Chapter 6
Maintenance and Repair

Important  This section does not contain maintenance and repair instructions for the truck. Refer to the truck manufacturer's manual for instructions pertaining to the truck.

Safety

Prevent injury to personnel or damage to crane and property. Take the following precautions when making maintenance checks, adjustments, or repairs to crane.

- Apply truck parking brakes.
- Lower all loads to ground so wire rope is slack.
- Move all controls to OFF.
- Disengage Power Take-Off (PTO) and turn engine OFF.
- Attach CAUTION sign to start controls warning personnel that crane is being serviced and must not be started.
- Do not place hands or tools into any opening in boom sections while power is on or boom sections are moving.
- Do not perform maintenance, adjustment, or repair procedures unless authorized to do so. Make sure all applicable instructions have been read and are thoroughly understood.
- Do not check for hydraulic leaks with hands. Oil under pressure can penetrate human skin causing serious injury. Oil under pressure can be nearly invisible; therefore, check for hydraulic leaks with a piece of cardboard or wood.
- Hydraulic oil is flammable; do not check inside hydraulic tank with open flame.
- Do not alter specified flow and pressure settings. Higher than specified flow and pressure can cause damage to crane and hydraulic components. Lower than specified flows and pressures can result in loss of control.
- Do not weld or burn close to hydraulic lines and components without first placing a protective cover over them.
- Do not remove cylinders until working parts are resting on ground or are securely blocked from movement.
- Components are heavy. Do not attempt to lift them by hand; use a chain hoist, jacks, or blocking.
- Do not place crane back into service until all guards and covers have been securely replaced and all service equipment has been removed.
- Personnel getting on or off the crane must do so only while the truck is parked. Do not attempt to get on or off the crane while it is moving.
- This crane has a step and two grab handles for climbing on and off the pedestal from either side of the crane. Crane owner/user shall provide sturdy ladders for personnel to gain access to components that cannot be reached from the ground, operator platform or top of flatbed. Do not allow personnel to climb onto turret, winch, or top of boom; use a sturdy ladder to gain access to these locations.

Storing Components

Store new components, such as, valves, pumps, motors, cylinders, hoses, tubes and fittings in a clean, dry indoor location.

Do not unpack components or remove port plugs until the components are needed.

Once unpacked, carefully inspect each component for damage that may have occurred during shipping.

Fittings, hoses, and tubes that are not equipped with shipping caps or plugs must be carefully cleaned before they are used. Flush the fittings, hoses, and tubes with clean hydraulic oil. Then seal all openings until use at assembly.

Important  Do not use rags to plug openings. Use clean plastic shipping plugs and caps.
Labeling Components at Disassembly

Before disconnecting wires, hoses, or tubes, tag them for proper identification at reassembly.

Before removing a component, such as a pump, motor, or a valve, match-mark its mounting position with relation to the adjacent component.

Before disassembling any multiple section component, such as a pump, motor or a valve, match-mark the position of each section with relation to each other. Do not mix parts from one section with those from another; keep parts segregated.

Before removing shims, tie them together and identify their location.

Cleanliness

Before removing a component from the crane, thoroughly, clean the area around it to prevent dirt from entering the mating component or the hydraulic system. Cover all openings with plastic to prevent dirt and water from entering.

Carefully clean the area around fittings before disconnecting hoses and tubes. Install plastic plugs or caps on the ends of hoses and tubes and the mating ports of all components to prevent dirt and water from entering.

Disassemble components on a clean work bench that is free from dust, dirt, metal particles and other contaminants.

Use tools that are clean and in proper working order.

Clean metal parts in nonflammable safety solvent. Clean rubber parts in warm water and soap. Lubricate all parts with clean oil at assembly.

Torque Values

The torque values for fasteners that must be torqued to a specific value are identified in Table 6-1 and shown in Figure 6-2.

Loose or improperly torqued subframe mounting studs and slewing ring mounting bolts will cause studs or bolts to fail, possibly allowing crane to come off truck.

Important: Observe following precautions when installing fasteners; failing to do so will seriously weaken attachment.

- Make sure each fastener is of correct size length and grade. If in doubt, refer to Parts Manual for specifications.
- Do not interchange Grade-5 fasteners with Grade-8 fasteners and vice versa refer to Figure 6-1 for identification.
- Use Grade-8 nuts with Grade-8 bolts.
- Use hardened flat washers under head of screws and under each nut of bolts and studs.
- Make sure threads are clean and free of burrs.
- Torque fasteners to proper torque values. Semiannual Check, items 1-9, Table 6-1.
- Use a torque wrench that is properly calibrated. Check calibration of torque wrench on a regular basis.

Note: Use Grade-2 nuts with Grade-5 bolts. Grade-2 nuts do not have any grade marking.
### Table 6-1 Torque Values

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Fastener Size</th>
<th>Grade</th>
<th>Torque Ft·Lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pedestal Mounting Studs</td>
<td>1-8 UNC</td>
<td>5</td>
<td>440</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-1/8-7 UNC</td>
<td>8</td>
<td>960</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-1/4-7 UNC</td>
<td>8</td>
<td>1300</td>
</tr>
<tr>
<td>2</td>
<td>Stabilizer Mounting Studs</td>
<td>3/4-10 UNC</td>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-8 UNC</td>
<td>5</td>
<td>440</td>
</tr>
<tr>
<td>3</td>
<td>Slew Ring Mounting Bolts</td>
<td>5/8-11 UNC</td>
<td>9</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3/4-10 UNC</td>
<td>9</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7/8-9 UNC</td>
<td>9</td>
<td>400</td>
</tr>
<tr>
<td>4</td>
<td>Swing Reducer Mounting Screws</td>
<td>3/4-10 UNC</td>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3/4-10 UNC</td>
<td>8</td>
<td>280</td>
</tr>
<tr>
<td>5</td>
<td>Swing Motor Mounting Bolts</td>
<td>1/2-13 UNC</td>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td>Winch Mounting Bolts</td>
<td>5/8-11 UNC</td>
<td>5</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3/4-10 UNC</td>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>7</td>
<td>Telescope Manifold Mounting Screws</td>
<td>1/2-13 UNC</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>8</td>
<td>Winch Motor Mounting Screws</td>
<td>1/2-13 UNC</td>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td>9</td>
<td>Pump Mounting Screws</td>
<td>1/2-13 UNC</td>
<td>5</td>
<td>55</td>
</tr>
</tbody>
</table>

