Grove YB4409-2

Operator Manual

Independent Outriggers	Eight-section, closed center, load sense, with individual section compensation
Swing Motor	Single section, gerotor-type
Winch Motor	Fixed displacement, axial piston
Hydraulic Filters	One 10-micron filter in line from valves, One 30-mesh suction filter inside hydraulic tank
Hydraulic Cylinders	Double-acting cylinders for lift, crowd, steering and outriggers
Hydraulic Tank	23.5 gal. (89.0 L) capacity, steel construction with internal baffles

WIRE ROPE

Wire Rope (Main Winch):	
Diameter	1/2 in. (12.7 mm)
Type	Python Ultra EIPS
Length	120 ft. (36.6 m)
Wire Rope (Optional Below Deck Winch):	
Diameter	1/4 in. (6 mm)
Length	100 ft. (30.5 m)

TORQUE CONVERTER

Model	Borg and Beck
Type	Hydraulic

TRANSMISSION

Type	International Transmissions Limited
Model	SS620
Type	Synchroshuttle
Travel Speed:	
First	4.62 mph (7.44 km/h)
Second	7.26 mph (11.68 km/h)
Third	13.35 mph (21.48 km/h)
Fourth	22.15 mph (35.65 km/h)

FRONT AXLE, DRIVE/STEER

Type	Carraro
Model	26.18M-164
Ratio	10.66:1

- Do not travel. Lift only from a stationary position.

PILE DRIVING AND EXTRACTING

Pile driving and extracting are applications approved by Manitowoc, provided all equipment is operated within factory guidelines. The following operating requirements must be used during pile driving and extracting with a Manitowoc mobile hydraulic crane:

Pile driving and pile extraction using a mobile crane introduces many variable and unknown factors that must be considered when using a crane for this application. Because of these factors, discretion must be exercised when pile driving or pile extraction is being considered.

It is not the intention of Manitowoc to recommend specific types or makes of pile driving and pile extraction equipment, but rather to advise of the operational requirements to help avoid the detrimental effects that pile driving and pile extraction can have on the crane.

In addition to the operating requirements that are detailed in the operating manuals and on the load capacity chart, pile driving and extracting operations are approved by Manitowoc, provided all guidelines outlined below are followed:

- All pile driving and extracting operations shall be restricted to fully extended outriggers with all tires clear of the ground.
- The combined weight of the driver or extractor, piling, leads, attachments, etc., shall not exceed 80% of the published load chart values for on-outriggers operation.
- The pile driver or pile extractor and attachments shall be kept clear of the boom nose at all times.
- The pile driver and piling shall be suspended from a hoist cable with sufficient line speed to meet or exceed the rate of descent of the driver and piling to preclude impact loading or vibration from being induced into the boom and crane structure.
- Pile driving or extracting shall be restricted to over the main boom only and shall not be permitted over a boom extension or jib.
- Pile extraction using only the crane’s hoist line is unsafe and not permitted since load values cannot be accurately determined. Only pile extraction devices that do not transmit vibration or shock loading into the crane are permitted. All possible precautionary measures shall be taken to prevent shock loads or vibration from being imposed on crane components, either directly through the hoist cable or indirectly from ground borne vibration.
- The load lines shall be kept vertical at all times during pile driving and pile extraction operations.
- The operator and other personnel associated with the pile driving and pile extraction operation shall have read and understood all safety standards applicable to crane operations as well as being thoroughly trained in the safe operation of pile driving and extracting equipment.

Crane Equipment

- Hoists shall be equipped with a cable follower to aid in proper spooling of cable.
- All cable retainer pins and cable guides/retainers shall be in place.
- All boom extensions or jibs must be removed from the machine before pile driving or extraction begins.
- All hoist hooks shall be equipped with a positive locking latch.

Crane Inspection

- In addition to the crane's frequent and periodic inspections, dated daily records shall be maintained showing inspections were performed on the crane during the time it was used for pile driving or extraction.
- All anti-two block warning devices and RCL systems shall be inspected daily and verified to be functional.
- All areas of the crane subject to fatigue shall be inspected monthly, and before the crane is to return to lifting service.
- The boom shall be inspected daily to ensure all wear pads remain in place. Cranes which utilize pinned boom sections shall be inspected daily to ensure the pinning mechanism operates properly and to check for undue wear at the pins and pinning plates. The hoist cable shall be inspected daily to ensure no chafing or wear is occurring.

ELECTROCUTION HAZARD

Thoroughly read, understand, and abide by all applicable federal, state, and local regulations regarding operation of cranes near electric power lines or equipment.

United States federal law prohibits the use of cranes closer than 6 m (20 ft) to power sources up to 350 kV and greater distances for higher voltages unless the line’s voltage is known [29CFR1910.180 and 29CFR1926, subpart CC].

To avoid death or serious injury, Manitowoc recommends that all parts of crane, boom, and load be kept at least 6 m (20 ft) away from all electrical power lines and equipment less than 350 kV.

NOTE: For detailed guidelines on operating near power lines, refer to the current edition of OSHA 29CFR1926, subpart CC and ASME B30.5 American National Standard.

Always drive the crane carefully obeying speed limits and highway regulations.

Stay alert at the wheel.

If equipped, ensure that the hoist access platform hand rail and step are in the travel configuration.

