Crane Serial Number

The crane serial number is on the Crane Rating Manual in the lower right interior of the upper operator's cab. The serial number and a Vehicle Identification Number (VIN) is also stamped on a plate on the left side of the carrier cab dash. The crane serial number should always be furnished when ordering parts for the crane, or when corresponding with the Link-Belt Distributor or Factory regarding the crane. The serial number is the only method the Link-Belt Distributor or Factory has of ensuring that the correct parts and/or information will be furnished.

In the event the serial number cannot be found, a number is stamped on the outside of the right carrier frame rail to the rear of the right front tires and on the right side of the upper frame near the swing reduction unit. 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.

An Operator’s Manual is stored in the pocket on the rear of the seat in both the carrier and upper operator’s cab. The Operator’s Manuals should remain in the cabs and accessible at all times. **If either of the Operator’s Manuals 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.

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 seat of the carrier or upper operator's cab with the upper directly over the front of the carrier, 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, 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.** Information contained on such labels, decals, and plates 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:

DANGER

An operating procedure, practice, etc. which, if not correctly followed, will result in severe personal injury, dismemberment, or loss of life.

WARNING

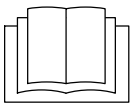
An operating procedure, practice, etc. which, if not correctly followed, may result in personal injury and may result in damage to or destruction of equipment or property.

CAUTION

An operating procedure, practice, etc. which, if not correctly followed, may result in damage to, or destruction of, equipment or property.

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 or on a label on the crane to alert personnel that additional instructions are included in this 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 1–326

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 2–64

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 3–56

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 4–146

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 offset lattice fly.

Section 5 – General Information . . . . . Pages 5–1 Thru 5–40

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 6–4

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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Notes:

1. Six Section Boom
2. Upper Operator's Cab
3. Front Winch
4. Rear Winch
5. Counterweight
6. Rear Outrigger
7. Turntable Bearing
8. Counterweight Storage
9. Front Outrigger
10. Carrier Cab

Figure 1–1
Crane Nomenclature

On Delivery

When a new crane is delivered, follow the instructions outlined in the latest version of Technical Bulletin General Series #213A. A copy of this Technical Bulletin can be obtained from a Link-Belt Distributor.

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 may 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 a Link-Belt Distributor. A phone call could save someone's life.

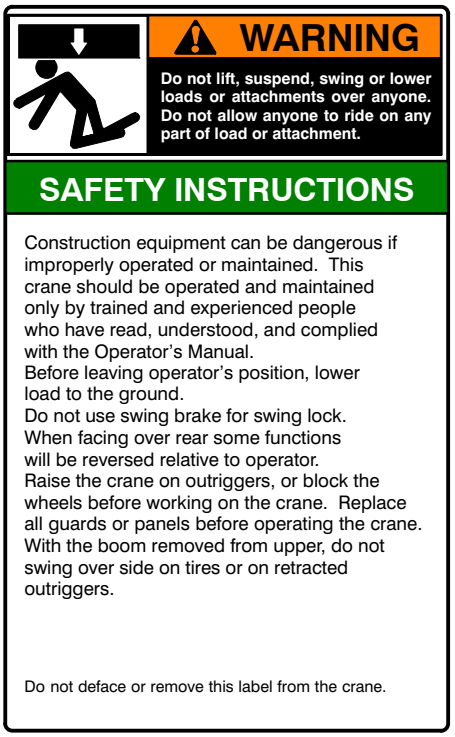


Figure 1–2
Read and understand all points covered in this Operator's Manual before operating the crane.

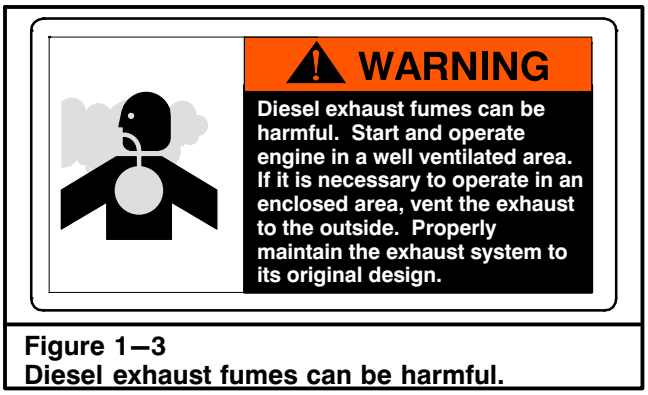


Figure 1–3
Diesel exhaust fumes can be harmful.

Figure 1–4
Do not smoke when fueling, or fuel up near an open flame.

General Safety Rules

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

Operator Awareness

1. Read and understand this Operator's Manual, all Safety Manuals, and the Crane Rating Manual and heed them. These manuals contain important information.
2. A driver/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(s) in a well ventilated area. Diesel exhaust fumes can be harmful. If it is necessary to operate an engine 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(s) when fueling.

Figure 1–5
Keep hands and tools clear of moving parts.

5. 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.
6. Keep your shoes clean. Before entering the upper operator's or lower carrier cab, clean any mud, gravel, snow, ice, moisture, and grease from your shoes. Slippery shoes could cause momentary loss of control of crucial foot operated controls.
7. 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.
8. Keep fingers, feet, and clothing away from sheaves, drums, and wire rope(s) unless the crane is shutdown and everyone knows what you are doing. Do not place a hand on wire rope(s) when climbing on the crane. A sudden movement could pull them into the drums or sheaves.
9. To prevent movement of the individual boom sections, shutdown the engine(s) and ensure that the operator has vacated the upper operator's cab before putting your hands or tools inside the boom. Unexpected movement of the boom section 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.

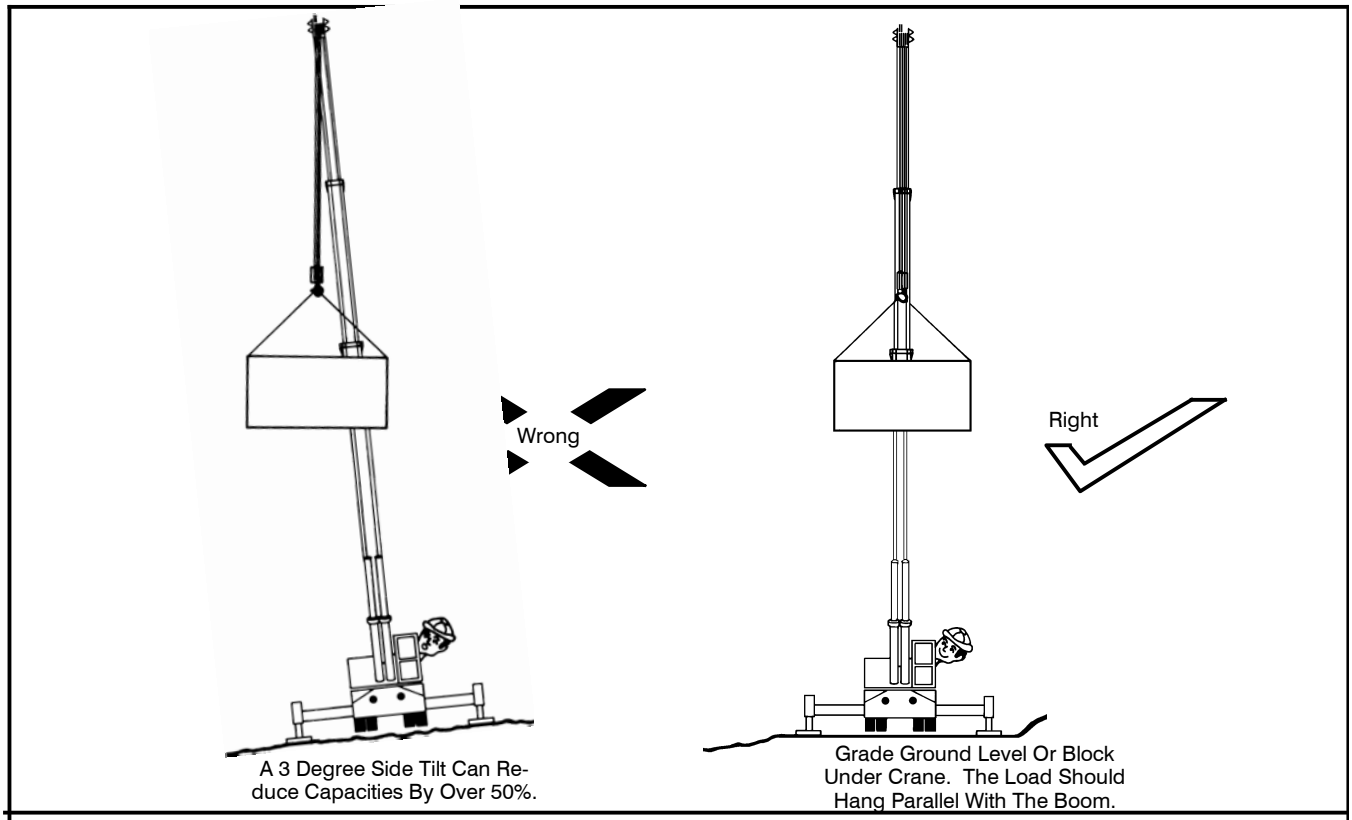


Figure 1 - 6
Level the crane.

12. The operator, supervisor, or person in charge of the load must observe the following rules:
    a. Loads must be well secured before lifting. Ensure that the rigging can't 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.
    b. Chains and slings must be of adequate size, in good condition, and not twisted around each other.
    c. The load must not catch on an obstruction when lifting or swinging. Ensure the load, winch wire ropes, or any other parts of the crane do not snag or strike any obstruction.
    d. 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.
    e. When hoisting with a single part of line, especially in long fall 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.
    f. 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.
    g. Do not wrap the winch wire rope around the load. Do not use discarded, worn, or damaged wire ropes for slings. They may break and drop the load.
    h. The crane must be level before making a lift. Use the bubble level, to help determine when the crane is level. Check its accuracy frequently with a carpenter's level. Remember, a three degree side tilt can reduce capacities by 50% or more.
    i. 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.

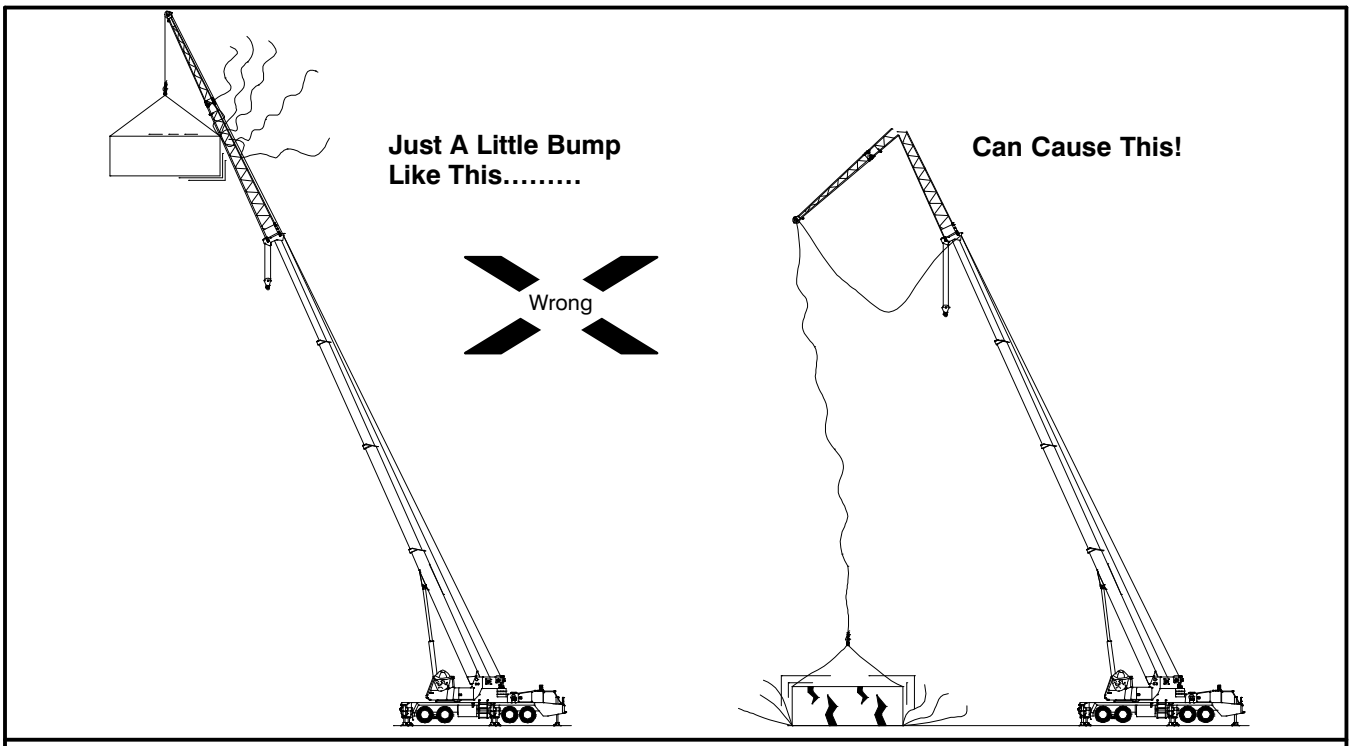


Figure 1—7
Do not let the load hit the boom or fly.

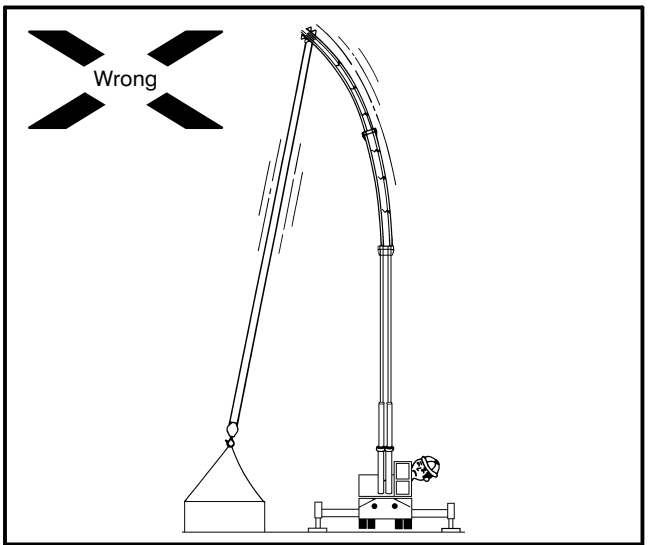


Figure 1—8
Do not use the boom to pull sideways.

13. Don't let the load 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 the damage is major, the attachment could collapse. If a lattice or diagonal bracing member on the fly is broken, cracked, or bent, contact a Link-Belt Distributor for repair procedures. If the boom or fly is struck, or damaged by anything, STOP. The loading on a boom or attachment 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(s) 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.
16. Do not "two block" (pulling the hook block, hook ball, or 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.
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.

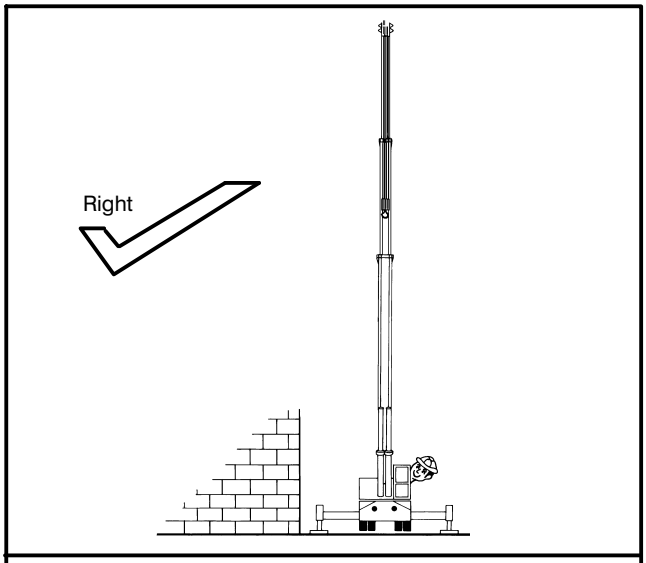


Figure 1—9
Crane level, all beams extended equally (or in accordance with V-CALC), and tires clear of the ground.

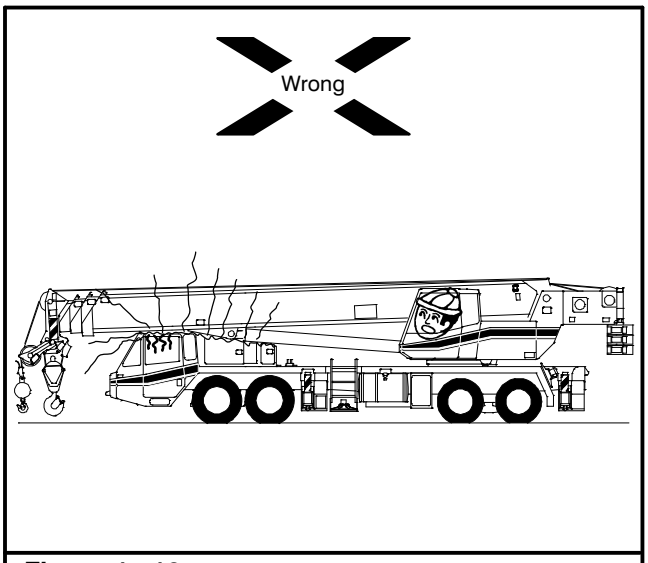
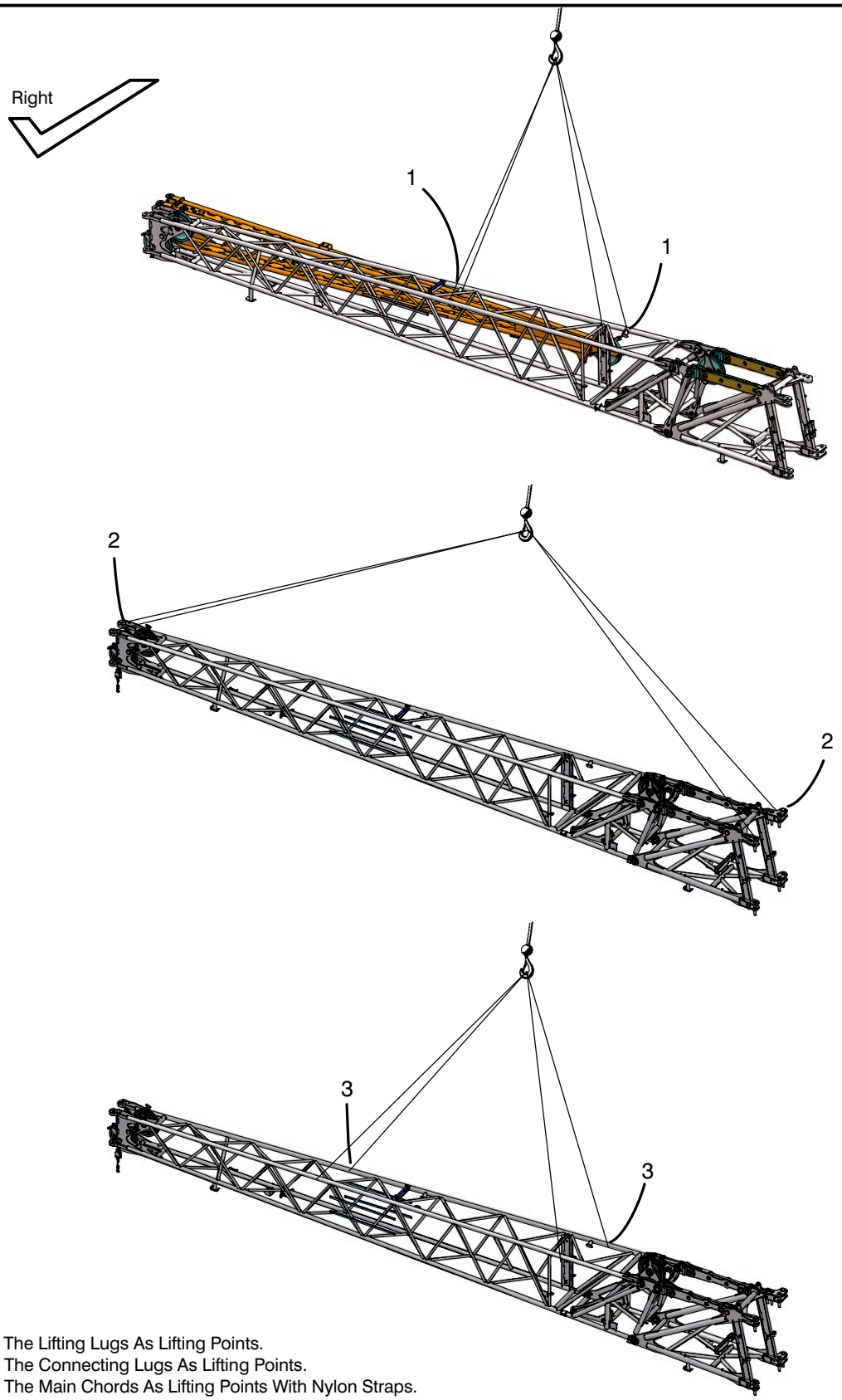


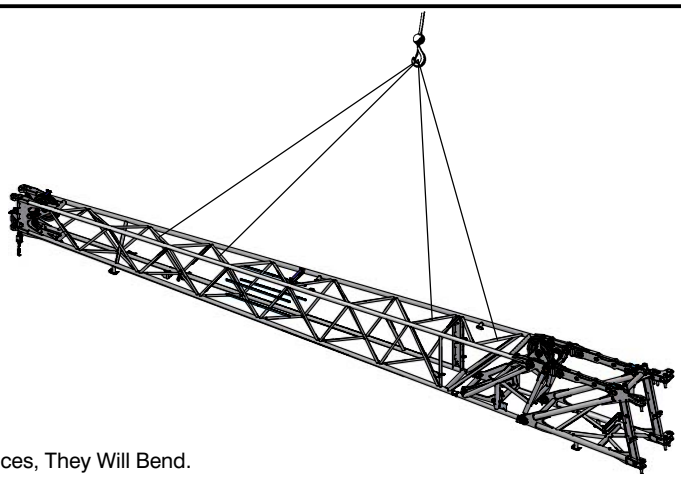
Figure 1—10
Watch that carrier cab!

19. Confirm that 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 have a major affect on the usable capacities and make the entire Crane Rating Manual invalid. Such changes can cause a major 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 may have 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 extended equally, or in accordance with the V—CALC (Variable Confined Area Lifting Capacities). Refer to the Crane Rating Manual. All jacks must be extended so all tires are clear of the ground, and the crane must be level. Ensure that blocking or pontoons are set on a 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.
23. Before attempting to move the carrier, confirm there is enough air pressure to operate the brakes. Always check the brake operation before traveling the crane.
24. Brake firmly in one application. Avoid fanning the brakes. This could exhaust air pressure so fast that the compressor may not supply enough air.
25. Do not coast downhill with the transmission in neutral. It makes control of the crane more difficult and dangerous.
26. 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 the wheels if not on a level surface.
27. When operating over the front, use care not to hit the carrier cab or front of the crane with the load or boom.



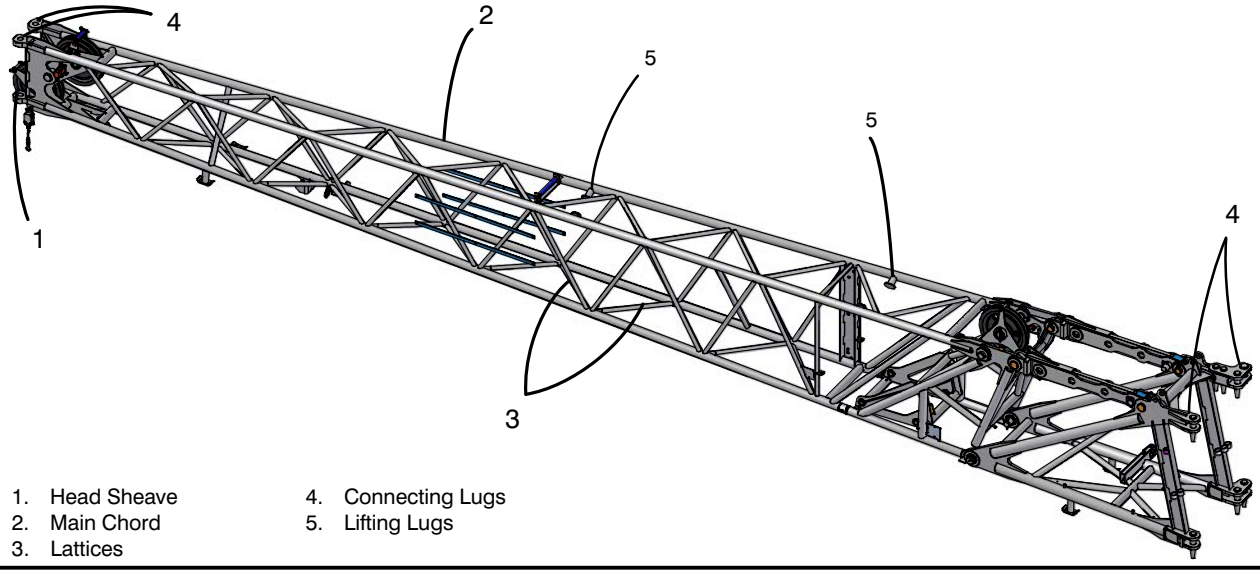
1. Use The Lifting Lugs As Lifting Points.
2. Use The Connecting Lugs As Lifting Points.
3. Use The Main Chords As Lifting Points With Nylon Straps.

Figure 1–11
Handling The Fly Section(s).



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

Figure 1–12
Handling The Fly Section(s).



1. Head Sheave
2. Main Chord
3. Lattices
4. Connecting Lugs
5. Lifting Lugs

Figure 1–13
Fly Section Nomenclature

28. 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 section(s), as they will bend. It is recommended that the lifting lugs or 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.

29. Block under and between the fly section(s) when loading them on a transport vehicle. When securing the fly section(s) to a transport vehicle, it is best to use synthetic webs or slings. If using wire rope slings, pad the fly section(s) to protect them from damage. Do not overtighten the tie downs or the fly section(s) may be damaged. Do not use chain ties downs, as they may dent and damage the fly section(s).

30. Thoroughly inspect all the elements of each fly section before installing it on the crane. Check each main chord, picture frame, diagonal, lattice, connecting lug and lifting 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 a Link-Belt Distributor for the proper repair procedures.
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 personel.
    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 can be dangerous if the manufacturer's directions are not closely followed.
    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. In freezing weather, more frequent checks for water in the air tanks are recommended.
    h. 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.

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 ($in^3/in^3/°F$) X 12 in/ft. Coefficient = 0.00043 ($in^3/in^3/°F$)										

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 ($mm^3/mm^3/°C$) X 1000 mm/m Coefficient = 0.000774 ($mm^3/mm^3/°C$)										

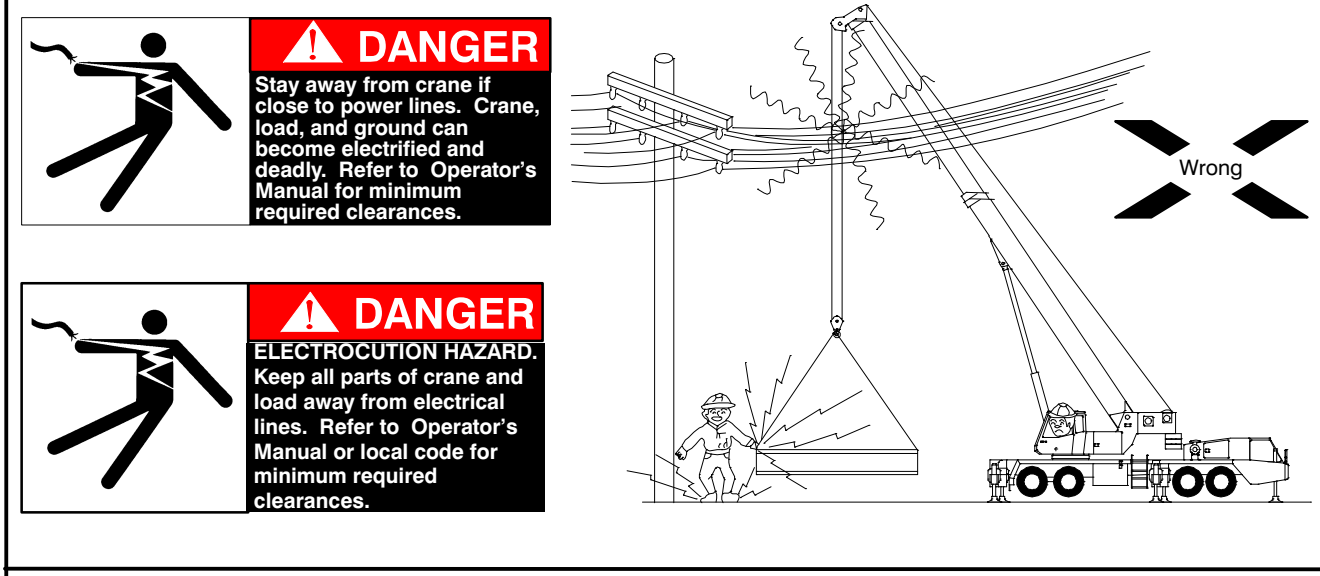


Figure 1–14
Stay away from power lines.

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 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 – 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. 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.
   e. Do not perform any crane assembly/disassembly under any energized power line.
   f. 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.

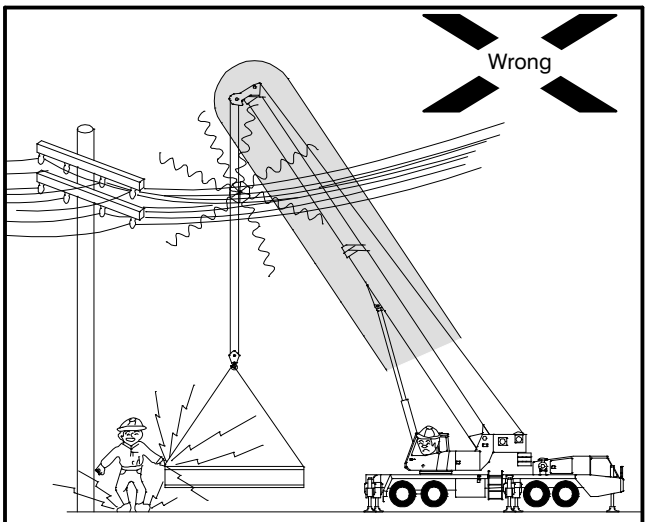
Minimum Clearance When Traveling With No Load

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 (15.2*m*) 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.

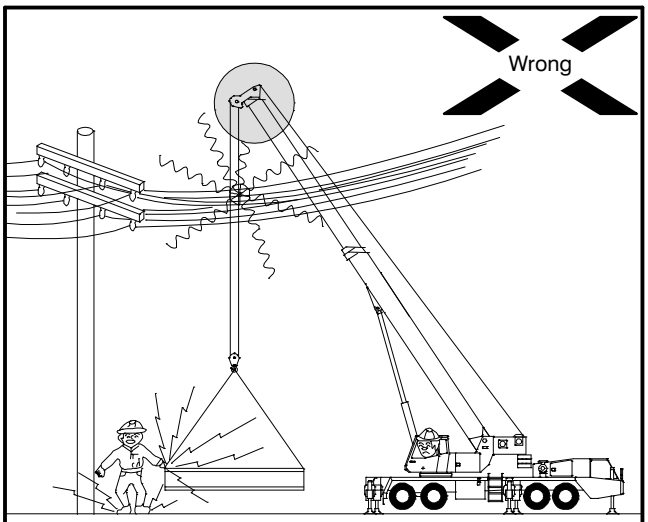
Note 2: Environmental conditions such as wind, fog, smoke, or precipitation may require increased clearances.

High Voltage Power Line Clearance Chart



Shaded area shows "sensitivity zone" with full boom length sensor used. Contact can be made outside this zone by the 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 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 The Boom Tip

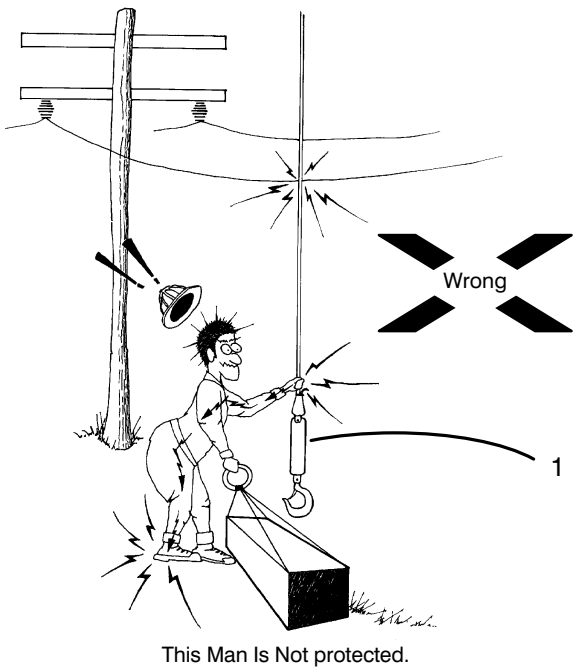
g. Warn all personnel of the potential danger. Do not allow unnecessary persons in the area. Don't allow anyone to lean against or touch the crane. Don't allow workers or load handlers to hold load, load lines, or rigging gear unless absolutely necessary. In these cases, use dry hemp or plastic ropes as tether lines. Make certain everyone stays at least the 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.

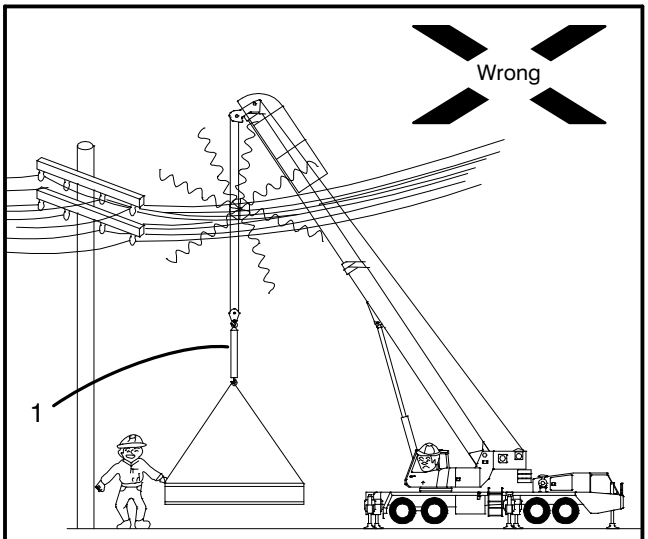
2. **What do you do if a power line is touched by a crane or load?**
   a. Remain calm — think — a mistake can kill someone.
   b. Warn all personnel to keep clear.
   c. If crane will still operate, try to move it away from contact. You, the operator are reasonably safe in the cab unless the crane is 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.
   e. When the arc breaks, continue moving until you are at least the 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 the crane for damage. Repair any damage before further use.



This Man Is Not protected.

1. Insulated Link

Figure 1–17
Crane Equipped With Insulated Link



1. Insulated link if wet or contaminated will not provide protection.

Figure 1–18
Crane Equipped With Insulated Link And Boom Point Guard

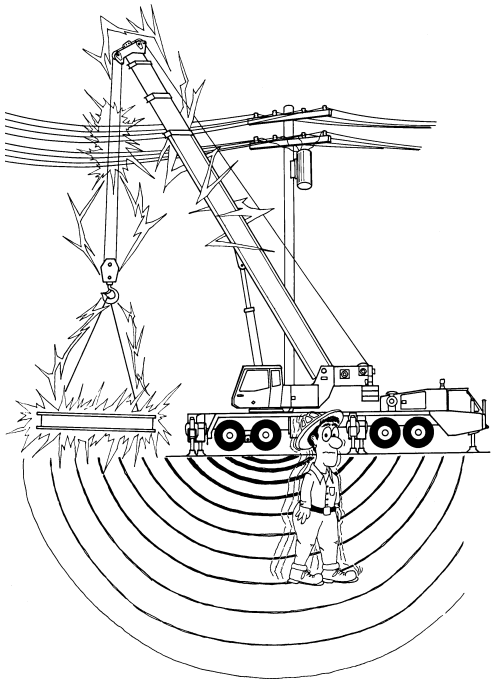


Figure 1–19
If you must leave the crane, do not step off. Leap as far as you can with feet together and hop or shuffle away from the crane.

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 the 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 until you are a safe distance away. 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 workers touch magnet or load.
   c. Do not let workers 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.

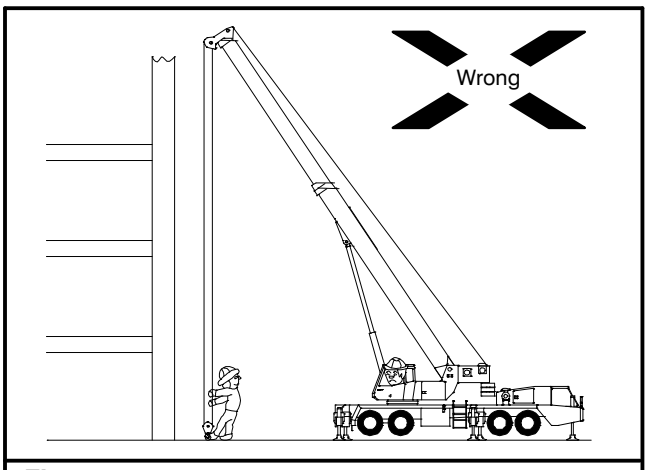


Figure 1—20
No hook riders!

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 regulations.
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. Keep a dry chemical or carbon dioxide fire extinguisher of 10BC rating or larger in the upper operator's and lower carrier cab or in the immediate area of the crane at all times. Instruct all operating and maintenance personnel in proper use of the extinguisher. Check periodically to ensure it is fully charged and in working order.
6. Do not tamper with safety devices. Keep them in good repair and properly adjusted. They were put on the crane for your protection.

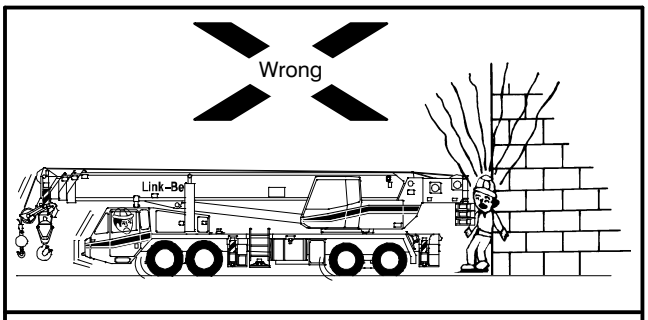


Figure 1—21
Use a signal person, back safely.

7. 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 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 his duties, but he should not rely on them to keep him out of trouble.

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 ball, hook block, 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 in upper cab and it is for the operator. A fall from the crane can cause death or serious injury.
4. Always look before you back up, or better yet, post a signal person to guide you. If crane is equipped with a back up alarm, ensure it is working properly. Use the horn as a signal. Use a code such as one beep — stop, two beeps — forward, and three beeps — backward. Confirm that everyone on the job site knows the code.
5. Do not make a lift which is not in plain view of the operator without a signal person. This can lead to an accident or crane damage.

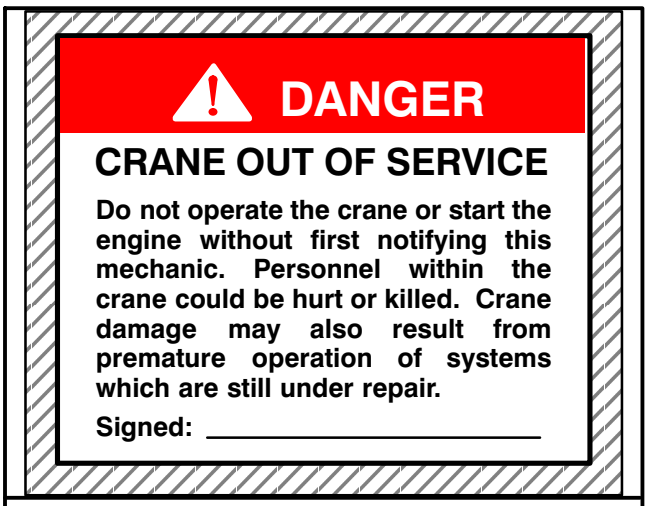


Figure 1–22
Remove the keys from the ignition and post a sign to make others aware of repair activity.

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, repair or 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 a 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 cylinder or in the boom rest.
   b. Shutdown engine(s) and work all control levers back and forth to relieve pressure and relax the attachment.
   c. If above instructions cannot be followed, block securely under the attachment so it cannot move.
   d. Bleed any precharge off the hydraulic reservoir(s) before opening them 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 the skin.
   f. Post warning signs in cab(s) so no one will try to start the engine(s). 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. Always reduce pressure in hydraulic and air systems to zero before working on any part of the system. Pin sized and smaller streams of hydraulic oil or air under pressure can penetrate the skin and result in serious infection. Do not use your hand to check for leaks. If hydraulic oi or air does penetrate the skin, seek medical treatment immediately.
6. Use extreme care when working with circuits with accumulators. Check that hydraulic pressure is relieved before opening the circuit for repairs.
7. 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.
8. When making repairs which require welding, use proper welding procedures. Make note of the following:
   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.
   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 a Link-Belt Distributor for proper procedures.
   f. Remove all flammables from the proximity of the welding area.

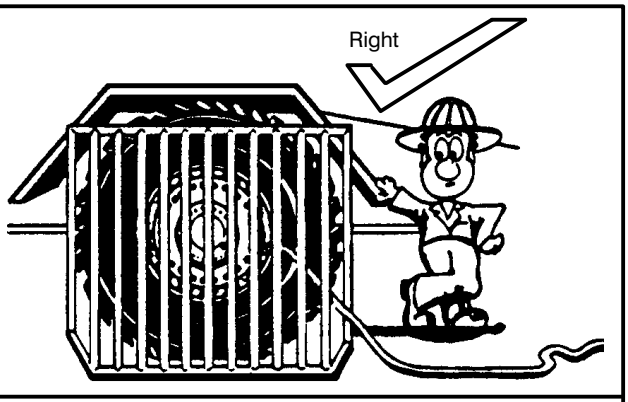


Figure 1–23
Use a guard when inflating tires.

9. 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.
10. 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.
11. Keep the crane clean, in good repair, and in proper adjustment. Oil, grease, or tools left on the decks may cause falls. Improper adjustments can lead to crane damage, load dropping, or other malfunctions. After working on the crane, remove all oil, grease, and tools before resuming operation.
12. 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.
13. Use an approved fall protection system as required by any application codes when working at elevated heights. Falls can lead to severe personal injuries and/or death.
14. 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.
15. 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.

Figure 1–24
Allow engine(s) to cool before removing the radiator/surge tank cap.

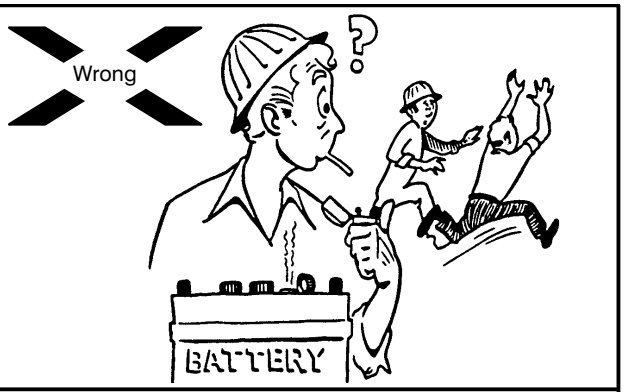


Figure 1–25
Do not use an open flame near the battery.

WARNING

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

16. Don't check battery charge by shorting across posts. The resulting spark could cause the battery to explode. If the battery explodes, you can get acid in your eyes, which could cause blindness. Check with a tester or hydrometer. Don't smoke near batteries.

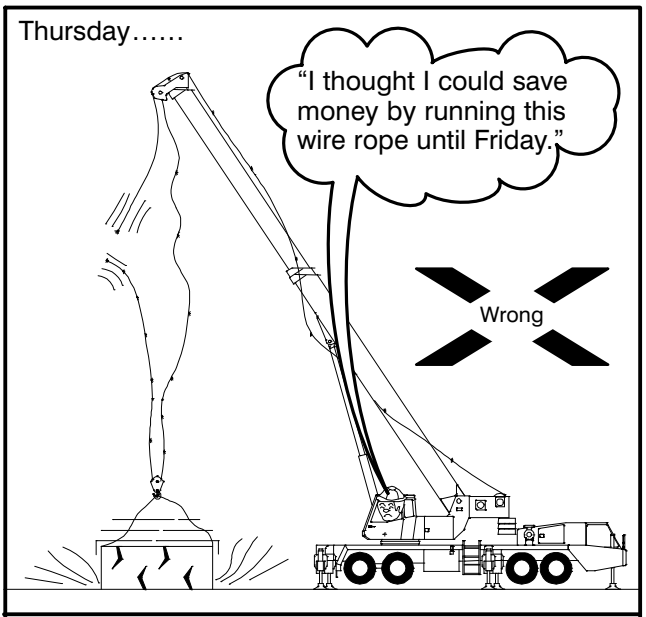


Figure 1–26
Do not operate the crane with worn or damaged wire rope.

17. When using jumper cables to start an engine, always connect negative post to negative post, and positive post to positive post. Always connect the two positive posts first. 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.
18. Test the automatic winch brake by raising the load a few inches *(cm)* 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 *(cm)* above the ground with only a few wraps of wire rope on the drum.

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." 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.
2. Use at least the number or parts of 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 wire rope 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 $\geq$ 120ft (36.6m)]. Only if certain criteria are met may a swivel hook ball be used with rotation resistant wire rope. Refer to "Single Part Line Hoisting' and "Hook Ball Usage With Rotation Resistant Wire Rope" in Section 5 of this Operator's Manual.
4. Do not handle wire rope with bare hands. Always use gloves to prevent possible injury from frayed or damaged spots in the wire rope.
5. Inspect head machinery and hook block often as damaged or deteriorating sheaves can cause unnecessary wear on the wire rope.
6. 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. Use an approved fall protection system
7. Use caution when disconnecting the dead end of wire ropes. Reeved wire rope can become twisted on the sheaves. When the dead end pin or socket is removed the wire rope may spin.

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. Make any necessary arrangements to eliminate any potential hazards, if possible.
2. Erect barricades around the immediate work area to prevent unauthorized personnel from wandering onto the job site.
3. Ensure the work area is clear. Ensure proper clearance for the crane, boom, and load. Don't swing, travel, lift, or lower loads, or 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 he can see all areas you can't. Follow his signals. Confirm that you and the signal person understand each other's signals. Refer to the Hand Signals Chart in this Section of this Operator's Manual or the Hand Signal Label on the crane. Use the horn to signal or warn. Confirm that everyone on the job site understands signals before starting operations.
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 setup may have been clear, situations change.