---

**Figure 6-1** Grade Markings

- Grade-6 Socket Head Bolt or Screw
- Grade-8 Nut 6 Radial lines
- Grade-5 Bolt or Screw 3 Diagonal lines in head
- Grade-8 Bolt or Screw 6 Diagonal lines in head

**Figure 6-2** Fastener Locations

1. Outer Ring
2. Inner Ring
3. Outer Ring
4. Inner Ring
5. 3 Outer Ring
6. 3 Inner Ring
7. 3 Outer Ring
8. 3 Inner Ring
9. 3 Outer Ring
Maintenance Checks

General
The following is a list of safety and preventive maintenance checks that should be made to maintain the safety, dependability and productivity built into the crane.

Inspection Intervals
The intervals given are provided as a guide only. Follow these intervals until adequate experience is gained to establish intervals that meet your operating conditions.

Any increase or decrease in the intervals should be preceded by a complete analysis of crane performance. Carefully study previous maintenance and repair records before making any changes in the intervals.

Records
Dated and signed records of all defects and repairs must be kept on file so future maintenance needs can be accurately forecast.

Repairs
Any hazardous or abnormal conditions found while making the maintenance checks must be corrected before the crane is placed back into service. All adjustments and repairs must be made by authorized personnel only.

Note Maintenance checks that require the engine to be running and the Power Take-Off (PTO) to be engaged are identified with a ✓.

CAUTION Take every precaution to prevent injury from moving parts when power is on.

Daily Checks
- Perform the daily lube services.
- Clean all debris and dirt from the crane.
- Check for fluid and air leaks.
- Verify all guards, covers, and platforms are securely in place.
- Inspect the crane for signs of damage.
- Inspect the wire rope for signs of wear and damage.
- Check the wire rope for proper spooling on the winch drum and reeving through all sheaves. Check that all sheaves turn freely.
- Make sure the load line is properly fastened to the load block or the overhaul ball.
- Check the load block or the overhaul ball whichever is being used, for loose or missing nuts, screws, and cotter pins.
- Check all slings and other loose gear to be used to make lifts are safe for operation.
- Inspect the hook latch for proper operation.
- Check that the Capacity Chart is present at each control station.
- Perform all daily inspections according to the prime mover and PTO manufacturers’ specifications.

✓ Test the anti-two-block/overload warning horn.
  - Start the truck engine and engage the PTO.
  - Lift the anti-two-block weight by hand so the chain is slack.
  - The warning horn should sound and the Winch Up and Telescope Out functions should be inoperable. For cranes equipped with shutdown, the Boom Down will also be inoperable.
  - Release the weight so it hangs freely. The warning horn should go off and all crane functions should be operable.

✓ Test the overload warning system.
  - Identify a known load and a near overload radius for the load from the capacity chart. Lift and luff the load to the determined radius. The overload warning horn and shutoff device should sound. The Boom Down, Winch Up and Telescope Out functions should be inoperable. Refer to PAT LMI Operator Handbook for further instructions.

Note The crane may simulate an overload condition when the boom is raised to 80° and hydraulic pressure is allowed to build on the extend side of the hydraulic cylinder. To lower the boom from this position, do the following.
1. Press the override button and lower the boom. The warning buzzer will stop sounding once the boom has
lowered a few degrees.
2. Release the override button and continue to lower the boom to the desired angle.

- Test the Load Moment Indicator (LMI).
- Refer to Pre-Operation Inspections section in the PAT LMI System Operator’s Handbook for daily check routine to be performed. The PAT LMI Operator’s Handbook is issued in the same package as this manual.
- Check for proper operation of the engine and PTO.
- Check for proper operation of all accessory devices such as horn, start/stop switch and so forth.
- Check for proper operation of each crane function in response to control lever movements.

**Note**  All crane controls, when set to Off or returned to the Neutral position, must bring the crane function to a complete stop and maintain its position.

- Remove all rust, corrosion, and dirt from the oil cooler core to ensure proper heat transfer. Steam clean the core, if necessary.

**Note**  The oil cooler fan comes on only when the temperature of the hydraulic oil rises to 120°F.

**Weekly Checks**
- Perform the daily and weekly lube services.
- Perform the daily inspection checks.
- Check all mechanical control linkage for excessive wear and binding; oil the linkage as required.
- Clean the vent plug on the winch.
- Check for missing bolts, pins, keeper plates, retaining rings, and cotter pins.
- Check the winch drum and all sheaves for excessive wear, cracks or other damage.
- Check the boom angle indicators and readout on the LMI, if equipped, for accuracy over the full range of boom elevation.
- Check LMI. Refer to separate PAT LMI Operator’s Handbook weekly check routine to be performed.

**Monthly Checks**
- Perform the daily, weekly and monthly lube services.
- Perform the daily and weekly maintenance checks.
- Check the boom and all structural components of the crane for deformed, cracked or corroded members. Pay close attention to all welds.
- Clean, prime and paint any rusted surfaces.
- Thoroughly inspect the wire rope for damage.
- Check that the hook and hook housing on the load block and the swivel on the overhaul ball rotate freely without excessive play. Faulty operation indicates faulty bearings or inadequate lubrication.
- Check the load block or the overhaul ball for signs of overloading; spread side plates, elongated holes, bent or elongated tie bolts, and cracks.
- Check the gap between the shank and the barrel of the swivel on the overhaul ball. The gap must not exceed 1/16-inch.
- Carefully check the hook on the load block or the overhaul ball for signs of distortion or cracks.

