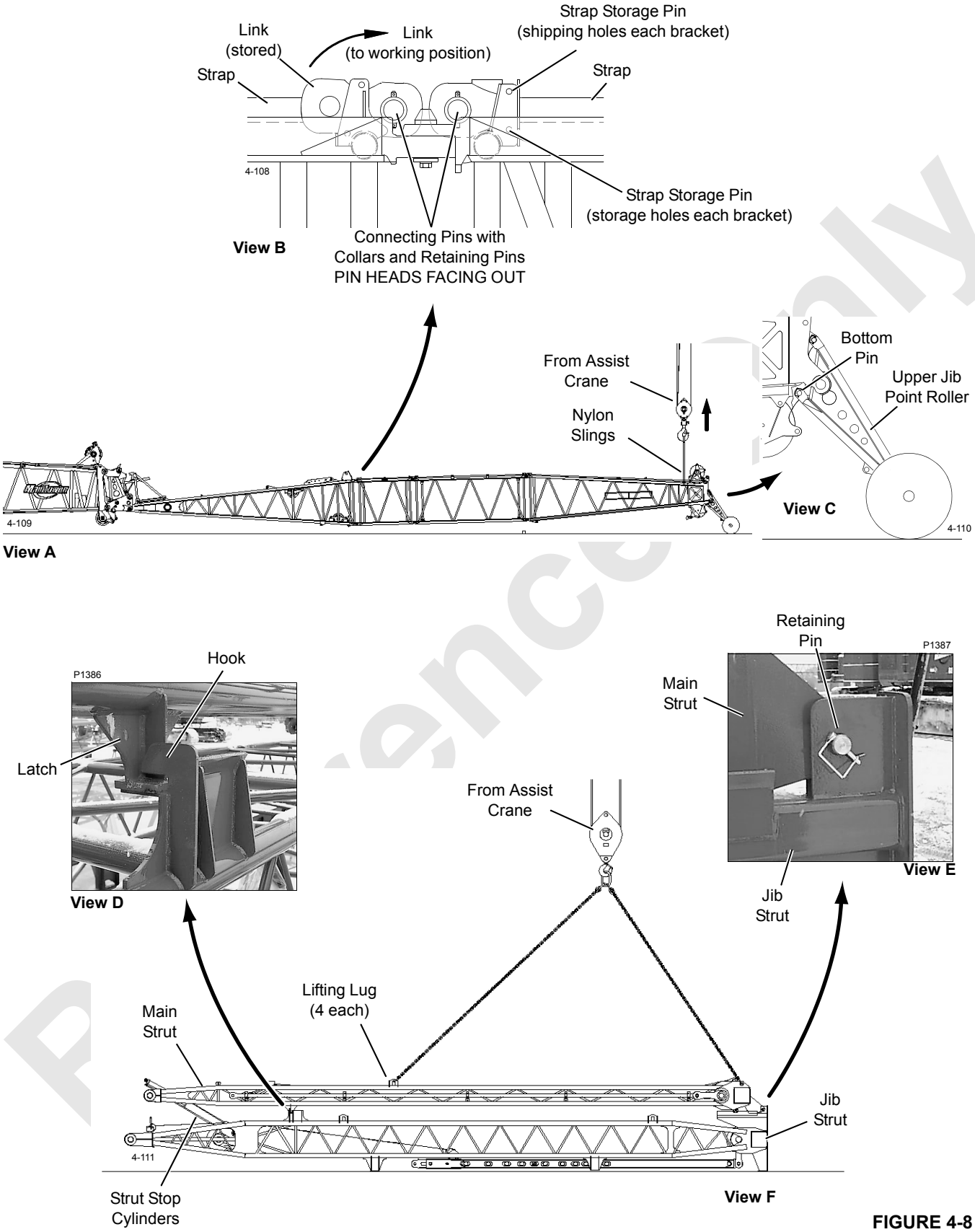

Link
(stored)
Link
(to working position)
Strap Storage Pin
(shipping holes each bracket)
Strap
Strap
4-108
Strap Storage Pin
(storage holes each bracket)
View B
Connecting Pins with
Collars and Retaining Pins
PIN HEADS FACING OUT
From Assist
Crane
Nylon
Slings
Bottom
Pin
Upper Jib
Point Roller
4-109
View C
4-110
View A
Hook
P1386
Latch
View D
Retaining
Pin
P1387
Main
Strut
View E
From Assist
Crane
Jib
Strut
Lifting Lug
(4 each)
Main
Strut
Jib
Strut
4-111
Strut Stop
Cylinders
View F

FIGURE 4-8

Complete Upper Jib Point Roller Installation

See Figure 4-8 for the following procedure.

1. Attach nylon slings from assist crane to top chords at top end of jib top (View A).

NOTE: Assist crane must have sufficient capacity to lift weight of assembled jib.

2. Slowly lift jib top until bottom holes in upper jib point roller are aligned with holes in jib top.
3. Insert bottom pins to connect upper jib point roller to jib top (View C).
4. Lower jib top until rollers are on ground.
5. Disconnect slings from jib top.

Connect Jib Straps

See Figure 4-8, View B for the following procedure.

Jib straps and links are stored on the inserts and jib top for shipping.

1. Remove strap storage pins from shipping holes and install in storage holes.
2. Remove retaining pins, collars, and connecting pins from end of straps on adjacent insert.
3. Rotate links from storage position to working position.
4. Install connecting pins, collars, and retaining pins to connect links to adjacent straps so the PIN HEADS FACE OUT.
5. Repeat steps at end of each insert.

Install Struts

See Figure 4-8 for the following procedure.

1. The main strut, jib strut, and adjustable straps can be shipped as an assembled unit to reduce shipping space. If struts are assembled, proceed as follows:
   a. Connect chain slings from assist crane to four lifting lugs on main strut (View F).
   b. Lift strut assembly off transport trailer and place assembly on ground.
   c. Remove retaining pins connecting main strut to jib strut (View E). Store pins in jib strut holes once main strut is removed.

      If necessary, lift main strut slightly to loosen pins.
   d. Lift main strut slightly so that it just lifts off jib strut at hook and latch (View D).
   e. Swing, boom, and hoist assist crane as required to disengage latch on main strut from hook on jib strut.

      Use care not to hit strut stop cylinders with main strut.
   f. Place main strut on blocking and disconnect slings.

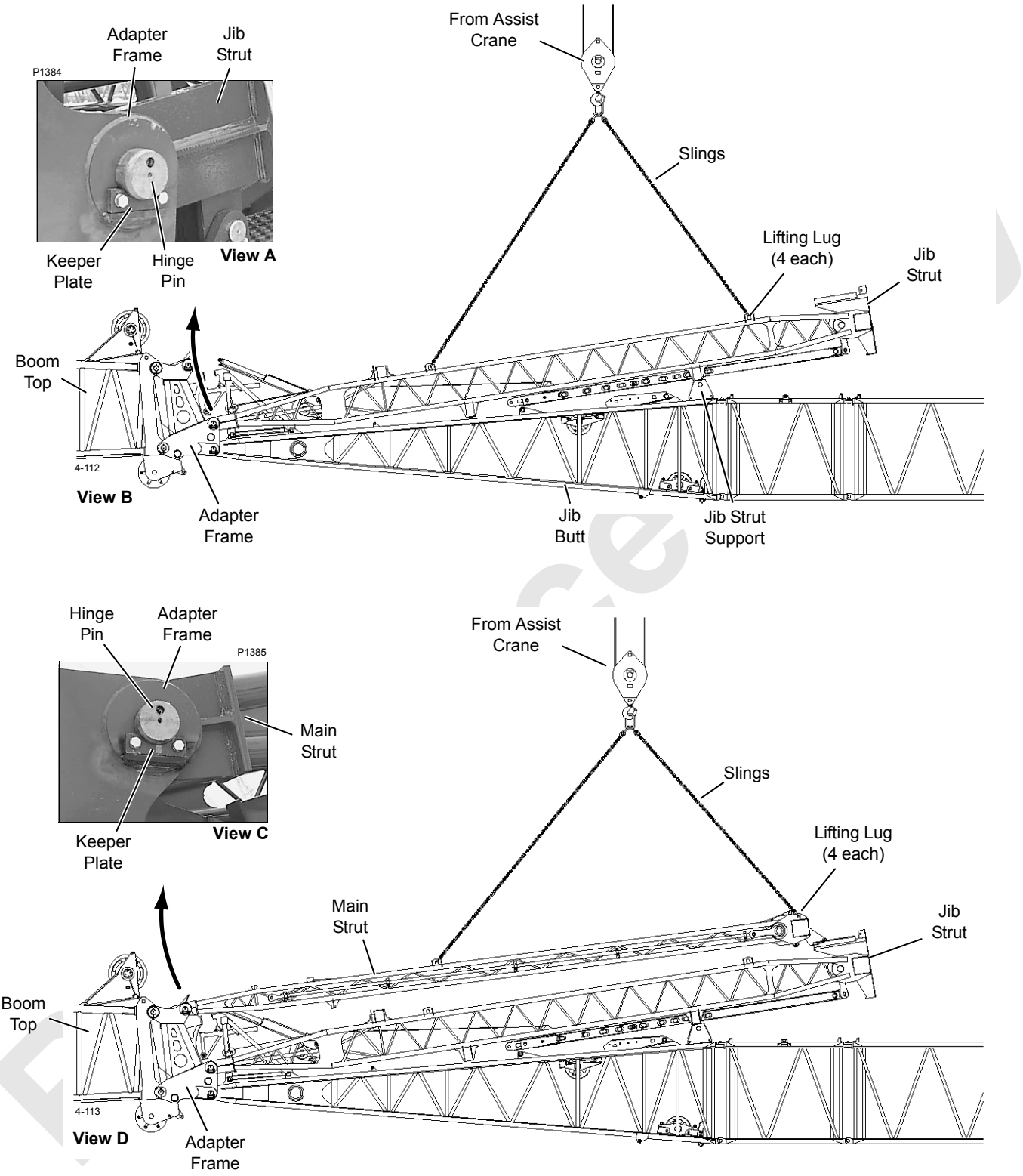

Adapter Frame
Jib Strut
P1384
Keeper Plate
Hinge Pin
View A
From Assist Crane
Slings
Lifting Lug (4 each)
Jib Strut
Boom Top
4-112
View B
Adapter Frame
Jib Butt
Jib Strut Support
Hinge Pin
Adapter Frame
P1385
Main Strut
Keeper Plate
View C
From Assist Crane
Slings
Lifting Lug (4 each)
Main Strut
Jib Strut
Boom Top
4-113
View D
Adapter Frame

FIGURE 4-9

See Figure 4-9 for the following procedure.

2. Install jib strut as follows:
   a. Connect chain slings from assist crane to four lifting lugs on main strut (View B).

      Adjust length of rear chain slings so rear end of strut hangs at least 8 ft (2,4 m) lower than top end of strut.

   b. Lift jib strut into position at end of adapter frame and align connecting holes.

   c. Pin jib strut to adapter frame and install keeper plates (View A).

      As pins are installed, install washers to ***limit side play of jib strut to 1/8 in (3,2 mm).***

   d. Disconnect slings from jib strut.
3. Install main strut as follows:
   a. Connect chain slings from assist crane to four lifting lugs on main strut (View D).

      Adjust length of rear chain slings so rear end of strut hangs at least 8 ft (2,4 m) lower than top end of strut.

   b. Lift main strut into position at end of adapter frame and align connecting holes.

   c. Pin main strut to adapter frame and install keeper plates (View C).

      As pins are installed, install washers to ***limit side play of main strut to 1/8 in (3 mm).***

   d. Disconnect slings from main strut.

Install Luffing Hoist Wire Rope

1. Select and confirm LUFFING JIB mode.
2. Place reel of luffing hoist wire rope on ground along right side of jib near sheave end of struts.
3. Attach wire rope to sucker line, if installed in strut sheaves.

   If sucker line is not installed, reeve free end of luffing hoist wire rope through strut sheaves and under guide sheave (right side) on boom top as shown in reeving diagram on rigging drawing.
4. Route free end of luffing hoist wire rope through guide sheaves in 40 ft (12,2 m) insert nearest boom butt.
5. Securely anchor free end of luffing hoist wire rope to luffing hoist drum with wedge provided (see Wire Rope Installation and Maintenance in this section).

   Wire rope must spool off bottom of luffing hoist drum.
6. Tightly wind excess wire rope onto luffing hoist drum.
7. Anchor other end of luffing hoist wire rope to right side of main strut with socket and wedge provided (see Wire Rope Installation and Maintenance in this section).

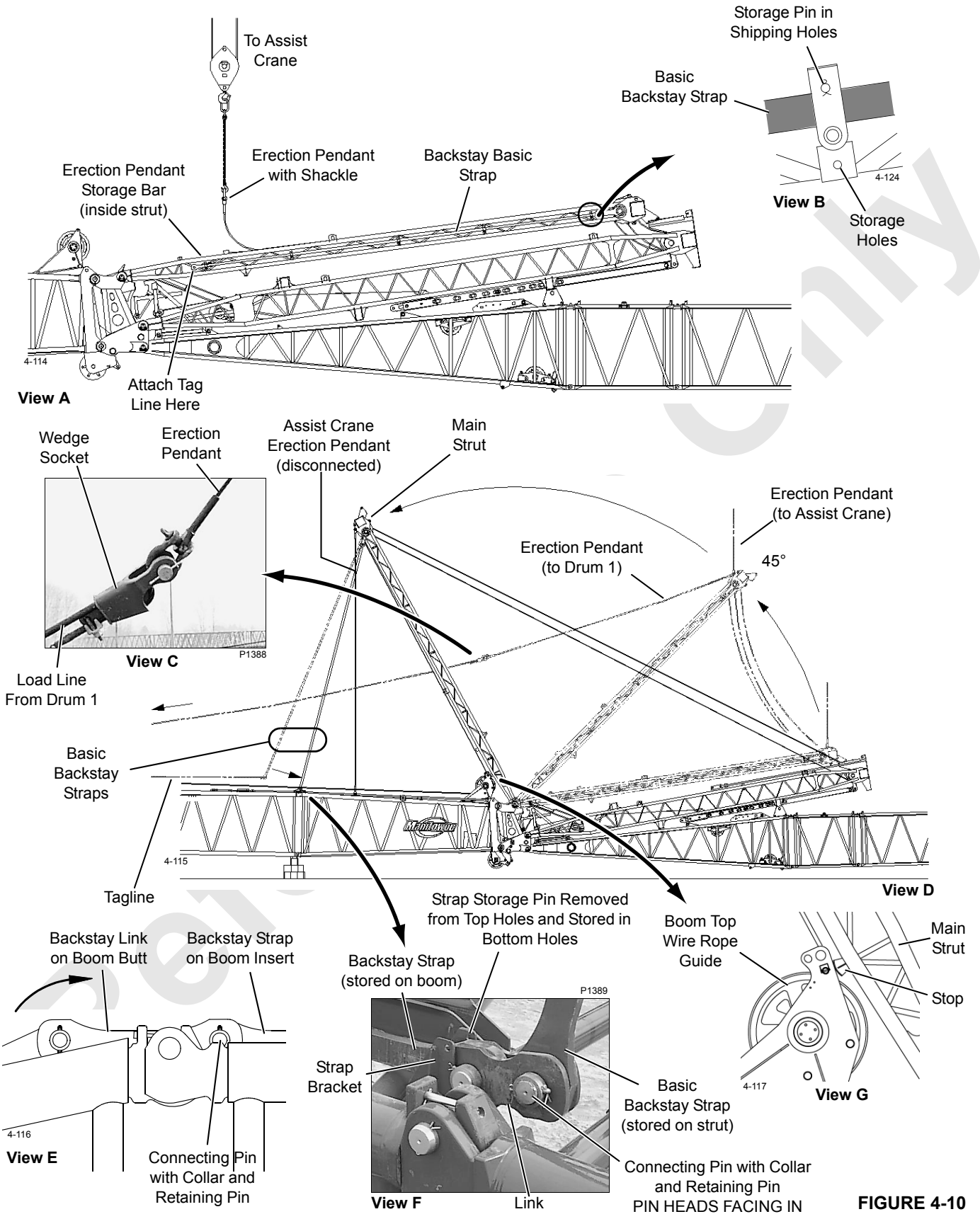

To Assist Crane
Erection Pendant with Shackle
Backstay Basic Strap
Erection Pendant Storage Bar (inside strut)
Attach Tag Line Here
4-114
View A
Storage Pin in Shipping Holes
Basic Backstay Strap
4-124
View B
Storage Holes
Wedge Socket
Erection Pendant
P1388
View C
Load Line From Drum 1
Assist Crane Erection Pendant (disconnected)
Main Strut
Erection Pendant (to Assist Crane)
Erection Pendant (to Drum 1)
45°
Basic Backstay Straps
Tagline
4-115
View D
Backstay Link on Boom Butt
Backstay Strap on Boom Insert
4-116
View E
Connecting Pin with Collar and Retaining Pin
Strap Storage Pin Removed from Top Holes and Stored in Bottom Holes
Backstay Strap (stored on boom)
P1389
Strap Bracket
View F
Link
Boom Top Wire Rope Guide
Main Strut
Stop
4-117
View G
Basic Backstay Strap (stored on strut)
Connecting Pin with Collar and Retaining Pin
PIN HEADS FACING IN

FIGURE 4-10

Raise Main Strut

See Figure 4-10 for the following procedure.

WARNING

Moving Part Hazard!

Do not stand on boom top or jib butt while main strut is being raised or lowered.

Wait until main strut is stopped and supported by assist crane or luffing hoist line before climbing onto boom top or jib butt.

1. Remove backstay strap storage pins from shipping holes (View B) and install in storage holes.

   Allow straps to rest in storage brackets.
2. Attach taglines to backstay basic straps. Taglines should be at least 20 ft (6 m) long.
3. Disconnect shackles on ends of strut erection pendants from storage bar in base of main strut.

   Reconnect shackles to pendants.
4. Connect chain sling from assist crane to shackle on one erection pendant (View A).
5. Hoist and swing with assist crane so erection pendant is extended vertically above top of main strut.
6. Connect shackle on other erection pendant to load line from Drum 1 (View C).

CAUTION

Strut Damage!

- Do not attempt to raise main strut with load line from Drum 1 until step 7 is performed. Structural damage to strut will occur.
- Keep load line from assist crane centered over main strut while raising strut. Structural damage can occur if strut is side loaded.

7. Slowly haul in ***load line from assist crane*** to raise main strut. At same time pay out luffing hoist wire rope.
8. Raise strut to at least 45° with assist crane and stop (view D).
9. Slowly haul in load line from Drum 1 until load line is supporting strut.
10. Lower erection pendant from assist crane to vertical and disconnect assist crane.
11. Slowly haul in load line from Drum 1 to raise jib strut. Continue to pay out luffing jib hoist wire rope.

    Operator shall carefully match rate of speed that luffing hoist wire rope is payed out with speed that load line is hauled in.

    Luffing hoist wire rope must remain slack until strut is raised to vertical.

CAUTION

Strut Damage!

Too much tension in luffing hoist wire rope can cause structural damage to strut. Keep luffing hoist wire rope slack until strut nears vertical.

12. As strut nears vertical, haul in luffing hoist wire rope just enough so main strut moves smoothly past vertical.

    Jib strut should not rise off jib butt during remaining steps.
13. Continue to slowly pay out luffing hoist wire rope to lower main strut. Keep load line from Drum 1 slack.
14. Have ground personnel use taglines to guide jib backstay straps so they do not hit boom lacings.
15. Stop lowering main strut when stops on strut are against side plates of boom top wire rope guide (View G).
16. Pay out load line from Drum 1 so erection pendant hangs vertically (View D) and disconnect load line (View C).

Connect Backstay Straps

See Figure 4-10, Views E and F for the following procedure.

1. Remove strap storage pins from shipping position and store in bottom holes in strap brackets.
2. Remove retaining pins, collars, and connecting pins from end of each basic backstay strap.
3. Rotate links from storage position to working position and pin to ends of basic backstay straps (View F). PIN HEADS MUST FACE IN.
4. Repeat above steps for backstay links between each boom section.
5. See View E for connection of backstay link at boom butt.

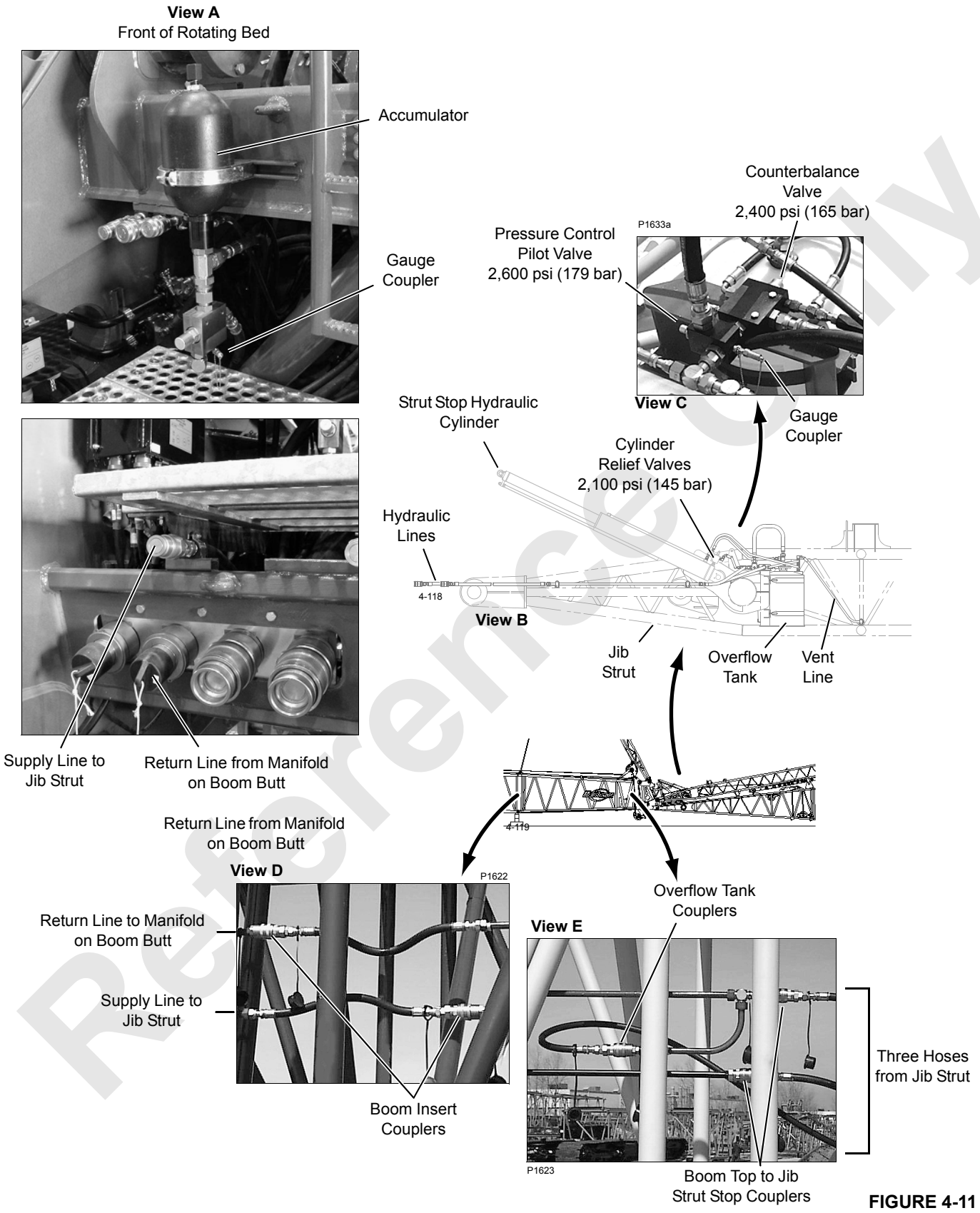


FIGURE 4-11

Connect Hydraulic Hoses

CAUTION

Strut Damage

If luffing jib will be operated when air temperature is below 32°F (0°C), drain and refill hydraulic systems (crane and boom) with Petro Canada Premium Plus hydraulic oil (MCC #549318). Be sure strut stop cylinders and supply lines are completely drained before refilling.

For operation below 10°F (-12°C) use a thinner fluid such as Petro Canada Premium Arctic 15 (MCC #A03745).

See Figure 4-11 for the following procedure.

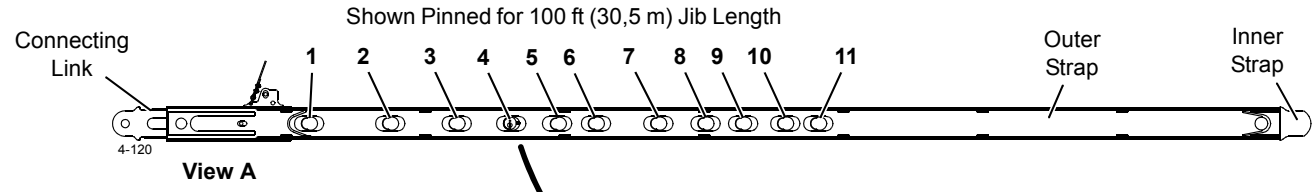
The strut stop hydraulic hoses have quick couplers with dust caps. The dust caps must be removed before making the connections.

1. ***Stop engine***.
2. Connect luffing hoist hydraulic hoses (View A) between crane and boom butt.
3. Connect hoses between ends of boom inserts along entire length of boom (View D).
4. Connect hydraulic hoses from jib strut to couplers on boom top (View E).
5. Start engine.
6. Strut stop cylinders should fully extend, if not already done.
7. Check fluid level in overflow tank. Tank should be empty.

   If tank is not empty, possible causes include:

   - Wrong oil viscosity for cold weather operation (see CAUTION above)
   - Drain line hydraulic connections not made
   - Bent or kinked drain line blocking oil flow
   - Drain line check valve on transition insert incorrectly installed
8. Attach an accurate hydraulic pressure gauge to coupler at accumulator on front of rotating bed (View A). Verify that system pressure is 2,900 psi (200 bar).

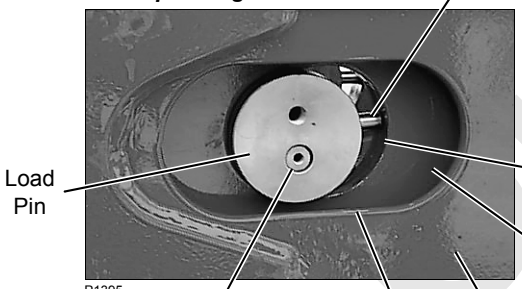
   All other valves are preset to pressure settings given in Views B and C.

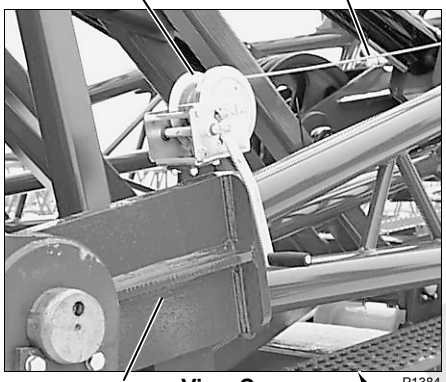


View A

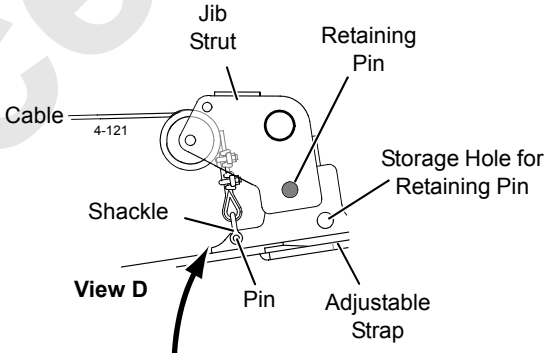
Hole No.	Jib Length feet (meter)	Hole No.	Jib Length feet (meter)
1	70 (21,3)	8	150 (48,8)
2	80 (24,4)		160 (48,8)
3	90 (27,4)	9	170 (51,8)
4	100 (30,5)		180 (54,9)
5	110 (33,5)	10	190 (57,9)
6	120 (36,6)		200 (61,0)
			210 (64,0)
7	130 (39,6)	11	220 (67,1)
	140 (42,7)		230 (70,1)
			240 (73,2)

View B
Load Pin Shown ***Locked in Operating Position***

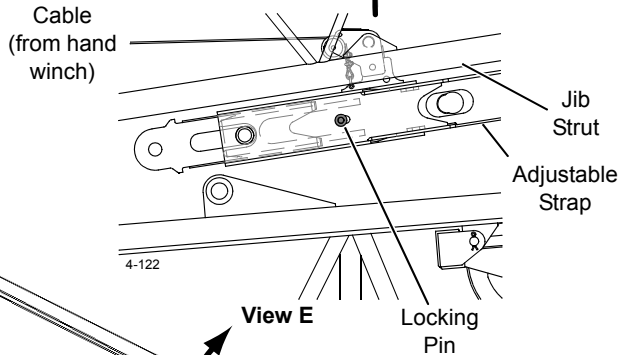




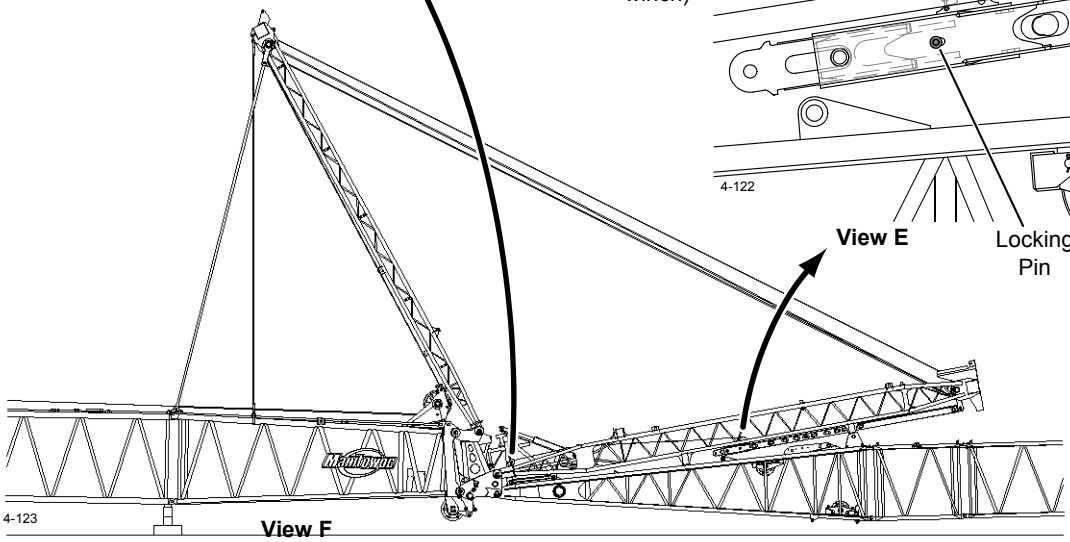
View C



View D



View E



View F

FIGURE 4-12

Set Up Adjustable Straps

See Figure 4-12 for the following procedure.

The adjustable strap (View A) consists of four major parts: a connecting link, an inner strap, an outer strap, and a load pin.

The connecting link is pinned to the backstay strap on the strut. The inner strap is retained inside the outer strap. The outer strap slides up or down over the inner strap. The load pin must be installed in the proper key hole in the inner strap before the jib strut is raised. The length of the jib dictates which key hole must be used.

The outer rims of the load pin have flanges that hold the pin in place in the key hole in the inner strap (View B). A slide pin mounted inside the load pin holds the load pin in place. Depressing a spring-loaded plunger in the load pin allows the slide pin to move through the load pin as long as the plunger is depressed. When released, the plunger engages one of two grooves in the slide pin to lock the slide pin in place. Extending the slide pin holds the load pin in place in the key hole.

DANGER

Crane Collapse!

Install and lock load pins in proper holes of adjustable straps for jib length in use (Figure 4-12, View A)

WARNING

Adjustable Strap Separation!

Make sure adjustable strap locking pin is installed (Figure 4-12, View E) before raising jib strut.

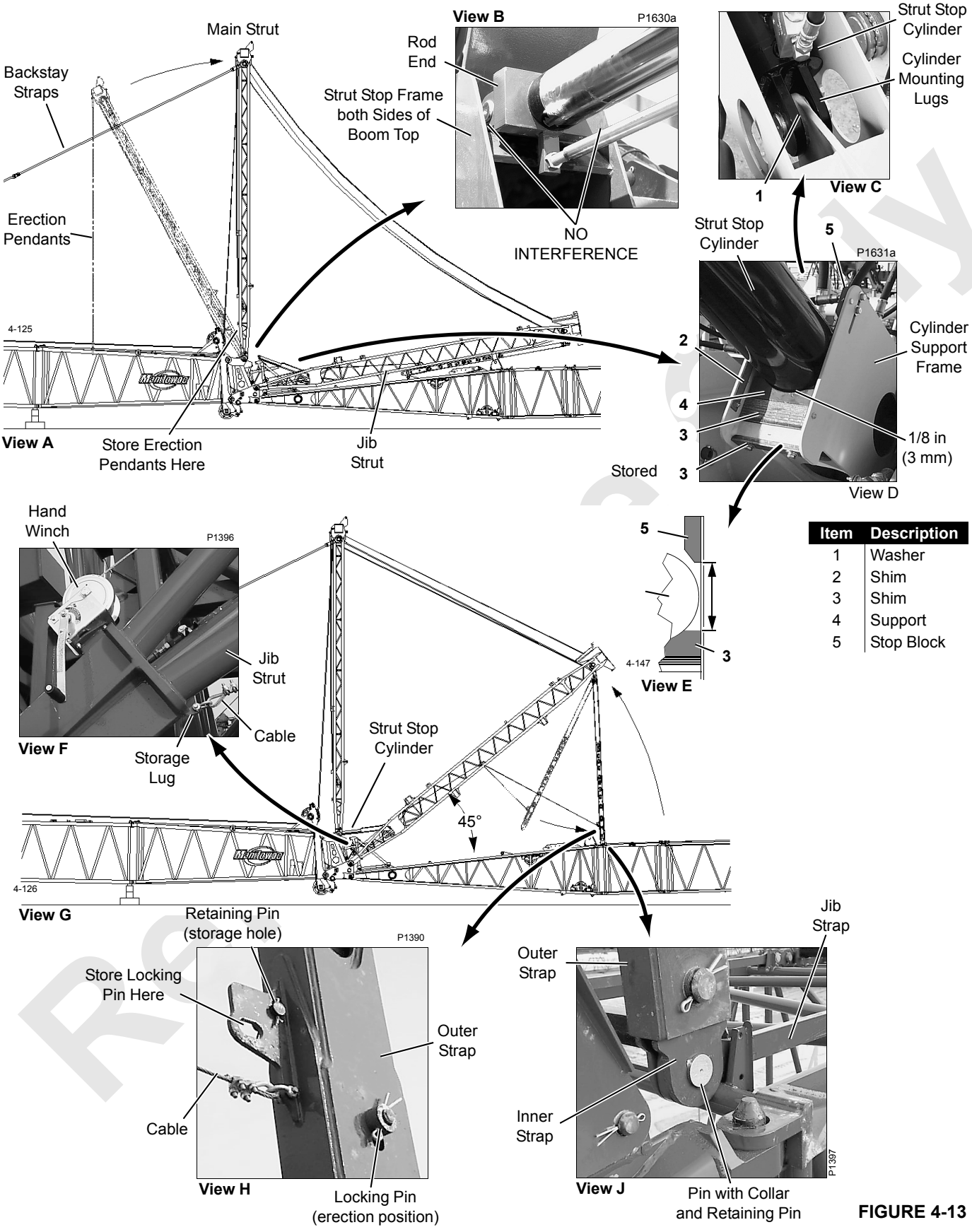
Perform the following steps at both adjustable straps.

1. Determine correct pinning location for adjustable strap based on jib length (See View A and table in Figure 4-12).
2. Remove load pin from its stored position in adjustable strap by depressing plunger and sliding load pin toward wider end of key hole (View B).

   Remove pin through access hole in outer strap.
3. Insert pin through access hole in outer strap at required pinning location.
4. Depress plunger and slide load pin into narrow end of key hole. Release plunger.
5. Check that load pin is tightly locked against narrow end of key hole (View B).

NOTE: If load pin is not tightly locked in operating position, remove load pin, rotate it 180°, and reinstall.

6. Make sure locking pin is installed as shown in View E.
7. Check that cable from hand winch is attached to adjustable strap (View D).
8. Check that cable between hand winch and adjustable strap is snug.
9. Check that ratchets on hand winches are set to prevent winches from paying out line.
10. Remove retaining pin connecting adjustable strap to jib strut. Install retaining pin in storage hole (View D).



Item	Description
1	Washer
2	Shim
3	Shim
4	Support
5	Stop Block

FIGURE 4-13

Raise Jib Strut

See Figure 4-13 for the following procedure, unless otherwise noted.

WARNING

Moving Part Hazard!

Do not stand on boom top or jib butt while either strut is being raised or lowered.

Wait until struts are stopped and supported by an assist crane or luffing hoist wire rope before climbing onto boom top or jib butt.

NOTE: While raising strut, use mechanical angle indicator mounted on jib strut to monitor strut angle.

1. Haul in luffing hoist wire rope until main strut is near vertical and jib strut just starts to rise (View A).
2. Attach both erection pendants to storage bar on main strut with shackles on ends of pendants (Figure 4-10, View A).
3. Continue hauling in luffing hoist wire rope to slowly raise jib strut to approximately 45° and stop (View G).
4. While raising jib strut, observe strut stop cylinder rod ends. Following adjustments were made at factory and should not require field adjustment.
   a. Make sure rod ends do not interfere with any part of strut stop frames (View B).

      If interference occurs, readjust washers (1, View C) and shims (2, View D) until there is NO INTERFERENCE (cylinders centered in frames).

   b. Install shims (3, View D) under supports (4) so that when rollers bottom out in strut stop pockets on boom top (Figure 4-14, View B) gap is 1/8 in (3 mm) between supports (4) and underside of cylinders.
   c. Reposition stop blocks (5, View E) so distance between stop blocks and supports (4) is 5 in (127 mm).

CAUTION

Structural Damage!

Do not raise jib strut above 70° during erection while boom is on ground. Structural damage to jib strut or strut stop cylinders will occur. At 70° strut angle, cylinder rods will have approximately 5 in (127 mm) travel remaining (Figure 4-14, View B).

5. Connect adjustable straps to jib straps on jib insert:
   a. Using hand winch, lower adjustable straps to vertical (View G). Raise or lower strut as needed.
   b. Raise or lower strut as needed to align connecting holes in inner straps with connecting holes in jib straps on jib insert.
   c. Pin adjustable straps to jib straps (View J).
6. With jib straps resting in supports on insert, raise or lower jib strut so there is ***no load on locking pin in each adjustable strap***.
7. Remove locking pins (View H) and store in holes in outer straps.

CAUTION

Structural Damage!

Inner straps will not extend to proper length if locking pins are not removed. Structural damage will occur.

8. Disconnect cables from outer straps (View H) and connect cables to storage lugs at base of jib strut (View F).

   Use hand winch to tighten cable as needed.

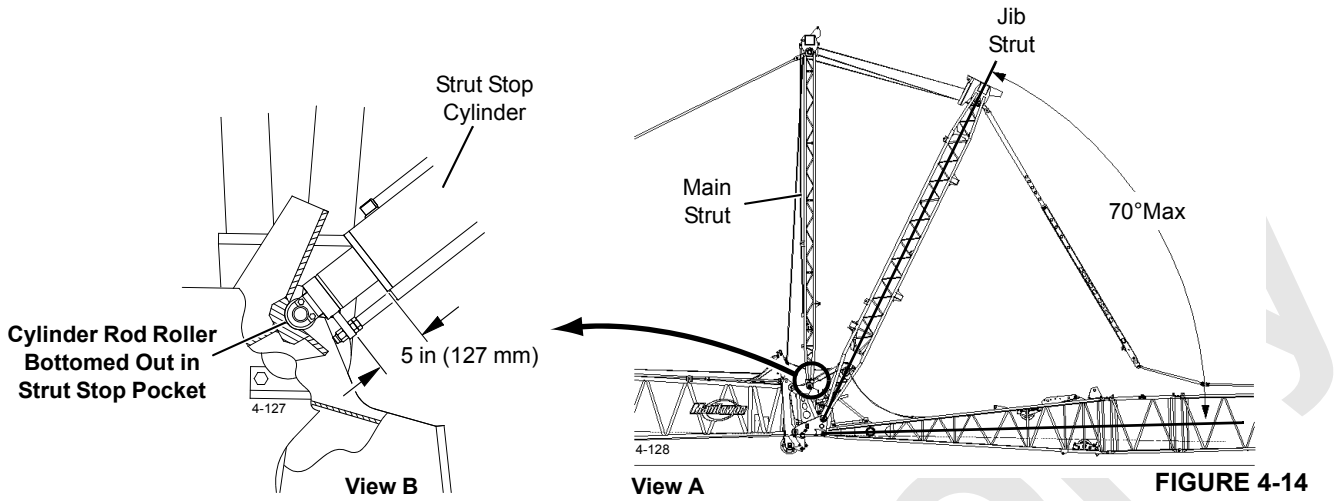


FIGURE 4-14

Install Load Lines

Depending on your lifting requirements, the luffing jib can be operated with load lines over either jib point, lower or upper.

1. See Capacity Chart for lifting limitations and required deducts when handling loads from selected locations.
2. See Wire Rope Specifications Chart in Luffing Jib Capacity Chart Manual to determine parts of line required for your job. Size load block accordingly.
3. Route load line from desired drum through proper guide sheaves on boom (see Load Line Reeving in this section).
4. If jib will be raised using In-Line Method, install load block and weight ball from jib points before boom and jib are raised.
5. If jib will be raised using Jack-Knife Method, proceed as follows:
   a. Reeve load lines through guide sheaves in jib point.
   b. Pull load lines approximately 20 ft (6,1 m) past end of jib and lay lines on ground.
   c. Securely tie off load lines to jib point. Install load block and weight ball after boom and jib are jack-knifed into position just prior to raising jib point rollers off ground.

WARNING

Run-Away Wire Rope!

For long boom and short jib combinations, wire rope on boom side of attachment can overhaul unsecured wire rope on jib side. This could cause personnel injuries and damage to equipment. Securely tie off load lines to jib before raising attachment.

Connect Electric Cords

Connect electric cords to respective junction boxes and switches. See Boom Wiring and Limits Diagram at the end of this section:

- Jib stop limit switches on jib adapter
- Block-up limit switches
- Load sensors (for attachments without wireless RCL)

Install Wind Speed Indicator Assembly

Install wind speed indicator if removed for shipping. Use star washers to attach mounting bracket to jib top to provide good a ground (see Wind Speed Assembly drawing at the end of this section).

Connect electrical cable at base of wind speed mounting bracket.

Adjust Electronic Devices

Adjust electronic devices according to instructions in Section 6 of this manual:

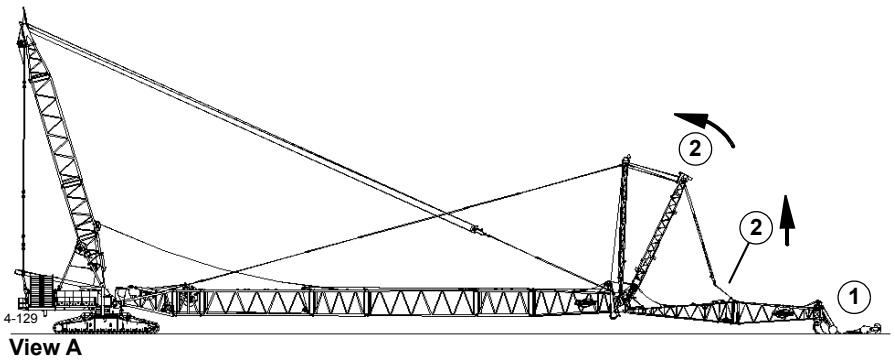
- Jib stop limit switches
- Boom stop limit switch (to 85° or 87°, depending on boom length, after boom and jib are raised)
- Block-up limit switches

Pre-Raising Checks

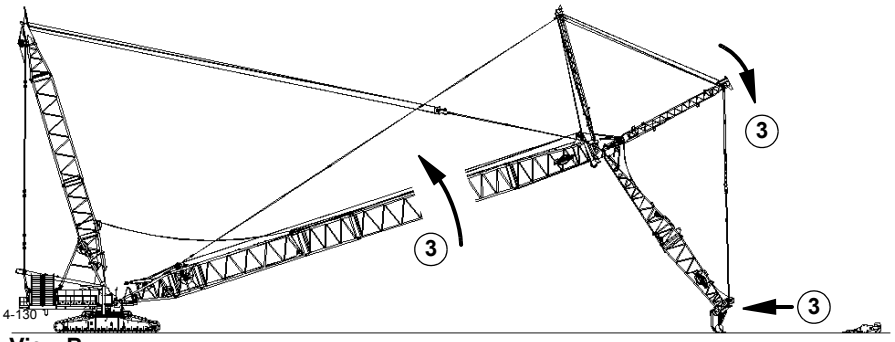
Make the following checks and correct any defects before raising the attachment.