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 1–27
Safety Instruction Label

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 and/or 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. Remember – capacity chart ratings in the Crane Rating Manual are based on ideal conditions:

   a. Standing on firm, level surface
   b. Calm wind
   c. No side loads or out swing of load
   d. Good visibility
   e. 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, the actual operating conditions are. It is a matter of judgment and experience. Some factors which may require reduction of capacities are:

   a. Soft or unpredictable supporting surfaces
   b. Wind
   c. Hazardous surroundings
   d. Inexperienced personnel
   e. Poor visibility
   f. Fragile loads

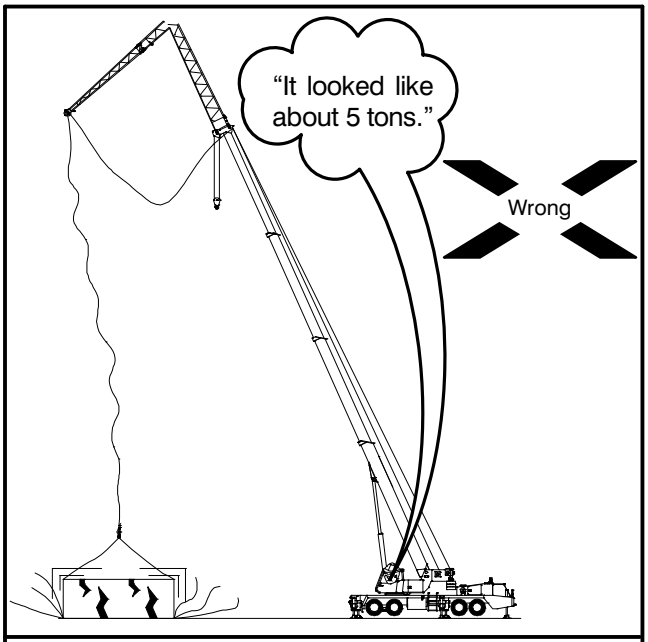


Figure 1–28
Know your load.

   g. Crane in poor condition
   h. Condition and inflation of tires

   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 to those listed 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 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.
2. When operating off the main boom with the fly erected, deductions must be made for its weight. The weight of the fly, pendants, etc., must be subtracted to obtain a "NET" capacity. Failure to do so could result in an overload condition and cause boom failure. Refer to the Crane Rating Manual for amounts to be deducted.
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.

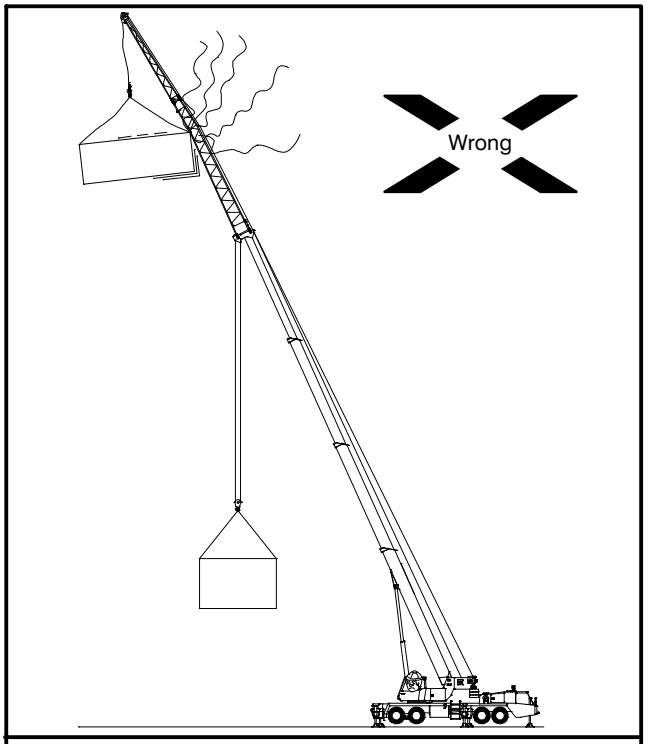


Figure 1—29
Do not lift two loads at the same time.

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 located 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.
   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.
6. Some capacities are based on limitations other than stability. In these cases, overloads may 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 the boom modes as selected through the RCL System.
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.

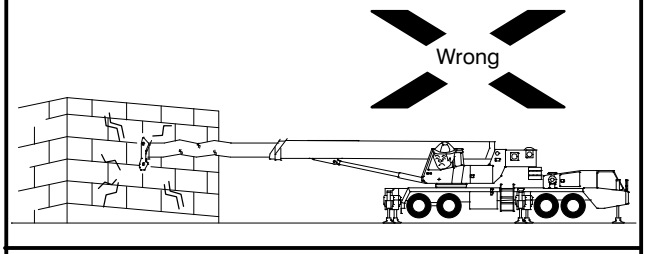


Figure 1—30
Do not push with the boom.

15. Do not operate a hydraulic crane at radii or boom lengths where the Crane Rating Manual shows no capacity. Do not use a fly not designed for this 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 lifting a load with any crane, the load may swing out or swing 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. Confirm that 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 telescope 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, or load contacts the head machinery. Two blocking can lead to sheave or wire rope damage.

Figure 1—31
Pinch Point Label

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 the load.
21. Pinch points, which result from relative motion between mechanical parts, can cause injury. Keep clear of the rotating upper or moving parts.

A little side tilt while working over the end.....

Wrong

.....Increases load radius when swung over the side!

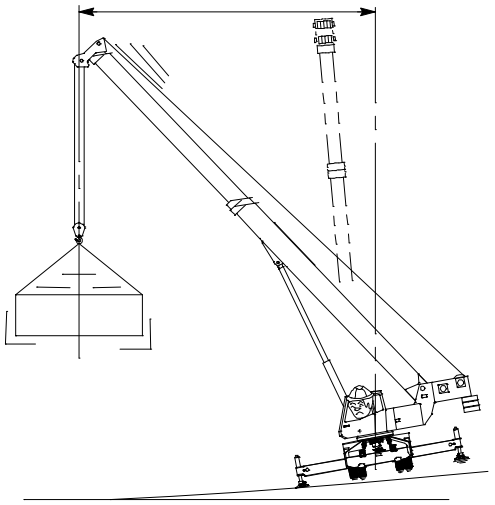
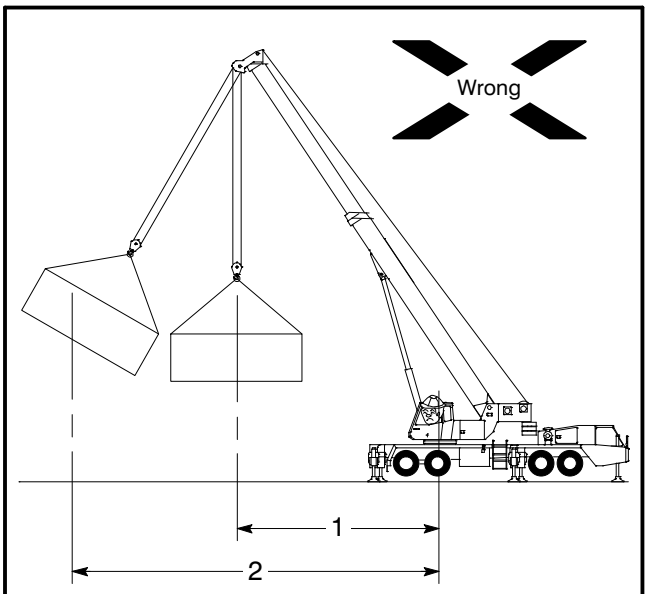


Figure 1—32
Watch that side tilt!



1. Load Radius At Rest
2. Load Radius Increases Due To Centrifugal Force

Figure 1—33
Watch that centrifugal force!

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 or lower 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. Do not move a crane away from the load while handling near capacity loads. Due to load inertia (weight) the load will tend to stay in position when the crane starts to move, and then will swing in towards the crane. The inertia effect will tend to increase load radius and decrease stability. This could lead to boom failure or crane tipping.
26. Don't increase the maximum allowable 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 making lifts on tires, the tires must be inflated to pressures shown on the Tire Inflation label on the carrier or in the Crane Rating Manual.
29. Prior to lifting any loads, inspect the boom or boom and fly combination to ensure they are straight. The heat from the sun may distort the boom 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. Refer to "Boom Distortion Due To Thermal Effects Of The Sun" in this Section of this Operator's Manual for additional information.

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 in the Crane Rating Manual.
   f. Don't travel with a load on soft ground. If the crane sinks into the 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 anytime.
   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 on the carrier 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. Do not exceed the maximum axle load ratings as listed on the Gross Axle Weight Rating plate.
3. Road the crane safely. Watch for narrow bridges and low clearances. Check load limits, heights, width, and length restrictions in the area you are traveling. Ensure the crane complies with all regulations.
4. Do not allow anyone to ride in the upper operator's cab during any highway travel. Highway travel is considered to be any travel of the crane over 5.0 mph (*8.0km/h*). Refer to "Highway Travel" in this Section of this Operator's Manual for more details.
5. 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.

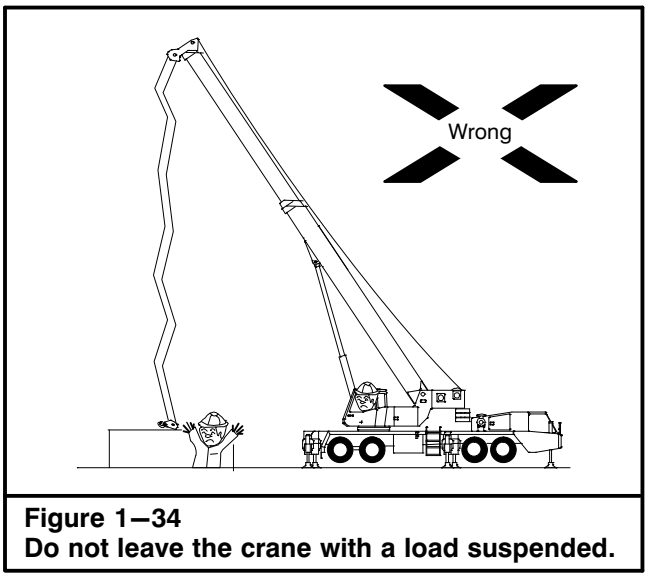


Figure 1–34
Do not leave the crane with a load suspended.

   b. Engage travel swing lock. Release the 360° swing lock.
   c. Tie down or otherwise restrain the hook block and/or hook ball to prevent them from swinging.
   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. When traveling, outriggers must be fully retracted.
   f. Remove all pontoons from the outrigger jacks and store them properly.
   g. See "Traveling The Crane" in this Section of this Operator's Manual for more details.
6. 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.
7. If the crane must be towed, shift the transmission to neutral and move slowly. Slowly take up slack in the rope or chain. Don't jerk, the chain or rope may break. Keep the chain or rope tight while towing. See "Towing The Crane" in this Section of this Operator's Manual for more details.

Leaving The Station

1. Do not get on or off a crane in motion. Use the grab handles and ladders when climbing on or off the crane. Remain in three point contact with the crane at all times (two hands and one foot or two feet and one hand).
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 the travel swing lock. Engage the park brake. Shutdown engine(s) and remove 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 the engine(s) 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.

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, 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 of this Operator's Manual 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 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.

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 this Operator's Manual.
2. The crane shall be maintained, lubricated, and adjusted, by a designated person, as specified in this 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.

Inspection And Rigging

1. The lift crane and work platform shall be inspected immediately prior to commencement of operation. (Refer to this Crane Operator's Manual and ANSI B30.5, Section 5, Section 5—2.1.2 and 5.2.4, and ANSI 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 this 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 this 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.

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.

Lifting Sheaves For Personnel Handling With Suspended Work Platforms			
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
Luffing Attachments	Not Recommended	Allowed	Allowed	Not Recommended

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 *(cm)* 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 wire rope is slack, it must be inspected to ensure that all wire 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.

Operation And Safety

1. This Operator's Manual for the crane shall be read and fully understood by operating personnel. This Crane Operator's Manual shall be available to them at all times.
2. 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.
3. 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.
4. 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.
5. Unauthorized personnel shall not be in the upper operator's cab on the lift crane, or near the lift crane while a work platform is suspended from the load line.
6. 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:
   a. That the crane does not have safety devices normally used on personnel handling equipment.
   b. That the safety of the operation depends on the skill and judgment of the crane operator and others present.
   c. Of procedures to enter and leave the work platform and other safety procedures.
7. After positioning of the work platform:
   a. All brakes and locks on the lift crane shall be set before personnel perform any work.
   b. 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.
8. Telescope operation is not recommended with any extendable boom with personnel in a suspended work platform.
9. 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.
10. 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.)
11. 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 operation at or near these conditions.
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 of the platform.
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 this Operator's Manual, the Crane Rating Manual, and the Safety Manuals.

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.

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 wire 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.

Carrier Cab

The carrier cab contains various controls needed to operate the crane. Figure 1—35 illustrates the general location of the these controls.

WARNING

This Operator's Manual must be thoroughly read and understood by the driver/operator before driving the crane. Major crane damage or serious personal injury could result from improper operating procedures.

Fire Extinguisher

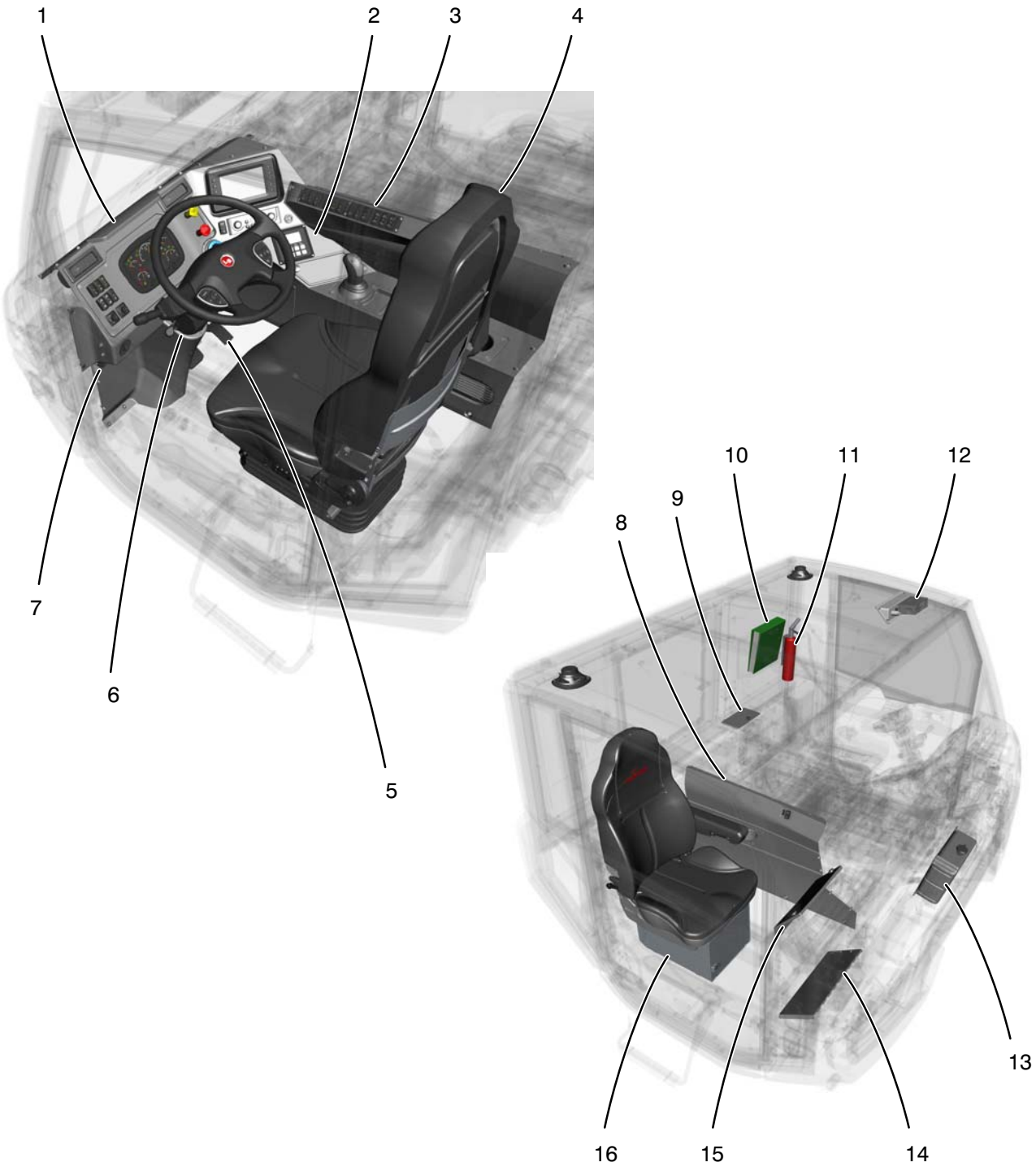
A fire extinguisher is mounted behind the carrier cab driver seat. It is an A B C type fire extinguisher, meaning it is capable of extinguishing most types of fires. The operator should be familiar with its location, the clamp mechanism used to secure it in place, and foremost, the operation of the device. 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.

Operator's Manual

An Operator's Manual is stored in the pocket behind the carrier cab driver seat. An Operator's Manual should remain in the carrier cab and accessible at all times. If an Operator's Manual is not in the carrier cab, order a replacement from your Link-Belt Distributor.

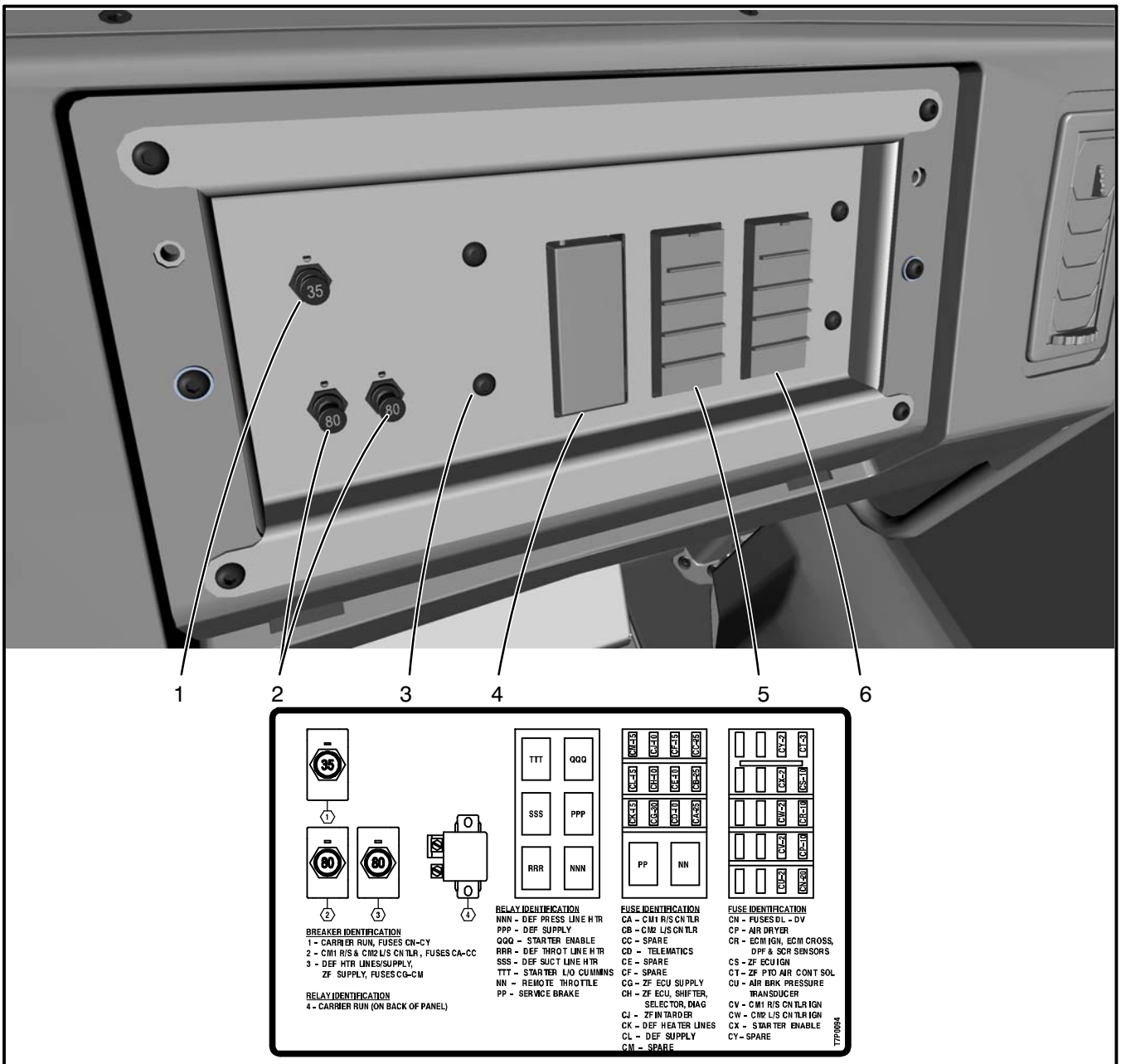
Windshield Washer Reservoir

The windshield washer reservoir for washer fluid is located in the center of the carrier cab bumper. Check the windshield washer reservoir daily. Visual inspection can determine if the washer fluid is adequate. 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 and prevents freezing.



1. Carrier Cab Dash Panel
2. Carrier Cab Right Control Console
3. Carrier Cab Control Switch Panel
4. Carrier Cab Driver Seat
5. Carrier Cab Foot Operated Controls
6. Carrier Cab Steering Column
7. Carrier Cab Diagnostic Connectors
8. Carrier Cab Passenger Panel
9. Carrier Cab Electronic Logging Device Access Panel
10. Operator's Manual
11. Fire Extinguisher
12. Carrier Cab Radio Panel
13. Windshield Washer Reservoir
14. ATB Weight Storage Box
15. Carrier Electrical Center Access Panel
16. Carrier Cab Passenger Seat

Figure 1–35
Carrier Cab Layout

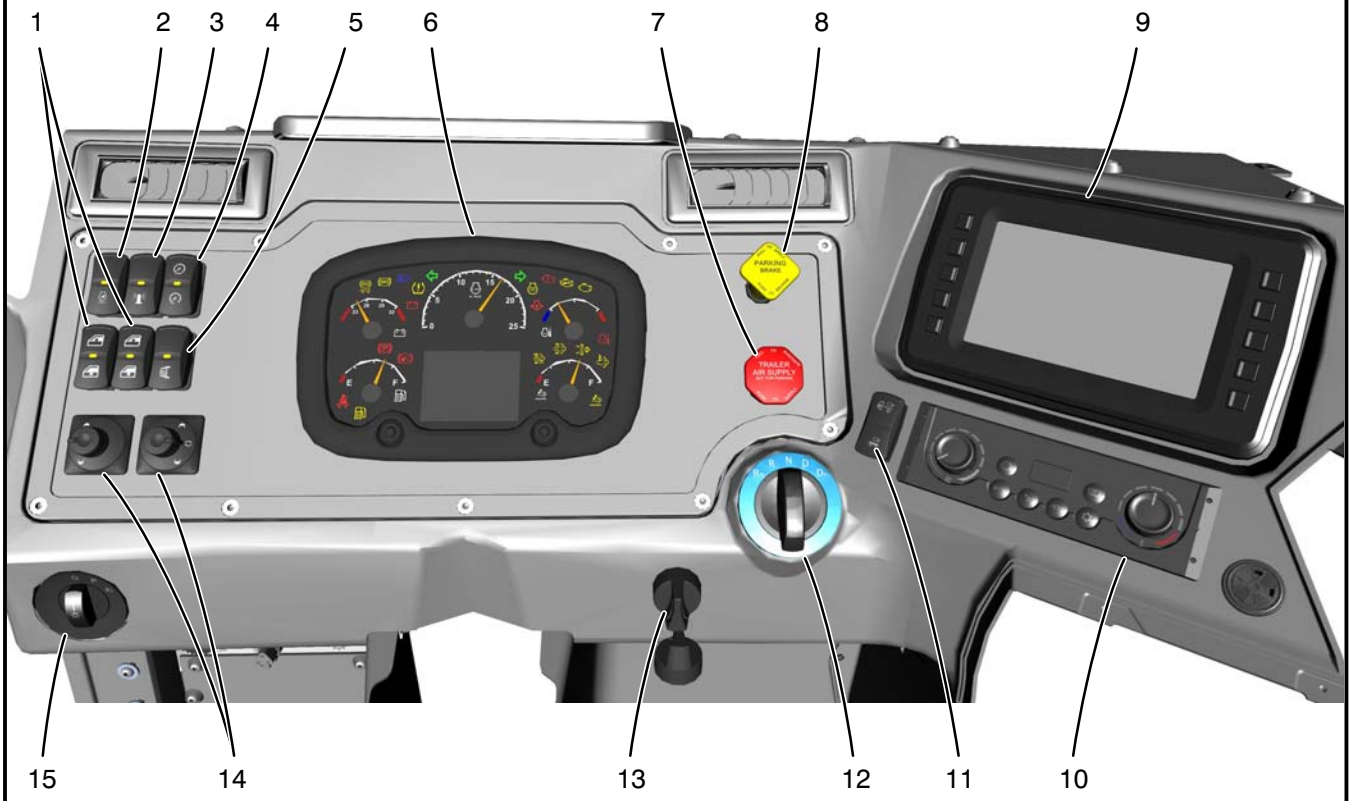


1. 35 Amp Circuit Breaker
2. 80 Amp Circuit Breaker
3. Run Relay (On Back of Panel
4. Relay Block
5. Relay/Fuse Block
6. Fuse Block

Figure 1—36
Carrier Electrical Center

Carrier Electrical Center

The carrier electrical center is mounted in front of the passenger seat of the carrier cab. Refer to Figure 1—35. It contains the circuit breakers, relays, and fuses for the carrier. Refer to Figure 1—36. Remove the carrier electrical access panel to access the electrical center components. Fuse and breaker identification label is found on the inside of the access panel. Refer to Figure 1—35.



1. Power Window Switches
2. Upper Throttle Control/PTO Enable Switch
3. Warning Light Switch
4. Dash Illumination Switch
5. Heated Mirror Switch
6. Instrument Cluster
7. Trailer Air Supply Control Knob
8. Park Brake Control Knob
9. Carrier Cab Control And Camera Display
10. HVAC Controls
11. Camera Selection Switch
12. Transmission Mode Selection Switch
13. Carrier Cab Ignition Switch
14. Mirror Adjustment Controls
15. Headlamp Switch

Figure 1–37
Carrier Cab Dash Panel

Carrier Cab Dash Panel

The carrier cab dash panel is directly in front of the driver/driver seat. It contains the following controls and is shown in Figure 1–37.

1. Power Window Switches

Press these switches in the up position to roll up the windows, or in the down position to roll down the windows. The left power window switch controls the operator side window, the right power window switch controls the passenger side window.

2. Upper Throttle Control/PTO Enable Switch

This switch toggles between the upper throttle control/PTO enable and the carrier throttle control/PTO disable. Press this switch in the down position to toggle between the upper throttle control/PTO enable and carrier throttle control/PTO disable.

3. Warning Light Switch

This switch controls the carrier cab warning light. Press the switch in the down position to toggle between four warning light modes: carrier only, upper only, carrier and upper, and all off.

4. Dash Illumination Switch

The dash illumination switch is used to dim the dash lights. Press this switch in the down position to dim the lights or press in the up position to brighten dash lights.

5. Heated Mirror Switch

The heated mirror switch is used to heat the side mirrors if they are covered with snow or ice. Do not remove snow or ice with a scraper as it may damage them.

6. Instrument Cluster

The instrument cluster displays information and messages to the operator, including tachometer, voltmeter, DEF level, fuel level, engine coolant temperature, and indicator lights. Refer to carrier engine manufacturer's manual for suggested operating speeds. Refer to "Instrument Cluster" in this section of this Operator's Manual for additional information.

7. Trailer Air Supply Control Knob

This valve is used on cranes which are equipped with a boom dolly/trailer, to pressurize the system which supplies air to the dolly/trailer brake circuit. See the operating instructions for "Boom Dolly/Trailer" in this Section of this Operator's Manual for operating procedures.

8. Park Brake Control Knob

This knob controls engaging and releasing the park brake.

WARNING

Avoid using the park brake to stop the crane in motion (as a service brake) except in cases of extreme emergency. Brake wear will not be distributed evenly and application cannot be controlled.

To Engage Park Brake
a. Bring the crane to a full stop.
b. Shift the transmission to neutral.
c. Pull the park brake control knob out.

To Release Park Brake
a. Apply the service brakes.
b. Push the park brake control knob in.

Note: If the park brake control knob will not stay in the released position, check the air system pressure. It must be at least 60 psi (*414kPa*) before the brake will release. The emergency park brake will also begin to apply if pressure decreased below 60 psi *(414kPa)*, and will fully engage if pressure decreases below 40 psi (*276kPa*).

9. Carrier Cab Control And Camera Display

The Carrier Cab Control And Camera Display will display various carrier engine data such as rpm's, coolant temperature, oil pressure, etc. as well as camera views. Refer to "Carrier Cab And Camera Control Display" in this Section of this Operator's Manual for operating instructions.

10. 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 Button

Press the vent selector button 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.

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.

Max Defog Selector Switch

Push this switch to enable the max 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 compressor 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.

Note: Changing any setting, other than the temperature control knob, while in AUTO mode, will automatically change the system to manual mode. This AUTO feature helps to provide a balance in the cab to keep the windows and windshield defogged, 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.

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.

11. Camera Selection Switch

The camera selection switch toggles between the rear camera and dolly/trailer camera views on the carrier cab control and camera display. With the transmission in reverse, press the switch in the up position to display the rear camera view or press in the down position to display the dolly/trailer camera view.

12. Transmission Mode Selection Switch

This switch allows the operator to select the transmission mode. Refer to "Main Transmission Controls" in this section of this Operator's Manual for additional information.

13. Carrier Cab Ignition Switch

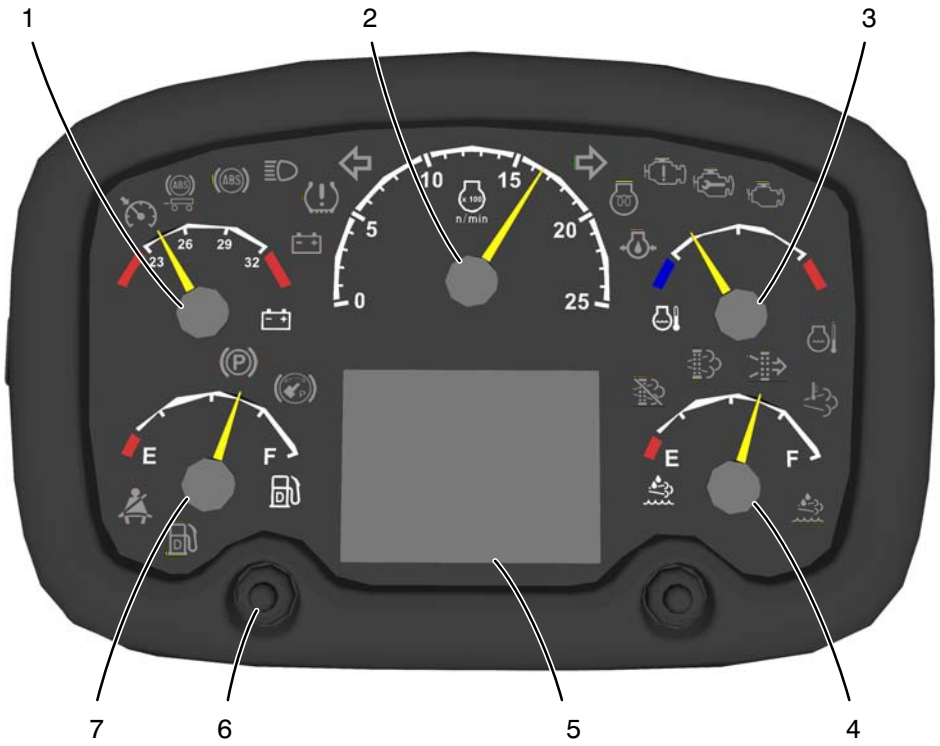
The carrier cab ignition switch is the key operated, conventional, automotive type. It controls carrier engine off/run/start and energizes the instrument panel gauges in the carrier cab.

14. Mirror Adjustment Controls

Use these controls to adjust the carrier cab mirrors.

15. Headlamp Switch

Rotate this switch to turn on the parking lights and headlights, or turn them off.



1. Volt Meter
2. Tachometer
3. Engine Coolant Temperature Gauge
4. Diesel Exhaust Fluid (DEF) Level Gauge
5. LCD Display
6. Push Buttons
7. Fuel Level Gauge

Figure 1—38
Instrument Cluster

Instrument Cluster

1. Volt Meter

This volt meter registers the charge in the carrier batteries and the output of the alternator through the regulator. It should read 26 volts with the carrier ignition switch on, and 26.5—28.5 volts with the carrier engine running. When the charge or the voltage in the batteries is not within normal operating range, an indicator light will illuminate. Refer to "Instrument Cluster Indicator Lights" in this section of this Operator's Manual for additional information.

2. Tachometer

The tachometer registers carrier engine speed in revolutions per minute (rpm). Refer to carrier engine manufacturer's manual for suggested operating speeds.

3. Engine Coolant Temperature Gauge

   This gauge registers carrier engine cooling system temperature. For proper cooling system operating temperature range, refer to the carrier engine manufacturer's manual. If cooling system overheats, reduce carrier engine speed or shift to a lower gear, or both, until the temperature returns to normal operating range. If carrier engine temperature does not return to normal temperature, refer to carrier engine manufacturer's manual. When coolant temperature exceeds normal operating range an indicator light will illuminate, an alarm buzzer will sound, and the stop engine light will illuminate.

4. Diesel Exhaust Fluid (DEF) Level Gauge

   This gauge registers the level of fluid in the diesel exhaust fluid tank. The diesel exhaust fluid tank capacity is 10 gal (*37.8L*). Refer to the carrier engine manufacturer's manual for the correct grade of diesel exhaust fluid. An indicator light within the gauge will illuminate to alert the driver/operator when the fluid level is low. Refer to "Selective Catalytic Reduction System" in this section of this Operator's Manual for additional information.

5. LCD Display

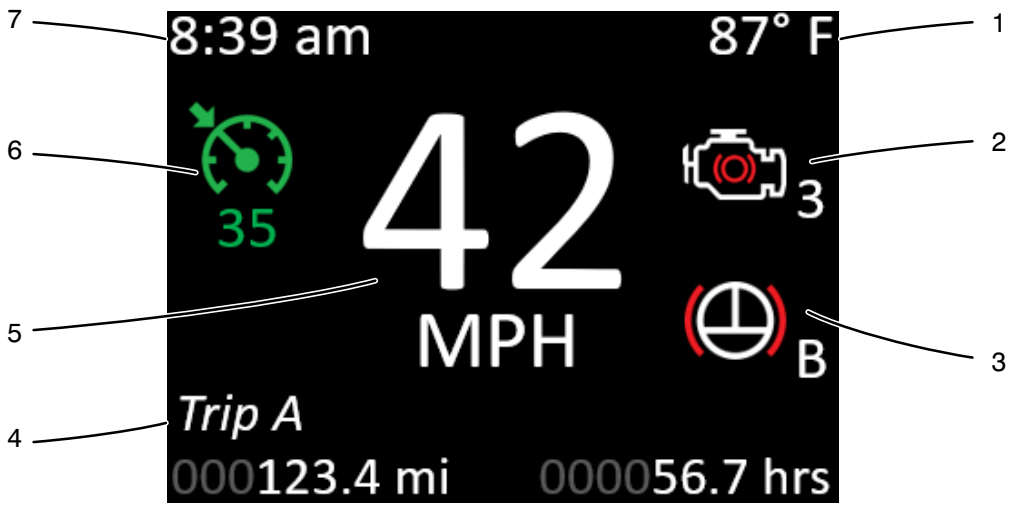
   The LCD display displays the speedometer, odometer, trip meter, etc. Refer to "Instrument Cluster LCD Display" in this section of this Operator's Manual for additional information.

6. Push Buttons

   The push buttons allow the operator to navigate and make selections on the LCD display. Refer to "Instrument Cluster LCD Display" in this section of this Operator's Manual for additional information.

7. Fuel Level Gauge

   This gauge registers the level of diesel fuel in the carrier fuel tank. The fuel tank capacity is 117 gallons (*443L*). The indicator within the gauge will illuminate when the fuel level is less than 1/8 capacity. Refer to the carrier engine manufacturer's manual for the correct grade of diesel fuel for the carrier engine.



1. Exterior Temperature Gauge
2. Engine Brake State Indicator
3. Intarder State Indicator
4. Trip Meter
5. Speedometer
6. Cruise Control State Indicator
7. LCD Clock

Figure 1—39
Instrument Cluster LCD Display

Instrument Cluster LCD Display

Setting the LCD Clock:

The instrument cluster LCD clock may need to be set occasionally. Refer to Figure 1—39. The instrument cluster push buttons can be used to set the clock with long presses (>2.5 seconds) and short presses (<2.5 seconds). Refer to Figure 1—38. To activate clock settings, long press both push buttons simultaneously until the clock displays in the center of the LCD display.

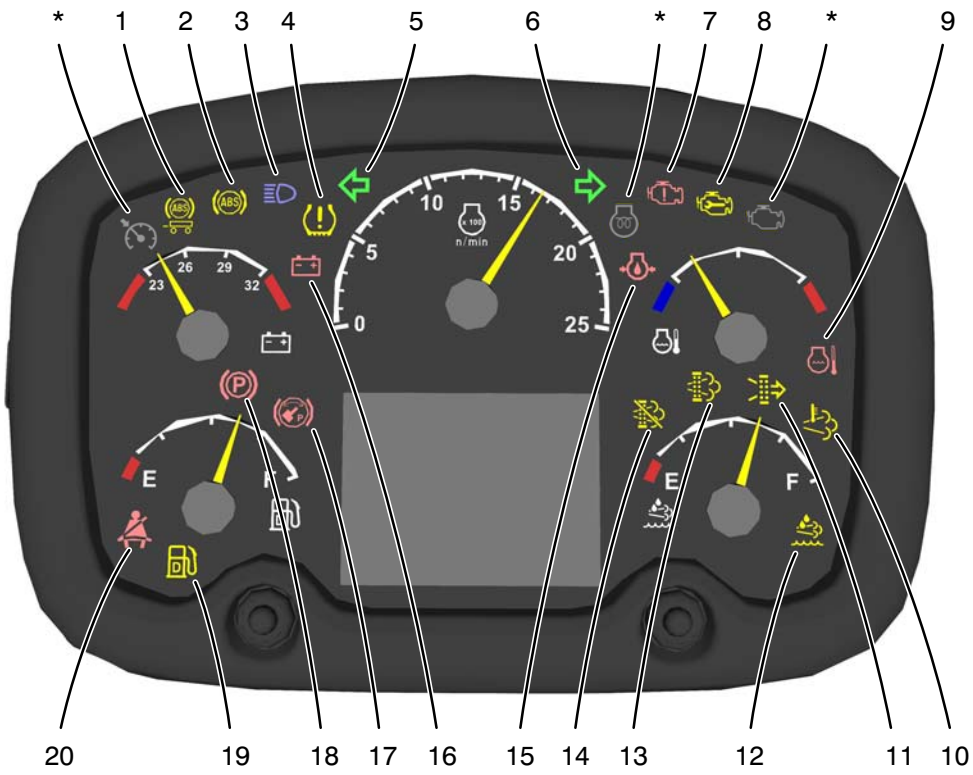
The clock setting default is the hour setting. From the hour setting, a long press of the left push button will toggle through the hour, minute, and am/pm settings, in that order. A long press of the right push button will toggle back to the previous setting.

Once a setting is activated, a short press of the left push button will decrease the selection value, a short press of the right push button will increase the selection value. After all selections have been made, long press both push buttons simultaneously to return to the LCD main display.

Instrument Cluster Trip Selection States

The instrument cluster trip selection states may need to be set occasionally. Refer to Figure 1—39. The instrument cluster push buttons can be used to select the trip state with long presses (>2.5 seconds) and short presses (<2.5 seconds). Refer to Figure 1—38. To toggle through trip meter states, short press either push button.

The trip meter state default is the odometer. From the odometer, the trip meter selection state will toggle through the odometer, Trip A, Trip B, and back to the odometer in that order. A long press of either push button will reset the selected trip meter state.



1. Trailer ABS Indicator Light
2. ABS Indicator Light
3. High Beam Indicator Light
4. TPMS Indicator Light
5. Left Turn Indicator Light
6. Right Turn Indicator Light
7. Stop Engine Indicator Light
8. Check Engine Indicator Light
9. Engine High Coolant Temperature Indicator Light
10. Exhaust Temperature Indicator Light
11. Air Filter Restriction Indicator Light
12. Diesel Exhaust Fluid Indicator Light
13. DPF Regen Initiation Indicator Light
14. DPF Regen Inhibit Indicator Light
15. Engine Oil Pressure Indicator Light
16. Battery Indicator Light
17. Swing Brake Indicator Light
18. Park Brake Indicator Light
19. Low Fuel Indicator Light
20. Seat Belt Indicator Light

* Not Used

Figure 1–40
Instrument Cluster Indicator Lights

Instrument Cluster Indicator Lights

1. Trailer ABS Indicator Light

This amber indicator light illuminates when there is a problem with the trailer ABS system.

2. ABS Indicator Light

This amber indicator light illuminates when there is a problem with the ABS system.

3. High Beam Indicator Light

This blue indicator light illuminates when the high beam headlamps are on.

4. TPMS Indicator Light

This amber indicator light illuminates when any of the tires are under inflated. Refer to "Carrier Cab Control Display Diagnostics Menu" for instructions to access tire pressure information.

5. Left Turn Indicator Light

This green indicator light flashes when the left turn signal or hazard lights are activated.

6. Right Turn Indicator Light

This green indicator light flashes when the right turn signal or hazard lights are activated.

7. Stop Engine Indicator Light

This red indicator light illuminates along with the sounding of the alarm to alert the operator of major engine problems.

8. Check Engine Indicator Light

This amber indicator light illuminates to make the operator aware of minor engine problems.

9. Engine High Coolant Temperature Indicator Light

This red indicator light illuminates along with an audio alarm when the coolant temperature exceeds normal operating range along with sounding the alarm.

10. Exhaust System Temperature Indicator Light

This amber indicator light illuminates when the exhaust system temperature is above normal.

11. Air Filter Restriction Indicator Light

This amber indicator light illuminates when the air filter is restricted and requires replacement.

12. Diesel Exhaust Fluid Indicator Light

This amber indicator light will illuminate to alert the driver/operator that the diesel exhaust fluid level is low. When this light illuminates, stop the crane as soon as safely possible and fill the DEF tank. Refer to the carrier engine manufacturer's manual for the correct grade of diesel exhaust fluid. Refer to "Selective Catalytic Reduction System" in this section of this Operator's Manual for additional information.

13. DPF Regen Initiation Indicator Light

This amber indicator light illuminate along with a message in the message area to alert the driver/operator that an active regeneration of the carrier diesel particulate filter is required but cannot occur. When this light illuminates, use the DPF Manual Regeneration Switch (Refer to Figure 1—43) to initiate a manual regeneration cycle as soon as safely possible. Refer to "Diesel Particulate Filter (DPF)" in this section of this Operator's Manual and the carrier engine manufacturer's manual for the proper filter regeneration procedures.

14. DPF Regen Inhibit Indicator Light

This amber indicator light illuminates when the operator has manually disabled exhaust system cleaning. When the exhaust system debris level reaches a critical level, the indicator light will flash, the engine de-rates, and the Check Engine Indicator Light illuminates. Refer to "DPF Regeneration Inhibit Switch And Indicator Light" in this section of this Operator's Manual for additional information.

15. Engine Oil Pressure Indicator Light

This red indicator light illuminates along with the sounding of the alarm when the engine oil pressure is below normal.

16. Battery Indicator Light

This red indicator light illuminates along with the sounding of the alarm to alert the operator that the charge or the voltage in the battery is not within normal operating range.

17. Swing Brake Indicator Light

This red indicator light illuminates when the swing park brake is applied and the boom is not positioned over front.

18. Park Brake Indicator Light

This red indicator light illuminates when the park brake is applied.

19. Low Fuel Indicator Light

This amber indicator light illuminates when the fuel level reaches 1/8 of a tank.

20. Seat Belt Indicator Light

This red indicator light illuminates when the the seat belt is not buckled.

1. Rear Steering Control Panel
2. Carrier Cab Relay Blocks And Diagnostic Center
3. Carrier Cab Fuse Blocks
4. Transmission Lever

Figure 1—41
Carrier Cab Right Control Console

Carrier Cab Right Control Console

The carrier cab right control console is to the right of the driver/operator. It contains the following components and is shown in Figure 1—41.

4. Transmission Lever

The transmission lever has multiple functions. Refer to "Main Transmission Controls" in this section of this Operator's Manual for additional information.

3. Carrier Cab Fuse Blocks

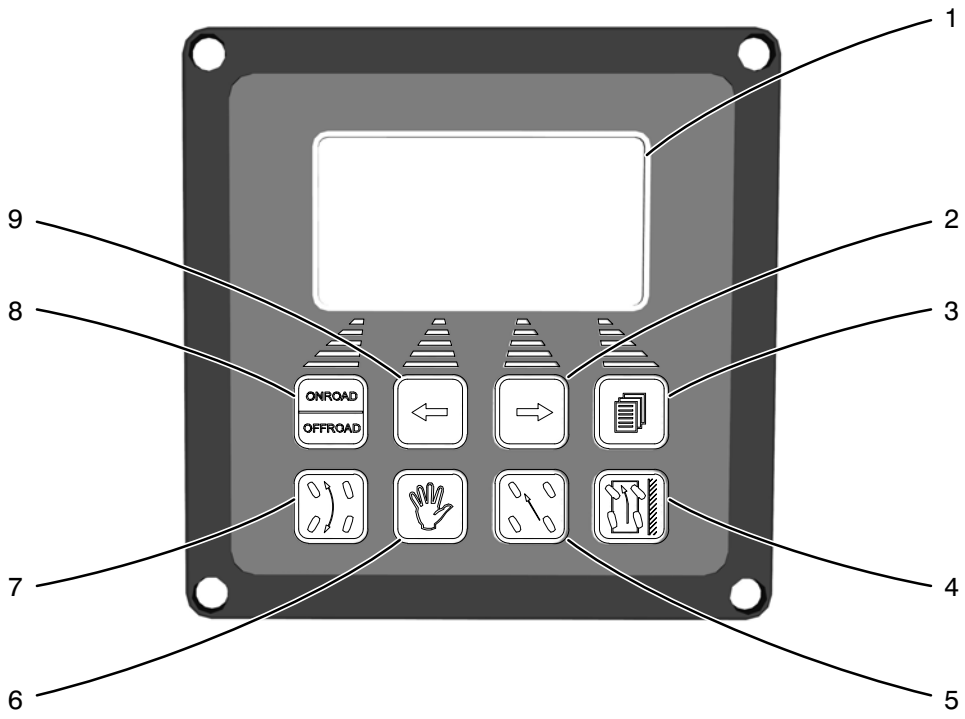
The carrier cab fuse blocks are mounted in the carrier cab right control console. Refer to Figure 1—41. Remove the access panel to gain access to the fuse blocks. A label which designates the fuse blocks is on the back of the access panel.

