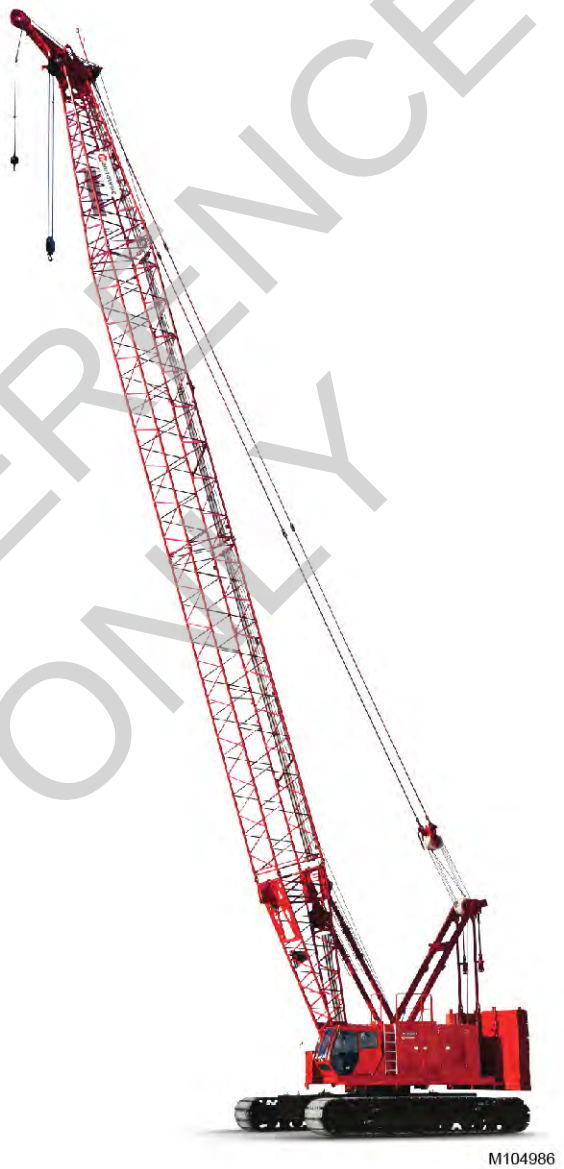
Manitowoc MLC150-1

Operator Manual



M104986

Manitowoc®

WARNING

California Proposition 65

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Always start and operate the engine in a well-ventilated area.

If in an enclosed area, vent the exhaust to the outside.

Do not modify or tamper with the exhaust system.

Do not idle the engine except as necessary.

For more information, go to www.P65warnings.ca.gov/diesel

Batteries, battery posts, terminals, and related accessories can expose you to chemcials, including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling. For more information, go to www.P65warnings.ca.gov

California Spark Arrestor

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

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OPERATOR MANUAL

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

MLC150-1

Crane Model Number

91501xxx

Crane Serial Number

This Manual is divided into the following sections:

NOTICE

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

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

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

⚠ WARNING

To prevent death or serious injury:

- Avoid unsafe operation and maintenance.

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

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

Published 07-28-21, Control # 263-03

THE ORIGINAL LANGUAGE OF THIS PUBLICATION IS ENGLISH

See end of this manual for Alphabetical Index

SECTION 1
INTRODUCTION

TABLE OF CONTENTS

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Published 07-28-21, Control # 263-03

SECTION 1
INTRODUCTION

CRANE DATA

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

- Basic Specifications
- EC Declaration (if applicable)

CRANE WEIGHTS

See the end of this section for crane weights.

OUTLINE DIMENSIONS

See the end of this section for outline dimensions.

CRANE IDENTIFICATION

An identification plate (Figure 1-1) is attached to the outside of the operator cab and to the luffing jib butt.

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

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

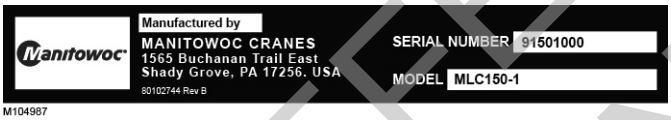


FIGURE 1-1

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.manitowoc.com.
2. Go to SUPPORT>SERVICES>CHANGE OF OWNERSHIP.
3. Complete the form.

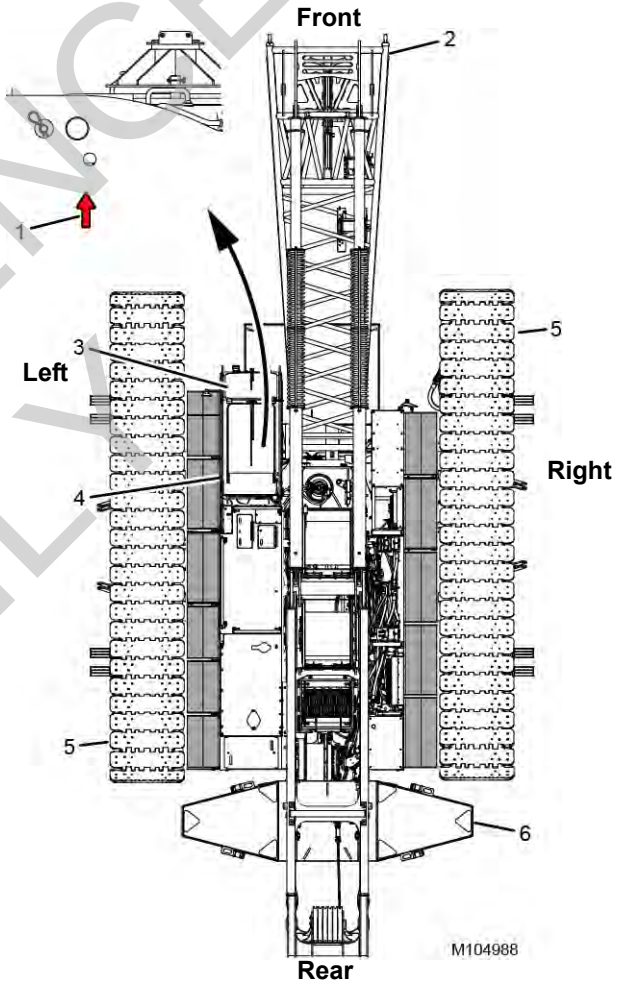
MANITOWOC DEALER

For questions about this manual or 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.manitowoc.com
2. Click on the red FIND A DEALER button.
3. Follow the on-screen prompts to locate your Manitowoc dealer.

CRANE ORIENTATION

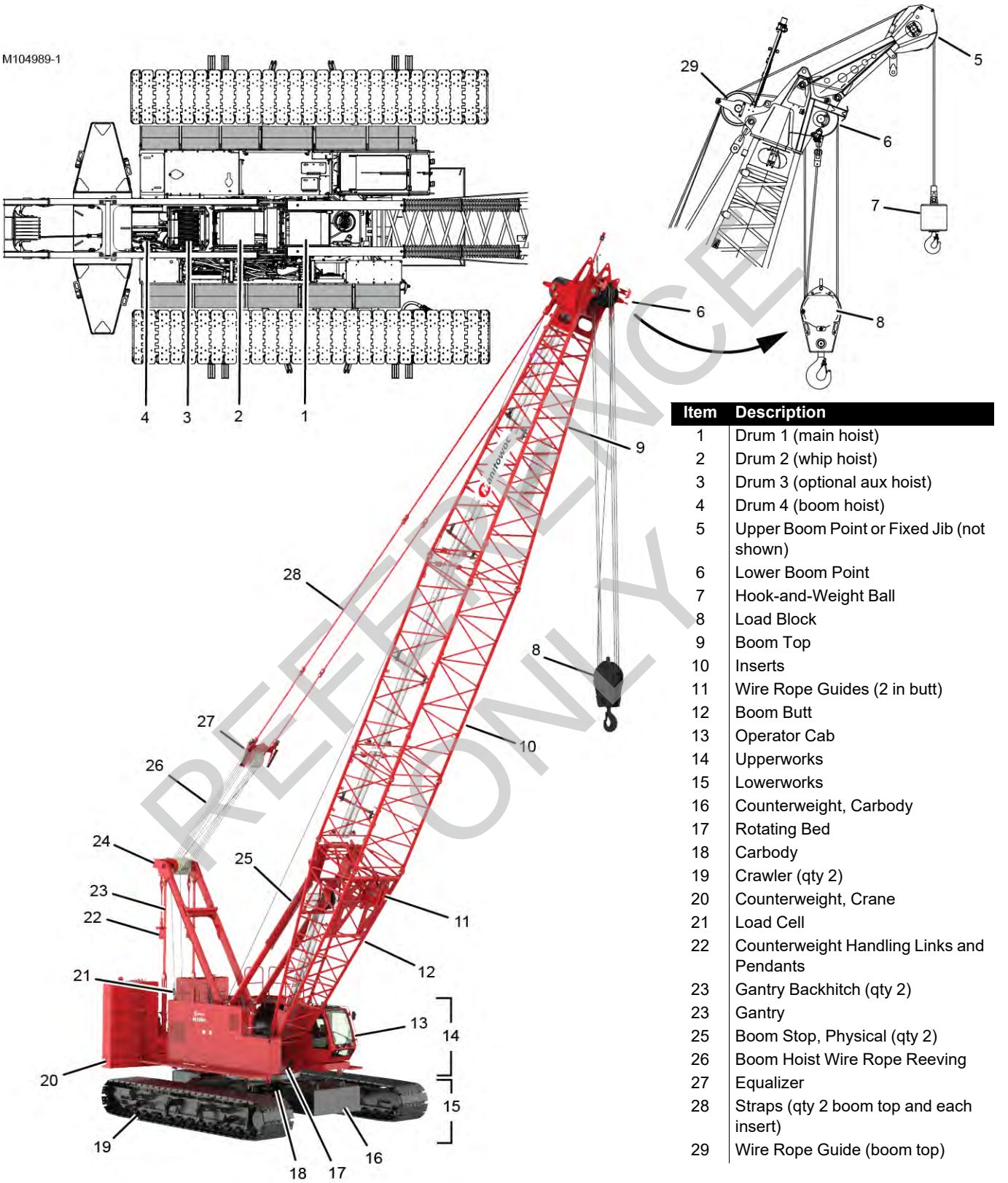
The terms right, left, front, and rear (Figure 1-2) used in this manual refer to the operator's right, left, front, and rear sides when seated in the operator cab. The red arrow on each side of the carbody indicates the front of the lowerworks. The boom is on the front the of upperworks.



Item	Description
1	Red Arrow
2	Boom Butt
3	Operator Cab
4	Identification Plate
5	Crawler Drive
6	Crane Counterweight

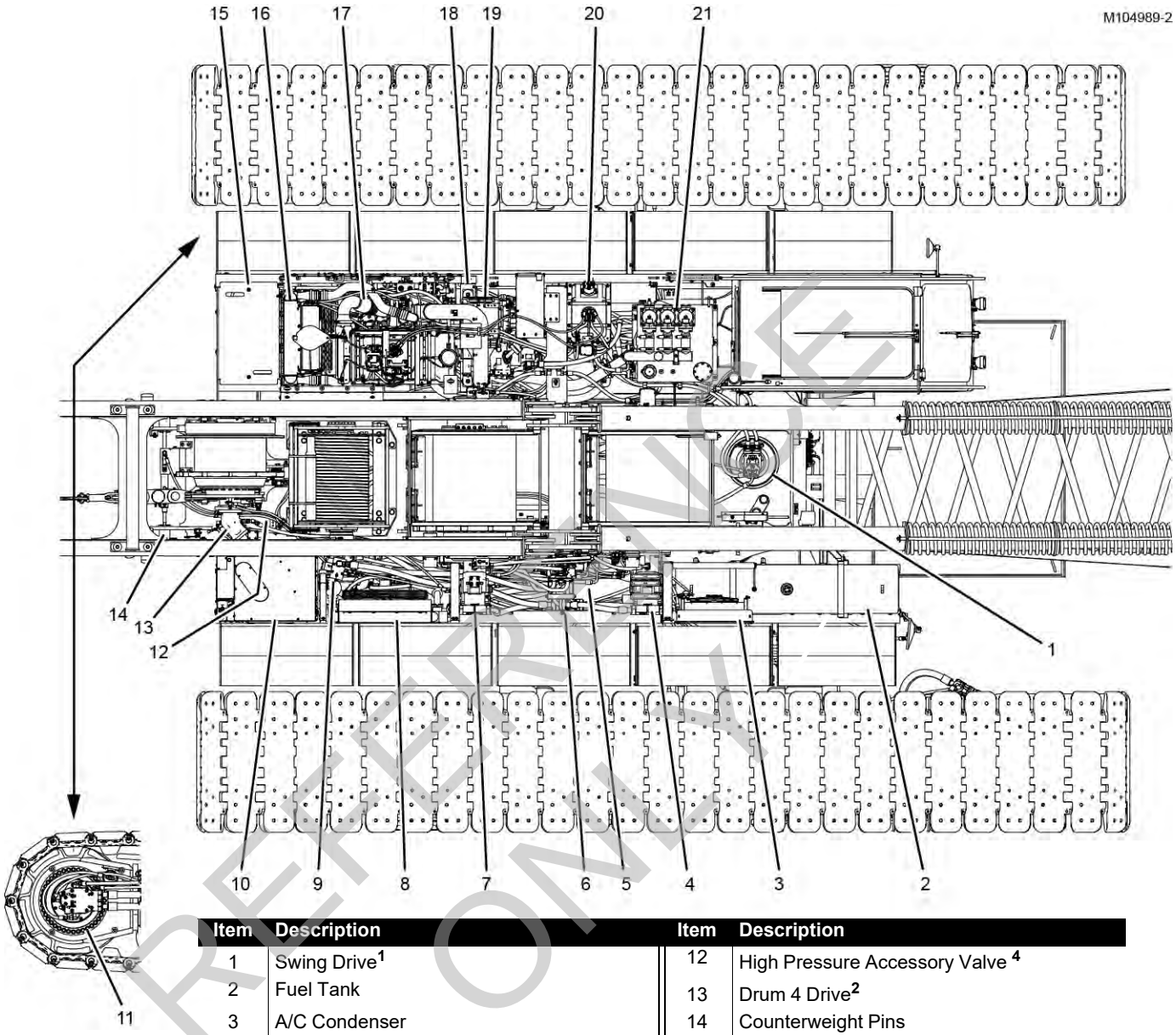
FIGURE 1-2

IDENTIFICATION AND LOCATION OF COMPONENTS



Item	Description
1	Drum 1 (main hoist)
2	Drum 2 (whip hoist)
3	Drum 3 (optional aux hoist)
4	Drum 4 (boom hoist)
5	Upper Boom Point or Fixed Jib (not shown)
6	Lower Boom Point
7	Hook-and-Weight Ball
8	Load Block
9	Boom Top
10	Inserts
11	Wire Rope Guides (2 in butt)
12	Boom Butt
13	Operator Cab
14	Upperworks
15	Lowerworks
16	Counterweight, Carbody
17	Rotating Bed
18	Carbody
19	Crawler (qty 2)
20	Counterweight, Crane
21	Load Cell
22	Counterweight Handling Links and Pendants
23	Gantry Backhitch (qty 2)
23	Gantry
25	Boom Stop, Physical (qty 2)
26	Boom Hoist Wire Rope Reeving
27	Equalizer
28	Straps (qty 2 boom top and each insert)
29	Wire Rope Guide (boom top)

FIGURE 1-3



Item	Description	Item	Description
1	Swing Drive[1]	12	High Pressure Accessory Valve [4]
2	Fuel Tank	13	Drum 4 Drive[2]
3	A/C Condenser	14	Counterweight Pins
4	Drum 1 Drive[2]	15	Battery Box
5	Low Pressure Accessory Valve	16	Radiator
6	Main Control Valve	17	Engine
7	Drum 2 Drive[2]	18	Pump Drive and Pump
8	Hydraulic Oil Cooler	19	Engine Air Cleaner
9	Drum 3 Drive[2]	20	Tier 4 DEF Tank
10	Generator Set	21	Hydraulic Tank
11	Crawler Drive (inboard side both crawlers)[3]		

[1] Swing drive includes a planetary gearbox with swing pinion, a spring-applied brake, and a motor.

[2] Each drum drive includes a drum, a planetary gearbox, a spring applied brake, and a motor.

[3] Each crawler drive includes a planetary gearbox, a drive tumbler, a spring applied brake, and a motor.

[4] Inside rotating bed. Accessible from under rotating bed.

FIGURE 1-4

ENGLISH AND METRIC CONVERSIONS

Direct Conversion

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

12 ft x 0.3048 = 3,6576 m

Inverse Conversion

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

3,6576 m ÷ 0.3048 = 12

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

To Convert	Symbol	Application	To	Symbol	Multiply By
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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SECTION 2
SAFETY INFORMATION

TABLE OF CONTENTS

SECTION 2
SAFETY INFORMATION

WARNING

California Proposition 65

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel.

Batteries, battery posts, terminals, and related accessories can expose you to chemicals, including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling. For more information go to www.P65warnings.ca.gov.

California Spark Arrestor

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

CONTINUOUS INNOVATION

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

NAMEPLATES AND DECALS

See the drawing at the end of this section.

SAFETY MESSAGES

General

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

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

Safety Alert Symbol

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

Signal Words

DANGER

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

WARNING

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

CAUTION

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

CAUTION

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

NOTE Highlights operation or maintenance procedures.

Symbol Identification

Many of the symbols used in the safety and information signs and nameplates on this crane are identified in Table 2-1 on page 2-2 and Table 2-2 on page 2-3.

Table 2-1 Common Safety Symbols

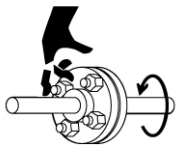
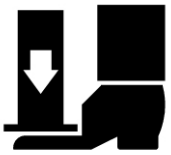
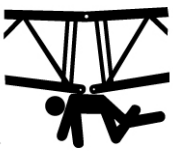
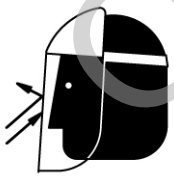
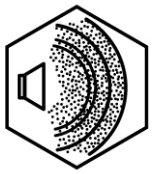
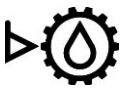
Cut or Crush Hazards					Cut Hazard
 M100090	 M100091	 M100066	 M100065	 M100069	 M100067
Crush Hazards					**Fire Extinguisher**
 M100070	 M100071	 M100072	 M100073	 M100074	 M100082
Fall Hazards			**Falling Boom (Crush) Hazards**		**Explosion Hazard**
 M100083	 M100084	 M100085	 M100068	 M100075	 M100080
Falling Load Hazards		**Flying Objects Hazards**		**Overhead Obstruction Hazard**	**Pressure Release Hazard**
 M100076	 M100077	 M100088	 M100088	 M100089	 M100081
Electrocution Hazards		**Personal Fall Protection**	**Pressure Cleaning**	**Sound Power Level**	**Read Manual**
 M100078	 M100079	 M100095	 M100087	 M100096	 M100093

Table 2-1 Common Safety Symbols

Emergency Cab Exit	Lift	Do Not Lift	Prohibited	
 M102486	 M104626	 M104627	 M104628	

Table 2-2 Miscellaneous Symbols

Diesel Fuel	Engine Coolant	Engine Coolant Vent	Engine Oil Level	Hydraulic Filter	Hydraulic Oil
 M100271	 M100267	 M100268	 M100269	 M100272	 M100273
Pump Drive Oil Level	**Tire Pressure (if equipped)**				
 M100270	 M100266				

SAFETY AND INFORMATION SIGNS

Maintaining Signs

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

Ordering Signs

Order replacement safety and information signs from your Manitowoc dealer.

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

Item	Description	Material
1	Steps (both crawlers)	Non-skid grating
1A	Steps (stowed)	Non-skid grating
1B	Steps (working)	Non-skid grating
2	Platform (both sides)	Non-skid grating
3	Crane Counterweight	Non-skid paint
4	Boom Section Catwalks (optional)	Non-skid grating
5	Enclosure Platform	Non-skid paint
6	Handrails	
7	Ladder	Grated rungs
8	Carbody Counterweights	Non-skid paint

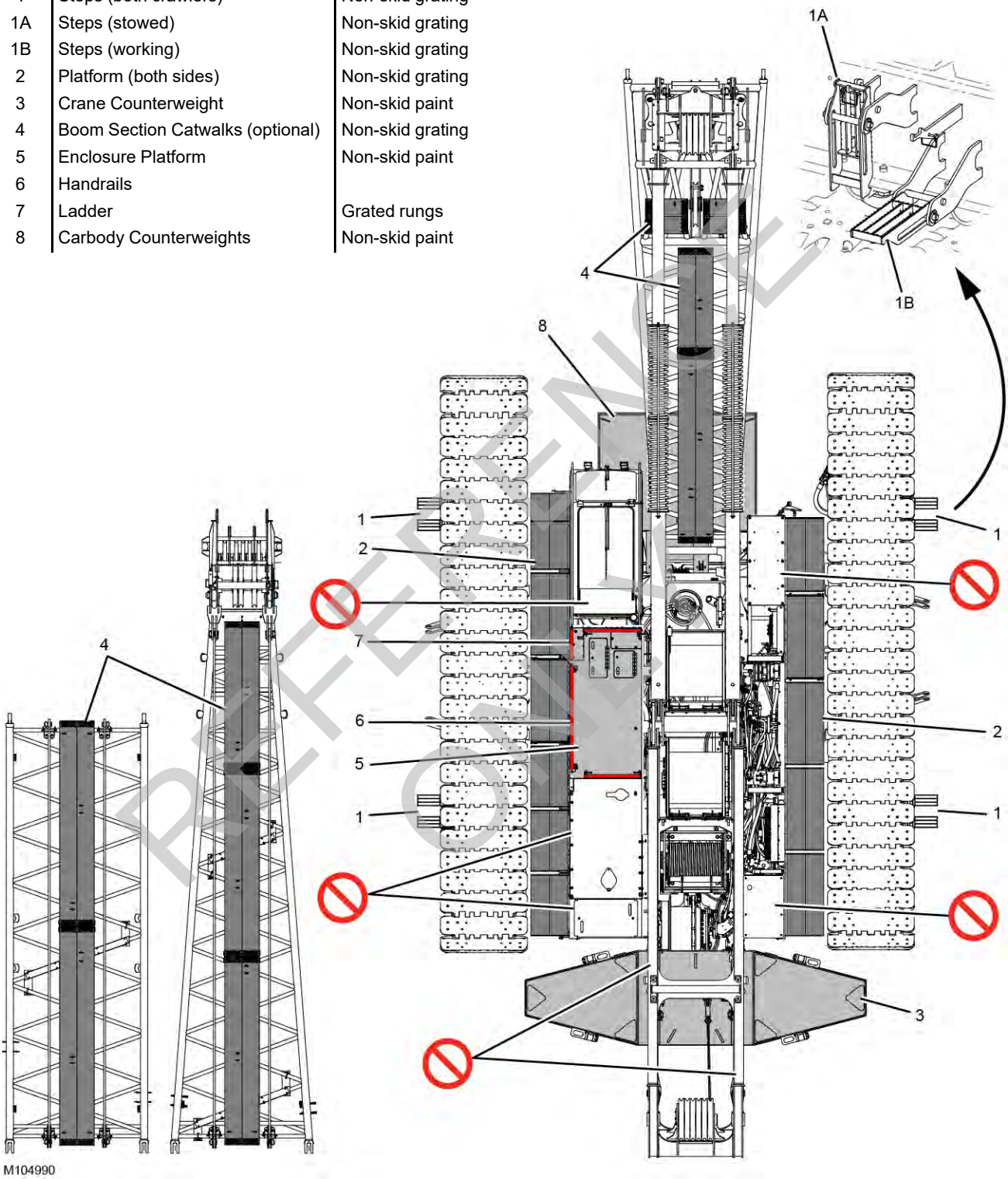


Figure 2-1. Crane Access Points

CRANE ACCESS POINTS

WARNING

Crush Hazard!

The upperworks can swing into and crush personnel climbing on or off the crane.

Moving crawlers can crush personnel climbing on or off the crane.

To prevent death or serious injury:

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

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

General

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

Manitowoc has provided a ladder, steps platforms, and optional catwalks at the locations shown in Figure 2-1.

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

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

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

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

GETTING ON OR OFF CRANE

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

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

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

Always maintain a three-point contact with the ladder: two feet and one hand of two hands and one foot.

PERSONAL FALL-PROTECTION

It is the crane owner/user's responsibility to provide assembly/maintenance personal with appropriate fall-protection equipment.

WARNING

Fall Hazard!

To prevent falling from any height during crane assembly and disassembly, personnel shall appropriate wear fall-protection equipment.

OPERATOR MANUAL/CAPACITY CHART STORAGE

General

Manitowoc provides the following manuals and other important literature with your crane:

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

The manuals which must be retained in the operator cab (Operator Manual, Capacity Charts, Maintenance Checks and Lube Guide, and RCL Operation) are supplied in an OPERATOR INFORMATION binder.

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

The crane model and serial number are located on the Crane Identification Plate on the crane cab.

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

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

Storing Manuals

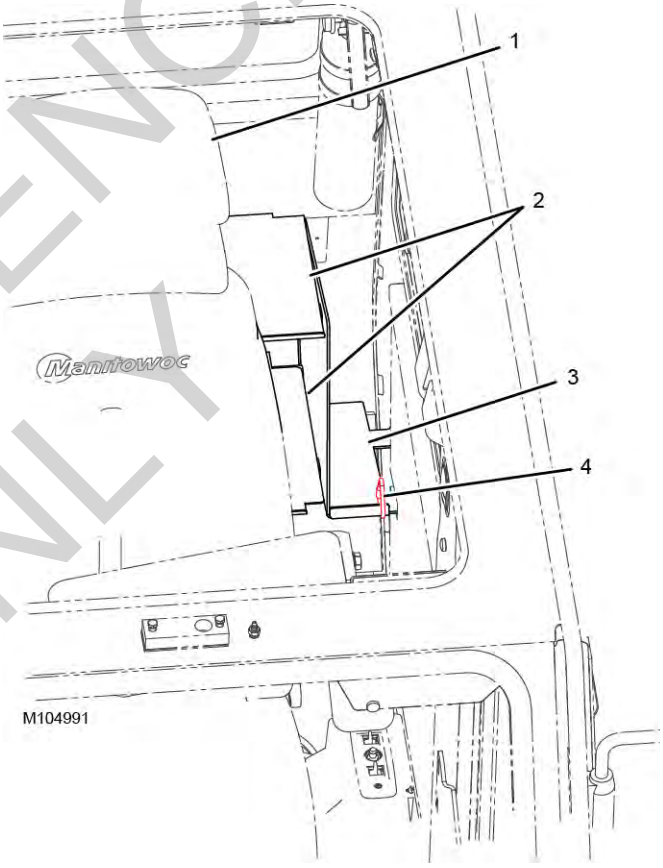
See Figure 2-2.

Store the Operator Information binder in the holder (3) located behind the seat (1) in the left rear corner of the operator cab.

Attach the chain from the manual to the link (4) on the holder.

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

Additional storage is provided on the storage shelves (2).



Item	Description
1	Seat
2	Storage Shelves
3	Holder for Operator Information Binder
4	Link

Figure 2-2. Manual Holder in Cab

SAFE OPERATING PRACTICES

General

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

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

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

Read Operator Manual

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

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

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

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

Operator Qualifications

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

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

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

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

Operator training and qualification is crane owner's responsibility.

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

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

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

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

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

Operator Conduct

1. The operator shall not engage in any practice which diverts his/her attention while operating the crane.
2. The operator shall not operate the crane when he/she is physically or mentally unfit.
3. The operator shall be responsible for all operations under his/her direct control. When safety of an operation is in doubt, the operator shall stop the crane's functions in a controlled manner. Lift operations can resume only after safety concerns have been addressed or the continuation of crane operations is directed by the lift supervisor.

4. The operator shall be thoroughly familiar with operation of the crane and its proper care. If adjustments or repairs are necessary or if there are known defects that impair safe operation, the crane must not be operated until unsafe conditions have been corrected.
5. If there is a warning sign at the start controls, the operator shall not start the engine until the warning sign has been removed by the person who installed it.
6. Before starting the engine, the operator shall make sure that:
   a. All daily inspection and maintenance services have been performed.
   b. All controls are in the off position and all brakes and locking devices are applied or engaged.
   c. All personnel are clear of the crane. Deploy a swing radius barrier.

WARNING

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

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

- See Size of Load later in this section.
- For a description of each safety device and operational aid, see Section 3 of the MLC100-1 Operator Manual.

7. The operator shall test all controls, limits, and communication systems at the start of each shift. Any defects found must be corrected before operation is begun.
8. The operator shall not start crane movement if the load or designated signal person is not within his/her range of vision or communication.
9. The operator shall understand and respond to signals from the person directing the lift or from the designated signal person. When a signal person or crane follower is not required, the operator is responsible for the lift. ***Operator shall obey a stop signal at all times, no matter who gives it.***
10. The operator shall verify that the Capacity Chart being used is the correct one for the cranes configuration (boom length, load line reeving, counterweight, etc.).
11. The operator shall verify that:
    a. All attachments are properly assembled and attached to the crane according to the rigging drawings called for in the Capacity Chart.
    b. The counterweight — to include applicable auxiliary counterweight — is in place and of proper weight. ***Maximum required counterweight must not be exceeded.***

WARNING

Moving Load/Tipping Crane Hazard!

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

12. The operator shall perform the following operations before leaving the operator cab for any reason:
    a. Park the crane and position upperworks so the crane does not interfere with operation of other equipment.
    b. Apply travel and swing brakes or locking devices.
    c. Land any attached load.
    d. Lower the boom onto blocking at ground level or onto a boom rest if possible.

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

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

    e. Move all controls to off.
    f. Apply all drum brakes and pawls.
    g. Disengage the master clutch, if equipped.
    h. Stop the engine.

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

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

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

b. Apply all brakes and locking devices.

c. Move all controls to off.

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

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

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

Never operate the crane during an electrical thunderstorm.

When a local weather storm warning exists (including electrical thunderstorm), stop operation and secure the crane. See step 12 on page 2-8.

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

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

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

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

b. If the wind exceeds 16 m/s (35 mph), land all loads and apply the drum brakes, lower the boom onto blocking at ground level or otherwise restrain it, and apply the swing and travel brakes and/or locks.

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

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

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

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

Handling Load

Size of Load

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

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

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

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

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

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

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

Attaching Load

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

a. Inspect each hook and latch before using.

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

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

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

2. Only use slings and other rigging that are in safe operating condition and have a rating equal to or greater than the load to be lifted.
3. Do not wrap the load line around the load.
4. Use suitable protection between slings and any sharp edges on the load. When synthetic slings are used, the synthetic sling manufacturer's instructions, limitations, specifications, and recommendations must be followed.
5. Secure unused legs of a multi-leg sling before handling a load with one leg of sling.

Lifting/Moving Load

1. Before lifting or moving a load, the operator or qualified person directing the lift shall make the following checks:
   - **a.** Crane has a firm, uniformly supporting foundation under all crawlers. Unless otherwise specified in the Capacity Chart, the foundation must be level to within 1% — 0,3 m (1ft) rise or fall in 30,5 m (100 ft) distance.

     When such a surface is not available, it must be provided with timbers, cribbing, or other structural members to distribute the load such that the allowable bearing capacity of the underlying member is not exceeded.
   - **b.** The load is secured and properly balanced in the slings or the lifting device before lifting the load more than 76 to 152 mm (3 to 6 in).
   - **c.** The lift and swing paths are clear of personnel and obstructions.
   - **d.** The load is free to be lifted.
   - **e.** The load line is not kinked or otherwise damaged.
   - **f.** Multiple part load lines are not twisted around each other in such a manner that the lines will not separate when the load is lifted.
   - **g.** The hook is brought over the load in a manner that will minimize twisting or swinging.
   - **h.** The load line and the boom hoist rope are properly spooled on the drums and seated in the sheaves.
   - **i.** The load drum brakes are in proper working order.

     The operator shall test the load drum brakes each time a load approaching the rated load is handled. Lift the load 76 to 152 mm (3 to 6 in) and fully apply the brakes — load must not lower through applied brakes.
   - **j.** Unused load drums are parked (working and parking brakes applied; if equipped, drum pawls engaged).
   - **k.** All personnel are clear of the swing radius of the crane's counterweight.
2. While lifting or moving the load, the operator shall take the following precautions:
   - **a.** Accelerate and decelerate the load smoothly to avoid excessive stress on the boom and machinery.
   - **b.** Avoid sudden starts and stops while swinging. Keep the swing speed under control to prevent the load from swinging out beyond the radius at which the load can be handled and to minimize the pendulum action of the load.
   - **c.** Sound the signal horn before swinging and intermittently while swinging, especially when approaching personnel.

     If equipped, the automatic swing alarm will sound when the crane is swung.
   - **d.** Use taglines or other restraints to control the load when necessary.
   - **e.** Do not exceed any swing limitations (areas of operation) given in the Capacity Chart.
   - **f.** Do not allow the load, boom, or any other part of the crane to contact obstructions.
   - **g.** Do not use the crane to drag a load.
   - **h.** Do not hoist, lower, or swing the load while personnel are on the load or the hook. See Personnel Handling in this section.
   - **i.** Avoid carrying the load over personnel. Loads which are suspended must be blocked or cribbed before personnel are allowed to work under or between them.
   - **j.** Before lifting a load which requires the use of outriggers (or anytime outriggers are used), fully extend the outrigger beams and jacks so the truck tires do not bear any load.

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

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

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

     - Free of defects
     - Strong enough to prevent crushing, bending, or shear failure

- Of sufficient thickness, width, and length to completely support the jack pad or float, transmit the load to the supporting surface, and prevent shifting, toppling, or excessive settlement under load.

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

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

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

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

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

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

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

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

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

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

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

d. Secure the rotating bed against rotation except when it is necessary to negotiate a turn, and then only when the operator is seated at controls or the boom is supported on a dolly.

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

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

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

b. Maintain specified tire pressures (truck cranes).

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

Multiple Load Line Operation

WARNING

Avoid Over Load and Side Load Damage to Crane

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

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

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

1. The qualified lift planner and crane operator shall read and become thoroughly familiar with the appropriate Capacity Charts and Wire Rope Specification Charts.
2. The lift planner and the crane operator shall make sure the total load does not exceed the rated capacity given in the Capacity Chart and Wire Rope Specification Chart for given boom point or jib point, whichever is less.

   EXAMPLE: If one load line is lifting from the jib point, the proper jib chart applies.
3. The crane must be thoroughly inspected by a qualified person prior to setup.
4. The crane must be thoroughly inspected for load line interference caused by routing and reeving of multiple load lines. If interference is found, it must be eliminated.
5. For cranes produced before 2003, Rated Capacity Indicators/Limiters were not required by ASME B30.5 for non-personnel lifting.

   To aid the operator in staying within the crane's Capacity Chart with the total applied load, Manitowoc recommends that its cranes be equipped with Rated

Capacity Indicators/Limiters to monitor the load on each load line.

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

6. Manitowoc recommends that each load line be equipped with an anti two-block device.
7. Manitowoc's Capacity Charts are based on freely suspended loads. To prevent side load damage to the boom, jib, and sheaves:
   - The load lines must hang as close to vertical as possible to minimize side and forward loads.
   - The distance between the load points and the hook points must be a minimum of three times the horizontal distance between the hook point on the load being lifted.
   - The load must remain centered on the boom and jib point shafts unless special lift approval is granted by Manitowoc.
   - The load lines should be located over the load's center of gravity as it is supported on a trailer, a barge, or the ground.
8. The crane operator shall be familiar with the operational characteristic of the crane as it relates to multiple drum operation (simultaneous operation, same or opposite direction, or individual operation).
9. When using tandem drums, the maximum operating layers may be limited depending on whether the crane was initially designed for tandem drum operation or not.
10. Load shift when lifting with two hooks may be more unpredictable than typical one hook lifting.

Holding Load

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

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

SIGNALS

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

SAFETY DEVICES

WARNING

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

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

Manitowoc provides the following safety devices on its cranes.

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

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

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

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

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

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

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

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

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

OPERATIONAL AIDS

WARNING

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

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

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

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

Category 1 Operational Aids

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

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

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

   Temporary alternative measures if inoperative or malfunctioning:

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

   a. Measure radius using a tape measure.

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

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

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

   d. Clearly mark the boom or luffing hoist cable (so it can easily be seen by a designated signal person)

at a point that gives the signal person sufficient time to signal the operator and have the operator stop the boom or jib within the minimum allowable radius.

2. **Anti-Two-Block Device**

   Temporary alternative measures if inoperative or malfunctioning:

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

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

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

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

Category 2 Operational Aids

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

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

1. **Rated Capacity Indicator/Limiter**

   Temporary alternative measures if inoperative or malfunctioning:

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

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

2. **Boom Angle** or **Radius Indicator**

   Temporary alternative measures if inoperative or malfunctioning:

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

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

   c. Measure radius using a tape measure.

3. **Jib Angle** or **Radius Indicator**

   Temporary alternative measures if inoperative or malfunctioning. Use either or both:

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

   b. Then, measure radius using a tape measure.

4. **Drum Rotation Indicator**

   Temporary alternative measures if inoperative or malfunctioning:

   Mark the drum to indicate its rotation.

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

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

   Temporary alternative measures if inoperative or malfunctioning:

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

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

   Temporary alternative measures if inoperative or malfunctioning:

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

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

   Temporary alternative measures if inoperative or malfunctioning:

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

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

Electrocution Hazard

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

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

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

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

WARNING

Electrocution Hazard!

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

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

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

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

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

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

Set-Up and Operation

1. During crane use, assume that every line is energized ("hot" or "live") and take necessary precautions.
2. Position the crane such that the load, boom, or any part of the crane and its attachments cannot be moved to within 6 m (20 ft) of electrical power lines or equipment. This includes the crane boom and all attachments. Overhead lines tend to blow in the wind, so allow for movement of the overhead lines when determining a safe operating distance.
3. Erect a suitable barricade to physically restrain the crane, all attachments, and the load from entering into an unsafe distance from electrical power lines or equipment.
4. Plan ahead and always plan a safe route before traveling under power lines. A wooden clearance frame should be constructed to ensure sufficient clearance is maintained between crane and power lines.
5. Appoint a reliable and qualified signal person, equipped with a loud signal whistle or horn and voice communication equipment, to warn the operator when any part of the crane or load moves near a power

source. This person should have no other duties while the crane is working.

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

Electrocution Hazard Devices

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

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

Electrical Contact

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

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

   Only as a last resort should an operator attempt to leave the crane upon contacting a power source. If it is absolutely necessary to leave the cab, JUMP

COMPLETELY CLEAR OF CRANE. DO NOT STEP OFF. Hop away with both feet together. DO NOT walk or run.

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

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

REFUELING

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

FIRE EXTINGUISHERS

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

ACCIDENTS

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

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

Phone: 920-684-6621

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

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

SAFE MAINTENANCE

WARNING

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

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

Maintenance Instructions

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

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

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

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

Safe Maintenance Practices

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

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

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

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

3. Wear clothing that is relatively tight and belted.

4. Wear appropriate eye protection and approved hard hat.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

15. Stop the engine before refueling the crane.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

31. Do not store flammable materials on the crane.

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

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

ENVIRONMENTAL PROTECTION

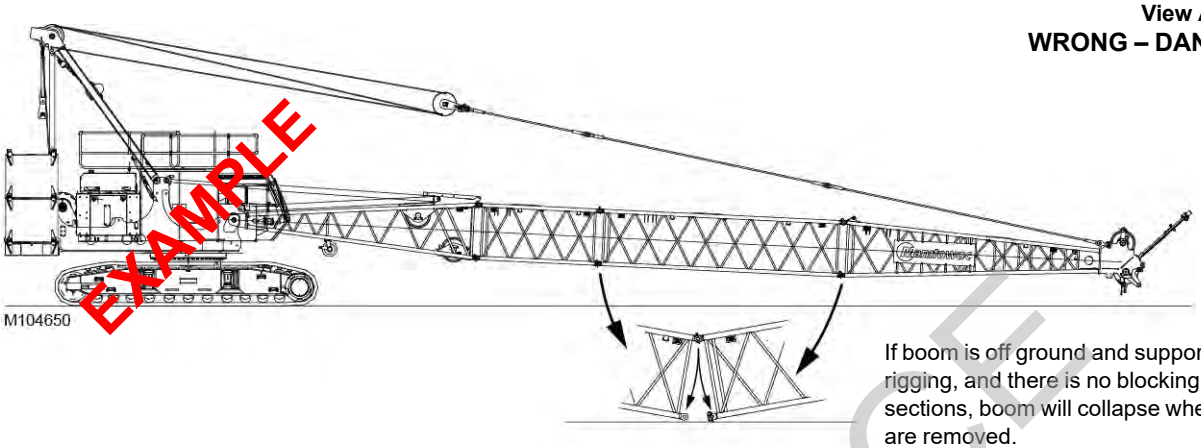
Dispose of waste properly! Improperly disposing of waste can threaten the environment.

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

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

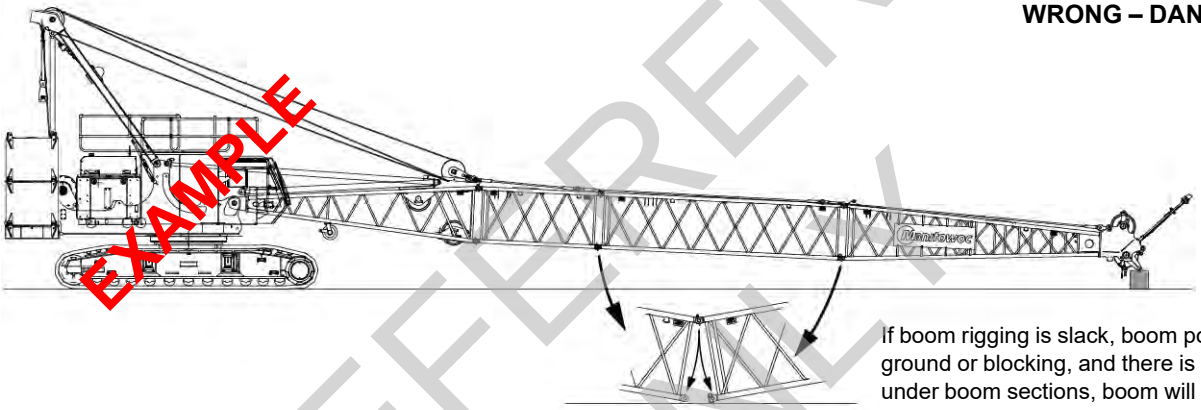
When filling and draining crane components: do not pour waste fluids onto the ground, down any drain, or into any source of water.

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



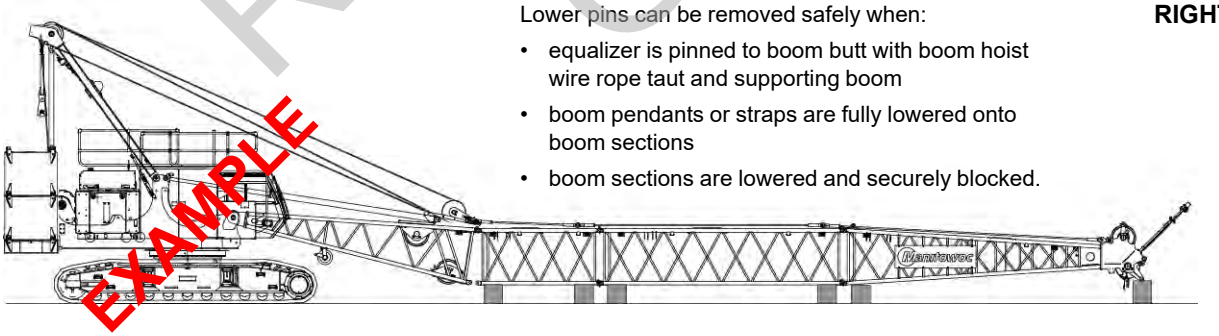
View A
WRONG – DANGEROUS!

If boom is off ground and supported by boom rigging, and there is no blocking under boom sections, boom will collapse when lower pins are removed.



View B
WRONG – DANGEROUS!

If boom rigging is slack, boom point is on ground or blocking, and there is no blocking under boom sections, boom will collapse when lower pins are removed.



View C
RIGHT – SAFE

Lower pins can be removed safely when:

- equalizer is pinned to boom butt with boom hoist wire rope taut and supporting boom
- boom pendants or straps are fully lowered onto boom sections
- boom sections are lowered and securely blocked.

Figure 2-3. Boom Disassembly

BOOM DISASSEMBLY SAFETY

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

DANGER!

Collapsing Boom Hazard!

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

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

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

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

General

Safety decals (Figure 2-4) are placed near the connectors on the boom sections as shown on the Boom Disassembly Decal Drawing at the end of this section.

Workers involved with boom disassembly shall be trained and experienced in the operation and disassembly of construction cranes. Everyone shall read and understand these instructions, the information in the Boom Assembly Drawing, and the instructions in Section 4 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 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.

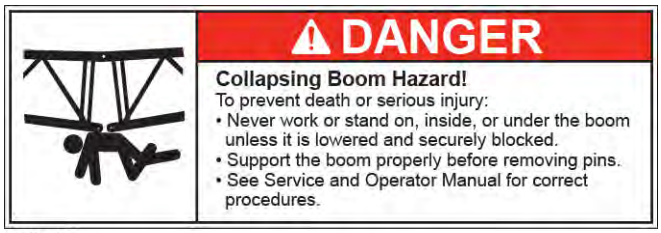


Figure 2-4. Safety Decal

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 pendants as shown in Figure 2-3, View A.
- Do not remove pendant connecting pins until pendants are fully lowered onto boom sections as shown in Figure 2-3, View C.
- Do not remove bottom connecting pins from any boom section when boom point is resting on ground or blocking and boom rigging is slack as shown in Figure 2-3, View B.
- Never work or stand inside boom unless it is lowered and securely blocked as shown in Figure 2-3, View C.
- Do not stand or walk on top of the boom.

DANGER

Falling Boom Hazard!

Crane can tip or the boom can collapse if excess boom is cantilevered. Never cantilever more boom than allowed in rigging drawing or capacity chart.

PERSONNEL HANDLING POLICY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Phone: 920-684-6621

PEDESTAL/BARGE MOUNTED CRANES

WARNING

Overload Hazard!

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

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

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

WARNING

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

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

Pedestal Mounted Crane

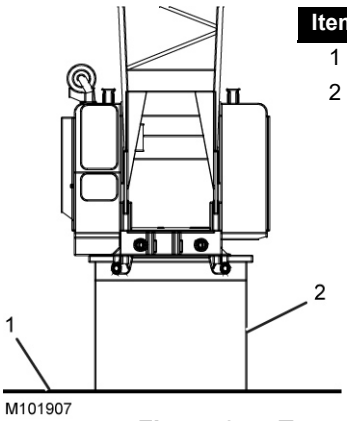
Also see ASME publication B30.8-2004, Floating Cranes and Derricks.

Definition

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

Examples

1. Crane rotating bed mounted on a turret (pedestal) which is securely fastened to the foundation (Figure 2-5).



Item	Description
1	Foundation
2	Turret

Figure 2-5. Turret-Mounted Crane

2. Crane rotating bed mounted on a carbody (crawlers removed) which is securely fastened to the foundation Figure 2-6).

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

Item	Description
1	Foundation
2	Carbody

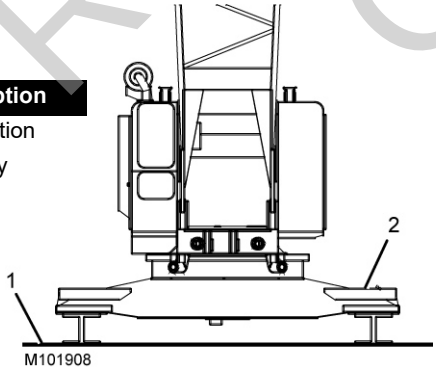


Figure 2-6. Carbody-Mounted Crane

Barge Mounted Crane

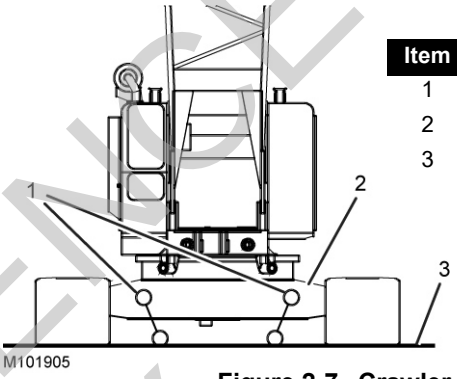
Definition

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

Examples

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

1. Crawler-mounted crane with the carbody anchored with tie-downs to the foundation (Figure 2-7).



Item	Description
1	Tie-Downs
2	Carbody
3	Foundation

Figure 2-7. Crawler-Mounted Crane

2. Crawler-mounted crane working on a timbered area of the barge, ship, or floating platform with the crawlers restrained by curbing and end stops (Figure 2-8). When not working, the crane carbody is anchored with tie-downs to the foundation. ***Traveling with load is not permitted.***

NOTE Manitowoc does not permit traveling on a barge deck with load.

Item	Description
1	Curbing
2	Tie-Downs Required when Parked
3	Carbody
4	End Stop Front and Rear
5	Foundation

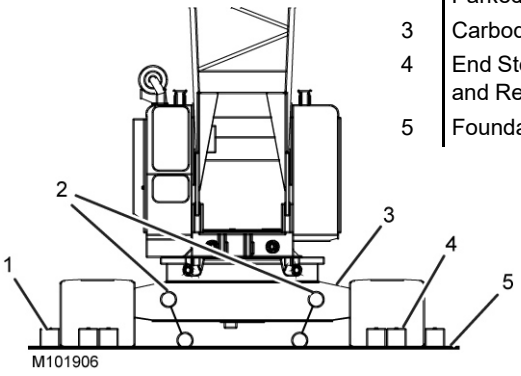
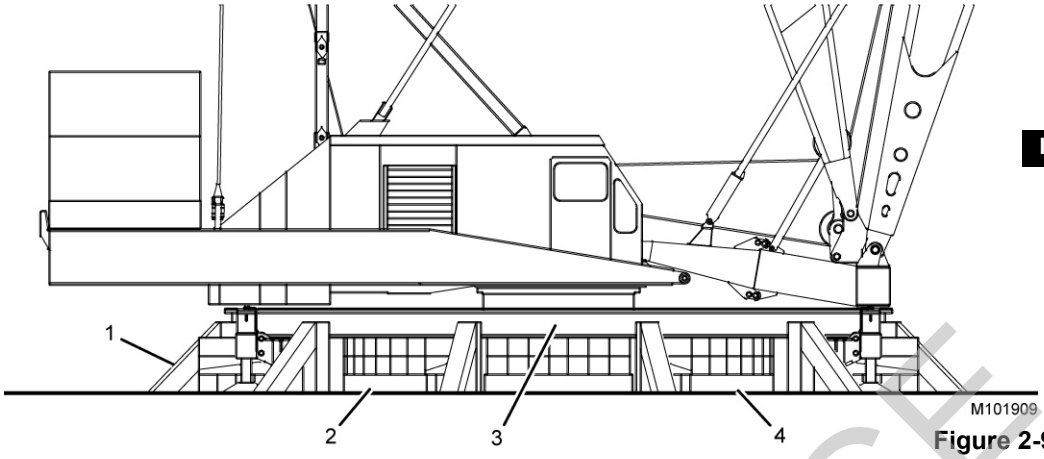
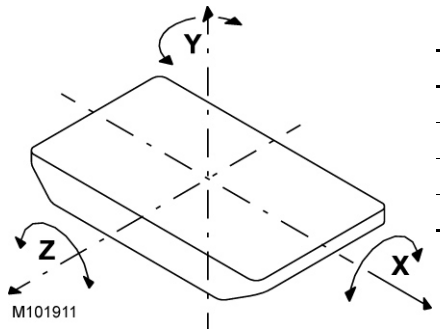


Figure 2-8. Crawler-Mounted Crane



Item	Description
1	Bracing
2	Ring Support
3	Ring Assembly
4	Foundation

Figure 2-9. RINGER-Mounted-Crane



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

Figure 2-10. Barge Dynamics

3. RINGER® (crawler mounted, carbody mounted) supported on blocking, screw jacks, or steel pedestals which are braced and fastened to the foundation in such a manner as to prevent movement (Figure 2-9).

NOTE RINGERS must be equipped with hook rollers on the boom carrier and the counterweight carrier.

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

Capacity Charts for Barge Mounted Crane

Manitowoc provides two types of Capacity Charts for a crane mounted on a barge or other supporting structure under static conditions.

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

NOTE Unless otherwise specified in a machine list Capacity Chart, a 0 degree machine list Capacity Chart rating applies to machine list ***not to exceed 1/2 degree***. All other machine list ratings – 1°, 2°, and 3° – must NOT be exceeded.

Shock Loading Caused by Barge Dynamics

Shock loads to the crane can be experienced when the barge is subjected to up and down movement of wave action (referred to as DYNAMICS). Figure 2-10 illustrates the dynamic conditions of the barge which influence crane capacity.

CAUTION

Structural Damage Hazard!

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

NOTE Manitowoc does not recommend crane operation under dynamic conditions.

Operation on Barge

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

WARNING

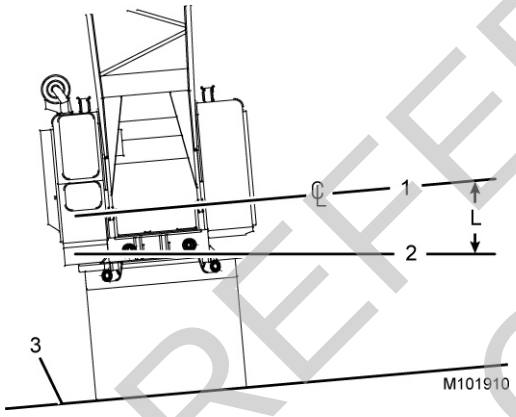
Tipping Crane Hazard!

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

Failing to use the correct Capacity Chart can result in an accident.

Barge Mount Definitions

1. Machine List, as defined by Manitowoc, is the crane's out-of-level condition — from side-to-side — as measured by the angle between horizontal and a line drawn through the centerline of the crane's boom hinge pins (Figure 2-11). This out-of-level condition creates side load and affects the crane's lifting capacity.



Item	Description
1	Centerline through Boom Hinge Pins
2	Horizontal
3	Barge Deck
L	Degrees of Machine List (Maximum allowable is specified in Capacity Chart)

Figure 2-11. Machine List

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

   Unless otherwise specified in the Capacity Chart, barge list (heel or trim) must not exceed the machine list degrees given in the Capacity Chart.

3. Barge List and Machine List are not the same. As the crane rotates on a barge, barge list (as defined above) will change. The worst machine list condition generally occurs when the crane swings over the corner of the barge, producing maximum side load.

Inspection of Barge-Mounted Crane

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

- Boom
- Counterweight
- Backhitch
- Rotating Bed
- Wire Rope
- Pendants and Straps
- Hook and House Rollers

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

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

Transporting Crane on Barge

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

SECTION 3
OPERATING CONTROLS AND PROCEDURES

TABLE OF CONTENTS

SECTION 3
OPERATING CONTROLS AND PROCEDURES

3

THIS SECTION STARTS ON THE NEXT PAGE

STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

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

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

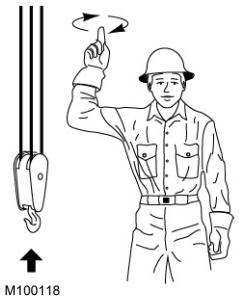
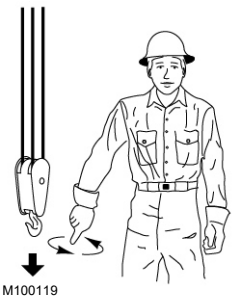
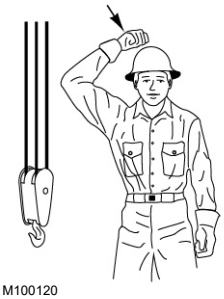
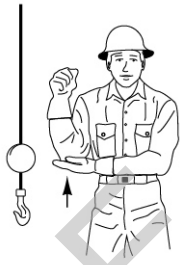
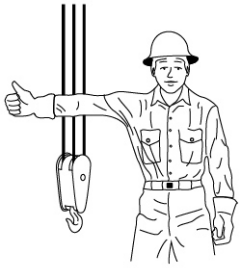
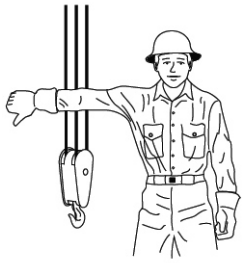
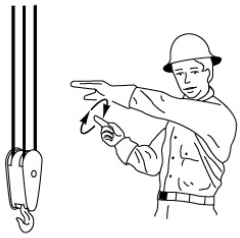
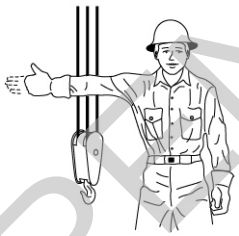
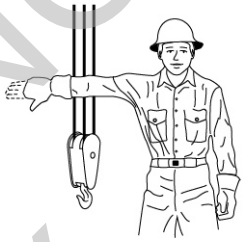
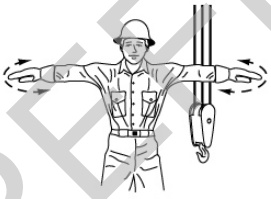
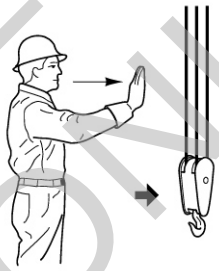
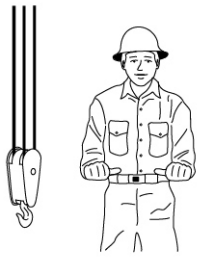
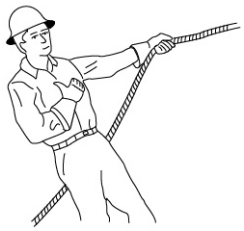
1	2	3	4	5
 M100118	 M100119	 M100120	 M100121	 M100122
6	**7**	**8**	**9**	**10**
 M100123	 M100124	 M100125	 M100126	 M100127
11	**12**	**13**	**14**	**15**
 M100128	 M100129	 M100130	 M100131	 M100132
16	**17**	**18**	**19**	**20**
 M100133	 M100134	 M100135	 M100136	 M100137

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

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

SYMBOLS USED ON CONTROL CONSOLES

The following symbols are used on the control consoles to identify the operating controls and their operation.

Table 3-2. Symbol Identification — Control Consoles

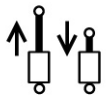
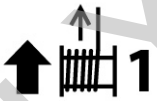
 M100138	Air Conditioner	 M100144	Cylinders, Extend and Retract
 M100154	Battery, 12 Volt Supply	 M100151	Drum with or without Number (number and its location varies)
 M100168	Bypass, Crane Limits	 M100149	Drum, Free Fall with Drum Number
 M102790a	Cab	 M100150	Drum, Lower
 M101960	Camera	 M100152	Drum, Raise
 M100191a	Crawlers	 M100155	Engine or Auxiliary Engine
 M100196	Crawler Speed		

Table 3-2. Symbol Identification — Control Consoles

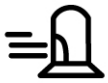
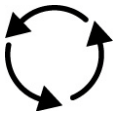
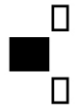
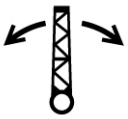
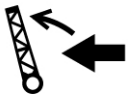
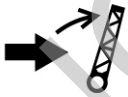
 M100154	Energize	 M100165-1	Lights, Console
	Engine Run	 M100291	Light, Position
 M100160	Engine Start	 M100166	Light, Work and Camera
 M100161	Engine Stop	 M100167	Lighter
 M100142a	Fan	 M100170	Off
 M102435	Gantry	M100171	On
 M102084	Heater	 M101959	Park Off
 M100164	Horn	 M100172	Park On

Table 3-2. Symbol Identification — Control Consoles

 M100177	Pin, Disengage	 M100186	Swing
 M100178	Pin, Engage	 M100189	Swing Left
 M100285	Regen (Tier 4), Inhibit	 M100190	Swing Right
 M100284	Regen (Tier 4), Initiate	 M100192a	Travel Forward and Reverse—Left Crawler
 M100182	Setup	 M100193a	Travel Forward and Reverse—Right Crawler
 M100183	Speed, Fast	 M104620	USB
 M100184	Speed, Slow	 M101957a	Windshield Washer, Front
 M100185	Stop, Emergency	 M101958a	Windshield Washer, Overhead

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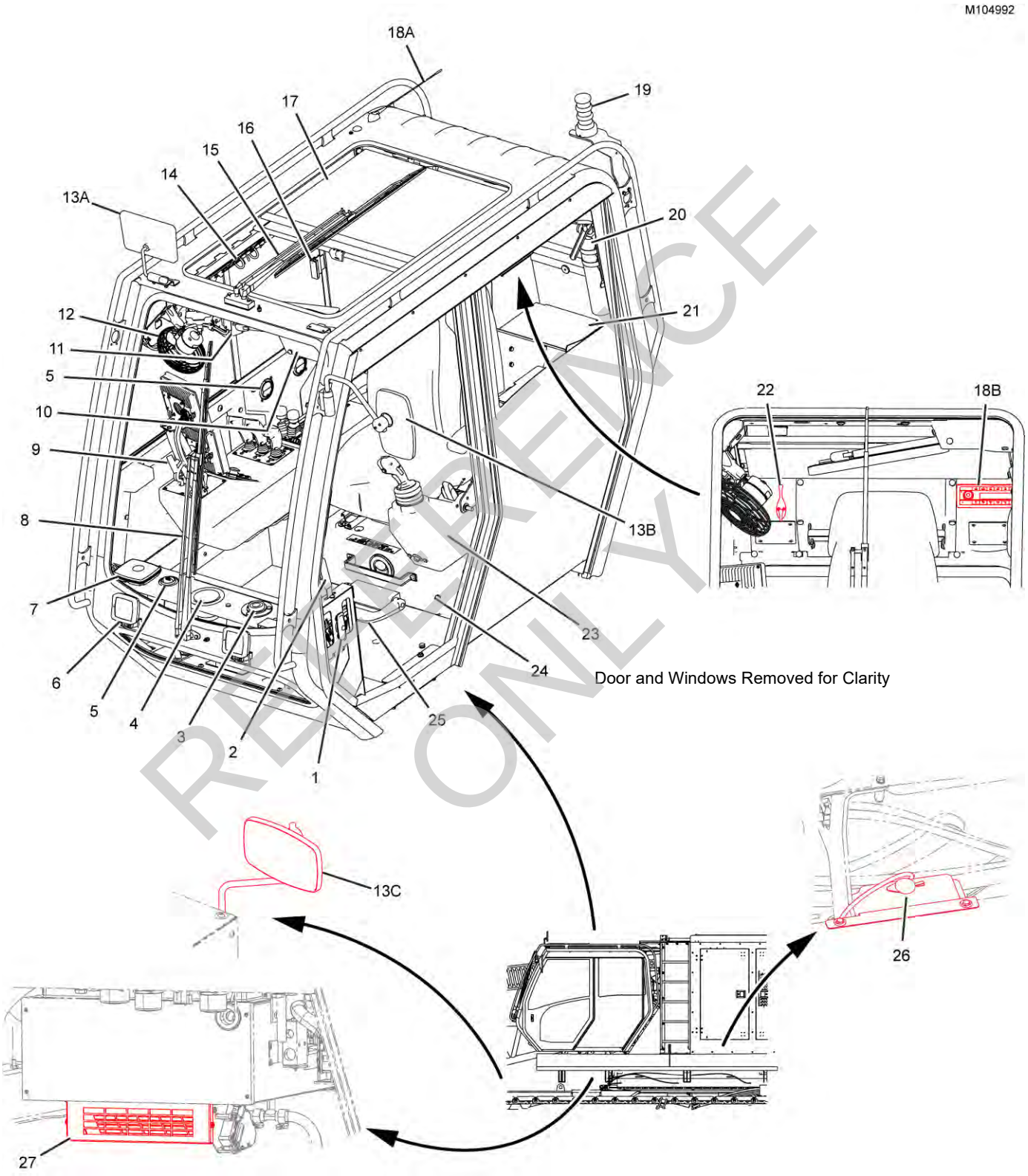
OPERATING CONTROLS

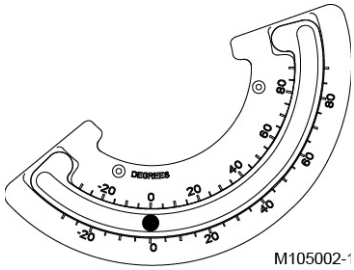
This section identifies all standard and optional controls and indicators available for the MLC150-1. Therefore, some of the controls and indicators identified may not be provided on your crane.



Door and Windows Removed for Clarity

Table 3-3. Cab Controls and Indicators

Item	Name	Description
1	Outside Door Handle	• Unlock the door using the key provide with the crane. • Press the button in the handle and the handle will pop out. • Rotate the handle to open the door. • Slide the door rearward to access the cab. Reverse the steps to close and lock the door.
2	Inside Door Latch	The door will latch when slid fully rearward and forward. • To close the door from inside the cab — push the door latch forward to unlatch the door. Use the grab handle above the door latch to slide the door forward until it latches. • To open the door from inside the cab — pull the door latch rearward to unlatch the door. Use the grab handle above the door latch to slide the door rearward.
3	Crane Level	Two levels are provided. See page 3-27 for more information.
4	Cup Holder	Provided for operator convenience.
5	Air Vents (Qty 6)	Adjust as desired to circulate air in the operator cab.
6	Crane Work Lights	See page 3-21 for more information.
7	GPS Antenna	Contact your Manitowoc dealer for CraneSTAR information.
8	Front Windshield Wiper	See page 3-21
9	Right Console	See page 3-14 for more information.
10	Sun Visor (front window)	Position the visor as desired to shade the sunlight.
11	Crane Camera Monitor	See page 3-31 for more information.
12	Fan	The fan as its own on-off switch. The fan's position is adjustable for directing air flow in the cab.
13A	Drum Mirror	Adjustable to provide a view of the drums.
13B	Rear View Mirror (optional left side)	Adjustable to provide a view to the rear of the crane.
13C	Rear View Mirror (optional right side)	Adjustable to provide a view to the rear of the crane.
14	Overhead Console	See page 3-21 for more information.
15	Upper Windshield Wiper	See page 3-21 for more information.
16	Window Latch	See page 3-39 for more information.
17	Sun Shade	A shade is provided for the roof window. Position the shade as desired to shade the sunlight.
18A	Radio Antenna	See the manufacturer's manual at the end of this section.
18B	Radio (left rear upper corner)	

19	Rated Capacity Limiter (RCL) Light	The beacon rotates and the alarm sounds whenever the crane's capacity is near an overload condition (when RCL system is ON). See page 3-27.
20	Fire Extinguisher	In Cab (standard): 2.5# Dry Chemical 1A:10-B:C On Right Enclosure (optional): 15# Carbone Dioxide 10B:C
21	Storage Shelves and Operator Information Manual Holder	Store manuals and capacity charts here.
22	Coat Hook	Provided for operator convenience.
23	Left Console	See page 3-12 for more information.
24	HVAC Unit	The main components for heating and cooling the operator cab are located here.
25	Engine Foot Throttle and Optional Free Fall Brake Pedals	See page 3-25 for more information
26	Windshield Washer Fluid Tank	Inside the left enclosure. Fill with a quality brand of non-freezing windshield washer fluid.
27	HVAC Filter Element	Remove the cover and replace the filter element every six months, or sooner in extremely dusty climates. Reinstall the cover.
28	Boom Angle Indicator	See page 3-27 for more information.  M105002-1

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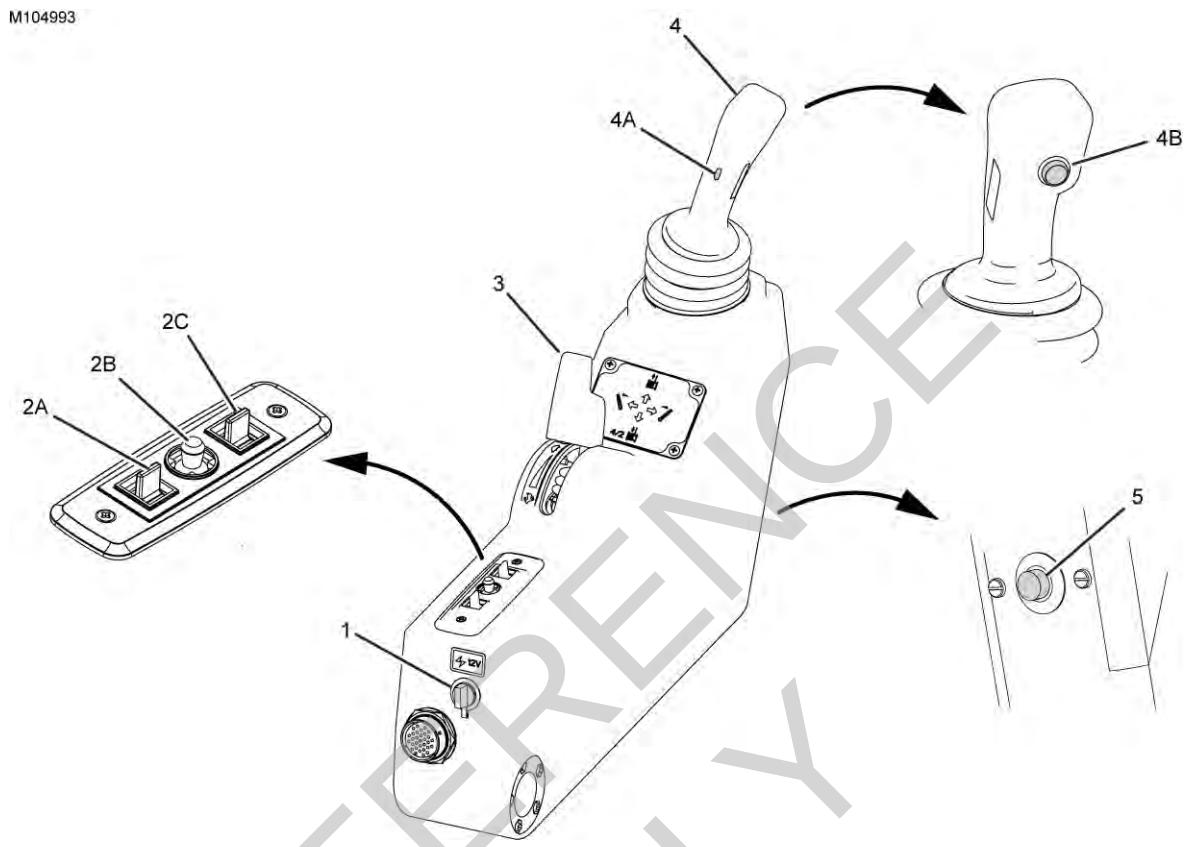
Left Console

Table 3-4. Left Console



Item	Name	Description
1	12VDC Power Source	Maximum current draw is 15A. For the fuse locations, see Fuses and Circuit Breakers on page 3-62.
2	Seat Riser Control	<table><tr><th>Item</th><th>Description</th></tr><tr><td>A</td><td>Engage this switch to raise or lower the front riser.</td></tr><tr><td>B</td><td>Engage this switch to raise and lower the seat and to move the seat forward or backward.</td></tr><tr><td>C</td><td>Engage this switch to raise or lower the rear riser.</td></tr></table>
3	Hand Throttle	• Move the handle FORWARD to DECREASE the engine speed. • Move the handle BACK to INCREASE the engine speed. Engine speed must be fast enough to provide sufficient power for the work being done. ***The engine can stall under the load if the engine speed is too slow.***

Table 3-4. Left Console

<table>
<tr>
<td>4</td>
<td>Boom and Swing Control Handle</td>
<td>
Boom or Luffing Hoist Control Handle:
The location of the control handles can vary depending on crane configuration. For drum and control handle identification, see Figure 3-1 on page 17.
See Boom Hoist Operation on page 3-42.
See Luffing Hoist Operation on page 3-44.
• Move the control handle BACK to RAISE the boom or luffing jib. The hoist brake releases and speed changes in relation to control handle movement.
• Release the control handle to CENTER to STOP the boom or luffing jib. Speed decreases to off and the hoist brake applies to hold the boom or jib in position.
• Move the control handle FORWARD to LOWER the boom or luffing jib. The hoist brake releases and speed changes in relation to the control handle movement.
Swing Control Handle:
See Swing Operation on page 3-46.
• Move the control handle to the LEFT to SWING LEFT.
• Release the control handle to CENTER to STOP swinging. Swing speed decreases and the rotating bed slows to a stop. Move the control handle in the opposite direction to stop the swing motion faster.
• Move the control handle to the RIGHT to SWING RIGHT.
The swing and travel alarm beeps to warn personnel when the crane is swung.
<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>A</td><td>Drum rotation indicator—a pin-type actuator in the control handle moves up and down to signal the operator by feel that the drum is turning.</td></tr>
<tr><td>B</td><td>Swing holding brake switch—holds the rotating bed in position for short periods of time. The swing control handle is not operable while the swing holding brake switch is pressed.
• PRESS the switch to APPLY the swing holding brake.
• RELEASE the switch to RELEASE the swing holding brake.</td></tr>
</table>
</td>
</tr>
<tr>
<td>5</td>
<td>Left Console Tilt Button</td>
<td>
• To RAISE the left console, press and hold the button on the front of the console. A gas cylinder will raise the console to make more room for entering or exiting the cab.
• To LOWER the left console, press and hold the button, and push the console down to the desired position.
</td>
</tr>
</table>

Right Console

Table 3-5. Right Console

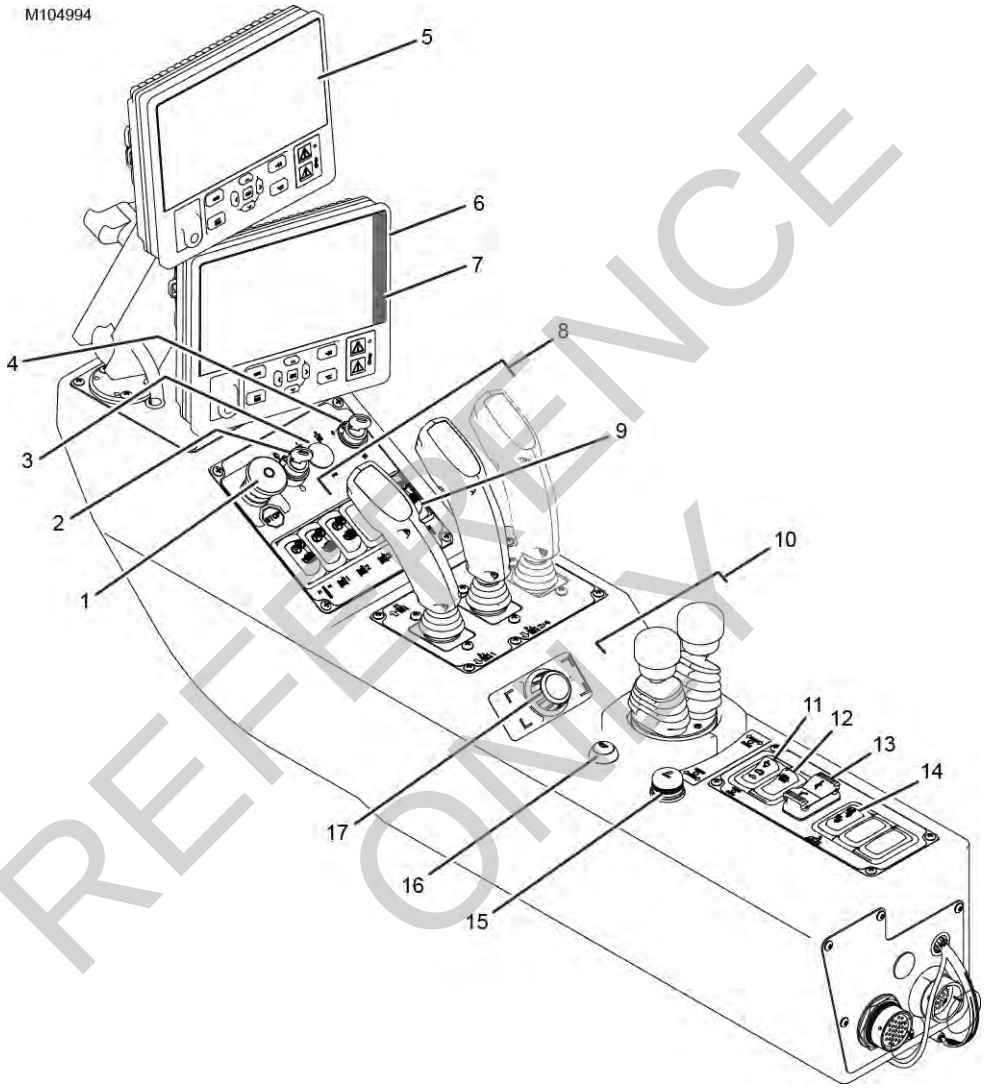


Table 3-5. Right Console

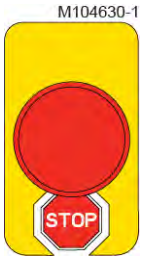
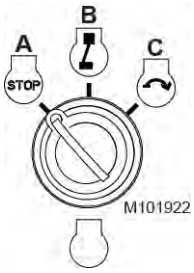
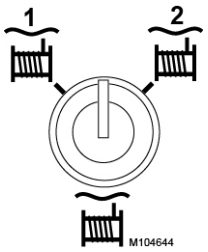
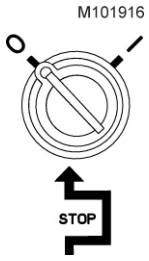
Item	Name	Description
1	Emergency Stop Button	When this button is depressed, the crane engine shuts off, the brakes apply, and the currently operated crane functions come to a complete stop. For normal engine shut down, use the engine ignition switch. **NOTE** The button must be pulled up before the engine can be restarted. If the emergency stop switch has been activated while functions were being operated, test the corresponding disk brakes for proper operation before putting the crane back into service. 
2	Engine Ignition Switch	The engine ignition switch has the following positions: • Stop (**A**) • Run (**B**) • Start (**C**) 
3	Free Fall Enable Switch	See Load Drum Operation—Liftcrane Free Fall on page 3-48 for detailed instructions on turning free fall on and off. This key switch spring returns to center when released. • Turn COUNTERCLOCKWISE and release to ENABLE Drum 1 free fall. • Turn COUNTERCLOCKWISE again and release to DISABLE Drum 1 free fall. • Turn CLOCKWISE and release to ENABLE Drum 2 free fall. • Turn CLOCKWISE again and release to DISABLE Drum 2 free fall. Remove the key to prevent unauthorized operation. **NOTE** The crane's control system will not allow Drum 2 to be enabled for free fall if the RCL/RCI is configured for luffing jib operation. 
4	Limit Bypass Key Switch	This key bypasses the limits described in Operating Limits Identification on page 3-35: • Turn the key to **I** and hold to BYPASS an operating limit. • RELEASE the key to **O** to ENABLE operating limits. This position allows the limits to stop the crane functions in the normal matter. **The key must be in this position for all normal operation. Otherwise, structural damage can occur.** Remove the key to prevent unauthorized operation. 
5	Rated Capacity Limiter (RCL) and Rated Capacity Indicator (RCI) Display	Displays load lifting information and alerts the operator to overload conditions. See the RCL/RCI Operation Manual for detailed information.