- ☐ Lower boom point removed from boom top if required by raising procedure chart.
- ☐ Rigging winch and wire rope guides removed from jib butt if required by raising procedure chart.
- ☐ Crawlers blocked if required by raising procedure chart. See Crawler Blocking Diagram for blocking procedure.
- ☐ All installation steps given in this section performed.
- ☐ Boom and jib inserts installed in proper sequence according to rigging drawings.
- ☐ Upper jib point roller installed.
- ☐ Boom, jib, and backstay straps installed in proper sequence according to rigging drawings.
- ☐ Adjustable jib straps locked in proper position.
- ☐ All connecting pins installed and properly secured.
- ☐ Main and jib struts in operating position.
- ☐ All hydraulic connections made.
- ☐ Jib stop in operating position.
- ☐ Jib strut stop cylinders extended and adjusted.
- ☐ Boom and luffing hoist wire rope anchored properly to drums, spooled tightly onto drums, and engaged with proper sheaves (see Rigging Drawings and Wire Rope Installation and Maintenance in this section).
- ☐ Load lines anchored properly to drums, spooled tightly onto drums, and engaged with proper sheaves (see Reeving Diagrams and Wire Rope Installation and Maintenance in this section).
- ☐ Wire rope guard pins, bars, or rollers installed to retain wire rope in sheaves.
- ☐ **If load line will be installed after boom and jib are jack-knifed into position, make sure load line going to jib point is securely attached to end of jib point so load line cannot fall off jib and boom.**
- ☐ All blocking, tools, and other items removed from boom and jib.
- ☐ All blocking, tools, and other items removed from jib point roller path area.
- ☐ All safety devices installed, electric cords connected, and limits adjusted (see appropriate adjustments sections in this manual):
  - Rated Capacity Indicator/Limiter
  - Boom and jib angle indicators
  - Automatic boom stop (must be reset for luffing jib operation after boom and jib are raised)
  - Automatic jib stops
  - Jib and boom block-up limits
- ☐ Luffing Jib Raising Procedure Chart reviewed, and following operations determined:
  - Raising method — in-line or jack-knife
  - Required boom to jib angle for jack-knife raising method
- ☐ Raising procedure in this section read and thoroughly understood.
- ☐ Proper amount of crane counterweight installed.
- ☐ Wind within allowable limits for raising boom and jib (see charts in Luffing Jib Operator Manual).
- ☐ All lube points greased (see Lubrication Guide in Luffing Jib Operator Manual).
- ☐ LUFFING JIB mode selected and confirmed.

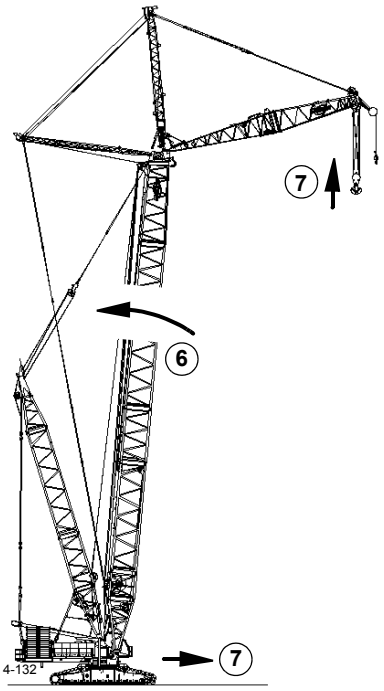
ITEM NUMBERS CORRESPOND TO IN-LINE RAISING PROCEDURE STEPS



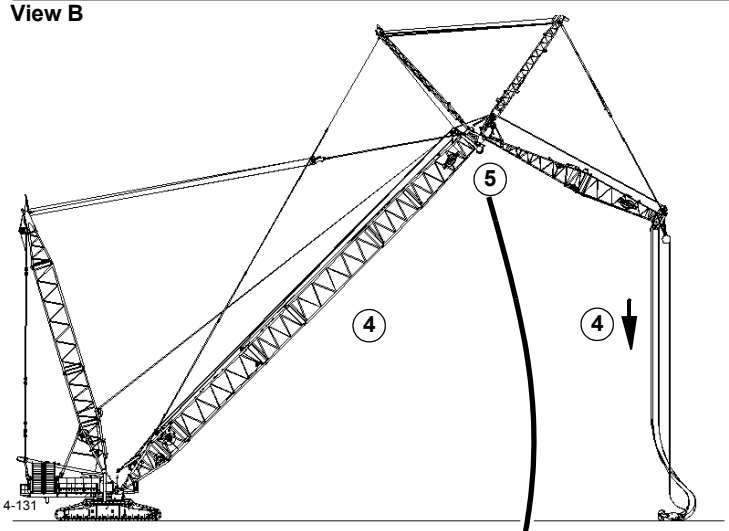
View A



View B



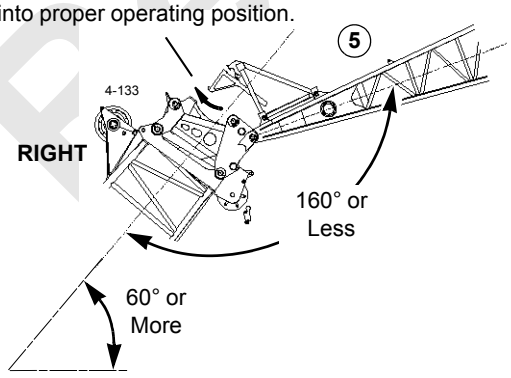
View D



View C

When steps 4 and 5 are performed, jib stop will swing past adapter frame into proper operating position.

View E



If steps 4 and 5 are not performed, jib stop will not swing past boom top into proper operating position.
Damage could occur. Jib stop will not operate properly.

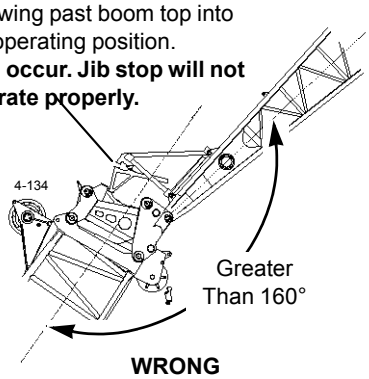


FIGURE 4-15

Raising Boom and #44 Luffing Jib

General

WARNING

Falling Boom And Jib Hazard!

Select and confirm LUFFING JIB mode. Operating in any other mode with luffing jib attached is prohibited.

Luffing jib limits are disabled when LUFFING JIB mode is off. Boom and jib could be pulled over backwards.

WARNING

Moving Part Hazard!

Warn all personnel to stand clear of jib point rollers while raising boom and jib.

Use digital display in operator's cab to monitor boom angle and boom to luffing jib angle while raising boom and jib.

In-Line Raising Procedure

See Figure 4-15 for the following procedure.

NOTE: It is normal for the following limits to come on during the raising procedure:

BLOCK UP – this fault will go off once the boom and luffing jib are raised and the load lines/block-up limit chains are hanging freely.

MAX UP 1 and MAX UP 2 – these faults will go off once the boom to luffing jib angle is less than 168°.

WARNING

Tipping Crane Hazard!

When using in-line method:

- Do not raise boom and jib combinations longer than specified on raising procedure chart.
- Raise boom to desired operating angle and position jib at required operating radius before lifting load block and/or weight ball from ground.

1. Install load block and/or weight ball (if not already done).
2. Slowly luff up to raise jib strut until jib straps clear strap storage brackets on jib and stop.

   It will be necessary to use limit bypass switch to luff up if MAX UP 1 limit is on.

CAUTION

Structural Damage!

Do not exceed 70° jib strut angle while boom is on ground. Use mechanical angle indicator on jib strut to monitor strut angle.

3. Slowly boom up to raise boom until jib straps are taut and stop. Jib point rollers will roll along ground as boom and jib rise.

   Pay out load lines as boom is raised.

CAUTION

Jib Stop Damage!

Jib stop will not swing past boom top to operating position if steps 4 and 5 are not performed. Damage could occur. Jib stop will not operate properly.

4. Continue to slowly boom up to raise boom and jib until boom angle is 60° or higher and stop.

   Pay out load lines as boom is raised.

5. Check boom to luffing jib angle. If angle is more than 160°, luff down until angle is 160° or less.

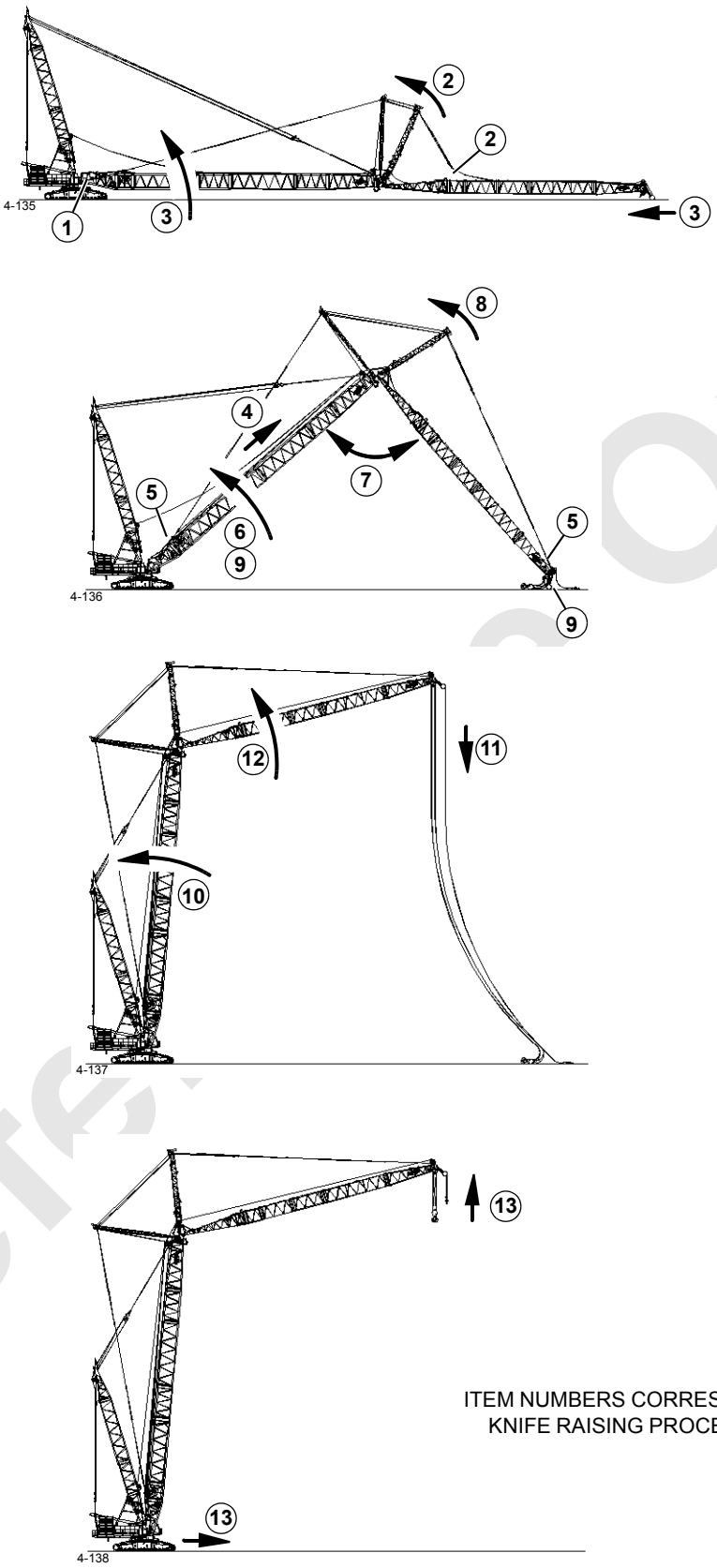
   Jib stop will swing past boom top into operating position.

   It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

6. Raise boom and jib to desired operating angle and radius.

   Pay out load lines as boom and jib are raised.

7. Travel crane forward until jib point is over load block and/or weight ball and lift load block and/or weight ball to desired operating position.



ITEM NUMBERS CORRESPOND TO JACK-KNIFE RAISING PROCEDURE STEPS

FIGURE 4-16

Jack-Knife Raising Procedure

See Figure 4-16 for the following procedure.

WARNING

Tipping Hazard/Structural Damage!

- See Raising Procedure Chart to determine BOOM TO LUFFING JIB ANGLE that boom and jib must be jack-knifed to before jib can be raised.
- Do not raise boom and jib combinations longer than specified on raising procedure chart.
- Monitor angle on digital display as boom and jib are raised.

CAUTION

Structural Damage!

- Do not exceed 70° jib strut angle while boom is on ground. Use mechanical angle indicator on jib strut to monitor strut angle.
- **Avoid side loading as boom and jib are raised.**
- Disengage swing lock and release swing brake until boom and jib have been raised to required boom to luffing jib angle.

NOTE: It is normal for the following limits to come on during the raising procedure:

BLOCK UP – this fault will go off once the boom and luffing jib are raised and the load lines/block-up limit chains are hanging freely.

MAX UP 1 and MAX UP 2 – these faults will go off once the boom to jib angle is less than 168°.

1. Disengage swing lock and release swing brake.
2. Slowly luff up until jib straps lift out of strap brackets on jib and stop.
3. Slowly boom up.

   Jib point rollers will roll along ground as boom and jib are jack-knifed into position.

WARNING

Tipping Hazard/Structural Damage!

Do not allow jib or backstay straps to become too tight during raising steps. Crane will tip or structural damage will result.

Do not allow jib and backstay straps to become too slack during raising steps. Jib strut could fall onto jib butt.

4. Pay out load lines as boom and jib are raised.
5. Jib straps and backstay straps will tighten as boom and jib rise.

   OPERATOR AND SIGNAL PERSON — watch backstay straps and jib straps along left side of boom and jib as boom and jib rise.

   Pay out luffing hoist wire rope (luff down) so jib straps remain slack.

   - Allow backstay straps to float up and down 3 - 6 in (76 - 162 mm) above strap brackets at top end of boom butt.
   - Allow jib straps to float up and down 3 - 6 in (76 - 162 mm) above strap brackets at end of jib top.

   It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

6. Slowly continue with Jack-Knife Raising Procedure steps 3 - 5.

WARNING

Falling Jib Hazard/Structural Damage!

Do not lower jib to any boom or jib angle less than minimum stop (70°).

7. Stop raising boom when boom and jib have been positioned at required boom to luffing jib angle or jib is vertical, whichever occurs first. ***Monitor this angle on digital display***.
8. Slowly luff up until jib straps start to go into tension and stop.
9. Boom up to raise jib point rollers clear of ground, apply swing brake, and install load block and/or weight ball (see Install Load Lines in this section).

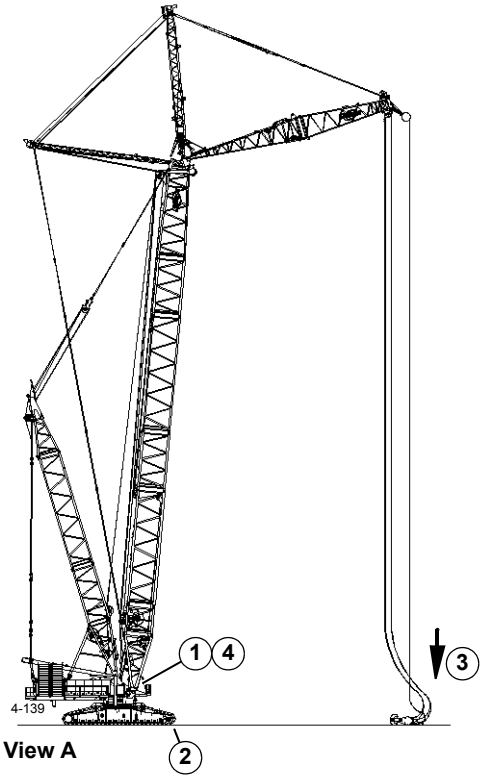
   Untie load lines from jib after installing load block and/or weight ball.

WARNING

Falling Load Hazard!

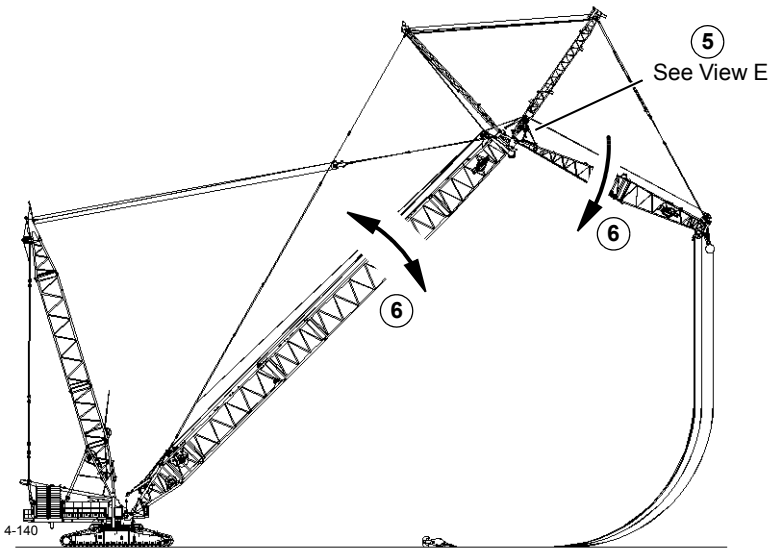
Raise boom to desired operating angle and position jib at required operating radius before lifting load block and/or weight ball from ground.

10. Slowly raise boom to desired operating angle. See Capacity Chart for allowable boom angles.
11. Pay out load lines as boom and jib are raised.
12. Luff up to position jib at required operating radius for load to be handled.
13. Travel forward as required to position load block and/or weight ball below jib points and lift load block and/or weight ball to desired operating position.



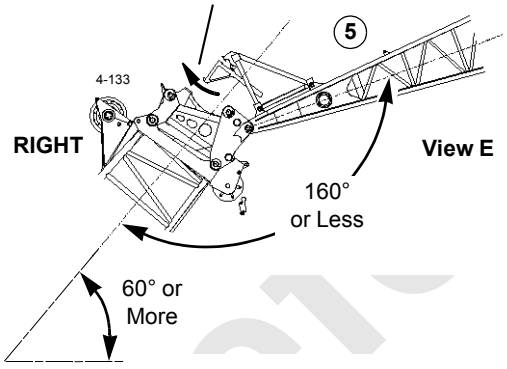
View A

ITEM NUMBERS CORRESPOND TO IN-LINE LOWERING PROCEDURE STEPS

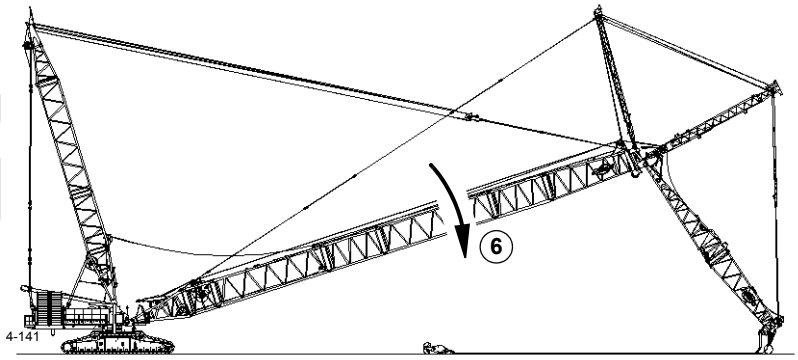


View B

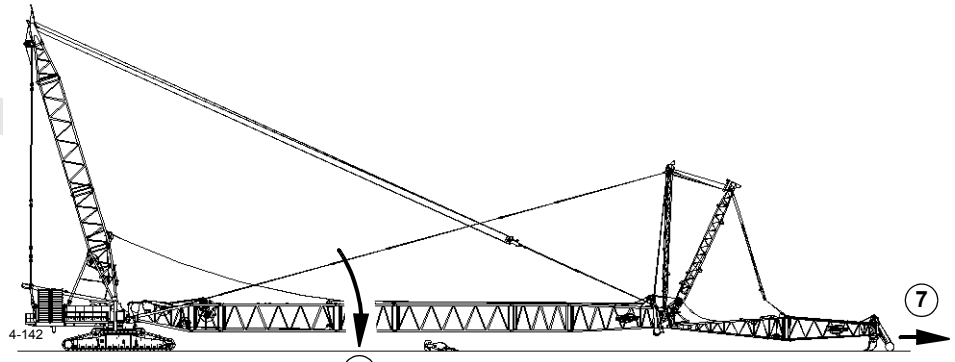
When step 5 is performed, jib stop will swing past adapter frame into proper operating position.



View E



View C



View D

FIGURE 4-17

Lowering Boom and #44 Luffing Jib

General

WARNING

Falling Boom And Jib Hazard!

Select and confirm LUFFING JIB mode. Operating in any other mode with luffing jib attached is prohibited.

Luffing jib limits are disabled when LUFFING JIB mode is off. Boom and jib could be pulled over backwards.

WARNING

Moving Part Hazard!

Warn all personnel to stand clear of jib point rollers while lowering boom and jib.

As defined in the raising procedure chart, one of two methods can be used to lower the boom and jib depending on the boom and jib combination: In-Line Method or Jack-Knife Method. See the chart to determine which method can be used. **Be sure crane is properly configured for selected method**.

NOTE: Use digital display in cab to monitor boom and boom to luffing jib angles while lowering boom and jib.

In-Line Lowering Procedure

See Figure 4-17 for the following procedure.

WARNING

Tipping Crane Hazard!

- Observe boom to luffing jib angles specified on raising procedure chart.
- If required by raising procedure chart, lower boom and jib over blocked crawlers.
- Lower load block and/or weight ball to ground before lowering boom and jib.

NOTE: It is normal for BLOCK UP, MAX UP 1, and MAX UP 2 limits to come on during the lowering procedure.

1. Swing upperworks in line with lowerworks so boom is over *front of crawlers*.
2. Travel crawler rollers onto blocking, if required.
3. Swing boom and jib slightly to either side of center and lower load block and/or weight ball to ground.
4. Swing boom and jib in line with crawlers.

CAUTION

Jib Stop Damage!

Jib stop will not rotate to proper storage position if step 5 is not performed.

5. Position boom at 60° or higher boom angle and lower luffing jib to 160°or less boom to luffing jib angle (View E).
6. Slowly boom down until jib point rollers contact ground.

   It will be necessary to use limit bypass switch to boom down if BLOCK UP limit is on.

   Haul in load lines as boom and jib are lowered but *do not lift load block and/or weight ball off ground*.

CAUTION

Structural Damage!

Do not exceed 70° jib strut angle while boom is on ground. Use mechanical angle indicator on jib strut to monitor strut angle.

7. Perform Jack-Knife Lowering Procedure steps 7–12 to lower boom and jib remaining distance.

A1275

ITEM NUMBERS CORRESPOND TO JACK-KNIFE LOWERING PROCEDURE STEPS

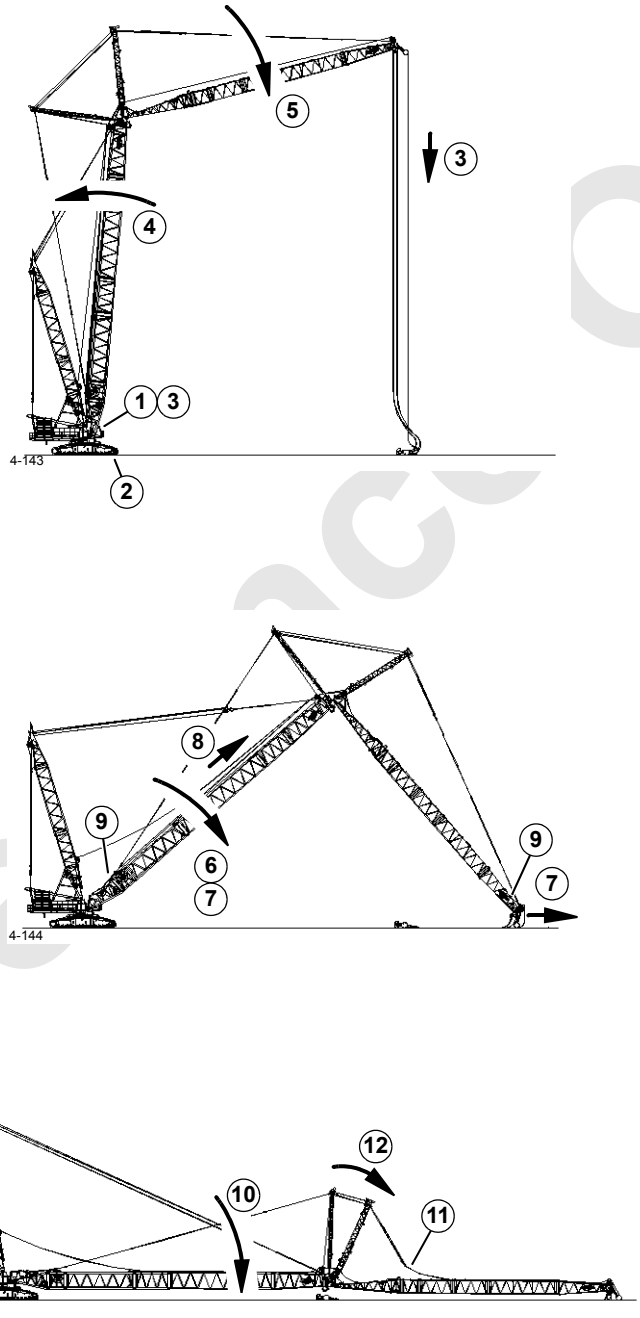


FIGURE 4-18

Jack-Knife Lowering Procedure

See Figure 4-18 for the following procedure.

WARNING

Tipping Crane Hazard!

- Observe boom to luffing jib angles specified on raising procedure chart. Use digital display in cab to monitor boom and boom to luffing jib angles.
- If required by raising procedure chart, lower boom and jib over blocked crawlers.
- Lower all load block and/or weight ball to ground before lowering boom and jib.

WARNING

Moving Part Hazard!

Warn all personnel to stand clear of jib point rollers while lowering boom and jib.

NOTE: It is normal for the BLOCK UP, MAX UP 1, and MAX UP 2 limits to come on during the lowering procedure.

1. Swing upperworks in line with lowerworks so boom is centered over *front of crawlers.*
2. Travel crawler rollers onto blocking, if required.
3. Swing boom and jib slightly to either side of center and lower load blocks and/or weight balls onto ground. Then swing boom and jib in line with crawlers and apply swing brake.

WARNING

Tipping Crane Hazard!

Do not lower boom and jib to ground until boom has been positioned at minimum boom angle of 70° and jib has been positioned at specified boom to luffing jib angle. Use digital display in cab to monitor boom and boom to luffing jib angles.

WARNING

Falling Jib Hazard!

Do not lower jib to any boom to luffing jib angle less than minimum stop (70°). Structural damage to jib butt will occur, possibly causing jib to collapse.

4. Position boom at 70° or higher boom angle.
5. Slowly luff down to position jib at required boom to luffing jib angle (see Luffing Jib Raising Procedure Chart for angle). ***Monitor angle on digital display***.

   It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

CAUTION

Structural Damage!

- **Avoid side loading as boom and jib are lowered.**
- Disengage swing lock and release swing brake when jib point rollers contact ground.

6. Slowly boom down until jib point rollers contact ground.

   Depending on boom and jib combination, jib may be hanging vertical when rollers contact ground. If this happens, raise jib (luff up) until jib is a few degrees forward of vertical.

   It will be necessary to use limit bypass switch to boom down if BLOCK UP limit is on.
7. Release swing brake (disengage swing lock) and continue to lower boom slowly.

   Jib point rollers will roll along ground as boom and jib unfold.
8. Pay out load lines as boom and jib lower.
9. Jib straps and backstay straps will slacken as boom and jib lower.

   OPERATOR AND SIGNAL PERSON — watch backstay straps and jib straps along left side of boom jib as boom and jib lower.

   Do not allow straps to become too slack.

   - Allow backstay straps to float up and down 3–6 in (76–162 mm) above strap brackets at top end of boom butt.
   - Allow jib straps to float up and down 3–6 in (76–162 mm) above strap brackets at end of jib top.

   It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

WARNING

Tipping Hazard/Structural Damage!

Do not allow jib or backstay straps to become too tight during lowering steps. Crane will tip or structural damage will result.

Do not allow jib and backstay straps to become too slack during lowering steps. Jib strut could fall onto jib butt.

10. Continue with Jack-Knife Lowering Procedure steps 7–9 until boom top is resting on blocking at ground level.
11. Slowly luff down to lower jib strut until jib straps rest in strap storage brackets on jib.

12. Lower struts as described in Removing Jib topic later in this section.

Removing #44 Luffing Jib

Lowering Jib Strut

WARNING

Moving Part Hazard!

Do not stand on boom top or jib butt while either strut is being lowered.

Wait until struts have been stopped and are supported by load line or luffing hoist line before climbing onto boom top or jib butt during disassembly.

1. Pay out luffing jib hoist line (Drum 6) to lower jib strut. Continue lowering strut until jib straps are resting in strap brackets and adjustable straps are fully retracted (Figure 4-11, View G). Strut will be at approximately 45°.
2. Remove locking pins from storage holes and install in adjustable straps (Figure 4-11, View H). Luff up or down to align holes in straps.
3. Disconnect inner straps from jib straps. (Figure 4-11, View J). Luff up or down to loosen pins.

   Store pins in inner straps.
4. Store adjustable straps:
   a. Release ratchet on hand winch (Figure 4-11, View F).
   b. Disconnect cable from storage lug on jib strut (Figure 4-11, View F).
   c. Attach cable to lug on adjustable strap (Figure 4-11, View H).
   d. Remove retaining pin from storage hole in outer strap (Figure 4-11, View H).
   e. Using hand winch, raise adjustable strap to storage position (Figure 4-10, View E).
   f. Install retaining pin to secure adjustable strap to jib strut (Figure 4-10, View D).
   g. Repeat preceding steps 4a – 4f for other adjustable strap.
5. Lower jib strut onto strut supports (Figure 4-10, View F).
6. Continue to luff down until main strut comes to rest on boom top wire rope guide (Figure 4-10, View F).
7. Disconnect hydraulic hoses from jib strut at boom top (Figure 4-9, View E). ***Install dust caps.***

   Coil hoses and tie them to jib strut for storage.
8. If boom will be removed, disconnect hydraulic hoses between boom inserts (Figure 4-9, View D). ***Install dust caps.***

Lowering Main Strut

1. Disconnect both erection pendants from storage bar on main strut (Figure 4-8, View A).
2. Connect one erection pendant to load line from (Drum 1) (Figure 4-8, View C).
3. Connect other erection pendant to sling from assist crane.

   Haul in assist crane load line until erection pendant is hanging vertically above main struts. Keep pendant slack.
4. Disconnect basic backstay straps from backstay straps on boom (Figure 4-8, View F).
5. Pin links in storage position on boom (Figure 4-15, View B).
6. Attach taglines to end of basic backstay straps. Taglines should be about 20 ft (6,1 m) long.
7. Slowly haul in luffing hoist wire rope while paying out load line from Drum 1 to pull main strut forward.
   - Match rate of speed that luffing hoist wire rope is hauled in with speed that load line from Drum 1 is payed out so strut moves smoothly past vertical without falling.
   - Once strut is past vertical, keep luffing hoist wire rope slack while paying out load line.
   - Guide basic backstay straps into storage brackets on side of strut with taglines.
8. Lower main strut to approximately 45° and stop (Figure 4-8, View D).
9. Haul in assist crane load line until assist crane is supporting strut.
10. Lower strut with assist crane while keeping luffing hoist wire rope and load line from Drum 1 slack.
11. Stop lowering main strut when it comes to rest on jib strut.
12. Remove taglines.
13. Disconnect erection pendants from assist crane and Drum 1 load line.

    Connect pendants to storage bar on main strut for storage.
14. Install strap storage pins in shipping holes to secure straps to sides of main strut (Figure 4-8, View B).

Remove Struts

See Figure 4-14 for the following procedure.

1. Remove main strut, as follows:
   a. Connect chain slings from assist crane to four lifting lugs on main strut (View D).

      Rear slings should be 6 - 8 ft (1,8 - 2,4 m) longer than front slings.

   b. Attach taglines to strut so that swing motion can be controlled when hinge pins are removed.

   c. Remove keeper plate from both sides of adapter frame (View C).

   d. Lift main strut so slings are taut and hinge pins are loose.

   e. Remove hinge pins.

   f. Lift main strut away from adapter frame and jib strut, and place main strut on blocking at ground level.

   g. Disconnect slings from main strut.

   h. Reinstall hinge pins and keeper plates in adapter frame for storage.
2. Remove jib strut, as follows:
   a. Connect chain slings from assist crane to four lifting lugs on jib strut (View B).

      Rear slings should be 6 - 8 ft (1,8 - 2,4 m) longer than front slings.

   b. Attach taglines to strut so that swing motion can be controlled when hinge pins are removed.

   c. Remove keeper plate from both sides of adapter frame (View A).

   d. Lift jib strut so slings are taut and hinge pins are loose.

   e. Remove hinge pins.

   f. Lift jib strut away from adapter frame and place jib strut on ground.

   g. Disconnect slings from jib strut.

   h. Reinstall hinge pins and keeper plates in adapter frame for storage.

See Figure 4-15 for the remaining steps.

3. The main strut, jib strut, and adjustable straps can be shipped as an assembled unit to reduce shipping space. To assemble struts for shipping, proceed as follows:
   a. Connect chain slings from assist crane to four lifting lugs on main strut. Lift strut so it is level.

   b. Lift main strut into position over jib strut.

   c. Swing, boom, and hoist assist crane as required to engage latch on main strut with hook on jib strut (View D).

      Use care not to hit strut stop cylinders with main strut.

   d. Remove retaining pins from jib strut holes (View E).

   e. Align holes in end of main strut with holes in end of jib strut and install retaining pins (View E).

   f. Lift strut assembly onto transport trailer and disconnect slings.

Removing Jib Attachment

WARNING

Collapsing Boom/Jib Hazard!

Improper disassembly of boom and jib sections can cause boom or jib to collapse onto personnel removing connecting pins.

Death or serious injury can result if precautions listed below are not taken:

- Lower boom/jib so boom and jib points are supported on blocking or ground.
- Slacken rigging — do not attempt to remove connecting pins while boom or jib is supported by rigging.
- Block below both ends of each boom or jib section before removing connecting pins.
- Stand on outside of boom or jib sections when removing connecting pins. Never work under or inside boom or jib sections. Use care not to damage lacings and chords as pins are knocked out.

Remove jib in opposite sequence of installing jib.

Automatic boom stop must be reset to 85° for MAX-ER operation without jib.

THIS PAGE INTENTIONALLY LEFT BLANK

LUFFING JIB RIGGING GUIDE – #79A

General

The following installation, raising, lowering, and removal instructions apply to the #79A luffing jib mounted on a #55 or #55A boom.

As shown on the Luffing Jib Assembly drawing, 20 ft (6,1 m) and 40 ft (12,2 m) inserts from a #79 boom can be used to make up the desired jib length. However, the jib has a different 20 ft (6,1 m) butt with a special 20 ft (6,1 m) insert, and a different top.

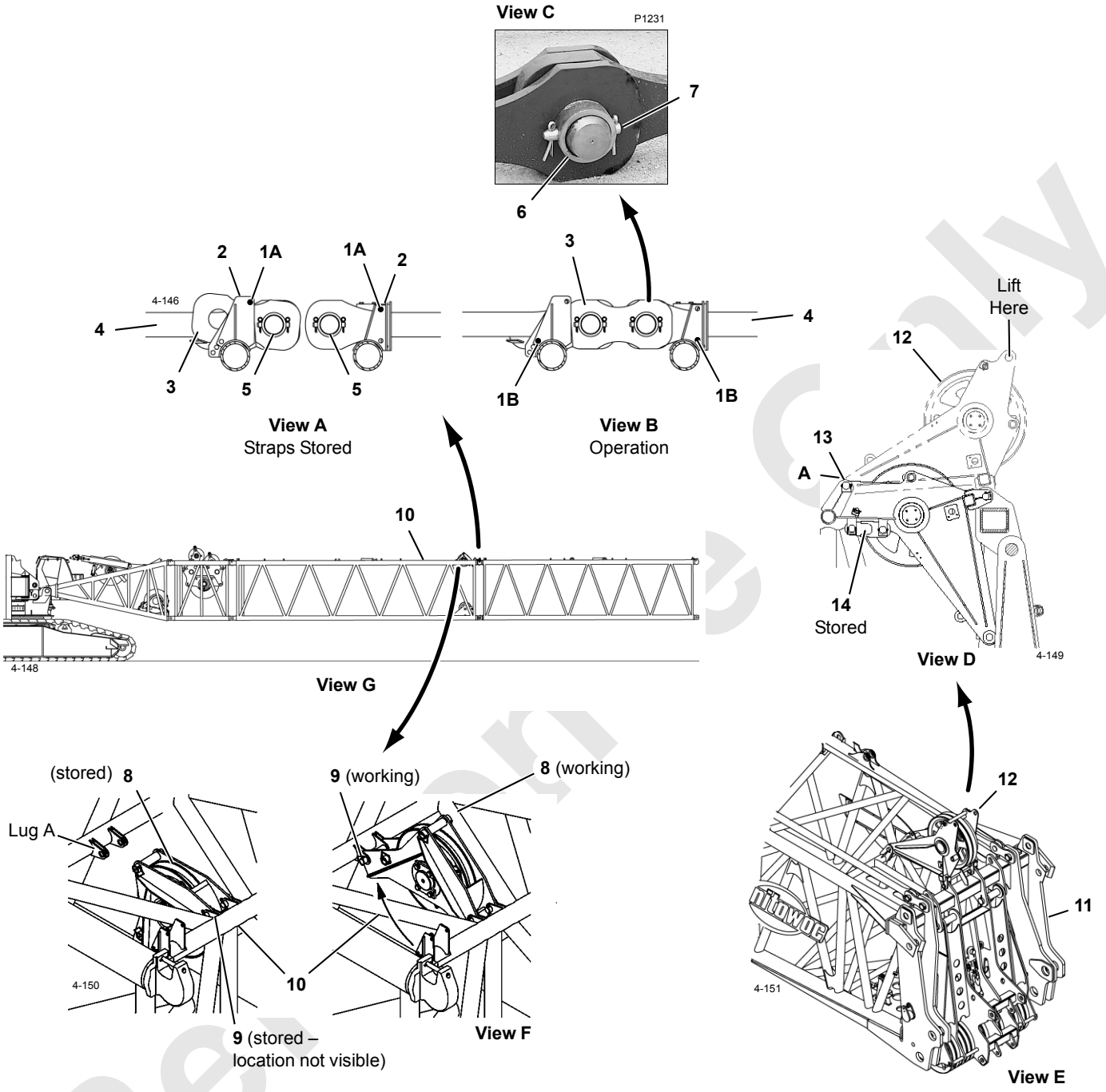
Assist Crane Requirements

An assist crane is required for jib installation and removal.

The heaviest individual parts to be lifted are the strut tops which are shipped assembled together. This assembly weighs approximately 18,500 lb (8 392 kg).

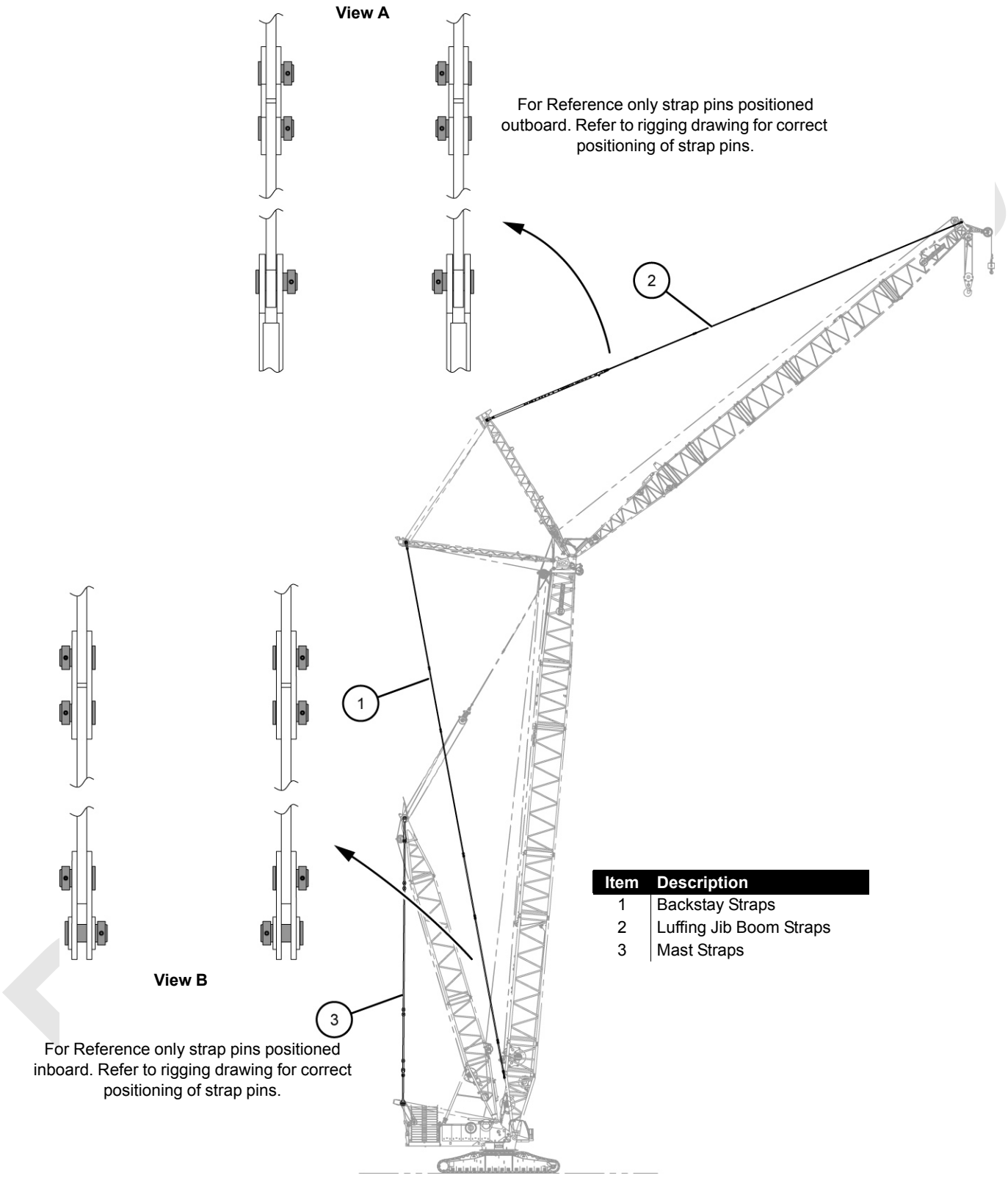
The assist crane must also be capable of handling the following weights:

- Main Strut — 50,000 lb (22 680 kg) during strut raising and lowering. The assist crane must have a hook height of 110 ft (33,5 m) minimum.
- Jib — maximum of 100,000 lb (45 360 kg) when lifting jib point onto the dolly. This is 1/2 the weight of the maximum jib length.



Item	Description	Item	Description
1A	Storage Pin (strap stored)	9	Pin with Snap Pin
1B	Storage Pin (operation)	10	40 ft (12,2 m) #55 Insert with Drum 6 Sheaves
2	Strap Bracket (typical)		
3	Link (typical)	11	#55 Boom Top
4	Strap (typical)	12	Wire Rope Guide
5	Connecting Pin (typical)	13	Connecting Pin with Snap Pins
6	Collar (typical)	14	Link with Pins and Snap Pins (stored)
7	Retaining Pin (with cotter pins)	15	Counterweight Box
8	Drum 6 Wire Rope Guide	16	Lug

FIGURE 4-19



Item	Description
1	Backstay Straps
2	Luffing Jib Boom Straps
3	Mast Straps

FIGURE 4-20

Preparing Crane, Boom, and Mast

See Figure 4-19 for the following procedure.

1. Lower boom to ground level onto blocking approximately 4 ft (1,2 m) high.
2. Remove load block.
3. If installed, remove load block and upper boom point.
4. Boom point sheave assembly can be installed on boom point.
5. Connect unused block-up limit electric cords to terminating plugs on boom point junction boxes.
6. If necessary, remove 40 ft (12,2 m) insert and install 40 ft (12,2 m) insert with Drum 6 sheaves (10, View F).
7. Raise luffing hoist wire rope guide (8, View F) on boom insert (10):
   a. Remove stored pin (9).
   b. Rotate wire rope guide with assist crane as shown.
   c. Using pin (9), pin wire rope guide to Lug A.
8. Remove boom top wire guide links if installed (View D):
   a. Support wire rope guide (12) with slings from assist crane.
   b. Remove connecting pins (13).
   c. Remove links (14) from location A and store them.

      Do not install links (14) for luffing jib configuration — luffing hoist wire rope will rub against wire rope guide frame.

   d. Pin wire rope guide (12) directly to the boom top lugs with pins (13).
9. Make sure removable strap brackets for luffing jib (18, Figure 4-23, View J) are installed on main strut butt.
10. If necessary, add lugs (16) for counterweight tie links to top crane counterweight boxes (15), one on each side, as shown in Figure 4-19, View H.

Install Backstay Straps on Boom

See Figure 4-19 and Figure 4-20 for the following procedure.

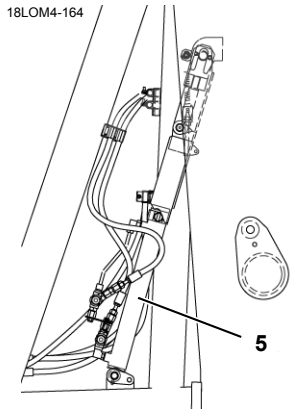
Starting at butt end of boom, install backstay straps in proper sequence on boom sections according to Luffing Jib Rigging Drawing. *This step is required only if straps are not stored on boom sections.*

To prevent interference between pins, heads of luffing jib boom strap pins must face outboard sides of boom. Heads of luffing jib backstay strap pins must face inboard as shown in Figure 4-20.

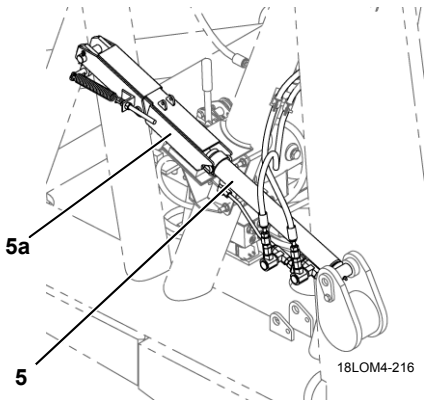
If the straps are already installed, proceed as follows:

1. Remove storage pins from top hole (1A, View A) in brackets (2).
2. Store pins in bottom holes (1B, View B) in brackets (2).
3. Rotate links (3) forward and pin to adjacent straps (4, View B).
4. Retain connecting pins (5, View B) with collars (6, View C) and retaining pins (7).

