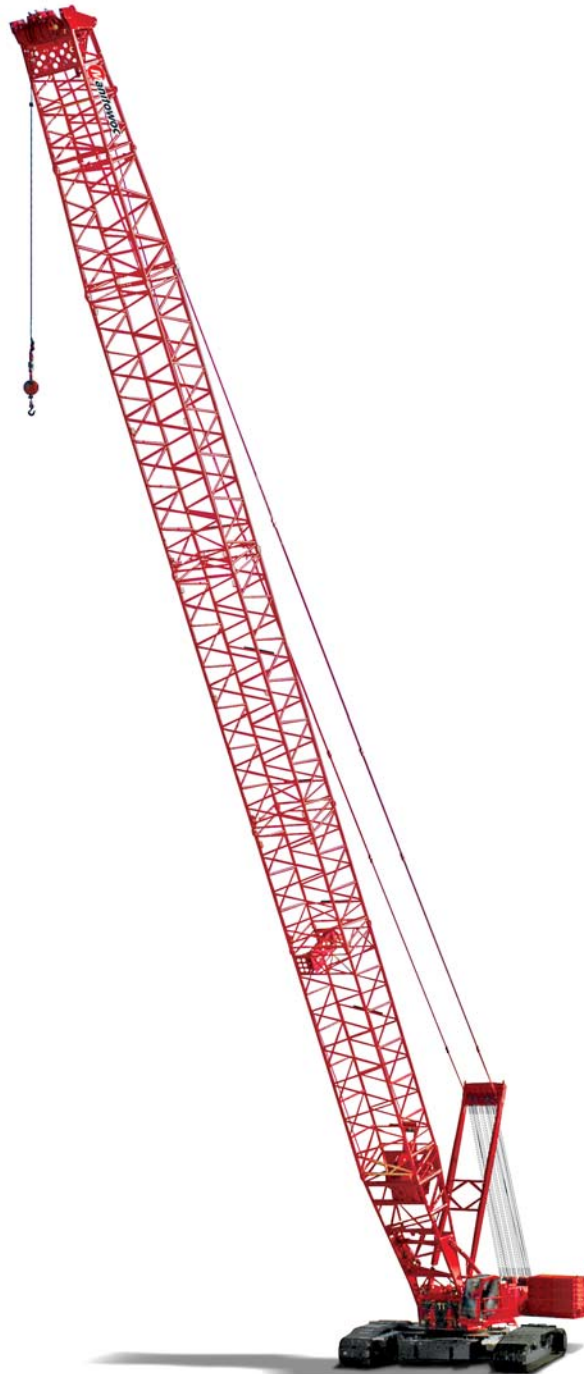


Manitowoc 16000WA

Operator Manual





OPERATOR'S MANUAL

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

16000WA

Model Number

16007Ref

Serial Number

This manual is divided into the following sections:

- SECTION 1** Introduction
- SECTION 2** Safety Information
- SECTION 3** Operating Controls And Procedures
- SECTION 4** Set-up and Installation
- SECTION 5** Lubrication
- SECTION 6** Maintenance



NOTICE

The serial number of the crane and this attachment are the only method your Manitowoc dealer or the factory has of providing you with correct parts and service information.

- The serial number of the crane is located on an identification plate attached to the operator's cab.
- The serial number of this attachment is located on an identification plate attached to the boom cap.

Refer to the Nameplate and Decal Assembly Drawing in Section 3 of this manual for the exact location of the identification plates.

Always furnish serial number of crane and attachment when ordering parts or discussing service problems with your Manitowoc dealer or the factory.

 WARNING	
	<p>To prevent death or serious injury:</p> <ul style="list-style-type: none">• 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. <p>If Operator Information Manual or Service Manual is missing from cab, contact your Manitowoc dealer for a new one.</p>

The original language of this publication is English.

See end of this manual for Alphabetical Index

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SECTION 1 INTRODUCTION

CRANE DATA

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

- Basic Specifications.
- EC Declaration (if applicable).

CRANE/ATTACHMENT IDENTIFICATION

An identification plate (see Figure 1-1) is attached to the following locations:

- Outside of the operator's cab. It contains the model number and the serial number of the crane.
- Boom cap. It contains the model number and the serial number of the wind attachment.

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 16000 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.

- The boom is on the front of the rotating bed.
- The carbody and crawler controls are on the front of the carbody.

OUTLINE DIMENSIONS

Refer to Section 1 of the Operator's Manual supplied with your 16000.

CRANE WEIGHTS

Refer to Section 1 of the Operator's Manual supplied with your 16000.

CONTINUOUS IMPROVEMENT

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 Crane Care in Manitowoc.

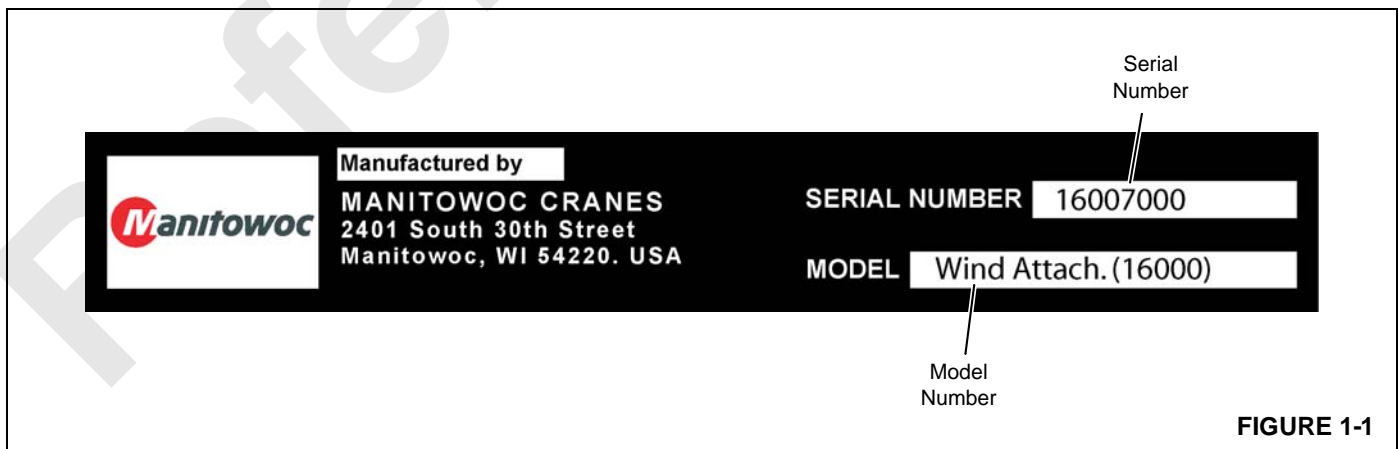


FIGURE 1-1

IDENTIFICATION AND LOCATION OF COMPONENTS

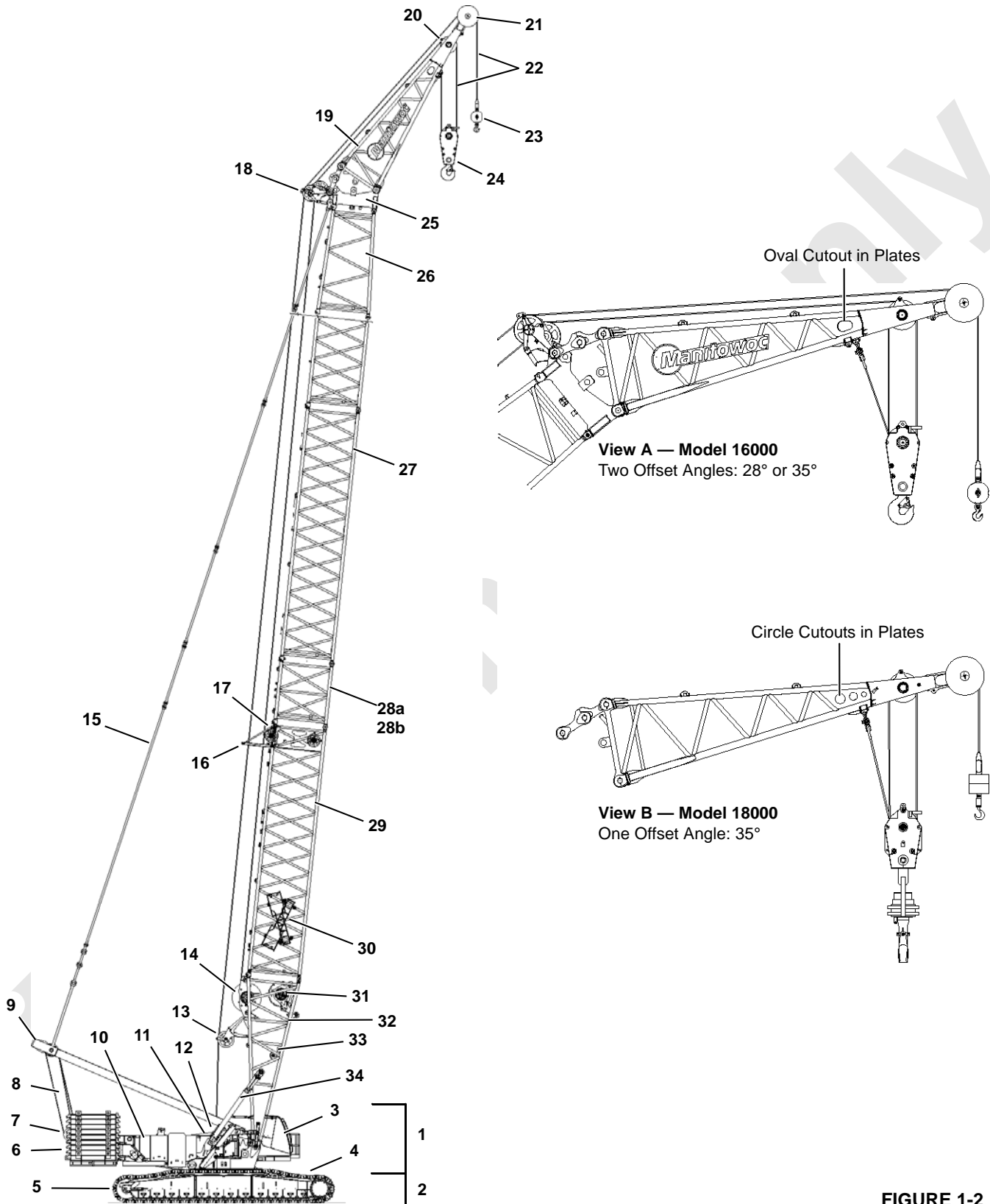


FIGURE 1-2

Item	Description	Notes
1	Upperworks	
2	Undercarriage	
3	Operator's Cab	
4	Carbody Counterweight (both ends)	
5	Crawler	
6	Crane Counterweight (Special)	
7	Boom Hoist Sheaves	
8	Boom Hoist Wire Rope	
9	Mast (Live)	
10	Enclosures (both sides)	
11	Mast Arms with Cylinders	
12	Auxiliary Drum (in rotating bed)	
13	Wire Rope Guide	
14	Main Hoist	
15	Boom Straps	
16	Wire Rope Guide	Optional
17	Wire Rope Guides (in Insert)	Optional
18	Wire Rope Guide	From 16000 #58WA Boom
19	Extended Upper Boom Point	Either from 16000 #58WA Boom Rigging (View A) OR from 18000 #55-79A Boom Rigging (View B)
20	Lower Point	4 Sheaves
21	Upper Point	1 Sheave
22	Load Lines	
23	Hook and Weight Ball	
24	Load Block	
25	Boom Cap	Serial Numbered
26	Transition Insert	From 16000 #58 Boom
27	Insert, Heavy — 12 m (39.4 ft)	From 16000 MAX-ER® Attachment
28a	Insert, Heavy — 6 m (19.7 ft) OR	From 16000 #58WA Boom
28b	Insert, Heavy — 3 m (9.8 ft)	From 16000 #58WA Boom
29	Insert, with Sheaves — 12 m (39.4 ft)	From 16000 #58 Boom
30	Boom Ladders	Optional
31	Luffing/Auxiliary Hoist	Optional
32	Boom Butt	From 16000 #58 Boom
33	Rigging Winch	Optional
34	Telescopic Boom Stops	

WIND ATTACHMENT MODEL DIFFERENCES

See page 1-6 for legend.

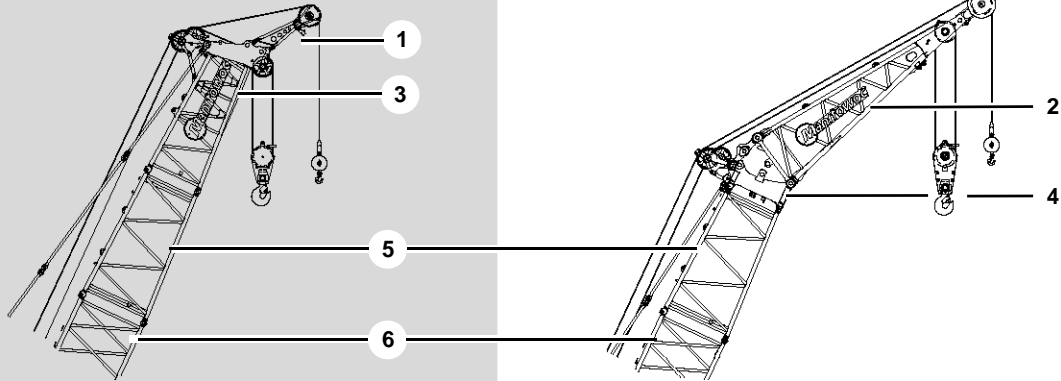
#58 Boom without Wind Attachment

- Rigging drawing: A10415
- Crane serial number: 16001xxx

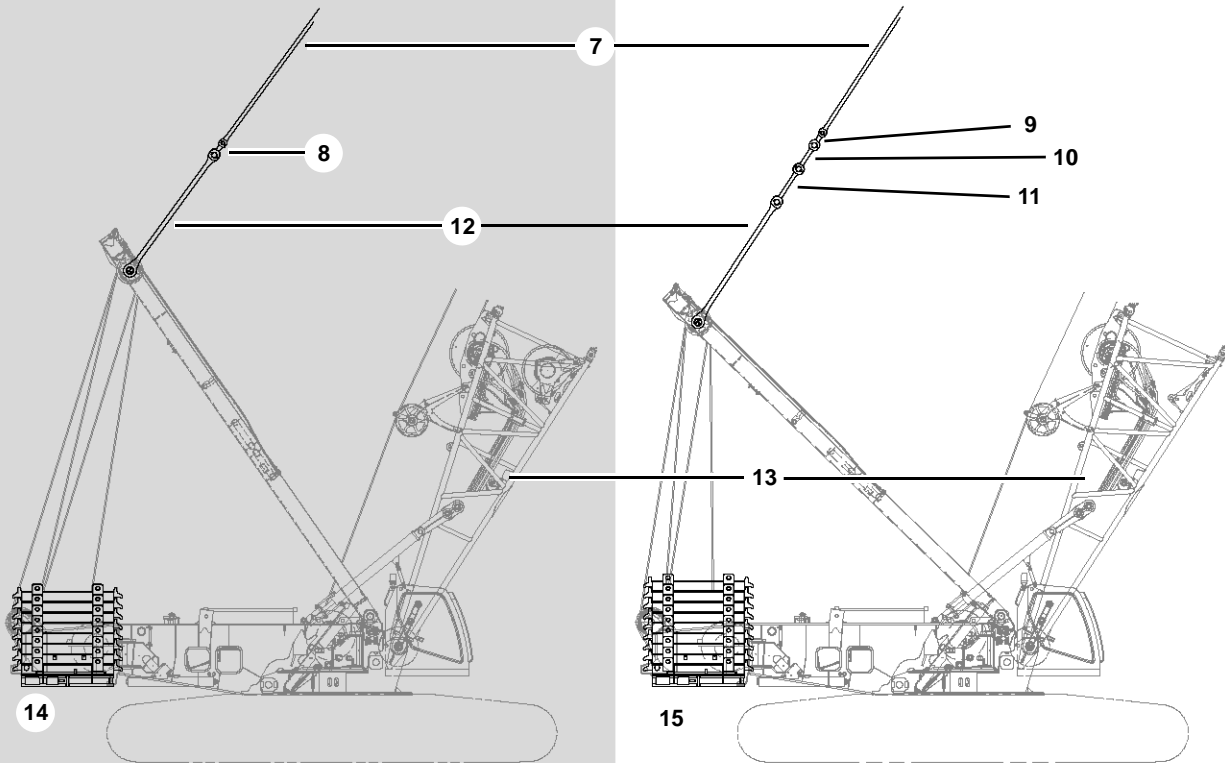
#58WA Boom with Wind Attachment

- Rigging drawing: 81009833
- Crane serial number: 16007xxx

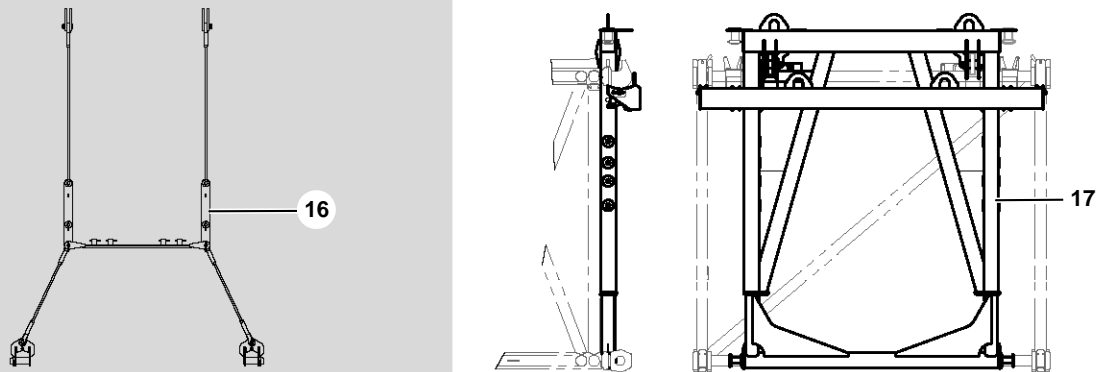
BOOM TOP



BOOM BUTT, MAST STRAPS, COUNTERWEIGHTS



INTERMEDIATE SUSPENSION



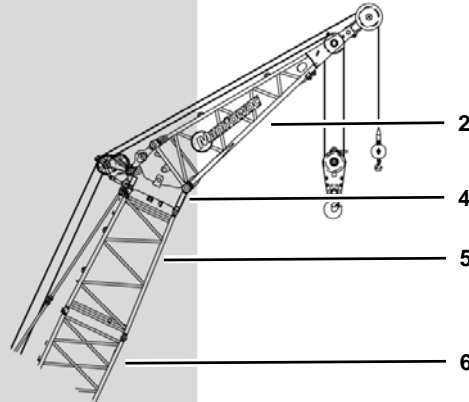
#58WA Boom with Wind Attachment and Auxiliary Counterweights

- Crane serial number: 16007xxx
- Rigging drawing: 81018003
- Instructions: F2245 at end of Section 4 in this Manual

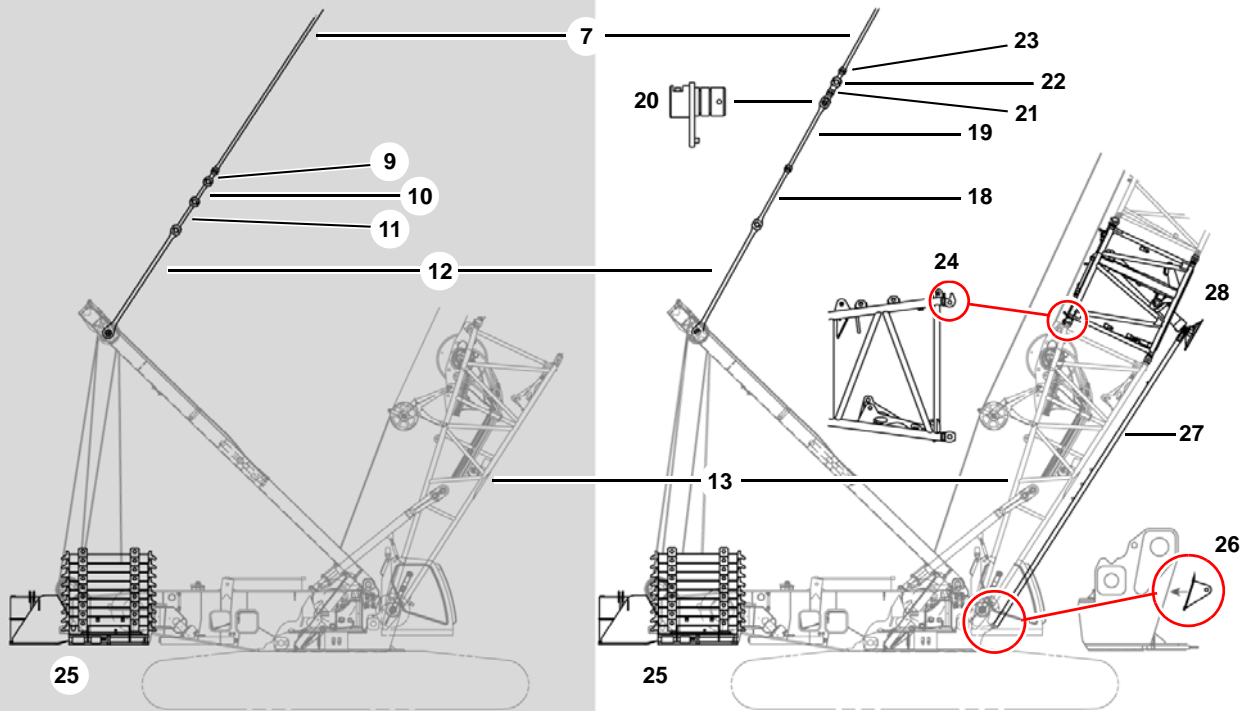
#58BRS Boom with Wind Attachment and Boom Raising System (BRS)

- Crane serial number: 16008xxx
- Rigging drawing: 81016771
- Instructions: F2241 in separate Operator Manual

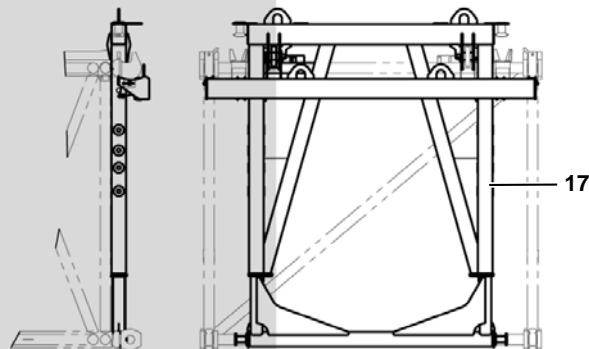
BOOM TOP



BOOM BUTT, MAST STRAPS, COUNTERWEIGHTS



INTERMEDIATE SUSPENSION



Legend for Model Differences

Item	Description	Notes
1	Boom point or extended upper point	
2	Wind attachment upper boom point	
3	5M top assembly insert	
4	1M cap insert	
5	5M transition insert	
6	12M medium insert	
7	12M strap	
8	Link	
9	Link	
10	Strap	
11	Strap	
12	Mast strap	
13	Boom butt	
14	Series 1, 2, or 3 counterweights	See Counterweight Arrangements chart.
15	Series 1, 2, 3, or 4 counterweights	See Counterweight Arrangements chart.
16	Intermediate suspension	Used on #58 boom crane configuration.
17	Intermediate suspension	"5-hole" version used on Wind Attachment models.
18	Strap	
19	Strap	
20	Load pin	
21	Link	
22	Link	
23	Link	
24	Upper FACT connector modification	Holes are drilled in boom butt upper connectors.
25	Series 5 counterweight	See Counterweight Arrangements chart.
26	Adapter frame mounting lugs	Crane may need to be modified to add these lugs.
27	Boom lift assist frame	
28	3M BRS insert	

OUTLINE DIMENSIONS

See Operator's Manual supplied with your 16000.

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:

$$12 \text{ ft} \times 0.3048 = 3,6576 \text{ m}$$

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:

$$3,6576 \text{ m} \div 0.3048 = 12$$

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

To Convert	Symbol	Application	To	Symbol	Multiply By
Cubic Inch	in ³	Pump Displacement	Cubic Centimeter	cm ³	16.3871
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
Ton (2,000 lb.)	USt	Load Ratings	Metric Ton	t	0.9072
Ton (2,000 lb.)	USt		Kilogram	kg	907.1847

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Reference Only

SECTION 2

SAFETY INFORMATION

NAMEPLATES AND DECALS

See drawing at the end of this section.

SAFETY TOPICS

Read and thoroughly understand all of the safety topics located in Section 2 of the Operator's Manual supplied with the crane.

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 this 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.

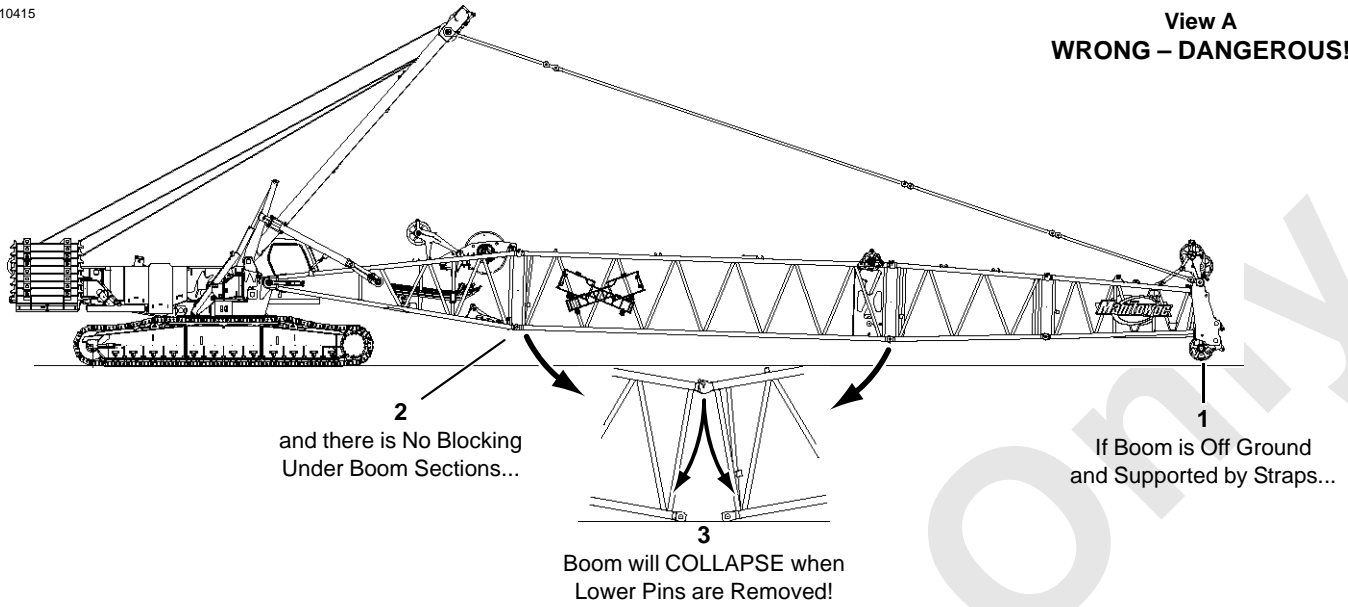
CAUTION

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

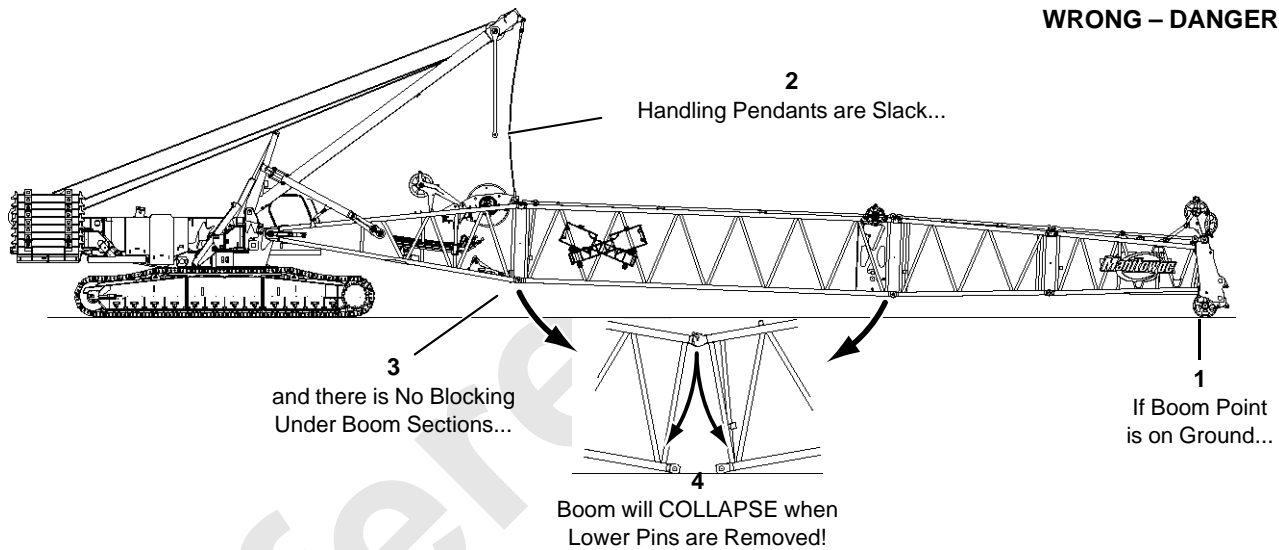
NOTE: Highlights operation or maintenance procedures.

A10415

**View A
WRONG – DANGEROUS!**



**View B
WRONG – DANGEROUS!**



**View C
RIGHT – SAFE**

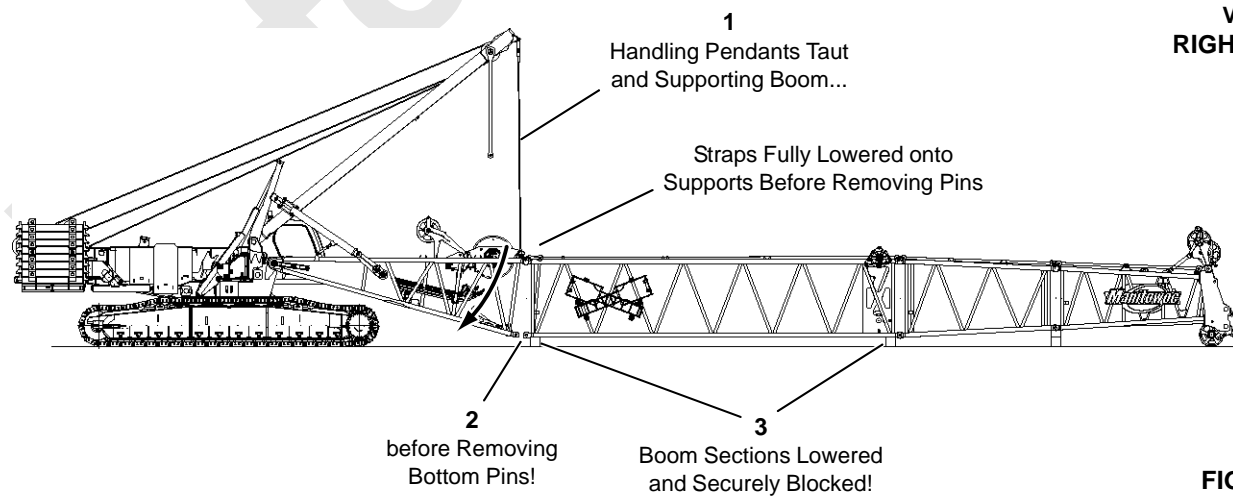


FIGURE 2-1

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 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 2-2) 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 must be trained and experienced in the operation and disassembly of construction cranes. Everyone must 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 2-2

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 jerk 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 2-1, View A.
- Do not remove strap connecting pins until straps are fully lowered into supports as shown in Figure 2-1, 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 2-1, View B.
- Never work or stand inside boom unless it is lowered and securely blocked as shown in Figure 2-1, 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.