**Important**  Hooks are to be discarded if cracks exist or if throat opening is 15 percent more than original throat opening. Hooks should also be discarded if bent or twisted more than 10° from plane of normal configuration.
- Check that the wire rope clip is tight at the dead end wedge socket.
- Inspect all electrical wiring and devices for malfunctioning, signs of deterioration, and dirt or moisture accumu-
- Inspect all hydraulic hoses and tubes for the following.
  - Evidence of excessive scrubbing or abrasion on the outer surface of hoses, tubing, and fittings.
  - Dented, kinked or cracked tubing.
  - Evidence of leakage at the surface of hoses caused by blistering or abnormal deformation of the outer cover.
  - Leakage at threaded, clamped or welded connections.
- Check the hydraulic pumps and motors for the following.
  - Loose bolts or fasteners.
  - Leaks at joints between sections.
  - Shaft seal leaks.
- Unusual noise and vibration.
- Loss of operating speed or pressure.
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- ✔ Excessive heating of the oil.
- Check the hydraulic valves for the following.
  - Cracks in the valve housings.
  - Leaks at the spools or between the sections.
  - Sticking spools.
- Check the hydraulic cylinders for the following.
  - Drift caused by internal leakage.
  - Rod seal leakage.
  - Leaks at welded joints.
  - Scored, nicked or dented cylinder rods.
  - Dented case (barrel).
  - Loose or deformed rod eyes or connecting joints.
- Check that all nameplates and safety decals are readable and securely attached at the proper locations on the crane.
- Check all control levers for proper adjustment.
- ✔ Check the foot throttle settings for the proper engine speed.

Semiannual Checks
- Perform the daily, weekly, monthly and semiannual lube services.
- Perform the daily, weekly, and monthly maintenance checks.
- Tighten all fasteners on the crane. Tighten those fasteners that require torquing to the specified value, including slewing ring bolts.
- ✔ Check the adjustment of the crowd rope system in the boom.
- ✔ Check the boom slider pads for wear and proper adjustment.
- ✔ Check relief valve settings for all crane functions, refer to Hydraulic Schematic.

Annual Checks
- Perform all lube services.
- Perform the daily, weekly, monthly and semiannual maintenance checks.
- Check each hook for cracks using a nondestructive test.
- ✔ Check the Foot Air Throttle controller for correct settings, operating performance and leakage. Replace rubber and all worn parts as necessary.

Wire Rope Maintenance

Lubrication
New wire rope is lubricated during manufacturing, however, this lubrication is adequate only for initial storage and the early stages of operation. The wire rope must be lubricated at regular intervals to prevent the damaging effects of corrosion and to reduce wear.

The lubrication interval and the type of lubricant to be used depend on the type of wire rope, the severity of duty and the type of corrosive elements the wire rope is subjected to, therefore, contact the nearest wire rope dealer for lubrication recommendations.

The wire rope must be properly protected at all times. The gaps between the strands and wires must be filled with lubricant to provide a complete seal. Use one of the methods shown in Figure 6-3 to lubricate the wire rope. For maximum penetration, the lubricant should be applied where the wire rope opens up as it travels around a sheave or winds onto the drum.
The wire rope must be clean and dry before applying the lubricant. An air jet, steam, and a wire brush are some suggested cleaning methods.

**Inspection**

It is impossible to predict when a wire rope will break, however, regular careful inspection will indicate when the potential for breakage exists.

The wire rope needs to be visually inspected each work shift for obvious signs of gross damage by a qualified person. Each month, the entire length of wire rope must be thoroughly and carefully inspected by a qualified person. This interval also applies to any rope being placed into service that has been idle for one month or longer.

A dated and signed report of the wire rope's condition at each inspection interval must be kept on file at all times. The data from these reports can then be used to determine when the wire rope needs to be replaced.

When inspecting the wire rope, pay particular attention to the condition of the wire rope in the following areas.

- **Pick-Up Points**—sections of wire rope that are repeatedly stressed during each lift, such as those sections in contact with sheaves.
- **End Attachments**—the point where a fitting is attached to the wire rope or the point where the wire rope is attached to the drum.
- **Abuse Points**—points where the wire rope is subjected to abnormal scuffing and scraping.

**Replacement**

No precise rules can be given for determining when to replace a wire rope. Wire rope replacement depends upon the good judgment of the qualified person making the inspection and the comparison of the data recorded on previous inspection reports. Any deterioration resulting in an appreciable loss of wire rope strength is sufficient cause for removing the wire rope from service.

Guidelines for replacement are listed in the following paragraphs.

- Six randomly distributed broken outer wires in one rope lay length or three broken outside wires in one strand of one rope lay length. Refer to Figure 6-4.
- One broken outside wire at the point the wire contacts the core. The broken wire will have worked its way out of the rope structure and either protrude or loop out from the rope structure. Additional inspection of this area of the wire rope is required to determine if there is core damage.

- Wear of one-third the original diameter of outside wires.
- Kinking, crushing, bird-caging, core protrusion or any other damage resulting in distortion of the rope structure.
- Evidence of heat damage from any cause.
- Reductions from the nominal diameter of more than the following limits.
  - 1/64-inch for rope diameters through 5/16-inch.
  - 1/32-inch for rope diameters 3/8-inch through 1/2-inch.
  - 3/64-inch for rope diameters 9/16-inch through 3/4-inch.
  - 1/16-inch for rope diameters 7/8-inch through 1-1/8-inch.
  - 3/32-inch for rope diameters 1-1/4-inch through 1-1/2-inch.