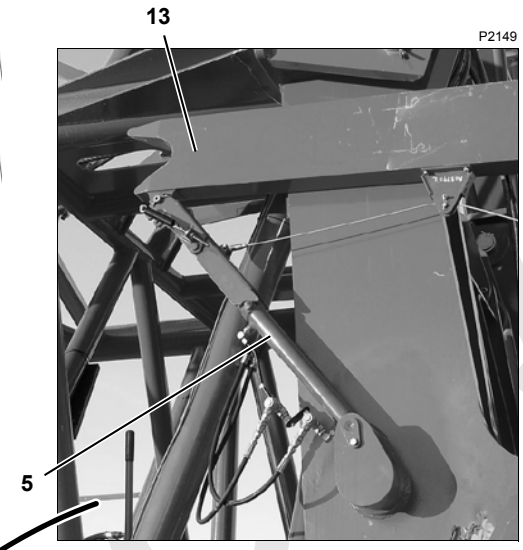
THIS PAGE INTENTIONALLY LEFT BLANK



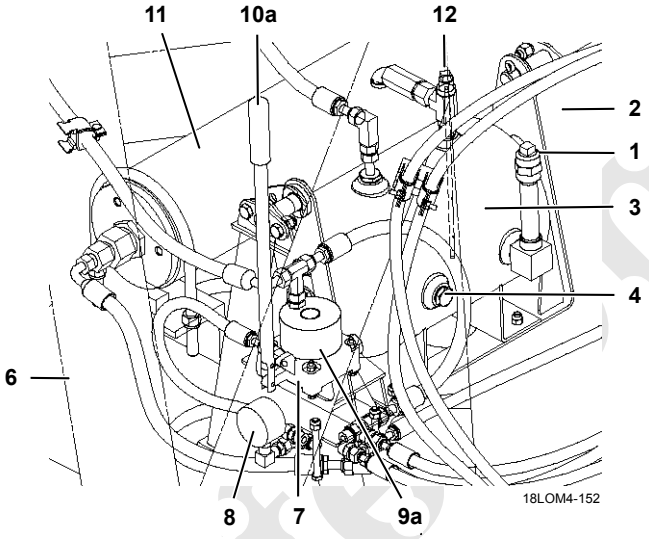
Stored Position



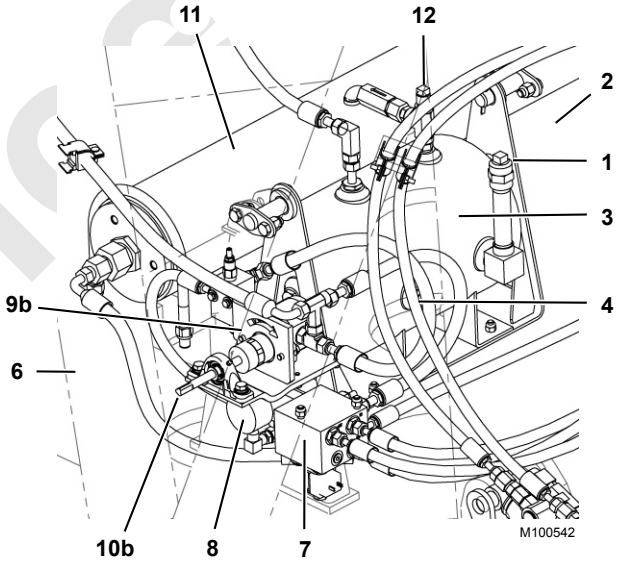
Erecting Position



Working Position



PAST PRODUCTION



CURRENT PRODUCTION

Item	Description	Item	Description
1	Fill Plug	8	Pressure Gauge
2	Support Frame	9a	Pump, Manual
3	Reservoir, 4.7 gal (17,8 L)	9b	Pump, Powered
4	Drain Plug	10a	Pump Handle
5	Jib Stop Positioner	10b	Drive Shaft (for 1/2 in-drive drill)
5a	Support	11	Accumulator, 5 gal (18,9 L)
6	Boom Top	12	Dipstick
7	Manifold, Valve	13	Jib Stop

FIGURE 4-21

Jib Stop Positioner Hydraulic System Operation

CAUTION

Structural Damage!

Read and adhere to these instructions to prevent structural damage to components.

Positioner cylinders are extended and retracted using crane mode switch in operator's cab. Read Section 3 in this manual and Section 3 in the crane Operator Manual for mode selection instructions.

WARNING

System Under Pressure!

Do not disconnect any part of system until system is depressurized. Components may shift suddenly, causing bodily injury.

See Figure 4-21 for the following procedures.

NOTE: The following procedures require two people: one at the boom top and an operator in the cab.

Depending on when your luffing jib was built, pump (9a or 9b) is powered by hand lever (10a) or by an owner supplied 1/2 in-drive drill. ***Drill must be operated in clockwise direction***.

Initial Setup

1. Cylinders must be retracted and connected to jib stops.
2. Verify that accumulator pressure corresponds to pressure in following table (depending on ambient temperature).

Ambient Temperature	Pressure
Interpolate as Required	
30°F (-1°C)	1600 psi (110 bar)
50°F (10°C)	1665 psi (115 bar)
70°F (21°C)	1730 psi (119 bar)
90°F (32°C)	1796 psi (124 bar)

3. Put 2-1/2 gallons (10 L) of MCC A03745 Arctic 15 pre-filtered hydraulic oil in reservoir. Leave fill cap off.
4. Prime pump by pressuring reservoir slightly with user-supplied air pressure.
5. Begin pumping (with pump handle or drill). Bleed cylinder and accumulator lines. When fluid flows clear, close lines.
6. Continue pumping. Cylinders will extend.
7. When cylinders are fully extended, signal operator to retract cylinders with mode switch. Weight of jib stops will retract cylinders.
8. Repeat steps 6 and 7 for 3 cycles to expel all air from cylinders and lines.
9. Pump until cylinders are fully extended.
10. Adjust tank oil level to top mark on dipstick. Dipstick should rest on tank fitting for proper oil level check.
11. Pump until oil level is at low mark on dipstick. Gauge reading must be 2,450 – 2,500 psi (169 – 172 bar). Record pressure on inspection record.
12. Seal fill and dipstick ports with hydraulic sealant.

Procedure For Raising Boom And Jib

1. Pump until pressure gauge reads 2,500 psi (172 bar).
2. Disengage safety latch using hand winch in jib top.
3. Set spring tension adjustment: 8-3/4 in (222 mm) minimum to 9 in (229 mm) maximum (see Set Up Jib Stop Positioners topic in this manual).
4. Signal crane operator to retract cylinders with mode switch.
5. Release tension on safety latch cable allowing enough slack for engagement when cylinders are extended. **Slack must be at safety latch.**
6. Raise boom to where boom to jib angle is 140°.
7. Signal operator to extend cylinders with mode switch. Cylinders will extend and remain pressurized.
8. Verify safety latches are latched to prevent cylinders from retracting.
9. Continue raising boom and jib to working position.

Procedure For Lowering Boom And Jib

1. Lower boom and jib. With jib in dolly, boom down until boom to jib angle is 140°.
2. Release jib safety latch with hand winch in jib top.
3. Signal crane operator to retract cylinders with mode switch.
4. Release tension on safety latch cable allowing enough slack for engagement when cylinders are extended.
5. Continue lowering boom slowly verifying that stops do not engage pins in boom top.
6. Continue to lower boom and jib to ground.
7. Signal crane operator to extend cylinders with mode switch. If cylinders do not extend automatically, manually pump cylinders to extended position.

Periodic Check Of Oil Level

See F2104, Lubrication Guide, at the end of Section 5 for oil change interval and instructions.

Legend is on following page.

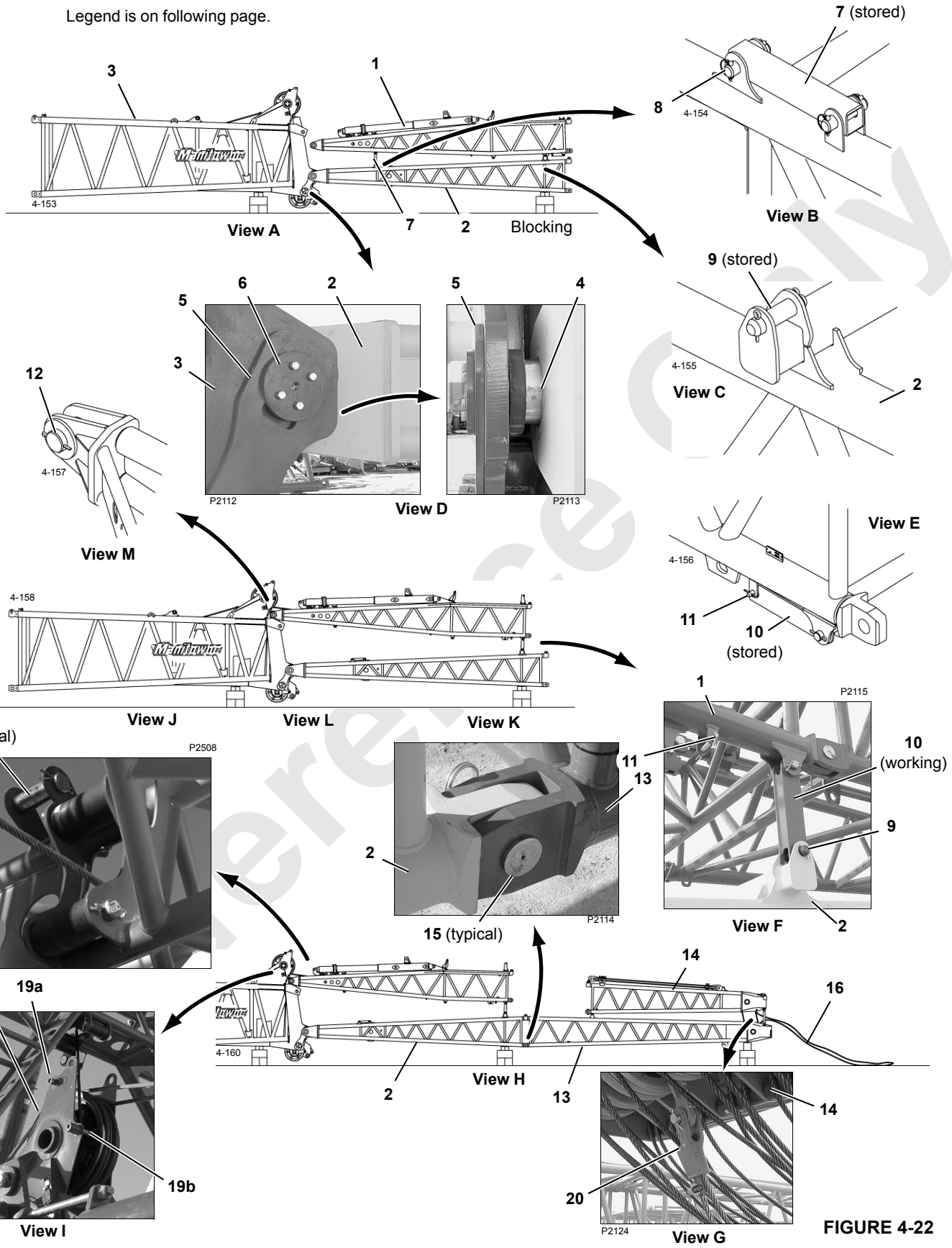


FIGURE 4-22

Installing #79A Luffing Jib

Install Jib and Main Strut Butts

See Figure 4-22 for the following procedure.

NOTE: Main strut butt (1) and jib strut butt (2) are shipped together as shown in View A. Main strut butt is above jib strut butt.

1. Using appropriate slings, lift jib strut/main strut butts into position at boom top (3) and align jib strut butt connecting holes (View A).
2. Connect jib strut butt (2) to boom top (3) with connecting pins (4, View D) (pin heads toward outboard side).
3. Securely fasten keeper plates (5, View D) to pins (4).
4. Temporarily attach end plates (6, View D) over ends of pins (2). Block top end of jib strut butt approximately 3 ft (0,9 m) high.
5. Lower main strut/jib strut butts onto blocking about 3 ft (0,9 m) high.
6. Support main strut butt (1) with slings from assist crane, and remove shipping pins (9, View A).
7. Remove pin (8, View A) from strut support A (7).
8. Rotate strut support A (7) to stored position on jib strut butt and connect to lugs with pin (8) (View B).

   Main strut butt is now separated from jib strut butt.
9. Lift main strut butt about 1 ft (0,3 m) clear of jib strut butt.
10. Store shipping pins (9, View C) in lugs on jib strut butt.
11. Lift main strut butt (1) into position at boom top (3) and align connecting holes.
12. Using pins (12, View M), connect main strut butt to boom top.
13. Remove strut supports B shipping pins (11, View E).
14. Rotate strut supports B (10, View F) to working position.
15. While lowering main strut butt (1), guide saddles in strut supports B (10) to rest on pins (9, View C) attached to lugs on jib strut butt.
16. Disconnect assist crane from lifting slings.

Install Jib Strut Top

See Figure 4-22 for following procedure.

NOTE: Main strut top and jib strut top are shipped together as shown in View H. Main strut top is above jib strut top.

1. Using appropriate slings attached to main strut top (14, View H), lift jib strut/main strut tops into position at jib strut butt (2). Adjust slings so butt end of top is higher than top end.
2. Position jib strut top (13) so bottom connecting holes in strut top line up with connecting holes in jib strut butt (2)
3. Install connecting pins (15, View K) and safety pins (pin heads facing outboard side).
4. Lower jib strut top onto blocking 3 ft (0,9 m) high.
5. Disconnect assist crane from slings. Remove slings.

Install Luffing Hoist Wire Rope

Shipping jib strut top (13) and main strut top (14) assembled as shown in Figure 4-22, View H allows reeving a sucker line through the luffing sheaves in the strut tops. See Luffing Jib Rigging Drawing for wire rope specifications.

- Make sure wire rope is properly anchored to Drum 6 (luffing hoist) and tightly spooled onto drum.
- Make sure Drum 6 wire rope guide is raised in 40 ft (12,2 m) boom insert.
- Make sure wire rope passes under lower sheave and over upper sheave in 40 ft (12,2 m) boom insert.
- Make sure wire rope passes under sheave in boom top wire rope guide and rollers (17, View J) in main strut butt.
- Pull out upper wire rope guide bar (19a, View I) to the left about half way. Remove lower wire rope guide bar completely (19b). ***If this step is not performed, wire rope damage can occur when main strut is raised.***

  Do not remove upper wire rope guide bar completely. You will not be able to reinstall it after main strut is raised.
- Route wire rope through proper sheaves as shown in reeving diagram on Luffing Jib Rigging Drawing.
- Pull lead end of luffing hoist wire rope approximately 100 ft (30,5 m) past end of struts and lay on ground. This will allow strut to be raised to erection position.
- Anchor lead end of luffing hoist wire rope to socket (20, View G) in main strut top (14)

Component Identification for Figure 4-22

Item	Description	Item	Description	Item	Description
1	Main Strut Butt	8	Shipping Pin with Wire Lock	15	Connecting Pin with Safety Pin
2	Jib Strut Butt	9	Shipping Pin with Cotter Pins	16	Luffing Hoist Wire Rope
3	Boom Top	10	Strut Support B	17	Roller
4	Connecting Pin	11	Storage Pin with 2 Cotter Pins	18	Wire Rope Guide
5	Keeper Plate	12	Connecting Pin with 2 Cotter Pins	19a	Wire Rope Guide Bar (upper)
6	End Plate	13	Jib Strut Top	19b	Wire Rope Guide Bar (lower)
7	Strut Butt Support A	14	Main Strut Top	20	Dead End Socket

Legend is on following page.

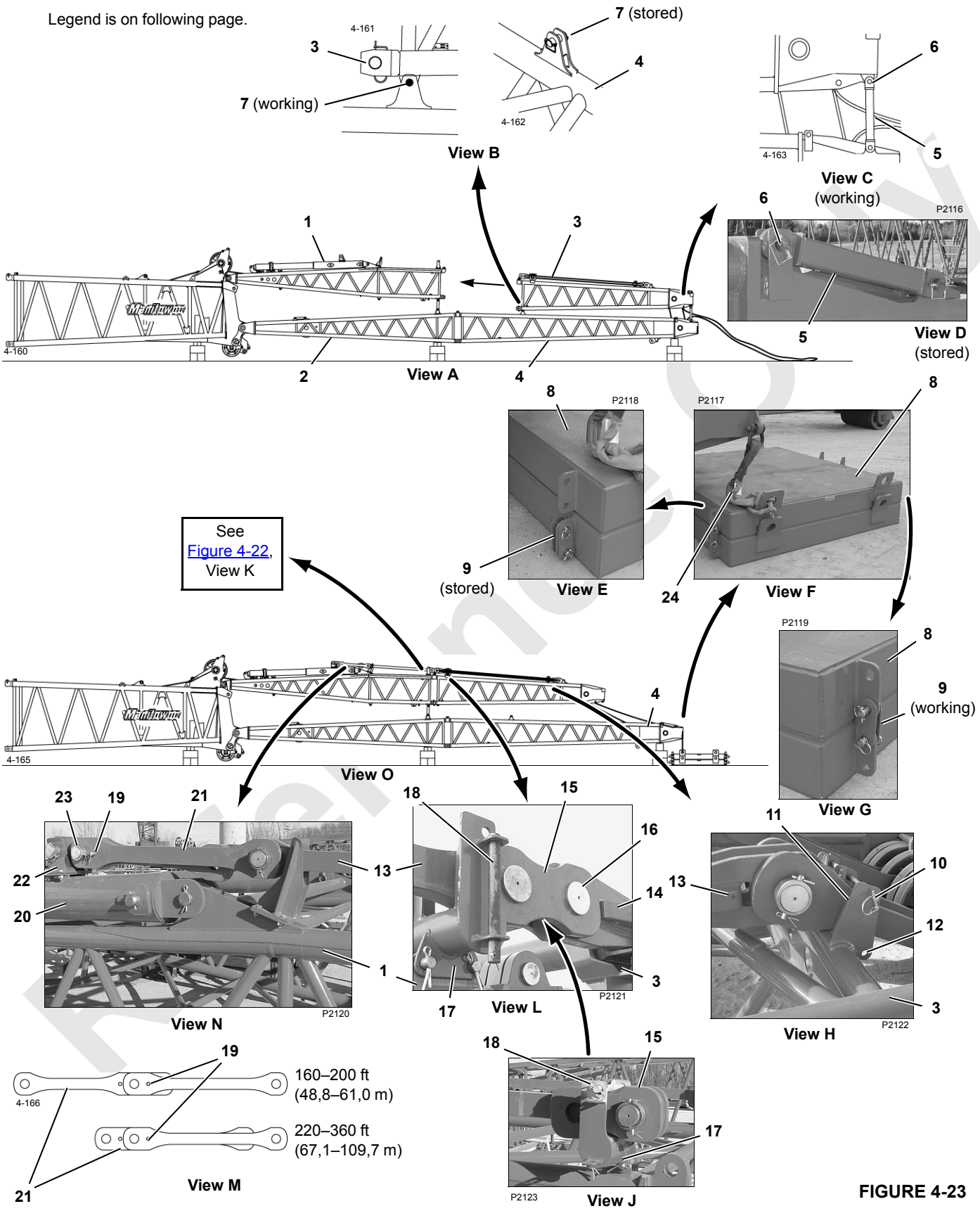


FIGURE 4-23

Install Main Strut Top

See Figure 4-23 for the following procedure.

Connect Main Strut Top to Strut Butt

1. Support main strut top (3, View A) with slings from assist crane. Adjust slings so butt end of top is higher than top end.
2. Remove rear shipping pins (7, View B).
3. Remove pins (6, View C) from strut support C.
4. Lift main strut top clear of jib strut top.
5. Store rear shipping pins (7, View B) in lugs on jib strut top.
6. Rotate strut supports C (5, View D) into stored position and pin to jib strut top with shipping pins (6).
7. Move strut top slowly to the rear while paying out luffing hoist wire rope from Drum 6 so that wire rope between struts pays out smoothly without kinking or binding.
8. When sufficient wire rope has been paid out, position main strut top in front of main strut butt (View O).

   Install bottom and top connecting pins (15, Figure 4-22, View K) and safety pins.

NOTE: Top connecting pins are 2 in (51 mm) in diameter. Bottom connecting pins are 2-1/2 in (64 mm) in diameter.

9. Raise insert until top connecting holes line up and install connecting pins and safety pins.
10. Disconnect assist crane from slings. Remove slings.

Connect Backstay Straps

1. Remove shipping pins (10, View H) from strap brackets (11) and store in hole (12).
2. Remove shipping pins (18, View J) from straps on main strut butt. Store in brackets (17, View L).
3. Rotate links (15, View L) forward and pin to links (14) using pins (16) stored in links (15) (pin heads facing outboard side).

   Install collars, retaining pins, and cotter pins.
4. Remove pins (23, View N) securing adjustable straps (21) to shipping brackets (22) mounted on strut stop cylinders (20).

   Pins (23) will be used to attach adjustable links to backstay straps on boom butt.
5. If necessary, adjust length of adjustable links (21) for boom length (View M).

Connect Jib Strut Top to Counterweight

WARNING

Falling Equipment Hazard!

Counterweight is required to prevent jib strut from rising when main strut is raised with luffing hoist.

If counterweight becomes disconnected from jib strut, jib strut will rise part way and then both struts could fall forward violently. Minimum capacity required for slings is 25,000 lb (11 340 kg) per side.

1. Remove one top crane counterweight box from each side of crane counterweight.

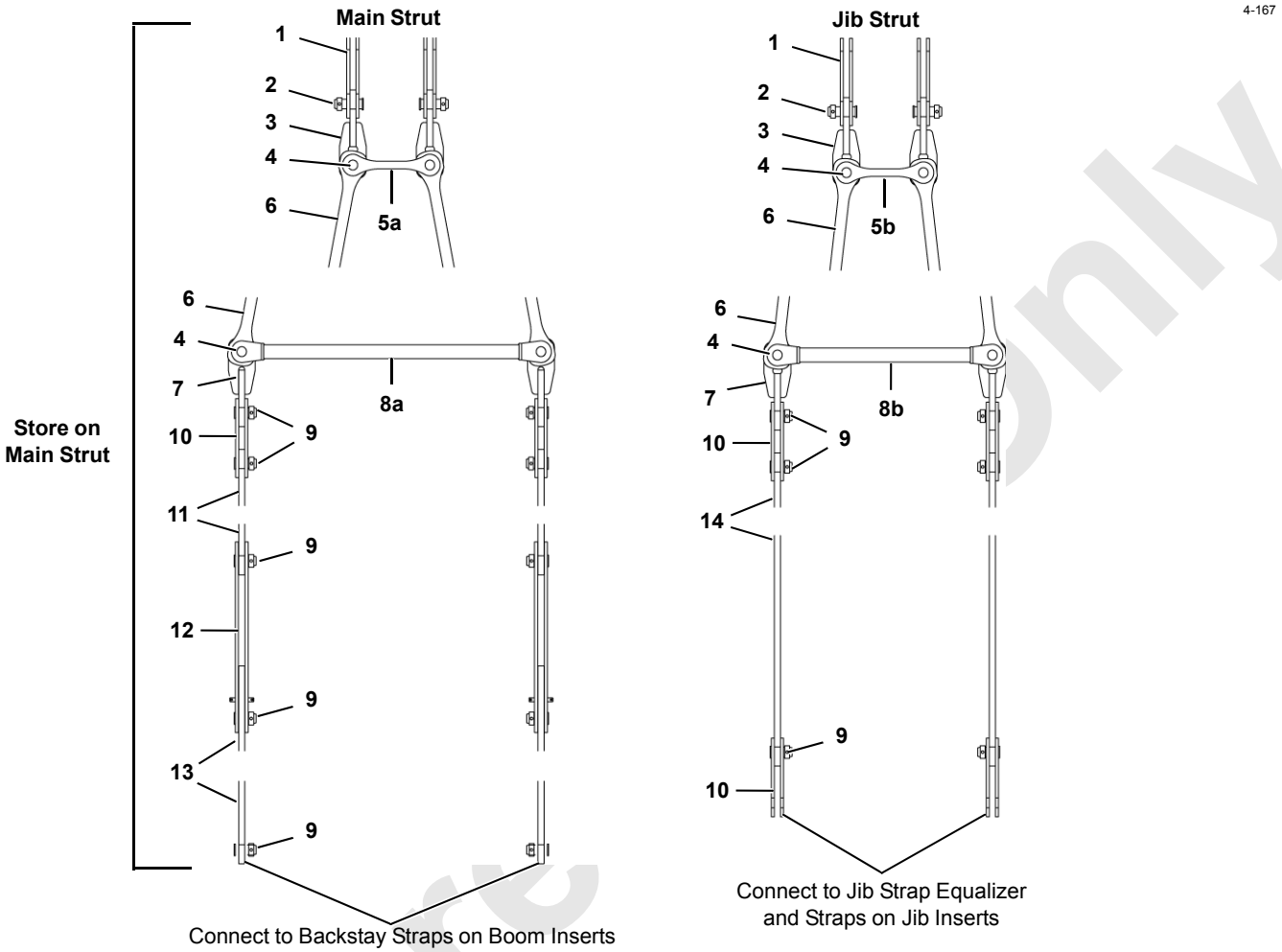
   Boxes must be equipped with tie link lugs.
2. Stack counterweight boxes (8, View F), one at a time, at jib strut top (4, View O).
3. Secure lifting lugs on top counterweight box (5) to lugs on jib strut top (4) with shackles and suitable slings (24, View F).
4. If desired, front counterweight tie links (9, View G) may be connected at this time. *Do not connect rear counterweight tie links (9, View E).*

Component Identification for Figure 4-23

Item	Description	Item	Description
1	Main Strut Butt	13	Backstay Strap
2	Jib Strut Butt	14	Link
3	Main Strut Top	15	Connecting Link
4	Jib Strut Top	16	Connecting Pin with Collar, Retaining Pin and Cotter Pins
5	Strut Support C	17	Removable Strap Bracket
6	Pin with Wire Locks	18	Strap Shipping Pin with Cotter Pin
7	Pin with Wire Locks	19	Retaining Pin with Cotter Pins
8	Crane Counterweight Boxes	20	Strut Stop Cylinder
9	Counterweight Tie Links	21	Adjustable Link
10	Strap Shipping Pin with Snap Pins	22	Strap Bracket
11	Strap Bracket	23	Connecting Pin with Collar, Retaining Pin and Cotter Pins
12	Storage Hole for Shipping Pin	24	Sling and Shackle

Install Backstay Straps on Main Strut

1. Install backstay straps on main strut as shown in Figure 4-24.
2. Adjust length and position of straps (14) as shown on Luffing Jib Rigging Drawing.



Item	Description	Length		Quantity
1 *	Link	50 in	1270 mm	4
2 *	Pin with Collar and Retaining Pin (3 in dia.)	10-1/16 in	256 mm	4
3	Link (3.375 in dia.)	18 in	457 mm	4
4	Pin with 2 Collars and Retaining Pins	10-5/8 in	270 mm	8
5a	Spreader	42-5/16 in	1075 mm	2
5b	Spreader	27-31/32 in	710 mm	2
6	Strap	14 ft, 0-5/8 in	4,5 m	8
7	Link	18 in	457 mm	4
8a	Spreader	94 in	2,4 m	1
8b	Spreader	84-1/2 in	2,146 mm	1
9	Pin with Collar and Retaining Pin (3 in dia.)	6-1/2 in	165 mm	10/6 main/jib
10	Link	8-5/8 in	219 mm	4/8 main/jib
11	Strap	105-1/4 in	2,7 m	2
12	Link	48 in	1,2 m	4
13	Adjustable Link	46-1/2 in	1181 mm	1
14	Strap	17 ft, 10-1/2 in	5.5 m	2

* These in corresponding Strut Top
NOTE: Links and Straps Hole-to-Hole, Pins are Overall Length

FIGURE 4-24

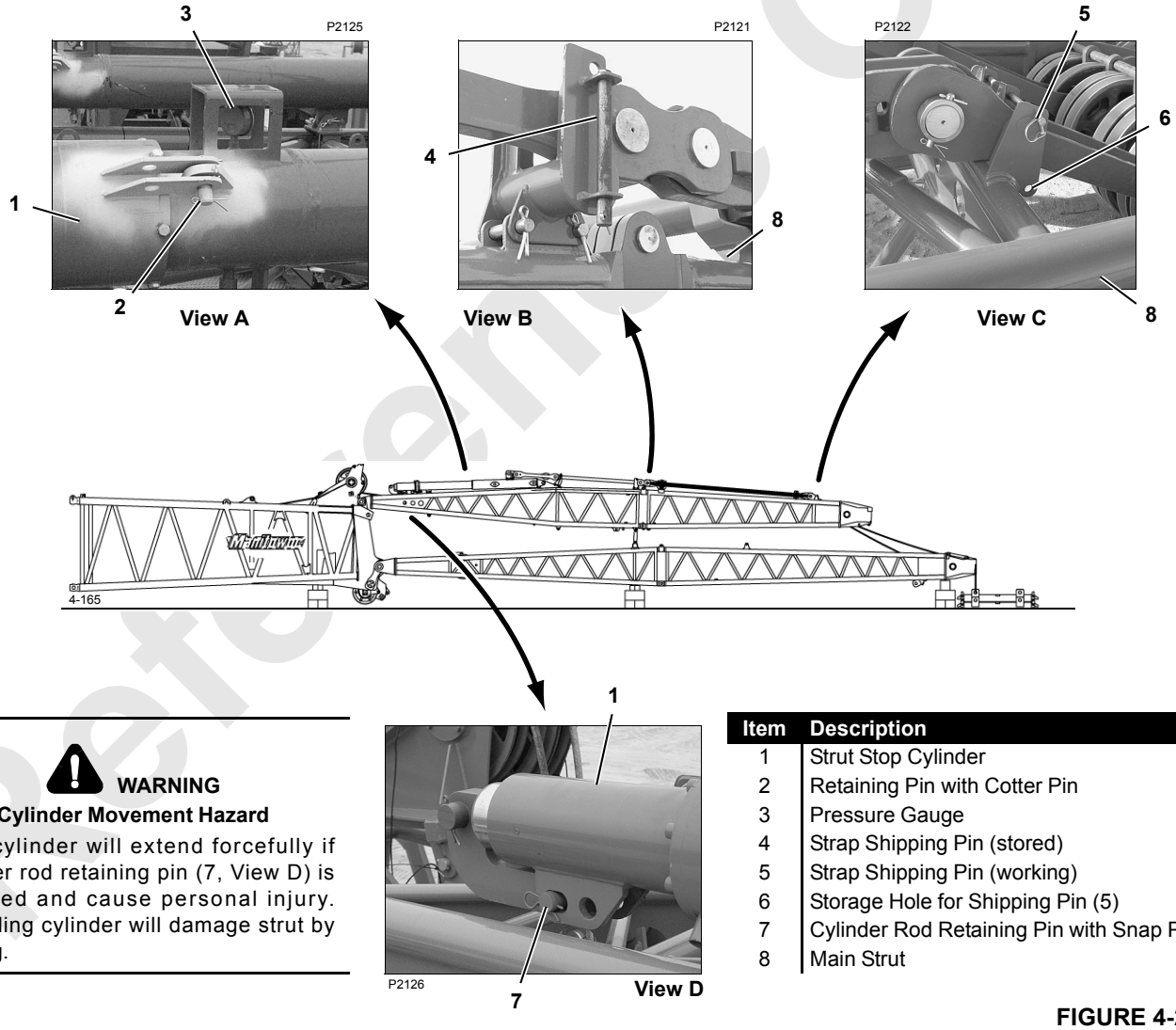
Raise Main Strut

See Figure 4-25 for the following procedure.

1. Make sure all strap storage pins (4, View B and 5, View C) on main strut (8) are stored.
2. Check that strut raising pendants are lying over strut backstay straps.
3. Verify that top of jib strut is properly anchored to counterweight (Figure 4-23, Views E, F, and G).
4. Check strut stop cylinder to verify the following:
   - Strut stops (1) are fully retracted and retaining pins (2, View A) are installed.
   - Strut stops are pinned to strut butt. ***Do not remove pin (7, View D).***
   - Precharge pressure on strut stop pressure gauges (3, View A) corresponds to pressure in the following table:

Ambient Temperature	Pressure
Interpolate as Required	
30°F (-1°C)	230 ± 5 psi (15,8 ± 0,3 bar)
50°F (10°C)	240 ± 5 psi (16,5 ± 0,3 bar)
70°F (21°C)	250 ± 5 psi (17,2 ± 0,3 bar)
90°F (32°C)	260 ± 5 psi (17,9 ± 0,3 bar)

If difference in strut stop cylinder pressure is greater than 5 psi (0,3 bar) or pressures are not within limits specified in the preceding table, contact factory for assistance.



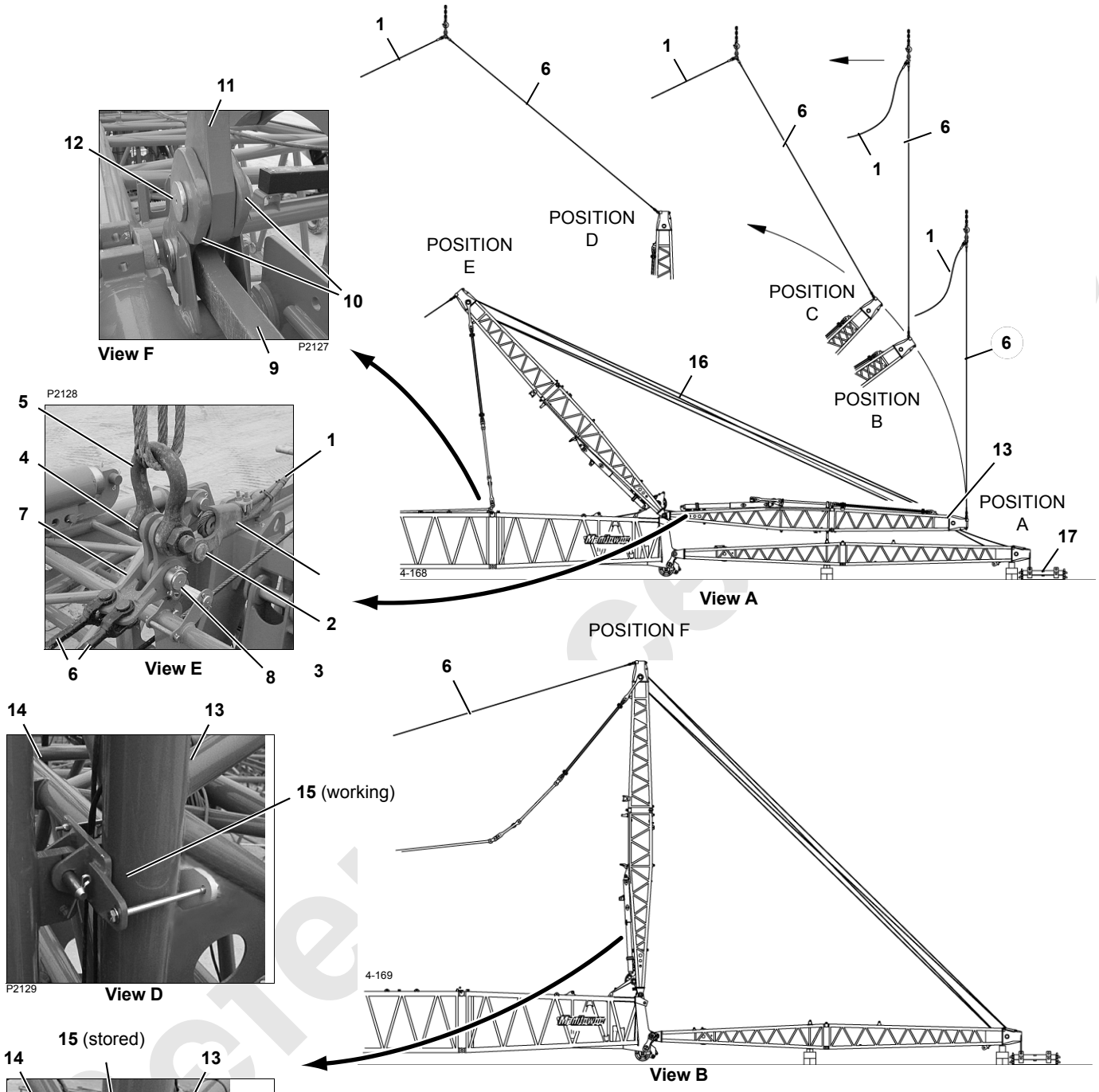
WARNING

Cylinder Movement Hazard

Strut cylinder will extend forcefully if cylinder rod retaining pin (7, View D) is removed and cause personal injury. Extending cylinder will damage strut by twisting.

Item	Description
1	Strut Stop Cylinder
2	Retaining Pin with Cotter Pin
3	Pressure Gauge
4	Strap Shipping Pin (stored)
5	Strap Shipping Pin (working)
6	Storage Hole for Shipping Pin (5)
7	Cylinder Rod Retaining Pin with Snap Pin
8	Main Strut

FIGURE 4-25



Item	Description	Item	Description
1	Drum 3 Load Line	10	Link
2	Socket	11	Strut Backstay Strap
3	Pin with Cotter Pin	12	Pin with Collar and Retaining Pin
4	Links	13	Main Strut
5	55 USt (50 t) Shackle	14	Strut Stop
6	Strut Handling Pendants	15	Retaining Pin with Cotter Pins
7	Link	16	Drum 3 Luffing Hoist Line
8	Pin with Collar and Retaining Pin	17	Upper Crane Counterweight Box
9	Boom Backstay Strap		

FIGURE 4-26

Raise Main Strut (continued)

See Figure 4-26 for the remaining steps.

5. Attach assist crane to main strut lifting links (4, View E) with user-supplied 55 USt (50 t) shackle (5, View E).

6. Connect Drum 3 load line (1) to links (4) as shown in View E.

- Use same socket used to anchor load line to boom or jib point.
- Make sure Drum 3 load line passes over Drum 3 guide sheave in mast.
- Make sure Drum 3 load line passes through center of the slack boom hoist wire rope reeving and over the boom hoist equalizer (which should be resting on boom rails).

NOTE: After the main strut is fully raised, it will be necessary to lift the boom hoist equalizer slightly to pass the load line under the equalizer.

7. Remove pins (8, View E) from links (4) on main strut (13) and raise links 2 - 3 ft (0,6 - 0,9 m). Store pins (8) in same holes after links are raised.

8. Slowly raise pendants (6) until it is taut (POSITION A, View A). Pay out Drum 3 load line (1), if required.

9. Continue to hoist pendants (6) to raise main strut (13) to POSITION B. Pay out Drum 3 load line (1) and luffing hoist wire rope (16) as strut rises.

Keep pendants (6) vertical during this step.

NOTE: Control hoist speed by observing upper counterweight box (17, View A). Upper box must not lift off lower box during strut raising procedure.

CAUTION

Overload Hazard!

Do not allow upper crane counterweight (17) box to lift off lower box at any time during strut raising procedure. Load line and pendants could be overloaded, possibly resulting in damage.

10. Once main strut is at approximately 45° (POSITION C, View A), slowly haul in Drum 3 load line (1) while paying out luffing hoist wire rope (16).

11. Follow with assist crane — pay out load line and travel —while performing step 10.

Do not induce any side load in main strut with assist crane. Load line from assist crane should remain vertical during strut raising procedure.

12. When main strut is approaching vertical — POSITION D, pay out load line from assist crane so that pendants (6) and Drum 3 load line (1) start to pull in a straight line.

13. Continue to luff down and haul in Drum 3 load line (1) while following with assist crane to lower main strut until backstay straps can be connected (POSITION E).

Watch closely as strut lowers so that load line does become tangled in boom hoist equalizer. Signal operator as required.

14. Connect backstay straps (11) to connecting links (10) using pins (12) (View F).

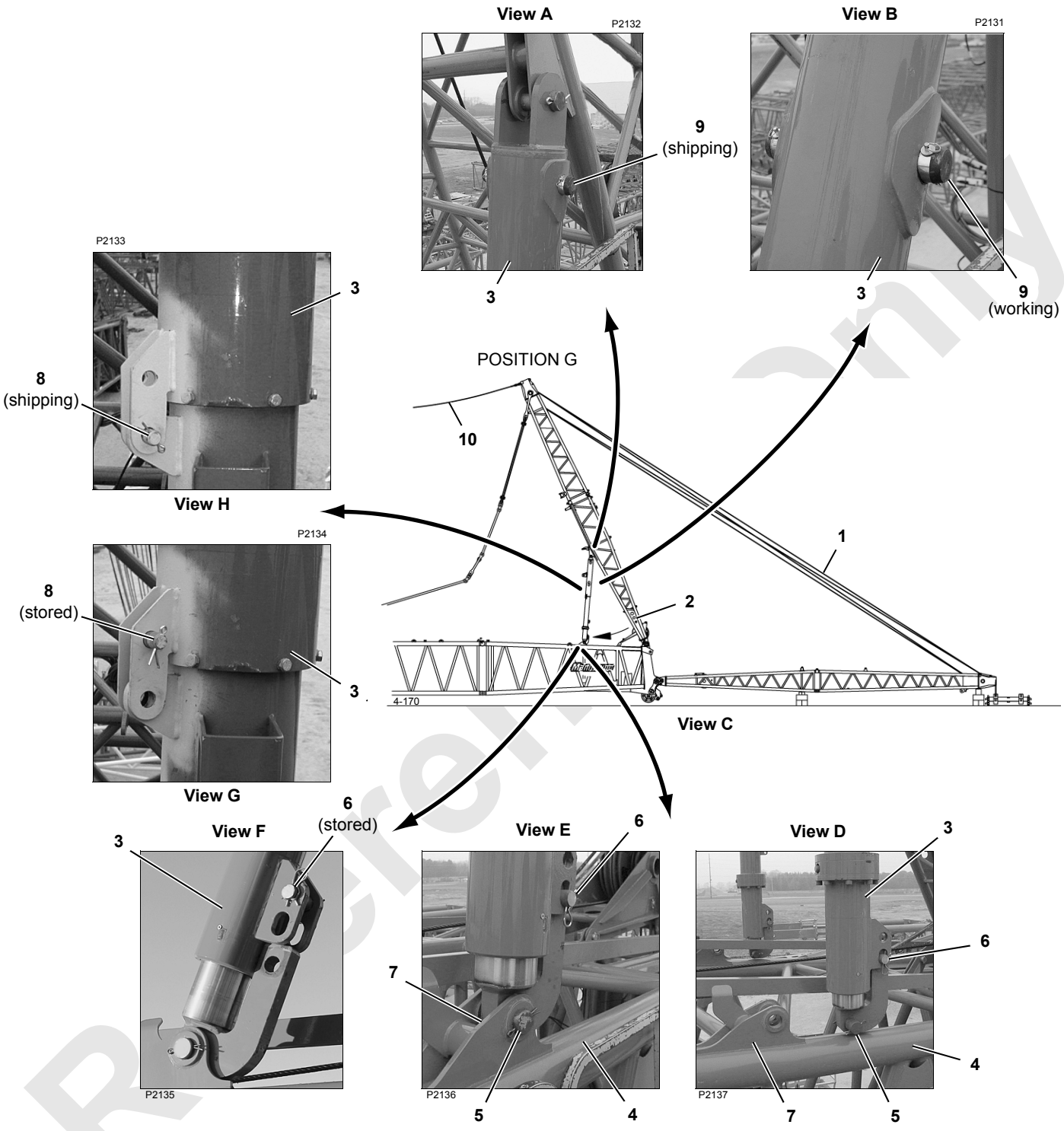
15. Connect rear tie links (9, Figure 4-23, View E) between two crane counterweight boxes at jib strut top.

16. Slowly luff up to raise main strut to POSITION F.

17. Remove retaining pins (15, View D) from strut stops (14).

Support strut stops when removing pins. Strut stops will swing away from main strut.

18. Store pins (15) in lugs on main strut (13, View C).



Item	Description	Item	Description
1	Luffing Hoist Line (Drum 6)	6	Cylinder Rod Retaining Pin
2	Main Strut	7	Lug
3	Strut Stop	8	Tube Retaining Pin
4	Boom Top	9	Strut Locking Pin
5	Pin with 2 Cotter Pins	10	Handling Pendants

FIGURE 4-27

Raise Main Strut (continued)

See Figure 4-27 for the remaining steps.

19. Slowly luff down to lower main strut (2) to rear – POSITION G (View C).

Stop when strut stops (3) are just above boom top (4) as shown in View D.

20. Remove pins (5, View D).

WARNING

Cylinder Movement Hazard

Strut cylinder will extend forcefully if cylinder rod pin (6, View D) is removed and cause personal injury. Extending cylinder will damage strut by twisting. Strut may fall.

21. Swing strut stops (3) to rear and position main strut (2) as needed to align holes in strut stop (3) with lugs (7) on boom top (View E).

22. Pin strut stops (3) to lugs (7) on boom using pins (5) (View E).

23. Remove tube retaining pins (8, View H) and store as shown in View G.

24. Remove strut locking pins (9, View A) from stored position.

25. Insert pins (9) in lower holes on outer stop tube (View B).

Luff up as needed to align holes in strut stops.

26. Pull strut slightly to rear by slowly hauling in Drum 3 hoist line slightly to remove load on cylinder rod retaining pins (6, View E).

CAUTION

Strut Damage!

Pulling strut too far to rear will damage strut and/or strut stop cylinders.

27. Remove retaining pins (6, View E) and store as shown in View F.

28. Slowly pay put Drum 3 hoist line. Cylinder rods will extend, allowing strut to rotate forward (View F).

29. Store handling pendants (10) and links:

a. Leave assist crane attached to the links at end of handling pendants (10).

b. Lower links with assist crane and pay out Drum 3 hoist line until handling pendants are hanging vertically between backstay straps.

Pendants will lie against cross brace between straps.

c. Disconnect Drum 3 hoist line from links and lay hoist line on top of boom.

d. Disconnect one handling pendant from links and allow pendant to hang vertically.

e. Use assist crane to lift other pendant (with links) back up and outside of jib backstay straps. Lower pendant to vertical and disconnect assist crane from links.

f. Repeat step 29e for other pendant.

g. Reconnect pendant to links and pin links with handling pendants to jib strut butt.

h. Use assist crane to lift Drum 3 hoist line into position behind boom hoist equalizer. Haul in excess line on Drum 3.

i. If Drum 3 hoist line will not be used, store it on Drum 3.

