# Grove

# OPERATOR'S MANUAL

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

## TMS700E

Crane Model Number

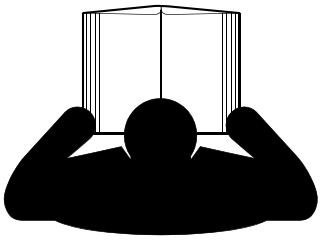
This Manual is divided into the following sections:



**NOTICE**

The crane serial number is the only method your distributor or the factory has of providing you with correct parts and service information.

The crane serial number is identified on the builder's decal attached to the operator's cab. ***Always furnish crane serial number*** when ordering parts or communicating service problems with your distributor or the factory.



## ⚠DANGER

**An untrained operator subjects himself and others to death or serious injury. Do not operate this crane unless:**

- You are trained in the safe operation of this crane. Manitowoc is not responsible for qualifying personnel.
- You read, understand, and follow the safety and operating recommendations contained in the crane manufacturer's manuals and load charts, your employer's work rules, and applicable government regulations.
- You are sure that all safety signs, guards, and other safety features are in place and in proper condition.
- The Operator's Manual and Load Chart are in the holder provided on crane.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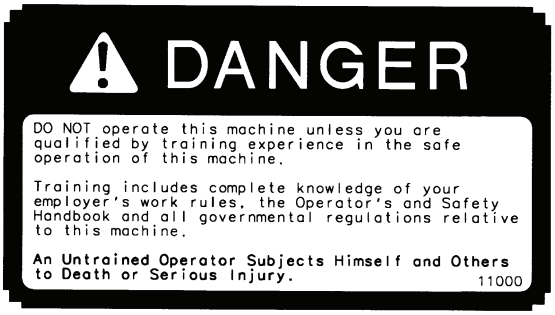
should fail to work properly, the crane user or owner must assure that repair or recalibration is accomplished as soon as is reasonably possible. If immediate repair or recalibration of an operational aid is not possible and there are exceptional circumstances which justify continued short-term use of the crane when operational aids are inoperative or malfunctioning, the following requirements shall apply for continued use or shutdown of the crane:

1. Steps shall be taken to schedule repairs and recalibration immediately. The operational aids shall be put back into service as soon as replacement parts, if required, are available and the repairs and recalibration can be carried out. Every reasonable effort must be made to expedite repairs and recalibration.
2. When a **load indicator, rated capacity indicator**, or **rated capacity limiter** is inoperative or malfunctioning, the designated person responsible for supervising the lifting operations shall establish procedures for determining load weights and shall ascertain that the weight of the load does not exceed the crane ratings at the radius where the load is to be handled.
3. When a **boom angle** or **radius indicator** is inoperative or malfunctioning, the radius or boom angle shall be determined by measurement.
4. When an **anti-block device, two-blocking damage prevention** or **two-block warning device** is inoperative or malfunctioning, the designated person responsible for supervising the lifting operations shall establish procedures, such as assigning an additional signal person to furnish equivalent protection. This does not apply when lifting personnel in load-line supported personnel platforms. Personnel shall not be lifted when anti-two block devices are not functioning properly.
5. When a **boom length indicator** is inoperative or malfunctioning, the designated person responsible for supervising the lifting operations shall establish the boom lengths at which the lift will be made by actual measurements or marking on the boom.
6. When a **level indicator** is inoperative or malfunctioning, other means shall be used to level the crane.

## OPERATOR'S QUALIFICATIONS




An untrained operator subjects himself and others to death or serious injury.

YOU MUST NOT OPERATE THIS MACHINE UNLESS:

- You have been trained in the safe operation of this machine.
- You read, understand, and follow the safety and operating recommendations contained in the manufacturer's manuals, your employer's work rules, and applicable government regulations.
- You are sure the machine is operating properly and has been inspected and maintained in accordance with the manufacturer's manuals.
- You are sure that all safety signs, guards, and other safety features are in place and in proper condition.

Do not attempt to operate the crane unless you are trained and thoroughly familiar with all operational functions. Controls and design may vary from crane to crane, therefore, it is important that you have specific training on the particular crane you will be operating.

