OPERATOR'S AND SAFETY HANDBOOK

RT 9000E SERIES

CRANE

Revised 11-22-2004 Control # 011-00

TABLE OF CONTENTS (CONTINUED)

- The crane is improperly operated.

Wind forces can exert extreme dynamic loads. **Grove recommends that a lift not be made if the wind can cause a loss of control in handling the load.** Grove recommends if the wind speed (velocity) is between 32 km/h (20 mph) to 48 km/h (30 mph), that the load capacities shall be reduced to account for the size and shape of the load and the wind direction in relation to the machine for all boom, boom extension, and jib lengths. Further, operation of the crane in wind velocities over 48 km/h (30 mph) is not recommended. To assist you in determining prevailing wind conditions, refer to the "WIND VELOCITY CHART" on page 2-5.

The crane cab is equipped with a sight level bubble that should be used to determine whether the crane is level. The load line can also be used to estimate the levelness of the crane by checking to be sure it is in-line with the center of the boom at all points on the swing circle.

Use tag lines whenever possible to help control the movement of the load.

When lifting loads, the crane will lean toward the boom and the load will swing out, increasing the load radius. Ensure the load capacity chart is not exceeded when this occurs.

Be sure the hoist line is vertical before lifting. Do not subject the crane to side loading. A side load can tip the crane or cause it to fail structurally.

Do not strike any obstruction with the boom. If the boom should accidentally contact an object, stop immediately. Inspect the boom. Remove the crane from service if the boom is damaged.

Never push or pull with the crane boom.

Avoid sudden starts and stops when moving the load. The inertia and an increased load radius could tip the crane over or cause it to fail structurally.

Load Chart capacities are based on freely suspended loads. Do not pull posts, pilings, or submerged articles. Be sure the load is not frozen or otherwise attached to the ground before lifting.

Use only one hoist at a time when lifting loads.

WIND VELOCITY CHART

Wind Force		Wind Velocity km/h (mph)	Visible Indicator Effects of wind as observed on land
Beauford Scale	**Designation**		
Zero (0)	Calm	<2 (<1)	No wind: smoke rises vertically
1	Light Air	2-5 (1-3)	Wind direction seen by smoke but not by wind vanes
2	Light Breeze	6-11 (4-7)	Wind felt on face: leaves rustle: wind vane moves slightly
3	Gentle Breeze	13-19 (8-12)	Leaves/small twigs in constant motion: wind extends flag
4	Moderate Breeze	21-29 (13-18)	Raises dust & loose paper: moves small branches
Reduce crane load ratings and operating parameters at 32 km/h (20 mph)			
5	Fresh Breeze	31-39 (19-24)	Small trees in leaf begin to sway: on ponds, crested wavelets form
6	Strong Breeze	40-50 (25-31)	Large branches in motion: telegraph wires whistle: umbrellas used with difficulty
Cease all craning operations at 48 km/h (30 mph); lower & retract boom			
7	Moderate Gale	52-61 (32-38)	Whole trees in motion: walking against wind is inconvenient

- Do not short across the battery posts to check charge. Short circuit, spark, or flame could cause battery explosion.

- Maintain battery electrolyte at the proper level. Check the electrolyte with a flashlight.

- If applicable to your crane, check battery test indicator on maintenance-free batteries.

- Do not break a live circuit at the battery terminal. Disconnect the ground battery cable first when removing a battery and connect it last when installing a battery.

- Check battery condition only with proper test equipment. Batteries shall not be charged except in an open, well-ventilated area that is free of flame, smoking, sparks, and fire.

ENGINE

Be careful when checking the engine coolant level. The fluid may be hot and under pressure. Shut down the engine and allow the radiator time to cool before removing the radiator cap.

Shut down the engine and disconnect the battery before performing maintenance. If unable to do so for the task required, keep hands clear of the engine fan and other moving parts while performing maintenance.

Be careful of hot surfaces and hot fluids when performing maintenance on or around the engine.

On cranes with intake manifold grid heaters, do not use ether to start a cold engine.