Slopes:

- Pick and carry on level surfaces only.
- Refer to the *Operation Section* for more detailed information on traveling on slopes.
- Driving across a slope is dangerous, as unexpected changes in slope can cause tip over. Ascend or descend slopes slowly and with caution.
- When operating on a downhill slope, reduce travel speed and downshift to a low gear to permit compression braking by the engine and aid the application of the service brakes.

WORK PRACTICES

Personal Considerations

Always adjust the seat and lock it in position, and fasten the seat belt securely before you start the engine.

Do not wear loose clothing or jewelry that can get caught on controls or moving parts. Wear the protective clothing and personal safety gear issued or called for by the job conditions. Hard hat, safety shoes, ear protectors, reflective clothing, safety goggles, and heavy gloves may be required.

Crane Access

WARNING

Fall Hazard!

Working at elevated heights without using proper fall protection can result in severe injury or death.

Always use proper fall protection as required by local, state or federal regulations.

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). Use the recommended hand-holds and steps to maintain a three-point contact when getting on or off the crane.

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

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

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.

Use the hoist access platform (if equipped) when working in the hoist area.

Wear shoes with a highly slip-resistant sole material. Clean any mud or debris from shoes before entering the crane cab/operator's station 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 allow ground personnel to store their personal belongings (clothing, lunch boxes, water coolers, and the like) on the crane. This practice will prevent ground personnel from being crushed or electrocuted when they attempt to access personal belongings stored on the crane.

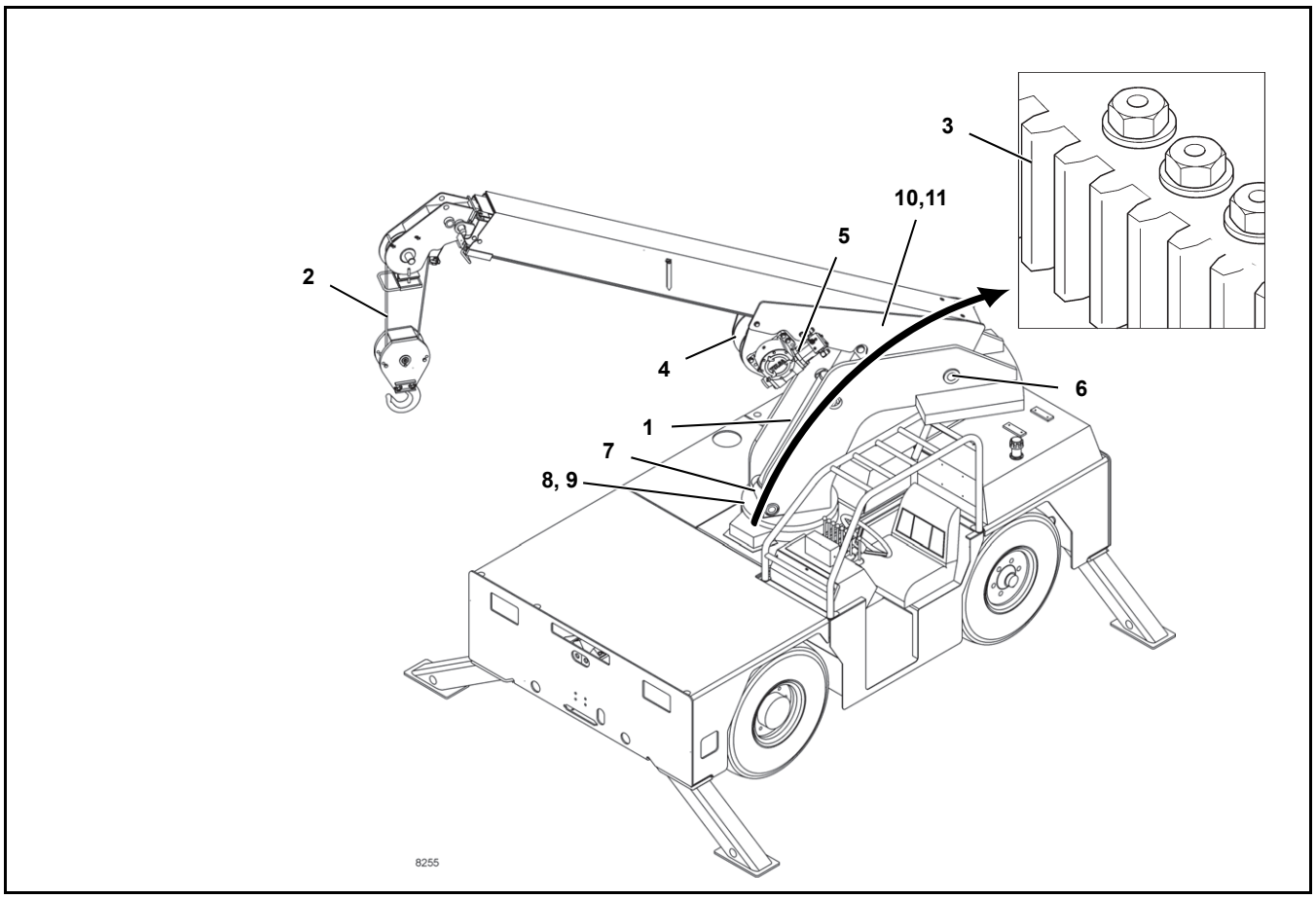
Job Preparation

Before crane use:

- Barricade the entire area where the crane is working and keep all unnecessary personnel out of the work area.
- Ensure that the crane is properly equipped including access steps, covers, doors, guards, and controls.
- Conduct a visual inspection for cracked welds, damaged components, loose pins/bolts, and wire connections. Any item or component that is found to be loose or damaged (broken, chipped, cracked, worn-through, etc.) must be repaired or replaced. Inspect for evidence of improper maintenance (consult your *Service Manual*).
- Check for proper functioning of all controls and operator aids (for example, RCL).
- Check all braking (for example, wheel, hoist, and swing brakes) and holding devices before operation.