30. Disconnect crane counterweight from jib strut top (Figure 4-23, View F).

31. Disconnect tie links from counterweight boxes (Figure 4-23, Views E and G).

32. Remove boxes, one at a time, and install. Place one box on each side of crane counterweight

33. Reinstall wire rope guide bars (19a and 19b, Figure 4-22, View I).

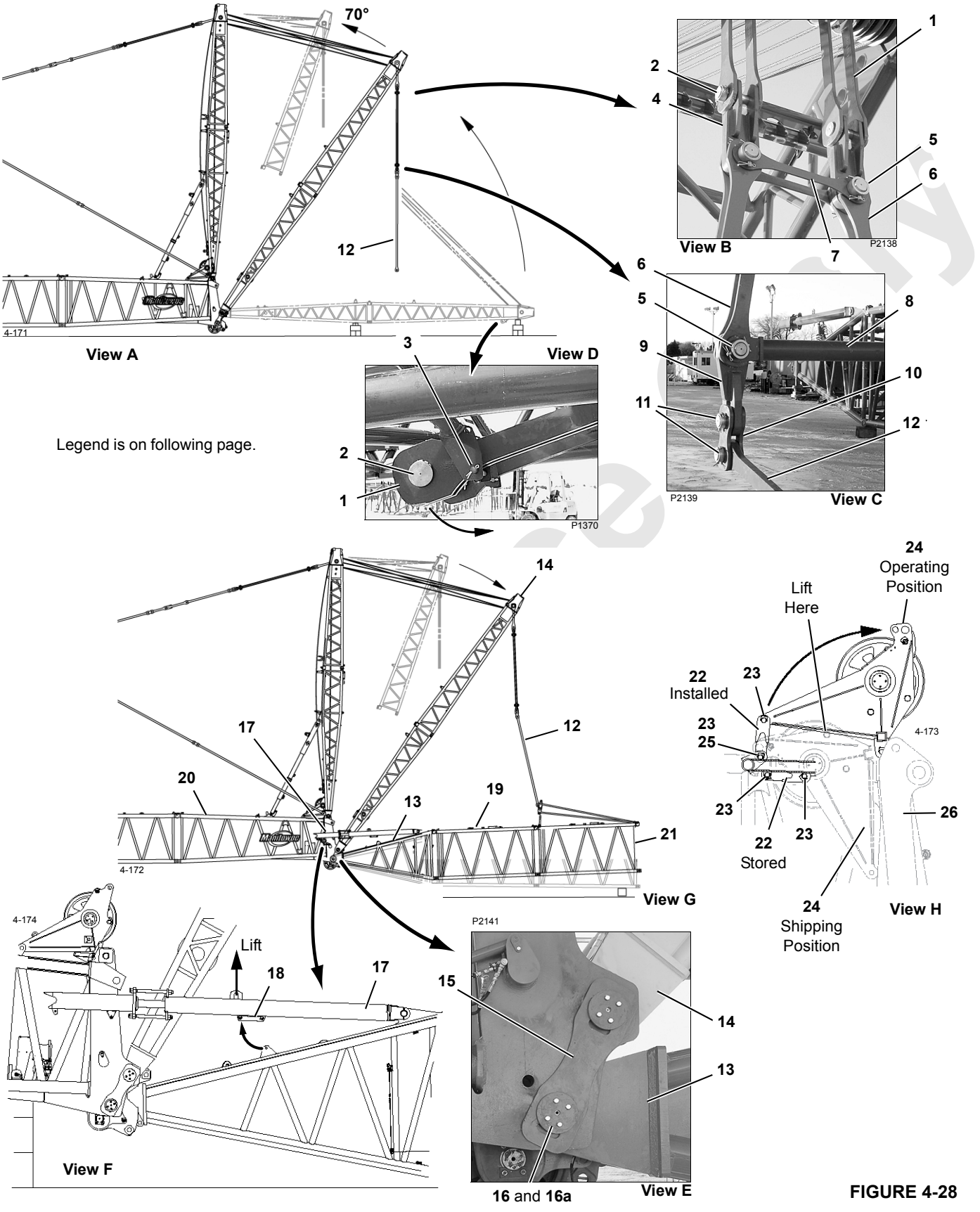

70°
12
4-171
View A
1
2
4
5
6
7
P2138
View B
6
5
8
9
10
11
12
P2139
View C
3
2
1
P1370
View D
Legend is on following page.
14
17
12
20
19
13
21
4-172
View G
24
Operating
Position
Lift
Here
22
Installed
23
23
25
4-173
23
26
22
Stored
23
24
Shipping
Position
View H
4-174
Lift
18
17
View F
P2141
15
14
13
16 and 16a
View E

FIGURE 4-28

Raise Jib Strut

See Figure 4-28, Views A – D for the following procedure.

1. Slowly luff up to raise end of jib strut to desired working height.
2. Support links (1) so they cannot fall and remove link storage pins (3) from shipping holes (View D).
3. Lower links (1). Store link storage pins (3) in shipping holes.
4. Connect links (4), spreaders (7, 8), and jib straps (6) to jib strut (14) as jib strut is raised (Views B and C).
5. Attach a 20 ft (6,1 m) long sling to end of each strap (12). Slings will be used to pull jib strut down later in procedure.
6. Slowly luff up to raise jib strut to no higher than 65° to 70° as shown in View A.

Install Jib

See Figure 4-28, Views E – G for the following procedure.

NOTE: Jib assembly is identical to boom assembly. The following instructions assume that assembly personnel already know how to assemble the boom (jib) sections. If in doubt, see Boom Rigging Guide in Crane Operator Manual.

See Luffing Jib Assembly drawing at the end of this section for proper positioning of jib sections.

1. Install Jib Butt and First Two Inserts:
   a. Assemble jib butt (13) and first two inserts (19, 21) on blocking in front of boom.
   b. Using nylon slings and a four point hookup from assist crane, hook onto butt and first two inserts. Wrap slings around chords only. *Do not use lifting lugs on butt or inserts and do not lift against lacings*.
   c. Lift jib butt and inserts into position at end of boom top (20) as shown in View G.
   d. Guide jib butt as required so jib stops (17) are outside of jib strut (14) as shown in View F.
   e. Align connecting holes in jib butt (13) with holes in boom top (20) and install keeper plates (15, View E) and end plates (16).
   f. Apply Loctite to jib strut and jib butt keeper plate cap screws. Securely tighten keeper plate screws. Torque to 100 ft-lb (136 Nm).
   g. Lower jib butt and inserts onto blocking approximately 8 in (203 mm) high.
2. Assemble remaining jib inserts and jib top in proper sequence as shown on Luffing Jib Rigging Drawing.
3. Unpin jib straps from stored position on inserts and connect links between straps.
4. Raise jib top wire rope guide:

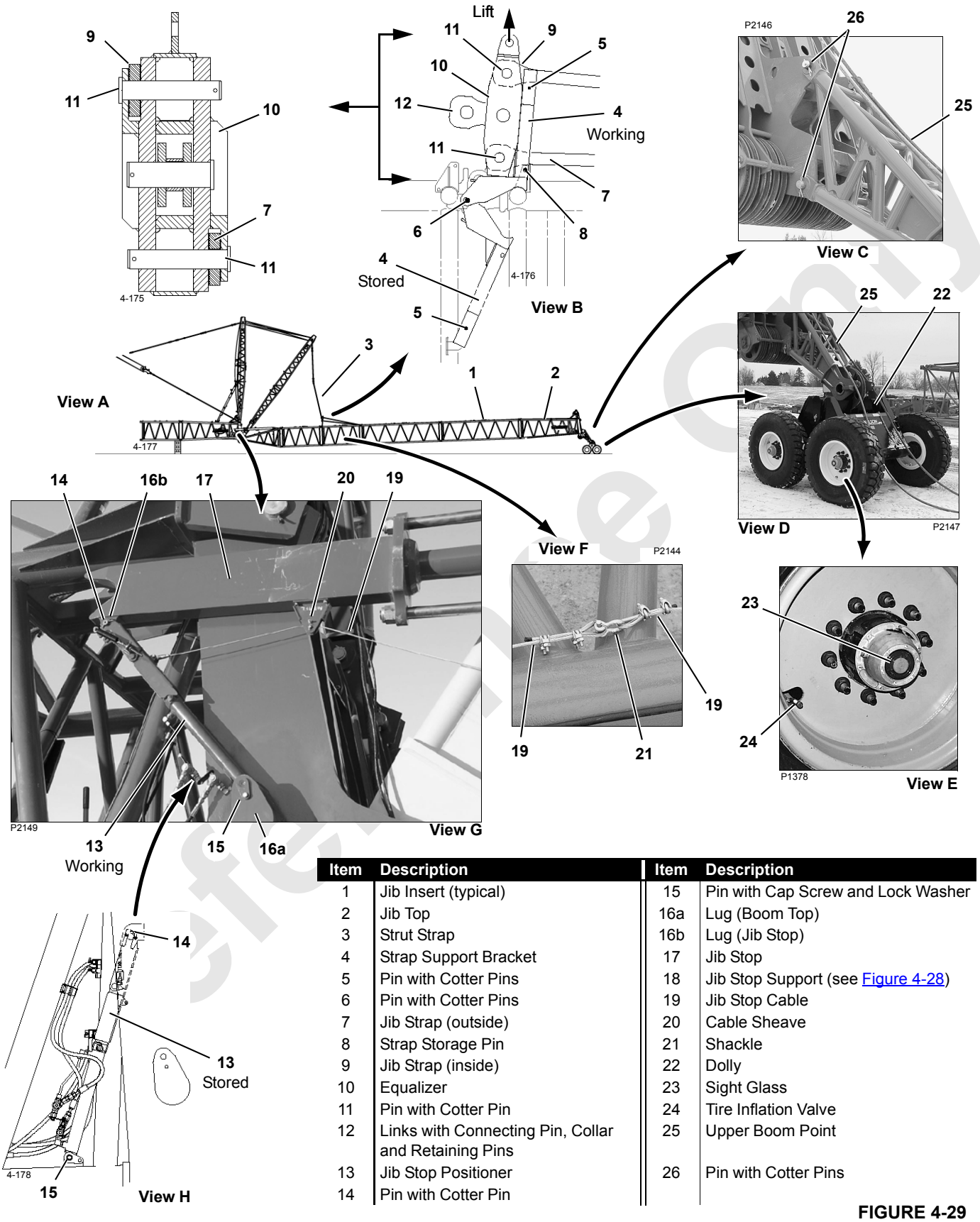
See Figure 4-28, View H for the remaining steps.

   a. Remove links (22) and pins (23) from storage.
   b. Support wire rope guide (24) with slings from assist crane.
   c. Remove pins (23) from lugs (25).
   d. Raise wire rope guide (24) to operating position.
   e. Pin links (22) to wire rope guide (24) and to lugs (25) with pins (23).***Wire rope will rub on jib point if links are not installed.***
   f. Store extra two pins (23) in link storage lugs.

Component Identification for Figure 4-28

Item	Description	Item	Description
1	Links (4)	15	Keeper Plate (2)
2	Pin w/Collar and Retaining Pin (2)	16	Pin (2)
3	Link Storage Pin (2)	16a	End Plate with Cap Screws (4)
4	Link (2)	17	Jib Stop
5	Pin w/Collar and Retaining Pin (4)	18	Jib Stop Support
6	Strap (4)	19	20 ft (6,1 m) Jib Insert with Bracket Lugs*
7	Spreader (2)	20	Boom Top
8	Spreader (1)	21	20 ft (6,1 m) or 40 ft (12,2 m) Insert*
9	Link (2)	22	Link (2)
10	Link (4)	23	Pin with Snap Pins (6)
11	Pin w/Collar and Retaining Pin* (4)	24	Wire Rope Guide
12	Jib Strap (2)	25	Lug (2)
13	Jib Butt (1)	26	#79A Luffing Jib Top
14	Jib Strut (1)		

Number in parenthesis ( ) equals quantity.
* See Luffing Jib Assembly drawing for quantity and installation location.



Item	Description	Item	Description
1	Jib Insert (typical)	15	Pin with Cap Screw and Lock Washer
2	Jib Top	16a	Lug (Boom Top)
3	Strut Strap	16b	Lug (Jib Stop)
4	Strap Support Bracket	17	Jib Stop
5	Pin with Cotter Pins	18	Jib Stop Support (see Figure 4-28)
6	Pin with Cotter Pins	19	Jib Stop Cable
7	Jib Strap (outside)	20	Cable Sheave
8	Strap Storage Pin	21	Shackle
9	Jib Strap (inside)	22	Dolly
10	Equalizer	23	Sight Glass
11	Pin with Cotter Pin	24	Tire Inflation Valve
12	Links with Connecting Pin, Collar and Retaining Pins	25	Upper Boom Point
13	Jib Stop Positioner	26	Pin with Cotter Pins
14	Pin with Cotter Pin		

FIGURE 4-29

Install Jib Strap Equalizers

See Figure 4-29, View B for the following procedure.

1. Remove strap support brackets (4) from stored position and install in working position.
2. Rest outside strap (7) on top of strap storage pin (8) (installed in strap support on insert).
3. Rest inside strap (9) on top of pin (5) (installed in strap support bracket).
4. Remove pins (11) from equalizer (10).
5. Lift equalizer (10) into position at ends of straps (7 and 9).
6. Pin equalizer to straps (7 and 9) with pins (11).

Connect Jib Strut Straps to Equalizers

See Figure 4-29 for the following procedure.

1. Using assist crane connected to slings on strut straps (3, View A), pull jib strut forward and down until strut straps can be connected to equalizer links.
2. Pay out luffing hoist wire rope as strut is pulled forward.

NOTE: Jib strut is not heavy enough to overhaul luffing hoist wire rope. Approximately 15,000 lb (6 804 kg) of pull is required.

3. Pin strut straps (3) to equalizer links (12, View B) with pin heads facing outside of jib.

Complete Jib Assembly

1. Install jib stop positioner, one side at a time:

See Figure 4-28, View F, steps a - c for the following procedure.

   a. Attach assist crane to lifting lug on jib stop (17, View F).
   b. Support jib stop with assist crane and unpin jib stop support (18) from jib butt.
   c. Pin support to jib stop for storage.

See Figure 4-29 for steps d - h

   d. Loosen spring tension on positioner safety latch only enough to allow removal of pins (14 and 15, View H).
   e. Remove jib stop positioner (13) from storage (View H).
   f. Pin jib stop positioner (13, View G) to lug (16a) on boom top and to lug (16b) on jib stop (17).
   g. Disconnect assist crane.
   h. Tighten eye bolt until positioner safety latch spring is tensioned to approximately 9 in (229 mm) long (see Figure 4-30, View F).

2. Route cable (19, Figure 4-29, View G) through cable sheaves (20) on jib stop and in boom butt and pin cable to jib stop.
3. Connect other end of cable to cable from hand winch as shown in View F.

Prepare Jib Dolly

See Figure 4-29 for the following procedure.

Check the following items each time dolly (22, View D) is used:

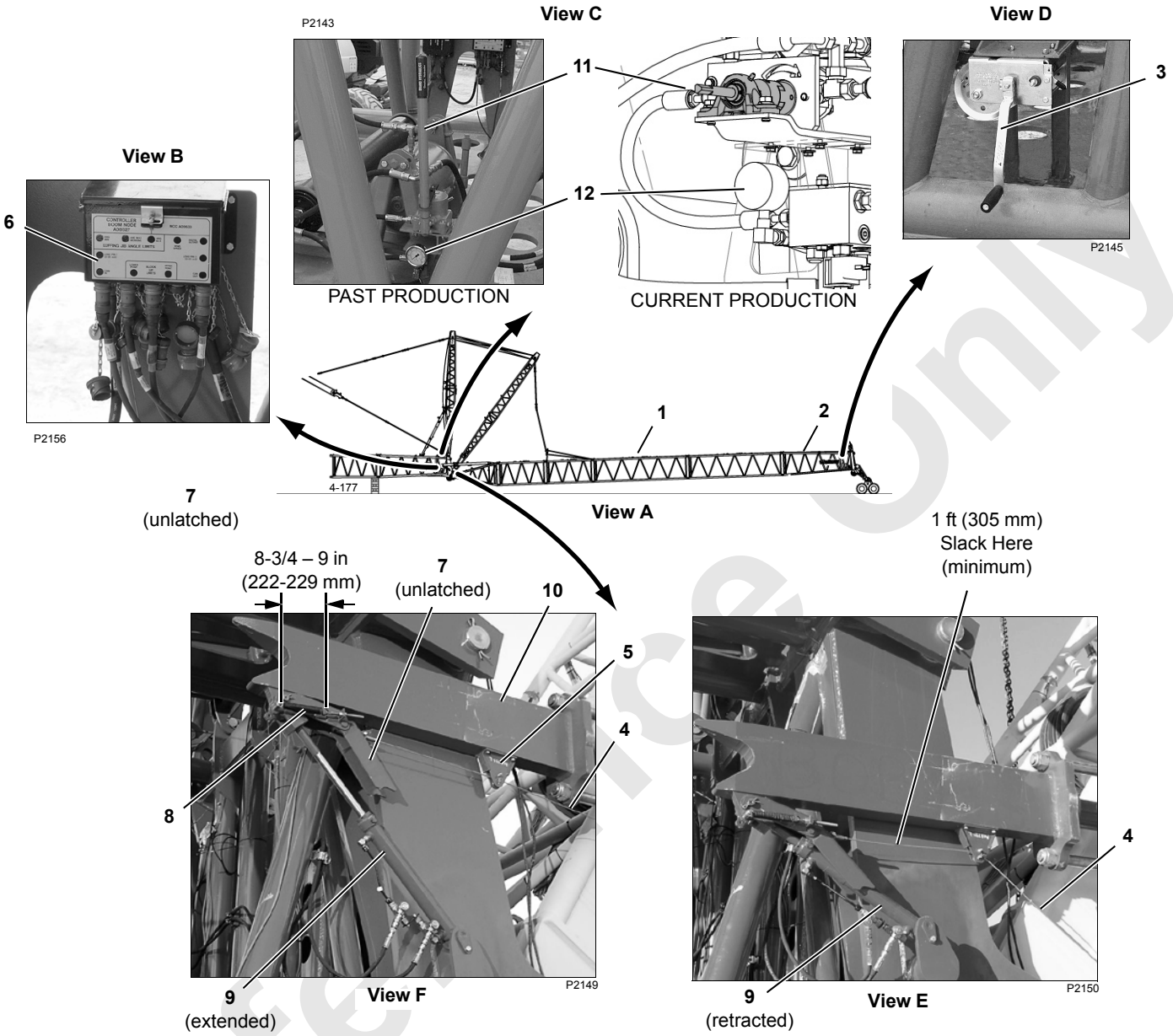
1. Tire pressure at inflation valve (24, View E). Inflate to 112 psi (7,7 bar) if necessary.
2. Oil level in wheel hubs. Fill, if required, to FULL ring in sight glass (23, View E). Use same gear oil used in drum planetaries on crane.

Install Jib Dolly

See Figure 4-29 for the following procedure

An assist crane capable of lifting half the weight of the jib is required for the following procedure. A fork-lift truck is required to handle the upper jib point.

1. Attach slings from assist crane to end of jib top.
2. Lift jib top with assist crane.
3. Install upper jib point:
   a. Using a fork-lift truck, lift upper jib point (25, View C) into position at jib top.
   b. Pin upper jib point to jib top with pins (26, four places).
   c. Remove fork-lift truck.
4. Position dolly (22, View D) under upper jib point (25) with the longest guide forward and to the right.
5. Lower jib top so upper point engages saddles in dolly.
6. Disconnect assist crane.



Item	Description	Item	Description
1	Jib Insert (typical)	7	Safety Latch
2	Jib Top	8	Spring
3	Hand Winch	9	Hydraulic Cylinder
4	Cable	10	Jib Stop
5	Cable Sheave	11	Pump Handle
6	Junction Box	12	Pressure Gauge

FIGURE 4-30

Install Jib Load Line

Route load lines through proper guide sheaves on boom butt, on boom top, and in jib strut. The position of the guide sheaves in the strut must match the guide sheaves on the boom top.

Pull load lines approximately 40 ft (12,19 m) past end of jib and lay them on ground. Securely fasten load lines to jib point. Install load block after boom and jib have been jack-knifed into position and dolly has been removed.

NOTE: Load block(s) will be installed after boom and jib are jack-knifed to required angle.

WARNING

Falling Wire Rope Hazard!

For long boom and short jib combinations, wire rope on boom side of attachment can overhaul unsecured wire rope on jib side of attachment. Wire rope could fall off boom. Securely fasten load line to jib point before raising attachment.

Connect Electric Cords/Adjust Electronic Devices

1. Connect electric cords to respective junction boxes and switches. See Boom Wiring Diagram at the end of this section.
   - Angle indicator on jib butt
   - Jib stop limit switches on boom top
   - Block-up limit reel in jib butt
   - Block-level sensor switches
   - Jib stop positioner electrical valve
   - For hard-wired load links (if equipped): install load link, associated links, and swivel. Route and secure load link cord so that during erection and operation the link can pivot without pulling on the cord or interfering with other parts.
2. Connect all unused electric cords to proper terminating plugs on junction boxes.

NOTE: Block-up limit electric cords will be connected to limit switches after boom and jib are jack-knifed to required angle.

3. Adjust electronic devices according to instructions in Section 6 of this manual:
   - Boom stop
   - Luffing jib stop limit switches
   - Jib angle indicator
   - Block-level sensor switches (in this section)

Install Wind Speed Indicator Assembly

Install wind speed indicator if removed for shipping. Use star washers to attach mounting bracket to jib top to provide good a ground (see Wind Speed Assembly drawing at the end of this section).

Connect electrical cable at base of wind speed mounting bracket.

Set Up Jib Stop Positioners

See Figure 4-30 for the following procedure.

1. Pump hand pump or drill (11, View C) until pressure gauge (12) reads 2500 psi (172,3 bar).
2. Using hand winch (3, View D) in jib top, disengage safety latch (7, View F) in jib butt.
3. Adjust safety latch spring tension if necessary (View F).
4. Signal crane operator in operator's cab to retract positioner cylinders. Weight of jib stops retracts cylinders (9, View E).

WARNING

Structural Damage!

Raising boom and jib with jib stop positioner cylinders extended will result in structural damage. Be sure cylinders are retracted.

5. Using hand winch (3, View D) in jib top, release tension on safety latch cable (4).
6. Pay out additional cable and pull cable through jib as needed to provide at least 12 in (305 mm) slack ***at safety latch***. Slack is needed to allow latch engagement when cylinders are extended.

THIS PAGE INTENTIONALLY LEFT BLANK

Pre-Raising Checks

Make the following checks and correct any defects before raising the attachment.

- ☐ All installation steps given in this section performed.
- ☐ Boom and jib inserts installed in proper sequence according to Rigging Drawings.
- ☐ Boom, jib, and backstay straps installed in proper sequence and unpinned from storage positions.
- ☐ All connecting pins installed and properly retained.
- ☐ Boom and luffing hoist wire rope anchored properly to drums, spooled tightly onto drums, and engaged with proper sheaves. Make sure rope guard pins, bars, or rollers are installed to retain wire rope in sheaves.
- ☐ Main strut raised and strut stop tubes pinned in operating position.
- ☐ Main strut cylinders pressurized.
- ☐ Jib stop positioner cylinders retracted.
- ☐ Load lines anchored properly to drums, spooled tightly onto drums, and engaged with proper sheaves. Make sure rope guard pins, bars, or rollers are installed to retain wire rope on sheaves.
- ☐ Load line going to jib point is securely attached to end of jib so load line cannot fall off jib and boom.
- ☐ All blocking, tools, and other items removed from boom and jib and from dolly travel path.
- ☐ All safety devices installed, electric cords connected, and limits adjusted.
- ☐ Raising instructions in this section read and thoroughly understood.
- ☐ Proper amount of crane counterweight and, if required, MAX-ER counterweight installed.
- ☐ Wind within allowable limits for raising boom and jib.
- ☐ All lubrication points greased.
- ☐ LUFFING JIB mode selected and confirmed.

WARNING

Falling Boom And Jib Hazard!

Select and confirm LUFFING JIB mode. Operating in any other mode with luffing jib attached is prohibited. Jib stop positioner cylinders are extended and will cause structural damage.

Luffing jib limits are disabled when LUFFING JIB mode is off. Boom and jib could be pulled over backwards.

Raising Boom and #79A Luffing Jib

General

ALL boom and jib combinations must be raised and lowered using the ***Jack-Knife Method.*** See the Liftcrane Luffing Jib Capacities Chart to determine the following:

- Counterweight Requirements (crane and MAX-ER)
- Boom to Luffing Jib Angle
- Maximum Boom and Jib Lengths Raised or Lowered:
  - Over end of blocked crawlers
  - Over end or side of unblocked crawlers

4

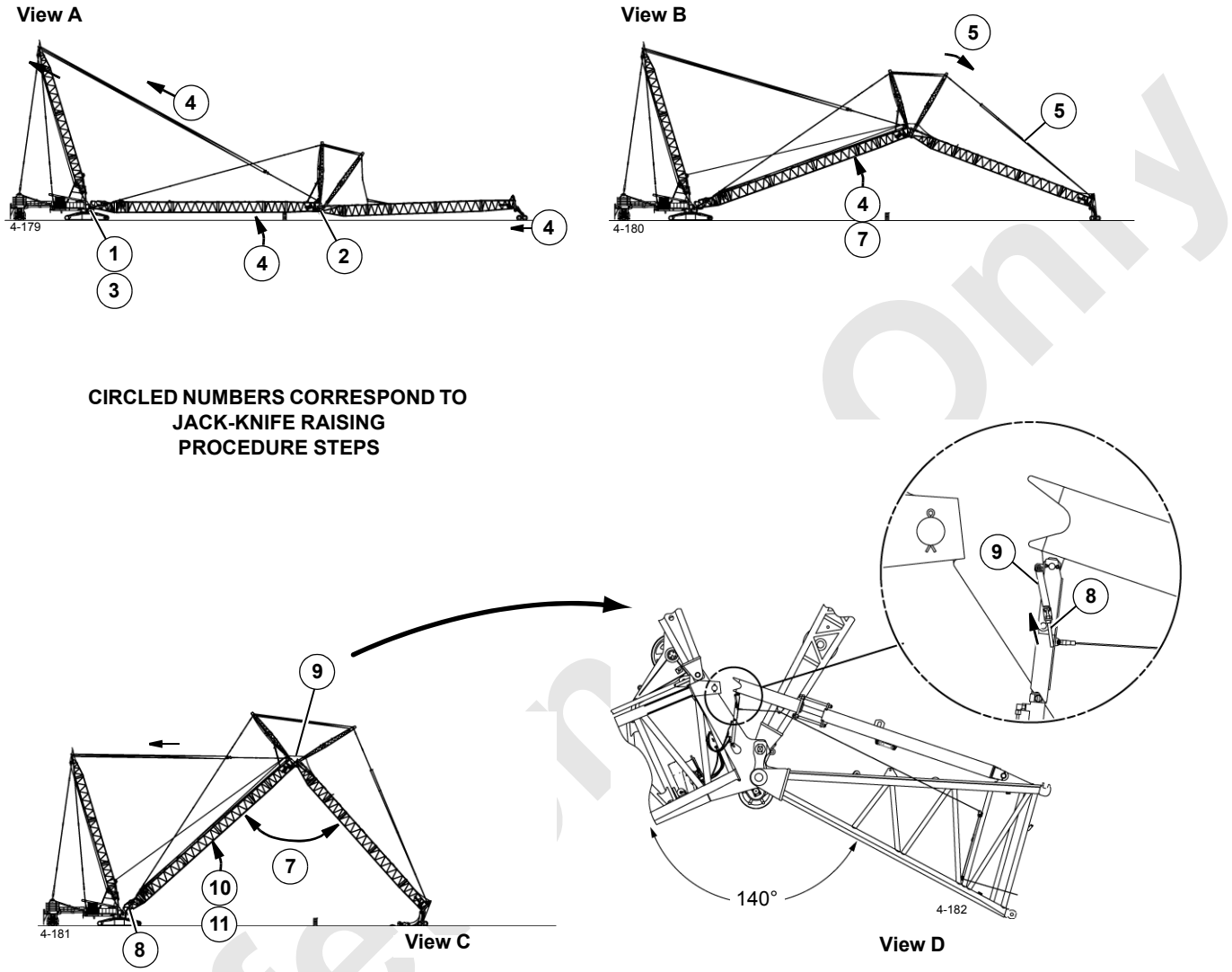


Figure 4-31

Jack-Knife Raising Procedure

Circled numbers in Figure 4-31 correspond to numbered steps in the following procedure.

WARNING

Moving Part Hazard!

Warn all personnel to stand clear of jib point dolly while raising boom and jib.

Death or severe crushing injuries will occur if personnel come into contact with dolly.

WARNING

Tipping Hazard!

Determine BOOM TO LUFFING JIB ANGLE that boom and jib must be jack-knifed to before jib can be raised (see Raising Procedure Chart). Crane will tip or structural damage will result if specified angle is not adhered to.

Monitor angle on digital display as boom and jib are raised.

CAUTION

Structural Damage!

Avoid possible structural damage to boom and jib from side loading as boom and jib are raised:

Disengage swing lock and release swing brake until boom and jib have been raised to required boom to luffing jib angle.

Retract jib stop positioner cylinders before beginning to raise boom and jib.

NOTE: It is normal for the following limits to come on during the raising procedure:

BLOCK UP – this fault will go off once the boom and luffing jib are raised and the load lines/block-up limit chains are hanging freely.

MAX UP 1 and MAX UP 2 – these faults go off once boom to luffing jib angle is less than 169.2 to 170°.

1. Determine boom to luffing jib angle that boom and jib must be raised to before jib can be raised (see Liftcrane Luffing Jib Capacities Chart).
2. Signal crane operator to retract positioner cylinders with mode switch.
3. Disengage swing lock, release swing brake and slowly boom up.

   Jib point dolly will roll along ground as boom and jib are jack-knifed into position.
4. Pay out load line as boom and jib are raised.
5. Jib and backstay straps will tighten as boom and jib rise.

   Signal person, watch jib straps and jib point dolly along left side of jib as boom and jib are raised. Do not allow jib point to rise off dolly.

WARNING

Tipping Hazard!

Do not allow jib straps to become too tight during raising steps. Crane will tip or structural damage will result.

Do not allow jib straps to become too slack during raising steps. Straps will bounce against jib inserts, possibly resulting in damage.

Signal operator to pay out luffing hoist wire rope (luff down) so jib straps remain slack. Do not allow straps to become too slack or they will bounce against jib inserts. Keep jib straps 2-1/2 – 3-1/2 ft (0,76 – 1,07 m) above strap supports at end of jib top.

It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

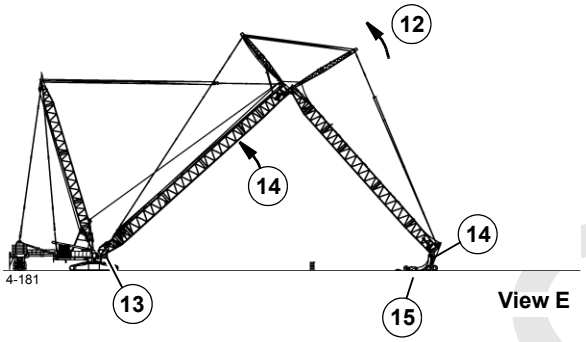
6. Continue slowly with Jack-Knife Raising Procedure.
7. Stop raising boom when boom to jib angle is 140°. ***Monitor this angle on digital display***.
8. Signal crane operator to extend positioner cylinders. See LJIB STOP MODE topic in Section 3 of this manual for the procedure. The cylinders will extend and remain pressurized.
9. Verify that safety latches are in position and will prevent cylinders from retracting.

WARNING

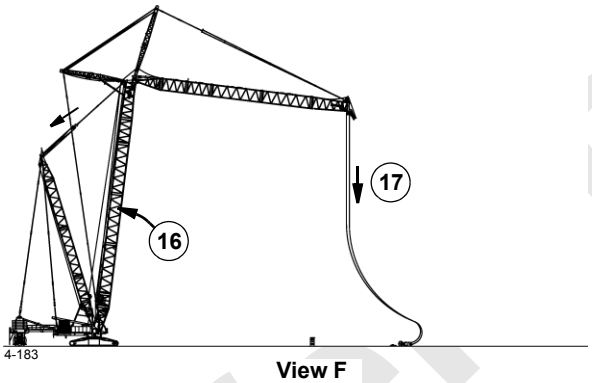
Falling Jib Hazard!

Jib can fall over backwards if steps 8 and 9 are not performed.

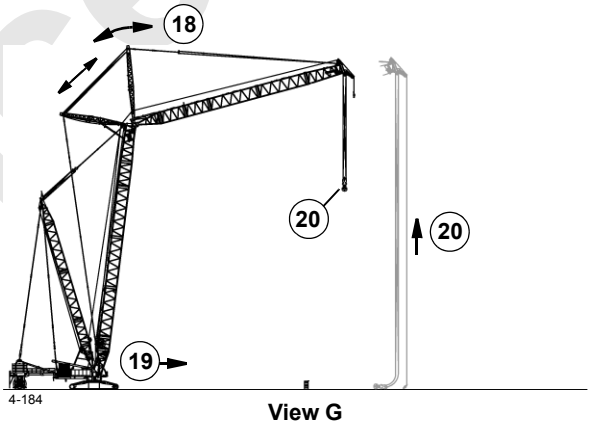
10. Continue slowly with Jack-Knife Raising Procedure.
11. Stop raising boom when boom and jib have been positioned at required boom to luffing jib angle. ***Monitor this angle on digital display***.



View E



View F



View G

FIGURE 4-31 continued

WARNING

Falling Jib Hazard!

Do not position boom and jib at any boom to luffing jib angle less than minimum stop (70°). Structural damage to jib butt will occur, possibly causing jib to collapse.

When boom and jib are at proper angle, jib stop saddles will be in position to automatically engage pins in boom top.

12. Slowly luff up until jib straps start to go into tension and stop.
13. Apply swing brake.
14. Boom up to raise jib point clear of dolly and remove dolly.
15. Install load blocks or weight ball (see Load Block Reeving in this section.

WARNING

Falling Load Hazard!

Do not lift load blocks or weight balls off ground until boom has been raised to desired operating angle and jib has been positioned at required operating radius for load to be handled. Structural damage can occur and attachment can collapse if this precaution is not observed.

WARNING

Falling Load Hazard!

Load lines going up boom can overhaul load lines going down jib. Do not untie load lines from jib until load blocks or weight balls have been installed. Load lines can fall off boom if this precaution is not followed.

16. Slowly raise boom and jib to desired boom angle (see capacity chart for boom angles).
17. Pay out load line as boom and jib are raised.
18. Position jib at required operating radius.
19. Travel forward until load blocks and/or weight balls are directly below jib point.
20. Lift load blocks and/or weight balls to desired position.

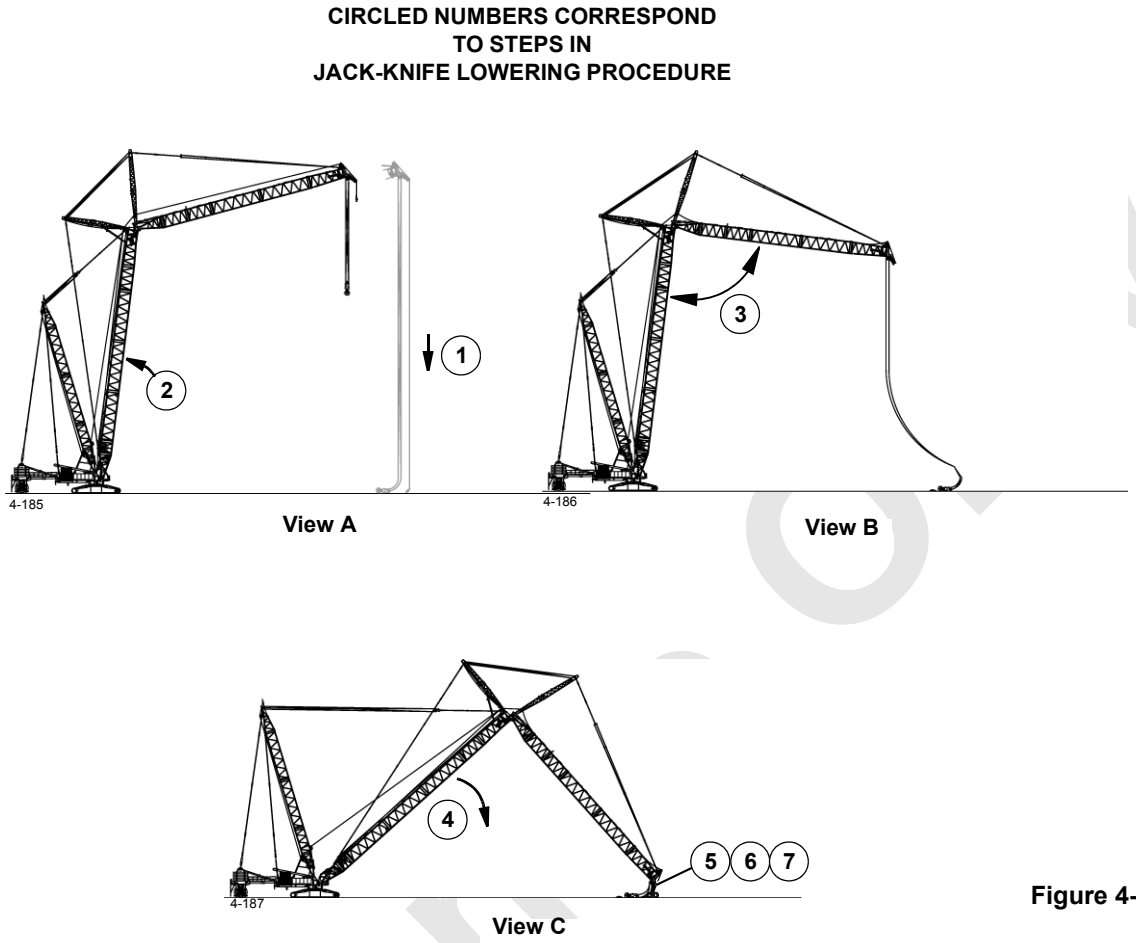


Figure 4-32

Lowering Boom and #79A Luffing Jib

General

ALL boom and jib combinations must be raised and lowered using the ***Jack-Knife Method.*** See the Liftcrane Luffing Jib Capacities Chart to determine the following:

- Counterweight Requirements (crane and MAX-ER)
- Boom to Luffing Jib Angle
- Maximum Boom and Jib Lengths Raised or Lowered:
  - Over end or side of blocked crawlers
  - Over end or side of unblocked crawlers

Jack-Knife Lowering Procedure

DANGER

Moving Part Hazard!

Warn all personnel to stand clear of jib point dolly while lowering boom and jib.

Death or severe crushing injuries will occur if personnel come in contact with tires.

See Figure 4-32 for the following procedure.

NOTE: Item numbers in Figure 4-32 correspond to numbered steps in the following procedure.

It is normal for the BLOCK UP, MAX UP 1, and MAX UP 2 limits to come on during the lowering procedure.

1. Swing boom and jib slightly to either side of center and lower load block or weight ball onto ground. Then swing boom and jib to desired position with relation to crawlers and apply swing brake.

   Adhere to raising and lowering limitations given in Liftcrane Luffing Jib Capacities Chart.

WARNING

Tipping Crane Hazard!

Lower load block or weight ball onto ground before lowering boom and jib. Structural damage can occur and attachment can collapse if this precaution is not observed.

DANGER

Tipping Crane Hazard!

Do not lower boom and jib to ground until boom has been positioned at minimum angle of 85° and jib has been positioned at specified boom to luffing jib angle. Crane will tip, or structural damage will occur, possibly causing attachment to collapse.

2. Raise boom to a minimum angle of 85°.
3. Position jib at required boom to luffing jib angle (see Luffing Jib Raising Procedure Chart).

   Monitor angles given in the following procedure on digital display.

WARNING

Tipping Crane Hazard!

Do not allow boom to luffing jib angle to become less than 70°. Structural damage to jib can occur.

CAUTION

Structural Damage!

Side loading can cause structural damage to boom and jib as boom and jib are lowered.

Disengage swing lock and release swing brake when jib point rollers contact ground.

CAUTION

Jib Point Damage!

Do not allow upper jib point to contact ground while lowering luffing jib. Damage will occur.

4. Slowly lower boom until upper jib point is approximately 6 ft (1,8 m) off ground.

   It will be necessary to use limit bypass switch to lower boom if BLOCK UP limit is on.

5. Remove load blocks or weight balls:

   a. Remove block-up limit weights and chains and connect block-up limit electric cords to terminating plugs on junction boxes.

   b. Securely fasten load lines to jib point so load lines cannot fall off boom and jib.

WARNING

Falling Wire Rope Hazard!

For long boom and short jib combinations, wire rope on boom side of attachment can overhaul unsecured wire rope on jib side of attachment. Wire rope could fall off boom. Securely fasten load lines to jib point before removing load blocks or weight balls.

6. Check dolly oil level and tire pressure (Figure 4-29, View F).
7. Using a fork-lift truck, lift jib point dolly into position under jib top. Lower boom (and jib) so upper jib point engages saddles in dolly (see Figure 4-29, View F).

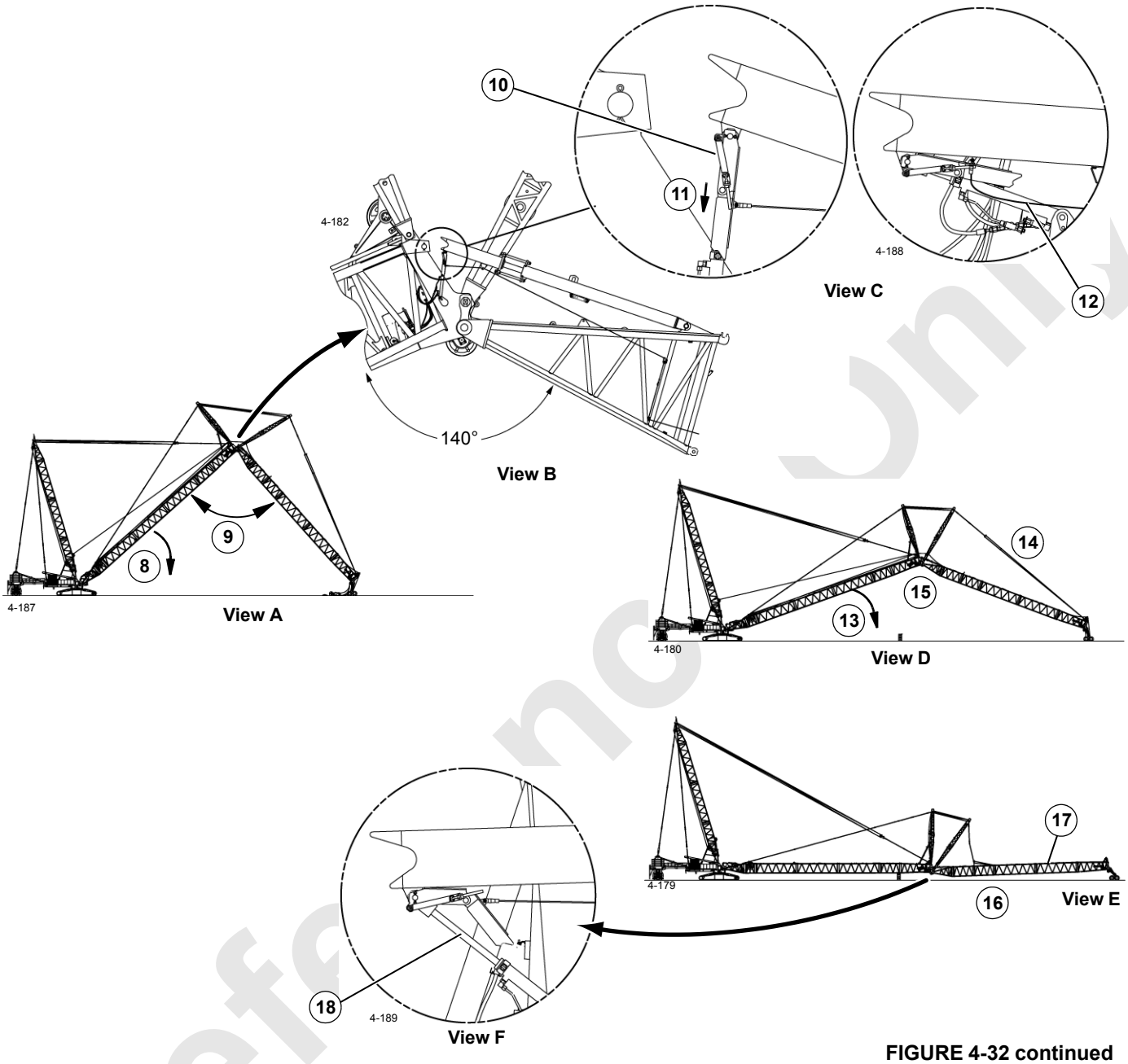


FIGURE 4-32 continued

8. Release swing brake (disengage swing lock) and slowly boom down. Jib point dolly will roll along ground as boom and jib are lowered.
9. Boom down until boom to luffing jib angle is 140° (View A).

   Pay out load lines as boom and jib are lowered.
10. Release jib safety latch with hand winch (3, Figure 4-29, View D) in jib top.
11. Signal crane operator to retract positioner cylinders. See LJIB STOP MODE topic in Section 3 of this manual for the procedure. Weight of jib struts will retract cylinders (View C).
12. Release tension on safety latch cable allowing enough slack for engagement when cylinders are extended.

CAUTION

Jib Stop Damage!

Do not luff down until steps 10, 11, and 12 are performed. Jib stops could be damaged.

13. Continue to boom down slowly.

    Pay out load lines as boom and jib are lowered.

    Signal person, watch jib stops to verify that stops do not engage pins in boom top.