2. Carrier Cab Relay Blocks And Diagnostic Center

The carrier cab relay blocks and diagnostic center is mounted in the carrier cab right control console. Refer to Figure 1—41. Remove the access panel to gain access to the relay blocks and diagnostic connectors. A label which designates the electrical components is on the back of the access panel.

1. Rear Steering Control Panel

The rear steering control panel can be used to change between steering modes. Refer to "Rear Steering Control Panel" in this section of this Operator's Manual for additional information.



1. Rear Steering Display
2. Right Manual Steering Switch
3. Menu Switch
4. Reduced Tailswing Select Switch
5. Diagonal Steering (Crab) Select Switch
6. Manual Steering Mode Switch
7. Minimum Turning Circle (All Wheel) Select Switch
8. Steering Selection Switch
9. Left Manual Steering Switch

Figure 1—42
Rear Steering Control Panel

Rear Steering Control Panel

1. Rear Steering Display

The rear steering display will display error codes and other information regarding rear steering operations and maintenance. Refer to Figure 1—42.

2. Right Manual Steering Switch

This switch is used to manually turn the rear wheels to the right. The indicator light within the switch will illuminate to alert the driver/operator that right manual steering is activated. An indicator bar will appear in the rear steering display and will move to the right relative to turning of the right wheels. The steering position of the right rear wheels can be observed in the rear view mirrors. When in maintenance mode, this switch is used as the "+" (plus) switch to scroll forward. This switch is active only when steering selection switch is in the OFF-ROAD position.

3. Menu Switch

This switch is used to display the rear steering error codes. Press and release to display error codes in the rear steering display. Press and hold the switch for approximately twenty seconds for maintenance and service options such as alignment, to view operating data, and input/outputs. When in maintenance mode, this switch is used as the enter "↵" or select key.

4. Reduced Tailswing Select Switch

This switch is for moving away form a barrier without the tailswing associated with conventional steering mode. This switch is active only when steering selection switch is in the OFF-ROAD position. When in maintenance mode, this switch is used as the number four (4) key.

5. Diagonal Steering (Crab) Select Switch

This switch is used to select diagonal (crab) steering mode. The indicator light within the switch will illuminate to alert the driver/operator that diagonal steering mode is activated. An indicator bar will appear in the rear steering display and will move to the left or right relative to turning of the wheels. This switch is active only when steering selection switch is in the OFF-ROAD position. When in maintenance mode, this switch is used as the number three (3) key.

6. Manual Steering Mode Switch

This switch is used to select manual steering mode. Press this switch to activate, then use the left/right manual steering switches for steering the rear axles. When in maintenance mode, this switch is used as the number two (2) key. This switch is active only when steering selection switch is in the OFF-ROAD position.

7. Minimum Turning Circle (All Wheel) Select Switch

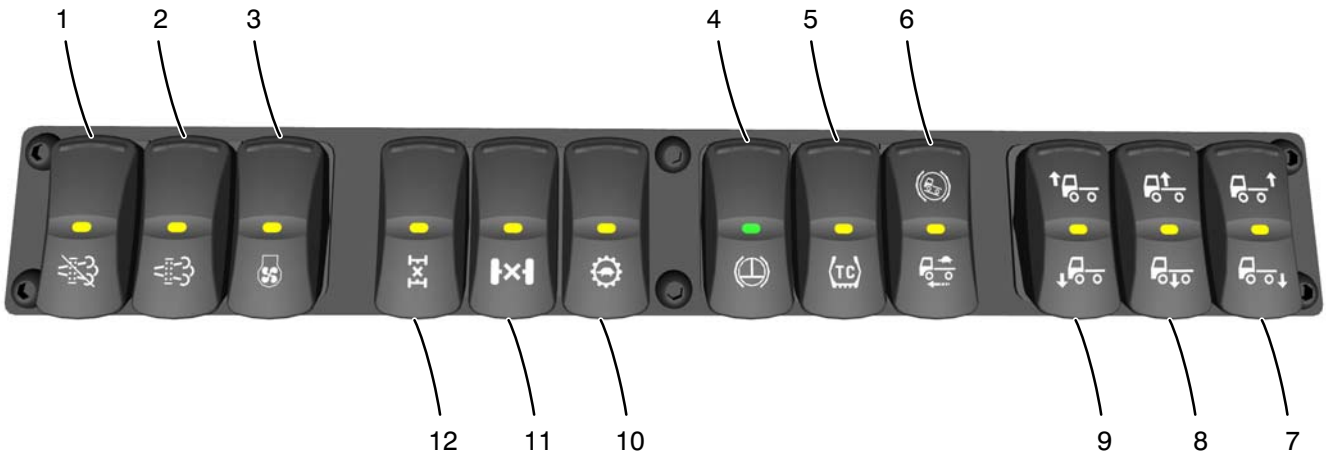
This switch is used to select minimum turning circle steering mode. The indicator light within the switch will illuminate to alert the driver/operator that minimum turning circle steering mode is activated. This switch is active only when steering selection switch is in the OFF-ROAD position. When in maintenance mode, this switch is used as the number one (1) key.

8. Steering Selection Switch

This switch is used to select the desired steering mode. Press the switch in the ON ROAD position for conventional steering anytime extended or high speed travel is required especially on a paved roadway. High speed travel is any traveling above 15 mph *(24km/h)*. Press the switch to the OFF ROAD position to activate the rear steer functions for maneuvering the crane around the job site. When in maintenance mode, this switch is used as the "ESC" or escape key to back out of a particular function or return to the previous menu.

9. Left Manual Steering Switch

This switch is used to manually turn the rear wheels to the left. The indicator light within the switch will illuminate to alert the driver/operator that left manual steering is activated. An indicator bar will appear in the rear steering display and will move to the left relative to turning of the left wheels. The steering position of the left rear wheels can be observed in the rear view mirrors. When in maintenance mode, this switch is used as the "–" (minus) switch to scroll backward. This switch is active only when steering selection switch is in the OFF-ROAD position.



1. DPF Regeneration Inhibit Switch
2. DPF Manual Regeneration Switch
3. Fan Control Override Switch
4. Transmission Intarder Activation Switch
5. Traction Control Disable Switch
6. Travel Mode/Hill Start Disable Switch
7. Rear Axle Suspension Height Switch
8. Ride Height Switch
9. Front Axle Suspension Height Switch
10. Transfer Case Range Selector Switch
11. Cross Axle Differential Lock Switch
12. Inter Axle Differential Lock Switch

Figure 1—43
Carrier Cab Control Switch Panel

Carrier Cab Control Switch Panel

The Carrier Cab Control switch panel is to the right of the driver/operator. It contains the following controls and is shown in Figure 1—43.

1. DPF Regeneration Inhibit Switch

This switch is used to prevent the regeneration of the DPF system. Refer to "DPF Manual Regeneration" and "DPF Regeneration Inhibit Switch And Indicator Light" in this Section of this Operator's Manual for additional information.

2. DPF Manual Regeneration Switch

This switch is used to start a manual regeneration to purge the accumulated soot from the diesel particulate filter (DPF). During normal highway travel, the accumulated soot in the DPF will be purged by the automatic regeneration cycle. Use this switch only when the DPF Regeneration Indicator Light illuminates or flashes. Refer to "DPF Manual Regeneration" in this Section of this Operator's Manual for addition information.

3. Fan Control Override Switch

The fan control override switch is used to help control carrier engine temperature. The fan speed is controlled by the engine and will automatically adjust based on engine coolant and intake air temperatures. The fan speed is controlled by the engine and will automatically adjust based on engine coolant and intake air temperatures. With the switch toggled on (indicator light illuminated), the fan will run continuously. Normally the switch should remain toggled off except, for example, when climbing a long grade. Before climbing a long grade, toggle the switch on to prevent an unexpected power reduction of the carrier engine if the fan comes on.

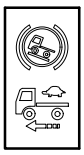
4. Transmission Intarder Activation Switch

This switch is used to activate the Intarder system in the transmission. Refer to "Transmission Intarder" in this Section of this Operator's Manual for additional information.

5. Traction Control Disable Switch

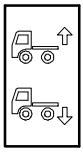
This switch is used to temporarily disable automatic traction control. Press and release this momentary switch to disable traction control. When traction control is disabled, the light on the switch will illuminate and the indicator light on the Carrier Cab Control Display will illuminate. To enable automatic traction control, press and release the Traction Control Disable Switch. Do not disable ATC on normal, paved road surface. Use this mode for job site traveling on soft surfaces. Refer to "Anti-lock Brake System (ABS)" in this section of this Operator's Manual for additional information.

6. Travel Mode/Hill Start Disable Switch



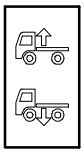
Hill Start Aid defaults to the "On" position. It can be overridden by pressing and releasing the top of the Travel Mode/Hill Start Disable Switch. Refer to "Hill Start Aid (HSA) Operation" in this section of this Operator's Manual for additional information. Press and release the bottom of the Travel Mode/Hill Start Disable Switch to select between highway travel and job site travel. Refer to "Carrier Suspension" in this Section of this Operator's Manual for additional information.

7. Rear Axle Suspension Height Switch



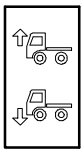
The crane is equipped with Hydro-pneumatic suspension system which utilizes cylinders to absorb shock. This switch is used to adjust the rear axle suspension and return the suspension to proper ride height before traveling the crane. Refer to "Carrier Suspension" in this Section of this Operator's Manual for additional information.

8. Ride Height Switch



The crane is equipped with Hydro-pneumatic suspension system which utilizes cylinders to absorb shock. This switch is used to adjust the front and rear axle suspension and return the suspension to proper ride height before traveling the crane. Refer to "Carrier Suspension" in this Section of this Operator's Manual for additional information.

9. Front Axle Suspension Height Switch



The crane is equipped with Hydro-pneumatic suspension system which utilizes cylinders to absorb shock. This switch is used to adjust the front axle suspension and return the suspension to proper ride height before traveling the crane. Refer to "Carrier Suspension" in this Section of this Operator's Manual for additional information.

10. Transfer Case Range Selector Switch

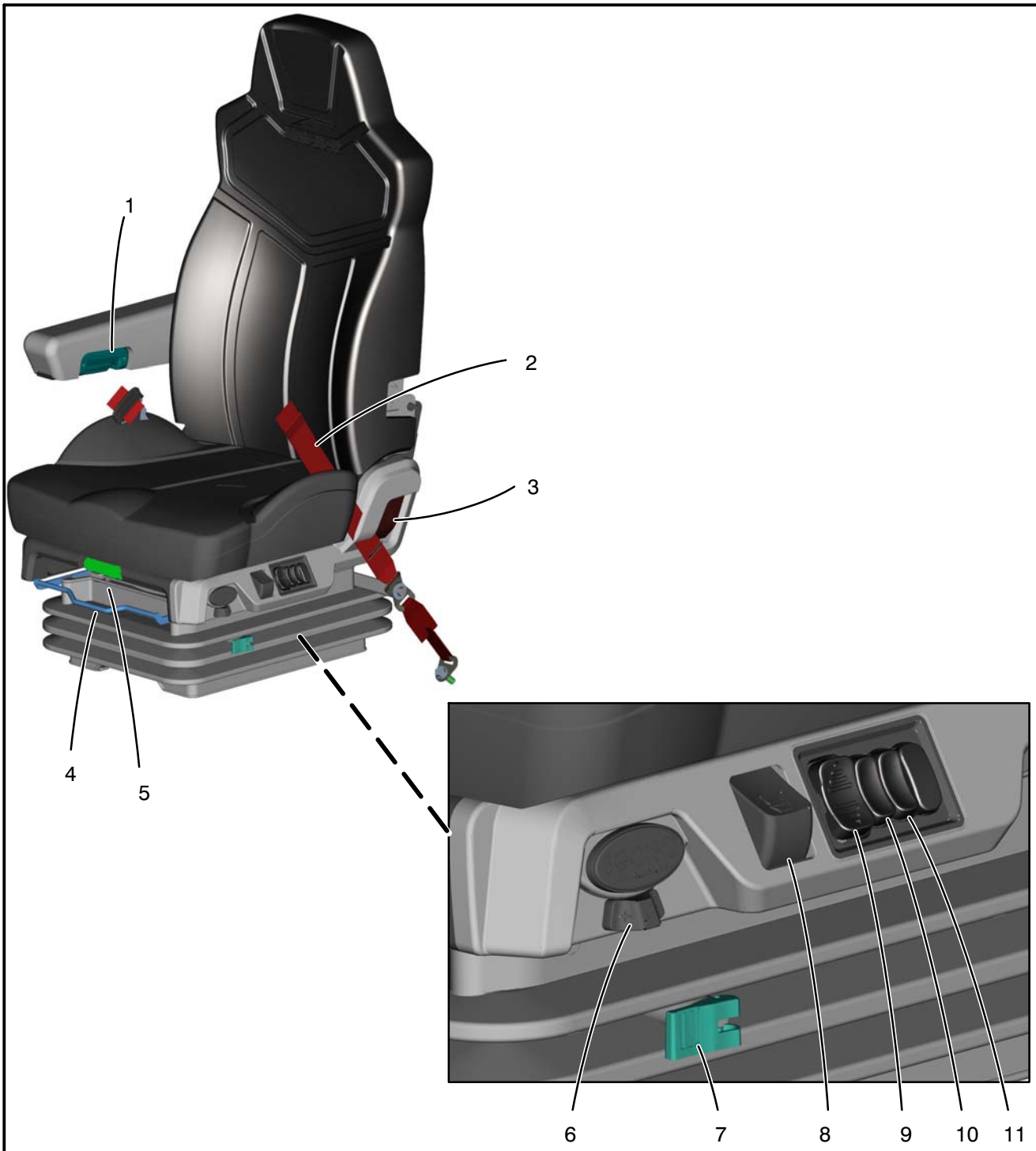
This switch is used to toggle through the transfer case gears. The indicator light on the switch will illuminate amber when the transfer case is in low range and blue for neutral; the light will cease to illuminate when the transfer case is in high range. Refer to "Two Speed Transfer Case" in this Section of this Operator's Manual for additional information.

11. Cross Axle Differential Lock Switch

This switch is used to engage the differential lock between the right and left wheels on axles 1, 2, 4, and 5. When the cross axle differential lock is engaged, an indicator light on the Carrier Cab Control display will illuminate. Refer to "Axle Differential Lock System" in this Section of this Operator's Manual for additional information.

12. Inter Axle Differential Lock Switch

This switch is used to engage the differential lock in transfer case, between axles 2 and 1, and between axles 4 and 5. When the inter axle differential lock is engaged, an indicator light on the Carrier Cab Control display will illuminate. Refer to "Axle Differential Lock System" in this Section of this Operator's Manual for additional information.



1. Arm Rest Adjustment Wheel
2. Seat Belt
3. Seat Back Adjustment Lever
4. Seat Slide Release Lever
5. Adjustable Leg Support Lever
6. Shock Adjustment Lever
7. Fore/Aft Isolator Lever
8. Seat Rake Adjustment Button
9. Air Ride Control Valve
10. Lower Back 2-Way Lumbar Valve
11. Mid-Back 2-Way Lumbar Valve

Figure 1–44
Carrier Cab Driver Seat

Carrier Cab Driver Seat

The driver/operator's seat in the carrier cab is fully adjustable for driver/operator comfort. For average conditions, the seat cushion surface should be level while the driver/operator is seated. The seat should ride freely up and down, without bottoming out, while traveling the crane.

Seat back angle and the forward and backward position of the seat should be adjusted to provide driver/operator comfort. The seat is adjusted by manual controls. Refer to Figure 1—44.

Note: For optimum comfort and proper seat adjustment, the driver/operator should "sit back in the seat" and sit erect while making any adjustment.

1. Arm Rest Adjustment Wheel

   To adjust the arm rest, raise the arm rest slightly, then rotate the arm rest adjustment wheel to adjust the arm rest stop position. Lower the arm rest into position.

⚠ WARNING

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

2. Seat Belt

   A seat belt is provided for driver/operator safety while driving the crane. The seat belt must be used at all times while driving the crane.

⚠ WARNING

Do not make seat adjustments while crane is in motion. Properly park crane before making seat adjustments.

3. Seat Back Adjustment Lever

   To recline the seat back, pull the lever and lean back. To bring the seat back forward, pull the lever and lean forward.

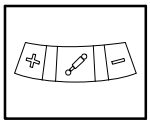
4. Seat Slide Release Lever

   To move the seat forward or backward, pull the seat slide release lever up and hold. Position the seat as desired and release the lever to lock the seat in place.

5. Adjustable Leg Support Lever

   2.5" of adjustable leg support. 8—position cushion extension adjustment. Adjustable while seated.

6. Shock Adjustment Lever

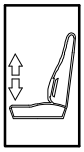


   A shock adjustment lever is used to adjust the weight resistance for maximum driver/operator comfort. Move the lever forward to increase the weight resistance for a heavier driver/operator; move the lever rearward to decrease the seat weight resistance for a lighter driver/operator.

7. Fore/Aft Isolator Lever

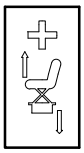
   Rotate the lever to the forward position to prevent the seat from floating. Rotate the lever rearward, to allow the seat to slightly float fore/aft. Either mode may be used to aid driver comfort, as desired.

8. Seat Rake Adjustment Button



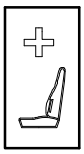
   To adjust the seat rake, push the button in and hold. Position the seat as desired and release the button to lock the seat in place.

9. Air Ride Control Valve



   The air control valve is used to adjust the seat height and weight for maximum driver/operator comfort. Press the top part of the switch to increase the seat height for a taller/heavier driver/operator; press the bottom of the switch to decrease the seat height/weight resistance for a shorter driver/operator.

10. Lower Back 2-Way Lumbar Valves



    Press the lower back 2 way lumber valve in the up position to increase lower back lumbar support and in the down position to decrease lower back lumbar support.

11. Mid—Back 2-Way Lumbar Valves

    Press the mid-back 2 way lumber valve in the up position to increase mid-back lumbar support and in the down position to decrease mid-back lumbar support.

1. Carrier Cab Throttle Pedal
2. Carrier Cab Service Brake Pedal
3. Tilt/Telescope Lever
4. Hazard Flasher Switch
5. Turn Signal Lever
6. Steering Wheel

Figure 1—45
Carrier Cab Steering Column And Foot Operated Controls

Carrier Cab Steering Column And Foot Operated Controls

The steering column is the conventional automotive type equipped with a tilt/telescope function. The following is a description of the switches and controls on the steering column and the foot operated controls, along with an explanation of their function and/or operation. Refer to Figure 1—45.

1. Carrier Cab Throttle Pedal

Carrier engine speed is controlled by the carrier cab throttle pedal. Press down on the carrier cab throttle pedal to increase carrier engine speed. Release the carrier cab throttle pedal to decrease carrier engine speed.

2. Carrier Cab Service Brake Pedal

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

Air Brake Operation

The distance the carrier cab service brake pedal is moved regulates the amount of air delivered to the brake chamber, which determines the braking force.

The smoothest stop results when the brake application is as hard at first as crane speed and road conditions will permit. Then gradually release the pedal as crane speed decreases. As the crane stop is completed, the brake application should only be enough to hold the crane stationary. A rough stop will occur if the application is light at first and increased as crane speed decreases.

Do not fan the carrier cab service brake pedal. This wastes compressed air and increases stopping distance. Depress the pedal fully only in cases of emergency as this makes control of the crane difficult.

If the air system pressure decreases below the normal operating range of 110–130 psi (*758–896kPa*), stop the crane and repair the problem. As the air system pressure decreases below 60 psi (*414kPa*), the park brake will automatically begin to apply and will fully engage if pressure drops below 40 psi (*276kPa*).

3. Tilt/Telescope Lever

This lever controls the tilt (angle) and telescope function of the steering wheel. To change steering wheel tilt and/or telescope:

a. Bring the crane to a complete stop.
b. Engage the park brake and shift the transmission to neutral.
c. To change the steering wheel angle, pull the tilt/telescope control lever toward the steering wheel and hold. Position the steering wheel at the desired angle and release the lever.
d. To change the steering column length, push the tilt/telescope control lever away from the steering wheel and hold. Position the steering column at the desired length and release the lever.
e. Check all steering wheel functions before continuing operations.

4. Hazard Flasher Switch

This switch controls the hazard warning flashers. Press the switch to turn the flashers on. Press the switch again to turn the flashers off.

5. Turn Signal Lever

The turn signal lever controls the following functions:

a. Turn Signals: Push the lever down for left turn signal, push the lever up for right turn signal.
b. Headlight Beam Control: Pull the lever toward the steering wheel to change to high beam headlights. Pull the lever toward the steering wheel again to return to low beam headlights.
c. Windshield Wiper: Rotate the turn signal lever counterclockwise to activate the windshield wiper. Rotate the lever counterclockwise to the first through fifth detent for intermittent wiper and to the sixth detent for low speed wiper, and to the seventh detent for high speed wiper. Rotate the lever fully clockwise to turn wiper off.
d. Windshield Washer: Push in on the end of the turn signal lever to spray washer fluid onto the windshield.

Note: If the right hand turn signal is activated, the carrier cab control and camera display working screen will automatically display the right hand camera view.

6. Steering Wheel

Turn the steering wheel clockwise for right turns and counterclockwise for left turns. It is equipped with cruise control, engine brake, intarder control, and horn functions. Refer to "Carrier Cab Steering Wheel Controls" in this section of this Operator's Manual for additional information.

1. Horn
2. Engine Brake Level "1" Button
3. Engine Brake Off Button
4. Top Intarder Level Paddle Switch
5. Bottom Intarder Level Paddle Switch
6. Engine Brake Level "2" Button
7. Engine Brake Level "3" Button
8. Cruise Control Resume Button
9. Cruise Control Off Button
10. Cruise Control Set Button
11. Cruise Control Cancel Button
12. Cruise Control On Button

Figure 1–46
Carrier Cab Steering Wheel Controls

Carrier Cab Steering Wheel Controls

The steering wheel is the conventional automotive type and is equipped with cruise control, engine brake, intarder control, and Horn functions. Refer to Figure 1–46.

1. Horn

Press the steering wheel pad to activate the Horn. Always sound the Horn with two quick bursts before starting the engine.

2. Engine Brake Level "1" Button

The Engine Brake Level "1" Button provides a low amount of engine braking force. Refer to "Carrier Engine Brake" in this section of this Operator's Manual for additional information.

3. Engine Brake Off Button

The Engine Brake Off Button deactivates the carrier engine brake.. Refer to "Carrier Engine Brake" in this section of this Operator's Manual for additional information.

4. Top Intarder Level Paddle Switch

The top intarder level paddle increases the intarder level. Tap the paddle back or forth to increase the intarder braking level by one level for each tap. Refer to "Transmission Intarder Operation" in this section of this Operator's Manual for additional information.

5. Bottom Intarder Level Paddle Switch

The bottom intarder level paddle decreases the intarder level. Tap the paddle back or forth to decrease the intarder braking level by one level for each tap. Refer to "Transmission Intarder Operation" in this section of this Operator's Manual for additional information.

6. Engine Brake Level "2" Button

The Engine Brake Level "2" Button provides a medium amount of engine braking force. Refer to "Carrier Engine Brake" in this section of this Operator's Manual for additional information.

7. Engine Brake Level "3" Button

The engine brake level "3" button provides a high amount of engine braking force. Refer to "Carrier Engine Brake" in this section of this Operator's Manual for additional information.

8. Cruise Control Resume Button

The Cruise Control Resume Button allows the operator to resume or decelerate the speed setting of the cruise control. This button also allows the operator to decrement engine idle speed. Refer to "Cruise Controls" in this section of this Operator's Manual for additional information.

9. Cruise Control Off Button

The Cruise Control Off Button deactivates the cruise control system. Refer to "Cruise Controls" in this section of this Operator's Manual for additional information.

10. Cruise Control Set Button

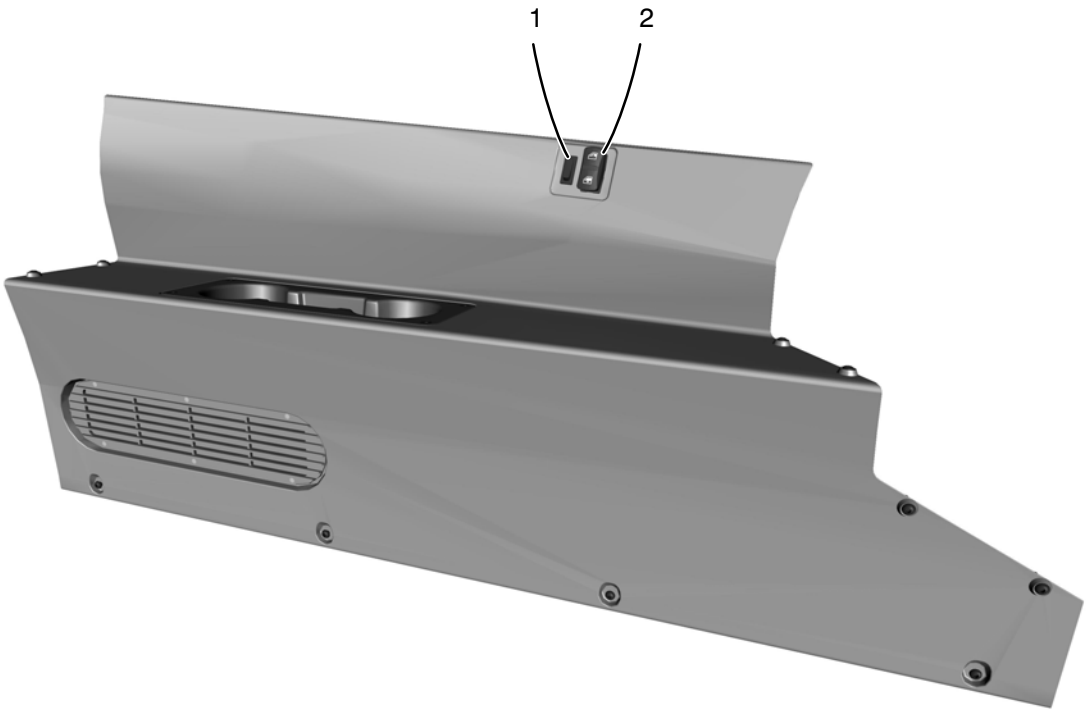
The Cruise Control Set Button sets the cruise control at the speed the crane is traveling, at or above 30 mph (48km/h). This button also allows the operator to increment engine idle speed. Refer to "Cruise Controls" in this section of this Operator's Manual for additional information.

11. Cruise Control Cancel Button

The Cruise Control Cancel Button temporarily disables cruise control without deactivating the cruise control system. The previously set speed is retained in memory. Refer to "Cruise Controls" in this section of this Operator's Manual for additional information.

12. Cruise Control On Button

The Cruise Control On Button activates the cruise control system. Refer to "Cruise Controls" in this section of this Operator's Manual for additional information.



1. Passenger Dome Light Switch
2. Passenger Power Window Switch

Figure 1–47
Carrier Cab Passenger Panel

Carrier Cab Passenger Panel

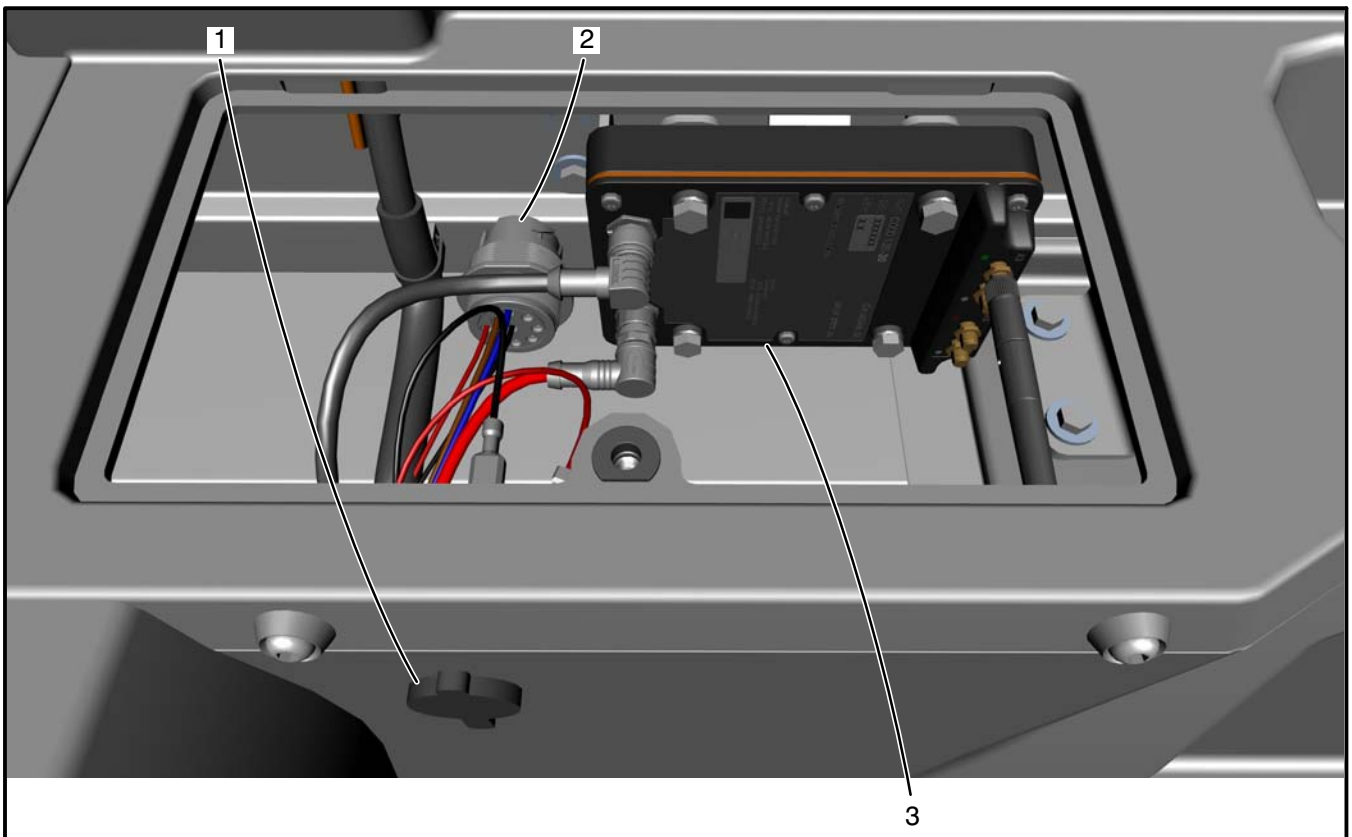
The carrier cab passenger panel is to the left of the passenger. It contains the following controls and is shown in Figure 1–47.

2. Passenger Power Window Switches

Press this switch in the up position to roll up the window, or in the down position to roll down the window.

1. Passenger Dome Light Switch

Press this switch in the active (up) position to illuminate the cab dome lights above the passenger. Press this switch in the inactive (down) position to illuminate the dome lights when either carrier cab door is opened.



1. 12 Volt Accessory Outlet (Unswitched)
2. Electronic Logging Device (ELD) Connector
3. Wi-fi Programming Module

Figure 1—48
Carrier Cab Electronic Logging Device (ELD) Access Panel

Carrier Cab Electronic Logging Device (ELD) Access Panel

The crane is equipped with a connector for an optional Electronic Logging Device (ELD), purchased separately. The ELD Connector is located in the access panel behind the carrier cab Driver's seat. Refer to Figure 1—48. The Wi-fi Programming Module and 12 volt accessory outlet wiring are also in this location.

1. 12 Volt Accessory Outlet (Unswitched)

   Use this outlet for electrical accessories. This outlet is powered regardless of ignition switch position

CAUTION

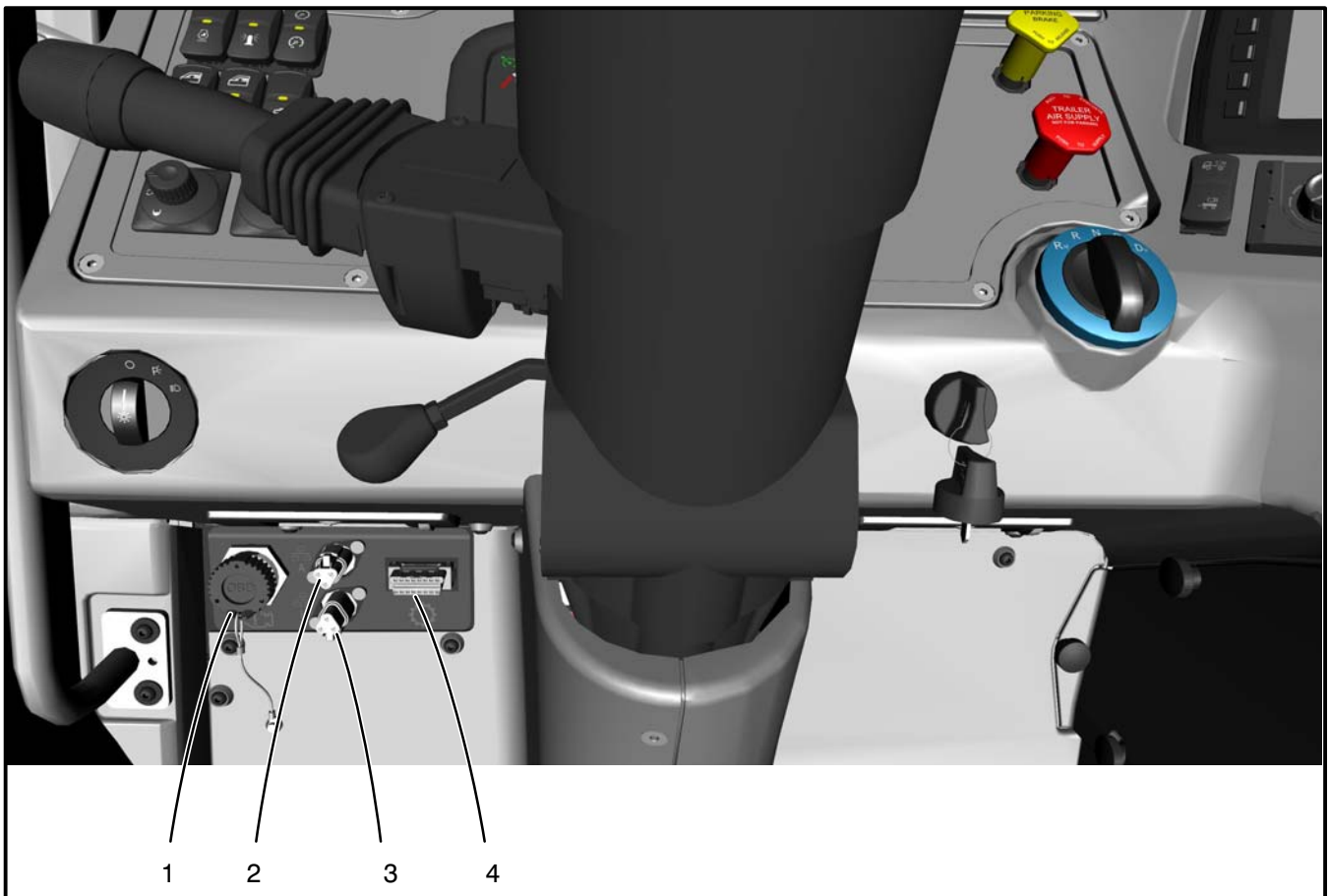
Do not connect an accessory to any part of the crane other than the accessory outlet. Damage to the crane's electrical system may result. If it is necessary to do so, contact a Link-Belt Distributor.

2. Electronic Logging Device (ELD) Connector

   This connector is provided for connecting a user-supplied aftermarket ELD system to the vehicle.

3. Wi-fi Programming Module

   This module is used by service technicians to wirelessly update vehicle software.



1. Carrier Cab Engine Diagnostic Connector
2. Anti-Lock Brake System (ABS) Diagnostic Connector
3. Carrier CAN Bus H Diagnostic Connector
4. Transmission Diagnostic Connector

Figure 1—49
Carrier Cab Diagnostic Connectors

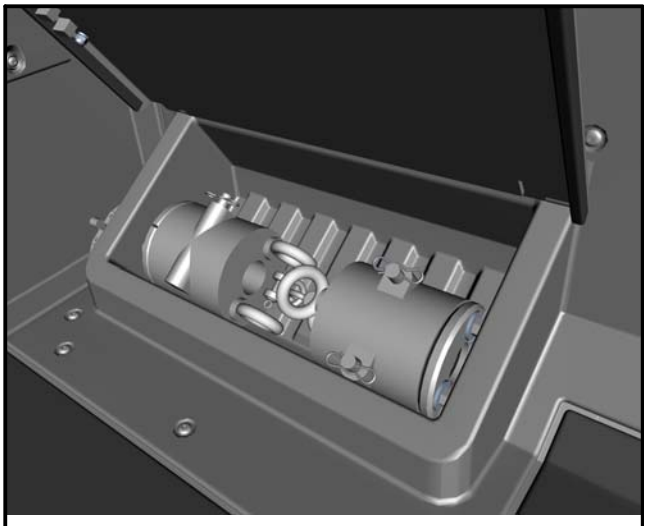


Figure 1—50
ATB Weight Storage Box

Carrier Cab Diagnostic Connectors

The Transmission, Carrier CAN BUS H, ABS, and Carrier Engine Diagnostic Connectors are located inside the carrier cab below the dash. Refer to Figure 1—49.

ATB Weight Storage Box

The ATB weight storage box is in the passenger side floorboard of the carrier cab. The ATB weights and chains can be stored in this location when not in use. Refer to in Figure 1—50.

1. Seat Belt
2. Carrier Cab Passenger Seat Storage Box
3. 2 Way Lumbar Handle
4. Seat Back Adjustment Lever
5. Arm Rest Adjustment Wheel

Figure 1–51
Carrier Cab Passenger Seat

Carrier Cab Passenger Seat

Seat back angle of the seat can be adjusted to provide passenger comfort. The seat is adjusted by manual controls. Refer to Figure 1–51.

WARNING

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

1. Seat Belt

   A seat belt is provided for passenger safety while riding in the crane. The seat belt must be used at all times while riding in the crane.

2. Carrier Cab Passenger Seat Storage Box

   The carrier cab passenger seat storage box stores the anemometer and ATB switch. Refer to "Carrier Cab Passenger Seat Storage Box" in this section of this Operator's Manual for additional information.

WARNING

Do not make seat adjustments while crane is in motion. Properly park crane before making seat adjustments.

3. 2 Way Lumbar Handle

   Rotate the lumbar handle into one of 6 detent positions for differing levels of lumbar support.

4. Seat Back Adjustment Lever

   To recline the seat back, pull up on the lever and lean back. To bring the seat back forward, pull up on the lever and lean forward.

5. Arm Rest Adjustment Wheel

   To adjust the arm rest, raise the arm rest slightly, then rotate the arm rest adjustment wheel to adjust the arm rest stop position. Lower the arm rest into position.

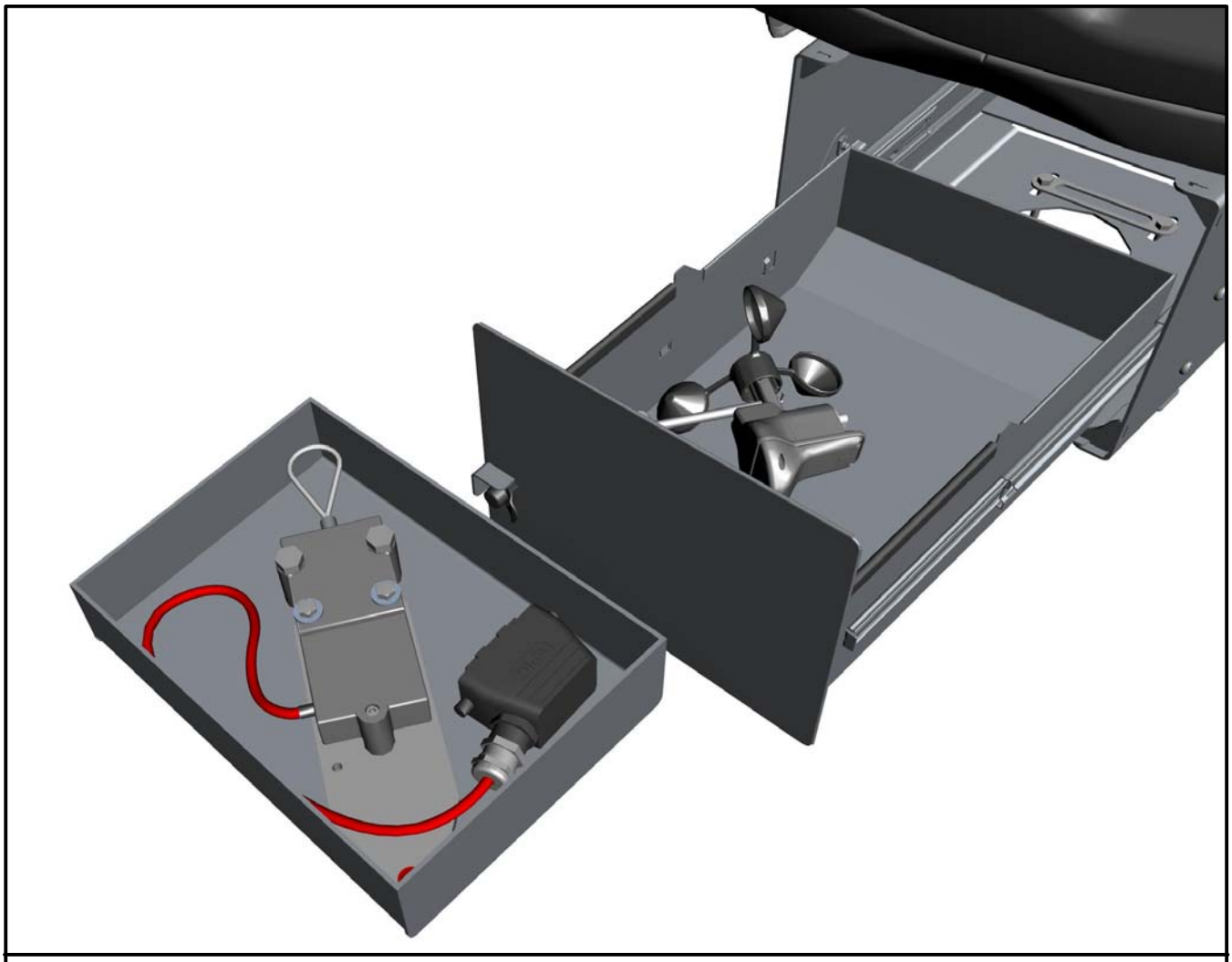
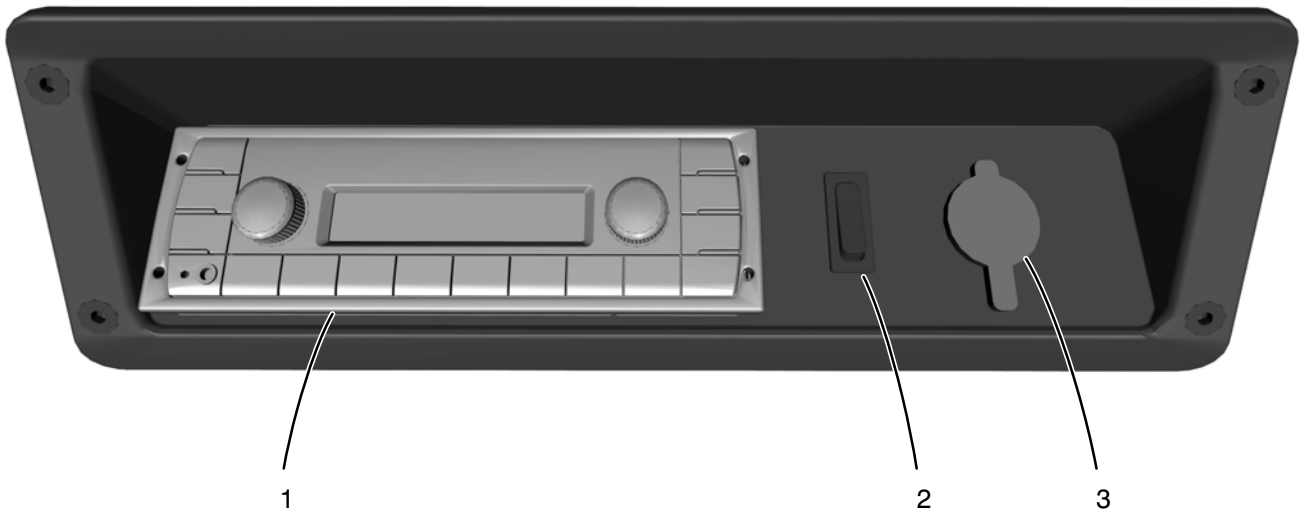


Figure 1—52
Carrier Cab Passenger Seat Storage Box

Carrier Cab Passenger Seat Storage Box

The carrier cab passenger seat storage box is under the carrier cab passenger seat. Refer to Figure 1—52.



1. Carrier Cab Radio
2. Dome Light Switch
3. 12 Volt Accessory Outlet (Switched)

Figure 1—53
Carrier Cab Radio Panel

Carrier Cab Radio Panel

The carrier cab radio panel is in front of the driver/operator, above the windshield. It contains the following components and is shown in Figure 1—53.

3. 12 Volt Accessory Outlet (Switched)

   Use this outlet for electrical accessories. This outlet is only powered when the ignition switch is on.