You must ensure that the outriggers and jack cylinders 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 also be pinned when operating from the mid-extend position.

Superstructure Inspection



Transmission High Temperature Warning Light *(See Figure 3-15)*

When this light is illuminated it is an indication that the transmission temperature is above the proper operating temperature. High operating temperature could cause serious damage to the transmission. If this light illuminates during operation, immediately shut down the engine and have the transmission and/or the transmission cooling system serviced.

FIGURE 3-15

Brake System Low Pressure Warning Light *(See Figure 3-16)*

When illuminated, the light indicates that there is a loss in brake pressure. At this point there is still enough pressure to stop the crane. Immediately stop the crane and shut off the engine. Do not drive the crane until the problem has been repaired. The light will illuminate briefly when the brake system charges during operation.

WARNING

When the low brake pressure warning light is illuminated, immediately stop and shutdown the crane. ***DO NOT*** drive the crane with the warning light illuminated. Brake failure is possible and the result could be serious personal injury and property damage.

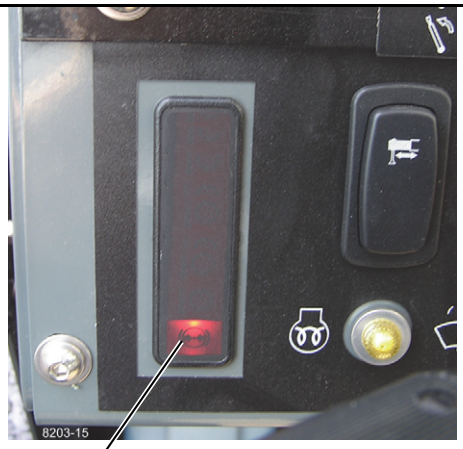


FIGURE 3-16

Crane Level Indicator

This is a bubble-type indicator (Figure 3-17) that allows the operator to level the crane when using the outrigger controls.

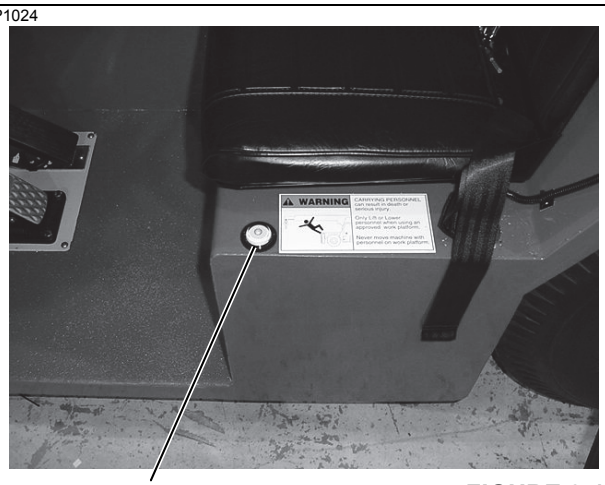


FIGURE 3-17

Proper Leveling of the Crane

ASME B30.5 specifies that if a crane is not level within 1% of grade, the allowable capacities must be reduced. Therefore, whether lifting on rubber or outriggers, it is essential that the crane is level to within 1% of grade. The bubble level that is provided on the crane is calibrated to be accurate within 1% of grade.

To properly level the crane, the boom must be positioned over the front of the crane, fully lowered to horizontal and fully retracted (for cranes fitted with a boom rest, the boom shall be stowed onto the rest). Raise and level the crane using the outriggers; refer to *Outrigger Controls*, page 3-3.

A working crane may settle during lifting operations. Frequently check the crane for level. When rechecking the crane for level, the boom must be positioned over the front of

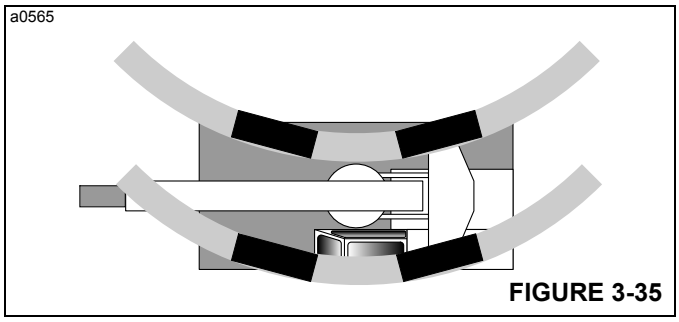


FIGURE 3-35

3. Crab Steer Mode

CAUTION

DO NOT travel at high speed with the crane in the crab steer mode. Possible tipping may occur when turning.