Training is ESSENTIAL for proper crane operation. Never jeopardize your own well-being or that of others by attempting to operate a crane on which you have not been trained.

You must be mentally and physically fit to operate a crane. Never attempt to operate a crane while under the influence of medication, narcotics, or alcohol. Any type of drug could impair physical, visual and mental reactions, and capabilities.

faster, and makes proper maintenance difficult. Cleaning solutions used should be non-flammable, non-toxic and appropriate for the job.

ROUTINE MAINTENANCE and INSPECTION of this crane must be performed by a qualified person(s) according to the recommendations in the Grove Service Manual. Any questions regarding procedures and specifications should be directed to the your local, authorized Grove distributor.

## Service and Repair

Service and repairs to the crane must only be performed by a qualified person. All service and repairs must be performed in accordance with manufacturer's recommendations, this handbook, and the service manual for this machine. All replacement parts must be approved by Grove.

Any modification, alteration, or change to a crane which affects its original design and is not authorized and approved by Manitowoc Crane Care is STRICTLY PROHIBITED. Such action invalidates all warranties and makes the owner/user liable for any resultant accidents.

Before performing any maintenance, service or repairs on the crane:

- The boom should be fully retracted and lowered and the load placed on the ground.
- Stop the engine and disconnect the battery.
- Controls should be properly tagged. Never operate the crane if it is TAGGED-OUT nor attempt to do so until it is restored to proper operating condition and all tags have been removed by the person(s) who installed them.

Recognize and avoid pinch-points while performing maintenance. Stay clear of sheave wheels and holes in crane booms.

After maintenance or repairs:

- Replace all guards and covers that have been removed.
- Remove all tags, connect the battery, and perform a function check of all operating controls.
- Perform load tests when a structural or lifting member is involved in a repair.

## Lubrication

The crane must be lubricated according to the factory recommendations for lubrication points, time intervals, and types. Lubricate at more frequent intervals when working under severe conditions.

Exercise care when servicing the hydraulic system of the crane, as pressurized hydraulic oil can cause serious injury. The following precautions must be taken when servicing the hydraulic system:

1. Follow the manufacturer's recommendations when adding oil to the system. Mixing the wrong fluids could destroy seals, causing machine failure.
2. Be certain all lines, components, and fittings are tight before resuming operation.
3. When checking for suspected leaks, use a piece of wood or cardboard and wear appropriate personal protective equipment.
4. Never exceed the manufacturer's recommended relief valve settings.

## Tires

Inspect the tires for nicks, cuts, embedded material, and abnormal wear.

Ensure all lug nuts are properly torqued.

Ensure pneumatic tires are inflated to the proper pressure (refer to the Load Chart Book in the crane cab). When inflating tires, use a tire gauge, clip-on inflator, and extension hose which will permit standing clear of the tire while inflating.

## Wire Rope

Use ONLY the wire rope specified by Manitowoc Crane Care as indicated on the crane's load capacity chart. Substitution of an alternate wire rope may require the use of a different permissible line pull and, therefore, require different reeving.

Always make daily inspections of the wire rope, keeping in mind that all wire rope will eventually deteriorate to a point where it is no longer usable. Wire rope shall be taken out of service when any of the following conditions exist:

1. For rotation-resistant running ropes-more than two (2) broken wires in a length of rope equal to six (6) times the rope diameter, or more than four (4) broken wires in a length of rope equal to thirty (30) times the rope diameter.
2. For running ropes other than rotation resistant-six (6) broken wires in one rope lay or three (3) broken wires in one strand.
3. One valley break where the wire fractures between strands in a running rope is cause for removal.
4. Abrasion of the rope resulting in wear of the individual outside wires of 1/3 of the original wire diameter.
5. Any kinking, bird caging, crushing, corrosion, or other damage resulting in distortion of the rope structure.
6. Rope that has been in contact with a live power line or has been used as a ground in an electric circuit (e. g. welding) may have wires that are fused or annealed and must be removed from service.

stationary exhaust regeneration. If engine RPM is zero, it works as the engine diagnostics switch. If engine RPM is greater than zero, it works as the regeneration switch. The switch must be cycled on to initiate regeneration. The clutch and brake pedals must also be released. The engine will automatically change speed as needed. The cycle may take approximately 20 minutes.