WORK PRACTICES

CRANE ACCESS

You must take every precaution to ensure you do not slip and/or fall off the crane. Falling from any elevation could result in serious injury or death.

Never exit or enter the crane cab or deck by any other means than the access system(s) provided (i.e., steps and grab handles).

If necessary, use a ladder or aerial work platform to access the boom nose.

Do not step on surfaces on the crane that are not approved or suitable for walking and working. All walking and working surfaces on the crane should be clean, dry, slip-resistant, and have adequate supporting capacity. Do not walk on a surface if slip-resistant material is missing or excessively worn.

Do not use the top of the boom as a walkway.

Do not step on the outrigger beams or outrigger pads (floats) to enter or exit the crane.

Wear shoes with a highly slip-resistant sole material. Clean any mud or debris from shoes before entering the crane cab or climbing onto the crane superstructure. Excessive dirt and debris on the hand-holds, access steps, or walking/working surfaces could cause a slipping accident. A shoe that is not clean might slip off a control pedal during operation.

Do not make modifications or additions to the crane's access system that have not been evaluated and approved by Grove Worldwide.

JOB PREPARATION

You must inspect the crane prior to your work shift - checking for cracked welds, damaged components, and evidence of improper maintenance (consult Grove Worldwide Maintenance and Inspection Manual).

You must ensure that the crane is properly equipped including access steps, covers, doors, guards, and controls.

You must ensure that the outriggers are properly extended and set before performing any lifting operations. On models equipped with outriggers that can be pinned at the mid-extend position, the outriggers must

operation of the air conditioning system in conjunction with the FAN switch. When the switch is in the ON position, the square amber LED on the switch is illuminated.

SWING BRAKE CONTROL SWITCH

The SWING BRAKE control switch (10) is located on the left side of the front console. This two-position rocker switch (ON/OFF) is used to control a hydraulic valve that directs a regulated flow of pressure to and from the swing brake. Positioning the switch to ON will apply the swing brake and positioning the switch to OFF will release the swing brake. When the switch is in the ON position, the square red LED in the switch is illuminated. The switch has a lock to prevent accidental activation.

DIFFERENTIAL LOCK CONTROL SWITCH (OPTIONAL)

NOTE

The differential lock will only work when the crane is in the 4WD mode.

The differential lock (AXLE DIFF) control switch (11) is located on the left side of the front console. It is a two position, momentary rocker switch placarded LOCK and UNLOCK. When positioned to LOCK, the splines on the shift collar are engaged with the splines on the differential case and the axle shafts and the differential assembly are locked together and there is no differential action between the wheels. When positioned to UNLOCK, there is normal differential action between the wheels all the time. The square amber LED on the switch is illuminated when the switch in each axle is activated.

SWING SPEED CONTROL SWITCH

The SWING SPEED CONTROL switch (12) is located on the left side of the console. This two position (fast/slow) locking rocker switch, determines the speed of swing. When in fast position, it energizes the SWING SPEED high solenoid.

DRIVE AXLE SELECTOR SWITCH

The DRIVE AXLE selector switch (13) is located on the left side of the front console. This two-position rocker switch is placarded 2WD HI (high range) and 4WD LO (low range). The switch controls a solenoid valve (energized for 2WD HI) that operates the speed range and axle disconnect cylinders on the transmission. When the switch is in the 4WD LO position, the square LED on the switch is illuminated.

CAB TILT SWITCH

The CAB TILT switch (14) is located on the far left side of the front console. It is a three position, momentary spring centered to off rocker switch. It has two placarded positions, (up and down), allowing the cab to be tilted either up or down.

NOTE

Park brake must be engaged to operate the cab tilt feature and cab must be completely down for the drive functions to be enabled.

OUTRIGGER CONTROL SWITCHES

The outrigger control switches (15) are located on the left side of the front console. There are four three-position, momentary, spring centered to off rocker switches on the panel. These switches, in conjunction with the OUTRIGGER Extension/Retraction switch (27), provide control of all four outrigger extension and stabilizer cylinders. Positioning any one of the EXTENSIONS or STABILIZERS switches so that the desired component is selected, energizes the solenoid valve for the selected component. When the OUTRIGGER Extension/Retraction switch is positioned to EXTEND or RETRACT, the selected component moves in the selected direction.

