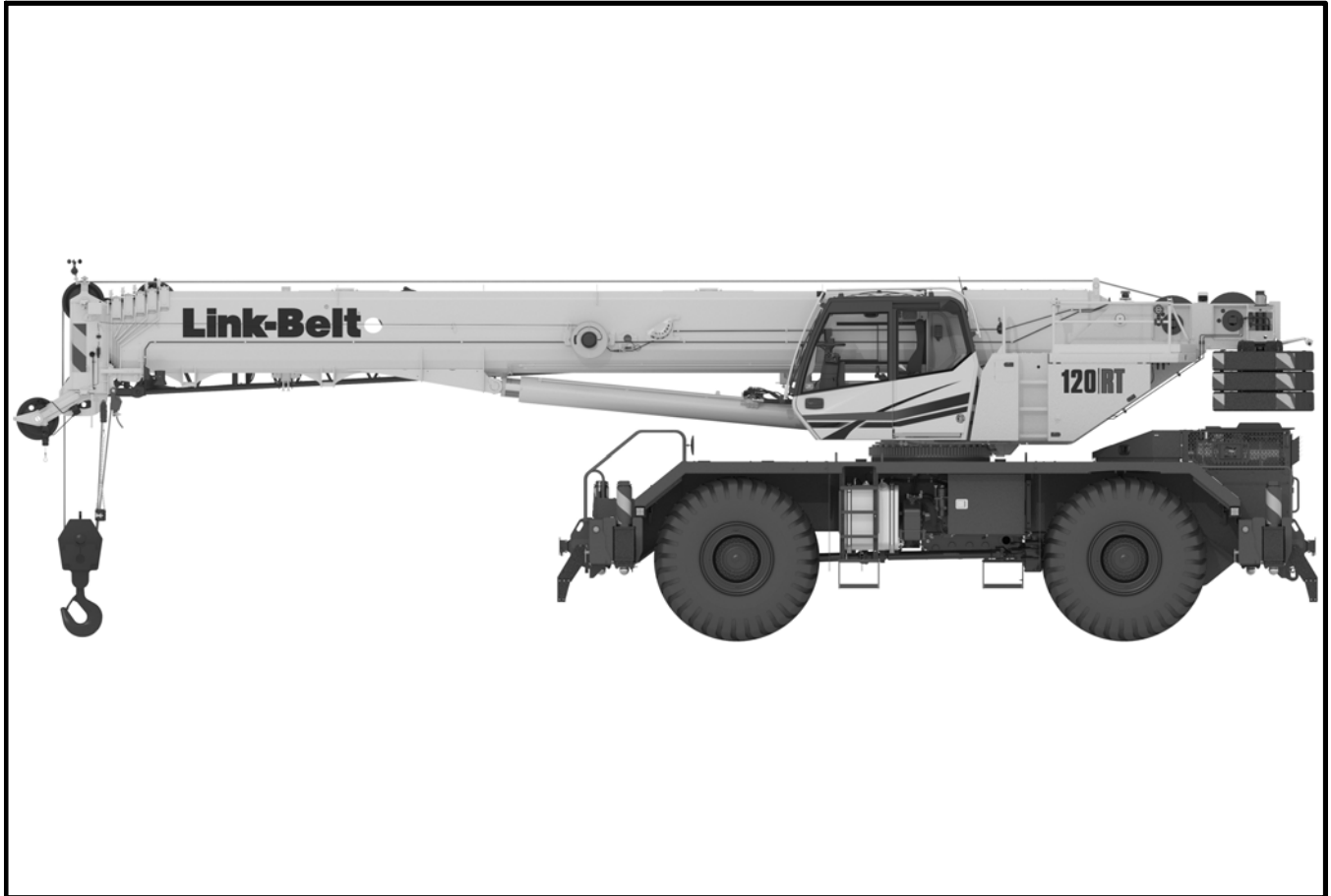


Operator's Manual



Crane Serial Number

The crane serial number is on the Crane Rating Manual in the lower right interior of the operator's cab. The crane serial number should always be furnished when ordering parts for the crane, or when corresponding with the Link-Belt Distributor or the Factory regarding the crane. The serial number is the only method of ensuring that the correct parts will be furnished.

In the event the serial number cannot be found on the Crane Rating Manual, a number is stamped on top of the outrigger box on the right side of the carrier and on the two position swing lock weldment. This number can then be used to help to identify the crane.



WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel.



WARNING: Cancer and Reproductive Harm-
www.P65warnings.ca.gov/diesel.

Operator's Manual



WARNING

CONSTRUCTION EQUIPMENT CAN BE DANGEROUS IF IMPROPERLY OPERATED OR MAINTAINED. THIS CRANE SHOULD BE OPERATED AND MAINTAINED ONLY BY TRAINED AND EXPERIENCED PEOPLE WHO HAVE READ, UNDERSTOOD, AND COMPLY WITH THE OPERATOR'S & MAINTENANCE MANUAL.

The productive life of construction equipment depends largely on the care and consideration given to it. This especially holds true for hydraulic cranes. This Operator's & Maintenance Manual was compiled to explain the procedures and adjustments necessary for proper operation of this crane.

A study of this Operator's Manual will acquaint the operator and service personnel with the construction of this crane. It will enable them to identify and remedy most problems that may occur. Any questions pertaining to the care and upkeep of this crane which are not covered in this Operator's Manual should be directed to your Link-Belt Distributor.

The Operator's Manual is stored in the pocket on the rear of the operator's seat. The Operator's Manual should remain in the cab and accessible at all times. **If the Operator's Manual becomes lost, damaged, or unreadable, it must be replaced before operating the crane.**

In addition to this Operator's & Maintenance Manual, a Parts Manual, Crane Rating Manual, and Safety Manual are supplied with the crane. Read and understand all safety guidelines before operating the crane. Additional copies of all manuals are available through your Link-Belt Distributor.

Operator's Manual

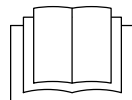
Throughout this Operator's Manual, reference is made to the left, right, front, and rear pertaining to direction and locations. These reference directions are relative to the operator, sitting in the operator's seat with the upper directly over the front of the carrier (engine to the rear), unless otherwise stated.

Danger, warning, and caution captions as well as special notes are used throughout this Operator's Manual and on the crane to emphasize important and critical instructions. Labels, plates, decals, etc. should be periodically inspected and cleaned as necessary to maintain good legibility for safe viewing. **If any instruction, caution, warning, or danger labels, plates, or decals become lost, damaged, or unreadable, they must be replaced.** Information contained on such labels, plates, and decals is important and failure to follow the information they contain could result in an accident. Replacement labels, decals, and plates can be ordered through your Link-Belt Distributor. For the purpose of this Operator's Manual, and the labels which are placed on the crane, danger, warning, and caution captions and notes are defined as follows:



NOTE

Note: An operating procedure step, condition, etc. which is essential in order for the process to be completed properly.



This symbol may appear in this Operator's Manual and/or on a label on the crane to alert personnel that additional instructions are included in the crane Operator's Manual.

Operator’s Manual

General Index

A detailed Table Of Contents for each Section of this Operator’s Manual is included at the beginning of each Section. The following is a description of each Section:

Section 1 – Operating Instructions Pages 1–1 Thru 1–256

Section 1 includes the necessary information for safe, productive crane operation. It includes the nomenclature and operation of all control switches, levers, pedals, and instrumentation of the crane.

Section 2 – Lubrication And Preventive Maintenance Pages 2–1 Thru 2–42

Section 2 includes the necessary information for proper lubrication and preventive maintenance for daily operations. It includes the check/change intervals and procedures for maximizing the service life of the crane under normal working conditions. It also includes lubrication types and specifications approved for use in the crane.

Section 3 – Periodic Adjustments Pages 3–1 Thru 3–42

Section 3 includes the adjustments which must be made periodically to keep the crane in proper, safe working order. It includes the procedures and necessary information for adjusting the brakes, mechanical linkages, and hydraulic pressures on the crane.

Section 4 – Attachments Pages 4–1 Thru 4–92

Section 4 includes the use and operation of the crane attachments. It includes the necessary information for installation, erection, storage, and removal of the auxiliary lifting sheave and lattice fly.

Section 5 – General Information Pages 5–1 Thru 5–30

Section 5 includes general information on the Crane Rating Manual and serial number as well as wire rope specifications, inspection, replacement, connections, and reeving. General specifications for the crane are also included.

Section 6 – Fundamental Terms Pages 6–1 Thru 6–10

Section 6 includes a list of terms which are used to refer to crane functions, assembly, operation, and maintenance. These terms are defined as to how they are used in this Operator’s Manual.

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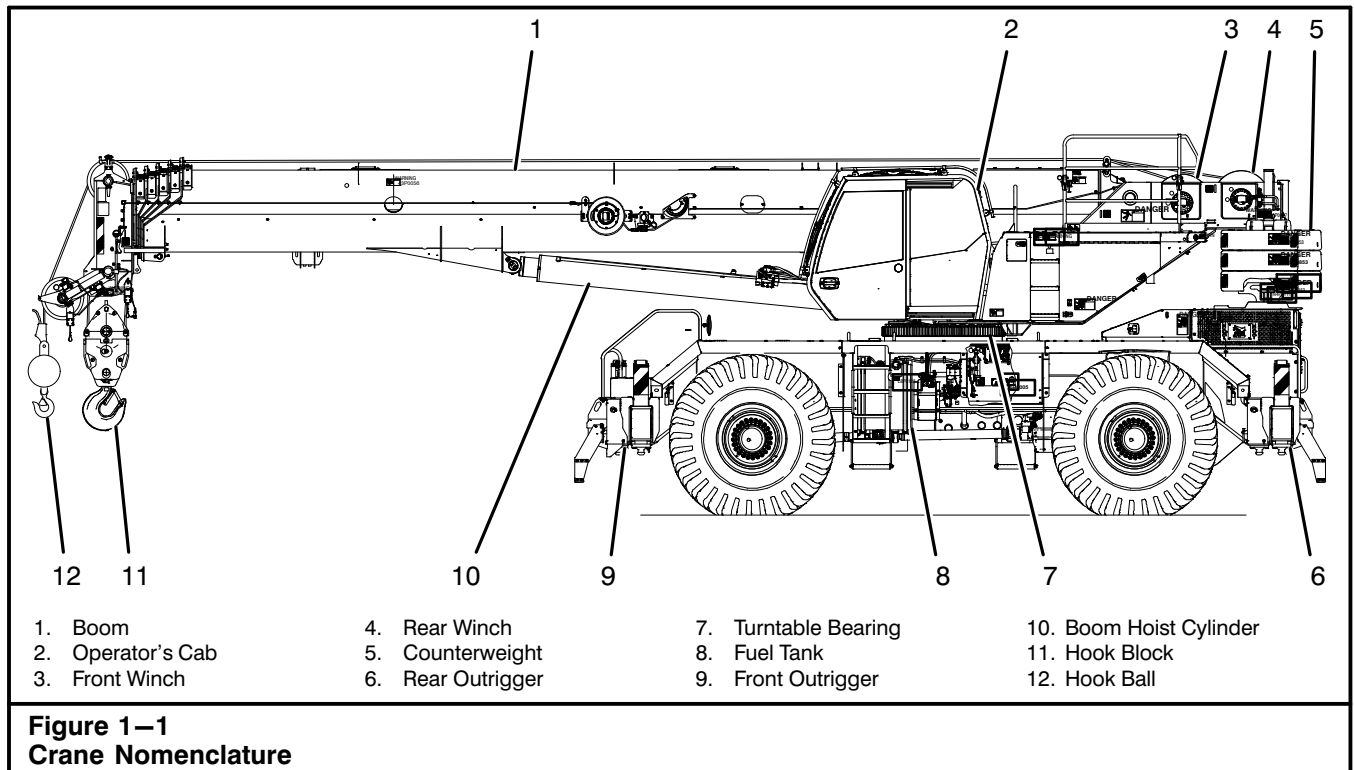
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On Delivery

When a new crane is delivered, follow the instructions outlined in the latest version of Technical Bulletin General Series #213.

Operating Safety

Remember **SAFETY** every day. Someone's **LIFE** may depend on it, **MAYBE YOUR OWN**.

Safe operations of a hydraulic crane requires a well trained, qualified operator. Crane operation is more involved than it may appear, and operation by a careless or unqualified person can result in a serious accident.

When a hydraulic crane is maintained and used properly it can be a safe, highly productive piece of equipment, but if not used properly, it can be dangerous.

Think Safety – You, the operator, are in charge of an important piece of equipment. It is very important that you know what it can do. It is also important that you know what it should not do. No set of instructions can anticipate all of the situations you will encounter. The rules given here cover the general usage, and some of the more common specific cases. If conditions arise not covered by these rules, contact your Link-Belt Distributor. A phone call could save someone's life.



WARNING
Do not lift, suspend, swing or lower loads or attachments over anyone. Do not allow anyone to ride on any part of load or attachment.

SAFETY INSTRUCTIONS

Construction equipment can be dangerous if improperly operated or maintained. This crane should be operated and maintained only by trained and experienced people who have read, understood, and complied with the Operator's Manual.

Before leaving operator's position, lower load to the ground.

Do not use swing brake for swing lock.

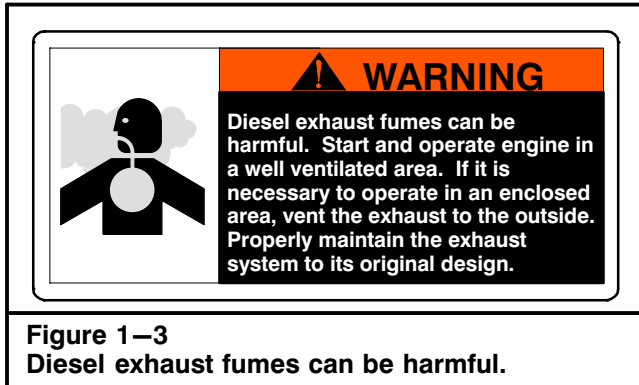
When facing over rear some functions will be reversed relative to operator.

Raise the crane on outriggers, or block the wheels, and shutdown the engine before working on the crane. Replace all guards or panels before operating the crane.

Do not deface or remove this label from the crane.

Figure 1-2
Read and understand all points covered in this Operator's Manual before operating the crane.

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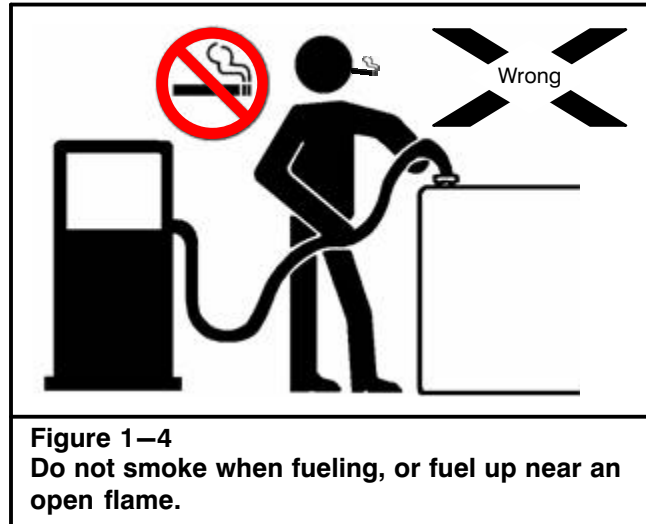


General Safety Rules

The following is a list of safety rules which should be followed during all crane operations.

Operator Awareness

1. Read this Operator's Manual and heed it. The manual contains important information.
2. An operator must not eat, read, or otherwise divert his attention while operating a crane. Remember—operating is a full-time job.
3. Start and operate the engine in a well ventilated area. Diesel exhaust fumes can be harmful. If it is necessary to operate in an enclosed area, vent the exhaust to the outside. Properly maintain the exhaust system to its original design.

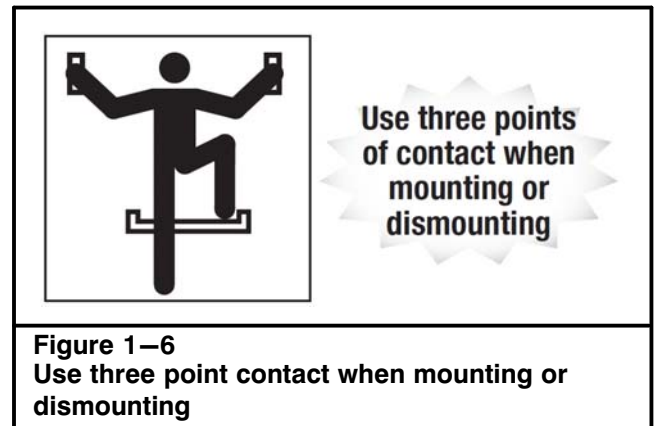


4. Don't smoke when fueling, or fuel up near an open flame. Keep the nozzle in contact with the filler neck to prevent static electric sparks. Shutdown the engine when fueling.
5. Keep your shoes clean. Before entering the operator's cab, wipe clean any mud, gravel, snow, ice, moisture, or grease from your shoes. Slippery shoes could cause momentary loss of control of crucial foot operated controls.
6. Keep all walking surfaces (steps, ladders, platforms, etc.) and slip resistant areas on the crane clean. Slip resistant areas are located on the crane to assist operators and service personnel with safe access/egress to/from the crane and to/from adjustment and inspection areas. Do not allow slip resistant areas to become contaminated with mud, snow, ice, oil, paint, wax, etc. Any contamination can cause the slip resistant areas to become slick, reducing their effectiveness for safety while walking on the crane. If any slip resistant areas become ineffective due to wear, age, or destroyed in any way, they must be repaired or replaced.

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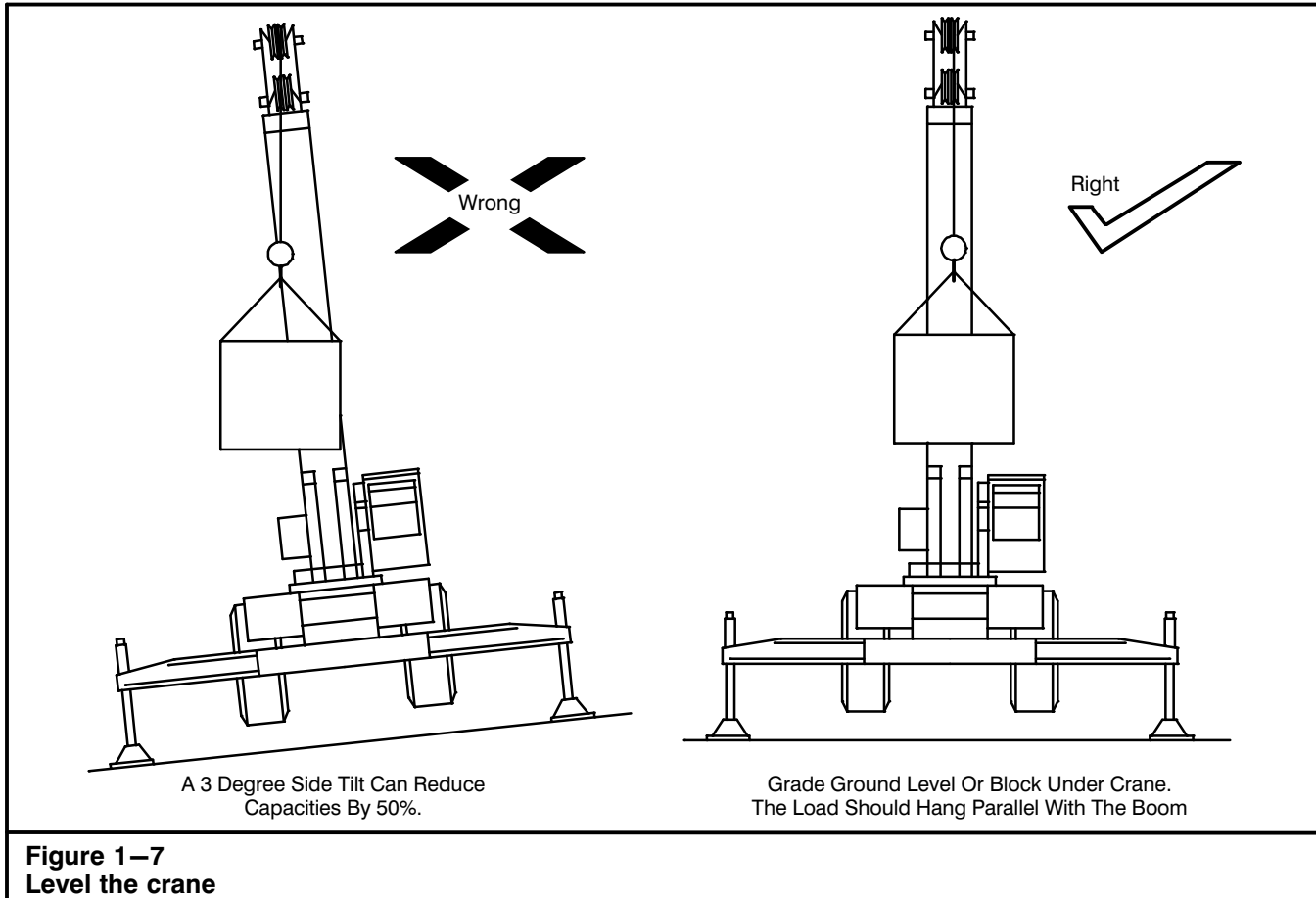


7. Keep fingers, feet, and clothing away from sheaves, drums, and wire ropes unless the crane is shutdown and everyone knows what you are doing. Do not place a hand on wire ropes when climbing on the crane. A sudden movement could pull you into the drums or sheaves.
8. Use care during all access/egress to/from the crane. Use the hand rails, hand grips, steps ladders, guard rails, etc. to prevent slips and falls. Remain in three point contact (two hands and one foot or two feet and one hand) with the crane at all times.



9. To prevent movement of individual boom sections, shutdown the engine and ensure that the operator has properly vacated the operator's cab before putting hands or tools inside the boom. Unexpected movement of the boom sections could sever fingers, hands, arms, etc.
10. Operate the crane from the operator's seat only. Operating the crane from any other position, such as reaching in a window, constitutes a safety hazard.
11. Watch the load or a signal person at all times. A suspended load must have your undivided attention.

Operator's Manual



12. The operator, supervisor, or person in charge of the load must observe the following rules:

- Loads must be well secured before lifting. Ensure that the rigging cannot slip off or pull away from the load, or get out of position on the load. Use a three-point sling if necessary to keep the load from rolling or turning over.
- Chains and slings must be of adequate size, in good condition, and not twisted around each other.
- The load must not catch on an obstruction when lifting or swinging. Ensure the load, winch wire rope(s), or any other parts of the crane do not snag or strike any obstruction.
- Do not allow the load to rotate out of control. Personal injury to ground personnel, load damage, crane damage, or damage to anti-two block system may occur.
- When hoisting with single part line, especially in long falls applications, the design of wire rope and hook ball is crucial to minimize the potential for uncontrolled wire rope and/or load rotation. Rotation-resistant category 1 wire rope is recommended for single part of line applications. See Wire Rope Capacity Chart in the Crane Rating Manual for the specific types of rotation-resistant category 1 wire rope recommended for the crane.

- Avoid sudden starts and stops. Lift carefully, swing gently, brake smoothly, lower and set loads carefully. Jerking the load, swinging and engaging swing brake roughly, and lowering the load rapidly and slamming on brakes, will put shock loadings and possible side loadings on the boom. Unnecessary abuse labels the operator as a beginner. Be a professional.
- Do not wrap the winch wire rope around the load. Do not use discarded, worn, or damaged wire ropes for slings. They may fail and drop the load.
- The crane must be level on a firm supporting surface before making a lift. Use the bubble level or level indicator display to level the crane. Check its accuracy frequently with a carpenter's level. Remember, a three degree side tilt can reduce capacities by 50% or more.
- If working at night, ensure adequate lighting is provided so the operator and all other workers can see all movements of the crane, attachment, and load.

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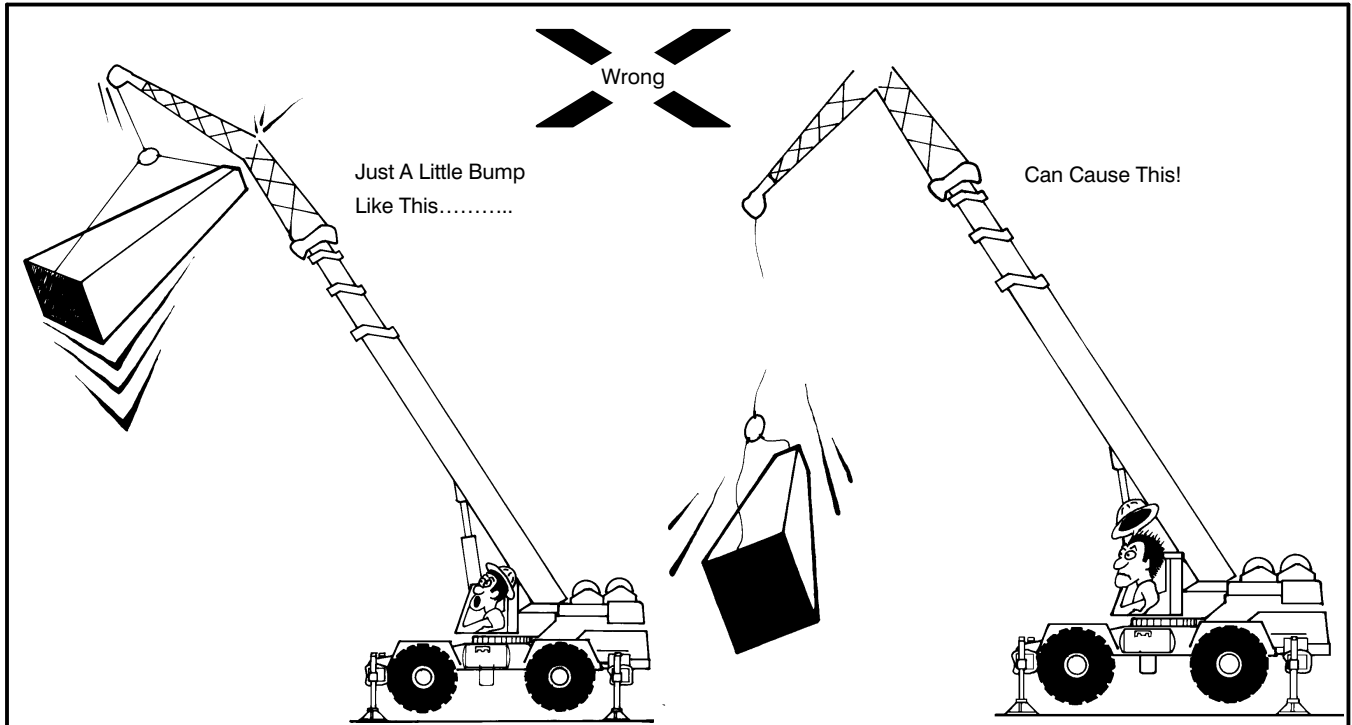


Figure 1-8
Do not let the load hit the boom or fly.

13. Don't let the load or bucket hit the boom or fly. Don't let the boom or attachment rest on, or hit, a building or any other object. A dent or other damage could result, which will weaken the boom or attachment. If there is major damage, the attachment could collapse. If a lattice or diagonal bracing member on the fly is broken, cracked, or bent, contact your Link-Belt Distributor for repair procedures. If the boom or fly is struck, or damaged by anything, STOP. The loading on a boom or attachments increases as they are lowered, therefore their suspension systems could collapse during lowering. Use another crane to lower a damaged boom or attachment.
14. Don't pull sideways on the boom or fly, not even a little. Lift straight up on every load. Moving trucks, rail cars, barges, or anything else pulling sideways on the winch wire rope could buckle the boom or fly. It could also damage the swing mechanism. Pulling sideways on a boom or fly can overturn the crane.
15. Heat from the sun only on one side of the boom may cause a temperature differential between the sides of the boom. The thermal effects may cause boom distortion (the boom to "deflect" to one side) creating a side load on the boom and/or fly. Side loading is dangerous and shall be avoided.

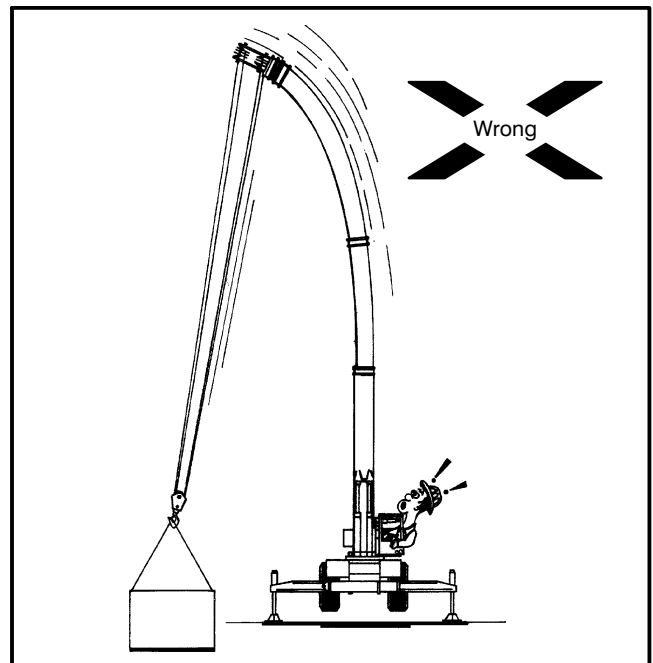


Figure 1-9
Do not use the boom to pull sideways.

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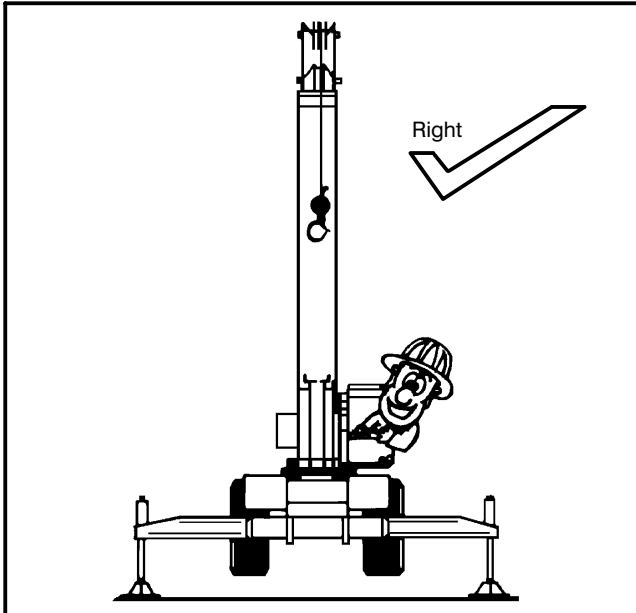


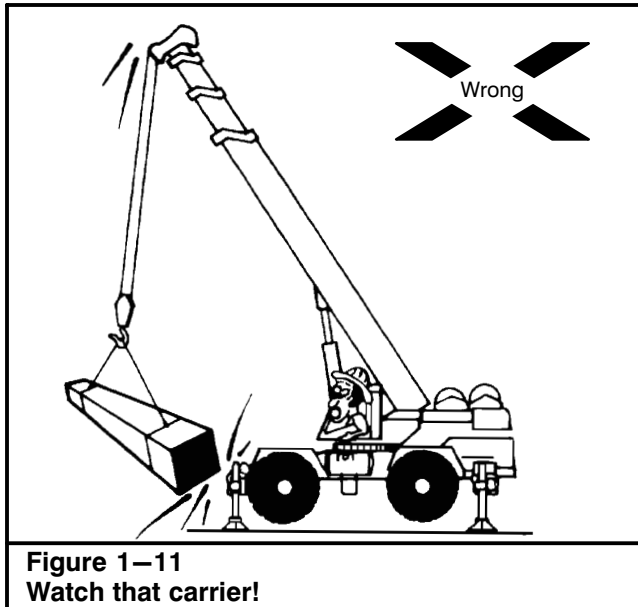
Figure 1–10
Crane level, all beams extended equally (or in accordance with V–CALC) and tires clear of the ground.

16. Do not “two block” (pull the hook block, hook ball, and/or the load into the head machinery) as this can cause winch wire rope and sheave breakage resulting in an accident.
17. After slack winch wire rope operation, ensure the winch wire rope is properly seated in sheaves and on drums before continuing to operate. Use a stick or mallet to set the winch wire rope, not your hands. Ensure the crane is properly shutdown before entering the winch area and prior to working with the wire rope.
18. Do not lower the load beyond the point where less than three full wraps of winch wire rope are left on the drum. This condition could occur when lowering a load beyond ground level. If all the winch wire rope runs off the drum, the load will jerk which could break the winch wire rope.
19. Ensure there is a safety latch on the hook, and that it works properly. Without a latch, it is possible for slings or chains to come off the hook, allowing the load to fall.
20. Don't alter any part of the crane. Additions to or changes in any part of the equipment can create loadings for which the crane was not designed. Such changes may seriously affect the usable capacities and make all capacities in the Crane Rating Manual invalid. Alterations can dangerously overload or weaken critical parts and may cause disastrous failure.
21. Do not exceed the rated capacities of the crane under any circumstances. While a crane has more stability when lifting over a corner (as compared to straight over the side) the crane capacity is not increased. Anytime the load exceeds the rated capacities listed in the Crane Rating Manual, the crane is overloaded. Overloads can damage the crane and such damage could cause failure and accidents.
22. When operating on outriggers, all beams must be equally extended, or in accordance with the V–CALC (Variable Confined Area Lifting Capacities). Refer to the Crane Rating Manual. Jacks must be extended so all tires are clear of the ground, and the crane must be level. Ensure that pontoons are set on firm surface, adequate to support the blocking, pontoon, crane and load without settling, slipping or collapsing. Blocking or matting under pontoons must form a smooth level surface under the entire pontoon. Do not block under outrigger beams inside the pontoons as this reduces stability. Blocking must be under pontoons only. Remember—there are tremendous loadings on pontoons and blocking – the weight of the entire crane plus any load.

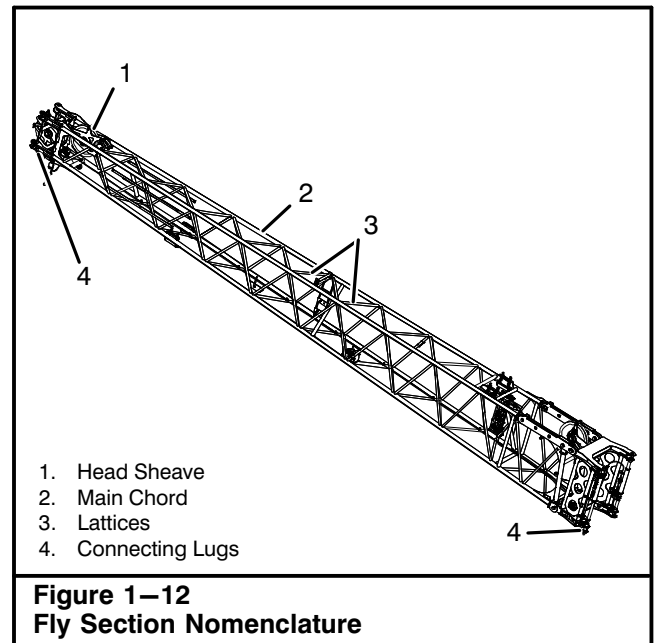
When blocking or matting under pontoons, ensure that each pontoon is supported fully – no unsupported pontoon area is permissible. Ensure pontoons are on a smooth surface. Rough surface, rocks, etc., under pontoons will cause unequal loadings, and can puncture them, causing them to collapse.

Capacities are based on all outriggers being equally extended, or in accordance with the V–CALC (Variable Confined Area Lifting Capacities). Refer to the Crane Rating Manual.

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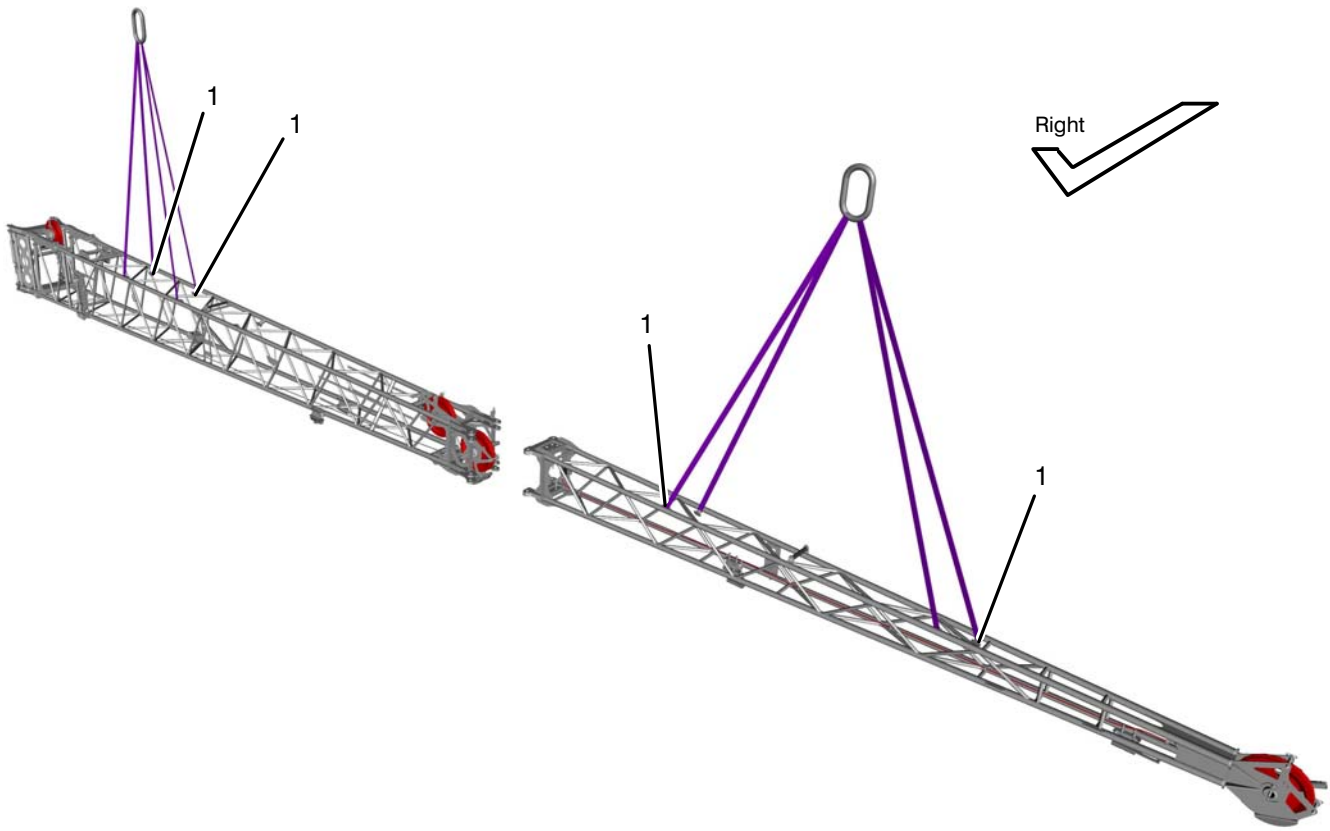


23. When operating with the boom at a high angle, use care not to let the load hit the carrier.
24. Before attempting to move the carrier, ensure there is enough oil pressure to operate the brakes. Always check the brake operation before traveling the crane.
25. Brake firmly in one application. Avoid fanning the brakes. This could exhaust oil pressure so fast that the pump may not supply enough oil.
26. Do not coast downhill with the transmission in neutral. It makes control of the crane more difficult and dangerous.
27. Shift the transmission to neutral before operating the crane. Crane operation can cause movement which can damage the transmission or drive line. When parking, shift to neutral and engage the park brake. Block wheels if not on a level surface.



28. Use care handling the fly when loading, transporting, and unloading. Damage that occurs during these operations can go undetected and could result in failure of the attachment, once subjected to loading. Do not attach slings to the lattices, when lifting the fly or fly extensions, as they will bend. It is recommended that the lifting lugs and/or connecting lugs be used as the lifting points. However, it is permissible to attach nylon straps around all four main chords.
29. Block under and between the fly sections when loading them on a transport vehicle. When securing the fly to a transport vehicle, it is best to use synthetic webs or slings. If using wire rope slings, pad the fly to protect it from damage. Do not overtighten the tie downs or the fly may be damaged. Do not use chain tie downs, as they may dent and damage the fly section.
30. Thoroughly inspect all the elements of the fly section before installing it on the crane. Check each main chord, picture frame, diagonal, lattice, and connecting lug for bends, dents, and cracked or corroded welds. Picture frames must be square. Do not use any fly section that is even slightly damaged. Contact your Link-Belt Distributor for the proper repair procedures.

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1. Use The Main Chords With Nylon Straps Only And/Or Head Machinery Cross Shafts As Lifting Points.
2. Use The Main Chords As Lifting Points With Nylon Straps Only.

3. Do Not Attach Slings To Lattices, They Will Bend.

Figure 1–13
Handling The Fly Sections

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31. Cold weather operation requires some special attention by the operator to allow for changes in everyday routines:
- a. Clean the crane, especially the boom, of accumulated amounts of ice or snow. Operating the crane with an ice covered boom is dangerous. The added weight of the ice or snow can drastically reduce the capacity of the crane. Also, falling ice may pose danger for ground personnel.
 - b. Clean all snow and ice from steps, ladders, platforms, etc. to eliminate slippery walking surfaces.
 - c. If cold weather starting aids are provided on the crane, use them. The use of aerosol starting sprays are not permitted.
 - d. Pay close attention to the gauges in the operator's cab when starting the engine. Normal "warm up" times will be longer. Ensure pressures and temperatures are within normal ranges before beginning operations.
 - e. Always handle flammable materials according to the manufacturer's instructions. Propane, diesel, or other fuel for auxiliary heaters can be dangerous if not properly handled. Do not store such fuels on the crane.
 - f. Use caution when lifting any load during freezing weather, as it may be frozen to the ground or the supporting surface. The added tension, to break the load free, could cause an unexpected overload situation. Also, when the load does finally break loose it could create an erratic motion causing damage or injury.
 - g. At the end of the work shift, park the crane where it will not freeze to the ground. Major damage to the drive mechanism could occur while trying to free the crane from a frozen surface.

Thermal Effects on Hydraulic Cylinders

Hydraulic oil expands and contracts when heated or cooled. This is a natural occurrence that effects all liquids. The coefficient of expansion for API Group 1 hydraulic oil is approximately 0.00043 cubic inches per cubic inch of volume for 1°F of temperature change. Thermal contraction will allow a cylinder to retract as the trapped hydraulic fluid in the cylinder cools. The change in length of a cylinder is proportional to the extended length of the cylinder and to the change in temperature of the oil in the cylinder. For example, a cylinder extended 20 feet and the oil cools down 40°F would retract the cylinder approximately 4 inches (refer to Cylinder Drift Chart. A cylinder extended 5 feet and the oil cools down 40°F would only retract the cylinder approximately 1 inch. The rate at which the oil cools depends on many factors and will be more noticeable with a larger difference in oil temperature verses the ambient temperature.

Thermal contraction combined with improper lubrication or improper boom wear pad adjustments may cause a "stick-slip" condition in the boom. This condition could result in the load not moving smoothly. Proper boom lubrication and wear pad adjustment is important to permit the boom section to slide freely. Slow movement of the boom may be undetected by the operator unless a load is suspended for a long period of time.

This situation can also occur in reverse. If the crane is setup on a cold morning and as the daytime ambient temperature heats the oil, the cylinders will extend in similar proportions.

The Cylinder Drift chart can assist in determining the approximate amount of retraction/extension that may be expected from a hydraulic cylinder as a result of a change in temperature of the hydraulic oil inside the cylinder. That chart is for dry rod cylinders. If the cylinder rod is filled with hydraulic oil, the contraction rate is somewhat greater.

Note: Operators and service personnel must be aware that load movement as a result of thermal expansion/contraction of hydraulic oil within cylinders can be mistaken as leaking cylinder seals or faulty holding valves.

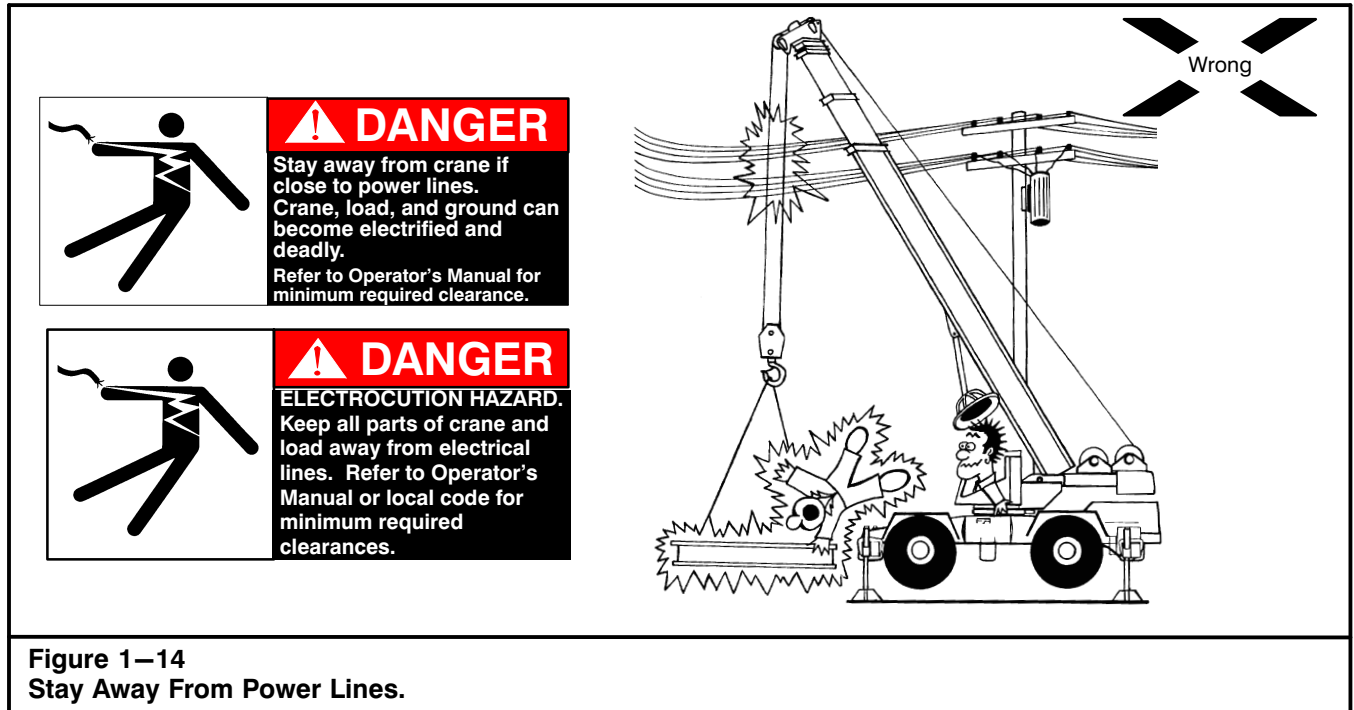
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CYLINDER DRIFT (Cylinder Length Change in Inches)										
Stroke (Ft.)	Temperature Change (°F)									
	10	20	30	40	50	60	70	80	90	100
5	0.26	0.52	0.77	1.03	1.29	1.55	1.81	2.06	2.32	2.58
10	0.52	1.03	1.55	2.06	2.58	3.10	3.61	4.13	4.64	5.16
15	0.77	1.55	2.32	3.10	3.87	4.64	5.42	6.19	6.97	7.74
20	1.03	2.06	3.10	4.13	5.16	6.19	7.22	8.26	9.29	10.32
25	1.29	2.58	3.87	5.16	6.45	7.74	9.03	10.32	11.61	12.90
30	1.55	3.10	4.64	6.19	7.74	9.29	10.84	12.38	13.93	15.48
35	1.81	3.61	5.42	7.22	9.03	10.84	12.64	14.45	16.25	18.06
40	2.06	4.13	6.19	8.26	10.32	12.38	14.45	16.51	18.58	20.64

Length change in inches = Stroke (ft.) X Temperature Change (°F) X Coefficient (in³/in³/°F) X 12 in/ft.
Coefficient = 0.00043 (in³/in³/°F)

CYLINDER DRIFT (Cylinder Length Change in Millimeters)										
Stroke (M.)	Temperature Change (°C)									
	5	10	15	20	25	30	35	40	45	50
1	4	8	12	15	19	23	27	31	35	39
2	8	15	23	31	39	46	54	62	70	77
3	12	23	35	46	58	70	81	93	104	116
4	15	31	46	62	77	93	108	124	139	155
5	19	39	58	77	97	116	135	155	174	194
6	23	46	70	93	116	139	163	186	209	232
7	27	54	81	108	135	163	190	217	244	271
8	31	62	93	124	155	186	217	248	279	310
9	35	70	104	139	174	209	244	279	313	348
10	39	77	116	155	194	232	271	310	348	387
11	43	85	128	170	213	255	298	341	383	426
12	46	93	139	186	232	279	325	372	418	464
13	50	101	151	201	252	302	352	402	453	503

Length change in millimeters = Stroke (m) X Temperature Change (°C) X Coefficient (mm³/mm³/°C) X 1000 mm/m
Coefficient = 0.000774 (mm³/mm³/°C)

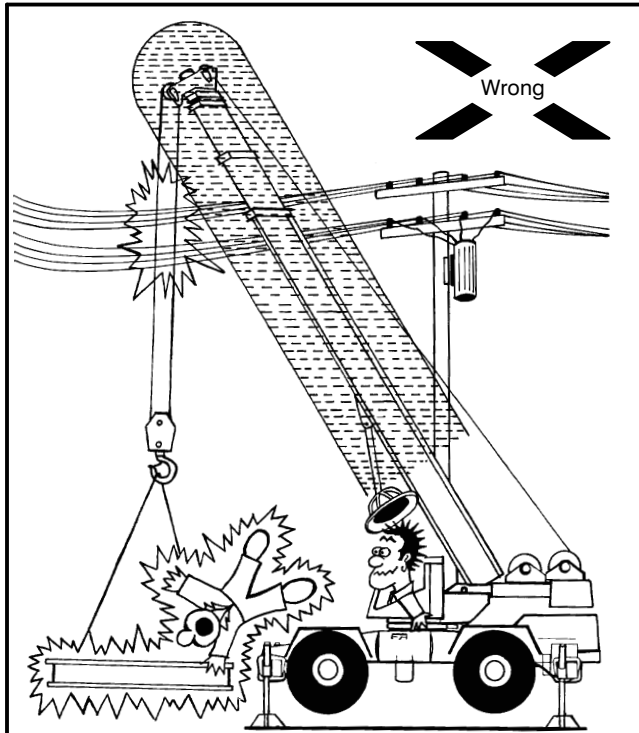


Electrical Dangers

1. All Electrical Power Lines Are Dangerous. Contact with them, whether insulated or not, can cause death or injury. When operating near power lines, the best rule is to have the power company turn off the power and ground the lines. However, in some cases, the operator may be unable to have the power turned off. Follow these rules whether the power is turned off or not. Follow all requirements per OSHA regulations 1926.1407 through 1926.1411 as applicable while assembling, disassembling, operating, or traveling the crane in the vicinity of any power lines.
 - a. Be alert. You are working around conditions which can cause death.
 - b. Keep all parts of the crane – winch wire rope(s), hook block, hook ball, and load – at least the distance from the power line as specified in the “High Voltage Power Line Clearance Chart”, or such distance as required by any other state or local requirements.
 - c. Assume that every line is “Hot”.
 - d. Do not perform any crane assembly/disassembly under any energized power line.
 - e. Overhead lines can move when the wind blows against them. Allow for this when determining safe operating distances.

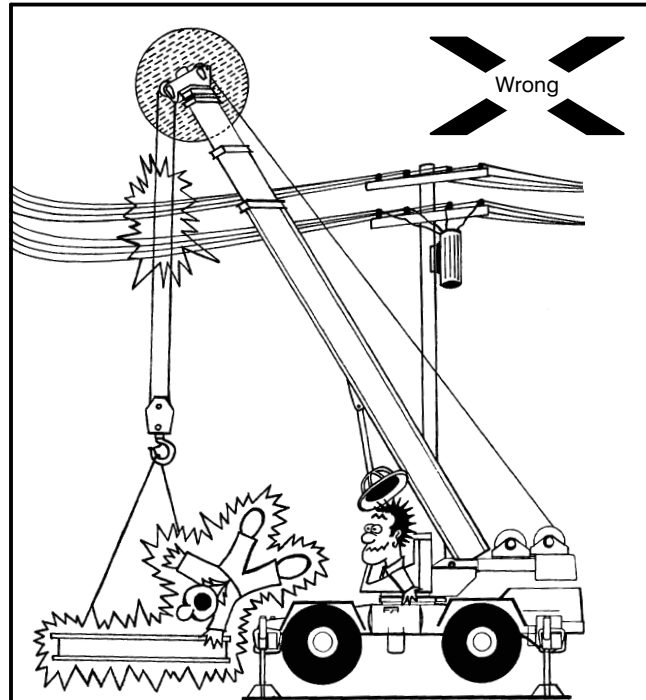
Minimum Clearance When Operating Near High Voltage Power Lines Or During Crane Assembly/Disassembly	
Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance, ft (m) See Note 1
To 200	15 (4.57)
Over 200 To 350	20 (6.10)
Over 350 To 500	25 (7.62)
Over 500 To 750	35 (10.67)
Over 750 To 1000	45 (13.72)
Over 1000	As established by the power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.
Minimum Clearance When Traveling With No Load	
To 345	15 (4.57)
Over 345 To 750	16 (4.87)
Over 750 To 1000	20 (6.10)
Over 1000	As established by the power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.
Note 1: Maintain 50 ft (15.2m) minimum clearance from power lines if voltage is unknown. If unknown but yet known to be less than 350 kV, maintain 20 ft (6.1m) minimum clearance. Note 2: Environmental conditions such as wind, fog, smoke, or precipitation may require increased clearances.	
High Voltage Power Line Clearance Chart	

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Shaded area shows "sensitivity zone" with full boom length sensor used. Contact can be made outside this zone by the winch wire rope(s), cab, etc. In such cases the warning will not sound until contact is made, and the crane is electrified and deadly.

Figure 1-15
Crane equipped with proximity warning device on the entire boom.



Shaded area shows "sensitivity zone" with the probe near the boom peak. Contact can be made outside this zone by the winch wire rope(s), cab, etc. In such cases the warning will not sound until contact is made, and the crane is electrified and deadly.

Figure 1-16
Crane equipped with proximity warning device on boom tip.

- f. Appoint a reliable person equipped with a loud signal (whistle or horn) to warn the operator when any part of the crane is working around the power line. This person should have no other duties while the crane is working around the power line.
- g. Warn all personnel of the potential danger. Don't allow unnecessary persons in the area. Don't allow anyone to lean against or touch the crane. Don't allow workers or load handlers to hold load, load lines, or rigging gear unless absolutely necessary. In these cases, use dry hemp or plastic ropes as tether lines. Make certain everyone stays a minimum distance away from the load as specified in the "High Voltage Power Line Clearance Chart", or such distance as required by any other state or local requirements.
- h. The use of boom point guards, proximity devices, insulated hooks or swing limit stops do not assure safety. Even if codes or regulations require the use of such devices, you must follow rules listed here. If you do not follow them, the result could be serious injury or death.
- i. Grounding the crane can increase the danger. Poor grounding such as a pipe driven into the ground, will give little or no protection. In addition, a grounded crane may strike an arc so heavy that a live line may be burned down. This could cause the crane and the area around it to be electrified.
- j. When operating near radio or T.V. transmitting stations, high voltage can be induced in metal parts of the crane, or in the load. This can occur even if the crane is some distance from the transmitter or antenna. Painful, dangerous shocks could occur. Contact trained electronic personnel before operating the crane to determine how to avoid electrical hazards.

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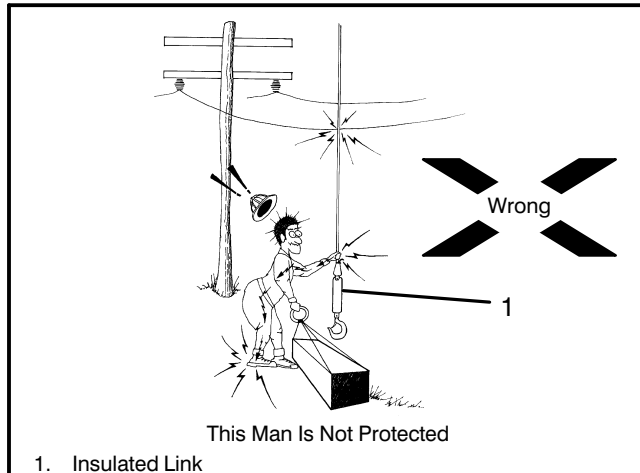


Figure 1-17
Crane equipped with insulated link.

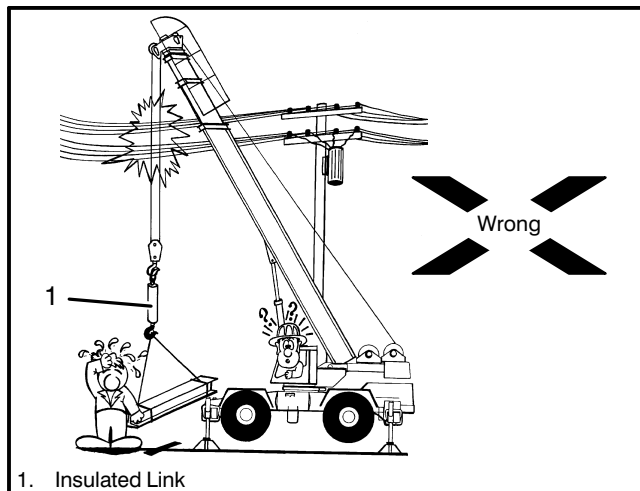


Figure 1-18
Crane equipped with insulated link and boom point guard.

2. **What do you do if a power line is touched by a crane or load?**
 - a. Remain calm – think – a mistake can kill someone.
 - b. Warn all personnel to keep clear.
 - c. If crane will still operate, try to move it away from contact. You, the operator are reasonably safe in the cab unless the crane is on fire or an arc is cutting through the cab.
 - d. Move away from contact in the reverse direction to that which caused the contact. Example: If you swing left to the wire, swing to the right to break contact. Remember – once an arc has been struck, it will stretch out much farther than you think before it breaks. Keep moving until the arc has been broken.

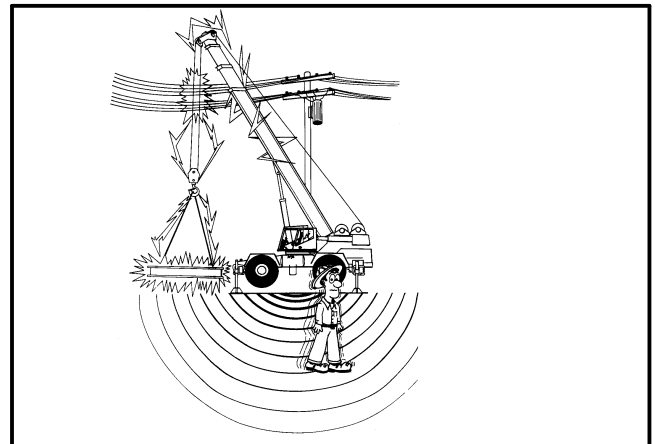


Figure 1-19
If you must leave the crane, do not step off. Leap as far as you can with feet together and hop or shuffle away from the crane.

- e. When the arc breaks, continue moving until you are at least the minimum distance away as specified in the "High Voltage Power Line Clearance Chart", or such distance as required by any other state or local requirements. Stop the crane. Thoroughly inspect crane and repair any damage before further use. Contact a Link-Belt Distributor and request a "Crane Inspection After Contacting Power Line" form which lists necessary inspection items.
 - f. If you cannot disengage from the electrical line, and the crane is not on fire or no arc is cutting through the cab, stay in your seat until power line can be turned off.
 - g. If you must leave the crane, don't step off. Leap from the crane as far as you can, landing with feet together, then hop away from the crane with feet together, or shuffle feet to keep them close together. This could help prevent personal injury.
3. When using a magnet:
 - a. Lifting magnet generators produce voltage in excess of 200 volts and present an electrical shock hazard. Only trained personnel should work on the magnet, controller, or wiring. Don't open the controller door with the generator running.
 - b. Do not let workmen touch magnet or load.
 - c. Do not let workmen get between magnet and a metal object.
 - d. If necessary to position a load, use a dry, wooden stick.
 - e. Open magnet disconnect switch at magnet control panel before connecting or disconnecting leads.

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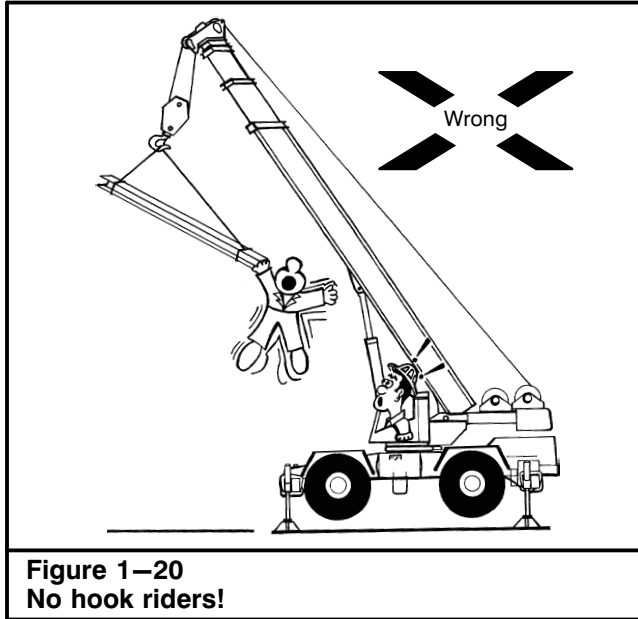
Radio Frequency Or Electro Magnetic Interference (RFI Or EMI)

Certain areas may contain high Radio Frequency Or Electro Magnetic Interference (RFI or EMI). In these areas the boom can act like an antenna and produce an electrical current that may cause electrical shocks and/or the crane to malfunction. If operating in an area where these conditions may exist, test the crane or have the area tested for the magnitude of this interference before operating the crane. Operation may not be possible or boom length may be limited. Comply with all local, state, and federal laws when operating in high RFI/EMI areas.

Protective Equipment

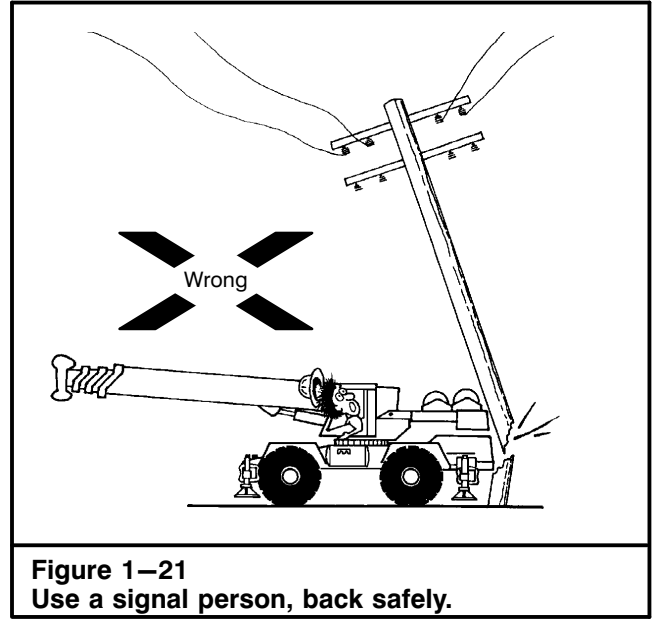
1. Always replace protective guards and panels before operating the crane.
2. Always wear hard hats, safety glasses, steel toe shoes, hearing protection, and any other safety equipment required by local job conditions, OSHA, or any other requirements of applicable codes.
3. Always wear safety glasses when drilling, grinding or hammering. Flying chips could injure the eyes.
4. Always wear a mask to prevent breathing any dust, smoke, fumes, etc. while cleaning, drilling, welding, grinding, sanding, etc. on any part of the crane. Breathing dust, smoke, fumes, etc. can be very hazardous.
5. When operating a crane equipped with any form of load indicating mechanism, overload warning system, or any automatic safety device, remember that such devices cannot replace the skill and judgment of a good operator. For instance, such devices cannot tell when a crane is setting on a supporting surface that will give away, that too few parts of line are being used to lift a load, cannot correct for the effects of wind, warn that the device may be improperly adjusted, correct for side pulls on the boom, or for many conditions which could occur and create hazards. It requires all the skill, experience, judgment, and safety consciousness that a good operator can develop to attain safe operation. Many safety devices can assist the operator in performing their duties, but they should not rely on them to keep them out of trouble.
6. The crane is equipped with a fire extinguisher in the operator's cab. Ensure all personnel know that one is available and where it is located. It must be kept in the crane at all times (except when needed). Instruct all operating and maintenance personnel in proper use of the extinguisher. Check periodically to ensure it is fully charged and in working order. Replace immediately if required.
7. Do not tamper with safety devices. Keep them in good repair and properly adjusted. They were put on the crane for your protection.

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Signal Persons And Bystanders

1. Don't allow crane boom or loads to pass over people, or endanger their safety. Remove all loose objects from load. All unnecessary personnel should leave the immediate area when crane is operating.
2. Do not allow anyone to ride on the hook block, hook ball, or any part of the load or attachment for construction work or recreational activities. (This applies to recreational activities such as "bungee jumping" or "bungee cord jumping".) Cranes are intended to lift objects, not people. They are not elevators.
3. Do not carry passengers! There is only one seat and it is for the operator. Do not allow personnel to ride on the crane during operation or while traveling the crane. A fall from the crane can cause death or serious injury.



4. Always look before you back up and post a signal person to guide you. Ensure the back up alarm is working properly. Use the horn as a signal. Use a code such as one beep – stop, two beeps – forward, and three beeps – backward. Ensure everyone on the job site knows the code.
5. Do not make a lift which is not in plain sight without a signal person. This can lead to an accident or crane damage.

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Operating In Wind Or Lightning

Avoid working a crane in high winds and when there is a likelihood of lightning. If you must work in a wind, reduce capacities to those listed in "Wind Restrictions" chart in the Crane Rating Manual. Wind blowing against the load and the boom produces a side load on the boom and reduces its capacity. When lifting loads which have large surface areas in a wind, such as building panels, the movement of the load may pose a danger to workers or building structures. Out swing of a load will increase the load radius, and may overload the crane. This could lead to boom failure or the crane tipping. Monitor the wind speed using a wind speed indicator or the "Wind Scale" chart below.

Stop lifting operations, ground the load and fully retract and lower the boom to a horizontal position if wind speed exceeds the maximum allowed listed in "Wind Restrictions" chart in the Crane Rating Manual. Refer to Maximum Wind Speed for Loads with Large Wind Sail Area found in Section 5 of this Operator's Manual.


DANGER

If there is a likelihood of lightning, immediately stop lifting operations, ground the load, and fully retract and lower the boom.

Wind Scale				
Wind Speed		Wind Strength		Inland Wind Effect
mph	km/h	Beaufort Scale	WMO* Description	
0 to 1	0 to 2	0	Calm	Calm, smoke rises vertically.
1 to 3	2 to 5	1	Light Air	Smoke drift indicates wind direction, wind vanes remain still.
4 to 7	6 to 11	2	Light Breeze	Wind felt on face, leaves rustle, wind vanes begin to move.
8 to 12	12 to 19	3	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended.
13 to 18	20 to 29	4	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move.
19 to 24	30 to 39	5	Fresh Breeze	Small trees and leaves begin to sway. Crested waves form on inland waters.
25 to 31	40 to 49	6	Strong Breeze	Larger tree branches moving. Telephone wires whistle. Umbrellas used with difficulty.
32 to 38	50 to 61	7	Near Gale	Whole trees moving. Resistance felt walking against wind.
39 to 46	62 to 74.0	8	Gale	Breaks twigs off trees. Resistance felt walking against wind.
47 to 54	75 to 87	9	Strong Gale	Slight structural damage. Slate blows off roofs.
55 to 63	88 to 101	10	Storm	Trees broken or uprooted. Considerable structural damage.
* World Meteorological Organization				

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Wind Gusts At Various Heights

The maximum wind speed in the Crane Rating Manual refers to a 3 second gust measured at the boom or fly tip.

Weather reports often report wind speed based on a 10-minute average measured at a height of 10 meters (33 ft). The table below shows the maximum 3 second gust based at various heights based on the 10-minute average:

Beaufort Scale	3	4	5	6	7	8	9	10
V [m/s] (mph)	5.4 (12.1)	7.9 (17.7)	10.7 (23.9)	13.8 (30.9)	17.1 (38.3)	20.7 (46.3)	24.4 (54.6)	28.4 (63.5)
z [m] (ft)	v(z) [m/s] (mph)							
10 (32.8)	7.6 (17)	11.1 (24.8)	15 (33.6)	19.3 (43.2)	23.9 (53.5)	29 (64.9)	34.2 (76.5)	39.8 (89)
20 (65.6)	8.1 (18.1)	11.9 (26.6)	16.1 (36)	20.7 (46.3)	25.7 (57.5)	31.1 (69.6)	36.6 (81.9)	42.7 (95.5)
30 (98.4)	8.5 (19)	12.4 (27.7)	16.8 (37.6)	21.6 (48.3)	26.8 (59.9)	32.4 (72.5)	38.2 (85.5)	44.5 (99.5)
40 (131.2)	8.7 (19.5)	12.8 (28.6)	17.3 (38.7)	22.3 (49.9)	27.6 (61.7)	33.4 (74.7)	39.4 (88.1)	45.8 (102.5)
50 (164)	8.9 (19.9)	13.1 (29.3)	17.7 (39.6)	22.8 (51)	28.3 (63.3)	34.2 (76.5)	40.3 (90.1)	46.9 (104.9)
60 (196.8)	9.1 (20.4)	13.3 (29.8)	18 (40.3)	23.3 (52.1)	28.8 (64.4)	34.9 (78.1)	41.1 (91.9)	47.9 (107.1)
70 (229.7)	9.3 (20.8)	13.5 (30.2)	18.3 (40.9)	23.6 (52.8)	29.3 (65.5)	35.5 (79.4)	41.8 (93.5)	48.7 (108.9)
80 (262.5)	9.4 (21)	13.7 (30.6)	18.6 (41.6)	24 (53.7)	29.7 (66.4)	36 (80.5)	42.4 (94.8)	49.4 (110.5)
90 (295.3)	9.5 (21.3)	13.9 (31.1)	18.8 (42.1)	24.3 (54.4)	30.1 (67.3)	36.4 (81.4)	42.9 (96)	50 (111.8)
100 (328.1)	9.6 (21.5)	14.1 (31.5)	19.1 (42.7)	24.6 (55)	30.4 (68)	36.9 (82.5)	43.4 (97.1)	50.6 (113.2)
110 (360.9)	9.7 (21.7)	14.2 (31.8)	19.2 (42.9)	24.8 (55.5)	30.8 (68.9)	37.2 (83.2)	43.9 (98.2)	51.1 (114.3)
120 (393.7)	9.8 (21.9)	14.3 (32)	19.4 (43.4)	25.1 (56.1)	31.1 (69.6)	37.6 (84.1)	44.3 (99.1)	51.6 (115.4)
130 (426.5)	9.9 (22.1)	14.5 (32.4)	19.6 (43.8)	25.3 (56.6)	31.3 (70)	37.9 (84.8)	44.7 (100)	52 (116.3)
140 (459.3)	10 (22.4)	14.6 (32.7)	19.8 (44.3)	25.5 (57)	31.6 (70.7)	38.2 (85.5)	45.1 (100.9)	52.5 (117.4)
150 (492.1)	10 (22.4)	14.7 (32.9)	19.9 (44.5)	25.7 (57.5)	31.8 (71.1)	38.5 (86.1)	45.4 (101.6)	52.9 (118.3)
160 (524.9)	10.1 (22.6)	14.8 (33.1)	20.1 (45)	25.9 (57.9)	32.1 (71.8)	38.8 (86.8)	45.7 (102.2)	53.2 (119)
170 (557.7)	10.2 (22.8)	14.9 (33.3)	20.2 (45.2)	26 (58.2)	32.3 (72.3)	39.1 (87.5)	46 (102.9)	53.6 (119.9)
180 (590.5)	10.3 (23)	15 (33.6)	20.3 (45.4)	26.2 (58.6)	32.5 (72.7)	39.3 (87.9)	46.3 (103.6)	53.9 (120.6)
190 (623.4)	10.3 (23)	15.1 (33.8)	20.4 (45.6)	26.4 (59.1)	32.7 (73.1)	39.5 (88.4)	46.6 (104.2)	54.2 (121.2)
200 (656.2)	10.4 (23.3)	15.2 (34)	20.6 (46.1)	26.5 (59.3)	32.8 (73.4)	39.8 (89)	46.9 (104.9)	54.6 (122.1)

V= 10 minute average wind speed at 10m (32.8 ft) height

z=height above ground

v(z)=3 second gust speed at height z

ref. EN13000

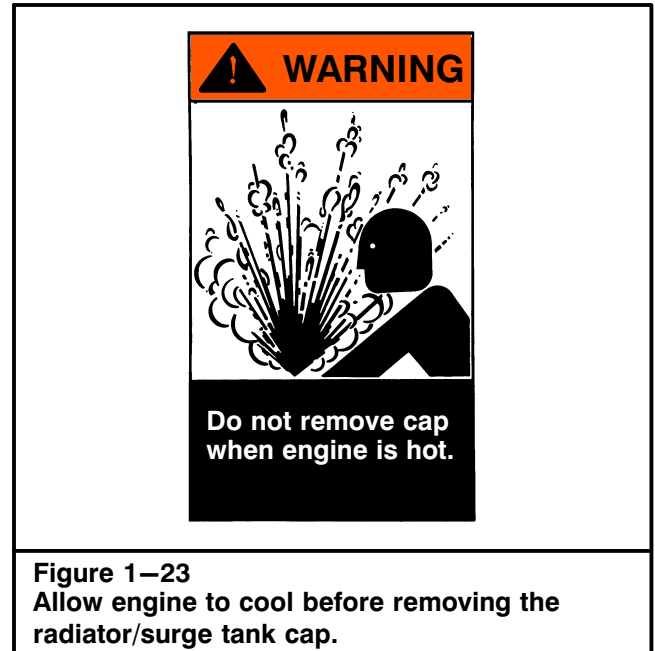
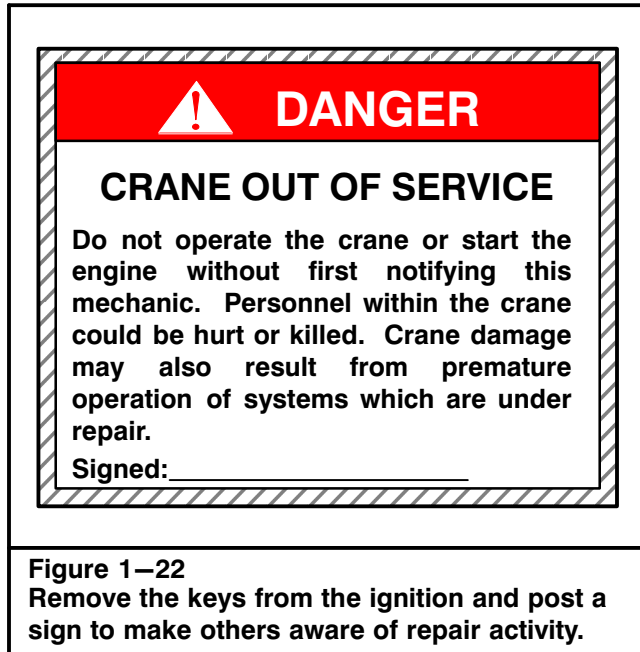
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Crane Inspections And Adjustments

1. Inspect the crane daily. Do not operate a damaged or poorly maintained crane. Pay particular attention to the clutches, brakes, attachments, and wire ropes. If a component is worn or damaged, replace it before operating.
2. Labels, decals, plates, etc. should be periodically inspected and cleaned as necessary to maintain good legibility for safe viewing. If any instruction, caution, warning, or danger labels, decals, or plates become lost, damaged, or unreadable, they must be replaced.
3. When performing repetitive lift applications, especially at or near maximum strength limited capacities, an inspection of the major structural areas of the crane, for cracks or other damage, should be conducted on a regular basis. (A non-destructive test such as magnetic particle or dye penetrant may even be considered.) Along with inspection for cracks and damage, frequently check the critically loaded fasteners, such as the turntable bearing mounting capscrews, to ensure they have not been stretched. Not only does frequent inspection promote safety, but it is also much easier and less expensive to perform a repair when a crack is small, before it has a chance to traverse through a structural member. Any sign of cracks or damage must be repaired before continuing operations. Contact your Link-Belt Distributor for repairs.
4. When performing maintenance on the crane, do the following:
 - a. Fully retract the boom. Lower the boom to the limit of the boom hoist cylinders.

- b. Shutdown the engine, disengage the main pump, (if equipped) and work all control levers back and forth to relieve pressure and relax the attachment.
 - c. If the above instructions cannot be followed, block securely under the attachment so it cannot move.
 - d. Bleed any precharge off the hydraulic reservoir before opening it or disconnecting a line.
 - e. Hydraulic oil becomes hot during operation. In some cases it becomes hot enough to cause severe burns. Be careful not to let hydraulic oil come in contact with skin.
 - f. Post warning signs in cab so no one will try to start the engine. Do not adjust, maintain, or repair a crane while it is in operation without visual and/or verbal contact to ensure the safety of service personnel.
5. When making repairs, which require welding, use proper welding procedures. Also the following precautions must be taken:
 - a. All paint and acoustical material in the area should be removed to prevent burning them. The smoke and fumes from the burning paint and/or acoustical material can be very hazardous.
 - b. Turn the battery disconnect switches to the "OFF" position to protect any electronic equipment on the crane which may be effected by electric arc welding. Contact a Link-Belt Distributor for proper procedures.
 - c. The welding ground cable should be attached to the portion of the crane being welded. If welding on the upper, ground on the upper. If welding on the carrier ground on the carrier. Failure to take this precaution may result in electrical arcs in the turntable bearing.

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- d. The welding ground cable should always be connected as close as possible to the area being welded. This minimizes the distance that electricity must travel.
- e. Disconnect computers and other electronic equipment (such as rated capacity limiters and engine computers) to prevent damage. Contact your Link-Belt Distributor for proper procedures.
- f. This crane is equipped with a 24V system. Remove the fuses before welding.
- g. Remove all flammables from the proximity of the welding area.
6. Keep the crane clean, in good repair, and in proper adjustment. Oil or grease on the decks may cause falls. Improper adjustments can lead to crane damage, load dropping, or other malfunctions.
7. Keep all walking surfaces (steps, ladders, platforms, etc.) and non-skid materials on the crane clean. Non-skid materials are placed on the crane to assist operators and service personnel with safe access/egress to/from the crane and to/from adjustment and inspection areas. Do not allow non-skid materials to become contaminated with mud, snow, ice, oil, paint, wax, etc. Any contamination can cause the non-skid materials to become slick, reducing their effectiveness for safety while walking on the crane. If any non-skid materials become ineffective due to wear, age, or destroyed in any way, they must be replaced.
8. Use proper fall protection such as a fall arrest system as required by any applicable codes when working at elevated heights. Falls can lead to severe personal injuries and/or death.
9. Use extreme caution when removing radiator/surge tank caps, hydraulic pressure caps, etc. They can fly off and hit you, or you could be burned by hot oil, water, or steam.

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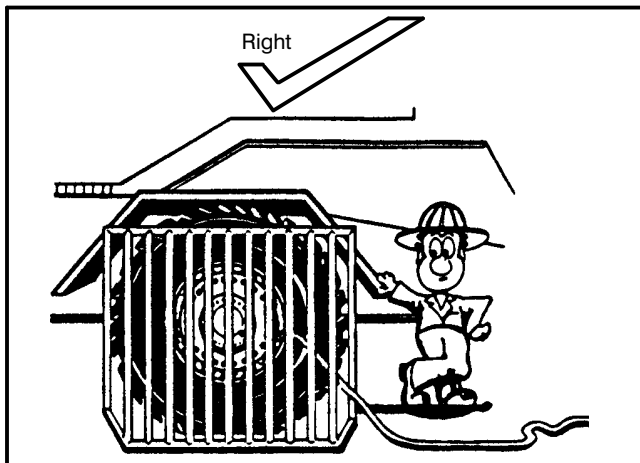


Figure 1-24
Use a guard when inflating tires.

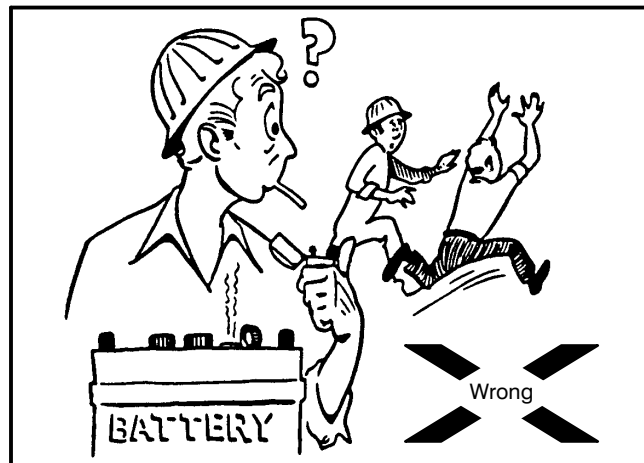


Figure 1-25
Do not use an open flame near the battery.

10. Check tires daily for correct pressure. Do not stand in front of a tire when inflating it. The lock ring can fly off and injure you. Use a clip on inflator, and stand aside. Use a guard in front of the tire.
11. Test the automatic winch brake by raising the load a few inches (*centimeters*) and holding. It should hold without slipping. It takes more braking power to hold a load in the air when the drum is full of wire rope than when it is a few inches (*centimeters*) above the ground with only a few wraps on the drum.
12. Always reduce pressure in hydraulic system to zero before working on any part of the system.
13. Use extreme care when working with circuits with accumulators. Check that hydraulic pressure is relieved before opening the circuit for repairs.
14. When setting pressures, never exceed the manufacturer's ratings. Always follow instructions exactly. Over pressurization can cause hydraulic component damage or failure of mechanical parts on the crane. Either of the above can lead to an accident.



WARNING

Battery posts, terminals, and related accessories contain lead and lead compounds. Wash hands after handling.

15. Batteries are sealed and fluid is non-serviceable. Don't check battery charge by shorting across posts. The resulting spark could cause the battery to explode. Check with a battery tester. Don't smoke near batteries.
16. This crane is equipped with a 24V system. When using jumper cables to start an engine, connect the negative post to negative post, and positive post to positive post. Always connect the two positive posts first. Then make one negative post connection. Make the final negative connection a safe distance from the battery. It can be made on almost any bare metal spot on the crane. Any spark could cause the battery to explode. Refer to "Jump Starting the Crane" in this Section of this Operator's Manual for the proper procedure.

Wire Rope

1. Inspect all wire rope thoroughly. OSHA (Occupational Safety And Health Act) regulations state "a thorough inspection of all wire ropes shall be made once a month and a full written, dated, and signed report of the wire rope condition be kept on file where readily available." A visual inspection must also be performed daily. Replace any worn or damaged wire rope. Pay particular attention to winch wire ropes. Check end connections (pins, sockets, wedges, etc.) for wear or damage.

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2. Use at least the number or parts of winch wire rope specified on the Wire Rope Capacity chart in the Crane Rating Manual to handle the load. Local codes may require more parts of line than is shown. Check code requirements and use them where applicable.
3. Category 1 per ASTM A1023/A1023M type ropes are recommended for single part of line applications. This is of utmost importance for long fall hoist line applications. [LBC general guideline: Long Fall $\geq 120\text{ft}$ (36.6m)]. Only if certain criteria are met may a swivel hook ball be used with rotation resistant rope. Refer to "Hook Ball Usage With Rotation Resistant Wire Rope" in Section 5 of this Operator's Manual.
4. Wire rope not classified as "Category 1" per ASTM A1023/A1023M may be used with a swivel hook ball or swivel termination where operating requirements or job applications demand only if certain criteria are met. Refer to "Hook Ball Usage With Rotation Resistant Wire Rope" in Section 5 of this Operator's Manual.
5. Do not handle wire rope with bare hands. Always use gloves to prevent possible injury from frayed or damaged spots in the wire rope.
6. Inspect head machinery and hook block often as damaged or deteriorating sheaves can cause undue wear of the wire rope.
7. When reeving wire rope on the crane, do not stand, walk, or climb on the boom or attachment. Use a ladder or similar device to reach necessary areas.

Crane And Area Clearance

1. Know your job site conditions. Familiarize yourself with work site obstructions and other potential hazards in the area which might lead to mishaps. If possible, make any necessary arrangements to eliminate any potential hazards.
2. Erect barricades around the immediate work area to prevent unauthorized personnel from wandering onto the job site.
3. Ensure your work area is clear. Ensure you have proper clearance for the crane, boom, and load. Don't swing, travel, lift, or lower loads, raise or lower jacks, without first making sure no one is in the way. If your vision is obscured, locate a signal person so you can see them, and they can see all areas you can't. Follow their signals. Ensure you and the signal person understand each other's signals. See Hand Signals Chart in this Section of this Operator's Manual. Use the horn to signal or warn. Ensure everyone on the job site understands signals before starting operations.

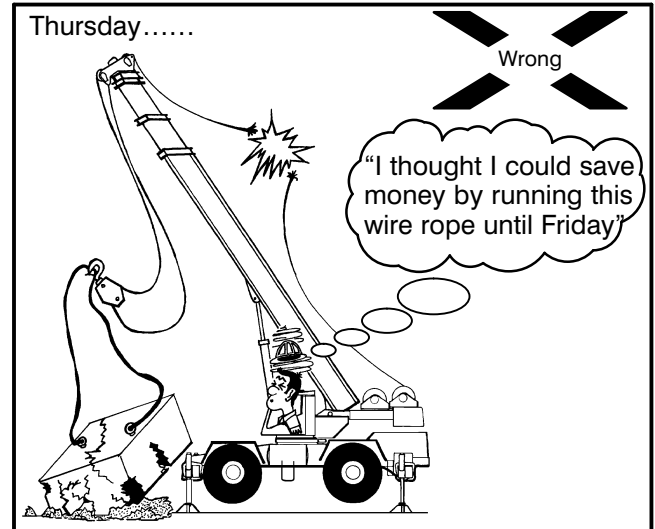


Figure 1–26
Do not operate the crane with worn or damaged wire rope.

4. When working inside a building, check overhead clearance to avoid a collision. Check load limits on floors or ramps so as not to crash through.
5. Don't operate close to an overhang or deep ditch. Avoid falling rocks, slides, etc. Don't park crane where a bank can fall on it, or it can fall in an excavation. Don't park where rain can wash out footing.
6. Watch the tailswing of the upper revolving frame and counterweight. Even though the original set-up may have been clear, situations change.
7. Do not store material under or near electrical power sources. Make material handlers aware of the dangers involved with storing material under power lines or in the vicinity of any other hazards.

Weights, Lengths, And Radii

1. Know your load. Don't try to guess or estimate the load. Use a scale or a load indicating system to determine exact weight. Remember the weight you are lifting includes the weight of any lifting slings or gear, the hook block, hook ball, and any other weight on the hook. If lifting off the boom with the fly installed, the weight of the fly and rigging must also be considered as part of the load. The total load weight must never exceed the rated capacity of the crane, as listed in the Crane Rating Manual, for the position, boom length, load radius, and condition of operation being used.

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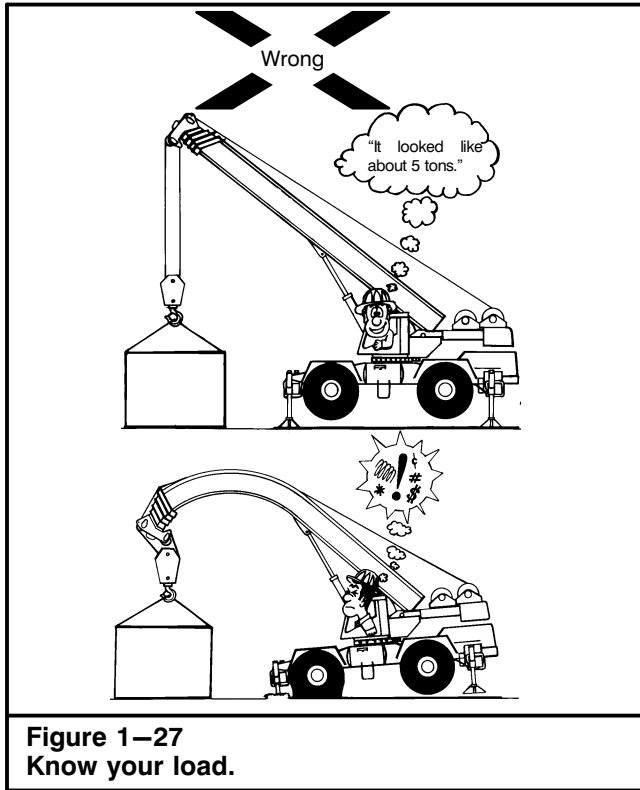


Figure 1-27
Know your load.

Remember — capacity chart ratings in the Crane Rating Manual are based on ideal conditions:

- Standing on firm, level surface.
- Calm wind.
- No side loads or out swing of load.
- Good visibility.
- Crane in top condition and equipped as when leaving the factory.

When such conditions cannot be attained, loads being handled must be reduced to compensate. The amount loads are reduced depends upon how good or how poor actual operating conditions are. It is a matter of judgment and experience. Some factors which may require reduction of capacities are:

- Soft or unpredictable supporting surfaces.
- Wind.
- Hazardous surroundings.
- Inexperienced personnel.
- Poor visibility.
- Fragile loads.
- Crane in poor condition.
- Condition and inflation of tires.

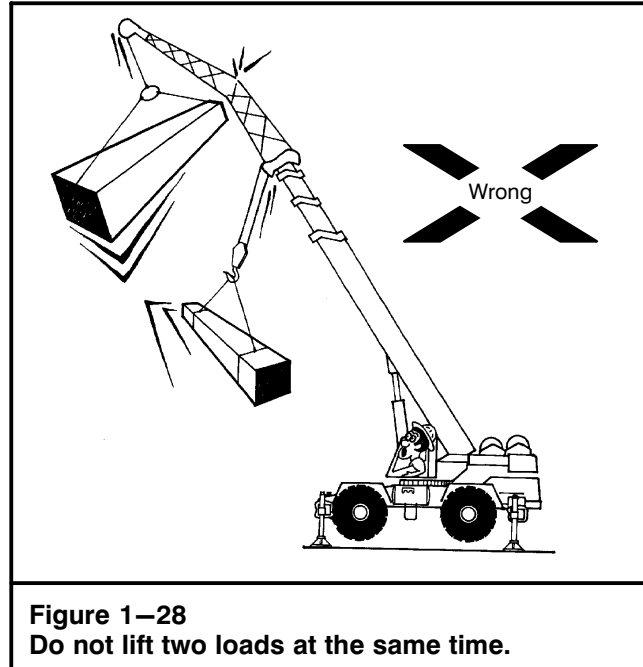


Figure 1-28
Do not lift two loads at the same time.

When in doubt, do not take a chance. Reduce ratings more than you think you need. Avoid working a crane in high winds. If you must work in a wind, reduce capacities as shown in “Wind Speed Restrictions” in the Crane Rating Manual. Wind blowing against the load and the boom produces a side load on the boom and reduces its capacity.

When lifting loads in a wind which have large surface areas, such as building panels, the movement of the load may pose a danger to workmen or building structures. Out swing of a load will increase the load radius, and may overload the crane. This could lead to boom failure or the crane tipping.

- When operating off the main boom with the fly erected, deductions must be made for its weight. The weight of the fly must be subtracted to obtain a “NET” capacity. Failure to do so could result in an overloading condition and cause boom failure. Refer to the Crane Rating Manual for amounts to be deducted.

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3. When operating off the main boom with the auxiliary lifting sheave installed, the weight of the auxiliary lifting sheave must be deducted. Refer to the Crane Rating Manual for amount to be deducted.
4. Do not lift two loads at the same time, even if the total load weight is within crane capacity. Loads on the boom and fly at the same time, stress the boom and drastically reduce its ability to handle loads. Your full attention cannot be given to both loads, creating a dangerous situation.
5. Lifts where two or more cranes work together can be hazardous and should be avoided. Such lifts should be made only under the direction of a qualified engineer. If a multiple crane lift is unavoidable, observe the following rules:
 - a. The cranes must be level and sitting on firm surfaces.
 - b. The cranes should be the same size and capacity, use the same boom length and be reeved similarly.
 - c. Cranes must be positioned so that each boom point is directly over its load attaching point. The winch lines must be vertical during all phases of the lift.
 - d. The rigging must be placed so each crane lifts a share of the load well within the crane's capacity.

SAFETY INSTRUCTIONS

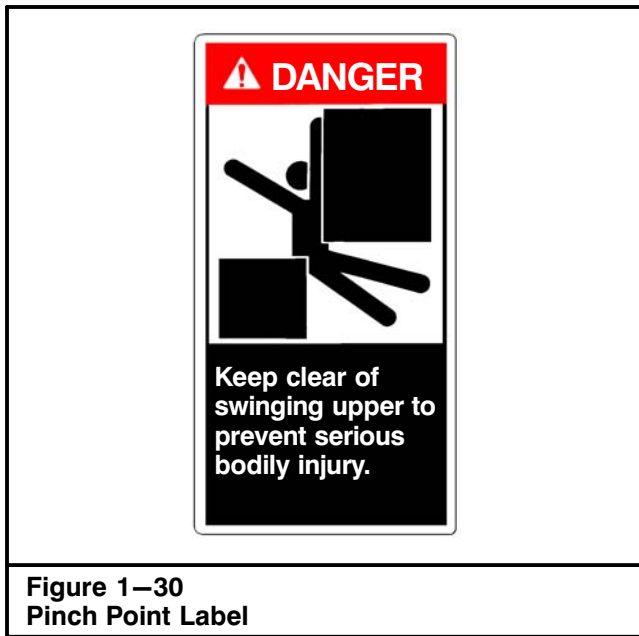
Operation under conditions which exceed listed capacities may result in overturning.

Swinging, extending, or lowering boom to radii where no capacities are listed may result in overturning even without a load.

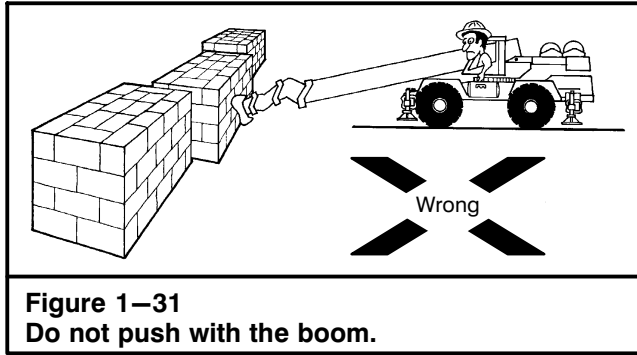
Figure 1–29
Safety Instruction Label

- e. Ensure that during handling more load is not transferred to any crane than it can handle.
- f. Don't attempt to travel when making multiple crane lifts.
- g. Coordinate plans with the other operator before beginning to lift.
- h. Use only one signal person.
- i. Use of an operable load and angle indicating system is desirable.

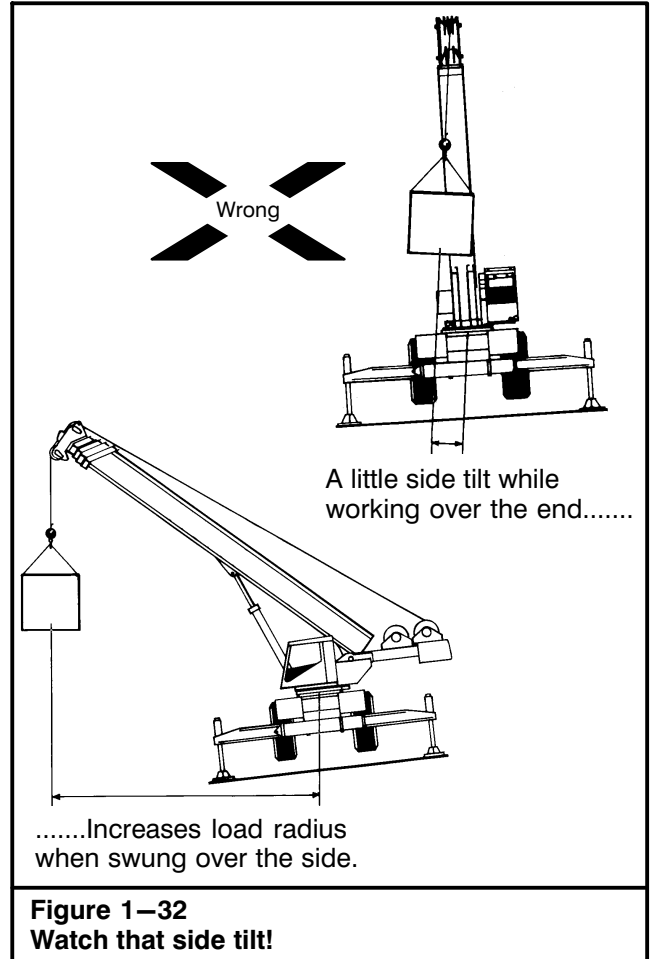
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6. Some capacities on hydraulic cranes are based on strength of materials. In these cases, overloads will cause something on the crane to break, before it will tip. Do not use signs of tipping as a warning of overload.
7. Don't tie a crane down. Tying a crane down encourages overloading. Crane damage or injury could result.
8. Do not shock load and/or overload the crane at anytime. Shock loading or overloading the crane will reduce the fatigue life of crane components and could result in component failure.
9. When performing repetitive lift applications, especially at or near maximum strength limited capacities, be aware that these applications may reduce component life. These applications include repeated lifting (or lifting and swinging) of near 100% strength limited capacities and repeated lifting maximum moment loads. These applications may fatigue the major structural portions of the crane. Although the crane may not break during these applications, they can reduce the fatigue life and shorten the service life of the crane. To improve the service life, while performing repetitive lift applications, consider reducing the capacities to 70% of maximum strength limited capacities to reduce fatigue cracking, also reduce the wire rope capacity to 70% of maximum to reduce stress on the nylon sheave. Frequently perform a thorough inspection of all the structural areas of the crane. Any sign of cracks or damage must be repaired before continuing operations. Contact a Link-Belt Distributor for repairs.
10. Do not suspend or hold a load with wire rope tension near maximum wire rope capacity for a long period of time. High rope tension for long durations can cause nylon sheave damage.
11. Always refer to the Crane Rating Manual after changing the arrangement of the attachments for the correct lifting capacities.
12. The boom must be extended in the correct manner before making a lift. The capacities listed in the Crane Rating Manual for this crane are based on the boom sections being extended in accordance with each specific boom mode as described in the Crane Rating Manual.

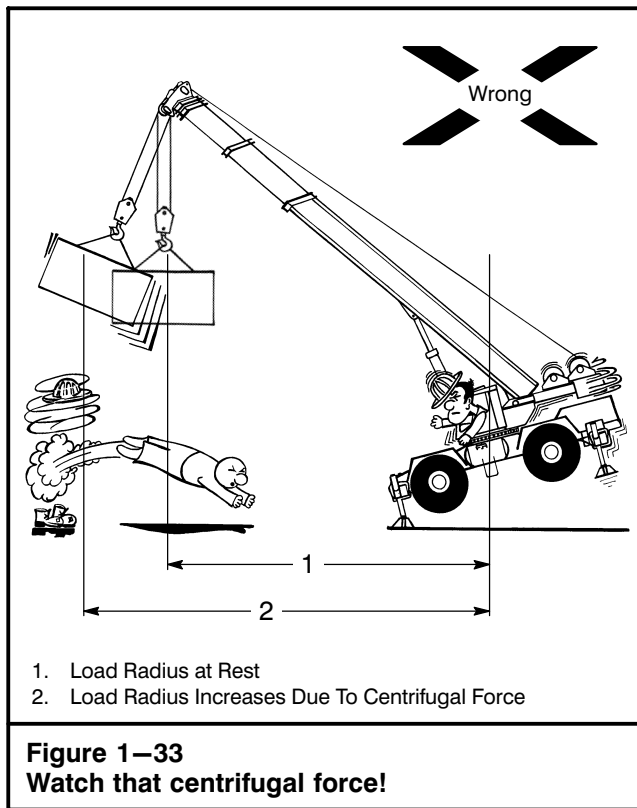


13. Do not use the boom to push or pull. It is not designed for this purpose. Such action can damage the boom and lead to an accident.
14. Know the load radius. Don't guess at it. Determine the load radius by using the boom angle indicator, the boom length indicator, and the Crane Rating Manual, or measure it with a steel tape. Remember – Radius is the horizontal distance from the centerline of rotation of the upper to the center of gravity of the load, when the load is hanging free.
15. Do not operate a hydraulic crane at radii or boom lengths where the capacity charts in the Crane Rating Manual shows no capacity. Don't use a fly not designed for your crane. Either of the above can tip the crane over or cause attachment failure. In some cases, the crane can tip over with no load on the hook, forward or backward! Also, if the boom is fully extended at a low angle, the crane may tip until the boom touches the ground. In any of these cases, injury or crane damage could result.
16. When a load is lifted with any crane, the load may swing out, or sideways. The load radius will increase. Due to the design of hydraulic crane booms, (cantilever boom, supported by cylinders and overlapping sections) this increase is much more pronounced. The increase or out swing of the load can overload the boom, and lead to boom failure or tipping. Also, movement of the load can cause it to hit something. Ensure the load being lifted will remain within capacity as it is lifted and the boom deflects.



17. When extending or lowering a boom with a load, the load radius increases. As the load radius increases, capacity decreases. If capacity is exceeded, the boom may bend or the crane may tip over. Sometimes at low angles, a hydraulic crane boom can be extended with a load, but cannot be retracted. This is because more power is available in the boom cylinders to extend than to retract. If an operator extends the boom under load, he may not be able to retract the boom and may get into a dangerous situation.
18. Know the boom length. Don't guess. Use of an incorrect boom length can cause an accident.
19. When lowering or retracting the boom, the load will lower. To compensate for this, the operator must hoist up on the winch wire rope. Otherwise, movement of the load may cause an accident. When extending the boom, the load will raise. The operator must hoist down the winch wire rope to keep the load in place. Extending the boom without winching down, can lead to "two blocking". This is when the hook block, hook ball, and/or the load contacts the head machinery. Two blocking can lead to sheave or wire rope damage.

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20. The winch wire rope must be vertical when starting to lift. If not, the load will swing in, out, or sideways when lifted from the ground. The crane will lean toward the load when lifting heavy loads. This is caused by elasticity of the crane and the boom. This lean will increase operating radius so the load will swing outward when it clears the ground. This out swing is dangerous to anything in the path of the load, and because of the increase in load radius may overload the crane. To overcome this out swing, boom up as the load is lifted so winch wire ropes remain vertical. When setting the load on the ground, lower boom after the load touches down to avoid hook block and/or hook ball swing when it is unhooked from load.
21. Pinch points, which result from relative motion between mechanical parts, can cause injury. Keep clear of the rotating upper or moving parts.

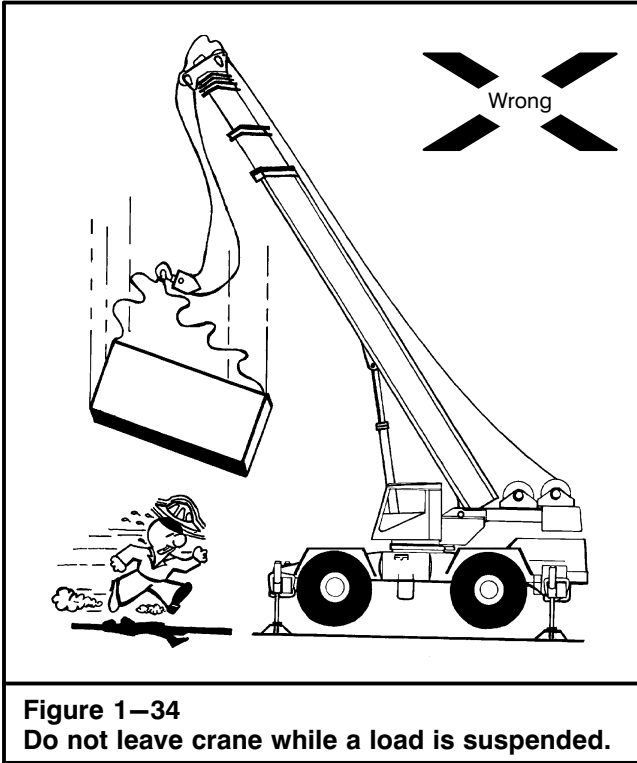
22. Lifting heavy loads can cause the crane to tilt or lean toward the load. When swinging a load from over the end to over the side, the tilt of the crane will increase. Since tilt acts to increase load radius, it must be compensated for when swinging the load. Swing slowly. Change boom angle (raise the boom) while swinging, to maintain a constant radius, and prevent in swing or out swing of load. If not, a dangerous condition could result.
23. Watch out for centrifugal force when swinging a load. Swing gently. Centrifugal force tends to increase load radius. This increase in radius could overload the crane and cause crane damage or tipping. When stopping the swing, over swing of the load can side load the boom.
24. Keep the winch wire ropes as short as possible to prevent excessive swinging. Always use the shortest boom length which will do the job. Remember — the shorter the boom, the better the capacity.
25. Due to inertia (weight), a load will momentarily tend to stay in position when the crane starts to move. For this reason do not back the crane away from a suspended load when handling near capacity loads. The inertia effect will tend to increase load radius and decrease stability. Use hand lines as required to control the load.
26. Don't increase the counterweight. Don't add anything to the crane that will act as additional counterweight. Remember that anything which has weight, if carried behind the crane's center of gravity, acts as counterweight. Adding counterweight affects backward stability of the crane, particularly when working over the side. It also encourages overloading of the crane.
27. Working areas for cranes are defined per the Working Areas chart in the Crane Rating Manual. Permissible loads, per the Crane Rating Manual, will vary from lifting quadrant to lifting quadrant. The operator must ensure capacity ratings are not exceeded regardless of which quadrant he is operating in, or when swinging from one quadrant to another.
28. When working on tires, the tires must be inflated to pressures shown on the Tire Inflation Label on the carrier and/or the Tire Inflation Chart in the Crane Rating Manual.
29. It is possible for one pontoon to lift up due to carrier deflection while operating within the limits of the capacity chart. This situation is normal with some crane configurations and does not indicate loss of stability. If this situation occurs, verify the crane is level and all pontoons are fully supported without a load on hook.

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Traveling

1. Traveling with a suspended load should be avoided if possible. It is especially hazardous when terrain is rough or irregular, on a side slope, or in a hilly area. When traveling with a load, observe the following rules:
 - a. Use a hand line to control the load and reduce load swing.
 - b. Travel by the smoothest, most level route. If a smooth, level route is not available, don't travel with a suspended load. Grade the route to provide a smooth, level path. If it is not possible to grade the route, move the load by stepping. Level the crane on outriggers, lift the load and set it down ahead of the crane. Travel the unloaded crane beyond the load, level the crane on outriggers, lift the load, swing and set it down farther along the route. Continue this procedure until the load is at its destination.
 - c. Carry loads as close to the ground as possible.
 - d. Do not allow side swing of the load.
 - e. Don't attempt to carry loads which exceed the crane's rating. Refer to On Tires and Pick And Carry capacities shown in the Crane Rating Manual.
 - f. Don't travel with a load on soft ground. If the crane sinks into ground, stability can be affected to the point of tipping the crane.
 - g. Keep all personnel clear of crane and load. Be prepared to set load down quickly at any time.
 - h. Fully extend outrigger beams. Extend or retract jacks until pontoons just clear the ground.
 - i. Check clearance for the extra width of the crane with the outriggers extended. Outrigger beams or pontoons must not hang on any obstruction.
 - j. Inflate tires as shown on the Tire Inflation Label or in the Crane Rating Manual when making lifts on tires.
 - k. See "Pick And Carry Operation" in this Section of this Operator's Manual for more details.
2. When traveling on the highway, road the crane safely. Watch for narrow bridges and low clearances. Check load limits, height, width, and length restrictions in the area you are traveling. Ensure the crane complies with all regulations.
3. When roading the crane, note the following:
 - a. Operate with lights on. Use proper warning signs, flags, and other devices. Use an escort service if required.
 - b. Engage travel swing lock. Release the 360° swing lock.
 - c. Tie down or otherwise restrain the hook block and/or hook ball.
 - d. Check for maximum allowable travel speed and any other travel limitations. Don't exceed these maximums. Crane damage or an accident could result.
 - e. Inflate tires as shown on the Tire Inflation Label when traveling on highway.
 - f. When traveling, outriggers must be fully retracted.
 - g. Remove all pontoons from the outrigger jacks and store them properly.
4. Ensure the driver and all passengers are wearing seat belts and keep all doors closed during travel eg storage box doors, tool box doors, cab door, etc.
5. If the crane must be towed, refer to "Towing The Crane" in this Section of this Operator's Manual for specific instructions.

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Leaving The Station

1. Do not get on or off a crane in motion. When climbing on the crane, remain in three point contact with the crane at all times (two hands and one foot or two feet and one hand). If a ladder is provided, use it.
2. Whenever an operator leaves the control station for any reason, the following must be done:
 - a. Lower the load to the ground.
 - b. Tie down the hook block and/or hook ball. Do not leave them where the wind could swing them to cause damage to the attachment and/or nearby objects.
 - c. Engage swing lock. Engage the park brake. Shutdown the engine and remove the keys.
 - d. Do not depend on a brake to suspend a load unless the operator is at the controls, alert and ready to handle the load. Brake slippage, vandalism, or mechanical malfunctions could cause the load to drop.
3. Do not leave crane unattended with engine running.
4. When changing work shifts, notify the next operator of any changes or problems with the crane.
5. Hydraulic cylinders, left extended under load, oftentimes have a tendency to drift in (retract) due to internal fluid passage in the cylinders and/or control valves. Do not shutdown the crane and leave it unattended for extended periods of time, i.e. overnight, with the boom positioned over anything or the crane itself that the boom could damage if it should lower. For instance the boom hoist cylinder may drift allowing the boom to lower and damage the engine hood. Position the boom over the front to avoid the engine hood on the rear of the crane.

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Personnel Handling Guidelines

Introduction

The following information is intended to provide Link-Belt's recommended minimum requirements that must be followed when handling personnel with a personnel basket or work platform (hereafter referred to as a work platform) suspended by wire rope from the boom of Link-Belt cranes. These requirements are based upon several sources and are put forth in recognition of current industry practices. However, safety, when handling personnel, remains the full responsibility of job site management and is dependent upon the responsible action of every person on the job involved in the related work.

This information is intended to supplement and not to supersede or replace any more restrictive federal, state, or local regulations, safety codes, or insurance requirements. It is intended to serve users of personnel work platforms in achieving the following objectives.

1. Reduce risk of personal injuries to users and the public.
2. Inform users of their respective responsibilities.
3. Provide standards of equipment requirements.
4. Provide standards for tests and inspections.
5. Provide standards of operation to promote safety.

Link-Belt cranes are designed and intended for handling material. They are not normally equipped with secondary systems or other devices required by personnel lift or elevator standards and are not intended for handling personnel for construction or amusement purposes. Use of cranes for these purposes is hazardous and is not recommended by Link-Belt. However, Link-Belt understands that circumstances may occur (in construction work) when lifting or lowering personnel on a materials handling crane load line is the only or the least hazardous method available to position personnel. In fact, Occupational Safety and Health Administration (OSHA) Part 29, CFR 1926.1431 states "The use of equipment to hoist employees is prohibited except where the employer demonstrates that the erection, use, and dismantling of conventional means of reaching the work area, such as personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions."

Much corollary and supplementary information is contained within the following resource documents pertaining to both cranes and personnel work platforms. Job site management must ensure all requirements listed in these resource documents are followed for all personnel handling operations.

- American National Standards Institute Reference – ANSI Standards A10.28, A92.2, A92.3, and American Society of Mechanical Engineers – ASME, ANSI/ASME B30.5, and B30.23.
- Power Crane and Shovel Association (PCSA) Bureau of the Association of Equipment Manufacturers (AEM) Reference – PCSA Standard No. 4.
- American Petroleum Institute (A.P.I.) Specification 2C.
- OSHA Part 29, CFR 1926.1431 Cranes and Derricks.

Authorization

Authorized use of a work platform may be permitted only after the following on-site procedures have been performed:

1. A competent person on the job site (job site manager) specifically responsible for the overall work function to be performed has determined that there is no practical alternative means to perform the needed work and has authorized a personnel lifting operation.
2. For each instance of such lifting, a competent person responsible for the task has attested to the need for the operation by issuing a written statement describing the operation and its time frame and itemizing that each of the on-site authorization requirements has been met. The written statement, after being approved by a qualified person, shall be retained at the job site. (Refer to *Personnel Handling Pre-Lift Check List For Link-Belt Cranes* in this Section for a sample check list.)
3. Review of crane inspection records has been conducted to ensure the crane being used meets applicable provisions in ANSI/ASME B30.5 and B30.23.
4. Review of the work platform inspection records and specifications has been conducted to ensure it meets applicable design standards (refer to ANSI A10.28).
5. Review of the personnel lifting operation practices specified in these instructions have been conducted with job site managers and crane operator(s), foreman, designated signal person, personnel to be lifted, safety supervisor, and any other person(s) who has jurisdiction over the operation to ensure that they are aware of the hazards of the operation and they are aware of provisions of these instructions that must be adhered to before and during the personnel lifting operation.

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Equipment

1. The crane system shall be equipped with the following:
 - a. A fully functional working operational aid such as a Rated Capacity Limiter (RCL) system – A system consisting of devices that sense crane loading, boom length (extendable booms only), boom angle, and also automatically provide an audible/visual signal when the loading conditions approach, reach, and/or exceed the rated capacity values. When the Actual Load exceeds the Rated Capacity, the system supplies a signal to a function cutout system. The operational aid shall be equipped with these additional devices:
 1. Anti-two block device to prevent damage to the hoist wire rope, other crane components, or attachments, and subsequent endangerment of personnel.
 - It is required that the anti-two block device warn both audibly and visually as well as have the capability to cutout the controls/functions that may cause a two block condition.
 2. Boom angle indicator.
 - Cranes with extendable booms must utilize a boom angle indicator having “high and low” set points and audible/visual alarm(s) capable of activating function cutouts.
 - b. Boom hoist and load line shall have power lowering and raising and shall have an automatic brake which is applied when the applicable control is in neutral, or when the anti-two block device is actuated.
 - c. If the crane is equipped with a “free-fall” hoist, steps shall be taken to ensure its use is not possible during the use of the work platform. (Note: A.P.I. applications do not permit the crane to be equipped with free-fall.)

- d. Each crane shall have a mechanical swing park brake or swing lock capable of being set at any swing position, and shall have a variable swing brake or swing controls capable of stopping the upper swing motion smoothly. The swing brake must be properly maintained at all times to ensure its holding capability.

Note: All operational aids and equipment must be maintained in operable condition. Alternative measures are not permitted.

2. The work platform shall be designed by a qualified engineer competent in structural design. Its maintenance, and its attachment to the crane load line, is the responsibility of the job site management. Their arrangement shall comply with the following as a minimum:
 - a. The work platform harness must be of sufficient length to prevent any portion of the work platform or the harness from coming in contact with the boom at any working boom angle.
 - b. Audible and visual alert systems shall be provided to the personnel in the work platform to signal for assistance in the event of an emergency.
 - c. Hooks on hook block assemblies, hook ball assemblies, or other assemblies, shall be of a type that can be closed and locked, (with a working safety latch) eliminating the hook throat opening, and shall be full load-bearing, and contain a manual trigger release.
3. No unauthorized alterations or modifications are allowed to be made to the basic crane.

Maintenance, Lubrication, And Adjustments

1. The crane operator must have a complete understanding of the crane's maintenance, lubrication, and adjustment instructions as outlined in the Operator's Manual.
2. The crane shall be maintained, lubricated, and adjusted, by a designated person, as specified in the Operator's Manual.
3. The crane and work platform decals must be understood and maintained.
4. All decal precautions and instructions shall be strictly observed.

Operator's Manual

Inspection And Rigging

1. The lift crane and work platform shall be inspected immediately prior to commencement of operation. (Refer to the Crane Operator's Manual and ANSI B30.5, Section 5, Section 5—2.1.2 and 5.2.4, and ANSI/ASME B30.23 for the required inspection procedures for the crane. Refer to ANSI A10.28 for inspection procedures required for the work platform.)
2. The inspection shall be performed once daily when the crane is being used in work platform service or each time the crane is converted from material lifting to personnel handling operation. In the event the operator is replaced, a new inspection is required. Written documentation of all inspections must be kept on the job site during personnel handling operations.
3. Inspect the crane and work platform for any loose, damaged, or missing components.
4. Any structural or functional defect which adversely affects the safe operation of the lift crane shall be corrected before any operation utilizing a work platform begins or continues.
5. The hoist drum shall have at least three full wraps of wire rope remaining on the drum at all times when using a work platform.
6. Minimum load hoist and boom hoist wire rope design factors for the combined weight of the lift attachments, work platform personnel, and tools shall be 10:1 for "Non-Rotating" and "Rotation Resistant" wire ropes. All other wire rope types require a 7:1 design factor. (Note: A.P.I. applications require 10:1 design factor for all wire rope construction.)
7. The work platform shall be suspended from a wire rope that is reeved from an allowed lifting sheave. Refer to "Lifting Sheaves For Personnel Handling With Suspended Work Platforms" chart to determine the allowed sheave(s).
8. Inspect the wire ropes, sheaves, hoist drum brakes, and other mechanical and rigging equipment vital to the safe operation of the crane.
9. Ensure that all wire rope sockets and dead end lugs are properly installed and are in good working condition.
10. Ensure that all wire rope guards are in good working order and that they are properly installed and adjusted to prevent wire rope from jumping off sheaves.
11. Inspect all structural members of all boom sections, fly sections, luffing jib sections, and live mast, as equipped.
12. In addition to other regular inspections, visual inspection of the crane and work platform shall be conducted immediately after testing and prior to lifting personnel. The following inspections shall be conducted on extendable booms prior to lifting personnel:
 - a. Full power style booms:
 1. Inspection of all extension wire ropes at the access points in the boom where the end connections are visible — Refer to the Operator's Manual for inspection and adjustment procedures.
 - b. Pinning and latching style booms:
 1. Inspection of the latching mechanism, sensors, and hydraulic/electrical circuit at the access points.
 2. Inspection of all pins and pinning locations in the individual boom sections and at the fully retracted position.
 3. Verification of the accuracy of the boom length indicator. Refer to the Operator's Manual for the procedures.
13. The following inspections shall be conducted on fixed length style booms prior to lifting personnel:
 - a. Inspection of all pendants, pendant links, pendant spreader bars, links, etc.
 - b. Inspection of all mechanical linkages, shafts, drums, etc.
14. A written record of all the above inspections must be maintained on the job site.

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Crane Test Procedures

The test procedures listed below shall be conducted at the following intervals:

- Daily,
- At each job site before hoisting employees,
- After any repairs or modifications to the equipment,
- When an operator is replaced, and
- When, in the judgement of responsible job site management, or controlling entity, there has been a significant change in the conditions of the personnel lifting operation.

Note: No personnel are allowed to ride the work platform during any of the tests recommended in this Section.

1. The work platform and rigging shall be proof tested to 125 percent of the work platform's rated capacity. (The proof test may be done concurrently with the trial lift by completing the following test procedures.) Do not exceed the rated lifting capacity of the applicable lift crane as listed on the crane capacity charts. (Refer to ANSI A10.28 for suspended work platform testing and inspection.)
 - a. This test load shall be tested for stability.
 - The operator and signal person shall conduct this test.
 - This test shall include movement of the work platform through its entire intended range of motion, simulating the specific operation to be undertaken.
 - A successful stability test must not produce instability of the crane or cause permanent deformation of any component.
 - b. This test load shall be raised and lowered at maximum power controlled line speed (NOT FREE-FALL). The acceleration must be smooth and the deceleration capability of the control/braking system shall be confirmed by bringing the work platform to a smooth stop. The work platform shall be held in a suspended position for a minimum of five minutes with the test load evenly distributed on the work platform. (This experience is intended to sharpen the skill of the operator in handling the work platform and to give the operator an opportunity to evaluate the crane's performance.) The work platform shall then be inspected for any evident sign of damage or defect.
2. All limiting and warning devices shall be tested by activation of each appropriate control function.
3. With pinning and latching style extendable booms, a visual inspection shall be conducted to verify that the boom extend pins are properly set in the extended boom sections.
4. At the beginning of each lift, the work platform must be hoisted a few inches (*mm*) with the personnel and materials/tools on board and inspected by a competent person to ensure;
 - The work platform is secure and properly balanced,
 - All wire ropes are free of deficiencies such as kinking, crushing, corrosion, etc.,
 - Any multiple part lines are not twisted,
 - The primary attachment is centered over the work platform, and
 - If any load rope is slack, it must be inspected to ensure that all ropes are properly seated on the drum and in the sheaves.
5. Any condition found during any of these tests/inspections that fails to meet requirements or may create a safety hazard, must be corrected before hoisting personnel.

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Telescopic Booms		Main Boom Head Sheaves		Auxiliary Head Sheaves		Fixed Fly Sheave			
		Allowed		Allowed		Allowed			
		Offset Fly Sheave		Offset Fly With Extension(s) Sheave		A—Frame Jib Sheave			
		Allowed		Allowed		Not Recommended			
Conventional Lattice Tubular or Angle Booms		Main Boom Head Sheaves		Tip Extension Sheaves		Jib Head Sheave			
		Allowed		Allowed		Allowed			
Luffing Attachments		Luffing Boom Auxiliary Head Sheaves		Midfall Sheaves		Luffing Jib Head Sheaves		Fixed Jib Head Sheave	
		Not Recommended		Allowed		Allowed		Not Recommended	
Lifting Sheaves For Personnel Handling With Suspended Work Platforms									

Operation And Safety

- The Operator's Manual for the crane shall be read and fully understood by operating personnel. The Crane Operator's Manual shall be available to them at all times.
- Safety when handling personnel remains the full responsibility of job site management and is dependent upon the responsible action of every person on the job involved in the related work.
- Mobile lift cranes shall be erected to obtain maximum crane stability. The crane must be level and on firm ground. It is recommended that the outriggers be fully extended and the tires must be clear of the ground before beginning any operation.
- The operator shall not leave the operator's station when the work platform is occupied. The operator shall remain alert in a position of readiness at the work station with the engine running and the master clutch engaged, if crane is so equipped.
- Unauthorized personnel shall not be in the operator's cab on the lift crane, or near the lift crane while a work platform is suspended from the load line.
- Any operation in which a work platform is to be suspended from the load line shall be carefully planned by the operator, supervisory personnel, designated signal person, and personnel to be lifted prior to commencement of such operation. They are to be advised:
 - That the crane does not have safety devices normally used on personnel handling equipment.
 - That the safety of the operation depends on the skill and judgment of the crane operator and others present.
 - Of procedures to enter and leave the work platform and other safety procedures.
- After positioning of the work platform:
 - All brakes and locks on the lift crane shall be set before personnel perform any work.
 - With pinning and latching style extendable booms, a visual inspection shall be conducted to verify that the boom extend pins are properly set in the extended boom sections.
- Telescope operation is not recommended with any extendable boom with personnel in a suspended work platform.
- A work platform attached to load line of lift cranes shall not be used for working on any energized electric power line, or any energized device or facility used for electric power generation or transmission. Minimum working clearance shall be at least twice that recommended for material handling operations in ANSI B30.5b section 503.4.5 and ANSI B30.23.
- The combined weight of the work platform, any attachment device, personnel, tools, and other equipment shall not exceed 50% of the lifting capacity of the applicable lift crane as listed on the crane capacity chart. (Note: A.P.I. applications require 25% of lifting capacity as the limit.)
- Use caution when utilizing pendant supported lattice jibs on tubular or angle booms as the jib can drift backwards into the jib backstops under certain conditions. This is most likely with short jib lengths with minimum jib offset and maximum boom angle. Pay special attention to detect the possibility of jib drift during the work platform test lift. An additional test lift is recommended with an empty work platform when operating under these conditions.

Operator's Manual

12. The following actions and operations are strictly prohibited when working with personnel suspended in a work platform:
 - a. Cranes shall not travel while personnel are in the work platform.
 - b. No lifts shall be made on another of the crane's load lines with personnel suspended in a work platform.
 - c. No external load is allowed to be lifted by attaching it to the work platform.
 - d. Work platform lifts shall be a single crane operation. A work platform shall not be lifted using two cranes.
 - e. Hoisting of personnel shall be discontinued upon indication of any dangerous weather conditions, wind, or other impending danger.
 - f. The emergency manual mode operation of pinning and latching style extendable booms shall not be utilized.
 - g. Free-fall (if equipped) shall not be used.
 13. Movement of the work platform with personnel shall be done in a slow, controlled, cautious manner with no sudden movements of the crane or work platform. Do not use high speed functions, if equipped.
 14. Do not use multi-function crane operation. If load hoist, boom hoist, and swing functions must be used to position the work platform, perform each function individually.
 15. Clear, unobstructed visibility between personnel on the work platform and the crane operator shall be maintained at all times except where a designated signal person has been assigned and positioned such that he is visible to both. Such designated signal person shall have no other duties to perform when personnel are in the work platform.
 16. Voice communication between work platform personnel, the crane operator, and designated signal person, if assigned, shall be maintained.
 17. If other cranes or equipment may interfere with the lifting of personnel, signals or other means of communication between all crane or equipment operators shall be maintained to avoid interference with individual operations.
 18. If the work platform is not landed, it shall be tied to a structure before personnel mount or dismount the work platform.
 19. Personnel in the work platform shall wear personal fall arrest systems. Anchors used for attachment of personal fall arrest equipment shall be independent of any anchors being used to support or suspend work platforms. Personnel shall keep all parts of body, tools, and equipment inside work platform during raising, lowering, and positioning.
 20. Personnel shall always stand firmly on the floor of the work platform and shall not sit or climb on the edge of the work platform or use planks, ladders, or other devices for attaining a work position. (This does not apply to offshore personnel transfer baskets. Personnel must ride on the exterior of this type of personnel handling device to assure greater safety of the operation.)
 21. When welding is done by personnel in the work platform, the electrode holders shall be protected from contact with metal components of the work platform. If electrically connected electrode holders contact work platform, work platform could be dropped due to burning/melting of wire ropes suspending the work platform.
 22. A pre-lift meeting must be conducted with the crane operator, signal person, employee(s) to be hoisted, person responsible for the task to be performed, and anyone else that is directly involved with the lift (as applicable) to review all the requirements and procedures that must be followed to complete the lift.
 23. Follow all procedures for determining the rated capacity and perform all testing as outlined in the Crane Operator's Manual, the Crane Rating Manual, and this Safety Manual.
- ## Additional Requirements For Offshore Cranes
1. Link-Belt offshore cranes are designed to handle materials. However, due to the special conditions commonly existing offshore, the use of cranes to transfer personnel between vessels or from a vessel to a work platform is an established practice. The safety of the personnel, if a materials handling crane is used in transferring personnel, depends upon the skill and judgment of the crane operator and alertness of the personnel being transferred. Sea and weather conditions may create additional hazards beyond the skill of persons involved.

This operation is approved by the American Petroleum Institute (A.P.I.). By adopting procedures for this operation, the institute has determined that the transfer of personnel may be performed safely under certain offshore conditions. Therefore, whenever an offshore crane is used to transfer personnel, all persons involved in the operation must know and implement the A.P.I. procedures and verify that sea and weather conditions are within safe limits for the transfer.

In addition to all previous requirements in these Instructions, A.P.I. 2C requires the following:

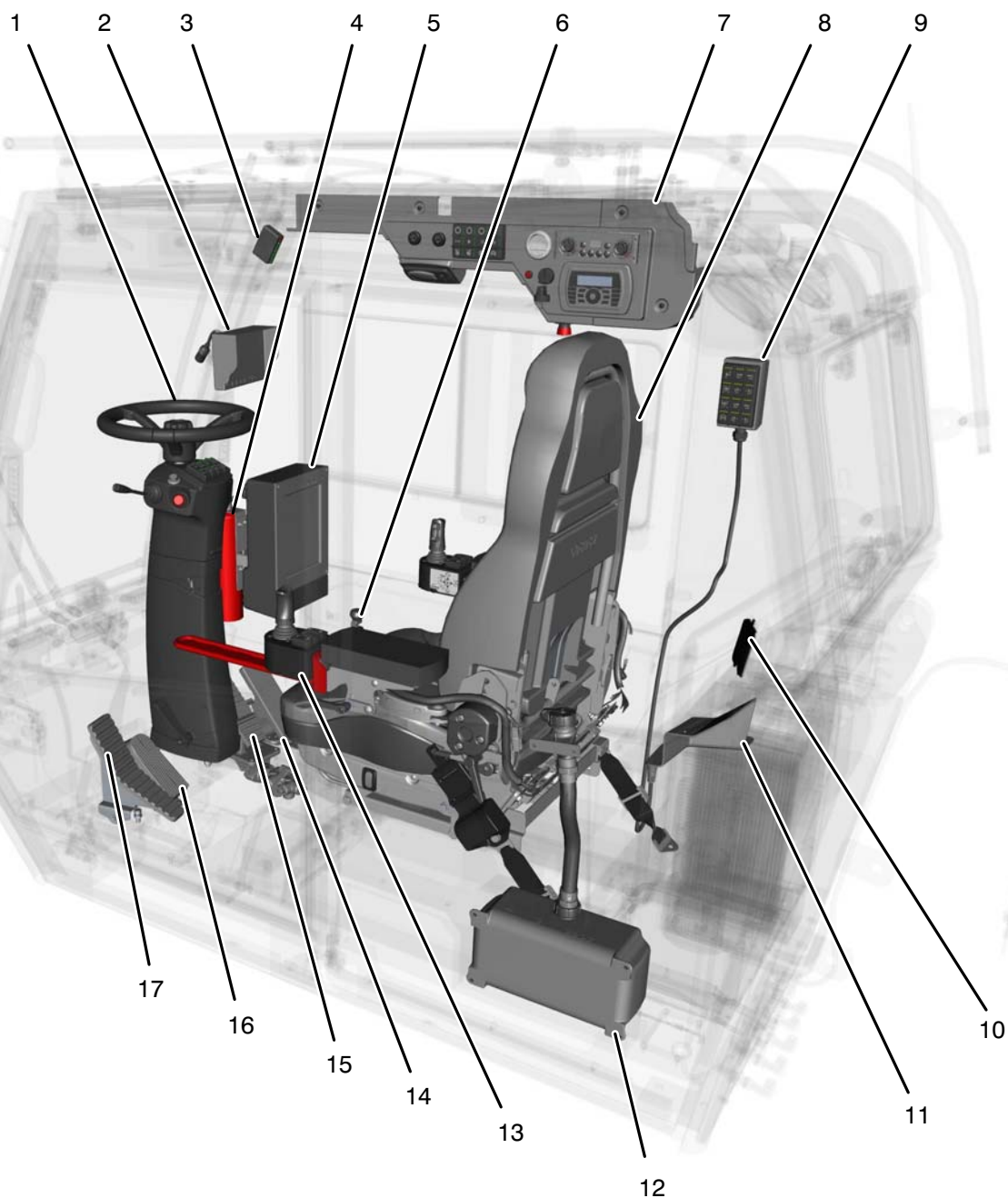
 - Boom and load hoists used shall be approved by the hoist manufacturer for personnel handling and shall be so indicated on their name plate.
 - Refer to A.P.I. 2C Section 6 for further details and procedures.

Operator's Manual

Personnel Handling Pre-Lift Check List for Link-Belt Cranes 	
1	I am the designated person responsible for verifying that all safety requirements are met for this personnel handling operation; Name: _____ Title: _____ Signature: _____ Date: ____/____/____ Initials _____
2	I have verified that there are no conventional means to handle personnel for this operation.
3	I have a written statement authorizing personnel handling from a competent person on the job who accepts full responsibility, or I accept full responsibility for the operation.
4	The Crane Operator acknowledges that he has read and fully understands the Crane Operator's Manual and Crane Rating Manual. All personnel involved have been informed and understand the tasks required to complete the personnel lifting operation.
5	The crane has been maintained, lubricated, and adjusted by a designated person, as specified in the Crane Operator's Manual.
6	The lift crane is equipped, and all devices operate properly as follows: • Anti-two block device with hydraulic cutouts • Power load raising and lowering with automatic brakes and function cutouts – Free-Fall (if equipped) shall not be used • Boom angle indicator with high and low set points and function cutouts • Boom length indicator (telescopic booms only) and function cutouts • Load Indicating System or Rated Capacity Limiter System • A variable swing brake or swing controls capable of stopping upper swing motion smoothly • A mechanical swing park brake or swing lock to hold the upper in position while personnel are working from the work platform • Hook block or hook ball being used can be closed and locked with a safety latch
7	A working audible and visual alert system is provided to the personnel in the work platform.
8	A mechanical and structural crane inspection has been completed by a designated person.
9	The wire rope used to lift the work platform is reeved from an allowed lifting sheave
10	Crane travel is not allowed with personnel in the work platform.
11	Telescoping the boom is not recommended with personnel in the work platform.
12	When handling personnel with pinning and latching style booms, it is recommended boom be kept in a pinned position. Inspections must be made to ensure boom extend pins are set.
13	All wire rope sockets and dead end lugs are properly installed and are in good working condition. All Wire rope guards are properly installed and adjusted to hold all ropes on the appropriate sheaves.
14	Voice communications between the Crane Operator and the personnel in the work platform are present and operational.
15	Fall arrest systems are present and in use by personnel in the work platform.
16	Weather and wind conditions are acceptable to safely perform the lift.
17	A Proof-Test/Trial Lift was completed with 125% of the work platform's rated capacity.
18	The total load being lifted will not exceed 50% of the standard lift crane capacity charts.
19	Cranes with outriggers have them equally extended with tires clear of the ground.
20	A Pre-Lift meeting was held with all appropriate personnel to review all aspects of the lift.

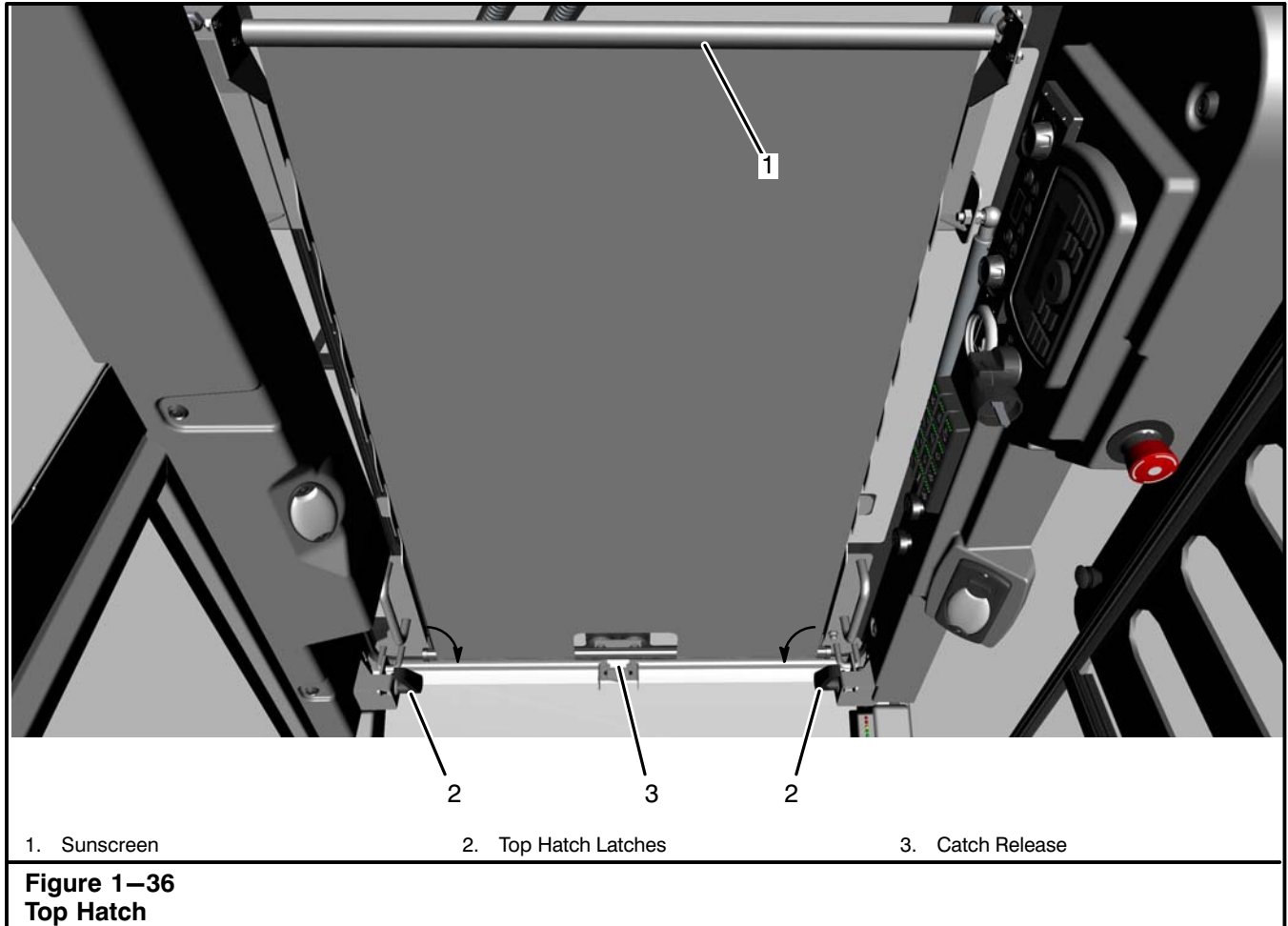
Note: This checklist is to be used as a supplement to (not a substitute for) the information and procedures supplied for personnel handling operations.

Operator's Manual



1. Steering Column And Wheel	7. Right Overhead Control Console	13. Seat Console Control Switches
2. Camera Monitor	8. Operator's Seat	14. Throttle Pedal
3. RCL Overhead Light Bar	9. Outrigger Control Box	15. Service Brake Pedal
4. Fire Extinguisher	10. Diagnostic Panel	16. Swing Brake Pedal
5. Rated Capacity Limiter Display	11. Fuse Panel	17. Boom Telescope Pedal
6. Travel Swing Lock Control	12. Windshield Washer Reservoir	

Figure 1–35
Operator's Cab



Operator's Cab

Several panels which contain the controls, switches, and gauges to operate and monitor crane operations are mounted throughout the operator's cab. Refer to Figure 1—35. The following is a description of each gauge, switch, or control in each panel, along with an explanation of their function and/or operation.



WARNING

Read and understand all “Operating Safety” procedures as well as all other operating instructions in this Operator's Manual and the engine manufacturer's manual before attempting to operate the crane. This crane should only be operated by a qualified operator who has read and understood this entire Operator's Manual.

Top Hatch

Top Hatch Wiper And Washer

The top hatch wiper is mounted in the top of the operator's cab roof. Refer to Figure 1—36. The switch for the top hatch wiper/washer is on the overhead control console. Refer to Figure 1—40 for switch location.

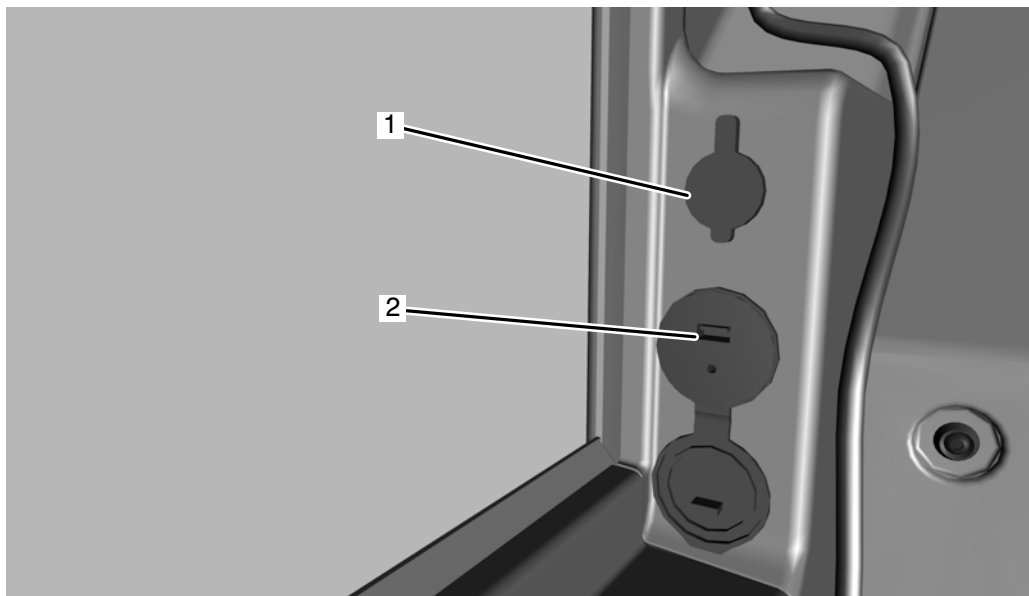
Top Hatch Window

The top hatch window can be opened to improve operator's cab ventilation. To open the top hatch window, rotate the latches, press the catch release, and push up on the top hatch window. Refer to Figure 1—36.

Top Hatch Sunscreen

The top hatch is equipped with a roller type sunscreen to assist operator vision when looking up through the top hatch. Refer to Figure 1—36.

Operator's Manual



1. 12V DC Accessory Outlet
2. USB Accessory Outlet

Figure 1–37
Power Outlets

Fire Extinguisher

A fire extinguisher is mounted in the operator's cab behind the RCL display. It is an A B C type fire extinguisher, meaning it is capable of extinguishing most types of fires. The operator should be familiar with its location, the clamp mechanism used to secure it in place, and foremost the operation of the device. Specific instructions, regarding operation, are given on the label attached on the fire extinguisher. A charge indicator on the fire extinguisher monitors the pressure within the tank. Check the indicator daily to ensure the fire extinguisher is adequately charged and ready for use.

Windshield Washer Reservoir

The reservoir for washer fluid is mounted in the lower left rear of the cab. Refer to Figure 1–35. Do not operate the washer when the reservoir is empty. Use specially formulated windshield washer fluid rather than water because specialty washer fluids contain additives that dissolve road grime.

Power Outlets

12V DC Accessory Outlet

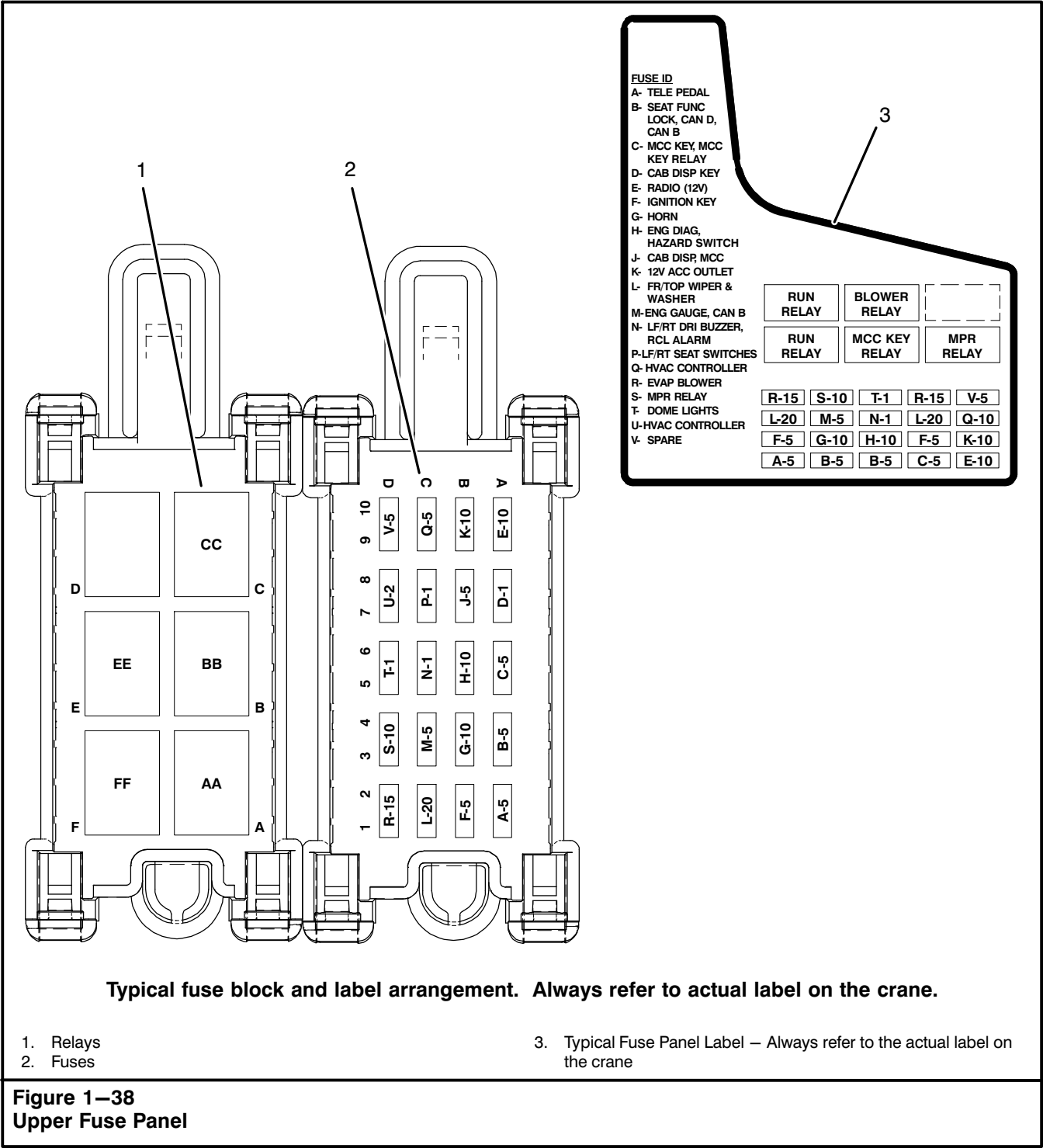
Use this outlet for electrical accessories.

CAUTION

Do not connect an accessory to any part of the crane other than the accessory outlets or cigarette lighter. Major damage to the crane's electrical system may result. If it is necessary to do so, contact your Link-Belt Distributor.

USB Accessory Outlet

Use this outlet for USB playback of MP3/WMA files, iPod/iPhone USB input, and an Auxiliary Audio Input.

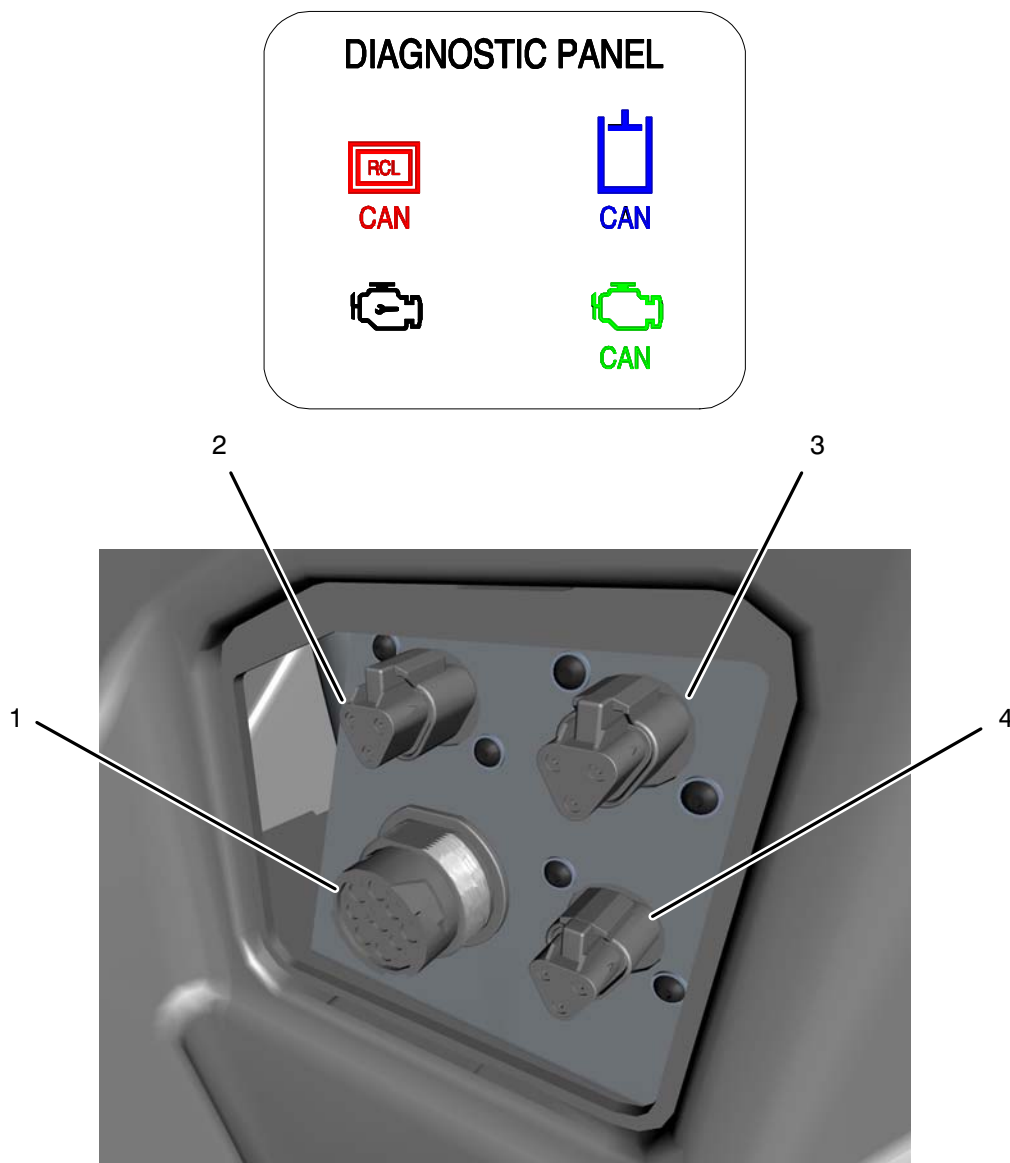


Fuse Panel

The fuse panel is located in the rear panel on the left side of the upper operator's cab. Refer to Figure 1–35. A label which designates the electrical circuit protected by each fuse is on the panel cover. Refer to Figure 1–38.

Each fuse has a letter designation which corresponds to the upper electrical system as shown on the fuse identification label.

Operator's Manual



Typical diagnostic panel. Always refer to actual label on the crane.

- 1. Engine Diagnostic Connector
- 2. RCL CAN

- 3. Hydraulic CAN
- 4. Engine CAN

**Figure 1–39
Upper Diagnostic Panel**

Upper Cab Diagnostic

The diagnostic panel is located in the rear panel on the right side of the upper operator's cab. Refer to Figure 1–35. A label which identifies each diagnostic connector is on the panel cover. Refer to Figure 1–39.

The central location of panel allows easy access for technicians to retrieve fault codes and conduct systematic troubleshooting of various upper control systems.

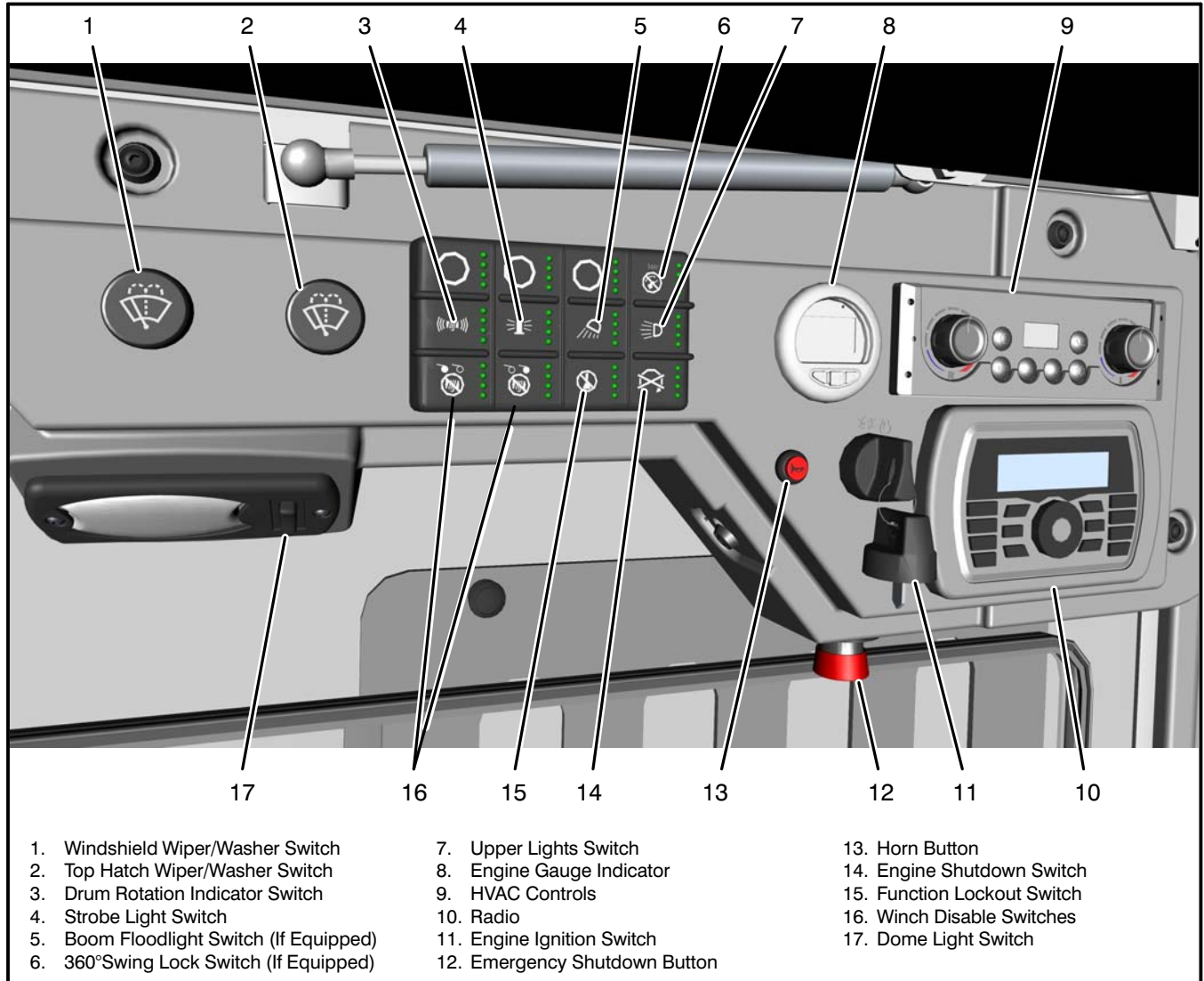


Figure 1—40
Right Overhead Control Console

Right Overhead Control Console

A control panel on the upper right side of the operator's cab contains the following controls. Refer to Figure 1—40.

1. Windshield Wiper/Washer Switch



Rotate the wiper/washer knob clockwise to activate the windshield wiper. Rotate the knob to the first detent for low speed wiper or to the second detent for high speed wiper. Rotate the knob counterclockwise to turn the wiper off. Rotating the knob between the off position and the first detent enables intermittent wiper delay between long delay and short delay. Pushing the knob sprays washer fluid on the windshield to clean the window.

2. Top Hatch Wiper/Washer Switch



Rotate the top hatch wiper knob clockwise to activate the wiper. Rotating the knob between the off position and the first detent enables intermittent wiper delay between long delay and short delay. Rotate the knob to the first detent for low speed wiper or to the second detent for high speed wiper. Rotate the knob counterclockwise to turn the wiper off. Pushing the knob sprays washer fluid on the windshield to clean the window.

Operator's Manual

3. Drum Rotation Indicator Switch



This switch is used to activate the drum rotation indicator system. To activate the system, press the switch once. Press the switch again to deactivate the system. All four green LED indicators will illuminate to indicate the switch is in the ON position. Refer to "Drum Rotation Indicators" in this Section of this Operator's Manual for complete operating procedures.

4. Strobe Light Switch



This switch controls the two frame mounted strobe lights. Push the switch once to activate the strobe lights, and again to inactivate them. All four green LED indicators will illuminate to indicate the switch is in the ON position..

5. Boom Floodlight Switch (If Equipped)



This switch operates the boom floodlight. Push the switch once to activate the floodlight, and again to inactivate it. All four green LED indicators will illuminate to indicate the switch is in the ON position.

6. 360° Swing Lock Switch



This switch is used to operate the 360° swing lock to hold the upper in any position over the carrier. Refer to "Swing System" in this Section of this Operator's Manual for complete operating procedures.

7. Upper Lights Switch



This switch operates upper floodlights. Push the switch once to activate the bottom cab floodlights. The bottom green LED indicator will illuminate. Press the switch again to activate the cab bar floodlight (if equipped). The two bottom green LED indicators will illuminate. Press the switch again to activate the frame mounted floodlights (if equipped). The three bottom green LED indicators will illuminate. Press the switch again to inactivate the upper floodlights.

8. Engine Gauge Indicator

The engine gauge indicator displays engine information and warning lamps.

9. HVAC Controls

Fan Speed Rotary Knob



This rotary knob controls the fan speed. Use the variable position switch to control the air flow into the operator's cab. The fan speed is depicted on the HVAC control panel display.

Note: When the HVAC system is in AUTO mode, the fan speed is controlled automatically. If the fan speed is adjusted while in AUTO mode, the system will automatically change to manual mode.

Vent Selector Buttons



Press the vent selector buttons to toggle through which vents air is directed from. Active vents are depicted on the HVAC control panel display.

Note: When the HVAC system is in AUTO mode, the vent selection is controlled automatically. If the vent selection is adjusted while in AUTO mode, the system will automatically change to manual mode. This AUTO feature helps to provide a balance in the cab to keep the windows and windshield defogged, provide an air curtain overhead during high solar load events, and provide maximum heating to the foot area during high heat requirements. The system also automatically controls the velocity to the face area based on the temperature of the air, to prevent dry eyes and tearing.

Temperature Control Rotary Knob



Turn the temperature control rotary knob to adjust the temperature in the operator's cab.

Note: When the HVAC system is in auto mode, the entire system will automatically adjust as required to maintain desired cab temperature. When in manual mode the temperature displayed is only an indication of the heat setting, and not an indication of the actual cab temperature.

Operator's Manual

Max Defrost/Defog Selector Switch



Push this switch to enable the max defrost/defog system. The switch will illuminate and the symbol will be depicted on the HVAC control panel when enabled. The system will direct air to the windshield and windows while automatically adjusting the air flow and temperature, as needed, to clear the windshield. The A/C may be automatically enabled to dehumidify the air in accordance with the outside air temperature and interior humidity level.

Note: While active, the interior temperature of the cab is not monitored and may increase or decrease from desired temperature while defogging/defrosting the windshield and windows. Changing any settings will automatically change the system to manual mode.

A/C Control Switch



Push this switch to manually toggle the air conditioning unit off and on. The switch will illuminate and the symbol will be depicted on the HVAC control panel display when the A/C is enabled in manual mode.

Note: When in AUTO mode, the air conditioning unit may turn on and off as required to maintain desired cab temperature. Pressing this switch while in AUTO mode will automatically change the system to manual mode.

Automatic Climate Control Switch



Pressing the automatic switch automatically controls the heater, air conditioner, fan speed, vent selection, and recirculation selection, as required, to maintain a constant temperature and humidity level in the cab. The switch will illuminate and "AUTO" will be depicted on the HVAC control panel display when in recirculation mode.

Note: Changing any setting, other than the temperature control knob, will automatically change the system to manual mode.

Air Recirculation Control Switch



This switch toggles between recirculating the air in the cab and drawing fresh air into the cab through the HVAC system.

Note: In order to maintain low levels of carbon dioxide in the cab, recirculation mode will automatically turn off after 10 minutes. The carbon dioxide level is NOT monitored by the system; it is to the operator's discretion whether to press the switch again and reactivate the recirculation mode.

HVAC Controls Display



All information for the HVAC system is contained in the display. The temperature setting, the vent selection, recirculation mode, blower speed, and AUTO mode symbols are all depicted on the display.

10. Radio

The crane is equipped with an AM/FM radio/audio system. Refer to "Radio Operation" in this section of this Operator's Manual.

11. Engine Ignition Switch

The engine ignition switch is the conventional, key operated, automotive type. It controls engine off/on/start, accessories, and energizes the instrument panel in the operator's cab.

12. Emergency Shutdown Button



The emergency shutdown button is used to shutdown the engine and power to accessories in emergency situations. Press the button to shutdown the engine. Reset the button by turning it counterclockwise.

Operator's Manual

13. Horn Button



Press this button to sound the horn. Before starting the engine, it is recommended to sound the horn twice in succession and wait 10–15 seconds while making a visual check to verify that there are no persons under or in close proximity to the crane. There also is a horn button on the right control lever and the steer column, which are enabled when the ignition switch is activated.

14. Engine Shutdown Switch



This switch will shut the engine down while displays and accessories remain on. Press and hold the switch to shut down the engine. All four green LED indicators will illuminate while the switch is being pressed. Engine can be restarted with the ignition switch while engine shutdown switch is activated.

15. Function Lockout Switch



This switch is used to disable the hydraulic functions which are operated by the control levers, the boom telescope foot pedal, and cab tilt switch. Press the switch once to disable hydraulic functions and to prevent inadvertent operation of these controls. To allow normal operation of the control levers and boom telescope foot pedal and cab tilt switch and press the switch again. All four green LED indicators will illuminate when hydraulic functions are disabled.

16. Winch Disable Switches



These switches are used to disable the front and/or rear winch. Refer to “Wire Rope Winch System” in this Section of this Operator's Manual for complete operating procedures.

17. Dome Light Switch



Press the top of this switch to activate the red reading lamps. Press the bottom of the switch to activate the white dome lights.

Boom Floodlight With Remote Control (If Equipped)

The remote controlled boom floodlight is equipped with a remote control. Refer to Figure 1–41.

1. Direction Buttons



The direction buttons control the direction of movement of the boom floodlight(s). The light has confined rotation. If the light stops rotating before reaching desired position, it must be rotated in the reverse direction.

Note: Depending on mounting orientation of the light, the arrow directions on the remote may not be indicative of the light movement.

2. Flashlight Button

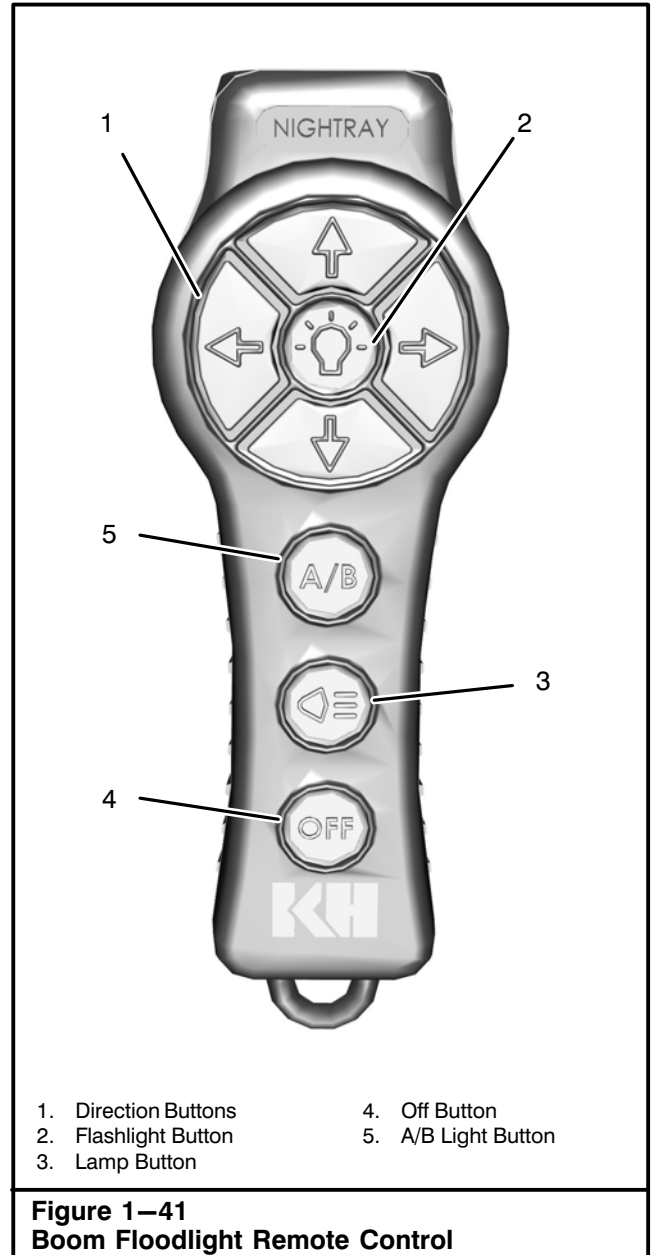


The flashlight button will shut off after 20 minutes if no buttons are pushed on the remote control.

3. Lamp Button



The lamp button will turn on the floodlight. Press and hold button until light turns on (1–5 seconds). Some remotes may be equipped with the accelerometer feature. Pressing and holding the lamp button activates the accelerometer. When holding this button and rotating the remote, the light will rotate in the same direction as the remote is rotated.



1. Direction Buttons	4. Off Button
2. Flashlight Button	5. A/B Light Button
3. Lamp Button	

Figure 1–41
Boom Floodlight Remote Control

4. Off Button



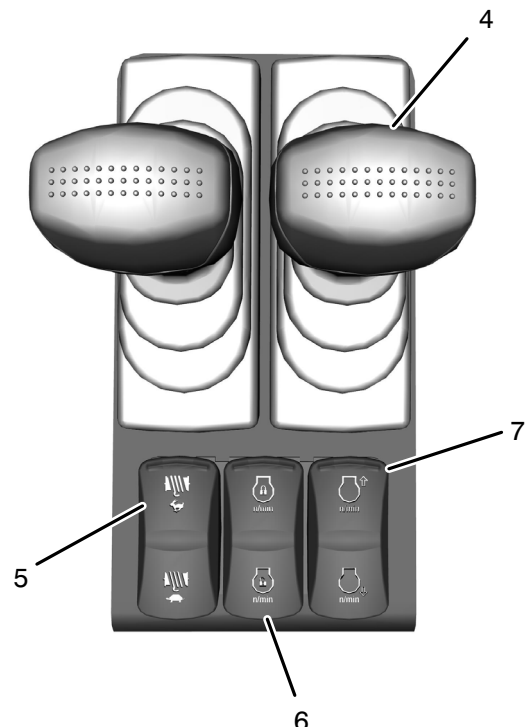
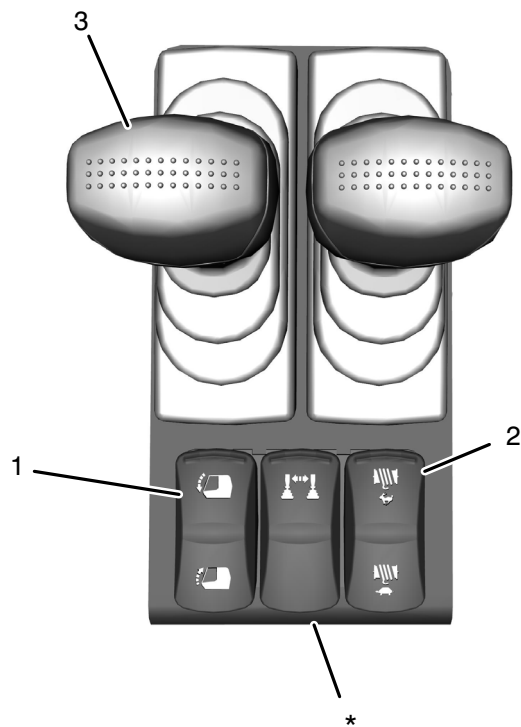
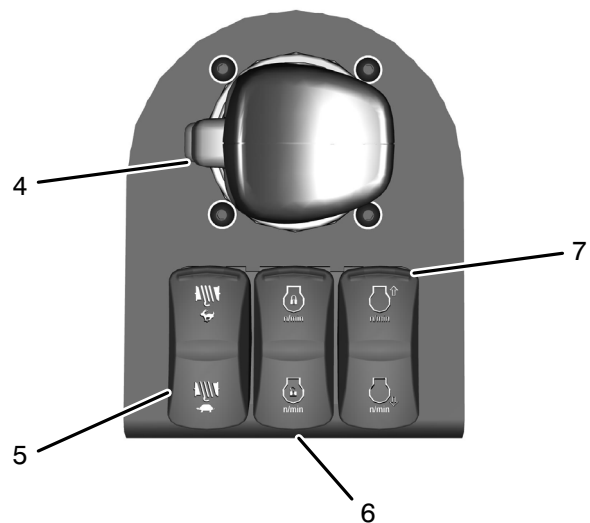
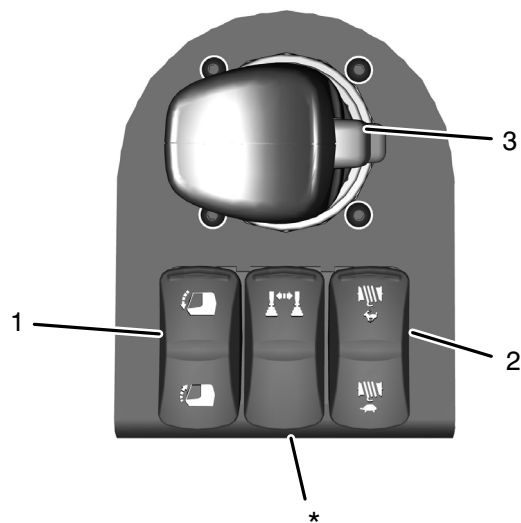
This button turns the boom floodlight off.

5. A/B Light Button



The A/B light button allows the controller to control two lights independently. The current transmitting code is indicated by a red or green light. If the machine is configured with only one remote lights, both channels will operate the light.

Operator's Manual



Left

Right

- 1. Upper Cab Tilt Switch
- 2. Auxiliary Winch Control Switch
- 3. Swing Park Brake Switch
- 4. Horn Switch (Top on Dual Axis)
- * Not Used

- 5. Main Winch Control Switch
- 6. Throttle Lock/Unlock Switch
- 7. Throttle Increase/Decrease Switch

Figure 1–42
Seat Console Control Switches

Operator's Manual

Seat Console Control Switches

Control switches are on the left and right consoles of the operator's seat. Refer to Figure 1–35 and Figure 1–42.

1. Upper Cab Tilt Switch



This switch is used to tilt the upper operator's cab from 0 to 20 degrees above horizontal. Use this switch to improve vertical visibility and help to reduce operator fatigue due to neck strain when the load is high overhead. Refer to "Cab Tilt Operation" in this section of the Operator's Manual.

2. Auxiliary Winch Control Switch



This switch is used to control engaging/disengaging the high speed hoist. Refer to "Wire Rope Winch System" in this section of this Operator's Manual for complete operating procedures.

3. Swing Park Brake Switch



Press the top portion of this switch on the dual axis control lever, or the switch at the top of the far left single axis control lever, to operate the swing park brake to hold the upper in any position over the lower. An indicator light on the Pulse Crane Control System Display will illuminate to indicate the button is in the ON position. Refer to "Swing System" in this section of this Operator's Manual for complete operating procedures. The bottom portion of this switch has no function.

4. Horn Switch



Press the top portion of this switch on the dual axis control lever, or the switch at the top of the right single axis control lever on the right side console, to activate the horn. The key must be in the "ON" position for the switch to be enabled.

5. Main Winch Control Switch



This switch is used to control engaging/disengaging the high speed hoist. Refer to "Winch Control Switch(es)" in this section of this Operator's Manual for complete operating procedures.

6. Throttle Lock/Unlock Switch



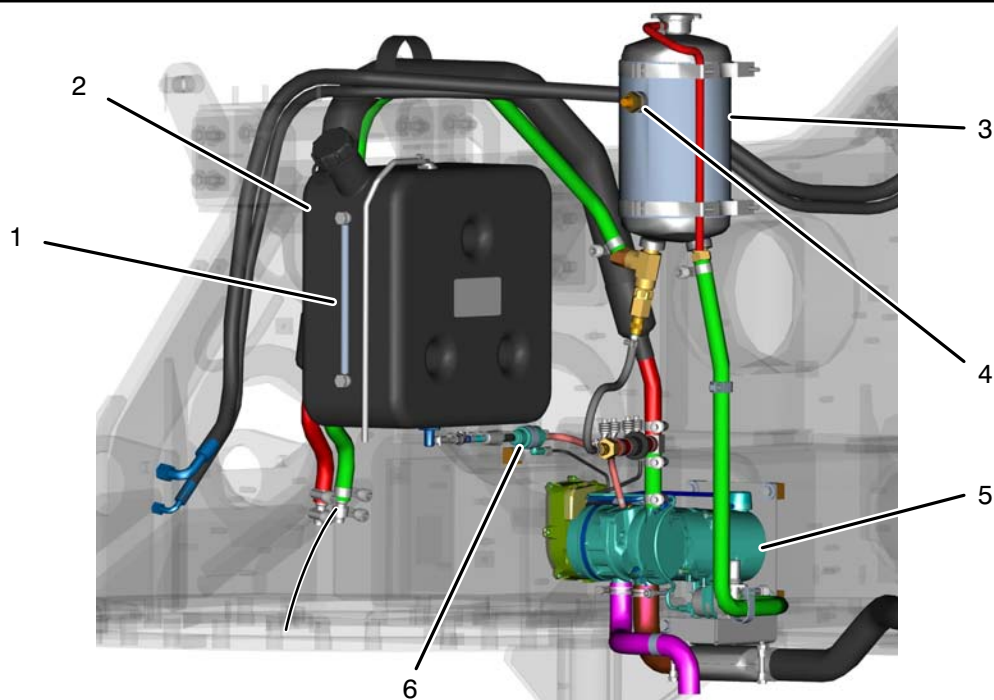
This switch is used to hold the engine at a constant speed. This provides the operator with more flexibility for certain job requirements. Refer to "Throttle Lock System" in this Section of this Operator's Manual.

7. Throttle Increase/Decrease Switch



Once the throttle lock is activated, this switch is used to increase or decrease the engine throttle. Refer to "Throttle Lock System" in this Section of this Operator's Manual.

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- 1. Diesel Fuel Tank Sight Tube
- 2. Diesel Fuel Tank

- 3. Coolant Reservoir
- 4. Coolant Reservoir Sight Gauge

- 5. Heater/Pump
- 6. Diesel Fuel Filter

Figure 1—43
Diesel Fired Warm-water Cab Heater

Cab Heater Operation

This crane may be equipped with a diesel fired warm-water cab heater or an optional engine dependant warm-water cab heater. Refer to the following instructions to operate the cab heater that is used on the crane. Refer to Right Overhead Control Console in this section of this Operator's Manual for HVAC controls.

Diesel Fired Warm-water Cab Heater

This cab heater uses antifreeze circulating through the unit to provide heat. Antifreeze is stored in a reservoir mounted on the left side of the upper revolving frame. This antifreeze is heated by a diesel fired heater/pump and circulated through the heat exchanger in the cab. The diesel fuel tank, for the system, is mounted on the left side of the upper revolving frame. Refer to Figure 1—43. Diesel fuel should be #1, #2, or arctic. The antifreeze used should be the same type used in the crane's engine. Refer to engine manufacturer's manual for proper antifreeze selection.

Note: Operate the heater at least once a month for 20 minutes.

Note: To improve heater performance when operating the crane in prolonged ambient temperatures below -7°C (20°F), arctic fuel is recommended.

	 WARNING Diesel exhaust fumes can be harmful. Start and operate diesel cab heater in a well ventilated area. If it is necessary to operate in an enclosed area, vent the exhaust to the outside.

Operator's Manual

Automatic Operation

1. Before activating the heater, ensure that the diesel fuel tank and the coolant reservoir are full.
2. With the engine running, press the AUTO switch on the HVAC control panel.
3. Rotate the temperature control knob to the desired setting. The HVAC controller will automatically adjust all settings to achieve and maintain the desired temperature, as well as reducing the humidity level in the cab to prevent the windshield and windows from fogging.
4. The diesel fired heater will automatically turn off and on as heat is required. It is normal for the diesel fired heater to turn on, even in warm weather, to stabilize the system, or defog the windows. In addition, the air conditioning system may operate in cooler weather to stabilize the system or defog the windows.
5. Changing any setting, other than the temperature control knob, or pressing the AUTO button again, will return the system to manual mode.
6. To deactivate the diesel fired heater, rotate the temperature knob to the coolest setting.

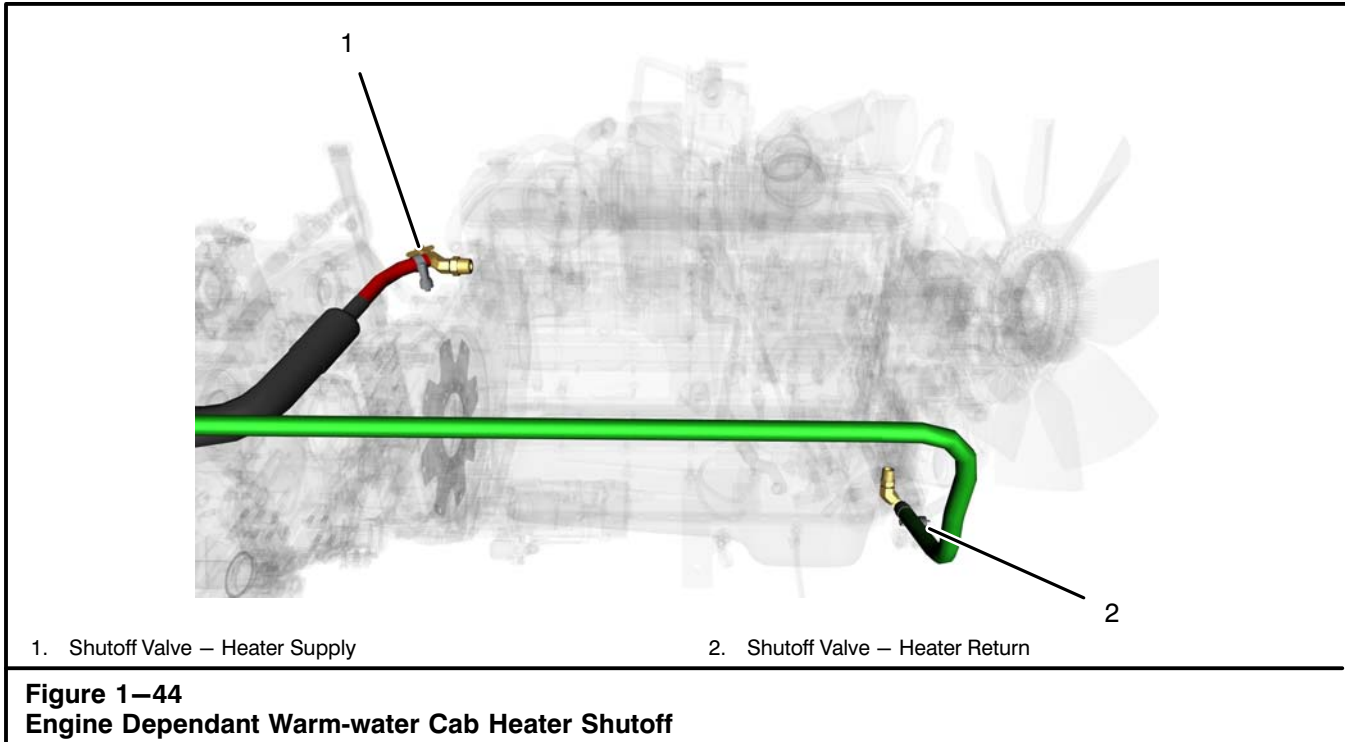
Note: The diesel fired heater may continue to run for up to 10 minutes to complete the cycle.

Diesel Fired Heater Reset Procedure:

There are situations which could cause the diesel fired heater to enter into an interlock state, which will require resetting the diesel fired heater. To prevent these situations, ensure the diesel fuel tank has a sufficient fuel level, the coolant reservoir is full, the ignition key is not cycled repeatedly over a short period of time, and the battery disconnects are not turned off while the heater is running. In the event the diesel fired heater enters into an interlock state, reset as follows:

1. Turn ignition key to 'ON' position (machine can be running).
2. Turn heat knob to 'HI'.
3. Wait a minimum of 30 seconds and remove heater enable relay from the relay block in electrical box behind the cab and reinstall within 10 seconds.
4. Within 10 seconds of installing the relay, remove Webasto heater relay fuse from the fuse block in electrical box behind the cab.
5. Wait 20 seconds and reinstall the fuse.
6. Remove the heater enable relay from the relay block in electrical box behind the cab.
7. Reinstall the heater enable relay from the relay block in electrical box behind the cab.
8. The heater should now be reset and begin its startup procedure.

Operator's Manual



Engine Dependant Warm-water Cab Heater (If Equipped)

This cab heater uses engine coolant circulating through the unit to provide heat. Normally the engine coolant circulates through the heater in the cab regardless of the settings on the HVAC control panel. Refer to Right Overhead Control Console in this section of this Operator's Manual for HVAC controls.

Automatic Operation

1. With the engine running, press the AUTO switch on the HVAC control panel.
2. Rotate the temperature control knob to the desired setting. The HVAC controller will automatically adjust all settings to achieve and maintain the desired temperature, as well as reducing the humidity level in the cab to prevent the windshield and windows from fogging. The air conditioner may operate to stabilize the system, or defog the the windows.
3. Changing any setting, other than the temperature control knob, or pressing the AUTO button again, will return the system to manual mode.

Manual Operation

1. Rotate the temperature control knob to the desired setting.

Note: When in manual mode the temperature displayed is only an indication of the heat setting, and not an indication of the actual cab temperature.

2. Rotate the fan speed knob to control the air flow into the cab.
3. Use the vent selector buttons to direct air to the desired locations.
4. Use the recirculation switch to toggle between recirculated air flow, or fresh air flow, sourced from outside the machine.

Note: In order to maintain low levels of carbon dioxide in the cab, recirculation mode will automatically turn off after 10 minutes. The carbon dioxide level is NOT monitored by the system; it is to the operator's discretion whether to press the switch again and reactivate the recirculation mode.

5. During warm weather conditions, or if the heater will not be used for extended periods, deactivate the heater by rotating the temperature knob to the coolest setting.

Air Conditioning

The operator's cab is equipped with an air conditioning system. Use the following instructions to operate the system. Refer to "Right Overhead Control Console" in this section of this manual for HVAC controls.

Automatic Operation

1. With the engine running, press the AUTO switch on the HVAC control panel.
2. Rotate the temperature control knob to the desired setting. The HVAC controller will automatically adjust all settings to achieve and maintain the desired temperature, as well as reducing the humidity level in the cab to prevent the windshield and windows from fogging. The heater may operate to stabilize the system, or defog the the windows.
3. Changing any setting, other than the temperature control knob, or pressing the AUTO button again, will return the system to manual mode.

Manual Operation

1. With the engine running, press the air conditioner selector switch to activate the air conditioning system. The switch will illuminate and the symbol will be depicted on the HVAC control panel display.
2. Press the air conditioner selector switch to activate the air conditioning unit. Switch will illuminate.

3. Rotate the temperature control knob to the desired setting.

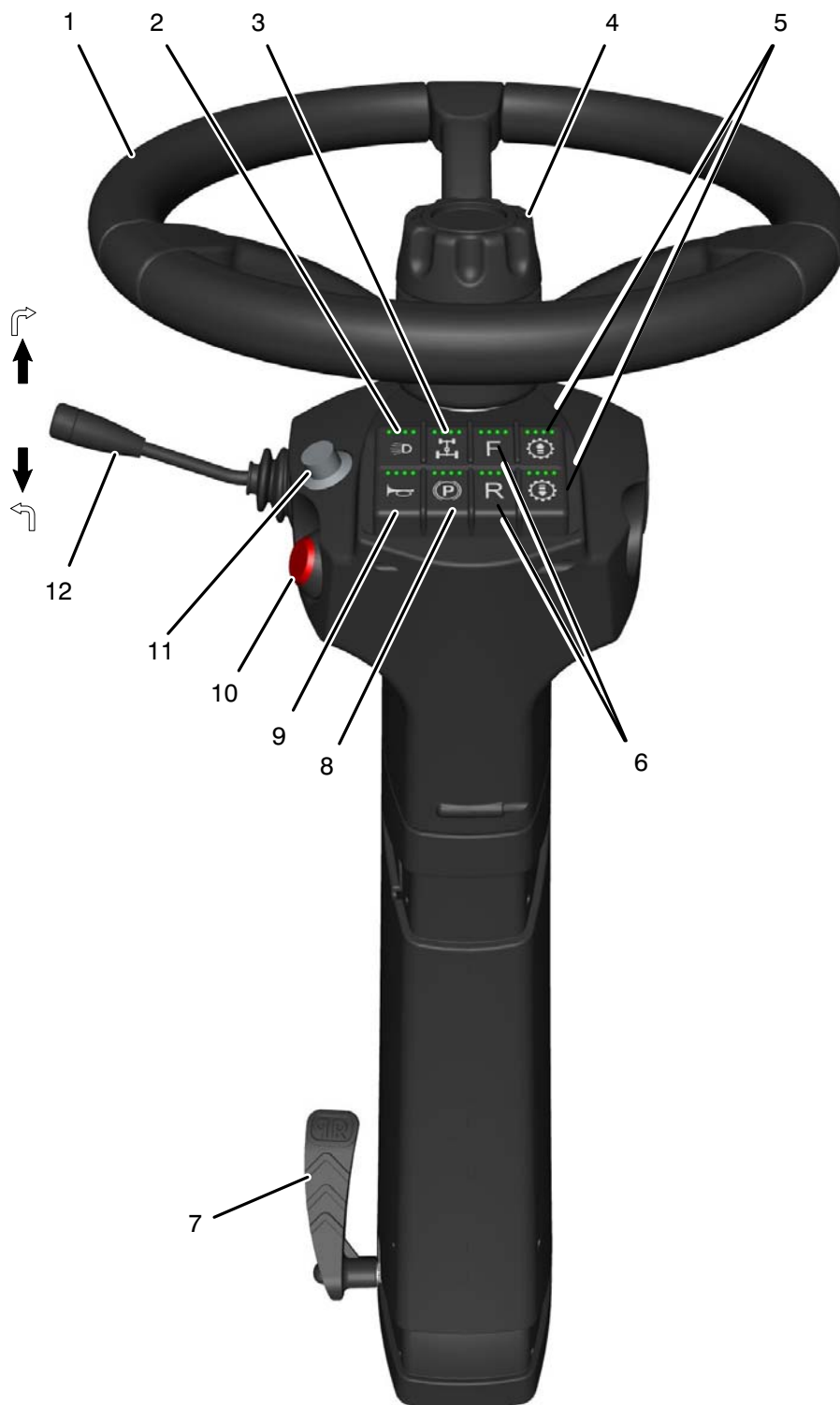
Note: When in manual mode the temperature displayed is only an indication of the heat setting, and not an indication of the actual cab temperature.

4. Rotate the fan speed knob to control the air flow into the cab.
5. Use the vent selector buttons to direct air to the desired locations.
6. Use the recirculation switch to toggle between recirculated air flow, or fresh air flow, sourced from outside the machine.

Note: In order to maintain low levels of carbon dioxide in the cab, recirculation mode will automatically turn off after 10 minutes. The carbon dioxide level is NOT monitored by the system; it is to the operator's discretion whether to press the switch again and reactivate the recirculation mode.

7. Press the air conditioner selector switch to the OFF position to deactivate the air conditioning system. The switch will cease to be illuminated.

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1. Steering Wheel	5. Transmission Gear Shift Switches	9. Horn Switch
2. Driving Lights Switch	6. Transmission Travel Direction Switches	10. Emergency Hazard Switch
3. 4-Wheel Drive/Range Switch	7. Lower Column Tilt Lever	11. Upper Column Tilt Button
4. Telescoping Column Dial	8. Travel Park Brake/Neutral Switch	12. Turn Signal Lever

Figure 1—45
Steering Column And Wheel

Steering Column And Wheel

The following is a description of the controls on the steering column along with an explanation of their function and/or operation. Refer to Figure 1–45.

1. Steering Wheel

Turn the steering wheel clockwise for right turns and counterclockwise for left turns.

Note: Relative direction of the steering wheel is based on the position of the upper over the carrier.

2. Driving Lights Switch



Press this switch once to illuminate the driving and parking lights. All LED indicators on the switch will illuminate. Press the switch again to turn off driving and parking lights. All LED indicators on the switch will cease to illuminate.

3. 4-Wheel Drive/Range Switch



This switch is used to select either the 2-wheel drive mode or 4-wheel drive mode for the carrier power train by engaging or disengaging the front drive axle. This switch also simultaneously selects either high or low range speeds for the transmission. When the switch is in the "4-WHEEL DRIVE" mode, the transmission is in the low speed range. When the switch is in the "2-WHEEL DRIVE" mode, the transmission is in the high speed range. Bring the crane to a complete stop and shift the transmission to neutral before pressing the 4-wheel drive switch. The LED indicators on the switch will illuminate to alert the operator that the 4-wheel drive mode has been engaged.

4. Telescoping Column Dial

This dial controls the telescoping function of the column. Rotate the dial counter-clockwise until dial loosens. Position the steering wheel, as desired. Rotate the dial clockwise to lock the desired position.

5. Transmission Gear Shift Switches



Press the up switch to increase the transmission by one gear. Press the down switch to decrease the transmission by one gear. The number of LED indicators illuminated on the transmission gear switches corresponds to the activated gear (1st gear – one LED indicator will be illuminated, 2nd gear – two LED indicators will be illuminated, 3rd gear – three LED indicators will be illuminated).

6. Transmission Travel Direction Switches



The transmission travel direction switches are used to select the forward and reverse gear in the transmission. Press the "F" switch once to engage the forward gear. All LED indicators on the "F" switch will illuminate. Press the "F" switch a second time to disengage the forward gear and place the transmission into neutral. Press the "R" switch once to engage the reverse gear. All LED indicators on the "R" switch will illuminate. Press the "R" switch a second time to disengage the reverse gear and place the transmission into neutral. When in neutral, all LED indicators on the "F" and "R" switches will cease to illuminate. Do not attempt to shift from forward to reverse, or reverse to forward with the crane in motion.



WARNING

If the crane is in motion, do not shift the transmission from forward to reverse, or reverse to forward. Damage to the transmission could occur. Bring the crane to a complete stop before shifting the transmission from forward to reverse, or reverse to forward.

Pressing the transmission travel direction switches will shift the transmission between forward, neutral, and reverse, but will not release the park brake. The park brake must be released prior to travelling the crane. The Pulse Crane Control System Display will show the travel screen unless the park brake is applied and the transmission is in neutral.

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7. Lower Column Tilt Lever

This lever controls the tilt (angle) of the lower portion of the steering column. Press and hold the lever to rotate the column to the desired position, then release the lever. Pressing the lever will return the column to the most upright position.

8. Travel Park Brake/Neutral Switch



This switch engages and releases the travel park brake. It also controls the shifting of the transmission into neutral. Bring the crane to a complete stop before engaging the travel park brake. Press the travel park brake switch, the park brake will be applied and the transmission will be shifted into neutral. All LED indicators on the switch will illuminate. Press the switch again to release the park brake. When the park brake is released, all LED indicators on the switch will cease to illuminate.



WARNING

Do not use the park brake to stop the crane in motion (as a service brake) except in cases of extreme emergency. Application cannot be controlled.

9. Horn Switch



Push switch to sound the horn.

10. Emergency Hazard Switch

This switch controls the emergency hazard flashers. Push the switch to turn flashers on, push the switch again to turn them off.

11. Upper Column Tilt Button

This button controls the tilt (angle) of the upper portion of the steering column. Press and hold the button to rotate the column to the desired position, then release the button. Pressing the button will return the column to the most upright position.

12. Turn Signal Lever

Pull the lever down for the left turn signal and up for the right turn signal.

Transmission Controls

The transmission controls are on the steering column. Refer to Figure 1—45. The transmission shift switches control all functions of the powershift transmission. The transmission contains three forward and three reverse high range speeds in 2-wheel drive mode and three forward and three reverse low range speeds in 4-wheel drive mode. See “Traveling The Crane” in this Section of this Operator's Manual for necessary preparations before traveling the crane.

Shifting The Transmission

1. Engage the park brake and shift transmission into neutral. Start the engine. (Engine will start only when transmission is in neutral.) Allow the transmission oil temperature to reach normal operating range.
2. Engage travel swing lock and release the swing park brake and the 360° swing lock, if equipped.

CAUTION

Do not leave the swing park brake or 360° swing lock engaged during pick and carry operations or when traveling the crane. Use the travel swing lock. Failure to release the swing park brake and 360° swing lock during these operations may result in damage to the swing gear.

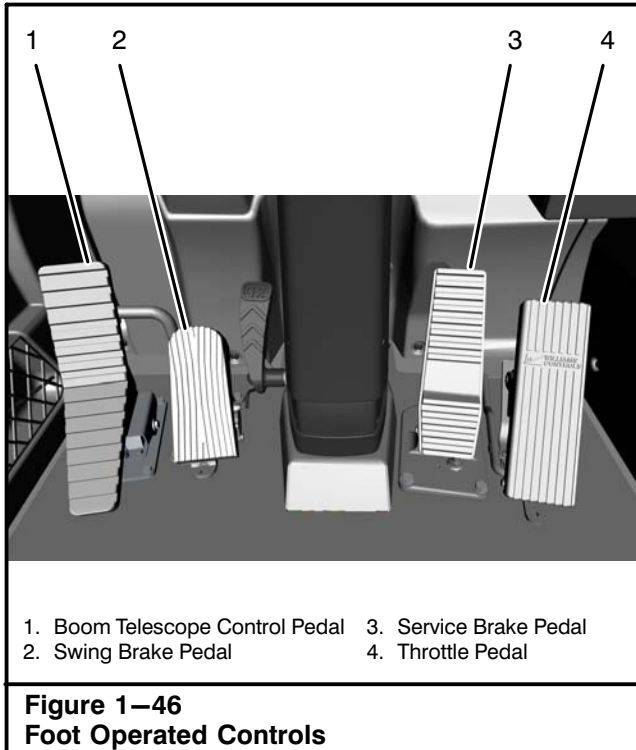
3. Forward Travel
 - a. With crane at a complete stop, apply the carrier service brakes, and release the park brake.

- b. Press “F” transmission travel direction switch.
 - c. Slowly release the service brake while using the throttle pedal to increase the engine speed allowing the crane to accelerate.
 - d. At full engine speed, press the transmission gear up switch to shift to the next gear. Repeat to shift through the desired gears.
4. Reverse Travel
 - a. With crane at a complete stop, apply the carrier service brakes, and release the park brake.
 - b. Press “R” transmission travel direction switch.

The back-up alarm will sound anytime the transmission is shifted into reverse. It will also sound anytime the transmission is shifted out of neutral and the upper is not positioned directly over the front of the carrier.

- c. Slowly release the service brake while using the throttle pedal to increase the engine speed allowing the crane to accelerate.
 - d. At full engine speed, press the transmission gear up switch to shift to the next gear. Repeat to shift through the desired gears.

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Foot Operated Controls

The following is a description of the foot controls in the operator's cab along with an explanation of their function and/or operation. Refer to Figure 1—46.

1. Boom Telescope Control Pedal

Depress the toe of the pedal to extend the boom. Depress the heel to retract the boom. Refer to "Boom Telescope System" in this Section of this Operator's Manual for complete operating instructions.

2. Swing Brake Pedal

The swing brake pedal is used to stop rotation of the upper over the carrier. Refer to "Swing System" in this Section of this Operator's Manual for complete operating instructions.

3. Service Brake Pedal

The carrier service brakes are controlled by the brake pedal. Press the pedal down to apply the service brakes. Release the pedal to release the service brakes.

The distance the service brake pedal is moved determines the braking force. Depress the pedal fully only in cases of emergency as this makes control of the crane difficult.

4. Throttle Pedal

Engine speed is controlled by the throttle pedal. Press the throttle pedal down to increase engine speed. Release the throttle pedal to decrease engine speed.

Combination Steering

The crane is equipped with four different modes of steering in order to provide maximum maneuverability on the job site: conventional, rear wheel, 4-wheel, and crab steer. Each steer mode provides slightly different maneuverability to meet job site requirements. Refer to Figure 1—47 for illustration of the different steer modes. Refer to "Rated Capacity Limiter" in this section of this Operator's Manual for instructions to change steering modes for travel.

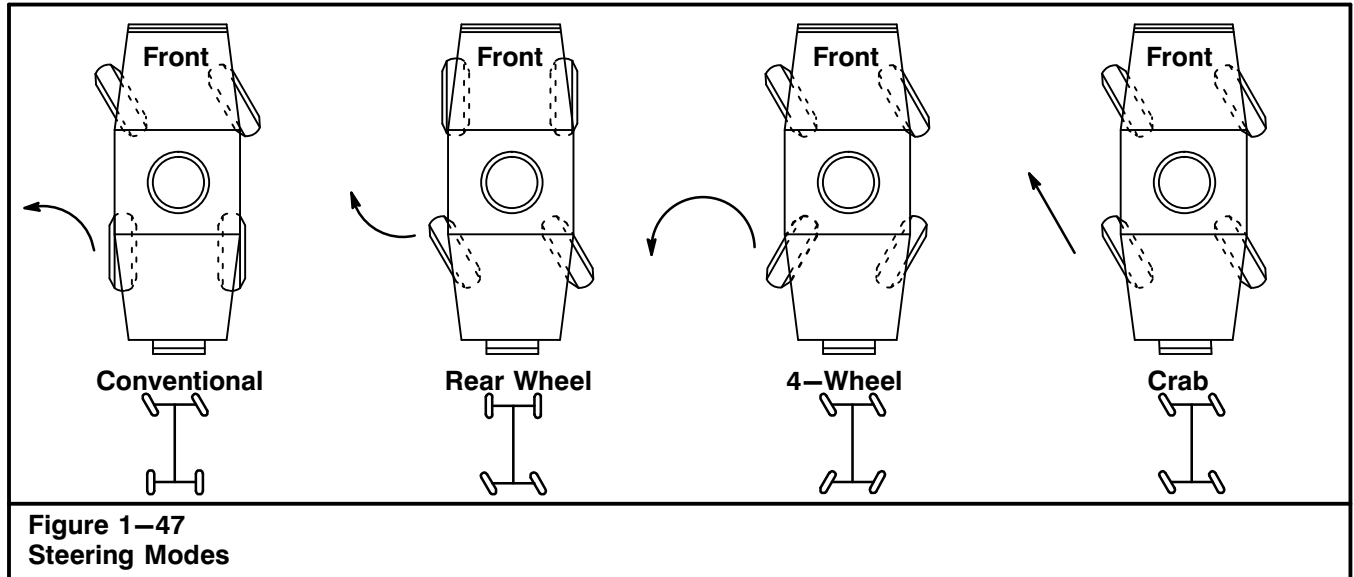
Conventional Steer Mode

This steer mode is similar to that of an automobile. In this steer mode, the front wheels may be turned in either direction and the rear wheels remain stationary. Use this steer mode for all extended or high speed travel.



WARNING

Do not use rear wheel, 4-wheel, or crab steer mode for extended or high speed travel as steering behavior may be unfamiliar and a loss of crane control could occur.



Rear Wheel Steer Mode

This steer mode is similar to that of a fork truck. In this steer mode, the rear wheels may be turned in either direction and the front wheels remain stationary. Use this steer mode for job site travel only; not for extended or highway travel.

4-Wheel Steer Mode

This steer mode allows steering with all four wheels. The front wheels turn in one direction and the rear wheels turn in the opposite direction. This results in a greatly reduced turning radius that allows extra maneuverability in certain job site conditions. Use this steer mode for job site travel only; not for extended or highway travel.