See Figure 3-36. All of the wheels steer in the same direction. This mode permits the operator to move the crane sideways over short distances. This feature is especially helpful in tight areas on the job.

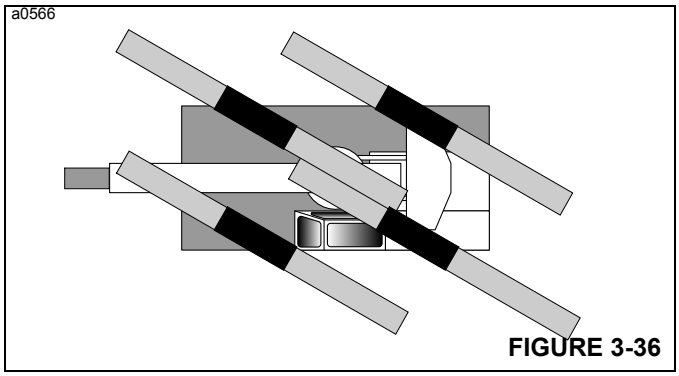


FIGURE 3-36

Four-Wheel Steering Indexing Procedure

1. Place the steering select switch in the four-wheel steer mode.
2. Turn the steering wheel until the rear wheels are in a straight forward position.
3. Place the steering select switch in the two-wheel steering mode and align the front steering wheels in a straight forward position.
4. The crane should now be properly indexed and the steering select switch can now be placed in the four-wheel steering mode or the crab steering mode.

Changing Travel Direction

1. The crane ***must*** come to a complete stop before changing travel direction.
2. Move the travel select lever to the opposite travel direction.

CAUTION

To avoid possible damage to the transmission ***DO NOT*** attempt to start the engine by pushing or towing with another vehicle. The power train does not allow starting this way, and transmission damage may occur.

CAUTION

The following practices could result in transmission failure:

- Shifting between forward and reverse while the engine is at high speed or heavy throttle, such as when the driving wheels are in mud or snow -- commonly called rocking.
- Shifting to reverse or forward while operating the engine at high speed in neutral.
- Operating the transmission at or near “stall speed” for more than 10 seconds at a time. “Stall condition” is when the engine runs at high speed while the transmission is in forward or reverse and the drive wheels are not moving. For example, when the wheels are mired in deep sand or mud, or when the crane is against a fixed barrier.
- Continually downshifting and over-revving the engine.

Stopping Travel

1. Apply the service brakes and downshift as necessary to slow the crane until it comes to a complete stop.
2. Place the travel select lever in Neutral (N) and engage the parking brake.
3. Turn the ignition switch to the OFF position to stop the engine.
4. If the crane is parked and unattended, remove the ignition key.

Operating the Outrigger Controls

To Raise and Lower the Outriggers

With independent outrigger controls, each outrigger is independently controlled (Figure 3-37). Two or more outriggers may be simultaneously lowered or raised by simultaneously actuating the controls for each of the outriggers.

Optional Controls Operation

Auxiliary Winch

w0031

Always keep hands and clothing clear of the fairlead rollers and front opening while the winch is operating. Keep persons away from the area. Injury can be caused if the wire rope breaks or the hook becomes disconnected.

CAUTION

The optional auxiliary winch is only intended for intermittent use. Prolonged operation may cause excessive drain on the batteries.

To Extend the Wire Rope

Hold the toggle switch in the up position (Figure 3-46). Keep tension on the wire rope to inhibit twisting of the wire rope on the winch drum.

To Stop the Winch

Release the toggle switch.

To Retract the Wire Rope

Hold the toggle switch in the down position (Figure 3-46).