CAUTION

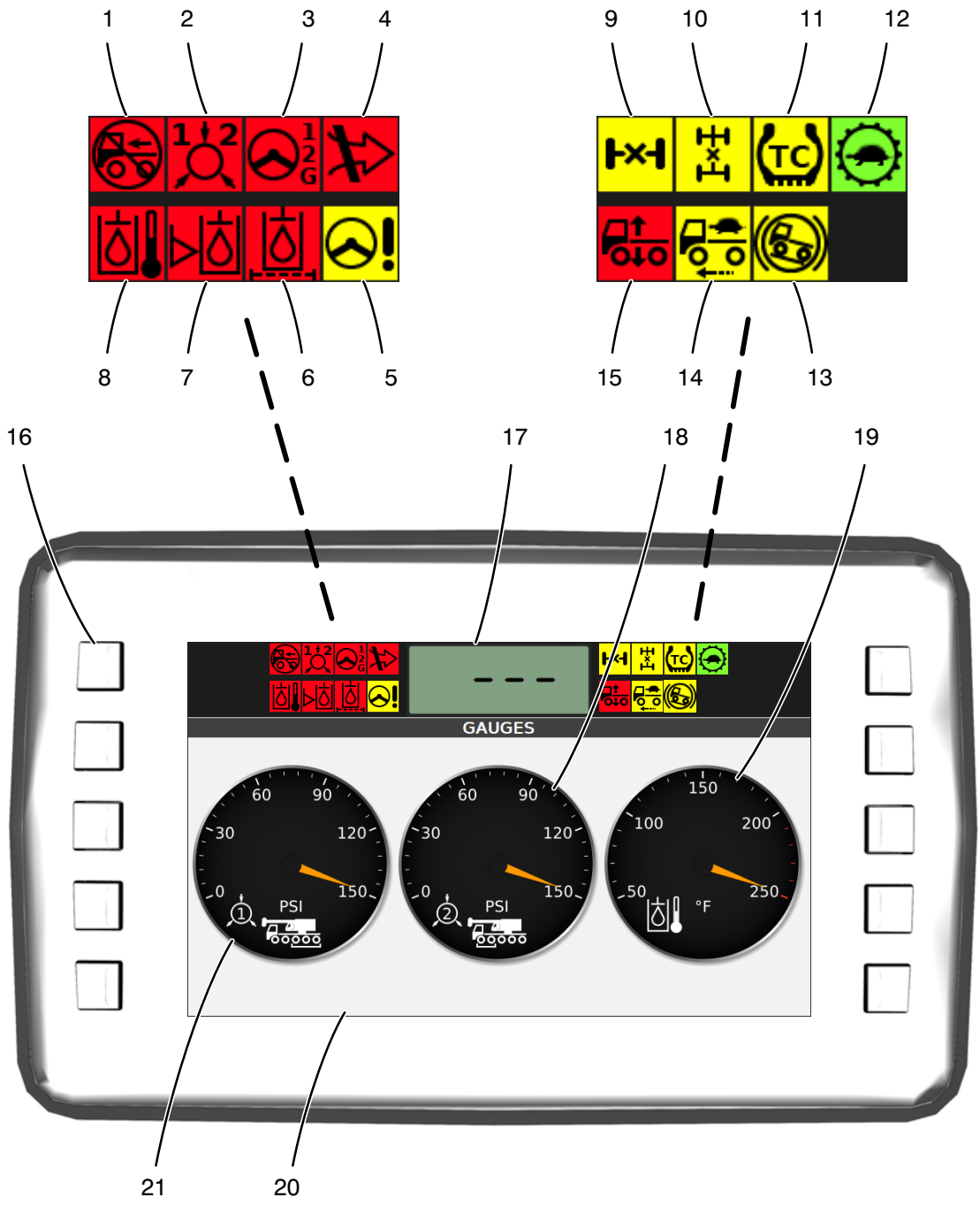
Do not connect an accessory to any part of the crane other than the accessory outlet. Damage to the crane's electrical system may result. If it is necessary to do so, contact a Link-Belt Distributor.

2. Dome Light Switch

   Press this switch in the active (up) position to illuminate the carrier cab dome lights. Press this switch in the inactive (down) position to illuminate the dome lights when either carrier cab door is opened.

1. Carrier Cab Radio

   The crane is equipped with an AM/FM/Bluetooth radio. Refer to the radio manufacturer's owner's manual for details.



1. Drive Caution Warning Indicator Light
2. Low Air Pressure Indicator Light
3. Steering Warning Indicator Light
4. Emergency Air Shutoff Indicator Light – Optional
5. Steering Malfunction Indicator Light
6. Hydraulic Oil Filter Indicator Light
7. Carrier Hydraulic Oil Level Indicator Light
8. Hydraulic Oil Temperature Indicator Light
9. Cross Axle Differential Lock Indicator Light
10. Inter Axle Differential Lock Indicator Light
11. Automatic Traction Control (ATC) Indicator Light
12. Two Speed Transfer Case Indicator Light
13. Hill Start Aid Disable Indicator Light
14. Travel Mode Indicator Light
15. Ride Height Indicator Light
16. Menu Selection Buttons
17. Transmission Display
18. Secondary Air Pressure Gauge
19. Hydraulic Oil Temperature Gauge
20. Message Area Display
21. Primary Air Pressure Gauge

Figure 1–54
Carrier Cab Control And Camera Display Working Screen

Carrier Cab Control And Camera Display

The Carrier Cab Control And Camera Display is mounted to the right of the carrier cab dash. It contains the following controls, gauges, and indicators. Refer to Figure 1–54. The camera display is automatically activated for the right camera if the right turn signal is engaged, and for the rear camera if the transmission is in reverse range.

1. Drive Caution Warning Indicator Light

This red indicator light will illuminate along with a banner and an audio alarm will sound if the engine is running, transmission is in drive mode (and not in neutral), travel mode is set to highway and the following conditions are met:

Cab Tilt – The upper cab is tilted.

House Lock Applied – The boom is not over the front (not in the boom rest) and the house lock is applied.

360° Swing Lock – The boom is not over the front (not in the boom rest) and the 360° swing lock is applied

Swing Park Brake – The boom is rotated +/– 10° (*170°–190°*) over rear and the swing park brake is applied.

Boom Float – The boom is not over the front (not in the boom rest) and the boom float valve is closed OR boom is over front and the boom float valve is open.

2. Low Air Pressure Indicator Light

This red indicator light will illuminate and an audio alarm will sound if the front or rear system air pressure falls below 80 psi. An alarm will also alert the operator of these conditions.

3. Steering Warning Indicator Light

This red indicator light will illuminate and an audio alarm will sound when the crane is not moving or is on outriggers. This light will also illuminate when the crane is moving and a front and rear steering pump failure occurs.

Steer 1 – This red indicator light will illuminate when the low pressure switch indicates a failure of the pump to axles 1 and 2, and the hydraulic pressure is lost. An alarm will also alert the operator of these conditions.

Steer 2 – This red indicator light will illuminate when the low pressure switch indicates a failure of the pump to axles 3 and 4, or if the pump fails to supply pressure to axle 5, and the hydraulic pressure is lost. An alarm will also alert the operator of these conditions.

Steer 1 and 2 – This red indicator light will illuminate when the switches at the front axles, and either of the switches at the rear axles, indicate low pressure. An alarm will also alert the operator of these conditions.

Steer G – This yellow indicator light will illuminate when the low flow switch indicates a failure of the pump to provide flow. If the machine is stationary, the ground driven pump will not provide flow through the sensor switch and the light will illuminate. If the ground driven pump fails to provide flow while the machine is in motion, the indicator light will illuminate.

Steer 1 and G – This red indicator light will illuminate when the switches at the front axles indicate low pressure and the emergency steer is on low pressure. An alarm will also alert the operator of these conditions.

Steer 2 and G – This red indicator light will illuminate when either of the switches at the rear axles indicate low pressure and the emergency steer is on low pressure. An alarm will also alert the operator of these conditions.

Steer 1, 2, and G – This red indicator light will illuminate when the switches at the front axles, and either of the switches at the rear axles, indicate low pressure and the emergency steer is on low pressure. An alarm will also alert the operator of these conditions.

4. Emergency Air Shutoff Indicator Light — Optional

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.

5. Steering Malfunction Indicator Light

This indicator light will illuminate yellow and an audio alarm will sound to alert the driver/operator that the rear steering system has been switched to the backup steer system due to a malfunction in the primary steer system or low hydraulic fluid.

This indicator light illuminates red to alert the operator that the rear steer wheels are not centered.

When this light begins to flash red and the rear wheels are centered, a computer/sensor fault has been detected.

If this light illuminates while the crane is moving, maneuver the crane to a safe location and determine and repair the malfunction. Test all steering functions before placing the crane back into service.

6. Hydraulic Oil Filter Indicator Light

This indicator light will illuminate along with a pop up warning will appear and an audio alarm if the temperature meets or exceeds 100°F (*37.78°C*) and the hydraulic reservoir filter needs to be replaced. If the hydraulic tank pressure is between 22 to 24 PSI (*151.69—165.47kPa*) for more than 10 seconds the light will illuminate yellow. If the hydraulic tank pressure meets or exceeds 25 PSI (*172.37kPa*) for more than 10 seconds the light will illuminate red.

7. Carrier Hydraulic Oil Level Indicator Light

This indicator light will illuminate yellow and a pop up warning will appear along with an audio alarm if the hydraulic oil level is low. This light will illuminate red and a pop up warning will display on the Crane Control Display if the hydraulic oil level is critically low. These warnings will also be reported to the Pulse Crane Control System Display in the upper cab.

8. 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.

9. Cross Axle Differential Lock Indicator Light

This yellow indicator light will illuminate when axles 1, 2, 4, and 5 are locked and the transfer case is in low range. This light will flash if the cross axle differential lock switch is pressed to engage the cross axle lock and will continue flashing until cross axles are locked and the transfer case is in low range. This light will also flash if the cross axle differential lock switch is pressed to disengage the cross axle lock and will continue flashing until axles 1, 2, 4, and 5 are unlocked and the transfer case is in high range. An alarm buzzer will sound along with illumination of this indicator light if the wheel angle exceeds 10°. Refer "Axle Differential Lock System" in this section of this Operator's Manual for additional information.

10. Inter Axle Differential Lock Indicator Light

This yellow indicator light will illuminate when axles 2 and 4 are locked and the transfer case is in low range. This light will flash if the inter axle differential lock switch is pressed to engage the inter axle lock and will continue flashing until axles 2 and 4 are locked and the transfer case is in low range. This light will also flash if the inter axle lock differential lock switch is pressed to disengage the inter axle lock and will continue flashing until axles 2 and 4 are unlocked and the transfer case is in high range. Refer "Axle Differential Lock System" in this section of this Operator's Manual for additional information.

11. Automatic Traction Control (ATC) Indicator Light

This yellow indicator light will flash during a traction control event. This light will illuminate if the ATC is disabled using the Traction Control Disable Switch. Refer to "Anti-lock Brake System (ABS)" in this section of this Operator's Manual for additional information.

12. Two Speed Transfer Case Indicator Light

This green indicator light will illuminate and display a turtle icon when the transfer case is engaged in low range. The light will cease to illuminate and display a rabbit icon when the transfer case is in high range or neutral range. If the transfer case is in neutral range, the Transfer Case Range Selector Switch will illuminate blue.. Refer to "Two Speed Transfer Case" in this Section of this Operator's Manual for additional information.

13. Hill Start Aid Disable Indicator Light

This yellow indicator light will illuminate when the hill start aid is disabled. Refer to "Hill Start Aid (HSA) Operation" in this section of this Operator's Manual for additional information.

14. Travel Mode Indicator Light

This yellow indicator light will illuminate while the machine is in job site travel mode. If the crane is in job site travel mode when shut off, this light will illuminate by default during startup. This light will not illuminate if highway travel mode is activated. A warning message will appear in the message area display and an audio alarm will sound if the machine is not on ride height. Refer to "Carrier Travel Mode" in this Section of this Operator's Manual for additional information.

15. Ride Height Indicator Light

This red indicator light will illuminate along with an audible alarm during carrier suspension adjustment procedure. Refer to "Carrier Suspension" in this Section of this Operator's Manual for additional information.

16. Menu Selection Buttons

The menu selection buttons correspond to the touch buttons on the display and can be pressed instead of the touch buttons.

17. Transmission Display

The transmission display illuminates to provide the system and shift status of the transmission. Visual indicators will alert the operator if a system malfunction occurs. Refer to "Main Transmission Controls" in this section of this Operator's Manual for additional information.

18. Secondary Air Pressure Gauge

The secondary air pressure gauge displays the pressure of the front air system.

19. Hydraulic Oil Temperature Gauge

This gauge registers the the hydraulic oil temperature. An alarm buzzer will sound and the indicator within the gauge will illuminate when the hydraulic oil exceeds maximum operating temperature. If the system overheats, shutdown the crane immediately and correct the problem.

20. Message Area Display

Various messages will be displayed here during operation of the crane.

21. Primary Air Pressure Gauge

The primary air pressure gauge displays the pressure of the rear air system.

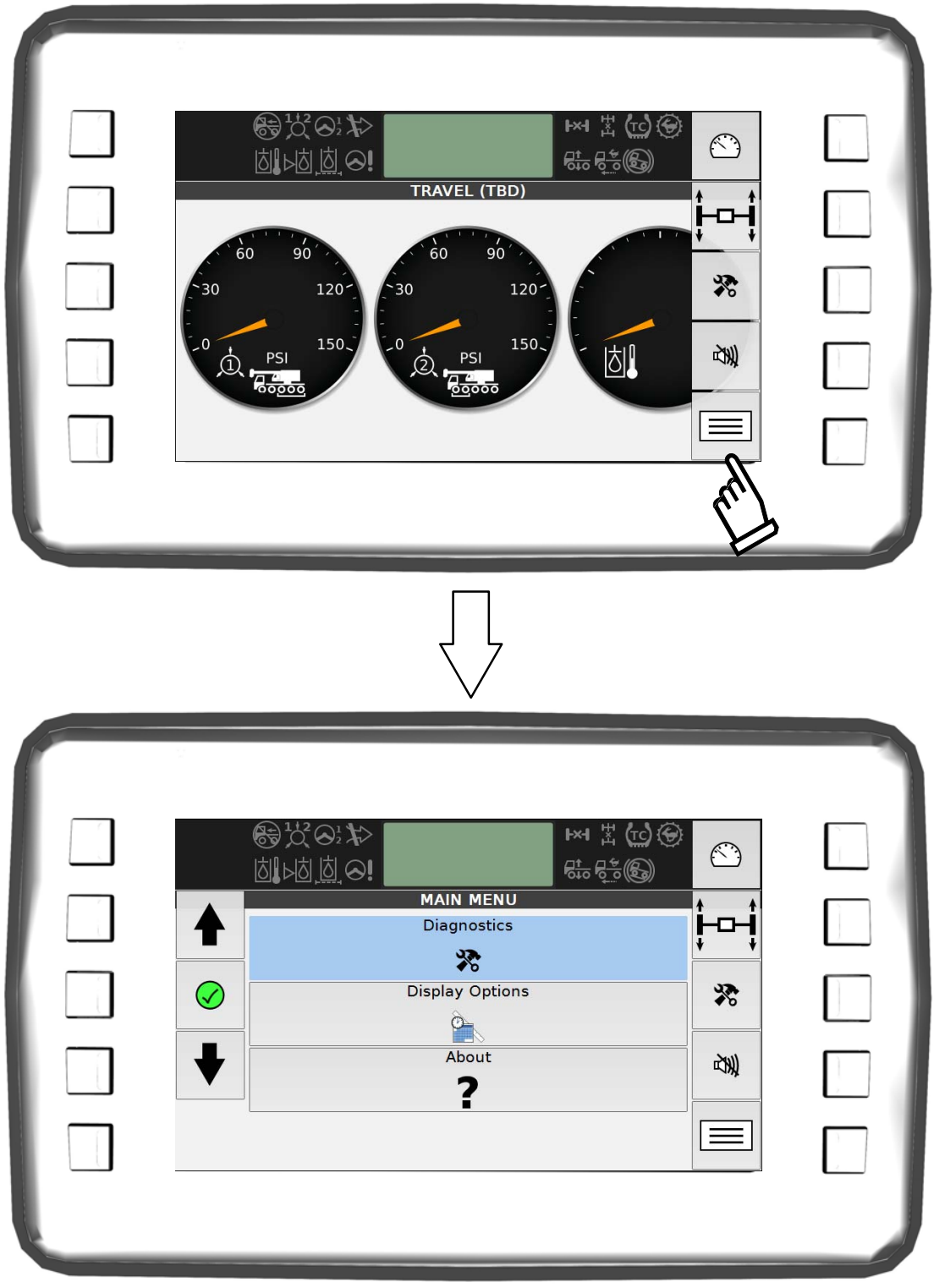


Figure 1–55
Carrier Cab Control Display Main Menu

Carrier Cab Control Display Diagnostic Menu

Access the Carrier Cab Control Display Diagnostic Menu by pressing the button corresponding to the diagnostics icon . Alternately, the Diagnostic Menu can be accessed by pressing the button corresponding to the main menu icon on the Main Working Screen, highlighting "Diagnostics" using the buttons corresponding to the arrow icons on the Main Menu, and pressing the button corresponding to the selection icon . Refer to Figure 1−55.

Highlight the desired diagnostics selection using the buttons corresponding to the arrow icons on the Diagnostic Menu and press the button corresponding to the selection icon . Diagnostic selections are as follows:

- Active System Faults
- Engine
- Powertrain
- Axle Lock
- Suspension
- Tire Pressure
  (toggles between dolly and crane)
- CAN BUS
- Outrigger
- Steering
- Auxiliary Power Emergency System
- About

Press the bottom left button to return to the Diagnostics Menu. Press the bottom right button to return to the Main Menu. Press the top right button to return to the Main Working Screen.

Carrier Cab Control Display Options Screen

Access the Carrier Cab Control Display Options Screen by pressing the button corresponding to the main menu icon on the Main Working Screen. Highlight "Display Options" using the buttons corresponding to the arrow icons on the Main Menu and press the button corresponding to the selection icon . Refer to Figure 1−55.

Changing Dash Readout Between English and Metric

Access the Carrier Cab Control Display Options Screen by pressing the button corresponding to the main menu icon on the Main Working Screen. Highlight "Display Options" using the buttons corresponding to the arrow icons on the Main Menu and press the button corresponding to the selection "Display Units". Select "Metric Units". Cycle the Keyswitch and then restart the crane. To switch back to English Units reverse the above procedure. Refer to Figure 1−55.

Note: The above setting will not change the entire machine between English and Metric only the carrier display instrument cluster. RCL in the upper cab is separate and is driven by charts.

Carrier Cab Control Display About Screen

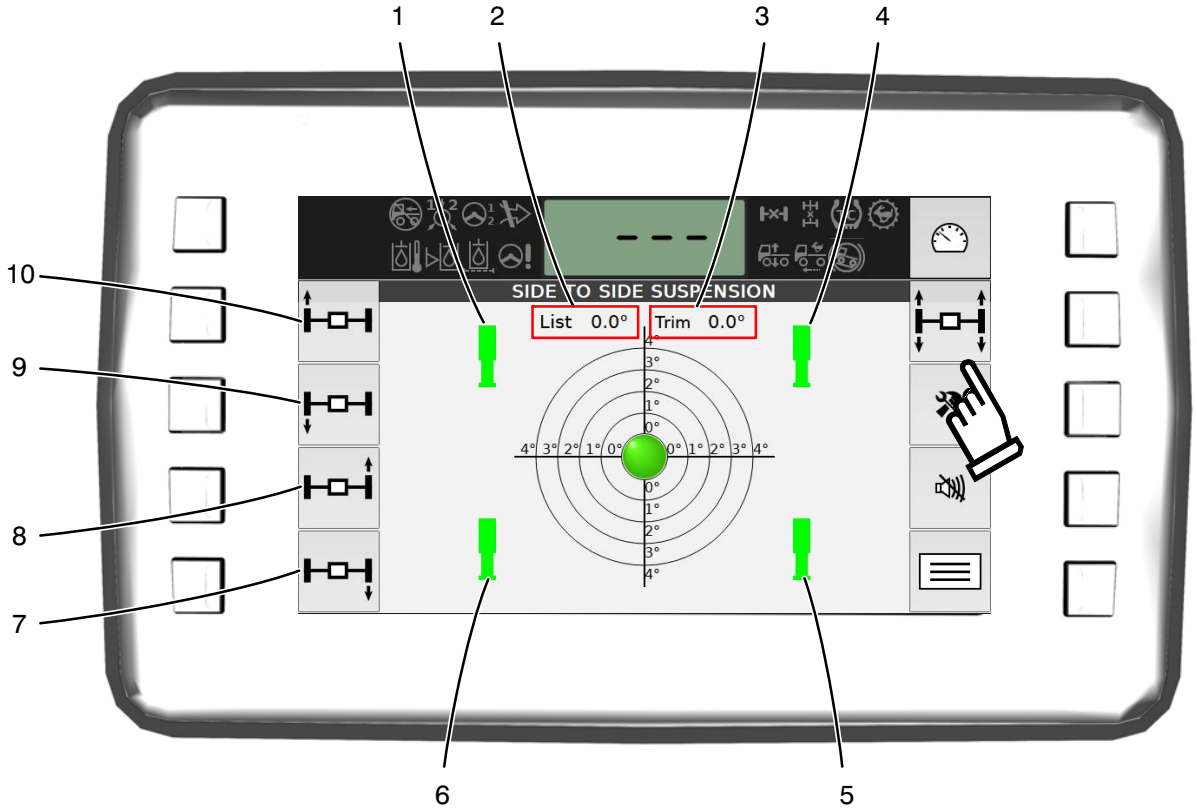
The About menu displays which version of the Display and Controller software are currently installed.

Access the Carrier Cab Control Display Diagnostic Screen by pressing the button corresponding to the main menu icon on the main working screen. Highlight "About" using the buttons corresponding to the arrow icons on the main menu and press the button corresponding to the selection icon . Refer to Figure 1−55.

Press the bottom right button to return to the Main Menu. Press the top right button to return to the Main Working Screen.

Wireless Rigging Remote Mode

The Wireless Rigging Remote option allows the Operator to activate the Wireless Rigging Remote to be used for outrigger operation, winch operation, and boom hoist/down operation. Refer to "Wireless Rigging Remote" in this section of this Operator's Manual for specific information.



1. Left Front Pressure Transducer Status Indicator Light
2. List (Side to Side) Value
3. Trim (Front to Rear) Value
4. Right Front Pressure Transducer Status Indicator Light
5. Right Rear Pressure Transducer Status Indicator Light
6. Left Rear Pressure Transducer Status Indicator Light
7. Right Side Lower Icon
8. Right Side Raise Icon
9. Left Side Lower Icon
10. Left Side Raise Icon

Figure 1–56
Inclination Adjustment Screen

Inclination Adjustment Feature

The inclination adjustment feature is available to assist in outrigger setup on inclined surfaces. It is only to be used in extreme situations when outrigger beams cannot be properly extended due to inclined surface interference. The inclination adjustment controls are only active when the crane is stationary, transmission in neutral, and with the engine running.

DANGER

Do not perform the inclination adjustment with the upper in motion. Loss of stability can occur causing the crane to roll over. Crane upper must be stationary with carrier on a firm surface before performing inclination adjustment operations.

DANGER

Do not travel the crane until the suspension is returned to a highway or job site travel state. Loss of stability can occur causing the crane to roll over.

DANGER

Do not perform the inclination adjustment with the crane on an unstable surface and/or when all tires are not parallel to the centerline of the carrier. Loss of stability can occur causing the crane to roll over. Crane must be on a firm surface and all tires parallel to centerline of carrier before performing inclination adjustment operations.

1. Configure the crane per the appropriate job site travel chart. Refer to Job Site Travel in this Section of this Operator's Manual for additional information.
2. Ensure the travel swing lock is engaged.
3. Travel the crane to the lift location. The location must be a firm surface.
4. Access the Inclination Adjustment screen by pressing the button corresponding to the inclination icon . Refer to Figure 1−56.
5. For smoothest operation, press and hold the top part the ride height switch to fully raise the crane. Refer to Figure 1−43.
6. Lower the crane to the desired inclination by pressing the button corresponding to one of the lower icons . Refer to Figure 1−56.

   Note: Only one button will operate at a time.

   Note: The inclination adjustment feature allows up to 4±0.2 degrees of inclination from horizontal before the function will cutout. If function has cutout, only the buttons that will eliminate the cutout situation are active. Inactive buttons will reactivate when inclination is within −3 to 3 degrees. When using the extend buttons, the function may cutout due to high cylinder pressure.

   Note: Pressure status transducer indicator lights will illuminate different colors depending on the inclination status. Normal status will illuminate green, high status will illuminate yellow, and cutout will flash red.

7. If required, press the button corresponding to the opposite of the lower icon from step 6 to lower the crane to the desired inclination.
8. Properly level the crane on outriggers. Refer to Main Outrigger Operation in this Section of this Operator's Manual for additional information.
9. Once the crane is leveled on outriggers, use the axle retract switch at the ground controlled outrigger station, the inclination adjustment switches, or the front or rear carrier suspension switches to raise the tires to increase ground clearance.

Axle Differential Lock System

The axle differential lock system is used to increase wheel traction on slippery roads or soft ground. Under normal driving conditions the differential locks (Inter Axle and Cross Axle) should remain unlocked. This will provide differential action between axles 2 and 4 (Inter Axle) and the right and left wheels of axles 1, 2, 4, and 5 (Cross Axle). To provide maximum pulling power when wheels are likely to slip, press the inter axle differential lock switch and/or cross axle differential lock switch to limit slipping. The inter axle differential lock switch will lock transfer case inter axle differential and axles 2 and 4. The the cross axle differential lock switch will lock the right and left wheels of rear axles 4 and 5. Refer to Figure 1−43 for switch locations.

Note: For the cross axle lock, 5th gear is the maximum selection.

To access the Axle Lock Diagnostic Screen on the Carrier Cab Control Display, navigate to the Diagnostic Menu, then use the buttons corresponding to the arrow icons to highlight "Axle Lock". Press the button corresponding to the selection icon . Refer to "Carrier Cab Control Display Diagnostic Menu" in this section of this Operator's Manual and Figure 1−57.

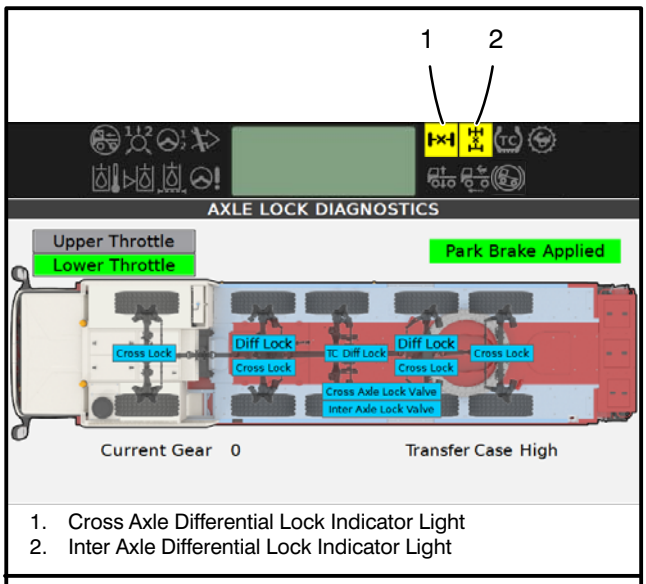
CAUTION

Do not use the differential lock(s) on hard, dry, non-slip surfaces or in normal driving conditions. Operation on these surfaces may damage driveline components. The differential lock(s) is/are designed to be used only on slippery surfaces where the crane cannot move due to one tire spinning.

To Engage The Differentials

CAUTION

Do not actuate the differential lock(s) when the wheels are slipping or spinning without traction. Do not allow wheels to spin with differentials unlocked. Either situation can damage the differential gears. Engage axle locks only with crane at a complete stop and brakes are applied.



1. Cross Axle Differential Lock Indicator Light
2. Inter Axle Differential Lock Indicator Light

Figure 1−57
Axle Lock Diagnostic Screen

1. Bring the crane to a complete stop.
2. With the brakes applied, press and release the axle differential lock switch(es).

   Note: The cross axle lock will disengage after 15 seconds.

3. Slowly, proceed with caution. Steering the crane with the differential lock(s) engaged is not recommended, however if required, do so very carefully.

   Note: The corresponding indicator light(s) on the carrier cab control and camera display will illuminate while the inter and cross axle differentials are locked as a reminder to unlock them as soon as slippery surface conditions have ceased. The corresponding indicator light(s) will illuminate and an alarm buzzer will sound continuously if the differentials are locked and the steering angle is above 10° or less than −10°. Refer to Figure 1−57.

4. When driving conditions have returned to normal, immediately bring the crane to a complete stop and disengage the differentials.

To Disengage The Differentials

1. Bring the crane to a complete stop.
2. With the brakes applied, release the axle differential lock switch(es).
3. Slowly, proceed with caution.

Carrier Suspension

The crane is equipped with a Hydro-pneumatic carrier suspension system. The suspension can be adjusted for specific crane functions.

To access the Suspension Diagnostic Screen on the Carrier Cab Control Display, navigate to the Diagnostic Menu, then use the buttons corresponding to the arrow icons to highlight "Suspension". Press the button corresponding to the selection icon . Refer to "Carrier Cab Control Display Diagnostic Menu" in this section of this Operator's Manual and Figure 1—58.

Carrier Travel Mode

The Hydro-pneumatic carrier suspension system has two travel modes:

Highway Travel Mode (Unblocked)

The Highway Travel Mode is the default travel mode. It unblocks the Hydro-gas suspension hydraulic circuit and allows oscillation between the right and left side axle groups of the front and rear suspension. This mode allows independent oscillation of the axle groups. The Highway Travel mode provides a smoother ride and more roll stability than the Job Site Travel Mode. When in the Highway Travel mode, there is no indicator light illumination on the switch or on the display.

Job Site Travel Mode (Blocked)

The job site travel mode is activated by pressing the Travel Mode/Hill Start Disable Switch. Refer to Figure 1—43. It blocks the Hydro-gas suspension hydraulic circuit and does not allow side to side oscillation between the right and left side axle groups of the front and rear suspension. This mode only allows independent oscillation of the left front, right front, right rear, and left rear axle groups. This mode provides for maximum crane load and stability during job site travel. The travel mode indicator lights on the carrier cab display and on the Job Site mode switch will illuminate when the Job Site switch is in the Job Site Travel Mode position. See Job Site Travel load and speed chart for allowed operating conditions while in the Job Site Travel mode. This mode should be limited to 5 MPH (*8.0km/h*) maximum travel speed to prevent axle overloading.

If the crane is raised onto outriggers while in Highway Travel mode, the travel mode condition will automatically change to job site travel mode and the audio alarm and indicator message on the carrier cab control and camera display will flash. The mode change will lock the suspension when the crane is raised onto outriggers. Refer to Figure 1—58.

CAUTION

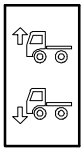
Do not travel the crane above or below ride height at speeds greater than 1 mph. Do not travel the crane with the suspension cylinder fully extended or retracted. Traveling the crane with the suspension fully retracted or extended may cause major damage to the carrier frame, suspension cylinders, and axles due to limited suspension cylinder travel. Always set the suspension to ride height before traveling the crane.

Note: The crane can travel in either travel mode without restrictions if the crane is at ride height and there is no counterweight on the upper frame or the carrier deck. The counterweight tray can be on the carrier deck. If traveling the crane with counterweight or other equipment in place, refer to Job Site Travel procedures in this Operator's Manual.

Carrier Axle Suspension Control

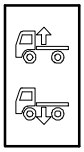
The Hydro-pneumatic carrier suspension system has three suspension control options:

Front Axle Suspension Control



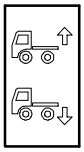
The front axle suspension control is only active in job site travel mode. The front axle suspension can be raised by pressing the top , or lowered by pressing the bottom , of the front axle suspension height switch on the Carrier Cab Control switch panel. Refer to Figure 1−43.

Front And Rear Axle Suspension Control

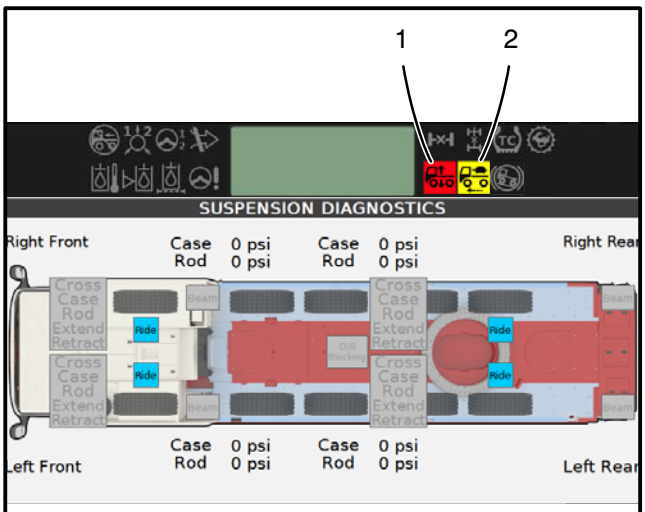


The front and rear axle suspension control adjusts the front and rear axle suspension simultaneously. The front and rear axle suspension can be raised to travel height by pressing the top of the ride height switch on the Carrier Cab Control switch panel. The carrier suspension indicator lights on the carrier cab display and on the ride height switch and an audio alarm will pulse to indicate the suspension is moving while the suspension cylinders are extending. When travel height is achieved, the indicator lights and audio alarm will stop pulsing. The crane can be lowered by pressing the bottom of the ride height switch. Lowering the crane prior to raising the crane on outriggers will provide improved ground clearance. Refer to Figure 1−43 and Figure 1−58.

Rear Axle Suspension Control



The rear axle suspension control is only active in job site travel mode. The rear axle suspension can be raised by pressing the top , or lowered by pressing the bottom , of the rear axle suspension height switch on the Carrier Cab Control switch panel. Refer to Figure 1−43.



1. Carrier Suspension Indicator Light
2. Travel Mode Indicator Light

Figure 1−58
Suspension Diagnostic Screen

Carrier Suspension System Alarms

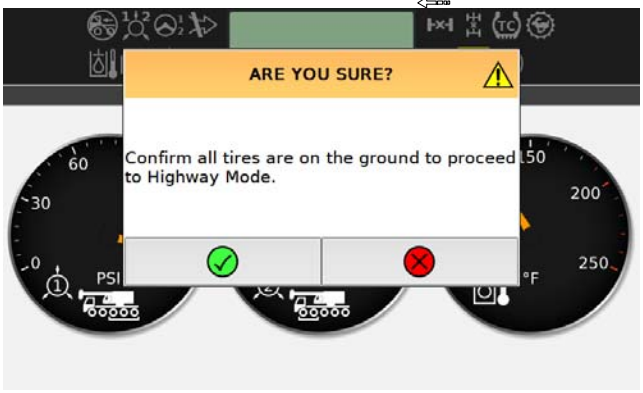
The Hydro-pneumatic carrier suspension system is equipped with an alarm when the crane is being put into ride height, until ride height is achieved.

Changing The Travel Mode

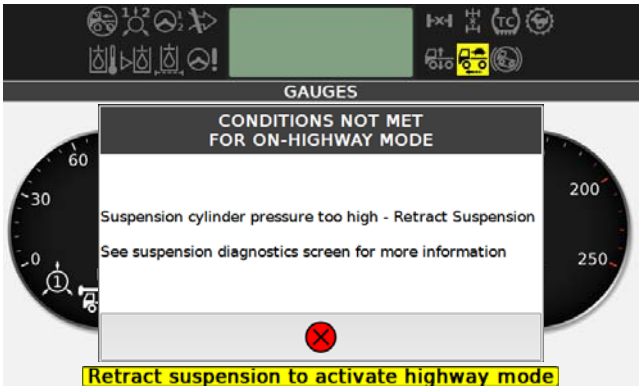
Refer to "Carrier Cab Control Switch Panel" in this section of this Operator's Manual for switch locations.

To Activate Highway Travel Mode

1. Press and release the bottom portion of the Travel Mode/Hill Start Disable Switch .



2. Press the selection icon on the Carrier Crane Control Display.

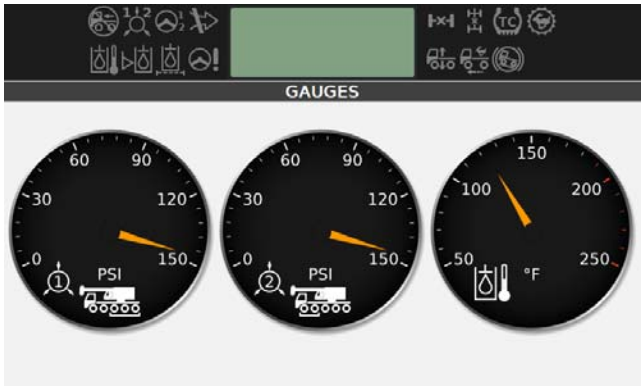


3. If the "Conditions Not Met" pop up appears on the Carrier Crane Control Display, press and hold the ride height switch in the position until the suspension is fully lowered. Refer to "Carrier Axle Suspension Control" in this section of this Operator's Manual for additional information. Once the conditions are met, the pop up will disappear.

CAUTION

Do not travel the crane with the suspension fully retracted. Traveling the crane with the suspension fully retracted may cause major damage to the carrier frame and axles.

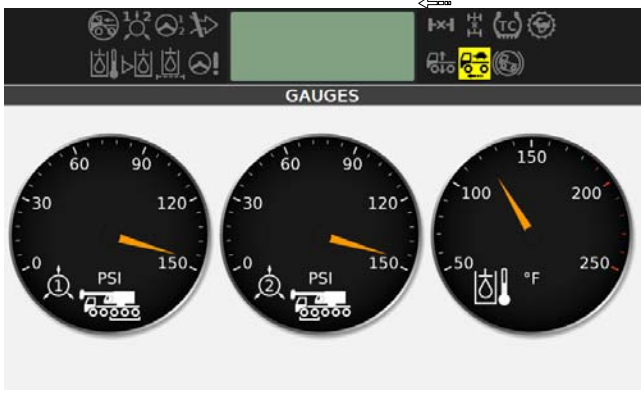
4. Press and hold the top portion of the Ride Height switch until the suspension reaches the proper height (ride height).



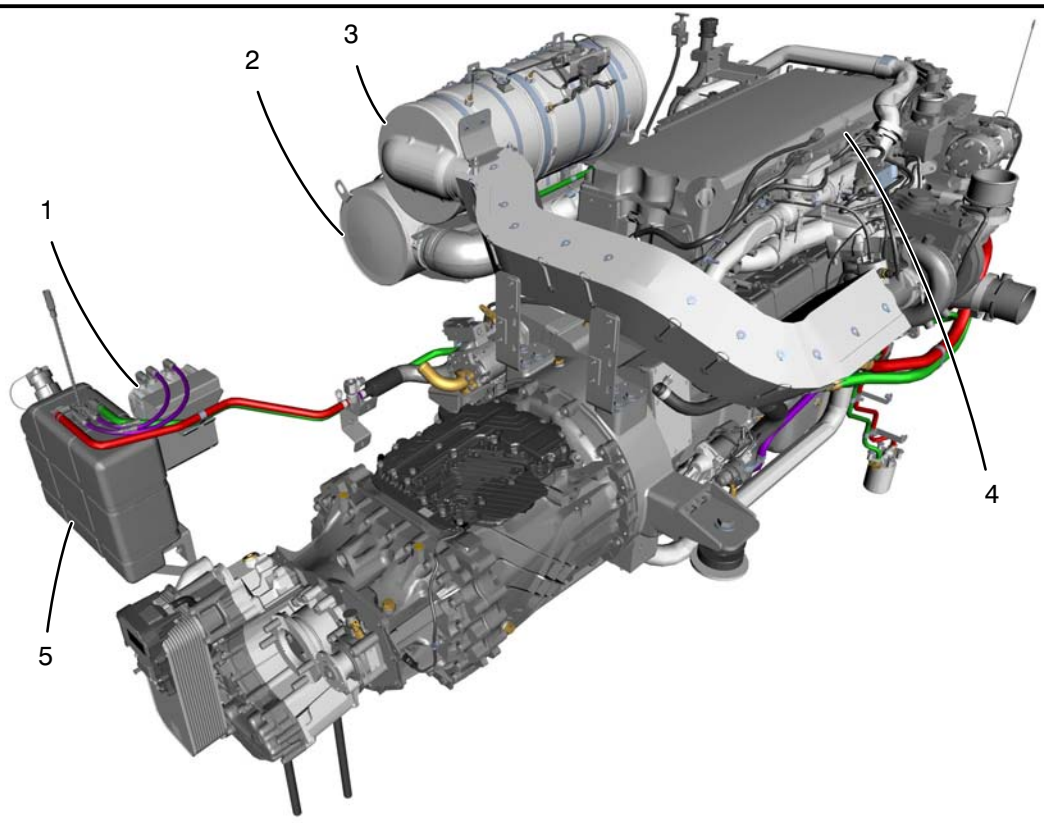
Note: Once ride height is achieved, Highway Travel Mode will be activated, the pop up will disappear, and the Travel Mode Indicator Light and Travel Mode/Hill Start Disable Switch light will cease to illuminate.

To Activate Jobsite Travel Mode

1. Press and release the bottom portion of the Travel Mode/Hill Start Disable Switch .



Note: Once Jobsite Travel Mode is activated, the Travel Mode Indicator Light and Travel Mode/Hill Start Disable Switch light will illuminate.



1. Diesel Exhaust Fluid (DEF)Dosing Control Module
2. Selective Catalytic Reduction (SCR) Chamber
3. Diesel Particulate Filter (DPF)
4. Diesel Engine
5. Diesel Exhaust Fluid (DEF)Tank

Figure 1—59
Carrier Engine Exhaust System

Selective Catalytic Reduction System

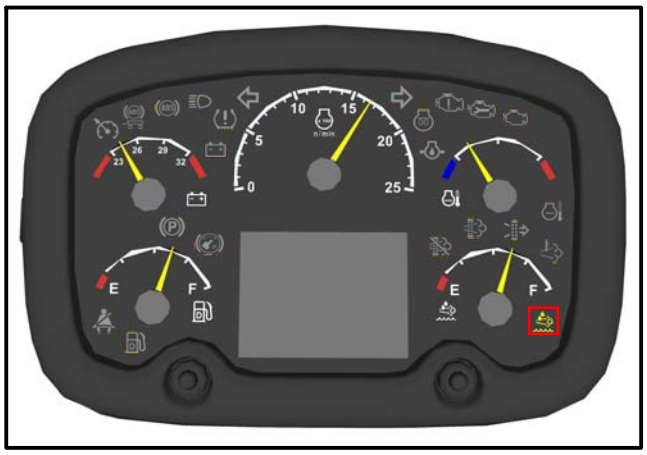
Selective Catalytic Reduction (SCR) is an emission-control technology that helps diesel engines meet regulations on nitrogen oxide (NOx) emissions. In a SCR system, a liquid reducing agent known as Diesel Exhaust Fluid (DEF) is combined with engine exhaust in the presence of a catalyst to convert NOx into nitrogen (N_2) and water vapor.

The process starts with ultra-low sulfur diesel fuel combusted in the carrier engine. Hot exhaust from the carrier engine flows through a diesel particulate filter (DPF), which removes particulate matter from the exhaust prior to entering the SCR chamber. DEF is injected into the exhaust stream, and the exhaust and finely atomized DEF enters the SCR catalyst chamber together. In the presence of the SCR catalyst, the exhaust and DEF react to convert NOx into N_2 and water vapor. One important requirement of the SCR system is to ensure the DEF tank remains filled. Monitor the DEF level gauge in the carrier cab to ensure an adequate supply of fluid is available to the SCR System.

Diesel Exhaust Fluid (DEF)

Diesel exhaust fluid (DEF) level must be maintained in the tank for the SCR system to control nitrogen oxide emissions. The crane has a DEF gauge incorporated into the carrier cab instrument cluster allowing constant monitoring of the DEF level in the tank. Additionally, the crane has a low DEF warning light in the carrier cab instrument cluster, ensuring the operator has ample notices to replenish the DEF. Refer to Figure 1—40 for instrument cluster indicators and descriptions. Refer to Figure 1—43 for carrier cab control switches and descriptions.

Diesel Exhaust Fluid Indicators



The diesel exhaust fluid indicator 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.

The diesel exhaust fluid indicator will flash to alert the operator that the diesel exhaust fluid level is critically 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.

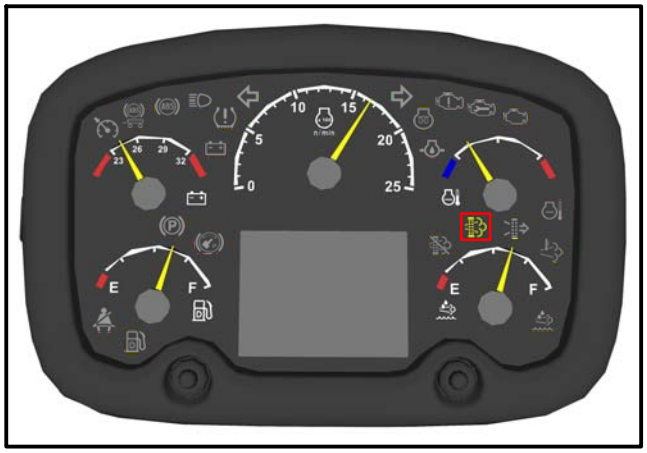
The diesel exhaust fluid indicator will flash combined with an illuminated check engine light to alert the operator that the diesel exhaust fluid has fallen below the initial derate level. Engine power will be limited automatically. This can be corrected by filling the diesel exhaust fluid tank. It is recommended that the tank be filled completely in order to correct any fault conditions.

The diesel exhaust fluid indicator will flash combined with an illuminated check engine and stop engine 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 5 mph. 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.

Diesel Particulate Filter (DPF)

The diesel particulate filter (DPF) is designed to remove diesel particulate matter or soot from the exhaust gas of the diesel engine. The filter must be periodically regenerated to remove the soot from the filter. During normal highway travel, the accumulated soot in the DPF will be purged by an automatic regeneration cycle. In some cases an automatic regeneration may not occur and the regeneration cycle must be initiated manually. Refer to "DPF Manual (Parked) Regeneration" in this Section of this Operator's Manual and the carrier engine manufacturer's manual for additional information on the regeneration process and procedures.

DPF Regeneration Indicators

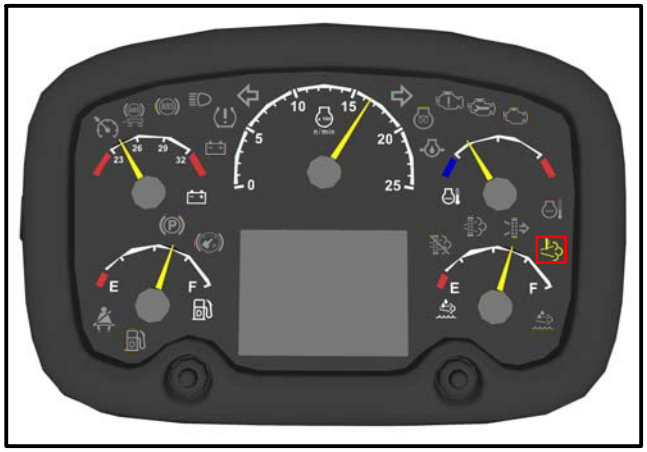


1. This indicator light on the instrument cluster will illuminate to alert the driver/operator that an active regeneration of the diesel particulate filter is required. When this light illuminates, ensure the regeneration inhibit switch is off (regeneration inhibit indicator light is off) increase carrier engine speed to allow the carrier engine to run until regeneration is complete or use the DPF manual regeneration switch to initiate a manual parked regeneration cycle as soon as safely possible. Refer to Figure 1–43 for switch location.