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OPERATING CONTROLS AND PROCEDURES

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SECTION 3

OPERATING CONTROLS AND PROCEDURES

OPERATING CONTROLS AND PROCEDURES

Read and thoroughly understand the instructions in Section 3 of the Operator's Manual supplied with the crane.

WIND CONDITIONS

Wind adversely affects lifting capacity and stability as shown in Figure 3-1. The result could be loss of control over the load and crane, even if the load is within the crane's capacity.



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

Wind speed at the boom 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.

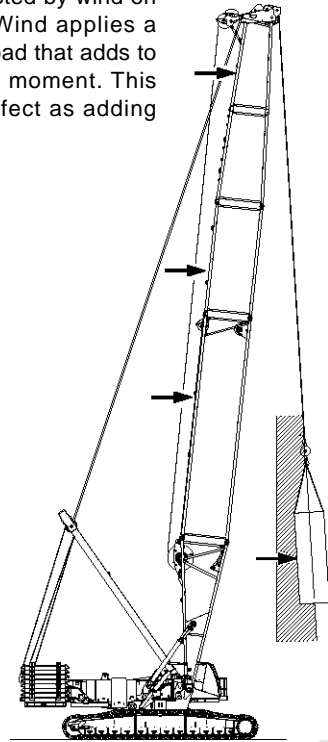
As a general rule, ratings and operating speeds must be reduced when:

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

For wind conditions specific to the extended upper boom point, see the Wind Conditions Chart at end of this section or, if applicable, see the wind conditions in the Capacity Chart Section of the Operator Information Manual supplied with the extended upper boom point.

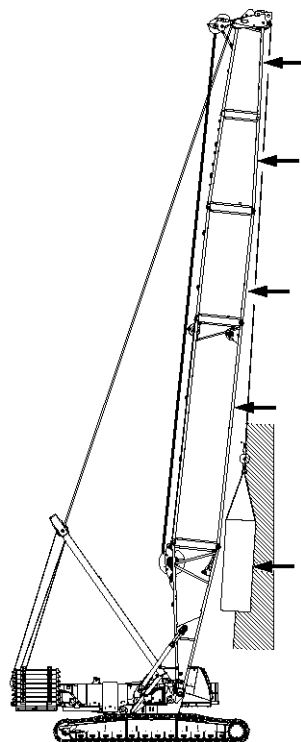
A910

Forward stability is affected by wind on the rear of the boom. Wind applies a force to the boom and load that adds to the crane's overturning moment. This action has the same effect as adding load to the hook.



The wind's affect on the rear of the load increases load radius. This condition can result in an overload hazard, possibly causing the crane to tip or the boom to collapse.

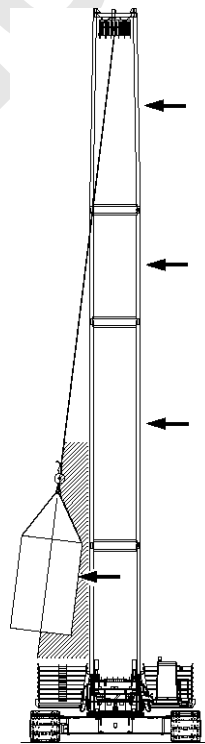
To avoid this hazard, reduce operating speeds and load (see Wind Conditions Chart at end of this section or see wind conditions in Capacity Charts if applicable).



Backward stability is affected by wind on the front of the boom. This condition is especially dangerous when the boom is at or near the maximum angle when operating without load.

Wind forces on the front of the boom reduce the normal forward tipping effect of the boom. The crane can tip or the boom can collapse if this condition is not avoided.

The boom can buckle and collapse if the load contacts the boom.



Boom strength is affected the most when the wind acts on the side of the boom.

The wind's affect on the side of the load can cause the load to swing out past the boom hinge pin. This condition can result in excessive side load forces on the boom, possibly causing the crane to tip or the boom to collapse.

To avoid this hazard, reduce operating speeds and load (see Wind Conditions Chart at end of this section or see wind conditions in Capacity Charts if applicable).

FIGURE 3-1

SECTION 4

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SECTION 4

SET-UP AND INSTALLATION

GENERAL

This section contains installation and removal instructions only for the Model 16000 #58WA boom.

Refer to the Operator's Manual supplied with your 16000 for instructions on assembling and disassembling the crane.

SUPPLEMENTAL INSTRUCTIONS

Refer to the following supplemental instructions and related drawings at the end of this section:

F2241: if equipped with Boom Raising System (BRS) and auxiliary counterweight.

F2245: if equipped with auxiliary counterweight less BRS.

GENERAL SAFETY

To prevent accidents that can result in death or injury during crane assembly and disassembly, comply with the following general safety information and with the specific safety information contained in the assembly and disassembly steps.



WARNING

Avoid Death or Serious injury!

Read and understand setup and installation instructions in this section before attempting to assemble or disassemble the #58WA boom and extended upper boom point.

Tipping/Overload Hazard!

Avoid tipping crane over or collapsing live mast:

- Assemble and disassemble the boom on a firm, level, uniformly supporting surface.

Avoid Falling Off Crane and Boom!

It is necessary to climb onto crane and boom during assembly and disassembly steps.

Use sturdy owner furnished ladders or an aerial work platform to gain access to areas which cannot be reached from ladders or steps provided with crane.



WARNING

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.
- Do not raise or lower live mast until all personnel are off crane.
- 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 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.

SHIPPING CRANE COMPONENTS

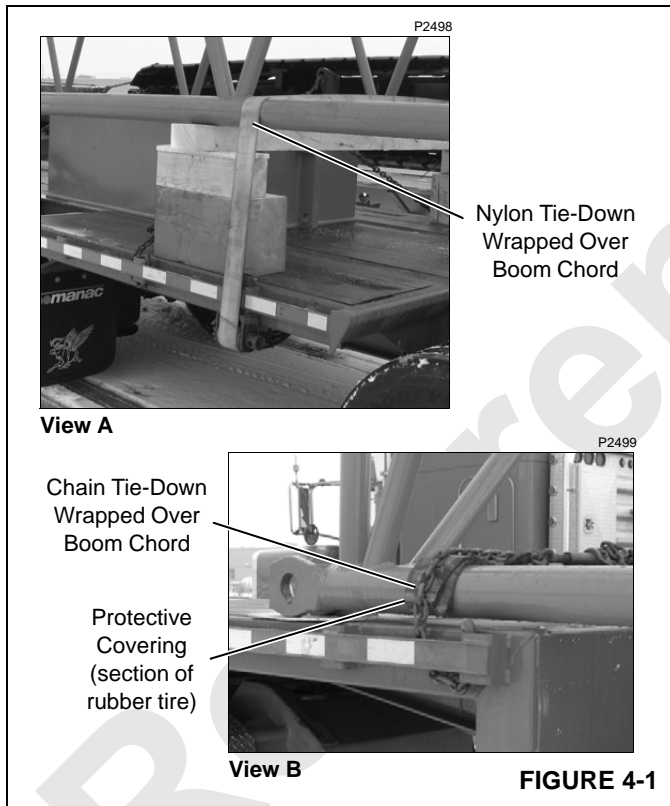
It is the owner/user's responsibility to ensure the following:

- That all trailer loads comply with local, state, and federal transportation requirements.
- **That 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 4-1, View A.

If chain tie-downs are used, install protective covering (such as sections of rubber tire) between the chain and component being secured as shown in Figure 4-1, 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 the chords.



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.

SELF-ERECTING EQUIPMENT

The 16000 is equipped with the following self-erect components for assembly and disassembly:

1. Live mast which can be used as a boom to assemble the #58WA boom sections and to install the boom butt.
2. 45 USt (41 t) load block and 4-leg lifting sling (chain) with hooks for handling parts.

ASSEMBLY AND DISASSEMBLY NOTES

The #58WA boom shall be assembled and disassembled by experienced personnel trained in erection and operation of construction cranes.

Read and become thoroughly familiar with the instructions in this section and in the assembly drawings at the end of this section before attempting to assemble or disassemble the boom.

Contact your Manitowoc dealer for assistance if any procedure is not fully understood.

ASSEMBLY AND DISASSEMBLY AREA

Select an assembly/disassembly area that has a firm, level, uniformly supporting surface. Make sure the area is large enough to accommodate the 16000 with selected boom length, movement of trucks with trailers, and movement of an assist crane (if used).

ACCESSING PARTS

Some parts of the crane and boom cannot be reached from the ground. Take necessary precautions to prevent slipping and/or falling off the crane or boom during assembly, disassembly, maintenance, or other work. **Falling from any height can result in serious injury or death.**

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

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

Do not use top of mast or boom as a walkway.

Optional boom ladders (stored in boom first 40 ft [12 m] insert) are available from Manitowoc. If your crane has ladders, see the instructions later in this section.

CRANE WEIGHTS

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

RETAINING CONNECTING PINS

Connecting pins are retained in various ways:

- Wire-lock pins.
- Safety pins.
- Cotter pins.

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

COUNTERWEIGHT REQUIREMENT

16000 operation with the #58WA boom requires the counterweight shown in Figure 4-2.

The special counterweight consists of the following:

- Series 3 Carbody Counterweight.
- Series 3 Crane Counterweight — eight 18, 000 lb (8 165 kg) boxes each side.
- Additional Crane Counterweight — one additional 18, 000 lb (8 165 kg) box each side.
- Auxiliary Counterweight (hangs from back of crane counterweight): see F2241 or F2245 at the end of this section.

Install the counterweight according to the instructions in Section 4 of the Operator's Manual supplied with your 16000.

! WARNING
Tipping Hazard!

To prevent crane from tipping, install carbody counterweights before installing crane counterweights.

NOTE: During setup, the crane can be swung 360° with the counterweight installed, either with the mast forward or in the transport position. **The crane must be on a firm, level, uniformly supporting surface.**

ROTATING BED MODIFICATION

Prior to using the #58WA Boom, Wind Attachment, and Special Counterweight on an existing 16000 in the field, the counterweight hooks on the rotating bed must be modified.

Contact your Manitowoc dealer to determine if your crane has been modified or, if not, to get your crane modified.

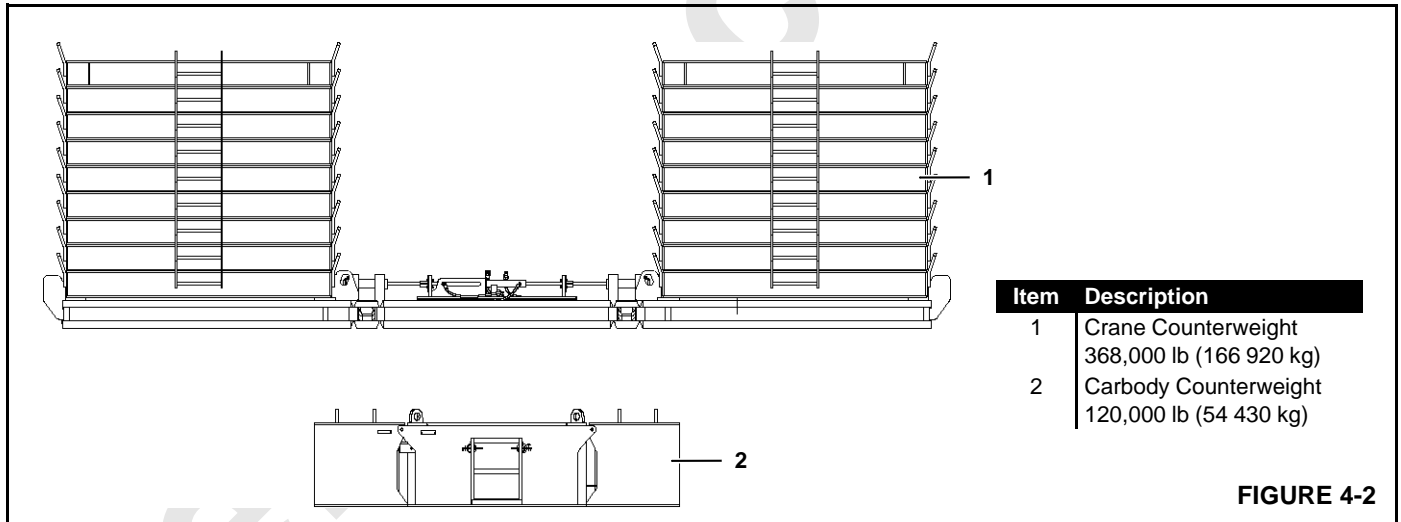


FIGURE 4-2

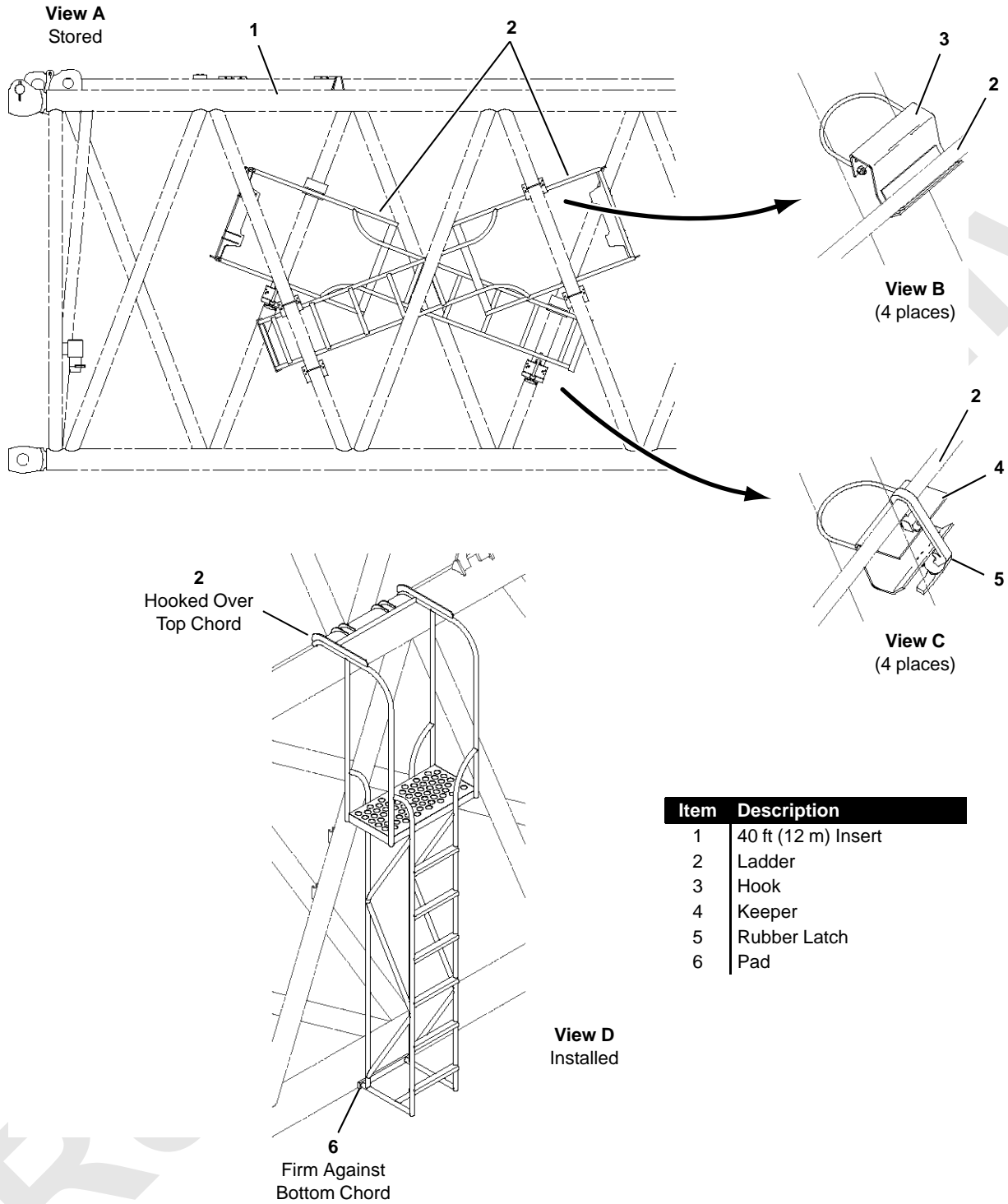


FIGURE 4-3

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BOOM LADDERS

See Figure 4-3 for following procedure.



WARNING

Fall Hazard!

To prevent falling off boom ladders:

- Limit load on ladder to 300 lb (136 kg).
- Avoid improper use. Ladder is intended for use only on Manitowoc #58WA boom inserts. Any other use is prohibited.
- Use ladder for boom assembly/disassembly and maintenance only when boom is horizontal.
- Make sure ladder is properly secured to insert.
- Keep hands free of any objects while climbing ladder. Objects which cannot be carried in pockets or tool belts shall be lifted into place onto ladder platform prior to climbing ladder.
- Stand only on platform. Do not stand on cross braces.

General

Two ladders (2) are stored inside 40 ft (12 m) heavy insert (1) as shown in View A. The ladders are designed for use in assembly/disassembly and maintenance of #58WA boom sections and components. Each ladder weighs approximately 15 lb (7 kg).

Removing Ladders from Boom Butt

It is recommended that two people remove either ladder from the boom insert: one person inside the insert to unlatch and lift the ladder and another person outside the insert to help

guide the ladder out of the insert. Use the following procedure:

1. Lower the boom onto blocking at ground level. **Boom sections must be horizontal.**
2. Unhook rubber latches (5, View C).
3. Lift ladder (2) up and out of hooks (3, View B).
4. Guide ladder through lacings to outside of insert.

Installing Ladders on Boom Inserts

Lift ladder (2) to the desired outside location on the insert so the ladder is securely hooked over the backside of the top chord and pads (6) are firm against bottom chord (View D).

Ladder must hang vertically against boom insert when in use.

Storing Ladders in boom butt

It is recommended that two people store either ladder in the boom insert: one person outside the insert to help guide the ladder into the insert and another person inside the insert to lift the ladder and latch it in position. Use the following procedure:



WARNING

Falling Load Hazard!

Ladders must be properly stored to prevent them from falling out of insert when boom is raised.

1. Hang ladder rails over hooks (3, View B) inside insert.
2. Pull rubber latches (5) tightly over lower rails and latch in keepers (4, View C).
3. Make sure ladder cannot move once latched.

A10740-14a

Component Identification

Item	Description
1	Live Mast
2	Handling Pendant (Mast and boom butt)
3	Load Block — 45 USt (41 t)
3a	Dead-End Button Socket
4	4-Leg Lifting Sling (chain)
5	Operator's Cab
6	Carbody Counterweight (both ends)
7	Crawler Assembly
8	Rotating Bed Adapter Frame (with Carbody)
9	Live Mast Assist Arm (1 each side)
10	Rotating Bed Jack (2 at Front)
11	Rotating Bed
12	Rotating Bed Jack (2 at Rear)
13	Boom Hoist
14	Crane Counterweight
15	Boom Hoist Wire Rope

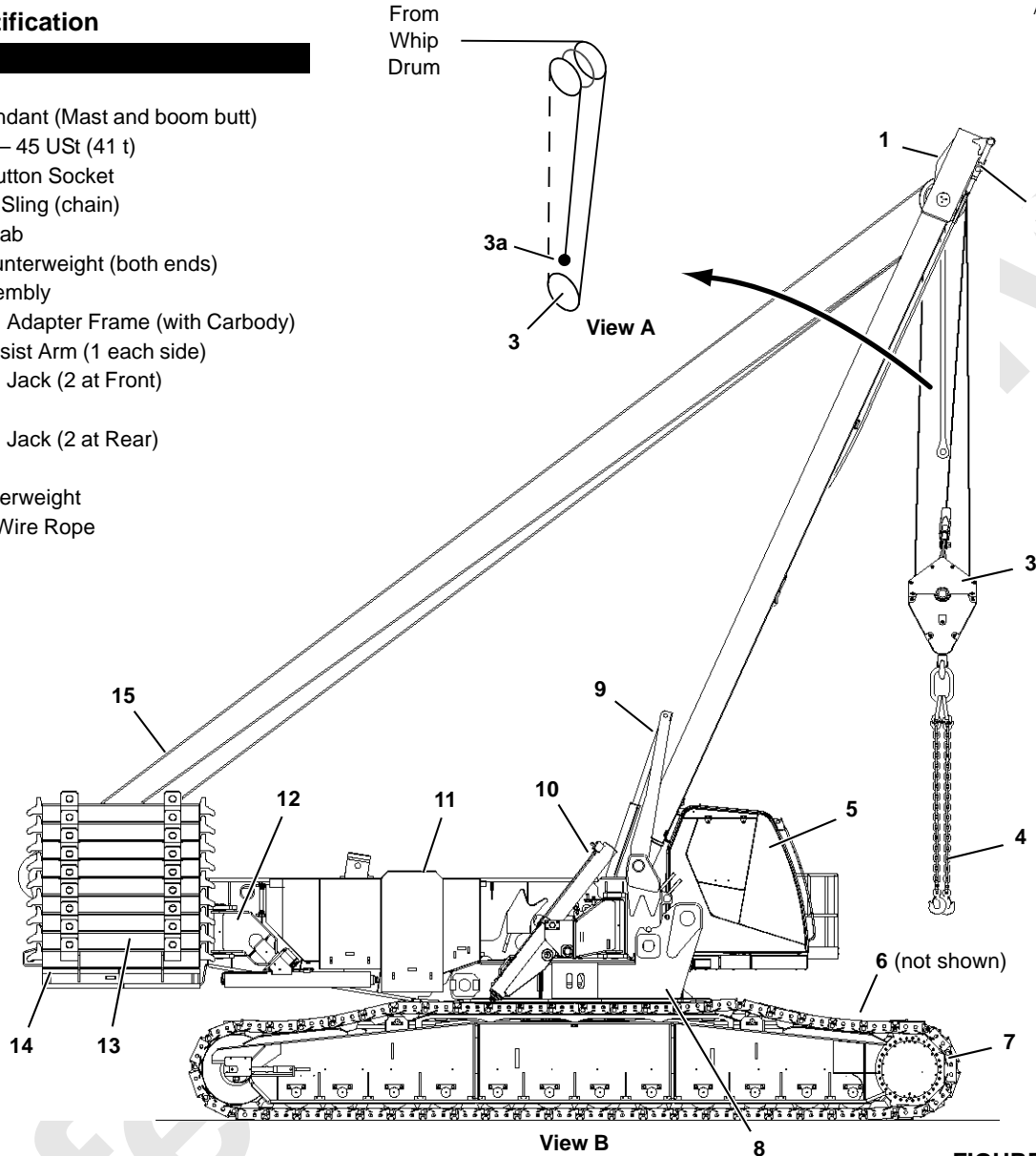


FIGURE 4-4

ASSEMBLE CRANE

Assemble the 16000 to the extent shown in Figure 4-4. Follow the instructions in the Operator's Manual supplied with your 16000.

If an assist crane will be used to assemble and attach the boom, do not install load block (3, Figure 4-4).

ASSEMBLE BOOM

Assist Crane Requirements

Either the 16000 live mast or an assist crane can be used to handle and assemble the boom sections. See the Crane

Weights in Section 1 of this manual for the weights of components.

Blocked Crawler

To prevent the crane from tipping, some boom lengths must be raised and lowered over the end of blocked crawlers. See Capacity Charts for blocked crawler requirements and Crawler Blocking Diagram in Capacity Charts Manual for instructions.

Do not attempt to raise or lower the boom from or to the ground until the crawlers are blocked, if required.

! WARNING
Tipping Hazard

Block ends of crawlers, if required, before you attempt to raise or lower boom from or to ground.

Handling Components

The boom sections are equipped with lifting lugs as shown in Figure 4-5. The four-leg lifting sling can be used to lift the boom sections.

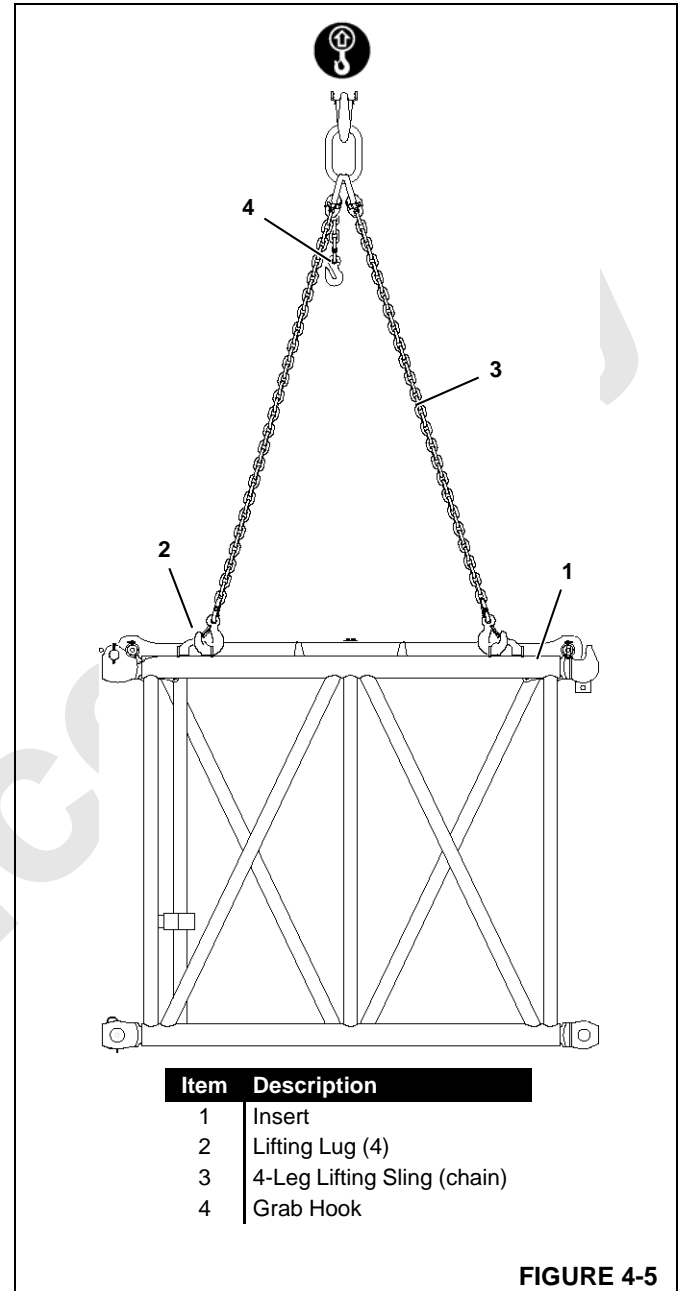
It will be easier to connect the boom sections together if the rear end of the section being lifted hangs lower than the front end of the section. Grab hooks (4) are provided so two legs of the lifting sling can be shortened as desired.

! WARNING
Falling Load Hazard!

Lifting lugs on a particular boom section are designed only for lifting that section only. Do not attempt to lift two or more boom sections with lifting lugs only on one section. Lifting lugs may break allowing boom sections to fall.

When lifting lugs are not used:

- *Lift against chords only, never against lacings.*
- Use nylon lifting slings. If wire rope or chain slings are used, install protective covering (such as sections of rubber tire) between slings and chords.



Boom Assembly Drawing

The boom sections (top, inserts, straps) must be assembled in proper sequence according to the Boom Assembly Drawing at the end of this section.



WARNING

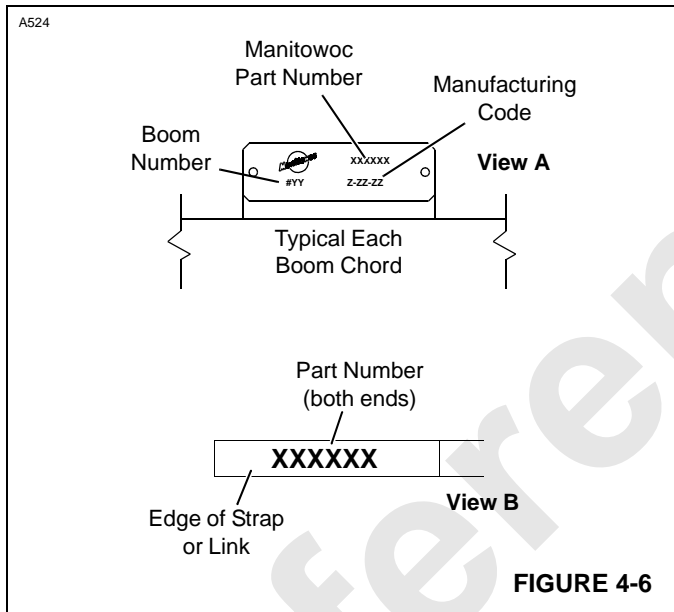
Collapsing Boom Hazard!

Boom can collapse if not assembled in correct sequence. Follow assembly sequence in Boom Assembly Drawing.

Identifying Boom Sections and Straps

The boom sections are marked for proper identification as shown in Figure 4-6, View A.

The straps and links are marked for proper identification as shown in Figure 4-6, View B.



Identifying “Heavy” Boom Inserts

The following #58WA boom inserts are classified as “heavy:”

- 3 m (9.8 ft)
- 6 m (19.7 ft)
- 12 m (39.4 ft)

Each heavy insert has two identification plates with an H cut into them as shown in Figure 4-7.

