Grove

SUPERSTRUCTURE OPERATOR'S MANUAL

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

TM500E-2

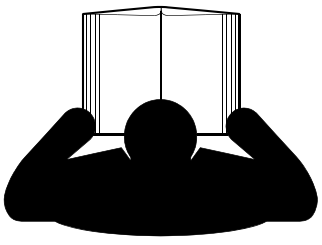
Crane Model Number

This Manual is divided into the following sections:

NOTICE

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

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



⚠DANGER

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

- You are trained in the safe operation of this crane. Manitowoc is not responsible for qualifying personnel.
- You read, understand, and follow the safety and operating recommendations contained in the crane manufacturer's manuals and load charts, your employer's work rules, and applicable government regulations.
- You are sure that all safety signs, guards, and other safety features are in place and in proper condition.
- The Operator's Manual and Load Chart are in the holder provided on crane.

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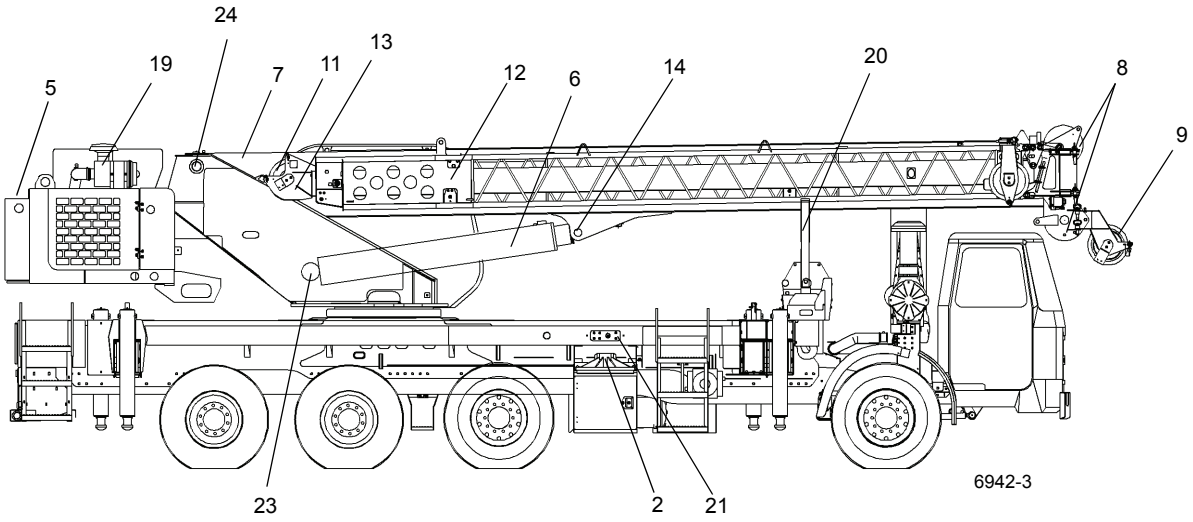


View for 95 Foot Boom Crane

FIGURE 1-1 continued

the mid-extend position, the outriggers must also be pinned when operating from the mid-extend position.

- Cribbing under the outrigger pads is inadequate.
- The crane is improperly operated.

Do not rely on the crane's tipping to determine your lifting capacity.

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.

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.

If you should encounter a tipping condition, immediately lower the load with the hoist line and retract or elevate the boom to decrease the load radius. Never lower or extend the boom; this will aggravate the condition.

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 crane's capacity is not exceeded when this occurs.

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.

Use only one hoist at a time when lifting loads.

Always use enough parts-of-line to accommodate the load to be lifted. Lifting with too few parts-of-line can result in failure of the wire rope.

Counterweight

On cranes equipped with removable counterweights, ensure the appropriate counterweight sections are properly installed for the lift being considered.