WORK LIGHT SWITCH

The WORK light switch (16) is a two-position rocker switch (ON/OFF), located on the left side of the front console. The switch controls the operation of the crane's work light (37). When the switch is in the ON position, the square amber LED on the switch is illuminated.

HEADLIGHTS SWITCH

The HEADLIGHTS switch (17) is located on the left side of the front console. This two-position rocker switch (ON/OFF) controls operation of the instrument lights, switch LED's, and the headlights on the front of the crane. When the switch is in the ON position, the square amber LED on the switch is illuminated.

NOTE

When the front outrigger box is electrically disconnected, only the headlights located on the carrier fender and decking will illuminate.

When the front outrigger box is electrically connected, only the headlights in the outrigger box will illuminate.

NOTE

The engine will not crank unless the transmission shift lever is in neutral.

2. Turn the IGNITION switch to START and release immediately when the engine starts. Do not push or hold the throttle down. The ECM will automatically provide the proper amount of fuel to start the engine.

CAUTION

IF TEMPERATURE INDICATOR(S) DO NOT DISPLAY PROPER READINGS, SHUT DOWN THE ENGINE AND CORRECT THE MALFUNCTION BEFORE RESUMING OPERATION.

3. Allow the engine to warm up at least five minutes before applying a load. Do not race the engine for a faster warm up.

Cold Engine

DANGER

DO NOT SPRAY STARTING FLUID INTO THE AIR INLET. THE SPRAY WILL CONTACT THE HEATER ELEMENTS AND COULD EXPLODE CAUSING PERSONAL INJURY.

NOTE

The engine ECM monitors the engine and, under certain conditions, cycles the air heater on and off at start-up and during operation.

The engine is equipped with an electric air heater grid at the air inlet elbow to aid in cold starting and reduce white smoke at start-up. In the preheat mode, the engine should not be cranked until the WAIT-TO-START lamp turns off.

1. Prior to starting a cold engine, ensure the CRANE FUNCTION switch is positioned to OFF and the hydraulic pump is disconnected.

2. Ensure the parking brake is set and position the transmission in neutral.

NOTE

The engine will not crank unless the transmission is in neutral.

3. The WAIT-TO-START lamp is illuminated during the preheat time that takes place when the IGNITION switch is in the ON position during cold weather starting. To minimize cranking time during cold weather starting, the engine should not be cranked until the WAIT-TO-START lamp turns off.

4. Turn the IGNITION switch to START and release immediately when the engine starts. Do not push or hold the throttle down. The ECM will automatically provide the proper amount of fuel to start the engine.

CAUTION

IF TEMPERATURE INDICATOR(S) DO NOT DISPLAY THE PROPER READINGS, SHUT DOWN ENGINE AND CORRECT MALFUNCTION.

5. Allow the engine to warm up at least five minutes before applying a load. Do not race the engine for a faster warm up.

Detailed cold weather starting and operating procedures are covered in the engine manual.

IDLING THE ENGINE

Idling the engine unnecessarily for long periods of time wastes fuel and fouls injector nozzles. Unburned fuel causes carbon formation, oil dilution, formation of lacquer or gummy deposits on the valves, pistons, and rings, and rapid accumulation of sludge in the engine.

Note

When prolonged idling is necessary, maintain at least 800 rpm.

RACING THE ENGINE

NEVER race the engine during the warm-up period. NEVER operate the engine beyond governed speed (as might occur in downhill operation or downshifting). Engine bearings, pistons, and valves may be damaged if these precautions are not taken.

SHUTDOWN PROCEDURE

1. Allow the engine to operate at fast idle for about five minutes to avoid high internal heat rise and allow for heat dissipation.

2. Turn the ignition switch to OFF.

TELESCOPING THE BOOM

Extending the Boom

DANGER

WHEN EXTENDING THE BOOM, SIMULTANEOUSLY LET OUT THE HOIST CABLE TO PREVENT TWO-BLOCKING THE BOOM NOSE AND HOOK BLOCK.