**Note** Measure the wire rope diameter only across the crowns of the strands so the true diameter is measured as shown in Figure 6-5.

- Core failure. This type of damage is usually indicated by a reduction in the nominal diameter or by an increase in rope lay length. When a reduction in diameter or an increase in rope lay length is noted, open up the
wire rope as shown in Figure 6-6 and carefully inspect the core. The wire rope should be replaced if any wires in the core are broken.

- Severe corrosion.

**Sheave and Drum Inspection**

Proper operation of the sheaves and the winch drum has a direct affect on wire rope wear; therefore, the sheaves and winch drum must be inspected monthly for the following defects.

- Check the depth, width, and contour of each sheave using a groove gauge as shown in Figure 6-7. Replace sheaves that have over or undersized grooves.
- Replace the winch drum or any sheave that has broken or cracked flanges.
- Check that the winch drum and all sheaves turn true on the shafts. If the drum or any sheave has a wobble to it, replace the bearings.

**Replacing Hydraulic Filter Element**

Refer to Figure 6-8.

Replace the filter element when the pressure gauge on the head reads 25 psi with the engine at high idle and the oil warm from operation.

*Note* The filter has a 25 psi bypass that opens when the element is plugged with dirt.

*Important* Do not operate crane when filter is bypassing oil (gauge reads 25 psi); otherwise, unfiltered oil will be drawn into system and faulty operation or damage to parts will occur.

- Stop engine.
- Remove and discard the old element.
- Wipe clean the base of the filter head.
- Apply clean oil to the gasket on the new element.
- Thread the new element onto the head until the gasket contacts the head. Hand tighten the element an additional 3/8-1/2 turn. Do not use a wrench to tighten element.
- Check the element for leaks during operation. If necessary, tighten the element until the leak stops.

**Replacing Hydraulic Tank Breather**

*Note* If equipped with a spin-on breather, replace it at least once every three months. Do not attempt to clean and reuse the breather.

- Remove and discard the old breather.
- It is not necessary to apply thread sealant to the threads of the breather. Install the new breather hand tight; do not tighten with a wrench.
Changing Oil

Drain and refill the hydraulic system every six months unless an alternate interval has been established by an oil analysis program.

- Operate the crane until the oil is at its normal operating temperature. This step will help prevent impurities from settling in the system.
- Move all controls to OFF and stop engine.
- Remove the drain plug from the bottom of the tank to drain the oil, see Figure 6-8.

*Note* Crack open one of the hydraulic fittings in a line at the high point of the system. This step will vent the system so that all of the oil drains out. Tightly close fitting once oil has drained.

- Thoroughly clean all dirt from the access cover on the tank and remove the access cover.
- Clean out any sediment from inside the tank.
- If equipped, remove and clean the suction strainer. Soak in solvent and blow out with compressed air. Securely replace the strainer.
- Replace the cover on the hydraulic tank. Replace gasket if necessary.
- Replace the filter element
- Replace the spin on breather, if equipped, otherwise, soak the fill cap breather in solvent and blow it clean with compressed air.
- Clean any metal particles from the drain plug. Replace and securely tighten the drain plug.

*Note* If a new pump or motor has been installed, fill all ports with clean oil before connecting any lines. This step will provide initial lubrication of the unit.

- Fill the hydraulic tank to the proper level with approved hydraulic oil, see Lubrication Section.

*Important* Filter new oil through a 25-micron element when filling tank.

- Connect and securely tighten any hydraulic lines that are disconnected.
- Open suction line shut-off valve before starting engine or engaging PTO; otherwise, the pump will cavitate and be ruined. See Figure 6-8.
- Start the engine, engage the PTO, and operate the pump for at least two minutes with no load at lowest possible rpm. During this priming period, the pump should run smoothly and not develop excessive heat.
- Gradually increase speed and operate all functions (cylinders and motors) to purge all air from the system. Operation will be sluggish or erratic until all air is purged.
- Once the functions are operating smoothly, speed and loading can be increased to normal.
- Stop the engine.
- Fill the hydraulic tank to the proper level.

*Important* If hydraulic system is extremely dirty (gum or lacquer formation on parts indicated by jerky, sluggish, or erratic operation) repeat Changing Oil procedure after next 48 hours of operation.

Adjusting Levels

Check the adjustment of the bubble levels on the control consoles every month using the following procedure.

- Extend all outriggers and stabilizers so the crane is level according to the bubble level at either control console.
- Raise the boom to the maximum angle of 80° and fully retract the boom.
- Place an accurate carpenter's level on either side of the turret, see Figure 6-9. Do not lay the level across the top of the bolts.
- Adjust the outriggers and stabilizers so the crane is level from front to rear according to the carpenter's level.
- Swing the boom 90° over either side of the truck and adjust the outriggers and stabilizers so the crane is level from side to side according to the carpenter's level.
- Repeat Adjusting Levels procedure until the crane is level with all tires off the ground.
- Check the bubble level at each control console. If necessary, adjust the levels as follows.

*Note* Verify the spring washer is installed correctly. The cone shaped washer should be installed with the large diameter bearing against the bubble level. If not installed correctly, the spring will not spring back into shape when the fasteners are loosened.

Figure 6-9  Carpenter Level

Figure 6-10  Control Console Level
Loosen adjusting screws, see Figure 6-10, until spring under level is no longer compressed.
Preload spring by tightening adjusting screws evenly. Do not overtighten as this will cause loss of adjustment range.
Turn adjusting screws until the bubble is centered in the circle.