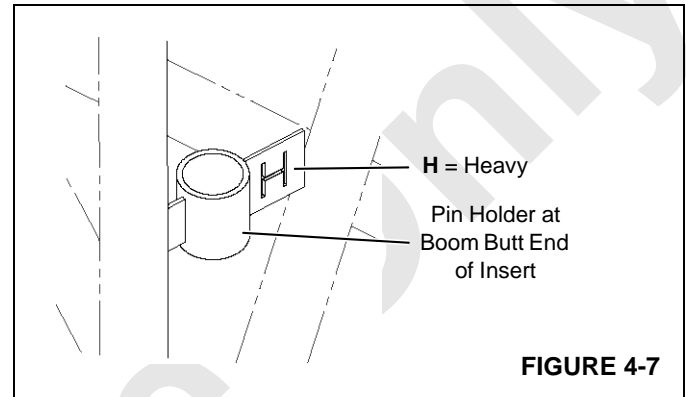


FIGURE 4-7

Reference Only

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#58, 12 m (39.4 FT) MAX-ER Insert with Storable Equalizer Rails
CONFIGURED FOR USE WITH MAX-ER ATTACHMENT
Past Production only on S/N 16003016

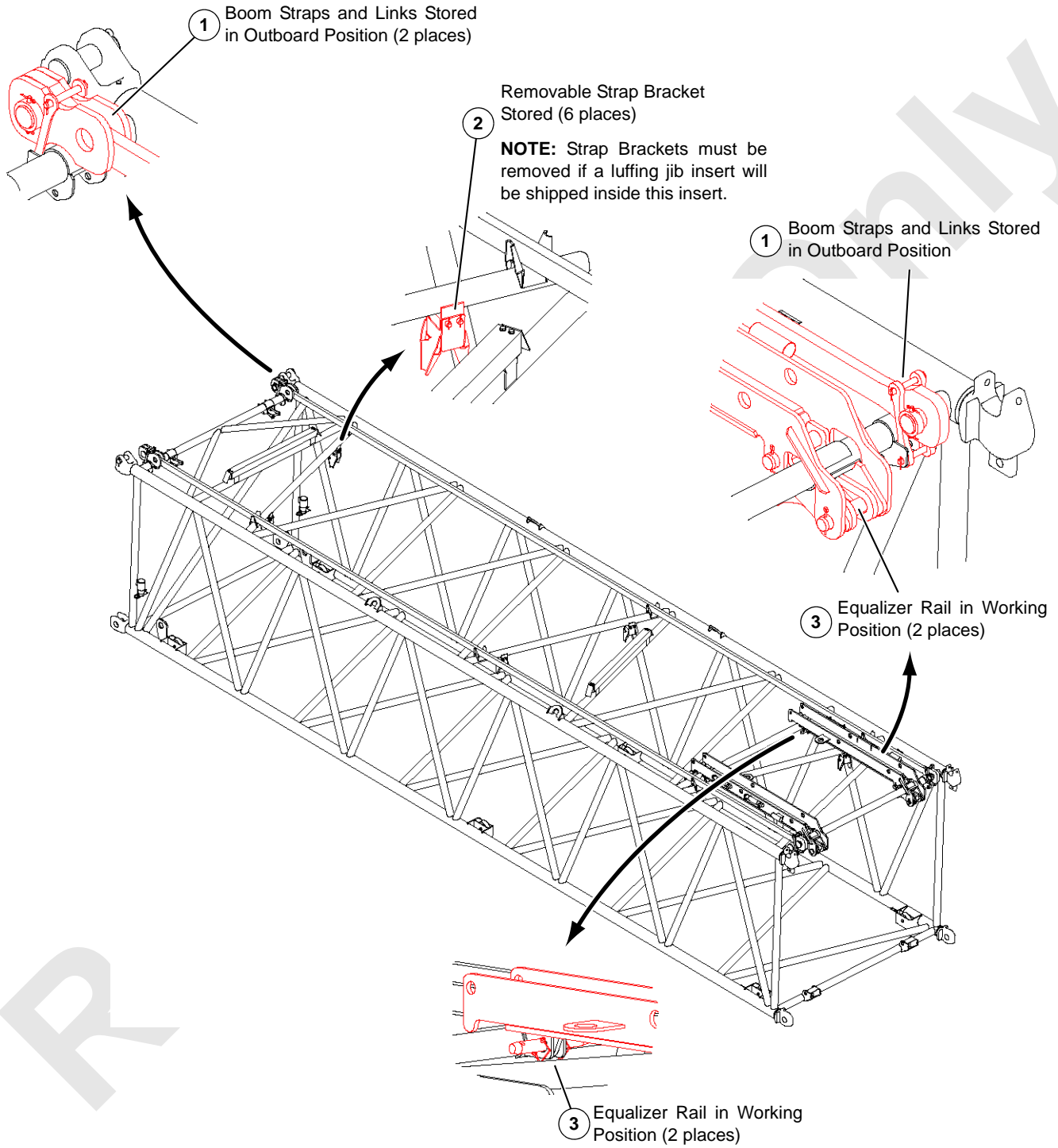


FIGURE 4-8

#58, 12 m (39.4 FT) MAX-ER Insert with Storable Equalizer Rails
CONFIGURED FOR USE WITH 16000 WIND ATTACHMENT
Past Production only on S/N 16003016

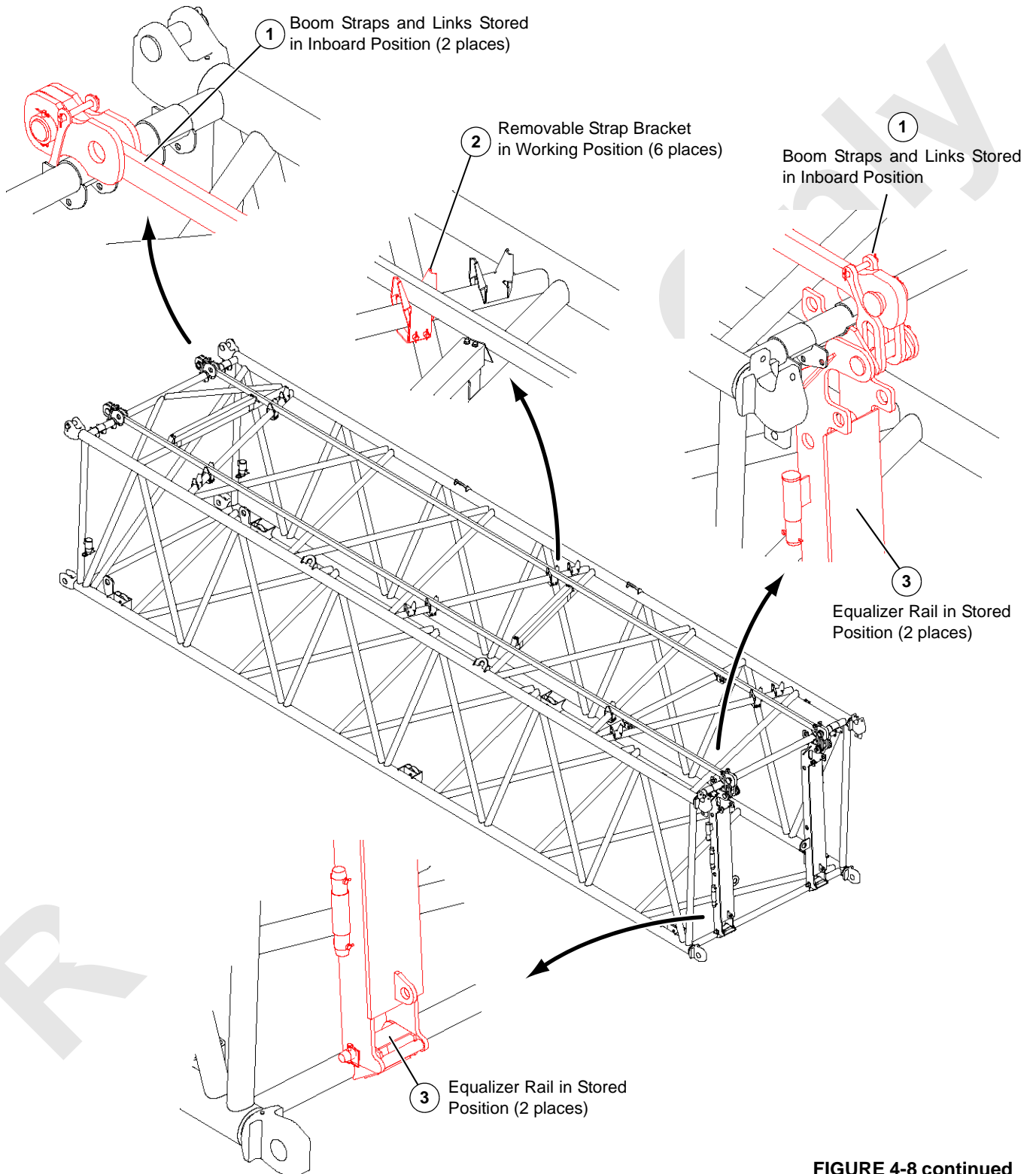


FIGURE 4-8 continued

#58, 12 m (39.4 FT) MAX-ER Insert with Storable Equalizer Rails
CONFIGURED FOR USE WITH MAX-ER ATTACHMENT
Current Production

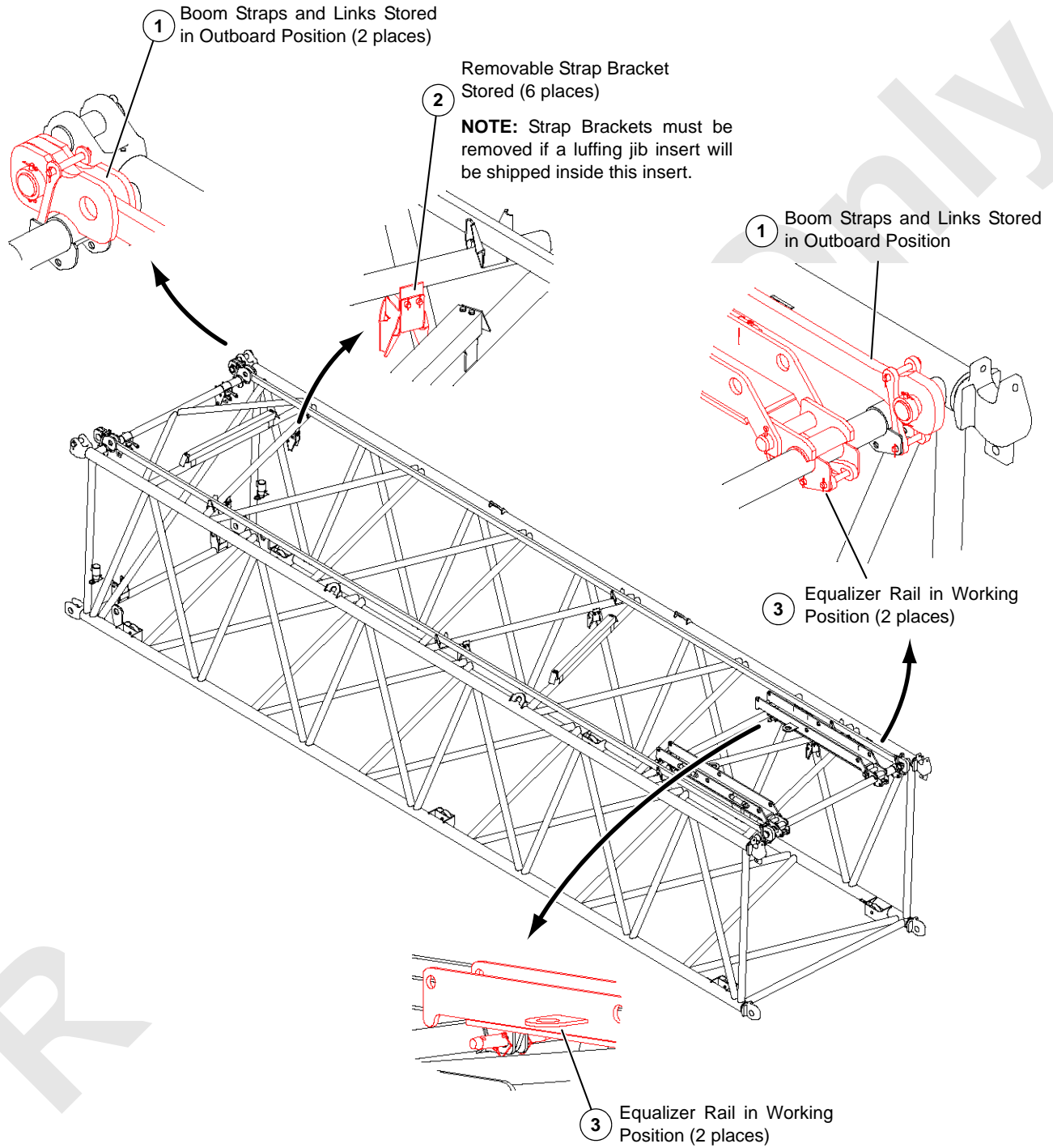
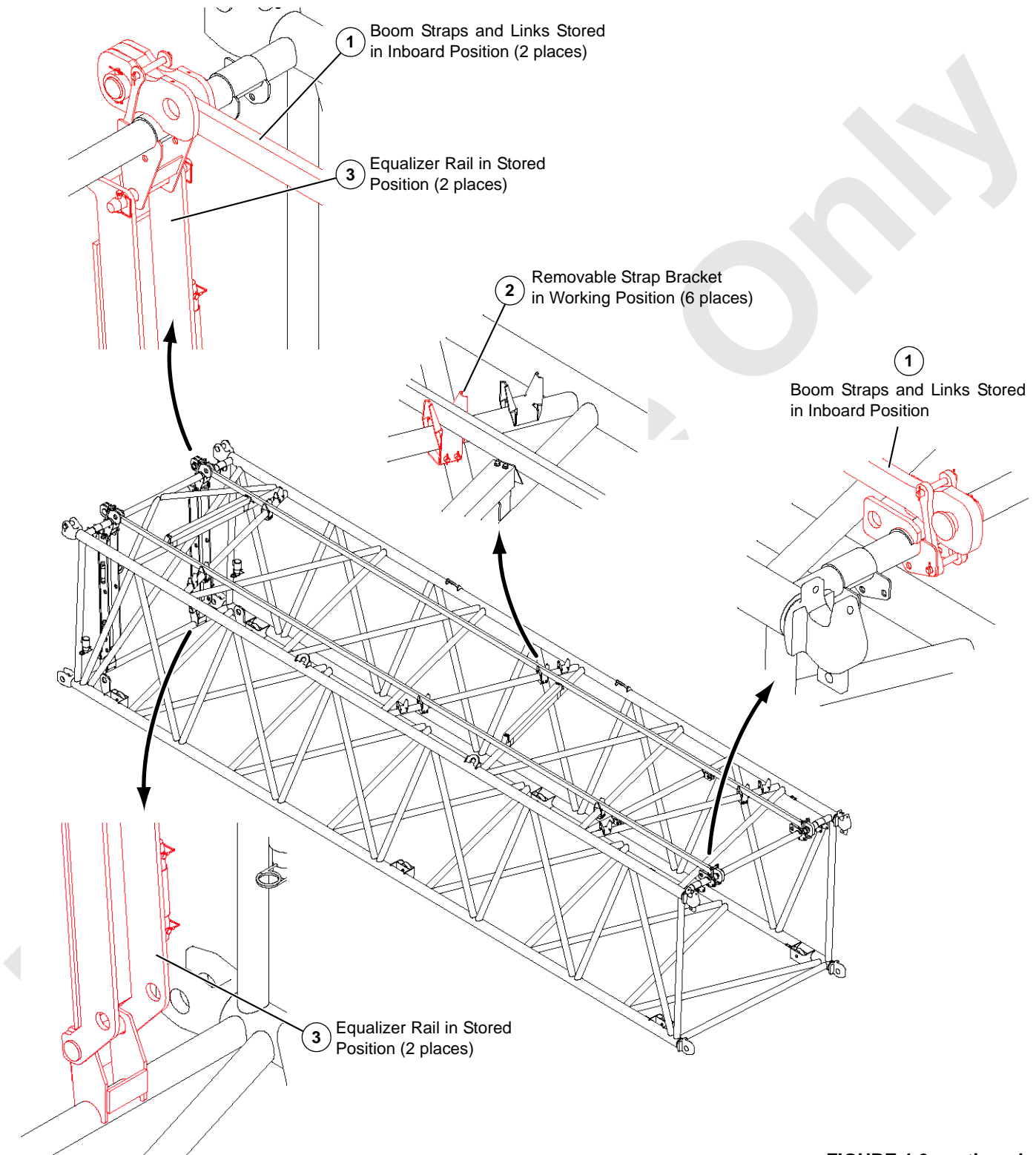


FIGURE 4-9

#58, 12 m (39.4 FT) MAX-ER Insert with Storable Equalizer Rails
CONFIGURED FOR USE WITH 16000 WIND ATTACHMENT
Current Production



4

FIGURE 4-9 continued

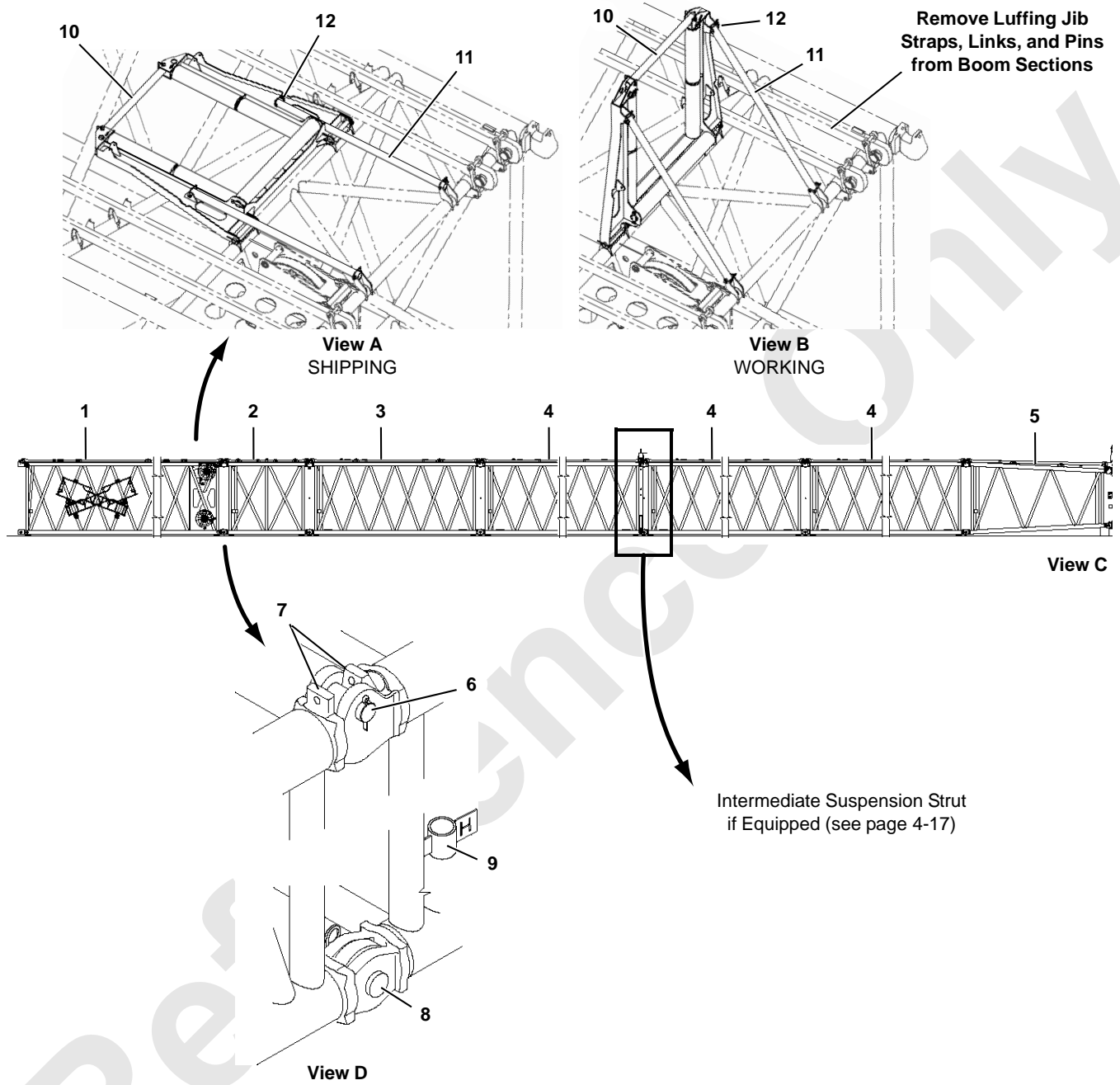


FIGURE 4-10

Legend for Figure 4-10

Item	Description
1	12 m (39.4 ft) Insert (with sheaves)
2	3 m (9.8 ft) Insert
3	6 m (19.7 ft) Insert
4	12 m (39.4 ft) Insert
5	5 m (16.4 ft) Transition Insert
6	Fixed Horizontal Pin
7	Hooked Connector
8	Bottom Connecting Pin
9	Storage Tube (2 each insert)
10	Wire Rope Guide
11	Strut (2)
12	Wire-Lock Pin (2)

**WARNING****Crush Hazard!**

To prevent being crushed by a falling boom section:

- Never work under or inside a boom section that is not securely blocked.

Falling Load Hazard!

Luffing jib backstay straps can be stored on boom sections for shipping.

- Remove all jib backstay straps, links, and pins stored on boom sections prior to operating #58WA boom with extended upper boom point.

Assemble Boom Sections

See Figure 4-10 for following procedure.

Boom sections must be assembled in proper sequence. See the Boom Assembly Drawing at the end of this section for the assembly sequence.

NOTE: The #58, 12 m (39.4 ft) MAX-ER insert with storable equalizer rails can be used. The insert components must be configured as shown in Figure 4-8 or Figure 4-9.

1. If equipped, remove all jib backstay straps, links, and pins stored on the boom sections.
2. Place 12 m (39.4 ft) insert (1) on blocking a **minimum of 6 in (152 mm) high**.
3. Lift the next insert into position and engage fixed horizontal pins (6, View D) in the insert with hooked connectors (7) on the adjacent insert.
4. Lower the insert to horizontal and install both bottom connecting pins (8, View D).

The bottom connecting pins are stored in tubes (9, View D) on the insert.

5. Block under the top end of the insert.
6. Raise wire rope guide (10, View A):
 - a. Remove wire-lock pins (12, View A).
 - b. Raise wire rope guide (10, View A) from the shipping position to the working position (View B).
 - c. Pin struts (11) to the wire rope guide with wire-lock pins (12).
7. Repeat steps 3 – 5 for the next insert.

Continued on next page.

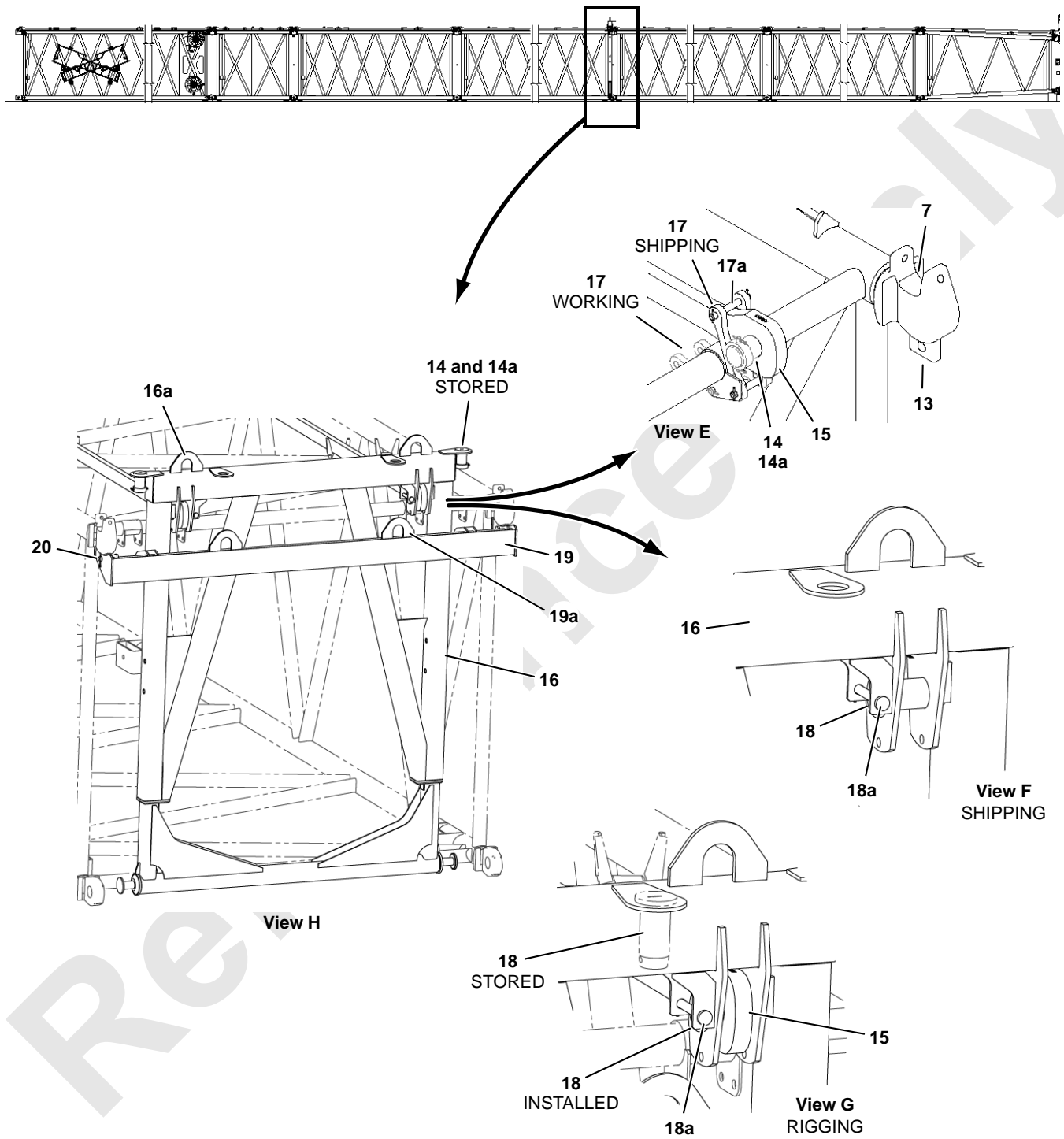


FIGURE 4-10 continued

Legend for Figure 4-10

Item	Description
13	Lug (2)
14	Pin (2)
14a	Collar with Pin and Cotter Pins (2)
15	Strap (2)
16	Intermediate Suspension Strut
16a	Lifting Lug (2)
17	Link (4)
17a	Pin with Cotter Pins (2)
18	Pin (2)
18a	Retaining Pin with Cotter Pin (2)
19	Intermediate Suspension Beam
20	Pin with Cotter Pin (2)

NOTE: Refer to the Boom Assembly Drawing to determine if intermediate suspension is required and, if so, the location of the intermediate suspension strut. The insert to which the strut is attached must be equipped with lugs (13, View E).

8. If intermediate suspension is required, proceed as follows:
 - a. Remove collar (14a, View E) and pin (14) from both straps (15) and store the pins in the lugs on strut (16, View H).
 - b. Unpin links (17, View E) from the shipping position and pin them in the working position.
 - c. Remove retaining pins (18a, View F) and pins (18) from the shipping position in intermediate suspension strut (16).
 - d. Store pins (18) as shown in View G.
 - e. Lift intermediate suspension strut (16, View H) into position at the end of the insert.
The strut has two lifting lugs (16a).
 - f. Align the connecting holes in the intermediate suspension strut with the connecting holes in strap (15).
 - g. Install pins (18, View G) and retaining pins (18a).
Head end of pin (18a) must face top end of boom.
 - h. Lift intermediate suspension beam (19, View H) into position at the end of the insert and pin it to lugs (13, View E) on the hooked connectors.
The beam has two lifting lugs (19a).
 - i. Install pins (20, View E).
9. Repeat steps 3 – 5 (on page 4-15) for the remaining inserts.

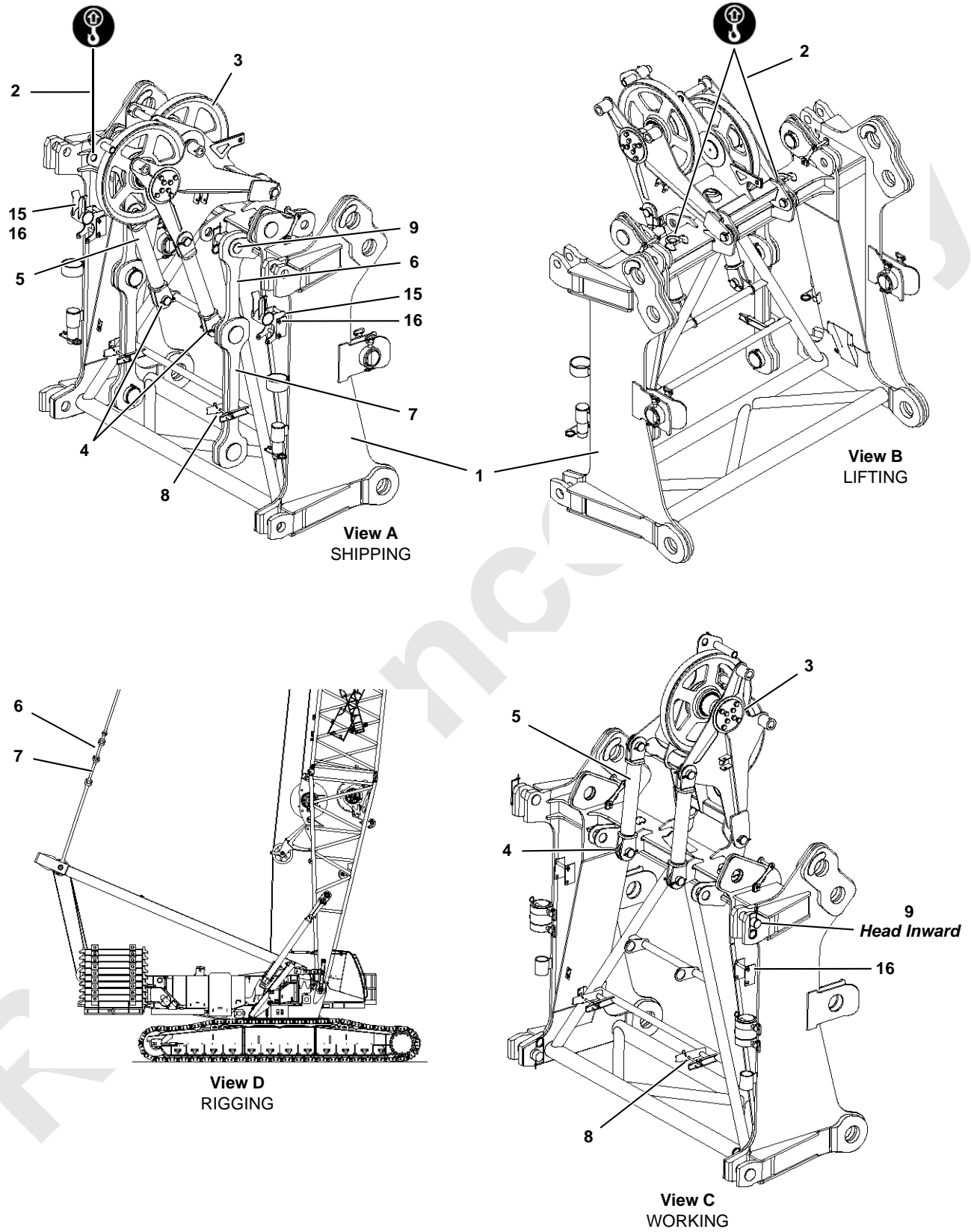


FIGURE 4-11

Legend for Figure 4-11, 4-12, and 4-13

Item	Description
1	Boom Cap
2	Lifting Sling (4-leg chain slings)
3	Wire Rope Guide
4	Pin with Cotter Pins (2)
5	Strut (2)
6	Strap (2)
7	Links with Connecting Pin (4)
8	Pin with Hair-Pin Cotters (2)
9	Pin with Safety Pin (2)
10	Insert
11	Pin with Cotter Pins (2)
12	Links (4)
13	Links (4)
14	Pin, with Collar, Retaining Pin, and Cotter Pins (2)
15	Strap Bracket (2)
16	Pins with Cotter Pins (4)

Prepare Boom Cap

Raise Wire Rope Guide

See Figure 4-11 for following procedure.