Crab Steer Mode

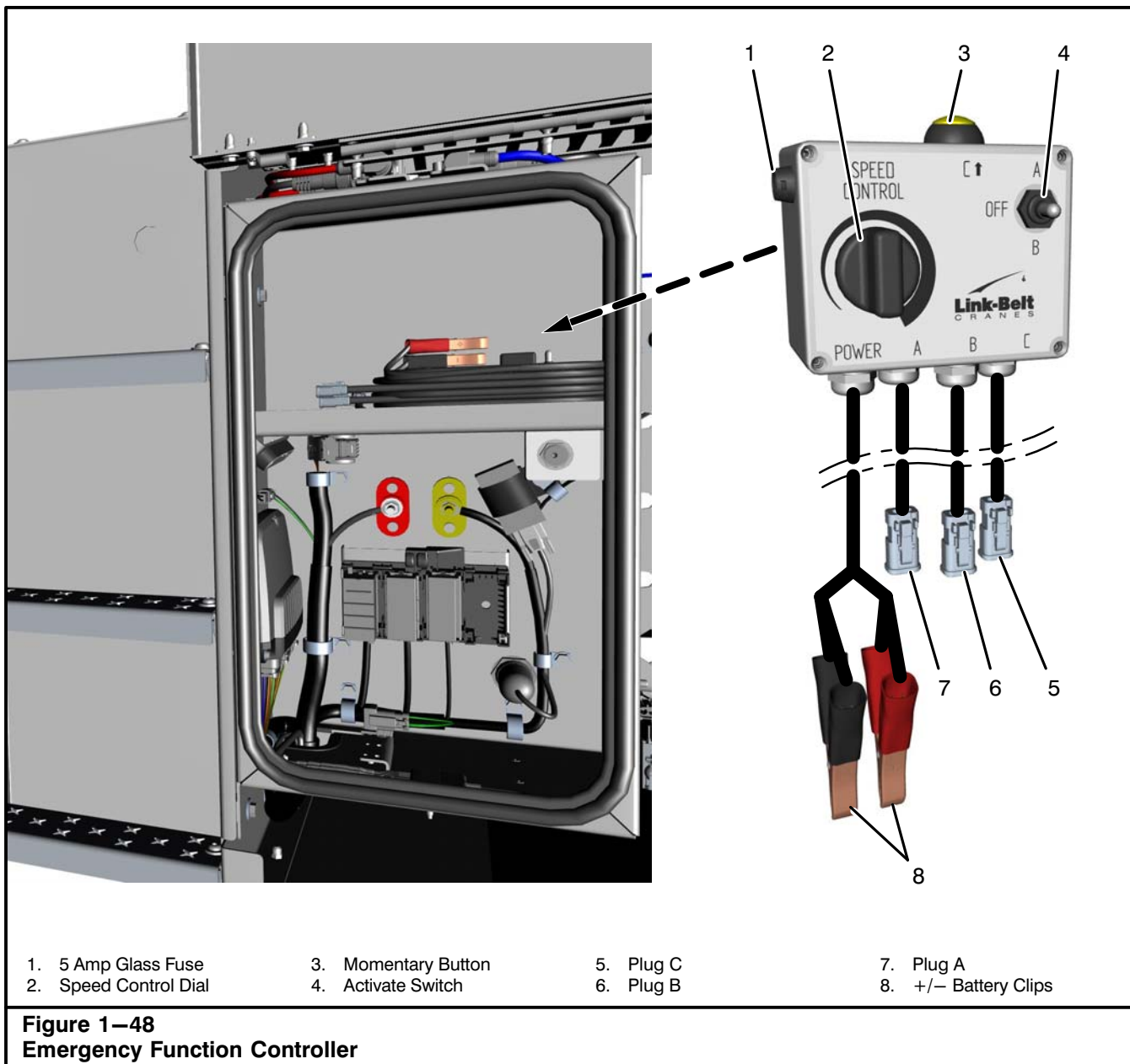
This steer mode allows steering with all four wheels. The front and rear wheels turn simultaneously in the same direction which moves the crane in the diagonal path of travel. This gives the operator another method of maneuvering the crane where job site conditions require it. Use this steer mode for job site travel only; not for extended or highway travel.

Changing Steering Modes

The rear wheel offset light, on the Pulse Crane Control Display Indicator Light Panel (refer to Figure 1—77), is designed to assist the operator in changing steering modes by determining when the rear wheels are straight. This light will come on anytime the rear wheels are not in-line with the carrier. Use the following procedure when changing steering modes:

1. Bring the crane to a complete stop and straighten the front wheels.
2. If the rear wheel offset light is illuminated, switch to Rear Wheel Steer mode. If light is not illuminated skip to step 5.
3. Turn the steering wheel until the rear wheel offset light goes off.
4. Press the conventional steering mode button on the Travel Display of the RCL. Refer to "Rated Capacity Limiter" in this section of this Operator's Manual.
5. Check all wheels for proper alignment by traveling the crane a short distance, straight ahead, to ensure it tracks straight.
6. Bring the crane to a complete stop and press the button for the desired steering mode on the Travel Display of the RCL.

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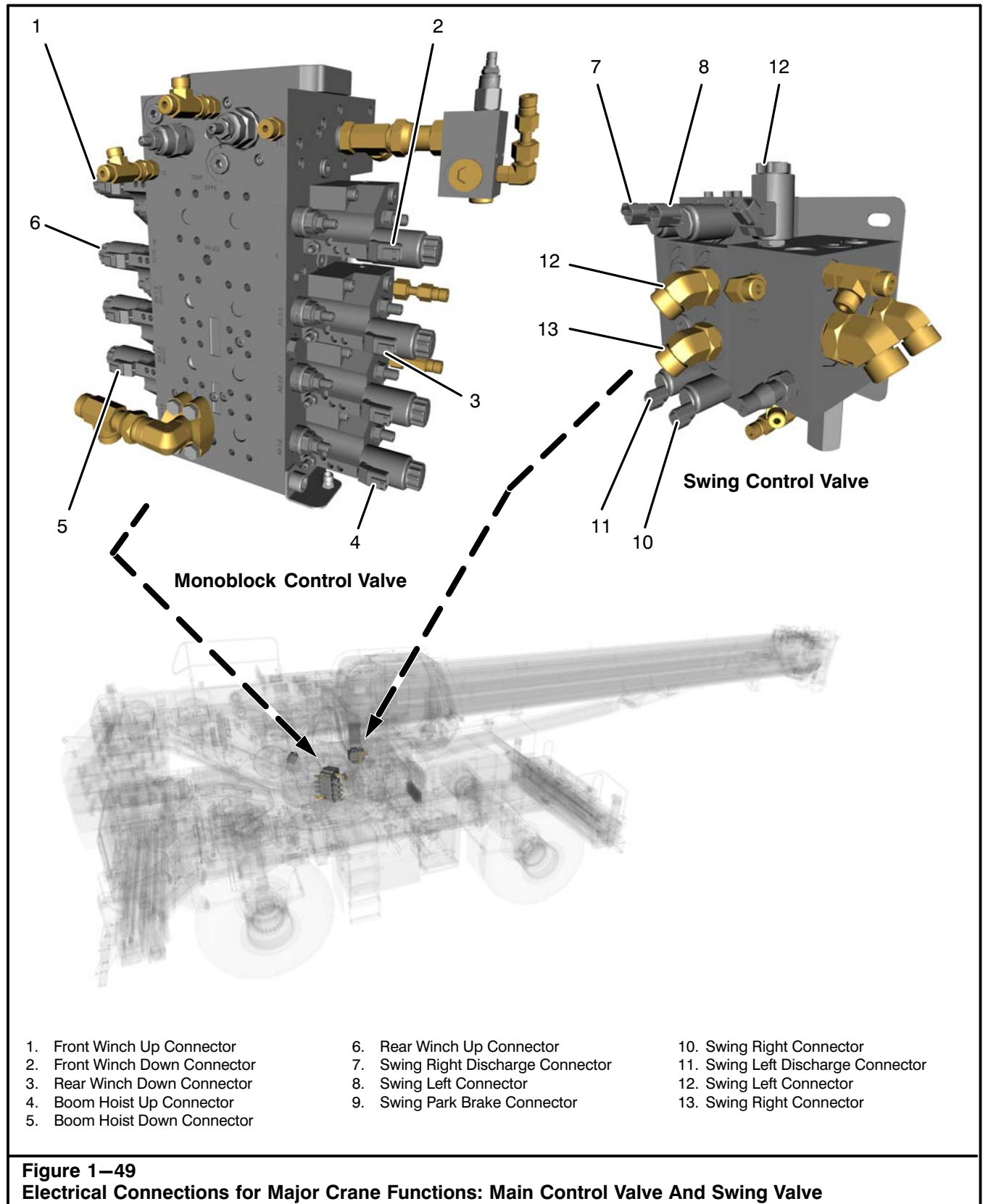
Emergency Function Controller

The emergency function controller is intended to operate crane functions in the event of failure of the Pulse 2.0 control system. The engine must be running and the batteries must have full voltage. The emergency function controller is capable of running two proportional functions consecutively, but not simultaneously by using 2 outputs with a 3 position activate switch. The controller is also capable of running non-proportional functions simultaneously with one of the proportional functions.

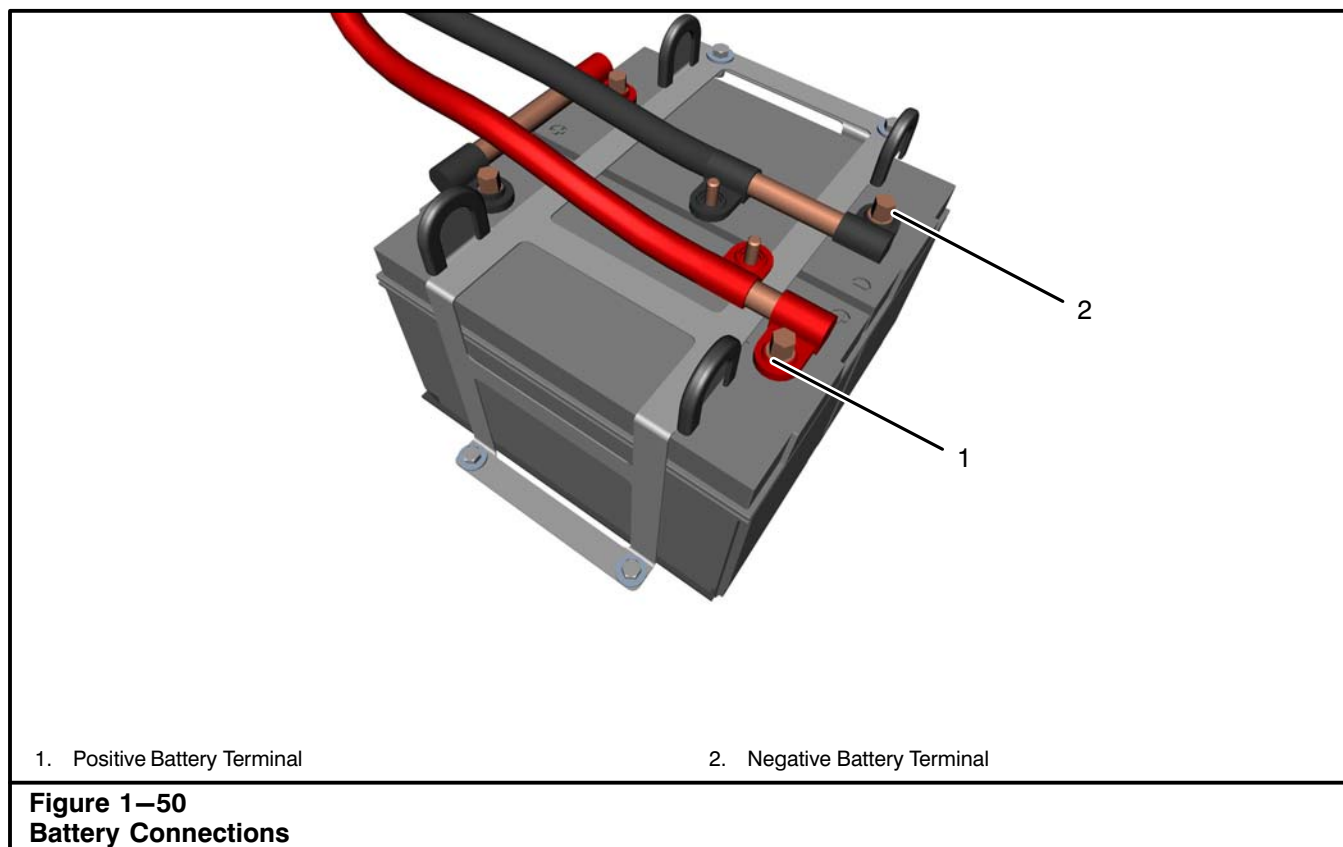


WARNING

Emergency Function Controller is intended for emergency operation only. Improper operation of the crane functions using the emergency function controller can lead to major crane damage, property damage, or possibly serious personal injury.



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To Manually Control Crane Functions



WARNING

All RCL or Operator Settable alarms and kickouts will be inactive while using the emergency function controller.

1. Connect the +/– battery clips to the crane batteries. Ensure the positive and negative battery clips are installed on the correct battery terminals. Refer to Figure 1–50.
2. Connect plug A and/or plug B to the electrical connector for the desired function(s). Refer to Figure 1–49.
3. If required, connect plug C to the electrical connector for any auxiliary function that is to be operated simultaneously. A jumper is provided to operate two valves, if required, from plug C.

Note: Plug C is on/off only and has no metering capabilities.

Note: The emergency function controller is capable of activating any hydraulic valve with a 2-pin Deutsch connector, if required.

4. Fully turn speed control dial counterclockwise.
5. With engine running at desired engine speed, push the activate switch to the A or B position to activate the desired function.

Note: The emergency function controller will only operate one function at a time.

6. While holding the activate switch and, if required, the momentary button in the desired position, slowly increase the speed by turning the speed control dial clockwise until function begins.

Note: When switching between A and B functions, best practice is to always start from the lowest speed and slowly increase until desired speed is reached.



WARNING

Plug C provides full speed or electrical output at all times, regardless of the control dial position while the momentary button is being pushed. Use caution when using plug C.

7. To stop function fully turn speed dial counterclockwise and release and activate the switch.

Operator's Manual

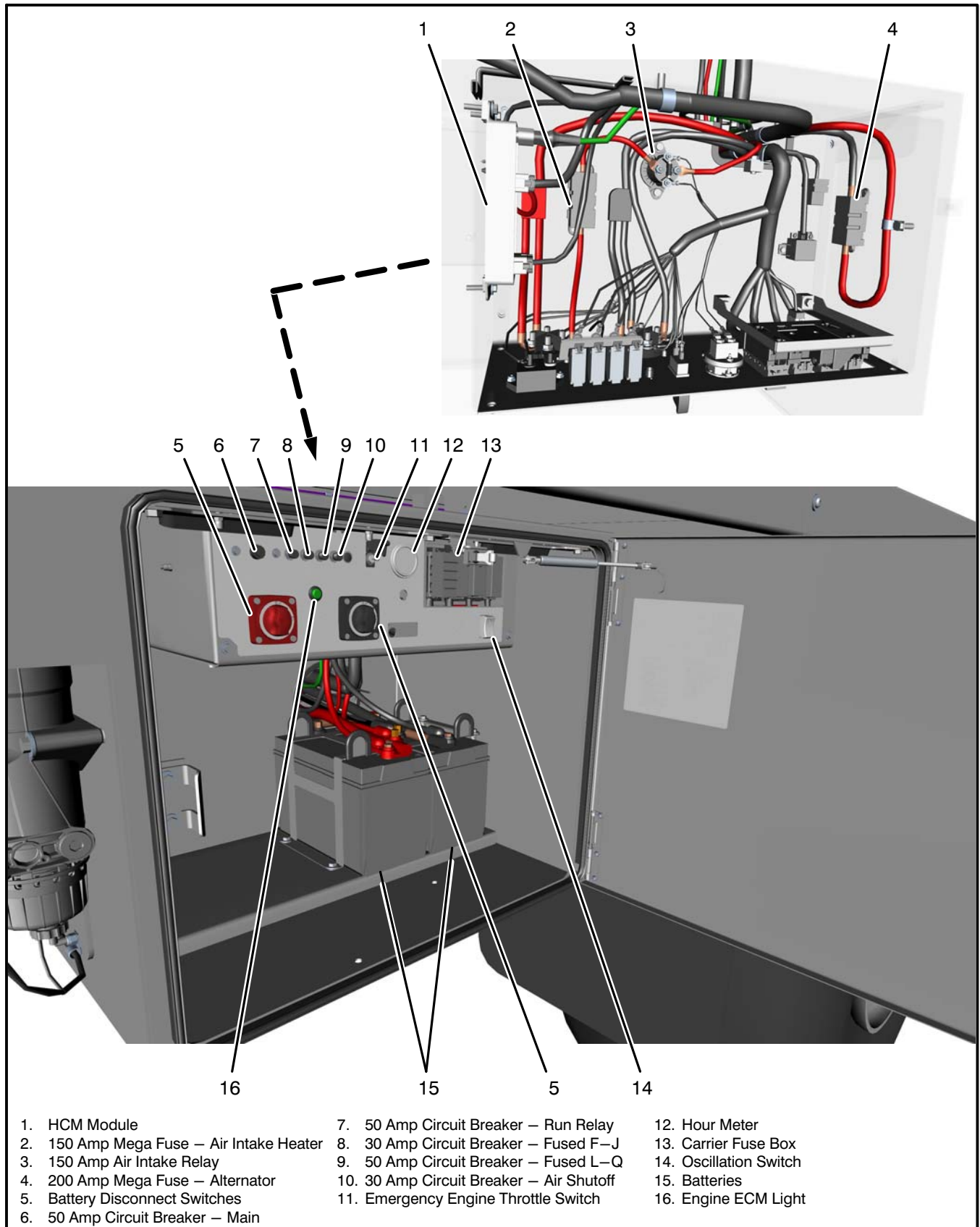


Figure 1–51
Carrier Power Panel

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Carrier Power Panel

The power panel is on the left side of the carrier next to the fuel tank. Refer to Figure 1–51.

Emergency Engine Throttle Switch

The emergency engine throttle switch should be activated when there is a loss of communication between the engine and the pulse crane control system display, or there is a failure of the pulse crane control system display. When activated, the engine will rev at 1200 rpm. Refer to Figure 1–51.

Circuit Breakers

The circuit breakers are in the power panel. Refer to Figure 1–51. There is one manual reset type circuit breakers which service the crane's electrical system. If a breaker has been tripped, push and release the breaker to reset.

Hour Meter

The hour meter is in the power panel. Refer to Figure 1–51. The hour meter registers engine operating hours. It is useful in determining lubrication and maintenance schedules.

Mega Fuses

There are two mega fuses in the electrical control center. Refer to Figure 1–51. These fuses protect the alternator and engine intake air heater electrical circuits. If these system are not functioning, check and replace these fuses as required.

Battery Disconnect Switches

The battery disconnect switches are in the power panel. Refer to Figure 1–51.

CAUTION

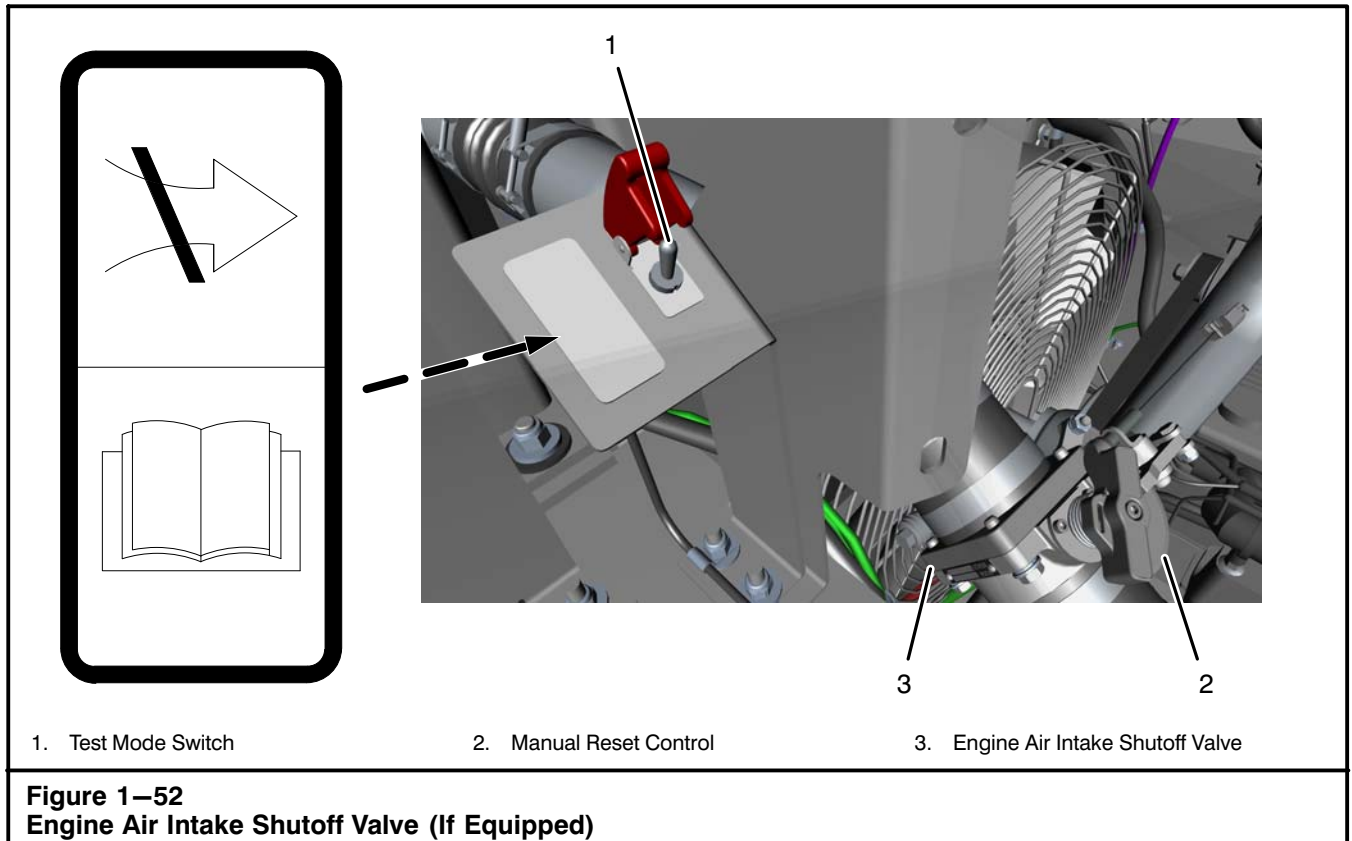
Ignition switch should be shut off for at least 70 seconds and engine ECM light should be off prior to turning disconnect switches to the "OFF" position.

Major damage may occur to the electronic equipment from welding on the crane prior to turning disconnect switches to the "OFF" position.

Ignition switch should be shut off for at least 70 seconds and the engine ECM light should be off prior to turning disconnect switches to the "OFF" position. Move the disconnect switches to the "Off" position before welding on the crane to protect the crane's electronic components from damage due to an electric arc type welder.

1. Shutdown the engine and wait at least 70 seconds.
2. Turn positive disconnect to the OFF position.
3. Turn negative disconnect to the OFF position.
4. Return disconnects to the ON position in reverse order.

Note: If the batteries are disconnected, the start-up time for on-board computer systems will be longer than normal.



Engine Air Intake Shutoff Valve (If Equipped)

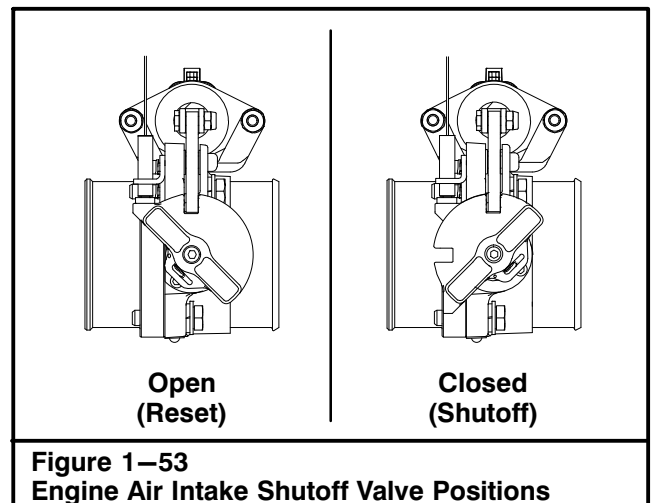
This crane may be equipped with an engine air intake shutoff valve. The air shutoff valve circuit is controlled by the engine ECM and has an automatic mode and a test mode. Refer to Figure 1–52.

Automatic Mode

In automatic mode, when the engine rpm's exceed a specified engine speed (2,500 rpm), the ECM will send a signal to the engine air intake shutoff valve, activating the engine air intake shutoff valve shutting down the engine. The indicator light on the Pulse Crane Control System Display will illuminate. The engine air intake shutoff valve must be manually reset before the engine can be restarted.

Test Mode

Activation of the engine air intake shutoff valve occurs when the test mode switch (momentary) is pressed and held while the engine rpm is increased gradually from idle to above 1,500 rpm. The engine air intake shutoff valve will be closed at 1,500 rpm shutting down the engine. The indicator light on the Pulse Crane Control System Display will illuminate.. The engine air intake shutoff valve must be manually reset before the engine can be restarted.



Manual Reset

To manually reset the engine air intake shutoff valve and/or turn off the emergency air shutoff indicator light, rotate the manual reset control to the reset position. Refer to Figure 1–53.

Operator's Manual



1. Arm Rest Front To Back Adjustment Knob (Both Sides)	4. Front To Rear Adjustment Lever	8. Seat Belt
2. Seat Back Connecting Hardware (Both Sides)	5. Seat Height Adjustment Lever	9. Arm Rest Height Adjustment Knob (Both Sides)
3. Operator's Manual And CRM Storage	6. Controller Angle Adjustment Knob (Both Sides)	10. Seat Back Adjustment Lever
	7. Seat Arm Lock Up Release Lever	

Figure 1–54
Operator's Seat

Operator's Seat

This 6-way adjustable seat is controlled by manual controls. Refer to Figure 1–54.



WARNING

Do not make seat or console adjustments while operating the crane or while crane is in motion. Discontinue operations and properly park crane before making adjustments.

1. Arm Rest Front To Rear Adjustment Knob

Loosen the arm rest front to rear adjustment knob. Position the arm rest, as desired, and tighten the knob to lock the arm rest in place.

5. Seat Height Adjustment Lever

Move the height adjustment lever to the left and hold. Position the seat as desired and release the lever to lock the seat in place.

4. Front To Rear Adjustment Lever

Lift the seat front to rear adjustment lever and hold. Position the seat, as desired, and release the lever to lock the seat in place.

3. Operator's Manual And CRM Storage

The Operator's Manual and CRM are stored in the storage location beneath the Operator's Seat.

2. Seat Back Connecting Hardware

The seat back can be removed if necessary. Remove seat back connecting hardware on the back of seat (two on one side and one on the other side). Slide the seat to the right towards the cab door and lift the seat back.

10. Seat Back Adjustment Lever

Raise the lever and adjust the seat back to the desired position. Release the lever to lock the seat back in place.

9. Arm Rest Height Adjustment Knob

Hold the arm rest with one hand and loosen the arm rest height adjustment knob with the other. Position the arm rest, as desired, and tighten the knob to lock the arm rest in place.

8. Seat Belt

A seat belt is provided and must be worn during all operations. To fasten the seat belt pull the belt out of the retractor and insert the tongue into the buckle until you hear a snap and feel the latch engage. Ensure the belt is not twisted and is fitting snugly around the hips, not around the waist.



WARNING

Always wear the seat belt while operating the crane. The seat belt must be snug and low across the hips.

7. Seat Arm Lock Up Release Lever

When the arm rest is raised to exit the cab, the seat arm will lock in the upward position. To move the arm rest to the operating position, hold the arm rest with one hand, and push the arm lock up release lever downward and lower the arm rest to the operating position.

6. Controller Angle Adjustment Knob

Loosen the controller angle adjustment knob. Position the controller, as desired, and tighten the knob to lock the controller in place.

Operator's Manual

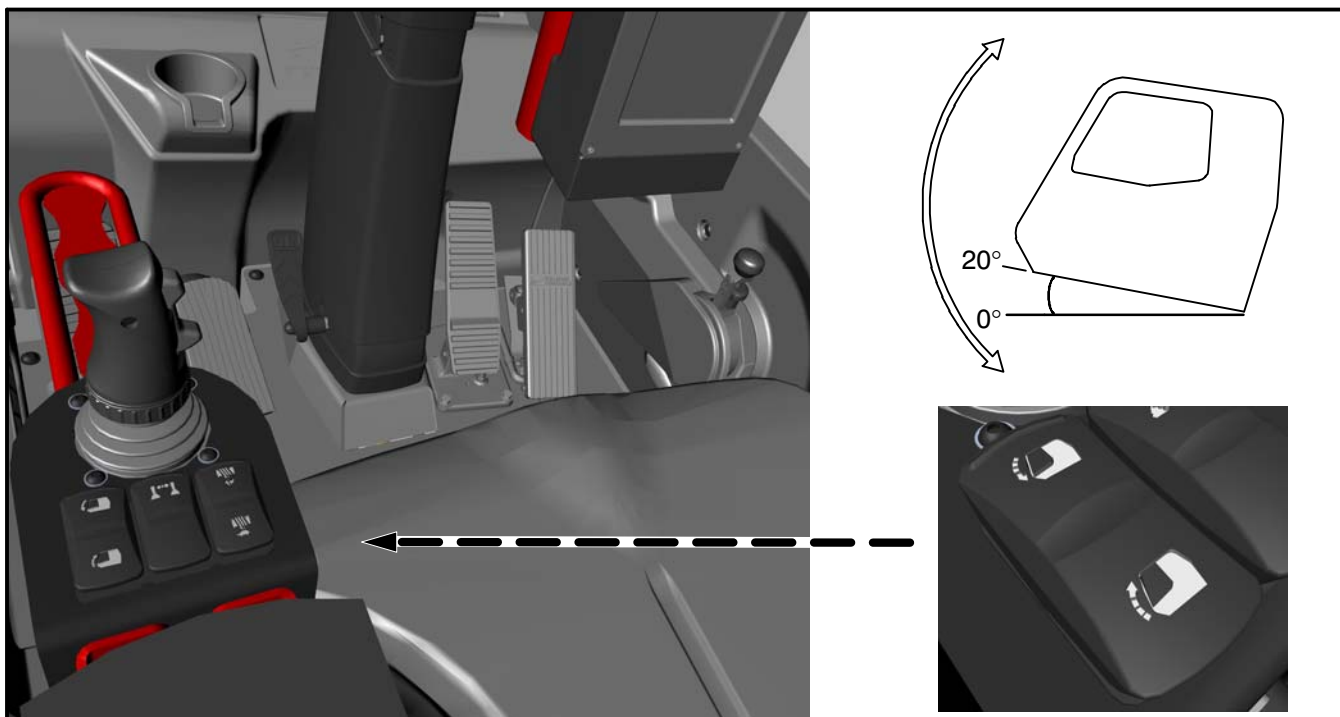


Figure 1–55
Operator's Cab Tilt Control Switch

Cab Tilt Operation

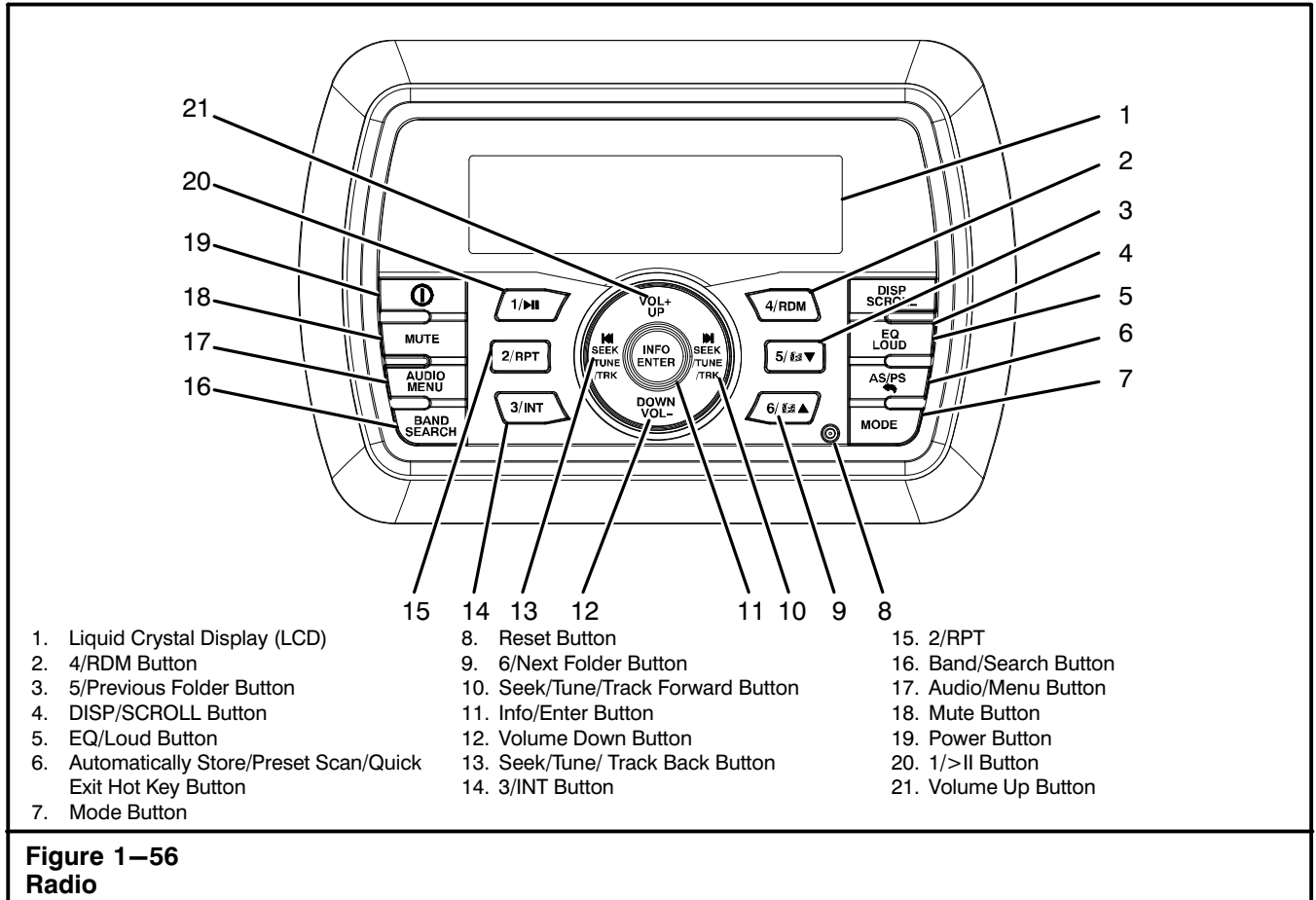
The operator's cab tilts up from 0 to 20° above horizontal to improve vertical visibility and help to reduce operator fatigue due to neck strain when at high boom angles. Use the three position momentary switch on the left seat console. Refer to Figure 1–55.

Cab must be returned to its horizontal, 0° position, before exiting the cab or traveling the crane. An alarm will sound anytime the cab tilt switch is pressed. The LED indicator on the switch will illuminate green if the cab is in the horizontal, 0 degree position and red if tilted to any angle.

Before operating the cab tilt feature, the operator's cab door must be secured in the fully closed or fully open position.

To Raise the Cab Tilt Angle: Place and hold the cab tilt switch in the.  position. Release the switch to stop tilt operation.

To Lower the Cab Tilt Angle: Place and hold the cab tilt switch in the.  position. Release the switch to stop tilt operation.



Radio Operation

Note: Keep the volume level low enough to be aware of your surroundings while operating the crane.

The crane is equipped with an AM/FM radio/audio system. It includes the following features: an AM/FM/EURO tuner with 30 Presets (12 AM and 18 FM), Weather Band with Weather Alert, Bluetooth (Supports A2DP and AVRCP), USB playback of MP3/WMA files, iPod/iPhone USB input, Mute, Preset Equalizer (User, Flat, Pop, Classical, Rock), Electronic Bass, Treble, Balance, and Fade Controls, Output Power (40W x 4), Wired Remote Control Ready, 2 Channel Pre-amp Line Level Outputs, and an Auxiliary Audio Input.

This radio generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

If this radio does cause harmful interference to radio or television reception, which can be determined by turning the radio OFF and ON, the Operator is encouraged to try to correct the interference by one or more of the following measures:

- Relocate the receiving antenna.
- Increase the distance between the radio and receiver.
- Connect the radio into an outlet on a different circuit that to which the receiver is connected.
- Contact your Link-Belt Distributor for the service.

Operator's Manual

1. Liquid Crystal Display (LCD)

The LCD shows the reception frequency and activated functions of the system.

Note: LCD panels may take longer to respond when subjected to cold temperatures for an extended period of time. In addition, the visibility of the numbers on the LCD may decrease slightly. The LCD display will return to normal when the temperature increases to a normal range.

2. 4/RDM Button

Press the 4/RDM Button to go to preset 4. During playback mode, press the 4/RDM Button to play all songs in the current category in random order. Random order will occur once the current song has finished playing. "Random On" will appear on the LCD. Press the 4/RDM Button again to stop random playback.

3. 5/Previous Folder Button

Press the 5/Previous Folder Button to go to preset 5. When navigating folders, press the 5/Previous Folder Button to go to the previous folder and begin playback of the first song in that folder.

4. DISP/SCROLL Button

Press the DISP/SCROLL Button to change the display information from single line default display to Artist/Song Title double line display mode.

5. EQ/Loud Button

Press the EQ/Loud Button to turn on the equalization function and select between five pre-defined bass and treble curves: User, Flat, Pop, Classical, Rock. Press and hold the EQ/Loud Button to toggle true loudness ON/OFF. When listening to music at low volumes, this feature will boost the bass ranges to compensate for the characteristics of human hearing.

6. Automatically Store/Preset Scan/Quick Exit Hot Key Button

Automatically Store

Select an AM or FM band. Press and hold the Automatically Store/Preset Scan/Quick Exit Hot Key Button for more than 2 seconds to automatically select strong stations and store them in all bands. The new stations replace any previous stored stations within the band.

Preset Scan

Select a band if needed. Press the Automatically Store/Preset Scan/Quick Exit Hot Key Button to scan all stations stored in all bands. The system will pause for 10 seconds at each preset station. Press the Automatically Store/Preset Scan/Quick Exit Hot Key Button to stop scanning when the desired station is reached.

Quick Exit Hot Key

While in system menu operation, searching mode, or audio menu operation press and hold the Automatically Store/Preset Scan/Quick Exit Hot Key Button for 3 seconds to quickly exit the operation without waiting for the system default time out.

7. Mode Button

Press this button to toggle between modes. Modes include AM/FM Tuner, Weather Band, iPod, USB, AUX In (optional Auxiliary Input), and Bluetooth Audio.

8. Reset Button

Press the reset button:

- After initial installation of the radio; after all wiring is complete.
- If function buttons do not operate.
- If an error pops up on the display.

Use a ball point pen or similar sized object to press the reset button.

Operator's Manual

9. 6/Next Folder Button

Press the 6/Next Folder Button to go to preset 6. When navigating folders, press the 6/Next Folder Button to go to the next folder and begin playback of the first song in that folder.

10. Seek/Tune/Track Forward Button

Press the Seek/Tune/Track Forward Button to adjust menu items, seek stations (press to manually seek or press and hold to automatically seek stations in radio mode), and to go to next track in Playback Mode (press and hold to fast forward).

11. Info/Enter Button

Press the Info/Enter Button to select or enter a function and to get information.

12. Volume Down Button

Press the Volume Down Button to turn the volume down and to navigate down.

13. Seek/Tune/Track Back Button

Press the Seek/Tune/Track Back Button to adjust menu items, seek stations (press to manually seek or press and hold to automatically seek stations in radio mode), and to go to previous track in Playback Mode (press and hold to fast reverse).

14. 3/INT Button

Press the 3/INT Button to go to preset 3. When in playback mode, press the 3/INT Button to play the first ten seconds of each file on the current device. When the desired file is reached, press the 3/INT Button to end the scan and play the selected file.

15. 2/RPT Button

Press the 2/RPT Button to go to preset 2. When in playback mode, press the 2/RPT Button to repeatedly play the current file. Press the 2/RPT Button again to repeat all songs in the current folder. Press the 2/RPT Button once more to resume normal playback.

16. Band/Search Button

Press the Band/Search Button to navigate between the three FM bands and the two AM (MV) bands. In playback mode, press the Band/Search Button to enter search mode.

17. Audio/Menu Button

Press the audio menu button to access the system menu. Continue to press the system menu button to navigate through the system menu. When the proper menu is displayed, press the volume buttons within 5 seconds to adjust that option.

Bass

Adjusts from “-6” to “+6”.

Treble

Adjusts from “-6” to “+6”.

Balance

Adjusts from “L12” (Full Left) to “R12” (Full Right).

Fade

Adjusts from “R12” (Full Rear) to “F12” (Full Front).

18. Mute Button

Press this button to mute audio output. Press again to enable audio output.

19. Power Button

Press the power button to turn the system ON; press it again to turn the system OFF.

20. 1/>II Button

Press the 1/>II Button to go to preset 1. When in playback mode, press the 1/>II Button to pause playback. Press the 1/>II Button once more to resume playback.

21. Volume Up Button

Press the Volume Up Button to turn the volume up and to navigate up.

Operator's Manual

System Menu

1. Press and hold the Audio/Menu Button for more than 2 seconds to enter the system menu.
2. Press the Volume Up Button repeatedly to navigate the system menu and select the desired item.
3. Press the Info/Enter Button or Seek/Tune/Track Forward Button to adjust the selected menu item.
4. Press the Automatically Store/Presets Scan/Quick Exit Hot Key Button to go back to the previous operation.

The following items can be adjusted within the System Menu:

- Key Beep (ON/OFF): Turn the audible beep ON/OFF (heard when functions/buttons are selected).

Note: Beep tone OFF will not affect Battery Alarm audible tone.

- LCD Backlight (1/10–10/10): Adjust LCD brightness.
- LCD Contrast (1/10–10/10): Set LCD contrast.
- Tuning Region (USA/Europe): Set frequency spacing for various regions.
- Weather Alert Configure: Press the Info/Enter Button to see weather alert options:
 - Weather Alert (ON/OFF): Determines if the weather band alert feature is activated.
 - Alert Volume (1/40–40/40): Set default volume for weather alert broadcasts.
- Battery Alarm (ON/OFF): Monitor voltage on ACC line and send alert when voltage is low.
- Battery Auto—OFF (ON/OFF): Automatically turn OFF power to system when battery voltage is low.

Note: Bluetooth Device and Bluetooth Pair menu options are only available while the Bluetooth feature is ON and the system is in Bluetooth Audio mode.

Note: A locked Bluetooth device will be overwritten from the list.

- Bluetooth Device (Lock/Unlock, Disconnect/Connect, Delete): View, lock, and delete from a list of previously paired mobile phone device models.
- Bluetooth Pair <ENTER>: Press Info/Enter Button to automatically pair a device.
- Bluetooth (ON/OFF): Choose “Bluetooth ON” or “Bluetooth OFF”.
- Volume Preset (1/40–40/40): Select an automatic turn-ON volume.
- Reset to Defaults <ENTER>: Return the EEPROM to factory default set up values. Press the Info/Enter Button to select.

Battery Alarm Operation

If Battery Alarm is set to “ON”, an alarm will sound (8 beeps every 30 sec) when the voltage drops to 10.5V (+/– 0.3V). The LCD will display the “low battery” and the current mode alternatively.

Note: “OFF” is the default setting for Battery Alarm. If the audio is muted or the volume is set to 0, the audible beep will not be heard.

Auxiliary Input

To access an auxiliary device:

1. Connect the portable audio player to the AUX IN cables routed from the rear of the system.
2. Press the Mode Button to select Aux In mode.
3. Press the Mode Button again to cancel Aux In mode and switch to the next mode.

Preset Stations

Six numbered preset buttons store and recall stations for each band.

To store a station:

Select a band (if needed), then select a station. Press and hold a preset button for two seconds. The preset number will appear in the display.

To recall a station:

Select a band (if needed). Press a preset button to select the corresponding stored station.

Operator's Manual

Weather Band Operation

Note: If the system is programmed for European operation, the Weather Band function will be disabled.

Press the Mode Button to access weather band mode.

What is the NOAA Weather Radio?

NOAA is a nationwide system that broadcasts local weather emergency information 24 hours a day. The U.S. network has more than 530 stations covering the 50 states, as well as the adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands and the U.S. Pacific Territories. Each local area has its own transmitting station and there are a total of seven broadcasting frequencies used: 162.400MHz (CH2), 162.425MHz (CH4), 162.450MHz (CH5), 162.475Mhz (CH3), 162.500MHz (CH6), 162.525MHz (CH7) and 162.550MHz (CH1).

How many stations can I expect to receive?

Since the broadcasts pertain to local weather and information, the transmission power is usually very low (much less than AM or FM stations) which means you will usually receive only one station unless you are on the edge of two or more broadcast signals. The most you will receive is two or three.

Is it possible I won't receive any stations?

Depending on location, it's possible to receive a very weak signal or none at all. Also, similar to AM and FM signals, weather band signals are subject to surrounding conditions, weather, obstructions of the signal by hills or mountains, etc. If no NOAA signals are found/received, the tuner will scan all seven NOAA frequencies every 30 seconds.

How will I know I am tuned to the weather band?

When you select the weather band, the "WB" icon will appear on the LCD, along with the current channel indication. Press the Seek/Tune/Track Forward or Back Buttons to tune to each of the seven channels until you find the weather band station broadcasting in your area.

NOAA Weather Alert

The Weather Alert function adds an additional level of user safety by automatically switching from the current function mode to weather band mode for a minimum of 120 seconds if a NOAA warning tone (1050 Hz) is received/detected. If no additional warning tone is received for 60 seconds, the system will switch back to the last known function mode.

The Weather Alert function can be turned ON or OFF by the Audio/Menu Button. When ON, the weather tuner remains active, even when the system is turned OFF (as long as the power is still applied to the system). If a weather alert is issued, the system will turn ON and play the announcement for 60 seconds, then turn back OFF and revert to weather alert monitor mode.

The system will not respond to any weather alerts when it is OFF and will not automatically switch to the weather band if an alert is issued.

Operator's Manual

MP3/WMA Operation

MP3/WMA File Requirements:

This system can play MP3 (MPEG1, 2, 2.5 Audio Layer 2/3) and WMA (version 7/8/9).

Media Requirements

The following formats are available for the media used in this system. The maximum number of characters used for file name, including the delimiter (".") and three-character extension, are indicated in parentheses:

- ISO 9660 Level 1 (11 characters)
- ISO 9660 Level 2 (31 characters)
- Joliet (31 characters)
- Romeo (31 characters)

The media reproducible on this system has the following limitations:

- Maximum number of nested folders: 8
- Maximum number of files per device: 999
- Maximum number of folders per device: 99

Use the following settings when compressing audio data in MP3 data with the MP3 encoder:

- Transfer bit rate: 32 – 320 kbps
- Sampling frequency
 - MPEG1: 32/44.1/48 KHz
 - MPEG2: 16/22.05/24 KHz
 - MPEG2.5: 8/11.025/12 KHz
 - WMA: 22/32/44/48 KHz
- Maximum file/directory name: 64 bytes

ID3 Support

This system supports ID3 tag versions 1.0, 1.1, 2.0, and 2.3 (Max 32 bytes).

Installing a USB Device

Insert your USB thumb drive into the USB connector routed from the rear of the radio. The system will automatically search for MP3 and WMA files on the device and begin playback. You can access USB mode from any other mode by pressing the Mode Button.

Note: Do not remove the device when USB PLAY mode is active. Press the Mode Button to change to another mode before removing the device.

MP3/WMA Directory Search

1. Press the Band/Search Button to enter directory search mode.
2. The LCD will display the folder list for the current directory. Press the Band/Search Button to view the folder directory list.
3. Navigate the folder list by pressing the Volume Up and Down Buttons.
4. Press the Info/Enter Button to select a folder. The LCD will display the list of files within that folder.
5. Navigate the file list by pressing the Volume Up and Down Buttons.
6. Press the Info/Enter Button to select a file.
7. Use the Automatically Store/Preset Scan/Quick Exit Hot Key Button to reverse navigate the list.

iPod Operation

This system is equipped with an iPod ready function that will allow the Operator to control their iPod (if compatible) using the control panel buttons. The following iPod versions are supported:

- iPod Nano 5G, iPod Nano 6G
- iPod 5G
- iPod Classic
- iPhone 4, iPhone 4S
- iPod Touch 3G, iPod Touch 4G

Note: Earlier model iPods may not be supported because they do not implement the USB control protocol. Also, the iPod Shuffle is not supported because it does not utilize the 30-pin Apple iPod Connector. These unsupported iPod models may be connected to the radio using one of the Auxiliary Inputs.

Accessing iPod Mode

Connect a supported iPod or iPhone to the USB connector. The iPod icon illuminates in the bottom left corner of the LCD whenever an iPod or iPhone is attached to the USB connector. Music playback begins automatically.

To enter iPod mode from any other source, press the Mode Button until "LOADING" appears on the display. If the user connects an iPod containing no songs, the radio will display a message stating "Device No File" when it enters iPod mode.

Operator's Manual

Turning The iPod ON/OFF

The iPod power turns on automatically when an iPod is connected to the USB connector, as long as the crane ignition is turned ON. You can turn the iPod OFF by disconnecting it or by turning the ignition OFF. When the ignition is turned OFF, the iPod will pause and then enter sleep mode after 2 minutes. While the iPod is connected, the power cannot be turned ON or OFF from the iPod itself.

Note: The iPod will continuously recharge while in iPod playback mode.

iPod Search Mode

1. Press the Band/Search Button to enter iPod search mode and choose from the following search criteria: Playlist, Artist, Album, Song, Genre, Composer, Audiobooks, and Podcasts (consecutively).
2. When search mode is selected, press the Info/Enter Button to confirm selection.
3. Use the Volume Up and Down Buttons to navigate through various list selections.
4. Press Info/Enter Button to make your final selection.
5. Use the Automatically Store/Preset Scan/Quick Exit Hot Key Button to reverse navigate the list.

Bluetooth® Operation

This system includes built-in Bluetooth technology that allows you to connect this system to Bluetooth devices for streaming audio playback.

Bluetooth is a short-range wireless radio connectivity technology developed as a cable replacement for various electronic devices. Bluetooth operates in 2.4 GHz frequency range and transmits voice and data at speeds up to 1 megabit per second. Bluetooth was launched by a special interest group (SIG) comprised of Ericsson Inc., Intel Corp., Nokia Corp., Toshiba and IBM in 1998, and it is currently developed by nearly 2,000 companies worldwide. The Bluetooth word mark and logos are owned by the Bluetooth SIG, Inc. and any use of such marks is under license. Other trademarks and trade names are those of their respective owners.

Note: Some Bluetooth menu options are only available while the system is in Bluetooth Audio mode.

Bluetooth Menu Options

Press and hold the Audio/Menu Button to enter menu adjustment mode. Repeatedly press the Volume Up and Down Buttons to access the "Bluetooth ON/OFF" menu function. Press the Info/Enter Button to turn the Bluetooth function ON or OFF. The following menu options are available when the system is in Bluetooth mode:

- Bluetooth Pair <ENTER>: Press the Info/Enter Button to begin pairing with a Bluetooth enabled device in pairing mode.
- Bluetooth Device: Press the Info/Enter Button to view a list of previously paired mobile phone device models. Press the Seek/Tune/Track Forward and Press the Seek/Tune/Track Back Buttons to view devices from the list. A device that is actively connected cannot be deleted. Press the Info/Enter Button to select the device. Press the Seek/Tune/Track Forward and Press the Seek/Tune/Track Back Buttons to choose Lock/Unlock, Disconnect, or Delete for this device.
- Lock/Unlock: The system can store up to 5 devices for Bluetooth connection. The devices are stored in FIFO (First In First Out) order. To prevent a device from being bumped from the list when more than 5 devices are used, the device must be locked. To Lock/Unlock a device, press the Info/Enter Button to display/change the Locked or Unlocked icon.
- Disconnect: To disconnect a paired device, press the Info/Enter Button to temporarily remove the Bluetooth link. The link can be re-established through the phone menu by selecting the system for connection.
- Delete: To delete a device from the list, press the Info/Enter Button.

Operator's Manual

Pairing A Bluetooth Device

Before beginning Bluetooth sequence, consult the owner's manual for the Bluetooth device to pair with this system.

1. Power ON radio.
2. Press and hold the Audio Menu button until System Menu appears.
3. Use the Up/Down arrow buttons to scroll to Bluetooth. Ensure Bluetooth is ON. If Bluetooth is OFF, press the Info/Enter button to turn Bluetooth ON.
4. Press the Mode button to cycle through the menu until BT Audio appears on the display.
5. Press and hold the Audio Menu button until the System Menu appears on the display.
6. Use the Up/Down arrow buttons to scroll to Bluetooth Pairing.
7. Press the Info/Enter button to initiate the pairing sequence.
8. On the mobile device to pair, toggle the Bluetooth OFF then back ON to begin the search.
9. When JHD40BT appears, select it to pair. The Bluetooth Audio symbol (🎵) will now appear on the display.
10. Enter pairing code 0000.
11. If the system does not pair, press the Reset button on the front of the radio and repeat this procedure.

Note: If mobile device still will not pair, contact **ASA Electronics Support** at customerservice@asaelectronics.com.

After connecting successfully, the Operator can listen to music stored on their Bluetooth enabled device through the system.

Answering A Call

When answering a call using the connected phone, Bluetooth Audio will pause. After hanging up from the call, Bluetooth Audio will continue on some phones. It may be necessary to press the play button to resume Bluetooth Audio.

BT Audio (A2DP)

The A2DP music is available for Bluetooth enabled phones when the phone is connected. To access Bluetooth mode and play songs stored on your phone.

1. Press the Mode Button.
2. While in Bluetooth mode, the Bluetooth Audio symbol (🎵) will appear on the display.

3. If the system is changed to another mode, the mobile phone audio will pause. Press the Mode Button to return to Bluetooth mode and resume mobile phone audio playback.

Note: If a Bluetooth device is disconnected due to the power being turned OFF or if the device is disconnected inadvertently, the system will automatically search for the matching Bluetooth mobile phone when the power is restored.

Care And Maintenance

- Keep the system dry. If it does get wet, wipe it dry immediately. Liquids might contain minerals that can corrode the electronic circuits.
- Keep the product away from dust and dirt, which can cause premature wear of parts.
- Handle the system gently and carefully. Dropping it can damage circuit boards and cases, and can cause the system to work improperly.
- Wipe the system with a dampened cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the system.
- Use and store the system only in normal temperature environments. High temperature can shorten the life of electronic devices, damage batteries, and distort or melt plastic parts.

Ignition

- The most common source of noise in reception is the ignition system. This is a result of the radio being placed close to the ignition system (engine). This type of noise can be easily detected because it will vary in intensity of pitch with the speed of the engine.
- Usually, the ignition noise can be suppressed considerably by using a radio suppression type high voltage ignition wire and suppressor resistor in the ignition system. Another method of suppression is the use of additional noise suppressors.

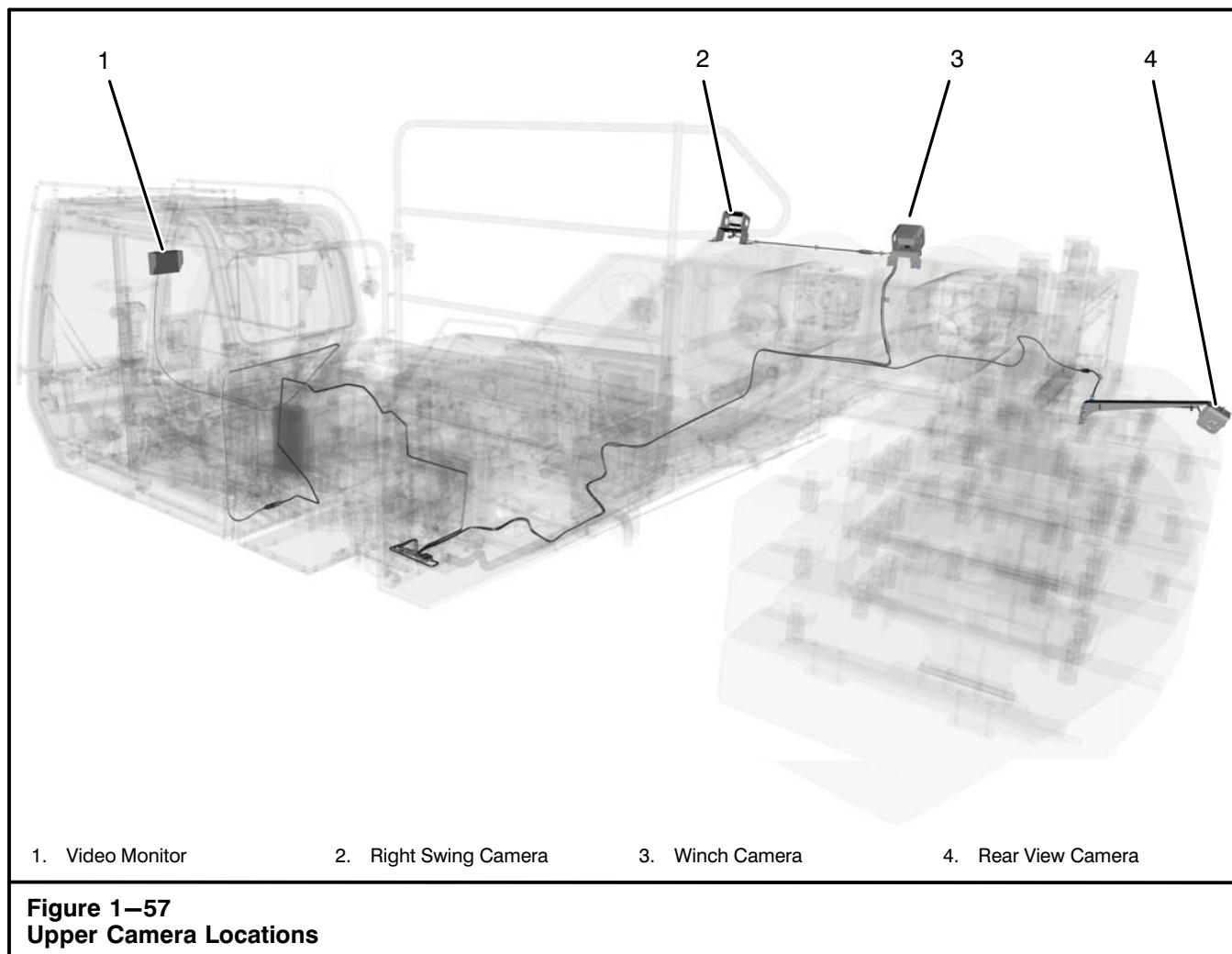
Interference

- Radio reception in a moving environment is very different from reception in a stationary environment (home). It is very important to understand the difference.
- AM reception will deteriorate when passing under a bridge or when passing under high voltage lines. Although AM is subject to environmental noise, it has the ability to be received at great distance. This is because broadcasting signals follow the curvature of the earth and are reflected back by the upper atmosphere.

Operator's Manual

Radio Troubleshooting		
Symptom	Cause	Solution
No power	The accessory switch is not ON	If the power supply is properly connected to the cranes accessory terminal, switch the ignition key to "ACC".
	Fuse is blown	Replace the fuse.
No sound	Volume is too low	Adjust volume to audible level.
	Wiring is not properly connected	Check wiring connections.
The operation keys do not work	Built-in microcomputer is not operating properly due to noise	Press the Reset Button.
Cannot tune to radio station, auto-seek does not work	Antenna cable is not connected	Insert the antenna cable firmly.
	Signals are too weak	Select a station manually.

Operator's Manual



Winch, Rear View, And Right Side Swing View Cameras

The upper is equipped with three cameras. One camera gives the operator a view of the winches to monitor wire rope spooling on the winch drum(s). Another camera gives a view of the area to the right side the crane to be used before swinging the upper to the right. The other camera gives a view of the area to the rear of the crane to be used before backing up the crane.

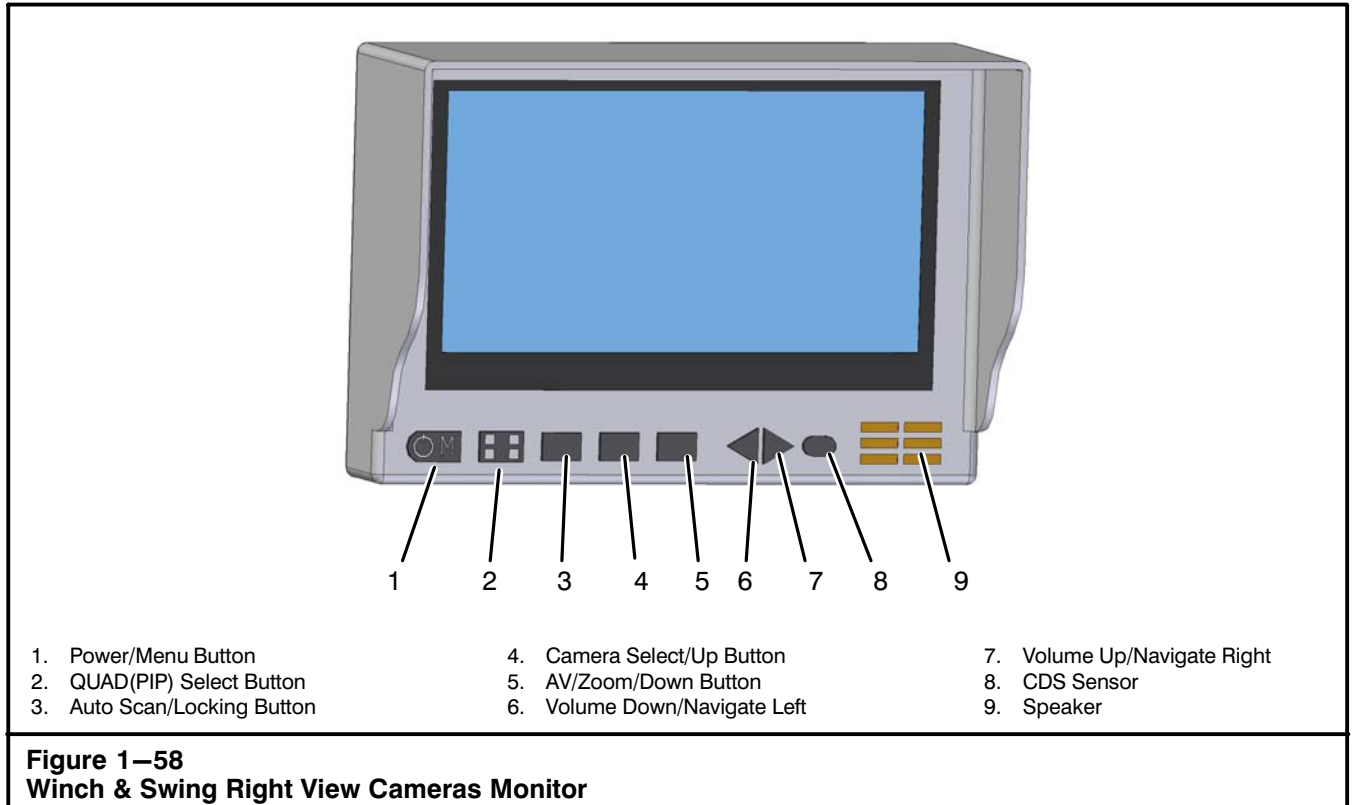
During initial crane start up and inspection each day, verify the proper operation of all cameras. If the cameras are found to be damaged or missing, order replacement parts as required to repair or replace the damaged or missing component. Continue operation with caution as you should normally do with all crane operations.



WARNING

Cameras are being supplied as an operator's aid. They do not relieve the crane operator of any responsibilities during crane operation. Always look directly in the direction of crane travel or at the load during crane lifting operations. Do not rely solely on the camera to determine if an obstruction is present.

When the swing brake is released the monitor will automatically display the right swing view. When the back-up alarm is triggered, the monitor will automatically display the rear view.



Camera Monitor

A video monitor in the Operator's Cab is supplied to help the Operator see areas that can be obstructed from their view. This monitor can distract the Operator from their normal duties if not used properly. Use these monitors as an Operator's aid and not as the sole method of seeing where the crane is going. Primary attention is to be on where the crane is going or the lifted load, not the monitor.

Cameras do not eliminate the requirement for a signal person during crane travel. Do not attempt to move the crane without a signal person. A trained signal person working in conjunction with a trained Operator is required to move the crane.



WARNING

Do not rely solely on the cameras and monitors.

- The field of vision of the camera may be limited.
- Just because the monitor looks clear does not mean that an obstruction does not exist.
- Images in the monitor may be farther than they appear.
- Images in the monitor may be distorted.
- Weather conditions (ice, snow, rain, etc) may distort or block the camera lens and inhibit visibility.
- Do not operate the crane using the camera's alone.
- Always look before moving the crane.
- Always employ a signal person to move the crane.

Operator's Manual

1. Power/Menu Button

Power

Press the left side of the Power/Menu Button to turn the monitor ON.

Press and hold the top left corner of the Power/Menu Button to turn the monitor OFF.

Menu (While Monitor Is Powered ON)

Press the right side of the Power/Menu Button to enter MENU MODE.

Press the AV/Zoom/Down Button or Camera Select/Up Button to scroll through the MENUS.

2. QUAD(PIP) Select Button

The QUAD(PIP) Select Button allows the Operator to change the monitor to a split screen display. Refer to "Split Screen Displays" in this section of the Operator's Manual for additional information.

3. Auto Scan/Locking Button

Auto Scan

Press the Auto Scan/Locking button one time to initiate auto scan mode. Auto scan mode will scroll through the camera views for a set period of time as follows: CA1—>CA2—>CA3—>CA4. After the last camera (CA4) is shown in scan mode the screen will automatically go back to the first camera (CA1). Refer to "SCAN Function" in this section of the Operator's Manual for additional information.

Button Lock

Hold the Auto Scan/Locking Button for 3 seconds to lock all of the buttons. At this time all functions of the buttons are disabled. While the buttons are locked, press and hold the Auto Scan/Locking Button for 3 more seconds to unlock the buttons.

4. Camera Select/Up Button

Press the Camera Select/Up Button to scroll through the camera views one by one and to get out of a split screen view. Press the Camera Select/Up Button while in MENU MODE to scroll UP.

5. AV/Zoom/Down Button

Press the AV/Zoom/Down Button to zoom in on a specific camera view. Press the AV/Zoom/Down Button while in MENU MODE to scroll DOWN.

6. Left Arrow Button

The left arrow button turns the volume down and changes functions within the MENUS.

7. Right Arrow Button

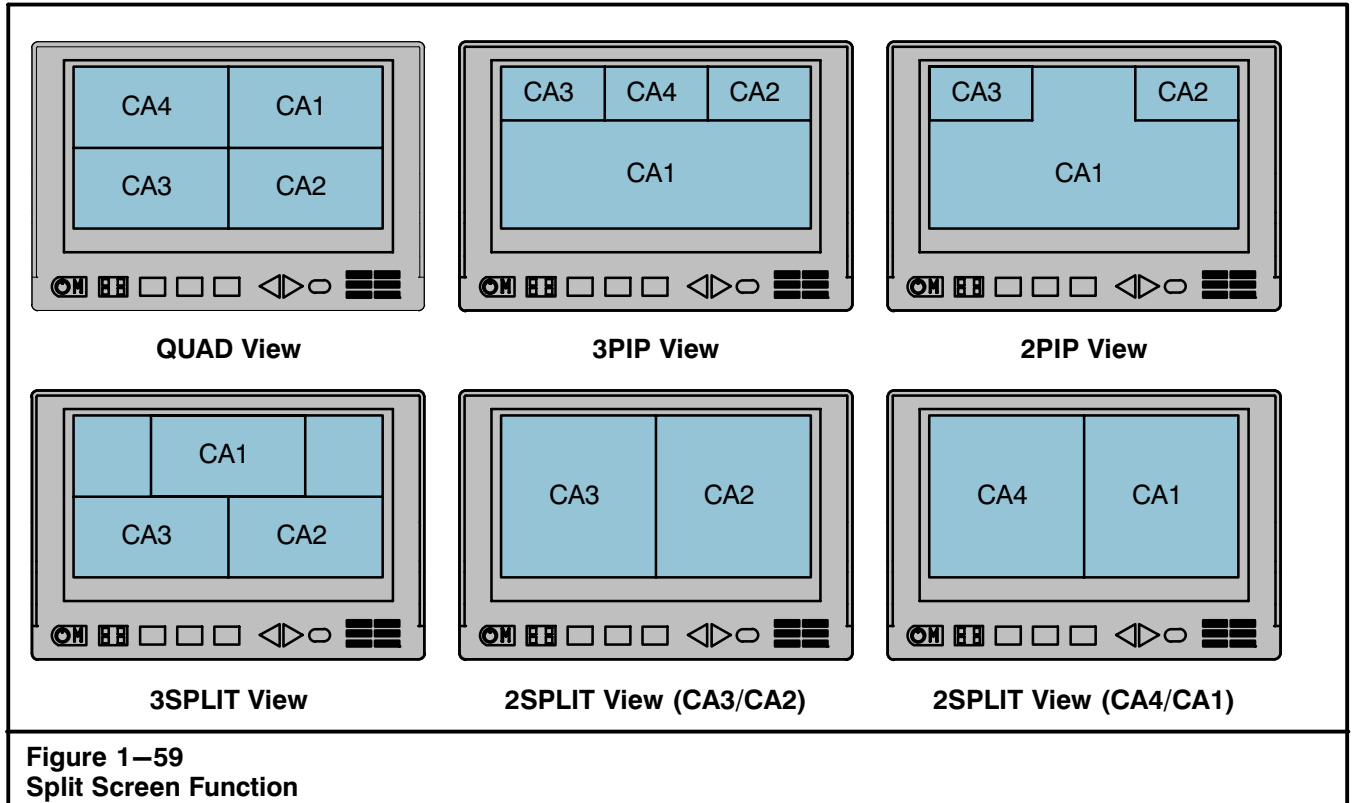
The right arrow button turns the volume up and changes functions within the MENUS.

8. CDS Sensor

The CDS Sensor has an auto dimming feature making the monitor available for night viewing.

9. Speaker

The speakers allows the Operator to hear sounds within the camera view.

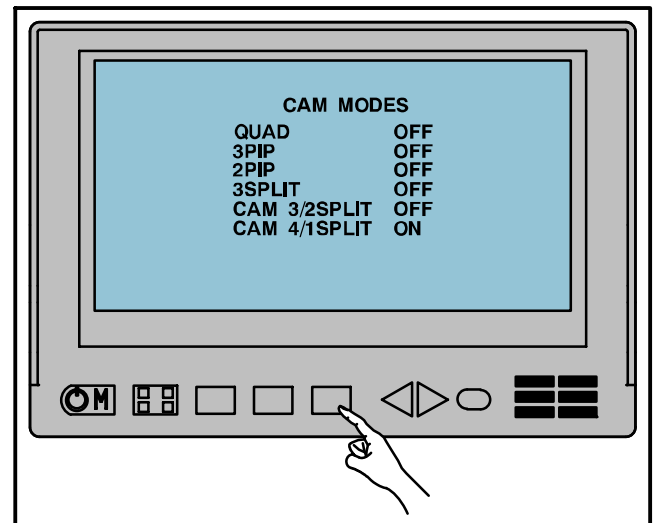


Split Screen Function

The upper camera has split screen capabilities allowing the Operator to view up to four cameras on one screen. Refer to Figure 1–59. Depending upon which split screen views are turned on, press the QUAD(PIP) Select Button to scroll through the different split screen views. To turn ON/OFF a split screen view:

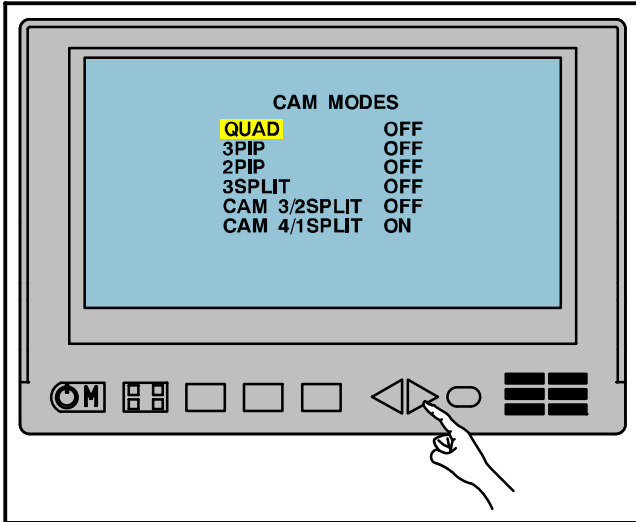
Refer to Figure 1–58.

1. Press the Power/Menu Button to enter MENU MODE.

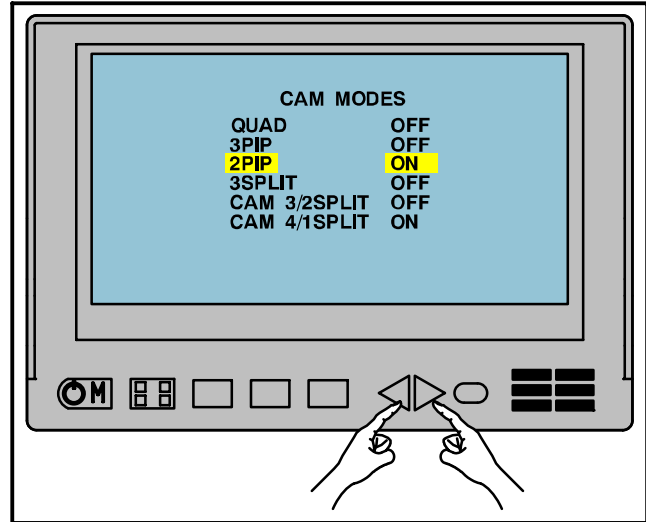


2. Press the AV/Zoom/Down Button until CAM MODES is displayed on the screen.

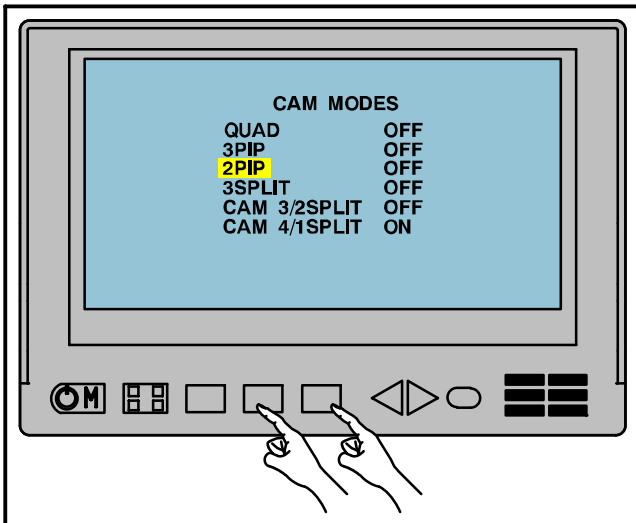
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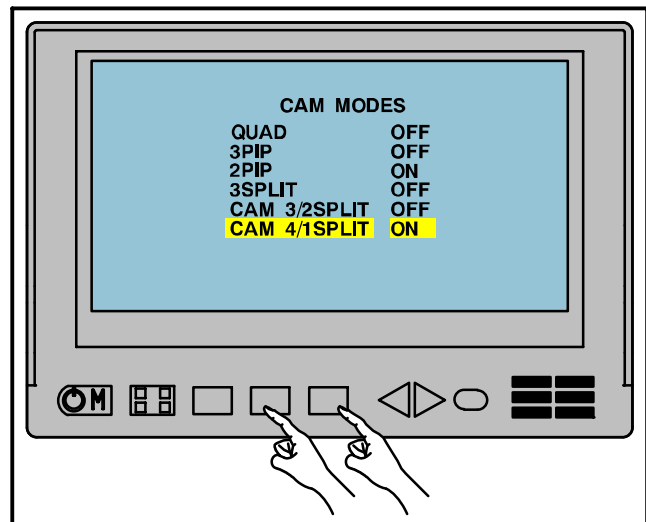
3. Press the Right Arrow Button to enter into CAM MODES.



5. When the proper split screen mode is selected press the Left Arrow or Right Arrow Button to turn it ON or OFF.



4. Press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN within CAM MODES.

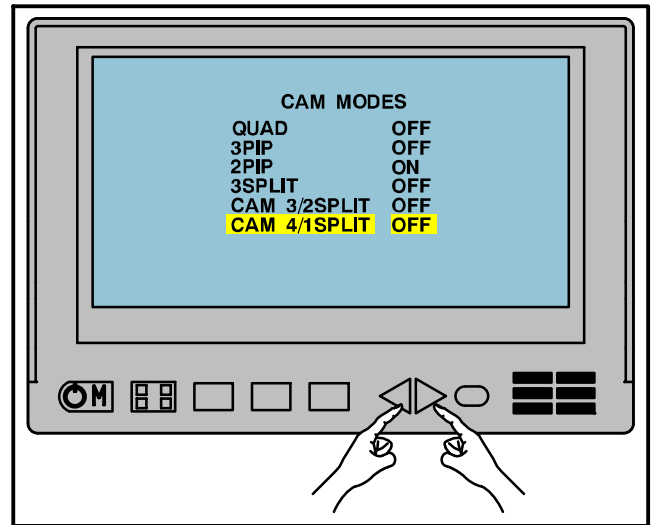


6. To turn ON or OFF another split screen mode press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN.

Operator's Manual

7. Then press the Left Arrow or Right Arrow Button to turn it ON or OFF.
8. To go back to MENU MODE press the Power/Menu Button.

Note: If the crane is equipped with two cameras, only CAM4/1SPLIT MODE needs to be on.



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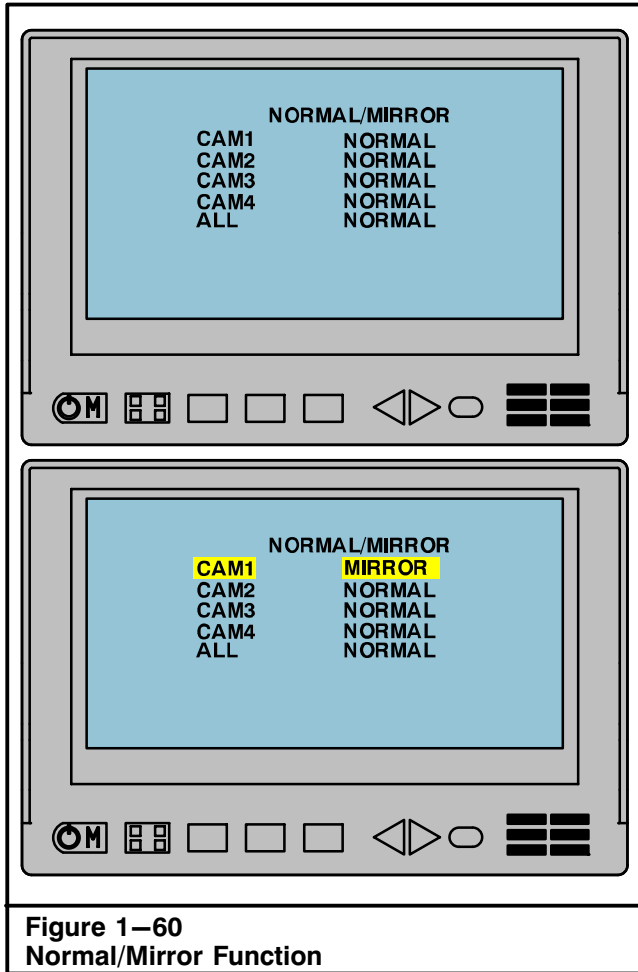


Figure 1–60
Normal/Mirror Function

NORMAL/MIRROR Function

The upper monitor has a NORMAL/MIRROR Function that allows the Operator to mirror the monitor image vertically. Refer to Figure 1–60. To change the monitor image from NORMAL to MIRROR:

Refer to Figure 1–58.

1. Press the Power/Menu Button to enter MENU MODE.
2. Press the AV/Zoom/Down Button until NORMAL/MIRROR is displayed on the screen.
3. Press the Right Arrow Button to enter into NORMAL/MIRROR.
4. Press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN.
5. Press the Left Arrow or Right Arrow Button to change the camera view from NORMAL to MIRROR.
6. To go back to MENU MODE press the Power/Menu Button.

UP/DOWN Function

The upper monitor has a UP/DOWN Function that allows the Operator to mirror the image horizontally. Refer to Figure 1–61. To change the monitor image from UP to DOWN:

Refer to Figure 1–58.

1. Press the Power/Menu Button to enter MENU MODE.
2. Press the AV/Zoom/Down Button until UP/DOWN is displayed on the screen.
3. Press the Right Arrow Button to enter into UP/DOWN.
4. Press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN.
5. Press the Left Arrow or Right Arrow Button to change the camera view from UP to DOWN.
6. To go back to MENU MODE press the Power/Menu Button.

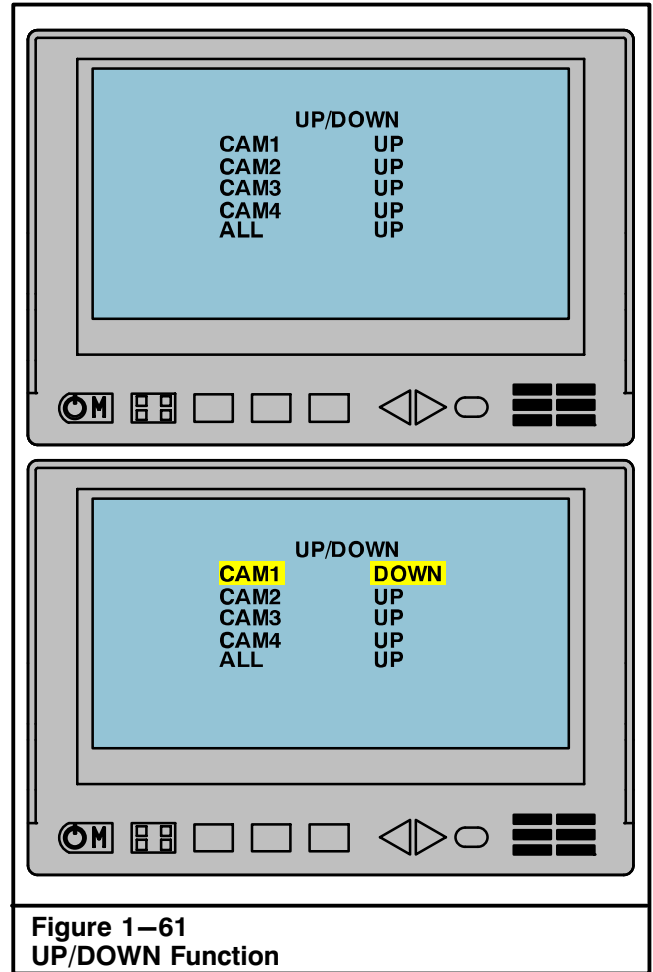


Figure 1–61
UP/DOWN Function

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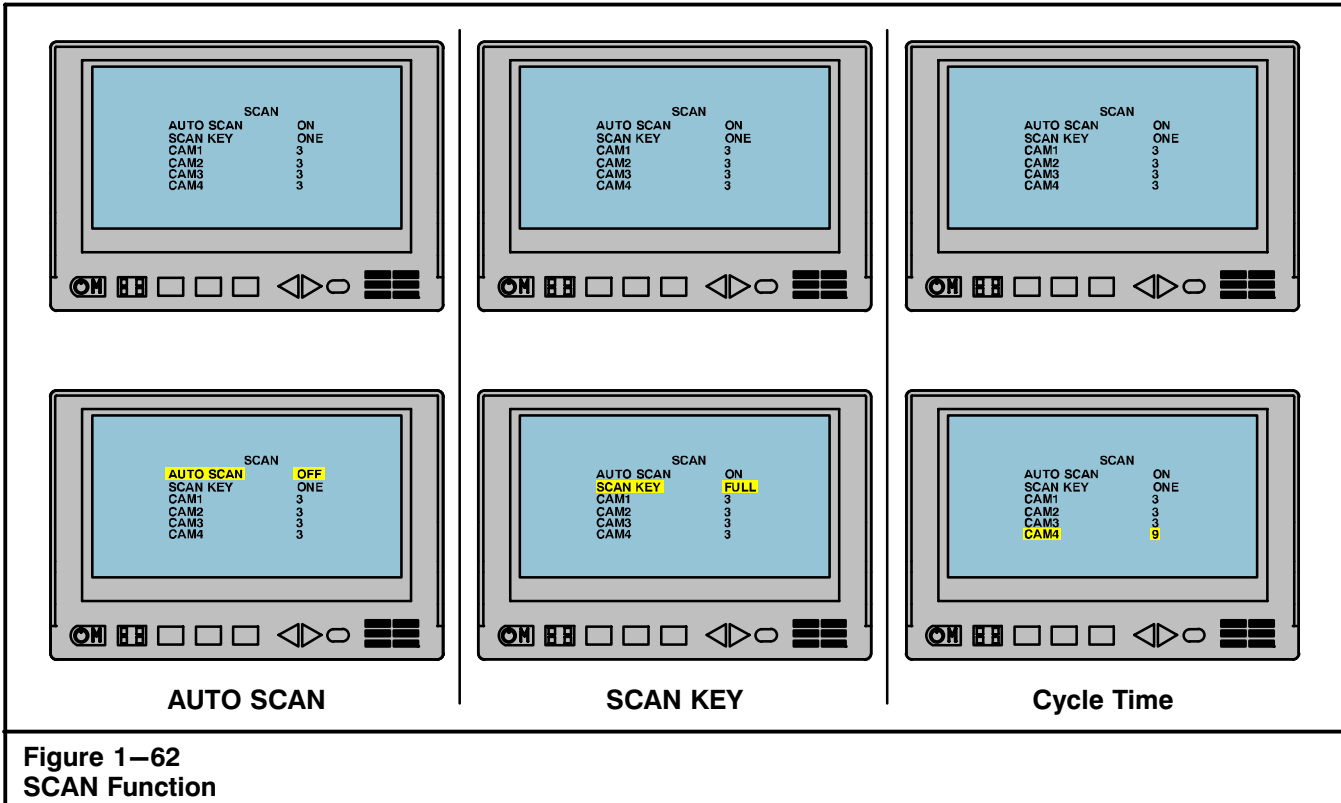


Figure 1-62
SCAN Function

SCAN Function

The upper camera has a SCAN Function that allows the monitor to automatically scan through the different camera views at the press of a button. The SCAN KEY function can be set to cycle through the camera views only one time or continuously scroll through the camera views. Refer to Figure 1-62. To start an AUTO Scan:

Refer to Figure 1-58.

1. Press the Auto Scan/Locking Button.

To turn AUTO SCAN OFF:

1. Press the Power/Menu Button to enter MENU MODE.
2. Press the AV/Zoom/Down Button until SCAN is displayed on the screen.
3. Press the Right Arrow Button to enter into SCAN.
4. Press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN to AUTO SCAN.
5. Press the Left Arrow or Right Arrow Button to change AUTO SCAN from ON to OFF..
6. To go back to MENU MODE press the Power/Menu Button.

To change the SCAN KEY cycle from ONE to FULL :

1. Press the Power/Menu Button to enter MENU MODE.
2. Press the AV/Zoom/Down Button until SCAN is displayed on the screen.
3. Press the Right Arrow Button to enter into SCAN.
4. Press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN to SCAN KEY.
5. Press the Left Arrow or Right Arrow Button to change SCAN KEY from ONE to FULL.
6. To go back to MENU MODE press the Power/Menu Button.

To change the SCAN cycle time:

1. Press the Power/Menu Button to enter MENU MODE.
2. Press the AV/Zoom/Down Button until SCAN is displayed on the screen.
3. Press the Right Arrow Button to enter into SCAN.
4. Press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN to specific camera.
5. Press the Left Arrow or Right Arrow Button to change the time interval (1-9 seconds).
6. To go back to MENU MODE press the Power/Menu Button.

PREFERRED SETTINGS

FUNCTION		TRIGGER	
LANGUAGE	ENGLISH	REAR SCALE	OFF
SYSTEM	NTSC/PAL	BLINK MARK	OFF
DIRECTION	0°	TRIG 1	CAM1
DIMMER	1	TRIG 2	CAM3/CAM2
AUTO POWER	ON	TRIG 3	2PIP
LOGO SET	>	TRIG 4	CAM4
AV OUTPUT	LIVE	HAZARD	QUAD
SHUTTER	ON		
RESET	>		

PICTURE		CAMERA NAME	
CONTRAST	15	CAM1	REAR
BRIGHTNESS	15	CAM2*	WINCH
COLOR	15	CAM3*	NO CAMERA
TINT	15	CAM4*	SWING

NOR/MIR		CAM MODES	
CAM1	NORMAL	QUAD*	OFF
CAM2	NORMAL	3PIP*	OFF
CAM3	NORMAL	2PIP*	OFF
CAM4	NORMAL	3SPLIT*	OFF
ALL	NORMAL	CAM3/2 SPLIT*	OFF
		CAM4/1 SPLIT	ON

UP/DOWN		SCAN	
CAM1	UP	AUTO SCAN	OFF
CAM2	UP	SCAN KEY	ONE
CAM3	UP	CAM1	3
CAM4	UP	CAM2	3
ALL	UP	CAM3	3
		CAM4	3

*Setting may be different if equipped with a third camera.

Figure 1–63
Monitor Preferred Settings

RESET

Note: Resetting the monitor will reset it to the monitor factory settings. The monitor will then need to be set to the Link-Belt preferred settings. Refer to Figure 1–63.

To reset the monitor settings:

1. Press the Power/Menu Button to enter MENU MODE.
2. Press the AV/Zoom/Down Button until FUNCTION is displayed on the screen.
3. Press the Right Arrow Button to enter into FUNCTION.
4. Press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN to RESET.
5. Press the Left Arrow or Right Arrow Button to reset the monitor.
6. The monitor will power off during reset.

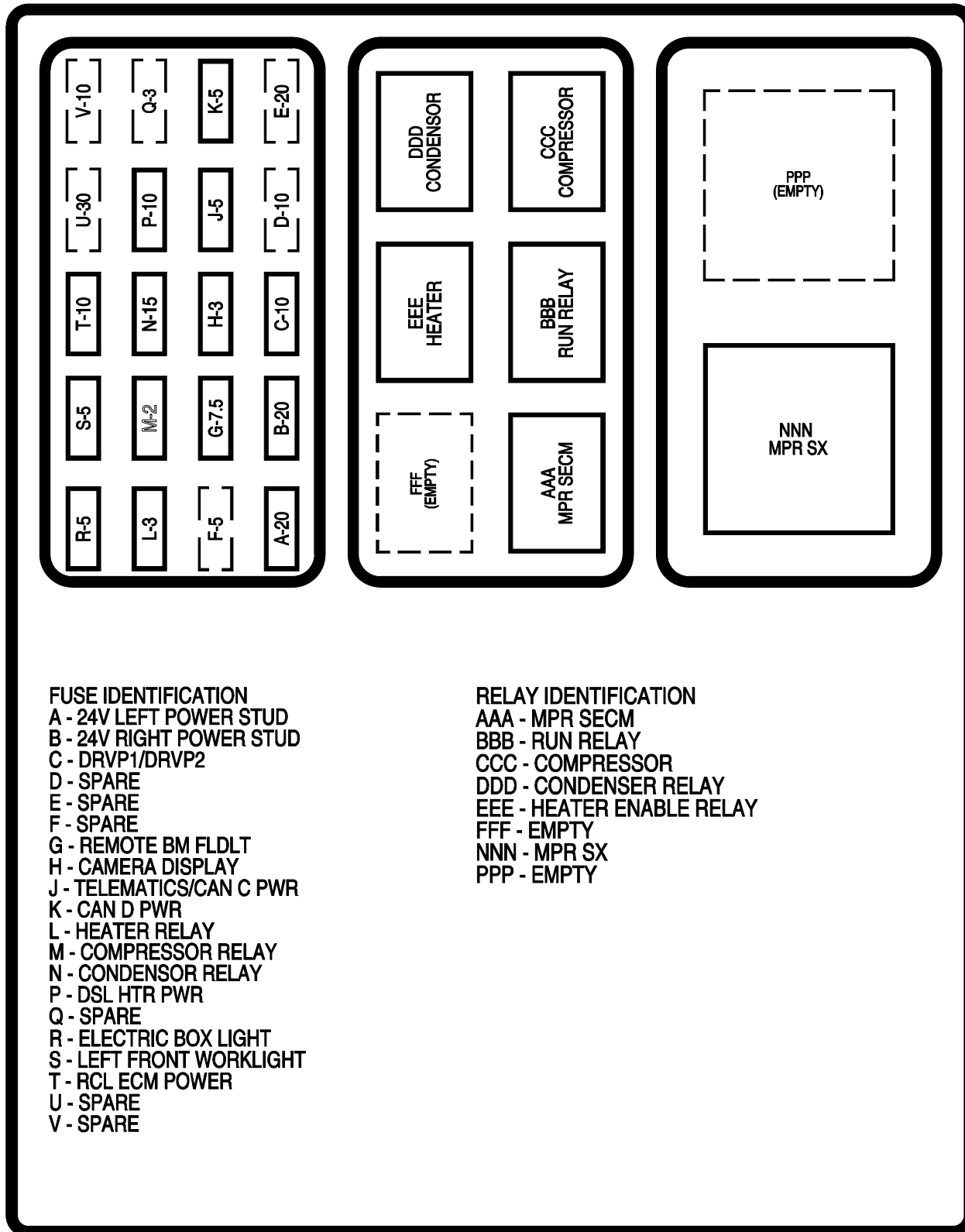
Care and Maintenance

If crane has been parked in direct sunlight, allow time for the monitor to cool down.

Clean the monitor with a slightly damp cloth. Use a mild household detergent. Do not use strong solvents such as thinner or benzene as they can damage the finish of the monitor.

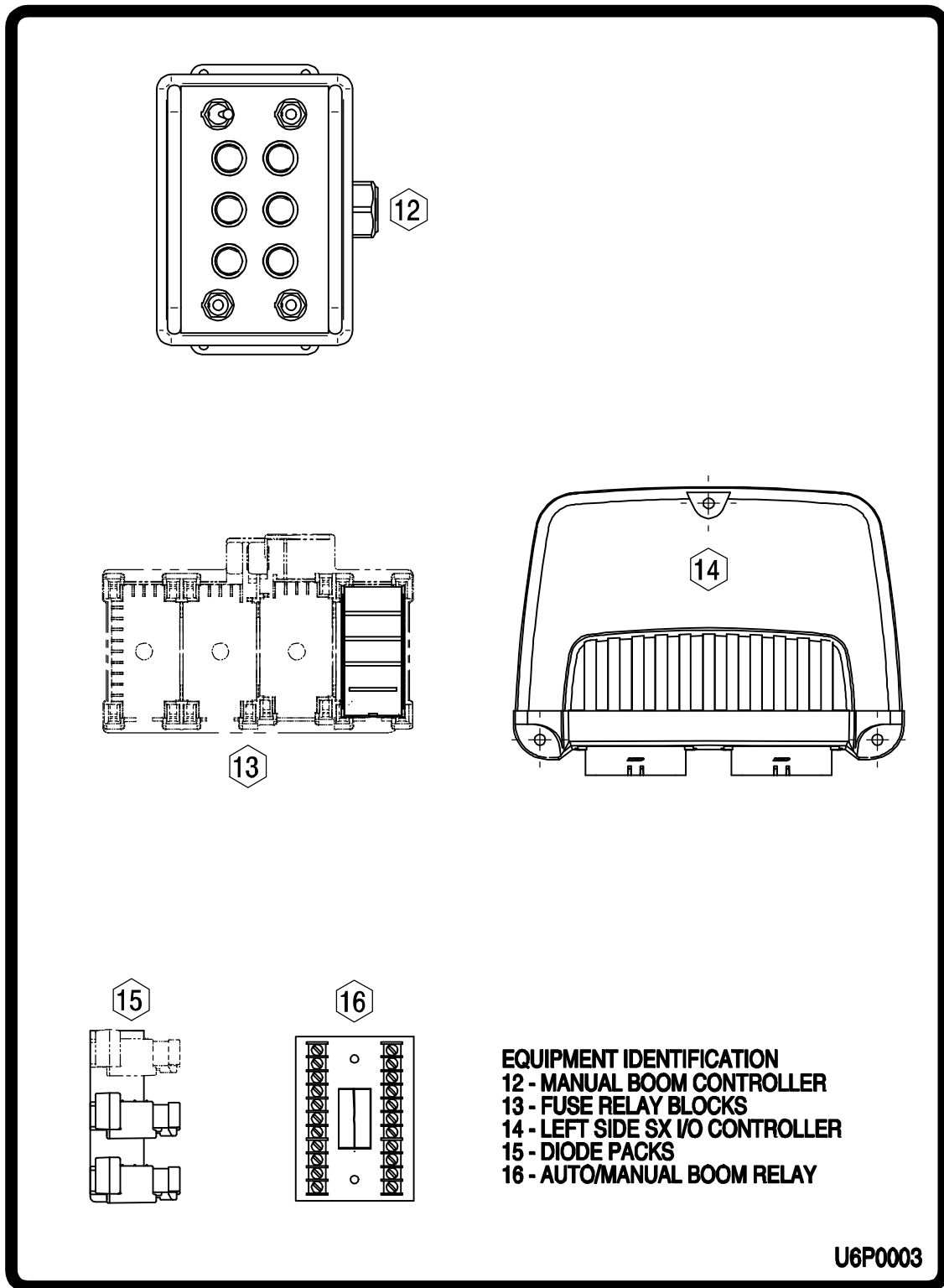
Contact your Link-Belt Distributor for the proper repair procedures.

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Typical fuse block and label arrangement. Always refer to actual label on the crane.

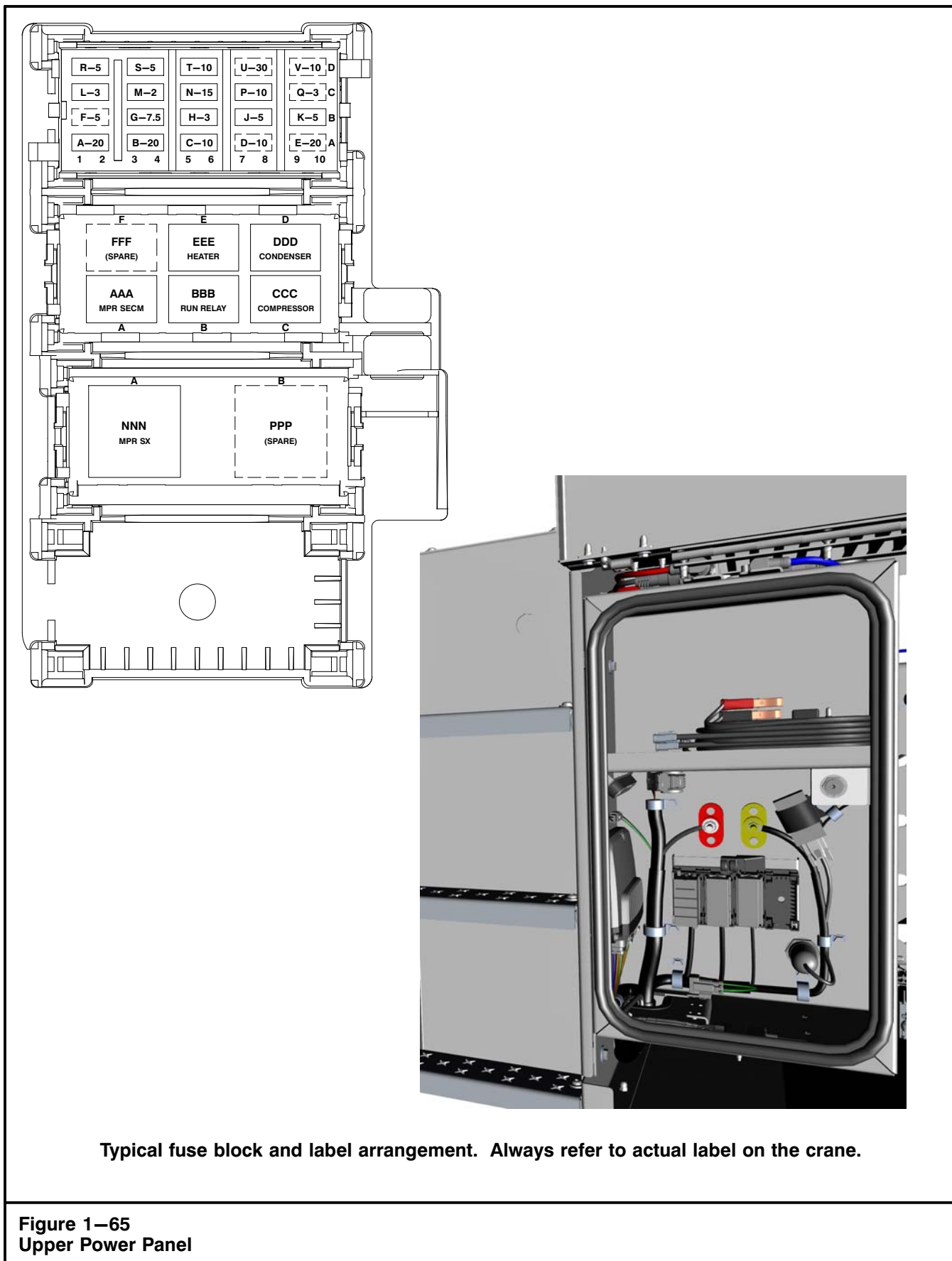
Figure 1–64
Fuse Blocks, Resistors, And Relays Identification



Typical fuse block and label arrangement. Always refer to actual label on the crane.

Figure 1–64 Continued
Fuse Blocks, Resistors, And Relays Identification

Operator's Manual



Upper Power Panel

The upper power panel is beside the ladder on the left side of the upper behind the upper operator's cab. Release the latches and open the panel to access the upper power panel. Refer to Figure 1–64.

RCL Bypass Keyswitch

The RCL Bypass Keyswitch is located in the upper power panel back behind the cab. Refer to Figure 1–65. The RCL bypass keyswitch is used to bypass the Rated Capacity Limiter computer in emergency situations. Refer to “Crane Monitoring System” in this Section of this Operator's Manual.

Fuse Blocks, Resistors, And Relays

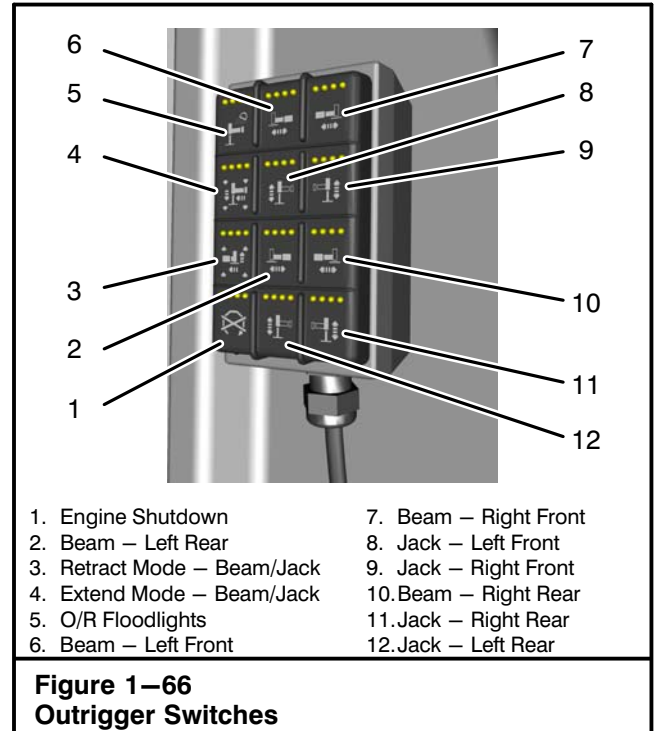
Fuse blocks, resistors, and relays are mounted in the upper electrical center. Refer to Figure 1–64 and Figure 1–65. Refer to Figure 1–64 for identification of these components.

Outrigger Operation

The outriggers can be used in any one of three positions; fully retracted, intermediate extended, fully extended, or in accordance with the V–CALC (Variable Confined Area Lifting Capacities). Refer to the Crane Rating Manual.

The outriggers are controlled by switches on a hand held control box connected by a cable (Refer to Figure 1–66) and the extend position pins on the outrigger boxes (Refer to Figure 1–67). Each outrigger switch (Left Front, Left Rear, Right Front, Right Rear) controls all functions of that outrigger beam and jack cylinder. The mode switch controls outrigger cylinder direction, extend/retract. The extend position pins limit the beam to the intermediate position when inserted. Otherwise, the beam can be fully extended.

The outrigger pontoons must set on a smooth, solid surface flush with ground with no hills or valleys under them or they may be damaged or destroyed. Depending on the nature of the supporting surface, it may be necessary to have structural supports or mats under the outrigger pontoons to equalize the load to a larger bearing surface. Check pontoons before and during operations. If they are allowed to settle, they may lose their effectiveness, and make continued operations unsafe.



A bubble level is mounted on the upper, to assist in determining when crane is level. The hand held, tethered control box stores on the right side wall of the cab near the operator's seat. Refer to Figure 1–70. The control box allows the operator to remotely control all outrigger functions.



WARNING

Do not extend or retract an outrigger beam or jack unless it is in full view of the operator or signal person. Ensure all personnel and obstructions are clear from the path of the machinery.

Outrigger Floodlights

Outrigger floodlights are mounted at the end of each outrigger box and near the bumper outrigger at the front of the crane. Operate the lights by pushing the outrigger floodlights switch . All LED indicators on the O/R floodlight switch will illuminate when the lights are activated. Refer to Figure 1–66.

Engine Shutdown

The engine shutdown switch  will shut the engine down while displays and accessories remain on. Press and hold the switch to shut down the engine. All LED indicators on the engine shutdown switch will illuminate while the switch is being pressed. Engine can be restarted with the ignition switch while engine shutdown switch is activated.

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To Extend Outrigger Beams

1. Park crane in the desired location. Engage the park brake and shutdown engine.
2. Remove the pontoons from storage, and attach one to each outrigger jack.



WARNING

Pontoons must be attached to outrigger jacks before crane is set on outriggers. If pontoons should settle, the jacks could disengage from the pontoons, causing a loss of stability.

3. Determine the outrigger position desired. Set the extended position pins, if using intermediate outriggers, as required. (Refer to Figure 1–67.)



WARNING

When making lifts on outriggers, all outrigger beams must be extended in accordance with the V–CALC (Variable Confined Area Lifting Capacities). Refer to the Crane Rating Manual. Failure to do so will cause a loss of stability and possible crane damage and/or personal injury.

4. Start the engine.
5. Set the extend position levers in the desired position. (Refer to Figure 1–67.)

Note: Extend and retract functions can not be activated simultaneously.

6. Press and hold the extend mode switch . Press and hold the switch for the desired beam to extend. All LED indicators on the pressed switches will illuminate while the switches are being pressed.
7. Continue to press the switches until the beam reaches the selected position; intermediate or fully extended.
8. When the beam reaches selected position, release the switches.
9. Repeat Steps 6–8, for each outrigger beam, until all the beams are set to the selected position.

Note: As conditions warrant, a proficient crane operator may operate multiple beams such as one end or side at the same time.

10. If the intermediate extended beam position is to be used, visually check that all beams are properly positioned in the intermediate extended position. All beams must be extended until the stop plate contacts the extend position pins and the arrows are aligned with the outrigger box collar. Refer to Figure 1–67.
11. Set the Rated Capacity Limiter to the proper setting to match the position of the outrigger beams.

Note: If an “Outrigger Position Mismatch” warning appears on the display, ensure the outriggers are in the correct position and select the configuration on the display to match the current outrigger position.



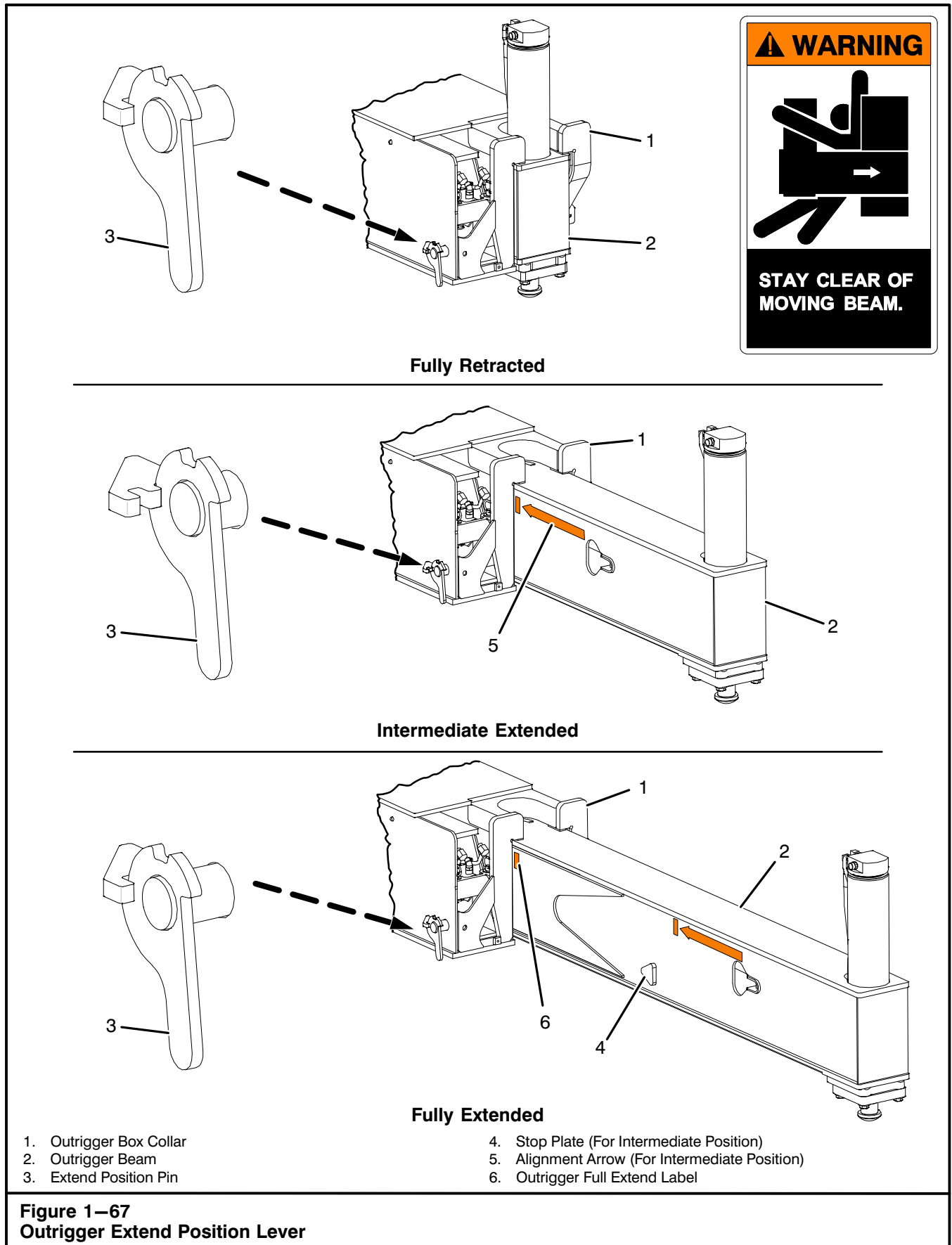
WARNING

When making lifts with the crane on outriggers, all outrigger beams must be extended in accordance with the V–CALC (Variable Confined Area Lifting Capacities). Refer to the Crane Rating Manual.

When making lifts with the outrigger beams in the intermediate extended position, the extend position pins must be in the intermediate extended position. Visually check that all outrigger beams are extended until the stop plate contacts the extend position pin and the arrow is aligned with the outrigger box collar before beginning operations.

Check that the Rated Capacity Limiter is set to the correct outrigger position before beginning operation.

Failure to perform any of the above may cause crane damage and/or serious personal injury.



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Figure 1–68
Keep Clear of Pinch Points

To Extend Outrigger Jacks – Raise The Crane

1. With the beams extended to the selected position (fully retracted, intermediate extended, or fully extended), extend outrigger jack(s):
 - a. To extend one jack, press and hold the extend mode switch . Press and hold the switch for the desired jack to extend. All LED indicators on the pressed switches will illuminate while the switches are being pressed.
 - b. To extend all jacks, double press and hold the extend mode switch . All LED indicators on the extend mode switch will blink while the switch is being pressed.



WARNING

Ensure all jacks are extending equally when the beams are extended unequally in accordance with V–CALC. Crane damage may occur.

CAUTION

When the hoist line is tied off to the crane or any solid object, the winch system can be overloaded causing major winch, wire rope, or crane damage. Do not extend boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum to prevent tension on the wire rope.

2. Continue holding the switch(es) until the jack cylinder(s) is/are fully extended.
3. Release the switch(es).
4. Repeat Steps 1–3 for each outrigger jack, as required.
5. Raise or lower jacks as required to level the crane.

Note: As conditions warrant, a proficient crane operator may operate multiple jack cylinders such as one end or side at the same time.

Note: A bubble level is provided on the upper side cab wall to assist in determining when the crane is level.

6. Ensure all tires are clear of the ground and pontoons are not settling.

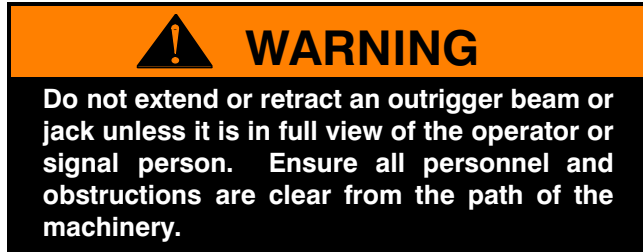


WARNING

All capacities listed in the Crane Rating Manual, when on outriggers, are based on all tires clear of the ground, all outrigger beams equally extended (fully retracted, intermediate extended, or fully extended), or in accordance with V–CALC, using the proper chart for the outrigger position and the crane setting level on a firm, solid surface. Major reductions in the crane lifting capacity and unsafe operating conditions can result if these conditions are not met.

To Retract Outrigger Jacks – Lower The Crane

1. Fully retract the boom. Swing the upper over the front of the carrier and engage the travel swing lock.
2. Fully boom down.



3. With the beams extended to the selected position retract jack(s):
 - a. To retract one jack, press and hold the retract mode switch . Press and hold the switch for the desired jack to retract. All LED indicators on the pressed switches will illuminate while the switches are being pressed.
 - b. To retract all jacks, double press and hold the retract mode switch . All LED indicators on the retract mode switch will blink while the switch is being pressed.
4. Continue holding the switch(es) until the jack cylinder(s) is/are fully retracted.
5. Release the switch(es).
6. Repeat Steps 3–5 for each outrigger jack.

Note: As conditions warrant, a proficient crane operator may operate multiple jack cylinders such as one end or side at the same time.

To Retract Outrigger Beams

1. Set the extend position pins in the fully retracted position. (Refer to Figure 1–67.)

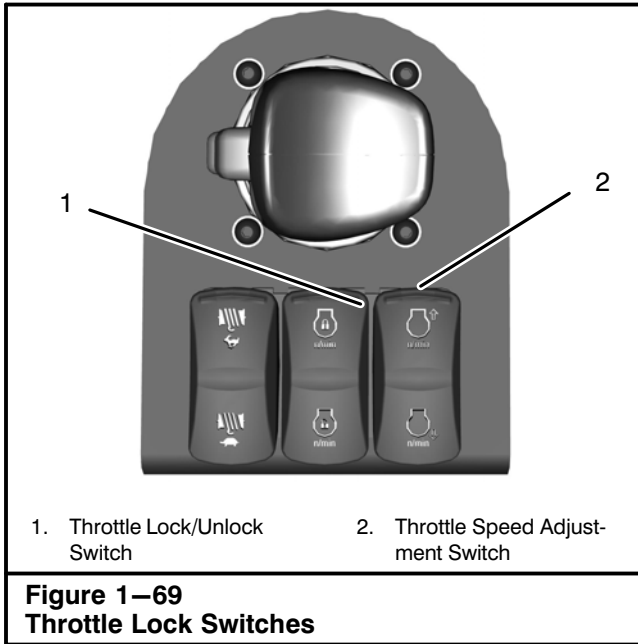
Note: Extend and retract functions can not be activated simultaneously.

2. Press and hold the retract mode switch . Press and hold the switch for the desired beam to retract. All LED indicators on the pressed switches will illuminate while the switches are being pressed.
3. Continue to press the switches until the beam is fully retracted.
4. Release the switches.
5. Repeat Steps 1–4 for each beam.

Note: As conditions warrant, a proficient crane operator may operate multiple beams such as one end or side at the same time.

6. Store all pontoons in the brackets provided.

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Crane System Controls

The following pages, along with Figure 1–70, give detailed instructions of individual controls related to crane operation. It is essential that the operator knows the function of each control and its duty in the overall operation of the crane.



WARNING

Read and understand all “Operating Safety” procedures as well as all other operating instructions in this manual before attempting to operate the crane. Operation of the crane by unqualified personnel may result in an accident.

Engine Throttle

The crane is equipped with a throttle pedal to control the engine speed. Press pedal down to increase engine speed; release to decrease engine speed.

Throttle Lock System

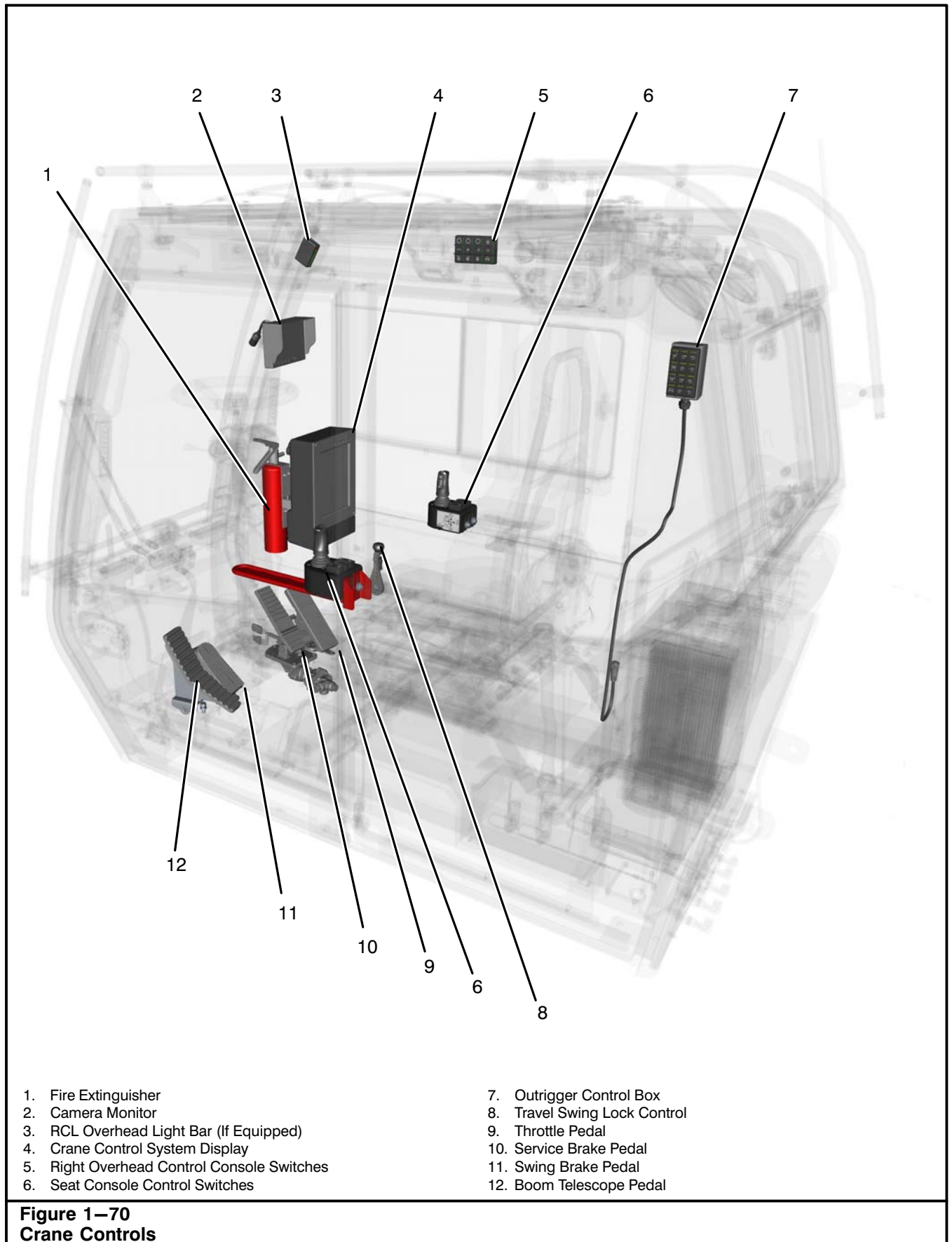
To lock the throttle, press the throttle pedal until the desired engine speed is reached and press and release the top part of the throttle lock/unlock switch. Refer to Figure 1–69. The engine should continue to run at a constant speed when the throttle pedal is released. The LED indicator on the switch will illuminate green and the lock symbol will be displayed in the tachometer on the crane control system display when the throttle lock is activated.

To increase throttle lock setting, either press the top part of the throttle speed adjustment switch and hold until desired engine speed is reached and release switch, or press the throttle pedal until the desired engine speed is reached and press and release the top part of the throttle lock/unlock switch. The throttle lock setting can also be increased incrementally by pressing and releasing (tap up) the top part of the throttle speed adjustment switch.

To decrease throttle lock setting, press and hold the bottom part of the throttle speed adjustment switch until desired engine speed is reached and release switch. The throttle lock setting can also be decreased incrementally by pressing and releasing (tap down) the bottom part of the throttle speed adjustment switch.

To return to idle, press and release the bottom part of the throttle lock/unlock switch. The LED indicator on the switch will illuminate amber and the lock symbol will not be displayed in the tachometer on the crane control system display when the throttle lock is not activated.

Note: The throttle lock system is deactivated anytime the ignition switch is turned off.



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Auto Idle System

When ON (function is ON by default) and with engine coolant temperature above 150 deg F and throttle lock set: The auto idle indicator will begin blinking after 10 seconds of all crane functions becoming neutral. Once the crane functions are neutral for 15 seconds, the light will illuminate green, at which point, the RPM will drop to idle. Engine will resume to previously set RPM when any control lever or pedal is activated or the throttle pedal is depressed. Refer to “Engine Diagnostics” in this section of this Operator’s Manual to turn OFF this function.

To Activate Or Deactivate Auto Idle:

1. Press the Diagnostics Button  on the Pulse Crane Control System Display. The Diagnostics Menu will appear.

Note: The Shortcut Button  can be programmed to directly access the Engine Diagnostics Screen  from any screen. Refer to “Shortcut Button” in this section of this Operator’s Manual.

2. Press the Engine Diagnostics Button in the Diagnostics Menu. The Engine Diagnostics Screen will appear. Press the Auto Idle Button  to toggle off or on, as required. Refer to “Engine Diagnostics” in this section of this Operator’s Manual.



0 lb



142 ft



None



None





1

ENGINE DIAGNOSTICS

Information

Hydraulic Oil Temperature	-58.0 °F
Engine Speed	0.0 rpm
Engine Fuel Rate	0.0 g/hr
Engine Coolant Temperature	---
Battery potential / power input 1	0.0 volts
Engine Total Hours Of Operation	0 hr
Transmission Oil Temperature	-58.0 °F
Intake 1 Manifold Pressure	0.0 psi
Engine Percent Load	0.0 %



















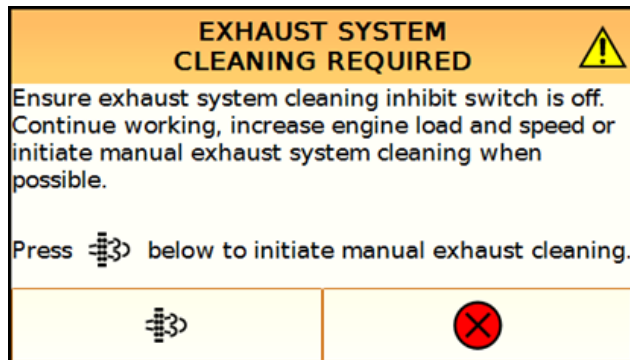
Exhaust System Cleaning

The Exhaust System Cleaning is designed to remove Diesel Exhaust Fluid (DEF) deposits and condition the exhaust cleaning system. The exhaust system cleaning must be done periodically to remove DEF deposits from the system. During normal operation, the accumulated deposits in the system will be purged by an automatic cleaning cycle. In some cases an automatic cleaning may not occur and the cleaning cycle must be initiated manually. Stationary exhaust system cleaning may be initiated manually by the operator at any time the exhaust cleaning required indicator light  is illuminated.

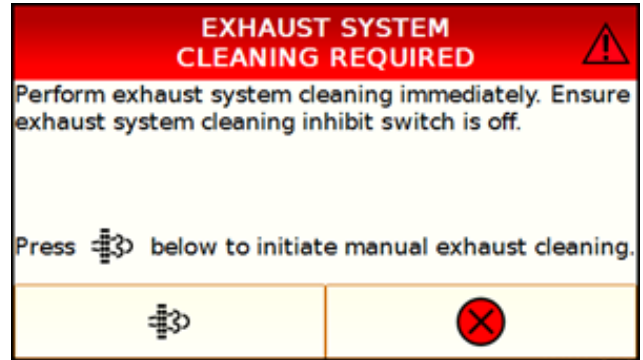
Refer to engine manufacturer's manual for additional information on the exhaust system cleaning process and procedures.

Exhaust System Cleaning Indicators

If exhaust system cleaning does not initiate automatically at the predetermined time interval, the exhaust cleaning required indicator light  will illuminate and a pop up will appear to alert the operator that an exhaust system cleaning is required.



If the machine continues to be utilized with the exhaust cleaning required indicator light  illuminated without initiating a manual exhaust system cleaning within the predetermined time interval, the check engine indicator light  will illuminate and a pop up will appear to alert the operator that a manual stationary exhaust system cleaning is required immediately.

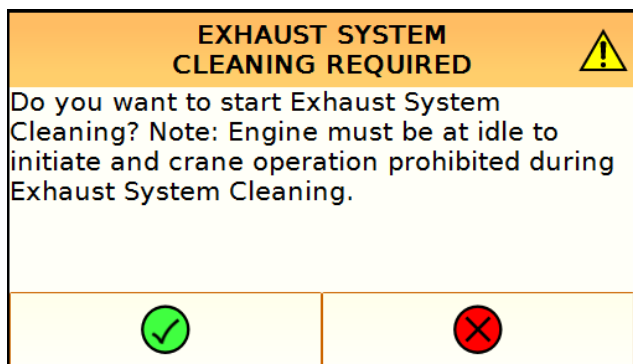


To Initiate Manual Stationary Exhaust System Cleaning:

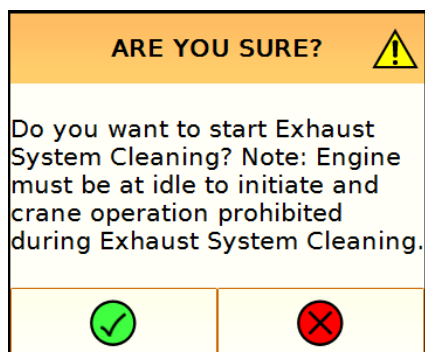
Note: The exhaust system cleaning required button  is used to start a stationary exhaust system cleaning only when the exhaust system cleaning required indicator light  is illuminated. The crane must remain stationary for approximately 45 minutes to complete a stationary exhaust system cleaning.

1. Park the crane in a safe location.
2. Engine must be at minimum operating temperature of 140°F (60°C).
3. Ensure that the Exhaust System Cleaning Inhibit indicator light  is off. If required, press the exhaust system cleaning inhibit button  on the Engine Diagnostics Screen to toggle off the exhaust system cleaning inhibit function. Refer to "Engine Diagnostics" in this section of this Operator's Manual.
4. Press the exhaust system cleaning required button  on the Exhaust System Cleaning Required pop up or Engine Diagnostics Screen, as required. The confirmation pop up will appear.
 - a. If the exhaust system cleaning required button  was accessed from the Engine Diagnostics Screen, the confirmation pop up screen will appear in the Pulse Feature And RCL Configuration Area on the Pulse Crane Control System Display.

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- b. If the exhaust system cleaning required button  was accessed from the Exhaust System Cleaning Required pop up, the confirmation pop up screen will appear in the RCL Working Screen on the Pulse Crane Control System Display.

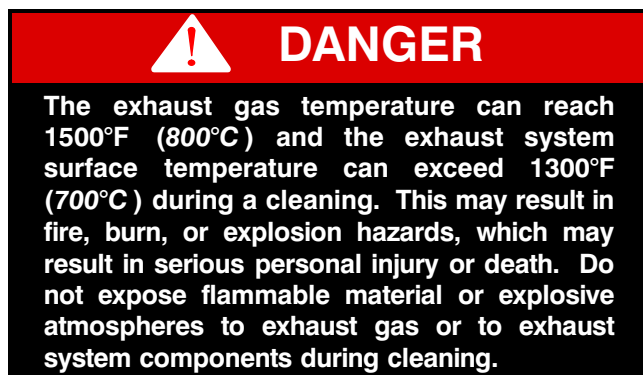


5. Press the activation icon button  on the active pop up to initiate exhaust system cleaning. If exhaust system cleaning is not desired at this time, close the pop up by pressing the deactivation icon button .

Note: Do not press the engine throttle pedal during a stationary exhaust system cleaning. Pressing the engine throttle pedal will deactivate the stationary exhaust system cleaning and the engine will return to idle. The stationary exhaust system cleaning must be restarted.

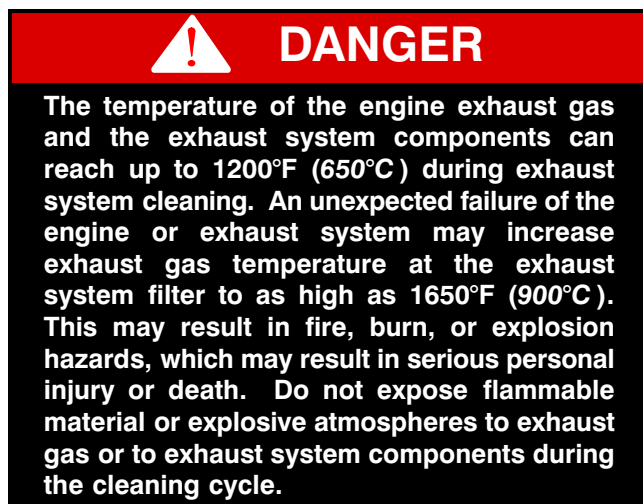
The engine ECM will perform a system check for approximately 30 seconds before starting the stationary exhaust system cleaning; also, the engine speed will increase to 1,000–1,400 rpm. When the cleaning begins, the exhaust cleaning required indicator light  flashes and the high exhaust system temperature indicator light  will illuminate.

When stationary exhaust system cleaning is complete, the upper engine will return to idle and the high exhaust system temperature indicator light  and exhaust cleaning required indicator light  will go out.



High Exhaust System Temperature Indicator Light

The high exhaust system temperature indicator light  will illuminate to alert the operator that the outlet temperature in the upper engine exhaust system is above normal. This condition can occur under normal operation or during an automatic or manual exhaust system cleaning cycle. No action is required.



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Exhaust System Cleaning Inhibit Button

The exhaust system cleaning inhibit button  disables any automatic or manual cleaning of the exhaust system. It may be used to prevent any cleaning when the crane is operating in a hazardous environment and there is a concern about high temperatures from the exhaust system.

To Activate The Exhaust System Cleaning Inhibit Button:

1. Access the Engine Diagnostics Screen on the Pulse Crane Control System Display. Refer to "Engine Diagnostics" in this section of this Operator's Manual.
2. Press the exhaust system cleaning inhibit button .
3. The exhaust cleaning inhibit indicator light  will illuminate to alert the operator that the system is inhibited.

To Deactivate The Exhaust System Cleaning Inhibit Button:

1. Access the Engine Diagnostics Screen on the Pulse Crane Control System Display. Refer to "Engine Diagnostics" in this section of this Operator's Manual.
2. Press the exhaust system cleaning inhibit button .
3. The exhaust cleaning inhibit indicator light  will go out to alert the operator that the system will allow an exhaust system cleaning to occur.

Diesel Exhaust Fluid

Diesel exhaust fluid (DEF) level must be maintained in the tank for the SCR system to control nitrogen oxide emissions. The gauge registers the level of DEF in the DEF tank. The DEF tank capacity is 5 gal (18.9L). Additionally, the crane is equipped with a diesel exhaust fluid level indicator light  on the Pulse Crane Control System Display ensuring the operator has ample notice to replenish the DEF.

Refer to engine manufacturer's manual for additional information on the DEF process and procedures.

The diesel exhaust fluid level indicator light  will illuminate to alert the operator that the diesel exhaust fluid level is low. This can be corrected by filling the diesel exhaust fluid tank. It is recommended that the tank be filled completely in order to correct any fault conditions. Press the deactivation icon button  to acknowledge pop-up and return to previous screen.

If the machine continues to be utilized with the diesel exhaust fluid level indicator light  illuminated without filling the DEF tank, the check engine indicator light  will illuminate to indicate initial engine derate. Engine power will be limited automatically. This can be corrected by filling the diesel exhaust fluid tank. Press the deactivation icon button  to acknowledge pop-up and return to previous screen.

Further use of the machine with the diesel exhaust fluid level indicator light  illuminated will increase the severity of the engine derate and the diesel exhaust fluid level indicator light  will begin to flash. This can be corrected by filling the diesel exhaust fluid tank. Press the deactivation icon button  to acknowledge pop-up and return to previous screen.

The diesel exhaust fluid level indicator light  will flash combined with an illuminated check engine indicator light  and stop engine indicator light  if the engine has been shutdown or has idled for an extended period of time after the diesel exhaust fluid tank has been emptied. Engine power will continue to be limited automatically and crane speed will be limited to idle. This can be corrected by filling the diesel exhaust fluid tank to at least 10 percent volume of the tank. However, it is recommended that the tank be filled completely in order to correct any fault conditions. An Active System Fault will appear. The diesel exhaust fluid tank must be filled to remove the fault.

The DEF tank is equipped with a strainer insert. The strainer insert can accumulate contaminants, causing an overflow when filling the DEF tank. Refer to "DEF Strainer Insert" in Section 2 of this Operator's Manual for cleaning instructions.

Operator's Manual



Swing System

Rotation of the upper over the carrier is controlled by the swing system. Use the following controls to operate the swing function of the crane:

Swing Brake Pedal

The swing brake pedal is used to stop rotation of the upper over the carrier. To apply the swing brake, push down on the swing brake foot pedal. To release the swing brake, release the swing brake foot pedal.

Swing Control Lever

The control lever, on the left side of the operator's seat, is used to operate the swing function of the upper. Move the control lever to the  position to swing left; move it to the  position to swing right.

 **WARNING**

Do not exceed maximum boom angles listed on the "Backward Stability – Maximum Boom Angle" chart in the Crane Rating Manual or the Backward Stability label in the operator's cab. Crane may tip over backwards causing personal injury and/or crane damage.

To Swing The Upper

1. Compare the boom configuration and length to the capacity chart in the Crane Rating Manual. Position the boom safely within the limits specified on the capacity chart.
2. Ensure that all personnel are out of the swing path. Dangerous pinch points are created during swinging.

 **DANGER**

Swing slowly and cautiously. Watch for centrifugal force. Out swing of a load increases the load radius and thus decreases capacity. Load out swing may result in tipping or damaging the crane.

All personnel and equipment must be out of the path of the rotating upper. Failure to do so could result in severe personal injury or major equipment damage.

3. Fully apply the swing brake pedal and release the swing park brake and/or swing lock(s).
4. Release the swing brake pedal and begin to engage the swing control lever.

To Stop Upper Swing

1. Ease swing control lever into the neutral position.
2. Apply the swing brake to bring the upper to a complete stop.
3. Engage the swing park brake as required.
4. Check engagement of the swing park brake by trying to swing right, then left. The upper should not swing.

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Travel Swing Lock

Use the travel swing lock to lock the upper directly over either the front or rear of the carrier. The travel swing lock will engage in these two positions only. Use of the travel swing lock is mandatory when traveling or transporting the crane and during pick and carry operations.

To Release The Travel Swing Lock

1. Fully apply the swing brake pedal.
2. Raise the detent pin and rotate the travel swing lock lever up.

Note: In order to disengage the travel swing lock, it may be necessary to swing the upper slightly to relieve the pressure on the swing lock pin.

3. Release the detent pin into the top detent. The lever should remain in the released  position.

To Engage The Travel Swing Lock

1. Position the upper directly over either the front or rear of the carrier. Fully apply swing brake pedal.
2. Raise the detent pin and rotate the travel swing lock lever down. Release the detent pin into the bottom detent. The lever should remain in the locked  position.

Note: In order to engage the travel swing lock, it may be necessary to swing the upper slightly to align the swing lock pin and retaining ring on the carrier deck.

3. Check the engagement of the travel swing lock by trying to swing the upper right, then left. The upper should not swing.

Swing Park Brake

The swing park brake button/toggle switch  is located on a control lever in the left seat console. Refer to Figure 1–42. The swing park brake is a multiple disc type brake and is used for holding the upper, in any position, over the carrier during normal crane operations. An indicator light on the Pulse Crane Control System Display will illuminate when the swing park brake is applied.

Note: The swing park brake will automatically apply if the engine stops.

CAUTION

Do not leave the swing park brake applied during pick and carry operations or when traveling the crane. Use the travel swing lock. Failure to release the swing park brake during these operations may result in damage to the swing mechanism.

To Release The Swing Park Brake:

1. Fully apply the swing brake pedal. Refer to Figure 1–70.
2. Press the swing park brake button/toggle switch  on the swing control lever in the left console. Refer to Figure 1–72. The swing park brake indicator light  on the Pulse Crane Control System Display will go out.

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To Apply The Swing Park Brake:

1. Rotate the upper to the desired position over the carrier. Apply the swing brake pedal to bring the upper to a complete stop. Refer to Figure 1–70.
2. Press the swing park brake button/toggle switch  on the swing control lever in the left console. Refer to Figure 1–72. The swing park brake indicator light  will illuminate on the Pulse Crane Control System Display.

CAUTION

Do not attempt to apply swing park brake with the upper in motion. This practice will result in damage to the swing mechanism. Use the swing brake pedal to stop rotation of upper.

3. Check engagement of swing park brake by trying to swing the upper right, then left. The upper should not swing.



DANGER

Swing slowly and cautiously. Watch out for centrifugal force. Out swing of a load increases the load radius and thus decreases capacity. Load out swing may result in tipping or damaging the crane.

All personnel and equipment must be out of the path of the rotating upper. Failure to do so could result in serious personnel injury or major equipment damage.

360° Swing Lock

The 360° swing lock, if equipped, is a positive lock against rotation of the upper over the carrier. The upper is mechanically locked by a pawl that engages the gear teeth in the turntable bearing. Use this swing lock during normal, stationary crane operations. Engage the travel swing lock and release the 360° swing lock anytime the crane is used for pick and carry or is traveled or transported.

CAUTION

Do not leave the 360° swing lock engaged during pick and carry operations or when traveling or transporting the crane. Use the travel swing lock. Failure to release the 360° swing lock during these operations may result in damage to the swing mechanism.

To Release The 360° Swing Lock:

1. Fully apply the swing brake pedal.
2. Press the 360° swing lock switch. All LED indicators on the switch will cease to illuminate. The 360° swing lock indicator on the Pulse Crane Control System Display will cease to illuminate.

To Engage The 360° Swing Lock:

1. Rotate the upper to the desired position over the carrier. Apply the swing brake pedal to bring the upper to a complete stop.

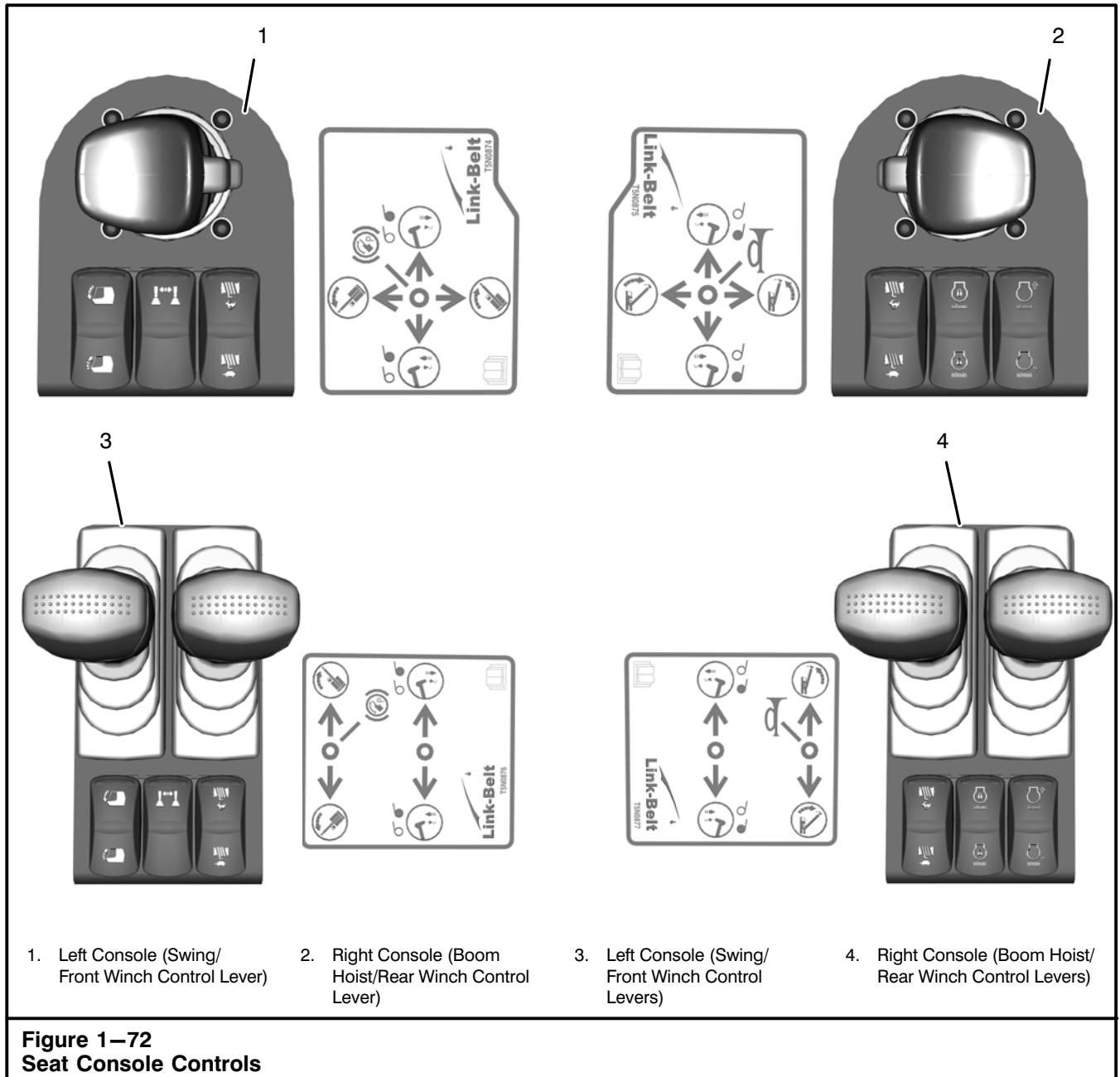
CAUTION

Do not attempt to engage 360° swing lock with the upper in motion. This practice will result in damage to the swing mechanism. Use swing brake pedal to stop rotation of the upper.

2. Press the 360° swing lock switch. All LED indicators on the switch will illuminate. The 360° swing lock indicator on the Pulse Crane Control System Display will illuminate.

Note: Flashing LED indicators on the switch and the Pulse Crane Control System Display indicates that the 360° swing lock is not fully engaged. In order to engage the 360° swing lock, it may be necessary to swing the upper slightly to allow the swing lock pawl to engage in the turntable gear teeth.

3. Check engagement of 360° swing lock by trying to swing upper right, then left. The upper should not swing.



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Wire Rope Winch System

This system controls raising and lowering the winch lines. The system is equipped with a two speed motor that, when activated, will approximately double winch line speed. The controls for the system are shown in Figure 1–70 or Figure 1–72 . Review the following for control descriptions and brief summary of operation.

CAUTION

When the hoist line is tied off to the crane or any solid object, the winch system can be overloaded causing major winch, wire rope, or crane damage. Do not extend boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum to prevent tension on the wire rope.

CAUTION

Cold weather operation of the winch requires a warm-up procedure. Failure to properly warm-up the winch may result in brake slippage. Warm-up the winch before beginning crane operations.

Warm-Up Procedure

A warm-up procedure is recommended at each start-up and is essential at ambient temperatures below 40°F (4°C). Allow the engine to run at idle speed, with winch control lever(s) in neutral, for several minutes. Once the hydraulic oil begins to warm, operate the winch at low speed, with no load, lifting and lowering only the hook block or hook ball until warm oil circulates throughout the winch.



WARNING

The weight of the load must be known before making a lift. Compare the load weight to the appropriate capacity chart in the Crane Rating Manual to ensure compliance with capacity ratings. Compare the load weight to the Wire Rope Capacity chart in the Crane Rating Manual to determine the number of parts of line required to lift the load. Rig and set up the crane to ensure compliance with both the appropriate crane capacity chart and Wire Rope Capacity chart in the Crane Rating Manual. Properly set the Rated Capacity Limiter to the correct crane configuration.

Do not lift a load to the point where the hook block, hook ball and/or the load contacts the head machinery. “Two blocking” could damage the hook block, hook ball, wire rope, and/or the head machinery. Always keep the hook block, hook ball, and/or the load a safe distance from the boom.

Front Winch Control Lever (If Equipped)

This lever controls the front winch drum. Pull this control lever back to the  position to lift the load. Push this control lever forward to the  position to lower the load. Refer to “Winch Operation” for more specific instructions.

Rear Winch Control Lever

This lever controls the rear winch drum. Pull this control lever back to the  position to lift the load. Push this control lever forward to the  position to lower the load. Refer to “Winch Operation” for more specific instructions.

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Winch Operation

The following is a brief description of the basic procedure for operating the wire rope winch. Crane operations are to be performed only by a qualified operator who has read and fully understands the entire content of this manual.

To Lift A Load: Attach the hook block or hook ball to the load. Position head machinery directly above the load, and pull the control lever back toward the operator.

Note: When both winch levers are activated simultaneously, the winch line requiring the most line pull may not function.

To Hold A Load: Return the control lever to the neutral position. The automatic brake in the winch system will hold the load in position.

To Lower A Load: Push the control lever forward. Return the control lever to neutral to stop the load.

Winch Control Switch(es)

This switch is used to control engaging/disengaging the high/low speed hoist. Refer to Figure 1–72. The LED indicator on the switch(es) will illuminate amber when high speed hoist is engaged and blue when low speed hoist is engaged.

High Speed Hoist Or Lower

Move the control lever to the neutral position to bring the load to a complete stop. Press the winch control switch to the high speed (H) position. Move the control lever to the (H) or (L) position. The high speed hoist will activate after engaging the control lever. Refer to Figure 1–70.

Note: Using the high speed hoist reduces the maximum line pull by approximately one half. It is recommended that the high speed hoist button be activated before engaging the winch control lever(s).



WARNING

Do not activate the high speed hoist if the line pull exceeds the available high speed winch line pull. Crane damage can occur. Always refer to the Crane Rating Manual for the winch available line pulls before lifting or lowering any load.

To Return To Standard Winch Mode: Move the control lever to the neutral position to bring the load to a complete stop. Press winch control switch(es) to the low speed (L) position. Move the control lever to the (H) or (L) position. Standard winch mode will activate after engaging the control lever(s).

Winch Disable

Press the winch control switch(es) (D) to the disable the winch(es) to prevent inadvertent operation of the winch(es) while using the control levers to perform other operations. All LED indicators on the switch will illuminate when disabled.

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Drum Rotation Indicators

This system is used to monitor winch drum speeds through the use of an audible signaling devices in the cab. To activate the system, push the drum rotation indicator switch , on the upper right control panel (Figure 1–70), to the “ON” position. All indicators on the switch will illuminate when activated. As the winch drum rotates, an audible alarm will be sound on the side of the cab corresponding to the controller being used. The frequency of the audible signal is a direct indication of the winch drum speed. Push the drum rotation indicator switch to deactivate system. All LED indicators on the switch will cease to illuminate.

First Layer/Third Wrap Indicator

The crane is equipped with a first layer/third wrap warning system. This system allows the operator to monitor the wire rope windings on the drum(s). An audible alarm will sound intermittently and “First Layer” will appear in the warning message area of the Pulse Crane Control System Display to alert the operator that the wire rope is down to the first layer on the winch drum(s). When the wire rope is down to the third wrap on the winch drum(s), an audible alarm will sound continuously, and “Third Wrap” will appear in warning message area on the Pulse Crane Control System Display. If enabled and activated, the winch function will also cutout with the third wrap alarm. Refer to First Layer/Third Wrap Calibration in Section 5 of this Operator's Manual for calibration procedures.



WARNING

Three (3) full wraps of wire rope must be maintained on the winch drum(s) at all times during operation. Wire rope failure may occur.

Boom Hoist System

Raising and lowering the boom is controlled by the boom hoist control lever on the right arm rest. Refer to Figure 1–70.



WARNING

Do not exceed maximum boom angles listed on the “Backward Stability – Maximum Boom Angle” chart in the Crane Rating Manual or the Backward Stability label in the operator's cab. Crane may tip over backwards causing personal injury and/or crane damage.

To Raise The Boom (Boom Up): Move the right control lever to the  position.

CAUTION

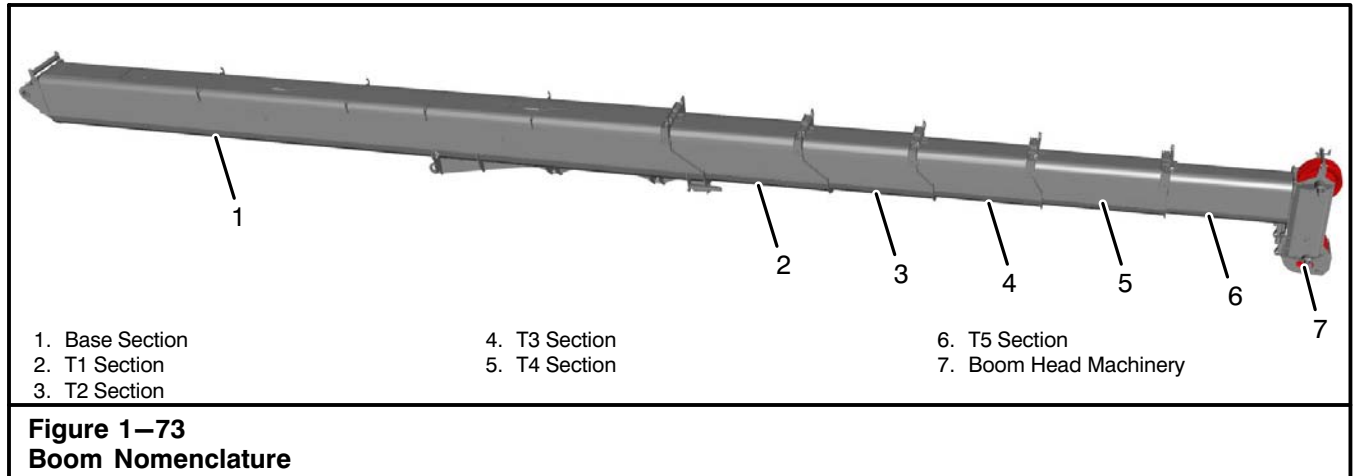
When the hoist line is tied off to the crane or any solid object, the winch system can be overloaded causing major winch, wire rope, or crane damage. Do not extend boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum to prevent tension on the wire rope.

To Lower The Boom (Boom Down): Move the right control lever to the  position.

CAUTION

Wire rope must be spooled off the winch drum as the boom is lowered. Failure to do so may cause two blocking.

To Stop The Boom: Ease the boom hoist control lever to the neutral  position.



Boom Telescope System

The crane is equipped with a six section boom. The six section boom consists of a base, T1, T2, T3, T4 and a T5 section. Refer to Figure 1–73.

One telescope cylinder, one pin cylinder, and one latch cylinder are used to sequentially telescope one section at a time and pin that section to the next adjacent section in one of 3 positions: 0%, 50%, or 100% extension for each section. The operation of these cylinders is a combination of computer control and operator input. The computer controls which section is being extended or retracted, all pinning and unpinning operations, direction, and in some cases the speed of the telescope cylinder. The operator controls whether to extend or retract the boom and the speed at which to extend or retract the boom.

The telescope feature has four modes of operation (Refer to Figure 1–74):

- EM1 extends all sections 100% for a max boom length of 164.10 ft (50.0m).

- EM2 extends T1, T2, and T3 to 100% and T4 and T5 to 50% for a max boom length of 140.30 ft (42.76m).
- EM3 extends T1 to 100% and T2, T3, T4, and T5 to 50% for a maximum boom length of 114.60 ft (34.92m).
- EM4 extends T1, T2, T3, and T4 to 50% for a maximum boom length of 89.5 ft (27.28m). The T5 section remains fully retracted. Maximum rated capacities are only available when all the sections are pinned together or the boom is fully extended.

Note: When utilizing the EM4 boom mode, ensure the boom sections are pinned together or are at the maximum length for boom mode EM4 before lifting the maximum allowable capacity loads. Utilize the boom pinning information in boom telescope animation display on the RCL main working screen to confirm a “Pinned” condition.

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Boom Extend Modes

Boom Length			Telescope Length				
	ft	m	T5	T4	T3	T2	T1
*	38.3	11.67					
	50	15.24	50%				
*	61.7	18.80	100%				
	75	22.86	100%	55%			
*	86	26.21	100%	100%			
	100	30.48	100%	100%	56%		
*	111.2	33.88	100%	100%	100%		
	125	38.10	100%	100%	100%	53%	
*	137.2	41.82	100%	100%	100%	100%	
	150	45.72	100%	100%	100%	100%	48%
*	164.1	50.02	100%	100%	100%	100%	100%

EM 1

Extend

38.30 ft (11.65m)

Base

164.10 ft (50.0m)

T5

T4

T3

T2

T1

Base

Boom Length			Telescope Length				
	ft	m	T5	T4	T3	T2	T1
*	38.3	11.67					
*	50	15.24	50%				
*	62.1	18.94	50%	50%			
	75	22.86	50%	50%	51%		
*	87.3	26.62	50%	50%	100%		
	100	30.48	50%	50%	100%	49%	
*	113.4	34.55	50%	50%	100%	100%	
	125	38.10	50%	50%	100%	100%	44%
*	140.3	42.75	50%	50%	100%	100%	100%

EM 2

Extend

38.30 ft (11.65m)

Base

140.30 ft (42.76m)

T5

T4

T3

T2

T1

Base

Boom Length			Telescope Length				
	ft	m	T5	T4	T3	T2	T1
	38.3	11.67					
	50	15.24	50%				
	62.1	18.94	50%	50%			
	74.7	22.78	50%	50%	50%		
	87.8	26.75	50%	50%	50%	50%	
	100	30.48	50%	50%	50%	50%	46%
	114.6	34.94	50%	50%	50%	50%	100%

EM 3

Extend

38.30 ft (11.65m)

Base

114.60 ft (34.92m)

T5

T4

T3

T2

T1

Base

Boom Length			Telescope Length				
	ft	m	T5	T4	T3	T2	T1
	38.3	11.67					
	50.5	15.38	0%	50%			
	63	19.21	0%	50%	50%		
	76.1	23.18	0%	50%	50%	50%	
	89.5	27.28	0%	50%	50%	50%	50%

EM 4

Extend

38.30 ft (11.65m)

Base

89.5 ft (27.28m)

T4

T3

T2

T1

Base

* Denotes boom lengths charted for main boom and fly capacities.

Figure 1–74
Boom Extend Modes

Boom Telescope Mode Selection

The boom modes can be changed only when the boom is fully retracted (Boom modes will not appear in the display if the boom is not fully retracted). If a boom mode change is attempted before the boom is fully retracted, the message "Retract Boom" will be displayed and the boom mode will not change. To change or select a boom mode, refer to "Rated Capacity Limiter" in this Section of this Operator's Manual. When a boom mode is selected, the telescope controller's first command requires the telescope pedal to be pressed and held to move the telescope cylinder into alignment with the first boom section that is to be extended for the boom mode selected.

This movement of the telescope cylinder must be allowed to finish before any other telescope function can happen. Be patient and allow the system to complete these functions before attempting other functions.

Boom Telescope Control Pedal

The telescope control pedal is in the left front of the operator's cab floor. Refer to Figure 1-70. Depress the toe of the telescope control pedal to extend the boom. Depress the heel of the telescope control pedal to retract the boom.

To Extend The Boom Sections

1. Park the crane on a firm level surface, engage the park brake, and shift the transmission to neutral.
2. Review the appropriate capacity chart in the Crane Rating Manual to establish boom length, angle, and load limitations.
3. Set the Rated Capacity Limiter to the desired telescope mode. Refer to "Rated Capacity Limiter" in this Section of this Operator's Manual.

Note: Mode changes can only be made when the boom is fully retracted. When a mode change is selected, the computer requires the telescope pedal to be pressed and held to move the telescope cylinder to line up with the first section to be extended. Allow this operation to finish before continuing. If a boom mode change is attempted before boom is fully retracted, the message "Retract Boom" will be displayed in the Boom Controller Message area on the RCL main working screen and the boom mode will not change.

CAUTION

When the hoist line is tied off to the crane or any solid object, the winch system can be overloaded causing major winch, wire rope, or crane damage. Do not extend boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum to prevent tension on the wire rope.

CAUTION

Wire rope must be spooled off the winch drum as the boom is extended. Failure to do so may cause two blocking.

4. Depress the toe of the telescope control pedal to extend the boom. Allow time for the telescope cylinder to latch to the correct section and pull the pin between sections. The computer will then accelerate the boom section up to a speed proportional to the amount the telescope pedal is depressed. Releasing the pedal will stop telescope operation.

Note: The telescope control pedal is spring loaded and should return to the neutral position when released.

Note: In very cold weather, the latch and pin cylinder will not function as fast as normal due to the change in the viscosity of the hydraulic oil. Allow extra time for this function in very cold weather.

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5. Depressing the toe of the pedal will begin telescoping. When the section nears the point where the section will be pinned to the adjacent section, the computer automatically slows down the speed of the telescope cylinder. It is not necessary to remove your foot from the pedal or reduce the amount the pedal is depressed, this is done automatically. The section will actually be extended slightly past the pinning point and then slowly reverse direction to gently load up the pin and unload the latches that attach the telescope cylinder to the section being extended.

Note: The boom telescope animation display on the RCL main working screen provides visual feedback about what is occurring while telescoping the boom. Refer to **Rated Capacity Limiter System** in this Section of the Operator's Manual for normal boom operation and fault messages.

CAUTION

If a load is suspended while telescoping, the load will lower slightly during the pinning operation. This is more noticeable with a single part of line.

6. Continue to depress the toe of the telescope control pedal until the desired boom length is achieved. When the desired boom length is achieved release the telescope control pedal.

To Retract The Boom Sections

1. Depress the heel of the telescope control pedal.

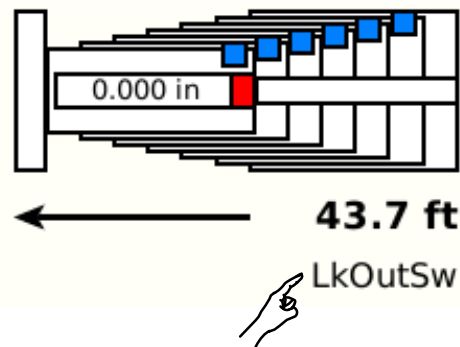
Note: As the boom is retracted, the hook block or hook ball will lower. Winch up as required to keep the hook block or hook ball in the desired position.

Note: In very cold weather, the latch and pin cylinder will not function as fast as normal due to the change in the viscosity of the hydraulic oil. Allow extra time for this function in very cold weather.

Boom Operating And Error Messages

Boom Operating And Error Messages

The boom message area on the RCL working screen will display normal boom operating messages and any active error message. Refer to "Boom Controller Messages" in this section of this Operator's Manual for telescope control states.

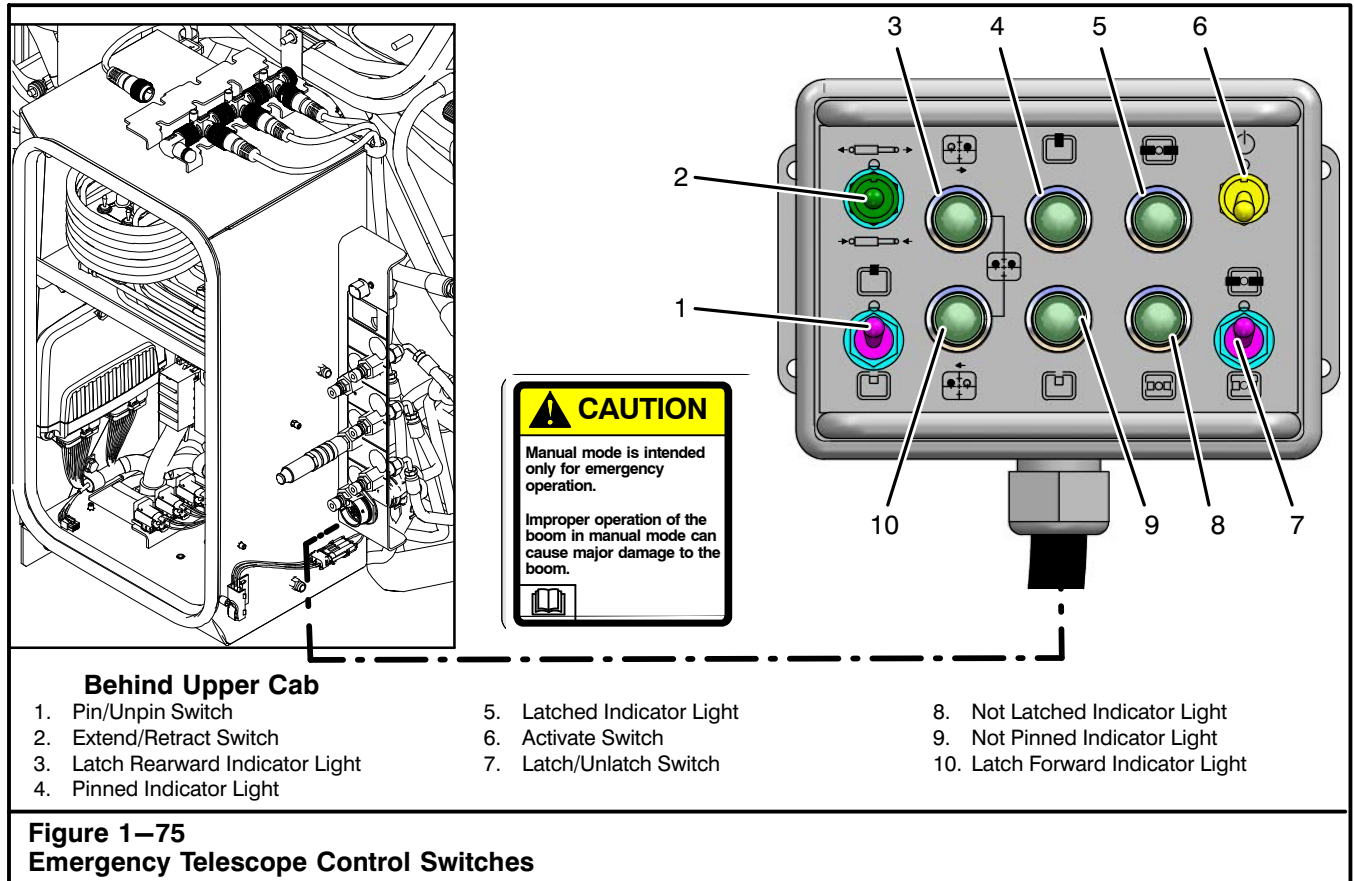


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Boom Controller Messages		
StopExt	Boom Stop Extend	Boom has finished extending. No further action is required.
E_PLB	Extend – Pin Latch Bottom During boom extend operation, pin/latch state is PINNED and NOT LATCHED.	Telescope cylinder is centering the latches in the next section to extend.
E_Ext	Extend – Boom Extend Extending boom at speed proportional to extend pedal input.	Section is LATCHED to telescope cylinder and NOT PINNED. Boom will not enter this condition unless pin/latch state is NOT PINNED and LATCHED.
E_PLT	Extend – Pin Latch Top During boom extend operation, pin/latch state is PINNED and LATCHED.	Pin should be fully engaged in the hole and the telescope cylinder is retracting to gently load up the pin and unload the latches so they disengage from the section.
E_Ret	Extend – Cylinder Retract Telescope cylinder is retracting at maximum speed to line up with the next section to be extended.	Boom is PINNED and NOT LATCHED. Telescope cylinder moves at speed proportional to pedal position within retract range. Boom will not enter this condition unless pin/latch state is PINNED and NOT LATCHED.
StopRet	Boom Stop Retract	Boom has finished retracting. No further action is required. This is only shown during a boom mode change.
R_PLB	Retract – Pin Latch Bottom During boom retract operation, pin/latch state is PINNED and LATCHED.	Pin should be fully engaged in the pin hole in the adjacent boom section and the telescope cylinder is centering the latches to unload them so they disengage from the section.
R_Ext	Retract – Boom Extend Retracting boom at speed proportional to retract pedal input.	Boom section is LATCHED to telescope cylinder and NOT PINNED. Boom will not enter this condition unless pin/latch state is NOT PINNED and LATCHED.
R_PLT	Retract – Pin Latch Top During boom retract operation, pin/latch state is PINNED and NOT LATCHED.	Telescope cylinder is centering the latches in the next section to retract.
R_Ret	Retract – Cylinder Retract Telescope cylinder is extending at maximum speed to line up with the next section to be retracted.	Boom is PINNED and NOT LATCHED. Telescope cylinder moves at maximum speed regardless of pedal position within retract range. Boom will not enter this condition unless pin/latch state is PINNED and NOT LATCHED.
Wt4Pin	Wait for PINNED signal	Telescope cylinder has reached the pinning location and stopped moving. Cylinder is Latched and state has changed to PINNED. Computer is waiting for a PINNED switch signal.
Wt4PPul	Wait for NOT PINNED signal	Telescope cylinder is Latched to the boom section and has unloaded the pin. Cylinder movement is stopped. Computer is waiting for a NOT PINNED switch signal.
Wt4Ltch	Wait for LATCHED signal	Telescope cylinder is centered on the latching location and stopped moving. State has changed to LATCHED. Computer is waiting for a LATCHED switch signal.

Operator's Manual

Boom Controller Messages		
Wt4LPul	Wait for NOT LATCHED signal	Telescope cylinder is centered on the latching location and stopped moving. The boom section is PINNED to the adjacent section. State has changed to NOT LATCHED. Computer is waiting for a NOT LATCHED switch signal.
Re-Zero	Re-Zero telescoping boom	A switch error has occurred causing the possibility of incorrect boom extension. Manually retract all the boom sections and retract the telescope cylinder until it bottoms out while PINNED and NOT LATCHED. Re-Zero the length of the telescope cylinder at this point. This resets the boom length and cylinder location.
Neutral	Telescope pedal is centered.	No input from the operator is being sensed by the controller.
Release	Pin and unlatch from incorrect section	Telescope cylinder is not lined up with correct section to be moved. Controller is automatically pinning and unlatching from the incorrect section and moving to line up with correct section.
ExtSlwL	Slow Extend while latching and not pinning	Unpinning a boom section that is incorrectly pinned to the adjacent boom section upon startup of the crane.
LkOutSw	Function lockout switch is activated	Function lockout switch is activated.
ArmRest	Arm rest switch is activated	The arm rest is up causing functions to be disabled.
PdICtr?	Telescope foot pedal is not centered when expected	Telescope foot pedal is not centered upon crane startup.
AutoSRB	(Automatic) slow retract button	During extend mode changes the telescope cylinder pins off the section it is currently attached to and goes to the correct boom section.
AutoPLB	(Automatic) slow pin-latch button	During extend mode changes the telescope cylinder pins off the section it is currently attached to and goes to the correct boom section.
ovrLoad	Overload condition is active and extend function is disabled	Winch down, boom hoist up or retract boom to reduce load.
atbKo	ATB is triggered and extend function is disabled	Winch down or retract boom.
flyKo	Fly extend sensor is triggered and extend function is disabled	Retract boom.



Emergency Telescope Operation

WARNING

Manual mode is intended for emergency operation and service requirements only. Improper operation of the boom in manual mode can damage internal components of the boom. This can lead to crane damage, property damage, or possibly personal injury.

The crane has been designed with the ability to telescope the boom manually. This is intended only for emergency operations and service requirements. Note the following restrictions:

- Do not telescope the boom in manual mode with a load on the hook. Set the load down before telescoping.
- Use the holes provided in the side of each boom section to visually check to ensure that pins and latches are fully engaged or disengaged before moving boom sections or the telescope cylinder.
- Clear all unauthorized personnel from the area surrounding the crane. Ensure that all authorized personnel are well out of the way of all moving parts.

The emergency telescope control switches are on a boom telescope remote control box stored in the upper power panel. To enable the switches, connect the cord to the electrical connector next to the upper power panel. To enable the extend/retract and pin/latch switches, move and hold the activate switch to the "ACTIVATE" (I) position. Refer to Figure 1-75.

WARNING

When the emergency telescope control box is connected to the upper, the RCL System automatically changes to rigging mode. The RCL System is not operational when in the rigging Mode. Disconnect the remote control box, turn the ignition switch to the "OFF" position, and return the RCL System to normal operation before operating the crane.

When the emergency telescope control box is connected to the upper, the RCL System automatically changes to the rigging mode. All function limiters except anti-two block are disabled when the RCL is in the rigging mode through the telescope control box.

If the remote control box is unplugged in a different condition than when it was plugged in, it will require zeroing the telescope cylinder. Contact your Link-Belt distributor to properly zero the cylinder.

Operator's Manual

To Manually Retract A Boom Section



WARNING

Manual mode is intended for emergency operation and service requirements only. Improper operation of the boom in manual mode can damage internal components of the boom. This can lead to crane damage, property damage, or possibly personal injury.

1. If the telescope cylinder is not already latched to the section to be retracted, push the Pin/Unpin switch to the PIN  position and visually check to ensure the pin cylinder is all the way up. PINNED indicator light  should illuminate.
2. Push the Latch/Unlatch switch to the UNLATCH  position and visually check to ensure that the telescope cylinder is not latched to a section. NOT LATCHED indicator light  should illuminate.
3. Push the Extend/Retract switch to telescope the cylinder until the latches are centered with the holes in the rear of the section to be retracted. The LATCH FORWARD and LATCH REARWARD indicator lights will illuminate when the latches are centered with the holes in the rear of the section. Refer to the following chart for approximate telescope cylinder positions.

Extend Mode	Boom Length (ft)	Boom Length (m)	Telescope Cylinder Length (in)	Telescope Cylinder Length (cm)
	±0.25 ft	±0.08 m	±0.25 in	±0.64 cm
EM1	164.1	50.02	324.38	823.93
	137.2	41.82	324.38	823.93
	111.2	33.89	324.38	823.93
	86.0	26.21	324.38	823.93
EM2	140.3	42.76	324.38	823.93
	113.4	34.56	324.38	823.93
	87.3	26.61	324.38	823.93
	62.1	18.93	178.48	453.34
	50.0	15.24	184.01	467.39
EM3	114.6	34.93	324.38	823.93
	87.8	26.76	168.09	426.95
	74.7	22.77	173.33	440.26
	62.1	18.93	178.48	453.34
	50.0	15.24	184.01	467.39
EM4	89.5	27.28	162.94	413.87
	76.1	23.20	168.09	426.95
	63.0	19.20	173.33	440.26
	50.5	15.39	178.48	453.34

4. Push the Latch/Unlatch switch to the LATCH  position and visually check to ensure that the latches have fully engaged the section. LATCHED indicator light  should illuminate.
5. Push and hold the Extend/Retract switch to telescope the cylinder in or out slightly as needed to allow the latches to fully engage the section if the latch light does not illuminate.
6. When the latches are fully engaged (LATCHED indicator light illuminated), telescope the cylinder out approximately 3 inches (7.62cm) to unload the pin.
7. Push the Pin/Unpin switch to the UNPIN  position and visually check to ensure that the pin has fully disengaged from the adjacent boom section. The pin will pull when it is unloaded. NOT PINNED indicator light  should illuminate.
8. When the pin is pulled, the section can be retracted. Winch up while retracting the section to maintain tension on the wire rope so it will spool correctly.
9. When the section is fully retracted, push the Pin/Unpin switch to the PIN  position. PINNED indicator light  should illuminate.
10. Extend or retract the cylinder until the LATCH FORWARD and LATCH REARWARD indicator lights illuminate. Push the Latch/Unlatch switch to the UNLATCH  position and visually check to ensure that the latches are fully disengaged from the section before retracting another section. NOT LATCHED indicator light  should illuminate.
11. Repeat this operation until boom is fully retracted.
12. Disconnect remote control box and return the RCL System to normal operation before operating the crane.

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To Manually Extend A Boom Section



WARNING

Manual mode is intended for emergency operation and service requirements only. Improper operation of the boom in manual mode can damage internal components of the boom. This can lead to crane damage, property damage, or possibly personal injury.

1. If the telescope cylinder is not already latched to the section to be extended, push the Pin/Unpin switch to the PIN  position and visually check to ensure the pin cylinder is all the way up. PINNED indicator light  should illuminate.
2. Push the Latch/Unlatch switch to the UNLATCH  position and visually check to ensure that the telescope cylinder is not latched to a section. NOT LATCHED indicator light  should illuminate.
3. Push the Extend/Retract switch to telescope the cylinder until the latches are centered with the holes in the rear of the section to be extended. The LATCH FORWARD AND LATCH REARWARD indicator lights will illuminate when the latches are centered with the holes in the rear of the section. Refer to the following chart for approximate telescope cylinder positions.

Extend Mode	Boom Length (ft)	Boom Length (m)	Telescope Cylinder Length (in)	Telescope Cylinder Length (cm)
	±0.25 ft	±0.08 m	±0.25 in	±0.64 cm
EM1	38.3	11.67	42.95	823.93
	61.7	18.81	31.96	823.93
	86.0	26.21	21.58	823.93
	111.2	33.89	11.2	823.93
	137.2	41.82	0.82	823.93
EM2	38.3	11.67	42.95	823.93
	50.0	15.24	31.96	823.93
	62.1	18.93	21.58	823.93
	87.3	26.61	11.20	453.34
	113.4	34.56	0.82	467.39
EM3	38.3	11.67	42.95	823.93
	50.0	15.24	31.96	426.95
	62.1	18.93	21.58	440.26
	74.7	22.77	11.20	453.34
	87.8	26.76	0.82	467.39
EM4	38.3	11.67	31.96	413.87
	50.5	15.39	21.58	426.95
	63.0	19.20	11.20	440.26
	76.1	23.20	0.82	453.34

4. Push the Latch/Unlatch switch to the LATCH  position and visually check to ensure that the latches have fully engaged the section. LATCHED indicator light  should illuminate.

5. Push the Extend/Retract switch to telescope the cylinder in or out slightly as needed to allow the latches to fully engage the section if the latch light does not illuminate.
6. When the latches are fully engaged (LATCHED indicator light illuminated), retract the cylinder until it bottoms out to unload the pin.
7. Push the Pin/Unpin switch to the UNPIN  position and visually check to ensure that the pin has fully disengaged from the adjacent boom section. The pin will pull when it is unloaded. NOT PINNED indicator light  should illuminate.

CAUTION

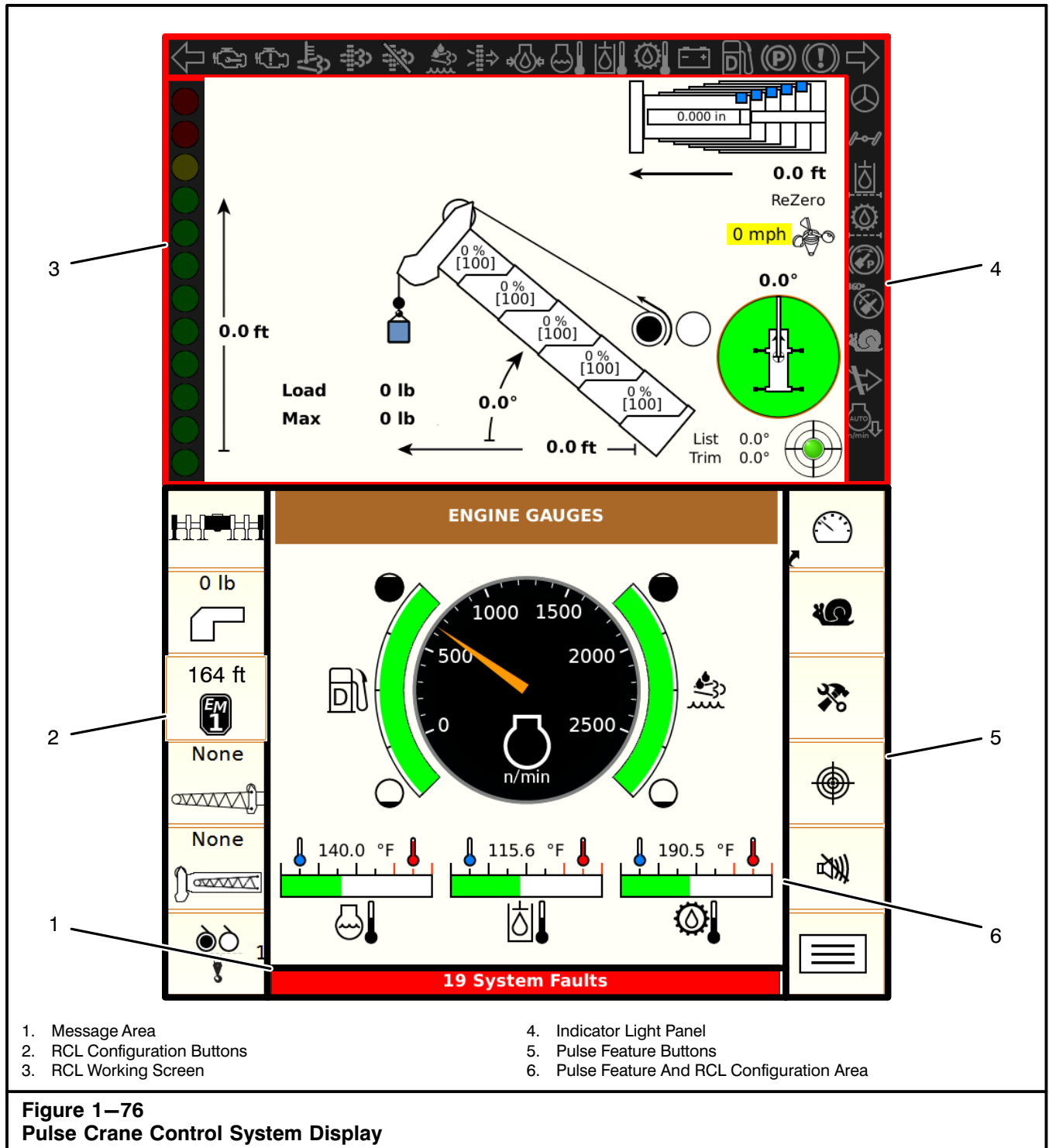
Wire rope must be spooled off the winch drum(s) as the boom is extended. Failure to do so may cause two blocking.

8. When the pin is pulled the section can be extended. Winch down while extending the section to avoid two blocking.
9. At the telescope cylinder length on the chart below, push the Pin/Unpin switch to the PIN  position and continue to extend the boom section until the pin engages into the hole. PINNED indicator light  should illuminate.

Extend Mode	Boom Length (ft)	Boom Length (m)	Telescope Cylinder Length (in)	Telescope Cylinder Length (cm)
	±0.25 ft	±0.08 m	±0.25 in	±0.64 cm
EM1	164.1	50.02	324.38	823.93
	137.2	41.82	324.38	823.93
	111.2	33.89	324.38	823.93
	86.0	26.21	324.38	823.93
	140.3	42.76	324.38	823.93
EM2	113.4	34.56	324.38	823.93
	87.3	26.61	324.38	823.93
	62.1	18.93	178.48	453.34
	50.0	15.24	184.01	467.39
	114.6	34.93	324.38	823.93
EM3	87.8	26.76	168.09	426.95
	74.7	22.77	173.33	440.26
	62.1	18.93	178.48	453.34
	50.0	15.24	184.01	467.39
	89.5	27.28	162.94	413.87
EM4	76.1	23.20	168.09	426.95
	63.0	19.20	173.33	440.26
	50.5	15.39	178.48	453.34

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10. Visually check to verify that the pin has fully engaged the pin hole. If it has not engaged the pin hole, telescope the cylinder in the direction required to align the pin with the hole.
11. Retract the cylinder to load up the pin. If this is done at a high boom angle further retraction of the cylinder will unload the latches and allow them to disengage from the section. If this is done at a low boom angle, the cylinder must be extended slightly to unload the latches and allow them to disengage from the section.
12. Push the Extend/Retract switch to telescope the cylinder until the latches are centered with the holes in the rear of the section to be extended. The LATCH FORWARD and LATCH REARWARD indicator lights will illuminate when the latches are centered with the holes in the rear of the section.
13. Push the Latch/Unlatch switch to the UNLATCH  position and visually check to ensure that the telescope cylinder is not latched to a section. NOT LATCHED indicator light  should illuminate.
14. When the cylinder is disengaged from the section, it can be retracted to align with the next section to be extended and the process can be repeated to extend other boom sections as required.
15. Disconnect remote control box and return the RCL System to normal operation before operating the crane.



Pulse Crane Control System

The pulse crane control system provides interaction and feedback for the RCL, crane controls, and engine.

While viewing RCL information and important system indicator lights, an operator can switch between different crane configurations, system diagnostics, and system features.

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Pulse Crane Control System Display

The Pulse Crane Control System Display is comprised of the following components:

1. Message Area

The Message Area displays text messages of various alarms which may occur during normal operation of the system. When an alarm occurs, the rectangular area fills in a color corresponding to the message. The Message Area will only appear when there is an active message.

2. RCL Configuration Buttons

The RCL Configuration Buttons can be used to directly access configuration menus and screens from any screen in the Pulse Feature And RCL Configuration Area. Refer to "RCL Configuration Buttons" in this section of this Operator's Manual.

3. RCL Working Screen

The RCL Working Screen displays the current crane configuration. Refer to "RCL Working Screen" in this section of this Operator's Manual.

4. Indicator Light Panel

The Indicator Light Panel contains crane system indicator and warning lights. Refer to "Indicator Light Panel" in this section of this Operator's Manual.

5. Pulse Feature Buttons

The Pulse Feature Buttons can be used to serve a quick function to directly access menus and screens from any screen in the Pulse Feature And RCL Configuration Area. Refer to "Pulse Feature Buttons" in this section of this Operator's Manual.

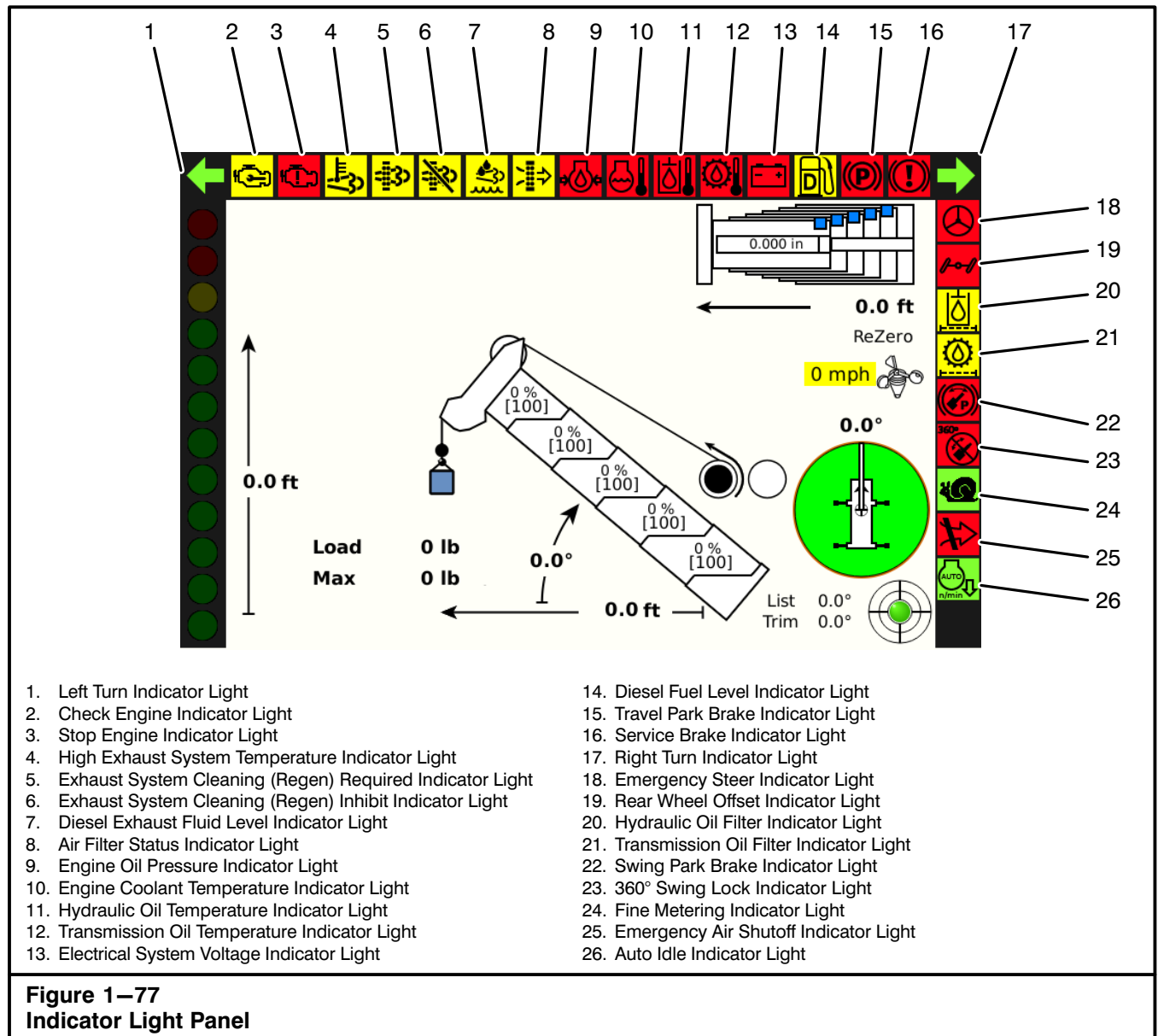
6. Pulse Feature And RCL Configuration Area

The Pulse Feature And RCL Configuration Area is the area of the Pulse Crane Control System Display that displays menus and screens used to navigate the pulse feature and RCL configuration. Refer to "Pulse Feature And RCL Configuration Area" in this section of this Operator's Manual.

Pulse Screen Cleaning and Care

It is advised that the following cleaning instructions and precautions are practiced to ensure proper and reliable functionality over time:

- Wipe the device clean from dirt using a soft, light damp cloth, preferably of microfiber type.
- Avoid using alkaline, alcoholic or other chemicals for cleaning; doing so may damage the device. However, a small amount of isopropyl alcohol may be used for removing harsh stains.
- Never spray or apply water or alcohol directly to the device. Instead, dampen the cloth lightly before using it to clean the device.
- After cleaning, ensure the device surface is left dry.
- Never use high-pressure air, water, or steam to clean the device.



Indicator Light Panel

The following is a description of the indicator lights on the Pulse Crane Control System Display. Use them along with Figure 1-77.

1. Left Turn Indicator Light



This indicates that the left turn light has been activated.

2. Check Engine Indicator Light



This yellow indicator light will illuminate along with an error message in the Message Area to make the operator aware of minor engine problems. When this light illuminates, engine operation may continue. However, refer to the engine manufacturer's manual and determine the problem as soon as possible to avoid prolonged operation of the malfunctioning engine, which could develop into a major problem.

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3. Stop Engine Indicator Light



This red indicator light will illuminate along with an alarm buzzer and an error message in the Message Area to alert the operator of major engine problems. When this light illuminates, stop operations immediately and shutdown the engine. Refer to the engine manufacturer's manual and determine the problem before any further operation of the engine.

4. High Exhaust System Temperature Indicator Light



This yellow indicator light will illuminate during the Exhaust System Cleaning Operation to alert the operator of a high exhaust system temperature. Refer to "Exhaust System Cleaning" in this section of this Operator's Manual.

5. Exhaust Cleaning (Regen) Required Indicator Light



This yellow indicator light will illuminate when an automatic cleaning of the exhaust system is required but can not occur. It will also flash during manual stationary Exhaust System Cleaning Operation. Refer to "Exhaust System Cleaning" in this section of this Operator's Manual.

6. Exhaust Cleaning (Regen) Inhibit Indicator Light



This yellow indicator light will illuminate when the exhaust cleaning inhibit is activated, which will prevent automatic Exhaust System Cleaning Operation. Refer to "Exhaust System Cleaning" in this section of this Operator's Manual.

7. Diesel Exhaust Fluid Level Indicator Light



This yellow indicator light will illuminate when the diesel exhaust fluid is running low. Refer to "Exhaust System Cleaning" in this section of this Operator's Manual.

8. Air Filter Status Indicator Light



This yellow indicator light will illuminate along with an error in the Message Area to alert the operator that the air filter is restricted and requires replacement. Once this light illuminates, the air cleaner must be serviced immediately. Refer to "Engine Air Cleaner" in Section 2 of this Operator's Manual for instructions on changing the air cleaner filter.

9. Engine Oil Pressure Indicator Light



This red indicator light will illuminate along with an alarm buzzer to alert the operator that the engine oil pressure is not within normal operating range. For proper oil pressure operating range, refer to the engine manufacturer's manual. If there is no engine oil pressure after 10–15 seconds of running time, shut down the engine immediately and repair the problem to avoid major engine damage.

10. Engine Coolant Temperature Indicator Light



This red indicator light will illuminate along with an alarm buzzer to alert the operator that the engine cooling system temperature exceeds the maximum operating temperature. For proper cooling system operating temperature range, refer to the engine manufacturer's manual. If the cooling system overheats, reduce the engine speed until the temperature returns to normal operating range. If engine temperature does not return to normal temperature, refer to engine manufacturer's manual. When the coolant temperature exceeds normal operating range, the engine stop engine indicator light will also illuminate.

11. Hydraulic Oil Temperature Indicator Light



This red indicator light will illuminate and an audio alarm will sound if the hydraulic oil temperature exceeds the maximum operating temperature. If the system overheats, shutdown the crane and immediately correct the problem. Refer to Section 2 of this Operator's Manual for proper oil viscosities and operating temperature ranges.

12. Transmission Oil Temperature Indicator Light



This red indicator light will illuminate and an audio alarm will sound if the transmission oil temperature is equal to or greater than 240 degrees Fahrenheit.

13. Electrical System Voltage Indicator Light



This red indicator light will illuminate and an audio alarm will sound when the voltage is not within normal operating range.

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14. Diesel Fuel Level Indicator Light



This yellow indicator light will illuminate and an audio alarm will sound when the level of diesel fuel in the fuel tank is low. The diesel fuel tank capacity is 73 gal (276.3L). Refer to the engine manufacturer's manual for the correct grade of diesel fuels.

15. Travel Park Brake Indicator Light



This red indicator light will illuminate when the travel park brake is activated.

16. Service Brake Indicator Light



This red indicator light illuminates when the service brake pressure switch is closed, indicating low brake pressure.

17. Right Turn Indicator Light



This indicates that the right turn light has been activated.

18. Emergency Steer Indicator Light



This red indicator light illuminates when the steering pressure switch is closed, indicating low steering pressure.

19. Rear Wheel Offset Indicator Light



This red indicator light will illuminate when the rear wheels are offset.

20. Hydraulic Oil Filter Indicator Light



This yellow indicator light will illuminate when the hydraulic reservoir filter requires replacement.

21. Transmission Oil Filter Indicator Light



This yellow indicator light will illuminate when the transmission oil filter requires replacement.

22. Swing Park Brake Indicator Light



This red indicator light will illuminate any time the swing park brake is applied and the ignition switch is on.

23. 360° Swing Lock Indicator Light



This red indicator light will illuminate when the 360° swing lock is fully engaged and will flash when the 360° lock is between fully engaged and fully disengaged.

24. Fine Metering Indicator Light



This green indicator indicator light alerts the operator that the fine metering system has been enabled. Refer to "Fine Metering" in this section of this Operator's Manual.

25. Emergency Air Shutoff Indicator Light



This red indicator light will illuminate to alert the operator that the emergency air shutoff valve has been closed and the engine cannot be restarted until the valve is reset.

26. Auto Idle Indicator Light



This light blinks when the auto idle feature has been enabled, engine coolant temperature is above 150° F, throttle lock is set and no functions have been operated for 10 seconds. Once the crane functions are neutral for 15 seconds, the light will illuminate green, at which point, the RPM will drop to idle. Refer to "Auto Idle System" in this section of this Operator's Manual.

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Rated Capacity Limiter

The following describes the function and operation of the Rated Capacity Limiter (RCL). The system is intended to aid the operator in the efficient operation of the crane by continually monitoring the load and warning of an approach to an overload or unsafe condition.

WARNING

Although the system will alert the operator of an approaching overload or unsafe condition, it remains the responsibility of the operator to operate the crane safely at all times.

This system must never be substituted for the good judgment of the crane operator using safe operating procedures. The operator is solely responsible for safe operation of the crane.

!!THIS SYSTEM IS AN OPERATOR'S AID – NOT A SAFETY DEVICE!!

System Description

The system monitors crane functions by means of high accuracy sensors and continuously compares the load with a copy of the crane capacity chart which is stored in the computer memory. If an overload is approached, the system warns by means of audible and visual alarms and is configured to cause function limitation. Refer to "RCL Working Screen" in this section of this Operator's Manual.

The Rated Capacity Limiter provides the operator with a continuous display of:

- Rated Capacity
- Actual Load
- Radius of the Load
- Angle of the Main Boom
- Crane Configuration
- Length of the Main Boom
- Height of the Main Boom Head Above the ground

Note: The function of the RCL system is an operational aid to warn or to indicate to the operator when the load being lifted approaches, meets, or exceeds the rated capacity of the crane. The RCL system does not function as a scale or weighing device.

The actual load displayed on the RCL Working Screen is less accurate when the actual load lifted is a small percentage of the allowable load. This typically occurs when lifting light loads with a short boom length at high boom angles. Crane configurations of this type produce low pressures in the boom hoist cylinder resulting in less accuracy of the RCL sensors and calculated load. The RCL load accuracy improves greatly when the actual load lifted approaches the rated load (higher boom hoist cylinder pressures).

An additional feature of the system is the provision of operator alarms. These alarms, when properly set, provide a method of obstacle avoidance. This is achieved by means of maximum boom length, maximum boom angle, maximum load radius, maximum boom head height, left and right swing, and defined area alarms. These alarms can be programmed for each job site and set rapidly for the prevailing site conditions thereby aiding the operator in safe operation of the crane. Refer to "Operator Settable Alarms" in this section of this Operator's Manual.

System Operation

The following is a list of procedures which are used to operate the multiple features of the Rated Capacity Limiter. Refer to "Configuration Selection" in this section of this Operator's Manual.

System Bypass

In emergency situations, the Rated Capacity Limiter computer can be bypassed. There is a RCL Bypass Keyswitch power panel behind the operator's cab, to bypass the system. Refer to Figure 1–78. Move the key to the "RCL BYPASSED" position to bypass the system. For emergency use while the system is bypassed, refer to "System Inoperative or Malfunctioning" in this section of this Operator's Manual.

WARNING

The RCL System is not operational when the computer is bypassed. Bypass the system in emergency situations only.

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System Inoperative Or Malfunctioning

When operational aids are inoperative or malfunctioning, the following recommendations for continued use of the crane should be followed or the crane should be shutdown.

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

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1. RCL Bypass Keyswitch

Figure 1–78
Rated Capacity Limiter Bypass Keyswitch

Cancel Audible Alarm And Reset Function Limiters

The Cancel Alarm Button  is used to cancel the audible alarm when the alarm has occurred as a result of either an overload, a two block alarm, or an operator settable alarm. The audible alarm may be canceled by pressing and releasing the Cancel Alarm Button. Refer to "Pulse Feature Buttons" in this section of this Operator's Manual. The audible alarm remains canceled until the condition which caused the alarm has been removed. For example, if the audible alarm was canceled because of an overload condition, it will remain canceled until the overload condition is removed. However, if a different alarm, e.g. two block condition, were to occur while the audible alarm was canceled for previous overload condition, the new alarm condition would cause the audible alarm to sound.



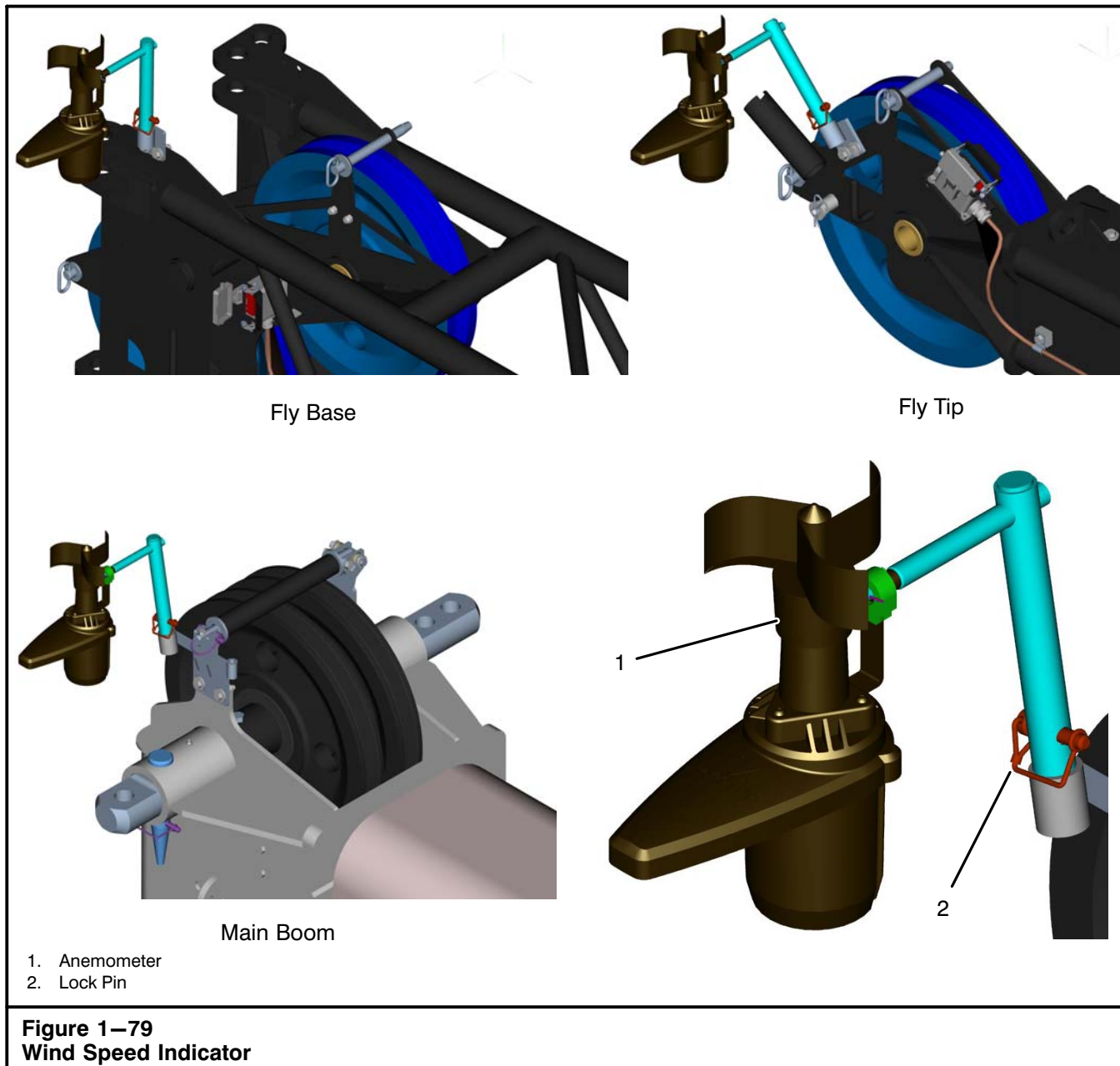
WARNING

Once the function limiters have been by-passed, the crane is no longer protected against the condition that initially caused the function limiters to occur.

Note: The Cancel Alarm feature is a temporary function. The audible alarm or function limit is automatically reset when the condition which caused the alarm is no longer present.

The Cancel Alarm Button is also used to reset the function limiters when it is necessary to by-pass the function limiters which has occurred as a result of either an overload, a two block alarm, or a wire rope limit. Function limiters are reset by pressing and holding the Cancel Alarm Button, after which the function limiters will be reset to allow operation. As long as the button is held, the system will stay in rigging mode and all function limiters will be bypassed.

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Crane Monitoring System

A Crane monitoring system is included to assist the operator in safe operation of the crane. The following systems outline some of the aids used for monitoring crane conditions during operation.