14. Jib straps will slacken as boom and jib lower (View D).

    Signal person, watch jib straps along left side of jib as boom and jib are lowered. Do not allow straps to become too slack or they will bounce against jib inserts. Signal operator to haul in luffing hoist wire rope (luff up) so jib straps remain 2-1/2 – 3-1/2 ft (0,76 – 1,07 m) above strap supports at end of jib top. ***Do not allow jib straps to go into tension.***

    It will be necessary to use limit bypass switch to luff down if BLOCK UP limit is on.

WARNING

Tipping Hazard!

Do not allow jib straps to become too tight during lowering steps. Crane will tip or structural damage will result.

Do not allow jib straps to become too slack during lowering steps. Strap connectors will bounce against jib inserts, possibly resulting in damage.

15. Continue to boom down approximate boom to luffing jib angle shown in View D and stop booming down and luffing up.

    Luff up or down as required to position jib straps 2-1/2 – 3-1/2 ft (0,76 – 1,07 m) above strap supports at end of jib top.

16. Boom down until connectors between jib butt and first jib insert are approximately 6 in (150 mm) from ground.

17. Make sure jib straps lower into strap supports at ends of inserts.

18. Signal crane operator to extend cylinders with the mode switch. Cylinders will extend (View F) and remain extended.

Removing #79A Jib

Remove Jib Load Line

Jib load line will be used to lower main strut later in the removal procedure. Haul in load line on Drum 3 until end of line is near boom hoist equalizer.

Remove Jib Dolly

Reverse installation steps to remove jib dolly (Figure 4-29). *Do not lower jib onto ground.*

Remove Upper Jib Point

1. Support upper point with fork-lift truck.
2. Remove connecting pins (7, Figure 4-29, View E)
3. Lower jib onto blocking approximately 6 in (150 mm) high.

   Boom down as required so jib sections are parallel to ground.

Remove Jib

Jib removal is identical to boom removal. The following instructions assume that assembly personnel already know how to disassemble the boom (jib) sections. If in doubt, see Boom Rigging Guide in Crane Operator Manual.

WARNING

Tipping Hazard!
Crushing Injury Hazard!

Jib sections can collapse when connecting pins are removed.

Block both ends of each jib insert before removing connecting pins.

Never work under or inside jib sections that are not securely blocked.

Disassemble Jib

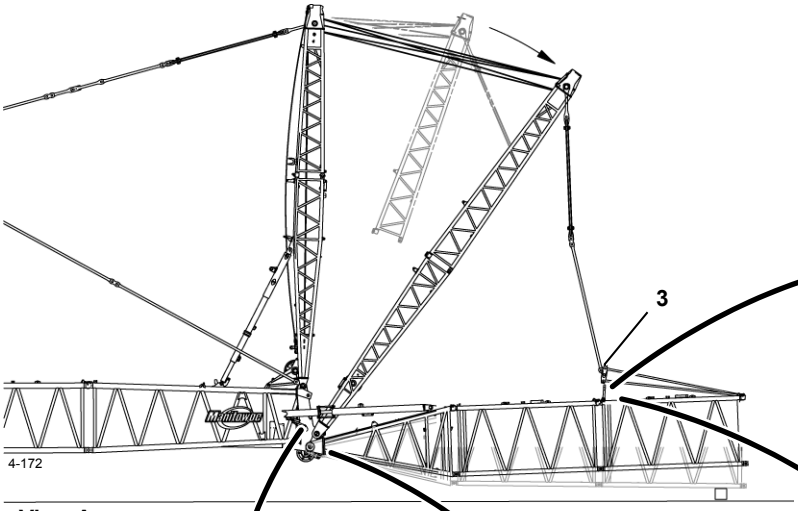
NOTE: Do not disassemble butt and first two inserts at this time.

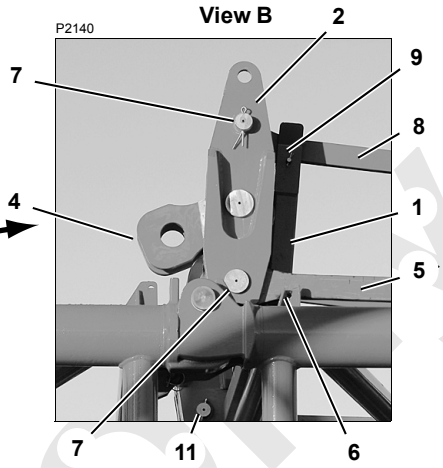
1. Remove jib top and all but two inserts next to jib butt.
2. Disconnect jib straps. Store links as shown in Figure 4-23, View J.
3. Store straps on jib sections.
4. Remove wind speed indicator from jib top to prevent damage during shipping.

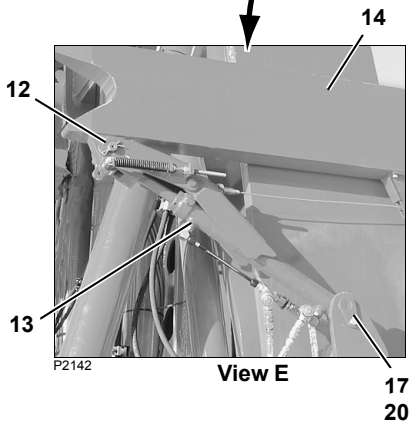
   a. Disconnect electrical cable at base of wind speed.

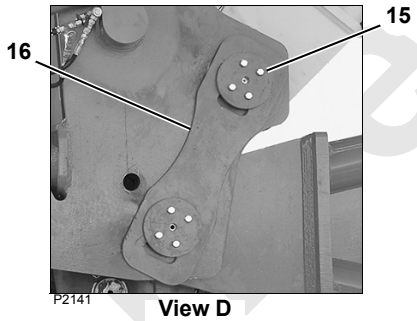
   b. Remove nuts, star washers, and bolts from base of wind speed mounting bracket.

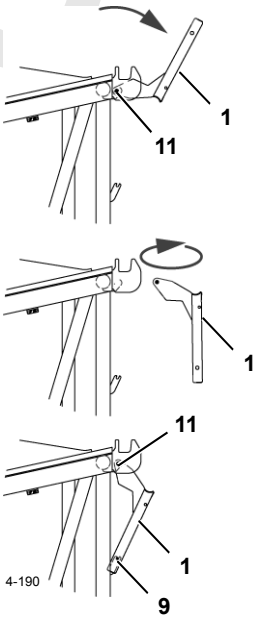
   c. Store indicator assembly in a safe place on crane.

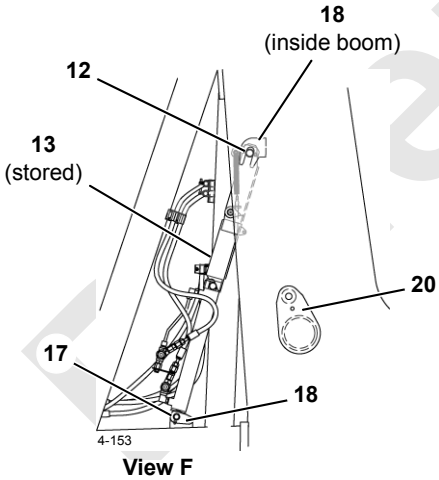












Item	Description	Item	Description
1	Strap Support Bracket	11	Pin
2	Equalizer	12	Pin with Cotter Pins
3	Jib Strut Straps	13	Jib Stop Positioner Cylinder
4	Link	14	Jib Stop
5	Jib Strap (outside)	15	End Plate with Cap Screws
6	Strap Retaining Pin (outside strap)	16	Keeper Plate
7	Pin with Cotter Pin	17	Pin
8	Jib Strap (inside)	18	Bracket A
9	Pin with Cotter Pin	19	Lug B
10	Strap Retaining Pin (inside strap)	20	Lug C

Figure 4-33

Remove Jib Strap Equalizers

See Figure 4-33 for the following procedure.

1. Luff down to lower jib strut (View A).
2. Guide strut strap equalizers (2, View B) into strap support brackets (1) as jib strut is lowered.
3. Disconnect jib strut straps (3, View A) from equalizer links (4, View B). ***Strut straps will swing to rear.***

   Store connecting pins in holes of jib strut straps (3).
4. Support outside jib strap (5, View B) with assist crane and remove connecting pin (7) from strap bracket.
5. Remove strap retaining pin (6).
6. Lower strap (5) into outside strap bracket. Store strap in bracket with retaining pin (6).
7. Support inside jib strap (8) and remove connecting pin (7).
8. Set strap on pin (9) in strap support bracket (1).
9. Remove equalizer (2).
10. Rotate strap bracket forward (View C).
11. Lower inside strap (8) into inside strap bracket.
12. Store strap support brackets (1, View C):
    a. Remove connecting pin (11).
    b. Rotate support bracket (1) 180°.
    c. Repin bracket (1) to jib butt with pin (11) and pin to storage lug with pin (9).
13. Remove strap retaining pin (10, View C) and store support bracket.
14. Store inside strap (8) in inside strap bracket with retaining pin (10).
15. Store connecting pins (7) in holes on jib straps.
16. Store strap support bracket on jib butt.

Remove Butt and First Two inserts

See Figure 4-33 for the following procedure.

1. Raise jib strut to approximately 70°.
2. Store jib stop positioner cylinders (View F):

NOTE: Disconnecting hydraulic hoses is not necessary.

   a. Support cylinder (13) to prevent its dropping when pins are removed.
   b. Remove pin (12) from lug on jib stop and store in clevis on positioner top.
   c. Remove pin (17, View E) from lug (20).
   d. Rotate positioner so pin (12) slides into bracket (18, View F).
   e. Using pin (17), connect bottom of positioner to lug (18) as shown in View F.
3. Using nylon slings from assist crane, hook onto butt and first two inserts. Wrap slings around chords only. *Do not use lifting lugs on butt or inserts and do not lift against lacings*.
4. Remove end plates (15, View D), keeper plates (16) and pins connecting jib butt to boom top. Store pins and keeper plates in boom top holes after butt and inserts are removed.
5. Remove jib butt and inserts. Guide jib butt as required so jib stops do not hit lacings.
6. Disassemble inserts from butt, if desired.

Lower Jib Strut

1. Slowly luff down to lower luffing jib.
2. As luffing jib is lowered, disconnect links (4), spreaders (7, 8), and jib straps (6) from jib strut (Figure 4-28, Views B and C).

   Do not remove links (1)
3. Lower jib strut onto blocking approximately 3 ft (0,9 m) high.

   Place blocking at front of butt just behind connecting pins.
4. Store links as shown in Figure 4-28, View D.

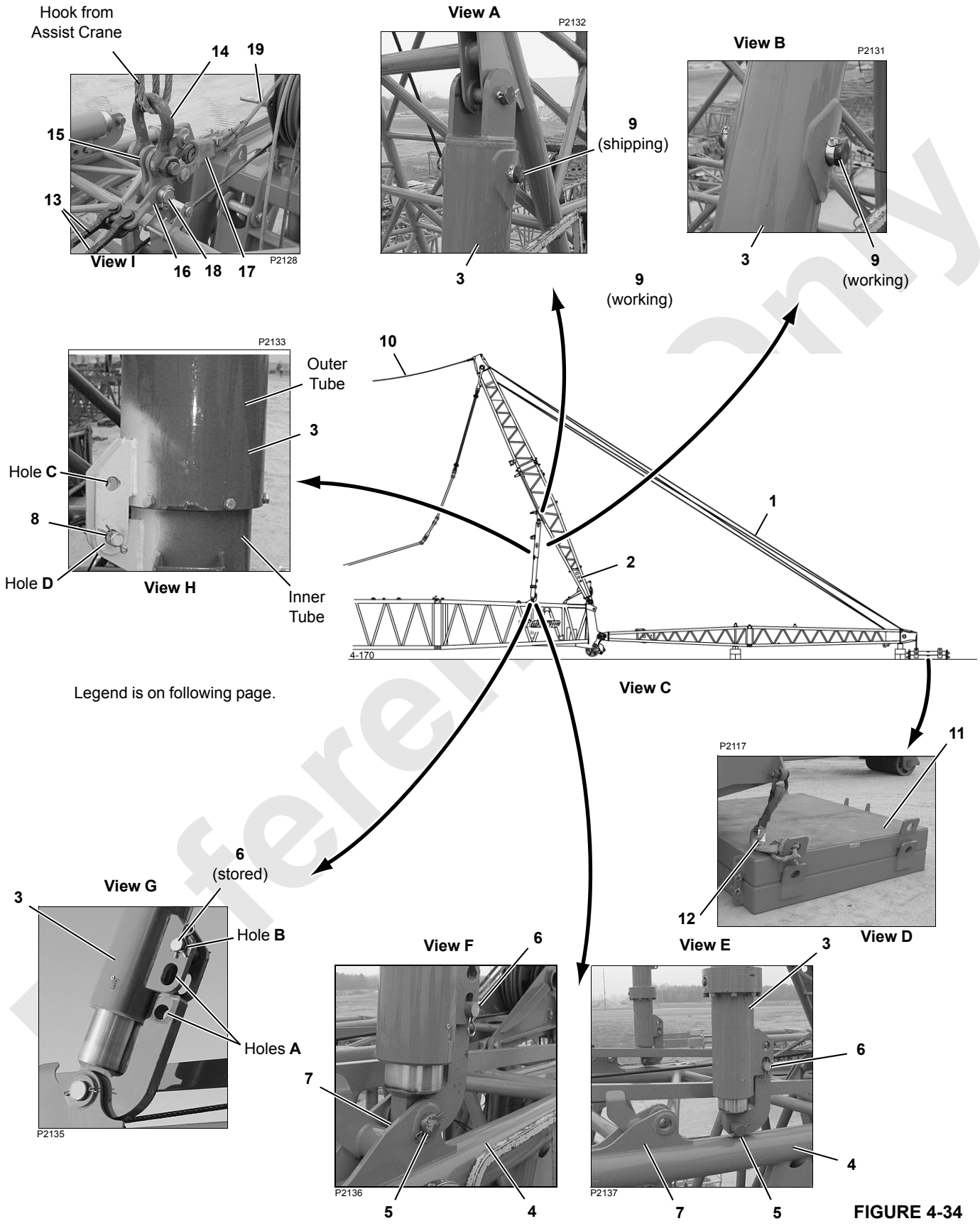

Hook from Assist Crane
14
19
15
13
View I
16
18
17
P2128
View A
P2132
9 (shipping)
3
View B
P2131
3
9 (working)
9 (working)
P2133
Outer Tube
3
Hole C
8
Hole D
View H
Inner Tube
10
1
2
4-170
View C
Legend is on following page.
P2117
11
12
View D
6 (stored)
View G
3
Hole B
Holes A
P2135
View F
6
7
5
4
P2136
View E
3
6
4
7
5
P2137

FIGURE 4-34

Lower Main Strut

See Figure 4-34 for the following procedure.

1. Anchor end of jib strut to counterweight:
   a. Remove one top crane counterweight box from each side of crane counterweight.

      Boxes must be equipped with tie link lugs.

   b. Stack counterweight boxes (11, View D), one at a time, at jib strut top.

   c. Secure lifting lugs on top counterweight box (11) to lugs on jib strut top with shackles and suitable slings (12, View D). Minimum capacity required for slings is 25,000 lb (11 340 kg) per side.

   d. Connect counterweight boxes with tie links as shown in Figure 4-23, View G (four places).

WARNING

Falling Strut Hazard!

Do not disconnect crane counterweight (11) from jib strut until all remaining steps are performed. Counterweight is required to prevent jib strut from rising when main strut is lowered.

If counterweight is not connected to jib strut, jib strut will rise part way and then both struts could fall forward violently.

2. Luff down until luffing hoist wire rope is slack.
3. Unpin handling pendants and links from lugs on main strut butt.
4. Attach 55 USt (50 t) shackle (14, View I) and hook from assist crane to links (15).
5. Connect Drum 3 load line (19, View I) to link (16) with load line socket (17).
   - Use same socket used to anchor load line to boom or jib point.
   - Make sure Drum 3 load line passes under Drum 3 guide sheave in mast.
   - Make sure Drum 3 load line passes through center of boom hoist wire rope and over top of boom hoist equalizer.
6. Pin strut handling pendants (10, View I) to link (16).
7. Slowly pull main strut back until Holes A in strut stop are aligned.

CAUTION

Strut Damage!

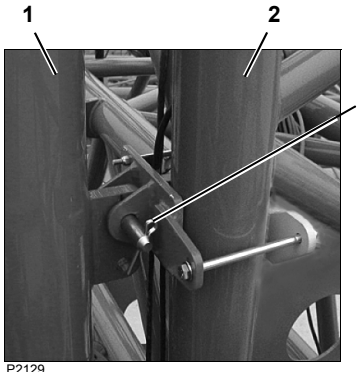
Pull strut back only until holes are aligned. Pulling strut further back may damage strut to strut stops.

8. Remove pin (6) from Hole B and insert in Hole A so cylinders cannot extend (View G).
9. Pay out Drum 3 load line so line is slack.
10. Luff up as needed to remove load from pins (9, View B).
11. Remove pins (9, View B) from lower holes and store in upper holes (View A).
12. Luff down to retract strut stop tubes.
13. Remove tube retaining pins (8, View H) from Hole C and insert in Hole D.
14. Luff up slightly to remove load from strut stop pins (5, View F).
15. Remove pins (5) and luff up until stops can be swung to strut (View E).

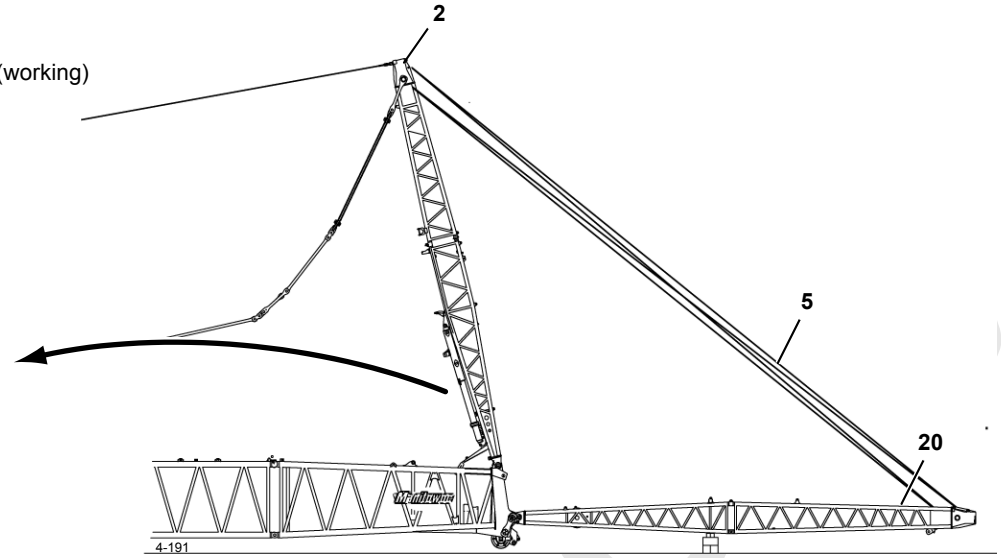
Continued on Next Page

Component Identification for Figure 4-34

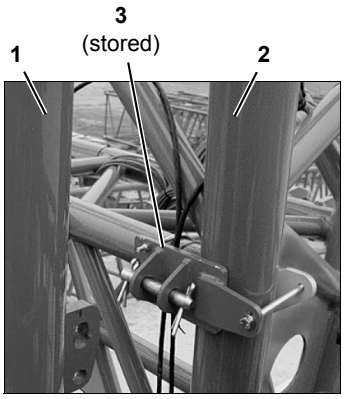
Item	Description	Item	Description
1	Luffing Hoist Line (Drum 6)	11	Crane Counterweight Boxes
2	Main Strut	12	Sling and Shackle
3	Strut Stop	13	Retaining Pin with Cotter Pins
4	Boom Top	14	Shackle (user-supplied)
5	Pin with Cotter Pins	15	Links
6	Cylinder Rod Retaining Pin	16	Link
7	Lug	17	Socket
8	Tube Retaining Pin	18	Pin with Cotter Pin
9	Strut Locking Pin	19	Drum 3 Load Line
10	Handling Pendants		



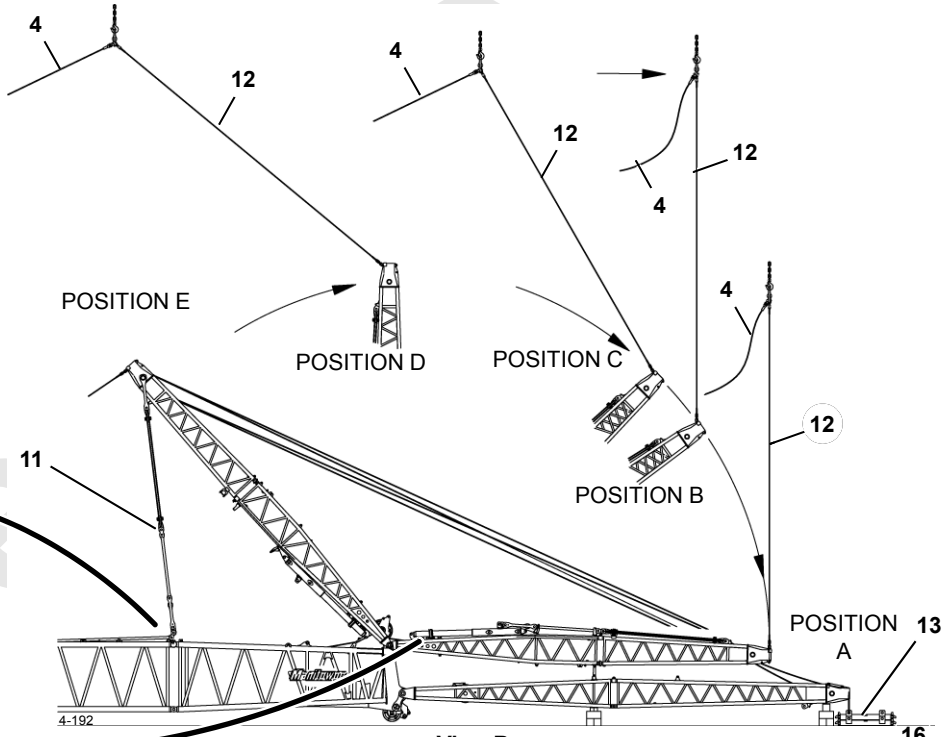
View H



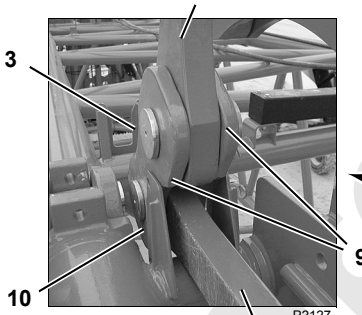
View A



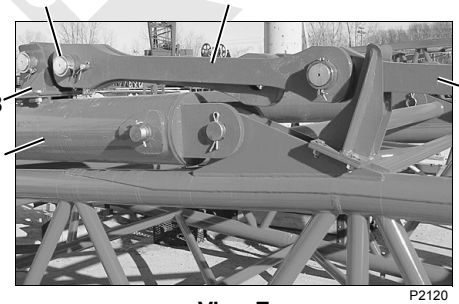
View G



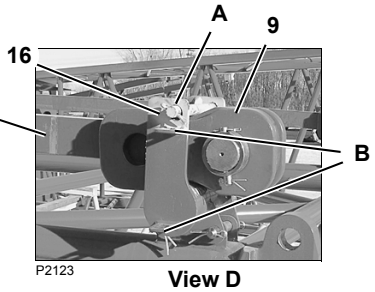
View B



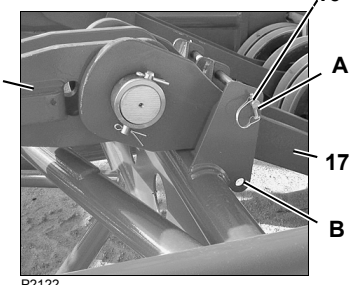
View F



View E



View D



View C

Figure 4-35

Lower Main Strut (continued)

See Figure 4-35 for the remaining steps.

16. Remove retaining pins (3, View G) from lugs on main strut (2).

17. Pin strut stops (1) to main strut (View H).

18. Luff down to lower main strut until strut backstay straps (11) can be disconnected (POSITION E, View B).

Guide boom backstay straps (8) into strap brackets (10, View F) on boom.

19. Remove pins (3, View F) to disconnect adjustable links (6) from connecting links (9) and boom backstay straps (8).

Store pins (7) in adjustable link (6). Store links (9) with boom backstay straps (8).

20. Disconnect rear tie links on counterweight boxes (13) as shown in Figure 4-23, View E.

21. Raise strut handling pendants (12) with assist crane so links and hook from assist crane are slightly higher than top of main strut.

Pay out Drum 3 load line while raising pendants

22. Slowly luff up to raise main strut while paying out Drum 3 load line and following with assist crane.

Do not induce any side load in main strut with assist crane. Load line from assist crane should remain vertical during strut lowering procedure.

CAUTION

Overload Hazard!

Do not allow crane counterweight (13) to rise off ground at any time during strut lowering procedure. Load line and pendants could be overloaded, possibly resulting in damage.

23. As main strut nears vertical — POSITION D — tighten pendants (12) and Drum 3 load line (4) so main strut moves forward smoothly past vertical without dropping (View B).

24. Continue to luff up while following with assist crane — pay out load line and travel — until main strut is at approximately 45° (POSITION C).

25. Slacken Drum 3 load line (4) and raise pendants (12) to vertical — POSITION B — while luffing up.

26. Continue to lower main strut with assist crane while luffing up until main strut comes to rest on jib strut — POSITION A. Guide strut straps into strap brackets as strut comes to rest on jib strut.

Allow luffing hoist wire rope (5) to slacken as strut is lowered, but do not allow wire rope to kink or jump off sheaves.

27. Lower pendants (10, Figure 4-27, View I) and links (15, Figure 4-27, View I) to storage position on main strut butt. Unpin socket (17) from link (16) and pins links (15) to main strut butt.

28. Remove counterweight (11) from end of jib strut, one at a time.

29. Disconnect strut top straps (14) from strut butt straps (15). Store connecting pins in holes on strut top straps.

30. Rotate connecting links (9, View D) to stored position. Remove strap shipping pins (16) from holes B and install in holes A as shown in View D.

31. Remove strap shipping pins (16, View C) from holes A and install in holes B to secure strut straps to main strut top.

32. Pin adjustable links (6) to brackets (18) with connecting pin (7) as shown in View E. If necessary, adjust link (6) to shorter length (Figure 4-23, View M) before pinning.

Component Identification for Figure 4-35

Item	Description	Item	Description
1	Strut Stop	10	Strap Bracket
2	Main Strut	11	Strut Backstay Straps
3	Pin with Cotter Pins	12	Strut Handling Pendants
4	Drum 3 Load Line	13	Counterweight
5	Luffing Hoist Line	14	Backstay Strap (strut top)
6	Adjustable Link	15	Backstay Strap (strut butt)
7	Pin with Collar and Retaining Pins	16	Strap Shipping Pin
8	Boom Backstay Strap	17	Link
9	Connecting Links	18	Strap Bracket

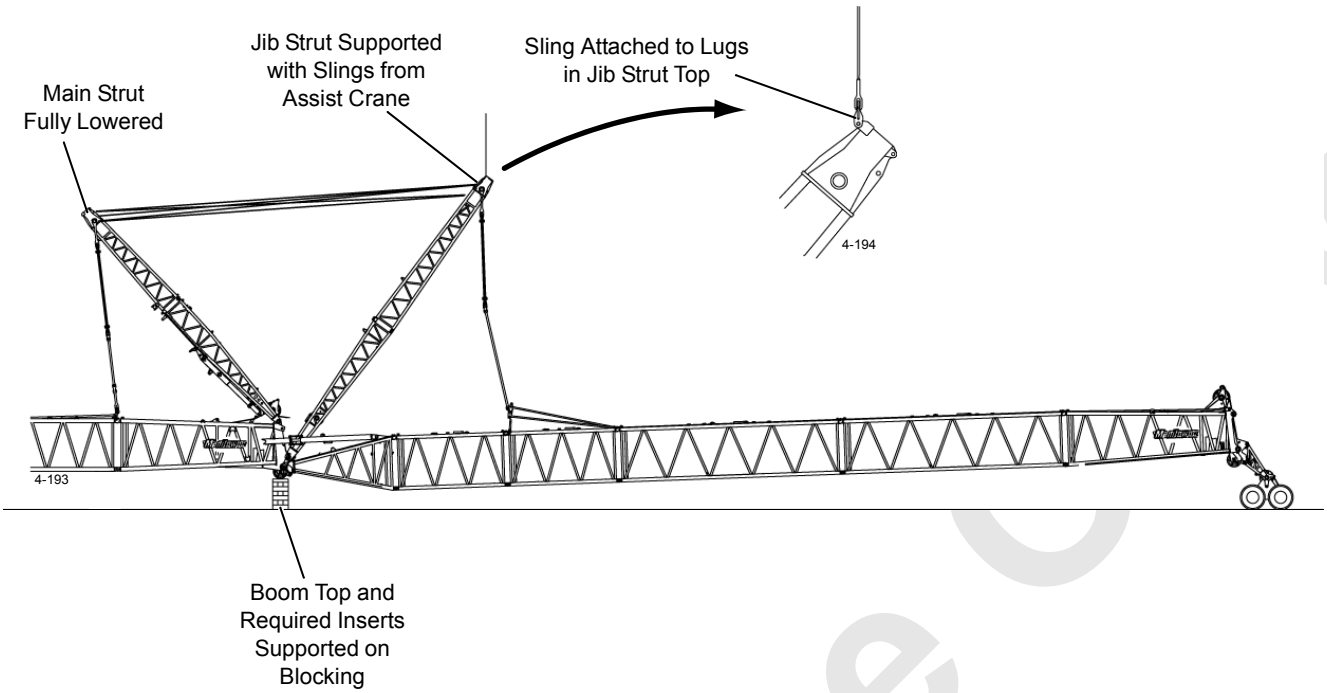


Figure 4-36

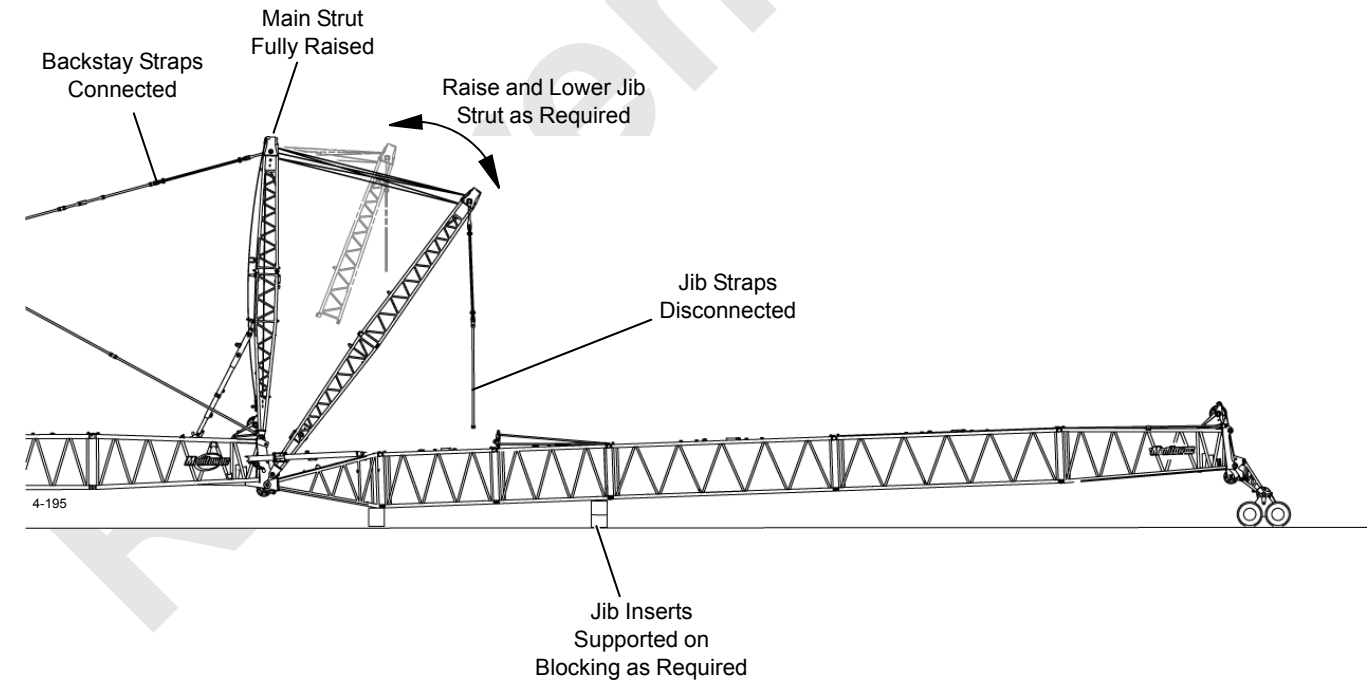


Figure 4-37

Store Main Strut Top

See Figure 4-23 for the following procedure.

1. Support main strut top (3, View A) with slings from assist crane.
2. Remove bottom and top pins (Figure 4-22, View H) connecting strut top to strut butt.
3. Move strut top slowly forward while hauling in luffing hoist wire rope so that wire rope between struts pays out smoothly without kinking or binding.
4. Rotate strut supports C (5, View D) to working position (View C) and pin main strut top to jib strut top with shipping pins (6).
5. Lower butt end of main strut top and pin to jib strut top with pins (7, View A).

Store Luffing Hoist Wire Rope

1. Disconnect wire rope from socket (20, Figure 4-22, View G) in end of main strut. Store socket with main strut.
2. Spool luffing hoist wire rope onto Drum 3 for storage.

   If desired, a “sucker line” can be attached to end of luffing hoist wire rope and spooled through sheaves in struts as luffing hoist wire rope is removed. This practice will make it easier to install the luffing hoist wire rope next time.

Remove Main and Jib Strut Tops

Main strut top and jib strut top are shipped together as shown in Figure 4-22, View H.

Reverse assembly steps under Install Jib Strut Top topic to remove strut tops.

Remove Jib and Main Strut Butts

Main strut butt and jib strut butt are shipped together as shown in Figure 4-22, View A.

Reverse assembly steps under Install Jib and Main Strut Butts topic to remove strut butts.

Changing Boom and Jib Length

DANGER

Crushing Injury Hazard!

Boom and jib sections can collapse when connecting pins are removed.

- Block or support ends of boom and jib sections with slings from an assist crane before removing connecting pins.
- Never work under or inside boom or sections that are not securely blocked or supported with slings from an assist crane.

Boom

See Figure 4-36 for the following procedure.

To prevent parts from collapsing and possible death or serious injury to personnel, observe the following safety precautions when changing boom length:

- Know weight of what you are lifting and size assist crane and all lifting slings accordingly.
- Lower and pin boom hoist equalizer to rails on boom insert. ***Do not disconnect boom straps until this step is performed. Equalizer could slide off rails.***
- Lower main strut fully. Perform Lower Main Strut steps 2–18.
- Connect slings from assist crane to both sides of jib strut and hoist so slings are just taut. ***Do not disconnect backstay straps until this step is performed.***
- Do not attempt to handle boom with equalizer pinned to rails. ***Structural failure will result and boom will fall.***

  Handle boom only with nylon slings securely attached to chords as close to end of inserts as possible. ***Do not lift against lacings or lifting lugs on inserts***.
- Do not cantilever more than 40 ft (12,2 m) of insert from end of inserts being lifted. Attach nylon slings to both inserts as shown in Figure 4-38.

Do not disconnect assist crane from jib strut until all of following steps are performed:

- Boom length changed
- Boom straps connected to boom hoist equalizer and equalizer unpinned from rails
- Backstay straps pinned to main strut
- Main strut fully raised. Perform Raise Main Strut steps 16–28.

Jib

See Figure 4-37 for the following procedure.

It is okay to change the jib length with the struts positioned, as follows:

- Main strut fully raised. Do not disconnect backstay pendants.
- Jib straps disconnected from jib strut straps.
- Jib strut raised and lowered as required to provide clearance. ***Do not raise strut above 70° or lower strut to point that it contacts jib butt.***
- To prevent parts from collapsing and possible death or serious injury to personnel, observe the following safety precautions when changing jib length:
- Know weight of what you are lifting and size assist crane and all lifting slings accordingly.
- Handle jib only with nylon slings securely attached to chords as close to end of inserts as possible. ***Do not lift against lacings or lifting lugs on inserts***.
- Do not cantilever more than 40 ft (12,2 m) of insert from end of inserts being lifted. Attach nylon slings to both inserts as shown in Figure 4-38.

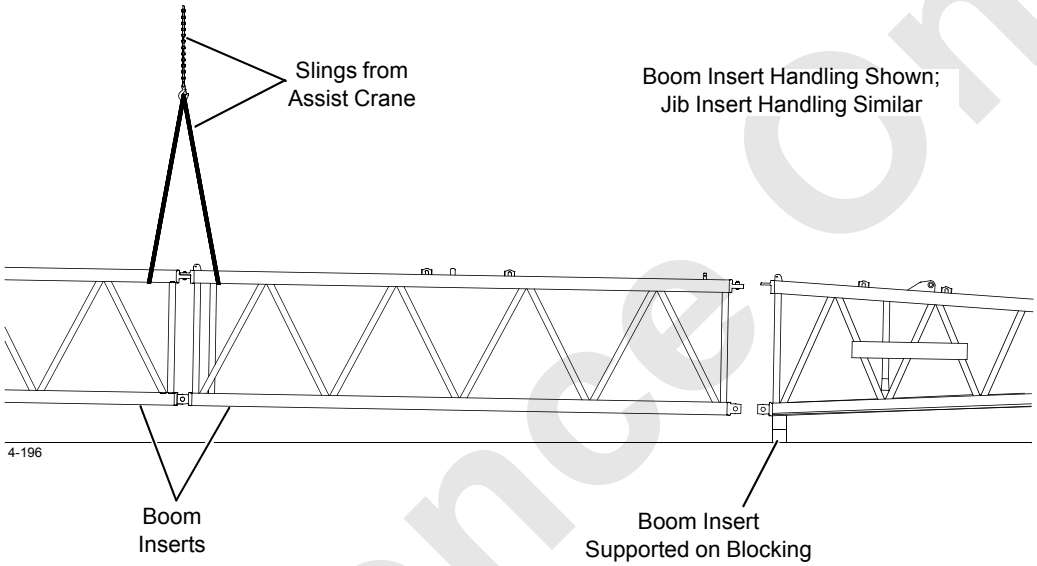


FIGURE 4-38

WIRE ROPE INSTALLATION

NOTE: Wire rope installation instructions from various Original Equipment Manufacturers (OEM) are provided at the end of this section. If a conflict exists between the following instructions and the OEM instructions, the OEM instructions apply.

Wire Rope Storage

Store wire rope in coils or on reels off the ground or floor in a clean and dry indoor location. If outdoor storage is necessary, the wire rope must be covered with a protective wrapper. Keep the wire rope away from acids, fumes, and other corrosives. Keep the wire rope away from heat that can dry out the lubricant. If the storage period will be long, lubricate the wire rope and perform periodic inspection given in this section at least monthly.

Removing Wire Rope from Shipping Reel

CAUTION!

Wire Rope Damage!

Shipping reel must rotate when wire rope is unwound. Attempting to remove wire rope from a stationary reel can result in a "kinked" wire rope, and wire rope will be ruined.

1. Mount wire rope shipping reel on a shaft supported at both ends by jacks or blocks as shown in Figure 4-39.

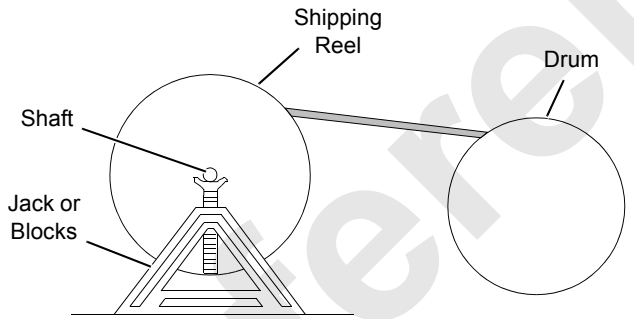


FIGURE 4-39

2. Provide a brake at shipping reel (see Figure 4-40) so wire rope can be wound tightly onto drum.

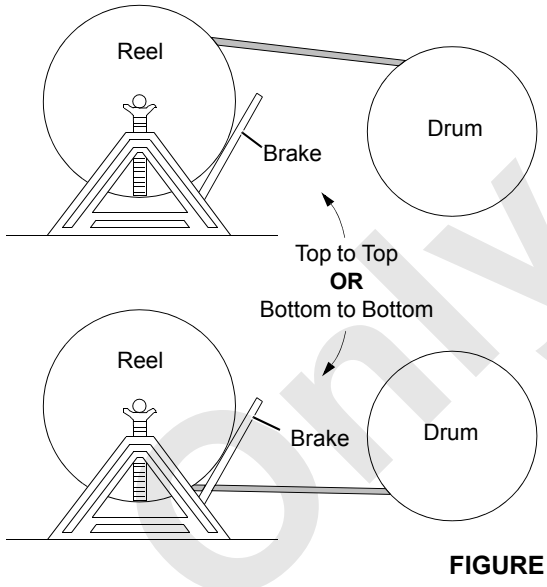


FIGURE 4-40

3. *Avoid a reverse bend when winding wire rope onto drum:* wind from top of reel to top of drum or from bottom of reel to bottom of drum as shown in Figure 4-40.
4. Avoid dragging wire rope in dirt or around objects that can scrape, nick, cut, or crush wire rope.

Seizing and Cutting Wire Rope

Apply tight seizings of annealed wire to the ends of all wire rope. If not done, the rope wires and strands may slacken. This action will result in overloading of some strands and underloading of others. Bird caging and breakage of the wire rope can occur.

Before cutting wire rope, apply seizings on both sides of the point where the cut will be made. Then cut the wire rope with a torch, rope cutter, or abrasive cut-off wheel.

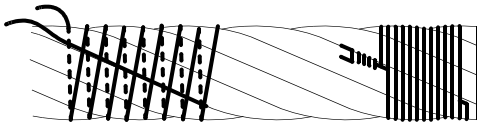
See Figure 4-41 for:

- Number of seizings to be applied to the ends of wire rope and to both sides of the point where a cut will be made.
- Proper application method. Each seizing should be one rope diameter long.

A925

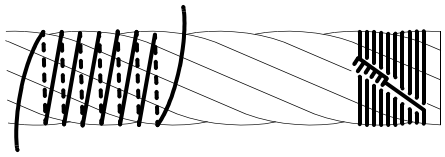
Wire Rope Type	Seizings Required
Preformed	1
Non-preformed	3

Place free end of seizing wire in valley between two stands. Then wind seizing wire over free end as shown. Finally, twist and pull two ends of seizing wire together until seizing is tight.



View A Rope Diameter 1 in (26 mm) and Larger

Wind seizing wire around wire rope as shown. Then twist two ends of seizing wire together at center of seizing. Alternately twist and pull ends until seizing is tight.



View B Rope Diameter Smaller than 1 in (26 mm)

FIGURE 4-41

Anchoring Wire Rope to Drum

See Figure 4-42 for the following procedure.

Use the correct wedge part number for the size of wire rope being used. See parts drawing for the boom hoist drums or for the load drum shaft to obtain the correct part number.

1. Assemble wire rope and wedge to drum socket.
2. Tighten wedge, rapping back of wedge with a brass drift pin and hammer.

WARNING!

Falling Load Hazard!

Wire rope can be pulled out of drum if the following steps are not taken.

- Install straight wedge so corrugated side is against wire rope.
- Install wedge so end of wire rope extends past end of wedge, but not out of drum socket.
- Make sure seizing is not under wedge. Remove seizing if it interferes with assembly.

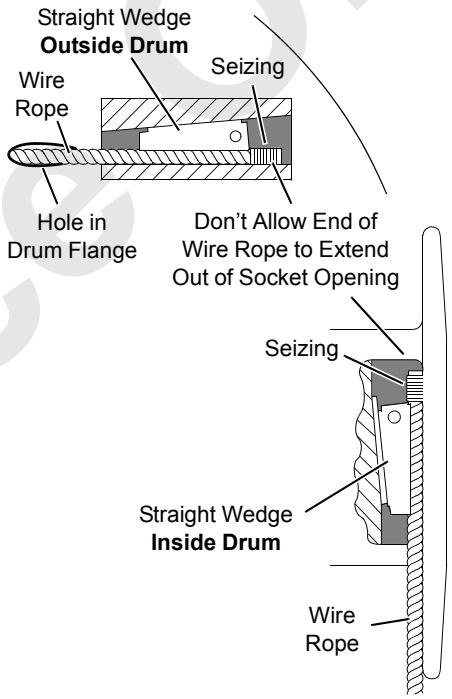


FIGURE 4-42

Winding Wire Rope onto Drum

See Drum and Lagging Chart in Capacity Chart Manual for correct size of drum laggings, if used.

See Wire Rope Specifications Chart in Capacity Chart Manual for correct type, size, and amount of wire rope to be installed on load drums.

See Boom Rigging Drawing at the end of this section for correct type, size, and amount of wire rope to be installed on boom hoist drums.

1. Carefully inspect drums and all rope guides, rollers, and sheaves for wear or damage that can cause wire rope to wear or be cut. If defects cannot be fixed, replace faulty parts.
2. Apply tension to wire rope as it is wound slowly onto drum.

   First wrap must be tight against drum flange for approximately three-fourths of drum diameter (see Figure 4-43).
3. Tap adjacent wraps against each other with a soft metal or wooden mallet.

   Use extreme care not to put twists or turns in wire rope; allow rope to assume its natural lay.

CAUTION!

Wire Rope Damage!

Voids or spaced wraps in first layer (Figure 4-43, View B) will permit movement and a wedging action with subsequent layers. Wedging action will cause crushing and abrasion of wire rope.

Never allow wire rope to “cross wind” on drums.