1. Attach one leg of lifting sling (2, View A) to the lifting hole in wire rope guide (3).
2. Hoist just enough to support the wire rope guide and remove pins (4, View A).
3. Raise the wire rope guide to the working position (View C) and pin struts (5) to the lugs on the boom cap.
 - a. Disconnect the lifting sling.

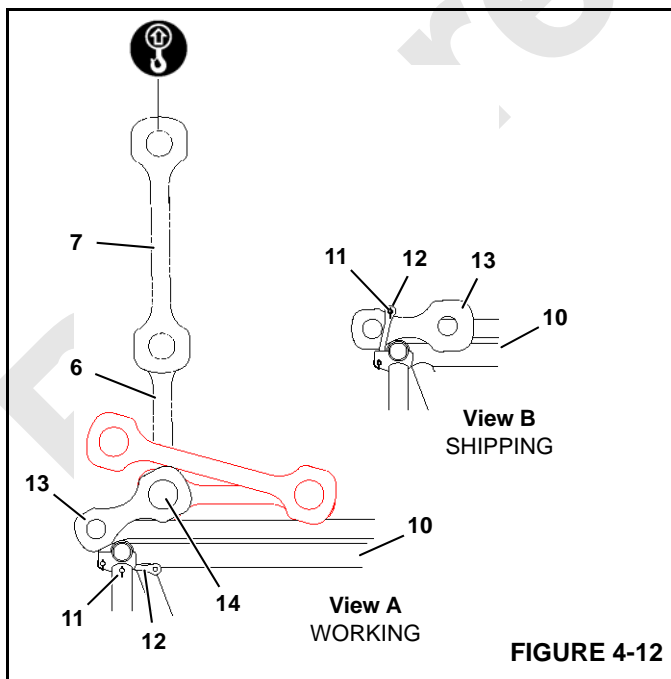


FIGURE 4-12

Remove Mast Straps and Links from Storage

See Figure 4-11, View A for following procedure.

1. Attach a nylon lifting sling to the top end of strap (6) using a “choker” hitch.
2. Hoist just enough to support strap (6) and links (7).
3. Remove pins (8 and 9).
4. Lift the strap and links clear of the boom cap.
5. Reinstall pins (8 and 9, View C).
6. Lay the straps and link on the ground and disconnect the lifting sling.
7. Repeat the above steps for the other strap and links.
8. Connect straps (6) and links (7) to the boom straps:

See Figure 4-12 for following procedure.

- a. Attach a nylon lifting sling to the pin at the top end of links (7, View A).
 - b. Lift strap (6) and links (7) into position at the butt end of insert (10, View A).
 - c. Remove pins (11, View B), rotate links (12) to the working position (View A), and install pins (11).
 - d. Pin links (13, View A) to strap (6) with pin (14).
Pin (14) is stored in a pocket on the vertical lacing of the insert.
 - e. Lower strap (6) and links (7) to the folded position (View A).
9. Disconnect the lifting sling.

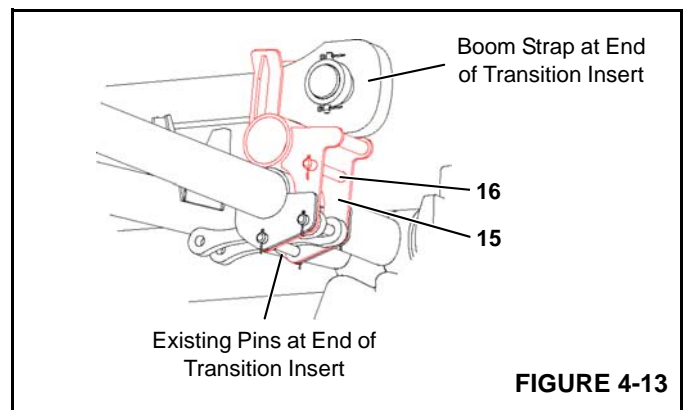


FIGURE 4-13

Remove Strap Brackets from Storage

1. Remove strap brackets (15, Figure 4-11, View A) from storage.
2. Store two pins (16, Figure 4-11, View C).
3. Install strap brackets (15, Figure 4-13) under the top end of the straps on the transition insert.

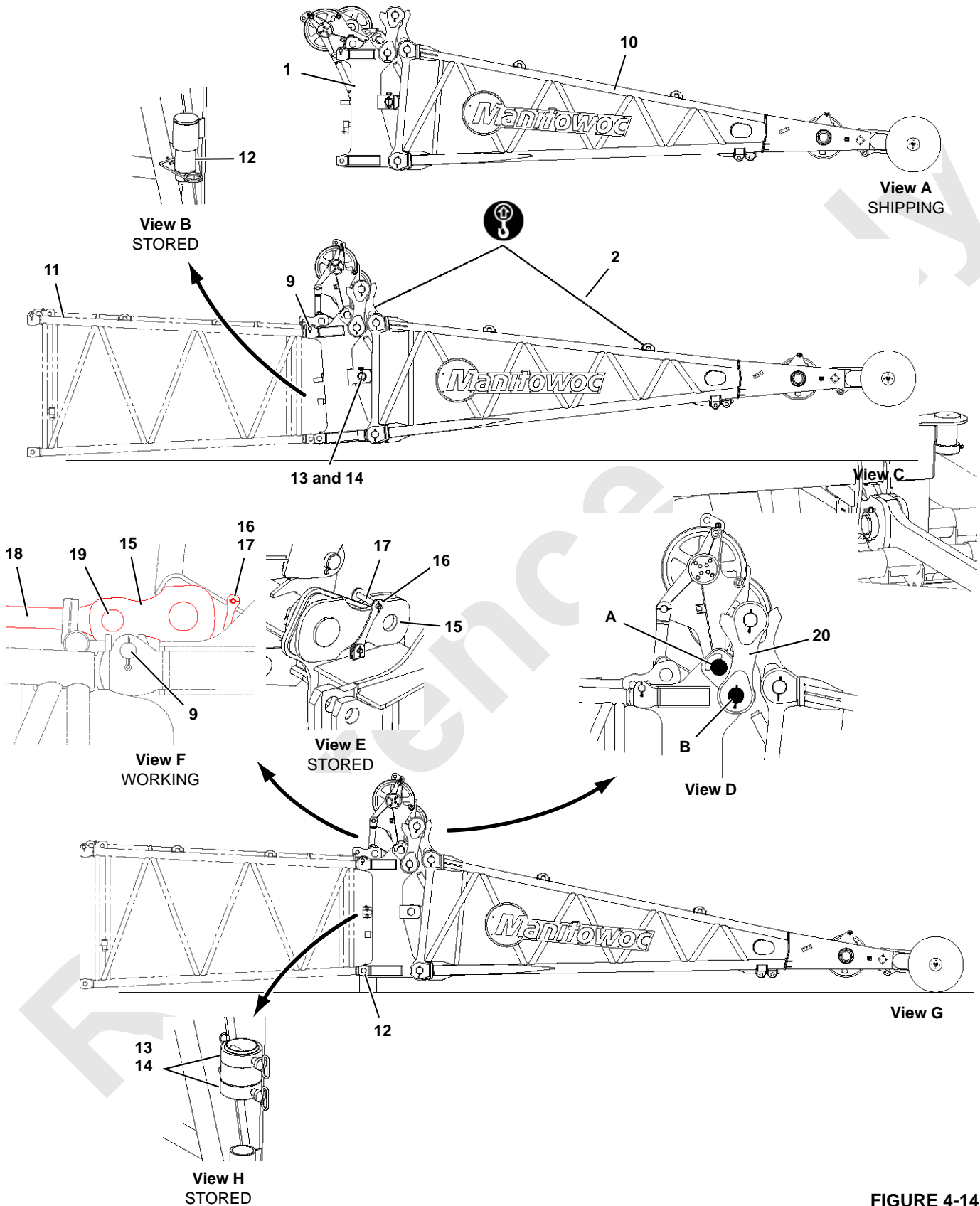


FIGURE 4-14

NOTE: There are two procedures for installing the extended upper boom point:

- Procedure 1 — The boom cap and extended upper boom point are shipped assembled.
- Procedure 2 — The boom cap and extended upper boom point are shipped separately.

Legend for Figure 4-14

Item	Description
1	Boom Cap
2	Lifting Sling (4-leg chain slings)
3-8	See Figure 4-11
9	Pin with Safety Pin
10	Extended Upper Boom Point <ul style="list-style-type: none"> • 16000 #58WA OR • 18000 #55-79A
11	Transition Insert
12	Pin with Safety Pin (2)
13	Pin (2)
14	Collars with Hitch Pins (4)
15	Links (strap) (4)
16	Links (storage) (4)
17	Pin with Cotter Pins (2)
18	Strap (2)
19	Pin with Collar and Retaining Pin (2)
20	Link with Pin and Cotter Pins (2)

5. Engage pins (9, Views C and F) in the boom cap with the hooked connectors on transition insert (11).
6. Lower the boom cap and the extended upper boom point until the bottom connecting holes are aligned and install pins (12, View G). The pins are stored as shown in View B.
7. Remove pins (13, View C) and collars (14) and lower the extended upper boom point to the ground.
8. Store pins (13, View H) and collars (14).
9. Disconnect the lifting slings.
10. Unpin storage links (16, View E).
11. Rotate links (15, View E) rearward and pin them to straps (18, View F) on the transition insert.
12. Pin storage links (16, View F) in the working position.
13. Repin links (20, View D) to the desired offset holes.

Hole	Description
A	28° Offset <ul style="list-style-type: none"> • 16000 #58WA ONLY
B	35° Offset <ul style="list-style-type: none"> • 16000 #58WA OR • 18000 #55-79A

14. As the boom is raised, the extended upper boom point rollers will roll along the ground until the links unfold. The extended upper point will then lift off the ground as the boom is raised.

Make sure roller path is clear of obstructions.

Install Extended Upper Boom Point — Procedure 1

See Figure 4-14 for following procedure.

1. View A shows boom cap (1) and extended upper boom point (10) pinned together for shipping.
2. Prepare the boom cap as instructed on page 4-19.
3. Attach all four legs of lifting sling (2, View C) to the lifting lugs on boom cap (1) and to the forward lifting lugs on extended upper boom point (10).
4. Lift the boom cap and extended upper boom point into position at the end of transition insert (11, View C).

! WARNING
Crush Hazard!

Prior to raising boom, warn personnel to stand clear of extended upper boom point rollers.

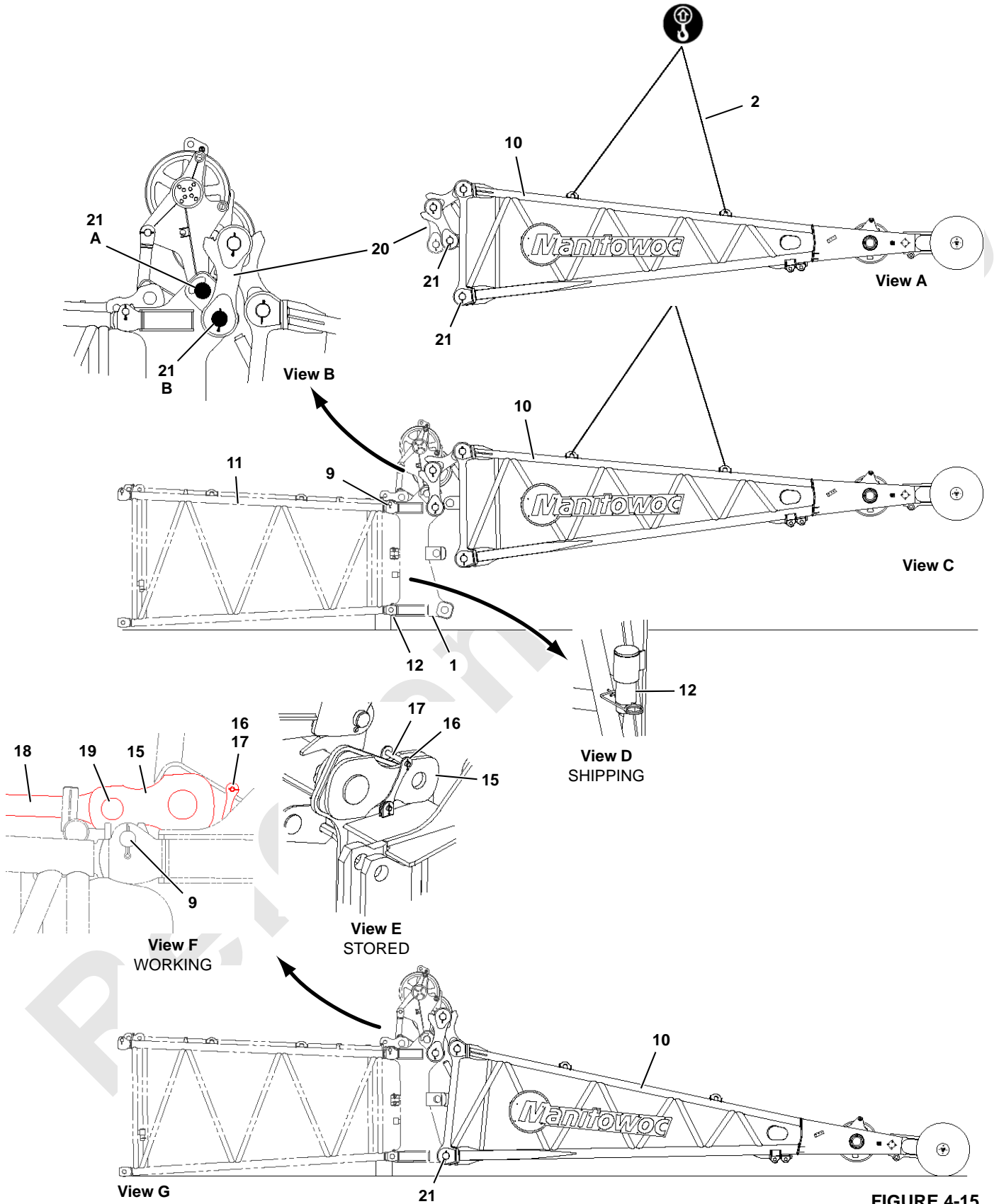


FIGURE 4-15

Install Extended Upper Boom Point — Procedure 2

Legend for Figure 4-15

Item	Description
1	Boom Cap
2	Lifting Sling (4-leg chain slings)
3-8	See Figure 4-11
9	Pin with Safety Pin
10	Extended Upper Boom Point <ul style="list-style-type: none"> • 16000 #58WA OR • 18000 #55-79A
11	Transition Insert
12	Pin with Safety Pin (2)
13-14	See Figure 4-14
15	Links (strap) (4)
16	Links (storage) (4)
17	Pin with Cotter Pins (2)
18	Strap (2)
19	Pin with Collar and Retaining Pin (2)
20	Link (2) with Pin and Cotter Pins
21	Pin with Cotter Pins (4)

See Figure 4-15 for following procedure.

- View A shows extended upper boom point (10) in the shipping position.
- Prepare the boom cap as instructed on page 4-19.
- Lift the boom cap into position at the end of transition insert (11, View C).
Lift at two lifting lugs on the top of the boom cap.
- Engage pins (9, Views C and F) in the boom cap with the hooked connectors on transition insert (11).
- Lower the boom cap until the bottom connecting holes are aligned and install pins (12, View C). The pins are stored as shown in View D.
- Unpin storage links (16, View E).
- Rotate links (15, View E) rearward and pin them to straps (18, View F) on the transition insert.
- Pin storage links (16, View F) in the working position.
- Remove pins (21, View A) and rotate links (20) to vertical.
- Remove pins (21, View A) from the bottom connecting holes in the extended upper boom point.
- Attach all four legs of lifting sling (2, View A) to the lifting lugs on extended upper boom point (10).
- Lift the extended upper boom point into position at the end of boom cap (1, View C).
- Pin links (20, View B) to the desired offset holes.

Hole	Description
A	28° Offset <ul style="list-style-type: none"> • 16000 #58WA ONLY
B	35° Offset <ul style="list-style-type: none"> • 16000 #58WA OR • 18000 #55-79A

- Align the bottom connecting holes in the extended upper boom point with the bottom connecting holes in the boom cap and install pins (21, View G).
- Lower the extended upper boom point to the ground and disconnect the lifting slings.
- As the boom is raised, the extended upper boom point rollers will roll along the ground until the links unfold. The extended upper point will then lift off the ground as the boom is raised.

Make sure roller path is clear of obstructions.



Prior to raising boom, warn personnel to stand clear of extended upper boom point rollers.

Item	Description
1	Intermediate Suspension Strut
2	Lifting Lug (2)
3	Pin with Pin and Cotter Pins (2)
3a	Retaining Pin and Cotter Pin (2)
4	Links (2)
5a	Strap
5b	Strap
6	Alignment Hole (4)

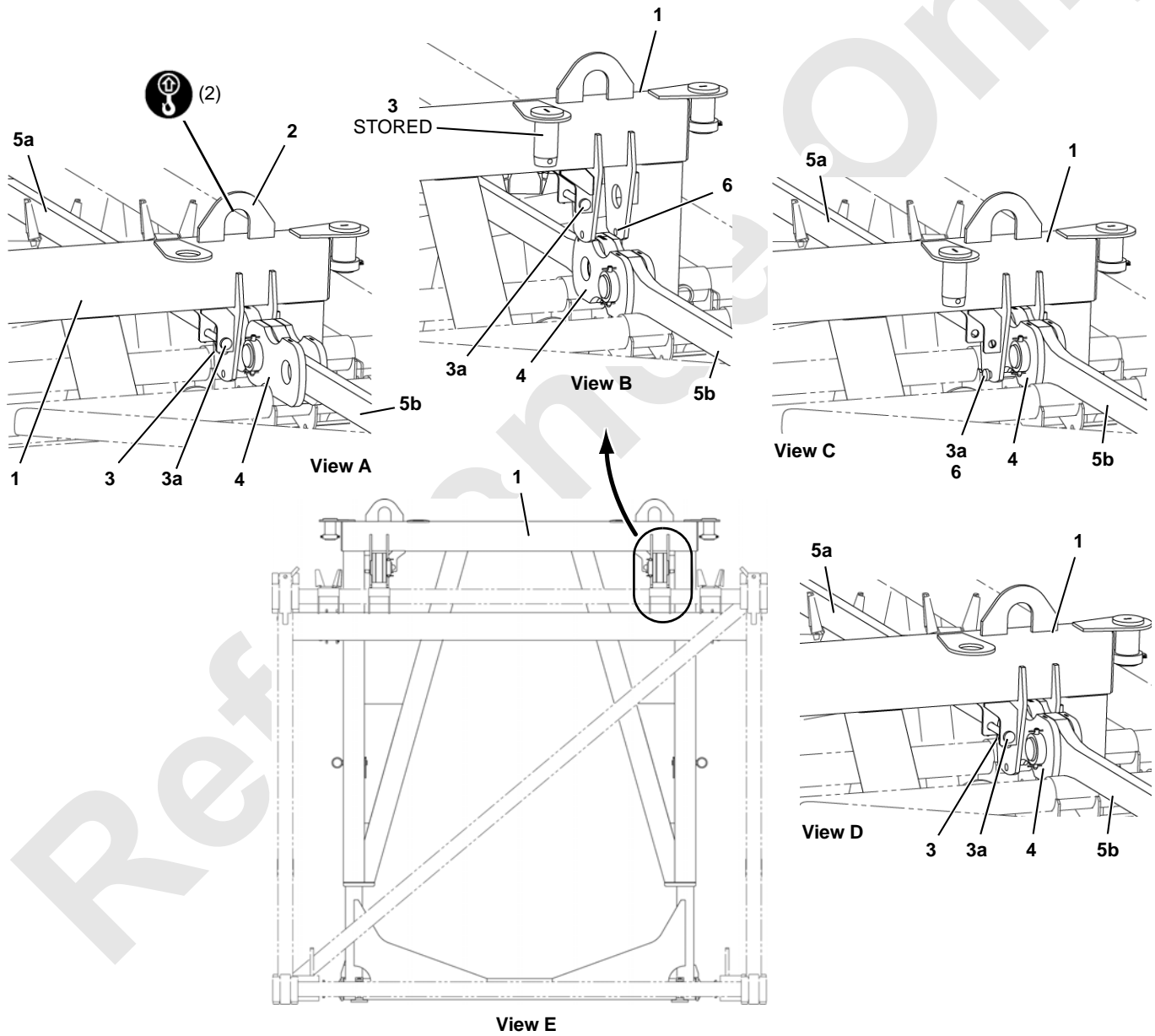


FIGURE 4-16

Connect Boom Straps to Intermediate Suspension Strut

See Figure 4-16 for following procedure.

NOTE: Skip this procedure if intermediate suspension is not required.

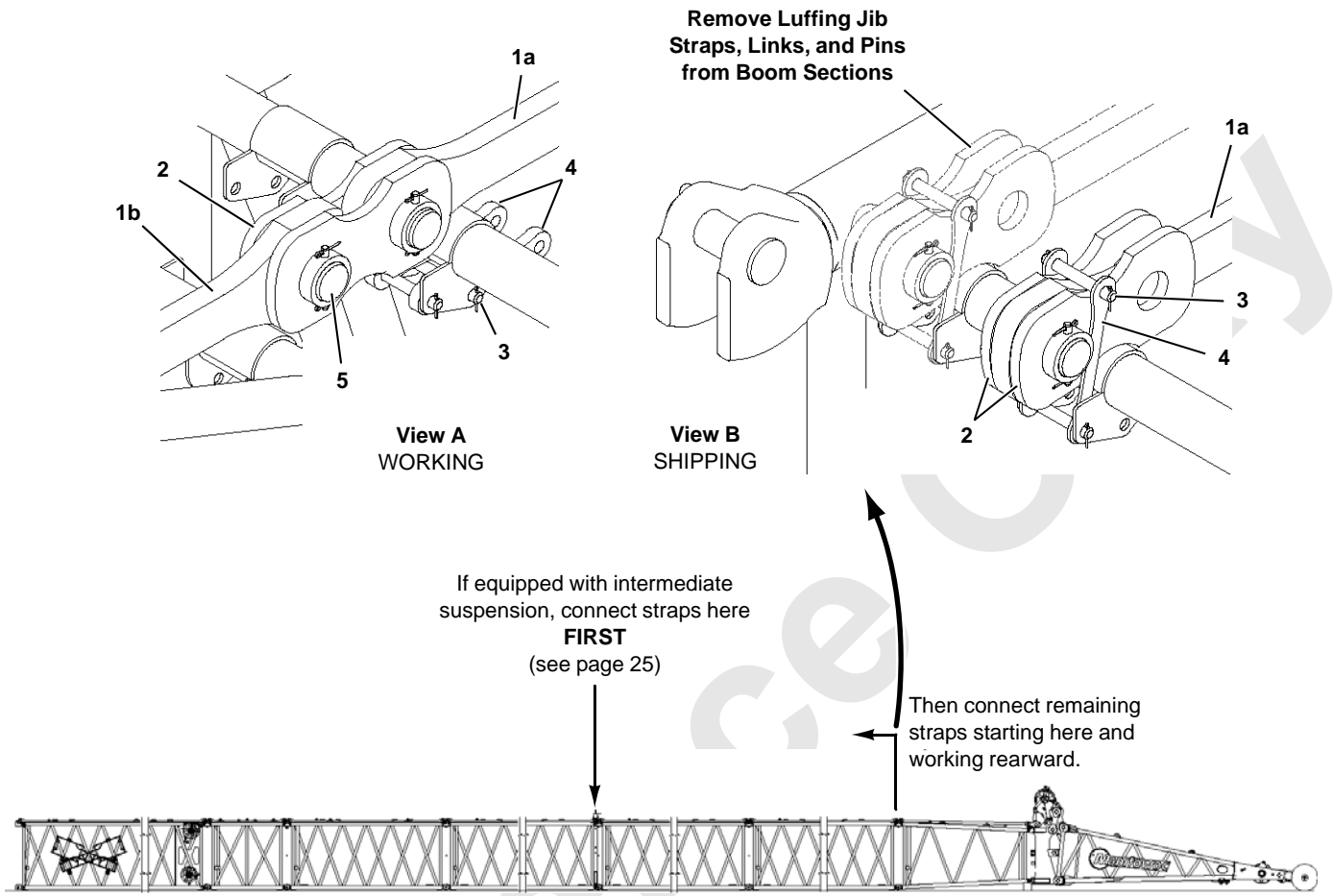
If intermediate suspension is installed, connect the boom straps to intermediate suspension strut (1) first. Then connect the boom straps at the inserts, starting at the transition insert and working rearward (see page 27).

It may be difficult to connect the straps to the intermediate suspension strut if you connect the straps at the inserts first.

1. Attach lifting slings to lifting lugs (2, View A) on intermediate suspension strut (1).
2. Raise intermediate suspension strut (1) with the assist crane until pins (3, View A) are loose.
3. Remove retaining pins (3a, View A) and pins (3).
4. Store pins (3 and 3a, View B).

Head end of pin (3a) must face top end of boom.

5. Lift intermediate suspension strut (1) approximately 12 in (305 mm) so there is room to rotate links (4, View B) to the working position.
6. Unpin links (4, View A) from the shipping position and rotate them rearward to the working position (View B).
7. Remove retaining pins (3a, View B) from storage.
8. Lower intermediate suspension strut (1) until alignment holes (6, View B) are lower than links (4, View C).
9. Install retaining pins (3a, View C) in alignment holes (6).
10. Raise intermediate suspension strut (1, View C) with the assist crane until the connecting holes in the strut are aligned with the holes in links (4) and straps (5a).
11. Remove pins (3, View B) from storage and pin intermediate suspension strut (1, View D) to links (4) and straps (5a).
12. Remove pins (3a, View C) from alignment holes (6) and install the retaining pins in the working position (View D).
Head end of pins (3a) must face top end of boom.
13. Lower intermediate suspension strut (1) until the lifting slings are slack.
14. Disconnect the lifting slings.



Item	Description
1a	Strap
1b	Strap
2	Link
3	Pin with Cotter Pins
4	Link
5	Pin, with Collar, Retaining Pin, and Cotter Pins

FIGURE 4-17

Connect Boom Straps

See Figure 4-17 for following procedure.

NOTE: The boom straps and links are shipped on the boom sections as shown in View B.

If intermediate suspension is installed, connect the boom straps to the intermediate suspension strut first (see page 25). Then connect the boom straps at the inserts, starting at the transition insert and working rearward.

It may be difficult to connect the straps to the intermediate suspension strut if you connect the straps at the inserts first.

1. Remove pins (3, View B), rotate links (4) to the working position (View A), and install pins (3) at both ends of the insert.
2. Remove pin (5, View A) from the end of strap (1b).
3. Rotate links (2, View B) rearward and pin them to strap (1b) with pin (5, View A).

Item	Description
1	Boom Butt
2	Wire Rope Guide
3	Lifting Lug
4	Pin with Cotter Pins
5a	Hoses
5b	Couplers on Boom Butt
5c	Couplers on Rotating Bed
6	Hinge Pin
7	Locking Pin
8	Shims

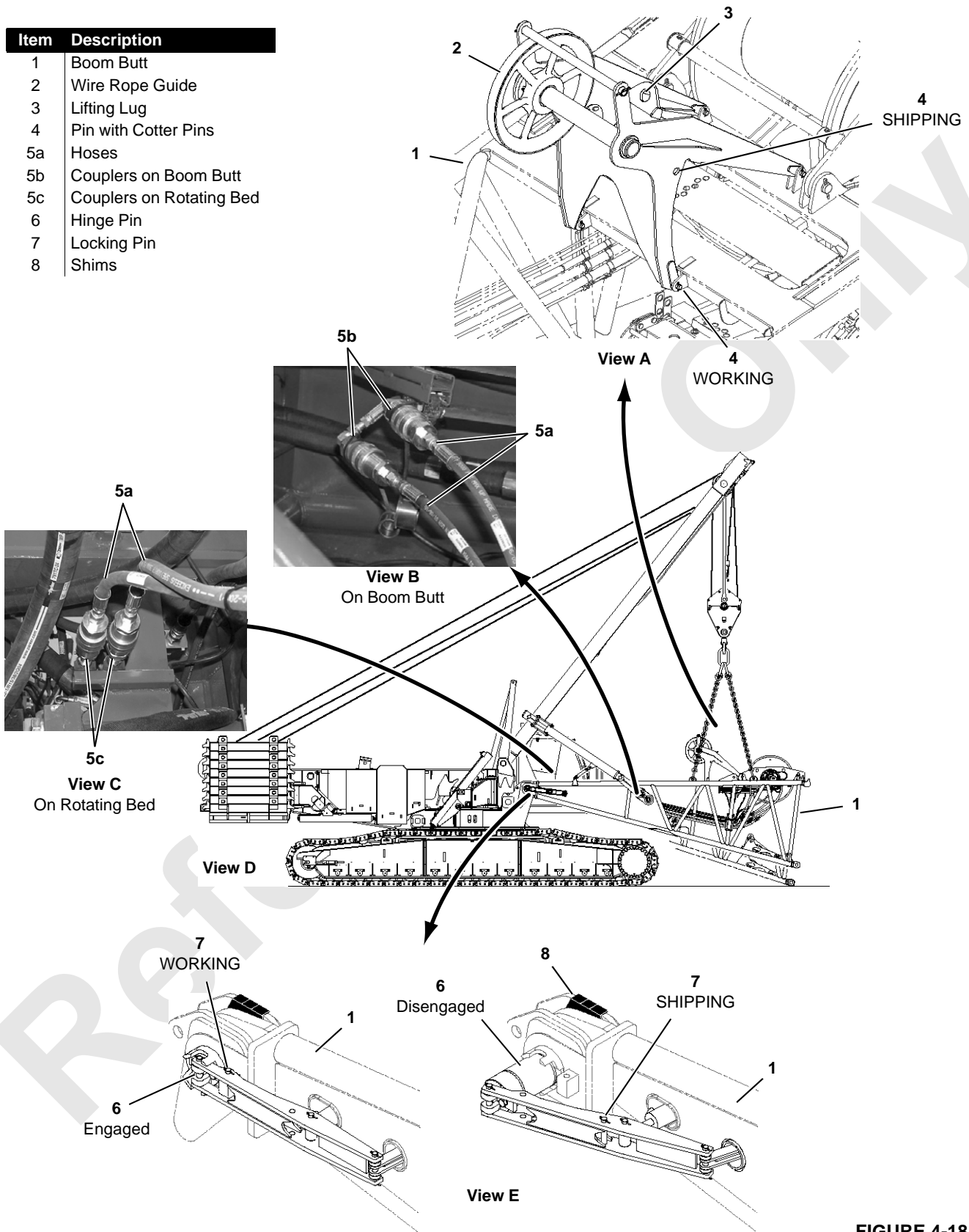


FIGURE 4-18

Install boom butt

See Figure 4-18 for following procedure.

