Chapter 2
Rigging

Cutting Wire Rope
The wire rope must be tightly seized on both sides of the point where the wire rope will be cut, as shown in Figure 2-1.

Seize the wire rope with either seizing wire or annealed wire. The seizing will prevent the wire rope strands from unraveling and prevent distortion of the rope ends from the pressure applied during cutting.

Anchoring Wire Rope to Drum

CAUTION Prevent possibility of wire rope slipping out of drum pocket and dropping the load!

Use only the correct wedge corresponding to the wire size being used. See Parts Manual for exact part number of wedge to be used.

Remove all rough edges and burrs from wedge and drum pocket that may cut wire rope or prevent rope and wedge from seating properly in the pocket.

Dead end of wire rope and seizing must extend past end of wedge, but not out of drum pocket.

If dead end of wire rope is welded, seize the rope near the end and cut weld off before assembling to drum pocket. Weld will not allow strands of wire rope to adjust around the wedge resulting in high strands and wavy rope. This condition can seriously weaken the rope.

Insert the free end of the wire rope through the small opening in the drum pocket as shown in Figure 2-2.

Loop the wire rope and push the free end about three-quarters of the way back into the drum pocket.

Insert small end of the wedge and pull the slack out of the wire to seat the wedge and wire rope in the pocket.

Winding Wire Rope Onto Drum

Carefully inspect the drum and sheaves for defects that might cut the rope or cause excessive wear. If the defects cannot be corrected, replace the faulty part.

Apply tension to the wire rope as it is slowly wound onto drum. The first wrap must be tight against the drum flange for approximately three-fourths of the drum circumference. Tap the adjacent wraps against each other with a soft metal or wooden mallet.

Important All wraps of first layer must be tight against drum and against each other.

Voids or spaced wraps in first layer will permit movement and wedging action with subsequent layers. Wedging action will cause crushing and abrasion of wire rope. Never allow wire rope to cross wind.
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Anchoring Wire Rope to Wedge Socket

For Installations using conventional wedge and sockets

Prevent possibility of wire rope slipping out of socket and dropping the load!

**CAUTION**
Use only the correct wedge and socket corresponding to the wire rope size being used. See Parts Manual for exact part number of wedge and socket required.

Remove all rough edges and burrs from wedge and socket that may cut wire rope or prevent rope and wedge from seating properly in the socket.

Do not replace shipping material (bolt, plastic strap or wire) in hole of wedge or socket after assembling. Discard these materials because they can prevent wedge and rope from seating properly in the socket.

Attach wire rope clip to dead end of wire rope after assembling wire rope to wedge and socket. Figure 2-3 shows correct clip attachments.

If dead end of wire rope is welded, seize end of wire rope and cut off weld before assembling to wedge and socket. Weld will not allow strands of wire rope to adjust around bend of wedge, resulting in high strands and wavy rope. This condition can seriously weaken the rope.

Assemble the wire rope and wedge to the socket so the live side of the wire rope is in a straight line with the socket pin hole. Correct and incorrect assemblies are shown in Figure 2-3.

Allow the dead end of the rope to extend past the end of the socket.

Pull on the live side of the wire rope enough to tighten the wedge in the socket.

**Correct Methods**

*Live side in straight line with socket*

*Dead end looped back*

*Short piece of wire rope*

*Rope Clip*

*Seizing*

*Wedge*

*Socket*

**Incorrect Methods**

*Dead end*

*Rope Clip will transfer load to dead end of wire rope*

*Live side*

*Live side kinked here because not in straight line with socket*

**Figure 2-3  Wedge Socket Assembly**

Attach a wire rope clip to the dead end of the wire rope using one of the Correct methods shown in Figure 2-3. The rope clip will aid in preventing the wire rope from being pulled out of the socket.

**CAUTION**

Do not attach dead end of wire rope to live side of wire rope with a wire rope clip. Wire rope clip will transfer load from live side of wire rope to dead end, seriously weakening attachment.

After the socket is pinned in place (to dead end on boom head, overhaul ball or loadblock), hoist the load slowly so the wedge and rope will seat firmly in the socket. Do not shock load the socket and wedge.
For installations using the Crosby “Terminator” wedge and socket

Note: The following text is taken from the Crosby Terminator application sheet.

**WARNING**
- Loads may slip or fall if the Wedge Socket is not properly installed.
- A falling load can seriously injure or kill.
- Read and understand these instructions before installing the Wedge Socket.
- Do not side load the Wedge Socket.
- Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.
- Do not interchange wedges between S-421T and US422T or between sizes.