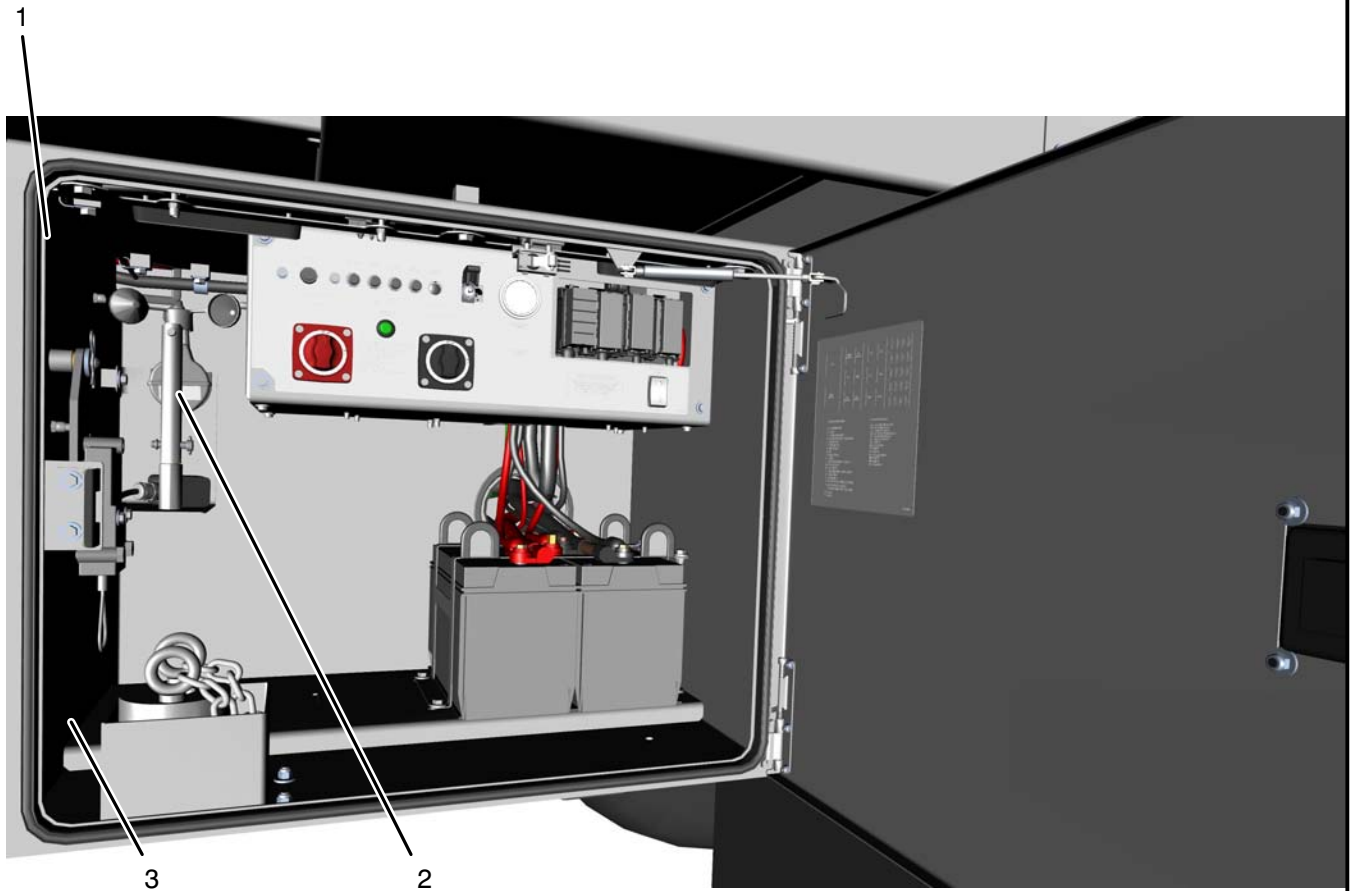
Wind Speed Indicator

The crane may be equipped with a wireless wind speed indicator integrated into the Rated Capacity Limiter system.

The indicator is used to monitor wind speeds at the main boom head or the fly head when erected. Refer to Figure 1–79. An anemometer transmits wind speed data to the display unit in the operator's cab. Refer to "Wind Speed Restrictions" found in the Crane Rating Manual for more information on wind speed restrictions.

CAUTION

Remove the anemometer assembly from the boom head or fly during transport to prevent damage to the unit.



1. ATB Switch Storage

2. Wireless Wind Speed Storage

3. ATB Weight Storage

Figure 1–80
Wind Speed Indicator And ATB Storage

Wind Speed Indicator And ATB Storage

The wind speed indicator, ATB switch, and ATB weight are stored at the left side of the crane, inside the carrier power panel. Refer to Figure 1–80.

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Operating In Wind Or Lightning

Avoid working a crane in high winds and when there is a likelihood of lightning. If you must work in a wind, reduce capacities to those listed in "Wind Restrictions" chart in the Crane Rating Manual. Wind blowing against the load and the boom produces a side load on the boom and reduces its capacity. When lifting loads which have large surface areas in a wind, such as building panels, the movement of the load may pose a danger to workers or building structures. Out swing of a load will increase the load radius, and may overload the crane. This could lead to boom failure or the crane tipping.

Monitor the wind speed using a wind speed indicator or the "Wind Scale" chart below. Stop lifting operations, ground the load and fully retract and lower the boom to a horizontal position if wind speed exceeds the maximum allowed listed in "Wind Restrictions" chart in the Crane Rating Manual.


DANGER

If there is a likelihood of lightning, immediately stop lifting operations, ground the load, and fully retract and lower the boom.

Wind Scale				
Wind Speed		Wind Strength		Inland Wind Effect
mph	km/h	Beaufort Scale	WMO* Description	
0 to 1	0 to 2	0	Calm	Calm, smoke rises vertically.
1 to 3	2 to 5	1	Light Air	Smoke drift indicates wind direction, wind vanes remain still.
4 to 7	6 to 11	2	Light Breeze	Wind felt on face, leaves rustle, wind vanes begin to move.
8 to 12	12 to 19	3	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended.
13 to 18	20 to 29	4	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move.
19 to 24	30 to 39	5	Fresh Breeze	Small trees and leaves begin to sway. Crested waves form on inland waters.
25 to 31	40 to 49	6	Strong Breeze	Larger tree branches moving. Telephone wires whistle. Umbrellas used with difficulty.
32 to 38	50 to 61	7	Near Gale	Whole trees moving. Resistance felt walking against wind.
39 to 46	62 to 74.0	8	Gale	Breaks twigs off trees. Resistance felt walking against wind.
47 to 54	75 to 87	9	Strong Gale	Slight structural damage. Slate blows off roofs.
55 to 63	88 to 101	10	Storm	Trees broken or uprooted. Considerable structural damage.
* World Meteorological Organization				

Operator's Manual

Wind Gusts At Various Heights

The maximum wind speed in the Crane Rating Manual refers to a 3 second gust measured at the boom or fly tip.

Weather reports often report wind speed based on a 10-minute average measured at a height of 10 meters (33 ft). The table below shows the maximum 3 second gust based at various heights based on the 10-minute average:

Beaufort Scale	3	4	5	6	7	8	9	10
V [m/s] (mph)	5.4 (12.1)	7.9 (17.7)	10.7 (23.9)	13.8 (30.9)	17.1 (38.3)	20.7 (46.3)	24.4 (54.6)	28.4 (63.5)
z [m] (ft)	v(z) [m/s] (mph)							
10 (32.8)	7.6 (17)	11.1 (24.8)	15 (33.6)	19.3 (43.2)	23.9 (53.5)	29 (64.9)	34.2 (76.5)	39.8 (89)
20 (65.6)	8.1 (18.1)	11.9 (26.6)	16.1 (36)	20.7 (46.3)	25.7 (57.5)	31.1 (69.6)	36.6 (81.9)	42.7 (95.5)
30 (98.4)	8.5 (19)	12.4 (27.7)	16.8 (37.6)	21.6 (48.3)	26.8 (59.9)	32.4 (72.5)	38.2 (85.5)	44.5 (99.5)
40 (131.2)	8.7 (19.5)	12.8 (28.6)	17.3 (38.7)	22.3 (49.9)	27.6 (61.7)	33.4 (74.7)	39.4 (88.1)	45.8 (102.5)
50 (164)	8.9 (19.9)	13.1 (29.3)	17.7 (39.6)	22.8 (51)	28.3 (63.3)	34.2 (76.5)	40.3 (90.1)	46.9 (104.9)
60 (196.8)	9.1 (20.4)	13.3 (29.8)	18 (40.3)	23.3 (52.1)	28.8 (64.4)	34.9 (78.1)	41.1 (91.9)	47.9 (107.1)
70 (229.7)	9.3 (20.8)	13.5 (30.2)	18.3 (40.9)	23.6 (52.8)	29.3 (65.5)	35.5 (79.4)	41.8 (93.5)	48.7 (108.9)
80 (262.5)	9.4 (21)	13.7 (30.6)	18.6 (41.6)	24 (53.7)	29.7 (66.4)	36 (80.5)	42.4 (94.8)	49.4 (110.5)
90 (295.3)	9.5 (21.3)	13.9 (31.1)	18.8 (42.1)	24.3 (54.4)	30.1 (67.3)	36.4 (81.4)	42.9 (96)	50 (111.8)
100 (328.1)	9.6 (21.5)	14.1 (31.5)	19.1 (42.7)	24.6 (55)	30.4 (68)	36.9 (82.5)	43.4 (97.1)	50.6 (113.2)
110 (360.9)	9.7 (21.7)	14.2 (31.8)	19.2 (42.9)	24.8 (55.5)	30.8 (68.9)	37.2 (83.2)	43.9 (98.2)	51.1 (114.3)
120 (393.7)	9.8 (21.9)	14.3 (32)	19.4 (43.4)	25.1 (56.1)	31.1 (69.6)	37.6 (84.1)	44.3 (99.1)	51.6 (115.4)
130 (426.5)	9.9 (22.1)	14.5 (32.4)	19.6 (43.8)	25.3 (56.6)	31.3 (70)	37.9 (84.8)	44.7 (100)	52 (116.3)
140 (459.3)	10 (22.4)	14.6 (32.7)	19.8 (44.3)	25.5 (57)	31.6 (70.7)	38.2 (85.5)	45.1 (100.9)	52.5 (117.4)
150 (492.1)	10 (22.4)	14.7 (32.9)	19.9 (44.5)	25.7 (57.5)	31.8 (71.1)	38.5 (86.1)	45.4 (101.6)	52.9 (118.3)
160 (524.9)	10.1 (22.6)	14.8 (33.1)	20.1 (45)	25.9 (57.9)	32.1 (71.8)	38.8 (86.8)	45.7 (102.2)	53.2 (119)
170 (557.7)	10.2 (22.8)	14.9 (33.3)	20.2 (45.2)	26 (58.2)	32.3 (72.3)	39.1 (87.5)	46 (102.9)	53.6 (119.9)
180 (590.5)	10.3 (23)	15 (33.6)	20.3 (45.4)	26.2 (58.6)	32.5 (72.7)	39.3 (87.9)	46.3 (103.6)	53.9 (120.6)
190 (623.4)	10.3 (23)	15.1 (33.8)	20.4 (45.6)	26.4 (59.1)	32.7 (73.1)	39.5 (88.4)	46.6 (104.2)	54.2 (121.2)
200 (656.2)	10.4 (23.3)	15.2 (34)	20.6 (46.1)	26.5 (59.3)	32.8 (73.4)	39.8 (89)	46.9 (104.9)	54.6 (122.1)

V= 10 minute average wind speed at 10m (32.8 ft) height

z=height above ground

v(z)=3 second gust speed at height z

ref. EN13000

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Capacity Reduction for Loads with Large Wind Sail Area

Allowable wind speed must be reduced for loads with large wind sail area (Frontal Area, $A > 4.9 \text{ ft}^2$ per 1000 lbs or Wind Coefficient, $C_f > 1.2$) by the following formula:

$$v_r = v \sqrt{\frac{(.00586)W}{C_f A}}$$

$K = .00586 \text{ ft}^2/\text{lb}$ [$.0012 \text{ m}^2/\text{kg}$]

C_f = Wind coefficient of load

W = Rated lifting capacities (lbs) (kg)

W_r = Reduced lifting capacities (lbs) (kg)

v = Maximum wind speed from Crane Rating Manual
Wind Restrictions chart (mph) [m/s]

v_r = Reduced wind speed based on wind sail area of load (mph) [m/s]

A = Actual wind sail area of load (ft^2) [m^2]

Example 1:

Rated lifting capacities, $W = 50,000 \text{ lbs}$ [22 650kg]

Actual load = 45,000 lbs [20 400kg]

Maximum wind speed, $v = 20 \text{ mph}$ [9m/s]

Actual wind coefficient, $C_f = 1.6$

Actual wind sail area of load, $A = 300\text{ft}^2$ [27.9m²]

$$v_r = 20 \sqrt{\frac{(.00586)(50,000)}{(1.6)(300)}} = 15.6 \text{ mph}$$

$$v_r = 9 \sqrt{\frac{(.0012)(22650)}{(1.6)(27.9)}} = 7.0\text{m/s}$$

The wind coefficient is a measure of resistance to air flow, and is dependent on the object's shape and size. This value can be estimated using relevant standards such as ISO 4302. The following table gives a general guideline of typical shapes and corresponding coefficients:

Shape	Example	Wind Coefficient C_f
	Plate, shutter, or sheet pile	1.1 to 2.0
	Ball, spherical reservoir	0.3 to 0.4
	Silo, reactor vessel	0.6 to 1.0
	Half sphere	0.8 to 1.2
	Half sphere	0.2 to 0.3
	Wind turbine blade or complete rotor	0.05 to 0.1
	Wind turbine blade or complete rotor	Approx. 1.6
Typical Shapes And Corresponding C_f Values		

Example 2: 40% Capacity Deduction

Rated lifting capacities, $W = 50,000 \text{ lbs}$ [22 650kg]

Actual load = 25,000 lbs [11 300kg]

Maximum wind speed, $v = 20 \text{ mph}$ [9m/s]

40% Capacity Reduction, $W_r = 30,000 \text{ lbs}$ [13 600kg]

Max wind speed w/ Capacity Reduction, $v_r =$
29 mph [13m/s]

Actual wind coefficient, $C_f = 1.6$

Actual wind sail area of load, $A = 300 \text{ ft}^2$ [27.9m²]

$$v_r = 13 \sqrt{\frac{(.0012)(13600)}{(1.6)(27.9)}} = 7.9\text{m/s}$$

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Boom Angle Indicator

A bubble type boom angle indicator is mounted to the right of the operator's cab on the base section of the boom. Refer to Figure 1–81. It must be adjusted properly and the crane must be level for the unit to accurately indicate boom angles. Even under these conditions its readings are only approximate. When making near capacity lifts, measure the load radius to determine crane capacity. Check the adjustment of the boom angle indicator daily to ensure its accuracy. Refer to “Boom Angle Indicator Adjustment” in Section 3 of this Operator's Manual.

Anti-Two Block Warning System

Integrated into the Rated Capacity Limiter System is an anti-two block (ATB) warning system. An anti-two block warning system is an electromechanical system designed to alert the operator before the hook block, hook ball, or load contacts the head machinery of the main boom, auxiliary lifting sheave, or fly. When a two block situation is imminent, an audio/visual alarm is activated to alert the operator of the pending danger. When the alarm activates it is essential that the operator discontinue operations immediately, and correct the two block situation.

Basic components are used to make up the anti-two block system. The anti-two block weight, main boom head anti-two block switch with lockout clip, an anti-two block switch for extensions, and the Pulse Crane Control System Display in the operator's cab. Refer to Figure 1–82 and Figure 1–76. The auxiliary ATB switch and ATB weight(s) are stored in the lower tool box. Refer to “Lower Toolbox Storage” in this section of this Operator's Manual.

An anti-two block weight is suspended from the head machinery switch(es) where lifts are to be made and is used to hold the switch(es) in the “working” position. When the anti-two block weight is lifted by the hook block, hook ball, or load, it allows the switch to activate an audio alarm and a visual alarm on the Pulse Crane Control System Display in the operator's cab. In addition to the audio and visual alarms, function limiters will be activated.

CAUTION

Do not allow the load to spin out of control when hoisting. The anti-two block weight may become entangled with the wire rope and could damage the anti-two block system, wire rope, or boom. Use rotation resistant wire rope during single part line hoisting applications, especially when long fall lifts are involved.

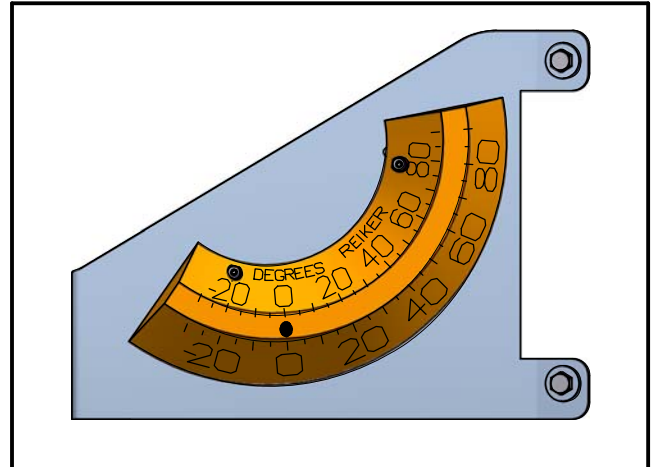


**Figure 1–81
Boom Angle Indicator**

The added feature of hydraulic function limiters, prevents the operator from continuing crane functions which will cause a two block situation to occur. The crane functions of winch up, boom down, and boom extend are disabled when the anti-two block weight is lifted. These functions will remain disabled until the two block situation is corrected or the “Cancel Alarm” button on the Pulse Crane Control System Display is pressed and held to override the system.

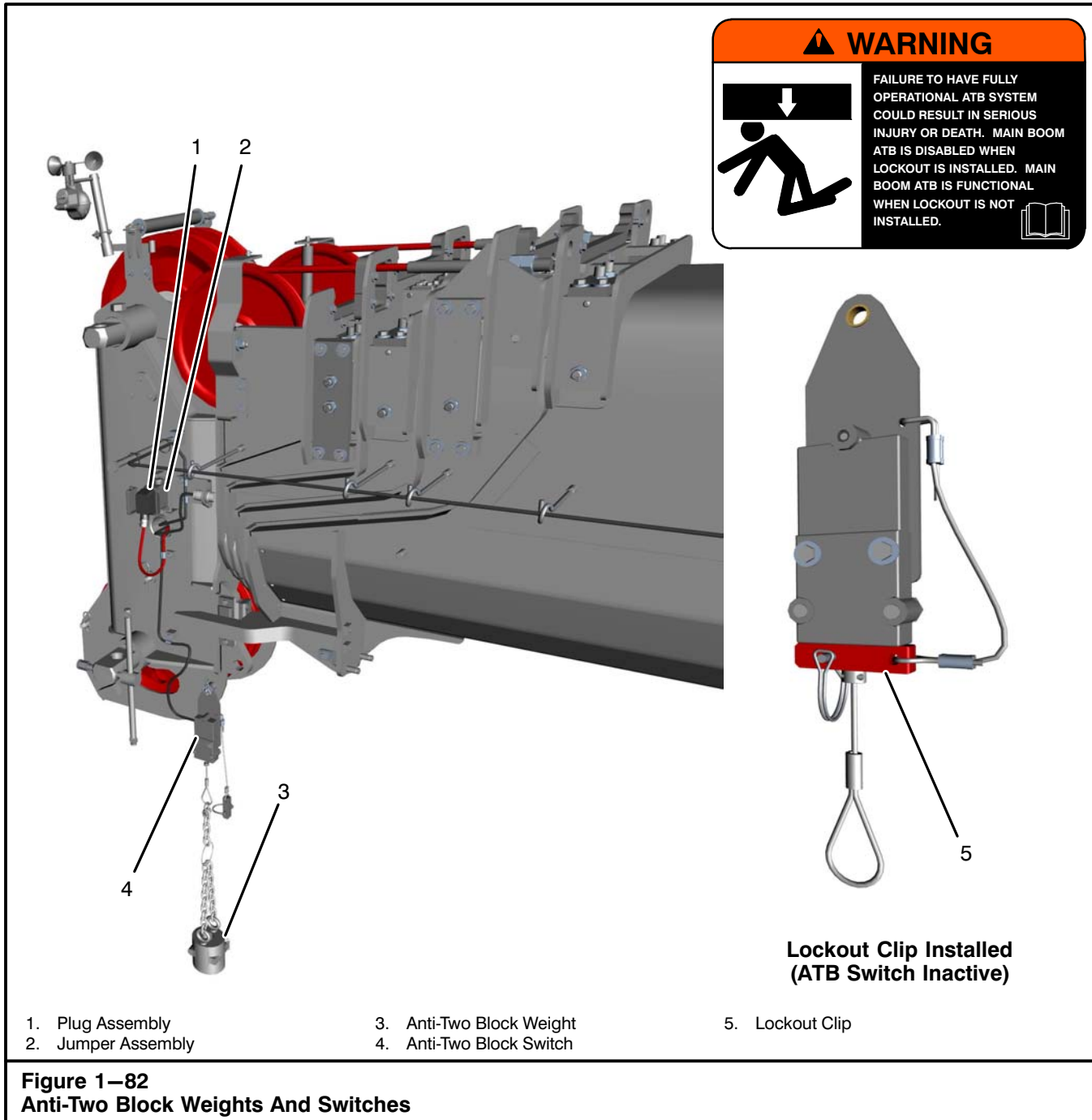
Note: Push the “Cancel Alarm” button momentarily once to silence the audible alarm. Press and hold the “Cancel Alarm” button to temporarily override the system. Refer to “cancel Audible Alarm And Reset Function Limiters” in this section of this Operator's Manual.

The main boom head must always have an anti-two block switch. Each of the added attachments used on the crane must employ a similar head machinery switch as well, in order for that particular attachment to be monitored by the system.

The plug assembly is connected to the jumper assembly on the boom head when operating from the main boom. It is connected to the jumper assembly on the attachment when operating from that attachment.

Check that all the harness connections between the attachments are properly connected and test the system before beginning operations. Test the system by manually lifting the ATB weight and verifying that the functions of winch up, boom down, and boom extend are disabled.

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Lockout Clip

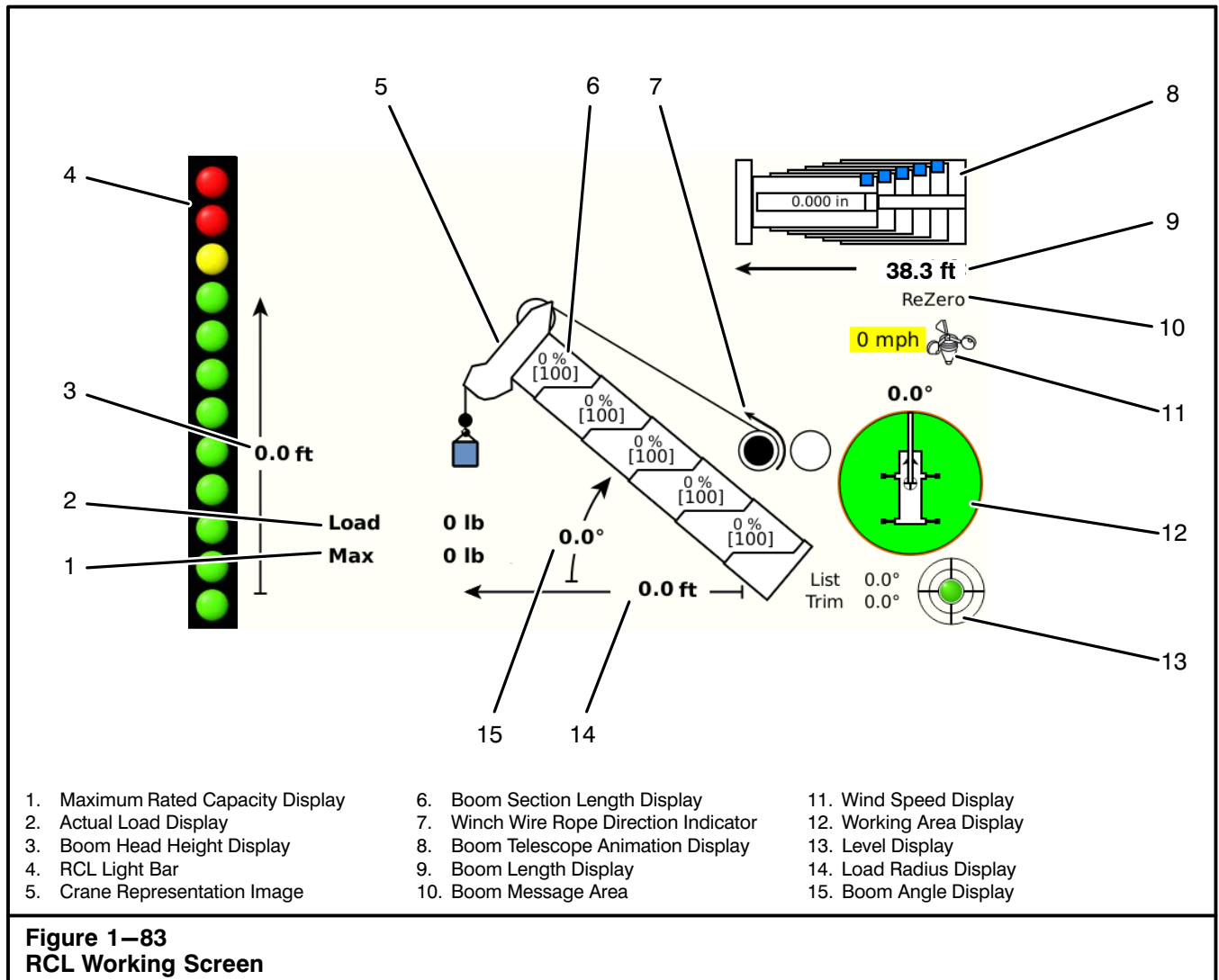
The lockout clip is used to hold the main boom anti-two block switch in the “inactive” position.

When operating from the main boom, the lockout clip must be removed from the anti-two block weight cable. When operating from an attachment only, the lockout clip must be installed on the anti-two block weight cable. Refer to Figure 1-82.

When both main boom and any attachment are reeved for operation, the lockout clip must be removed from the cable.

Note: When the lockout clip is installed, the anti-two block switch is inactive.

Note: When using both the main boom and any attachment, an anti-two block weight must be suspended from the anti-two block switch on the main boom and on any attachment anti-two block switch that is to be monitored.



RCL Working Screen

The RCL Working Screen displays the current crane configuration. The RCL Working Screen is comprised of the following components:

1. Maximum Rated Capacity Display

The Maximum Rated Capacity Display is a digital display of the maximum permitted capacity. It is derived from a copy of the crane's capacity chart which is stored in the computer memory and is the reference capacity for any lifting operation. It is dependent on the configuration currently selected, which is shown in the RCL Working Screen, and which determines the section of the capacity chart to be used as the rated capacity reference.

2. Actual Load Display

The Actual Load Display is a digital display of the total load suspended below the boom or fly head. It includes the load, any slings, pins, or tackle used to secure the load and the hook block or hook ball.

3. Boom Head Height Display

The Boom Head Height Display gives a continuous display of the height of the boom head or attachment head above the ground.

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4. RCL Light Bar

The RCL Light Bar is a series of twelve colored lights which gives a visual indication of how much the crane's capacity is being used and the rate at which an overload is being approached. Each green light represents 10% of the crane's rated capacity being used. Yellow indicates 90–99.9%, and the red lights indicate an overload. Refer to "RCL Light Bar" in this section of this Operator's Manual.

5. Crane Representation Image

This Crane Representation Image is a generic representation of the boom, active winch configuration, auxiliary head configuration (on or off), and fly configuration (on or off). The attachment image will not change in accordance with the length of the installed attachment.

6. Boom Section Length Display

The Boom Section Length Display shows the current section lengths as a percentage of their absolute maximum length (independent of the current boom mode maximum lengths).

7. Winch Wire Rope Direction Indicator

This Winch Wire Rope Direction Indicator is used to monitor Winch Up , Winch Down , and Error states . This indicator appears around the winch being operated by the control lever(s).

Note: If the error state indicator appears, contact your Link-Belt Distributor or Factory for service.

8. Boom Telescope Animation Display

The Boom Telescope Animation Display is a real-time visual representation of the location of the boom sections.

9. Boom Length Display

The Boom Length Display gives a continuous indication of the boom length in feet (*m*). It is the distance from the centerline of the boom foot pin to the centerline of the boom head machinery.

10. Boom Message Area

The Boom Message Area displays the most recent message sent from the boom controller. This message may contain operation messages or error messages. Refer to Boom Message Area in this section of this Operator's Manual.

11. Wind Speed Display

The current wind speed is displayed here.

12. Working Area Display

This area displays a graphical representation of the allowable lifting section(s) based on the selected configuration. A section not allowed will be filled red, if load on hook is at 90% capacity, a yellow section will be visible, and an allowable section will be filled green. Pressing the Working Area Display opens the Radius Range Screen. Refer to "Radius Range" in this section of this Operator's Manual.

13. Level Indicator

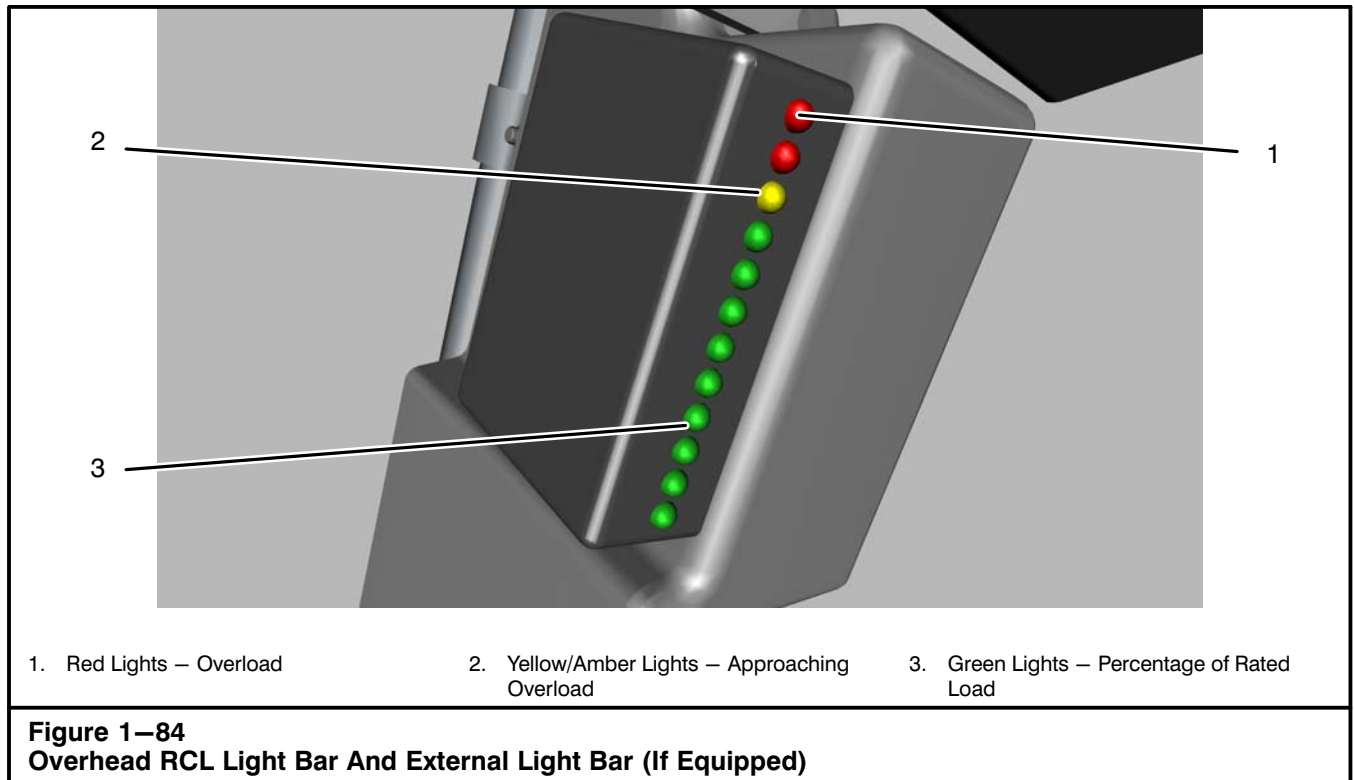
The Level Indicator is a digital display of the crane's level.

14. Load Radius Display

The Load Radius Display gives a continuous indication of the radius of the load in feet (*m*). It is the horizontal distance from the centerline of rotation to the centerline of the hook.

15. Boom Angle Display

The Boom Angle Display gives a continuous indication of the angle of the main boom relative to the horizontal plane.



RCL Light Bar

The following is a description of the RCL bar graph indicators on the Pulse Crane Control System Display. Refer to Figure 1–85.

Note: System may be equipped with an overhead RCL light bar and/or an external light bar which operates similarly to the RCL light bar on the Pulse Crane Control System Display. Refer to Figure 1–84.

1. Pre-Alarm Indicator

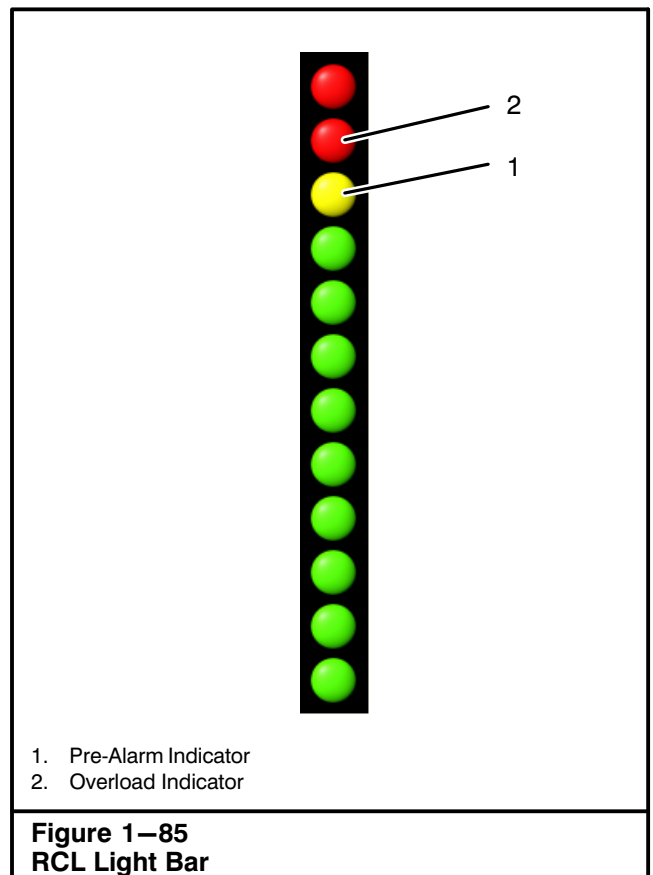


The Pre-Alarm Indicator illuminates yellow at a pre-set value of 90% of Maximum Rated Capacity and provides a visual indication of an approach to an overload.

2. Overload Indicator



The Overload Indicator illuminates red at a pre-set value of 100% of the Maximum Rated Capacity and provides a visual indication of Maximum Allowed Load. It will also illuminate whenever a wire rope limit is exceeded. Function limiters will occur simultaneously for an overload, wire rope limit, or a two block condition. Function limiters will also occur when exceeding an operator settable alarm. An audible alarm will sound and a message will appear in the Message Area for all alarm conditions.



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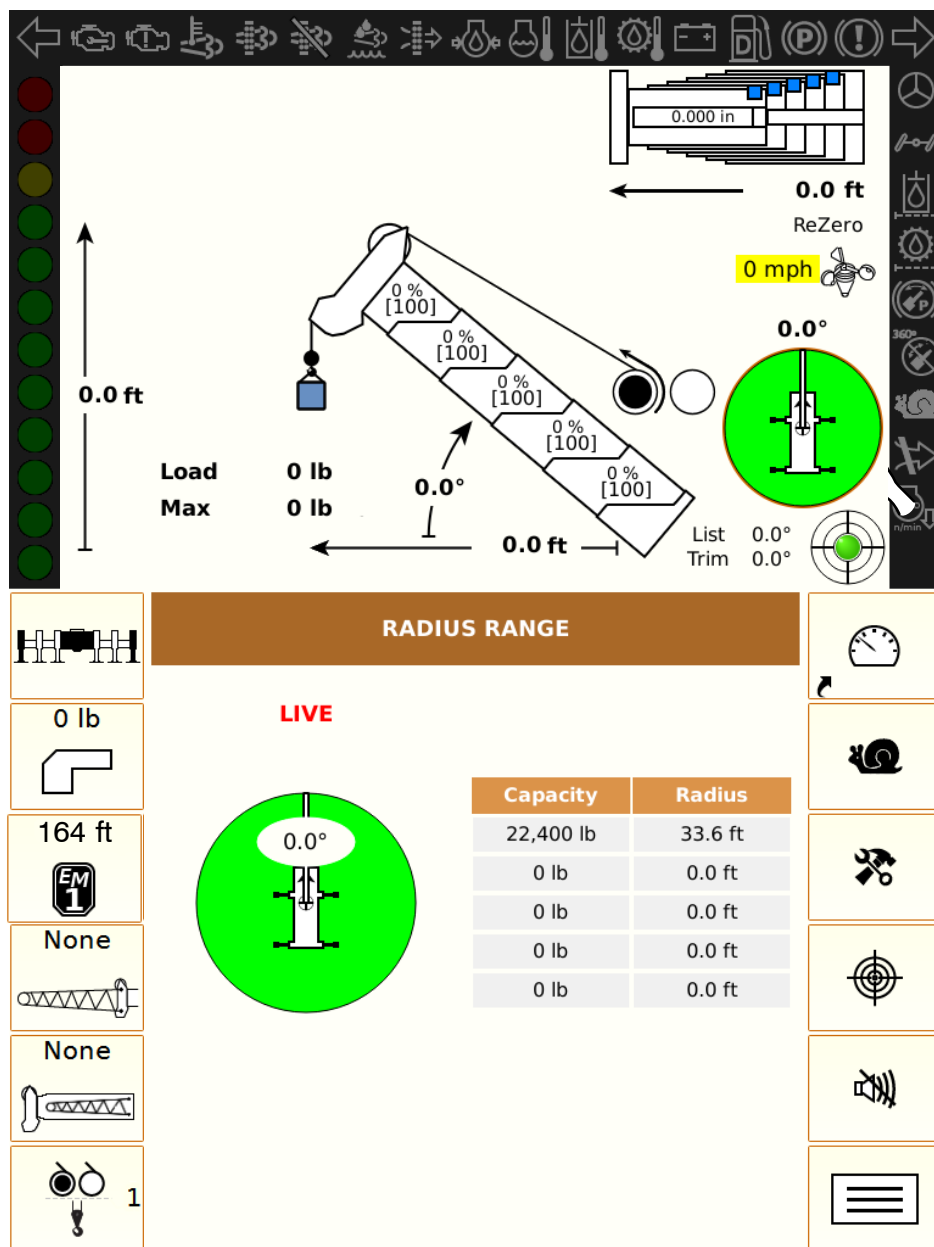


Figure 1–86
Radius Range

Radius Range

The Radius Range Screen displays the current Capacity and Radius of the crane, along with the capacity of the next four larger radii for the given boom length.

1. Press the Working Area Display  on the RCL Working Screen. Refer to Figure 1–86.
2. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen.

Pulse Feature Buttons

The following is a description of the Pulse Feature Buttons to the right of the Pulse Feature And RCL Configuration Area. The Pulse Feature Buttons can be used to serve a quick function or directly access menus and screens from any screen. Refer to Figure 1–87.

Note: The icon for the shortcut button will change to reflect the current programming of the shortcut button.

1. Shortcut Button



Refer to “Shortcut Button” in this section of this Operator’s Manual.

2. Fine Metering Pulse Feature Button



This Pulse Feature Button accesses the Fine Metering Screen, which allows the user to configure the fine metering. Refer to “Fine Metering” in this section of this Operator’s Manual.

3. Diagnostics Pulse Feature Button

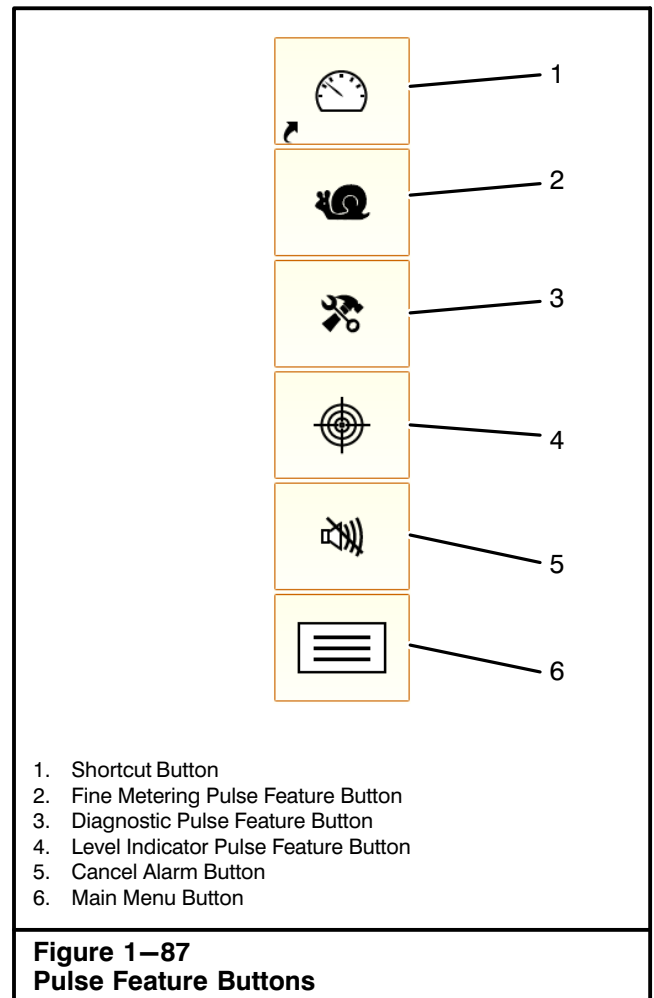


This Pulse Feature Button navigates to the Diagnostics Menu, Which allows the user to access data, such as Active System Faults, Sensor Data, Crane Functions, Engine, Temperature And Fan, User Selected, and Function Times. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.

4. Level Indicator Pulse Feature Button



This Pulse Feature Button navigates to the Level Indicator Screen. Refer to “Level Indicator” in this section of this Operator’s Manual.



5. Cancel Alarm Button



This Pulse Feature Button can be pressed once to silence the audible alarm when the alarm has occurred as a result of either an overload, a two block alarm, or an operator settable alarm. It is also used to reset the function limit relay when it is necessary to by-pass a function limit which has occurred as a result of either an overload or a two block alarm. This requires the button be pressed and held for 2 seconds or longer. Refer to “Cancel Audible Alarm And Reset Function Limiters.”

6. Main Menu Button



This Pulse Feature Button navigates to the Main Menu. Refer to “Main Menu Screen” in this section of this Operator’s Manual.

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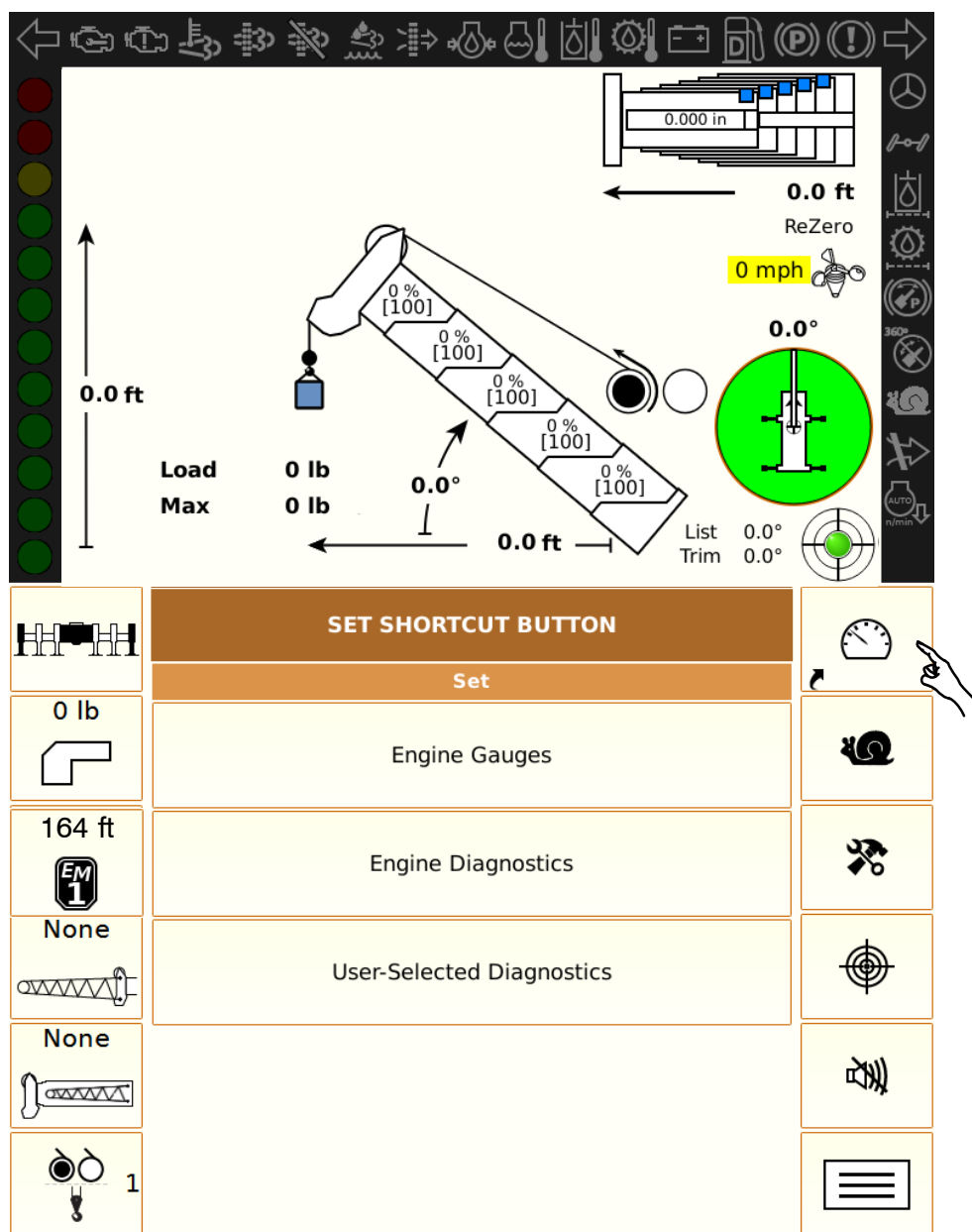


Figure 1-88
Shortcut Button

Shortcut Button

The Shortcut Button displays an arrow  in the bottom left corner. It may be set as a Pulse Feature Button to access the Engine Gauges  Screen, the Engine Diagnostics  Screen, or the User-Selected Diagnostics  Screen. To set the Shortcut Button, press and hold the Shortcut Button until the Set Shortcut Button Menu appears. Press the corresponding button in the Pulse Feature And RCL

Configuration Area for desired selection. The Shortcut Button icon will change to display the icon of the active selection. Refer to Figure 1-88.

Note: Refer to “User-Selected Diagnostics” in this section of this Operator’s Manual for User-Selected Diagnostics configuration instructions.

Note: The icon associated with the shortcut button will be the default start up screen for the Pulse System.

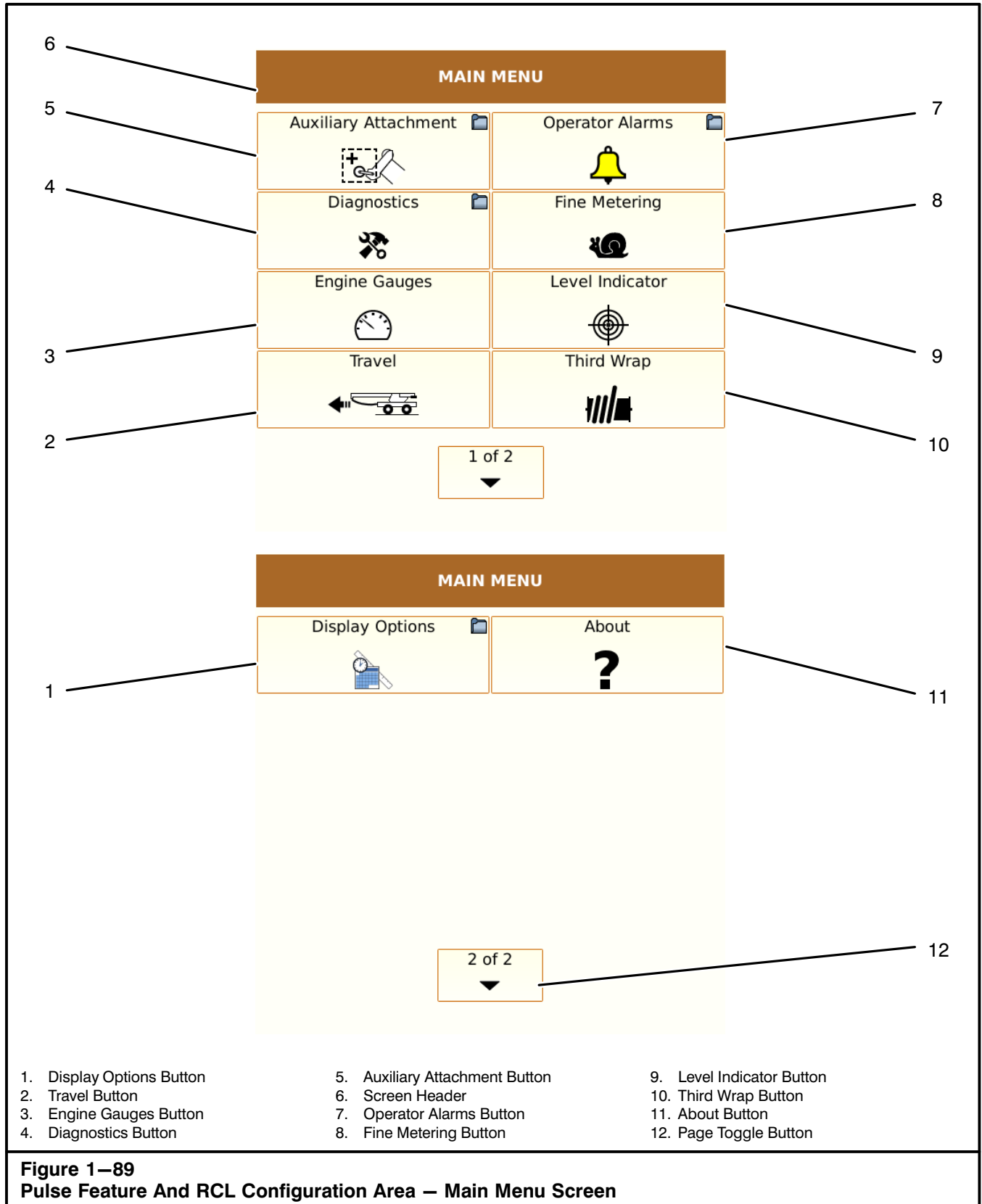


Figure 1–89
Pulse Feature And RCL Configuration Area – Main Menu Screen

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Pulse Feature And RCL Configuration Area

The Pulse Feature And RCL Configuration Area is the area of the Pulse Crane Control System Display that displays menus and screens used to navigate the pulse features and RCL configuration. The menus and screens displayed in this area change based on the current pulse feature or RCL configuration button selected.

Main Menu

The following is a description of the menu buttons on the Main Menu Screen. Use them along with Figure 1–89.

1. Display Options Button



This button navigates to the Display Options Menu, which allows the user to configure Style Sheets and to highlight data in the RCL Working Screen. Refer to Figure 1–90.

2. Travel Button



This button navigates to the Travel Screen which contains information relative to machine travel. Refer to “Travel” in this section of this Operator's Manual.

3. Engine Gauges Button



This button navigates to the Engine Gauges Screen. Refer to “Engine Gauges” in this section of this Operator's Manual.

4. Diagnostics Button



This button navigates to the Diagnostics Menu, Which allows the user to access data, such as Active System Faults, Sensor Data, Crane Functions, Engine, Temperature And Fan, User Selected, and Function Times. Refer to “Diagnostics Menu” in this section of this Operator's Manual.

5. Auxiliary Attachment Button



This button navigates to the Auxiliary Attachment Menu, which allows the user to configure the auxiliary head. Refer to “Auxiliary Attachment” in this section of this Operator's Manual.

6. Screen Header

The Screen Header displays the name of the current menu or screen displayed on the Pulse Feature And RCL Configuration Area. Refer to Figure 1–89.

Note: If a back arrow  is present in the Screen Header, the header will function as a back button to navigate to the previous menu. The back arrow appears on headers for menus and screens which are not associated with RCL Configuration Buttons or Pulse Feature Buttons.

7. Operator Alarms Button



This button navigates to the Operator Alarms Menu, which allows the user to configure alarms for Boom Length, Boom Angle, Radius, Head Height, Swing Angle, and Defined Area. Refer to Figure 1–111.

8. Fine Metering Button



This button accesses the Fine Metering Screen, which allows the user to configure the fine metering. Refer to “Fine Metering” in this section of this Operator's Manual.

9. Level Indicator Button



This button navigates to the Level Indicator Screen. Refer to “Level Indicator” in this section of this Operator's Manual.

10. Third Wrap Button



This button navigates to the Third Wrap Screen, which allows the user to calibrate the third wrap indicator for one or both winch(es). Refer to “First Layer/Third Wrap Calibration” in Section 5 of this Operator's Manual.

11. About Button



This button navigates to the About Screen. Refer to “About” in this section of this Operator's Manual.

12. Page Toggle Button



This button allows the user to navigate through menu pages, as required.

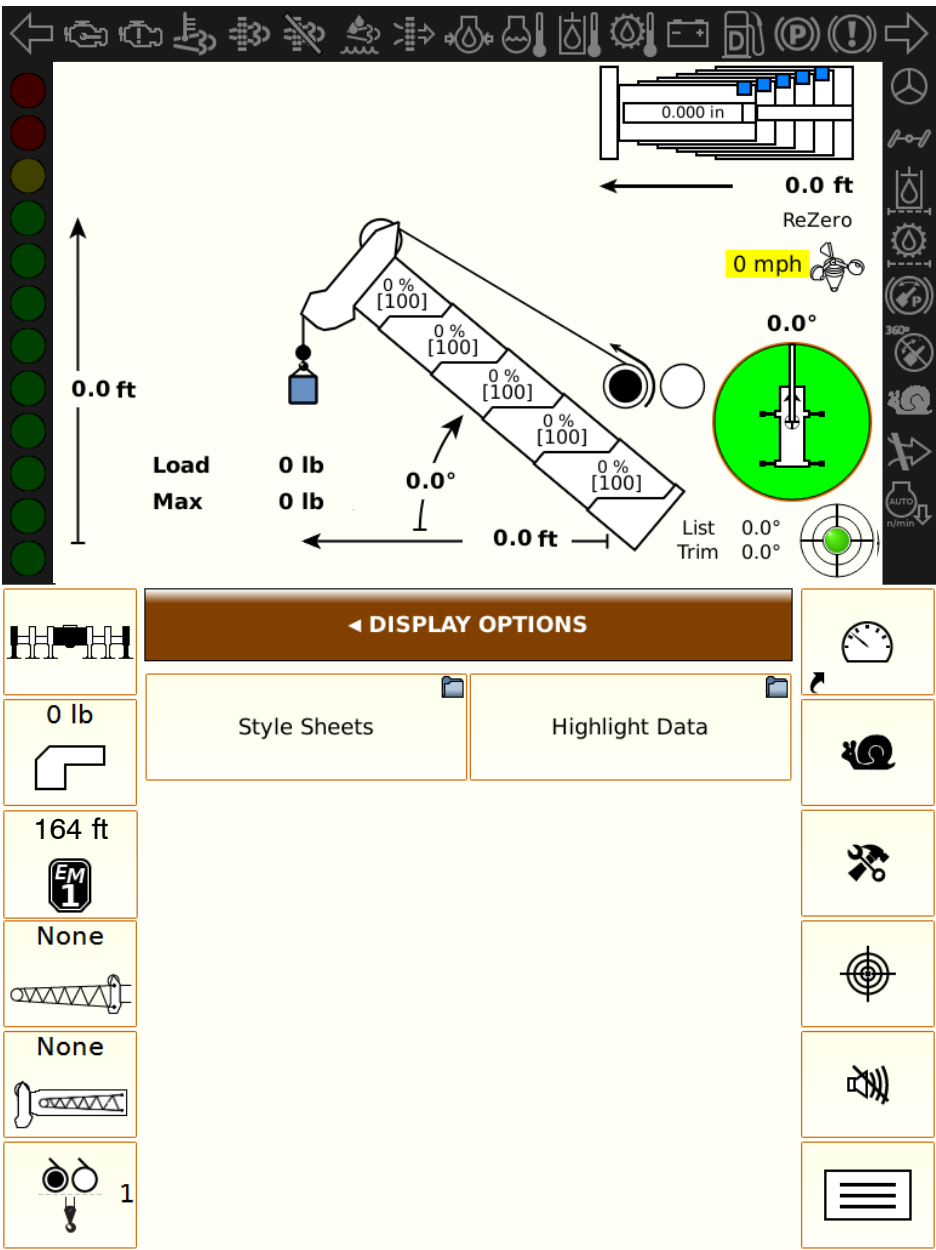


Figure 1–90
Display Options

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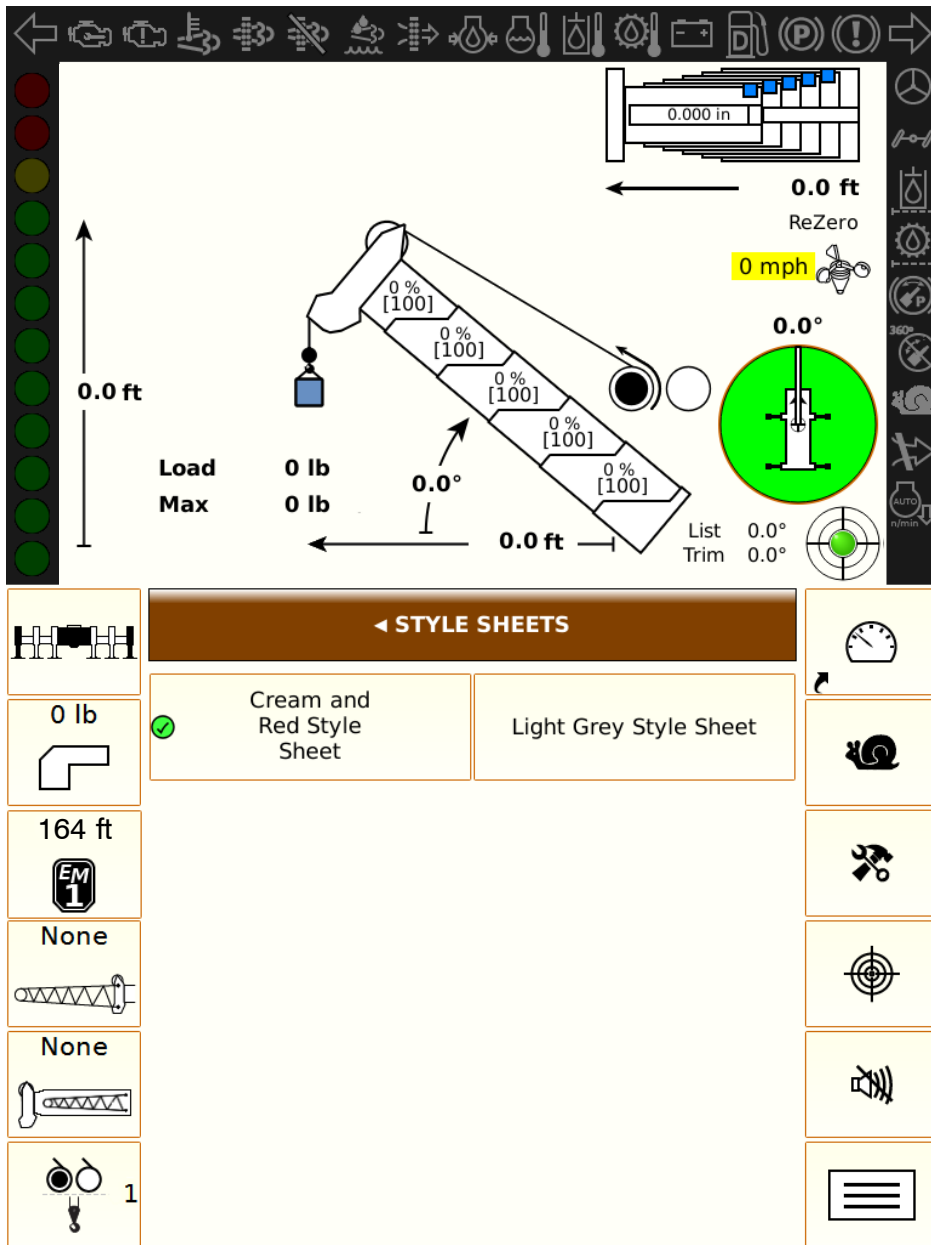


Figure 1–91
Display Options – Style Sheets

Style Sheets

1. From the Main Menu Screen, press the Display Options Button . Refer to Figure 1–89.
2. The Display Options Menu will appear. Press the Style Sheets Button. Refer to Figure 1–90.

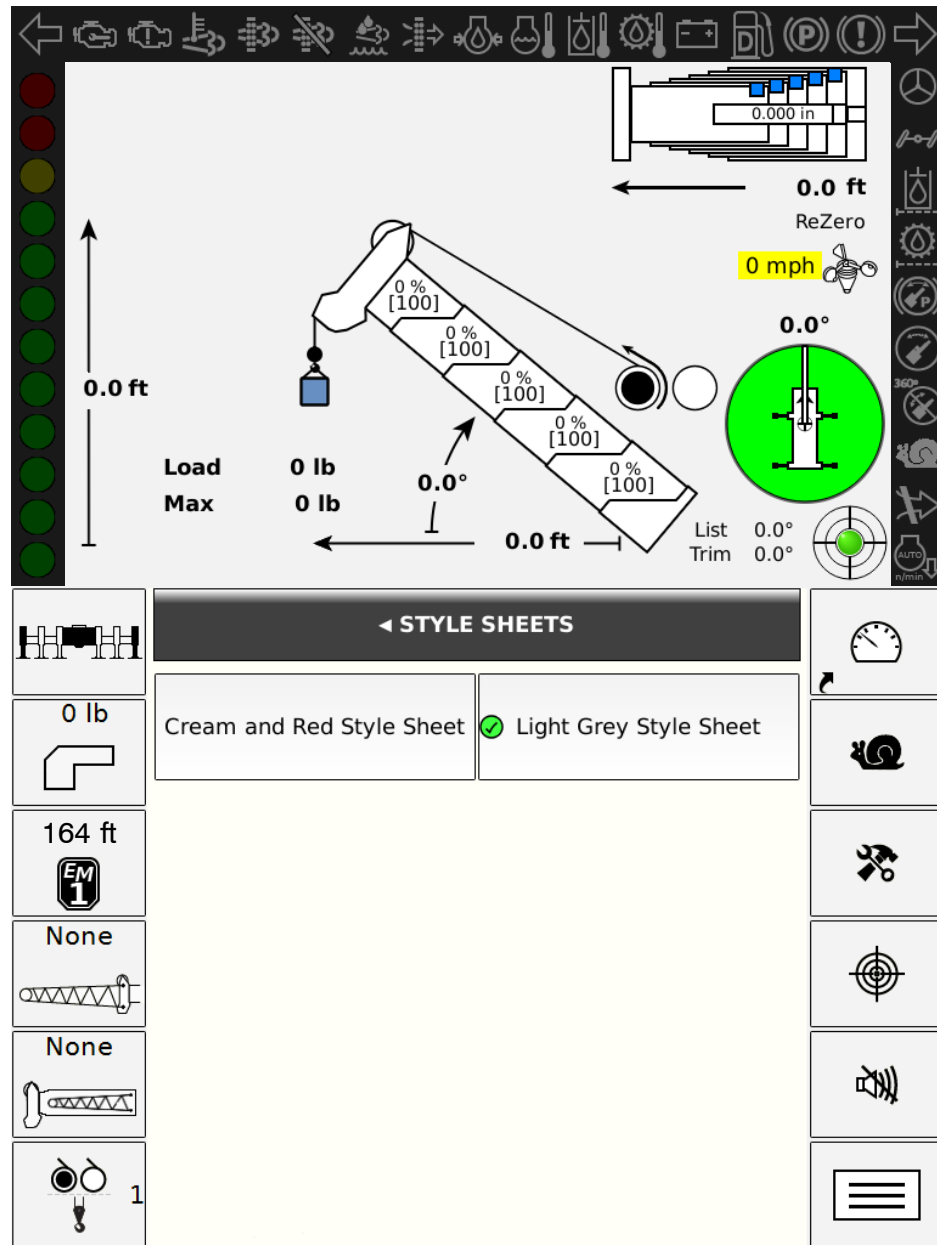


Figure 1–92
Display Options – Style Sheets – Light Grey

Note: The default Style Sheet is Cream Red Style Sheet. Refer to Figure 1–91. Refer to Figure 1–92 for an example of Light Grey Style Sheet.

4. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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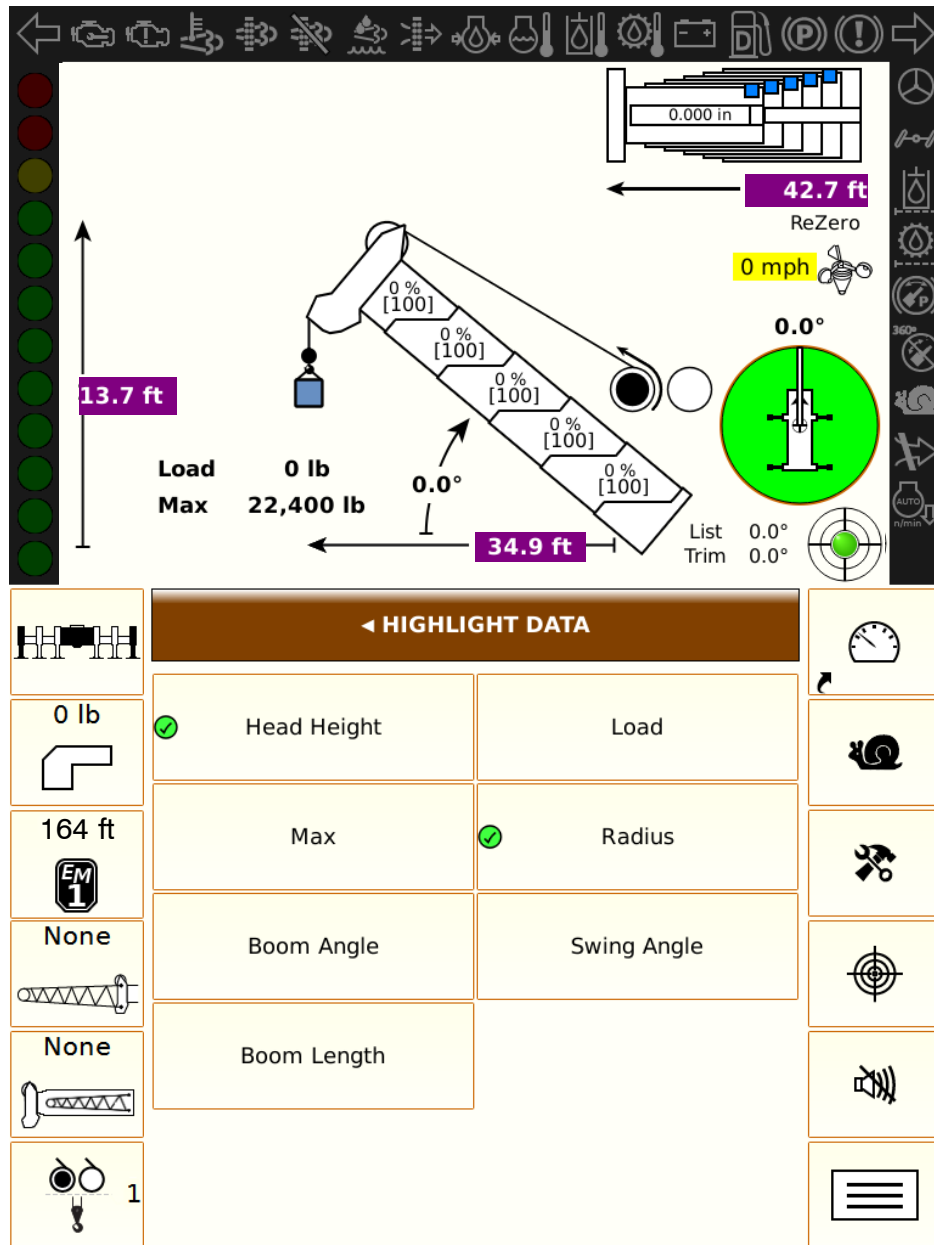


Figure 1–93
Display Options – Highlight Data

Highlight Data

1. From the Main Menu Screen, press the Display Options Button . Refer to Figure 1–89.
2. The Display Options Menu will appear. Press the Highlight Data Button. Refer to Figure 1–90.
3. The Highlight Data Menu will appear. Press the button(s) for the corresponding data to be highlighted in the RCL Working Screen. Refer to Figure 1–93.
4. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

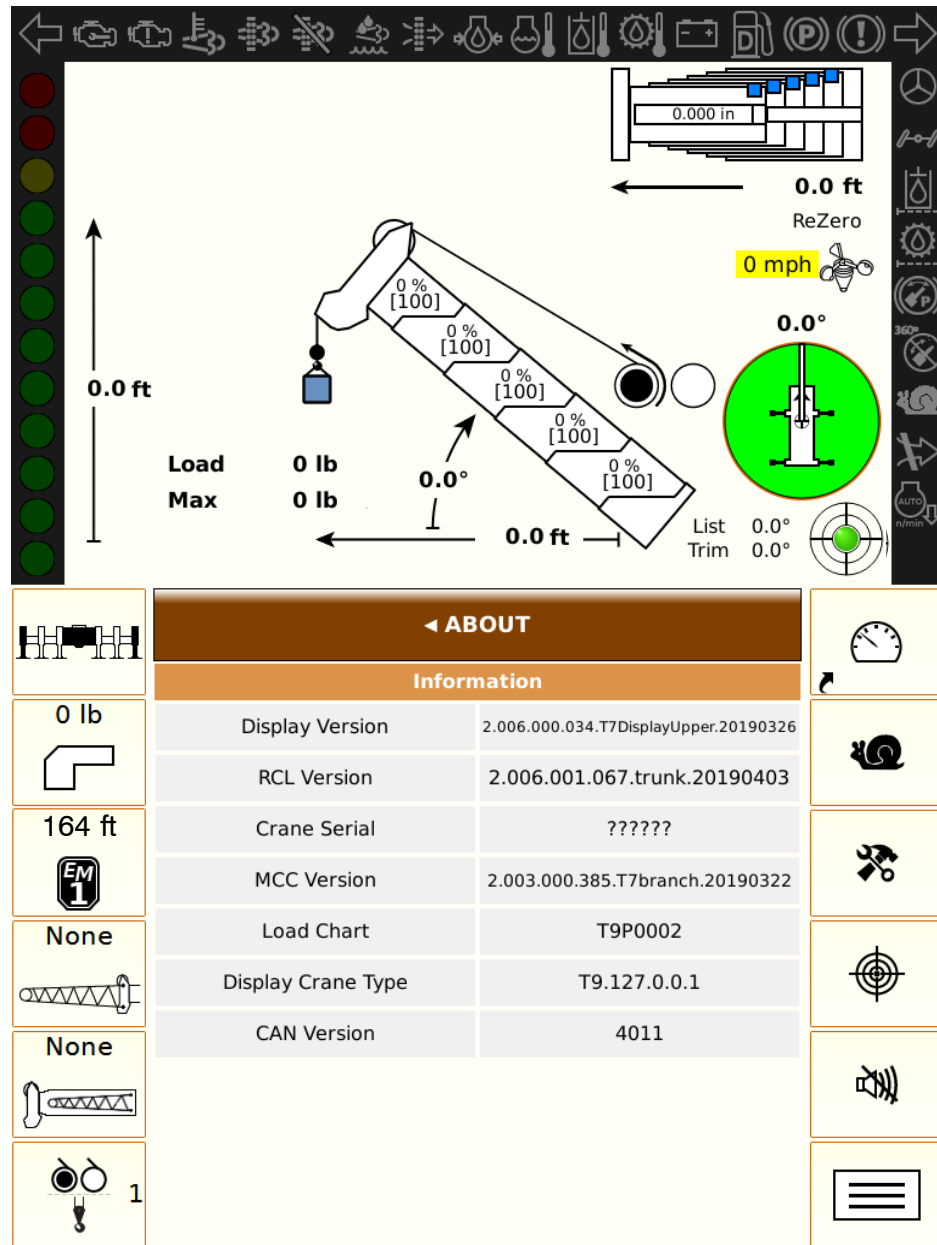


Figure 1–94
About

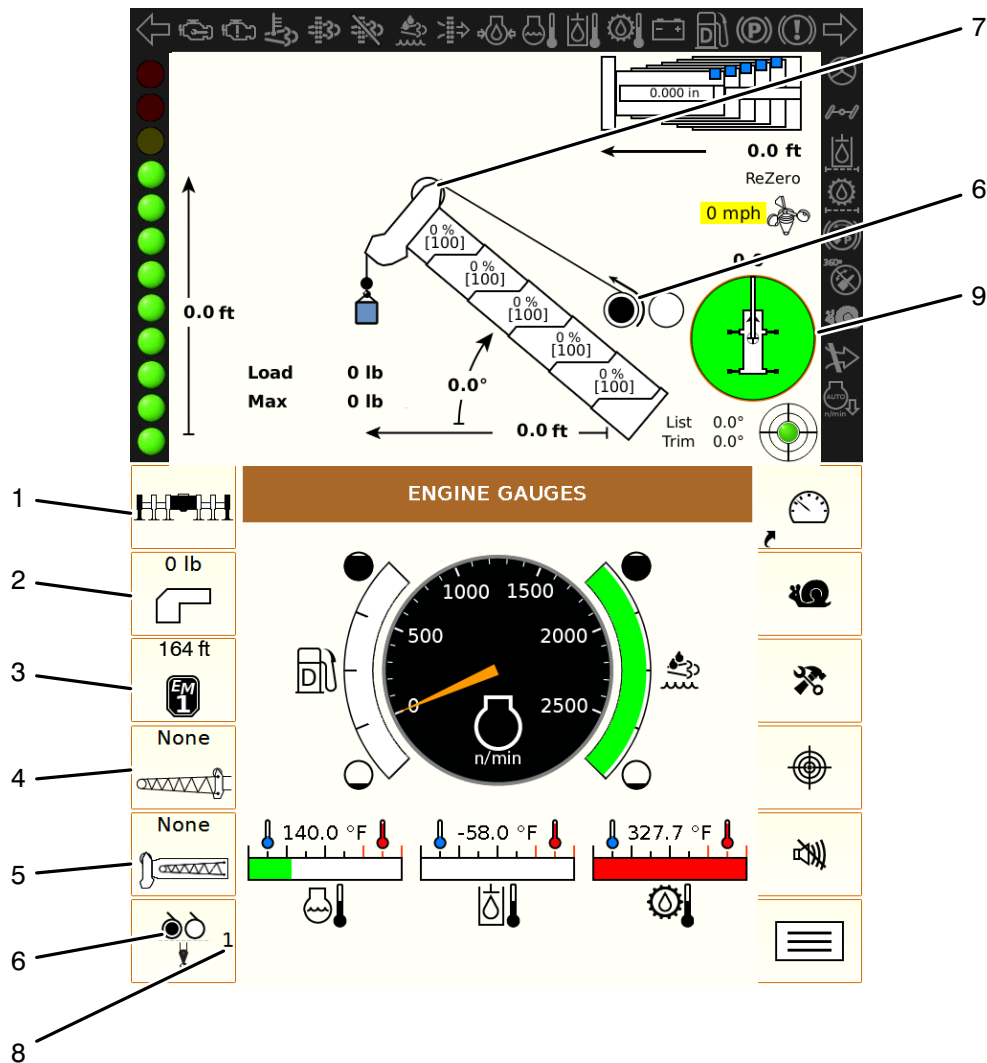
About

The About Screen indicates which version of the Display, RCL and MCC controller software as well as the crane serial number, load chart, crane type, and CAN version. Refer to Figure 1–94.

1. From the Main Menu Screen, press the About Button . Refer to Figure 1–89.

2. The About Screen will appear. Refer to Figure 1–94.
3. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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In this example the crane is setup on fully extended outriggers (1), 0 lb counterweight (2), boom mode EM1 (3), no fly erected (4), no stowed attachment (5), the front winch selected (6), with the winch wire rope reeved over the main boom head (7), with one part of line (8), and 360° capacities with the boom currently positioned at 0.0° (9).

Figure 1-95
RCL Working Screen Configuration Example

Configuration Selection

In the normal operational mode the system is programmed to remember the last configuration selected. Each time the system is powered up it will automatically default to the last configuration. Only when the crane is rigged differently must a new configuration be selected. Use the following procedure to select the crane configuration.

Note: Depending on how the crane is equipped or which selections have been made, some screens shown may or may not appear as illustrated. The system cannot be programmed for configurations not allowed by the capacity charts in the Crane Rating Manual.

RCL Configuration Buttons

The following are descriptions of the RCL Configuration Buttons. The RCL Configuration Buttons can be used to directly access configuration menus and screens from any screen. Refer to Figure 1–96.

Note: The icons for RCL Configuration Buttons will change to reflect the current crane configuration.

1. Base Configuration Button



This RCL Configuration Button displays the lower configuration. It will also display rigging mode. It navigates to the Outrigger Or Tire Menu, which allows the user to modify the lower configuration, including rigging mode and V-CALC. Refer to “Base Configuration” in this section of this Operator's Manual.

2. Counterweight Configuration Button



This RCL Configuration Button displays the current counterweight configuration. It navigates to the Counterweight Menu, which allows the user to configure the counterweights. Refer to “Counterweight Configuration” in this section of this Operator's Manual.

3. Boom Extension Mode Button

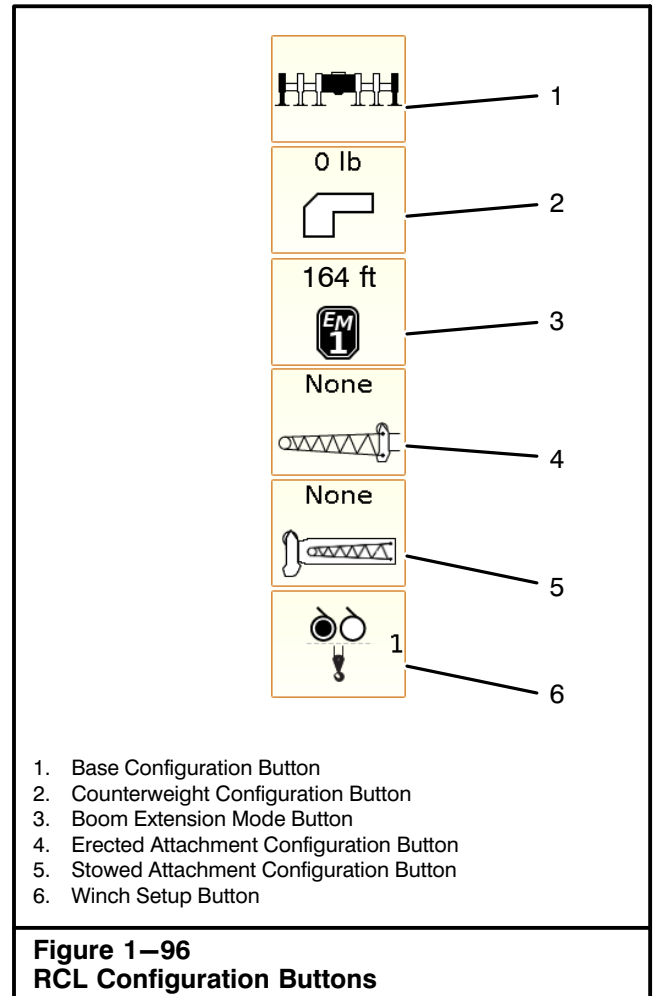


This RCL Configuration Button displays the current boom extension mode and the maximum boom length for the current boom extension mode. It navigates to the Boom Extend Mode Menu, which allows the user to configure boom extension modes. Refer to “Boom Extension Mode” in this section of this Operator's Manual.

4. Erected Attachment Configuration Button



This RCL Configuration Button displays the current attachment configuration. It navigates to the Erected Attachment Menu, which allows the user to modify attachment and offset configurations. Refer to “Erected Attachment Configuration” in this section of this Operator's Manual.



5. Stowed Attachment Configuration Button



This RCL Configuration Button displays the current stowed attachment configuration. It navigates to the Stowed Attachment Menu, which allows the user to configure stowed attachments. Refer to “Stowed Attachment Configuration” in this section of this Operator's Manual.

6. Winch Setup Button



This RCL Configuration Button displays the active winch and selected parts of line. It navigates to the active Winch Setup Screen, which allows the user to activate each winch configure lift point and parts of line for the active winch. Refer to “Winch Setup Configuration” in this section of this Operator's Manual.

Operator's Manual

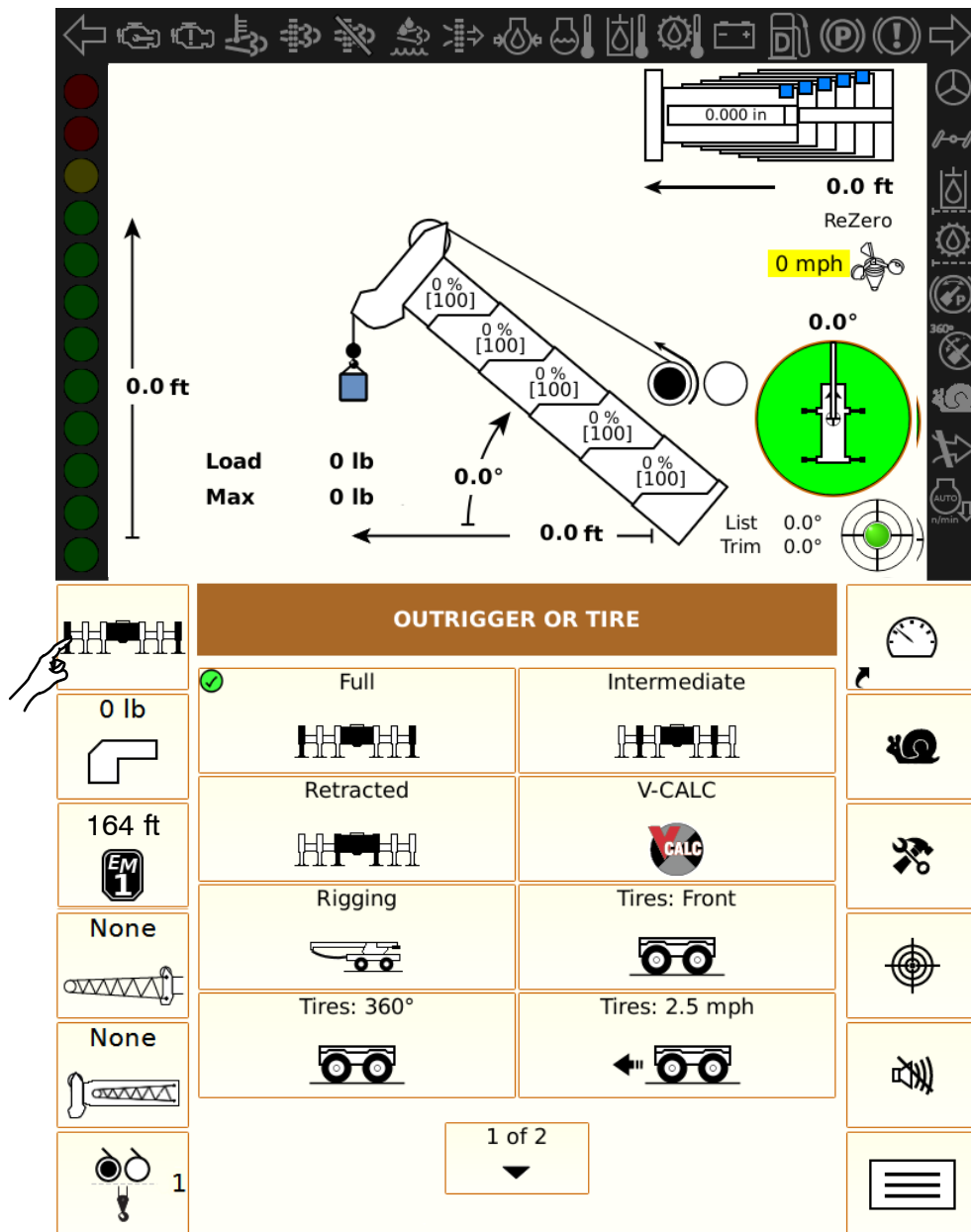


Figure 1-97
Base Configuration

Base Configuration

1. Press the Base Configuration Button . Refer to Figure 1-96.
2. The Outrigger Or Tire Menu will appear. The activation icon will be present on the button of the previously selected configuration. Press the Page Toggle Button to toggle between pages, as required. Refer to Figure 1-97 and Figure 1-98.

Note: When in rigging mode, RCL kickouts are inactive.

3. Press the button for the actual base configuration.
 - a. If any configuration other than V-CALC is selected, the activation icon will appear on the button for the selected base configuration.

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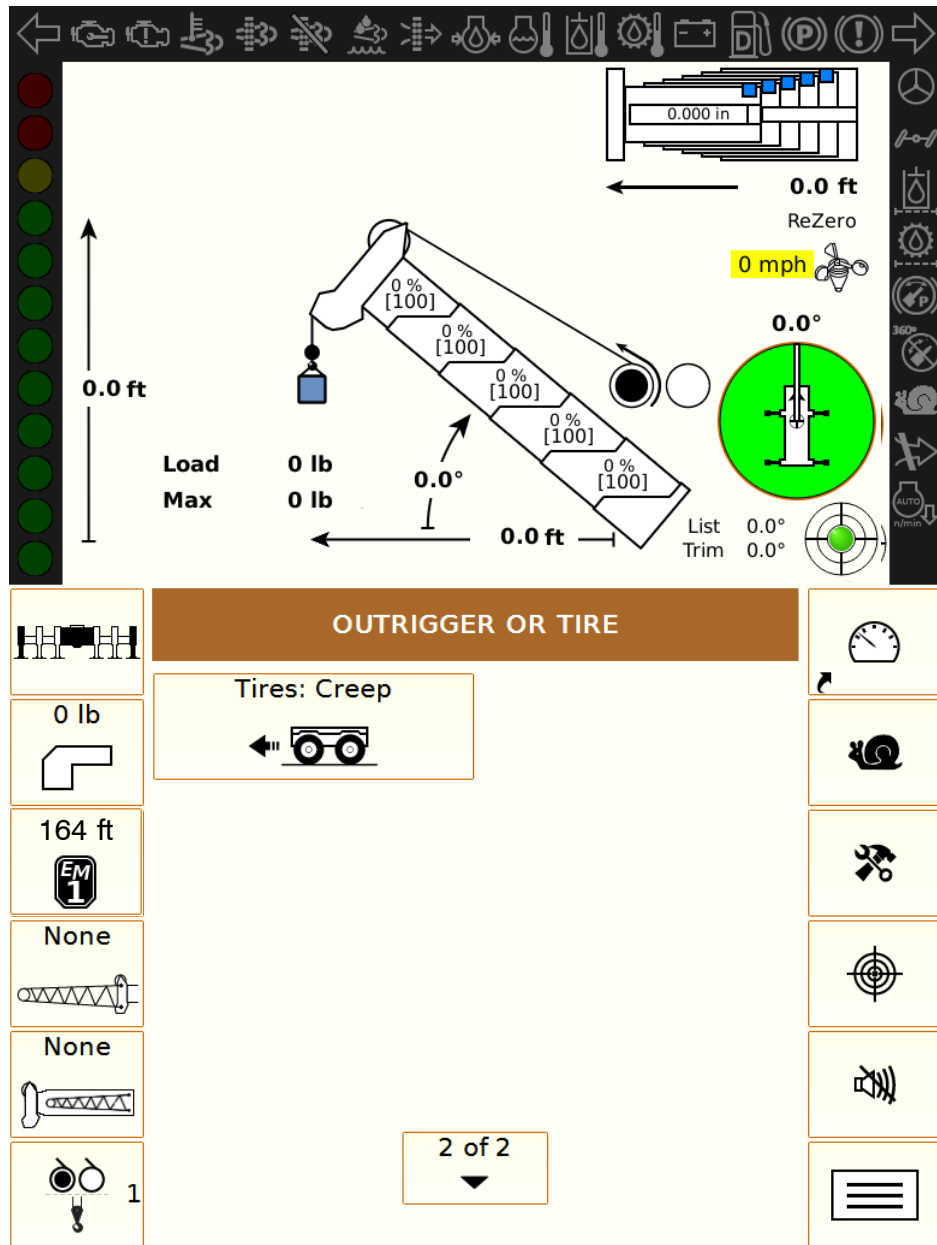


Figure 1–98
Base Configuration – Continued

- b. If V-CALC is selected, the V-CALC Capacity Preview Display will appear. There is an Outrigger Button for each of the four outriggers. Each Outrigger Button will show the position for that individual outrigger. Refer to Figure 1—99.

Note: The Capacity Preview Display is dynamic. If the V-CALC configuration has a corresponding Back Stability Preview, a Back Stability Preview Button will be displayed under the Capacity Preview Display next to the Live Button. If there is no corresponding Back Stability Preview, Only the Live Button will be displayed. Refer to Figure 1—99 and Figure 1—100.

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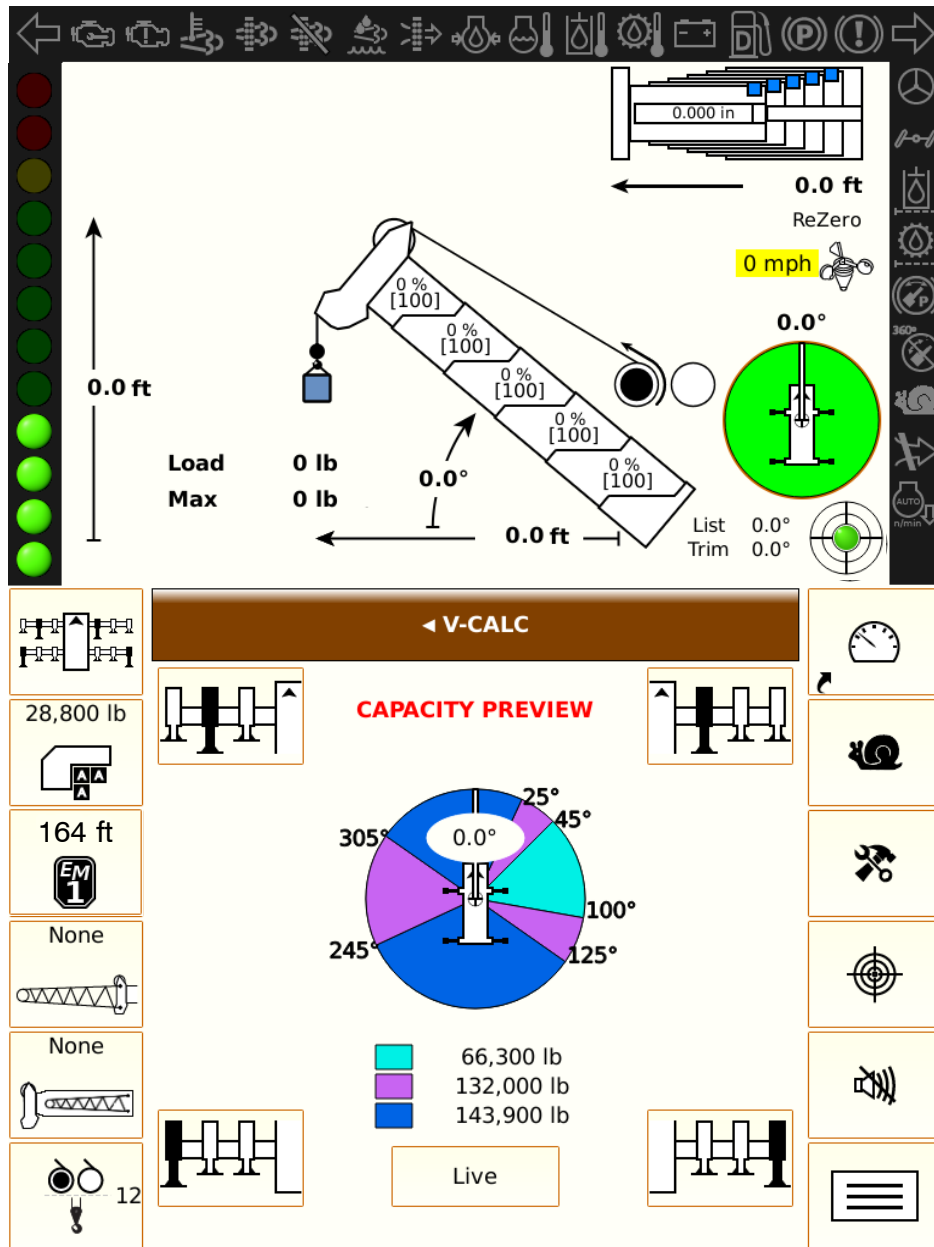


Figure 1–99
Base Configuration – V-CALC – Capacity Preview

- c. Press any outrigger button to toggle through the outrigger positions for that individual outrigger. Press the Screen Header  to return to the previous menu, as required. Refer to Figure 1–99 and Figure 1–100.

Note: Outrigger beams can be positioned anywhere in their length of travel. Select outrigger position that is equal to or less than actual extended length.

Note: In the Capacity Preview Display, different colors represent different allowable capacities. Refer to the legend for actual capacity values. The Live Display accounts for load on hook. In the Live Display, green represents safe swing range, yellow is nearing maximum load capacity, and red is at maximum load capacity. Refer to Figure 1–99 and Figure 1–100.

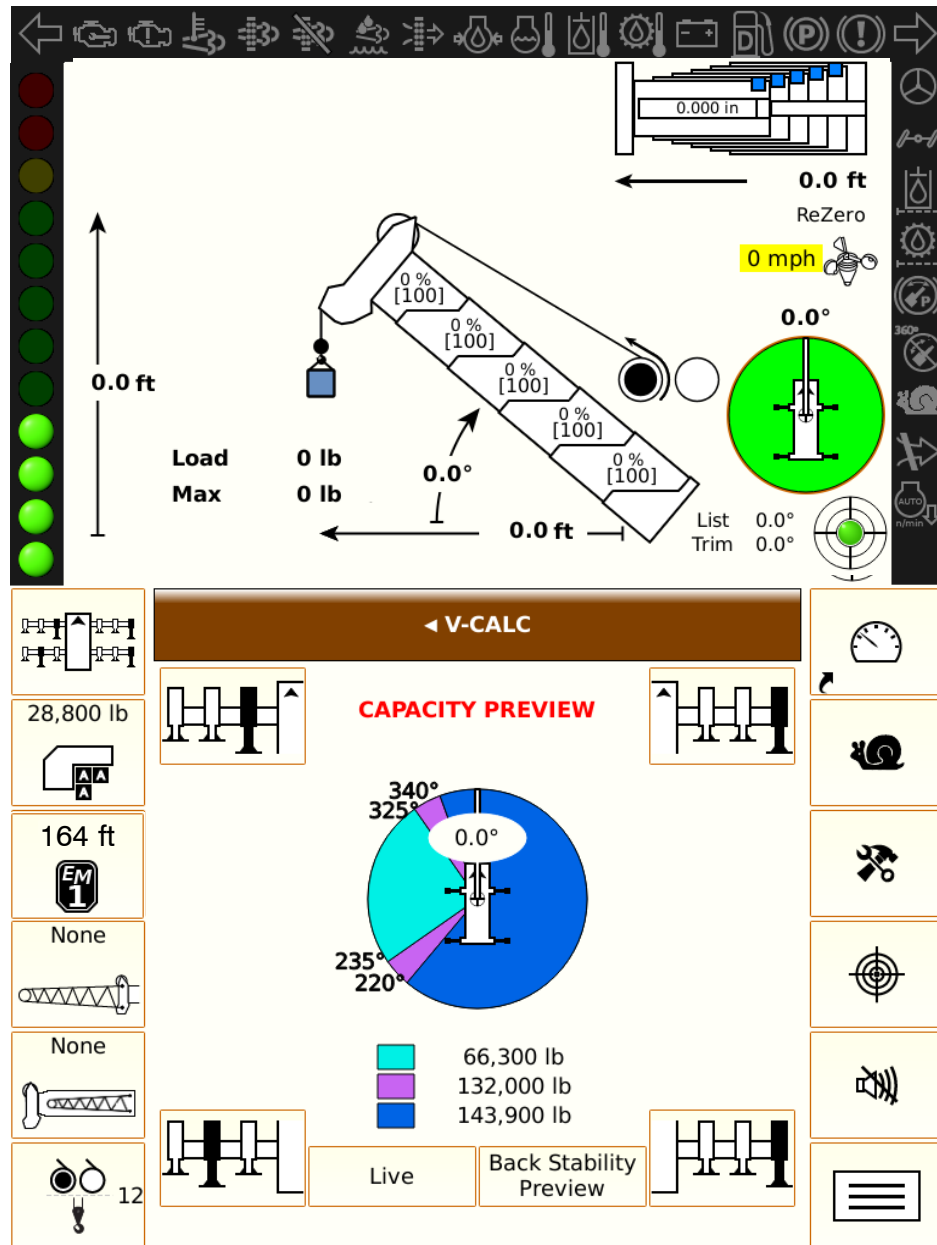


Figure 1–100
Base Configuration – V-CALC – Capacity Preview With Back Stability

- d. If the Back Stability Preview Button is selected, the Back Stability Preview Display will appear. Press the Screen Header  to return to the previous menu, as required. Refer to Figure 1–101.

Note: In the Back Stability Preview Display, different colors represent maximum allowable boom angles. Refer to the legend for actual boom angle values. Refer to Figure 1–101.

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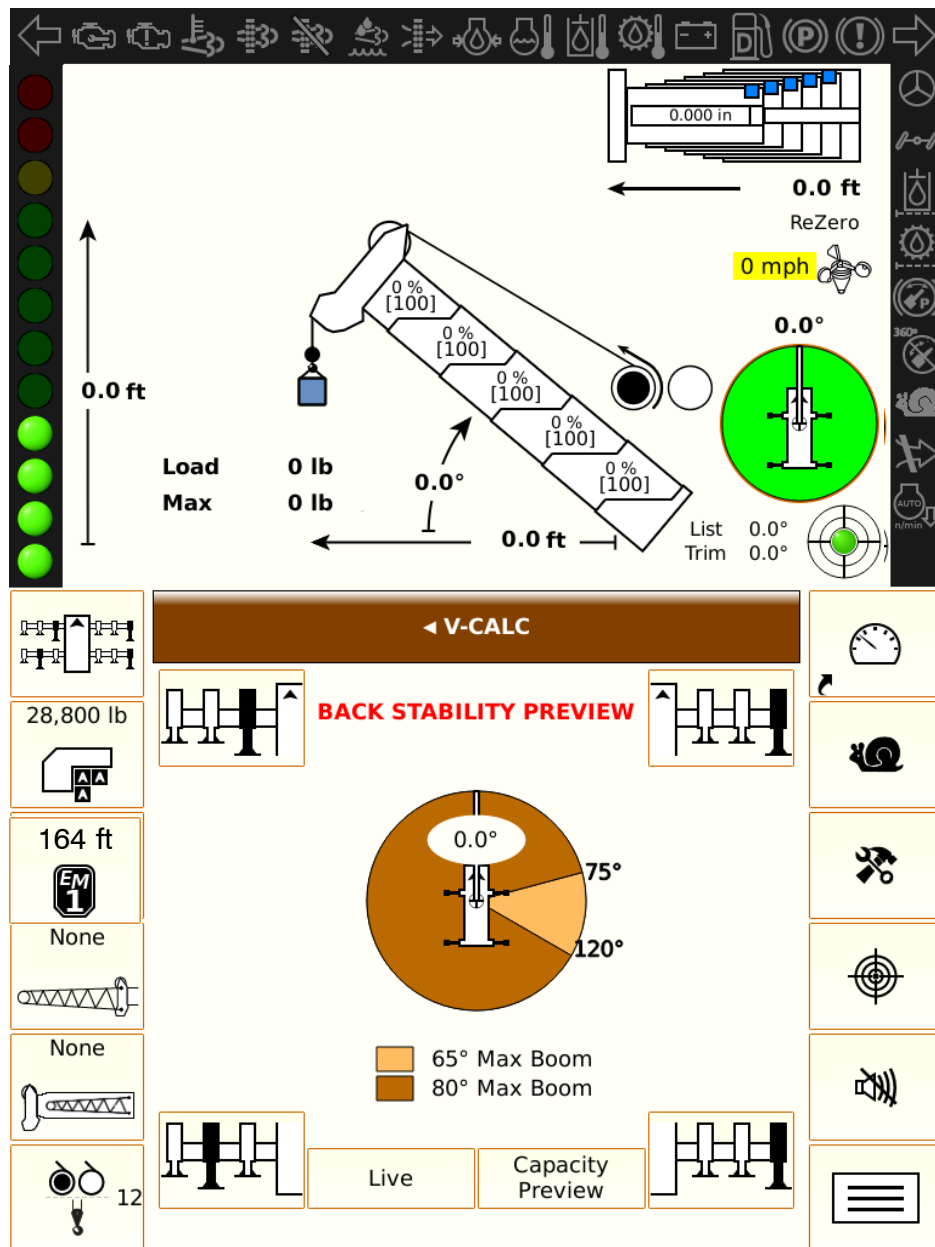


Figure 1–101
Base Configuration – V–CALC – Back Stability Preview

- e. If the Live Button is selected, the Live Radius Range will appear. Press the Capacity Preview Button below the Live Radius Range to return to the V-CALC Menu, as required. Press the Screen Header  to return to the previous menu, as required. Refer to Figure 1–99 and Figure 1–102.

Note: The Live Radius Range can also be accessed from any screen by pressing the Working Area Display  on the RCL Working Screen. Refer to “Radius Range” in this section of this Operator’s Manual.

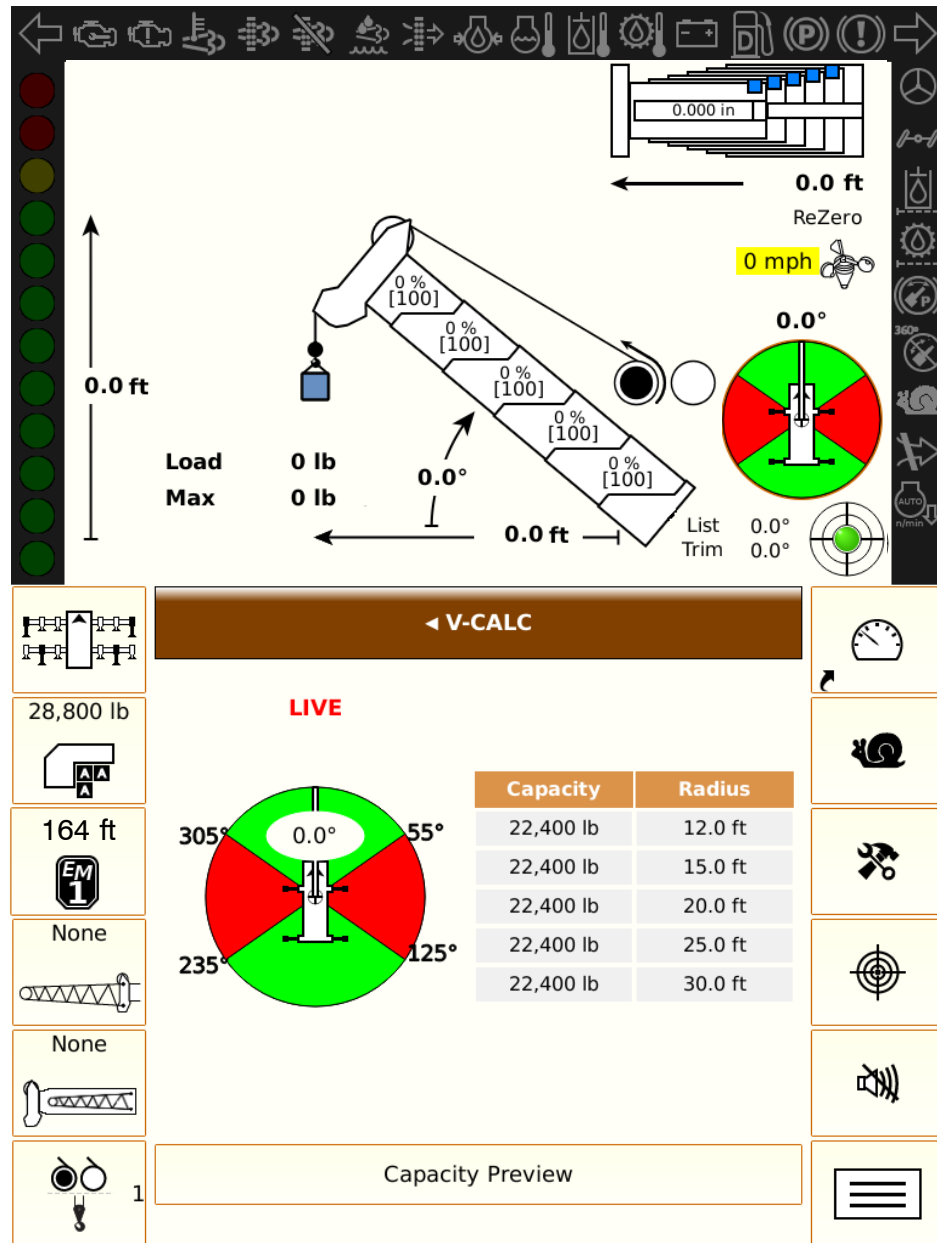


Figure 1-102
Base Configuration – V-CALC – Live Working Radius

Note: The Live Display accounts for load on hook. In the Live Display, green represents safe swing range, yellow is nearing maximum load capacity, and red is at maximum load capacity.

4. If further crane configuration is required, proceed to the next page of this manual. Otherwise, press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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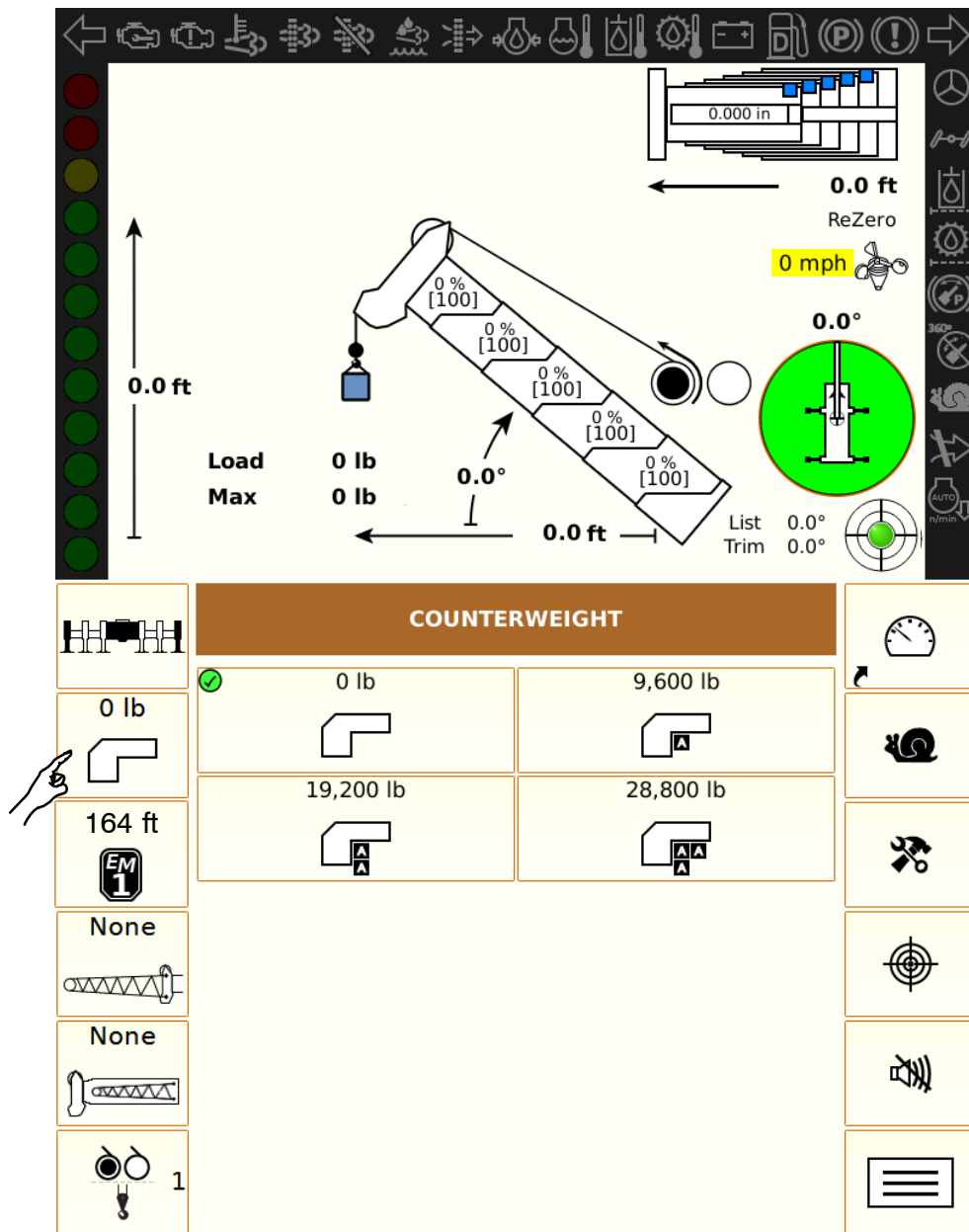


Figure 1-103
Counterweight Configuration

Counterweight Configuration

1. Press the Counterweight Configuration Button . Refer to Figure 1-96.
2. The Counterweight Menu will appear. The activation icon will be present on the button of the previously set configuration. Refer to Figure 1-103.
3. Press the button for the actual counterweight configuration. The activation icon will appear on the button for the selected counterweight configuration.
4. If further crane configuration is required, proceed to the next page of this manual. Otherwise, press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen.

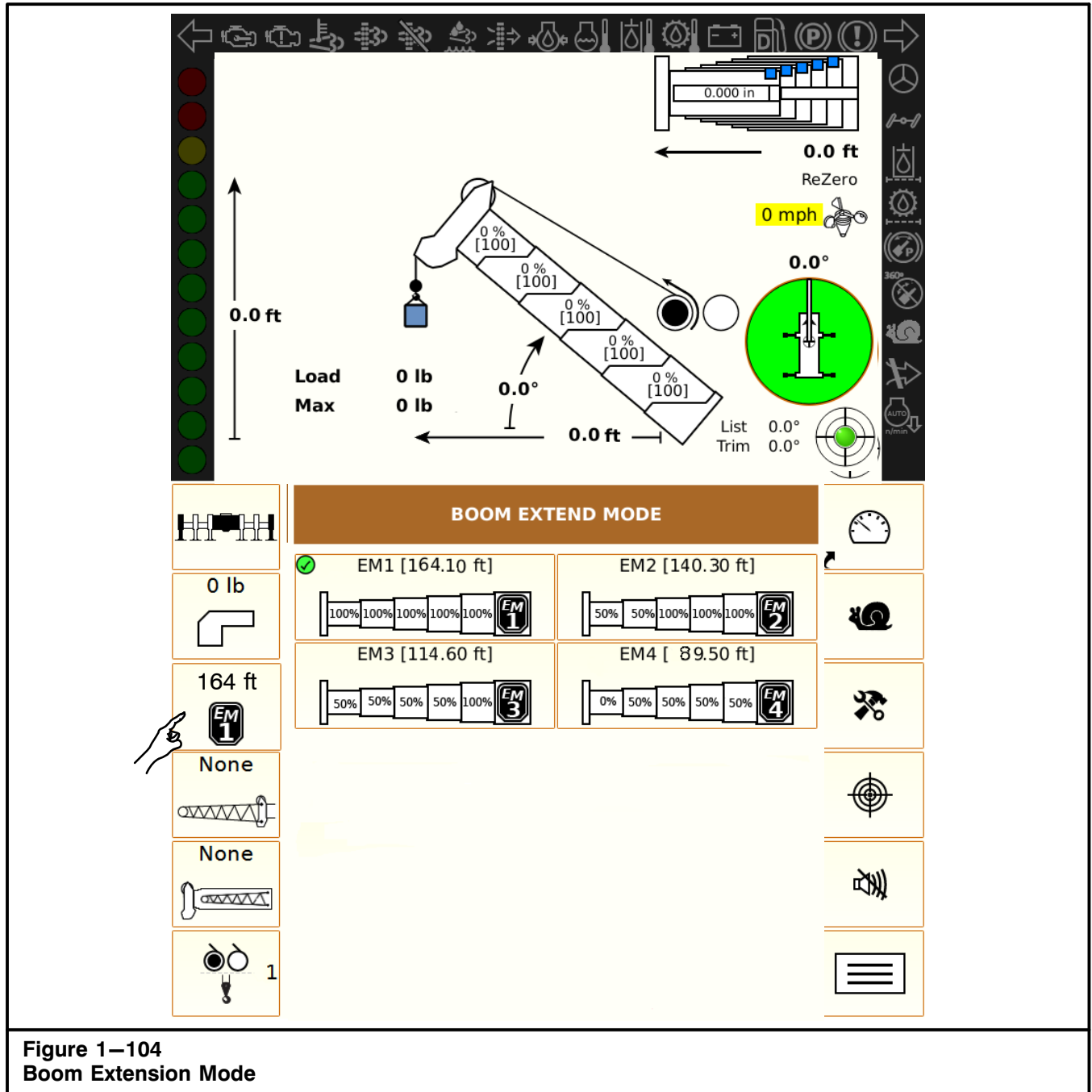


Figure 1–104
Boom Extension Mode

Boom Extension Mode

1. Press the Boom Extension Mode Button . Refer to Figure 1–96.
2. The Boom Extend Mode Menu will appear. The activation icon  will be present on the button of the previously set configuration. Refer to Figure 1–104.

Note: If the boom is not fully retracted, menu options will not be available.

3. Press the button for the actual boom extend mode. The activation icon  will appear on the button for the selected boom extension mode.

Note: Refer to the Crane Rating Manual to determine the best boom mode to maximize lifting capacity at working radius.

4. If further crane configuration is required, proceed to the next page of this manual. Otherwise, press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen.

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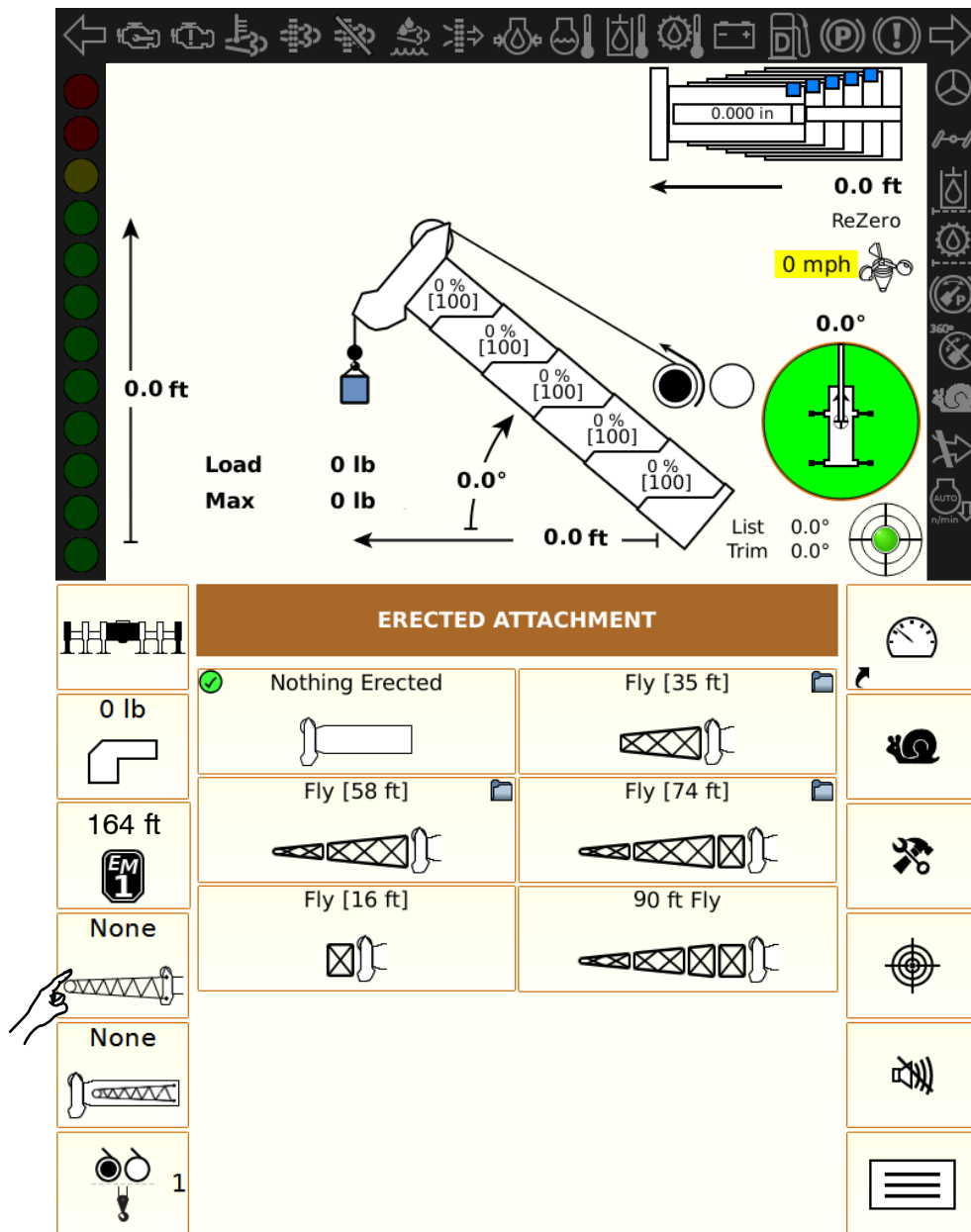


Figure 1–105
Erected Attachment Configuration

Erected Attachment Configuration

1. Press the Erected Attachment Configuration Button . Refer to Figure 1–96.
2. The Erected Attachment Menu will appear. The activation icon  will be present on the button of the previously selected configuration. Refer to Figure 1–105.
3. Press the button for the actual erected attachment.
 - a. If Nothing Erected is selected, the activation icon  will appear on the Nothing Erected Button.

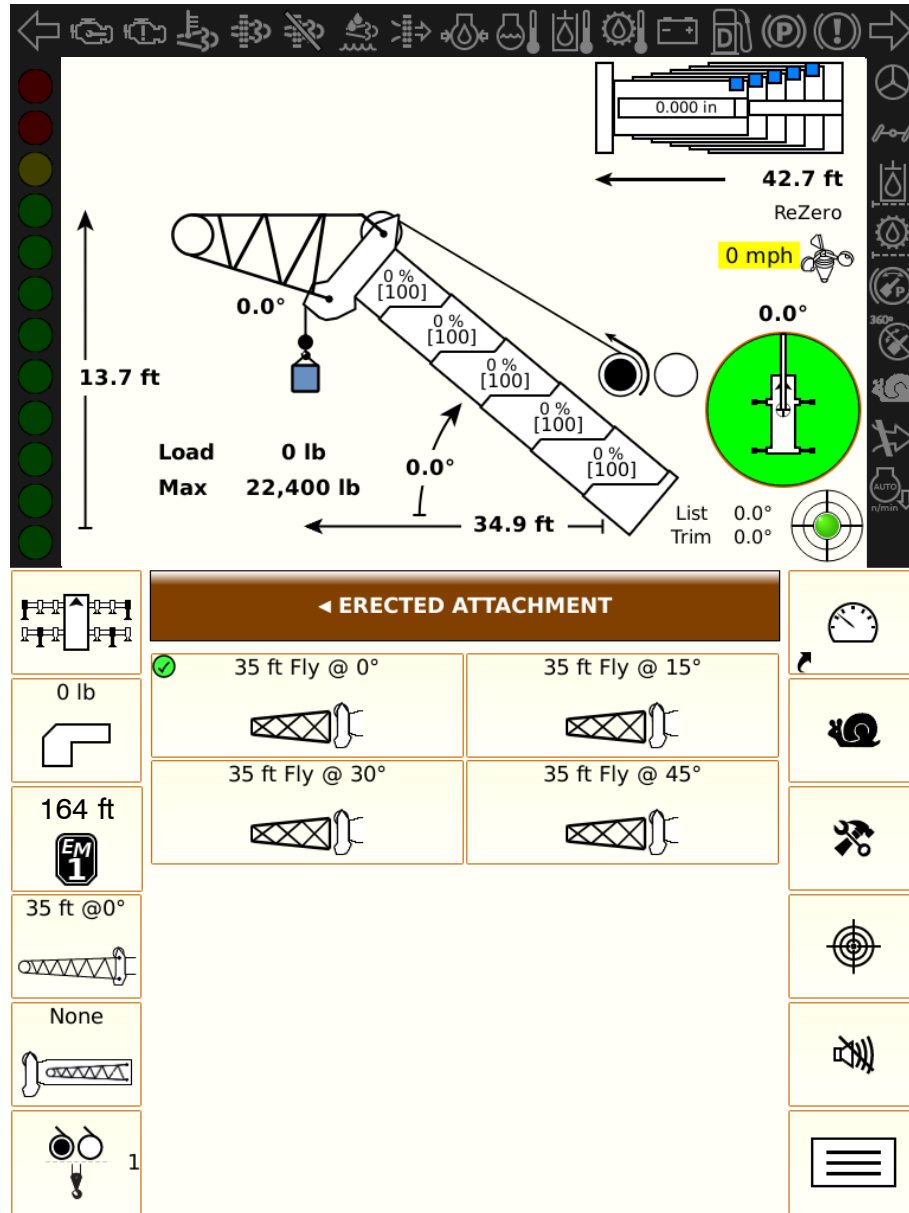


Figure 1–106
Erected Attachment Offset Configuration

- b. If an Erected Attachment is selected, a secondary Erected Attachment will appear. Press the button for the actual offset fly configuration. The activation icon  will appear on the selected button for the desired erected attachment configuration. Refer to Figure 1–106.
4. If further crane configuration is required, proceed to the next page of this manual. Otherwise, press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

Note: If a fixed offset fly angle is selected, the fly angle will appear on the Erected Attachment Configuration Button. Refer to Figure 1–106.

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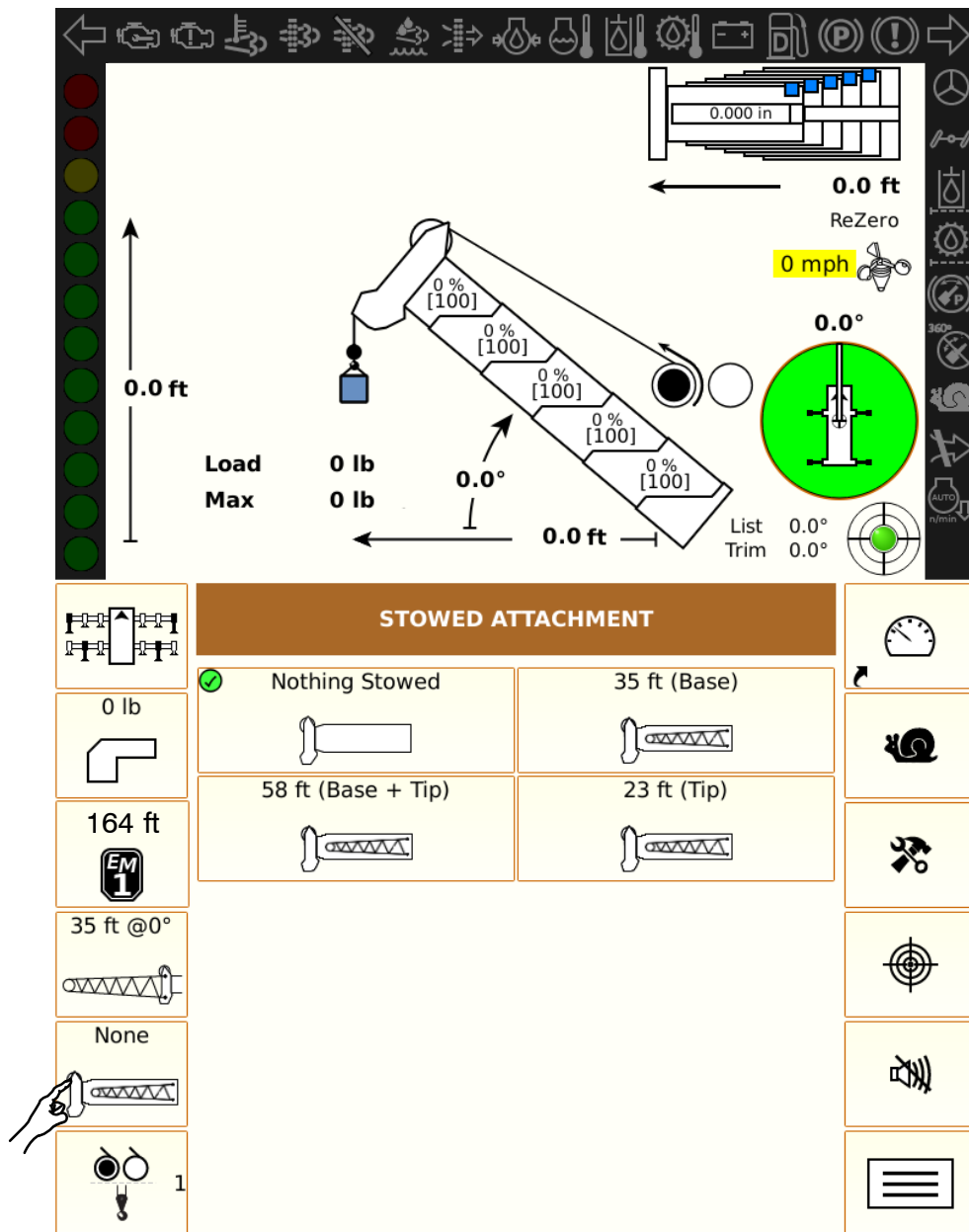
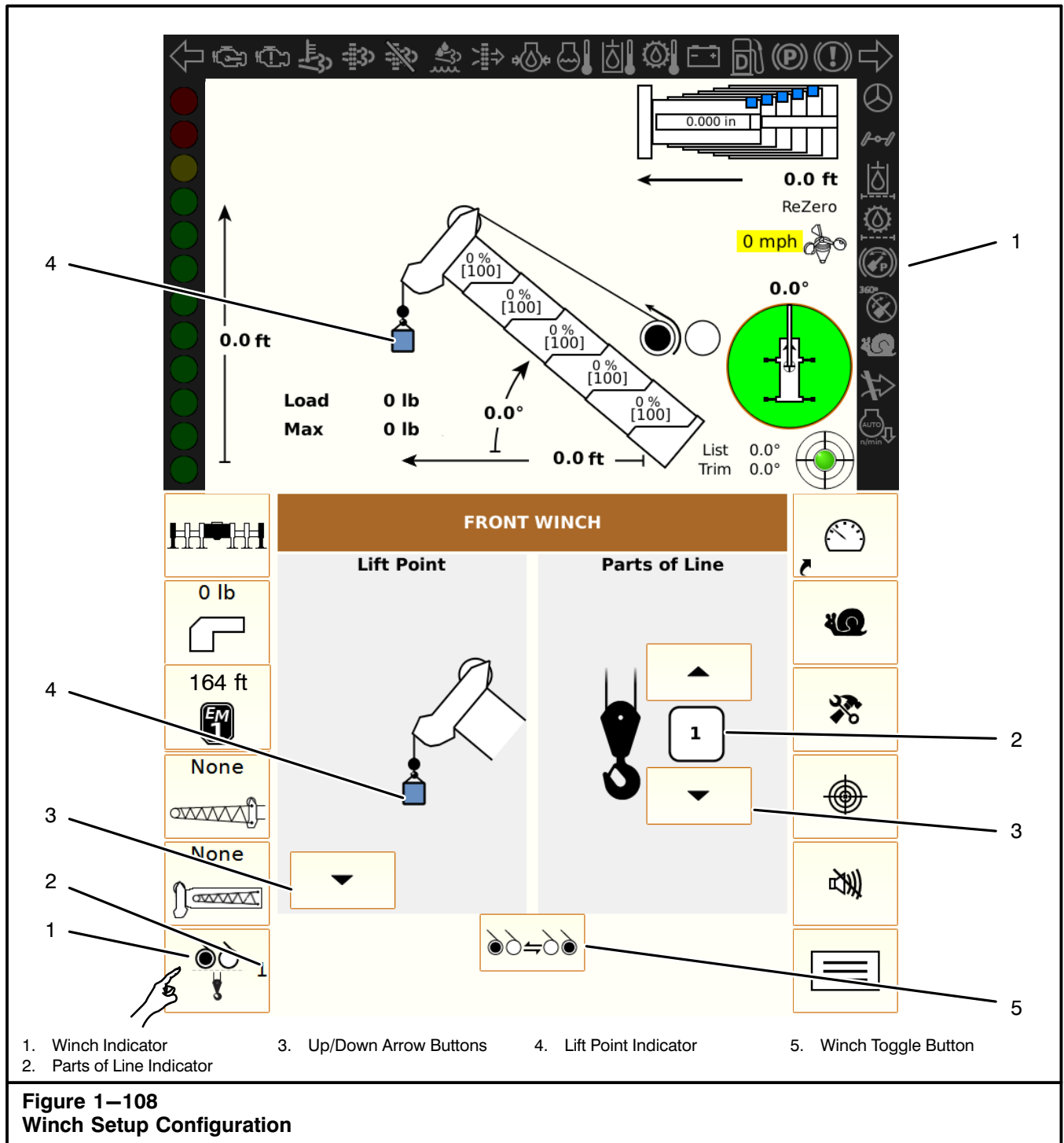


Figure 1-107
Stowed Attachment Configuration

Stowed Attachment Configuration

1. Press the Stowed Attachment Configuration Button . Refer to Figure 1-96.
2. The Stowed Attachment Menu will appear. The activation icon  will be present on the button of the previously selected configuration. Refer to Figure 1-107.
3. Press the button for the actual stowed attachment configuration. The activation icon  will appear on the button for the selected stowed attachment configuration.
4. If further crane configuration is required, proceed to the next page of this manual. Otherwise, press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen.



Winch Setup Configuration

Note: The Winch Setup Button will display the active winch and selected parts of line. The RCL Working Screen will display the active winch and lift point. Refer to Figure 1-108.

1. Press the Winch Setup Button  1. Refer to Figure 1-96.

2. The Winch Setup Screen will appear for the active winch. Refer to Figure 1-108.

- Activate the desired winch by pressing the Winch Toggle Button  until the desired winch is displayed on the menu header.
- Select the desired lift point by pressing the Down Arrow Button  below the Lift Point Indicator until the desired lift point is displayed.

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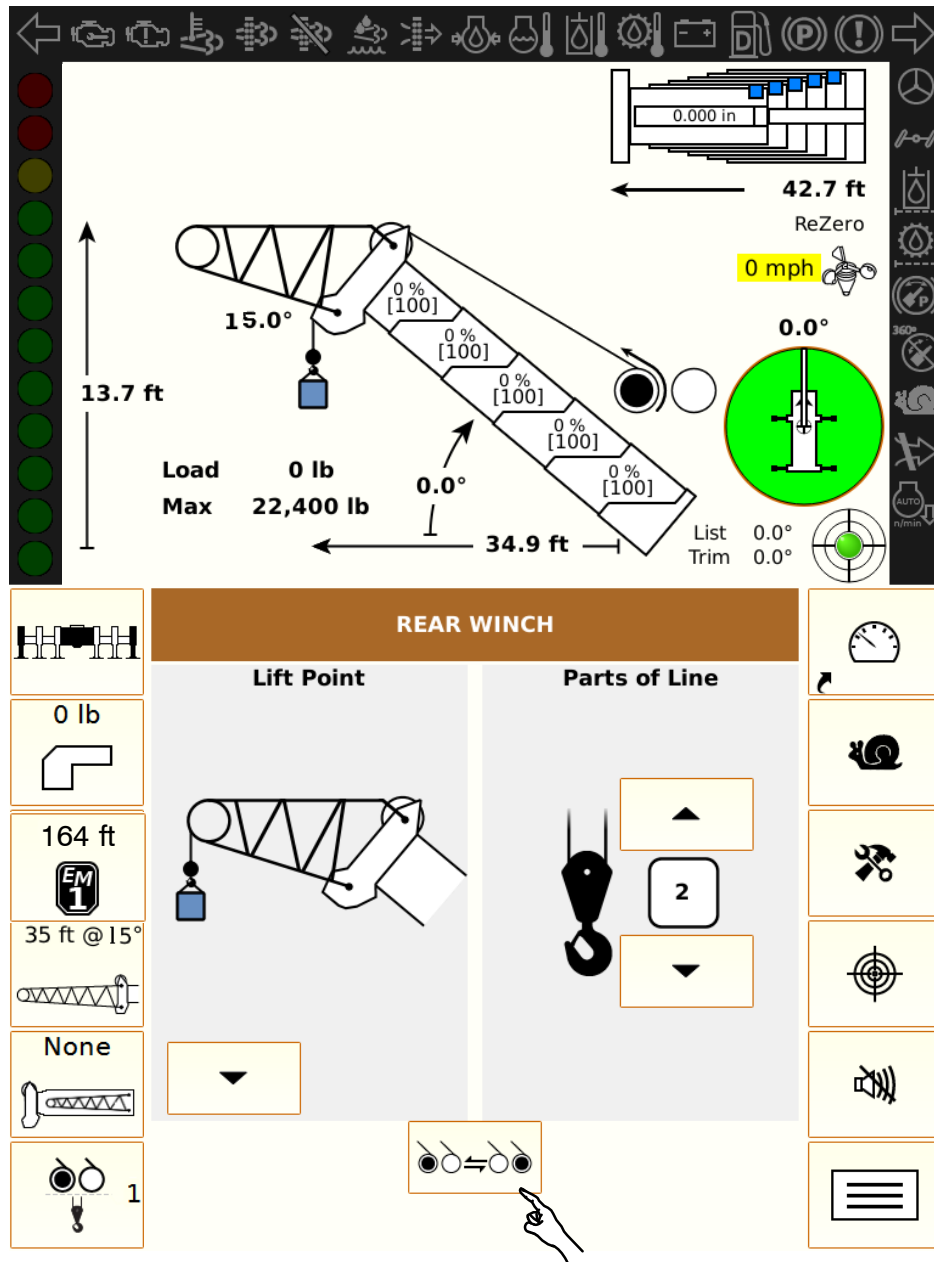


Figure 1–109
Winch Setup Configuration Continued

- c. Select the desired parts of line by pressing the Up/Down Arrow Buttons ▲▼ above or below the Parts of Line Indicator until the desired parts of line are displayed.
- d. Repeat Steps a through c for the other winch, as required. Refer to Figure 1–109.

Note: Figure 1–109 is an example of a front winch configuration in which there are two parts of line and the lift point is at the head of the installed 35 ft (10.67m) fly.

Note: A change to any selection can be made at anytime during the configuration routine, simply navigate to the desired configuration menu to access to that sub-routine.

3. If further crane configuration is required, proceed to the next page of this manual. Otherwise, press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen.

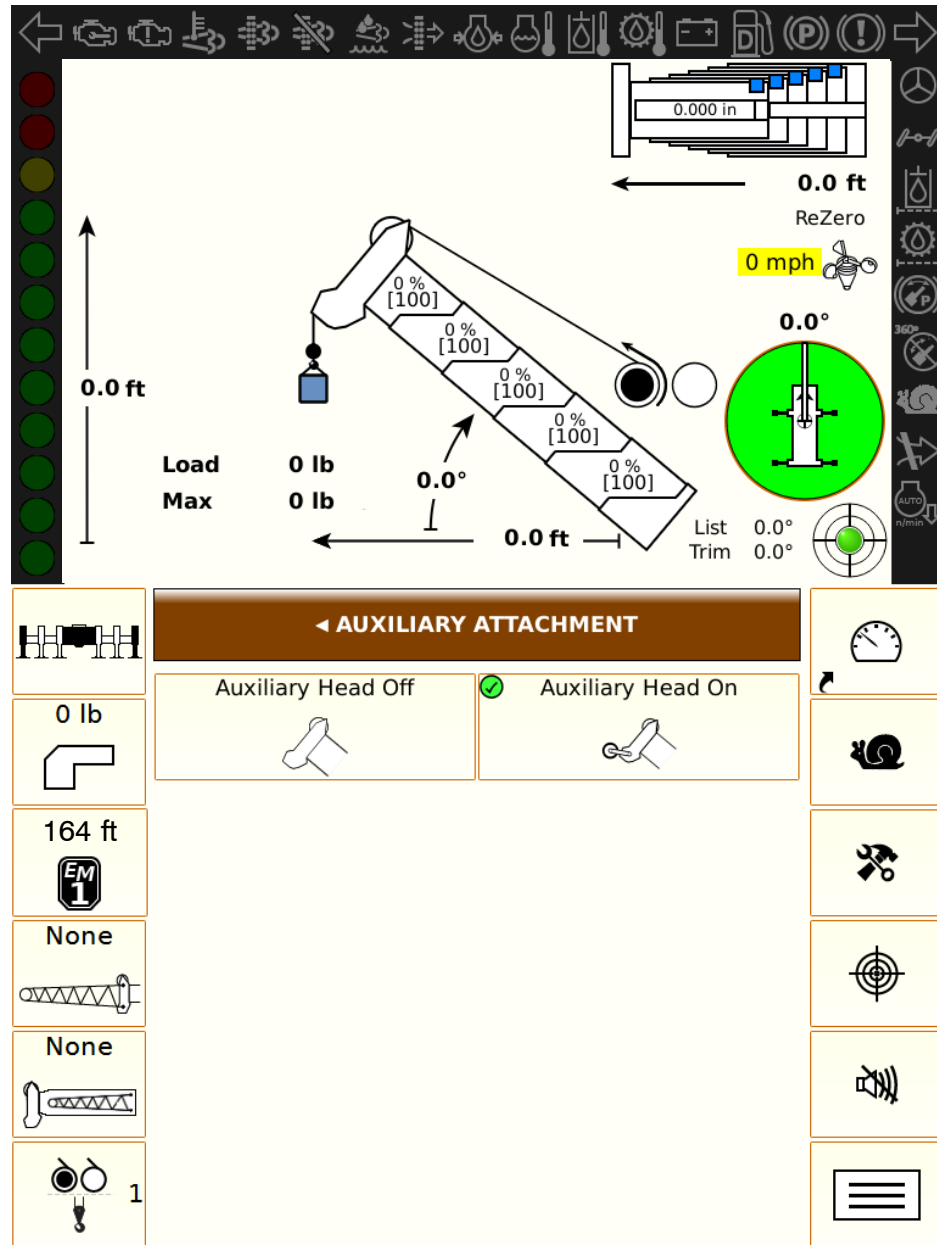


Figure 1–110
Auxiliary Attachment

Auxiliary Attachment

1. From the Main Menu Screen, press the Auxiliary Attachment Button . Refer to Figure 1–89.
2. The Auxiliary Attachment Menu will appear. The activation icon will be present on the button of the previously set configuration. Refer to Figure 1–110.
3. Press the button for the actual auxiliary attachment configuration. The activation icon will appear on the button for the selected auxiliary attachment configuration.

Note: The RCL Working Screen will display the current auxiliary head configuration as shown in Figure 1–110.

4. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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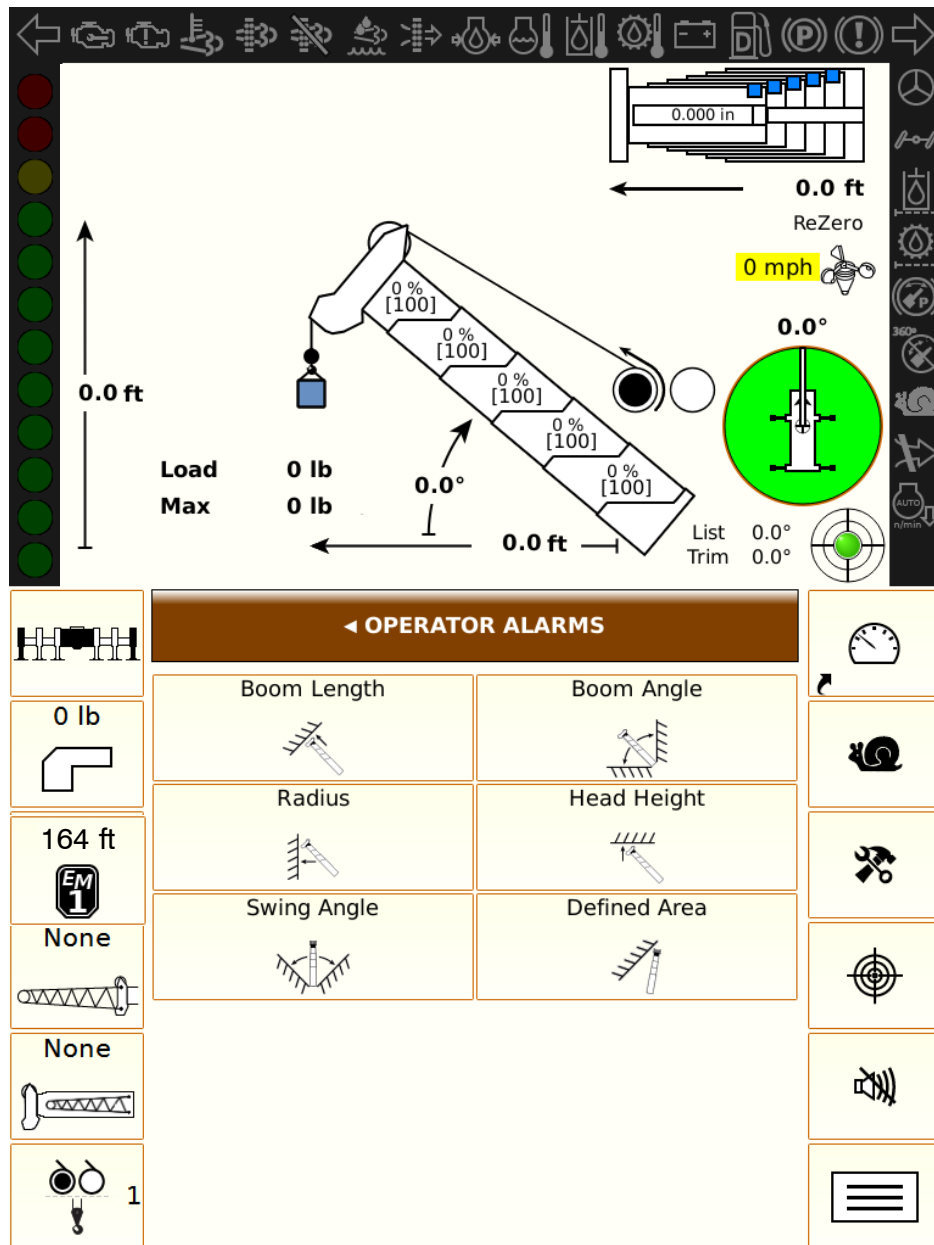


Figure 1-111
Operator Alarms

Operator Settable Alarms

Some alarms occur automatically as a result of limitations imposed by the capacity chart. The operator has control over additional alarms which can be set to operate within the normal chart limitations and which are in addition to those already set by the chart.

Operator alarms will be stored in the computer memory, even if the crane is shutdown, until they are disabled. Refer to "To Disable Operator Settable Alarms" in this section of this Operator's Manual.



WARNING

For safe operation, adequate distance must be maintained to allow for operator reaction time to avoid entering the bad area. It is the responsibility of the operator to set points which ensure that the crane's boom, attachment, load, rigging, etc. maintains a safe working distance and complies with local safety regulations.

Setting Boom Length, Boom Angle, Radius, Head Height, and Swing Angle

1. From the Main Menu Screen, press the Operator Alarms Button . Refer to Figure 1–89.

Note: Before activating a specific alarm, the previous alarm value for that specific alarm must first be disabled. Refer to “To Disable Operator Settable Alarms” in this section of this Operator's Manual.

Note: When setting the Head Height alarm, the height value is the height of the tip of the attachment from the carrier deck.

2. The Operator Alarms Menu will appear. Press the button for the desired operator alarm. Refer to Figure 1–111.
 - a. The selected operator alarm display will appear. Refer to Figure 1–112 through Figure 1–123.



WARNING

Avoid positioning the boom, attachment, load, rigging, etc. into the bad area when setting the alarm values.

When selecting the alarm values, ensure that the load will maintain a safe distance from the obstacle.

- b. Position the crane in accordance with the desired alarm value.
- c. Press the Down Arrow Button  below the selected alarm value display to activate the corresponding alarm value. The Activation Toggle above the selected alarm value display will toggle from deactivated  to activated .

Note: Once all alarm values are set for an alarm, an alarm icon  will appear in the upper left of the RCL Working Screen to alert the operator that an operator alarm has been set.

3. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.
4. Repeat Steps 2 through 3, as required, until all desired operator alarms are set.
5. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching the alarm set point, the audible alarm will sound intermittently and a warning message will appear in the Message Area. When reaching the alarm set point, the audible alarm will sound continuously, the function limiters will activate, and a warning message will appear in the Message Area.



WARNING

If crane or obstacle is moved or if a different size load is lifted, the alarm(s) must be reset.



WARNING

Check the crane's current configuration, capacity chart, and Working Areas chart in the Crane Rating Manual to ensure safe, stable operation under conditions described in the following examples.

Operator's Manual

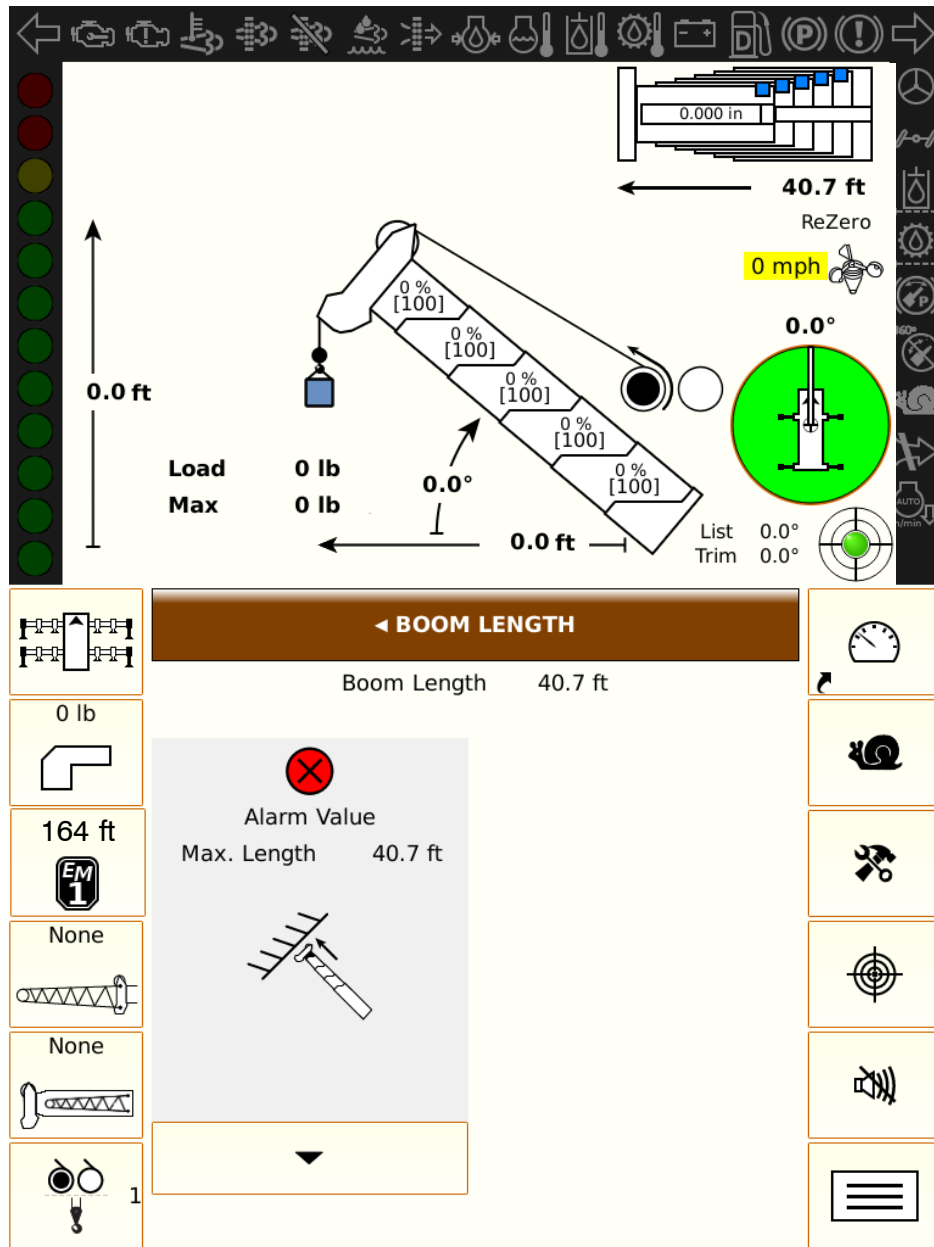


Figure 1-112
Operator Alarms – Boom Length

To Set Maximum Boom Length Alarm (Example)

Example: To have an alarm whenever the boom length reaches 50 feet (15.24m), use the following procedure:

1. From the Main Menu Screen, press the Operator Alarms Button . Refer to Figure 1-89.
2. The Operator Alarms Menu will appear. Press the Boom Length Button . Refer to Figure 1-111.
3. The Boom Length Screen will appear. Refer to Figure 1-112.
4. Extend the boom to the length of 50 feet (15.24m).
5. Press the Down Arrow Button below the Max. Length alarm value display to activate the selected alarm value. The Activation Toggle above the alarm value display will toggle from deactivated to activated . Refer to Figure 1-113.

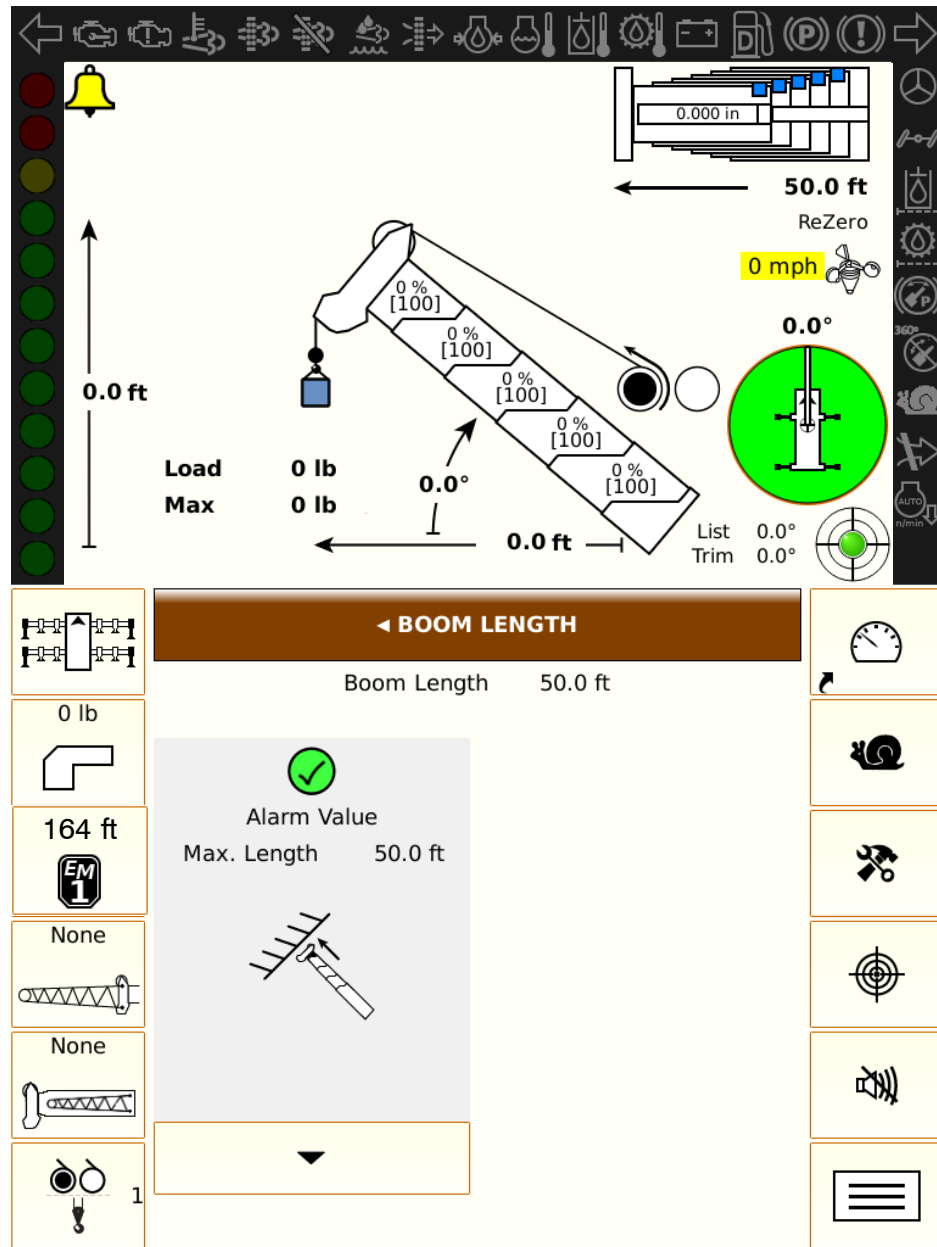


Figure 1–113
Operator Alarms – Boom Length Activated

- Note:** An alarm icon  will appear in the top left of the RCL Working Screen to alert the operator that an operator alarm has been set.
- Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.
 - Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching 50 ft (15.24m) boom length, the audio alarm will sound intermittently and “Approaching Maximum Length” will appear in the Message Area. If the boom length reaches 50 feet (15.24m), the audible alarm will sound continuously, the function limiters will activate, and “Maximum Length” will appear in the Message Area. Refer to Figure 1–76.

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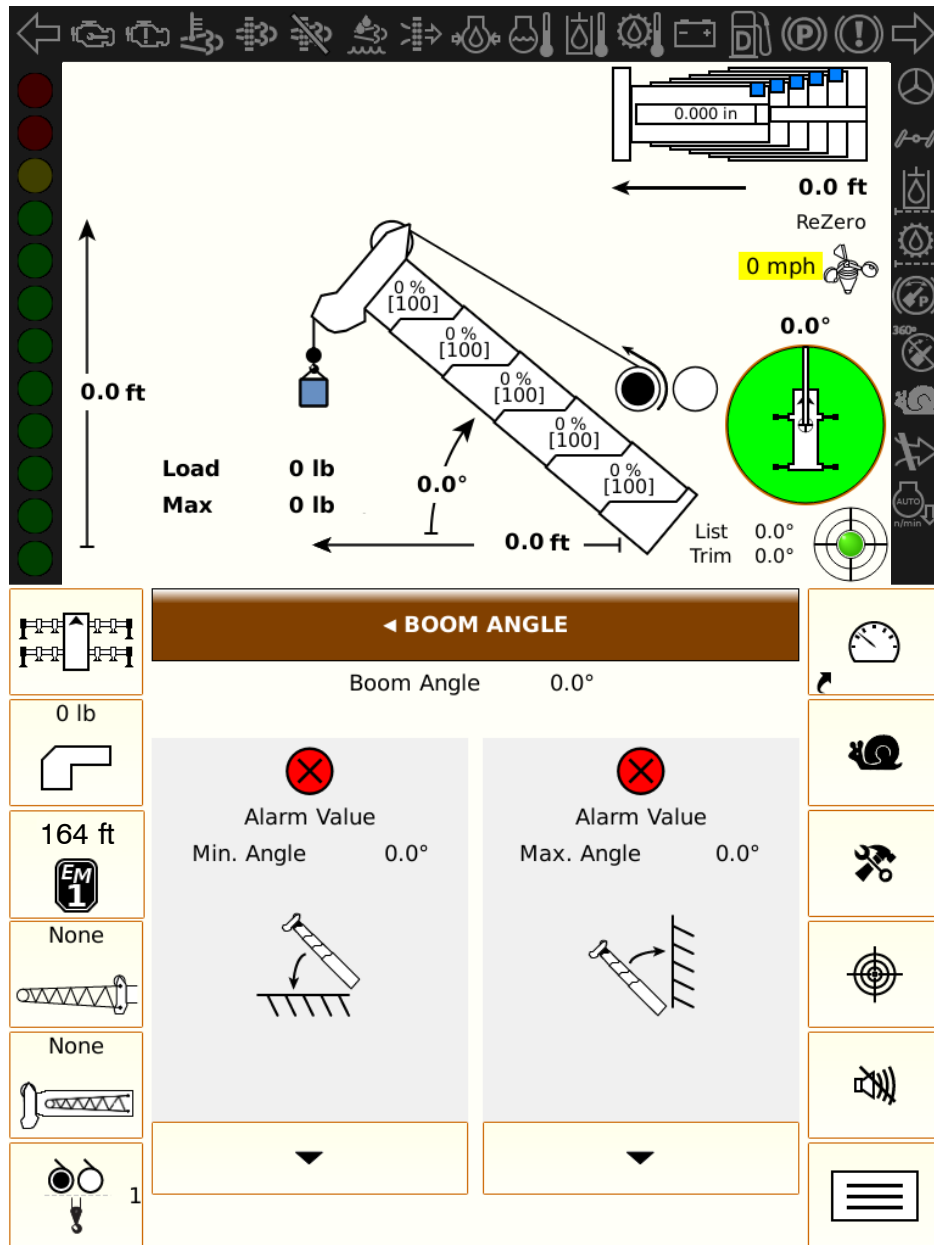


Figure 1–114
Operator Alarms – Boom Angle

To Set Minimum and Maximum Boom Angle Alarms (Example)

Example: To have an alarm whenever the boom is at a 13.1° minimum angle or a 48.4° maximum angle, use the following procedure:

1. From the Main Menu Screen, press the Operator Alarms Button . Refer to Figure 1–89.
2. The Operator Alarms Menu will appear. Press the Boom Angle Button . Refer to Figure 1–111.
3. The Boom Angle Screen will appear. Refer to Figure 1–114.
4. Raise the boom to a 13.1° angle.

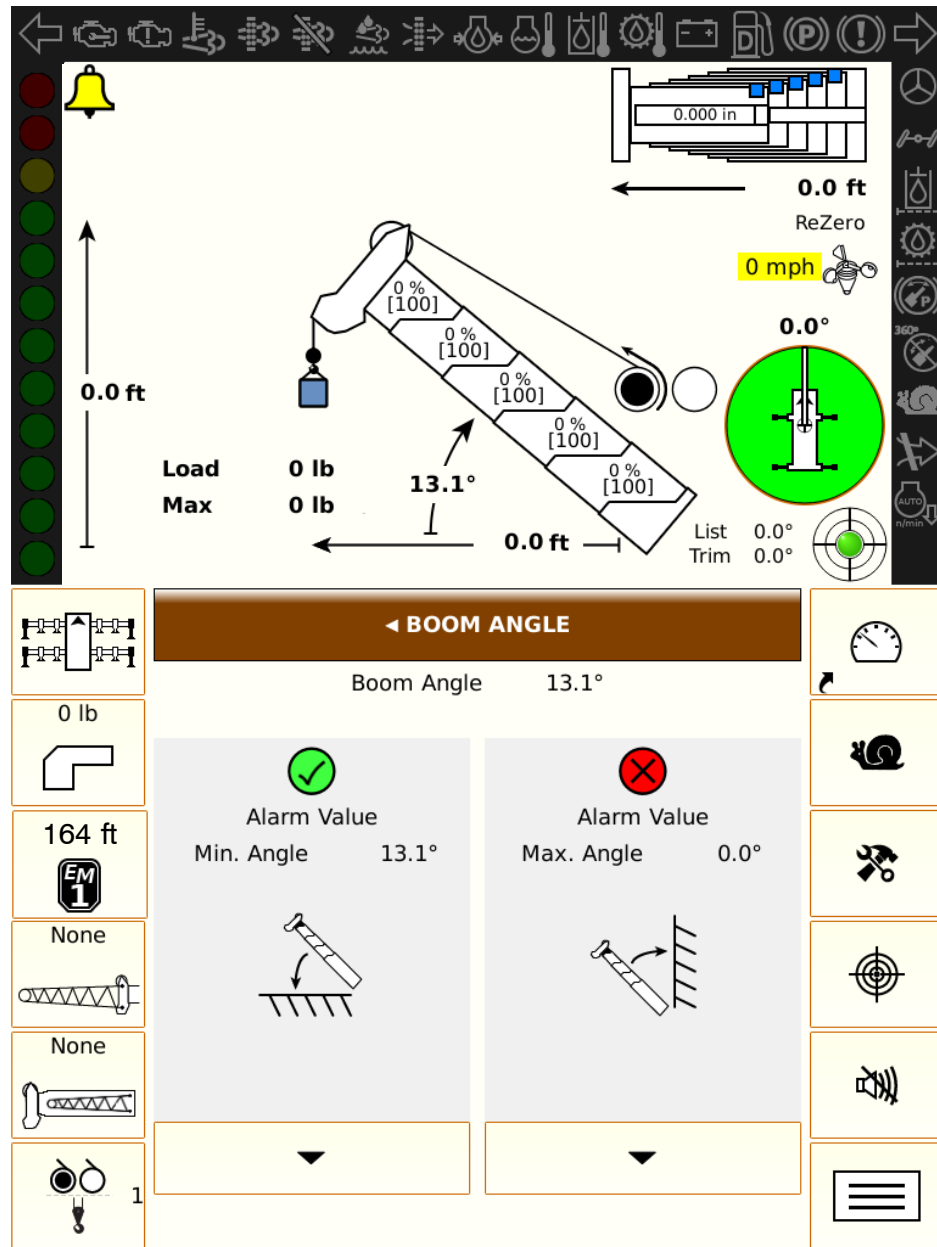


Figure 1–115
Operator Alarms – Boom Angle Minimum

5. Press the Down Arrow Button ▼ below the Min. Angle alarm value display to activate the selected alarm value. The Activation Toggle above the alarm value display will toggle from deactivated  to activated . Refer to Figure 1–115.
6. Raise the boom to a 48.4° angle.
7. Press the Down Arrow Button ▼ below the Max. Angle alarm value display to activate the selected alarm value. The Activation Toggle above the alarm value display will toggle from deactivated  to activated . Refer to Figure 1–116.

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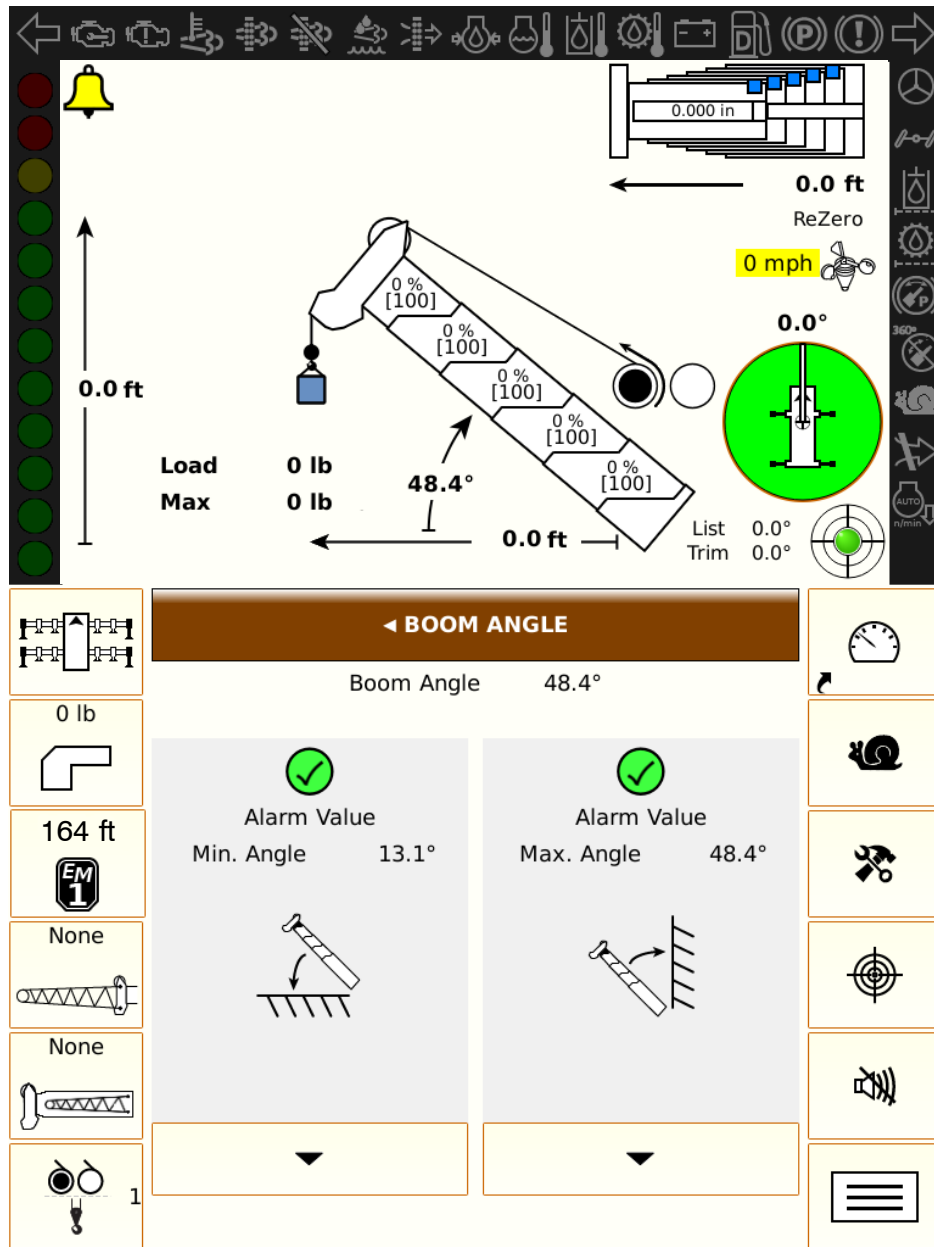


Figure 1–116
Operator Alarms – Boom Angle Activated

- Note:** An alarm icon  will appear in the top left of the RCL Working Screen to alert the operator that an operator alarm has been set.
8. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.
 9. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching 13.1° minimum or 48.4° maximum boom angle, the audio will sound intermittently and “Approaching Minimum Angle” or “Approaching Maximum Angle” will appear in the Message Area. If the boom is positioned at 13.1° or 48.4°, the audible alarm will sound continuously, the function limiters will activate, and “Minimum Angle” or “Maximum Angle” will appear in Message Area. Refer to Figure 1–76.

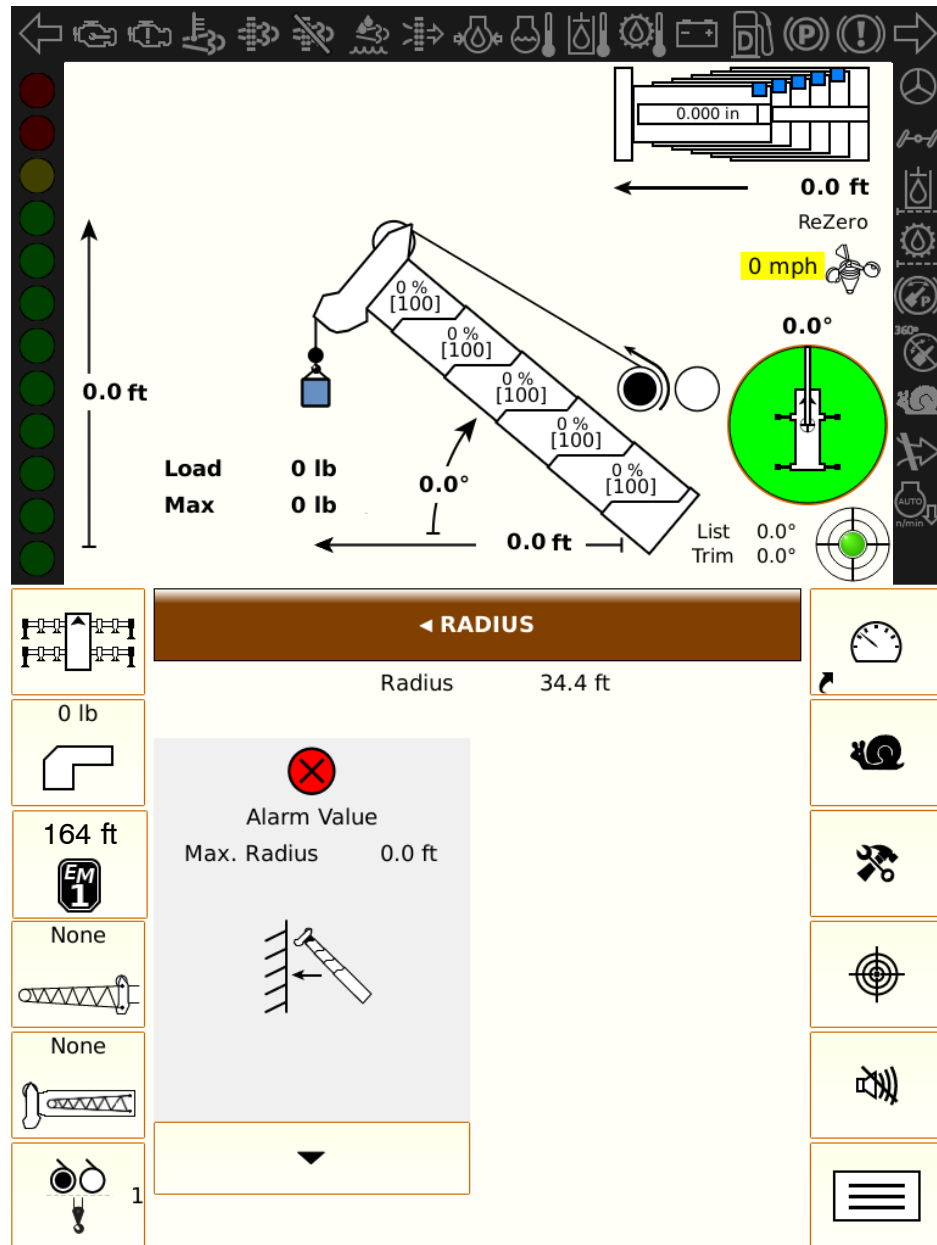


Figure 1–117
Operator Alarms – Radius

To Set Maximum Radius Alarm (Example)

Example: To have an alarm whenever the boom radius reaches 71.9 feet (21.92m), use the following procedure:

1. From the Main Menu Screen, press the Operator Alarms Button . Refer to Figure 1–89.
2. The Operator Alarms Menu will appear. Press the Radius Button . Refer to Figure 1–111.
3. The Radius Screen will appear. Refer to Figure 1–117.
4. Extend the boom and/or adjust the boom angle to the radius of 71.9 ft (21.92m).
5. Press the Down Arrow Button below the Max. Radius alarm value display to activate the selected alarm value. The Activation Toggle above the alarm value display will toggle from deactivated to activated . Refer to Figure 1–118.

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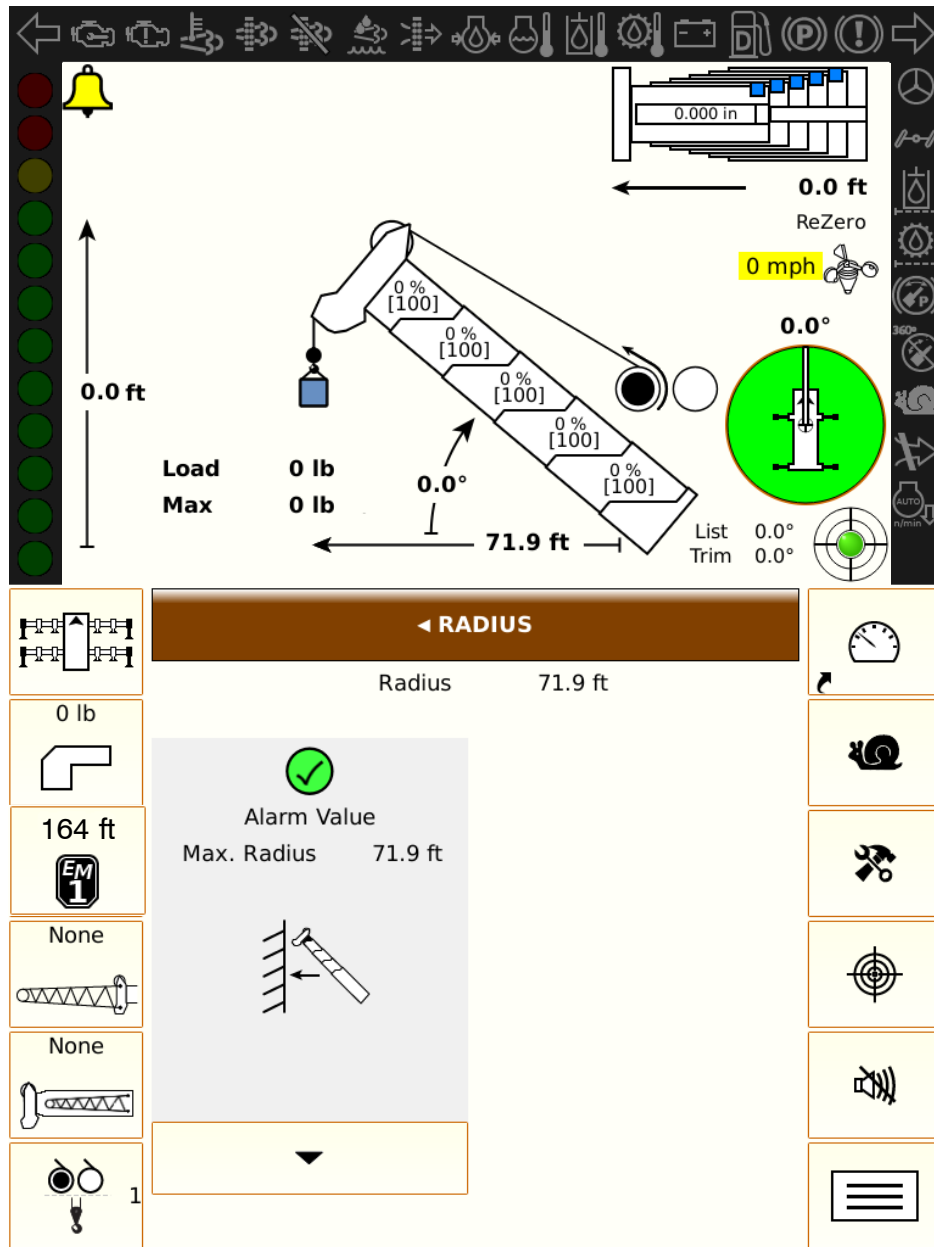


Figure 1–118
Operator Alarms – Radius Activated

- Note:** An alarm icon 🚨 will appear in the top left of the RCL Working Screen to alert the operator that an operator alarm has been set.
- Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.
 - Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching 71.9 ft (21.92m) boom radius, the audio will sound intermittently and “Approaching Maximum Radius” will appear in the Message Area. If the boom radius reaches 71.9 feet (21.92m), the audible alarm will sound continuously, the function limiters will activate, and “Maximum Radius” will appear in Message Area. Refer to Figure 1–76.

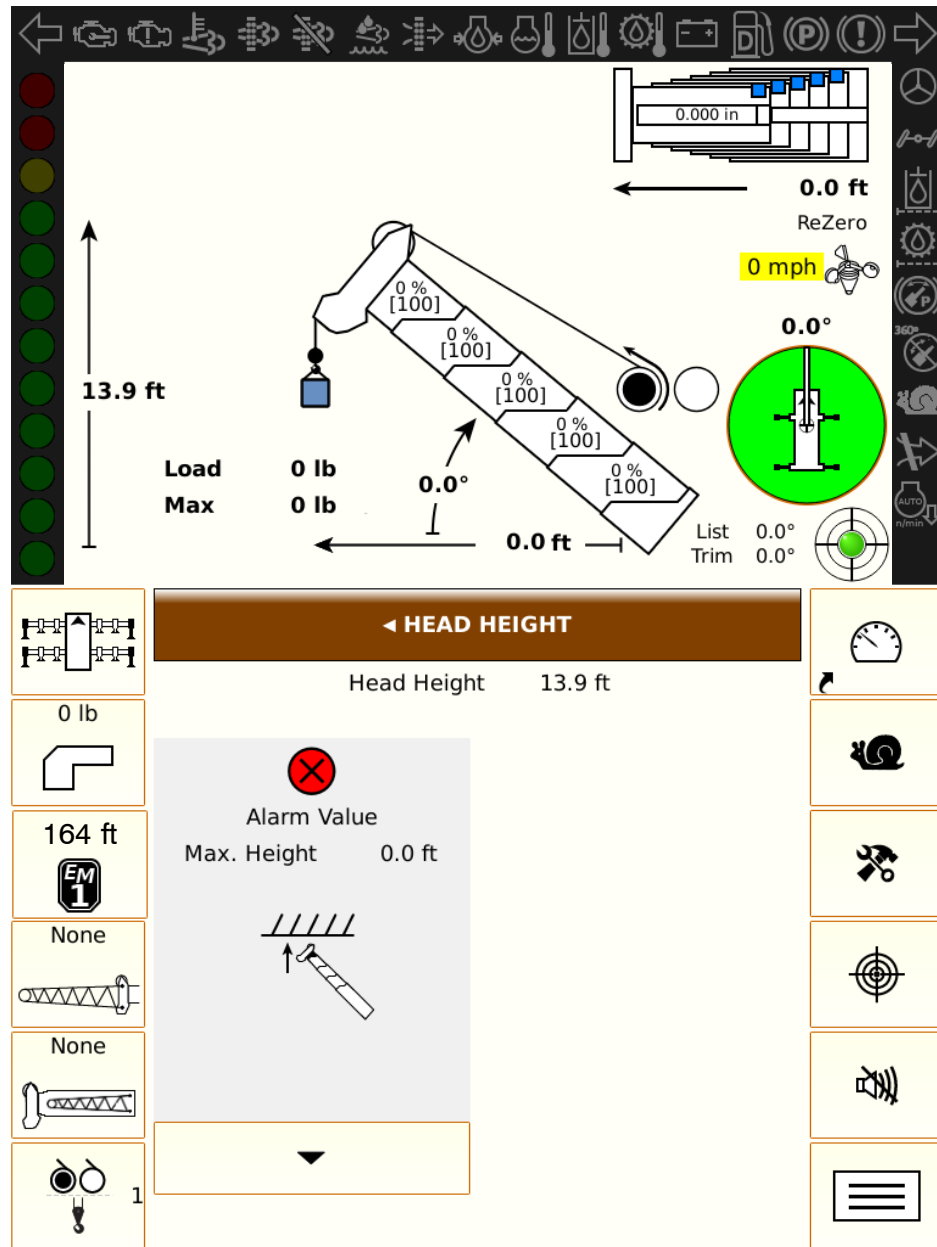


Figure 1–119
Operator Alarms – Head Height

To Set Maximum Head Height Alarm (Example)

Example: To have an alarm whenever the boom tip height reaches 44.8 feet (13.66m) from the carrier deck, use the following procedure:

1. From the Main Menu Screen, press the Operator Alarms Button . Refer to Figure 1–89.
2. The Operator Alarms Menu will appear. Press the Head Height Button . Refer to Figure 1–111.
3. The Head Height Screen will appear. Refer to Figure 1–119.
4. Extend the boom and/or adjust the boom angle to the head height of 44.8 ft (13.66m).
5. Press the Down Arrow Button below the Max. Height alarm value display to activate the selected alarm value. The Activation Toggle above the alarm value display will toggle from deactivated to activated . Refer to Figure 1–120.

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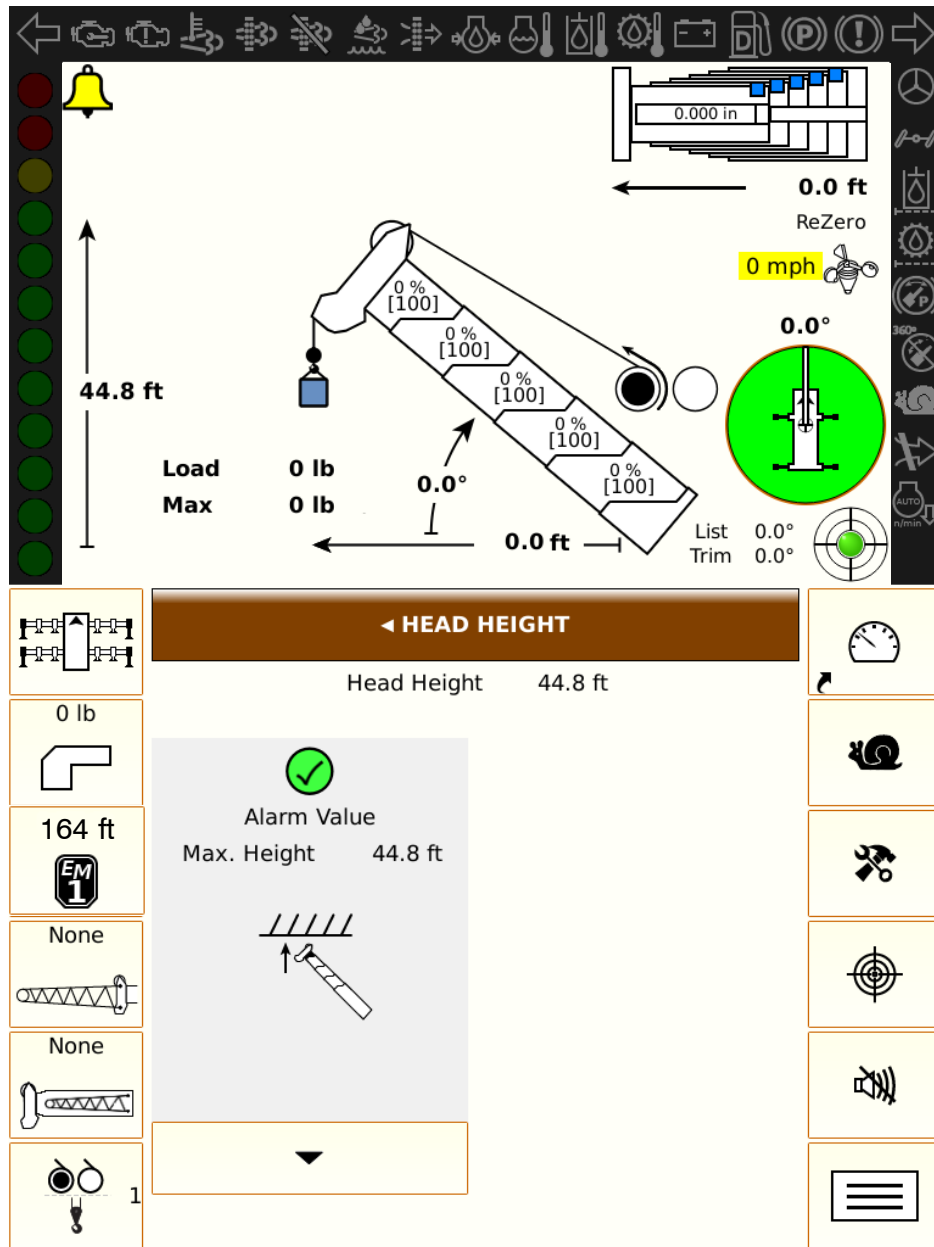


Figure 1–120
Operator Alarms – Head Height Activated

Note: An alarm icon  will appear in the top left of the RCL Working Screen to alert the operator that an operator alarm has been set.

6. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

7. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching 44.8 ft (13.66m) boom tip height, the audio alarm will sound intermittently and “Approaching Maximum Height” will appear in the Message Area. If the boom tip height reaches 44.8 ft (13.66m), the audible alarm will sound continuously, the function limiters will activate, and “Maximum Height” will appear in the Message Area. Refer to Figure 1–76.

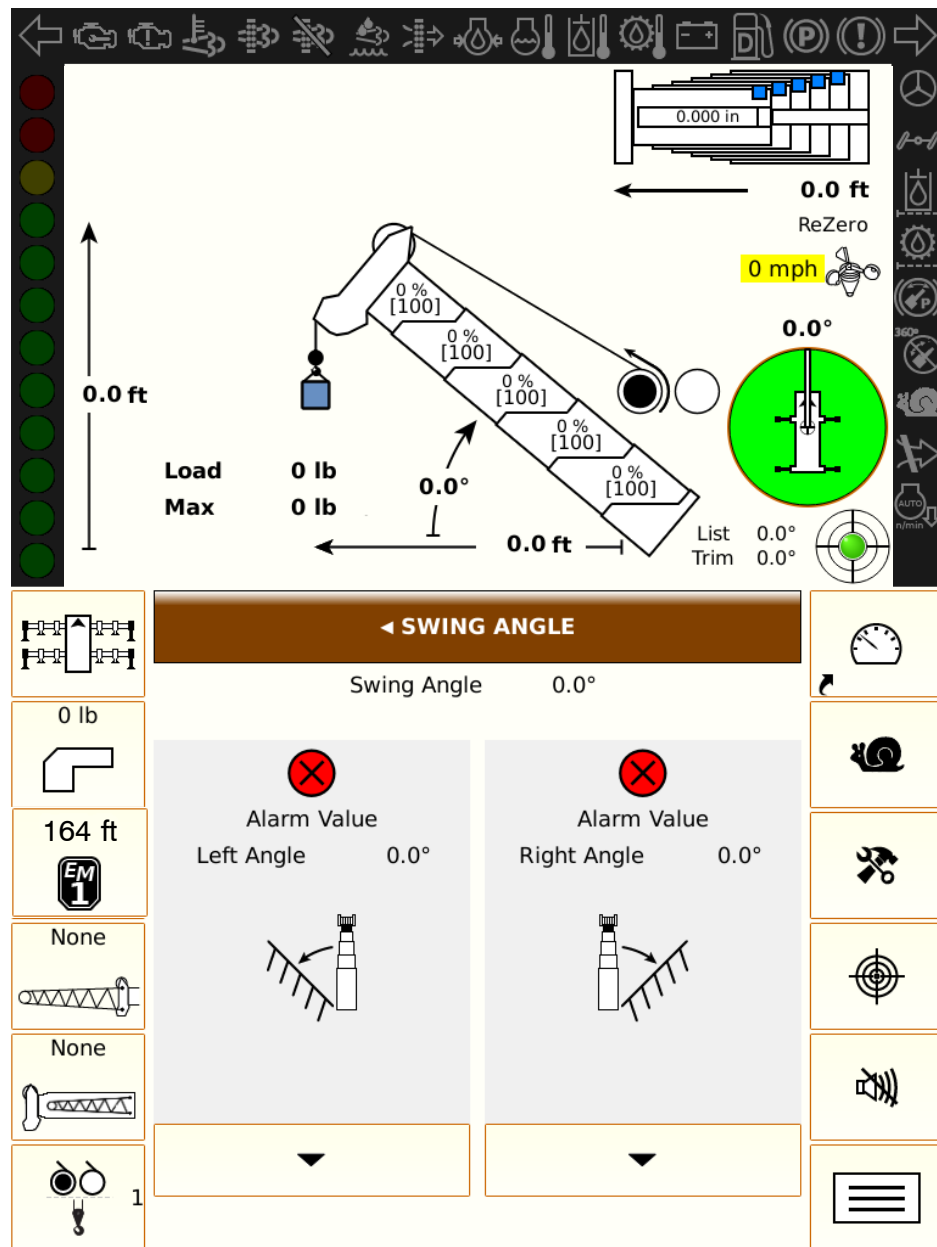


Figure 1–121 Operator Alarms – Swing Angle

To Set Left and Right Swing Alarms (Example)

Example: To have an alarm whenever the left swing and right swing reach pre-determined alarm points, use the following procedure:

1. From the Main Menu Screen, press the Operator Alarms Button . Refer to Figure 1–89.

2. The Operator Alarms Menu will appear. Press the Swing Angle Button . Refer to Figure 1–111.
3. The Swing Angle Screen will appear. Refer to Figure 1–121.

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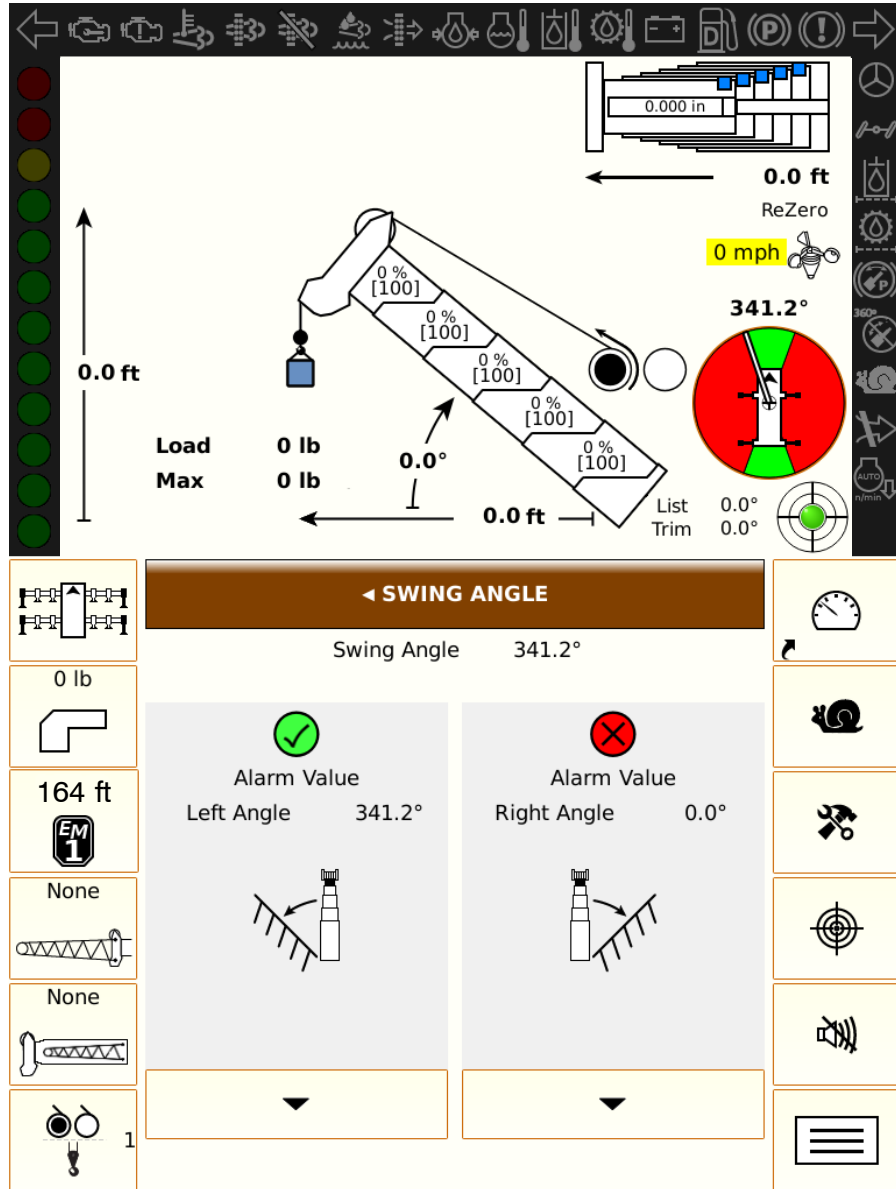


Figure 1–122
Operator Alarms – Swing Angle Left

4. Swing the boom to the desired left alarm angle.
5. Press the Down Arrow Button ▼ below the Left Angle alarm value display to activate the selected alarm value. The Activation Toggle above the alarm value display will toggle from deactivated ⓧ to activated ✔. Refer to Figure 1–122.
6. Swing the boom to the desired right alarm angle.

7. Press the Down Arrow Button ▼ below the Right Angle alarm value display to activate the selected alarm value. The Activation Toggle above the alarm value display will toggle from deactivated ⓧ to activated ✔. Refer to Figure 1–123.

Note: Both the left and right swing alarms must be set for the system to determine the operator set working area.

Note: An alarm icon 🔔 will appear in the top left of the RCL Working Screen to alert the operator that an operator alarm has been set.

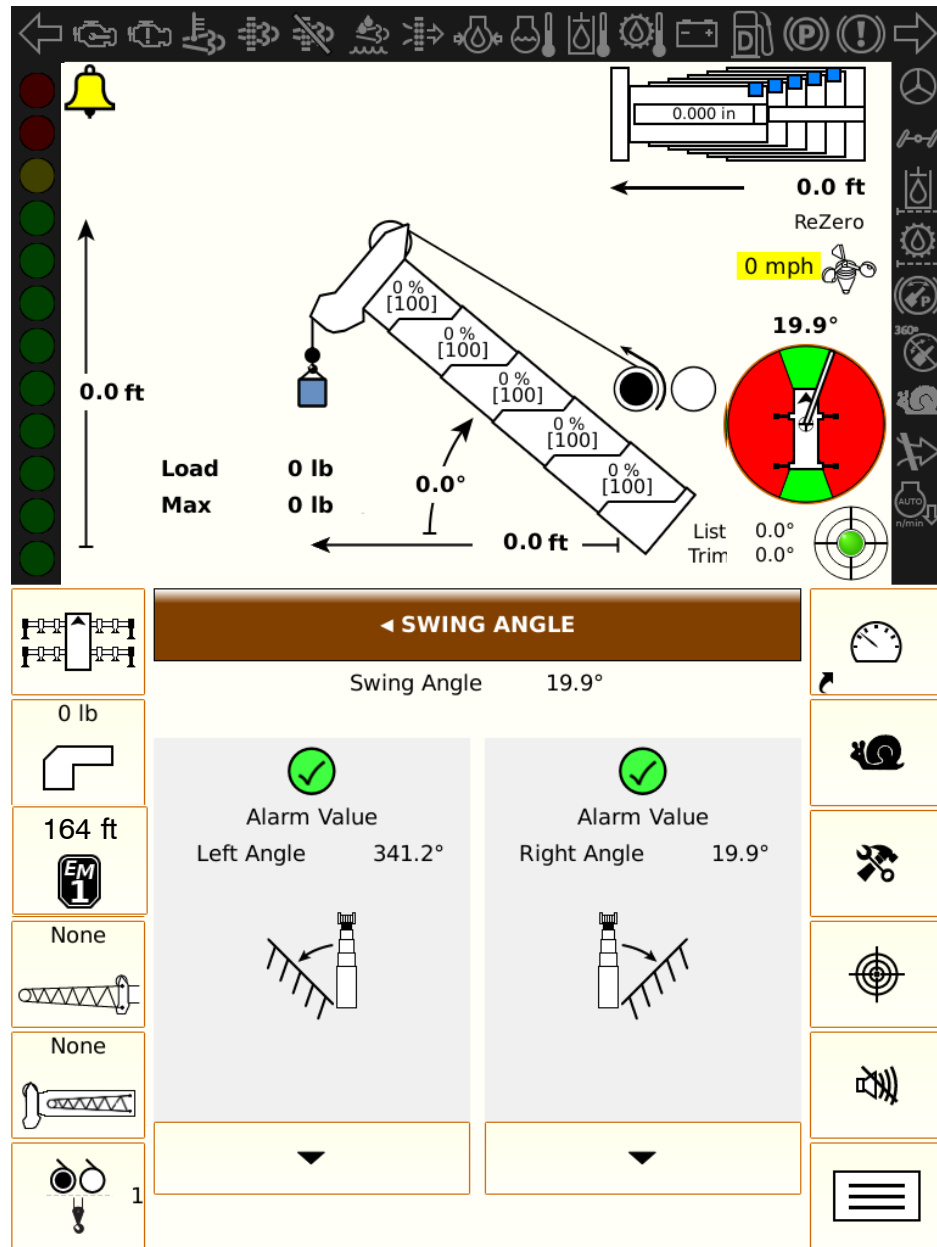


Figure 1–123
Operator Alarms – Swing Angle Activated

8. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.
9. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching one of the set alarm points, the audio alarm will sound intermittently, the swing speed will automatically be reduced and "Approaching Swing Angle Limit" will appear in the Message Area. If the swing reaches the alarm points, the audible alarm will sound continuously, the function limiters will activate, and "Swing Angle Limit" will appear in Message Area. Refer to Figure 1–76.

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Operator Defined Area Alarm

The operator defined area alarm, when set, will define an imaginary vertical plane between two set points to optimize the working area. When approaching the plane, the audio alarm will sound intermittently, and the message "Approaching Defined Area" will appear in the Message Area. When plane is reached, the audio alarm will sound continuously and the message "Defined Area" will appear on the Message Area. Function limiters will activate. Use the following procedure to set the operator defined area alarm.



WARNING

For safe operation, adequate distance must be maintained to allow for operator reaction time to avoid entering the bad area. It is the responsibility of the operator to set points which ensure that the crane's boom, attachment, load, rigging, etc. maintains a safe working distance and complies with local safety regulations.

Setting Operator Defined Area Alarm

1. Disable any previously set left and right swing alarms if required. Refer to "To Disable Operator Settable Alarms" in this section of this Operator's Manual.

Note: It is recommended to clear the left and right swing alarms prior to setting the defined area alarm.

2. From the Main Menu Screen, press the Operator Alarms Button . Refer to Figure 1–89.
3. The Operator Alarms Menu will appear. Press the Defined Area Button . Refer to Figure 1–111.
4. The Defined Area Screen will appear. Refer to Figure 1–124.



WARNING

Avoid positioning the boom, attachment, load, rigging, etc. into the bad area when setting the left or right alarm points.

When selecting the left and right alarm points, ensure that the load will maintain a safe distance from the obstacle. Also ensure that the two points are set so that the tailswing of the crane will not enter the bad area.

5. Position the boom, attachment, load, rigging, etc. to the desired Point A. The displayed values for swing angle and radius will be the set point.
6. Press the Down Arrow Button below the Point A alarm value display to activate the selected alarm value. The Activation Toggle above the alarm value display will toggle from deactivated to activated . Refer to Figure 1–125.
7. Position the boom, attachment, load, rigging, etc. to the desired Point B. The displayed values for swing angle and radius will be the set point.
8. Press the Down Arrow Button below the Point B alarm value display to activate the selected alarm value. The Activation Toggle above the alarm value display will toggle from deactivated to activated . Refer to Figure 1–126.

Note: For best results, the two points should be separated by a minimum of 10 ft (3m) or 30°.

Note: Both the Point A and Point B defined area alarms must be set for the system to determine the operator set working area.

Note: An alarm icon will appear in the top left of the RCL Working Screen to alert the operator that an operator alarm has been set.

9. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.
10. Test the alarm, with no load, to ensure the alarm points have been properly set. When approaching the plane, the audio alarm will sound intermittently and the message "Bad Working Area" will appear on the Message Area. When passing the plane, the audio alarm will sound continuously, the function limiters will activate and the message "Bad Working Area" will appear on the Message Area.



WARNING

If crane or obstacle is moved or if a different size load is lifted, the area alarm must be reset.