Table 3-5. Right Console

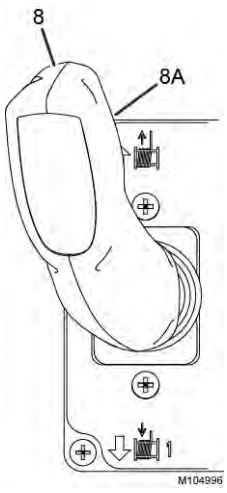
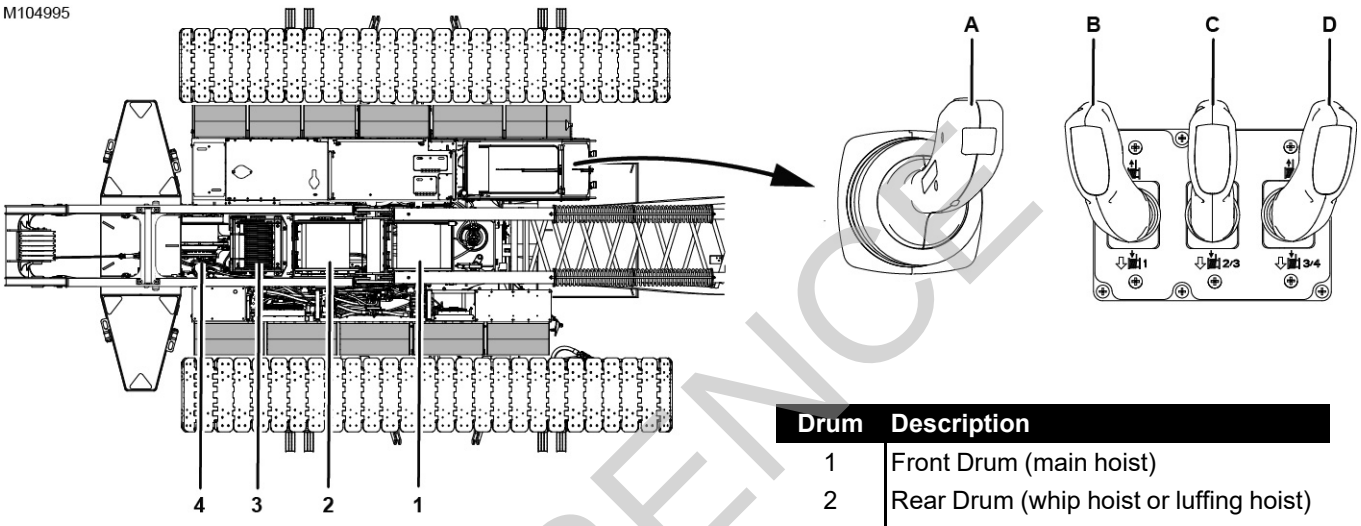
6	Main Display	Displays operating conditions, faults, and diagnostic information. See the Main Display Operation Manual for detailed information.
7	Drum Indicator	The status bar on the right side of the Main Display Working Screen indicates which drums are parked and which drum is being controlled by the corresponding handle. • Gray colored drum icon = Drum is PARKED • White colored drum icon = Drum is UNPARKED In the example, Drums 3 and 4 are parked and Drums 1 and 2 are unparked. The orange dot below each drum icon indicates which handle controls the corresponding drum. In the example, Drum 4 is controlled by the left handle, Drum 1 by the first right handle, and so on. The handle ordering will stay the same and the drums will change when the configuration changes, as indicated in Figure 3-1 on page 17. When the setup remote is controlling Drum 4, none of the dots will be highlighted in orange.  M105018
8	Load Drum Control Handles	In the luffing jib mode the rightmost handle controls the boom hoist. See item 4 on page 3-13 for boom hoist operation. For drum and control handle identification, see Figure 3-1 on page 17. For non-free fall load drums, see Load Drum Operation—Liftcrane Full Power on page 3-47. For free fall load drums, see Load Drum Operation—Liftcrane Free Fall on page 3-48. **NOTE** The free fall option is available only for Drums 1 and 2. • Pull the handle BACK to RAISE the load. The drum brake releases and speed increases in relation to handle movement. • Release the handle to OFF (center) to STOP the load. Speed decreases to off and the drum brake applies to stop and hold the drum in position. ***If equipped with free fall, make sure the brake pedal is depressed or the load will continue to lower under its own weight.*** • Push the handle FORWARD to LOWER the load. The drum brake releases and speed increases in relation to handle movement.  M104996
8A	Drum Rotation Indicator	A pin-type actuator in the control handle for each drum moves up and down to signal the operator by feel that the drum is turning.

Table 3-5. Right Console



Drum	Description
1	Front Drum (main hoist)
2	Rear Drum (whip hoist or luffing hoist)
3	Auxiliary Drum (optional)
4	Boom Hoist

Handle Options	Handle **A** Controls Drum	Handle **B** Controls Drum	Handle **C** Controls Drum	Handle **D** Controls Drum
Crane Equipped WITHOUT Drum 3				
Standard Mode	**4** - Boom Hoist	**1** - Front Drum	**2** - Rear Drum	Not equipped
Luffing Jib Mode	**2** - Luffing Hoist	**1** - Front Drum	**4** - Boom Hoist	
Crane Equipped WITH Drum 3				
Standard Mode	**4** - Boom Hoist	**1** - Front Drum	**2** - Rear Drum	**3** - Auxiliary Drum
Luffing Jib Mode	**2** - Luffing Hoist	**1** - Front Drum	**3** - Auxiliary Drum	**4** - Boom Hoist

Figure 3-1. Drum and Control Handle Identification

Table 3-5. Right Console

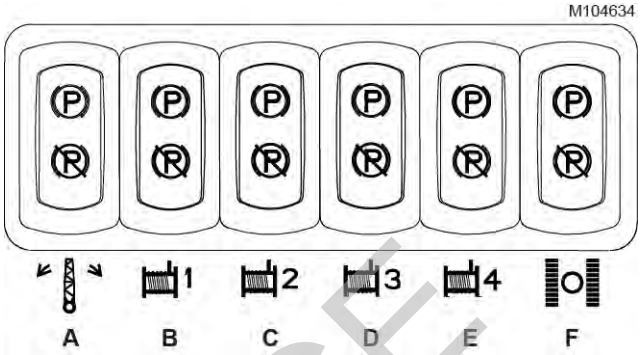
9	Park Switches	A separate switch is provided for each crane function: Swing (**A**), Drum 1 (**B**), Drum 2 (**C**), Drum 3 (**D**), Drum 4 (**E**), and Travel (**F**).  • Press and release the TOP of the rocker to PARK the corresponding crane function. With park on, the corresponding control handle is inoperable, the brake is applied, and (if equipped) the pawl is engaged. • Press and release the BOTTOM of the rocker to UNPARK the corresponding crane function. With park off, the corresponding control handle is operable, the brake is applied and released in conjunction with control handle movement, and (if equipped) the pawl is disengaged. **NOTE** At startup: • All functions are automatically parked. • All drum pawls remain in the state they were at shutdown and will not engage or disengage until the corresponding park/unpark switch is pressed. The status bar on the right side of the Main Display Working Screen indicates which functions are parked and unparked. Alternatively, each crane function can be parked in the Main Display Speed and Torque Settings Screen. See the Main Display Operation Manual for instructions. If the operator moves a control handle for a function that is parked, the corresponding fault icon will appear in the Alerts Bar of the Main Display Working Screen and the function will be inoperable until unparked.  if the function was parked with a park switch OR  if the function was parked in the speed and torque settings screen.

Table 3-5. Right Console

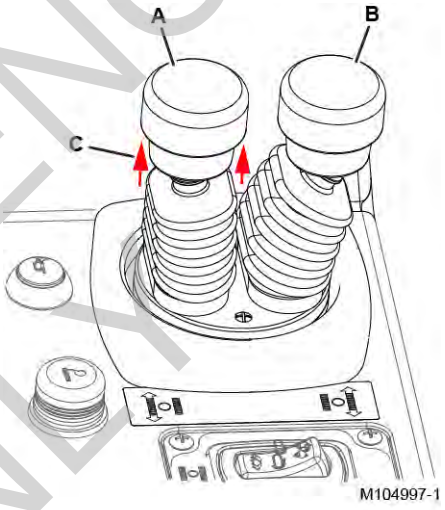
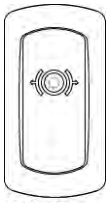
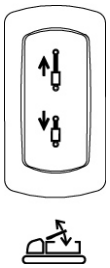
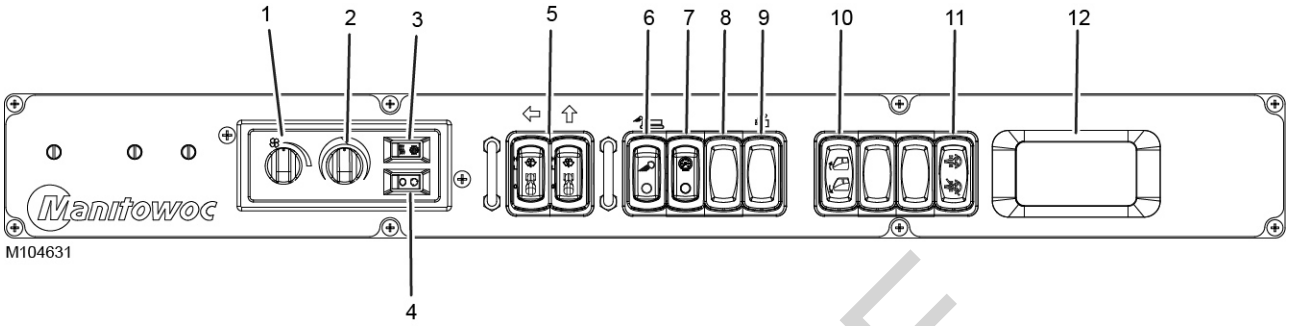
10	Crawler Handles	See Travel Operation on page 3-51. The following directions of travel are with the ***front of the rotating bed and the front of carbody facing the same direction.*** The swing and travel alarm beeps to warn personnel when the crane is traveled. **A** = left crawler handle, **B** = right crawler handle, and **C** = cruise control. • Pull the control handle BACK to travel the corresponding crawler in REVERSE. The travel brake releases and speed increases in relation to control handle movement. • Release the control handle to OFF (center) to STOP the crawler. Speed decreases to off and the travel brake applies to stop and hold the crawler in position. • Push the control handle FORWARD to travel the corresponding crawler FORWARD. The travel brake releases and speed increases in relation to control handle movement.  • To turn travel CRUISE ON, pull up and release the bottom portion of handle (C) while traveling in the desired direction and speed. The crane will continue to travel in the selected direction and speed when the operator releases the crawler handles. • To turn travel CRUISE OFF, push either crawler control handle in the opposite direction or pull up and release the bottom portion of handle (C) again. Travel cruise will also turn off if an operating limit that prevents operation is reached (for example, seat switch or park switch).
11	Travel Speed Switch	• Press the TOP of the rocker to operate the travel motors in HIGH speed. High speed operation provides maximum available travel speed for traveling long distances. • Press the BOTTOM of the rocker to operate the travel motors in LOW speed. Low speed operation provides smooth starts and stops and allows more precise control of the travel motors than high speed. 

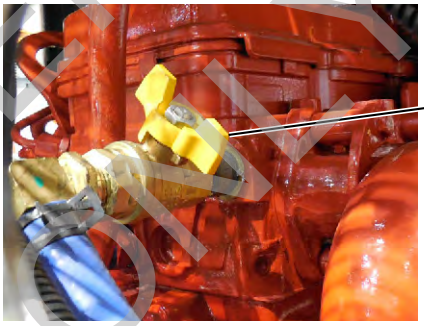
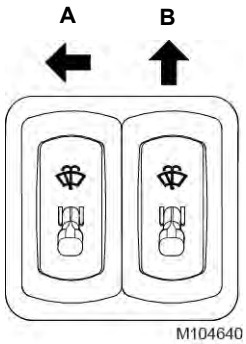
Table 3-5. Right Console

12	Free Spool Activation Switch	This is a 2-position momentary switch that is spring returned to the center position. After enabling free spool in the Main Display: • Press and release the top of the rocker to activate free spool. • Press and release the bottom of the rocker to deactivate free spool. If free spool is disabled in the Main Display, it will also be automatically deactivated, and have to be re-activated after it is re-enabled. For detailed Free Spool Operating Instructions, refer to publication F2334 provided with the Main Display Operation Manual.  M105195
13	USB Receptacles	Use to power/charge a personal electronic device (like a cell phone) while the ENGINE is RUNNING.
14	Gantry Cylinders Switch	To activate this switch, the Boom Butt Configuration must be selected in the RCL/RCI Display. See Section 4 of the MLC150-1 Operator Manual for gantry raising and lowering instructions. • Press and hold the TOP of the rocker to EXTEND the gantry cylinders (raise gantry). • Release the rocker to CENTER to STOP the cylinders. The valves on the cylinders will lock them in position. • Press and hold the BOTTOM of the rocker to RETRACT the gantry cylinders (lower gantry). M101933 
15	Cigarette Lighter	• Push IN to TURN ON the lighter. • The lighter will pop out when the coil is hot. This receptacle can be used to power other 12VDC devices. The maximum current draw is 15A.  M101923
16	Horn Switch	• Press and hold the TOP of the rocker to TURN ON the horn. • RELEASE the rocker to TURN OFF the horn. Before swinging or traveling, sound the horn to alert nearby personnel.  M100164-1
17	Jog Dial	Used in conjunction with the Crane Control System (CCS). See the MLC150-1 Main Display Operation Manual and the RCL/RCI Operation Manual for more information.

Overhead Console

Table 3-6. Overhead Console



Item	Name	Description
1	Blower Fan Speed Switch	• CLOCKWISE faster. • COUNTERCLOCKWISE slower.
2	Temperature Switch	• CLOCKWISE hotter. • COUNTERCLOCKWISE cooler.
3	HVAC Selector Switch	• LEFT end, heater. • RIGHT end, air conditioner. **NOTE** The shut-off valves in the heater hoses at the engine must be open for heater operation. The shut-off valves can be closed to block hot water flow through the heater core during warm weather.  M104968 Cab heater shut-off valve at engine (Qty 2). Shown closed. Turn counterclockwise to open.
4	Outside Air Switch	• LEFT end, off. • RIGHT end, on. Draws in and circulates outside air.
5	Windshield Wiper Switches	**A** = front windshield and **B** = upper windshield wiper. • Toggle fully down = OFF. • Toggle up = INTERMITTENT depending on how far up the toggle is moved. • Toggle fully up = HIGH speed. • Press the TOP END of the switch to SPRAY WASHER FLUID onto the windows. During cold weather, fill the windshield washer tank with a non-freezing cleaning fluid.  M104640

3

Table 3-6. Overhead Console

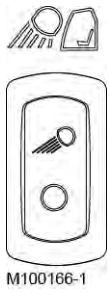
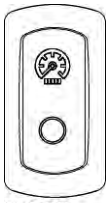
6	Cab Work Lights Switch	• Press the TOP of the rocker to TURN ON the cab work lights. • Press the BOTTOM of the rocker to TURN OFF the cab work lights. For optional gantry and boom work lights see Work Lights on page 3-58.	 M100166-1
7	Console Switch Back Lights	• Press the TOP of the rocker to TURN ON the console switch back lights. • Press the BOTTOM of the rocker to TURN OFF the console switch back lights.	 M100165
8	Boom Position Light	• Press the TOP of the rocker to TURN ON the boom position light. • Press the BOTTOM of the rocker to TURN OFF the boom position light.	 M105196
9	Camera Lights	• Press the TOP of the rocker to TURN ON the camera lights. • Press the BOTTOM of the rocker to TURN OFF the camera lights.	 M100166-2

Table 3-6. Overhead Console

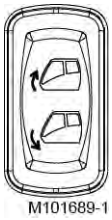
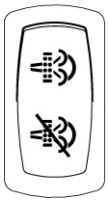
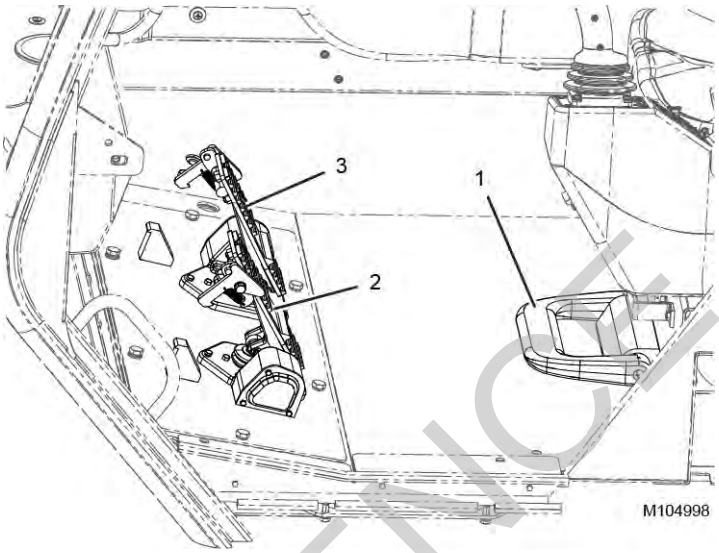
10	Cab Tilt Switch	If equipped with the cab tilt option:  M101689-1 • Press the top of the rocker to RAISE the front of the cab up to 20° above horizontal. • Release the rocker to CENTER to LOCK the cab in the desired position. • Press the bottom of the rocker to LOWER the front of the cab to horizontal. **WARNING** **Crush Hazard!** To avoid serious crushing injury: • Do not attempt to enter or exit the cab while it is tilted. You could lose you balance and fall. Lower the cab to horizontal before attempting to enter or exit it. • Operator, make sure all people are in the clear before operating cab tilt. • Do not stand or work between the cab and the left enclosure while cab tilt is being operated. • Do not work between the cab and the cab frame while cab tilt is being operated. • Perform all cab maintenance and service only when the cab is in the level position. Stop the engine and lockout-tagout the ignition switch before performing cab maintenance or service.
11	Diesel Particulate Filter Regeneration/Inhibit Switch	M101927  The regeneration/inhibit switch is a three-position rocker switch. The top position is momentary. The center and bottom positions are maintained. For more information on this switch, see Section 7 of the MLC150-1 Service Manual. **Active Position** The active center position is for normal engine operation. The position does not require operator assistance under normal conditions. This position allows the exhaust system to actively (automatically) regenerate. ***Continued on next page.***

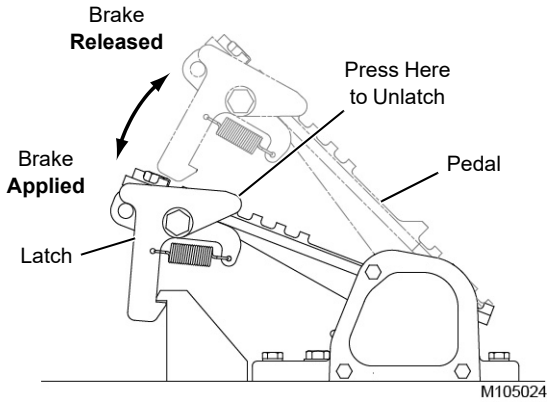
Table 3-6. Overhead Console

11	Diesel Particulate Filter Regeneration/Inhibit Switch (continued)	**Manual Regeneration** If the Engine Information Screen in the Main Display indicates the exhaust system requires a manual regeneration, press and release the top of the rocker. The engine ECM will control a regeneration cycle. The top of the rocker switch is momentary and the switch will return to the active position after the top of the switch is pressed. A manual regeneration will begin only if the engine is at low idle. **NOTE** The top end of the switch has a guard that prevents accidental manual regeneration. The High Exhaust System Temperature (HEST) lamp may come on during regeneration and remain on for a short time after regeneration. **Regeneration Inhibit** To prevent the exhaust system active (automatic) regeneration, press the bottom of the rocker. The switch will remain depressed. The amber LED in the rocker will glow. To re-enable active regeneration, manually return the switch to the active position. Do not use the Inhibit switch unless specifically instructed by Manitowoc Crane Care or a Cummins' technical advisor. The exhaust system regen inhibited icon indicates the after-treatment system active (automatic) regeneration is prevented because the inhibit switch is in the inhibit position. For information on exhaust system-related faults, see the MLC150-1 Main Display Operation Manual. See engine manufacturer's operation and maintenance manual for information on the after-treatment system and engine faults.
12	Dome Light	PRESS the lens to turn the light ON and OFF.

Foot Pedals

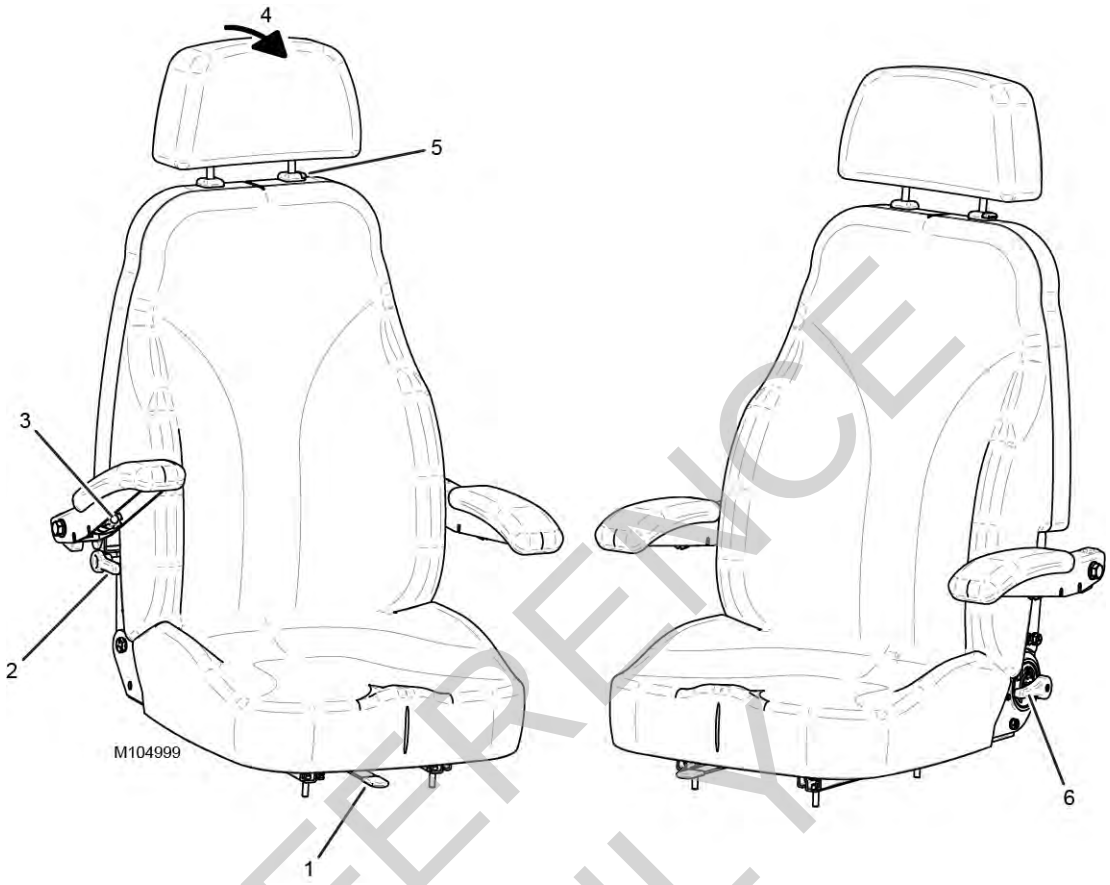
Table 3-7. Foot Pedals



Item	Name	Description
1	Engine Foot Throttle	• Press DOWN on the foot throttle to INCREASE engine speed above the hand throttle setting. • RELEASE the foot throttle to DECREASE engine speed to idle or to the hand throttle setting.
2 **3**	Drum 1 Free Fall Brake Pedal Drum 2 Free Fall Brake Pedal	Each free fall equipped drum has a spring-applied, hydraulically-released free fall brake controlled by a brake pedal. When free falling a load, the free fall brake can be applied at any time to slow down and stop the load. The brake pedals have no function and are inoperable when operating with free off. • Depress to apply the free fall brake in relation to pedal movement. Fully depress and latch the pedal to fully apply the brake. • Depress the heel of the latch to unlatch the pedal and then release the pedal (ease up) to release the free fall brake gradually as the pedal rises. 

Seat Controls

Table 3-8. Seat Controls



Item	Name	Description
1	Fore-Aft Control Lever	• Push to the LEFT to UNLOCK the seat. • Use your body weight to slide the seat to the desired position. • RELEASE the lever and ensure that it is latched to LOCK the seat in position.
2	Lumbar Adjustment Lever	Rotate up or down to adjust the lumbar support in or out.
3	Armrest Adjustment Knob	• Rotate CLOCKWISE to RAISE the armrest. • Rotate COUNTERCLOCKWISE to LOWER the armrest.
4	Headrest Position	Pull or push to position the headrest at 1 of 3 detents between 0 to 30°.
5	Headrest Adjustment Button	• Depress and move the headrest up or down. • Make sure the button is latched to lock the headrest in the desired position.
6	Backrest Adjustment Handle	• Rotate up to adjust the backrest. • Release to lock the backrest in the desired position.
7	Seat Switch (not shown)	Prevents the crane from being operated until the operator is seated. When the operator is out of the seat, all control handles are inoperable, all brakes are applied, and travel cruise is turned off. ***When the Liftcrane Boom Butt Capacities Chart selected in the RCL/RCI Display, the boom hoist function is operable.***

Other Operating Aids and Controls

Boom Angle Indicator

The boom angle indicator (Figure 3-2) is located on the boom butt and is visible through the right side cab window. The indicator shows the angle of the boom in degrees above horizontal.

NOTE The boom angle can also be viewed in the RCL/RCI Display or in the Main Display.

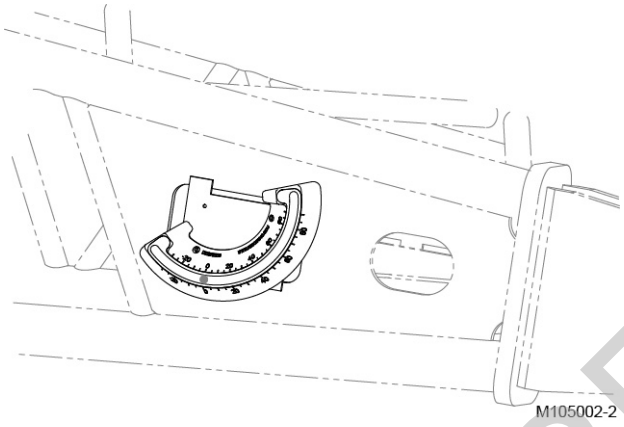


Figure 3-2. Boom Angle Indicator

WARNING

Overload Hazard

Use the boom angle indicator only as a guide to position the boom near the angle corresponding to the radius for a given load.

In all cases, radius shall govern the capacity. Exceeding the radius given in the capacity chart can result in tipping or structural damage.

Crane Capacity Beacon (Optional)

The purpose of the crane capacity beacon is to alert personnel in the vicinity of the crane to the degree at which the crane is operating within its rated capacity:

- Green Beacon ON = Crane's rated capacity is at a safe level.
- Amber Beacon ON = Crane's rated capacity is approaching the maximum level.
- Red Beacon ON = Crane's rated capacity has been exceeded.

The beacon colors correspond to the colors shown in the rated capacity bar or triangle in the RCL/RCI Display.

Crane Levels

Two levels (Figure 3-3) are provided:

- One in the operator cab (see Table 3-3 on page 3-9)
- One on the front of the carbody near the carbody controls (see Table 3-12 on page 3-34)

The levels indicate crane levelness from front to rear and from side to side.

Level is indicated when the bubble is centered in the circle. One degree out of level is indicated when the bubble is touching the outside edge of the circle.

WARNING

Crane Tipping Hazard

Unless otherwise specified on the capacity chart, perform all crane operations with the crane level to within one percent of grade in all directions — 0,3 m in 30 m (1 ft in 100 ft); otherwise, the crane could tip.

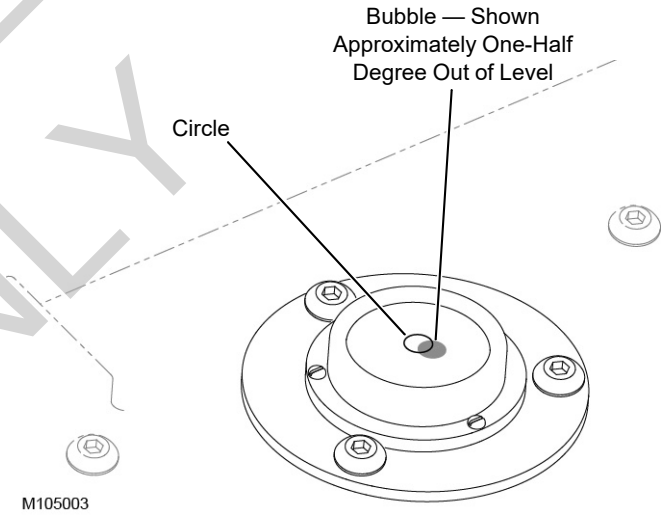


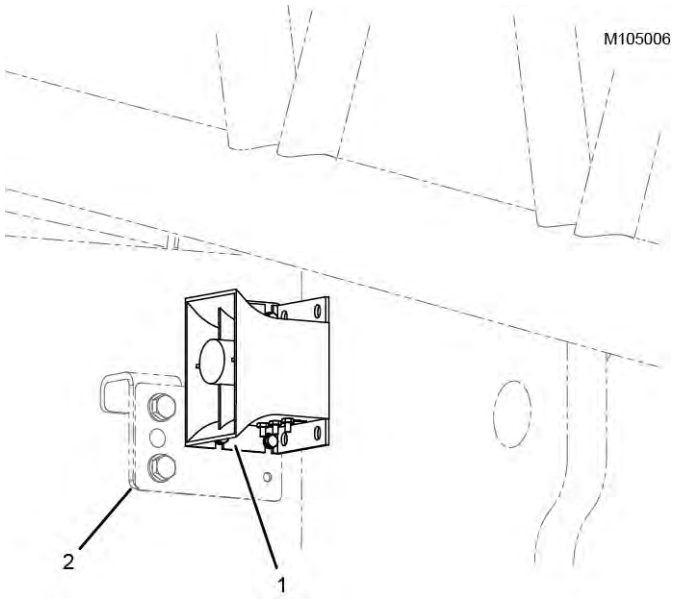
Figure 3-3. Level

NOTE Optionally, crane pitch, roll, and levelness can be monitored in the Crane Position Bar of the Main Display Working Screen. See Main Display Operation Manual for instructions.

Swing and Travel Alarm

See Figure 3-4 on page 28.

The swing and travel alarm is mounted on the front of the rotating bed. It is a dual-tone, interrupted alarm that sounds when the swing or either travel control handle is moved in either direction from off. The alarm turns off when the control handles are moved to off.



Item	Description
1	Swing and Travel Alarm
2	Front of Rotating Bed

Figure 3-4. Swing and Travel Alarm

Battery Disconnect Switch

CAUTION

Engine Damage!

To avoid possible engine fault codes and undesirable operation, make sure the engine ignition switch has been off five minutes before disconnecting the batteries.

Do not rely on this switch to protect the crane's electronic systems when welding. Disconnect the cables at the batteries before welding.

See Figure 3-5.

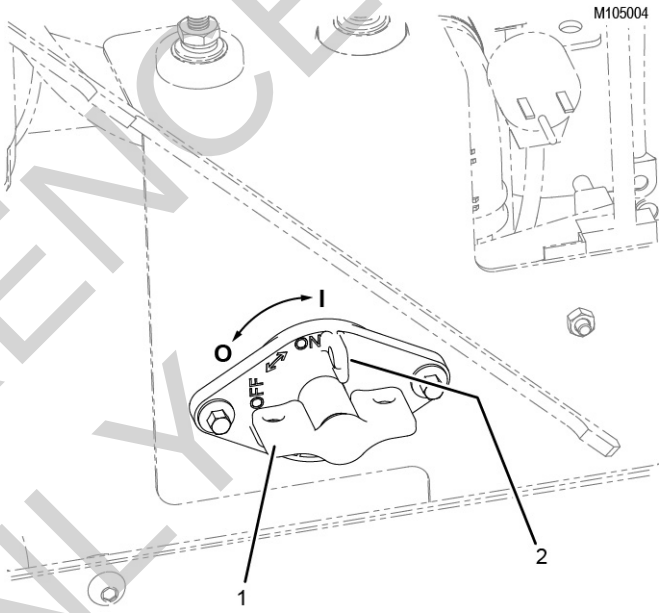
Turn the knob CLOCKWISE to CONNECT (**I**) the battery circuit.

Turn the knob COUNTERCLOCKWISE to DISCONNECT (**O**) the battery circuit for the following reasons:

- When servicing the crane's electrical control system.
- If desired, to prevent the batteries from discharging when the crane is stored for extended periods of time.
- If desired, to prevent the crane from being started by unauthorized personnel.

The disconnect switch can be padlocked to prevent unauthorized use.

Access Through Engine Enclosure Door
on Left Side of Upperworks



Item	Description
1	Battery Disconnect Switch
2	Padlock Holes
I	Connect Batteries.
O	Disconnect Batteries

Figure 3-5. Battery Disconnect Switch

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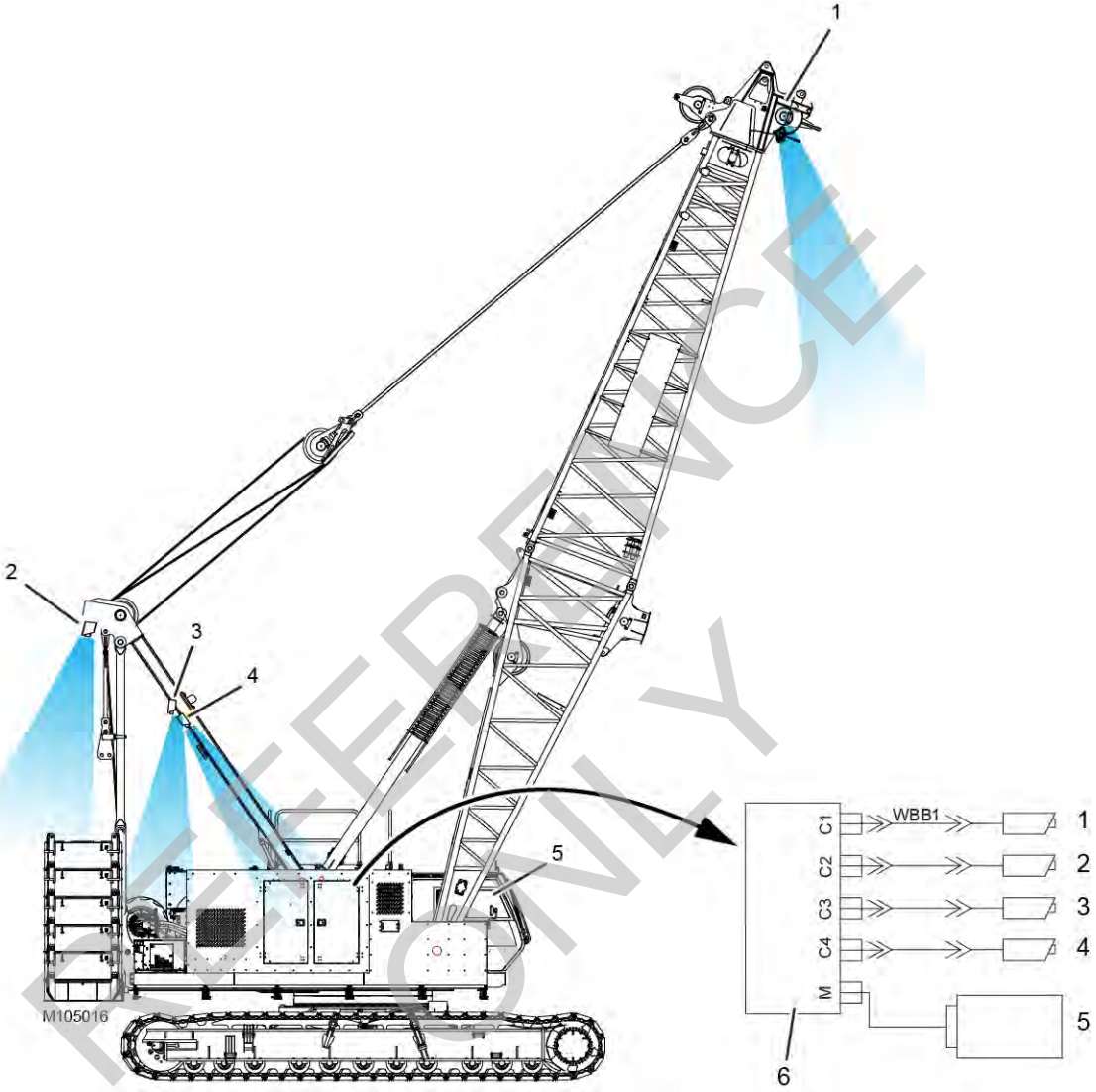
Crane Cameras

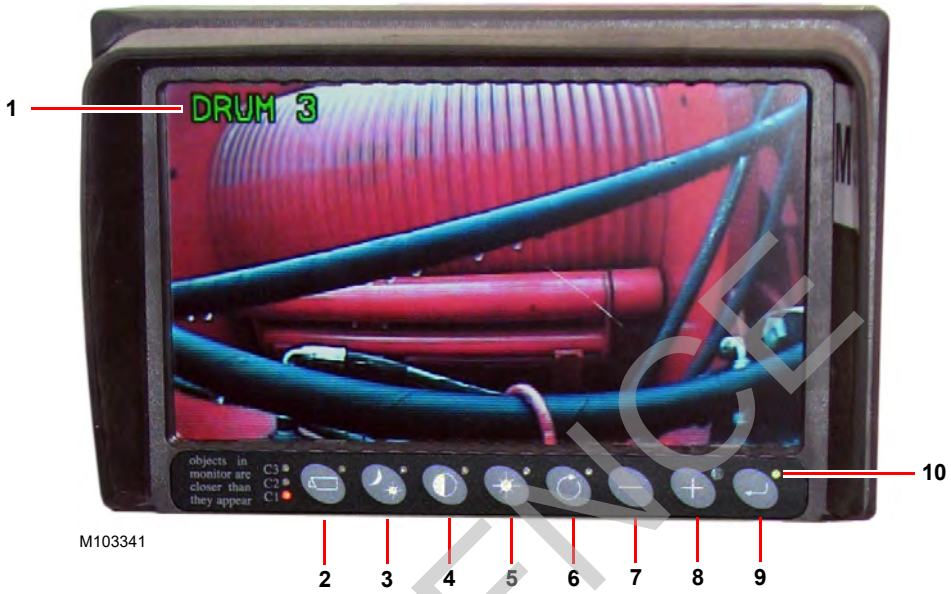
Table 3-9. Crane Camera Locations



Item	Name
1	Camera Points at LOAD from boom point or from jib point
2	Camera Points to REAR (tail swing)
3	Camera Points at DRUM 3/4
4	Camera Points at DRUM 1/2
5	Monitor in Cab (see Table 3-10)
6	Camera Switcher (in left front enclosure)

Crane Camera Monitor

Table 3-10. Camera Monitor Operating Controls

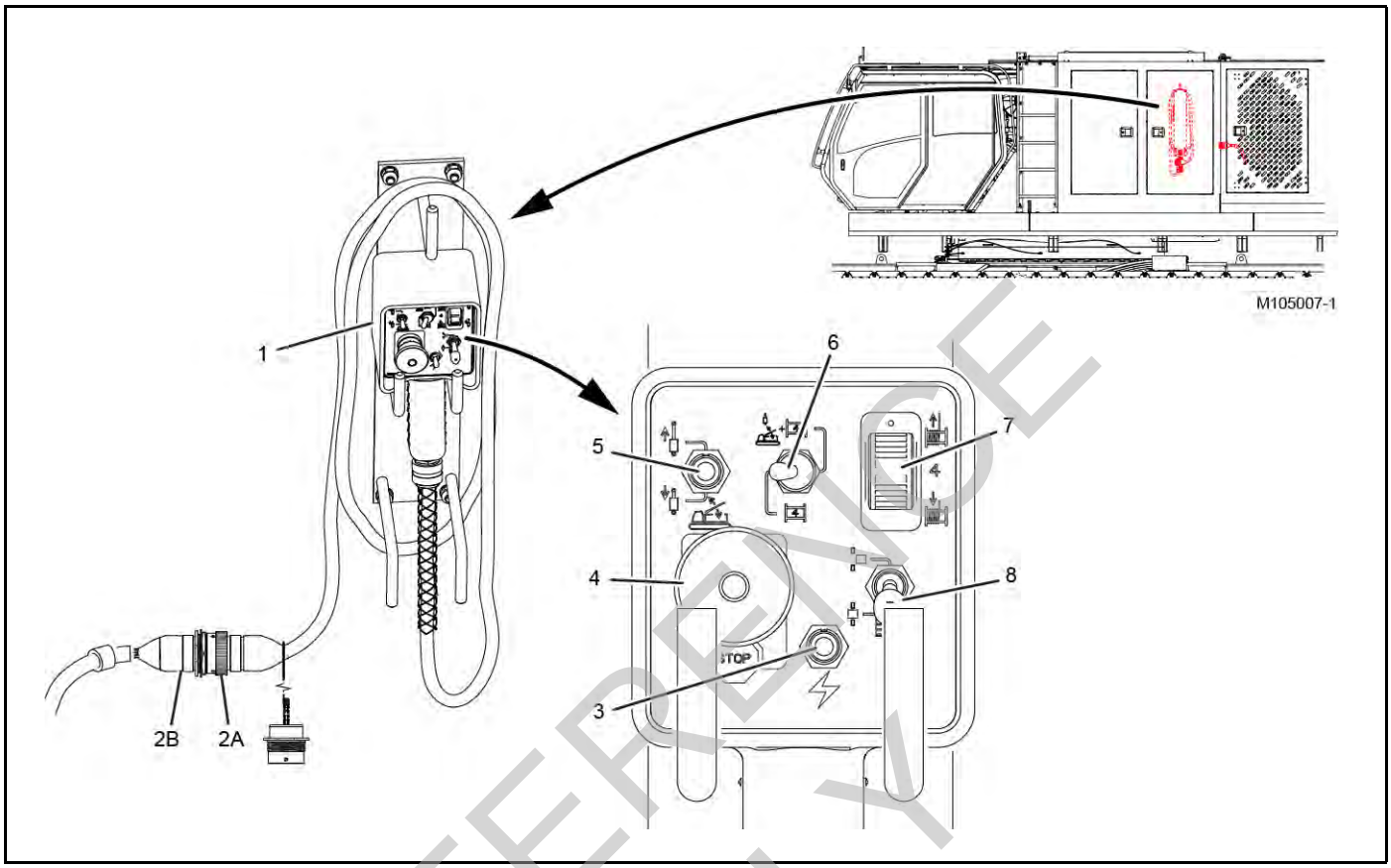


NOTE For detailed information about the camera monitors, refer to the camera manual that is supplied with the crane.

Item	Name	Description
1	Camera label	To change the label (“DRUM 3” in this case), refer to the vendor manual.
2	CAMERA button	After pressing CAMERA, use PLUS or MINUS to select the desired camera.
3	AUTOMATIC BRIGHTNESS button	Press AUTOMATIC BRIGHTNESS. The monitor brightness will adjust automatically to changing light conditions.
4	CONTRAST button	After pressing CONTRAST, use PLUS and MINUS to adjust the monitor contrast.
5	BRIGHTNESS button	After pressing BRIGHTNESS, use PLUS and MINUS to adjust the monitor brightness.
6	OPTION button	Used to go to a previous menu item. Press button for 3 seconds to exit menu screens.
7	MINUS button	After pressing BRIGHTNESS, *decreases* the monitor brightness. After pressing CONTRAST, *decreases* the monitor contrast. In the Operator Menu, go to the *previous* menu option.
8	PLUS button	After pressing BRIGHTNESS, *increases* the monitor brightness. After pressing CONTRAST, *increases* the monitor contrast. In the Operator Menu, go to the *next* menu option.
9	ENTER button	Press once to enter the monitor Operator Menu.
10	Power LED	Glows green when the monitor is powered.

REMOTE CONTROL

Table 3-11. Remote Control Identification and Operation



To operate the hand-held remote control (1):

- The electric cable (2A) must be connected to the receptacle (2B) (WRLI-J1) on the inside of the left-rear enclosure door.
- The Boom Butt Configuration must be selected in the RCL/RCI Display.
- The remote must be turned on in the Main Display Self-Erect Controls Screen. The remote control and the carbody controls cannot be turned on at the same time.

See Section 4 of this manual for Assembly and Disassembly procedures using the remote control (1).

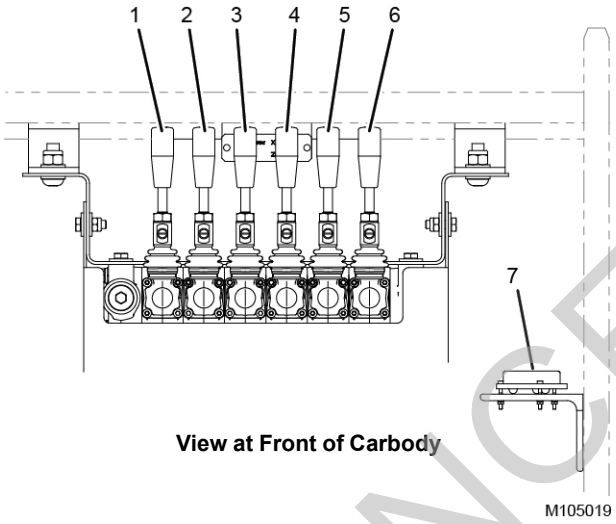
Item	Name	Description
3	Power Toggle	• Push UP and hold to turn ON power to the hand-held remote control. • RELEASE to turn OFF power to the hand-held remote control.
4	Emergency Stop Button	• Press to stop the engine and all remote control functions. • Pull up to restart the engine. ***Only use this button in an emergency because the engine will stop and any function being used will come to an abrupt stop.*** In normal situations, use the ignition switch to stop the engine.
5	Gantry Cylinders Switch	• Push UP and hold to EXTEND the gantry cylinders (raise gantry). • RELEASE to STOP the cylinders. The valves on the cylinders will lock them in position. • Push DOWN and hold to RETRACT the gantry cylinders (lower gantry).

Table 3-11. Remote Control Identification and Operation

6	Sync Switch	This switch allows the gantry raising cylinders to extend and retract automatically in conjunction with the boom hoist when using the Drum 4 (boom hoist) thumb-wheel control (item 5 on remote control). • Push RIGHT to SYNC (synchronize) operation of the gantry cylinders and the boom hoist. Use this position for counterweight installation and removal. This will allow the gantry cylinders to follow along with the gantry as the boom hoist controls gantry raising and lowering. • Push LEFT to turn OFF SYNC. The gantry raising cylinders and the boom hoist are controlled independently of each other. Use this position for all other operations. Refer to Section 4 of the MLC150-1 Operator Manual for detailed instructions on: • Gantry raising and lowering • Counterweight Installation and removal
7	Drum 4 (boom hoist) Thumb-Wheel Control	• Rotate UP to PAY OUT Drum 4 wire rope. Speed is in relation to control movement. • RELEASE to center to STOP Drum 4. The drum brake applies to stop and hold the drum in position. • Rotate DOWN to HAUL IN Drum 4 wire rope. Speed is in relation to control movement.
8	Counterweight Pins Switch	• Pull OUT to UNLOCK the switch. • Push UP and lock to DISENGAGE the counterweight pins. • Push DOWN and lock to ENGAGE the counterweight pins.

CARBODY CONTROLS

Table 3-12. Carbody Controls Identification and Operation



View at Front of Carbody

To operate the carbody controls:

- The Boom Butt Configuration must be selected in the RCL/RCI Display.
- The carbody controls must be turned on in the Main Display Self-Erect Controls Screen. The carbody controls and the remote control cannot be turned on at the same time.

See Section 4 of this manual for Assembly and Disassembly procedures using the carbody controls.

Item	Name	Description
1	Right Front Carbody Jack	• Push the handle toward the carbody to raise the carbody (extend jack). • Release the handle to center to stop the jack. Valves on the jack lock it in position. • Pull the handle away from the carbody to lower the carbody (retract jack).
2	Right Rear Carbody Jack	
5	Left Rear Carbody Jack	
6	Left Front Carbody Jack	
3	Right Crawler Pins	• Push the handle toward the carbody to engage the crawler connecting pins. The crawler locking pins must be installed to lock the connecting pins in the engaged position. • Release the handle to center to stop the pins. • Pull the handle away from the carbody to disengage the crawler connecting pins.
4	Left Crawler Pins	
7	Level	See Crane Levels on page 3-27.

OPERATING LIMITS IDENTIFICATION

The following table lists the operating limits this crane is equipped with and identifies which of those limits are bypassable. When a limit is reached, the operating limit fault is activated and the corresponding fault icon appears in the fault bar of the Main Display Working Screen (see Table 3-14. Operating Limits Description on page 3-36).

Table 3-13 Bypassable Limit Identification

Limit	Bypassable		Bypassable in Luffing Jib Set [1]		Bypassable with External Override Switch [2]
	Non-CE	**CE [3]**	**Non-CE**	**CE [3]**	**CE [3]**
Block Up (each drum)	Yes	Yes [4]	Yes	Yes	No
Boom Max Up	No [5]	No [5]	No	No	No
Counterweight Too High	No	No	No	No	No
Free Fall Lowering Over Speed	No [6]	No [6]	No [6]	No [6]	No
Function Parked	No	No	No	No	No
Invalid Configuration	No	No	No	No	No
Luffing Jib Maximum Up 1	Yes	No	Yes	Yes	No
Luffing Jib Maximum Up 2	Yes [7]	No	Yes [7]	Yes [7]	No
Luffing Jib Maximum Down 1	Yes	No	Yes	Yes	No
Luffing Jib Maximum Down 2 [8]	No	No	No	No	No
Motor Failure	No	No	No	No	No
Operator Out of Seat	No	No	No	No	No
Pawl Engaged	No	No	No	No	No
Rated Capacity Indicator/Limiter	Yes	Yes [7]	Yes	Yes [7]	Yes [9]
Speed Sensor Failure	No [6]	No [6]	No [6]	No [6]	No [6]
Working Range Limiter	No	No	No	No	No

[1] Use only for rigging. See procedure for Bypassing Limits in Luffing Jib Setup Mode on page 3-44.

[2] See RCL/RCI Manual.

[3] CE = Cranes that comply with European requirements. Cranes meeting European requirements are equipped an RCL/RCI External Override Switch located outside the operator cab (see RCL/RCI Manual).

[4] Only if boom or luffing jib is below allowable angle given in Capacity Chart (while raising or lowering boom and luffing jib from or to ground level).

[5] This limit is not active in the boom butt configuration.

[6] Alert only. Does not stop operation.

[7] Only when boom is below 50°.

[8] When this limit is contacted, operation will stop and you will not be able to continue lowering the luffing jib. See Luffing Jib Maximum Down 2 (minimum angle) on page 3-37 for detailed instructions.

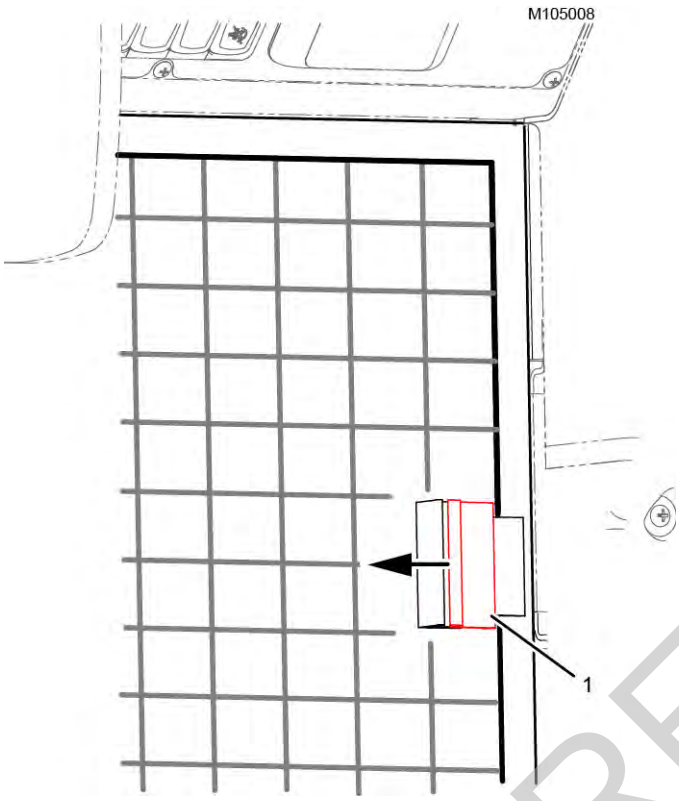
[8] When the external bypass is in override, the speed of the crane functions is limited to 15% of their maximum speed for movements that increase load.

Table 3-14. Operating Limits Description

Operating Limit	Icon
Bail, Minimum This limit stops the corresponding drum from lowering when there are three to four wraps of wire rope remaining on the drum. • The load can be raised after the limit is contacted. • This limit can only be bypassed by disconnecting the electric cable from the limit switch and connecting the shorting plug to the cable end. **WARNING** **Falling Load Hazard!** When lowering a load below the minimum bail limit, do so slowly with extreme caution. Do not lower the load to the point where less than three full wraps of wire rope are on the drum. The wire rope could be pulled out of the drum allowing the load to fall.	 M102775
Block Up This limit stops the boom from lowering and the load drum from hoisting when the load contacts a block-up limit switch. • The load on the corresponding drum can be lowered and the boom can be raised after a block-up limit switch is contacted. **WARNING** **Two-Blocking Hazard!** If it is necessary to hoist a load above the block-up limit, do so slowly with extreme caution to prevent two-blocking. Do not hoist the load above the minimum block clearance given in the Reeving Diagrams in Section 4 of this manual (MLC150-1 Operator Manual). Do not use the limit bypass switch to lower the boom after the block-up limit is contacted, or two-blocking could occur. The load could fall. **CAUTION** **Avoid Boom Damage!** When operating at high boom angles and high load block heights, maintain adequate clearance between the load block and the boom top. If this precaution is not observed, the load block can contact the boom top resulting in damage to the boom top.	 M102773
Boom Max Up This limit stops the boom when it is raised to: • 82° for boom only and boom with fixed jib • 88.5 ° for boom with luffing jib The boom can be lowered after this limit is reached.	 M102777
Counterweight Too High This limit stops Drum 4 if the crane counterweight is raised to high during crane setup. See Section 4 in this manual (MLC150-1 Operator Manual) for counterweight installation instructions.	 M104647

Operating Limit	Icon
Free Fall Lowering Over Speed This limit does not stop operation. It alerts the operator if the load on either Drum 1 or 2 is being lowered faster than 300 rpm, which can result in accelerated wear and shortened service life of the free fall brake.	 M104600
Function Parked This limit prevents the selected crane function from being operated until the park switch is turned off (unparked).	 M102772  M104949
Luffing Jib Maximum Down 1 (minimum working angle) • This programmed limit stops the luffing jib when the boom-to-luffing jib angle is 60°. • The luffing jib can be raised after this limit is reached.	 M102792
Luffing Jib Maximum Down 2 (minimum angle) • A limit switch stops the luffing jib before the boom-to-luffing jib angle is 57°. If this limit is contacted on cranes meeting CE requirements, the luffing jib cannot be raised until the limit is reset. See Resetting Luffing Jib Limits on page 3-45. **WARNING** **Falling Boom/Jib Hazard!** Do not lower the luffing jib below the minimum angle given in the Luffing Jib Raising (and lowering) Procedure chart. Structural damage could result, possibly causing the boom and luffing jib to collapse.	 M102781
Luffing Jib Maximum Up 1 (maximum working angle) • This programmed limit stops the luffing jib when the boom-to-luffing jib angle is 168°. • The luffing jib can be lowered after this limit is reached. The limit bypass switch must be turned to the bypass position to raise the jib an additional 1.5° to the Luffing Jib Maximum Up 2 limit. **WARNING** **Falling Boom/Jib Hazard!** Proceed slowly when operating the luffing jib above the Luffing Jib Maximum Up 1 limit. Do not raise the luffing jib above the Luffing Jib Maximum Up 2 limit. Structural damage will occur, possibly causing the boom and luffing jib to be pulled over backwards.	 M102782
Luffing Jib Maximum Up 2 (maximum angle) • This limit switch stops the luffing jib before the boom-to-luffing jib angle is 169.5°. If this limit is contacted on cranes meeting CE requirements, the luffing jib cannot be raised until the limit is reset. See Resetting Luffing Jib Limits on page 3-45.	 M102783

Operating Limit	Icon
Motor Failure This limit immediately applies the drum brake and prevents further operation of the corresponding hoist in the event of motor failure. Contact the Manitowoc Crane Care Lattice Team for corrective action.	 M104966
Operator Out of Seat This limit prevents the crane functions from being operated when the operator is out of the seat. Sit down in the seat to operate the crane functions.	 M102790
Pawl Engaged This limit prevents the corresponding drum from lowering until the pawl is disengaged from the ratchet. It may be necessary to hoist slightly to fully disengage the pawl.	 M102794
Rated Capacity Limiter This fault is activated for the following conditions. Take immediate corrective action. • Overload • Sensor fault • Out of the capacity chart (a condition that is not covered by the current capacity chart) • Unconfirmed or invalid RCL/RCI configuration.	 M102787
Speed Sensor Fault Does not stop operation. Alerts the operator if a drum speed sensor is not detecting drum rotation. Diagnose the speed sensor failure and replace the sensor or the harness as needed.	 M104967
WRL (working range limit) Boom/Luffing Jib Angle • Operate boom/jib in opposite direction. • Change angle (see the Main Display Operation Manual). • Turn limit off, if desired.	 M104538
WRL Swing Angle • Operate swing in opposite direction. • Change angle (see the Main Display Operation Manual). • Turn limit off, if desired.	 M104539



Item	Description
1	Latch (right-side and roof window)

Figure 3-6. Cab Windows

CAB WINDOW OPERATION

See Figure 3-6.

Opening Windows for Ventilation

The right-side and roof windows can be opened for ventilation as shown.

For non-European cabs only, the roof window can be opened for ventilation in the same manner as the right-side window.

For European cabs, the roof window that cannot be opened.

Exiting Cab in Emergency

If you cannot exit the cab through the sliding door, proceed as follows:

While seated in the cab seat, kick out the front window and exit the cab through the opening. The front window is attached to the cab frame with offset rubber molding that allows the window to be kicked out.

OPERATING IN WIND

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

Do not raise the boom for the purpose of measuring the wind speed with the crane's anemometer.

WARNING

Tipping Crane Hazard

The judgment and experience of qualified operators, job planners, and supervisors shall be used to compensate for the affect of wind on the lifted load and the boom and/or jib by reducing ratings or operating speeds, or a combination of both.

Failing to observe this precaution can cause the crane to tip or the 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.

The wind speed at the boom or jib point can be greater than the 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 the ***wind causes the load to swing forward past the allowable operating radius or sideways past either boom hinge pin***.

For wind conditions specific to this crane, see the Wind Conditions chart at the end of this section or, if applicable, see the wind conditions in the capacity charts provided with the crane and attachment.

CRAWLER BLOCKING

DANGER

Tipping Hazard!

Do not attempt to raise or lower the boom or the boom and jib from or to ground level until the crawlers are blocked, if required. Otherwise, the crane will tip.

To prevent the crane from tipping, some boom and jib lengths require blocked crawlers. See the appropriate Liftcrane Boom or Jib Capacities chart for blocked crawler requirements.

For crawler blocking dimensions and instructions, see the Crawler Blocking topic in the Capacity Chart Information folio located in the Capacity Chart Manual supplied with the crane.

PREPARING CRANE FOR OPERATION

WARNING

Read Capacity Charts

Do not attempt to operate the crane without first reading and understanding the capacity charts located in the Capacity Chart Manual provided with the crane.

The crane must be rigged and operated according to the instructions given in the capacity charts and in Section 4 of the MLC150-1 Operator Manual.

Unless otherwise specified in the capacity charts, all crane operations must be performed with the crane level to within one 1% of grade in all directions — 0,3 m in 30 m (1 ft in 100 ft); otherwise, crane could tip.

Do not operate the crane—including raising the boom from ground level—if the wind speed exceeds the limits given in the capacity charts. Contact your local weather station for the wind velocity in your area.

Failing to comply with the requirements of the capacity charts can result in tipping or structural failure of the boom or jib.

Equipment Failure Hazard

At low ambient temperatures, dynamic loads (impact and shock) can affect the steels used in Manitowoc cranes when operating in cold weather. Read and comply with Cold Weather Operation on page 3-56 before operating the crane.

WARNING

Moving Load Hazard

The operator shall select the proper crane capacity chart in the RCL/RCI Display before operating.

Unexpected drum motion or improper limit responses can result if the wrong capacity chart is selected.

The limit bypass switch shall be in the enable position (on) and all of the limits with which the crane is equipped shall be operational before operating the crane.

Avoid Injuring Personnel in Operating Area

Sound the horn to alert personnel that operation is about to begin.

WARNING

Moving Machinery Hazard

To avoid injuring personnel or damaging the crane and property:

- Do not start the engine if an out-of-order sign or do not operate tag is present at the start controls.
- Check that all controls are off and parked so the crane and load do not move when the engine is started.
- Check that all personnel are clear of the crane before starting the engine. ***Sound horn to alert personnel.***

Engine Explosion Hazard

Do not use starting fluids with this crane's engine. The engine is equipped with an air intake heater. Use of starting fluid can cause an explosion, fire, personal injury, severe damage to the engine and damage to property.

CAUTION

Machinery Damage Hazard

Before operating the crane at the start of each shift:

- Perform the preventative maintenance checks and lubrication requirements listed in Sections 5 and 6 of the this manual (MLC150-1 Operator Manual).
- Adjust the operator's seat. See Seat Controls on page 3-26.

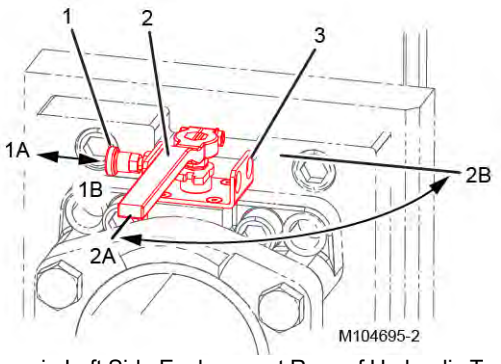
STARTUP PROCEDURES

Read and understand the starting instructions in the engine manufacturer's operation and maintenance manual provided with this crane.

1. If used, unplug or turn off the engine block heater, engine oil pan heater, hydraulic tank heaters, and any other crane heaters.

NOTE Manitowoc recommends the use of the Cold Weather Package to aid startup when the ambient temperature will be 0°C (32°F) and below. See Cold Weather Heaters on page 3-60.

2. Make sure the battery disconnect switch is in the **I** (on) position. The engine will not start if the batteries are disconnected. See Battery Disconnect Switch on page 3-28.



Two Places in Left Side Enclosure at Rear of Hydraulic Tank

Figure 3-7. Hydraulic Tank Shut-Off Valve

Item	Description
1	Locking Knob
1A	Unlock
1B	Lock
2	Shut-Off Valve
2A	Open
2B	Close
3	Padlock Holes (for owner furnished padlock)

CAUTION

Engine Damage!

To avoid possible engine fault codes and undesirable operation, make sure the engine ignition switch has been off five minutes before disconnecting the batteries.

Do not rely on this switch to protect the crane's electronic systems when welding. Disconnect the cables at the batteries before welding

3. Make sure the emergency stop button on the right console and on the setup remote control is UP. The engine will not start if either button is depressed (see Emergency Stop Button on page 3-15).
4. Make sure the hydraulic tank shutoff valve is open as shown in Figure 3-7.

CAUTION

Pump Damage

Do not start the engine until the hydraulic tank shutoff valve is open. Otherwise, the pumps could cavitate and be damaged.

5. Make sure all crane functions are parked.

   The crane is equipped with a hydraulic oil warm-up circuit. The warm-up circuit is activated only if all crane functions are parked. The warm-up circuit stays on until the hydraulic oil temperature reaches 18.3°C (65°F).

   If a function is unparked, the warm-up circuit will deactivate and remain deactivated until all functions are again parked and the hydraulic oil temperature drops below 15.6°C (60°F).

6. Turn the ignition switch to the RUN position.
   - The indicator lights on the RCL/RCI and Main Displays, the operating limit buzzer, and the system fault beeper should come on for 2 to 3 seconds when the ignition switch is in the RUN position; if not, correct the fault as soon as possible.
   - The *WAIT TO START* icon will appear in the Crane Operation Status Bar of the Main Display indicating that the pre-heater is warming the engine's air intake.

     The length of time the wait to start icon remains on depends on ambient temperature. The lower the ambient temperature, the longer the icon will stay on.
7. When the *WAIT TO START* icon turns off, turn the ignition switch to the START position.

CAUTION

Avoid Starter Damage

If the engine does not start after 30 seconds of cranking, wait a few minutes before starting again so the starter motor cools.

8. Once the engine starts, increase engine speed as necessary to keep the engine running.

NOTE You will not be able to increase engine speed until the hydraulic oil temperature is warmed to at least 17°C (63°F).

The hydraulic oil temperature fault will remain on until the hydraulic oil temperature is 17°C (63°F). **There will be no throttle response until this fault is cleared.**

9. Once the engine starts, the Confirmation Screen (Figure 3-8) will appear in the RCL/RCI Display. You must either confirm the current configuration or select a new configuration.

   See the RCL/RCI Operation Manual for detailed instructions.

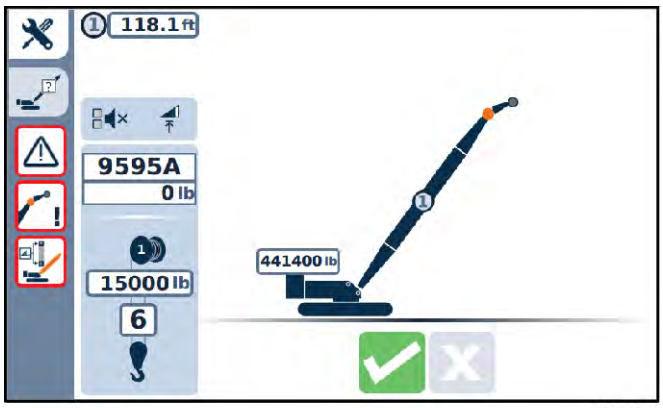


Figure 3-8. RCL/RCI Confirmation Screen

10. Once the engine starts, it is normal for faults to appear in the Alerts Bar of the Main Display Working Screen. The faults should go away as soon as the engine oil pressure and the hydraulic oil temperature rise to normal.

    See the MLC150-1 Main Display Operation Manual for fault identification,

CAUTION

Machinery Damage

Do not operate the crane while faults exist. If the faults do not go away soon after the engine is started, or if any faults come on during operation, immediately proceed as follows:

- Determine fault in the Main Display Working Screen.
- Land loads, if possible, and park all functions.
- Move all control handles to off.
- Stop engine.
- Correct cause of fault.

WARNING

Falling Load Hazard!

Faulty drum operation and possible uncontrolled lowering of the loads can occur if the following step is not performed.

11. ***Warm up the drum circuits during cold weather***. To ensure proper operation of the drums after cold weather startup, slowly operate them in both directions (up and down) several times to flush the control circuits with warm oil.

12. If equipped/required, turn on the work lights. See AC Power Supply on page 3-58.

OPERATING PROCEDURES

NOTE The following operating procedures assume the following:

- Engine is already running.
- The correct capacity chart and crane configuration have been selected in the RCL/RCI Display. For detailed instructions, see the MLC150-1 RCL/RCI Operation Manual.

Boom Hoist Operation

CAUTION

Avoid Boom Stop Damage

Do not lower the boom more than 7° below horizontal. The boom stop tubes will interfere with the front drum frame. Damage can occur.

Avoid Rigging Damage

Check that the boom hoist wire rope is reeved through all sheaves and spooled properly onto Drum 4 before raising the boom from the ground.

- For wire rope and reeving specifications, see the Boom Rigging Drawing in Section 4 of the MLC150-1 Operator Manual.
- For instructions on attaching the wire rope to boom hoist drum, see the Wire Rope Installation topic in Section 4 of the MLC150-1 Operator Manual.

Avoid Boom Damage

When operating at high boom angles and high load block heights, maintain adequate clearance between the load block and the boom top. If this precaution is not observed, the load block can contact the boom top resulting in damage to the boom top.

NOTE The location of the boom hoist control handle can vary depending on whether or not the crane is equipped with a luffing jib. For Drum and Control Handle Identification, see Figure 3-1 on page 17.

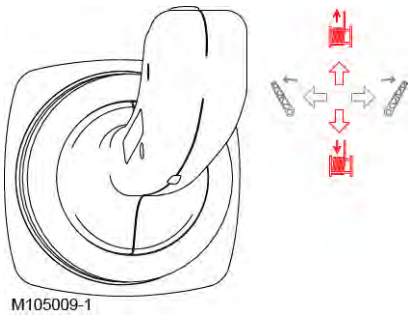


Figure 3-9. Boom or Luffing Jib Control Handle

1. Adjust boom hoist (Drum 4) speed to meet operator need.

   Speed can be adjusted between 25% and 100%. See the Speed and Torque Setting Screen topic in the MLC150-1 Main Display Operation Manual for detailed instructions.

2. Make sure the boom maximum up limit is set at the proper angle:

   - 82° for boom only and boom with fixed jib
   - 88.5 ° for boom with luffing jib

   For detailed instructions, see the Automatic Boom Stop Adjustment topic in Section 4 of the MLC150-1 Service Manual.

3. Unpark the boom hoist. It may be necessary to raise the boom slightly to disengage the boom hoist pawl.

   Reminder: the boom hoist can be parked either with the switch on the right control console or in the Speed and Torque Setting Screen of the Main Display

CAUTION

Avoid Boom Damage

Do not park the boom hoist while raising or lowering the boom. The brake will bring the boom to an abrupt stop. This action could cause shock load damage to the boom and load line. Bring the boom to a smooth stop with the control handle and then park the boom hoist.

4. Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase the engine speed when more power is required.

5. Pull the boom control handle (Figure 3-9) BACK from off to RAISE the boom or push the boom control handle FORWARD from off to LOWER the boom.

   The boom hoist brake will release and speed will increase/decrease in relation to control handle movement.

WARNING

Avoid Two-Blocking Hazard

Pay out the load lines while lowering the boom. The load may contact the boom point or jib point sheaves if this step is not taken. The wire rope or other parts could break, allowing the load to fall.

6. As the boom nears the desired angle, slowly move the boom control handle toward off to decrease speed.

   Then, move the control handle to off to stop the boom when it reaches the desired angle. The boom hoist brake will apply to hold the boom in position.

7. Besides the boom maximum up limit, a physical boom stop is provided. The physical boom stop serves the following purposes:

   - It cushions boom raising between approximately 59.1° and the boom maximum up limit.
   - It provides a physical stop at 89.9°.

8. To hold the boom in position for long periods, turn park the boom hoist. The boom hoist pawl will engage.

Luffing Hoist Operation

WARNING

Avoid Death or Serious Injury

Read and understand the instructions in the Luffing Jib Operator Manual and the Luffing Jib Raising Procedure chart in the Luffing Jib Capacity Chart Manual before attempting to raise or lower the luffing jib from or to the ground.

Use extreme care when operating the luffing hoist and the boom hoist at the same time. The maximum or minimum operating radius will be reached quickly when operating both hoists at the same time.