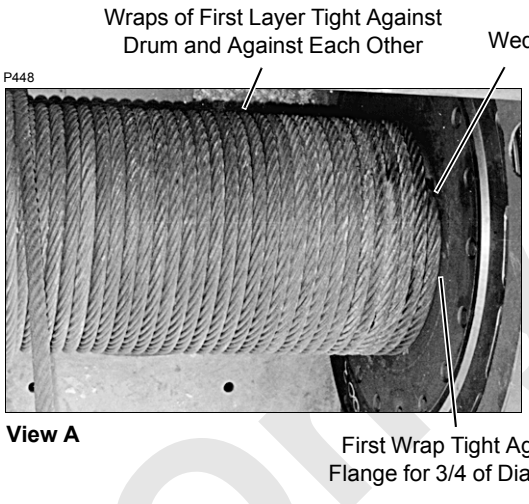


FIGURE 4-43

4

Anchoring Wire Rope to Wedge Socket

WARNING

Falling Load Hazard!

- Inspect all parts prior to use. Do not use parts that are cracked or otherwise defective.
- Remove minor nicks, burrs, or rough edges from socket, wedge, or pin by lightly grinding. Do not reduce original dimensions by more than 10%.
- Do not reinstall shipping material (bolt, plastic strap or wire) in hole of wedge or socket after assembling. Discard these materials because they can prevent wedge from tightening in socket.
- Only use a wedge and socket which are correct size for wire rope being used. Do not mix and match parts from one assembly with parts from another assembly.

  Terminator™ wedge has “go” and “no-go” holes to check for proper rope size.
- Attach wire rope clip to dead end of wire rope after assembling wire rope to wedge and socket.
- If dead end of wire rope is welded, seize end of wire rope and cut off weld before assembling to wedge and socket. Weld will not allow strands of wire rope to adjust around bend of wedge, resulting in high strands and wavy rope. This condition can seriously weaken attachment.

See Figure 4-45 for the following procedure.

1. Assemble wire rope and wedge to socket so live end of wire rope is in a straight line with socket pin hole. *Do not assemble WRONG as shown.*
2. Allow dead end of wire rope to extend past end of socket amount shown.
3. Allow wire rope to assume its natural lay.
4. Pull against wedge and live end of wire rope enough to tighten wedge in socket.

   Use a brass hammer to seat wedge and wire rope as deep into socket as possible.
5. Attach a wire rope clip to dead end of wire rope using one of the RIGHT methods shown. Rope clip will aid in preventing wire rope from being pulled out of socket.

NOTE: Use Right Method A only if wire rope clip is small enough to be securely tightened to dead end. Right Method C is only for a Terminator™ wedge socket

6. After socket is pinned in place, hoist load slowly so wedge seats tight. *Do not shock load socket and wedge*.

WARNING

Falling Load Hazard!

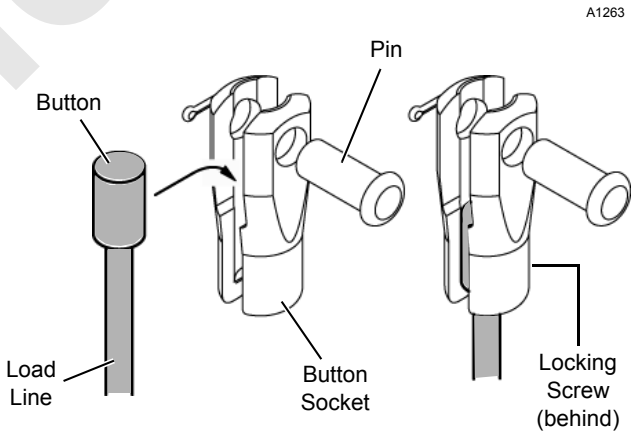
Wire rope can break if following precaution is not observed:

- Do not attach dead end of wire rope to live end of wire rope with wire rope clip. Wire rope clip will transfer load from live side of wire rope to dead end, seriously weakening attachment.

Anchoring Wire Rope to Button Socket

See Figure 4-44 for the following procedure.

1. Remove pin from socket.
2. Install button end of load line in socket.
3. Pin socket to anchor point.
4. Securely tighten locking screw.



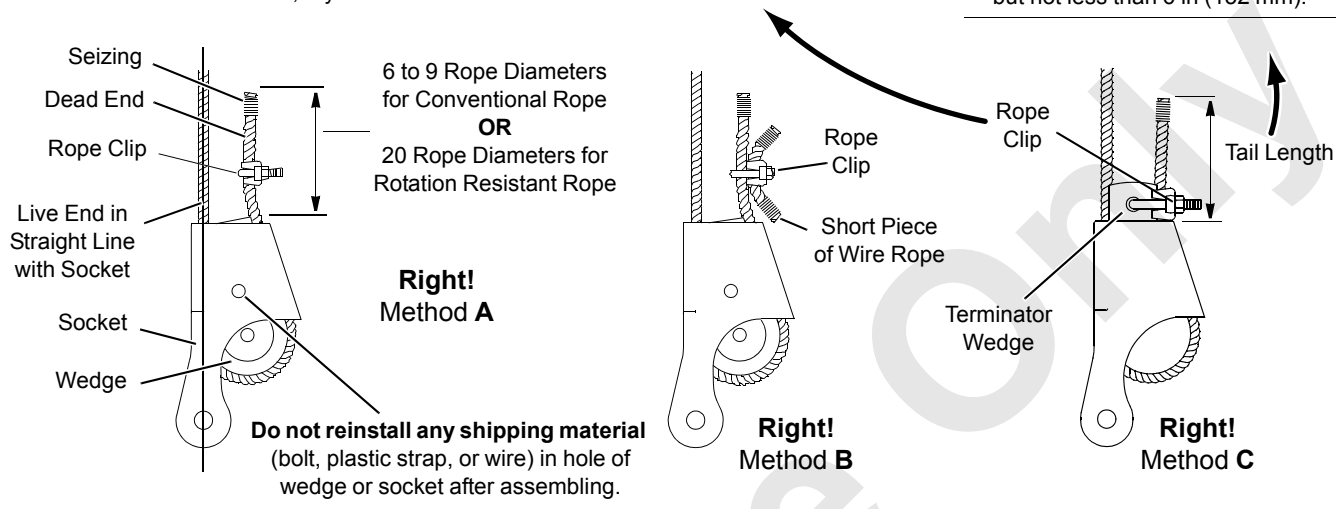
Button Socket Assembly

FIGURE 4-44

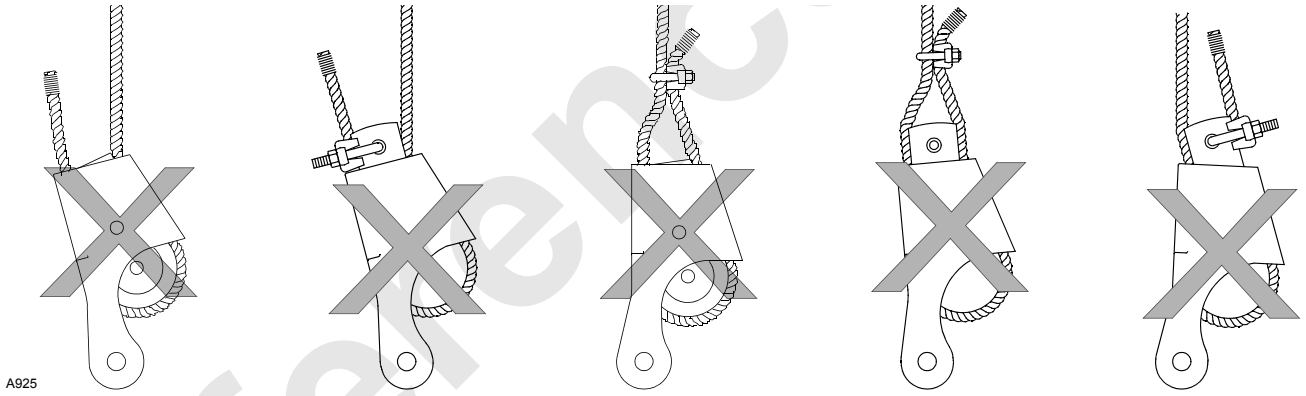
Wire Rope/Clip Size inch (mm)	0.875 (22,23)	1.0 (25,4)	1.125 (28,58)	1.25 (31,75)
Torque * ft/lbs (kN/m)	225 (0,30)	225 (0,30)	225 (0,30)	360 (0,49)

***** Tightening torque values shown are based on threads being clean, dry and free of lubrication.

Standard 6 to 8 Strand Wire Rope
Minimum of 6 rope diameters, but not less than 6 in (152 mm).
Rotation Resistant Wire Rope
Minimum of 20 rope diameters, but not less than 6 in (152 mm).



ALL ARE DANGEROUS AND PROHIBITED!



WRONG
Rope Backward

WRONG
Rope Backward

WRONG
Dead End Clipped to Live End

WRONG
Dead End Clipped to Live End

WRONG
Wedge Backward

FIGURE 4-45

Breaking in Wire Rope

After installing a new wire rope, break it in by operating it several times under light load and at reduced speed. This practice allows the wire rope to form its natural lay and the strands to seat properly.

NOTE: Wire rope will stretch during the break-in period, reducing the wire rope's diameter as the strands compact around the core.

The dead wraps of wire rope on the drum can become slack during operation, even if the utmost care is used during installation of the wire rope. This slackening is caused by the normal stretch that occurs in a new wire rope under tension and periodically throughout the wire rope's life from release of the load.

When slackness is noted, tightly wind the dead wraps of wire rope onto the drum. If left uncorrected, a wedging action with subsequent layers will occur and the resultant abrasion may cause broken wires in the dead wraps.

PAD EYE USAGE FOR WIRE ROPE REEVING

See Figure 4-46 for the following procedure.

General

Some rotation-resistant wire rope supplied by Manitowoc is equipped with a No. 1.5 pad eye welded to the leading end of the wire rope.

A sucker-line can be attached to the pad eye to make it easier to reeve the load block.

Safety

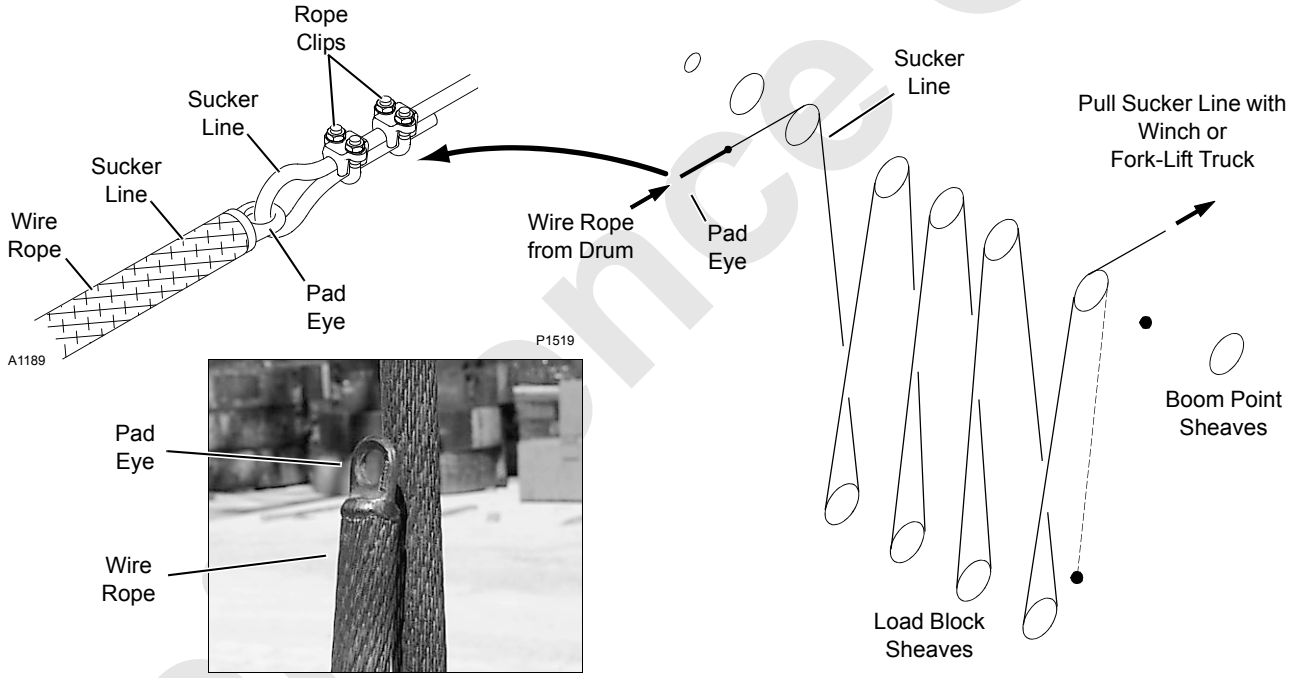
1. For No. 1.5 pad eye, do not exceed 4,45 kN single line pull.
2. Make sure sucker line and rope clips are rated for at least 4,45 kN line pull.
3. Inspect pad eye prior to each use. ***Replace it if:***
   - Original dimensions have changed (Figure 4-46)
   - Cracks or breaks exist in metal or weld

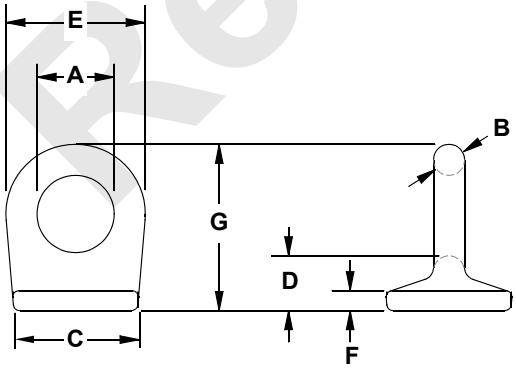
WARNING

Flying Part Hazard!

Pad eye on end of wire rope has been provided ***for reeving purposes only***. Any other use is neither intended nor approved.

Pad eye can break and fly apart with considerable force if it is overloaded, not used properly, or not maintained properly.





No. 1.0 Pad Eye		
Item	Inch	mm
A	3/8	9,65
B	1/4	6,35
C	7/8	22,40
D	13/32	10,40
E	7/8	22,40
F	1/8	3,30
G	1-1/32	26,20

No. 1.5 Pad Eye		
Item	Inch	mm
A	5/8	16,00
B	1/6	6,35
C	1	25,40
D	7/16	11,20
E	1-1/8	28,70
F	5/32	4,05
G	1-5/16	33,30

FIGURE 4-46

RIGGING WINCH OPERATION

If your crane is equipped with the optional rigging winch in the boom butt, see Rigging Winch Operation topic in the Operator Manual for the crane. Also see drawing at the end of this section.

LOAD LINE REEVING - #44 LUFFING JIB

Load Blocks

See the Luffing Jib Assembly Drawings at the end of this section for a complete list of load blocks and weight balls available for this crane.

WARNING

Falling Load Hazard!

Use only a hook-and-weight ball or load block with a capacity equal to or greater than load to be handled.

Avoid overloading bearings in load block sheaves. Attach load to duplex hook so load hangs straight.

Load block can fail if overloaded, allowing load to fall.

Guide Sheaves

See Figure 4-48 and Figure 4-49 for guide sheave identification and location of components in the lower and upper boom points.

Once the wire rope is routed through the guide sheaves, be sure to install rope guard pins, bars, and rollers to retain rope on guide sheaves. ***Wire rope and sheaves can be damaged if rope is not properly retained on sheaves***.

Duplex Hook

Attach the load so it is balanced equally on the hook. Lifting slings must be within angles given in Figure 4-47 to achieve maximum hook capacity. The duplex hook has a hole to which an optional shackle can be attached as shown in Figure 4-47.

WARNING

Falling Load Hazard!

Limit load to be handled with shackle to capacity of load block or shackle, whichever is less.

Load block or shackle can fail if overloaded, allowing load to fall.

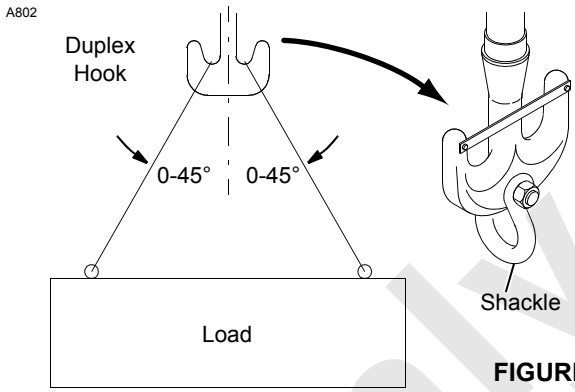


FIGURE 4-47

Wire Rope Specifications

See Wire Rope Specifications chart in Capacity Chart Manual for the following load block reeving information:

- Parts of line required to handle desired load
- Wire rope length required for various boom/jib lengths and parts of line
- Maximum spooling capacity of load hoists

Wire Rope Installation

See Wire Rope Installation in this section for the following instructions:

- Anchoring wire rope to drum
- Installing wire rope on drum
- Anchoring wire rope to wedge socket

Reeving Diagrams

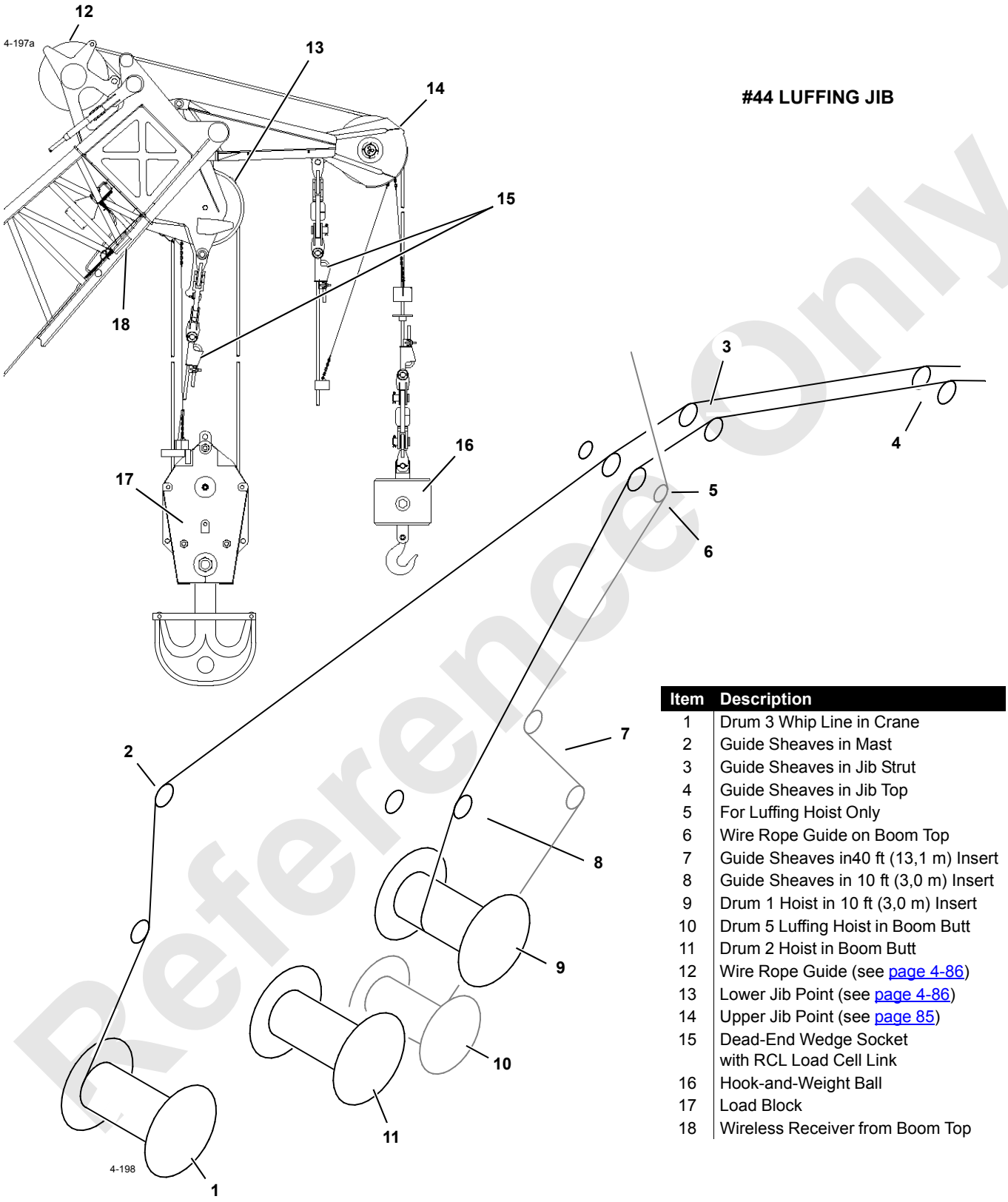
See Figure 4-50 for #44 Luffing Jib reeving diagrams.

WARNING

Avoid Death or Serious injury!

- Exercise care when block is standing in vertical position (Figure 4-51), as the potential for tipping exists. Potential causes of tipping are unstable work area, boom movement and the reeving process.
- If work area is unstable, lay block flat on side plate.

4

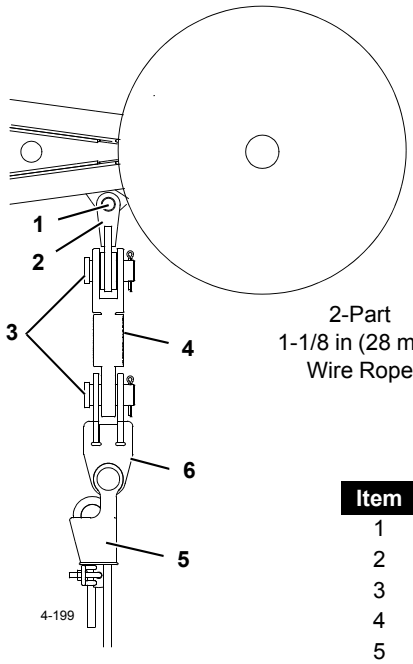


#44 LUFFING JIB

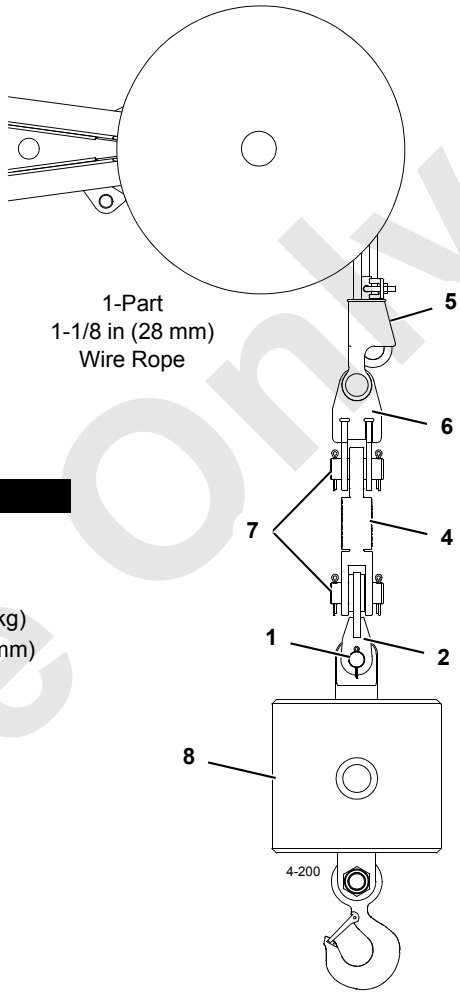
Item	Description
1	Drum 3 Whip Line in Crane
2	Guide Sheaves in Mast
3	Guide Sheaves in Jib Strut
4	Guide Sheaves in Jib Top
5	For Luffing Hoist Only
6	Wire Rope Guide on Boom Top
7	Guide Sheaves in40 ft (13,1 m) Insert
8	Guide Sheaves in 10 ft (3,0 m) Insert
9	Drum 1 Hoist in 10 ft (3,0 m) Insert
10	Drum 5 Luffing Hoist in Boom Butt
11	Drum 2 Hoist in Boom Butt
12	Wire Rope Guide (see page 4-86)
13	Lower Jib Point (see page 4-86)
14	Upper Jib Point (see page 85)
15	Dead-End Wedge Socket with RCL Load Cell Link
16	Hook-and-Weight Ball
17	Load Block
18	Wireless Receiver from Boom Top

FIGURE 4-48

#44 UPPER JIB POINT



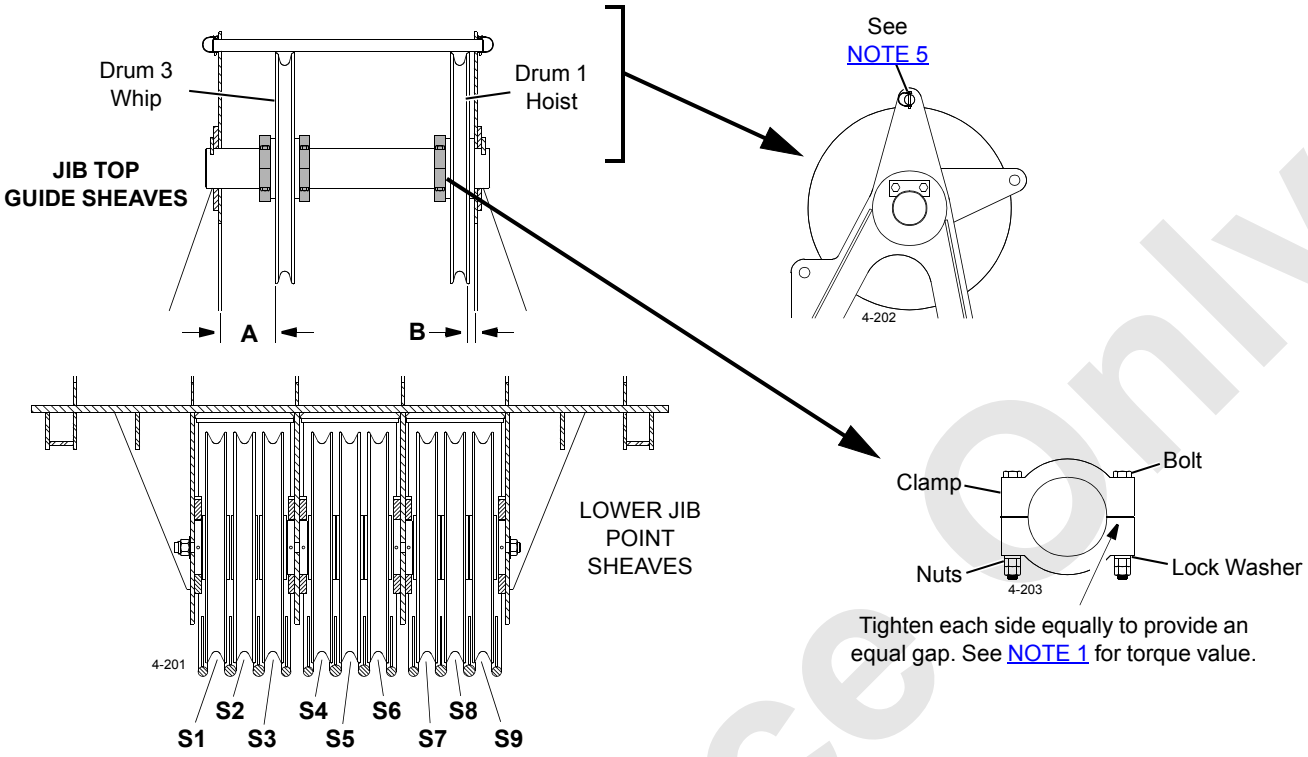
2-Part
1-1/8 in (28 mm)
Wire Rope



1-Part
1-1/8 in (28 mm)
Wire Rope

Item	Description
1	Pin with Cotter Pin
2	Link
3	Pin with Cotter Pin
4	Load Cell - 70,000 lb (31 751 kg)
5	Wedge Socket – 1-1/8 in (28 mm)
6	Link
7	Pin with Cotter Pin
8	Swivel Weight Ball

FIGURE 4-48 continued



#44 LOWER JIB POINT

Location of Guide Sheaves with Lead Line Going to Point Sheave Indicated

Drum 1	
Lead Line Routed to Sheave	**Dimension B**
S9	0.62 in (16 mm) NOTE 2
S8	2.06 in (52 mm) NOTE 3
S7	4.75 in (121 mm) NOTE 3
S6	10.44 in (265 mm) NOTE 3
Drum 3	
Lead Line Routed to Sheave	**Dimension A**
S4	10.69 in (272 mm) NOTES 3 & 4
S3	5.00 in (127 mm) NOTE 3
S2	2.06 in (52 mm) NOTE 3
S1	0.62 in (16 mm) NOTE 2

NOTE 1: Position clamps hand tight against sheave bearing. Before torquing bolts, check that sheave turns freely. Torque bolts lubricated with S.A.E. 20 oil to 120 ft-lb (163 Nm).

NOTE 2: This location requires sheave bearing to be snug against jib top side plate as shown at Dimension B.

NOTE 3: This location requires two clamps as shown at Dimension A.

NOTE 4: Position guide sheave at this location for whip line operation over upper jib point. Use two clamps.

NOTE 5: Install rope retaining pin in this hole.

FIGURE 4-49

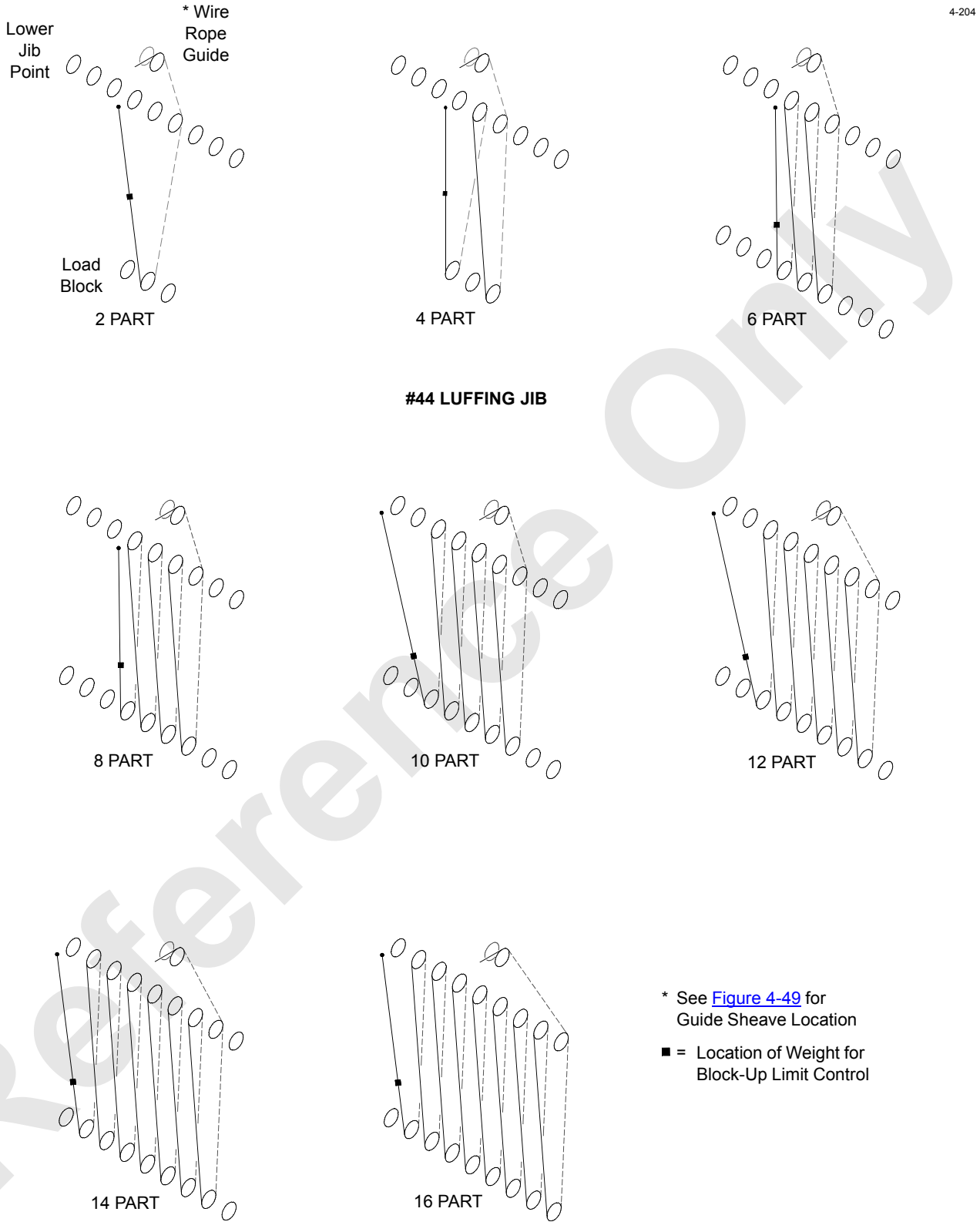


FIGURE 4-50

LOAD LINE REEVING - #79A LUFFING JIB

Load Block Identification

See the Luffing Jib Assembly Drawings at the end of this section for a complete list of load blocks and weight balls available for this crane.

WARNING

Falling Load Hazard!

Use only a hook-and-weight ball or load block with a capacity equal to or greater than load to be handled.

Avoid overloading bearings in load block sheaves. Attach load to duplex hook so load hangs straight.

Load block can fail if overloaded, allowing load to fall.

Load Block Handling

Each load block has two lifting lugs as shown in Figure 4-51, View A.

The load blocks can be stood up for reeving as shown in Figure 4-51, View B.

Duplex Hook

Attach the load so it is balanced equally on the hook. Lifting slings must be within angles given in Figure 4-52 to achieve maximum hook capacity. The duplex hook has a hole to which an optional shackle can be attached as shown in Figure 4-52.

WARNING

Falling Load Hazard!

Limit load to be handled with shackle to capacity of load block or shackle, whichever is less.

Load block or shackle can fail if overloaded, allowing load to fall.

Wire Rope Specifications

See Wire Rope Specifications chart in Capacity Chart Manual for the following load block reeving information:

- Parts of line required to handle desired load
- Wire rope length required for various boom lengths and parts of line
- Maximum spooling capacity of load hoists

Wire Rope Installation

See Wire Rope Installation in this section for instructions:

- Installing wire rope on drums
- Anchoring wire rope to drums

See Figure 4-53 and Figure 4-54 for dead-end locations and components in the lower and upper boom points.

Guide Sheaves and Drums

See Figure 4-55 for identification of the load drums and guide sheaves.

Once wire rope is routed through the guide sheaves, be sure to install rope guard pins, bars, and rollers to retain the wire rope on the sheaves. ***Wire rope and sheaves can be damaged if rope is not properly retained on sheaves***.

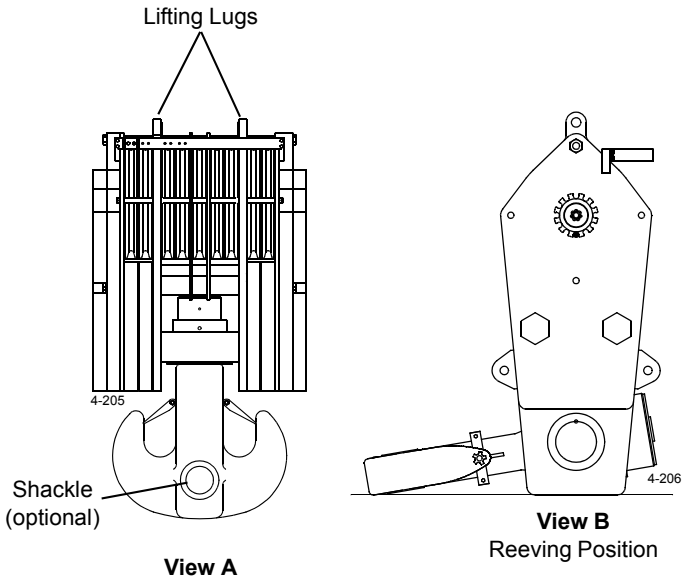
Reeving

See Figure 4-56 and Figure 4-57 for load block reeving. Reeving the load block in any manner other than shown can result in excessive block twist.

CAUTION

Wire Rope Damage!

Do not hoist load block closer to boom point than shown on Load Block Reeving charts. Improper fleet angle or contact with other parts can damage wire rope.



WARNING

Avoid Death or Serious injury!

- Exercise care when block is standing in vertical position, as the potential for tipping exists. Potential causes of tipping are unstable work area, boom movement and the reeving process.
- If work area is unstable, lay block flat on side plate.

FIGURE 4-51

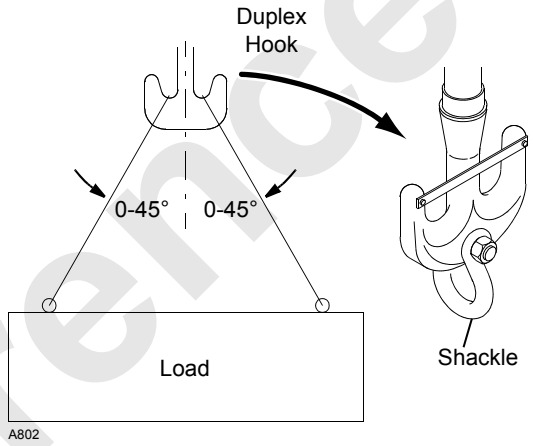
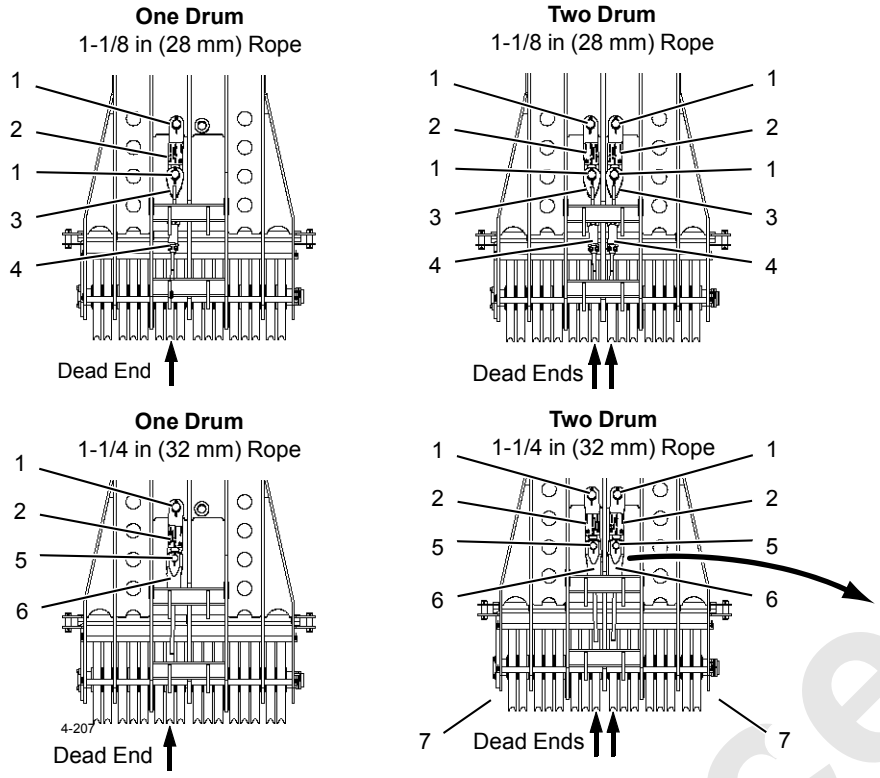


FIGURE 4-52

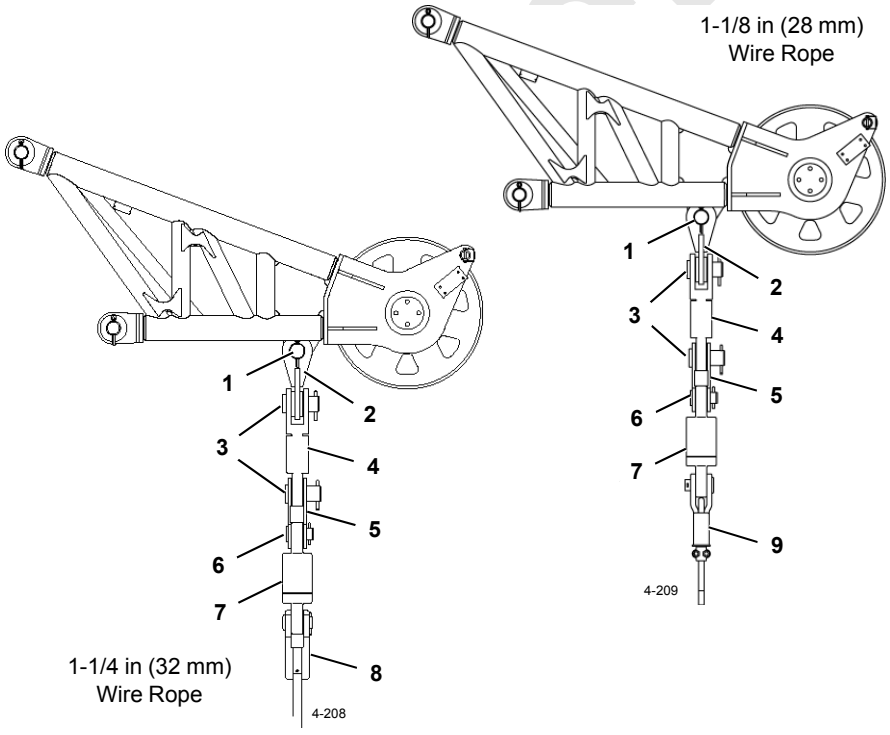


Item	Description
1	Pin with Cotter Pin
2	Load Cell (70 k)
3	Link
4	Wedge Socket – 1-1/8 in (29 mm) with Pin and Cotter Pin
5	Bushing – 3 inch OD x 2-9/32 inch ID (76 mm OD x 56 mm ID)
6	Button Socket – 1-1/4 in (32 mm) with Pin and Cotter Pin
7	Dead End Lug - Optional

See Figure 4-44

#79A LOWER JIB POINT

FIGURE 4-53

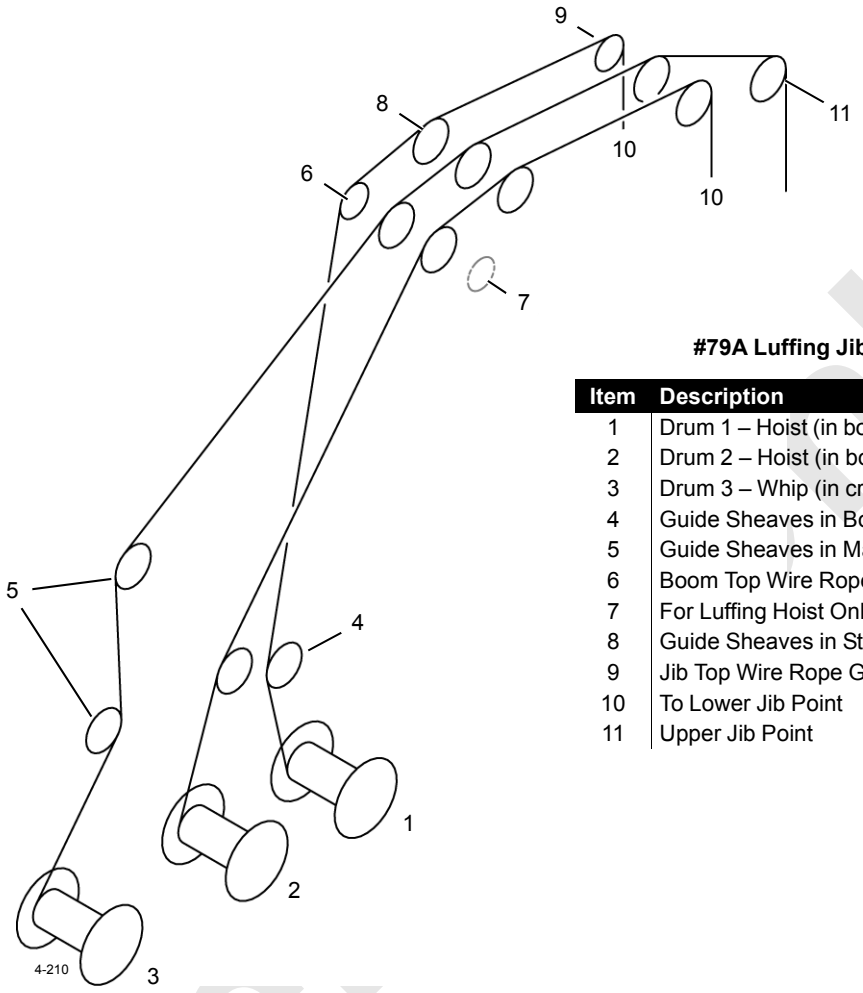


#79A UPPER JIB POINT

Item	Description
1	Pin with Cotter Pin
2	Link
3	Pin with Cotter Pin
4	Load Cell - 70,000 lb (31 751 kg)
5	Link
6	Pin with Cotter Pin
7	Swivel (25 USt)
8	Button Socket – 1-1/8 in (28 mm) or 1-1/4 in (32 mm) Wire Rope with Pin
9	Wedge Socket – 1-1/8 in (28 mm)
10	Link
11	Pin with Cotter Pin
12	Swivel Weight Ball

FIGURE 4-54

A08237



#79A Luffing Jib

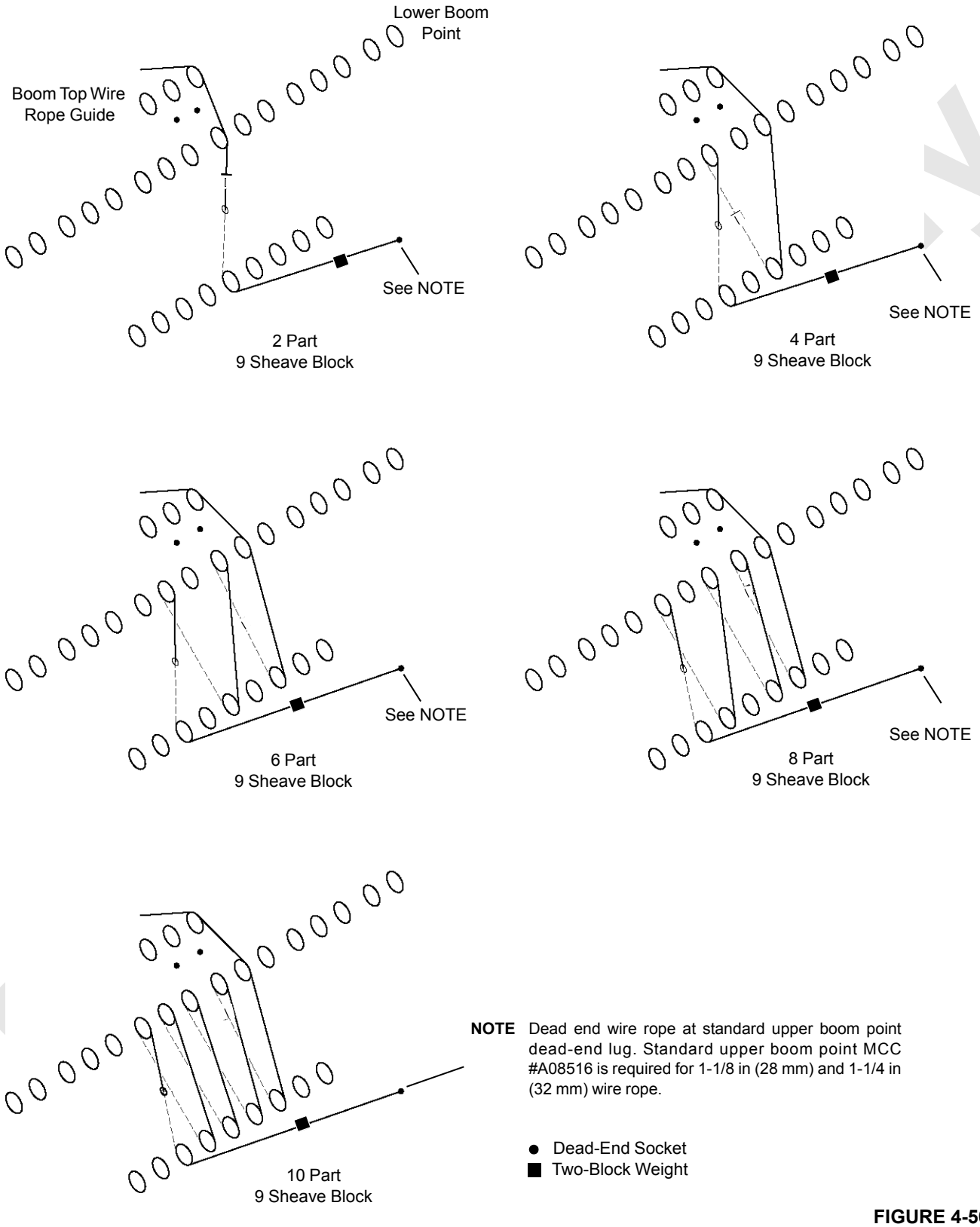
Item	Description
1	Drum 1 – Hoist (in boom insert)
2	Drum 2 – Hoist (in boom butt)
3	Drum 3 – Whip (in crane)
4	Guide Sheaves in Boom
5	Guide Sheaves in Mast
6	Boom Top Wire Rope Guide
7	For Luffing Hoist Only
8	Guide Sheaves in Strut
9	Jib Top Wire Rope Guide
10	To Lower Jib Point
11	Upper Jib Point

FIGURE 4-55

4

4-211

SINGLE HOIST DRUM REEVING
#79A Top



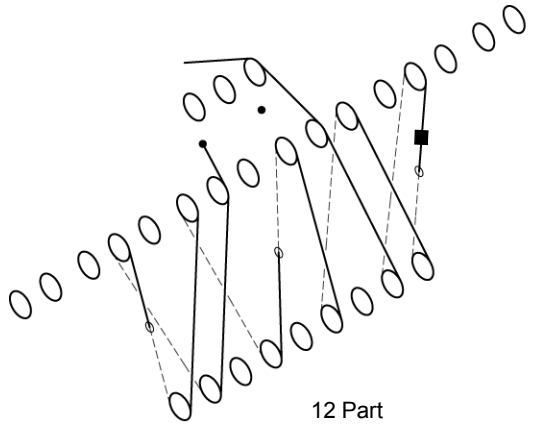
NOTE Dead end wire rope at standard upper boom point dead-end lug. Standard upper boom point MCC #A08516 is required for 1-1/8 in (28 mm) and 1-1/4 in (32 mm) wire rope.

