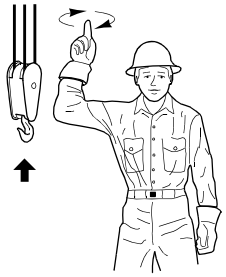
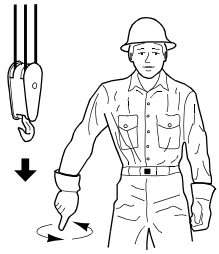
SECTION 3
OPERATION

STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

The following standard hand signals comply with ASME B30.5



HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.



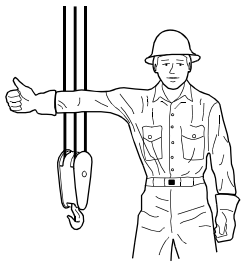
LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.



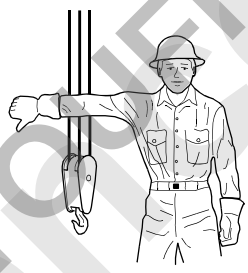
USE MAIN HOIST. Tap fist on head; then use regular signals.



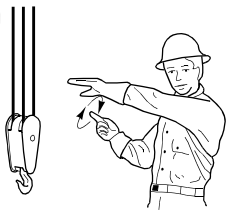
USE WHIPLINE. (Auxiliary Hoist.) Tap elbow with one hand; then use regular signals.



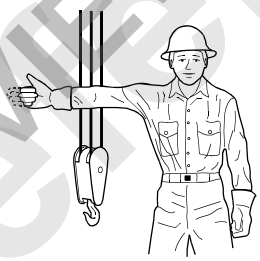
RAISE BOOM. Arm extended, finger closed, thumb pointing upward.



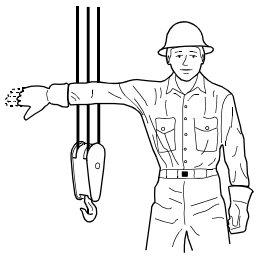
LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.



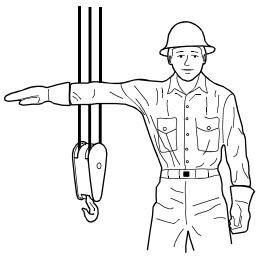
MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as an example.)



RAISE BOOM & LOWER LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.



LOWER BOOM & RAISE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.



SWING. Arm extended, point with finger in direction of swing of boom.

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FIGURE 3-1

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INSTALLING JIB

Lower Boom

1. Travel front crawler rollers onto blocking or level truck carrier on extended outriggers.
2. Swing upper slightly to either side and lower load block and weight ball onto ground.
3. Swing boom in-line with crawlers or carrier and lower boom onto blocking approximately 2 ft (0,6 m) high (Figure 4-7).

Prepare Boom for Jib

1. If installed, disconnect load line from hook and weight ball. ***Load line from left rear drum is required for raising main strut.***

   The load block can remain reeved if it is required for operation. See Install Boom Load Line topic in this section.
2. Remove upper boom point if equipped.
3. Remove #132 fixed jib if equipped.
4. If equipped with a long reach boom, convert it to a heavy lift boom as shown on Luffing Jib Rigging Assembly drawing.
5. Change boom length as necessary to meet job requirements.
6. ***For #49A-44 boom only***, install backstay pendant adapters at proper location between #49A boom sections (see Figure 4-7, View A and B, and rigging drawing at end of this section).
7. ***For #79-44 boom only***, pin backstay pendant links to boom stop lugs on boom butt (see Figure 4-7, View C and rigging drawing at end of this section).
8. Check that all inserts and pendants or straps are assembled in proper sequence according to rigging drawing.
9. If necessary remove left and right sheave clusters from lower boom point and replace them with spacers (see Lower Boom Point Sheaves in Section 4 of the Crane Operator's Manual). See raising procedure chart for boom length limitations with all nine lower boom point sheaves installed.

WARNING

Tipping Crane Hazard!