1. Raise the wire rope guide to the operating position (View A):
 - a. Attach a lifting sling to lifting lug (3, View A) on wire rope guide (2).
 - b. Support the wire rope guide so pins (4) are loose and remove the pins.
 - c. Raise the wire rope guide from the shipping position to the working position.
 - d. Install pins (4).
 - e. Disconnect the lifting sling.

2. Attach lifting slings to the lifting lugs on the top chords of the boom butt as shown in View D.

Adjust length of slings so boom butt is horizontal when lifted.

3. Lift the boom butt into position at the connecting holes in the front of the rotating bed (View D).
4. Disconnect hydraulic hoses (5a, View B) from couplers (5b) on the boom butt.

Thoroughly clean couplers to prevent dirt from entering hydraulic system.

5. Connect hydraulic hoses (5a, View C) to couplers (5c) on the left side of the rotating bed.
6. Using the setup remote control, disengage boom hinge pins (6, View E).
7. Position the boom butt so the connecting holes in boom butt are aligned with the connecting holes in the rotating bed.
8. Center the boom butt between the rotating bed lugs and check side play. If total side play is greater than 5/64 in (22 mm), install shims (8, View E) as follows:
 - a. Install the thickest possible shim between the inboard side of the boom butt and the rotating bed lug on both sides of the crane.

Shim tabs must face inward and rest on rotating bed lugs.

- b. Install the next thickest possible shim between the inboard side of the boom butt and the first shim on both sides of the crane.
 - c. If possible, install the thinnest shim between the inboard side of the boom butt and the second shim on both sides of the crane.
9. Using the setup remote control, engage the boom hinge pins.
 10. Remove locking pins (7, View E) from the shipping position and install them in the working position.
 11. Lower the boom butt onto the ground.
 12. Disconnect the lifting slings.
 13. Disconnect hydraulic hoses (5a, View C) from couplers (5c) on the rotating bed and connect them to couplers (5b, View B) on the boom butt.
 14. Hold retaining bar (2, Figure 4-19, View D) down and remove safety pin (3) from one end of the bar.
 15. Slowly raise retaining bar (2) and rotate the hydraulic hoses forward.
 16. Repin the retaining bar for storage.
 17. Remove the protective caps from the couplers on the boom butt and from the couplers and the hydraulic hoses on the rotating bed.

Thoroughly clean couplers to prevent dirt from entering hydraulic system.

18. Connect the hydraulic hoses between the rotating bed and the boom butt as shown in Figure 4-19.

NOTE: These are straight line connections. No hoses will cross when the hoses are correctly connected.

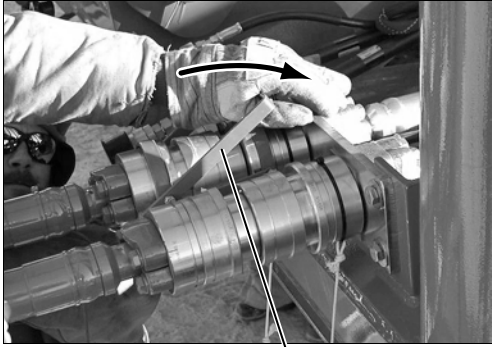
On current production cranes, the hoses and couplers between the boom butt and rotating bed have numbered tags. To ensure proper connection, match the numbers on the tags.

Coupler-assist tool (1, Figure 4-19, View A) can be used to connect the large couplers.

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Reference Only

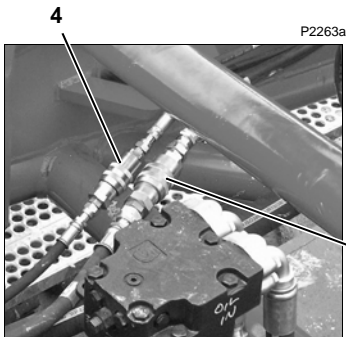
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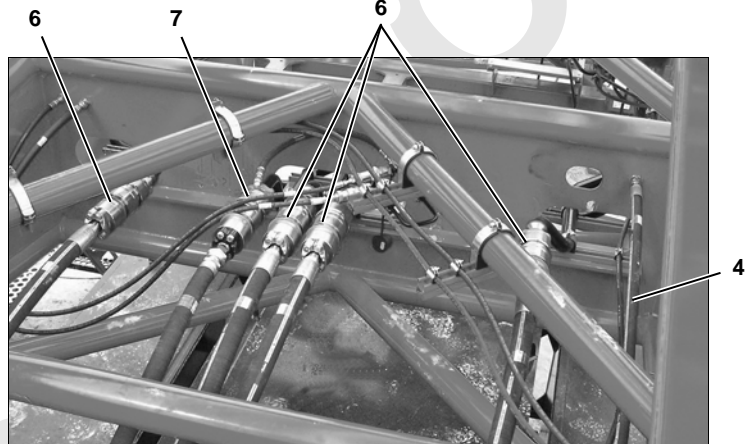
View A

Item	Description
1	Coupling Assist Tool
2	Retaining Bar
3	Safety Pin
4	Motor Pilot
5	Anti-Cavitation
6	High Pressure
7	Case Drain

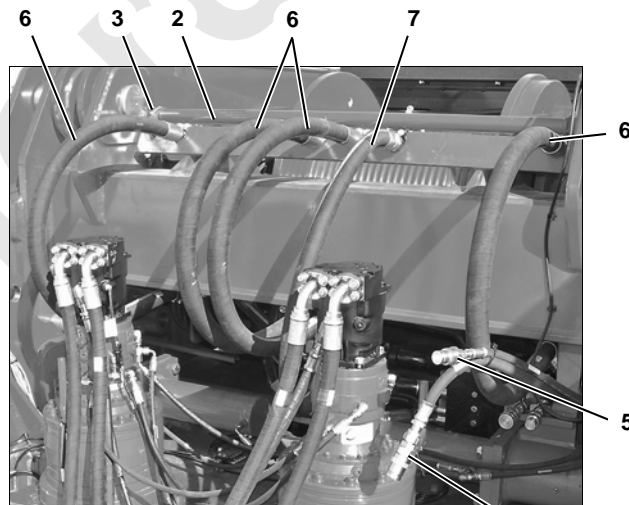
Views B and C are from Crane Looking Forward



View B



View C



View D
From Front

FIGURE 4-19

A10740-17
A10740-19
A10740-20

Item	Description
1	Trailer
2	Boom Butt
3	Mast
4	Chain Sling
5	Assembly Block
6	Handling Pendant
7	Assist Crane Load Block
8	Nylon Sling
9	Mast Strap
10	Hooked Connector
11	Fixed Pin
12	Pin with Safety Pin

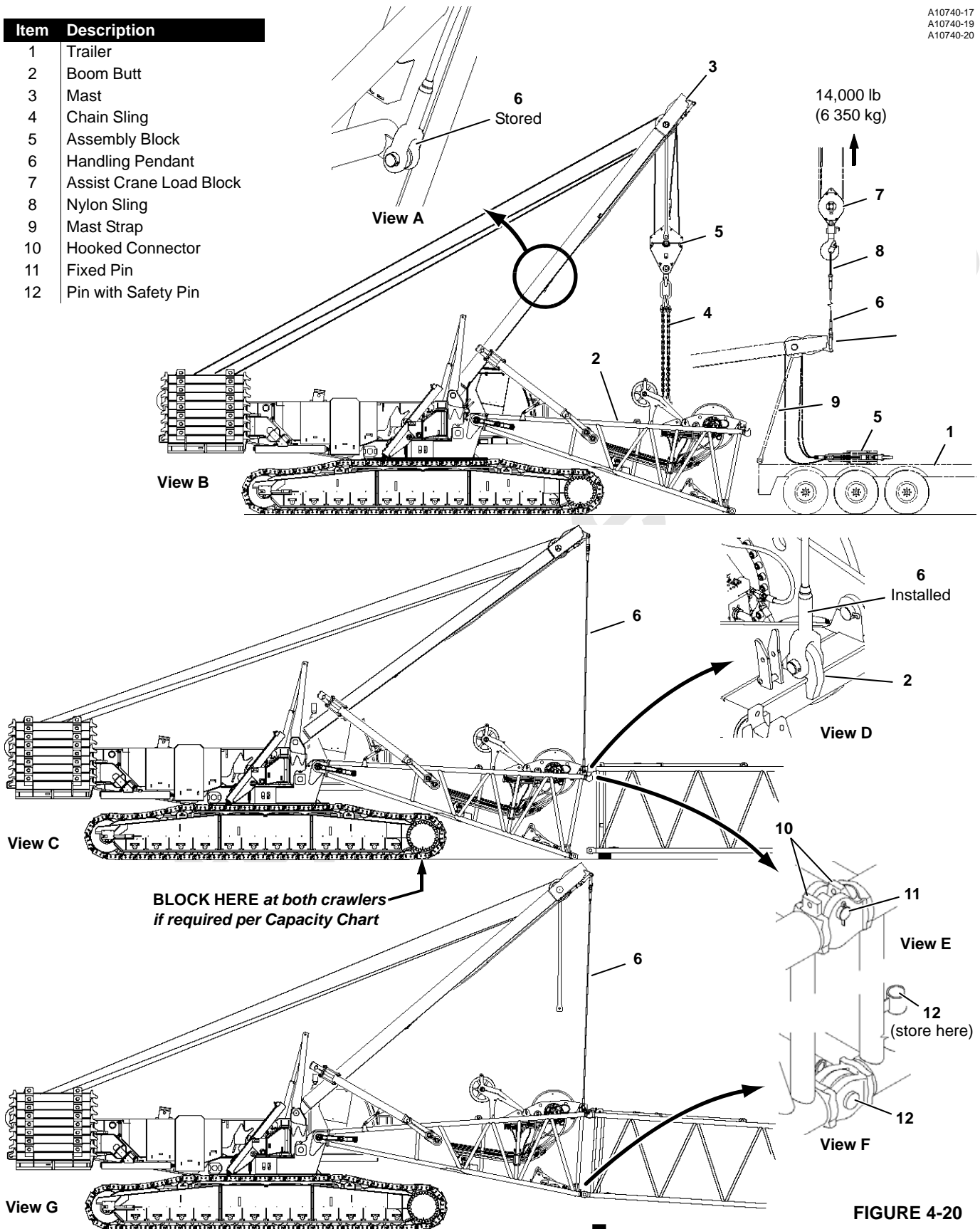


FIGURE 4-20

Remove Assembly Block

See Figure 4-20 for following procedure.



WARNING

Falling Mast Hazard!

Prevent mast from falling:

- Do not use limit bypass to lower mast below 156° until **mast is supported with slings from assist crane.**
- Assist crane must lift 14,000 lb (6 350 kg).

1. Position trailer (1, View B) or other means of transport in front of boom butt (2) as shown. Or, lower the assembly block onto the ground and remove it with an assist crane.
2. BOOM DOWN to lower mast (3) to approximately 150°.
3. Guide slings (4) and assembly block (5) around the end of the boom butt as the mast is lowered.
4. Unpin handling pendants (6, View A) from the mast and attach the pendants to assist crane block (7) with nylon lifting slings (8).
5. Support the mast with the assist crane.
6. Lower the mast to the desired position with the assist crane. *Do not side load mast.*

Use the limit bypass switch to bypass the mast limit and pay out boom hoist wire rope as the mast is lowered with the assist crane.



WARNING

Crush Hazard!

Do not stand or work under mast unless it is supported by assist crane.

7. Lower assembly block (5, View B) onto the trailer or the ground. Guide the mast straps clear of the trailer, as required.
8. Remove the wire rope from the assembly block and the mast and store the wire rope on the whip drum.

CAUTION

Lacing Damage!

Take necessary precaution while storing wire rope on drum so boom button end of rope does not fall and damage lacings in boom butt.

9. Raise the mast to at least 150° with the assist crane. As the mast is raised haul in wire rope on the boom hoist.
10. Once the mast is at or above 150°, support the mast with the boom hoist wire rope and disconnect handling pendants (6) from the assist crane block.
11. Position the mast at approximately 140° (View C).

Connect Boom Butt to Boom

See Figure 4-20 for following procedure.

1. Pin handling pendants (6, View D) to lugs (2) on the boom butt.
2. Boom up to lift the boom butt just clear of the ground.
3. Position the 16000 so the boom butt is in line with the end of boom (View C).
4. Travel forward and boom down to align hooked connectors (10, View E) on the boom butt with fixed pins (11) on the adjacent insert.
5. See Capacity Chart to determine if crawlers must be blocked to raise assembled length of boom. **If blocking is required:**
 - a. Mark the ground at front end of the crawler — center of tumbler on one crawler and center of front roller on other crawler.
 - b. Disengage the boom butt from the insert and travel backwards approximately 4 ft (1,2 m).
 - c. Install the required blocking at the points marked in step 5a.
 - d. Repeat step 4.



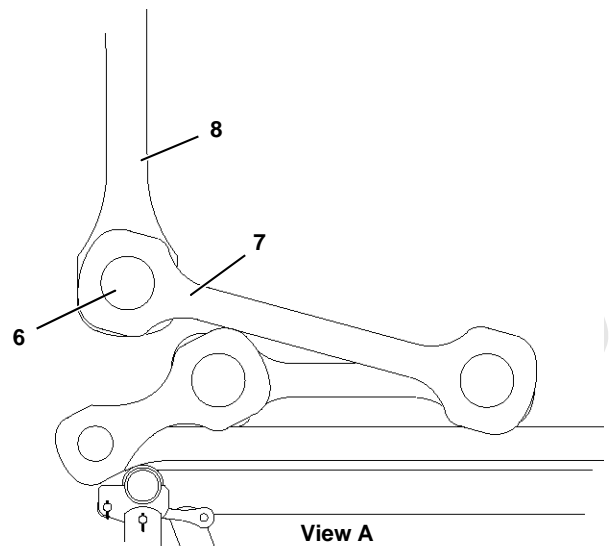
WARNING

Falling Boom Hazard

Do not attempt to lift assembled boom with handling pendants. Handling pendants could break allowing boom to fall.

6. Boom up slowly (View F) until the bottom connectors are aligned between the boom butt and the insert.
7. Install pins (12, View G).
8. Unpin handling pendants (6, View D) from the boom butt and pin them to the mast (View A) for storage.

Item	Description
1	Terminator Plug with Sealing Cap
2	Electric Cable on Crane
3	Electric Cable From Boom
4	Electric Cable from Drum 1 on Boom
5	Electric Cable from Drum 3 on Boom
6	Pin, with Collar, Retaining Pin, and Cotter Pins (2)
7	Links (2)
8	Mast Strap (2)



ARMS DOWN before raising mast with boom connected to mast straps.

ARMS UP before raising mast with boom disconnected from mast straps.

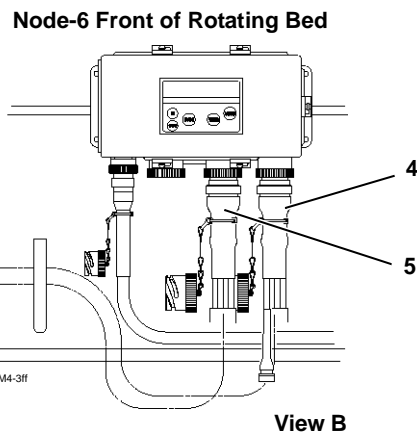
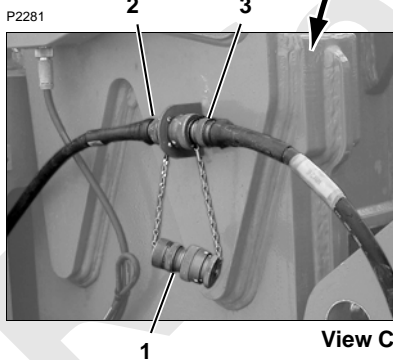
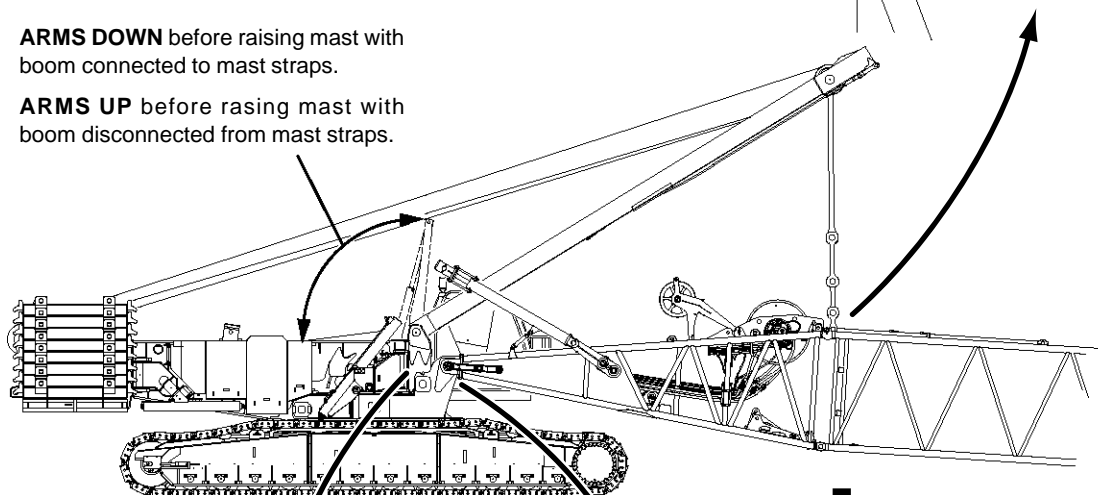


FIGURE 4-21

See Figure 4-21 for remaining steps.

9. Connect the electric cable from the crane to the controller on the boom butt:
 - a. Remove terminator plug (1, View C) from electric cable (2) on the crane.
 - b. Connect electric cable (3) from the boom butt to cable (2).
10. Connect electric cables (4, View B) and (5 optional) from the boom butt to the node on the front of the rotating bed.
11. Remove pins (6, View A) from links (7).
12. Lower the mast until the holes in mast straps (8, View A) are aligned with the holes in links (7).

13. Install pins (6, View A).

**DANGER****Falling Mast/Boom Hazard!**

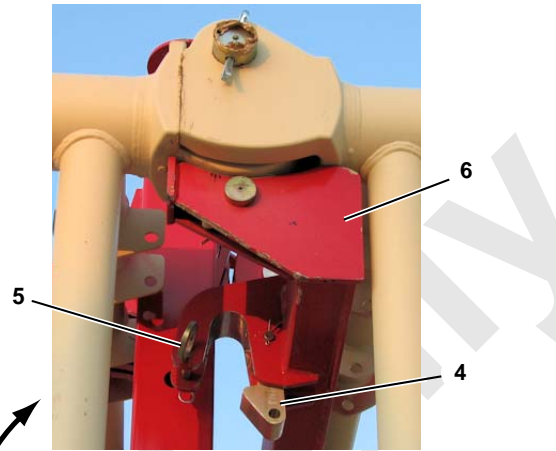
Prevent mast and boom from falling:

- Fully lower mast arms before raising boom. *Mast can buckle and collapse if it contacts mast arms with a fully rigged boom.*

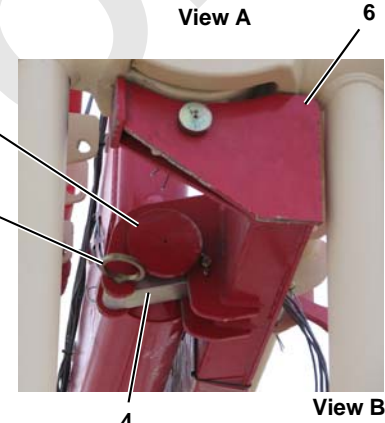
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14. Fully lower the mast arms using the switch on the remote control.
 15. Select the proper capacity chart on the configuration screen of the RCL display.

Reference Only

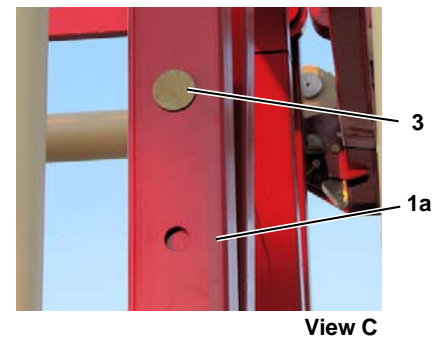
Item	Description
1	Intermediate Suspension Strut
1a	Top Strut
1b	Bottom Strut
2a	Support (2) (Past Production)
2b	Blocking (2) (Current Production) 4 in x 4 in x 30 in (102 mm x 102 mm x 762 mm)
3	Pin with Cotter Pin(2)
4	Latch (2)
5	Hitch Pin with Hair-Pin Cotter (2)
6	Beam



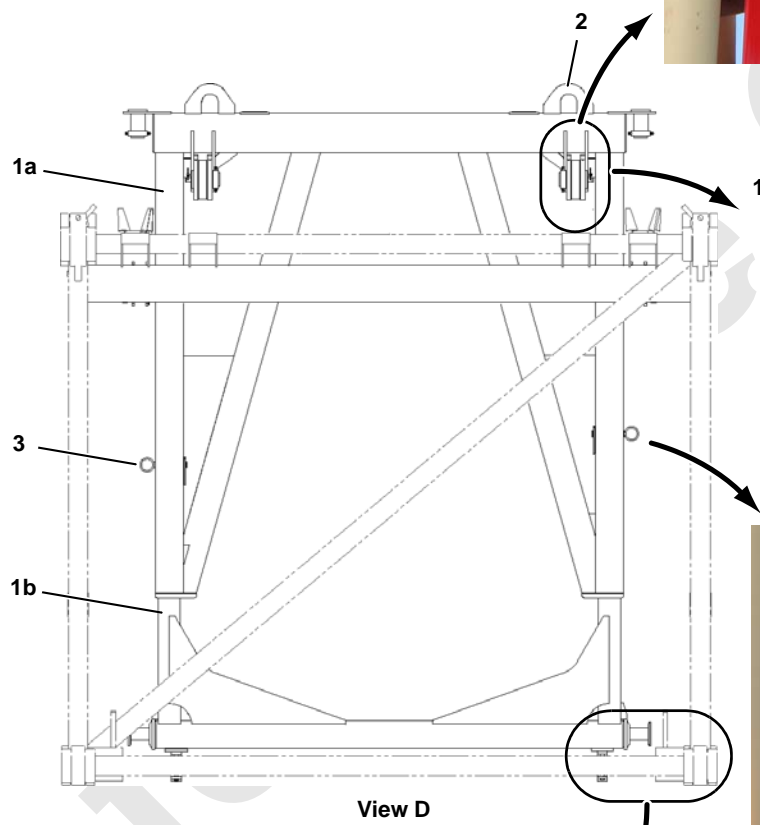
View A



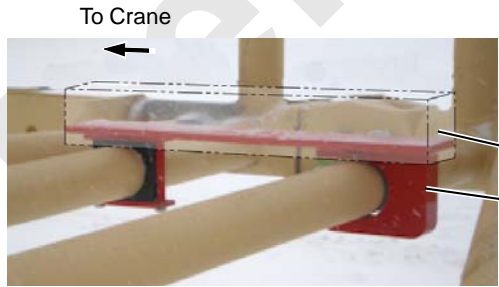
View B



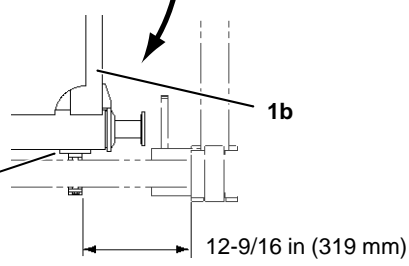
View C



View D



View F



View E

FIGURE 4-22

Raise/Adjust Intermediate Suspension

See Figure 4-22 for following procedure.

NOTE: Skip this procedure if intermediate suspension is not required.

1. Slowly boom up to raise the intermediate suspension strut approximately 12 in (305 mm).
2. Attach supports (2a, View F) between the inserts on both sides of the boom at the dimension given in View E **OR** lay blocking (2b) across the lacings on both sides of the boom.
3. Slowly boom down until bottom strut (1b, View D) is resting on supports (2a or blocking 2b).
4. Boom up or down as needed to loosen pins (3, View C)

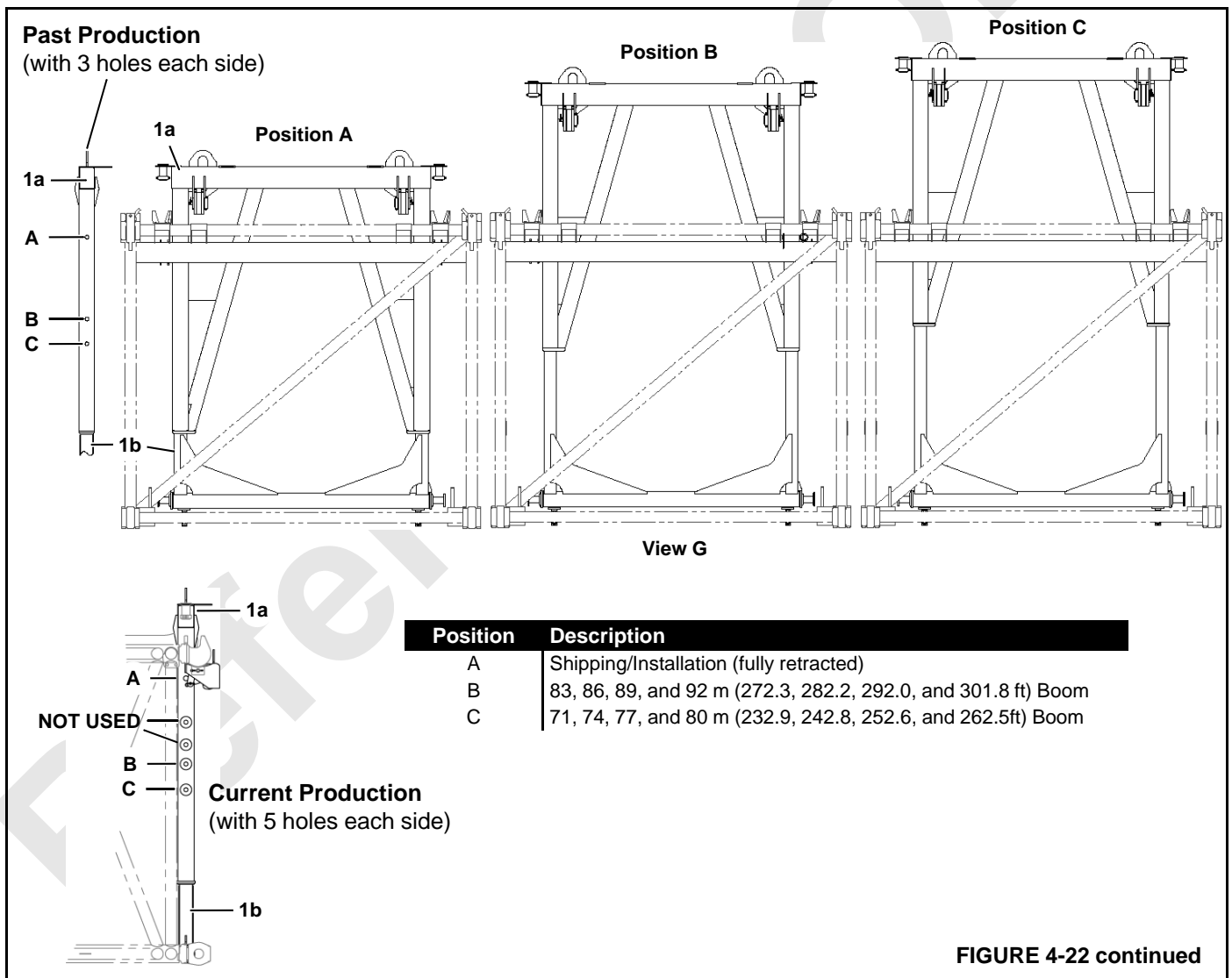
5. Remove pins (3).
6. Slowly boom up to raise top strut (1a) to the required operating length (View G).

Make sure the top strut does not hang up on the boom strap brackets as the strut is raised.

7. Install pins (3) to connect the top strut to the bottom strut at the required length.
8. Unpin latch (4, View A) on both ends of beam (6).

NOTE: The boom may start to rise off the blocking before the bottom strut shaft engages the lug in step 9.

9. Slowly boom up until the bottom strut shaft engages the lug at both ends of beam (6, View B).
10. Close latches (4, View B) and install pins (5).