● Dead-End Socket
■ Two-Block Weight

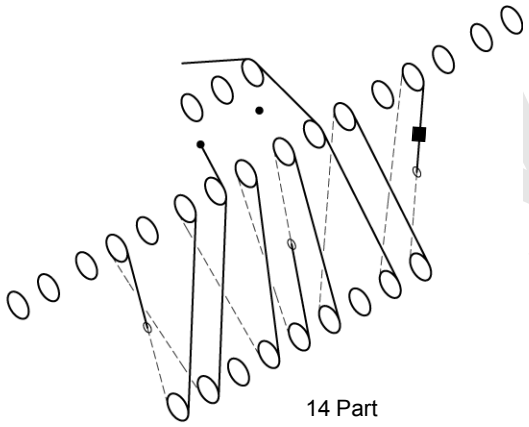
FIGURE 4-56

4-212

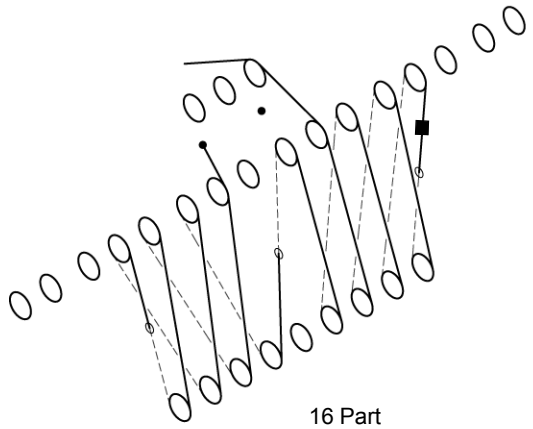
SINGLE HOIST DRUM REEVING
#79A Top



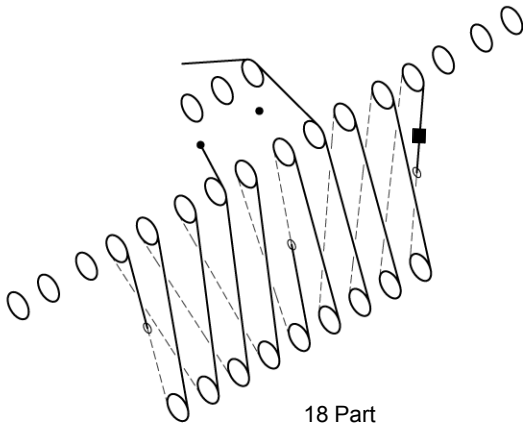
12 Part
9 Sheave Block



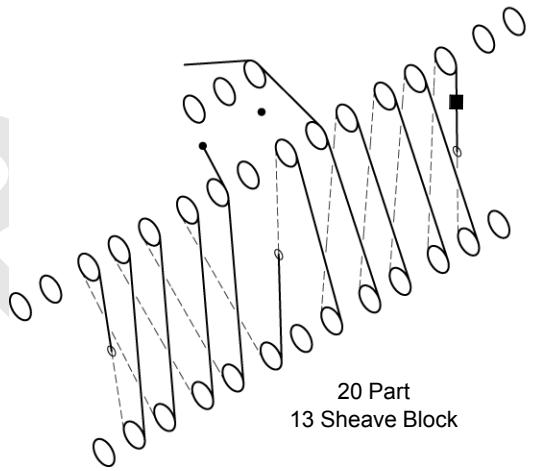
14 Part
9 Sheave Block



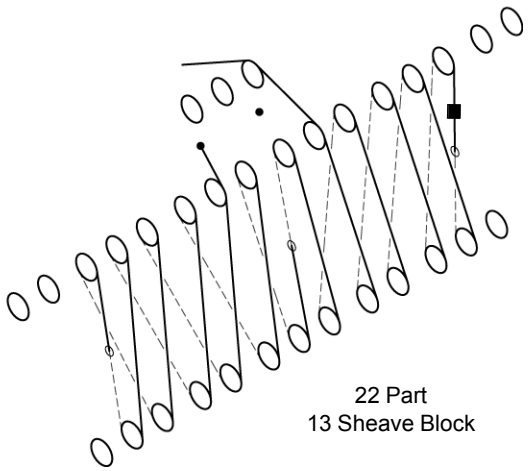
16 Part
9 Sheave Block



18 Part
9 Sheave Block



20 Part
13 Sheave Block

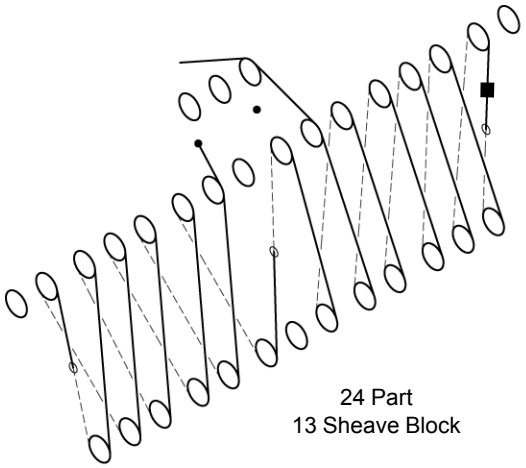


22 Part
13 Sheave Block

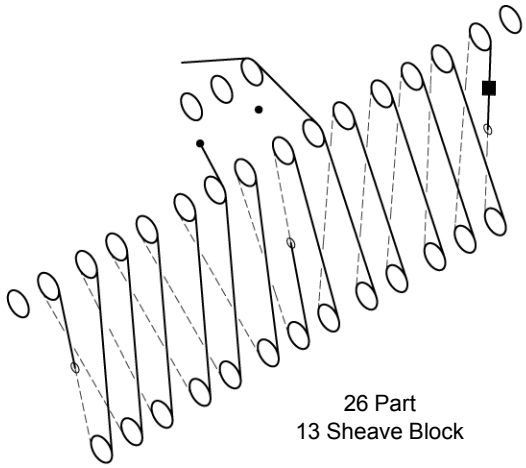
FIGURE 4-56 continued

4-213

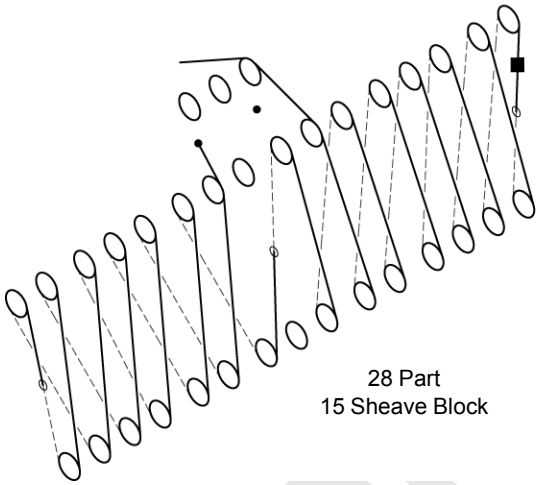
SINGLE HOIST DRUM REEVING
#79A Top



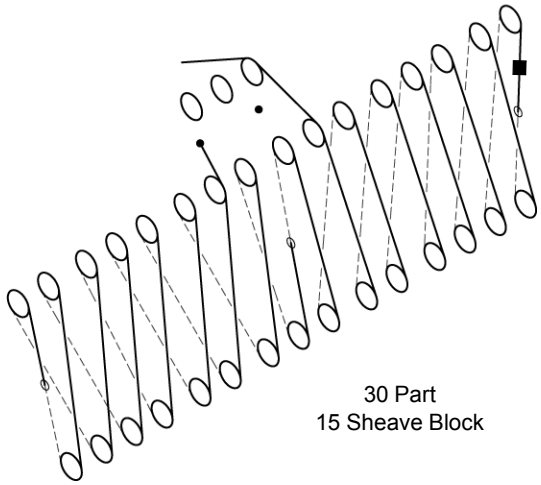
24 Part
13 Sheave Block



26 Part
13 Sheave Block



28 Part
15 Sheave Block

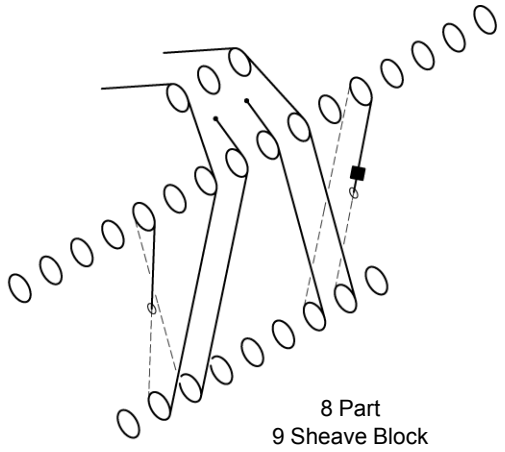


30 Part
15 Sheave Block

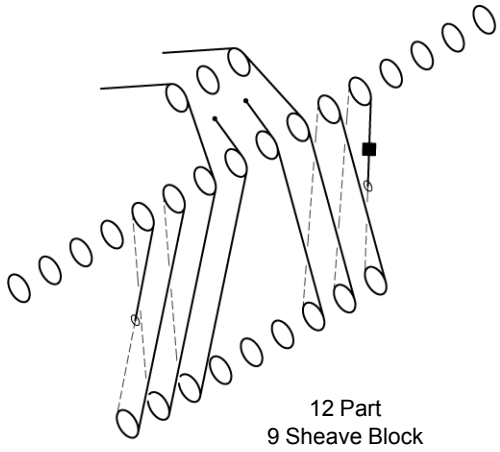
FIGURE 4-56 continued

4-214

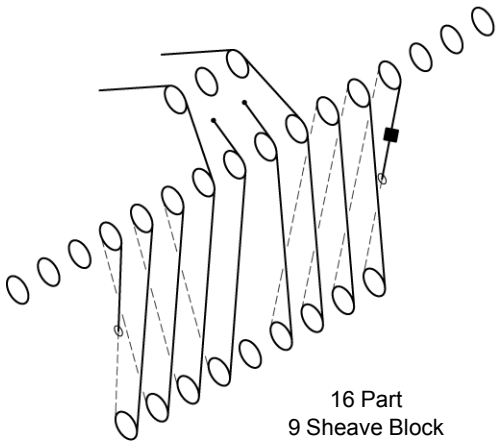
TANDEM HOIST DRUM REEVING
#79A Top



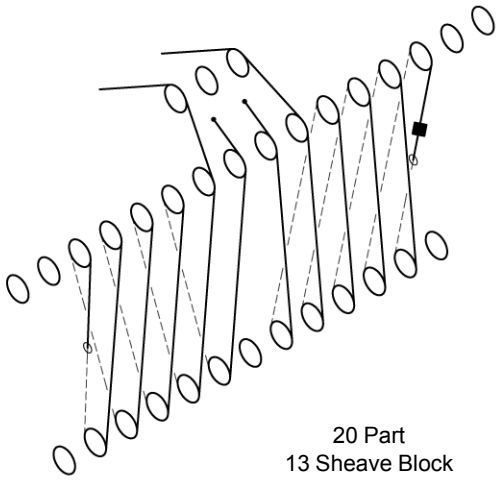
8 Part
9 Sheave Block



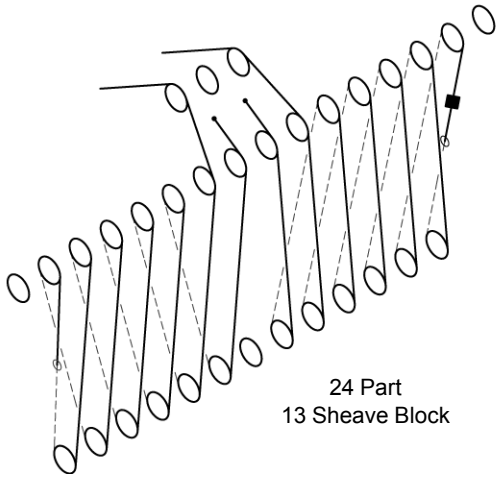
12 Part
9 Sheave Block



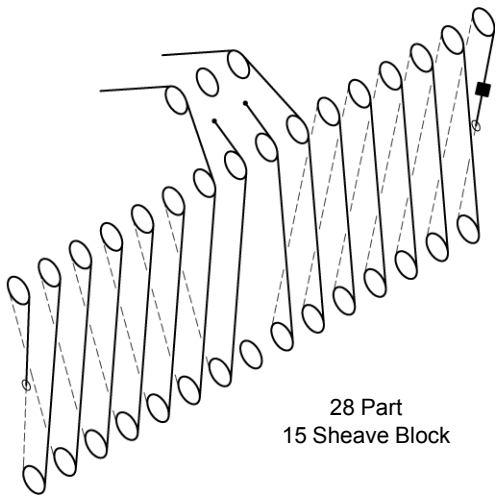
16 Part
9 Sheave Block



20 Part
13 Sheave Block



24 Part
13 Sheave Block



28 Part
15 Sheave Block

FIGURE 4-57

BLOCK LEVEL SENSOR ADJUSTMENT

General

The block level sensors (Figure 4-58) ensure that the load block remains level when two load lines — Drums 1 and 2 — are routed to the load block over the #79A luffing jib top.

NOTE: This block level sensor is only on cranes without wireless communication. On cranes with wireless communication, the controller adjusts block level automatically (see Crane Diagnostics, Block Level Sensor topic in Section 3 of Operator Manual).

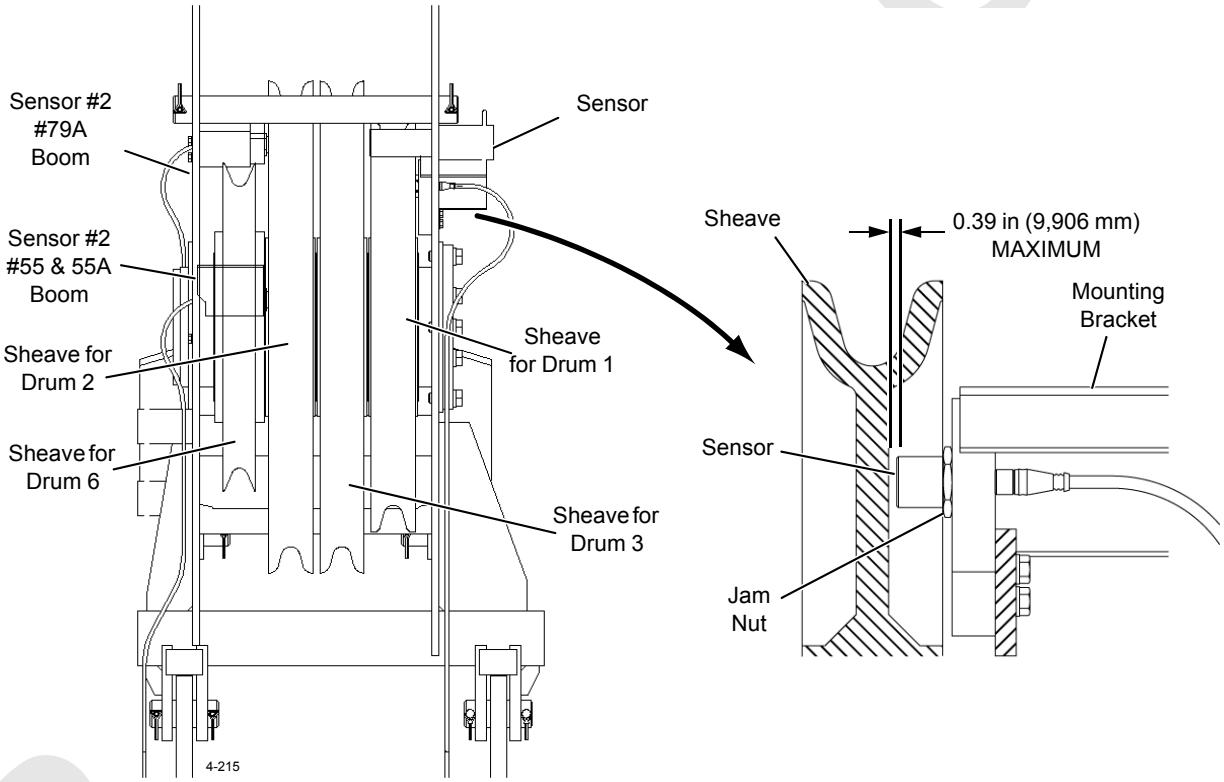
The sensors monitor guide sheave rotation speed. The crane's programmable controller uses signals from the sensors to equalize the rotation speed of the drums so the load block remains level.

The sensors were adjusted at the factory and need to be readjusted only when a new sensor is installed or the position of a sensor is changed.

Sensor Adjustment

1. If necessary, attach mounting bracket to guide sheave frame with cap screws.
2. Loosen jam nut securing sensor to bracket.
3. Turn sensor in or out to obtain specified dimension between end of sensor and wall of sheave.
4. Tighten jam nut.
5. Check for proper operation without load. Drums should operate at same speed and load block should remain level.

   Readjust sensor if required.



Front View of Boom Top Guide Sheaves

FIGURE 4-58

SECTION 5
LUBRICATION

TABLE OF CONTENTS

5

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 5
LUBRICATION

LUBRICATION

See F2104 at the end of this section.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 6
MAINTENANCE

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 6
MAINTENANCE

GENERAL MAINTENANCE

This section contains maintenance and adjustment instructions for the limit devices used with the luffing jib attachment.

For maintenance and inspection of the following components, see the Service Manual supplied with your crane:

- Straps
- Wire Rope
- Load Block and Weight Ball
- Boom and Jib

JIB STOP ADJUSTMENT — (PAST PRODUCTION)

General

The luffing jib attachment is equipped with three limit switches (Figure 6-1) which automatically stop the luffing hoist and apply its brake when the luffing jib is raised or lowered to the following angles:

NOTE: Luffing jib angles given in this section can vary plus or minus 1°.

- **Luffing Jib MAX UP 1** (maximum working angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 168°.

  The limit bypass switch must be turned to the bypass position to allow the jib to be raised an additional 1.2° to luffing jib MAX UP 2 limit.

- **Luffing Jib MAX UP 2** (maximum angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 169.2°.

  This limit can be bypassed with the limit bypass switch only when the attachment is lowered to ground (boom below 50°).

- **Luffing Jib MAX DOWN** (minimum angle) – 70° boom to luffing jib angle. This limit cannot be bypassed.

The operating limit alert (yellow light and buzzer in operator's cab) comes on when the jib reaches any of the limits. The operating limit alert also comes on any time the luffing jib is lowered below horizontal.

WARNING

Falling Attachment Hazard!

Do not operate crane unless luffing jib stops are properly adjusted and operational.

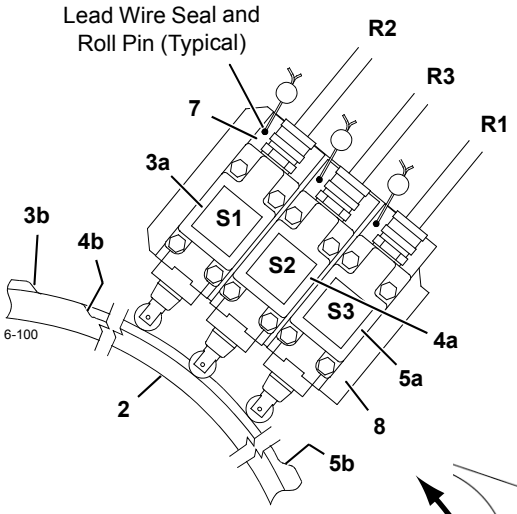
Operating luffing jib above MAX UP limit or below MAX DOWN limit is neither intended nor approved. Jib can be pulled over backwards or collapse.

Removing Luffing Jib

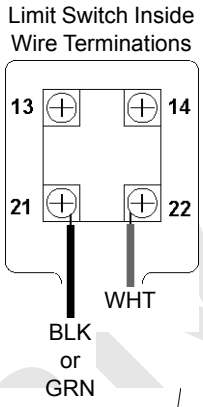
Perform the following steps to bypass the luffing jib stops and block-up limits when the luffing jib is removed. If you fail to perform these steps, the operating limit alert will come on and you will not be able to boom down or hoist loads.

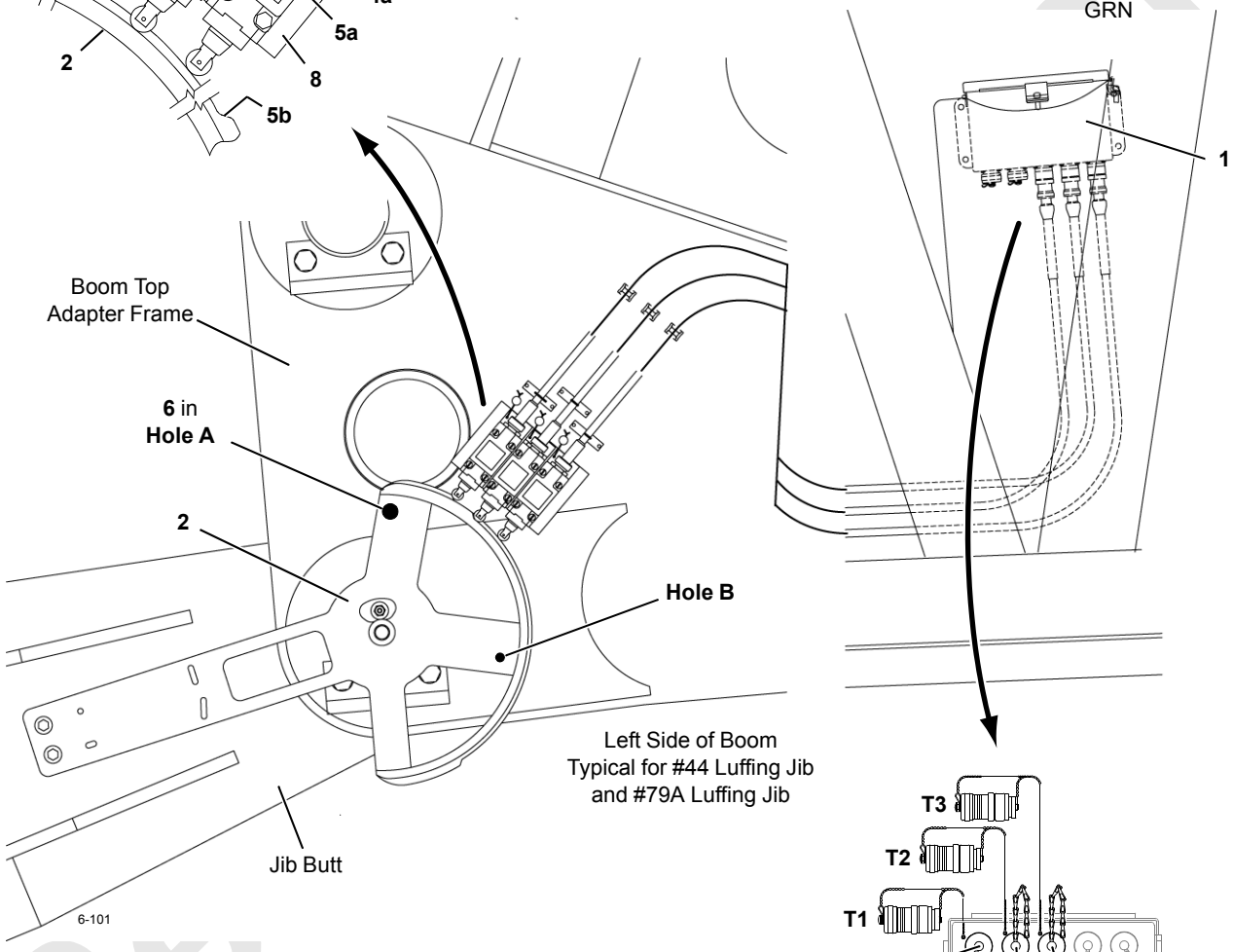
See Figure 6-1 for the following procedure.

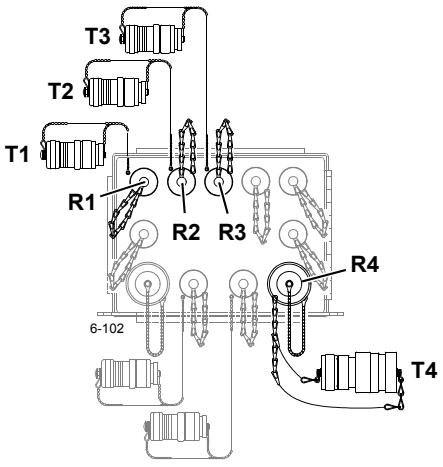
1. Unplug electric cords from receptacles R1- R4 on boom node controller (1).
2. Coil electric cords and fasten to boom top adapter frame for storage.
3. Connect terminating plugs T1 - T4 to receptacles R1- R4 on boom node controller (1).



LIMIT SWITCH WIRING		
Receptacle	**Terminal**	**System Operation**
S1-1 (White)	S1-22	24 Volts DC
S1-2 (Black)	S1-21	MAX UP 1
S2-1 (Green)	S2-21	MAX UP 2
S2-2 (Black)		Not Used
S2-3 (White)	S2-22	24 Volts DC
S3-1 (White)	S3-22	24 Volts DC
S3-2 (Black)	S3-21	MAX DOWN







Item	Description	Item	Description
1	Boom Node Controller	**Receptacles**	
2	Actuator	R1	MAX DOWN
3a	Limit Switch - MAX UP 1	R2	MAX UP 1 (maximum working)
3b	Cam - MAX UP 1	R3	MAX UP 2 (maximum)
4a	Limit Switch - MAX UP 2	R4	To Luffing Jib Cable Reel
4b	Cam - MAX UP 2	**Terminating Plugs**	
5a	Limit Switch - MAX DOWN	T1	MAX DOWN
5b	Cam - MAX DOWN	T2	MAX UP 1 (maximum working)
6	Alignment Pin	T3	MAX UP 2 (maximum)
7	Spacer (each limit switch)	T4	To Luffing Jib Cable Reel
8	Mounting Bracket		

FIGURE 6-1

Maintenance

At least once weekly, check that the limit switches stop the luffing jib at the specified angles. If not, replace any defective parts and/or adjust jib stop limit switches.

Adjustment

The jib stop limit switches must be installed, adjusted, and sealed at initial assembly of the attachment. Limit switch adjustments must be checked and readjusted if required each time the attachment is reassembled and when parts are replaced. *Seals must be removed to allow readjustment.*

See Figure 6-1 for the following procedures.

Preliminary Adjustment

1. Lower attachment to ground.
2. Remove screws connecting actuator (2) to jib butt.

NOTE: Check jib butt side-to-side position on pivot pin when attaching actuator. Ensure switches remain on cam surface when jib butt shifts side to side. Install shims at actuator attachment point or jib butt, if necessary.

MAX UP 1 Limit Adjustment

1. Loosen screws in limit switch (3a).
2. Rotate actuator (2) clockwise until Hole A in actuator lines up with hole in boom top.
3. Insert alignment pin (6) through Hole A in actuator and into hole in boom top. *Make sure shoulder of pin rests squarely against actuator to ensure proper alignment for adjustment.*
4. Slide limit switch (3a) against cam (3b) until limit switch just “clicks” open and hold.
5. Securely tighten screws in limit switch.
6. Remove alignment pin (6).
7. Check MAX UP 1 limit setting as follows:
   a. Rotate actuator (2) counterclockwise and then clockwise so MAX UP 1 limit switch roller contacts cam (3b).
   b. Limit switch must click open when Hole A in actuator lines up with hole in boom top (step 3).
   c. With LUFFING JIB mode selected, pull luffing jib handle back. Luffing hoist must not turn and luffing jib MAX UP 1 operating limit should come on.
   d. Readjust limit switch if necessary to ensure proper operation.
8. After boom and jib are raised, check operation of MAX UP 1 limit. See instructions under Operational Checks.

MAX UP 2 Limit Adjustment

See Figure 6-1 for the following procedure.

1. Loosen screws in limit switch (4a).
2. Rotate actuator (2) so roller on limit switch (4a) is between cams (4b and 5b).
3. Slide limit switch (4a) toward actuator (2) until roller just touches actuator and hold. *Switch must not click open.*
4. Securely tighten screws in limit switch.
5. After boom and jib are raised, check operation of MAX UP 2 limit following instructions under Operational Checks.

MAX DOWN Limit Adjustment

See Figure 6-1 for the following procedure.

1. Loosen screws in limit switch (5a).
2. Rotate actuator (2) counterclockwise until Hole B in actuator lines up with hole in boom top.
3. Insert alignment pin (6) through Hole B in actuator and into hole in boom top. *Make sure shoulder of pin rests squarely against actuator to ensure proper alignment for adjustment.*
4. Slide limit switch (5a) against cam (5b) until limit switch just “clicks” open and hold.
5. Securely tighten screws in limit switch.
6. Remove alignment pin (6).
7. Check MAX DOWN limit setting as follows:
   a. Rotate actuator (2) clockwise away from limit switch and then counterclockwise so MAX DOWN limit switch roller contacts cam (5b).
   b. Limit switch must click open when Hole B in actuator lines up with hole in boom top (step 3).
   c. With LUFFING JIB mode selected, push luffing jib handle forward. Luffing hoist must not turn and luffing jib MAX DOWN limit should come on.
   d. Readjust limit switch if necessary to ensure proper operation.

Final Adjustment Steps

1. Securely fasten actuator (2) to jib butt with screws and lock washers provided.
2. Once limit switches are properly adjusted, drill and seal limit switch spacers (7, Figure 6-1) to mounting bracket (8) with roll pins and lead wire seals.
3. *Make sure boom and luffing jib angle indicators are properly adjusted before raising boom and luffing jib.* See instructions in this section.

THIS PAGE INTENTIONALLY LEFT BLANK

Operational Checks

For the past production limit switch, make the following operational checks after the boom and jib are raised.

1. Raise boom and luffing jib until boom is at 80°.
2. Monitor BOOM TO LUFFING JIB ANGLE on digital display while performing remaining steps.
3. SLOWLY raise luffing jib.
4. Luffing hoist must stop and be inoperable when boom to luffing jib angle is 168° (maximum working angle).
5. Operating limit alert should come on indicating luffing jib MAX UP 1 limit has been reached.

   Stop raising luffing jib immediately if limit switch fails to stop luffing hoist. Lower boom and jib to ground and readjust MAX UP 1 limit switch.

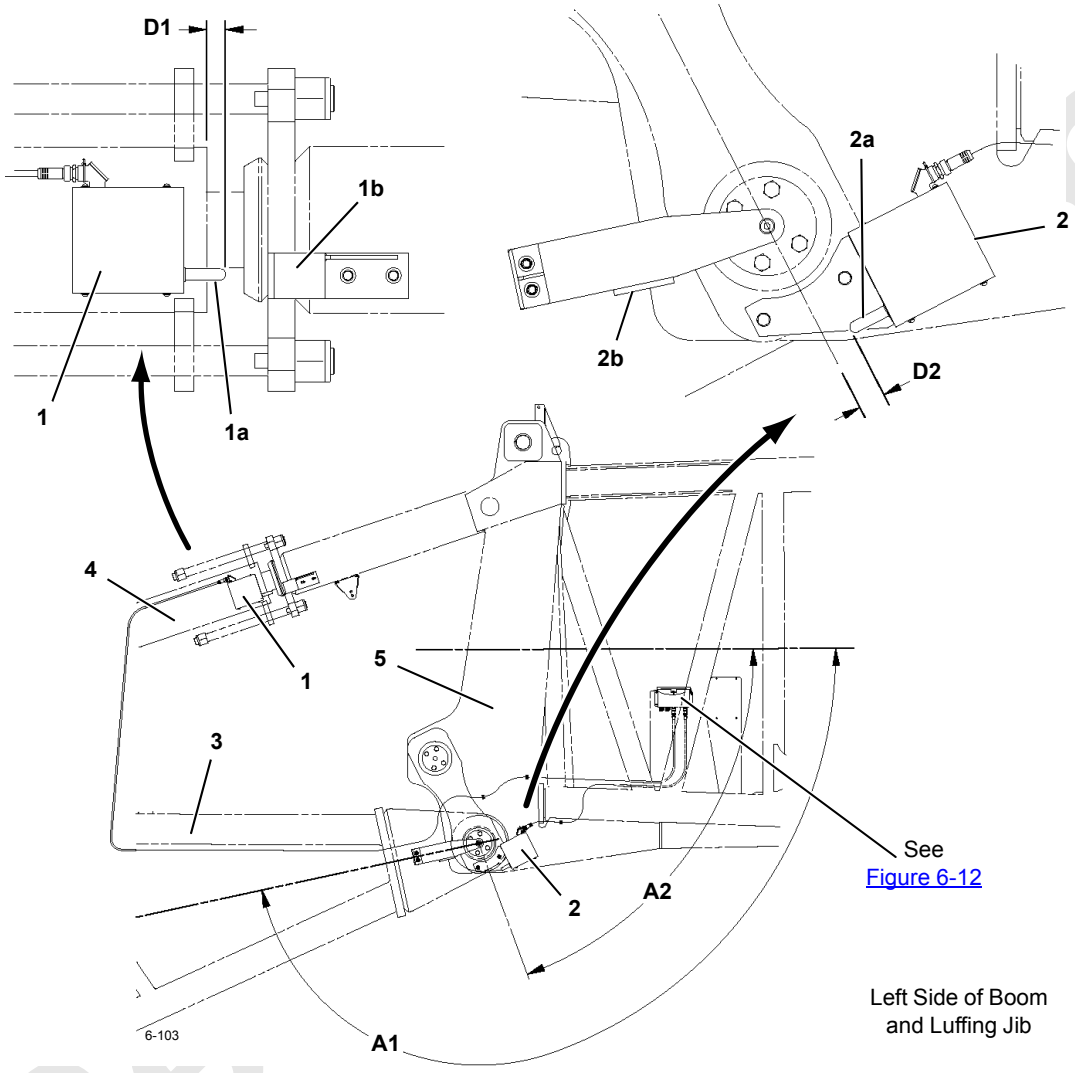
6. Turn limit bypass key clockwise to bypass MAX UP 1 limit.
7. SLOWLY raise luffing jib past MAX UP LIMIT 1.
8. Luffing hoist must stop and be inoperable when boom to luffing jib angle is 169.2° (maximum angle).
9. Operating limit alert should come on indicating luffing jib MAX UP 2 limit has been reached.

   Stop raising luffing jib immediately if limit switch fails to stop luffing hoist. Lower boom and jib to ground and readjust MAX UP 2 limit switch.

10. SLOWLY lower luffing jib.
11. Luffing hoist must stop and be inoperable when boom to luffing jib angle is 70°.

    Stop lowering luffing jib immediately if limit switch fails to stop luffing hoist. Lower boom and jib to ground and readjust MAX DOWN limit switch.

Item	Description	Deactivated	Activated
D1	Edge of Actuator Rod to Edge of Jib Stop Tube	1.44 in (36,7 mm)	1.22 in (30,9 mm)
D2	Edge of Actuator Rod to Center of Pin	1.75 in (44,5 mm)	1.50 in (38,1 mm)



Left Side of Boom and Luffing Jib

Item	Description
1	Limit Switch - MAX UP 2
1a	Actuator Rod
1b	Actuator Rod Bracket
2	Limit Switch - MAX DOWN 2
2a	Actuator Rod
2b	Actuator Rod Bracket
3	Luffing Jib Butt
4	Jib Stop (Mechanical)
5	Boom Top

Item	Description
A1	MAX UP 1 Angle = 168° (programmed limit)
	MAX UP 2 Angle = 169-170.5° (limit switch)
A2	MAX DOWN 1 Angle = 70° (programmed limit)
	MAX DOWN 2 Angle = 69-66° (limit switch)

FIGURE 6-2

JIB STOP ADJUSTMENT — (CURRENT PRODUCTION)

WARNING

Falling Attachment Hazard!

Do not operate crane unless luffing jib stops are properly adjusted and operational.

Operating luffing jib above MAXIMUM UP 2 limit or below MAXIMUM DOWN limit is neither intended nor approved. Jib can be pulled over backwards or collapse.

General

The luffing jib attachment is equipped with two limits which automatically stop the luffing hoist and apply its brake when the luffing jib is raised or lowered to the following angles.

NOTE: Luffing jib angles given in this section can vary plus or minus 1°.

- **Luffing Jib MAX UP 1** (maximum working angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 168°. This is a programmed limit controlled by angle sensors on the boom and jib.

  The limit bypass switch must be turned to the bypass position to allow the jib to be raised an additional 1 to 2.5° to luffing jib MAX UP 2 limit.

- **Luffing Jib MAX UP 2** (maximum angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 169 to 170.5°. This limit is controlled by a limit switch.

  This limit can be bypassed with the limit bypass switch only when the attachment is lowered to ground (boom below 50°).

- **Luffing Jib MAX DOWN 1** (maximum working angle)

  Automatically stops the luffing jib when the boom to luffing jib angle is 70°. This is a programmed limit controlled by angle sensors on the boom and jib.

  The limit bypass switch must be turned to the bypass position to allow the jib to be lowered an additional 1 to 4° to luffing jib MAX DOWN 2 limit.

- **Luffing Jib MAX DOWN 2** (maximum angle) which automatically stops the luffing hoist when the boom to luffing jib angle is 69 to 66°. This limit is controlled by a limit switch.

  The luffing jib can be raised after the limit is contacted.

Maintenance

At least once weekly and each time the attachment is erected, check that the luffing jib stops at the specified angles.

Pre-Erection Checks

To ensure proper operation of the luffing jib stops:

- The jib stop cables must be connected to receptacles (7 and 8, Figure 6-12, View A).
- The luffing jib angles must be properly calibrated. See Rated Capacity Indicator/Limiter Operation Guide for instructions.
- The jib stop limit switches must be mounted properly.

MAX UP Limit Checks

See Figure 6-1 for the following procedure.

Perform the following steps with the boom and luffing jib on the ground:

1. Check Dimension D1, View A. If necessary, adjust position of limit switch housing to obtain deactivated dimension.

   Perform the remaining steps with engine running and appropriate Luffing Jib Capacity Chart selected.

2. Depress limit switch (1) actuator rod to activated Dimension D1 and hold. Listen for limit switch to “click” open (if equipped, LED OFF).
3. Turn limit bypass key clockwise and hold.
4. Pull luffing jib handle back.

   Luffing hoist must not turn in up direction and MAX UP 2 fault should come on.

MAX DOWN Limit Checks

See Figure 6-1 for the following procedure.

Perform the following steps with the boom and luffing jib on the ground:

1. Check Dimension D2, View B. If necessary, adjust position of limit switch housing to obtain deactivated dimension.

   Perform the remaining steps with engine running and appropriate Luffing Jib Capacity Chart selected.

2. Depress limit switch (2) actuator rod to activated Dimension D2 and hold. Listen for limit switch to “click” open (if equipped, LED OFF).
3. Turn limit bypass key clockwise and hold.
4. Push luffing jib handle forward.

   Luffing hoist must not turn in down direction and MAX DOWN 2 fault should come on.

Operational Checks

For the current production jib stop, make the following operational checks after the boom and jib are raised.

1. Travel crane onto a firm level surface or level crane by blocking under crawlers.
2. Raise boom and luffing jib until boom is at 80°.
3. Monitor BOOM TO LUFFING JIB ANGLE on main display information screen while performing remaining steps.
4. SLOWLY raise luffing jib.
5. Luffing hoist must stop and be inoperable in up direction when boom to luffing jib angle is 168°.
6. Fault alarm should come on indicating MAX UP 1 limit has been reached.
7. Turn limit bypass key clockwise to bypass MAX UP 1 limit.
8. SLOWLY raise luffing jib past MAX UP 1 limit.
9. Luffing hoist must stop and be inoperable in up direction when boom to luffing jib angle is 169 to 170.5°.
10. Fault alarm should come on indicating MAX UP 2 limit has been reached.

    If maximum stops do not operate properly, troubleshoot system.
11. SLOWLY lower luffing jib.
12. Luffing hoist must stop and be inoperable in down direction when boom to luffing jib angle is 70°.
13. Fault alarm should come on indicating MAX DOWN 1 limit has been reached.
14. Turn limit bypass key clockwise to bypass MAX DOWN 1 limit.
15. SLOWLY lower luffing jib past MAX DOWN 1 limit.
16. Luffing hoist must stop and be inoperable in down direction when boom to luffing jib angle is 69 to 66°.
17. Fault alarm should come on indicating MAX DOWN 2 limit has been reached.

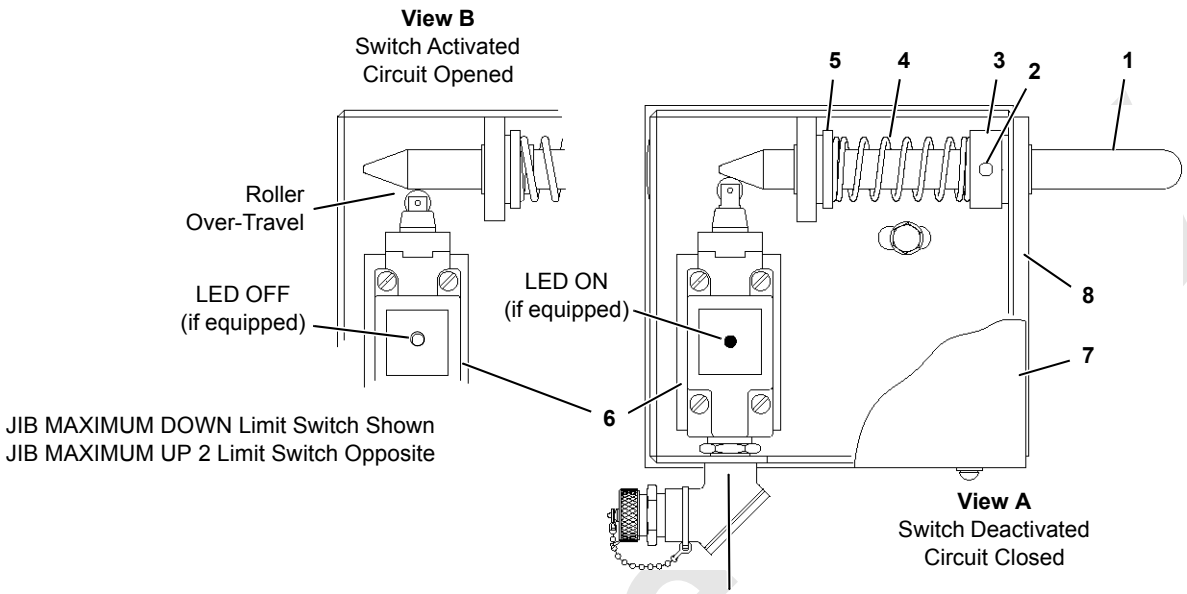
    If minimum stops do not operate properly, troubleshoot system.