Operator's Manual

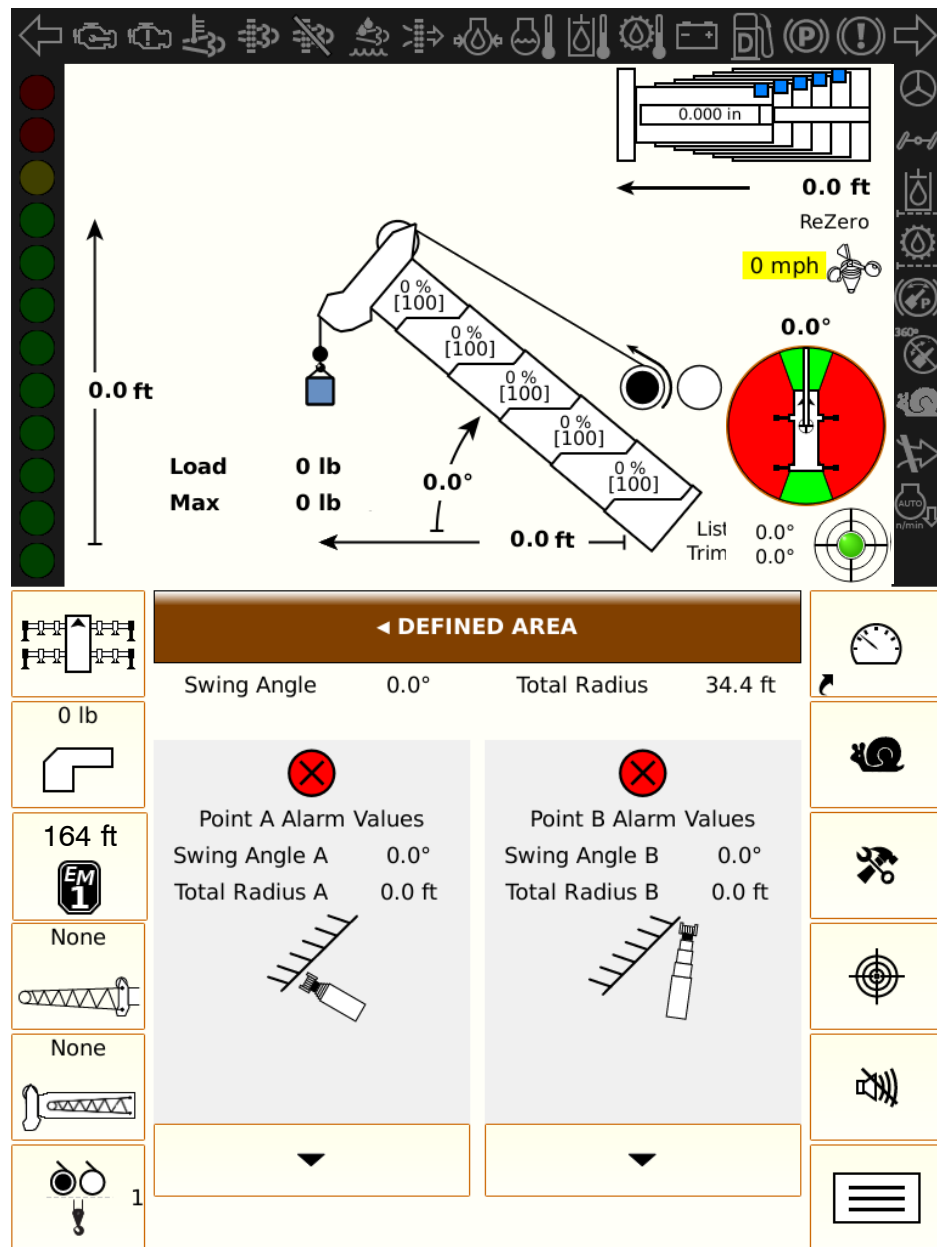


Figure 1–124
Operator Alarms – Defined Area

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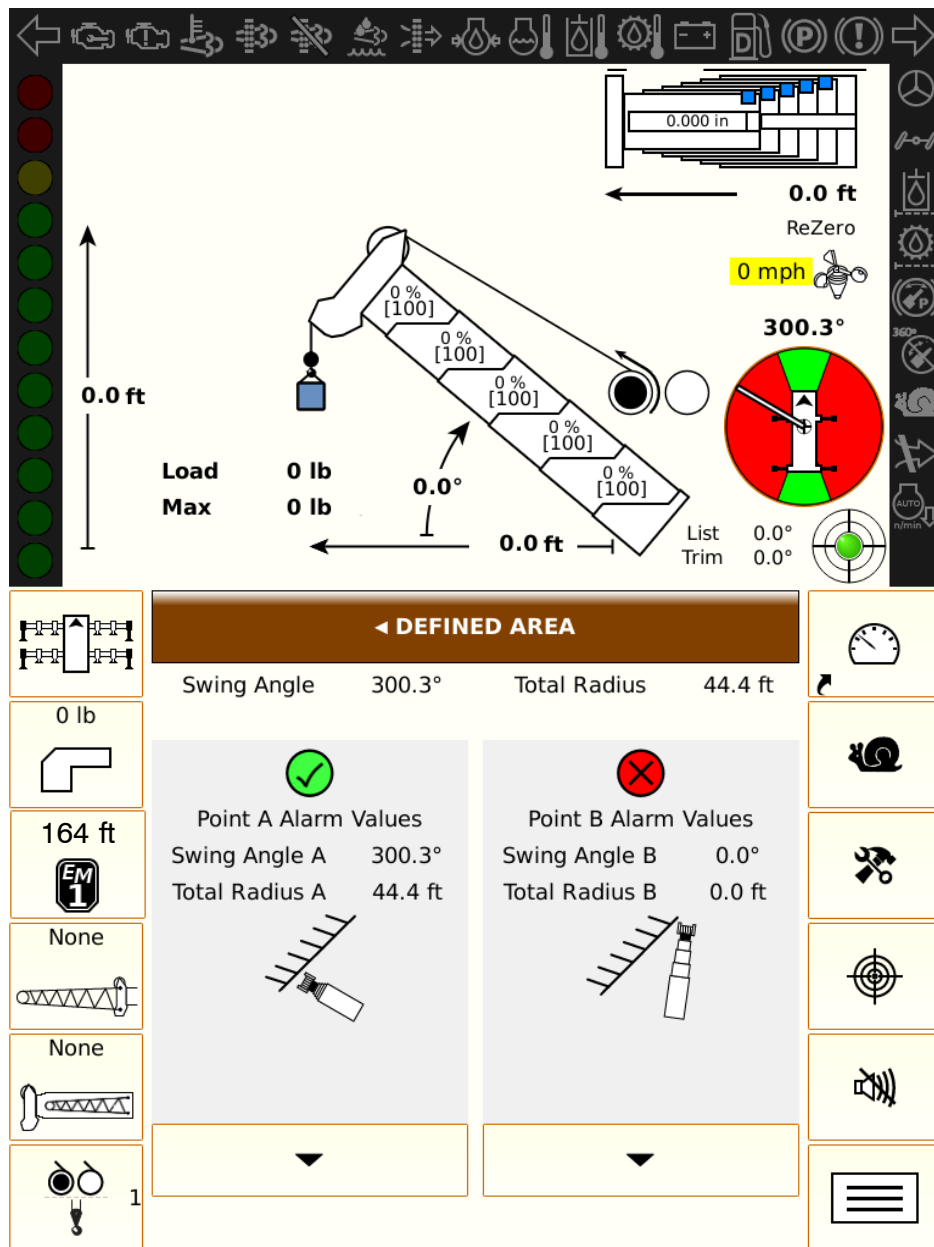


Figure 1–125
Operator Alarms – Defined Area Point A

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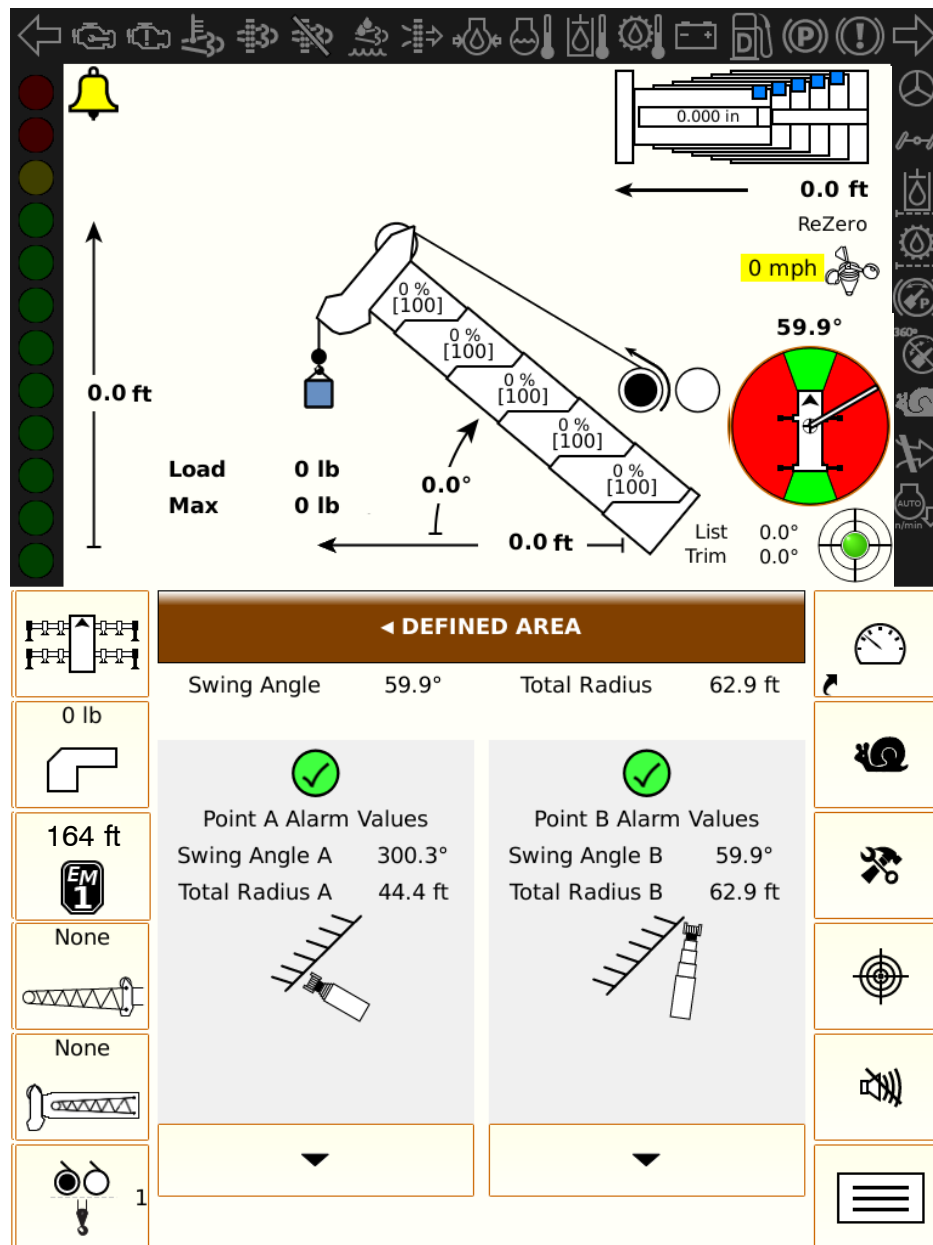


Figure 1–126
Operator Alarms – Defined Area Activated

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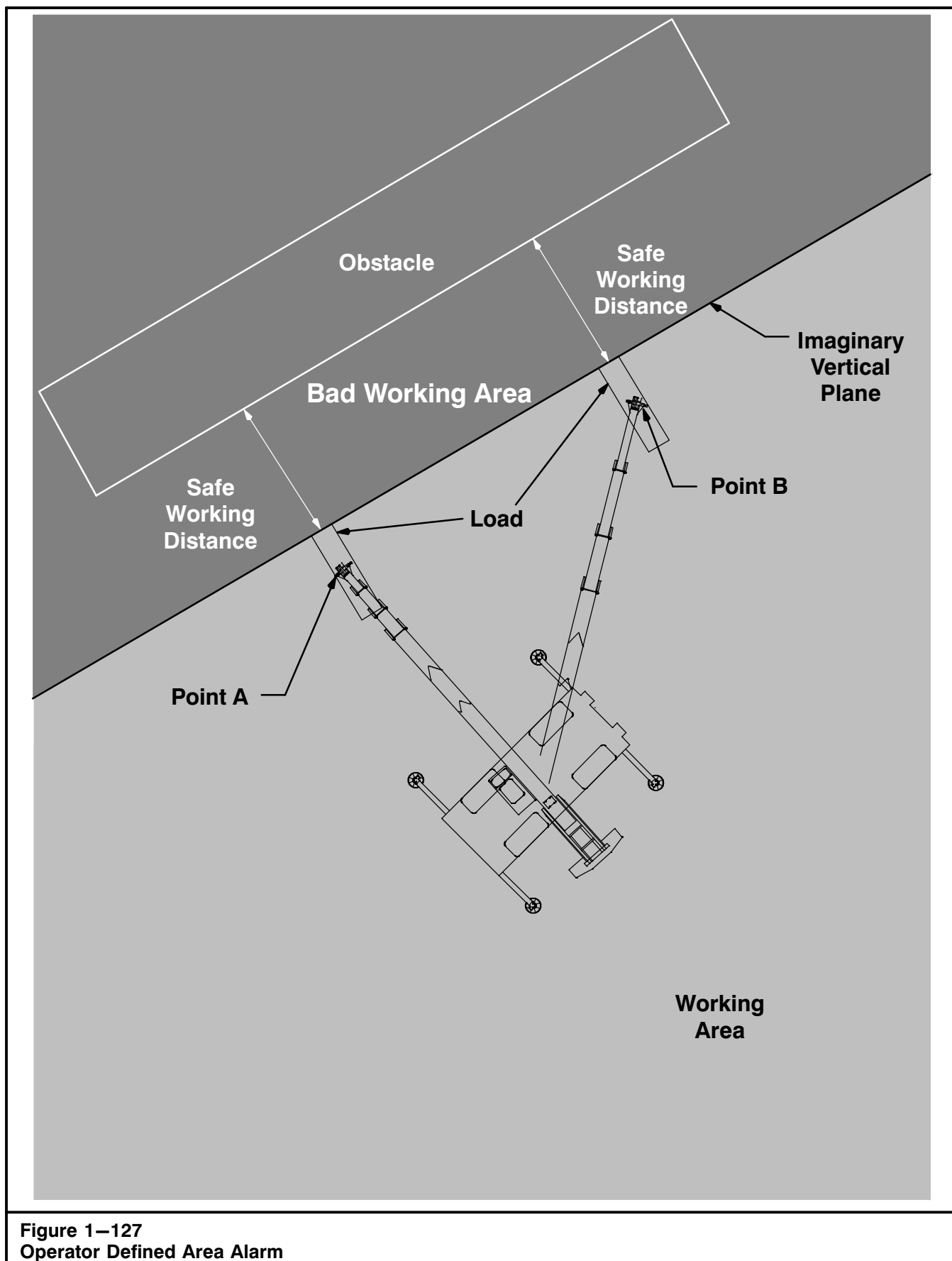


Figure 1–127
Operator Defined Area Alarm



WARNING

If crane or obstacle is moved or if a different size load is lifted, the area alarm must be reset.

To Disable Operator Settable Alarms

1. From the Main Menu Screen, press the Operator Alarms Button. Refer to Figure 1–89.
2. The Operator Alarms Menu will appear. Press the button for the desired operator alarm to be disabled. Refer to Figure 1–111.
3. Press the Down Arrow Button(s) ▼ below the selected alarm value display(s) to deactivate the corresponding alarm value(s). The Activation Toggle(s) above the selected alarm value display(s) will toggle from activated ✓ to deactivated ✗.
4. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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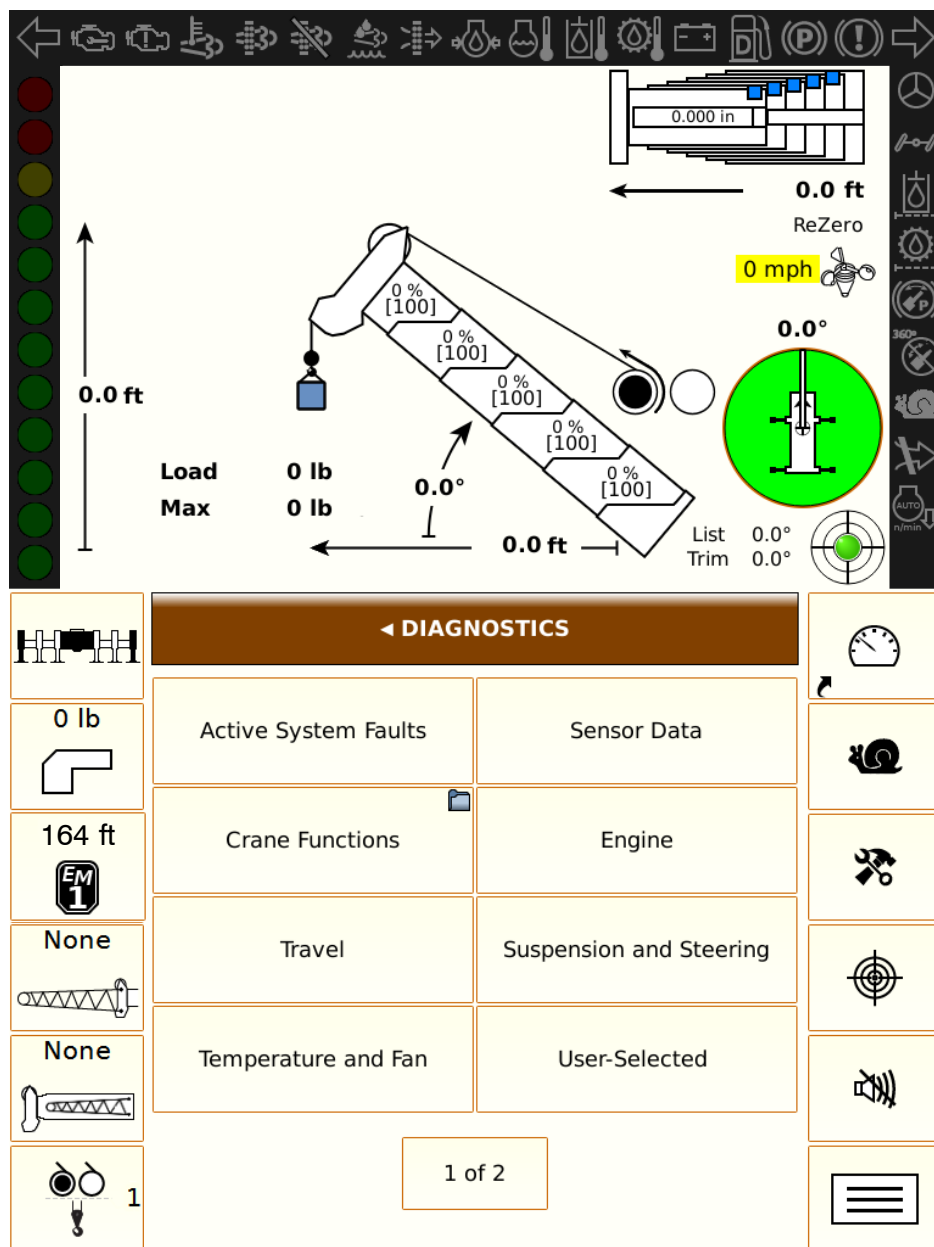


Figure 1–128
Diagnostics

Diagnostics Menu

The Diagnostics Menu allows the operator to navigate to data based on the current crane configuration.

Note: The Diagnostics Pulse Feature Button  can be used to access the Diagnostics Menu from any screen. Refer to “Pulse Feature Buttons” in this section of this Operator’s Manual.

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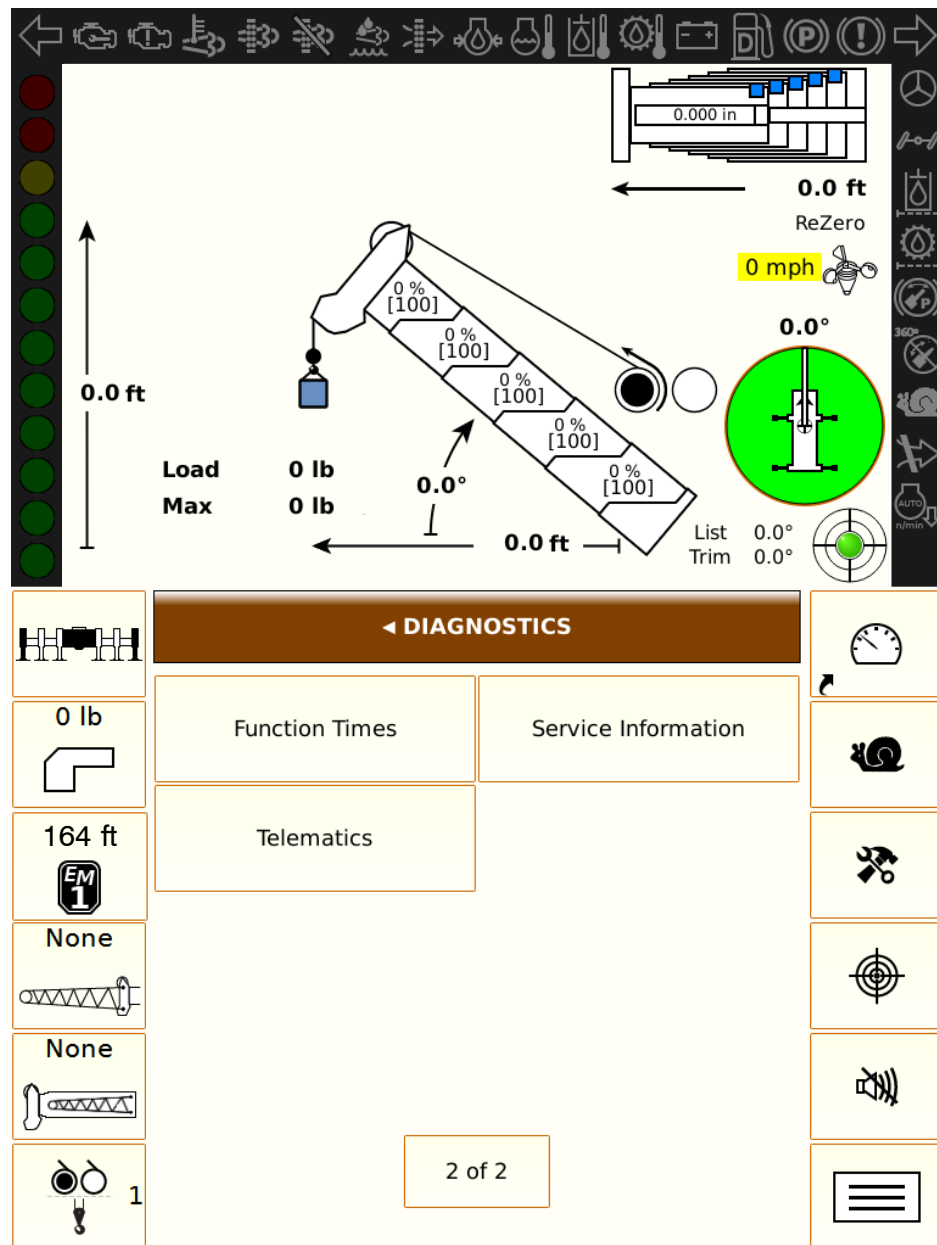
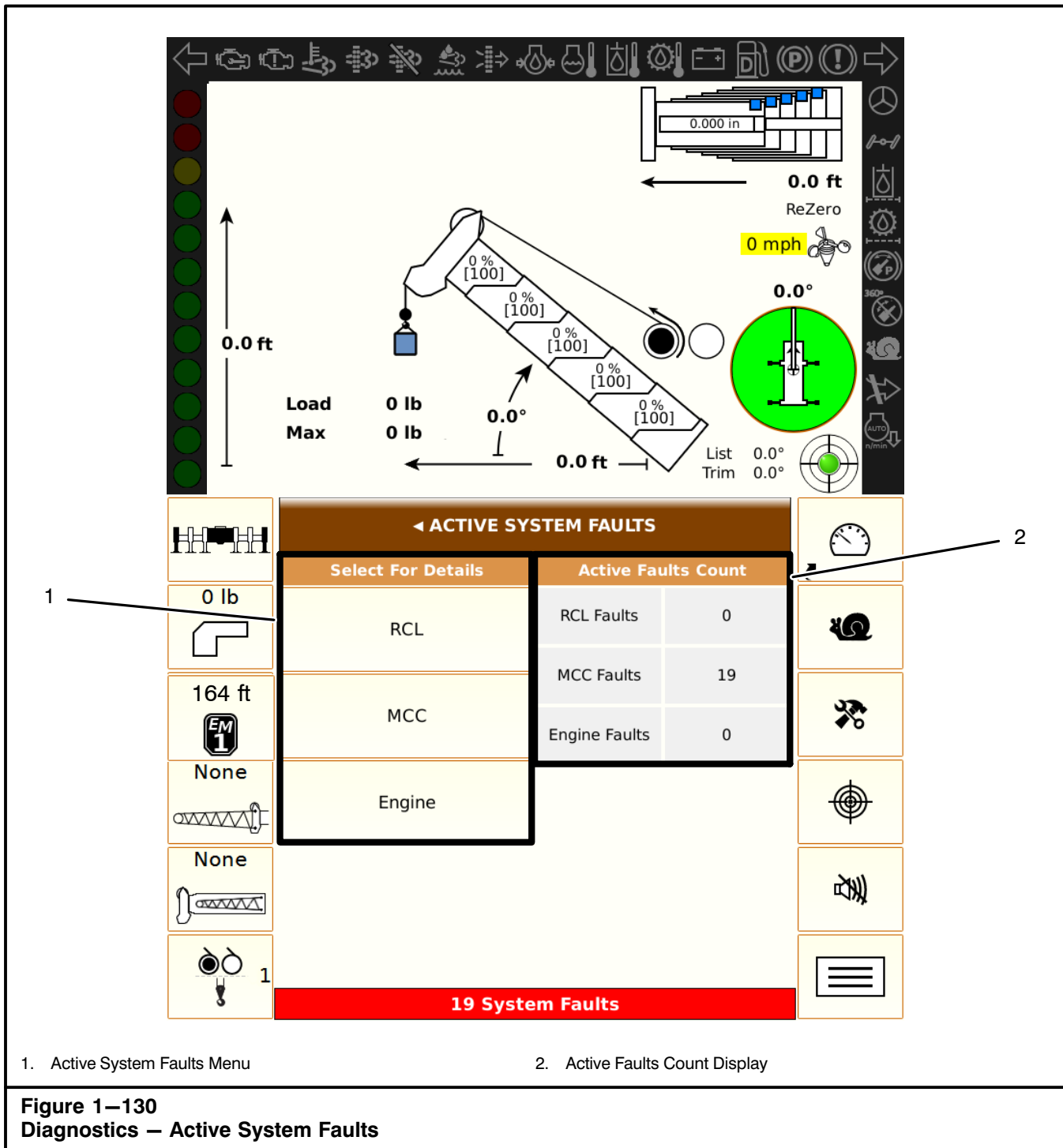


Figure 1–129
Diagnostics

Operator's Manual



Active System Faults

The Active System Faults menu displays current system faults. Refer to Figure 1–130.

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.
2. The Diagnostics Menu will appear. Press the Active System Faults Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.

3. The Active System Faults Screen will appear. Refer to Figure 1–130.
4. Using the counts in the Active System Faults Count Display as a reference, press the desired Active System Faults Menu button for the desired system fault details.

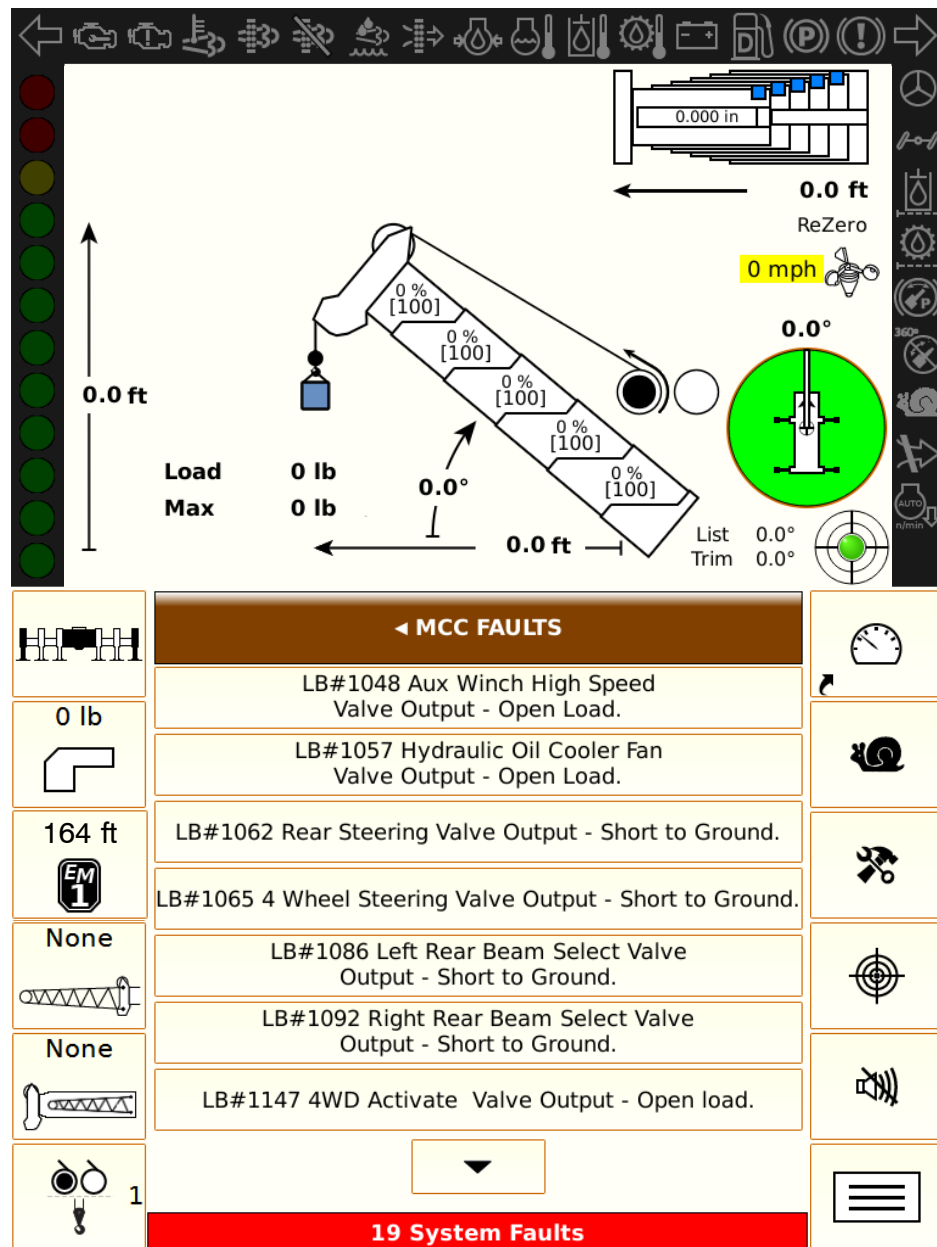


Figure 1–131
Diagnostics – Active System Faults – MCC Faults

- The Faults Screen for the selected active system fault will appear. The message selected, meaning of the message, and how to clear the message will be displayed. Refer to Figure 1–131.

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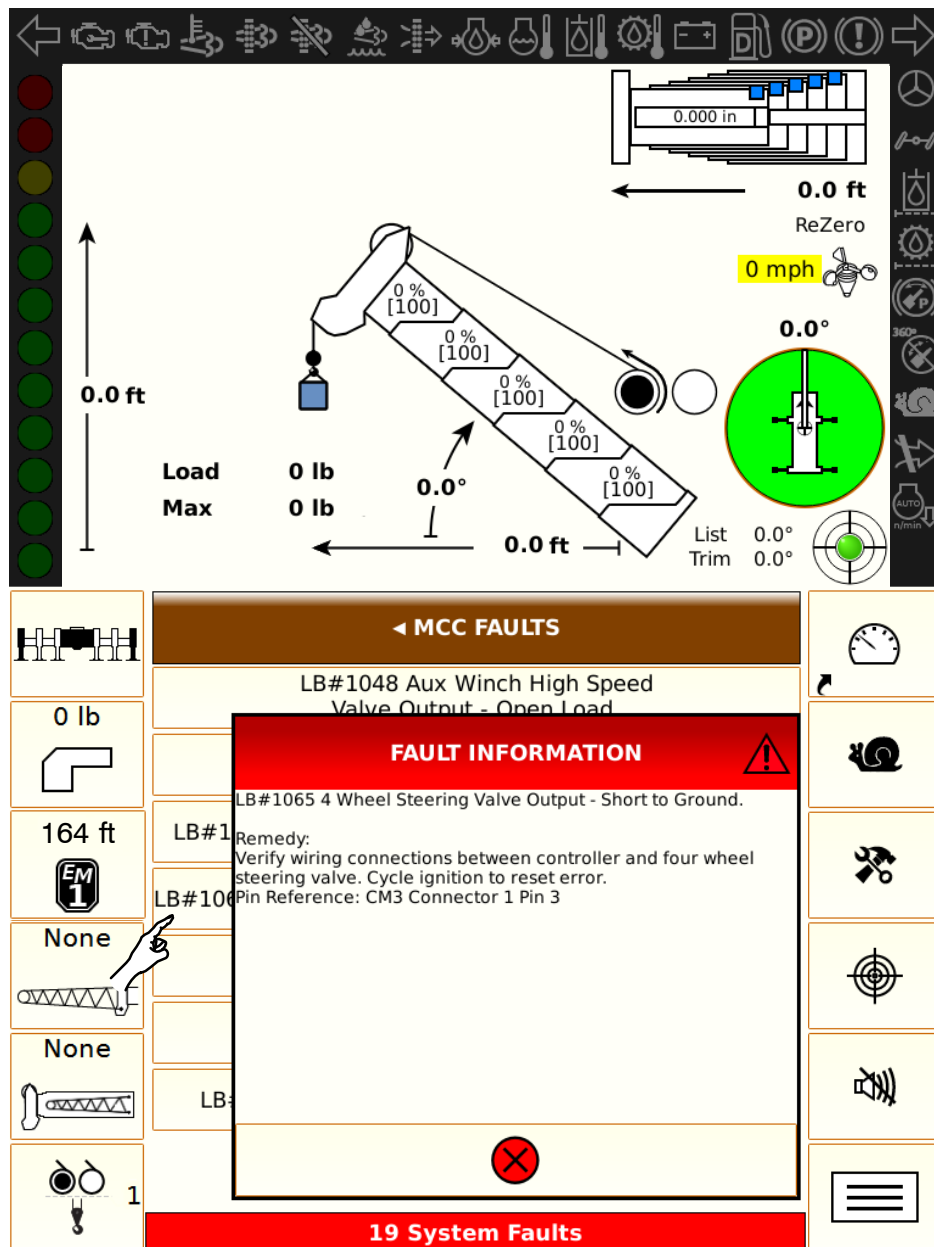


Figure 1–132
Diagnostics – Active System Faults – MCC Faults

6. Press the desired fault message. The Fault Information Screen will appear. The Fault Information Screen includes the meaning of the message, the remedy for the fault, and the pin reference, as applicable. Press the Close Button  to close the Fault Information Screen. Refer to Figure 1–132.
7. Press the Down Arrow Button , as required, to navigate through additional pages of the faults screen.
8. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

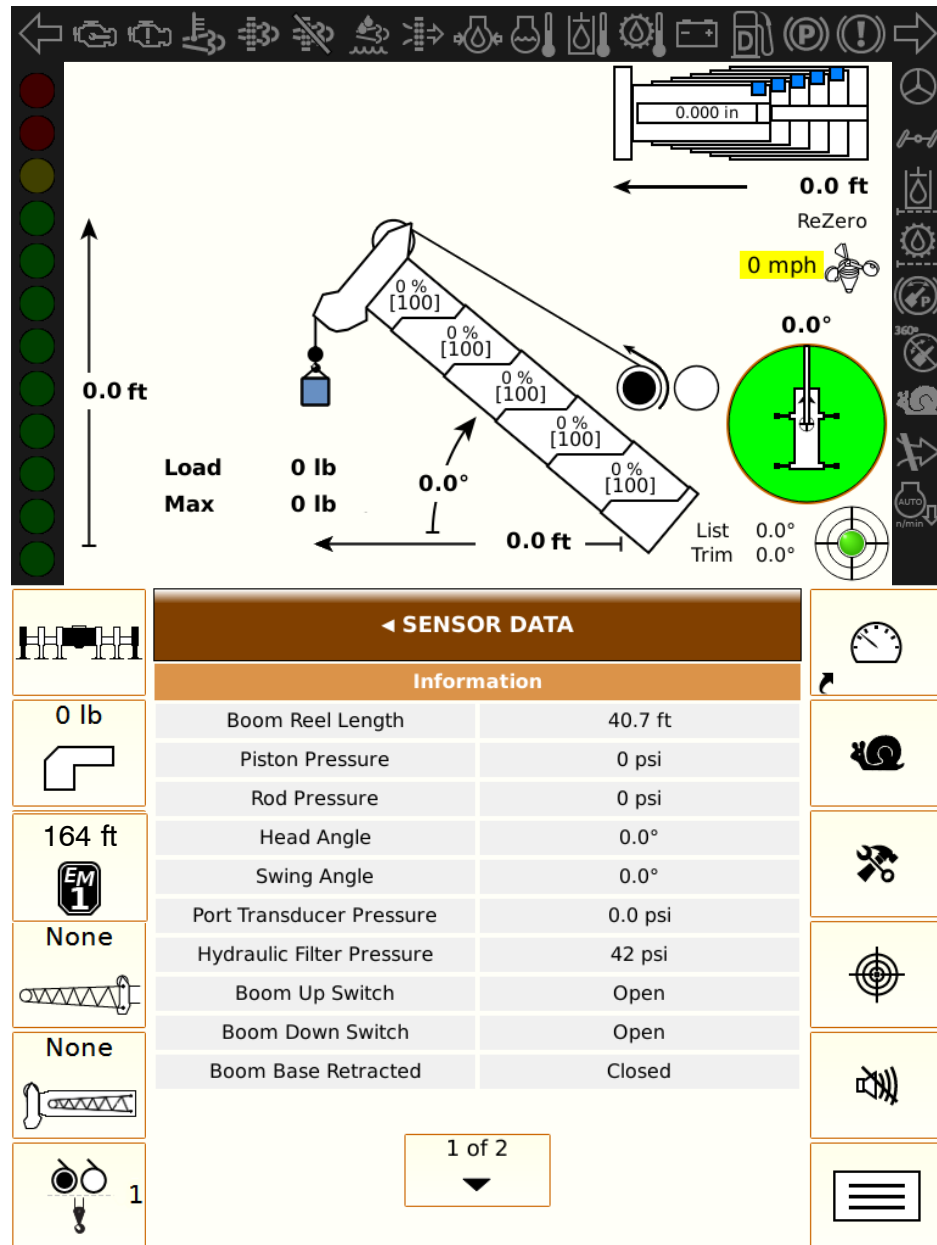


Figure 1-133
Diagnostics – Sensor Data

Sensor Data

The Sensor Data Screen displays data being read by various sensors on the crane. Refer to Figure 1-133.

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1-89.
2. The Diagnostics Menu will appear. Press the Sensor Data Button. Refer to "Diagnostics Menu" in this section of this Operator's Manual.

3. The Sensor Data Screen will appear. Refer to Figure 1-133.
4. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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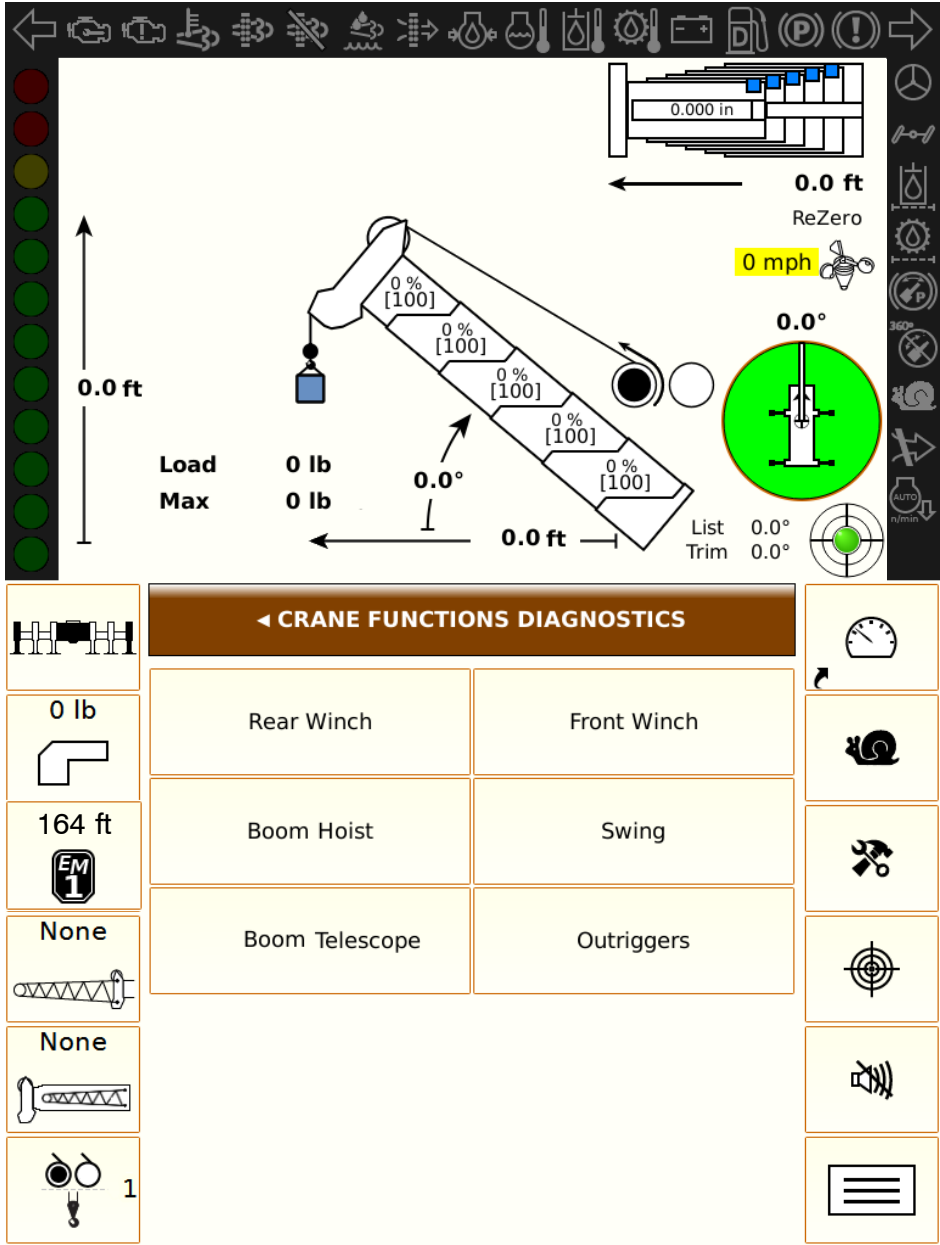


Figure 1–134 Diagnostics – Crane Function

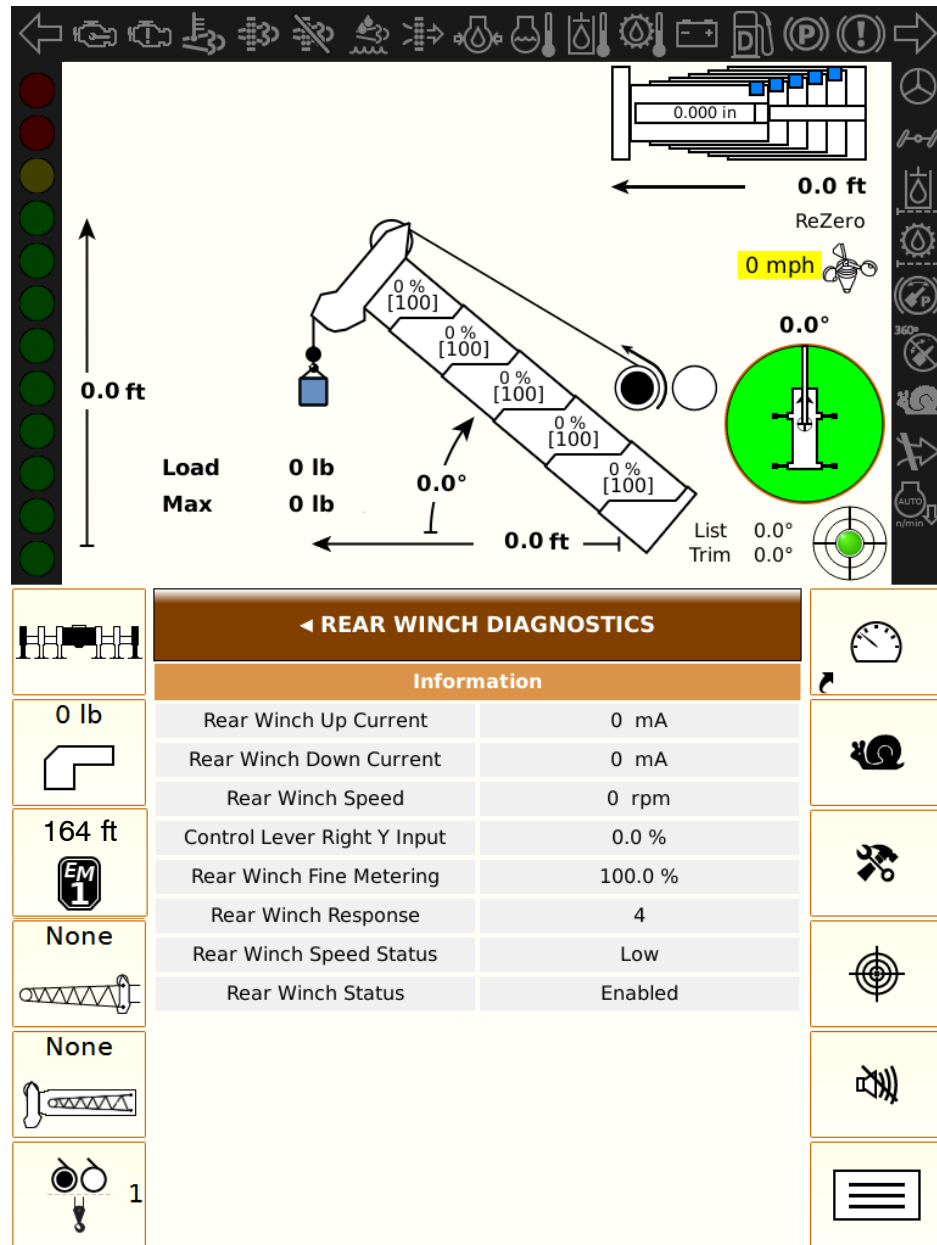


Figure 1-135
Diagnostics – Crane Function – Rear Winch

Rear Winch Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1-89.
2. The Diagnostics Menu will appear. Press the Crane Functions Button. Refer to "Diagnostics Menu" in this section of this Operator's Manual.
3. The Crane Functions Diagnostics Menu will appear. Press the Rear Winch Button. Refer to Figure 1-134.
4. The Rear Winch Diagnostics Screen will appear. Refer to Figure 1-135.
5. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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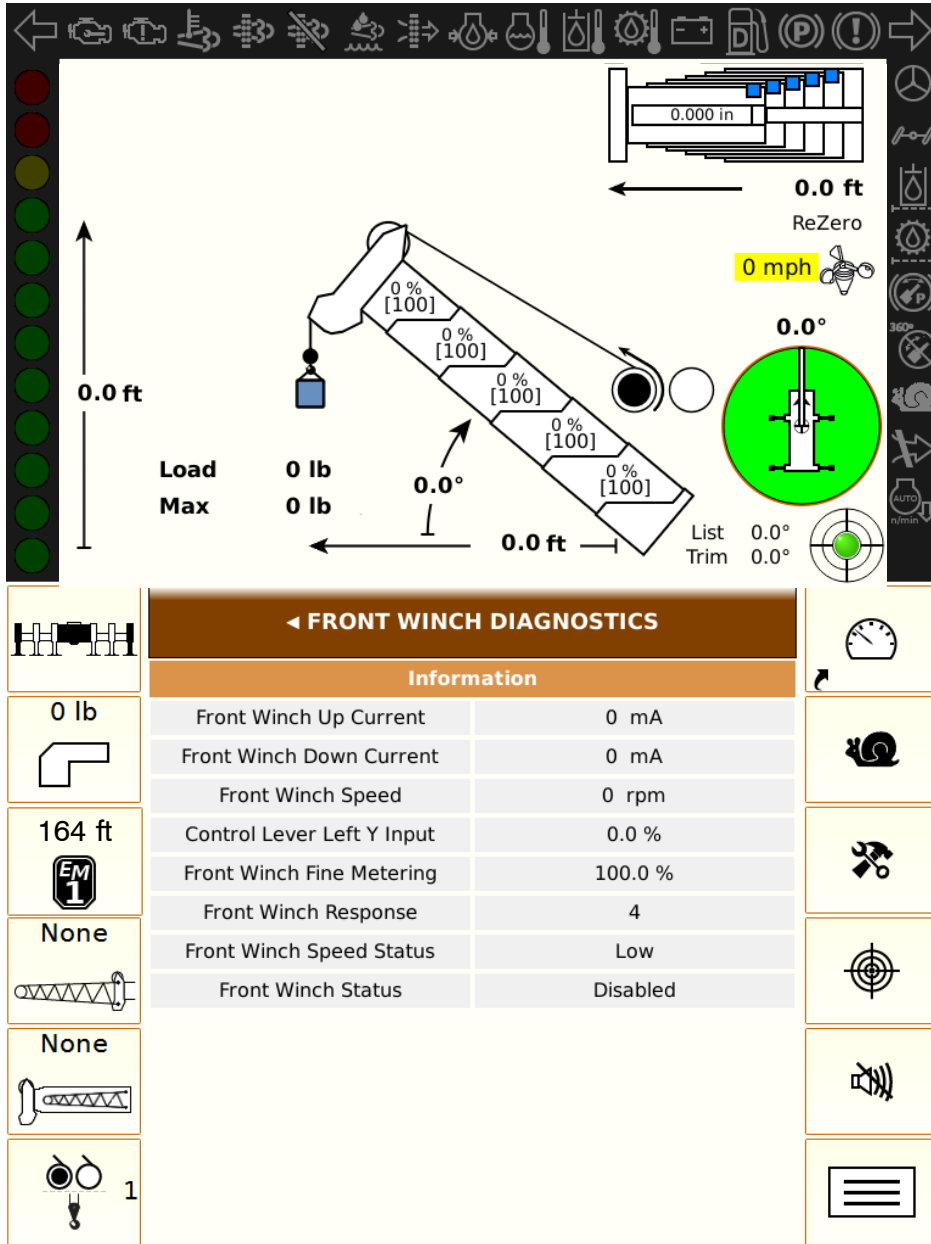


Figure 1-136 Diagnostics – Crane Function – Front Winch

Front Winch Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.
2. The Diagnostics Menu will appear. Press the Crane Functions Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.
3. The Crane Functions Diagnostics Menu will appear. Press the Front Winch Button. Refer to Figure 1–134.
4. Refer to Figure 1–136.
5. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

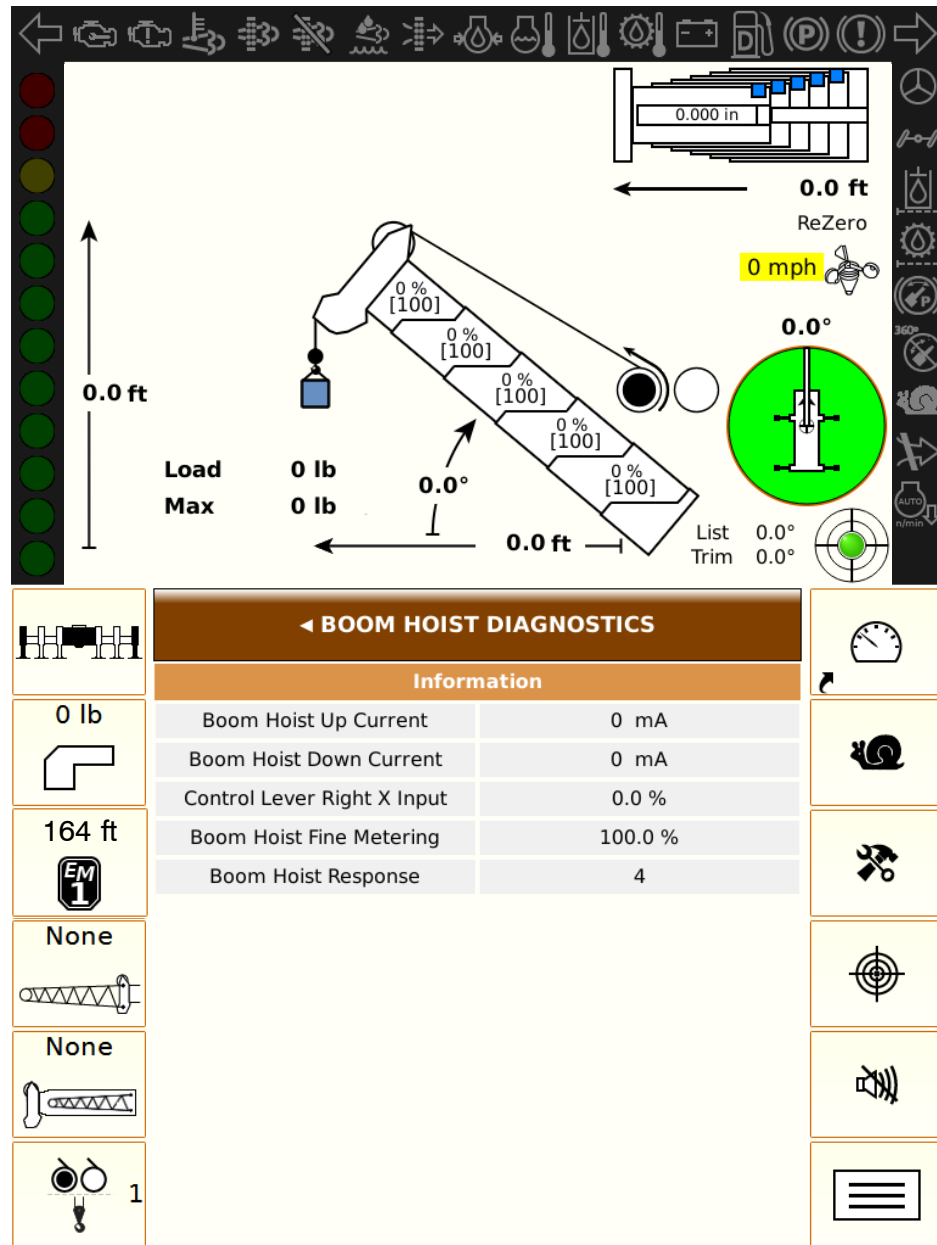


Figure 1–137
Diagnostics – Crane Function – Boom Hoist

Boom Hoist Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.
2. The Diagnostics Menu will appear. Press the Crane Functions Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.
3. The Crane Functions Diagnostics Menu will appear. Press the Boom Hoist Button. Refer to Figure 1–134.
4. The Boom Hoist Diagnostics Screen will appear. Refer to Figure 1–137.
5. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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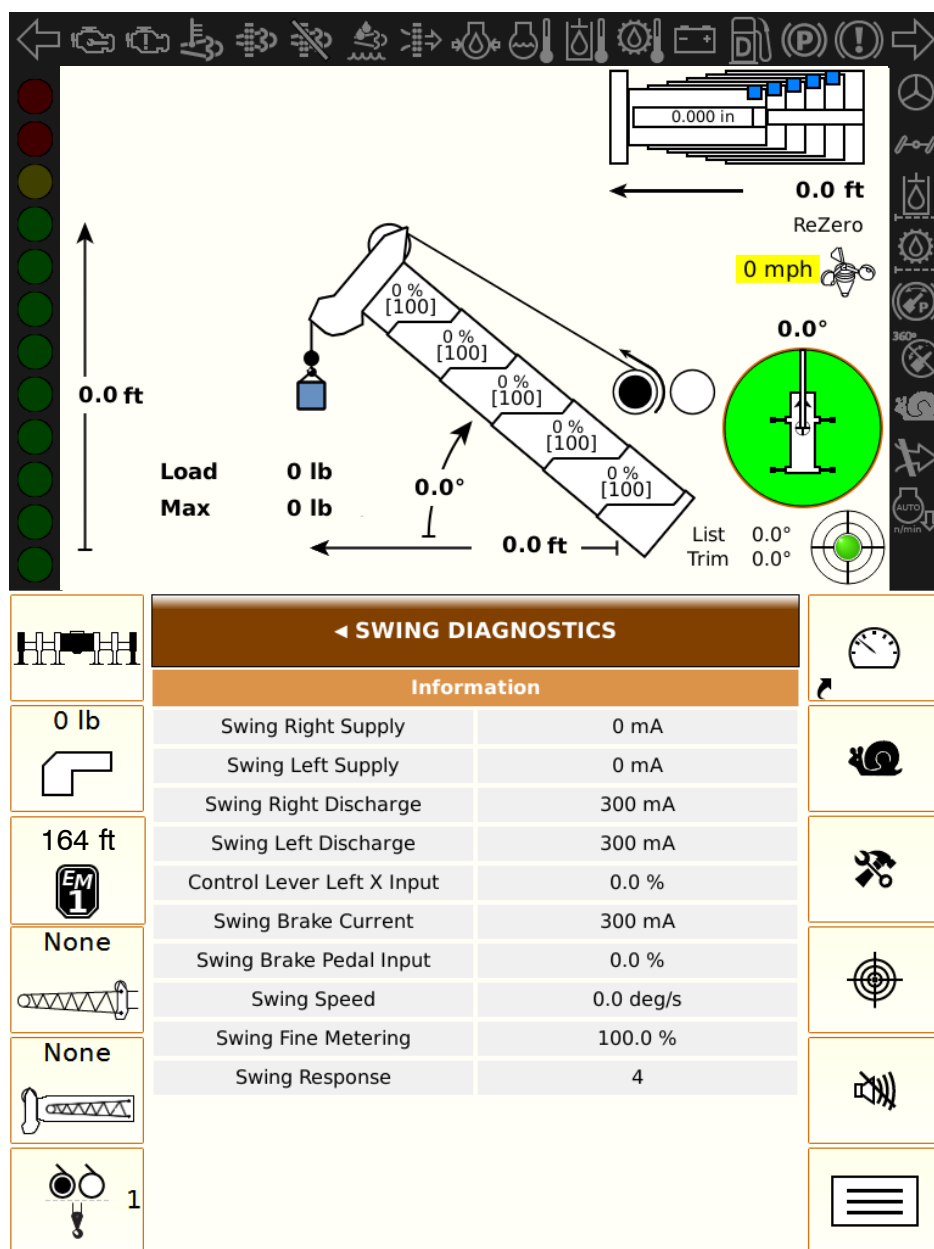
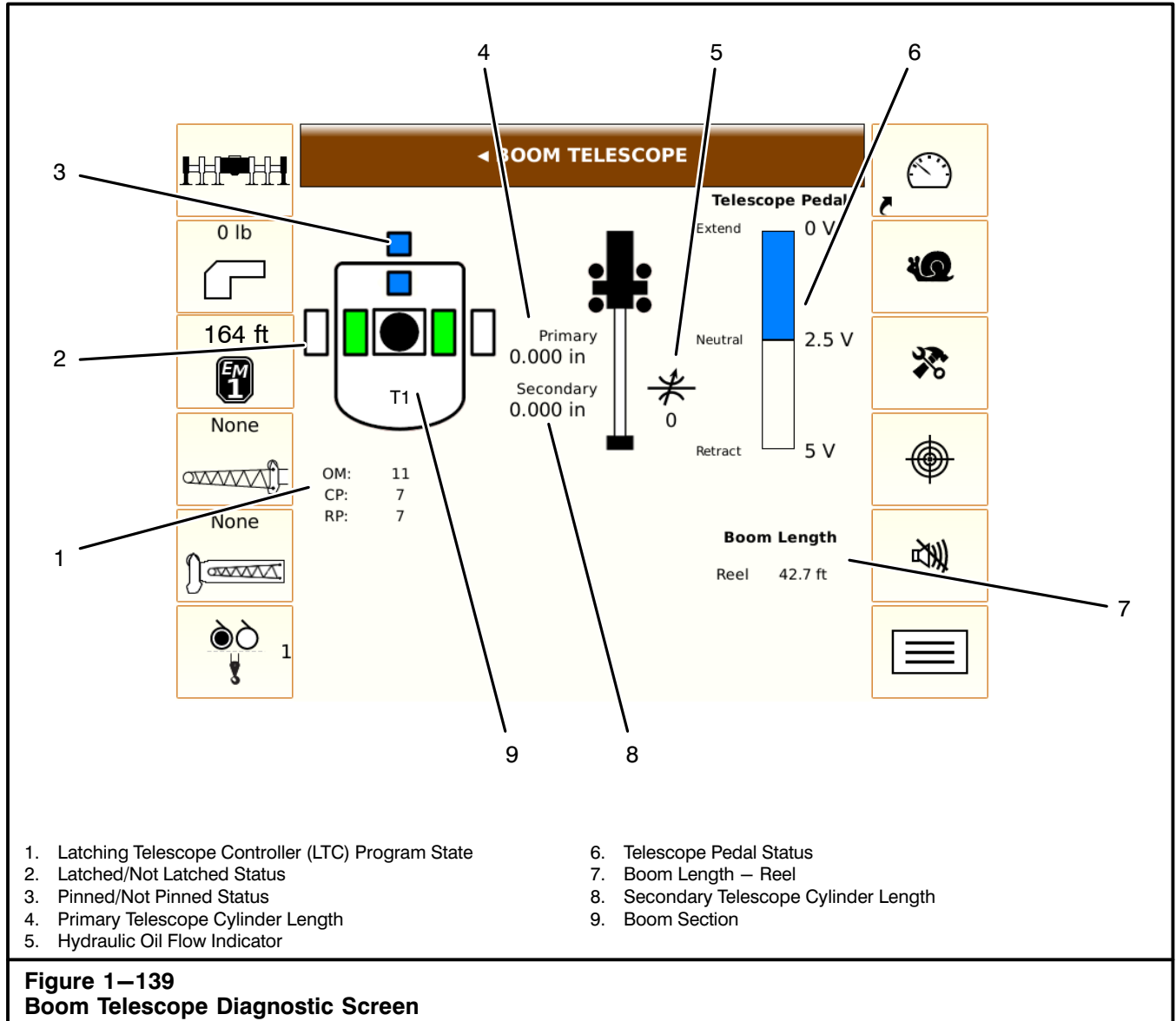


Figure 1–138
Diagnostics – Crane Function – Swing

Swing Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.
2. The Diagnostics Menu will appear. Press the Crane Functions Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.
3. The Crane Functions Diagnostics Menu will appear. Press the Swing Button. Refer to Figure 1–134.
4. The Swing Diagnostics Screen will appear. Refer to Figure 1–138.
5. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.



Boom Telescope Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button .
2. The Diagnostics Menu will appear. Press the Crane Functions Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.
3. The Crane Functions Diagnostics Menu will appear. Press the Boom Telescope Button. Refer to Figure 1–134.
4. The Boom Telescope Screen will appear. Refer to Figure 1–139 and “Boom Telescope Diagnostics Screen” in this section of this Operator’s Manual.
5. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

Boom Telescope Diagnostics Screen

The following are descriptions of the Boom Telescope Diagnostic Screen components. Refer to Figure 1–139.

1. Latching Telescope Controller (LTC) Program State

This displays the current state of the telescope controller program. OM=Operation Mode, CP=Current Phase, and RP=Resume Phase.

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2. Latched/Not Latched Status

This is a graphic representation of the current latched/not latched status. When the section is latched, the outer boxes will be shaded. When the section is not latched, the inner box will be shaded.

3. Pinned/Not Pinned Status

This is a graphic representation of the current pinned/not pinned status. When the section is pinned, the top box will be shaded. When the section is not pinned, the inner box will be shaded.

4. Primary Telescope Cylinder Length

The Primary Telescope Cylinder Length gives a continuous indication of the primary telescope cylinder length in inches. * – indicates Latching Telescope Controller (LTC) is currently using encoder.

5. Hydraulic Oil Flow Indicator

This indicator shows the hydraulic oil flow rate in the telescope cylinder.

6. Telescope Pedal Status

This displays the status of the telescope pedal.

7. Boom Length – Reel

This area displays a continuous indication of the boom length in feet as read by the boom reel.

8. Secondary Telescope Cylinder Length

The Secondary Telescope Cylinder Length gives a continuous indication of the secondary telescope cylinder length in inches. * – indicates Latching Telescope Controller (LTC) is currently using encoder.

9. Boom Section

This area displays the boom section that is currently being pinned/latched.

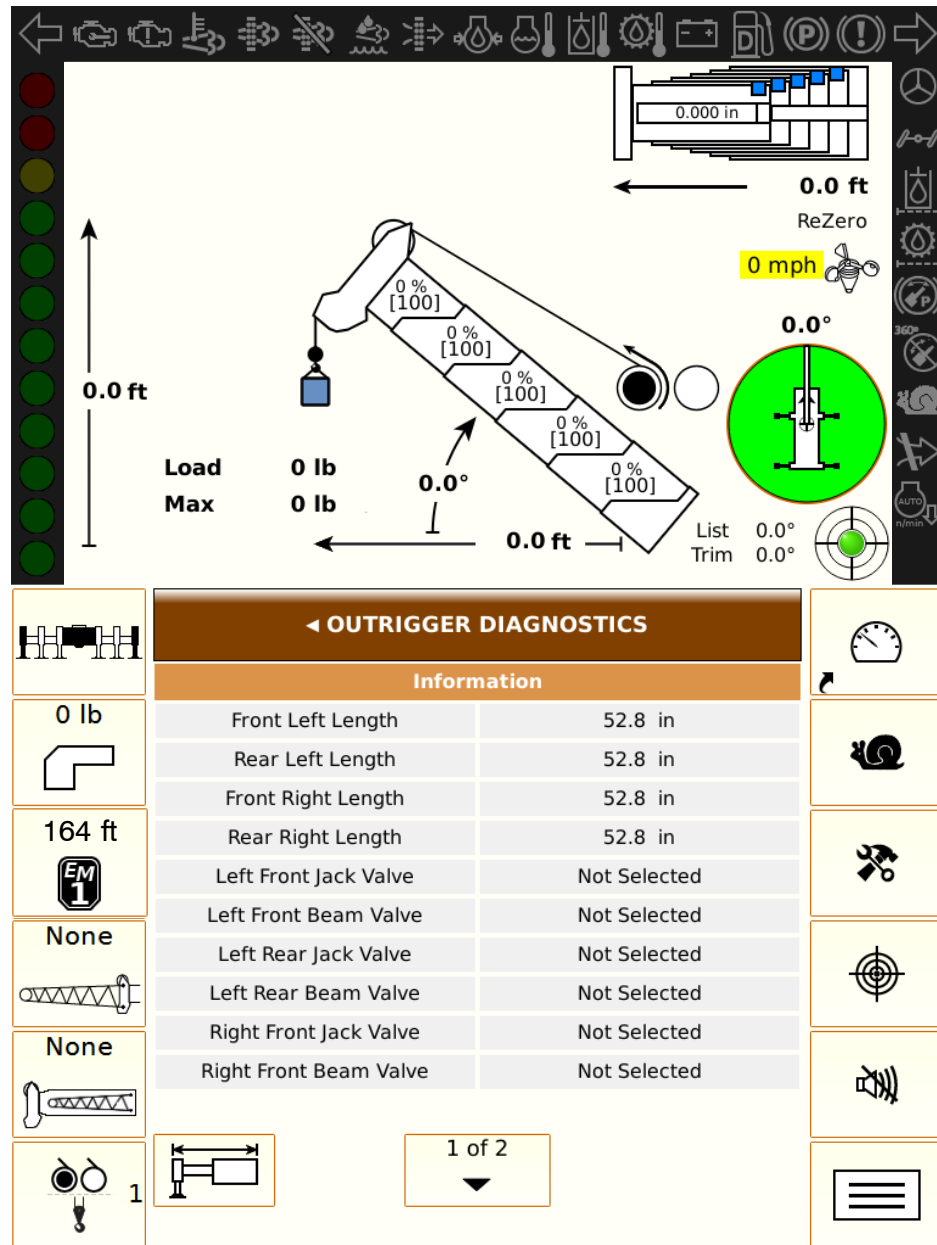


Figure 1–140
Diagnostics – Crane Function – Outrigger

Outrigger Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.

2. The Diagnostics Menu will appear. Press the Crane Functions Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.

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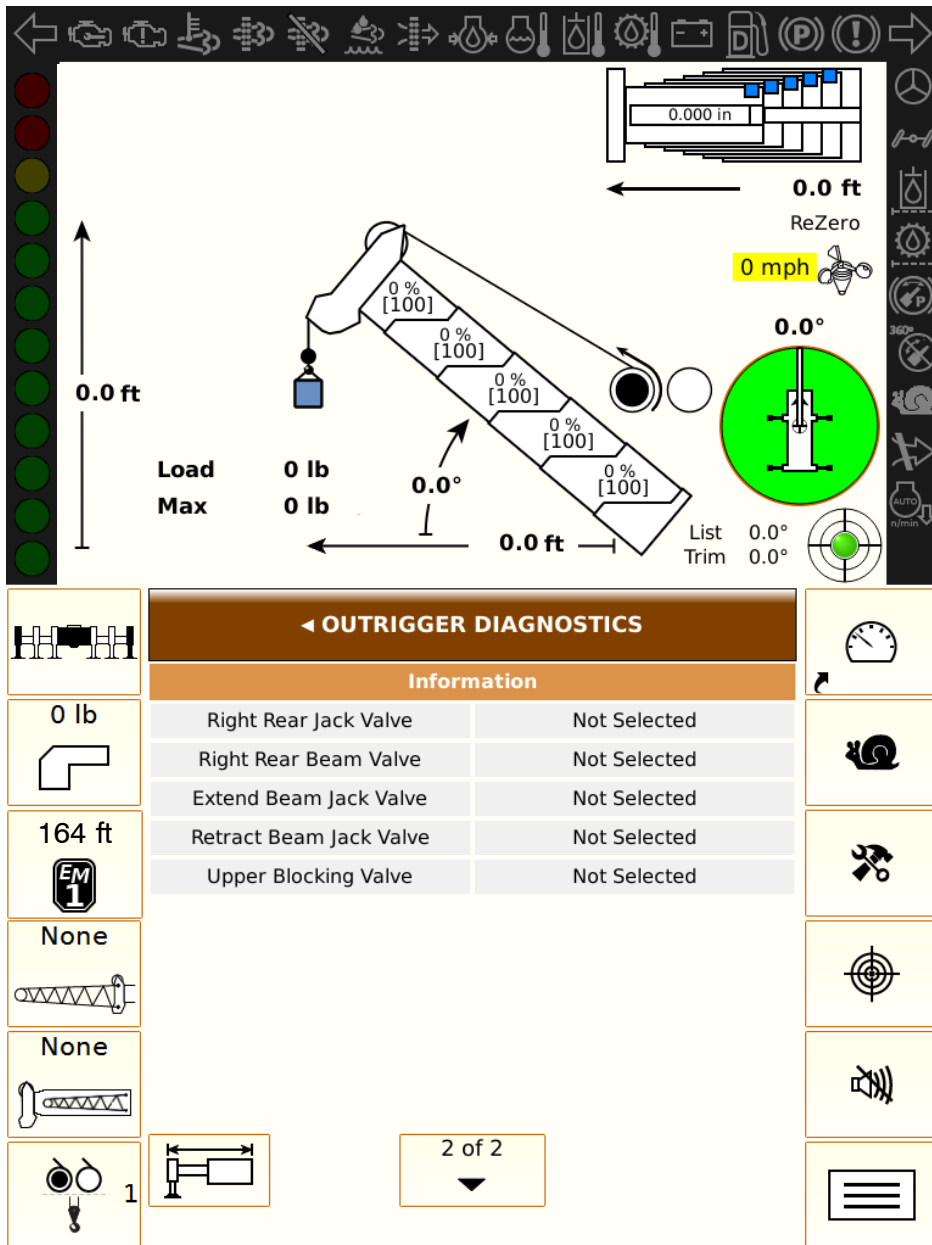


Figure 1–141
Diagnostics – Crane Function – Outrigger – Continued

3. The Crane Functions Diagnostics Menu will appear. Press the Outrigger Button. Refer to Figure 1–134.
4. The Outrigger Diagnostics Screen will appear. Press the Page Toggle Button  to toggle between pages, as required. Refer to Figure 1–140.
5. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

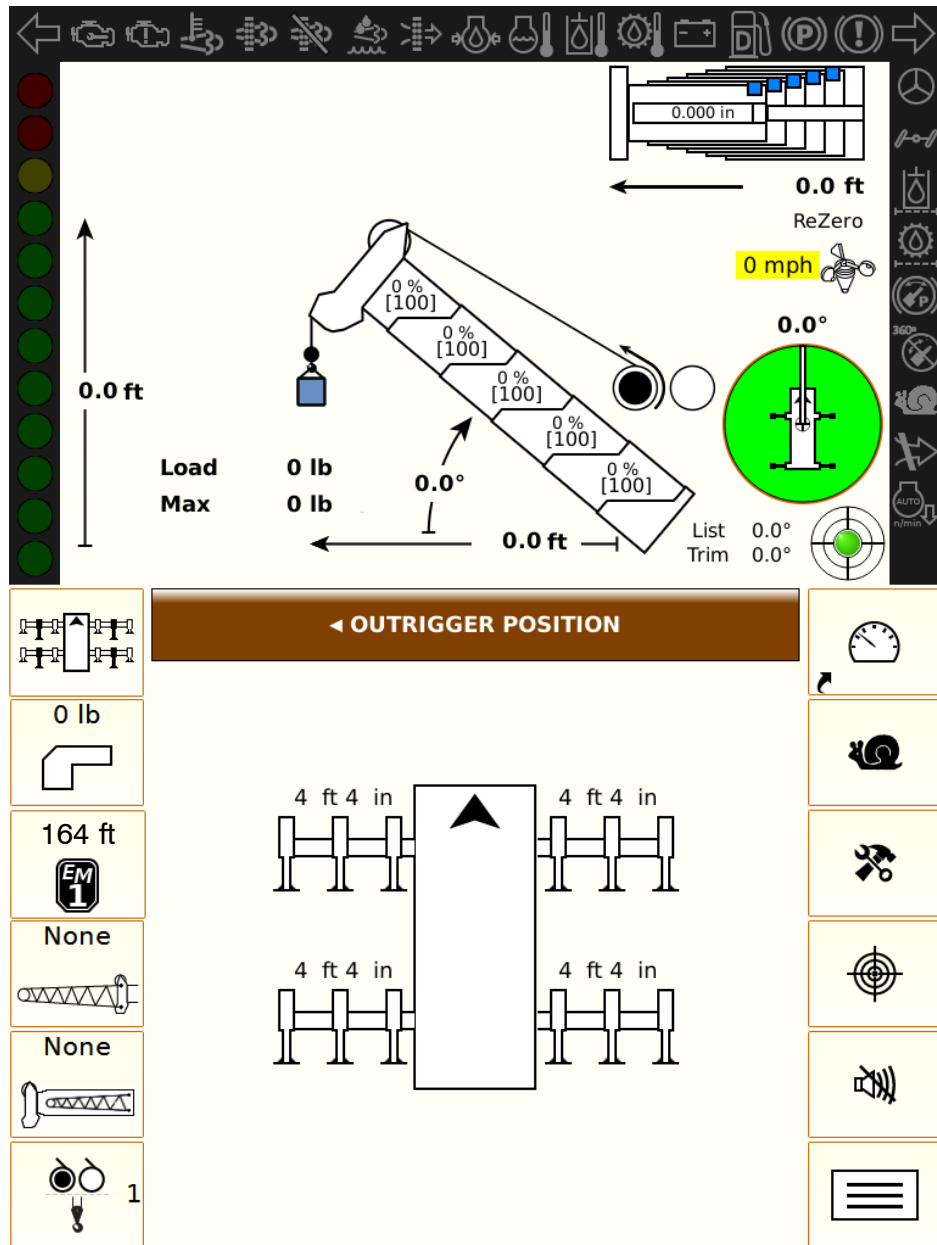
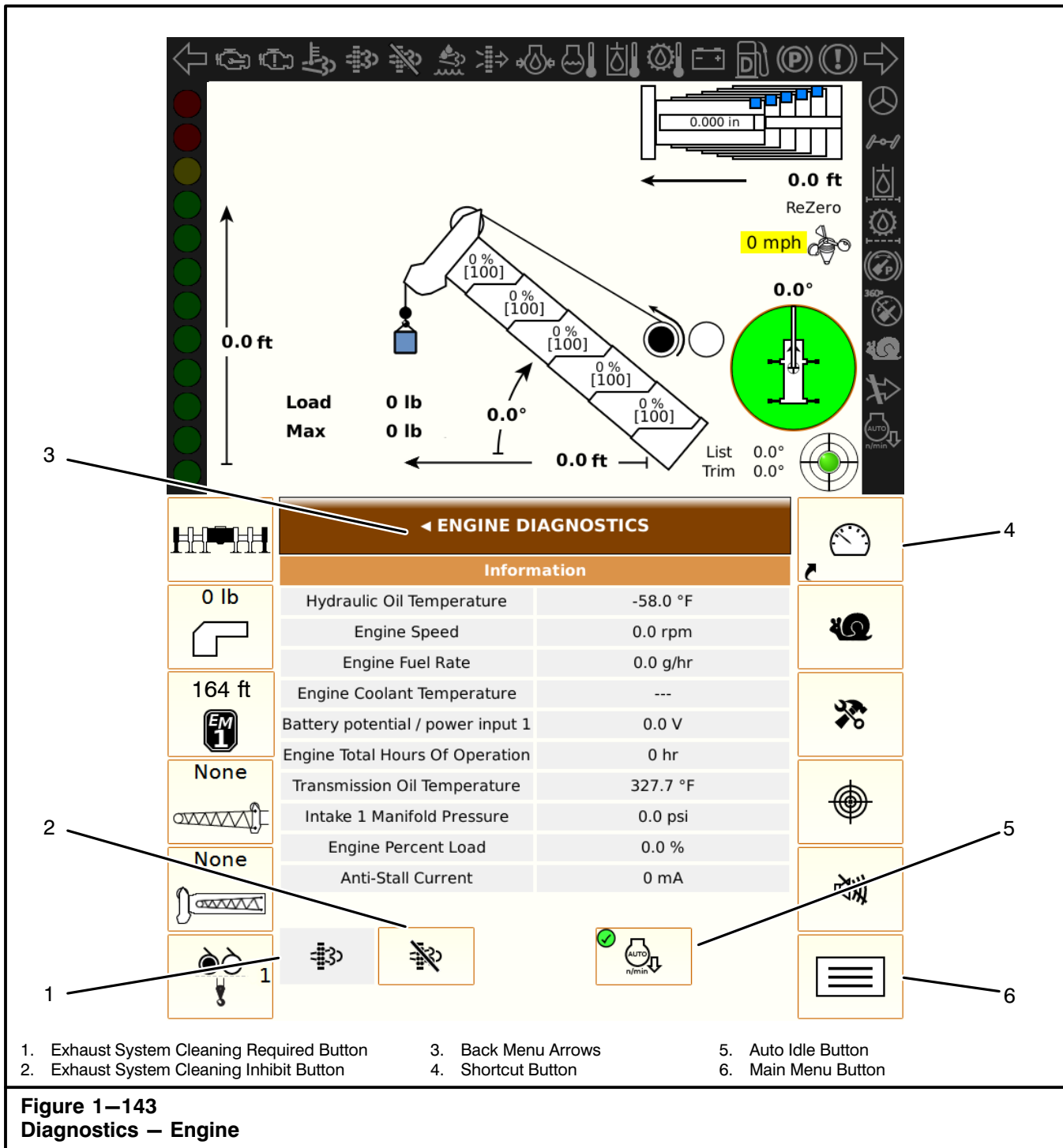


Figure 1–142
Diagnostics – Crane Function – Outrigger Position

Outrigger Position

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.
2. The Diagnostics Menu will appear. Press the Crane Functions Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.
3. The Crane Functions Diagnostics Menu will appear. Press the Outrigger Button. Refer to Figure 1–134.
4. Press the Outrigger Position Button  to access the Outrigger Position Screen. Refer to Figure 1–141.
5. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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Engine Diagnostics

Note: The Shortcut Button  can be programmed to directly access the Engine Diagnostics Screen  from any screen. Refer to “Shortcut Button” in this section of this Operator’s Manual.

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.
2. The Diagnostics Menu will appear. Press the Engine Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.
3. The Engine Diagnostics Screen will appear. Refer to Figure 1–143.

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4. The Exhaust Cleaning (Regen) Button  initiates a stationary manual exhaust system cleaning. This button will only be active when a manual exhaust system cleaning is required (light illuminated ). Refer to “Exhaust System Cleaning” in this section of this Operator's Manual.
5. The Exhaust Cleaning (Regen) Button  declines an Active and a (parked) Manual Exhaust System Cleaning until disabled. Refer to “Exhaust System Cleaning” in this section of this Operator's Manual.
6. Press the Auto Idle Button  to toggle the auto idle function off and on. An information display will appear and the activation icon  will appear on the Auto Idle Button  when it is activated. The Auto Idle function is activated as a startup default. Refer to Figure 1–143 and “Auto Idle System” in this section of this Operator's Manual.
7. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header, if the back arrow  is present, to return to the previous menu.

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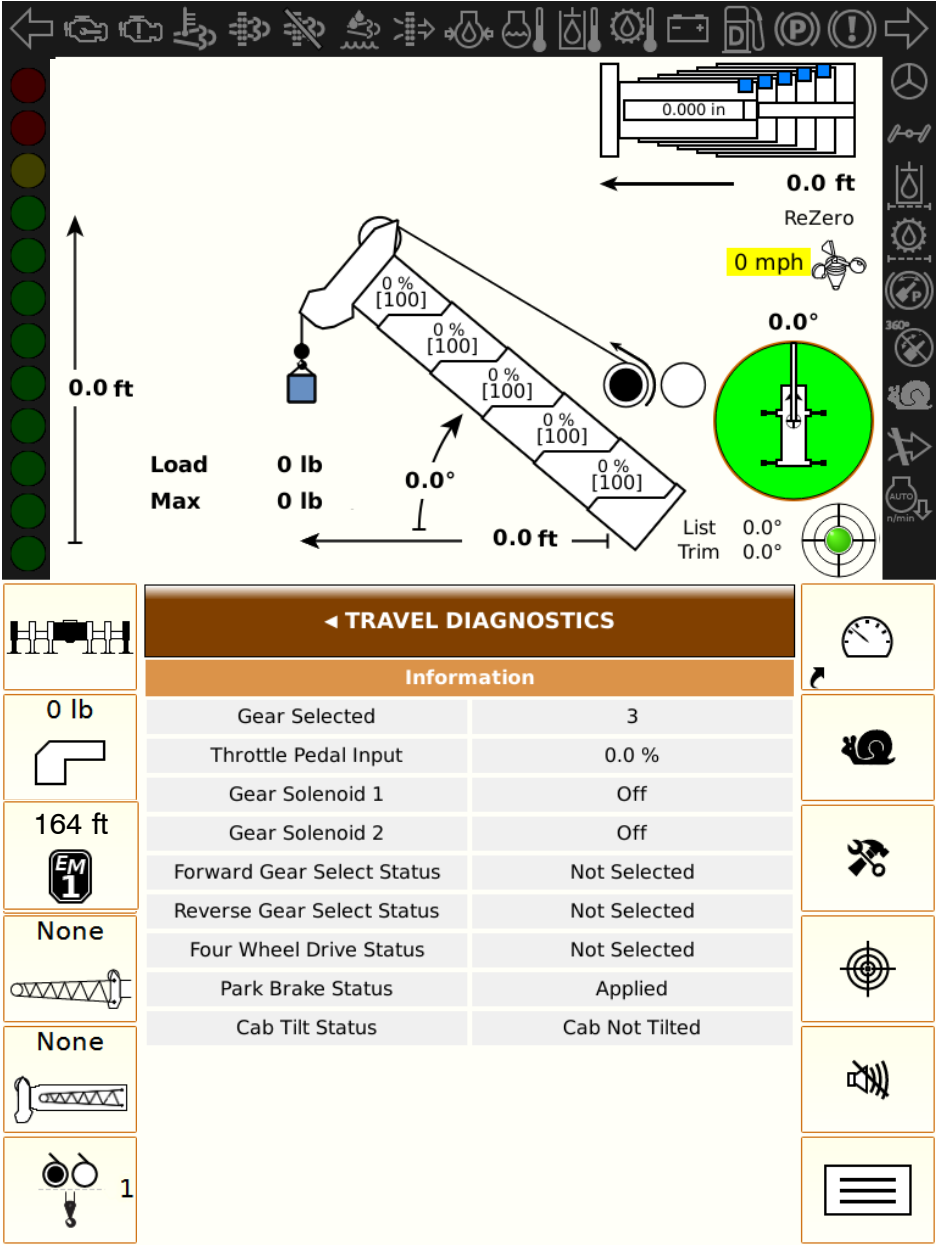


Figure 1–144
Diagnostics – Travel

Travel Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.
2. The Diagnostics Menu will appear. Press the Travel Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.
3. The Travel Diagnostics Screen will appear. Refer to Figure 1–144.
4. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

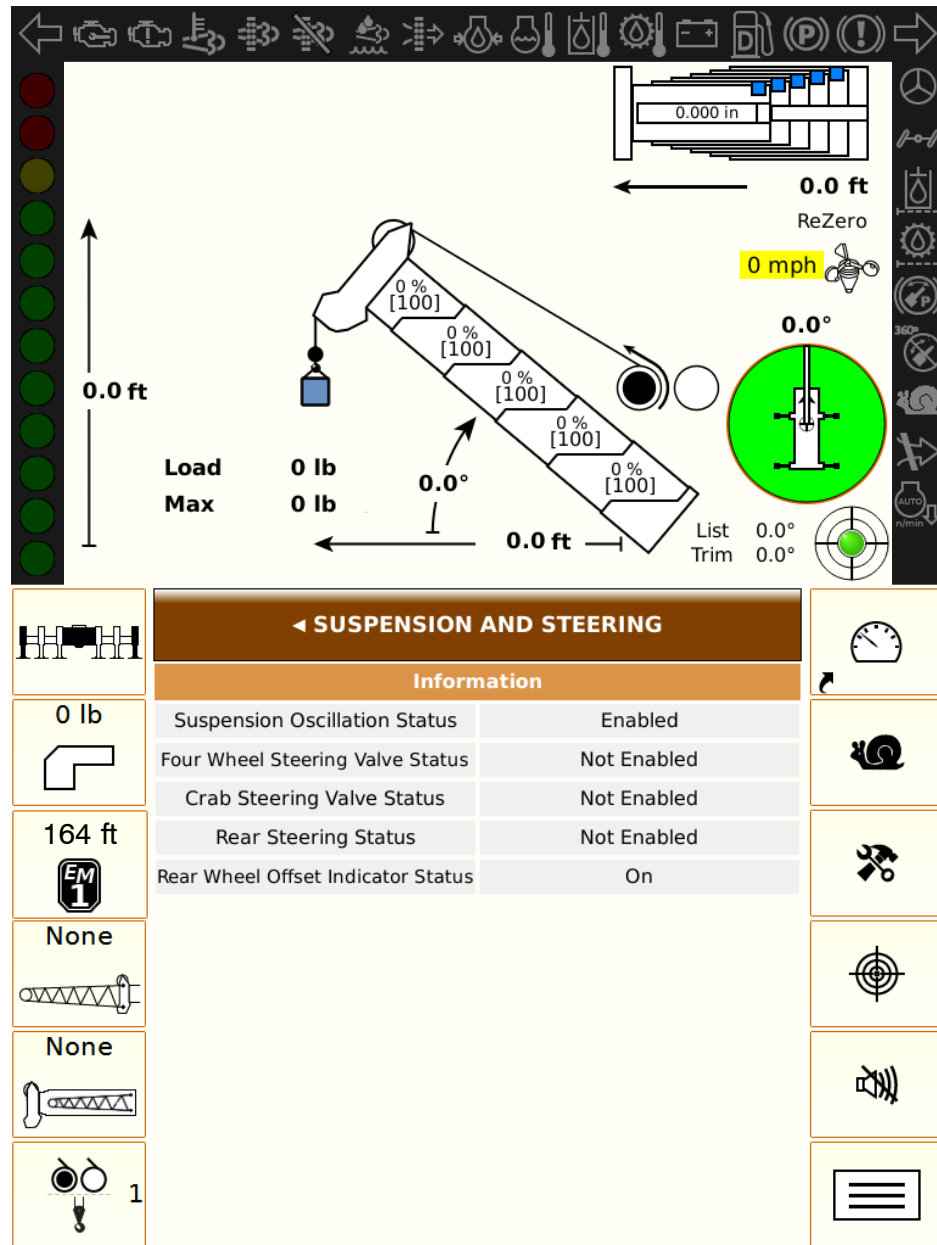


Figure 1-145
Diagnostics – Suspension And Steering

Suspension And Steering

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1-89.
2. The Diagnostics Menu will appear. Press the Suspension And Steering Button. Refer to "Diagnostics Menu" in this section of this Operator's Manual.
3. The Suspension And Steering Screen will appear. Refer to Figure 1-145.
4. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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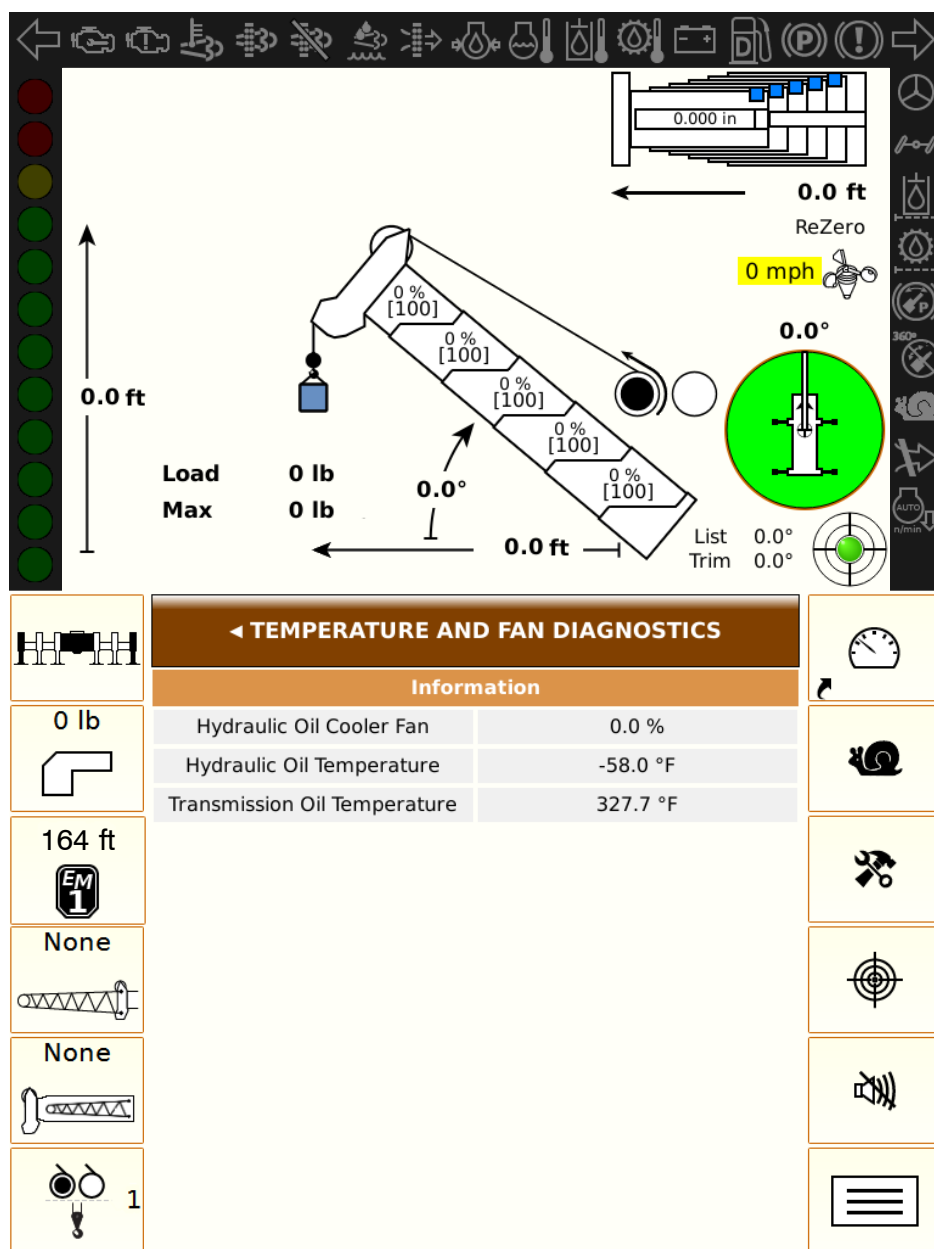


Figure 1–146
Diagnostics – Temperature And Fan

Temperature And Fan

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.
2. The Diagnostics Menu will appear. Press the Temperature And Fan Button. Refer to “Diagnostics Menu” in this section of this Operator's Manual.
3. The Temperature And Fan Diagnostics Screen will appear. Refer to Figure 1–146.
4. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

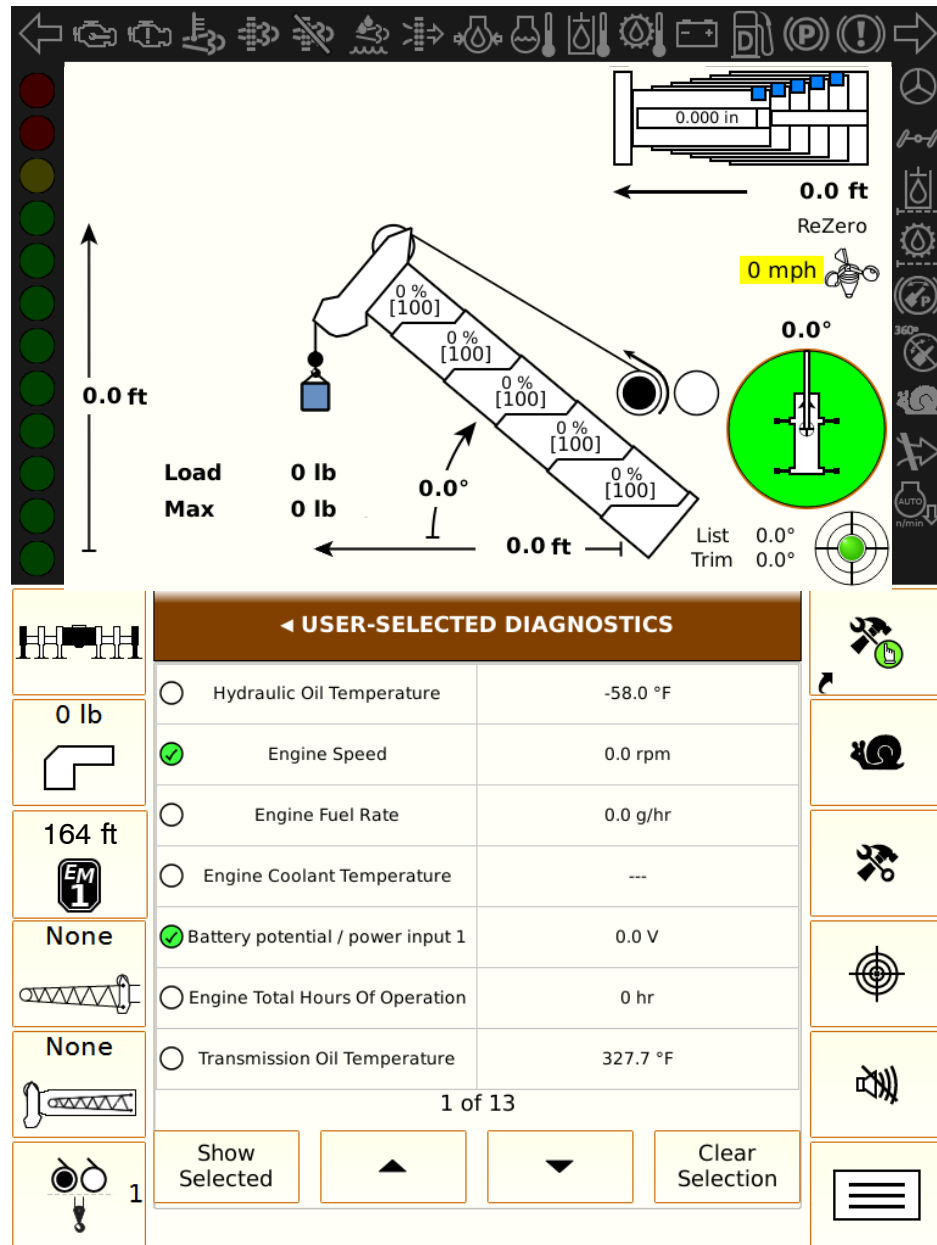


Figure 1–147
Diagnostics – User-Selected Options

User-Selected Diagnostics

The User-Selected Diagnostics can be configured to display diagnostics specified by the user. This section explains the process of configuring the user-selected diagnostics. Once the User-Selected Diagnostics Screen has been configured, the selections will be accessed directly.

Note: The Shortcut Button  can be programmed to directly access the User-Selected Diagnostics Screen  from any screen. Refer to “Shortcut Button” in this section of this Operator’s Manual.

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.

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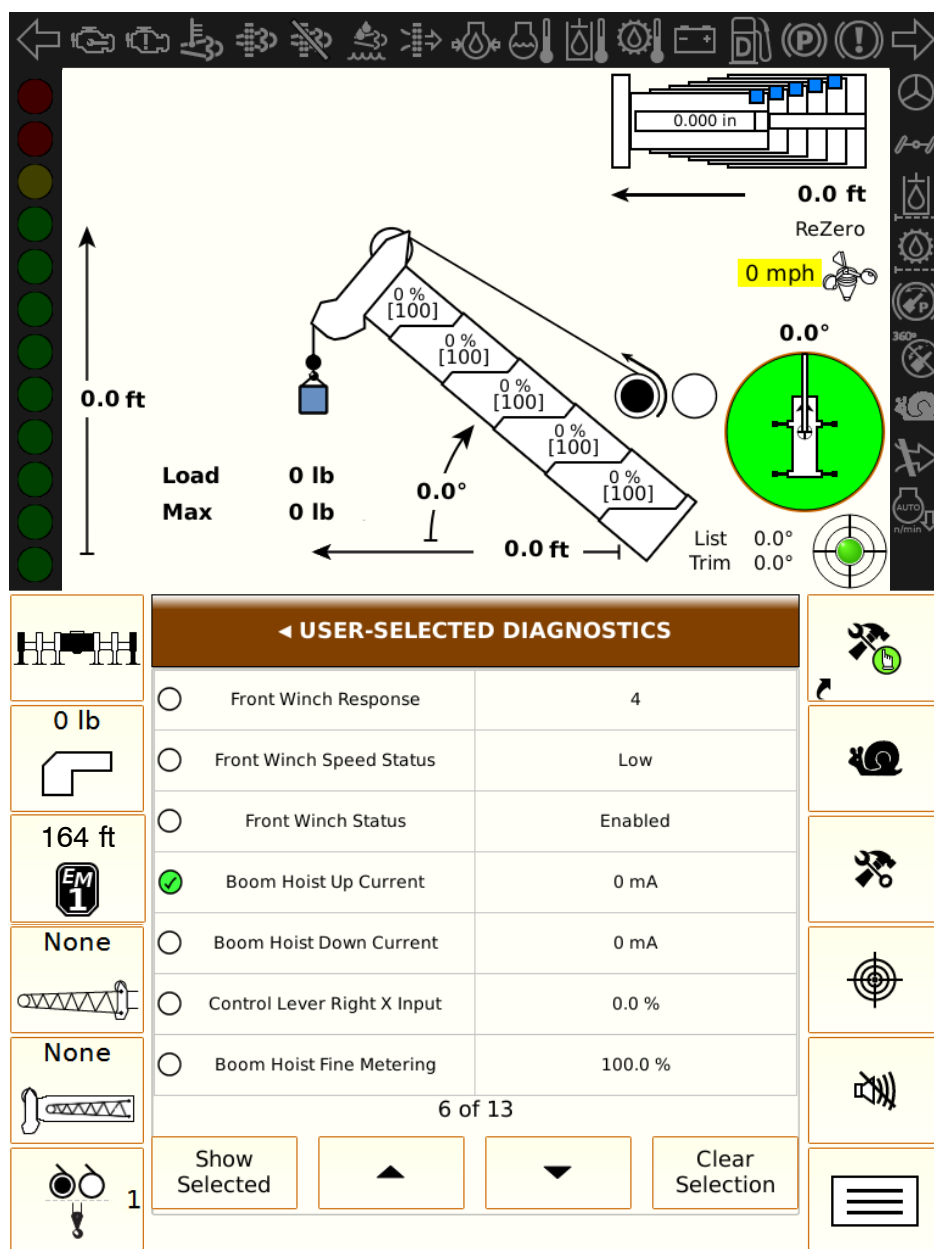


Figure 1–148
Diagnostics – User-Selected Options Continued

2. The Diagnostics Menu will appear. Press the User-Selected Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.
3. The User-Selected Diagnostics Selection Screen will appear. Refer to Figure 1–147.
4. Press the Up/Down Arrow Buttons ▲▼ to navigate through additional pages of the selection display. Refer to Figure 1–147 through Figure 1–149.
5. Select, deselect, or clear all diagnostic selections, as required, to configure desired user-selected diagnostics.

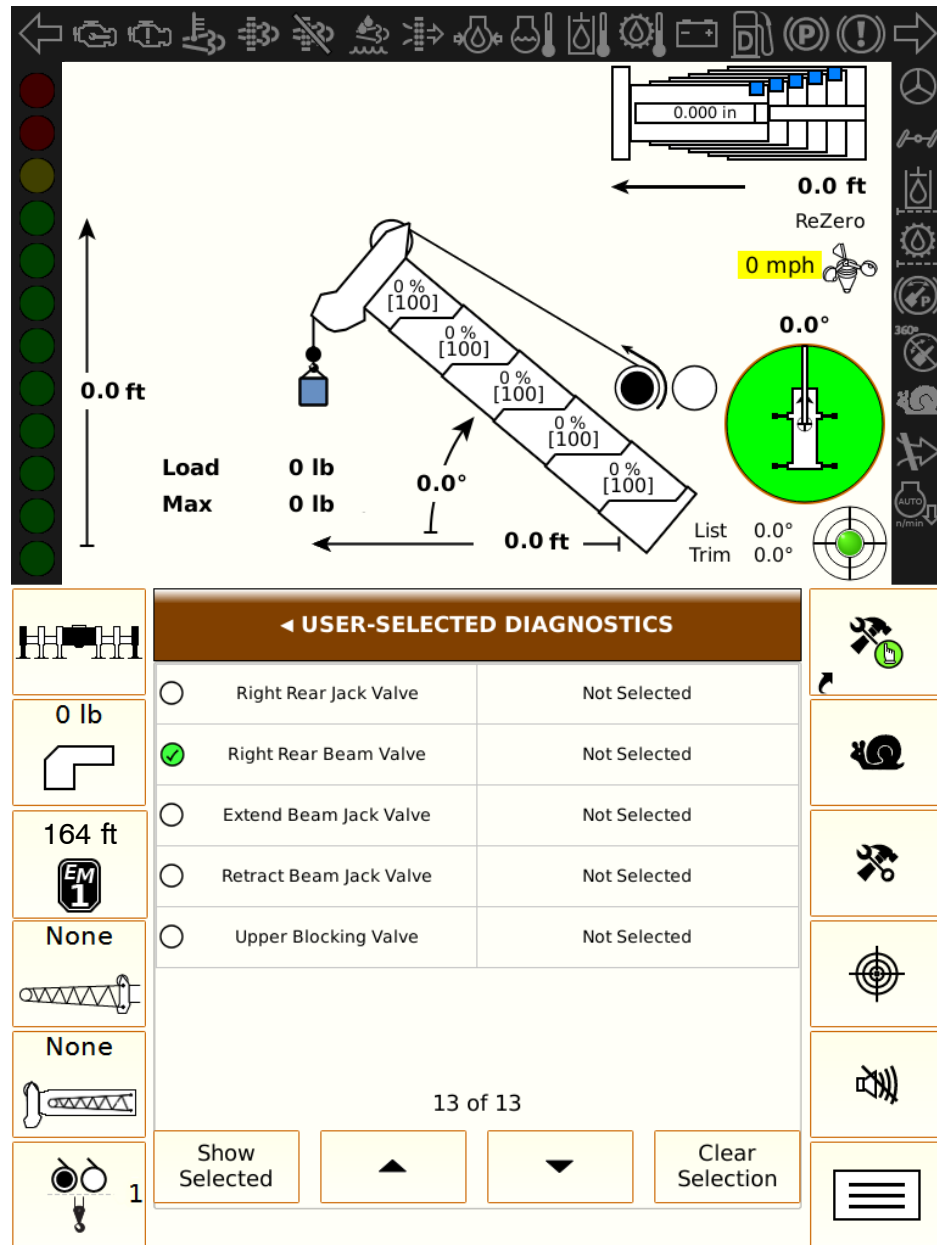


Figure 1–149
Diagnostics – User-Selected Options Continued

- To select diagnostics, press the deactivated Activation Toggle ☐ to the left of the associated diagnostic. The Activation Toggle will toggle from deactivated ☐ to activated ☒.
- To deselect diagnostics, press the activated Activation Toggle ☒ to the left of the associated diagnostic. The Activation Toggle will toggle from activated ☒ to deactivated ☐.
- To clear all diagnostic selections, press the Clear Selections Button .
- Once the desired diagnostics have been selected, press the Show Selected Button .

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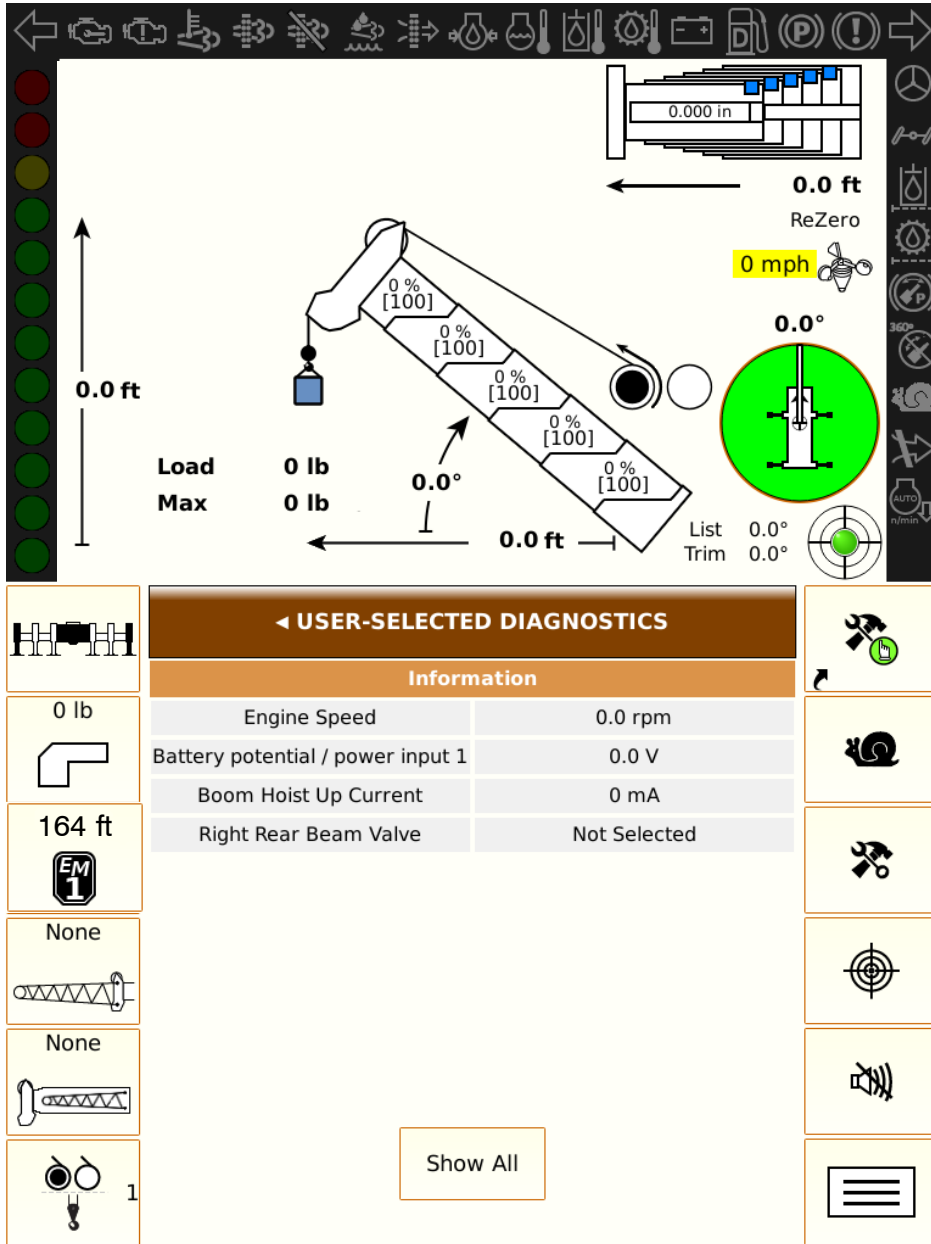


Figure 1–150
Diagnostics – User-Selected

7. The User-Selected Diagnostics Screen will change to show the user selections. Refer to Figure 1–150.
8. If further configuration is required, press the Show All Button  and repeat Steps 3 through 7.
9. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header, if the back arrow  is present, to return to the previous menu.

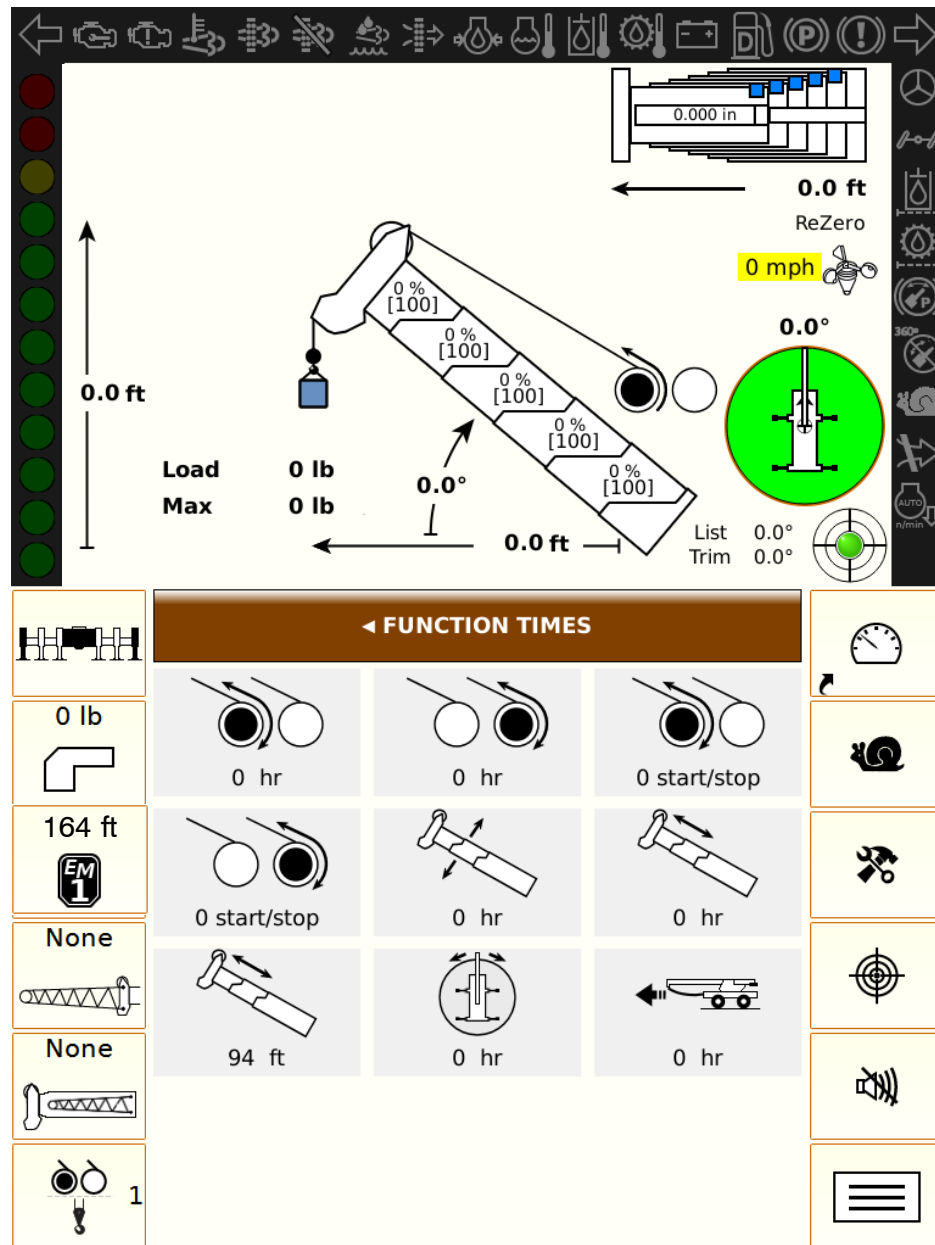


Figure 1–151
Diagnostics – Function Times

Function Times

The function time monitoring screen enables the operator to monitor the hours of use for the winch(es), boom hoist cylinder, and boom telescope cylinder, for service purposes. The screen also displays the number of times each winch has started and stopped along with the total cumulative distance the boom has been extended and retracted.

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.

2. The Diagnostics Menu will appear. Press the Function Times Button. Refer to “Diagnostics Menu” in this section of this Operator's Manual.
3. The Function Times Screen will appear. Refer to Figure 1–151.
4. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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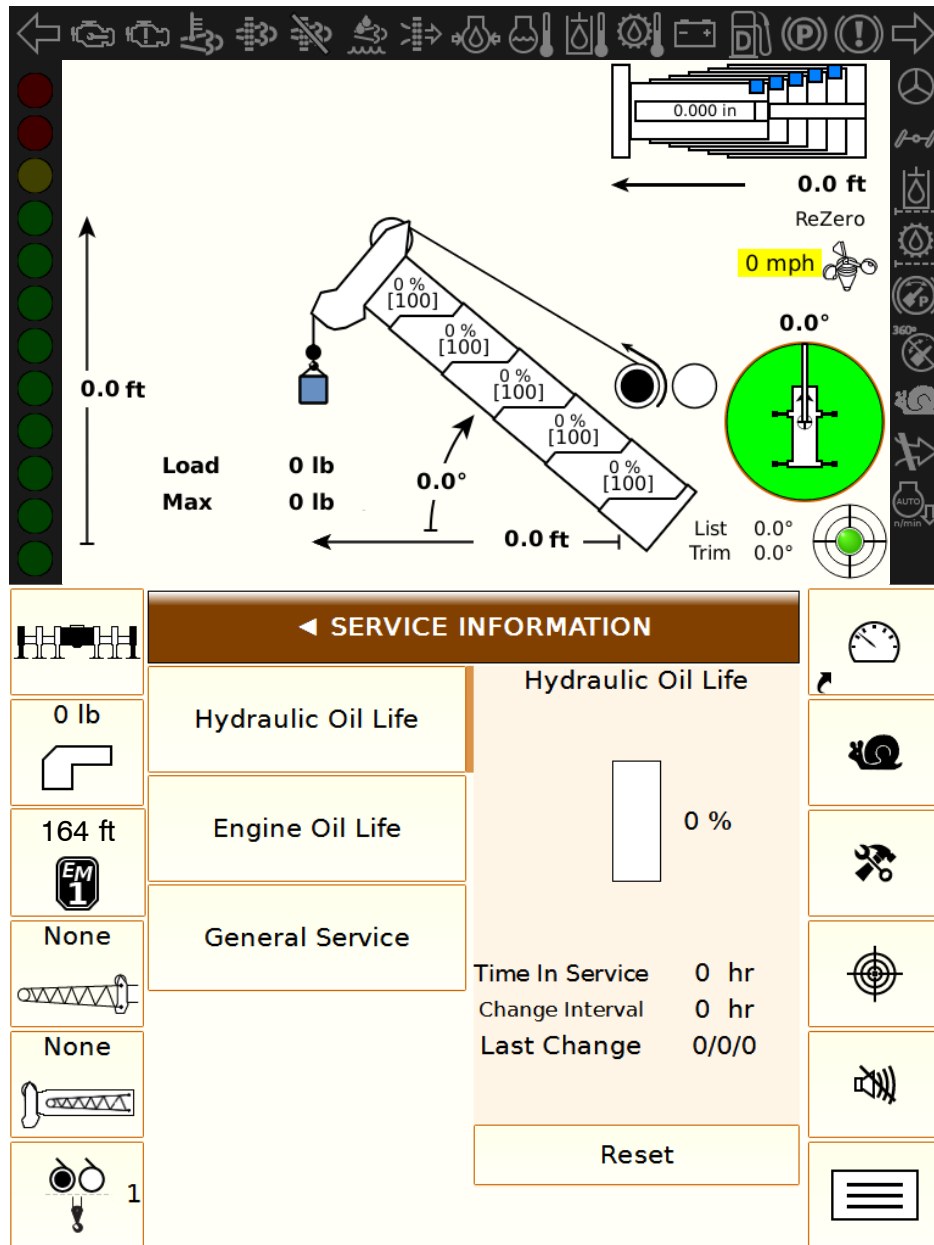


Figure 1–152
Diagnostics – Service Information

Service Information

The service information screen displays hydraulic oil life, engine oil life, and general service. Oil life is measured in a percentage of oil life remaining, and the general service bar is the total amount of hours remaining, before the next servicing. Each hour meter must be reset after service is completed. Refer to “Hour Meter Reset” in this section of this Operator’s Manual.

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.

2. The Diagnostics Menu will appear. Press the Service Information Button. Refer to “Diagnostics Menu” in this section of this Operator’s Manual.
3. The Service Information Screen will appear. Refer to Figure 1–152.
4. Access Hydraulic Oil Life, Engine Oil Life, or General Service by pressing the corresponding button.
5. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

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Telematics

TELEMATICS - refers to the use of wireless devices and computer module technologies to transmit data in real time back to an organization.

This Link-Belt crane is equipped with one or more onboard computers that monitor and/or control the crane's performance. Crane owners may access electronic data by subscribing to the optional telematics feature offered by our telematics partner.

Specific electronic data transmitted by the onboard computers may be, but is not limited to, water temperature, oil temperature, engine rpm, fuel consumption, crane location, and other data that may be transmitted via satellite to our telematics partner. A crane owner may access this data by subscribing to the telematics feature through our telematics partner. A crane owner may then use some or all of the data transmitted from the crane's onboard computers to monitor the crane's activity, location, maintenance/service schedule, and/or other areas to assist them in managing this crane.

Note: Link-Belt recognizes that each individual crane's data transmitted via telematics is the property of the crane owner.

Data sharing is offered by Link-Belt through our telematics partner in an effort to provide Link-Belt distributors and our crane owners with overall enhanced product support through field troubleshooting, expedited parts procurement, infield repairs and other various support outlets. Any data shared by the crane owner is a "snapshot" of the data from the crane.

Link-Belt may request the crane owner "share data". The crane owner should determine who and when specific data related to their crane is shared. Link-Belt and its representatives may be in possession of specific crane data only when the crane owner selects "share data".

Shared data received by Link-Belt is not intended to be "stored" in any permanent data file at our factory. Shared data may exist at the factory location through the normal course of business until deleted by automatic expiration.

Link-Belt reserves the right to modify this policy as required and make every reasonable attempt to notify telematics subscribers of changes to this policy.

Transmitting Data

1. From the Main Menu Screen, press the Diagnostics Button . Refer to Figure 1–89.

2. The Diagnostics Menu will appear. Press the Telematics Button. Refer to "Diagnostics Menu" in this section of this Operator's Manual.
3. The Telematics Menu and Information Screen will appear. Refer to Figure 1–153.
4. Send the Pulse, MCC, or Engine Diagnostics Data by pressing the corresponding button.
5. A confirmation screen will pop up. Press  to send the data or press  to cancel and return to the previous screen. Refer to Figure 1–154.
6. The activation icon  will be shown beside the data selected while the data is being sent. The Telematics Module will send data every 10 seconds for 10 minutes or until ignition is turned off. Refer to Figure 1–153.
7. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

Computer Return And Stored Data Disclosure

In the event the Rated Capacity Limiter (RCL), Load Moment Indicator (LMI), or other computer containing recorded/stored data on this crane is returned to Link-Belt Cranes or the original equipment manufacturer (OEM) of an onboard computer, for service or replacement, the crane owner must submit a written request to have the recorded/stored data on that computer downloaded to an electronic device that is to be returned to the crane owner before any examination and/or work is started on that specific computer.

Should Link-Belt direct the crane owner to return an onboard computer to the OEM of that computer, Link-Belt Cranes recommends the crane owner submit a written request to the OEM requesting the OEM download the recorded/stored data to an electronic device and return that device to the crane owner prior to any examination and/or work being started on that specific computer.

In some instances, in order to read data recorded/stored in an onboard computer special equipment is required, and access to the crane and/or the computer is needed. Link-Belt or the OEM of the computer has the special equipment necessary to retrieve the recorded data, or directions on how the data may be retrieved. Please contact your nearest Link-Belt distributor for assistance.

It is the position of Link-Belt that the crane owner owns any data that is recorded and stored in the onboard computer system(s) installed on our cranes.

Operator's Manual

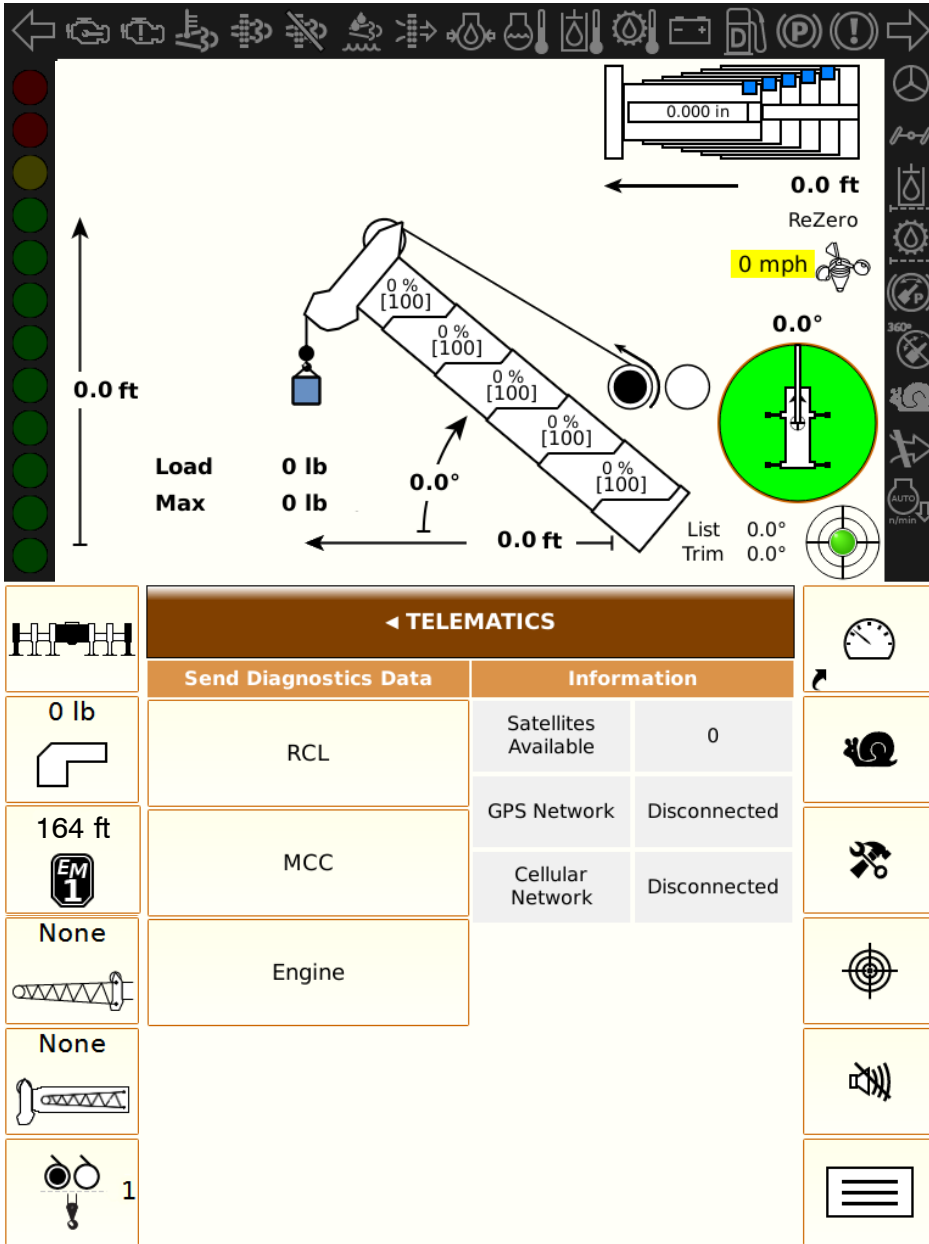


Figure 1–153
Diagnostics – Telematics

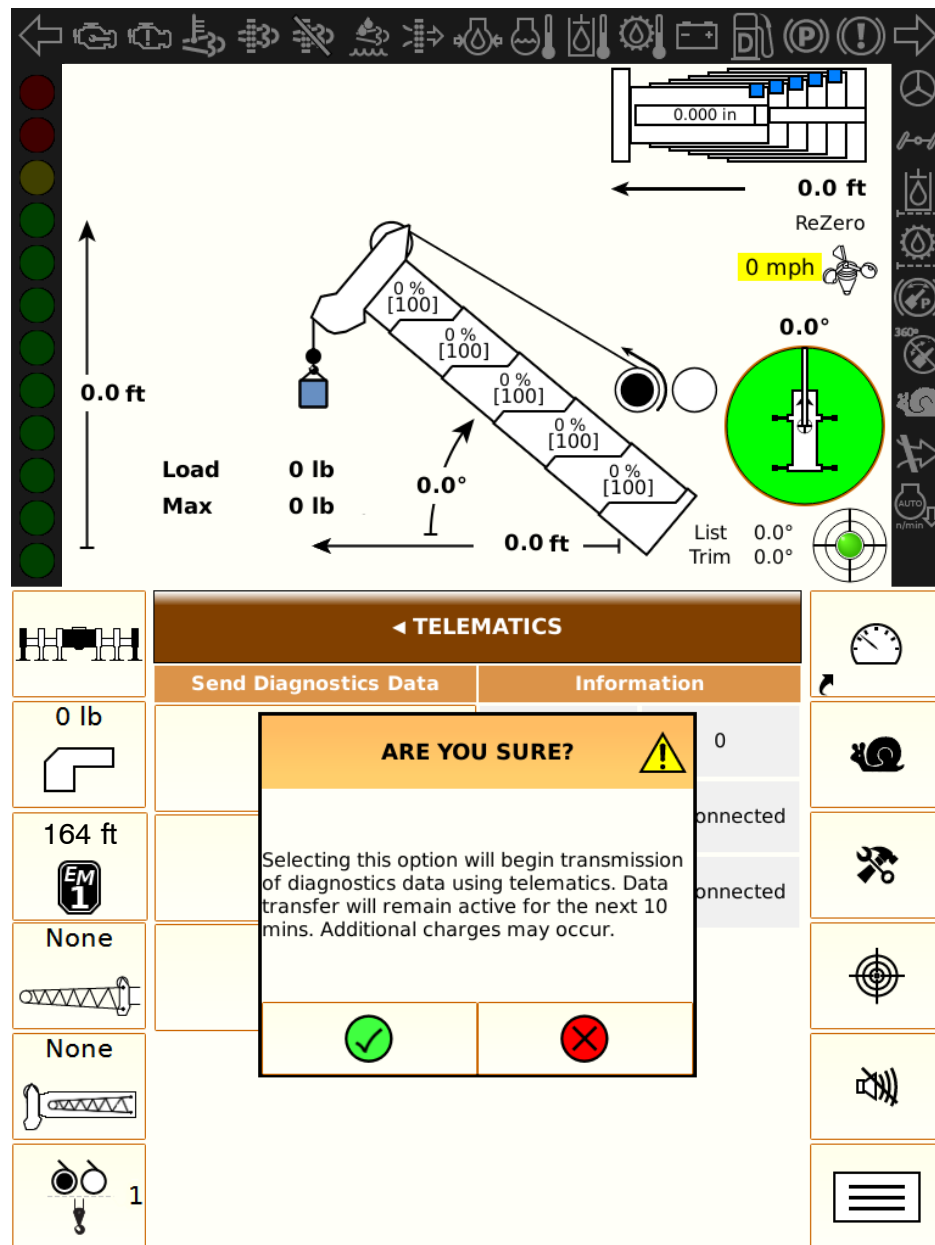


Figure 1–154
Diagnostics – Telematics – Confirmation Screen

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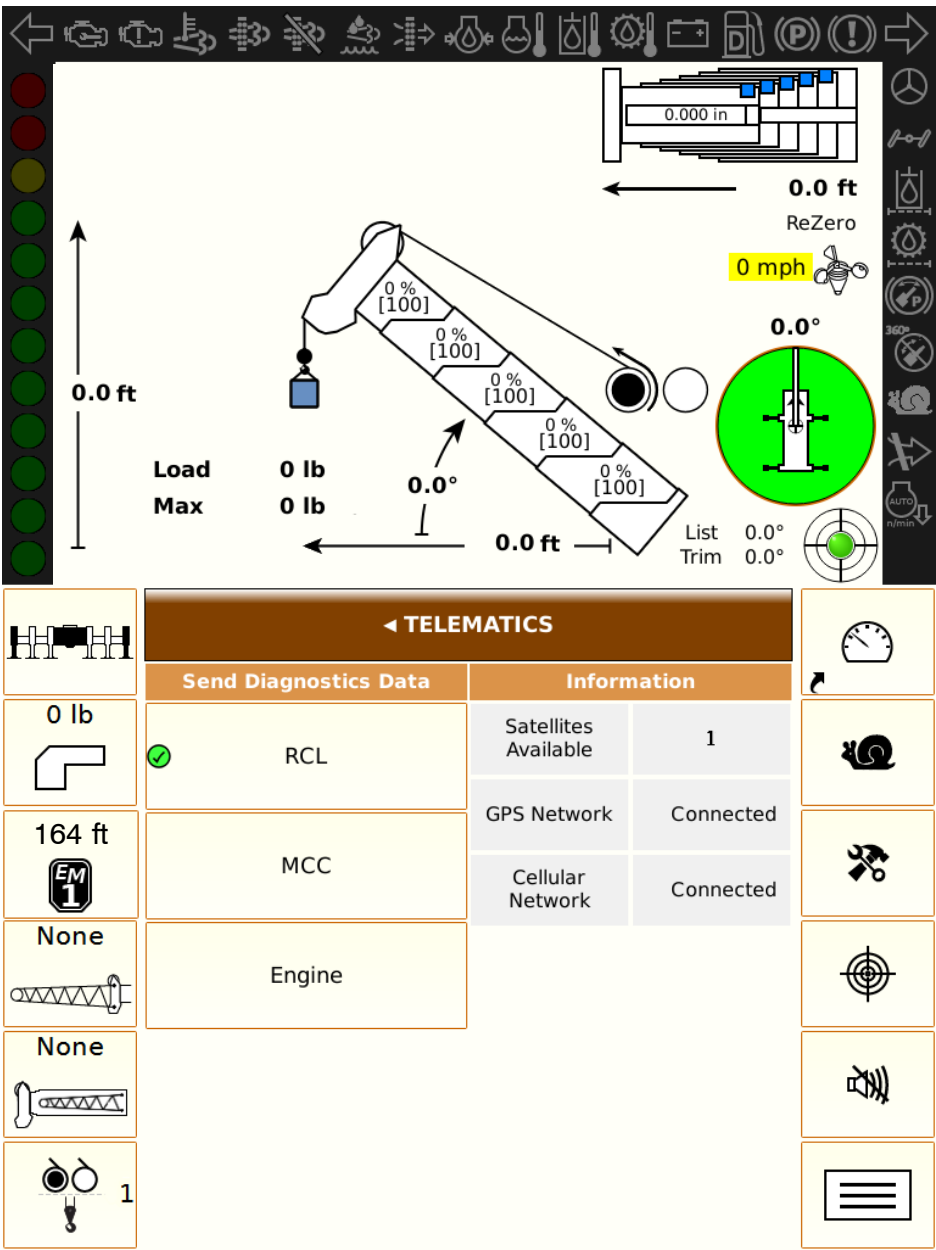
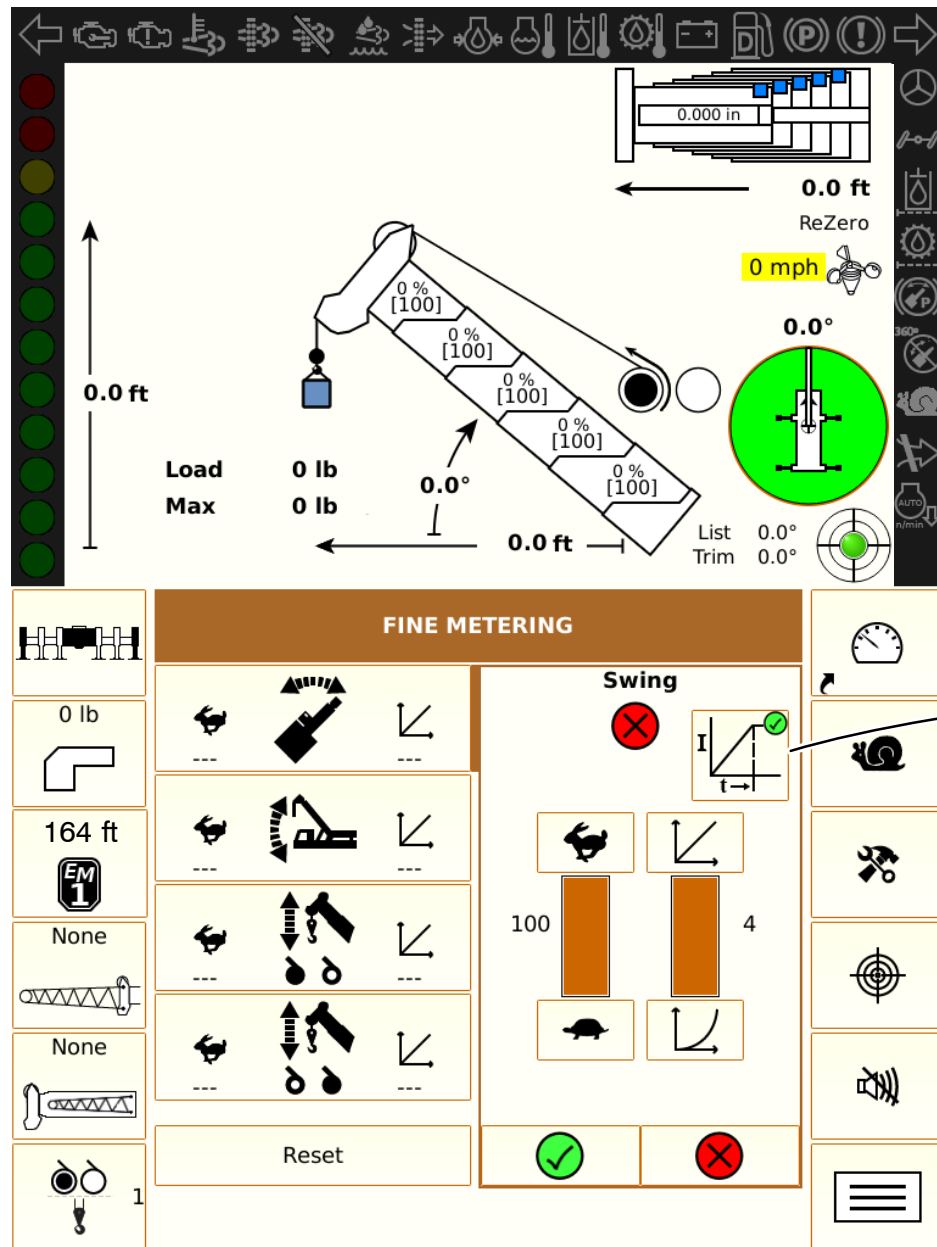


Figure 1–155
Diagnostics – Telematics – Sending



1. Accelerated Function Response Button

Figure 1–156
Fine Metering

Fine Metering

The fine metering mode allows very slow movements of the swing, boom hoist, and winch functions, enabling the operator more precise movement of the load when required for more precision work. Fine metering can be adjusted on a scale from 10% to 100%, which restricts the maximum function speed to be approximately equal to the percentage chosen.

In addition, the function response can be adjusted for each function and can be set to four predetermined levels. Level 1 will provide slow function response and response will increase as the level number increases.

1. From the Main Menu Screen, press the Fine Metering Button . Refer to Figure 1–89.

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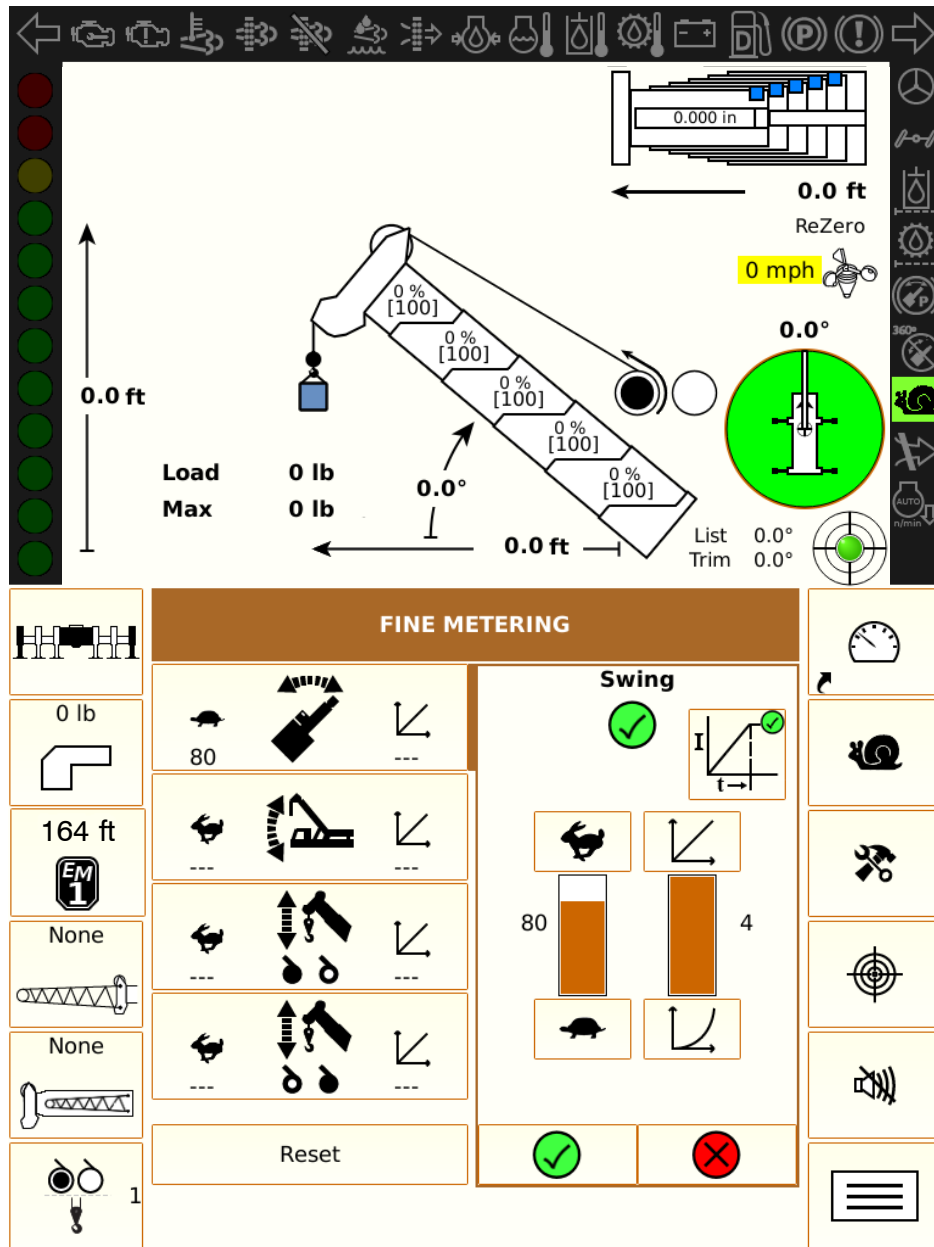


Figure 1–157
Fine Metering – High And Low Speed

Note: The Fine Metering Pulse Feature Button  can be used to access the Fine Metering Screen from any screen. Refer to “Pulse Feature Buttons” in this section of this Operator’s Manual.

2. The Fine Metering Screen will appear. Refer to Figure 1–156.
3. Access Swing , Boom Hoist , Front Winch , or Rear Winch  by pressing the corresponding button.

4. Press the High Speed Button  or Low Speed Button  to adjust the fine metering for the selected function. Refer to Figure 1–157.
5. Press the Greater Function Response Button  or Lesser Function Response Button  to adjust the function response for the selected function. Refer to Figure 1–158.

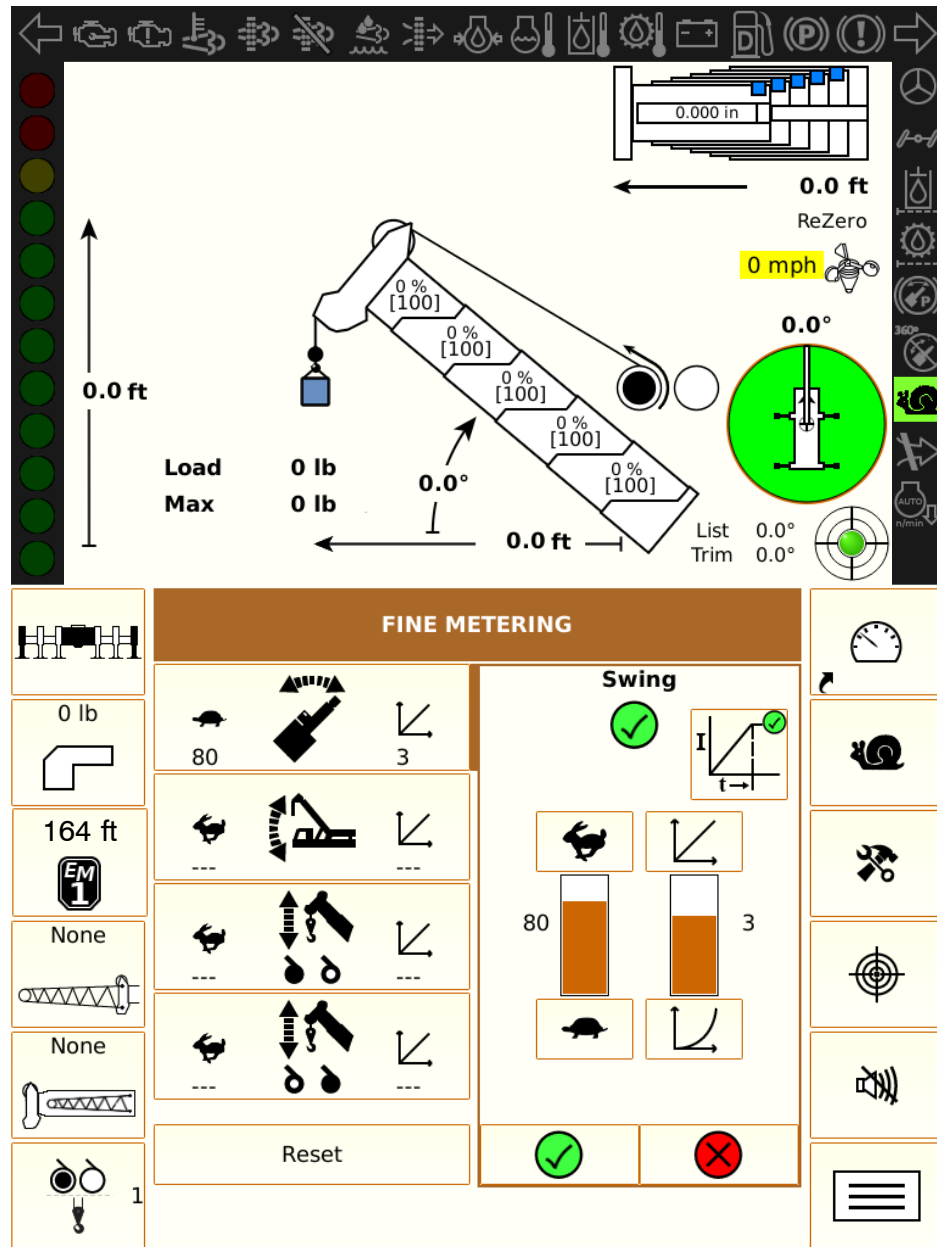


Figure 1–158
Fine Metering – Greater And Lesser Function Response

6. To activate  or deactivate  the values for the chosen function, press the Activation Button  or the Deactivation Button  below the value display, as required. The fine metering indicator light will illuminate when any function has fine metering activated below 100, but will not be illuminated if only Function Response is activated.
7. Press the Accelerated Function Response Button  to achieve a greater function response, where available. The activation icon  will appear on the Accelerated Function Response Button  when it is activated. Refer to Figure 1–156.
8. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header, if the back arrow  is present, to return to the previous menu.
9. The reset button will deactivate all values for all functions and return the set value back to the default values (100 for fine metering and 4 for function response).

Operator's Manual

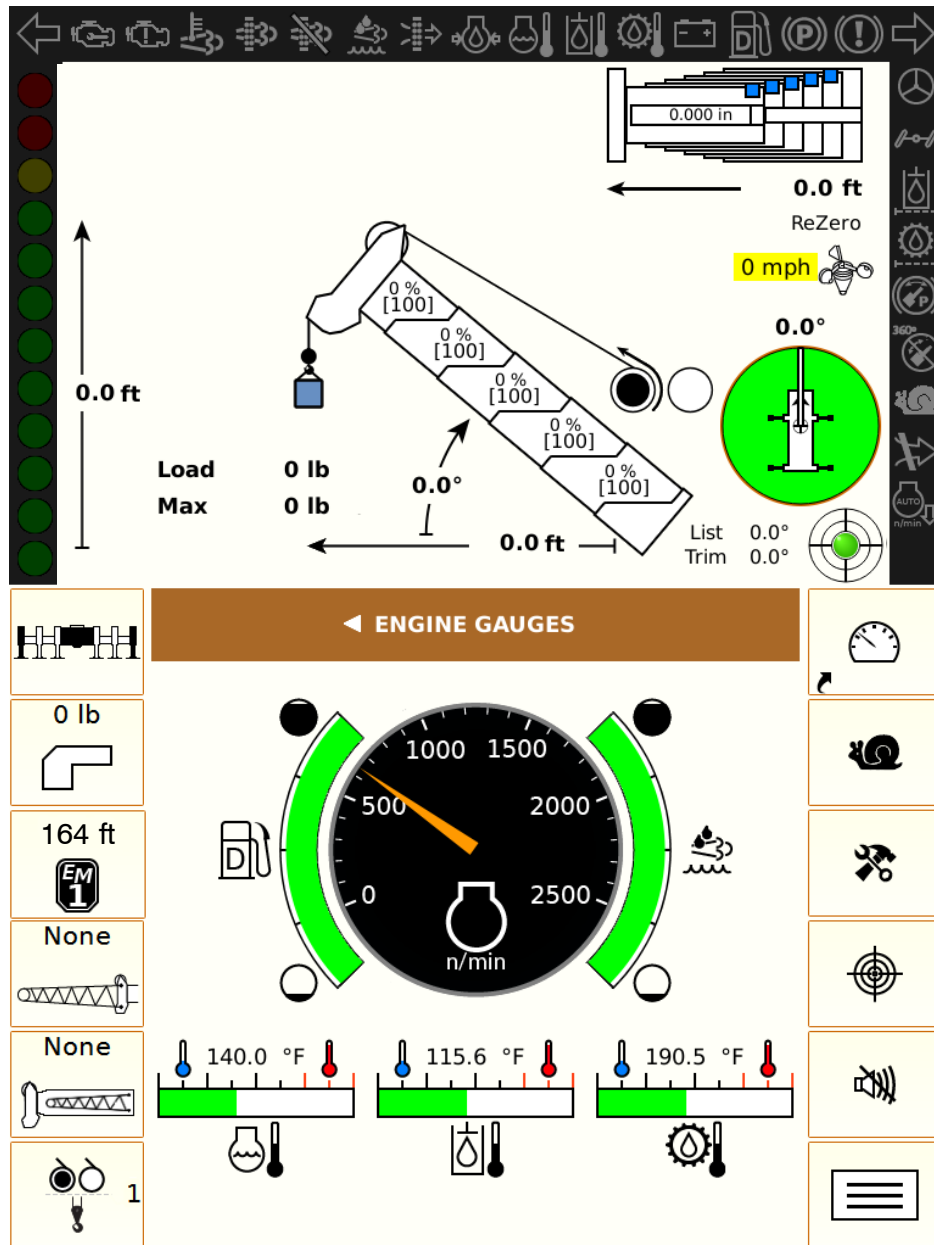


Figure 1-159
Engine Gauges

Engine Gauges

Note: The Shortcut Button  can be programmed to directly access the Engine Gauges Screen  from any screen. Refer to “Shortcut Button” in this section of this Operator’s Manual.

1. From the Main Menu Screen, press the Engine Gauges Button . Refer to Figure 1-89.

2. The Engine Gauges Screen will appear. Refer to Figure 1-159.

3. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header, if the back arrow  is present, to return to the previous menu.

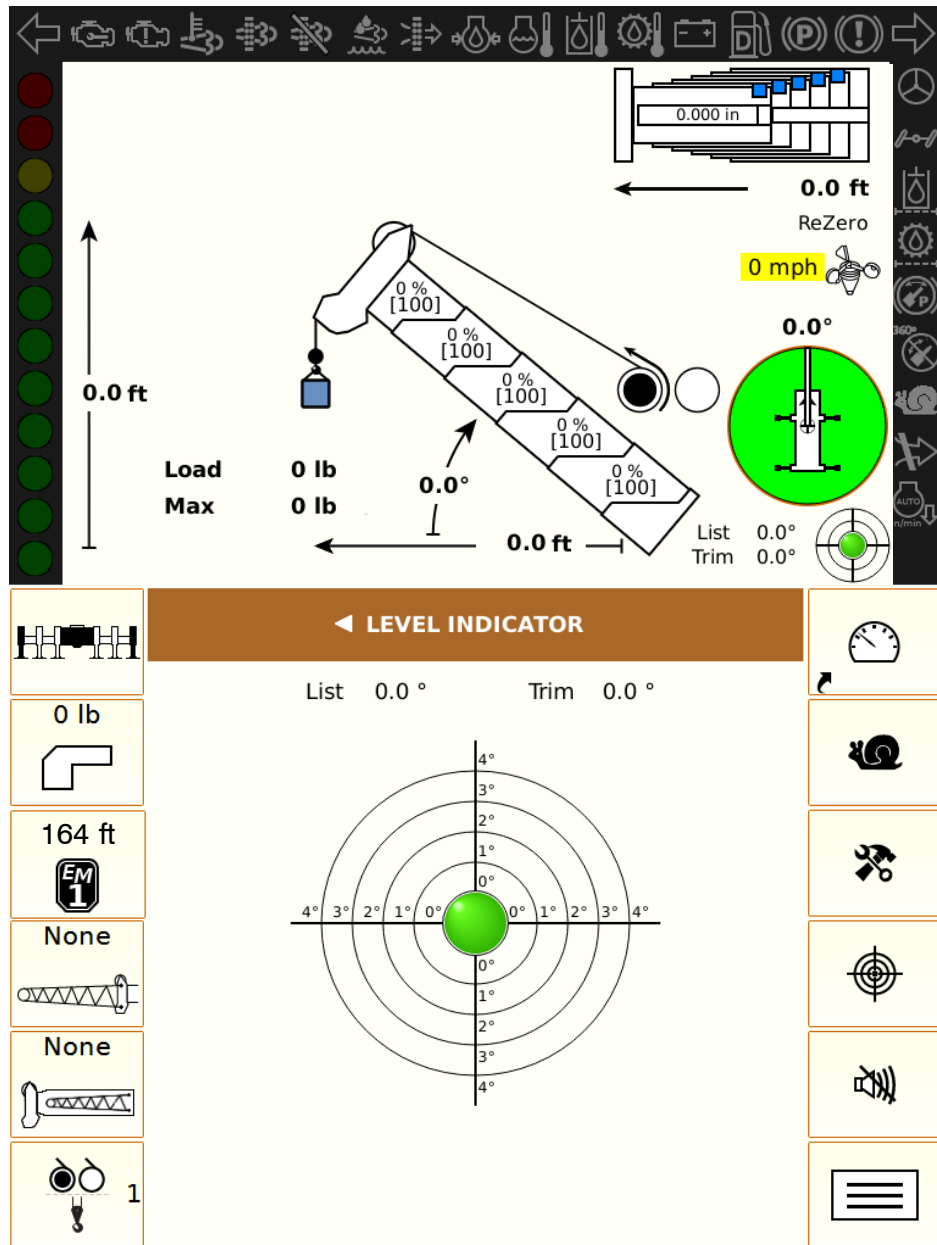


Figure 1–160
Level Indicator

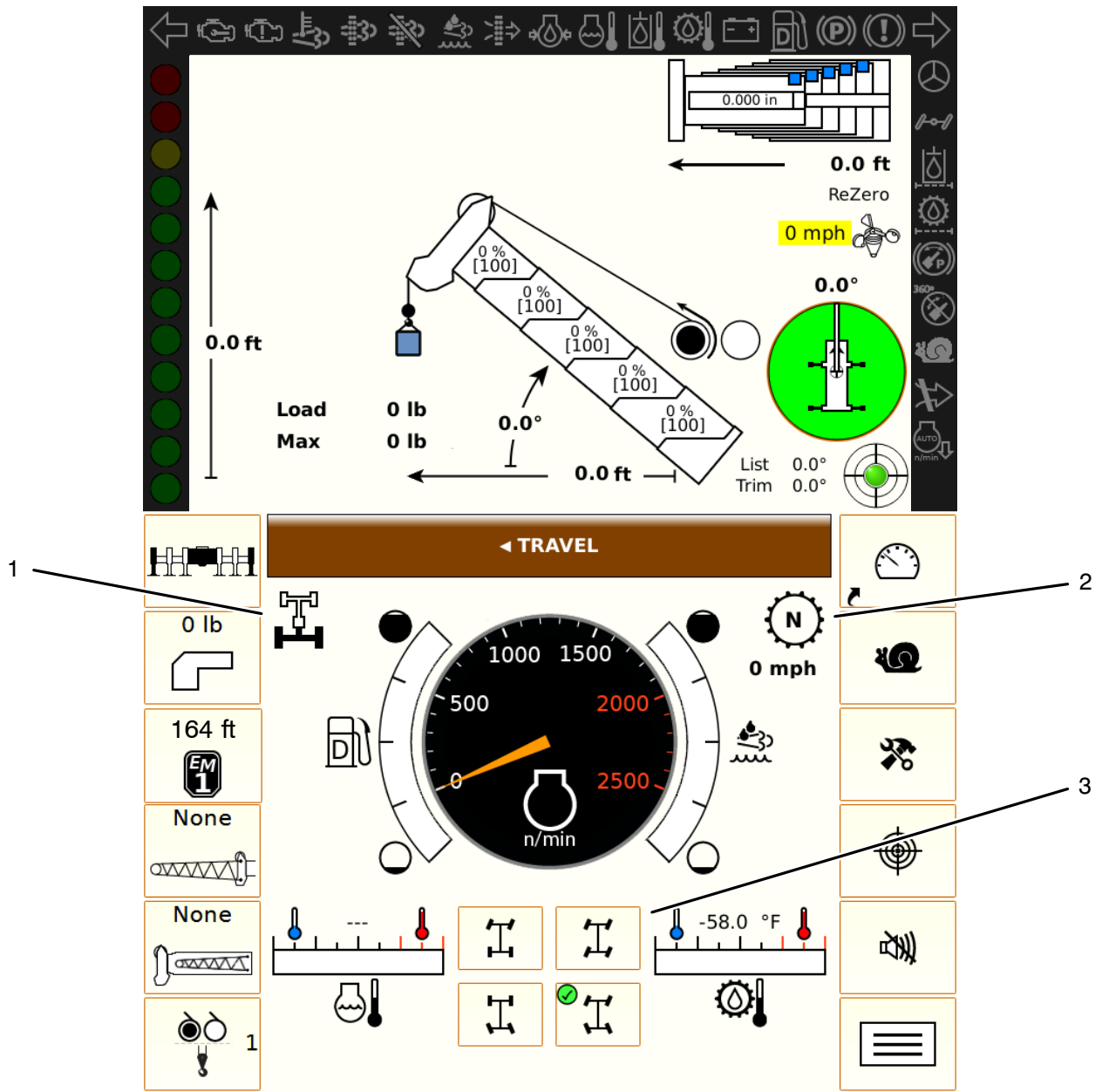
Level Indicator

1. From the Main Menu Screen, press the Level Indicator Button . Refer to Figure 1–89.

Note: The Level Indicator Pulse Feature Button  can be used to access the Level Indicator Screen from any screen. Refer to “Pulse Feature Buttons” in this section of this Operator’s Manual.

2. The Level Indicator Screen will appear. Refer to Figure 1–160.
3. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header, if the back arrow  is present, to return to the previous menu.

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1. 4-Wheel Drive/Range Mode

2. Transmission Mode

3. Steering Mode Buttons

Figure 1-161
Travel

Travel

The Travel Screen allows the operator to view the current travel configuration and diagnostics, as well as change steering modes.

1. From the Main Menu Screen, press the Travel Button . Refer to Figure 1-89.

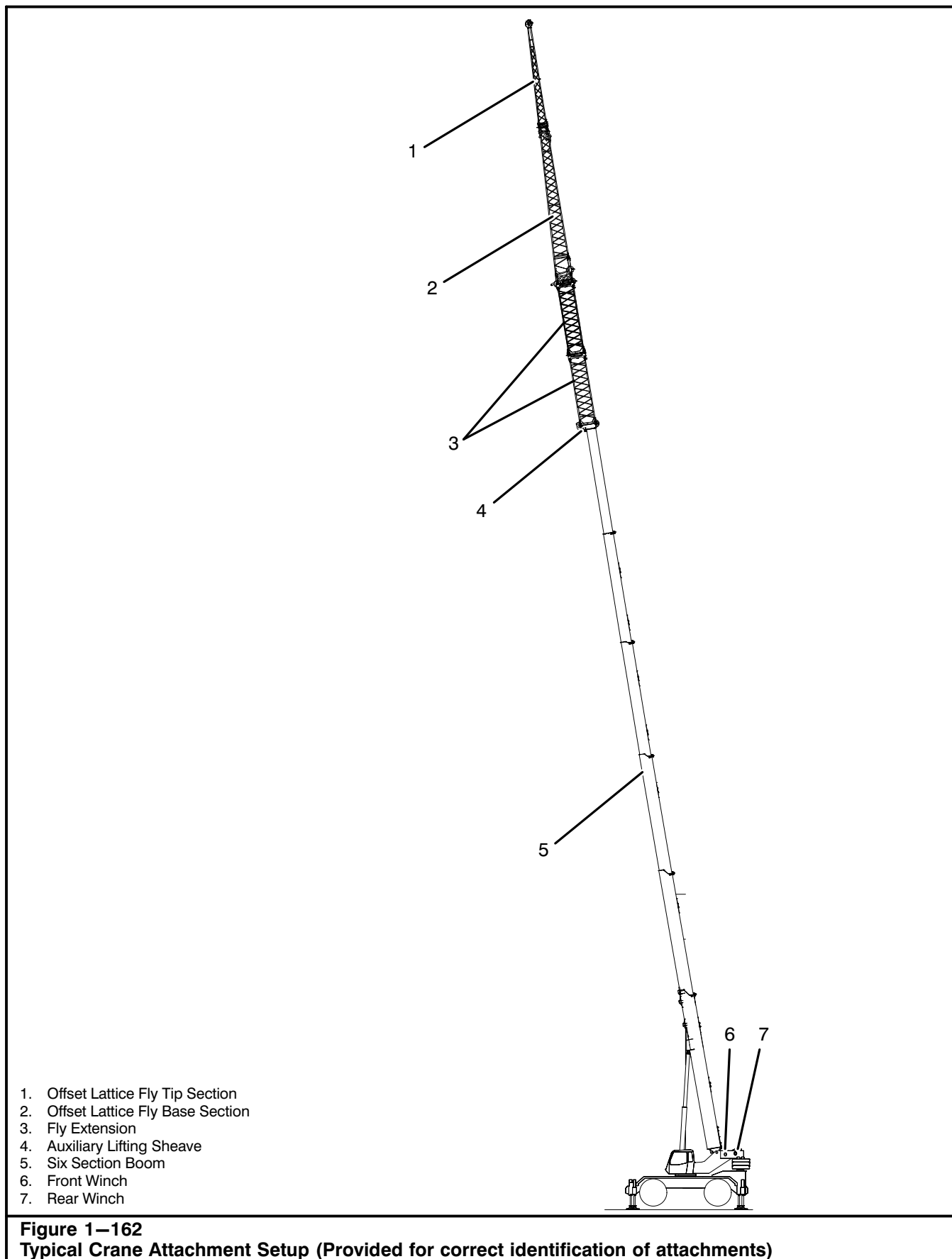
2. The Travel Screen will appear. Refer to Figure 1-161.

Note: The Travel Screen will automatically be displayed any time the transmission is shifted out of neutral or park brake is disengaged.

Operator's Manual

3. This icon represents the current 4-wheel drive/range mode. To change the 4-wheel drive/range mode, press the 4-Wheel Drive/Range Switch  on the steering column. Refer to "Steering Column And Wheel" in this section of this Operator's Manual.
4. This icon represents the current transmission mode. The transmission modes are as follows: N – Neutral, P – Park, F1 – Forward Gear 1, F2 – Forward Gear 2, F3 – Forward Gear 3, R1 – Reverse Gear 1, R2 – Reverse Gear 2, and R3 – Reverse Gear 3. To change transmission mode, press the corresponding switch(es) on the steering column. Refer to "Column And Wheel" in this section of this Operator's Manual.
5. To change the steering mode, press the corresponding button: Conventional , Rear Wheel , 4-Wheel , or Crab . Refer to "Combination Steering" in this section of this Operator's Manual for more information about steering modes.
6. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen, or press the Screen Header to return to the previous menu.

Operator's Manual



Entering And Exiting The Upper Operator's Cab

Entering or exiting the upper operator's cab could be hazardous if certain aspects are not taken into consideration. The elevation of the carrier deck and upper operator's cab alone could cause serious injury if someone was to fall. For this reason ladders are mounted on each side of the carrier to provide easy access to the carrier deck and the upper operator's cab. Numerous hand grips are also attached to the cab as well as slip resistant paint on the surface of the carrier deck, to provide safe entry to the cab. Use these features to make climbing on the crane as safe as possible. Remain in three point contact with the crane at all times (two hands and one foot or two feet and one hand).

Another feature which is available to ease entry and exit of the upper operator's cab, is the adjustable operator's seat. Move the seat back as required to allow safe entry. This feature also provides operator comfort during crane operation. Refer to "Operator's Seat" in this Section of this Operator's Manual for complete seat operating instructions.

Inside the cab, two separate features are provided to prevent accidental operation of the hydraulic controls while entering or exiting the operator's seat.

Note: Do no attempt to enter or exit the cab while it is tilted.

Operator's Manual



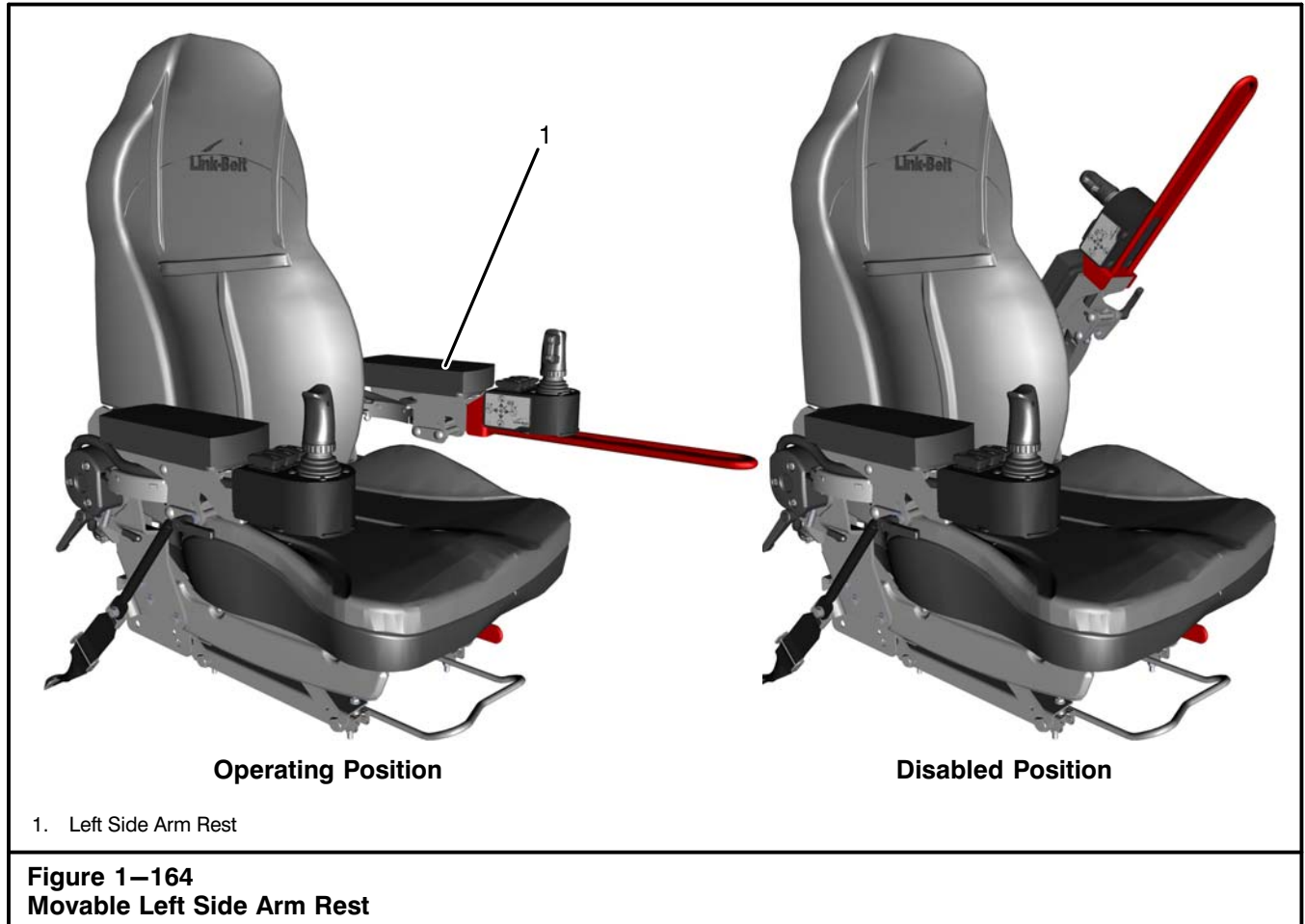
1. Function Lockout Switch

Figure 1–163
Function Lockout Switch

Function Lockout Switch

This switch is used to disable the hydraulic functions which are operated by the control levers, the boom telescope foot pedal, and cab tilt switch. The switch is on the right overhead control console.

Refer to Figure 1–163. Press the switch once to disable hydraulic functions and to prevent inadvertent operation of these controls. To allow normal operation of the control levers, boom telescope foot pedal and cab tilt switch, press the switch again. All four green LED indicators will illuminate when hydraulic functions are disabled. This switch must always be in the “DISABLE” position before entering or exiting the operator's seat.



Movable Left Side Arm Rest

The left side arm rest is hinged at the rear to allow the operator to lift the arm rest up, out of the way while entering or exiting the upper operator's cab. Refer to Figure 1–164.

The left arm rest also has a locking feature in the disabled position. Pull the release lever on the left of the seat base to release the locking mechanism and allow the arm rest to return to the operating position. Refer to "Operator's Seat" in this section of this Operator's Manual.

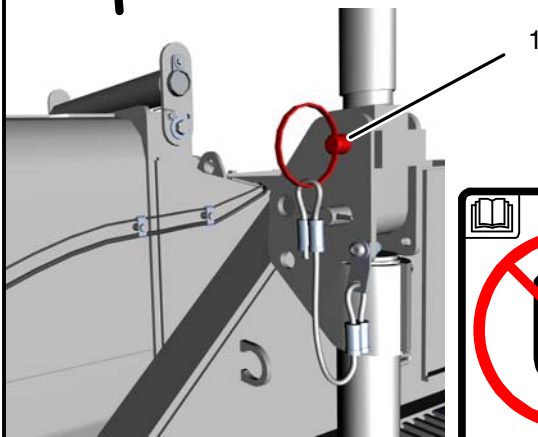
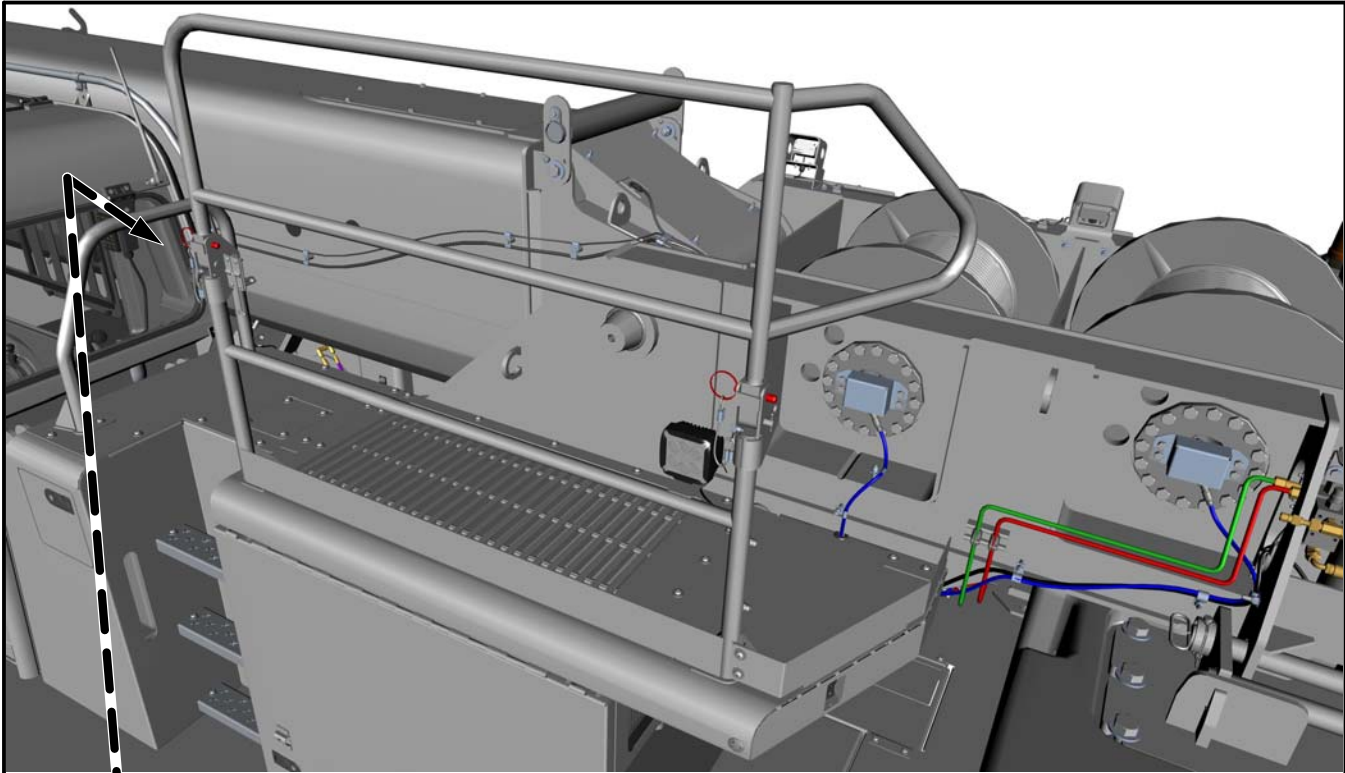


WARNING

To prevent personal injury do not attempt to enter operator's cab prior to raising the left arm rest .

Lifting the left side arm rest also performs the same duty as the function lockout switch, disabling all hydraulic functions related to the control levers and boom telescope foot pedal. Ensure the arm rest is lifted up, out of the way before attempting to enter or exit the upper operator's cab.

Operator's Manual



1. Quick Release Pin



WARNING

Do not enter while the crane is in operation. Failure to comply could result in serious injury or death.



Working Position

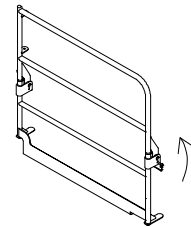
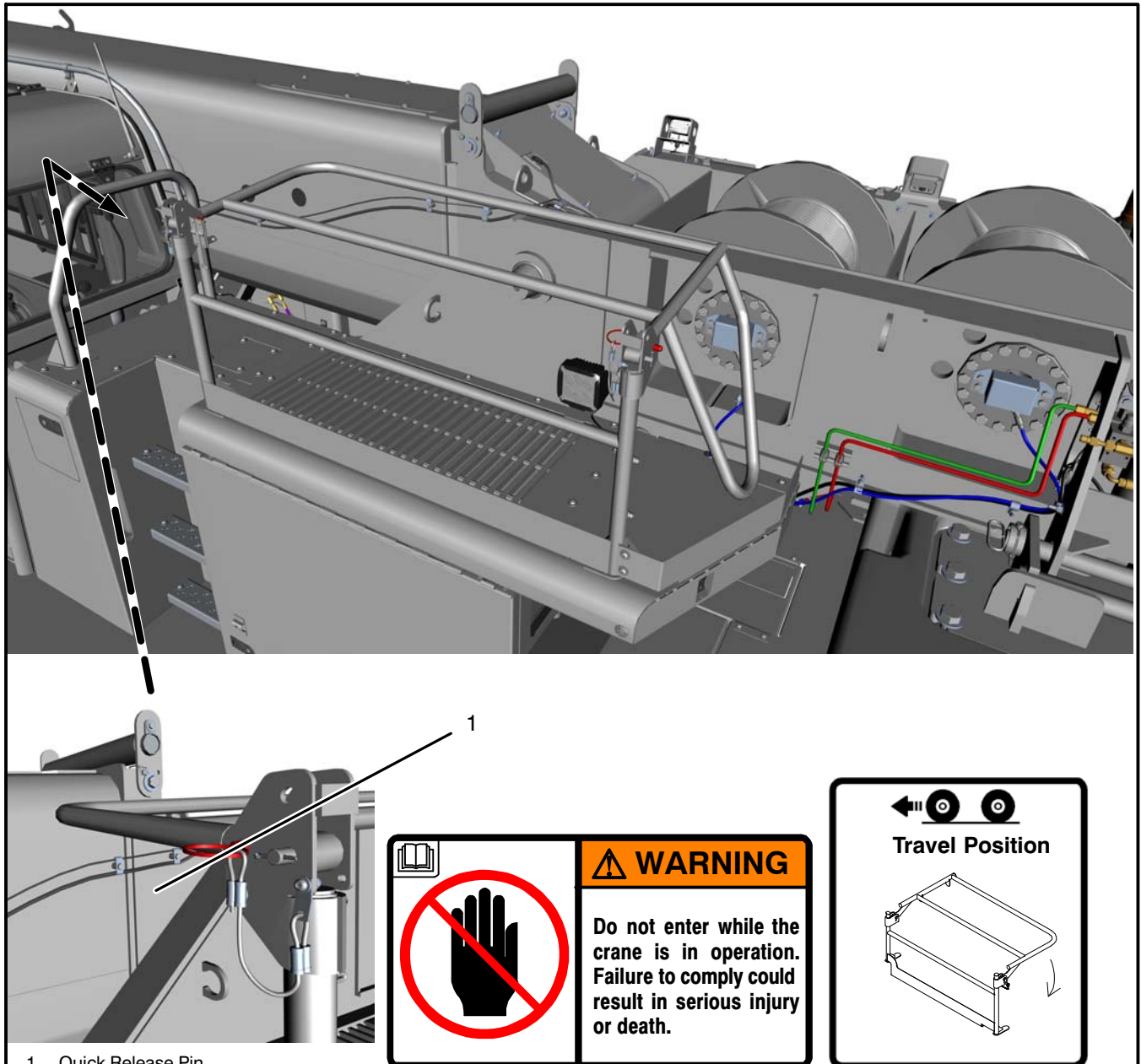


Figure 1–165
Upper Guard Rails – Working Position

Upper Guard Rails

The crane is equipped with guard rails on the upper to make access to upper components safer when servicing the crane.

The rails should remain in the working position at all times except during highway travel and crane transport. Refer to Figure 1–165. Position the rails in the storage/travel position before traveling the crane on highway and transporting the crane. Refer to Figure 1–166.



1. Quick Release Pin

Figure 1–166
Upper Guard Rails – Stored/Travel Position

Operator's Manual

Break-In Period

Operate a new crane at half throttle for the first twenty (20) hours of operation. A break-in period under moderate loads will assist in providing long, troublefree performance.

Before Starting Operations

Before starting daily operations, make the following checks and inspections:

Engine

Check fuel, oil, and cooling systems for proper fluid levels. Check for leaks. Repair or fill as required. Refer to engine manufacturer's manual for additional details.

Gear Cases

Visually inspect all gear cases for leaks or damage. If leaks or damage exist, repair and fill case to proper lubrication level.

Hydraulic System

Check all hoses for chafing, bulging, or other damage. Replace as necessary. Inspect hydraulic system for external leaks. Repair as needed. Check hydraulic reservoir oil level. Add oil if necessary.

Lubrication

Lubricate the crane as outlined in Section 2 of this Operator's Manual.

Note: Operators may have nothing to do with lubrication or maintenance of the crane, but it could be advantageous for them to be familiar with it. Knowledge of preventive maintenance makes the operator more aware of malfunctions in the crane so repairs can be made with a minimum of downtime.

Tires And Rims

Check tire inflation. Inflate to pressures per the Tire Inflation Label or the Tire Inflation Chart in the Crane Rating Manual. Check wheel lug nut torque, each day, for the first five (5) days of operation and every 100 hours of operation thereafter. Refer to Section 3 of this Operator's Manual for additional information on tires and rims.

Wire Rope And Sheaves

Inspect all wire rope and sheaves for damage or deterioration. Replace as necessary. Refer to Section 3 and Section 5 of this Operator's Manual for additional information on wire rope.

General Inspection

Visually inspect the entire crane for loose or missing cotter pins or bolts, or damaged fly chords or lattices. Check for oil or fluid leaks. Make repairs as needed.

Electrical System

Check the operation of all lights, windshield wipers, horns, turn signals, etc. Repair as needed.

Brakes

Start the engine and check park brake and service brake operations. Adjust or repair as needed.

Controls

Check all controls for proper operation and adjustment. Repair as needed.

Fire Extinguisher

A fire extinguisher is mounted in the operator's cab behind the rated capacity limiter display. Refer to Figure 1–54. It is an A B C type fire extinguisher, meaning it is capable of extinguishing most types of fires. The operator should be familiar with its location, the clamp mechanism used to secure it in place, and foremost the operation of the device. Specific instructions, regarding operation, are given on the label attached on the fire extinguisher. A charge indicator on the fire extinguisher monitors the pressure within the tank. Check the indicator daily to ensure the fire extinguisher is adequately charged and ready for use.

Carrier Suspension

Check that the oscillation suspension is properly adjusted and functioning normally. Refer to "Suspension Height Adjustment" in this Section of this Operator's Manual. During pick and carry operations and/or when traveling the crane, damage to the axles, cylinders, and other suspension components can occur if the oscillation suspension is not properly adjusted. Oscillation cylinders which are not properly adjusted can leave suspension components unprotected from shock loads which can lead to major crane damage.

Operator's Manual

Boom Distortion Due To Thermal Effects Of The Sun

The heat from the sun may have a thermal effect on the sides of telescopic booms causing the sides of the boom to expand (lengthen). The sides of the boom may not expand equally if the boom is extended for long periods of time with only one side of the boom exposed to the sun. The unequal expansion may cause boom distortion (the boom may “deflect” to one side). This is more noticeable with long boom lengths and/or long booms with long lattice flies attached to the boom.

For example, a 100 ft (30.5m) main boom, with a 50°F (10°C) temperature differential between the two sides of the boom, may cause the centerline of the main boom head to “deflect” as much as 3 ft (0.9m) off the centerline of the crane. Attaching a 50 ft (15.2m) lattice fly to the same boom may cause the centerline of the fly head to “deflect” as much as 10 ft (3.0m) off the centerline of the crane. This “deflection” to one side creates a “side load” on the boom and/or fly. Side load on a boom or fly, whether induced by the load or thermal effects, is dangerous and shall be avoided.

Prior to lifting any loads, inspect the boom or boom and fly combination to ensure they are straight. If the boom or boom and fly combination is not straight, ensure that all the boom wear pads are properly adjusted.

If the boom is distorted due to temperature differential on the sides of the boom, reposition the boom to allow the thermal effects from the sun to equalize the temperatures of the side walls of the boom to eliminate the distortion before lifting a load.

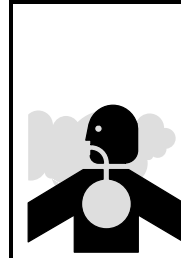
Engine Starting Procedure



WARNING

This Operator's Manual and the engine manufacturer's manual must be thoroughly read and understood by the operator before starting the engine. Serious personal injury and/or major crane damage could result from improper operating procedures.

Before attempting to start the engine, the operator should carefully read and understand the engine starting instructions in the engine manufacturer's manual and this Operator's Manual. Attempting to start or run the engine before studying these instructions may result in engine damage. The operator should learn and obey all applicable “Rules of the Road” and if not already a competent driver, obtain instructions to attain these necessary skills. With the crane fully serviced and the operator familiar with all gauges, switches, controls, and having read and fully understood this entire manual, start the engine using the following procedures:



WARNING

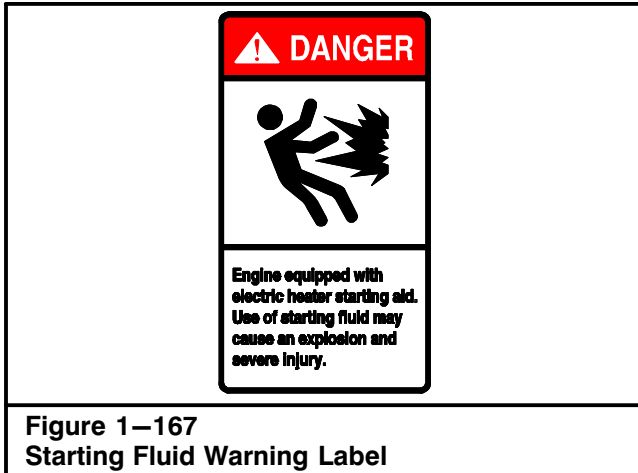
Diesel exhaust fumes can be harmful. Start and operate engine in a well ventilated area. If it is necessary to operate in an enclosed area, vent the exhaust to the outside. Properly maintain the exhaust system to its original design.

1. Walk around the crane to verify that there are no persons under, or in close proximity to the crane.
2. Check the cab to ensure that the transmission is in neutral and the park brake is engaged.
3. Sound the horn twice in succession, wait 10–15 seconds while making a visual check to verify that there are no persons under, or in close proximity to the crane.
4. In the cab, turn the ignition switch to the “On” position to energize the engine electrical system and allow the gauges to go through their self-test routine.
5. If required, allow the Wait To Start indicator light to go out.
6. Turn the ignition switch to the “Start” position. Release the ignition switch when the engine starts. If the engine fails to start in 30 seconds, release the ignition switch and allow the starter motor to cool a few minutes before trying to start the engine again. If the engine fails to start after four attempts, refer to the engine manufacturer's manual for instructions.
7. Warm Up — Run the engine at low throttle with no load while the engine is warming up. Observe the engine oil pressure gauge for proper indications. If there is no engine oil pressure after 10–15 seconds of running time, shutdown the engine immediately and repair the problem to avoid major upper engine damage. Refer to engine manufacturer's manual for proper oil pressure operating range.
8. When the engine has thoroughly warmed up, after all pressures and temperatures are within operating ranges, and all daily checks have been made, the crane is ready for operation.

Engine Shutdown Procedure

1. Lower any load to the ground and secure it properly.
2. Engage the swing park brake or travel swing lock as required.
3. Throttle the engine back to idle.
4. Allow the engine to idle 3 to 5 minutes to allow the engine to cool gradually and uniformly.
5. Turn the ignition switch to the “Off” position.
6. Remove the ignition keys from both the cab and lock the door if the crane is to be left unattended.

Operator's Manual



Cold And Arctic Weather Operation

Cold weather operation requires some special attention by the operator to allow for changes in everyday routines:

1. Clean the crane, especially the boom, of accumulated amounts of ice or snow. Operating the crane with an ice covered boom is dangerous. The added weight of the ice or snow can drastically reduce the capacity of the crane. Also, falling ice may pose danger for ground personnel.
2. Clean all snow and ice from steps, ladders, platforms, etc. to eliminate slippery walking surfaces.
3. Check and clean all ice build up in and around the crankcase breather tube.

4. If cold weather starting aids are provided on the crane, use them. The use of aerosol starting sprays are prohibited.
5. Pay close attention to the gauges in the operator's cab when starting the engine. Normal "warm up" times will be longer. Ensure pressures and temperatures are within normal ranges before beginning operations.
6. Always handle flammable materials according to the manufacturer's instructions. Propane, diesel, or other fuel for auxiliary heaters can be dangerous if not properly handled. Do not store such fuels on the crane.
7. Use caution when lifting any load during freezing weather, as it may be frozen to the ground or the supporting surface. The added tension, to break the load free, could cause an unexpected overload situation. Also, when the load does finally break loose it could create an erratic motion causing damage or injury.
8. At the end of the work shift, park the crane where it will not freeze to the ground. Major damage to the drive mechanism could occur while trying to free the crane from a frozen surface.

Note: LCD panels may take longer to respond when subjected to cold temperatures for an extended period of time. In addition, the visibility of the numbers on the LCD may decrease slightly or not be visible at all. The LCD display will return to normal when the temperature increases to a normal range.

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Absorbent Glass Mat Batteries

Machines equipped with the arctic climate option will be equipped with absorbent glass mat batteries, which replace the standard flooded type batteries. Absorbent glass mat (AGM) batteries will provide greater performance at lower temperatures and do not need to be watered as flooded batteries.

Battery Pad Heaters

In cold weather, the lower battery temperatures will charge the batteries to a reduced reserve capacity. In order to aid the batteries in charging, the crane will be equipped with four batteries wrapped with insulation, and include pad heaters that are powered by the alternator attached to the engine. The heaters will turn on only when the engine is running. The pad heaters are thermostatically controlled to prevent high temperatures and will maintain heat through the operation of the crane in cold weather. In warmer weather, the thermostat will disable the pad heaters. The pad heaters can be left in place during warmer weather, if desired, but the battery insulation blanket will need to be removed.

Battery Replacement

If the batteries need to be replaced, close attention must be paid to the pad heater and battery insulation installation. The heaters will need to be in close contact with the sides of the batteries and secured tightly in place with the battery tie downs to achieve maximum heat transfer. The new batteries will need to be wrapped with the insulation blanket. Failure to properly install will result in improper battery warm up.

Cold Engine Starting

To help ignition in cold ambient conditions, an air intake heater is used to warm the intake air prior to starting the engine. This improves combustion efficiency which aids in starting a cold engine. With the ignition switch in the on position, the ECM senses ambient air temperature then determines if the air intake must be energized to warm the intake air. A "Wait To Start" indicator light  in the engine gauge display will illuminate to alert the operator not to crank the engine because the combustion chamber is too cold for fuel ignition. When the cylinders are warm enough to ignite the first charges of fuel, the indicator light will go out and the engine can be started.



DANGER

Do not use starting fluids to aid in engine start up. This engine is equipped with a air intake grid heater type cold starting aid and use of a starting fluid can cause an explosion resulting in serious personal injury or death.

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Warm Up Procedure in Cold & Arctic Weather

If equipped with the Arctic Weather System, run the carrier arctic heater according to the ambient temperature table below until hydraulic oil has warmed up to operating temperature (0°F). It may be necessary to change the default run time of the timer. Refer to Arctic Weather System for instructions on running the heater and setting the default run time of the timer.

Ambient Temperature		Heating Duration
°F	°C	Minutes
-10	-23.3	50
-20	-28.8	70
-30	-34.4	90
-40	-40.0	110

It is important that the engine take in warm air from underneath the engine hood in cold ambient conditions below 32°F. The intake panel on the right side of the radiator must be in the open position in order for the air cleaner to access the warm air. Refer to Arctic Weather System in this Operator's Manual.

Install Winterfront to grill when operating at temperatures below 32°F.

Turn the key to the "On" position and wait until the "Wait to Start" indicator has extinguished before starting the engine. Run engine at 1200 rpm for 5-7 minutes to allow the hydraulic fluid, transmission, and DEF tank to continue to warm. Increase engine RPM to 1500 RPM and run with no load for an additional 10-15 minutes.

Allow the engine to run at 1,200 rpm and the winch control lever(s) in neutral, for several minutes. This will help prevent cold oil from damaging the main pump. Increase engine RPM to 1500 RPM and begin cycling all hydraulic functions until warm hydraulic fluid has circulated through all hydraulic components. This includes steering, outrigger beams, outrigger jacks, cab tilt, swing, swing brake, counterweight cylinders, telescope cylinder, boom hoist, and service brakes. For the winches, operate the winches at low speed, with no load, lifting and lowering only the hook block or hook ball until warm oil circulates throughout the winch.

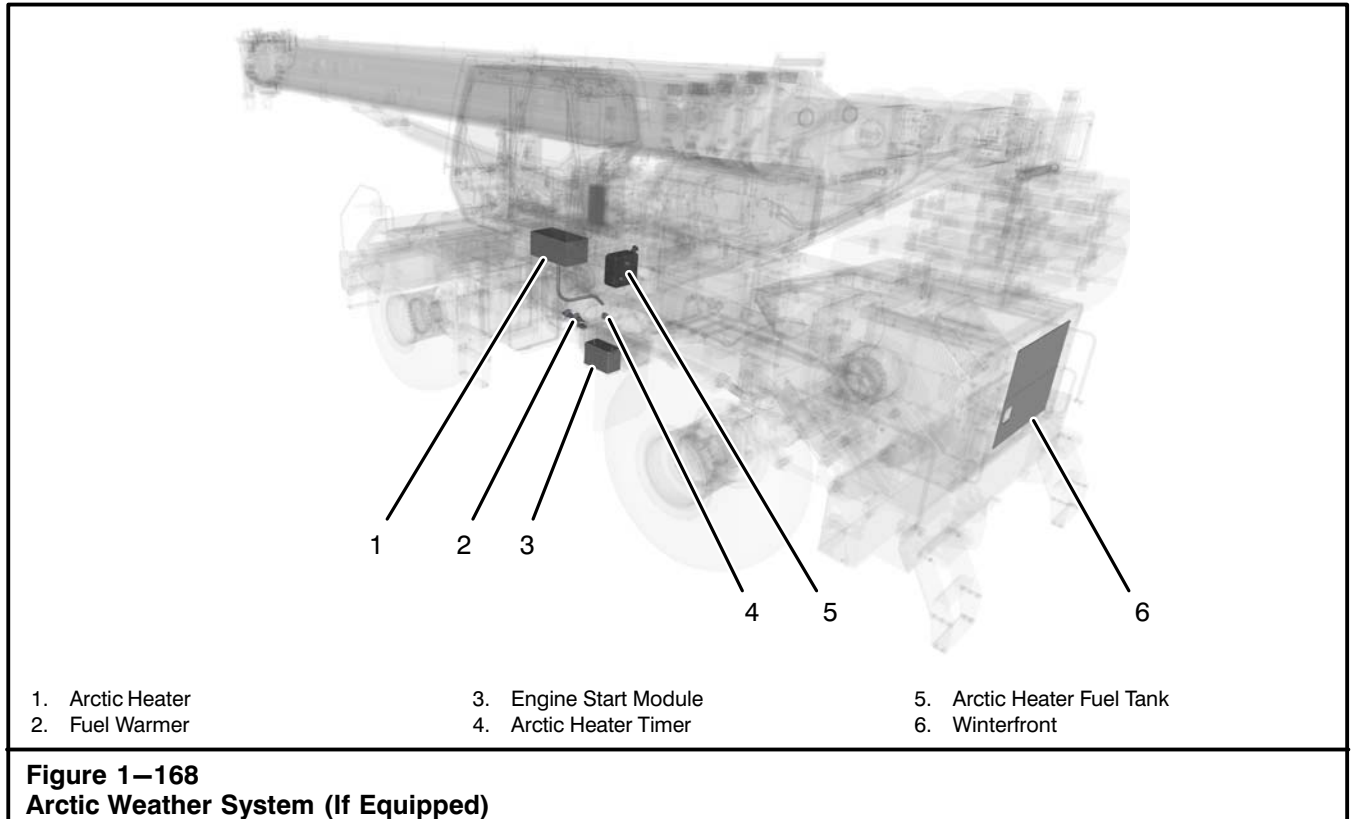
Note: At temperatures below -20°F it is critical to operate the machine low idle set at 1200RPM to keep the engine running at operating temperature.



WARNING

Cold weather operation of the winch requires a warm-up procedure. Failure to properly warm-up the winch may result in brake slippage. Warm-up the winch before beginning crane operations.

Note: It may be necessary to stall out the convertor to bring the transmission oil to operating temperature. To stall out the convertor, shift the transmission to "3", hold the brakes and accelerate engine to full throttle. Continue in this position until proper operating range is reached.



Arctic Weather System (If Equipped)

Arctic Heater



WARNING

This crane is equipped with a fuel operated heater that starts automatically when the timer is set. Ensure the timer is in manual mode and the heater is turned off when the crane is in enclosed spaces and during refueling. Failure to do so may lead to serious personal injury and/or major crane damage.



WARNING

Avoid the Risk of Explosion:

Switch heater off at filling stations and areas where explosive material, fumes, and dust may collect.

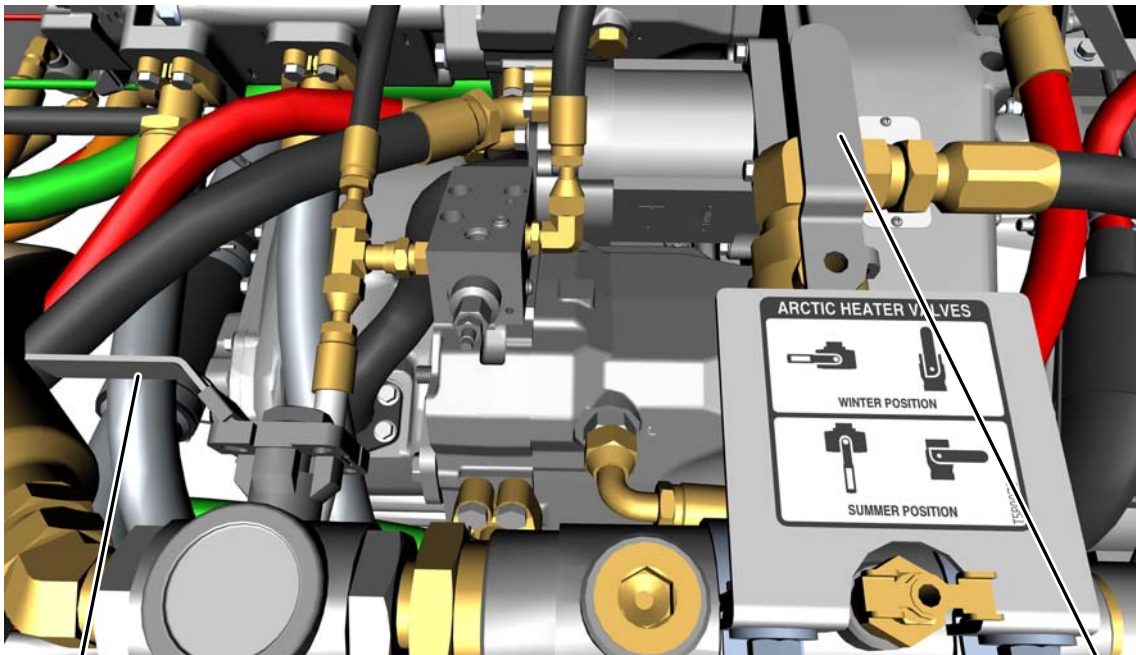
Avoid the Risk of Asphyxiation:

Do not operate heater in closed spaces such as garages and shops without adequate ventilation or exhaust extraction.

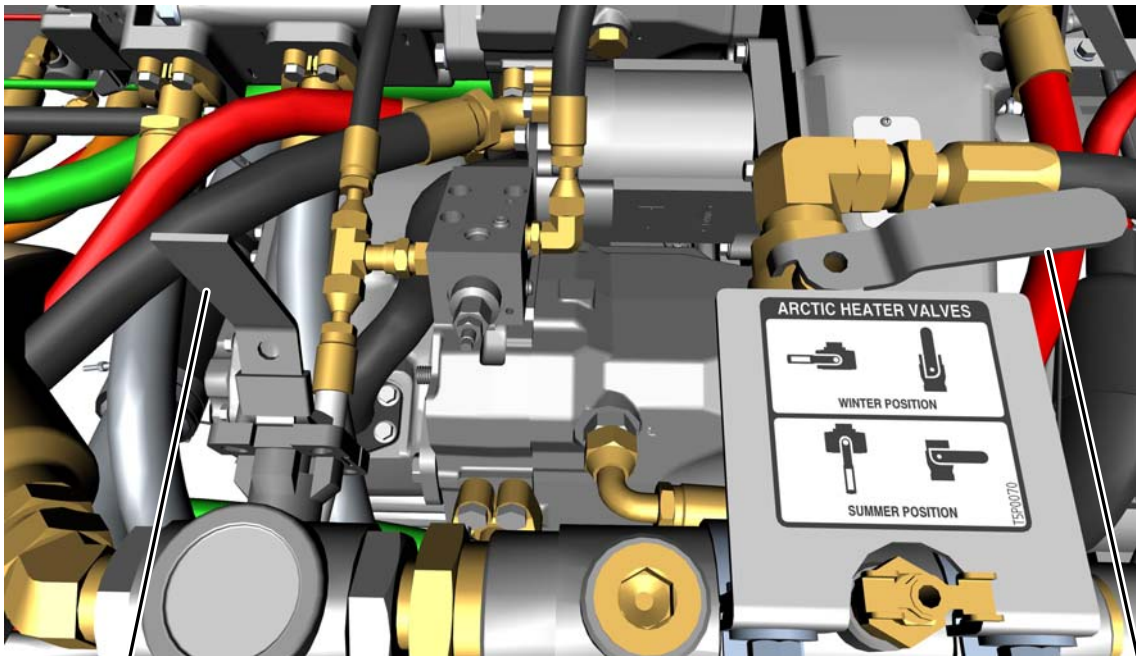
This crane may be equipped with an arctic heater. Refer to the following instructions to operate the arctic heater.

This heater uses coolant circulating through the unit to provide heat and is controlled using a timer. The coolant from the radiator is heated by a kerosene fired heater. An electric pump circulates coolant through heat exchangers to various parts of the crane such as the hydraulic reservoir, fuel supply line, and engine block. The kerosene fuel tank, for the system, is mounted on the right side of the carrier beside the hydraulic reservoir. Refer to Figure 1–168. Only use kerosene fuel. The coolant heater fuel system is equipped with an inline fuel filter and a fuel spray nozzle. They should be changed annually. Refer to Section 2 of this Operator's Manual.

Operator's Manual



Warm Ambient Temperature



Low Ambient Temperature

1. 3 Way Ball Valve

2. On/Off Ball Valve

Figure 1–169
Coolant Supply Ball Valves

Coolant Supply Ball Valves

There are two manual ball valves directing the flow of coolant. Refer to Figure 1–169. A manual 3–way ball valve and an on/off ball valve controlling the main coolant supply to the heater are located behind the engine. It is critical the ball valves are configured as followed:

Low Ambient Temperature (Below -20°F),
Heater On or Off

1. On/Off ball valve open
2. 3–way Valve directing flow to the heater

It may be necessary to run the heater with the engine running if the engine struggles to reach operating temperature. In this case the heater **MUST** be shut off once the coolant temperature reaches 180°F . At this temperature the thermostat begins to open which restricts coolant supplied to the heater pumps.

It is possible to start the engine at -20°F without circulating heated coolant, though leaving the valves configured in “Low Ambient Temperature” while the engine is running will allow coolant heated by the engine to circulate to the hydraulic reservoir, and fuel while the engine is operating. The valves should be turned to the “Warm Ambient Temperature” when above 32°F to ensure the engine does not overheat.



WARNING

The heater must never be turned on while in the summer configuration. Damage to the heater could occur.

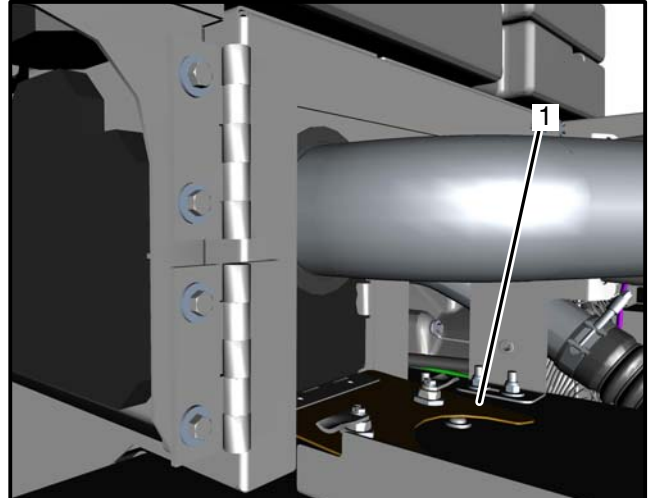


WARNING

The ball valves must never be left in “Low Ambient Temperature” configuration in warm weather. Overheating of the engine could occur.

Warm Ambient Temperature (Above 32°F),
Heater On or Off

1. On/Off ball valve closed
2. 3–way Valve directing flow to the engine.



1. Baffle Door

Figure 1–170
Warm Air Intake Baffle Door

Leaving the ball valve directing flow to the engine, while the heater is on, will starve the coolant pumps and cause an overheating situation that will overheat the fuse within the heater. It is recommended that the operator check the position of the manual ball valve before operation of the heater. Adversely, leaving the ball valves directing flow to the heater in warmer ambient temperatures could create an engine overheat situation.

Warm Air Intake

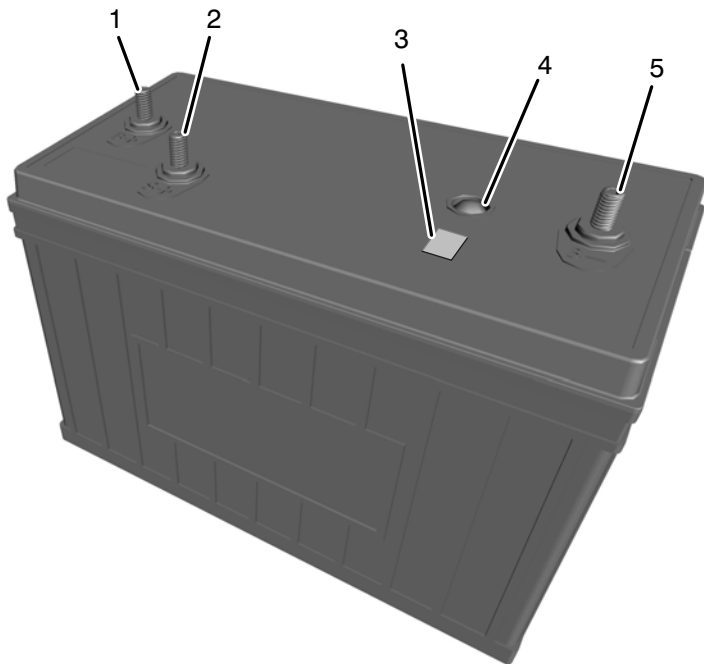
The crane is equipped with a baffle door that allows warm air from underneath the engine hood to circulate through the air intake. This baffle door should be in the open position in ambient temperatures below 32°F . Refer to Figure 1–170.