2. The DPF regeneration light on the instrument cluster begin to flash, alerting the driver/operator that the soot loading in the DPF has reached a level where a regeneration, either automatic or manual, must be performed as soon as safely possible.

3. The check engine light will illuminate in conjunction with a flashing DPF regeneration light on the instrument cluster. This condition alerts the driver/operator that the soot loading in the DPF has reached a level where a regeneration, either automatic or manual, must be performed as soon as safely possible.

4. The DPF regeneration light on the instrument cluster will go out and the stop engine light will illuminate. This condition alerts the driver/operator that the soot loading in the DPF has reached a critical level and the carrier engine must be shutdown. If the carrier engine is not shutdown the aftertreatment protection system (APS) may initiate a carrier engine protection shutdown (EPS) sequence. This protects the carrier engine and aftertreatment system from damage. The stop engine light will flash for 30 seconds prior to carrier engine shutdown.



High Exhaust Temperature Indicator Light

This indicator light will illuminate on the instrument cluster to alert the driver/operator that the outlet temperature in the exhaust system is above normal if the crane is traveling less than 5 mph (*8km/h*). This condition can occur under normal operation or during an automatic or manual regeneration cycle. No action is required. When this lamp illuminates, ensure the exhaust pipe outlet is not directed at any surface or material that can melt, burn, or explode.

DANGER

The temperature of the exhaust gas and the exhaust system components can reach up to 1500°F (*816°C*) during regeneration. An unexpected failure of the carrier engine or regeneration system may increase exhaust gas temperature at the particulate exhaust filter to as high as 1650°F (*900°C*). This may result in fire, burn, or explosion hazards, which may result in personal injury or death. Do not expose flammable material or explosive atmospheres to exhaust gas or to exhaust system components during regeneration.

DPF Regeneration Inhibit Switch And Indicator Light

The DPF regeneration inhibit switch disables any automatic or manual regeneration of the carrier engine diesel particulate filter. Refer to Figure 1—43 for inhibit switch location. It may be used to prevent any regeneration when the crane is operating in a hazardous environment and there is a concern about high temperatures from the DPF system. An indicator light on the instrument cluster will illuminate to alert the operator that the DPF system is inhibited. Unnecessary or excessive use of this switch will result in a loss of fuel economy or an increased need for parked regeneration.

DPF Manual (Parked) Regeneration

The DPF manual regeneration switch is used to start a manual regeneration only when when the DPF regeneration light is illuminated or flashes. Refer to the carrier engine manufacturer's manual for additional information on the regeneration process and procedures.

Note: The crane must remain stationary for approximately 45 minutes to complete a manual regeneration.

1. Park the crane in a safe location, shift the transmission to neutral, and engage the park brake.
2. Set up a safe exhaust area. Confirm that nothing is on or near the exhaust system surfaces.
3. Ensure that the DPF regeneration inhibit switch is off. Refer to Figure 1—43 for inhibit switch location. DPF regeneration inhibit Indicator light on the instrument cluster will be off.
4. Ensure the Upper Throttle Control/PTO Enable Switch is disabled. Refer to "Carrier Cab Dash Panel" in this section of this Operator's Manual for additional information.
5. Press and hold the DPF manual regeneration switch for at least two seconds and release to initiate a manual regeneration cycle.

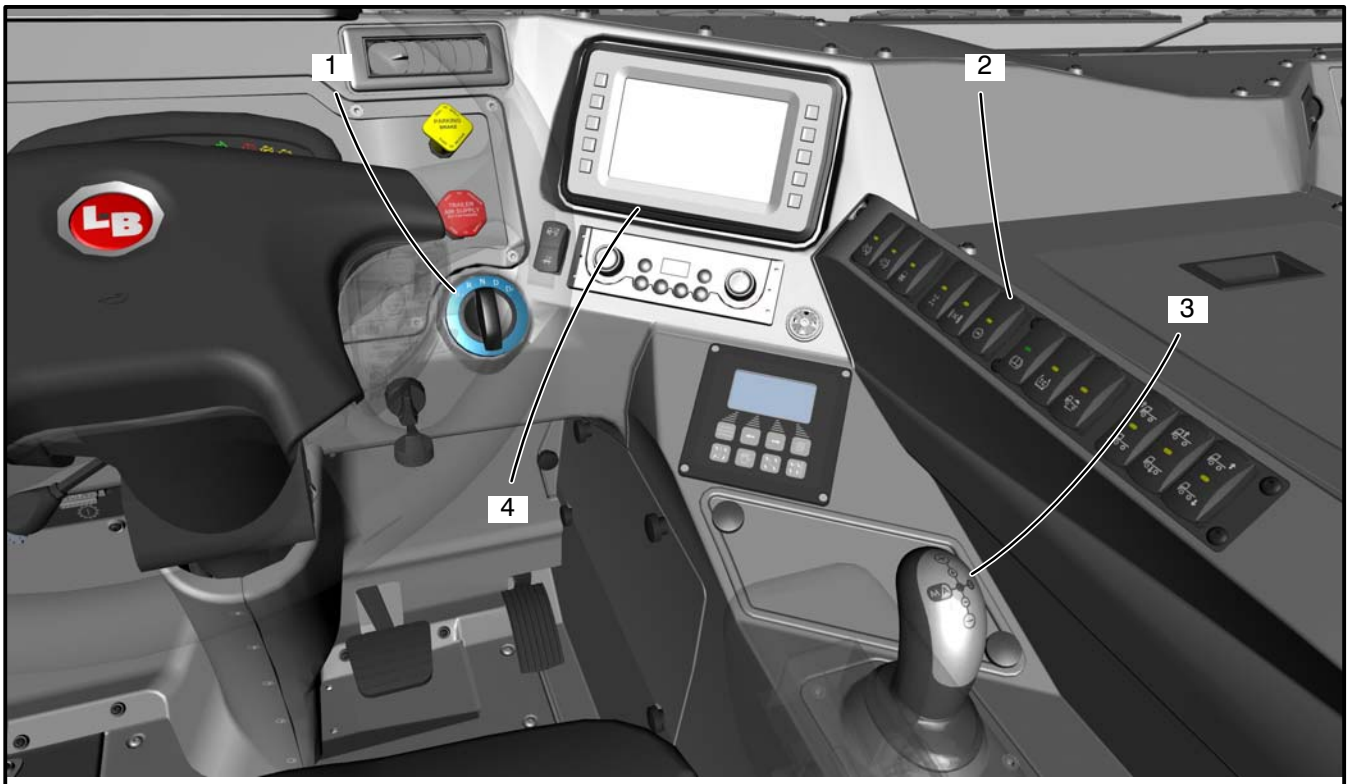
   Note: Do not press the throttle or carrier service brake pedal during a manual regeneration cycle. Pressing these pedals will deactivate the regeneration cycle and the carrier engine will return to idle. The manual regeneration cycle must be restarted.

6. Carrier engine must be at minimum operating temperature of 140°F (*60°C*).
7. Monitor the area surrounding the crane during regeneration. If any unsafe condition occurs. Shutdown the engine immediately. The regeneration cycle can be stopped by pressing the throttle or brake pedal.

The carrier engine control module (ECM) will perform a system check for approximately 30 seconds before starting the manual regeneration cycle; also, the carrier engine speed will increase to 900—1,200 rpm and there maybe a noticeable sound of the turbocharger. When the cycle begins, the DPF regeneration indicator light goes out. When regeneration is complete, the carrier engine will return to idle and the exhaust temperature indicator light goes out.. However, exhaust gas and exhaust surface temperatures will remain elevated for 3 to 5 minutes.

DANGER

The temperature of the exhaust gas and the exhaust system components can reach up to 1500°F (*816°C*) during regeneration. An unexpected failure of the carrier engine or regeneration system may increase exhaust gas temperature at the particulate exhaust filter to as high as 1650°F (*900°C*). This may result in fire, burn, or explosion hazards, which may result in personal injury or death. Do not expose flammable material or explosive atmospheres to exhaust gas or to exhaust system components during regeneration.



1. Transmission Mode Selection Switch
2. Transfer Case Range Selector Switch
3. Transmission Lever
4. Carrier Cab Control Display

Figure 1—60
Main And Two Speed Transfer Case Controls

CAUTION

This crane is equipped with a two speed transfer case. Come to a complete stop before shifting the transfer case. Do not attempt to shift the transfer case while traveling the crane. Transfer case damage may occur.

Two Speed Transfer Case

A two speed transfer case is used in the carrier to provide a low gear ratio for slow, careful movement around the job site, and a high ratio for normal use. The low ratio is not for extra tractive effort or for heavy pulls. For normal use, the transfer case range selector switch should be in high range. Refer to Figure 1—60. For job site use, the transfer case should be in low range. The transfer case is also equipped with an inter axle differential lock. Shifting the transfer case must be done with the crane at a complete stop.

Main Transmission Controls

The main transmission controls are on the carrier cab right control console to the right of the driver/operator. Refer to Figure 1—60. It controls all functions of the fully-automated manual transmission. The transmission contains 12 forward speeds and 2 reverse speeds. The transmission can be selected to operate in automatic or manual mode. See "Traveling The Crane" in this Section of this Operator's Manual for necessary preparations before traveling the crane.

CAUTION

This crane is equipped with a fully-automated manual transmission. In other words, it has all the components of a typical manual transmission (including a clutch, but no clutch pedal) but the transmission computer controls clutch actuation and can control gear shifting. Do not attempt to operate this transmission any differently than a typical manual transmission. Clutch damage may occur.

1. Transmission Mode Selection Switch

   Use the switch to select the gear:

   D—Drive (Forward) DM—Drive (Forward) Maneuver

   N—Neutral,

   R—Reverse RM—Reverse Maneuver

2. Transfer Case Range Selector Switch

   Switch used to toggle between high and low transfer case range.

3. Transmission Lever

   The transmission lever has multiple functions. It can be used to select the desired mode of operation (automatic or manual). While in manual mode, it is used to upshift and downshift the transmission. Tap the lever one time, up or down (⊕⊖), to shift by one gear. Tap the lever two times, up or down (⊕ ⊖), to perform a two gear shift.

   Manual/Automatic Mode Toggle

   S — Not Used

   Cumulative Upshift (by 2 gears)

   Upshift

   Downshift

   Cumulative Downshift (by 2 gears)

4. Carrier Cab Control Display

   The Transmission Display on the Carrier Cab Control Display Working Screen displays the transmission status. Transmission Faults may also be accessed from the Active System Faults Menu on the Carrier Cab Control Display. Refer to Figure 1—61 and "Carrier Cab Control And Camera Display" in this section of this Operator's Manual.

Display	Status
CH	System Self-Check Refer to "System Self-Check"
DM	Drive (Forward) Maneuver Refer to "Drive Maneuver Mode"
N	Neutral - Transmission is in Neutral
▲ P1 ▼	Power Take-Off - PTO 1 (up arrow) and 2 (down arrow) are activated and Gear 1 (P1) is engaged
▲ PD	Power Take-Off - PTO 1 (up arrow) is activated and gear is in Drive (PD)
▲ PN	Power Take-Off - PTO 1 (up arrow) is activated and gear is in Neutral (PN)
▲ PR	Power Take-Off - PTO 1 (up arrow) is activated and gear is in Reverse (PR)
RH	Reverse High - High speed reverse is engaged
RL	Reverse Low - Low speed reverse is engaged
RM	Reverse Maneuver Refer to "Drive Maneuver Mode"
▲ 4 ▼	"4" means gear 4 in engaged
▼ 5	Shift Recommendation in Manual Mode Shift down (down arrow) by up to 2 gears (2 bars)
D 3	Automatic Mode is shown by the letter D "3" means gear 3 is engaged
System Warning	
AL	System Air Pressure Low Do Not turn the carrier ignition switch off or drive the crane! Refer to "System Air Pressure Low Warning"
CC	Clutch Check - clutch position cannot be taught in

Display	Status
CL	Clutch Overload Limit crane operation! Refer to "Clutch Overload Warning"
CW	Clutch Wear Do Not drive the crane! Refer to "Clutch Wear Warning"
EE	Electronic Error - The display line between the main transmission control unit (TCU) and the transmission electronic controller (TEC) is faulty. Do Not drive the crane!
EX	External Signal - Starting and engaging gear is prevented by external signal
FP	Foot Pedal - Remove foot from pedal Do not drive the crane if warning persists!
FS	Fault Switch - Implausible transmission lever position
NS	Neutral Select - Select neutral with transmission lever or transmission mode selection switch
HT	High Temperature - Allow transmission to cool
TC	Transmission Check - Transmission positions cannot be taught in
System Malfunction Refer to "System Malfunction Warning"	
	System Error. Travel can continue with restrictions.
STOP	System Error. Stop!
153	Error Code (Error Code 153)
- -	NO DATA (the SAE J1587 info is absent)
SM	System Malfunction

Figure 1- 61
Transmission Display

System Malfunction Warning

If a system malfunction occurs, the transmission display will alert the driver/operator that the shift controls may not be operable. Refer to Figure 1—61. Apply the brakes to slow the crane. Move the crane to a safe location. Stop the crane and apply the parking brake. Contact your Link-Belt Distributor for assistance.

WARNING

If a system malfunction occurs, the transmission display Illuminates a system malfunction code (Refer to Figure 1—61). When a warning occurs, it may not be possible to shift the transmission. Do not continue to operate the crane. Serious personal injury and major damage to components can result. Move the crane to a safe location and contact your Link-Belt Distributor for assistance.

System Air Pressure Low Warning

"AL" will appear on the transmission display if the TCU determines that system air pressure is low. Refer to Figure 1—61. Engine brake and shifting (outside of neutral) functions will be disabled. Shift into neutral and idle the carrier engine to allow air pressure to build up. Do not drive the crane with "AL" on the display. Do not turn the carrier ignition switch OFF with "AL" on the display. The carrier engine may shutdown in gear and not start until air pressure is built up again.

CAUTION

Do not operate the crane with "AL" displayed in the transmission display. Serious personal injury and major damage to components can result. Allow system air pressure to reach normal operating range before continuing operations.

Clutch Protection Features

To prevent the clutch from being damaged as a result of prolonged friction, current clutch loads are calculated on the basis of effective torque, speed differential on the clutch and the slip time. Previous friction processes are considered to determine whether the load limit has been exceeded. If this is the case, the driver receives a visual and acoustic warning (passive protection measure). The warning stops when a defined load limit is fallen below. If the warnings are ignored, the transmission control unit can initiate active protective measures:

- Engine speed and clutch torque can be modulated.
- To avoid continued load on the clutch, the clutch torque can be gradually increased until the clutch is completely closed. With this procedure, the vehicle speed may increase, the engine speed may be reduced, and the engine may stall.
- The permissible starting gears are limited depending on the calculated clutch load.
- Depending on the applicable boundary conditions, automatic downshifts can take place when launching and/or maneuvering.
- If the clutch slip is not even completely reduced with the clutch closed, the engine torque is limited via engine intervention of the transmission control unit. This ends the continuous slip situation and avoids permanent load on the clutch.

Clutch Abuse Protection

It is recommended that the Operator utilizes the clutch in accordance within the following guidelines:

- Ensure appropriate actions are taken when alerted of a system warning or malfunction. Read and understand all system warnings and malfunctions before operating the clutch.
- DO select the lowest possible start gear for the application. If moving slowly is required, select 1st gear or RL.
- DO use Creep mode when appropriate.
- DO use the Service Brakes and let the Hill Start Aid assist you when launching on an incline.
- DO minimize the time it takes to engage the clutch from rest.
- Do NOT use the throttle to hold the vehicle on an incline. Use Service Brakes.
- Do NOT use the throttle to stop roll back on an incline after Hill Start Aid disengages. (Use Service Brakes and then relaunch).
- Do NOT continually start and stop, especially when loaded (use a lower gear or Creep mode).

Clutch Overload Warning

"CL" will appear on the transmission display if the TCU determines that the clutch is operating at a higher temperature than is desirable. Refer to Figure 1−61. This will occur if operating conditions require the clutch to slip excessively. Shift into Neutral and idle the carrier engine to allow the clutch to cool. Limit the amount of time to a minimum that the crane is operated with this warning displayed. Drive the crane in the lowest gear possible when doing slow speed maneuvering to minimize the amount of clutch slippage required. Manipulate the foot throttle position to achieve slow travel speed by using low carrier engine RPM rather than slipping the clutch. This crane uses an automated clutch for launching; however the clutch can still overheat and slip with improper use.

WARNING

Operating the crane for extended periods of time with "CL" displayed in the transmission display can damage the clutch and reduce its service life.

Clutch Wear Warning

"CW" will display on the transmission display if the TCU determines that the clutch is worn beyond safe operation. Replace the clutch. Do not drive the crane with an excessively worn clutch.

WARNING

Do not drive the crane if "CW" displays in the transmission display indicating the clutch is worn beyond safe operation. Serious personal injury and major damage to components can result. Replace the clutch.

System Self-Check

"CH" will appear on the transmission display while the transmission control unit (TCU) performs a system self-check. Refer to Figure 1−61. A self-check is performed when the carrier ignition switch is turned ON. Typically, the self-check continues until the carrier engine is started, but can last longer if the TCU is being powered-up for the first time.

Note: If the system self-check continues for an excessive amount of time after the carrier engine is started, contact your Link-Belt Distributor for assistance.

Drive Maneuver Mode

The transmission is equipped with a maneuver mode system that allows more precise control of travel speed. The system is activated by moving the transmission mode selection switch on the shift console to DM−Drive (Forward) Maneuver or RM−Reverse Maneuver.

When driving in first gear in forward (DM) or reverse (RM), maneuver mode occurs between 1 and 70% of full throttle position. In this mode, the carrier throttle pedal position controls the amount of torque transmitted to the clutch. The transmission adjusts the carrier engine speed to the level necessary for the maneuvering operation. The clutch does not transmit the entire output produced by the carrier engine, but only as much as necessary to overcome resistance of crane travel. This allows slow, precise maneuvering forward or backward using the carrier throttle pedal.

CAUTION

Clutch may become hot during maneuvering operations. Observe all precautions as stated in "Clutch Overload Warning" in this Section of this Operator's Manual for additional information.

Manual Mode Operation

1. Properly start the carrier engine. Allow system pressures to reach normal operating range.
2. Apply and hold the carrier service brake pedal.
3. Release the carrier park brake.
4. With the transmission selector in Neutral, tap the transmission lever to the left (M/A) position to select manual mode.

   Note: Automatic mode is the default starting mode. Tapping the transmission selector to the left (M/A) toggles between automatic and manual modes.

5. Move the transmission mode selection switch to the desired gear ("D", "DM" or "R", "RM").

WARNING

This crane is equipped with a fully-automated manual transmission. The crane can roll backward when stopped on a hill or grade, or when the crane is starting from a stop on a hill or grade. Serious personal injury and major damage to components can result. Coordinate the use of the carrier service brake and carrier throttle pedal as required to control movement of the crane.

6. Remove foot from the carrier service brake pedal and depress the carrier throttle pedal. Move the transmission lever forward to upshift through the gears as required. Move the transmission lever backward to downshift.

WARNING

Do not let the crane coast in neutral. Loss of control and major transmission damage could occur. Do not allow the crane to roll backwards when the transmission is in a forward gear or forward when it is in a reverse gear. If this is allowed, the transmission controls will repeatedly engage and disengage the clutch slightly to warn the driver/operator that this is happening.

7. Tap the transmission lever to the left (M/A) position to return to automatic mode, if desired.

   Note: Automatic mode is the default starting mode. Tapping the transmission selector to the left (M/A) toggles between automatic and manual modes.

Automatic Mode Operation

1. Properly start the carrier engine. Allow system pressures to reach normal operating range.
2. Apply and hold the carrier service brake pedal.
3. Ensure the transmission is in automatic mode. Refer to Figure 1–61. If required, move the transmission selector to Neutral, tap the transmission lever to the left (M/A) position to select automatic mode.

   Note: Automatic mode is the default starting mode. Tapping the transmission selector to the left (M/A) toggles between automatic and manual modes.

4. Move the transmission mode selection switch to the desired gear ("D", "DM" or "R", "RM").
5. Release the carrier park brake.

WARNING

This crane is equipped with a fully-automated manual transmission. The crane can roll backward when stopped on a hill or grade, or when the crane is starting from a stop on a hill or grade. Serious personal injury and major damage to components can result. Coordinate the use of the carrier service brake and carrier throttle pedal as required to control movement of the crane.

6. Remove foot from the carrier service brake pedal and depress the carrier throttle pedal. The transmission should automatically shift gears as required.

WARNING

Do not let the crane coast in neutral. Loss of control and major transmission damage could occur. Do not allow the crane to roll backwards when the transmission is in a forward gear or forward when it is in a reverse gear. If this is allowed, the transmission controls will repeatedly engage and disengage the clutch slightly to warn the driver/operator that this is happening.

7. Tap the transmission lever to the left (M/A) position to return to manual mode if desired.

   Note: Automatic mode is the default starting mode. Tapping the transmission selector to the left (M/A) toggles between automatic and manual modes.

Transmission Diagnostics

The transmission control unit (TCU) uses a series of alpha-numeric characters that enable the technician to identify, locate, and repair malfunctions that have occurred in the system. Refer to Figure 1−61. These characters are called fault codes and are listed in the transmission display. The TCU stores these fault codes into memory until the malfunction is repaired and cleared. After retrieving a fault code and identifying the fault, use a volt-ohm meter (VOM) to test the area where the fault code indicates that the malfunction has occurred. Contact your Link-Belt Distributor and request a transmission specialist to repair the fault. Refer to the Transmission Fault Code Identification Manual for more details.

Active Fault Codes

An active fault is a malfunction that currently exists in the transmission or system components. The TCU detects the malfunction during operation and stores it into memory as an active fault.

Note: All active fault codes will steadily display for approximately 1-1/2 seconds each. Ignore fault codes that flash. When the TCU has listed all active fault codes, the list will repeat.

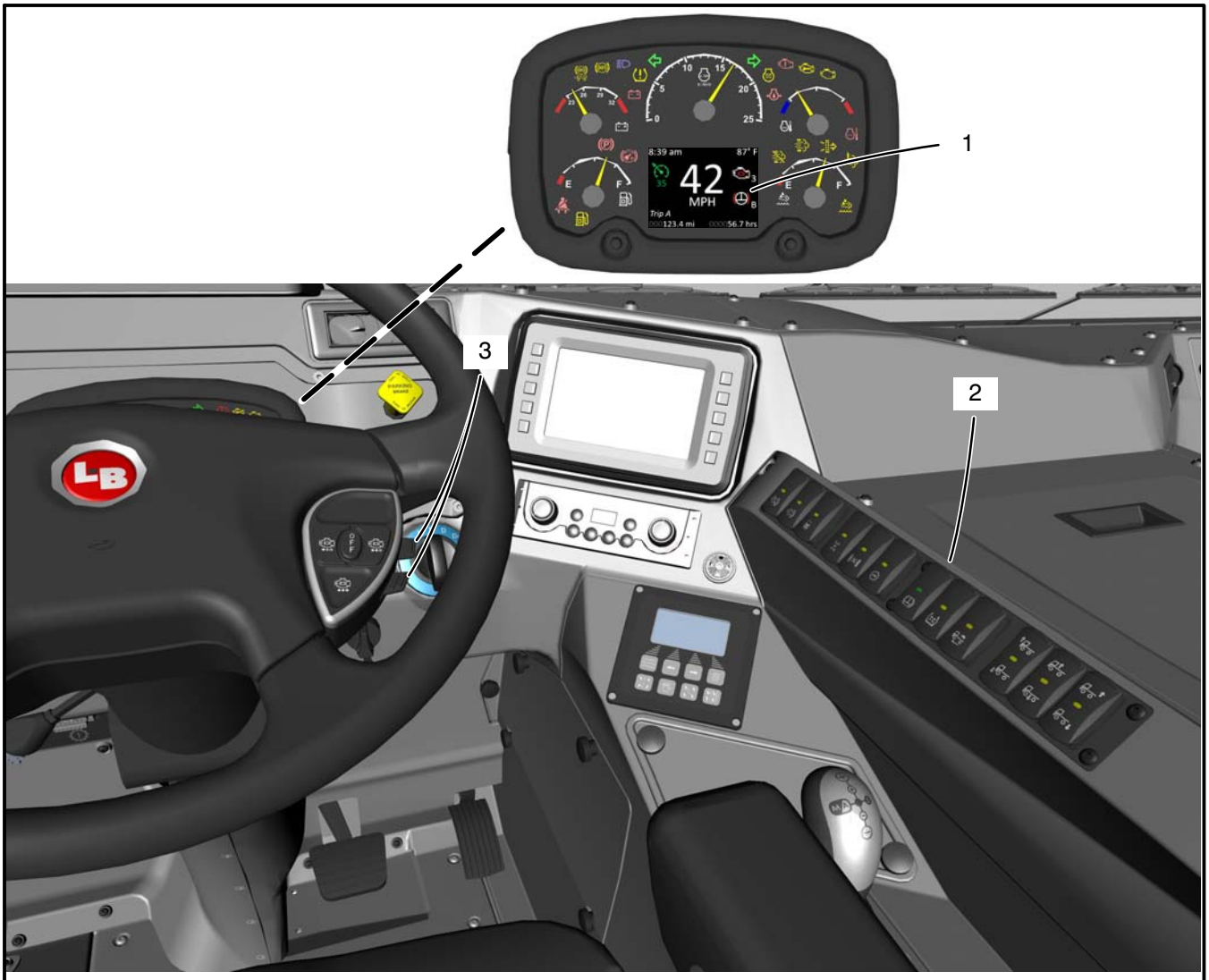
Inactive Fault Codes

An inactive fault results when a system malfunction (an active fault) was repaired but not cleared from TCU memory. The fault exists in TCU memory as inactive until it is cleared.

Note: All inactive fault codes will steadily display for approximately 1-1/2 seconds each. Ignore fault codes that flash. When the TCU has listed all inactive fault codes, the list will repeat.

Retrieving Fault Codes

1. Park the crane and apply the carrier park brake. Turn the carrier engine OFF, but leave the carrier ignition switch ON. Prepare to record the fault codes before beginning to retrieve them from the transmission display.
2. To retrieve active fault codes, push the transmission lever forward or backward. The TCU will begin to list the active fault codes on the transmission display.
3. To retrieve inactive fault codes, move the transmission lever forward or backward and press the carrier service brake pedal at the same time. The TCU will begin to list the inactive fault codes on the transmission display.
4. Record the fault codes.
5. When finished retrieving fault codes, turn the carrier ignition switch OFF.



1. Intarder State Indicator
2. Transmission Intarder Activation Switch
3. Intarder Level Paddle Switches

Figure 1—62
Transmission Intarder Controls

Transmission Intarder

The crane is equipped with a transmission intarder. The intarder is an additional brake integrated with the transmission and functions hydro-dynamically. When used properly, the intarder assists in crane deceleration which also reduces service brake wear. Use the Transmission Intarder Activation Switch to activate the intarder system, then use the intarder level paddle(s) to select intarder level. Refer to Figure 1—62. The intarder has a Bremsomat mode and five intarder braking levels.

Bremsomat Mode

The "Bremsomat" mode can be used to help keep the crane speed constant when driving on downhill grades. The necessary braking torque is automatically adjusted to help maintain the set speed through the transmission electronics. If the Bremsomat's braking effort is no longer sufficient to keep the speed constant on a downhill grade, use the carrier service brake to prevent over-speeding the carrier engine and to keep the crane at a safe speed.

To Set Bremsomat

1. Toggle the Transmission Intarder Activation Switch on.

Note: The instrument cluster will show intarder 0 level icon in LCD display with the intarder control on.

2. Adjust crane speed to the safest control speed to descend the grade.
3. Push or pull the intarder level paddle switches until the Bremostat icon displays on the instrument cluster.
4. Remove pressure from the accelerator. The crane should maintain the set speed.

CAUTION

With the intarder activated, do not descend a grade with the transmission in neutral (coasting) and ensure that the carrier engine speed does not decrease below 1,600 rpm. Carrier engine may overheat. If necessary, downshift by one gear to increase the carrier engine speed

Note: When setting the Bremsomat and cruise control systems at the same time, ensure that the speed set for cruise control is lower than the Bremsomat set speed. If this is not done, the systems will work against each another.

Note: Pressing the accelerator pedal will deactivate the Bremsomat set speed allowing the crane speed to increase. Taking your foot off the accelerator pedal re-activates the Bremsomat allowing the crane to return to the set speed.

To Cancel Bremsomat

1. Push or pull the intarder level paddle switches until the desired intarder level displays on the instrument cluster.

To Change Bremsomat

1. Change the road speed by depressing the accelerator or carrier service brake pedal. The new road speed is automatically saved.

Transmission Intarder Operation

Once the Transmission Intarder Activation Switch is toggled on, operation is controlled by the intarder level paddle switches. The intarder state indicator will illuminate on the instrument cluster display LCD and shows the set intarder position.

0% Brake Level

Bremsomat Active

20% Brake Level

40% Brake Level

60% Brake Level

80% Brake Level

100% Brake Level

For smooth operation and minimal heat generation, start with intarder level paddle switch(es) in the lowest level and slowly select higher intarder levels as increased deceleration is required. If the required brake power is higher than the intarder's maximum braking power, use the service brake to prevent over-speeding the carrier engine and to keep the crane at a safe speed.

To deactivate the intarder, slowly decrease intarder level to the "0" (OFF) level and toggle the transmissioin intarder activation switch off.

Carrier Engine Brake

The carrier engine brake is a device which uses the carrier engine to aid in slowing down and controlling the carrier speed. When activated, the carrier engine brake alters the operation of the carrier engine's exhaust valves so the carrier engine works as a power-absorbing air compressor. This provides a retarding action to the wheels.

WARNING

The carrier engine brake is a crane slowing device. It is not a substitute for the service braking system. The carrier's service brakes must be used to bring the crane to a complete stop.

Carrier Engine Brake Controls

The carrier engine brake "retard" level buttons are on the steering wheel. Refer to "Carrier Cab Steering Wheel Controls" in this section of this Operator's Manual for additional information. The switches regulate the amount of braking force made available: 1 (Low), 2 (Med), and 3 (High), or off.

Carrier Engine Brake Operation

Once a carrier engine brake level button is pressed, operation of the carrier engine brake is fully automatic. Since the carrier engine brake depends on the free flow of carrier engine oil for operation, allow the carrier engine to warm up before turning the carrier engine brake on. The carrier engine brake can be left on whenever driving, providing the weather and road conditions are favorable.

To activate the carrier engine brake, simply remove pressure from the carrier throttle pedal. Note that the carrier engine brake remains activated even after the carrier service brake pedal has been depressed, giving the combined power of both the carrier engine and service brakes. The carrier engine brake alone will slow the carrier. However, it is essential that the service brakes be used to bring the carrier to a complete stop.

To deactivate the carrier engine brake, reapply the carrier throttle pedal or press the Engine Brake Off Button.

Descending A Grade

An explanation of "control speed" is helpful in understanding how to use the carrier engine brake while descending a grade. Control speed is the constant speed at which the forces pushing the carrier forward on a grade are equal to the forces holding it back, without using the service brakes. For example, it may be safe to descend a grade at 10 mph (*16km/h*), without a carrier engine brake. With the carrier engine brake, it might be safe to descend that same grade at 25 mph (*40km/h*), and still remain under control.

Under some circumstances, descending a grade at a faster rate than the control speed may be desired. This can be done by selecting a higher gear, or the carrier Engine Brake Level "1" Button. However, it may require applying the service brakes intermittently to prevent over-speeding the carrier engine and to keep the crane at a safe speed.

WARNING

Frequent use of the carrier service brakes, while descending a grade, will cause them to heat up and reduce their stopping ability. The result can be dangerous "brake fade". Use carrier engine brake, transmission intarder, and carrier service brakes as required to control crane speed.

Since the carrier engine brake is most effective at rated carrier engine speeds, gear selection is very important. Maximum retarding power is obtained by using the lowest possible gear without exceeding the recommended carrier engine speed. Refer to the carrier engine manufacturer's manual for rated carrier engine speeds.

There are other circumstances when descending a grade at a rate slower than the control speed may be desired. This is done by selecting a lower gear, one that will not over-speed the carrier engine. Apply the carrier service brakes to obtain the desired lower speed.

As a general rule for maintaining control speed, estimate the gear used to climb the grade. Usually this is the same gear that can be used for a controlled descent with a carrier engine brake.

It's always a good idea to determine if the carrier engine brake is operational before beginning a long steep descent. This can be done by briefly lifting your foot off the throttle. You should feel the carrier engine brake going into action.

Slippery Pavement

If the carrier engine brake operation is unfamiliar, it is recommended that it not be used on slick roads until you gain some experience with it on dry pavement.

Since the operation of any vehicle under slippery conditions is unpredictable, keep necessary braking distance when testing service brakes or carrier engine brake.

When driving on wet or icy pavement, start with the carrier engine brake "OFF" and use the same gear you would normally use under these conditions.

Before activating the carrier engine brake, confirm that the crane is maintaining traction and stability using the natural retarding of the carrier engine alone.

If the crane is maintaining traction, activate the carrier engine brake by pressing the level "1" button. If the drive wheels begin to lock or there is a "fishtail" motion, immediately press the Carrier Engine Brake Off Button. Don't turn the carrier engine brake on until road conditions improve.

If there was no tendency for the drive wheels to lose traction and greater slowing power is desired, press the Engine Brake Level "2" Button. If the drive wheels tend to lock, immediately press the Engine Brake Level "1" Button. Do not attempt to press the engine brake level "2" or "3" buttons until road conditions improve.

In changing weather conditions, check the proper positioning of the control switch often. Remember: do not skip a step when changing carrier engine brake levels. Always go from level "1", then to level "2", and then to level "3".

Cruise Controls

The crane is equipped with cruise control that allows the crane to maintain a constant speed at or above 30 mph (48km/h). The controls are on the steering wheel. Refer to "Carrier Cab Steering Wheel Controls".

WARNING

Do not use the cruise control in heavy traffic or on roads that are winding, slippery, or unpaved.

To Set The Cruise Control

1. Press and release the Cruise Control On Button to activate the cruise control system.
2. Accelerate to the desired speed above 30 mph (*48km/h*) using the accelerator pedal.
3. Press and release the Cruise Control Set Button. This will set the speed.
4. Remove pressure to the accelerator. The crane should maintain the set speed.

   Note: Pressing the accelerator pedal will allow the crane speed to increase. Removing pressure from the accelerator pedal allows the crane to return to the set speed.

Resetting The Cruise Control

To reset the cruise control to a lower speed, do either of the following:

- Press and release the Cruise Control Resume Button to decrease the cruise control speed by increments of 1 mph (*1.6km/h*).
- Press and hold the Cruise Control Resume Button. Decelerate to desired speed and release the Cruise Control Resume Button. The cruise control speed is now set at the lower speed.

To reset the cruise control to a higher speed, do either of the following:

- Press and release the Cruise Control Set Button to increase the cruise control speed by increments of 1 mph (*1.6km/h*).
- Press and hold the Cruise Set Resume Button. Accelerate to desired speed and release the Cruise Control Set Button. The cruise control speed is now set at the higher speed.

Suspending And Resuming A Set Speed

To suspend the cruise control, do any of the following:

- Depress the carrier service brake pedal. The cruise controls are suspended, but can be reset by pressing the Cruise Control Set Button or return to the previous set speed with the Cruise Control Resume Button.
- The carrier engine speed drops below the set point (1,000 rpm) or the crane speed drops below the mph set point (30 mph *[48km/h]*). The cruise controls are suspended, but can be reset by pressing the Cruise Control Set Button or return to the previous set speed with the Cruise Control Resume Button.
- Press and release the Cruise Control Cancel Button to suspend the cruise controls. The cruise control setting can be reset by pressing the Cruise Control Set Button or returned to the previous set speed with the Cruise Control Resume Button.

Turning The Cruise Control Off

To deactivate cruise controls, do either of the following:

- Press the Cruise Control Off Button. All cruise control switches are off. To resume cruise control, press the Cruise Control On Button and reset the speed control by pressing the Cruise Control Set Button.
- The cruise control system is deactivated each time the carrier engine ignition switch is turned off.

WARNING

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

Steering The Crane

The crane can be steered in one ON-ROAD mode and four OFF-ROAD modes. The ON-ROAD mode is used anytime extended or high speed travel is required especially on a paved roadway. The OFF-ROAD mode is used in order to provide maximum maneuverability on the job site at low speeds. Use the following along with Figure 1−63 and "Rear Steering Control Panel" in this section of this Operator's Manual to steer the crane as required.

WARNING

Do not use any OFF-ROAD steering mode for extended or high speed travel as steering behavior may be unfamiliar and a loss of crane control could occur.

High Idle Feature

The crane is equipped with a High Idle feature that allows the engine idle RPM to be increased to up to 1000rpm. The Cruise Control buttons on the steering wheel are used to adjust High Idle RPM.

To Increase High Idle RPM

1. Ensure the Cruise Control system is turned off.
2. Press the Cruise Control Set Button. Each press will increase the engine idle speed by 50rpm.

To Decrease High Idle RPM

1. Ensure the Cruise Control system is turned off.
2. Press the Cruise Control Resume Button. Each press will decrease the engine idle speed by 50rpm.

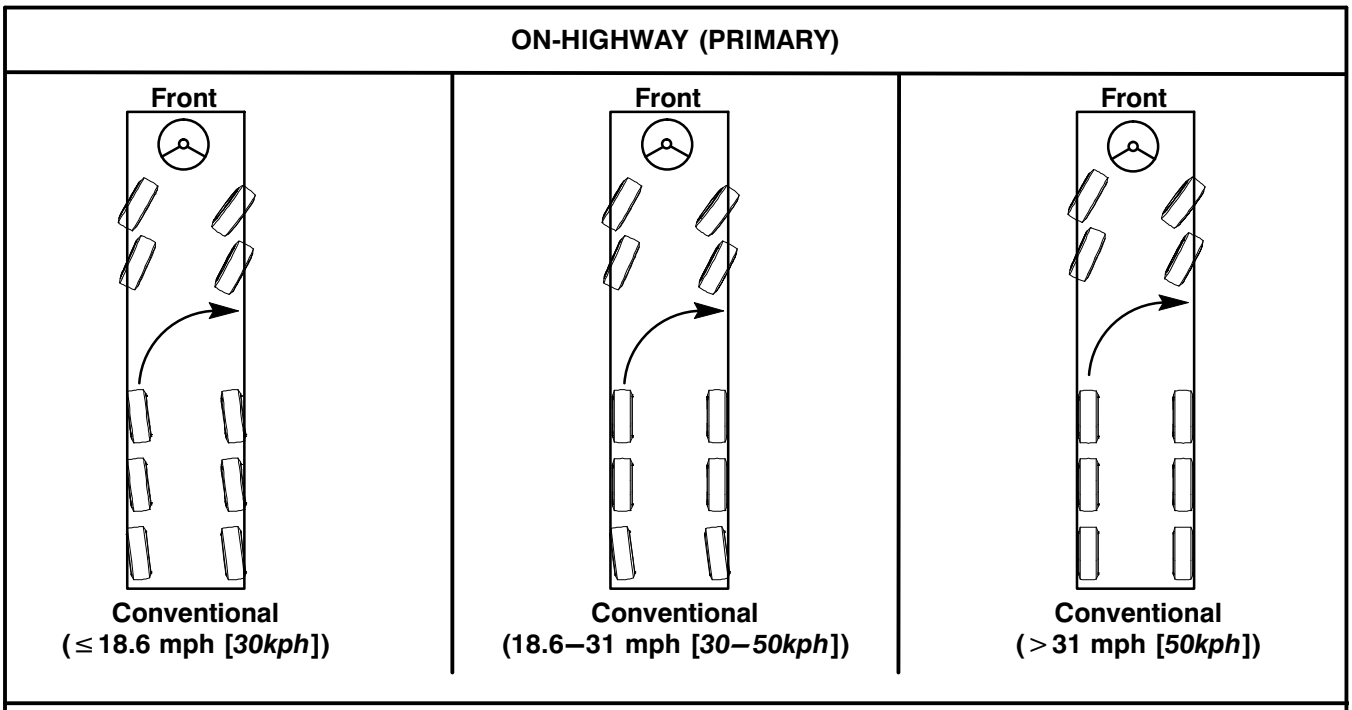


Figure 1–63
On Highway Steering Mode

On-Highway (Primary) Steer Mode

The On-Highway (Primary) steer mode is similar to that of an automobile. However the rear wheels will automatically steer on combination with the front wheel based on crane travel speed. The front wheels are controlled by the steering wheel (turn clockwise for right turn or counterclockwise for left turn). All the rear wheels remain in the straight ahead, locked position at speeds greater than 31 mph (*50km/h*). At speeds less than 18.6 mph (*30km/h*), all the rear wheels will turn within seven degrees simultaneously with the front wheels to aid in slow speed maneuvers. At speeds between 18.6 mph (*30km/h*) and 31 mph (*50km/h*), only the rear wheels on axle five will turn within seven degrees simultaneously with the front wheels.

This mode is the default at ignition start-up or is selected by pressing the switch to the ON-ROAD position if in OFF ROAD mode. Use this steer mode for all extended or high speed travel.

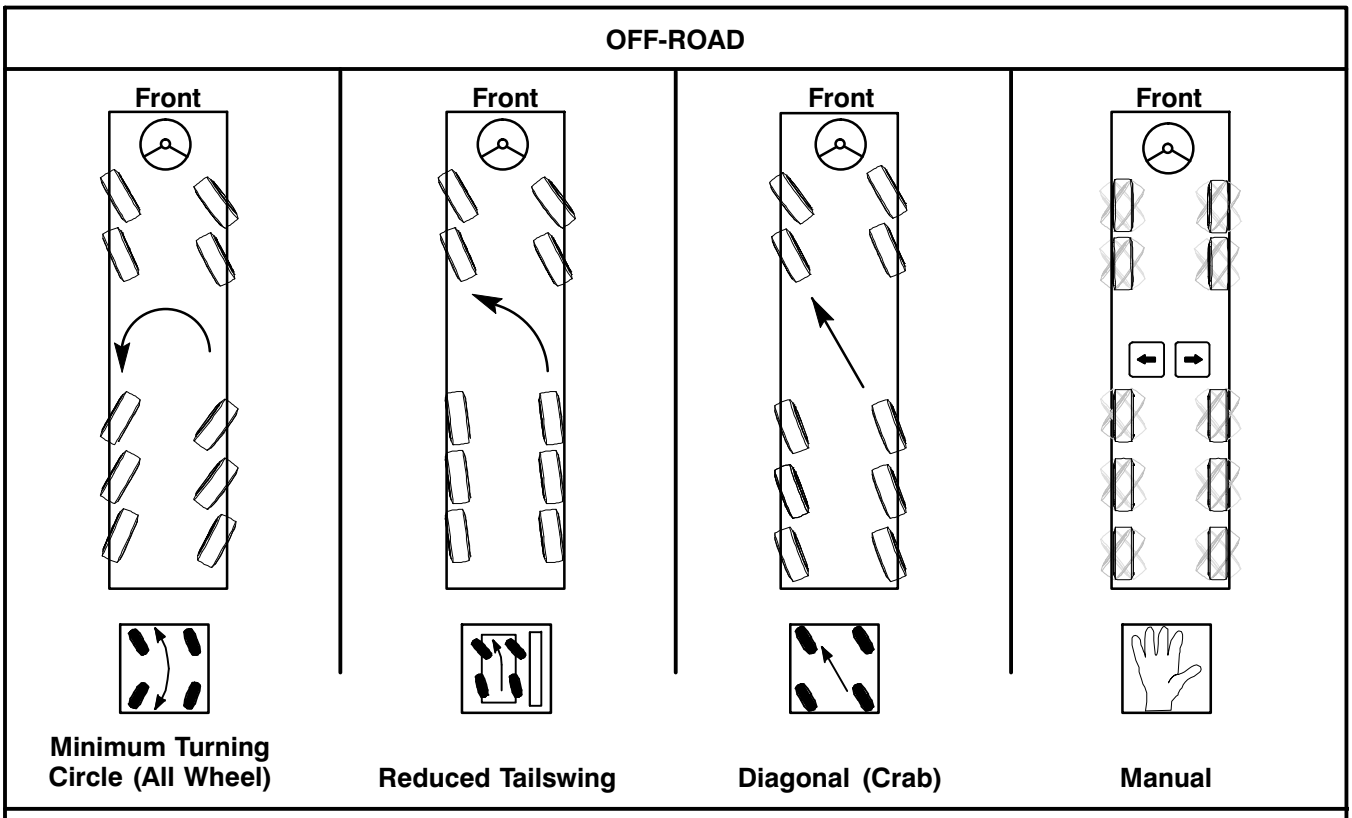


Figure 1—64
Off-Road Steering Modes

Minimum Turning Circle (All-Wheel) Steer Mode

WARNING

Do not use Minimum Turning Circle (All-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 the upper facing over the side. The crane may tip over causing serious personal injury and/or major crane damage.

This steer mode allows the rear wheels to automatically be steered together with the front wheels when turning the steering wheel. 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. Use the following for all-wheel steering.

1. Bring the crane to a complete stop.
2. Press the Steering Selection Switch to the OFF-ROAD position to activate the rear steer functions.
3. Press the Minimum Turning Circle (All Wheel) Select Switch.
4. Travel the crane slowly and cautiously.

To Deactivate Minimum Turning Circle (All-Wheel) Steer Mode

1. Bring the crane to a complete stop.
2. Press the Steering Selection Switch to the ON-ROAD position.
3. Turn the steering wheel to position the rear wheels straight ahead; the rear wheels should center and lock.
4. The indicator light above the Minimum Turning Circle (All Wheel) switch should go out. If indicator light does not go out, repeat deactivation procedure.

Reduced Tailswing Steer Mode

WARNING

Do not use Reduced Tailswing 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 the upper facing over the side. The crane may tip over causing serious personal injury and/or major crane damage.

This steer mode allows steering the front and rear wheels simultaneously in the same direction which moves the crane in the diagonal path of travel. This gives the driver/operator another method of maneuvering the crane where job site conditions require it such as moving away from a barrier. Use this steer mode for job site travel only; not for extended or highway travel. Use the following for diagonal (crab) steering.