Do not add material to the counterweight to increase capacity. United States Federal law prohibits modification or additions which affect the capacity or safe operation of the equipment without the manufacturer's written approval. [29CFR 1926.1434]

Outrigger Lift Off

Regarding "lifting" of an outrigger pad during craning activities, be advised that the rated loads for these cranes, as indicated on the crane's *Load Chart*, do not exceed 85% of the tipping load on outriggers as determined by SAE J765 OCT80 "Cranes Stability Test Code." An outrigger pad may lift off the ground during operation of the crane within the capacity limits of the *Load Chart*, yet the crane will not have reached instability. The "balance point" for stability testing according to SAE and Manitowoc criteria is a condition of loading wherein the load moment acting to overturn the crane is equal to the maximum moment of the crane available to resist overturning. This balance point or point of instability for a crane does not depend on "lifting" of an outrigger but rather on comparison of the "opposing" load moments.

The occurrence of an outrigger lifting from the ground is often attributed to the natural flex in the crane's frame. This may happen when lifting a load in certain configurations within the capacity limits of the *Load Chart* and is not necessarily an indication of an unstable condition.

Provided the crane is properly set up, the crane is in good working condition, that all operator's aids are properly programmed, that the qualified crane operator adheres to the instructions found in the applicable *Load Chart*, *Operator's Manual* and decals on the crane, the crane should not be unstable.

Multiple Crane Lifts

Multiple crane lifts are not recommended.

Any lift that requires more that one crane must be precisely planned and coordinated by a qualified engineer.

If it is necessary to perform a multi-crane lift, the operator shall be responsible for assuring that the following minimum safety precautions are taken:

- Secure the services of a qualified engineer to direct the operation.
- Use one qualified signal person.
- Coordinate lifting plans with the operators, engineer, and signal person prior to beginning the lift.
- Maintain communication between all parties throughout the entire operation. If possible, provide approved radio equipment for voice communication between all parties engaged in the lift.
- Use cranes and rigging of equal capabilities and use the same boom length.
- Use outriggers on cranes so equipped.
- Be certain cranes are of adequate lifting capacity.
- Calculate the amount of weight to be lifted by each crane and attach slings at the correct points for proper weight distribution.

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 (e.g. LMI).
- Check all braking (e.g. wheel, hoist, and swing brakes) and holding devices before operation.

You must ensure that the outriggers and stabilizers 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.

Clear all personnel from the outrigger area before extending or retracting the outriggers. Carefully follow the procedures in this *Operator's Manual* when extending or retracting the outriggers. Death or serious injury could result from improper crane set up on outriggers.

Be familiar with surface conditions and the presence of overhead obstructions and power lines.

Working

Operator shall be responsible for all operations under his/her direct control. When safety of an operation is in doubt, operator shall stop the crane's functions in a controlled manner. Lift operations shall resume only after safety concerns have been addressed or the continuation of crane operations is directed by the lift supervisor.

Know the location and function of all machine controls.

Make sure all persons are away from the crane and the Travel Select Lever is in the "N" (Neutral) position with the parking brake engaged before starting the engine.

Overload less than 25%			
1	Sheaves	Inspect all for damage.	
2	Luffing Mechanism/ Cylinder	Inspect for damage/leaks.	
3	Collar-wear pads	Inspect all for damage.	
Overload from 25% to 49%			
1	Sheaves	Inspect all for damage.	
2	Luffing Mechanism/ Cylinder	Inspect for damage/leaks.	
3	Collar-wear pads	Inspect all for damage.	
4	Collar-welds	Inspect all for cracks.	
5	Telescopic Sections	Inspect for bent or twisted sections. Check the boom for straightness.	
6	Lift Cylinder Head Area	Inspect for bends or cracked welds.	
7	Turret-Base Section	Inspect for cracked welds.	
8	Locking Area (Pin Booms)	Inspect for elongated holes.	
9	Welds	Inspect for cracks.	
10	Paint	Inspect for cracked paint which could indicate twisted, stretched, or compressed members.	