WARNING

The heater must never be turned on while the coolant temperature is above 180°F . Damage to the heater could occur.

Operator's Manual



1. Battery (+) Terminal +24V

2. Starter (+) Terminal

3. Push-To-Test Button (Activates Status LEDs)
4. Status LEDs

5. Battery (–) Terminal Ground Connection

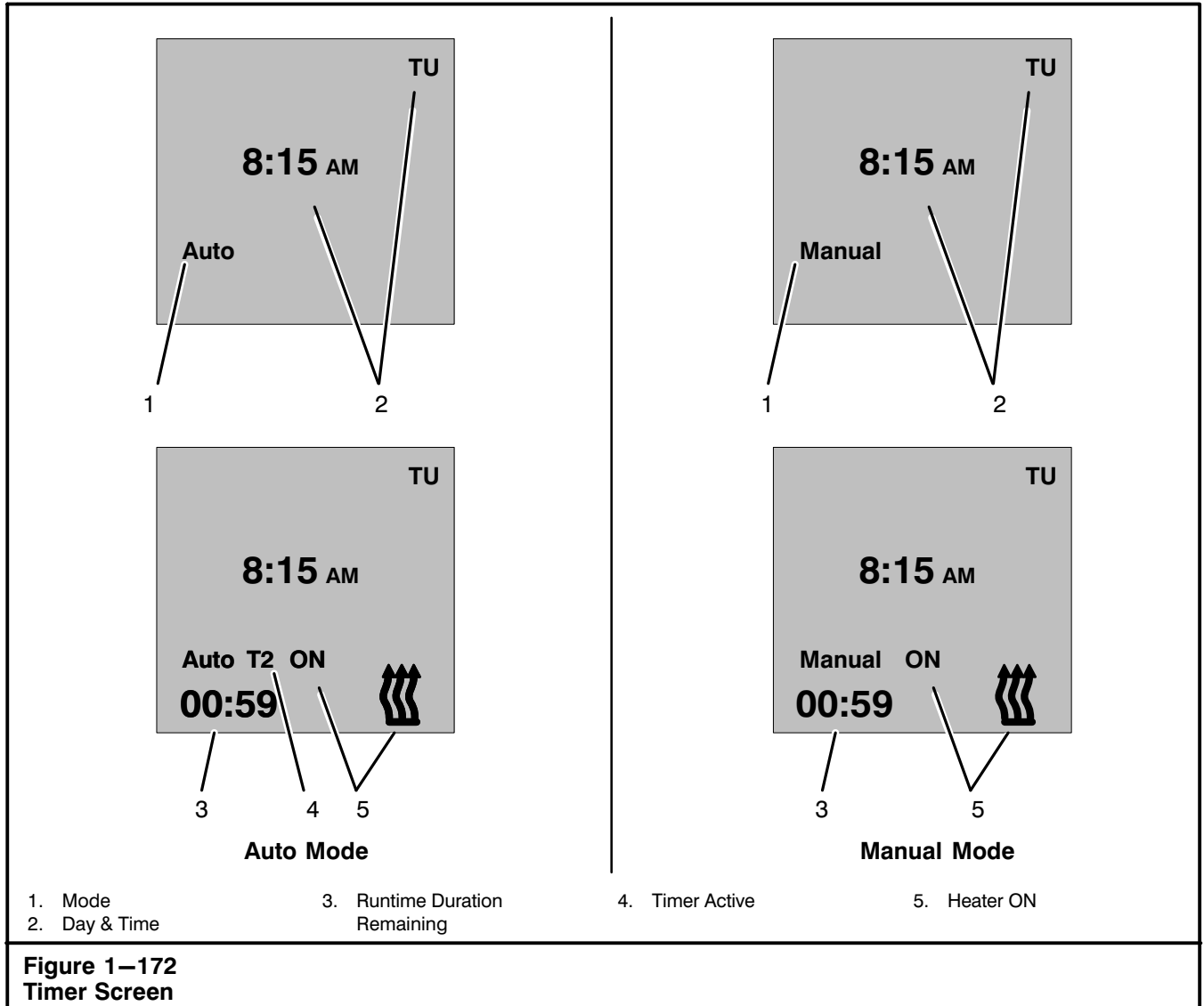
Figure 1–171
Engine Start Module (ESM)

Engine Start Module (ESM)

This crane may be equipped with an Engine Start Module which replaces the function of the batteries to send power to the starter. This is an ultracapacitor module that has superior performance at low temperatures and allows a large surge of current to the starter for a short period of time. The ESM can maintain 10–15 seconds of cranking before losing power when fully charged. If multiple attempts are needed to start the engine allow 15 minutes between each crank for the main batteries to recharge the ESM. Press the test button to determine if the ESM is ready to crank. Just like other automotive batteries, the ESM terminals should be periodically checked for oxidation or lose connections and cleaned and tightened as necessary.

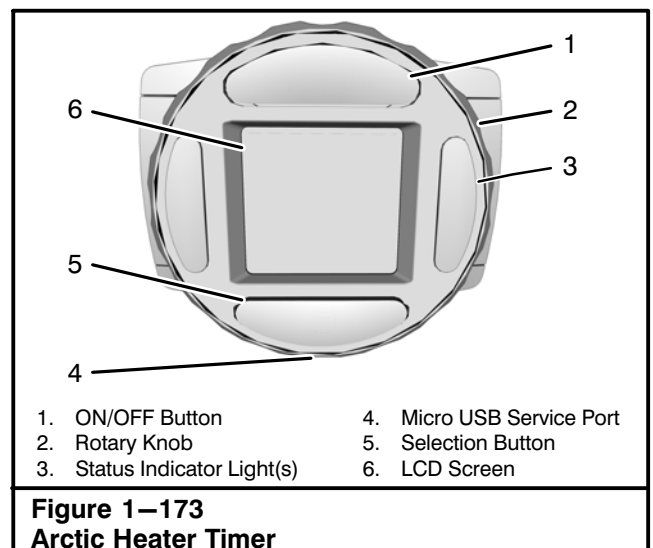
The unit is equipped with a test button to support troubleshooting and display the charge status. Status light sequences are listed in the table below.

Status Lights		
Green LED	Red LED	Meaning
 Lit Solid	 Not Lit	Ready to crank
 Flashing	 Not Lit	Charging: WAIT 15 minutes
 Not Lit	 Flashing	Stuck Pushbutton
 Not Lit	 Lit Solid	Internal error – push test pushbutton for 10 seconds
 Flashing	 Lit Solid	Refer to manual



Arctic Heater Timer

This arctic heater is controlled using a timer. Refer to Figure 1–172 and Figure 1–173. The timer is located in a box near the batteries at the left rear of the crane. Refer to Figure 1–168. The timer has two modes (automatic and manual) and is defaulted to manual mode. The timer allows the operator to preheat the various parts of the crane at a set time to reduce idling and fuel consumption. Refer to “Timer Definitions” found later in this section of the Operator’s Manual for more information on the timer.



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Use the chart below to set the heater duration at various temperatures. This will allow the engine block and oil in the hydraulic reservoir to heat sufficiently for an engine start.

Ambient Temperature		Heating Duration
°F	°C	Minutes
–10	–23.3	50
–20	–28.8	70
–30	–34.4	90
–40	–40.0	110

Note: The timer LCD display will not function below –22°F. To run the manual mode while the timer display is not functioning, press the ON/OFF button once to activate the timer, then press the ON/OFF button a second time to start the heater. A green light attached to the timer enclosure will illuminate when the heater should be running and the light is not illuminated, refer to the manufacturer service manual for troubleshooting the heater.

If the batteries have been disconnected from the machine, the time, low-voltage threshold, and duration must be reset.

1. To set the time and date on the timer
 - a. Press the ON/OFF Button to enter the time and date.
 - b. Use the Rotary Knob to scroll through each value and use the Selection Button to advance to the next setting.

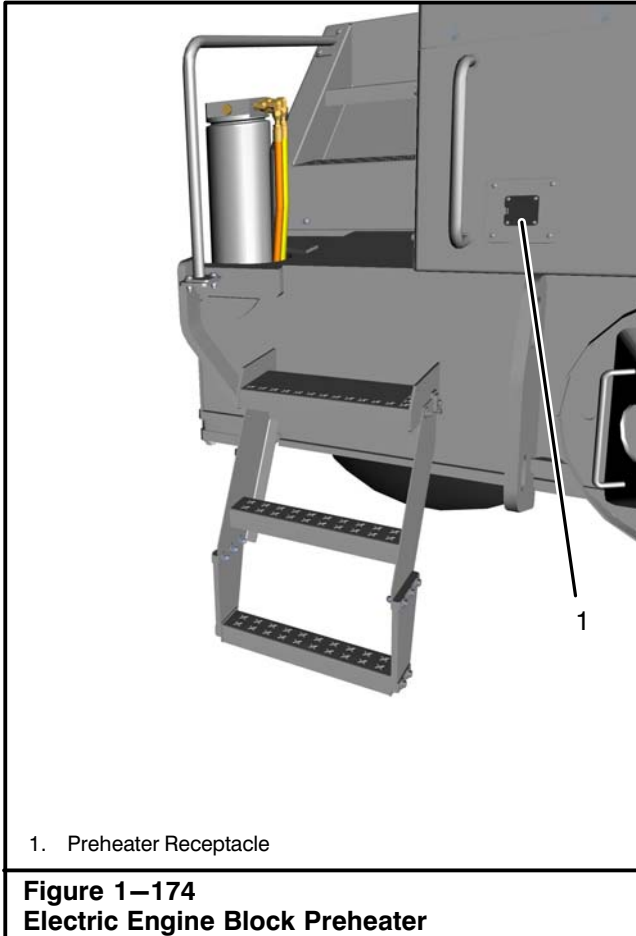
2. Set the lower voltage threshold
 - a. Press the Selection Button to enter into the menu.
 - b. Use the Rotary Knob to scroll to “Options”, then “LVD”.
 - c. Change the voltage from 24.2V to 22.0V then press the Selection Button to save and return to the “Options” menu.
 - d. Scroll to the “Back” selection and select until you have returned to the main screen.
3. To set the duration
 - a. Press the Selection Button to enter into the menu.
 - b. Use the Rotary Dial to scroll up to “Duration” and select.
 - c. Use the Rotary Dial to change the duration from 120 min to 60 min, then press the Selection Button to save the duration and return to the menu.
 - d. Scroll to the “Back” selection and select until you have returned to the main screen.

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Timer Definitions

	Definitions	Default
Mode	Two modes are possible: Auto mode enables the pre-defined timer programs. Standard ON/OFF functionality is still possible while in this mode. Manual mode allows the heater to be operated via the ON button on the timer. While in Manual Mode, all Auto Mode functionality is indefinitely disabled.	Manual
Language	Language changes between English, Spanish, and French.	English
Duration	Duration allows user to select heater runtime of the heater. Set range is between 10–120 minutes selectable by 10 minute increments. While using Manual Mode, the “Duration” setting will be used for the runtime of the heater when the ON button is pressed. Note: Setting the Duration run-time (in the Duration section) before setting a timer program will default all new programs to the user defined duration time.	60 minutes
Error Codes	This section will log the last 5 error codes and the date that it was set. Highlight and select an error code for a full description. If the heater produces an error code, the status indicator lights will flash red and the error will display on the main screen. Error codes cannot be reset through the timer. Contact a Link-Belt Distributor for resetting an error code. Note: Error code functionality does not apply to most coolant heaters. Codes on products with no blink code functionality can still be obtained using the PC Diagnostics test tool. Contact a Link-Belt Distributor for detailed PC diagnostics information.	No Errors
Time & Date	Time & Date allows user to properly set the current date and time. User also has the ability to switch between AM/PM and 24 hour format. If the 24 hour format is selected the date format will change to dd/mm/yyyy.	AM/PM mm/dd/yyyy
Timer	There are 4 heater start-up cycles possible 7 days per week. Select the day or the specific timer (T1 – T4) using the rotary knob and the selection button. Once the day, time, and duration have been entered, press the selection button to set. A check mark will confirm the timer has been saved. To turn the timer OFF, select the timer check mark and dial the duration down to the OFF position and click the selection button.	Calendar Fields Empty
Skip	The Skip feature looks similar to timer programming; however when a specific timer program is selected, it will update the check mark to an “s” for skipped. When a program has been skipped, it will disable that specific timer program for one cycle (7 day period). Preset timer programming will reactivate after this one-time skip cycle.	Calendar Fields Empty
LVD	LVD “Low Voltage Disconnect” allows the user to adjust the battery voltage level at which the timer will shut down heater functionality. If battery voltage is equal to or less than the threshold selected +0.1v, the heater will not start. i.e. if an 11.5v threshold is selected the heater cannot be started until B+ has reached 11.7v. 12 volt – Range between 11v – 12.5v 24 volt – Range between 21v – 25.5v	11.4V 24.2V
Default	Default allows the user to perform a factory reset of the control settings and saved timer program data.	N/A
Hour Meter	The hour meter logs the operating hours of an active ON signal to the heater. This does not reflect the true runtime of the heater itself. Note: For warranty purposes a diagnostic printout is still required where applicable. This hour meter is for reference only.	N/A
SW Version	This displays the firmware version of the timer.	Installed Version
Back	Select this to return to the previous screen.	N/A

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Electric Engine Block Preheater

The electric engine block preheater uses electrical power to heat the coolant and circulate it through the engine. The electric engine block preheater receptacle is on the rear of the carrier. Refer to Figure 1–174.

To Start The Electric Engine Block Preheater

1. Park the crane in suitable area for storage, engage the park brake, position the transmission shifter to neutral, and shutdown the engine.



WARNING

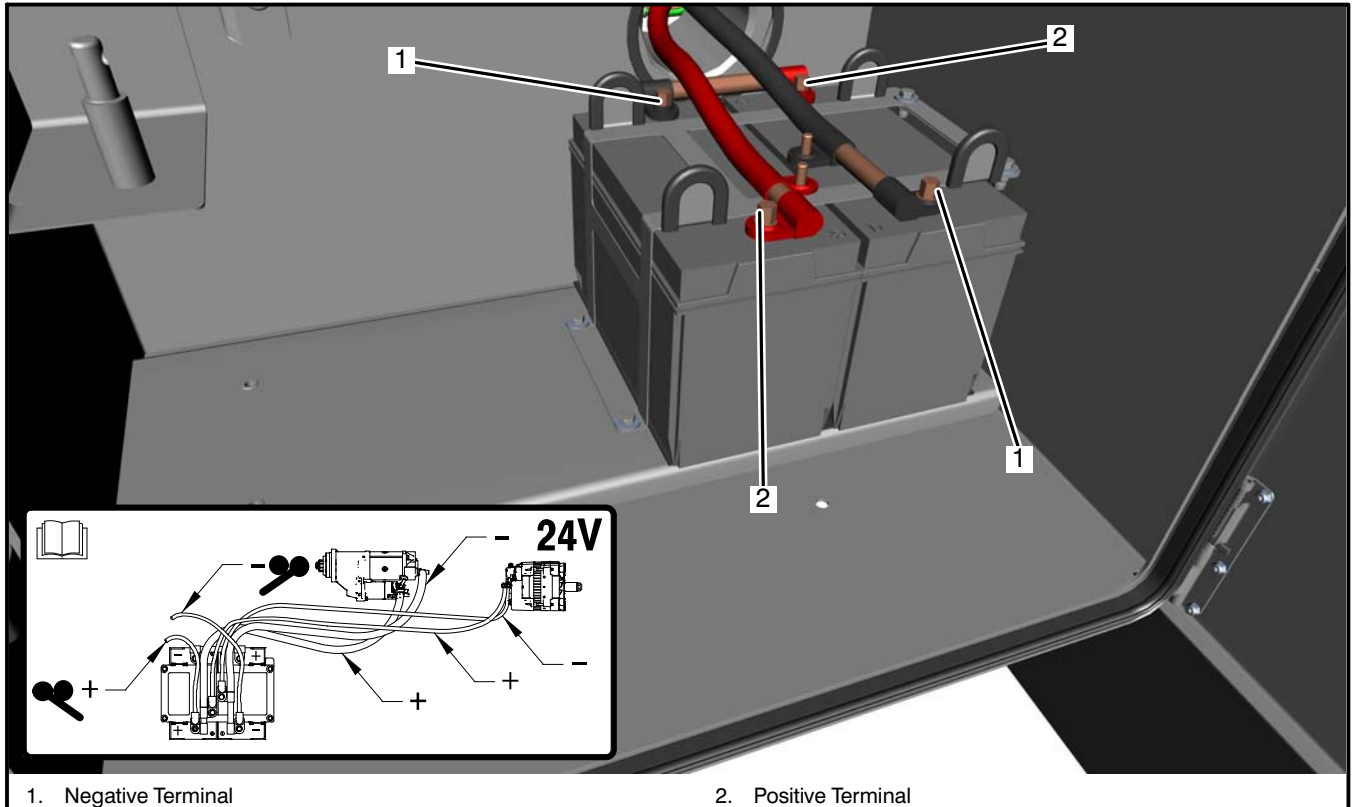
Areas adjacent to the preheater must be clean and free of oil and debris to avoid possible fire hazard.

2. Plug an approved extension chord into the receptacle on the rear of the carrier. Plug the other end into an approved electrical source.

Note: Unplug the engine block preheater before starting the engine.

To Stop Electric Engine Block Preheater

1. Unplug preheater cord from electrical source and the receptacle on the rear of the carrier.
2. Properly store the extension cord.



1. Negative Terminal

2. Positive Terminal

Figure 1–175
Standard Battery Cable Connections

Jump Starting The Crane

The crane electrical system is 24V, which consists of two 12V batteries wired in a series. These batteries are mounted in the battery box at the left side of the crane.

If the crane is equipped with a cold weather system, two additional standard batteries will be installed within the compartment at the rear of the crane. If the crane is equipped with an arctic weather system, the crane will be equipped with four AGM batteries with an insulation wrap, pad heaters, and an engine starting module mounted in the battery box at the rear of the crane.



WARNING

To avoid serious personal injury and/or major equipment damage, follow these procedures in the order they are given.

Wear protective clothing and shield your face and eyes when working around batteries. Batteries contain sulfuric acid which burns skin, eyes, and clothing.

Do not jump start a damaged battery. Ensure vent caps are tight and level. If another vehicle is used, ensure booster vehicle and crane are not touching.

The gases around the battery can explode if exposed to open flames or sparks. An explosion could result in serious personal injury and/or major equipment damage.

Battery posts, terminals, and related accessories contain lead and lead compounds. Wash hands after handling.

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Standard Batteries Without Start Module

1. Check all battery terminals and remove any corrosion before attaching jumper cables.
2. Connect one end of the first jumper cable to the positive (+) terminal, on the front left side of the discharged battery pair.
3. Connect the other end of the first cable to the 24V positive (+) terminal of the 24V power source or booster battery pair.
4. Connect one end of the second jumper cable to the negative (–) terminal of the power source or booster battery pair.
5. Connect the other end of the second jumper cable to a ground location on the carrier frame as far away from crane batteries as possible.



WARNING

Do not connect any of the jumper cables to the small center cable connecting the two 12V batteries. Serious injury and/or damage to the batteries and machine could occur.

6. If another vehicle is used to jump start the crane, start the booster vehicle. Ensure booster vehicle and crane are not touching. Run the booster vehicle's engine at a moderate speed.
7. Start the disabled crane. After the crane is started, remove jumper cables in reverse order.
8. Let the crane's engine run for a few minutes to charge the discharged batteries.
9. Check the battery indicator light on the Pulse Crane Control System Display.

Note: If the batteries are at very low charge, voltage may increase slowly. If voltage does not increase, replace the batteries and/or check the electrical system.

AGM Batteries With Start Module

The ESM should never be jump started across the "S+" terminal. If jump start is needed, the red starter cable will need to be moved from the "S+" terminal on the ESM to the battery "+" terminal.

1. Check all battery terminals and remove any corrosion before attaching jumper cables.



WARNING

Do not connect the terminals in reverse. Sparks and arcing will occur on a charged ESM creating a shock and/or burn hazard and damage to the ESM.



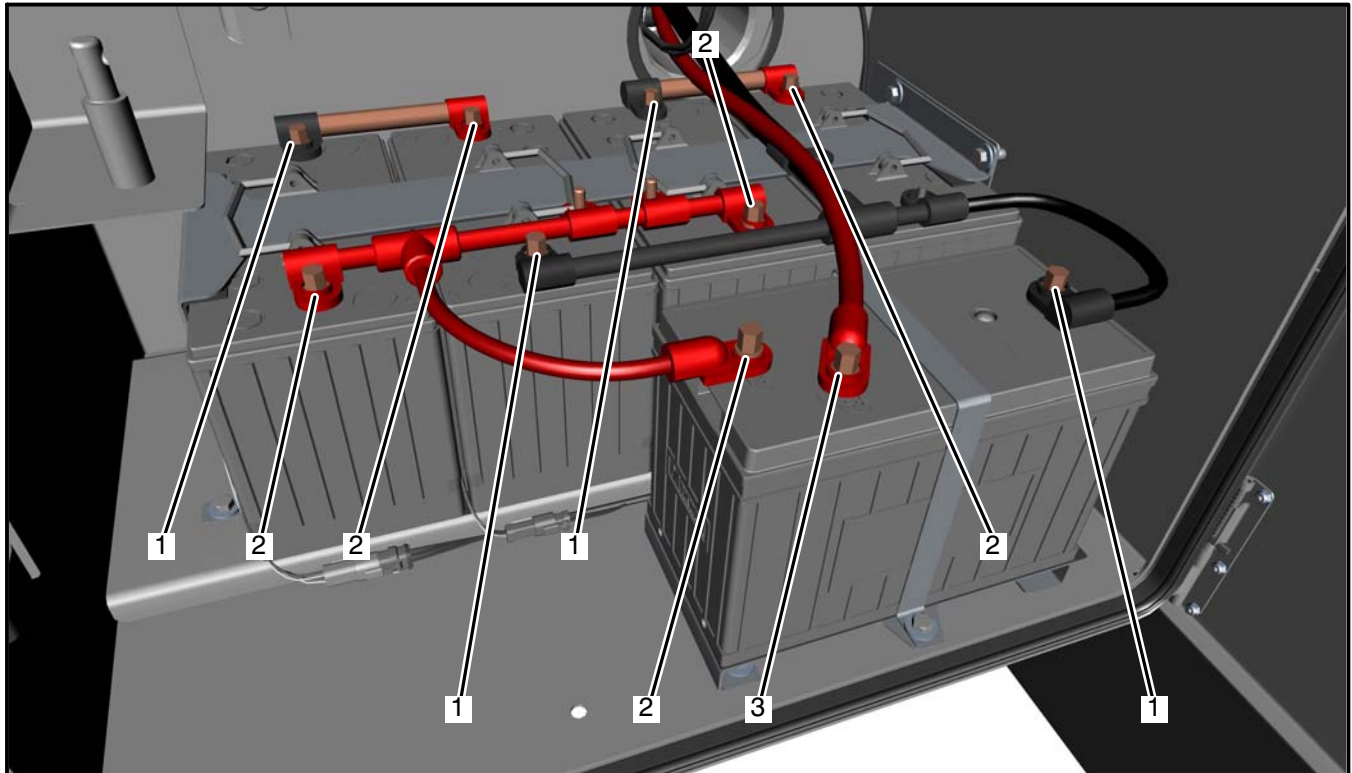
WARNING

Power terminals pose an extreme arcing hazard when the ESM is charged. Always discharge the ESM before handling.



WARNING

The ESM is not a battery. Do not jump the ESM. Do not connect the jump start cables from the booster battery to the "S+" terminal on the ESM and/or the "B–" terminal on the discharged battery. Shorting of the battery, arcing and/or damage to the battery could occur.



1. Negative Terminal

2. Positive Terminal

3. Starter "S+" Cable

Figure 1–176
Rear AGM Battery Cable Connections (For ESM)

2. Move red starter cable from the "S+" terminal on the ESM to the 12V positive (+) terminal of the discharged battery.
3. Connect one end of the first jumper cable to the 12V positive (+) terminal of the discharged battery.
4. Connect the other end of the first cable to the 12V positive (+) terminal of the 12V power source or booster battery.
5. Connect one end of the second jumper cable to the negative (–) terminal of the 12V power source or booster battery.
6. Connect the other end of the second cable to a ground location on the carrier frame as far away from crane batteries as possible.
7. If another vehicle is used to jump start the crane, start the booster vehicle. Ensure booster vehicle and crane are not touching. Run the booster vehicle's engine at a moderate speed.
8. Start the disabled crane. After the crane is started, remove jumper cables in reverse order.
9. Let the crane's engine run for a few minutes to charge the discharged batteries.
10. Check the battery gauge in the operator's cab. The gauge reading should be increasing toward 14 volts.
11. Turn off the machine and ensure engine is able to start with the charged batteries.
12. Shut down the crane and reconnect the red starter cable from the battery to the "S+" terminal of the ESM.

Note: If the batteries are at very low charge, voltage may increase slowly. If voltage does not increase, replace the batteries and/or check the electrical system.

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Crane Operation

Cranes are used primarily for making heavy lifts. In order to do this properly, certain procedures must be followed. The following is a suggested procedure for making typical lifts:

Note: Before operating the crane near airports, radio and microwave towers, power lines, etc., always refer to and comply with all local, state, and federal laws.

1. Determine the weight to be lifted. Add the weight of the hook block and/or hook ball, slings, rigging, fly, etc. Determine height to which the load must be lifted.
2. Refer to the capacity chart, Working Areas and Working Range charts in the Crane Rating Manual in the operator's cab. Find the shortest boom length and load radius that will accomplish the job.
3. Position the crane so a minimum swing is necessary. Do not swing the upper over areas not covered on the capacity chart in the Crane Rating Manual, as the crane could tip, even without a load on the hook in these areas.
4. The crane must be supported by a firm, solid level surface before starting to lift. All capacities in the Crane Rating Manual are based on the crane being level in all directions. If the crane is not level, out swing or side swing of the load will greatly reduce lifting capacities and could cause crane damage or an accident. If the ground is soft, use mats.
5. If outriggers are used, the following points must be observed:
 - a. When making lifts on outriggers, all tires must be free of supporting surface. All outrigger beams must be extended to the same fully retracted, intermediate extended, or fully extended length, or in accordance with V-CALC (Variable Confined Area Lifting Capacities) operation. When in V-CALC operation, each outrigger beam can be positioned anywhere in its length of travel. Unless fully extended, the allowed capacity will reflect intermediate or retracted chart values based on the actual extended length.
 - b. Outrigger pontoons must be on solid, smooth footing, flush with the ground (no hills, or valleys under pontoons), otherwise pontoons may be damaged or destroyed. If there is any doubt, use mats.
 - c. All capacities listed for the crane on outriggers are based on the outrigger jacks being used to raise the crane so that all tires are clear of the ground and the crane is level. A bubble level is provided to assist the operator in leveling the crane.
6. When making lifts on tires, the following points must be observed:
 - a. All tires must be inflated to pressures as listed on the Tire Inflation Label or the Tire Inflation Chart in the Crane Rating Manual.
 - b. On tire lifts are to be made from the main boom only. Do not use the auxiliary lifting sheave or fly.
 - c. Lifts while on tires must be from firm level surface. Use mats and/or grade the supporting surface as required to ensure safe lift.
7. Raise the boom and swing over the load. Extend the boom to the desired length.
8. Lower the hook block and/or hook ball and fasten it onto the load. The following points must be observed:
 - a. The boom peak must be directly above the load. Booms are made to lift, and must never be used to drag a load sideways.
 - b. Always use chains, wire ropes, or slings of ample size and make periodic checks of their condition.
 - c. Always use sufficient parts of line. Refer to Wire Rope Capacity chart in the Crane Rating Manual in the operator's cab for the number of parts of line needed for a given lift.
 - d. When lifting loads, care should be taken to prevent sudden loading or unloading of the winch wire rope. Ease into the load. Lift the load a few inches (*centimeters*) off the ground and hold to check the winch brakes.
9. Lift the load to the desired height. Boom to the desired angle. Be careful when booming down or extending the boom, as these increase the load radius and result in a decrease in capacity. Ensure the load being lifted remains within the lifting capacity of the crane at the boom length and radius being used.
10. Control the load at all times. Use hand lines to guide the load. Do not guide loads into place with your hands. Swing slowly and smoothly. Avoid jerks when starting or stopping swings.
11. If the crane is to travel with a suspended load, refer to "Pick And Carry Operation" in this Section of this Operator's Manual for further instructions.

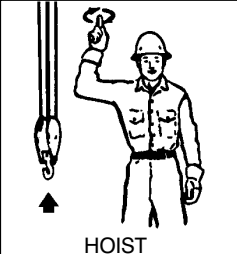
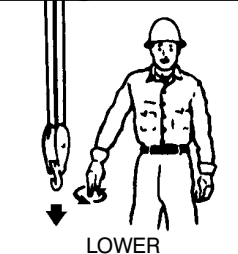
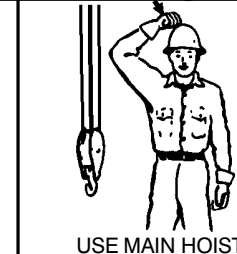
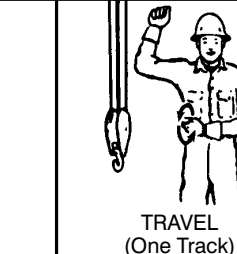
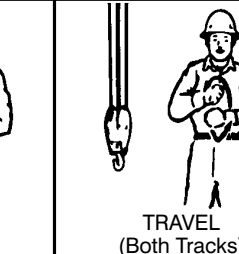
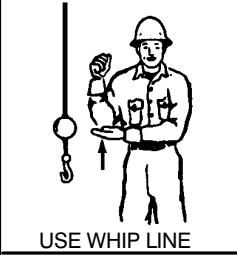
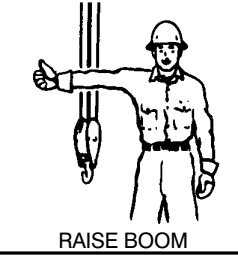
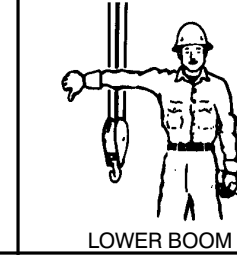
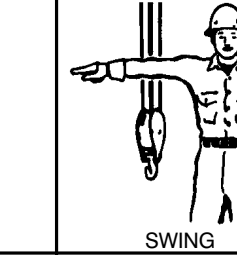
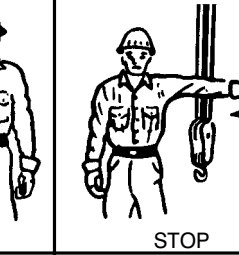
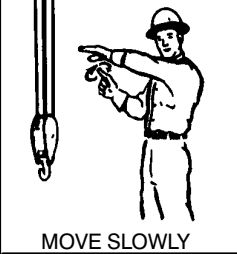
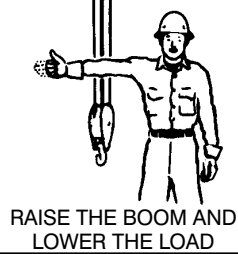
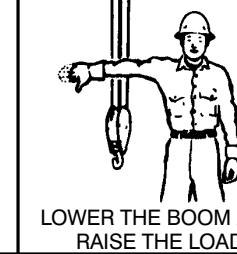
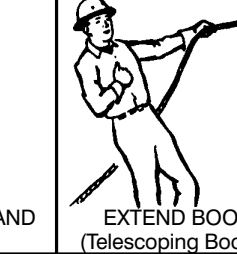
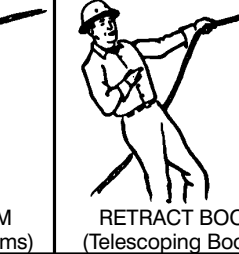
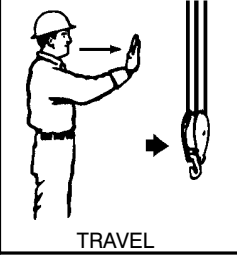
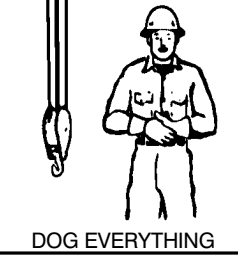
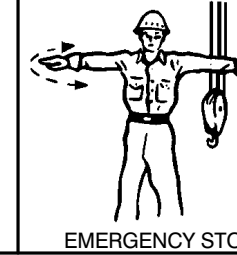
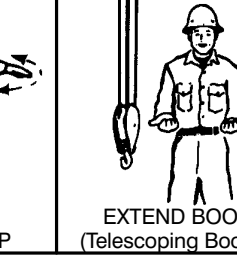
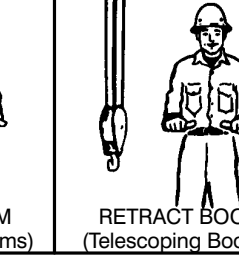
During Operation

The operator must remain alert to possible malfunctioning of the crane while operating. If the crane does malfunction, lower the load and shutdown the crane until the problem is found and corrected. During operation, the operator must:

1. Remain alert to any noise, loss of power, or bad response to control of the crane. Watch the engine oil pressure and coolant temperature gauges for proper operating ranges.

Operator's Manual

Standard Hand Signals For Controlling Crane Operations

 HOIST	 LOWER	 USE MAIN HOIST	 TRAVEL (One Track)	 TRAVEL (Both Tracks)
 USE WHIP LINE	 RAISE BOOM	 LOWER BOOM	 SWING	 STOP
 MOVE SLOWLY	 RAISE THE BOOM AND LOWER THE LOAD	 LOWER THE BOOM AND RAISE THE LOAD	 EXTEND BOOM (Telescoping Booms)	 RETRACT BOOM (Telescoping Booms)
 TRAVEL	 DOG EVERYTHING	 EMERGENCY STOP	 EXTEND BOOM (Telescoping Booms)	 RETRACT BOOM (Telescoping Booms)

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Figure 1—177
Hand Signals

2. Watch the hydraulic system oil temperature gauge. If the temperature exceeds maximum temperature, shutdown the crane until the problem is corrected. (Refer to Section 2 of this Operator's Manual for the maximum temperature for each viscosity of hydraulic oil.)
3. Listen for any unusual noises in the hydraulic system, power train, gear boxes. If any, correct problem.
4. Watch for oil leaks or any loss of control. If any develop, correct before continuing operation.
5. Ensure all controls work freely and easily, with no sticking or binding. Lubricate or adjust as necessary.
6. If working on outriggers, periodically check the outriggers to ensure the crane is level and stable. If working on tires, ensure the tires are inflated to the proper pressure. (Refer to the Tire Inflation Label or the Tire Inflation Chart in the Crane Rating Manual for proper tire pressure.)
7. Heed all DANGER, WARNING, and CAUTION labels. Observe good safety practices at all times.

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Hand Signals

Hand Signals are important for communications between the designated signal person and the operator. A Hand Signals Chart, Figure 1–177, is included in this Section of this Operator's Manual. A copy is also on the right side window in the operator's cab.

These signals should be used at all times unless voice instructions with a radio or telephone are being used. One person should be designated as a signal person and their signals obeyed by the operator. Obey a stop signal from anyone.

Pick And Carry Operation

Travel during pick and carry operations is restricted to speeds of 2.5 mph (4km/h) or less, and creep, on a firm, level surface. Creep is defined as crane movement limited to 200 ft (61m) in a 30 minute period and not to exceed 1mph (1.6km/h) maximum speed. Lifts are to be made off the main boom only, with the crane prepared as follows:

1. Ensure the driver and all passengers are wearing seat belts and keep all doors closed during travel eg storage box doors, tool box doors, cab door, etc.
2. Ensure that the suspension has been adjusted to the proper travel height. Refer to "Suspension Height Adjustment" in this Section of this Operator's Manual.
3. Inflate the tires to the required pressure listed on the Tire Inflation Label or the Tire Inflation Chart in the Crane Rating Manual.
4. Do not exceed On Tires, Pick And Carry capacities. Refer to Creep or 2.5 mph (4km/h) capacity charts in the Crane Rating Manual.

5. Level the crane on fully extended outriggers with the tires clear of the ground.
6. Position upper over front of the carrier and engage the travel swing lock. Release the swing park brake and the 360° swing lock if equipped.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during pick and carry operations. Failure to release these devices during this operation may result in damage to the swing speed reducer.

7. Boom must be extended in accordance with boom mode EM1.
8. Properly store the fly base and tip, if equipped.
9. Retract all outrigger jacks just clear of the ground but leave the outrigger beams fully extended.
10. Attach as many hand lines as necessary to prevent the load from swinging during travel.
11. Carefully attach the load to the winch wire rope and lift it only as high as necessary.
12. Carefully travel at no more than 2.5 mph (4km/h) depending on chart selection. Take extra care due to the increased overall width caused by the extended outrigger beams. The outriggers or pontoons must not be allowed to hit any obstructions. Maintain a safe distance from all personnel and obstructions. Travel only on a firm, level surface.
13. Once the desired destination is reached, shift the transmission to neutral and apply the park brake.

Operator's Manual

Job Site Travel, No Load Upper Over The Front, Boom Retracted 2.5 MPH (4.0km/h) Maximum

Counterweight lb (t) Installed on Upper	Minimum—Maximum Boom Angle (°)			
	35—58 Ft (10.67—17.68m) Fly Stored or Removed	35 Ft (10.67m) Fly Erected (0° Offset)	58 Ft (17.68m) Fly Erected (0° Offset)	74—90 Ft (22.56—27.43m) Fly Erected (0° Offset)
0 (0)	0—45	0—45	0—45	PROHIBITED
9,600 (4.4t)	0—45	0—45	0—45	PROHIBITED
19,200 (8.8t)	0—45	0—45	0—45	0—30
28,800 (13.2t)	0—45	0—45	0—45	0—30

Traveling The Crane

Certain conditions must be met for safe travel. Refer to the following procedures before traveling the crane.



WARNING

Do not use 4-wheel, crab, or rear wheel steer mode for extended or high speed travel as steering behavior may be unfamiliar and a loss of crane control could occur.

Do not travel with upper over the side. Position upper over the front and engage the travel swing lock. Crane may tip over causing personal injury and/or crane damage.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during pick and carry operations. Failure to release these devices during this operation may result in damage to the swing speed reducer.

CAUTION

When the hoist line is tied off to the crane or any solid object, do not extend the boom, raise or lower the boom, or raise the crane on outriggers. The winch system could be overloaded causing major winch or crane damage.

Job Site Travel

Job site travel is limited to speeds less than 2.5 mph (4km/h). The crane may be traveled on the job site with no load per the following procedure:

1. Ensure the driver and all passengers are wearing seat belts and keep all doors closed during travel eg storage box doors, tool box doors, cab door, etc.
2. Ensure that the suspension has been adjusted to the proper travel height. Refer to "Suspension Height Adjustment" in this Section of this Operator's Manual.
3. Inflate the tires to pressure listed on the Tire Inflation Label or the Tire Inflation Chart in Crane Rating Manual for 2.5 mph (4km/h) maximum speed.
4. The boom must be over the front of the crane with the travel swing lock engaged. Release the swing park brake and the 360° swing lock, if equipped. If required, level the crane on fully extended outriggers before swinging.
5. If traveling on a firm, smooth, and level surface, refer to the "Job Site Travel" chart in this Section of this Operator's Manual. Do not move the boom during travel.
6. If traveling on a slope, refer to "Traveling On A Slope" in this section of this Operator's Manual.
7. Secure hook block and/or hook ball to prevent excessive swinging.
8. Ensure cab is returned to its the horizontal (0 degree) position.
9. Carefully travel at no more than 2.5 mph (4km/h). Maintain a safe distance from all obstructions, structures, and power lines.
10. Once the desired destination is reached, shift the transmission to neutral and apply the park brake.

Operator's Manual

INFORMATION

Read Operator's Manual for this crane before operating or performing maintenance functions

TIRE INFLATION CHART

SIZE	PLY RATING	INFLATION				
		MAXIMUM LIFTS ON RUBBER			TRAVEL SPEED	
		STATIC	CREEP**	2.5 MPH 4 km/h	5 MPH 8 km/h	15 MPH* 24 km/h
29.5 X 25	34	76 PSI 524 kPa	76 PSI 524 kPa	76 PSI 524 kPa	76 PSI 524 kPa	76 PSI 524 kPa

For pick and carry applications, see crane rating manual

* Travel distance is limited to 10 miles in one hour. A minimum stopping time of one hour must be observed after every 10 miles (16 kilometers) of travel to permit cooling.

** CREEP: Crane movement limited to 200 feet (61 m) in a 30 minute period and not to exceed 1 MPH (2 km/h) maximum speed.

This chart approved by the tire manufacturer of the specific tires furnished as original equipment on this crane. Do not change brand, size, or ply rating.

DO NOT DEFACE OR REMOVE THIS LABEL FROM THE CRANE

Figure 1—178
Travel Speed Limitation Label

Highway Travel

Highway travel is considered to be any travel of the crane over 2.5 mph (4km/h). The following conditions and precautions must be met for any highway travel.

1. Ensure the driver and all passengers are wearing seat belts and keep all doors closed during travel eg storage box doors, tool box doors, cab door, etc.
2. If equipped, the fly base and tip must be secured in the stored position on boom.
3. The boom must be over the front of the crane with the travel swing lock engaged. Release the swing park brake and the 360° swing lock, if equipped. If required, level the crane on fully extended outriggers before swinging.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during pick and carry operations. Failure to release these devices during this operation may result in damage to the swing speed reducer.

4. All boom sections must be fully retracted with the boom below 15°. Secure the hook block and/or hook ball to prevent excessive swinging.

CAUTION

When the hoist line is tied off to the crane or any solid object, do not extend the boom, raise or lower the boom, or raise the crane on outriggers. The winch system could be overloaded causing major winch or crane damage.

5. All outriggers must be fully retracted (jacks and beams) with all pontoons removed from jacks and stored properly.
6. The drive train must be set to 2-Wheel drive and the steering selection switch in the conventional steer mode.
7. Ensure that the suspension has been adjusted to the proper travel height. Refer to "Suspension Height Adjustment" in this Section of this Operator's Manual.
8. Fold the guard rails in the stored/travel position.
9. Check all tires for correct pressure, adjust if required. Refer to the Tire Inflation Label or the Tire Inflation Chart in the Crane Rating Manual.
10. Ensure cab is returned to its the horizontal (0 degree) position.
11. During highway travel, travel distance is limited to 10 miles in one hour. A minimum rest period of 1 hour must be observed after every 10 miles of travel to allow for cooling.
12. Obey all "Rules of the Road" and travel carefully.

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Traveling On A Slope						
Counterweight lb (t) Installed on Upper	Ascending		Descending		Side	
	Degrees	% Grade	Degrees	% Grade	Degrees	% Grade
0 (0)	17.0	31%	5.0	9%	3.0	5%
9,600 (4.4)	15.0	27%	14.0	25%		
19,200 (8.8)	14.0	25%	14.0	25%		
28,800 (13.2)	13.0	23%	13.0	23%		

Traveling On A Slope

The crane may be traveled on slopes under the following conditions:

1. Ensure the driver and all passengers are wearing seat belts and keep all doors closed during travel eg storage box doors, tool box doors, cab door, etc.
2. Ensure that the suspension has been adjusted to the proper travel height. Refer to "Axle Suspension System" in Section 3 of this Operator's Manual.
3. Inflate the tires to the pressure listed on the Tire Inflation Label, located on the left side of the hydraulic reservoir, or the Tire Inflation Chart in the Crane Rating Manual for 2.5 mph (4km/h) maximum speed.
4. Position the upper over front with the travel swing lock engaged. Release the swing park brake and 360° swing lock, if equipped.
5. Fully retract all outrigger jacks and beams.
6. Boom must be fully retracted and lowered to 15°, or less.
7. Fly must be properly stored, if equipped.
8. Ensure cab is returned to its the horizontal (0 degree) position.
9. Travel at no more than 2.5 mph (4km/h). Maintain a safe distance from all obstructions, structures, and power lines.
10. Do not travel with a load on a slope.
11. Travel only on a firm, smooth surface.
12. Always travel straight up or down the slope. Do not exceed 3.0° (5%) side slope.
13. Always refer to the Traveling On A Slope chart to determine maximum slope, depending on the crane configuration.

Operator's Manual

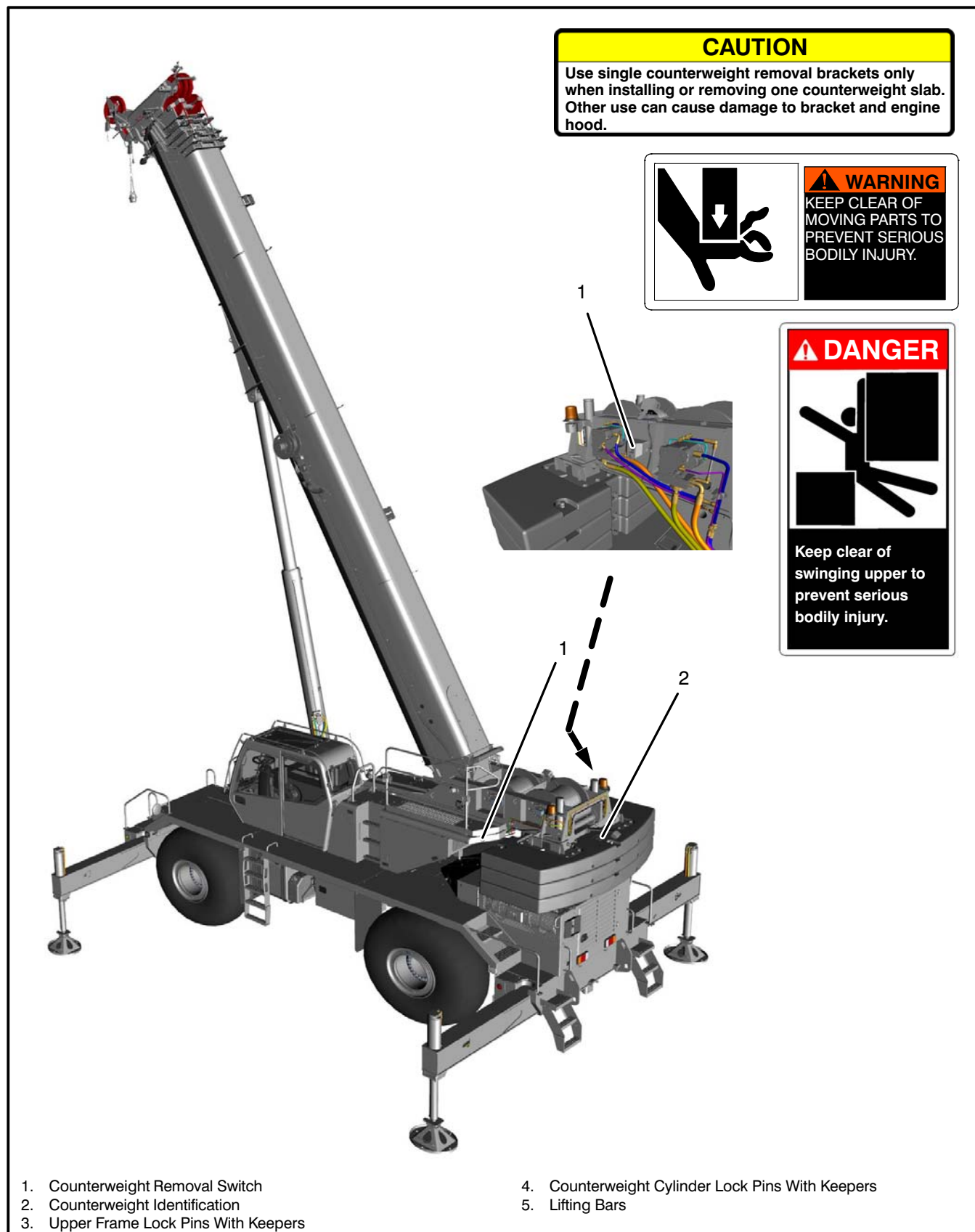
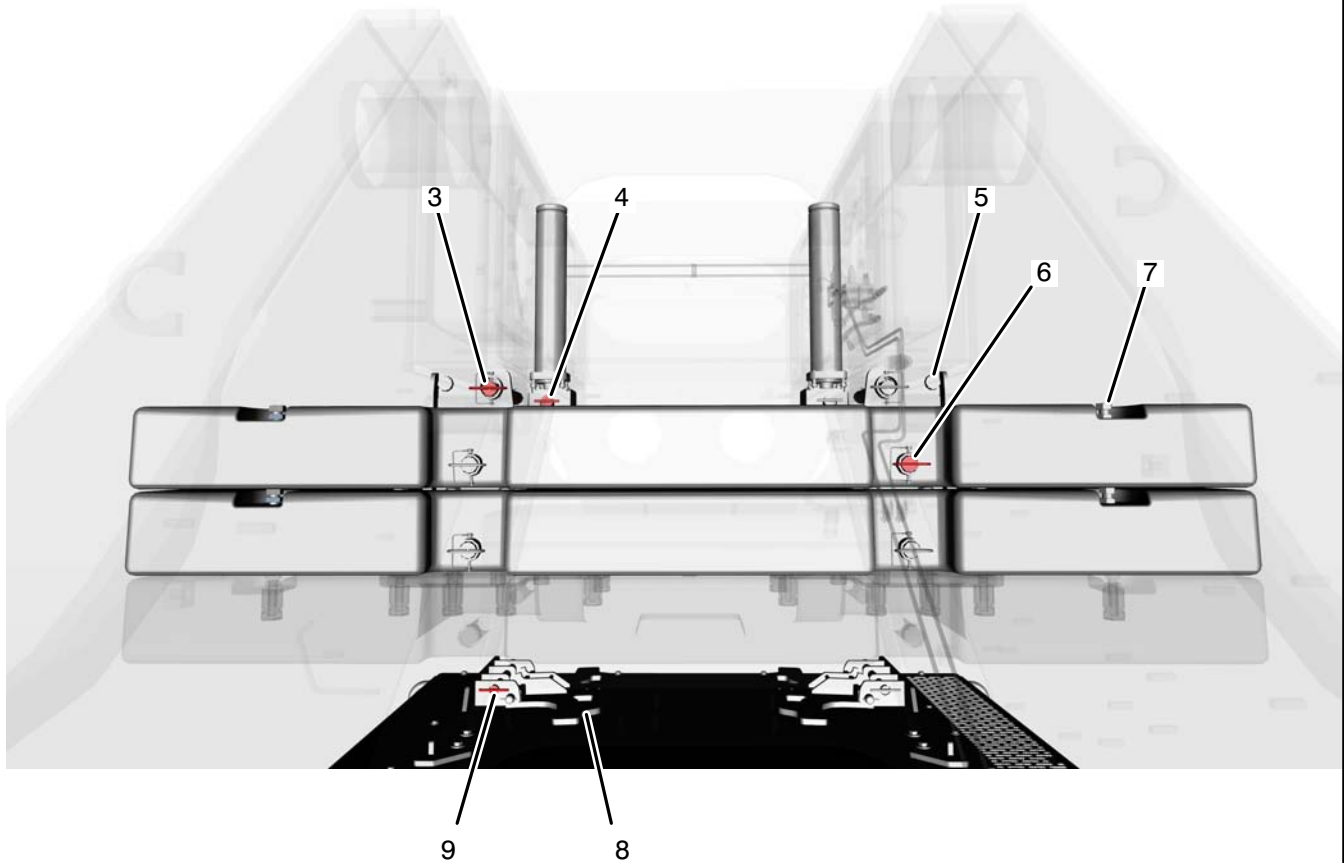
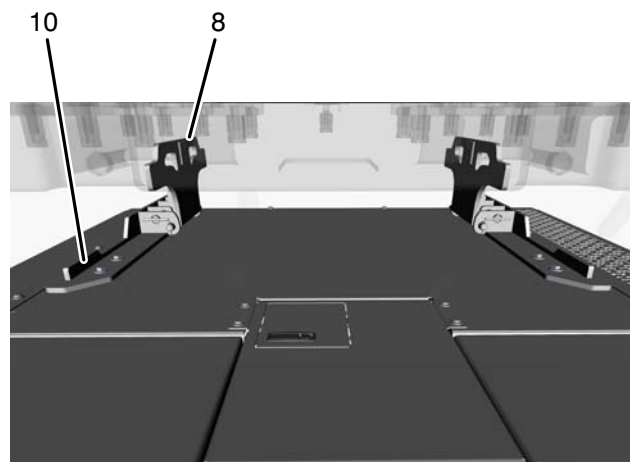


Figure 1–179
Counterweight Removal And Installation



**Single Counterweight Removal Brackets – Stored Position
(Two Or More Counterweights Removal/Install)**



**Single Counterweight Removal Brackets – Working Position
(Single Counterweight Removal/Install)**

- 6. Counterweight Connecting Pins With Keepers
- 7. Counterweight Leveling Bolts
- 8. Single Counterweight Removal Brackets

- 9. Storage Pin
- 10. Counterweight Removal Brackets

**Figure 1–179 Continued
Counterweight Removal And Installation**

Operator's Manual

Counterweight Removal And Installation

Access to certain job sites may require the crane to be transported on roads with strict vehicle load limitations. In order to meet such limitations, the counterweight can be removed and transported separately. If the crane is equipped with maximum counterweight, removing the counterweight can reduce the weight of the crane by as much as 28,800 lb (13.2t).



WARNING

When operating the crane with no counterweight, always refer to the Crane Rating Manual to ensure lifting capacities are not exceeded.

Counterweight Removal

1. Park the crane on a firm level surface, engage the park brake, and shift the transmission to neutral.
2. Properly level the crane on fully extended outriggers with all tires clear of the ground.
3. Fully retract all boom sections. If equipped, properly store the fly on the boom.

Note: If only one counterweight slab is installed on the upper, ensure the single counterweight removal brackets are in the working position.

4. If required, remove the storage pins and pivot the single counterweight removal brackets into the proper position. Install the storage pins.



WARNING

To avoid personal injury, do not place any body part under counterweight during lowering or raising of the counterweights.

5. Remove the upper frame keepers and lock pins. Refer to Figure 1–179.

Note: Counterweight cylinders may have to be raised (retracted) to relieve pressure and ease removal of lock pins.

CAUTION

Do not fully extend the counterweight removal cylinders allowing them to push down on the counterweights. Damage to the engine hood may occur. Extend the cylinder just enough to allow the counterweights to rest on the removal brackets.

6. Toggle the counterweight removal switch to the DOWN position to lower (extend) the counterweight(s) to the counterweight removal brackets.
7. Remove the counterweight cylinder keepers and lock pins securing the counterweight(s) to the counterweight removal cylinders.

Note: If all counterweights are not to be removed, remove only the two counterweight connecting pins above the counterweight to be removed.

8. Toggle the counterweight removal switch to the UP position to raise (retract) the cylinders away from counterweight(s).

Note: The counterweight slabs weigh 9,600 lb (4.4t) each.

9. Swing the upper over the rear of the carrier. Attach a sling to the counterweight(s) using the lifting bars in the top counterweight.
10. Attach other end of sling to the crane's hook block.



WARNING

When operating the crane with no counterweight, always refer to the Crane Rating Manual to ensure lifting capacities are not exceeded.

Do not travel or transport the crane with the counterweight positioned on the removal brackets. Counterweight may fall causing serious personal injury and/or major crane damage.

11. Lift counterweight(s) off removal brackets and onto transport vehicle.
12. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Counterweight Configuration" in this section of this Operator's Manual.

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Counterweight Installation

1. Park the crane on a firm level surface, engage the park brake, shift the transmission to neutral.
2. Properly level the crane on fully extended outriggers with all tires clear of the ground.
3. Attach a sling to the counterweight(s) using the lifting bars on the top counterweight. Refer to Figure 1–179.

Note: If only one counterweight slab is installed on the upper, ensure the single counterweight removal brackets are in the working position. If two or more counterweight slabs are installed on the upper, ensure the single counterweight removal brackets are in the stored position.

4. If required, remove the storage pins and pivot the single counterweight removal brackets into the proper position. Install the storage pins.

Note: The counterweight slabs weigh 9,600 lb (4.4t) each.

5. Using the crane, pick up the counterweight(s) from the transport vehicle.



WARNING

When operating the crane with no counterweight, always refer to the Crane Rating Manual to ensure lifting capacities are not exceeded.

6. Swing the upper over the rear of the carrier. Engage the travel swing lock. Set the counterweight(s) on the removal brackets. Ensure counterweight(s) are balanced on the counterweight removal brackets.



WARNING

Counterweight must be balanced on the removal brackets. Counterweight may fall causing personal injury and/or crane damage.

7. Swing the upper over the front of the carrier and engage the travel swing lock.

CAUTION

Do not fully extend the counterweight removal cylinders allowing them to push down on the counterweight. Damage to the engine hood may occur. Extend the cylinder just enough to align with the counterweights connecting lugs.

8. Toggle the counterweight removal switch to the DOWN position to align connecting lugs on the counterweight(s).
9. Install the counterweight cylinder lock pins and keepers to secure the counterweight(s) to the counterweight removal cylinders.
10. Toggle the counterweight removal switch to the UP position to raise (retract) the cylinders and lift the counterweight(s).

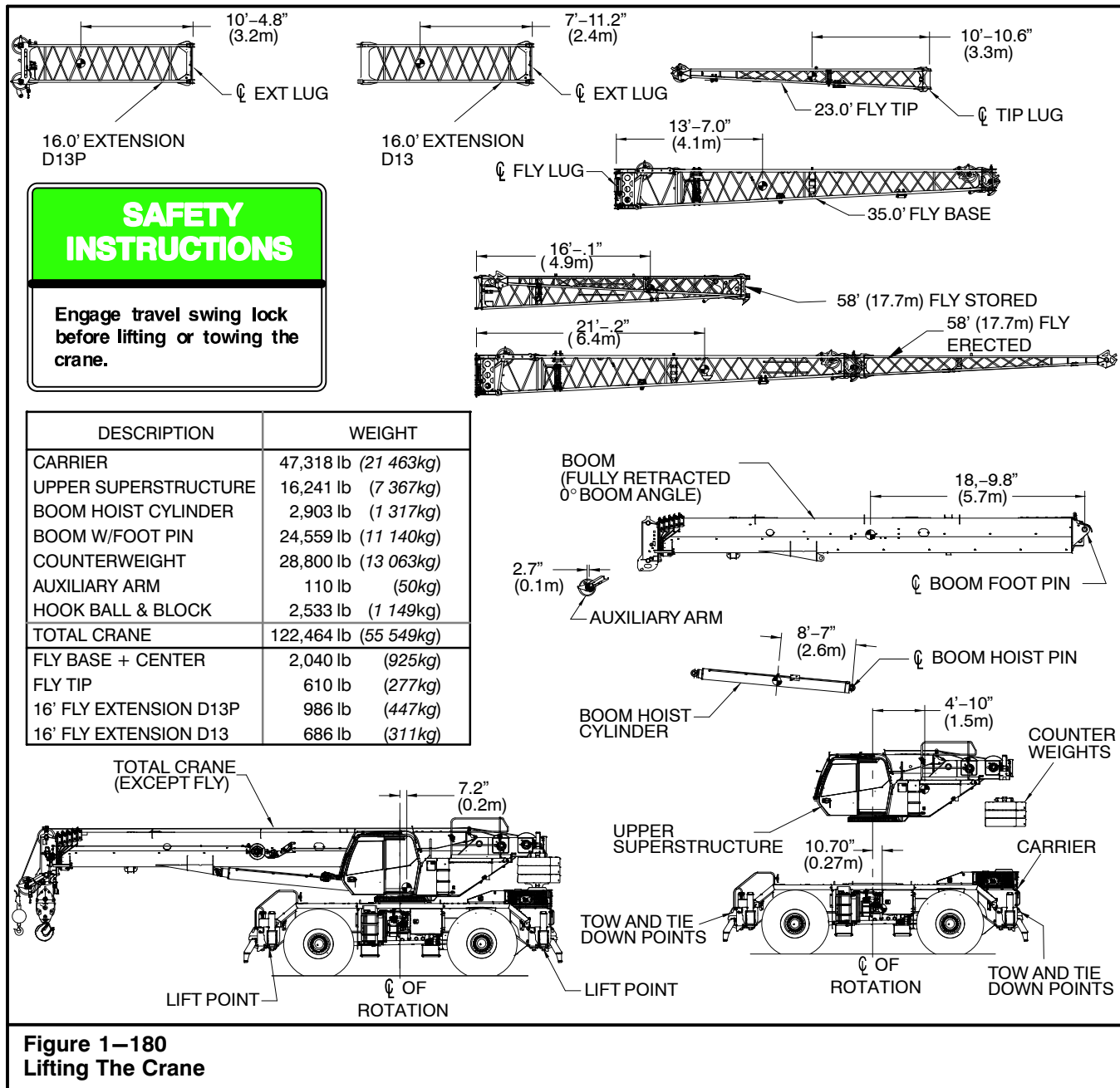


WARNING

To avoid personal injury, do not place any body part under counterweight during lowering or raising of the counterweights.

11. Continue to lift counterweight(s) until the lugs on the counterweight(s) align with the lugs on the upper frame.
12. Install the upper frame lock pins and keepers.
13. Lower (extend) cylinders slightly to transfer the weight of the counterweight(s) from the cylinders to the upper frame.
14. Adjust the counterweight leveling bolts so the counterweight(s) hang level and do not sway. Do not tighten the leveling bolt to the point the counterweight pins cannot be easily removed.
15. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Counterweight Configuration" in this section of this Operator's Manual.

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Lifting The Crane

The entire crane (except the fly) can be lifted or the components may be removed from the crane and lifted individually. Refer to Figure 1-180 for the center of gravity (CG) and weights for the entire crane and the individual components. The following conditions and precautions must be met before lifting the crane or removing any component.

1. The crane must be parked on a firm level surface with the travel swing lock engaged. The swing park brake and 360° swing lock, if equipped, must be released.

2. Use lifting equipment, shackles, slings, chains, etc. of suitable size and strength. All lifting equipment must be inspected before lifting the crane. The inspection must be recorded and dated in accordance with current OSHA regulations.
3. Do not lift crane with fly attached to boom. Damage to the fly may result. Remove the fly from the crane before lifting. Refer to Section 4 of this Operator's Manual for the correct procedures for removing the fly.
4. Fold the guard rails in the stored/travel position.

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5. When lifting the entire crane (without fly), extend the outrigger beams to the intermediate position and install slings around the beams. Protect slings from any sharp edges.
6. The weights and locations of all CG's include all possible options (heaviest crane) except the fly base and fly tip. Use the CG's as a starting point. Center hoist line on the CG, lift a few inches (*centimeters*) and adjust the hoist line to keep the crane/component(s) level at all times.
7. Removal of any component(s) from the crane will shift the CG of the entire crane. Adjust hoist line to account for the removal of any component(s).
8. Use only properly attached nylon straps to lift fly base or fly tip to prevent damage to the component. Refer to Figure 1–13. Protect the straps from sharp edges.
9. Do not allow the hoist lines to contact boom while lifting crane. Damage to the boom may result.

Towing The Crane

Always use good judgment and reliable equipment when towing the crane. Use extra caution when towing the crane on the highway and in traffic. When making connections between the crane and towing vehicle, ensure none of the connections will cause damage to either vehicle. Pay particular attention to tie rods, brake lines, power steering cylinders, and power steering lines. The tow lugs are the recommended connection points on the crane.

Note: Due to difficulty in steering the crane, towing should be limited to short distances.

Always exercise safety and follow all local codes when towing the crane. Prepare the crane as follows before towing it.

1. If equipped, store the fly base and tip on the boom.
2. The boom must be over the front of the crane with the travel swing lock engaged. Release the swing park brake and the 360° swing lock if equipped.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during towing operations. Failure to release these devices during this operation may result in damage to the swing speed reducer.

3. All boom sections must be fully retracted with the boom at a 0° angle. Secure the hook block and/or hook ball to prevent excessive swinging.

CAUTION

When the hoist line is tied off to the crane or any solid object, do not extend the boom, raise or lower the boom, or raise the crane on outriggers. The winch system could be overloaded causing major winch or crane damage.

4. All outriggers must be fully retracted (jacks and beams) with all pontoons removed from jacks and stored properly.
5. All control levers in the operator's cab must be in the neutral position.
6. Remove the drive tube between the transmission and axle or lift the rear driving wheels.

CAUTION

Failure to disconnect the drive tube, or lift the driving wheels, before pushing or towing the crane can cause major transmission damage.

7. If possible, start the engine. Shift the transmission to neutral and engage the 2–Wheel Drive mode.. Turn on the hazard flashers.



WARNING

When the park brake is released, the crane may roll. Ensure the wheels are blocked and the crane is attached to the tow vehicle before releasing the park brake. Failure to do so could cause personal injury and/or crane damage.

8. Release the park brake when the crane is attached to the towing vehicle and ready to be towed.

Note: If there is no hydraulic pressure available to release the park brake, refer to Emergency Release in Section 3 in this Operator's Manual.

9. If engine will not start, turn key to "ON" position, ensure the 2-Wheel Drive mode is selected & turn on the hazard flashers.

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Transporting The Crane

When transporting the crane, precautions should be taken in securing the crane to the trailer, barge, or other means of conveyance. The tow lugs are the recommended tie down points. If the tow lugs cannot be used to tie the crane down, chains may be looped around the outrigger boxes or the axle housings to secure the crane down.

CAUTION

If chains are wrapped around the axle housing, be certain the chains will not damage the tie rods, brake lines, power steering cylinders, or power steering lines.

If chains are wrapped around the outrigger box collar, be certain the chains will not damage the hydraulic lines and fittings. The chains should be wrapped around the outrigger box, not the outrigger beam.

Always exercise safety and follow all local codes when loading, unloading, or transporting the crane.

Prepare the crane as follows before transporting it:

1. If equipped, store the fly base and tip on boom.
2. The boom must be over the front of the carrier with the travel swing lock engaged. Release the swing park brake and 360° swing lock if equipped.

CAUTION

Do not leave the 360° swing lock, if equipped, in the engaged position while transporting the crane. Failure to release the 360° swing lock during this operation may result in damage to the swing speed reducer.

3. All boom sections must be fully retracted with the boom at a 0° angle. Secure the hook block and/or hook ball to prevent excessive swinging.

CAUTION

When the hoist line is tied off to the crane or any solid object, do not extend the boom, raise or lower the boom, or raise the crane on outriggers. The winch system could be overloaded causing major winch or crane damage.

4. All outriggers must be fully retracted (jacks and beams) with all pontoons removed from jacks and stored properly.
5. Engage the park brake and shift the transmission to neutral.
6. If transport height adjustment is required, refer to "Suspension Height Adjustment" in this Section of this Operator's Manual.
7. All control levers in the operator's cab must be in the neutral position.
8. Shutdown the engine and remove the keys from the crane. Lock all windows and doors.
9. Securely cover the exhaust to prevent air being forced into the exhaust. Covering the exhaust will also help prevent any water or other contamination from entering the exhaust which could also damage the turbocharger.

CAUTION

When a turbocharged engine is not running, air forced into the exhaust will cause the turbocharger impeller to spin. Without the engine running, the turbocharger bearing is not lubricated. When transporting the crane and the exhaust is facing in a direction such that the travel speed continually forces air into the exhaust, it may cause major damage to, or total destruction of the turbocharger.

10. Fold the guard rails in the stored/travel position.
11. Retract the upper cab walk to its stored position.
12. Depending on the specific situations, further preparations may be needed to protect the crane from the environment or vandalism. Refer to "Crane Storage" for further suggestions.

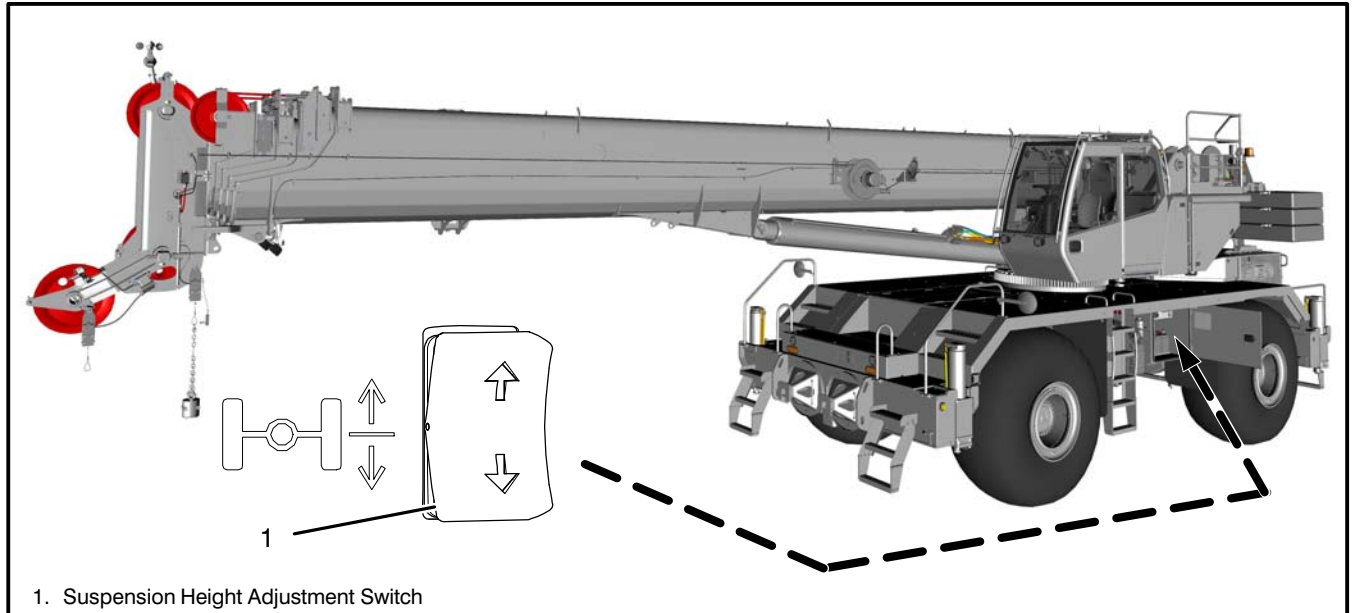


Figure 1—181
Suspension Height

Suspension Height Adjustment

The oscillation suspension cylinders can be retracted to reduce the overall height of the crane during transport. The suspension height adjustment switch is used to adjust the height of the crane.

Once the crane reaches the job site and is unloaded from the transport vehicle, the suspension must be properly adjusted to the correct travel height before operating the crane.

Note: If the crane is equipped with the Hydro—gas option do not use the suspension height adjustment switch when the crane is on jacks.

CAUTION

Do not travel the crane with the axle oscillation cylinders fully extended or fully retracted. Major damage to suspension components can occur if the crane's oscillation suspension is not properly adjusted. Oscillation cylinders which are not properly adjusted can leave suspension components unprotected from shock loads which can lead to major crane damage. Inspect the axle oscillation cylinders daily for the proper adjustment as required.

Use the following procedures to adjust the travel height.

1. Park the crane on a firm level surface.
2. Position the upper directly over the front of the carrier, fully retract the boom and lower to 0° angle, and engage the travel swing lock.
3. Measure the non-painted rod length for each oscillation cylinder. The sum of the exposed rods should equal 4.0 in $\pm$ 0.125 in (10.16cm $\pm$ 0.3cm). If suspension cylinders are not within specification proceed to the next step.
4. With the crane on a firm, level surface and on tires, toggle the suspension height adjustment switch to the UP position to extend the oscillation cylinders until the measured sum of the exposed rods equals 4.0 in (10.16cm).

Note: Do not retract suspension cylinders to obtain the measured sum of the exposed rods.

5. On cranes equipped with the Hydro-gas option, toggle the suspension height adjustment switch to the DOWN position and hold for approximately 30 seconds. Then toggle the suspension height adjustment switch to the UP position until the non-painted rod length equals 4.0 in $\pm$ 0.125 in (10.16cm $\pm$ 0.3cm).
6. For transporting the crane, the suspension may be fully lowered exposing 0 in (0 cm) of rod length. If equipped with hydro-gas suspension, toggle the suspension height adjustment switch to the DOWN position and hold for approximately 30 seconds.

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Crane Storage

Any time the crane is going to be left unattended, it should be prepared so that it will not be damaged by the elements, be an attraction to vandals, or a plaything for children.

Short Term Storage

1. Do not leave the crane where it will be a traffic hazard.
2. Lower all loads to the ground.
3. The travel swing lock must be engaged.
4. It is recommended to fully retract the boom and store at 3–5 degrees, or fully lowered to a negative angle, to allow water to drain. The fly may be erected if the crane is on fully extended outriggers or side frames. The boom can be left in the air provided that the “Wind Restriction Guide” in the Crane Rating Manual is adhered to. If the wind velocity exceeds the Link-Belt guidelines at any time during crane storage, store boom as outlined above. Do not take chances. Refer to the Crane Rating Manual for wind speed, other applicable restrictions, and allowable configurations.
5. Tie off the hook block and/or hook ball to keep the winch wire ropes snug.
6. All control levers must be in the neutral position with the function lockout switch in the “DISABLE” position.
7. Block the tracks to prevent the crane from rolling.
8. In cold weather, locate the crane where it will not freeze to the ground.
9. To preserve battery life, move the battery disconnect switches to the off position.
10. Remove the keys from the crane. Lock all windows and doors.
11. Prepare the engine as per the engine manufacturer's manual. Ensure antifreeze protection is sufficient to prevent the engine from freezing. If antifreeze protection is not adequate, completely drain the engine block.

Long Term Storage

1. Store the crane inside a building if possible.
2. Inspect the inside of all boom sections and ensure the water drain hole at the bottom rear of each shell is clear of debris to allow water to drain properly from the boom.
3. It is recommended to fully retract the boom and store at 3–5 degrees, or fully lowered to a negative angle, to allow water to drain. The fly may be erected if the crane is on fully extended outriggers or side frames. The boom can be left in the air provided that the “Wind Restriction Guide” in the Crane Rating Manual is adhered to. If the wind velocity exceeds the Link-Belt guidelines at any time during crane storage, store boom as outlined above. Do not take chances. Refer to the Crane Rating Manual for wind speed, other applicable restrictions, and allowable configurations.
4. Thoroughly clean the crane.

5. Touch up any spots where paint has chipped. This will prevent rusting.
6. Lubricate the entire crane as per the Lubrication Chart. Ensure all gear cases are filled to their proper oil level.
7. If possible, block the crane up so the tracks clear the ground. Ensure the blocking is placed so the crane cannot fall off it. If this is not possible, set the crane on planks so the tracks will not sink in the ground. Block the tracks to prevent the crane from rolling.
8. Fully retract all hydraulic cylinders. Cover all cylinder rods, machined, and unpainted surfaces with a coat of grease.
9. The travel swing lock must be engaged.
10. Tie off the hook block and/or hook ball to keep the winch wire ropes snug.
11. All control levers must be in the neutral position with the function lockout switch in the “DISABLE” position.
12. Cover all open areas around the engine and operator's cab to prevent entry of water. Cover the entire engine area with a tarp if possible.
13. Prepare the engine as per the engine manufacturer's manual. Ensure antifreeze protection is sufficient to prevent the engine from freezing. If antifreeze protection is not adequate, completely drain the engine block.
14. Drain the DEF tank into an approved container. The best temperature for storing DEF is 77°F (25°C). When stored under optimal conditions — between 12°F and 86°F (–11 and 30°C) — DEF has a shelf life of up to two years. If stored in warmer temperatures, shelf life decreases. Refer to the engine manufacturers manual for more details.
15. To preserve battery life, move the battery disconnect switches to the off position.
16. If in a location where vandalism may occur, remove the keys from the crane and lock the operator's cab doors. Cover all operator's cab glass with plywood or sheet metal to prevent glass breakage. Provide a means of locking the engine access doors, fuel tank, and hydraulic reservoir.
17. Store the crane so it does not provide a plaything for children. Such a unit can be an “attractive nuisance” for children to play on. If they fall off it or get entangled, serious injury may result.
18. While in storage, the crane should be “exercised” every 60 days to ensure the working condition of the crane. Remove all covers from around the engine. Start the engine and operate all switches, control cables, and hydraulic functions several times to circulate lubricants and to keep all mechanisms and linkages operative.
19. The boom should be “exercised” by fully extending and retracting the boom. Refer to the Crane Rating Manual for boom angle.
20. A crane that has been in storage shall have a thorough inspection prior to returning the crane to service.

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General Lubrication Information

The crane should be regularly and systematically lubricated in accordance with this Operator's Manual and the Lubrication Chart shown on the following pages. Refer to Figure 2–2. Another copy of the chart is on the carrier. The time intervals are intended as a guide only. Under unusual working conditions, such as working in dry, dusty conditions, in water or mud, or around a corrosive atmosphere, more frequent lubrication could be necessary. In these cases, the oiler must use good judgment and work out a proper lubrication schedule.

In addition to the points on the Lubrication Chart, all movable linkages and control cables should be periodically lubricated to resist wear. The only exception is the boom internal components as they do not require periodic lubrication.

There are some very practical reasons for lubricating and lubricant changes. Lubricants serve more than one purpose. They not only lubricate, but they transport chemically reactive additives, wash away minute wear particles, serve as a corrosion inhibitor, and act as a heat transfer medium. Draining and refilling any gear unit with a fresh supply of oil also assists in eliminating wear particles not trapped by magnetic plugs.



WARNING

Shutdown the engine before fueling or lubricating crane. To avoid a fire hazard, do not smoke or handle fuel around an open flame. To avoid crane damage and to prevent serious injury, do not lubricate gears or any assemblies while they are in motion.

The following procedures are important for proper lubrication of the crane:

1. Clean the grease gun nozzle and grease fitting before lubricating. This will help keep dirt and grit from entering the bushing or bearing.
2. Keep all grease and oil cans and containers clean. Always replace the lid on containers when finished to prevent entry of foreign materials. Wipe off oil can covers before using.
3. Drain oil cases when hot to drain off accumulated sludge.
4. Watch for signs of incorrect lubrication such as failure of clean grease to purge the old grease.
5. Bleed off hydraulic pressure before opening or removing a line or fitting.
6. Replace all guards before starting crane.
7. Use a clean funnel equipped with a strainer for pouring lubricants.
8. Clean the area around check and fill plugs before removing them to prevent entry of foreign particles.



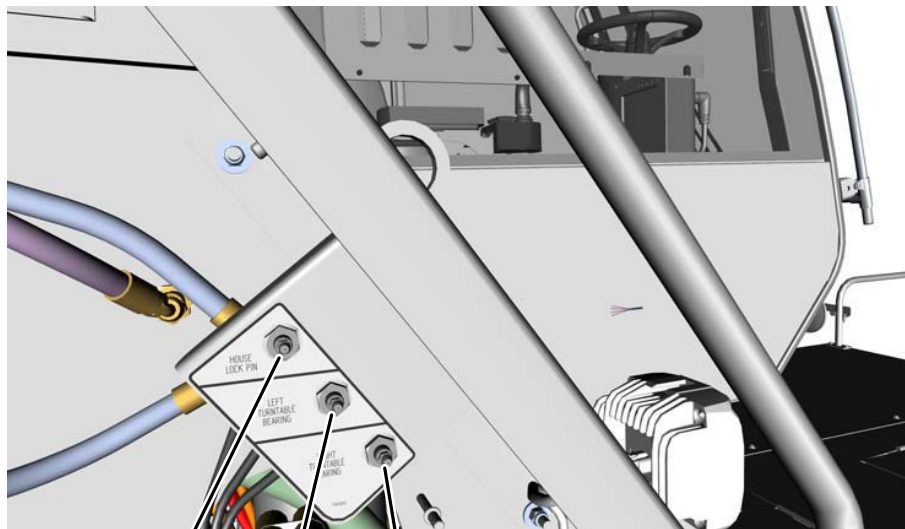
DANGER

When it is required to operate the crane during maintenance and/or adjustments, use extreme caution as service personnel may have to work near and/or under moving machinery. Serious personal injury and/or death may result. Always remain in visual and/or verbal contact to ensure the safety of service personnel. Use a signal person if necessary.

Note: See specific instructions in this Section of this Operator's Manual for lubrication check and change procedures on all gear compartments.

Keep grease, oil containers, and guns clean. Wipe all fittings before lubrication. Raise the crane on outriggers or block the wheels and shutdown the engine before working on the crane. Replace all guards and panels before operating the crane.

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1. House Lock Pin Grease Port

2. Left Turntable Bearing Grease Port

3. Right Turntable Grease Port

Figure 2—1
Centralized Grease Bank

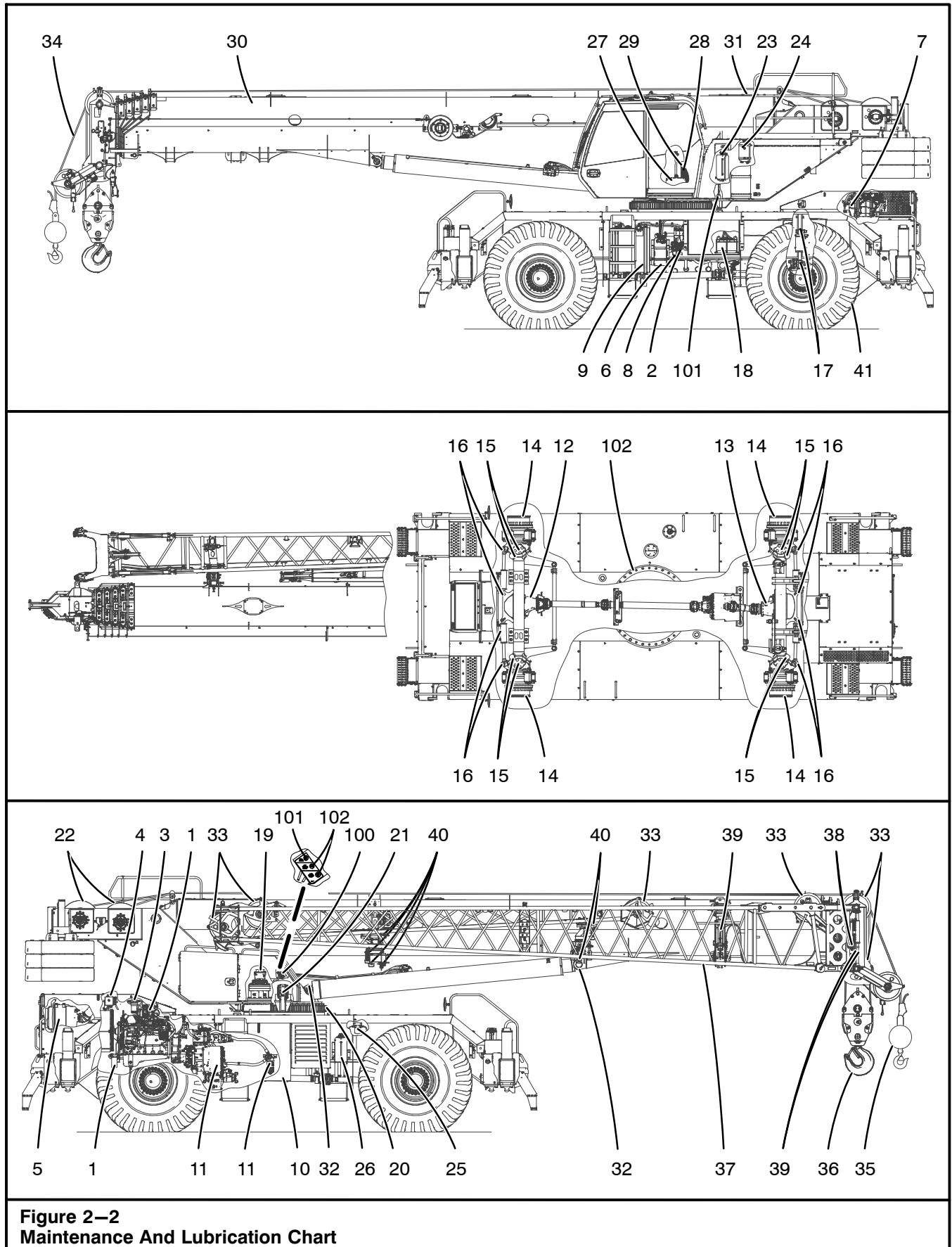
Centralized Grease Bank

The crane is equipped with a centralized grease bank which has three ports to grease the house lock pin, left turntable bearing, and right turntable bearing. The centralized grease bank is located behind the plastic door on the right side of the machine. Refer to Figure 2—1. Refer to the “Maintenance And Lubrication Chart” in this section of the Operator’s Manual for proper service intervals.

Turntable Bearing Lubrication

Lubricate the turntable bearing through the grease fittings located in the centralized grease bank on the front of the upper frame. Use the low pressure handgun and pump grease until clean grease is expelled. Rotate the upper a few degrees and pump grease until clean grease is expelled. Repeat this process throughout the full 360° cycle of the turntable bearing.

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Lubrication Chart

SYMBOL KEY:

	Check fluid level and fill as required.		Initial Service.
	Inspect, lubricate, adjust, repair, or replace as required.		Change fluid (and filter if applicable).
	Lubricate.		Change filter only.
	Refer to manufacturer's manual for proper maintenance, lubrication, fuel or coolant grade.		Drain water
	Refer to Operator's Manual for additional information and lubrication specifications.		

MAINTENANCE SCHEDULE													
Location	No.	Service Interval (Hours)									No. Pts.	Capacity	
		8 Daily	40 Weekly	150 Monthly	250 6 Weeks	500 3 Months	1,000 6 Months	2,000 Annual				GAL.	LITERS
Engine Oil System	1											3.8	14.4
Primary Fuel Filter, Water Separator	2											—	—
Secondary Fuel Filter	3											—	—
Engine Cooling System	4											8.0	30.4
Engine Air Cleaner/Air System	5											—	—
Diesel Exhaust Fluid (DEF) System	6											10.0	37.9
Aftertreatment - Diesel Particulate Filter (DPF)	7											—	—
Dosing Module Filter	8											—	—
Fuel Tank	9											73.0	276.3
Hydraulic Reservoir/(System)	10	 	 							 		182.5 (260.0)	690.8 (984.2)
						 						6.6	25.0
Axle Differential (Front)	12					 						10.0	37.9
Axle Differential (Rear)	13					 						10.3	38.8
Planetary Wheel Ends (Each)	14					 						0.9	3.4
Steering Knuckles	15										8	—	—
Steering Cylinder Ends	16										8	—	—
Oscillation Cylinder Pins	17										4	—	—
Batteries	18											—	—
Swing Speed Reducer	19		 	 								1.9	7.0
Turntable Gear Teeth	20										ALL	—	—
360 Degree Swing Lock – If Equipped	21										4	—	—
Winch Drums (Each)	22											2.0	7.6
Cab Heater Fuel Tank And Filter	23											6.4	24.2
Cab Heater Coolant Tank	24											1.3	4.9
Arctic Heater Option, Fuel Filter And Nozzle – If Equipped	25							 				—	—
Arctic Heater Option Fuel Tank – If Equipped	26											6.4	24.2

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Lubrication Chart

SYMBOL KEY:



— Check fluid level and fill as required.



— Inspect, lubricate, adjust, repair, or replace as required.



— Lubricate.



— Refer to manufacturer's manual for proper maintenance, lubrication, fuel or coolant grade.



— Refer to Operator's Manual for additional information and lubrication specifications.



— Initial Service.



— Change fluid (and filter if applicable).



— Change filter only.



— Drain water

MAINTENANCE SCHEDULE

Location	No.	Service Interval (Hours)									No. Pts.	Capacity	
		8 Daily	40 Weekly	150 Monthly	250 6 Weeks	500 3 Months	1,000 6 Months	2,000 Annual				GAL.	LITERS
Windshield Washer Reservoir	27											1.3	4.7
Cabin Filter	28											—	—
Cabin Recirculation Air Filter	29											—	—
Boom	30											—	—
Boom Locking Pins	31										5	—	—
Boom Hoist Cylinder Pins	32										2	—	—
Boom And Fly Sheaves	33										ALL	—	—
Wire Rope	34											—	—
Hook Ball	35										1	—	—
Hook Block And Sheaves	36										ALL	—	—
Fly	37											—	—
Fly Pinning Bearings	38										5	—	—
Fly Pinning Screws	39										3	—	—
Fly Storage Retaining Pins	40										ALL	—	—
Tires	41											—	—
Centralized Grease Bank	100											—	—
— Travel Swing Lock	101										1	—	—
— Turntable Bearing	102										2	—	—

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Lubrication Specifications

The following specifications are approved for use in Link-Belt cranes. These lubricants are listed by specifications and by one brand name. Most reputable oil companies can provide a lubricant to match a particular grade and classification. It may then be used in the crane no matter what the brand name. When using other brand names, the user assumes all responsibility for product liability, and warranty may be void.

Location Number	Lubricant/ Fluid	Link-Belt-Spec.	Accepted Lubricants	Grade	Classification
1	Tier 4/Stage V Engine Oil**	830346	Shell Rotella T Shell RIMULA Super Conoco Fleet Supreme EC Mobil Delvac 1300 Super Chevron Delo 400 LE Petro-Canada DURON-E Or Equivalent	15W40**	API CJ-4
4 24	Engine Coolant*** Heater Coolant	835006	Cummins Fleet Guard ES Compleat OAT	50/50 or 60/40 Mix***	
11	Transmission Fluid	830326	Conoco Phillips PowerDrive Synthetic All Season TO-4 Fluid Petro Canada Produro Synthet- ic All Season TO-4+ Fluid Mobil Delvac 1 Transmission Fluid Arctic Chevron Delo TorqForce Syn Or Equivalent	Multigrade	TO-4
10	Standard Temperature Hydraulic Oil*	830559	Shell Tellus S2 V68 Conoco Powerflow HE68 Mobile UNIVIS N68 Chevron Rando HDZ 68 Pinnacle National VHVI 68 Or Equivalent	Multigrade	ISO 3448-1975
	Extended Temperature Hydraulic Oil*	830674	Petro-Canada Hydrex XV		
	Arctic Temperature Hydraulic Oil*	830348	Petro-Canada Hydrex Extreme		
12 13 14 19	Axle Differential Oil Planetary Wheel End Oil Swing Drive Oil	830338	Shell SPIRAX S Mobil Mobilube SHC Chevron RPM Syn Gear Lube Phillips 66 Triton Syngear FE 76 Lubricants 76 Triton Syn Lube EP Or Equivalent	75W90	API GI-5 & MT-1
22	Winch Drum Oil	830342	Shell Omala S4 GX Conoco Syncon EP Plus Mobil SHC Or Equivalent	ISO 150	AGM No. 4 EP

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Location Number	Lubricant/ Fluid	Link-Belt-Spec.	Accepted Lubricants	Grade	Classification
15,16,17, 21,31,32, 35,36,38, 39,40, 101,102	Grease, Multipurpose	830002	Conoco Kendall L-427 Super Blu Or Equivalent	NLGI-2	
20	Turntable Gear Teeth Open Gear Lube	830013	Shell Gadus S2 A1000XD 2 Or Equivalent		
27	Windshield Washer Reservoir Fluid	835002	Gold Eagle Redi-Mix Coolants + CP Wndshld Wshr Fluid-25 (blue) Or Equivalent		

- * Oil type filled from the factory is indicated on the hydraulic information label. Refer to Figure 2–19. Refer to “Link-Belt Preferred Hydraulic Oil” in this section of this Operator’s Manual for temperature usage.
- ** Machine factory filled with 15W40 oil for ambient temperature usage of 5° F–120° F. For temperatures outside this range, refer to the engine maintenance manual.
- *** Coolant mixture ratio and temperature range filled from the factory is indicated on the coolant information label. Refer to Figure 2–7. For temperatures outside this range, refer to the engine maintenance manual.

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Link-Belt Preferred Hydraulic Oil

Important:

- Use only pre-filtered hydraulic oil.
- Change interval based on normal operating conditions. Extreme conditions may shorten life. Extended change intervals may be possible for light duty conditions. Oil analysis is recommended at 500 hour intervals to determine fluid health.
- Link-Belt Preferred hydraulic oil is recommended for refill and/or top off. The oil type filled from the factory is indicated on the hydraulic information label. Refer to Figure 2—19. Mixing of oil types is not recommended and may cause adverse effects and warranty may be void.
- Ambient temperature usage based on normal duty cycles. Extreme duty cycles may impact machine's ability to cool the hydraulic oil. Maximum hydraulic oil temperature for the specific oil used must never be exceeded.

Oil Grades	Oil Temperature Use	Ambient Temperature Use	Oil Change Interval (Hours)	Container Capacity		Part Number
				Gallons	Liters	
Standard Temperature Multigrade Oil	10°F to 195°F -12°C to 91°C	10°F to 120°F -12°C to 49°C	3,500	5 55	18.9 208.0	830667001 830667002
Extended Temperature Multigrade Oil	-5°F to 195°F -21°C to 91°C	-5°F to 120°F -21°C to 49°C	4,000	5 55	18.9 208.0	830675001 830675002
Arctic Temperature Multigrade Oil	-40°F to 165°F -40°C to 74°C	-40°F to 80°F -40°C to 27°C	4,000	5 55	18.9 208.2	830673001 830673002



Figure 2—3
Please Don't Do It!

Disposal Of Used Lubricants, Fluids, Etc.

Properly dispose of used lubricants and filters. Every drop of misplaced oil damages the environment. Each year literally thousands of gallons of used oil is dumped into our fields and streams or buried in community landfills. These methods of disposal permanently damage the world around us. You can see that the oil you use is properly disposed of by sending it to a recycling center. Most local automobile service stations are happy to receive used oil and will see to it that the oil is recycled. Refer to the latest EPA, state, and local regulations regarding proper disposal.

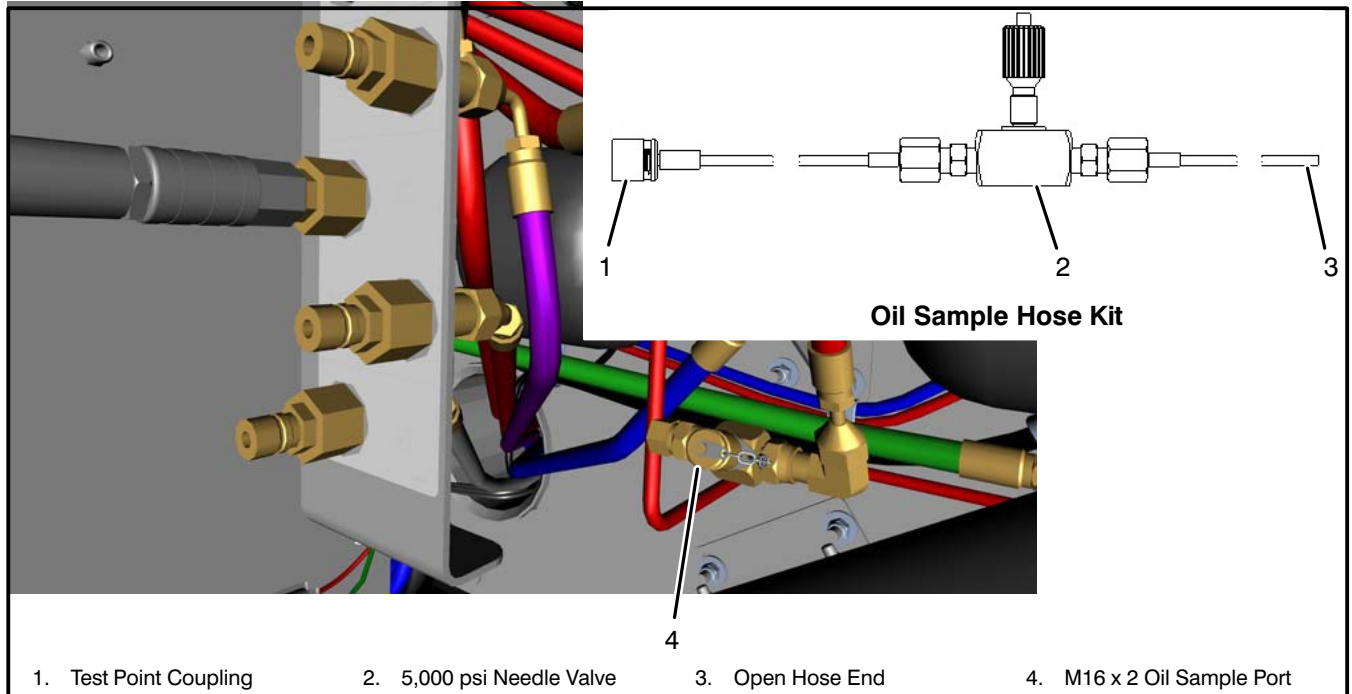


Figure 2—4
Hydraulic Oil Sampling

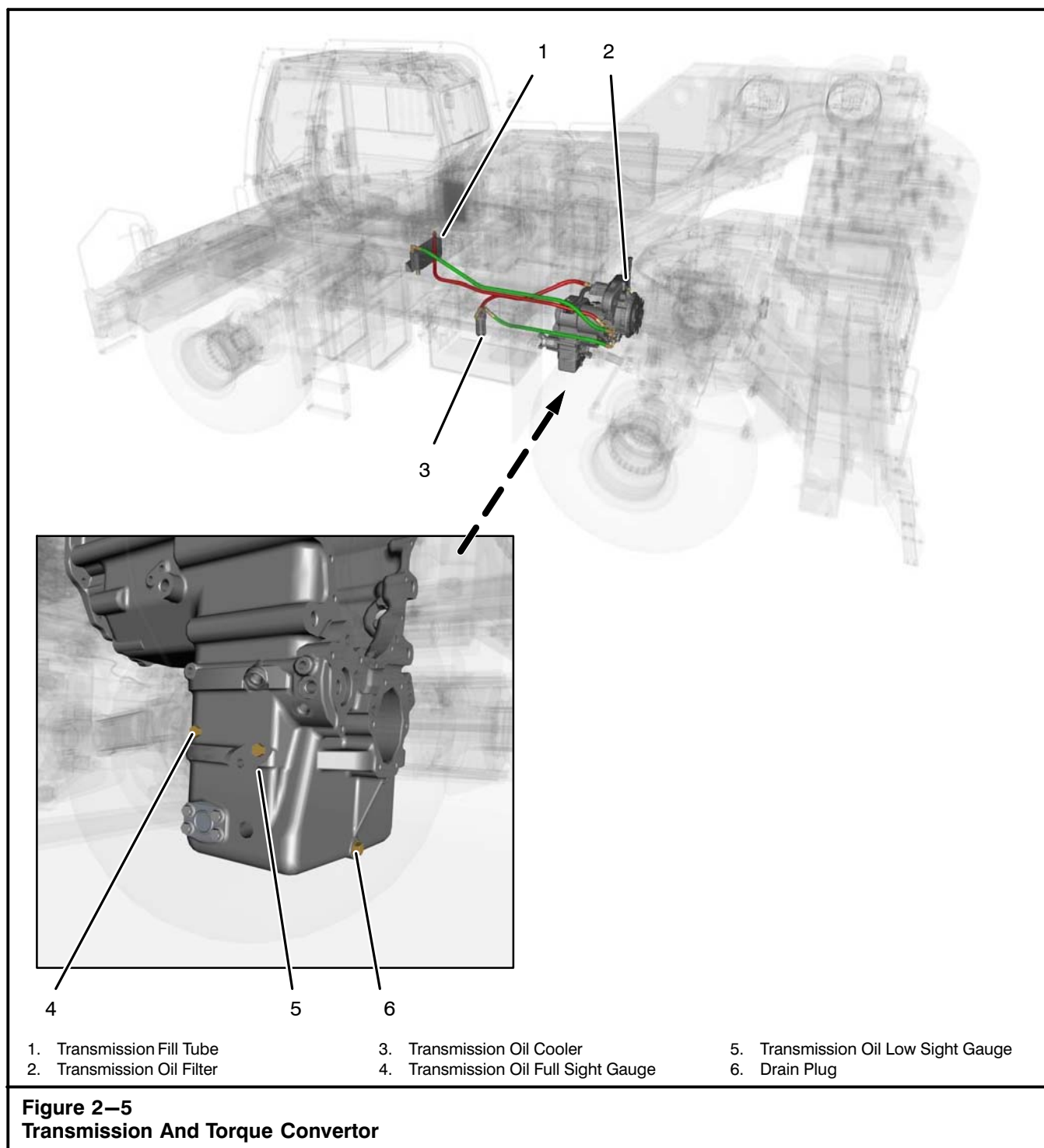
Hydraulic Oil Sampling

Hydraulic oil analysis is recommended at 500 hour intervals to determine fluid health. This machine is equipped with a dedicated sample port for hydraulic oil sampling.

Method of Extracting a Hydraulic Oil Sample

1. Obtain a contamination free sample container, verify it is visibly clean, and label it with the relevant information, crane serial number, hour meter reading, date, and operator's initials.
2. Use an appropriate oil sampling hose kit. Refer to Figure 2—4. Verify that it is clean and free of visible contamination.
3. Clean the quick disconnect and lines around the sampling area to prevent any extraneous material from entering the sample bottle. Use only lint free rags. Verify the area is clean and free of visible contamination.
4. Connect the oil sampling hose kit to designated test port. Ensure the needle valve is closed.
5. Start the engine and allow it to run at idle.
6. Open the needle valve and adjust to a convenient flow rate. Take care that the oil is flowing from the oil sample hose kit, and not dripping. Allow 3 to 4 quarts of oil to flow into the waste container. Once the oil is flowing, do not change the flow rate, using the needle valve, until the sample is obtained.
7. Fill the sample bottle halfway with system fluid. Use this to rinse the inner surfaces, and discard the oil into the waste container. When opening the sample bottle, use extreme care not to contaminate it. Repeat one additional rinse, following the same procedure.
8. Without changing the flow rate, collect a 4 oz. Oil sample. Do not touch the valve, or allow the sample bottle to contact the valve while taking a sample. When the sample has been collected, remove the bottle from the oil flow, replace the cap on sample bottle and close the sample valve. Send the sample to preferred analysis lab.

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Transmission And Torque Converter Lubrication

The transmission and torque converter share the same oil which is serviced at the transmission. In order for both units to work properly, the correct oil level must be maintained and the oil and filters changed periodically.

If the oil level is low, the internal transmission and converter parts may not receive adequate lubrication. This will cause poor performance and lead to failure. If the oil level is too high, the oil will aerate and overheat which can also cause component failure. Use the following procedures to properly service the transmission and torque converter. Do not overfill.

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Transmission Oil Level Check

Check the transmission oil level daily. Dirt or foreign material should not be permitted to enter the transmission oil system. It can cause valves to stick, oil passages to clog, and excessive wear on internal transmission parts.

1. Operate the crane in a drive range until the transmission oil reaches its normal operating temperature 180–200°F (82–93 °C).

Note: Under certain conditions it may be necessary to stall out the convertor to bring the transmission oil to operating temperature. To stall out the convertor, shift the transmission to “3”, hold the brakes and accelerate engine to full throttle. Continue in this position until proper operating range is reached.

CAUTION

Using full throttle speed and stalling out the convertor for an excessive length of time will overheat the convertor.

2. Find the transmission oil level sight gauges on the left side of the transmission. Refer to Figure 2–5.
3. Shutdown the engine and add oil as required through the fill tube to bring the level to the sight gauge marked “FULL”.

Transmission Filter Change

Change the transmission oil filter after the first 500 hours and every 1,000 hours of operation thereafter. The transmission oil filter is mounted on the transmission. Refer to Figure 2–5.

1. Park the crane on firm level ground, shift the transmission to neutral, apply the park brake, and shutdown the engine.
2. Clean the area around the filter housing to prevent contamination from entering the system.
3. Turn the filter housing counterclockwise to remove it.
4. Remove filter element. Properly dispose of the used filter element.
5. Install new filter element. Install filter housing onto the filter adaptor.
6. Check transmission oil level. Refer to “Transmission Oil Level Check” in this Section of this Operator's Manual.
7. Start the engine and inspect the system for leaks.
8. Properly dispose of the used oil.

Transmission Oil Change

Change the transmission oil every 1,000 hours of operation or seasonally, whichever occurs first. Change it more often if job site conditions demand. If the oil has overheated, change it and the filter immediately.

1. Operate the crane in a drive range until the transmission oil reaches its normal operating temperature 180–200°F (82–93 °C).

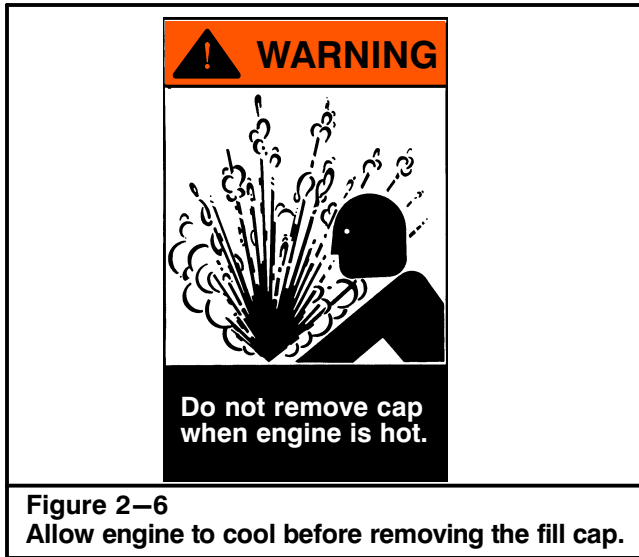
Note: Under certain conditions it may be necessary to stall out the convertor to bring the transmission oil to operating temperature. To stall out the convertor, shift the transmission to “3”, hold the brakes and accelerate engine to full throttle. Continue in this position until proper operating range is reached.

CAUTION

Using full throttle speed and stalling out the convertor for an excessive length of time will overheat the convertor.

2. Park the crane on firm level ground, shift the transmission to neutral, apply the park brake, and shutdown the engine.
3. Clean the area around the drain plug and sump screen. Refer to Figure 2–5.
4. Remove the transmission drain plug. Allow the oil to drain into a suitable container.
5. Remove sump screen, clean and reinstall it.
6. Replace transmission filter. Refer to “Transmission Filter Change” in this Section of this Operator's Manual.
7. Install transmission drain plug.
8. Fill transmission with oil to the sight gauge marked “LOW”. Refer to “Transmission Oil Level Check” in this Section of this Operator's Manual. Refer to the the Lubrication Specifications in this Operator's Manual. Do not overfill.
9. Start the engine and let it idle a few minutes. This will prime the convertor lines.
10. Recheck the transmission oil level with the engine idling. Add oil until it comes to the sight gauge marked “LOW”.
11. Operate the crane until the oil reaches 180–200° F (82–93 °C). Make final oil level check. Add oil as required to bring the level to the sight gauge marked “FULL”.
12. Check the system for leaks.

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Engine Cooling System

The coolant in the engine cooling system must be maintained at the proper level and proper concentration levels to adequately keep the engine operating at safe temperatures.

Antifreeze must be used in all climates for both freezing and boiling protection. It broadens the operating temperature range by lowering the coolant freezing point and by raising its boiling point. Refer to Lubrication Specifications or engine manufacturer's manual for proper coolant selection.

**WARNING**

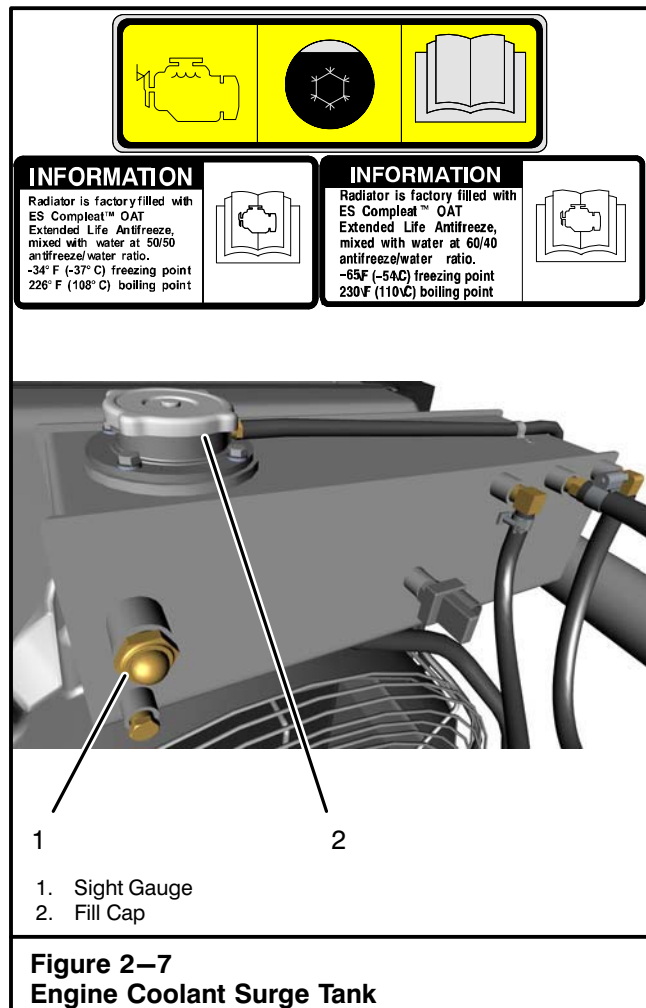
Avoid prolonged and repeated skin contact with antifreeze. Such prolonged, repeated contact can cause skin disorders or other bodily injury. Keep out of reach of children.

Coolant is toxic. Keep away from children and pets. If not reused, dispose of in accordance with local environmental regulations.

Cooling System Test

Check the glycol (antifreeze) concentration and the freezing point protection as outlined in the engine manufacturer's manual.

Testing the engine coolant is important to ensure that the engine is protected from internal cavitation and from corrosion. Refer to engine manufacturer's manual for additional information on coolant system analysis.



Cooling System Level Check

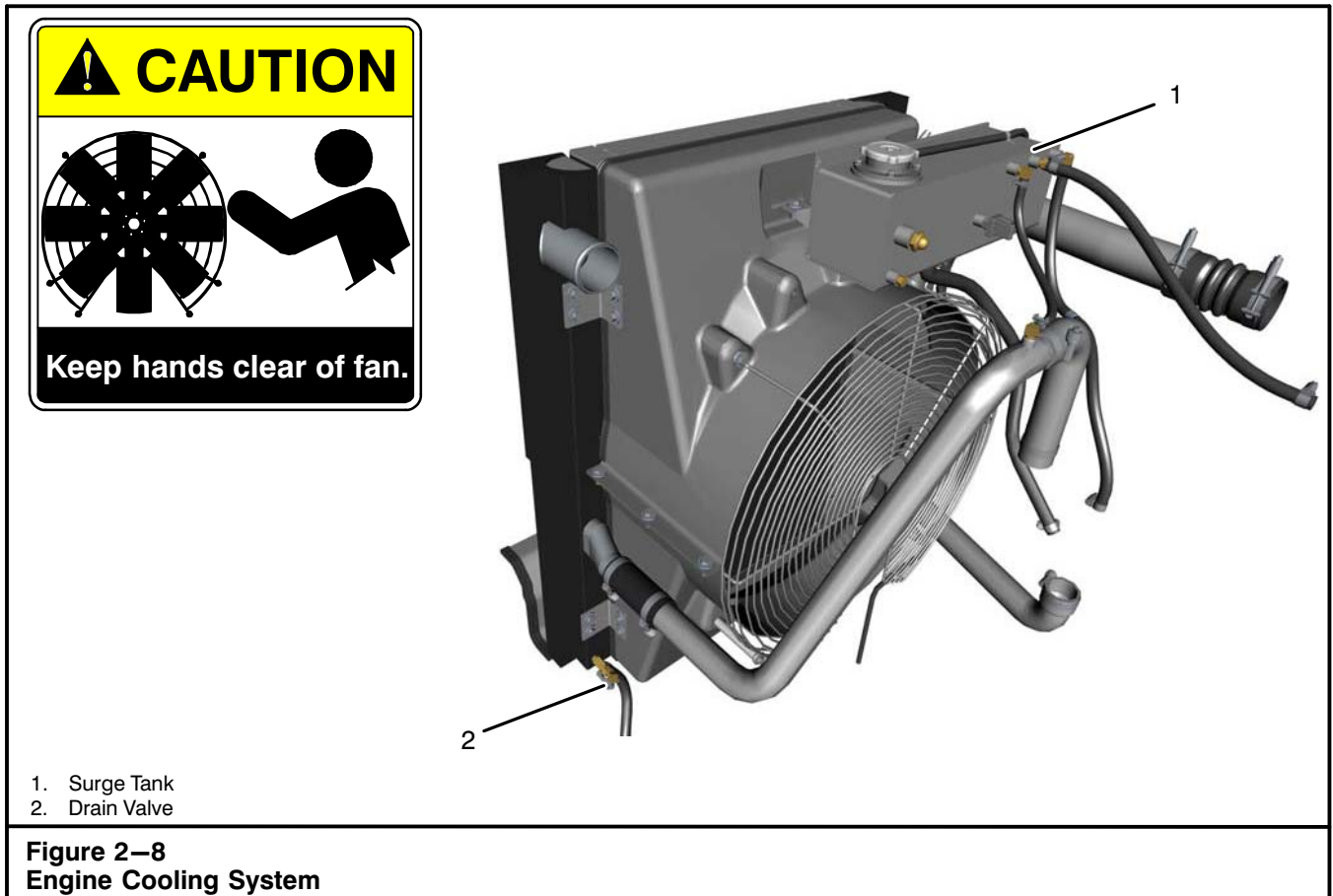
Check the coolant level in the surge tank daily. Check the protection level per the maintenance interval schedule in the engine manufacturer's manual.

1. Park the crane on a firm, level surface, shift the transmission to neutral, apply the park brake, and shutdown the engine.
2. Check that the coolant level in the surge tank is visible within the sight gauge on the side of the tank. Refer to Figure 2-7.

**WARNING**

Engine cooling system is pressurized. Do not remove fill cap from the surge tank with a hot engine. Heated coolant spray or steam can cause personal injury. Wait until the engine has cooled before slowly removing fill cap.

3. If coolant must be added, allow the engine to cool until the the coolant temperature is below 122° F (50° C).



CAUTION

Do not add cold coolant to a hot engine. Engine castings can be damaged. Allow the engine to cool until the coolant temperature is below 122°F (50°C) before adding coolant.

Do not use a sealing additive to stop leaks in the cooling system. This can result in cooling system plugging and inadequate coolant flow, causing the engine to overheat.

If additional coolant must be added, it must be pre-mixed before being added to the system. Since the ability of antifreeze to remove heat from the engine is not as good as water, pouring antifreeze into the system first could contribute to an overheated condition before the liquids are completely mixed.

4. Slowly remove the fill cap. Add coolant, as required, until the coolant level in the surge tank is visible within the sight gauge on the side of the tank. Use a pre-mixed solution per the engine manufacturer's specification. Refer to engine manufacturer's manual for proper coolant selection.

Note: There is also a fill level indicator at the bottom of the fill tube inside the surge tank to assist when determining when the proper coolant level is achieved.

5. Replace fill cap. Inspect and clean any debris from the radiator fins.
6. Start the engine and let it run until it reaches normal operating temperature. Shutdown the engine and repeat Step 2.

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Cooling System Coolant Change

Drain, flush, and fill the engine cooling system at the intervals outlined in the engine manufacturer's manual. Use a pre-mixed solution per the engine manufacturer's specification. Refer to engine manufacturer's manual for proper coolant selection.

CAUTION

Protect the environment: Handling and disposing of used antifreeze is subject to federal, state, and local regulations. Use authorized waste disposal facilities, including civic amenity sites and garages providing authorized facilities for the receipt of used antifreeze. If in doubt, contact your local authorities or the EPA for guidance as to proper handling of used antifreeze.

1. Park the crane on a firm, level surface, shift the transmission to neutral, apply the park brake, and shutdown the engine.
2. Allow the engine to cool until the coolant temperature is below 122°F (50°C).



WARNING

Engine coolant may be hot and could cause burns. Avoid prolonged and repeated skin contact with antifreeze. Such prolonged, repeated contact can cause skin disorders or other bodily injury. Keep out of reach of children.

Coolant is toxic. Keep away from children and pets. If not reused, dispose of in accordance with local environmental regulations.

3. Drain the cooling system by opening the drain valve on the radiator and engine block. Allow the coolant to drain into a suitable container. Properly dispose of used antifreeze.
4. Check for damaged hoses and hose clamps. Hoses must be firm to the feel. If they are soft and spongy they must be replaced. Replace as required. Check the radiator for leaks, damage, and build up of dirt. Clean and replace as required.
5. Inspect and clean any debris from the radiator fins.

6. Close the drain valve on the radiator and engine block.

CAUTION

During filling, air must be vented from the engine coolant passages. Wait 2 to 3 minutes to allow air to be vented. Air trapped in the system may cause damage to the engine.

7. Remove the fill cap from the surge tank.
8. Flush the system as outlined in the engine manufacturer's manual. If the engine is warm, fill slowly to prevent the rapid cooling and distortion of the metal castings.
9. Flush the system as many times as required until the water is clean.
10. Add coolant, as required, until coolant is visible within the sight gauge on the surge tank. Use a pre-mixed solution per the engine manufacturer's specification. Refer to engine manufacturer's manual for proper coolant lubrication specifications or selection. Do not install the fill cap.

Note: The radiator manufacture recommends that types and brands of coolant not to be intermixed because of possible incompatibility.

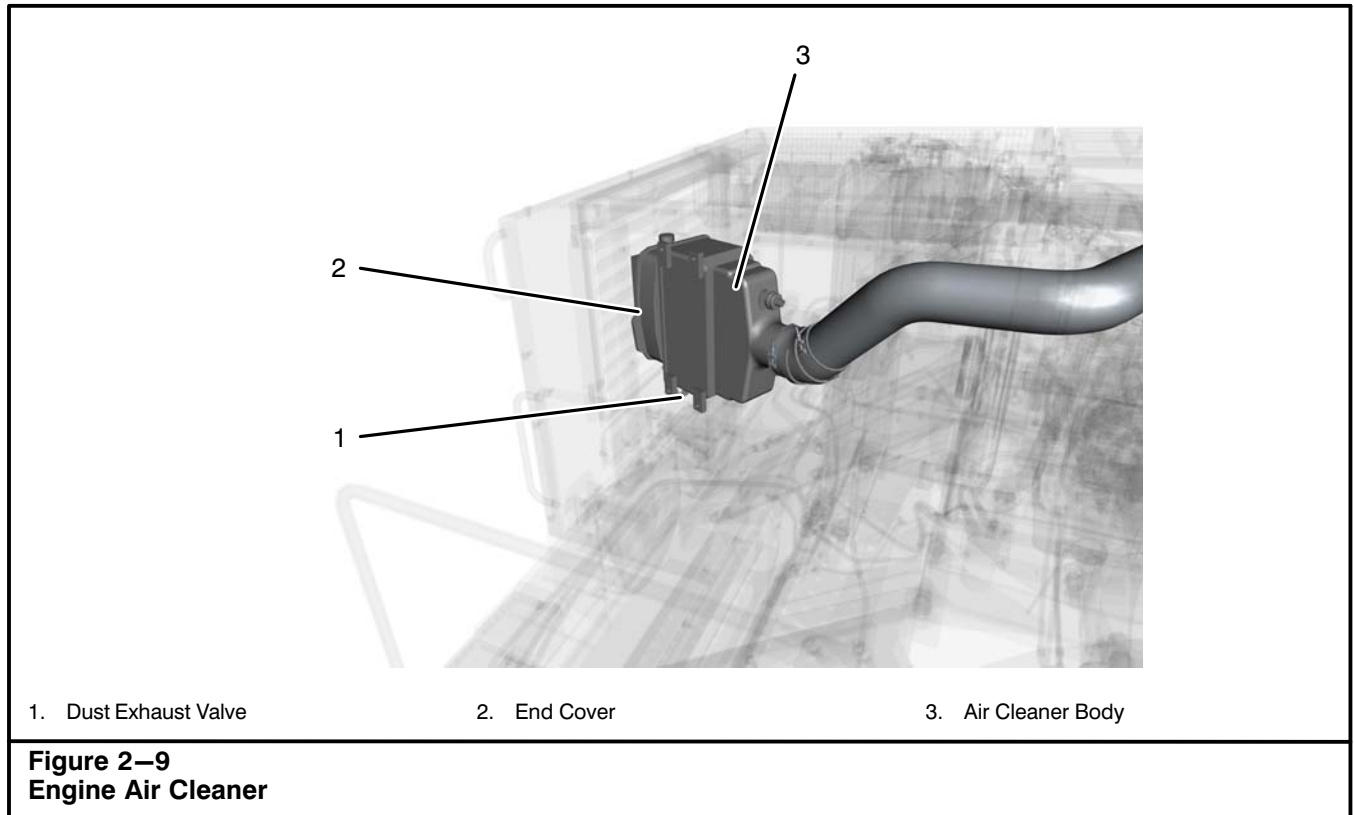
11. Start the engine and let it run at low idle. Increase engine to 1,500 rpm. Run the engine until it reached normal operating temperature to purge trapped air from the system. Shutdown the engine.
12. Check the coolant level to ensure that the coolant level is visible within the sight gauge on the side of the tank. Refer to "Coolant System Level Check" in this Section of this Operator's Manual.
13. Install the fill cap on the surge tank.



WARNING

Engine cooling system is pressurized. Do not remove fill cap from the surge tank with a hot engine. Heated coolant spray or steam can cause personal injury. Wait until the engine has cooled before slowly removing fill cap.

14. Start the engine. Check system for leaks and for proper operating temperature.



Engine Air System Inspection

It is recommended that the engine air system be inspected every 250 hours. Inspect the air system pipes, hoses, and turbocharger systems, as equipped. (Inspect all the pipes and hoses associated with the turbocharger, air cleaner, and air intake.) Check for any cracks, corrosion, loose clamps, wear points, leaks, or punctures which can allow contaminants to enter the system and damage air system components and/or the engine. All hoses should be kept free of oil contaminants, both internally and externally. Disassemble and clean as required. Tighten or replace parts as necessary to ensure that the air system does not leak.

Engine Air Cleaner

Variations in job site conditions prevent establishing a set interval for air cleaner servicing. For this reason a service indicator light is provided to assist in determining the condition of the air cleaner element. Refer to "Indicator Light Panel" in Section 1 of this Operator's Manual. Anytime the service indicator light illuminates, service the primary air filter immediately.

The air cleaner contains a primary and secondary (safety) filter element. The safety element requires servicing in the event the primary element is damaged or every third primary element service event.

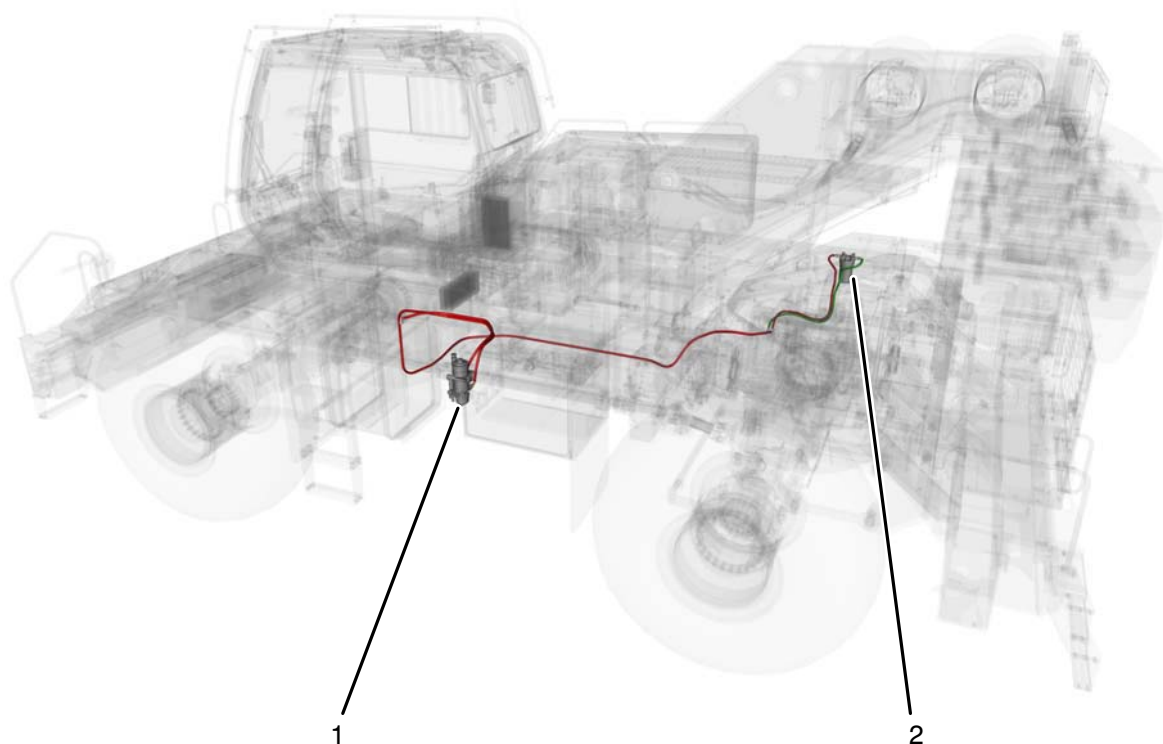
Changing The Air Cleaner Element

1. Park the crane on a firm level surface, shift the transmission to neutral, engage the park brake, and shutdown the engine.
2. Remove the end cover from the air cleaner body.
3. Remove element from air cleaner body.
4. Remove the dust exhaust valve and inspect it for damage or wear. Replace it if required.
5. Wipe the inside of the air cleaner body clean using a damp cloth. Install the dust exhaust valve.
6. If necessary, remove the safety element.
7. If necessary, install new safety element.
8. Slide the new element into the air cleaner body.
9. Install the end cover to the air cleaner body.

Dust Exhaust Valve

The dust exhaust valve is used to accumulate and remove dust ejected from the pre-cleaner stage of the air cleaner. The valve must be purged of dust daily to prevent clogging. To purge the valve, squeeze the end of the valve until the dust is purged. Repeat until all dust is removed. Refer to Figure 2—9.

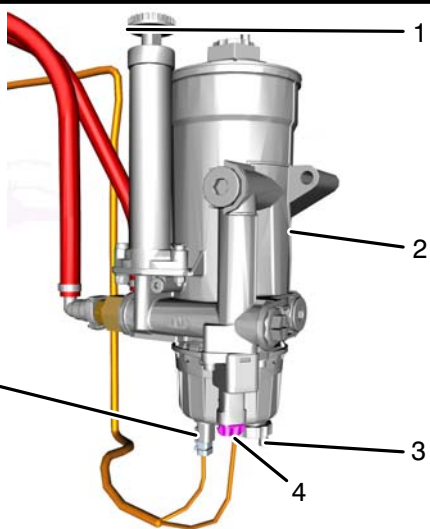
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1. Primary Fuel Filter/Water Separator

2. Secondary Fuel Filter

Figure 2-10
Engine Fuel Filters



1. Hand Priming Pump
2. Fuel Filter
3. Water Drain Valve

4. Fuel Heater
5. Water In Fuel Sensor

Figure 2-11
Engine Primary Fuel Filter/Water Separator

Engine Fuel Filter

Two filters are used, a cartridge type primary fuel filter/water separator and a spin on type secondary fuel filter. (Refer to Figure 2-10.) The function of the filters is to remove water and contaminants from the fuel before they enter the fuel system. Removal of water and contaminants is important for troublefree operation and long life of the fuel system. Water should be drained daily before start-up. Change the filters at intervals outlined in the engine manufacturer manual. Use the following procedures along with Figure 2-11.

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Fuel Filter Water Drain

1. Park crane on a firm level surface, engage park brake, shift the transmission to neutral, and shutdown the engine.

CAUTION

The engine must be shutdown when draining water from the fuel filter to prevent water from being drawn into the fuel system.

2. Place a suitable container under the drain valve. Turn the drain valve counterclockwise approximately 1 and 1/2 to 2 turns and operate the priming pump until draining occurs.
3. Continue draining until clean fuel is visible.

CAUTION

Do not over-tighten the valve. Over-tightening the drain valve can damage the threads.

4. Close the water drain valve.
5. Properly dispose of contaminated fuel.

Fuel Filter/Water Separator Change

1. Park crane on a firm level surface, and position the upper over the front of the carrier. Engage park brake, shift the transmission to neutral, and shutdown the engine.
2. Turn the battery disconnects to the "OFF" position. Refer to "Battery Disconnect Switches" in Section 1 of this Operator's Manual.
3. Clean the area around the filter cap.
4. Disconnect the wire harness from the fuel heater and the water in fuel sensor.
5. Place a suitable container under the water drain valve. Open the drain valve. Drain all fuel from filter.
6. Remove the cap and the attached filter element. Unclip the filter element from the cap.
7. Remove the filter from the filter cap. Ensure the seal ring does not stick to the filter cap.
8. Lubricate a new seal ring with clean engine oil. Install the new filter onto the filter head by hand.

9. Clip the new element filter onto the cap. Install the filter and cap into the filter housing and torque cap to 35 ft lb (48Nm).

CAUTION

To prevent fuel leaks, confirm that the filter is installed tightly but do not over-tighten. Mechanical tightening will damage the filter.

10. Connect the wire harness to the fuel heater and the water in fuel sensor.
11. Turn the battery disconnects to the "ON" position. Refer to "Battery Disconnect Switches" in Section 1 of this Operator's Manual.
12. Prime the fuel system using the primer pump on the filter head.
13. Start the engine and check for leaks. Slowly increase engine speed to allow air to be purged from the fuel system.
14. Properly dispose of contaminated fuel and filter.

Secondary Fuel Filter Change

1. Park crane on a firm level surface, engage park brake, shift the transmission to neutral, and shutdown the engine.
2. Clean the area around the filter head.
3. Remove the filter from the head.
4. Fill a new filter with clean fuel and thoroughly lubricate the o-ring with clean engine oil.
5. Install new filter on filter head and tighten by hand.

CAUTION

To prevent fuel leaks, confirm that the filter is installed tightly but do not over-tighten. Mechanical tightening will damage the filter.

6. Prime the fuel system using the primer pump on the filter head.
7. Start the engine and check for leaks. Slowly increase engine speed to allow air to be purged from the fuel system.
8. Properly dispose of contaminated fuel and filter.

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Engine Lubricating Oil System

The engine lubricating oil system must be maintained at the proper level to prevent damage to the engine. Check level daily, before startup. Drain, change oil filter, and refill engine oil at intervals outlined in the engine manufacturer's manual.

Engine Oil Drain Valve

The engine oil drain valve is located on the bottom of the engine. Refer to Figure 2–12.

Engine Oil Filter

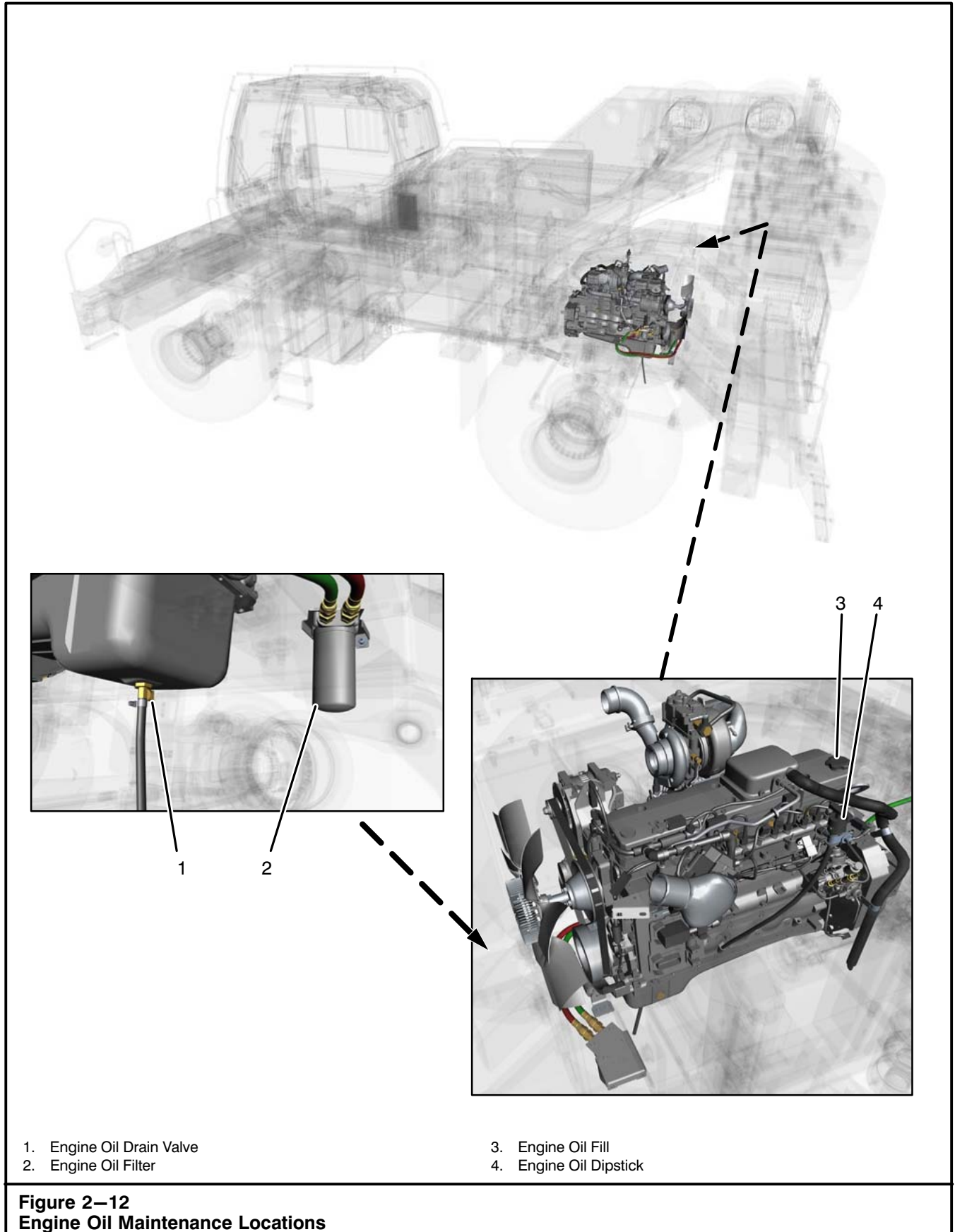
The engine oil filter is located on the side of the engine and can be accessed from the right side of the upper. Refer to Figure 2–12. Refer to engine manufacturer's manuals for proper maintenance, lubrication, grade, and additional information.

Engine Oil Dipstick

The engine oil dipstick is located on the side of the engine and can be accessed from the right side of the upper. Refer to Figure 2–12. Refer to engine manufacturer's manuals for proper maintenance, lubrication, grade, and additional information.

Engine Oil Fill

The engine oil fill is located on the side of the engine and can be accessed from the right side of the upper. Refer to Figure 2–12. Refer to engine manufacturer's manuals for proper maintenance, lubrication, grade, and additional information.



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Diesel Exhaust Fluid (DEF) System

The DEF system filters must be maintained to ensure proper engine operation.

Dosing Module Filter

The dosing module filter is located below the upper frame and can be accessed from the bottom of the upper. Refer to Figure 2–12. Refer to engine manufacturer's manuals for proper maintenance and additional information.

DEF Strainer Insert

Replace the strainer insert, as required. Refer to Figure 2–12. Remove the strainer insert by pressing the strainer tabs together while pulling the strainer insert up simultaneously with two flat head screwdrivers. Ensure the strainer insert clicks into place when installing.

CAUTION

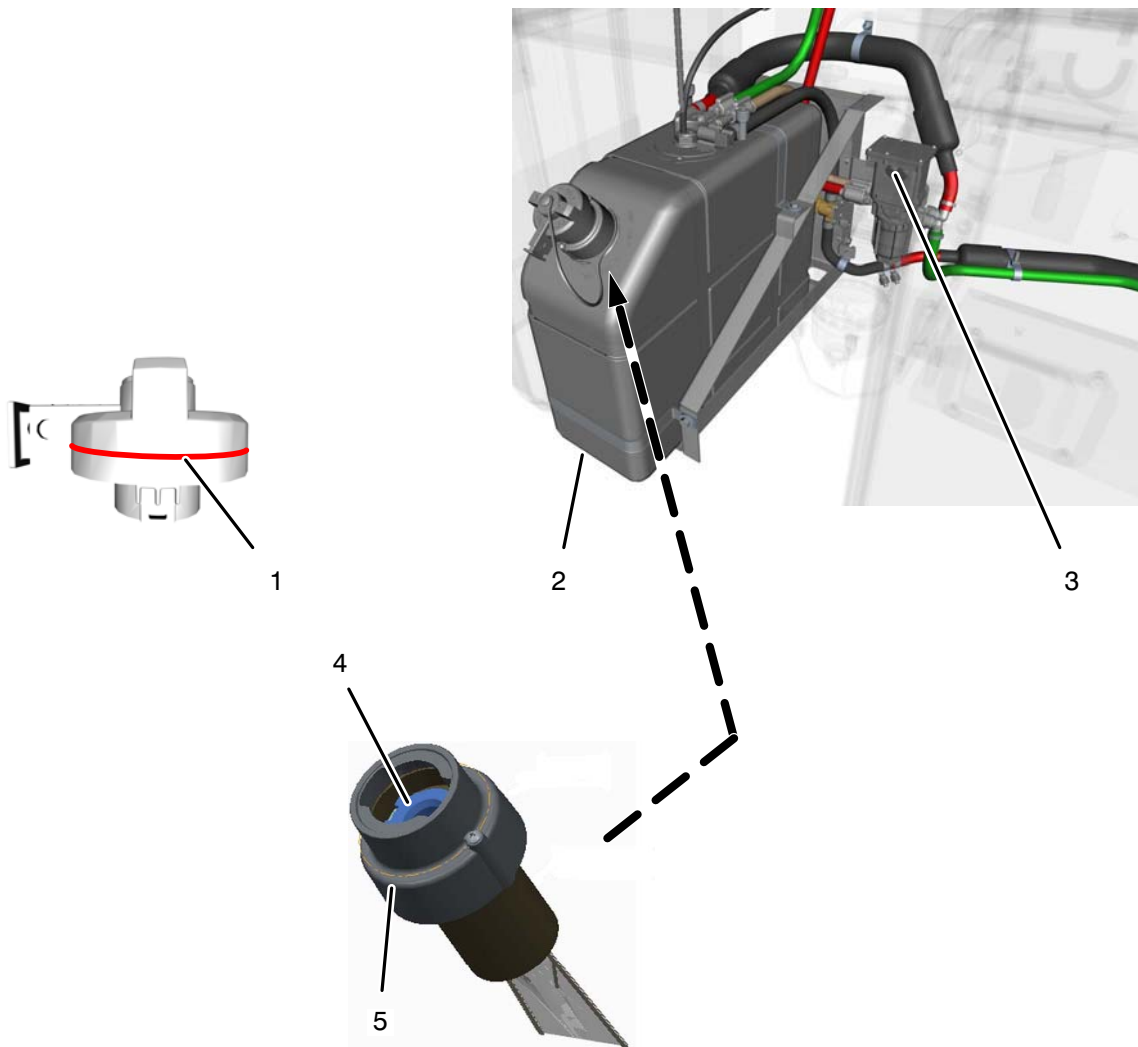
To prevent debris contamination, ensure the DEF tank is clean before and after the strainer insert replacement procedure.

DEF Cap

The DEF cap may require periodic cleaning to prevent contaminants from accumulating and infiltrating the DEF tank. Wipe the cap and adapter before removing the cap from the DEF tank to prevent contaminants from entering through the inlet. Remove the cap from the DEF tank, and remove the lanyard from the cap, if equipped. Place the cap in a container filled with water to the soak line on the cap, as shown in Figure 2–12 (approximately half way on the upper section of the cap). Soak the cap for approximately 5 minutes. Remove the cap from the water and shake it to remove excess water. Wipe the seal with a damp cloth to remove any remaining debris. Wipe the cap adapter with a damp cloth before installing the cap on the DEF tank.

CAUTION

Ensure the cap does not become completely immersed in water. Immersing the cap in water may affect the venting capabilities of the cap.

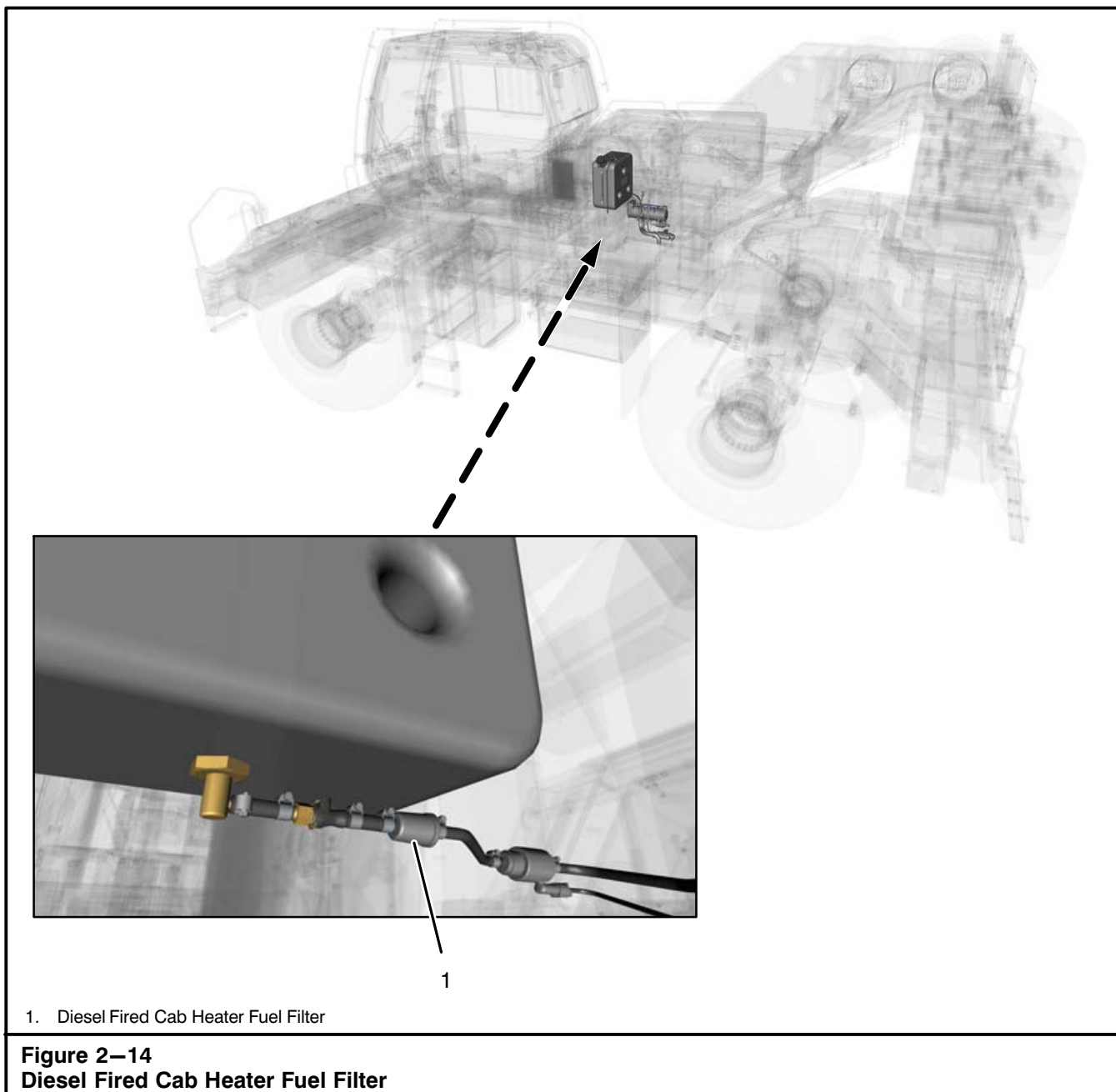


- 1. Cap Soak Line
- 2. DEF Tank
- 3. Dosing Module

- 4. Strainer Insert
- 5. Adapter

Figure 2–13
DEF Tank Internal Components

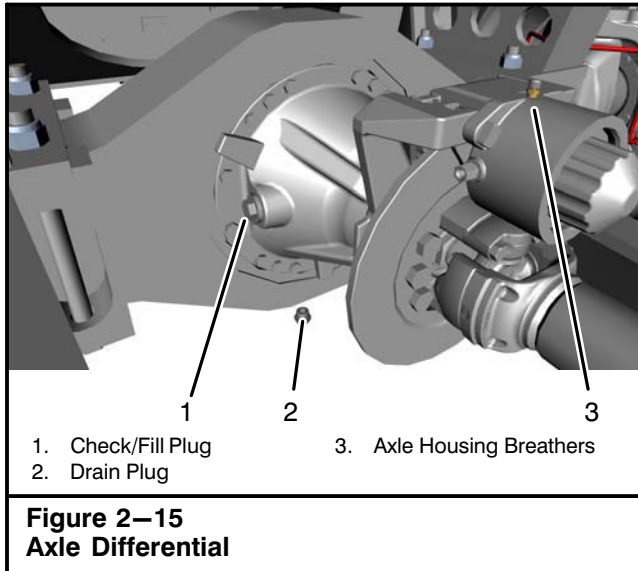
Operator's Manual



Diesel Fired Cab Heater Fuel Filter

To maintain proper heater operation, change the in-line filter every 2,000 hours of operation or annually, whichever occurs first.

1. Park crane on a firm level surface, engage park brake, shift the transmission to neutral, and shutdown the engine.
2. Turn the battery disconnects to the "OFF" position.
3. Clean the area around the in-line fuel filter.
4. Place a suitable container under the fuel filter to capture any fuel and remove the fuel filter.
5. Install new filter and tighten all clamps.
6. Turn the battery disconnects to the "ON" position and run heater while checking for leaks.
7. Properly dispose of contaminated fuel and filter.



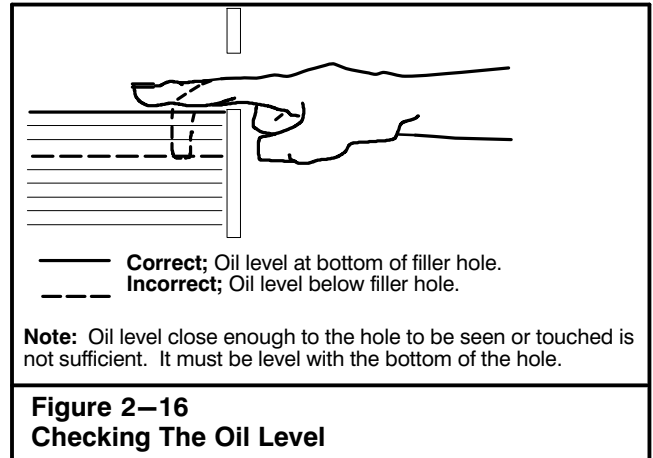
Axle Differentials Lubrication

For troublefree operation, over a period of years, the axle differentials of any crane must be properly lubricated. Check the oil level in each axle differential every 40 hours of operation. The oil in a new or rebuilt axle should be changed after the first 500 driving hours or 3 months of operation. Change the oil every 2,000 hours, or annually thereafter, whichever occurs first.

Axle Differentials Oil Level Check

Check the oil level in both of the axle differentials using the following procedure:

1. Park the crane on a firm level surface, shift the transmission to neutral, engage the park brake, and shutdown the engine.
 2. From the underside of the carrier, find the check/fill plug of the differential. Refer to Figure 2-15.
 3. Clean the area around the check/fill plug.
 4. Remove the check/fill plug and check the oil level. Oil must be level with the bottom of the check/fill hole. Refer to Figure 2-16.
 5. Add oil as required, until it begins to flow from the check/fill hole. Refer to "Lubrication Specifications" in this section of this Operator's Manual for proper grade of oil.
- Note: The axle manufacturer recommends that types and brands of oil not be intermixed because of possible incompatibility.**
6. Clean and install the check/fill plug.
 7. Check and clean the axle housing breathers, on the top of the axle housings. Refer to Figure 2-15.



Axle Differentials Oil Change

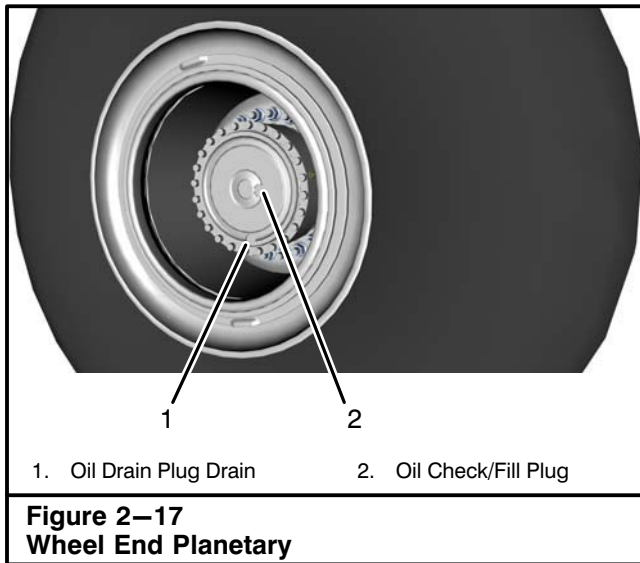
The best time to change oil in the differentials is immediately after the crane has been driven. At this time, the lubricant will be warm and easily drained. This procedure is especially desirable in cold weather conditions. Change the oil in each of the axle differentials using the following procedure:

1. Park the crane on a firm level surface, shift the transmission to neutral, engage the park brake, and shutdown the engine.
2. Find the drain plug in the bottom of the differential. Refer to Figure 2-15.
3. Clean the area around the drain plug.
4. Remove the drain plug and allow the oil to drain into a suitable container. The drain plug is magnetic and should be inspected for large quantities of metal particles. After the initial oil change, this is a sign of damage or extreme wear within the unit, and a complete internal inspection may be necessary.
5. Clean the drain plug and install it after the oil has thoroughly drained.
6. From the underside of the carrier, find the check/fill plug on the side of the differential. Refer to Figure 2-15.
7. Clean the area around the check/fill plug, and remove it.
8. Fill the differential with oil until it is level with the bottom of the check/fill hole. Refer to Figure 2-16. Refer to "Lubrication Specifications" in this section of this Operator's Manual for proper grade of oil.

Note: The axle manufacturer recommends that types and brands of oil not be intermixed because of possible incompatibility.

9. Clean and install check/fill plug.
10. Check and clean the axle housing breathers, on the top of the axle housings.
11. Properly dispose of the used oil.

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Planetary Wheel End Lubrication

Check the oil level in each wheel end every 40 hours of operation. The oil in a new or rebuilt wheel end should be changed after the first 100 hours or 3 months of operation. Change the oil every 1,000 hours, or annually thereafter, whichever occurs first.

Planetary Wheel End Oil Level Check

1. Park the crane on a firm level surface, shift the transmission to neutral, and apply the park brake.
2. Properly level the crane on outriggers and shutdown the engine.
3. Rotate the hub assembly until the oil drain plug is as close to the ground as possible. Refer to Figure 2-17.
4. Clean the area around the check/fill plug to prevent foreign material from entering the wheel end.
5. Remove the check/fill plug and check the oil level. Oil should be level with the bottom of the hole. Refer to Figure 2-16.
6. Add oil as required until it begins to flow from the hole. Refer to "Lubrication Specifications" in this section of this Operator's Manual for proper grade of oil.

Note: It is recommended that types and brands of oil not be intermixed because of possible incompatibility.

7. Clean and install the check/fill plug.
8. Repeat Steps 3 through 7 for the other planetary wheel ends.

Planetary Wheel End Oil Change

Perform the following procedure on all of the planetary wheel ends simultaneously to minimize the time spent to change the oil.

1. Drive the crane for 5 minutes to agitate and warm the oil.
2. Park the crane on a firm, level surface, shift the transmission to neutral, and apply the park brake.
3. Properly level the crane on outriggers and shutdown the engine.
4. Rotate the hub assembly until the oil drain plug is as close to the ground as possible. Refer to Figure 2-17.
5. Clean the area around the check/fill and drain plugs to prevent foreign material from entering the wheel end.
6. Remove the check/fill plug. Remove the drain plug and allow the oil to drain into a suitable container.



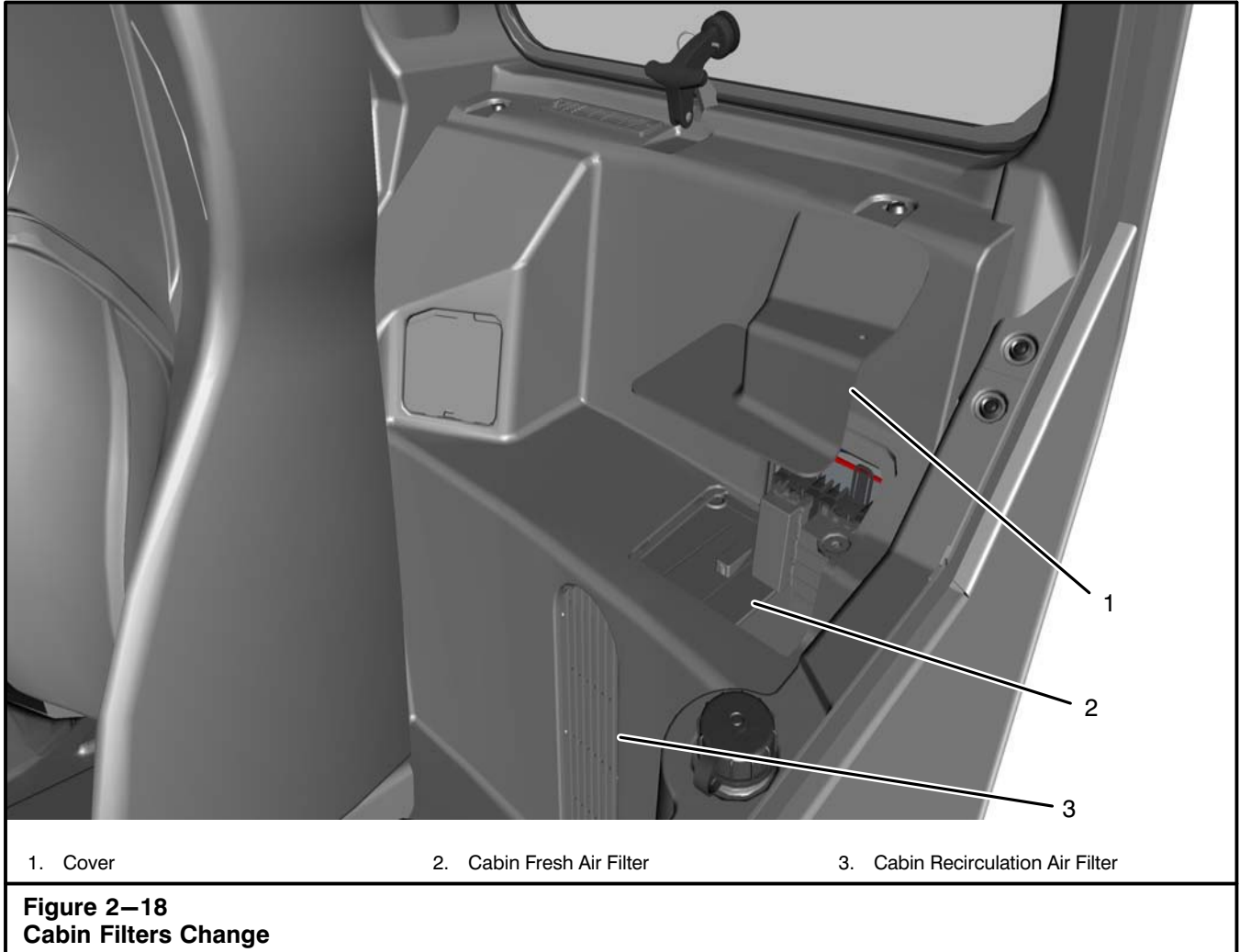
WARNING

Oil draining from the planetaries may be hot and could cause severe burns. Use caution when removing the plugs.

7. After thoroughly draining the oil, install the drain plug.
8. Fill the wheel ends with oil until it begins to flow from the check/fill hole. Refer to Figure 2-16. Refer to "Lubrication Specifications" in this section of this Operator's Manual for proper grade of oil.

Note: It is recommended that types and brands of oil not be intermixed because of possible incompatibility.

9. Clean and install the check/fill and drain plugs.
10. Properly dispose of used oil.



Cabin Fresh Air Filter Change

A cabin fresh air filter is located behind the seat in the operator's cab. The cabin fresh air filter must be checked monthly and changed at 6 month intervals.

1. Park the crane on a firm level surface, engage the park brake, and shut down the engine. Ensure the HVAC blower is turned off.
2. Remove the cover in the rear of the cab. Refer to Figure 2–18.
3. Remove the cabin fresh air filter and replace.
4. Install the cover.

Cabin Recirculation Air Filter Change

A cabin recirculation filter is located behind the seat in the operator's cab. The cabin recirculation air filter must be checked monthly and changed at 6 month intervals.

1. Park the crane on a firm level surface, engage the park brake, and shut down the engine. Ensure the HVAC blower is turned off.
2. Remove the six screws securing the cabin recirculation air filter to the HVAC unit. Refer to Figure 2–18.
3. Install the new cabin recirculation air filter and secure with existing six screws.

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Hydraulic Hose Assembly Inspection

The frequency of inspection and replacement of hose assemblies should be determined by the operating environment, the potential risk from a hose failure, and past experience of hose failures in the application and environment.



WARNING

Always wear safety glasses when working with or inspecting pressurized hose assemblies. Do not search for leaks by running your hand or finger along a hydraulic hose. Hot hydraulic oil, under high pressure leaking through a small pinhole in a hose, can puncture gloves, your skin, and penetrate several inches (*centimeters*) into soft body tissue causing serious personal injury.

A daily visual inspection is recommended for all hose assemblies in service.

1. Check all hose end fittings for cracks, crushing, corrosion, slippage on the hose, leakage, or any other damage.
2. Check all hoses for cracks, exposed reinforcement, chafing, bulging, loose covers, or any other damage.
3. Check the installation of all hose assemblies for any kinked, crushed, flattened, or twisted hoses.
4. Replace any damaged hose assemblies, hose end mating fittings, and seals as required.

Hydraulic Reservoir

The hydraulic reservoir is used to supply and store hydraulic oil needed to operate all hydraulic functions of the crane. The hydraulic reservoir, as shown in Figure 2–19, is equipped with a sight gauge for checking the oil level.

The filter housing can be accessed through the top of the reservoir. A hydraulic pressure sensor is installed in the filter chamber. If the filter element is bypassed, an indicator light  will illuminate and an alarm will sound in the operator's cab. Refer to Section 1 of this Operator's Manual. Drain any water from the hydraulic reservoir, check the oil level, and inspect the contamination indicator daily. Operating the crane with the oil level below the full mark or with the filter element bypassed can lead to hydraulic component failure. Refer to the following procedures when servicing the hydraulic reservoir.

Water Drain

Drain the water from the hydraulic reservoir daily before start-up. Contaminated oil will damage the systems hydraulic components.

1. Relieve any trapped hydraulic system pressure by loosening the filler/breather cap, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2–19.



WARNING

All trapped hydraulic pressure must be exhausted from the system before removing any plug or cover. A sudden release of hot oil could cause burns or other serious injury.

2. Loosen the water drain plug and allow the water to drain into a suitable container. The water drain plug is slotted and need not be completely removed to drain the water.
3. When a clean flow of hydraulic oil begins to drain from the water drain plug, tighten the plug.
4. Check the oil level in the hydraulic reservoir before beginning operation of the crane. Add oil if necessary. Properly dispose of the contaminated water.

Hydraulic Reservoir Oil Level Check

Check the oil level in the hydraulic reservoir daily before start-up. Operating the crane with the oil level below the full mark can lead to hydraulic component failure.

1. Park the crane on a firm, level surface, shift the transmission to neutral, and apply the park brake. Fully retract all hydraulic cylinders and shutdown the engine.
2. With the hydraulic oil cold (approximately 62°F 17 °C), check its level through the sight gauge on the front of the hydraulic reservoir. Refer to Figure 2–19. The proper level must be maintained at all times. Add hydraulic oil as necessary to bring the oil level between the “ADD” and “FULL” marks. Refer to “Adding Oil To The Hydraulic Reservoir” in this section of this Operator's Manual. Refer to “Lubrication Specifications” and “Link-Belt Preferred Hydraulic Oil” in this section of this Operator's Manual for the correct grade of oil. Do Not Overfill.

Adding Oil To The Hydraulic Reservoir

1. Park the crane on a firm, level surface, shift the transmission to neutral, and apply the park brake. Fully retract all hydraulic cylinders and shutdown the engine.
2. Relieve any trapped hydraulic system pressure by loosening the filler/breather cap, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2–19.

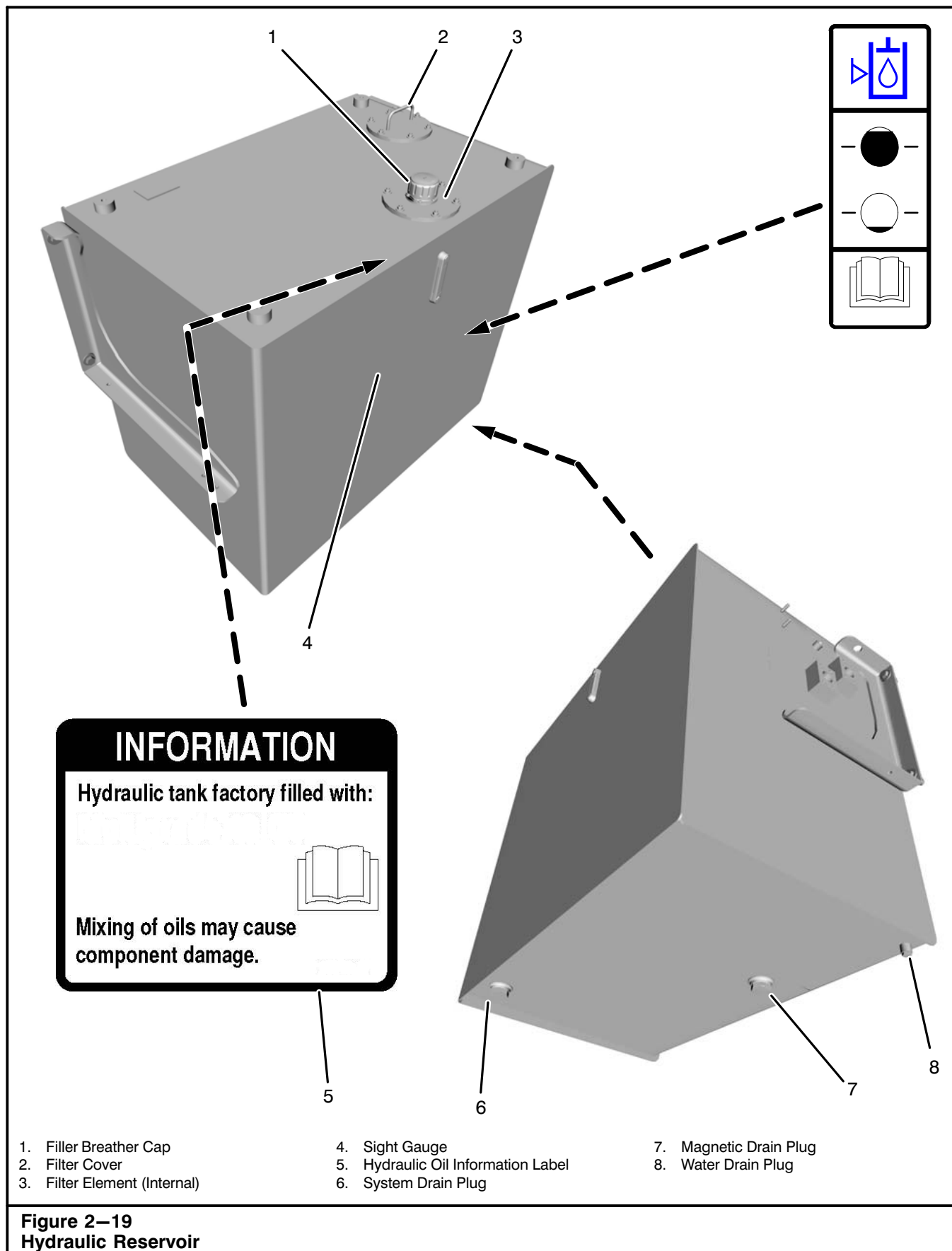


WARNING

All trapped hydraulic pressure must be exhausted from the system before removing any plug or cover. A sudden release of hot oil could cause burns or other serious injury.

3. Clean the top of the hydraulic reservoir and filler breather cap to prevent foreign material from entering the hydraulic system.
4. Remove the filler breather cap.
5. Add oil as required. Check the oil level. Refer to “Link-Belt Preferred Hydraulic Oil” and hydraulic oil information label (Figure 2–19) for proper oil grade.
6. Install filler breather cap.

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Hydraulic Reservoir Oil Change

The hydraulic reservoir oil should be changed to maintain proper hydraulic system operation. Refer to "Link-Belt Preferred Hydraulic Oil" chart for correct change interval. Change the hydraulic reservoir oil at the end of a working day when any foreign particles will be suspended in the warm oil. If this is not possible, cycle the crane until the oil is warm and proceed as follows:

1. Park the crane on a firm, level surface, shift the transmission to neutral, and apply the park brake. Fully retract all hydraulic cylinders and shutdown the engine.
2. Relieve any trapped hydraulic system pressure by loosening the filler breather cap, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2–19.



WARNING

All trapped hydraulic pressure must be exhausted from the system before removing any plug or cover. A sudden release of hot oil could cause burns or other serious injury.

3. Thoroughly clean the exterior surface of the hydraulic reservoir to prevent foreign materials from entering the system, once the access panels and filter housing are opened.
4. Remove the filler breather cap and pump the hydraulic oil into suitable containers. Refer to the Lubrication Chart to determine the volume of oil to be removed.

Note: If a pump is not available to remove the oil from the reservoir, place a suitable container under the system drain plug. Open the plug and drain one container full at a time, until the oil has thoroughly drained from the reservoir.

5. Remove the system and water drain plug.
6. Remove the bottom access panel, filter cover, and the filter element. Properly dispose of the filter element.
7. Clean any old gasket material from the access panel and hydraulic reservoir.
8. Clean the interior of the hydraulic reservoir with clean diesel fuel or kerosene.
9. Allow the diesel fuel or kerosene to drain into a suitable container until the hydraulic reservoir is thoroughly drained. Inspect the interior of the hydraulic reservoir for foreign material and wipe clean.
10. Clean and install the system and water drain plug.
11. Clean the filter housing. Install a new filter element.
12. Install the access panel using new gasket.
13. Using clean, uncontaminated oil, fill the reservoir through the filter element until it reaches the full mark by the sight plugs. Refer to "Link-Belt Preferred Hydraulic Oil" and hydraulic oil information label (Figure 2–19) for proper oil grade.
14. Install the filter cover.
15. Start the engine. Allow the engine to idle several minutes to ensure oil is being cycled properly. Check for any leaks.
16. Check the oil level in the hydraulic reservoir for proper level. Refer to "Hydraulic Reservoir Oil Level Check" in this section of this Operator's Manual. Add oil if necessary. Refer to "Adding Oil To The Hydraulic Reservoir" in this section of this Operator's Manual. Add oil if necessary. Properly dispose of the used oil.

Note: In case of hydraulic system component failure, a more thorough oil change procedure is required. Contact a Link-Belt Distributor for this procedure.

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Hydraulic Reservoir Filter Change

Change hydraulic reservoir filter element after the initial 50 hours of operation and every 500 hours of operation thereafter. Change the filter element immediately if the contamination indicator needle is in the red area.

1. Park the crane on a firm level surface. Shift the transmission to neutral, engage the park brake, and shutdown the engine.
2. Relieve any trapped hydraulic system pressure by loosening the filler breather cap, located on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2–19.



WARNING

All trapped hydraulic pressure must be exhausted from the system before removing any plug or cover. A sudden release of hot oil could cause burns or other serious injury.

3. Clean the top of the hydraulic reservoir and filter cover to prevent foreign material from entering the hydraulic system.

4. Remove the filter cover.
5. Remove the filter element and inspect it for contamination. Any dirt or foreign particles on the filter element may indicate excessive system contamination or imminent system component failure. Once the filter has been thoroughly inspected, dispose of it properly.
6. Install new filter element and reinstall filter cover.
7. Start engine and check the filter cover for leaks.
8. Check the hydraulic reservoir oil level. Refer to "Hydraulic Reservoir Oil Level Check" in this section of this Operator's Manual. Add oil if necessary. Refer to "Adding Oil To The Hydraulic Reservoir" in this section of this Operator's Manual.

Swing Speed Reducer Lubrication

Check the oil level in the swing speed reducer after every 40 hours of operation. The oil in a new or rebuilt swing speed reducer should be changed after the initial 250 hours of operation. Thereafter, change the oil with each 2,000 hours of operation or annually, whichever occurs first.

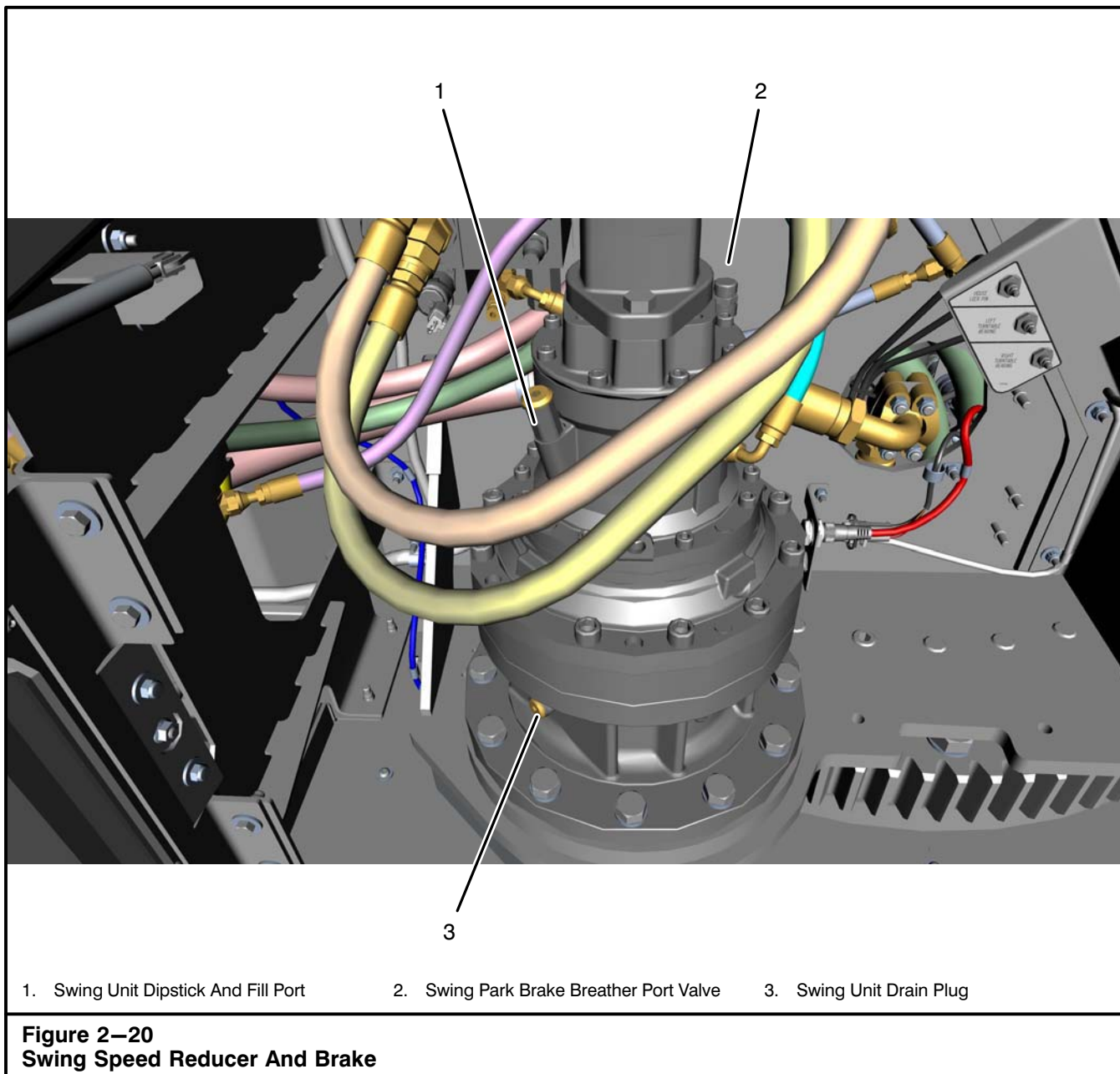
Swing Speed Reducer Oil Level Check

1. Park the crane on a firm, level surface. Shift the transmission to neutral, and engage the park brake.
2. Engage the travel swing lock and shutdown the engine. Refer to Figure 2–20.
3. Clean the speed reducer around the check/fill plug to prevent contamination from entering the system. Remove the check/plug.
4. Oil should be within 0.25 in (6mm) of the bottom of the threads. Add oil as required to bring the oil to the proper level. Refer to the Lubrication Specifications for the correct grade of oil.
5. Clean and install the check/fill plug.

Swing Speed Reducer Oil Change

1. Park crane on a firm, level surface, shift the transmission to neutral, and engage the park brake.
2. Level the crane on fully extended outriggers and swing the upper for several minutes, to agitate and warm the oil within the swing speed reducer.
3. Engage the travel swing lock, fully lower the boom, and shutdown the engine.
4. Thoroughly clean the exterior surface of the swing speed reducer around the dipstick and drain plug to prevent contamination from entering the unit. Refer to Figure 2–20.
5. Remove the dipstick and drain plug and allow the oil to drain into a suitable container. The drain plug is magnetic and should be inspected for large quantities of metal particles. After the initial oil change, this is a sign of damage or extreme wear within the unit, and a complete internal inspection may be necessary.
6. After the oil has thoroughly drained, clean and install the drain plug.
7. Fill the unit with oil through the dipstick port, until the oil is at the full line on the dipstick.
8. Clean and install the dipstick. Properly dispose of the used oil.

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Winch Drum(s) Lubrication

For maximum operating efficiency and service life of the winch drum(s), check oil level after every 40 hours of operation. The oil, in a new or rebuilt winch drum, should be changed after the initial 150 hours of operation. Thereafter, change oil with each 2,000 hours of operation or annually, whichever occurs first.

Winch Drum Oil Level Check

1. Park the crane on a firm, level surface, shift the transmission to neutral, apply the park brake, and shutdown the engine.
2. Wait at least 5 minutes after the last winch drum movement to check the oil level to allow the oil to settle in the winch drum. Observe the oil level within the sight gauge. Oil should be approximately midway in the sight gauge. Refer to Figure 2–21.
3. To add oil, rotate the drum until the fill/drain port and sight gauge are aligned with the alignment holes in the side support. Shutdown the engine. Fill the unit with oil through the fill/drain port, until oil is visible within the sight gauge. Add oil as required to bring the oil to the proper level. Refer to the “Lubrication Specifications” for the correct grade of oil.

Winch Drum Oil Change

1. Park the crane on a firm level surface, shift the transmission to neutral, engage the travel swing lock, and apply the park brake.
2. Cycle the winch for several minutes, without a load to agitate and warm the oil within the winch drum.
3. Rotate winch drum until the fill/drain plug is aligned with the fill alignment hole in the side support. Refer to Figure 2–21.
4. Engage the travel swing lock and shutdown the engine.
5. Thoroughly clean the exterior surface of the winch around the fill/drain plug to prevent contamination from entering the unit.
6. Remove the fill/drain.
7. Position a suitable container under the winch drum drain plug or the winch drum drain tube (front drum only).
8. Start the engine. Rotate the drum until the fill/drain port is in the drain position. Shutdown the engine and allow the oil to drain into a suitable container.
9. After the oil has thoroughly drained, start the engine and rotate the drum until the fill/drain port is aligned with the fill alignment hole in the side support. Shutdown the engine.
10. Fill the unit with oil through the fill/drain port, until oil is approximately midway in the sight gauge.
11. Clean and install the fill/drain plug. Properly dispose of the used oil.
12. Repeat procedure for the other winch drum if equipped.

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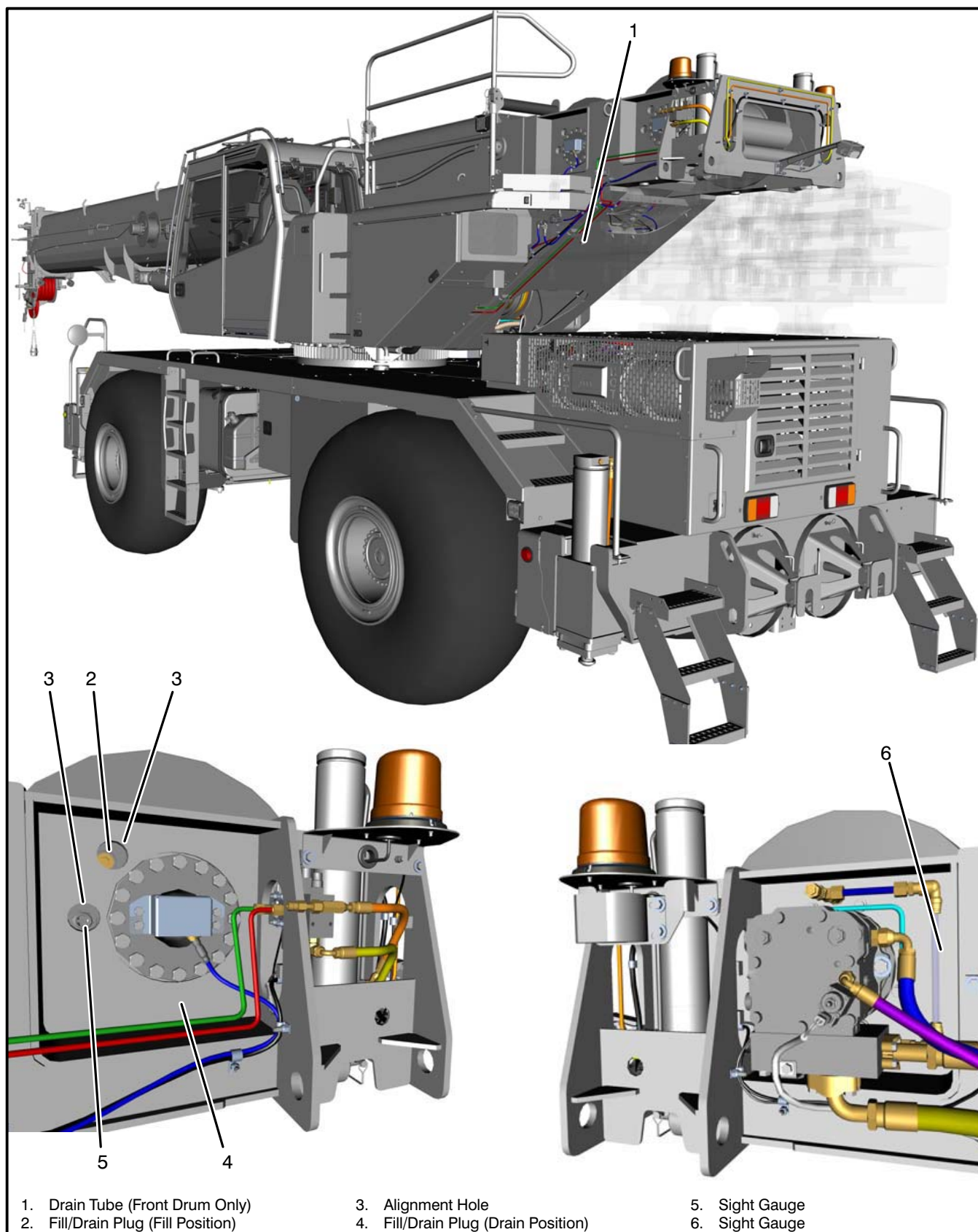


Figure 2–21
Winch Drum Lubrication

Boom Inspection & Lubrication



WARNING

To avoid personal injury, do not climb, stand, or walk on the boom or fly. Use a ladder or similar device to reach necessary areas.

Before putting hands or tools inside a boom section, ensure the engine is shutdown and operator has properly vacated the operator's cab. Movement of the boom could cause serious injury.

Do not use a crane that has a damaged boom. The structural integrity of the boom is lost and could collapse with any load. Use the crane only after the boom has passed a thorough inspection. Contact a Link-Belt Distributor for the proper inspection procedures.

To prevent movement of the individual boom sections, shutdown the engine and ensure that the operator has vacated the operator's cab before putting hands or tools inside the boom. Unexpected movement of the boom section could sever fingers, hands, arms, etc.

The boom wear shoes are equipped with teflon inserts that self-lubricate the boom. Therefore, the boom wear shoe areas require no lubrication. However, visually inspect all boom sections daily for damaged or cracked members or welds. If any dents, bends, cracked welds, etc. are found, do not use the crane. Contact a Link-Belt Distributor for repair procedures. Check for damaged or leaking hoses, fittings, valves, cylinders, etc. Repair as necessary. At 250 hour intervals, check all boom wear shoes for proper adjustment. See "Boom Wear Shoe Adjustment" in Section 3 of this Operator's Manual for further details. Inspect for wear on the wire rope deflector bar at the top front of each boom section. Reverse or replace the wear bars as required.

Inspect the inside of all boom sections and ensure the water drain hole at the bottom rear of each shell is clear of debris to allow water to drain properly from the boom every 250 hours, or 6 weeks.

Lubricate the boom hoist cylinder pins weekly.



Figure 2-22

Do not climb on boom or attachments.

Fly Inspection



WARNING

To avoid personal injury, do not climb, stand, or walk on the boom or fly. Use a ladder or similar device to reach necessary areas.

Do not use a fly which has been damaged. The structural integrity of the fly is lost and the attachment could collapse with any load. Use the fly only after it has passed a thorough inspection.

Inspect all parts of the fly daily. Pay particular attention to the chords and lattice. If any dents, bends, cracked welds, etc. are found, do not use the fly. Contact a Link-Belt Distributor for repair procedures.

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Wire Rope Lubrication

Inspect wire ropes daily to ensure they are not damaged.

Wire rope is like a machine. Each time a wire rope bends over a sheave or straightens from a slack position many wires move against each other. Lubrication is necessary to help prevent wear caused by this movement. Lubrication also helps prevent deterioration of wire rope due to rust and corrosion.



WARNING

Rusty wire rope is dangerous since there is no way to determine its remaining strength. Do not use rusty wire rope.

Most wire ropes are lubricated during manufacture, but the lubricant does not last the life of the wire rope. The lubricant is squeezed out of the wire rope as it runs over sheaves under tension, or is washed off by rain.

For the above reasons, wire rope **MUST BE** periodically lubricated. Crude or used oils and grease should not be used as lubricants because they may be grit or acid laden. Either of these conditions can cause damage to the wire rope.

No set rule can be given for lubrication frequency. This will depend on the type of conditions under which the wire rope is used.

A wire rope used in wet conditions would need to be lubricated more often than one used in dry conditions, to prevent rust and corrosion.

Lubricants used for wire rope lubrication should have the following properties:

1. They must have enough adhesive strength to stay on the wire rope.
2. They must be able to penetrate between the wires and strands.
3. They must have high film strength.
4. They must resist oxidation.
5. They must remain soft and pliable.

Application Of Wire Rope Lubricant

Wire ropes that have been in service should be cleaned before re-lubricating them. Use a wire brush and compressed air to clean the wire rope. All possible foreign material and old lubricant should be removed from the wire rope before re-lubricating it. Use one of the following methods to apply the lubricant.

1. Continuous Bath

Run the wire rope through a container filled with lubricant. A sheave mounted in the center of the container will hold the wire rope submerged as it passes through the container. Use swabbing to remove excess lubricant as the wire rope leaves the container.

2. Dripping

Place a container above a sheave so a spigot can be opened to drip oil on the wire rope as it passes through the sheave groove.

3. Swabbing And Painting

Two fast methods are swabbing the lubricant on with rags or painting it on with a brush.

4. Spraying

Light lubricants may be applied with a spray gun. Aerosol cans of lubricant are also available.

Hook Block, Hook Ball, And Swivel Inspection And Maintenance

1. All nuts, setscrews, pins, bolts, and retainers should be checked for tightness every 14 to 30 days, depending on the operating conditions and the product involved.
2. Inspect the components carefully at least once a month.

Swivels: Check for excessive gap distance between the rotating parts. Check threaded parts that are installed together to see that they are secure and tight. Check all setscrews to see that they are tight and staked.

Hook Blocks: Check all pins and bolts for tightness, spreading of side plates, weld cracks, sheave wear, bearing wear, spreading of hook, and that setscrews are tight and staked. Check that hook latch is operative.

Hook Balls: Check pin, nut, and washer to ensure ball halves are held securely together. Check locating pin for excessive wear. Inspect swivel parts as specified previously. Check that hook latch is operative.

3. If a swivel is constantly overloaded, it will cause damage to the unit. The first sign of damage is often bearing brinelling (dimpling of the bearing races). This condition is determined by spinning the swivel by hand. If the motion is rough or has a ratchet-like effect, the bearing has been damaged and should be replaced.
4. The distance between the swivel barrel and shank or rotating members are pre-set with a factory clearance of 0.020–0.050 in (0.5–1.2mm). If this distance increases more than 0.060 in (1.5mm) over the above distance, it is a good indication of bearing fatigue and the unit should be removed from service.

Item	Under Intermittent Operating Conditions	Under Continuous Operating Conditions
Swivels, Swivel Overhaul Balls, Swivel Balls	14 days	24 hours
Blocks with Bronze Bushed Sheaves	14 days	8 hours
Blocks with Roller Bearing Sheaves	14 days	24 hours

Chart A – Hook Block, Hook Ball, & Swivel Lubrication Frequency

Item	Frequency	What to Check For	Appropriate Action
Swivels	14 days under continuous operation 30 days under intermittent operation	End play or gap of more than 0.06 in (1.5mm) along the axis.	Remove from service immediately.
		Rough turning.	Defective bearing. Remove from service immediately.
		Elongated eye holes, bent clevis pins.	Indicates overload. Remove for repairs.
Sheaves	14 days under continuous operation 30 days under intermittent operation	Misalignment, as evidenced by wobble or uneven groove flange wear.	Indicates severe bearing wear. Remove from service. Check for wear in bronze spacers where used.
		Striations or corrugations in sheave groove.	Result of wire rope wear. If serious, replace.
Hook Latch	When Used	Missing, off center, bent, broken spring, or defective.	Replace immediately
Hooks	Daily or When Used	Permanent deformation or stretching.	An indication of overload. If serious, replace. Any suspicion of fractures calls for an immediate investigation and, if necessary, replacement of part.
		Crack or other defects.	Hooks should be tested at least once a year by magnafluxing, x-ray, or other qualified method. Intermittent tests can be conducted by a less accurate oil stain method.

Chart B – Hook Block, Hook Ball, & Swivel Inspection Frequency

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Turntable Bearing Capscrew Torque

Maintaining the proper torque on turntable bearing mounting capscrews is critical. If the bearing has been replaced, the crane undecked, or a turntable bearing capscrew is removed for any reason, the capscrew(s) must be replaced. Reuse of turntable bearing mounting capscrews is not allowed.

CAUTION

All turntable bearing capscrews use Loctite® 571 Pipe Sealant, or equivalent. The sealant or coating is used to protect the threads of the capscrews from rust and corrosion. Unprotected capscrews will not maintain the proper torque. Always use sealant or coating when installing turntable bearing capscrews.

Turntable Bearing Capscrew Inspection Schedule

Capscrews should be inspected and/or torqued after the initial 250 hours of operation of any new crane, if the crane has been undecked, or if any turntable bearing mounting capscrew has been replaced for any reason. Inspect and/or torque capscrews per the Turntable Bearing Capscrew Torque Inspection Schedule, therefore.

Use the minimal applicable torque 2,120 ft lb (2 875Nm) when checking the turntable bearing mounting capscrews. When checking the torque it is acceptable for the 7 capscrew to turn as long as the applicable torque is achieved.. If the applicable torque cannot be achieved, the capscrew must be replaced. Torque newly installed capscrews to the midpoint of the torque range: 2,120–2,335 ft lb (2 875–3 166Nm).

Turntable Bearing Capscrew Torque Inspection Schedule

Schedule	Interval	Requirements
A	500 Hrs	Perform an initial torque of the capscrews after the first 250 hours of operation of a new crane, or if the crane has been undecked for any reason, to establish capscrew torque baseline. Note: Use the minimum applicable torque value when checking.
		After the next 500 hours of operation, if any of the capscrew torques have degraded, tighten capscrews to the proper torque. Note: Use the minimum applicable torque value when checking.
		If the crane is utilized for duty cycle work, Schedule A must be continuously maintained during duty cycle applications.
		Inspection Schedule A must be maintained until such a time that no capscrews require tightening after 500 hours of operation. Schedule B can then be followed.
		The minimum applicable torque value is acceptable for the turntable bearing capscrew torque inspection.
B	Annually	If the capscrew torque has degraded at any annual check, Torque Inspection Schedule A must be followed until such time that no loss of capscrew torque is observed.
		The minimum applicable torque value is acceptable for the turntable bearing capscrew torque inspection.

Crane Monitoring System

Maintenance of the Rated Capacity Limiter System consists of the following daily inspection prior to the first operation:

1. Check that the system is operating normally as described in Section 1 of this Operator's Manual.
2. Check the electrical cables connecting the various parts of the system.
3. Check insulation on the boom reeling drum cable.
4. Check boom reeling drum cable for proper tension.
5. Check all anti-two block switches for freedom of movement.
6. Check that the anti-two block weights are installed and working properly with the anti-two block switches.
7. Inspect the pressure transducers and the connecting hoses for oil leaks.
8. Test that the function limiters activate properly by simulating a two-block condition. (Do this by manually lifting the ATB weight.)
9. Using a known test weight, check that the displayed weight agrees with the test load. The displayed load includes the hook block and/or hook ball and any lifting equipment such as slings, pins, shackles, etc.

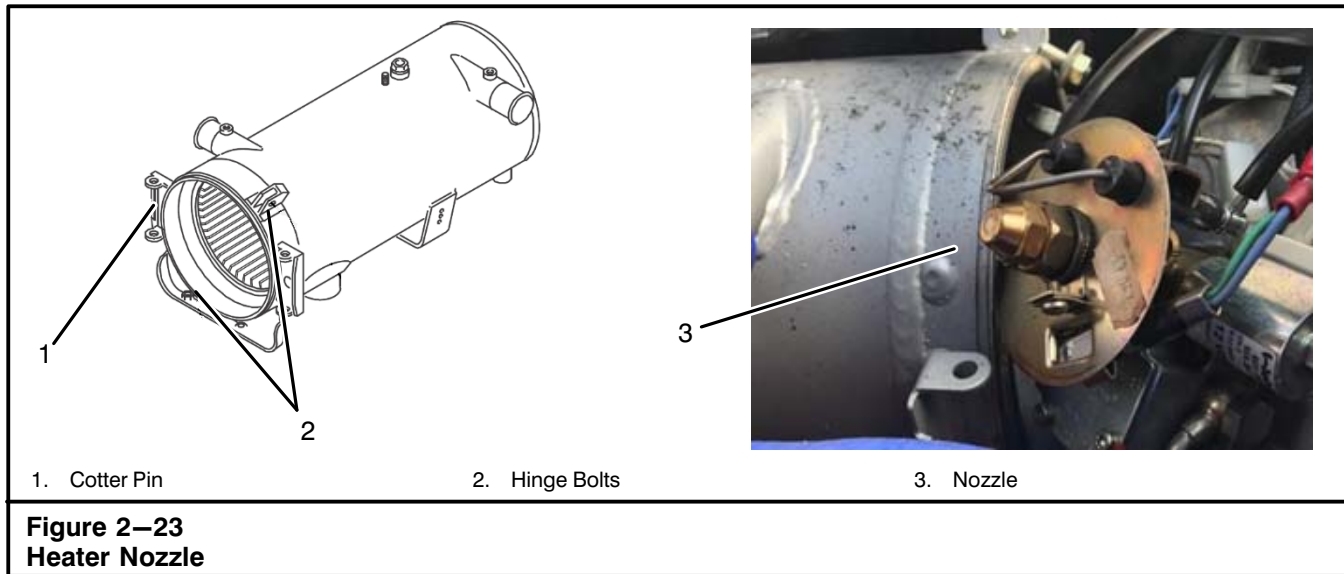
10. If crane capacities are rated for specific areas e.g. side, front, rear, check the system by swinging the boom into the permitted areas and checking that the rated capacity reading agrees with the crane capacities as listed in the Crane Rating Manual.
11. Check for erratic readings on the boom angle, the boom length, and the operating radius displays. Check the boom angle, boom length, and the operating radius for accuracy every 30 days.



WARNING

Any unusual or erratic system operation must be investigated and corrected immediately. If any problem is found with any of the above inspection steps, the problem must be corrected/repared as soon as possible. If necessary to continue crane operations, refer to "System Inoperative Or Malfunctioning" in Section 1 of this Operator's Manual.

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Arctic Weather System (If Equipped)

One spin-on type filter is used to remove contaminants from the fuel before they enter the heater assembly. Removal of contaminants is important for trouble-free operation and long life of the heater. Change the filter annually. Use the following procedure to replace the filter.

Fuel Filter Change

1. Park the crane on a firm level surface, engage the park brake and ensure the upper cab is facing the forward direction. Shift the transmission to neutral and shut down the engine. Ensure the heater is turned off.
2. Open the access door to access the heater enclosure and fuel filter.
3. Clean the area around the filter head.
4. Remove the filter from the filter head. Ensure seal ring does not stick to the filter head. Remove the smaller seal ring from the filter head.
5. Seal the center opening of the filter and fill with clean fuel through the outer openings.
6. Lubricate the new seals with clean fuel. Install the new filter by hand.

CAUTION

To prevent fuel leaks, confirm that the filter is installed tightly but do not over-tighten. Mechanical tightening will damage the filter.

7. The system will self-prime when the heater is turned on.
8. Properly dispose of contaminated fuel.

Nozzle Change

The heater contains a high-pressure fuel atomizer nozzle to direct a fuel spray into the combustion chamber. It is important that the nozzle is changed annually to prevent contaminants from accumulating at the opening of the nozzle. Use the following procedure to replace the nozzle.

CAUTION

Power must be removed from the heater to prevent the heater from turning on during maintenance.

Ensure heater is cool before replacing the nozzle.

Do not disturb ignition electrodes.

To change the nozzle:

1. Remove the capscrews and remove the cover from the heater enclosure.
2. Loosen the two hinge bolt nuts, remove the closest cotter pin and swing burner head open.
3. Remove the nozzle using 16mm and 19mm wrenches.
4. Replace nozzle and tighten to 15 ft-lbs.

Note: Operate the heater at least once a month for 20 minutes.

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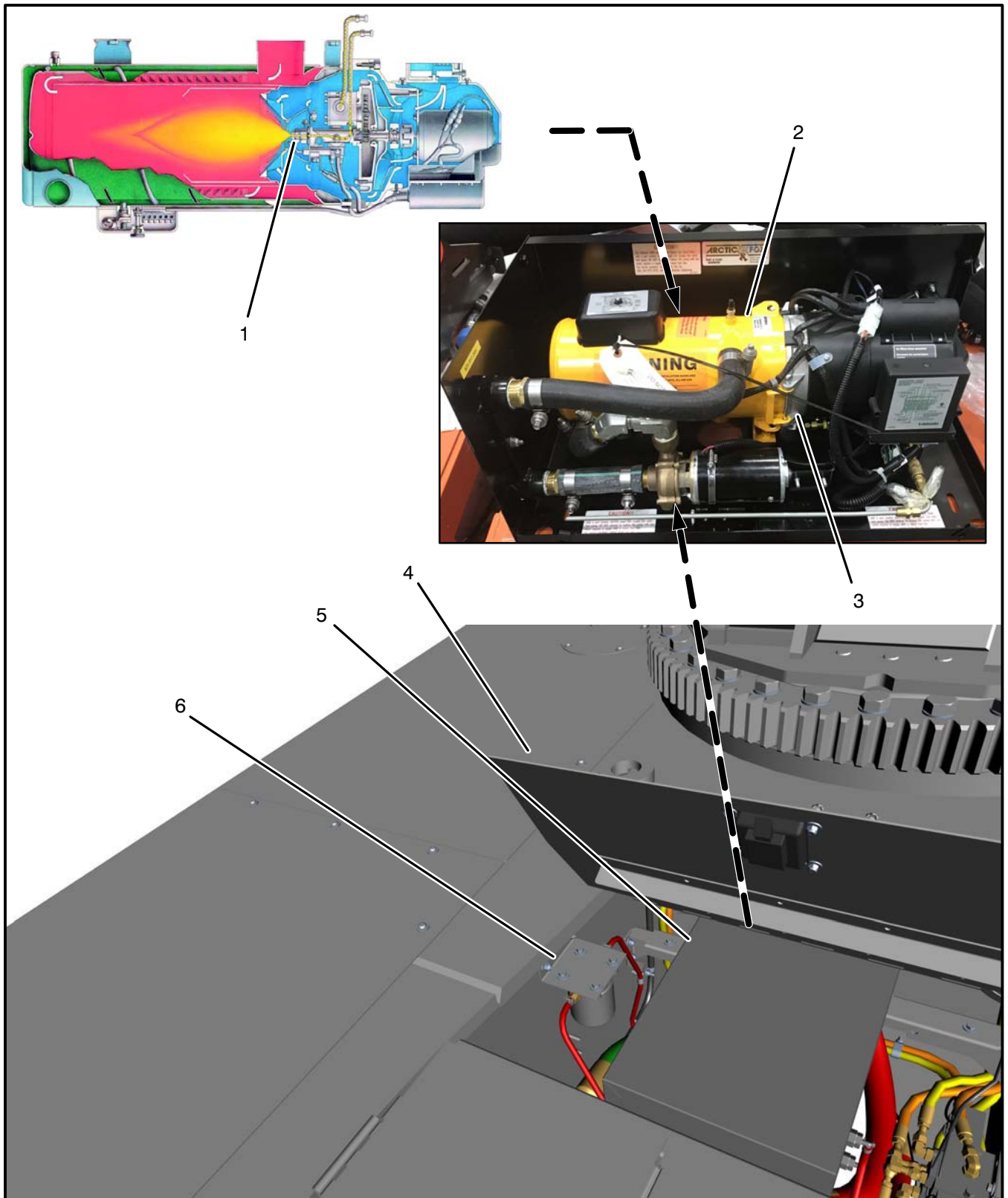


Figure 2–24
Arctic Heater (If Equipped)

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Paint Maintenance

Knowledgeable equipment owners realize the value of periodic preventative maintenance and responsible care. A regular surface care program should be followed to protect the equipment's paint finish and maintain a like-new appearance. There is no one correct/ultimate procedure since the uniqueness of every crane's operating environment and owner/operator maintenance habits differ. However, it is important to remove surface contaminants before they have time to bond or etch into the paint finish.

The crane has slip resistant areas to assist operators and service personnel with safe access/egress to/from the crane. Do not paint or wax slip resistant areas. Paint or wax will cause the slip resistant areas to become slick, reducing their effectiveness for safety while walking on the crane. If any slip resistant areas become ineffective due to wear, age, or destroyed in any way, it must be repaired.



WARNING

Do not apply paint or wax over slip resistant areas. Keep all slip resistant areas clean and free of all contaminants. All walking surfaces on the crane should be cleaned to eliminate any contaminants. Paint, wax, or other contaminants will reduce the effectiveness of the slip resistant area. Ineffective slip resistant areas can create unsafe access/egress to/from the crane leading to serious personal injury. Mask off and/or cover slip resistant areas prior to painting or waxing areas around any slip resistant area(s). Contact a Link-Belt Distributor for information regarding the repair of any slip resistant areas.

Regular Preventative Maintenance

1. Regular washing is the best way to remove surface contaminants.
2. Always use mild cleaners and soaps, and rinse thoroughly after washing. Do not use harsh detergents, such as household laundry detergents, or cleaners that contain phosphates, as they will "burn" the paint, strip off protective coating, diminish the gloss and accelerate the contamination process.

3. Periodic waxing will enhance the luster and protect the paint surface.

If environmental damage to the paint finish is detected (loss of some of its luster due to lack of or inability to maintain as recommended) the paint finish can be restored to near-new appearance by following a simple polishing and waxing procedure.

Polishing And Waxing Procedure

1. Clean surface thoroughly by hand washing or power washing with a mild detergent. Rinse thoroughly with water before buffing.
2. Apply a polishing compound, such as Meguiar's M8432, or equivalent, to a surface area approximately two feet (.6m) by two feet (.6m) at a time. Ensure the compound is applied liberally to entire area and work on only that area with the buffing wheel.
3. Buff surface with an electric or air buffer at 1,000 rpm using a 3M Superbuff polishing pad, or equivalent, with light to medium pressure until a uniform high gloss is obtained. Hand wipe with a clean cloth.
4. After surface has been buffed, apply a quality automotive wax such as Meguiar's M-26 Hi-Tech Yellow Wax, or equivalent, and hand buff until the cloth moves freely. The original luster of coating should be restored.