3

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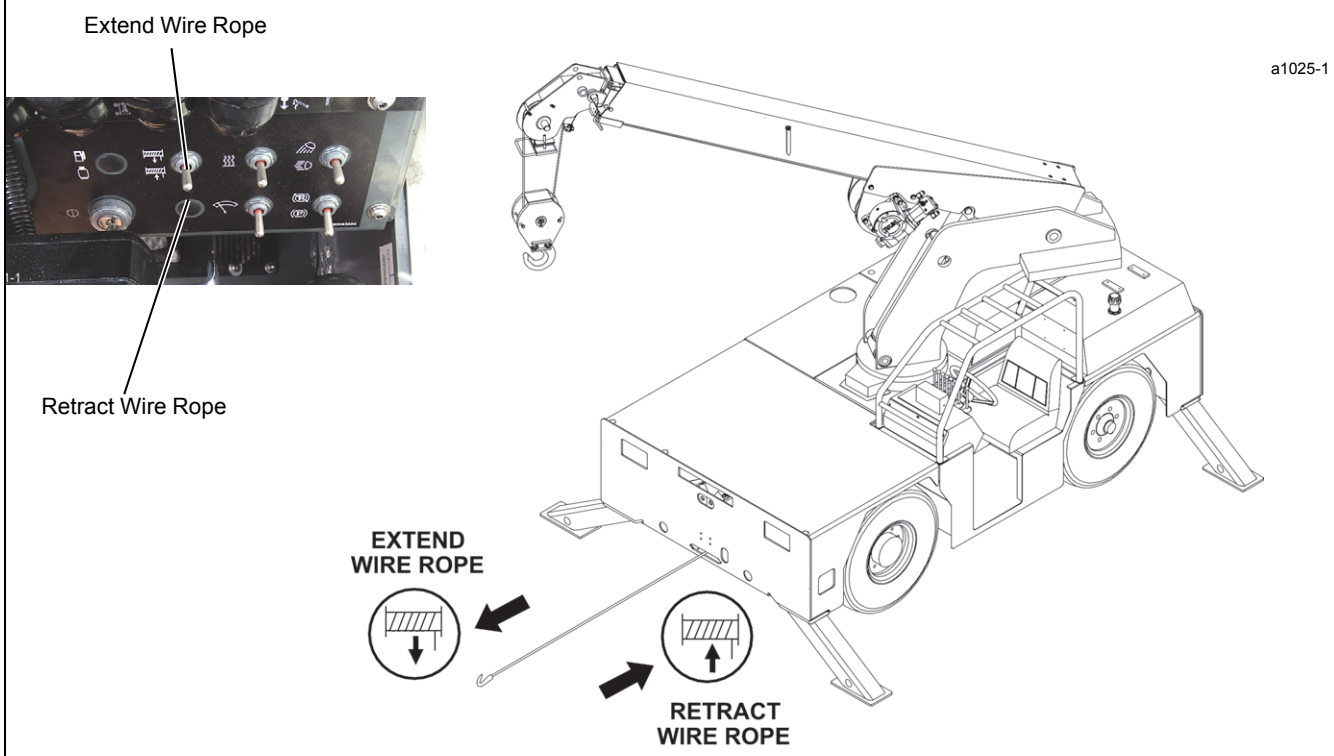


FIGURE 3-46

NOTE: It may be necessary to remove and stow the retention pin for later application.

9. When offsetting boom head (Figure 5-4) to +30° move rope retention pin from position 1 to position 2 and run rope between pin and sheave wheel. Check that the wire rope is not contacting retention pin at the top of the boom head.

10. Raise the hook and ball. Check that the wire rope is engaged in all the sheaves in the boom, hoist block and hoist drum.

HOIST BLOCK

Removing the Hoist Block

1. Lower the hoist block to the ground to place slack in the wire rope.

CAUTION

Ensure that the hook assembly's safety latch does not get damaged.

2. Remove the pin (Figure 5-5) securing the rope wedge socket to the boom head. Remove the wire rope dead end socket.

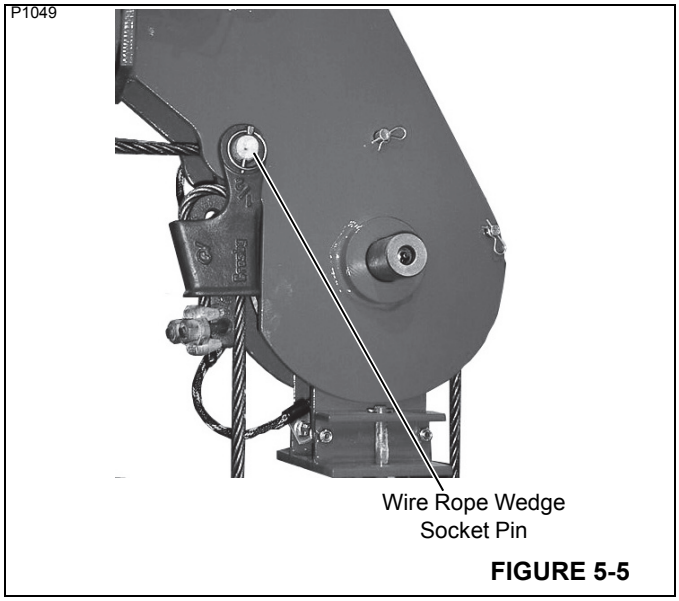


FIGURE 5-5

NOTE: When removing the hoist block to install the hook and ball assembly, the wire rope dead end assembly does not have to be disassembled.

3. Remove the four pins as indicated in Figure 5-6. Remove the hook assembly.

4. Remove the wire rope from the hook block sheave.

5. Install the hook assembly and four pins.

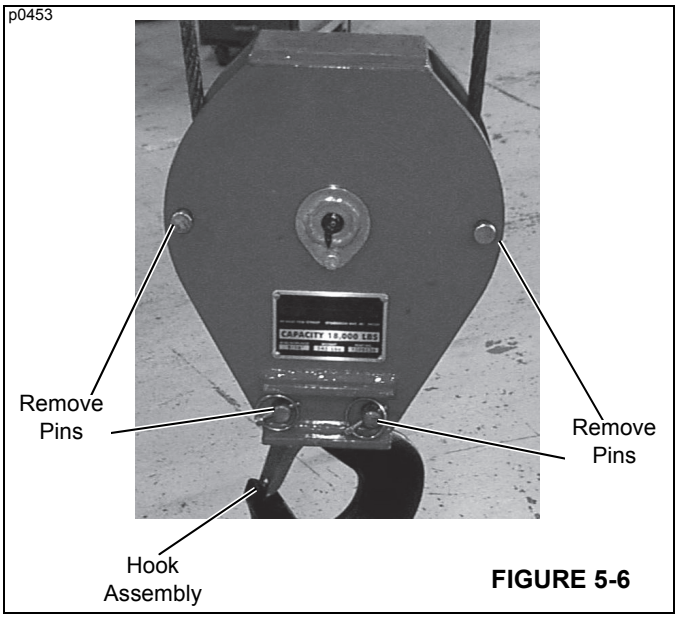


FIGURE 5-6

Installing the Hoist Block

1. Remove the four pins and hook assembly from the hoist block assembly. See Figure 5-6.

2. Thread the wire rope through the hoist block so it is under the hoist block sheave.

3. Install the hook assembly and four pins to the hook block assembly.

4. Attach the wire rope wedge assembly to boom head.

5. Lift the hoist block off of the ground. Be sure the wire rope is engaged in the sheave grooves in the boom head, hoist block, and hoist drum.