DANGER

CHECK THE LOAD CHART FOR THE MAXIMUM LOAD AT A GIVEN RADIUS, BOOM ANGLE, AND LENGTH BEFORE EXTENDING THE BOOM WITH A LOAD.

CAUTION

BEFORE EXTENDING THE BOOM, ENSURE THE LARGE ACCESS COVER ON TOP OF THE BOOM BASE SECTION IS INSTALLED.

NOTE

The telescope function is controlled by a foot pedal if the crane is equipped with an auxiliary hoist.

To extend the boom, push on the top of the TELESCOPE control foot pedal.

Retracting the Boom

DANGER

WHEN RETRACTING THE BOOM, THE LOAD WILL LOWER UNLESS THE HOIST CABLE IS TAKEN IN AT THE SAME TIME.

To retract the boom, push on the bottom of the TELESCOPE control foot pedal.

LOWERING AND RAISING THE HOIST CABLE

DANGER

KEEP THE AREA BENEATH THE LOAD CLEAR OF ALL OBSTRUCTIONS AND PERSONNEL WHEN LOWERING OR RAISING THE CABLE (LOAD).

DANGER

DO NOT JERK THE CONTROL LEVER WHEN STARTING OR STOPPING THE HOIST. JERKING THE LEVER CAUSES THE LOAD TO BOUNCE, WHICH COULD RESULT IN POSSIBLE DAMAGE TO THE CRANE.

NOTE

When the load is stopped at the desired height, the automatic brake will engage and hold the load as long as the control lever remains in neutral.

Lowering the Cable

Push the MAIN or AUX hoist control lever forward, away from the operator, and hold until the hook or load is lowered to the desired height.

Raising the Cable

Pull the MAIN or AUX hoist control lever back, toward the operator, and hold until the hook or load is raised to the desired height.

Hoist Speed Range Selection

DANGER

DO NOT CHANGE THE HOIST SPEED RANGE WITH THE HOIST ROTATING.

To change the speed range of the hoist(s), position the applicable switch (MAIN HOIST SPEED or optional AUX HOIST SPEED) to HIGH or LOW as applicable.

RAISING AND LOWERING THE HYDRAULIC BOOM EXTENSION

The normal operating range for lifting loads with the hydraulic boom extension is an extension offset of 5 - 40 degrees. The extension must be retracted to 0 degree offset for stowage on the side of the boom.

The hydraulic luffing boom extension is controlled by two switches in the seat on the left hand seat armrest. The extension is controlled by an ON/OFF switch and a RAISE/LOWER switch. See SECTION 3 - CAB CONTROLS AND INDICATORS for location and description of these switches.

19. Cab Tilt Cylinder Pivot Pins.

Lube Type - EP-MPG
Lube Interval - 500 hours or 3 months
Lube Amount -Until grease extrudes
Application - 2 grease fittings

20. Pillow Block.

Lube Type - EP-MPG
Lube Interval - 500 hours or 3 months
Lube Amount - Until grease extrudes
Application - 2 grease fittings

21. Outrigger Beams.

Lube Type - EP-MPG
Lube Interval - 500 hours or 6 months
Lube Amount - Thoroughly coat the area the beam moves on.
Application - By brush; 16 places; extend beams fully and coat the bottom plate.

22. Jack Cylinder Support Tubes.

Lube Type - EP-MPG
Lube Interval - 500 hours or 6 months
Lube Amount - Spread grease on ID of jack cylinder support tubes before installing jack cylinders.
Application - By brush; 4 places

23. Upper Lift Cylinder Pivot Pin.

Lube Type - EP-MPG
Lube Interval - 500 hours or every 3 months
Lube Amount - Until grease extrudes
Application - 1 grease fitting

24. Lower Lift Cylinder Pivot Pin.

Lube Type - EP-MPG
Lube Interval - 500 hours or 3 months
Lube Amount - Until grease extrudes
Application - 2 grease fittings

25. Hook Block Swivel Bearing.

Lube Type - EP-MPG
Lube Interval - 250 hours or 3 months
Lube Amount - Until grease extrudes
Application - 1 grease fitting