CAUTION

Avoid Rigging Damage

Check that the luffing hoist wire rope is reeved through all sheaves and spooled properly onto the luffing hoist drum before raising the boom and luffing jib from the ground.

- For wire rope and reeving specifications, see the Luffing Jib Rigging Drawing in the MLC150-1 Luffing Jib Operator Manual.
- For instructions on attaching wire rope to the luffing hoist drum, see the Wire Rope Installation topic in Section 4 of MLC150-1 Operator Manual.

NOTE The location of the boom hoist and luffing hoist control handles vary when the crane is equipped with a luffing jib. For Drum and Control Handle Identification, see Figure 3-1 on page 17.

The crane's control system will not allow Drum 2 to be enabled for free fall when the RCL/RCI is configured for luffing jib operation. Make sure the free fall selector valve handle for Drum 2 is in the off position (see Figure 3-15 on page 48).

1. Adjust luffing hoist (Drum 2) speed to meet operator need.

   Speed can be adjusted between 25% and 100%. See the Speed and Torque Settings Screen topic in the MLC150-1 Main Display Operation Manual for detailed instructions.

2. Make sure the boom maximum up limit is set at the proper angle:
   - 82° for boom only and boom with fixed jib
   - 88.5 ° for boom with luffing jib

   For detailed instructions, see the Automatic Boom Stop Adjustment topic in Section 4 of the MLC150-1 Service Manual.

3. Make sure the automatic jib stops are set at the proper angles. For detailed instructions, see the Automatic Jib Stop Adjustment topic in Section 6 of the MLC150-1 Luffing Jib Operator Manual.

4. Unpark the luffing hoist. It may be necessary to raise the luffing jib slightly to disengage the luffing hoist pawl.

   Reminder: the luffing hoist can be parked either with the switch on the right control console or in the Speed and Torque Setting Screen of the Main Display.

CAUTION

Avoid Boom or Luffing Jib Damage

Do not park the luffing hoist while raising or lowering the luffing jib. The brake will bring the luffing jib to an abrupt stop. This action could cause shock load damage to the boom and jib. Bring the luffing jib to a smooth stop with the control handle and then park the luffing hoist.

5. Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase the engine speed when more power is required.

6. Pull the luffing jib control handle (Figure 3-9) BACK from off to RAISE the luffing jib.

   Push the luffing jib control handle FORWARD from off to LOWER the luffing jib.

WARNING

Avoid Two-Blocking Hazard

Pay out the load lines while lowering the luffing jib. The load may contact the jib point sheaves if this step is not taken. The wire rope or other parts could break, allowing the load to fall.

7. As the luffing jib nears the desired angle, slowly move the luffing jib control handle toward off to decrease speed.

   Then, move the control handle to off to stop the luffing jib when it reaches the desired angle. The luffing hoist brake will apply to hold the jib in position.

8. To hold the luffing jib in position for long periods, park the luffing hoist. The luffing hoist pawl will engage.

Bypassing Limits in Luffing Jib Setup Mode

See Figure 3-10.

1. Go to the Luffing Jib Setup Screen (1) in the Main Display.

   See the MLC150-1 Main Display Operation Manual for detailed instructions.

2. Turn the luffing jib setup mode ON (2).

   The luffing jib setup icon (3) in the Status Bar of the Main Display will turn orange.

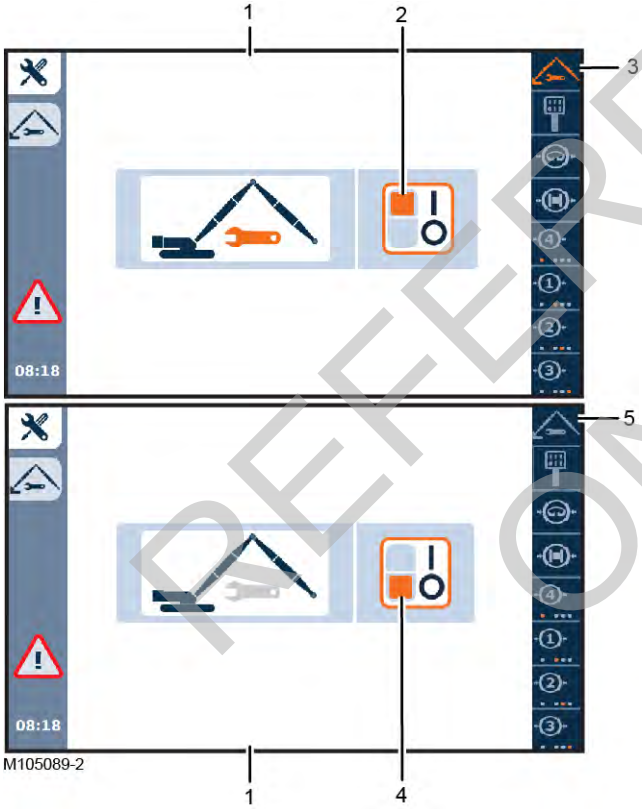
3. Rotate the limit bypass key switch (page 3-15) CLOCKWISE and release it. The limits will remain bypassed for 10 seconds.

4. Move the desired control handle (luffing hoist, boom hoist, load drum) in the required direction. The limits will remain bypassed for as long as the control handle is moved in either direction.

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

6. Turn the luffing jib setup mode OFF (4) for normal operation when done with luffing jib setup.

   The luffing jib setup icon (5) in the Status Bar of the Main Display will turn light blue.



Item	Identification
1	Luffing Jib Setup Screen
2	ON
3	Luffing Jib Setup Icon ON
4	OFF
5	Luffing Jib Setup Icon OFF

Figure 3-10. Luffing Jib Setup Mode

Resetting Luffing Jib Limits

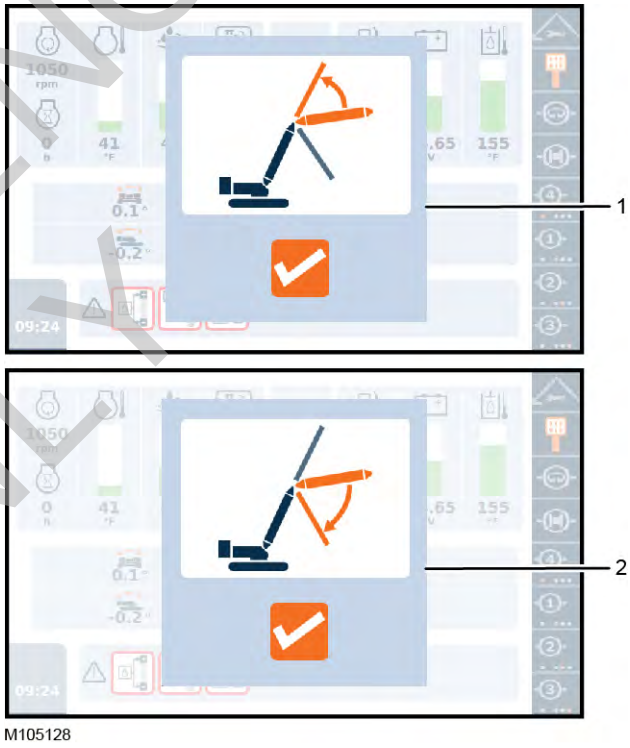
See Figure 3-11.

This procedure applies only to cranes meeting CE requirements.

If the Luffing Jib Maximum Up 2 limit or the Luffing Jib Maximum Down 2 limit is contacted, operation will stop and the jib up prompt (1) or the jib down prompt (2) will appear in the Main Display.

If either prompt appears:

1. Release the control handle to off.
2. To reset the limit, press the OK key either on the main display or the jog dial.
3. The prompt will go off and you will be able to operate the luffing jib in the opposite direction, down or up.



Drum	Description
1	Jib Up Prompt
2	Jib Down Prompt

Figure 3-11. Resetting Luffing Jib Limits

Swing Operation

WARNING

Tipping Hazard

To prevent the crane from tipping, adhere to any swing limitations given in the capacity chart.

DANGER

Moving Crane Hazard

The counterweights can strike personnel in the area of the swing path! Warn personnel to stay clear of the swing path. Sound the horn prior to swinging.

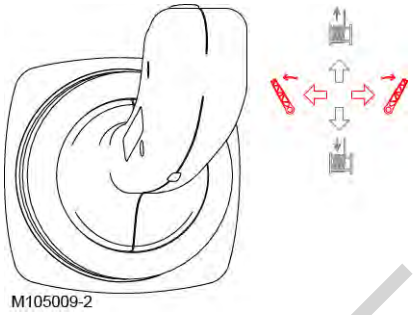


Figure 3-12. Swing (and Boom or Luffing Jib) Control Handle

1. Adjust swing speed to meet operator need.

   Speed and torque can be adjusted between 25% and 100%. See the Speed and Torque Setting Screen topic in the MLC150-1 Main Display Operation Manual for detailed instructions.

2. Unpark swing.

CAUTION

Avoid Boom/Swing Drive Damage

Do not park swing while swinging. The brake will bring the rotating bed to an abrupt stop. This action could cause damage to the boom and jib from side loading or damage to the swing drive from shock loading.

Bring the rotating bed to a smooth stop with the swing control handle and then apply the swing holding brake or park swing.

3. Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase the engine speed when more power is required.
4. Move the swing control handle (Figure 3-12) to the LEFT from off to SWING LEFT or move the swing control handle to the RIGHT from off to SWING RIGHT.

   Speed will increase/decrease in relation to control handle movement.
5. Start the swing motion with a smooth acceleration. Continue control handle motion to swing at the desired speed.
6. Stop swinging by releasing the swing control handle to OFF. Swing speed will decrease to off and the rotating bed will coast to a stop.

   If a faster stop is desired, move the swing control handle past OFF to the opposite swing direction.
7. Once the rotating bed stops, depress the button on the control handle to apply the swing holding brake to hold the rotating bed in position for short periods during the operating cycle.
8. To hold the rotating bed in position for long periods, park swing.

Load Drum Operation—Liftcrane Full Power

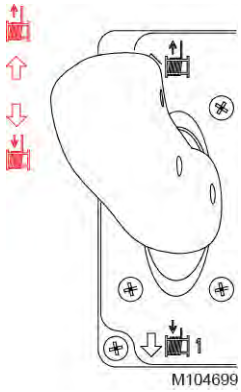
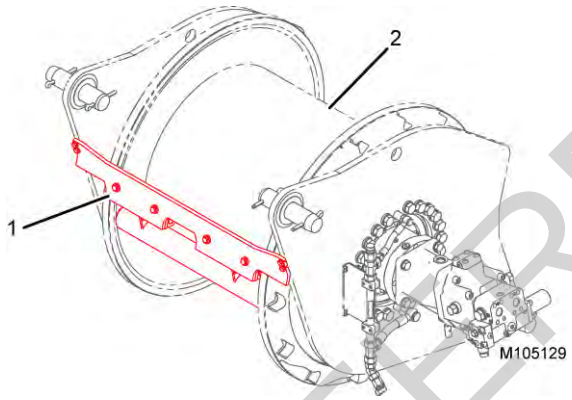


Figure 3-13. Load Drum Control Handle



Drum	Description
1	Pressure Roller
2	Load Drum: Front and Rear with or without Free

Figure 3-14. Load Drum Pressure Roller

WARNING

Falling Load Hazard

Prevent the load on unused drums from falling. Turn on the drum park switch for drums not in use.

WARNING

Avoid Pressure Roller/Drum Damage

Remove the pressure roller (1, Figure 3-14) from the front and rear drums for liftcrane operation if the drums will be operated with more than three layers of wire rope.

1. If required, remove the pressure roller (1, Figure 3-14) from the front and rear drums. For instructions, See Section 5 of the MLC150-1 Service Manual.
2. Adjust load drum speed to meet operator need.

   Speed can be adjusted between 25% and 100%. See the Speed and Torque Setting Screen topic in the MLC150-1 Main Display Operation Manual for detailed instructions.
3. Unpark the load drum to be operated.

CAUTION

Avoid Boom Damage

Do not park a load drum while raising or lowering the load. The brake will bring the load to an abrupt stop. This action could cause shock load damage to the boom/jib and load line.

Bring the load to a smooth stop with the drum control handle and then park the load drum.

4. Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase the engine speed when more power is required.

CAUTION

Avoid Boom Damage

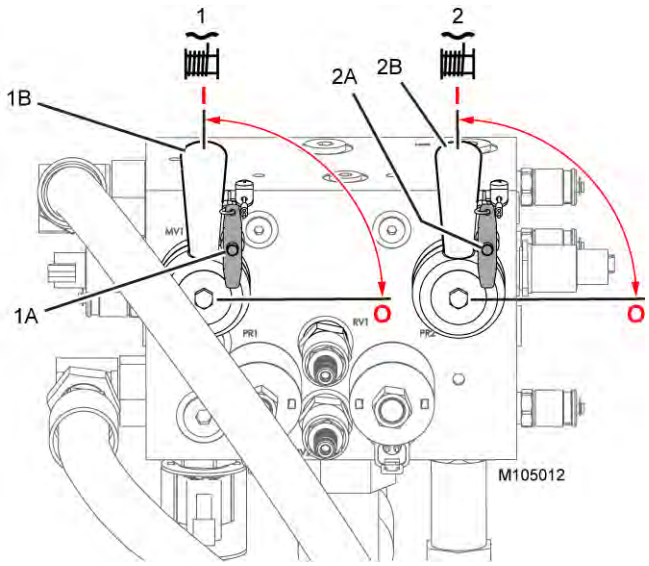
When operating at high boom angles and high load block heights, maintain adequate clearance between the load block and the boom top. If this precaution is not observed, the load block can contact the boom top resulting in damage to the boom top.

5. Pull the drum control handle (Figure 3-13) BACK from OFF to RAISE the load or push the drum control handle FORWARD from OFF to LOWER the load.

   The drum brake will release and speed will increase/decrease in relation to control handle movement.
6. As the load nears the desired position, slowly move the drum control handle toward OFF to slow down the load.
7. Then release the control handle to OFF to stop the load when it reaches the desired position. The drum brake will apply to hold the load in position.
8. To hold the load in position for long periods, park the corresponding load drum.

Load Drum Operation—Liftcrane Free Fall

Left Side Enclosure Near Pumps



Item	Description
1A	Drum 1 Locking Pin
1A	Drum 1 Free Fall Selector Valve Handle
2A	Drum 2 Locking Pin
2B	Drum 2 Free Fall Selector Valve Handle
O	Off
I	On

Figure 3-15. Free Fall Selector Valves

1. If required, remove the pressure roller from the front and rear drums. For instructions, see Section 5 of the MLC150-1 Service Manual.
2. To turn on free fall for the desired load drum:

NOTE The crane's control system will not allow Drum 2 to be enabled for free fall if the RCL/RCI is configured for luffing jib operation.

   a. Park the load drum.

   b. Latch down the free fall brake pedal. This will close a safety switch to allow free fall to be enabled.

   See page 3-25 for operation of the brake pedals.

   Free fall cannot be turned on until the free fall brake pedal is latched down. If the pedal is not latched down, the free fall "pedal not latched" icon will appear in the Free Fall Enable Screen of the main display.

   Depress the button on the locking pin, and pull out the locking pin (1A or 2A, Figure 3-15) for the drum to be operated.

   c. Rotate the corresponding free fall selector valve handle (1B or 2B, Figure 3-15) to the ON (**I**) position.

   Leave the Drum 2 free fall selector valve handle in the off position (**O**) if the crane will be configure for luffing jib operation.

   d. Reinstall the locking pin (1A or 2A, Figure 3-15).

   e. Unpark the load drum.

   Free fall cannot be turned on until the drum is unparked. If the drum is not unparked, the "function parked" icon will appear in the Free Fall Enable Screen of the main display.

   f. Turn on free fall for the corresponding drum using the free fall enable switch on the right console (see page 3-15).

   The free fall icon for Drum 1, Drum 2, or both drums will appear in the Crane Operation Status Bar of the main display.

CAUTION

Avoid Boom Damage

Do not park a load drum while raising or lowering a load; the brake will bring the load to an abrupt stop. This action could cause shock load damage to the boom/jib and the load line. Bring the load to a smooth stop with the drum control handle and then park the drum.

3. Increase the engine speed to the desired RPM with the hand throttle. Press the foot throttle to momentarily increase the engine speed when more power is required.

CAUTION

Avoid Boom Damage

When operating at high boom angles and high load block heights, maintain adequate clearance between the load block and the boom top. If this precaution is not observed, the load block can contact the boom top resulting in damage to the boom top.

4. To raise the load, leave the free fall brake pedal latched down and pull the corresponding drum control handle back from off. The drum brake will release and the load will rise under hydraulic power at a speed in relation to handle movement.

   As the load nears the desired position, slowly move the drum control handle toward off to slow down the load. Then release the drum control handle to off to stop the load. The drum brake will apply to hold the load in position.

WARNING

Falling Load Hazard

When operating in free fall, the load will lower uncontrolled if the free fall brake pedal is not applied when the drum handle is released to off (center).

When operating either drum in free fall, do not exceed 300 rpm free fall lowering speed.

Exceeding this limit is not recommended and can result in accelerated wear and reduced free fall brake life. The brake could slip allowing the load to lower uncontrolled.

WARNING

Falling Load Hazard

Free fall operation is limited to 6 710 kg (14,800 lb) per part of line when lowering a load with the free fall clutch/brake pedal. Hydraulic power shall be used for full line pull. Permanent brake damage could occur, allowing the load to lower uncontrolled.

5. The load can be lowered in one of two ways — with the free brake pedal or with hydraulic power.

   a. ***To lower a load with the free fall brake pedal —*** leave the drum control handle in off (center) and slowly release the free fall brake pedal to lower the load at the desired speed.

      When free falling a load, the corresponding free fall icon will appear in the Crane Operation Status Bar of the main display.

      As the load nears the desired position, increase foot pressure on the free fall brake pedal to slow down the load. Then fully apply the brake to stop the load and hold it in position.

      Alternatively, pull the corresponding drum control handle back from off to slow down the load. When the load stops moving, the hoist will automatically transition to power raising.

      Be aware that if the free fall brake pedal is fully released when the drum control handle is moved to off, the load will begin to lower uncontrollably. Be sure to latch down the free fall brake pedal before moving the drum control handle to off.

      Drum slip and brake pedal response can be adjusted to meet operator need. See Free Fall Drum Slip and Pedal Response.

   b. ***To lower a load with hydraulic power —*** with the desired free fall brake pedal latched down, push the corresponding drum control handle forward from off. The drum brake will release and the load will lower under hydraulic power at a speed in relation to handle movement.

      As the load nears the desired position, slowly move the drum control handle toward off to slow down the load. Then release the drum control handle to off to stop the load. The drum brake will apply to hold the load in position.

6. If the load will be suspended for any length of time, latch down the free fall brake pedal and park the drum.

NOTE The drum brakes will apply and free fall for both drums will turn off automatically (and have to be turned back on) if:

- The engine is stopped (or power is lost for any reason)
- When applicable operating limits are reached
- When applicable system faults occur
- When the drum park switches are moved to the park position
- The operator gets out of the seat

7. To turn off free fall for the desired drum:

   a. Latch down the desired brake pedal.

   b. Turn off free fall for the corresponding drum using the free fall enable switch on the right console (see page 3-15).

      The corresponding free fall drum icon will disappear from the Crane Operation Status Bar of the main display.

   c. Park the drum.

   d. Depress the locking pin button, and pull out the desired locking pin (1A or 2A, Figure 3-15).

   e. Rotate the corresponding free fall selector valve handle (1B or 2B, Figure 3-15) to the OFF (**O**) position.

   f. Reinstall the locking pin (1A or 2A, Figure 3-15).

Free Fall Drum Slip and Pedal Response

Two free fall adjustments can be made for each drum: drum slip and pedal response.

To adjust drum slip and pedal response, see the MLC150-1 Main Display Manual.

Drum slip can be adjusted to meet the type of operation being performed:

- For most operations (such as liftcrane), 100% slip should be selected so that the load line pays out freely when a load is lowered with the brake pedal.
- For applications like pile driving, adjust slip so the hammer follows the pile at the desired rate of speed (load line pays out automatically without having to use the brake pedal).

The corresponding free fall brake pedal can be applied to stop the drum regardless of the slip adjustment. Likewise, the corresponding drum control handle can be pulled back or pushed forward to hoist or lower the load with hydraulic power.

Pedal response can be adjusted to suit operator feel. A high setting increases the free fall brake pedal movement required to control a small load and decreases the free fall brake pedal movement required to control a heavy load.

Load Drum Operation—Clamshell

For clamshell operation, the crane must be equipped with Drums 1 and 2:

- Drum 1 is the closing line
- Drum 2 is the holding line

NOTE The parking brakes for Drums 1 and 2 are released at all times when operating in the Clamshell Mode. Some creeping down of the holding and closing lines is normal when the drums are not being used (handles in off). Turn on the drum park switches for Drums 1 and 2 when not actively operating in the Clamshell Mode to prevent the bucket from creeping down.

Preparing For Clamshell Operation

1. To ensure proper wire rope spooling, install the pressure roller (1, Figure 3-14 on page 47) on the front and rear drum. For instructions, See Section 5 of the MLC150-1 Service Manual.
2. Select the desired Clamshell/Duty Cycle Capacity Chart in RCL/RCI display.
3. Enable the clamshell mode in the Main Display. This step can only be performed after the capacity chart is selected in step 2.
4. Unpark both drums.
5. Set engine speed at high Idle to provide smooth operation and maximum production.
6. The clam closing pressure is set automatically.

Clamshell Operation In Full-Power

Perform Preparing for Clam Operation steps. Then proceed as follows:

CLOSING BUCKET (Digging)

1. Lower the bucket into the digging area.
2. Pull back the closing line handle to close the bucket. The holding line will pay out automatically allowing the bucket to dig in as it closes.
3. Release the closing line handle to off when the bucket is fully closed.

NOTE Use care when digging in a blind area. The bucket is closed when the holding line starts to slacken.

RAISING BUCKET

1. Pull the holding line handle back to raise the bucket at the desired speed.
2. Swing to the dumping area as the bucket rises.
3. Release the holding line handle to off when the bucket is at the desired height.

DUMPING BUCKET

1. Push the closing line handle forward to dump the bucket at the desired speed.
2. Release the closing line handle to off as soon as the bucket is empty and fully open.

   Use care not to slacken the closing line while dumping. Any slack in the closing line will have to be taken out while digging. This action will slow down the clam cycle.

LOWERING BUCKET

1. Push the holding line handle forward to lower the bucket at the desired speed.
2. Control the lowering speed by slowly moving the holding line handle toward off.

NOTE Lowering speed is controlled by handle movement. It is not necessary to apply the working brakes to slow down the bucket during full-power clamshell operation.

3. Swing back to the digging area as the bucket lowers.
4. Stop swinging when the bucket lands in the digging area.
5. The bucket will stop lowering automatically when it contacts ground.
6. Release the holding line handle to off.
7. Repeat the clam cycle.

NOTE Clamshell operation can also be performed with free fall enabled for both drums.

With clamshell enabled, the free fall brakes will release only when the closing line handle is pushed forward. The free fall brakes for both drums are

released at this time. Full power dumping of the bucket is not possible with free fall enabled.

If the holding line is operated in free fall, the closing line must also be operated in free fall; otherwise, the closing line will not keep up with the holding line and the bucket will close while lowering.

Travel Operation

WARNING

Tipping Hazard

The travel surface must be firm and uniformly supporting.

Refer to the Maximum Allowable Travel Specifications chart in the Capacity Chart Manual for:

- Travel specifications with load
- Travel specifications without load

Failure to comply with the Maximum Allowable Travel Specifications can result in tipping.

Moving Crane Hazard

Know the position of the rotating bed with relation to the front of the carbody before traveling. An accident can result if the crane travels opposite of the intended direction.

- The boom is at the FRONT of the rotating bed.
- A red painted arrow (Figure 3-18) on the front or the carbody indicates the FRONT of the carbody.

Flying Object Hazard

Excessive dirt build-up at the tumbler and the roller ends of crawlers can result in excessive tension in tread connectors. The tread connectors can break if over tensioned, causing the treads to fly apart unexpectedly with dangerous force.

CAUTION

Boom Damage

Abrupt travel operation could result in shock loading to the boo/jib and rigging. To avoid this, perform all travel functions—starting, turning, stopping—slowly and smoothly.

Accelerated Crawler Wear

To reduce the wear and tear of the crawler components (treads, rollers, frames), try not to allow dirt to pile up at the tumbler and the roller ends of the crawlers.

Dirt can pile up when turning on soft surfaces. To avoid this:

- Bring the crawlers to a complete stop before changing the direction of travel.
- Turn a few degrees. Then slowly travel forward or reverse so dirt falls away from the crawlers. Continue this procedure until the desired turn has been made.
- Avoid sharp turns if possible.
- Make gradual turns or counter-rotate whenever possible so both crawlers are always powered.
- Clean the crawlers often.
- Keep the crawler treads properly adjusted.

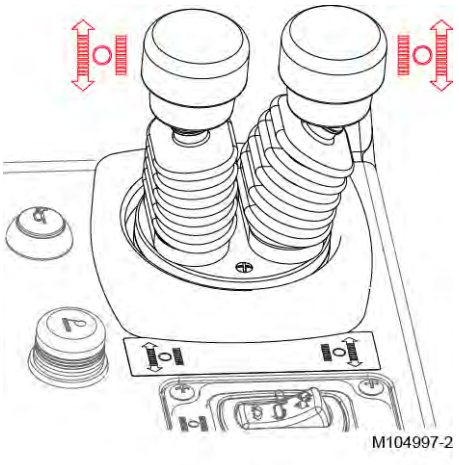


Figure 3-16. Crawler Handles

1. Before traveling:
   - Check for travel restrictions. See the Maximum Allowable Travel Specifications chart in the Capacity Chart Manual.
   - Plan the travel route. It must be firm, level, and free of obstructions. Do not exceed the grades specified in the Maximum Allowable Travel Specifications chart.
   - Check the crawlers for proper adjustment.
   - Warn personnel to stand clear of the travel area. ***Do not travel without a signal person***.
2. Unpark travel.

CAUTION

Avoid Boom Damage

Do not park travel while traveling. The brakes will bring the crane to an abrupt stop. This action could cause shock load damage to the boom/jib and the load line.

Bring the crane to a smooth stop with the travel control handles and then park travel.

1. When ***traveling with load***, position the boom at or above the boom angle given in the Maximum Allowable Travel Specifications chart.

   When ***traveling with load***, carry the load as close to the ground as possible. Stabilize the load with taglines.

   For ***traveling without load***, carry the load block and weight ball low enough that they cannot swing into the boom or jib. If desired, tie off the load block at the front of the rotating bed. Position the boom as specified in the Maximum Allowable Travel Specifications chart.
2. Increase the engine speed to the desired RPM with the hand throttle. When more power is needed, depress the foot throttle to momentarily increase the engine speed.
3. Travel speed can be adjusted between 25% and 100% to meet operator need. See the Speed and Torque Setting Screen topic in the MLC150-1 Main Display Operation Manual for detailed instructions.
4. Select the desired travel speed—low or high—using the switch on the right console.

NOTE The following directions of travel are with the front of the rotating bed and the front of carbody facing the same direction.

If the front of the rotating bed and the front of the carbody face in opposite directions, the crane will travel in the direction opposite of control handle movement.

Travel cruise can be turned on once the crane is being traveled in the desired direction (see Crawler Handles on page 3-19).

When either crawler control handle is moved in either direction from off, the corresponding travel brake releases and speed increases/decreases in relation to control handle movement.

CAUTION

Avoid Travel Damage

The maximum allowed travel drive temperature is 110°C (230°F). If the duration of crane travel exceeds 3 hours within an 8-hour period, then the travel drive temperature must be monitored. The temperature is to be measured on the travel final drive cover (Figure 3-17). Do not exceed 110°C (230°F) at the travel final drive cover. Halt travel if the temperature approaches 110°C (230°F). Allow travel drive to cool prior to resuming travel. Continue to monitor the travel drive temperature when travel is resumed.

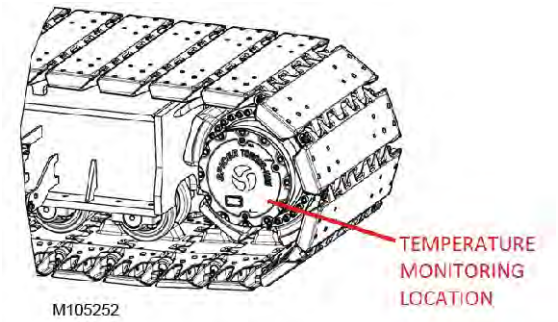


Figure 3-17. Travel Cover Temperature

5. To TRAVEL STRAIGHT (Figure 3-18), move both of the crawler handles the same amount in the desired direction from the neutral position.

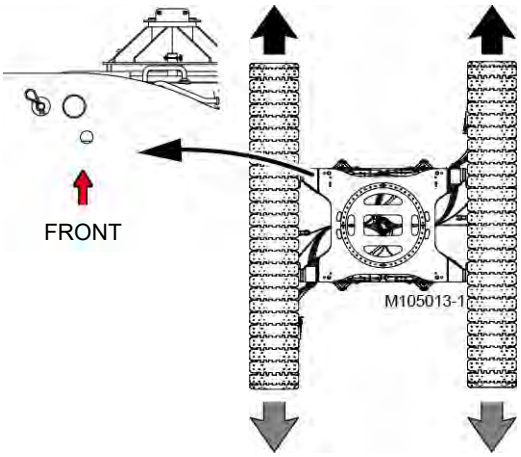


Figure 3-18. Travel Straight

6. To make a SHARP LEFT TURN (Figure 3-19), move the right crawler control handle forward from the neutral position and leave the left crawler control handle in the neutral position. The crane will pivot about the left crawler.

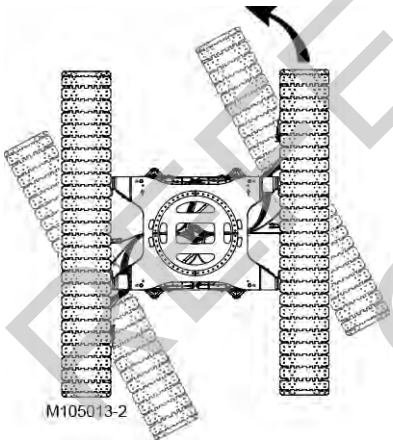


Figure 3-19. Travel Left (sharp turn)

7. To make a SHARP RIGHT TURN, move the left crawler control handle forward from the neutral position and leave the right crawler control handle in the neutral position. The crane will pivot about the right crawler.

8. To make a GRADUAL LEFT TURN (Figure 3-20), move both crawler handles forward from the neutral position. Move the right crawler control handle farther forward than the left crawler handle. The right crawler will turn faster than left crawler.

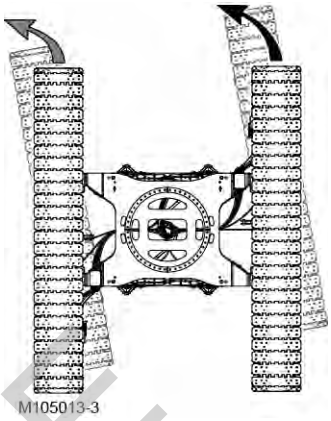


Figure 3-20. Travel Left (gradual turn)

9. To make a GRADUAL RIGHT TURN, move both crawler handles forward from the neutral position. Move the left crawler control handle farther forward than the right crawler handle. The left crawler will turn faster than right crawler.

10. To COUNTER-ROTATE LEFT (Figure 3-21), move the right crawler control handle forward from the neutral position and move left crawler control handle reward from the neutral position.

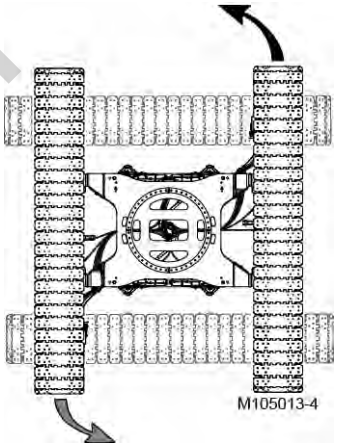


Figure 3-21. Counter-Rotate Left

11. To COUNTER-ROTATE RIGHT, move the left crawler control handle forward from the neutral position and move right crawler control handle reward from the neutral position.

12. Slowly move both crawler handles to the neutral position to stop traveling. The travel brakes will apply to hold the crane in position.

13. When finished traveling, park the travel function.

SHUTDOWN PROCEDURE OR LEAVING THE CRANE UNATTENDED

WARNING

Moving Load/Tipping Crane Hazard

The operator shall not leave the operator cab until the crane, loads, and boom have been secured against movement.

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

1. Travel the crane onto a level surface. ***Do not leave the crane unattended on a grade***.
2. Park travel.
3. Swing the rotating bed to the desired position. Then park swing.
4. Lower all loads to the ground.
5. Park each load drum.
6. If possible, lower the boom and jib (if equipped) onto blocking at ground level.

   If the boom cannot be lowered, as determined by a qualified designated person, it must be securely fastened from movement by the wind or other outside forces.

   Refer to the wind conditions in the Wind Conditions chart for operating restrictions under various wind conditions.

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

7. Park the boom hoist and, if equipped, the luffing hoist.
8. Check that all the control handles are in the off position.
9. Decrease engine speed to idle. Allow the engine to idle for three to five minutes so it cools evenly.
10. Stop the engine.
11. Remove all keys from the cab to prevent unauthorized operation.
12. Lock the operator cab windows and door to prevent unauthorized entry.

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COLD WEATHER OPERATION

Also see AC Power Supply on page 3-58.

Crane Limitations

The static load-carrying limitations of the steels used in Manitowoc cranes are not affected by cold weather. Manitowoc's capacity charts are acceptable for use in cold weather.

However, dynamic loads (impact and shock) can affect the steels used in Manitowoc cranes when operating in cold weather. Dynamic loads are created by traveling, sudden application and release of load, and duty-cycle operations.

DANGER

Injury and Equipment Failure Hazard

At low ambient temperatures, dynamic loads (impact and shock) can result in structural failure leading to serious injury or death.

When operating in ambient temperatures of:

–20 to –30°C (–5 to –22°F):

- Avoid impact or shock-loading of the crane and any attachment.
- Conduct operations with regard to potential failure of hydraulic components.

–31 to –40°C (–23 to –40°F):

- De-rate crane by 40% for all lift operations. Halting all lifts should be considered.
- Duty-cycle operation is prohibited.

below –40°C (–40°F):

- All operation (lift and duty-cycle) is prohibited except in extreme emergencies, and then only with approval from a competent engineer who has de-rated crane accordingly.

Wire Rope

Wire rope manufacturers state that wire rope will not become brittle in temperatures down to -34°C (-30°F). However, lubrication may be a problem during extremely cold weather because normal wire rope lubricants may harden and chip off, leaving rope without lubrication.

Consult your wire rope supplier for recommended cold–weather lubricants.

Cold Weather Starting Aid

The engine has a heater ("grid heater") in the air intake that comes on during crane startup.

WARNING

Engine Explosion Hazard

An explosion and serious burns may result if ether is sprayed into the engine air intake.

Do not spray any combustible starting aid (ether) into the air intake. The grid heater will ignite the ether.

To prevent overheating, the oil pan and coolant heaters must be unplugged when the engine is running or when the ambient temperature is above –1°C (30°F).

Cooling System

The cooling system must be kept full and be protected from freezing at the lowest expected ambient temperature. See engine manual for antifreeze recommendations.

A mixture of 40% antifreeze and 60% water provides freeze protection to -37°C (-35°F). A mixture of 60% antifreeze and 40% water provides freeze protection to approximately -51°C (-60°F). 100% antifreeze will freeze at -23°C (-10°F).

Batteries

To provide maximum cranking power and to prevent the batteries from freezing, they must be kept fully charged (resting voltage 12.4V–13.2V) and warm when crane is idle during cold weather.

It is recommended that batteries be stored indoors or heated with a battery heater when crane is idle. Be aware that:

- A battery with a 50% charge freezes at -27°C (-16°F). A battery with a 100% charge freezes at -57°C (-70°F).
- A battery with a 100% charge retains only 40% of its cranking power at -18°C (-0°F). At -29°C (-20°F), the same battery retains only 18% of its cranking power.

Engine Oil, Gear Oil, and Hydraulic Oil

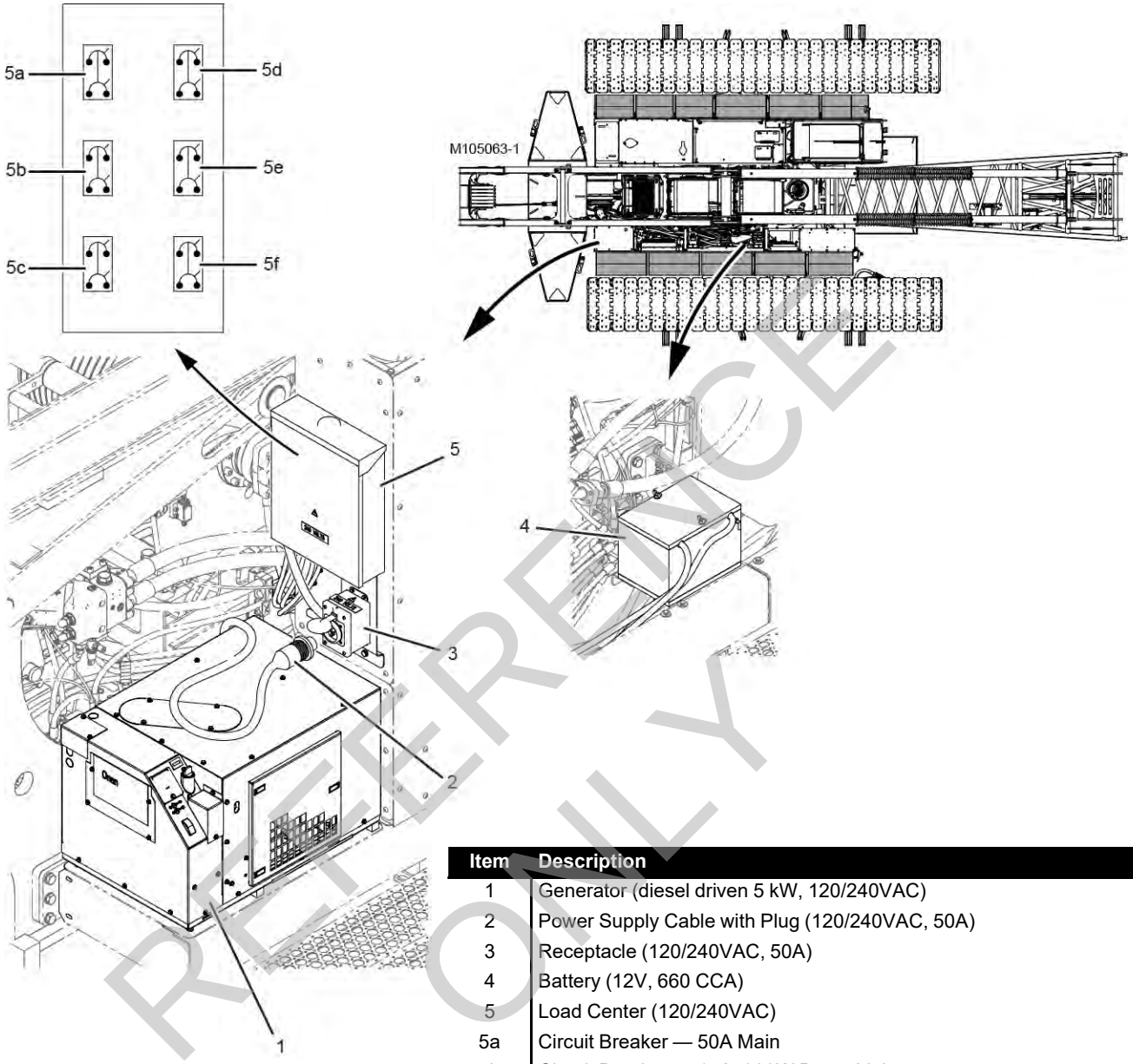
For extreme cold, refer to Approved Lubricants for Operation in Arctic Climate in the MLC150-1 Lubrication Guide.

CAUTION

Avoid Hydraulic Component Damage

Before operating any hydraulic components, always allow the hydraulic system to warm up to 18.3°C (65°F).

To activate the crane's hydraulic oil warm-up circuit during cold weather startup, all crane functions must be parked. The warm-up circuit will remain on until the hydraulic oil temperature reaches 18.3°C (65°F). If a function is unparked, the warm-up circuit will deactivate and remain deactivated until all functions are parked and the hydraulic oil temperature drops below 15.6°C (60°F).



Item	Description
1	Generator (diesel driven 5 kW, 120/240VAC)
2	Power Supply Cable with Plug (120/240VAC, 50A)
3	Receptacle (120/240VAC, 50A)
4	Battery (12V, 660 CCA)
5	Load Center (120/240VAC)
5a	Circuit Breaker — 50A Main
5b	Circuit Breaker — 15A, 900W Boom Lights
5c	Circuit Breaker — 15A, 300W Rotating Bed Lights
5d	Circuit Breaker — 15A,150W Battery Pads and 300W Engine Oil Heater
5e	Circuit Breaker — 15A, 2000W Hydraulic Tank Heater
5f	Circuit Breaker — 15A, 1500W Engine Coolant Heater

Figure 3-22. AC Generator

AC POWER SUPPLY

See Figure 3-22.

The optional work lights and cold weather heaters can be powered either by an owner supplied generator (shore power) or by an optional on-board generator (1).

DANGER

Generator Voltage is Deadly!

Lights and heaters are powered by 240V electricity —

- Do not attempt to service the AC electric system until power is turned off.
- Do not attempt to service the AC electric system unless you are a qualified electrician.
- Do attempt to operate or service the generator until you have thoroughly read the Generator Operator Manual at end of this section.

CAUTION

Avoid Machinery Damage

Do not turn on the heaters when the ambient temperature is above –1°C (30°F) or when the engine is running. Doing so may result in overheating.

Turning AC Power ON

1. Stop the generator (1) engine.
2. Turn OFF the circuit breakers in the load center (5).
3. Connect the power supply cable (2) to the receptacle (3) on the crane and to the receptacle on the generator.
4. Start the generator engine.
5. Turn ON the desired circuit breakers in the load center (5).

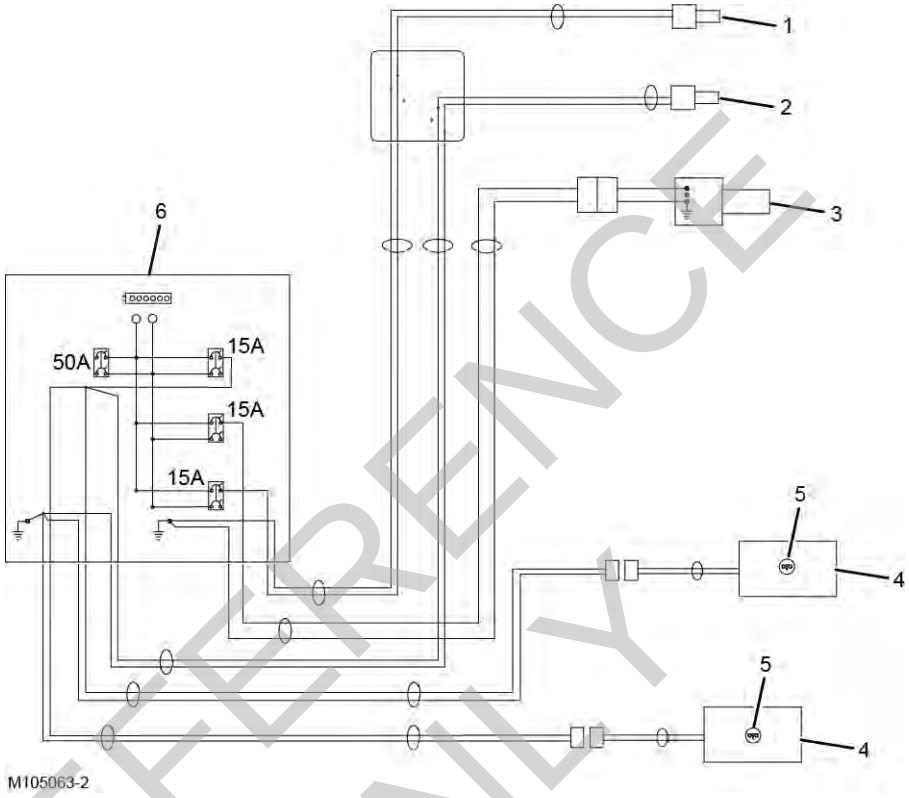
Turning AC Power OFF

1. Turn OFF the circuit breakers in the load center (6).
2. Stop the generator engine.
3. If necessary, disconnect the power supply cable (2) from the receptacle (3) on the crane. Store the cable on the generator.

WORK LIGHTS

The work lights package consist of the following:

- Cab (standard) — two 24V, LED floodlights controlled by a switch in the operator cab
- Gantry (optional) — two 240V, 150W LED wide floodlights controlled by a circuit breaker in the load center (Figure 3-22)
- Boom (optional) — one 240V, 290W LED barrow spotlight at boom top and two or more 240V, 150W LED medium floodlights or wide spotlights at the boom inserts controlled by a circuit breaker in the load center (Figure 3-22)



Item	Description
1	Engine Coolant Heater
2	Engine Oil Heater
3	Hydraulic Tank Heater
4	Battery Wrap Heater (2)
5	Battery Heater Thermostat Sensor
6	Load Center (see Figure 3-21 on page 3-51

Figure 3-23. Cold Weather Heaters

COLD WEATHER HEATERS

To preheat critical components and lubricant sumps during a cold weather shutdown, an optional Cold Weather Heater Kit is available. The kit contains the following heaters:

See Figure 3-23.

- Engine coolant heater (item 1) 750W.
- Engine oil heater (item 2) — 300W.

CAUTION

Avoid Machinery Damage

When the ambient temperature is above –1°C (30°F) or when the engine is running, do not turn on the engine oil pan or coolant heaters. Doing so may result in overheating because they are not supplied with a thermostat.

- Hydraulic tank heater (item 3) — 2,000 watt.

  The hydraulic tank heater is designed to keep the hydraulic oil temperature 17°C (30°F) warmer than the ambient air temperature.

  A thermostat (located under heater cover) is factory-set to turn the heater on at 31°C (87°F) and off at 38°C (100°F).

- Battery wrap heaters (item 4) — two, 160 watt each with a thermostat sensor (item 5) set at: ON 16°C (60°F) and OFF 27°C (80°F).

The heaters are powered by the 240V AC Power Supply described on page 3-58.

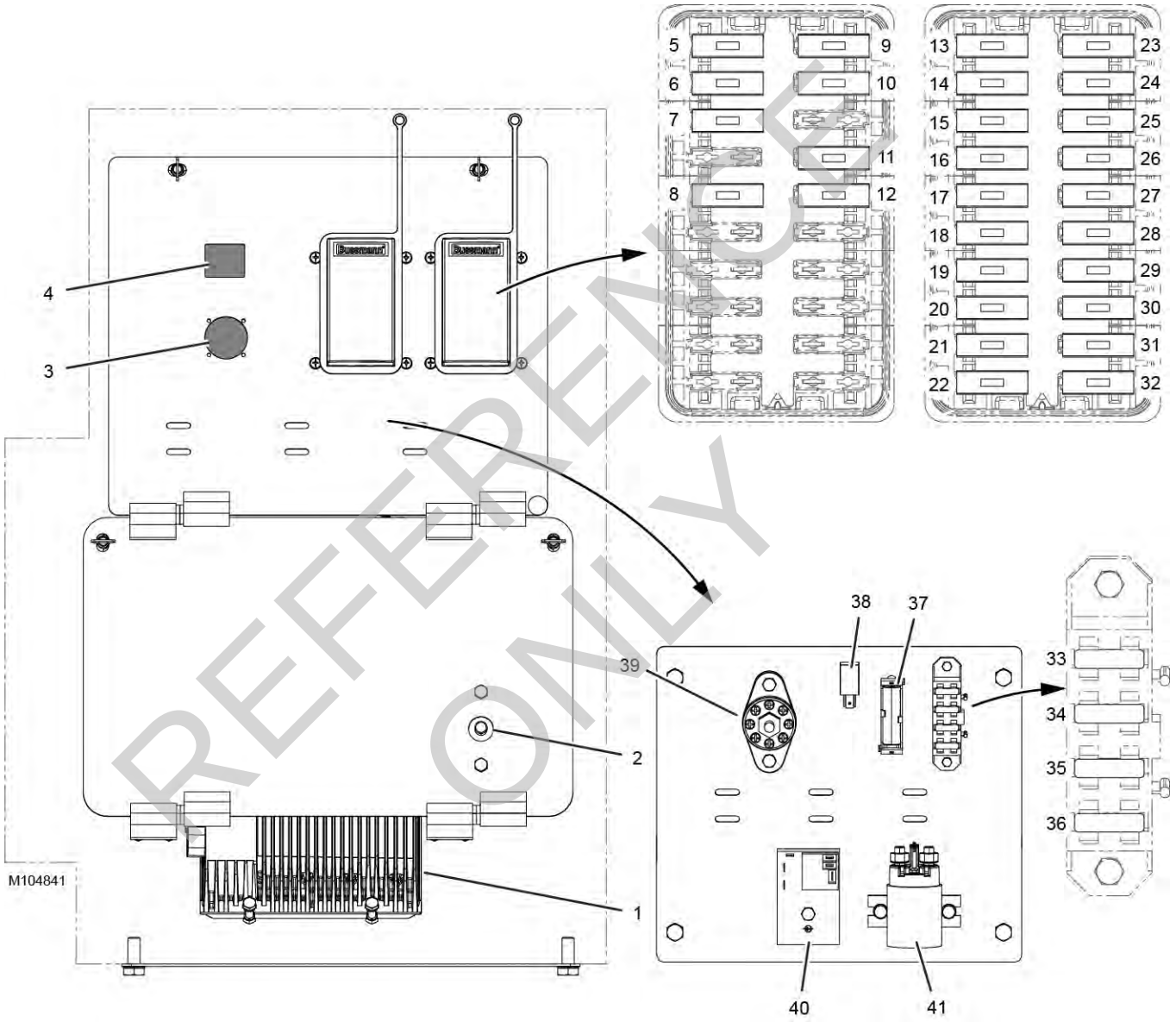
Refer to Figure 3-22 on page 57 for identification of the heater circuit breakers.

NOTE When operating below –30°F (–34°C), the heater package may not provide adequate protection. Contact your Manitowoc dealer for recommendations.

To turn the heaters ON, see Turning AC Power ON on page 3-58.

To turn the heaters OFF, see Turning AC Power OFF on page 3-58.

Electrical Control Panel Behind Operator Seat in Cab



FUSES AND CIRCUIT BREAKERS

Item	Description
1	Power Supply Converter — 24/12VDC, 30A
2	Main Circuit Breaker — 120A
3	Diagnostic Receptacle
4	Program Receptacle
5	Crane Bus — 15A Circuit Breaker 6C1
6	Key — 15A Circuit Breaker 6C3 (includes horn and USB accessory socket)
7	Radio — 15A Circuit Breaker 6C5
8	Cab Main and RCL Displays — 15A Circuit Breaker 6C9
9	Boom Position Light — 10A Circuit Breaker 6C2
10	ECM Key — 15A Circuit Breaker 6C4
11	Cab Accessories — 15A Circuit Breaker 6C8
12	DC/DC Converter — 25A Circuit Breaker 6C10
13	IOLC30 UB— 15A Circuit Breaker 8C21
14	IOLC31 UB— 15A Circuit Breaker 8C23 (includes SCMD01 UB)
15	IOLC32 UB— 15A Circuit Breaker 8C25
16	CCM10 UB— 15A Circuit Breaker 8C27
17	CCM10 UB — 15A Circuit Breaker 8C29
18	SCM00 UB — 15A Circuit Breaker 8C31
19	Cab A/C Heat— 25A Circuit Breaker 8C33
20	Switch Back Lights — 15A Circuit Breaker 8C35
21	J1939 Diagnostics— 15A Circuit Breaker 8C37
22	Radio Illumination — 15A Circuit Breaker 8C39
23	IOLC30 UB— 15A Circuit Breaker 8C22
24	IOLC31 UB— 15A Circuit Breaker 8C24
25	IOLC32 UB— 15A Circuit Breaker 8C26
26	CCM10 UB— 15A Circuit Breaker 8C28
27	CCM10 UB — 15A Circuit Breaker 8C30
28	IOSA22 UB — 15A Circuit Breaker 8C32
29	Wipers — 15A Circuit Breaker 8C34
30	Cab Work Lights — 15A Circuit Breaker 8C36
31	Camera Monitor Power — 15A Circuit Breaker 8C38
32	Joysticks — 15A Circuit Breaker 8C40
33	12VDC Accessory Socket (right console) — 15A Fuse 12VF1
34	Seat Riser — 20A Fuse 12VF2
35	12VDC Accessory Socket (left console) — 15A Fuse 12VF3
36	Spare — 15A Fuse
37	Battery, SCM Controller Real-Time Clock — 3.6V Lithium AA, 2400 mAh
38	Relay — 24V, 10A ECM Power
39	Ground Distribution Post
40	Time Delay Relay, SCM and CCM Controller Backup — 24V
41	Relay Contactor — 28V, 120A Cab Switch Power

- The circuit breaker numbers (for example, 6C1 and 8C21) correspond to the circuit breaker numbers in the MLC150-1 Electrical Schematic located at the end of this section.

SECTION 4
SET-UP AND INSTALLATION

TABLE OF CONTENTS

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SECTION 4
SETUP AND INSTALLATION

WARNING

Death or Serious Injury Hazard!

Read and understand the setup and installation instructions in this section before attempting to assemble or disassemble the crane. Comply with all safety information in this section to prevent accidents that can result in death or injury during crane assembly and disassembly

Tipping/Overload Hazard!

Avoid tipping the crane over or collapsing the attachment:

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

  Level = 1% of grade or

  0,3 m (1 ft) in 30,5 m (100 ft)

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

Avoid Falling Off Crane and Boom!

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

Use sturdy owner furnished ladders or an approved personnel hoist to gain access to areas that cannot be reached from the ladders, steps, or platforms provided with the crane.

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 the gantry until all personnel are off the crane.
- Keep unauthorized personnel well clear of the crane.

Falling Load Hazard!

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

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

BOOM AND JIB ASSEMBLY DRAWINGS

The Boom and Jib Rigging Drawings that apply to your crane are located at the end of this section.

LIFTCRANE BOOM BUTT CAPACITIES

Lifting capacities for the boom butt are located at the end of this section and in the Capacity Chart Manual for this crane.

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 cab looking forward.

- The operator cab is at the front of the upperworks.
- A colored arrow on both sides of the carbody indicate the FRONT of the carbody.

ACCESSING PARTS

WARNING

Fall Hazard!

To avoid serious injury, the owner/user shall provide workers with approved ladders or aerial work platforms to access those areas of the crane, boom, and jib that cannot be reached from the ground or from Manitowoc-provided steps, ladders, and platforms.

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

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

ASSEMBLY AND DISASSEMBLY NOTES

The crane, boom, and jib must be assembled and disassembled by experienced personnel trained in erection and operation of construction cranes.

Before attempting to assemble, operate, or disassemble the crane, boom, and jib, the experienced personnel shall read and become thoroughly familiar with the following:

- The instructions in the applicable capacity charts located in the Capacity Chart Manual or at the end of this section.

- The safety, assembly, and disassembly instructions in this section.
- The instructions in the Boom and Jib Rigging Drawings located at the end of this section.

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 crane and the selected boom and jib length, movement of trucks with trailers, and movement of an assist crane if used.

Set the jack pads on a flat, firm foundation that will support the load placed on them. See Table 4-1 for Jack Pad Data.

Do not set the jack pads in holes, on rocky ground, or on extremely soft ground.

If necessary, use wood blocking or steel plates (2, Figure 4-1) under the jack pads (1) to properly distribute loading and to provide a smooth surface. The wood blocking or steel plates must be:

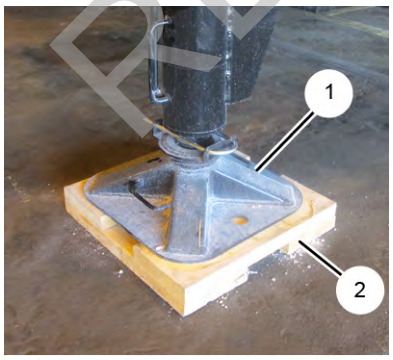
- Free of defects
- Strong enough to prevent being crushed or bent
- Of sufficient length and width to prevent settling under load

Table 4-1Jack Pad Data

Jack Pad Size = 460 x 460 mm (18.1 x 18.1 in)

Jack Pad Weight = 23 kg (51 lb)

Maximum Load Each Carbody Jack = 37 220 kg (82,050 lb)



M101811 **Figure 4-1**

Contact your Manitowoc dealer for ground bearing information.

HANDLING COMPONENTS

The major components are equipped with lifting lugs. The lifting lugs are identified by the following symbol in the assembly and disassembly illustrations.

Figure 4-2

When lifting lugs are not provided, use nylon lifting slings to lift the components. If wire rope or chain lifting slings are used, install protective covering (such as sections of rubber tire) between the slings and the component being lifted.

It is the crane owner's/user's responsibility to ensure that all lifting slings, hooks, and shackles are in safe working order and capable of handling the load applied to them.

RETAINING CONNECTING PINS

Connecting pins are retained in various ways:

- Wire-lock pins
- Quick-release pins
- Cotter pins
- Hitch Pins
- Safety pins
- Keeper plates with cap screws and lock washers

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

CRANE WEIGHTS AND SHIPPING DATA

See the Crane Weights topic in Section 1 of the MLC150-1 Operator Manual for the weights of individual crane components.

See the MLC150-1 Product Guide in Section 1 of the MLC150-1 Operator Manual for the outline and shipping dimensions of individual crane components.

PARTS STORAGE

Parts Box

Manitowoc provides a parts box that can be lifted with a forklift.

The following parts are stored in the parts box:

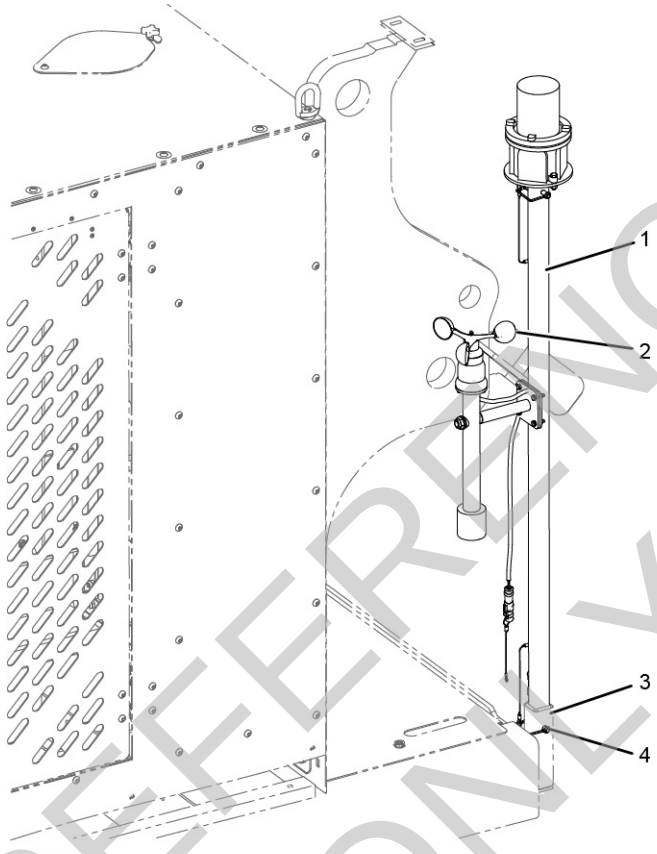
- Anti-two block chains and weights
- Chain lifting sling (Figure 4-4)
- Quick-drain drainer assembly (for oil changes)
- Button sockets, links, swivels, and pins
- Wedge socket (for use if button is removed from Drum 2 wire rope)

- Crawler adjustment hand pump, cylinder, and shims
- Touch-up paint
- Spray lubricant (for cylinder rods)
- Camera (optional boom and jib top)

Position Light and Anemometer Option

If equipped with the optional position light (1, Figure 4-3) and anemometer (2), pin the assembly to the bracket (4) on the right enclosure platform for storage.

It is the crane users responsibility to secure the anemometer so it cannot rotate during transport



Item	Description
1	Position Light
2	Anemometer
3	Bracket
4	Safety Pin

Figure 4-3

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CHAIN LIFTING SLING

The chain lifting sling is provided for handling the following parts:

- Crawlers
- Carbody counterweight
- Crane counterweight tray
- Crane counterweight boxes.

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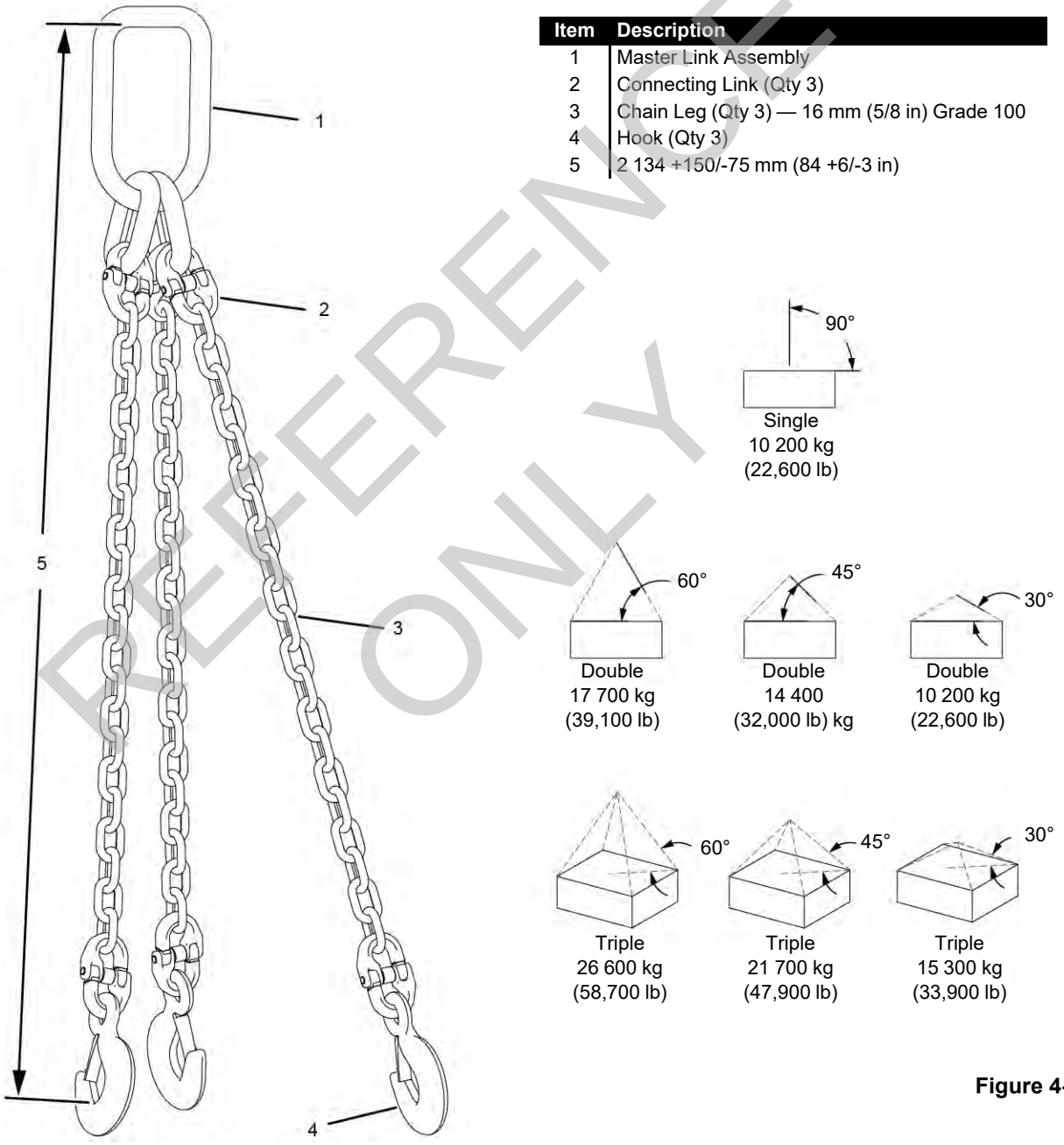
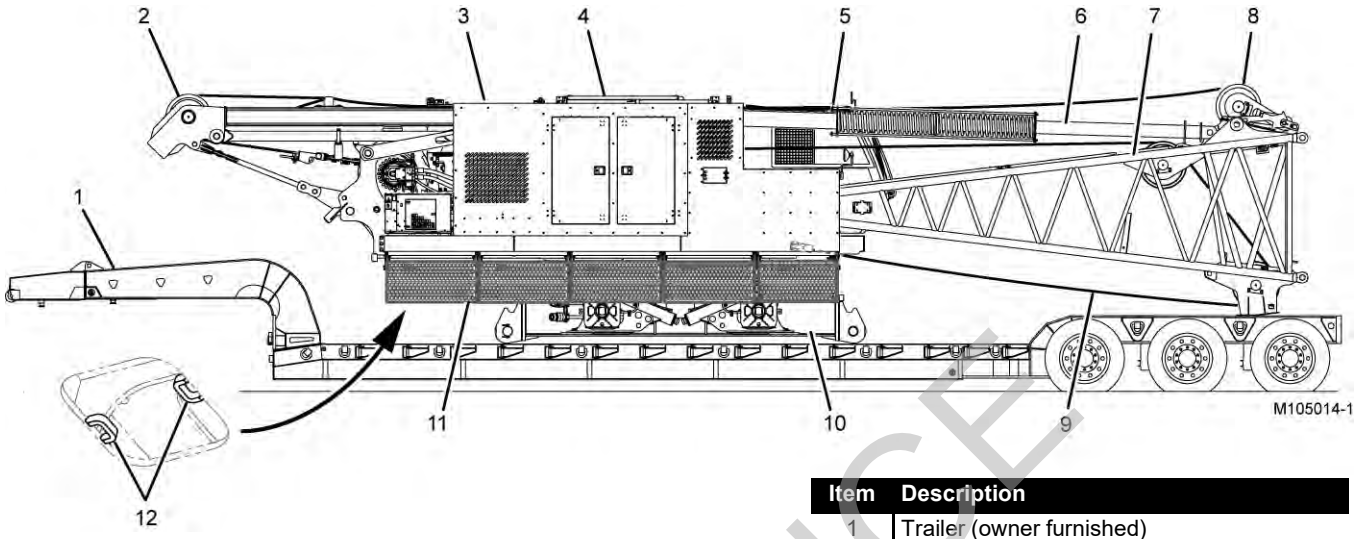


Item	Description
1	Master Link Assembly
2	Connecting Link (Qty 3)
3	Chain Leg (Qty 3) — 16 mm (5/8 in) Grade 100
4	Hook (Qty 3)
5	2 134 +150/-75 mm (84 +6/-3 in)

Figure 4-4

4



Item	Description
1	Trailer (owner furnished)
2	Gantry Lowered
3	Upperworks without Crane Counterweight
4	Handrails Stored
5	Operator Cab
6	Boom Stops
7	Boom Butt Lowered onto Stand
8	Equalizer Pinned to Boom Butt
9	Load Line Pinned to Rotating Bed Lug
10	Lowerworks without Crawlers, without Counterweight, with Carbody Jacks Stored
11	Platforms Stored
12	Tie-Down Lug (Qty 2)

U.S. Shipping Configuration shown. European Shipping Configuration ships with platforms removed

- Max shipping width: US = 10 ft — EURO = 3 m
- Max Shipping height: US = 13 ft 6 in — EURO = 4 m (depending on trailer)
- Shipping weight with Drums 1, 2, 3 and 4 with Free Fall and Wire Rope = 40 779 kg (89,902 lb)
- Shipping weight without Drum 3 = 39 064 (86,121 lb)

Figure 4-5

SHIPPING CONFIGURATION

The MLC150-1 ships in the configuration shown in Figure 4-5.

SELF-ERECT CONFIGURATION

The MLC150-1 can assemble and disassemble itself in the self-erect configuration shown in Figure 4-6.

The following self-erect components are provided:

- Hydraulic pin puller (2) (standard) for disengaging and engaging the counterweight pins.
- Hydraulic cylinders (3) (standard) for raising and lowering the gantry.
- Boom butt sheaves (8) (optional) for a two-part rigging line from the rear drum. The boom butt can be used to handle, assemble, and disassemble the following components:
  - Crawlers
  - Carbody counterweight boxes
  - Crane counterweight tray and boxes
  - Boom sections
  - Jib sections
- Self-erect hook block (9) (optional) and 3-leg chain lifting sling (10).
- Hydraulic pin pullers (11) (standard) for disengaging and engaging the crawler pins.
- Hydraulic cylinders (12) (optional) for supporting the carbody with the crawlers removed.
- Carbody manual controls (13) (standard) for operating the carbody jacks and the crawler pin pullers.
- Switches on the remote control and the right side console for operating the above components (see Figure 4-7 on page 4-8) (standard).

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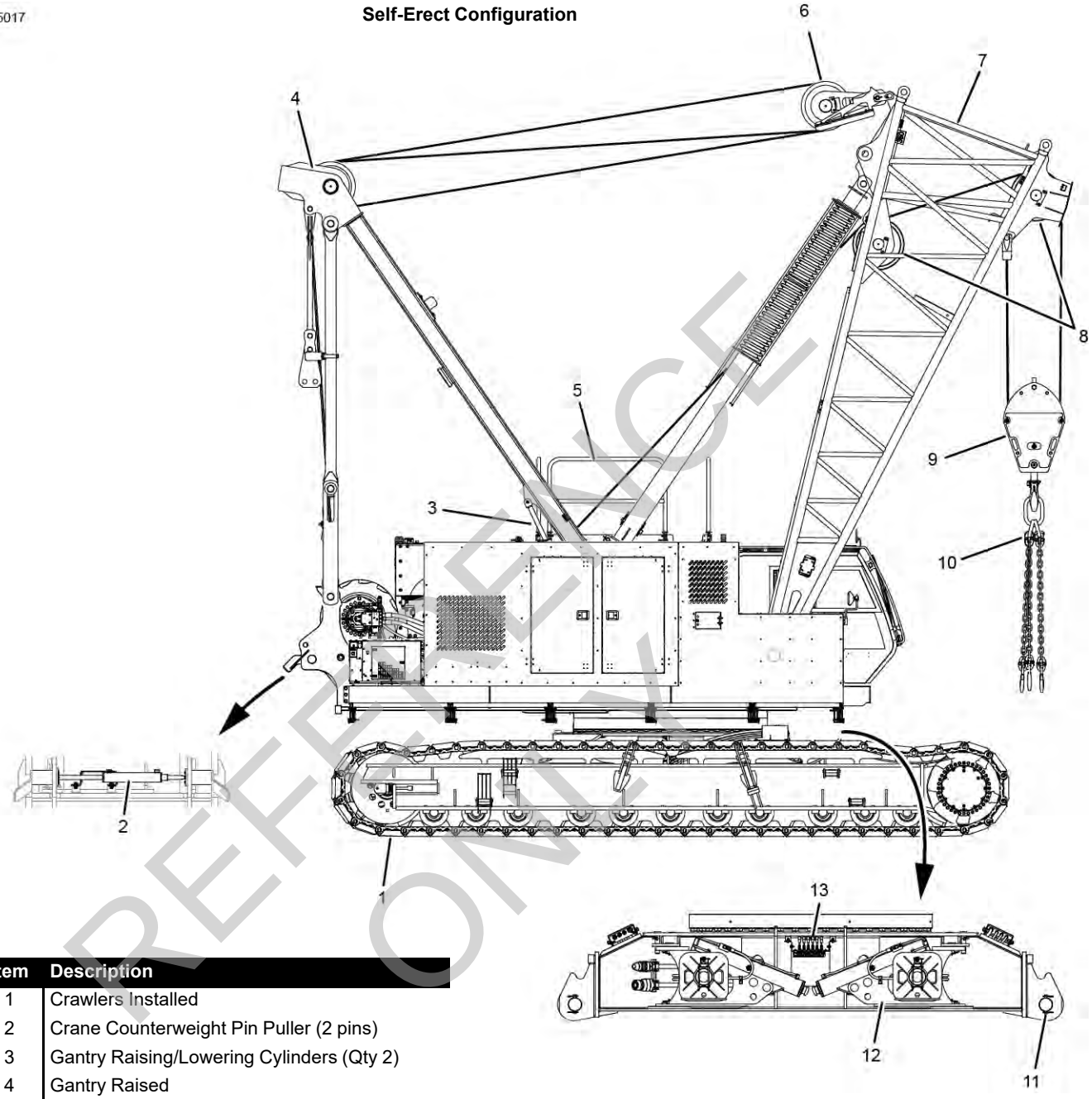
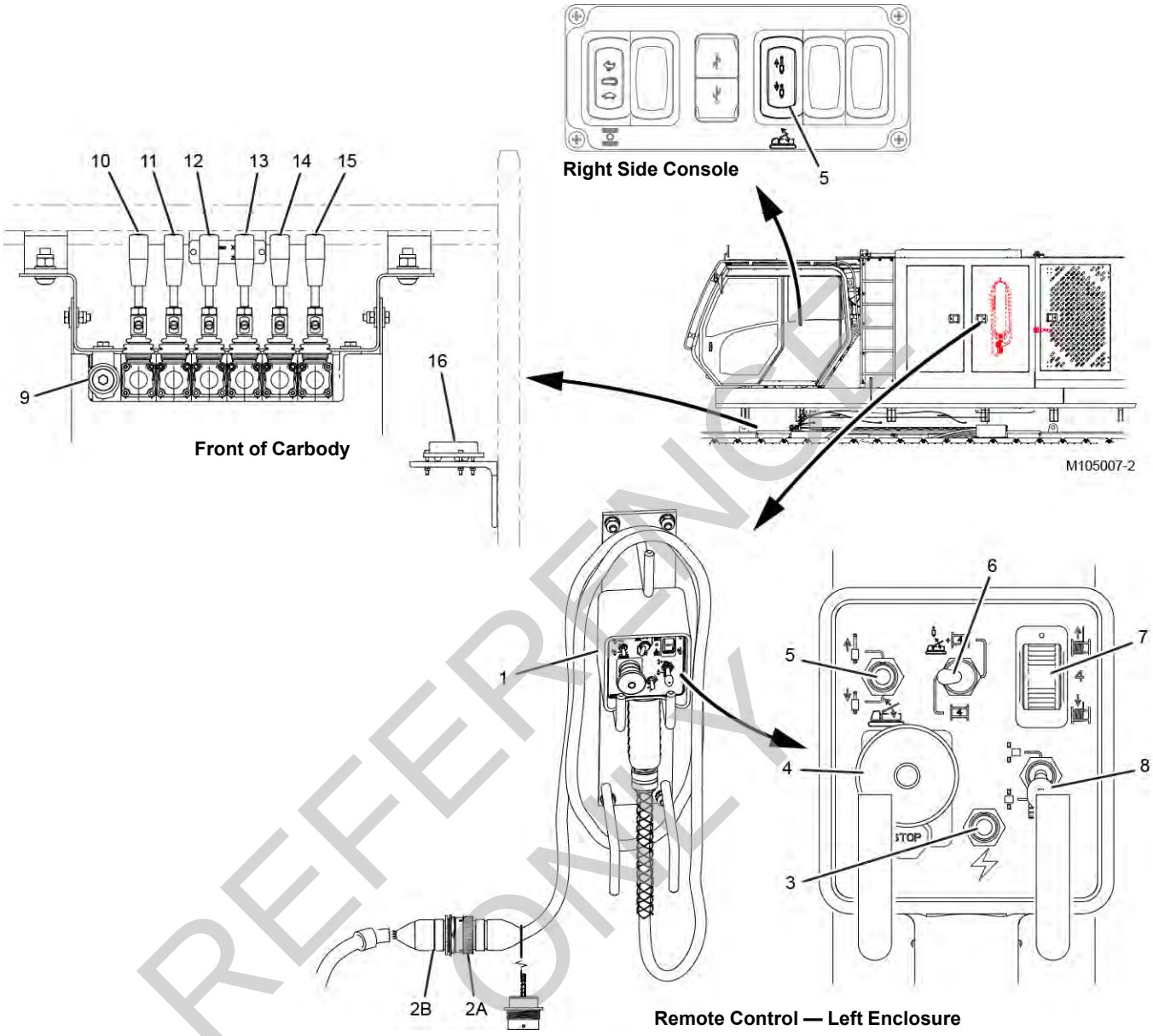
Self-Erect Configuration



Item	Description
1	Crawlers Installed
2	Crane Counterweight Pin Puller (2 pins)
3	Gantry Raising/Lowering Cylinders (Qty 2)
4	Gantry Raised
5	Handrails Raised
6	Equalizer Pinned to Boom Butt
7	Boom Butt
8	Boom Butt Sheave (Qty 2)
9	Self-Erect Hook Block (1 sheave)
10	3- Leg Chain Lifting Sling
11	Crawler Pin Puller (4 pins)
12	Carbody Jack with Pad (Qty 4)
13	Carbody Manual Controls

Figure 4-6



Item	Description	Item	Description
1	Remote Control	9	Carbody Control Valve
2A	Electric Cable	10	Right Front Carbody Jack Control Handle
2B	Receptacle	11	Right Rear Carbody Jack Control Handle
3	Power Switch	12	Right Crawler Pins Control Handle
4	Emergency Stop Switch	13	Left Crawler Pins Control Handle
5	Gantry Cylinders Switch	14	Left Rear Carbody Jack Control Handle
6	Sync Switch (Drum 4 and gantry cylinders)	15	Left Front Carbody Jack Control Handle
7	Boom Hoist Control (thumbwheel)	16	Level
8	Counterweight Pins Switch		

Figure 4-7

SELF-ERECT CONTROLS

See Figure 4-7.