SECTION 3
OPERATING CONTROLS

The following paragraphs describe all the available (standard and optional) controls and indicators located in the superstructure cab. Some machines may not be equipped with the optional controls shown. The cab utilizes international symbols to label the various controls.

The numbers in parenthesis ( ) represent the index number from (Figure 3-1, Figure 3-2 and Figure 3-3). The two types of controllers are shown in Figure 3-3.

NOTE: Unless otherwise noted, the "engine" called out in this section is the superstructure engine.

SUPERSTRUCTURE CAB CONTROLS AND INDICATORS

NOTE: The numbers in ( ) represent the index number from Figure 3-1.

All rocker switches contain one or two LEDs in the switch for illumination.

All indicators will light solid, all at the same time for approximately two seconds as a diagnostic test when the ignition switch is at on. If any indicator fails to light, replace it immediately.

Tachometer with Hourmeter

The tachometer/hourmeter (1) is located on the right side of the front console and registers engine RPM and speed of rotation. The tachometer is calibrated in rpm x 100 with a range of zero (0) to 35. It receives a signal from the crane's electronic operating system which receives the signal from the engine ECM via J1939.

The hourmeter at the bottom of the tachometer is used to register hours of engine operation.

Gauge Cluster

The gauge cluster (2) is located on the left side of the front console assembly and contains a voltmeter, oil pressure gauge, water temperature gauge and a fuel quantity gauge.

Voltmeter

The voltmeter (VOLTS) is located on the lower right of the gauge cluster. With the ignition switch in the run (between vertical and far right) position and before starting the engine, the voltmeter indicates the condition of the batteries. With the engine running, the voltmeter indicates output voltage of the alternator. The voltmeter scale is from 10 to 16 volts.

Engine Oil Pressure Gauge

The engine oil pressure (OIL) gauge is located on the upper right of the gauge cluster. The gauge indicates the engine oil pressure on a scale calibrated from zero (0) to 80 psi. It receives a signal from the crane's electronic operating system which receives the signal from the engine ECM via J1939.

Water Temperature Gauge

The engine coolant temperature (TEMP) gauge is located on the lower left of the gauge cluster. The gauge indicates the engine coolant temperature on a scale calibrated from 100° to 240° F. The gauge receives a signal from the crane's electronic operating system which receives the signal from the engine ECM via J1939.

Fuel Quantity Gauge

The fuel quantity (FUEL) gauge is located on the upper left of the gauge cluster. The gauge indicates the quantity of fuel in the tank and has a scale calibrated from empty (E) to full (F). The fuel quantity gauge receives a signal from the crane's electronic operating system which monitors a sending unit in the fuel tank.

Emergency Stop Switch

The emergency stop switch (3) is located on the right side of the front console. Push in on the switch to remove power and stop the engine.

Ignition Switch

The ignition switch (4) is located on the right side of the front console. The switch is key operated with four positions: accessory (left position), off (vertical position), run (position between vertical and right), and start (right position).

With the ignition switch in the off position, most electrical power is off except for the gauge and panel lights, work lights, cab dome lights, and cab 12V accessory outlet.

The accessory position energizes all electrical components except the engine ECM. The run position is the same as accessory except the engine ECM is energized. The start position energizes the starter relay which in turn energizes the cranking motor solenoid and cranks the engine for starting. The switch will return to run when the switch is released after the engine is started. Turn the switch to off to shut down the engine.

Engine Stop/Module Off Line Indicator

The engine stop/module off line indicator (5) is located on the top left side of the front console. The top portion of the switch is the stop indicator. It lights red when energized by a signal from the engine ECM that signifies a serious engine problem that requires the vehicle and the engine to be stopped as

ADDITIONAL CONTROLS AND INDICATORS

The following paragraphs describe the outrigger control panels located on each side of the crane carrier. The numbers in parentheses () represent the index number from Figure 3-5.

Outrigger Control Summary

There is an outrigger control panel located on each side of the crane carrier. Each control panel contains switches for extending and retracting the outrigger beams and for raising and lowering the outrigger stabilizer (jack) cylinders on all sides of the crane.