Boom Service

Recommended Boom/Slider Pad Break In
Frequent lubrication of the top rear boom slider pads and bottom plate of the powered boom sections is required during machine break in to prevent boom chatter and slider pad damage. As the slider pads seat against the boom shims and sliding surfaces, it is important to check all related slider pad fasteners for proper torque on regular intervals.

Note  Loctite-242 or equal thread lock is used on all of the top rear and most of the bottom forward slider pad fasteners. If loose hardware is found, reaplication of thread lock is required. Follow manufacture's recommendations to ensure best results.

Frequency of lubrication and duration of break in period will vary depending on use. In normal use, the boom slider pads should be lubed daily for the first two weeks and at least once a week after that. More frequent lubrication will be required on job sites requiring frequent extension and retraction of the boom. Chattering or jerking of the boom indicates more frequent lubrication is required. Lubrication intervals will become less frequent as the unit breaks in. The duration of the break in period is approximately 2-3 months.

Inspection and Lubrication

Bottom forward and side pads:
With the crane properly set up on outriggers and leveled, fully extend the boom over rear of the unit and lower the boom point to the ground while insuring the hook is kept close to the ground while lowering. Apply extreme pressure (EP) chassis lube lubrication to the sliding surfaces of the powered sections. MBT recommends using a 2"-3" nap roller to apply a thin film of lubrication. Refer to figure 6-13.

Inspection and lubrication of internal lube points in the boom can be performed at this time as well. Consult the operator's manual for table of lubrication points.

Use the boom hoist function to raise the boom to 65-75° and fully retract the boom. Retracting the boom from low boom angles will scrub the lubrication from the powered sections.

Top Rear Pads:

Do not place hands or tools into openings in boom sections until engine or prime mover is shut OFF. Keep arms, hands, and fingers away from moving boom components. Ensure the prime mover is shutdown when servicing the boom. Serious injury will result if boom is telescoped while hands are in openings.

With the boom in the boom rest, remove the inspection cover from the top of the boom base. There are up to four sets of top rear slider pads. Inspect each slider pad for loose hardware and shims. Apply a ½" thick coating of extreme pressure grease to the pads of each section with a spatula or similar tool. The boom will have to be extended slowly to bring each set of slider pads into view in the access area for inspection and lubrication. Refer to figure 6-12.

Raise the boom to 65-75° and fully extend the boom to carry lubrication up inside the powered sections.
**Slider Pad Adjustment/Replacement**

Refer to the Boom Assembly drawings in the crane’s Parts Manual for identification of slider pads and shims used with the crane being serviced.

Shims are matched to slider pads and are not interchangeable. It is possible to have more shims on one side of the boom than on the other side, as long as the boom is straight. Shims come in three thicknesses.

- 0.0478-inch (3/64-inch) (18 ga)
- 0.0747-inch (5/64-inch) (14 ga)
- 0.1345-inch (9/64-inch) (10 ga)

Some procedures or steps may be different, depending on the number of boom sections. When there is a difference, the steps will be noted.

Disregard the references to section numbers, such as fourth and fifth, if they don’t apply to the boom being serviced.

**Table 6-2**

<table>
<thead>
<tr>
<th>Size and Description</th>
<th>Where Used</th>
<th>New Thickness</th>
<th>Replace Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5”x3” Pad</td>
<td>2-Hole</td>
<td>Front Bottom: Crowd</td>
<td>3/8 Inch</td>
</tr>
<tr>
<td>5-Inch Pad</td>
<td>2-Hole with Threaded Insert</td>
<td>Front Side: All Rear Side: Crowd</td>
<td>3/8 Inch</td>
</tr>
<tr>
<td>5-Inch Pad</td>
<td>2-Hole</td>
<td>Front Side: Crowd</td>
<td>3/8 Inch</td>
</tr>
<tr>
<td>7-Inch Pad</td>
<td>2-Hole with Threaded Insert</td>
<td>Rear Side (except Crowd) &amp; Extend Sheave Bracket</td>
<td>1/2 Inch</td>
</tr>
<tr>
<td>7-Inch Pad</td>
<td>3-Hole</td>
<td>Front Bottom &amp; Top Rear</td>
<td>1/2 Inch</td>
</tr>
<tr>
<td>9-Inch Pad</td>
<td>2-Hole with Threaded Insert</td>
<td>Front Bottom</td>
<td>1/2 Inch</td>
</tr>
<tr>
<td>9-Inch Pad</td>
<td>3-Hole</td>
<td>Rear Top &amp; Front Bottom</td>
<td>1/2 Inch</td>
</tr>
<tr>
<td>11-Inch Pad</td>
<td>3-Hole</td>
<td>Rear Top &amp; Rear Bottom</td>
<td>1/2 Inch</td>
</tr>
</tbody>
</table>

Visual verification of pad size used is required; different models may require different pads. Table is for reference only. Refer to Boom Assembly drawings in Parts Manual before ordering parts for boom being serviced.
Rear Top Slider Pads

Refer to Figures 6-11 and 6-12.

- Remove the access cover from the rear of the boom base.
- Retract the boom so rear top slider pads on the last section line up with the access holes in the rear of the boom.
- Stop engine.

**DANGER**

Do not place hands or tools into holes in boom sections until engine is OFF. Serious injury will result if boom is telescoped while hands or tools are in holes.

- Measure the thickness of the slider pads. Replace both slider pads if either has worn to the dimension given in Table 6-2.
- Measure the clearance between rear top slider pads and the adjacent section.
- If necessary, loosen the mounting screws and add shims under the slider pads to provide the clearance given in Figure 6-11.
- Securely tighten the mounting screws to the torque specifications on the appropriate boom assembly drawing after the shims are installed.
- Repeat procedure for each section.
Front Side Slider Pads
Refer to Figure 6-11 and 6-13.

Note Rear side slider pads can only be replaced and adjusted when the boom is disassembled.