**High Exhaust Temp Light**

The high exhaust temp light (63) lights when an active exhaust regeneration has been initiated and the exhaust temperatures will be elevated above normal levels for the vehicle operating conditions This can occur while driving or during a manually initiated "stationary regeneration".

**WARNING**

While regenerating, ensure the exhaust is not aimed at any surface or material that will melt, burn, or explode.

## Travel Controls and Indicators

### *Dual Air Pressure Gauge*

The dual air pressure gauge (1) is located on the left side of the front console. The gauge is a direct reading pressure gauge with two indicating pointers, red for the primary system and green for the secondary system. The gauge has a dual scale calibrated from 100 to 1000 kPa and 0 to 150 psi. The gauge is connected to each air system separately through tubing.

### *Low Air Pressure Indicator*

The low air pressure (AIR PRESSURE LOW) indicator (27) is located on the upper center of the front console above the steering wheel. The indicator is a red light that lights when the pressure in either or both air systems is below 72-84 psi (5-5.8 bar). The indicator is controlled by two pressure switches electrically connected in parallel. To determine which system pressure is low, observe the dual air pressure gauge. In addition to illuminating the AIR PRESSURE LOW indicator, the pressure switches also energize a warning buzzer.

### *Speedometer*

The speedometer (4) is located on the upper left side of the front console above the steering wheel. The speedometer indicates road speed in both mph (miles per hour) and km/h (kilometers per hour). There is an odometer located at the bottom of the speedometer and shows total distance traveled.

### *Parking Brake Control*

**NOTE:** The park brake must be set before the outrigger controls will operate.

The parking brake control (12) is located on the right side of the front console. The control is a push-pull type air valve used to apply and release the parking brakes on all four rear wheels.

### *Park Brake On Indicator*

The PARK BRAKE ON indicator (29) is located at the top of the front console on the right side above the steering wheel. The indicator is a red light that lights when the crane parking brakes are applied. It is energized by a pressure switch on the parking brake valve. The pressure switch also controls the outrigger enable relay that permits operation of the outriggers.

### *Cross-Axle Differential Locked Indicator*

The cross-axle differential locked (CROSS AXLE LOCKED) indicator (26) is located at the top of the front console above the steering column. The amber indicator lights to show that the cross axle differential is locked.

**CAUTION**

Do not operate the cross axle differential lock or the inter-axle differential lock on dry roads.

### *Cross-Axle Differential Lock Control*

The CROSS-AXLE DIFFERENTIAL lock control (17) is located on the lower left side of the front console and is used to lock the right and left wheels in a tandem set. The cross-axle differential lock increases traction on slippery roads. It is a two position LOCK/UNLOCK lever actuated air valve.

**CAUTION**

Do not operate cross-axle differential lock while crane wheels are spinning or at speeds over approximately 10 mph (16 km/h). Release the throttle when locking or unlocking.

### *Inter-Axle Differential Lock Control*

The INTER-AXLE DIFFERENTIAL control (15) is located on the lower right side of the front console. In the LOCK position, both rear axles are locked together and turning at the same speed. In the UNLOCKED position, the axles operate independently of each other. The control is a lever actuated air valve.

| Item | Description |
|---|---|
| 1 | Work Lights |
| 2 | Windshield Wiper/Washer |
| 3 | Boom Telescope/Clamshell Control Pedal |
| 4 | Throttle Pedal |
| 5 | Bubble Level Indicator |
| 6 | Swing Pin Lock Control Lever |
| 7 | Seat Adjustment Lever |
| 8 | Boom Lift Control Lever |
| 9 | Main Hoist Control Lever |
| 10 | Main Hoist Speed Selector Switch |
| 11 | Hydraulic Boost Switch |
| 12 | Cab Dome Light |
| 13 | Fuse Panel |
| 14 | Beacon Light (Optional) |
| 15 | Fire Extinguisher |
| 16 | Auxiliary Hoist Speed Selector Switch (Optional) |
| 17 | Swing Brake Control Switch |
| 18 | Telescope or Auxiliary Hoist Control Lever |
| 19 | Swing Control Lever |
| 20 | Swing Horn Button |
| 21 | Skylight Wiper |
| 22 | Swing Brake Pedal |
| 23 | Cab Circulating Fan |
| 24 | Positive Swing Lock Control Pedal |
| 25 | Telescope/Clamshell Select Switch |