**Important Safety Information - Read and Follow**

**Inspection/Maintenance Safety**
- Always inspect socket, wedge and pin before using.
- Do not use part showing cracks.
- Do not use modified or substitute parts.
- Repair minor nicks or gouges to socket or pin by lightly grinding until surfaces are smooth. Do not reduce original dimension more than 10%. Do not repair by welding.
- Inspect permanent assemblies annually, or more often in severe operating conditions.
- Do not mix and match wedges or pins between models or sizes.
- Always select the proper wedge and socket for the wire rope size.

**Assembly Safety**
- Use only with standard 6 to 8 strand wire rope of designated size. For intermediate size rope, use next larger size socket. For example: When using 9/16” diameter wire rope use a 5/8” size Wedge Socket Assembly. Welding of the tail on standard wire rope is not recommended. The tail length of the dead end should be a minimum of 6 rope diameters but not less than 6” (See Figure 2-4).
- To use with Rotation Resistant wire rope (special wire rope constructions with 8 or more outer strands) ensure that the dead end is welded, brazed or seized before inserting the wire rope into the wedge socket to prevent core slippage or loss of rope lay. The tail length of the dead end should be a minimum of 20 rope diameters but not less than 6” (See Figure 2-4).
- Properly match socket, wedge and clip (See Table 2-1) to wire rope size.
- Align live end of rope, with center line of pin (See Figure 2-4).

![Figure 2-4 Terminator Wedge Socket Assembly](image)

![Figure 2-5 Incorrect assembly examples](image)

**Table 2-1**

<table>
<thead>
<tr>
<th>Rope Size</th>
<th>3/8</th>
<th>1/2</th>
<th>5/8</th>
<th>3/4</th>
<th>7/8</th>
<th>1</th>
<th>1 1/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clip Size</td>
<td>3/8</td>
<td>1/2</td>
<td>5/8</td>
<td>3/4</td>
<td>7/8</td>
<td>1</td>
<td>1 1/8</td>
</tr>
<tr>
<td>Torque Ft/lbs</td>
<td>45</td>
<td>65</td>
<td>95</td>
<td>130</td>
<td>225</td>
<td>225</td>
<td>225</td>
</tr>
</tbody>
</table>

* The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.
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- Secure dead end section of rope. (See Figure 2-4).
- Tighten nuts on clip to recommended torque. (Table 2-1)
- Do not attach dead end to live end or install wedge backwards (See Figure 2-5).
- Use a hammer to seat Wedge and Rope as deep into socket as possible before applying first load.

Operating Safety
- Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.
- Efficiency rating of the Wedge Socket termination is based upon the catalog breaking strength of Wire Rope. The efficiency of a properly assembled Wedge Socket is 80%.
- During use, do not strike the dead end section with any other elements of the rigging (Called two blocking).

Breaking In Wire Rope
After installing a new wire rope, break in the wire rope by operating it several times under light load and at reduced speed. This practice will allow the wire rope to form its natural lay and the strands to seat properly.

Note  Some stretch will occur during the break-in period causing a reduction in the wire rope's diameter as the strands compact around the core.

The dead wraps of wire rope on the winch 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.

Important  When slackness is noted, the dead wraps of wire rope should be tightly rewound onto the drum. If left incorrect, a wedging action with subsequent layers will occur, and the resultant abrasion will cause broken wires in the dead wraps.

Reeving
Reeving diagrams for the wire rope are shown in Figures 2-7 and 2-8. The number of parts of line used depends on the load to be lifted. Refer to the Capacity Chart for your specific crane to determine reeving requirements for the various loads that can be lifted.

Make sure the wire rope travels through each cable guide on the boom and on the jib, if erected.

The Manitex C-Series crane incorporates a “quick reeve” boom head. When used with our optional “quick reeve” load blocks, this feature allows the rigger to reeve multiple parts of line without removing the wedge and socket from the wire rope.

Ensure that all wire rope retaining pins are in place at all times. This will ensure that the wire rope remains in the sheave groove if they should become unloaded. Failure to comply will allow the wire rope to exit the sheave groove possibly causing damage to the wire rope and sheaves. Refer to Figure 2-6.

After the wire rope is reeved, make sure the Anti-Two-Block (ATB) system is properly installed:
- Check that the ATB counterweight is connected to the limit switch and the counterweight is installed on the correct part of the line. Refer to Figure 2-7 or 2-8.