1. Bring the crane to a complete stop.
2. Press the Steering Selection Switch to the OFF-ROAD position to activate the rear steer functions.
3. Press the Reduced Tailswing Select switch. Turn the steering wheel slowly until the indicator light above the switch flashes.
4. Travel the crane slowly and cautiously.

To Deactivate Reduced Tailswing Steer Mode

1. Bring the crane to a complete stop.
2. Press the Steering Selection Switch to the ON-ROAD position.
3. Turn the steering wheel to position the rear wheels straight ahead; the rear wheels should center and lock.
4. The indicator light above the Reduced Tailswing Select switch should go out. If indicator light does not go out, repeat deactivation procedure.

Diagonal (Crab) Steer Mode

WARNING

Do not use Diagonal (Crab) Steer Mode 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 the upper facing over the side. The crane may tip over causing serious personal injury and/or major crane damage.

This steer mode allows steering the front and rear wheels 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.

1. Bring the crane to a complete stop.
2. Press the Steering Selection Switch to the OFF-ROAD position to activate the rear steer functions.
3. Press the Diagonal (Crab) Select Switch.
4. Travel the crane slowly and cautiously.

To Deactivate Minimum Turning Circle (All-Wheel) Steer Mode

1. Bring the crane to a complete stop.
2. Press the Steering Selection Switch to the ON-ROAD position.
3. Turn the steering wheel to position the rear wheels straight ahead; the rear wheels should center and lock.
4. The indicator light above the Diagonal (Crab) switch should go out. If indicator light does not go out, repeat deactivation procedure.

Manual Steer Mode

WARNING

Do not use Manual 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 the upper facing over the side. The crane may tip over causing serious personal injury and/or major crane damage.

This steer mode allows the rear wheels to be independently steered from the front wheels by manually pushing the ⬅ ➡ steering switches. The front wheels are steered by the steering wheel and the rear wheels are steered by the control switches. This results in multiple turning conditions for extra maneuverability in certain job site conditions. Use this steer mode for job site travel only; not for extended or highway travel. Use the following for manual steering.

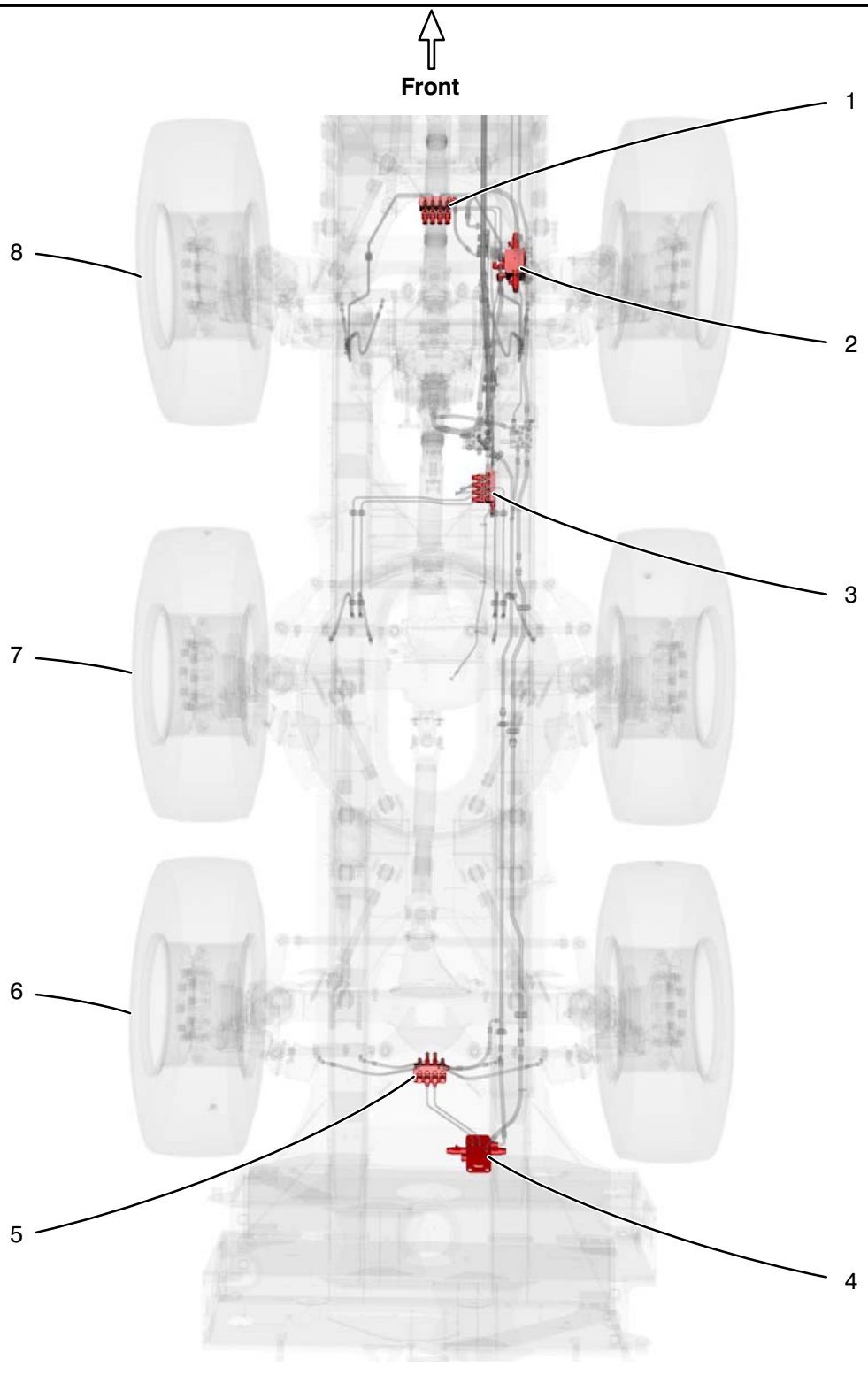
1. Bring the crane to a complete stop and align the front wheels in the straight-ahead position.
2. Press the Steering Selection Switch to the OFF-ROAD position to activate the rear steer functions.
3. Press the Manual Steering Mode switch.
4. Press the Left or Right Manual Steering Switch to turn the rear wheel in the desired direction. The indicator light above the switch should illuminate.
5. Travel the crane slowly and cautiously.

To Deactivate Manual Steer Mode

1. Bring the crane to a complete stop.
2. Press the Steering Selection Switch to the ON-ROAD position.
3. Turn the steering wheel to position the rear wheels straight ahead; the rear wheels should center and lock.
4. The indicator lights above the left and right Manual Steering switch should go out. If indicator light does not go out, repeat deactivation procedure.

Steering System Error Codes

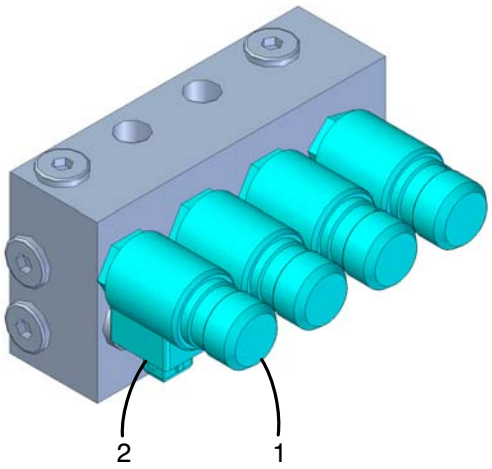
If a steering warning light illuminates and an audible alarm sounds, there is a fault in the steering electronics. Properly park the crane and shutdown the carrier engine. Restart the carrier engine. If the fault is not cleared, press and release the Menu Switch on the rear steering control panel. Refer to Figure 1–42. The steering error code will appear in the display area of the rear steering control panel. The first error code(s) is for the third (front-rear) axle. If more than one error code exists for the third axle, they will appear successively. To read the error code(s) for the fourth (center-rear) axle, press and release the Menu Switch again. Press the Menu Switch again to read the error code(s) for the fifth (rear-rear) axle. Refer to the crane's Shop Manual for error code listing and troubleshooting.



Bottom View

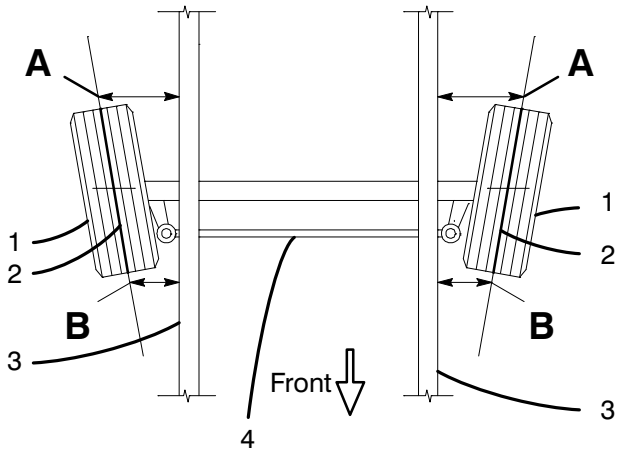
1. Axle 3 Blocking Valve
2. Axles 3 & 4 Directional Proportional Valve
3. Axle 4 Blocking Valve
4. Axle 5 Directional Proportional Valve
5. Axle 5 Blocking Valve
6. Axle 5 (Rear-Rear Axle)
7. Axle 4 (Center-Rear Axle)
8. Axle 3 (Front-Rear Axle)

Figure 1–65
Rear Steering Valve Locations



1. Retaining Knob
2. Solenoid Valve

Figure 1–66
Rear Steer Blocking Valve



1. Tire
2. Scribed Lines
3. Carrier Frame
4. Tie Rod

Figure 1–67
Rear Wheel Alignment

Emergency Rear Axle Wheel Alignment

This procedure covers emergency rear wheel alignment which may be required to return rear steered axles to the locked center position In the event of a rear steering malfunction.

DANGER

Emergency rear axle wheel alignment must never be used for normal crane operation. Driving the crane is possible with front axle steering with limitations as turning radius is increased. Rear steering malfunction must be repaired before placing the crane back into service.

DANGER

Use extreme caution when operating the steering with someone under the carrier. The hydraulic force behind the steering components is capable of seriously injuring anyone caught in the steering linkage or trapped behind a tire. Post a signalman to watch carefully to ensure the safety of the person under the carrier.

1. Lower, detach, and secure load, as required.
2. Fully retract and position the boom, as required.
3. Park the crane on a firm, level surface, shift the transmission to neutral, and engage the park brake.
4. Raise the crane on outriggers to get the tires off the ground. Release the park brake.

Refer to Figure 1–67.

5. Scribe a line on the approximate center of each tire by bringing a pointed, stationary object into contact with the tread while rotating the wheel. The line must begin and end at the same point on the tread.

Refer to Figure 1–66 and Figure 1–65.

6. Locate rear steer blocking valve and directional proportional valve associated with the non–centered rear axle.
7. Label for assembly purposes and disconnect the electrical connections to the solenoids.
8. Remove all blue solenoid retaining knobs, o-rings and solenoids from rear steer blocking valve.
9. Re-install blue knobs back onto the rear steer blocking valve to engage the manual plunger of each valve.

CAUTION

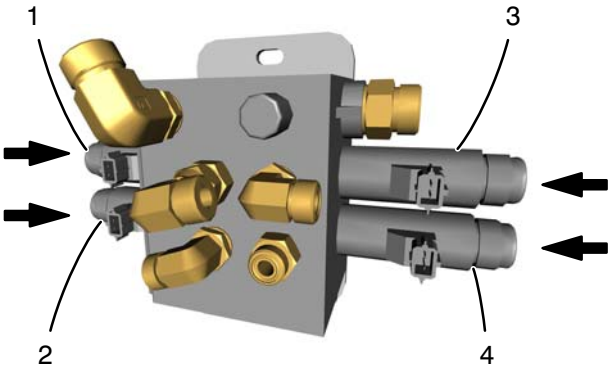
Do not lose o–rings associated with the solenoids and the retaining knobs.

10. Apply park brake and retract outriggers to allow the entire weight of the crane to rest on the tires.

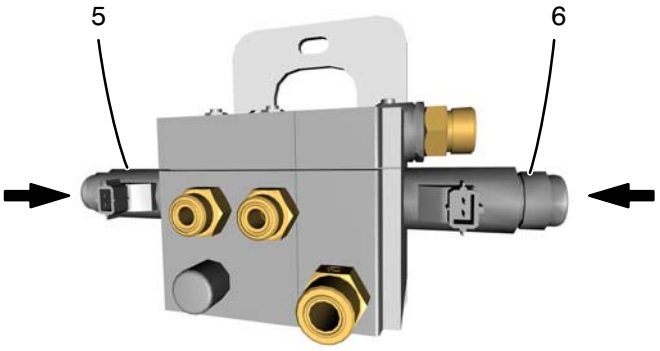
Refer to Figure 1–67.

11. Measure the distances at point "A" and point "B" on the left and right side tire. The distance at "A" should be 0–0.2 in (*0–5mm*) greater than at "B" for left and right tires.

    Note: For the center position, the difference between dimension "A" and "B" should be equal left to right.



Axles 3 And 4



Axle 5

1. Axle 3 Steer Left
2. Axle 4 Steer Right
3. Axle 3 Steer Right
4. Axle 4 Steer Left
5. Axle 5 Steer Left
6. Axle 5 Steer Right

Figure 1–68
Directional Proportional Valves

CAUTION

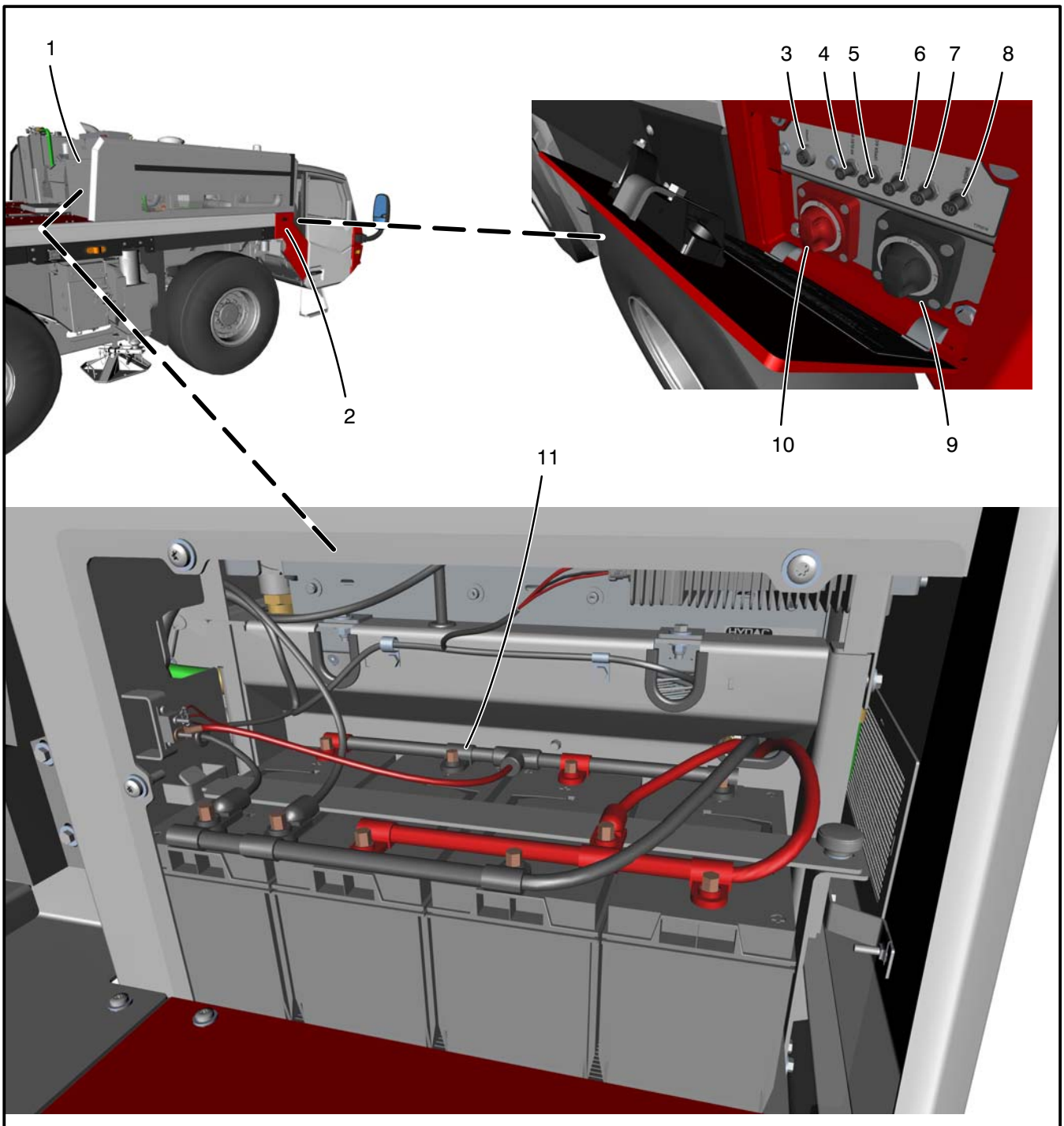
Do not manually engage the the proportional valve with sharp edged or pointed objects. Damage to the valve can occur resulting in valve failure. Always use a blunt object to manually engage the proportional valves.

Refer to Figure 1–68.

12. If adjustment is required, push the rear steering proportional valve for corresponding axle and wheel to center the tires.

Refer to Figure 1–66 and Figure 1–65.

13. Remove blue solenoid retaining knobs from check valve block and re-install solenoids, o-rings, and retaining knobs back onto blocking valve.
14. Repeat Steps 5-12 for the other two axles if required.
15. Travel crane forward at least 50 ft (*15m*) and repeat Steps 11–15 on each axle to check the adjustments. The difference between dimensions "A" and "B" must be equal on all the rear axles.
16. If the distance at "A" is not 0–0.2 in (*0–5mm*) greater than at "B", mechanical adjustments may be required to obtain the proper alignment. Refer to Rear Axle Wheel Alignment in the crane's Shop Manual.
17. Once the wheels are centered, tie back the loose wires to the solenoids and make the necessary repairs to the steering system.
18. Once repairs have been made, make the electrical connections to the solenoid as labeled during removal.
19. Test all steering functions before placing the crane in service.



1. Carrier Battery Box
2. Battery Disconnect And Power Panel
3. 105 Amp Circuit Breaker (Upper)
4. 80 Amp Circuit Breaker (Right Rear Electrical Box)
5. 50 Amp Circuit Breaker (Upper A/C)
6. 35 Amp Circuit Breaker (Air Shutoff Option)
7. 30 Amp Circuit Breaker (Fuel Heater)
8. 30 Amp Circuit Breaker (Engine)
9. Negative Battery Disconnect Switch
10. Positive Battery Disconnect Switch
11. Batteries

Figure 1–69
Carrier Batteries And Power Panel

Carrier Power Panel

The carrier power panel is located in the right front fender just behind the carrier cab. Refer to Figure 1—69. Circuit breakers that protect the carrier electrical system are in the carrier power panel. Also, a label which designates the carrier electrical circuit protected by each breaker is on the carrier power panel. If an electrical malfunction occurs within these circuits, reset and/or check these breakers as required.

Carrier Battery Box

The battery box is located in the hood behind the carrier cab. Refer to Figure 1—69. The battery box houses four 12 volt heavy duty maintenance free batteries and several other carrier electrical components. Inspect the batteries, battery cables, and connections every 50 hours of operation. Check that the battery connections are secure and corrosion free. If corrosion exists, remove the battery cables from the terminals and clean them with a wire brush. Install the cables and apply a small amount of grease to each terminal to prevent corrosion.

⚠ WARNING

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

Carrier Battery Disconnect Switches

The carrier battery disconnect switches are in the right fender behind the carrier cab. Refer to Figure 1—69. Move the disconnect switches to the "Off" position any time welding is being done on the crane to protect the cranes electronic components from damage due to an electric arc type welder.

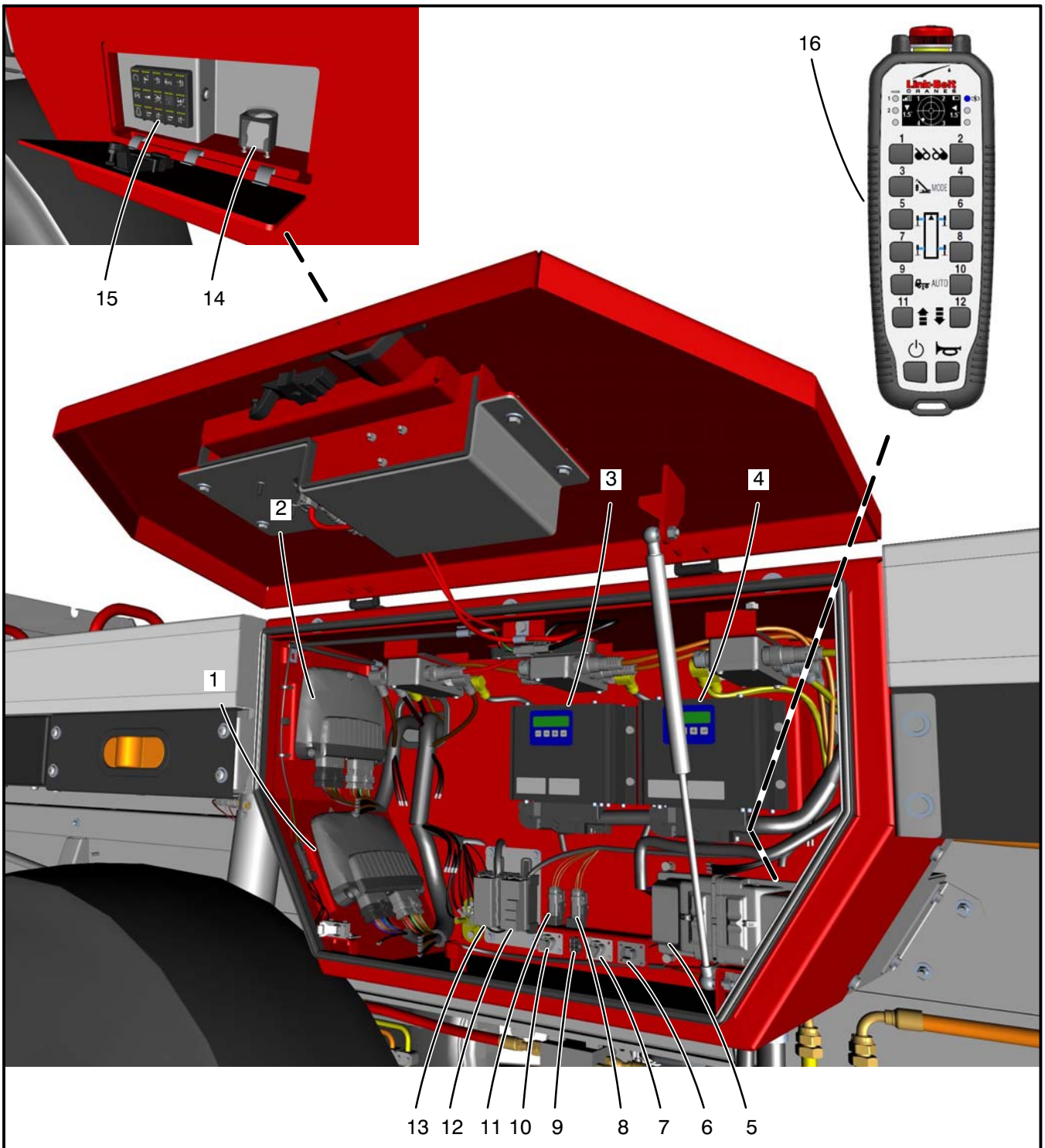
Note: If the batteries are disconnected, the start-up time for on-board computer systems will be longer than normal.

CAUTION

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

The carrier ignition switch should be shut off at least 70 seconds prior to turning disconnect switches to the "OFF" position.

1. Shutdown the carrier 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.



1. CM 4 Controller
2. CM 3 Controller
3. Steering Computer 1
4. Steering Computer 2
5. ABS Electronic Control Unit (ECU)
6. Wireless Rigging Remote Charging Base Power Connector
7. CAN E Diagnostics Connector
8. Diode Pack 2
9. Steer (Computer 2) Programming/Diagnostics Connector
10. CAN H Diagnostics Connector
11. Diode Pack 1
12. Fuse And Relay
13. Fuse
14. Level
15. Outrigger Switches
16. Wireless Rigging Remote

Figure 1–70
Rear Carrier Electrical Center

Rear Carrier Electrical Center

The Rear Carrier Electrical Center Is located on the left side of the carrier. Refer to Figure 1—70.

Steering Computers

The steering computers monitor the rear steering functions. They contain an interface that can be used during rear steer calibration procedures. Use the menu button on the rear steering control panel in the carrier cab to access maintenance and service menus. Refer to "Rear Steering Control Panel" in this section of this Operator's Manual for additional information. After these menus are accessed, the interface on the steering computers can be used to perform the calibration procedures. Steering computers should be calibrated by a qualified technician. Contact your Link-Belt Distributor for assistance when servicing the steering system.

Steer Programming/Diagnostic Connectors

There are two steer programming/diagnostic connectors. Steer (computer 1) programming/diagnostic connector is located in the carrier cab relay blocks and diagnostic center and can be used to program steering computer 1. Refer to "Carrier Cab Right Control Console" in this section of this Operator's Manual. Steer (computer 2) programming/diagnostic connector is located in the rear carrier electrical center and can be used to program steering computer 2. Refer to Figure 1—70. Each connector can be used to access diagnostics for both steering computers.

Anti-lock Brake System (ABS)

This crane is equipped with an anti-lock brake system. This system helps the driver/operator maintain control by preventing the wheels from locking up during hard braking.

The system operates with a computer that optimizes crane control during braking on varying tire and road conditions by modulating the brake pressure at each wheel. During an anti-lock stop, the modulating pressure will not allow the wheels to lock up. This is an indication that the ABS is working correctly.

CAUTION

The ABS may not assist the crane in stopping quickly on wet or icy surfaces. Heavy braking combined with poor road conditions could cause loss of steering control.

ABS Electronic Control Unit (ECU)

The ABS electronic control unit is located in the Carrier Electrical Box. Refer to Figure 1—70. The ABS electronic control unit controls and monitors the ABS system and communicates with other systems on the crane. The ABS electronic control unit also contains self-testing diagnostic circuitry that continuously checks for the normal operation of internal components and circuitry, as well as external ABS components and wiring. When a system malfunction has occurred, a warning light on the instrument cluster in the carrier cab will illuminate. Refer to Figure 1—40. When this light illuminates, a malfunction has been detected with the ABS system. Depending on which component has malfunctioned, the ABS may be fully or partially disabled. When the ABS warning light illuminates, the ABS system should be serviced as soon as possible.

ECU Diagnostics

The controller contains self-testing diagnostic circuitry that continuously checks for normal operation of internal components and circuitry, as well as external ABS components and wiring.

Active Diagnostic Error Codes

When an error is detected in the system, the ABS controller:

1. Illuminates the appropriate indicator light(s) and disengages part or all of the ABS and Automatic Traction Control (ATC) functions. Refer to Figure 1−40 and Figure 1−54.
2. Places the appropriate error code information in the ECU memory.
3. Communicates the appropriate error code information over the can bus communications diagnostic link as required. Diagnostic tools can be attached to the diagnostic connector to read error codes. Refer to " Anti-lock Brake System (ABS) Diagnostic Connector" in this Section of this Operator's Manual for additional information.

Anti-lock Brake System (ABS) Diagnostic Connector

The ABS diagnostic connector enables technicians to access data from the ABS control system with hand-held or PC-based tools and conduct systematic troubleshooting of ABS problems. The diagnostic connector is below the dash console to the left of the steer column. Refer to Figure 1−49.

Automatic Traction Control (ATC)

The ATC feature integrated into the ABS system improves control and traction during acceleration. The ABS controller detects drive wheel slip and adjusts engine throttle to help reestablish wheel traction. In normal on highway driving, ATC is always active.

ATC Indicator Light

An ATC indicator light is included within the Carrier Cab Control Display. Refer to Figure 1−54. The ATC light Illuminates:

1. During power up (e.g. when the carrier engine is started) and turns off after the self test is completed, providing no diagnostic error codes are present.
2. When ATC is disabled for any reason.
3. During an ATC event (the light will flash rapidly). When ATC is no longer active, the ATC indicator light turns off.

ATC Disable Mode

Automatic traction control is enabled by default when the ignition key is turned on. The Traction Control Disable Switch can be pressed to toggle between enabling and disabling the ATC. Refer to Figure 1−43. The disable mode will prevent the traction control system from activating, regardless of wheel slip.

⚠ WARNING

Do not disable ATC on normal, paved road surfaces. Crane stability may be adversely affected.

Hill Start Aid (HSA) Operation

Hill Start Aid defaults to the "On" position. It can be overridden by pressing and releasing the Travel Mode/ Hill Start Disable Switch, however, it will turn back on after the first successful launch. If the HSA is overridden, the Hill Start Aid Disable Indicator Light in the Carrier Control Display will illuminate. A grade sensor is used to determine when to engage Hill Start Aid.

Uphill

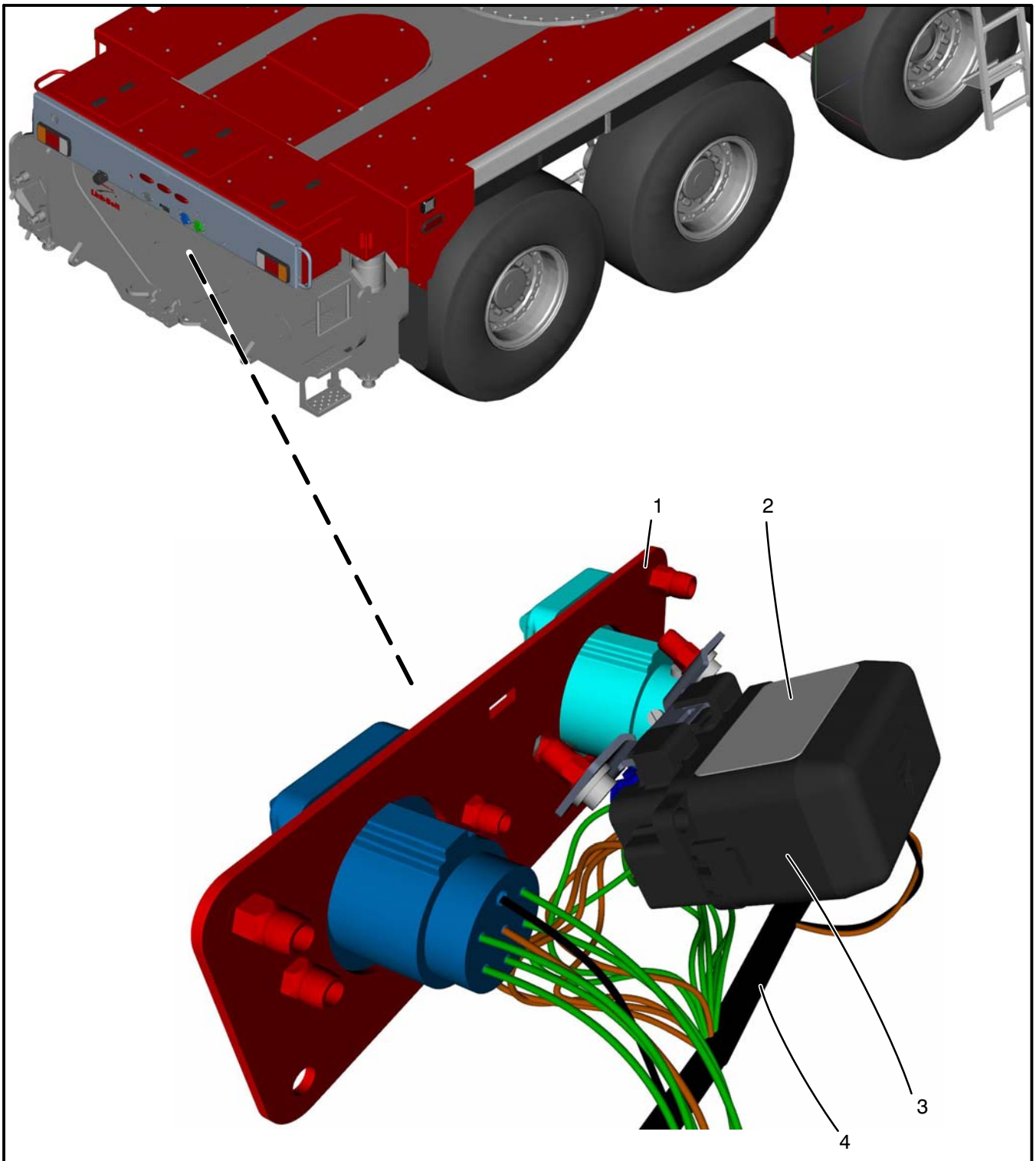
- Crane must be on incline greater than 3% and in a forward mode.
- Bring vehicle to a stop and depress the service brakes then release the service brakes.

Note: Vehicle will begin to move after 5 seconds, and the clutch will perform partial engagements to slow the vehicle motion. You must either step on the brake or apply the throttle.

Downhill

- Vehicle must be on a decline greater than 3% and in Reverse mode.
- Bring vehicle to a stop and depress the service brakes then release the service brakes.

Note: Vehicle will begin to move after 5 seconds, and the clutch will perform partial engagements to slow the vehicle motion. You must either step on the brake or apply the throttle



1. Trailer Connector Mounting Bracket
2. Fuse Box Identification Label
3. Fuse Box
4. Carrier Wire Harness

Figure 1–71
Carrier Rear Light Bar Fuse Box

Carrier Rear Light Bar Fuse Box

A fuse box is located at the rear of the carrier behind the trailer connections. These fuses protect the components on the rear light bar. To access this fuse box, remove the trailer connector mounting bracket. A fuse identification label is located on the trailer connector mounting bracket.

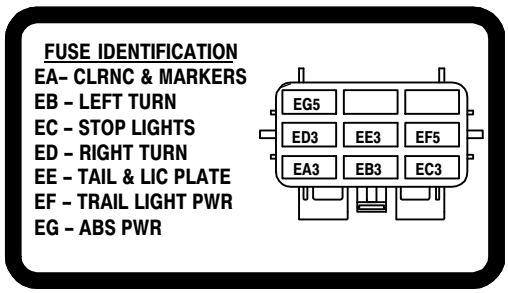
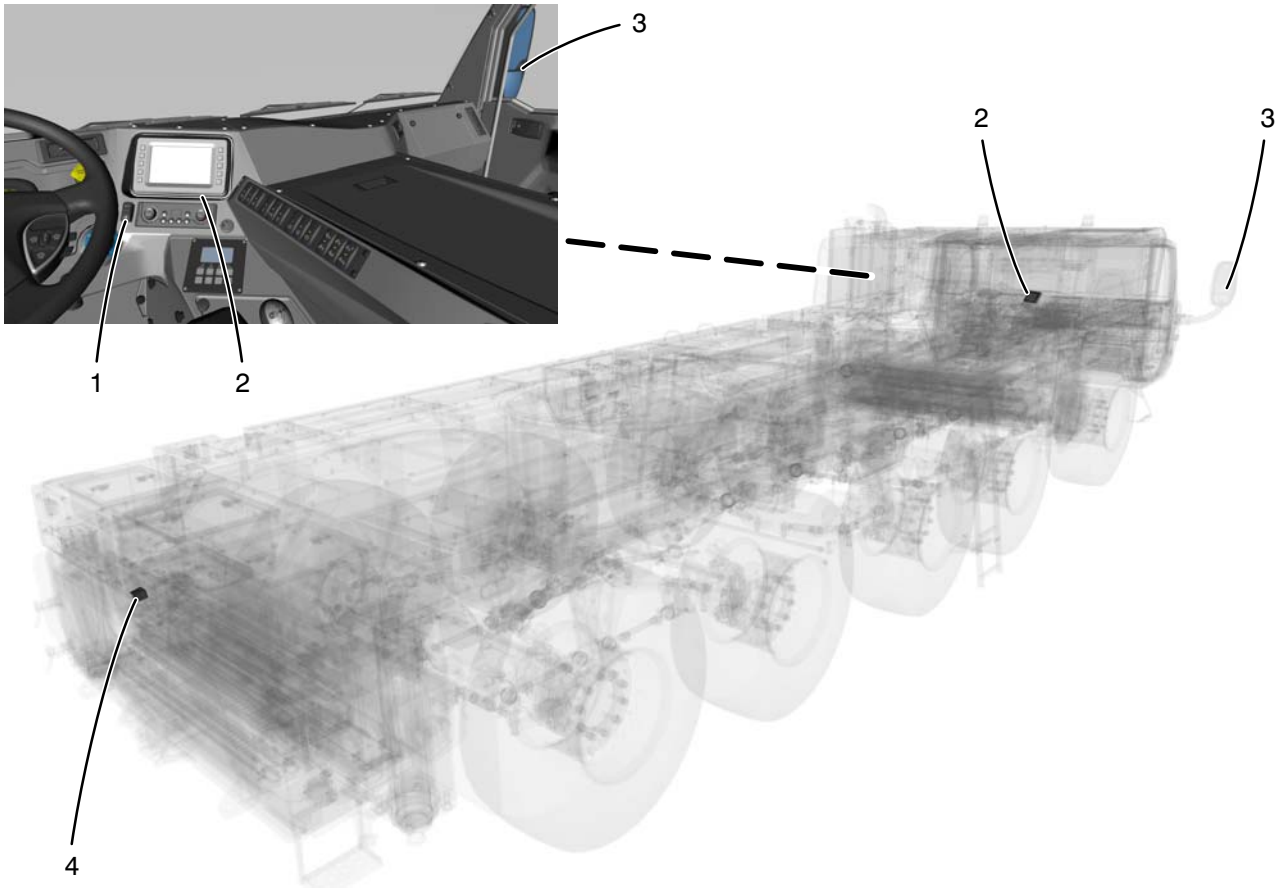


Figure 1–72
Light Bar Fuse Identification Label



1. Rear Camera Selection Switch
2. Carrier Cab Control And Camera Display
3. Right Side View Camera
4. Rear View Camera

Figure 1–73
Carrier Camera Location

Carrier Right Side, Rear, and Trailer Rear View Cameras (If Equipped)

The carrier may be equipped with three cameras. One camera gives the operator a view of the area to the right of the crane. Another camera gives the operator a view of the area at the rear of the crane. A third camera on the boom trailer, if equipped, gives a view of the area at the rear of the boom trailer.

During initial crane start up and inspection each day, verify the proper operation of the camera. If the camera is 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 Operator of any responsibilities during crane operation. Always look directly in the direction of crane travel. Do not rely solely on the camera to determine if an obstruction is present.

When the right side turn signal is activated, the Carrier Cab Control And Camera Display will automatically display the right side view camera. When the transmission is shifted into reverse, the Carrier Cab Control And Camera Display will automatically display the rear view camera or trailer rear view camera, depending on which mode is selected. Push the top of the camera selection switch to show the rear view camera when in reverse, or push the bottom of the camera selection switch to show the trailer rear view camera when in reverse.

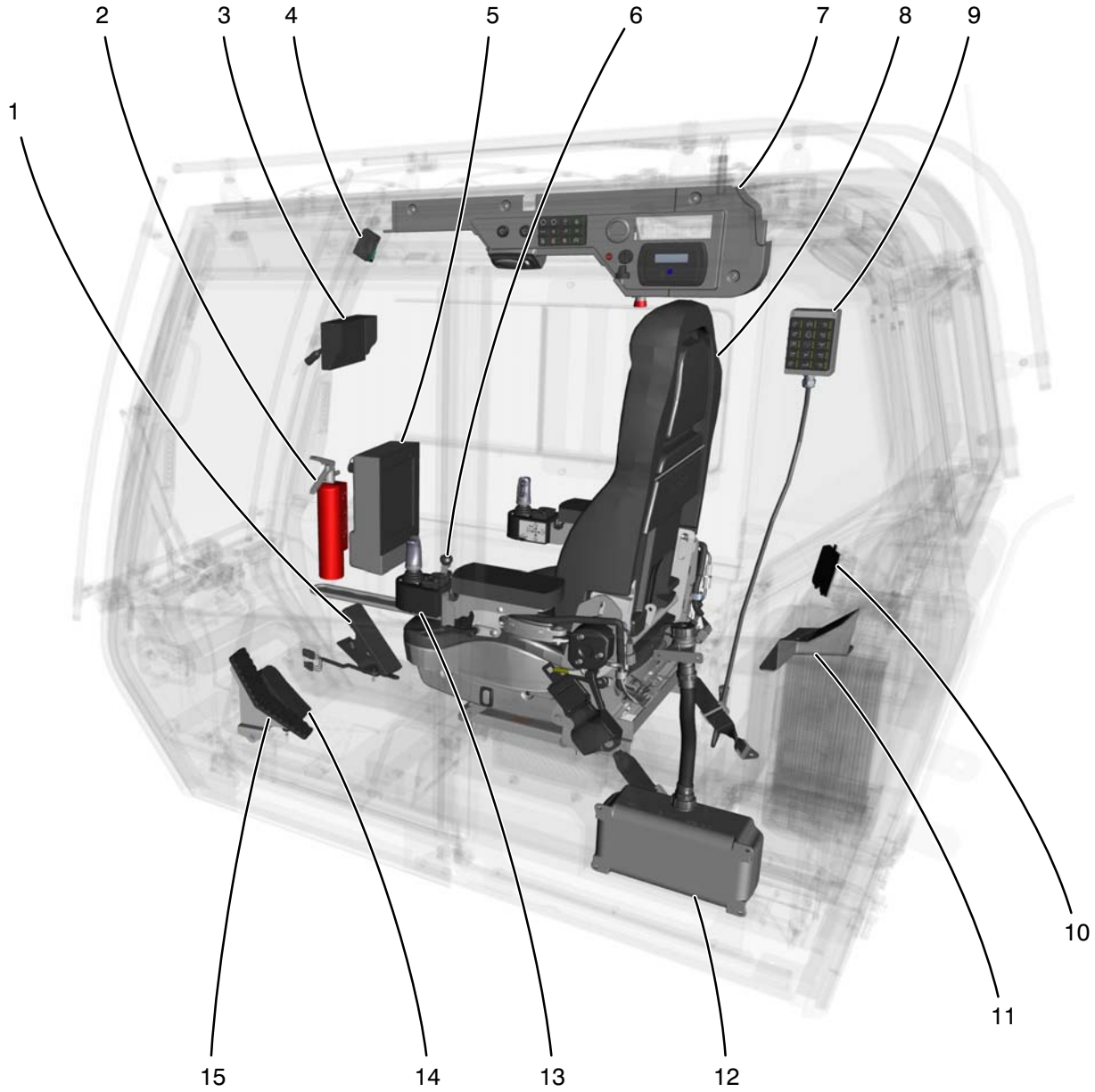
The Carrier Cab Control And Camera Display helps the Operator see areas that can be obstructed from their view. This display can distract the Operator from their normal duties if not used properly. Use this display as an Operator's aid and not as the sole method of seeing where the crane is going. Primary 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 crane operator is required to move the crane.

WARNING

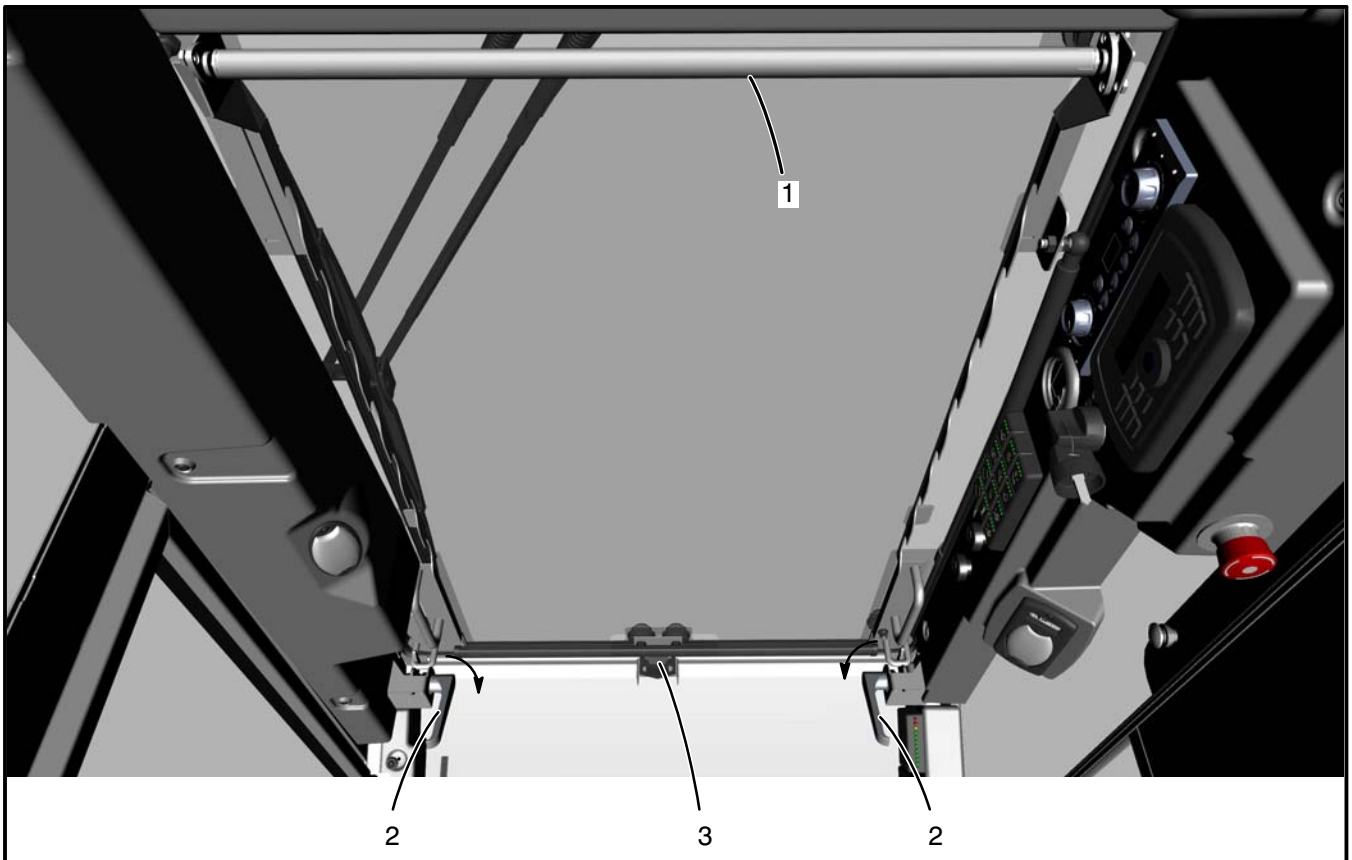
Do not rely solely on the cameras and monitors.