### *Regeneration Exhaust Filter Indicator*

The regeneration exhaust filter light (49) lights when the exhaust system has not been able to regenerate under normal operating conditions and is in need of assistance in order to perform an active regeneration. There are three progressive stages of need for regeneration indicated by this light: A) On solid: Regeneration should be done within two to six hours of operation. B) Flashing: Regeneration needs to be done in the next one to two hours. C): Flashing w/Engine Warning Light illuminated: Regenerate immediately.

An immediate regeneration must be done while the crane is parked. **IF IGNORED, THE ENGINE STOP INDICATOR WILL COME ON.** For the other conditions (2 to 6 hours or 1 to 2 hours), regenerate the exhaust system while parked, or change to a more challenging duty cycle, like highway driving, for about 20 minutes to get the exhaust system hot enough to regenerate properly. (Use the engine diagnostics/idle switch and the engine diagnostics/regeneration switch for regeneration.)

## Crane Controls and Indicators

### *Telescope or Auxiliary Hoist Control Lever*

The telescope or auxiliary hoist (TELE or AUX) control lever (18) is located on the left armrest. The lever controls the telescope functions when the crane is not equipped with an auxiliary hoist. Positioning the lever forward actuates the control valve to telescope the boom out and pulling the lever back actuates the boom to telescope in. When equipped with an auxiliary hoist, the lever controls auxiliary hoist functions and telescope functions are controlled through a foot pedal (3). Positioning the lever forward actuates the control valve to let out the hoist cable and pulling the lever back reels the cable in.

### *Swing Control Lever*

The SWING control lever (19), located on the left armrest, controls the swing function. The lever, when positioned forward (rotates the turntable clockwise) or back (rotates the turntable counterclockwise), actuates a control valve through hydraulic pilot pressure to provide 360 degree continuous rotation in the desired direction.

### *Boom Lift Control Lever*

The boom LIFT control lever (8) is located on the right armrest. The lever, when positioned forward (lowers the boom) or back (raises the boom), actuates the control valve through hydraulic pilot pressure to raise or lower the boom.

### *Main Hoist Control Lever*

The MAIN HOIST control lever (9) is located on the right armrest. The lever, when positioned forward (lowers the cable) or back (raises the cable), actuates the control valve through hydraulic pilot pressure to raise or lower the main hoist cable.

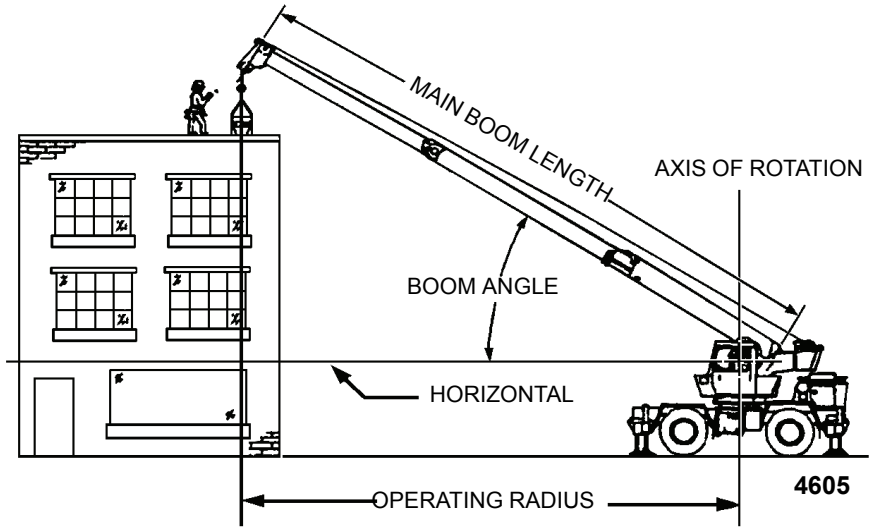
### *Swing Horn Switch*

The swing horn switch (20) is located on top of the swing controller and is used by the operator to provide a warning that the superstructure is rotating. Press down on the switch to sound the swing horn.