Important  Do not shorten length of chain/lanyard on ATB counterweight, if shortened, a two-block condition may occur.
- If the ATB system is equipped with an override flag, check that it is not installed on the switch lanyard thereby overriding the switch.

After verifying the installation, test the ATB warning horn and shut-down for proper operation before placing the crane in service. Refer to Daily Maintenance Checks in Chapter 6.
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Three-Sheave Boom Head

Figure 2-7  Load Line Reeving — Three-Sheave Boom Head

Five-Sheave Boom Head

Figure 2-8  Load Line Reeving — Five-Sheave Boom Head
Quick-Reeve Load Block

Wire Rope Installation

Step 1  Lower Crane boom to horizontal position and engage crane swing lock.

**CAUTION**  Crane swing motion during wire rope installation can cause tipping of the Quick-Reeve block.

Step 2  Ensure ground support is firm and level within 5º.

**CAUTION**  Soft or uneven ground may lead to tipping of the Quick-Reeve block.

Step 3  Place Quick-Reeve block in the folded position in line and forward of the boom as illustrated in Figure 2-9.

**CAUTION**  Improper placement will produce reeving forces that can cause tipping of the block.

Step 4  Remove Rope Guard Keeper Pins at (A) - Figure 2-9.
Step 5  Remove Rope Guard Pins (B).
Step 6  Remove boom sheave guards.
Step 7  Pull wire rope from the hoist drum and pass wire rope over the first boom and block sheave then over the second boom sheave. Ensure load line pull is always against the boom and never against the block.

**CAUTION**  Load line pull applied against block may cause tipping of the block. Avoid injury. Never stand on block.

Step 8  If multiple part reeving, repeat Step 7 for the next boom and block sheave until reeving is complete.
Step 9  Install wedge socket on wire rope if not already installed.
Step 10  Assemble wedge socket to boom or block dead end connection. Ensure connecting pin keeper is properly installed.
Step 11  Replace Rope Guard Pins (B).

**Note**  OSHA invokes ASME B30.5, which requires the sheaves in the lower load block shall be equipped with close-fitting guards that will prevent ropes from becoming fouled when the block is lying on the ground with loose ropes.

Step 12  Replace Rope Guard Keeper Pins (A).
Step 13  Replace boom sheave wire rope guards.
Step 14  Lift block to hanging position by raising boom.

**CAUTION**  Stand clear while lifting block off the ground.
**Wire Rope Removal**

Step 1  Lower crane boom to near horizontal position and engage crane upper swing lock.  
**CAUTION** Crane swing motion during wire rope removal may cause tipping of block.

Step 2  Ensure ground support is firm and level within 5º.  
**CAUTION** Soft or uneven ground may lead to tipping of the block.

Step 3  Rotate hook into position as shown in Figure 2-10.
Step 4  Lower Quick-Reeve block with hoist drum until hook touches ground - see Figure 2-10.
Step 5  Use a tagline to pull block forward and lower boom simultaneously to start block folding.
Step 6  Continue to pull block forward and lower boom until block rests on ground in folded position.
Step 7  Remove Rope Guard Keeper Pins (A).
Step 8  Remove Rope Guard Keeper Pins (B).
Step 9  Remove boom sheave guards.
Step 10 Disassemble wedge socket from dead end connection.
Step 11 Pull wire rope and wedge socket around first block and boom sheave.  
**CAUTION** Avoid possible injury. Do not allow wedge socket to fall from boom sheave and never stand on block.

Step 12 If multiple part reeving, repeat Step 11 for the next boom and block sheave until wire rope removal is complete.
Step 13 Replace Rope Guard Pins (B).
Step 14 Replace Rope Guard Keeper Pins (A).
Step 15 Proceed with next rigging arrangement.

Figure 2-10  Quick-Reeve Wire Rope Removal
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Erecting and Storing Jib

**DANGER**

Exceeding jib ratings or failing to comply with jib operating conditions and restrictions given on Capacity Chart will result in structural damage to crane components, collapse of crane, or tipping.

Read all instructions on Capacity Chart before handling any load with jib.

Do not attempt to erect jib until outriggers and stabilizers are properly set. Do not retract outriggers and stabilizers until jib is stored and boom is lowered onto boom rest.

Use these formulas to determine the minimum distances required for the side swing-around and rear clearances for the truck when erecting or storing the jib. The lengths are found in the crane’s range diagram.