JIB

Installing the Jib

To use the jib it must be attached to the boom head. The jib can be attached by performing the following procedure:

1. Completely retract the booms.

2. Remove the jib and the suspension cable assembly from their storage positions.

a. Remove the retaining pin (Figure 5-7) securing the suspension cable bracket to the bracket on the boom.

b. Remove the hair pins from the three connection pins.

c. Lift the jib and suspension cable from the support brackets.

d. Install the hair pins to the three pins on the jib for safe keeping.

When performing maintenance, do the required maintenance interval as well as all previous interval maintenance. For example, when performing the Monthly maintenance interval, perform all the tasks required for Daily, 50 Hour and 100 Hour maintenance.

SERVICE/CHECK	INTERVAL							See Page
	Daily Before Operation	50 Hours	100 Hours	250 Hours	500 Hours	1000 Hours	2000 Hours	
Inspect the Anti-Double Blocking System	X							6-8
Inspect the Wire Rope	X							6-8
Inspect Reeving, Clamps and Connections	X							6-9
Inspect the Lifting Hook	X							6-9
Inspect Safety Devices	X							6-9
Check Controls Operation	X							6-9
Check Engine Crankcase Oil Level	X							6-9
Check Transmission Oil Level	X							6-10
Check Engine Coolant Level	X							6-10
Check Fuel Level	X							6-9
Check Tire Pressure	X							6-12
Drain Water From Engine Fuel Filter/Water Separator	X							6-10
Check Air Cleaner Restriction Indicator	X							6-11
Check Hydraulic Oil Level	X							6-10
Inspect Wire Rope and Sheaves		X						6-12
Apply Grease to All Lubrication Fittings		X						6-13
Lubricate the Boom Slides		X						6-14
Lubricate the Boom Chains		X						6-14
Clean Air Cleaner Dust Cup		X						6-12
Inspect the Engine Fan Belts			X					6-14
Check Wheel Nut Torque			X					6-14
Lubricate the Swing Gear and Pinion				X				6-18
Lubricate the Wire Rope				X				6-17
Inspect the Boom Chains				X				6-15
Inspect All Hydraulic Hose				X				6-16
Replace Engine Crankcase Oil*				X				6-18
Replace Engine Oil Filter*				X				6-18
Clean Radiator Fins and Core				X				6-18
Clean Battery and Connections				X				6-17

General Inspection

NOTE: Always wear gloves when working with wire rope to prevent hand injuries.

1. Wire Rope - Inspect for damage, rust or wear to the wire rope. Keep a record of each inspection. Replace the wire rope if any of the conditions in Figure 6-26 are present.
2. Sheaves - Inspect sheaves for damage and/or wear. The sheave grooves must be smooth and a little larger than the wire rope. Use a sheave gauge to check the size of the sheave groove. Rough edges, narrow or worn grooves will cause damage to the wire rope. Replace any worn or damaged sheaves.