Item	Description
1	Boom Cap
2	Extended Upper Boom Point
3	Lower Point
4	Upper Point
5	Boom Node Controller (in boom cap)
6	Wireless Transceiver (in boom cap)
7	Link
8	Wired Load Cell
9	Link
10	Button Socket
11	Chain — 9 ft (2,7 m)(2)
11a	Shackle (3)
11b	Pin (3)
12	Block-Up Limit Weight
13	Load Block
14	Block-Up Limit Switch (2)
15	Link
16	Wireless Load Cell
17	Link
18	Block-Up Limit Weight with Lift Plate
19	Link
20	Link
21	Hook and Weight Ball
22	Aircraft Warning Light
23	Wind Speed Indicator

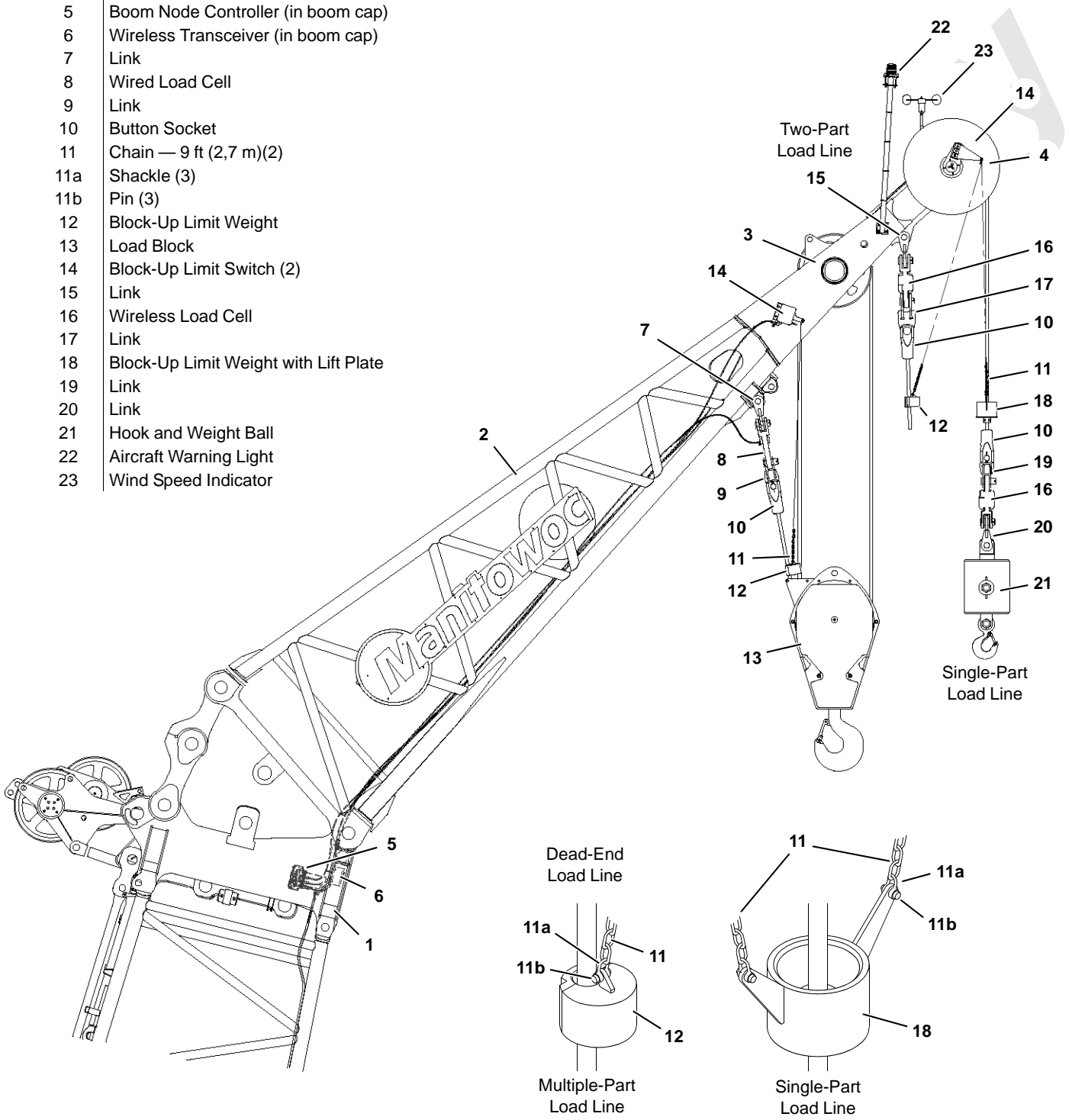


FIGURE 4-23

Reeve Load Lines

Raise the boom until the extended upper boom point rollers are about to lift off the ground.

Reeve the load lines as required. See Load Line Reeving instructions in this section for proper routing and reeving of the load lines.

Connect Boom Wiring

See Figure 4-23 for following procedure.

1. Move wireless transceiver (6) from the boom top to the boom cap (see Boom Wiring and Limits Assembly Drawing at end of this section).
2. Connect the electric cable from the cable reel in boom butt to the wireless transceiver.
3. Connect the electric cable between boom node controller (5) in boom cap and wireless transceiver (6)(see Boom Wiring and Limits Assembly Drawing at end of this section).
4. Install the block-up limit components. See the Boom Wiring and Limits Assembly Drawing at end of this section.
5. Install the wind speed indicator assembly, if equipped. Use star washers to attach the mounting bracket to the extended upper boom point to provide a good ground. See Wind Speed Indicator Assembly Drawing at the end of this section.
6. Install the aircraft warning light, if equipped. See Aircraft Warning Light Assembly Drawing at the end of this section.
7. Connect the electric cables from the load cell, the block-up limit switches, the wind speed transmitter, the aircraft warning light to proper receptacles on the boom node controller.
8. To protect electrical components:
 - a. Attach protective caps to the ends of all unused cables, unused receptacles, and unused terminator plugs.
 - b. If equipped, attach terminator plugs to unused receptacles.

Perform Pre-Raising Checks

Perform the following pre-raising checks and correct any defects before raising the boom:

- o Crane on firm, level surface.
- o Crawlers blocked if required per Capacity Chart.
- o All connecting pins installed and properly retained.
- o Boom inserts installed in proper sequence.
- o Intermediate suspension installed, if required, and raised to proper length.
- o Boom straps installed in proper sequence.
- o All insert and strap connecting pins installed and properly retained.
- o All luffing jib backstay straps, links, and pins removed from boom sections.
- o Mast arms fully lowered.
- o Boom hoist wire rope spooled tightly onto drum and engaged with proper sheaves. Wire rope securely anchored to socket and wedge at mast.
- o Load lines spooled tightly onto drums and engaged with proper sheaves. Load lines securely anchored to sockets at boom points or at load block and weight ball.
- o All blocking, tools, and other items removed from boom.
- o Electronic boom angle indicator properly installed and adjusted.
- o Block-up limit control properly installed and operational.
- o Rated Capacity Indicator/Limiter properly installed and operational.
- o Proper capacity chart selected on configuration screen of RCL display.
- o Automatic boom stop properly installed. Must be adjusted after boom is raised.
- o Crane and attachment properly lubricated.
- o Wind within allowable limits for operation.

DISASSEMBLE BOOM

Lower Boom onto Blocking

To prevent the crane from tipping, some boom lengths must be raised and lowered over the end of blocked crawlers. See Capacity Charts for blocked crawler requirements and Crawler Blocking Diagram in Capacity Charts Manual for instructions.

Do not attempt to lower the boom to the ground until the crawlers are blocked, if required.



WARNING

Tipping Hazard

Block ends of crawlers, if required, before you attempt to raise or lower boom from or to ground.

NOTE: The boom must be lowered onto blocking that is a minimum of 6 in (152 mm) high at the butt end of the transition insert.

The extended upper boom point may not fold properly when lowered onto soft ground. For that reason, prepare the lowering area with steel plates or matting.

1. Swing to either side of center and lower the load block and/or hook-and-weight ball to the ground.
2. Swing the boom back in line with the landing area and lower the boom to the ground. Haul in the load lines as the boom lowers.
3. The extended upper boom point rollers will roll forward once they contact the ground.

Make sure roller path is clear of obstructions.



WARNING

Crush Hazard!

Warn personnel to stand clear of extended upper boom point rollers.

4. If equipped with intermediate suspension, proceed as follows:

See Figure 4-22 for following steps.

- a. As the boom nears the blocking, check to see if pins (5, View B) are loose.

NOTE: The pins may loosen before the boom lands on the blocking.

- b. Once the pins are loose, remove them and open latches (4, View A).
 - c. Continue to lower the boom until it is on the blocking and bottom strut (1b, View D) is resting on supports (2a, View F) or blocking (2b).
 - d. Close latches (4) and install pins (5, View B) for storage.
 - e. Boom up or down as needed to loosen pins (3, View C)
 - f. Remove pins (3).
 - g. Slowly boom down to fully lower top strut (1a) to Position A (View G).
 - h. Install pins (3) to connect the top strut to the bottom strut.
 - i. Slowly boom up to raise the intermediate suspension strut approximately 12 in (305 mm).
 - j. Remove and store supports (2a, View F) or blocking (2b).
5. Boom down until the all of the boom straps are resting in the supports on the boom sections and straps and links at the end of the boom butt are folded as shown in Figure 4-21, View A.

Disconnect/Store Boom Wiring and Components

1. Disconnect boom wiring:

See Figure 4-21 for following steps.

- a. Disconnect electric cable (3, View C) (from boom) from electric cable (2) on the crane.
- b. Remove the sealing cap and connect terminator plug (1, View C) to electric cable (2).
- c. Connect the sealing cap to electric cable (3) and store electric cable (3) on the boom butt.
- d. Disconnect electric cables (4, View B) and (5 optional) from the node on front of the rotating bed.
- e. Connect sealing caps to electric cables (4 and 5) and store the cables in the boom butt.

See Figure 4-23 for remaining steps.

2. Disconnect the electric cables from the load cell, the block-up limit switches, the wind speed transmitter, the aircraft warning light from the boom node controller.
3. To protect electrical components:
 - a. Attach protective caps to the ends of all unused cables, unused receptacles, and unused terminator plugs.

- b. If equipped, attach terminator plugs to unused receptacles.
 - c. Securely attach the cables to the extended upper point for storage.
4. Disconnect the electric cable from the cable reel in boom butt to the wireless transceiver. Wind the cable onto the reel for storage.
 5. Disconnect the electric cable between the boom node controller in boom cap and the wireless transceiver (see Boom Wiring and Limits Assembly Drawing at end of this section).
 6. Remove the wireless transceiver from the boom cap and install it on the boom top (see Boom Wiring and Limits Assembly Drawing at end of this section).
 7. Remove and store the block-up limit components in the job box.
 8. Remove and store the wind speed indicator assembly, if equipped, in the job box.
 9. Remove and store the aircraft warning light, if equipped, in the job box.

Store Load Lines

Unreeve the load block and/or hook-and-weight ball and spool the load lines onto the drums for storage.

Disconnect Boom Butt from Boom

1. Disconnect the mast straps from boom (see Figure 4-21, View A):
 - d. Unpin links (7) from mast straps (8).
 - e. Store pins (6) in the pockets on the insert.
2. Fully raise the mast arms using the switch on the remote control.



DANGER

Falling Mast/Boom Hazard!

Prevent mast from falling:

- Fully raise mast arms before raising mast. Mast will fall over backwards if raised to vertical when arms are down.

3. Disconnect the boom butt:

See Figure 4-20 for following procedure.



DANGER

Falling Boom Hazard

Do not remove bottom pins between butt and insert until handling pendants are connected and supporting boom. Boom will collapse.

- a. Unpin handling pendants (6, View A) from the mast and pin them to the lugs on the boom butt (View D).
- b. Boom up until handling pendants (6, View G) are just taut.



WARNING

Falling Boom Hazard

Do not attempt to lift assembled boom with handling pendants. Handling pendants could break allowing boom to fall.

- c. Remove pins (12, View F) and store them in the pockets on the insert.
- d. Slowly boom down to lower the boom onto blocking at least 6 in. (152 mm) high (View C).
- e. Boom down until hooked connectors (10, View E) on the boom butt disengage fixed pins (11) in the adjacent insert.
- f. Travel backward until the crane is clear of the boom and there is enough room to install the assembly block.
- g. Lower the boom butt onto blocking.
- h. Unpin handling pendants (6, View D) from the boom butt.

Install Assembly Block

See Figure 4-20 for following procedure.



WARNING

Falling Mast Hazard!

Prevent mast from falling:

- Do not use limit bypass to lower mast below 156° until **mast is supported with slings from assist crane.**
1. Position the trailer carrying assembly block (5) at end of the boom butt as shown in View B.
 2. BOOM DOWN to lower mast (3) to approximately 160°.

3. Pin handling pendants (6) to assist crane block (7) with nylon lifting slings (8).
4. Support the mast with the assist crane.
5. Lower the mast to the desired position with the assist crane. *Do not side load mast.*

Use the limit bypass switch to bypass the mast limit and pay out boom hoist wire rope as the mast is lowered with the assist crane.



WARNING

Crush Hazard!

Do not stand or work under mast unless it is supported by assist crane.

CAUTION

Equipment Damage!

To prevent damage, guide mast straps (9) clear of trailer, as required.

6. Reeve the wire rope from the whip drum through the sheaves in the mast point and the sheaves in the assembly block (see Figure 4-4, View A).
 7. Anchor the wire rope to the socket and wedge on the load block (see Wire Rope Installation and Maintenance in this section).
 8. Connect 4-leg chain sling (4) to the assembly block.
 9. Raise the mast to at least 156° with the assist crane. As the mast is raised:
 - Pay out load line from whip drum.
 - Haul in wire rope on boom hoist.
 10. Once the mast is at or above 156°, support the mast with the boom hoist wire rope and disconnect handling pendants (6) from the assist crane block.
 11. Pin the handling pendants to the mast for storage (View A).
 12. Haul in load line on the whip hoist to lift the assembly block off the trailer. **Take every precaution to prevent block from swinging into end of boom butt and causing damage.**
 13. Position the mast in the operating range (see Section 4 of Crane Operator's Manual).
1. Lower the wire rope guide to the shipping position:
 - a. Attach a lifting sling from the assembly block to lifting lug (3, View A) on wire rope guide (2).
 - b. Support the wire rope guide so pins (4) are loose and remove the pins.
 - c. Lower the wire rope guide from the operating position to the shipping position.
 - d. Install pins (4).
 - e. Disconnect the lifting sling.
 2. Disconnect the hydraulic hoses between the boom butt and the rotating bed (see Figure 4-19):
 - a. **Thoroughly clean each coupler** and connect sealing covers to couplers to prevent dirt accumulation.
 - b. Unpin and move retaining bar (2) out of way.
 - c. Swing hydraulic hoses (6 and 7) rearward into the notches on the rotating bed (View D).
 - d. Pin the retaining bar in position to retain the hoses (View D).
 3. Attach lifting slings from the assembly block to the lifting lugs on the boom butt as shown in Figure 4-18, View D.
 4. Disconnect hydraulic hoses (5a, View B) from couplers (5b) in the boom butt.

Thoroughly clean couplers to prevent dirt from entering hydraulic system.
 5. Connect hydraulic hoses (5a, View C) to couplers (5c) on the left side of the rotating bed.
 6. Remove locking pins (7, View E) from the operating position and install them in the shipping position.
 7. Attach hand-held taglines to the butt so it can be stabilized when the pins are disconnected.
 8. Lift the butt clear of the ground (View D).



WARNING

Moving Load Hazard!

Warn personnel to stand well clear of boom butt. Butt may swing out away from crane when pins are disengaged.

9. Using the setup remote control, disengage boom hinge pins (6, View E).
10. Stabilize the butt with the taglines.
11. Raise the butt just clear of the rotating bed and engage boom hinge pins using the setup remote control,

Remove Boom Butt

See Figure 4-18 for following procedure.

12. Remove and store shims (8).
13. Disconnect hydraulic hoses (5a, View C) from couplers (5c) on the rotating bed.
14. Connect hydraulic hoses (5a, View B) to couplers (5b) on the boom butt.
15. Lift the butt onto the transport vehicle.
16. Disconnect the lifting slings.

The 16000 live mast can now be used as a boom for the remainder of the procedures. See Liftcrane Mast Capacities in the Capacity Chart Section of the Operator Information Manual supplied with the crane.

Disconnect and Store Boom Straps

See Figure 4-17 for following procedure.

1. Remove pin (5, View A).
2. Rotate links (2, View B) forward.
3. Store pin (5) in the end of strap (1b).
4. Remove pins (3, View A), rotate links (4) to the shipping position (View B), and install pins (3).
5. Repeat the steps for each set of links.

Disconnect Intermediate Suspension from Boom Straps

See Figure 4-22 for following procedure.

NOTE: Skip this procedure if intermediate suspension is not required.

1. Attach lifting slings to lifting lugs (2, View A) on intermediate suspension strut (1).
2. Hoist just enough to support the intermediate suspension strut.
3. Remove pins (3, View C) and store them (View B).
4. Lift intermediate suspension strut (1) approximately 12 in (305 mm) so there is room to rotate links (4, View B) to the shipping position.
5. Rotate links (4) forward and secure them in the shipping position (Figure 4-17, View B).
6. Lower intermediate suspension strut (1) until the connecting holes in the strut are aligned with the holes in straps (5a).
7. Remove pins (3, View B) from storage and install them (View A).
8. Lower intermediate suspension strut (1) until the lifting slings are slack.
9. Disconnect the lifting slings.

10. Disconnect the remaining boom straps.

NOTE: There are two procedures for removing the extended upper boom point:

- Procedure 1 — The boom cap and extended upper boom point are shipped assembled.
- Procedure 2 — The boom cap and extended upper boom point are shipped separately.

Remove Extended Upper Boom Point — Procedure 1

See Figure 4-14 for following procedure.

1. Unpin storage links (16, View F).
2. Remove pins (19, View F).
3. Rotate links (15, View F) forward and secure them to the boom cap (View E).
4. Store pins (19, View F) in straps (18).
5. Attach all four legs of lifting sling (2, View C) to the lifting lugs on boom cap (1) and to the forward lifting lugs on extended upper boom point (10).
6. Raise the extended upper point until the connecting holes in the boom cap are aligned with the holes in the extended upper point.
7. Remove pins (13) and collars (14) from storage (View H) and install them (View C).
8. Hoist enough so the lifting slings are snug.
9. Remove pins (12, View G) and store the pins (View B).
10. Lift the boom cap and extended upper boom point away from the transition insert.
11. Place the boom cap and extended upper point on a trailer for shipping or on blocking for storage.
12. Disconnect the lifting slings.
13. Reverse the Prepare Boom Cap steps on page 4-19 to store the wire rope guide and to store the mast straps and links.

Remove Extended Upper Boom Point — Procedure 2

See Figure 4-15 for following procedure.

1. Attach all four legs of lifting sling (2, View A) to the lifting lugs on extended upper boom point (10).
2. Hoist just enough to support the extended upper boom point and remove pins (21, View G).
3. Lift the extended upper boom point clear of the boom cap (View C) and reinstall pins (21) in the extended upper boom point holes.

4. Remove pins (21, View B) to disconnect links (20) from the boom cap.
5. Pin links (20, View A) to the extended upper boom point with pins (21).
6. Place the extended upper boom point on a trailer for shipping or on blocking for storage.
7. Disconnect the lifting slings.
8. Unpin storage links (16, View F).
9. Remove pins (19, View F).
10. Rotate links (15, View F) forward and secure them to the boom cap (View E).
11. Store pins (19, View F) in straps (18).
12. Attach two legs of the lifting sling to the lifting lugs on boom cap.
13. Hoist just enough so the slings are snug.
14. Remove pins (12, View C) and store the pins (View D).
15. Lift the boom cap away from the transition insert.
16. Place the boom cap on a trailer for shipping or on blocking for storage.
17. Disconnect the lifting slings.
18. Reverse the Prepare Boom Cap steps on page 4-19 to store the wire rope guide and to store the mast straps and links.

Disassemble Boom Sections

Reverse the assembly steps on page 4-15 to disassemble the boom.

- If the transition insert will be shipped with the wind attachment, strap brackets (15, Figure 4-24) can remain

attached to the transition insert. Store the straps as shown.

- If the transition insert will not be shipped with the wind attachment, remove strap brackets (15, Figure 4-24) from the transition insert. Store strap brackets (15) on the boom cap as shown in Figure 4-11, View A.

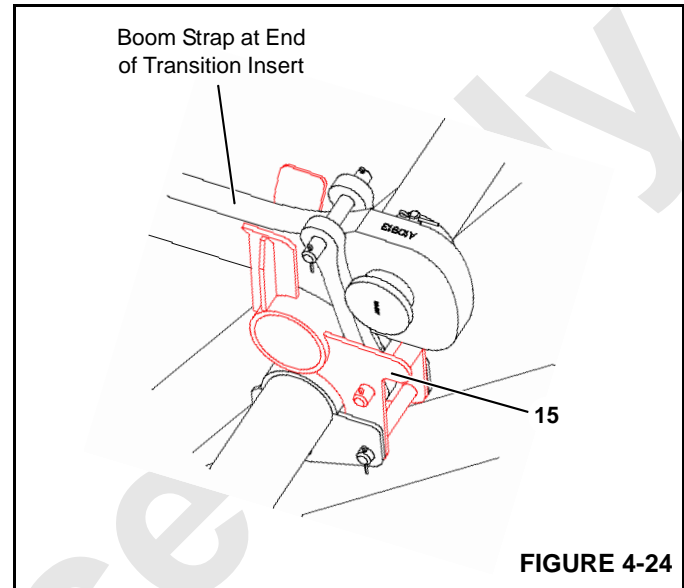


FIGURE 4-24

Disassemble Crane

Refer to the Crane Operator's Manual for disassembly instructions.

IDENTIFYING PARTS FOR SHIPPING

To determine which parts must ship together from one job to another, refer to Figure 4-25.

Reference Only

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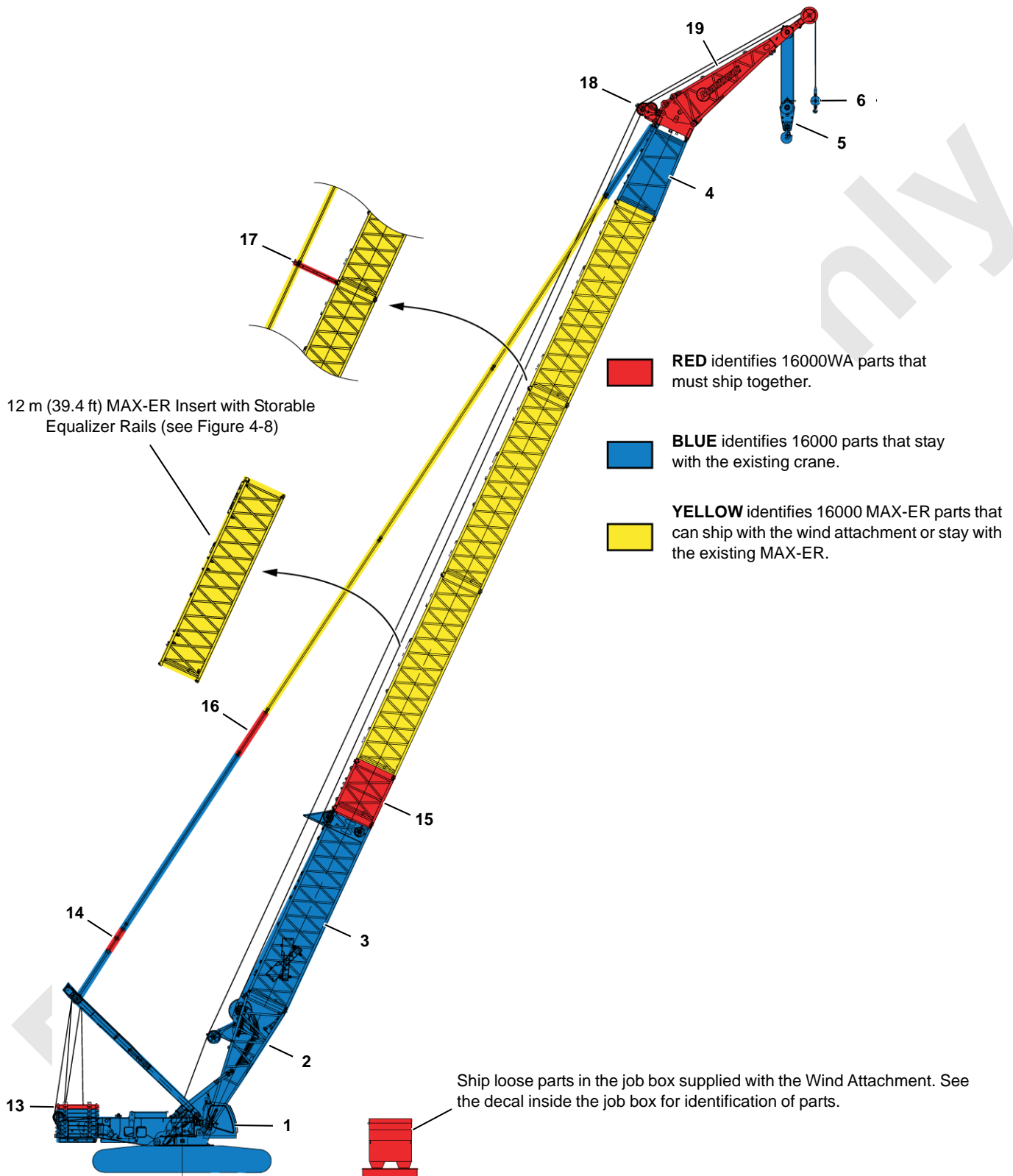


FIGURE 4-25

Item	Description
Blue	Stay with Crane
1	16000 with Counterweight
2	Boom Butt
3	12 m Insert with Boom Straps
4	Transition Insert with Boom Straps
5	Load Block
6	Hook-and-Weight Ball
7	WBM390 Electric Cable (from cable reel)
8	Wireless Transceiver with Electric Cable WBMJ8
9	Wired Load Cell without Electric Cable
10	Wireless Load Cell
11	Aircraft Warning Light without Mounting Hardware
12	Wind Speed Indicator with Mounting Hardware
Yellow	16000 MAX-ER Parts
Red	Stay with Wind Attachment
13	Counterweight Box (2)
14	Mast Straps and Links (store in boom cap)
15	3 m and 6 m Inserts (1 each)
16	3m and 6 m Straps (stored on inserts)
17	Intermediate Suspension
18	Boom Cap
19	Extended Upper Boom Point
20	Boom Node Controller (stays with boom cap)
21	Dead End Links, Pins, and Button Sockets
22	Block-Up Limit Switches, Electric Cables, Chains, and Weights
23	Wind Speed Indicator Electric Cable

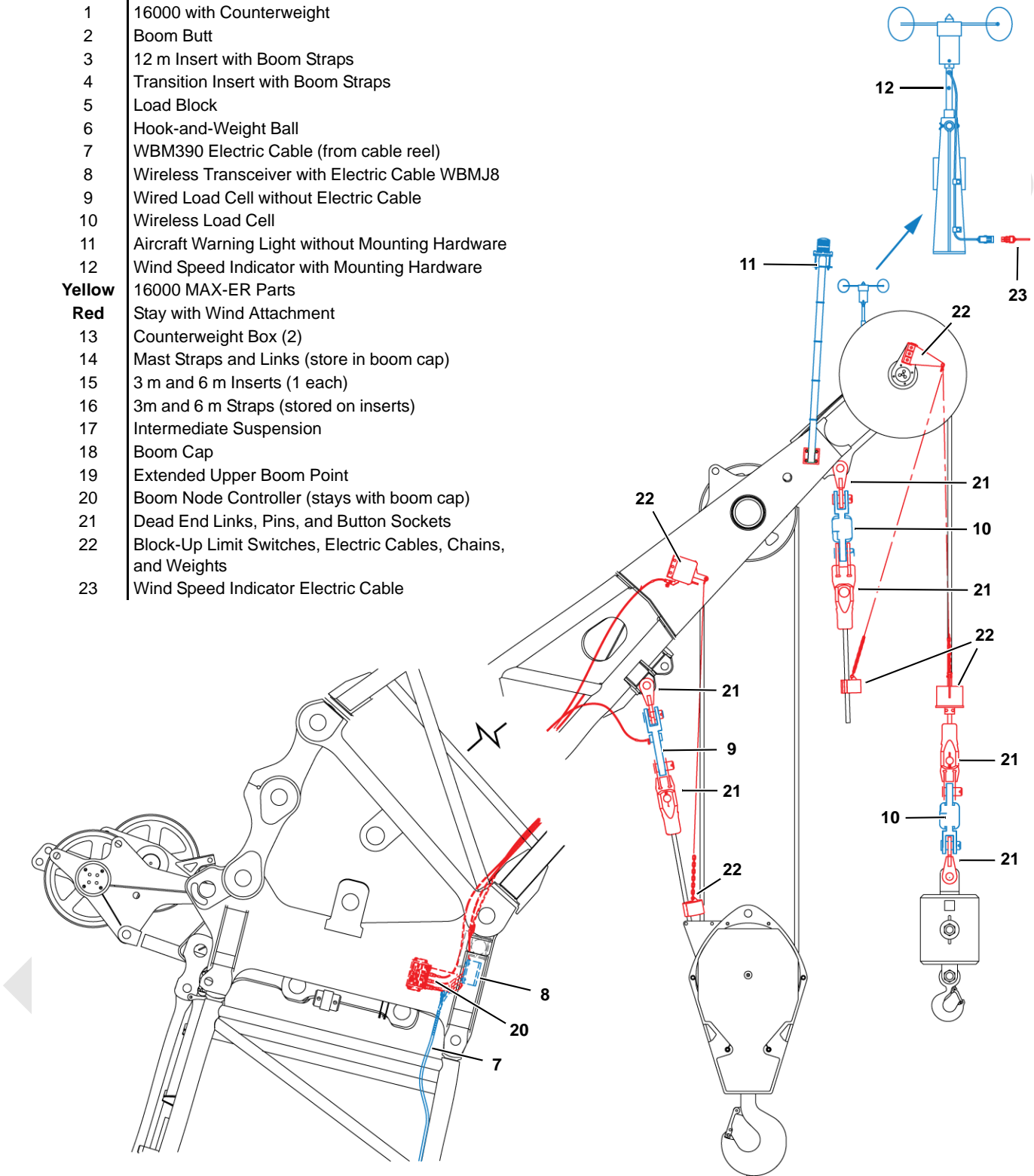


FIGURE 4-25 continued

WIRE ROPE INSTALLATION

NOTE: Wire rope manufacturer's recommendations take precedence over information in this section.

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.

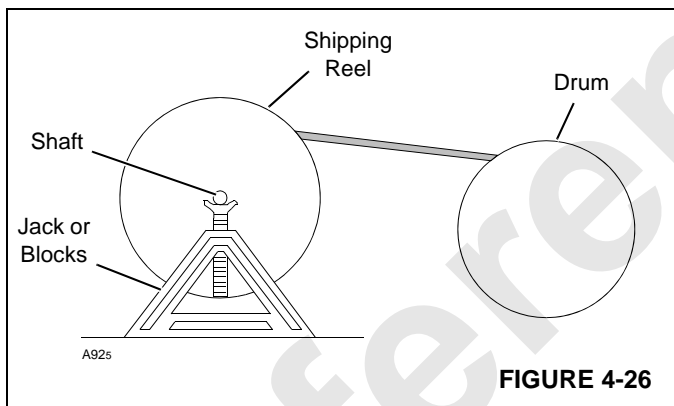
Removing Wire Rope from Shipping Reel

CAUTION!

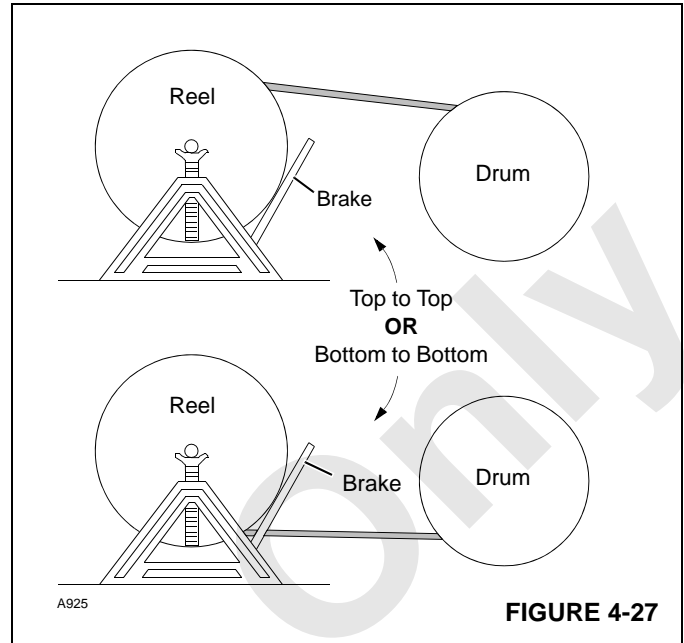
Wire Rope Damage!