- **Minimum side swing-around clearance**
  - Retracted boom length
  - Fixed jib length or retracted telescopic jib length
  - + 10 Feet

- **Minimum rear clearance**
  - Retracted boom length
  - Extended telescopic jib length (or fixed jib length)
  - + 10 Feet

**Erecting Jib**

**Important** Be sure to install hairpin cotters to retain all pins.

- To make lifts with the Jib, the crane must be rigged with a single part of line. Therefore, if the crane is rigged with a load block, break down the rigging to a single part of line and install the Manitex supplied overhaul hook ball.
- Using all applicable safety precautions, operate the crane systems to raise and swing the boom clear of boom support.
- Keeping the boom above horizontal, operate the telescope lever to extend the boom about three fourths (3/4) its total extended length and lower the headache ball onto the ground.
- Operate the telescope lever, retract boom fully allowing headache ball and wire rope to stay in its extended position. At same time lowering boom to allow access to anti-two block (ATB) counterweight and boom head.
- With boom lowered remove the two (2) hair pins on the anti-two block weight. Remove the weight from the wire rope and let it hang on the ATB switch.
- Remove the wire rope retaining pins from the boom head and temporarily lay the wire rope to left side of boom head, out of the way of jib attach lugs. With wire rope off to the side, re-install only the lower wire rope retaining pin (or pins) in boom head at this time. See figure 2-11.

**CAUTION** Although it may be necessary to operate the boom controls slightly to help align the jib attach point holes, do not attempt to telescope the boom at this time. Severe damage to the boom and/or jib may occur if a premature attempt is made to telescope the boom.

- Remove the four Jib Pins (1) from jib base and boom head, see Figure 2-11.
Install two Jib Pins (1) to fasten the jib to Holes A on the right side of the boom head.

Raise the boom to horizontal.

**CAUTION**

During the next few steps the jib will swing around uncontrolled if boom is not placed in a horizontal position.

Fasten a tagline, approximately fifteen feet long, to the bar at the jib head shown in Figure 2-13.

Remove Pin 2 from Bracket B shown in Figure 2-12.

**CAUTION**

Do not remove Pin 2 until Jib Pins (1) are installed on right side of boom head, otherwise, jib may fall from boom causing serious injury to personnel.

Extend the boom approximately nine inches so Bracket C, shown in Figure 2-12, is clear of Bracket B.

Swing the jib to the extended position with the tagline.

Lower the boom so the boom head can be reached from the ground.

Install the two remaining Jib Pins (1) to fasten the jib to Holes A on the left side of the boom head.

**If the telescopic jib will be operated in the extended position, proceed as follows:**

- Remove Pin 3 from Hole D, refer to Figure 2-13.
- Pull the jib stinger out until it is fully extended. Raise the boom if the jib head touches the ground.
- Re-install Pin 3 in Hole D and secure with hairpin cotter, refer to Figure 2-13.

*Note* Pin 3 cannot be installed unless the jib stinger is extended completely.

**CAUTION**

Do not proceed unless Pin 3 is installed in Hole D and secured in place with cotter pin. Failure to do so will allow jib stinger to retract suddenly when boom is raised. Do not operate crane unless Stop Pin, Lateral Adjustment Screw and Locknuts are also correctly installed, refer to Figure 2-13.
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- Lay wire rope over top sheave of boom head and re-install wire rope retaining pin, secure with hair pin.
- Lay wire rope along top plate of jib, at the jib base, insert wire rope through wire rope cable guide using the notch at the top of the guide.
- Remove jib wire rope retainer pins at the jib head. Lay wire rope on jib head sheave groove and re-install retaining pins, secure pin with hair pin, see Figure 2-14.
- If open wedge socket was removed due to multiple part line reeving, re-install open wedge wire rope socket onto end of wire rope, see Figures 2-3 thru 2-5.

Preparing Anti-Two Block (ATB) System
After erecting the Jib, the ATB must be configured to operate from the Jib head. The C-Series crane is equipped with a radio ATB system. Refer to Figure 2-15.

- Remove the ATB switch and weight from boom head and install on post on the left side of the jib head.
- Install ATB weight around wire rope.

Note: At this point the ATB and LMI circuit is enabled for lifting from the jib head.

Checking Operational Aids
- Reset the Load Moment Indicator (LMI), if equipped, to the correct operating mode for the jib. Refer to LMI Operating Codes in the Load Chart.
- Test the ATB warning horn and shutdown for proper operation, refer to Daily Checks in Chapter 6.