Cab Dash Cleaning

Care should be taken when cleaning the cab dash, especially the new polycarbonate dashes. If the incorrect cleaning agent is used, the finish of the material could be destroyed. It is recommended by the dash manufacturer that only the following materials be used for cleaning:

1. Soap and water
2. Denatured alcohol
3. Joy or Palmolive dishwashing liquids
4. Windex with Ammonia D
5. Formula 409
6. Fantastik
7. Mr. Clean

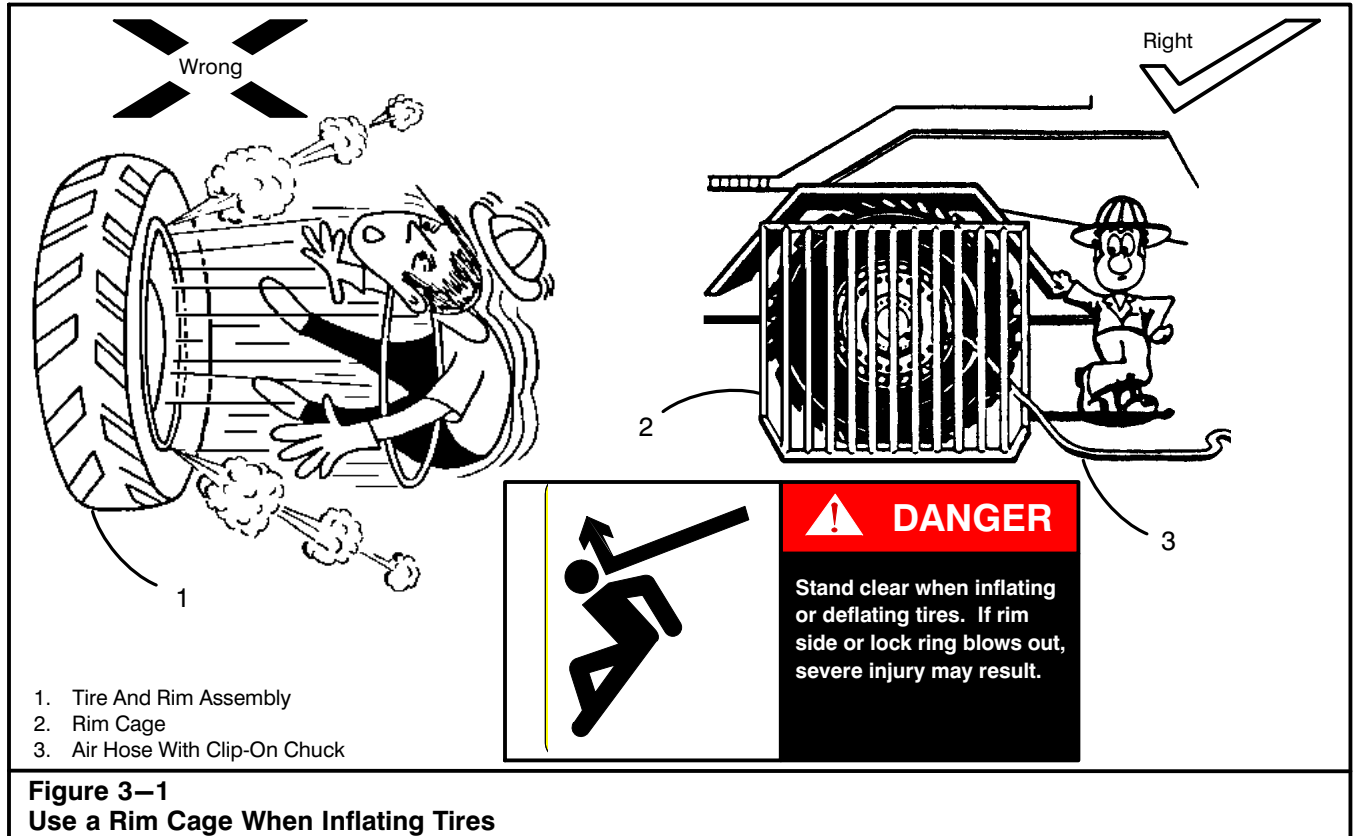
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Tire Inspection

Inspect the tire treads daily and remove any debris that may be wedged in the tire grooves. Check for nails, screws, glass, or anything that may penetrate the tire and permit air to leak from the tires. Check the side walls and treads for cuts, bulges, and other damage. If internal damage to any tire is suspected, have it demounted and checked. Make all necessary repairs or replace as required.

When replacing tires, all tires should be of the same manufacturer, size, type, load rating, and construction. Refer to the tire manufacturer and follow all recommendations regarding tire inspection and replacement.

**DANGER**

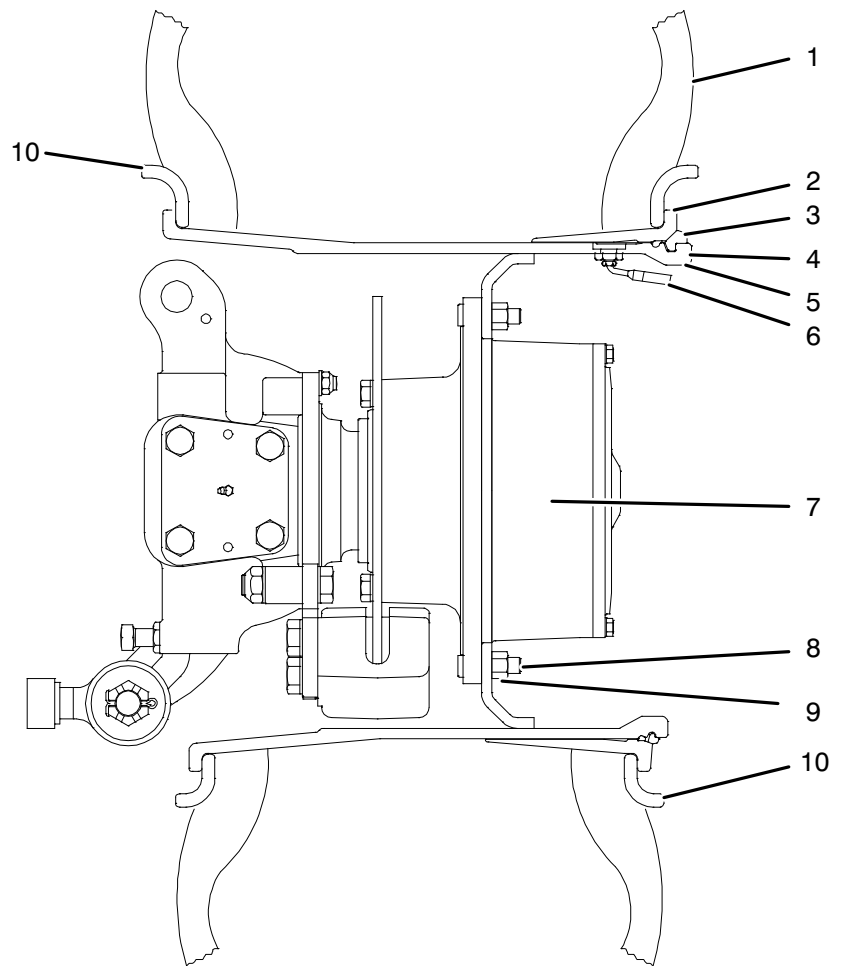
Use a rim cage when inflating tires. Lock ring or side flange may explode if damaged or improperly assembled. Always use a rim cage and stand clear of the tire while inflating it.

Tire Inflation

Check the tire inflation pressures daily when the tires are cold. Use the Tire Inflation Label or the Tire Inflation Chart in the Crane Rating Manual to determine the correct tire pressure for the type of operation being performed. This label contains recommended tire pressures for different operating conditions. A rim cage should be used when inflating tires to protect the mechanic and any bystanders from the danger of “rim explosion”. Improperly assembled or damaged rim components are subject to explode when tires are inflated. Refer to Figure 3—1.

Inspect the wheel rims, clamps, nuts, studs, etc., on a weekly basis. If any damage is apparent, repair or replace before operating the crane.

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1. Tire	4. Rim	7. Axle	9. Lug Nut
2. Bead Seat	5. O-Ring	8. Mounting Stud	10. Flange
3. Lock Ring	6. Valve Stem		

Figure 3–2
Typical Tire And Rim Assembly



DANGER

Servicing any tire and rim assembly can be extremely dangerous. For your protection, read and understand all safety instructions before removing or installing a tire and rim assembly.

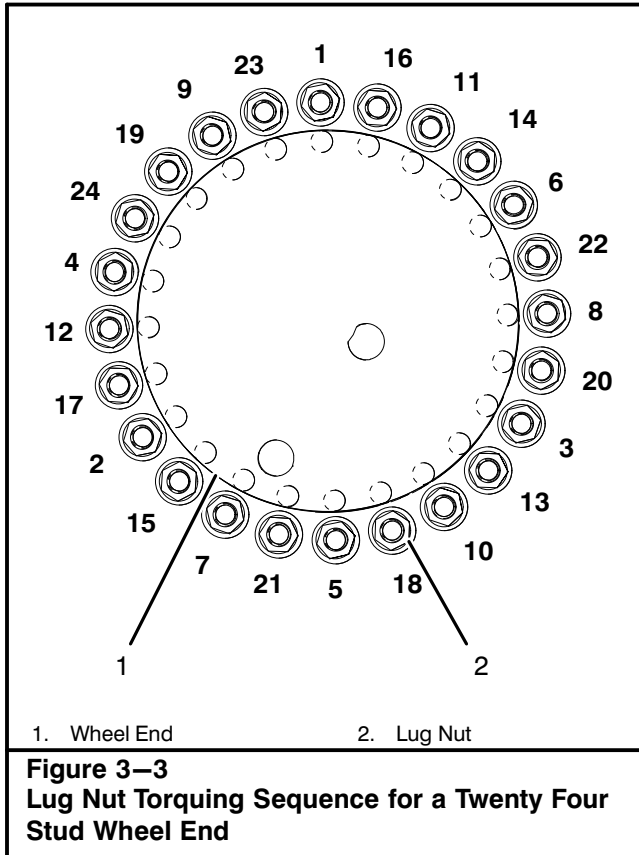
Tire And Rim Safety Instructions

1. Always remove the valve cores, and exhaust all air pressure from the tire, prior to removing it. Rim components are under extreme pressure and could fly off.
2. Use a rim cage and stand clear when deflating and inflating tires. A damaged or misassembled rim assembly may burst. The operator should stand well away from the potentially explosive force.

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3. After deflating the tire, check the valve stem by running a piece of wire through the stem, to ensure it is not clogged and the tire is completely deflated. Ice may form as the air leaves the tire or foreign material may clog the stem.
4. Do not reinflate a tire that has been run flat or extremely under inflated. Demount the tire and inspect it, the rim components, and wheel end for damage. These components may have been damaged or dislocated during the time the tire was under inflated.
5. Clean and inspect parts prior to assembly. Do not use bent, worn, damaged, or rusted parts.
6. When assembling the tire and rim assembly, use only parts of the same type, manufacturer, and correct size. Mismatched parts may appear to fit but when the tire is inflated they may fly apart with explosive force.
7. Always ensure that rim components are properly installed before inflating the tire. Misassembled parts could fly off during inflation.
8. When inflating a tire, use a air hose with a clip-on chuck and in-line pressure gauge. Ensure the air hose is long enough, to permit the person inflating the tire, to stand clear of the rim cage.
9. Inflate the tire to 10 psi (68kPa), and check the rim components for proper fit, before completely inflating. If the assembly is not correct, completely deflate the tire and correct the problem. Do not hammer on an inflated tire and rim assembly. Properly matched and assembled rim components will seat without tapping.
10. Once it is determined that the tire and rim are properly assembled, inflate the tire to the pressure listed on the Tire Inflation Label or the Tire Inflation Chart in the Crane Rating Manual. Do not over inflate the tire.
11. Always check rims and wheel ends for damage during normal tire inspection. Early detection of potential component failure may prevent serious injury.
12. Do not attempt to rework, weld, heat, or braze any damaged rim components. Heating may weaken the part and result in complete failure of the component and possible personal injury.

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Tire And Rim Removal And Installation

Carefully read and understand the safety instructions in this Section of this Operator's Manual before servicing the tire and rim assemblies.



DANGER

Servicing any tire and rim assembly can be extremely dangerous. For your protection, read and understand all safety instructions before removing or installing a tire and rim assembly.

Removal

1. Properly park the crane and engage the park brake. Level the crane on outriggers with all tires clear of the ground. Shutdown the engine.
2. Position a rim cage in front of the tire and rim assembly before deflating the tire.



DANGER

Exhaust all air pressure from the tire before removing it. Use a rim cage and stand clear when deflating a tire. Rim components are under extreme pressure and may fly off. Failure to exhaust air pressure, or use a rim cage, could result in a fatal accident.

3. Carefully remove the valve core from the valve stem (6). Refer to Figure 3—2. Allow the air pressure to exhaust from the tire (1). Install the valve core back in the valve stem. Remove the rim cage.
4. Remove all but four of the lug nuts (9) from the mounting studs (8). The four remaining lug nuts should be equally spaced around the rim (4).
5. Properly support the tire and rim assembly with an appropriate lifting device.
6. Remove the remaining lug nuts (9) from the mounting studs (8).
7. Carefully remove the tire and rim assembly from the axle (7).

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Installation

Correct installation and tightening of the tire and rim assembly is one of the most important operations in tire and rim maintenance. When tire or rim problems occur, incorrect installation and tightening procedures are usually found to be the cause of the problem. The following procedures must be carefully followed to ensure safe and dependable service.

1. Check the tire (1) to ensure it is completely deflated. Refer to Figure 3–2. Inspect the flanges (10), bead seat (2), o-ring (5), lock ring (3), and rim (4) for damage and proper assembly.



DANGER

All air pressure must be exhausted from the tire before installing it. An inflated tire may cause improperly assembled rim components to fly off. Failure to deflate the tire could result in a fatal accident.

2. Thoroughly clean the mounting surfaces of the rim (4) and axle (7). Remove any dirt, rust, excess paint, or other foreign materials. Also clean, but do not lubricate, the lug nuts (9) and mounting studs (8).
3. Properly support the tire and rim assembly with an appropriate lifting device. Lift the tire and rim assembly and carefully position it on the axle (7).
4. Install the lug nuts (9) on the mounting studs (8). Tighten the lug nuts evenly to ensure the rim (4) is properly seated on the axle (7).
5. Tighten the lug nuts (9) to 225 ft lb (305Nm). See Figure 3–3 for the proper torquing sequence.
6. Repeat the proper torquing sequence and tighten the lug nuts (9) to their final recommended torque value of 450–500 ft lb (610–678Nm).

CAUTION

Using improper torque values or torque procedure can cause distortion, slippage, or misalignment of the tire and rim assembly.

7. Properly position a rim cage in front of the tire and rim assembly.



DANGER

Use a rim cage and stand clear when inflating tires. Rim components are under extreme pressure and may fly off. Failure to use a rim cage could result in a fatal accident.

8. Inflate the tire to the pressure specified on the Tire Inflation Label or the Tire Inflation Chart in the Crane Rating Manual.
9. Start the engine, fully retract the outrigger jacks and beams, and drive the crane approximately 1 mile (1.6km). Tighten the lug nuts again to their final recommended torque value of 450–500 ft lb (610–678Nm) using the proper torquing sequence (Figure 3–3).

Note: Each time a tire and rim assembly is installed the lug nuts should be retightened to the recommended torque value after the initial 10 hours of operation. Check the lug nut torque every 100 hours of operation and every 500 hours of operation thereafter.

Brake Adjustments

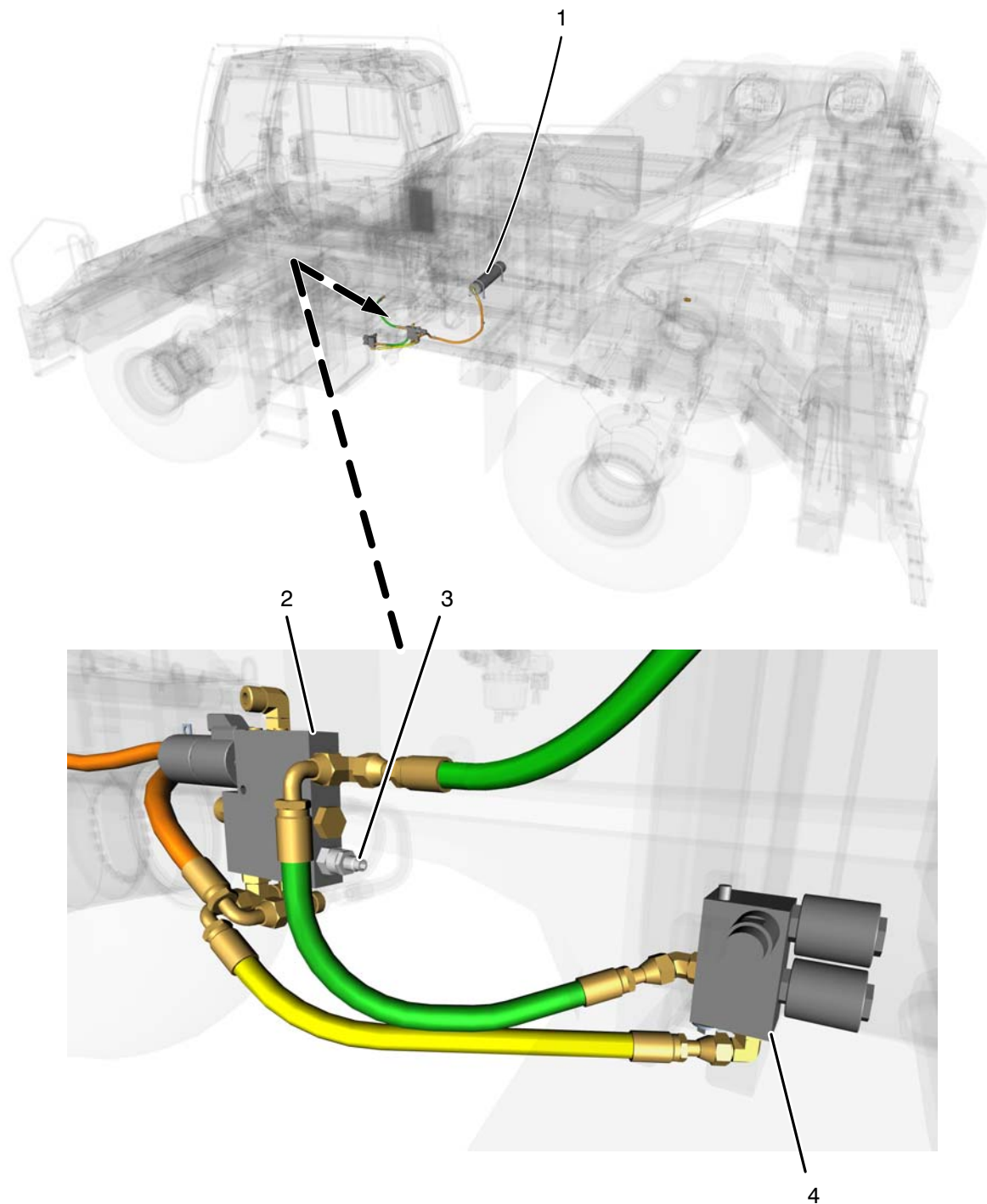
The crane is equipped with disc brakes which have an automatic adjustment system. Therefore, the brakes should not require any adjustment. However, the brake linings should be periodically inspected for wear and replaced as required.



WARNING

Brake linings wear and leave a “dust” in the area of the brakes. This “dust” can be hazardous. Wear a mask while working with brake linings to prevent breathing the “dust”.

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- 1. Hydro-gas Accumulator (If Equipped)
- 2. Suspension Height Adjustment Valve

- 3. Needle Valve
- 4. Hydro-gas Valve (If Equipped)

Figure 3–4
Axle Suspension Hydraulic System

Axle Suspension System

The axle suspension system is provided to improve crane stability. It also improves four wheel contact with the ground when traveling over rough terrain.

The front axle is rigidly bolted to the carrier frame. The rear axle is suspended on hydraulic cylinders with motion of the axle controlled by a four link suspension system. Two hydraulic cylinders are connected between the axle and carrier frame that allows an oscillation of the rear axle when the upper is over the front of the carrier.

When performing crane operations over the side on tires, a rigid rear axle suspension is needed to increase crane stability. Therefore, check valves are included in the rear axle suspension circuit to "lock" the rear axle frame when operations are performed other than over the front. When the upper is rotated to a position other than directly over the front, these check valves are shifted to the "locked" position. This system is automatically activated by rotating the upper.

The crane may be equipped with a hydro-gas suspension which includes an accumulator and additional solenoid operated check valve in the suspension hydraulic circuit to provide a smoother ride.

The suspension should be checked and adjusted on a daily basis. It also must be checked and adjusted prior to traveling the crane especially pick and carry operations. Refer to Figure 3—4.

CAUTION

Do not travel the crane with the axle oscillation cylinders fully extended or fully retracted. Major damage to suspension components can occur if the crane's oscillation suspension is not properly adjusted. Oscillation cylinders which are not properly adjusted can leave suspension components unprotected from shock loads which can lead to major crane damage. Inspect the axle oscillation cylinders daily for the proper adjustment as required.

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Suspension Check And Adjustment

1. Park the crane on a firm level surface, shift the transmission to neutral, and apply the park brake.
2. Position the upper directly over the front of the carrier, boom fully retracted at 0 degree angle, and the travel swing lock engaged.
3. Measure the non painted rod length on the left and right suspension cylinder. The sum of the exposed rods should equal 4 in $\pm$ 0.125 in (10cm $\pm$ 0.3cm). If suspension cylinders are not within specification proceed to the next step.
4. If any part of the suspension hydraulic system has been disassembled, bleed the oscillation system. If not, go to step 5.
 - a. Level the crane on fully extended outriggers with all tires clear of the ground.
 - b. Loosen the jam nut and ensure the needle valve located on the solenoid adjust valve is open. Tighten jam nut.
 - c. Push the Suspension Extend switch located in the power panel to the extend position and fully extend the suspension cylinders.

Note: The tires must be off the ground in this position.

- d. Push the Suspension Retract switch located in the power panel to the retract position and fully retract the suspension cylinders with engine at idle.
- e. Push the Suspension Extend switch located in the power panel to the extend position and fully extend the suspension cylinders.
- f. Push and hold the Suspension Retract switch with the engine at idle and use the lower bleeder valves on both suspension cylinders to remove all of the air out of the retract sides.

Note: The suspension cylinders should remain in the fully extended position for this bleeding process even though oil is being supplied to the retract sides of the suspension cylinders.

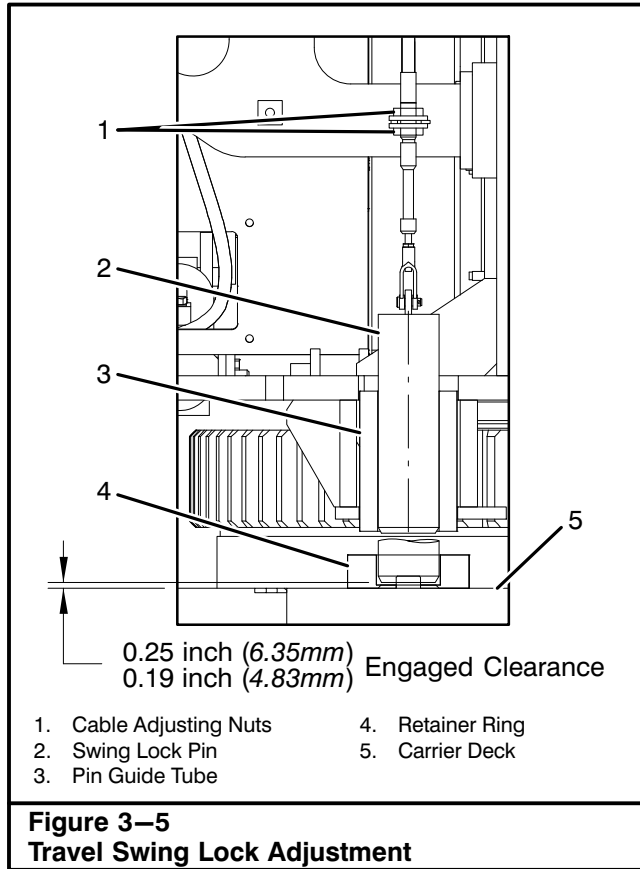
- g. Release the Suspension Retract switch and lower the crane on tires.
- h. Push the Suspension Retract switch to the retract position with the engine at idle and retract the suspension cylinders.
- i. Push and hold the Suspension Extend switch to the extend position with the engine at idle and use the upper bleeder valves on both suspension cylinders to remove all air out of the extend side of each cylinder. Also, if equipped bleed the hydro-gas accumulator.

Note: The suspension cylinders should remain in the retracted position for this bleeding process even though the valve is in the extend position.

- j. If equipped, bleed the Hydro-Gas suspension accumulator.
- k. Close the needle valve and tighten jam nut.
5. With the crane on a firm level surface and on tires, push the Suspension Extend switch to the extend position.
6. Extend the suspension cylinders until the measured sum of the exposed rod equals 4 in $\pm$ 0.125 in (10cm $\pm$ 0.3cm).

Note: Do not retract suspension cylinders to obtain the measured sum of the exposed rods.

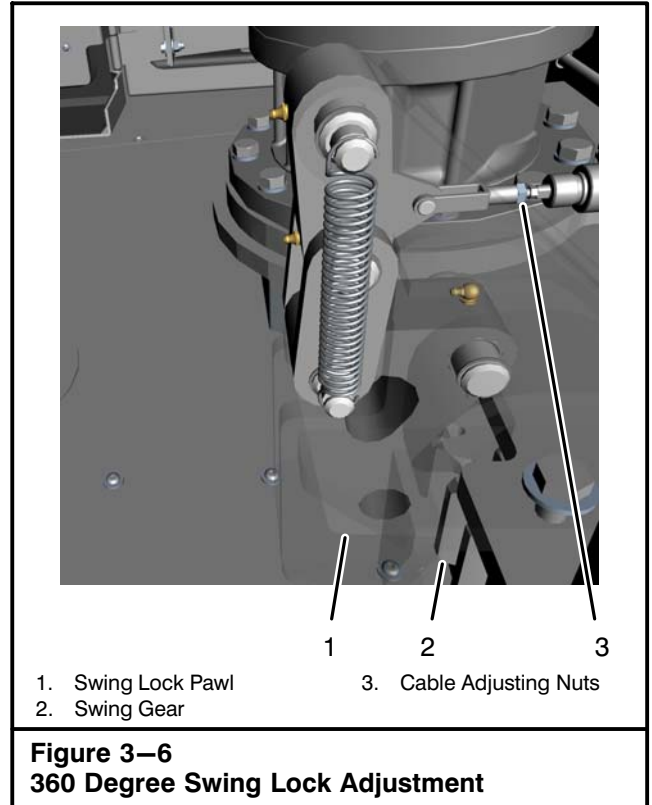
7. Measure the non-painted rod length on the left suspension cylinder. Length should equal approximately 2 in (5cm).
8. Measure the non-painted rod length on the right suspension cylinder. Length should equal approximately 2 in (5cm).



Travel Swing Lock Adjustment

The travel swing lock is a two position, positive lock of the upper over the carrier to prevent swinging of the upper. For the travel swing lock to operate properly, it must be adjusted correctly.

1. Park the crane on a firm level surface. Shift transmission to neutral and engage the park brake. Level the crane on outriggers.
2. Check that the travel swing lock is engaged and shutdown engine. Refer to Figure 3-5.
3. Check the engagement of the swing lock pin in the retainer ring on the carrier deck. The pin should extend in the retainer plate to within .25 inch (6.35mm) of the carrier deck.
4. Adjust the stroke of the swing lock as required by using the cable adjusting nuts.
5. Test the swing lock in each working position before operating the crane.



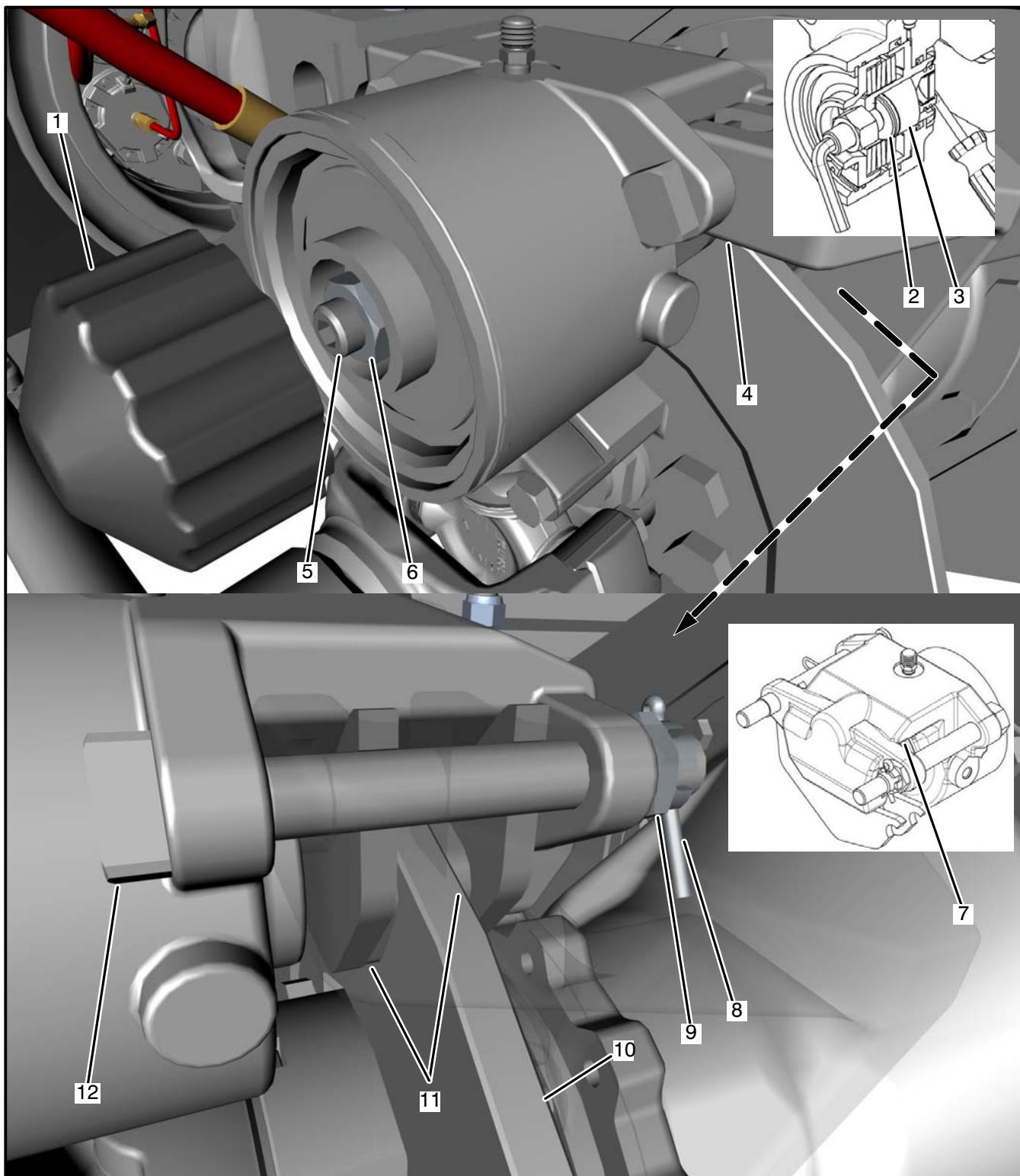
360 Degree Swing Lock (If Equipped)

The 360° swing lock, if equipped, functions to prevent rotation of the upper over the carrier by engaging a pawl in the external swing gear teeth. For the swing lock to operate properly it must be adjusted correctly.

360° Swing Lock Inspection And Adjustment

1. Park the crane on a firm, level surface, shift the transmission to neutral, and apply the park brake. Level the crane on outriggers.
2. Engage the travel and 360° swing locks. Shutdown the engine.
3. Visually inspect the 360° swing lock pawl. The pawl should be fully engaged with the linkage just over center. Refer to Figure 3-6.
4. If the pawl is not fully engaged and the linkage is not just over center, use the cable adjusting nuts to correctly position it.
5. Tighten the adjusting nuts and test the 360° swing lock before operating the crane.

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1. Screw Cap	4. Mounting Bracket	7. Permanent Magnets	10. Brake Disk
2. Piston	5. Setscrew	8. Lock Pin	11. Brake Pads
3. Thrust Bolt	6. Coupling Nut	9. Castle Nut	12. Capscrew

Figure 3—7
Park Brake Check And Adjustment

Park Brake

Check And Adjustment

Park brake wear can cause reduced holding capability and lead to unintentional movement of the crane. The total running clearance should be checked annually to ensure proper operation. Park brake wear pads should be visually inspected at regular intervals, the intervals should not exceed six months. Refer to Figure 3–7.

1. Park the crane on a firm, level surface and level the crane on outriggers.
2. Shift the transmission into neutral, release the park brake, and run the engine at idle.



WARNING

With park brake released and engine running, rotation of drive shafts and tires may occur. Keep body parts and clothing away from rotating components. Failure to do so could result in serious personal injury.

3. Measure the brake pad thickness. If the measurement is less than 0.079" (2.00mm) continue to Step 4 to replace the brake pads. If the measurement is greater than 0.079" (2.00mm), skip to Step 6 to adjust the running clearance.

Brake Pad Replacement

4. Remove the wear pads as follows:
 - a. Remove the screw cap.
 - b. Loosen the coupling nut and tighten the setscrew until it is flush with the inside of the piston.
 - c. Use a screwdriver to press back the thrust bolt until it makes contact with the piston.
 - d. Remove the lock pin and castle nut from one of the capscrews.
 - e. Remove the capscrew. Disengage the brake pads from the other capscrew and remove the brake pads.
5. Install the wear pads as follows:
 - a. Engage the brake pads on the installed capscrew, on either side of the brake disk. Lift the brake pads and install the remaining capscrew. Engage the brake pads with the capscrew.
 - b. Ensure the permanent magnets sufficiently hold the brake pad plates. Replace the permanent magnets, as required.
 - c. Install the castle nut and lock pin on the capscrew.
 - d. Install the screw cap.
 - e. Adjust the park brake running clearance.

Running Clearance Adjustment

6. Measure the distance between the brake pads and the brake disk. If the measurement is greater than 0.12" (3.00mm) or less than 0.04" (1.00mm), adjust the running clearance.
7. Remove the screw cap.
8. Loosen the coupling nut and tighten the setscrew until both brake pads are clamped onto the brake disk.
9. Back out the setscrew 4/5 turn to achieve a running clearance of 0.079" (2.00mm) between each brake pad and the brake disk.
10. Hold the setscrew in position and secure by tightening the coupling nut.
11. Install the screw cap.
12. Actuate the brake valve several times. Ensure the park brake brakes efficiently on a slope before continued use.

Emergency Release

In some circumstances, the park brake may need to be released while hydraulic pressure is unavailable. Under these circumstances, the park brake must be manually released. Refer to Figure 3–7.

1. Park the crane on a firm, level surface and level the crane on outriggers, or properly secure the crane to prevent it from rolling.



DANGER

The park brake will not function when manually released. Ensure the crane is properly secured to prevent the crane from rolling. Before placing the crane into service, properly adjust the park brake.

2. Remove the screw cap.
3. Loosen the coupling nut. Loosen the setscrew until tension is released from the brake disk.
4. Tighten the coupling nut.
5. Install the screw cap.
6. Before putting the crane back into service, adjust the running clearance. Refer to Check And Adjustment in this section of this Operator's Manual.

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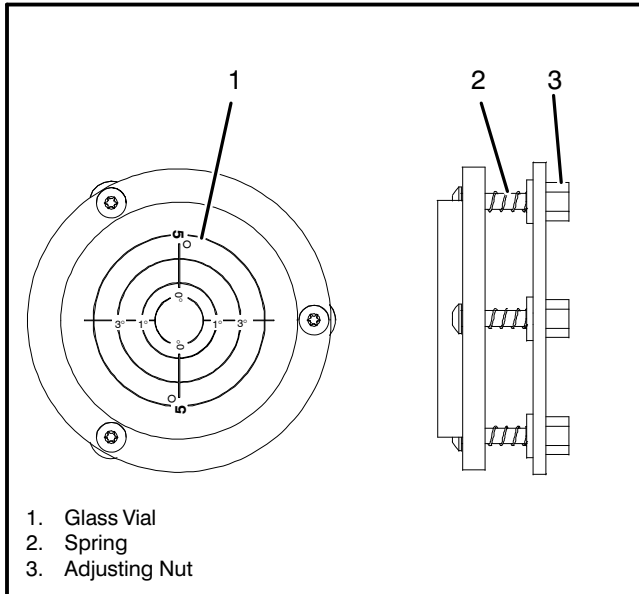


Figure 3-8
Bubble Level Adjustment

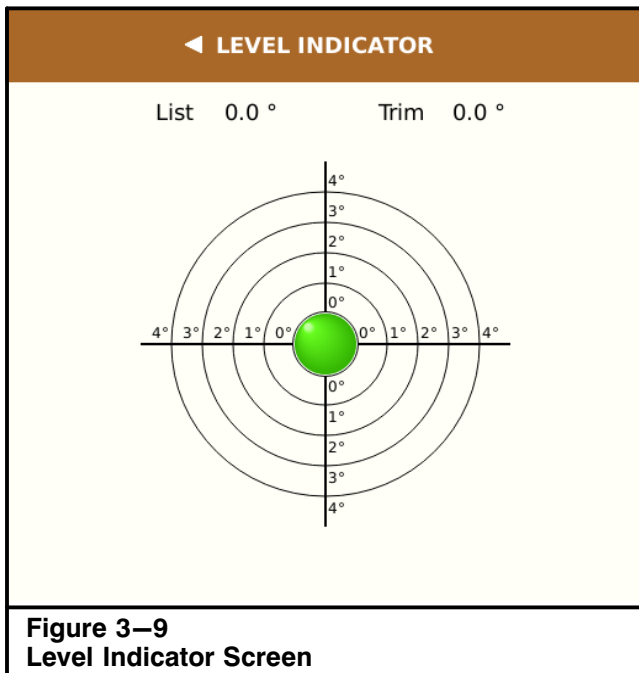


Figure 3-9
Level Indicator Screen

Bubble Level Adjustment

A bubble level, for leveling the crane on outriggers, is mounted on the front of the upper frame. It should be checked periodically to ensure proper adjustment.

1. Park the crane on a firm level surface, shift the transmission to neutral, and engage the park brake.
2. Level the crane on fully extended outriggers. Position the upper over the front of the carrier and engage the travel swing lock. Fully retract the boom. Boom down to 0° angle.
3. Verify the crane is level by placing a carpenter's level across the front of upper frame. Check levelness with the upper over the rear and over the side of the crane. Adjust the outriggers as necessary.
4. Rotate the adjustment nuts as required until the bubble is centered within the vial. Refer to Figure 3-8.

Note: Do not flatten out the springs under the bubble level. Loosen rather than overtighten the adjustment nuts to gain the necessary adjustment.

5. Once the bubble level is adjusted, verify the level indicator screen on the pulse crane control system display indicates a level reading. Refer to "Level Indicator" in Section 1 of this Operator's Manual to navigate to the level indicator screen. If the level indicator screen is not indicating that the crane is level, the inclinometer must be calibrated. Contact your Link-Belt distributor to calibrate the inclinometer. Refer to Figure 3-9.

Rated Capacity Limiter

A properly calibrated Rated Capacity Limiter is critical for safe crane operation. The boom angle and length are crucial factors in determining crane capacities. The Rated Capacity Limiter must be checked for accuracy on a daily basis and calibrated as needed. Refer to "Crane Monitoring System" in Section 2 of this Operator's Manual for the daily check list for the system.

The Rated Capacity Limiter should be calibrated by a qualified technician only. Contact a Link-Belt Distributor to arrange for a qualified technician to perform the calibration procedures.

Hydraulic System: Adjusting And Checking Circuit Pressures

The following instructions pertain to checking and setting all relief valve pressures in the hydraulic system. All cranes are tested and properly adjusted before leaving the factory and should not need checking when first put into operation. Each 250 hours of operation, the relief valve pressure settings should be checked. A drop in relief valve pressure setting may be noticed the first time checked. This is normal and is probably due to lessening of spring tension or stress relief in relief valve parts.

If a new or rebuilt pump is installed, all relief valve pressures must be backed off and reset, as outlined in this section of this Operator's Manual before putting the crane back in operation. The purpose of this is to avoid the possibility of damaging the new pump from over pressurization if relief valves are set incorrectly. Do not operate the crane over relief pressures for extended periods of time to avoid overheating of hydraulic oil.



DANGER

When it is required to operate the crane during maintenance and/or adjustments, use extreme caution as service personnel may have to work near and/or under moving machinery. Serious personal injury and/or death may result. Always remain in visual and/or verbal contact to ensure the safety of service personnel. Use a signal person if necessary.

CAUTION

Relief valves are provided to protect the hydraulic system. Do not increase relief valve pressures above specifications or hydraulic system damage may occur.

General Instructions For Checking Hydraulic Circuit Pressures

Refer to Figure 3–11 and Figure 3–12 for circuit pressure values and adjustment locations.

1. Park the crane on a firm level surface. Position the upper directly over the front or rear of the lower and engage the travel swing lock.
2. Operate the hydraulic functions as required to bring the hydraulic oil temperature to its normal operating range. Refer to Section 2 of this Operator's Manual for oil operating temperature ranges.
3. Fully retract and lower the boom. Shutdown the engine.
4. Use a gauge of known accuracy. Have the gauge calibrated if necessary. Use a snubber or gate valve to reduce shock loading in the gauge.
5. Release the hydraulic system precharge pressure by loosening the breather/filler cap on the hydraulic reservoir 1/4 turn until pressure is fully relieved.
6. Turn the ignition key to the "ON" position but do not start the engine and work the control or switch, for the circuit being checked, back and forth to relieve any trapped hydraulic pressure.



WARNING

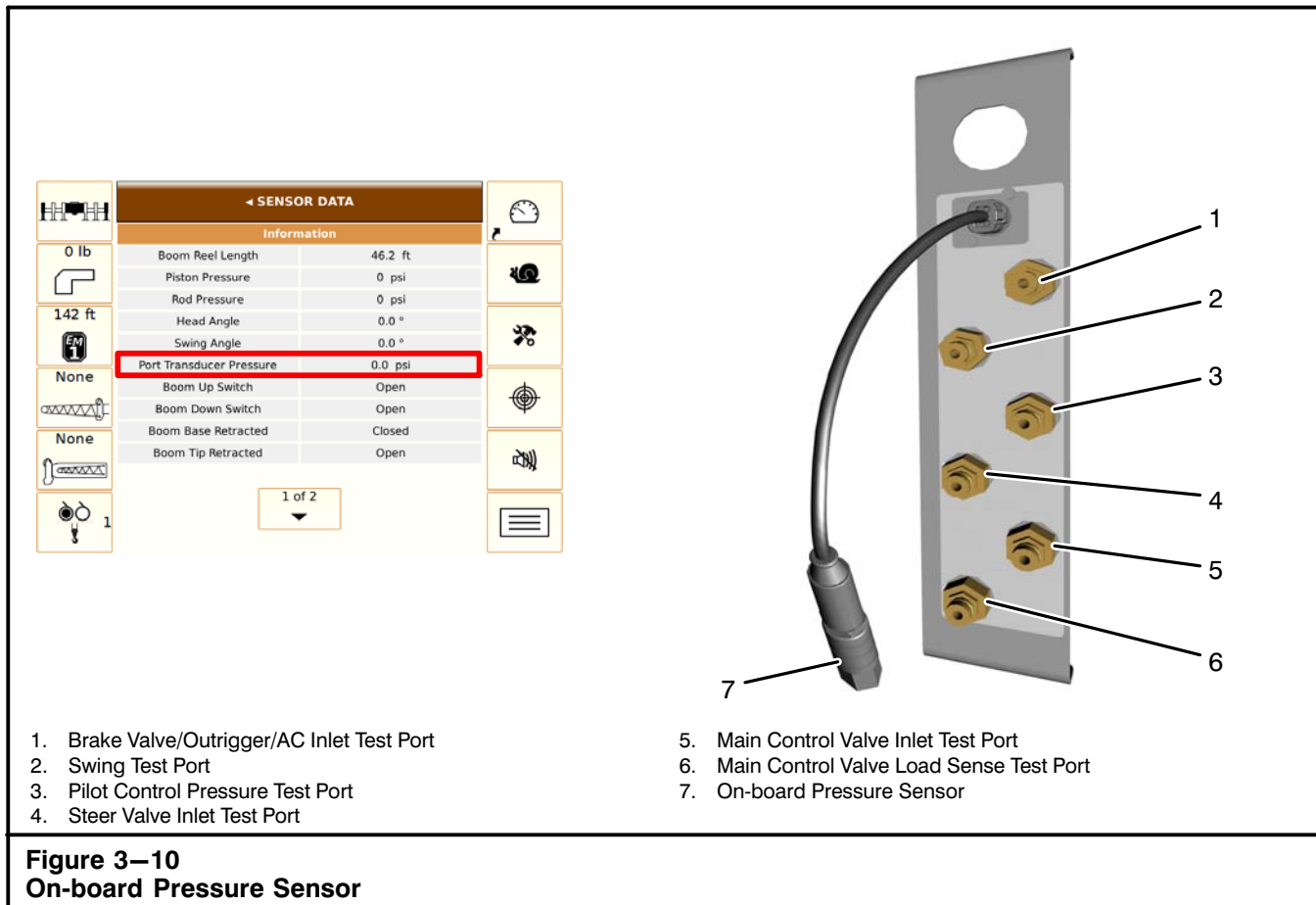
All trapped hydraulic pressure must be exhausted from the system before installing a gauge in any quick disconnect. A sudden release of hot oil could cause burns or other serious injury.

7. Install the on-board pressure sensor on the quick disconnect fitting.
8. Refer to the Figure 3–11 to determine the correct pressure setting for the circuit being checked.
9. Review the individual procedures for each circuit to determine engine speed required and pressure check/adjustment instructions.

Note: Obtain each final pressure by bringing the pressure up to the proper setting, not by backing down to it.

10. Allow the engine to return to idle before shutting it down.
11. Release the hydraulic system precharge pressure and work the control back and forth to relieve any hydraulic pressure before removing on-board pressure sensor from the quick disconnect fitting.

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Relief Valve Pressure Check Using The On-board Pressure Sensor And The Pulse Crane Control System Display

The crane is equipped with an on-board pressure sensor that can be used to check dedicated hydraulic circuit pressures. The pressure sensor can be installed on one of six designated test ports located behind the operator's cab next to the power panel, and will display a hydraulic pressure value on the sensor data screen on the Pulse Crane Control System Display. Refer to Figure 3-10 and "Diagnostics Menu" in Section 1 of this Operator's Manual.

Note: The following procedure is only for checking the pressures. Use the quick disconnect fitting on the relief valve when adjusting the pressure setting.

1. Review all the general instructions in this section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".

2. Install the on-board pressure sensor on the desired check port quick disconnect fitting. Refer to Figure 3-10.
3. Start the engine.
4. Access the Sensor Data Screen by pressing the Diagnostics Button , then the Sensor Data Button on the Pulse Crane Control System Display.
5. Refer to the appropriate hydraulic circuit in this Operator's Manual for engine speed and procedure required to check and/or adjust each individual circuit pressure.
6. Read the Port Transducer Pressure value on the Sensor Data screen.
7. Repeat procedure for the remaining relief valves, as required.

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Hydraulic Pressure Settings

Valve	Hydraulic Circuit	Quick Disconnect & Adjustment Location	Relief Valve Setting*
1	Counterweight Removal	Figure 3–17	Extend: 1,000 psi (69bar) Retract: See Brake Valve Inlet & Auxiliaries
2	Boom Pinning Cylinder	Figure 3–25	100 psi ± 10 (689 ± 68.9kPA)
3	Brake Charging	Figure 3–24	Start Cycle: 2,321 psi ± 145psi (160bar ± 10bar) End Cycle: 2,756 psi +73 –145 psi (190bar + 5 –10bar)
4	Fly Storage (If Equipped)	Figure 3–22	150 psi ± 10 psi (10.3bar ± 0.7bar)
5	Swing	Figure 3–16	2,700 psi (186bar)
6	Steering Valve Inlet	Figure 3–15	4,000 psi (297bar) (Not Adjustable)
7	Travel Park Brake	Figure 3–23	1,700 psi (117bar)
8	Hydraulic Oil Cooler	Figure 3–21	1,200 psi – 1,600 psi (83bar – 110bar)
9	Brake Valve Inlet, Outrigger & Auxiliaries	Figure 3–14	2,900 psi (200bar)
10	Pilot Supply	Figure 3–13	500 psi (35bar)
	Minimum Load Sense	Figure 3–13	300 + 20 –0 psi (20.7 + 1.4 –0 bar)
11	Main Control Valve Load Sense	Figure 3–18	4,600 psi (317bar)
	Boom Extend/Retract	Figure 3–19	Extend: 3,200 psi (220bar) Retract: See Main Control Valve Load Sense
	Boom Hoist Extend/Retract	Figure 3–20	Extend: 4,300 psi (296bar) Retract: 500 ± 10 psi (35bar ± 0.7bar)
	Front & Rear Winch	—	See Main Control Valve Load Sense

***Adjust All Pressures to Within +50 psi –0 psi (+3.5 –0bar) Except Where Noted.**

**Figure 3–11
Relief Valves Pressures & Adjusting Procedures**

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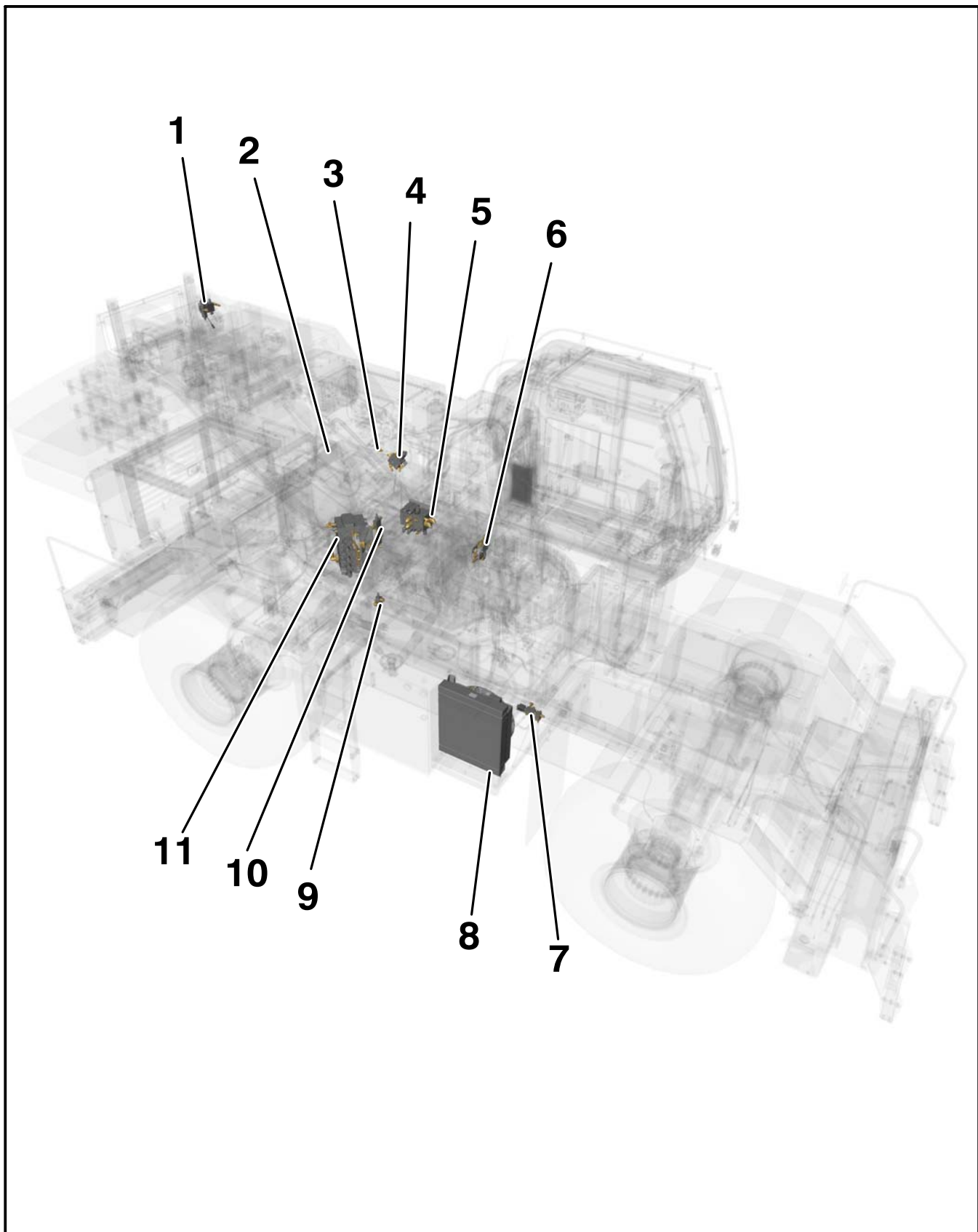
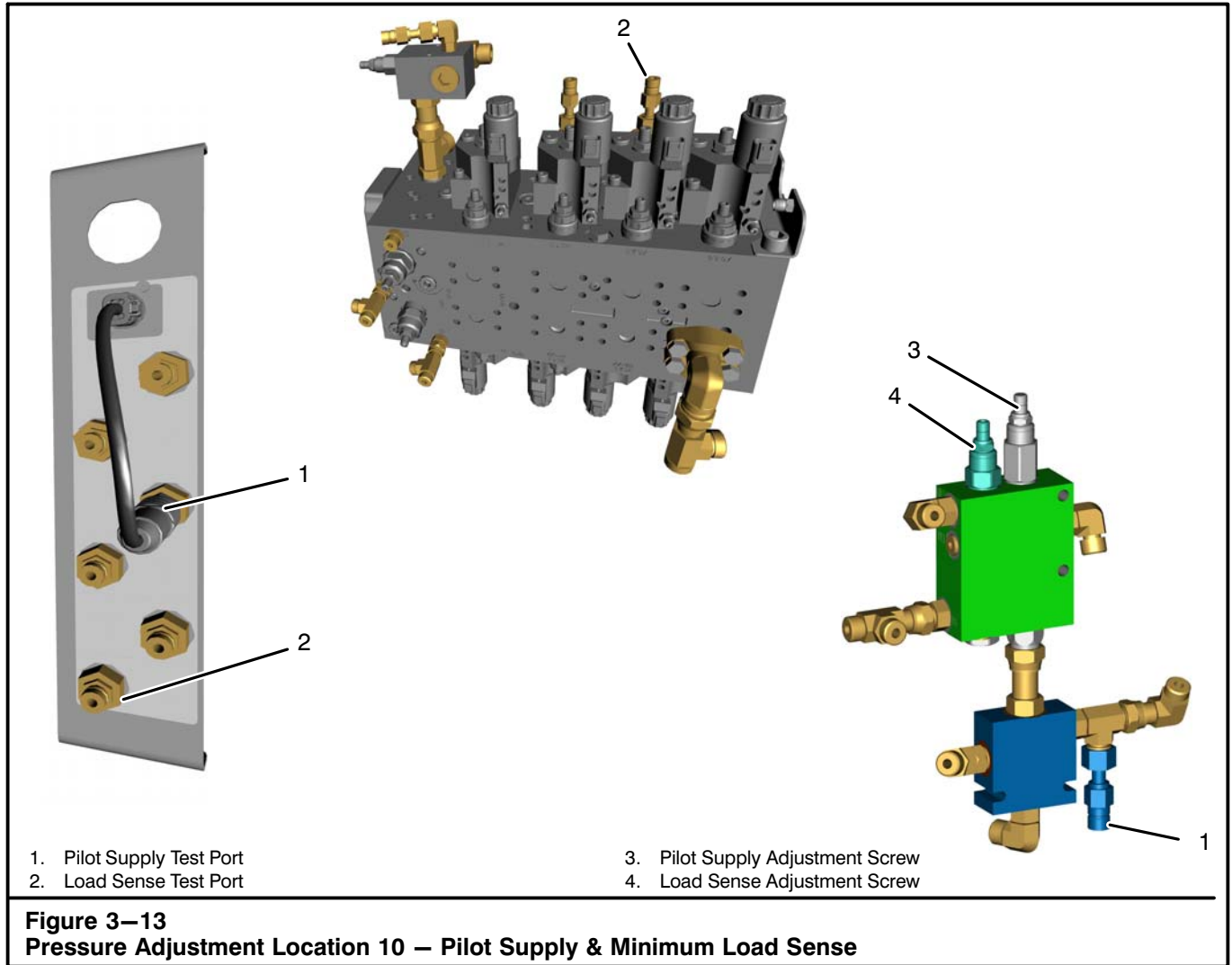


Figure 3–12
Pressure Adjustment Locations



Pilot Supply Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge or the on-board pressure sensor on either of the pilot pressure test ports.
3. Start the engine and maintain idle speed.
4. To check pilot supply pressure, retract the boom extend cylinder over relief and hold. Check pressure.
5. Adjust the pilot supply pressure as required to 500 psi +50 -0 psi (35bar +3.5 -0bar).

Note: Idle speed must be maintained in order to obtain an accurate reading.

6. Shutdown engine.
7. If required, remove the pressure gauge from the pilot pressure test port.

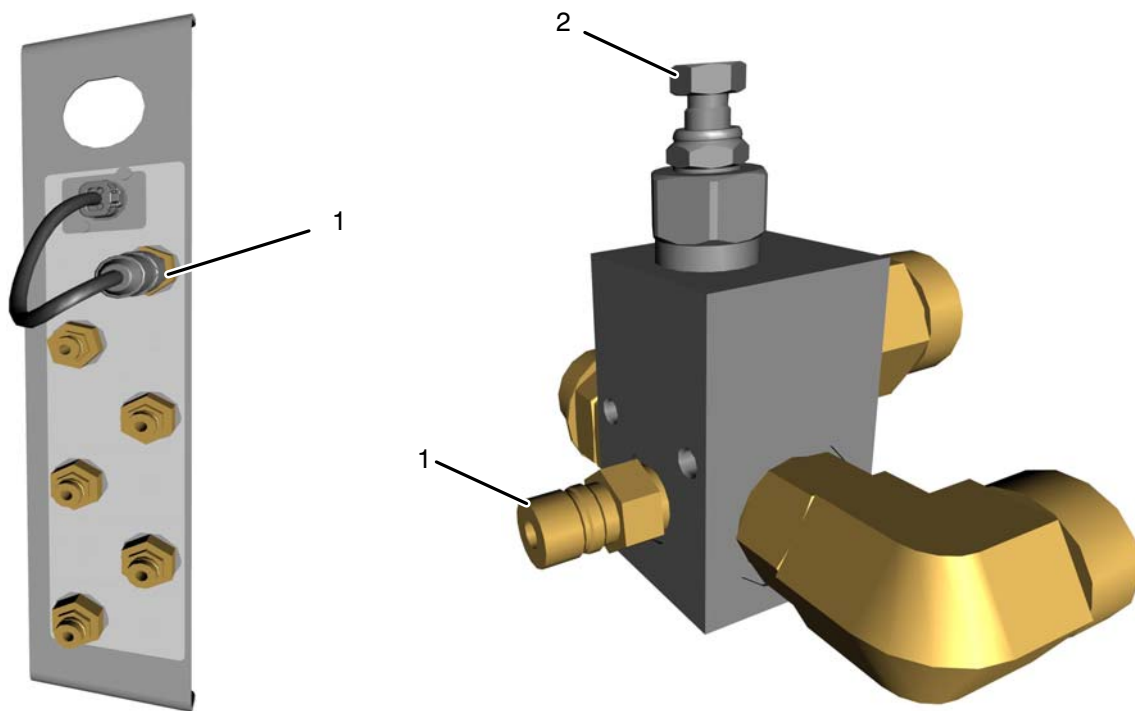
Minimum Load Sense Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off install pressure gauge or the on-board pressure sensor on either of the main control valve load sense test ports.
3. Start the engine and maintain idle speed.
4. While operating no functions, check load sense pressure.
5. Adjust minimum load sense pressure as required to 300 psi +20 -0 psi (20.7 + 1.4 -0 bar).

Note: Idle speed must be maintained in order to obtain an accurate reading.

6. Shutdown engine.
7. Remove the pressure gauge from the load sense pressure test port.

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1. Brake Valve Inlet & Auxiliaries Pressure Test Port

2. Pressure Adjustment Screw

Figure 3-14

Pressure Adjustment Location 9 – Brake Valve Inlet, Outrigger, & Auxiliaries Pressure

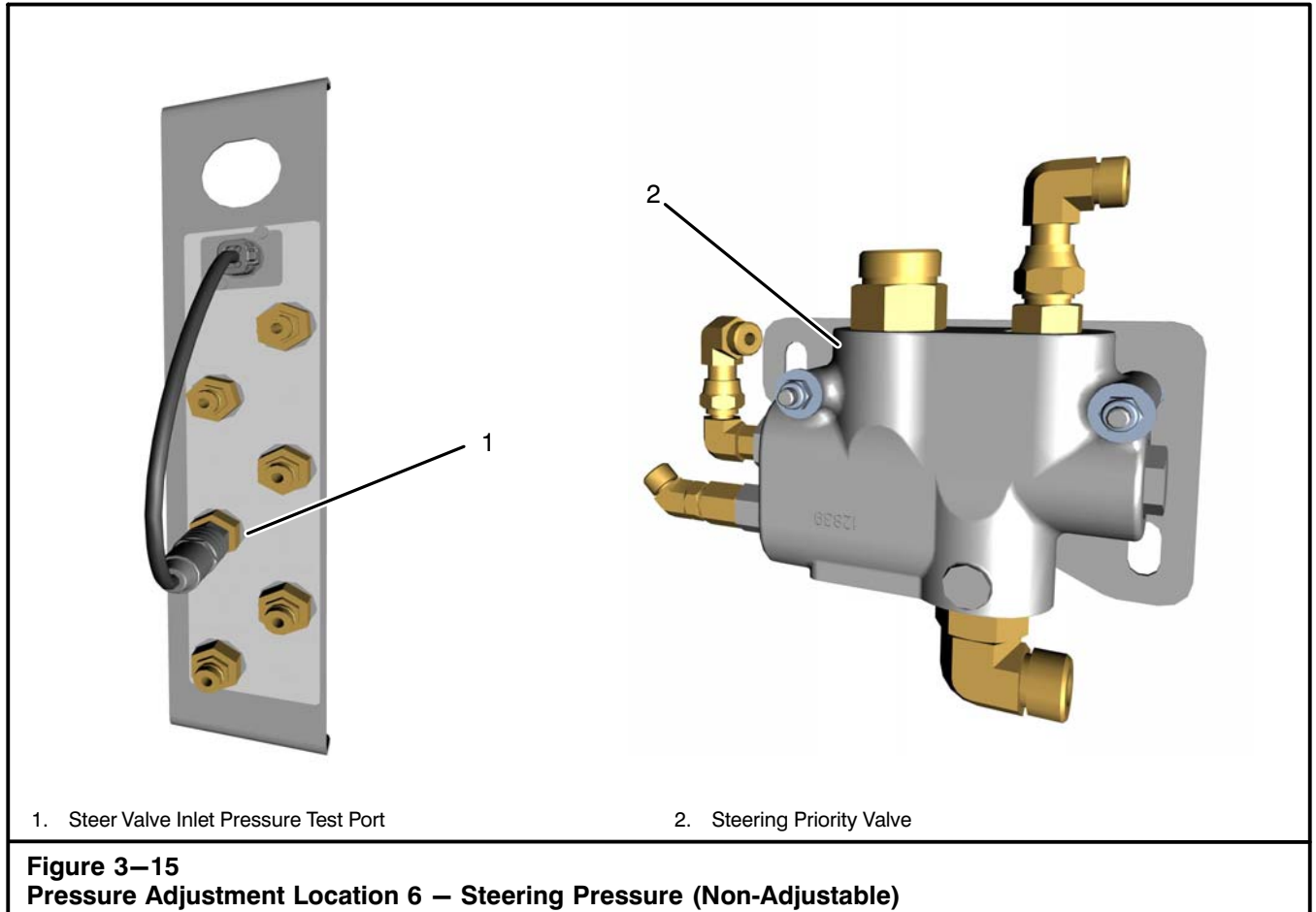
Brake Valve Inlet, Outrigger & Auxiliaries Pressure Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge or the on-board pressure sensor on either of the brake valve inlet test ports.
3. Start the engine and maintain at idle.

4. Fully retract an outrigger beam and hold. Check pressure. Refer to "Outrigger Operation" in Section 1 of this Operator's Manual.
5. Adjust pressure, as required, to 2,900 psi +50 –0 psi (200bar +3.5 –0bar).

Note: Idle speed must be maintained in order to obtain an accurate reading.

6. Shutdown engine.
7. If required, remove the pressure gauge from the brake valve inlet test port.

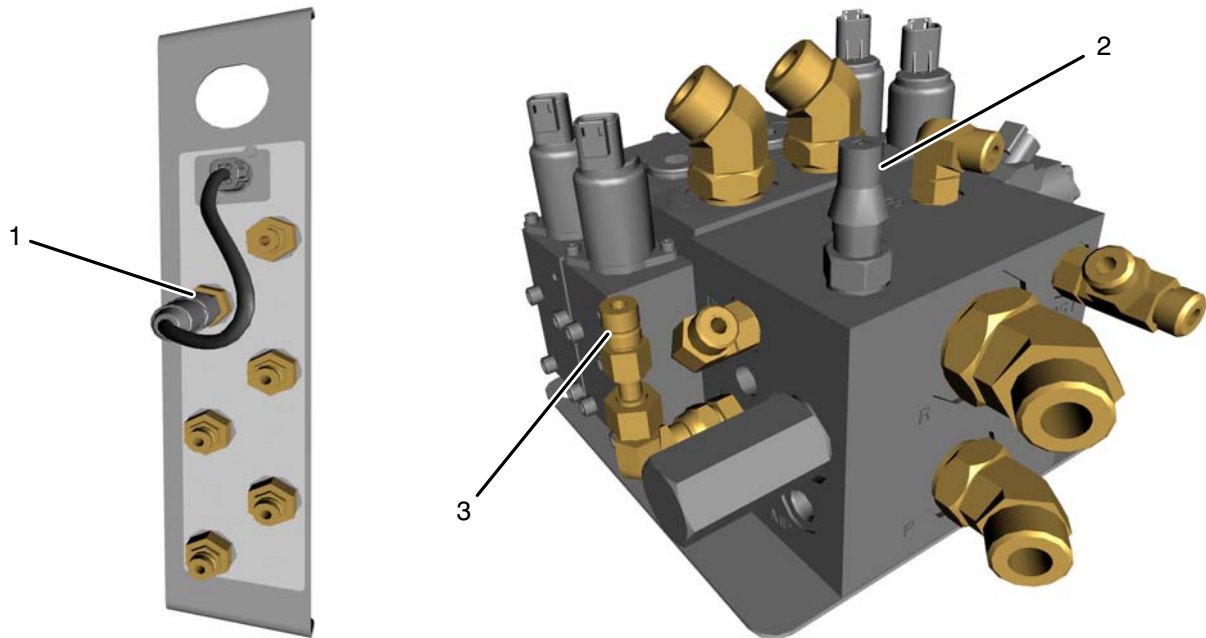


Steering Pressure Checking Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures"
2. With engine off, install a pressure gauge or the on-board pressure sensor on the steer valve inlet test port.
3. Start the engine and maintain at idle.
4. With crane on tires, boom fully retracted, travel swing lock engaged with boom over the front and 2-Wheel steer engaged, full steer left or right and hold.
5. Check the pressure. The on-board pressure sensor should read 4,000 psi (297bar).
6. Shutdown engine.
7. If required, remove the pressure gauge from the steer valve inlet test port.

Note: Idle speed must be maintained in order to obtain an accurate reading.

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1. Swing Valve Inlet Pressure Test Port
2. Swing Pressure Adjustment Screw

3. Swing Valve Load Sense Pressure Test Port

Figure 3–16
Pressure Adjustment Location 5 – Swing Pressure

Swing Pressure Checking Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge or the on-board pressure sensor on the swing inlet pressure test port.
3. Start the engine and maintain idle speed.
4. Engage the travel swing lock in one of the two positions and release the swing park brake.
5. Move the swing control lever to swing left position and hold.
6. Check the pressure. The on-board pressure sensor should read 2,900 psi +100 psi (200bar +/–7bar).
7. Move the swing control lever to swing right position and hold.
8. Check the pressure. The on-board pressure sensor should read 2,900 psi +100 psi (200bar +/–7bar).
9. See Swing Pressure Adjustment Procedure if pressures are not in range.
10. Shutdown the engine.
11. If required, remove the pressure gauge from the swing valve inlet pressure test port.

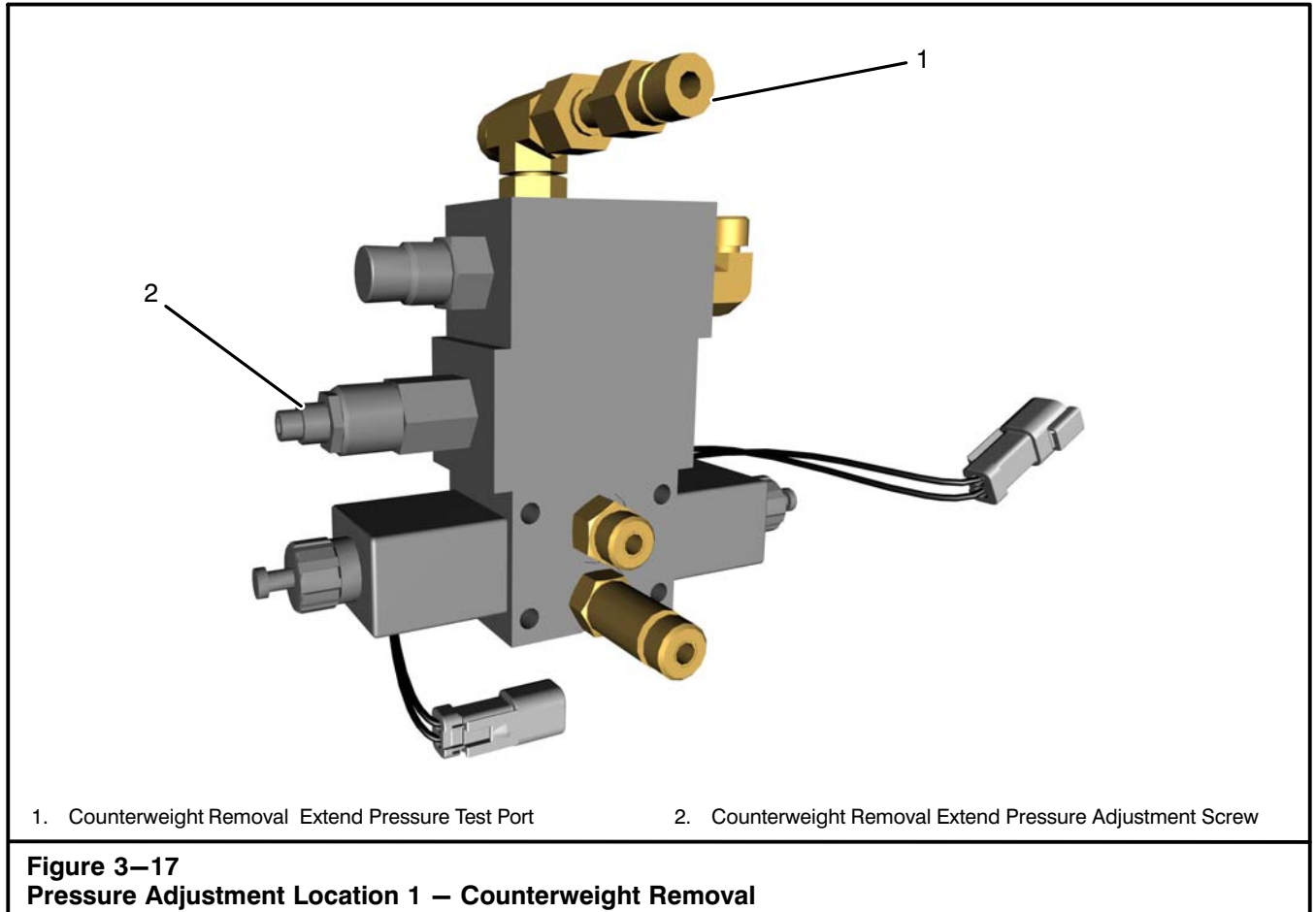
Swing Pressure Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge on the swing valve load sense test port.
3. Start the engine and maintain idle speed.
4. Engage the travel swing lock in one of the two positions and release the swing park brake.
5. Move the swing control lever to swing left position and hold.
6. Adjust the pressure, as required, to 2,700 psi +50 –0 psi (186bar +3.5 –0bar).
7. Move the swing control lever to swing right position and hold. Check Pressure.

Note: One relief adjustment controls the pressure for both swing right and swing left circuits. Check to ensure both circuits are within 50 psi (3.5bar) of each other.

8. Shutdown the engine.
9. Remove the on-board pressure sensor from the swing valve load sense pressure test port.

Note: Idle speed must be maintained in order to obtain an accurate reading.

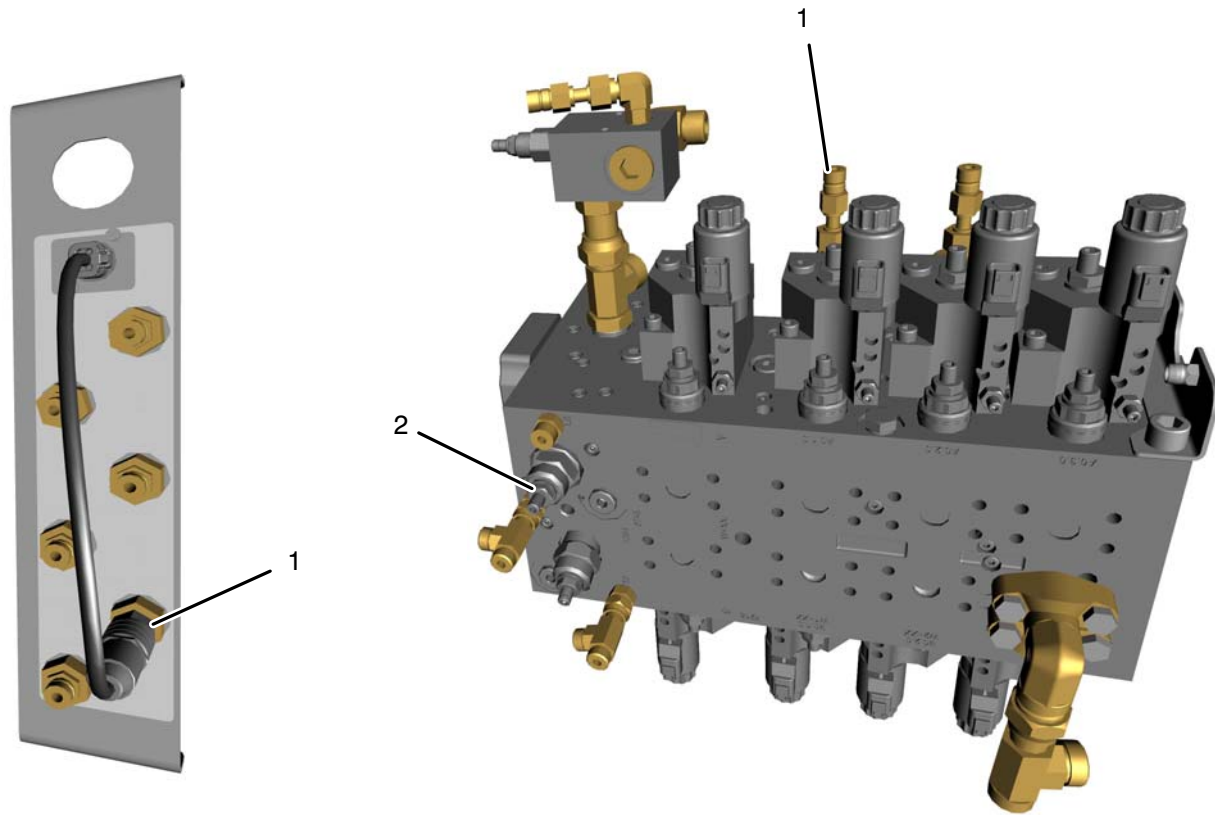


Counterweight Removal Extend Pressure Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install pressure gauge on the counterweight removal test port.
3. Start the engine and maintain at idle.
4. With crane on fully extended outriggers, boom fully retracted, travel swing lock engaged with boom over the front, unpin the counterweight from the upper. Refer to "Counterweight Removal" in Section 1 of this Operator's Manual.
5. Press and hold the "down" button until both cylinders have fully extended. Continue to hold. Check pressure.
6. Adjust the pressure, as required, to 1,000 psi +50 –0 psi (69bar +3.5 –0bar).
7. Shutdown the engine.
8. If required, remove the pressure gauge from the quick disconnect fitting on the counterweight removal valve.

Note: Idle speed must be maintained in order to obtain an accurate reading.

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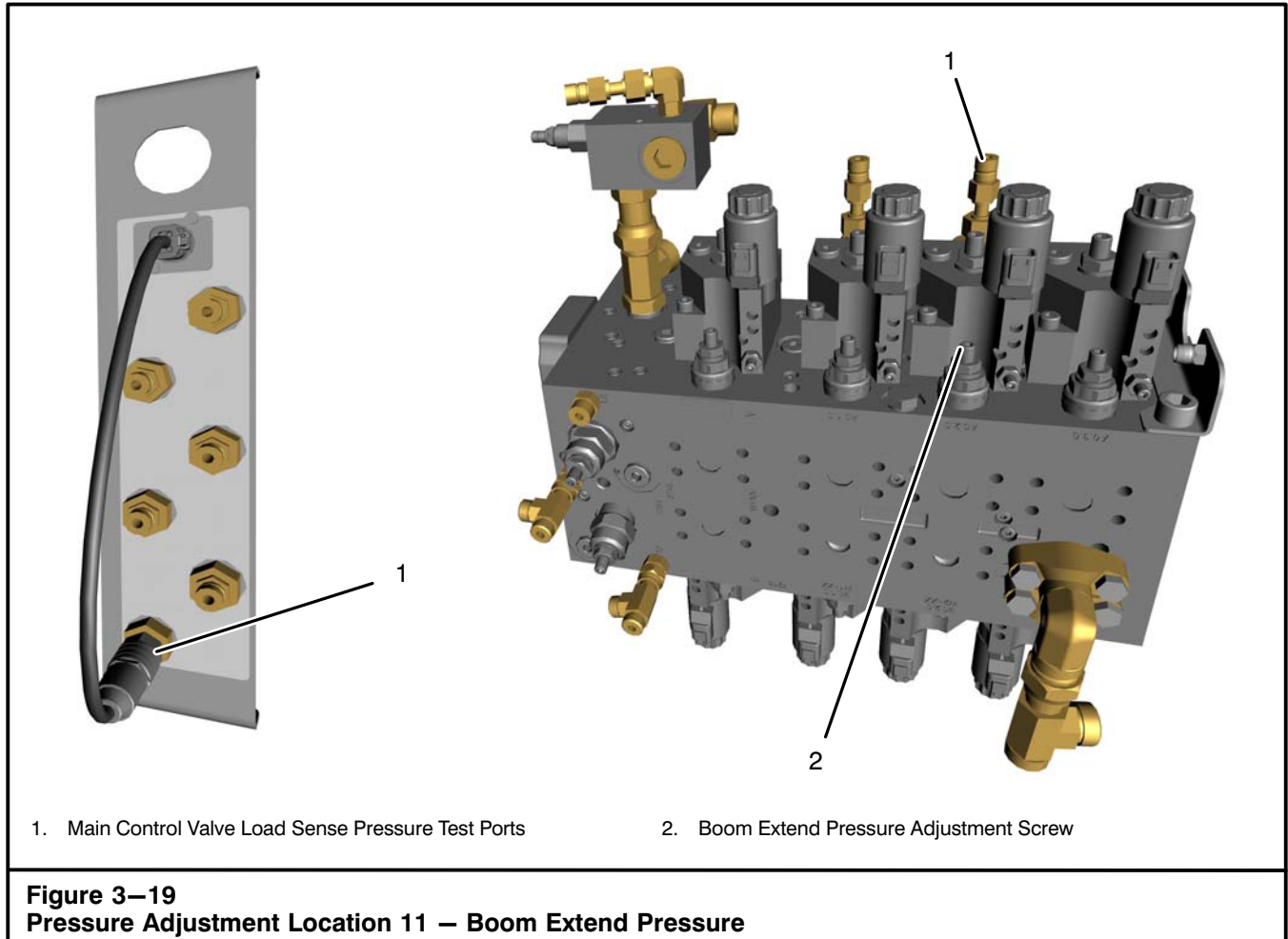
1. Main Control Valve Inlet Pressure Test Ports

2. Main Control Valve Load Sense Pressure Adjustment Screw

Figure 3—18
Pressure Adjustment Location 11 – Main Control Valve Load Sense Pressure

Main Control Valve Load Sense Pressure Adjustment Procedure (Boom Retract & Winch Up/Down)

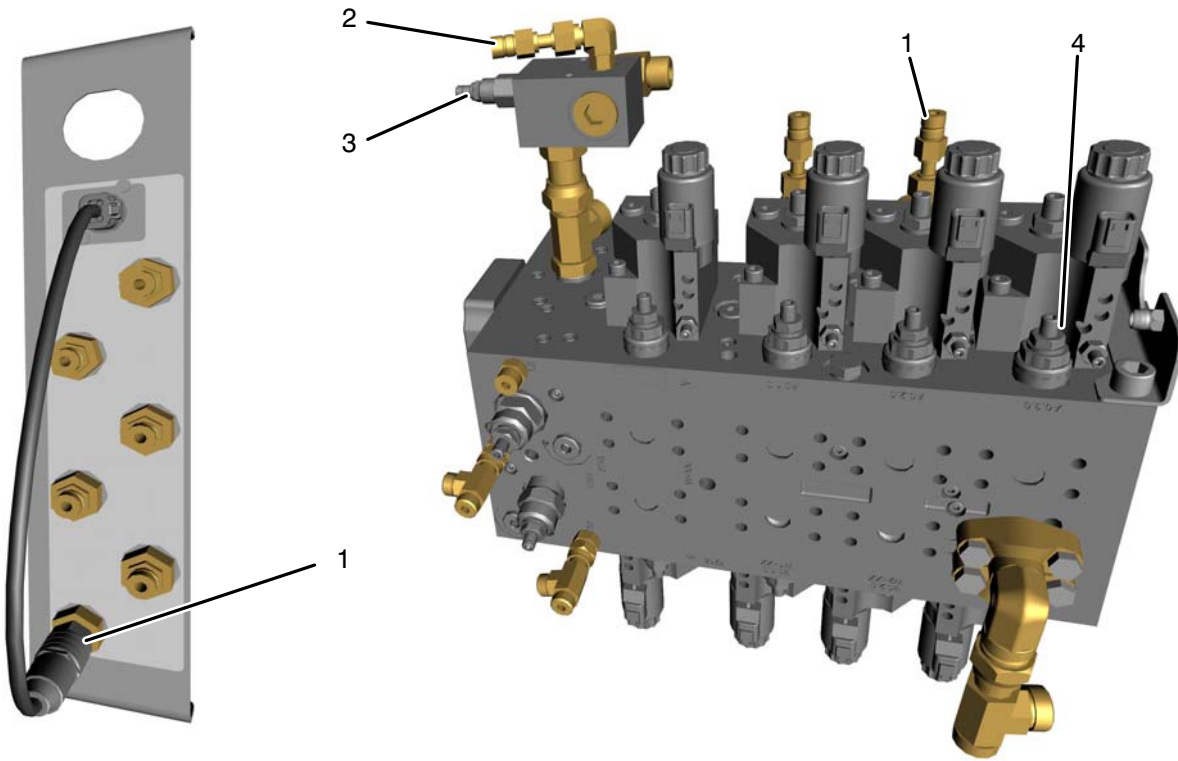
1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge or the on-board pressure sensor on either of the main control valve inlet test ports.
3. Start the engine and gradually increase the engine speed to full throttle.
4. With crane on fully extended outriggers, travel swing lock engaged, upper over the front, and RCL in "Rigging" mode, retract the boom extend cylinders fully and hold. Check pressure.
5. Adjust the pressure, as required, to 4,600 psi +50 –0 psi (317bar +3.5 –0bar).
6. Return engine to idle speed and shutdown.
7. If required, remove the pressure gauge from the main control valve load sense test port.



Boom Extend Pressure Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge or the on-board pressure sensor on either of the main control valve load sense test ports.
3. Start the engine and gradually increase the engine speed to full throttle.
4. With crane on fully extended outriggers, travel swing lock engaged, upper over the front, and RCL in "Rigging" mode, extend the boom extend cylinders fully and hold. Check pressure.
5. Adjust pressure, as required, to 3,200 psi +50 -0 psi (221bar +3.5 -0bar).
6. Return engine to idle speed and shutdown.
7. If required, remove the pressure gauge from the main control valve load sense test port.

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1. Main Control Valve Load Sense Test Ports
2. Boom Hoist Retract Pressure Test Ports

3. Boom Hoist Retract Pressure Adjustment Screw
4. Boom Hoist Extend Pressure Adjustment Screw

Figure 3—20
Pressure Adjustment Location 11 — Boom Hoist Extend/Retract Pressure

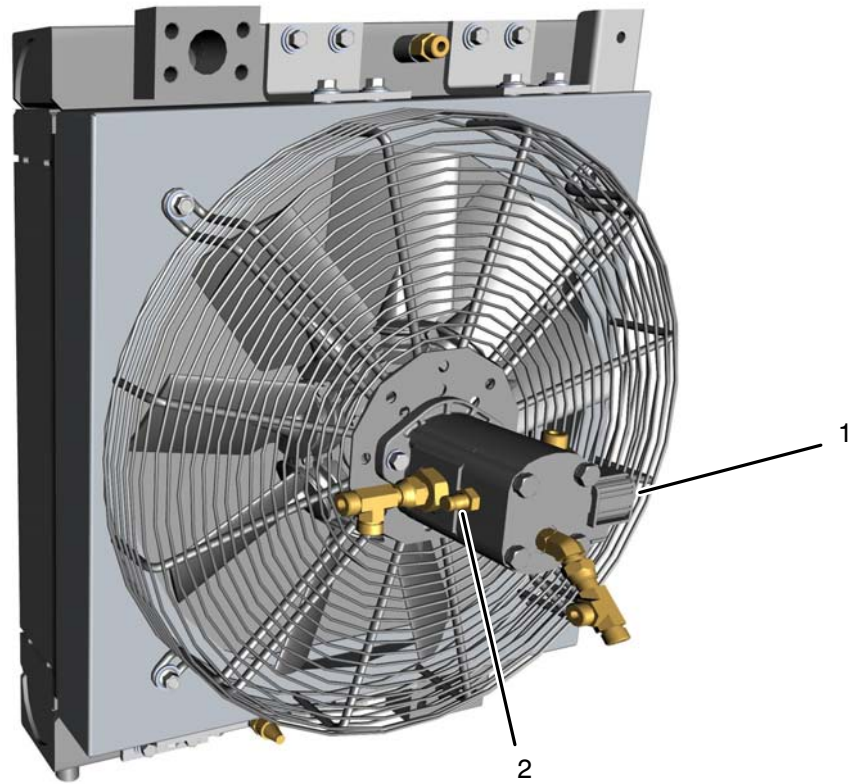
Boom Hoist Extend Pressure Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge or the on-board pressure sensor on either of the main control valve load sense test ports.
3. Start the engine and gradually increase the engine speed to full throttle.
4. With crane on fully extended outriggers, travel swing lock engaged, upper over the front, extend the boom hoist cylinders fully and hold. Check pressure.
5. Adjust pressure, as required, to 4,300 psi +50 –0 psi (296bar +3.5 –0bar).
6. Return engine to idle speed and shutdown.
7. If required, remove the pressure gauge from the main control valve load sense test port.

Boom Hoist Retract Pressure Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install pressure gauge on the boom hoist retract test port.
3. Start the engine and maintain at idle.
4. Engage boom hoist retract and hold until boom hoist cylinder is fully retracted. Continue to hold. Check pressure.
5. Adjust the cylinder port relief adjuster, as required, to 500 psi $\pm$ 10 psi (35bar $\pm$ 0.7bar).
6. Shutdown the engine.
7. If required, remove the pressure gauge from the boom hoist retract test port.

Note: Idle speed must be maintained in order to obtain an accurate reading.



1. Electrical Connector

2. Oil Cooler Fan Test Port

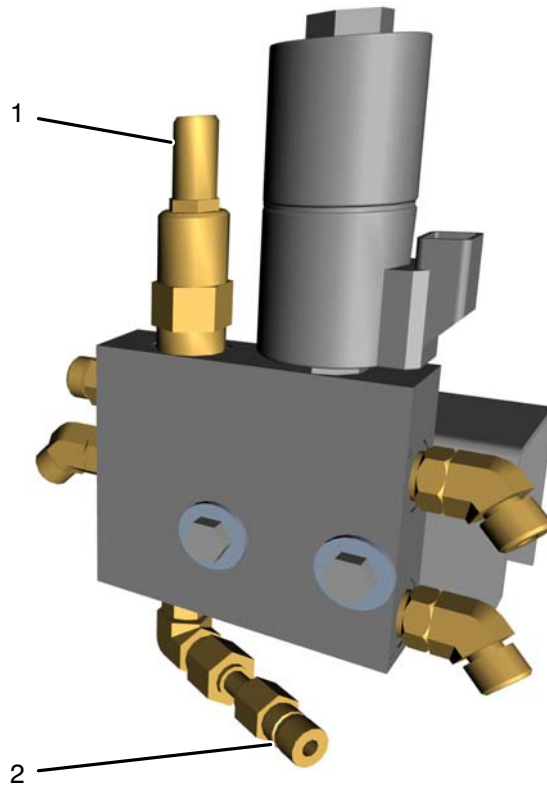
Figure 3–21

Pressure Adjustment Location 8 – Oil Cooler Fan Motor Circuit (Non-Adjustable)

Hydraulic Oil Cooler Motor Circuit Check Pressure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge on the oil cooler fan test port.
3. Remove the electrical connector from the relief valve solenoid. Fan will go to full speed.
4. Start the engine and gradually increase the engine to 1,800 rpm's.
5. Check pressure. Pressure should read 1,200–1,600 psi (83–110bar).
6. Return engine to idle speed and shutdown.
7. Install electrical connector into relief valve solenoid.
8. Remove the pressure gauge from the oil cooler fan test port.

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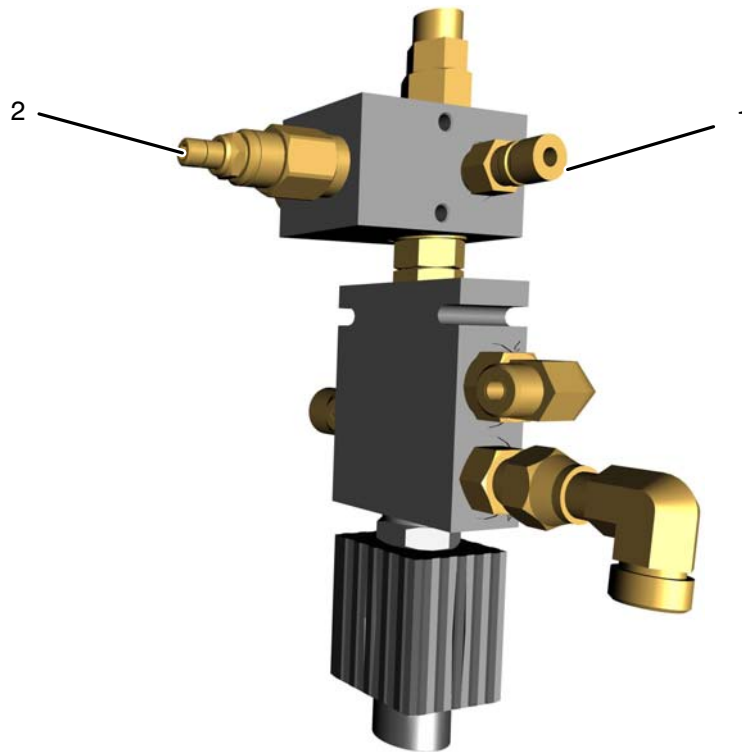
1. Fly Storage Extend Pressure Test Port

2. Fly Storage Extend Pressure Relief Adjustment Screw

Figure 3–22
Pressure Adjustment Location 4 – Fly Storage Circuit (If Equipped)

Fly Storage Circuit Check Pressure (If Equipped)

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge on the fly storage extend test port.
3. Start the engine.
4. Erect the 35ft fly enough to be able to fully extend the fly storage cylinder. Refer to "Erection of the 35ft fly from the stored position" in section 3 of this Operator's Manual
5. Fully extend cylinder and hold.
6. Adjust pressure, as required, to 150 psi ± 10 psi (10.3bar ± 0.7 bar).
7. Shutdown engine.
8. Remove the pressure gauge from fly storage extend test port.



1. Park Brake Release Pressure Relief Adjustment Screw

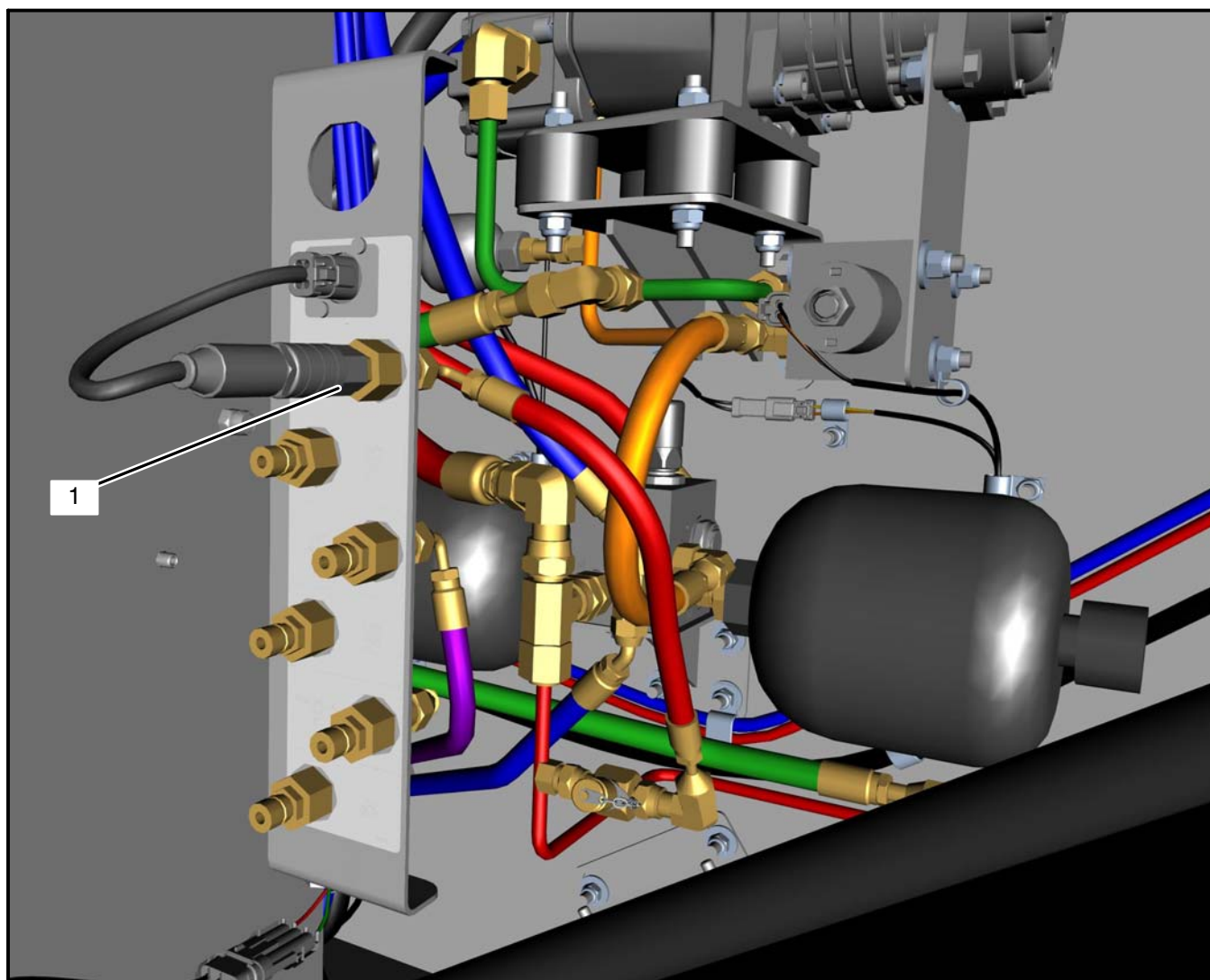
2. Park Brake Release Pressure Test Port

Figure 3–23
Pressure Adjustment Location 7 – Travel Park Brake Circuit

Travel Park Brake Release Pressure Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge on the park brake release test port.
3. Start the engine and level the crane on fully extended outriggers.
4. Without putting the crane in gear, press "P" on the steering column keypad to disengage the park brake.
5. With engine at idle and no functions activated, check pressure.
6. Adjust pressure, as required, to 1,700 psi +50 –0 psi (117bar +3.5 –0bar).
7. Shutdown engine.
8. Remove the pressure gauge from park brake release test port.
9. Observe the accumulator valve inlet pressure and listen for the charging cycle to end. Ending charge pressure should be 2,756 psi +73 –145 psi (190bar + 5 –10bar).
10. Shutdown engine.
11. Remove the pressure gauge from the brake valve inlet test port.

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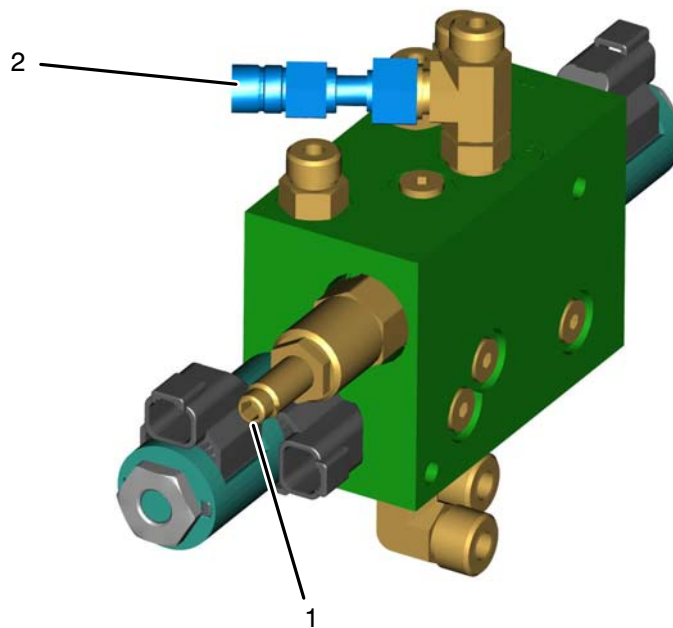


1. Brake Valve Inlet Test Port

Figure 3–24
Pressure Adjustment Location 3 – Brake Charging Valve Pressure

Brake Charging Valve Pressure Adjustment Procedure

1. Review all the general instructions in this Section of this Operator's Manual per "General Instructions For Checking Hydraulic Circuit Pressures".
2. With engine off, install a pressure gauge or the on-board pressure sensor on the brake valve inlet test port.
3. Start the engine.
4. Check accumulator charge starting pressure. Tap brake pedal repeatedly until the brake charging valve begins to cycle (listen for the sound of the valve located to the rear of the cab). Starting pressure should be $2,321 \text{ psi} \pm 145\text{psi}$ ($160\text{bar} \pm 10\text{bar}$).
5. Observe the accumulator valve inlet pressure and listen for the charging cycle to end. Ending charge pressure should be $2,756 \text{ psi} +73 -145 \text{ psi}$ ($190\text{bar} + 5 - 10\text{bar}$).
6. Shutdown the engine.
7. If required, remove the pressure gauge from the brake valve inlet test port.



1. Boom Pinning Cylinder Extend Relief Valve Adjuster
2. Quick Disconnect Fitting

Figure 3—25
Boom Pinning Cylinder Extend Relief Valve

Boom Pinning Cylinder Extend Circuit Adjusting Procedure

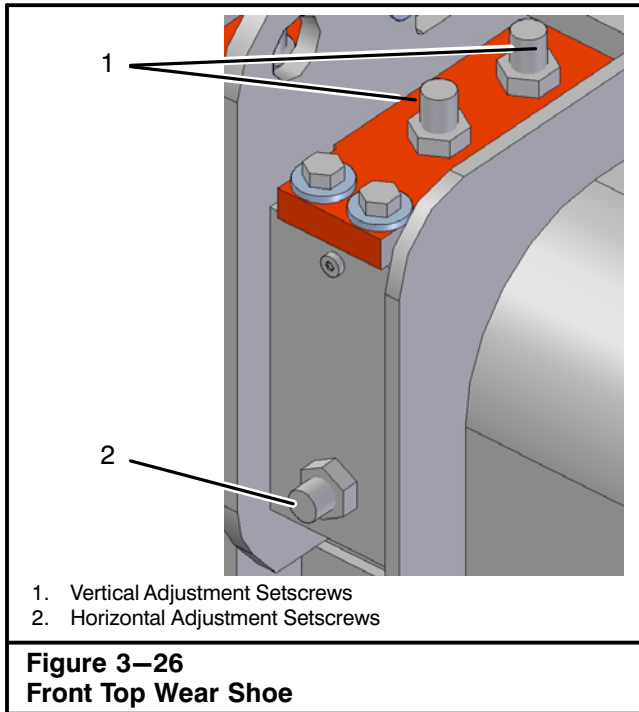
1. Review all the general instructions in this Section of this Operator's Manual per "Preparing The Crane For Checking Relief Pressures" and "Relief Valve Pressure Checking Instructions".

Note: Idle speed must be maintained in order to obtain an accurate reading.

2. Remove the hoses from work ports on the pinning cylinder control valve. Cap the hoses and block the ports.

3. Install the pressure gauge on the quick disconnect fitting.
4. Start the engine and maintain idle speed.
5. Using the manual telescope control box, extend pinning cylinder and hold. Check pressure. Adjust pressure as required to $100 \text{ psi} \pm 10$ ($689 \pm 68.9 \text{ kPA}$).
6. Shutdown the engine.
7. Relieve hydraulic system pressure.
8. Remove the pressure gauge from the quick disconnect fitting.

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Boom Wear Shoe Adjustment

Boom wear shoes are provided as a means of keeping the boom working smoothly. They must be adjusted periodically to prevent excessive deflection of the boom sections. Refer to Figure 3—27.

1. Level the crane on fully extended outriggers with all tires clear of the ground. Swing the upper over the front of the carrier and engage the travel swing lock. Lower the boom and extend each boom section as required to gain access to each wear shoe.

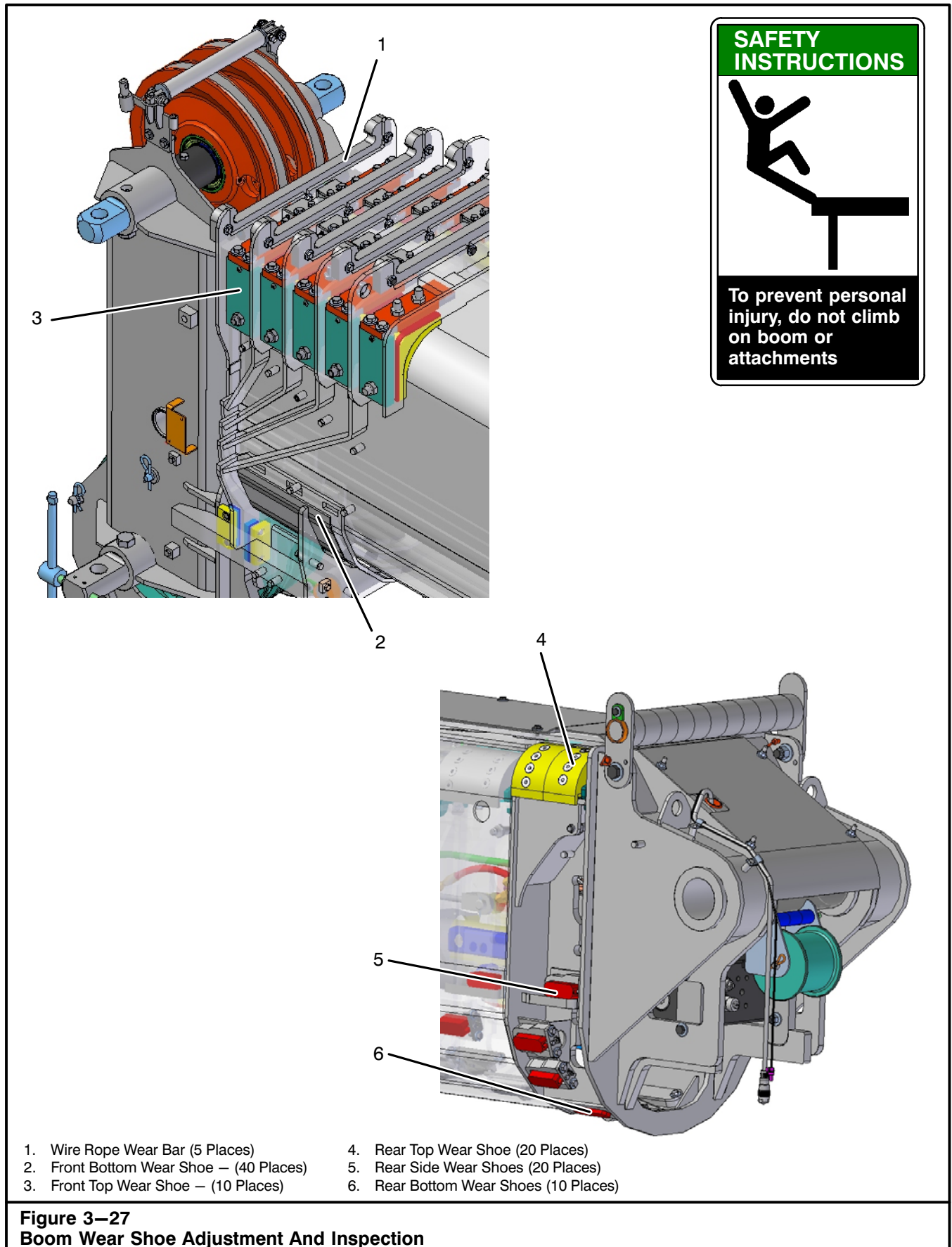


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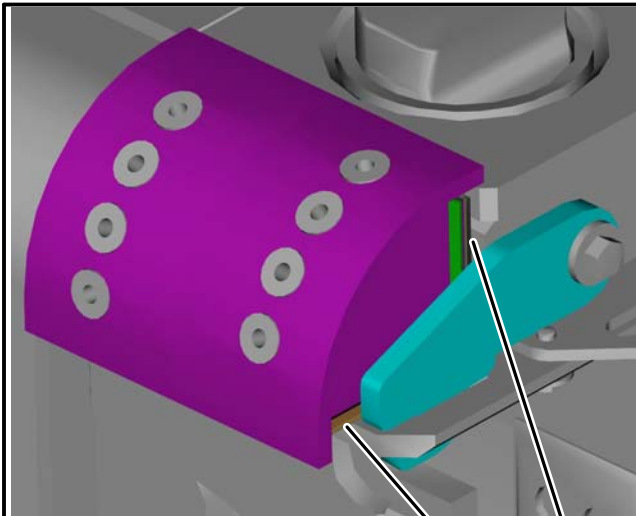
To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device to reach necessary areas.

To prevent movement of individual boom sections, shutdown the engine and ensure that the operator has properly vacated the operators cab before putting hands or tools inside the boom. Unexpected movement of the boom sections could sever fingers, hands, arms, etc.

2. Adjust the following wear shoes to ensure the boom is straight and each boom section is centered within the next.
 - a. Front Top Wear Shoes
(Refer to Figure 3—26 and Figure 3—27)
 1. There are a pair of front top wear shoes on the base, T1, T2, T3 and T4 boom sections. They are adjustable in both horizontal and vertical directions. The horizontal adjustment is used to center one boom section inside the other. Measure the clearance between sections on each side and space them equally. The wear pads should contact the inside section on both sides. No clearance between wear shoe and boom section is required.
 2. Vertical adjustment is used to hold the wear shoe down against the top of the inside boom section. Again this can be adjusted so that there is no clearance between wear pads and boom section.
 3. Replace when shoe is worn to 0.375 in (0.95cm) minimum thickness.



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1. Horizontal Adjustment Shims
2. Vertical Adjustment Shims

Figure 3-28
Rear Top Wear Shoe

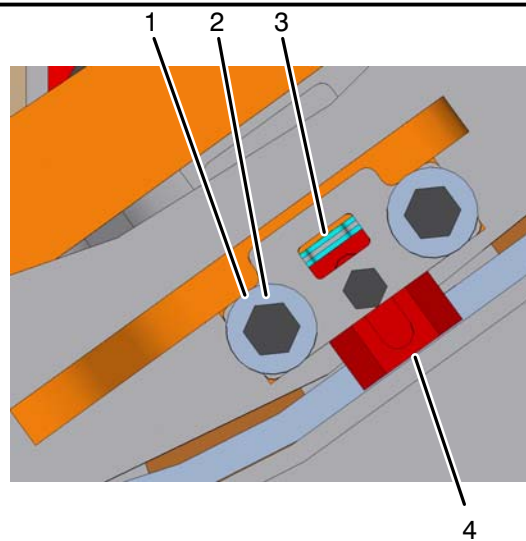
b. Rear Top Wear Shoes

(Refer to Figure 3-27 and Figure 3-28)

1. There are a pair of rear top wear shoes on each side of the T5, T4, T3, T2, and T1 boom sections. Access the shims through the hole in the side of the boom section.
2. Horizontal adjustment is accomplished with shims. This adjustment is used to align one section inside the other. The straightness of the boom is dependent on this adjustment. Small holes in the sides of the boom sections allow measurements between the section. Set the gap between sections equal on all sides to ensure boom straightness. It is helpful to lift the boom slightly until it just contacts the roller bracket to relieve some weight from the top rear shoes when adjusting.

Note: These wear shoes can be rotated to provide more service life before replacement as they will tend to wear on the top more than the on the side.

3. Vertical adjustment is accomplished by shimming the bottom roller. Add shims under the bottom rear roller assembly until the rollers are barely able to spin freely. Use an equal number of shims on each side of the roller assembly with a maximum of 6 shims per side.



1. Capscrew And Washer
2. Retaining Plate
3. Shims
4. Wear Shoe

Figure 3-29
Rear Bottom & Side Wear Shoe

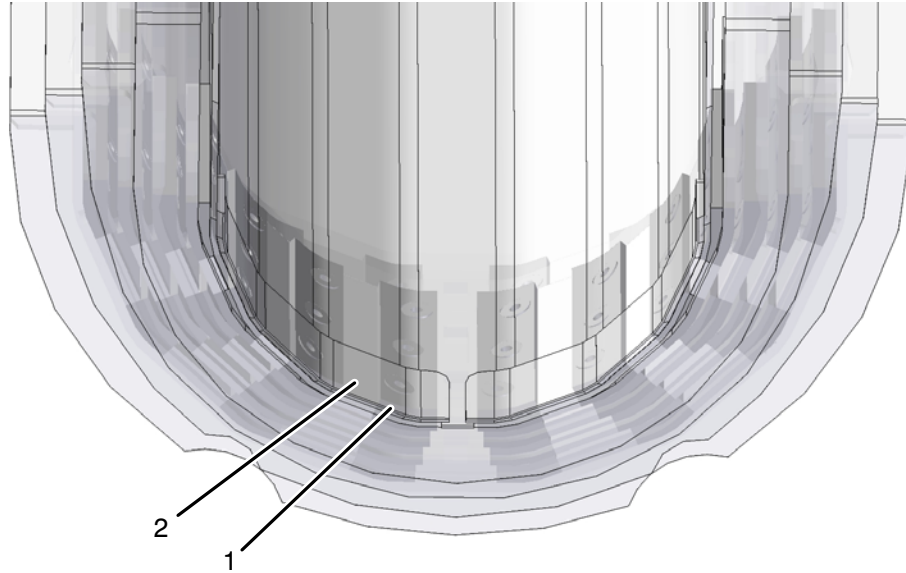
c. Rear Bottom Side Wear Shoes

(Refer to Figure 3-27 and Figure 3-29)

1. The rear bottom side wear shoes are adjustable. Shims should be added to the side wear shoes until the wear shoes are tight against the larger outer section.

Note: The wear shoe must be replaced if the number of shims required to make the shoe tight against the outer section will not fit through the hole in the retain-er plate.

2. For inspection and/or replacement, access to the retaining plates for these wear shoes is gained through holes in the sides of the external boom section when the boom is extended. Some wear shoes are in the rear subweld of the section and some are just in front of it.
3. Remove the capscrews and washers which secure the retaining plates. Remove the retaining plates. For wear shoes in front of the rear subwelds a rag or piece of cloth can be put below the wear pads to keep loose parts from falling down into the boom.
4. Remove shims and wear shoes to inspect the thickness. Minimum wear shoe thickness is 1.25 in (3.8cm) for the side wear shoes. Wear shoes worn to less than this dimension must be replaced.



1. Front Bottom Wear Shoe (40 Places)
2. Spacer (30 Places)

Figure 3—30
Front Bottom Wear Shoes

5. Install the rear bottom wear shoes back into their pockets and install shims until the wear shoes are tight against the larger outer section.
6. Apply Loctite® 243 to the capscrews used to secure the retaining plates.
7. Install the retaining plates and secure them with the capscrews and washers.
3. Check the thickness of the front bottom wear shoes. Refer to Figure 3—27 and Figure 3—30. The wear shoes and spacers are to be replaced when the bottom most wear shoes reach a minimum thickness of 1/2 in (1.3cm). To replace these shoes, remove the top front wear shoes, lift up on the inside section, and remove and replace the shoes. Reinstall and adjust the top front wear shoes.
4. After adjusting the boom wear shoes, boom up to a 60° angle and fully extend the boom. Confirm that the boom is straight and the sections are centered within each other.

Note: External effects such as sun and wind on one side of the boom or having the crane out of level can make the boom appear to not be aligned. Negate these effects as much as possible when checking boom straightness. Refer to “Boom Distortion Due To Thermal Effects Of The Sun” in Section 1 of this Operator's Manual.

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Boom Anti-Rotation Adjustment

Due to the shape of the boom, the boom may have a tendency to rotate during fly erection and storage. To compensate, an anti-rotation adjustment may be required to maintain the each section in a vertical position. Use the following procedure to periodically check and adjust the boom sections.

1. Park the crane on a firm level surface, position transmission shifter to neutral, and engage the park brake.
2. Fully retract the boom and place it at 0 degrees.
3. Use shims on the bottom of the tip section as required to maintain the tip section in a vertical position. Refer to Figure 3—31.
4. Adjust setscrews and bolts on top of boom as follows:
 - a. Loosen the jam nuts on the bolts and loosen bolts until they fit snug against the tip section.
 - b. Tighten jam nuts.
 - c. Remove the capscrews and washers and remove the plates.
 - d. Loosen the jam nuts and adjust the setscrews until the blocks fit snug against the boom sections.
 - e. Tighten jam nuts.
 - f. Position the plates and install the capscrews and washers.

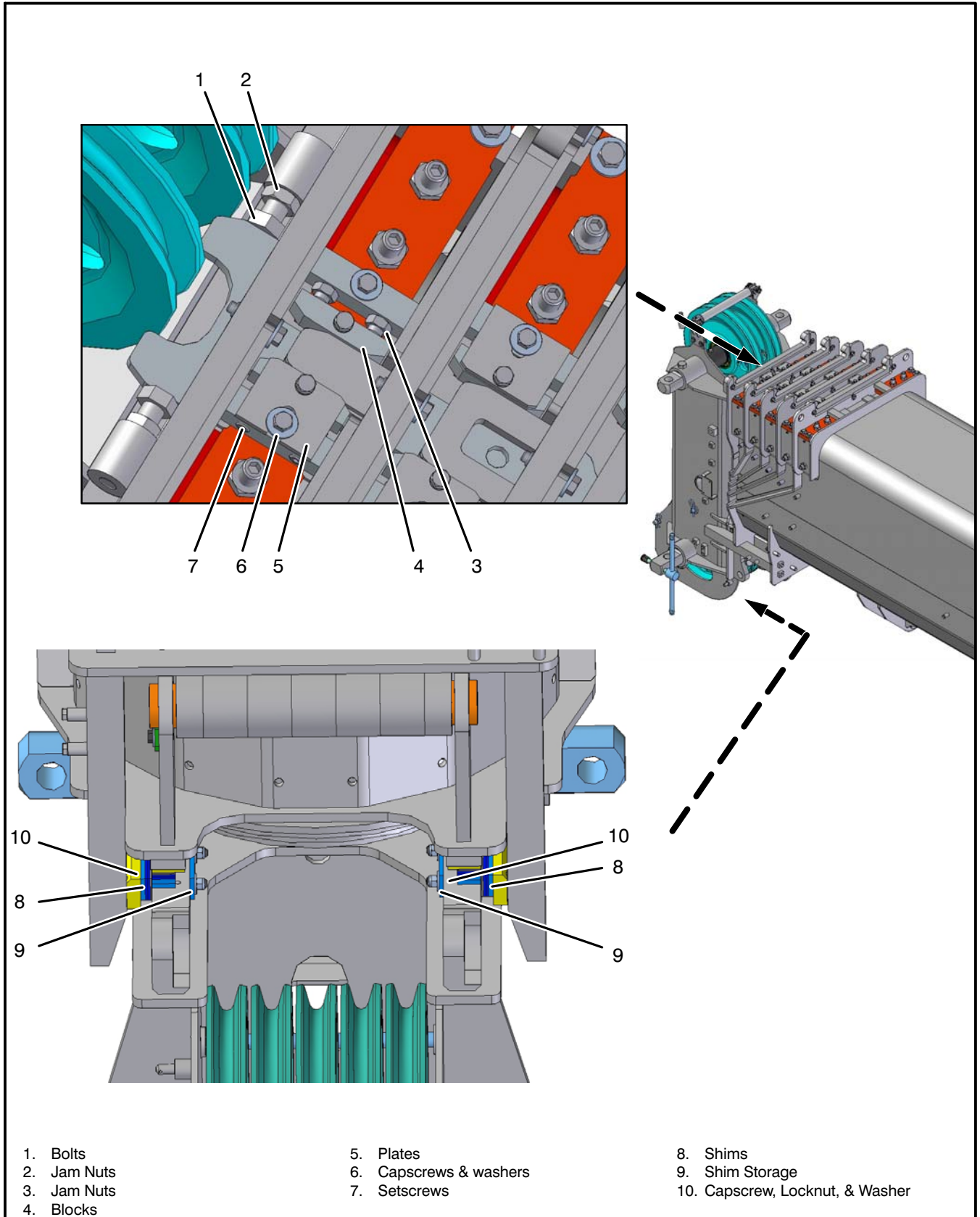
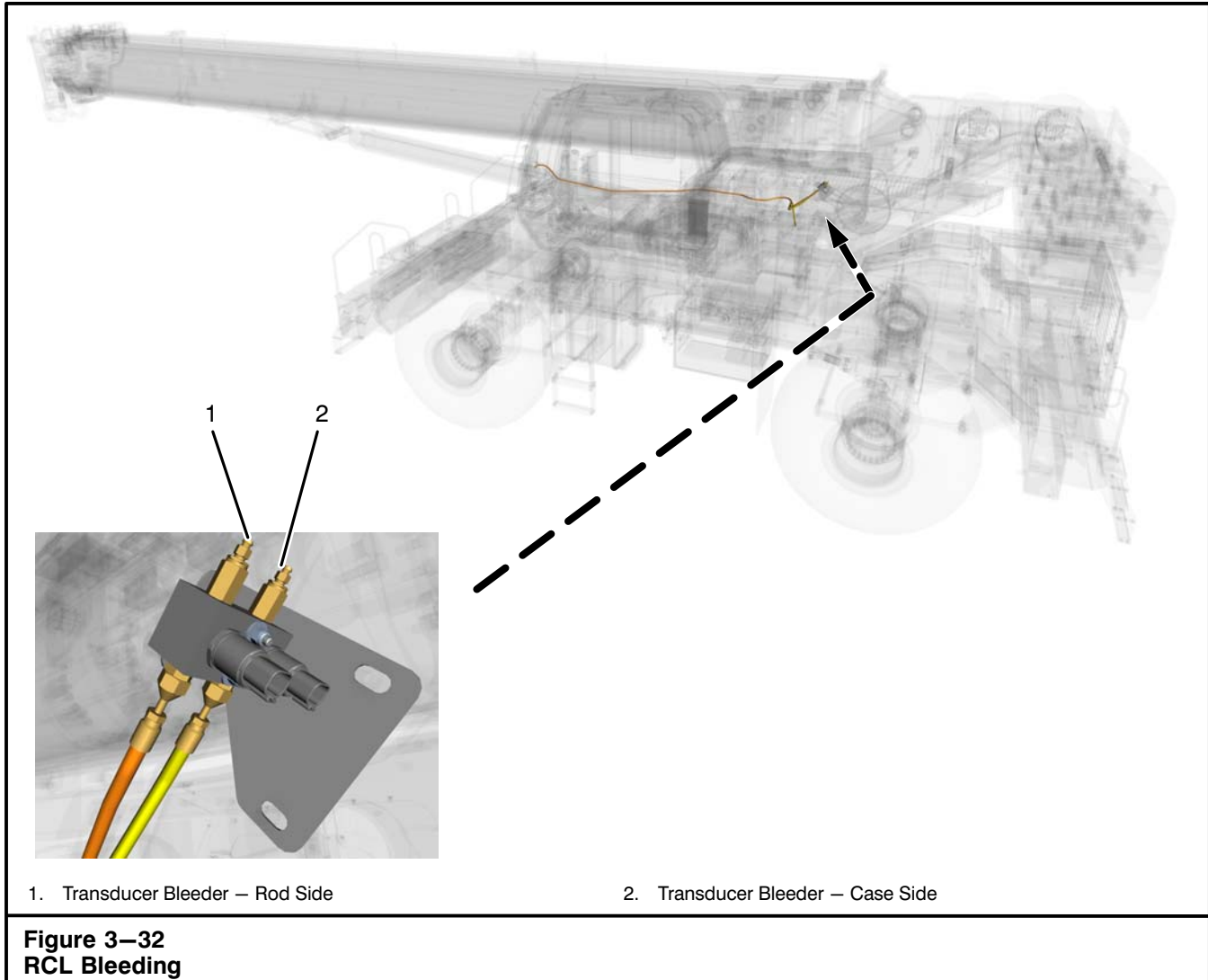


Figure 3-31
Boom Section Anti-Rotation Adjustment

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RCL Pressure Transducer Lines Bleeding Procedure

Bleed the RCL pressure transducer lines whenever a hydraulic line is removed from the RCL unit, to remove any air that may have been trapped in the circuit. Removal of any trapped air is essential for proper operation of the RCL. The bleeders can be accessed on the left side of the upper frame, under the removable grate on the upper walkway. The following procedure requires two people.

1. Park the crane on a firm level surface and engage the travel swing lock.
2. Check that all control levers are in the neutral position and move the function lockout switch to the "DISABLE" position.
3. Shutdown the engine.
4. Thoroughly clean the bleed plugs and surrounding area with an approved cleaning solvent to prevent contamination from entering the oil circuits. Allow the area to air dry.
5. Attach one end of a rubber hose to each of the bleeders. Refer to Figure 3-32. Ensure that each rubber hose fits securely on the bleeder plugs.
6. Fill a clean, clear container with clean hydraulic oil, and place the open end of each rubber hose into the container. For the correct grade, refer to "Hi Performance Hydraulic Oil" in Section 2 of this Operator's Manual.
7. Start the engine.

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8. With upper over front and travel swing lock engaged, fully retract boom hoist cylinder, then extend approximately 2" (5.1cm).

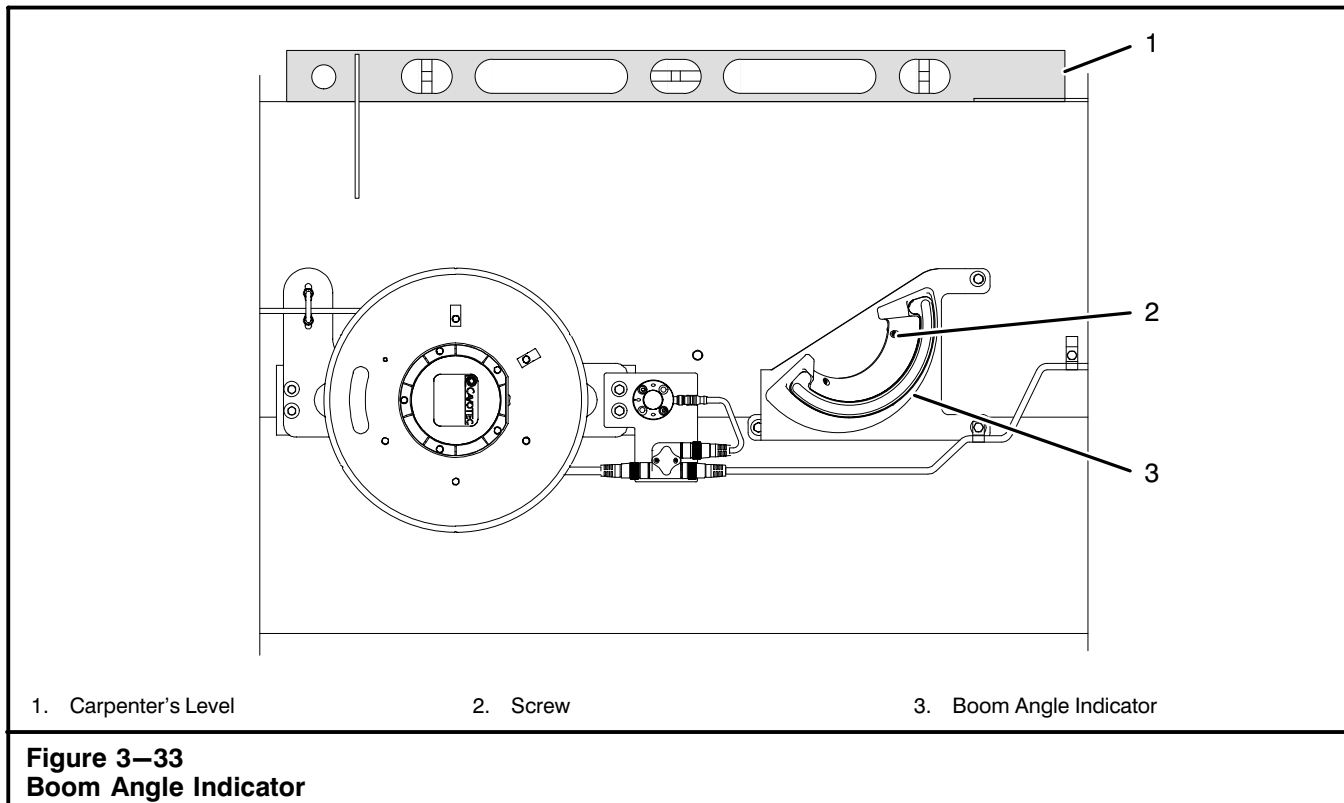


WARNING

The boom may lower slightly during the bleeding process. Do not allow the boom hoist cylinder to fully retract during the process.

9. Bleed case side as follows:
 - a. With engine running at idle speed and swing park brake engaged, slowly loosen the bleeder plug.
 - b. Repeat the process until no air bubbles are observed.
 - c. Securely close the bleeder plug and tighten to 9–12 ft lb (12–16Nm).
10. Bleed rod side as follows:
 - a. With engine running at idle speed and swing park brake engaged, slowly loosen the bleeder plug.
 - b. With one person stationed in the operator's cab and another observing the bleeder plug, the person in the operator's cab should slowly engage the boom up controller while the other observes the bleeder plug for air bubble after loosening bleeder plug. Repeat the process until no air bubbles are observed.
 - c. Securely close the bleeder plug and tighten to 9–12 ft lb (12–16Nm).
11. Remove the rubber hoses from the bleeder plugs.
12. Check the hydraulic oil level. Refer to "Hydraulic Reservoir Oil Level Check" in Section 2 of this Operator's Manual.
13. Properly dispose of the used oil.

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Boom Angle Indicator Adjustment

A bubble type boom angle indicator is mounted to the right of the operator's cab on the base section of the boom. Refer to Figure 3—33. It must be adjusted properly and the crane must be level for the unit to accurately indicate boom angles. Check the adjustment of the boom angle indicator daily to ensure its accuracy.

1. Park the crane on a firm level surface, shift the transmission to neutral, and engage the park brake.

2. Level the crane on fully extended outriggers. Position the upper over the front of the carrier and engage the travel swing lock. Fully retract the boom. Boom down to 0° angle.
3. Verify the crane is level by placing a carpenter's level across the front of upper frame. Check levelness with the upper over the rear and over the side of the crane. Adjust the outriggers as necessary.
4. Once the crane is level, verify that the boom is at 0° by placing carpenter's level on top of the boom. Refer to Figure 3—33. Adjust the boom as necessary.
5. If necessary, loosen the screw and adjust the angle indicator until the bubble within the vial is positioned under the 0° mark. Tighten the screw.

Emergency Steer Accumulator Pressure Check (If Equipped)

In the event of hydraulic pressure failure, the emergency steer accumulator is used to supply the hydraulic steering circuit with enough pressure to allow the operator to negotiate approximately eight 90° turns of the steering wheel. The accumulator pressure should be checked at 250 hour intervals to ensure the accumulator is properly pressurized. To check the accumulator pressure use the following procedures along with Figure 3–34.

1. Park crane on firm level surface, shift the transmission to neutral, and apply the park brake.
2. Level the crane on outriggers, position the upper directly over the front of the carrier, and engage the travel swing lock.
3. Properly check and adjust the steering relief valve as outlined in “Hydraulic System Relief Valve Adjustment” in this Section of this Operator's Manual.
4. Shutdown the engine and bleed all pressure from the accumulator by rotating the steering wheel back and forth until no pressure is available to move the wheels.



WARNING

All trapped hydraulic pressure must be exhausted from the system before installing a gauge in any quick disconnect. A sudden release of hot oil could cause burns or other serious injury.

5. Connect the pressure gauge to the quick disconnect on the hydraulic input to the accumulator.

Note: Pressure gauge must be accurate up to 5,000 psi (345bar).

6. Start the engine and align the tires straight ahead. Engage 2-wheel steer.
7. To charge the accumulator, steer left or right until cylinders bottom out and hold until pressure gauge reads 4,000 psi (275bar). The engine should be running at half throttle.
8. Shutdown engine and turn ignition switch to the “ON” position but do not start engine.

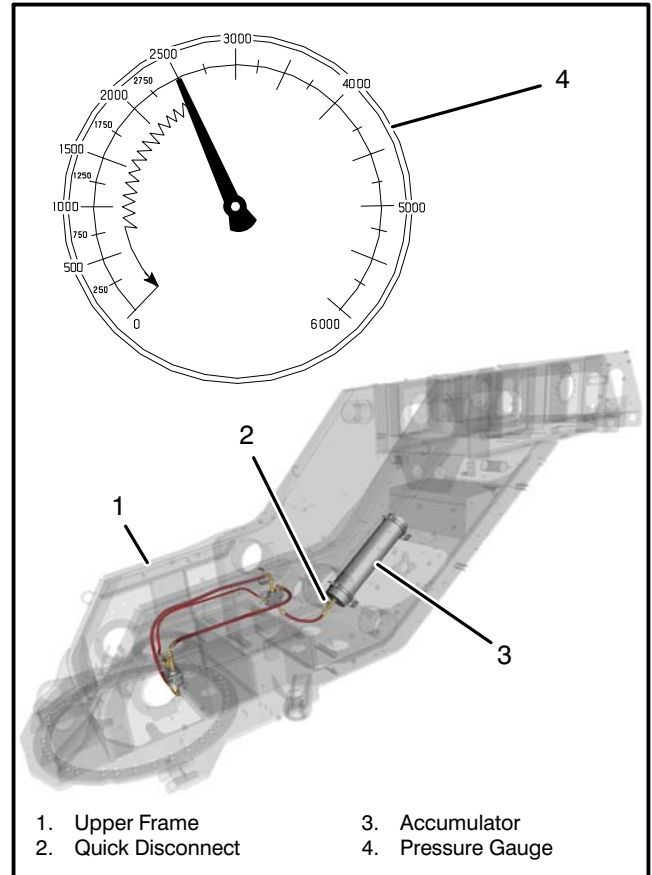


Figure 3–34

Emergency Steer Accumulator (If Equipped)

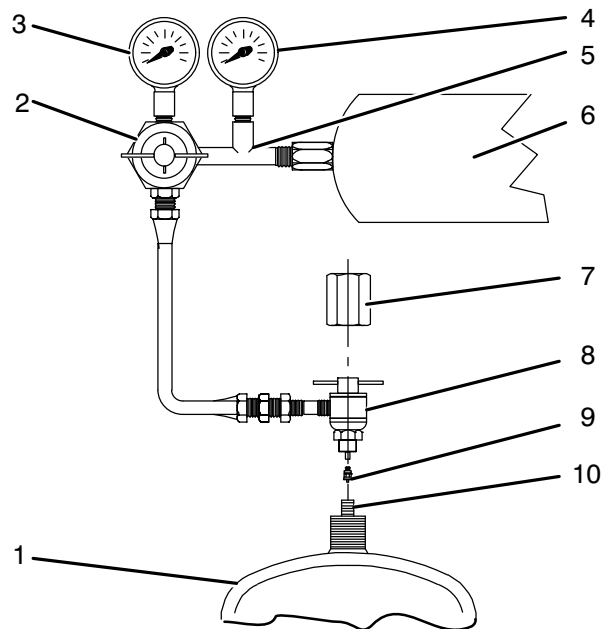
9. Turn the steering wheel to full left, then full right, then full left while counting the number of cycles as wheel crosses the straight ahead position.

Note: One full cycle equals center, to full left, to full right, to center (four 90° turns).

10. Observe the pressure gauge while accumulator pressure is being steered down. Note the pressure reading at which the accumulator pressure drops off rapidly. This is the accumulator precharge pressure, which should be 850 psi (58.6bar).

Note: One and a half cycles (six 90° turns), minimum should be obtained from a complete accumulator precharge.

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1. Accumulator	5. Regulator Assy	8. Chuck
2. Regulator Valve	6. Dry Nitrogen Tank	9. Adaptor *
3. Regulator Gauge	7. Cap	10. Charging Valve
4. Supply Gauge		

* An Adaptor May Be Required To Connect Chuck To Valve.

Figure 3–35
Typical Accumulator Charging Regulator Arrangement

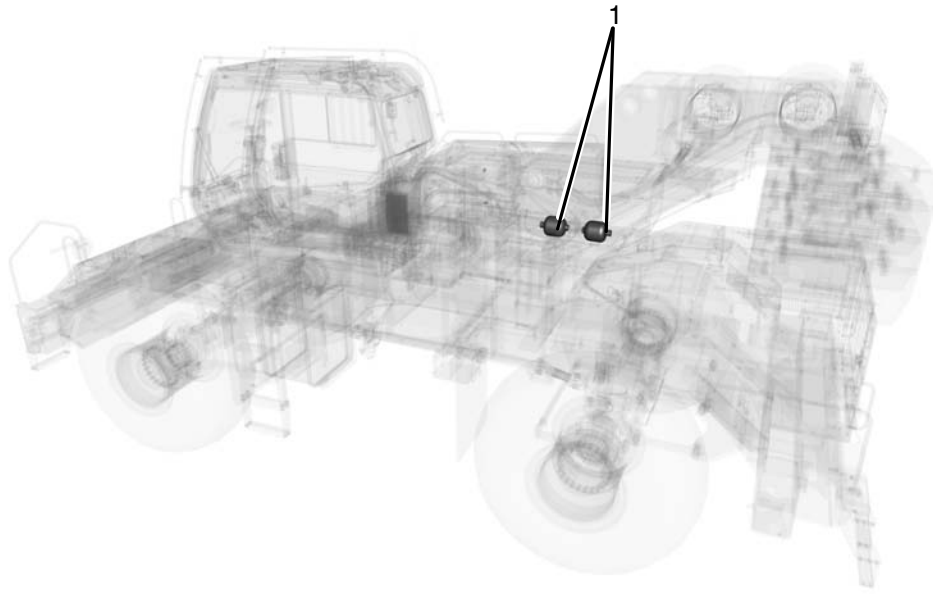
Accumulator Check/Charging

The crane may be equipped with up to four accumulators. These accumulators are pressurized with dry nitrogen. The accumulator pressure should be checked at 500 hour intervals to ensure the accumulators are properly pressurized. Small accumulators should be recharged rather than checked as they tend to lose pressure when checked. Charging accumulators should be done at approximately 65–75°F (18.3–23.9 °C). The charge pressure tolerance should be +/- 5%.

There are two carrier service brake hydraulic circuit bladder type accumulators on the upper. If the crane is equipped with the hydro-gas suspension, a piston type accumulator is on the carrier within that hydraulic circuit. If the crane is equipped with emergency steering, an accumulator is in the center of the upper frame. Refer to "Emergency Steer Accumulator Pressure Check (If Equipped) Emergency Steer Accumulator Pressure Check (If Equipped)" in this Section if the Operator's Manual.

The accumulators may be checked and/or charged with the unit installed or removed from the crane. If unit must be removed from the crane, refer to the crane Shop Manual for the correct procedure. Use the following procedure to check and/or charge the accumulators.

1. Lower, detach, and secure load, as required.
2. Stabilize the crane for service as follows:
 - a. Park the crane out of the way on a firm and level surface.
 - b. Engage the park brake and/or properly block the tires.
 - c. Engage the swing park brake and/or travel swing lock, as required.
 - d. Level the crane on fully extended outriggers.
 - e. Fully retract and lower the boom, as required.



1. Carrier Service Brake Circuit Accumulator

Figure 3—36
Upper Accumulator Locations

3. Shutdown the engine.



WARNING

Solvents and cleaning solutions can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all the manufacturer's recommendations concerning solvents and cleaning solutions.

4. Thoroughly clean area to be disassembled with an approved cleaning solvent to prevent contamination from entering the hydraulic oil circuits. Allow the area to air dry.



WARNING

Hydraulic oil is under pressure and may be hot. A sudden release of hot oil could cause burns or other serious injury. Shutdown the engine and exhaust all trapped hydraulic pressure from the system before removing any line or component.

5. To relieve hydraulic system pressure:
- Turn the ignition switch to "ON", but **DO NOT START THE ENGINE**. Move the function lockout switch to the "OPERATE" position.

- Work the crane control levers and outrigger switches back and forth several times.
- Rotate the steering wheel back and forth repeatedly until steering becomes hard. (On cranes equipped with emergency steering system, it will take several rotations of steering wheel before steering becomes hard.)
- Loosen the filler/breather cap on the hydraulic reservoir 1/4 turn until all pressure is fully relieved.
- Turn ignition switch to the "OFF" position.

- Check that all control levers are in the neutral position and move the function lockout switch to the "DISABLE" position.
- Remove cap (7) from the accumulator. Refer to Figure 3—35.
- Close the regulator valve (2) and the valve on the dry nitrogen tank (6).
- Connect the regulator assembly (5) to the dry nitrogen tank (6).
- Open the valve on the dry nitrogen tank (6). The regulator gauge (3) should read 0 psi (0kPa). If required, close the regulator valve (2) to achieve the zero pressure at the regulator gauge (3).
- Note the reading on the supply gauge (4). The dry nitrogen tank must contain sufficient volume and pressure to charge the accumulator.

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12. Connect chuck (8) to the charging valve (10) and turn the t-handle clockwise to open the charging valve (10).
13. When charging a new accumulator (1), open the regulator valve (2) slowly until the regulator gauge (3) reads 5 psi (34kPa).
14. Slowly open the regulator valve (2) until the regulator gauge (3) reaches the correct pressure. Refer to the following table for the correct pressure.

Accumulator	Pressure	
	psi	bar
Carrier Service Brake Circuit (2)	1,300	90
Hydro-Gas Suspension Circuit	750	52
Air Conditioner Motor	2,000	138

15. Close the valve on the dry nitrogen tank (6) and turn the t-handle of the chuck (8) counterclockwise to close the charging valve (10).
16. Remove the chuck (8) from the charging valve (10) and inspect the charging valve (10) for leaks.

There will be a slight discharge of nitrogen when the chuck (8) is removed.

Note: Allow accumulator to rest 10–15 minutes after charging. This will allow gas temperature to adjust and equalize. Recheck gas pressure and adjust as necessary.

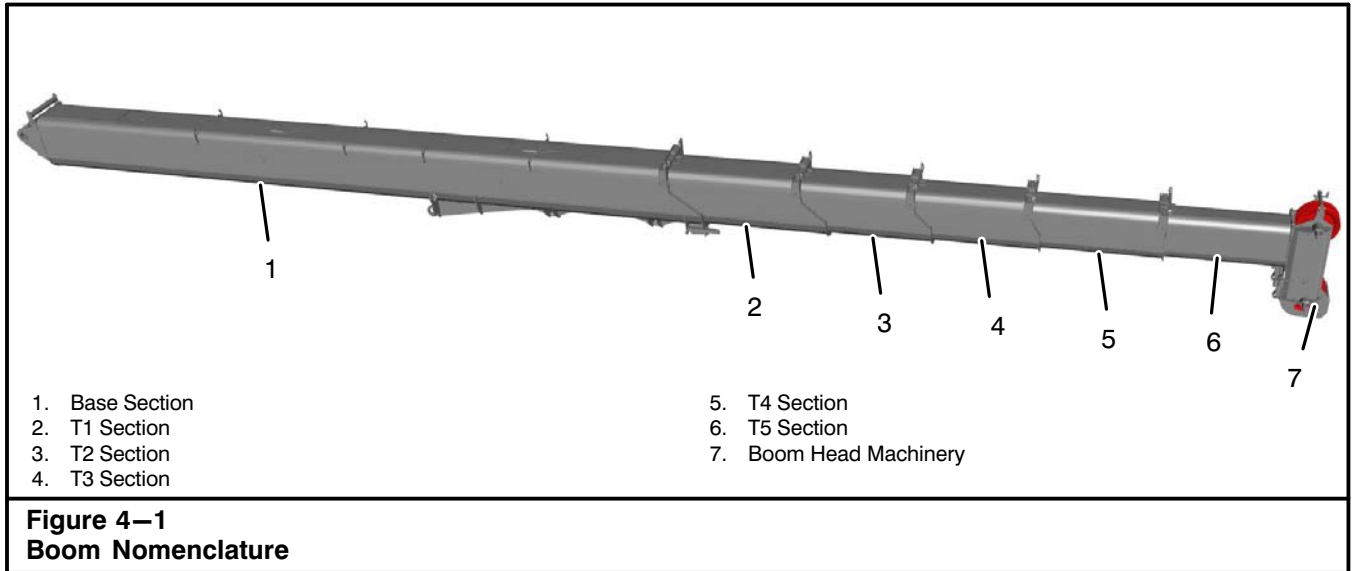
17. Check the charging valve (10) for leaks with soapy water. If leaks are present, repair as required.
18. If no leaks are present, install the cap (7) on the accumulator (1).
19. Check hydraulic reservoir oil level. Add oil as required. Refer to Section 2 of this Operator's Manual for correct type and procedure.
20. Start the engine and let idle for five minutes. Inspect the connections on the hydraulic lines for leaks. Repair if needed.
21. Test all hydraulic functions of the crane for proper operation before placing the crane into service.

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Boom

The boom is a six section full power latching boom. It consists of five basic parts: a base, T1, T2, T3, T4, and a T5 section. Refer to Figure 4—1.

The base section is connected to the upper revolving frame. It is raised and lowered by the boom hoist cylinder. Refer to Section 1 of this Operator's Manual for boom operating instructions.

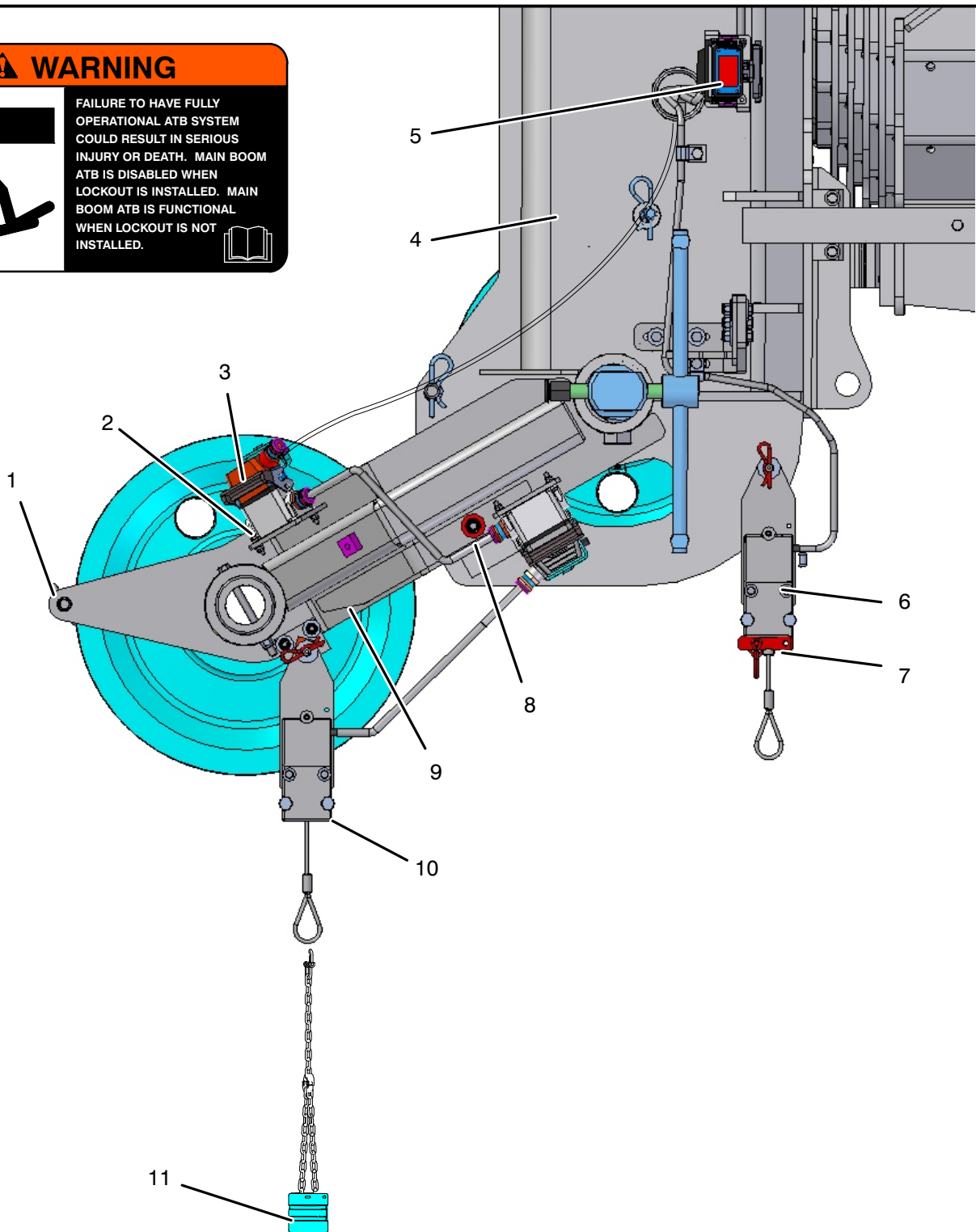
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⚠ WARNING



FAILURE TO HAVE FULLY OPERATIONAL ATB SYSTEM COULD RESULT IN SERIOUS INJURY OR DEATH. MAIN BOOM ATB IS DISABLED WHEN LOCKOUT IS INSTALLED. MAIN BOOM ATB IS FUNCTIONAL WHEN LOCKOUT IS NOT INSTALLED.





1. Auxiliary Lifting Sheave Wire Rope Guard
2. Auxiliary Lifting Sheave Anti-Two Block Connector
3. Plug Assembly
4. Main Boom Head
5. Jumper Assembly
6. Main Boom Anti-Two Block Switch

7. Lockout Clip (Installed — ATB Switch Inactive)
8. Capscrew, Locknut, & Washer
9. Auxiliary Lifting Sheave
10. Auxiliary Lifting Sheave Anti-Two Block Switch
11. Anti-Two Block Weight

Figure 4-2
Auxiliary Lifting Sheave With Anti-Two Block System

Auxiliary Lifting Sheave

The auxiliary lifting sheave connects to the boom head machinery. Refer to Figure 4–2. It is used for reeving winch wire rope for the second winch drum. Once installed, the unit may be left in place without interfering with the installation, erection, or storage of other boom attachments.

Auxiliary Lifting Sheave Installation

1. Park the crane on a firm, level surface, shift the transmission to neutral and apply the park brake.
2. Fully retract the boom and position the upper over the front of the carrier. Engage the travel swing lock.



WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

3. Boom down and/or extend the boom, as required, to ease access to the head machinery.
4. Adequately support the auxiliary lifting sheave with an appropriate lifting device. It weighs approximately 97 lb (44kg). Position the auxiliary lifting sheave frame under the boom head cross shaft. Align the holes in the auxiliary lifting sheave frame with the lugs in the main boom and install capscrews, locknuts, and washers. Refer to Figure 4–2.
5. Remove the wire rope guard from the auxiliary lifting sheave. Reeve the winch wire rope on the boom deflector sheave, then over the sheave on the auxiliary lifting sheave. Install the wire rope guard.

CAUTION

All wire rope guards must be in proper position during operation.

6. Properly connect the anti-two block system as follows:
 - a. Disconnect plug assembly from jumper assembly on the main boom head and connect it to the auxiliary arm connector. Refer to Figure 4–2.
 - b. Install the anti-two block weight to the auxiliary lifting sheave anti-two block switch cable.
 - c. Properly install lockout clip on the main boom anti-two block switch weight cable.

Note: When the lockout clip is installed, the anti-two block switch is inactive.

When both main boom and auxiliary sheave are reeved for operation, the lockout clip must be removed and an anti-two block weight must be suspended from each anti-two block switch.

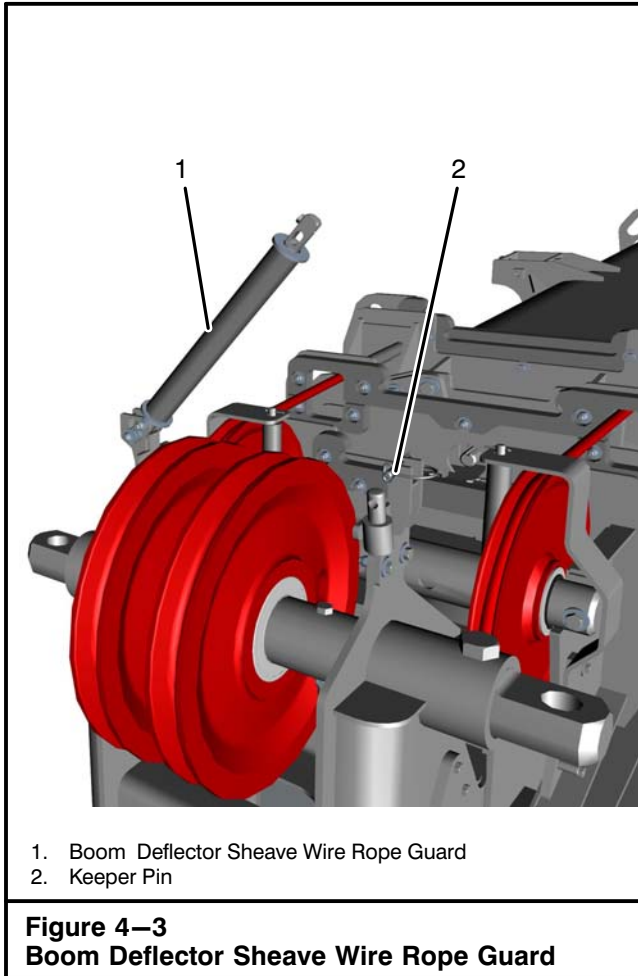
7. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to Section 1 of this Operator's Manual.
8. Check the Crane Rating Manual in the upper operator's cab for necessary deductions with the auxiliary lifting sheave installed before continuing operations.



WARNING

The auxiliary lifting sheave adds weight to the boom which must be considered in lifting capacities. When making lifts from the boom or fly with the auxiliary lifting sheave installed, refer to the Crane Rating Manual for the appropriate deductions from lifting capacities.

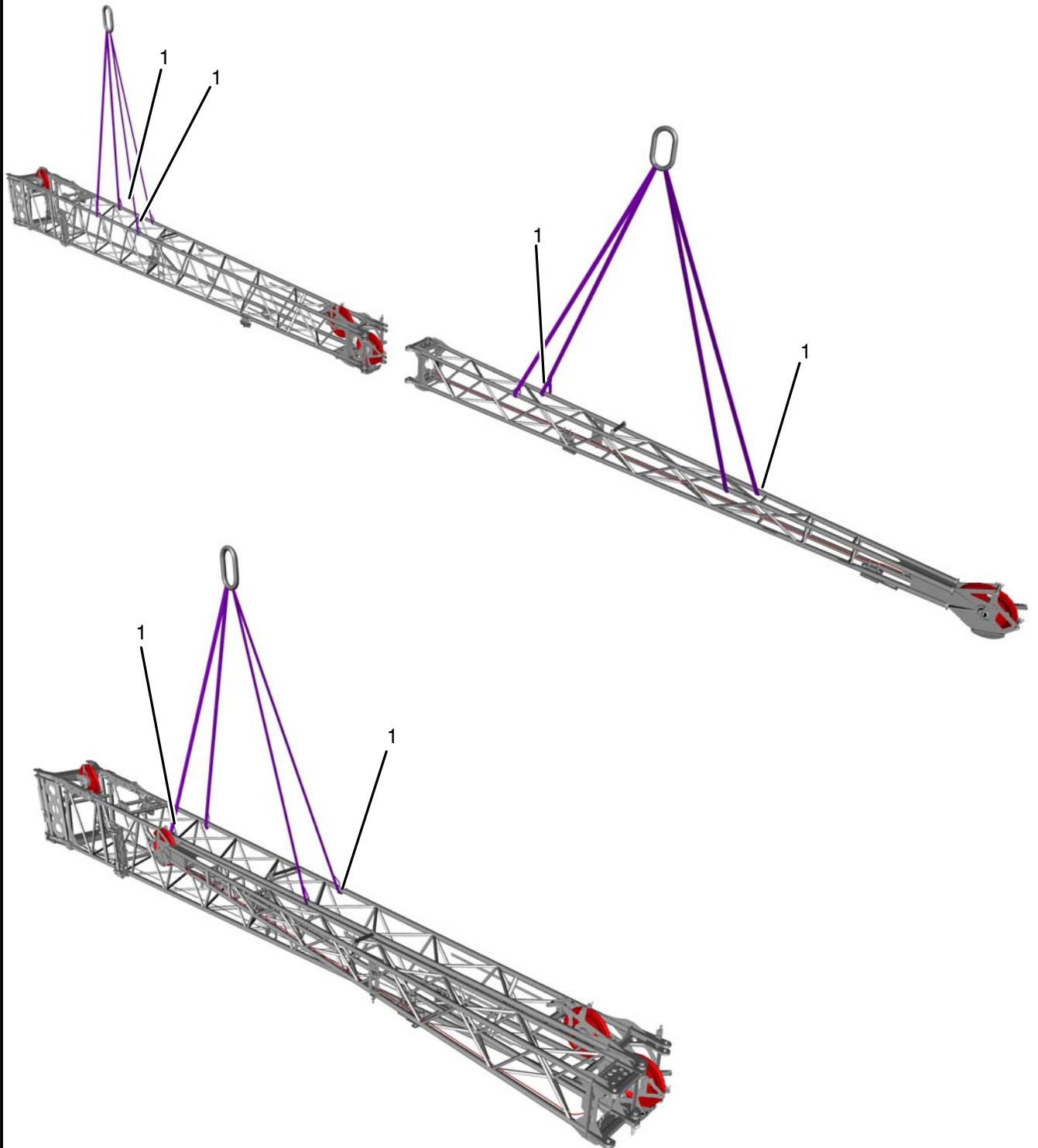
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Auxiliary Lifting Sheave Removal

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
 2. Fully retract the boom and position the upper over the front of the carrier. Engage travel swing lock.
 3. Boom down and/or extend the boom, as required, to ease access to the head machinery.
- WARNING**

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.
4. Properly disconnect the anti-two block system as follows:
 - a. Disconnect the plug assembly from the auxiliary lifting sheave and connect it to the jumper assembly on the main boom head. Refer to Figure 4—2.
 - b. Remove the lockout clip from the main boom head anti-two block switch weight cable.
 - c. Remove the anti-two block weight from the auxiliary lifting sheave and install it on the main boom anti-two block switch.
 5. Remove the wire rope guard from the auxiliary lifting sheave. Remove the winch wire rope and install the wire rope guard for storage.
 6. Adequately support the auxiliary lifting sheave. It weighs approximately 97 lb (44kg). Remove the capscrews, locknuts, and washers. Remove the auxiliary lifting sheave. Refer to Figure 4—2.
 7. Properly store the auxiliary lifting sheave, the capscrews, locknuts, and washers.
 8. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to Section 1 of this Operator's Manual.



1. Use The Main Chords With Nylon Straps Only And/Or Head Machinery Cross Shafts As Lifting Points.

Figure 4—4
Handling The Fly Sections

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Offset Lattice Fly

The crane may be equipped with one of the following offset fly arrangements:

- 35 ft (10.67m) lattice fly, stowable, manually offsettable to 0°, 15°, 30°, and 45°.
- 35–58 ft (10.67 – 17.68m) two piece bi-fold lattice fly, stowable, manually offsettable to 0°, 15°, 30°, and 45°.

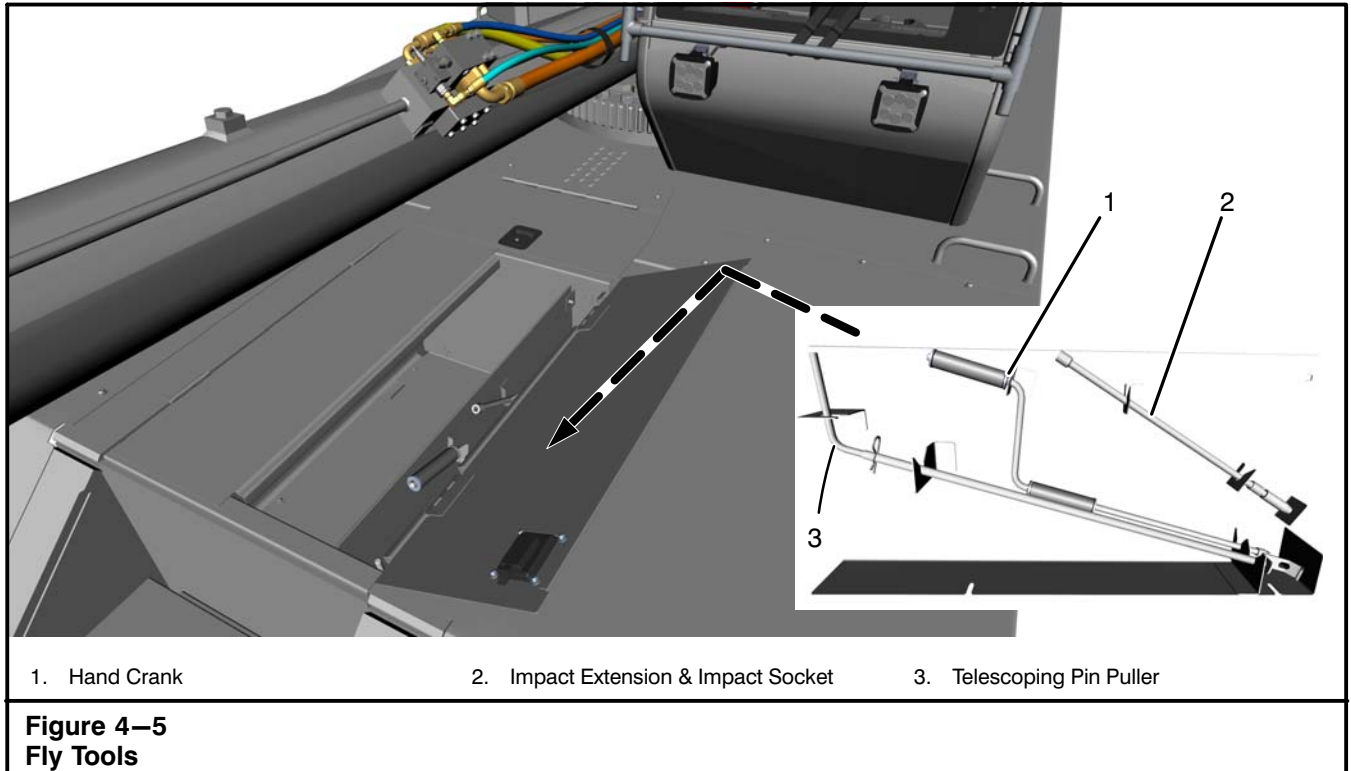
Refer to the appropriate arrangement in this section of this Operator's Manual for instructions on all of these arrangements.

Safety Instructions

The following points must be observed while performing any fly assembly or disassembly:

1. Read and understand the instructions outlined in this Operator's Manual before attempting to assemble or disassemble the fly.
2. Do not stand inside, on top, or under the fly at any time while assembling or disassembling the fly.
3. To avoid personal injury, do not climb, stand, or walk on the fly. Use a ladder or similar device to reach necessary areas.

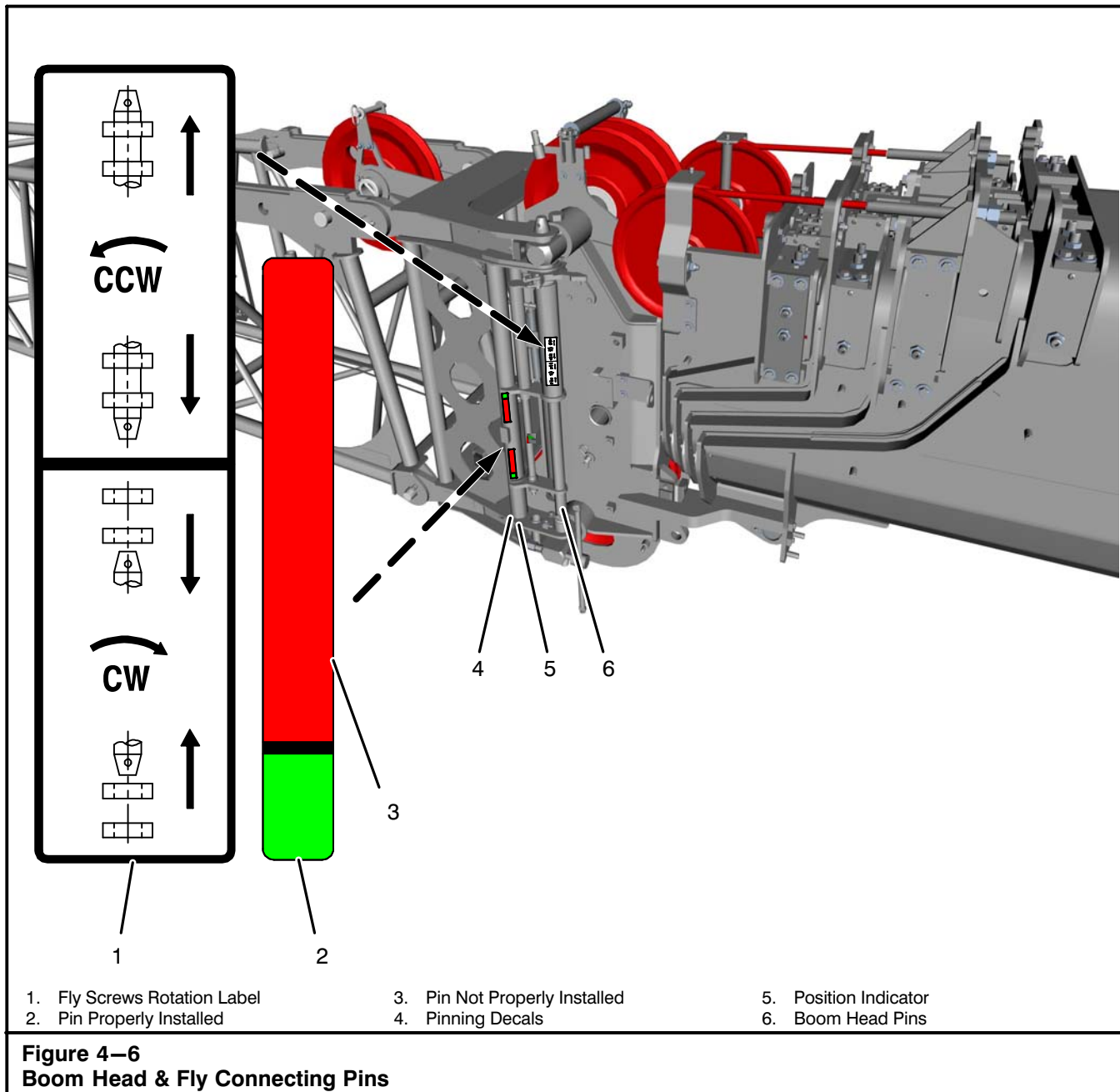
4. Use care handling the fly section(s) when loading, transporting, and unloading. Damage that occurs during these operations can go undetected and could result in failure of the attachment, once subjected to loading. Do not attach slings to the lattices, when lifting the fly, as they will bend. It is recommended to attach nylon straps around connecting lugs and/or head machinery cross shaft, or all four main chords. Refer to Figure 4–4.
5. Each individual fly section must be adequately supported before attempting to disassemble the fly. Removing the connecting pins or boom head pins from the fly before it is supported, may allow the fly to fall.
6. Stay clear of pinch points when aligning fly section connecting points. Never place your fingers in connecting pin holes.
7. Fully assemble the fly before installing it on the boom.



Fly Tools

The fly comes equipped with fly tools to aid in fly configuration. The fly tools are located in the large front carrier storage box, and include a hand crank, an impact extension, an impact socket, and a telescoping pin puller. Refer to Figure 4–5.

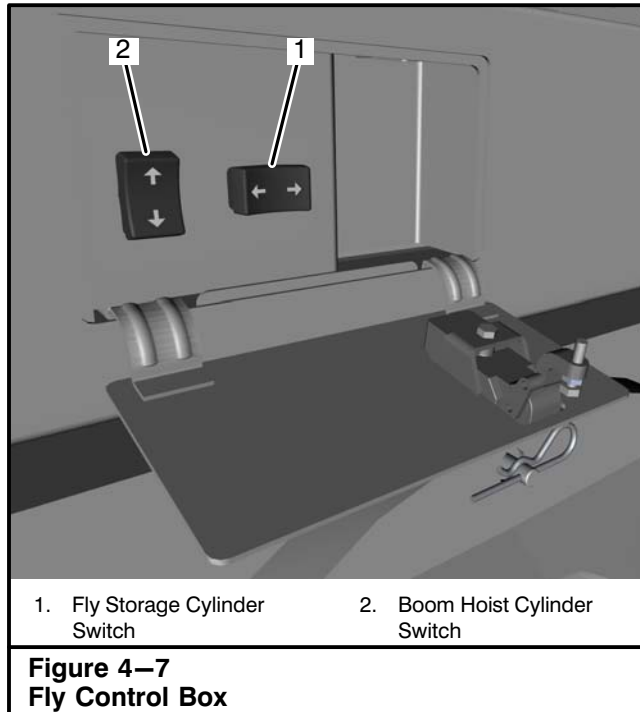
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Boom Head & Fly Connecting Pins

Note: Boom head pins do not require keeper pins.

The boom head and fly connecting pins have to be properly installed for the fly to operate safely and effectively. Pinning decals are located on the fly to ensure the pins are properly installed. When the position indicator is in the red area of the pinning decal the pin is not properly installed. When the position indicator is fully in the green area of the pinning decal the pin is properly installed.



Fly Control Box

The fly comes equipped with a fly control box on the front of the crane carrier, above pontoon storage. The fly control switches can be used to aid in storing and erecting the fly.

Fly Storage Cylinder Switch

This switch is located on the front of the machine and is used to operate the fly storage cylinder. This switch will only be activated when the following conditions are met:

- **Rigging Mode**

Extend: Boom is at 0 deg (± 0.5 deg).

Retract: Boom is at 0 deg (± 0.5 deg).

Function lockout activated in cab.

Swing park brake activated.

Travel park brake activated and transmission in neutral.

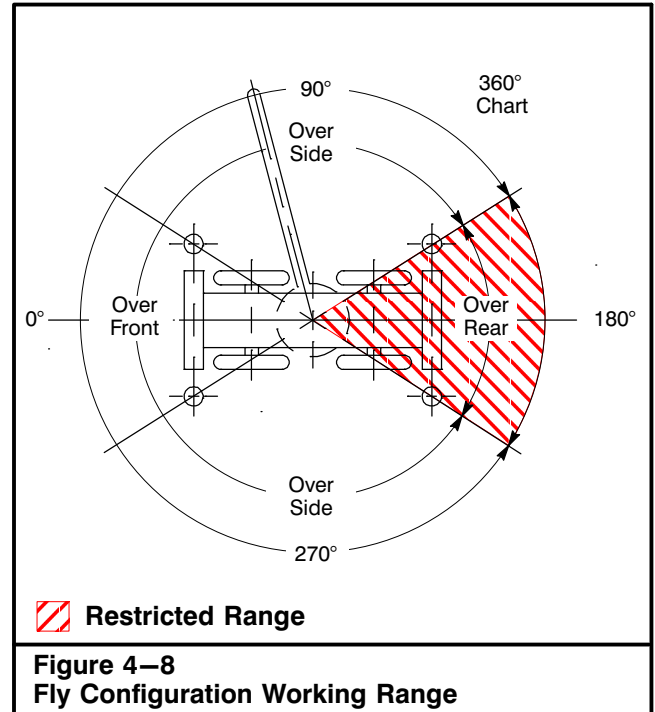
Engine RPM < 800

All states described above are to be monitored. If any of the states change, fly storage cylinder switch will be disabled.

- **Bypass Mode**

Active at all times.

Refer to Figure 4-7.



Fly Storage Boom Hoist Switch

This switch is located on the front of the machine and is used to operate the boom hoist cylinder in a limited manner for fly erection/storage operation. This switch will only be activated when the following conditions are met:

- **Rigging Mode**

Extend: Boom is below 0 deg.

Retract: Boom is at 10 deg or below.

Function lockout activated in cab.

Swing park brake activated.

Travel park brake activated and transmission in neutral.

Swing angle not in "Hood Alarm" area.

Engine RPM < 800

All states described above are to be monitored. If any of the states change, fly storage boom hoist switch will be disabled.

- **Bypass Mode**

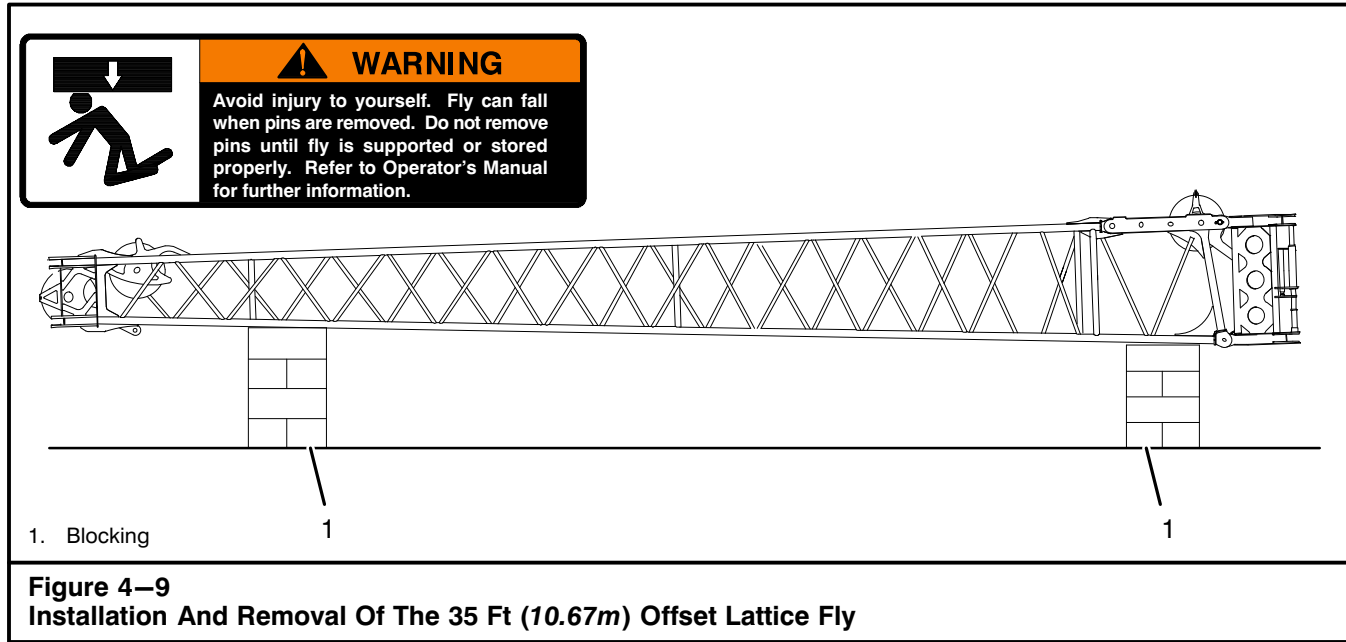
Active at all times.

Refer to Figure 4-7.

Fly Configuration Working Range

The fly can be configured while the boom is in the fly configuration working range. The working range includes over front, and over side, but not over rear. Refer to Figure 4-8.

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35 Ft (10.67m) Offset Lattice Fly

The crane may be equipped with a 35 ft (10.67m) offset lattice fly. The offset lattice fly, as shown in Figure 4—9, connects to the main boom head. It can be mounted in one of four offset positions: 0°, 15°, 30°, or 45°. Once installed, the offset lattice fly can be stored on the right side of the boom base section.

35 Ft (10.67m) Fly Installation

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the boom within the fly configuration working range. Refer to Figure 4—8. Engage travel swing lock.



WARNING

Install the fly with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper within the fly configuration working range, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in the personal injury and/or the crane tipping.

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5. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator's Manual for detailed instructions.
6. Ensure the the fly base deflector sheave is in the stored position. Refer to Figure 4–13.
7. Position the fly on secure blocking. Refer to Figure 4–9. The 35 ft (10.67m) fly weighs approximately 2,040 lb (926kg).
8. Raise and extend the boom to allow enough wire rope length to ease reeving of the fly and lower the hook ball (to be used on the fly) to the ground. Fully retract the boom.
9. Boom down fully.



WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

10. Remove the wire rope guard and wire rope from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4–2. Lay the wire rope aside to prevent damage to it during fly installation. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave for storage.
11. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly install. Install the wire rope guard and secure with keeper pin.

Note: The push pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open. Refer to Figure 4–11.

12. Ensure the boom head pins are fully retracted and the boom head pin access cover is open (secondary pivot pin is fully extended). If required, extend the secondary pivot pin. Provide clearance by pushing the pivot pin block plate back with a wooden block. Using the appropriate tools, rotate the pivot pin speed screw to fully extend the secondary pivot pin. Refer to Figure 4–11.
13. Carefully extend the boom head to the fly. Slowly raise or lower the boom, as required, to engage the fly catch with the boom head. Refer to Figure 4–22. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.
14. Using the appropriate tools, rotate the right side speed screw through the right side access tube to extend both right side boom head pins and fully engage the right side of the boom head machinery cross shafts. Refer to Figure 4–11.
15. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully extend the top left boom head pin.
16. Rotate the t-handle, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
17. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully extend the bottom left boom head pin.
18. Back off the t-handle until a clearance of at least 1/2 in (1.3cm) from the left fly lug is obtained.

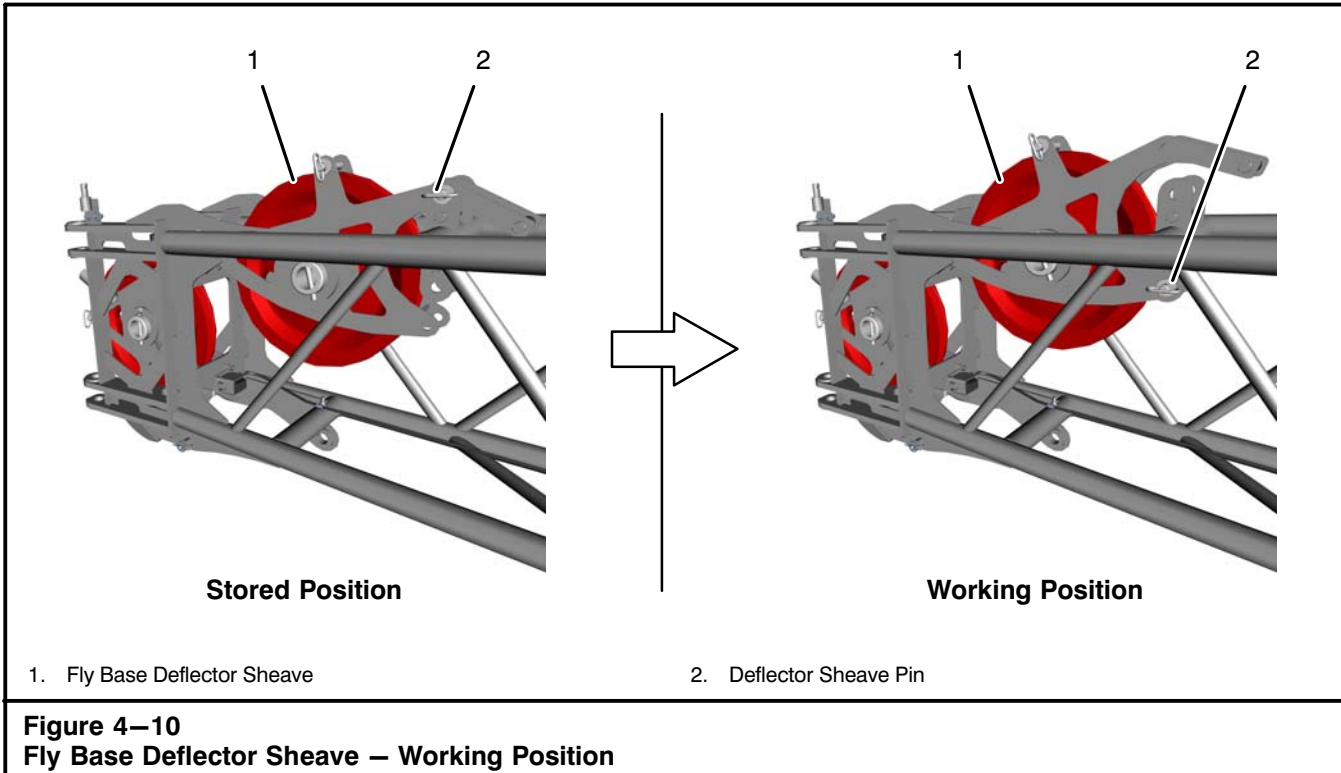


WARNING

All boom head pins and all fixed fly base connecting pins must be properly installed before operating the crane with the fly erected. Damage to the fly and/or personal injury could occur if all connecting pins and boom head pins are not properly installed.

19. Using the appropriate tools, rotate the pivot pin speed screw to fully retract the secondary pivot pin and close the boom head pin access cover.

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20. Remove the deflector sheave pin securing the fly base deflector sheave to the top of the fly bracket and rotate the fly base deflector sheave into the working position. Refer to Figure 4–10. Install the deflector sheave pin to secure the fly base deflector sheave to the bottom of the fly bracket.
21. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard.
22. Remove the wire rope guards from the fly base deflector sheaves. Refer to Figure 4–24. Reeve the wire rope from the boom deflector sheave over the fly base deflector sheaves. Install the wire rope guards.
23. Remove the wire rope guard from the fly base head sheave. Reeve the wire rope from the fly base deflector sheaves over the fly base head sheave. Install the wire rope guard.

CAUTION

All wire rope guards must be in proper position during operation.

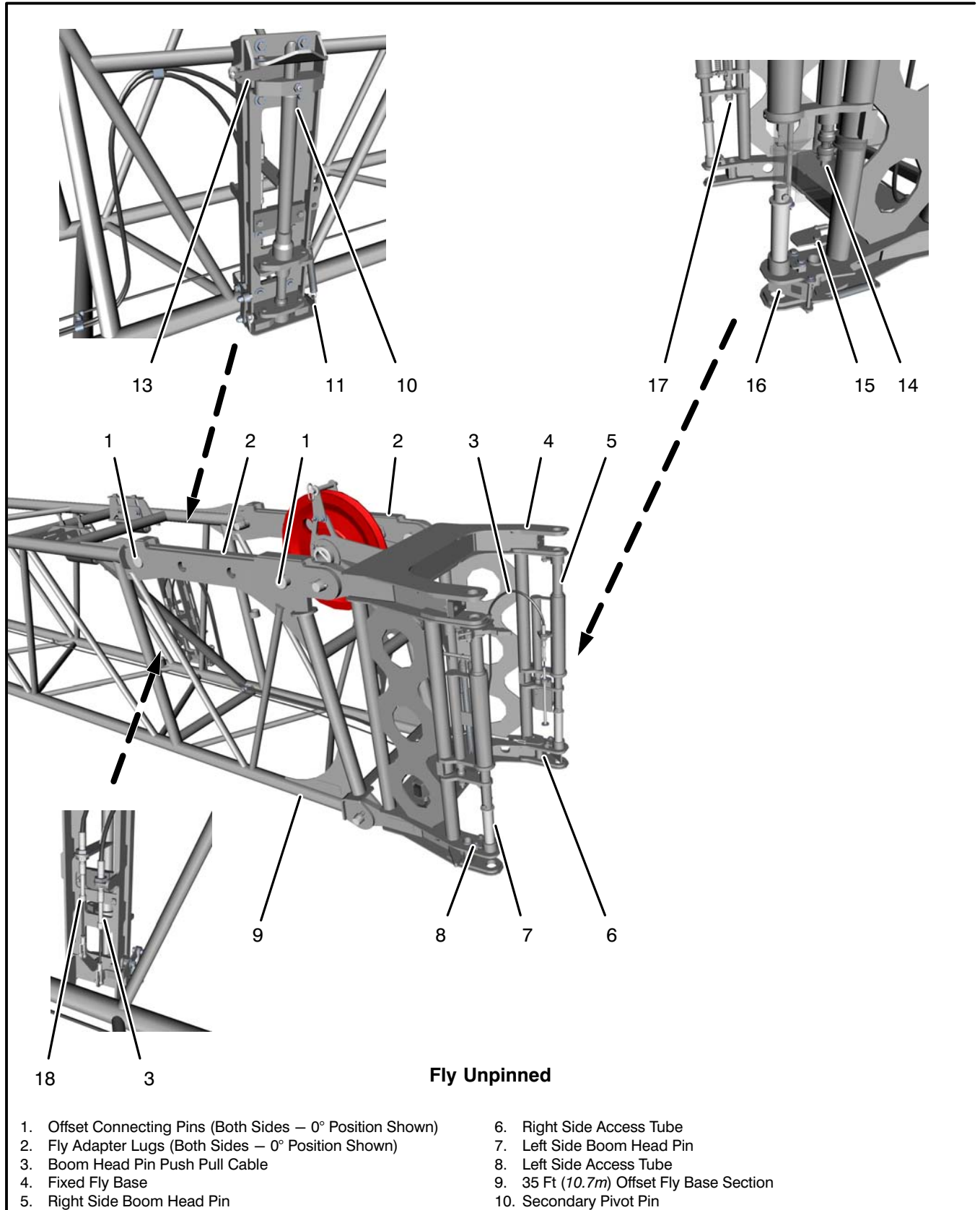
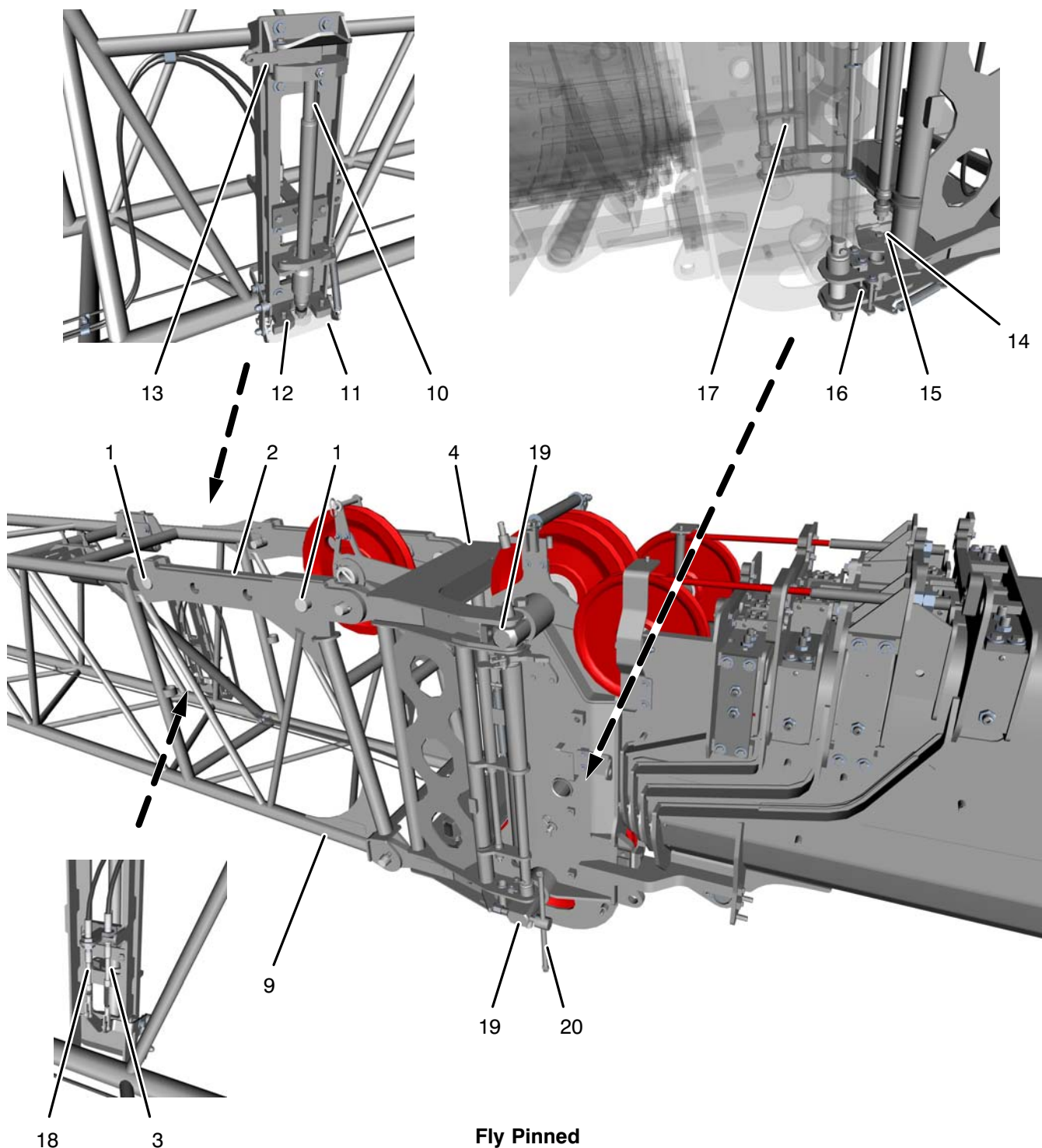


Figure 4–11
35 Ft (10.67m) Offset Lattice Fly Base

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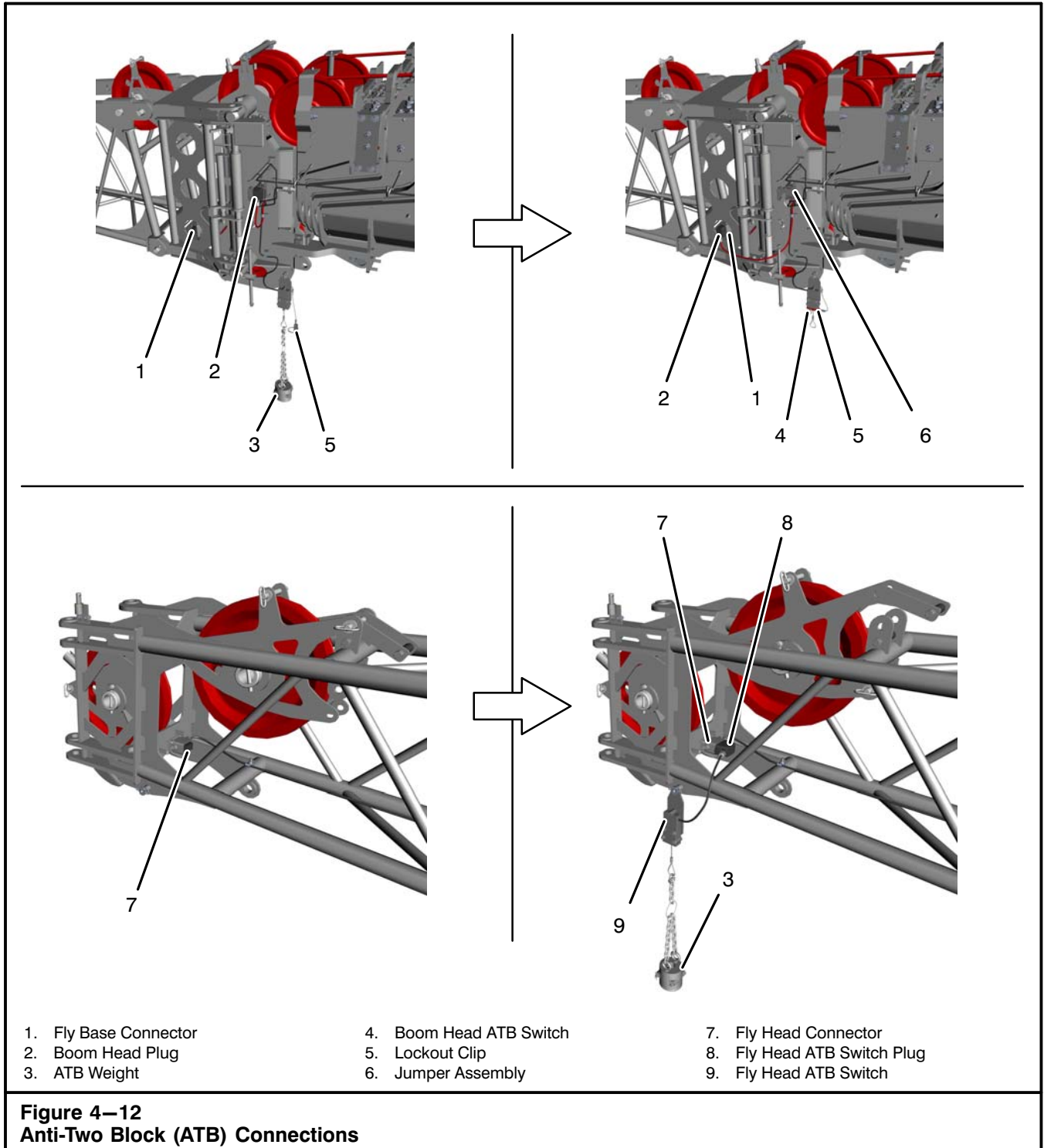


Fly Pinned

- 11. Pivot Pin Access Cover
- 12. Pivot Pin Speed Screw
- 13. Pivot Pin Block Plate
- 14. Right Side Speed Screw
- 15. Boom Head Pin Access Cover

- 16. Boom Head Pin Block Plate
- 17. Left Side Speed Screw
- 18. Pivot Pin Push Pull Cable
- 19. Boom Head Machinery Cross Shafts
- 20. T-handle

Figure 4–11 Continued
35 Ft (10.67m) Offset Lattice Fly Base



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24. Properly connect the anti-two block (ATB) system as follows:

- a. Install the lockout clip on the boom head ATB switch cable. Refer to Figure 4–12.
- b. Remove the ATB weight from the boom head ATB switch cable.
- c. Disconnect the boom head plug from the jumper assembly and connect it to the fly base connector.
- d. Install the fly head ATB switch on the fly head.
- e. Connect the fly head ATB switch plug to the fly head connector.
- f. Install the ATB weight on the fly head ATB switch cable.

Note: When lockout clip is installed, the main boom ATB switch is inactive.

When both main boom and fly are reeved for operation, the lockout clip must be removed and an ATB weight must be suspended from each ATB switch.

25. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to “Erected Attachment Configuration” in this section of this Operator's Manual.

26. Check the Crane Rating Manual, in the operator's cab, for deductions from the lifting capacities with the fly installed before continuing operations.



WARNING

The fly adds weight to the boom which must be considered in lifting capacities when the fly is erected. When making lifts from the boom or auxiliary lifting sheave with the fly erected, refer to the Crane Rating Manual for the appropriate deductions from lifting capacities. Use the offset lattice fly only when the crane is level on fully or intermediate extended outriggers with all tires clear of the ground.

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35 Ft (10.67m) Fly Removal

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the boom within the fly configuration working range. Refer to Figure 4–8. Engage travel swing lock.



WARNING

Remove the fly with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper within the fly configuration working range, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in the personal injury and/or the crane tipping.

5. If the fly is not in the erected position, erect it per “Erection Of The 35 ft (10.67m) Fly From The Stored Position” in this section of this Operator's Manual.

6. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. Refer to Figure 4–11. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator's Manual for detailed instructions.
7. Raise and extend the boom to allow enough rope to ease wire rope removal from the fly. Lower the hook block or hook ball (to be removed from the fly) to the ground. Fully retract the boom.
8. Boom down fully.

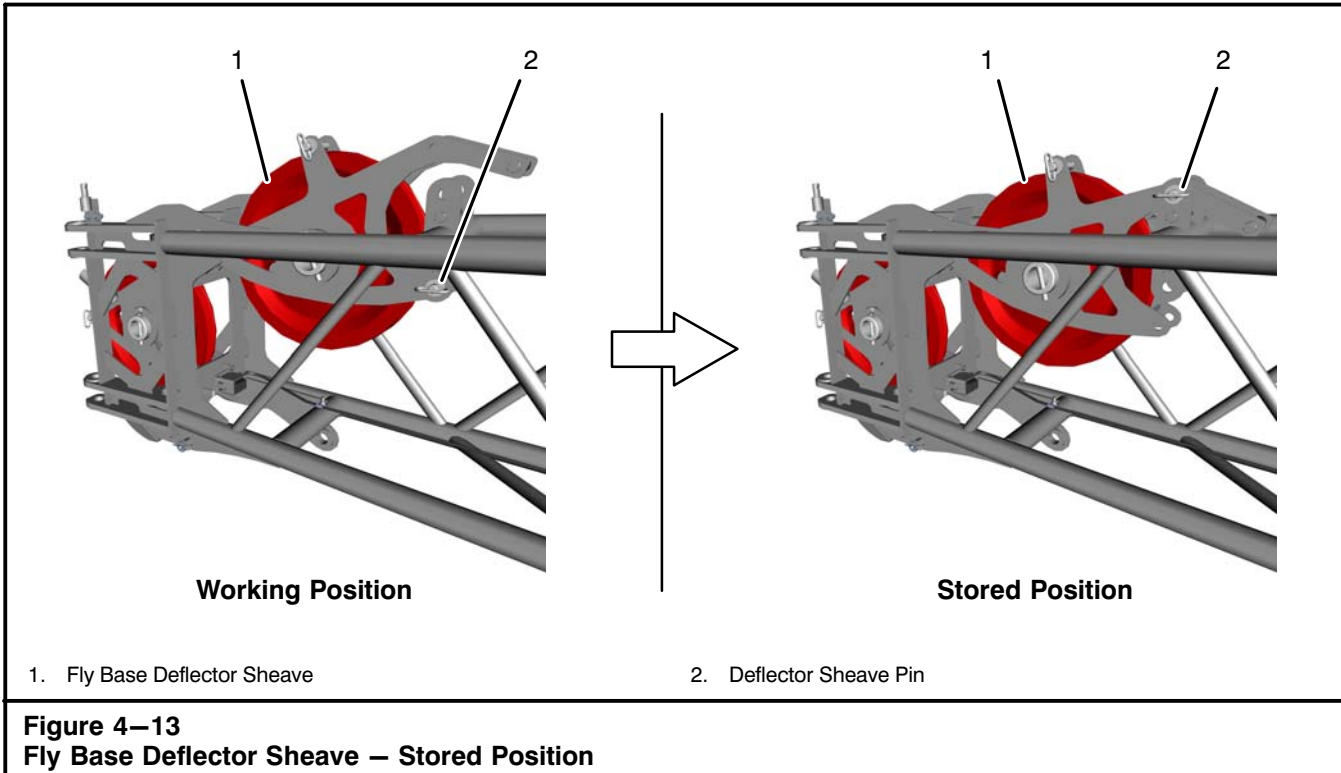


WARNING

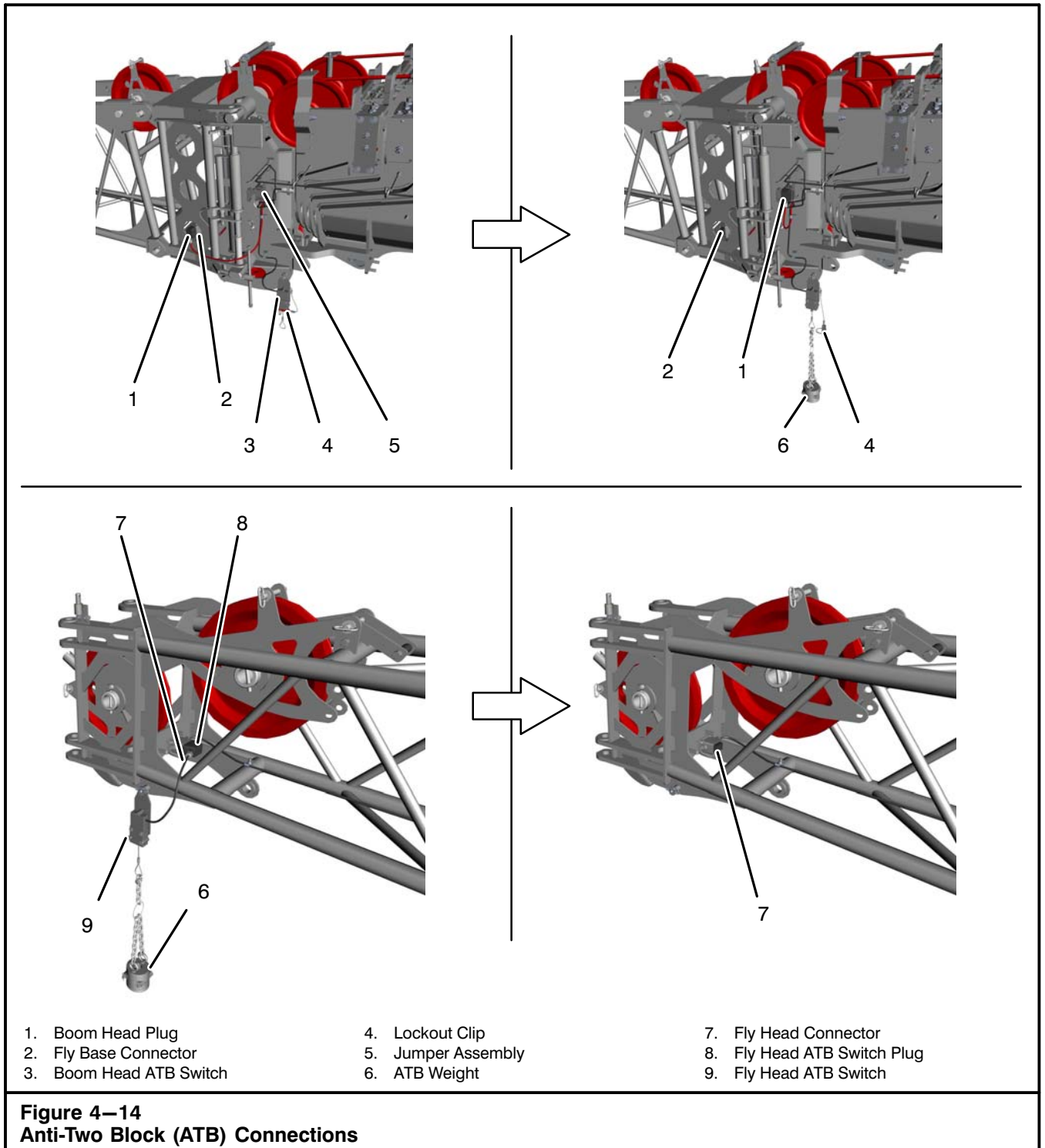
To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

9. Properly disconnect the anti-two block (ATB) system as follows:
 - a. Remove the ATB weight from the fly head ATB switch cable. Refer to Figure 4–14.
 - b. Disconnect the fly head ATB switch plug from the fly head connector.
 - c. Remove the fly head ATB switch from the fly head.
 - d. Disconnect the boom head plug from the fly base connector and connect it to the jumper assembly on the main boom head.
 - e. Install the ATB weight on the boom head ATB switch cable.
 - f. Remove the lockout clip from the boom head ATB switch cable.

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10. Remove the wire rope guard from the fly base head sheave. Refer to Figure 4–24. Remove wire rope from the fly base head sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guard.
11. Remove the wire rope guards from the fly base deflector sheaves. Remove wire rope from the fly base deflector sheaves and lay it aside to prevent damage to it during fly removal. Install the wire rope guards.
12. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guard and secure with keeper pin.
13. Remove the deflector sheave pin securing the fly base deflector sheave to the bottom of the fly bracket and rotate the fly base deflector sheave into the stored position. Refer to Figure 4–13. Install the deflector sheave pin to secure the fly base deflector sheave to the top of the fly bracket.
14. Properly store wire rope which was used on fly, as required.