Do not attempt to raise more boom than specified when all nine lower boom point sheaves are installed. Rear of crane will tip forward.

10. Fasten luffing hoist wire rope guides to proper boom sections (see rigging drawing):
    - Bottom chords of boom butt (#44, 44A, and 49A-44 boom).
    - Bottom chords of insert next to boom butt (#79-44 boom).
    - Top chords of insert next to boom butt (#49A-44 and #79-44 booms).
11. If required, install luffing hoist to include connecting hydraulic lines, air lines, and electric cord. See appropriate assembly drawings at the end of this section.

NOTE: On current production units, the MAX-ER 2000 luffing hoist can be used for all applications, provided:

- Luffing hoist sheaves are grooved for 1 in (26 mm) wire rope. Past production sheaves were grooved for 7/8 in (22 mm) wire rope. ***Be sure to check your sheaves before using MAX-ER 2000 luffing hoist.***
- Hydraulic lines are properly connected as instructed on Hydraulic Piping Assembly drawing in Crane Parts Manual.

12. For #44 or 44A boom only, install backstay pin on both sides of boom butt (Figure 4-7, View E).
13. Add or remove crane counterweight to comply with applicable capacity chart.

Install Jib Stop Assembly

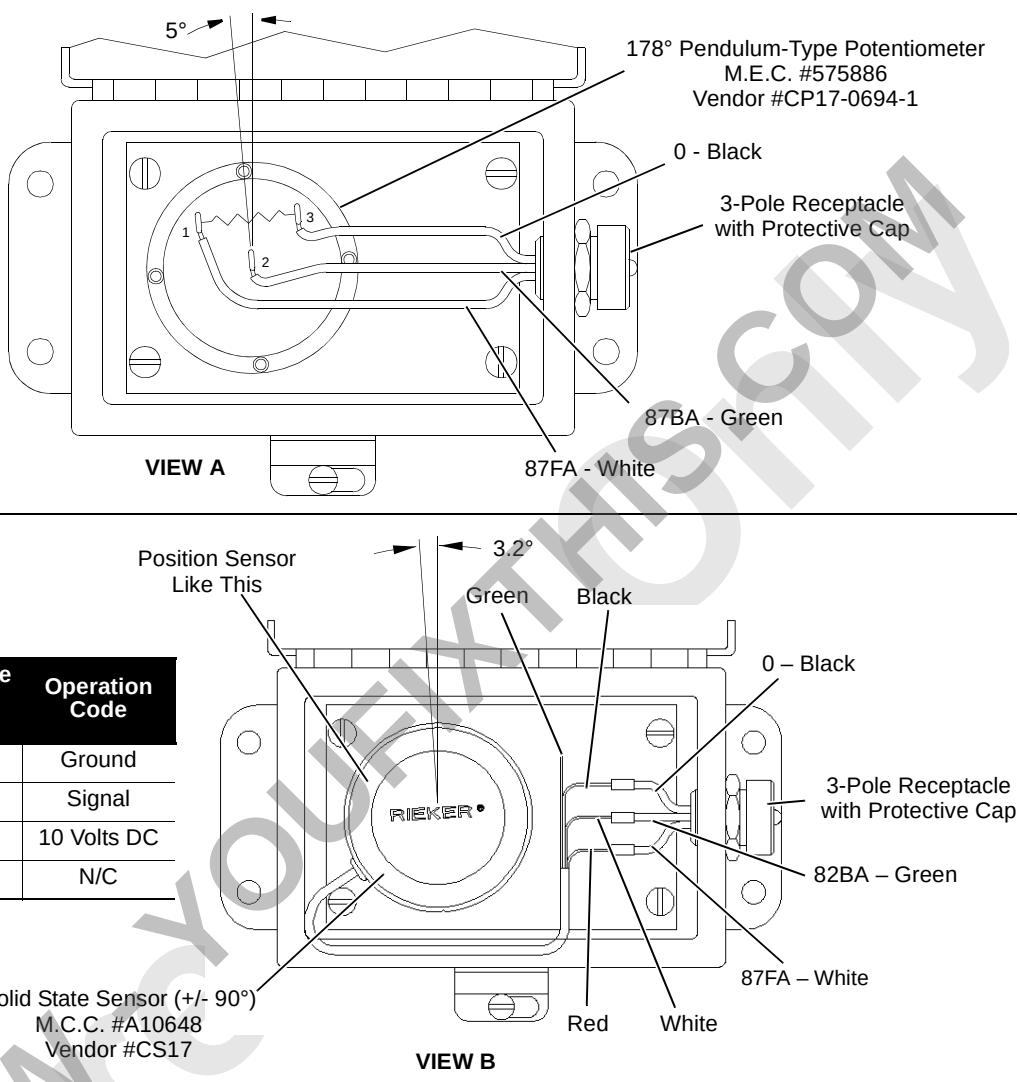
See Figure 4-7, View D for following procedure.