26. Hook Block Sheaves.

Lube Type - EP-MPG
Lube Interval - 250 hours or 3 months
Lube Amount - Until grease extrudes
Application - 1 grease fitting per sheave
(8 fittings total - 130 ton)
(5 fittings total - 80 ton)

27. Headache Ball.

Lube Type - EP-MPG
Lube Interval - 250 hours or 3 months
Lube Amount -Until grease extrudes
Application - 1 grease fitting

28. Telescope Cylinder Wear Pads.

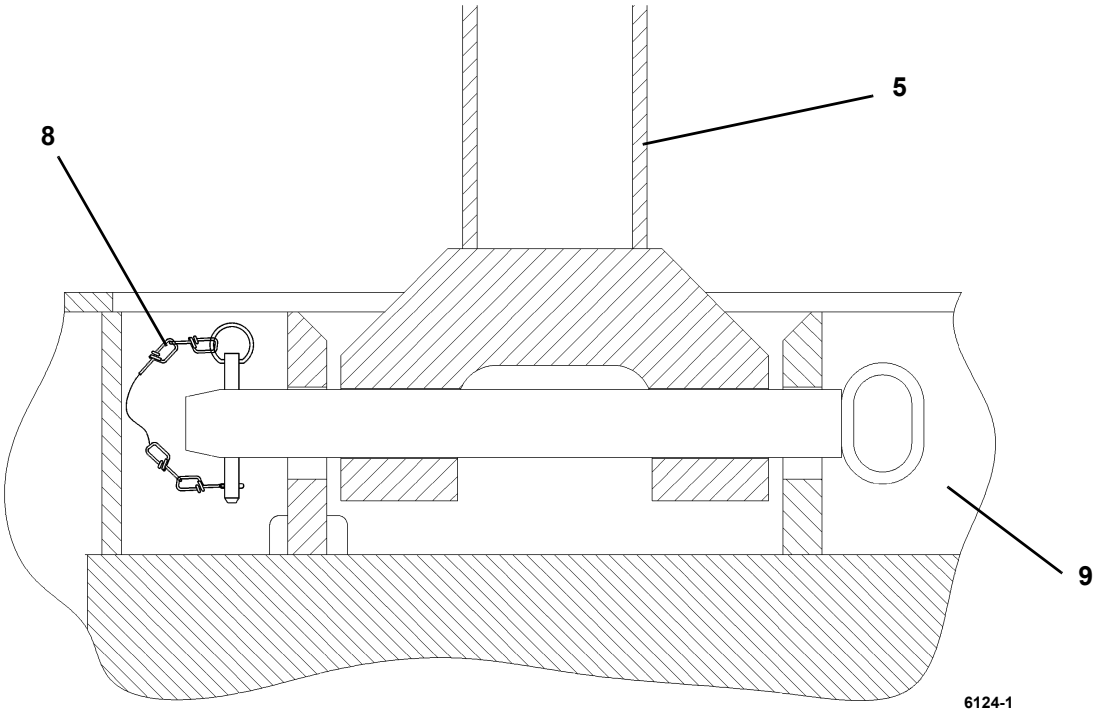
Lube Type - EP-MPG
Lube Interval - Every boom teardown.
Lube Amount - Thoroughly coat all areas the wear pad moves on.
Application - By brush: 5 places