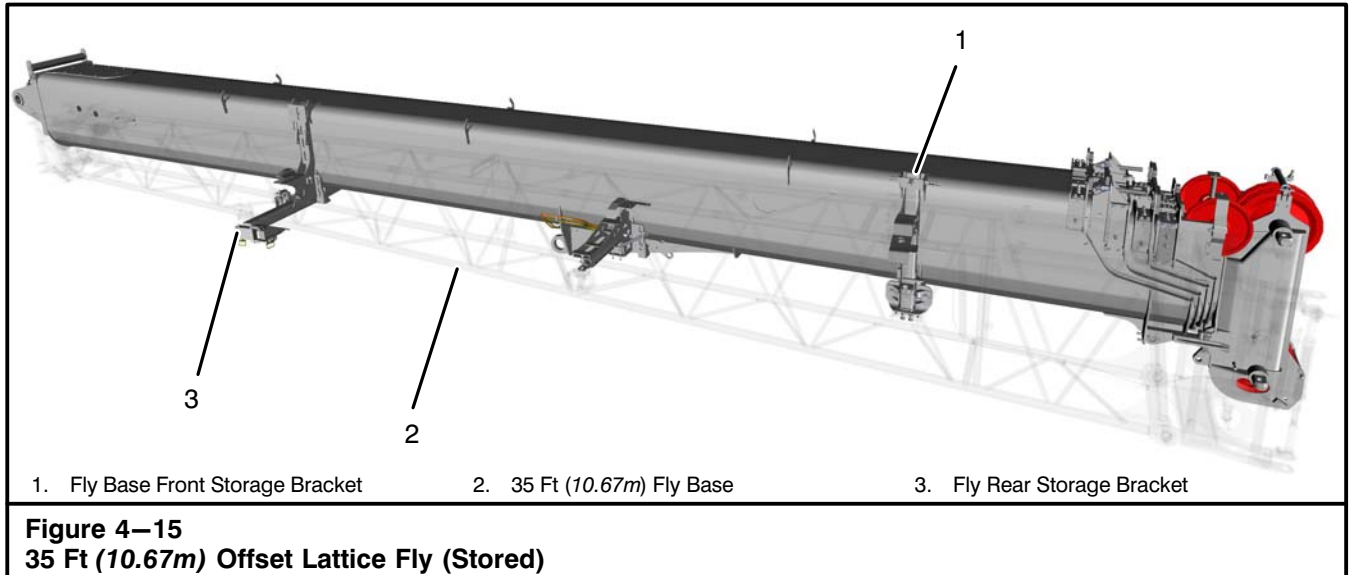
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CAUTION

Do not extend the boom or boom down to the point of over stressing the fly section. Structural damage to the fly could occur if care is not taken. Use a signal person to aid the operator in lowering the fly head wear pads to the ground.

15. Carefully extend the boom until the fly head wear pads rest on the ground. Use a signal person to alert the operator when the wear pads are resting on the ground.
16. Securely block up the fly to support it. Refer to Figure 4–9. The 35 ft (10.67m) fly weighs approximately 2,040 lb (926kg).

Note: The push pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open. Refer to Figure 4–11.
17. Ensure the secondary pivot pin is fully extended and the boom head pin access cover is open. If required, extend the secondary pivot pin. Provide clearance by pushing the pivot pin block plate with a wooden block. Using the appropriate tools, rotate the pivot pin speed screw to fully extend the secondary pivot pin. Refer to Figure 4–11.
18. Rotate the t-handle, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
19. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully retract the bottom left boom head pin.
20. Back off the t-handle until a clearance of at least 1/2 in (1.3cm) from the left fly lug is obtained.
21. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully retract the top left boom head pin.
22. Using the appropriate tools, rotate the right side speed screw through the right side access tube to fully retract the right side boom head pin and disengage from the right side of the boom head machinery cross shafts.
23. Carefully retract the boom away from the fly.
24. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
25. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4–2. Reeve the wire rope from the boom deflector sheave over the boom head sheave or auxiliary lifting sheave. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave, as required.
26. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to “Erected Attachment Configuration” in this section of this Operator's Manual.
27. Properly store the fly to prevent damage to it.



Erection Of The 35 Ft (10.67m) Fly From The Stored Position

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the boom within the fly configuration working range. Refer to Figure 4-8. Engage travel swing lock.
5. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator's Manual for detailed instructions.
6. Ensure the the fly base deflector sheave is in the stored position. Refer to Figure 4-13.
7. Raise and extend the boom to allow enough wire rope length to ease reeving of the fly and lower the hook ball (to be used on the fly) to the ground. Fully retract the boom.



WARNING

Erect the fly with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper within the fly configuration working range, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in personal injury and/or the crane tipping.

CAUTION

Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

8. Boom down fully.

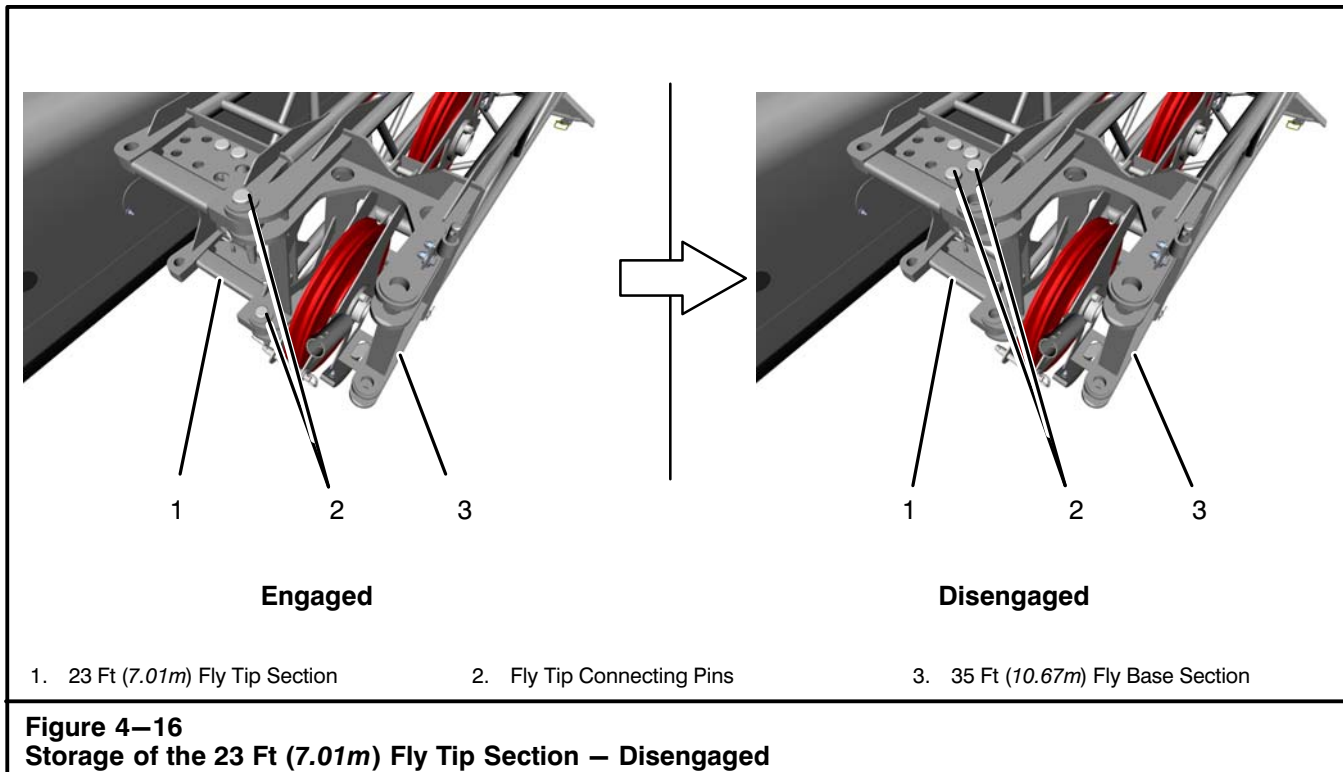


WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

9. Remove the wire rope guard and wire rope from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4-2. Lay the wire rope aside to prevent damage to it during fly erection. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave for storage.

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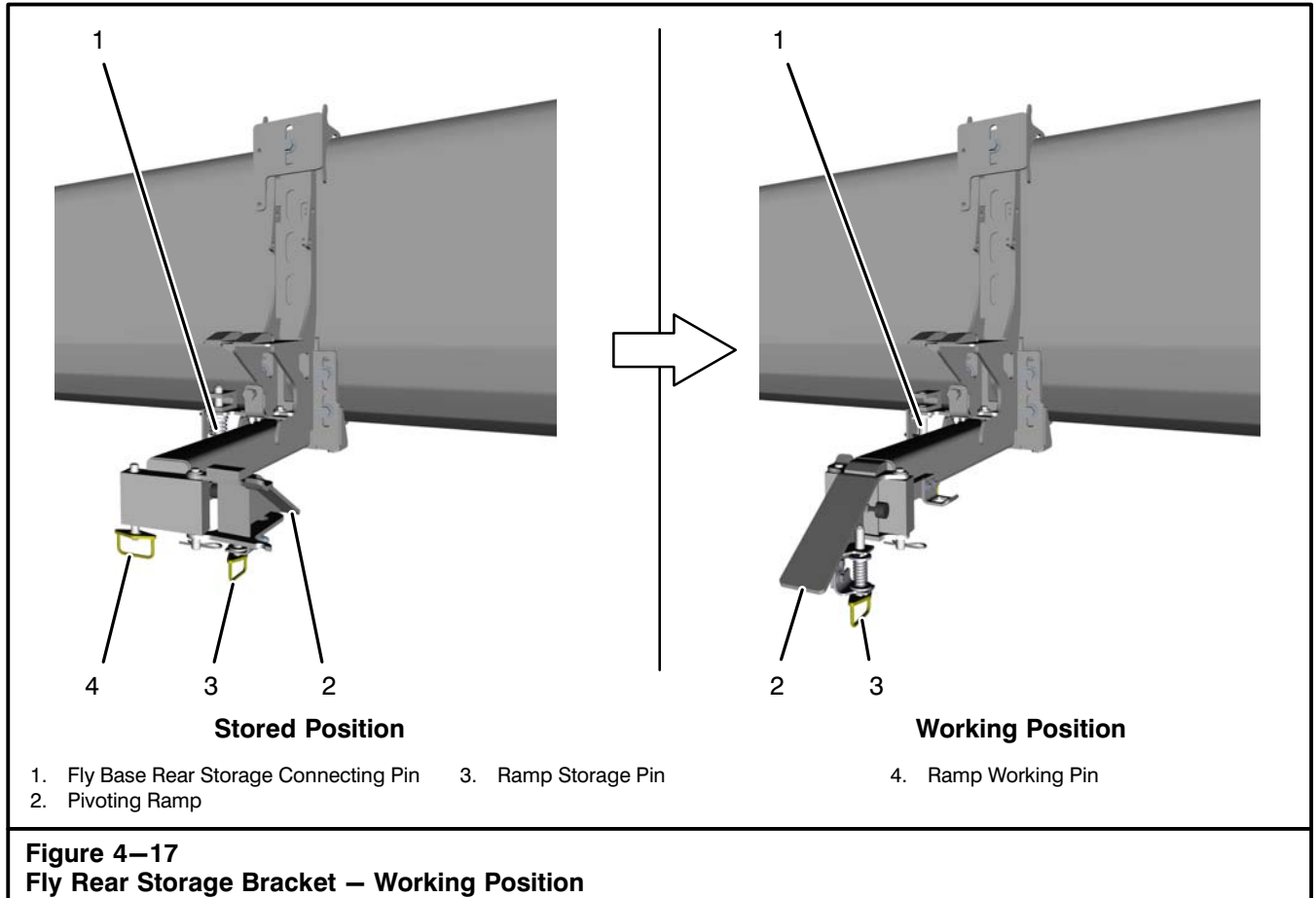
10. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly erection. Install the wire rope guard and secure with keeper pin.

Note: If the fly tip section is stored on the boom, disengage the 23 ft (7.01m) fly tip section from the 35 ft (10.67m) fly base section:

Ensure the 23 ft (7.01m) fly tip section is properly stored on the boom with the fly tip front storage connecting pin and fly tip rear storage connecting pin engaged. Refer to Figure 4–57 and Figure 4–60.

Disengage the fly tip to base storage pin. Refer to Figure 4–46.

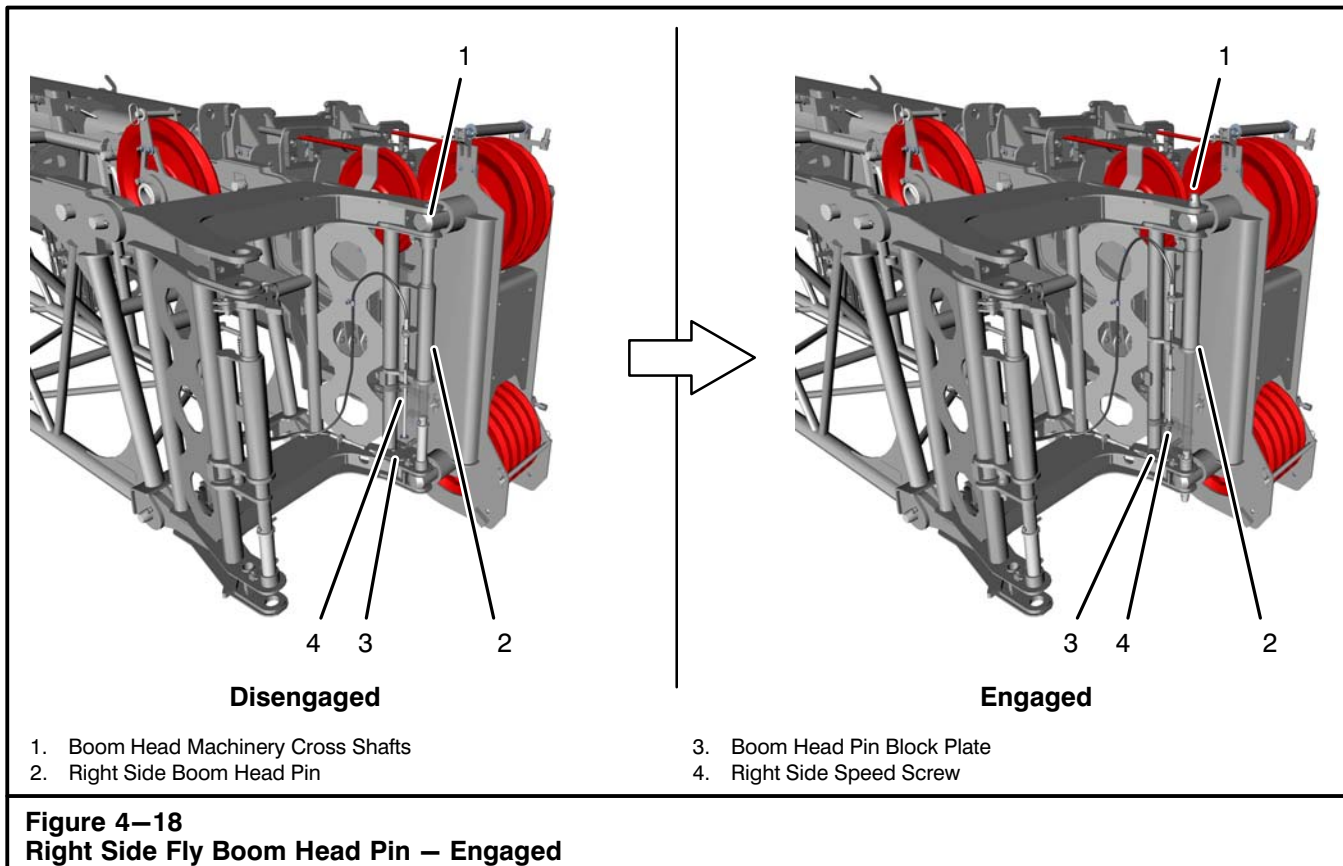
Remove the connecting pins securing the 23 ft (7.01m) fly tip section to the 35 ft (10.67m) fly base section and store the connecting pins in the rear of the fly tip. Refer to Figure 4–16.



Note: The push pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open. Refer to Figure 4–11.

11. Ensure the boom head pins are fully retracted and the boom head pin access cover is open (secondary pivot pin is fully extended). Refer to Figure 4–11.
12. Attach a hand line to the swing hook on the fly base. Refer to Figure 4–21.
13. Boom up to 10°, to ease accessibility.
14. Properly set the Rated Capacity Limiter to rigging mode. Refer to “Base Configuration” in Section 1 of this Operator’s Manual.
15. Lift the operator’s seat left arm rest into the function lockout position. Refer to “Moveable Left Side Armrest” in Section 1 of this Operator’s Manual.
16. Pull the ramp storage pin. Refer to Figure 4–17. Rotate the pivoting ramp into the working position until ramp working pin catches.
17. Disengage the fly base rear storage connecting pin.

Operator's Manual



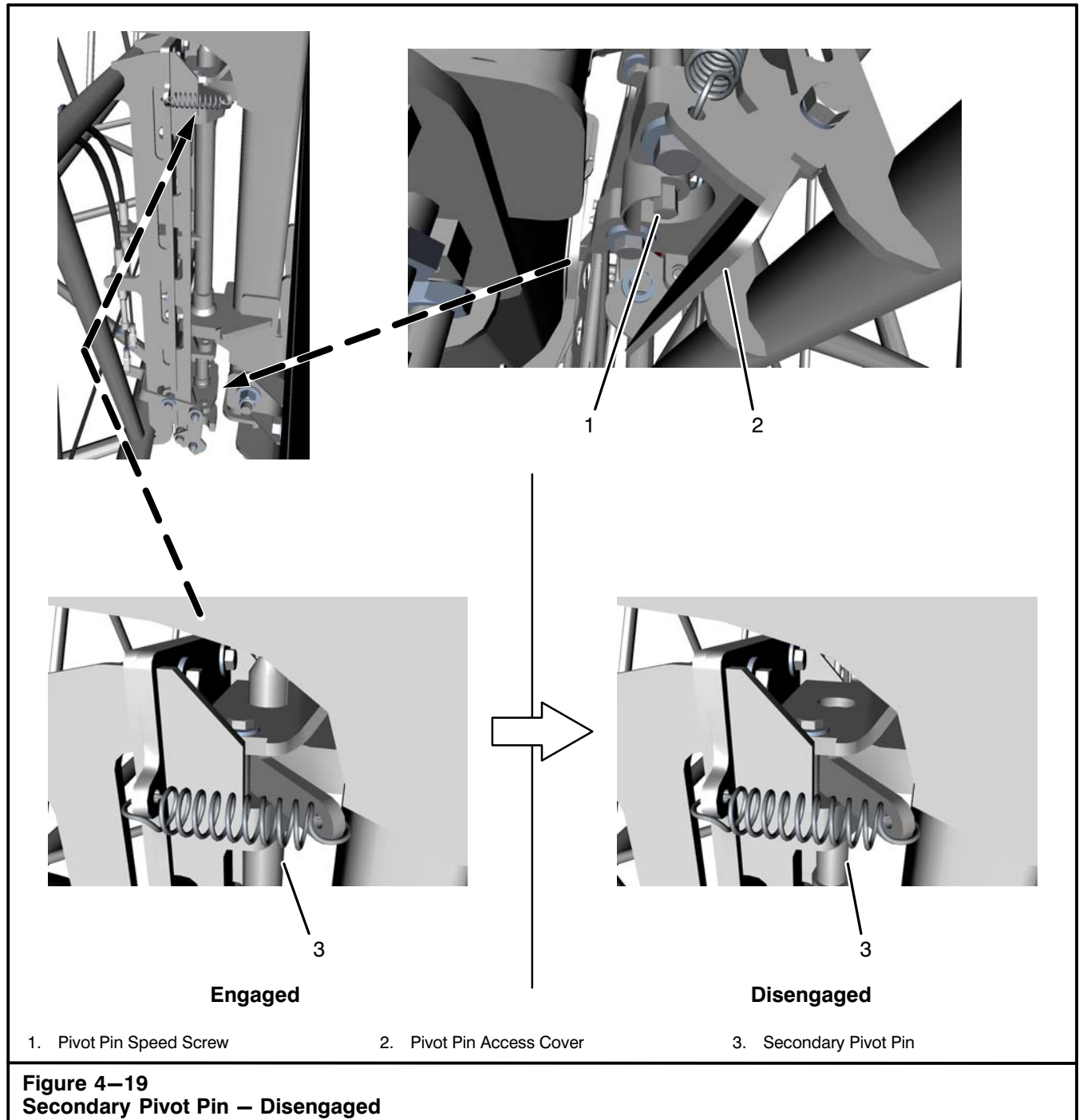
18. Use the boom hoist cylinder switch, as required, to boom down to 0°. Once boom is below 0° it can be raised up to 0° with the boom hoist cylinder switch and will stop automatically at 0°. Refer to Figure 4–7.

Note: The fly storage cylinder will only operate with the boom angle of 0°.

19. Use the fly storage cylinder switch to actuate the fly storage cylinder, as required, to align the right side fly lugs with the right side boom head machinery cross shafts. Refer to Figure 4–18. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.

20. Use the boom hoist cylinder switch, as required, to boom down fully. Refer to Figure 4–7.

21. Using the appropriate tools, rotate the right side speed screw through the right side access tube to extend both right side boom head pins and fully engage the right side of the boom head machinery cross shafts.

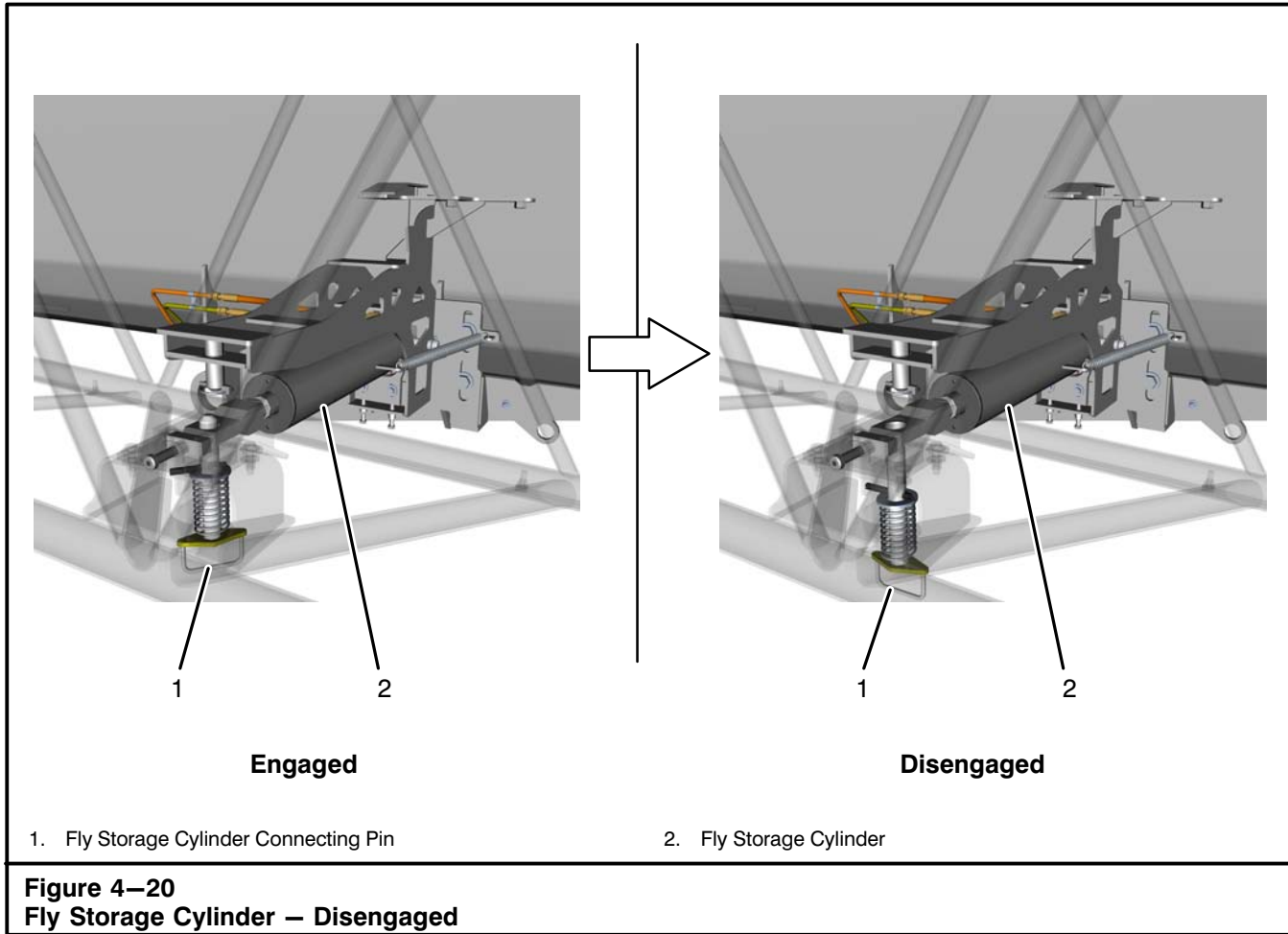


WARNING

The right side boom head pin and the fly storage cylinder must be properly installed before disengaging the secondary pivot pin. Damage to the fly and/or personal injury could occur if the right side boom head pin is not properly installed.

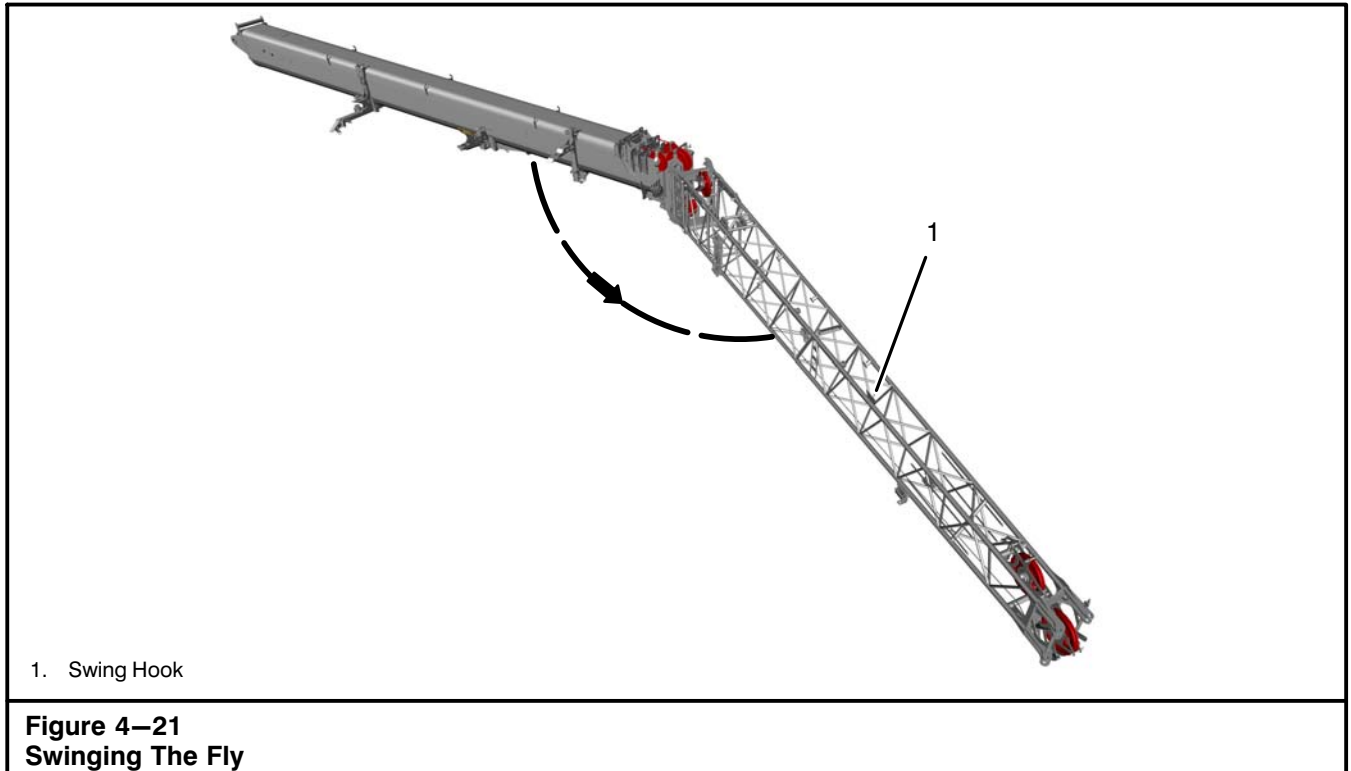
22. Using the appropriate tools, rotate the pivot pin speed screw to fully retract the secondary pivot pin and close the boom head pin access cover. Refer to Figure 4-19.
23. Use the boom hoist cylinder switch, as required, to boom up to 0°. Boom should automatically stop at 0°. Refer to Figure 4-7.

Operator's Manual



Note: The fly storage cylinder will only operate with the boom angle of 0°.

24. Use the fly storage cylinder switch to extend the fly storage cylinder, as required, to pivot the fly off the pivoting ramp.
25. While holding the hand line, use the appropriate tools to pull and rotate the fly storage cylinder connecting pin into detent position and disengage the fly storage cylinder from the 35 ft (10.67m) fly section. Refer to Figure 4-20.

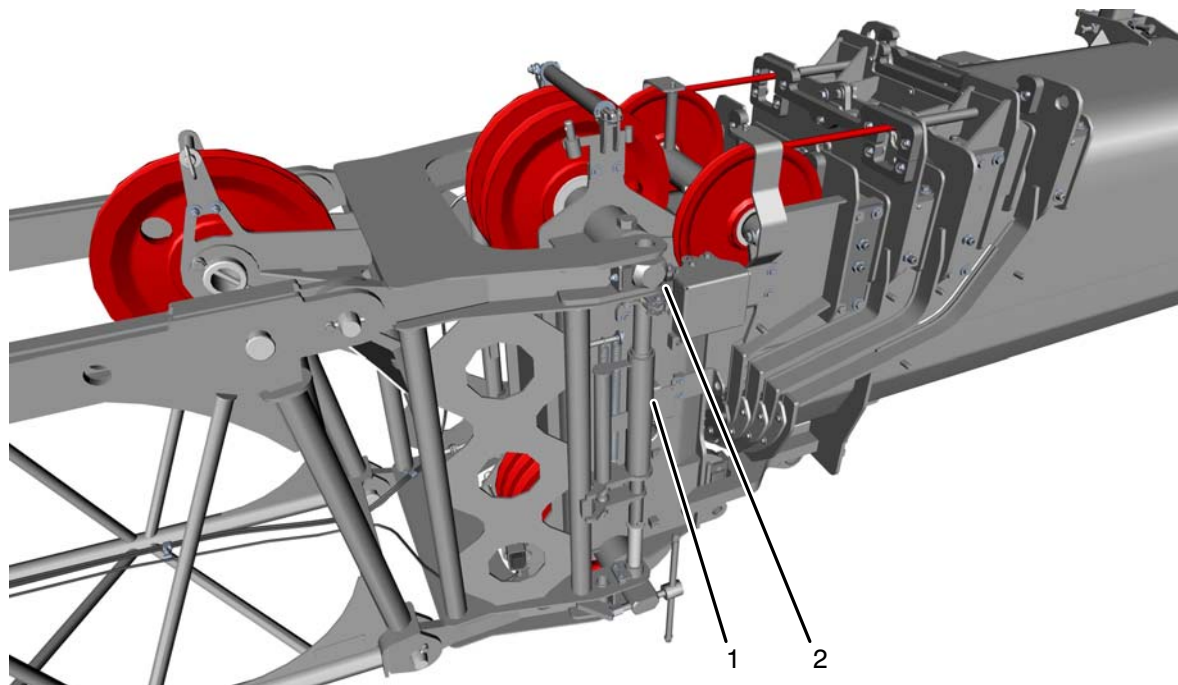


WARNING

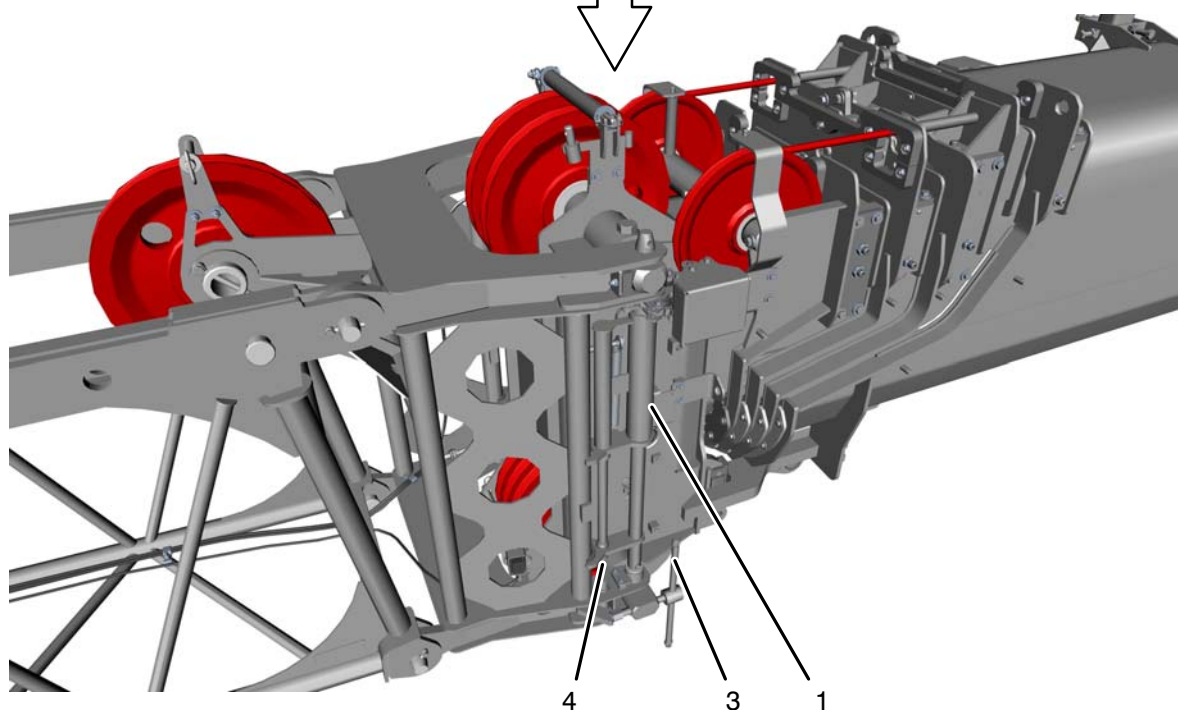
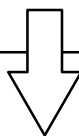
Use a hand line to control fly swing. The fly could swing rapidly. Keep all personnel clear of swing path to avoid personal injury.

26. Use the hand line attached to the swing hook on the 35 ft (10.67m) fly section to slowly swing the fly around the boom head. Refer to Figure 4–21.

Operator's Manual



Disengaged



Engaged

1. Left Side Boom Head Pin

2. Fly Catch

3. T-handle

4. Left Side Speed Screw

Figure 4–22
Left Side Fly Boom Head Pin – Engaged

Operator's Manual

27. Continue swinging the fly until the fly catch engages with the boom head and align the top left fly lug with the left side of the top boom head machinery cross shaft. Refer to Figure 4–22.
28. Use the fly storage cylinder switch to fully retract the fly storage cylinder. Refer to Figure 4–7.
29. Use the boom hoist cylinder switch, as required, to boom down fully.
30. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully extend the top left boom head pin. Refer to Figure 4–22.
31. Rotate the t-handle, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
32. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully extend the bottom left boom head pin.
33. Back off the t-handle until a clearance of at least 1/2 in (1.3cm) from the left fly lug is obtained.



WARNING

All boom head pins and all fixed fly base connecting pins must be properly installed before operating the crane with the fly erected. Damage to the fly and/or personal injury could occur if all connecting pins and boom head pins are not properly installed.

34. Remove the hand line from the swing hook on the fly base. Refer to Figure 4–21.
35. Remove the deflector sheave pin securing the fly base deflector sheave to the top of the fly bracket and rotate the fly base deflector sheave into the working position. Refer to Figure 4–10. Install the deflector sheave pin to secure the fly base deflector sheave to the bottom of the fly bracket.
36. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard.

37. Remove the wire rope guards from the fly base deflector sheaves. Refer to Figure 4–24. Reeve the wire rope from the boom deflector sheave over the fly base deflector sheaves. Install the wire rope guards.
38. Remove the wire rope guard from the fly base head sheave. Reeve the wire rope from the fly base deflector sheaves over the fly base head sheave. Install the wire rope guard.

CAUTION

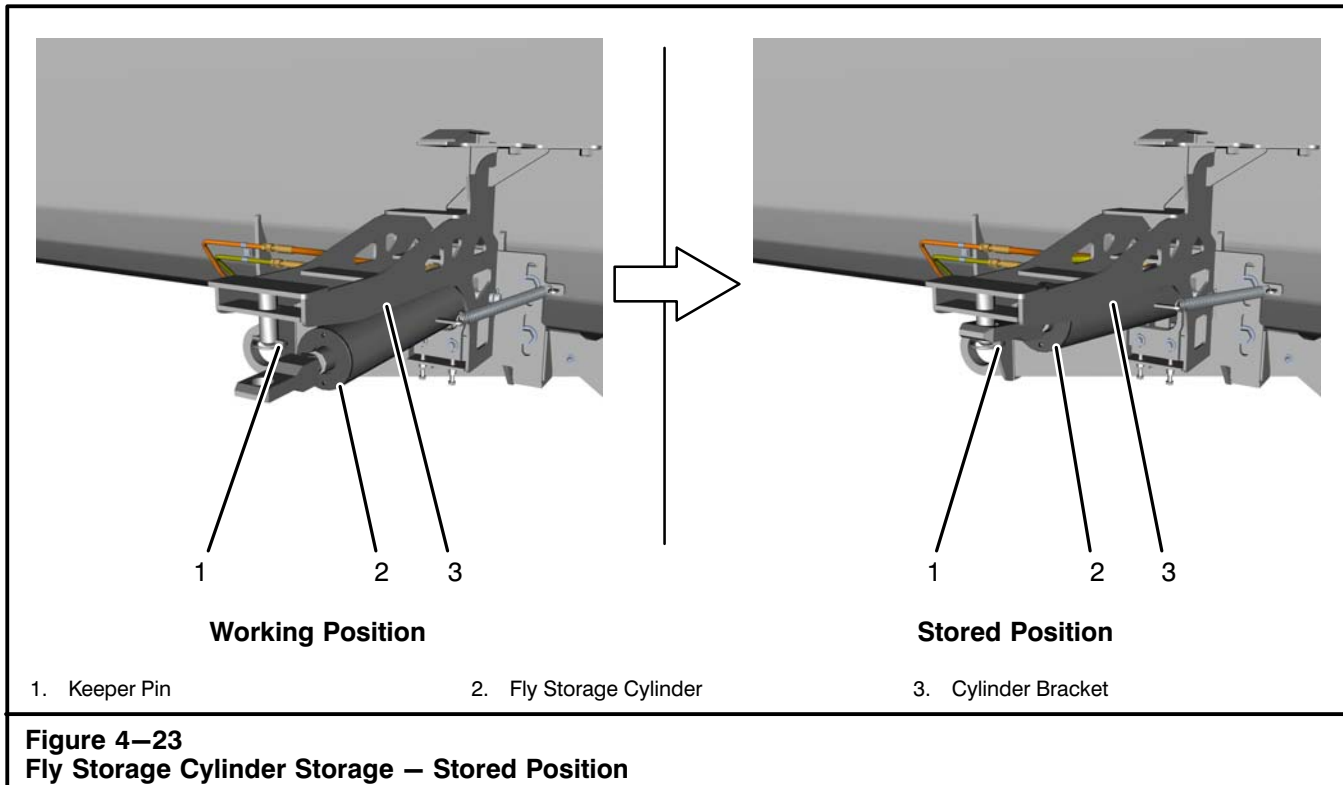
All wire rope guards must be in proper position during operation.

39. Properly connect the anti-two block (ATB) system as follows:
 - a. Install the lockout clip on the boom head ATB switch cable. Refer to Figure 4–12.
 - b. Remove the ATB weight from the boom head ATB switch cable.
 - c. Disconnect the boom head plug from the jumper assembly and connect it to the fly base connector.
 - d. Install the fly head ATB switch on the fly head.
 - e. Connect the fly head ATB switch plug to the fly head connector.
 - f. Install the ATB weight on the fly head ATB switch cable.

Note: When lockout clip is installed, the main boom ATB switch is inactive.

When both main boom and fly are reeved for operation, the lockout clip must be removed and an ATB weight must be suspended from each ATB switch.

Operator's Manual

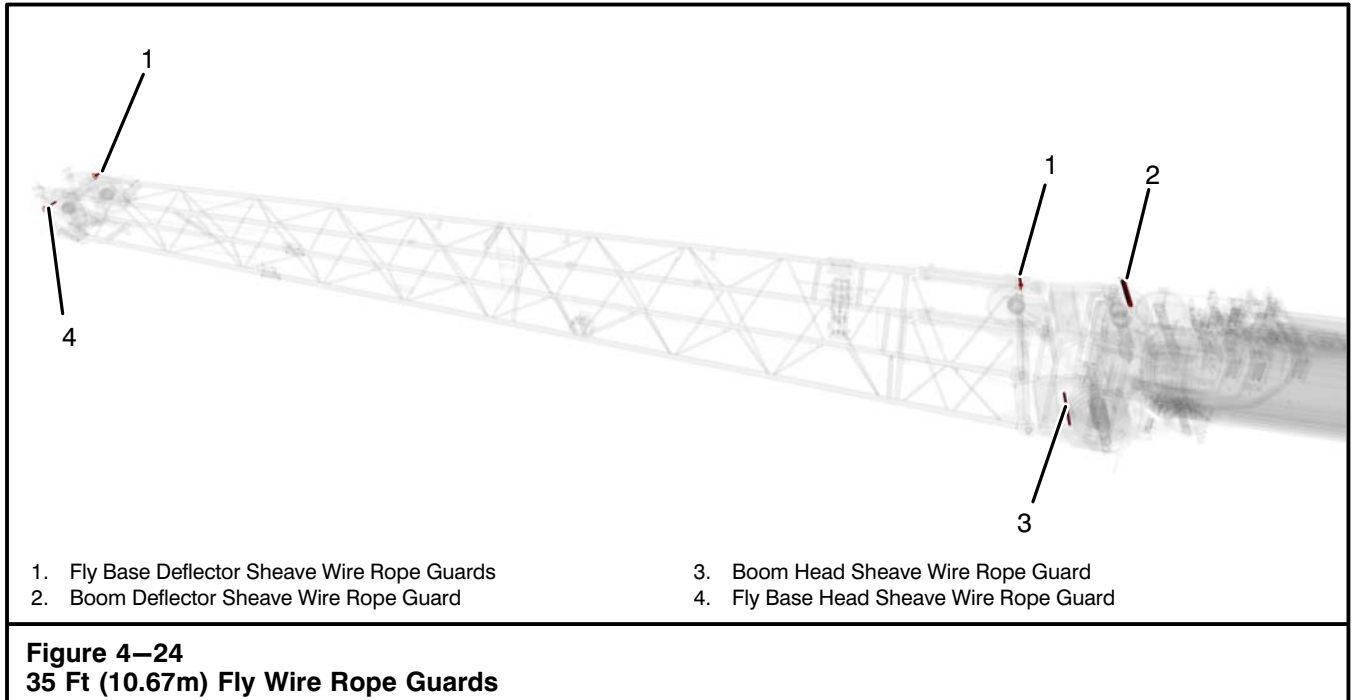


40. Secure the fly storage cylinder in the cylinder bracket with the keeper pin. Refer to Figure 4–23.
41. Pull the ramp storage pin. Rotate the pivoting ramp into the stored position until the ramp storage pin catches. Refer to Figure 4–23.
42. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to “Erected Attachment Configuration” in this section of this Operator’s Manual.
43. Check the Crane Rating Manual, in the operator’s cab, for deductions from the lifting capacities with the fly installed before continuing operations.



WARNING

The fly adds weight to the boom which must be considered in lifting capacities when the fly is erected. When making lifts from the boom or auxiliary lifting sheave with the fly erected, refer to the Crane Rating Manual for the appropriate deductions from lifting capacities. Use the offset lattice fly only when the crane is level on fully or intermediate extended outriggers with all tires clear of the ground.



Storage Of The 35 Ft (10.67m) Fly From The Erected Position

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the boom within the fly configuration working range. Refer to Figure 4–8. Engage travel swing lock.



WARNING

Store the fly with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper within the fly configuration working range, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in personal injury and/or the crane tipping.

5. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. Refer to Figure 4–11. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator’s Manual for detailed instructions.
6. Position the boom above a 50° boom angle and lower the hook ball (to be removed from the fly) to the ground. Fully retract the boom.
7. Boom down to a boom angle of 10° to ease accessibility.

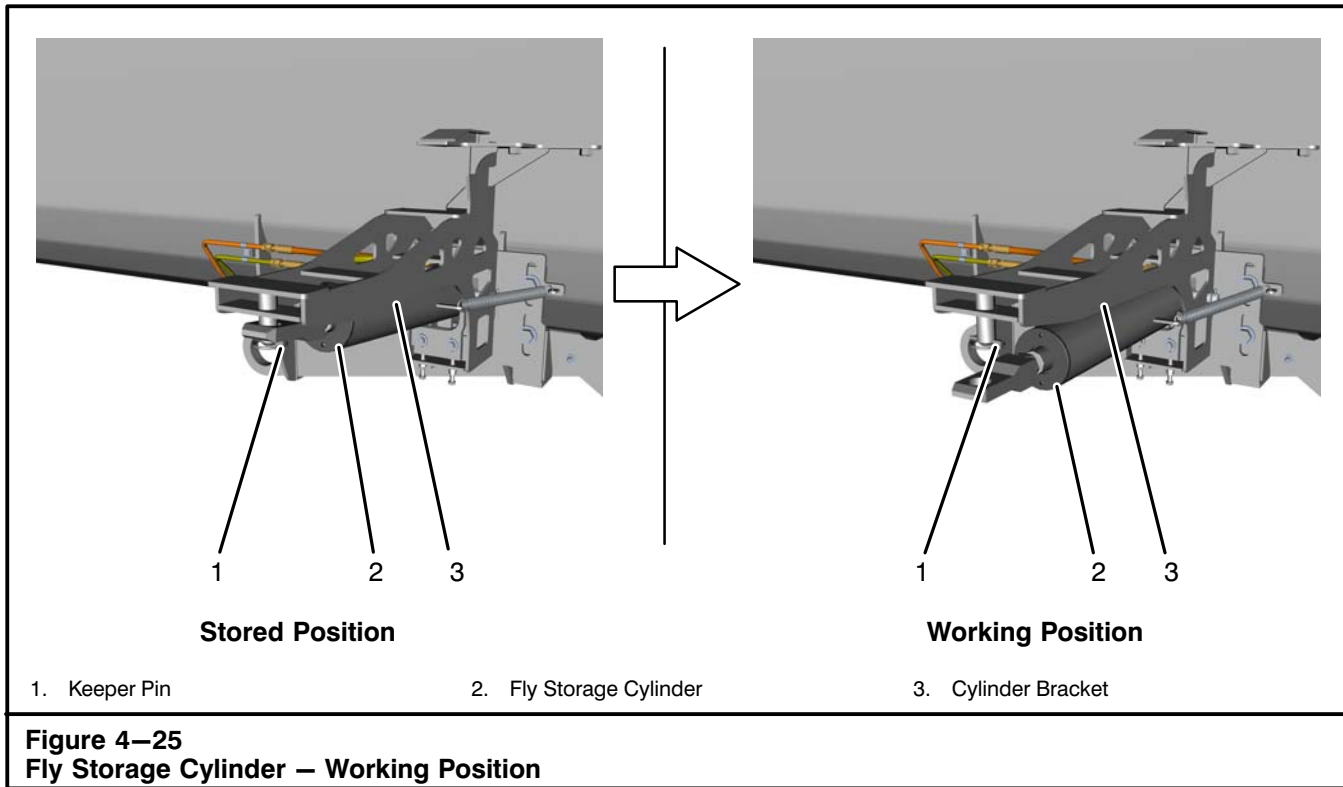


WARNING

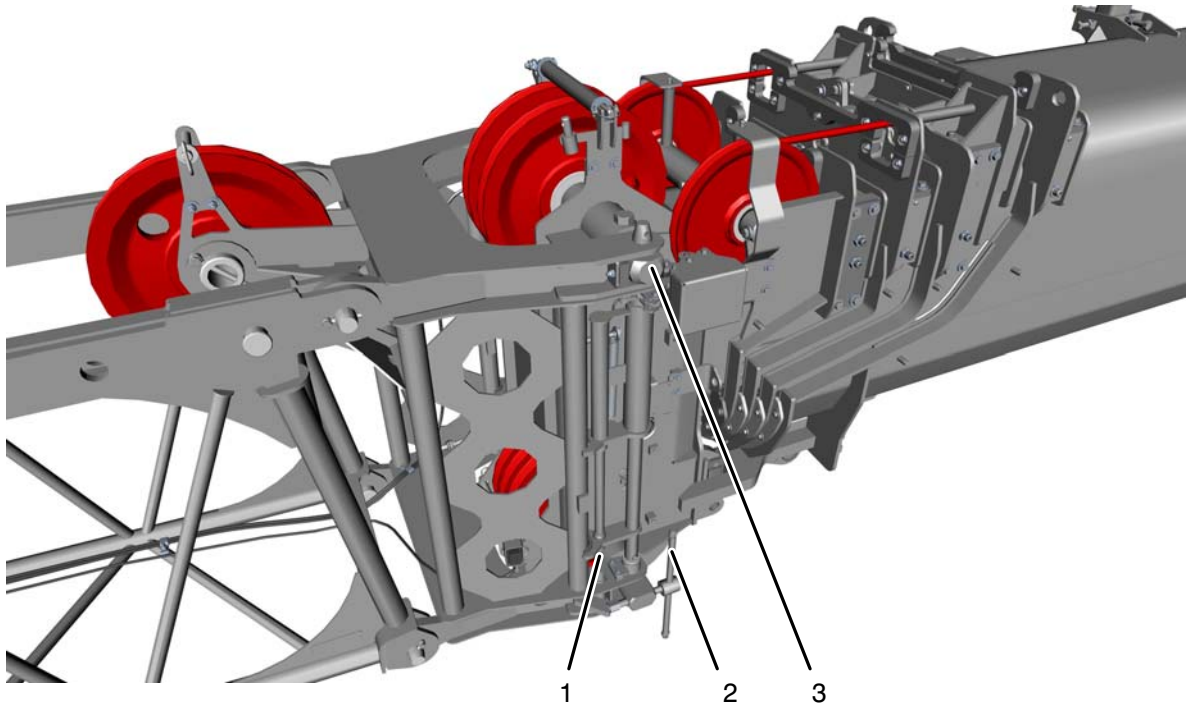
To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

8. Properly set the Rated Capacity Limiter to rigging mode. Refer to “Base Configuration” in Section 01 of this Operator’s Manual.
9. Lift the operator’s seat left arm rest into the function lockout position. Refer to “Moveable Left Side Armrest” in Section 1 of this Operator’s Manual.
10. Pull the ramp storage pin. Refer to Figure 4–17. Rotate the pivoting ramp into the working position until ramp working pin catches.
11. Disengage the fly base rear storage connecting pin, as required.

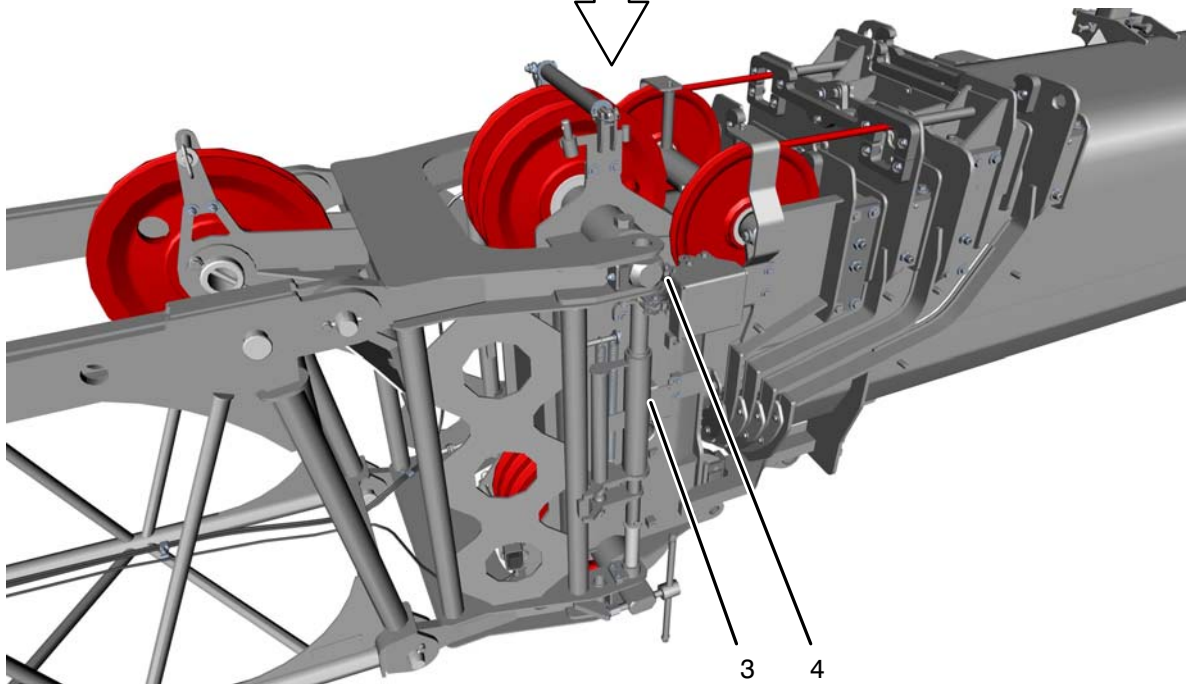
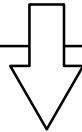
Operator's Manual



12. Use the boom hoist cylinder switch, as required, to boom down fully. Refer to Figure 4–7.
13. Remove the keeper pin securing the fly storage cylinder in the cylinder bracket. Refer to Figure 4–25. Disengage the fly storage cylinder from the cylinder bracket and install the keeper pin in the cylinder bracket for storage.
14. Properly disconnect the anti-two block (ATB) system as follows:
 - a. Remove the ATB weight from the fly head ATB switch cable. Refer to Figure 4–14.
 - b. Disconnect the fly head ATB switch plug from the fly head connector.
 - c. Remove the fly head ATB switch from the fly head.
 - d. Disconnect the boom head plug from the fly base connector and connect it to the jumper assembly on the main boom head.
 - e. Install the ATB weight on the boom head ATB switch cable.
 - f. Remove the lockout clip from the boom head ATB switch cable.
15. Remove the wire rope guard from the fly base head sheave. Refer to Figure 4–24. Remove wire rope from the fly base head sheave and lay it aside to prevent damage to it during fly storage. Install the wire rope guard.
16. Remove the wire rope guards from the fly base deflector sheaves. Remove wire rope from the fly base deflector sheaves and lay it aside to prevent damage to it during fly storage. Install the wire rope guards.
17. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly storage. Install the wire rope guard and secure with keeper pin.
18. Remove the deflector sheave pin securing the fly base deflector sheave to the bottom of the fly bracket and rotate the fly base deflector sheave into the stored position. Refer to Figure 4–13. Install the deflector sheave pin to secure the fly base deflector sheave to the top of the fly bracket.
19. Properly store wire rope which was used on fly, as required.



Engaged



Disengaged

1. Left Side Speed Screw

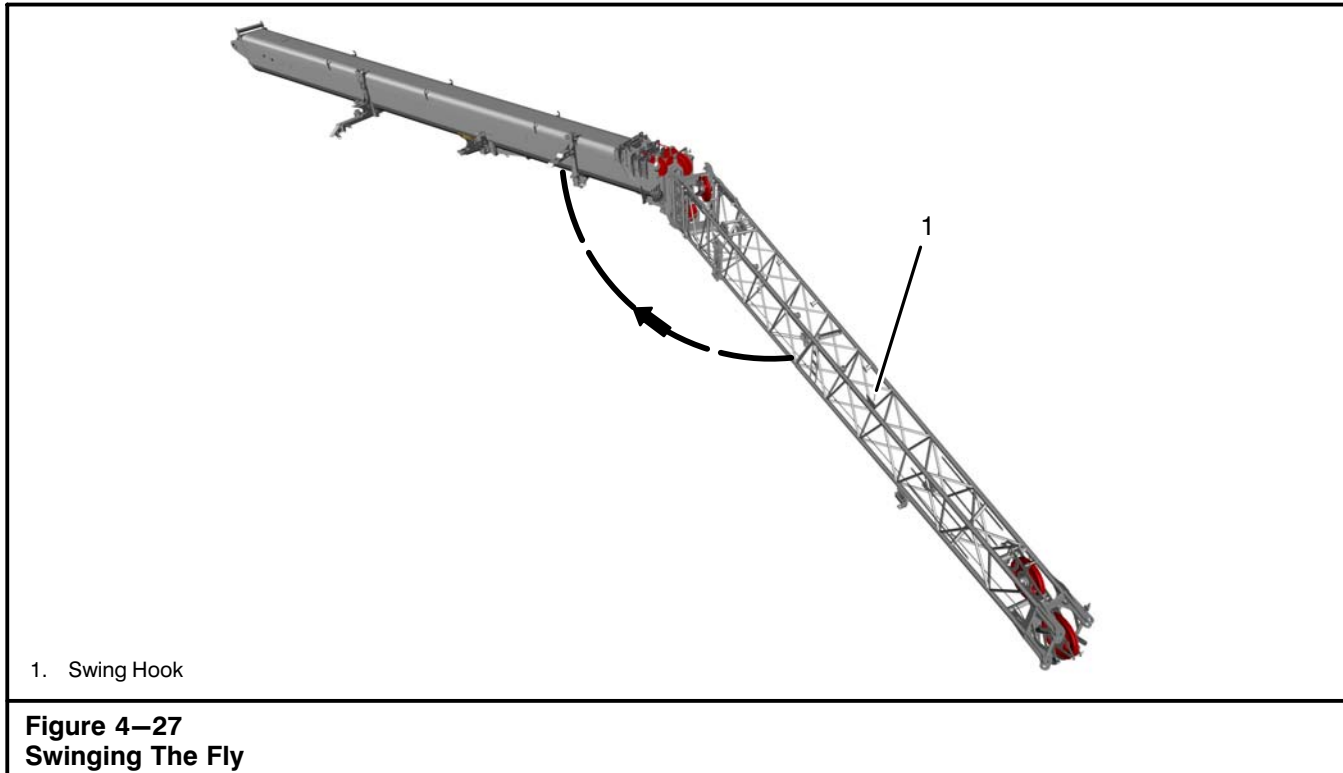
2. T-handle

3. Left Side Boom Head Pin

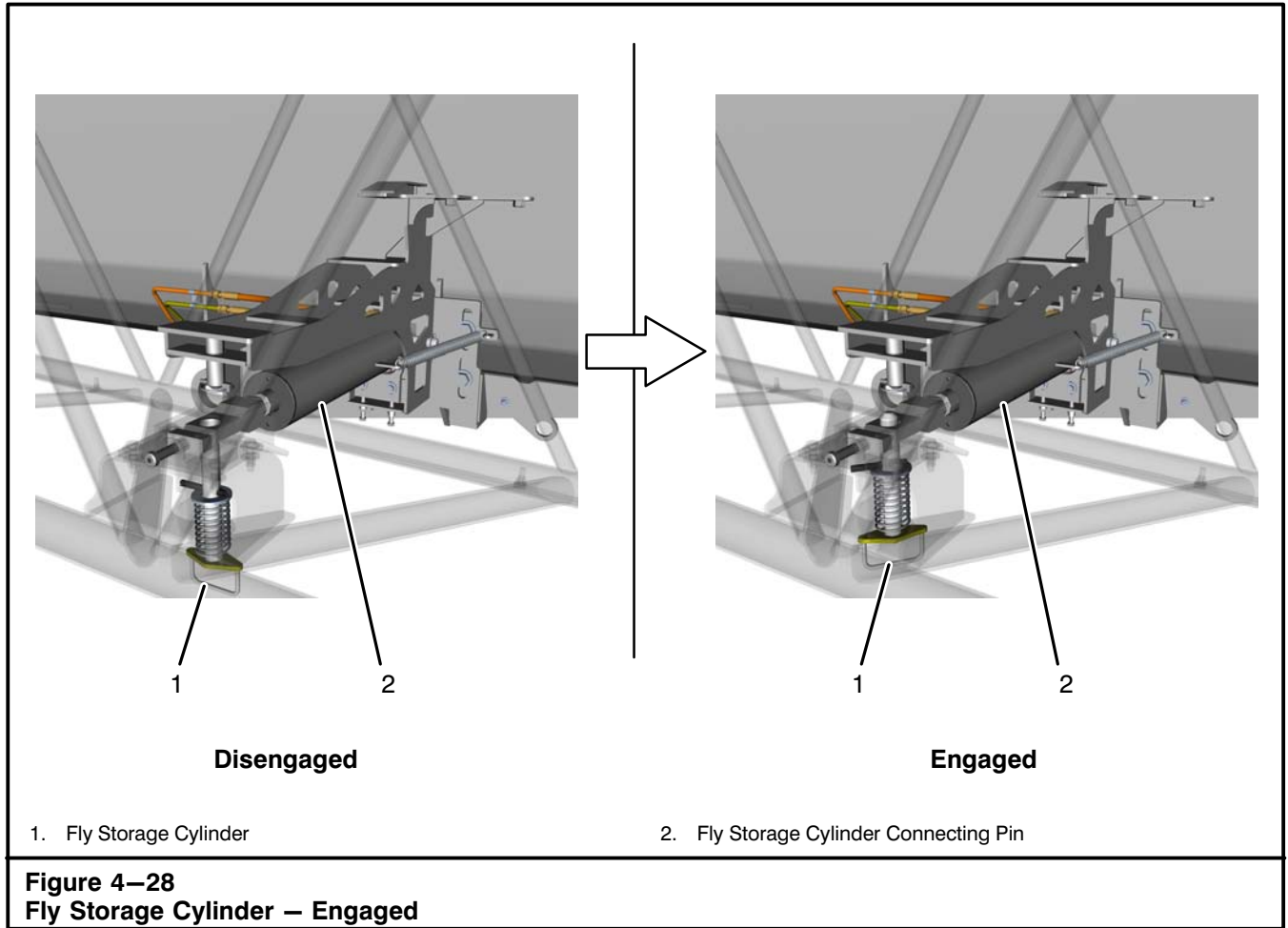
4. Fly Catch

Figure 4–26
Left Side Fly Boom Head Pin – Disengaged

Operator's Manual



20. Attach a hand line to the swing hook on the fly base. Refer to Figure 4–27.
 21. Ensure the secondary pivot pin is disengaged prior to swinging the fly. If required, use the appropriate tools to rotate the pivot pin speed screw to fully retract the secondary pivot pin. Refer to Figure 4–19.
 22. Rotate the t-handle, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft. Refer to Figure 4–26.
 23. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully retract the bottom left boom head pin.
 24. Back off the t-handle until a clearance of at least 1/2 in (1.3cm) from the left fly lug is obtained.
 25. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully retract the top left boom head pin.
 26. Use the boom hoist cylinder switch, as required, to boom up to 0°. Boom should automatically stop at 0°. Refer to Figure 4–7.
- Note: The fly storage cylinder will only operate with the boom angle of 0°.**
27. Use the fly storage cylinder switch to fully extend the fly storage cylinder. Rotate the cylinder rod as required to make end horizontal.
 28. Use the the appropriate tools to pull and rotate the fly storage cylinder connecting pin into detent position. Refer to Figure 4–20.
 29. Pull the hand line to disengage the fly catch and slowly swing the fly around to the right side of the boom. Refer to Figure 4–27.



WARNING

Use a hand line to control fly swing. The fly could swing rapidly. Keep all personnel clear of swing path to avoid personal injury.

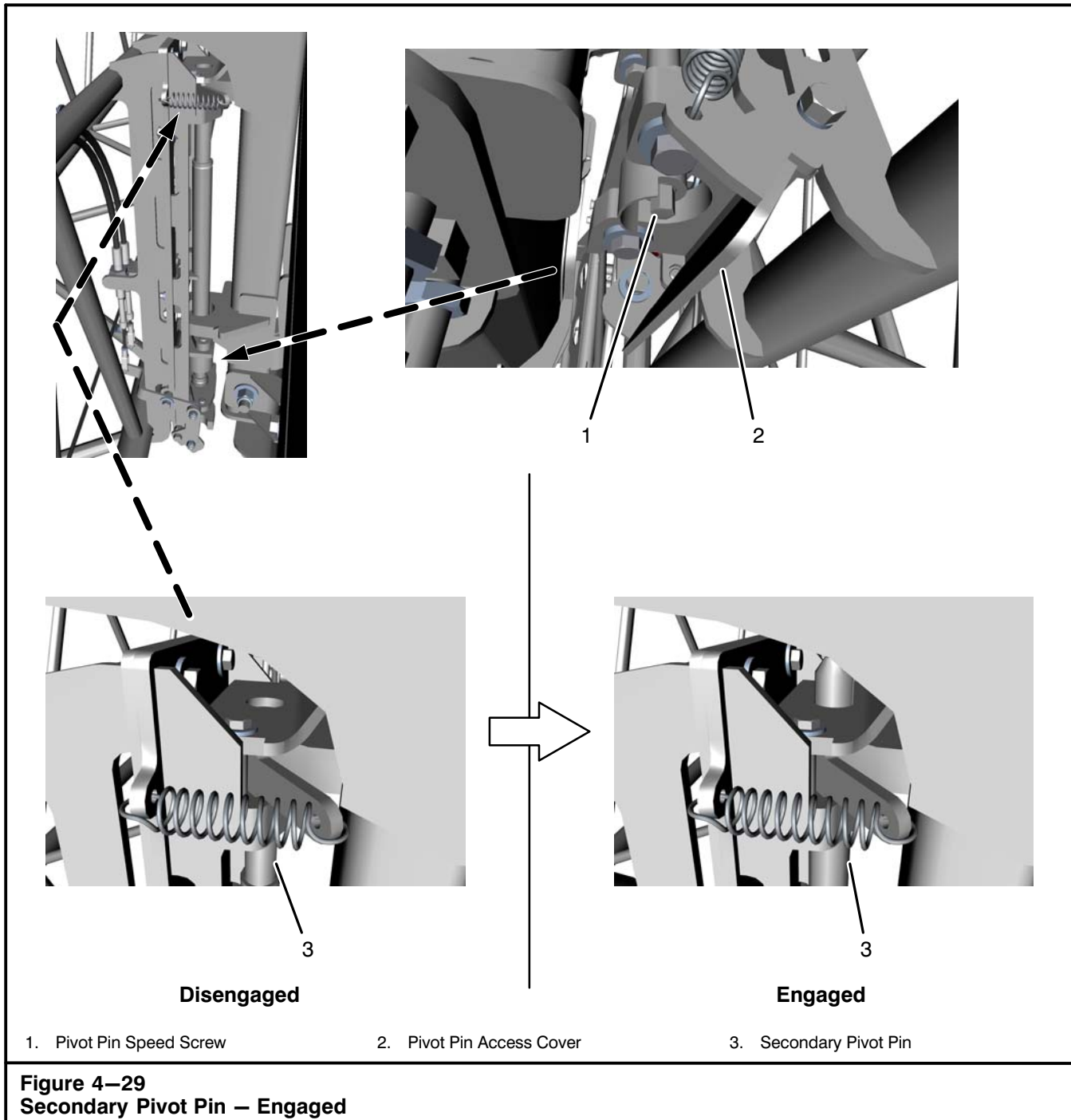
CAUTION

Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

30. Use the hand line to swing the fly until the fly engages the fly storage cylinder and the fly storage cylinder connecting pin catches. Refer to Figure 4–28.

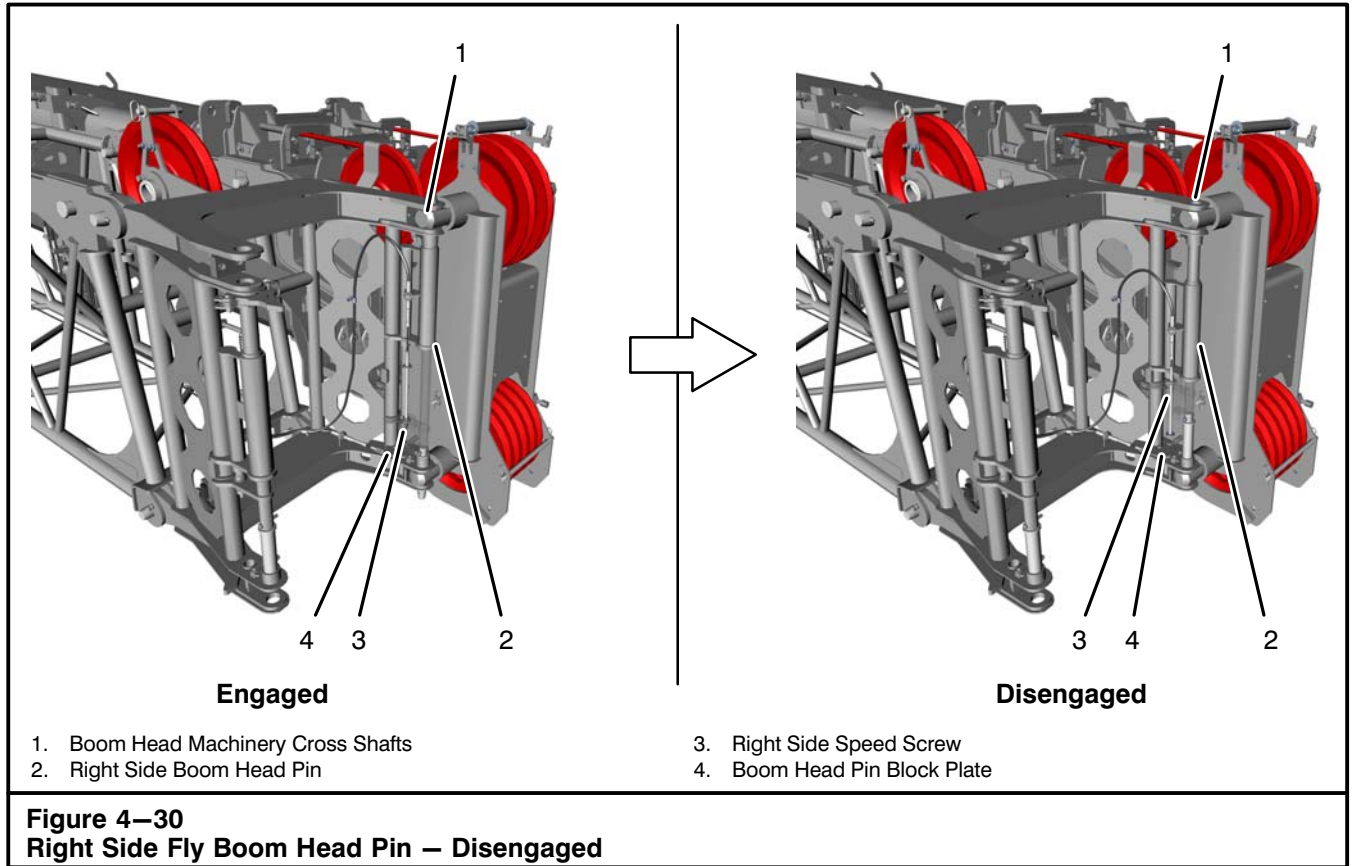
31. Use the fly storage cylinder switch to retract the fly storage cylinder to pivot the fly onto the pivoting ramp until it stops. Refer to Figure 4–7.
32. Use the boom hoist cylinder switch, as required, to boom up to 0°. Boom will automatically stop at 0°.

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Note: The push pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open. Refer to Figure 4-11.

33. Using the appropriate tools, rotate the pivot pin speed screw to fully extend the secondary pivot pin. Refer to Figure 4-29.



WARNING

Ensure that the secondary pivot pin is installed on the right side of the boom and the fly storage cylinder is installed in the base fly section before disconnecting the right side boom head pin from the boom head machinery cross shafts. The fly could fall causing crane damage and/or personal injury.

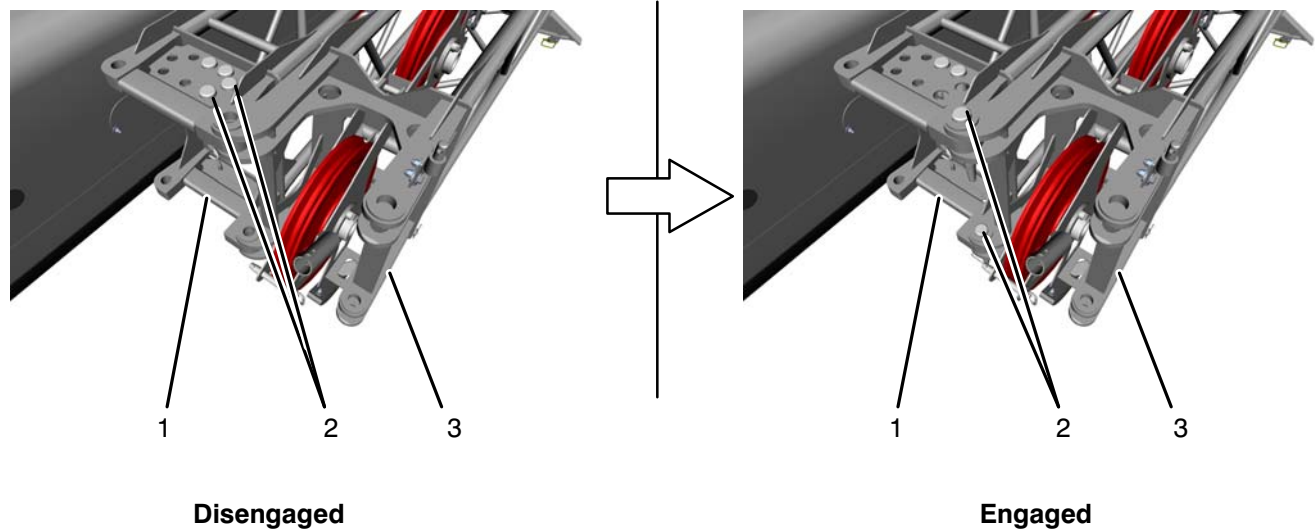
34. Using the appropriate tools, rotate the right side speed screw through the right side access tube to retract both right side boom head pins and fully disengage from the right side of the boom head machinery cross shafts. Refer to Figure 4–30.

35. Use the boom hoist cylinder switch, as required, to boom up to a boom angle of 0°. Refer to Figure 4–7.

Note: The fly storage cylinder will only operate with the boom angle of 0°.

36. Use the fly storage cylinder switch to actuate the fly storage cylinder to pull the fly into the pivoting ramp and align the fly with the fly base rear storage connecting pin.

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1. 23 Ft (7.01m) Fly Tip Section

2. Fly Tip Connecting Pins

3. 35 Ft (10.67m) Fly Base Section

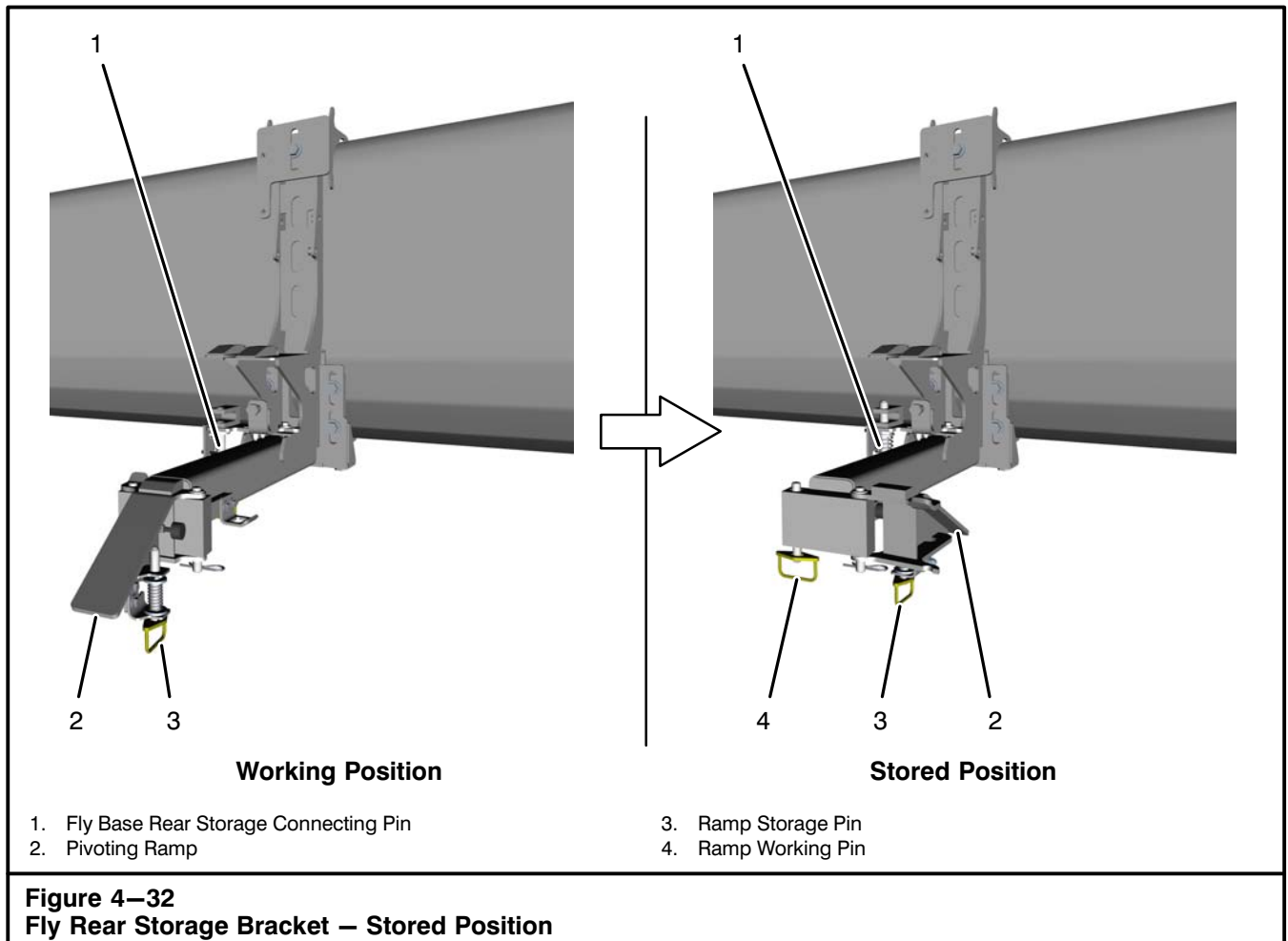
Figure 4–31
Storage of the 23 Ft (7.01m) Fly Tip Section – Engaged

Note: If the fly tip section is stored on the boom, engage the 35 ft (10.67m) fly base section with 23 ft (7.01m) fly tip section:

Use the fly storage cylinder switch to actuate the fly storage cylinder to engage the lugs of the 35 ft (10.67m) fly base section with the lugs of the 23 ft (7.01m) fly tip section. Refer to Figure 4–31.

Engage the fly tip to base storage pin. Refer to Figure 4–46.

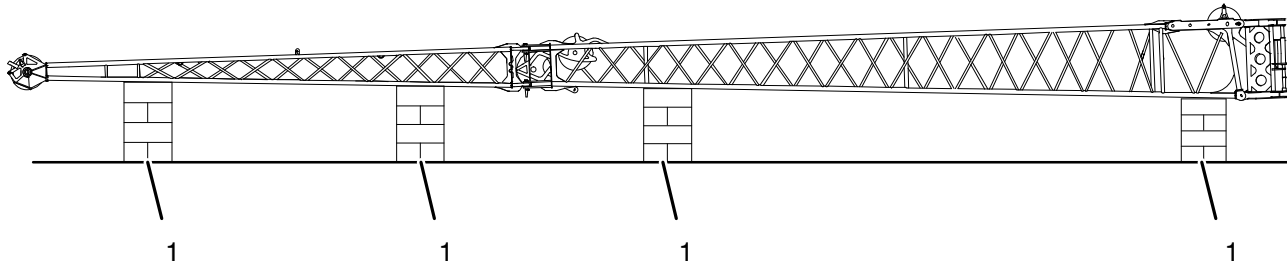
Remove the connecting pins from storage in the rear of the fly tip and install the connecting pins through the lugs of the 23 ft (7.01m) fly tip and 35 ft (10.67m) fly base sections. Refer to Figure 4–31.



Note: The boom hoist cylinder switch can not raise the boom above a boom angle of 0°. To use the boom hoist cylinder switch to lower the boom from an angle above 0°, or within the range of 0° to –3°, the RCL must be set to rigging mode and the operator's seat left side arm rest must be positioned in the function lockout position.

37. Engage the fly base rear storage connecting pin. Refer to Figure 4–32.
38. Pull the ramp storage pin. Rotate the pivoting ramp into the stored position until the ramp working pin catches.
39. Remove the hand line from the swing hook on the fly base. Refer to Figure 4–27.
40. Boom down fully.
41. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
42. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4–2. Reeve the wire rope from the boom deflector sheave over the boom head sheave or auxiliary lifting sheave. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave, as required.
43. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
44. Check the Crane Rating Manual, in the operator's cab, for lifting capacities with the fly in the stored position before continuing operations.

Operator's Manual



1. Blocking

Figure 4–33
Installation And Removal Of The 35–58 Ft (10.67–17.68m) Offset Lattice Fly

35–58 Ft (10.67–17.68m) Offset Lattice Fly

The crane may be equipped with a 35-58 ft (10.67–17.68m) two piece bi-fold offset lattice fly. The offset lattice fly, as shown in Figure 4–33, connects to the main boom head. It can be mounted in one of four offset positions: 0°, 15°, 30°, or 45°. Once installed, the offset lattice fly can be stored on the right side of the boom base section.

35–58 Ft (10.67–17.68m) Fly Installation

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the boom within the fly configuration working range. Refer to Figure 4–8. Engage travel swing lock.



WARNING

Install the fly with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper within the fly configuration working range, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in the personal injury and/or the crane tipping.

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5. Ensure the 23 ft (7.01m) fly tip sections are properly pinned to the 35 ft (10.7m) offset fly base section with connecting pins. Refer to Figure 4–35.
6. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator's Manual for detailed instructions.
7. Ensure the the fly base deflector sheave is in the stored position. Refer to Figure 4–37.
8. Position the fly on secure blocking. Refer to Figure 4–33. The 35–58 ft (10.67–17.68m) fly weighs approximately 2,650 lb (1 202kg).
9. Raise and extend the boom to allow enough wire rope length to ease reeving of the fly and lower the hook ball (to be used on the fly) to the ground. Fully retract the boom.
10. Boom down fully.



WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

11. Remove the wire rope guard and wire rope from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4–2. Lay the wire rope aside to prevent damage to it during fly installation. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave for storage.
12. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly install. Install the wire rope guard and secure with keeper pin.

Note: The push/pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open. Refer to Figure 4–35.

13. Ensure the boom head pins are fully retracted and the boom head pin access cover is open (secondary pivot pin is fully extended). If required, extend the secondary pivot pin. Provide clearance by pushing the pivot pin block plate back with a wooden block. Refer to Figure 4–35.
14. Carefully extend the boom head to the fly. Slowly raise or lower the boom, as required, to engage the fly catch with the boom head. Refer to Figure 4–45. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.
15. Using the appropriate tools, rotate the right side speed screw through the right side access tube to extend both right side boom head pins and fully engage the right side of the boom head machinery cross shafts. Refer to Figure 4–35.
16. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully extend the top left boom head pin.
17. Rotate the t-handle, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
18. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully extend the bottom left boom head pin.
19. Back off the t-handle until a clearance of at least 1/2 in (1.3cm) from the left fly lug is obtained.

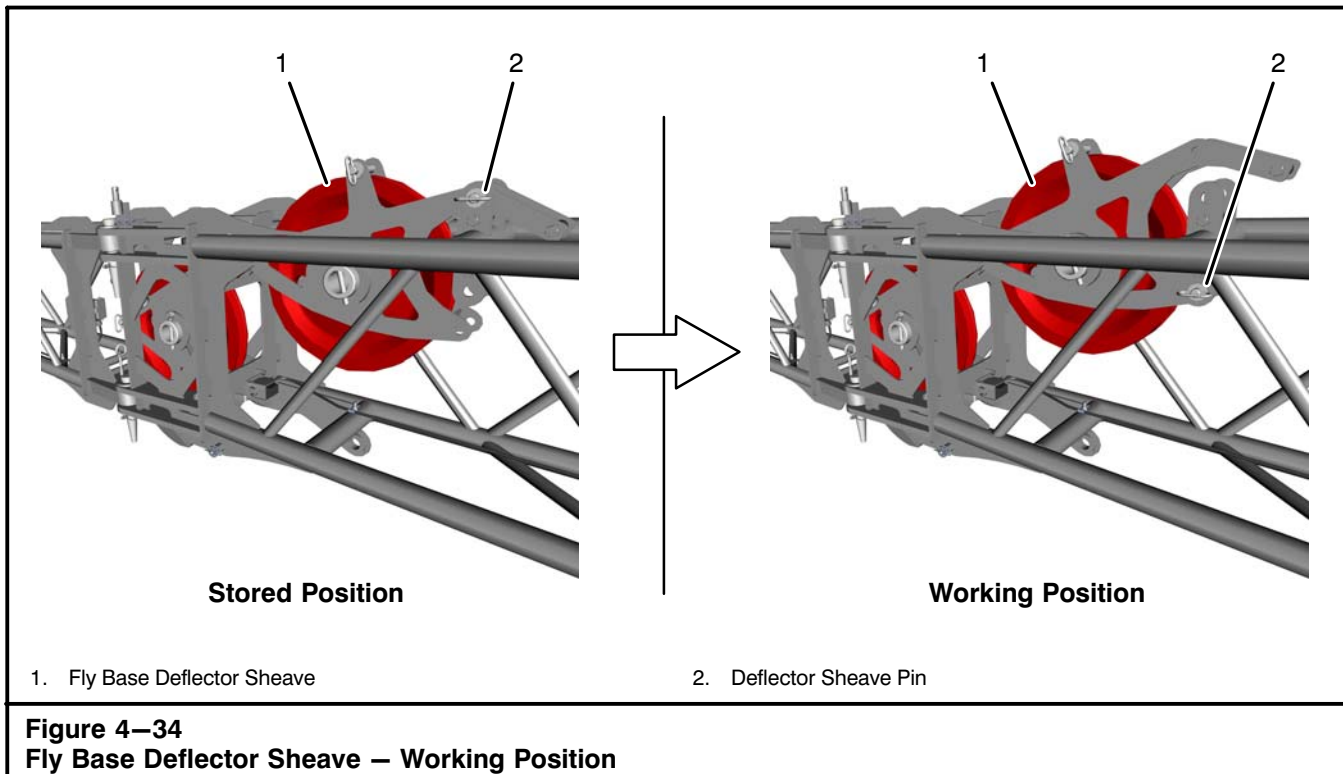


WARNING

All boom head pins and all fixed fly base connecting pins must be properly installed before operating the crane with the fly erected. Damage to the fly and/or personal injury could occur if all connecting pins and boom head pins are not properly installed.

20. Using the appropriate tools, rotate the pivot pin speed screw to fully retract the secondary pivot pin and close the boom head pin access cover.

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21. Remove the deflector sheave pin securing the fly base deflector sheave to the top of the fly bracket and rotate the fly base deflector sheave into the working position. Refer to Figure 4–34. Install the deflector sheave pin to secure the fly base deflector sheave to the bottom of the fly bracket.
22. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard.

23. Remove the wire rope guards from the fly base deflector sheaves. Refer to Figure 4–50. Reeve the wire rope from the boom deflector sheave over the fly base deflector sheaves. Install the wire rope guards.
24. Remove the wire rope guards from the fly tip head sheave. Reeve the wire rope from the fly base deflector sheaves over the fly tip head sheave. Install the wire rope guards.

CAUTION

All wire rope guards must be in proper position during operation.

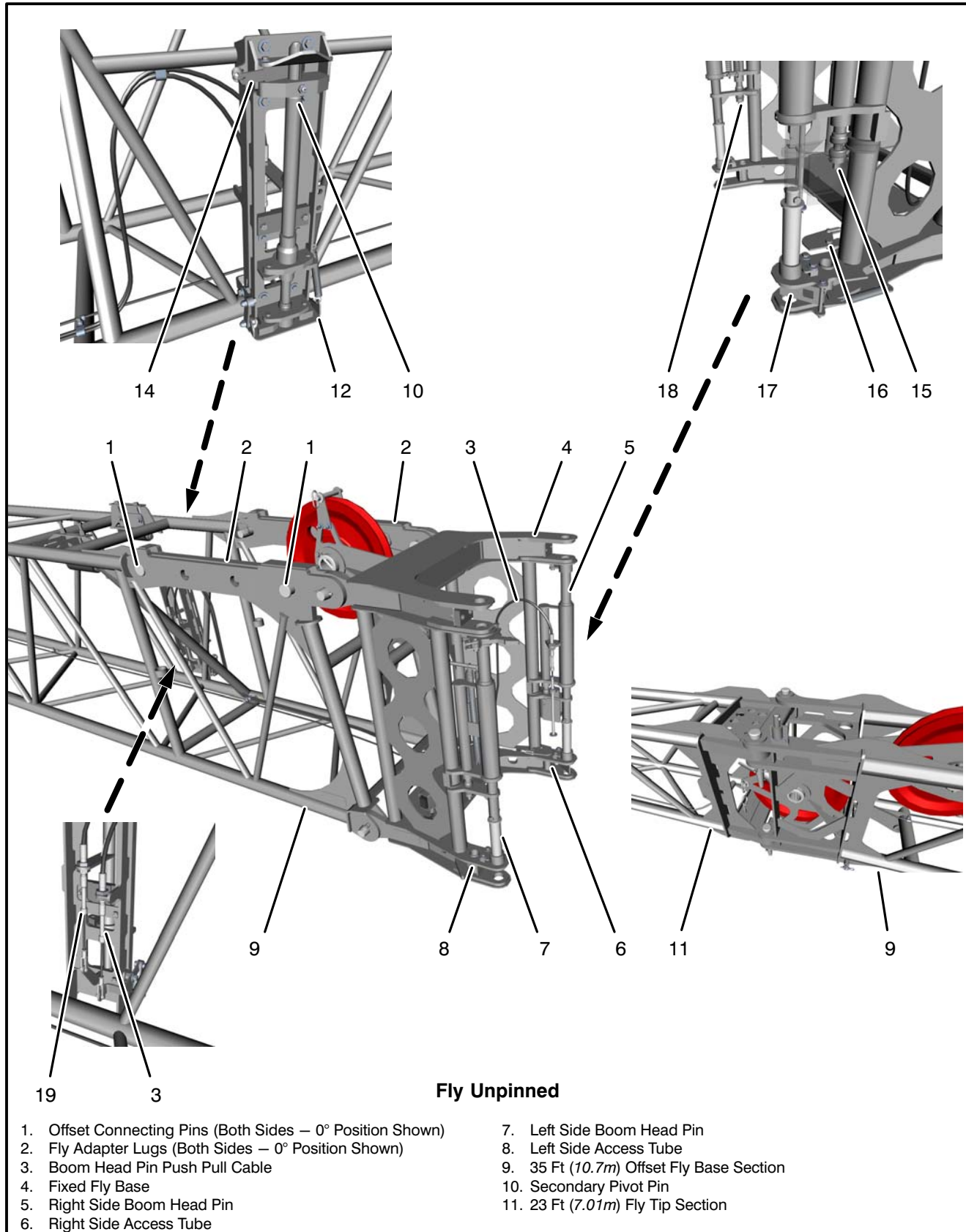
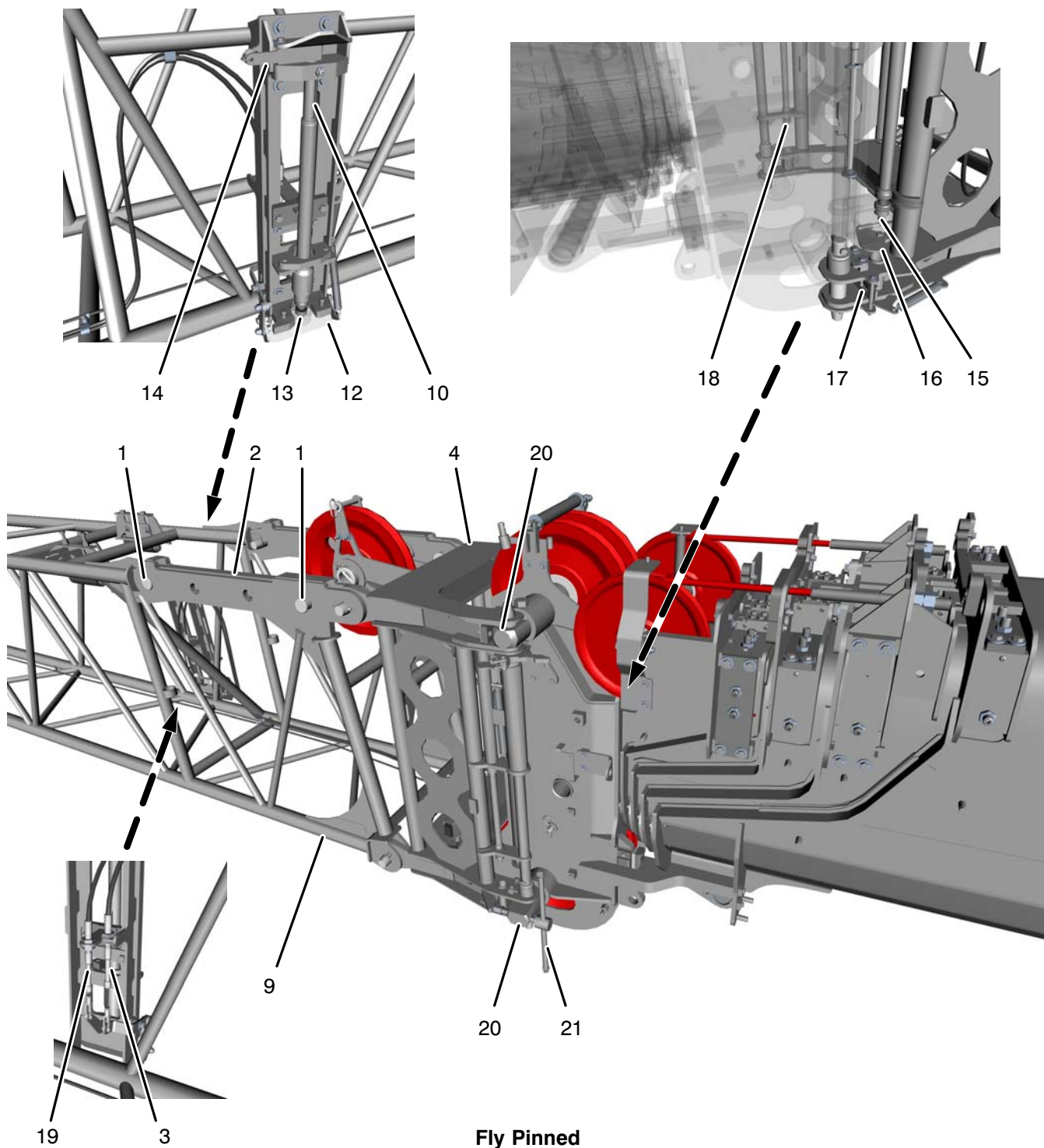


Figure 4–35
35–58 Ft (10.67–17.68m) Offset Lattice Fly

Operator's Manual



- 12. Pivot Pin Access Cover
- 13. Pivot Pin Speed Screw
- 14. Pivot Pin Block Plate
- 15. Right Side Speed Screw
- 16. Boom Head Pin Access Cover

- 17. Boom Head Pin Block Plate
- 18. Left Side Speed Screw
- 19. Pivot Pin Push Pull Cable
- 20. Boom Head Machinery Cross Shafts
- 21. T-handle

Figure 4–35 Continued
35–58 Ft (10.67–17.68m) Offset Lattice Fly

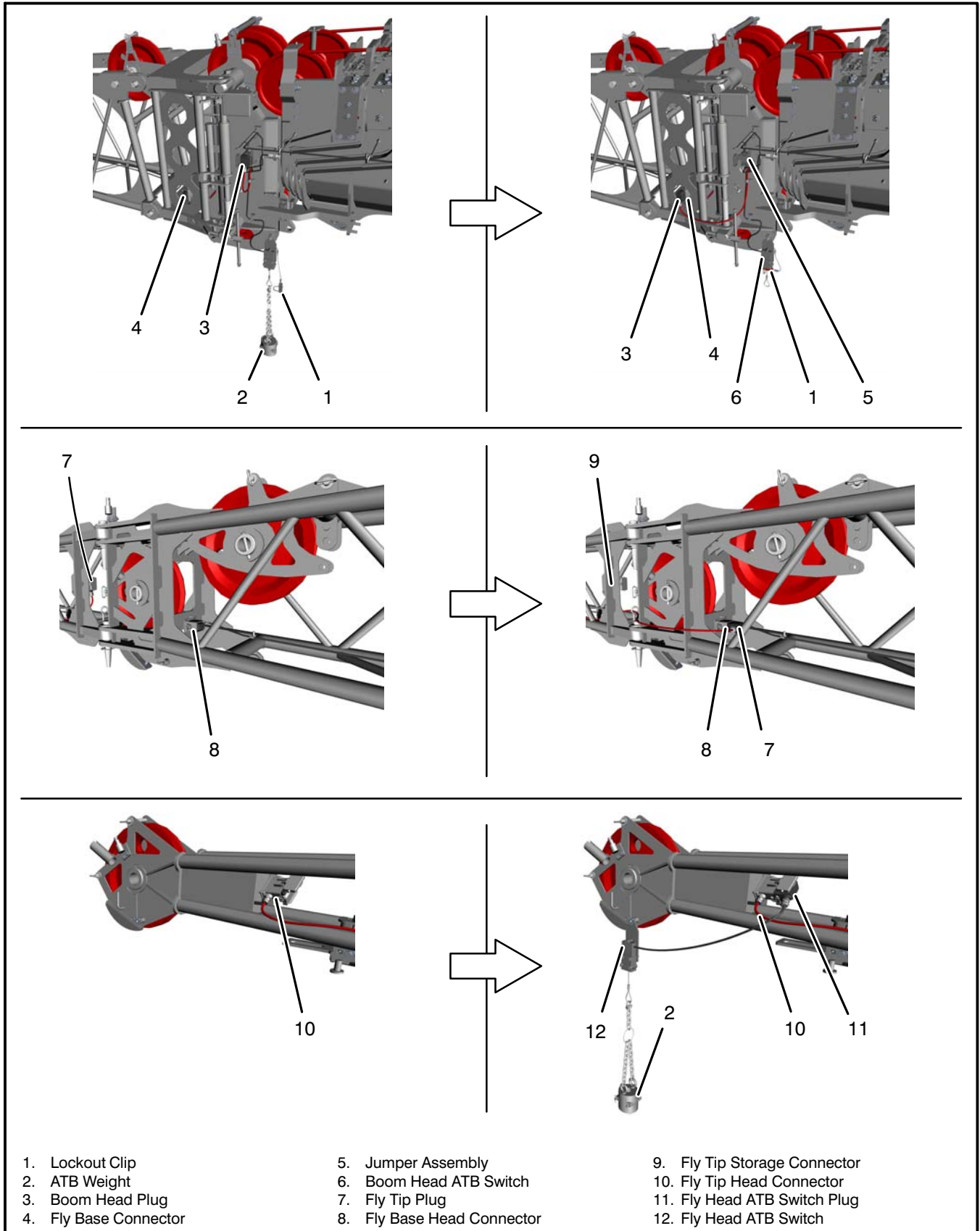


Figure 4-36
Anti-Two Block (ATB) Connections

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25. Properly connect the anti-two block (ATB) system as follows:

- a. Install the lockout clip on the boom head ATB switch cable. Refer to Figure 4–36.
- b. Remove the ATB weight from the boom head ATB switch cable.
- c. Disconnect the boom head plug from the jumper assembly and connect it to the fly base connector.
- d. Disconnect the fly tip plug from the fly tip storage connector and connect it to the fly base head connector.
- e. Install the fly head ATB switch on the fly head.
- f. Connect the fly head ATB switch plug to the fly tip head connector.
- g. Install the ATB weight on the fly head ATB switch cable.

Note: When lockout clip is installed, the main boom ATB switch is inactive.

When both main boom and fly are reeved for operation, the lockout clip must be removed and an ATB weight must be suspended from each ATB switch.

26. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to “Erected Attachment Configuration” in this section of this Operator's Manual.

27. Check the Crane Rating Manual, in the operator's cab, for deductions from the lifting capacities with the fly installed before continuing operations.



WARNING

The fly adds weight to the boom which must be considered in lifting capacities when the fly is erected. When making lifts from the boom or auxiliary lifting sheave with the fly erected, refer to the Crane Rating Manual for the appropriate deductions from lifting capacities. Use the offset lattice fly only when the crane is level on fully or intermediate extended outriggers with all tires clear of the ground.

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35–58 Ft (10.67–17.68m) Fly Removal

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the boom within the fly configuration working range. Refer to Figure 4–8. Engage travel swing lock.



WARNING

Remove the fly with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper within the fly configuration working range, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in the personal injury and/or the crane tipping.

5. If the fly is not in the erected position, erect it per “Erection Of The 35–58 ft (10.67–17.68m) Fly From The Stored Position” in this section of this Operator's Manual.

6. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. Refer to Figure 4–35. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator's Manual for detailed instructions.
7. Raise and extend the boom to allow enough rope to ease wire rope removal from the fly. Lower the hook block or hook ball (to be removed from the fly) to the ground. Fully retract the boom.
8. Boom down fully.

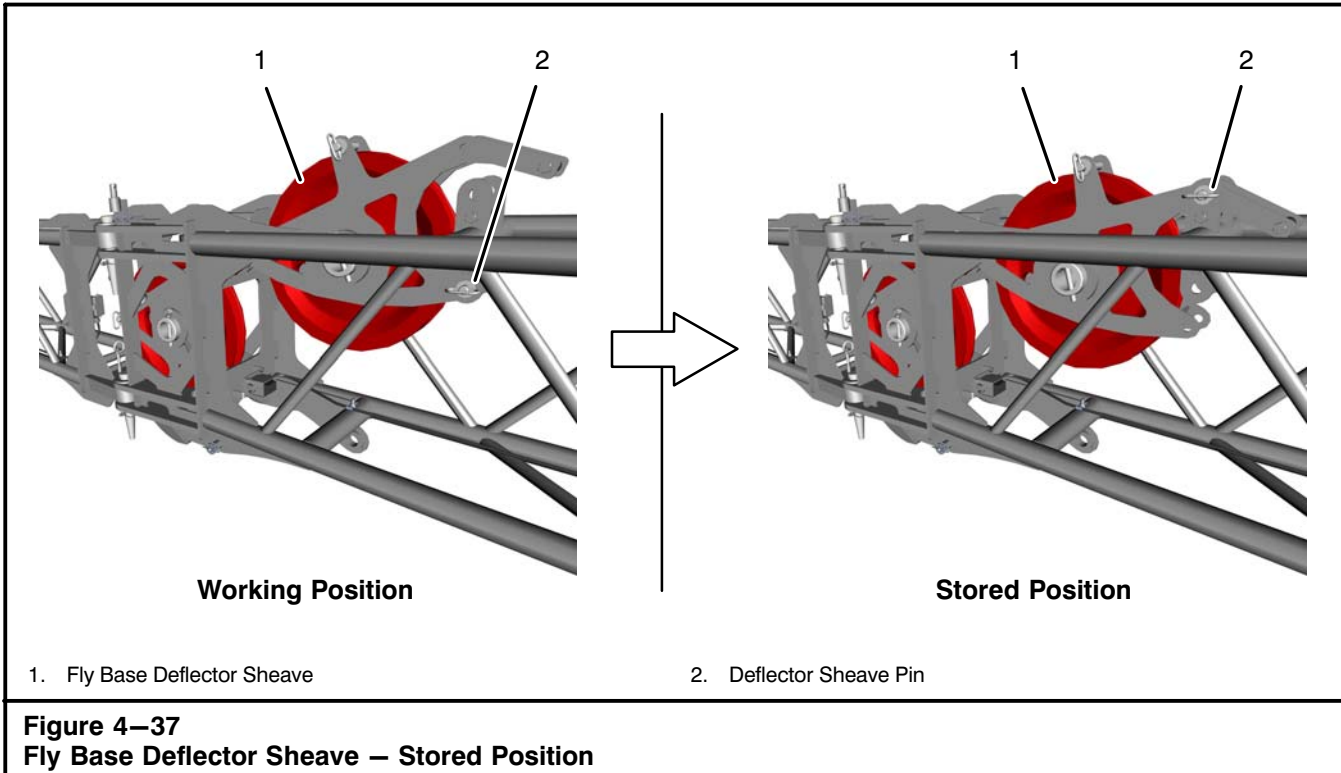


WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

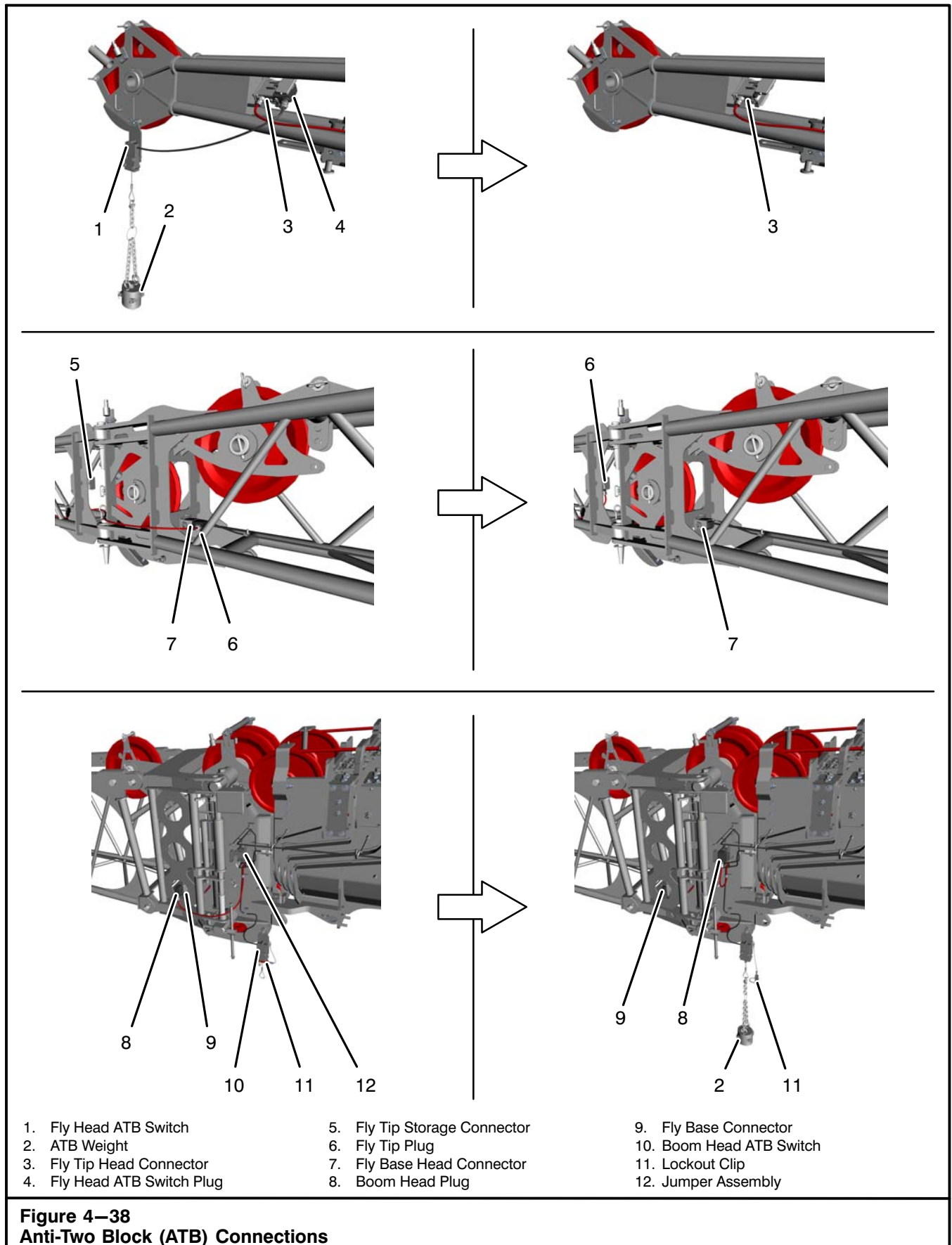
9. Properly disconnect the anti-two block (ATB) system as follows:
 - a. Remove the ATB weight from the fly head ATB switch cable. Refer to Figure 4–38.
 - b. Disconnect the fly head ATB switch plug from the fly tip head connector.
 - c. Remove the fly head ATB switch from the fly head.
 - d. Disconnect the fly tip plug from the fly base head connector and connect it to fly tip storage connector.
 - e. Disconnect the boom head plug from the fly base connector and connect it to the jumper assembly on the main boom head.
 - f. Install the ATB weight on the boom head ATB switch cable.
 - g. Remove the lockout clip from the boom head ATB switch cable.

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10. Remove the wire rope guards from the fly tip head sheave. Refer to Figure 4–50. Remove wire rope from the fly tip head sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guards.
11. Remove the wire rope guards from the fly base deflector sheaves. Remove wire rope from the fly base deflector sheaves and lay it aside to prevent damage to it during fly removal. Install the wire rope guards.
12. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guard and secure with keeper pin.
13. Remove the deflector sheave pin securing the fly base deflector sheave to the bottom of the fly bracket and rotate the fly base deflector sheave into the stored position. Refer to Figure 4–37. Install the deflector sheave pin to secure the fly base deflector sheave to the top of the fly bracket.
14. Properly store wire rope which was used on fly, as required.

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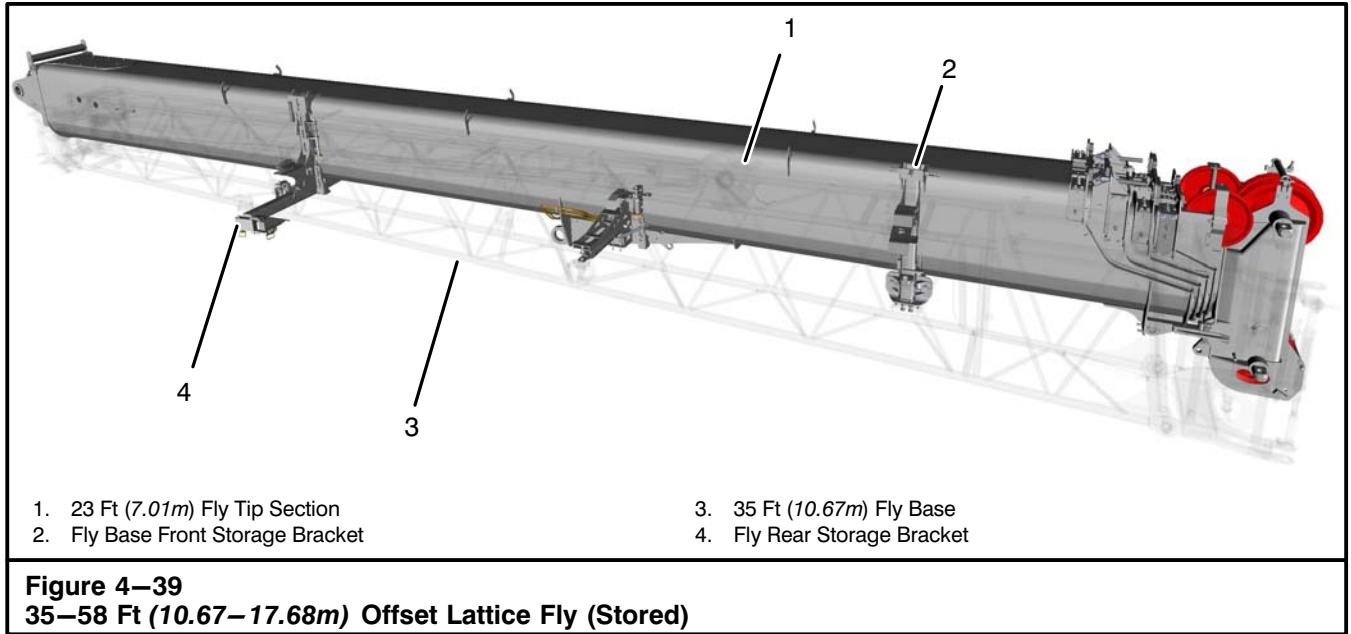
CAUTION

Do not extend the boom or boom down to the point of over stressing the fly section. Structural damage to the fly could occur if care is not taken. Use a signal person to aid the operator in lowering the fly head wear pads to the ground.

15. Carefully extend the boom until the fly head wear pads rest on the ground. Use a signal person to alert the operator when the wear pads are resting on the ground.
16. Securely block up the fly to support it. Refer to Figure 4–33. The 35–58 ft (10.67–17.68m) fly weighs approximately 2,650 lb (1 202kg).

Note: The push pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open. Refer to Figure 4–35.

17. Ensure the secondary pivot pin is fully extended and the boom head pin access cover is open. If required, extend the secondary pivot pin. Provide clearance by pinning the pivot pin block plate with a wooden block. Refer to Figure 4–35.
18. Rotate the t-handle, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
19. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully retract the bottom left boom head pin.
20. Back off the t-handle until a clearance of at least 1/2 in (1.3cm) from the left fly lug is obtained.
21. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully retract the top left boom head pin.
22. Using the appropriate tools, rotate the right side speed screw through the right side access tube to fully retract the right side boom head pin and disengage from the right side of the boom head machinery cross shafts.
23. Carefully retract the boom away from the fly.
24. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
25. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4–2. Reeve the wire rope from the boom deflector sheave over the boom head sheave or auxiliary lifting sheave. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave, as required.
26. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to “Erected Attachment Configuration” in this section of this Operator's Manual.
27. Properly store the fly to prevent damage to it.



Erection Of The 35–58 Ft (10.67–17.68m) Fly From The Stored Position

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the boom within the fly configuration working range. Refer to Figure 4–8. Engage travel swing lock.



WARNING

Erect the fly with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper within the fly configuration working range, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in personal injury and/or the crane tipping.

CAUTION

Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

5. Ensure the 23 ft (7.01m) fly tip section is properly pinned to the 35 ft (10.67m) offset fly base section with the fly tip to base storage pin. Refer to Figure 4–54.
6. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator's Manual for detailed instructions.
7. Ensure the fly base deflector sheave is in the stored position. Refer to Figure 4–37.
8. Raise and extend the boom to allow enough wire rope length to ease reeving of the fly and lower the hook ball (to be used on the fly) to the ground. Fully retract the boom.
9. Boom down fully.

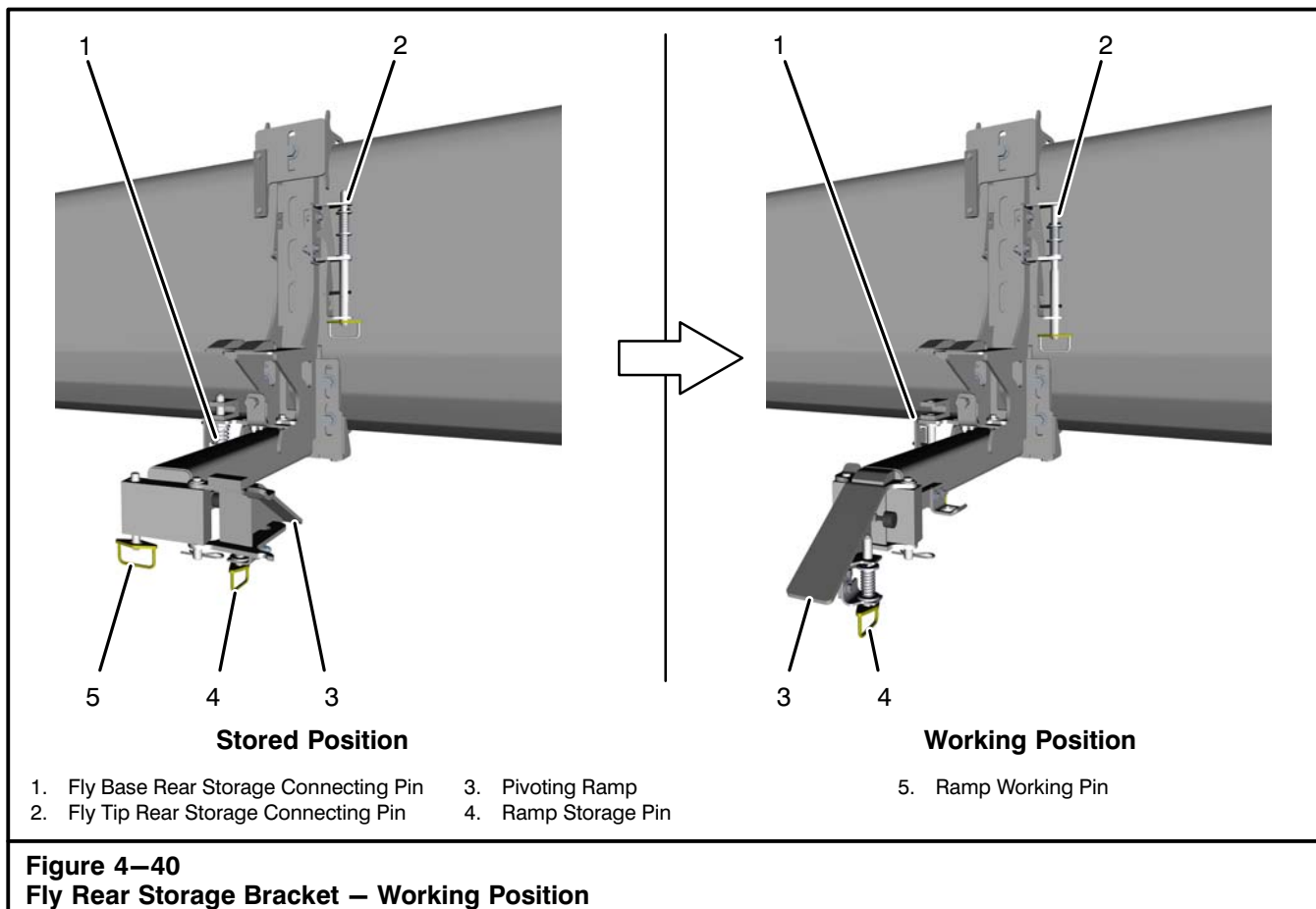


WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

10. Remove the wire rope guard and wire rope from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4–2. Lay the wire rope aside to prevent damage to it during fly erection. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave for storage.

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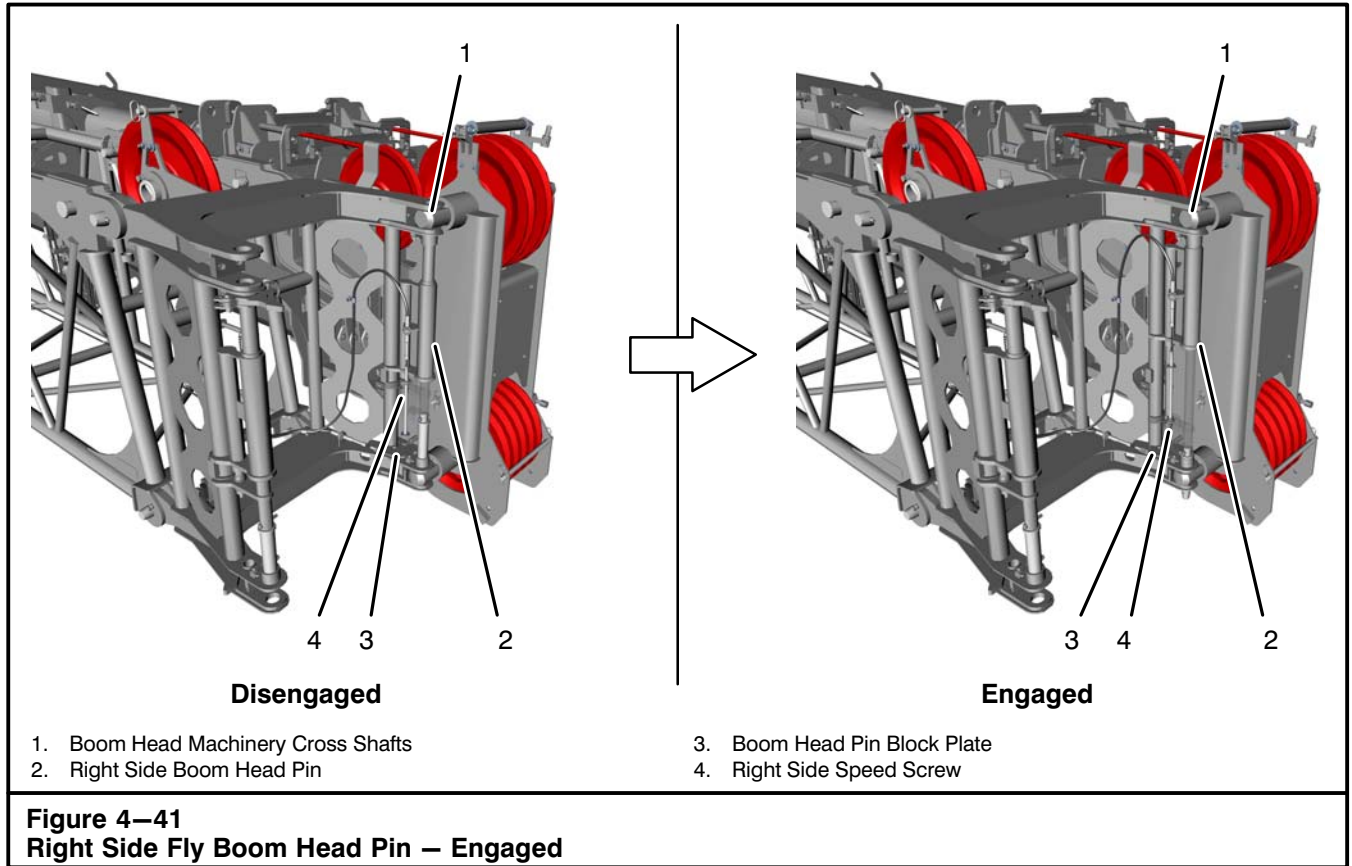


11. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly erection. Install the wire rope guard and secure with keeper pin.

Note: The push/pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open. Refer to Figure 4–35.

12. Ensure the boom head pins are fully retracted and the boom head pin access cover is open (secondary pivot pin is fully extended). Refer to Figure 4–35.

13. Attach a hand line to the swing hook on the fly base. Refer to Figure 4–44.
14. Boom up to 10°, to ease accessibility.
15. Properly set the Rated Capacity Limiter to rigging mode. Refer to “Base Configuration” in Section 01 of this Operator’s Manual.
16. Lift the operator’s seat left side armrest into the function lockout position. Refer to “Left Side Armrest” in Section 1 of this Operator’s Manual.
17. Pull the ramp storage pin. Refer to Figure 4–40. Rotate the pivoting ramp into the working position until ramp working pin catches.
18. Disengage the fly base and tip rear storage connecting pins.
19. Disengage the fly tip front storage connecting pin. Refer to Figure 4–43.



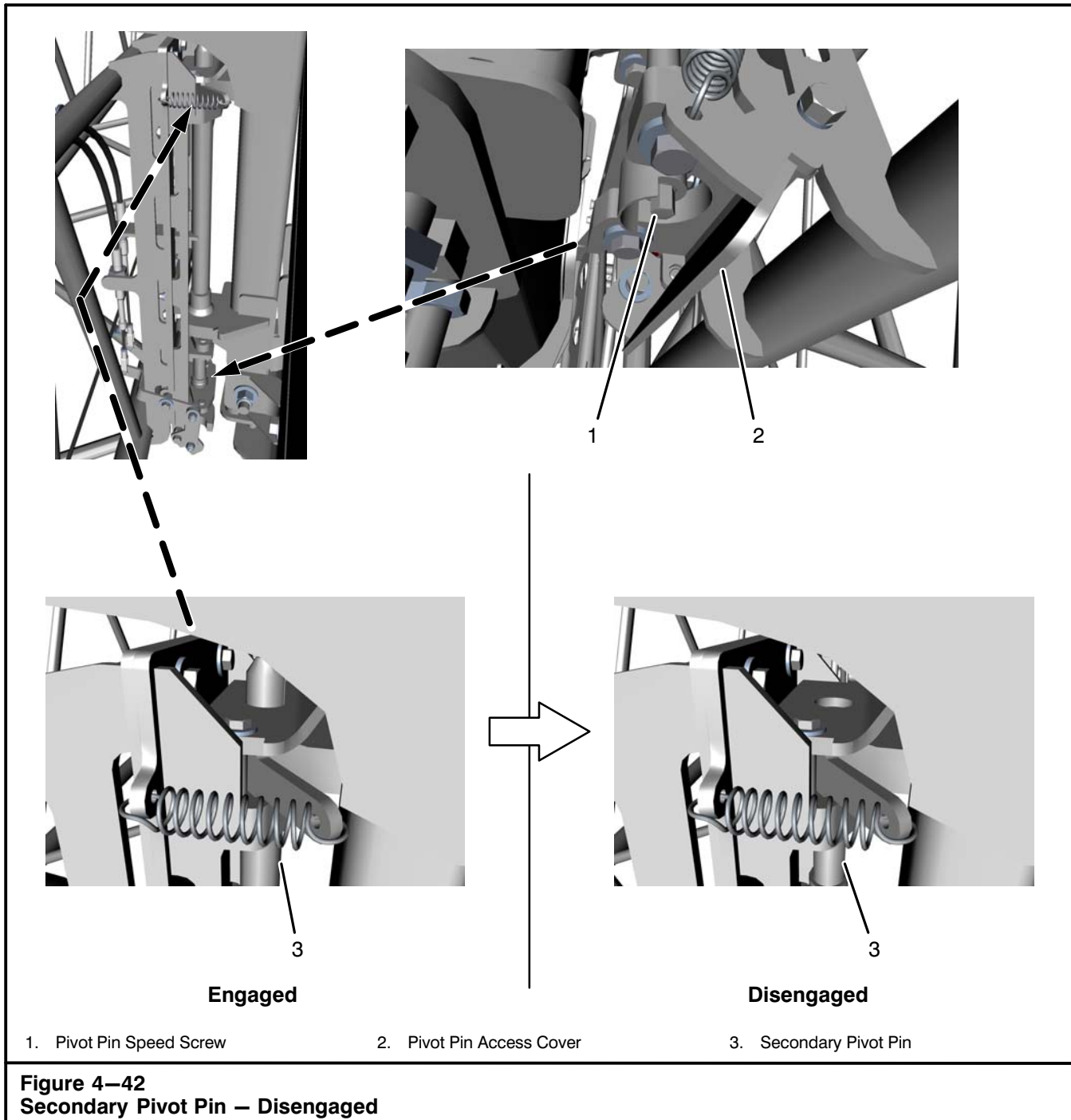
20. Use the boom hoist cylinder switch, as required, to boom down to a boom angle of 0°. Refer to Figure 4-7.

Note: The fly storage cylinder will only operate with the boom angle of 0°.

21. Use the fly storage cylinder switch to actuate the fly storage cylinder, as required, to align the right side fly lugs with the right side boom head machinery cross shafts. Refer to Figure 4-41. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.

22. Use the boom hoist cylinder switch, as required, to boom down fully. Refer to Figure 4-7.
23. Using the appropriate tools, rotate the right side speed screw through the right side access tube to extend both right side boom head pins and fully engage the right side of the boom head machinery cross shafts. Refer to Figure 4-41.

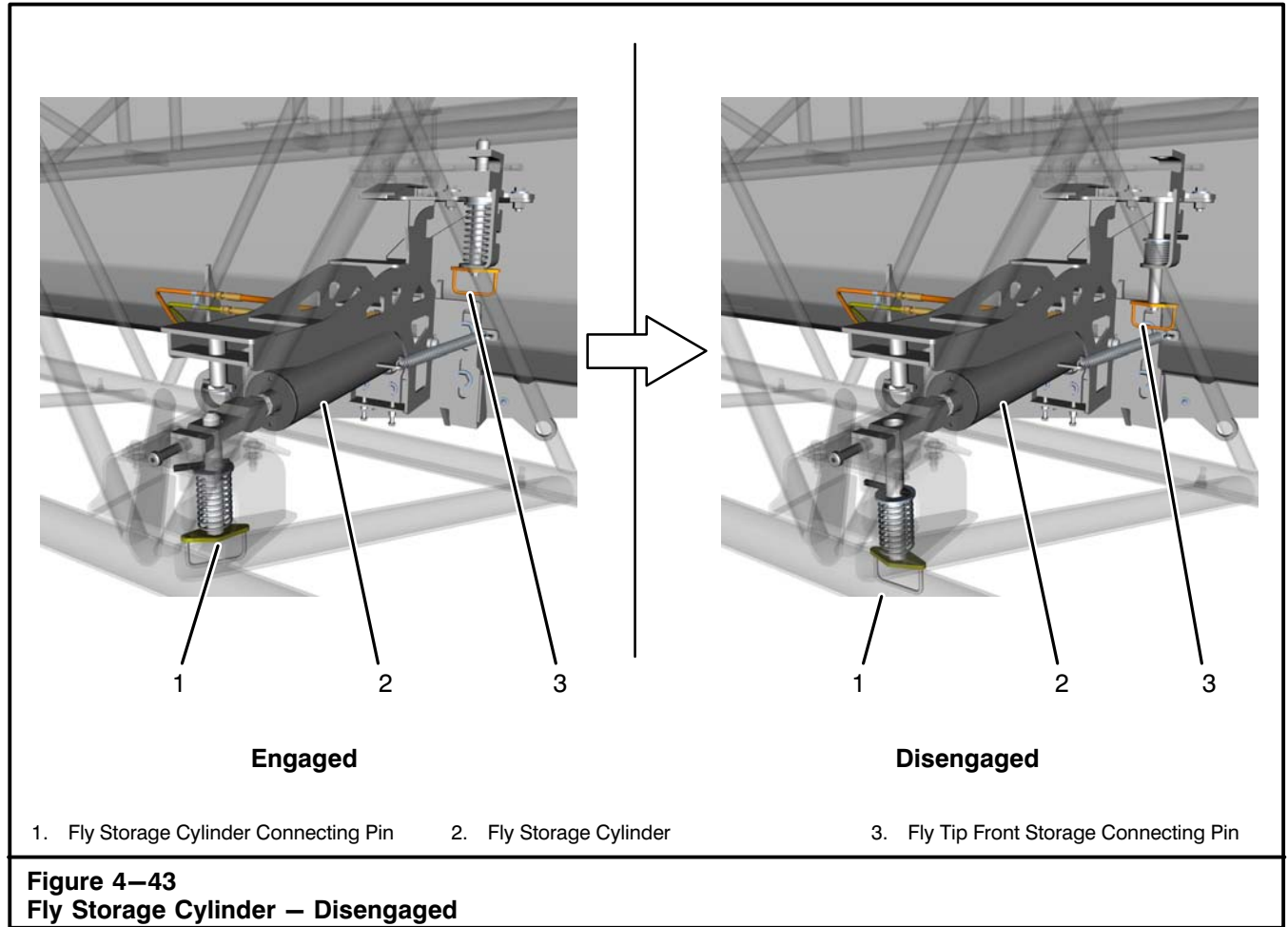
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WARNING

The right side boom head pin and fly storage cylinder must be properly installed before disengaging the secondary pivot pin. Damage to the fly and/or personal injury could occur if the right side boom head pin is not properly installed.

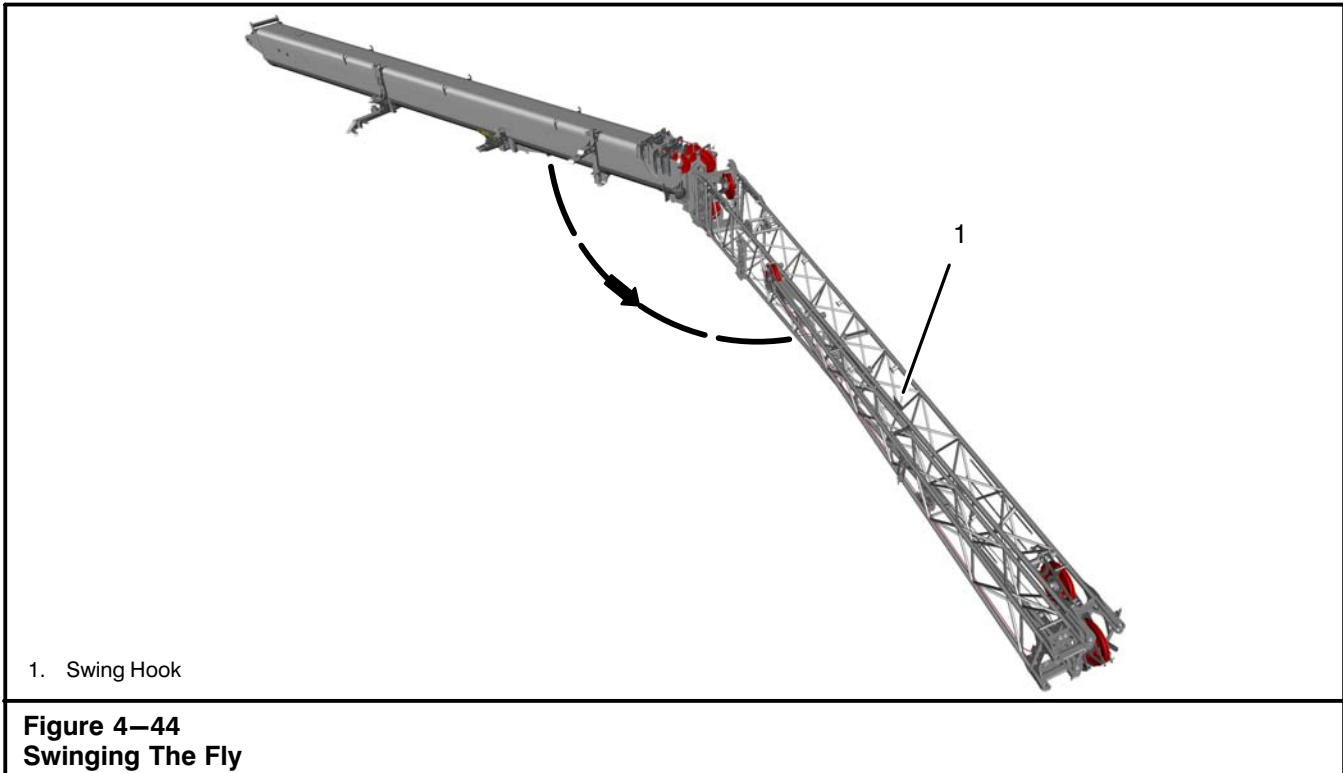
24. Using the appropriate tools, rotate the pivot pin speed screw to fully retract the secondary pivot pin and close the boom head pin access cover. Refer to Figure 4-42.
25. Use the boom hoist cylinder switch, as required, to boom up to a boom angle of 0°. Refer to Figure 4-7.



Note: The fly storage cylinder will only operate with the boom angle of 0°.

26. Use the fly storage cylinder switch to extend the fly storage cylinder, as required, to pivot the fly off the pivoting ramp.
27. While holding the hand line, use the appropriate tools to pull and rotate the fly storage cylinder connecting pin into detent position and disengage the fly storage cylinder from the 35 ft (10.67m) fly section. Refer to Figure 4–43.

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WARNING

Use a hand line to control fly swing. The fly could swing rapidly. Keep all personnel clear of swing path to avoid personal injury.

28. Use the hand line attached to the swing hook on the 35 ft (10.67m) fly section to slowly swing the fly around the boom head. Refer to Figure 4–44.
29. Continue swinging the fly until the fly catch engages with the boom head and align the top left fly lug with the left side of the top boom head machinery cross shaft. Refer to Figure 4–45.
30. Use the fly storage cylinder switch to fully retract the fly storage cylinder. Refer to Figure 4–7.
31. Use the boom hoist cylinder switch, as required, to boom down fully.

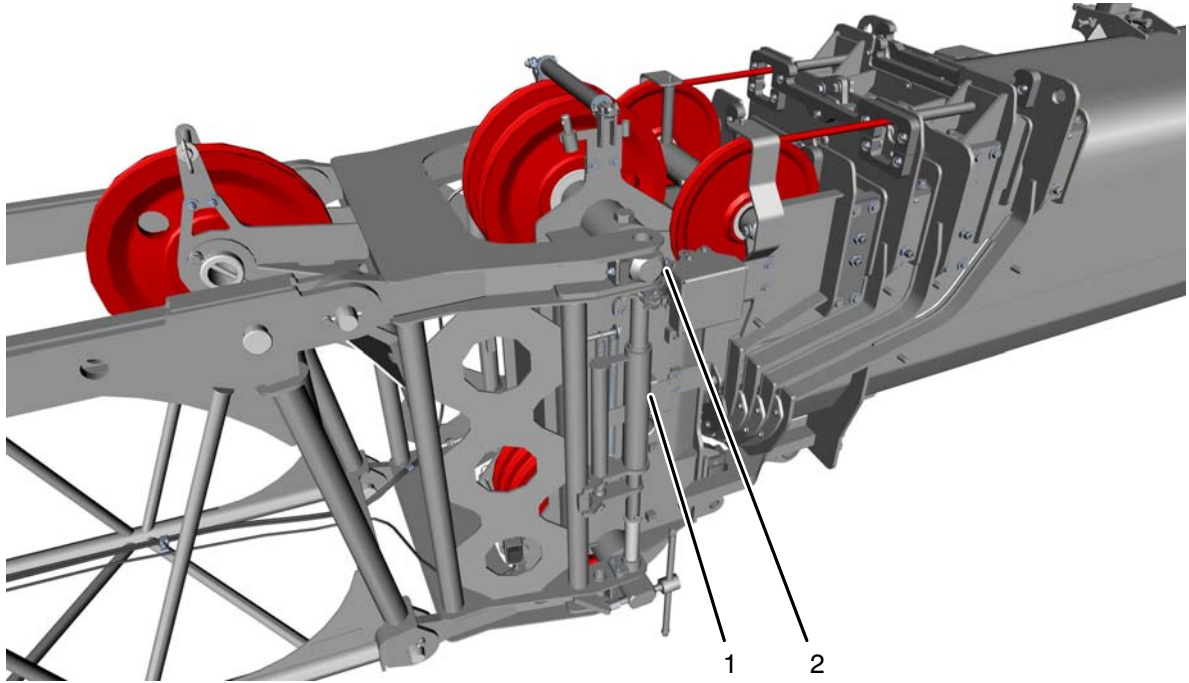
32. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully extend the top left boom head pin. Refer to Figure 4–45.
33. Rotate the t-handle, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
34. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully extend the bottom left boom head pin.
35. Back off the t-handle until a clearance of at least 1/2 in (1.3cm) from the left fly lug is obtained.



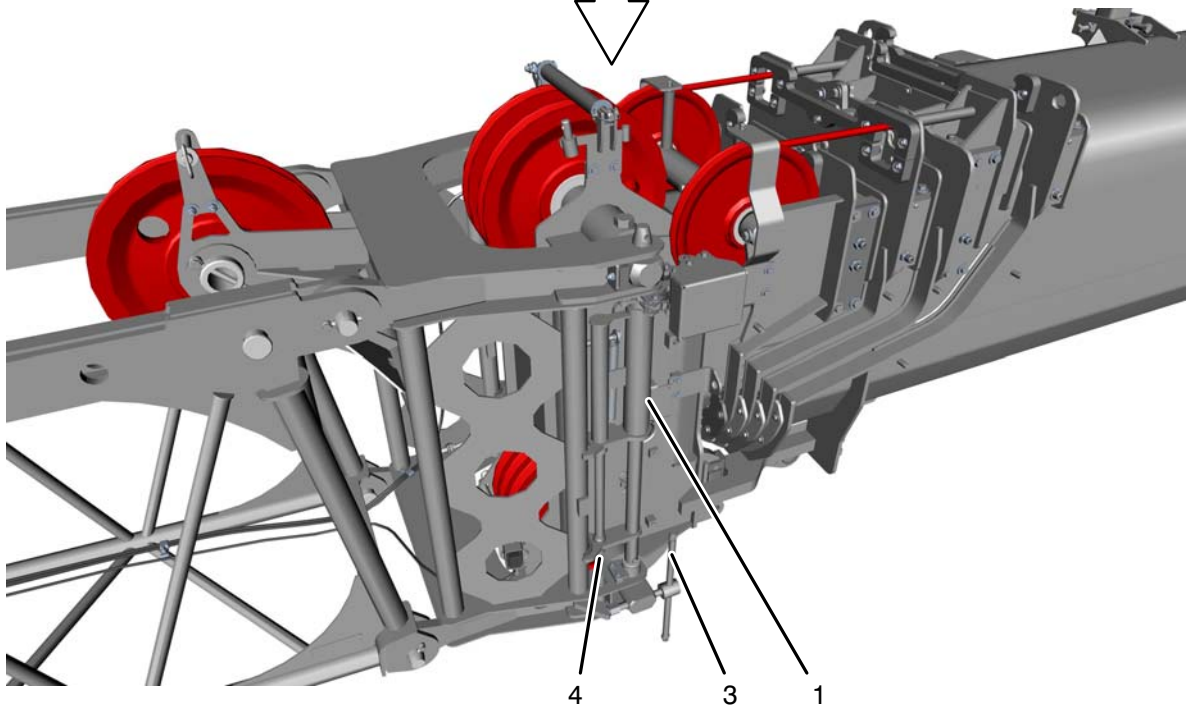
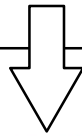
WARNING

All boom head pins and all fixed fly base connecting pins must be properly installed before operating the crane with the fly erected. Damage to the fly and/or personal injury could occur if all connecting pins and boom head pins are not properly installed.

36. Remove the hand line from the swing hook on the fly base and attach it to the tip of the fly tip section. Refer to Figure 4–44.



Disengaged



Engaged

1. Left Side Boom Head Pin

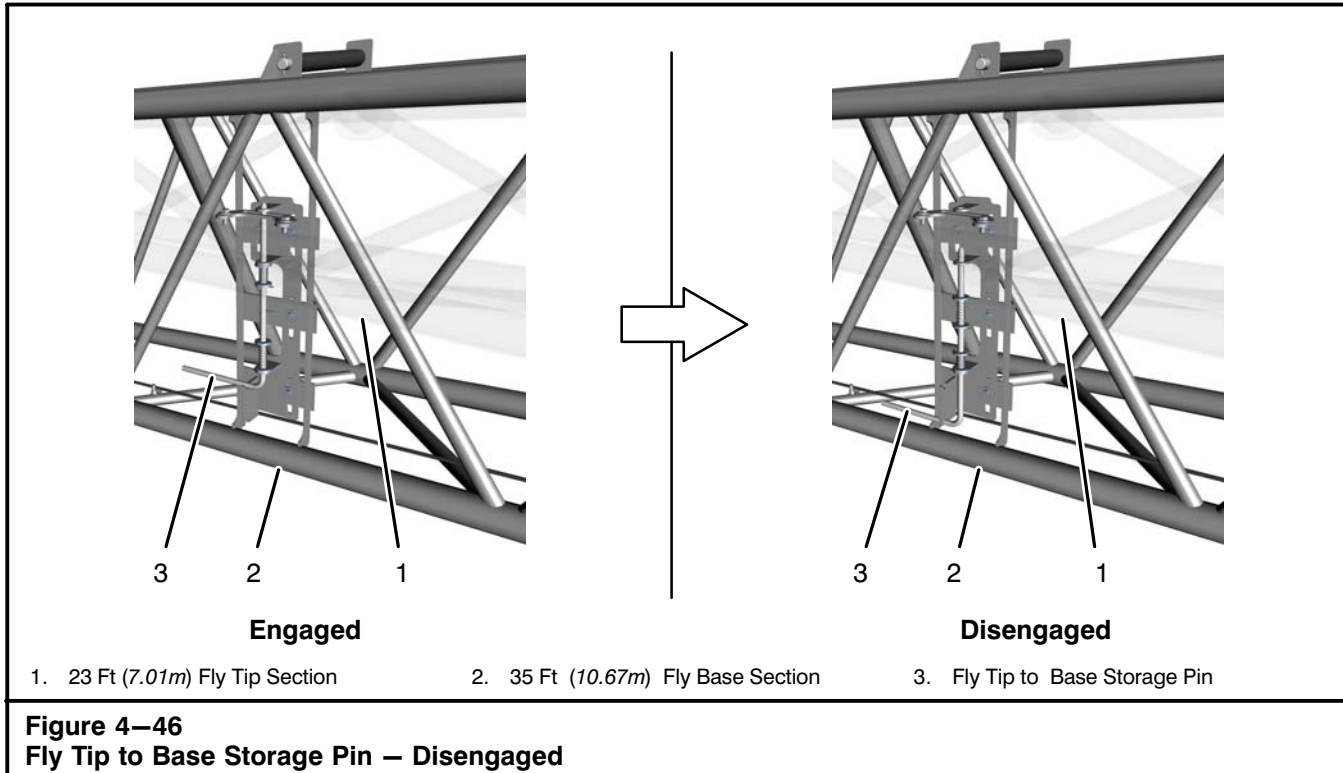
2. Fly Catch

3. T-handle

4. Left Side Speed Screw

Figure 4–45
Left Side Fly Boom Head Pin – Engaged

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37. Use the boom hoist cylinder switch, as required, to boom up to 0°. Refer to Figure 4–7.

38. Using the appropriate tools, pull and rotate the fly tip to base storage pin to disengage the 23 ft (7.01m) fly tip section from the 35 ft (10.67m) fly base section. Refer to Figure 4–46.

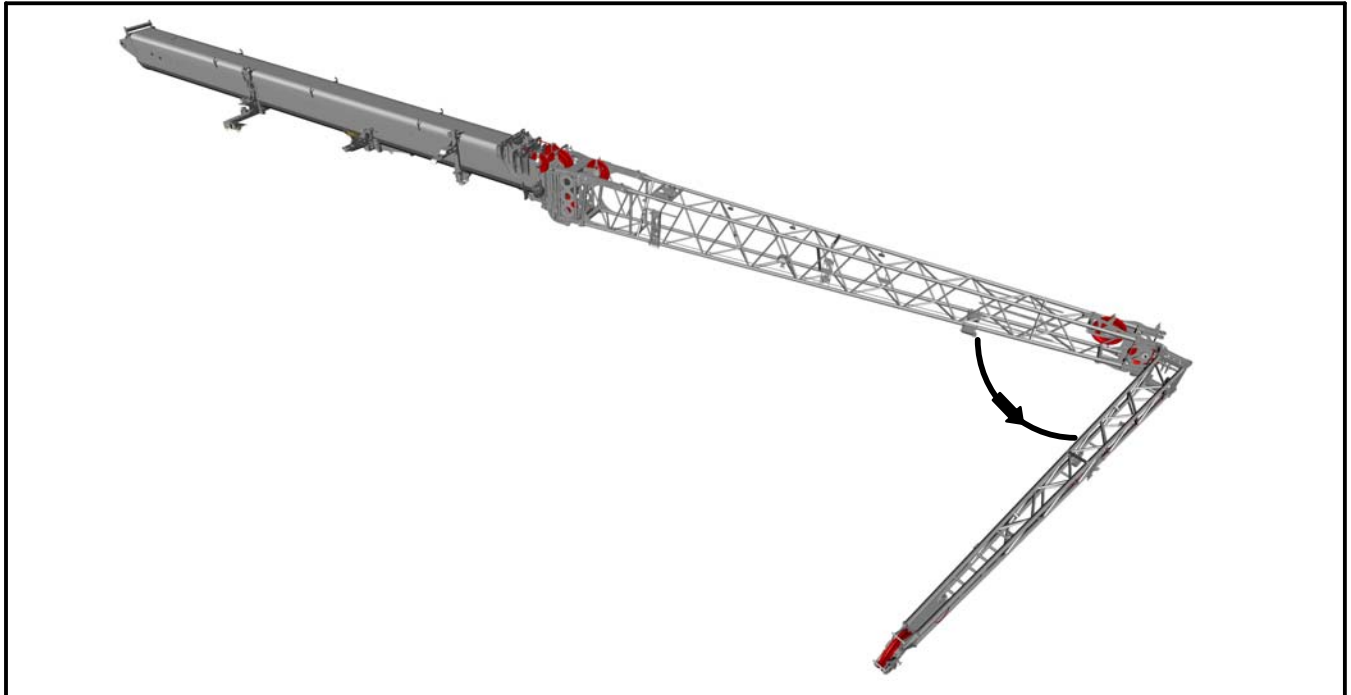


Figure 4–47
Swinging The Fly Tip Section



WARNING

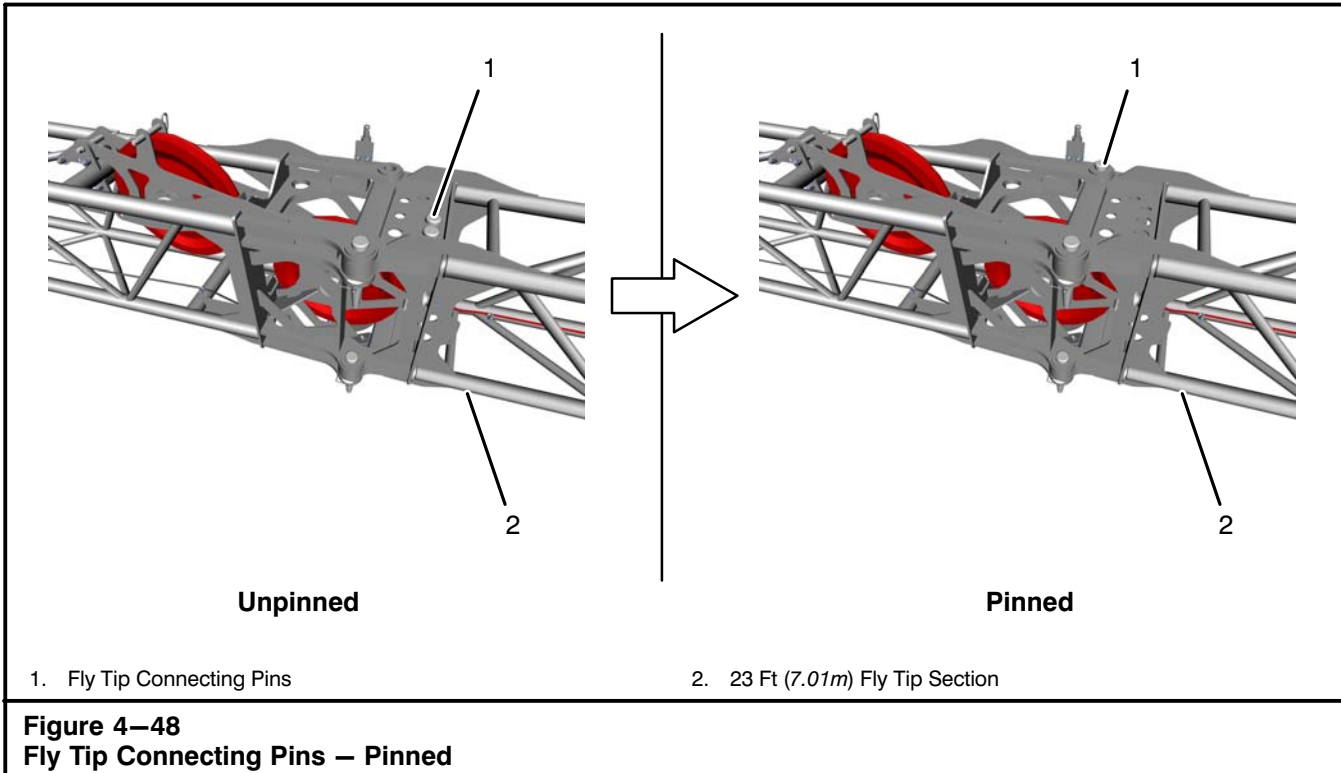
Use a hand line to control fly swing. The fly could swing rapidly. Keep all personnel clear of swing path to avoid personal injury.

39. Using the hand line attached to the fly tip section, swing the fly tip section around the fly base section until the fly tip lugs engage with the fly base lugs on the left side of the fly. Refer to Figure 4–47.

CAUTION

Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

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40. Remove the fly tip connecting pins from the storage locations on the rear of the 23 ft (7.01m) fly tip section. Refer to Figure 4-48. Install the left connecting pins through the fly tip connecting lugs on left side of the fly. (Install the pins with the head on top and the keeper on the bottom.) Install the pin keepers.



WARNING

Both boom head pins and all fixed fly base and fly tip connecting pins must be properly installed before operating the crane with the fly erected. Damage to the fly and/or personal injury could occur if all connecting pins and boom head pins are not properly installed.

41. Boom down fully.
42. Remove the hand line from the tip of the fly tip section.
43. Remove the deflector sheave pin securing the fly base deflector sheave to the top of the fly bracket and rotate the fly base deflector sheave into the working position. Refer to Figure 4-34. Install the deflector sheave pin to secure the fly base deflector sheave to the bottom of the fly bracket.

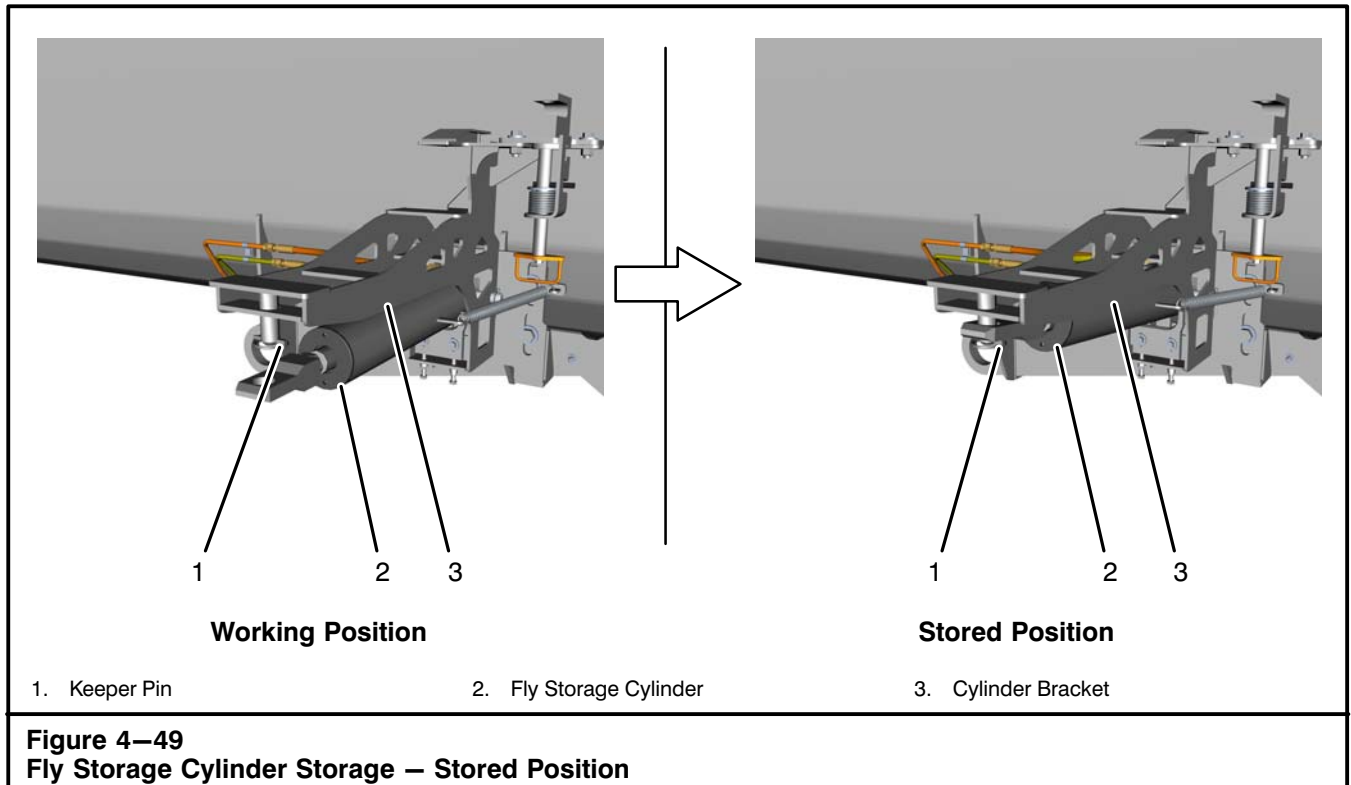
44. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4-3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard.

45. Remove the wire rope guards from the fly base deflector sheaves. Refer to Figure 4-50. Reeve the wire rope from the boom deflector sheave over the fly base deflector sheaves. Install the wire rope guards.

46. Remove the wire rope guards from the fly tip head sheave. Reeve the wire rope from the fly base deflector sheaves over the fly tip head sheave. Install the wire rope guards.

CAUTION

All wire rope guards must be in proper position during operation.



47. Disengage the fly tip front storage connecting pin, as required. Refer to Figure 4—43.
48. Properly connect the anti-two block (ATB) system as follows:
 - a. Install the lockout clip on the boom head ATB switch cable. Refer to Figure 4—36.
 - b. Remove the ATB weight from the boom head ATB switch cable.
 - c. Disconnect the boom head plug from the jumper assembly and connect it to the fly base connector.
 - d. Disconnect the fly tip plug from the fly tip storage connector and connect it to the fly base head connector.
 - e. Install the fly head ATB switch on the fly head.
 - f. Connect the fly head ATB switch plug to the fly tip head connector.
 - g. Install the ATB weight on the fly head ATB switch cable.

Note: When lockout clip is installed, the main boom ATB switch is inactive.

When both main boom and fly are reeved for operation, the lockout clip must be removed and an ATB weight must be suspended from each ATB switch.

49. Secure the fly storage cylinder in the cylinder bracket with the keeper pin. Refer to Figure 4—49.
50. Pull the ramp storage pin. Rotate the pivoting ramp into the stored position until the ramp storage pin catches. Refer to Figure 4—60.
51. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
52. Check the Crane Rating Manual, in the operator's cab, for deductions from the lifting capacities with the fly installed before continuing operations.



WARNING

The fly adds weight to the boom which must be considered in lifting capacities when the fly is erected. When making lifts from the boom or auxiliary lifting sheave with the fly erected, refer to the Crane Rating Manual for the appropriate deductions from lifting capacities. Use the offset lattice fly only when the crane is level on fully or intermediate extended outriggers with all tires clear of the ground.

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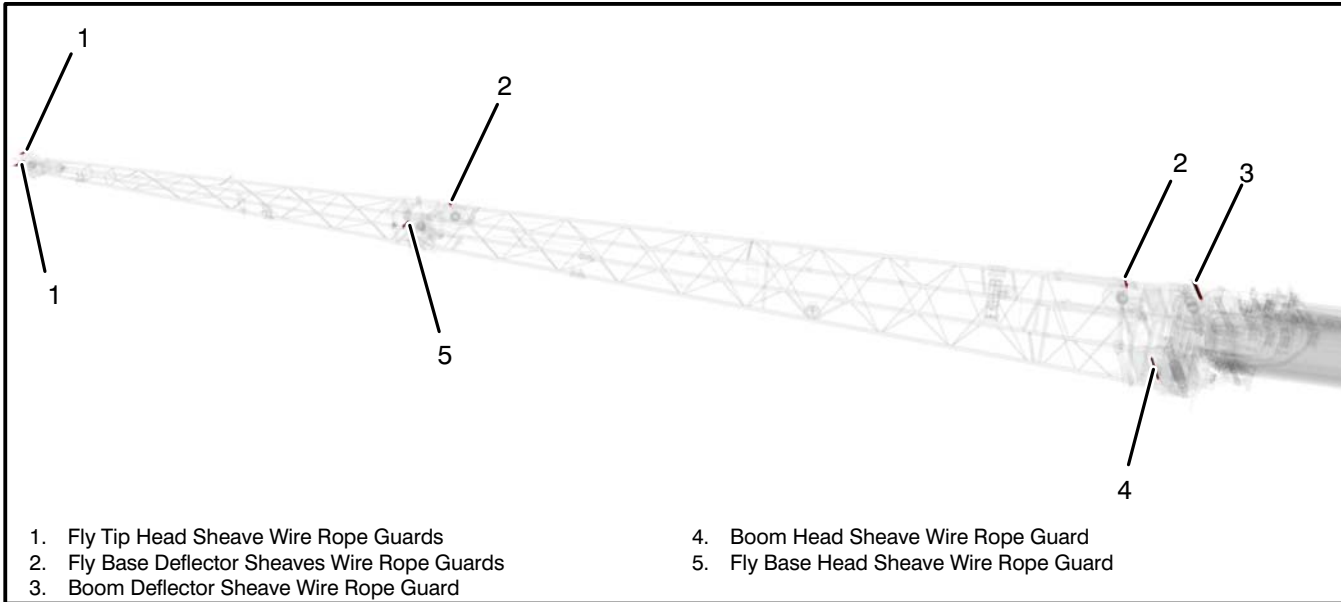


Figure 4–50
35–58 Ft (10.67–17.68m) Wire Rope Guards

Storage Of The 35–58 Ft (10.67–17.68m) Fly From The Erected Position

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the boom within the fly configuration working range. Refer to Figure 4–8. Engage travel swing lock.



WARNING

Store the fly with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper within the fly configuration working range, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in personal injury and/or the crane tipping.

5. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. Refer to Figure 4–35. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator’s Manual for detailed instructions.
6. Raise and extend the boom to allow enough rope to ease wire rope removal from the fly. Lower the hook block or hook ball (to be removed from the fly) to the ground. Fully retract the boom.
7. Boom down to 10°.



WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

8. Properly set the Rated Capacity Limiter to rigging mode. Refer to “Base Configuration” in Section 01 of this Operator’s Manual.
9. Lift the operator’s seat left side armrest into the function lockout position. Refer to “Moveable Left Side Armrest” in Section 01 of this Operator’s Manual.
10. Pull the ramp storage pin. Refer to Figure 4–40. Rotate the pivoting ramp into the working position until ramp working pin catches.
11. Disengage the fly base and tip rear storage connecting pins, as required.
12. Use the boom hoist cylinder switch, as required, to boom down fully. Refer to Figure 4–7.

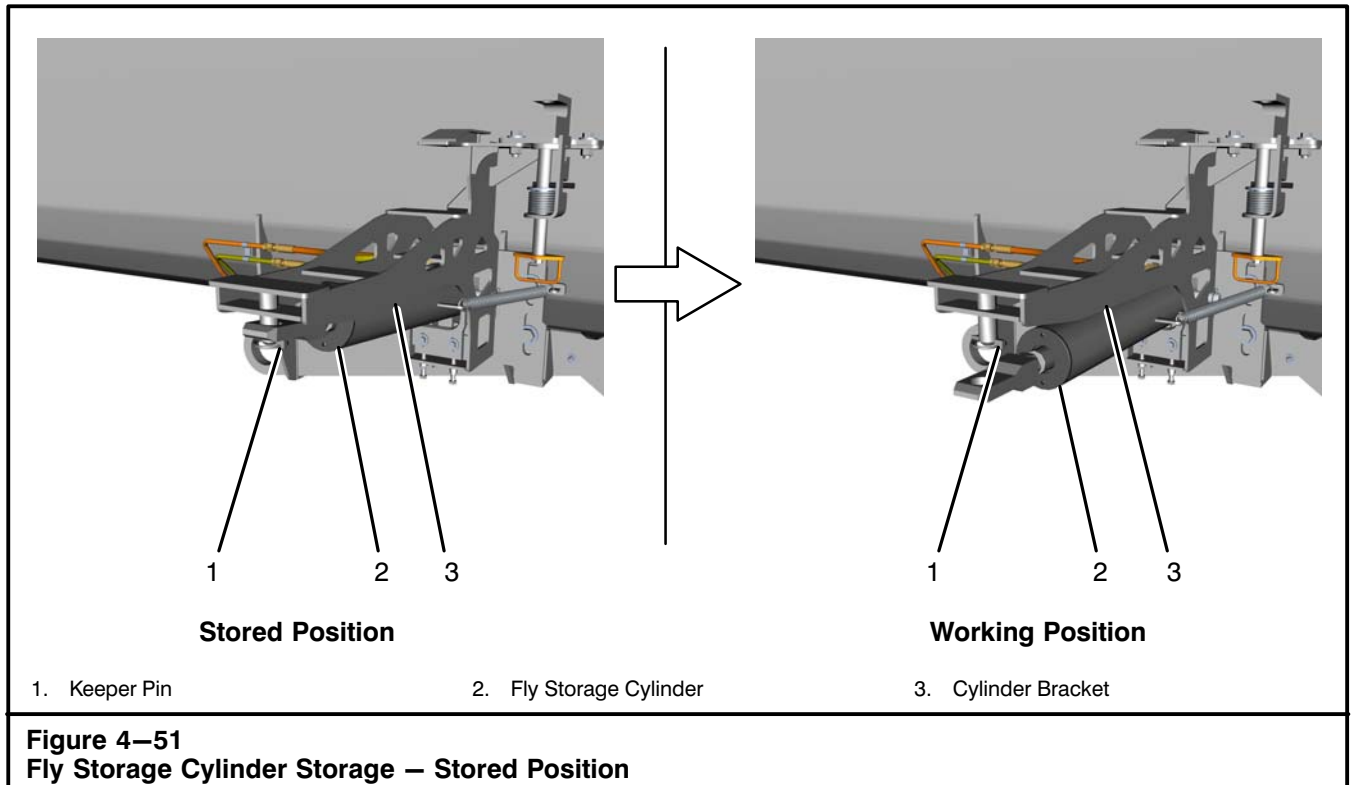
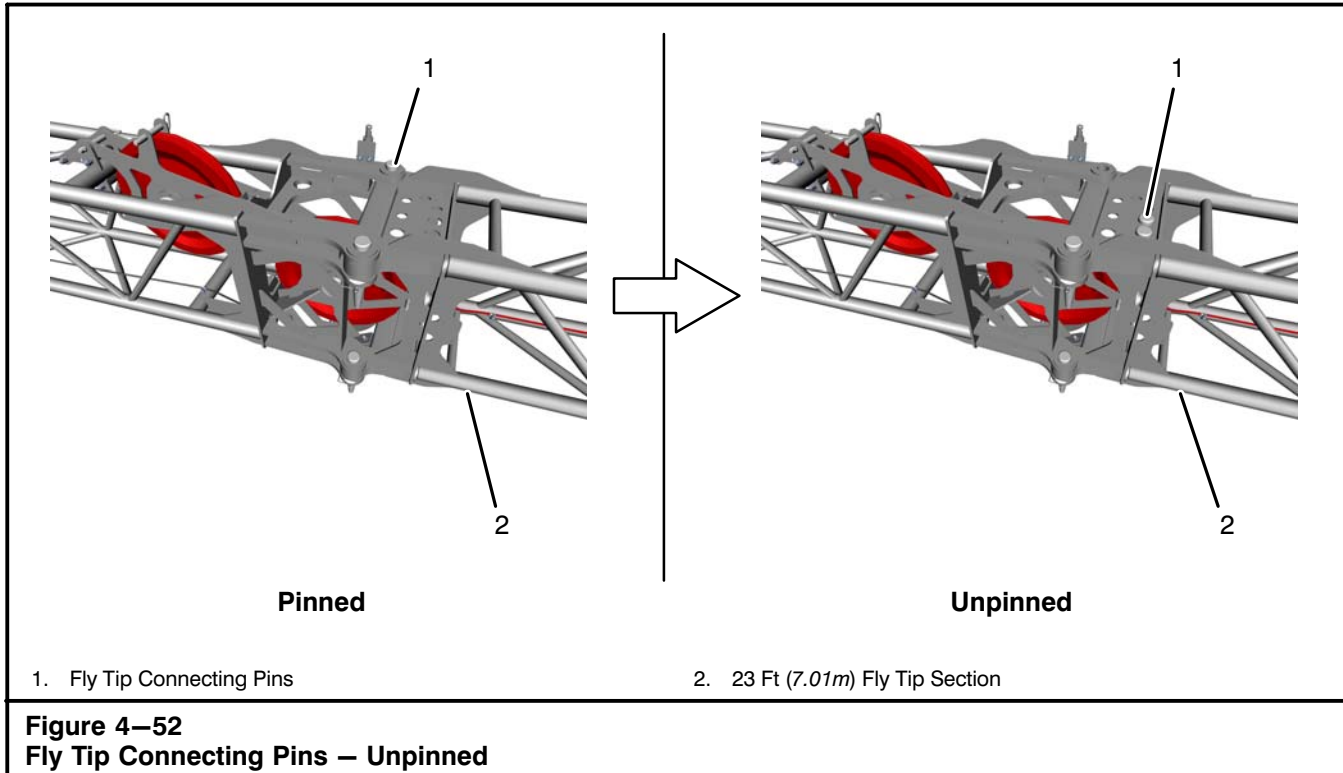


Figure 4–51
Fly Storage Cylinder Storage – Stored Position

13. Remove the keeper pin securing the fly storage cylinder in the cylinder bracket. Refer to Figure 4–51. Disengage the fly storage cylinder from the cylinder bracket and install the keeper pin in the cylinder bracket for storage.
14. Properly disconnect the anti-two block (ATB) system as follows:
 - a. Remove the ATB weight from the fly head ATB switch cable. Refer to Figure 4–38.
 - b. Disconnect the fly head ATB switch plug from the fly tip head connector.
 - c. Remove the fly head ATB switch from the fly head.
 - d. Disconnect the fly tip plug from the fly base head connector and connect it to fly tip storage connector.
 - e. Disconnect the boom head plug from the fly base connector and connect it to the jumper assembly on the main boom head.
 - f. Install the ATB weight on the boom head ATB switch cable.
 - g. Remove the lockout clip from the boom head ATB switch cable.
15. Remove the wire rope guards from the fly tip head sheave. Refer to Figure 4–50. Remove wire rope from the fly tip head sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guards.
16. Remove the wire rope guards from the fly base deflector sheaves. Remove wire rope from the fly base deflector sheaves and lay it aside to prevent damage to it during fly removal. Install the wire rope guards.
17. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guard and secure with keeper pin.
18. Remove the deflector sheave pin securing the fly base deflector sheave to the bottom of the fly bracket and rotate the fly base deflector sheave into the stored position. Refer to Figure 4–37. Install the deflector sheave pin to secure the fly base deflector sheave to the top of the fly bracket.
19. Properly store wire rope which was used on fly, as required.

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20. Attach a hand line to the tip of the fly tip.
21. Ensure the fly tip to base storage pin is disengaged prior to swinging the fly tip. Refer to Figure 4–46.



WARNING

Do not remove fly tip connecting pins on the right side of the fly. The fly could fall causing crane damage and/or personal injury.

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing personal injury.

22. Boom up to 0°.
23. Remove the fly tip connecting pins from the fly tip connecting lugs on left side of the fly. Refer to Figure 4–52. Install the left connecting pins in the storage locations on the rear of the 23 ft (7.01m) fly tip section. (Install the pins with the head on top and the keeper on the bottom.) Install the pin keepers.

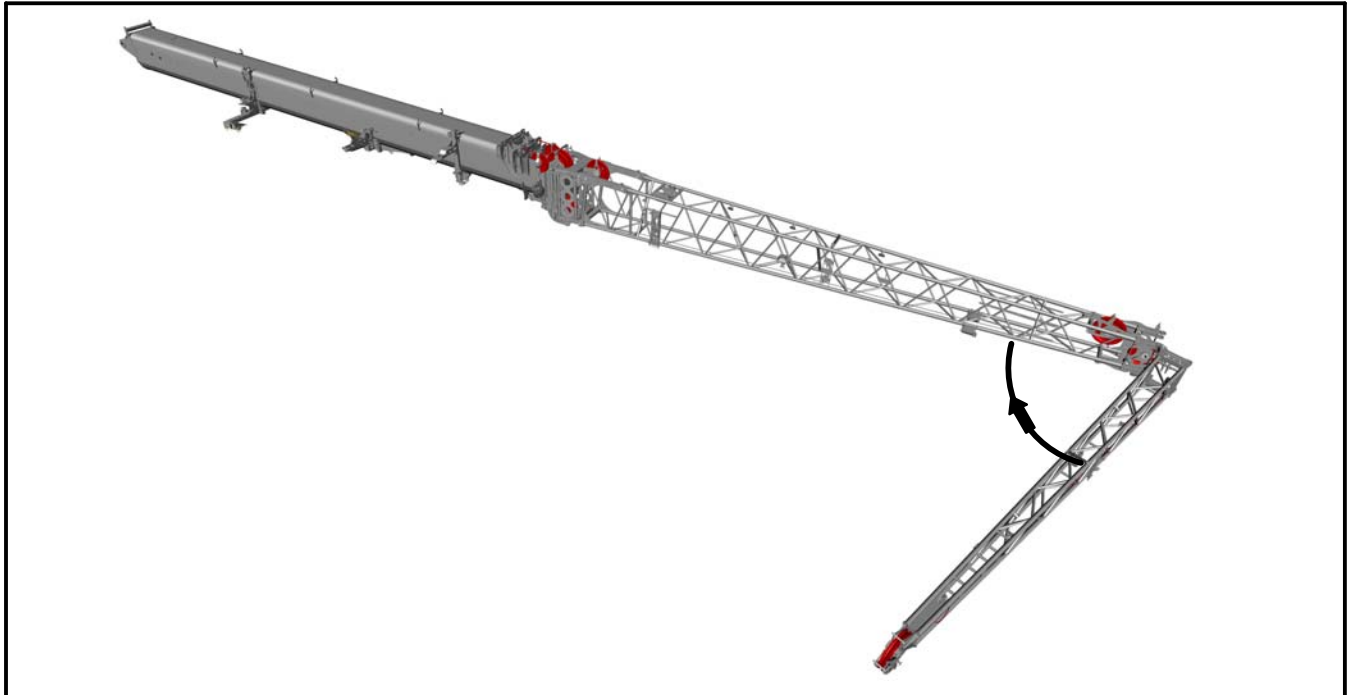


Figure 4–53
Swinging The Fly Tip Section



WARNING

Use a hand line to control fly swing. The fly could swing rapidly. Keep all personnel clear of swing path to avoid personal injury.

24. Using the hand line attached to the fly tip section, swing the fly tip section around the fly base section until the fly tip hitch pin bracket on the tip section engages with the fly tip hitch pin bracket on the right side of the fly base. Refer to Figure 4–53.

CAUTION

Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

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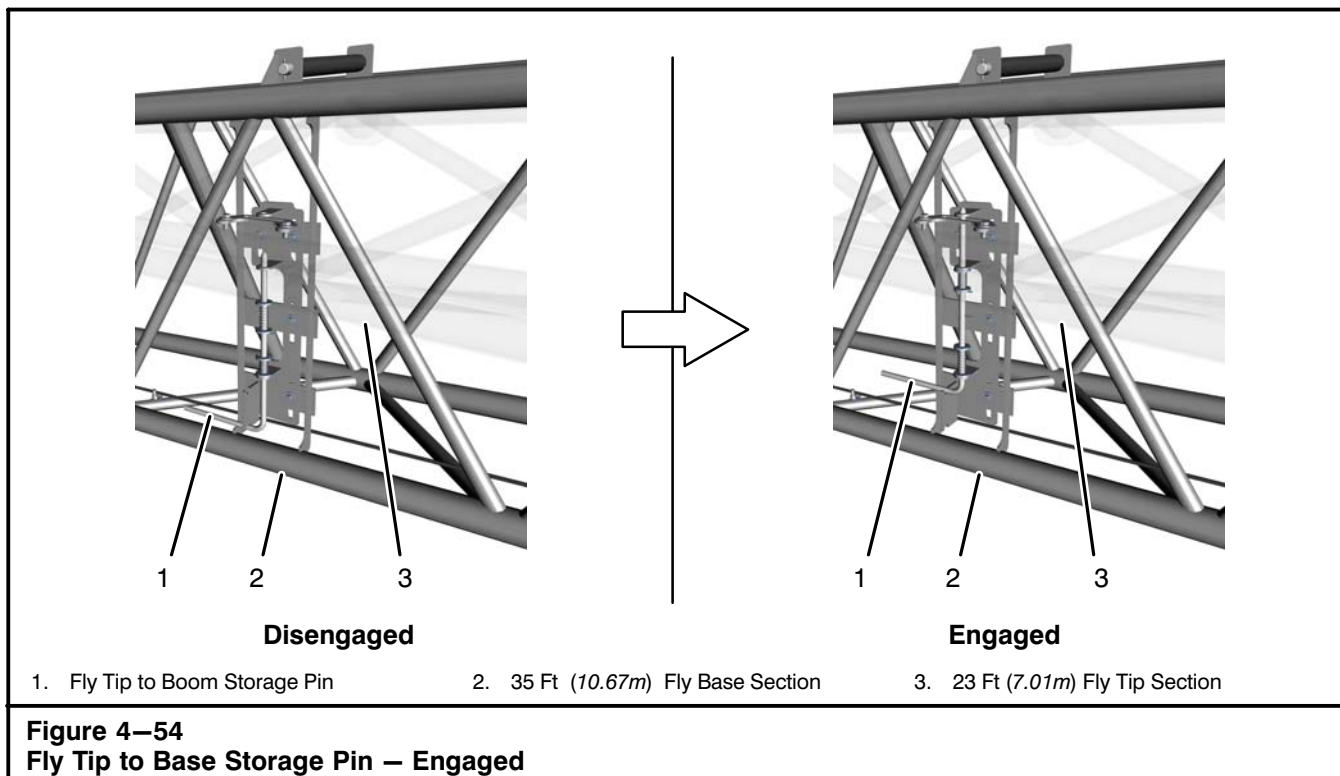
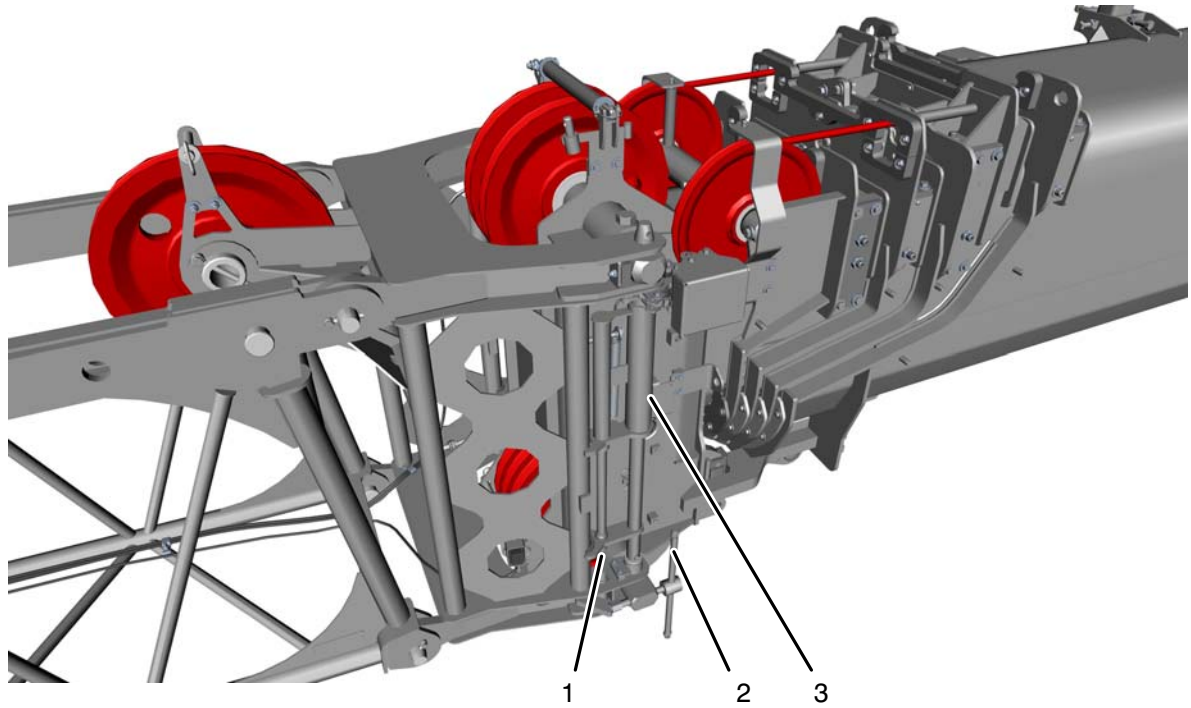


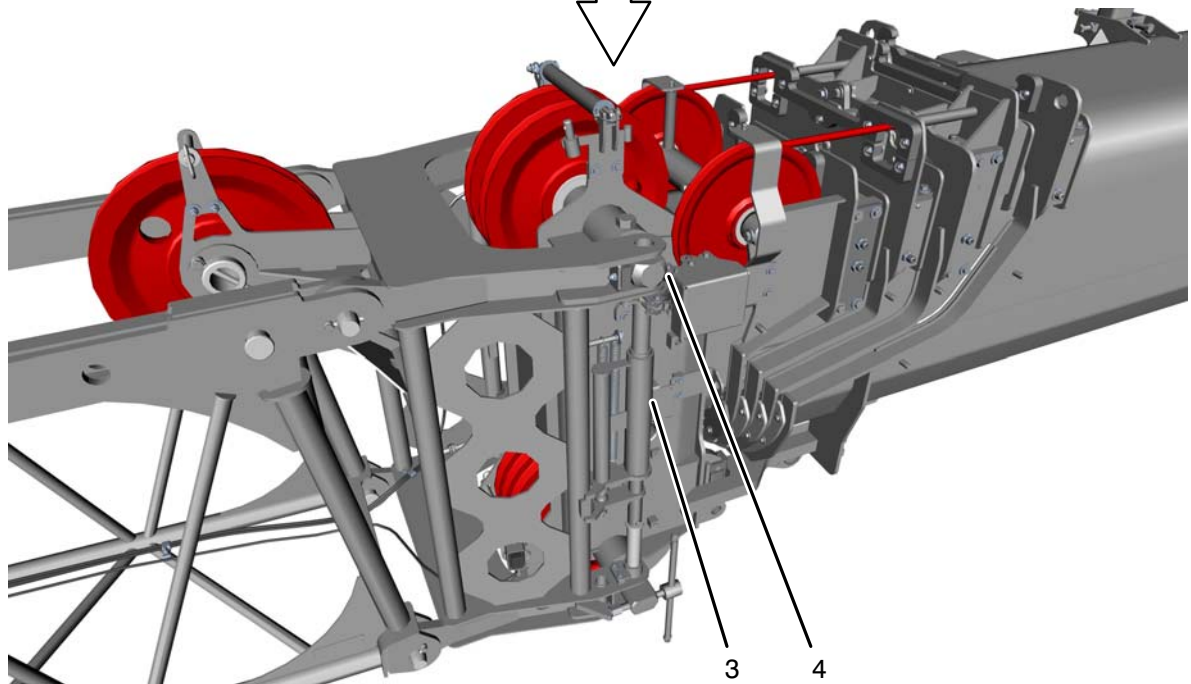
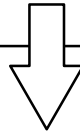
Figure 4-54

Fly Tip to Base Storage Pin – Engaged

25. Using the appropriate tools, pull and rotate the fly tip hitch pin to engage the 23 ft (7.01m) fly tip section with the 35 ft (10.67m) fly base section. Refer to Figure 4-54.
26. Boom down fully.
27. Remove the hand line from the tip of the fly tip and attach it to the swing hook on the fly base. Refer to Figure 4-56.
28. Ensure the secondary pivot pin is disengaged prior to swinging the fly. If required, use the appropriate tools to rotate the pivot pin speed screw to fully retract the secondary pivot pin. Refer to Figure 4-42.
29. Rotate the t-handle, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft. Refer to Figure 4-55.
30. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully retract the bottom left boom head pin.
31. Back off the t-handle until a clearance of at least 1/2 in (1.3cm) from the left fly lug is obtained.
32. Using the appropriate tools, rotate the left side speed screw through the left side access tube to fully retract the top left boom head pin.



Engaged



Disengaged

1. Left Side Speed Screw

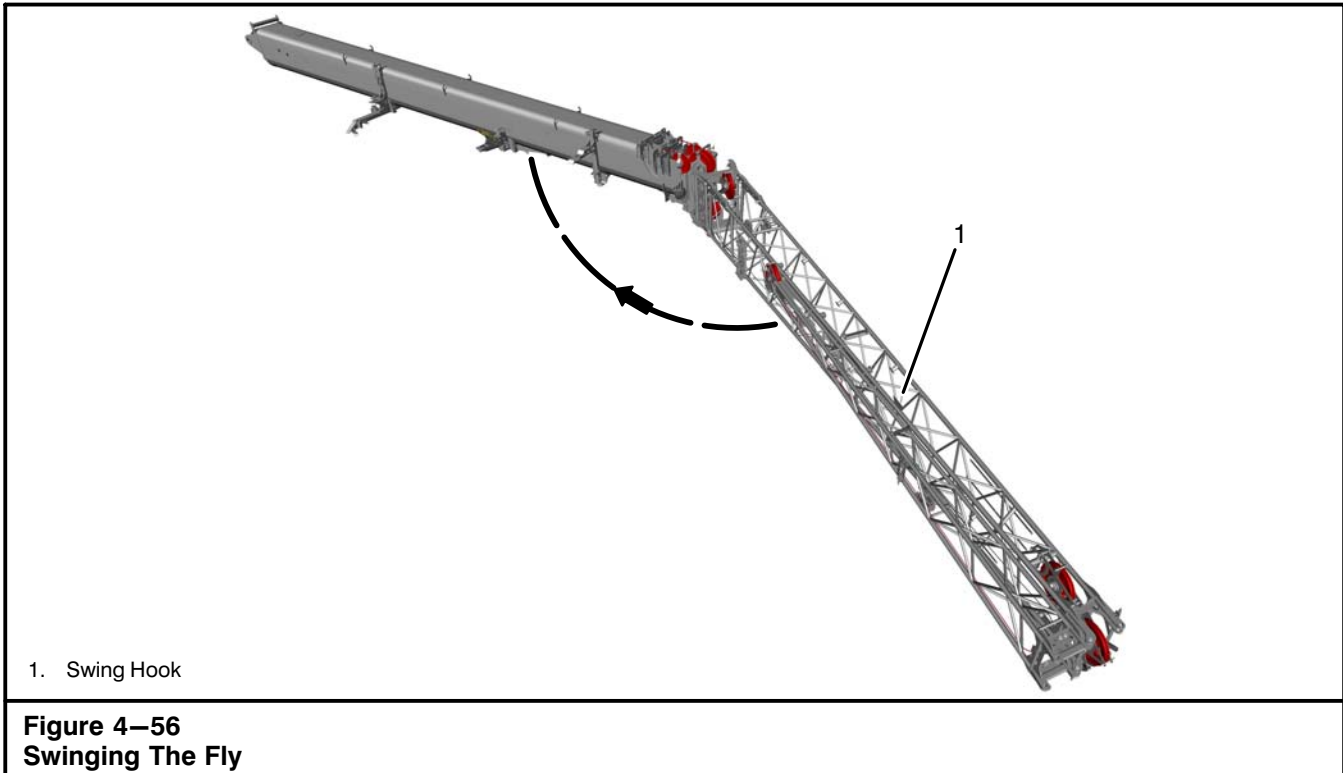
2. T-handle

3. Left Side Boom Head Pin

4. Fly Catch

Figure 4–55
Left Side Fly Boom Head Pin – Disengaged

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33. Use the boom hoist cylinder switch, as required, to boom up to 0°. Refer to Figure 4–7.

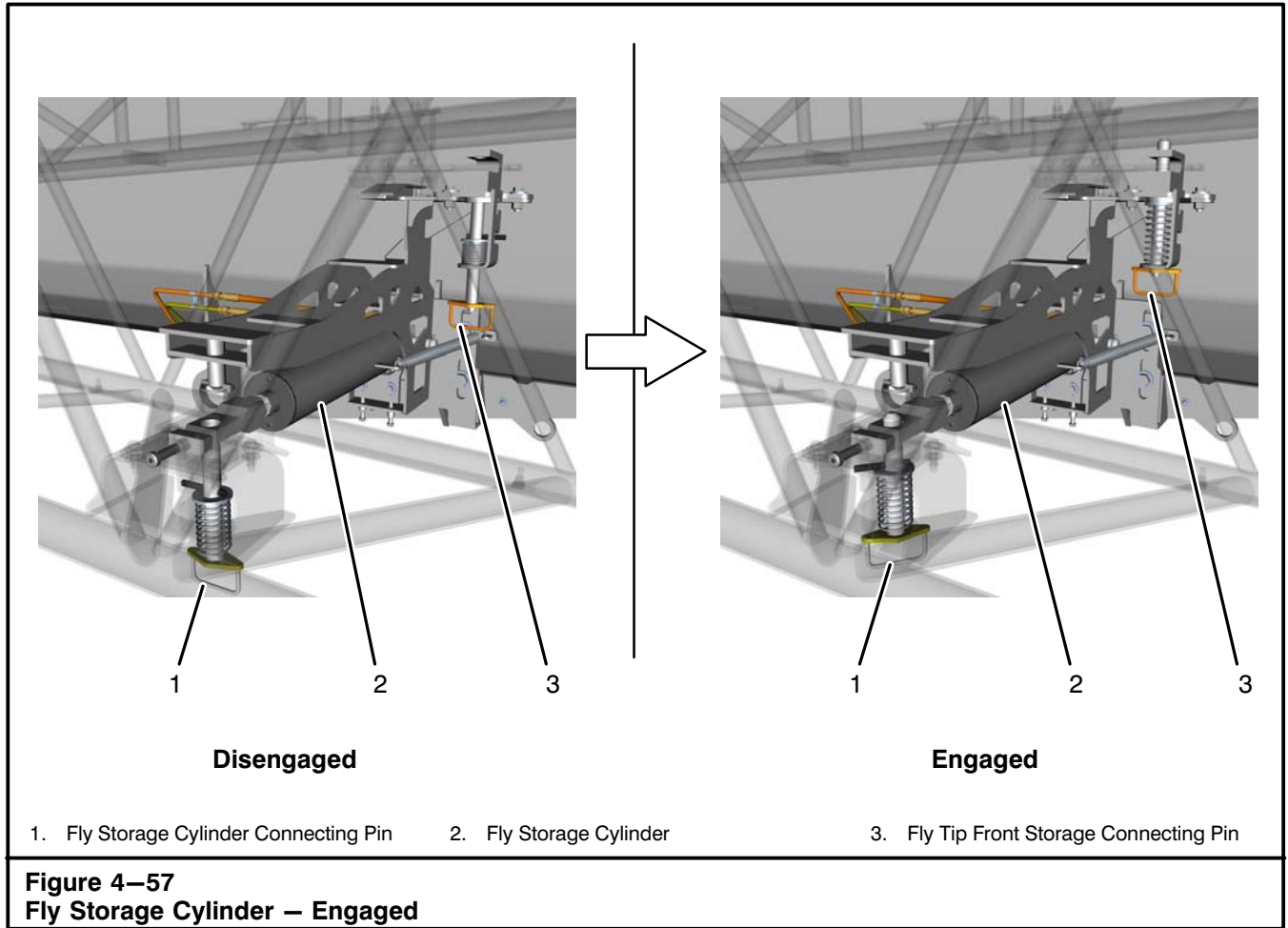
Note: The fly storage cylinder will only operate with the boom angle of 0°.

34. Use the fly storage cylinder switch to fully extend the fly storage cylinder. Rotate the cylinder rod as required to make end horizontal.
35. Use the appropriate tools to pull and rotate the fly storage cylinder connecting pin into detent position. Refer to Figure 4–43.

CAUTION

Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

36. Pull the hand line to disengage the fly catch and slowly swing the fly around to the right side of the boom. Refer to Figure 4–56.



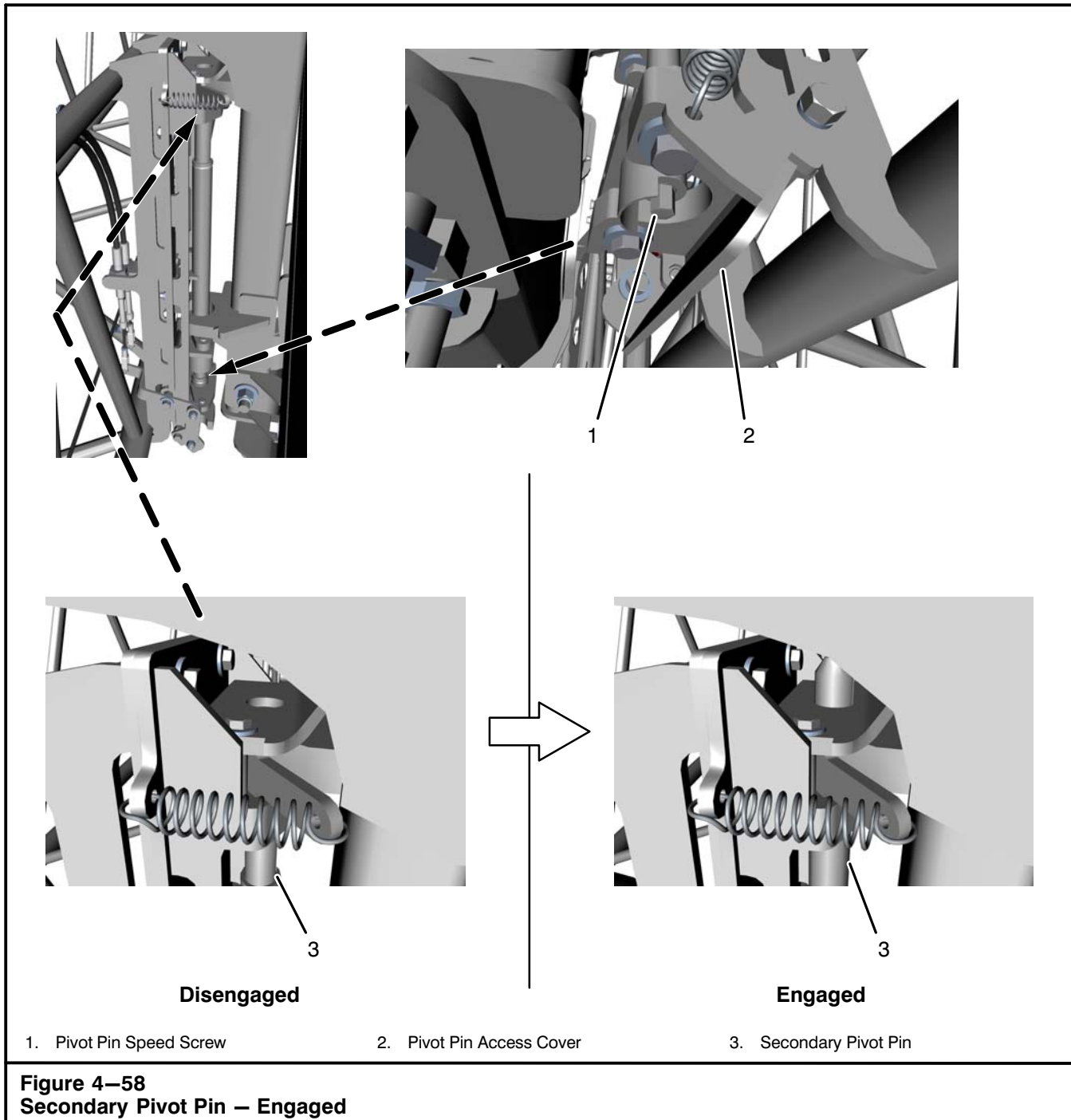
WARNING

Use a hand line to control fly swing. The fly could swing rapidly. Keep all personnel clear of swing path to avoid personal injury.

37. Use the hand line to swing the fly until the fly engages the fly storage cylinder and the fly storage cylinder connecting pin catches. Refer to Figure 4–57.

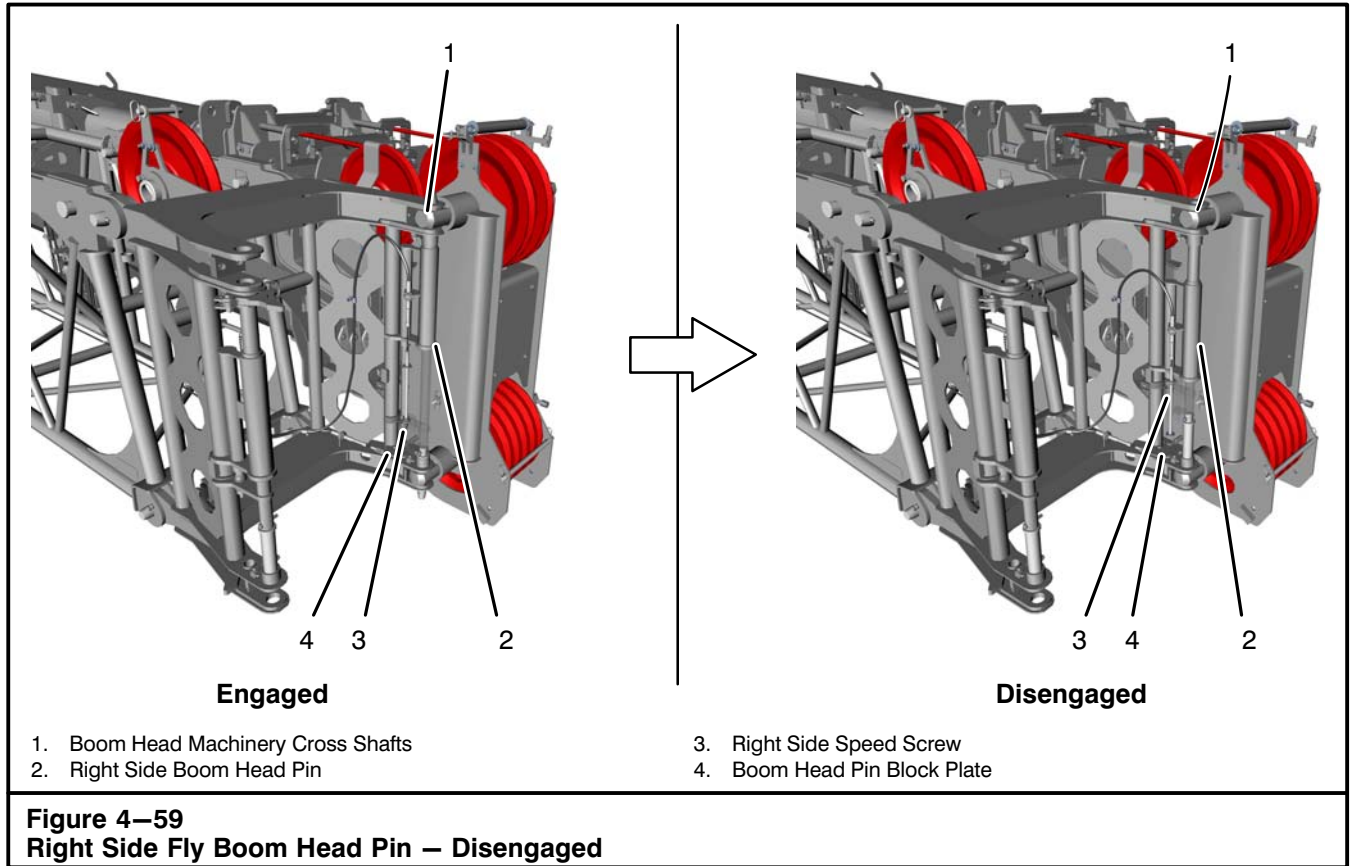
38. Use the fly storage cylinder switch to retract the fly storage cylinder to pivot the fly onto the pivoting ramp until it stops. Refer to Figure 4–7.
39. Use the boom hoist cylinder switch, as required, to boom down fully.

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Note: The push/pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open. Refer to Figure 4–35.

40. Using the appropriate tools, rotate the pivot pin speed screw to fully extend the secondary pivot pin. Refer to Figure 4–58.