**DANGER** Do not place hands or tools between boom sections until engine is OFF. Serious injury will result if boom is telescoped while hands or tools are between sections.

- Extend the boom approximately six inches.
- Stop engine.
- Measure the thickness of front side slider pads. Replace all of the front side slider pads for the respective section if any front side slider pad has worn down to the thickness given in Table 6-2.
- Fully extend the boom and stop engine.
- Adjust the sections from side to side so the boom is as straight as possible. If necessary, add shims behind the front side slider pads to keep the boom straight.
- Securely tighten the mounting screws to the torque specifications on the appropriate boom assembly drawing after the shims are installed.

**Important** End of mounting screws for front side slider pads must not rub against adjacent section. If necessary, install washers under head of mounting screws so screws fully engage nuts in slider pads, but do not rub against section.

Front Bottom Slider Pads
See Figure 6-11 and 6-13.

- Extend the boom approximately eight inches.
- Stop engine.

**DANGER** Do not place hands or tools between boom sections until engine is OFF. Serious injury will result if boom is telescoped while hands or tools are between sections.

- Measure the thickness of front bottom slider pads. Replace both front slider pads for the respective section if either slider pad has worn to the dimension given in Table 6-2.

Note It will be necessary to lift the ends of the sections with a hoist to remove and adjust the front bottom slider pad. Front bottom slider pads are fastened to mounting pads, therefore, the mounting pads must be removed to gain access to the slider pads. On four- and five-section booms, be sure to readjust extend and retract ropes after replacing the mounting pads between the first and second sections.

- Measure the clearance between the sections. If necessary, add shims under the front bottom slider pads to provide the clearance given in Figure 6-11.
- Securely tighten the mounting screws to the torque specifications on the appropriate boom assembly drawing after the shims are installed.

Crowd Rope Adjustment

General
When numbers in parentheses are used to identify the ropes being adjusted, they are the same item numbers used in the bill of material list on the Boom Assembly drawings.

Table 6-3 is used to determine the number of turns for the adjusting nut required to move the boom section 1/8 inch. For example, if the rope being adjusted has an adjusting nut of 7/8 inch, then 3-1/2 turns will move the section 1/8 inch.

### Table 6-3 Crowd Rope Adjustment

<table>
<thead>
<tr>
<th>Adjusting Nut Size</th>
<th>Number of Turns</th>
<th>Distance Section Moves</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8 Inch</td>
<td>2-3/4</td>
<td>1/8 Inch</td>
</tr>
<tr>
<td>7/8 Inch</td>
<td>3-1/2</td>
<td>1/8 Inch</td>
</tr>
<tr>
<td>1 Inch</td>
<td>2</td>
<td>1/8 Inch</td>
</tr>
<tr>
<td>1-1/4 Inch</td>
<td>1-3/4</td>
<td>1/8 Inch</td>
</tr>
<tr>
<td>1-1/2 Inch</td>
<td>1-1/2</td>
<td>1/8 Inch</td>
</tr>
</tbody>
</table>

Note Extend and retract ropes have wrench flats to hold the ropes stationary while tightening the nuts.
Three-Section Boom

Refer to Figure 6-14.

1. Check that the adjusting nuts and the locking nuts are loose on the extend and retract ropes.
2. Fully retract the boom. Ensure the second section has stopped against the first. If necessary, push against the end of the second section to further ensure the boom is fully retracted.
3. Put a match-mark on the side of the first section flush with the end of the base section; this will be match-mark A. Put a match-mark on the side of the second section flush with the end of the first section; this will be match-mark B.
4. Fully extend the boom and stop engine.

5. Tighten the adjusting nut on each extend rope until the distance from the end of each extend rope to the edge of each nut is 3/4-inch.

   Do not place hands or tools into any opening in boom sections while power is on or boom sections are moving.

6. Visually inspect the extend rope tension through the sight hole in the side of the boom section. Tighten the adjusting nut on the loosest rope until all extend ropes are tensioned equally.
7. Torque the adjusting nut on both retract ropes to 30-35 ft/lb.
8. Fully retract the boom while watching the end of the sections; note which section stops first.
9. Extend the boom approximately six inches and repeat previous step as slowly as possible. Release the telescope control lever to OFF as soon as the corresponding sections stops.
10. Determine the remaining stroke to fully retract the boom.
   A. If the second section stopped first, measure the remaining stroke between match-mark A on the first section and the end of the base section.
   B. If the first section stopped first, measure the remaining stroke between match-mark B on the second section and the end of the first section.
11. If the remaining stroke is greater than 1/8-inch proceed as follows.

   Important Refer to Table 6-3 for number of turns required for each type of rope.
   A. If the second section stopped first.
      1. Loosen the adjusting nut on the retract ropes the correct number of turns for each 1/8 inch of remaining stroke.
      2. Tighten the adjusting nut on the extend ropes the correct number of turns for each 1/8 inch of remaining stroke.
   B. If the first section stopped first.
      1. Loosen the adjusting nut on the extend ropes the correct number of turns for each 1/8 inch of remaining stroke.
      2. Tighten the adjusting nut on the retract ropes the correct number of turns for each 1/8 inch of remaining stroke.
   C. Repeat previous steps until the remaining stroke is 1/8 inch or less.
12. Re-check the torque of retract ropes.
13. Replace all lock nuts and securely tighten.

**Four-Section Boom**

Refer to Figure 6-15.

1. Remove the access cover from the top of the boom section at rear.

   **DANGER**

   Do not place hands or tools into any opening in boom sections while power is on or boom sections are moving.

2. Loosen the adjusting nut and the lock nut on each extend rope (28 and 29) and on retract ropes (33) so the ropes are slack.
3. Visually inspect the extend rope tension (30 and 31) through the sight hole in the side of the first section. Remove the lock nuts and tighten the adjusting nut on the loosest rope until both ropes are tensioned equally.