1. If not already done, pin jib stop inner strut in retracted position.
2. Pin jib stop outer strut to lugs on bottom of boom top — ***strut must point away from boom.***
3. Support strut on blocking approximately 12 in (0,3 m) high (will provide clearance for attaching pendants).
4. Fasten hand winch to lugs on boom butt and install control cable. See Jib Stop Assembly drawing at the end of this section.
   a. Make sure control cable is routed through all guide sheaves in boom top and in strut (it may be necessary to weld guide sheaves to boom top as shown on assembly drawing).
   b. Make sure cable slips are properly positioned to allow minimum cable movement given on assembly drawing.
   c. Make sure all cable clips are tight.

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Luffing Jib Angle Sending Unit

VIEW A

VIEW B

Input Wire Colors From	Sensor Wire Colors To	Operation Code
Black	Black	Ground
Green	White	Signal
White	Red	10 Volts DC
	Green	N/C

FIGURE 6-4

AUTOMATIC BOOM STOP ADJUSTMENT

General

This crane has limit switches which automatically stop the boom hoist and apply its brake when the boom is raised or lowered to a preset angle (see Tables in Figure 6-5 or Figure 6-6).

NOTE: For MAX-ER 2000 boom angles, refer to the Operator's Manual supplied with the MAX-ER.

WARNING

Falling Attachment Hazard!

Do not operate crane unless automatic boom stop is properly adjusted and operational. Do not adjust MAX operating angle higher than specified.

Boom can be pulled over backwards or collapse causing death or serious injury.

Adjust boom angle indicator before adjusting automatic boom stop (see procedure in this section).

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SECTION 6
MAINTENANCE

GENERAL MAINTENANCE

This section contains maintenance and adjustment instructions for the limit devices used with the luffing jib attachment.

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

- Straps
- Wire Rope
- Load Block and Weight Ball
- Boom and Jib

ANGLE INDICATOR ADJUSTMENT

General

An angle sending unit is mounted on the boom butt and on the luffing jib butt (see Figure 6-1).

Each sending unit houses either a pendulum-type potentiometer or a sensor which sends an electric signal to the crane's programmable controller. The programmable controller converts the electric signal into an angle which can be monitored on the digital display in the operator's cab.

Three angles (see Figure 6-2) can be monitored:

1. Boom angle.
2. Luffing jib angle.
3. Boom to luffing jib angle.

The sending unit for the boom and for the luffing jib are identical in appearance. ***The two units are different, however, and must not be interchanged.***

Disconnecting Luffing Jib Angle Indicator

Perform the following steps when removing the luffing jib (see Figure 6-1):

1. Unplug electric cord from receptacle on sending unit.
2. Connect protective cap to receptacle on sending unit.
3. Connect electric cord to shorting plug on boom point junction box (see Block-Up Limit Control Assembly drawing at end of Section 4 in this manual).