- **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.**



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

Figure 1–74
Operator's Cab



1. Sunscreen
2. Top Hatch Latches
3. Catch Release

Figure 1–75
Top Hatch

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 1–74. 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

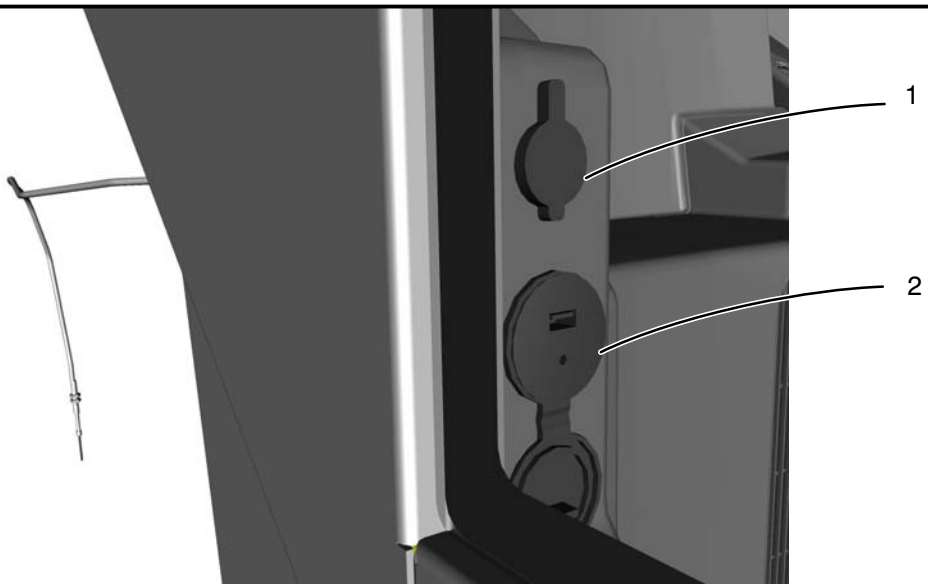
The top hatch wiper is mounted in the top of the operator's cab roof. Refer to Figure 1–75. The switch for the top hatch wiper/washer is on the overhead control console. Refer to Figure 1–79 for switch location.

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 1–75.

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 1–75.



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

Figure 1–76
Power Outlets

Fire Extinguisher

A fire extinguisher is mounted in the operator's cab behind the Rated Capacity Limiter display. Refer to Figure 1–74. 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 1–74. 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

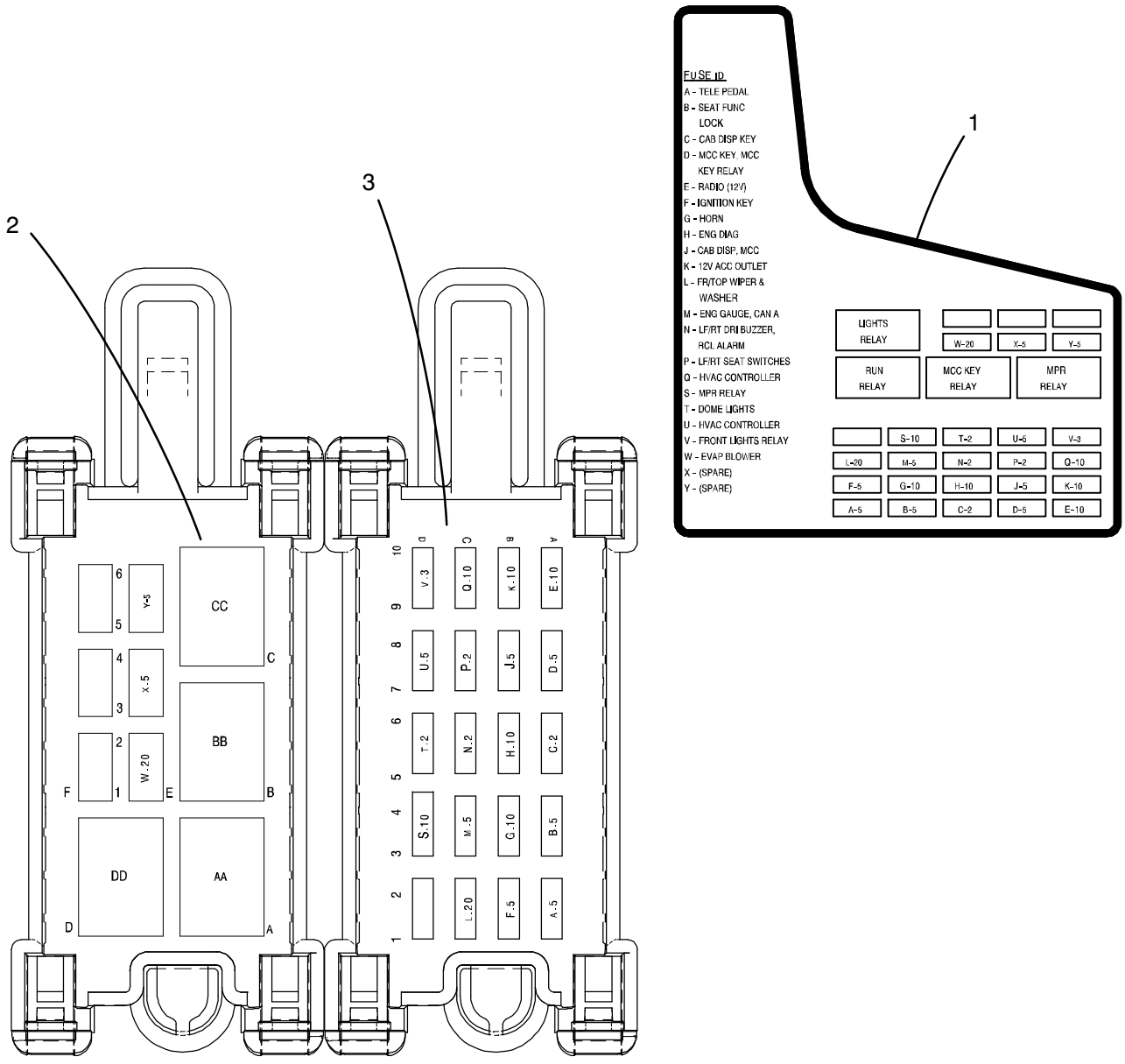
Use this outlet for electrical accessories.

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.



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

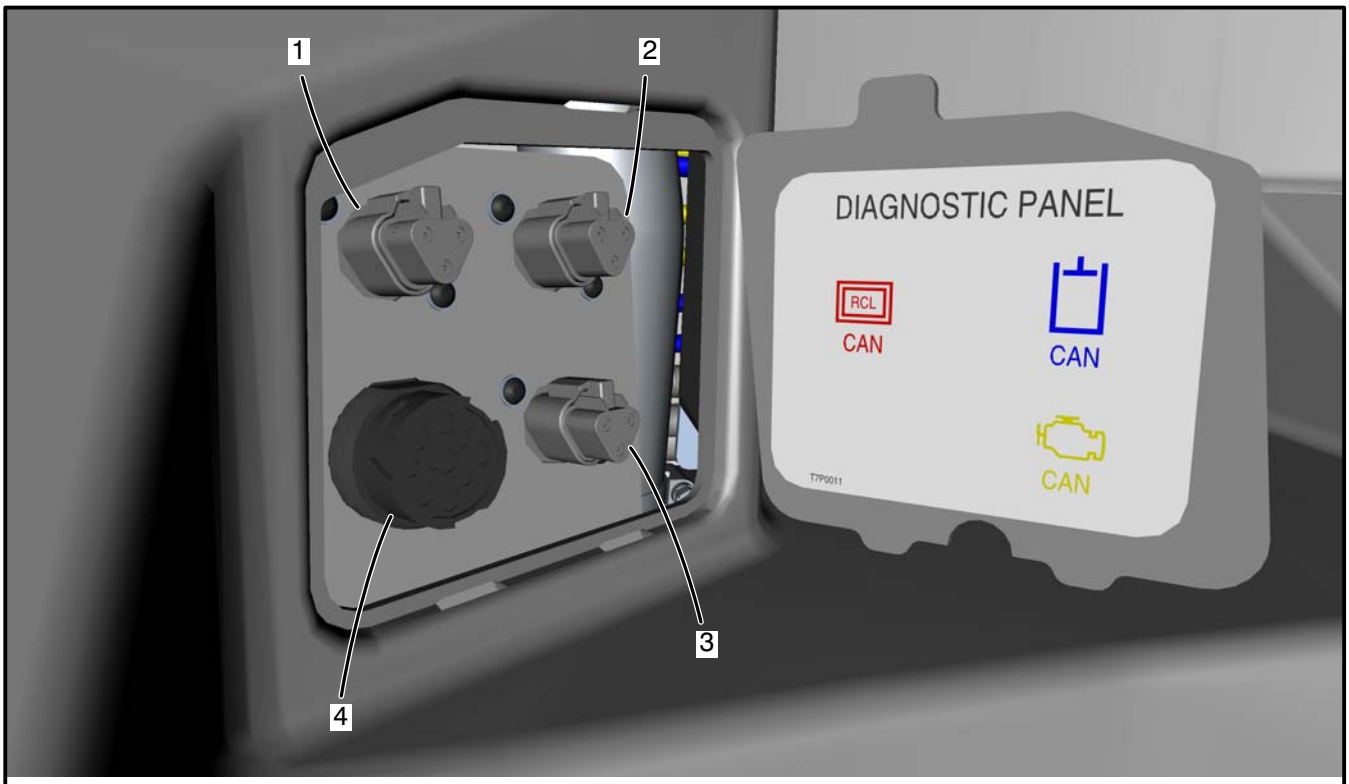
1. Typical Fuse Panel Label – Always refer to the actual label on the crane
2. Relays
3. Fuses

Figure 1–77
Upper Fuse Panel

Fuse Panel

The fuse panel is located in the rear panel on the left side of the upper operator's cab. Refer to Figure 1–74. A label which designates the electrical circuit protected by each fuse is on the panel cover. Refer to Figure 1–77.

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



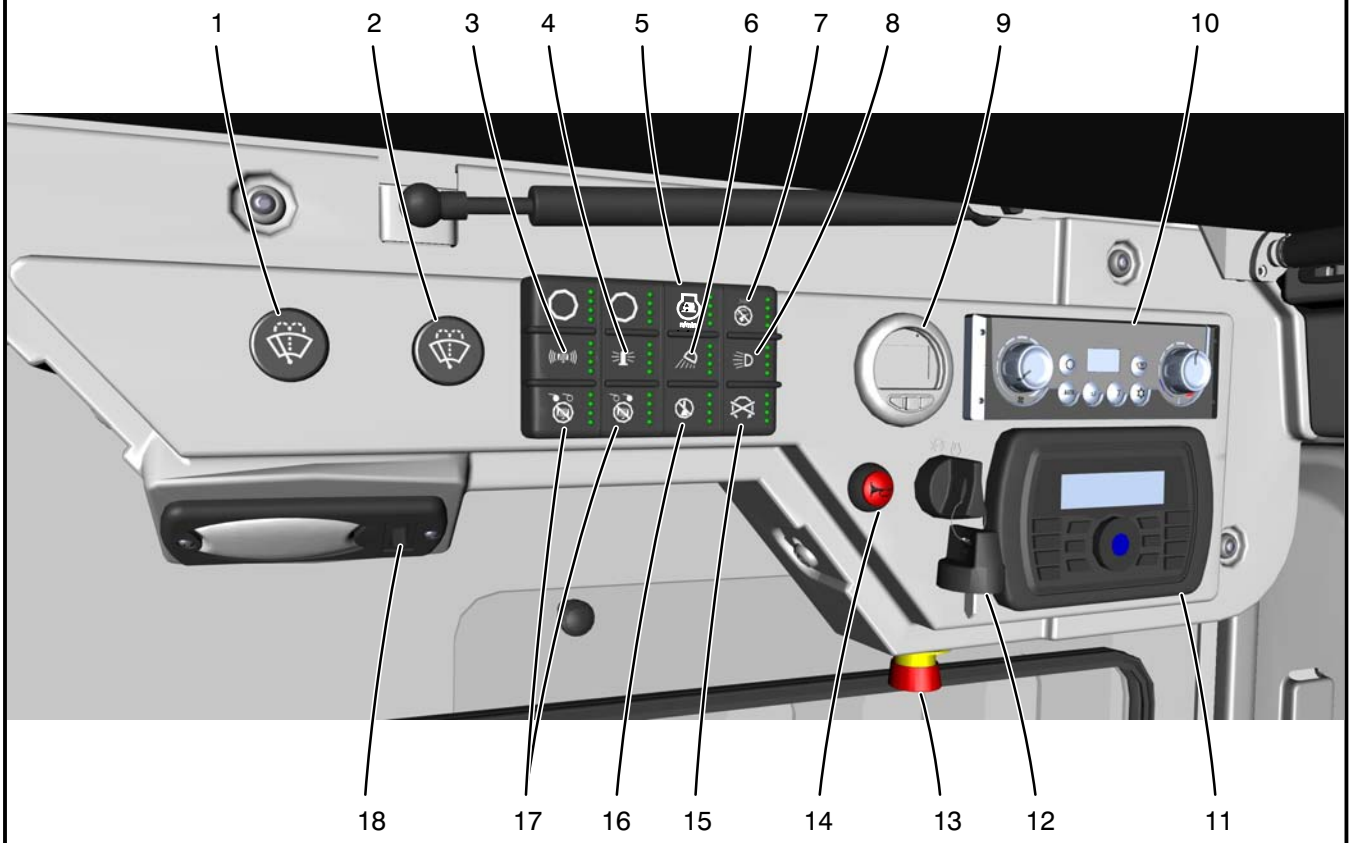
1. RCL CAN
2. Hydraulic CAN
3. Engine CAN
4. Engine Diagnostic Connector

Figure 1—78
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—74. A label which identifies each diagnostic connector is on the panel cover. Refer to Figure 1—78.

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



1. Windshield Wiper/Washer Switch
2. Top Hatch Wiper/Washer Switch
3. Drum Rotation Indicator Switch
4. Strobe Light Switch
5. Upper Throttle Control/PTO Enable Switch
6. Boom Floodlight Switch
7. 360° Swing Lock Switch (If Equipped)
8. Upper Lights Switch
9. Engine Gauge Indicator
10. HVAC Controls
11. Radio
12. Engine Ignition Switch
13. Emergency Shutdown Button
14. Horn Button
15. Engine Shutdown Switch
16. Function Lockout Switch
17. Winch Disable Switches
18. Dome Light Switch

Figure 1—79
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—79.

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.

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 switch is in the ON position. Refer to "Drum Rotation Indicators" in this Section of this Operator's Manual for complete operating procedures.

4. Warning Light Switch

This switch controls the carrier and upper warning lights. Press the switch to toggle between four warning light modes: carrier only, upper only, carrier and upper, and all off.

5. Upper Throttle Control/PTO Enable Switch

This switch toggles between the upper throttle control/PTO enable and the carrier throttle control/PTO disable. Press this switch in the down position to toggle between the upper throttle control/PTO enable and carrier throttle control/PTO disable.

Note: Upper hydraulic functions, including cab air conditioning, will be inoperable if upper throttle control/PTO enable is not selected.

6. Boom Floodlight Switch

This switch operates the boom floodlight. Push the switch once to activate the floodlight, and again to inactivate it.

7. 360° Swing Lock Switch (If Equipped)

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

8. Upper Lights Switch

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

9. Engine Gauge Indicator

The engine gauge indicator displays engine information and warning lamps.

10. HVAC Controls

Fan Speed Rotary Knob

This rotary switch 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 HVAC system is in AUTO mode, the fan speed is controlled automatically. If fan speed is adjusted when 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: Note: when HVAC system is in AUTO mode, the vent selection is controlled automatically. If the vent selection is adjusted when 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 feet area during high heating requirements. The system also automatically controls the velocity of the air provided to the face area based on the temperature of the air to prevent dry eyes and tearing.

Temperature Control Knob

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

Note: Note: when HVAC system is in AUTO mode, the entire system will automatically adjust to hold the cab at the desired temperature. When in manual mode the temperature displayed is only an indication of how high the heat setting is and not an indication of the actual cab temperature.

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 and windows. 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 clearing 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 compressor 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 compressor may turn on and off as needed. 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 enabled.

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

Recirculation Air Control Switch

Pressing the recirculation air control switch toggles between recirculating the air in the cab and drawing fresh air into the cab through the HVAC system. The switch will illuminate and the recirculation symbol will be depicted on the HVAC control panel display when in recirculation mode. 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; the operator can always use their own discretion and press the switch again if the operator desires to return to recirculation mode.

HVAC Controls Dispay

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 here.

11. Radio

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

12. 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.

Note: The carrier cab is powered on when the upper ignition switch is on. Any carrier cab accessories will run in the same state as the last time used (i.e. carrier HVAC blower fan speed).

13. Emergency Shutdown Button

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

14. 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.

15. 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.

16. Function Lockout Switch

This switch is used to disable hydraulic functions which are operated by the control levers and 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.

17. 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.

18. 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

The remote controlled boom floodlight is equipped with a remote control. It is stored in the netted pocket on the door of the upper cab. Refer to Figure 1−80.

1. Direction Buttons

   The direction buttons control the direction of movement of the boom floodlight. 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

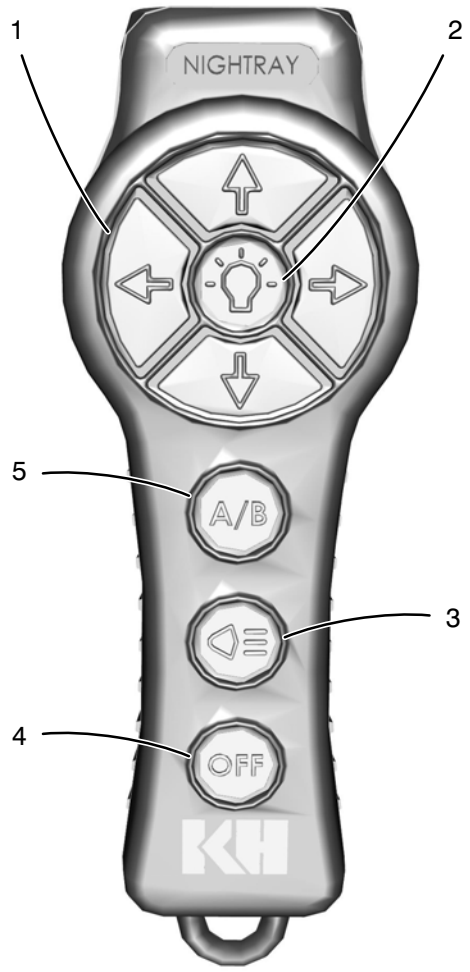
   The lamp button will turn on the floodlight. Press and hold button until light turns on (1−5 seconds).

4. Off Button

   This button turns the boom floodlight off.

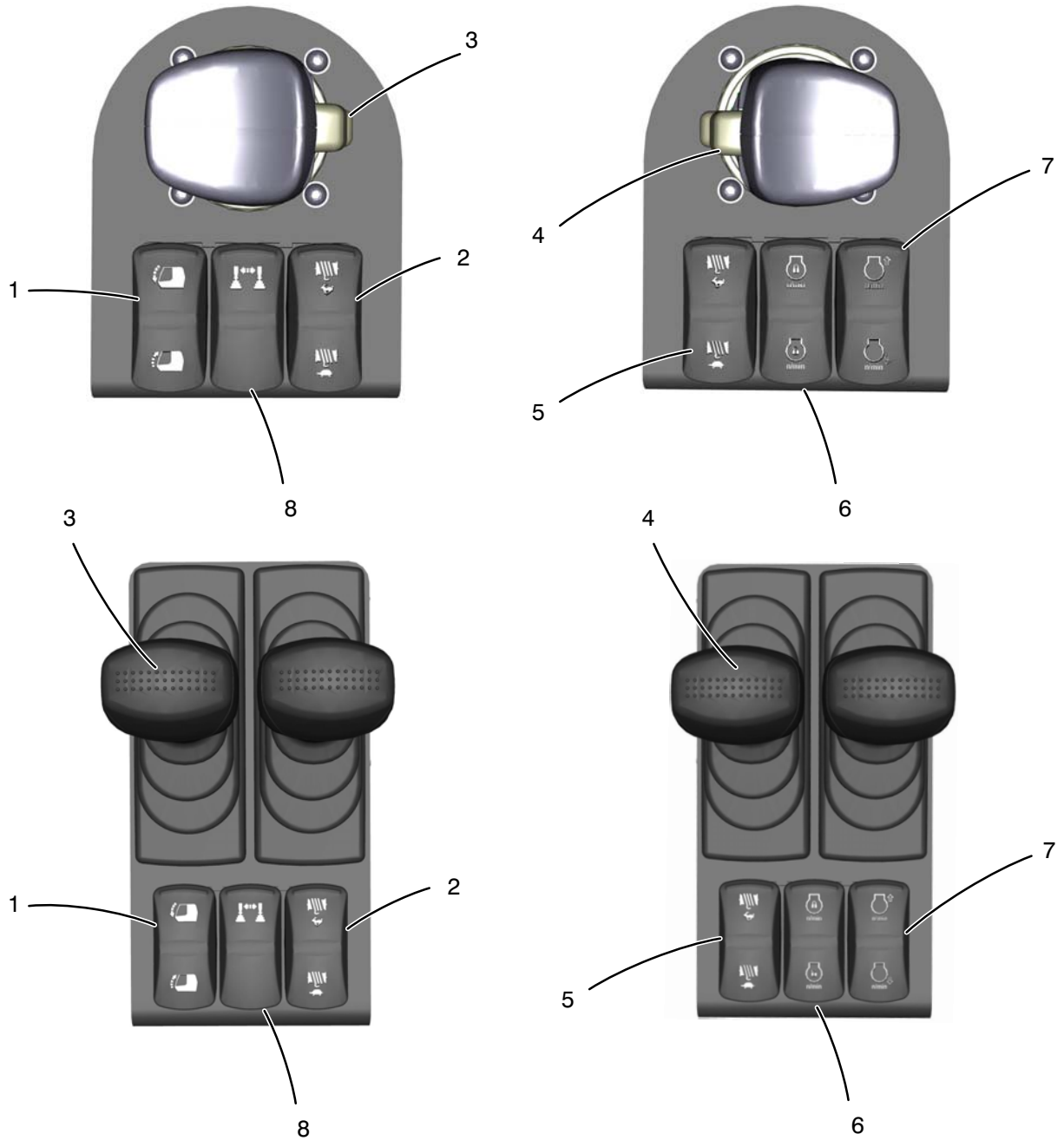
5. A/B Light Button

   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.



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

Figure 1−80
Boom Floodlight Remote Control



1. Upper Cab Tilt Switch
2. Auxiliary Winch Control Switch
3. Swing Park Brake Switch (Top on Dual Axis)
4. Horn Switch (Top on Dual Axis)
5. Main Winch Control Switch
6. Throttle Lock/Unlock Switch
7. Throttle Increase/Decrease Switch
8. Control Lever Mode Switch

Figure 1–81
Seat Console Control Switches

Seat Console Control Switches

Control switches are on the left and right consoles of the operator's seat. Refer to Figure 1−74 and Figure 1−81.

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.

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 left 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. Rear 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

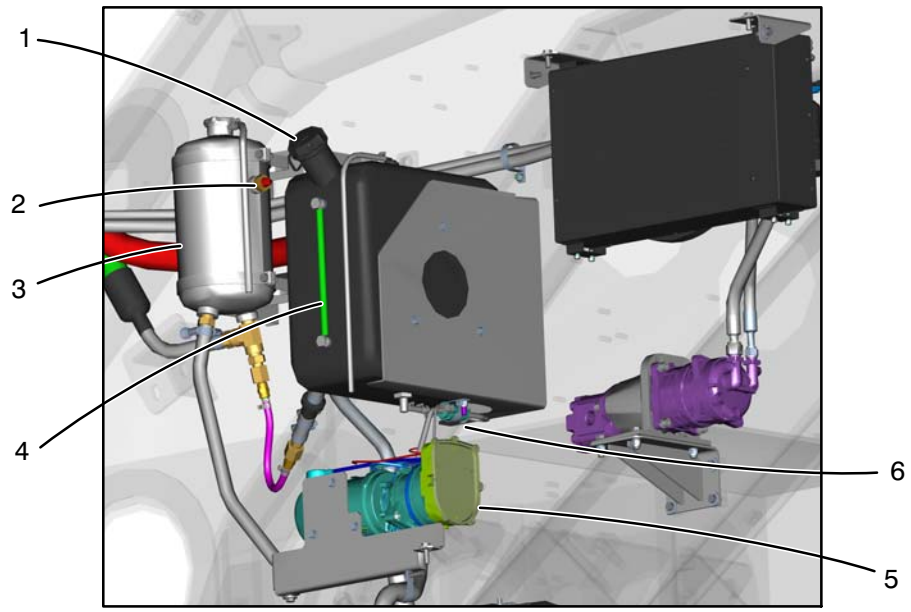
This switch is used to hold the engine at a constant speed. This provides the operator with more flexibility for certain job requirements. Refer to "Throttle Lock System" in this Section of this Operator's Manual.

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.

8. Control Lever Mode Switch

This switch is used to change the mode of the control levers from standard function control to counterweight function control or hydraulic offset fly function control, if equipped. When this switch is pressed, the Pulse Crane Control System Display will change to display the control lever function selection screen. Select the desired mode on the Pulse Crane Control System Display.



1. Diesel Fuel Tank
2. Coolant Reservoir Sight Gauge
3. Coolant Reservoir
4. Diesel Fuel Tank Sight Tube
5. Heater/Pump
6. Diesel Fuel Filter

Figure 1−82
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 Figure 1−79 Right Overhead Control Console in the section for HVAC controls.

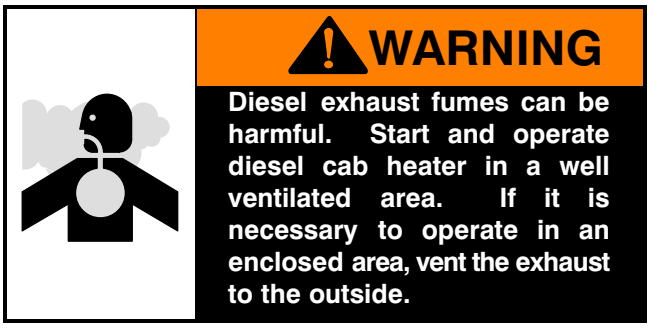
Diesel Fired Warm-water Cab Heater

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 1−82. 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.



To Operate The Diesel Fired Warm-water Cab Heater

For 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. Turn 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 stop the diesel fired heater turn the temperature knob to the coolest setting.

   Note: The diesel fired heater may continue to run for up to 10 minutes to complete its cycle. Do not turn off the battery disconnects while the heater is completing the cycle. This also applies for the 10 minutes when the heater may continue to run after the ignition has been turned off.

For Manual Operation:

1. Before activating the heater, ensure that the diesel fuel tank and the coolant reservoir are full.
2. With the engine running, turn the temperature control knob to the desired setting. Note: the temperature displayed will only be an indication of how high the heat setting is and not an indication of the actual cab temperature.
3. 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.
4. Use 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 select whether fresh air is brought in from the outside to supply HVAC system, or if inside air is recirculated. Note: In order to maintain low levels of carbon dioxide in the cab, recirculation mode will automatically turn off after 10 minutes.
7. To stop the diesel fired heater turn the temperature knob to the coolest setting. Note: The diesel fired heater may continue to run for up to 10 minutes to finish its cycle.
8. During warm weather conditions or if the heater is not going to be used for an extended period of time, rotate the temperature control knob to the coolest setting.

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 start-up procedure.

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 setting of the HVAC control panel

To Operate The Cab Heater

For Automatic Operation:

1. With the engine running, press the AUTO switch on the HVAC control panel.
2. Turn 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 conditioning system may operate to stabilize the system or defog 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.

For Manual Operation:

1. With the engine running, turn the temperature control knob to the desired setting. Note: the temperature displayed will only be an indication of how high the heat setting is and not an indication of the actual cab temperature.
2. Use 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 select whether fresh air is brought in from the outside to supply HVAC system, or if inside air is recirculated. Note: In order to maintain low levels of carbon dioxide in the cab, recirculation mode will automatically turn off after 10 minutes.
5. During warm weather conditions or if the heater is not going to be used for an extended period of time, rotate the temperature control 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.

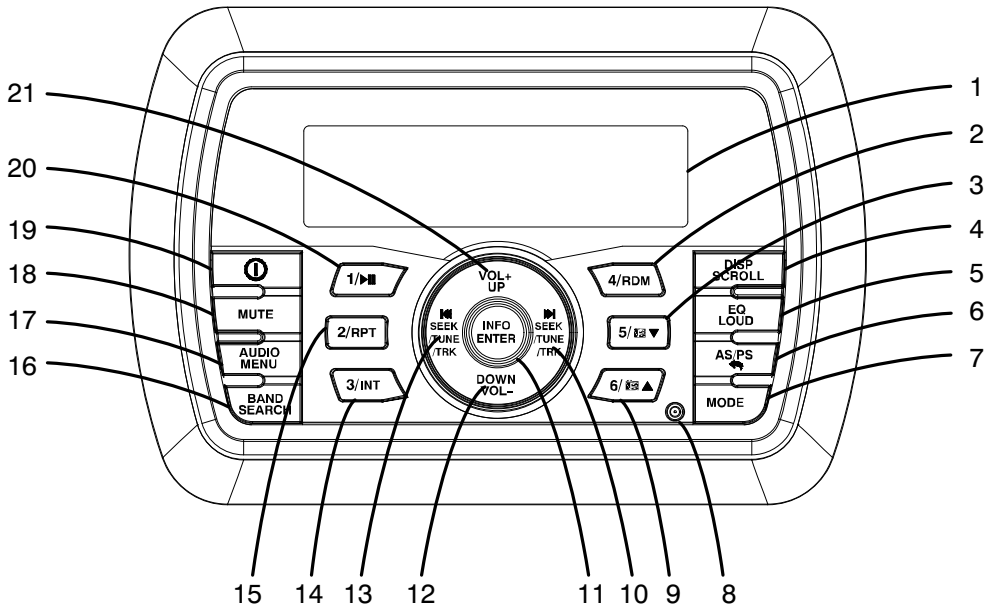
Note: Upper hydraulic functions, including cab air conditioning, will be inoperable if upper throttle control/PTO enable is not selected.

For Automatic Operation:

1. With the engine running, press the AUTO switch on the HVAC control panel.
2. Turn 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 windows.
3. Changing any setting, other than the temperature control knob, or pressing the AUTO button again will return the system to manual mode.

For Manual Operation:

1. With the engine running press the air conditioner selector switch to activate the air conditioning compressor. The switch will illuminate and the symbol will be depicted on the HVAC control panel display.
2. Turn the temperature control knob to the desired setting. Note: the temperature displayed will only be an indication of how high the heat setting is and not an indication of the actual cab temperature.
3. Use the fan speed knob to control the amount of air flow into the cab.
4. Use the vent selector buttons to direct air to the desired locations
5. Use the recirculation switch to select whether fresh air is brought in from the outside to supply HVAC system, or if inside air is recirculated. Note: In order to maintain low levels of carbon dioxide in the cab, recirculation mode will automatically turn off after 10 minutes.
6. To turn the air conditioning compressor off, press the air conditioner selector switch to the off position. Switch will not be illuminated.



1. Liquid Crystal Display (LCD)
2. 4/RDM Button
3. 5/Previous Folder Button
4. DISP/SCROLL Button
5. EQ/Loud Button
6. Automatically Store/Preset Scan/Quick Exit Hot Key Button
7. Mode Button
8. Reset Button
9. 6/Next Folder Button
10. Seek/Tune/Track Forward Button
11. Info/Enter Button
12. Volume Down Button
13. Seek/Tune/ Track Back Button
14. 3/INT Button
15. 2/RPT
16. Band/Search Button
17. Audio/Menu Button
18. Mute Button
19. Power Button
20. 1/>II Button
21. Volume Up Button

Figure 1—83
Radio

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.

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.

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.

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/Preset 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.

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.

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: 8/11.025/12KHz
  - WMA: 22/32/44/48KHz
- 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.

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.

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 paring 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.

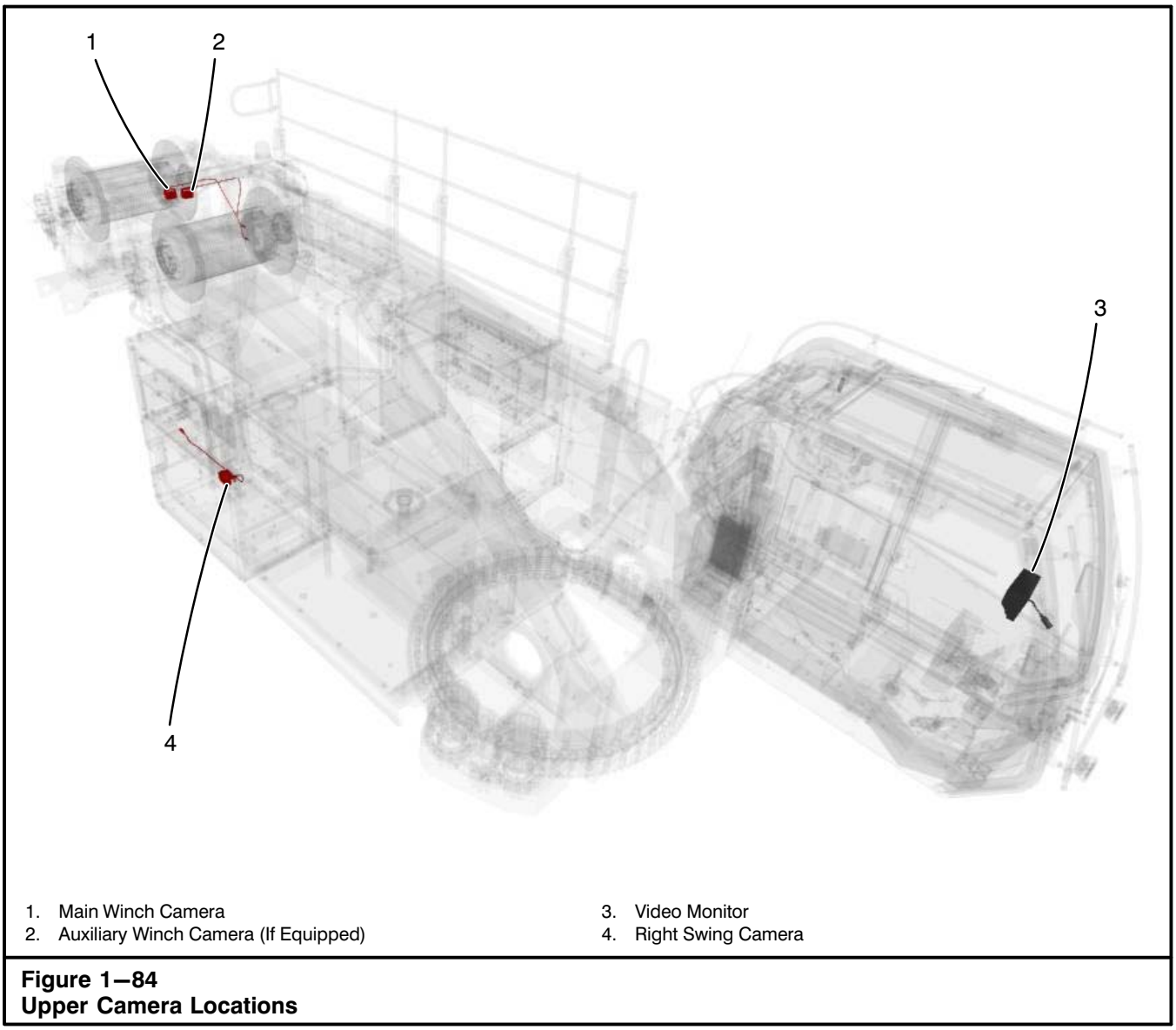
Ignition

- 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.

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.



1. Main Winch Camera
2. Auxiliary Winch Camera (If Equipped)
3. Video Monitor
4. Right Swing Camera

Figure 1–84
Upper Camera Locations

Winch And Right Swing View Cameras

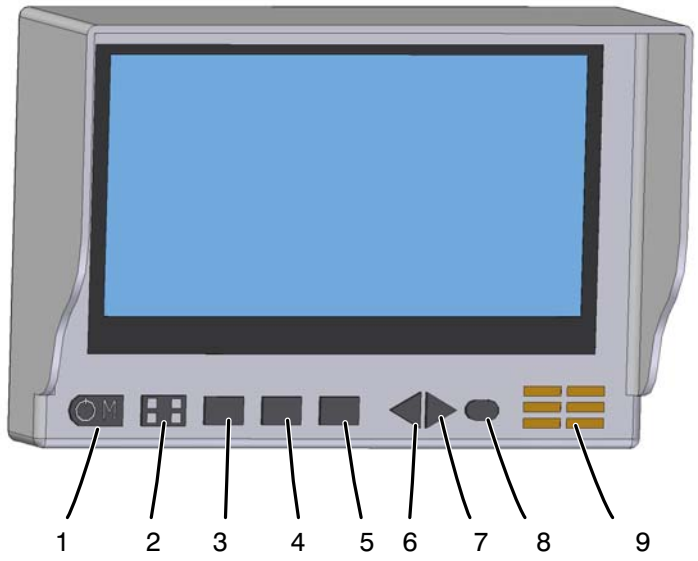
The upper is equipped with up to three cameras. One camera gives a view of the area to the right side the crane to be used before swinging the upper. Another camera gives the operator a view of the main winch, and an optional third camera is included with the auxiliary winch, as equipped, to monitor wire rope spooling on the winch drum(s).

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.



1. Power/Menu Button
2. QUAD(PIP) Select Button
3. Auto Scan/Locking Button
4. Camera Select/Up Button
5. AV/Zoom/Down Button
6. Volume Down/Navigate Left
7. Volume Up/Navigate Right
8. CDS Sensor
9. Speaker

Figure 1–85
Winch & Swing Right View Cameras Monitor

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.**

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.

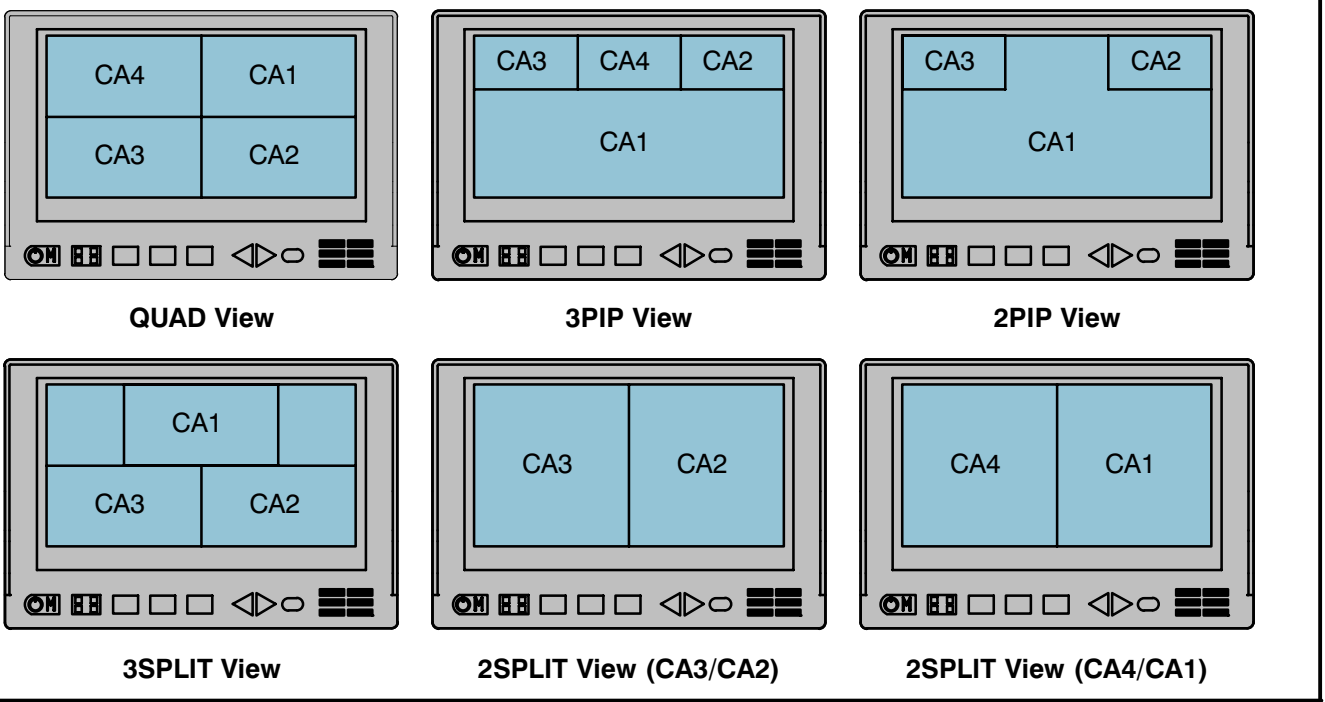


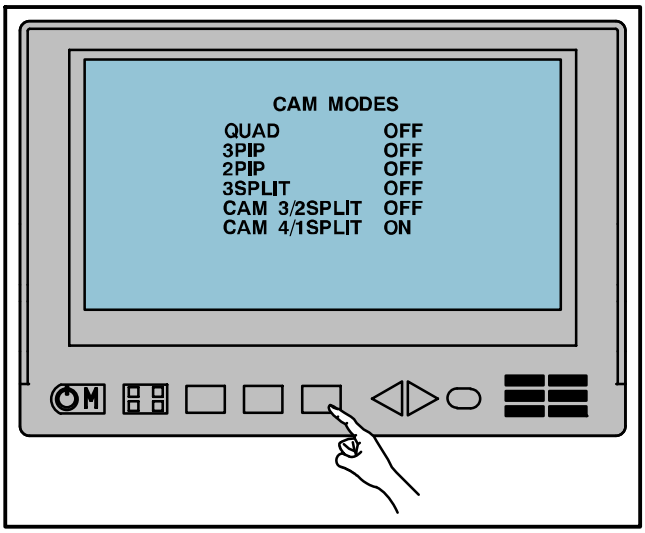
Figure 1–86
Split Screen Function

Split Screen Function

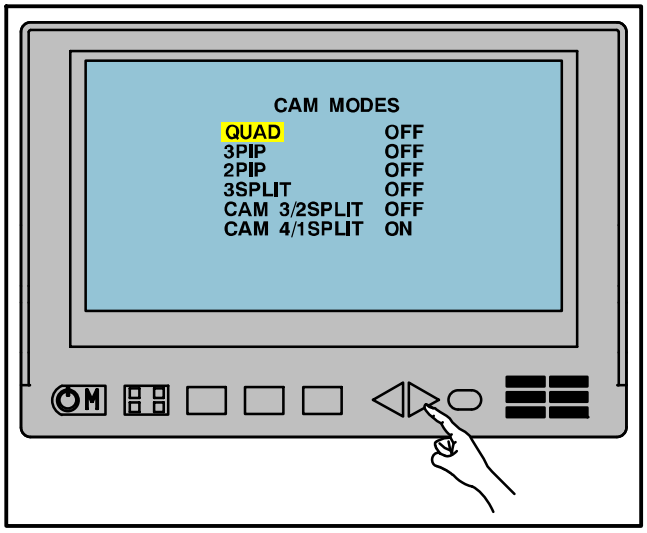
The upper camera has split screen capabilities allowing the Operator to view up to four cameras on one screen. Refer to Figure 1–86. Depending upon which split screen views are turned on, press the QUAD(PIP) Select Button to scroll through the different split screen views. To turn ON/OFF a split screen view:

Refer to Figure 1–85.

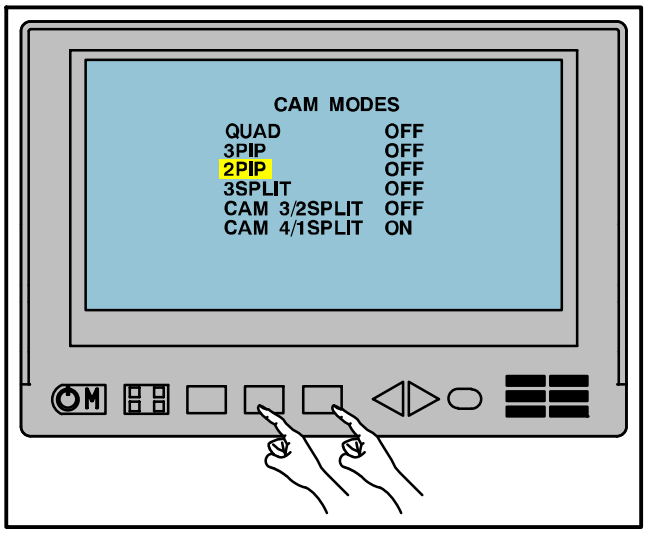
1. Press the Power/Menu Button to enter MENU MODE.



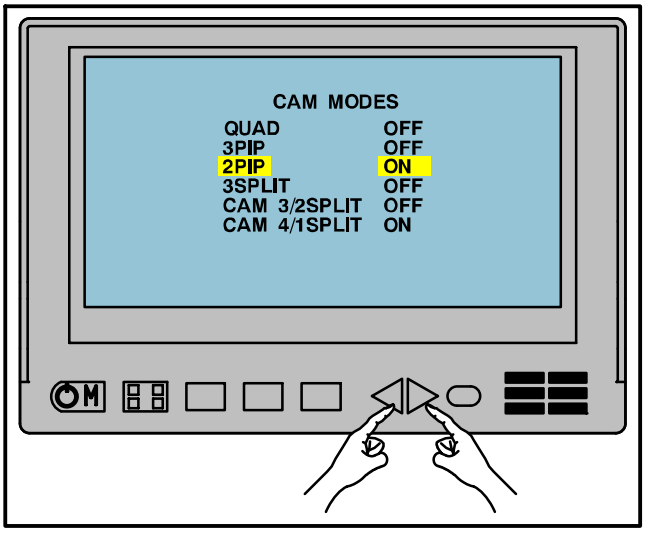
2. Press the AV/Zoom/Down Button until CAM MODES is displayed on the screen.