### *Telescope/Clamshell Selector Switch*

The telescope/clamshell select switch (25) is located on the righthand armrest controls.

Push on the top of the switch to select clamshell operation with the Telescope/Clamshell foot pedal. Push the bottom of the switch to use the foot pedal to telescope the boom.




**TERMS TO KNOW**

**FIGURE 3-4**

extended with swingaway extension. The number at the intersection of the left column and top row is the total load limit for that load radius and boom length. The number in parentheses below the total load limit is the required boom angle (in degrees) for that load. Boom lengths between increments should always be treated as if it were the next longer length. For example, if the actual boom length is 50 ft (15.2 m) and the chart shows boom lengths of 48 - 54 ft (14.6 - 16.4 m), use the load capacity shown in the 54 ft (16.4 m) column.

Another important section is the range diagram. The range diagram shows the operating radius and tip height that can be achieved at a given boom length and angle. If the operator knows the radius and tip height required for a specific lift, the angle and boom length can quickly be determined from the range diagram. Or if he knows the boom length and angle, he can quickly determine the tip height and operating radius.

A lifting diagram is included for over-side, over-rear, and over-front lifting areas. The lifting area diagram shows that the locations of the outrigger stabilizer cylinders in the full extended position are used to mark the boundaries of the lifting areas.

Another section contains notes for lifting capacities. Be sure to read and understand all notes concerning lifting capacities.

The load chart also gives weight reductions for Grove load handling devices such as hookblocks, headache balls, boom extension sections, etc, which must be considered as part of the load. The weight of any other load handling devices such as chains, slings, or spreader bars must also be added to the weight of the load.

**NOTE:** The information in the following paragraph is an example of how to compute a lift. The numbers used in the example may not coincide with the load chart in the crane cab.

Problem: A concrete beam weighing 5000 lbs (2268 kg) needs to be lifted to a height of 9.1 m (30 ft) at a radius of 50 ft (15.2 m) (maximum). The range diagram indicates the boom must be extended to 62 ft (18.9 m) in order to reach a height of 30 ft (9.1 m) at a radius of 50 ft (15.2 m).

First we need to check the crane for load handling devices. In our example, the crane is equipped with a auxiliary boom nose (rooster sheave) and a five ton headache ball. The rooster sheave is 110 lbs (50 kg), and the headache ball is 172 lbs (78 kg) for a total of 282 lbs (128 kg). The lift requires slings and spreader bars weighing 350 lbs (159 kg) which makes the total weight for the load handling devices 632 lbs (286 kg).

A check of the load chart for a 50 ft (15.2 m) radius and 64 ft (19.5 m) of boom length shows a capacity of 7940 lb (3601 kg) on outriggers over-front and 4970 lb on outriggers 360 degrees. We subtract the load handling weight of 632 lb from