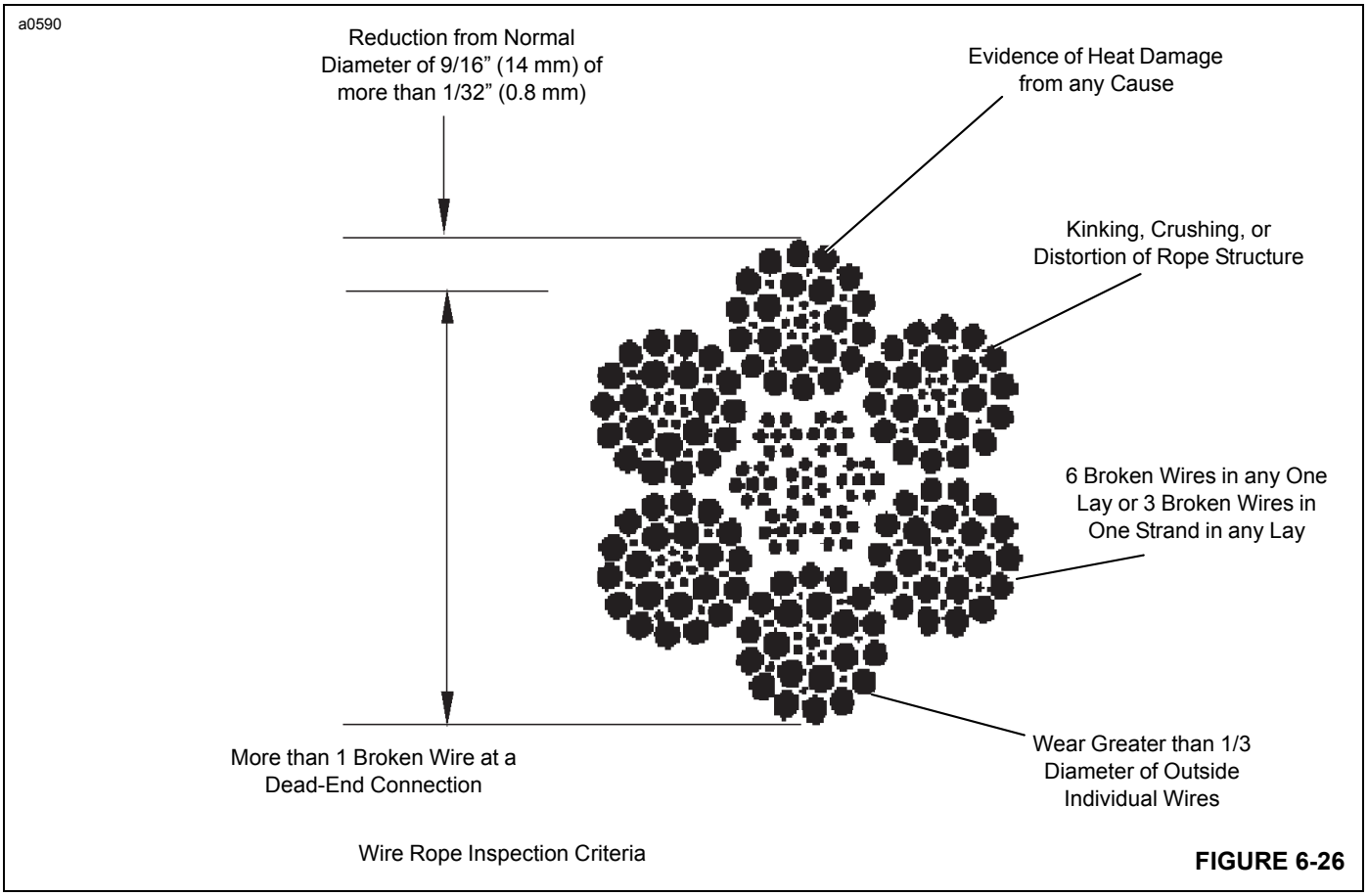
NOTE: As a sheave wears, the groove for the wire rope becomes smaller. The tracks on the sheave are caused by the wire rope. Yet, the wire rope will continue to engage these tracks, for example as a chain engages a sprocket. As the wire rope turns and twists on the sheave, the wire rope will move out of the worn track. This will cause increased wear on the wire rope.

Grease Fittings

Lubricate all points indicated under the heading *Lubrication Points*, page 6-4.

Lubricate the Boom Slides

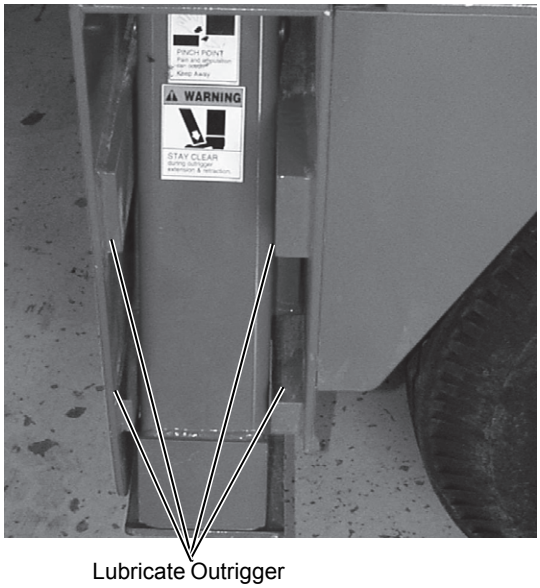
1. Lower the boom and then extend it to its maximum out position.
2. Engage the parking brake and shut off the engine.
3. Clean the old lubricant from the booms.
4. Apply bronze anti-seize, or equivalent, to the boom sliding surfaces (Figure 6-27) on the boom sections. Only use a small amount of lubricant for best results.
5. Align the boom access holes to gain access to the cable sheave bracket and slide pad at the end of the boom telescope cylinder.
6. Apply bronze anti-seize, or equivalent, to the inner boom surface in front of and behind the slide block. Only use a small amount of lubricant for best results. Extend and retract the booms to distribute the lubricant along the slide path.



Wire Rope Inspection Criteria

FIGURE 6-26

6



Lubricate Outrigger Slide Blocks

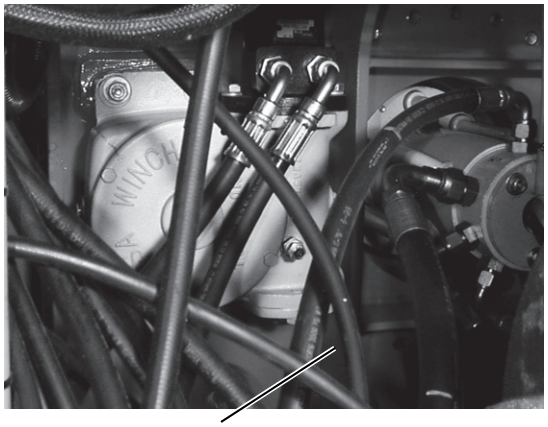
p0448 **FIGURE 6-51**

Add Grease to the Swing Gearbox

NOTE: It is necessary to climb under the crane to add grease to the swing gearbox. Be sure engine is shut off, the ignition key is removed and chock blocks are in place before climbing under the crane.