   **Important** If lock nuts are not removed in this step, damage to nuts or base section will result when boom is retracted later.

4. Tighten the adjusting nut on each retract rope (32) until the distance from the end of each rope to the outside edge of the adjusting nut is one inch.
5. Fully retract the boom.
6. Put a match-mark on the side of the first section flush with the end of the base section; this will be match-mark A. Put a match-mark on the side of the second section flush with the end of the first section; this will be match-mark B. Put a match-mark on the side of the third section flush with the end of the second; this will be match-mark C.

7. Extend the boom until ropes are accessible through cut-out on top of boom, see Figure 6-15, and stop engine. Tighten the adjusting nut on each extend rope (28 through 31) until the distance from the end of each rope to the outside edge of the adjusting nut is 3/4 inch.
8. Fully extend the boom and stop engine.
9. Visually inspect the extend rope tension (30 and 31) through the sight hole in the side of the boom section. Tighten the adjusting nut on the loosest rope until both ropes are tensioned equally.
10. Torque the adjusting nut on both retract ropes (33) to 30-35 ft/lb.
11. Fully retract the boom while watching the third and second sections, note whether the third section stops before match-mark B aligns itself with the end of the first section.
12. Extend the boom approximately six inches and repeat previous step as slowly as possible. Release the telescope lever to OFF as soon as the third section stops or as soon as match-mark B is aligned, whichever occurs first.
13. Determine the remaining stroke to fully retract the boom, as follows.
   A. If the third section stopped first, measure the remaining stroke between match-mark B on the second section and the end of the first section.
   B. If match-mark B aligned itself first, measure the remaining stroke between the third and second sections at location C.
14. If the remaining stroke is greater than 1/8-inch, proceed as follows.
   **Important** Refer to Table 6-3 for number of turns required for each type of rope.
   A. Extend the boom until ropes are accessible through cut-out on top of boom, see Figure 6-15, and stop engine.
   B. If the third section stopped first.
      1. Loosen the adjusting nut on each retract rope (33) the correct number of turns for each 1/8 inch of remaining stroke.
      2. Tighten the adjusting nut on each extend rope (30 and 31) the correct number of turns for each 1/8 inch of remaining stroke.
   C. If match-mark B aligned first.
      1. Loosen the adjusting nut on each extend rope (30 and 31) the correct number of turns for each 1/8 inch of remaining stroke.
      2. Tighten the adjusting nut on each retract rope (33) the correct number of turns for each 1/8 inch of remaining stroke.
   D. Repeat previous steps until the remaining stroke is 1/8 inch or less.
15. Recheck the torque of the adjusting nut for retract ropes (33).
16. Extend the boom until ropes are accessible through cut-out on top of boom, see Figure 6-15, and stop engine.
   Looking through the holes in the boom section, visually check the tension of extend ropes (28 and 29). Tighten the adjusting nut on the loosest ropes until all four ropes are tensioned equally.
17. Torque the adjusting nut on each retract rope (32) to 30-35 ft/lb.
18. Fully retract the boom while watching the second and first sections, note which section stops first.
19. Extend the boom approximately six inches and repeat previous step as slowly as possible. Release the telescope control lever to OFF as soon as the corresponding section stops.
20. Determine the remaining stroke to fully retract the boom as follows.
   A. If the second section stopped first, measure the remaining stroke between match-mark A on the first section and the end of the base section.
   B. If the first section stopped first, measure the remaining stroke between match-mark B on the second section and the end of the first section.
21. If the remaining stroke is greater than 1/8 inch, proceed as follows.
   **Important** Refer to Table 6-3 for number of turns required for each type of rope.
   A. Extend the boom approximately eight feet and stop engine.
   B. If the second section stopped first.
      1. Loosen the adjusting nut on each retract rope (32) the correct number of turns for each 1/8 inch of remaining stroke.
      2. Tighten the adjusting nut on each extend rope (28 and 29) the correct number of turns for each 1/8 inch of remaining stroke.
   C. If the first section stopped first.
      1. Loosen the adjusting nut on each extend rope (28 and 29) the correct number of turns for each 1/8 inch of remaining stroke.
      2. Tighten the adjusting nut on each retract rope (32) the correct number of turns for each 1/8 inch of remaining stroke.
   D. Repeat previous steps until the remaining stroke is 1/8 inch or less.
22. Recheck the torque of the adjusting nut for retract ropes (32).
23. Replace all lock nuts and securely tighten.
24. Cycle the boom two or three more times and check that all boom sections are properly synchronized per the above instructions. If not, check which sections require readjustment and perform the proper adjustment procedure for those sections.
25. Repeat until the boom is properly synchronized.
26. Recheck the torque of the adjusting nut for each retract rope (32 and 33).
27. Replace the access cover on the base section.

**Five-Section Boom**
Refer to Figure 6-16.

1. Remove the access covers from the top and rear of the base section.

   **DANGER** Do not place hands or tools into any opening in boom sections while power is on or boom sections are moving.

2. Loosen the adjusting nut and the lock nut on each extend rope (28 and 29) and on retract ropes (33) so the ropes are slack.

3. Visually inspect the extend rope tension (30 and 31) through the sight hole in the side of the boom section. Remove the lock nuts and tighten the adjusting nut on the loosest rope until both ropes are tensioned equally. **Important** If lock nuts are not removed in this step, damage to nuts or first section will result when boom is retracted later.

4. Tighten the adjusting nut on each retract rope (32) until the distance from the end of each rope to the outside edge of the adjusting nut is one inch.