A push button emergency stop switch (5) is installed on the panel.

A level (6) is installed on a bracket near the outrigger controls.

Outrigger Control Panel

There is one outrigger control panel (1) on each side of the unit's frame. The panel on the right side operates the outrigger beams for that side only. The panel on the left side operates the outrigger beams for that side only. The stabilizers may be operated from the left or right side of the unit.

Outrigger Beam Selector Switch

The outrigger beam selector switch (2) is used to indicate desired operation of the front or rear outrigger beam for the side of the unit the control panel is on.

Extend/Retract Switch

The extend/retract switch (3) will operate the outrigger beams or the stabilizers. After positioning the desired selector switch (beam or stabilizer), position the extend/retract switch to move the selected component in the desired direction.

In addition, when the switch is positioned to either position, a signal is sent to the engine ECM to increase engine speed above idle for operation of the outriggers.

Stabilizer Selector Switch

The stabilizer selector switch (4) selects which stabilizer is to be operated.

Emergency Stop Switch

The emergency stop switch (5) is located on the center of the outrigger panel. Push the switch to remove all electrical power from the controls and stop the engine.

Pull switch out to resume operation.

If the emergency stop switch on either outrigger control panel or in the superstructure cab is not pulled out for normal operation, the emergency stop indicator in the superstructure cab will light red if operation of any function is attempted.

Elevating and Lowering the Boom

Elevating the Boom

WARNING
Keep the area above and below the boom clear of all obstructions and personnel when elevating the boom.

To elevate the boom, push the controller on the right hand armrest to the left (raises the boom), and hold until the boom reaches the desired elevation.

Lowering the Boom

WARNING
Keep the area beneath the boom clear of all obstructions and personnel when lowering the boom.

WARNING
Long cantilever booms can create a tipping condition, even when unloaded and in an extended, lowered position.

WARNING
When lowering the boom, simultaneously let out the hoist cable to prevent two-blocking the boom nose and hook block.

CAUTION
The closer the load is carried to the boom nose, the more important it becomes to simultaneously let out the hoist cable as the boom is lowered.

To lower the boom, push the controller on the right hand armrest to the right (lowers the boom) and hold until the boom is lowered to the desired position.

Telescoping the Boom

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

Extending the Boom

WARNING
When extending the boom, simultaneously let out the hoist cable to prevent two-blocking the boom nose and hookblock.

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.

1. To extend the boom push the controller on the left hand armrest forward and hold until the boom reaches the desired length.

Retracting the Boom

WARNING
When retracting the boom, the load will lower unless the hoist cable is taken in at the same time

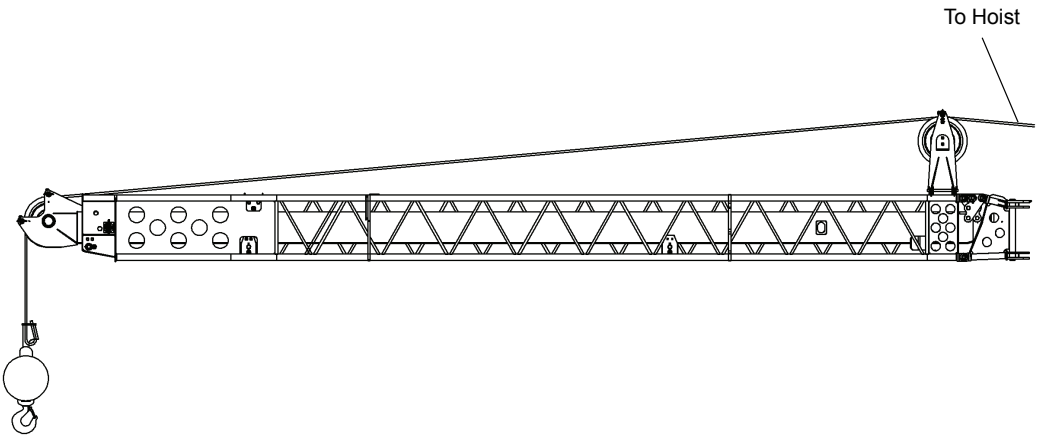
To retract the boom, pull the controller on the left armrest back and hold until the boom retracts to the desired position.