The grease fitting for adding grease to the swing gearbox can only be reached from under the crane. It will be necessary to use a light to see the fitting.

1. Lower the boom, engage the parking brake and shut off the engine. Remove the ignition key.
2. Clean the grease fitting (Figure 6-52), located on the swing gearbox housing.



Swing Gearbox Grease Fitting

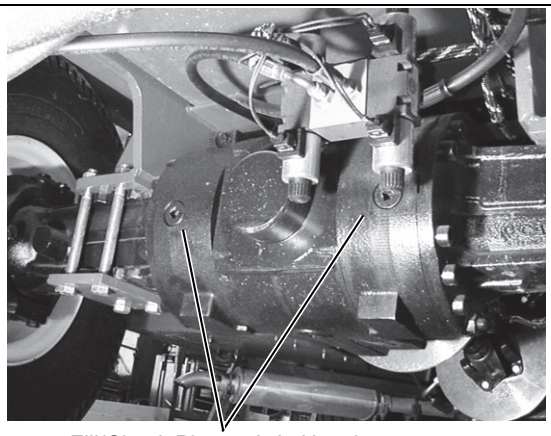
p0330 **FIGURE 6-52**

3. Clean around the check plug, located below the gearbox mounting flange. Remove the check plug.
4. Apply Lithium Base, E.P. No. 2 bearing grease to the fitting. Fill gear box until grease exits the check plug hole.
5. Install the check plug.

Check the Axle Housing Lubricant Level

It is necessary to climb under the crane to check the axle housing lubricant level. Be sure engine is shut off, the ignition key is removed and chock blocks are in place before climbing under the crane.

1. Clean around both fill/check plugs (Figure 6-53) in the brake housings and remove the plugs.



Fill/Check Plugs - Axle Housing

p0319 **FIGURE 6-53**

2. Check the lubricant level, which should be even with the bottom of each fill/check hole.
3. If necessary, add oil to fill the housings to the recommended level.

Check the Wheel Hub Lubricant Level

1. Position the wheel so that the fill/check plug is horizontal with the ground (Figure 6-54).
2. Clean around the plug and then remove it.
3. Check the lubricant level which should be even with the bottom of the hole.
4. If necessary, add oil to fill the hub to the recommended level.
5. Repeat Steps 1 through 4 for the other wheel hub.

Miscellaneous Maintenance

Batteries/Charging System

WARNING

The fluid in electric storage batteries contains sulfuric acid, which is a POISON and can cause SEVERE CHEMICAL BURNS. Avoid all contact of fluid with eyes, skin or clothing. Use proper protective gear when handling batteries. DO NOT tip any battery beyond a 45° angle in any direction.

NOTE: Lead-acid batteries produce flammable and explosive gases. To avoid personal injury, when checking, testing or charging batteries:

- **DO NOT** use smoking materials near batteries.
- Keep arcs, sparks and flames away from batteries.
- Provide ventilation and wear safety glasses.
- Never check battery charge by placing a metal object across the posts. The sparks could explode battery gases and cause injury or death. Use a voltmeter or hydrometer.

FIGURE 6-77

Checking the Charging System

Check the battery with a voltmeter. Normal voltmeter readings are as follows:

Normal Operating Ranges

Engine above idle - 14 to 16 volts
Engine stopped - 10 to 14 volts

A reading of less than 10 volts with the engine at low idle indicates a low battery charge.

A reading of less than 14 volts with the engine speed above low idle indicates a problem in the charging system. The system should be checked out by a qualified service technician.

When a voltmeter indicates a low battery charge, attach a battery charger and increase the battery charge.

Charging the Battery

Under normal conditions, the engine's alternator will have no problem keeping a charge on the battery. The only condition in which the battery may cause a problem is when it has been completely discharged for a long period of time. Under this condition the alternator may not be able to recharge the battery and a battery charger will be required for charging the battery.

Before using a battery charger, an attempt can be made to recharge the battery using the engine alternator by first jump starting the crane (See *Jump Starting the Engine*, page 3-12) and letting the engine run.

DO NOT charge a frozen battery; it may explode and cause injury. Let the battery warm up before attaching a charger.

Charging rates between 3 to 50 amperes are satisfactory if no excessive gassing or spewing of electrolyte occurs or the battery does not feel excessively warm (over 52°C [125°F]). If spewing or gasing occurs or temperatures exceed 52°C (125°F), the charging rate must be reduced or temporarily stopped to permit cooling.

Replacing the Battery

Remove the battery very carefully to avoid spillage of battery fluid. Properly dispose of the battery.

Fuel System

Fuel Storage

Storage of fuel for an extended period causes accumulation of sediment, dirt, water and other foreign materials in the fuel. Many engine problems are caused by dirty fuel and long storage periods.

Keep fuel in an outside location. Use a shelter to keep the fuel as cool as possible. The water from condensation must be removed at regular intervals from the storage tank.