The controls required for crane assembly and disassembly are located on the remote control, on the right console in the operator cab, and on the front of the carbody.

The remote control is stored in the left enclosure. It has an electric cable that is long enough to allow the operator to stand at the rear of the crane while using the remote control during counterweight installation and removal.

To operate the Remote Control:

- The electric cable (2A) from the remote control must be connected to the receptacle (2B) inside the left-rear enclosure door.
- The Boom Butt Configuration must be selected in the RCL/RCI Display. See the MLC150-1 RCL/RCI Operation Manual.
- The remote control must be turned on in the Self-Erect Controls Screen of the Main Display. See the MLC150-1 Main Display Operation Manual.
- Drum 4 must be un-parked to operate Drum 4 from the remote control.

To operate the Gantry Cylinders Switch on the Right Console:

- The Boom Butt Configuration must be selected in the RCL/RCI Display. See the MLC150-1 RCL/RCI Operation Manual.

To operate the Carbody Controls:

- The Boom Butt Configuration must be selected in the RCL/RCI Display.
- The carbody control must be turned on in the Self-Erect Controls Screen of the Main Display. See the MLC150-1 Main Display Operation Manual.

Refer to Section 3 of the MLC150-1 Operator Manual for instructions on operating the self-erect controls.

WARNING

Moving Load Hazard

When the Boom Butt Configuration is selected in the RCL/RCI Display, the boom hoist function is not disabled when the operator gets out of the seat.

Use extreme care not to activate the boom hoist function by inadvertently operating the boom hoist control handle when exiting and entering the operator cab.

PIN AND CONNECTING HOLE CLEANLINESS

To prevent dirt from damaging the closely machined surfaces of pins and connecting holes:

- Thoroughly clean all pins and connecting holes.
- Apply a light coat of grease to all pins and connecting holes.

HOSE AND CABLE CLEANLINESS

To prevent dirt from entering the hydraulic systems or from damaging the electric connectors:

- Thoroughly clean the hydraulic fittings and the electric connectors before connecting them.
- Thoroughly clean the dust caps before attaching them to hoses, tubes, or cables.
- Do not drag the hydraulic hose fittings, the hydraulic hoses, the electric cable connectors, or the electric cables on the ground.
- Apply a light coat of dielectric grease to all cable connector pins and connecting holes.
- Apply a light coat of silicone lubricant to the threads of all dust caps, couplers, and connectors to help in preventing the threads from seizing.

CONNECTING/DISCONNECTING HYDRAULIC HOSES AND ELECTRIC CABLES

Always ***STOP ENGINE*** before performing the following steps during crane assembly and disassembly:

- Connecting and disconnecting hydraulic lines. It will be easier to connect and disconnect the couplers when there is no pressure in the system.
- Connecting and disconnecting electric cables. The potential for operating faults or damage to the electric components exists if power is not turned off.

PRE-START CHECKS

Make the following checks before starting the engine upon arrival at the job site.

- See Section 5 of the MLC150-1 Operator Manual for lubrication requirements.
- See Section 3 of the MLC150-1 Operator Manual for starting instructions.

Deploy the crane platforms as necessary to gain access to components.

Engine

1. Check for leaks.
2. Check fuel, oil, and coolant levels.
3. Repair or refill as required.

Gear Boxes

1. Check for leaks.
2. Check levels.
3. Repair or refill as required.

Hydraulic System

1. Check for leaks.
2. Check level.
3. Repair or refill as required.
4. Make sure hydraulic tank shut-off valves are open.

OPERATING LIMITS FOR ASSEMBLY AND DISASSEMBLY

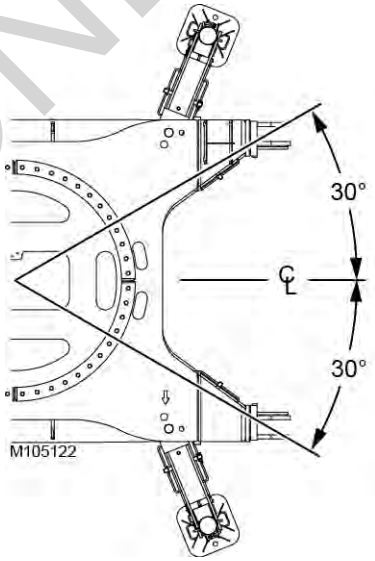
The crane counterweights (upper) cannot be installed until both crawlers are installed.

Crane Configuration	Can Swing	Max Capacity and Radius
• Crane on carbody jacks • Boom butt in operating range (0° to 87°) • No Counterweight	Yes 360°	Refer to Liftcrane Boom Butt Handling Capacities chart at end of this section.
• Crane with one crawler installed on four carbody jacks • Boom butt in operating range (0° to 87°) • No Counterweight	Yes, limited to 30° (see Figure 4-8	Use of self assembly sheave in boom butt not permitted.
• Crane with one crawler installed and lowered to ground and on remaining two carbody jacks • Boom butt in operating range (0° to 87°) • No Counterweight	Yes 360°	Refer to Liftcrane Boom Butt Handling Capacities chart at end of this section.
• Crane on Crawlers (carbody jacks stored) • Boom butt in operating range (0° to 87°) • No Counterweight	Yes 360°	Refer to Liftcrane Boom Butt Handling Capacities chart at end of this section.
• Crane on Crawlers • Boom butt in operating range (0° to 87°) • Counterweight installed	Yes 360°	Carbody counterweight must be installed before upper counterweight. Boom butt can be used as a boom to assemble boom and jib. Refer to Liftcrane Boom Butt Handling Capacities chart at end of this section.

WARNING

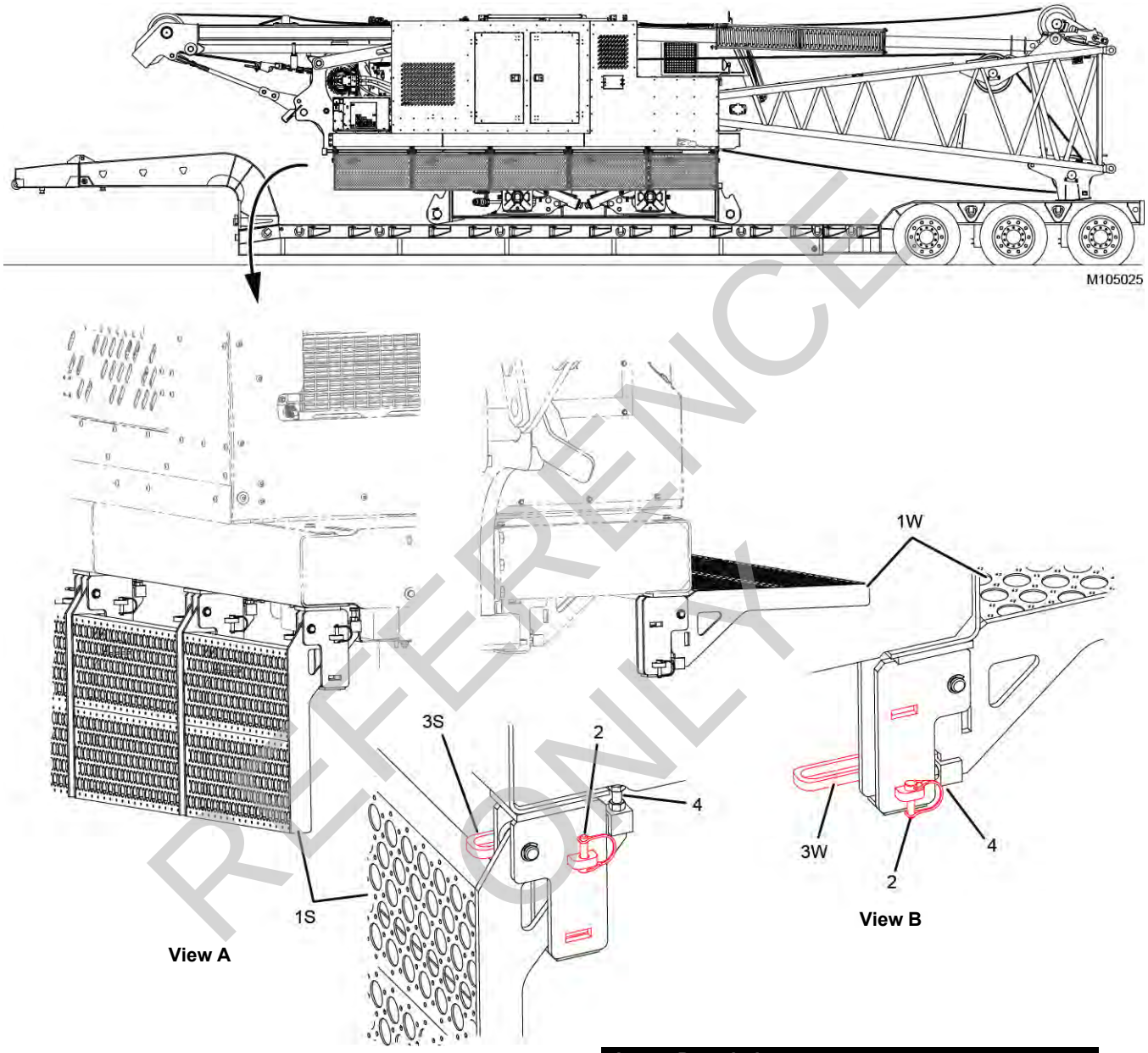
Crane Tipping Hazard!

To avoid serious or fatal crushing injury, do not exceed operating radii and capacities given in the Liftcrane Boom Butt Handling Capacities Chart. Structural failure or crane tipping may occur.



With First Crawler Installed on Four Jacks (crawler off ground)

Figure 4-8



Item	Description
1	Platform (Qty 6 left side, 5 right side)
2	Safety Pin (Qty 1 each locking bar)
3	Locking Bar (Qty 7 left side, 6 right side)
4	Adjusting Bolt and Lock Nut (Qty 2 each platform)
S	Stored
W	Working

Figure 4-9

CRANE ASSEMBLY

Prepare Trailer for Unloading

See Figure 4-9.

Position the trailer on a firm level surface in the desired assembly area.

Deploy Crane Platforms

See Figure 4-9.

Perform the following steps on both sides of the crane:

1. Remove the safety pins (2, View A) and the locking bars (3S) from the platforms (1S).
2. Rotate the platforms (1W, View B) to the working position.
1. Install the locking bars (3W, View B) to secure the platforms (1W) in the working position.
2. Install the safety pins (2, View B).
3. Using the adjusting bolts and lock nuts (4), adjust the platforms so they are level and at the same height — ***no trip points!***

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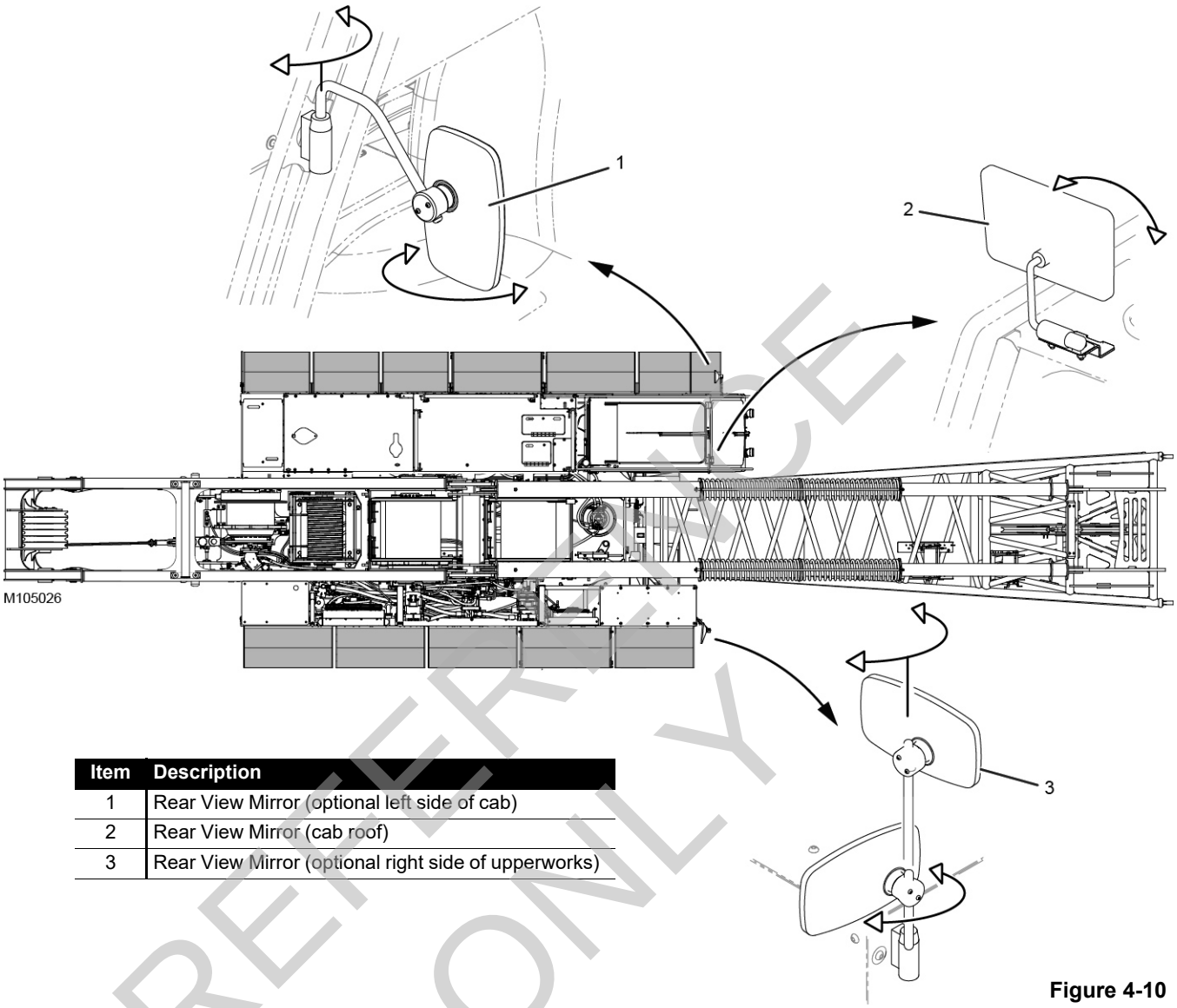


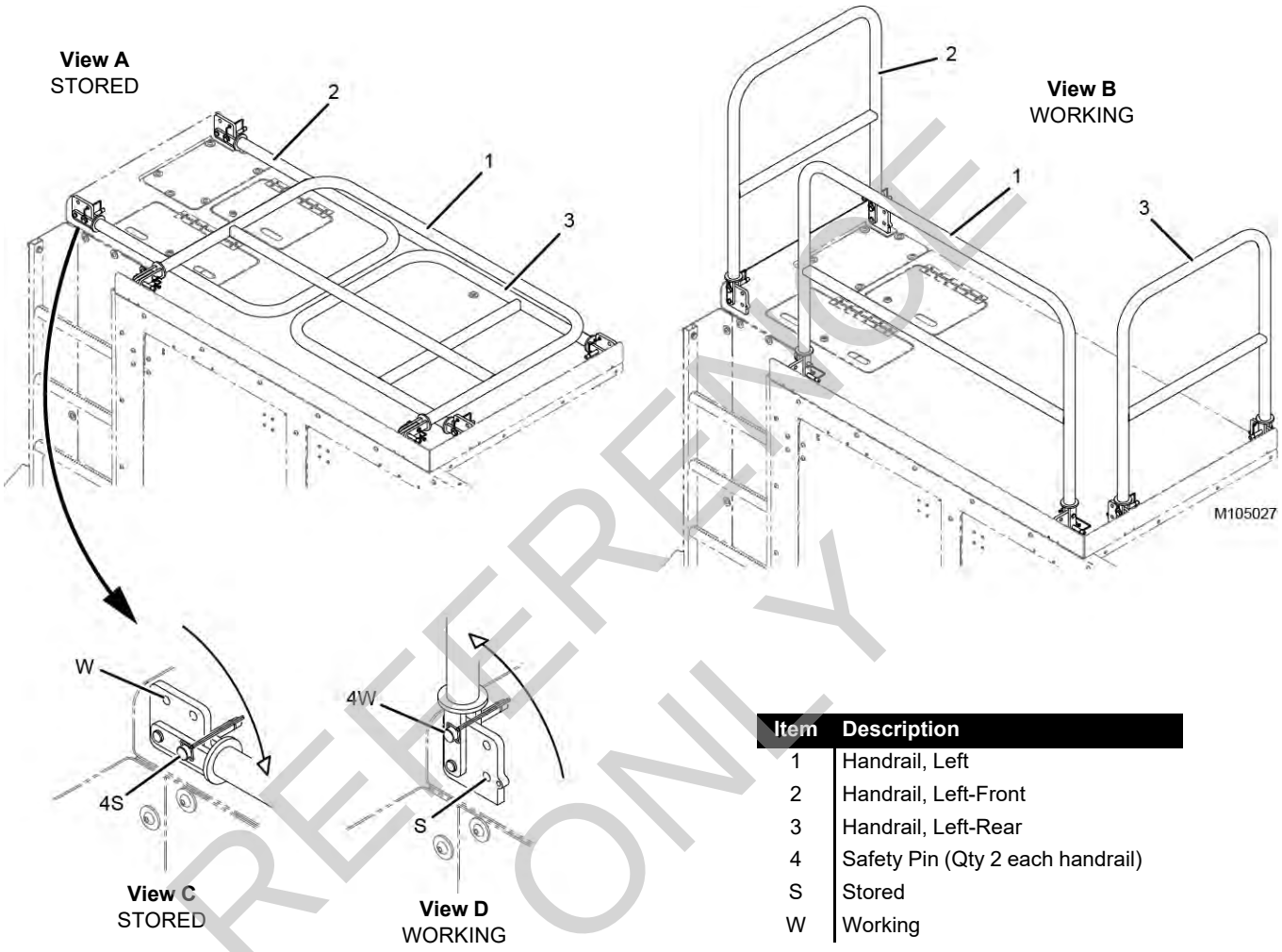
Item	Description
1	Rear View Mirror (optional left side of cab)
2	Rear View Mirror (cab roof)
3	Rear View Mirror (optional right side of upperworks)

Figure 4-10

Prepare Cab

Perform the following steps as required. See Figure 4-10.

1. Rotate the rear view mirror (1) to the operating position and adjust it as required.
2. Rotate the rear view mirror (2) to the operating position and adjust it as required.
3. Rotate the rear view mirror (3) to the operating position and adjust it as required.



Item	Description
1	Handrail, Left
2	Handrail, Left-Front
3	Handrail, Left-Rear
4	Safety Pin (Qty 2 each handrail)
S	Stored
W	Working

Figure 4-11

Raise Handrails

At the crane owner's discretion, the handrails can be raised now or after the crawlers are installed.

See Figure 4-11.

1. Remove the quick-release pins (4, View C) securing the left handrail (1) in the stored position (S).
2. Raise the left handrail (1, View B) to the working position and install the safety pins (4, View D) in the working position (W).
3. Repeat the steps for the left-front handrail (2).
4. Repeat the steps for the left-rear handrail (3).

Start Engine

Perform the pre-start checks given on page 4-10 and start the engine.

Configure RCL/RCI for Crane Setup

Select the Boom Butt Configuration in the RCL/RCI display. See the RCL/RCI Operation Manual. The block-up faults will come on at start-up and remain on until this step is performed.

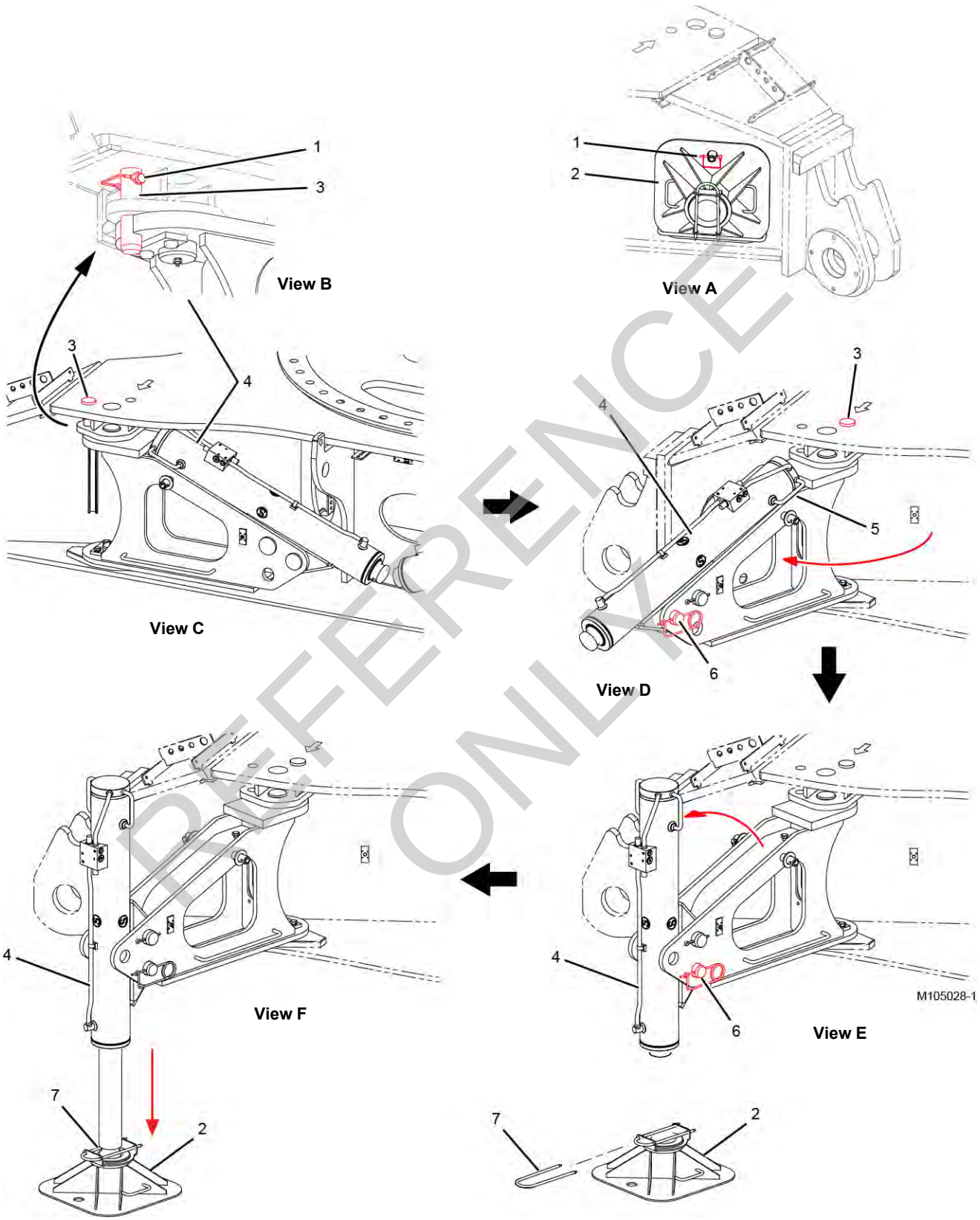


Figure 4-12

Legend for Figure 4-12.

Item	Description
1	Safety Pin
2	Jack Pad (shipping location, 4 places)
3	Locking Pin
4	Carbody Jack
5	Jack Handle (Qty 2 each jack)
6	Locking Pin with Safety Pin
7	U-Shaped Locking Pin

Deploy Carbody Jacks

Perform the following steps at each carbody jack. See Figure 4-12.

1. Remove the safety pin (1, View B) and the locking pin (3).
2. Swing the carbody jack (1, View C) out to the working position (View D) (approximately 112°).
3. Reinstall the locking pin (3, View D) and the safety pin (1) to lock the carbody jack in place.

WARNING

Crush Hazard!

To avoid serious injury:

To prevent the carbody jack from rotating out uncontrolled, grasp the jack handles before removing the locking pin.

4. Grasp the jack handles (5, View D) and remove the locking pin (6).
5. Rotate the carbody jack (4, View D) to the vertical working position (View E).
6. Reinstall the locking pin (6, View E) and the safety pin.
7. Remove the safety pin (1, View A) and the jack pad (2) from the storage lug on the carbody and place the jack pad on the ground below the carbody jack (View E).
8. Store the safety pin (1) in the lug on the carbody.
9. Enable the carbody control in the Self-Erect Controls Screen of the Main Display.
10. Remove the U-shaped locking pin (7, View E) from the jack pad (2).
11. Repeat the above steps at each carbody jack.

WARNING

Moving Part Hazard!

To avoid serious crushing injury, warn all personnel to stand clear of the jacks.

Crane Tipping Hazard!

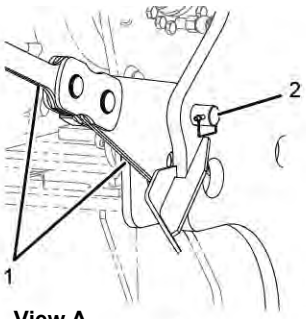
Keep the crane level while jacking.

12. Use the carbody controls to slowly extend the carbody jacks so the jack pads can be attached to the cylinder rods.
13. Fasten the jack pads (2, View F) to the cylinder rods using the U-shaped locking pins (7).
14. To stabilize the crane, continue to extend the jacks only until the jack pads are snug against the ground and the crane is level.

CAUTION

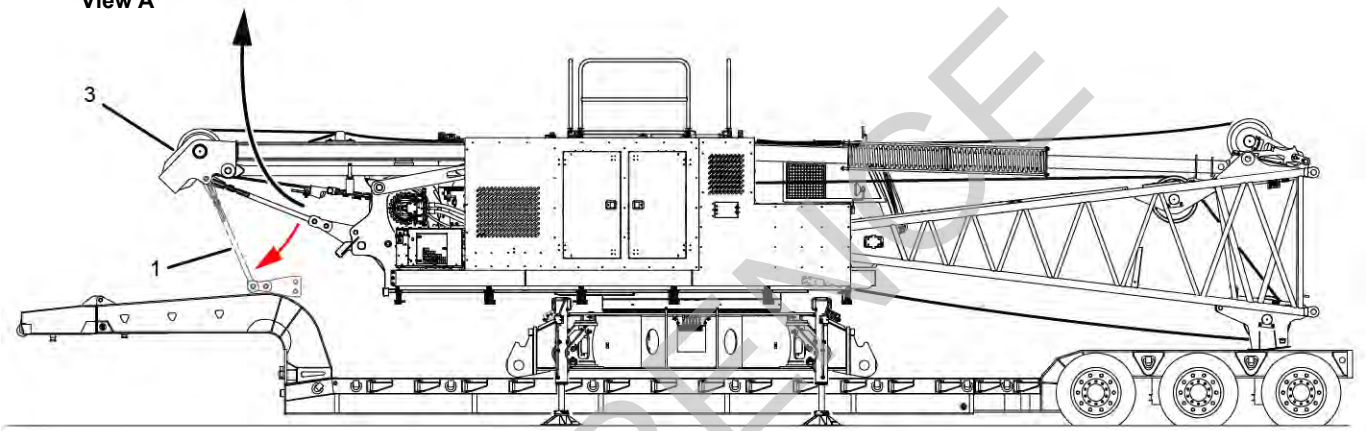
Avoid Damage!

DO NOT lift the carbody off the trailer until the gantry is raised and the boom butt is supported by the gantry.

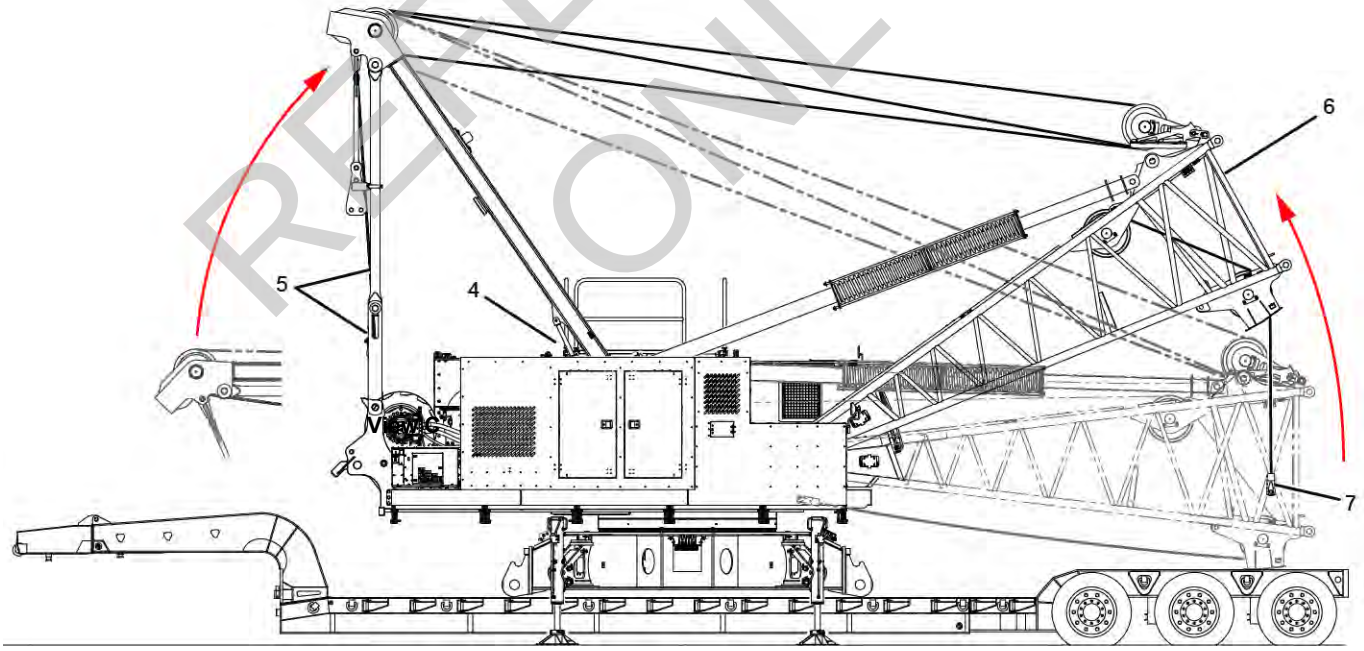


View A

Item	Description
1	Counterweight Links (both sides)
2	Pin with Safety Pin (Qty 2)
3	Gantry
4	Gantry Cylinder (Qty 2)
5	Backhitch Links
6	Boom Butt
7	Self-Erect Load Line



View B



View C

Figure 4-13

Raise Gantry

See Figure 4-13.

CAUTION

Avoid Damage!

DO NOT raise the boom butt until the gantry is fully raised.

1. Hold the counterweight links (1, View A) so they cannot fall when the pins are removed.
2. Remove the pins (2, View A) and lower the counterweight links.
3. Attach the pins (2) to the counterweight handling pendants on the crane counterweight tray (see Figure 4-29 on page 4-38).
4. Verify that the boom hoist wire rope is spooled properly on the boom hoist drum.
5. Disable the carbody control in the Self-Erect Controls Screen of the Main Display.
6. Using the gantry cylinders switch on the right console in the cab, extend the gantry cylinders (4, View C) to raise the gantry.
7. The boom hoist wire rope will slacken as the gantry rises. Haul in the wire rope with the boom hoist control in the cab only enough to remove the slack and to prevent improper wire rope spooling.
8. Continue to raise the gantry until the cylinders are fully extended and the backhitch links (5, View C) are tight.
9. Unpin the self-erect load line (7, View C) from the rotating bed.
10. Make sure the boom hoist wire rope is spooled properly on the boom hoist drum and raise the boom butt (6, View C) off the trailer.

Item	Description
1	Carbody Jacks
2	Trailer

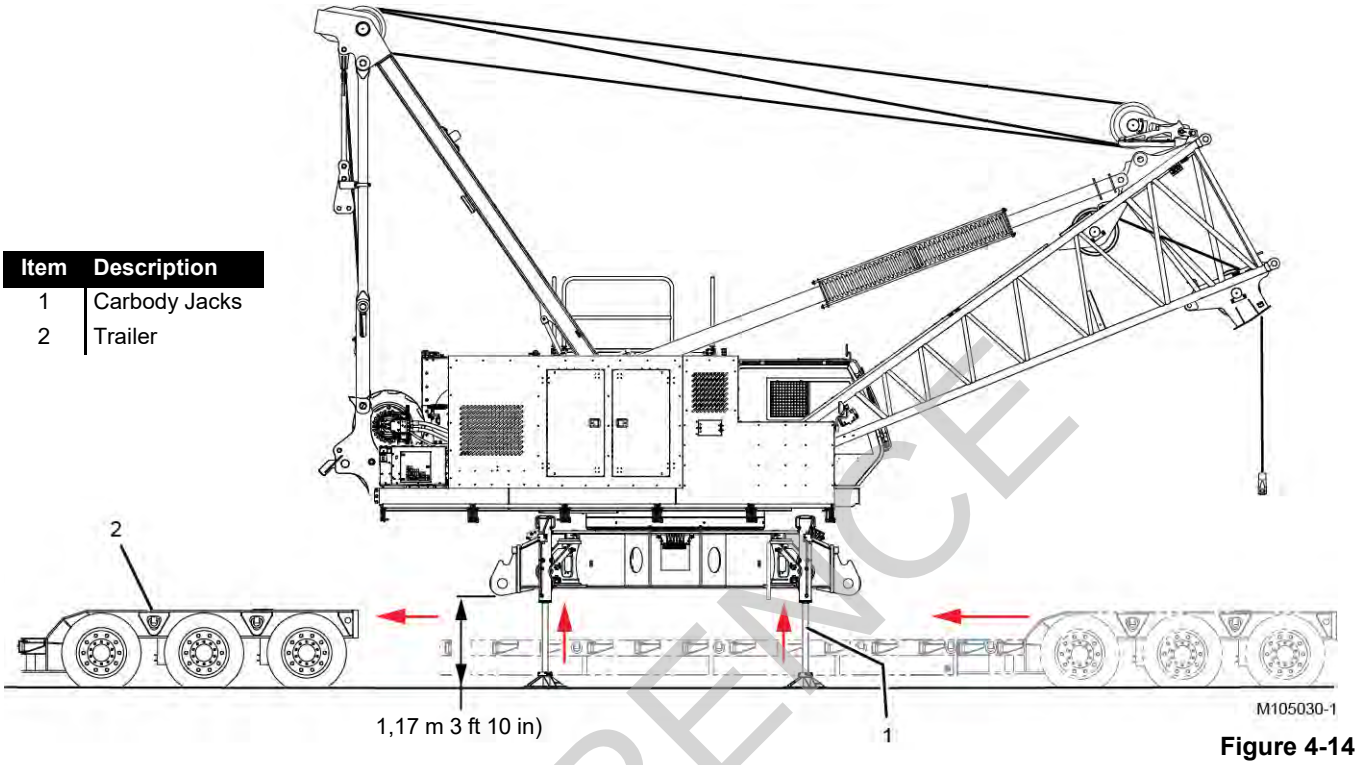


Figure 4-14

Remove Trailer

See Figure 4-14.

1. Extend the carbody jacks (1) as needed to clear the trailer (2).

   The maximum jacking height below the carbody is 1,17 m (3 ft 10 in).

2. Slowly pull the trailer (2) out from under the crane.
3. Remove the trailer from the assembly area.
4. Lower the crane to the dimension given in Figure 4-18 on page 4-24.

360° swing is permitted once the crane is off the trailer.

CAUTION

Avoid Wire Rope Damage!

To avoid wire rope, boom butt, or hook block damage, use extreme caution when installing and using the self-erect hook block during crane assembly/disassembly.

Do not hoist the self-erect hook block into the boom butt or exceed the operating radius given in the Liftcrane Boom Butt Handling Capacities Chart.

Install Self-Erect Hook Block

See Figure 4-15.

1. Position the trailer (1) carrying the self-erect hook block (2) below the boom butt sheaves (3) as shown.
2. If necessary, reeve the load line (4) from Drum 2 over the boom butt sheaves (3).
3. Reeve the load line (4) around the sheave in the self-erect hook block (2).
4. Attach the button socket (6) to the load line (see Anchoring Wire Rope to Button Socket on page 4-123 for instructions).
5. Pin the button socket to the lug on the boom butt.

CAUTION

Avoid Wire Rope Damage!

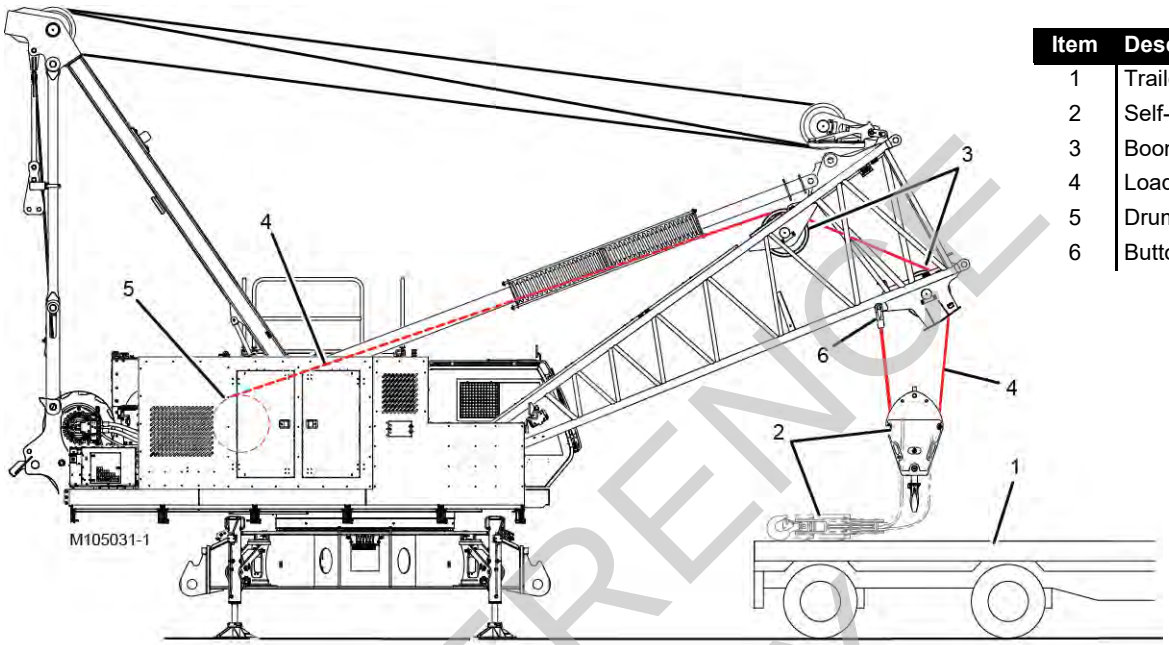
Do not operated the load drum with the boom butt at too low of an angle. The wire rope and the rope guard on the sheave can be damaged.

6. Raise the self-erect hook block off the trailer by booming up until the ***boom is at an angle from the capacity chart that allows operation of the load drum***.
7. Remove the trailer.

Install Chain Lifting Sling

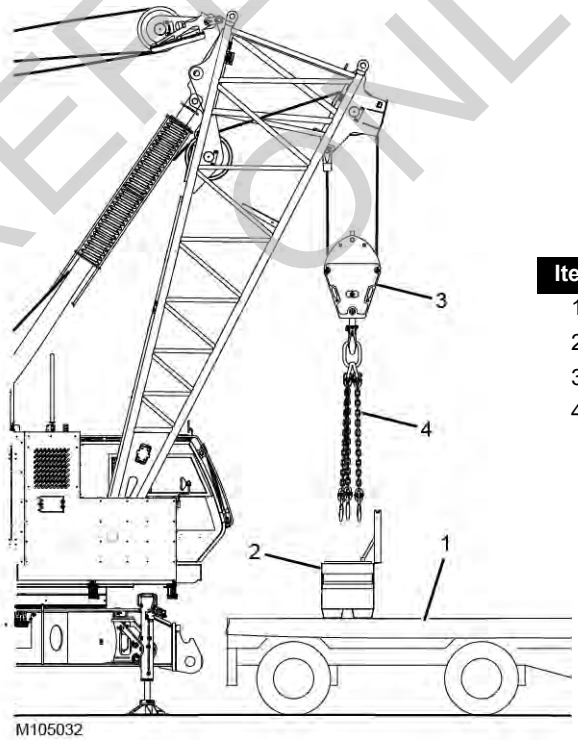
See Figure 4-16.

1. Position the trailer (1) or forklift carrying the parts box (2) under the self-erect hook block (3).
2. Attach the chain lifting sling (4) to the self-erect hook block (3).
3. Lift the chain lifting sling out of the parts box.
4. Remove the trailer or forklift from the assembly area.



Item	Description
1	Trailer
2	Self-Erect Hook Block
3	Boom Butt Sheaves
4	Load Line
5	Drum 2
6	Button Socket

Figure 4-15



Item	Description
1	Trailer or Forklift
2	Parts Box
3	Self-Erect Hook Block
4	Chain Lifting Sling

Figure 4-16

Item	Description
1	Carbody (4 places)
2	Crawler (4 places)
3	Locking Pin (Qty 4)
4	Crawler Pin (Qty 4)
*	Moly Grease

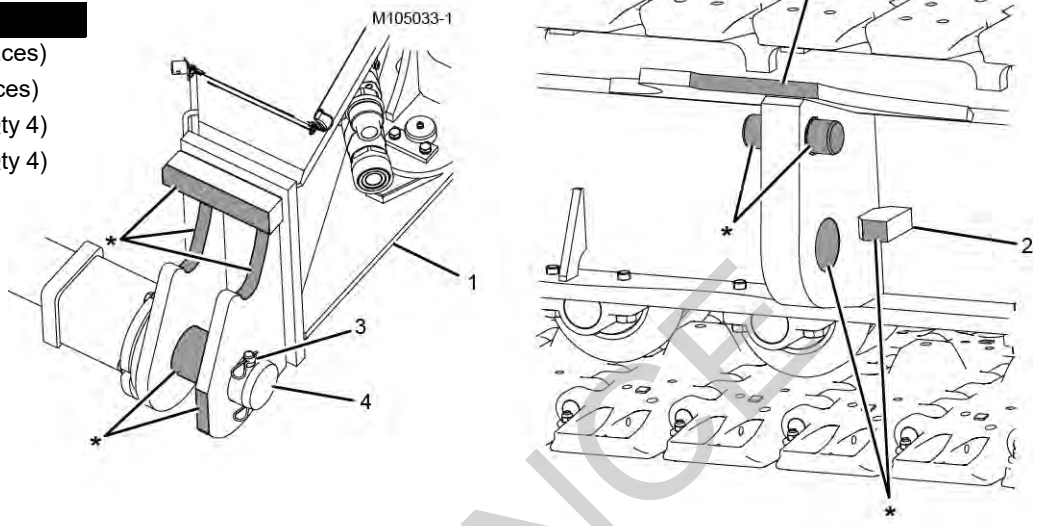


Figure 4-17

Item	Description	Item	Description
1	Trailer	4	Chain Lifting Sling
2	Crawler	5	Lifting Lug
3	Hydraulic Hoses	6	Lifting Link (Qty 2)
R	Max Radius (see Liftcrane Boom Butt Handling Capacity Chart at end of this section)		

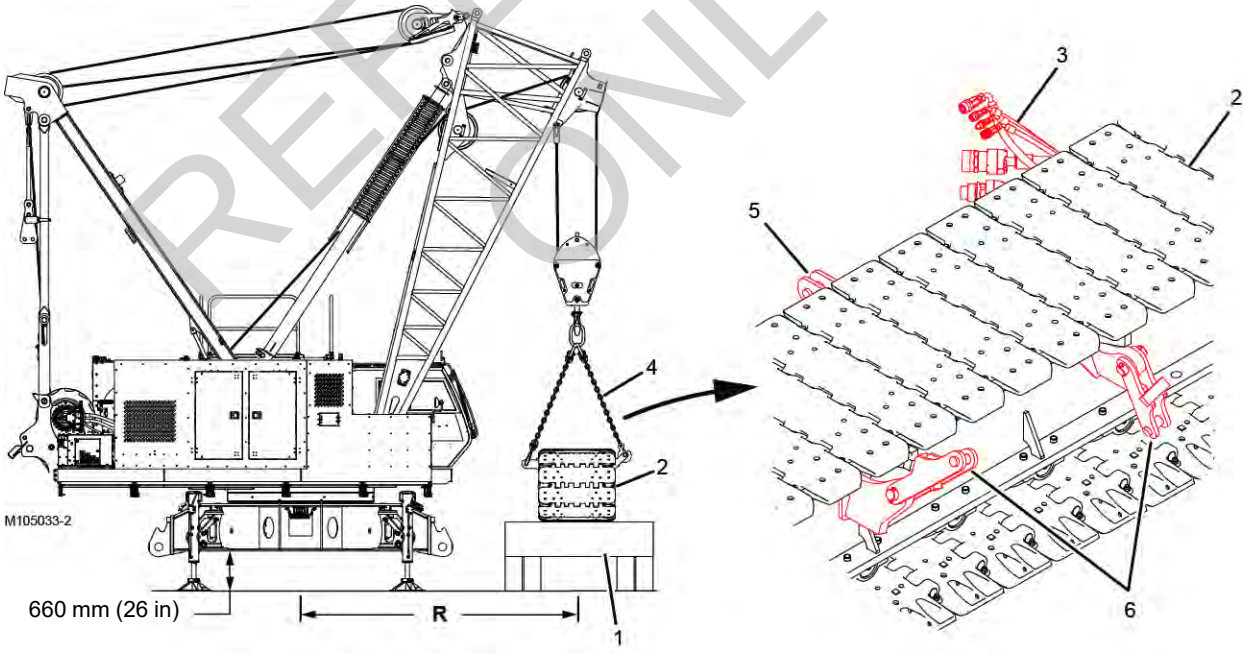


Figure 4-18

Install Crawlers — Preliminary Steps

1. Thoroughly clean and apply Dry Moly Lube Spray or an equivalent anti-seizing compound to all machined surfaces on the carbody and the crawlers — surfaces marked ✱ in Figure 4-17.

   If this step is not performed, excessive friction will occur in the closely machined mating surfaces between the crawlers and the carbody. The result will be loud noises coming from the lowerworks when turning (cutting) the crawlers or swinging the upperworks over the corner of the crawlers.

2. Enable the carbody control in the Self-Erect Controls Screen of the Main Display.
3. Using the carbody controls, lower the carbody so it is level at the dimension given in Figure 4-18.
4. Remove the locking pins (3, Figure 4-17).
5. Using the carbody controls, disengage the crawler pins (4, Figure 4-17).

Install First Crawler

See Figure 4-18.

1. Position the trailer (1) with the crawler (2) on the desired side of the carbody.
2. Center the crawler under the self-erect hook block at the maximum radius (**R**) from the Liftcrane Boom Butt Handling Capacities chart.

   Refer to the Crane Weights at the end of Section 1 of the MLC150-1 Operator Manual.

NOTE The hydraulic hoses (3) on the crawler must be adjacent to the hydraulic hoses on the carbody.

360° swing is permitted while handling the first crawler on the jacks.

DANGER

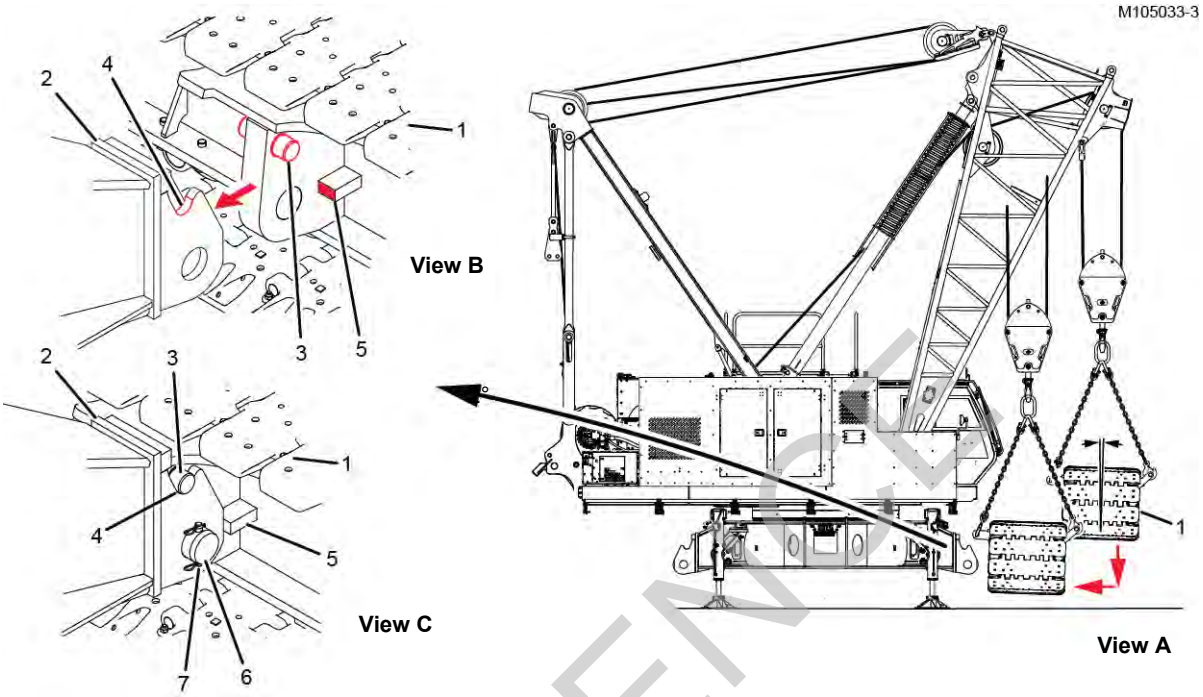
Falling Load Hazard!

Prevent structural failure of components or tipping:

- Do not exceed the radius given in the Liftcrane Boom Butt Handling Capacities chart at the end of this section.

3. Attach the hooks from the chain lifting sling (4) to the lifting lug (5) on the inboard side of the crawler and to the lifting links (6) on the outboard side of the crawler.

Continued on next page.



Item	Description
1	Crawler
2	Carbody
3	Alignment Pin (Qty 2)
4	Alignment Saddle (Qty 4)
5	Alignment Lug (Qty 2)
6	Crawler Pin (Qty 2)
7	Locking Pin with Hair-Pin Cotter (Qty 2)

Figure 4-19

See Figure 4-19 for the remaining steps.

4. Lift the crawler (1, View A) off the trailer and remove the trailer.
5. The crawler will hang approximately 2° out of level as shown in View A.

NOTE If there is room for a trailer on both sides of the crane, the first crawler can be installed on the same side of the crane that the trailer is on.

If there is not enough room for a trailer on both sides of the crane, the first crawler can be lifted off the trailer, swung 180°, and installed on the side of the crane opposite the trailer. ***Use care not to hit the carbody or the carbody jacks while swinging***.

6. Slowly hoist/lower, boom up, and swing as needed to position the crawler (1, View B) next to the carbody (2).

NOTE To accommodate crawler tread sag, adjust the carbody height as needed with the carbody jacks. Keep the carbody level while jacking.

7. Lower the crawler so the alignment pins (3, View C) engage the alignment saddles (4) and the alignment lugs (5) are against the carbody lugs.

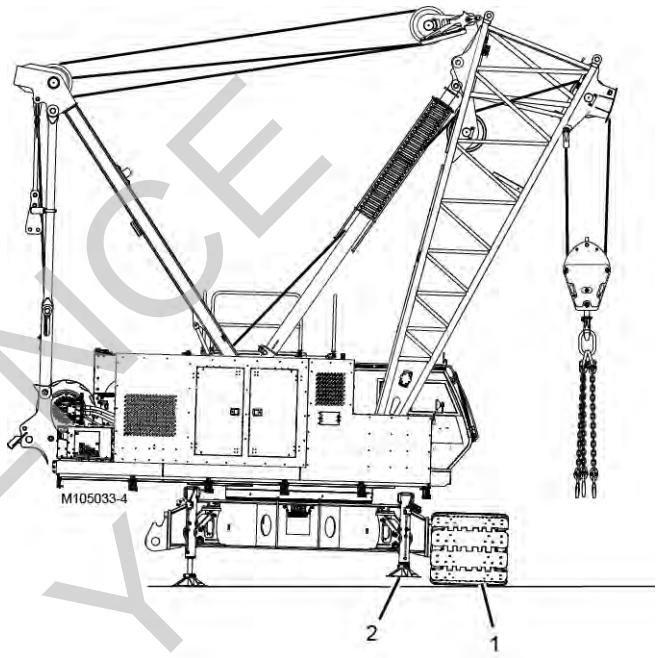
   The boom angle will be approximately 87°.

8. Maintain some tension in the chain lifting sling so the pins engage smoothly in the next step.
9. Using the carbody control, engage the crawler pins (6, View C).
10. Install the locking pins (7, View C) with the hair-pin cotters.
11. Disconnect the chain lifting sling from the crawler.
12. ***Lower the first crawler (1,*** Figure 4-20***) to the ground*** by fully retracting the carbody jacks (2) next to the first crawler.

CAUTION

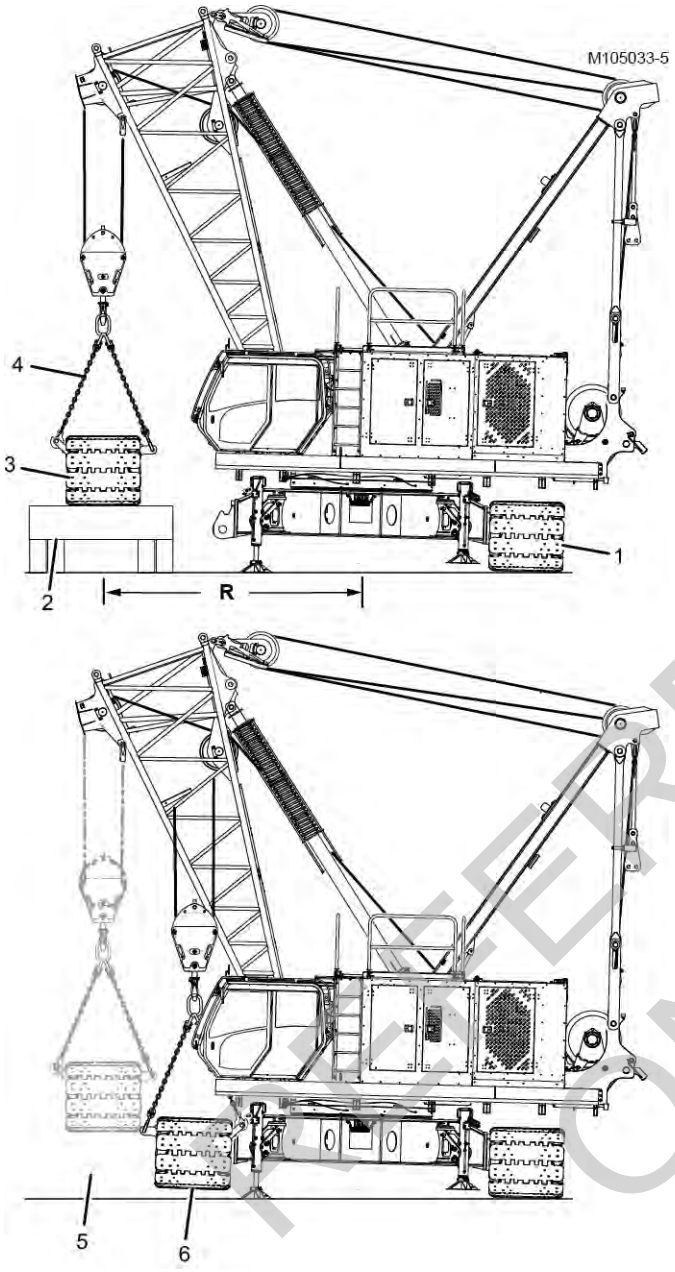
Avoid Jacking Cylinder Damage!

To prevent possible damage to the jacking cylinders, the first crawler MUST be lowered to the ground before installing the second crawler.



Item	Description
1	First Crawler on Ground
2	Carbody Jack Fully Retracted (Qty 2)

Figure 4-20



Item	Description
1	First Crawler on Ground
2	Trailer
3	Crawler
4	Chain Lifting Sling
5	Trailer Removed
6	Second Crawler Installed
R	Max Radius (see Liftcrane Boom Butt Handling Capacity Chart at end of this section)

Figure 4-21

Install Second Crawler

1. Depending on job site clearance, the second crawler can be lifted using one the following options:
   - From the same side as the first crawler (if room permits) and then swung 180° and installed on the side opposite the first crawler. ***First crawler must be on ground***.

   OR

   - From the side opposite the first crawler.
2. Position the trailer (2, Figure 4-21) with the crawler (3) on the desired side of the crane so the crawler is centered under the self-erect hook block within the maximum radius (**R**).
3. Attach the chain sling to the second crawler in the same manner they were attached to the first crawler. See step 3, page 25.
4. Lift the crawler (3) off the trailer and remove the trailer.
5. The crawler will hang approximately 2° out of level as shown in View A.
6. Install the second crawler in the same manner the first crawler was installed: perform step 6, page 27 through step 11, page 27.

   To aid in second crawler installation, the carbody jacks can be used to level the opposite side of the crane.

DANGER

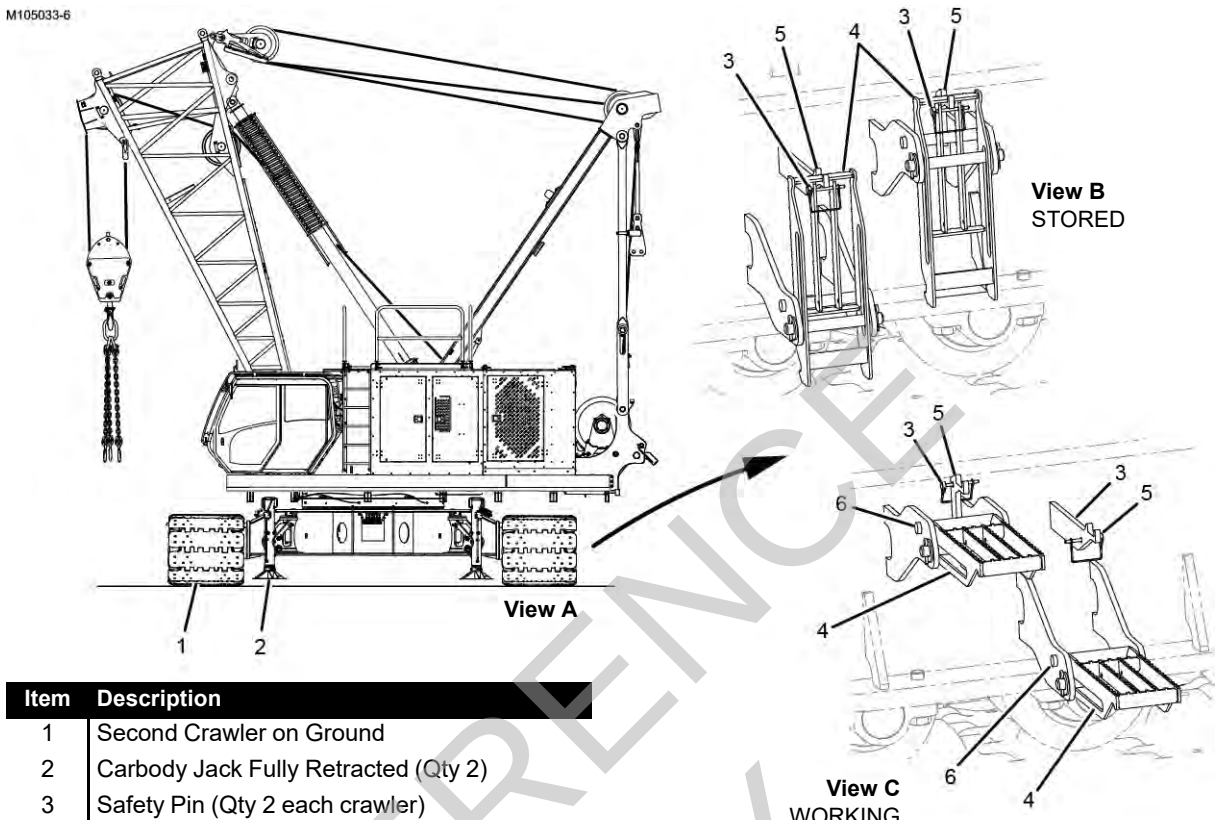
Falling Load Hazard!

Prevent structural failure of components or tipping:

Do not swing 360° while handling the second crawler on the jacks. Swing is limited to 30° to either side of center as shown in step 4-8, page 11.

Do not exceed the Operating Limits given on page 11 or in the Liftcrane Boom Butt Handling Capacities chart at the end of this section.

7. Lower the second crawler (1, View A, Figure 4-22) to the ground by fully retracting the carbody jacks (2).



Item	Description
1	Second Crawler on Ground
2	Carbody Jack Fully Retracted (Qty 2)
3	Safety Pin (Qty 2 each crawler)
4	Step (Qty 2 each crawler)
5	Storage Lug (Qty 2 each crawler)
6	Pin (Qty 2 each crawler)

Figure 4-22

Deploy Crawler Steps

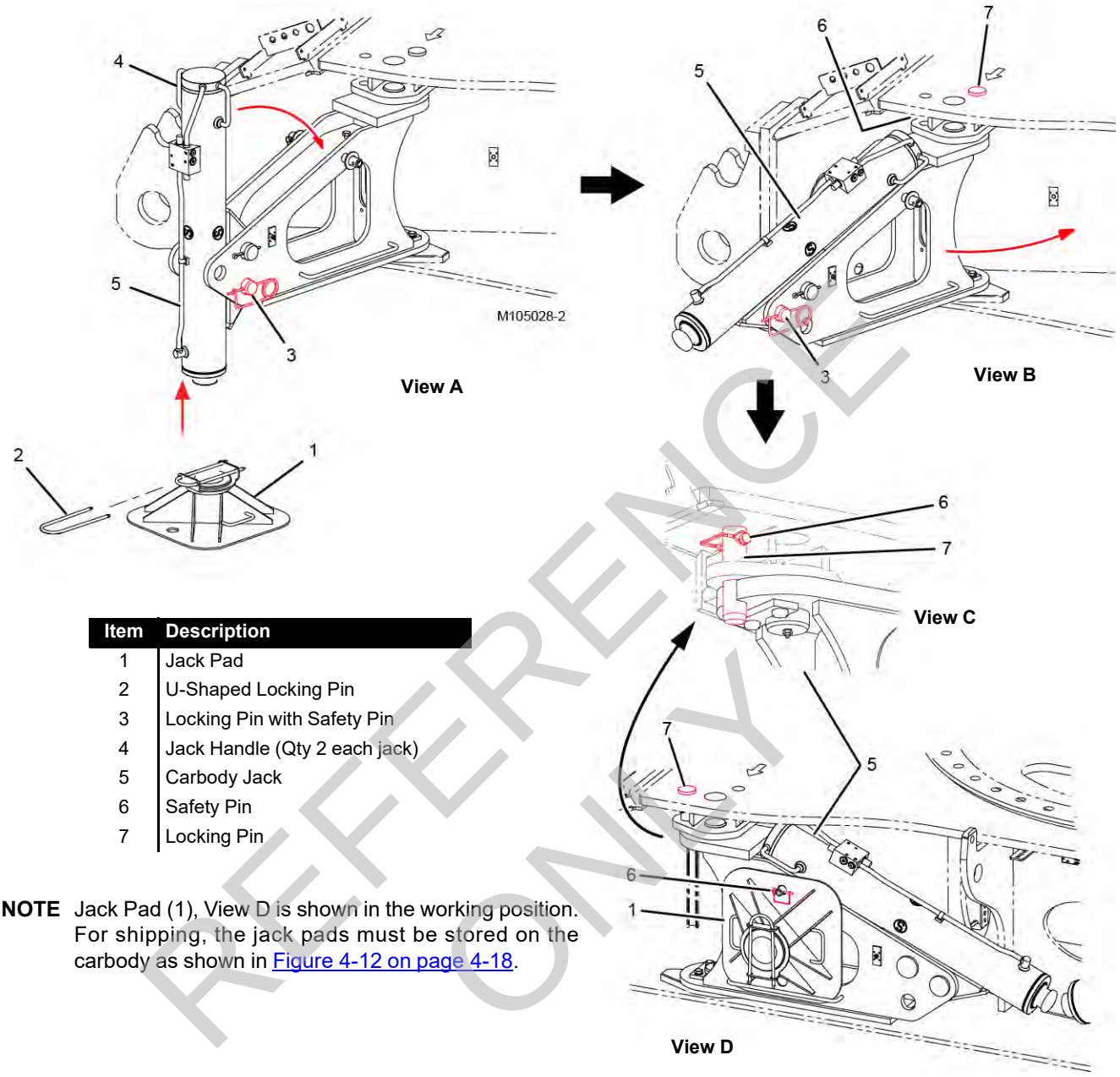
See Figure 4-22.

1. Remove the safety pin (3, View B) from the storage lug (5).
2. Unhook the step (4, View B) from the storage lug (5).
3. Lower the step (4, View C) to the working position and hook it under pin (6).
4. Store the safety pin (3, View C) in the storage lug (5).
5. Repeat the steps for each step at both crawlers.

Store Carbody Jacks

Perform the following steps at each carbody jack. See Figure 4-23.

1. Make sure all jacks are fully retracted.
2. Disable the carbody control in the Self-Erect Controls Screen of the Main Display.
3. Grasp the jack pad (1, View A) by the handles, remove the U-shaped locking pin (2), and place the jack pad on the ground.
4. Reinstall the U-shaped locking pin (2) in the jack pad (1).
5. Remove the locking pin (3, View A).
6. Using the jack handles (4, View A), rotate the carbody jack (5) to the stored position (View B).
7. Install the locking pin (3, View B) and the safety pin.
8. Remove the safety pin (6, View B) and the locking pin (7).
9. Swing the carbody jack (5, View B) to the stored position (View D).
10. Reinstall the locking pin (7, View C) and the safety pin (6) to lock the carbody jack in place.
11. Attach the jack pad (1, View D) to the carbody jack (5) with the safety pin (6).



Item	Description
1	Jack Pad
2	U-Shaped Locking Pin
3	Locking Pin with Safety Pin
4	Jack Handle (Qty 2 each jack)
5	Carbody Jack
6	Safety Pin
7	Locking Pin

NOTE Jack Pad (1), View D is shown in the working position. For shipping, the jack pads must be stored on the carbody as shown in Figure 4-12 on page 4-18.

Figure 4-23

Store Carbody Jacks

Perform the following steps at each carbody jack. See Figure 4-23.

1. Make sure all jacks are fully retracted.
2. Disable the carbody control in the Self-Erect Controls Screen of the Main Display.
3. Grasp the jack pad (1, View A) by the handles, remove the U-shaped locking pin (2), and place the jack pad on the ground.
4. Reinstall the U-shaped locking pin (2) in the jack pad (1).
5. Remove the locking pin (3, View A).
6. Using the jack handles (4, View A), rotate the carbody jack (5) to the stored position (View B).
7. Install the locking pin (3, View B) and the safety pin.
8. Remove the safety pin (6, View B) and the locking pin (7).
9. Swing the carbody jack (5, View B) to the stored position (View D).

10. Reinstall the locking pin (7, View C) and the safety pin (6) to lock the carbody jack in place.
11. Attach the jack pad (1, View D) to the carbody jack (5) with the safety pin (6).

Connect Crawler Hydraulic Hoses

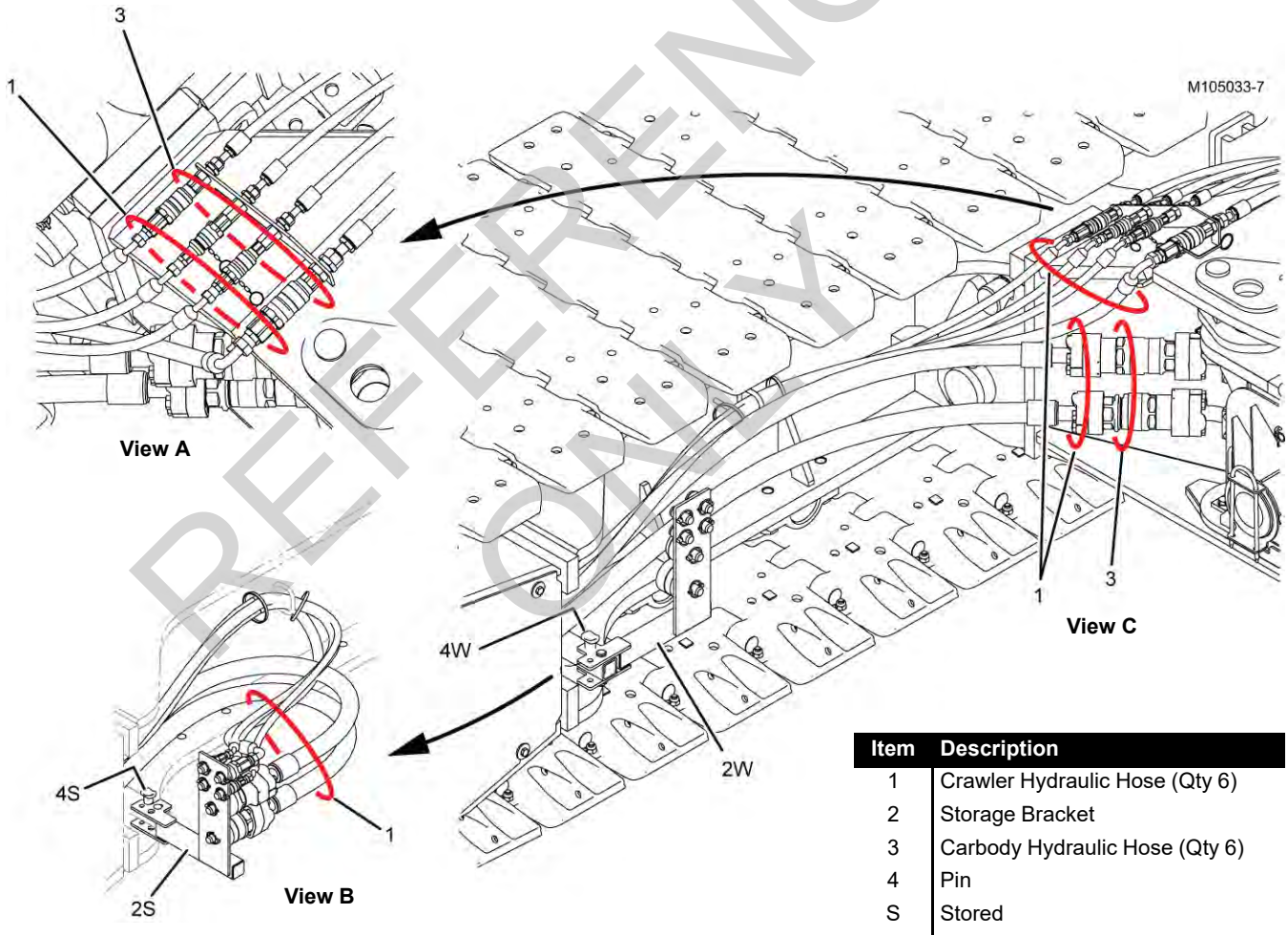
Perform the following steps at the drive end of both crawlers. See Figure 4-24.

NOTE At assembly, apply a light coat of silicone lubricant to the threads of all dust caps, couplers, and connectors to help prevent the threads from seizing.

1. Disconnect the dust caps from the carbody hydraulic hoses (3).
2. Disconnect the crawler hydraulic hoses (1, View B) from the storage bracket (2S).
3. Thoroughly clean, lubricate, and connect the dust caps to the fittings on the storage bracket (2S).
4. Thoroughly clean all fittings on the crawler hydraulic hoses (1) and the carbody hydraulic hoses (3).
5. Connect the crawler hydraulic hoses (1, View A and C) to the carbody hydraulic hoses (3). The hoses can be connected one way only.
6. Remove the pins (4S, View B) from the storage brackets (2) in the shipping position.
7. Rotate the storage brackets (2, View C) to the working position and install the pins (4W).