NOTE

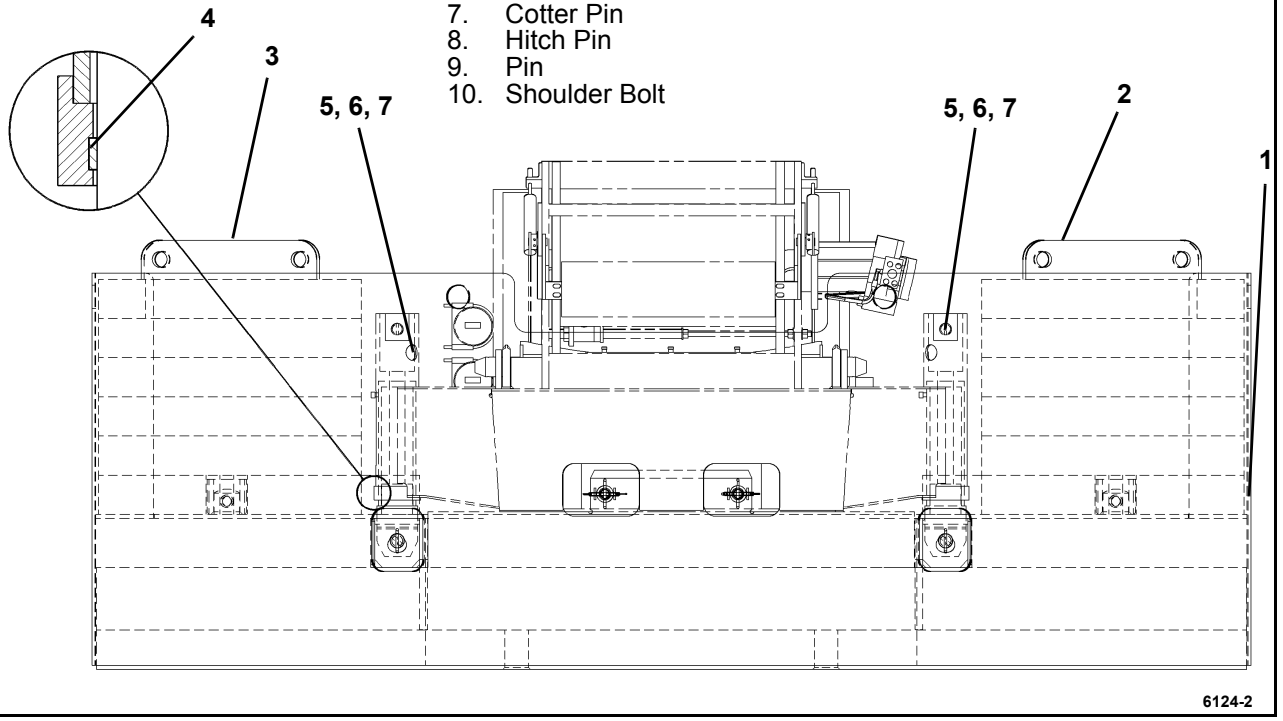
Should boom chatter or rubbing noises in the boom occur, it will be necessary to lubricate the telescope cylinder wear pads. By adding an extension adapter to a grease gun the wear pads and wear areas can be reached through the lubrication access holes in the side of the boom and through the access hole in the boom nose between the sheaves.

NOTE

Lubricate more frequently than interval indicated in table if environmental conditions and/or operating conditions necessitate.



1. Counterweight Weld
2. Right Heavy Counterweight Weld
3. Left Heavy Counterweight Weld
4. Wear Ring
5. Counterweight Removal Cylinder
6. Pin
7. Cotter Pin
8. Hitch Pin
9. Pin
10. Shoulder Bolt



Counterweight Removal and Installation (Sheet 2 of 2)

12. Ensure the pin and retaining pin attaching the fly section to the boom base section rear support bracket (see Detail C) are in place.

13. At the guide rail, pull downwards against the spring force of the eye bolt and fold in the guide rail and release the eye bolt to lock the guide rail in the stowed position (see Detail B).

14. Rig the boom nose and hoist cable as desired and operate the crane using normal operating procedures.

CONNECTING AND DISCONNECTING THE HYDRAULIC BOOM EXTENSION

CONNECTING

DANGER

IF THE HOSE COUPLINGS ARE DETACHED FROM THE BOOM AFTER THE HOSE DRUM LOCK PIN HAS BEEN RELEASED, DO NOT RELEASE THE HOSE COUPLINGS UNTIL THEY HAVE BEEN ATTACHED TO THE BOOM. IF THE HOSE COUPLINGS ARE RELEASED AFTER BEING DETACHED FROM THE BOOM, THE HOSES WILL SPRING BACK UNCONTROLLABLY DUE TO THE SPRING FORCE IN THE HOSE DRUM.