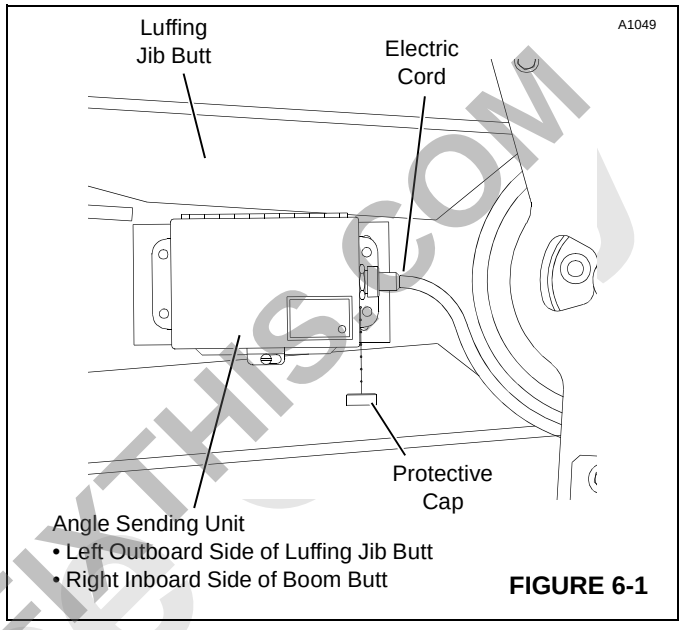


FIGURE 6-1

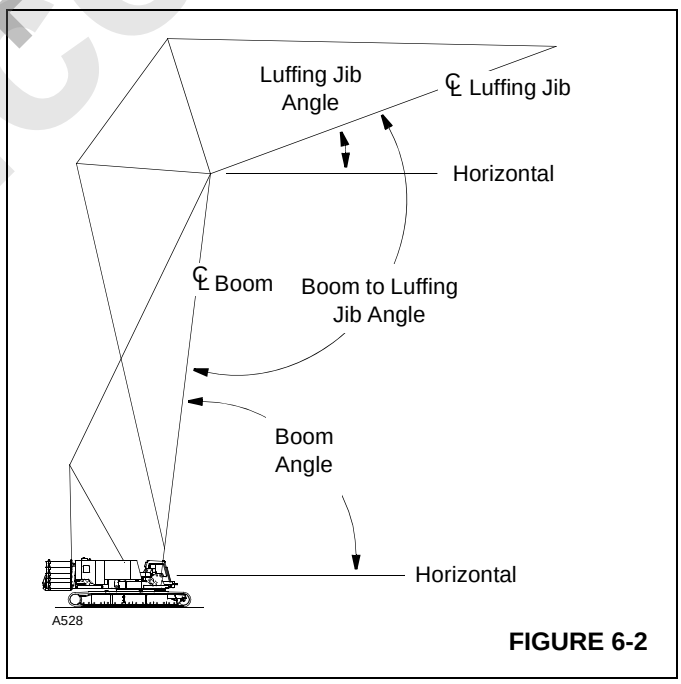


FIGURE 6-2

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SECTION 2
SAFETY INFORMATION

WARNING

California Proposition 65

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

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

California Spark Arrestor

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

CONTINUOUS INNOVATION

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

NAMEPLATES AND DECALS

See drawing at the end of this section.

SAFETY MESSAGES

General

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

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

Safety Alert Symbol

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

Signal Words

DANGER

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

WARNING

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

CAUTION

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

CAUTION

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

NOTE: Highlights operation or maintenance procedures.

Symbol Identification

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

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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 shall be deenergized OR,
   - Tests shall 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 (e.g. 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 must 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 must:

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

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

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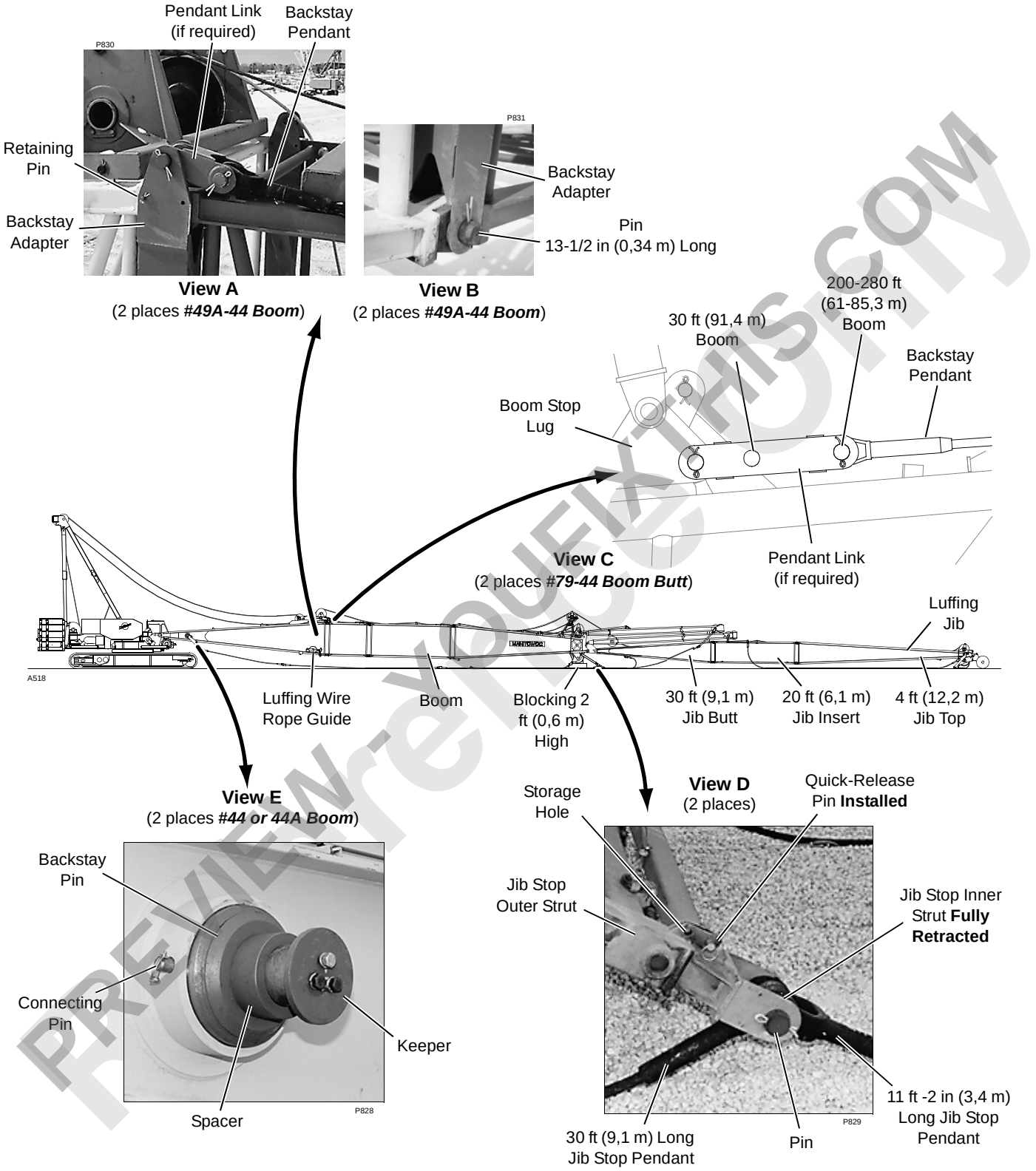
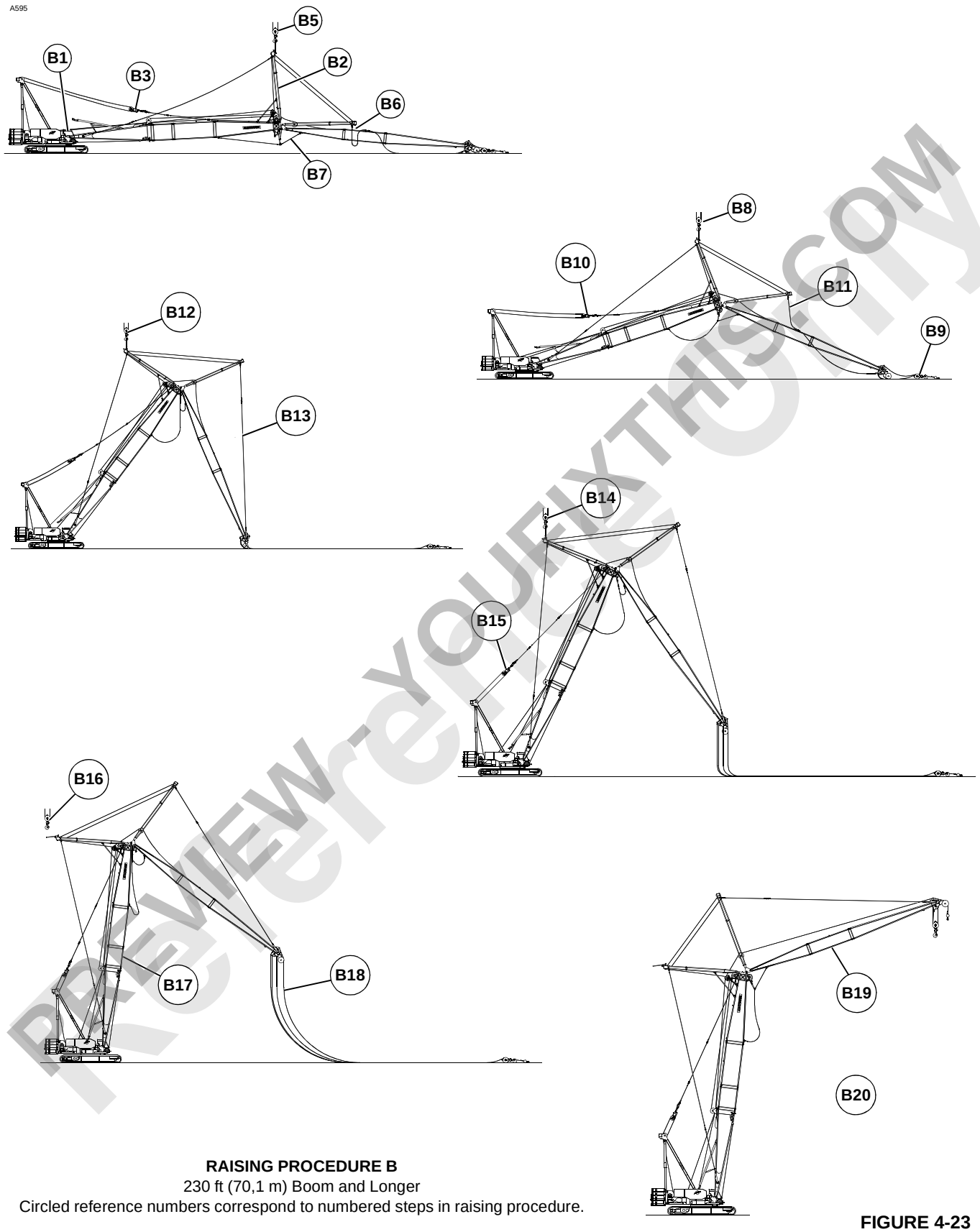