Raise Handrails

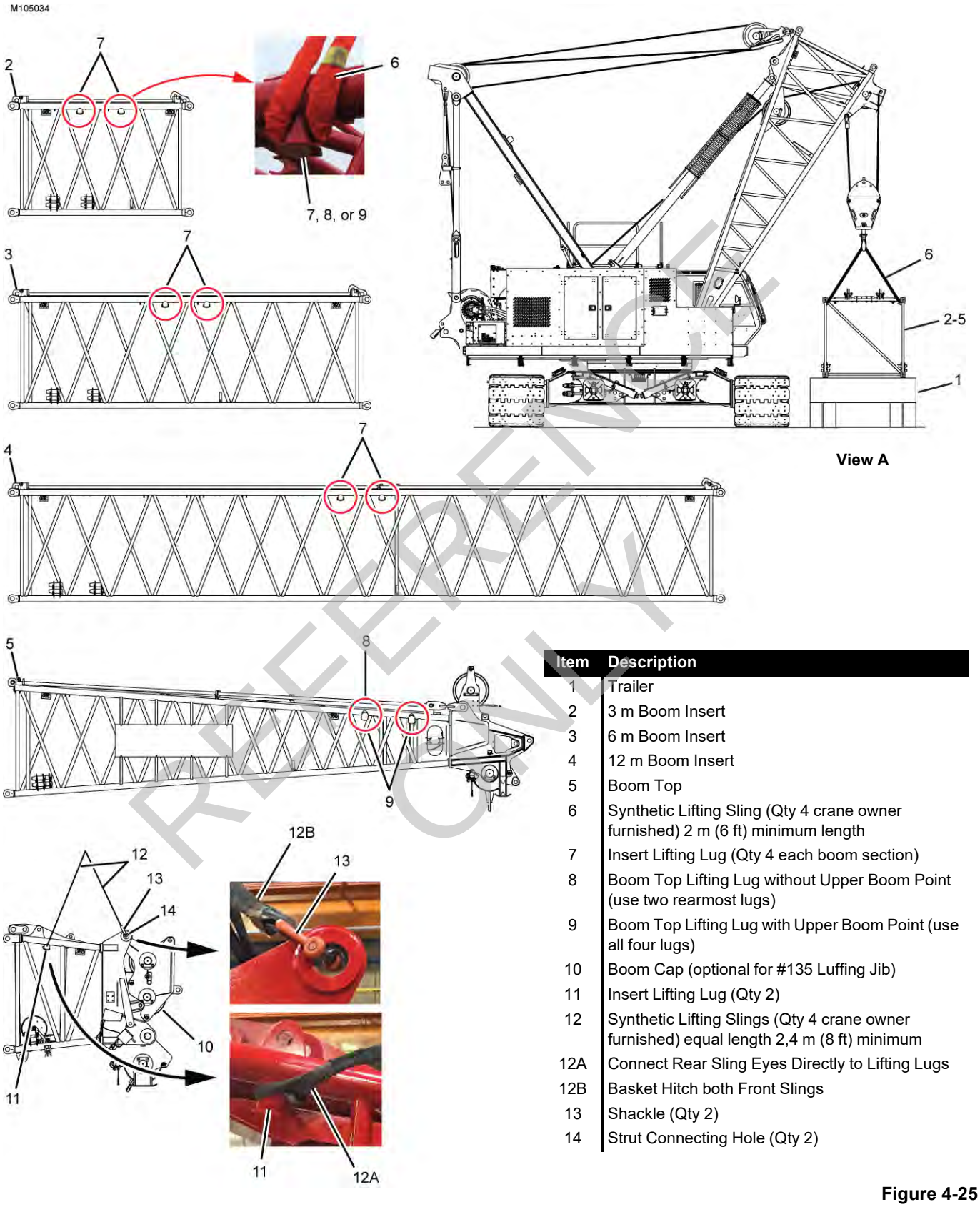
If not already done, raise the handrails on the left enclosure. See instructions on page 4-17.



Item	Description
1	Crawler Hydraulic Hose (Qty 6)
2	Storage Bracket
3	Carbody Hydraulic Hose (Qty 6)
4	Pin
S	Stored
W	Working

Figure 4-24

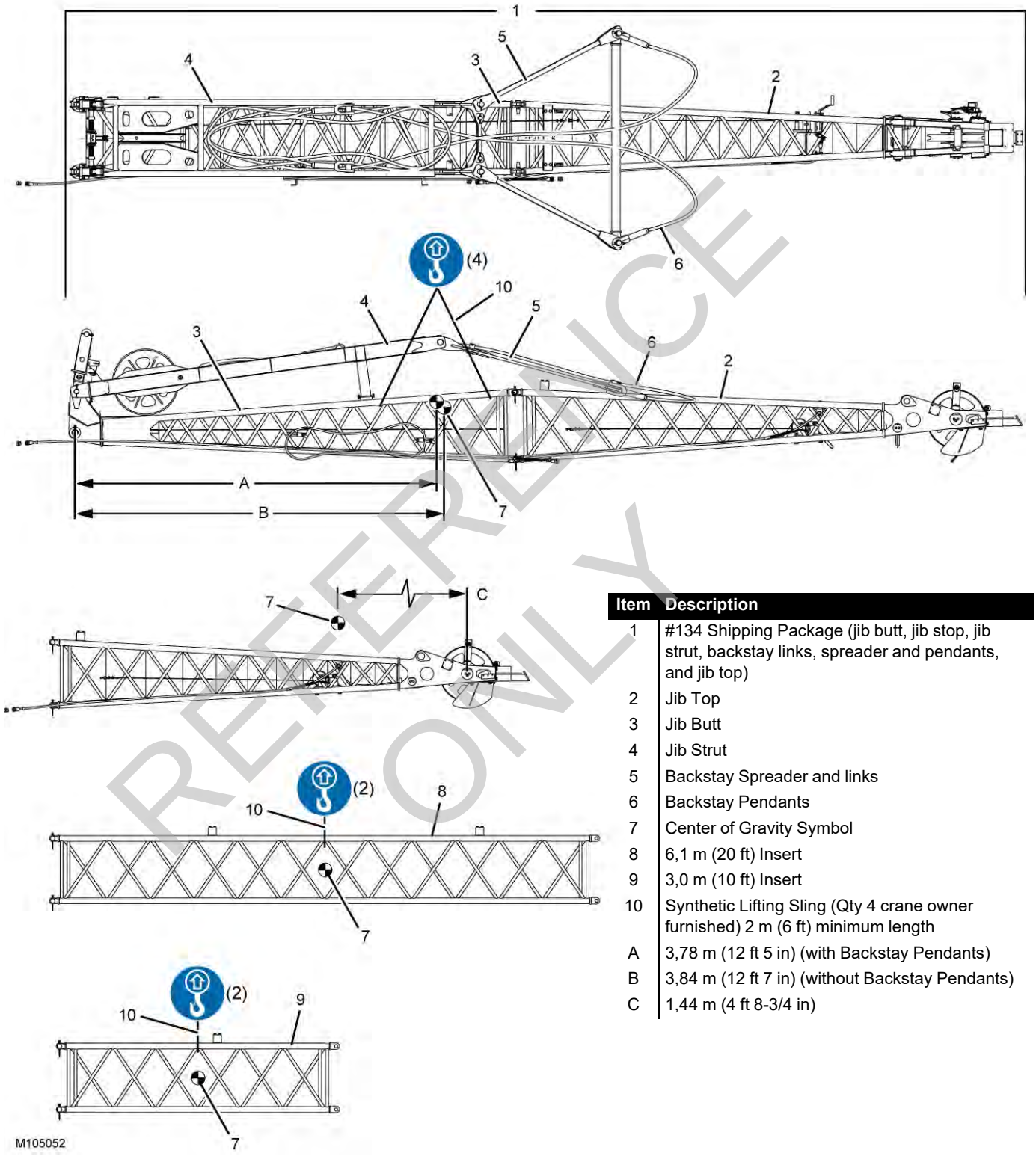
Boom Handling Locations



Item	Description
1	Trailer
2	3 m Boom Insert
3	6 m Boom Insert
4	12 m Boom Insert
5	Boom Top
6	Synthetic Lifting Sling (Qty 4 crane owner furnished) 2 m (6 ft) minimum length
7	Insert Lifting Lug (Qty 4 each boom section)
8	Boom Top Lifting Lug without Upper Boom Point (use two rearmost lugs)
9	Boom Top Lifting Lug with Upper Boom Point (use all four lugs)
10	Boom Cap (optional for #135 Luffing Jib)
11	Insert Lifting Lug (Qty 2)
12	Synthetic Lifting Slings (Qty 4 crane owner furnished) equal length 2,4 m (8 ft) minimum
12A	Connect Rear Sling Eyes Directly to Lifting Lugs
12B	Basket Hitch both Front Slings
13	Shackle (Qty 2)
14	Strut Connecting Hole (Qty 2)

Figure 4-25

Fixed Jib Handling Locations



Item	Description
1	#134 Shipping Package (jib butt, jib stop, jib strut, backstay links, spreader and pendants, and jib top)
2	Jib Top
3	Jib Butt
4	Jib Strut
5	Backstay Spreader and links
6	Backstay Pendants
7	Center of Gravity Symbol
8	6,1 m (20 ft) Insert
9	3,0 m (10 ft) Insert
10	Synthetic Lifting Sling (Qty 4 crane owner furnished) 2 m (6 ft) minimum length
A	3,78 m (12 ft 5 in) (with Backstay Pendants)
B	3,84 m (12 ft 7 in) (without Backstay Pendants)
C	1,44 m (4 ft 8-3/4 in)

Figure 4-26

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Unload Trailers

The MLC150-1 can now be used to unload the trailers as shown in Figure 4-25 on page 4-32, View A.

- See the Crane Weights in Section 1 of the MLC150-1 Operator Manual for the weights of individual components.

Refer to the Liftcrane Boom Butt Capacities Chart at the end of this section for lifting capacities.

WARNING

Falling Load Hazard!

The lifting lugs on each boom section are designed for lifting only that section. Do not attempt to lift two or more boom sections with the lifting lugs on one section. The lifting lugs may break allowing the boom sections to fall.\

The crane owner/user shall verify the following prior to each lift:

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

Boom Sections

All boom sections have lifting lugs as shown in Figure 4-25 on page 4-32.

- Handle the boom sections with care to avoid damaging the lacings and chords.
- Use synthetic lifting slings (crane owner furnished) to lift the boom sections. The lifting lugs have been positioned for a minimum sling length of 2 m (6 ft).

  If wire rope or chain lifting slings are used to handle the boom sections, install protective covering (such as sections of rubber tire) between the slings and the section being lifted.

WARNING

Personal Injury or Property Damage!

Make sure the boom straps and links (Figure 4-27) are secured in the shipping position on the boom inserts and top during handling and transportation.

Make sure the boom straps and links remain properly secured in the shipping position on the boom inserts and top during loading/unloading and during assembly/disassembly of the boom. The straps and links could shift or fall resulting in personal injury or property damage if not properly secured.

1	Strap
2	Links
3	Storage Pin with Safety Pins

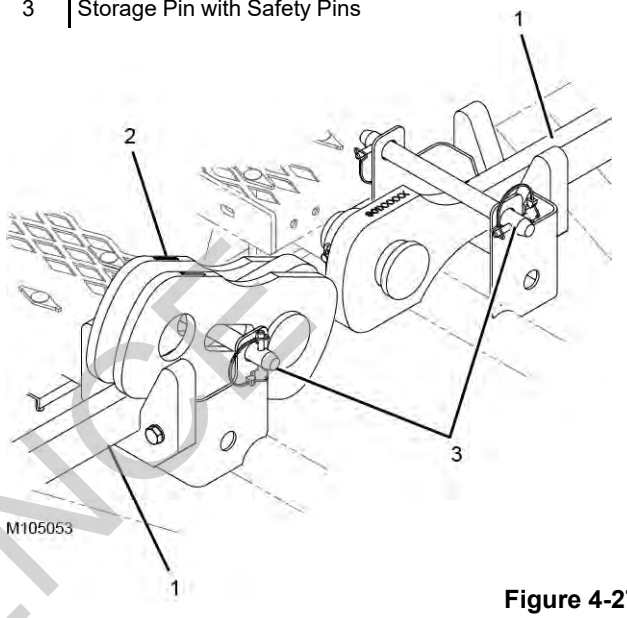


Figure 4-27

Jib Sections

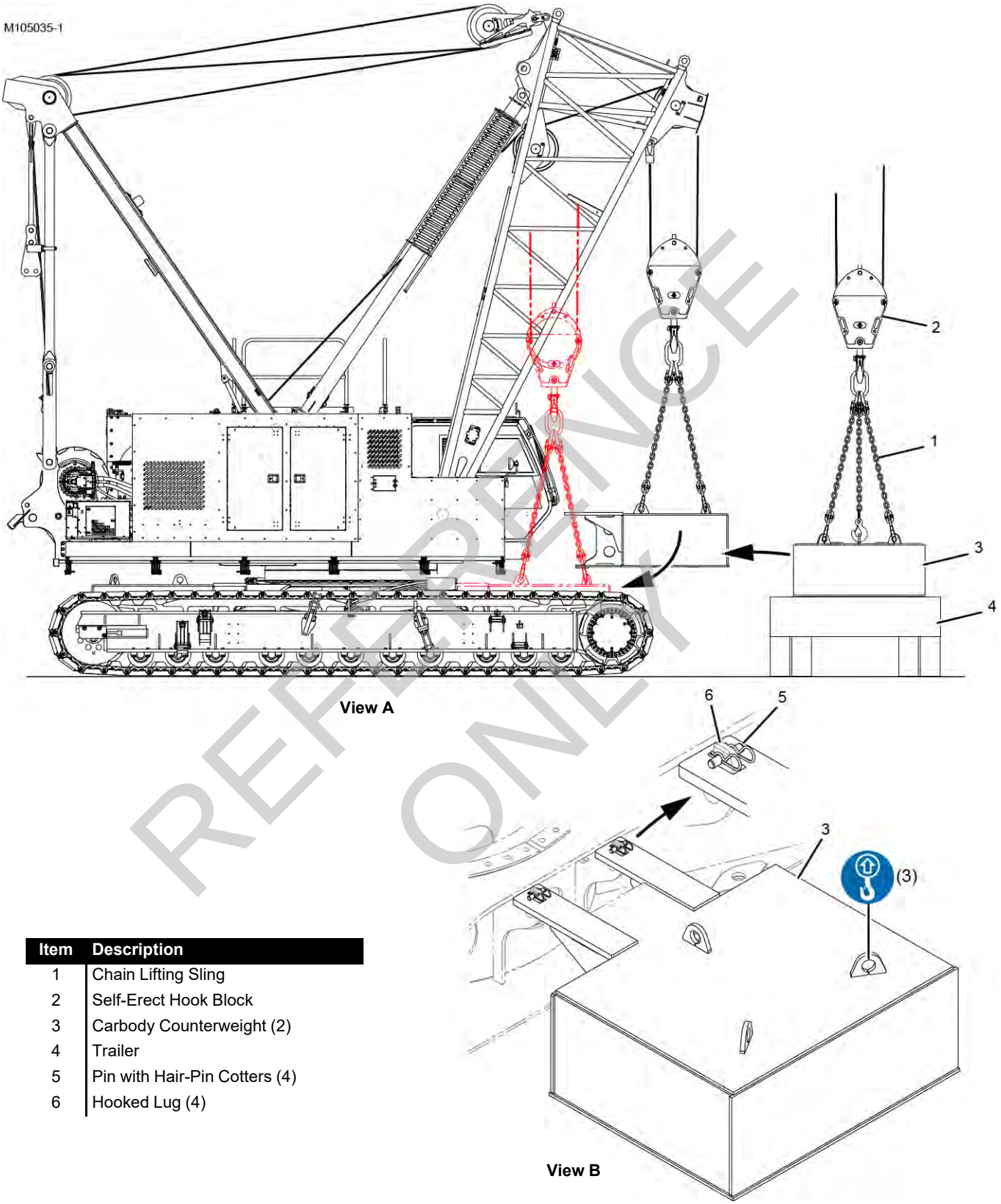
The jib sections do not have lifting lugs.

- Handle the jib sections with care to avoid damaging the lacings and chords.
- Use synthetic lifting slings (crane owner furnished) (2 m [6 ft] minimum length) to handle the jib sections. Lift at the chords only. Never lift at the lacings. If wire rope or chain lifting slings are used to handle the jib sections, install protective covering (such as sections of rubber tire) between the slings and the section being lifted.
- See Figure 4-26 on page 4-33 for the center of gravity of the jib sections.

Counterweight

- Each carbody counterweight has three lifting lugs. See Figure 4-28 on page 4-36.
- Each crane counterweight box has two lifting points. See Figure 4-29 on page 4-38.
- The crane counterweight tray counterweight has three lifting lugs. See Figure 4-29 on page 4-38.

Use the Manitowoc supplied chain lifting sling (Figure 4-4 on page 4-5) to handle the crane and carbody counterweight boxes and tray.



Item	Description
1	Chain Lifting Sling
2	Self-Erect Hook Block
3	Carbody Counterweight (2)
4	Trailer
5	Pin with Hair-Pin Cotters (4)
6	Hooked Lug (4)

Figure 4-28

Assemble Boom and Jib

The boom and jib can be assembled with the MLC150-1 boom butt or with an assist crane.

Refer to the lifting capacities given in the Liftcrane Boom Butt Handling Capacities Chart at the end of this section.

For instructions, see the following topics:

- Boom #350 Assembly on page 4-63
- Jib #134 Assembly on page 4-69

Install Carbody Counterweight

For Series 1, disregard this procedure and go to page 4-39.

If equipped with Series 2 counterweight, install the carbody counterweight at both ends of the carbody, as follows, ***BEFORE installing crane counterweight***.

See Figure 4-28.

DANGER

Falling Load Hazard!

Prevent structural failure of components or tipping:

- Do not exceed the lifting capacities given in the Liftcrane Boom Butt Handling Capacities Chart at the end of this section.

Crane Tipping Hazard!

To avoid serious crushing injury:

- For Series 2, install the carbody counterweight before installing the crane counterweight.

1. Attach the chain lifting sling (1, View A) to the self-erect hook block (2).
2. Hook onto the carbody counterweight (3) with the chain lifting sling (1) and lift the counterweight off the trailer (4).
3. Remove the trailer.
4. Lift the carbody counterweight into position at the desired end of the carbody.
5. Remove the pins (5, View B) from the hooked lugs (6) on the carbody.
6. Boom, swing, and hoist as required to engage the cutouts in the carbody counterweight (3, View B) with the hooked lugs (6) on the carbody.

   The boom will be at approximately 87°.
7. Lower the carbody counterweight until the lifting slings go slack.
8. Install the pins (5, View B) to secure the carbody counterweight to the carbody.
9. Disconnect the chain lifting sling from the carbody counterweight.
10. Repeat the above steps for the other carbody counterweight.

Item	Description
1	Self-Erect Hook Block
2	Chain Lifting Sling
3	Counterweight Tray
4	Counterweight Box • Qty 6 for Series 1 (3 each side) • Qty 10 for Series 2 (5 each side)
5	Connecting Pin with Safety Pins (Qty 2 each box)
6	Handling Pendants and Links (stored on tray)
6A *	Pin with Cotter Pin (Qty 4)
7	Grab Handle (Qty 2 each box)
*	Two pins (6A) are used to attach the counterweight handling links to the gantry during shipping.

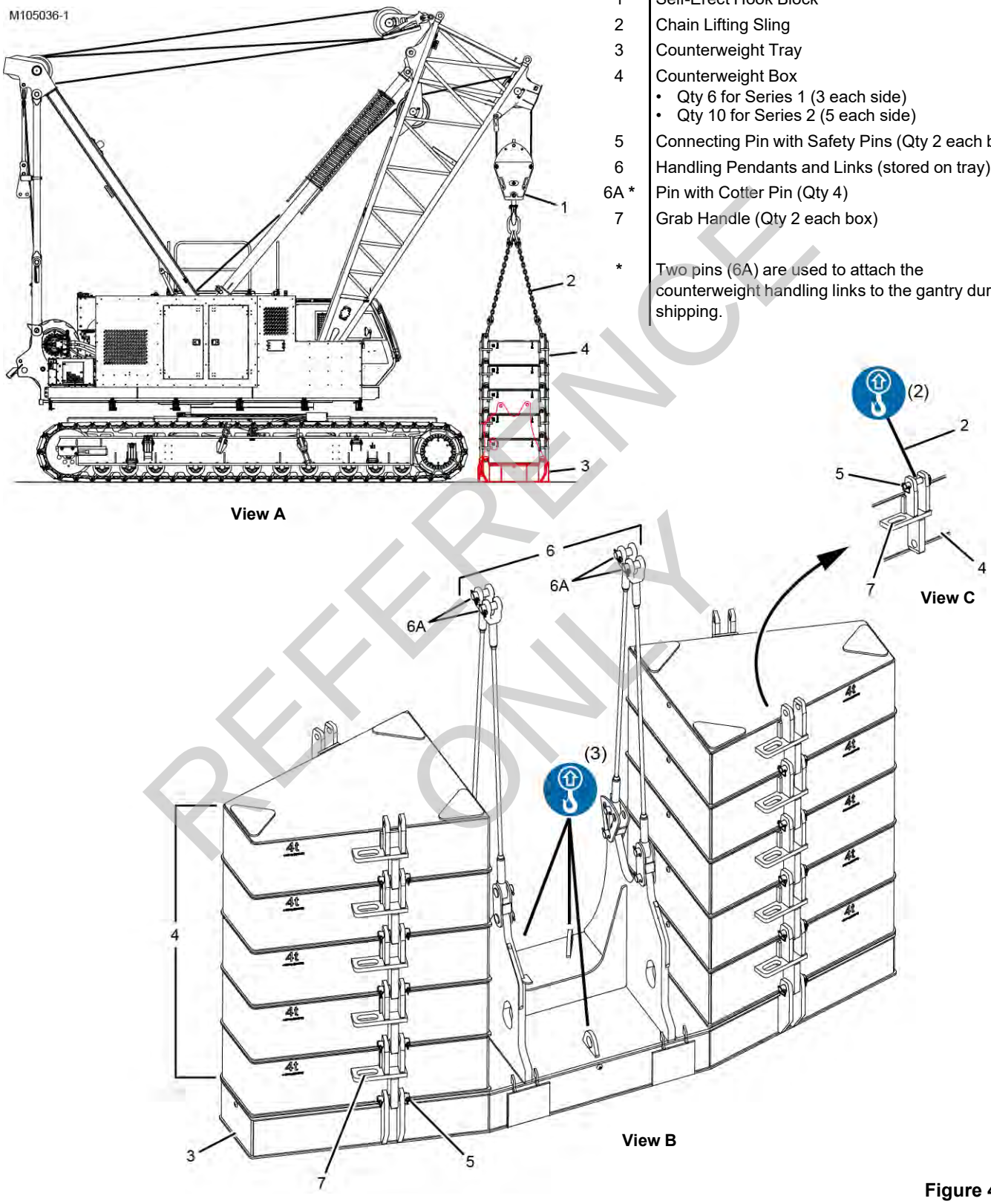


Figure 4-29

Assemble Crane Counterweight

See Figure 4-29.

The MLC150-1 can be used to assemble the crane counterweight using the chain lifting sling (2, View A) attached to the self-erect hook block (1).

DANGER

Falling Load Hazard!

Prevent structural failure of components or tipping:

- Do not exceed the lifting capacities given in the Liftcrane Boom Butt Handling Capacities Chart at the end of this section.

WARNING

Falling Load Hazard!

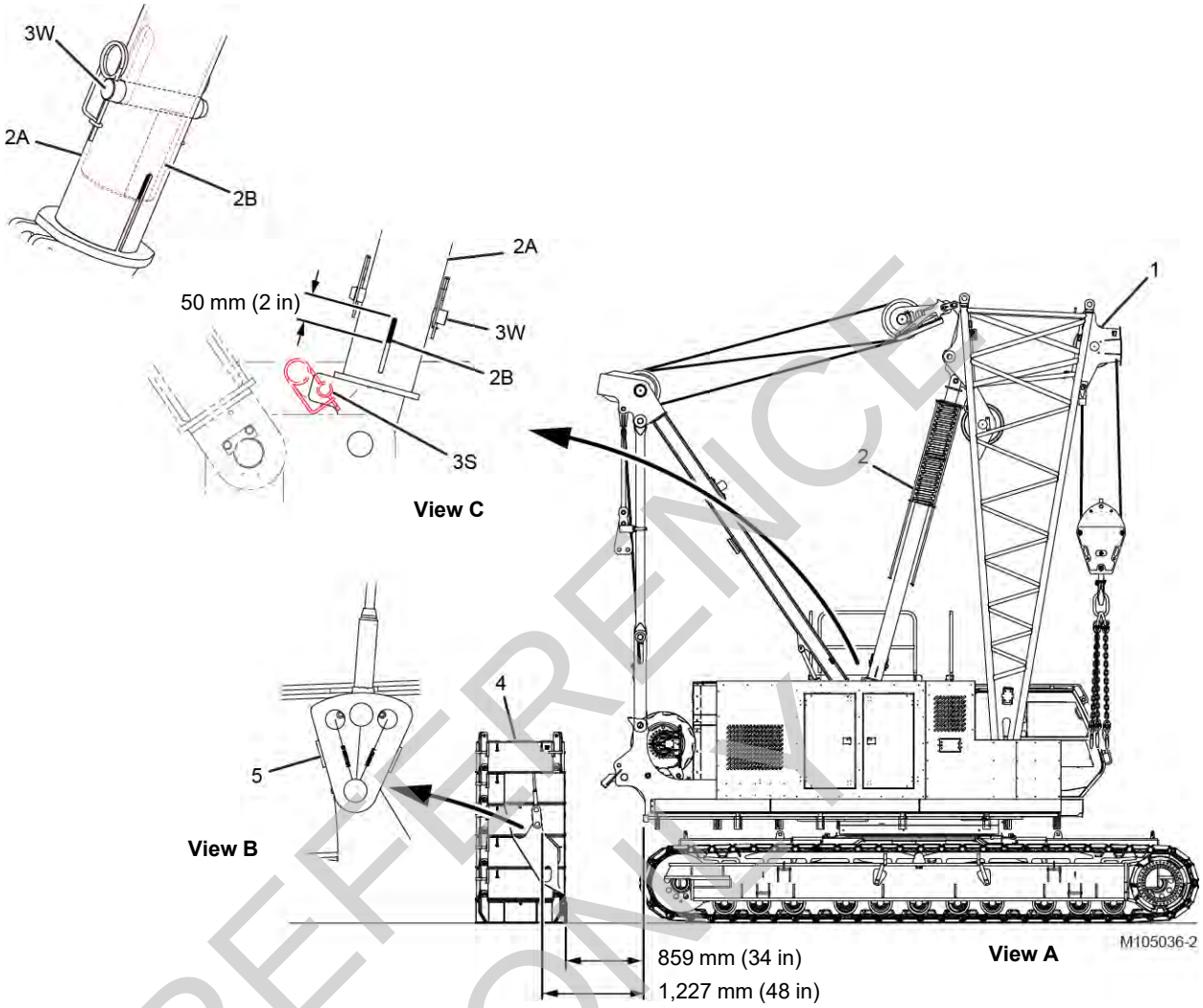
The three lifting lugs on the counterweight tray are designed only for lifting the tray. Do not attempt to lift the counterweight tray from the lifting lugs with the counterweight boxes installed. The lifting lugs may break allowing the tray and boxes to fall.

Refer to the Counterweight Arrangement Chart in the Capacity Chart Manual for counterweight requirements.

1. Lift the counterweight tray (3, View B) onto the ground. Lift at the three lifting lugs provided.

NOTE A maximum of two counterweight boxes (4) can be pinned together for handling.

2. Install the counterweight boxes:
   a. Install two connecting pins (5, View C) in the top holes of the counterweight box (4).
   b. Using two legs of the chain lifting sling (2, View C), lift the counterweight box (4) at the two connecting pins (5).
   c. Lift the counterweight box into position on the desired side of the counterweight tray (3, View B) and align the connecting lugs.
   d. Disconnect the lifting slings and remove the connecting pins (5, View B) from the top holes of the counterweight box (4).
   e. Pin the counterweight box (4, View B) to the counterweight tray (3) with the two connecting pins (5).
   f. Repeat the above steps until the required number of counterweight boxes are pinned to the tray and to one another.
3. Make sure all of the counterweight boxes are pinned to the tray and to each other with connecting pins (5). Make sure the safety pins are installed.



Item	Description
1	Boom Butt at 87°
2	Boom Stop Spring Compressed (Qty 2)
2A	Boom Stop Outer Tube (Qty 2)
2B	Boom Stop Inner Tube (Qty 2)
3	Hold-Back Pin with Safety Pin (Qty 2)
4	Crane Counterweight
5	Adjustable Handling Link (Qty 2)
S	Storage Holes
W	Working Holes

Figure 4-30

DANGER

Crush Hazard!

Avoid being crushed by moving parts:

- Do not stand between the crane counterweight and the crane while the crane counterweight is being installed.
- Do not stand on the crane counterweight while it is being raised or lowered.
- Do not climb onto the crane counterweight until the counterweight pins are engaged.
- Never go under the crane counterweight until the counterweight pins are engaged.

Enable Remote Control

Enable the remote control in the main display. Read the topic Self-Erect Controls on page 4-9.

Install Crane Counterweight

DANGER

Crane Tipping Hazard!

To avoid serious crushing injury:

- For Series 2 only, install the carbody counterweight before installing the crane counterweight.

See Figure 4-30.

1. Disable the RCL limiter and alarm in the Boom Butt Configuration screen. For instructions, see the topic “Entering Boom Butt Configuration” in the RCL/RCI Operation Manual.
   - Faulty operation during crane counterweight installation will occur if you do not perform this step.
   - You will have to repeat step 1 if you stop and restart the engine for any reason during the procedure.

WARNING

Crush Hazard!

Moving parts can cut or crush.

Do not stick your fingers into the slots in the boom stop outer tubes (2A, View C, Figure 4-30).

2. Prepare the boom butt.

NOTE Using the remote control will allow the operator to see the hold-back holes during the following steps.

CAUTION

Structural Damage to Crane!

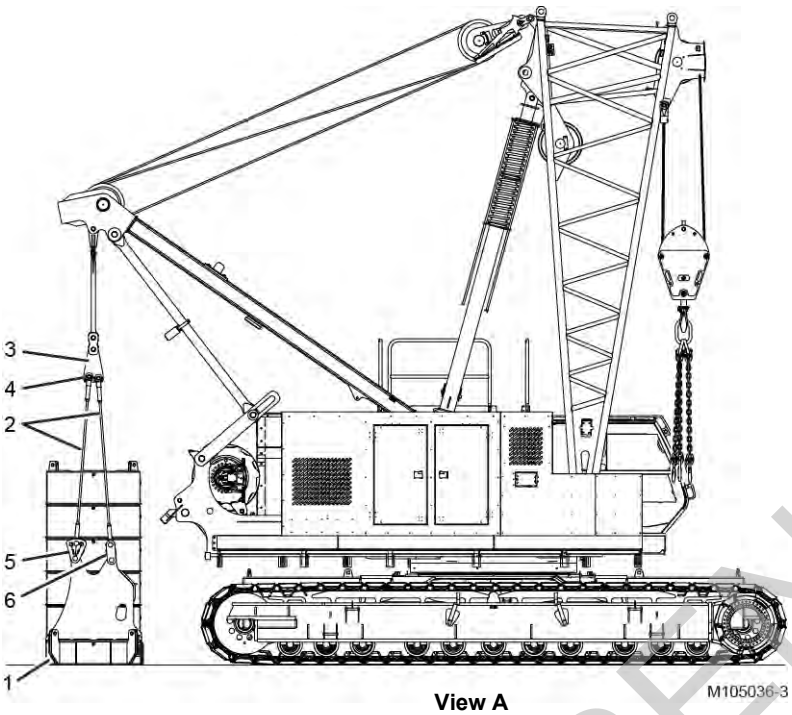
Use extreme care when compressing the boom stops during the following steps. Do not bottom out the boom stops while compressing them. Damage to the boom butt or boom stops can occur.

Stop compressing the boom stops when the hold-back holes are aligned.

   a. Slowly raise the boom butt (1, View A) to approximately 87°. This step will compress the boom stop springs (2).
   b. Stop raising the boom butt when the boom stop inner tubes (2B, View C) are visible approximately 50 mm (2 in) into the slots in the boom stop outer tubes (2A).

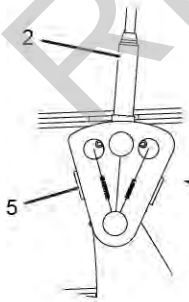
      The hold-back holes in the inner and outer tubes should now be aligned.
   c. Remove the hold-back pins (3, View C) from the storage holes (S) and install them in the working holes (W) between the boom stop tubes.
3. The boom butt will now remain in position while the gantry is raised and lowered during the remaining steps.
4. Travel the crane into position so it is in line and centered in front of the crane counterweight (4, View A) at the approximate dimension given.
5. The adjustable handling links (5, View B) must be toward the rear.

Continued on next page.



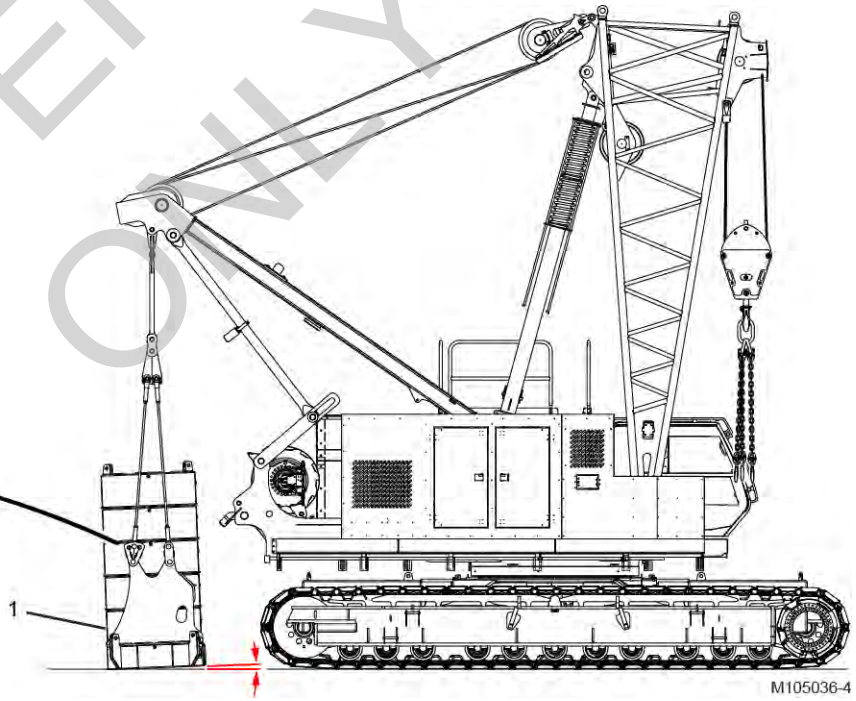
View A

Item	Description
1	Crane Counterweight
2	Handling Pendant (Qty 4)
3	Handling Link (Qty 2)
4	Pendant Pin with Safety Pin (Qty 4)
5	Adjustable Handling Link (Qty 2)
6	Front Handling Link (Qty 2)



View C

NOTE Larger radius corresponds to longer distance between holes.



View B

Figure 4-31

Install Crane Counterweight (continued)

Use the remote control for the remaining steps. This will allow the installer to stand at the rear of the crane and view the installation procedure.

- Use the Drum 4 (boom hoist) thumbwheel on the remote control to raise and lower the gantry.
- ***Turn ON the SYNC switch*** on the remote control so the gantry raising cylinders follow the gantry as it is raised and lowered during the following steps. See Section 3 of the MLC150-1 Operator Manual for detailed instructions.

See Figure 4-31.

6. Remove the pendant pins (4, View A) from the handling pendants (2).
7. Lower the gantry (boom down using the Drum 4 thumbwheel on the remote control) until the handling pendants (2, View A) can be pinned to the handling links (3).

   At this point:

   - The gantry will be at approximately 35°.
   - The handling links (3) will be centered over the crane counterweight (1).
8. Pin the handling pendants (2, View A) to the handling links (3) with the pendant pins (4).
9. Slowly raise the gantry (boom up using the Drum 4 thumbwheel on the remote control) until the crane counterweight is about to leave the ground. The tray should hang approximately 2° out of level (View B) — front of tray higher than rear of tray.
10. If needed, the angle can be adjusted slightly by changing which holes the handling pendants are pinned to in the adjustable handling links (5, View C).

    The rear handling pendants (2, View C) can be made longer (increase lifting angle) or shorter (decrease lifting angle) by pinning the pendants to the corresponding holes in the links. Be sure to pin both pendants to the same holes, or the crane counterweight will lift out of level from side to side.

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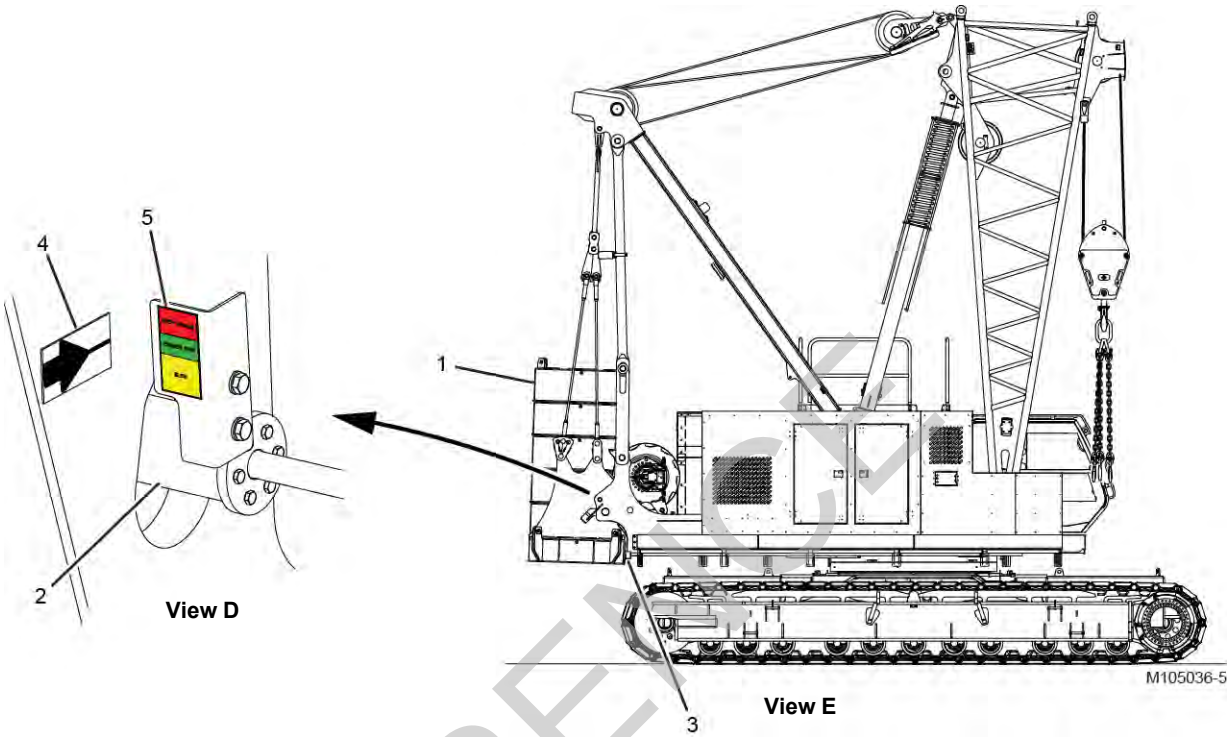
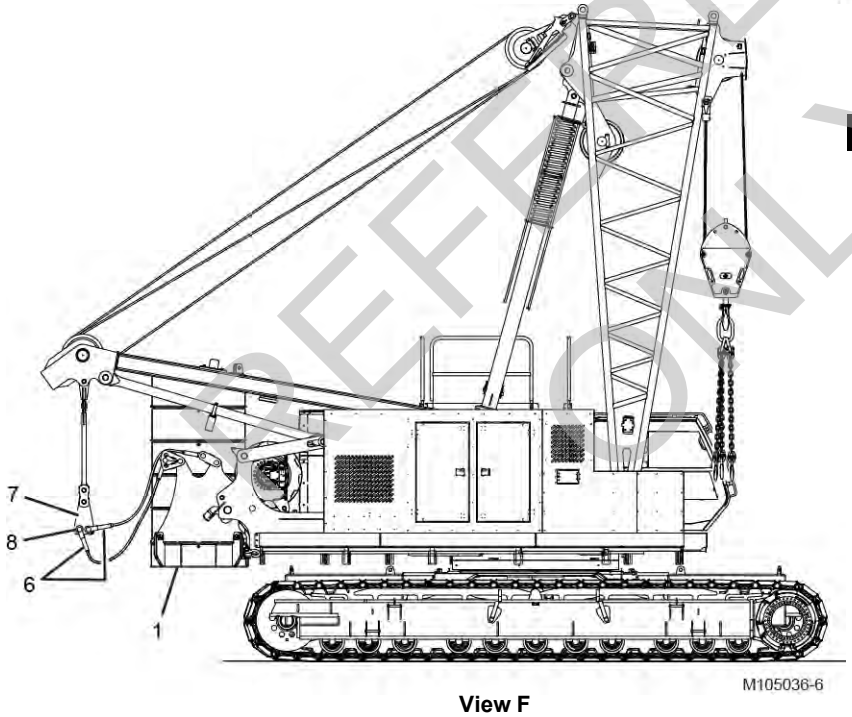




Item	Description
1	Crane Counterweight
2	Counterweight Pin (Qty 2)
3	Pad (Qty 2)
4	Arrow
5	Alignment Decal
6	Handling Pendant (Qty 4)
7	Handling Link (Qty 2)
8	Pendant Pin with Cotter Pin (Qty 4)

Figure 4-32

Install Crane Counterweight (continued)

See Figure 4-32.

11. Disengage the counterweight pins (2, View D) using the switch on the remote control.

12. Slowly raise the gantry (boom up using the Drum 4 thumbwheel on the remote control) to lift the crane counterweight (1, View E) into position.

The boom butt will rise slightly and the boom stops will fully compress during this step.

13. The pads (3, View E) on the front of the tray should contact the pads on the rear of the crane first.
14. Use the arrow (4, View D) on the tray and the alignment decal (5) to judge when the crane counterweight is high enough to engage the counterweight pins.
15. Once the arrow (4, View D) points to the green area of the alignment decal (5), engage the counterweight pins (2, View D) with the switch on the remote control.

NOTE If the crane counterweight is raised too high, a limit switch will trip open to stop the gantry and prevent the backhitch from fully extending. The COUNTERWEIGHT TOO HIGH fault will come on in the main display.

16. Verify that the counterweight pins are fully engaged.
17. Slowly lower the gantry (boom down using the Drum 4 thumbwheel on the remote control) to lower the crane counterweight onto the pins.
18. Continue to lower the gantry until the handling pendants (6, View F) can be unpinned from the handling links (7).
19. Unpin the handling pendants (6, View F) from the handling links (7).
20. Install the pendant pins (8) in the handling pendants (6) and store the handling pendants on the counterweight tray.

See Figure 4-33.

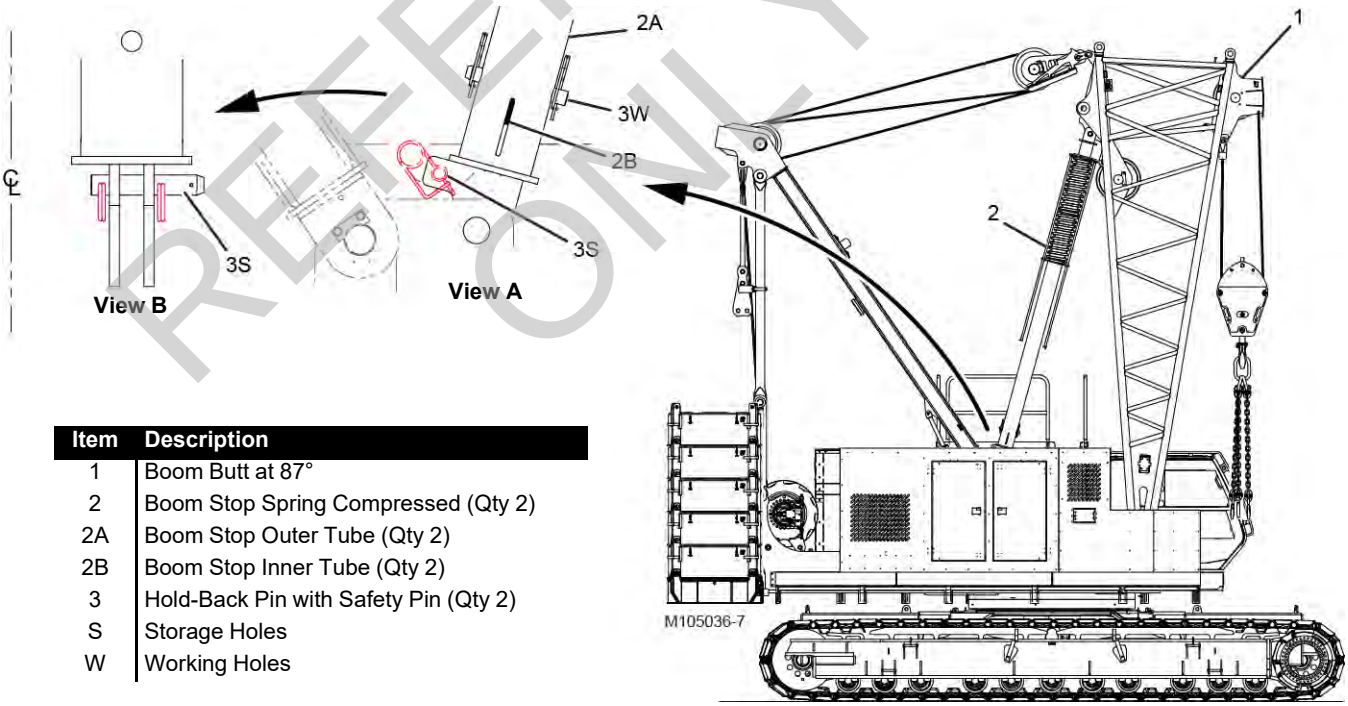
21. Fully raise the gantry (boom up using the Drum 4 thumbwheel on the remote control) until the cylinders are fully extended and the backhitch links are tight.
22. Boom up slightly using the Drum 4 thumbwheel on the remote control so the hold-back pins (3) are loose.
23. Remove the hold-back pins (3, View A) from the working holes (W) in the boom stop tubes and install the pins in the storage holes (S). The pins must be stored as shown in View B.

CAUTION

Avoid Wire Rope Damage!

The hold-back pins (3, Figure 4-33) must be installed as shown in View B — ***short end of pins toward center of crane.*** Otherwise, the load line from Drum 2 can catch under the pin. Wire rope or pin damage will occur.

24. ***Turn OFF the SYNC switch*** on the remote control.
25. Lower the boom butt into the working range.
26. Disable and store the remote control.



Item	Description
1	Boom Butt at 87°
2	Boom Stop Spring Compressed (Qty 2)
2A	Boom Stop Outer Tube (Qty 2)
2B	Boom Stop Inner Tube (Qty 2)
3	Hold-Back Pin with Safety Pin (Qty 2)
S	Storage Holes
W	Working Holes

Figure 4-33

Item	Description
1	Blocking Under Boom Top Stands
2	Synthetic Lifting Slings (Owner Furnished)
3	Boom Insert Top Connectors
4	Blocking—457 mm (18”)
5a	B10:350 Boom Top
5b	B20:350 Boom Cap

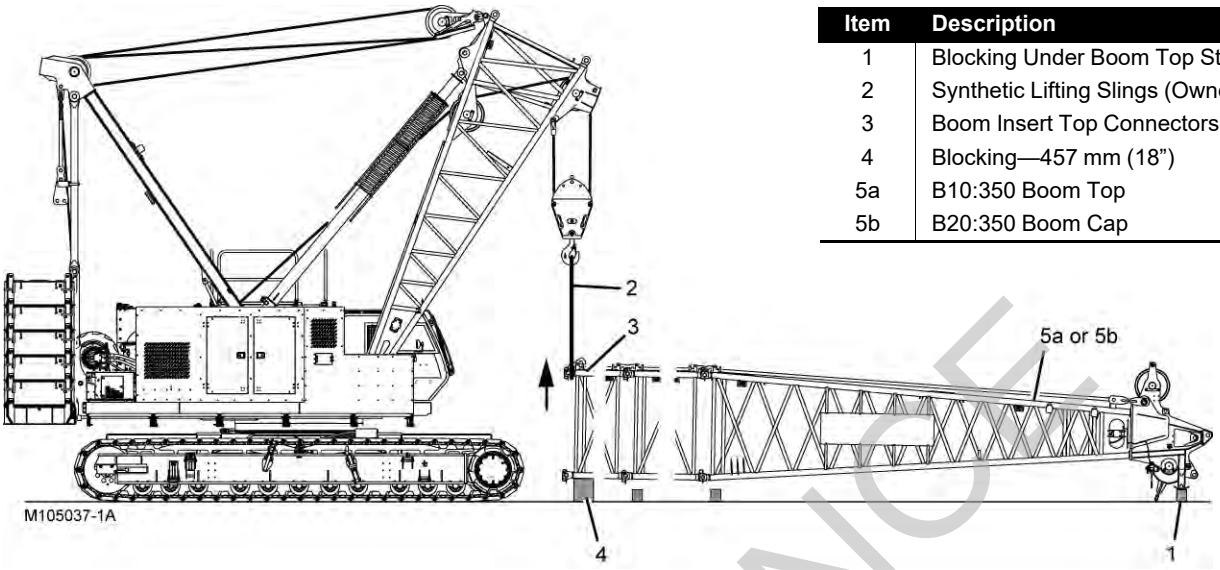
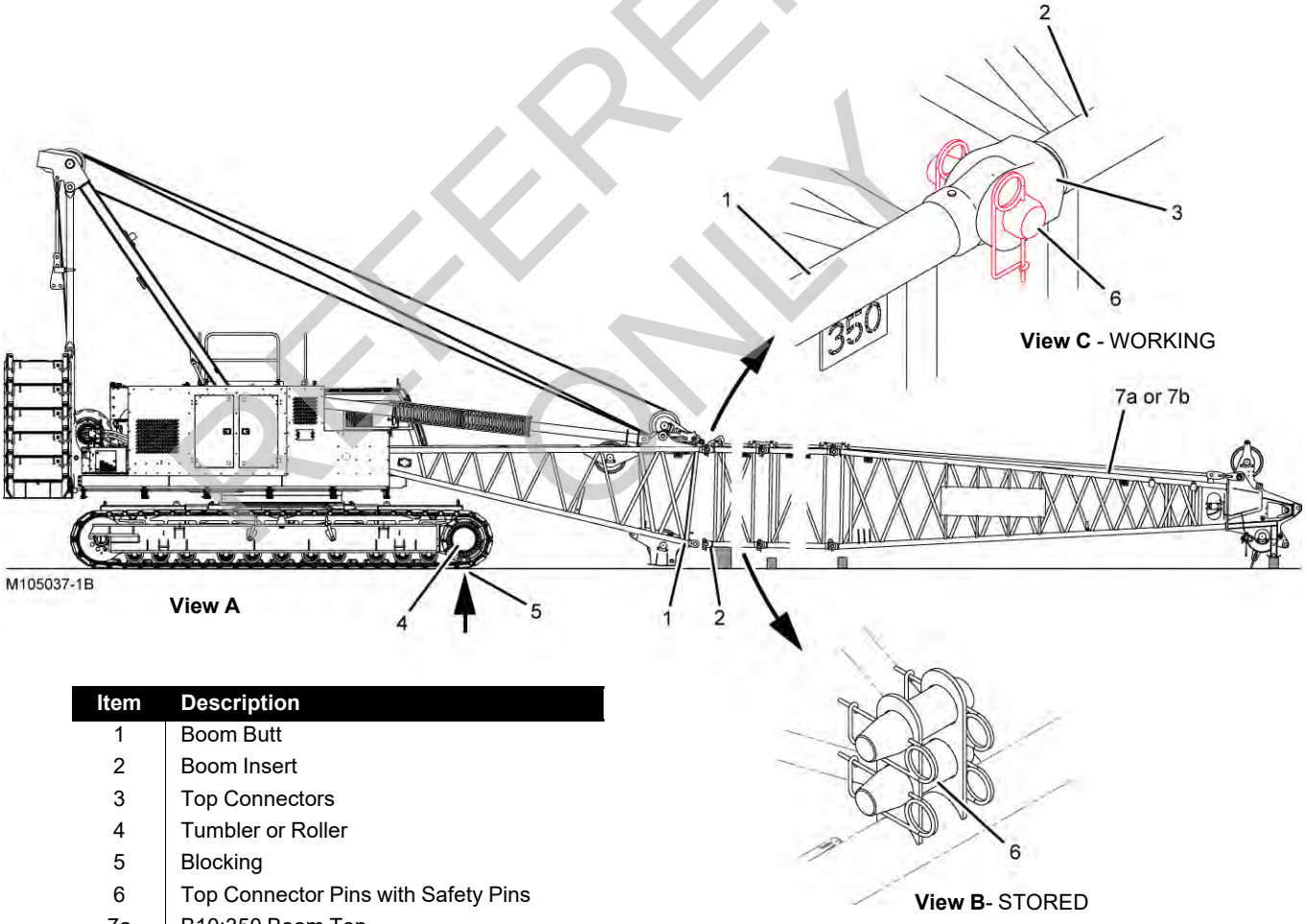


Figure 4-34



Item	Description
1	Boom Butt
2	Boom Insert
3	Top Connectors
4	Tumbler or Roller
5	Blocking
6	Top Connector Pins with Safety Pins
7a	B10:350 Boom Top
7b	B20:350 Boom Cap

Figure 4-35

Block Under Last Insert

The insert closest to the boom butt must be blocked at least 457 mm (18 in) to allow the boom butt to be connected to the insert. Otherwise, the boom butt stands will contact the ground.

See Figure 4-34.

1. Install the blocking (1) under the boom top stands to provide a fulcrum.
2. Using a chocker hitch, securely attach owner furnished synthetic lifting slings (2) to the top connectors of the boom insert (3) and to the hook of the self-erect hook block.

   The lifting slings must be sized to support one-half the weight of the boom.
3. Lift the boom insert (3).
4. Install the blocking (4) under the insert.
5. Lower the insert onto the blocking and remove the lifting slings.

Remove Self-Erect Hook Block

When done using the MLC150-1 for self-assembly, remove the chain lifting sling and the self-erect hook block from the boom butt. Store them in the parts box.

- Reverse the steps for Install Chain Lifting Sling on page 4-23.
- Reverse the steps for Install Self-Erect Hook Block on page 4-22.

Connect Boom Butt to Boom

See Figure 4-35.

NOTE The insert closest to the boom butt must be blocked at least 457 mm (18 in) to allow the boom butt to be connected. Otherwise, the boom butt stands will contact the ground.

1. If not already done, remove the self-erect hook block.
2. Lower the boom butt (1, View A) until the boom butt stands are just clear of the ground.
3. Position the crane so the boom butt (1, View A) is in line with the boom insert (2).
4. Travel forward slowly, swing, and boom up and down as needed to align the top connectors (3, View C) on the boom butt (1) with the top connectors (3) on the insert (2).

WARNING

Tipping Hazard!

Prevent the crane from tipping:

- Block the crawlers — if required per the capacity chart — before attempting to raise the boom.

5. Check the appropriate capacity chart to see if the crawlers need to be blocked to raise the boom. If so, proceed as follows:
   a. Mark the ground at the center of the front tumbler or roller (4, View A).

      See the Crawler Blocking Diagram in the Capacity Chart Manual for blocking requirements.
   b. Slowly travel in reverse several feet.
   c. Place the required blocking (5, View A) on the ground at the points marked in step a.
   d. Repeat step 4 while traveling onto the blocking.

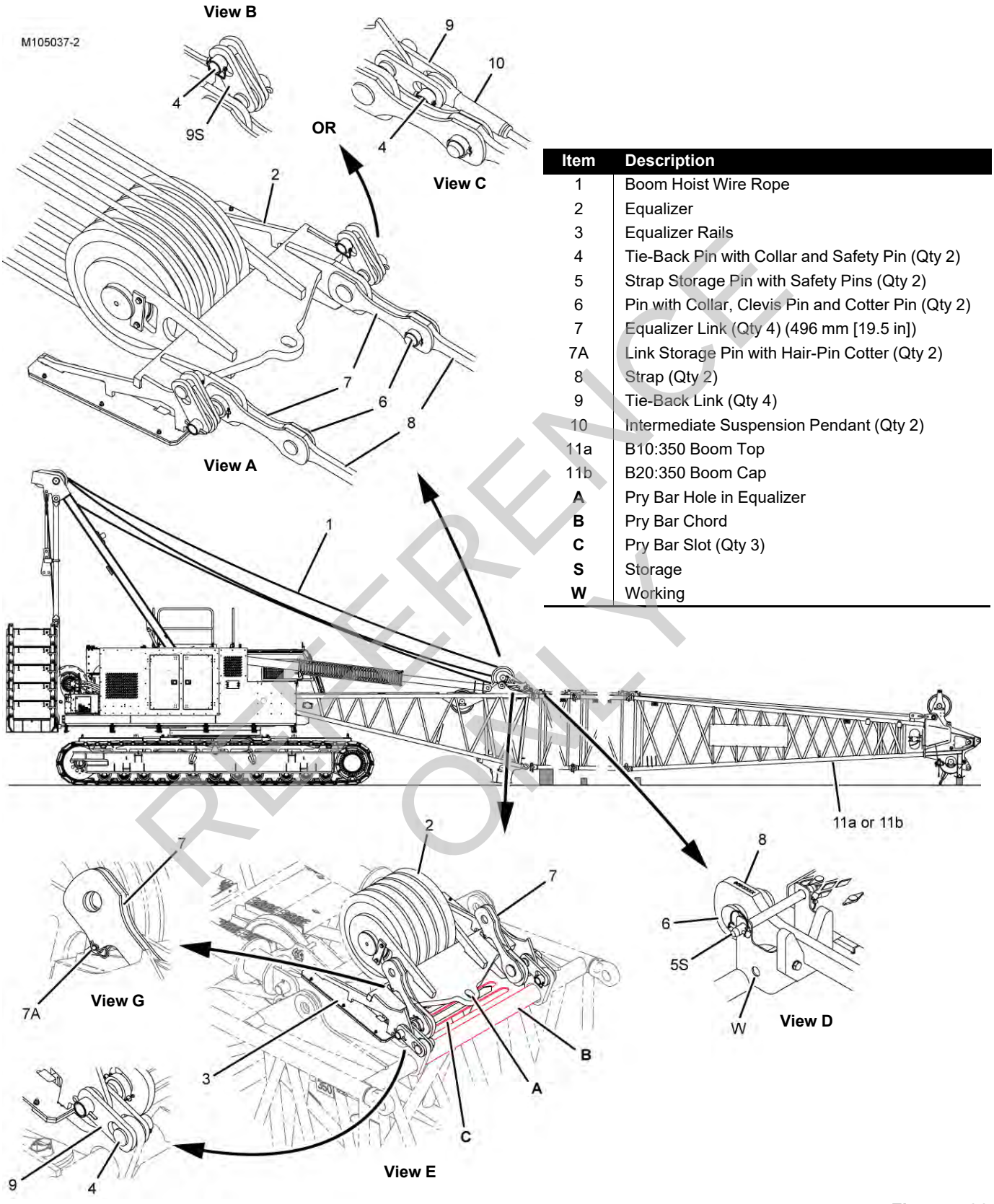
WARNING

Crushing Injury Hazard!

Prevent serious crushing injury:

- Do not stand inside the boom sections while installing the connector pins — STAND OUTSIDE BOOM.

6. Align the top connector holes and install the top connector pins (6, View C) — long tapered end pointing in.
   - Orient the connector pins so the safety pins can be installed vertically as shown.
   - The pins (6, View B) are stored in holders on the boom insert.
7. ***Connect the boom straps to the equalizer now, BEFORE CLOSING THE BOOM.*** See Connect Boom Straps to Equalizer on page 4-49.



Item	Description
1	Boom Hoist Wire Rope
2	Equalizer
3	Equalizer Rails
4	Tie-Back Pin with Collar and Safety Pin (Qty 2)
5	Strap Storage Pin with Safety Pins (Qty 2)
6	Pin with Collar, Clevis Pin and Cotter Pin (Qty 2)
7	Equalizer Link (Qty 4) (496 mm [19.5 in])
7A	Link Storage Pin with Hair-Pin Cotter (Qty 2)
8	Strap (Qty 2)
9	Tie-Back Link (Qty 4)
10	Intermediate Suspension Pendant (Qty 2)
11a	B10:350 Boom Top
11b	B20:350 Boom Cap
A	Pry Bar Hole in Equalizer
B	Pry Bar Chord
C	Pry Bar Slot (Qty 3)
S	Storage
W	Working

Figure 4-36

Connect Boom Straps to Equalizer

See Figure 4-36.

1. Boom down to slacken the boom hoist wire rope (1) until the equalizer (2, View E) is resting firmly on the boom butt equalizer rails (3) and the tie-back pins (4, View F) are loose.
2. Remove the strap storage pins (5, View D) from the storage holes (S) and install them in the working holes (W).
3. Remove the pins (6, View D) from the straps (8).
4. Remove link storage pins (7A, View G).
5. Rotate the equalizer links (7, View E) to the working position (View A).
6. Store the link storage pins (7A, View G) in the equalizer holes.
7. Install the pins (6, View A) — pin heads facing out — to connect the equalizer links (7) to the straps (8).

Close Boom

CAUTION

Avoid Gantry and/or Boom Butt Damage!

Do not boom up past the bottom connector holes.

1. Slowly boom up to align the bottom connector holes and install the connector pins (3, Figure 4-37). — long tapered end pointing in.
   - Orient the connector pins so the safety pins can be installed vertically as shown.
   - The pins are stored in holders on the boom insert.
2. Boom down to slacken the boom hoist reeving.

Disconnect Equalizer from Boom Butt

WARNING

Moving Object Hazard!

Prevent serious crushing injury:

- Make sure the tie-back pins (4, View F) are loose before removing them. Otherwise, the equalizer can be pulled rearward by the boom hoist wire rope.

See Figure 4-36.

1. Slacken the boom hoist wire rope.
2. If necessary, use a pry bar in hole (**A**, View A) to move the equalizer forward enough to loosen the tie-back pins (4, View F).
3. Pry against the chord (**B**) and the slots (**C**) in the boom butt.
4. Remove the tie-back pins (4, View F) to unpin the tie-back links (9) from the boom butt.
5. WITHOUT INTERMEDIATE SUSPENSION: rotate the tie-back links (9, View B) to the storage position (S) and install the tie-back pins (4).
6. WITH INTERMEDIATE SUSPENSION: pin the intermediate suspension pendants (9, View C) to the tie-back links (9) with the tie-back pins (4).

Configure RCL/RCI for Crane Operation

Select and confirm the required Crane Configuration and capacity chart in the RCL/RCI display.

Item	Description
1	Boom Butt
2	Boom Insert
3	Connector Pin with Safety Pins
S	Stored
W	Working

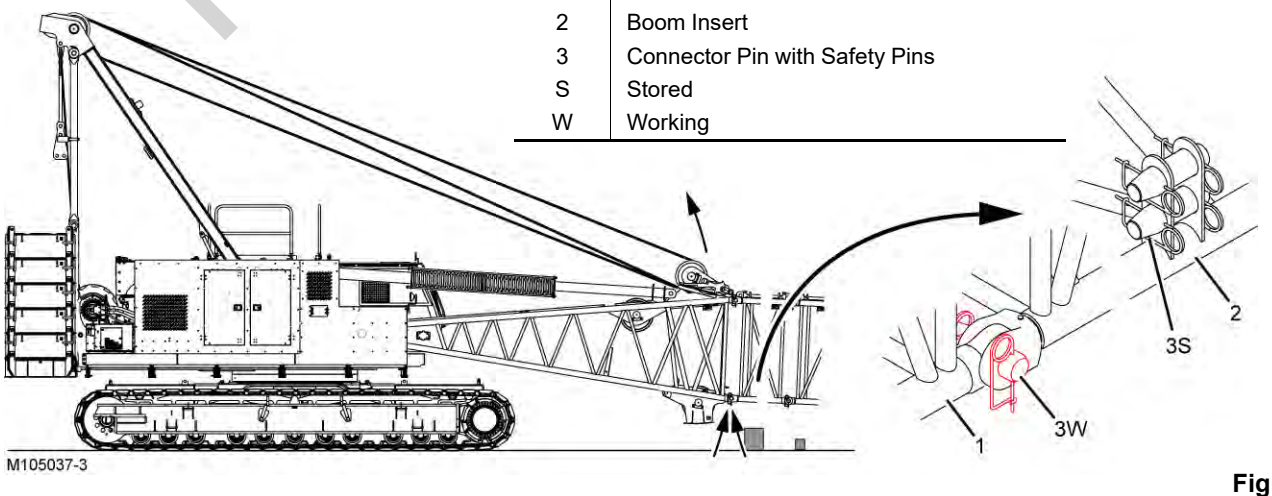


Figure 4-37

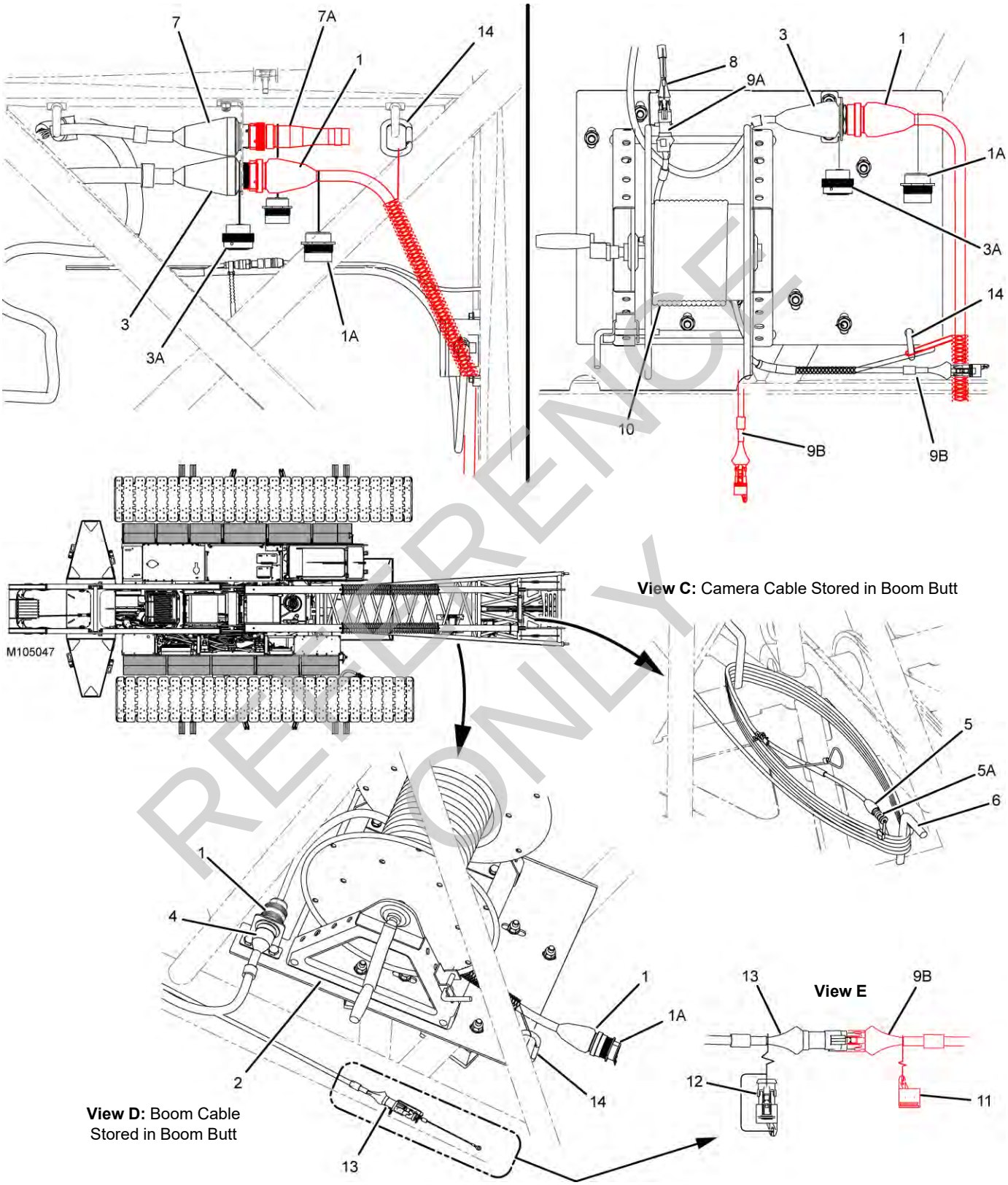


Figure 4-38

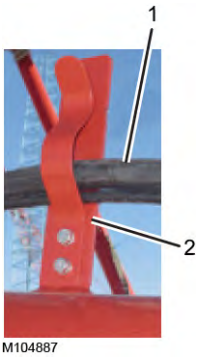
Legend for Figure 4-38.

Item	Description
1	Boom Extension Cable (WBR1-P2)
1A	Dust Cap
2	Cable Reel
3	Boom Top/Cap Connector
3A	Dust Cap
4	Boom Connector (WRRL1-J6)
5	Camera Extension Cable (WBB1 CCTV)
5A	Dust Cap
6	Storage Bracket
7	Attachment Connector
7A	Shorting Plug
8	CAN D Cable WTBT-J2
9A	CAN D Cable WN8100T (top end)
9B	CAN D Cable WN8100T (bottom end)
10	Cable Reel
11	Dust Cap
12	Terminator Plug with Dust Cap
13	Can D Cable WRR1-J2
14	Carabiner

Connect Boom Butt to Boom Top Electric Cables

See Figure 4-38.

1. STOP the engine (turn power off).
2. Prior to connecting the electric cables, remove the dust caps or shorting plugs, and thoroughly clean the cable connectors.
3. Apply dielectric grease to the cable connectors.
4. Unlock the cable reel (2) and pay out the required length of boom extension cable (1).
5. Route the boom extension cable (1) up the boom, to the boom top (View A) or to the boom cap (View B).
6. Secure the boom extension cable to the storage brackets in the boom sections as shown in Figure 4-39.
7. Remove the dust caps (1A and 3A, View A or View B) and connect the boom extension cable (1) to the boom top/cap connector (3).
8. Connect the strain relief on the boom extension cable (1, View A) to the carabiner (14) in the boom top/cap.
9. Connect the other end of the boom extension cable (1, View D) to the boom connector (4) and lock the cable reel.
10. For the B20:350 boom, also perform the following steps:
    a. At the cable reel (10, View B), disconnect CAN D cable (8) from the top end of cable (9A).
    b. Disconnect the bottom end of the CAN D cable (9B, View B) from the carabiner (14).
    c. Unlock the cable reel (10) and payout the CAN B cable (9B) to the CAN B cable (13, View D) in the boom butt.
    d. Secure the CAN D cable (9B) to the storage brackets in the boom sections as shown in Figure 4-39.
    e. Remove the dust cap (11, View E) from the CAN D cable (9B).
    f. Remove the terminator plug (12, View E) from the CAN D cable (13). Install the dust cap on the terminator plug.
    g. Apply dielectric grease to the cable connectors and connect the CAN D cable (9B) to the CAN D cable (13).
    h. Connect the strain relief on the CAN D cable (9B) to the carabiner (14, View D) on the cable reel (2).
    i. At the cable reel (10), reconnect the CAN D cable (8) to the top end of cable (9A).
    j. Lock the cable reel (10).



Item	Description
1	Electric Cable
2	Cable Storage Bracket

Figure 4-39

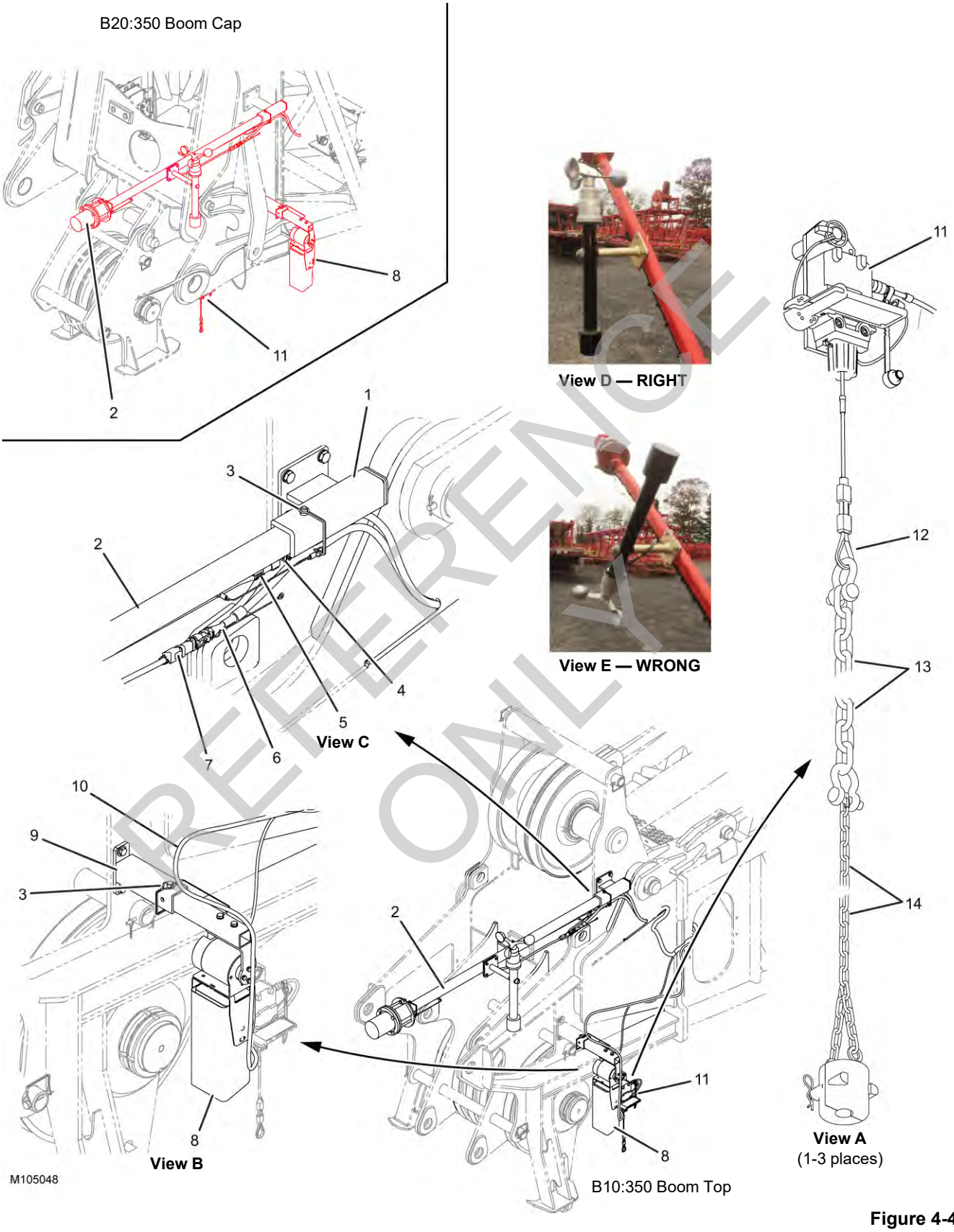


Figure 4-40

Legend for Figure 4-40

Item	Description
1	Position Light and Anemometer Bracket
2	Position Light and Anemometer Assembly
3	Safety Pin (Qty 2)
4	Electric Cable (WBT1-P5 from boom top)
5	Electric Cable (from position light)
6	Electric Cable (WBT1-P2 from boom top)
7	Electric Cable (from wind speed indicator)
8	Camera
9	Bracket
10	Camera Extension Cable (WBB1 CCTV from boom butt)
11	Limit Switch (Qty 1-3)
12	Actuator Cable (Qty 1-3)
13	Chain with Shackles and Pins (Qty 1-3)
14	Weight with Chain and Link (Qty 1-3)

Install Boom Top Position Light and Wind Speed Indicator (option)

The following procedure applies to the B10:350 boom top and to the B20:350 boom cap.

See Figure 4-40.

1. If not already done, fasten the position light and anemometer bracket (1, View C) to the left side of the boom top with the mounting hardware.
2. Remove the position light and anemometer assembly (2, View C) from storage. See Position Light and Anemometer Option on page 4-3.
3. Assemble the position light and anemometer assembly (2, View C) to the bracket (1) and install the safety pin (3).