When working with the main boom for longer periods of time, the hydraulic connection between the hose drum and the main boom should be disconnected. This prevents unnecessary reeling and unreeling of the hose.

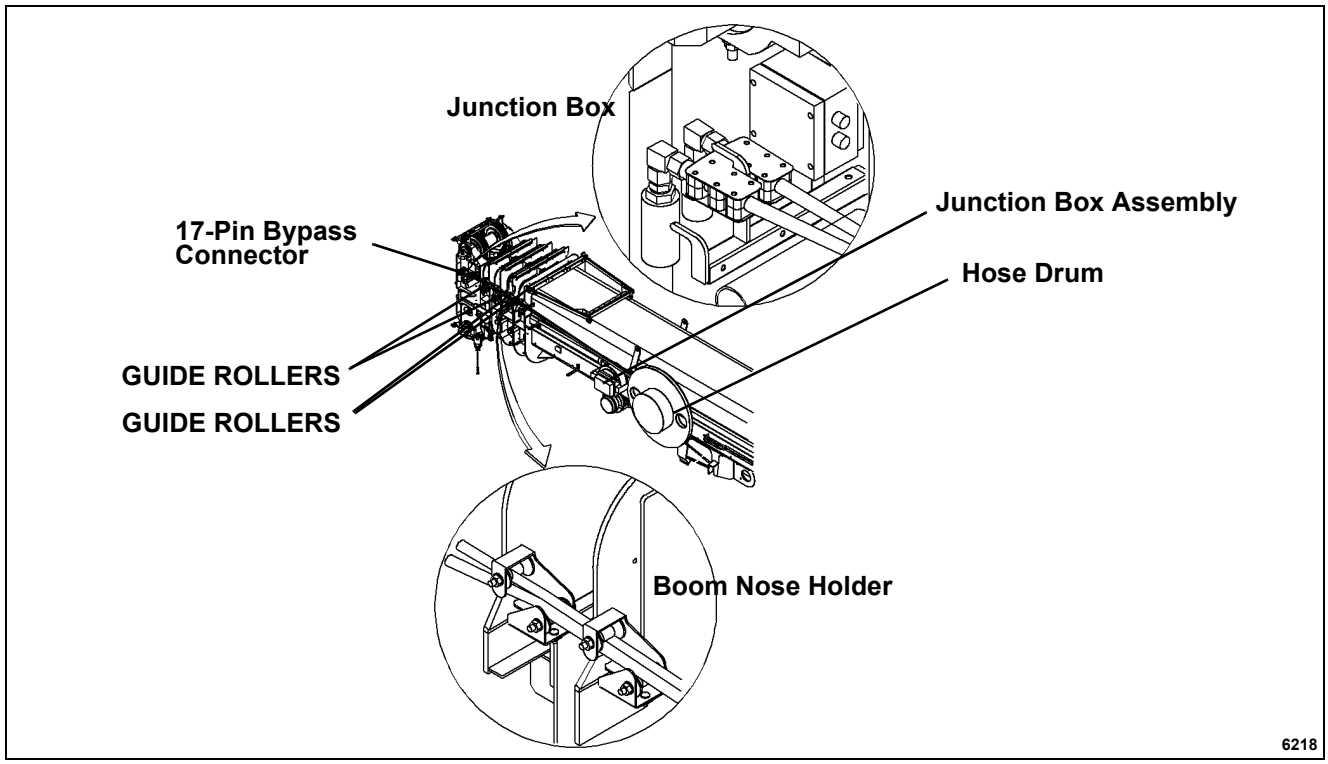
Establish a hydraulic connection between the lattice extension and the main boom.

If the hoses are stowed on the holder on the boom base section, release the hose drum lock pin and pull the hydraulic hoses toward the boom nose. Anchor the hydraulic couplings at the holder on the boom nose. Guide the hydraulic hoses through the guide rollers.

1. Unwind the hoses on the lattice extension.

2. Remove the dust caps from the couplings on the lattice extension and the drum hoses.

3. Connect the hose drum hoses to the hoses on the lattice extension. Do not detach the drum hoses from the holder on the boom nose.



Boom Luffing Extension