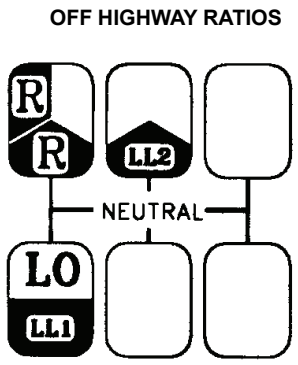



**FIGURE 3-8**

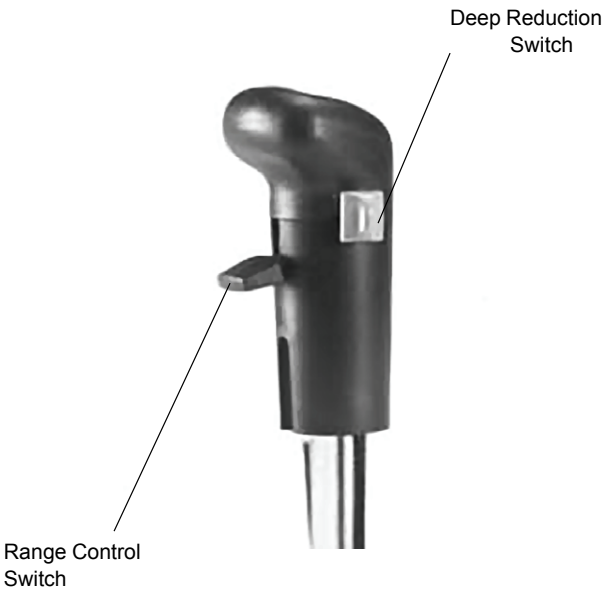



**FIGURE 3-9**

4. To shift in high range, proceed as follows.
   a. Move the shift lever, double clutching, to the next desired gear position in high range (5th to 6th to 7th to 8th).

**Downshifting**

**CAUTION**

Never move the deep reduction switch or range control switch with the shift lever in neutral while crane is moving.

1. To shift in high range, proceed as follows.
   a. Move the shift lever, double clutching, to the next desired gear position in high range (8th to 7th to 6th to 5th).
2. To shift from high (5th) to low (4th) range, proceed as follows.
   a. When in the 5th gear position for high range and ready for the next downshift, push the range control switch down to low range and move the shift lever, double clutching, to the next lower gear position. As the shift lever passes through neutral, the transmission will automatically shift from high range to low range.
3. To shift in low range, proceed as follows.
   a. Move the shift lever, double clutching, to the next desired gear position (4th to 3rd to 2nd to 1st).
4. To make a deep reduction switch shift from low range (1st) to low-low range (LL2), proceed as follows.
   a. Just before making the downshift, move the deep reduction switch forward to IN while maintaining foot throttle position.
   b. Immediately release the foot throttle pedal, depress the clutch pedal once to brake torque, release the pedal to engage the clutch, and depress the foot throttle pedal. The transmission shifts from 1st to LL2 when synchronous speed is reached.

**Shifting to Reverse**

**CAUTION**

Never make a range shift or deep reduction shift while moving in reverse.

1. With the transmission in neutral, determine which reverse range is to be used. Move the range control switch up for high reverse or down for low reverse.
2. Move the shift lever to the reverse position.

## DEAD-END RIGGING/WEDGE SOCKETS

Wedge socket assemblies are popular rigging accessories and have been successfully used for decades to terminate wire ropes on mobile cranes. A wedge socket assembly is easily installed and dismantled but it must be installed and used correctly. It is essential to use only a wedge and socket of the correct size for the rope fitted. Failure to do so may result in the rope pulling through the fitting.

Since state and local laws may vary, alternate attachment methods may be necessary depending upon work conditions. If alternate methods are selected, the user is responsible and should proceed in compliance with the regulations in force. If there are any questions, contact your local Grove distributor or Manitowoc Crane Care.

Do not mix components from different manufacturers. The selection, installation and use of a wedge socket assembly must be in accordance with the requirements of the wedge socket manufacturer and the wire rope manufacturer upon whose wire rope the wedge socket assembly will be used.

Manitowoc Cranes specifies the size, type, class and line pulls for wire rope, predominately rotation resistant wire rope, and rigging accessories such as overhaul balls and hook blocks for use with each new crane that it manufactures. Other wire ropes and rigging accessories are available from various vendors. Different wire rope manufacturers have differing requirements for the construction, handling, cutting, seizing, installation, termination, inspection and replacement of the wire ropes they produce. Their advice should be sought for each specific type of wire rope a crane user intends to install on a mobile crane.

When assembly is complete, raise the boom to a working position with a load suspended to firmly seat the wedge and rope into the socket before the crane is used operationally.

**CAUTION**

If the socket is not positioned with the flat face toward the boom sections, structural damage will occur.

When anchoring the socket to the boom (Figure 4-4), ensure the flat face of the socket is in position, as shown, toward the boom sections.