   Make sure the anemometer is hanging correctly as shown in View D.
4. STOP the engine (turn power off).
5. Remove the dust caps and thoroughly clean the cable connectors.
6. Apply dielectric grease to the cable connectors.
7. Connect the electric cable (4, View C) from the boom top to the electric cable (5) from the position light.
8. Connect the electric cable (6, View C) from the boom top to the electric cable (7) from the anemometer.

   Make sure the electric cable from the anemometer is not wrapped around the support bracket as shown in View E.

Install Boom Top Camera (option)

The following procedure applies to the B10:350 boom top and to the B20:350 boom cap.

See Figure 4-40.

1. If not already done, fasten the camera bracket (9, View B) to the left side of the boom top with the mounting hardware.
2. Remove the boom top camera (8, View B) from storage in the parts box.
3. Assemble the camera (8, View B) to the bracket (9) and install the safety pin (3).
4. Uncoil the required length of camera extension cable from the storage bracket in the boom butt (View C, Figure 4-38 on page 4-50.
5. Route the camera extension cable up the boom, remove the dust cap, and thoroughly clean the cable connectors.
6. Secure the camera extension cable to the storage brackets in the boom sections as shown Figure 4-39 on page 4-51.
7. STOP the engine (turn power off).
8. Apply dielectric grease to the cable connectors.
9. Connect the camera extension cable (10, View B) to the camera (8).
10. Connect the strain relief on the camera extension cable to the carabiner in the boom top.

Install Boom Block-Up Limit Components

The following procedure applies to the B10:350 boom top and to the B20:350 boom cap.

See Figure 4-40.

Perform the following steps at each of the required boom points:

- Upper boom point (right side, past or left side, current)
- Optional second block-up limit on right side of lower boom point
- Lower boom point (left side)

1. Remove the block-up limit chains (13) and weights (14) from storage in the parts box.
2. Connect the chain (13, View A) to the actuator cable (12) from the limit switch (11) at the corresponding boom point.
3. Connect the chain from the weight (14, View A) to the chain (13).
4. Make sure the locking flag is stored in each limit switch as shown in View E, Figure 4-42 on page 4-56.

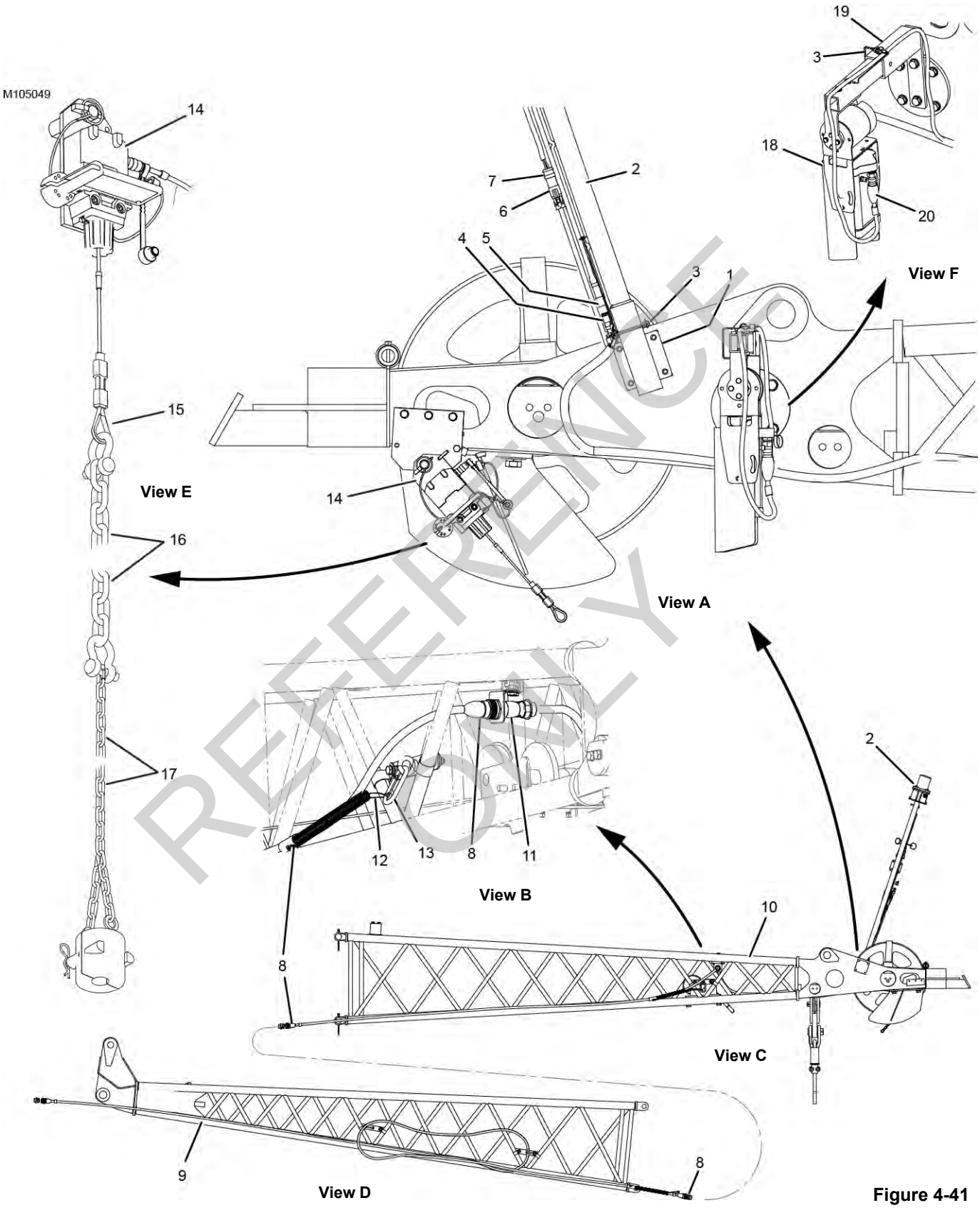


Figure 4-41

Legend for Figure 4-41

Item	Description
1	Bracket
2	Position Light and Anemometer Assembly
3	Safety Pin
4	Electric Cable (WZT1-P2)
5	Electric Cable (from position light)
6	Electric Cable (WZT1-P2)
7	Electric Cable (from wind speed indicator)
8	Jib Extension Cable
9	Jib Butt
10	Jib Top
11	Jib Top Receptacle (WZT1-J1)
12	Strain Relief
13	Carabiner
14	Limit Switch
15	Actuator Cable
16	Chain with Shackles and Pins
17	Weight with Chain and Link
18	Camera
19	Bracket
20	Camera Extension Cable (WBB1 CCTV from boom butt)

Install Jib Top Position Light and Wind Speed Indicator (option)

See Figure 4-41.

1. If required, fasten the bracket (1, View A) to the jib top.
2. Remove the position light and anemometer assembly (2, View A) from storage. See Position Light and Anemometer Option on page 4-3.
3. Assemble the position light and anemometer assembly (2, View A) to the bracket (1) and install the safety pin (3).

   Make sure the anemometer is hanging correctly (see View D, Figure 4-40 on page 4-52).
4. STOP the engine (turn power off).
5. Remove the dust caps and thoroughly clean the cable connectors.
6. Apply dielectric grease to the cable connectors.
7. Connect the electric cable (4, View A) from the jib top to the electric cable (5) from the position light.
8. Connect the electric cable (6, View A) from the jib top to the electric cable (7) from the wind speed indicator.

   Make sure the electric cable from the wind speed indicator is not wrapped around the support bracket (see View E, Figure 4-40 on page 4-52).

Install Jib Top Camera (option)

1. Remove the camera (18, View F, Figure 4-41.) from storage in the parts box.
2. Assemble the camera (18, View F, Figure 4-41) to the bracket (19) and install the safety pin (3).
3. Uncoil the required length of camera extension cable (View B, Figure 4-38 on page 4-50) from the storage bracket in the boom butt.
4. Route the camera extension cable up the boom, remove the dust cap, and thoroughly clean the cable connectors.
5. Secure the camera extension cable to the storage brackets in the boom sections as shown Figure 4-39 on page 4-51.
6. Apply dielectric grease to the cable connectors.
7. STOP the engine (turn power off).
8. Connect the camera extension cable (20, View F, Figure 4-41) to the camera.
9. Connect the strain relief on the camera extension cable to the carabiner in the jib top.
10. Secure the camera extension cable to the jib sections with plastic wire ties.

Connect Jib Extension Cable

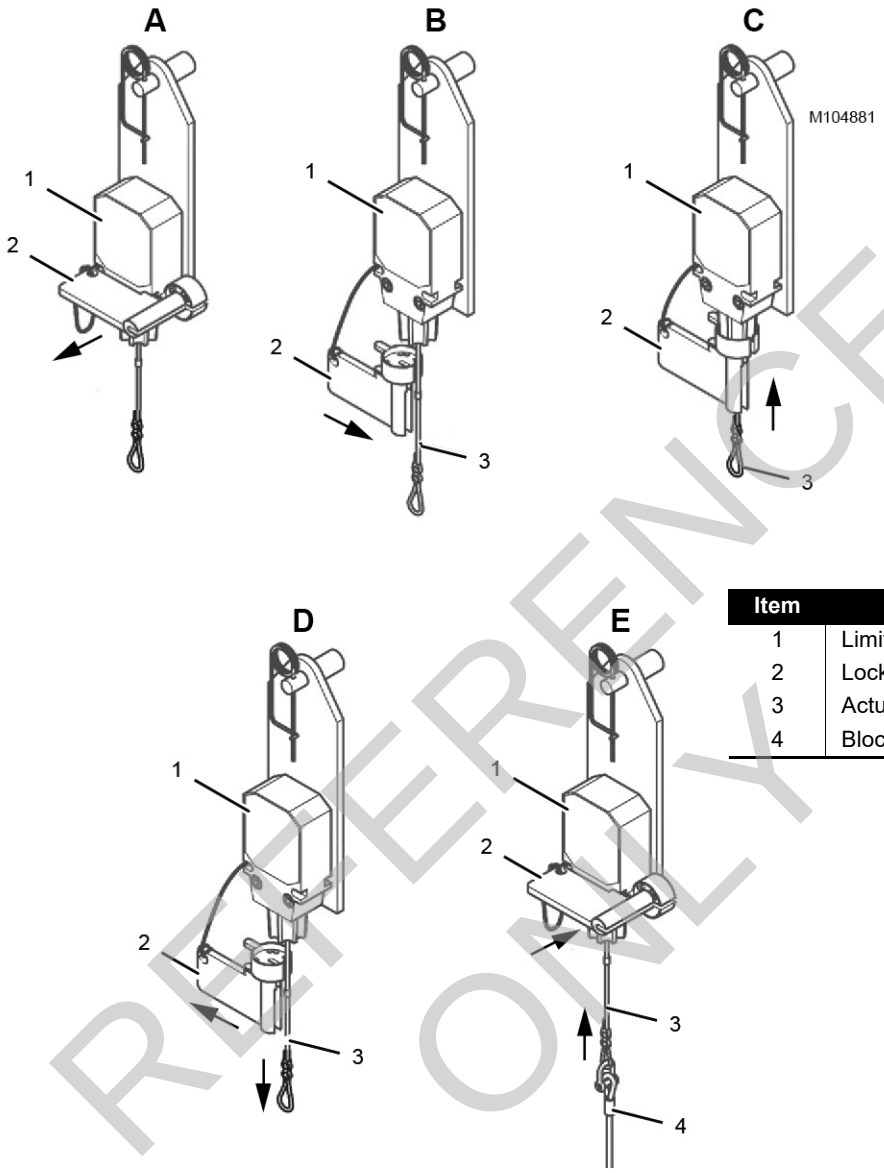
See Figure 4-41.

1. STOP the engine.
2. Uncoil the required length of jib extension cable (8, View D) from the storage brackets on the jib butt (9).
3. Route the jib extension cable to the jib top, remove the dust cap, and thoroughly clean the cable connectors.
4. Apply dielectric grease to the cable connectors.
5. Connect the top end of the jib extension cable (8, View B) to the jib top receptacle (11).
6. Connect the strain relief (12, View B) on the jib extension cable to the carabiner (13) in the jib top.
7. Connect the butt end of the jib extension cable to the attachment connector (7, View A, Figure 4-38 on page 4-50).
8. Secure the jib extension cable to the jib sections with plastic wire ties.

Install Jib Block-Up Limit Components

See Figure 4-41.

1. Remove the block-up limit chains (16, View E) and the weights (17) from storage in the parts box.
2. Connect the chain (16, View E) to the actuator cable (15) from the limit switch (14) at the jib point.
3. Connect the chain from the weight (17, View E) to the chain (16).
4. Make sure the locking flag is stored in the limit switch as shown in View E, Figure 4-42 on page 4-56.



Item	Description
1	Limit Switch (block-up limit)
2	Locking Flag
3	Actuator Cable
4	Block-Up Limit Chain

Figure 4-42

WARNING

Two-Blocking Hazard

Two-blocking is the condition in which the load block or the hook-and-weight ball runs into the boom or jib point sheaves.

Two-blocking can result in failure of the sheaves and wire rope, possibly causing the load to fall.

If a block-up limit switch is deactivated, it is the operator's responsibility to stop the load block or the hook-and-weight ball before it contacts the boom or jib point sheaves.

Deactivating/Activating a Block-up Limit Switch

If the block-up limit switch is not used at the following locations, the corresponding limit switch must be deactivated to prevent the block-up limit fault from coming on during operation.

- Lower Boom Point
- Upper Boom Point
- Jib Point

See Figure 4-42.

To DEACTIVATE a limit switch, proceed as follows:

1. Remove the locking flag (2, View A) from the storage slots in the limit switch (1).
2. Slip the locking flag (2, View B) over the actuator cable (3).
3. Engage the locking flag (2, View C) with the limit switch (1).
4. Release the actuator cable (3).
5. Disconnect the block-up limit chain (4) and weight from the actuator cable.

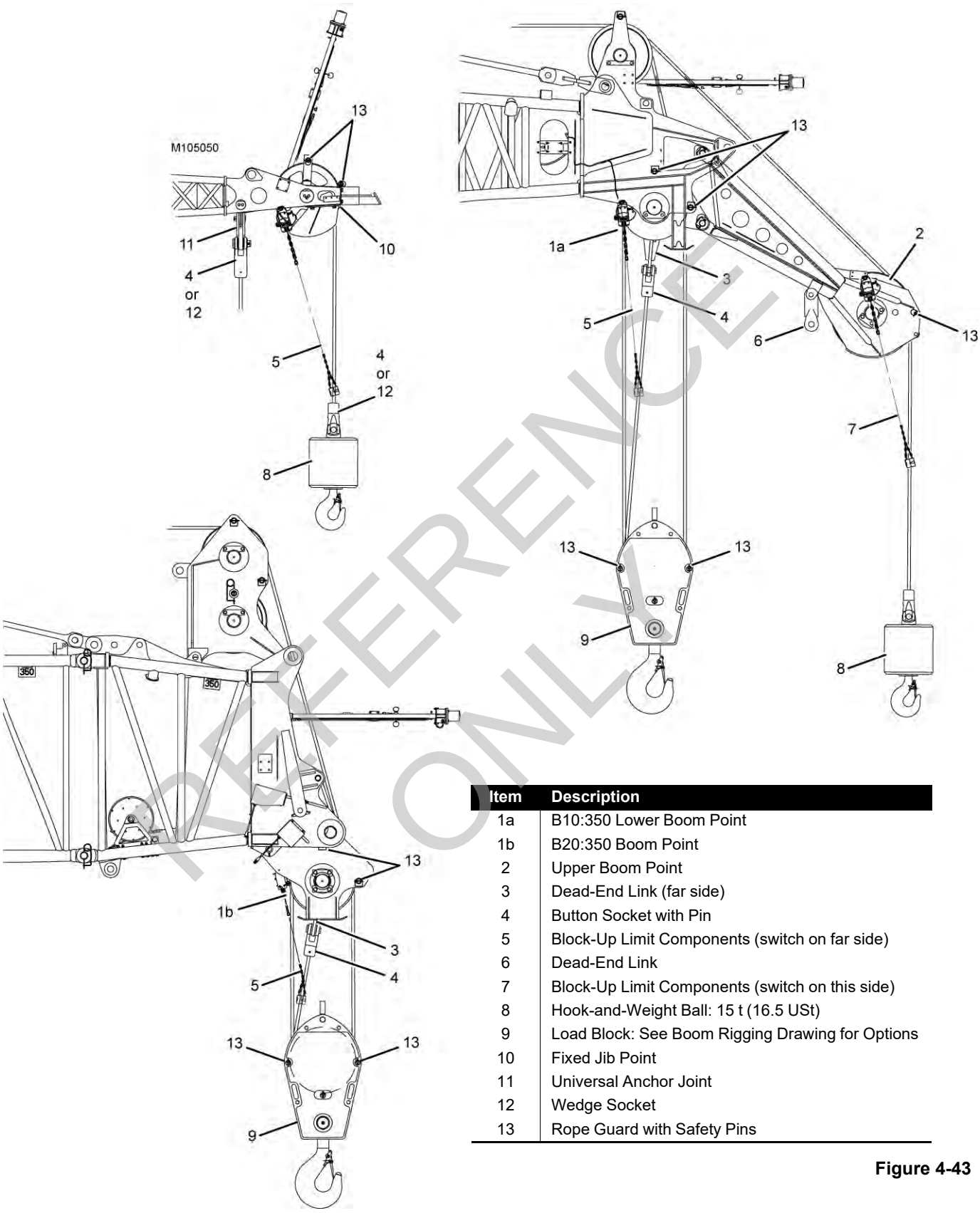
To ACTIVATE a limit switch, proceed as follows:

1. Pull down the actuator cable (3, View D) and remove the locking flag (2).
2. Install the locking flag (2, View E) in the storage slots in the limit switch (1).
3. Connect the block-up limit chain (4, View E) and weight to the actuator cable (3).

NOTE The optional second block-up limit switch at the lower boom point is equipped with a shorting plug.

If the optional second block-up limit switch is not used, it can be deactivated either by:

- Performing the above procedure.
- Attaching the shorting plug to the electric cable. This will allow the limit switch to be removed and stored in the tool box.



Item	Description
1a	B10:350 Lower Boom Point
1b	B20:350 Boom Point
2	Upper Boom Point
3	Dead-End Link (far side)
4	Button Socket with Pin
5	Block-Up Limit Components (switch on far side)
6	Dead-End Link
7	Block-Up Limit Components (switch on this side)
8	Hook-and-Weight Ball: 15 t (16.5 USt)
9	Load Block: See Boom Rigging Drawing for Options
10	Fixed Jib Point
11	Universal Anchor Joint
12	Wedge Socket
13	Rope Guard with Safety Pins

Figure 4-43

Install Load Lines

1. Read the following topics:
   - Wire Rope Installation on page 4-116
   - Load Line Reeving on page 4-125.
   - The Wire Rope Specifications chart located in the Capacity Chart Manual supplied with the crane for:
     - Parts of the line required for various loads
     - Wire rope lengths and notes about the hoisting distance for various parts of the line
     - Maximum spooling capacity of the load drums
   - Load Line Reeving diagrams at the end of this section.

WARNING

Falling Load Hazard!

For some parts of line, it is necessary to reeve the load line over the upper boom point to the load block hanging from the lower boom point (see Figure 4-44).

For these cases, REMOVE and store the front rope guard bar from the load block (location X in Figure 4-44) to prevent the load line from rubbing against the bar.

Failing to perform this step can result in wire rope damage and possible failure.

2. Remove the rope guards (13, Figure 4-43) as required.
3. Route the load lines up the boom (and jib, if equipped) and over the desired guide sheaves in the boom top (and jib top). See Figure 4-86 on page 4-124 and the Load Line Reeving Diagrams at the end of this section.
4. Install the load block(s) and the hook-and-weight ball(s) (Figure 4-43) after the boom (and jib, if equipped) is raised to a convenient height. See Boom Raising Procedure on page 4-76.
5. Be sure to route the load lines through the block-up limit weights. See Install Boom Block-Up Limit Components on page 4-53 and Install Jib Block-Up Limit Components on page 4-55.
6. Reinstall the rope guards (13, Figure 4-43).

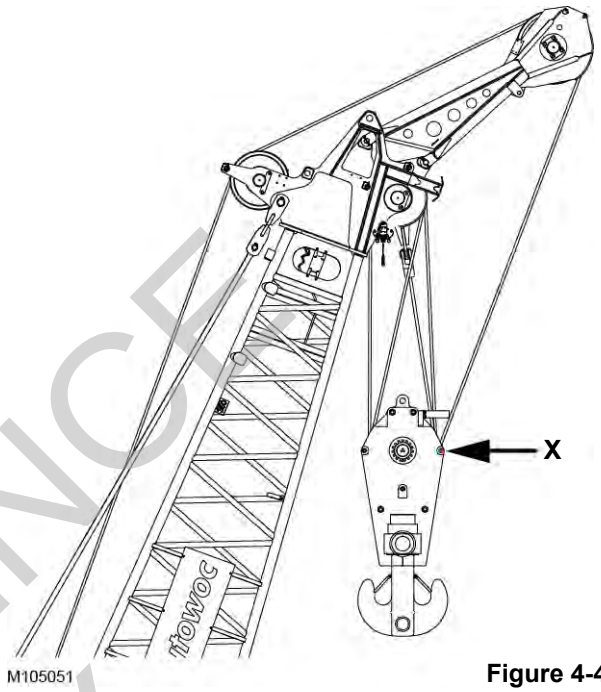
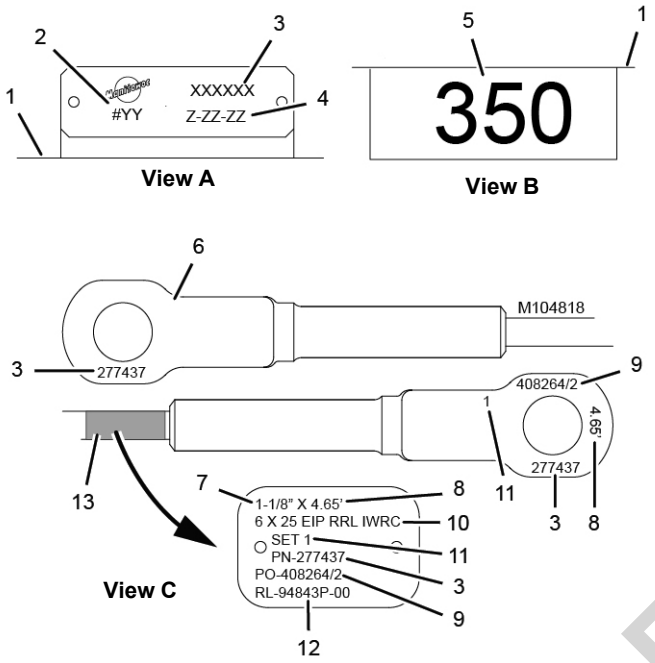


Figure 4-44



Item	Description
1	Boom or Jib Chord
2	Boom or Jib Number
3	Manitowoc Part Number
4	Manitowoc Manufacturing Code
5	Chord Identification
6	Pendant
7	Diameter
8	Length
9	Manitowoc Purchase Order Number
10	Wire Rope Type
11	Set Number
12	Manufacturer's Number
13	Aluminum Tag (if equipped)
14	Strap or Link Part Number

Figure 4-45

BOOM AND JIB RIGGING — GENERAL

Rigging Drawings

The boom and jib components (top, inserts, butt, pendants) must be assembled in the proper sequence according to the applicable Boom and Jib Rigging Drawings at the end of this section.

Blocked Crawlers

To prevent the crane from tipping, some boom and jib lengths must be raised and lowered over blocked crawlers. See the appropriate boom or jib capacity chart for blocked crawler requirements and the Crawler Blocking Diagram in the Capacity Chart Manual for instructions.

DANGER

Tipping Hazard!

Do not attempt to raise or lower the boom or the boom and jib from or to the ground until the crawlers are blocked, if required. Otherwise, the crane will tip.

Identifying Boom and Jib Components

See Figure 4-45.

The boom and jib sections are marked for proper identification as shown in View A. An identification plate is mounted on all four chords.

The boom inserts also have a chord identification plate mounted on both top chords as shown in View B.

The boom straps and links are marked for proper identification as shown in View D.

The jib pendants are marked for proper identification as shown in View C.

Boom Handling with Equalizer

Boom handling with the equalizer pinned to the boom butt (Figure 4-46) is limited to the boom length given in the Boom Rigging Drawing at the end of this section.

WARNING

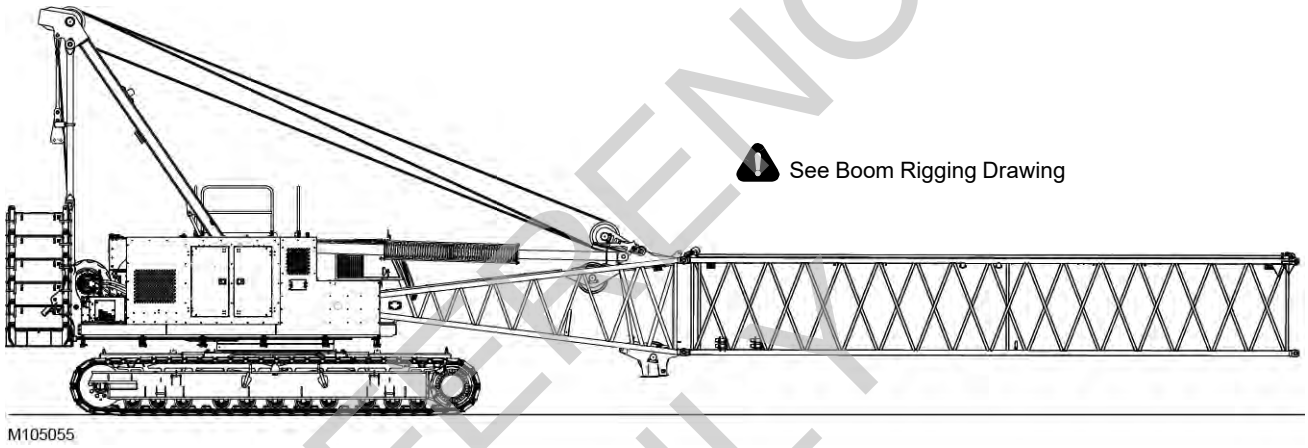
Falling Boom Hazard!

Do not attempt to handle more boom with the equalizer pinned to the boom butt than specified in the Boom Rigging Drawing. Structural failure of components can occur, allowing the boom to fall.

Handling Boom and Jib Sections

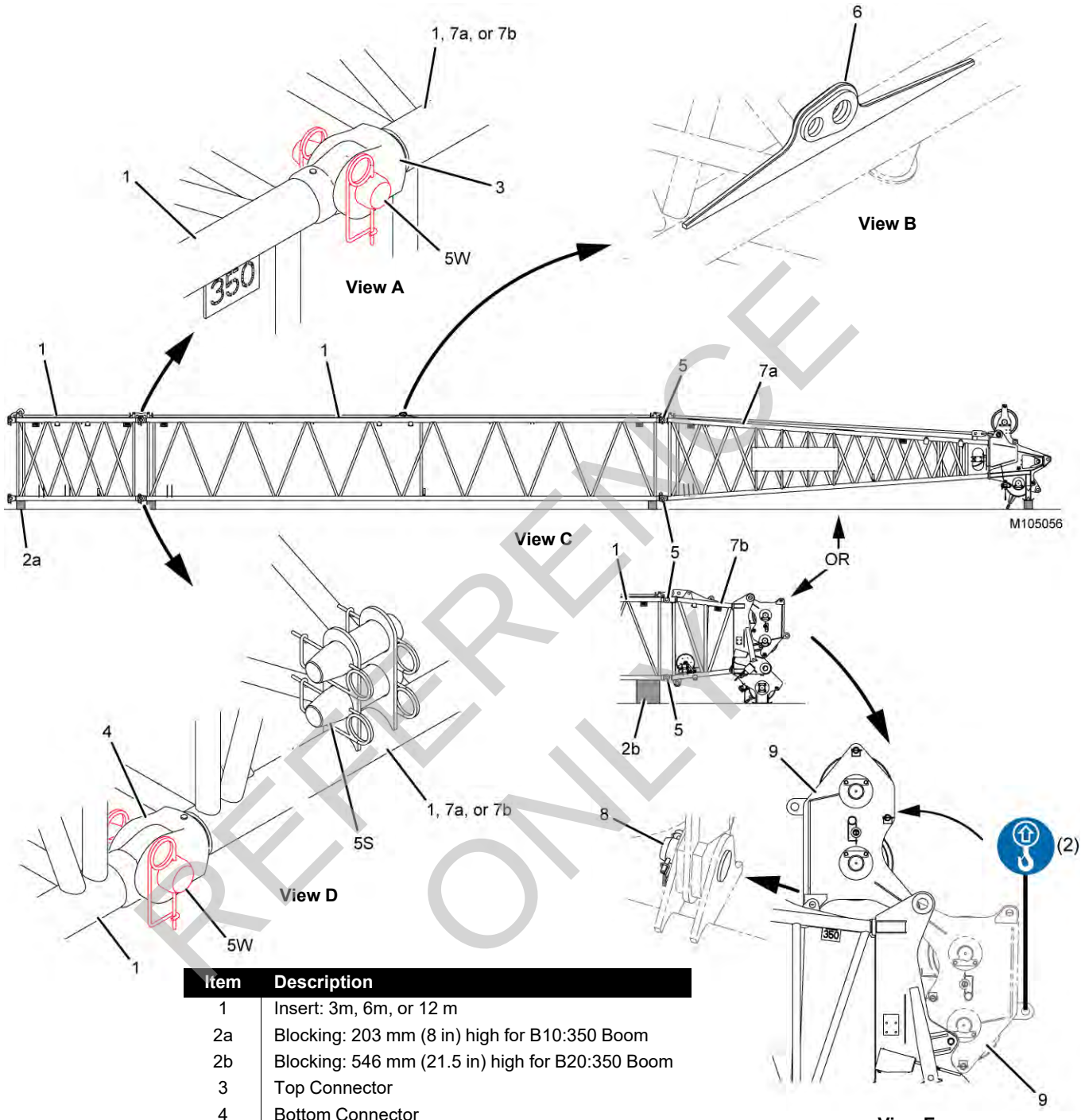
See Figure 4-25 on page 4-32 for Boom Handling

See Figure 4-26 on page 4-33 for Jib Handling



Boom Handling with Equalizer Pinned to Boom Butt

Figure 4-46



Item	Description
1	Insert: 3m, 6m, or 12 m
2a	Blocking: 203 mm (8 in) high for B10:350 Boom
2b	Blocking: 546 mm (21.5 in) high for B20:350 Boom
3	Top Connector
4	Bottom Connector
5	Connector Pin with Safety Pin
6	Jib Backstay/Intermediate Suspension Lug (Qty 2)
7a	Boom Top: B10:350 Boom
7b	Boom Cab: B20:350 Boom
8	Pin with Safety Pin (Qty 2)
9	Boom Top Wire Rope Guide
S	Stored
W	Working

Figure 4-47

BOOM #350 ASSEMBLY

WARNING

Crush Hazard!

Never work under or inside boom sections that are not securely blocked.

Assemble the boom in the exact sequence shown in the Boom Rigging Drawing at the end of this section.

See the Boom Rigging Drawing at the end of this section to determine if intermediate suspension is required for the boom length being assembled.

NOTE See Figure 4-25 on page 4-32 for boom section lifting locations.

Assemble Boom Inserts

See Figure 4-47.

1. Lift the first insert (1, View C) into position in the assembly area and place it on blocking (2a or 2b).
2. Adjust the blocking as needed so the insert is level.
3. Disconnect the lifting slings.
4. Lift the next insert into position, engage the top and bottom connectors (3, View A and 4, View D), and align the connecting holes.
5. Remove the connector pins (5, View D) from the storage brackets on each side of the insert.
6. Install the top connector pins (5, View A) — long tapered end pointing in.

   Orient the connector pins so the safety pins can be installed vertically as shown.
7. Install the bottom connector pins (5, View D) — long tapered end pointing in.

   Orient the connector pins so the safety pins can be installed vertically as shown.
8. Block the top end of the adjacent insert.
9. Disconnect the lifting slings.
10. Repeat the above steps until all inserts are installed in PROPER SEQUENCE per the rigging drawing.
11. Make sure the insert with the jib backstay/intermediate suspension lugs (6, View B) is installed next to the boom top.

Connect Boom Top/Cap to Inserts

See Figure 4-47.

1. Lift the boom top (7a, View C) or the boom cap (7b) into position, engage the top and bottom connectors (3, View A and 4, View D), and align the connecting holes.
2. Remove the connector pins (5, View D) from the storage brackets on each side of the boom top or the boom cap.
3. Install the top connector pins (5, View A) — long tapered end pointing in.

   Orient the connector pins so the safety pins can be installed vertically as shown.
4. Install the bottom connector pins (5, View C) — long tapered end pointing in.

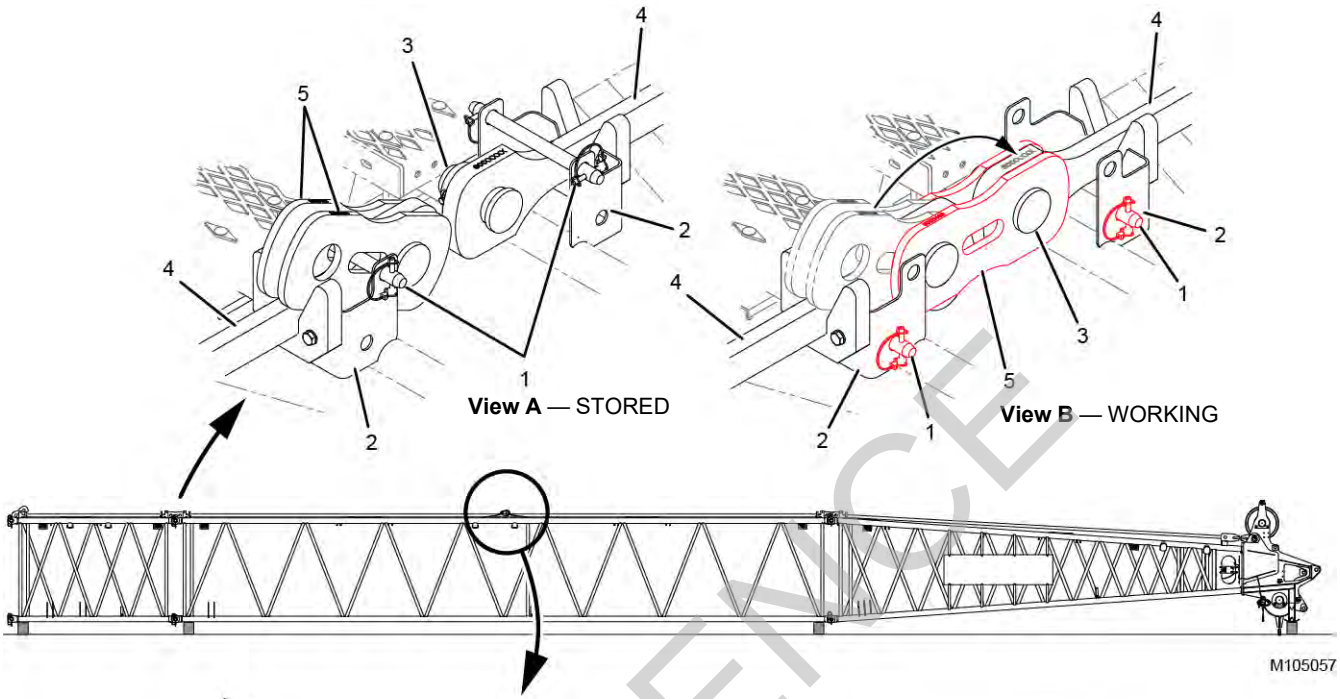
   Orient the connector pins so the safety pins can be installed vertically as shown.
5. Block under the boom top stands.
6. Disconnect the lifting slings.

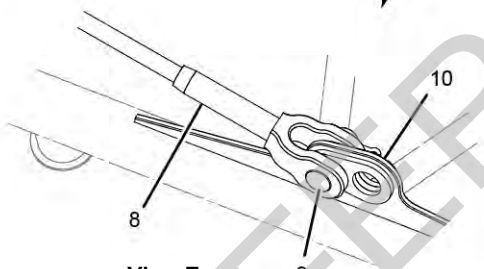
Raise Boom Cap Wire Rope Guide

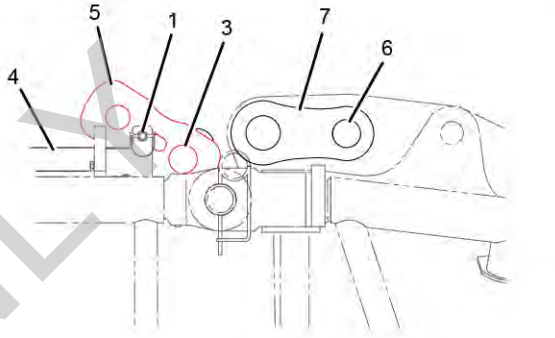
See View E, Figure 4-47.

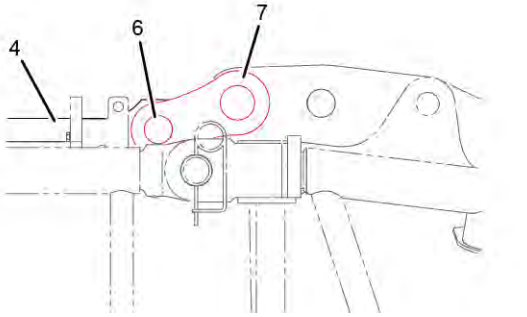
For the B20:350 boom, proceed as follows:

1. Remove the pins (8) from the lugs on the boom cap.
2. Attach a lifting sling to the lifting lug on the wire rope guide (9).
3. Rotate the wire rope guide (9) to the working position and install pins (8).
4. Disconnect the lifting sling.









Item	Description
1	Storage Pin with Safety Pins
2	Storage Bracket
3	Pin with Collar, Clevis Pins, and Cotter Pins
4	Boom Strap
5	Strap Links
6	Pin with Collar, Clevis Pins, and Cotter Pins
7	Strap Links (B20:350 Boom Cap)
8	Intermediate Suspension Pendant (Qty 2)
9	Pin with Cotter Pin (Qty 2)
10	Jib Backstay/Intermediate Suspension Lug (Qty 2)

Figure 4-48

Item	Description
1	Upper Boom Point
2	Boom Top
3	Upper Pin with Safety Pins
4	Lower Pin with Safety Pins (Qty 2)

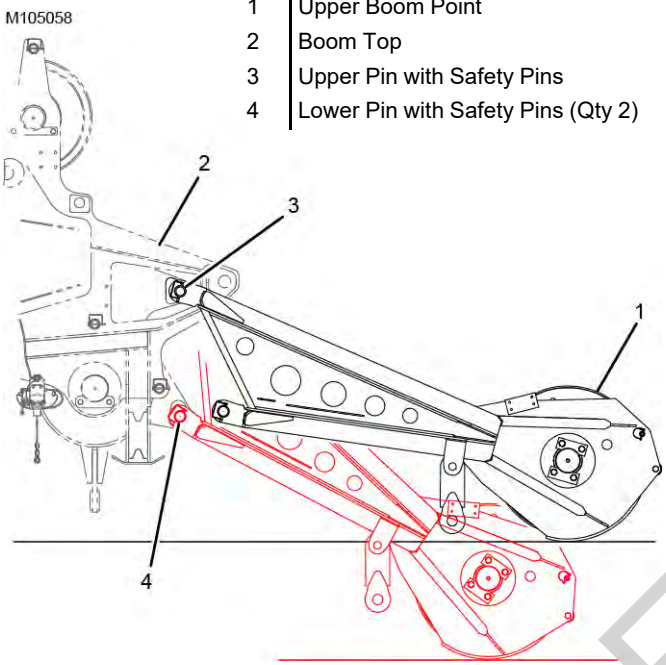


Figure 4-49

Connect Boom Straps

See Figure 4-48.

Perform the following steps at the butt end of the boom top and each insert.

The straps on the end of the insert next to the boom butt will be connected when the straps are connected to the equalizer. See Connect Boom Straps to Equalizer on page 4-49.

1. At all inserts and the B10:350 boom top:
   - **a.** Move the storage pins (1, View A) from the stored position to the working position (View B).
   - **b.** Remove the pins (3, View A) and the collars from the ends of the boom straps (4).
   - **c.** Rotate the links (5, View A) to the working position (View B).
   - **d.** Install the pins (3, View B) and the collars so the pin heads are toward the OUTBOARD SIDE of the inserts.

1. At the B20:350 boom cap:
   - **a.** Move the storage pins (1, View C) from the stored position to the working position (View B).
   - **b.** Remove the pins (3, View C), the collars, and the strap links (5) from the ends of the boom straps (4).
   - **c.** Store the pins (3, View C), the collars, and the strap links (5) in the parts box.
   - **d.** Remove the pins (6, View C) and the collars from the boom cap.
   - **e.** Rotate the links (7, View C) to the working position (View D).
   - **f.** Install the pins (6, View D) and the collars so the pin heads are toward the OUTBOARD SIDE of the inserts.

Install Intermediate Suspension Pendants

See Figure 4-48, View E.

1. If required, lift the intermediate suspension pendants (8) into position on the top of the boom inserts.
2. Pin the pendants (8) to the REAR HOLES in the jib backstay/intermediate suspension lugs (10) with the pins (9).

Install Upper Boom Point

Disregard this procedure if a jib will be installed.

See Figure 4-49.

WARNING

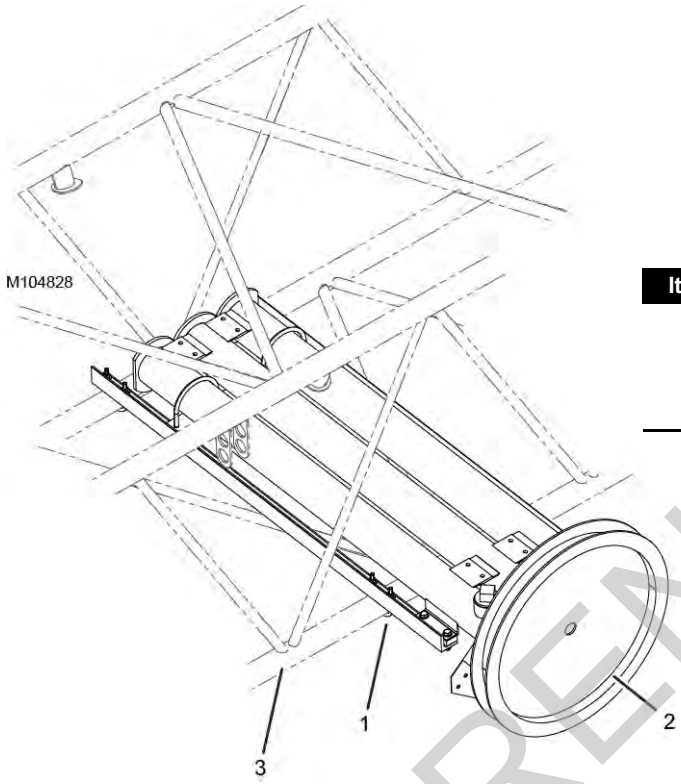
Crane Tipping Hazard!

To raise some boom lengths, the upper boom point must be removed. The crane will tip if this is not done.

Refer to the appropriate Liftcrane Boom Capacity Chart to determine upper boom point requirements and deducts.

1. Remove the upper pin (3) from the upper boom point (1). The lower pins can remain in place.
2. Lift the upper boom point (1) into position at the end of the boom top (2).
3. Align the upper holes in the upper boom point with the holes in the boom top and install the upper pin (3) with safety pins.
4. Lower the upper boom point to the ground and remove the lifting slings.
5. Proceed as follows once the boom can be raised:
   - **a.** Remove the lower pins (4) from the upper boom point (1).
   - **b.** Slowly boom up to align the lower connecting holes.
   - **c.** Once the holes are aligned, install the lower pins (4), long tapered end to inside, with the safety pins.

NOTE The upper boom point must be removed for jib installation.



Item	Description
1	U-Bolt with Flat Washers, Lock Washers, and Nuts (Qty 4)
2	Tagline Assembly
3	Boom Insert

Figure 4-50

Install Optional Tagline

See Figure 4-47.

If equipped with the optional tagline assembly, install it as follows:

1. Remove the U-bolts (1) from the tagline assembly (2).
2. Lift the tagline assembly (2) into position at the desired location in the boom. The tagline assembly weighs approximately 1 086 kg (2,394 lb).
   - The tagline should be mounted approximately one-third the way up the boom from the boom hinge pin.
   - The cable reel must be on the right side of the boom.
3. Install the U-bolts (1) with the flat washers, lock washers, and nuts.
4. Securely tighten the nuts.
5. Refer to the manufacturer's manual at the end of this section for tagline safety, operation, installation, and maintenance instructions.

Complete Boom/Crane Assembly

- Complete boom and crane assembly/rigging starting with Connect Boom Butt to Boom on page 4-47
- Then, perform the following steps:
  - Connect Boom Straps to Equalizer on page 4-49
  - Close Boom on page 4-49
  - Disconnect Equalizer from Boom Butt on page 4-49
  - Configure RCL/RCI for Crane Operation on page 4-49
  - Connect Boom Butt to Boom Top Electric Cables on page 4-51
  - Install Boom Top Position Light and Wind Speed Indicator (option) on page 4-53
  - Install Boom Top Camera (option) on page 4-53
  - Install Boom Block-Up Limit Components on page 4-53
  - Install Load Lines on page 4-59

Jib Shipping Package

Item	Description
1	Jib Stop
2	Jib Butt
3	Jib Strut
4	Backstay Links and Spreader
5	Jib Top

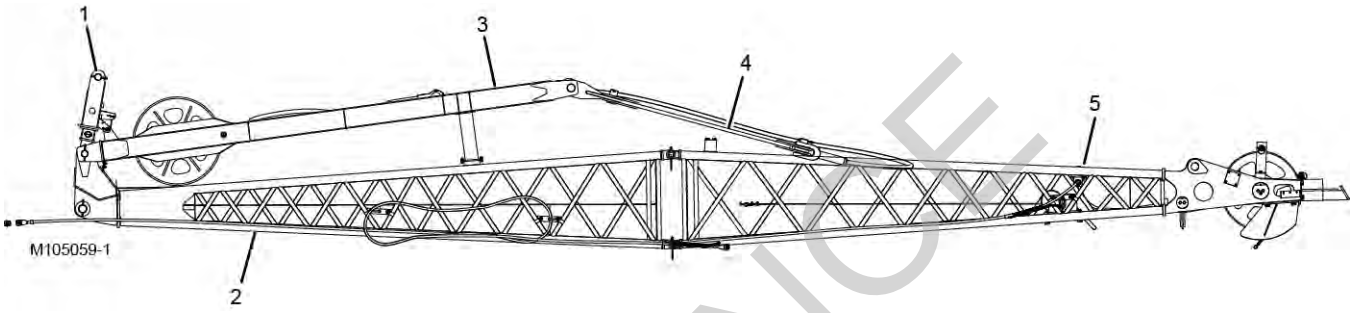


Figure 4-51

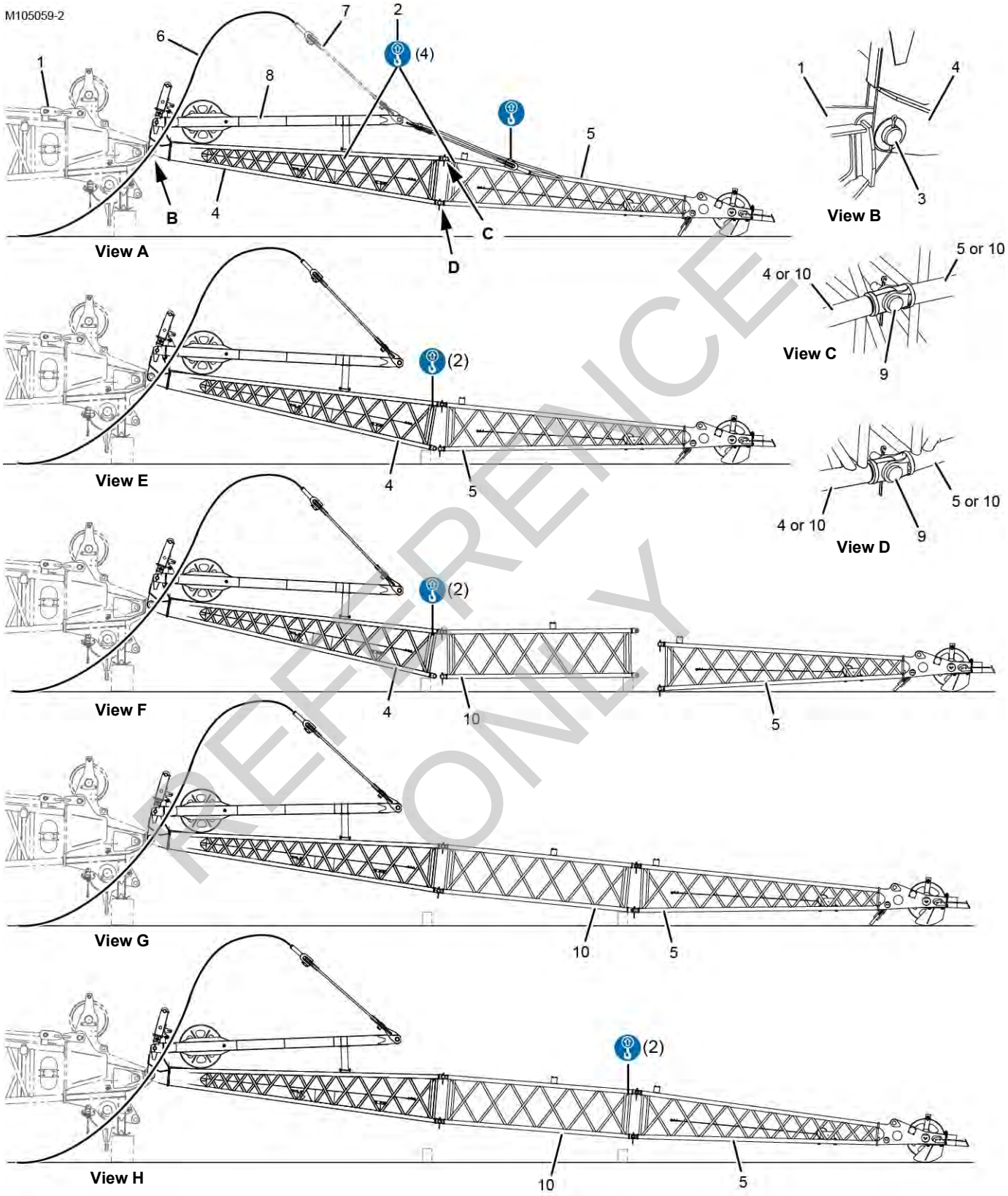


Figure 4-52

Legend for Figure 4-51

Item	Description
1	Boom Top
2	Jib Shipping Package
3	Pin with Cotter Pins (Qty 2)
4	Jib Butt
5	Jib Top
6	Jib Backstay Pendant (Qty 2)
7	Jib Backstay Spreader and Links
8	Jib Strut
9	Pin with Cotter Pin (Qty 4 each jib section)
10	Jib Insert: 3.0 m (10 ft) or 6,1 m (20 ft)

JIB #134 ASSEMBLY

See the #134 Jib Rigging Drawing at end of this section for jib makeup.

For boom and jib length limitations, see the Liftcrane Jib Capacities chart.

The jib top, jib butt, jib stop, jib strut, and backstay pendants are shipped as an assembled package as shown in Figure 4-51 on page 4-67).

Prepare Boom

See Figure 4-52.

1. Lower the boom (1, View A) onto blocking.
2. Remove the load line from the upper boom point, if equipped.
3. Remove and store the upper boom point.

Install Jib Package

See Figure 4-52.

1. Lift the jib package (2, View A) into position at the boom top (1) and remove the pins (3, View B) from the jib butt (4).

   See Figure 4-26 on page 4-33 for lifting locations.
2. Align the connecting holes and pin the jib butt (4, View B) to the boom top (1) with the pins (3) and the cotter pins.
3. Lower the jib top (5, View A) to the ground or blocking and disconnect the lifting slings.

Deploy Backstay Spreader

1. Uncoil the jib backstay pendants (6, View A) and lay them on the ground alongside the jib and boom.
2. Attach lifting slings from the assist crane to the jib backstay spreader (7, View A).
3. Lift and rotate the jib backstay spreader and links (7, View A) from the shipping position rearward as far as possible. There are stop blocks in the end of the jib strut (8).
4. Disconnect the lifting slings

Install Jib Inserts

WARNING!

Collapsing Jib Hazard!

To prevent death or serious injury, do not stand on, inside, or under the jib sections during assembly. Always stand outside of the jib sections while installing connecting pins.

See Figure 4-52.

Disregard this procedure if jib inserts are not being installed.

1. Connect lifting slings to the top end of the chords on the jib butt (4, View E).
2. Hoist only enough to support the jib butt and top. ***Do not attempt to lift the top off the ground.***
3. Remove the bottom pins (9, View D) between the jib butt (4) and the jib top (5).
4. Lower the jib butt (5, View E) onto blocking and disconnect the lifting slings.
5. Connect the lifting slings to the jib top (5).
6. Remove the top pins (9, View C) between the jib butt (4) and the jib top (5).
7. Lift the jib top away from the jib butt and place the top to the side.
8. Lift the jib insert (10, View F) into position at the jib butt (4) and remove the four pins (9, View C and D) from the jib Insert.
9. Align the top connecting holes and install the top connecting pins (9, View C).
10. Lower the jib insert onto blocking and disconnect the lifting slings.
11. Connect the lifting slings to the top end of the chords on the jib butt (4, View F).
12. Raise the jib butt until the bottom connecting holes are aligned between the jib butt and the jib insert (View G).
13. Install the bottom connecting pins (9, View D).
14. Disconnect the lifting slings.
15. Repeat the above steps for any remaining jib inserts.

Item	Description
1	Basic Jib Pendant (Qty 2)
2	Pendant Pin with Cotter Pin
3	Jib Top
4	Insert Pendant: 2,9 m (9 ft 6 in) and 5,8 m (19 ft) Qty 2 each insert
5	Jib Strut
6	Link (Qty 2)

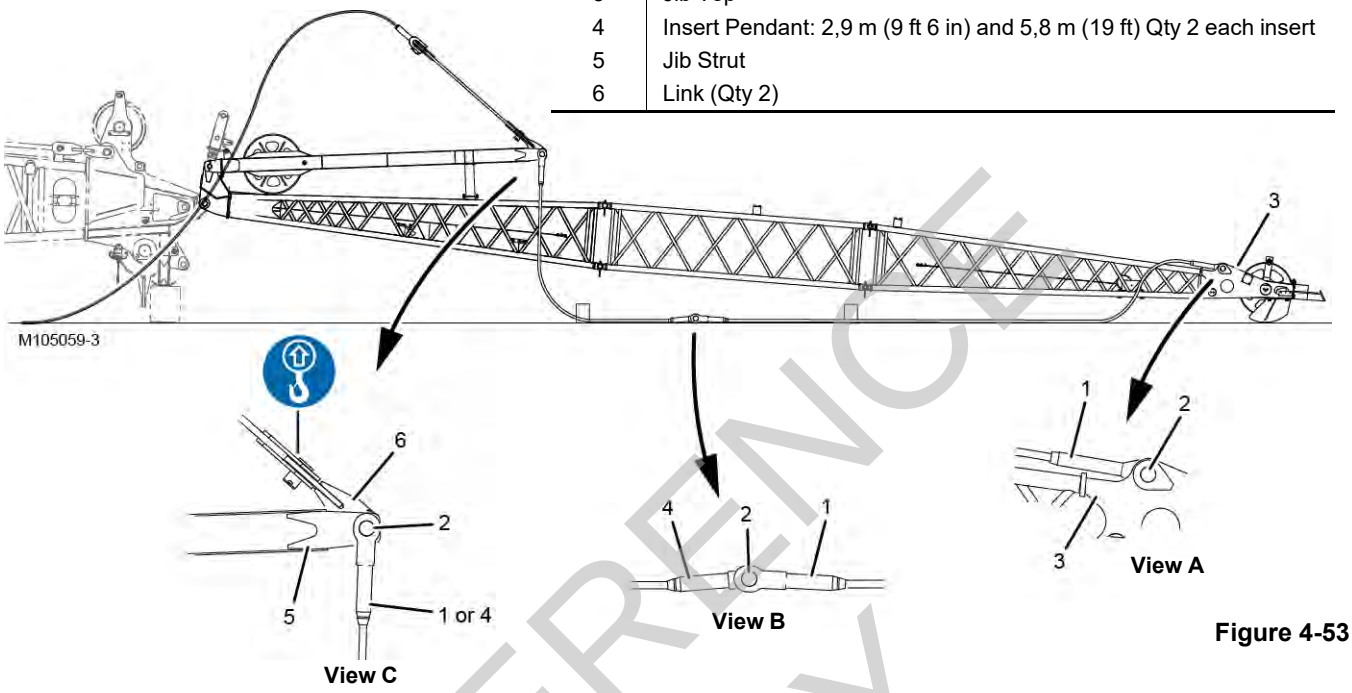
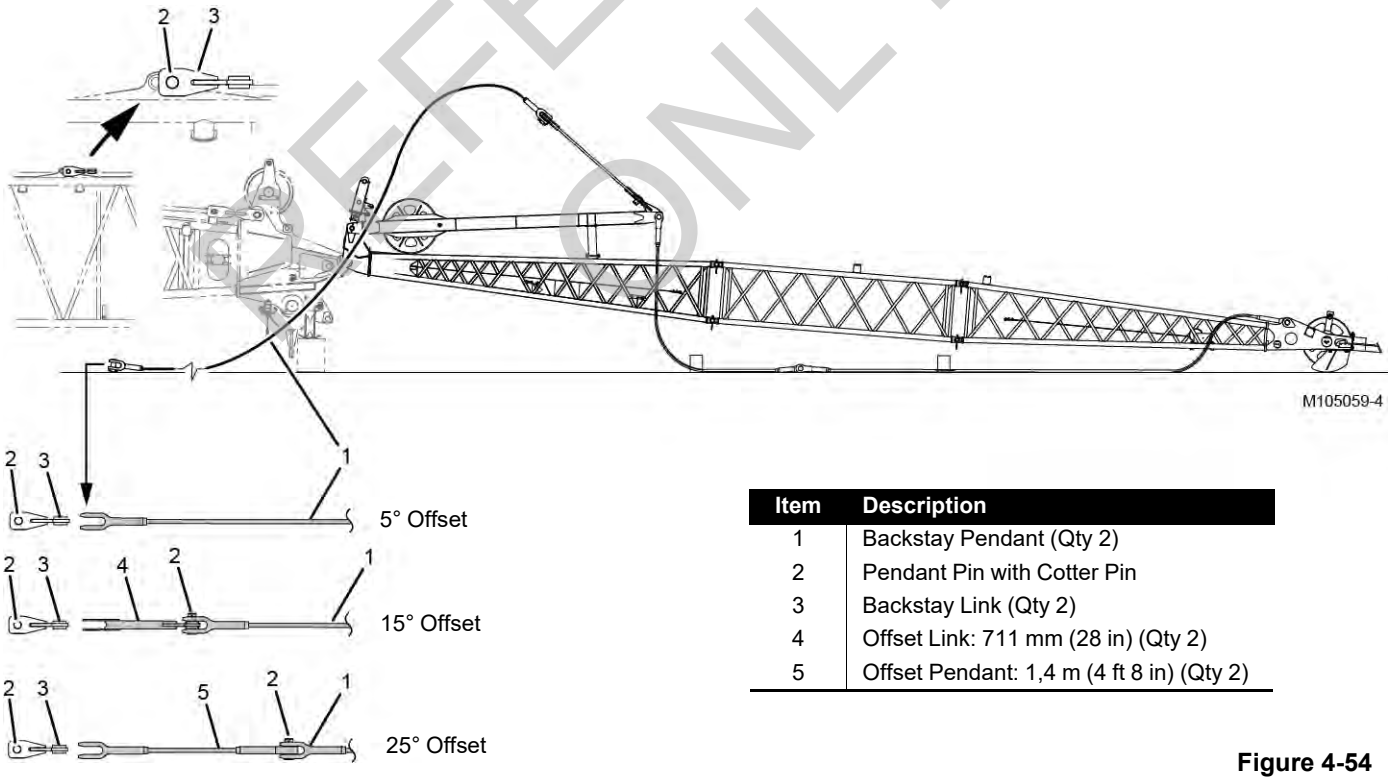


Figure 4-53



Item	Description
1	Backstay Pendant (Qty 2)
2	Pendant Pin with Cotter Pin
3	Backstay Link (Qty 2)
4	Offset Link: 711 mm (28 in) (Qty 2)
5	Offset Pendant: 1,4 m (4 ft 8 in) (Qty 2)

Figure 4-54

Install Jib Top

See Figure 4-52.

NOTE Disregard this step if the jib top was shipped pinned to the jib butt and no inserts were added.

1. Lift the jib top (5, View G) into position at the jib insert (10) and remove the four pins (9, View C and D) from the jib top.
2. Align the top connecting holes and pin the jib top to the jib insert with the pins (9, View C) and the cotter pins.
3. Lower the jib top onto the ground and disconnect the lifting slings.
4. Connect the lifting slings to the top end of the chords on the jib insert (10, View H).
5. Raise the jib insert until the bottom connecting holes are aligned between the jib insert and the jib top.
6. Install the bottom connecting pins (9, View D).
7. Disconnect the lifting slings.

Install Jib Pendants

See Figure 4-53.

WARNING

Flying Object Hazard!

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

NOTE: The jib pendants must be installed in the same sequence as the jib sections.

The jib pendants are furnished in matched sets of two and must be installed in matched sets — the pendant on one side of the jib section must match the pendant on the other side of the jib section.

1. Carefully uncoil the pendants alongside the jib. Use care not to kink them.
2. Thoroughly clean and lubricate the pendants.
3. Remove the pins (2) from the pendant ends.
4. Pin the basic jib pendants (1, View A) to the jib top (3) with the pendant pins (2) and cotter pins.
5. Lay the pendants on the ground alongside the jib.
6. If required, pin the required length of jib insert pendants (4, View B) to the basic jib pendants (1) and to each other with the pendant pins (2) and cotter pins.
7. Perform the following steps on both sides of the jib strut (5, View C) — one side at a time:
   a. ***Support the jib backstay spreader and links (6) with an assist crane before removing either pendant pin (2, View C).***
   b. Remove the pendant pin (2, View C).
   c. Lift the end of the pendant (1 or 4, View C) into position at the end of the jib strut and align the connecting holes.
   d. Install the pendant pin (2, View C) and the cotter pin.
   e. Repeat the steps on the other side of the jib strut.

Prepare Backstay Pendants

See Figure 4-54.

1. If the jib will be offset, pin either of the following to the backstay pendants (1):
   - Offset links (4) for a 15° offset
   - Offset pendants (5) for a 25° offset
2. Pin the backstay links (3) to the lugs on the boom insert.

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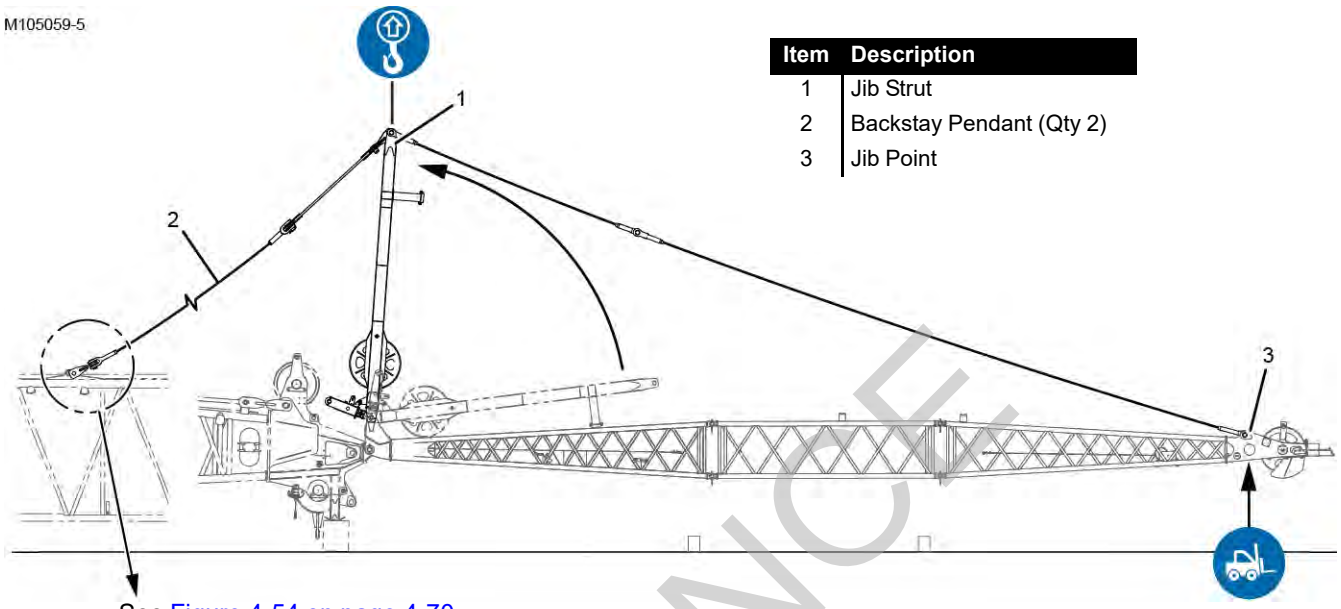


Item	Description
1	Jib Strut
2	Backstay Pendant (Qty 2)
3	Jib Point

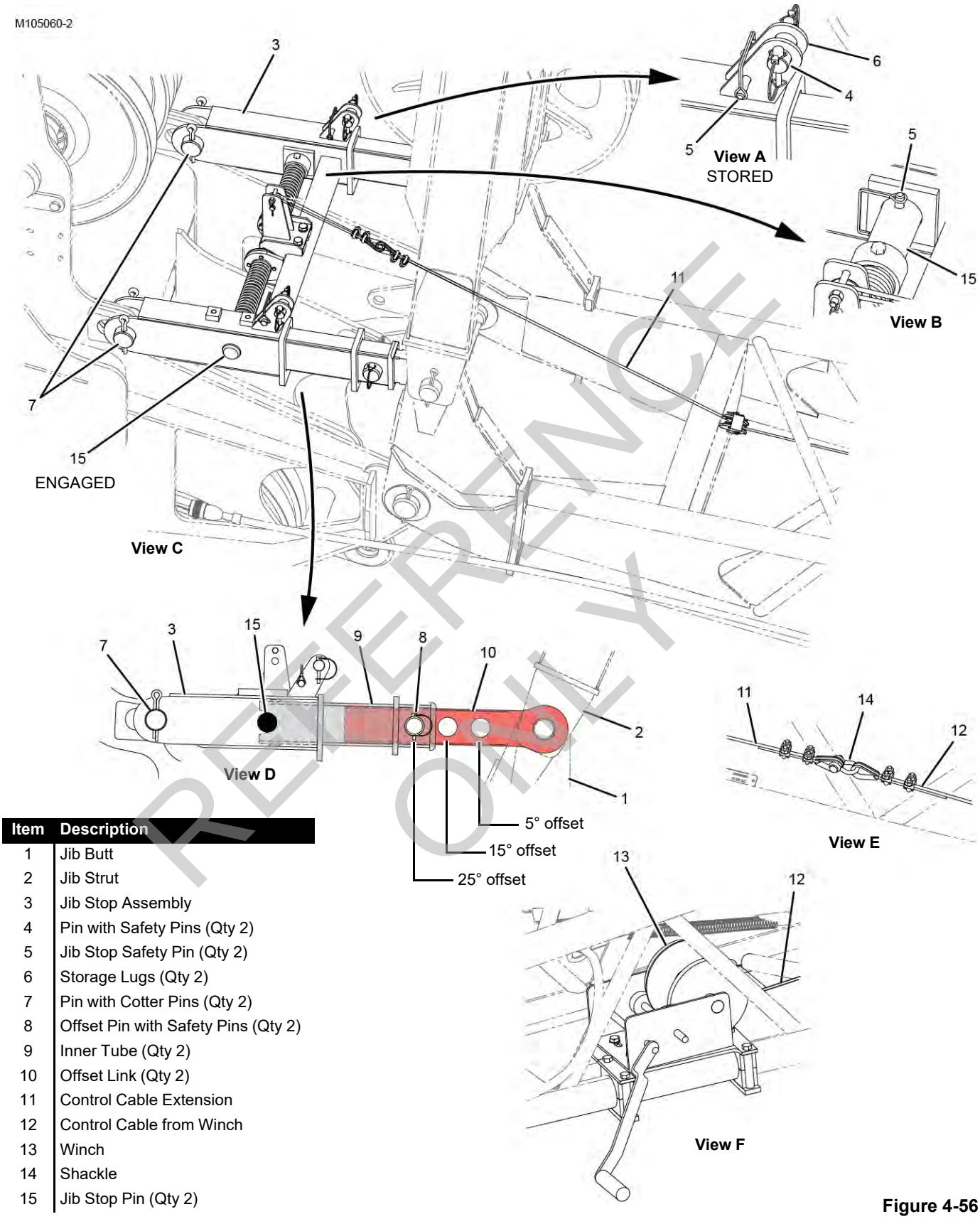
See Figure 4-54 on page 4-70

Figure 4-55

Connect Backstay Pendants to Boom

See Figure 4-55.

1. Raise the jib strut (1):
   a. Using appropriate lifting slings, attach the slings to the sheave in the front side of the jib strut (1).
   b. Attach the lifting slings to the hook from an assist crane.
   c. Slowly lift the strut over-center with the assist crane.
      - ***Use extreme caution not to side load the strut while lifting.***
      - ***Avoid lifting the jib butt/boom top during this step.***
   d. If required to gain enough slack to allow pinning the backstay pendants (1), raise the jib point (3) with a forklift or another crane.
2. Connect the backstay pendants (2) to the required links/ pendants shown in Figure 4-54 on page 4-70).
3. Disconnect the lifting slings and remove the forklift.



Item	Description
1	Jib Butt
2	Jib Strut
3	Jib Stop Assembly
4	Pin with Safety Pins (Qty 2)
5	Jib Stop Safety Pin (Qty 2)
6	Storage Lugs (Qty 2)
7	Pin with Cotter Pins (Qty 2)
8	Offset Pin with Safety Pins (Qty 2)
9	Inner Tube (Qty 2)
10	Offset Link (Qty 2)
11	Control Cable Extension
12	Control Cable from Winch
13	Winch
14	Shackle
15	Jib Stop Pin (Qty 2)

Figure 4-56

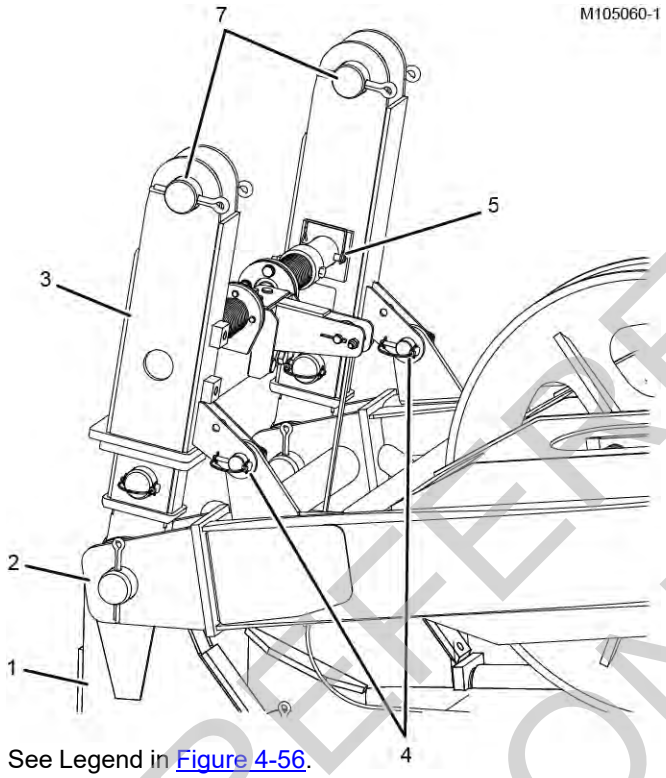
Install the Jib Stop

.

WARNING

Crushing Injury Hazard!

The jib stop pins are spring-engaged. Do not remove the safety pins (5, Figure 4-57) until the jib stop assembly is connected to the boom top and the control cables are attached and tensioned.



See Legend in Figure 4-56.

Figure 4-57

1. Remove pins (7, Figure 4-57).
2. Support the jib stop assembly (3, Figure 4-57), remove the pins (4) and pivot the assembly down. It weighs approximately 176 lb (80 kg).

See Figure 4-56 for the remaining steps.

3. Reinstall the pins (4, View A) in the storage lugs (6).
4. Attach the jib stop assembly (3) to the lugs on the boom top using the pins (7, View C).
5. Set the jib stop length (View D):
   a. Remove the offset pins (8).
   b. Adjust the position of the inner tubes (9) so the holes in the tubes are aligned with the desired offset holes in the offset links (10).
   c. Reinstall the offset pins (8).
6. Using the shackle (14, View E), connect the end of the control cable extension (11, View C) to the control cable (12, View E) from the winch (13, View F) in the jib top.
7. Using the winch, haul in the control cable enough to take the load off the two safety pins (5, View B) and remove both safety pins.
8. Pay out the control cable to engage the jib stop pins (15, View C). Then pay out an additional 2 ft (0,6 m) of cable.

   The pins will not engage the holes in the jib stop frame until the jib point is lifted clear of the ground.
9. Store the safety pins (5, View A) in the storage lugs (6).

WARNING

Falling Jib Hazard!

As the boom and jib are raised from the ground, observe the jib stop pins (15, View C) to make sure they fully engage the holes in the jib stop frame.

The jib can be pulled over backward if the jib stop pins do not engage the holes.

10. Boom up until the jib point just clears the ground.

Make sure the jib stop pins fully engage the holes in the jib stop frame as the boom and jib are raised from the ground.

Complete Jib Rigging

Perform the following steps:

- Install Jib Top Position Light and Wind Speed Indicator (option) on page 4-55
- Install Jib Top Camera (option) on page 4-55
- Connect Jib Extension Cable on page 4-55
- Install Jib Block-Up Limit Components on page 4-55
- Install Load Lines on page 4-59

RAISE BOOM

Pre-Raising Checks

Perform the following checks before raising the boom and jib:

- ☐ Maintenance and lubrication checks have been performed according to Maintenance Checklist and Lubrication Guide.
- ☐ Crane is on a firm, level surface.
- ☐ Crawlers are blocked if required per capacity chart in use.
- ☐ Boom and jib inserts are installed in proper sequence per Boom and Jib Rigging Drawings.
- ☐ Safety pins are installed in all boom and jib connecting pins.
- ☐ Intermediate suspension (if required) is installed.
- ☐ All straps and pendants are installed in proper sequence and properly pinned together. Cotter pins are installed and spread.
- ☐ Boom hoist wire rope is spooled tightly onto boom hoist and engaged with the proper sheaves.
- ☐ Load lines are spooled tightly onto drums and engaged with proper sheaves.
- ☐ Load lines are securely anchored at boom and jib points or at load block and hook-and-weight ball.
- ☐ All tools and other items are removed from boom and jib.
- ☐ Boom max up limit switch is properly installed, operational, and adjusted to proper angle.
- ☐ Electric cables from crane control system are connected between boom butt and boom top.
- ☐ Electric cables are properly connected in boom and jib.
- ☐ Block-up limit control is properly installed, operational, and adjusted.
- ☐ Anemometer is hanging correctly and electric cable is not wrapped around support bracket.
- ☐ RCL/RCI is properly configured and operational.
- ☐ Proper capacity chart is selected and necessary deducts applied on configuration screen of RCL/RCI Display.
- ☐ Operator has read and is thoroughly familiar with selected capacity chart. ***Consult selected capacity chart for applicable deducts and boom length raising limitations.***
- ☐ Wind is within allowable limits for operation as shown in Wind Conditions document located at end of Section 3.