5. Fully retract the boom.

6. Put a match-mark on the side of the second section flush with the end of the first section; this is match-mark A. Put a match-mark on the side of the third section flush with the end of the second section; this is match-mark B. Put a match-mark on the side of the fourth section flush with the end of the third section; this is match-mark C. Put a match-mark on the side of the first section flush with the end of the base section; this is match-mark D.

7. Extend the boom until ropes are accessible through cut-out on top of boom, see Figure 6-16, and stop engine. Tighten the adjusting nut on each extend rope (28 through 31) until the distance from the end of each rope to the outside edge of the adjusting nut is 3/4 inch.

8. Fully extend the boom and stop engine.

9. Visually inspect the extend rope tension (30 and 31) through the sight hole in the side of the boom section. Tighten the adjusting nut on the loosest rope until both ropes are tensioned equally.

10. Torque the adjusting nut on both retract ropes (33) to 30-35 ft/lb.

11. Fully retract the boom while watching the fourth and third sections, note whether the fourth section stops before match-mark B aligns itself with the end of the second section.

12. Extend the boom approximately six inches and repeat previous step as slowly as possible. Release the telescope lever to OFF as soon as the fourth section stops or as soon as match-mark B is aligned, whichever occurs first.
13. Determine the remaining stroke to fully retract the boom, as follows.
   A. If the fourth section stopped first, measure the remaining stroke between match-mark B on the third section and the end of the second section.
   B. If match-mark B aligned itself first, measure the remaining stroke between the fourth and third sections at location C.

14. If the remaining stroke is greater than 1/8 inch, proceed as follows.
   **Important** Refer to Table 6-3 for number of turns required for each type of rope.
   A. Extend the boom until ropes are accessible through cut-out on top of boom, see Figure 6-16, and stop engine.
   B. If the fourth section stopped first,
      1. Loosen the adjusting nut on each retract rope (33) the correct number of turns for each 1/8 inch of remaining stroke.
      2. Tighten the adjusting nut on each extend rope (30 and 31) the correct number of turns for each 1/8 inch of remaining stroke.
   C. If match-mark B aligned first,
      1. Loosen the adjusting nut on each extend rope (30 and 31) the correct number of turns for each 1/8 inch of remaining stroke.
      2. Tighten the adjusting nut on each retract rope (33) the correct number of turns for each 1/8 inch of remaining stroke.
   D. Repeat previous steps until the remaining stroke is 1/8-inch or less.

15. Recheck the torque of the adjusting nut for retract ropes (33).

16. Extend the boom until ropes are accessible through cut-out on top of boom, see Figure 6-16, stop engine. Looking through the access holes in the first section, visually check the tension of extend ropes (28 and 29). Tighten the adjusting nut on the loosest ropes until all four ropes are tensioned equally.

17. Torque the adjusting nut on each retract rope (32) to 30-35 ft/lb.

18. Fully retract the boom while watching the third and second sections, note which section stops first.

19. Extend the boom approximately six inches and repeat previous step as slowly as possible. Release the telescope control lever to OFF as soon as the corresponding section stops.

20. Determine the remaining stroke to fully retract the boom as follows.
A. If the third section stopped first, measure the remaining stroke between match-mark A on the second section and the end of the first section.
B. If the second section stopped first, measure the remaining stroke between match-mark B on the third section and the end of the second section.

21. If the remaining stroke is greater than 1/8 inch, proceed as follows.

**Important** Refer to Table 6-3 for number of turns required for each type of rope.
A. Extend the boom until ropes are accessible through cut-out on top of boom, see Figure 6-16, and stop engine.
B. If the third section stopped first.
   1. Loosen the adjusting nut on each retract rope (32) the correct number of turns for each 1/8 inch of remaining stroke.
   2. Tighten the adjusting nut on each extend rope (28 and 29) the correct number of turns for each 1/8 inch of remaining stroke.
C. If the second section stopped first.
   1. Loosen the adjusting nut on each extend rope (28 and 29) the correct number of turns for each 1/8 inch of remaining stroke.
   2. Tighten the adjusting nut on each retract rope (32) the correct number of turns for each 1/8 inch of remaining stroke.
D. Repeat previous steps until the remaining stroke is 1/8 inch or less.

22. Recheck the torque of the adjusting nut for retract ropes (32).

23. Fully retract the boom while watching the base and first sections, note whether the first section stops before match-mark D aligns itself with the end of the base section.

24. Extend the boom approximately six inches and repeat previous step as slowly as possible. Release the telescope lever to OFF as soon as the first section stops or as soon as match-mark D is aligned, whichever occurs first.

25. Determine the remaining stroke to fully retract the boom, as follows.
A. If the first section stopped first, measure the remaining stroke between match-mark D on the first section and the end of the base section.
B. If match-mark D aligned itself first, measure the remaining stroke between the first and base sections.

26. If the remaining stroke is greater than 1/8 inch, proceed as follows.
A. Extend the boom approximately 15 inches and stop engine.
B. If the first section stopped first.
   1. Loosen the adjusting nut on each retract rope 129 the correct number of turns for each 1/8 inch of remaining stroke.
      
      **Important** The starting point for rope 129 is 4-3/4 inches from the plate. Use only full size nut for both adjusting and locking nut, see Figure 6-16.
   2. Tighten the adjusting nut on each extend rope 123 the correct number of turns for each 1/8 inch of remaining stroke.
C. If match-mark D aligned first.
   1. Loosen the adjusting nut on each extend rope 123 the correct number of turns for each 1/8 inch of remaining stroke.
   2. Tighten the adjusting nut on each retract rope 129 the correct number of turns for each 1/8 inch of remaining stroke.
D. Repeat previous steps until the remaining stroke is 1/8 inch or less.

27. Replace all lock nuts and securely tighten.

28. Cycle the boom two or three more times to ensure synchronization.

29. Repeat until the boom is properly synchronized.
30. Replace the access covers on the base section.