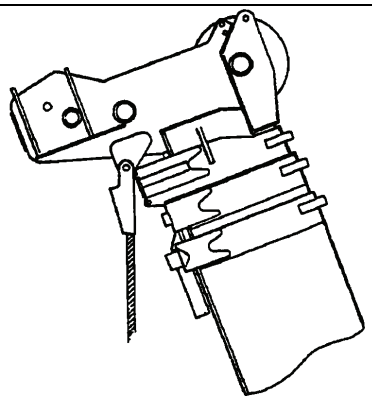


FIGURE 4-4

### Installing Wedge and Socket

1. Inspect the wedge and socket. Remove any rough edges and burrs.
2. The end of the wire rope should be seized using soft, or annealed wire or strand. If the end of the rope is welded, the welded end should be cut off. Do not weld on size 6X37 rope. This will allow the distortion of the rope strands, caused by the bend around the wedge, to adjust themselves at the end of the line. Refer to *Section 1 - Introduction* in the *Service Manual* for wire rope procedures.
3. Make sure the live-end (Figure 4-5) of the rope is directly in line with the ears of the socket and the direction of pull to which the rope will be subjected. If the rope is loaded into the socket incorrectly, under a load the rope will bend as it leaves the socket, and the edge of the socket will wear into the rope causing damage to the rope and eventual failure.

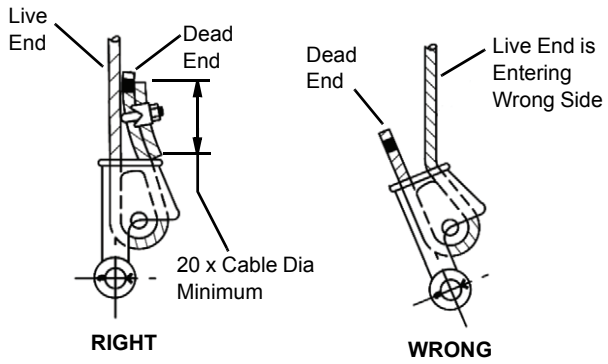



FIGURE 4-5

4. Insert the end of the wire rope into the socket, form a loop in the rope, and route the rope back through the

**25.** Route the hoist cable over the mast sheave, the rollers on the adapter, the roller on the fly extension, and the sheave on the extension tip. Install the cable retainer pins and clip pins.

**NOTE:** Do not reeve hoist cable through sheaves on the main boom nose.

**26.** Rig the hoist cable.

## Stowing

**NOTE:** The boom extension must be set at the zero (0) degree offset. Refer to *Setting the Folding Swingaway Offset*, page 4-18.

**NOTE:** If so equipped, the folding fly section must be stowed on the side of the base section.

**1.** Fully retract the boom and swing it over the rear.

**2.** Lower the boom to minimum elevation.

**3.** Remove the cable retainer pins and clip pins from the swingaway tip and mast assembly. Remove the hoist cable from the extension sheave and or mast. Install the cable retainer pins and clip pins.

**4.** Remove the mast assembly pin and clip pin securing the mast in the upright position. Lay the mast over to the stowed position and install the mast assembly pin and clip pin.

**5.** If erected, stow the extension fly section as follows:

**a.** Attach a length of rope to the fly extension tip.

**b.** Raise the boom to horizontal.

**c.** Remove the retainer clip and attachment pin from the anchor and attach fittings on the left side of the base section and stow in the base section.

**DANGER**

When stowing the extension fly, ensure that all personnel and equipment are kept clear of the swing path.

**d.** Slightly raise and/or lower the boom to help control the extension fly. Using the rope attached to the tip of the fly section, swing the fly to the side of the base section.

**e.** Elevate the boom and push in on the fly section to engage the spring loaded latch hook (see detail E) on the base section. Ensure the latch hook is properly engaged.

**f.** Lower the boom and remove the rope from the fly section.

**6.** Remove the pin and clip pin securing the boom extension alignment device in the stowed position. Pull the alignment device out to the working position and secure it in place with the pin and clip pin.

**7.** Lower the boom to minimum elevation.

**8.** Attach a length of rope to the base extension tip.

**9.** Raise the boom to horizontal.

**10.** Remove the retainer clips and attach pins from the anchor and attachment fittings on the left side of the boom nose and stow them in the base of the base extension.

**11.** Extend the boom enough so that the extension base and fly stowage lugs will line up in front of the guide ramps and pins on the stowage brackets when the swingaway is positioned to the side of the boom.