Do not handle any load with jib until ATB warning horn and shutdown are operational, otherwise, a two-block condition may occur.

Do not handle any load with the Jib until the LMI has been set to the proper operating mode. Failure to do so will prevent the LMI system from properly monitoring the load capacity of the crane, possibly resulting in damage to crane or property.
### Storing Jib

**Important**  
*Be sure to install hairpin cotters to retain pins.*

- Using all applicable safety precautions, operate the crane systems to position the boom in an area over the rear of the truck where easy access to the jib and boom components is possible.
- Retract the boom to within one (1) foot of its fully retracted position.
- Lower the boom until the jib head can be reached from the ground.
- Remove the ATB switch and weight from jib head and install on post on the left side of the boom head, see Figure 2-15.
- Remove the load line from the end of the jib and pull it out of the way towards the left side of the boom. Be sure to replace the wire rope retaining pins in the jib head.
- **If the telescopic jib stinger is extended**, proceed as follows:
  - Remove Pin 3 from Hole D, shown in Figure 2-13.
  - Push the jib stinger all the way in so the jib head is snug against the jib base.

**Note**  
Two people may be needed to retract the stinger into the jib base. Insert a pipe through the tube at the jib head to assist in this operation. Ideally, the pipe should be long enough to accommodate a person on each side.

- Replace Pin 3 in Hole D.

**CAUTION**  
Push jib stinger in until jib head snug against jib base before installing Pin 3. Failing to do so will allow jib stinger to extend suddenly when jib swings around, the boom is raised, or when traveling.

- Fasten a tagline, approximately fifteen feet long, to the bar on the jib head, refer to Figure 2-13.
- Remove the two Jib Pins (1) from Holes A, on the left side of the boom head, refer to Figure 2-11.
- Raise the boom to horizontal.
- Swing the jib to the stored position along side of the boom with the tagline.
- Retract the boom so Bracket C, on the jib engages the stop pin in Bracket B on the boom, refer to Figure 2-12.

**Note**  
Do not remove Jib Pins 1 on right side of boom head until Pin 2 is installed, otherwise, jib may fall from boom causing serious injury to personnel.

- Install Pin 2 in Bracket B and secure with keeper pin, refer to Figure 2-12.
- Remove remaining two Jib Pins (1) from Holes A, on the right side of the boom head, refer to Figure 2-11.

**Important**  
*Do not extend boom until Jib Pins (1) are removed when Pin 2 is installed; otherwise, brackets will be damaged.*

- Assemble the load line to the sheaves on the boom. Be sure to replace the wire rope retaining pins.
- If the overhaul ball will be used, assemble the ATB weight to the load line.
- If multiple-part reeving will be used, install the load block and, if necessary, the auxiliary sheave. Be sure to pass the dead end of the load line through the ATB weight, refer to Figure 2-7 or 2-8.
- Reset the Load Moment Indicator (LMI) to the correct operating mode for the boom and crane configuration. Refer to the LMI Operating Codes in Load Chart.
- Test the ATB warning horn and shutdown for proper operation, refer to *Daily Checks* in Chapter 6.

**CAUTION**  
Do not handle any load with boom until ATB warning horn and shutdown are operational, otherwise, a two-block condition may occur.

On LMI cranes, do not handle any load until the LMI has been set to the proper operating mode that matches the crane configuration. Failure to do so will prevent the LMI system from properly monitoring the load capacity of the crane, possibly resulting in damage to crane or property.
Adjusting Jib

Storing and deploying the Jib may become difficult if misalignment exists between the Jib and Boom head. Adjust jib storage brackets to shift the jib vertically and horizontally as required to set the jib at the proper height and align pin holes (Hole A).

Bracket F (see Figure 2-11) adjusts vertically to position the jib foot just above the boom head lugs. Setting this bracket properly prevents the jib foot from striking the boom head when the Jib is stored. Install shims behind Bracket F so Holes A on the right side of the boom head line up with holes on the jib. Perform this adjustment with the boom fully retracted and the jib stored.

Bracket B (see Figure 2-12) also adjusts vertically. Adjust bracket height so that jib bracket C meets the bottom of the ramp thus facilitating storing of Jib along the boom.

It should be necessary to perform these adjustments only when the pins have worn to the point that they allow the jib to sag while attempting to store the jib.

Alignment Screws

Telescopic Jib Only

Adjust the alignment screws, shown in Figure 2-13, so the jib stinger (when fully extended) is centered in the jib base. Be sure to tighten the locknuts to retain the adjustment.