Telescope Control Pedal

The telescope control pedal located to the left of the throttle pedal is used on cranes equipped with an auxiliary hoist. Push on the top of the pedal to extend the boom or push on the bottom of the pedal to retract the boom.

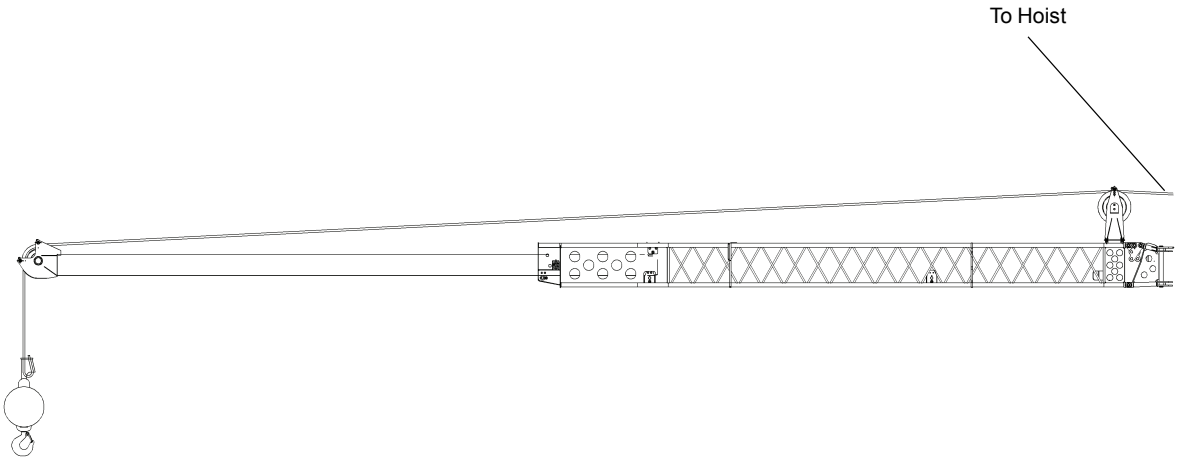
Lowering And Raising The Hoist Cable

WARNING
Keep the area beneath the load clear of all obstructions and personnel when lowering or raising the cable (load).



6710-2

7.9 M (26 Ft) Telescope Boom Extension



6685-7

13.7 M (45 Ft) Telescope Boom Extension

FIGURE 4-4 continued

SECTION 5
LUBRICATION

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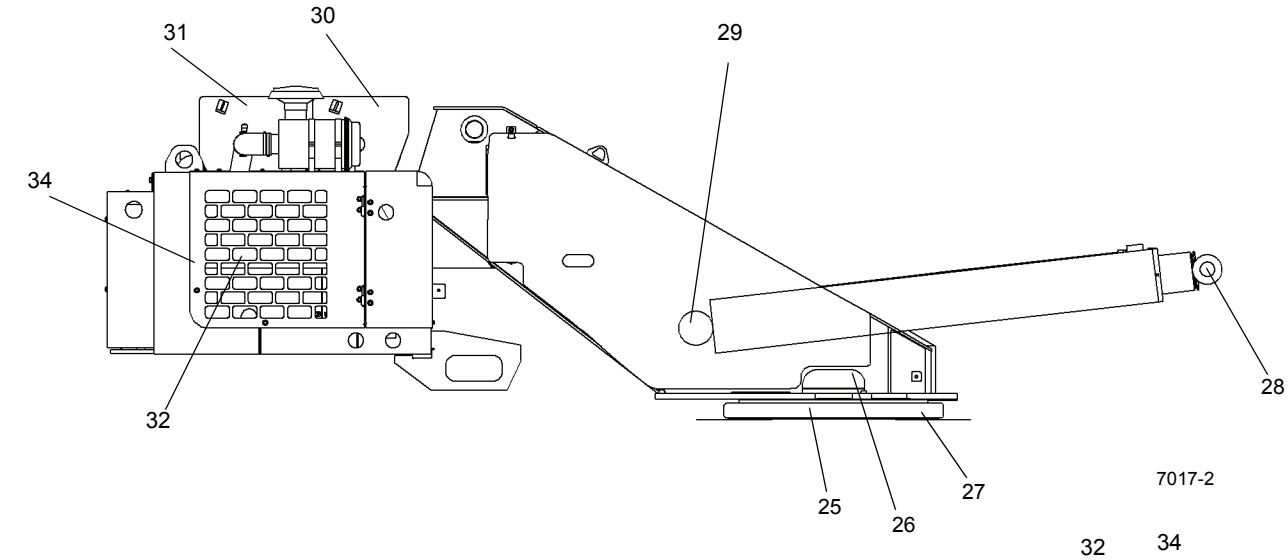
30. Main Hoist