**DANGER**

When stowing the extension, ensure that all personnel and equipment are kept clear of the swing path.

**12.** Raise and/or lower the boom to help control the swingaway and using the rope attached to the tip of the base extension, swing the base extension to the side of the boom.

**13.** Elevate the boom and push in on the extension to align the stowage lugs on the extension with the guide ramps and pins on the stowage brackets and fully retract the boom.

**DANGER**

During disengagement of the stop block, extend the boom only enough to free the clock. extending the boom too far will cause the base extension to slide off the guide ramps and allow the extension to swing.

**14.** Lower the boom and extend the boom only enough to disengage the spring loaded boom stop block.

**15.** Pull down on the rubber hook to disengage the spring loaded boom extension stop block. Place the end of the rubber hook in the retainer plate. Fully retract the boom.

## LUBRICATION POINTS

A regular frequency of lubrication must be established for all lubrication points. Normally, this is based on component operating time. The most efficient method of keeping track of lube requirements is to maintain a job log indicating crane usage. The log must use the engine hourmeter to ensure coverage of lube points that will receive attention based on their readings. Other lubrication requirements must be made on a time basis, i.e. weekly, monthly, etc.

All oil levels are to be checked with the crane parked on a level surface in transport position, and while the oil is cold, unless otherwise specified.

On plug type check points, the oil levels are to be at the bottom edge of the check port.

On all hoists with a check plug in the drum, the fill plug shall be directly on top of the hoist, and the check plug level.

All grease fittings are SAE STANDARD unless otherwise indicated. Grease non-sealed fittings until grease is seen extruding from the fitting. A measure of 0.28 kg (1 oz) of EP-MPG equals one pump on a standard 0.45 kg (1 lb) grease gun.

Over lubrication on non-sealed fittings will not harm the fittings or components, but under lubrication will definitely lead to a shorter lifetime.

On sealed U-joints, care must be exercised to prevent rupturing seals. Fill only until expansion of the seals first becomes visible.

Unless otherwise indicated, items not equipped with grease fittings, such as linkages, pins, levers, etc., should be lubricated with oil once a week. Motor oil, applied sparingly, will provide the necessary lubrication and help prevent the formation of rust. An Anti-Seize compound may be used if rust has not formed, otherwise the component must be cleaned first.

Grease fittings that are worn and will not hold the grease gun, or those that have a stuck check ball, must be replaced.

Where wear pads are used, cycle the components and relubricate to ensure complete lubrication of the entire wear area.

**Table 5-1**

**Lube Symbol Chart**

| Symbol | Description |
|---|---|
| AFC | Antifreeze/Coolant - 50/50 Blended, Fully Formulated - SAE Grade J1941 |
| EO | Engine Oil - SAE 15W-40, API Service Classification CJ-4. (CI-4 for pre-2007 ISM engines) |
| EP-MPG | Extreme Pressure Multipurpose Grease - Lithium Soap Base, NLGI Grade 2. |
| SGL-5 | Synthetic Gear Lubricant - SAE Grade 50, API Gravity 23. |
| HYDO | Hydraulic Oil - Must meet John Deere Standard JDM-J20C, Allison C4, and ISO 4406 level. |
| SSGL-5 | Semi-Synthetic Gear Lubricant - SAE Grade 80W-90, API Service Designation GL-5. |
| ASC | Anti-Seize Compound - Military Specifications MIL-A-907E. |
| EP-OGL | Open Gear Lubricant - Fucs Ceplattyn 300 Spray, NLGI Class 1-2 |
| EPGL-5H | Extreme Pressure Gear Lubricant - SAE Grade 80W-140 |

**Table 5-2**
**Lube Description**

| Lubrication Description | Lube Specification |
|---|---|
| 50/50 Fully Formulated Anti-Freeze Coolant | 6829101130 |
| Engine Oil SAE 15W40, CJ4 | 6829104182 |
| Engine Oil SAE 15W40, CI4 | 6829003483 |
| Extreme Pressure Multi-Purpose Grease | 6829003477 |
| Synthetic Gear Lube | 6829013433 |
| Hydraulic Oil | 6829006444 |
| Semi-Synthetic Gear Lube | 6829012964 |