Boom Raising Procedure

1. Verify that the pre-raising checks have been performed.
2. SLOWLY start to boom up:
   a. Have an assistant watch the boom straps as the boom rises.
   b. Also watch the intermediate suspension pendants, if equipped.
   c. Signal the operator to STOP raising the boom if the straps (or pendants) get caught on the boom sections. ***Correct the problem before continuing.***
3. SLOWLY continue to boom up.
4. If equipped with an upper boom point, pin it to the boom top. See Install Upper Boom Point on page 4-65.
5. Continue to raise the boom until the lower and upper boom points are at a convenient height for installing the load block(s) and hook-and-weight ball.
6. Install the load block(s) and the hook-and-weight ball at the lower and upper boom points (see Figure 4-43 on page 4-58).
7. If equipped with a jib, continue to raise the boom until the jib point is at a convenient height to install the load block or the hook-and-weight ball.
   a. Signal the operator to STOP raising the boom if the jib pendants get caught on the jib sections. ***Correct the problem before continuing.***
   b. Make sure the jib stop pins are fully engaged. See Figure 4-56 on page 4-74.
   c. Install the load block or the hook-and-weight ball at the jib point (see Figure 4-43 on page 4-58).

CAUTION

Avoid Wire Rope Damage

Have an assistant watch the load lines as the boom is raised.

Make sure the wire rope is engaged with the sheaves in the boom points, the jib point, and the load block.

Severe damage can occur if the wire rope has “jumped” off a sheave.

8. Continue to boom up until the boom is at an angle that safely allows the load block(s) and/or hook-and-weight balls to be lifted.
9. Once the boom is raised:
   a. Check all crane functions for proper operation.
   b. Check all safety devices for proper operation (see Section 3 of the MLC150-1 Operator Manual).
   c. Check that the boom max up limit switch is adjusted to the proper maximum boom angle.
   d. Check that the RCL/RCI is properly calibrated.

SHIPPING CRANE COMPONENTS

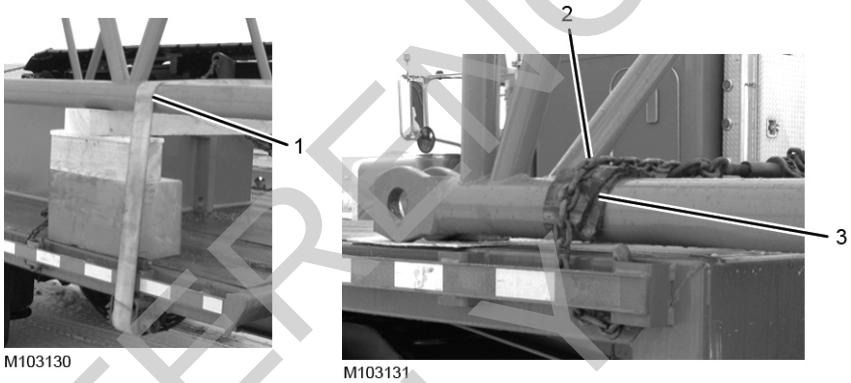
It is the owner/user's responsibility to ensure the following:

- All trailer loads comply with local, state, and federal transportation requirements.
- All crane components are properly blocked and secured so they cannot shift or fall off the trailers.
- All straps and links are securely attached to the boom sections as shown in Figure 4-27 on page 4-35.
- All pendants, if shipped on boom or jib sections, are securely attached with owner furnished cargo tie-down straps so the pendants cannot shift or fall off the sections.
- To avoid damage to components:

  Use synthetic tie-downs to secure components as shown in Figure 4-58, View A.

  If chain tie-downs are used, install protective covering (such as sections of rubber tire) between the chain and the component being secured as shown in Figure 4-58, View B.

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



View A View B

Item	Description
1	Synthetic Tie-Down Wrapped Over Boom Chord
2	Chain Tie-Down Wrapped Over Boom Chord
3	Protective Covering (section of rubber tire)

Figure 4-58

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CRANE DISASSEMBLY

Before proceeding, read and understand all of the topics on page 4-1 through page 4-11.

Prepare Crane

1. Position the crane in the desired disassembly area.
2. If required, ***block under the boom end of the crawlers***. See the following:
   - Appropriate Liftcrane Boom or Jib Capacity Chart for blocked crawler requirements.
   - Crawler Blocking Diagram in the Capacity Chart Manual for blocking dimensions.

DANGER

Tipping Hazard!

Do not attempt to lower the boom or the boom and jib to the ground until the crawlers are blocked, if required. Otherwise, the crane will tip.

Lower Boom

1. Swing the boom to either side of center and lower the load blocks and/or the hook-and-weight balls to the ground. Take every precaution to prevent damage to the load lines.
2. Swing the boom in line with the crawlers and slowly lower the boom.
   a. If equipped with a **luffing jib,** refer to the Luffing Jib Operator Manual for lowering instructions.
   b. If equipped with a **fixed jib,** disengage the jib stops before the jib point contacts the ground. See Lower Boom and Jib on page 4-111.
   c. If equipped with an **upper boom point,** remove the bottom connecting pins when the upper boom point just contacts the ground. See Figure 4-49 on page 4-65.
3. For the B10:350 boom, lower the boom onto blocking approximately 203 mm (8 in) high under the boom top stands.
4. For the B20:350 boom, lower the boom top stands directly onto the ground.
5. Continue lowering the boom until the boom straps are resting on the top of the boom sections and the equalizer is resting on the boom butt rails as shown in Figure 4-59 on page 4-80.

Store Load Lines

1. Disconnect the button sockets or wedge sockets from the links in the boom and jib tops (see Figure 4-43 on page 4-58).
2. Disconnect the load lines from the sockets.
3. Wind the load lines onto the load drums and secure them for shipping.

   The load line from Drum 2 is used for self-disassembly.
4. Store the button sockets, wedge sockets, and connecting pins in the parts box.

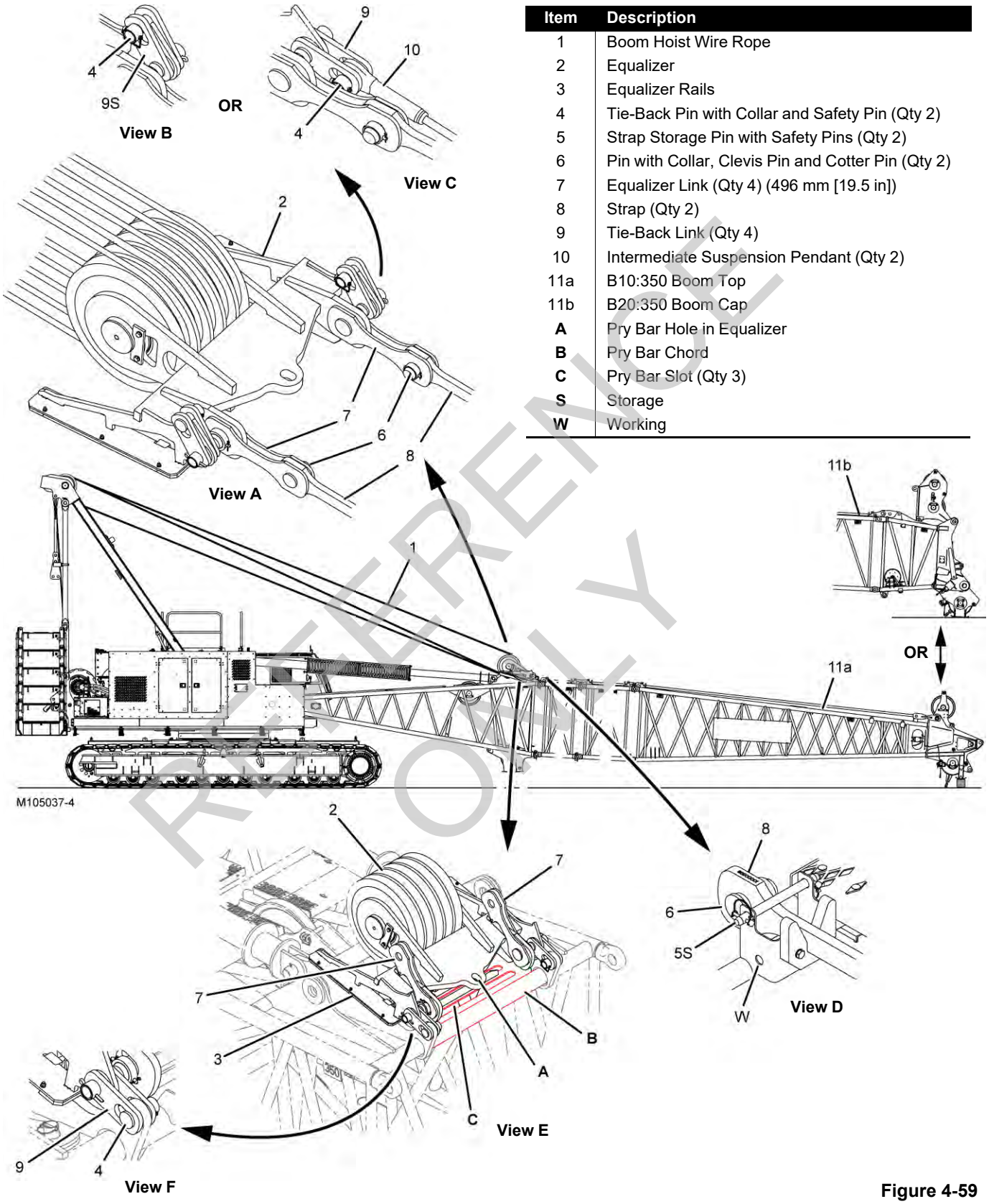
Store Block-Up Limit Components

Reverse the steps for Install Boom Block-Up Limit Components on page 4-53 and store the components in the parts box.

Reverse the steps for Install Jib Block-Up Limit Components on page 4-55 and store the components in the parts box.

Remove Boom/Jib Point Electronics

1. Stop the engine.
2. Reverse the steps for Install Jib Top Position Light and Wind Speed Indicator (option) on page 4-55 and store the position light and wind speed indicator (Figure 4-3 on page 4-3).
3. Reverse the steps for Install Jib Top Camera (option) on page 4-55 and store the camera in the parts box.
4. Reverse the steps for Install Jib Block-Up Limit Components on page 4-55 and store the block-up limit components in the parts box.
5. Reverse the steps for Install Boom Top Position Light and Wind Speed Indicator (option) on page 4-53 and store the position light and wind speed indicator (Figure 4-3 on page 4-3).
6. Reverse the steps for Install Boom Top Camera (option) on page 4-53 and store the camera in the parts box.
7. Disconnect the electric cables between the boom top and the upper boom point or the jib.
   - Clean all cable connectors and dust caps.
   - Securely fasten dust caps to all cable ends and receptacles.
   - Store the jib extension cable on the jib butt as shown in Figure 4-41 on page 4-54 and secure it with plastic wire ties.
   - Store the electric cables on the boom butt as shown in Figure 4-38 on page 4-50.



Item	Description
1	Boom Hoist Wire Rope
2	Equalizer
3	Equalizer Rails
4	Tie-Back Pin with Collar and Safety Pin (Qty 2)
5	Strap Storage Pin with Safety Pins (Qty 2)
6	Pin with Collar, Clevis Pin and Cotter Pin (Qty 2)
7	Equalizer Link (Qty 4) (496 mm [19.5 in])
8	Strap (Qty 2)
9	Tie-Back Link (Qty 4)
10	Intermediate Suspension Pendant (Qty 2)
11a	B10:350 Boom Top
11b	B20:350 Boom Cap
A	Pry Bar Hole in Equalizer
B	Pry Bar Chord
C	Pry Bar Slot (Qty 3)
S	Storage
W	Working

Figure 4-59

Connect Equalizer to Boom Butt

See Figure 4-59.

WARNING

Moving Object Hazard!

Prevent serious crushing injury:

- Do not disconnect the equalizer links (7, View A) from the straps (8) until the equalizer is pinned to the boom butt. Otherwise, the equalizer can be pulled rearward by the boom hoist wire rope.

1. Boom down to slacken the boom hoist wire rope until the equalizer (2, View E) is resting firmly on the boom butt equalizer rails (3).
2. If equipped with intermediate suspension, unpin the intermediate suspension pendants (10, View C) from the tie-back links (9).
3. If stored, remove the tie-back pins (4, View B).
4. Pin the tie-back links (9, View F) to the boom butt lugs with the tie-back pins (4).
5. If necessary, use a pry bar to move the equalizer forward enough to allow the tie-back links to be pinned to the butt lugs.

   A pry bar hole (**A**, View E) is provided in the equalizer. Pry against beam (**B**) and slots (**C**).

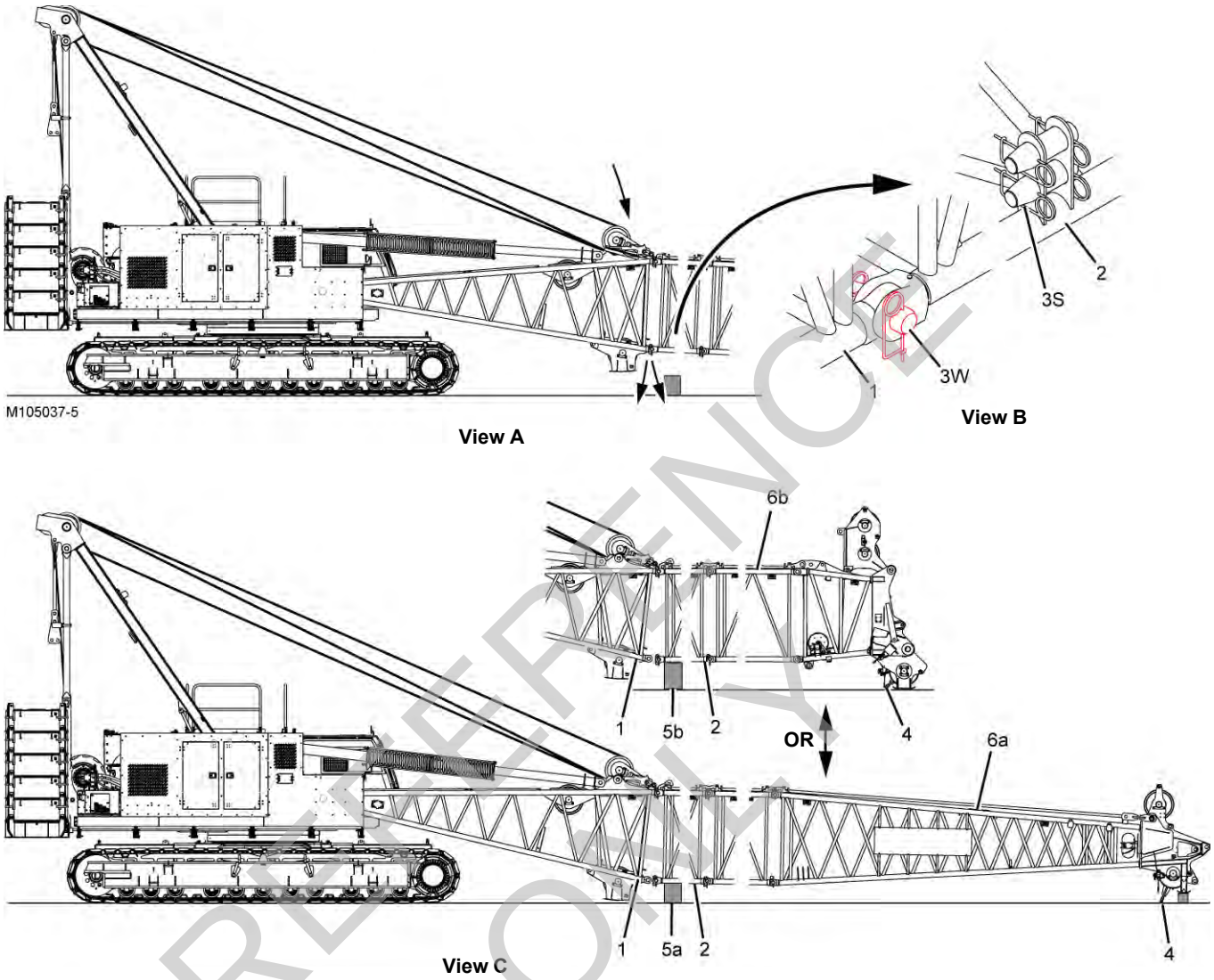


Figure 4-60

Item	Description
1	Boom Butt
2	Boom Insert
3	Bottom Connector Pin (Qty 2)
4	Dead-End Link
5a	Blocking: 457 mm (18 in) high for B10:350 Boom
5b	Blocking: 546 mm (21.5 in) high for B20:350 Boom
6a	B10:350 Boom Top
6b	B20:350 Boom Cap
S	Stored
W	Working

Open Boom

See Figure 4-60.

CAUTION

Avoid Gantry and/or Boom Butt Damage!

Do not attempt to lift the boom during the following step. Damage can occur.

1. Boom up only enough to support the boom when the bottom connector pins (3, View B) are removed.

WARNING

Crushing Injury Hazard!

Prevent serious crushing injury:

- Do not stand inside the boom sections while removing the connector pins — STAND OUTSIDE BOOM.

2. Remove the bottom connector pins (3).
3. Store the pins in the holders on the boom insert (2).
4. Take care not to damage the dead-end link (4) while lower the boom during the next step.
5. Slowly boom down and lower the boom sections onto blocking (5a or 5b, View C) under the bottom chords of the insert (2).

   The blocking is required to prevent the boom butt stands from contacting the ground when lowering the boom sections.

Item	Description
1	Boom Hoist Wire Rope
2	Equalizer
3	Equalizer Rails
4	Tie-Back Pin with Collar and Safety Pin (Qty 2)
5	Strap Storage Pin with Safety Pins (Qty 2)
6	Pin with Collar, Clevis Pin and Cotter Pin (Qty 2)
7	Equalizer Link (Qty 4)
7A	Link Storage Pin with Hair-Pin Cotter (Qty 2)
8	Strap (Qty 2)
9	Tie-Back Link (Qty 4)
10	Boom Butt
11	Insert
12	Top Connector Pin (Qty 2)
13a	B10:350 Boom Top
13b	B20:350 Boom Cap
S	Storage
W	Working

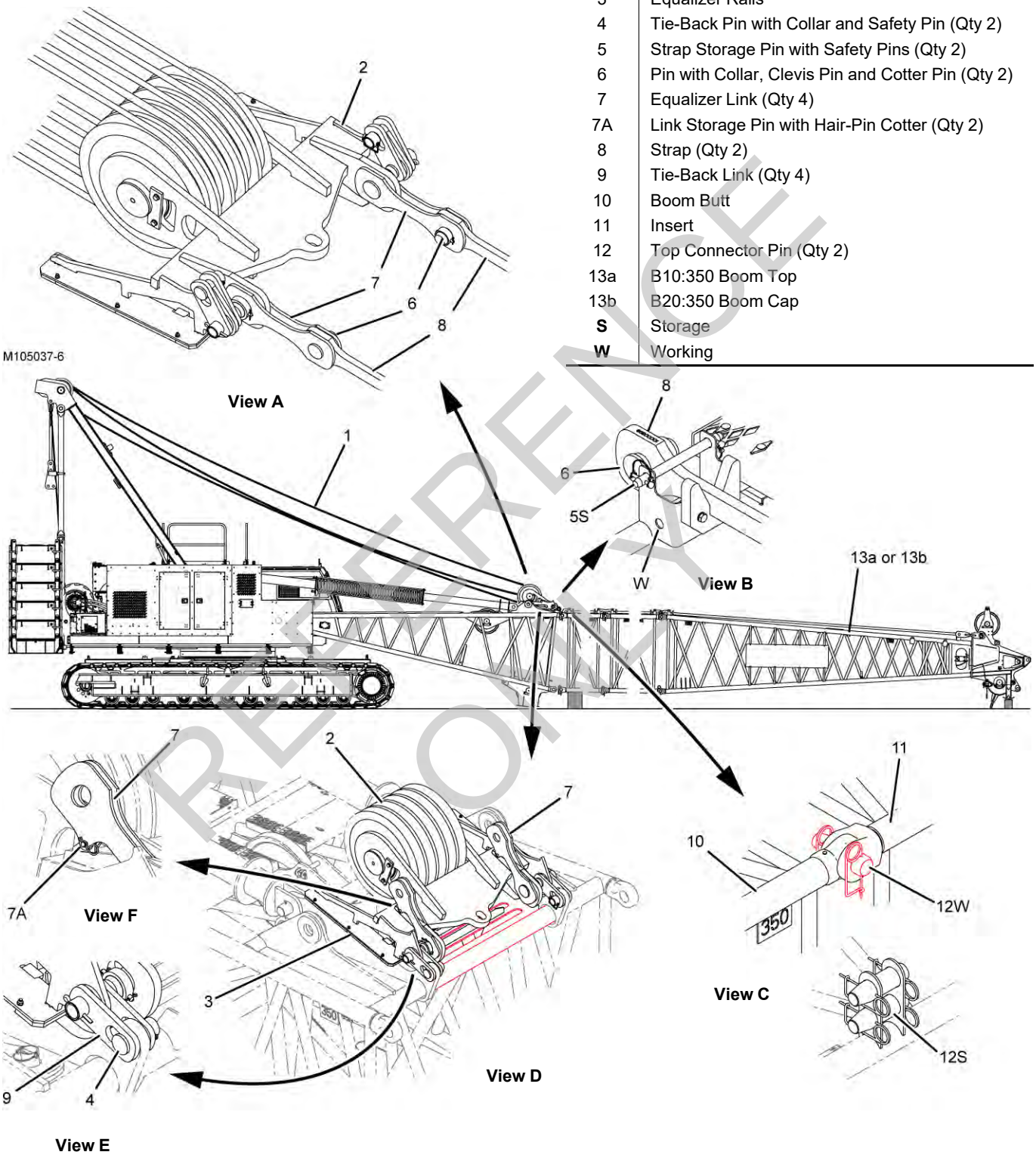


Figure 4-61

Disconnect Boom Straps from Equalizer

See Figure 4-61.

WARNING

Moving Object Hazard!

Prevent serious crushing injury:

Do not disconnect the equalizer links (7, View A) from the straps (8) until the equalizer is pinned to the boom butt. Otherwise, the equalizer can be pulled rearward by the boom hoist wire rope.

1. Make sure the equalizer is pinned to the boom butt with the tie-back links (4, View E).
2. Remove pins (6, View A).
3. Remove the link storage pins (7A, View F) from the equalizer holes.
4. Rotate the equalizer links (7, View A) rearward to the storage position (View F) and install the link storage pins (7A).
5. Install the pins (6, View B) in the straps (8).
6. Move the strap storage pins (5, View B) from the working holes (W) to the storage holes (S).

Disconnect Boom Butt from Boom

See Figure 4-61.

1. Boom up only enough to support the boom butt when the top connector pins are removed.
2. Remove the top connector pins (12, View C).
3. Store the pins in the holders on the boom insert.
4. Travel the crane in reverse, away from the boom sections.

Item	Description
1	Blocking Under Boom Top Stands
2	Synthetic Lifting Slings (Owner Furnished)
3	Boom Insert Top Connectors
4a	Blocking: 457 mm (18 in) high for B10:350 Boom
4b	Blocking: 546 mm (21.5 in) high for B20:350 Boom
5	Dead-End Link
6a	B10:350 Boom Top
6b	B20:350 Boom Cap

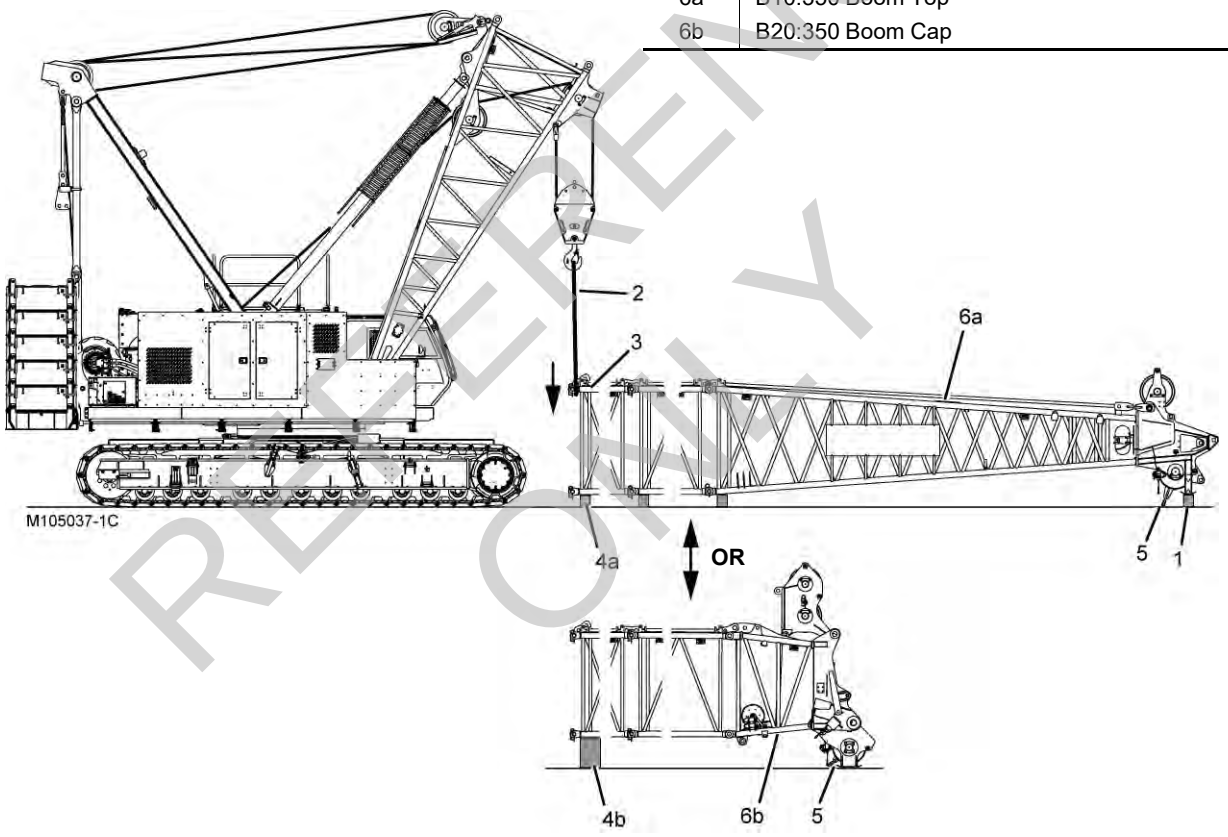


Figure 4-62

Install Self-Erect Hook Block

If you are going to use the crane for self-disassembly, see Install Self-Erect Hook Block on page 4-22.

Only use the load line from ***Drum 2.***

CAUTION

Wire Rope Damage!

Observe the load line spooling on Drum 2 often during crane disassembly.

To avoid wire rope damage, adjust the load line spooling as necessary.

Configure RCL/RCI for Crane Setup

Select the Boom Butt Configuration in the RCL/RCI display.

Remove Blocking from Under Last Insert

This step applies only to the B10:350 boom.

See Figure 4-62.

1. Using a chocker hitch, securely attach owner furnished synthetic lifting slings (2) to the top connectors of the boom insert (3) and to the hook of the self-erect hook block.

   The lifting slings must be sized to support one-half the weight of the boom.
2. Hoist just enough to support the boom insert (3) with the lifting slings.
3. Remove the 457 mm (18 in) high blocking (4) from under the insert (3).
4. Install blocking approximately 203 mm (8 in) under the inserts.
5. Take care not to damage the dead-end link (5) while lowering the boom inserts during the next step.
6. Lower the inserts onto the blocking.
7. Remove the lifting slings.

Install Chain Lifting Sling

See Install Chain Lifting Sling on page 4-23.

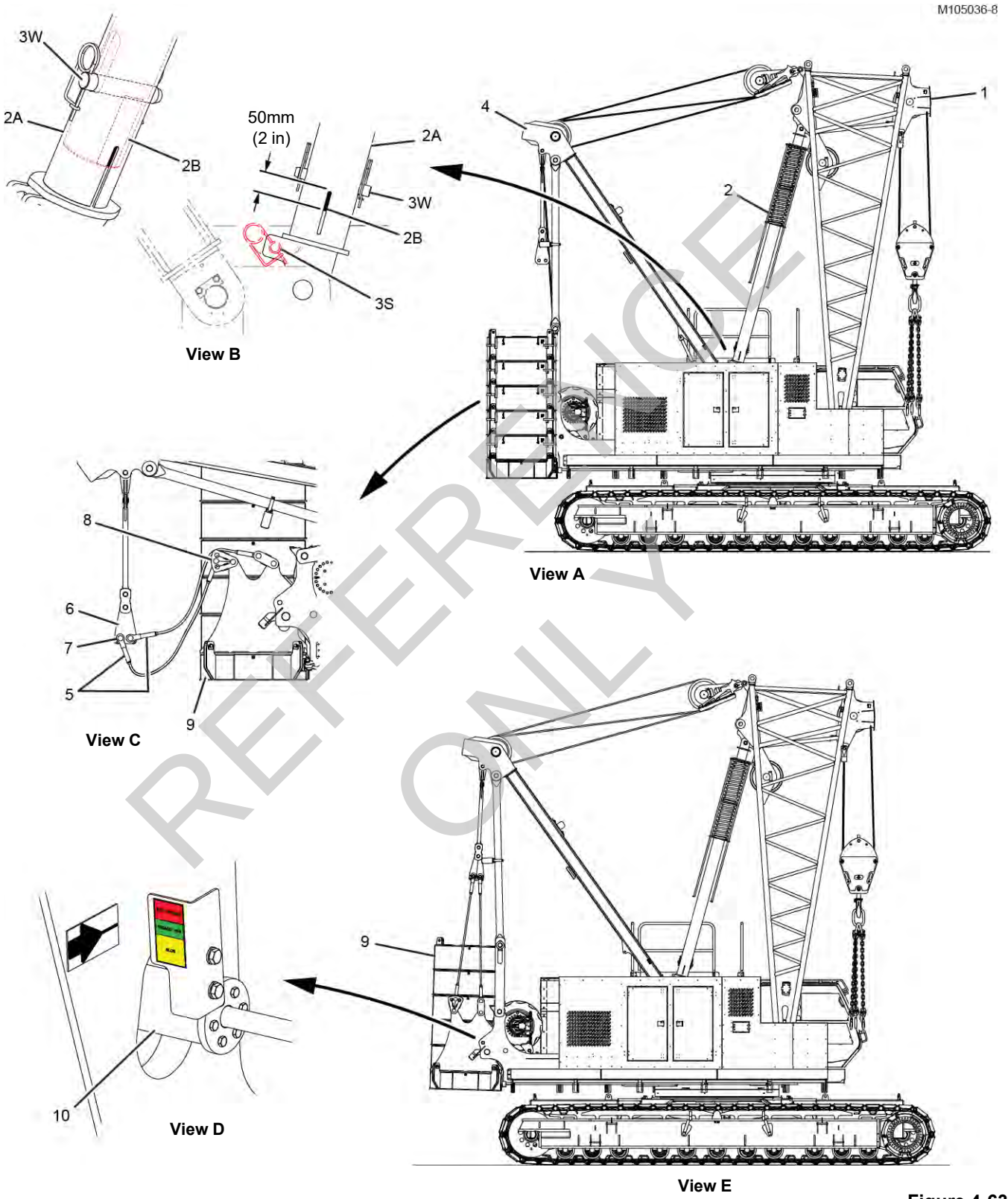


Figure 4-63

Legend for Figure 4-80.

Item	Description
1	Boom Butt at 87°
2	Boom Stop Spring Compressed (qty 2)
2A	Boom Stop Outer Tube (Qty 2)
2B	Boom Stop Inner Tube (Qty 2)
3	Hold-Back Pin with Safety Pin (qty 2)
4	Gantry
5	Handling Pendant (Qty 4)
6	Handling Link (Qty 2)
7	Pendant Pin with Cotter Pin (Qty 4)
8	Adjustable Handling Link (Qty 2)
9	Crane Counterweight
10	Counterweight Pin (Qty 2)
S	Storage Hole
W	Working Holes

DANGER

Crush Hazard!

Avoid being crushed by moving parts:

- Do not stand on the crane counterweight while it is being raised or lowered.
- Do not climb onto the crane counterweight once the counterweight pins are disengaged.
- Never go under the crane counterweight when it is unpinned from the crane and hanging from the gantry.

Remove Crane Counterweight

If equipped with Series 2 counterweight, remove the crane counterweight ***BEFORE removing carbody counterweight***.

See Figure 4-63.

1. Activate the remote control in the main display. Read the topic Self-Erect Controls on page 4-9.
2. Prepare the boom stops:

CAUTION

Avoid Structural Damage to Crane!

Use extreme care when compressing the boom stops during the following steps. Do not compress the boom stops until they are solid. Damage to the boom butt or boom stops can occur.

Stop compressing the boom stops when the hold-back holes are aligned.

WARNING

Crush Hazard!

Moving parts can cut or crush.

Do not stick your fingers into the slots in the boom stop outer tubes (2A, View B, Figure 4-63).

   a. Slowly raise the boom butt (1, View A) to approximately 87°. This step will compress the boom stop springs (2).
   b. Stop raising the boom butt when the boom stop inner tubes (2B, View B) are visible approximately 50 mm (2 in) into the slots in the boom stop outer tubes (2A).

      The hold-back holes in the inner and outer tubes should now be aligned.
   c. Remove the hold-back pins (3, View B) from the storage holes (S) and install them in the working holes (W) between the boom stop tubes.
3. The boom butt will now remain in position while the gantry is raised and lowered during the remaining steps.
4. Use the remote control for the remaining steps. This will allow the operator to stand at the rear of the crane and view the removal procedure.
   - ***Turn ON the SYNC switch*** on the remote control so the gantry raising cylinders follow the gantry as it is raised and lowered during the following steps. See Section 3 of the Operator Manual for detailed instructions.
   - Use the Drum 4 (boom hoist) thumbwheel on the remote control to raise and lower the gantry.
5. Lower the gantry (4, View C) (boom down using the Drum 4 thumbwheel on the remote control) until the handling pendants (5) can be pinned to the handling links (6).

   The pendants are stored on the counterweight tray.
6. Pin the handling pendants (5, View C) to the handling links (6) with the pendant pins (7).

CAUTION

Avoid Damage to Pendants!

Use extreme care when raising the gantry during the following step. Make sure the handling pendants don't get caught on the pins and links.

7. Slowly raise the gantry (boom up using the Drum 4 thumbwheel on the remote control) until the handling pendants are tight.

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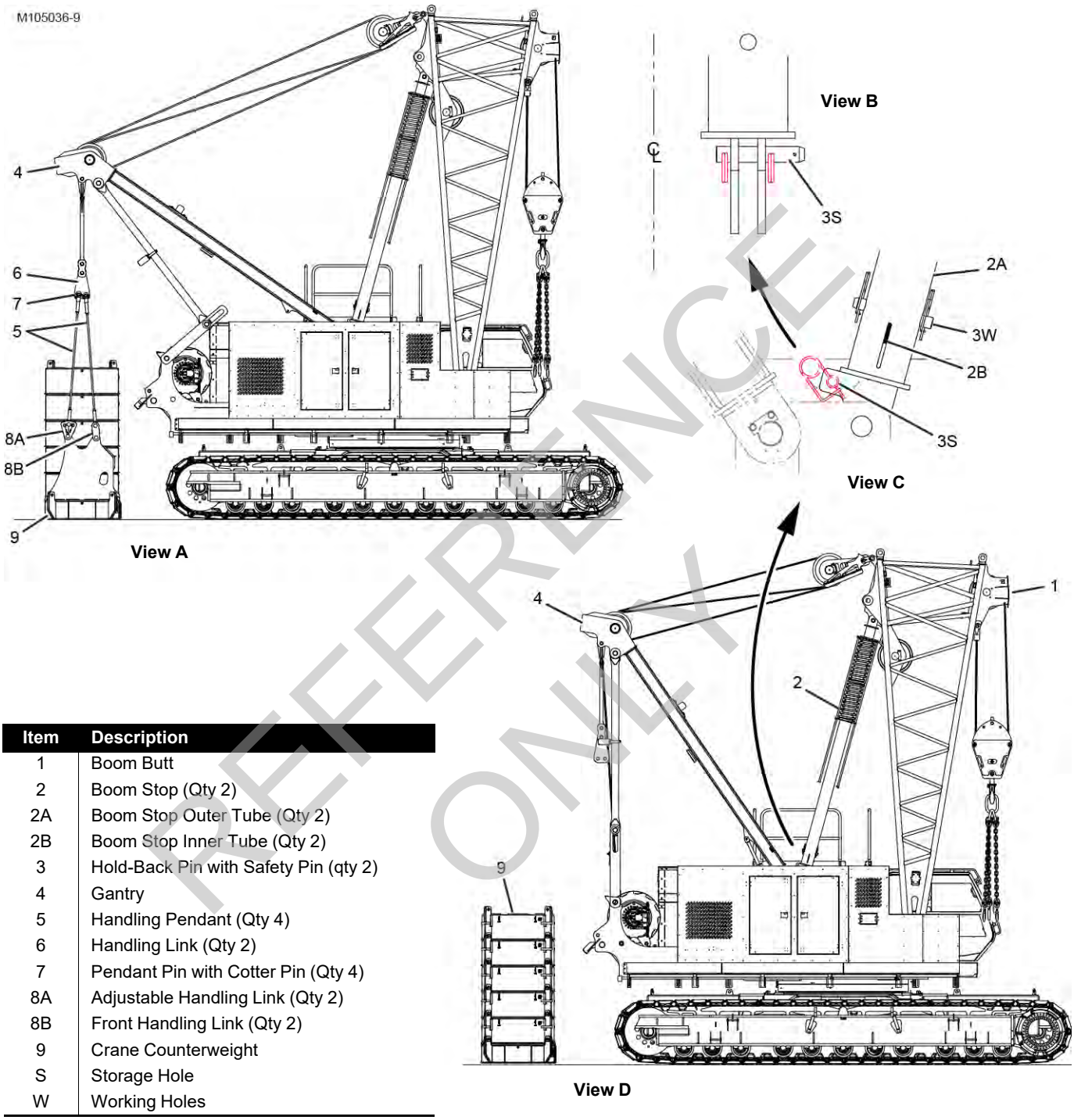


Item	Description
1	Boom Butt
2	Boom Stop (Qty 2)
2A	Boom Stop Outer Tube (Qty 2)
2B	Boom Stop Inner Tube (Qty 2)
3	Hold-Back Pin with Safety Pin (qty 2)
4	Gantry
5	Handling Pendant (Qty 4)
6	Handling Link (Qty 2)
7	Pendant Pin with Cotter Pin (Qty 4)
8A	Adjustable Handling Link (Qty 2)
8B	Front Handling Link (Qty 2)
9	Crane Counterweight
S	Storage Hole
W	Working Holes

Figure 4-64

Remove Crane Counterweight (continued)

8. Slowly continue to raise the gantry until the weight of the crane counterweight (9, View D, Figure 4-63 on page 4-88) is off the counterweight pins (10). The arrow (View D) should be pointing at the green area of the alignment decal.

   The boom butt will rise slightly and the boom stops will fully compress during this step.

9. Disengage the counterweight pins using the switch on the remote control. Raise the gantry (counterweight) as required to disengage the pins.

NOTE If the crane counterweight is raised too high, a limit switch will trip open to stop the gantry and prevent the backhitch from fully extending. The COUNTERWEIGHT TOO HIGH fault will come on in the main display.

10. Verify that the counterweight pins are fully disengaged.

See Figure 4-64.

11. Slowly lower the gantry (4, View A) (boom down using the Drum 4 thumbwheel on the remote control) to lower the crane counterweight (9) to the ground. If necessary, ***block under the counterweight tray so it is stable***.

12. Once the counterweight has been lowered far enough, engage the counterweight pins using the switch on the remote control.

13. Continue to lower the gantry until the handling pendants (5, View A) are slack.

14. Unpin the handling pendants (5, View A) from the handling links (6).

15. Store the pendant pins (7, View A) in the pendant holes.

16. Store the handling pendants (5, View A) and the links (8A and 8B) on the counterweight tray.

17. Leave the handling links (6, View A) pinned to the gantry links.

18. Fully raise the gantry (4, View D) (boom up using the Drum 4 thumbwheel on the remote control) until the cylinders are fully extended and the backhitch links are tight.

CAUTION

Structural Damage to Crane!

Use extreme care when compressing the boom stops during the following steps. Do not bottom out the boom stops while compressing them. Damage to the boom butt or boom stops can occur.

Stop compressing the boom stops when the hold-back holes are aligned.

19. Boom up slightly using the Drum 4 thumbwheel on the remote control to compress the boom stops (2, View C) and remove the hold-back pins (3, View C) from the working holes (W).

20. Install the hold-back pins (3, View C) in the storage holes (S).The pins must be stored as shown in View B.

CAUTION

Avoid Wire Rope Damage!

The hold-back pins (3, Figure 4-64) must be installed as shown in View B — ***short end of pins toward center of crane.*** Otherwise, the load line from Drum 2 can catch under the pin, resulting in wire rope or pin damage.

21. ***Turn OFF the SYNC switch*** on the remote control.

22. Lower the boom butt into the working range.

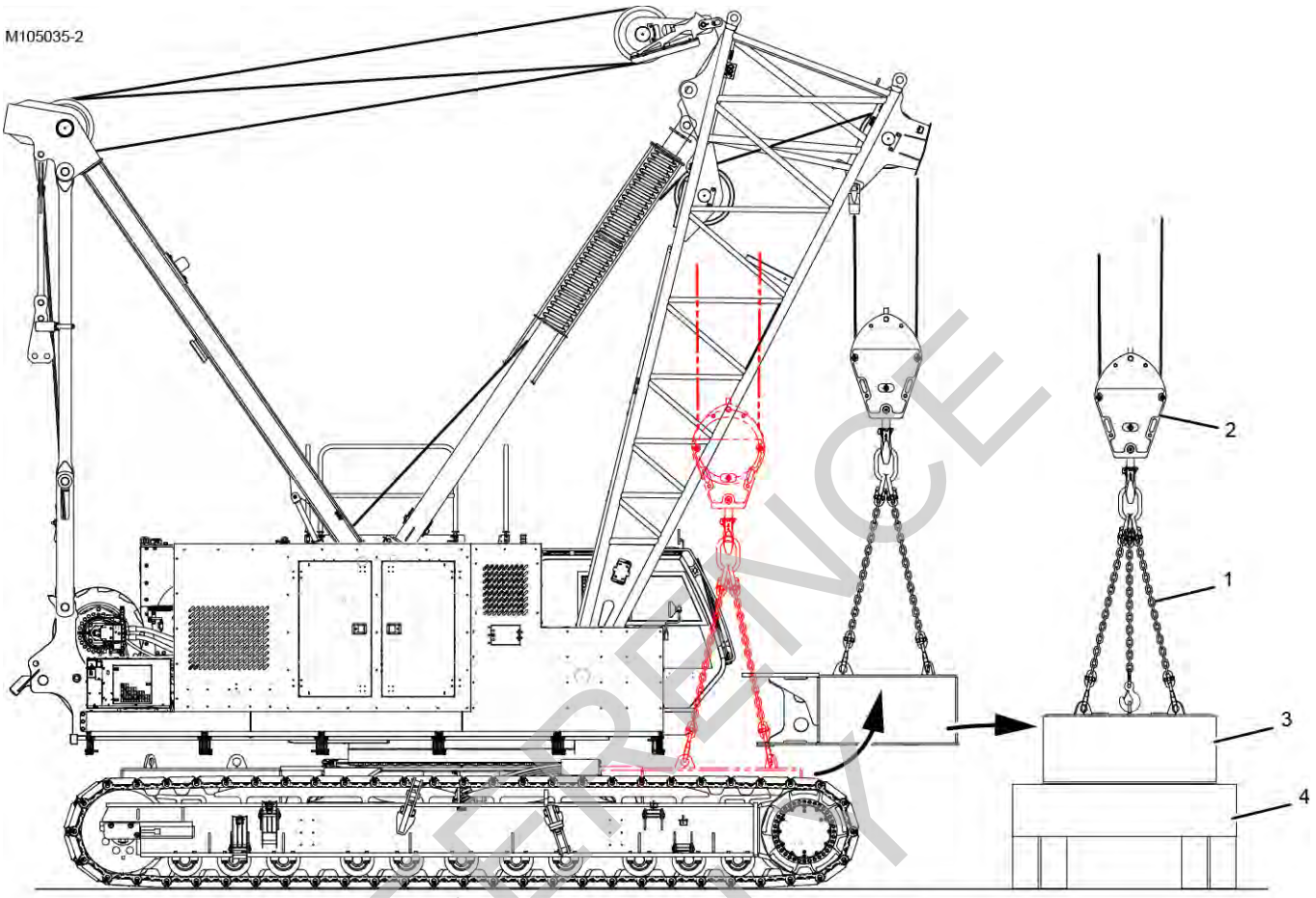
Disassemble Crane Counterweight

To disassemble the crane counterweight, reverse Assemble Crane Counterweight on page 4-39.

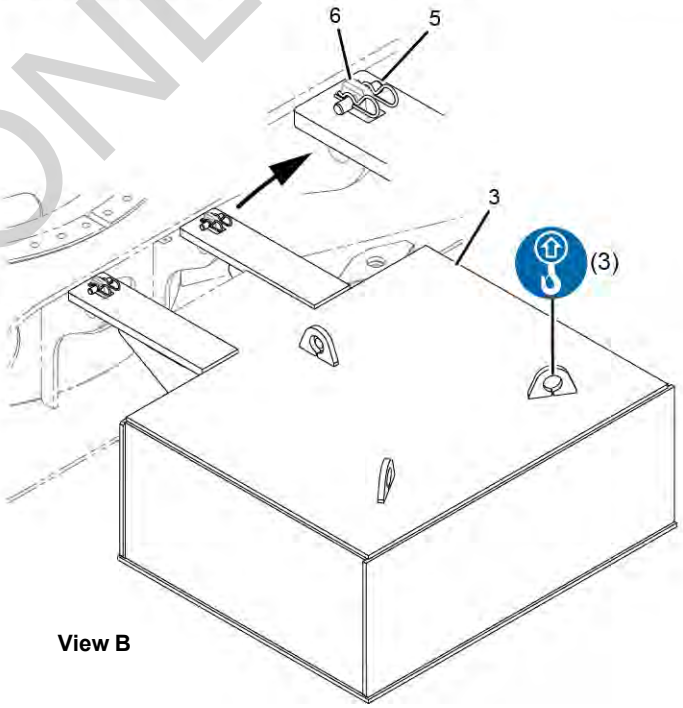
See Shipping Crane Components on page 4-77.

Store Handrails

Lower the Handrails on the left enclosure. Reverse the steps under the topic Raise Handrails on page 4-17.



View A



View B

Item	Description
1	Chain Lifting Sling
2	Self-Erect Hook Block
3	Carbody Counterweight (2)
4	Trailer
5	Pin with Hair-Pin Cotters (4)
6	Hooked Lug (4)

Figure 4-65

Remove Carbody Counterweight

For Series 1, disregard this procedure.

If equipped with Series 2 counterweight, remove the crane counterweight (page 4-89), ***BEFORE removing the carbody counterweight***.

See Figure 4-65.

DANGER

Falling Load Hazard!

Prevent structural failure of components or tipping:

- Do not exceed the lifting capacities given in the Liftcrane Boom Butt Handling Capacities Chart at the end of this section.

Crane Tipping Hazard!

To avoid serious crushing injury:

- For Series 2, remove the crane counterweight before removing the carbody counterweight.

1. Attach the chain lifting sling (1, View A) to the self-erect hook block (2).
2. Raise the boom to approximately 87°.
3. Hook onto the carbody counterweight (3) with the chain lifting sling (1).
4. Swing and position the boom butt so the self-erect hook block is centered over the counterweight.
5. Remove the pins (5, View B) from the hooked lugs (6) on the carbody.
6. Boom, swing, and hoist as required to disengage the cutouts in the carbody counterweight (3, View B) from the hooked lugs (6) on the carbody.
7. Lift the carbody counterweight onto the trailer (4, View A).
8. Lower the carbody counterweight until the lifting slings go slack.
9. Disconnect the chain lifting sling from the carbody counterweight and remove the trailer.

   See Shipping Crane Components on page 4-77.
10. Store the pins (5, View B) in the hooked lugs on the carbody.
11. Repeat the above steps for the other carbody counterweight.

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Disassemble Boom and Jib

The boom and jib can be disassembled with the MLC150-1 boom butt or with an assist crane.

Refer to the Liftcrane Boom Butt Capacities at the end of this section for lifting capacities.

For instructions, see the following topics:

- Boom #350 Disassembly on page 4-109
- Jib #134 Disassembly on page 4-111

Load Trailers

The MLC150-1 can load the trailers as shown in View A, Figure 4-25 on page 4-32.

Refer to the Liftcrane Boom Butt Capacities at the end of this section for lifting capacities.

WARNING

Falling Load Hazard!

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

Boom Sections

All boom sections have lifting lugs as shown in Figure 4-25 on page 4-32.

- Handle the boom sections with care to avoid damaging the lacings and chords.
- Use synthetic lifting slings (crane owner furnished) to lift the boom sections. If wire rope or chain lifting slings are used to handle the boom sections, install protective covering (such as sections of rubber tire) between the slings and the section being lifted.

Jib Sections

The jib sections do not have lifting lugs.

- Handle the jib sections with care to avoid damaging the lacings and chords.
- Use synthetic lifting slings (crane owner furnished) to handle the jib sections. Lift at the chords only. Never lift at the lacings. If wire rope or chain lifting slings are used to handle the jib sections, install protective covering (such as sections of rubber tire) between the slings and the section being lifted.
- See Figure 4-26 on page 4-33 for the center of gravity of the jib sections.

Counterweight

- Each crane counterweight box has two lifting points (see Figure 4-29 on page 4-38).
- The crane counterweight tray (Figure 4-29 on page 4-38) and each carbody counterweight (Figure 4-28 on page 4-36) has three lifting lugs.

Use the Manitowoc supplied chain lifting sling (Figure 4-4 on page 4-5) to handle the crane and carbody counterweight boxes and tray.

M105028-3

Item	Description
1	Safety Pin
2	Jack Pad (4 places)
3	Locking Pin
4	Carbody Jack
5	Jack Handle (Qty 2 each jack)
6	Locking Pin with Safety Pin
7	U-Shaped Locking Pin

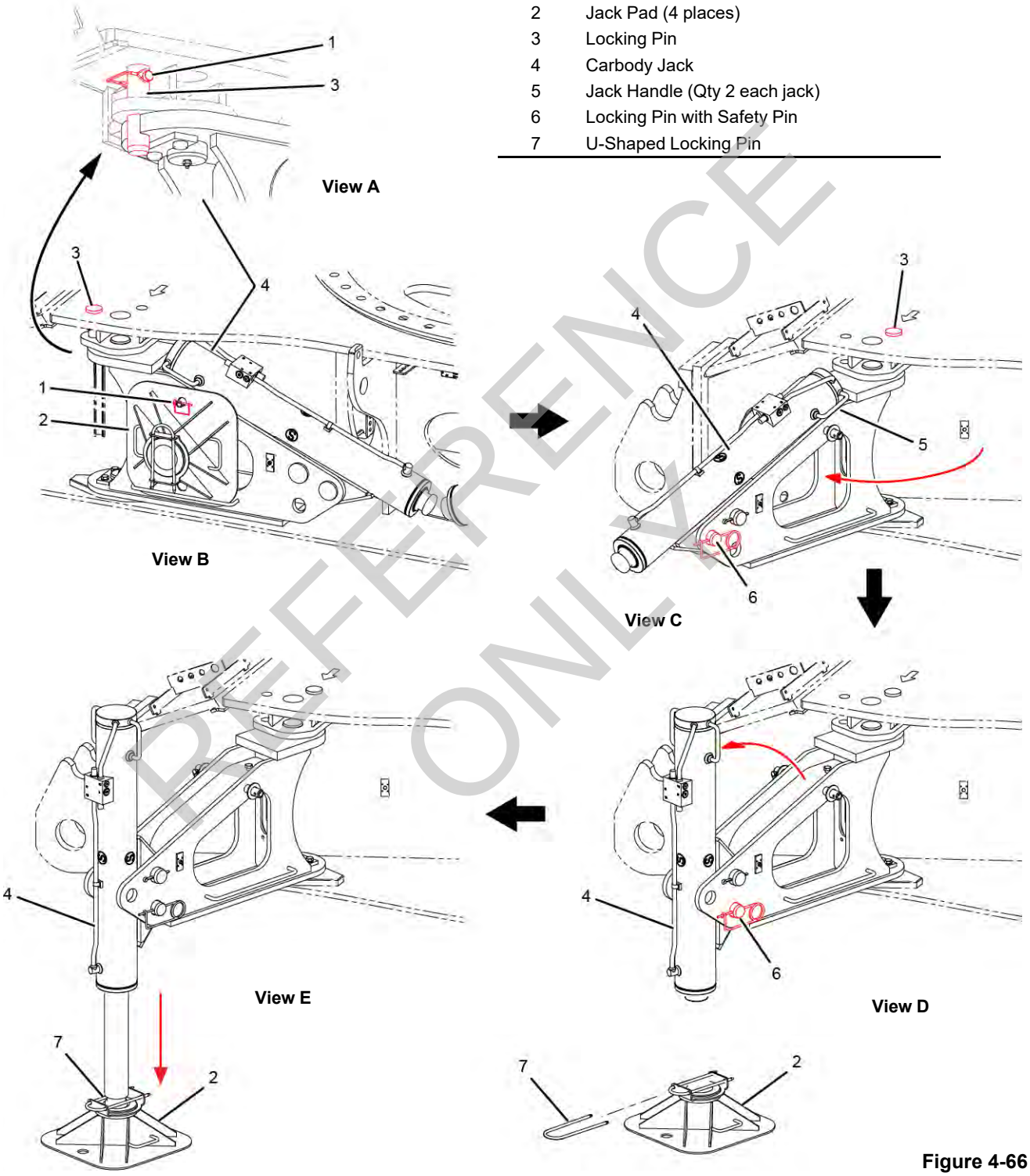


Figure 4-66

Deploy Carbody Jacks

Perform the following steps at each carbody jack. See Figure 4-66.

1. Remove the safety pin (1, View B) and the jack pad (2) from the storage lug on the carbody jack and place the jack pad on the ground.
2. Store the safety pin (1) in the lug on the carbody jack.
3. Remove the safety pin (1, View A) and the locking pin (3).
4. Swing the carbody jack (1, View B) to the working position (View C) (approximately 112°).
5. Reinstall the locking pin (3, View C) and the safety pin (1) to lock the carbody jack in place.

WARNING

Crush Hazard!

To avoid serious injury:

To prevent the carbody jack from rotating out uncontrolled, grasp the jack handles before removing the locking pin.

6. Grasp the jack handles (5, View C) and remove the locking pin (6).
7. Rotate the carbody jack (4, View C) to the vertical working position (View D).
8. Reinstall the locking pin (6, View D) and the safety pin.
9. Remove the U-shaped locking pin (7, View D) from the jack pad (2).
10. Repeat the above steps at each carbody jack.

WARNING

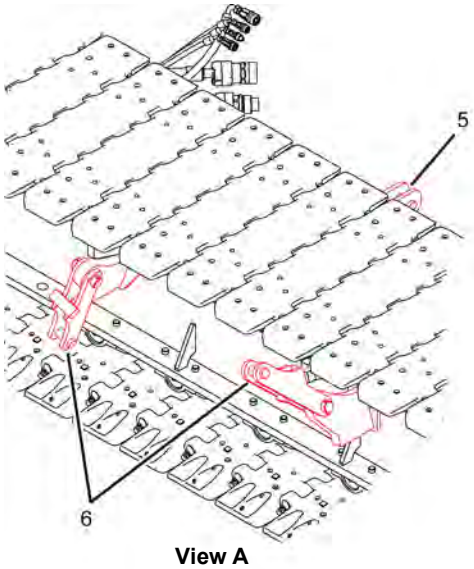
Moving Part Hazard!

To avoid serious crushing injury, warn all personnel to stand clear of the jacks.

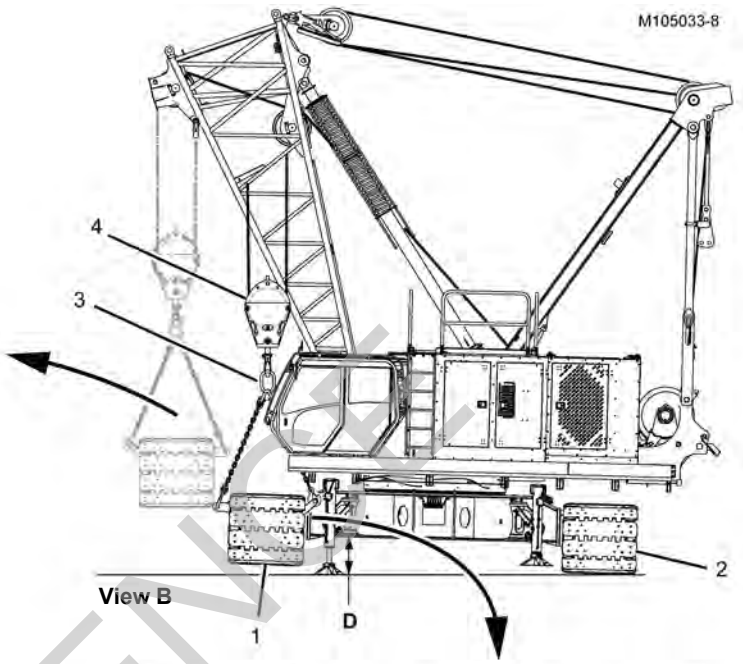
Crane Tipping Hazard!

Keep the crane level while jacking.

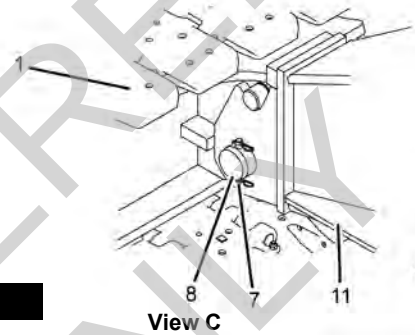
11. Enable the carbody control in the Self-Erect Controls Screen of the Main Display.
12. Use the carbody controls to slowly extend the carbody jacks so the jack pads can be attached to the cylinder rods.
13. Fasten the jack pads (2, View E) to the cylinder rods using the U-shaped locking pins (7).



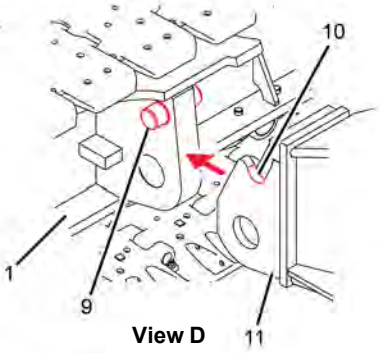
View A



View B

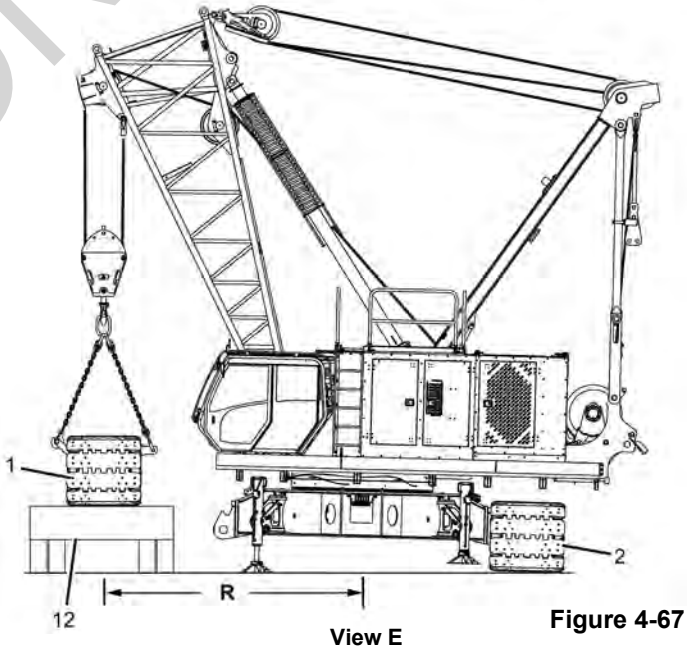


View C



View D

Item	Description
1	First Crawler
2	Second Crawler On Ground
3	Chain Lifting Sling
4	Self-Erect Hook Block
5	Lifting Lug
6	Lifting Link (Qty 2)
7	Locking Pin with Hair-Pin Cotters (Qty 2)
8	Crawler Pin (Qty 2)
9	Alignment Pin (Qty 2)
10	Alignment Saddle (Qty 4)
11	Carbody
12	Trailer
D	660 mm (26 in)
R	Max Radius (see Liftcrane Boom Butt Handling Capacity Chart at end of this section)



View E

Figure 4-67

Store Crawler Steps

Store the steps at both crawlers. Reverse the steps under the topic Deploy Crawler Steps on page 4-29.

Disconnect Crawler Hydraulic Hoses

Disconnect and store the hydraulic hoses at both crawlers. Reverse the steps under the topic Connect Crawler Hydraulic Hoses on page 4-31

NOTE At disassembly, apply a light coat of silicone lubricant to the threads of all dust caps, couplers, and connectors to help prevent the threads from seizing.

Remove First Crawler

See Figure 4-67.

1. Determine which crawler will be removed first.
2. Extend the carbody jacks adjacent to the first crawler (1, View B) so the carbody is approximately at dimension (**D**) off the ground.
3. Fully retract the carbody jacks adjacent to the second crawler (2, View B) so the ***second crawler is on the ground***.

CAUTION

Avoid Jacking Cylinder Damage!

To prevent possible damage to the jacking cylinders, the second crawler MUST be on the ground before removing the first crawler.

4. If not already done, attach the chain lifting sling (3, View B) to the self-erect hook block (4).
5. Swing the upperworks and center the boom over the first crawler (1, View B) (boom angle approximately 87°).
6. Attach the hooks from the chain lifting sling (3, View A) to the lifting lug (5) on the inboard side of the crawler and to the lifting links (6) on the outboard side of the crawler.
7. Remove the locking pins (7, View C).
8. Using the carbody controls, disengage the crawler pins (8, View C) at the first crawler.
9. Slowly hoist, boom, and swing as required to disengage the alignment pins (9, View D) in the crawler (1) from the alignment saddles (10) in the carbody (11).
10. Lift the crawler away from the carbody.

DANGER

Falling Load Hazard!

Prevent structural failure of components or tipping:

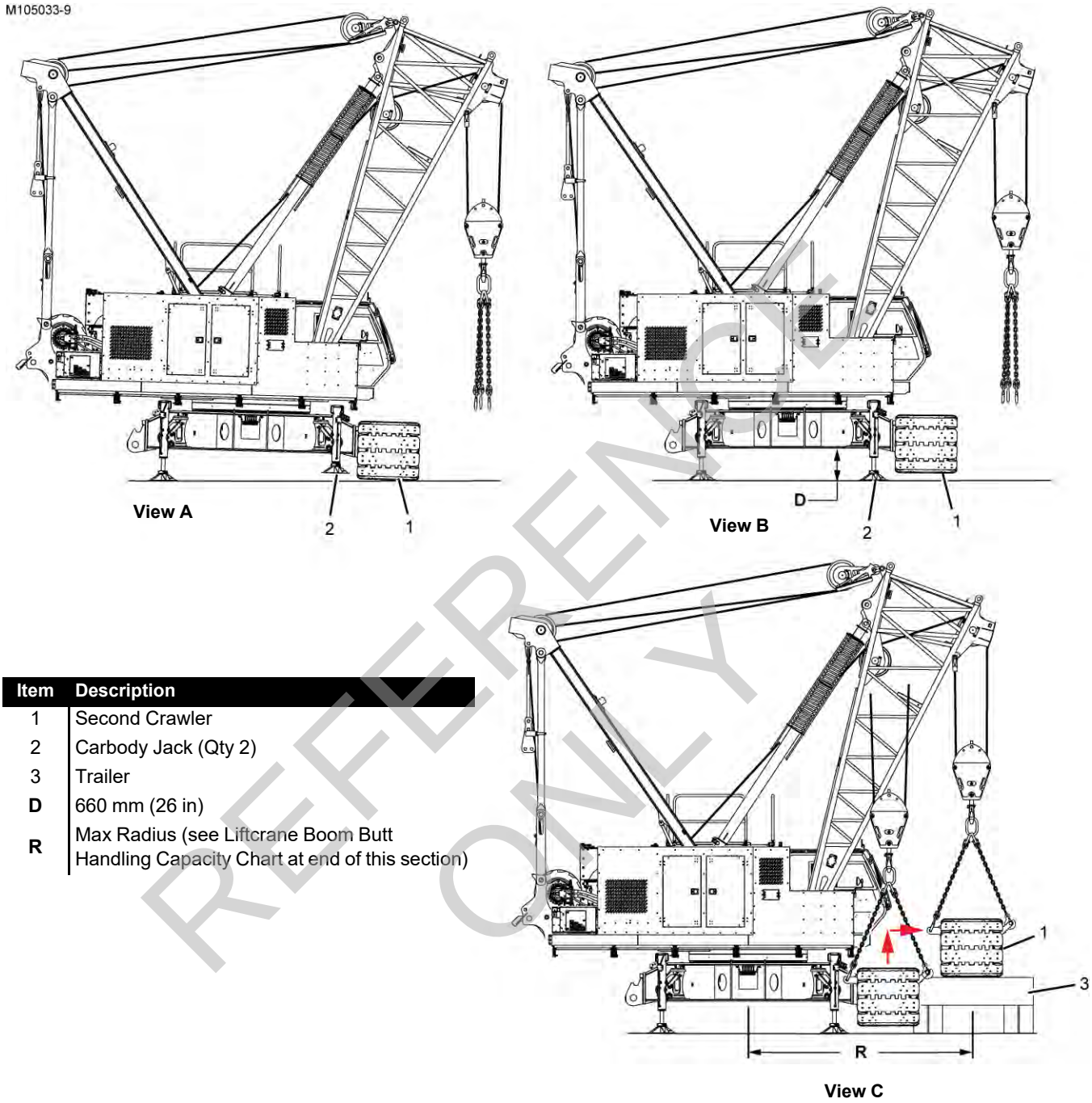
- Do not exceed the radius (**R**, View E) given in the Liftcrane Boom Butt Handling Capacities chart at the end of this section.

11. Using the carbody controls, engage the crawler pins (8, View C).
12. Install the locking pins (7, View C).
13. Position the trailer (12, View E) on the desired side of the carbody. Do not exceed the maximum radius (**R**) given in the Liftcrane Boom Butt Handling Capacities chart.

    If there is enough room for the trailer, the first crawler can be loaded on the trailer from the same of the crane the crawler was removed from.

    If there is not enough room for the trailer, the first crawler can be swung 180° and loaded on the trailer on the same of the crane as the second crawler. ***The second crawler must be on the ground.***
14. Position the first crawler on the trailer, disconnect the chain lifting sling, and remove the trailer.

    See Shipping Crane Components on page 4-77.



Item	Description
1	Second Crawler
2	Carbody Jack (Qty 2)
3	Trailer
D	660 mm (26 in)
R	Max Radius (see Liftcrane Boom Butt Handling Capacity Chart at end of this section)

Figure 4-68

Remove Second Crawler

See Figure 4-68.

1. Swing the upperworks 180° and center the boom over the second crawler (1, View A) (boom angle approximately 87°).
2. Extend the carbody jacks (2, View A) adjacent to the second crawler (1) so the carbody is level and approximately at dimension (**D**, View B) off the ground.

DANGER

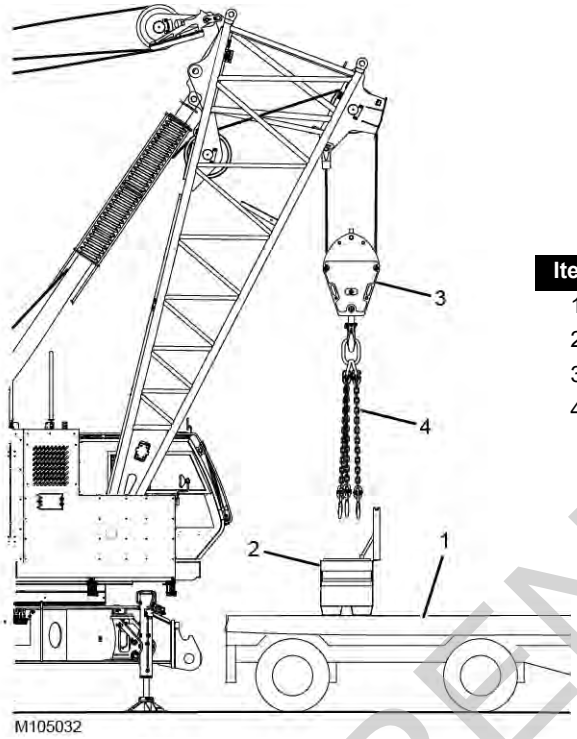
Falling Load Hazard!

Prevent structural failure of components or tipping:

- Do not exceed the radius (**R**) given in the Liftcrane Boom Butt Handling Capacities chart at the end of this section.
- Do not exceed the swing limits given in Figure 4-8 on page 4-11

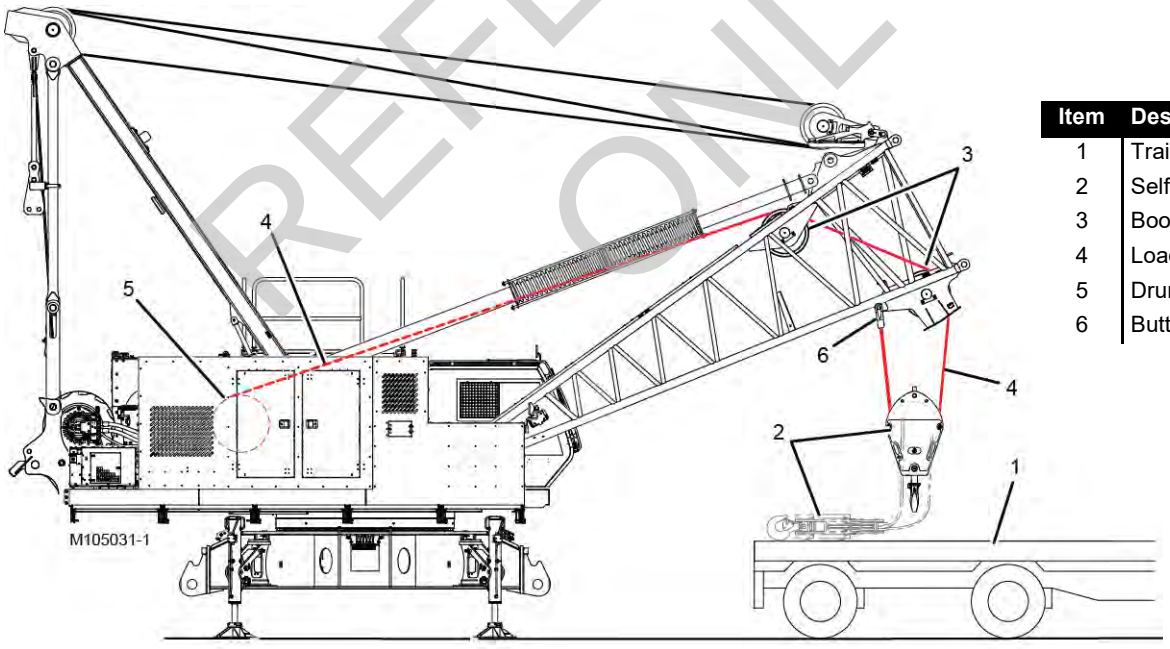
3. Perform step 6 through step 12 under the topic Remove First Crawler on page 4-99.
4. Position the trailer (3, View C) alongside the carbody on the same side of the crane as the second crawler.
5. Position the first crawler on the trailer, disconnect the chain lifting sling, and remove the trailer.

   See Shipping Crane Components on page 4-77.



Item	Description
1	Trailer or Forklift
2	Parts Box
3	Self-Erect Hook Block
4	Chain Lifting Sling

Figure 4-69



Item	Description
1	Trailer
2	Self-Erect Hook Block
3	Boom Butt Sheaves
4	Load Line
5	Drum 2
6	Button Socket

Figure 4-70

Remove Chain Lifting Sling

See Figure 4-69.

1. Position the trailer (1) or a forklift carrying the parts box (2) under the self-erect hook block (3).
2. Lower the chain lifting sling (4) into the parts box (2).
3. Disconnect the chain lifting sling (4) from the self-erect hook block (3).
4. Remove the trailer or forklift from the assembly area.

Remove Self-Erect Hook Block

See Figure 4-70.

1. Position the trailer (1) under the self-erect hook block (2) as shown.

CAUTION

Avoid Wire Rope Damage!

Do not lower the boom butt below the angle from the capacity chart that allows operation of the load drum.

If the load drum is operated with the boom butt at too low of an angle, the wire rope and the rope guard on the sheave can be damaged.

2. Lower the self-erect hook block (2) to the desired position on the trailer (1).
3. Unpin the button socket (6) from the lug on the boom butt.
4. Remove the load line (4) from the self-erect hook block (2).
5. The load line can be stored using either of the following options:
   - Spooled onto Drum 2 (for this option store the button socket in the parts box)
   - Attached to the tie-back hole (View A, Figure 4-72 on page 4-104) on the front of the rotating bed with the button socket
6. Remove the trailer.