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 4-26.



2. Provide a brake at shipping reel (see Figure 4-27) so wire rope can be wound tightly onto drum.



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 4-27.
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.

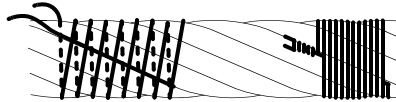
Before cutting wire rope, apply seizings on both sides of the point where the cut will be made. Then cut the wire rope with a torch, rope cutter, or abrasive cut-off wheel.

See Figure 4-28 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.

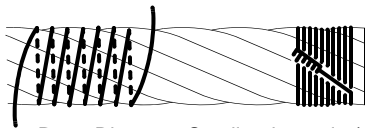
Wire Rope Type	Seizings Required
Preformed	1
Non-preformed	3

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)

A925

FIGURE 4-28

Anchoring Wire Rope to Drum

See Figure 4-29 for 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.

Drum Guards

The drums are equipped with guards which cover the dead-end sockets on the outside of the drum flanges.



WARNING

Moving Machinery Hazard!

Guards must be secured to drums during crane operation. When guards are removed for wire rope installation, use extreme care to prevent injury from a moving dead-end socket.



WARNING!

Falling Load Hazard!

Wire rope can be pulled out of drum if 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.

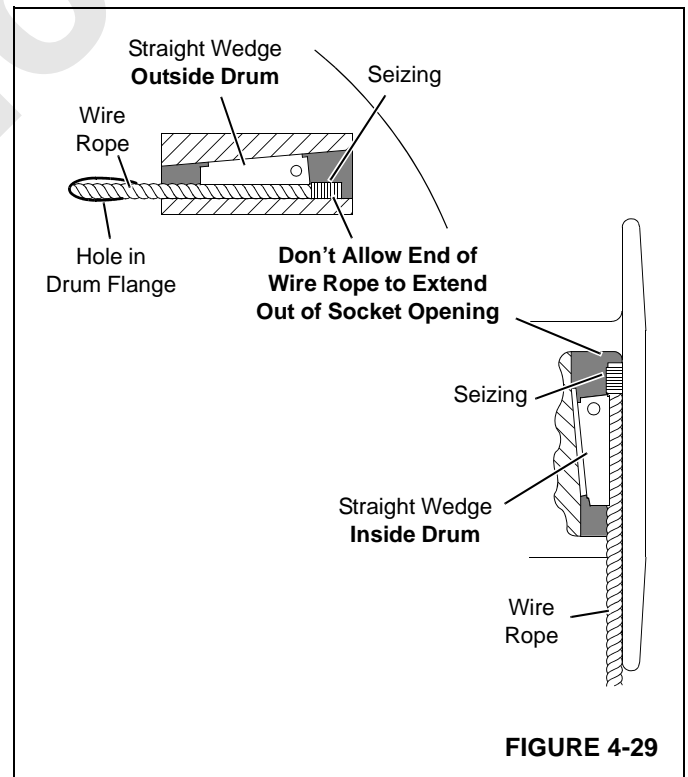


FIGURE 4-29

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Reference Only

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 Assembly Drawing at 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 defects 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 4-30).

3. Tap adjacent wraps against each other with a soft metal or wooden mallet.

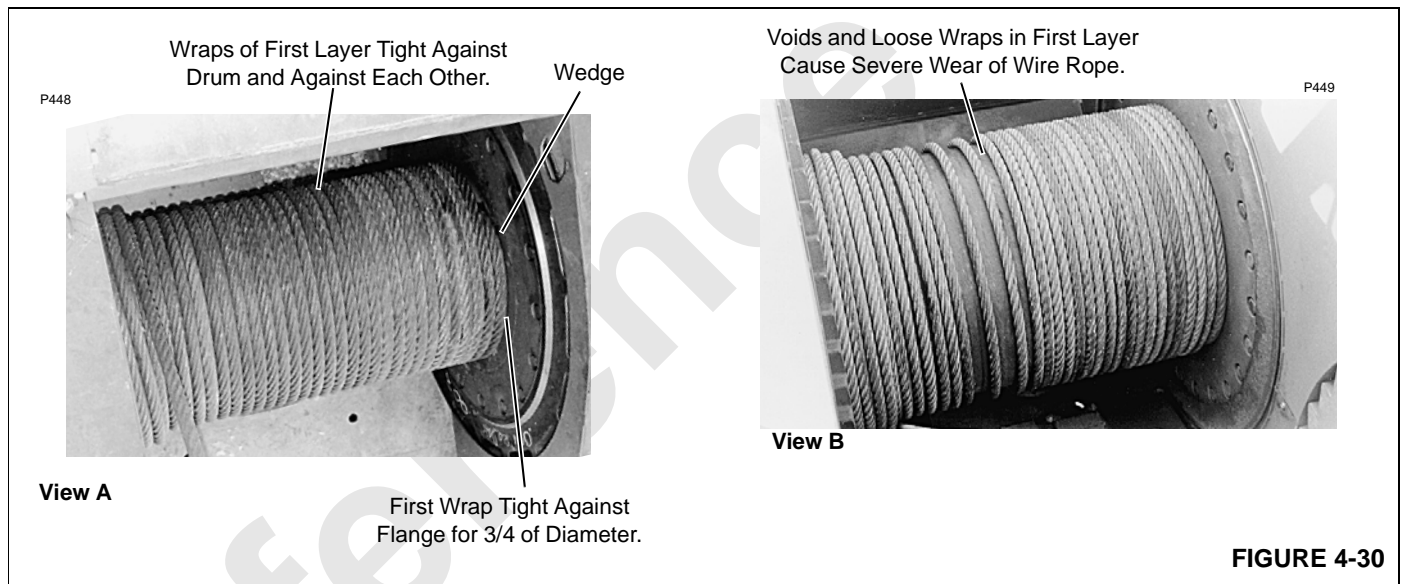
Use extreme care not to put twists or turns in wire rope; allow rope to assume its natural lay.

CAUTION!

Wire Rope Damage!

Voids or spaced wraps in first layer (see Figure 4-30, 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.



TL (Tail Length)

Standard 6 to 8 Strand Wire Rope

Minimum of 6 rope diameters, but not less than 6 in (152 mm).

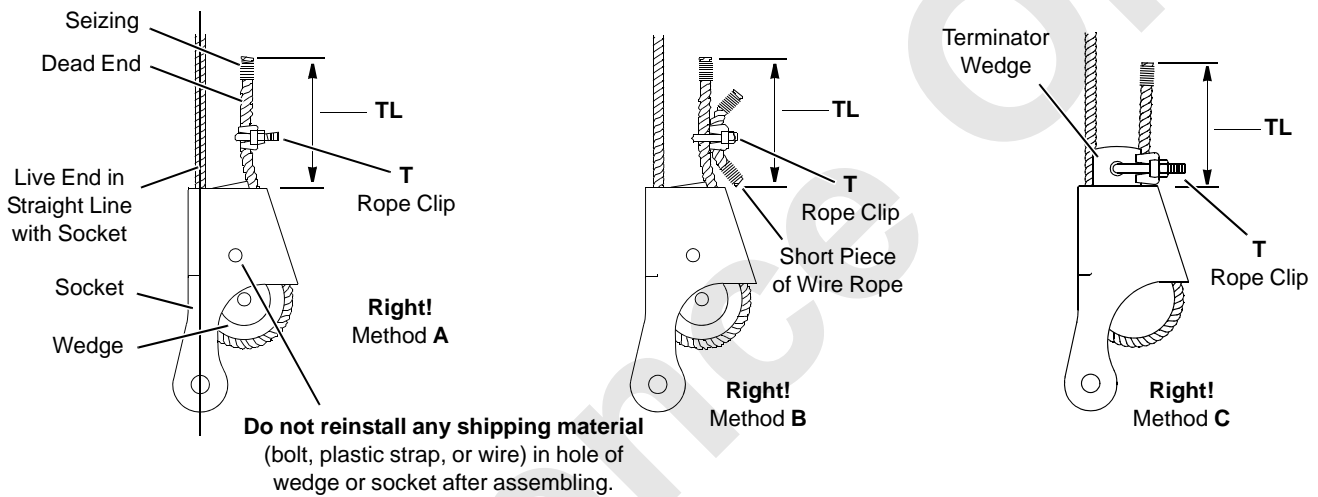
Rotation Resistant Wire Rope

Minimum of 20 rope diameters, but not less than 6 in (152 mm).

T (Rope Clip Nut Torque)

inch (mm)	Wire Rope/Clip Size			
	7/8 (22,23)	1 (25,4)	1-1/8 (28,58)	1-1/4 (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.



ALL ARE DANGEROUS AND PROHIBITED!

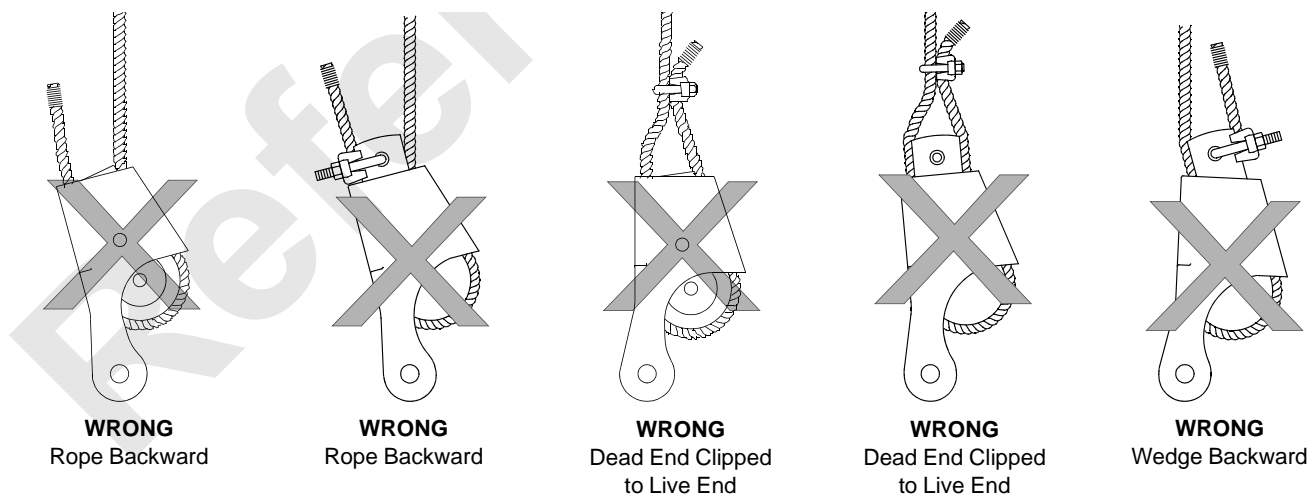


FIGURE 4-31

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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™ socket and 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 4-31 for 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 socket and wedge.

6. After socket is pinned in place, hoist load slowly so wedge seats tight. *Do not shock load socket and wedge.*

Anchoring Wire Rope to Button Socket

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.

See Figure 4-32 for 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.

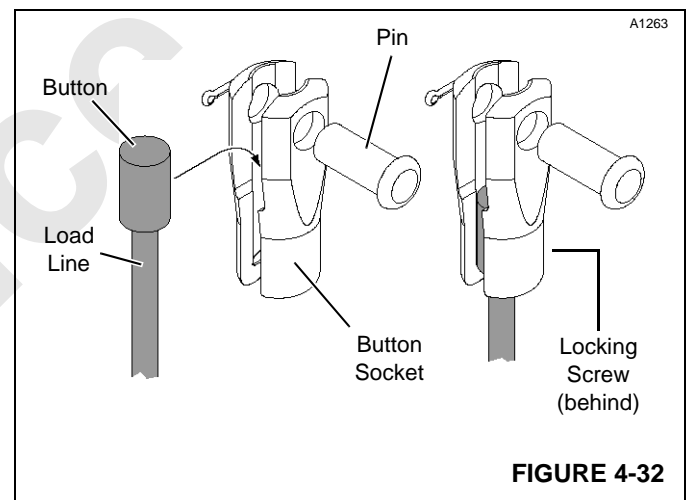


FIGURE 4-32

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.

DRUM KICKER ADJUSTMENT

General

On past production cranes, a drum kicker (see Figure 4-33) is provided on both flanges of the main load drum (in boom butt) to improve wire rope spooling for long boom lengths with small fleet angles where the wire rope might stack up along either drum flange.

Observe the wire rope during initial break-in and periodically during operation. If the rope stacks up at either end of the drum, adjust the drum kickers.

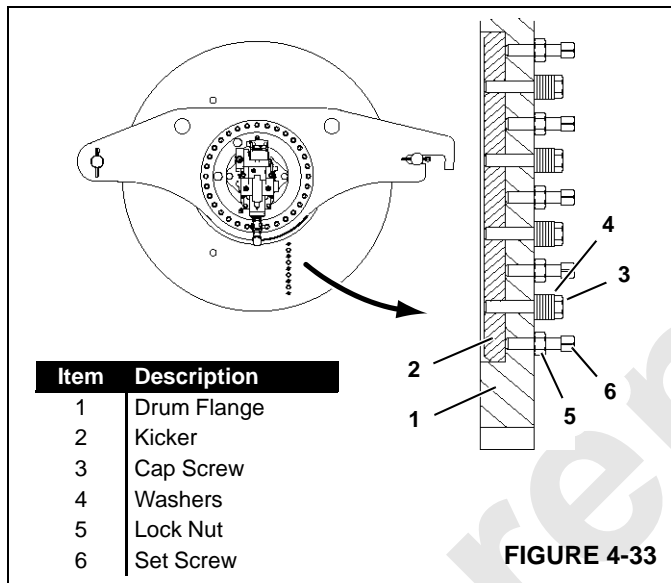


FIGURE 4-33

Adjustment

See Figure 4-33 for following procedure.

To move drum kickers (1) into the drum (take up space), proceed as follows:

1. Remove drum guard from both ends of drum.
2. Remove an equal number of washers (3) from both sides of kicker (1), one side at a time. Each washer allows kicker to move 0.098 in (2,5 mm).

3. Loosely reinstall cap screws (2) and remaining washers (3).
4. Loosen lock nuts (4) and adjust set screws (5) to move kickers (1) into drum.
5. Repeat steps 1-3 only enough to improve spooling. **Moving drum kickers in too far can cause premature wire rope wear.**
6. Securely tighten set screws (5) and lock nuts (4).
7. Reinstall drum guards.

PAD EYE USAGE FOR WIRE ROPE REEVING

See Figure 4-34 for 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 or to the button on the end of the wire rope.

A rigging line can be attached to the pad eye to make it easier to reeve the load block.

Safety

1. Do not exceed approximate capacities listed in Figure 4-34.
2. Make sure rigging line and attaching hardware (clips and rope connectors) are rated for the approximate capacities shown in Figure 4-34.
3. Inspect pad eye prior to each use. **Replace it if:**
 - Any original dimensions have changed.
 - Cracks or breaks exist in metal or weld.



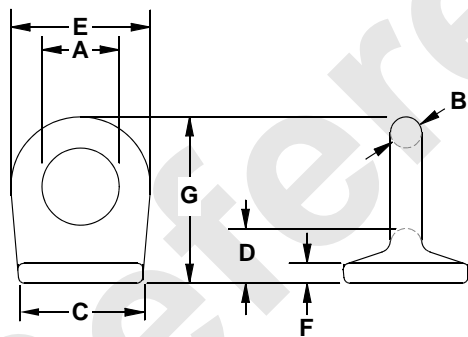
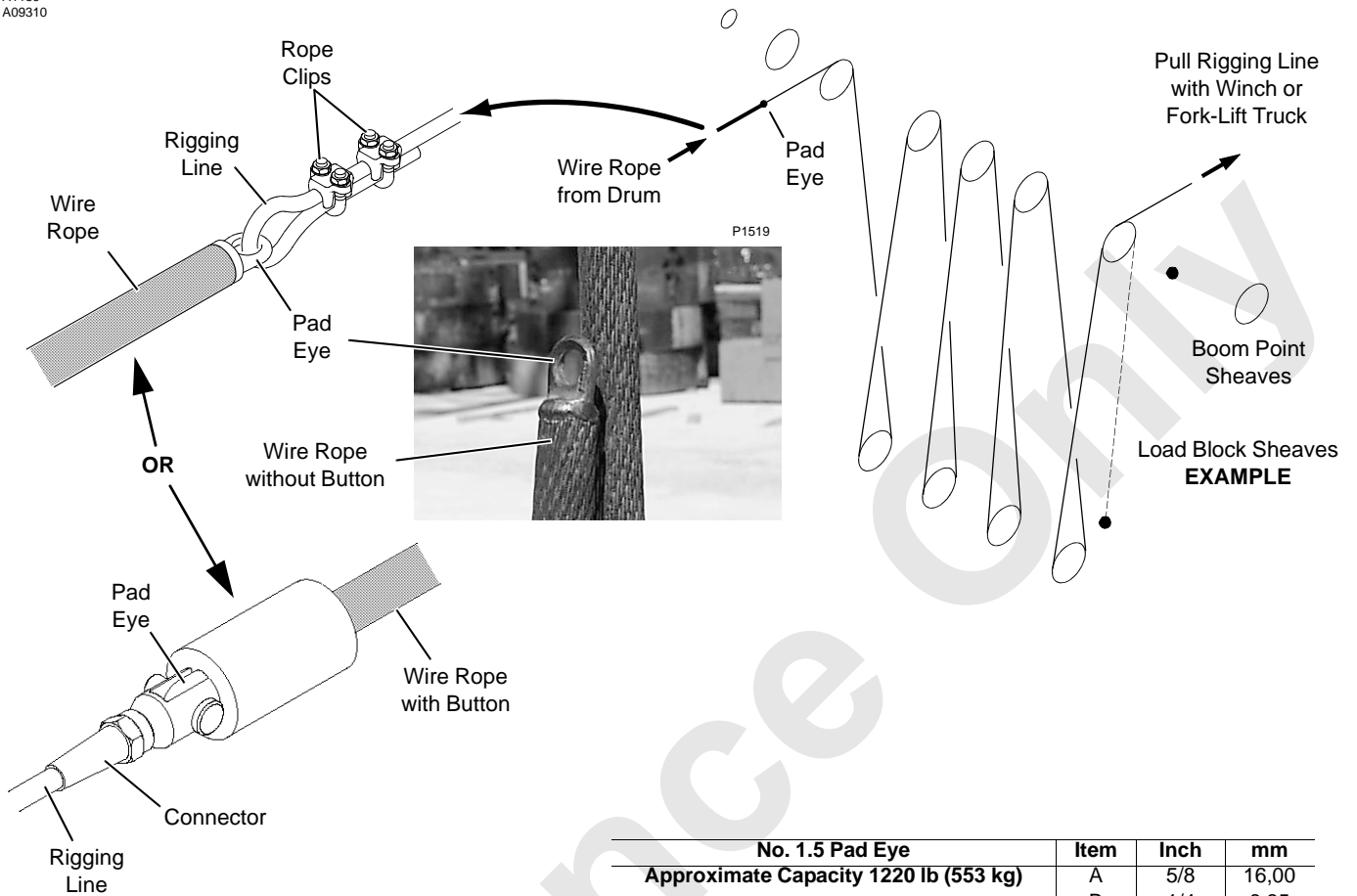
WARNING

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.

A1189
A09310



No. 1.5 Pad Eye			
Item	Inch	mm	
Approximate Capacity 1220 lb (553 kg)			
A	5/8	16,00	
B	1/4	6,35	
C	1	25,40	
D	7/16	11,18	
E	1-1/8	28,70	
F	1/16	4,06	
G	1-5/16	33,27	

No. 1 Pad Eye			
Item	Inch	mm	
Approximate Capacity 1220 lb (553 kg)			
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	25,40	

No. 2 Pad Eye			
Item	Inch	mm	
Approximate Capacity 2600 lb (1179 kg)			
A	3/4	19,05	
B	3/8	9,65	
C	1-1/16	26,92	
D	1/2	12,70	
E	1-1/2	38,10	
F	3/16	4,83	
G	1-5/8	41,26	

FIGURE 4-34

REEVING – LOAD BLOCK

Load Block Identification

See the Boom Assembly Drawing 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 load block with a capacity equal to or greater than load to be handled.

Avoid overloading load block sheave bearings. Attach load to duplex hook so load hangs straight.

Load block 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 Lubrication in section 5 of this manual for lubricating wire rope.

See Wire Rope Installation this section for instructions:

- Installing wire rope on drums.
- Anchoring wire rope to drums.

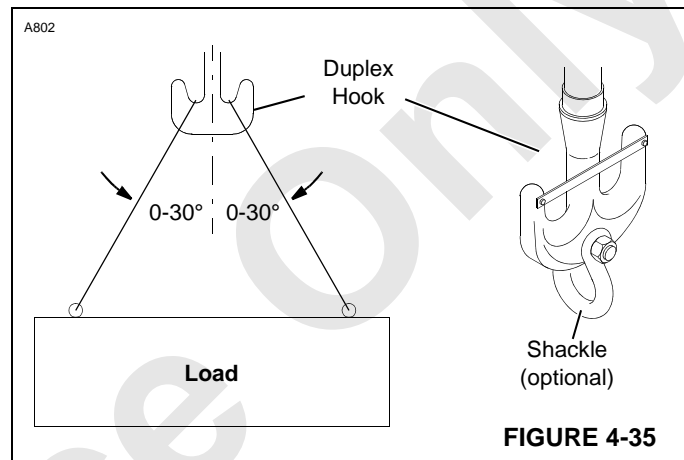
Duplex Hook

If equipped with a duplex hook, attach the load so it is balanced equally on the hook. Lifting slings must be within the angles given in Figure 4-35 to achieve maximum hook capacity. The duplex hook has a hole to which an optional shackle can be attached as shown in Figure 4-35.

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.



Guide Sheaves and Drums

See Figure 4-36 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.**

Load Block Reeving

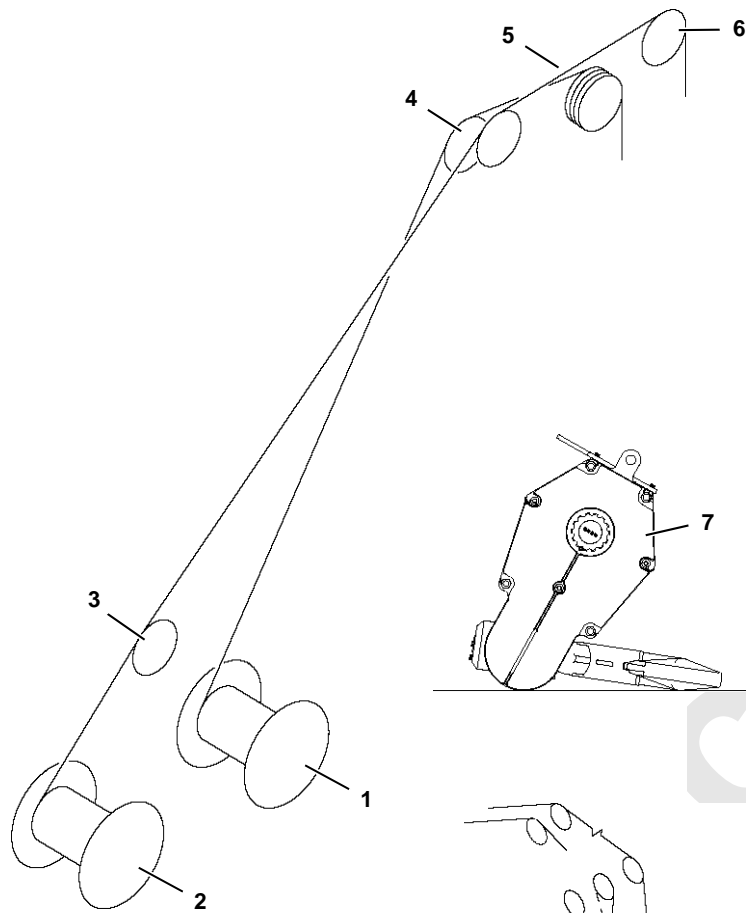
See Figure 4-23 for dead-end locations.

See Figure 4-36 for load block reeving. Reeving the load block in any manner other than shown can result in excessive block twist.

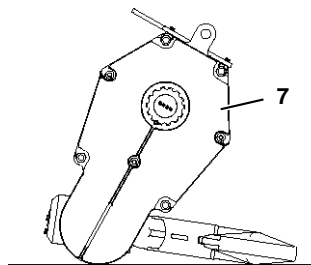
CAUTION

Wire Rope Damage!

Do not hoist load block closer to extended upper boom point than shown in Figure 4-37. Improper fleet angle or contact with other parts can damage wire rope.



Item	Description
1	Main Hoist (Drum 1 in boom butt)
2	Whip Hoist (Drum 2 in crane)
3	Wire Rope Guide (on boom butt)
4	Wire Rope Guide (on boom cap)
5	Lower Point
6	Upper Point
7	Load Block
●	Dead-End Socket
■	Block-Up Limit Weight



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.

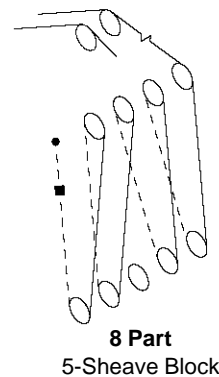
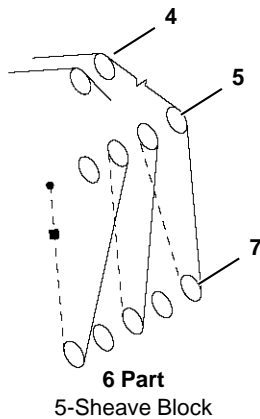
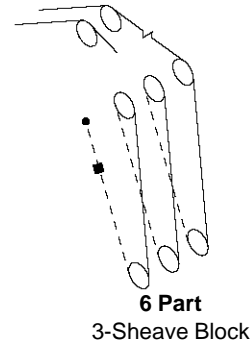
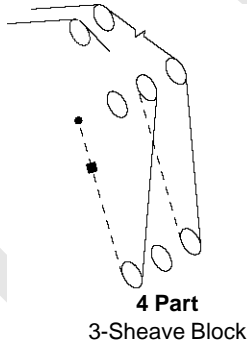


FIGURE 4-36

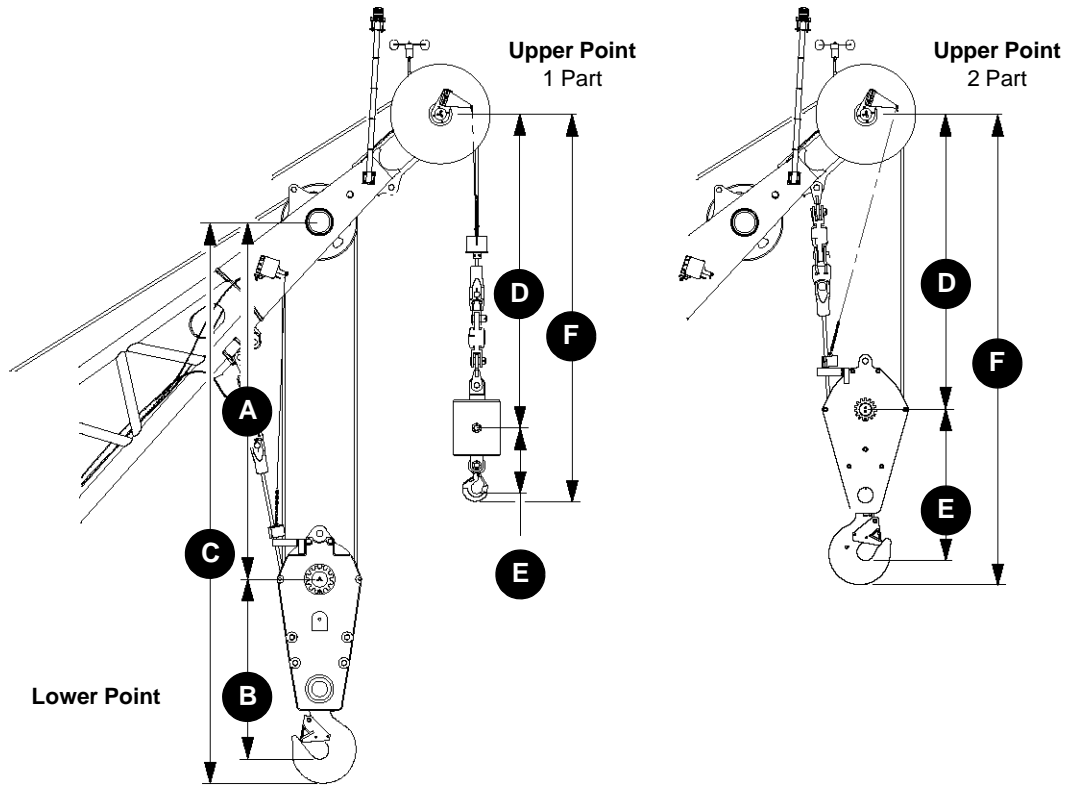


FIGURE 4-37

Referer

MINIMUM BLOCK DISTANCES FOR #58WA BOOM AT 83° BOOM ANGLE				
Lower Point with 28° Offset				
Parts of Line	A Minimum	B	C Minimum	Comments
4	20 ft 11 in 6,4 m	4 ft 2 in 1,3 m	25 ft 7 in 7,8 m	3-Sheave 110 USt (100 t) Block
4	17 ft 11 in 5,5 m	6 ft 1 in 1,9 m	24 ft 9 in 7,5 m	4-Sheave 200 USt (181 t) Block
6	15 ft 4 in 4,7 m	6 ft 1 in 1,9 m	22 ft 2 in 6,8 m	4-Sheave 200 USt (181 t) Block
8	15 ft 4 in 4,7 m	6 ft 1 in 1,9 m	22 ft 2 in 6,8 m	4-Sheave 200 USt (181 t) Block
Lower Point with 35° Offset				
Parts of Line	A Minimum	B	C Minimum	Comments
4	20 ft 11 in 6,4 m	4 ft 2 in 1,3 m	25 ft 7 in 7,8 m	3-Sheave 110 USt (100 t) Block
4	17 ft 11 in 5,5 m	6 ft 1 in 1,9 m	24 ft 9 in 7,5 m	4-Sheave 200 USt (181 t) Block
6	15 ft 1 in 4,6 m	6 ft 1 in 1,9 m	21 ft 11 in 6,7 m	4-Sheave 200 USt (181 t) Block
8	15 ft 1 in 4,6 m	6 ft 1 in 1,9 m	21 ft 11 in 6,7 m	4-Sheave 200 USt (181 t) Block
Upper Point with 28° or 35° Offset				
Parts of Line	D Minimum	E	F Minimum	Comments
1	19 ft 4 in 5,9 m	2 ft 3 in 0,7 m	21 ft 11 in 6,7 m	20 USt (18 t) Weight Ball
2	13 ft 3 in 4,0 m	4 ft 11 in 1,5 m	18 ft 11 in 5,8 m	1-Sheave 45 USt (41 t) Block

FIGURE 4-37 continued

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SECTION 5 LUBRICATION

LUBRICATION

See F2109 at the end of this section.