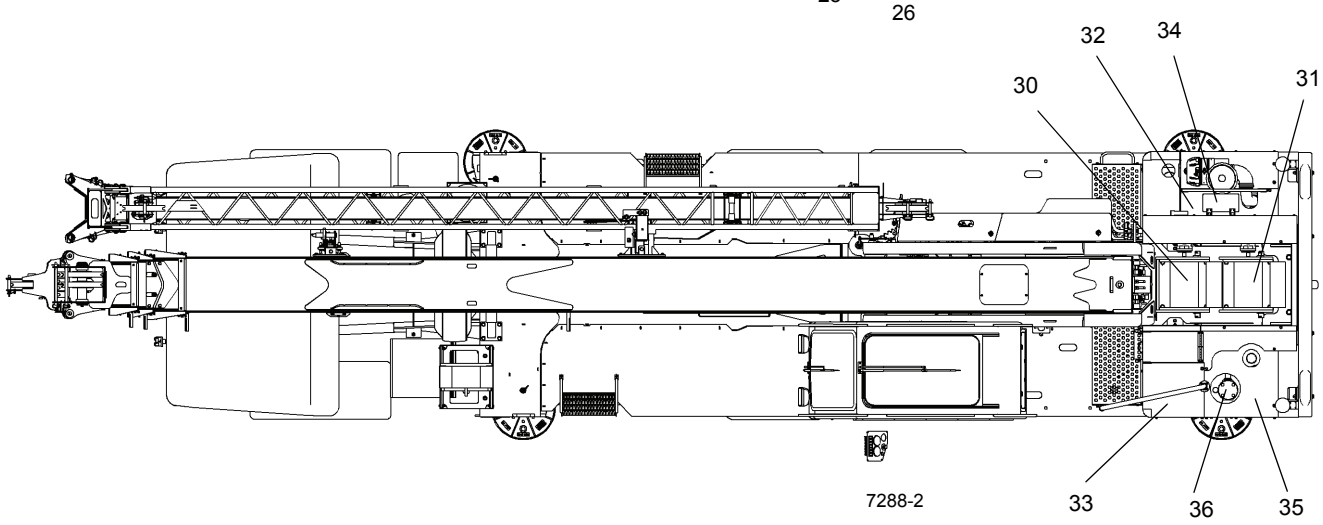
Lube Type - EP

Lube Interval:

- Check oil level daily using sight glass. Oil must be visible in bottom half of sight glass.
- Change gear oil after first 100 hours or 30 days.
- Check every 250 hours or 3 months.
- Sample gear oil for contaminants and other problems every 250 hours or 3 months.
- Drain and fill with new oil every 12 months.
- Clean vent plug every 12 months.

Lube Amount - Capacity - 5.5 quarts (5.2 liters)





Superstructure Lubrication Points

FIGURE 5-3

5