FIGURE 4-7

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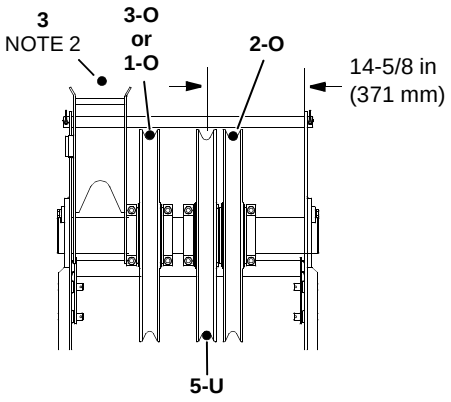
RAISING PROCEDURE B
230 ft (70,1 m) Boom and Longer
Circled reference numbers correspond to numbered steps in raising procedure.

FIGURE 4-23

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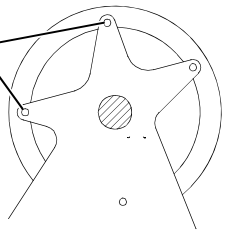
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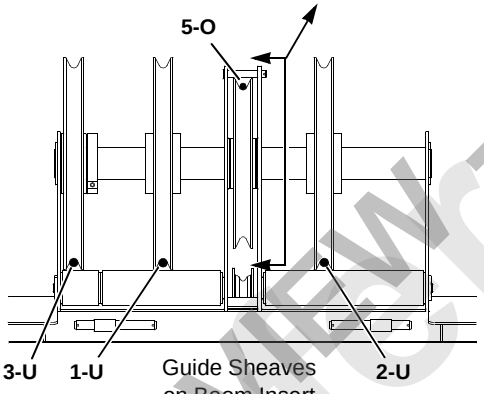
2250 or 2250T
#44 or 44A Boom



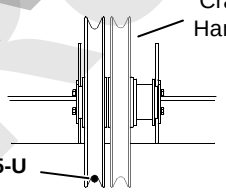
Upper Guide Sheaves on Boom Top

Install Rope Retaining Pins in these Holes after Reeving Luffing Hoist Wire Rope.



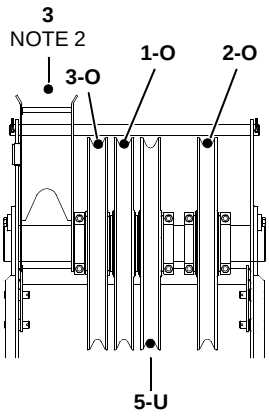


Guide Sheaves on Boom Insert

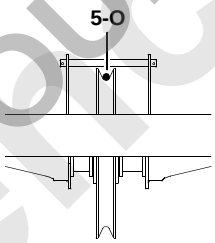


Guide Sheaves in Boom Butt

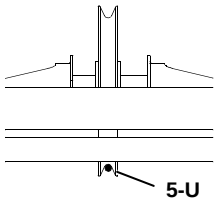
MAX-ER 225
#49A-44 Boom



Upper Guide Sheaves on Boom Top

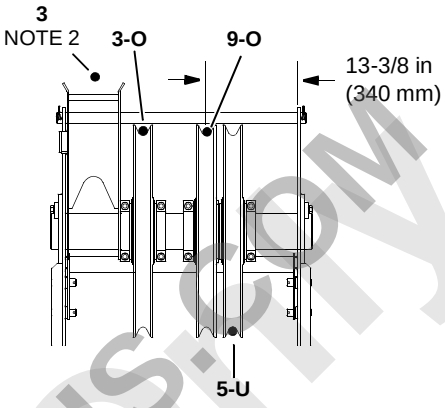


Guide Sheaves on Boom Insert

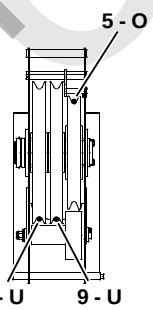


Guide Sheaves in Boom Butt

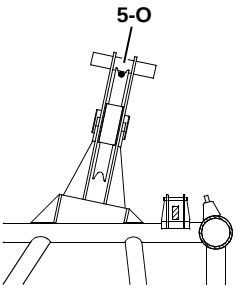
MAX-ER 2000
#79-44 Boom



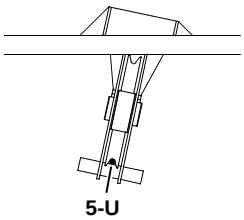
Upper Guide Sheaves on Boom Top



Guide Sheave on Top of #44 Boom Insert



Guide Sheave on Top of #79 Boom Insert



Guide Sheave on Bottom of #79 Boom Insert

A522
A1193

FIGURE 4-41

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