LUBE AND COOLANT PRODUCT GUIDE

See the publication at the end of this section.

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SECTION 6 MAINTENANCE

INSPECTION AND MAINTENANCE CHECKS

Read and follow the instructions in Section 6 of the Crane Operator's Manual supplied with your 16000.

GENERAL MAINTENANCE

This section contains maintenance and adjustment instructions for the limit devices used with the #58WA wind attachment.

For maintenance and inspection of the following components, see Service Manual supplied with your crane:

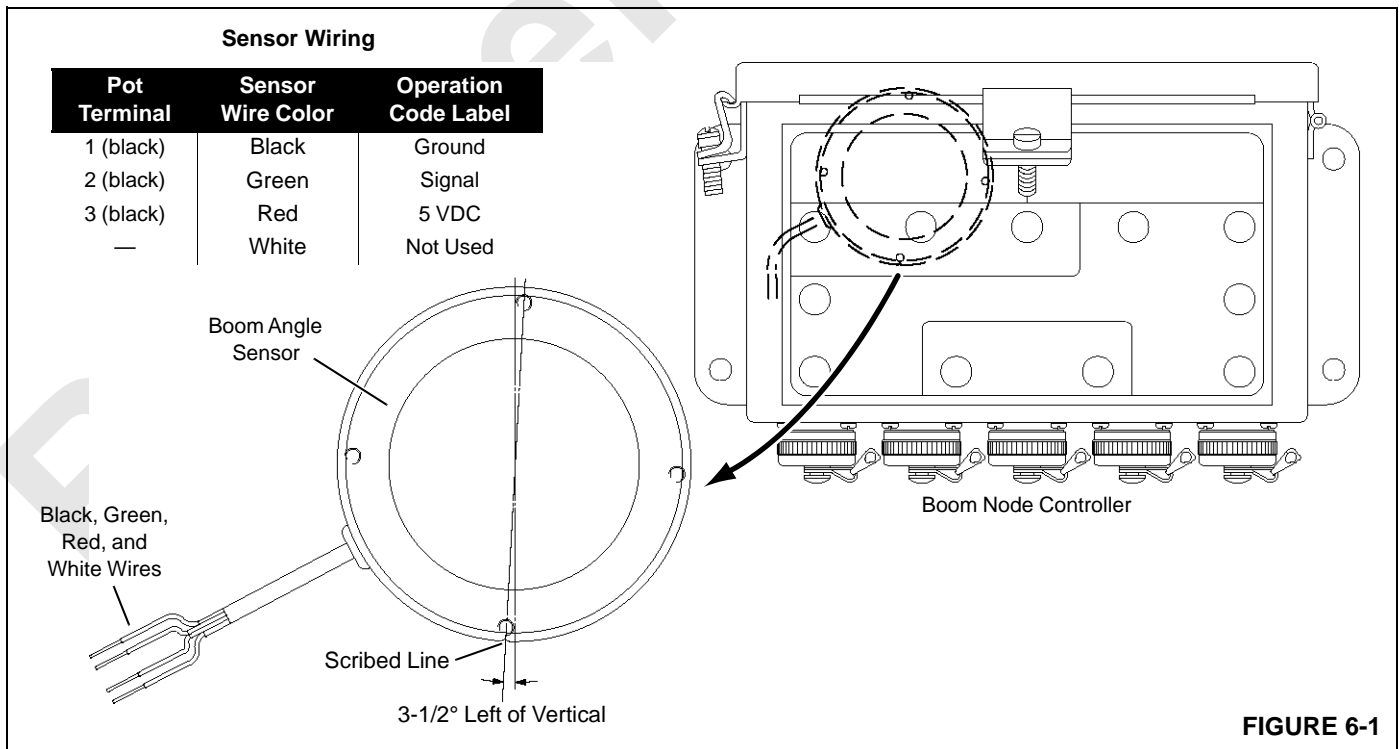
- Physical Boom Stop
- Straps
- Wire Rope
- Load Block and Weight Ball
- Boom and Extended Upper Boom Point

BOOM ANGLE SENSOR CALIBRATION

A boom angle sensor (see Figure 6-1) is located inside the boom node controller mounted on the boom cap. The boom angle sensor is calibrated automatically by the crane's programmable controller during calibration of the Rated Capacity Indicator/Limiter.

To replace the boom angle sensor with a new one, proceed as follows:

1. Locate three black wires from the circuit board in the boom node controller.
2. Cut the wires from the faulty boom angle sensor at the connections on the black wires.
3. Remove and discard the faulty boom angle sensor. It is attached with three screws and silicone sealant.
4. Thoroughly clean all silicone sealant from the sensor mounting surface in the boom node controller.
5. Apply a ring of silicone sealant (MCC 622201) to the back of the new boom angle sensor.
6. Securely attach the new boom angle sensor to the mounting holes in the boom node controller so the scribed line in the sensor is positioned as shown.
7. Connect the electric wires as indicated in the chart.
 - a. All connections must be made with parallel splices.
 - b. The parallel splices must be crimped, soldered, and sealed with heat-shrink tubing.
 - c. Cut off the white wire at the insulation, seal it with heat-shrink tubing, and coil it out of the way.



Angle A	
83°	For Cranes with a Boom Up Limit that Can be Bypassed *
84°	For Cranes with a Boom Up Limit that Cannot be Bypassed *

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

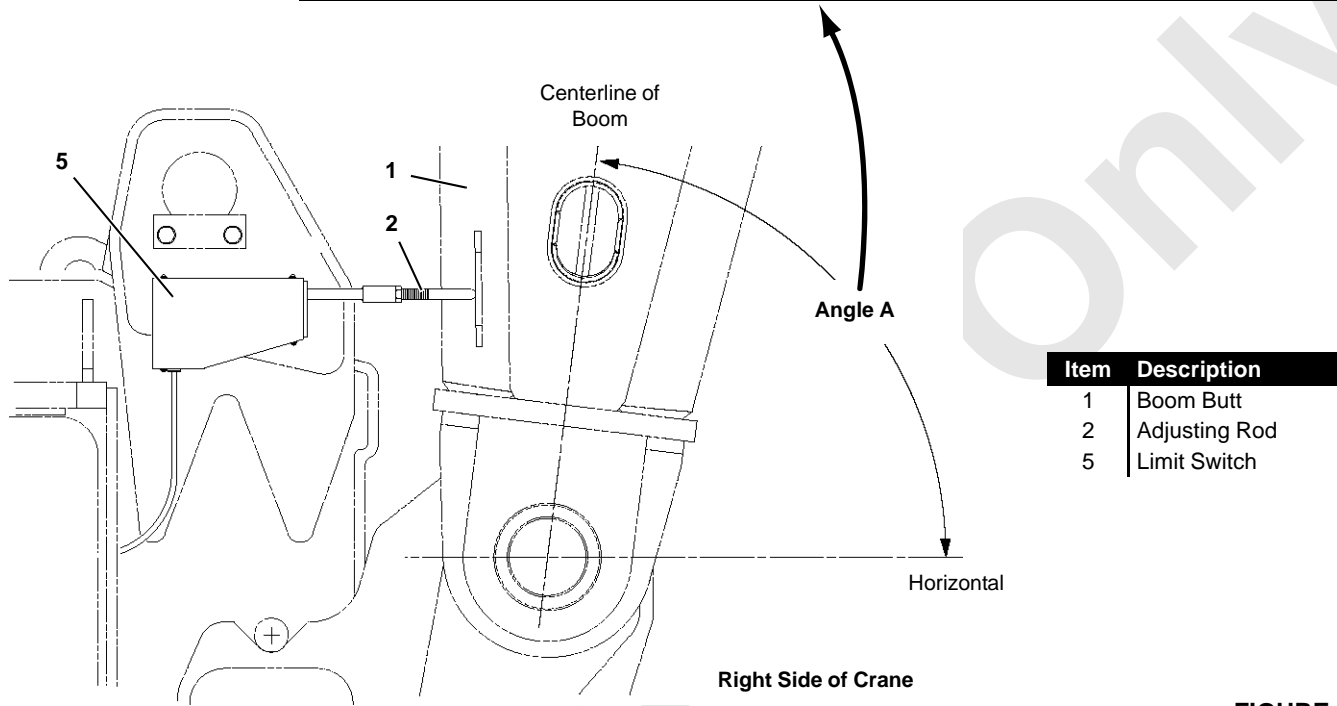


FIGURE 6-2

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 following steps.

Stay clear of moving parts.

1. Lower the boom onto blocking at ground level.
2. Have an assistant push adjusting rod (2, Figure 6-2) 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.

AUTOMATIC BOOM STOP ADJUSTMENT

Maximum Boom Angle

Boom stop limit switch (5, Figure 6-2) automatically stops the boom and applies the boom hoist brake when the boom is raised to **Angle A** given in Figure 6-2.

Operation

See Figure 6-3 for 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 (2) 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 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.

- c. If the boom does not rise, your boom up limit **cannot be bypassed**.
6. The test is complete. Release the limit bypass key and the adjusting rod to the normal operating positions.

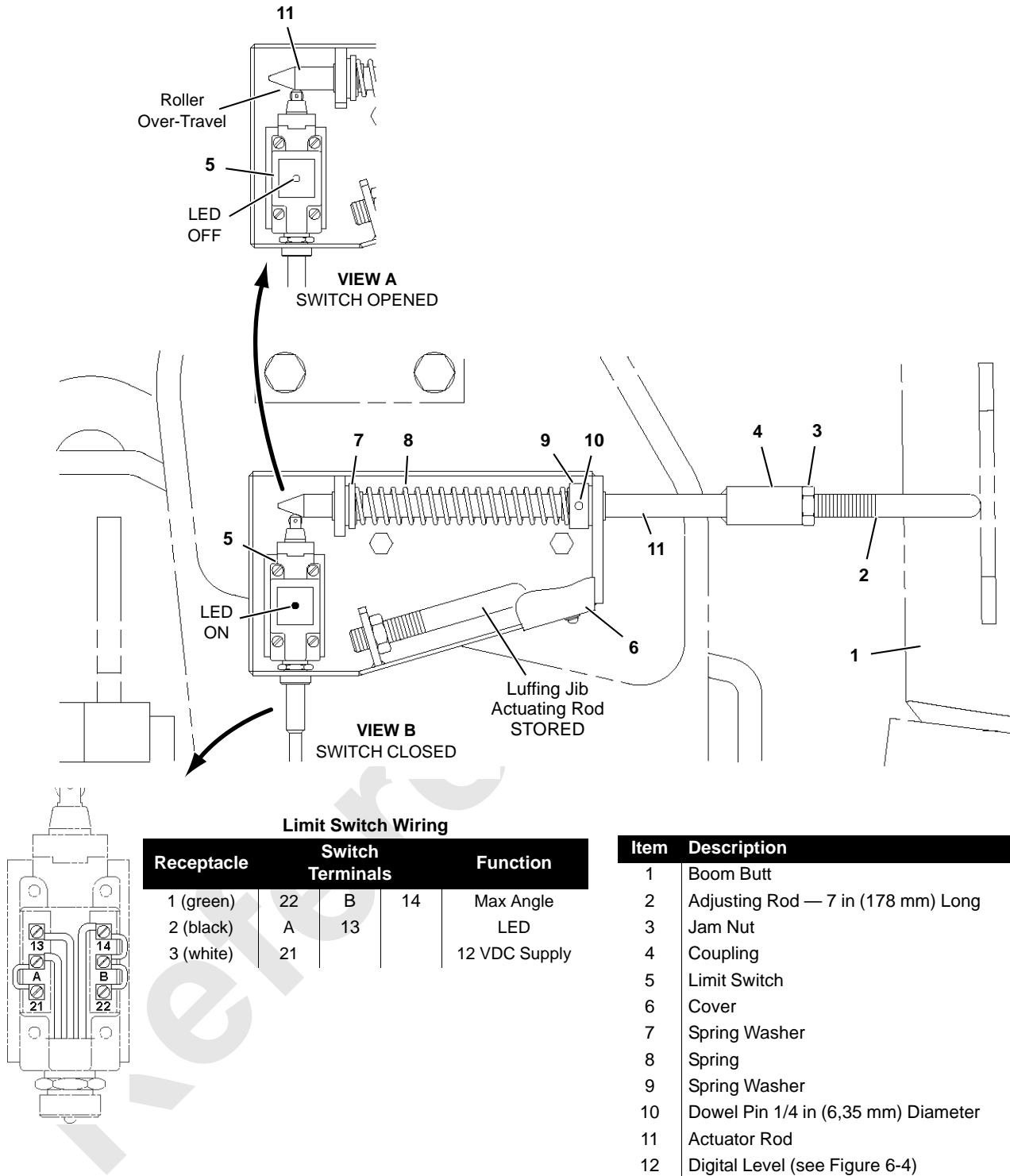
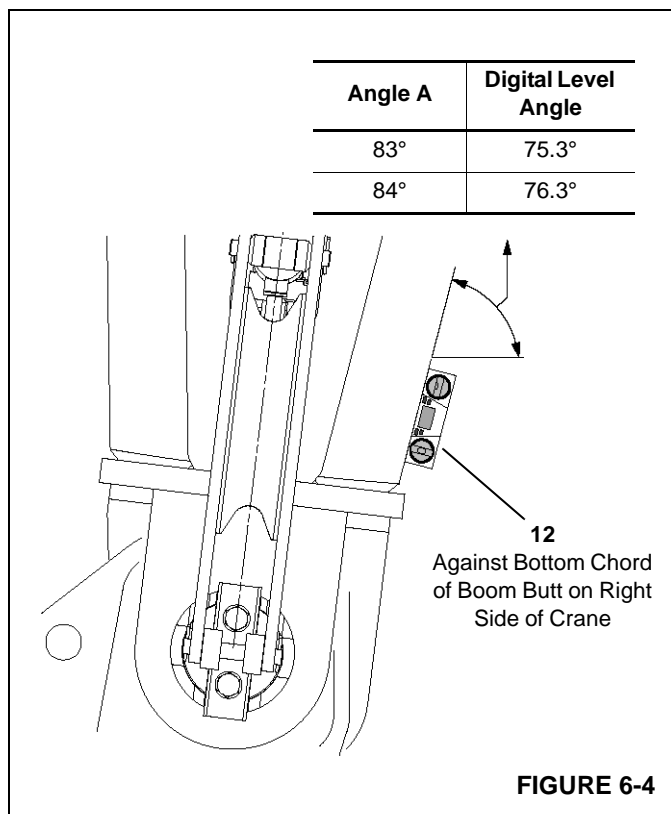


FIGURE 6-3



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. The adjusting rod should be 7 in (178 mm) long.

NOTE: The adjusting rod for boom with luffing jib is 6-1/8 in (156 mm) long.

3. Raise the boom to specified **Angle A** (Figure 6-2) 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 6-4. 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.
 - a. If the boom stops before reaching the specified angle, go to step 6.
 - b. If the boom reaches the specified angle before it stops, go to step 7.

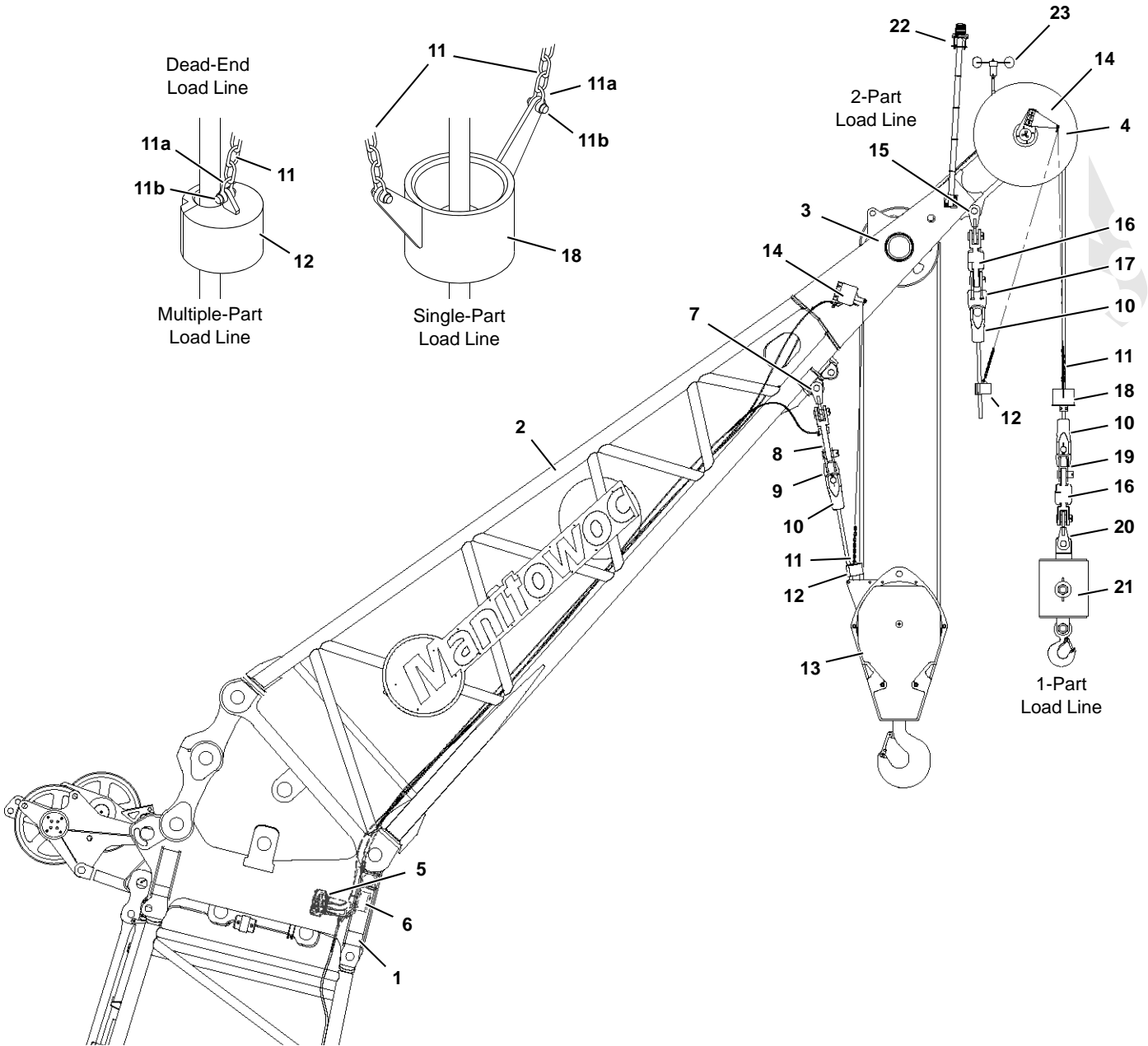
See Figure 6-3 for remaining steps.

6. If the boom stops before reaching the specified angle:
 - a. Loosen jam nut (3, View B).
 - b. Turn adjusting rod (2) all the way into coupling (4).
 - c. Boom up slowly until the boom reaches the specified angle.
 - d. Turn adjusting rod (2) 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 (2) 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 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

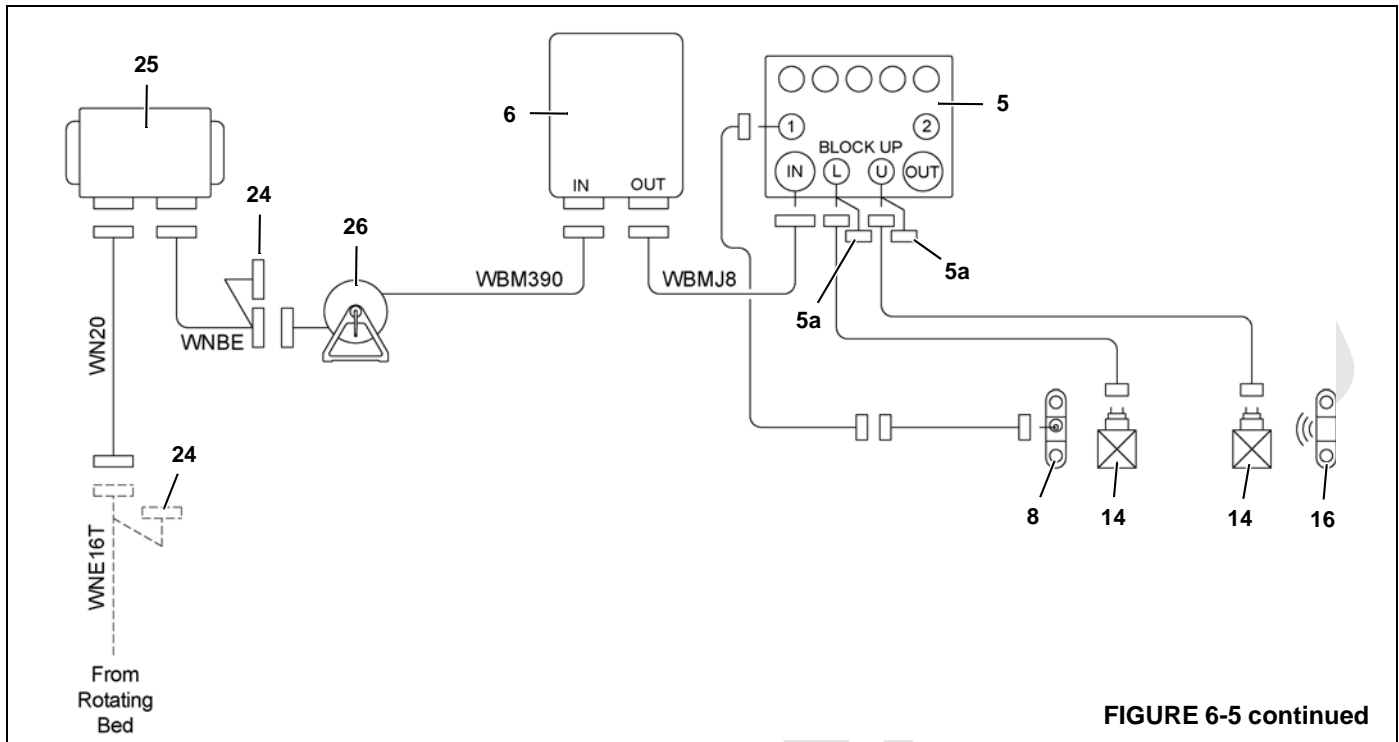
See Figure 6-3, View B for following procedure.

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 the roller of limit switch (5, 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 adjusting rod (2).
7. Adjust the boom stop.



Item	Description	Item	Description	Item	Description
1	Boom Cap	10	Button Socket	18	Weight with Lift Plate
2	Extended Upper Boom Point	11	Chain — 9 ft (2,7 m)(2)	19	Link
3	Lower Point	11a	Shackle (3)	20	Link
4	Upper Point	11b	Pin (3)	21	Hook and Weight Ball
5	Boom Node Controller (in boom cap)	12	Block-Up Limit Weight	22	Aircraft Warning Light
5a	Terminating Plug	13	Load Block	23	Wind Speed Indicator
6	Wireless Transceiver (in boom cap)	14	Block-Up Limit Switch (2)	24	Terminating Plug
7	Link	15	Link	25	BUS Interface Node Controller
8	Wired Load Cell	16	Wireless Load Cell	26	Cable Reel (boom butt)
9	Link	17	Link		

FIGURE 6-5



BLOCK-UP LIMIT INSTALLATION AND ADJUSTMENT



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 must determine fastest line speed that allows block-up limit control to function properly and, thereafter, not exceed that line speed.

General

The 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 from either point.

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.

The block-up limit system consists of the following components (Figure 6-5):

1. Boom node controller (5).
2. Normally closed limit switch assembly (14) at the following locations:
 - a. Lower point.
 - b. Upper point.
3. Weight (12 or 18) freely suspended by chain from each limit switch actuating lever (weight encircles load line as shown).
4. Lift block on load block or lift plate on load line.
5. Cable reel (26) in boom butt which allows the cable to be lengthened or shortened to meet varying boom lengths.

Disconnecting Block-Up Limits

See Figure 6-5 for following procedure.

Failing to perform following steps will prevent load drums from hoisting and boom from lowering. Also, a fault alarm will come on.

1. To provide proper operation, the electric cables from the block-up limit switches must be connected to receptacles (L and U) on boom node controller (5).
2. If a limit switch cable is disconnected from the boom node controller, corresponding terminating plug (5a) must be connected to the receptacle.

3. Always connect dust caps to the ends of cables and terminating plugs that are not in use.

Removing Extended Upper Boom Point

See Figure 6-5 for following procedure.

Failing to perform following steps will prevent load drums from hoisting and boom from lowering. Also, a fault alarm will come on.

1. Disconnect the electric cable from cable reel (26) at the IN receptacle on wireless transceiver (6) on the boom cap.
2. Connect a dust cap to end of the cable and coil the cable onto the cable reel.
3. Connect terminating plug (24) either to cable (WNBE) at BUS interface node controller (25) or to cable (WNE16T) on the rotating bed.
4. Connect dust caps to the ends of cables and terminating plugs not in use.

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.

At least once weekly, inspect and test the block-up limit switches, 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 6-6) 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 6-5) for freedom of movement on the load line.
 - c. Inspect each weight, each chain, each shackle and each connecting pin (Figure 6-5) for excessive or abnormal wear. Make sure the cotter pins for the shackles are installed and spread.
 - d. Inspect the entire length of electric cables for damage.
 - e. Check that electric cables are clear of all moving parts on the boom and extended upper boom point and that the cables are securely fastened with clips or nylon straps.
 - f. Check that all cables and terminating plugs are securely fastened.
2. Test the block-up limit controls for proper operation using either of following methods:
 - a. BOOM LOWERED: Manually lift each weight — **one at a time** — while the engine is running. The corresponding load drum should not operate in the up direction and the boom hoist should not operate in the down 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 hoist should not operate in the down direction.

CAUTION

Avoid Sheave Damage

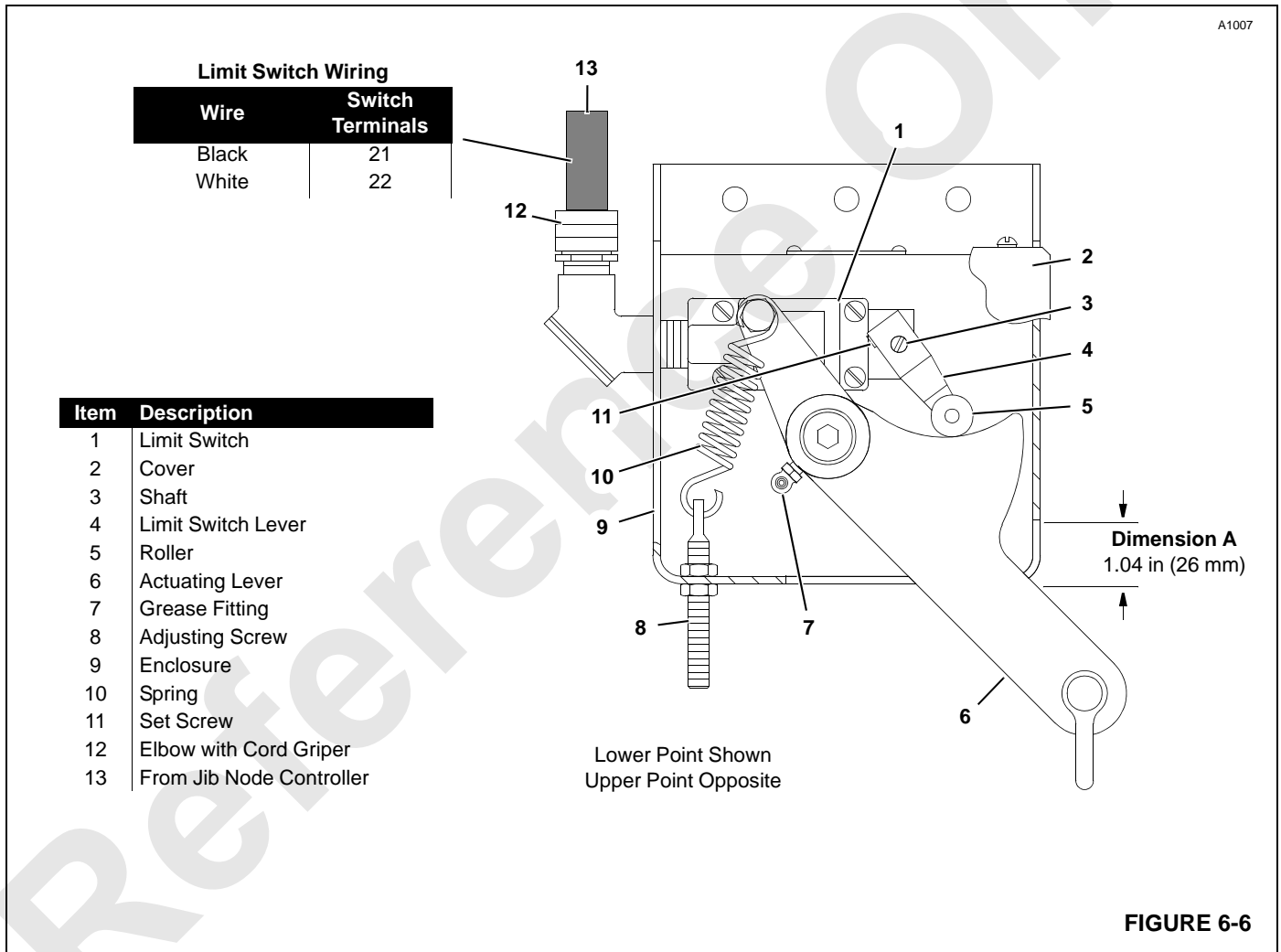
Use extreme care when testing block-up limit controls when boom is raised. If block-up limit control fails to stop load, immediately stop load by moving drum control handle to off; otherwise, two-blocking may occur.

Adjustment

See Figure 6-6 for following procedure.

Lower the boom onto blocking at ground level and adjust each limit switch as follows:

1. Adjust spring tension (10) so there is enough force to lift the weight of the chain and rotate actuating lever (6) up when the weight is lifted.
2. Loosen setscrew (11) in limit switch lever (4) so the lever is free to rotate.
3. Manually lift the weight to allow actuating lever (6) to rotate up.
 4. Hold lever (6) at Dimension A.
 5. Hold roller (5) on limit switch lever (4) against actuating lever (6) while performing step 6.
 6. Turn limit switch shaft (3) in the required direction (see below) *only enough to "click" the limit switch open and hold*. Then securely tighten setscrew (11) in the limit switch lever.
 - COUNTERCLOCKWISE for lower point.
 - CLOCKWISE for upper point.
7. Test the limit switch for proper operation (see Maintenance topic); repeat the adjustment steps until the limit switch operates properly.



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