Item	Description
1	Carbody Jack (Qty 4)
2	Trailer

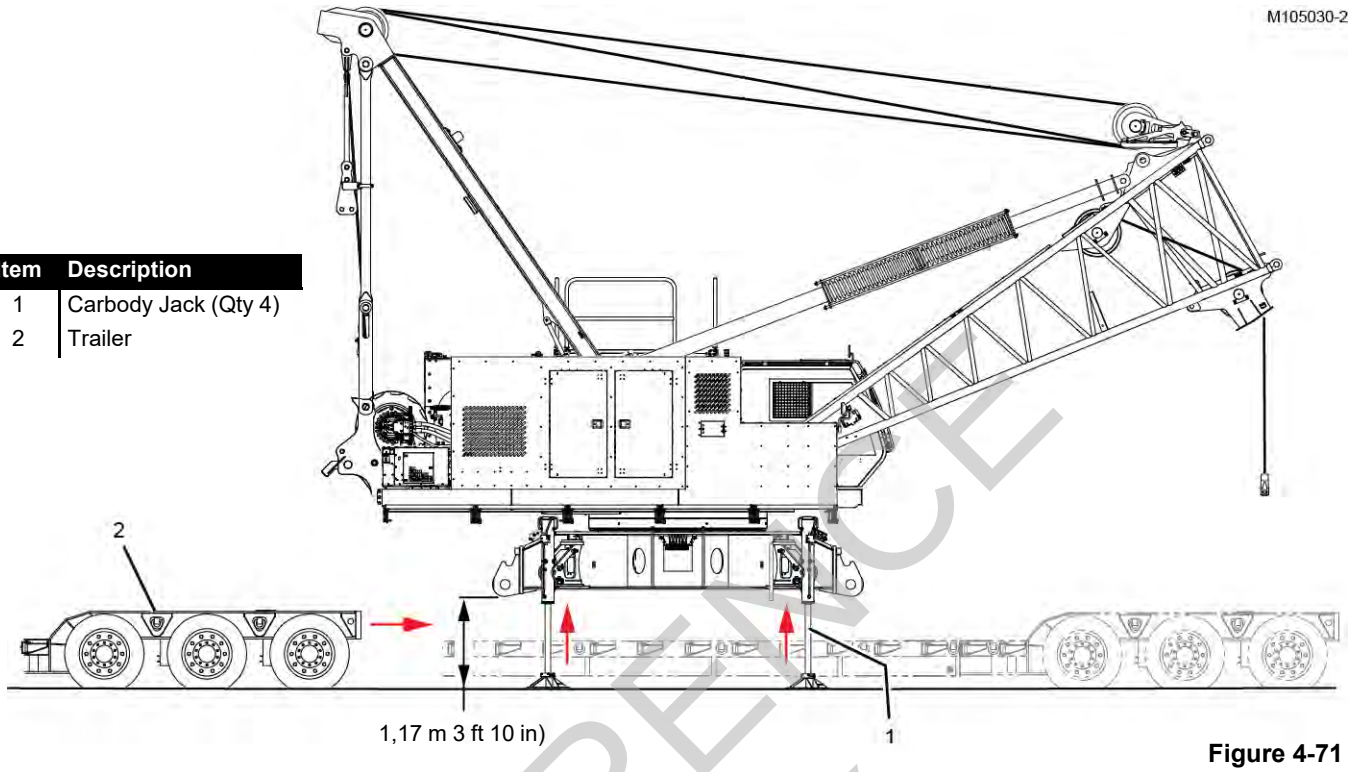
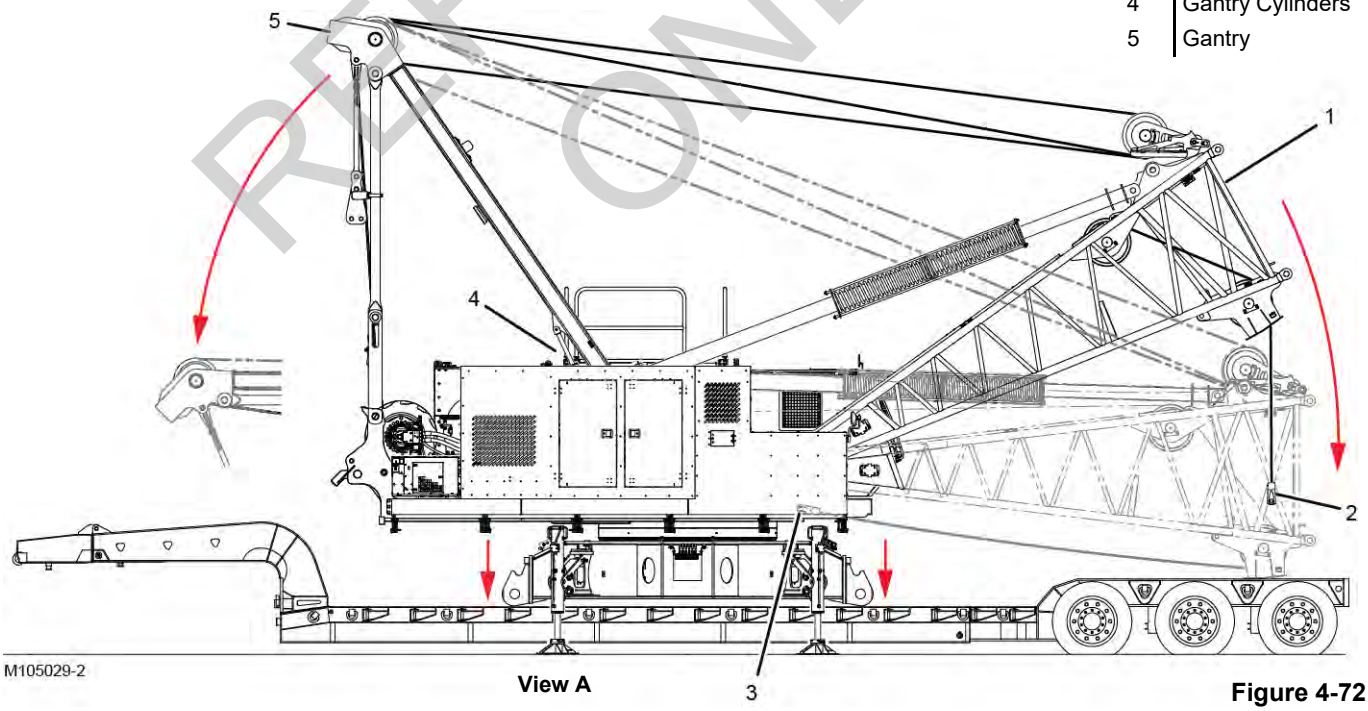


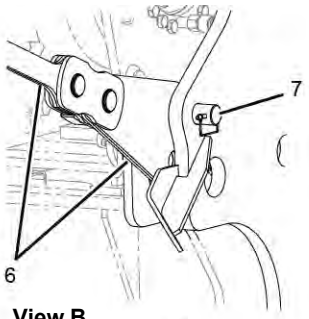
Figure 4-71

Item	Description
1	Boom Butt
2	Load Line
3	Tie-Back Hole
4	Gantry Cylinders
5	Gantry



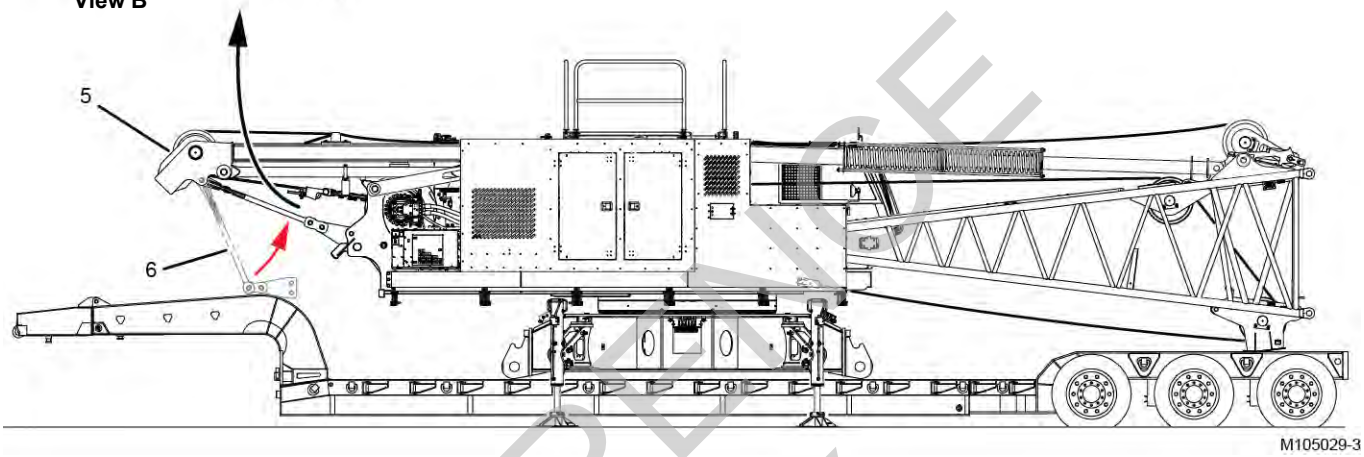
View A

Figure 4-72



View B

Item	Description
5	Gantry
6	Counterweight Links (both sides)
7	Pin with Safety Pin (Qty 2)



View C

Figure 4-72 continued

Install Trailer Under Crane

See Figure 4-71.

1. Extend the carbody jacks (1) as needed to clear the trailer (2).

   The maximum jacking height below the carbody is 1,17 m (3 ft 10 in).

2. Slowly position the trailer (2) under the crane. ***Take care not to hit the carbody jacks.***

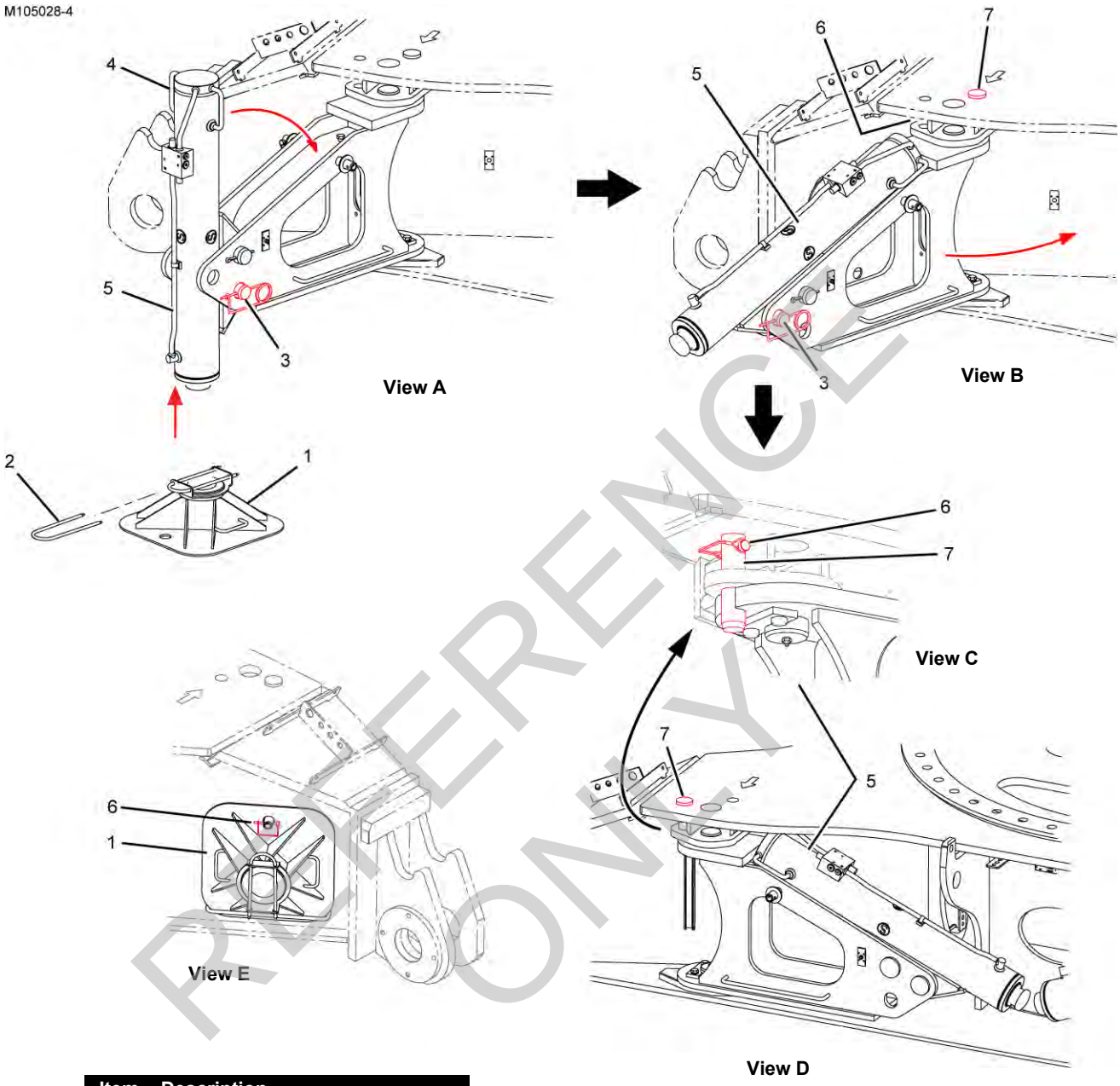
See Figure 4-72, View A.

3. Slowly retract the carbody jacks until the crane is fully lowered onto the trailer.
4. Leave the carbody jacks extended just enough to stabilize the crane and trailer.

Lower the Boom Butt and Gantry

See Figure 4-72.

1. Lower the boom butt (1, View A) onto the trailer while making sure the boom hoist wire rope spools properly onto the boom hoist drum.
2. The load line (2, View A) can be stored using either of the following options:
   - Spooled onto Drum 2 (for this option, store the button socket in the parts box)
   - Attached to the tie-back hole (3, View A) on the front of the rotating bed with the button socket
3. Using the gantry cylinders switch on the right console in the cab, retract the gantry cylinders (4, View A) to fully lower the gantry.
4. The boom hoist wire rope will tighten as the gantry lowers. Pay out the wire rope with the boom hoist control in the cab only enough to keep the wire rope taut and to prevent improper wire rope spooling.
5. Guide the counterweight links (6, View C) onto the trailer as the gantry lowers.
6. Remove two pins (7, View B) from the counterweight handling pendants on the crane counterweight tray (see Figure 4-29 on page 4-38).
7. Raise the counterweight links (6, View B) to the stored position on the rotating bed and install the pins (7, View B).
8. Secure the crane to the carbody. See Shipping Crane Components on page 4-77.



Item	Description
1	Jack Pad
2	U-Shaped Locking Pin
3	Locking Pin with Safety Pin
4	Jack Handle (Qty 2 each jack)
5	Carbody Jack
6	Safety Pin
7	Locking Pin

Figure 4-73

Store Carbody Jacks

See Figure 4-73.

1. Remove the U-shaped locking pins (2) to disengage the jack pads (1) from the jacks.
2. Fully retract all of the carbody jacks (5, View A).
3. Reinstall the U-shaped locking pins (2) in the jack pads (1).
4. Attach the jack pads (1, View E) to the carbody with the safety pins (8). The safety pins are stored in the carbody jacks.
5. Disable the carbody control in the Self-Erect Controls Screen of the Main Display.
6. At each carbody jack:
   a. Remove the locking pin (3, View A).
   b. Using the jack handles (4, View A), rotate the carbody jack (5) to the stored position (View B).
   c. Install the locking pin (3, View B) and the safety pin.
   d. Remove the safety pin (6, View B) and the locking pin (7).
   e. Swing the carbody jack (5, View B) to the stored position (View D).
   f. Reinstall the locking pin (7, View C) and the safety pin (6) to lock the carbody jack in place.

Secure Operator Cab

1. If not already done, disable and store the remote control in the left enclosure as shown in Figure 4-7 on page 4-8.
2. In the cab:
   - If equipped with cab tilt, lower the cab to horizontal with the cab tilt switch.
   - Park all crane functions.
   - Turn off all accessories.
   - Stop the engine.
   - Remove all keys from the control console.
   - Close and latch all windows.
3. Store all mirrors. Reverse the steps for Prepare Cab on page 4-15.
4. Close and lock the cab door.

Lower Handrails

If not already done, lower the handrails on the left enclosure. Reverse the steps for Raise Handrails on page 4-17.

Store Crane Platforms

To store the crane platforms, reverse the steps for Deploy Crane Platforms on page 4-13.

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BOOM #350 DISASSEMBLY

The following instructions assume that the boom and jib have already been lowered to the ground and the load lines have been stored.

The following instructions also assume that the boom butt has been disconnected from the boom and the crane is being used to self-disassemble the boom sections. If desired, an assist crane can be used.

1. If not already done, remove and store the block-up limit chains and weights. See Store Block-Up Limit Components on page 4-79.
2. If not already done, remove and store the boom and jib electronics. See Remove Boom/Jib Point Electronics on page 4-79.
3. If equipped, remove the following:
   - #134 jib (see Jib #134 Disassembly on page 4-111)
   - Upper boom point (reverse the installation steps on page 4-65).
   - Intermediate suspension pendants (reverse the steps for Install Intermediate Suspension Pendants on page 4-65.
   - Optional tagline (reverse the steps for Install Optional Tagline on page 4-66)

DANGER

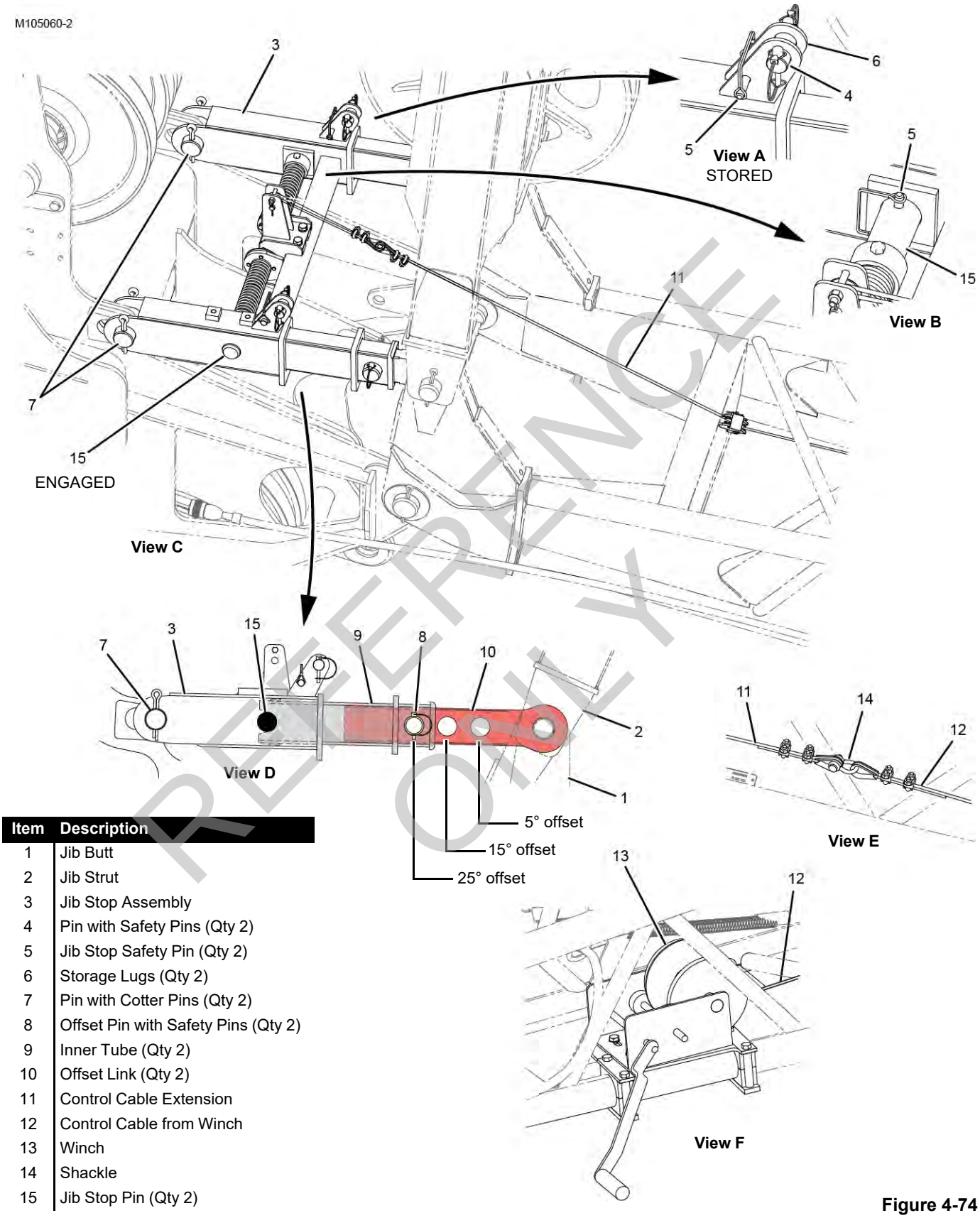
Collapsing Boom Hazard!

To prevent death or serious injury, do not stand on, inside, or under the boom sections during boom disassembly. Always stand outside the boom sections when removing connecting pins.

4. Disassemble the boom sections and place them on trailers for shipping:
   - Store the boom straps. Reverse the steps for Connect Boom Straps on page 4-65.
   - If equipped. lower the boom cap wire rope guide. Reverse the steps for Raise Boom Cap Wire Rope Guide on page 4-63.
   - Remove the boom top/cap. Reverse the steps for Connect Boom Top/Cap to Inserts on page 4-63.
   - Disassemble the boom inserts. Reverse the steps for Assemble Boom Inserts on page 4-63.

   See Figure 4-25 on page 4-32 for handling the boom sections.

   See Shipping Crane Components on page 4-77.



Item	Description
1	Jib Butt
2	Jib Strut
3	Jib Stop Assembly
4	Pin with Safety Pins (Qty 2)
5	Jib Stop Safety Pin (Qty 2)
6	Storage Lugs (Qty 2)
7	Pin with Cotter Pins (Qty 2)
8	Offset Pin with Safety Pins (Qty 2)
9	Inner Tube (Qty 2)
10	Offset Link (Qty 2)
11	Control Cable Extension
12	Control Cable from Winch
13	Winch
14	Shackle
15	Jib Stop Pin (Qty 2)

Figure 4-74

JIB #134 DISASSEMBLY

WARNING

Crush Injury!

The jib stop pins (15, View C, Figure 4-74) are spring engaged. Do not disconnect the control cables until the safety pins are installed.

CAUTION

Jib Stop Damage!

Avoid jib stop damage. Do not allow the jib point to contact the ground until jib stop pins are disengaged.

Lower Boom and Jib

1. Lower the boom until the jib point is approximately 12 in (305 mm) from contacting the ground.

See Figure 4-74.

2. Disengage the jib stop pins (15, View C and D) by hauling in the cable on the winch (13, View F). Turn the handle until the cable is tight and engage the winch pawl. ***Visually check that the pins are fully disengaged***.
3. Remove the safety pins (5, View A) from storage and install them in the jib stop pins (15, View B).
4. Lower the boom onto blocking.

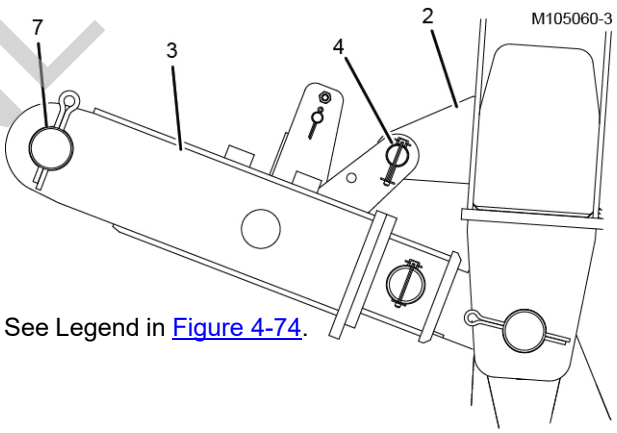
Prepare Jib for Shipping

1. Stop the engine.
2. Disconnect and store the load line from the jib point. Store the button socket or wedge socket in the parts box.
3. Reverse the steps for Install Jib Block-Up Limit Components on page 4-55 and store the components in the parts box.
4. Reverse the steps for Install Jib Top Position Light and Wind Speed Indicator (option) on page 4-55 and store the position light and wind speed indicator.
5. Reverse the steps for Install Jib Top Camera (option) on page 4-55 and store the camera in the parts box.
6. Disconnect the jib extension cable (Figure 4-41 on page 4-54) from the boom top and the jib top.
7. Clean all electric cable connectors and dust caps.
   - Securely fasten dust caps to all cable ends and receptacles.
   - Store the jib extension cable on the jib butt as shown in View D, Figure 4-41 on page 4-54 and secure it with plastic wire ties.

Store Jib Stop

See Figure 4-74.

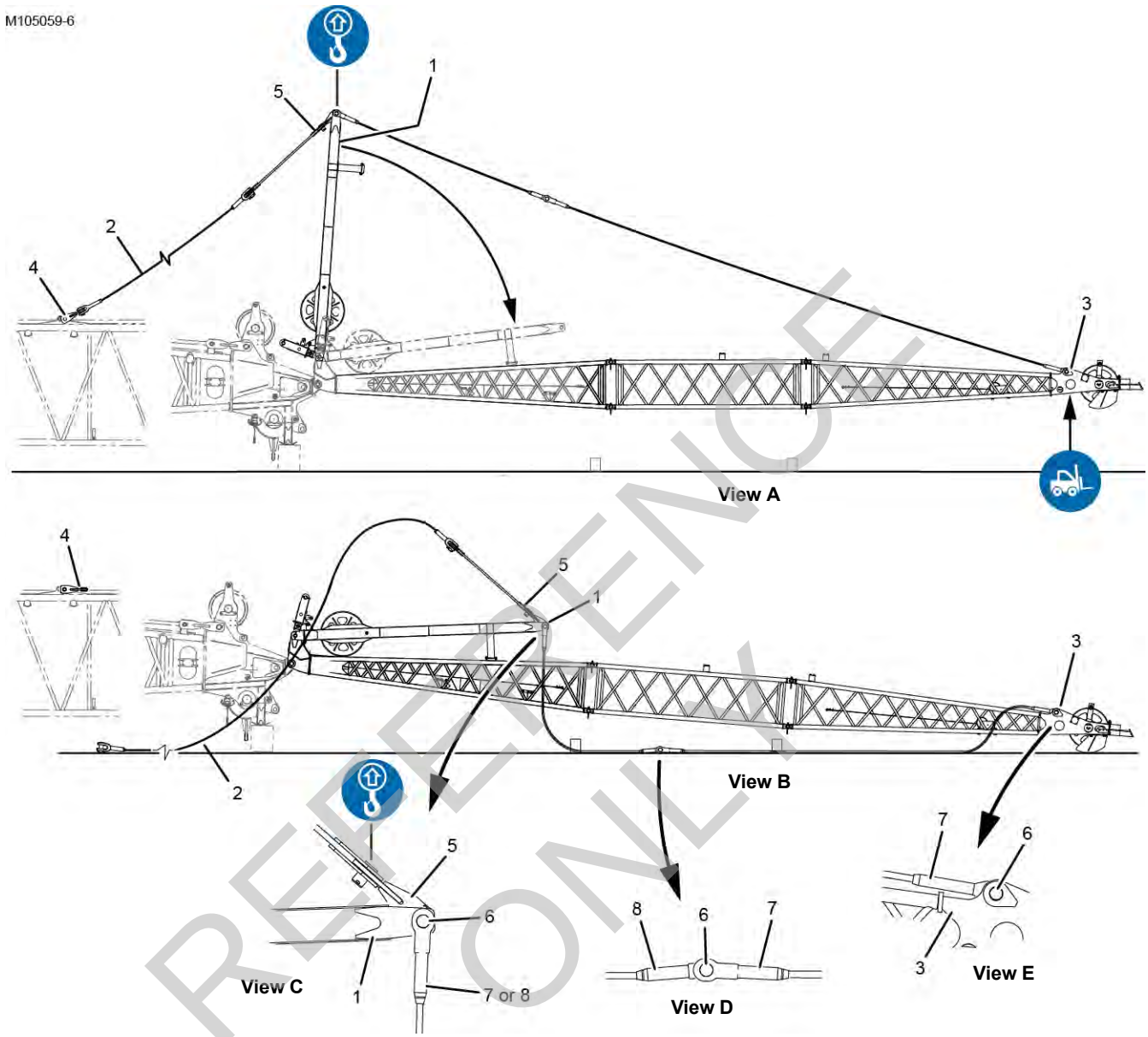
1. Store the control cable:
   a. Disconnect the cable extension (11, View E) from the shackle (14). Store the shackle on the cable extension.
   b. Secure the cable extension in the jib butt for storage.
   c. Coil the excess control cable (12, View E) onto the winch (13, View F).
2. Readjust the length of the jib stop by pinning the inner tubes (9, View D) in the 5° offset position.
3. Support the jib stop with lifting slings from the assist crane and remove pins (7, View C).
4. Remove the pins (4, View A) from storage.
5. Raise the jib stop assembly (3, Figure 4-75) and pin it to the strut (2) with pins (4).



See Legend in Figure 4-74.

Figure 4-75

6. Store the pins (7, Figure 4-75) in the jib stop holes.



Item	Description
1	Jib Strut
2	Backstay Pendant (Qty 2)
3	Jib Point
4	Backstay Links/Pendants
5	Backstay Spreader and Links
6	Pendant Pin with Cotter Pin
7	Basic Pendant (Qty 2)
8	Insert Pendant: 2,9 m (9 ft 6 in) and 5,8 m (19 ft) Qty 2 each insert

Figure 4-76

Lower Jib Strut

See Figure 4-76.

WARNING!

Pendant Under Tension!

Do not disconnect the pendants until they are slack.

1. Using appropriate lifting slings, attach the hook from the assist crane to the front side of the sheave in the jib strut (1, View A). Avoid lifting jib butt/boom top during this step.
2. If necessary to slacken the backstay pendants (2), raise the jib top (3, View A) as needed with another crane or a fork-lift truck.
3. Disconnect the backstay pendants (2, View A) from the backstay links/pendants (4).
4. Lay the backstay pendants (2, View B) on the ground alongside the boom.
5. Lower the jib point (3, View B) to the ground and disconnect the assist crane/forklift.
6. Lower the jib strut onto the jib butt (View B) and disconnect the lifting slings from the jib strut.
7. Remove and store the backstay links/pendants (4).

Remove Jib Pendants

1. ***Support the jib backstay spreader and links (5, View C) with an assist crane before unpinning the jib pendants from the jib strut.***
   a. Remove the pendant pin (6, View C).
   b. Lay the pendant (7 or 8, View C) on the ground.
   c. Reinstall the pendant pin (6, View C) to fasten the jib backstay spreader and links (5) to the strut (1).
   d. Repeat the steps on the other side of the jib.
2. Unpin the basic jib pendants (7, View E) from the jib top (3) and lay the pendants on the ground.
3. If equipped, unpin the jib insert pendants (8, View D) from the basic jib pendants (7) and from one another.
4. Store the pendants pin (6, View D and E) in the pendant connecting holes.
5. Coil the pendants for shipping and install them on the trailer. See Shipping Crane Components on page 4-77.

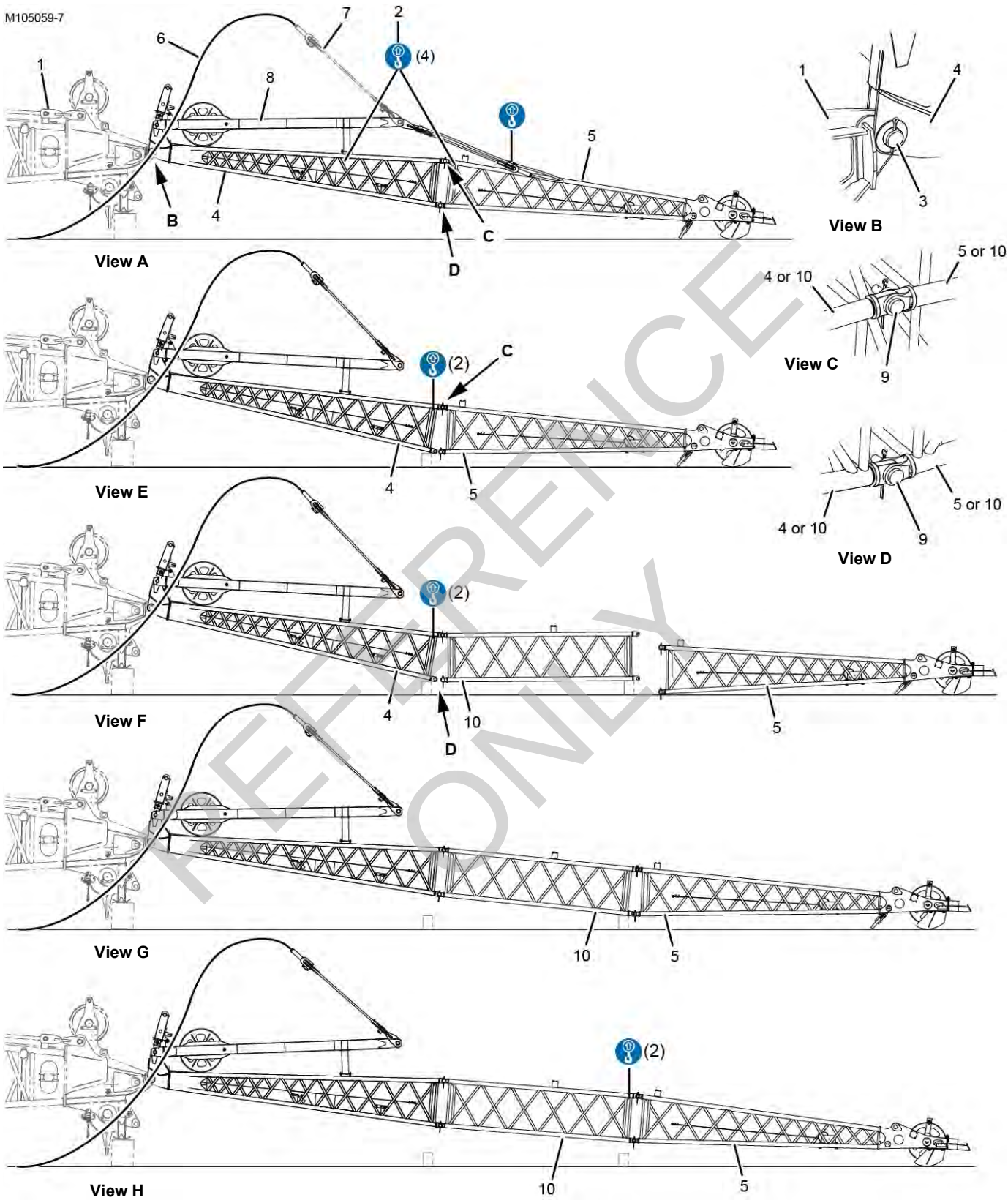


Figure 4-77

Legend for Figure 4-77

Item	Description
1	Boom Top
2	Jib Shipping Package
3	Pin with Cotter Pins (Qty 2)
4	Jib Butt
5	Jib Top
6	Jib Backstay Pendant (Qty 2)
7	Jib Backstay Spreader and Links
8	Jib Strut
9	Pin with Cotter Pin (Qty 4 each jib section)
10	Jib Insert: 3.0 m (10 ft) or 6,1 m (20 ft)

DANGER

Collapsing Jib Hazard!

To prevent death or serious injury, do not stand on, inside, or under the jib during disassembly. Always stand on the outside of the jib when removing connecting pins.

Support the jib properly before removing the pins. Block the sections at the connection points.

NOTE The jib top, jib butt, jib stop, jib strut, and backstay pendants are shipped as an assembled "jib package" as shown in Figure 4-51 on page 4-67).

Remove Jib Top

See Figure 4-77.

NOTE Disregard this step if the jib top is pinned to the jib butt — no inserts installed.

1. Attach lifting slings to the top end of the chords on the jib insert (10, View H).
2. Hoist only enough to support the jib. ***Do not attempt to lift the jib top off the ground.***
3. Remove the bottom connector pins (9, View D).
4. Lower the jib insert (10, View G) onto blocking and disconnect the lifting slings.
5. Attach lifting slings to the jib top and hoist just enough to support the jib top.
6. Remove the top connector pins (9, View C).
7. Lift the jib top (5, View F) away from the jib insert (10) place the jib top the ground in front of the insert.
8. Disconnect the lifting slings.
9. Store the pins (9) in the jib top connector holes.

Remove Jib Inserts

See Figure 4-77.

NOTE Disregard this step if no jib inserts are installed.

1. Remove the jib inserts (10, View F), one insert at a time, in the same manner the jib top was removed.
2. Place the inserts on trailers for shipping. See Shipping Crane Components on page 4-77.

Install Jib Top on Jib Butt

See Figure 4-77.

1. Lift the jib top (5, View E) into position at the jib butt (4) and remove the four pins (9, View C and D) from the jib top.
2. Align the top connector holes and pin the jib top (5) to the jib butt (4) with the pins (9, View C) and the cotter pins.
3. Lower the jib butt onto blocking (View E) and disconnect the lifting slings.
4. Connect the lifting slings to the top end of the chords on the jib butt (4, View E).
5. Raise the jib butt until the bottom connector holes are aligned between the jib butt and the jib top.
6. Install the bottom connector pins (9, View D).
7. Disconnect the lifting slings.

Store Backstay Spreader and Pendants

1. Attach lifting slings to the backstay spreader and links (7, View A).
2. Rotate the backstay spreader and links forward onto the jib top.

   Guide the backstay pendants forward as the spreader and links are rotated.
3. Coil the backstay pendants onto the jib strut (8) and jib top (5) for storage.
4. Secure the backstay pendants and spreader to the jib strut and jib top with owner furnished tie-down straps.

Remove Jib Package

See Figure 4-77.

1. Attach lifting slings to the jib package (2, View A).

   See Figure 4-26 on page 4-33 for lifting locations.
2. Hoist just enough to support the jib package and remove the pins (3, View B) connecting the jib butt (4) to the boom top (1).
3. Store the pins in the jib butt holes.
4. Lift the jib package onto a trailer. See Shipping Crane Components on page 4-77.
5. Disconnect the lifting slings.

WIRE ROPE INSTALLATION

NOTE The wire rope manufacturer's recommendations take precedence over the following information.

Wire Rope Specifications

See the Wire Rope Specifications Chart in the Capacity Chart Manual for the correct type, size, and amount of wire rope to be installed on the crane.

The Wire Rope Specifications Chart contains the following information:

- Parts of the line required for various loads.
- Wire rope lengths and notes about hoisting distance for various parts of the line.
- Maximum spooling capacity of the load drums.

Wire Rope Storage

Store the wire rope in coils or on reels off the ground or floor in a clean, 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 the periodic inspection given in the Service Manual at least monthly.

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 will result in overloading of some strands and under-loading of others. Bird-caging and breakage of the wire rope can occur.

Before cutting the 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.

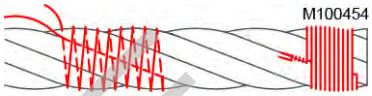
See Figure 4-78 for:

- The number of seizings to be applied to the ends of the wire rope and to both sides of the point where a cut will be made.
- The proper application method. Each seizing should be one rope diameter long.

NOTE Per the wire rope manufacturer, rotation resistant stranded ropes should be regarded as non-preformed rope even though the strands may have been partially (lightly) preformed during the closing process.

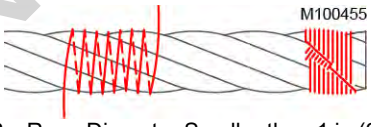
Wire Rope Type	Seizings Required
Preformed	1
Non-preformed	3

Place the free end of the seizing wire in the valley between two strands. Then wind the seizing wire over the free end as shown. Finally, twist and pull the two ends of seizing wire together until the seizing is tight.



View A—Rope Diameter 1 in (26 mm) and Larger

Wind the seizing wire around the wire rope as shown. Then twist the two ends of seizing wire together at the center of the seizing. Alternately twist and pull the ends until the seizing is tight.



View B—Rope Diameter Smaller than 1 in (26 mm)

Figure 4-78

Anchoring Wire Rope to Drum

Anchor the wire rope to the drums on this crane in the numbered sequence shown in Figure 4-79 or Figure 4-80

WARNING

Moving Machinery Hazard!

The drum guards must be secured to the drums during crane operation.

When a guard is removed for wire rope installation, use extreme care to prevent injury from a moving rope socket.

Falling Load Hazard!

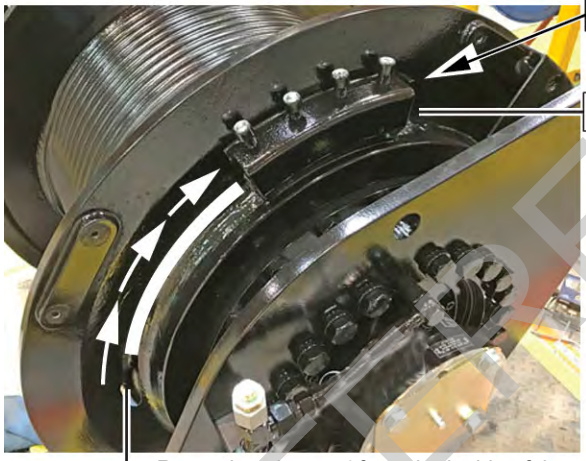
The wire rope can be pulled out of the drum if the following steps are not taken:

- Make sure the clamp bar is installed.
- Make sure there is no rope seizing under the clamp bar. Pull the rope past the end of the rope socket if necessary.
- Make sure Tuflok® is applied to the clamp screws.
- Make sure the screws are tightened to the proper torque.

Drums 1, 2, and 4

1 For Drum 4, remove the guard from the drum.

6 Reinstall the guard.



4 Install the clamp bar above the wire rope. ***Make sure there is no rope seizing under the clamp bar.***

3 Position the end of the rope at or slightly beyond the end of the rope socket.

5 Tighten the clamp screws (see Torque Note).

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4

2 Route the wire rope from the inside of the drum, through the hole in the drum flange, and into the rope socket on the outside of the drum flange.

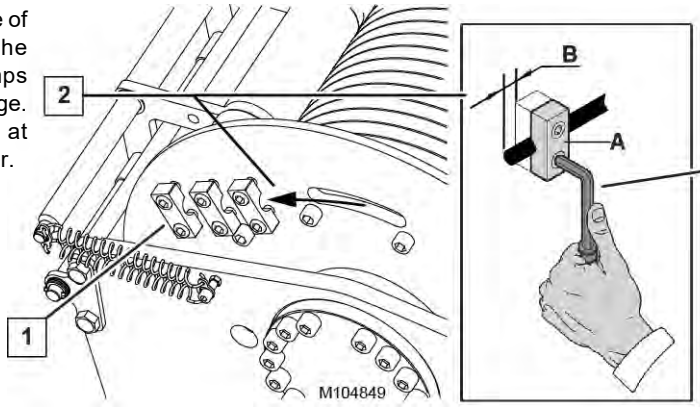
Torque Note

- Torque clamp screws to 206 Nm (150 ft-lb)
- Do not use Loctite
- Tuflok® thread-locking compound has been applied to the screws. The screws can be removed/installed several times before reapplying the compound.

Figure 4-79

Drum3

Route the wire rope from the inside of the drum, through the hole in the drum flange, and under the clamps “A” on the outside of the drum flange. The rope protrusion “B” must be at least twice the wire rope’s diameter.

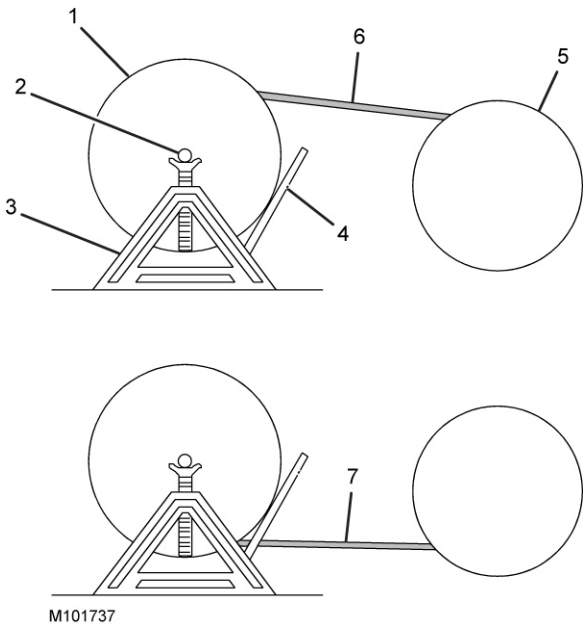


3 Securely tighten the clamp screws to 207 Nm (150 ft-lb).

Loosen the clamp screws. 1

Figure 4-80

4



Item	Description	Item	Description
1	Shipping Reel	5	Drum
2	Shaft	6	Top to Top Winding
3	Jack Stand	7	Bottom to Bottom Winding
4	Brake		

Figure 4-81

Winding Wire Rope onto Drum

CAUTION

Avoid Wire Rope Damage

The shipping reel must rotate when the wire rope is unwound.

Attempting to remove the wire rope from a stationary reel can result in a kinked wire rope, and the wire rope will be ruined.

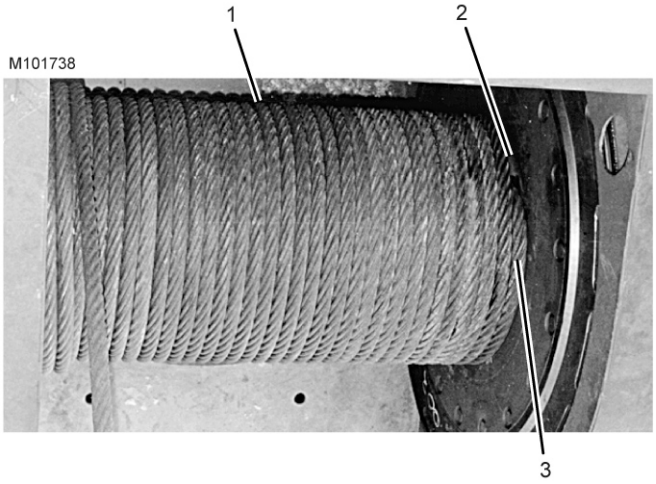
1. Remove the wire rope from the shipping reel:
   a. Mount the wire rope shipping reel (1, Figure 4-81) on a shaft (2) supported at both ends by jacks (3) or blocks.
   b. Provide a brake at the shipping reel so that the wire rope can be wound tightly on the drum.
   c. Avoid a reverse bend when winding the wire rope onto the drum: wind from the top of the reel to the top of drum (upper view) or from the bottom of the reel to the bottom of the drum (lower view).
   d. Avoid dragging the wire rope in the dirt or around objects that can scrape, nick, cut, or crush the wire rope.
2. Carefully inspect the drums and all rope guides, rollers, and sheaves for defects that can cause the wire rope to wear or be cut. If defects cannot be fixed, replace the faulty parts.
3. Apply tension to the wire rope as it is wound slowly onto the drum.
   a. The first wrap of wire rope must be tight against the drum flange for the approximately three-fourths of the drum diameter (View A, Figure 4-82).
   b. Tap the adjacent wraps against each other with a soft metal or wooden mallet as the wire rope is spooled onto the drum.
   c. Use extreme care not to put twists or turns in the wire rope. Allow the rope to assume its natural lay.

CAUTION

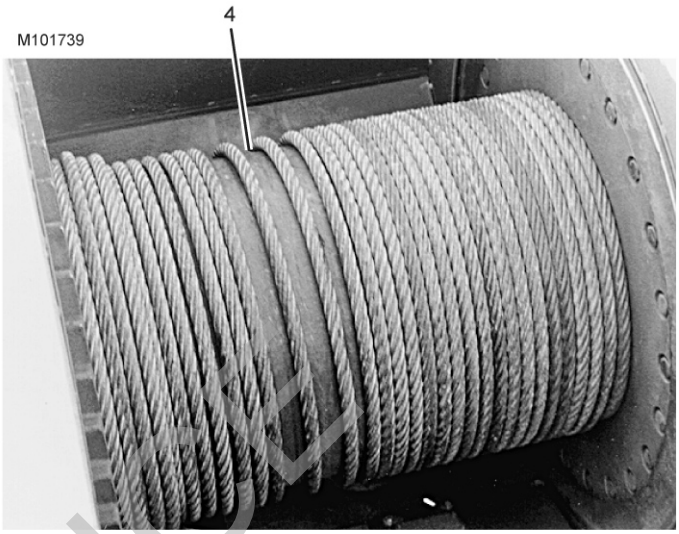
Avoid Wire Rope Damage

Voids or spaced wraps (View B, Figure 4-82) in the first layer will permit movement and a wedging action with the subsequent layers. Crushing and abrasion of the wire rope will occur.

Never allow the wire rope to “cross-wind” on the drum.



View A



View B

Item	Description
1	Wraps of first layer tight against drum flanges and each other
2	Wedge
3	Tight against drum flange for 3/4 of diameter
4	Voids and loose wraps in first layer will cause sever wear of wire rope

Figure 4-82

Item	Description
1	Seizing
2	Dead End
3	Live End in Straight Line with Socket
4	Socket
5	Wedge
6	Rope Clip
7	Short Piece of Wire Rope
8	Terminator Wedge
9	Shipping holes: **Do not reinstall any shipping material** (bolt, plastic strap, or wire) in shipping holes of wedge or socket after assembling.

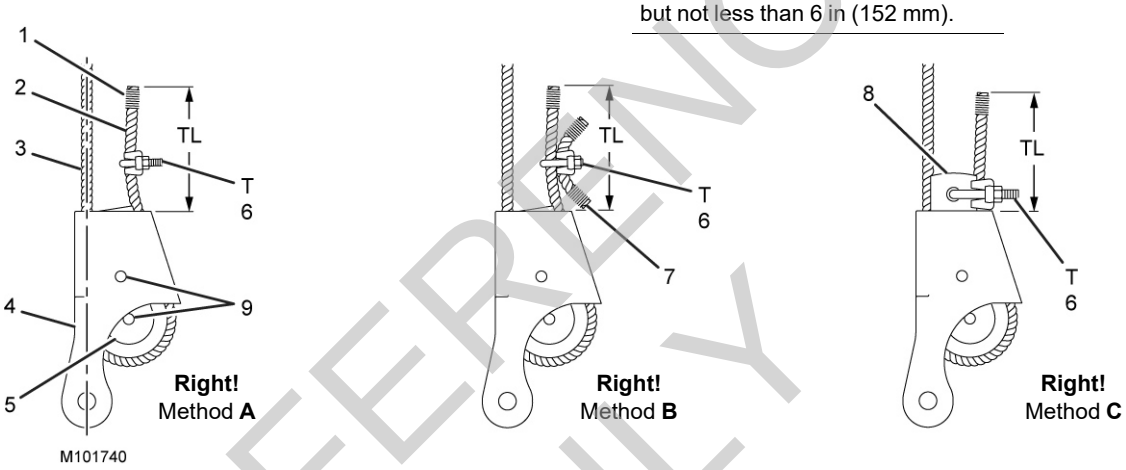
T (Rope Clip Nut Torque)

	Wire Rope/Clip Size			
inch (mm)	7/8 (22,23)	1 (25,4)	1-1/8 (28,58)	1-1/4 (31,75)
	Torque			
* ft/lb (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.

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).



ALL ARE DANGEROUS AND PROHIBITED!

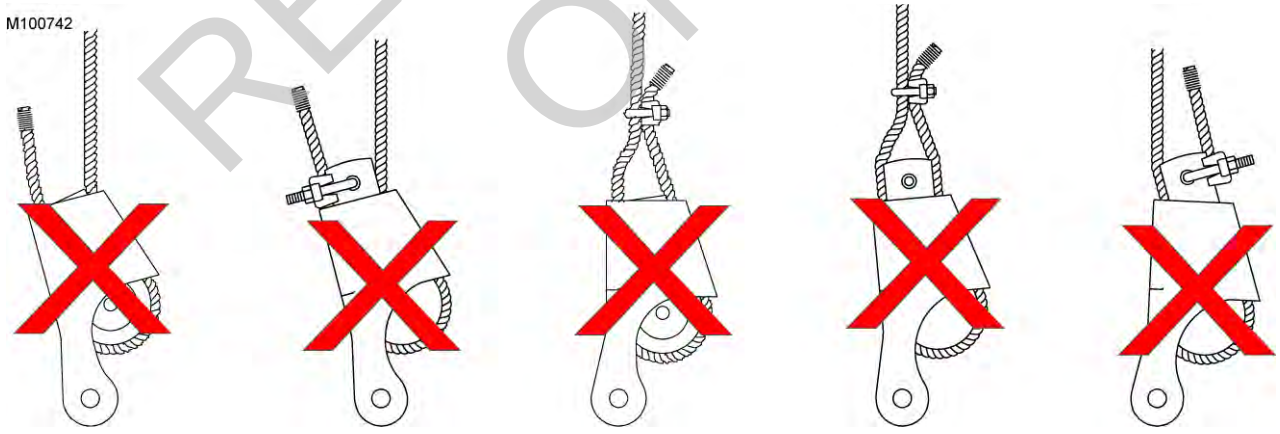


Figure 4-83

Anchoring Wire Rope to Wedge Socket

See Figure 4-83.

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 the shipping holes (9) of the wedge or the socket after assembling them. Discard these materials because they can prevent the wedge from tightening in the socket.
- Only use a wedge and socket which are the correct size for the wire rope being used. Do not mix and match parts from one assembly with parts from another assembly.
- The Terminator™ socket and wedge has “go” and “no go” holes to check for proper rope size.
- Attach the wire rope clip to the dead end of the wire rope after assembling the wire rope to the wedge and socket.

1. Assemble the wire rope and the wedge to the socket so the live end of the wire rope is in a straight line with the socket pin hole. Do not assemble WRONG as shown.
2. Allow the dead end of the wire rope to extend past the end of the socket the amount shown.
3. Allow the wire rope to assume its natural lay.
4. Pull against the wedge and the live end of the wire rope enough to tighten the wedge in the socket.
5. Use a brass hammer to seat the wedge and wire rope as deep into the socket as possible.
6. Attach a wire rope clip to the dead end of the wire rope using one of the RIGHT methods shown. The rope clip will aid in preventing the wire rope from being pulled out of the socket.

NOTE Use Right Method A only if the wire rope clip is small enough to be securely tightened to the dead end. Right Method C is only for use with a Terminator wedge socket.

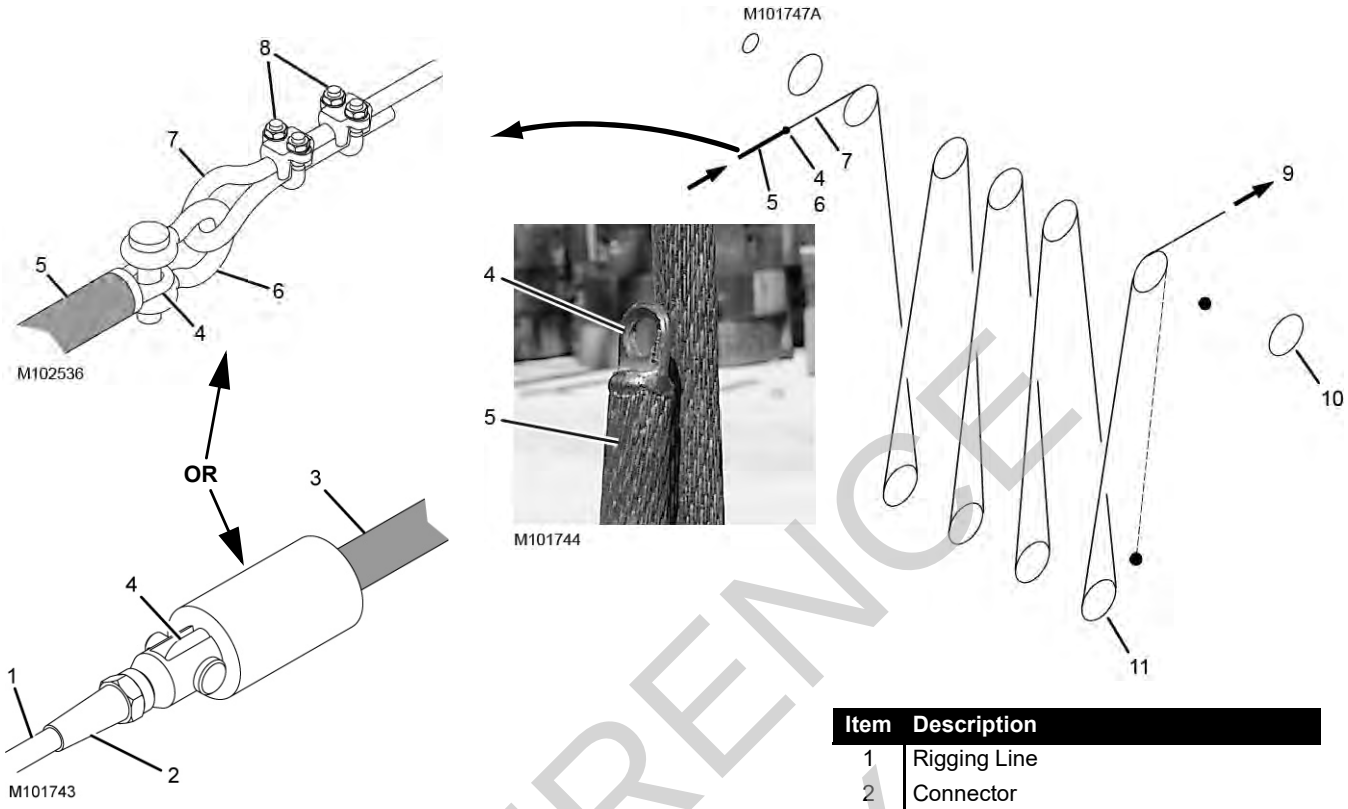
7. After the socket is pinned in place, hoist the load slowly so the wedge seats tightly. Do not shock load the socket and wedge.

WARNING

Falling Load Hazard!

The wire rope can break if the following precaution is not observed:

- Do not attach the dead end of wire rope to the live end of wire rope with a wire rope clip. The wire rope clip will transfer the load from the live side of the wire rope to the dead end, seriously weakening the attachment.



Item	Description
1	Rigging Line
2	Connector
3	Wire Rope with Button
4	Pad Eye
5	Wire Rope without Button
6	Shackle
7	Rigging Line
8	Rope Clips
9	Pull Rigging Line with Winch or Forklift
10	Boom Point Sheaves
11	Load Block Sheaves **EXAMPLE**

No. 1 Pad Eye	Item	mm	Inch
Approximate Capacity 553 kg (1220 lb)	A	9,65	3/8
	B	6,35	1/4
	C	22,40	7/8
	D	10,40	13/32
	E	22,40	7/8
	F	3,30	1/8
	G	25,40	1-1/32

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

No. 2 Pad Eye	Item	mm	Inch
Approximate Capacity 1 179 kg (2600 lb)	A	19,05	3/4
	B	9,65	3/8
	C	26,92	1-1/16
	D	12,70	1/2
	E	38,10	1-1/2
	F	4,83	3/16
	G	41,26	1-5/8

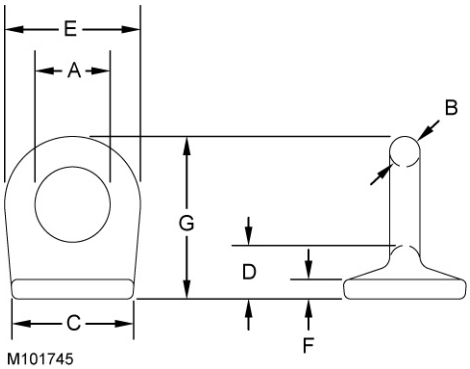
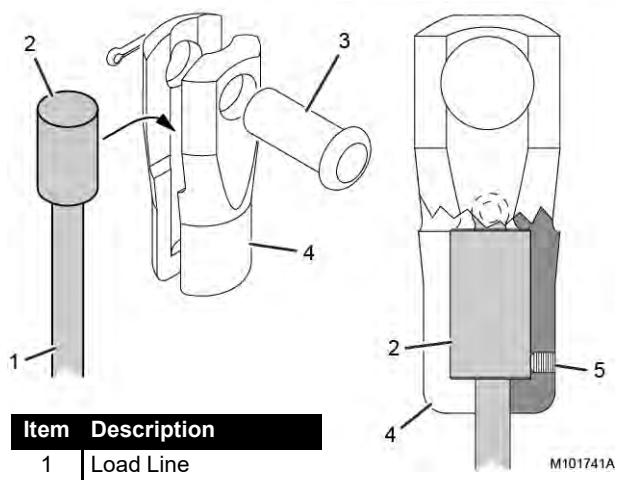


Figure 4-84



Item	Description
1	Load Line
2	Button
3	Pin
4	Button Socket
5	Locking Screw

Figure 4-85

WARNING

Falling Load Hazard!

The wire rope must be installed in the button socket as instructed below. Failing to follow these instructions can result in wire rope damage or failure.

Anchoring Wire Rope to Button Socket

See Figure 4-85.

1. Remove the pin (3) from the button socket (4).
2. Loosen the locking screw (5) so it is not protruding past the inner surface of the button socket.
3. Install the button (2) end of the load line (1) into the button socket (4). ***Make sure the button socket is fully seated in the button***.
4. Securely tighten the locking screw (5). There is no hole or flat spot on the button for the locking screw.

NOTE For rotation resistant ropes which allow a swivel to be used, it is not necessary to utilize the locking screw.

5. Pin the socket to the anchor point.

Pad Eye Usage for Wire Rope Reeving

See Figure 4-84.

General

Some rotation-resistant wire rope supplied by Manitowoc is equipped with a 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.

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.

The pad eye can break and fly apart with considerable force if it is overloaded, not used properly, or not maintained properly.

Safety

1. Do not exceed the approximate capacities listed in Figure 4-84.
2. Make sure the rigging line and the attaching hardware (clips and rope connectors) are rated for the approximate capacities shown in Figure 4-84.
3. Inspect the pad eye prior to each use. ***Replace it if:***
   - Any original dimensions have changed
   - Cracks or breaks exist in the metal or the weld

Breaking in Wire Rope

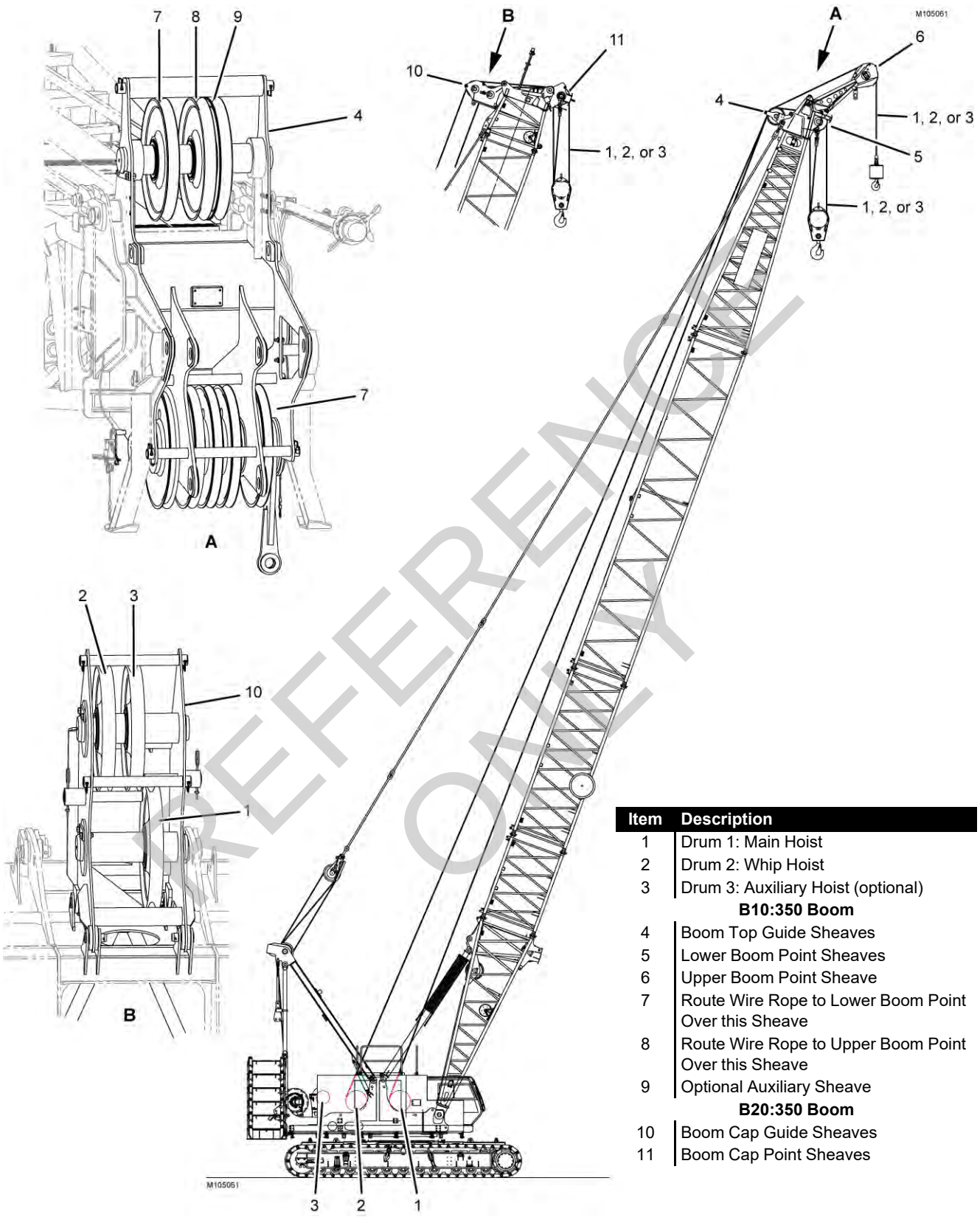
After installing a new wire rope, break it in by operating it several times under light load at reduced speed. This practice allows the wire rope to form its natural lay and the strands to seat properly.

NOTE The wire rope will stretch during the break-in period, reducing the wire rope's diameter as the strands compact around the core.

For rotation resistant ropes only, the button socket locking screw should be loosened during the rope break-in period. This will allow any twist to get out of the rope.

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.



Item	Description
1	Drum 1: Main Hoist
2	Drum 2: Whip Hoist
3	Drum 3: Auxiliary Hoist (optional)
	B10:350 Boom
4	Boom Top Guide Sheaves
5	Lower Boom Point Sheaves
6	Upper Boom Point Sheave
7	Route Wire Rope to Lower Boom Point Over this Sheave
8	Route Wire Rope to Upper Boom Point Over this Sheave
9	Optional Auxiliary Sheave
	B20:350 Boom
10	Boom Cap Guide Sheaves
11	Boom Cap Point Sheaves

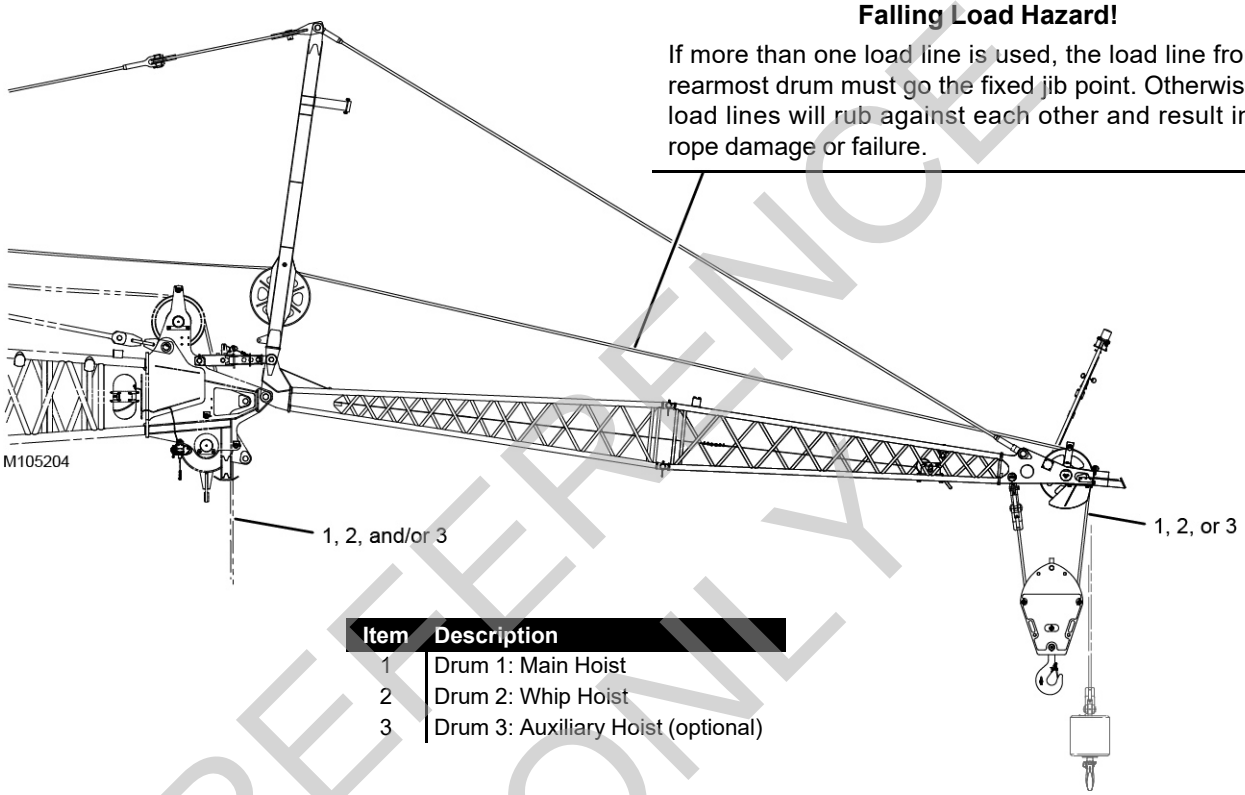
Figure 4-86

Fixed Jib #134 on B10:350 Boom

WARNING

Falling Load Hazard!

If more than one load line is used, the load line from the rearmost drum must go the fixed jib point. Otherwise, the load lines will rub against each other and result in wire rope damage or failure.



Item	Description
1	Drum 1: Main Hoist
2	Drum 2: Whip Hoist
3	Drum 3: Auxiliary Hoist (optional)

Figure 4-87

LOAD LINE REEVING

WARNING

Falling Load Hazard!

Use only a load block or hook-and-weight ball with a capacity equal to or greater than load to be handled.

The load block can fail if overloaded, allowing the load to fall.

Guide Sheaves and Drums

See Figure 4-86 and Figure 4-87 for identification of the load drums, the guide sheaves, and wire rope routing.

Refer to the Reeving Diagrams at the end of this section for wire rope routing over the boom top wire rope guide.

Once the wire rope is routed through the guide sheaves, install all rope guard pins, bars, and rollers to retain the wire rope on the sheaves. ***Wire rope and sheaves can be damaged if the rope is not properly retained on the sheaves.***

Dead End Location

See Figure 4-43 on page 4-58 for the dead end locations. All hardware is stored in the job boxes provided with the crane.

Load Block Identification

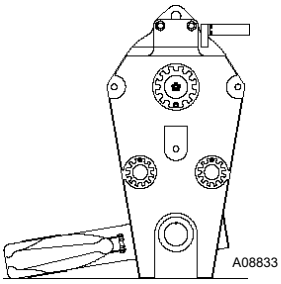
See the Boom Rigging Drawing at the end of this section for a complete list of load blocks and hook-and-weight balls available for use with this crane.

WARNING

Avoid Death or Serious Injury!

Exercise care when the load block is standing in the vertical position, as the potential for tipping exists. Potential causes of tipping are unstable work area, boom movement and the reeving process.

If the work area is unstable, lay the load block flat on the side plate.



Wire Rope Specifications

Refer to the Wire Rope Specifications chart in the Capacity Chart Manual for:

- Parts of the line required to handle desired load
- Wire rope length required for various boom lengths and parts of line
- Maximum spooling capacity of load drums

Load Block Reeving

For reeving of the lower boom point, see the Reeving Diagrams at the end of this section.

Also refer to Install Load Lines on page 4-59.

Reeving in any manner other than shown can result in excessive block twist.

CAUTION

Wire Rope Damage!

Do not hoist the load block closer to the boom point than shown in the reeving diagrams. Improper fleet angle or contact with other parts can damage the wire rope.

Item	Description
1	Hole: 54 mm (2-1/8 in) (Qty 2)
2	Sling (owner furnished)
3	Load Block

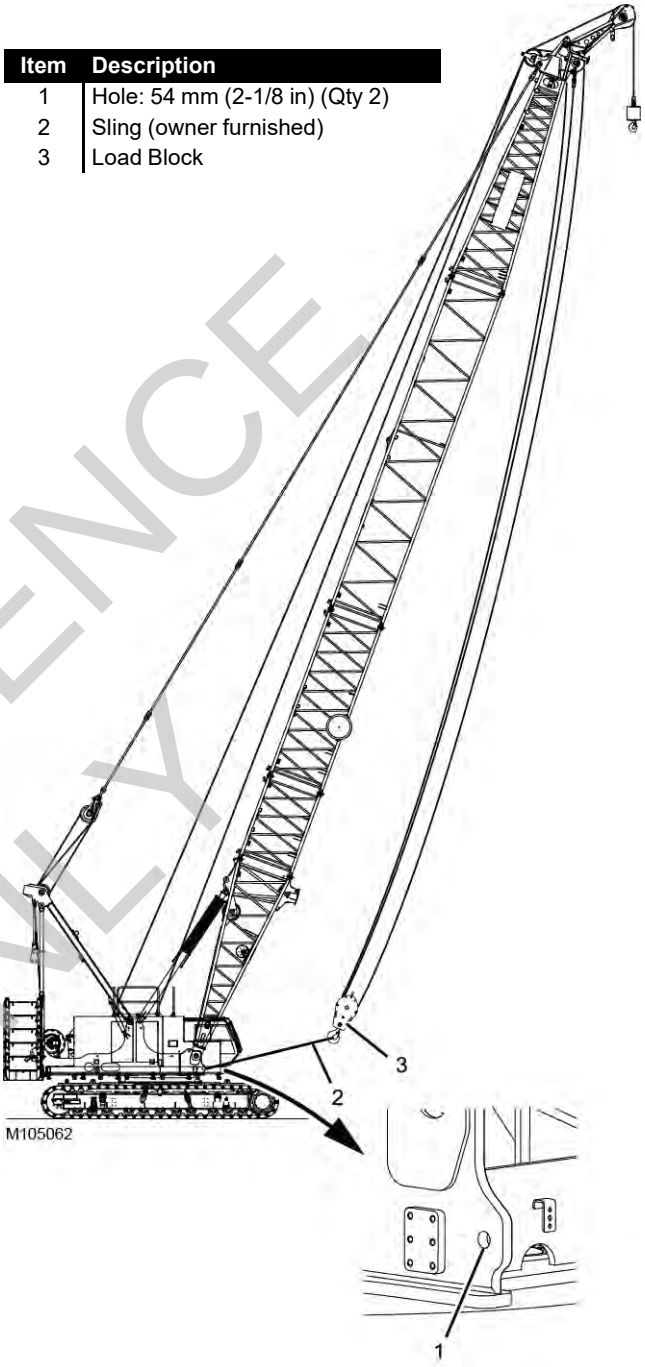


Figure 4-88

LOAD BLOCK TIEBACK

General

Holes (1, Figure 4-88) on the front of the rotating bed can be used to tieback the load block (3) when not in use.

Specifications

Sling Length

The owner furnish sling (2) must be long enough to connect it to owner furnished shackles in the tieback holes (1) and to the hook of the freely suspended load block (3). This will prevent personnel from having to swing the block in, toward the crane, to make the connection.

Sling and Shackle Capacity

The sling and shackles must be capable of supporting the weight of the load block and 1/2 the weight of the wire rope suspended from the boom point. When sizing the sling and shackles, take into account the dynamic affects of traveling and swinging the crane. ***It is the crane user's responsibility to calculate this load.***

CAUTION

Avoid damage:

- Haul in the load line only until the tieback sling is taut. The purpose of the tieback is only to prevent the load block from swinging when not in use.
- Do not tighten the load line to the point that the load line rubs against the lacings in the boom sections or to the point that the load block can bounce into the lacings.
- Operator, be aware that as you boom down, the load lines and tieback sling will tighten even more. Pay out the load line while booming down so that you don't pull the load block into the boom. Damage to lacings or chords could result.
- Only use the hole for tying back the load block. Using the hole for any other purpose is neither intended of authorized. Damage could result.

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SECTION 5
LUBRICATION

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