Actuator Rod Replacement

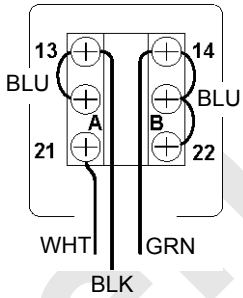
See Figure 6-3 for the following procedure.

1. Remove damaged actuator rod (1).
2. Slide spring washers (3 and 5) and spring (4) over new actuator rod while sliding actuator rod into bracket assembly.
3. Position actuator rod (1) so tapered end just touches limit switch (6) roller (View A). Actuator rod must not depress limit switch roller.
4. Drill 1/4 in (6,35 mm) hole through spring washer (3) and actuator rod (1).
5. Install dowel pin (2).
6. Check limit switch roller to insure there is over-travel as shown in View B.

6-104



Item	Description
1	Actuator Rod
2	Dowel Pin
3	Spring Washer
4	Spring
5	Spring Washer
6	Limit Switch
7	Cover
8	Bracket Assembly



Limit Switch Wiring
Past Production with LED

Receptacle	Switch Terminals			Operation
1 (green)	22	B	14	Jib Max Up or Jib Max Down
2 (black)	A	13		LED
3 (white)	21			24 VDC Supply

Limit Switch Wiring
Current Production without LED

Receptacle	Switch Terminals			Operation
1 (green)	22		14	Jib Max Up or Jib Max Down
2 (black)		13		GND
3 (white)	21			24 VDC Supply

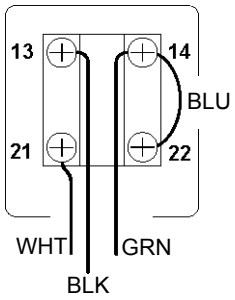


FIGURE 6-3

AUTOMATIC BOOM STOP ADJUSTMENT

Boom and Mast Stability

To maintain boom stability when operating at high boom angles, adhere to the minimum load requirements specified in the capacity chart for the boom and luffing jib combination in use.

Boom will settle back against boom stops, boom hoist reeving between boom and mast will go slack, and load block will swing in toward boom if minimum load is not used.

Maximum Operating Angles

Boom stop limit switch (5, Figure 6-5) automatically stops the boom and applies the boom hoist brake when the boom is raised to ***Angle A*** (see Figure 6-4 and Table 6-1).

Operation

See Figure 6-5 for the following description.

When the boom is below the maximum angle, limit switch (5) is closed and its LED (light-emitting diode) is ON (View B). The boom hoist can be operated.

When the boom is raised to the maximum angle, boom butt (1) pushes adjusting rod (2a or 2b) in and actuator rod (11, View A) opens limit switch (5). The LED then goes OFF. Boom hoist operation stops automatically because the open limit switch turns off power to the boom hoist electric circuit. The boom hoist pump shifts to neutral and the brake applies to stop boom movement.

WARNING

Falling Attachment Hazard!

If boom fails to stop for any reason, stop engine immediately. Troubleshoot system to determine problem.

Do not resume operation until problem has been corrected.

Maintenance

At least once weekly, check that the automatic boom stop stops the boom at the specified maximum angle. If not, replace any worn or damaged parts and/or adjust the boom stop.

Once the automatic boom stop is properly adjusted, it should not require periodic adjustment. Adjustment is required, however, when:

- The luffing jib is installed or removed
- Parts are replaced

WARNING

Falling Attachment Hazard!

Do not operate crane unless automatic boom stop is properly adjusted and operational. Do not adjust maximum operating angle higher than specified. Boom could be pulled over backwards or collapse, causing death or serious injury.

Table 6-1 — Automatic Boom Stop Angles

Angle A (see Figure 6-4)	Attachment
83° [1]	#55-79A, #55, or 55A Boom without Luffing Jib
OR	
84° [2]	#55-79A, #55, or 55A Boom without Luffing Jib
When Boom Up Limit *Can be Bypassed* *	
85°	#44 or 79A Luffing Jib on 140 – 180 ft (42,7 – 54,9 m) of Boom
87°	#44 or 79A Luffing Jib on 200 – 340 ft (61,0 – 103,6) of Boom
When Boom Up Limit *Cannot be Bypassed* *	
86°	#44 or 79A Luffing Jib on 140 – 180 ft (42,7 – 54,9 m) of Boom
88°	#44 or 79A Luffing Jib on 200 – 340 ft (61,0 – 103,6) of Boom

***** To determine if the boom up limit on you crane can be bypassed or not, perform Bypass Limit Test given below.

[1]: Past production with 4-3/4 in (121 mm) long adjusting rod.

[2]: Current production with 4-1/2 in (114 mm) long adjusting rod.

Bypass Limit Test

Perform the following test to determine if the boom up limit on your crane can be bypassed or not.

WARNING

Crush Hazard!

Maintain constant communication between operator and assistant during the following steps.

Stay clear of moving parts.

1. Lower the boom onto blocking at ground level.
2. Have an assistant push adjusting rod (2a or 2b Figure 6-5) in to trip the boom stop limit switch open.
3. Rotate the limit bypass key (in crane cab) to the bypass position and hold.
4. Try to boom up — do not raise the boom any higher than necessary to perform the test:
   a. If the boom rises, your boom up limit ***can be bypassed***.
   b. If the boom does not rise, your boom up limit ***cannot be bypassed***.
5. The test is complete. Release the limit bypass key and the adjusting rod to the normal operating positions.

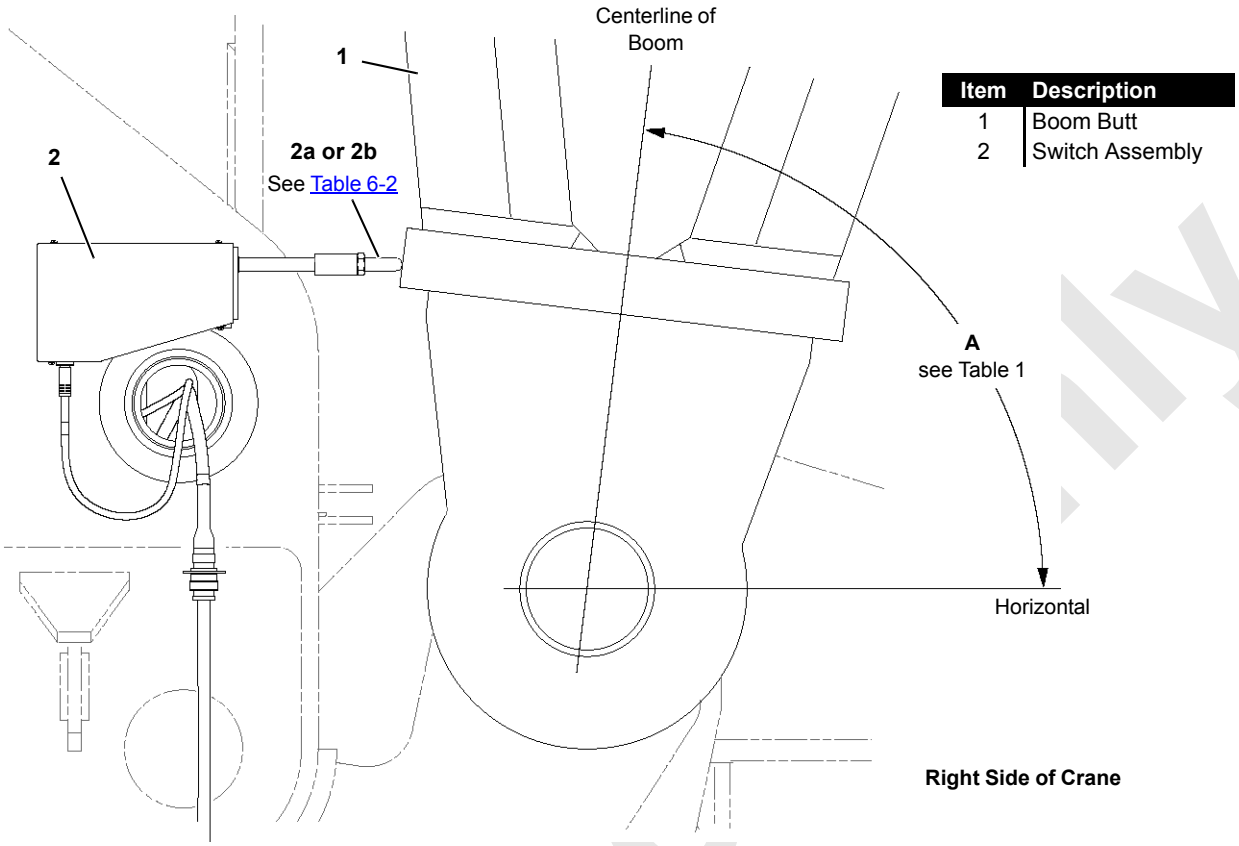
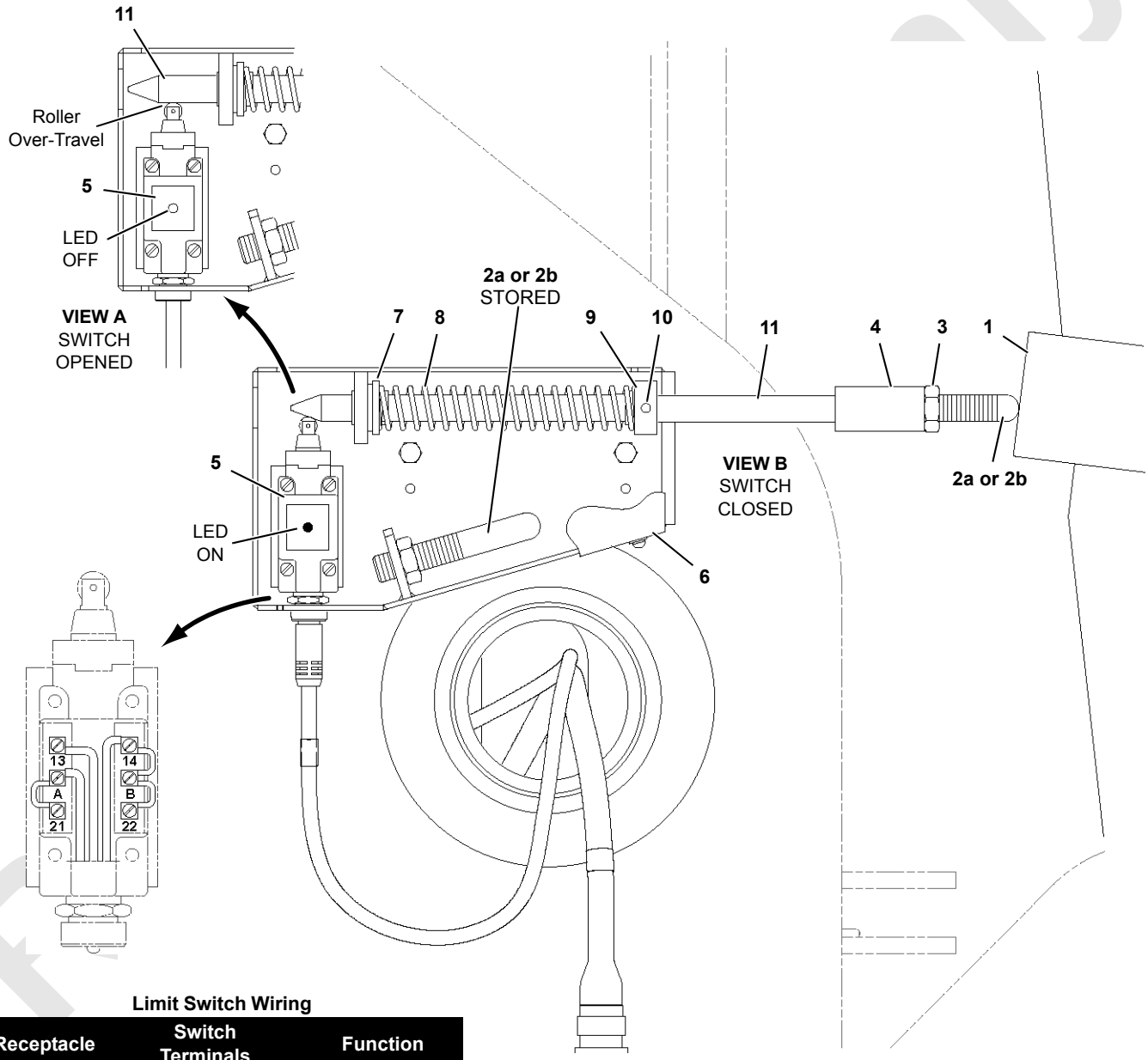


FIGURE 6-4

Table 6-2 — Adjusting Rods

Adjusting Rod Length	
2a Boom Only	**2b** With Luffing Jib
When Boom Up Limit *Can be Bypassed*	
4-3/4 in (121 mm) for 83° 4-1/2 in (114 mm) for 84°	3-3/4 in (83 mm)
When Boom Up Limit *Cannot be Bypassed*	
4-3/4 in (121 mm) for 83° 4-1/2 in (114 mm) for 84°	3-1/4 in (83 mm)

Item	Description	Item	Description
1	Boom Butt	7	Spring Washer
2a	Adjusting Rod – Boom only	8	Spring
2b	Adjusting Rod – Boom with Luffing Jib (see Table 6-2)	9	Spring Washer
3	Jam Nut	10	Dowel Pin 1/4 in (6,35 mm) Diameter
4	Coupling	11	Actuator Rod
5	Limit Switch	12	Digital Level (see Figure 6-6)
6	Cover		



Limit Switch Wiring

Receptacle	Switch Terminals			Function
1 (green)	22	B	14	Max Angle
2 (black)	A	13		LED
3 (white)	21			12 VDC Supply

FIGURE 6-5

Boom Stop Angle	Digital Level Angle
83°	70.7°
84°	71.7°
85°	72.7°
86°	73.7°
87°	74.7°
88°	75.7°

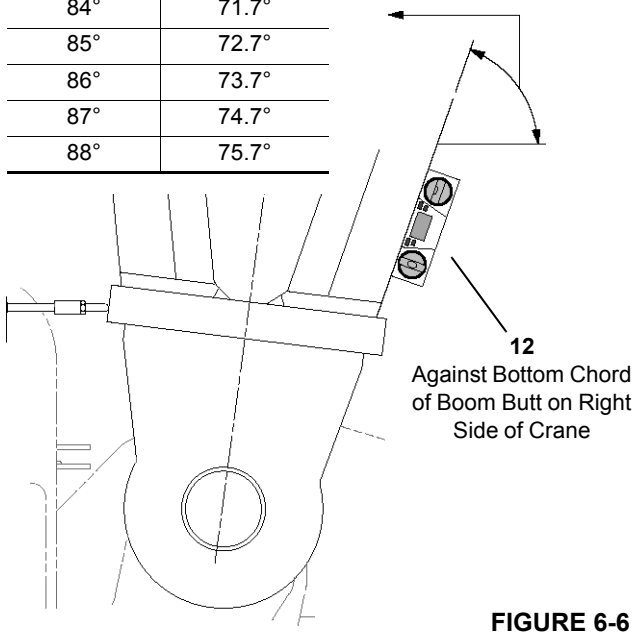


FIGURE 6-6

Adjustment

1. Park the crane on a firm level surface or level the crane by blocking under the crawlers.
2. Make sure the proper adjusting rod is installed (see Table 6-2):
   - Rod (2a) for BOOM ONLY
   - Rod (2b) for boom WITH LUFFING JIB
3. Raise the boom to specified **Angle A** (Figure 6-4) while monitoring the angle on the mechanical indicator or on the operating conditions screen of the front-console display.
4. Verify that the boom is at the proper Angle A:
   a. Place an accurate digital level (12) on the boom butt as shown in Figure 6-6. The corresponding **Digital Level Angle** should appear on the digital level.
   b. Raise or lower the boom as necessary.
5. If the boom stops at the specified angle, further adjustment is not needed.
   - If the boom stops before reaching the specified angle, go to step 6.
   - If the boom reaches the specified angle before it stops, go to step 7.

See Figure 6-5 for the remaining steps.

6. If the boom stops before reaching the specified angle:
   a. Loosen jam nut (3, View B).
   b. Turn adjusting rod (2a or 2b) all the way into coupling (4).
   c. Boom up slowly until the boom the reaches specified angle.
   d. Turn adjusting rod (2a or 2b) out against boom butt (1) until limit switch (5) “clicks” open and the LED is OFF (View A).
   e. Tighten jam nut (3).
7. If the boom reaches the specified angle before it stops:
   a. Loosen jam nut (3, View B).
   b. Turn adjusting rod (2a or 2b) out against boom butt (1) until limit switch (5) “clicks” open and the LED is OFF (View A).
   c. Tighten jam nut (3).
8. Check that actuator rod (11) over-travels the limit switch as shown in View A.
9. Test the adjustment as follows:
   a. Lower the boom several degrees below the specified Angle A.
   b. Slowly raise the boom.
   c. ***Boom must stop at specified Angle A.*** If the boom does not stop at the specified angle:
      - Stop raising the boom (move control handle to off).
      - Lower the boom several degrees below the specified angle.
   d. Repeat adjustment steps 2 through 9.

Actuator Rod Replacement

See Figure 6-5, View B for the following procedure.

1. Remove damaged actuator rod (11).
2. Slide spring washers (7 and 9) and spring (8) over new actuator rod (11) while sliding the actuator rod into the bracket assembly.
3. Position actuator rod (11) so the tapered end just touches limit switch (5) roller (View B). The actuator rod must not depress the limit switch roller.
4. Drill a 1/4 in (6,35 mm) hole through spring washer (9) and actuator rod (11).
5. Install dowel pin (10).
6. Install proper adjusting rod (2a or 2b).
7. Adjust the boom stop.

PHYSICAL BOOM STOP

WARNING

Falling Attachment Hazard!

Physical boom stops must be installed and pinned in working position for all crane operations.

Physical boom stops do not automatically stop boom at maximum operating angle. Automatic boom stop must be installed and properly adjusted.

General

The physical boom stops (Figure 6-7):

- Assist in stopping the boom smoothly at any angle above 77°.
- Assist in preventing the boom rigging from pulling the boom back when traveling or setting loads with the boom at any angle above 77°.
- Assist in moving the boom forward when lowering the boom from any angle above 77°.
- Provide a physical stop at 89 °.

Operation

See Figure 6-7 for the following procedure.

1. When boom is raised to 77°, springs in boom stop tubes begin to compress.
2. As boom is raised higher, spring compression increases to exert greater force against boom.
3. If for any reason boom is raised to 89°, boom stop springs fully compress to provide a physical stop.

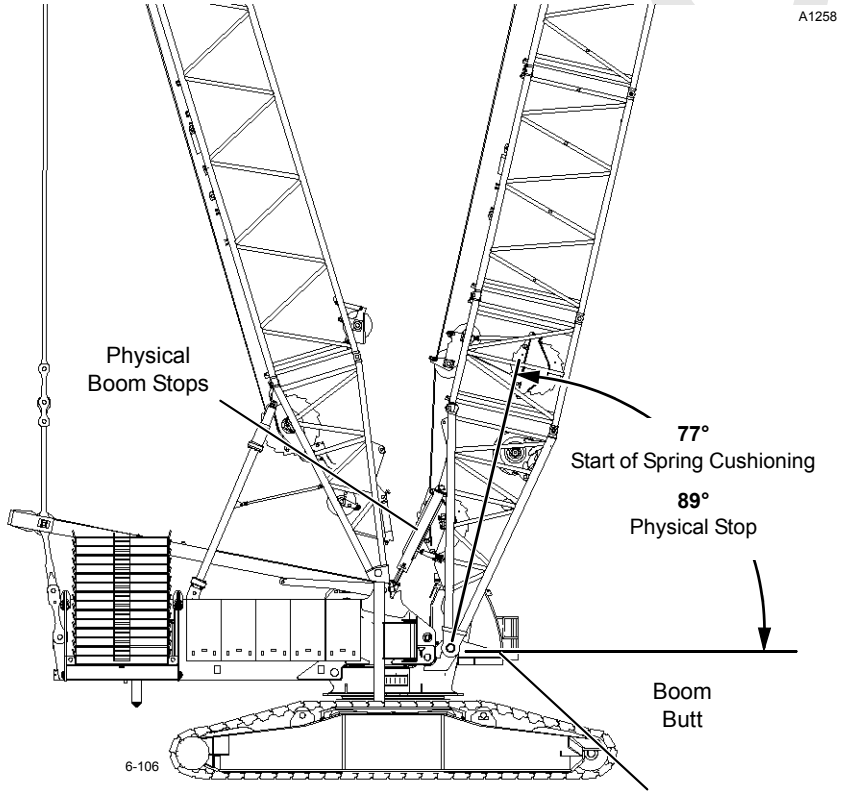
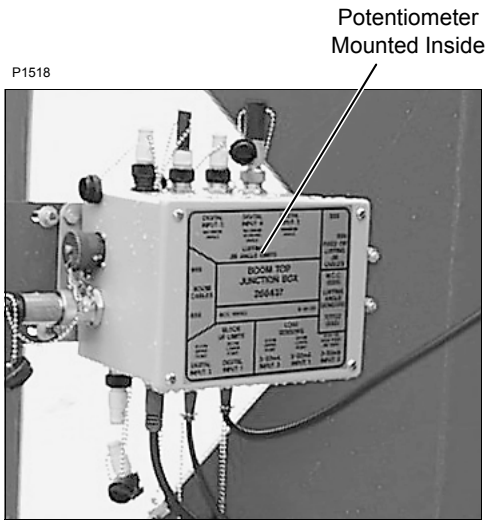


FIGURE 6-7

BOOM AND LUFFING JIB ANGLE INDICATOR CALIBRATION

The angle indicator potentiometers are located inside the node controllers mounted on the boom top and on the luffing jib top. The boom and luffing jib angles are calibrated automatically by the crane's programmable controller as part of the load indicator calibration procedure (See Rated Capacity Indicator/Limiter Operation manual for instructions).



Typical Node Controller Installation on Boom or Luffing Jib Top

FIGURE 6-8

BLOCK-UP LIMIT INSTALLATION AND ADJUSTMENT

General

A block-up limit control (also called anti two-block device) is a two-blocking prevention device which automatically stops the load drum from hoisting and the boom from lowering when a load is hoisted a predetermined distance.

DEFINITION: Two-blocking is the unsafe condition in which the load block or the weight ball contacts the sheave assembly from which either is suspended.

Two-blocking can result in failure of sheaves and wire rope, possibly causing load to fall.

WARNING

Two-Blocking Hazard!

Block-up limit control is a protective device designed only to assist operator in preventing a two-blocking condition, any other use is neither intended nor approved.

Block-up limit control may not prevent two-blocking when load is hoisted at maximum single line speed. Operator shall determine fastest line speed that allows block-up limit control to function properly and, thereafter, not exceed that line speed.

The block-up limit system consists of the following components (see Figure 6-9):

1. Normally closed limit switch assembly fastened at any or all of the following locations:
   a. Lower boom point
   b. Upper boom point
   c. Lower luffing jib point
   d. Upper luffing jib point
   e. Fixed jib point
2. Weight freely suspended by chain from each limit switch actuating lever (weight encircles load line as shown in Figure 6-11).
3. Lift block fastened to load line or lift plates fastened to load block (see Figure 6-11).

For detailed drawings of limit switch locations, see Boom Wiring and Limits Drawing in Section 4 of this manual.

Block-Up Limit Control Operation

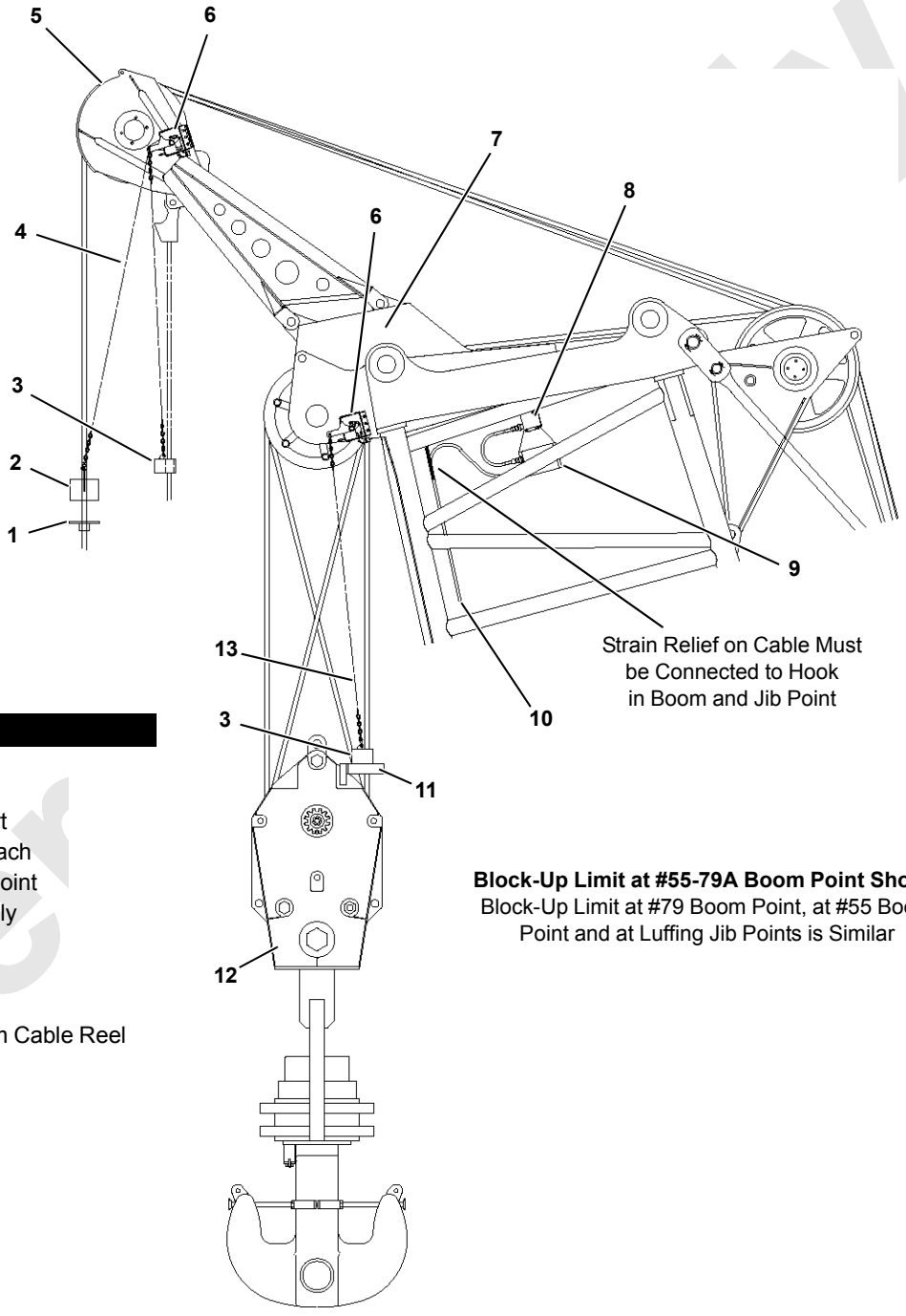
See Figure 6-9 through Figure 6-11 for the following description.

During normal operation, the weight overcomes spring force and rotates the actuating lever away from the limit switch lever. This action allows the limit switch to close the load drum ***up*** and boom/luffing jib ***down*** electric circuits. The load can be hoisted and the boom/luffing jib can be lowered.

When the weight is lifted by the lift block or lift plates, spring force rotates the actuating lever against limit switch lever. This action causes the corresponding limit switch to open the load drum ***up*** and boom/luffing jib ***down*** electric circuits.

The load drum and boom hoist pumps stroke to off. At the same time, the load drum and boom/luffing jib parking brakes apply to stop the load drum from hoisting and the boom/luffing jib from lowering.

18000MOM603



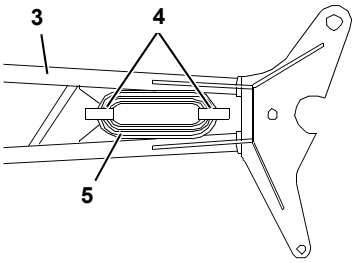
Item	Description
1	Lift Block
2	Weight - 1-Part
3	Weight - Multiple Part
4	8 Ft (2,4 m), 1 or 2 each
5	Upper Boom or Jib Point
6	Limit Switch Assembly
7	Lower Boom Point
8	Boom Node
9	Load Cell Receiver
10	Electrical Cable From Cable Reel
11	Lift Plates
12	Load Block
13	Chain - 12 ft (3,7 m)

Block-Up Limit at #55-79A Boom Point Shown
Block-Up Limit at #79 Boom Point, at #55 Boom Point and at Luffing Jib Points is Similar

FIGURE 6-9

A1131

Item	Description
1	Electrical Cable
2	Cable Reel
3	Fixed Jib Butt
4	Brackets
5	Cable



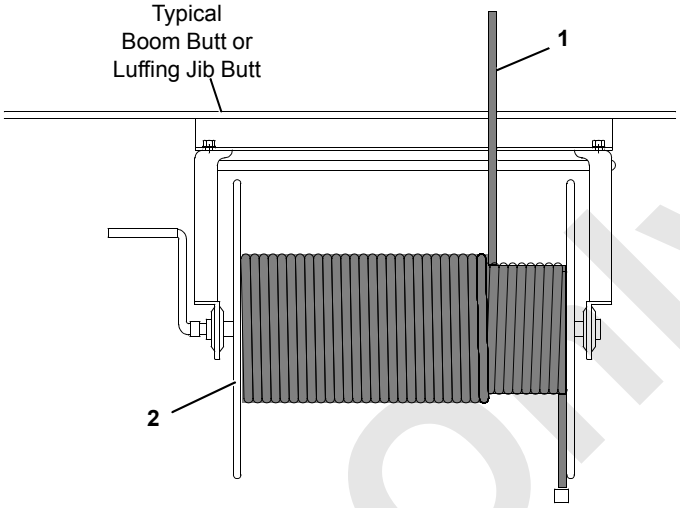
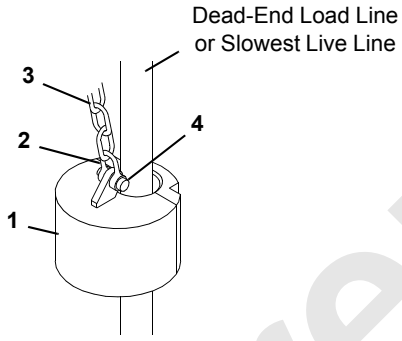


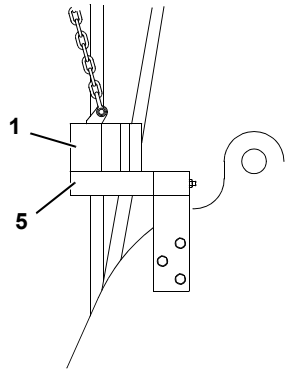
FIGURE 6-10

A837

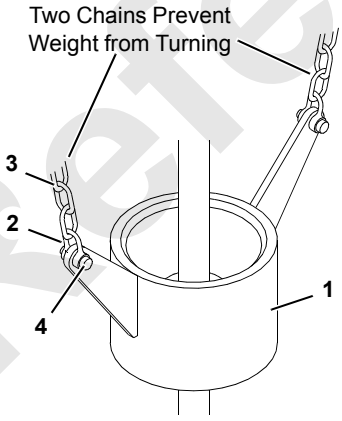


Lower or Upper Boom Point (multiple part)

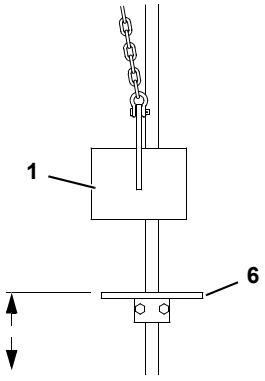
Item	Description
1	Weight
2	Shackle
3	Chain
4	Connecting Pin
5	Lift Plate
6	Lift Block



See Load Block Reeving in Section 4 for Suggested Location of Weight



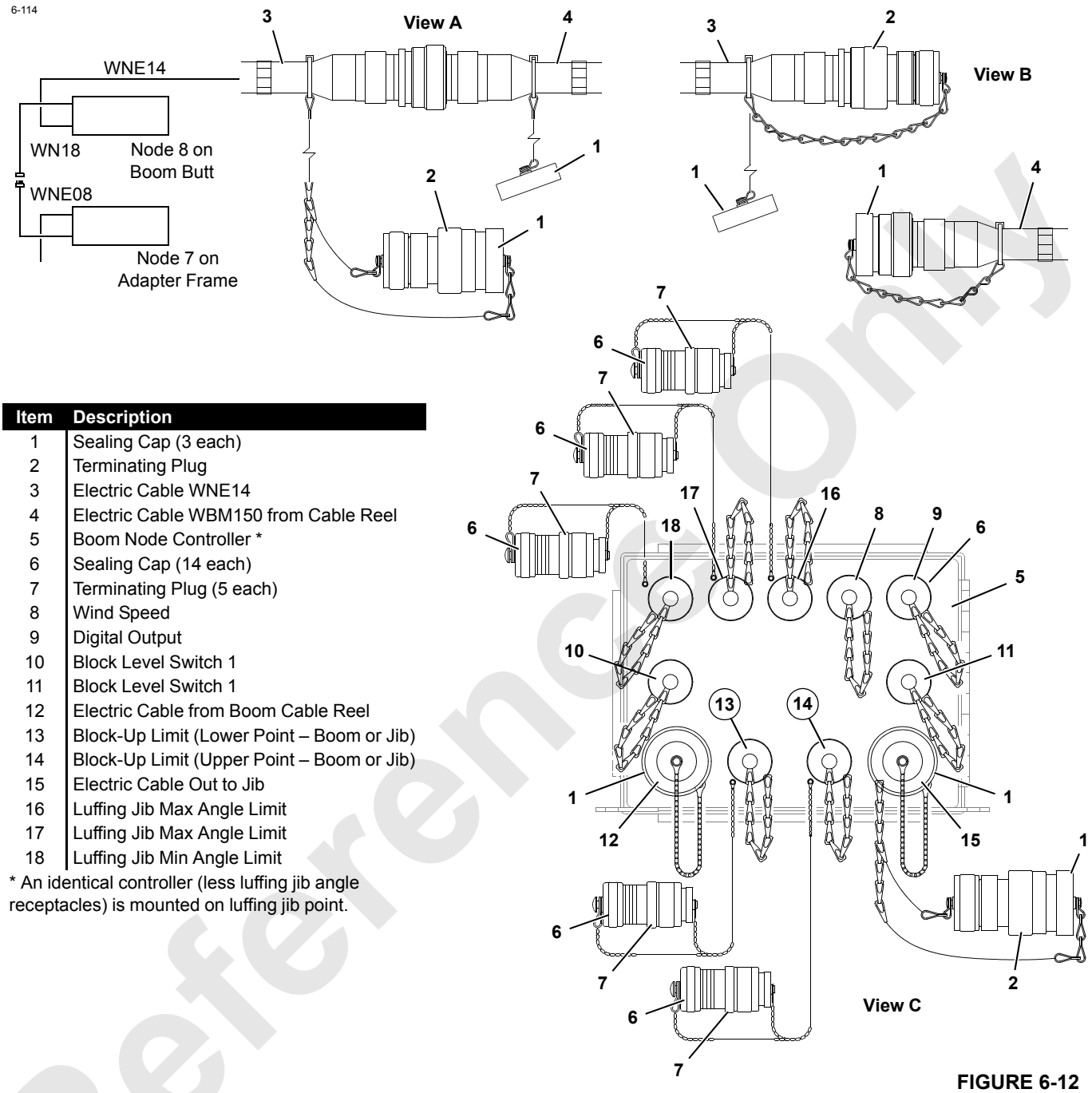
Upper Boom Point (1-part)
Upper Jib Point (1-part)
Lower Jib Point (1-part)



3 ft (0,9 m) to Top of Weight Ball

1-Part Reeving

FIGURE 6-11



Item	Description
1	Sealing Cap (3 each)
2	Terminating Plug
3	Electric Cable WNE14
4	Electric Cable WBM150 from Cable Reel
5	Boom Node Controller *
6	Sealing Cap (14 each)
7	Terminating Plug (5 each)
8	Wind Speed
9	Digital Output
10	Block Level Switch 1
11	Block Level Switch 1
12	Electric Cable from Boom Cable Reel
13	Block-Up Limit (Lower Point – Boom or Jib)
14	Block-Up Limit (Upper Point – Boom or Jib)
15	Electric Cable Out to Jib
16	Luffing Jib Max Angle Limit
17	Luffing Jib Max Angle Limit
18	Luffing Jib Min Angle Limit

* An identical controller (less luffing jib angle receptacles) is mounted on luffing jib point.

FIGURE 6-12

Disconnecting Block-Up Limit Control

See Figure 6-12 for the following procedure.

Terminating plug (2, Views A and B) is provided so the block-up limit control can be disconnected for the following reasons:

- Crane setup and rigging
- Maintenance

If electric cable (3) is terminated, all of the block-up limits (on boom and jib), the RCL, the block level sensor, and the wind speed indicator will be inactive.

1. Unscrew sealing cap (1, View A) from terminating plug (2).
2. Disconnect electric cable (3, View B) from cable (4).
3. Connect sealing cap (1, View A) to electric cable (4).

4. Connect terminating plug (2, View B) to electric cable (2).

   Failing to perform this step will prevent load drums from hoisting and boom from lowering. Operating limits alert will come on.

Reverse above steps to reconnect the block-up limits, the RCL, the block level sensor, and the wind speed indicator.

Removing Upper Boom Point or Jib Point

Failing to perform the following steps will prevent load drums from hoisting and boom (or luffing jib) from lowering. Also operating limits alert will come on.

Remove terminating plugs and reconnect electric cables to proper receptacles when corresponding attachment is reinstalled.

See Figure 6-10 for the following procedures.

If Upper Boom Point, Upper Luffing Jib Point, or Fixed Jib is Removed:

1. Disconnect cable from receptacle (14, View C).
2. Unscrew sealing cap (6, View C) from terminating plug (7) and attach to receptacle (14).
3. Connect sealing cap to end of cable and store on upper boom point or upper jib point.

If Luffing Jib Is Removed:

1. Unscrew sealing cap (1, View C) from terminating plug (2).
2. Disconnect cable from receptacle (15, View C).
3. Connect terminating plug (2, View C) to receptacle (15).
4. Connect sealing cap to end of cable and coil cable onto cable reel (luffing jib butt).
5. Remove sealing caps (7, View C) from terminating plugs (6) and connect terminating plugs to jib stop receptacles (16, 17, and 18).

Storing Electric Cable

See Figure 6-10 for the following procedure.

The electric cables for the boom and jib are long enough to accommodate the maximum length of each attachment.

Store excess electric cable for the boom and luffing jib by winding it onto the reel on mounted on the respective butt. The reel is equipped with a locking pin. Disengage the locking pin to allow the reel to be wound. Engage the locking pin to lock the reel in position. The electric cable from the crane to the reel must be disconnected before the reel can be wound.

Store excess electric cable for the fixed jib by winding it around the brackets on the fixed jib.

Maintenance

CAUTION

Prevent Damage

To prevent two-blocking from occurring, do not operate crane until cause for improper operation and all hazardous conditions have been found and corrected.

Inspect and test the block-up limit controls ***weekly*** *or* ***every 40 hours of operation***, as follows:

1. Lower the boom onto blocking at ground level and carefully inspect the following items:
   a. Inspect each limit switch lever and actuating lever (Figure 6-11) for freedom of movement. Apply one-half shot of grease to the fitting on the actuating lever. Wipe away any excess grease.
   b. Inspect each weight (Figure 6-10) for freedom of movement on the load line.
   c. Inspect each weight, chain, shackle, and connecting pin (Figure 6-10) for excessive or abnormal wear. Make sure cotter pins for shackles are installed and spread.
   d. Inspect the entire length of electric cables for damage.
   e. Check that the electric cables are clear of all moving parts on the boom and jib and that the cables are securely fastened to the boom and jib with clips or nylon straps.
   f. Check that all cables and terminating plugs (Figure 6-10) are securely fastened.
2. Test the block-up limit controls for proper operation using either of the following methods:
   a. BOOM LOWERED: Manually lift each weight — ***one at a time*** — while the engine is running. The load drum should not operate in the ***hoist*** direction and the boom/luffing hoist should not operate in the ***lower*** direction.
   b. BOOM RAISED: ***Slowly*** hoist each load block and weight ball — ***one at a time*** — against the weight. When the chain goes slack, the corresponding load drum should stop hoisting and the boom/luffing hoist should not operate in the lower direction.

CAUTION

Avoid Sheave Damage

Use extreme care when testing block-up limit controls when boom is raised. If block-up limit control fails to stop load, immediately stop load by moving drum control handle to off or by applying drum working brake, otherwise two-blocking may occur.

Adjustment

See Figure 6-13 for the following procedure.

Lower boom onto blocking at ground level and adjust each limit switch as follows:

1. Adjust spring tension so there is enough force to lift weight of chain and rotate actuating lever when weight is lifted.
2. Loosen setscrew in limit switch lever so lever is free to rotate.
3. Manually lift weight to allow actuating lever to rotate upward.
4. Hold lever at Dimension A.
5. Hold roller on limit switch lever against actuating lever while performing step 6
6. Turn limit switch shaft CLOCKWISE *only enough to "click" limit switch open and hold*. Then securely tighten setscrew in limit switch lever.
7. Test limit switch for proper operation (see Maintenance topic). Repeat adjustment steps until limit switch operates properly.

6-115

Item	Description	Item	Description
1	From Boom or Jib Node	7	Grease Fitting
2	Elbow with Cord Gripper	8	Actuating Lever
3	Setscrew	9	Roller
4	Spring	10	Limit Switch Lever
5	Enclosure	11	Shaft
6	Spring Tension Adjusting Screw	12	Cover

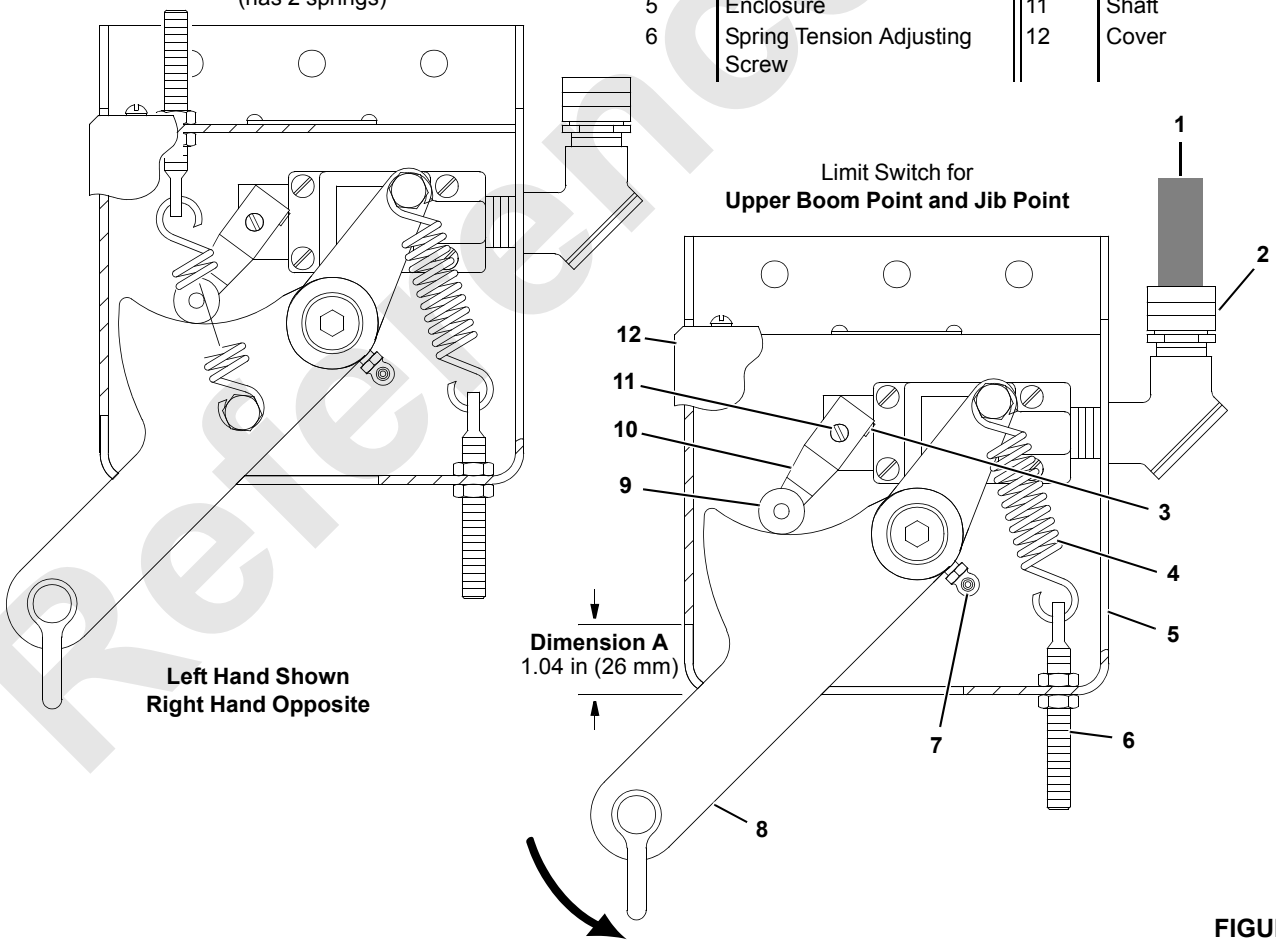


FIGURE 6-13

6

THIS PAGE INTENTIONALLY LEFT BLANK

ALPHABETICAL INDEX