WARNING

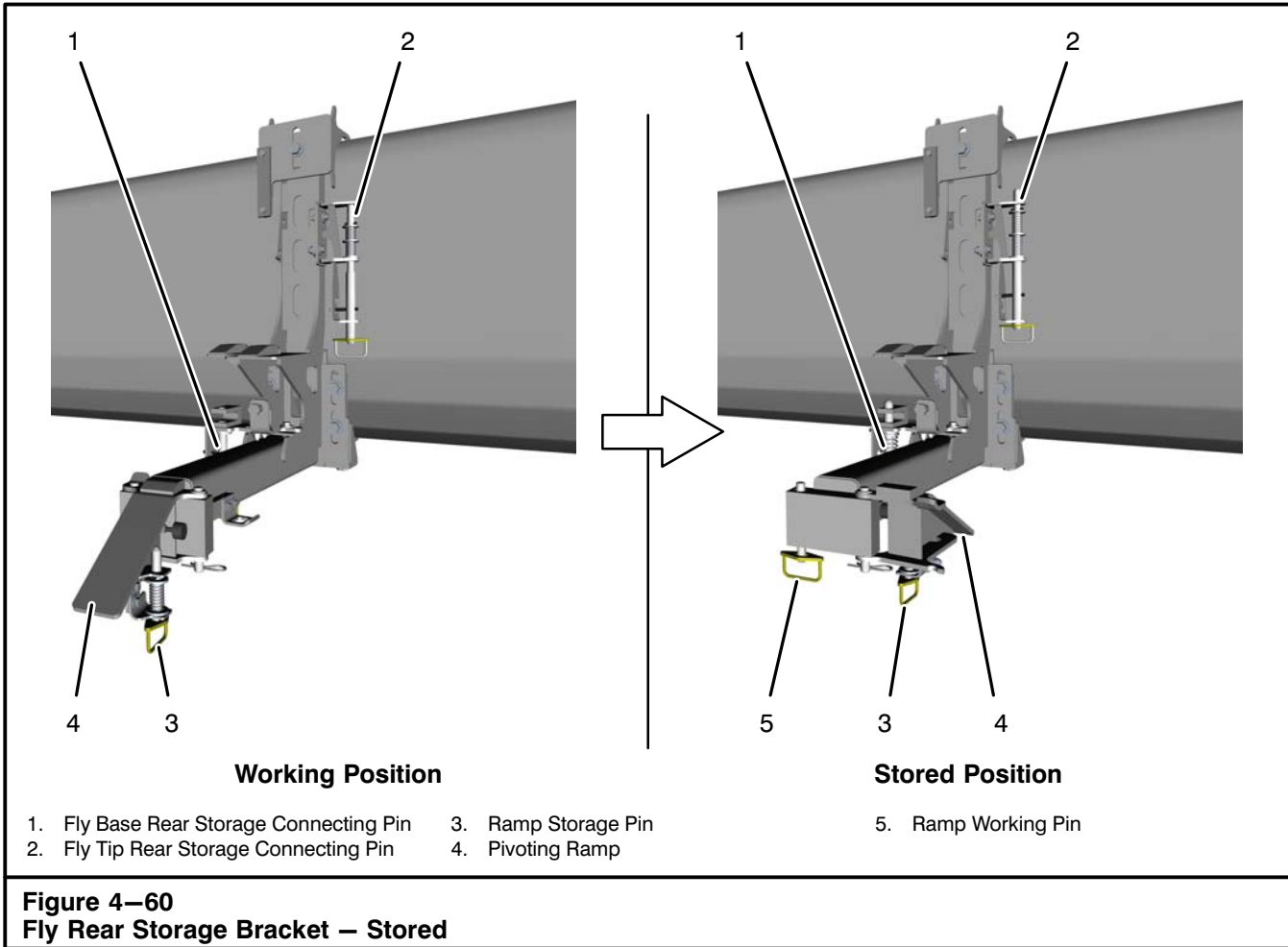
Ensure that the secondary pivot pin is installed on the right side of the boom and the fly storage cylinder is installed in the base fly section before disconnecting the right side boom head pin from the boom head machinery cross shafts. The fly could fall causing crane damage and/or personal injury.

41. Using the appropriate tools, rotate the right side speed screw through the right side access tube to retract both right side boom head pins and fully disengage from the right side of the boom head machinery cross shafts. Refer to Figure 4–59.
42. Use the boom hoist cylinder switch, as required, to boom up to 0°. Refer to Figure 4–7.

Note: The fly storage cylinder will only operate with the boom angle at 0°.

43. Use the fly storage cylinder switch to actuate the fly storage cylinder to pull the fly into the pivoting ramp and align the fly with the fly base rear storage connecting pin.

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Note: The boom hoist cylinder switch can not raise the boom above a boom angle of 0°. To use the boom hoist cylinder switch to lower the boom from an angle above 0°, or within the range of 0° to –3°, the RCL must be set to rigging mode and the operator's seat left side armrest must be positioned in the function lockout position.

44. Engage the fly tip front storage connecting pin. Refer to Figure 4–43.
45. Engage the fly base and tip rear storage connecting pins. Refer to Figure 4–60.
46. Pull the ramp storage pin. Rotate the pivoting ramp into the stored position until the ramp working pin catches.
47. Boom down fully.
48. Remove the hand line from the swing hook on the fly base. Refer to Figure 4–56.
49. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
50. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4–2. Reeve the wire rope from the boom deflector sheave over the boom head sheave or auxiliary lifting sheave. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave, as required.
51. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
52. Check the Crane Rating Manual, in the operator's cab, for lifting capacities with the fly in the stored position before continuing operations.

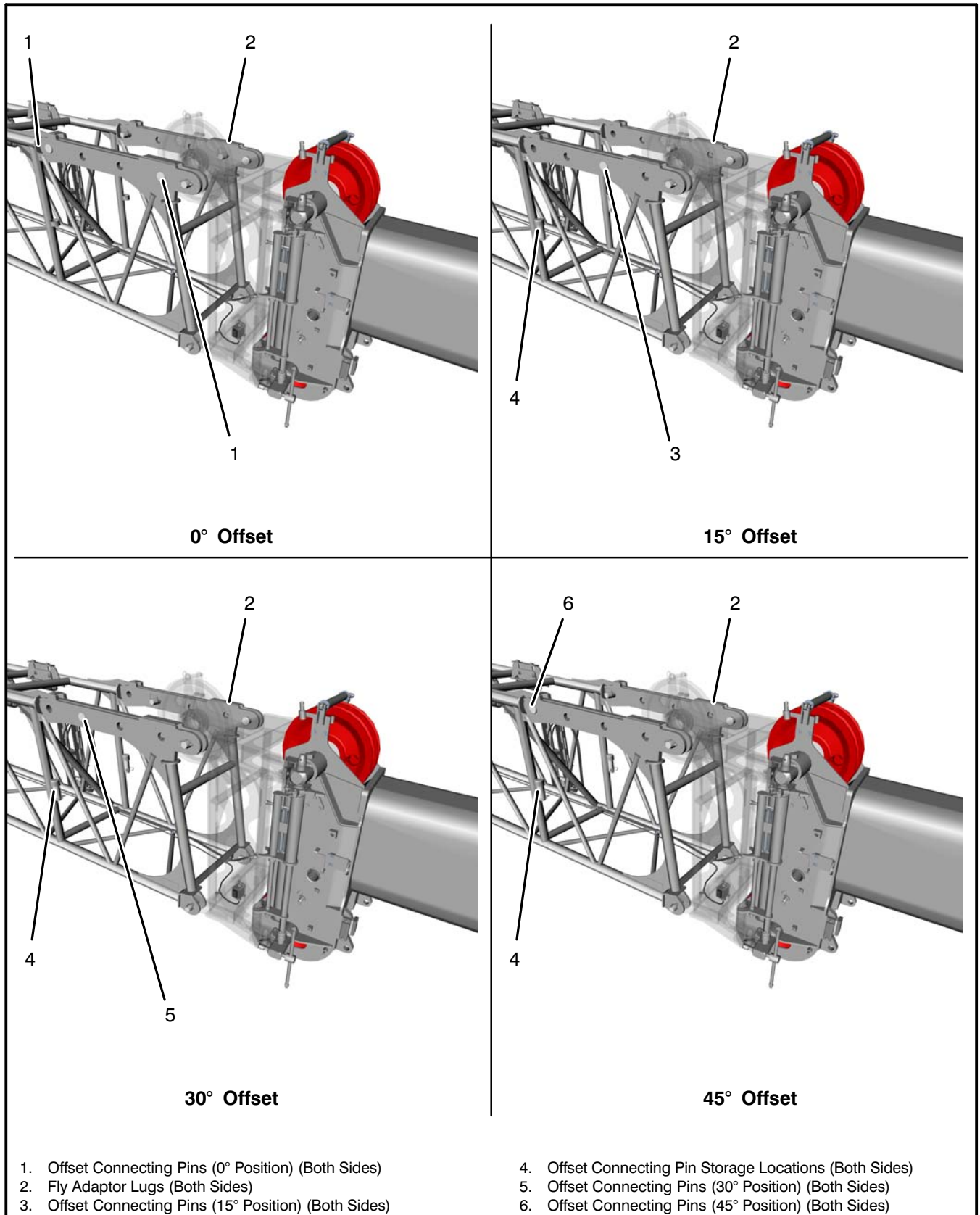


Figure 4–61
Changing The Fly Offset Angle

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Changing The Fly Offset Angle

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the upper over the front of the carrier. Engage travel swing lock.



WARNING

Change the fly offset angle with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper directly over the front of the carrier, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in the personal injury and/or the crane tipping.

5. If the fly is not in the erected position, erect it per the corresponding fly erection procedure in this section of this Operator's Manual.

CAUTION

Do not extend the boom or boom down to the point of over stressing the fly section. Structural damage to the fly could occur if care is not taken. Use a signal person to aid the operator in lowering the fly head sheave to the ground.

6. Carefully extend the boom until the fly head wear pads rest on the ground. Use a signal person to alert the operator when the wear pads are resting on the ground. If the ground conditions are soft, rocky, or otherwise poor, use matting to rest the fly wear pads on.



WARNING

Comply with the following to prevent personal injury or crane damage.

Pins must be properly installed on both sides of fly.

Rest fly sheave on ground before changing offsets.

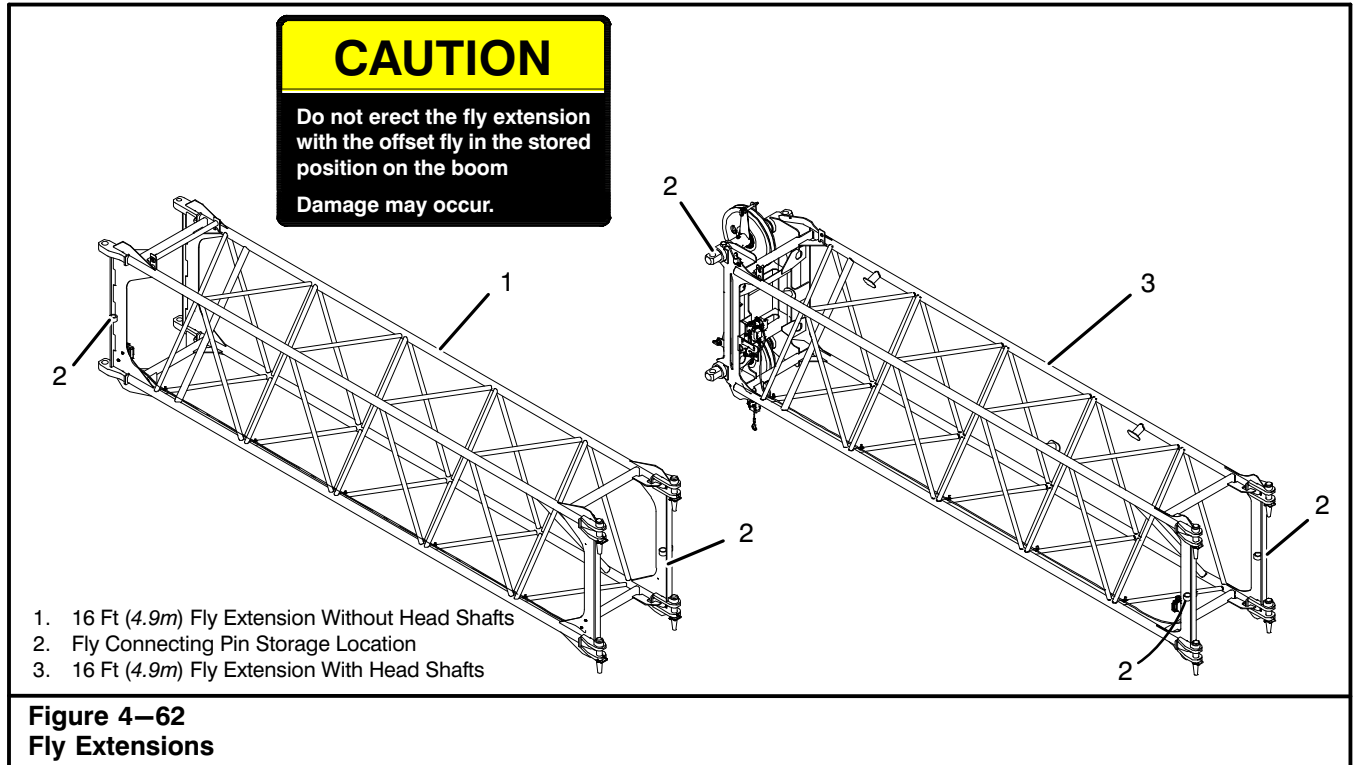
Install pins per 0° offset to store or erect fly.

7. Remove the offset connecting pins from the fly adaptor lugs, as required.
8. Install the offset connecting pins in the correct location for the desired offset angle. Use the information label, on the offset fly, to determine the correct offset connecting pin locations for the desired offset angle of the fly. Refer to Figure 4–61.
9. Ensure that the offset connecting pins are properly located on both sides of the fly and that the keeper pins are securely installed.
10. Slowly boom up to allow the fly to adjust itself to the desired offset angle.
11. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
12. Check the Crane Rating Manual, in the operator's cab, for lifting capacities with the fly in the stored position before continuing operations.



WARNING

The fly adds weight to the boom which must be considered in lifting capacities when the fly is erected. When making lifts from the boom or auxiliary lifting sheave with the fly erected, refer to the Crane Rating Manual for the appropriate deductions from lifting capacities. Use the offset lattice fly only when the crane is level on fully or intermediate extended outriggers with all tires clear of the ground.



Fly Extensions

If the crane is equipped with an offset lattice fly, up to two extensions are available to extend the overall fly length from 58 ft (17.7m) to 74 ft (22.6m), or 90 ft (27.4m). These extensions pin between the boom head and fly base section. The fly base section must be removed from the crane before adding or removing the fly extension(s). Refer to Figure 4-62.

CAUTION

Do not erect the fly extension(s) with the offset fly in the stored position on the boom. Major boom/fly damage may occur.



DANGER

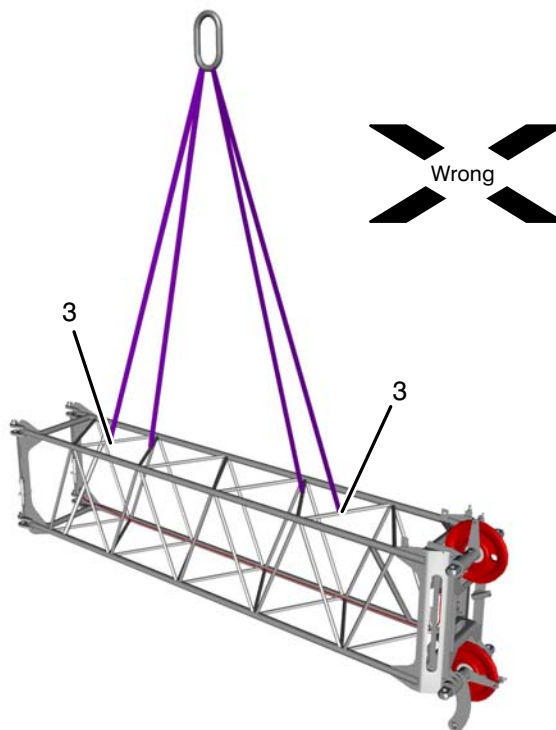
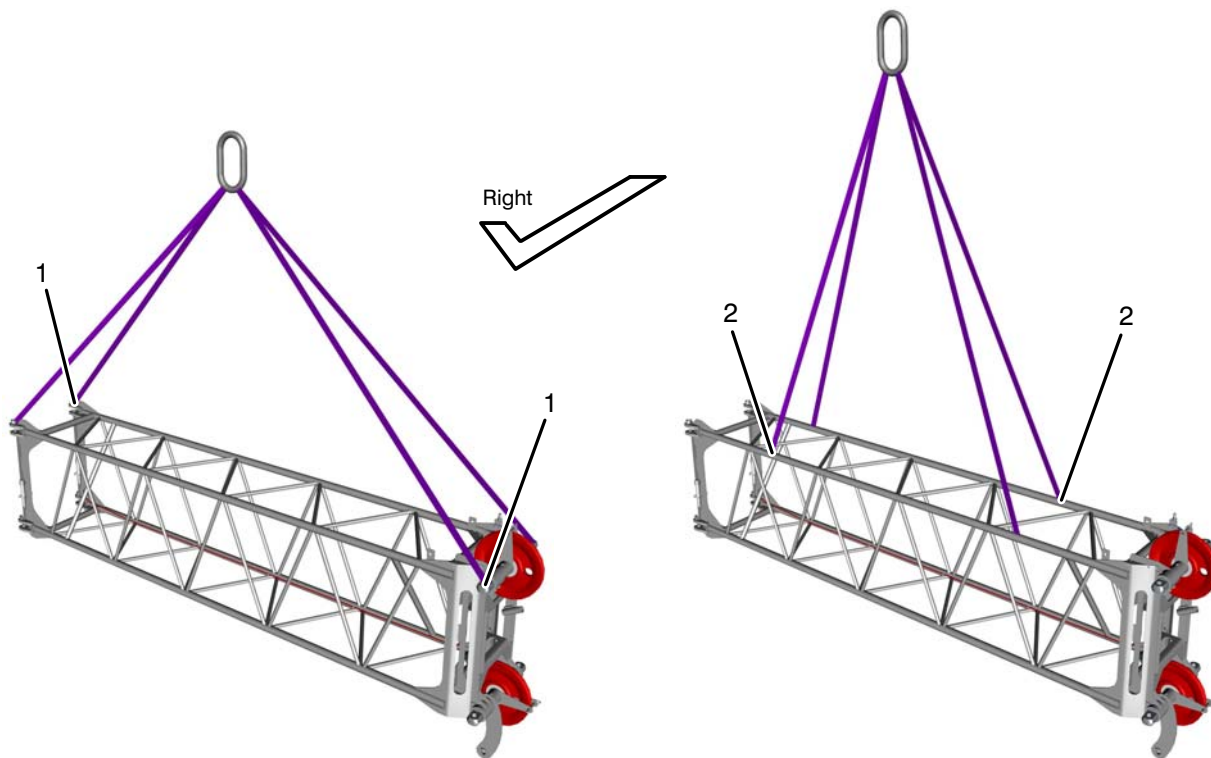
To avoid serious injury, carefully read and understand all safety instructions outlined in this Operator's Manual. Failure to follow these instructions could result in serious personal injury or death.

Safety Instructions

The following points must be observed while performing any fly assembly or disassembly:

1. Read and understand the instructions in this Operator's Manual before attempting to assemble or disassemble the fly.
2. Do not stand inside, on top, or under the fly at any time while assembling or disassembling the fly.
3. To avoid personal injury, do not climb, stand, or walk on the fly. Use a ladder or similar device to reach necessary areas.
4. Use care handling the fly or fly extension(s) when loading, transporting, and unloading. Damage that occurs during these operations can go undetected and could result in failure of the attachment, once subjected to loading. Do not attach slings to the lattices, when lifting the fly or fly extensions, as they will bend. It is recommended that the connecting lugs and/or head machinery cross shaft be used as the lifting points. However, it is permissible to attach nylon straps around all four main chords.
5. Each individual fly section must be adequately supported before attempting to disassemble the fly. Removing the connecting pins from the fly before it is supported, may allow the fly to fall.
6. Stay clear of pinch points when aligning fly section connecting points. Never place your fingers in connecting pin holes.
7. Fully assemble the fly before installing it on the boom.

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1. Use The Connecting Lugs And/Or Head Machinery Cross Shafts As Lifting Points.
2. Use The Main Chords As Lifting Points With Nylon Straps Only.
3. Do Not Attach Slings To Lattices, They Will Bend.

Figure 4–63
Handling The Fly Extension

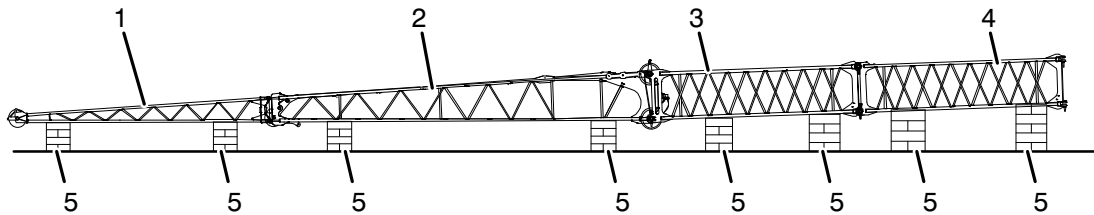


Figure 4–64
Fly Assembly On Blocking

16 Ft (4.9m) Fly Extension

The 16 ft (4.9m) fly extension without head shafts must be pinned between the boom head and the 16 ft (4.9m) fly extension with head shafts to obtain a 90 ft (27.4m) fly. A deflector roller is mounted on top of the fly extension. The fly extension without head shafts weighs approximately 658 lb (298kg). Refer to Figure 4–62 and Figure 4–73.

16 Ft (4.9m) Fly Extension With Head Shafts

The 16 ft (4.9m) fly extension with head shafts must be pinned between the boom head and the 58 ft (17.7m) offset fly to obtain 74 ft (22.5m) fly or between the 16 ft (4.9m) extension without sheaves and the 58 ft (17.7m) offset fly to obtain 90 ft (27.4m) fly. The extension can also be used alone when pinned to the boom head. The 16 ft (4.9m) fly extension with head shafts weighs approximately 986 lb (447kg). Refer to Figure 4–62 and Figure 4–73.

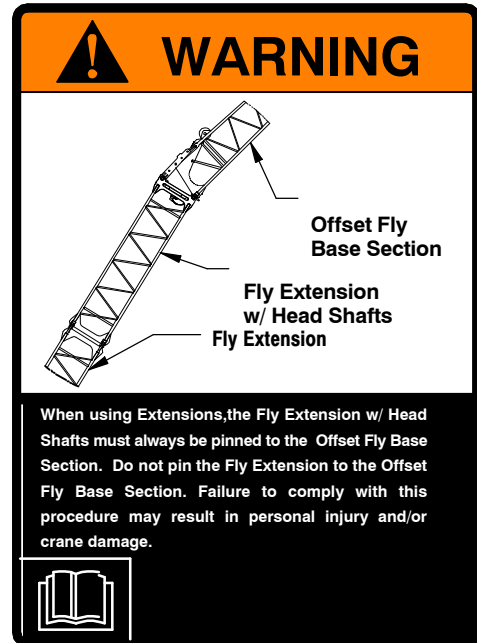
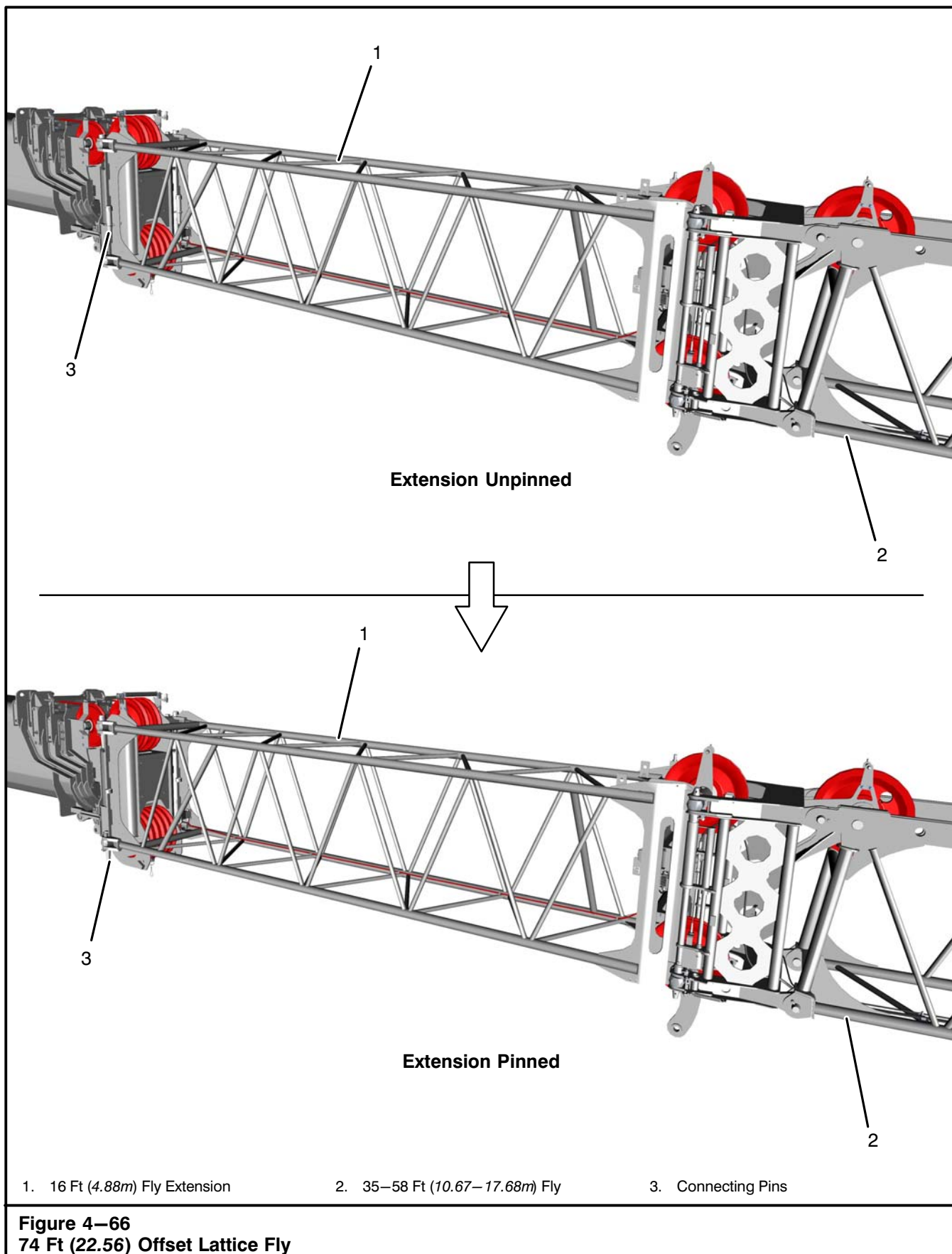
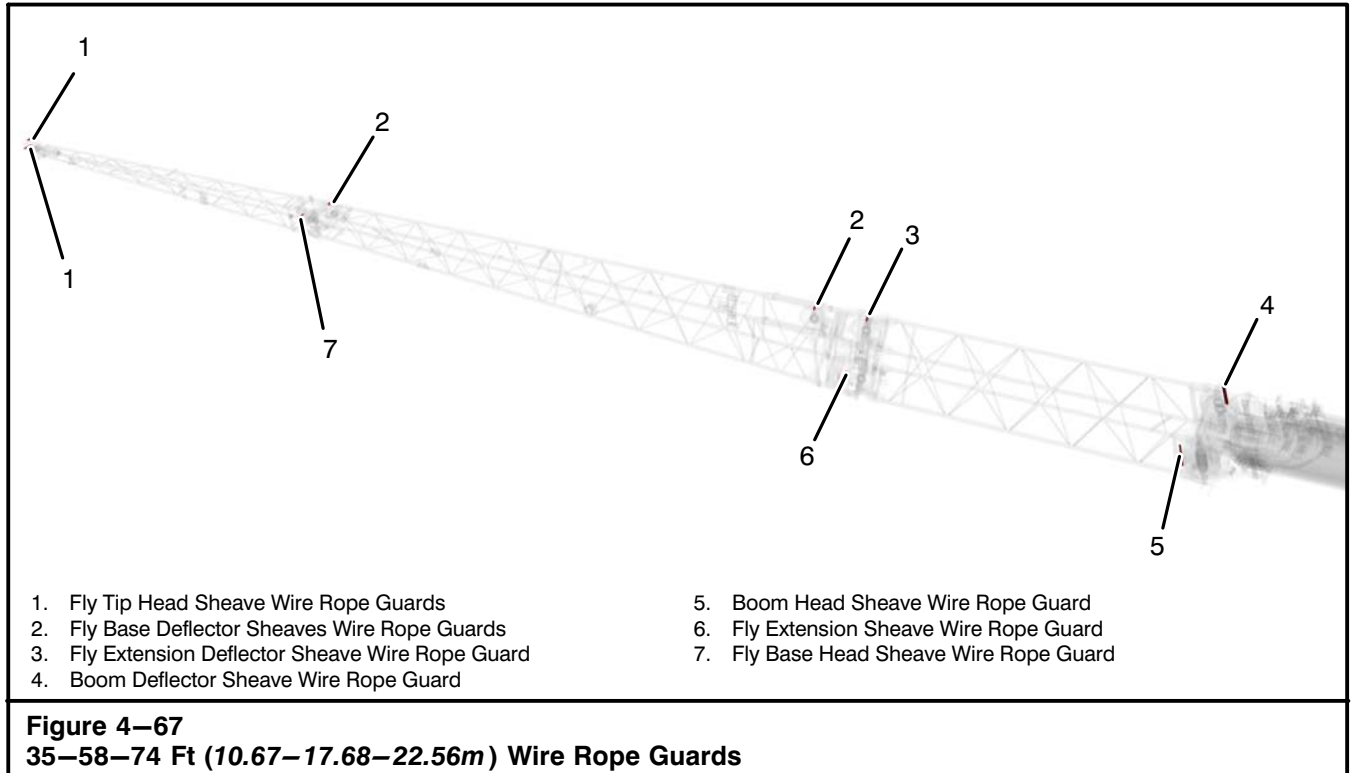


Figure 4–65
Fly Extension Label

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35–58 Ft (10.67–17.68m) Fly Arrangements					
Fly	Components Required				Refer to Figure 4–73
	35 Ft (10.67m) Fly Base	23 Ft (7.01m) Fly Tip	16 Ft (4.88m) Fly Ext W/Head Shafts	16 Ft (4.88m) Fly Ext W/O Head Shafts	
35 Ft (10.67m)	●				A
58 Ft (17.66m)	●	●			B
74 Ft (22.56m)	●	●	●		C
90Ft (27.43m)	●	●	●	●	D

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Adding Fly Extension(s)

The fly base section must be removed from the crane before installing/adding or removing fly extension(s). Remove the fly base and place adequate blocking under each end of the section(s) before removing any connecting pin. Refer to the instructions in this Section of this Operator's Manual for proper removal and installation procedures.

CAUTION

Do not erect the fly extension with the offset fly in the stored position on the boom. Boom and/or fly damage may occur.

WARNING

Properly remove the fly sections and extension from the boom before attempting to modify the length. Do not place any part of your body under any part of the fly when it is being assembled or disassembled. Removing any connecting pins from the fly or extension before they are properly supported may allow the fly or extension to jackknife and injure someone. Adequately support each end of each section before attempting to change the length of the fly.

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the upper over the front of the carrier. Engage travel swing lock.



WARNING

Install the fly extension with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper directly over the front of the carrier, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in the personal injury and/or the crane tipping.

5. If the 35–58 ft (10.67–17.68m) fly is to be installed with the fly extension, ensure the 16 ft (4.88m) extension and 23 ft (7.01m) fly tip section are properly pinned to the 35 ft (10.67m) fly base section with connecting pins.
6. If the 35–58 ft (10.67–17.68m) fly is to be installed with the fly extension, ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator's Manual for detailed instructions.

Note: The 16 ft (4.88m) extension can be used with or without the 35–58 ft (10.67–17.68m) fly, but can not be used with just the 35 ft (10.67m) fly base.

7. Position the fly and/or fly extension on secure blocking. Refer to Figure 4–64. The 16 ft (4.88m) fly extension weighs approximately 986 lb (447kg) and the full 74 ft (22.56m) fly assembly with extension weighs approximately 3,636 lb (1 649kg).

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8. Raise and Extend the boom to allow enough wire rope length to ease reeving of the fly. Lower the hook ball (to be used on the fly) to the ground. Fully retract the boom.
9. Boom down fully.



WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

10. Remove the wire rope guard and wire rope from the boom head sheave or auxiliary lifting sheave, as required. Lay the wire rope aside to prevent damage to it during fly installation. Refer to Figure 4-2. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave for storage.
11. If the 35–58 ft (10.67–17.68m) fly is to be installed with the fly extension, remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4-3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly install. Install the wire rope guard and secure with keeper pin.
12. Carefully extend the boom head to the 16 ft (4.88m) fly extension. Slowly raise or lower the boom, as required, to engage the fly extension lugs with the head machinery cross shafts. Refer to Figure 4-66.
13. Remove the fly extension connecting pins from the storage locations on the rear of the 16 ft (4.88m) fly extension. Install the right side connecting pins through the fly extension connecting lugs on right side of the fly extension. (Install the pins with the head on top and the keeper on the bottom.) Install the pin keepers.
14. Install the left side connecting pins through the fly extension connecting lugs on left side of the fly extension. (Install the pins with the head on top and the keeper on the bottom.) Install the pin keepers.



WARNING

Both boom head pins and all fly extension, fixed fly base, and fly tip connecting pins must be properly installed before operating the crane with the fly erected. Damage to the fly and/or personal injury could occur if all connecting pins and boom head pins are not properly installed.

15. Remove the blocking the fly was setting on.
16. Boom down fully to ease reeving of the fly and/or fly extension.
17. If the 35–58 ft (10.67–17.68m) fly is to be installed with the fly extension, remove the deflector sheave pin securing the fly base deflector sheave to the top of the fly bracket and rotate the fly base deflector sheave into the working position. Refer to Figure 4-34. Install the deflector sheave pin to secure the fly base deflector sheave to the bottom of the fly bracket.
18. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4-3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard.
19. Remove the wire rope guard from the fly extension deflector sheave. Refer to Figure 4-67. Reeve the wire rope from the boom deflector sheave over the fly extension deflector sheave. Install the wire rope guards.
20. If the fly extension is to be installed without the 35–58 ft (10.67–17.68m) fly, remove the wire rope guard from the fly extension head sheave. Reeve the wire rope from the fly extension deflector sheave over the fly extension head sheave. Install the wire rope guard.
21. If the 35–58 ft (10.67–17.68m) fly is to be installed with the fly extension, remove the wire rope guards from the fly base deflector sheaves. Reeve the wire rope from the fly extension deflector sheave over the fly base deflector sheaves. Install the wire rope guards.
22. If the 35–58 ft (10.67–17.68m) fly is to be installed with the fly extension, remove the wire rope guards from the fly tip head sheave. Reeve the wire rope from the fly base deflector sheaves over the fly tip head sheave. Install the wire rope guards.

CAUTION

All wire rope guards must be in proper position during operation.

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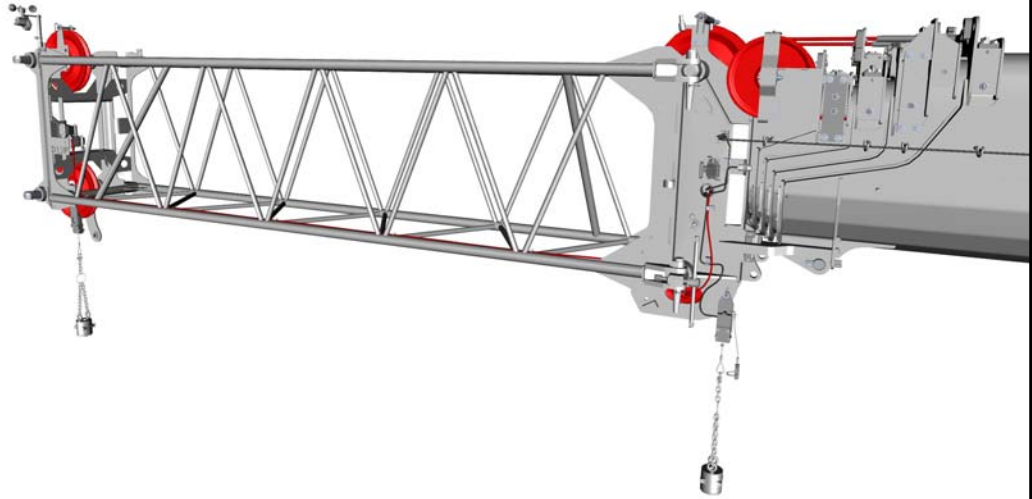


Figure 4-68
16 Ft (4.88m) Fly Extension Panel Lifting

23. Boom up to 0°.
24. If the fly extension is to be installed without the 35–58 ft (10.67–17.68m) fly, properly connect the anti-two block (ATB) system as follows:

Note: If the 16 ft (4.88m) fly extension is to be used for panel lifting, omit steps a and b. And install a second ATB weight in step f. Refer to Figure 4-68.

- a. Install the lockout clip on the boom head ATB switch cable. Refer to Figure 4-69.
 - b. Remove the ATB weight from the boom head ATB switch cable.
 - c. Disconnect the boom head plug from the jumper assembly and connect it to the fly extension connector.
 - d. Install the fly head ATB switch on the extension head.
 - e. Connect the fly head ATB switch plug to the fly extension head connector.
 - f. Install the ATB weight on the fly head ATB switch cable.
25. If the 35–58 ft (10.67–17.68m) fly is to be installed with the fly extension, properly connect the anti-two block (ATB) system as follows:
 - a. Install the lockout clip on the boom head ATB switch cable. Refer to Figure 4-69.
 - b. Remove the ATB weight from the boom head ATB switch cable.
 - c. Disconnect the boom head plug from the jumper assembly and connect it to the fly extension connector.
 - d. Disconnect the fly extension plug from the fly extension head connector and connect it to the fly base connector. Refer to Figure 4-70.

- e. Disconnect the fly tip plug from the fly tip storage connector and connect it to the fly base head connector.
- f. Install the fly head ATB switch on the fly head.
- g. Connect the fly head ATB switch plug to the fly tip head connector.
- h. Install the ATB weight on the fly head ATB switch cable.

Note: When lockout clip is installed, the main boom ATB switch is inactive.

When both main boom and fly are reeved for operation, the lockout clip must be removed and an ATB weight must be suspended from each ATB switch.

26. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to “Erected Attachment Configuration” in this section of this Operator's Manual.
27. Check the Crane Rating Manual, in the operator's cab, for deductions from the lifting capacities with the fly installed before continuing operations.



WARNING

The fly adds weight to the boom which must be considered in lifting capacities when the fly is erected. When making lifts from the boom or auxiliary lifting sheave with the fly erected, refer to the Crane Rating Manual for the appropriate deductions from lifting capacities. Use the offset lattice fly only when the crane is level on fully or intermediate extended outriggers with all tires clear of the ground.

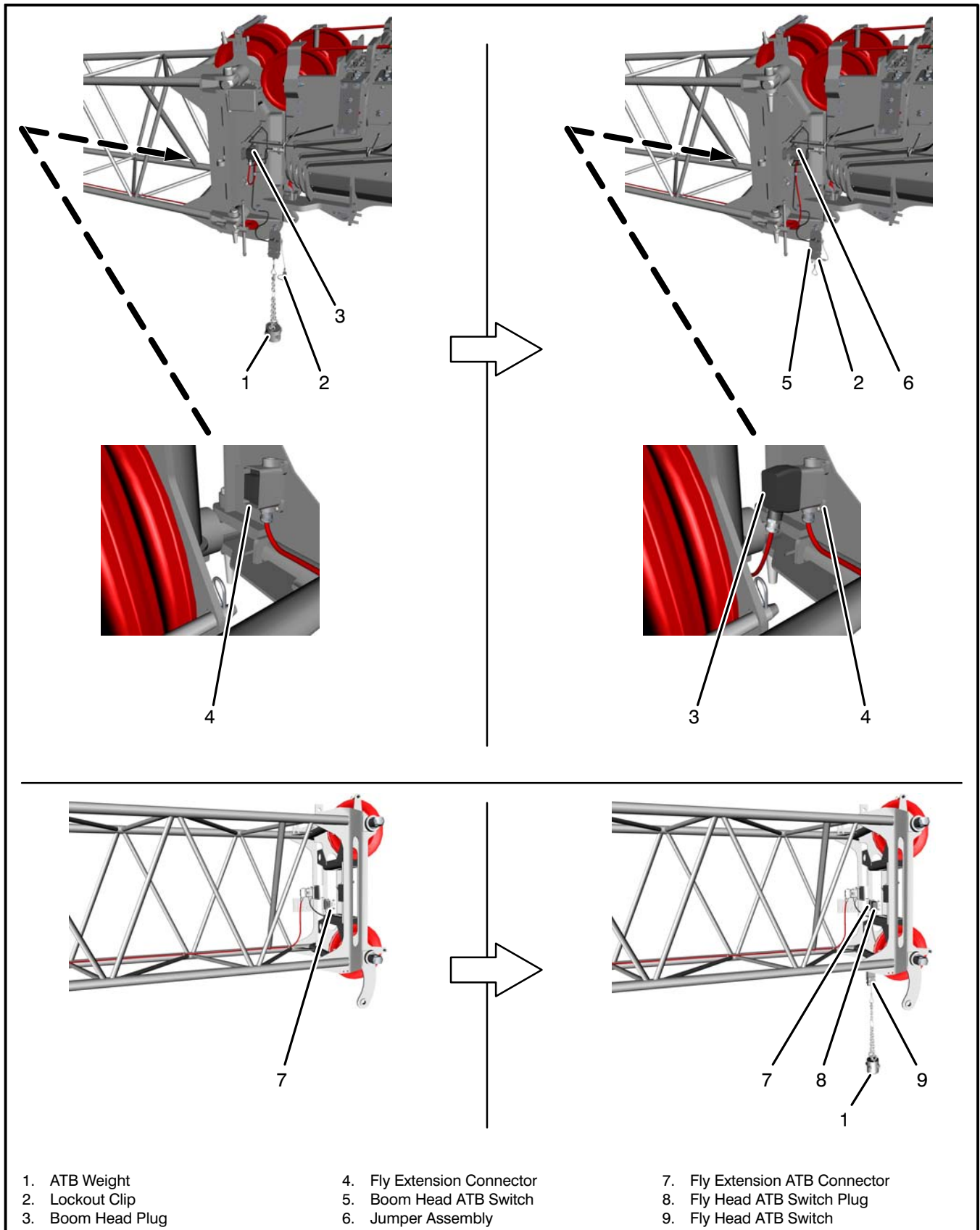


Figure 4–69
Anti-Two Block (ATB) Connections – Fly Extension

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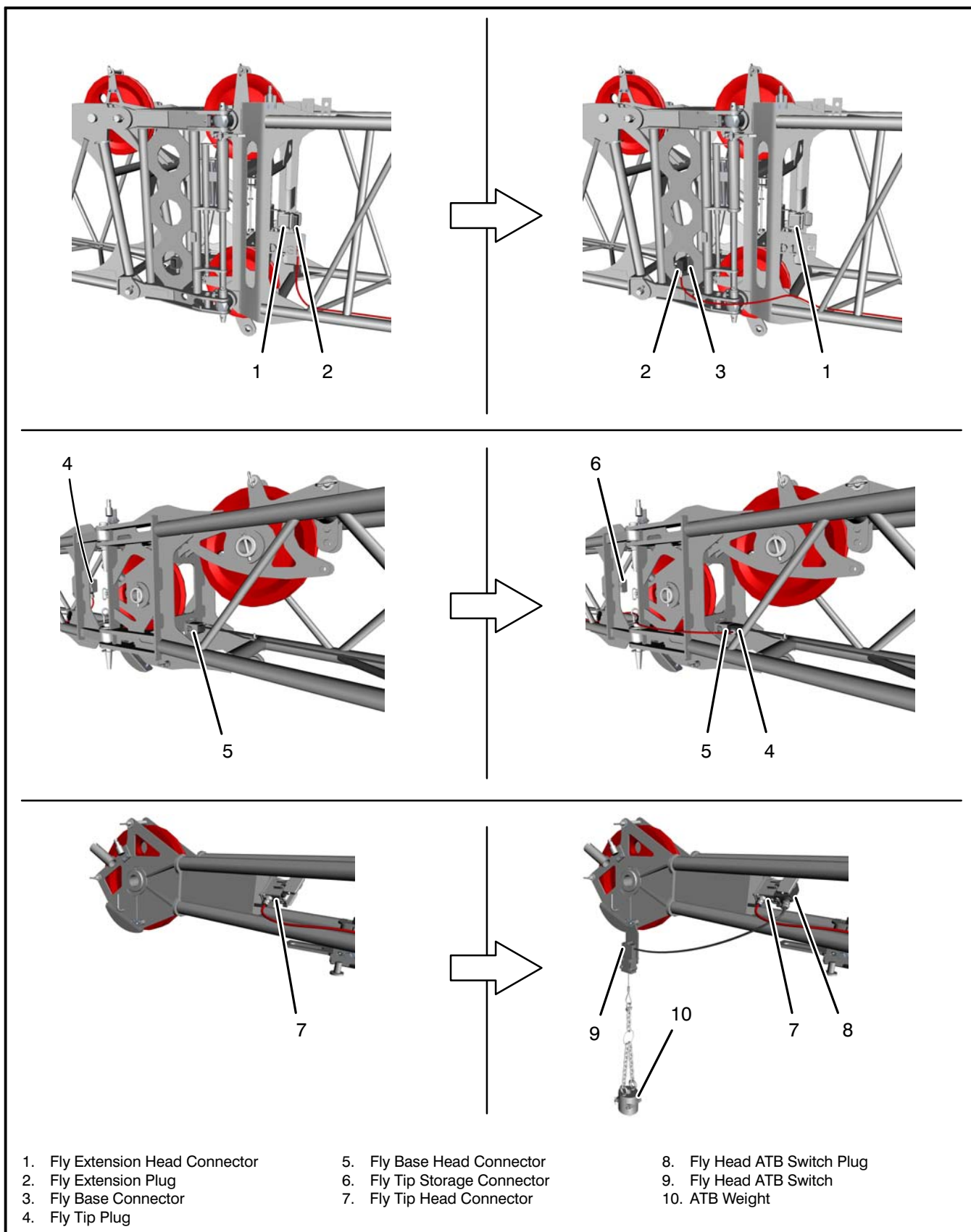


Figure 4-70
Anti-Two Block (ATB) Connections – Fly Extension And Fly

Removing Fly Extension(s)



WARNING

Properly remove the fly sections and extension from the boom before attempting to modify the length. Do not place any part of your body under any part of the fly when it is being assembled or disassembled. Removing any connecting pins from the fly or extension before they are properly supported may allow the fly or extension to jackknife and injure someone. Adequately support each end of each section before attempting to change the length of the fly.

1. Park the crane on a firm, level surface. Shift the transmission to neutral and engage park brake.
2. Level the crane on fully or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper and the boom mode is correct. Refer to the Crane Rating Manual for the correct counterweight configuration and boom mode per the current fly arrangement.
4. Fully retract the boom and position the upper over the front of the carrier. Engage travel swing lock.



WARNING

Install the fly extension with the crane level on fully or intermediate extended outriggers with all tires clear of the ground, an appropriate counterweight configuration installed, the correct boom mode, the upper directly over the front of the carrier, and the travel swing lock engaged.

The fly adaptor lug and offset connecting pins must be in the 0° offset position to remove, install, store, or erect the offset fly.

Refer to the Crane Rating Manual for the maximum boom length the fly can be raised/lowered to/from the ground.

Failure to do the above could result in the personal injury and/or the crane tipping.

5. If the 35–58 ft (10.67–17.68m) fly installed with the fly extension, ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position. If required, change the fly offset to the 0° position. Refer to “Changing The Fly Offset” in this section of this Operator's Manual for detailed instructions.
6. Raise and extend the boom to allow enough rope to ease wire rope removal from the fly. Lower the hook block or hook ball (to be removed from the fly) to the ground. Fully retract the boom.

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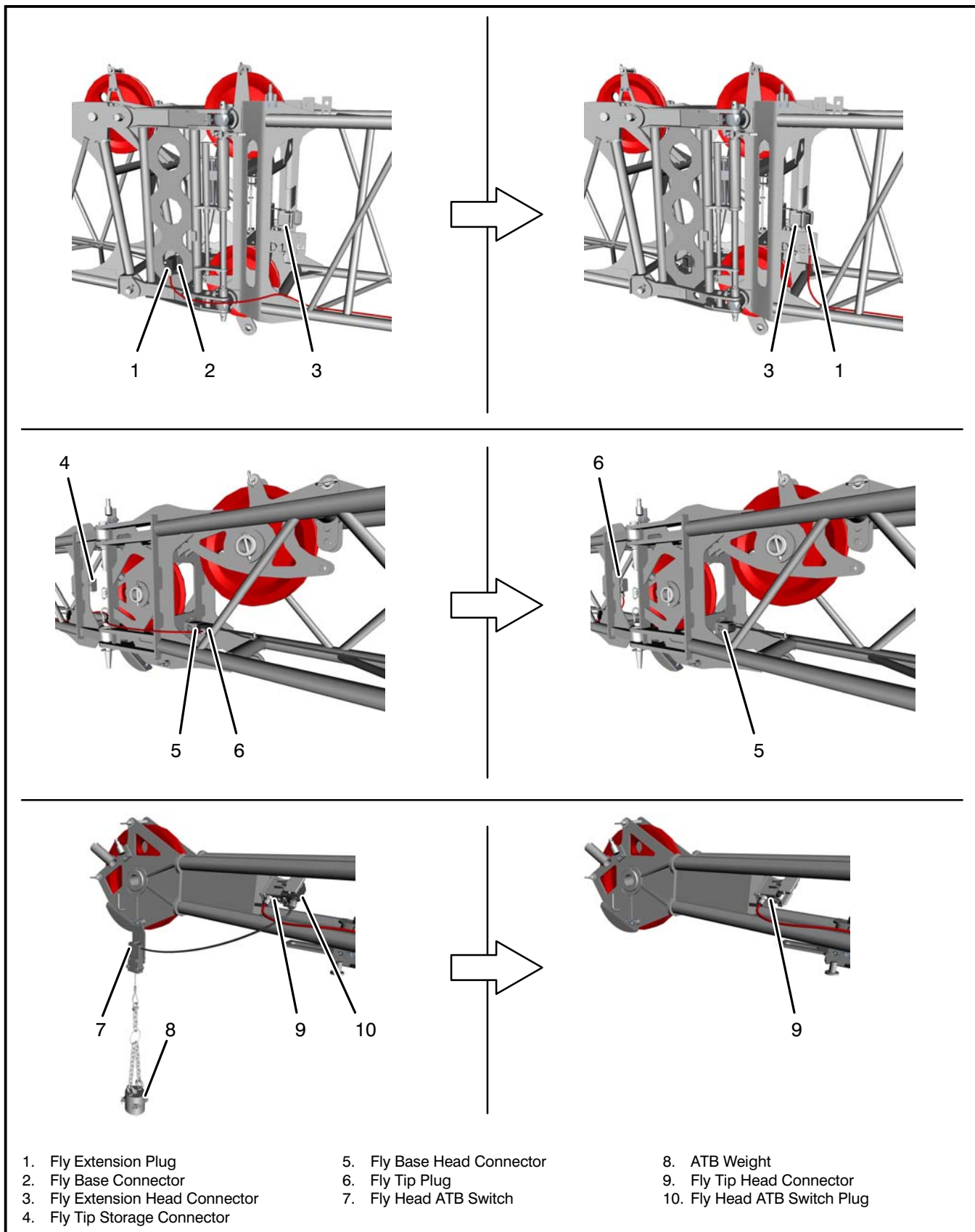
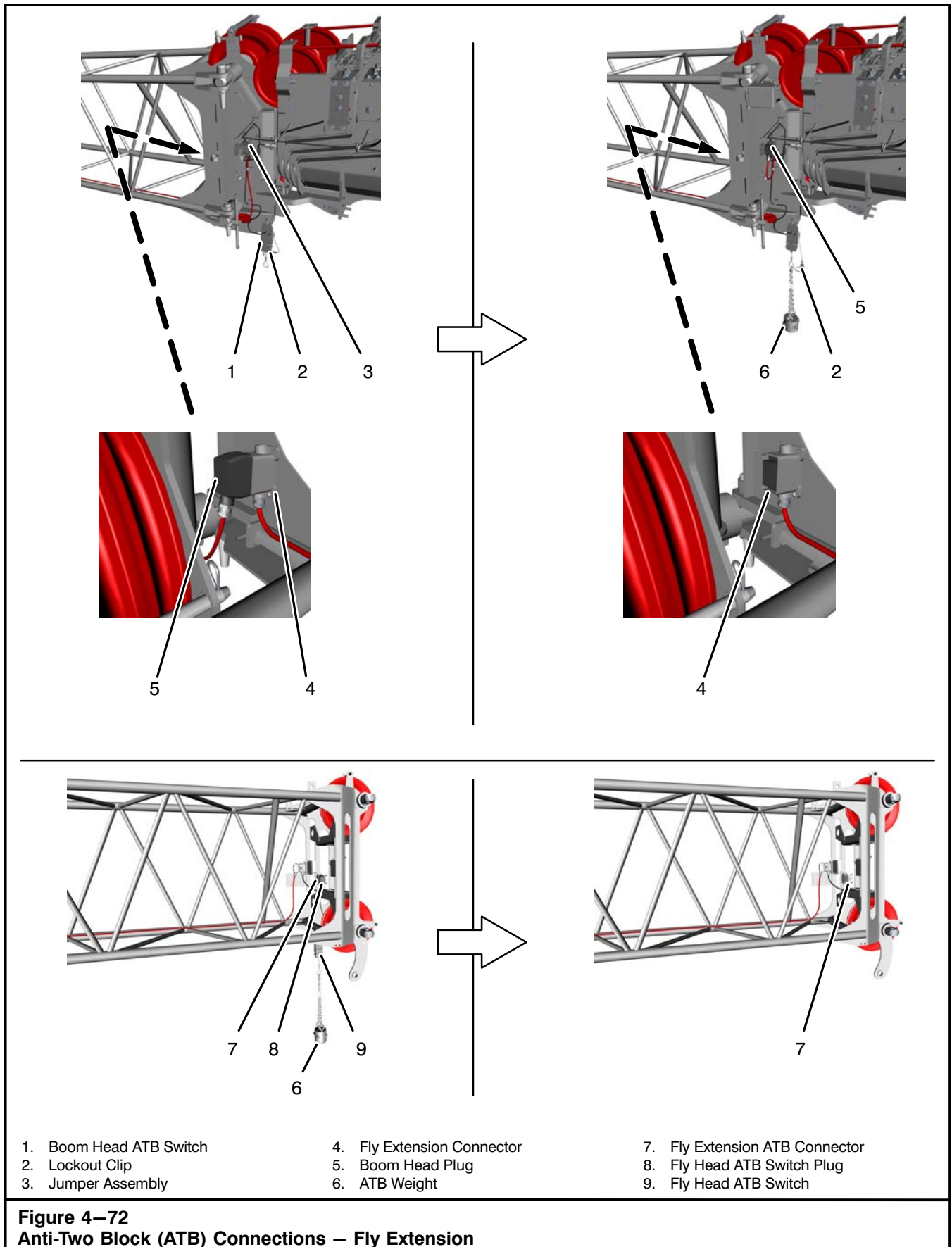


Figure 4-71
Anti-Two Block (ATB) Connections – Fly Extension And Fly



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7. Boom down fully.



WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

8. If the 35–58 ft (10.67–17.68m) fly is installed with the fly extension, properly disconnect the anti-two block (ATB) system as follows:
 - a. Remove the ATB weight from the fly head ATB switch cable. Refer to Figure 4–70.
 - b. Disconnect the fly head ATB switch plug from the fly tip head connector.
 - c. Remove the fly head ATB switch from the fly head.
 - d. Disconnect the fly tip plug from the fly base head connector and connect it to fly tip storage connector.
 - e. Disconnect the fly extension plug from the fly base connector and connect it to the fly extension head connector.

- f. Disconnect the boom head plug from the fly extension connector and connect it to the jumper assembly on the main boom head. Refer to Figure 4–69.
 - g. Install the ATB weight on the boom head ATB switch cable.
 - h. Remove the lockout clip from the boom head ATB switch cable.
9. If the fly extension is installed without the 35–58 ft (10.67–17.68m) fly, properly disconnect the anti-two block (ATB) system as follows:

Note: If the 16 ft (4.88m) fly extension is configured for panel lifting, omit steps e and f. Refer to Figure 4–68.

- a. Remove the ATB weight from the fly head ATB switch cable. Refer to Figure 4–69.
 - b. Disconnect the fly head ATB switch plug from the fly extension head connector.
 - c. Remove the fly head ATB switch from the extension head.
 - d. Disconnect the boom head plug from the fly extension connector and connect it to the jumper assembly on the main boom head.
 - e. Install the ATB weight on the boom head ATB switch cable.
 - f. Remove the lockout clip from the boom head ATB switch cable.

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10. If the 35–58 ft (10.67–17.68m) fly is installed with the fly extension, remove the wire rope guards from the fly tip head sheave. Refer to Figure 4–67. Remove wire rope from the fly tip head sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guards.
11. If the 35–58 ft (10.67–17.68m) fly is installed with the fly extension, remove the wire rope guards from the fly base deflector sheaves. Remove wire rope from the fly base deflector sheaves and lay it aside to prevent damage to it during fly removal. Install the wire rope guards.
12. If the fly extension is installed without the 35–58 ft (10.67–17.68m) fly, remove the wire rope guards from the fly extension head sheave. Remove wire rope from the fly extension head sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guards.
13. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guard and secure with keeper pin.
14. If the 35–58 ft (10.67–17.68m) fly is installed with the fly extension, remove the deflector sheave pin securing the fly base deflector sheave to the bottom of the fly bracket and rotate the fly base deflector sheave into the stored position. Refer to Figure 4–37. Install the deflector sheave pin to secure the fly base deflector sheave to the top of the fly bracket.
15. Properly store wire rope which was used on fly, as required.
16. If the 35–58 ft (10.67–17.68m) fly is installed with the fly extension, carefully extend the boom until the fly head wear pads rest on the ground. Use a signal person to alert the operator when the wear pads are resting on the ground.
17. If the fly extension is installed without the 35–58 ft (10.67–17.68m) fly, carefully extend the boom until the fly extension rest on secure blocking. Use a signal person to alert the operator when the fly extension is resting on secure blocking.
18. Securely block up the fly and/or fly extension to support it. Refer to Figure 4–64. The 16 ft (4.88m) fly extension weighs approximately 986 lb (447kg) and the full 74 ft (22.56m) fly assembly with extension weighs approximately 3,636 lb (1 649kg).
19. Remove the fly extension connecting pins from the connecting lugs on left side of the fly extension.
20. Remove the fly extension connecting pins from the connecting lugs on right side of the fly extension. Store all the connecting pins in the storage locations on the rear of the 16 ft (4.88m) fly extension. (Install the pins with the head on top and the keeper on the bottom.) Install the pin keepers.
21. Carefully retract the boom away from the 16 ft (4.88m) fly extension.
22. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4–3. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
23. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4–2. Reeve the wire rope from the boom deflector sheave over the boom head sheave or auxiliary lifting sheave. Install the wire rope guard on the boom head sheave or auxiliary lifting sheave, as required.
24. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to “Erected Attachment Configuration” in this section of this Operator's Manual.
25. Properly store the fly and/or fly extension to prevent damage to it.

CAUTION

Do not extend the boom or boom down to the point of over stressing the fly section. Structural damage to the fly could occur if care is not taken. Use a signal person to aid the operator in lowering the fly head wear pads to the ground or the fly extension onto blocking.

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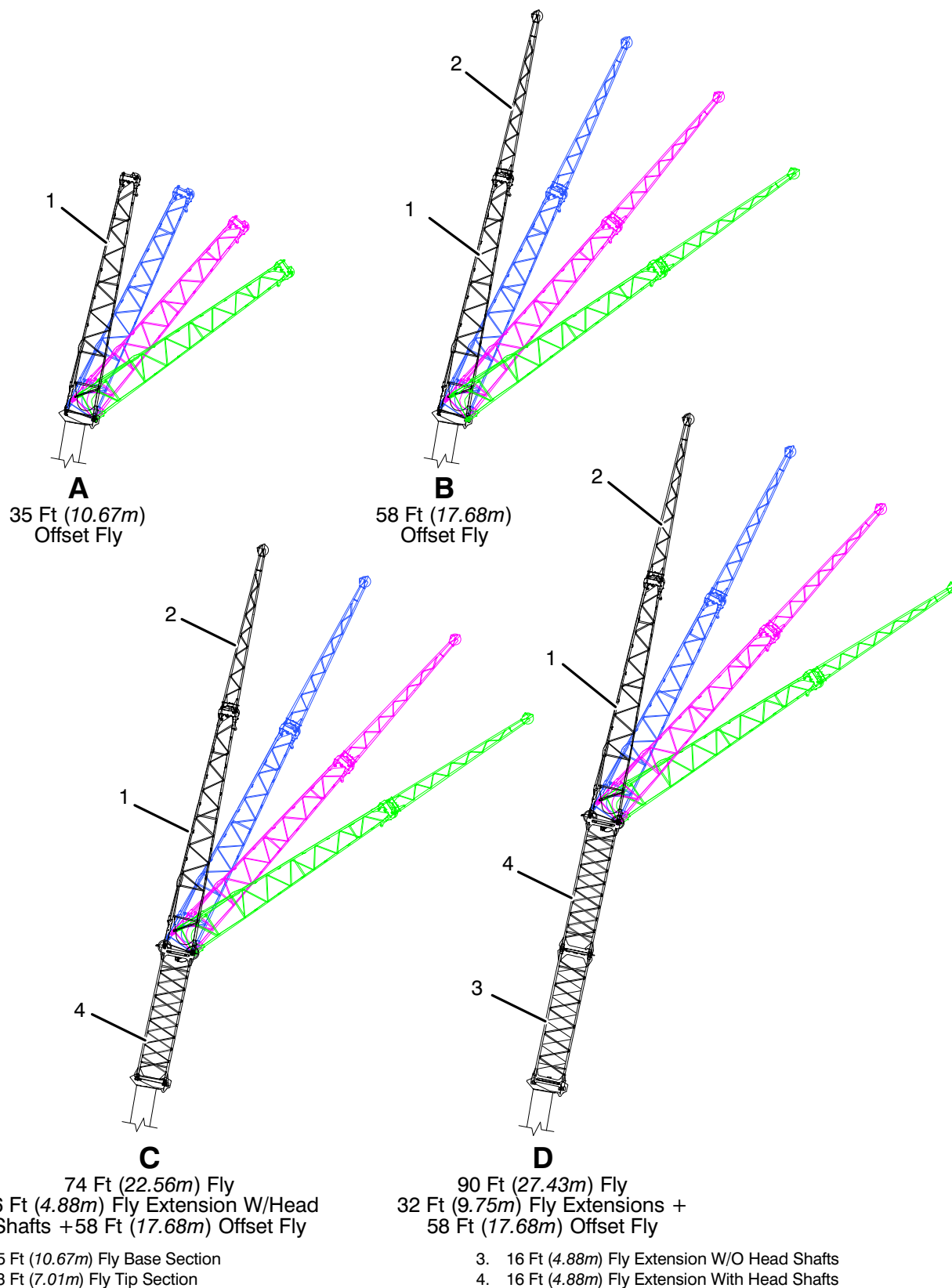


Figure 4-73
35-58 Ft (10.67-17.68m) Fly Arrangements

16 Ft (4.88m) Fly Extension Panel Lifting

The 16 ft (4.88m) fly extension with head shafts can be used for pre-cast panel lifting applications, as well as general lifting applications. During the panel lifting applications, a single load is allowed on both the main boom and 16 ft (4.88m) fly extension wire ropes at the same time, provided all panel lifting guidelines given here are followed.

Before making any lifts with the 16 ft (4.88m) fly extension, refer to the Crane Rating Manual to confirm that the load is within the rated capacity for the 16 ft (4.88m) fly extension.

The 16 ft (4.88m) fly extension adds weight to the boom which must be considered in lifting capacities. When making lifts from the main boom wire rope with the 16 ft (4.88m) fly extension installed, refer to the Crane Rating Manual for the appropriate deductions from lifting capacities.



WARNING

Do not simultaneously lift separate loads with the 16 ft (4.88m) fly extension and the main boom. Lifting two loads at the same time may cause boom failure leading to serious personal injury and/or major equipment damage.

In panel lifting applications, if both the main boom and 16 ft (4.88m) fly extension hooks are attached to a single panel, this is considered one load.

Panel Lifting Guidelines

Certain guidelines must be followed when using 16 ft (4.88m) fly extension in panel lifting applications. The following are the guidelines that must be followed unless otherwise stated in the Crane Rating Manual:

1. A single panel with two hooks (main boom and 16 ft (4.88m) fly extension hooks) attached is considered one load for this application.
2. Follow all 16 ft (4.88m) fly extension notes for General Operation listed in the Crane Rating Manual.
3. The Rated Capacity Limiter (RCL) and ATB (ATB) systems shall remain fully functional at all times. Select the 16 ft (4.88m) fly extension as the hook being used. The RCL will display approximately the total load lifted (the sum of the two lines) and will also display the 16 ft (4.88m) fly extension load radius and rated capacity.
4. The total load on both hooks (the sum of the two lines), including hook blocks, hook balls, slings, and rigging, etc. must not exceed the allowable lifting capacity of the main boom or the 16 ft (4.88m) fly extension, whichever is less. [The main boom capacity in this condition will be the main boom rated load less the deduct for "16 ft (4.88m) fly extension erected but not used" to account for the 16 ft (4.88m) fly extension and its load handling equipment.]
5. Lifting and placement of panels with two hooks is more complex than typical lift crane service. The crane operator and rigging personnel shall be experienced with and qualified for two hook panel lifting and placement applications.
6. Load shift while lifting with two hooks may be more unpredictable than typical single hook lift work. Extra precautions must be taken to avoid accidents. A qualified person on the ground shall be designated as the primary signal person.
7. When rigging two hooks on a panel, each hook or rigging device shall be capable of handling the entire weight of the panel being lifted.
8. Both load lines must remain in the vertical plane of the crane boom (no side load). The panel being lifted must also be in the same vertical plane as the crane boom.
9. The off-lead angle of the wire rope from true vertical must be minimized when initially lifting a panel with two hooks. The head height of the boom shall be a minimum of three times the horizontal distance between the two hook points on the panel being lifted.

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Crane Rating Manual And Serial Number

The Crane Rating Manual is located in the toolbox under the operator's seat of the operator's cab. The Crane Rating Manual has the crane serial number on it. The serial number is also stamped on the top of the outrigger box on the right side of the carrier and on the top right front of the upper frame near the boom hoist cylinder lug. The serial number must be used with any correspondence with a Link-Belt Distributor or the Factory concerning parts or warranty. The Crane Rating Manual also lists the maximum allowable lifting capacities for the crane. The Crane Rating Manual should be checked for the proper lifting capacities before making any lifts.

If the Crane Rating Manual becomes lost, damaged, or unreadable, it must be replaced before operating the crane. Information contained in the Crane Rating Manual is important and failure to follow the information it contains could result in an accident. A replacement Crane Rating Manual can be ordered through a Link-Belt Distributor.



WARNING

The Crane Rating Manual in the crane is the only authorized listing of lifting capacities for the crane. It supercedes any other printed literature which lists lifting capacities. It alone is to be used for determining crane capacities.

Wire Rope Capacity Chart

The Wire Rope Capacity chart gives the maximum lifting capacities based on wire rope capacity. A typical example is shown in Figure 5—1. It is in the Crane Rating Manual. It lists the maximum load that should be lifted with different sizes and types of wire rope. The weights shown are based on wire rope capacity alone. Exceeding these load weights may result in wire rope damage or failure.

Before making a lift, compare the weight being lifted (remember to add the weight of the hook block, hook ball, slings, and riggings to the actual load weight) with the Wire Rope Capacity Chart and/or the Winch Performance Chart in the Crane Rating Manual.

Check the chart for the number of parts of line required to make the lift. Use at least that number of parts of line to make the lift. When making a lift with more parts of line that is needed to make the lift, remember to add weight for each one (1) foot (0.3m) of extra wire rope required to reeve the extra parts of line, to the actual load weight. The extra parts of line act as additional load weight. Refer to Wire Rope Capacity chart in the Crane Rating Manual for actual weight per foot (0.3m) for the wire rope used.



WARNING

Do not exceed the capacities listed for wire rope strength or crane capacity, whichever is less, when making a lift. Serious personal injury or major crane damage may result.

Wire Rope Specifications

The specifications for the wire rope used on this crane are on the Wire Rope Capacity chart in the Crane Rating Manual. Refer to Figure 5—1 for a typical example. Always refer to the Wire Rope Capacity Chart in the Crane Rating Manual when ordering replacement wire rope.

Wire Rope Diameter

In standard practice, the nominal diameter of wire rope is the minimum acceptable diameter. It is always made larger, not smaller, than the nominal diameter according to the allowable tolerances shown in the following chart:

Nominal Wire Rope Diameter	Allowable Limits	
Thru 1/8" (3.2mm)	—0	+8%
Over 1/8" (3.2mm) thru 3/16" (4.8mm)	—0	+7%
Over 3/16" (4.8mm) thru 5/16" (8.0mm)	—0	+6%
Over 5/16" (8.0mm) and larger	—0	+5%

Wear and stress tend to reduce the diameter. It should be measured periodically and replaced if the size is below the nominal size of the wire rope being used as shown in the chart on page 5—4. It should always be measured across the largest diameter that will fit inside a true circle. Refer to Figure 5—2.

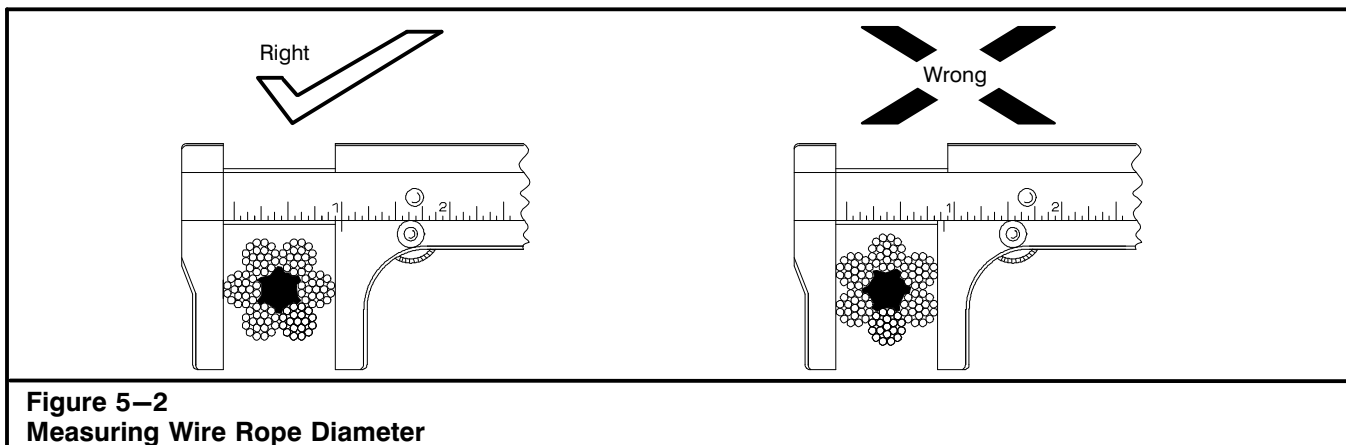
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Wire Rope Capacity			
Maximum Lifting Capacities Based On Wire Rope Strength			
Parts of Line	19mm	19mm	19mm
	Type KC	Type YB	Type CC
1	16,000	16,000	17,160
2	32,000	32,000	34,320
3	48,000	48,000	51,480
4	64,000	64,000	68,640
5	80,000	80,000	85,800
6	96,000	96,000	102,960
7	112,000	112,000	120,120
8	128,000	128,000	137,280
9	144,000	144,000	154,440
10	160,000	160,000	171,600
11	176,000	176,000	188,760
12	192,000	192,000	205,920
13	208,000	208,000	223,080
Rope Weight - Pounds Per Foot	1.2	1.2	1.2
Link-Belt Type	Description		
KC	37 X 7, Category 1, E.E.I.P.S., Right Lang Lay, Galvanized		
YB	34 X 7 Category 1, E.E.I.P.S., Right Lang Lay		
CC	35 X 7 Category 1, E.E.I.P.S., Right Lang Lay		

Notes:

- Capacities shown are in pounds and working loads must not exceed the ratings on the capacity charts in this Crane Rating Manual.
- Capacity deducts for auxiliary lifting devices do not apply for wire rope strength capacities.
- Special reeving, using the auxiliary sheave, is required when using more than 10 parts of line. Special equipment is required for greater than 12 parts of line.
- Consult Operator's Manual for wire rope inspection procedures, single part of line applications, and reeving diagrams.

Figure 5—1
Typical Wire Rope Capacity Chart (Example Only)



WIRE ROPE INSPECTION REPORT											
Crane S/N _____			Owned By _____			Crane Location _____					
Date of Inspection _____			Wire Rope Application _____			Wire Rope Description _____					
Manufacturer's I.D. No. _____			Applicable Standards _____								
Criteria for Removal				1/3 of Outside Wire Dia.	1						
Location on Wire Rope	Measured Diameter	Broken Wires		Excessive wear	End Attachments			Rope Damage	Sheave Condition	Drum Condition	Rope Lay Measurement
		In 1 Rope Lay	In 1 Strand of 1 Lay		Broken Wires	Corrosion of Rope	Fitting Condition				

Signature: _____

**Figure 5—3
Typical Wire Rope Inspection Report**

Wire Rope Inspection And Replacement Recommendations

The three basic reasons for deterioration of wire rope are abrasion, corrosion, and damage caused by fatigue bending, crushing, kinking, and forces or abuse acting against the wire rope during normal usage.

When wire rope is replaced, use the type specified on the Wire Rope Capacity Chart in the Crane Rating Manual. Cranes are designed to use a specific type and size of wire rope. Using wire ropes other than

those recommended, may result in short life or even failure of the wire rope.

According to ASME standards, all wire ropes in active service **MUST BE** visually inspected daily. A qualified, trained person should be appointed to conduct the inspection. Also on a monthly basis, that person is required to inspect all wire ropes and keep a dated, written record noting any damage and recording when wire ropes are replaced.

These inspections should be done to determine the degree of deterioration of the wire rope at any given section (refer to the following on wire rope replacement). This will determine the suitability of the wire rope for continued service. A sample inspection report is shown in Figure 5—3. It can be reproduced and used if desired.

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Wire Rope Inspection

Any of the following are reasons to question wire rope safety:

1. More than one broken wire in any one strand should be cause for caution. Breaks that occur on the worn crowns of the outside wires usually indicate normal deterioration. Breaks that occur in the valleys between strands can indicate an abnormal condition, possibly fatigue and breakage of other wires that are not readily visible. One or more valley breaks should be cause for replacement.
2. Wire breaks generally occur in those portions of wire rope which pass over sheaves, wind onto drums, or receive mechanical abuse. Breaks that occur near attached fittings are apt to result from fatiguing stresses concentrated in these localized sections. Breaks of the latter type should be cause for replacement of the wire rope or renewal of the attachment to eliminate the locally fatigued area. When running wire ropes over nylon sheaves, inspect the wire rope where it travels over the sheaves. Inspect for a loss of diameter and then bend the wire rope to inspect the internal wires for breaks and wear.
3. Heavy wear, or broken wires, may occur in sections under equalizer sheaves or other sheaves where wire rope travel is limited, or in contact with saddles. Particular care should be taken to inspect wire rope at these points. If wire rope wear is detected at these locations, these wear points can be shifted by removing the wire rope from the drum and cutting a 20 ft (6.1m) section off at the drum end. This may assist in extending the wire rope life.
4. Wire rope stretch is generally greatest during initial stages of operation when the strands are becoming adjusted and seated. This is accompanied by some reduction in wire rope diameter.
5. Time for wire rope replacement is indicated by the extent of abrasion, scrubbing, and peening on the outside wires, broken wires, evidence of pitting or severe corrosion, kink damage, or other mechanical abuse resulting in distortion of the wire rope structure.
6. Sheaves, guards, guides, drums, flanges, and other surfaces contacted by wire rope during operation should be examined at the time of inspections. Any condition harmful to the wire rope in use at the time should be corrected. The same equipment and particularly sheave and drum grooves should be inspected and placed in proper condition before a new wire rope is installed.

Wire Rope Replacement

Any of the following are reasons for wire rope replacement:

1. In running wire ropes, six randomly distributed broken wires in one wire rope lay or three broken wires in one strand in one wire rope lay.

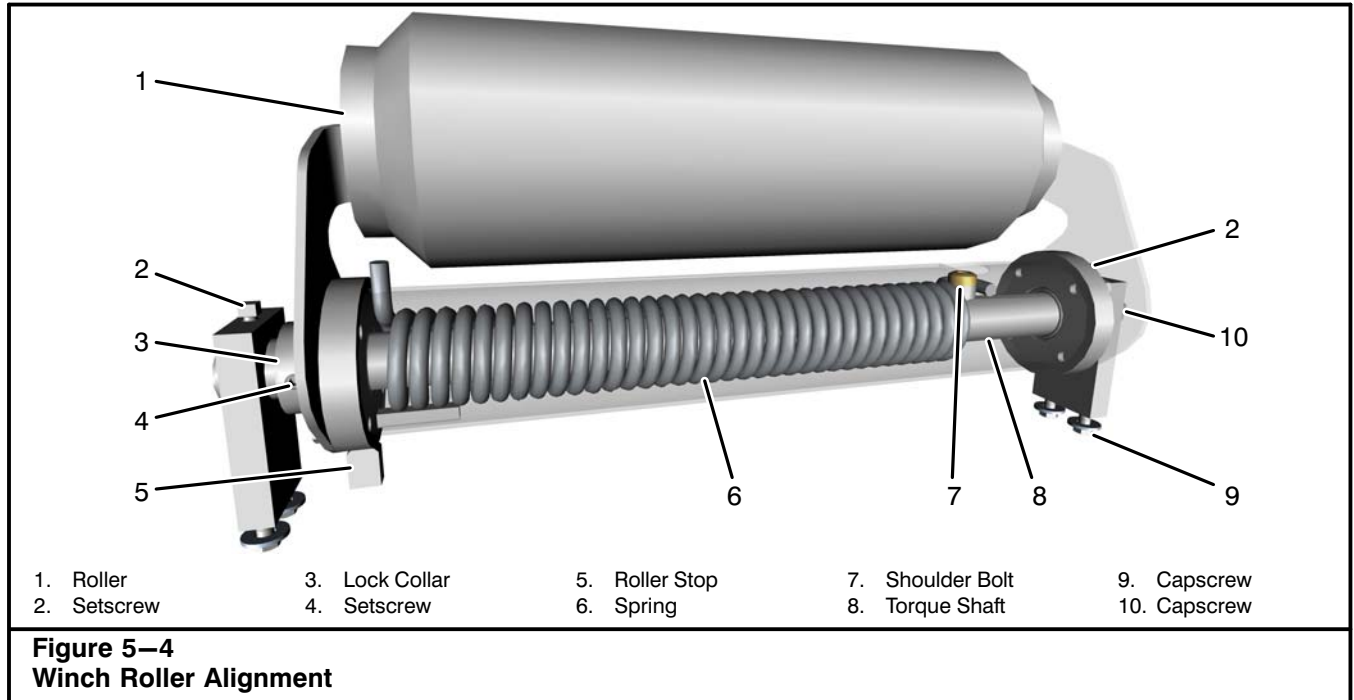
For rotation resistant wire ropes, two randomly distributed broken wires in six wire rope diameters, or four randomly distributed broken wires in thirty wire rope diameters.
2. In pendants or standing wire ropes, evidence of more than two broken wires in one lay in sections beyond end connections or more than one broken wire in one wire rope lay at end connection.
3. One outer wire broken at the contact point with the core of the wire rope which has worked its way out of the wire rope structure and protrudes or loops out from the wire rope structure.
4. Abrasion, scrubbing, or peening causing loss of more than 1/3 the original diameter of individual wires.
5. Evidence of wire rope deterioration from corrosion.
6. Kinking, crushing, "bird caging", or other damage resulting in distortion of the wire rope structure.
7. Evidence of any heat damage.
8. Marked reduction in diameter indicates deterioration of the core resulting in lack of proper support for the load carrying strands. Excessive wire rope stretch or elongation may also be an indication of internal deterioration. Reduction from nominal diameter or more than:

Reduction of	Nominal Wire Rope Diameters
1/64" (.4mm)	up to and including 5/16" (8mm)
1/32" (.79mm)	over 5/16" (9.5mm) to 1/2" (13mm)
3/64" (1.2mm)	over 1/2" (13 mm) to 3/4" (19mm)
1/16" (1.6mm)	over 3/4" (19mm) to 1-1/8" (29mm)
3/32" (2.4mm)	over 1-1/8" (29mm)

9. Noticeable rusting or development of broken wires in the area of connections.

Wire Rope Installation

When installing wire rope, the primary concern is getting the wire rope onto the drum without trapping any twist that may have been induced during handling. Use the following procedure to install the wire rope on the crane.



Winch Roller Adjustment

Before installing wire rope on the drum, adjust the drum roller. Refer to Figure 5—4. If the roller is not aligned to the drum, it may cause excessive wear on the wire rope, winch roller, or impede spooling of the wire rope on the drum. To adjust the roller, loosen the capscrews (9) and adjust roller assembly as required to align the roller parallel to the drum. Roller should lay flat across each full layer of wire rope on the drum and be centered between the drum flanges. Center the roller between the drum flanges by loosening the setscrews (4) in the lock collars (3), centering the roller (1), and tightening the setscrews. After roller is aligned and centered, preload the spring using the following procedure.



WARNING

Do not attempt to service winch roller before properly relieving torsion spring tension. If proper directions are not followed, the torsion spring could rapidly and forcefully uncoil. This may result in serious personal injury and component damage. Always release tension on torsion spring before attempting any winch roller repair.

1. Properly release torsion spring (6) tension as follows.

This procedure is greatly simplified by using two service technicians. One to hold the breaker bar/wrench, the other to loosen and tighten setscrews.

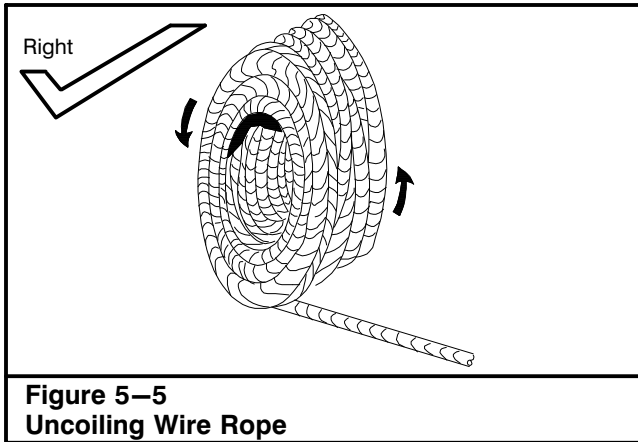
- a. Ensure capscrew (10) is tightened securely in torque shaft (8).
 - b. Using a breaker bar or long handle wrench, hold tension on torsion spring (6) while loosening the setscrews (2) on both ends of torque shaft (8).
 - c. Allow torque shaft (8) to rotate counterclockwise, as far as possible while maintaining control of the torque shaft (8), then securely tighten setscrews (2).
 - d. Reposition breaker bar or wrench on capscrew (10).
 - e. Repeat Steps b—d until tension is fully relieved from torsion spring (6).
2. Turn the capscrew (10), which will rotate the torque shaft (8), until the bolt (7) through the torque shaft contacts the spring (6).

CAUTION

Do not overtighten the spring. Damage to the wire rope may occur.

3. With the roller stop (5) resting against the drum flange or with the roller resting evenly on the first layer of wire rope on the drum, use 105 ft lb (124Nm) of torque to rotate the spring not to exceed one revolution (360°).
4. Tighten setscrews (2). The roller should roll freely when the drum rotates.

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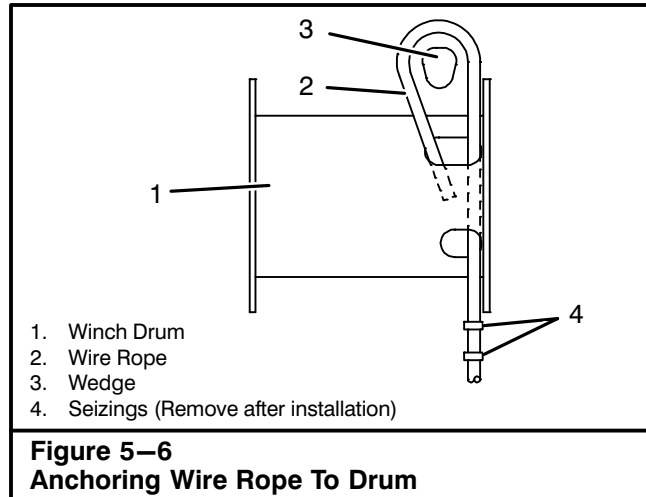


Uncoiling Wire Rope

1. To avoid twists, unreel the entire wire rope on the ground in line with the boom deflector sheave and drum. Set the reel up horizontally so it can rotate as the wire rope is reeled off. Refer to Figure 5-5. Reel the wire rope off slowly, so the reel won't tend to "throw" the wire rope off. If the new wire rope cannot be laid out on the ground, further steps are necessary:
 - a. Mount the reel on a shaft through flange holes and on jack stands, making sure the reel is set to be unreel over the top. Do not allow the reel to "free-wheel". Brake the reel by applying pressure to a flange. Do not apply braking pressure to the wire rope on the reel or pass wire rope between blocks of wood or other material.
2. Reeve the wire rope over the boom deflector sheave and anchor it to the drum.

Note: When replacing wire rope, the sheaves and grooves in drums should be checked for wear or damage and replaced if necessary. Damaged, worn or undersized sheaves will damage the wire rope. On older equipment, remember that new wire rope is usually larger in diameter than the worn wire rope it replaces. The sheave grooves may be worn to the smaller diameter of the old wire rope.

Note: A new wire rope should be broken in by running it slowly through its working cycle for a short period under a light load. Refer to "Wear Rope Break-In" in this Section of this Operator's Manual.



Anchoring Wire Rope To Drum

CAUTION

The ends of the wire rope must be fuse welded. Failure to do so may cause the core to slip and/or the strands to loosen causing major wire rope damage.

Attach two seizings (hose clamps are an effective and efficient alternative if traditional seizings are not available) about 24 in (609.6mm) from the end with a 3 in (76.2mm) space between them. Refer to Figure 5-6. The seizings will prevent any looseness of the outer strands from traveling up the wire rope during installation. Insert the free end of the wire rope into the small opening of the anchor pocket. Loop the wire rope and push the free end about 3/4 of the way back through the pocket. Install the wedge, then pull the slack out of the wire rope. Remove the seizings after the wire rope is secured in the drum. Keep tension on the wire rope to prevent the wire rope from becoming slack and forming loops or kinks and also to allow uniform winding on the drum. It is important that original wire rope lay is maintained at all times.

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Winding Wire Rope On Drum

Proper winding of the first layer of wire rope on a multiple wrap drum is important. If the first layer is properly wound, succeeding layers will be easier to control.

This is especially important on ungrooved drums. When starting new wire rope on such drums, drive each wrap of the first layer lightly with a wooden mallet so each wrap barely contacts the preceding one. Keep tension on the wire rope to prevent the wire rope from becoming slack and forming loops or kinks and also to allow uniform winding on the drum. It is important that original wire rope lay is maintained at all times.

It's important to apply a tensioning load while spooling the wire rope on the drum. (If not, the lower layers may be loose enough that the upper layers become wedged into the lower layers under load, which can seriously damage the wire rope.) The tensioning load should range from 1 to 2% of the wire rope's nominal capacity.

Wire Rope Reeving

Hook blocks should be reeved correctly so they hang straight and do not cause excessive wear on the wire rope and sheaves. Refer to Figure 5–7.



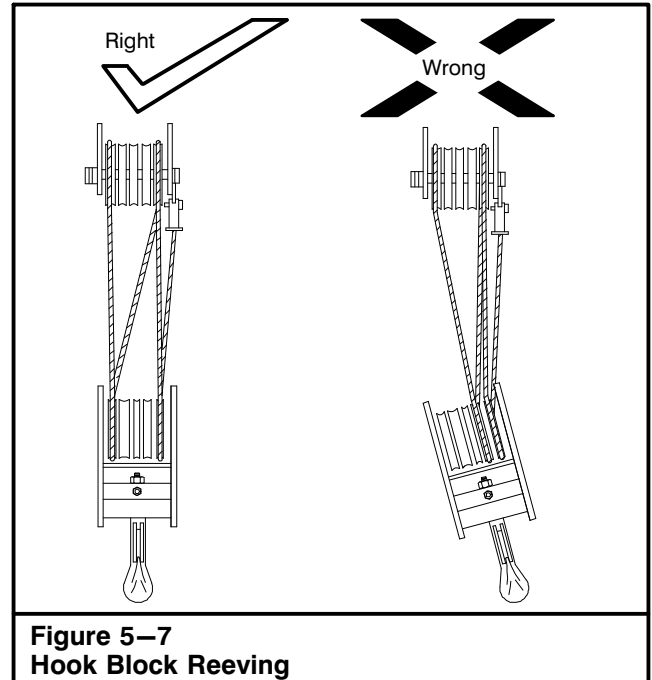
WARNING

To avoid personal injury, do not climb, stand, or walk on the boom or fly. Use a ladder or similar device to reach necessary areas when reeving the crane.

Only if certain criteria are met, a swivel hook ball may be used with rotation resistant wire rope. Refer to "Hook Ball Usage With Rotation Resistant Wire Rope" in this Operator's Manual.

The crane can use multiple parts of line when reeving the main winch, depending on the lift being made and the number of sheaves available. When reeving the winch, odd parts of line dead end at the hook block or hook ball and even parts dead end at the boom head. The auxiliary lifting sheave may be reeved with either one or two parts of line.

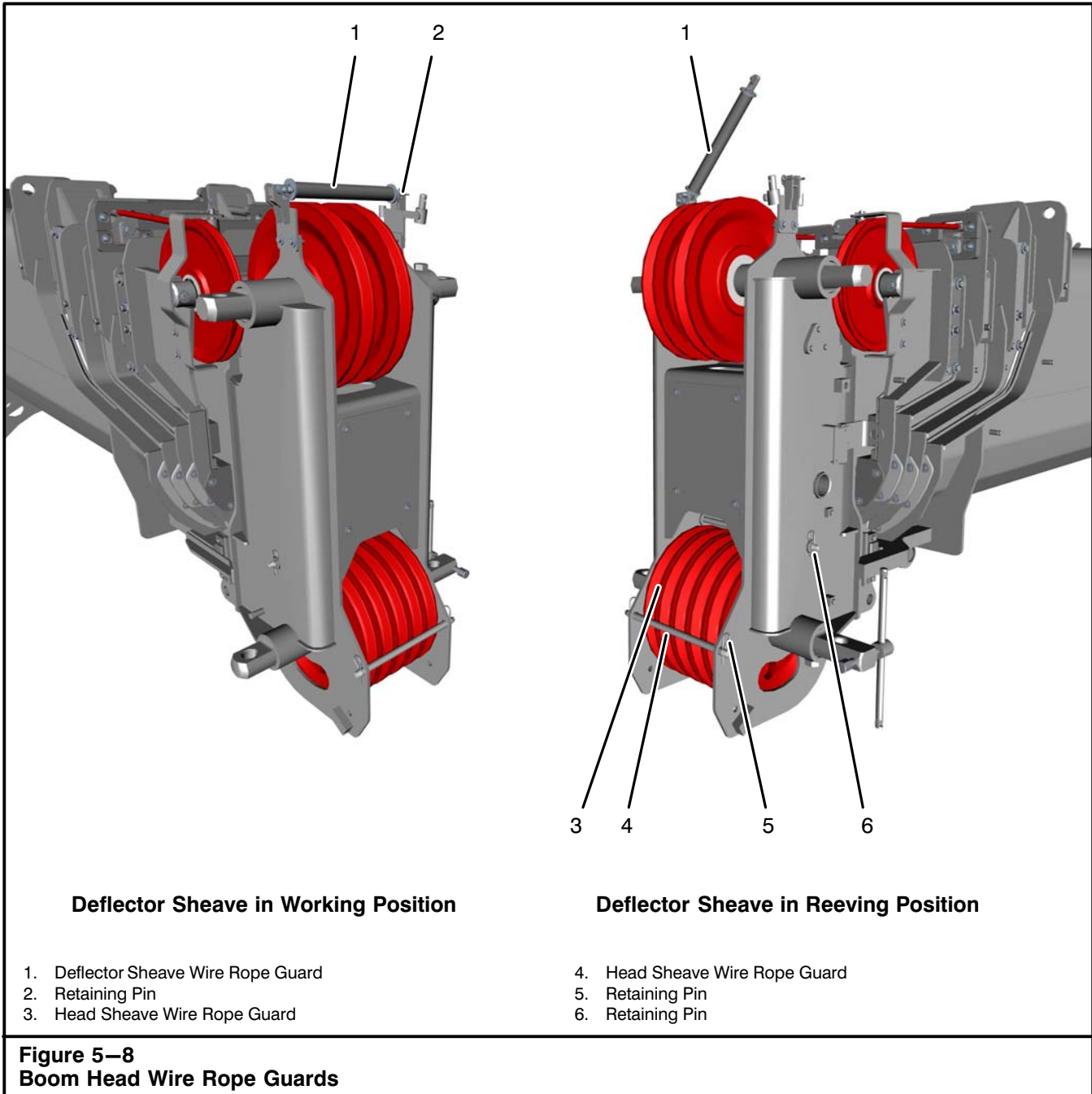
Note: Do not use a swivel at the dead end of a multi-part reeving.



The fly section may be reeved with two parts of line for better line control. Figure 5–22 and Figure 5–24 gives the proper reeving for various parts of line. The reeving patterns illustrated must be used at all times. To determine how many parts of line to use for a particular lift, check the Wire Rope Capacity chart and the Winch Performance chart in the Crane Rating Manual.

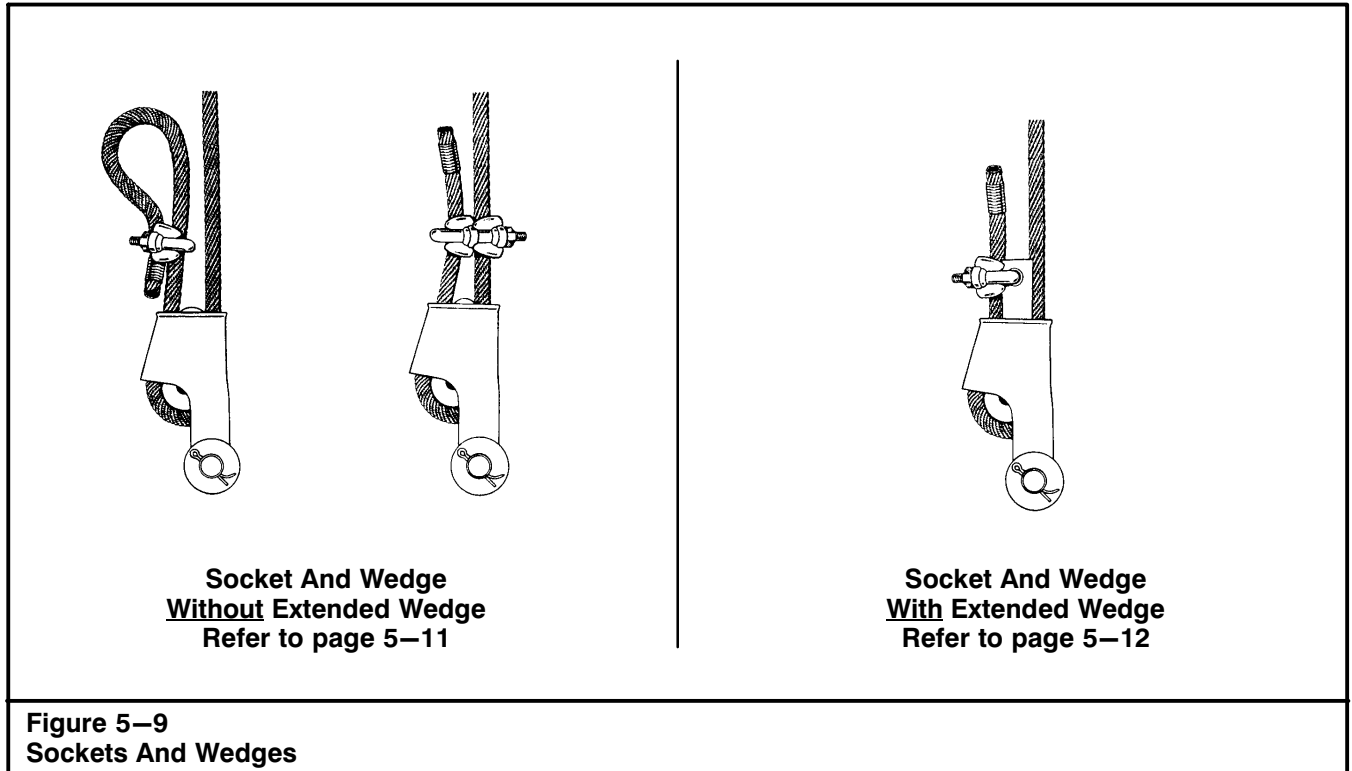
Note: Wire rope guards must always be used during operations. They must be pinned in place to prevent wire rope from jumping off the sheaves.

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When reeving the wire rope guard on the boom head sheaves, remove or position wire rope guards in position as required.

The boom head deflector sheave wire rope guard can be rotated and will remain in the reeving position without removal. Refer to Figure 5–8. All wire rope guards must be installed, or in the working position, with retaining pins in place before crane use.

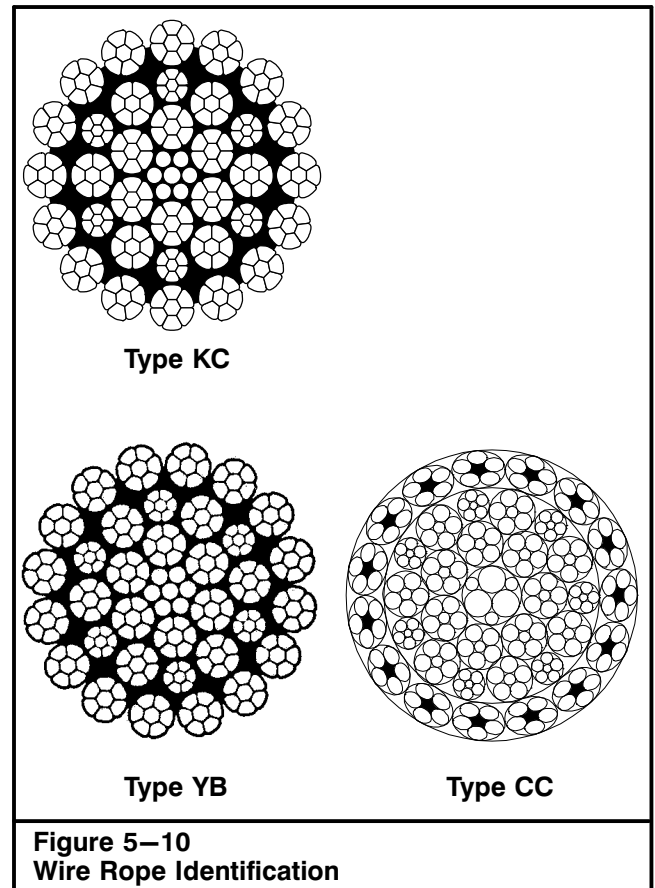


Sockets And Wedges

This crane may be equipped with either of two styles of sockets and wedges. One style socket uses a “terminator” extended wedge and the other does not. The wedges for each style are installed differently. Refer to Figure 5-9 to determine which style your crane has and where to find the appropriate information for use and installation.

**WARNING**

Do not interchange sockets and wedges. Loads may slip or fall if socket and wedge are not properly matched. Use a “terminator” wedge with a socket for a “terminator” wedge and a non-“terminator” wedge with a non-“terminator” socket.



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Wire Rope, Wedge and Socket Compatibility

Wedge	Socket				
	S-421	S-421-T	US-422	US-422-T	J7Y0002 US-8 422
S-412-W	YES	NO	NO	NO	NO
S-421-TW	NO	YES	NO	NO	NO
US-422	NO	NO	YES	NO	NO
US-422-TW	NO	NO	NO	YES	NO
J7Y0002 S-422-T	NO	NO	NO	NO	YES

NOTE: Check socket and wedge assemblies to ensure they comply to this chart and that the wire rope size marked on them matches the wire rope size installed on the crane.

Figure 5—11
Wire Rope, Wedge and Socket Compatibility

For This Wire Rope Diameter	Use This Socket and Wedge
5/8 in or 0.62 in	5/8 in or 0.62 in
3/4 in or 0.75 in	3/4 in or 0.75 in
7/8 in or 0.88 in	7/8 in or 0.88 in
16 mm	5/8 in or 0.62 in
19 mm	3/4 in or 0.75 in
20 mm	3/4 in or 0.75 in
22 mm	7/8 in or 0.88 in
26 mm	1 in or 1.00 in
28 mm	1 1/8 in or 1.12 in

Figure 5—12
Socket and Wedge Per Wire Rope Diameter

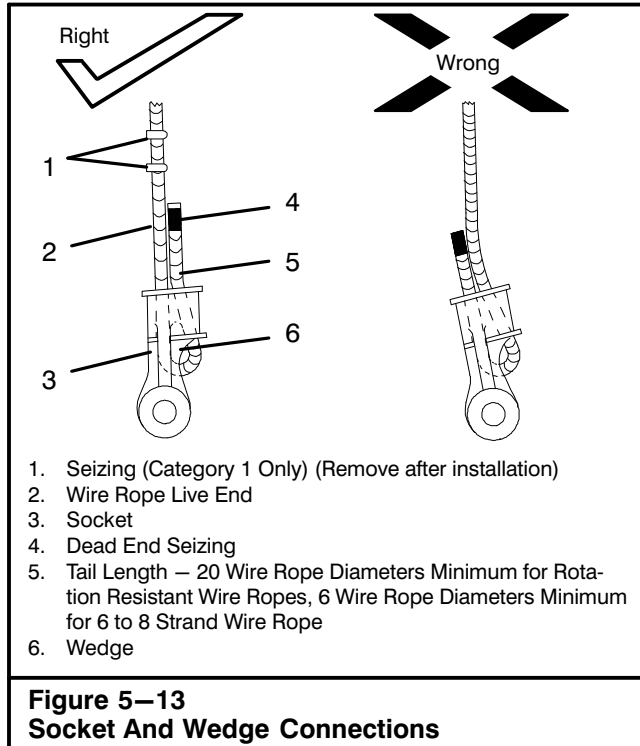
Socket And Wedge — Without Extended Wedge

Sockets and wedges shipped from the factory are identified with size and type or pair identification. Refer to Figure 5—18. Use the proper wedge for the proper wire rope socket. Refer to Figure 5—11. A socket or wedge may be identified for two or more sizes of wire rope. The size on the socket and wedge must correspond with the size of wire rope being used. Refer to Figure 5—12.

CAUTION

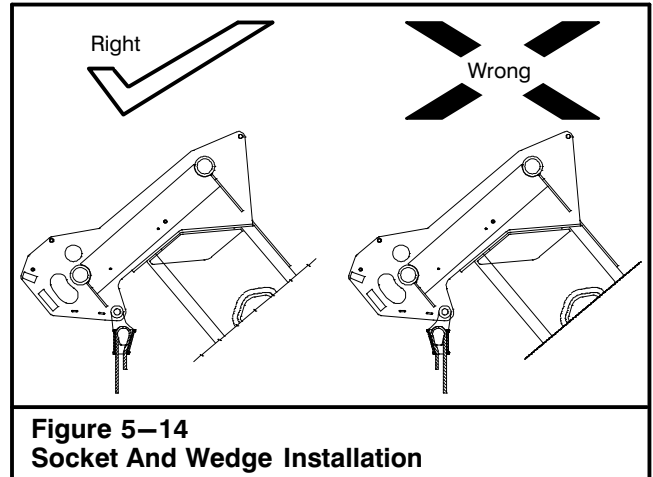
Use the proper size wedge with a wire rope socket or lagging. The use of an off-size wedge in a socket or lagging is dangerous as it may not hold. Wedges and sockets shipped from the factory are identified with size and type identification. A lagging or socket may be identified for two or more sizes of wire rope and a wedge for one or two. The size on the lagging, socket, and wedge must correspond with the size of wire rope being used.

The correct and incorrect methods of attaching a socket and wedge to wire rope are shown in Figure 5—13. The dead end of the wire rope must always be on the sloped portion of the socket. The load line must be in a straight line pull with the eye of the socket. If the wire rope is installed wrong as shown in Figure 5—13, a permanent set will develop at the point where the wire rope enters the socket. This permanent set will weaken the wire rope and accelerate wear at this point.



Before installing category 1 wire rope into a socket or wedge attach two seizings (hose clamps are an effective and efficient alternative if traditional seizings are not available) approximately 3–4 ft (0.9–1.2 m) from the end with a 3 in (76.2 mm) space between them. Refer to Figure 5–13.

The dead end must also be seized and a minimum tail length of 20 wire rope diameters [15" (.38m) for 3/4" (19mm) wire rope] for rotation resistant wire ropes and 6 wire rope diameters minimum for 6 to 8 strand wire rope is required. Refer to Figure 5–13. The seizings will help prevent core slippage and any looseness of the outer strands from traveling up the wire rope during installation while still allowing the wire rope strands to be free to adjust. If using category 1 wire rope, remove seizings from the live end after wire rope is securely installed into the socket.



Note: Refer to Figure 5–10 to identify which type of wire rope is installed on the crane.

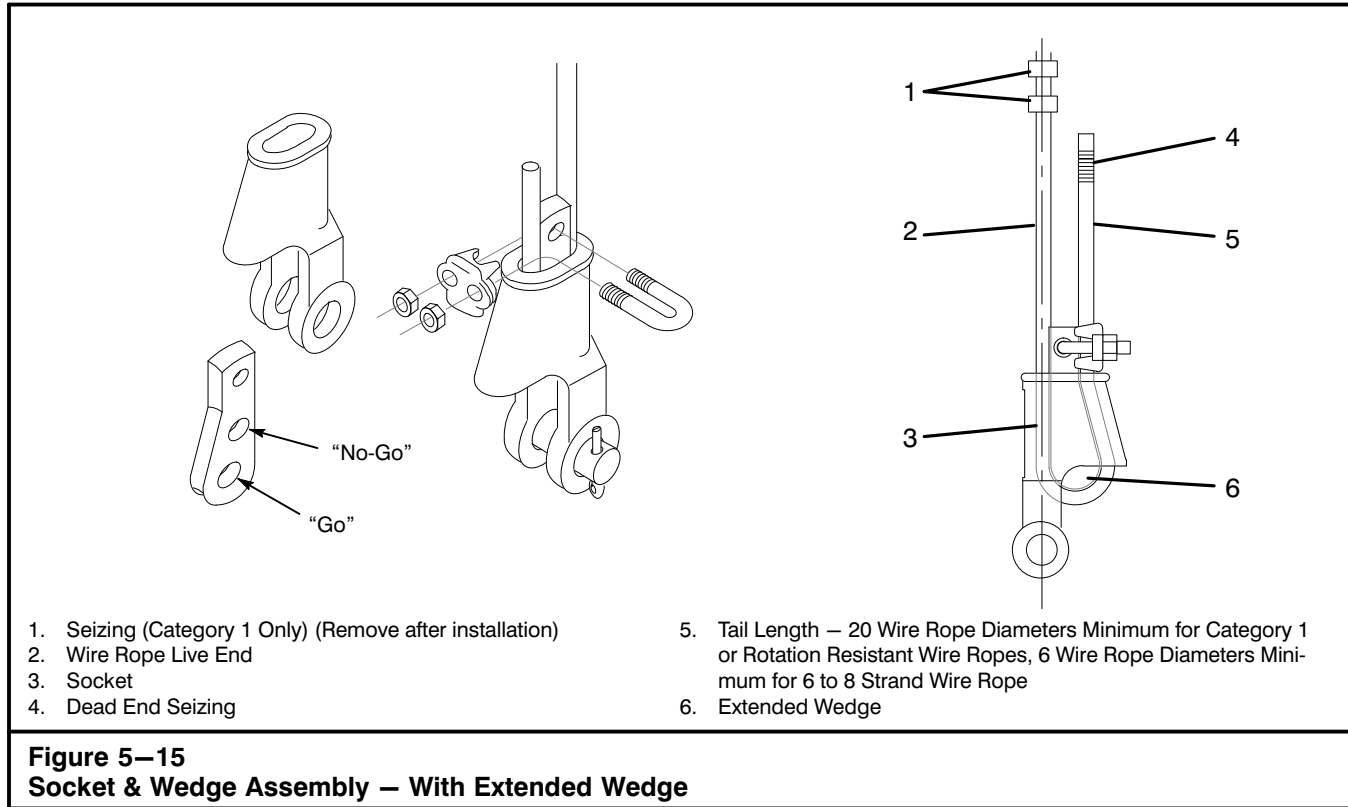
CAUTION

The ends of the wire rope must be fuse welded and the tail length of the dead end must be a minimum of 20 wire rope diameters [15" (.38m) for 3/4" (19mm) wire rope]. Failure to do the above may cause the core to slip and/or the strands to loosen causing major wire rope damage.

When anchoring the socket to the boom head, ensure the flat face is facing out as shown in Figure 5–14. If socket is not installed correctly structural damage to the boom head may occur.

It is recommended that the wire rope socket and wedge connection be reestablished on an annual basis. This can be accomplished by cutting the wire rope 6 in (0.15m) above the socket and wedge connection. See "Cutting Wire Rope" in this Section of this Operator's Manual. Install the socket and wedge connection as shown in Figure 5–13.

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Socket And Wedge Assembly — With Extended Wedge

WARNING

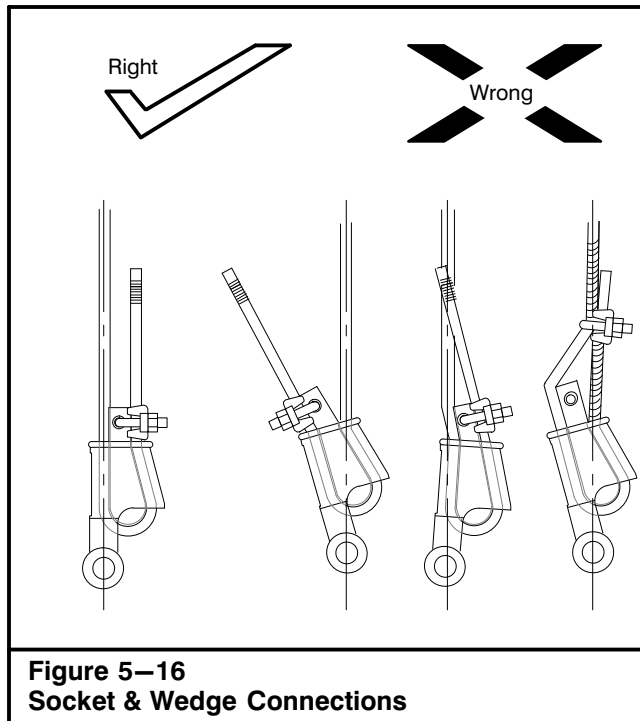
Use the proper size wedge with a wire rope socket or drum. The use of an incorrect size, type, or brand of wedge in a socket or drum is dangerous as it may not hold. Wedges and sockets shipped from the factory are identified with size and type identification. A drum or socket may be identified for two or more sizes of wire rope and a wedge for one or two. The size on the drum, socket, and wedge must correspond with the size of wire rope being used.

WARNING

Do not interchange sockets and wedges. Loads may slip or fall if socket and wedge are not properly matched. Use a “terminator” wedge with a socket for a “terminator” wedge and a non-“terminator” wedge with a non-“terminator” socket.

The correct and incorrect methods of attaching a socket and wedge to wire rope are shown in Figure 5—15 and Figure 5—16. The dead end of the wire rope must always be on the sloped portion of the socket. The load line must be in a straight line pull with the eye of the socket. If the wire rope is installed wrong as shown in Figure 5—16, a permanent set will develop at the point where the wire rope enters the socket. This permanent set will weaken the wire rope and accelerate wear at this point.

Sockets and wedges shipped from the factory are identified with size and type or pair identification. Refer to Figure 5—18. Use the proper wedge for the proper wire rope socket. Refer to Figure 5—11. A socket or wedge may be identified for two or more sizes of wire rope. The size on the socket and wedge must correspond with the size of wire rope being used. Refer to Figure 5—12. The wedge also has a “go”/“no-go” feature cast into the wedge to assist in determining the proper size wire rope that can be used with that particular socket and wedge. Refer to Figure 5—15. The proper size wire rope is determined when: 1) the wire rope passes through the “go” hole in the wedge, and 2) the wire rope does not pass through the “no-go” hole in the wedge. The part number may also be identified on the socket and wedge. Refer to the Parts Manual for confirmation. If there is any doubt as to the mating of the socket and wedge, contact a Link-Belt Distributor.

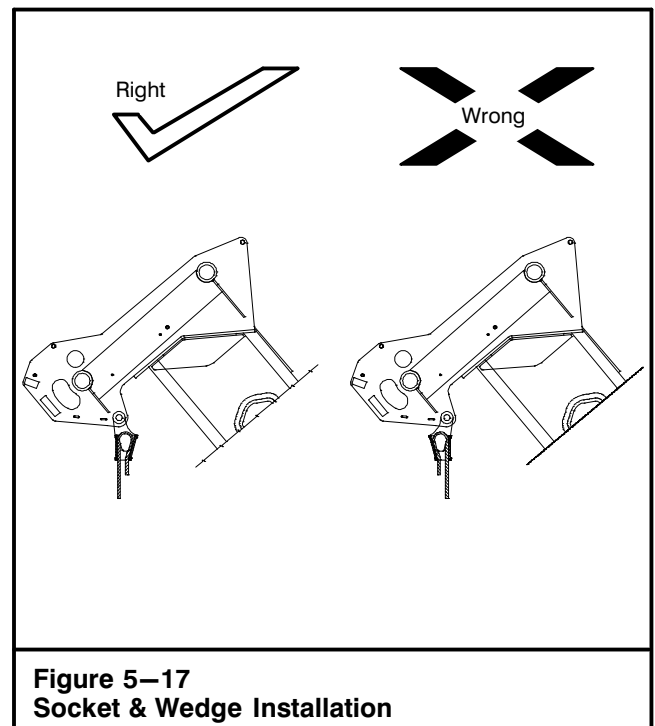


Before installing category 1 wire rope into a socket or wedge attach two seizings (hose clamps are an effective and efficient alternative if traditional seizings are not available) approximately 3–4 ft (0.9–1.2 m) from the end with a 3 in (76.2 mm) space between them. Refer to Figure 5-15.

The dead end must also be seized and a minimum tail length of 20 wire rope diameters [15" (.38m) for 3/4" (19mm) wire rope] for rotation resistant wire ropes and 6 wire rope diameters minimum for 6 to 8 strand wire rope is required. Refer to Figure 5-15. The seizings will help prevent core slippage and any looseness of the outer strands from traveling up the wire rope during installation while still allowing the wire rope strands to be free to adjust. If using category 1 wire rope, remove seizings from the live end after wire rope is securely installed into the socket.

Note: Refer to Figure 5-10 to identify which type of wire rope is installed on the crane.

Use a hammer to seat the wedge and wire rope into the socket before applying first load. Lift the first load a few inches (centimeters) from the ground to fully seat the wedge and wire rope in the socket. This load should be of equal or greater weight than loads expected in use.



Secure the dead end section of the wire rope by installing the clip through the wedge as shown in Figure 5-15. Tighten the nuts on the clip to the recommended torque as shown on the table in Figure 5-20.

When anchoring the socket to the boom head, ensure the flat face is facing out as shown in Figure 5-17. If socket is not installed correctly structural damage to the boom head may occur.

It is recommended that the wire rope socket and wedge connection be reestablished on an annual basis. This can be accomplished by cutting the wire rope 6 in (0.15m) above the socket and wedge connection. See "Cutting Wire Rope" in this Section of this Operator's Manual. Install the socket and wedge connection as shown in Figure 5-16.

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Wire Rope Break-In

After the wire rope has been installed and the ends secured in the correct manner, the new wire rope must be run through a break-in period. This allows the component parts of the new wire rope to gradually adjust itself to actual operating conditions.

1. Level the crane on fully extended outriggers with all tires clear of the ground. Position the upper over the front of the carrier and engage the travel swing lock.
2. Fully raise and fully extend the boom. Attach a light load at the hook and raise it a few inches (*centimeters*) off the ground. Allow to stand for several minutes.
3. Run the wire rope through a cycle of operation at very slow speeds. During this trial operation, a very close watch should be kept on all working parts—sheaves, drums, roller, etc. to make certain that the wire rope runs freely, and without any obstructions as it makes its way through the system.

Note: Run these loads with reeving that places the loads on the hook block with all wire rope off the drum except the last three wraps. If this is not possible, alternate methods must be used to assure proper tensioning of the wire rope on the drum.

4. If no problems appear in running the wire rope, repeat procedure with an increased load.

Maintaining Wire Rope Tension

Hook blocks should be reeved with the minimum parts of line required to make each lift. Operation with more parts of line than required can lead to spooling issues due to loosely tensioned rope. The “Minimum Hook Block/Ball Overhaul Weight” chart in the Crane Rating Manual provides the minimum weight needed to raise and lower the block or ball for a given boom length and parts of line.

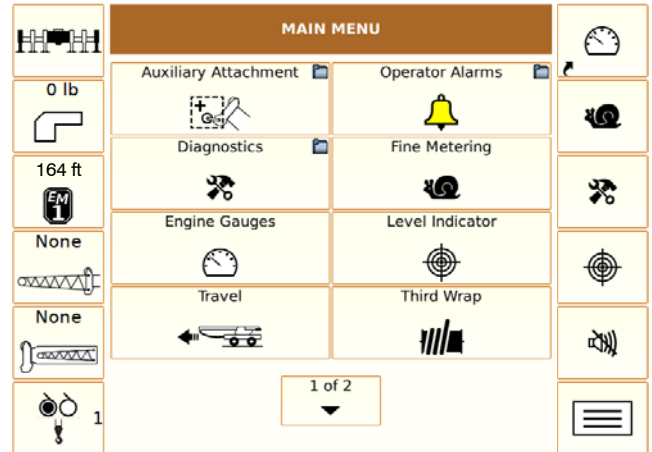
Certain applications require the hook to be raised with no load, and then lowered under load. This can lead to spooling inconsistencies due to loosely tensioned rope on lower layers of the winch drum combined with high tension on higher layers. Operation in these applications may require a heavier hook block.

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First Layer/Third Wrap Calibration

The crane is equipped with a first layer/third wrap warning system. This system allows the operator to monitor the wire rope windings on the drum(s). In order for this system to function correctly, it must be properly calibrated using the Pulse Crane Control System. Once the third wrap indicator is calibrated, the RCL system will automatically calibrate the first layer indicator. Calibrate the system anytime wire rope is installed on the winch drum(s) or the live end of the wire rope is wound past the winch drum(s).

Note: When the first layer/third wrap is enabled, first layer and third wrap warning indicators on the calibration screen will illuminate when either of these conditions are met. Warning indicators will also be displayed on the Pulse Crane Control System Display.

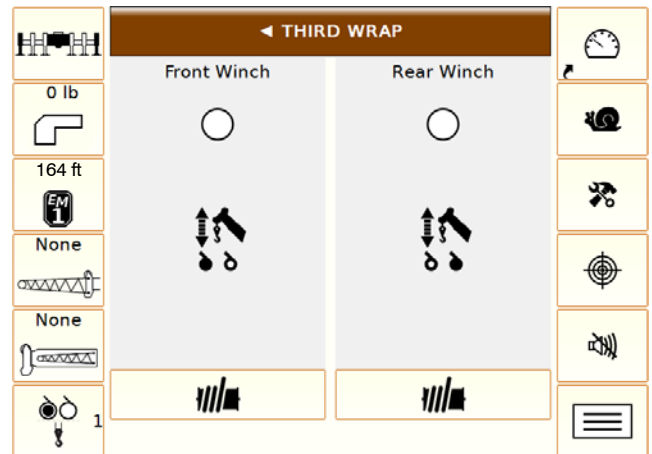


- From the Main Menu of the Pulse Crane Control System Display, press the Third Wrap Button. The Third Wrap Screen will appear.

**WARNING**

The first layer/third wrap system will not function properly if the live end of the hoist wire rope is wound past the winch drum(s). Wire rope failure may occur. Recalibrate the first layer/third wrap system so that three (3) full wraps of wire rope are maintained on the winch drum(s) at all times during operation.

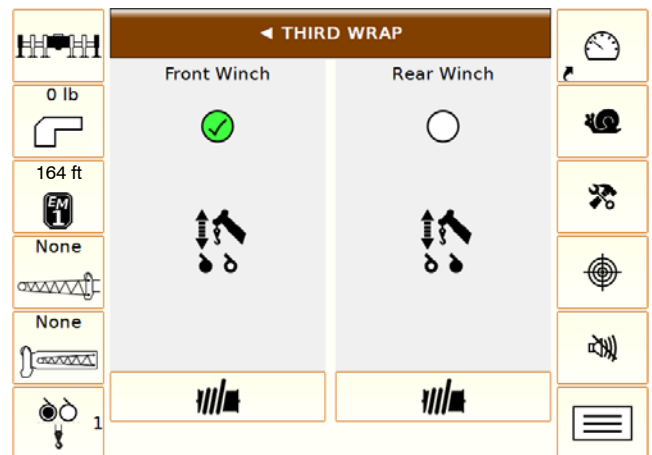
- Park the crane on a firm level surface.
- Set the RCL System to Rigging Mode.



**WARNING**

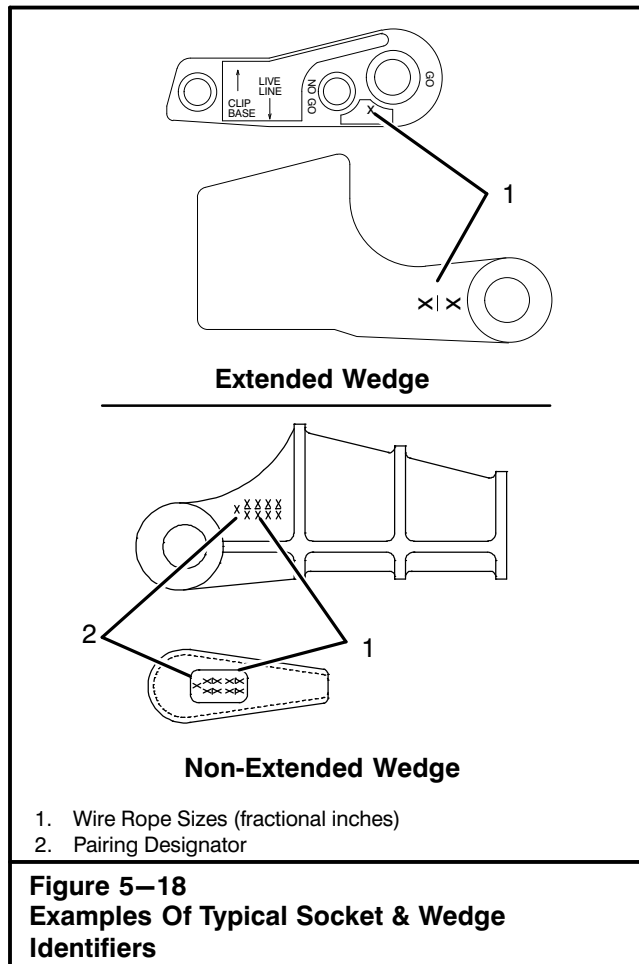
The RCL is not operational when in the Rigging Mode. Return the RCL to normal operation before operating the crane.

- Wind wire rope off the drum until only four full wraps are left on the drum. Or if installing wire rope on the drum, properly install the drum wedge to anchor the wire rope to the drum. Refer to "Anchoring Wire Rope To Drum" and "Winding Wire Rope On Drum" in this section of this Operator's Manual for instructions. Properly wind four full wraps on the drum.
- Visually verify that four full wraps are on the drum before proceeding.



- Press the Third Wrap Button below the winch icon to calibrate the third wrap indicator. An activation icon will appear above the appropriate winch icon.

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Single Part Line Hoisting

Rotation-resistant category 1 wire ropes are recommended for single part of line applications. This is of utmost importance for long fall hoist line applications. Link-Belt type “KC”, “YB”, “CC”, and “ZB” are examples of wire ropes recommended for single part hoisting. See the Wire Rope Capacity Chart in the Crane Rating Manual for the specific types of rotation-resistant wire rope recommended for your crane.

The use of non-rotation resistant wire rope is **not** recommended for long falls of single part of line hoisting since the wire rope and load may spin. If the crane operator allows either the load or the wire rope to rotate, the crane or wire rope can be damaged. The anti-two block weight may also become entangled with the wire rope and could damage the anti-two block system, wire rope, and/or head machinery.

Hook Ball Usage With Rotation Resistant Wire Rope

The rotation resistant characteristic is achieved by laying the outer strands around an independent wire rope that is wound in the opposite direction. When the wire rope has tension on it, opposing rotational forces are created between the core and outer strands. If a swivel hook ball is utilized with rotation resistant wire rope, the wire rope is allowed to twist. The outer strands unwind and get longer while the inner core is forced to rotate in the same direction and shortens in length. As a result of this treatment, the inner core sees a disproportionately greater load, and core damage may occur due to shock loading or overloading. A rotating load on an unrestrained, non-swivel hook ball without a tagline, also affects the internal loading of the wire rope in this manner. This practice, or any other which allows the wire rope to rotate while in service, leads to unbalanced loading between the inner and outer layer of strands, which may result in core failure. Wire rope manufacturer's testing has shown that rotation resistant wire rope utilized with a swivel hook ball has reduced the breaking strength by as much as 50% if excessive rotation occurs.

Non-Swivel Hook Ball Usage

A non-swivel hook ball in conjunction with a tagline or other device to control load spin should be used when the crane is equipped with rotation resistant wire rope. This is to avoid unrestrained rotation of the wire rope.

Swivel Usage

A swivel hook ball can be used with rotation resistant wire rope if:

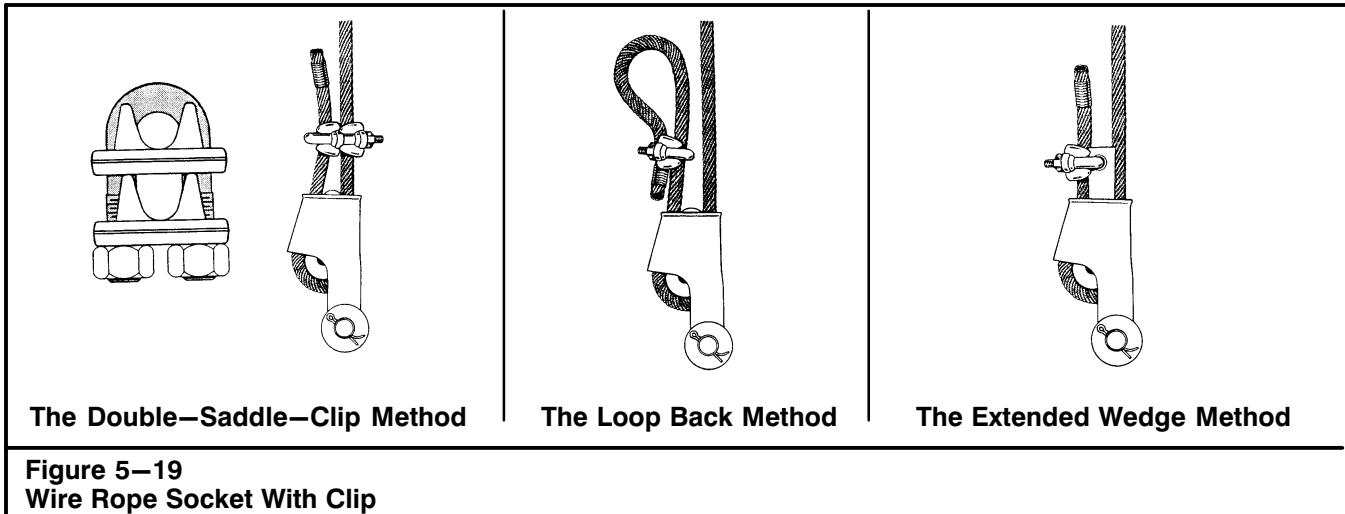
1. The wire rope is not shock loaded or overloaded.
2. Wire rope working strength is reduced to maintain original design factors.
3. The wire rope is inspected frequently as outlined below.

Wire Rope Inspection

Marked reduction in diameter indicates deterioration of the core resulting in lack of proper support for the load carrying strands. Excessive wire rope stretch or elongation may also be an indication of internal deterioration. Major concerns and replacement recommendations include:

1. Loss of wire rope diameter (in excess of those listed in the table in "Wire Rope Replacement" in this Operator's Manual), abnormal lengthening of wire rope lay, or protrusion of wires between the outer strands.
2. 2 randomly distributed broken wires in 6 wire rope diameters, or 4 randomly distributed broken wires in 30 wire rope diameters.

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Wire Rope Sockets With Clips

Some codes require the use of a wire rope clip in conjunction with a socket and wedge connection. Figure 5-19 illustrates some typical methods of clip installation with sockets. In some cases, particularly in wrecking ball work, there is a chance that the wedge can loosen, releasing the socket from the wire rope. This could be caused by the banging action and alternate loading and unloading of the wire rope that occurs during this type work.



WARNING

Regularly inspect the integrity of the wire rope at the point of exit at the dead end side. High velocity spin of wire rope when loading and unloading can cause the wire rope to flip-flop, fatigue, and finally break off.

The use of wire rope clips with a socket and wedge connection can weaken the connection if done improperly. Do not attach the dead end of the wire rope to the live side with the clip as this will seriously weaken the connection. The clip may ultimately take the load and may deform or break the wire rope.

If using the loop back method, the loop formed must not be allowed to enter the wedge, or the connection will be weakened. The tail length of the dead end must be a minimum of 20 wire rope diameters [15" (.38m) for 3/4" (19mm) wire rope].

CAUTION

The ends of the wire rope must be fuse welded and the tail length of the dead end must be a minimum of 20 wire rope diameters [15" (38cm) for 3/4" (19mm) wire rope]. Failure to do so may cause the core to slip and/or the strands to loosen causing major wire rope damage.

Wire Rope Clip Installation

The correct method of installing wire rope clips is shown in Figure 5-21. The u-bolt must always be over the short end of the wire rope and the base must always contact the long end.

Clips should NOT be staggered, that is u-bolt of one clip over short end and u-bolt of next clip over long end. This practice will not only distort the wire rope excessively, but will prevent maximum capacity of this type fastening. Placing all clips with the u-bolt over the long end of the wire rope will damage strands and result in an unsafe condition.

The distance between clips should be not less than six times the wire rope diameter. In relation to size of wire rope, the minimum number of clips recommended for safe connections is given in Figure 5-20.

CAUTION

Apply the initial load and retighten nuts to the recommended torque. Wire rope can stretch and reduce in diameter when loads are applied. Inspect periodically and retighten as required.

Clip Size		Minimum No. of Clips	Amount OF Wire Rope To Turn Back*		Torque	
Inches	mm	Quantity	Inches	mm	ft lb	Nm
1/4	3.2	2	3-1/4	82.5	---	---
3/16	4.7	2	3-3/4	95.2	---	---
1/4	6.3	2	4-3/4	120.6	15	20.0
5/16	7.9	2	5-1/4	133.3	30	40.7
3/8	9.5	2	6-1/2	165.1	45	60.1
7/16	11.1	2	7	177.8	65	86.8
1/2	12.7	3	11-1/2	292.1	65	86.8
9/16	14.3	3	12	304.8	95	126.9
5/8	15.9	3	12	304.8	95	126.9
3/4	19.0	4	18	457.2	130	173.6

* If a greater number of clips are used than shown in this table, the amount of wire rope turnback should be increased proportionally.

Figure 5—20
Wire Rope Clip Application Recommendation

Cutting Wire Rope

CAUTION

The ends of the wire rope must be fuse welded. Failure to do so may cause the core to slip and/or the strands to loosen causing major wire rope damage.

When wire rope is to be cut, seizings should be placed on each side of the point where the wire rope is to be cut, to keep the strands in place. On preformed wire rope such as type RB, one seizing on each side of the cut is enough. On non-preformed wire rope less than 7/8 in (22mm) diameter such as category 1, two seizings are recommended. On non-preformed wire rope over 7/8 in (22mm) diameter, three seizings are recommended. Original wire rope lay must be maintained at all times.

Three basic methods of cutting wire rope are recommended:

1. Abrasive cutting tools.
2. Shearing tools. (Wire cutters on small wire rope, a wire rope cutter and hammer for larger wire ropes.)
3. Oxy/acetylene fuel torch. This is the only suggested method for cutting category 1 wire rope.

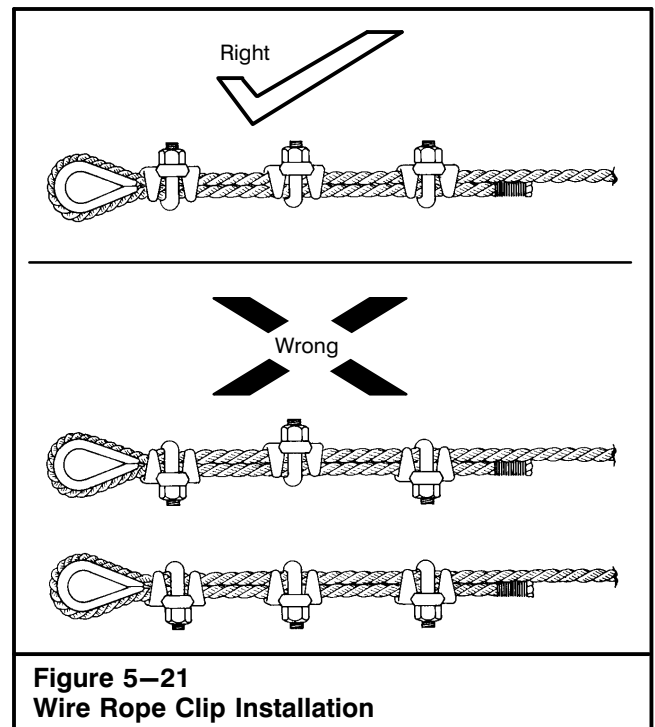
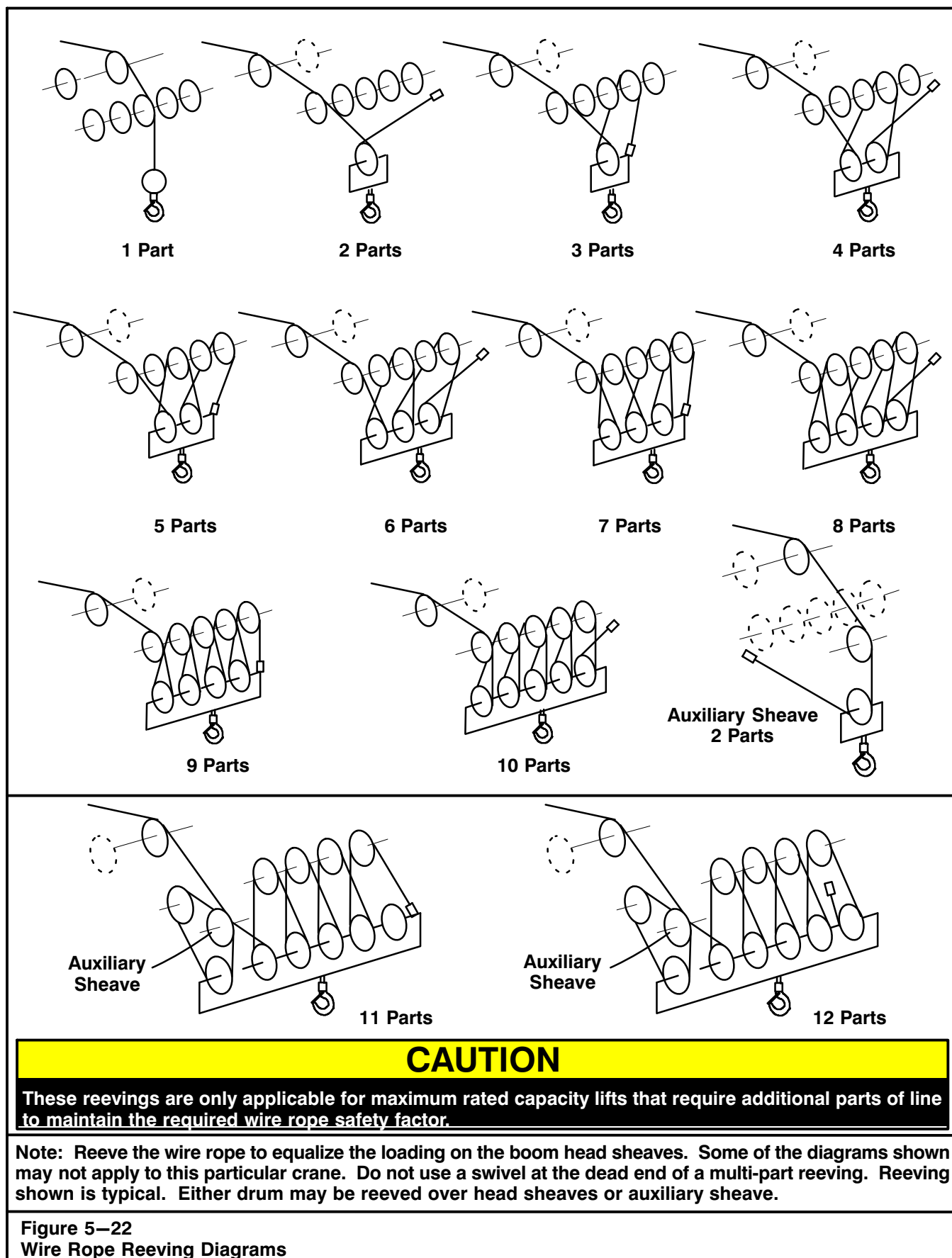
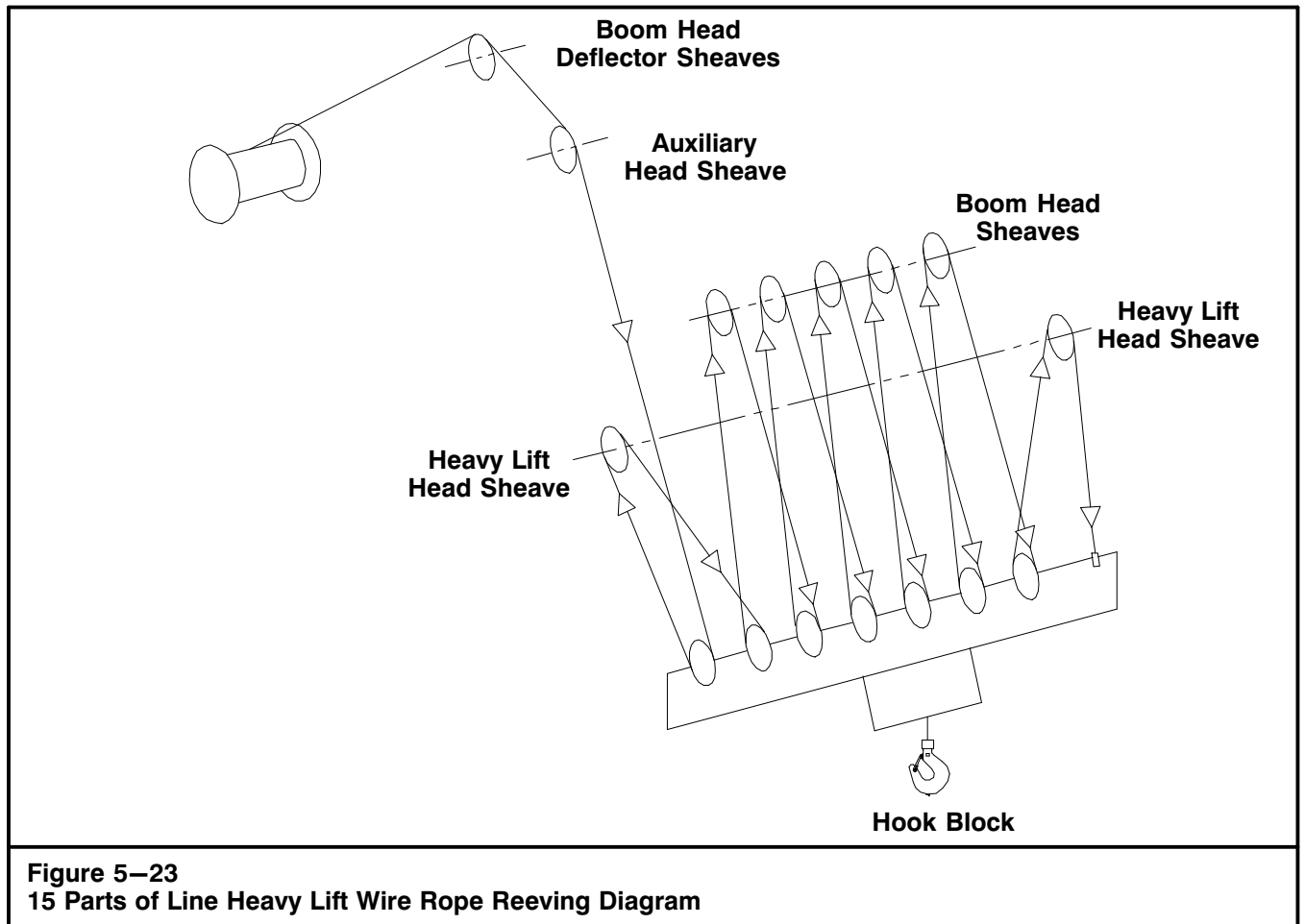


Figure 5—21
Wire Rope Clip Installation

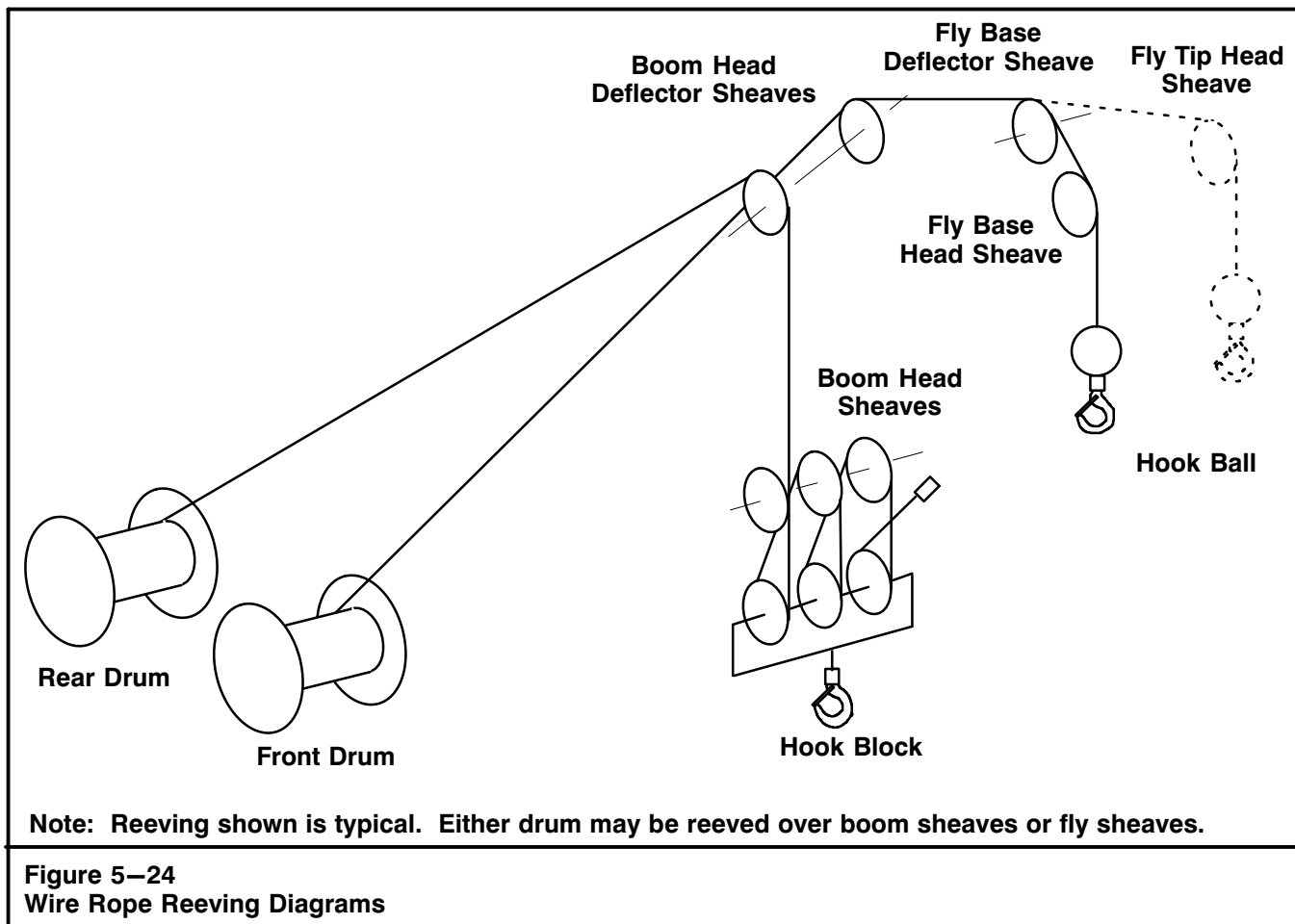
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Event Data Recording

This Link-Belt crane is equipped with one or more computers that monitor and/or control the crane's performance. This crane uses computer modules to monitor and retain crane operation, crane configuration, and as well as crane functions. These modules may aid the operator in the operation of the crane. The modules may also store data to help the Link-Belt dealer/distributor technician service the crane.

Event Data Recorder

This Link-Belt crane has an Event Data Recorder (EDR) system. The main purpose of the EDR is to record data relating to the crane operation and configuration that will assist in understanding how the crane's operating systems perform. The EDR is designed to record data related to crane dynamics and safety systems for a short period of time. The EDR in this crane is designed to record such data as:

- How various systems in the crane were operating
- How the crane was configured (counterweight, boom length, operational mode, etc.)
- What control functions were being used

This data will help provide valuable information as to how the crane was functioning and/or being operated.

Data And Recording Privacy

Important: EDR data is recorded in the crane only if a non-trivial situation occurs; no data is recorded by the EDR under normal operating conditions and no personal data (e.g., name, gender, age, or crane location) is recorded. However, other parties, such as law enforcement, or similar government offices, could combine the EDR data with the type of personal identifying data routinely acquired during a crane accident investigation.

To read data recorded by this EDR system, special equipment is required, and access to the crane and/or the EDR is needed. Link-Belt has the special equipment necessary to retrieve the recorded data.

It is the position of Link-Belt that the crane owner owns any data that is recorded and stored in the EDR or other onboard computer system(s). Link-Belt will not access this data, interpret data, or share the data with others, except by written request from the crane owner(s). The request by the crane owner may be due to an official request of police or similar government offices; as part of Link-Belt's defense of litigation through the discovery process; or as required by law. Data that Link-Belt retrieves may also be used for Link-Belt or component manufacturers for research purposes, where a need is shown and data is not tied to a specific crane or crane owner.

Link-Belt will retrieve crane data only by written request from the crane owner. The Electronic Data Recorder Request Form found at the end of this Operator's Manual can be used for this purpose.

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Crane Specifications

The following information is general in nature and is used for reference purposes only. Depending upon the vintage of the crane, some features may no longer be available. Standard and optional features may vary from crane to crane. Contact a Link-Belt Distributor or the Factory to verify the specific information if required.

Boom, Attachments, and Upper Structure

■ Boom

Design — Six section, formed construction of extra high tensile steel consisting of one base section and five telescoping sections. The two plate design of each section has multiple longitudinal bends for superior strength. Each telescoping section extends independently by means of one double-acting, single stage hydraulic cylinder with integrated holding valves.

Boom

- 38.3–164.1 ft (11.67–50.0m) six section boom
- Four boom extend modes (EM1 through EM4), controlled from the operator's cab, provide superior capacities by varying the extension of the telescoping sections:
 - EM1 extends to 164.1 ft (50.0m)
 - EM2 extends to 140.0 ft (42.7m)
 - EM3 extends to 114.6 ft (34.9m)
 - EM4 extends to 89.5 ft (27.3m)
- Mechanical boom angle indicator
- Maximum tip height for each extend mode is:
 - EM1 is 173.6 ft (52.9m)
 - EM2 is 150.2 ft (45.8m)
 - EM3 is 124.9 ft (38.1m)
 - EM4 is 100.2 ft (30.5m)

Boom Wear Pads

- Wear pads with Teflon inserts that self-lubricate the boom sections
- Bottom wear pads are universal for all boom sections
- Top wear pads are universal for all boom sections

Boom Head

- Five 16.5 in (41.9cm) root diameter nylon sheaves to handle up to ten parts of line
- Easily removable wire rope guards
- Rope dead end lugs on each side of the boom head
- Boom head is designed for quick-reeve of the hook block
- Wind speed indicator
- Aviation obstruction solar marking light and flag — optional

Boom Elevation

- One double acting hydraulic cylinder with integral holding valve
- Boom elevation: –3° to 80°

Auxiliary Lifting Sheave

- Single 16.5 in (41.9cm) root diameter nylon sheave
- Easily removable wire rope guards
- Does not affect erection of the fly or use of the main head sheaves

Hook Blocks and Balls — Optional

- 27 ton (25mt) 1 sheave quick-reeve hook block with safety latch
- 60 ton (55mt) 3 sheave quick-reeve hook block with safety latch
- 88 ton (80mt) 5 sheave quick-reeve hook block with safety latch
- 132 ton (120mt) 7 sheave quick-reeve hook block with safety latch
- 10 ton (9.1mt) swivel and non-swivel hook balls with safety latch

Fly — Optional

- 35–58 ft (10.7–17.7m) two piece bi-fold lattice fly, stowable, offsettable to 0°, 15°, 30°, and 45°. Maximum tip height is 230.4 ft (70.4m).

Fly Extensions — Optional

- One 16 ft (4.9m) lattice extension, to be mounted between the boom head and fly options. Maximum tip height is 246.1 ft (75.0m).
- Two 16 ft (4.9m) lattice extensions, to be mounted between the boom head and fly options. Maximum tip height is 261.7 ft (79.8m). Minimum of 19,200 lb (8.8t) of counterweight required.

Fly Controls

- One man assembly, minimizing ladder climbs
- Control box with fly assist and boom hoist cylinder switches located on front frame
- Sure-lock system prevents fly from ever being completely unpinned during assembly
- Speed screws for boom head and pivot point

■ Operator's Cab and Controls

Environmental Cab — Fully enclosed, one person cab of tubular and sheet steel structure with formed plastic interior panels.

Equipped with:

- Tinted and tempered glass windows
- Extra-large fixed front window with time delayed windshield wiper and washer
- Swing up roof window with windshield wiper and washer
- Sliding left side door with large fixed window

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- Sliding right side window and pop-out rear window for ventilation
- Six way adjustable, cushioned seat with seat belt and two storage compartments
- Diesel fired warm-water heater with ten air ducts for front windshield defroster and cab floor
- Air Conditioning – Integral with cab heating system utilizing the same ventilation outlets and automatic temperature control (ATC)
- Adjustable sun screen
- Dome lights with red nighttime reading LED's
- Cup holder
- Fire extinguisher
- Two position travel swing lock
- AM/FM radio
- Tilting cab (0°–20°)

Engine Dependent Warm-Water Heater – Optional – With air ducts for front windshield defroster and cab floor

Steering Column – Pedestal type with dual tilting functions for operator comfort. Column includes the following controls and indicators:

- Horn button
- Turn signal switch
- Driving light switch
- Transmission gear selector
- Transmission direction switches
- Travel park brake
- 2/4 wheel drive/range selector
- Hazard flasher

Armrest Controls – Two dual axis electronic joystick controllers or optional single axis electronic controllers for:

- Swing
- Boom hoist
- Main (rear) winch
- Auxiliary (front) winch
- Winch high/low speed switch(es)
- Warning horn button
- Swing park brake switch
- Engine throttle lock switch
- Engine set/resume switch
- Cab tilt
- Telescope override

Outrigger Controls – Hand held control box with umbilical cord gives the operator the freedom to view operation while setting the outriggers.

Foot Controls

- Boom telescope
- Swing brake
- Service brake
- Engine throttle

Upper Right Console – Controls and indicators for:

• Engine ignition	• Radio
• Engine stop	• DRI on/off selection
• Function lockout	• HVAC controller
• Front windshield wiper and washer	• Boom floodlights
• Cab lights and upper frame lights	• Rotating beacon/Strobe light
• Horn	• Top hatch wiper washer
• Dome light with switch	• Winch(es) disable
• E-stop switch	• Engine indicator gauge
	• 360° swing lock – optional

Internal RCL Light Bar – Visually informs the operator when crane is approaching maximum load capacity with a series of green, yellow, and red lights.

Integrated Third Wrap Function Kickout – Link-Belt Pulse 2.0 color display visually and audibly warns the operator when the wire rope is on the first/bottom layer and provides a function kickout when the wire rope is down to the last three wraps.

External RCL Light Bar – Optional – Visually informs the ground crew when crane is approaching maximum load capacity with a series of green, yellow, and red lights.

Rear Right Side Panel

- 12V accessory outlet (10amp)
- USB charge port

Camera Display – Located on the right A-post with an adjustable mount

- Displays right side of upper
- Displays main and auxiliary winches
- Displays rear view

Diagnostic Center – Located on the right rear wall behind the seat.

- Engine diagnostic
- RCL CANBUS diagnostic
- Master controller CANBUS diagnostic

Fuse & Relay Panel – Located on the left rear wall behind the seat.

Link-Belt Pulse 2.0 – The Link-Belt in-house designed, total crane operating system that utilizes a 10 in touch screen color display with integrated RCL and engine data, advanced diagnostics and systems monitoring, Wi-Fi capable for remote software updates, operator customizable, and a readout and operator interface for the following systems:

- **Rated capacity limiter** – LCD graphic audio – visual warning system integrated into the dash with anti – two block and function limiter. Operating data includes:
 - RCL controller USB diagnostic
 - Crane configuration
 - Boom length and angle
 - Boom head height
 - Allowed load and % of allowed load
 - RCL light bar
 - Boom angle
 - Radius of load
 - Actual load
 - Wind speed
 - Highlighted unit of measurement on working screen
 - Telescope operation displayed in real time
 - Steer mode selector
 - Outrigger position sensing
 - Drum Rotation direction indication
 - Third wrap indicator – optional
 - Diagnostics
 - Operator settable alarms with function kickout (include):
 - Maximum and minimum boom angles
 - Maximum tip height
 - Maximum boom length
 - Swing left/right positions
 - Operator defined area (imaginary plane)

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• Cab Instrumentation

- Speedometer
- Tachometer
- Engine water temperature
- Fuel level
- Hydraulic oil temperature
- Stop engine
- Check engine
- Wait to start
- Transmission oil temperature
- Diesel exhaust fluid (DEF) level⁽¹⁾
- Engine air filter high restriction light
- Regeneration light⁽¹⁾
- Regeneration inhibit switch⁽¹⁾
- Regeneration initiate switch⁽¹⁾
- High exhaust temperature light⁽¹⁾
- Regeneration disabled light⁽¹⁾
- Swing park brake light
- Engine speed
- Engine oil pressure light
- Battery voltage
- Fuel rate (gal/hr)
- Engine load
- Engine Diagnostics

⁽¹⁾ (Stage V/Tier 4F engine only)

- **Telematics** — Cellular based data logging and monitoring system that provides:
 - Location and operational settings
 - Routine maintenance
 - Crane and engine monitoring
 - Diagnostic and fault codes

■ Swing

Motor/Planetary — Bi-directional hydraulic swing motor mounted to a planetary reducer for 360° continuous smooth swing at 1.9 rpm

Swing Park Brake — 360°, electric over hydraulic, (spring applied/hydraulic released) multi-disc brake mounted on the speed reducer. Operated by a switch from the operator's cab.

Swing Brake — 360°, foot operated, speed reducing system with disc brake hold feature

Swing Lock — Two-position swing lock (boom over front or rear) operated from the operator's cab.

360° Positive Swing Lock — Optional — Meets New York City requirement

■ Electrical

Swing Alarm — Audio/video warning device signals when the upper is swinging.

Lights

- Two LED working lights on front of the cab
- Two amber strobe lights at rear of the upper frame
- LED Boom floodlight — Dual
- LED Frame work lights — right front, left rear, and work platform
- One LED working light on top of cab — optional
- Boom floodlight — High intensity remote controlled — optional
- LED electrical compartment

■ Load Hoist System

Load Hoist Performance

Main (Rear) and Auxiliary (Front) Winches — 3/4 in (19mm) Rope										
Layer	Maximum Line Pull		Normal Line Speed		High Line Speed		Layer		Total	
	lb	kN	ft/min	m/min	ft/min	m/min	ft	m	ft	m
1	20,739	92.25	168	51.2	334	101.8	114	34.7	114	34.7
2	19,066	84.81	183	55.8	363	110.6	124	37.8	238	72.5
3	17,644	78.48	198	60.4	393	119.8	134	40.8	372	113.4
4	16,419	73.04	213	64.9	422	128.6	144	43.9	516	157.3
5	15,353	68.29	227	69.2	451	137.5	154	46.9	670	204.2
6	---	---	---	---	---	---	164	50.0	834	254.2

Wire Rope Application		Diameter		Type	Maximum Permissible Load	
		in	mm		lb	kg
Main (Rear) Winch	Standard	3/4	19	37x7 rotation resistant — right lang lay (Type KC)	16,000	7 257.5
	Optional	3/4	19	35x7 rotation resistant — right lang lay (Type CC)	17,160	7 783.6
Auxiliary (Front) Winch	Standard	3/4	19	37x7 rotation resistant — right lang lay (Type KC)	16,000	7 257.5
	Optional	3/4	19	35x7 rotation resistant — right lang lay (Type CC)	17,160	7 783.6

Main and Auxiliary Winches

- Axial piston (2-speed) motors driven through planetary reduction unit for positive control under all load conditions.
- Grooved lagging
- Power up/down mode of operation
- Hoist drum cable follower

- Drum rotation indicator
- Drum diameter: 15 in (38.1cm)
- Rope length:
 - Main: 850 ft (259m)
 - Auxiliary: 600 ft (182.9m)
- Maximum rope storage: 850 ft (259m)
- Terminator style socket and wedge

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■ Hydraulic System

Counterbalance Valves — All hoist motors, boom extend cylinders, and boom hoist cylinders are equipped with counterbalance valves to provide load lowering and prevents accidental load drop when hydraulic power is suddenly reduced.

■ Counterweight

Standard — Total of 28,800 lb (13.2t) counterweight consisting of three counterweight slabs pinned to the upper with capacities for:

- 0 lb (0t) counterweight
- 9,600 lb (4.4t) counterweight
- 19,200 lb (8.8t) counterweight
- 28,800 lb (13.2t) counterweight

Hydraulic counterweight removal activated by upper frame mounted toggle switch.

Carrier

■ General

- 10 ft 11 in (3.33m) wide
- 14 ft 4 in (4.37m) wheelbase (centerline of first axle to centerline of second axle)

Frame — Box—type, torsion resistant, welded construction made of high tensile steel. Equipped with front and rear towing and tie—down lugs, tow connections, and access ladders.

- Six points of access
- Flat deck
- Three lockable storage boxes

Pintle Hooks — Optional — Front and rear available

■ Outriggers

Boxes — Two double box, front and rear welded to carrier frame

Beams and Jacks — Four single stage beams that are hydraulically controlled from the operator's cab with integral check valves.

V—CALC — Variable confined area lifting capabilities that are incorporated directly into the Pulse 2.0 display allowing multiple outrigger configurations of fully extended, intermediate, and fully retracted, with live on screen working radii, utilizing 360° charts, and swing arrest.

Pontoons — Four lightweight, serviceable, quick release, 24 in diameter (60.96cm), steel pontoons with contact area of 452 in² (2 916cm²) can be stored for road travel in storage racks on the carrier.

Main Jack Reaction — 120,300 lb (54 567kg) force and 249 psi (1 716kPa) ground bearing pressure.

■ Steering and Axles

Steering — Four independent modes consisting of two wheel front, two wheel rear, four wheel, and crab. Each mode is controlled from the Pulse 2.0 display.

Drive — Two modes: 4 x 2 and 4 x 4 for off highway travel

Axle 1 — Steered, non—driven for 4 x 2 and steered, driven for 4 x 4

Axle 2 — Steered, driven

Emergency Steer System — Optional

■ Suspension

Front — Rigid mount to the carrier frame

Rear — The rear axle is suspended on the oscillation cylinders with motion of the axle controlled by a four bar greaseless linkage system. The oscillation cylinders lockout when the upper structure rotates 2.5° past centerline.

Hydro—gas Rear Suspension — Optional

Ride Height Adjustment — Suspension can be lowered for transport using a carrier mounted toggle switch from ground level.

■ Tires and Wheels

Front and Rear — Four (single) 29.5 x 25—34 ply rating, earthmover type tires on steel disc wheels

- Spare tires and wheels — optional

■ Brakes

Service — Full hydraulic, dual circuit, disc type brakes on all wheel ends

Parking/Emergency — Spring applied type, acting on front axle

■ Electrical

Two batteries provide 24 volt starting and operation

Lights (LED)

- All lights are LED.
- Front lighting includes two main headlights and two parking/directional indicators.
- Side lighting includes outrigger lights and two parking/directional indicators per side.
- Rear lighting includes two directional indicators, two parking/brake lights, and two reversing lights.
- Electrical and battery compartment lights.

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■ Engine

Specification	Cummins QSB	
Emissions Compliance Level:	Stage V/Tier 4F ⁽¹⁾	Tier 3/Stage IIIA ⁽²⁾
Numbers of Cylinders	6	6
Cycle	4	4
Bore and Stroke: inch (mm)	4.21 x 4.88 (107 x 124)	4.21 x 4.88 (107 x 124)
Piston Displacement: in ³ (L)	408 (6.7)	408 (6.7)
Max. Brake Horsepower: hp (kW)	232 (173) @ 2,000 rpm	240 (179) @ 2,000 rpm
Peak Torque: ft lb (Nm)	700 (949) @ 1,500 rpm	728 (987) @ 1,500 rpm
Electric/starting systems: volts	24/24	24/24
Alternator: amps	140	140
Crankcase Capacity: qt (L)	15 (14.2)	15 (14.2)
- Water/fuel separator w/ heater and water in fuel (WIF) sensor 120-volt block heater — Stage V/Tier 4F 220-volt block heater — Tier 3/Stage IIIA - Grid heater — 112 amp - Mechanically driven, variable speed, engine controlled, viscous fan clutch ⁽¹⁾ Can only be sold and/or operated where Stage V/Tier 4F off-highway emission standards are accepted. ⁽²⁾ Can only be sold and/or operated where Tier 3/Stage IIIA off-highway emission standards are accepted.		

■ Transmission

Powershift — Three speed with high/low range for 6 forward and 6 reverse gears. Front axle disconnect for two or four wheel drive. Front axle disconnects in high range.

■ Fuel Tank

One 75 gallon (283.9L) capacity tank

Diesel Exhaust Fluid (DEF) tank (Stage V/Tier 4F Engine only)

- One 10 gal (37.9L) capacity tank

■ Hydraulic System

All functions are hydraulically powered allowing positive precise control with independent or simultaneous operation of all functions.

Main Pumps

- Two variable displacement, load sense, piston pumps with anti-stall for the boom hoist, boom extend, front winch and rear winch.
- One three section fixed displacement gear pump for the oil cooler, swing, steer, brakes, and outrigger.
- Combined pump capacity of 128 gpm (484.5Lpm)

Hydraulic Reservoir — 183 gal (692.7L) capacity equipped with sight level gauge. Diffusers built in for deaeration.

Filtration — One 5 micron, full flow return line filter. Accessible for easy filter replacement.

Hydraulic Oil Coolers — One carrier mounted cooler removes heat from the hydraulic oil. Remote mounted on right side of the carrier.

■ Pump Drive

All pumps are mechanically driven by the diesel engine.

■ Maximum Speed

15 mph (24.14 km/h)

■ Paint

Entire machine is pre-painted and oven baked with Highsolid Paint (2 part epoxy/polyester) and/or (2 part epoxy primer/2 part polyurethane top coat). Standard Link-Belt Red, Link-Belt Gray, and Gloss Black colors apply.

■ Additional Equipment Options

- Spark arrestor (export only)
- Engine air intake shutoff valve
- Cold weather package (domestic only)
- Arctic weather package (domestic only)
- Filter kits

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■ Gradeability

Counterweight	Ascending		Descending		Side	
	Degrees	% Grade	Degrees	% Grade	Degrees	% Grade
0	17.0	31%	5.0	9%	3.0	5%
9,600 lb (4.4t)	15.0	27%	14.0	25%		
19,200 lb (8.8t)	14.0	25%	14.0	25%		
28,800 lb (13.2t)	13.0	23%	13.0	23%		

Axle Loads

Base Machine Includes: two winches with cable followers, standard wire rope length, full counterweight, dual boom flood lights, auxiliary lifting sheave, two—piece fly, 60t hookblock, and 10t hookball.			Gross Vehicle Weight ⁽¹⁾		Front Axles		Rear Axles	
			lb	kg	lb	kg	lb	kg
	Stage V/Tier 4F		123,540	56 037	58,433	26 505	65,106	29 532
	Stage 3A/Tier 3		122,861	55 729	58,136	26 731	64,725	29 359
Remove	Full 28,800 lb (13.2t) Counterweight		−29,068	−13 185	10,157	4 607	−39,224	−17 791
	Two—piece Fly		−2,650	−1 202	−4,096	−1 858	1,446	656
	Auxiliary Lifting Sheave		−110	−50	−293	−133	183	83
	60t Hookblock		−1,400	−635	−2,124	−964	724	329
	10t Hookball		−580	−263	−880	−400	300	136

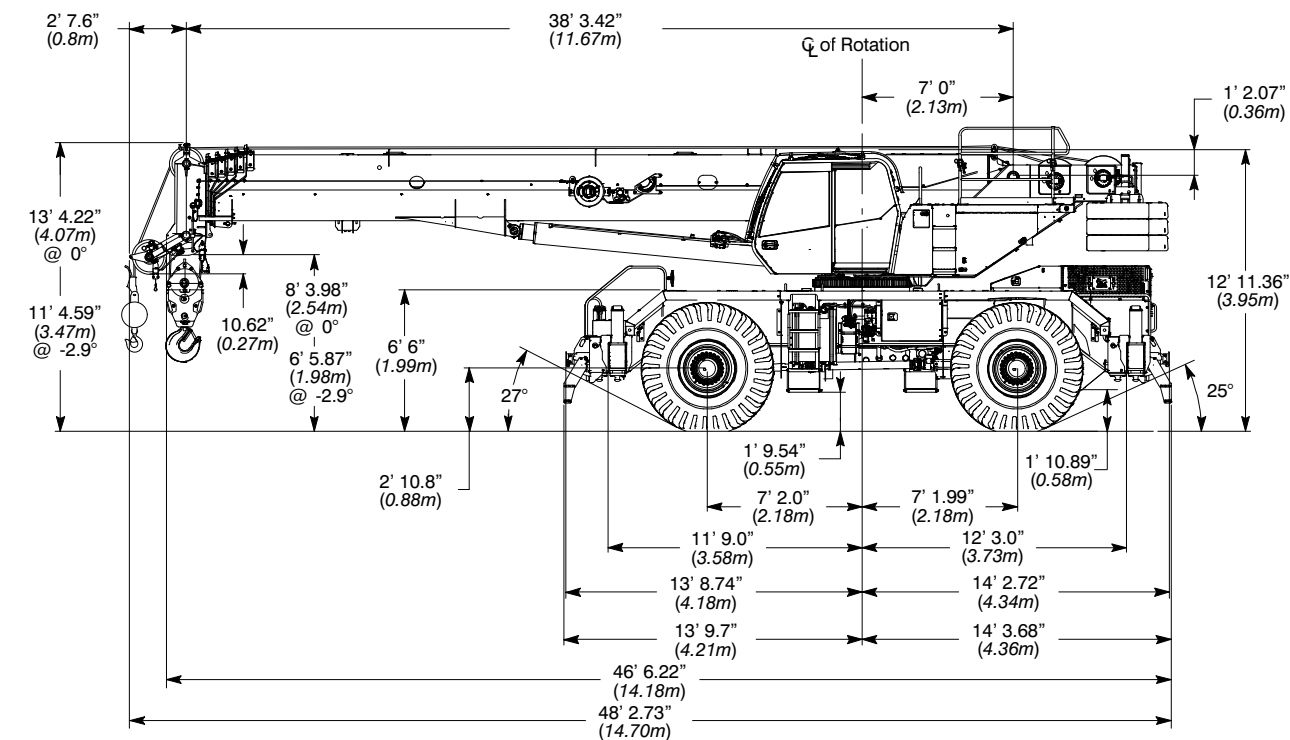
Tire	Maximum Allowable Axle Load @ 15 mph (24.1km/h)
29.5 x 25 (34—PR)	72,800 lb (33 021kg)

⁽¹⁾ Adjust gross vehicle weight and axle loading according to component weight.

Note: All weights are ±3%.

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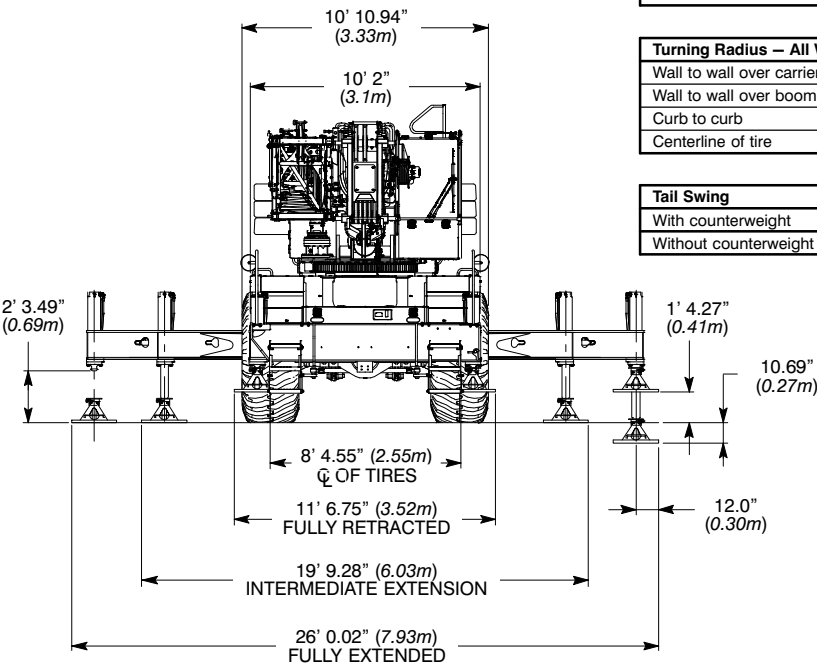
General Dimensions



Turning Radius – Front Wheel (4x2) Steering	English	Metric
Wall to wall over carrier	46' 11"	14.30m
Wall to wall over boom attachment	56' 8"	17.30m
Curb to curb	45' 4"	13.80m
Centerline of tire	43' 11"	13.40m

Turning Radius – All Wheel (4x4) Steering	English	Metric
Wall to wall over carrier	27' 2"	8.30m
Wall to wall over boom attachment	38' 11"	11.80m
Curb to curb	25' 4"	7.70m
Centerline of tire	24' 0"	7.30m

Tail Swing	English	Metric
With counterweight	14' 2"	4.32m
Without counterweight	13' 0"	3.96m



Not To Scale

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Fundamental Terms 6–1

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Fundamental Terms

Many terms are used which refer to crane function, assembly, operation, and maintenance. The following list gives a brief definition as to how the terms are used in Link-Belt technical literature.

A-frame Jib: The outer most attachment on a hydraulic boom, made of structural channel steel, which is connected to the fly section and is supported by pendants.

ABS: Anti—Lock Braking System or American Bureau of Shipping

Accumulator: A container in which fluid is stored under pressure as a source of hydraulic energy.

Aeration: The condition when air is present in the hydraulic fluid. This causes the fluid to appear milky and components to operate erratically because of the compressibility of air trapped in the fluid.

Aerial Platform: A work platform attached to the main boom head shaft, approved for personnel handling.

Anemometer: An instrument for measuring the direction and force, or velocity, of the wind; a wind gauge.

Angle Jib: A multiple section steel angle iron boom tip extension supported by pendants.

Annually: Once a year

Anti-Lock Braking System (ABS): A system that allows the wheels on the crane to maintain tractive contact with the road surface, preventing the wheels from locking up (ceasing rotation) and avoiding uncontrolled skidding.

Anti-Two Block System (ATB): A system of electro-mechanical devices used to prevent the crane operator from two blocking the crane. Also see “Two Block”.

API: American Petroleum Institute

ATB: Anti-Two Block

ATC: Hydraulic All Terrain Crane

Attachment: 1. The boom assembly, fly section, offset fly section, telescoping fly section, tubular jib, A-frame jib, or the combination of them. 2. The lattice boom assembly and either an angle jib or tubular jib or the combination of both.

Audio/Visual Warning System: 1. Alarm device that signals the operator of low engine oil pressure, high engine coolant temperature, and high hydraulic oil and transmission oil temperature. 2. Device utilizing buzzer and/or lights as a signal of approaching two block and/or overload condition. See “Rated Capacity Indicator”.

Auger: A boom attachment used to drill holes into the ground.

Automatic Brake: Drum brake system that is applied automatically any time the drum control lever is in neutral.

Auxiliary Lifting Sheave: A unit which connects to the boom head machinery cross shafts and is used for reeving winch wire rope for a second (auxiliary) winch drum.

Auxiliary Transmission (Creeper Transmission): An additional transmission used in the carrier to provide a low gear ratio for slow, careful movement around the job site and higher ratios for normal use.

Backstop: A device used to limit the angle of the boom, jib, or mast at the highest recommended angle.

Backward Stability: Resistance to overturning of the crane in a rearward direction.

Bail (Hanger): A frame equipped with sheaves. The bail is used in conjunction with the hoist drum(s) and bridle(s) to alter the crane's main boom, luffing boom, and/or luffing jib angle.

Balance Arm: An assembly that attaches to the top of the luffing boom and is connected to the live mast with pendants. It provides a point to attach the luffing jib and luffing jib strut. It also contains a bail assembly for luffing jib hoist reeving.

Band Brake: Circular external contracting type brake having a strap lined with heat and wear resistant friction material.

Bar Pendants: Pendants fabricated from high strength steel plate vs. the normal multi-wired wire rope pendants.

Base Section: 1. The segment of a telescoping boom that attaches to the upper frame by the boom foot pin. 2. The lower most section of a lattice boom, tower boom, or luffing boom. 3. The lower most section of any fly or jib.

Basic Boom: Lattice boom attachment made up of only the base and top sections of the boom.

Basic Jib: Jib attachment made up of only the base and top sections of the jib.

Boom: 1. The assembly of the base and one or more sections (inner power, inner mid, middle, center, outer power, outer mid, T1 through T7, manual, tip, etc.) used as the telescoping extension for a two, three, four, five, six, or seven section hydraulic attachment. 2. Lattice structure consisting of multiple sections, pinned or bolted together to a specific length, and their support system.

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Boom Angle: The angle above or below horizontal of the longitudinal axis of the boom.

Boom Angle Indicator: An accessory which measures the angle of the boom relative to horizontal.

Boom Chord: A main corner structural member of a boom.

Boom Foot: Base of boom where it attaches to the upper revolving frame.

Boom Hoist: 1. The hydraulic method of raising and lowering the boom to different boom angles. 2. Wire rope drum and its drive, or other mechanism, for controlling the angle of the boom.

Boom Lattice: Structural truss members at angles to, and supporting, the boom chords of a boom.

Boom Length: The distance from a straight line through the centerline of the boom foot pin to the centerline of the boom head sheave shaft, measured along the longitudinal axis of the boom.

Boom Section: 1. The base, inner power, inner mid, middle, center, outer power, outer mid, T1 through T6, manual, tip, etc. segments which are used as part of a telescoping attachment. 2. Individual lattice structures which are pinned together to form the boom attachment. Lattice booms are usually in two basic sections, top and base. Such booms may be lengthened by insertion of one or more additional extension sections.

Bridle: A frame equipped with sheaves. The bridle is used in conjunction with the hoist drum(s) and bail(s) to alter the crane's main boom, luffing boom, and/or luffing jib angle.

Bumper (5th) Outrigger: An outrigger mounted on the front of the carrier that provides additional stability for "On Outrigger" capacities when deployed.

Bypass: A secondary passage of fluid, air, or electrical flow, in addition to the main flow path.

Cab Walk: Platform attached to the operator's cab that provides a walkway along the side of the cab.

CALC: Confined Area Lifting Capacities

Cantilever: Any unsupported boom or jib section that projects beyond the supporting point.

Capacity Chart: The plate or plates on the crane or charts in the Crane Rating Manual which gives rated lifting capacities for the crane under different load conditions, crane configurations, and setups.

Carbody: The crawler lower upon which the upper revolving frame is mounted.

Carrier: The portion of the crane below the turntable bearing.

Carrier Cab: A housing which covers the driver's station on the carrier of a truck crane.

Carrier Frame: The main structure of the carrier section of the crane.

Carrier Roller: Rollers of track mechanism which are not power driven but are used to guide the track along the top of the side frame.

Catwalk: Platforms attached to the crane that provide a walkway along the side of the upper.

Cavitation: A condition where air is introduced into a cavity, line, or chamber normally filled with oil. This condition can cause damage to pumps, cylinders, valves, etc.

Center Section: See "Middle Section".

Check Valve: A valve which permits flow in one direction only.

Chord: A main corner structural member of a lattice boom, fly, or jib section.

Circuit: A complete or partial path over which electrical current, air, or hydraulic fluid may flow.

Clamshell Bucket: A device consisting of two or more similar scoops hinged together and used for digging and moving material.

Closed Center Circuit: A circuit where the fluid only flows through the main control valves when a control valve spool is actuated. This can be done two different ways: (1) using a pressure compensated pump or (2) using a fixed displacement pump, unloading valve, and an accumulator.

Closing Line: The wire rope reeved from the hoist drum to control closing of the clamshell bucket.

Clutch: A friction, electromagnetic, hydraulic, or pneumatic device for engagement or disengagement of power.

Collector Ring (Slip Ring): A device used to transmit the electrical power from the carrier to the upper utilizing a rotating disk to allow rotation of the upper and maintain connectivity.

Compressibility: The change in volume of air, fluid, or gas when it is subjected to a unit change in pressure.

Concrete Bucket: Bucket for handling wet concrete, fitted with bail or bridle, usually handled on lifting crane for hoisting to dumping location.

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Conical Roller: A device which attaches the upper to the carrier and allows the upper to rotate on the carrier.

Counterbalance Valve (Holding Valve): A valve which regulates fluid flow by maintaining resistance in one direction, but allows free flow in the other direction.

Counterweight: Weight used to supplement the weight of the crane in providing stability for lifting loads.

Cracking Pressure: The pressure at which a pressure actuated valve begins to open to allow flow.

Crane Configuration: The relative position and arrangement of the parts or elements of the crane e.g. amount of counterweight, attachment position, outrigger position, side frame position, etc.

Crane Rated Capacity: The maximum weight allowed to be lifted with the crane setup in a particular crane configuration.

Crane Rating Manual: A compilation of the necessary information needed to plan lifts with the crane. It includes instructions such as the allowable Lifting Capacity charts, Working Range diagrams, Working Area diagram, etc.

Crane Set Up: The act or instance of preparing the crane for operation which entails the positioning of the crane and its elements. It concerns such details or items such as finding a suitable location to perform the lift, setting the outrigger position, leveling, cribbing or blocking of the crane, etc.

Crawler Lower: The portion of a crawler crane below the turntable bearing.

Creep: Crane movement limited to 200 ft (60.96m) in a 30 minute period, and not to exceed 1 mph (1.6km/h) maximum speed.

Creeper Transmission: See "Auxiliary Transmission".

Cylinder: A device which converts fluid power into mechanical force and motion. It usually consists of a moveable element such as a piston and piston rod, which operates within a cylindrical bore.

Data Logging: See "Event Data Recording".

Delivery: The volume of fluid discharge by a pump in a given time, usually expressed in gallons per minute (gpm) or liters per minute (L/min).

Derricking: Operation of changing boom angle in a vertical plane. See "Boom Hoist".

Displacement: The quantity of fluid which can pass through a pump, motor, or cylinder in a single revolution or stroke.

Double Acting Cylinder: A cylinder in which fluid force can be applied in either direction.

Drag Rope (Inhaul Rope): Wire rope for pulling in bucket during dragline operations.

Dragline: Cranes with dragline attachments are generally used to excavate material from below the grade on which the crane is placed. A dragline bucket is loaded by the drag rope pulling it toward the crane, is lifted and carried by the hoist wire rope reeved over the boom point sheave, and is balanced by the dump wire rope interconnecting the drag and hoist wire ropes.

Drive Chain: Chain used to transfer power from the horizontal traction shaft to the track drive sprocket.

Driver Controlled Differential Lock: A driver operated device which locks the differential gears to prevent wheel spin and provide better traction on slick surfaces.

Drum Lagging: See "Winch Drum".

Drum Rotation Indicator: A device that is used to indicate winch drum motion and can also be used to monitor speed.

Engine Cooling Package: Typically consists of the radiator, surge tank, and engine fans. Can also include such components as the hydraulic oil cooler, transmission oil cooler, and charged air cooler.

Event Data Recording (EDR): May be one or more devices that monitor and/or control the crane's performance. These devices can record crane operation, configuration, and function.

Extension (Boom Or Jib): Sections of the boom or jib which come in various lengths and are used to increase the overall length of the boom or jib.

Fairleader: A combination of sheaves and or rollers mounted at the front of the crane to guide the drag wire rope.

Fan Post: An assembly that attaches to the luffing boom cap and controls the movement of the luffing jib. The front fan post provides a connection for the luffing jib pendants. The rear fan post is connected to the luffing jib's floating bridle with pendants. Center links are used to connect the front and rear fan posts.

Filter: A device which functions to remove insoluble contaminants from a fluid by a porous media.

Fixed Jib: A jib that is attached to the end of the luffing jib.

Float: See "Pontoon".

Flow Divider: A valve which divides a flow of oil into two circuits.

Fly Base (Fly Base Section): The lower most section of the fly.

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Fly Extension: A fly section, other than the base or tip section, used to increase the overall length of the fly.

Fly Section: Boom tip extension, pin supported at its base.

Force: Any cause which tends to produce or modify motion. In hydraulics, total force is expressed by the product of pressure (P) and the area of the surface (A) on which the pressure acts. (Force = P X A)

Fourth Drum: A fourth hoist drum, in addition to two main hoist drums and a third hoist drum.

Frame: Structure on which either upper or carrier machinery is attached.

Free-Fall: Lowering of the hook and/or load without using power. The motion is caused by gravity and must be controlled by a brake.

Freely Suspended Load: Load hanging free with no direct external force applied except by the hoist line.

Friction: The property which tends to resist the relative motion of one surface in contact with another surface. It always exerts a "Drag" in the direction opposite of the motion, thus consumes power.

Friction Clutch (PTO): Device (which uses friction discs) used for the transfer or transmission of engine power to the operating functions of the crane.

Full Flow: In a filter, the condition where all the fluid must pass through the filter element.

Full Load Speed: The speed at which an engine runs when it is delivering its full rated horsepower.

Full Power Boom: Hydraulic telescopic boom with cylinders, or cylinders and cables, to extend/retract each extendable section of the boom.

Function Limiter (Function Lockout, Hydraulic Cut-outs, Hydraulic Kickouts): Devices incorporated into the anti-two block system or Rated Capacity Indicator system which will disable the crane function of winch up, telescope out, and/or boom down (as applicable) as two block or overload situations approach.

Function Lockout: See "Function Limiter".

Gantry: A structural frame, mounted to the rear of the upper revolving frame and usually extending above the cab. Retractable means are usually available to lower to cab height for transportation convenience. Its purpose is to support the boom hoist system.

Gradability: The slope which a crane can climb expressed as a percentage. (45° equals 100% slope.)

Ground Pressure: Weight of crane divided by the area of the surface directly supporting the crane.

Grouser: Projecting lugs attached to, or integral with, track shoes to provide additional traction.

Guard Rails: Rails used to help provide safety (prevent falls) for personnel when required to be on the upper platforms of the crane during maintenance and/or adjustment procedures.

Hanger: See "Bail".

HC: Highway Crane

HCD: Hydraulic Cab Down

Head Machinery: An arrangement of sheaves on the end of an attachment used to reeve wire rope.

High Idle: Governed engine speed at full throttle and no load.

HLA: Heavy Lift Attachment

Hoist: Function of lifting and lowering loads.

Hoist Drum: A rotating cylindrical spool with side flanges used to wrap the winch wire rope during the raising and lowering of the load with the winch.

Hoist Wire Rope: The wire rope used to reeve the winch and the attachments for lifting loads.

Holding Valve: See "Counterbalance Valve".

Hook Ball: Ball with hook attached and used for lifting service. It is used with one part of line only.

Hook Block: Block with hook attached used in lifting service. It may have a single sheave for two or three part line, or multiple sheaves for four or more parts of line.

House Assembly: The housing which covers the machinery mounted on the upper revolving frame.

HSC: Hitachi Sumitomo Heavy Industries Construction Crane Co., Ltd.

HSL: Hitachi/Sumitomo/Link-Belt

HSP: Hydraulic Self-Propelled, Rough Terrain Crane.

HT: Hydraulic Truck

HTC: Hydraulic Highway Truck Crane

HTT: Hydraulic Truck Terrain Crane

Hydraulic Cutout: See "Function Limiter".

Hydraulic Kickout: See "Function Limiter".

Hydraulic Reservoir (Sump Tank): The storage tank for hydraulic fluid.

Idler Roller: Rollers of track mechanism which are not power driven but are used to maintain proper tension on the track.

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Inhaul Rope: See “Drag Rope”.

Inner Mid Section: The segment of a four section telescoping boom which is attached to the base and outer mid sections.

Instability: A “tipping condition” in which the moments acting to overturn a crane exceed the moments acting to resist overturning.

Jack Shaft: Term applied to an intermediate shaft used to transfer power.

Jib: A pendant supported extension attached to the boom or fly head to provide added boom length for handling specified loads. The jib may be in line, or offset, with the boom.

Jib Base (Jib Base Section): The lower most segment of the jib.

Jib Extension: A jib section, other than the base or tip section, installed to increase the overall length of the jib.

Latching Boom: Hydraulic telescopic boom that uses one telescope cylinder to extend/retract all sections of the boom. The cylinder extends/retracts one section at a time and pins them in place until desired length is reached based on the boom extend mode selected.

Lattice Boom: Boom of open construction with angle, or tubular, lacing between main corner members (chords) in the form of a truss.

LBCE: Link-Belt Construction Equipment

Lifting Capacity: The rated load for any given load radius and boom angle under specified operating conditions and crane configurations.

Line Pull: The wire rope pull generated off a wire rope drum or lagging at a specified pitch diameter.

Line Speed: The wire rope velocity at a wire rope drum or lagging at a specified pitch diameter.

Live Mast: Frame hinged at or near the boom foot and extending above the cab for use in connection with supporting a boom. Head of mast is usually supported and raised or lowered by the boom hoist wire ropes.

LMI: Load Moment Indicator.

LML: Load Moment Limiter.

Load Factor: Load applied at the boom tip which gives the same moment effect as the boom mass.

Load Indicator: A device for measuring and displaying the net load being lifted.

Load Line: Another term for “Hoist Rope”. In lifting crane service it refers to the main hoist. The secondary hoist is referred to as a “Whip Line”.

Load Moment Indicator (LMI): See “Rated Capacity Indicator”.

Load Moment Limiter (LML): A device which aids the operator by automatically sensing the overturning moment of the crane, i.e. load X radius. It compares this lifting condition to the crane’s rated capacity, provides an audible/visual signal when the loading conditions approach the rated capacity, and when the rated capacity is reached and/or exceeded, it limits crane functions that would result in an overload condition.

Load Radius: Horizontal distance from a projection of the axis of rotation to the supporting surface, before loading, to the center of the vertical hoist line or tackle with load applied. See “Radius”.

Load Stepping: The procedure of moving a load without traveling the crane when conditions do not allow traveling with a load (pick and carry). Park the crane on a level area, lift the load, swing around, and set it down ahead of the crane. Travel the unloaded crane beyond the load, level the crane, lift the load, swing, and set it down farther along the route. Continue this procedure until the load is at its destination.

Loaded Boom Angle: The angle between the boom base section and horizontal with a freely suspended load at the rated radius.

Lower Roller: See “Track Roller”.

LS: A track driven crawler crane.

Luffing Attachment: A crane attachment adaptable to a basic cable crane. The attachment consists of a vertical luffing boom which is capable of being offset, with a luffing jib (usually the basic crane boom) affixed to the upper part of the luffing boom.

Luffing Boom: The main boom of the luffing attachment. It is connected to the upper frame of the crane and can be set at certain angles to provide different working ranges for the luffing attachment.

Luffing Boom Cap: A structure mounted to the top of the luffing boom where the luffing jib and fan post are mounted.

Luffing Jib: The working boom of the luffing attachment. It is connected to the luffing boom cap.

Manual Section: The outer most segment (tip) of a four or five section telescoping boom attached to the outer mid section. This boom section shares the tele-

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scope cylinder used to operate the outer mid boom section. This section also contains the head machinery of the attachment.

Mat: Material, usually of timber or wire construction, for supporting pontoons or tracks on soft surfaces to add stability.

Middle Section (Mid Section): The segment of a telescoping boom which is midway between the base and tip sections.

Midpoint Pendants: Wire rope pendants used to support the center portion of a long lattice boom at lift off.

Motor (Hydraulic): 1. A rotary motion device which changes hydraulic energy into mechanical energy.
2. A rotary actuator.

No Load Stability Limit: The radius or boom angle beyond which it is not permitted to position the boom because the crane can overturn without any load on the hook.

Offset Fly: A fly section that is capable of being pinned at different working angles for greater reach or height. The working angle can also be changed with hydraulic cylinders.

Oil Cooler: A heat exchanger used to remove heat from the hydraulic or transmission fluid.

Open Center Circuit: A circuit where the pump continuously circulates fluid through the control valves when they are in a neutral position.

Operational Aid: An accessory that provides information to facilitate operation of a crane or that takes control of particular crane functions without action of the operator when a limiting condition is sensed.

Operator's Cab (Upper Cab): A housing which covers the operator's station.

Outer Mid Section: The segment of a four section hydraulic boom which is attached to the inner mid and manual or tip sections.

Outrigger: An extendable supporting device used to level the crane and increase stability.

Outrigger Beam: The part of the outrigger which extends horizontally and acts as the support for the outrigger jack.

Outrigger Jack: The hydraulic cylinder on the outrigger beam which extends vertically to raise and lower and support the crane during on outrigger operations.

Outrigger Pin System: A hydraulic system available to facilitate outrigger box removal by means of hydraulic cylinders used in place of the standard outrigger box mounting pins.

Outrigger Removal System: A system for removing front and rear outrigger boxes in order to reduce overall weight.

Pawl: A pivoting locking lever which will permit movement in only one direction. Movement in the opposite direction can be achieved only by manually releasing the mechanism.

Peak Section: See "Top Section".

Pendant: A supporting wire rope or bar, which under tension, maintains a constant distance between its points of attachment.

Pick And Carry: The crane operation of lifting a load and traveling with it suspended.

Pilot Pressure: Hydraulic pressure used to actuate or control hydraulic components.

Pinion: The small gear in a gear train which drives the other gears.

Pitch Diameter: Root diameter of drum, lagging, or sheave, plus the diameter of the wire rope.

Planetary: A set of gears used to either speed up or slow down the input vs. the output to gain speed or power, whichever is applicable.

Platform: A device (basket, work platform, bucket, cage, etc.) designed and fabricated with its intended use being to position personnel.

Pontoon (Float): The support which attaches to the outrigger jack to increase the supporting area.

Poppet: A disc, ball, or cone shaped part of certain valves, which when closed against a seat, prevents flow.

Port: The open end of a passage. May be within or at the surface of a hydraulic component housing or body.

Power Take-Off (PTO): Device used for the transfer or transmission of engine power to the operating functions of the crane.

Pressure: Force per unit of area usually expressed in pounds per square inch (psi) or Kilopascals (kPa).

Pressure Drop: The reduction in pressure between two points in a line or passage due to the energy lost in maintaining flow.

Pressure Reducing Valve: A valve which limits the maximum pressure at its outlet regardless of the inlet pressure.

PTO: See "Power Take-Off".

Pulse: A Link—Belt designed, total crane operating system that utilizes an in—cab display as a readout and

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operator interface with on—board diagnostics including the rated capacity limiter, wind speed, boom length and angle, radius of load, and crane configuration.

Pump (Hydraulic): A device which converts mechanical force and motion into hydraulic fluid flow.

Pump Disconnect: Device which engages and disengages the main hydraulic pump. Disengaging the pump aids in engine start up by reducing cranking resistance.

Radius: The horizontal distance from the centerline of rotation of the crane, with no load, to the center of gravity of the hook or suspended load.

Radius Of Load: The horizontal distance from the centerline of rotation of the crane to the center of gravity of the suspended load.

Rated Capacity Indicator (RCI): A device that automatically monitors radius, load weight, and load rating and warns the crane operator of an overload condition.

Rated Capacity (Load) Limiter (RCL): A device that automatically monitors radius, load weight, and load rating and prevents movements of the crane that would result in an overload condition.

Rated Load Indicator (RLI): See “Rated Capacity Indicator”.

RCI: Rated Capacity Indicator

RCL: Rated Capacity Limiter

Reeving: Passing of ropes over pulleys and/or sheaves.

Relief Valve: A pressure operated valve which bypasses pump delivery to the reservoir, limiting system pressure to a predetermined maximum value.

Reservoir: A container for storage of fluid.

Restriction: A reduced cross-sectional area in a line which produces a pressure drop.

Rigging Switch (System Override Switch): A switch which can be used to override any or all of the function limiters (cutouts) which have been activated on the crane during crane rigging/set up.

Rope: Refers to wire rope unless otherwise specified. See “Wire Rope”.

Rotating Joint: Component which transfers fluid, air, and/or electricity between a stationary and a rotating member.

Rotating Joint And Center Section: The assembly of the rotating joint and all its pneumatic, hydraulic, and electrical components.

RTC: Hydraulic Rough Terrain Crane.

Schematic: A diagram or representation of a system showing everything in a simple way. No attempt is made to show the various devices in their actual relative positions. A schematic points out the operation of a circuit for troubleshooting purposes.

SCM: Sumitomo Construction Machinery

Seasonally: Four times per year

Semiannually: Twice per year

Service Brake: A foot operated brake which regulates the amount of air or fluid delivered to the brake chamber, which determines the braking force.

Shall: The word shall is to be understood as mandatory.

Shim Pack (Wedge Pack): Wedging mechanism used to secure crawler crane side frames to the lower frame.

Should: The word should is to be understood as advisory.

Side Frame: Supporting structure of the track mechanism. Side frames are attached to the crawler crane lower frame and may be extendable and/or removable.

Side Load: 1. Load applied at an angle to the vertical plane of the boom. 2. Horizontal side force applied to the lifted load either on the ground or in the air.

Single Acting Cylinder: A cylinder in which fluid power can only be used in one direction. Another force must be used to return the cylinder.

Slew: See “Swing”.

Slip Ring: See “Collector Ring”.

SmartFly: Simple one—person fly erection and storage technology that minimizes work at height.

Speed-O-Matic (S-O-M): A term which applies to the hydraulic control system originally developed to apply two shoe clutches for transmission of power on Link-Belt products.

Spool: Term applied to almost any moving cylindrically shaped part of a hydraulic component which moves to direct flow through the component.

Sprocket: The driving element of the track mechanism. Receiving power through the drive chain, the sprocket meshes with the track to travel the crawler.

Strainer: A filtering device for the removal of coarse solids from a fluid.

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Stroke: The length of travel of a piston, spool, lever, etc.

Structural Member: Lattice booms, telescopic booms, jibs, gantries, masts, outriggers, carrier frames, and upper frames are considered structural members per ASME B30.5

Suction Line: The hydraulic line connecting the pump inlet port to the hydraulic reservoir.

Sump Tank: See "Hydraulic Reservoir".

Support Line: The cable reeved from the second hoist drum for holding the clamshell bucket suspended during dumping and lowering operations.

Surge: A very sudden rise in the hydraulic or air pressure or electrical potential in a circuit.

Swing (Slew): The rotation of the upper with the carrier remaining stationary.

Swing Brake: A brake which is used to stop the rotation of the upper.

Swing Lock: A mechanical lock that engages with the upper frame in any position over the lower frame.

Swing Motor: Hydraulic device which uses a planetary to rotate the upper on the carrier.

Swing Park Brake: A self contained brake used for holding the upper, in any position, during normal, stationary crane operations.

System Override Switch: See "Rigging Switch".

T1 Section Through T7 Section: Segments of a hydraulic boom. Some are numbered starting with the base section while others are numbered starting with the section next to the base section.

Tagline: A wire rope or cable attached to the bucket and a spring loaded, counterweighted, or powered unit keeping it under tension to retard rotation and pendulum swaying of the otherwise freely suspended bucket.

Tailswing: The distance from the centerline of rotation of the upper frame to the extreme rear swing arc of the counterweight.

TC: 1. Tower crane 2. An upper mounted on any supporting pedestal other than the usual crane lower.

TCC: Telescopic Crawler Crane.

Telematics: The use of wireless devices and computer module technology to transmit data in real time back to an organization.

Telescoping Fly: An extension to the fly section which is stored through its center. Mounted on rollers, this ex-

tension is easily erected by telescoping (pulling) it out of the center of the fly and then pinning it into position.

Third Drum: A third hoist drum, in addition to two main hoist drums, often used in piledriving.

Tip Section: The outer most live segment of a telescopic boom. It is attached to a middle, or outer mid, section and contains the head machinery of the attachment.

Top Section (Peak Section): The upper most section of a lattice boom or jib which also contains the head machinery of the attachment.

Torque: Turning or twisting force usually measured in foot-pounds (ft lb) or Newton meters (Nm).

Torque Converter (PTO): Device (which uses hydraulic fluid) used for the transfer or transmission of engine power to the operating functions of the crane.

Tower Attachment: A crane attachment usually adaptable to a basic crane. The attachment consists of a vertical tower with a working boom and/or jib attached to the upper part of the tower.

Track: 1. Assembled crawler track shoes and connecting pins around idler rollers and drive sprockets. 2. That part of the crawler which contacts the ground.

Track Roller: Rollers of track mechanism which are not power driven but are used to guide the track along the ground.

Traction Shaft: The horizontal shaft in the crawler lower which transfers power from the gear train in the upper to the track mechanism of the carrier.

Travel Swing Lock (2 Position Swing Lock): A mechanical lock that engages with the upper directly over either the front or the rear of the carrier only. Use of the travel swing lock is mandatory when traveling or transporting the crane and during pick and carry operations.

Tubular Jib: Multiple section lattice extensions supported by pendants and attached to the main boom head.

Turntable Bearing: A large bearing which attaches the upper to the carrier allowing the upper to rotate on the carrier.

Two Block: The situation when the crane's hook block, hook ball, or load contacts the attachment's head machinery.

Two Block Warning System: A system of electromechanical devices used to warn the crane operator of an impending two block condition.

UC: Utility Crane

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Unloading Valve: A valve which bypasses flow to tank when a set pressure is maintained on its pilot port.

Upper: The portion of the crane above the turntable bearing.

Upper Cab: See "Operator's Cab".

Upper Revolving Frame: The main structure of the upper section of the crane which serves as mounts for other components of the upper.

Upper Roller: See "Carrier Roller".

V—CALC (Variable Confined Area Lifting Capacities): Lift system that features infinite outrigger/crawler configurations with real time 360° charts.

Valve: A device for controlling flow rate, flow direction, or pressure of a fluid.

Viscosity: The resistance to flow. High viscosity indicates a high resistance; low viscosity, a low resistance.

Wedge Pack: See "Shim Pack".

Whip Line: Secondary hoist line. Also see "Load Line".

Winch: Function of lifting and lowering loads.

Winch Drum: A rotating cylindrical spool with side flanges used to wrap the winch wire rope during the raising and lowering of the load with the winch.

Winch Rope: The wire rope used to reeve the winch and the attachments for lifting loads.

Wire Rope (Rope): A flexible, multiwired member usually consisting of a core member around which a number of multiwired strands are helically wrapped.

Wiring Diagram: A diagram which includes all the devices in an electrical system and shows their functional relationships to each other. Such a diagram gives the necessary information for physically tracing circuits when troubleshooting is necessary.

Work Platform: See "Platform".

Working Area: Area measured in a circular arc about the centerline of rotation as shown on the Working Areas diagram.

Working Weight: Weight of crane with full radiator, half full fuel tank, and attachments installed.

YC: Yard Crane

360° Swing Lock: A positive mechanical lock against rotation of the upper over the carrier during normal, stationary crane operations.

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Notes:

Link-Belt Cranes
2651 Palumbo Drive
Lexington, Kentucky 40509
(859)-263-5200
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ELECTRONIC DATA RECORDER REQUEST FORM

We, _____, hereby request
(Company Name)
Link-Belt Cranes (LBC) retrieve, interpret, and
provide a summary of the electronic data recovered from the computer system
installed by LBC on model _____, with assigned serial
number _____.

We request the following data be retrieved:
(Place check mark in box for information requested)

Operational Mode (computer set-up)
Boom Length
Boom Angle
Load Radius
Counterweight Configuration
Lifted Load(s)
Number of Lifts
Anti -Two Block (ATB) Status
Status
Other

Note: All data may not be available for every crane model:

Date(s) and Time Range(s) of data requested: _____

The time to reply to this inquiry will be three (3) weeks from the time the data is received by the Link-Belt Cranes Technical Product Support Department in Lexington Kentucky. The reply time may increase due to the amount of Data, and/or the Date and Time Range requested.

Link-Belt Cranes may assess a charge to provide the service of retrieve and interpretation of the data requested, plus travel time that may be involved by a Link-Belt Cranes representative to retrieve the data.

Requesting Company Representative

Date