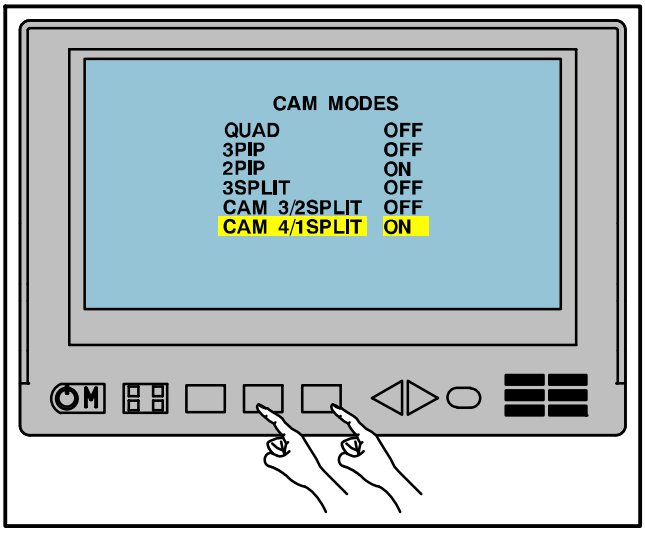
3. Press the Right Arrow Button to enter into CAM MODES.



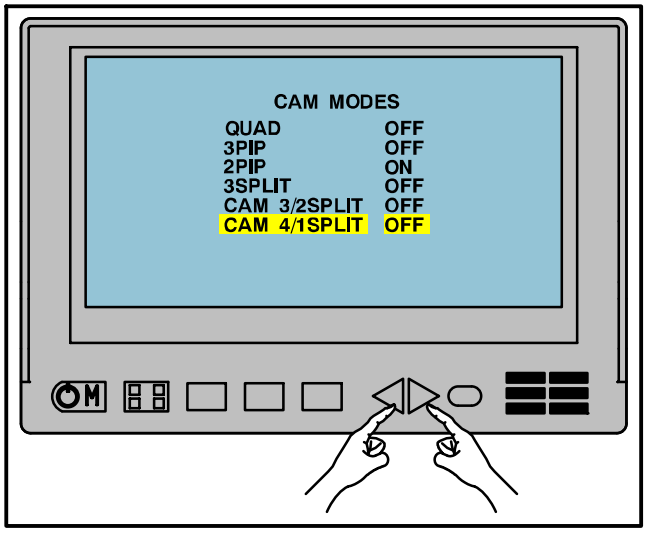
4. Press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN within CAM MODES.



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



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.



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.

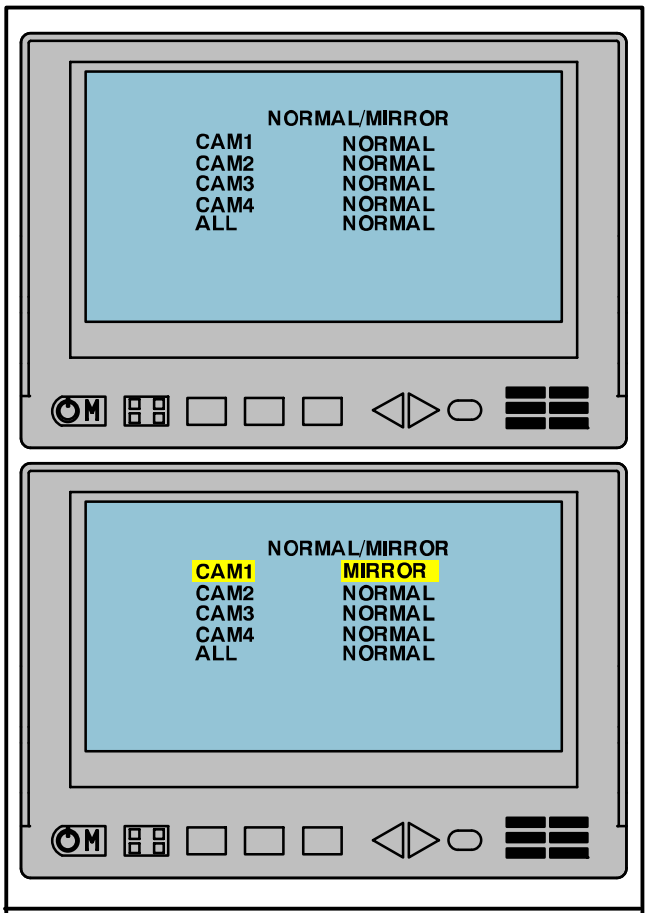


Figure 1–87
Normal/Mirror Function

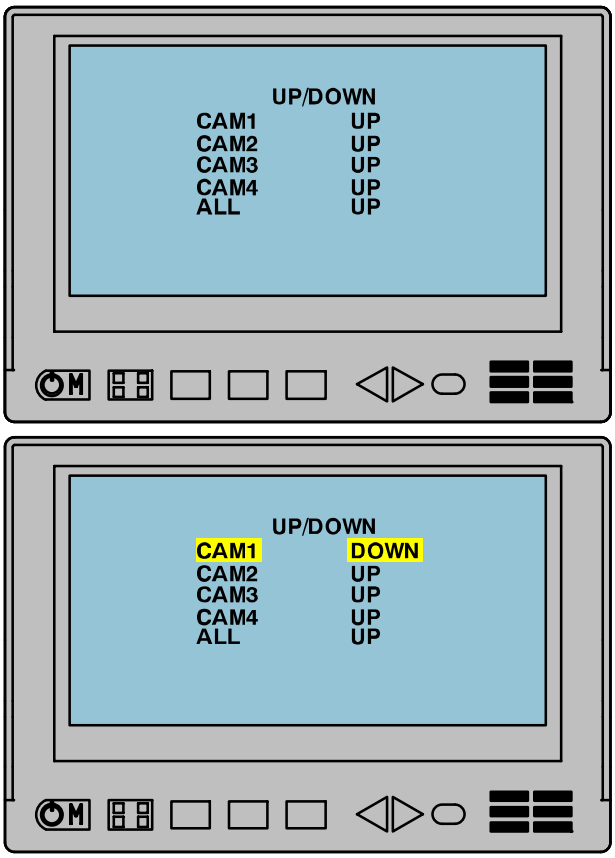


Figure 1—88
UP/DOWN Function

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—87. To change the monitor image from NORMAL to MIRROR:

Refer to Figure 1—85.

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 1−88. To change the monitor image from UP to DOWN:

Refer to Figure 1−85.

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.

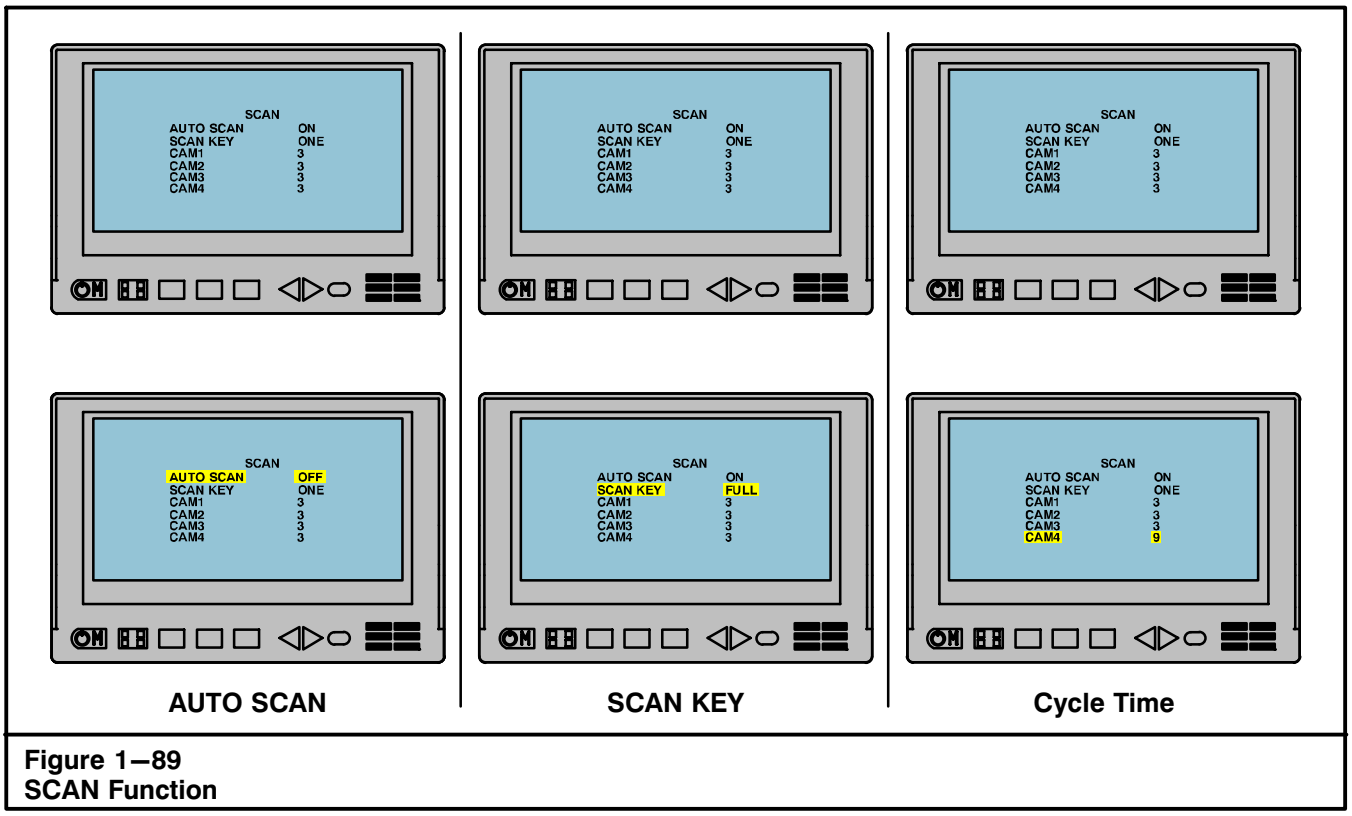


Figure 1—89
SCAN Function

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—89. To start an AUTO Scan:

Refer to Figure 1—85.
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	
LANGUAGE	ENGLISH
SYSTEM	NTSC/PAL
DIRECTION	0°
DIMMER	1
AUTO POWER	ON
LOGO SET	>
AV OUTPUT	LIVE
SHUTTER	ON
RESET	>

PICTURE	
CONTRAST	15
BRIGHTNESS	15
COLOR	15
TINT	15

NOR/MIR	
CAM1	NORMAL
CAM2	NORMAL
CAM3	NORMAL
CAM4	NORMAL
ALL	NORMAL

UP/DOWN	
CAM1	UP
CAM2	UP
CAM3	UP
CAM4	UP
ALL	UP

TRIGGER	
REAR SCALE	OFF
BLINK MARK	OFF
TRIG 1	CAM1
TRIG 2	CAM3/CAM2
TRIG 3	2PIP
TRIG 4	CAM4
HAZARD	QUAD

CAMERA NAME	
CAM1	REAR
CAM2*	WINCH
CAM3*	NO CAMERA
CAM4*	SWING

CAM MODES	
QUAD*	OFF
3PIP*	OFF
2PIP*	OFF
3SPLIT*	OFF
CAM3/2 SPLIT*	OFF
CAM4/1 SPLIT	ON

SCAN	
AUTO SCAN	OFF
SCAN KEY	ONE
CAM1	3
CAM2	3
CAM3	3
CAM4	3

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

Figure 1—90
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—90.

To reset the monitor settings:

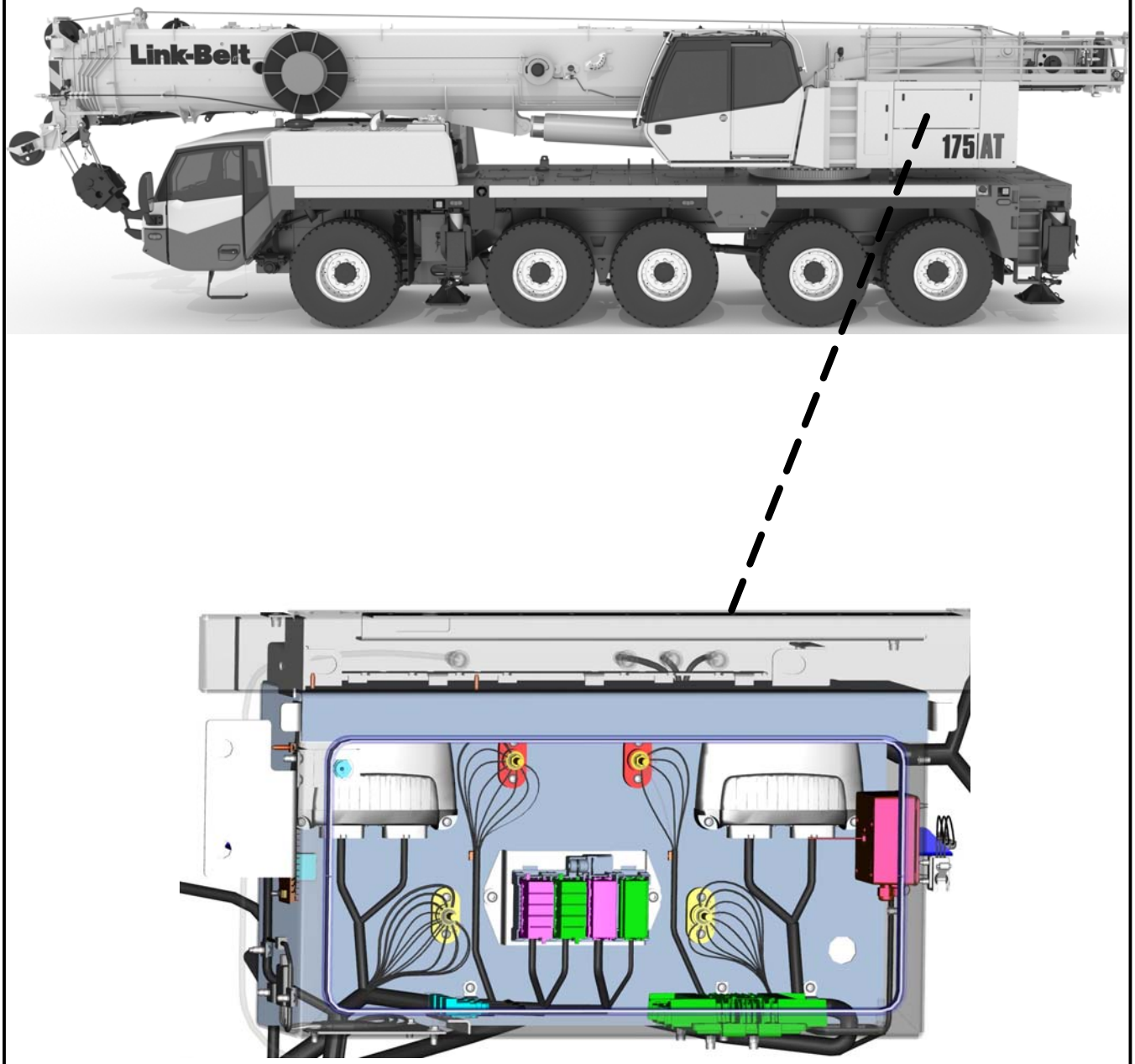
1. Press the Power/Menu Button to enter MENU MODE.
2. Press the AV/Zoom/Down Button until FUNCTION is displayed on the screen.
3. Press the Right Arrow Button to enter into FUNCTION.
4. Press the Camera Select/Up or AV/Zoom/Down Button to scroll UP and DOWN to RESET.
5. Press the Left Arrow or Right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

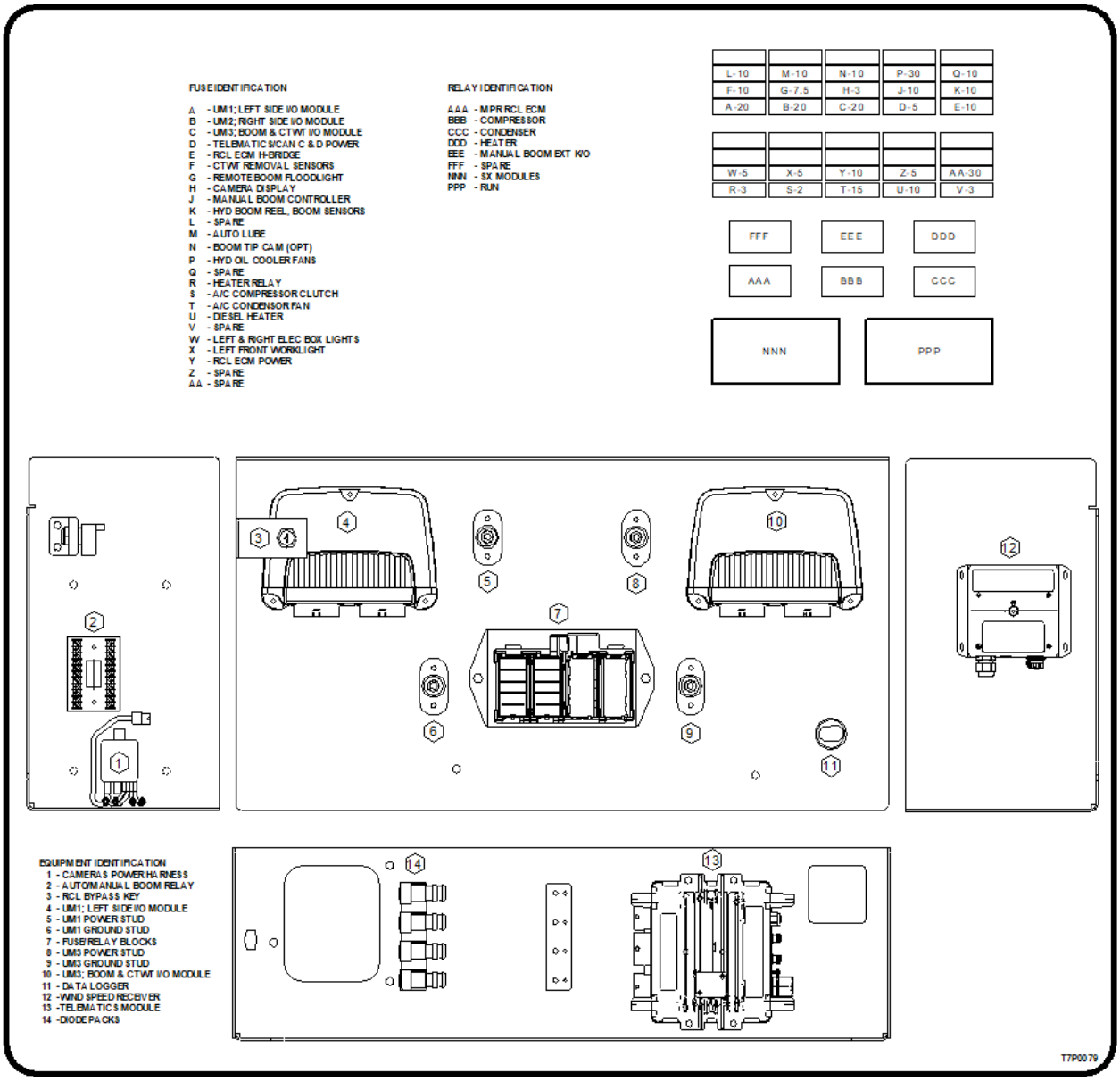
Clean the monitor with a slightly damp cloth. Use a mild household detergent. Do not use strong solvents such as thinner or benzine as they can damage the finish of the monitor.

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



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

Figure 1–91
Upper Power Panel



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

Figure 1–92
Fuse Blocks, Resistors, And Relays Identification

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 1–91.

Fuse Blocks, Resistors, And Relays

Fuse blocks, resistors, and relays are mounted in the upper power panel. Refer to Figure 1–92 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 V-CALC (Variable Confined Area Lifting Capacities). Refer to the Crane Rating Manual. The extend and retract functions of the outriggers can be controlled from the outrigger control box in the upper operator's cab (Figure 1−74 and Figure 1−93), one of two ground control stations near the side access ladders (Figure 1−70 and Figure 1−94), or the Wireless Rigging Remote, for crane setup, stored in the rear carrier electrical center (Figure 1−70 and Figure 1−95). The extend position of each beam is controlled by the placement of the outrigger position pin on each outrigger beam (Figure 1−97).

All of the outrigger pontoons must set on a smooth, solid surface flush with the ground or mats with no hills or valleys under them or they may be damaged or destroyed. If there is any doubt as to the ground conditions, use mats under the pontoons. 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 provided on the upper frame visible through the right window of the upper operator's cab and at each ground control station to assist in determining when the crane is level. All bubble levels must be checked weekly with an accurate level placed on the turntable bearing. Check that the bubble levels are accurate side to side and front to back. Refer to "Bubble Level Adjustment" in Section 3 of this Operator's Manual.

Included in the ground control outrigger stations is a carrier engine throttle switch which can be used to increase the carrier engine speed during outrigger operation and an axle retract switch that can be used to raise the axles while the crane is on outriggers.

Outrigger Controls In Upper Operator's Cab

The carrier engine must be running for the outrigger controls in the upper operator's cab to be used for outrigger operation. If required the carrier engine can be started from the upper cab using the carrier engine ignition switch. Refer to "To Start The Carrier Engine From The Upper Operator's Cab" in this Section of this Operator's Manual.

⚠ 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.

Wireless Rigging Remote

The Wireless Rigging Remote allows the operator to perform certain rigging functions for crane setup while on the ground. The Wireless Rigging Remote is stored in the Rear Carrier Electrical Center, located on the left side of the carrier. Refer to Figure 1−70 and Figure 1−95. If being used for winch functions, refer to "Wire Rope Winch System" in this section of this Operator's Manual. If being used for boom hoist functions, refer to "Boom Hoist System" in this section of this Operator's Manual. If being used for outrigger function, ensure the crane has been prepared according to "Outrigger Operation" in this section of this Operator's Manual before utilizing the Wireless Rigging Remote.

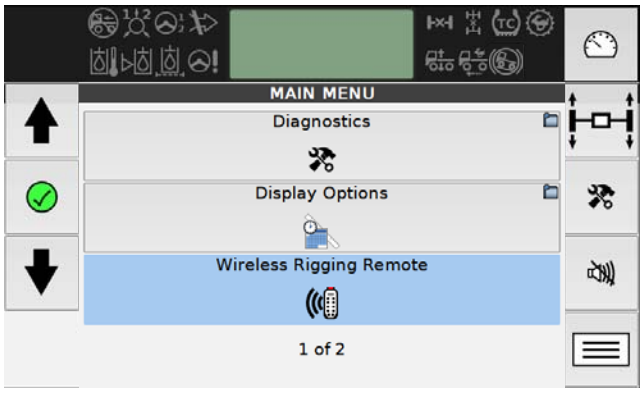
Crane Level Screen

The Crane Level Screen will appear shortly after the Wireless Rigging Remote has been powered on and a link has been established with the Wireless Rigging Remote.

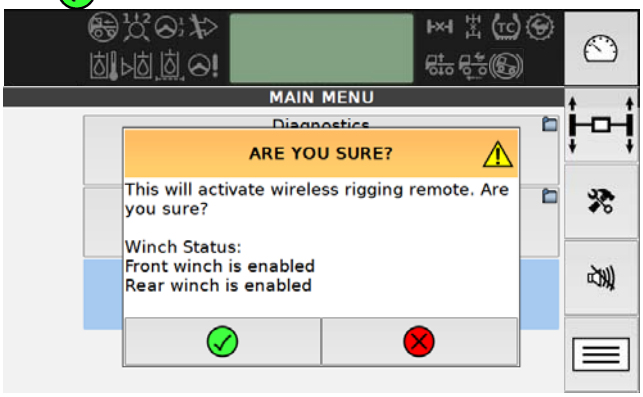
When the crane is level, the bubble will be displayed within the innermost circle of the screen. If the bubble is touching the middle circle of the screen, the crane tilt angle is approximately 1°, and if the bubble is touching the outermost circle, the crane tilt angle is approximately 1.5°. If the crane is not level, arrows will appear on the right (left to right of the crane) and left (front to back of the crane) of the screen. The arrows will point to the most elevated portion of the crane, and the tilt angle will display below each arrow.

To Turn The Wireless Rigging System On/Off

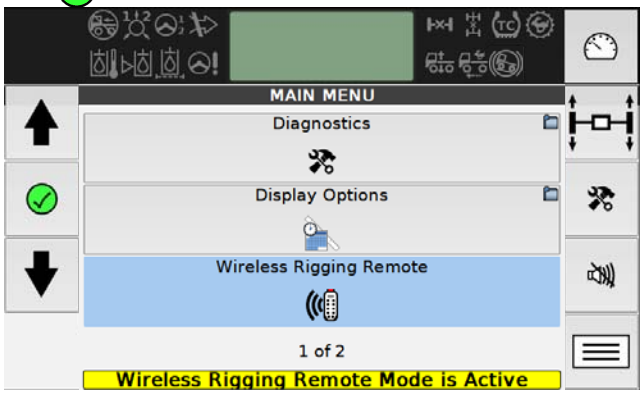
1. Start the carrier engine and press the Upper Throttle Control/PTO Enable Switch to enable PTO. Refer to Figure 1–37.



2. Press the button corresponding to the main menu icon on the Main Working Screen of the Carrier Cab Control Display. Highlight "Wireless Rigging Remote" using the buttons corresponding to the arrow icons on the Main Menu and press the button corresponding to the selection icon .



3. Ensure conditions from step 1 are met and press the button corresponding to the selection icon .



Note: Ensure the Engine Stop Button is released. When the Wireless Rigging Remote Mode is activated, a banner will be displayed.

4. Press the Wireless Rigging Remote Power On/Off Button. The Splash Screen will appear on the Wireless Rigging Remote screen.

Note: If the "No Radio Link" screen appears, the link between the wireless remote and the wireless receiver has been lost. Contact your Link-Belt distributor to correct the fault.

Note: If the "No CAN Communication" screen appears, the communication between the wireless receiver and the CAN BUS has been lost. Use the CAN diagnostic connector located on the Upper Cab Diagnostic Panel to determine the fault.

5. To turn off the Wireless Rigging Remote, press the Wireless Rigging Remote Power On/Off Button.

Carrier Engine Controls

Carrier engine controls are in the outrigger controls in the upper operator's cab, at each ground controlled outrigger station, and the Wireless Rigging Remote and are defined as follows:

Upper Operator's Cab Station

Carrier Engine Stop

Carrier Engine Throttle (High Idle)

Ground Control Stations

Carrier Engine Stop

Carrier Engine Throttle (High Idle)

Carrier Engine Start

Wireless Rigging Remote

Carrier Engine Stop
(Engine Stop Button)

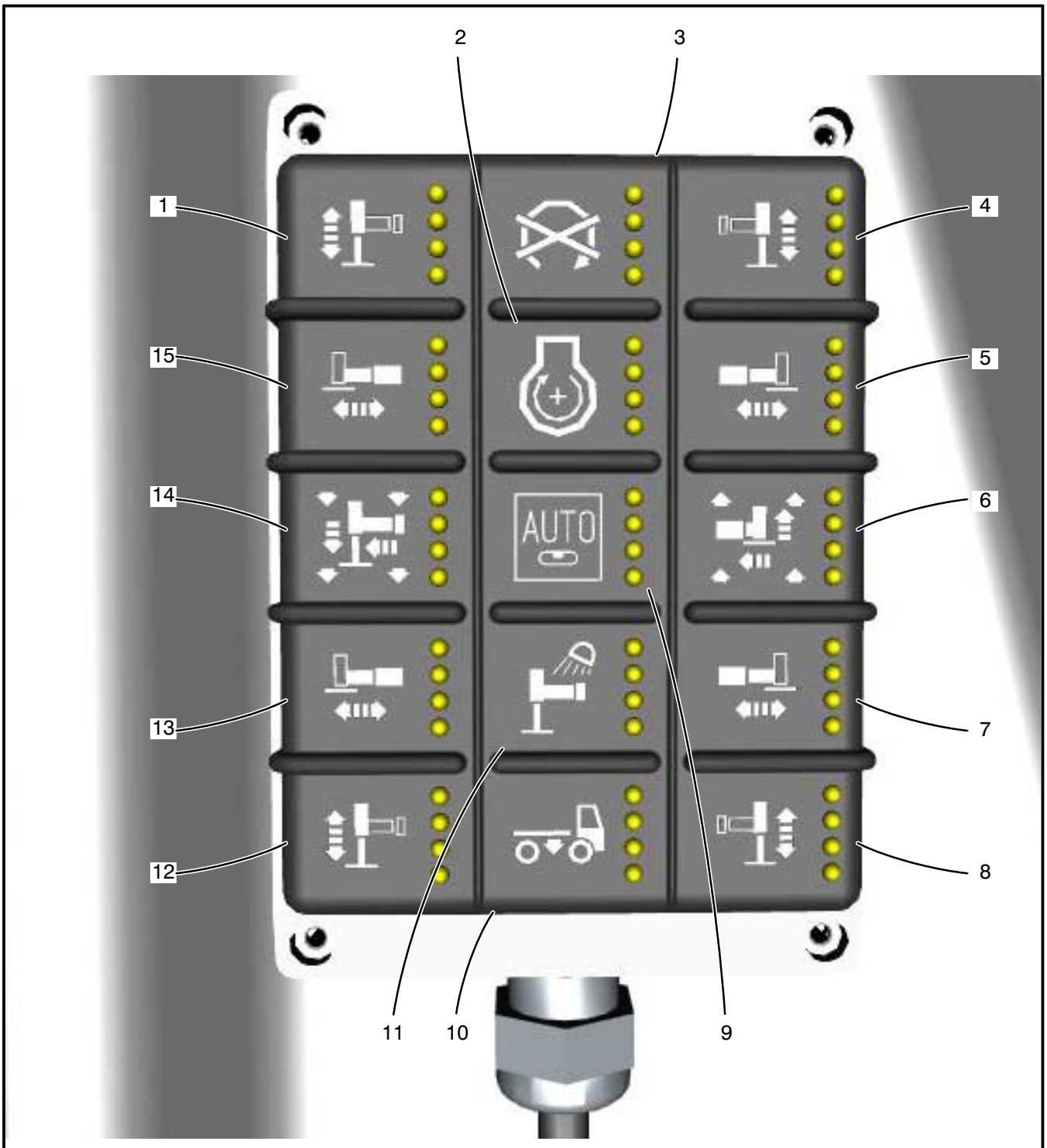
Carrier Engine Throttle (High Idle)
(Press Up and Down Buttons simultaneously)

Axle Lift System

The crane's suspension utilizes cylinders to allow the axles to be raised and lowered as well as to absorb shock. The outrigger controls in the upper cab and at both ground control outrigger stations are each equipped with an axle retract switch that can be used to raise all axles while the crane is on outriggers. Refer to Figure 1−93 and Figure 1−94. The Wireless Rigging Remote is equipped with an axle retract button to be used for crane setup. Refer to Figure 1−95. These switches, or button, can be used to adjust the crane's suspension depending on operating conditions. Press and hold this switch, or button, to raise the axles to obtain additional ground clearance for the tires when the crane is on outriggers.

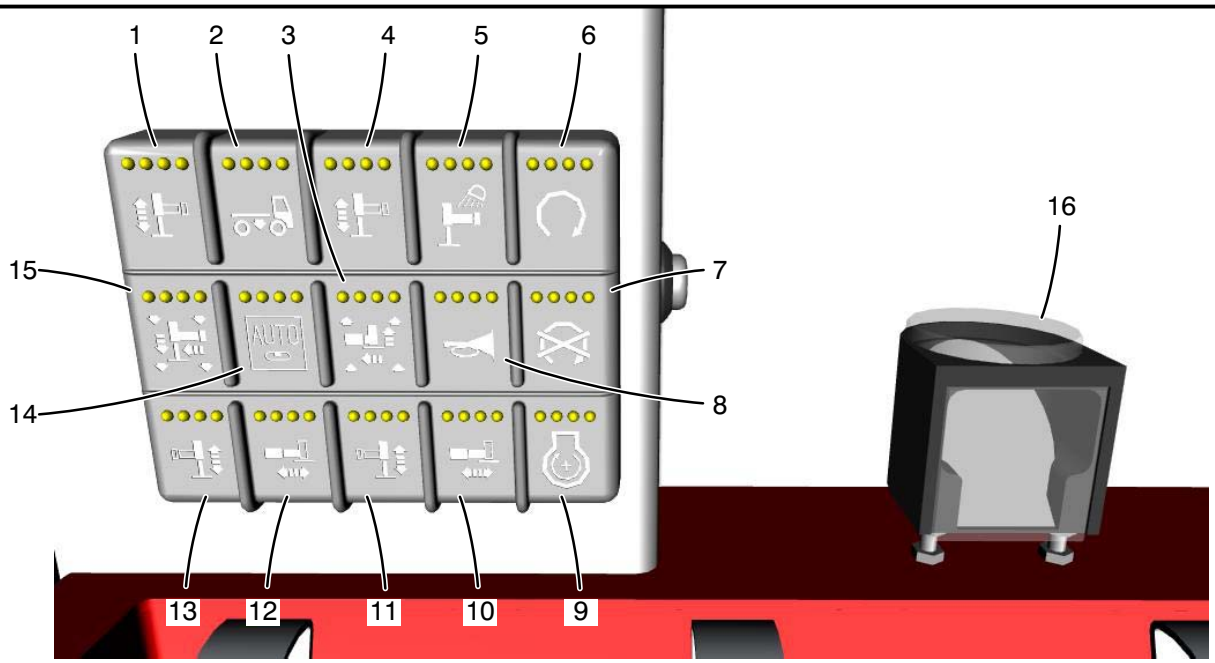
Outrigger Working Lights

Outrigger working lights are mounted at the end of each outrigger box. The outrigger controls in the upper cab and at both ground control outrigger stations are each equipped with an outrigger lights switch . Refer to Figure 1−93 and Figure 1−94.

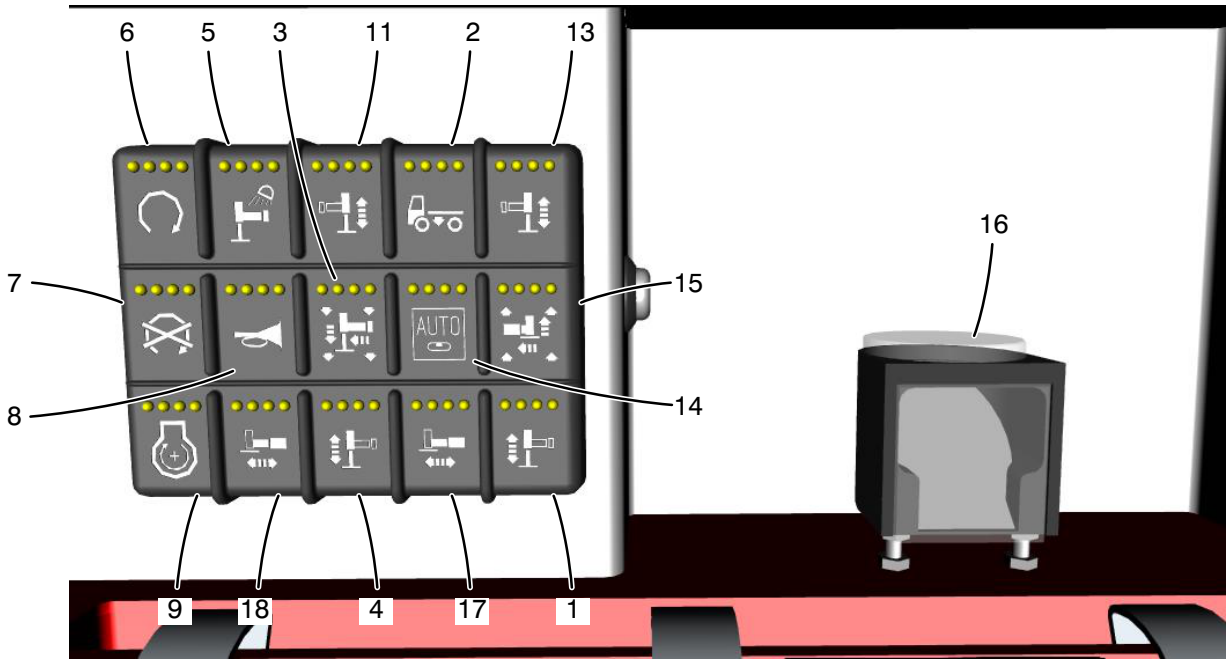


1. Front Left Jack Switch
2. Carrier Engine Throttle (High Idle) Switch
3. Carrier Engine Stop Switch
4. Front Right Jack Switch
5. Front Right Beam Switch
6. Beam/Jack Retract Switch
7. Rear Right Beam Switch
8. Rear Right Jack Switch
9. Auto Level Switch
10. Axle Retract Switch
11. Outrigger Lights Switch
12. Rear Left Jack Switch
13. Rear Left Beam Switch
14. Beam/Jack Extend Switch
15. Front Left Beam Switch

Figure 1–93
Outrigger Controls In Upper Operator's Cab



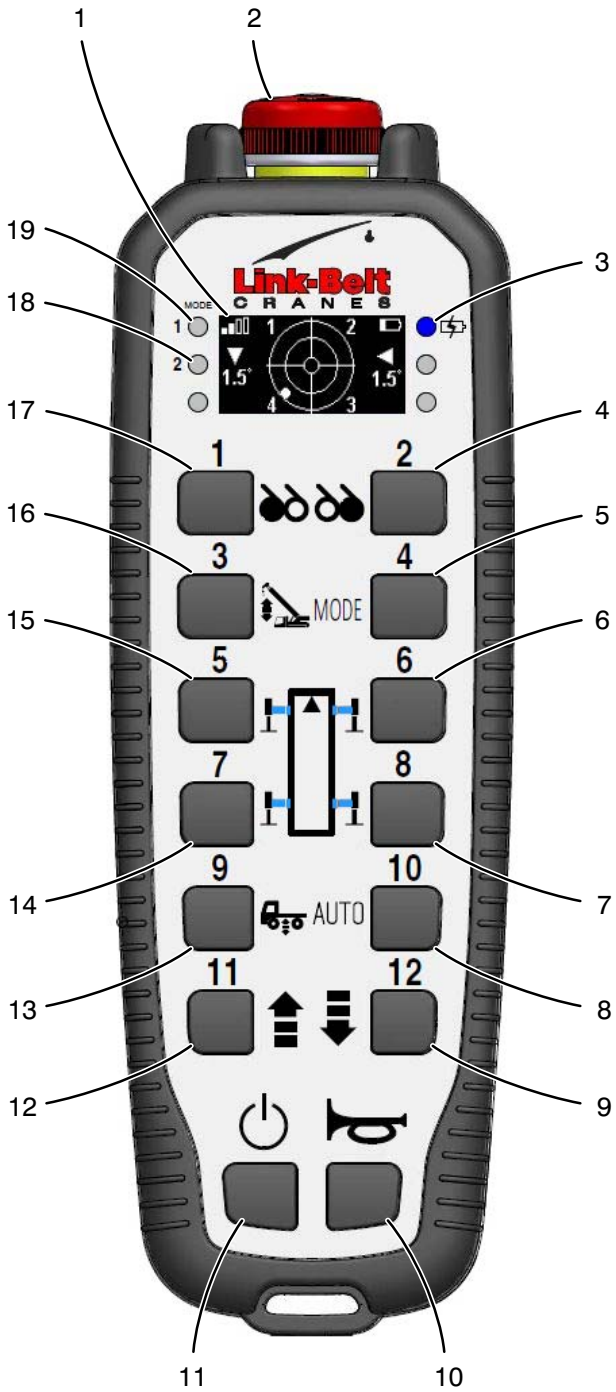
Right Side



Left Side

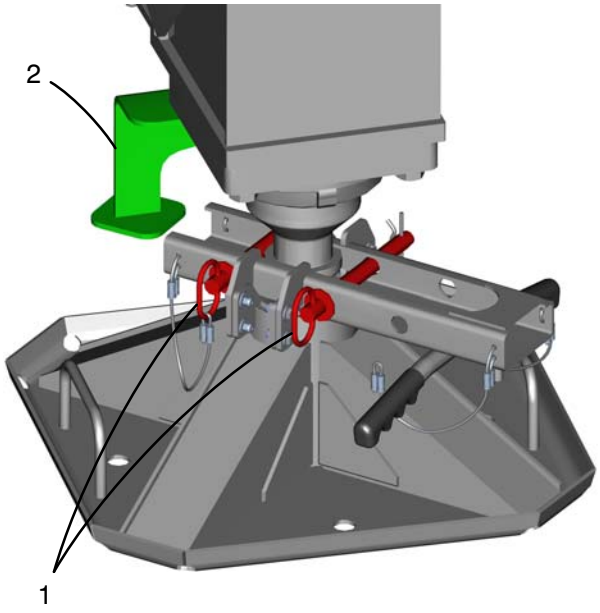
1. Rear Left Jack Switch
2. Axle Retract Switch
3. Beam/Jack Retract Switch
4. Front Left Jack Switch
5. Outrigger Lights Switch
6. Carrier Engine Start Switch
7. Carrier Engine Stop Switch
8. Horn Switch
9. Carrier Engine Throttle (High Idle) Switch
10. Front Right Beam Switch
11. Front Right Jack Switch
12. Rear Right Beam Switch
13. Rear Right Jack Switch
14. Auto Level Switch
15. Beam/Jack Extend Switch
16. Bubble Level
17. Rear Left Beam Switch
18. Front Left Beam Switch

Figure 1–94
Ground Controlled Outrigger Stations

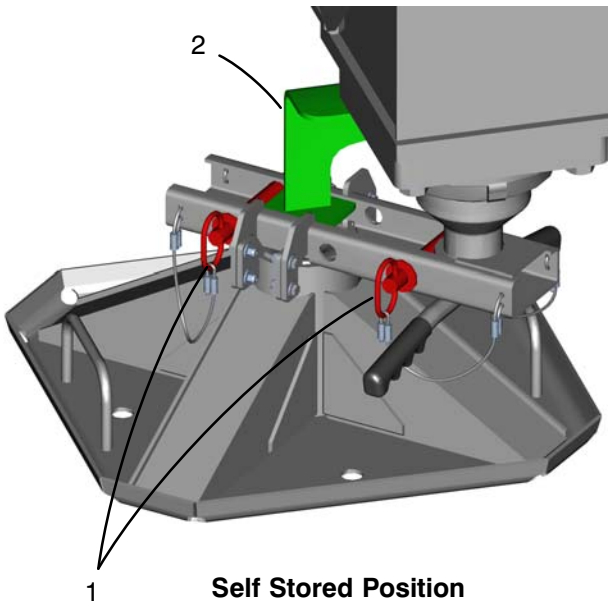


1. Crane Level Screen
2. Engine Stop Button (Carrier)
3. Wireless Rigging Remote Charging Light
4. Rear Winch Button
5. Mode Selector Button
6. Front Right Beam/Jack Button
7. Rear Right Beam/Jack Button
8. Auto Level Button
9. Down Button
10. Horn Button
11. Power On/Off Button
12. Up Button
13. Axle Retract Button
14. Rear Left Beam/Jack Button
15. Front Left Beam/Jack Button
16. Boom Hoist Button
17. Front Winch Button
18. Mode 2 Light
19. Mode 1 Light

Figure 1–95
Wireless Rigging Remote



Working Position



Self Stored Position

1. Hitch Pins With Keeper Pin
2. Storage Plate

Figure 1–96
Pontoon Storage

To Extend Outrigger Beams

1. Park the crane in the desired location. Engage the park brake and shift the transmission to neutral.
2. Set the Travel Mode Switch in the carrier cab to the "Job Site" mode.

   Note: If the crane is raised on outriggers while in Highway mode, the crane will automatically switch to Job Site mode.

3. Move all pontoons to the working position and install all hitch pins in their proper position. Refer to Figure 1–96.

WARNING

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

4. Determine the outrigger position desired. Install the extend position pins, as required. Refer to Figure 1–97.

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.

5. Start the carrier engine.

WARNING

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

The outrigger beams should not be retracted or extended with its corresponding jack extended. Jacks must be completely retracted before any beam operation.

6. Extend the outrigger beam:
   a. If using an outrigger control box, press and hold the desired outrigger beam switch and the beam/jack extend switch . Refer to Figure 1−93 and Figure 1−94.

      Note: The indicator lights on both switches will flash as the beam extends.

      Note: A bubble level is provided on the upper frame visible through the right window of the upper operator's cab and at each ground control station to assist in determining when the crane is level.

   b. If using the Wireless Rigging Remote, press the Mode Selector Button, as required, to display the Outrigger Beam Control Screen. Press and hold the desired outrigger beam/jack button and the Up Button . Refer to Figure 1−95.

      Note: Pressing the Mode Selector Button on the Wireless Rigging Remote toggles between the Outrigger Beam Control Screen and the Crane Level Screen. The Crane Level Screen on the Wireless Rigging Remote can assist in determining when the crane is level.

7. When the beam reaches the selected position, release both switches on any outrigger control box, or release one or both buttons on the Wireless Rigging Remote.
8. Repeat Steps 6 and 7 for each outrigger beam, as required.

   Note: As conditions warrant, a proficient crane operator may operate both beams on one side at the same time.

9. If the intermediate beam position is to be used, visually check that all beams are properly positioned in the intermediate position by observing the decals on the side of the beams and the extend position pins are in the correct position. Refer to Figure 1−97. All beams must be extended until the hydraulic system goes over relief.
10. Set the Rated Capacity Limiter to the proper setting to match the position of the outrigger beams.

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.

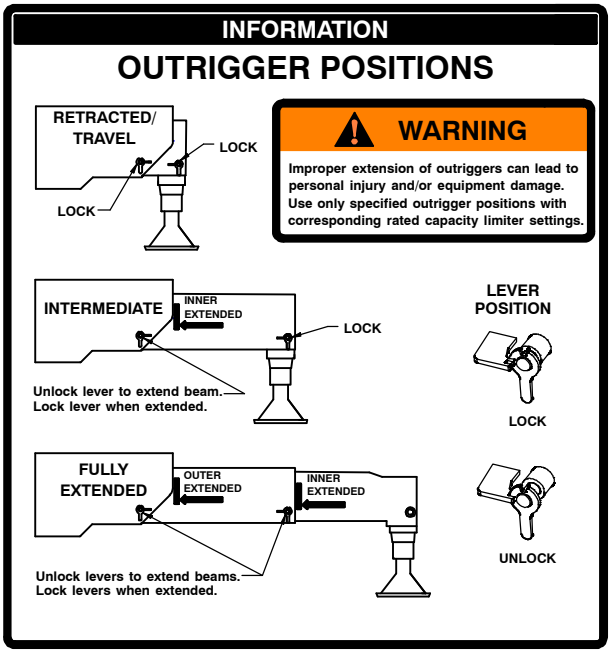


Figure 1–97
Outrigger Extend Positions

To Extend Outrigger Jacks – Raise The Crane

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(s) to prevent tension on the wire rope(s).

1. Extend the outrigger jack:
   a. If using an outrigger control box, press and hold the desired outrigger jack switch and the beam/jack extend switch . Refer to Figure 1–93 and Figure 1–94.

      Note: The indicator lights on both switches will flash as the jack extends.

      Note: A bubble level is provided on the upper frame visible through the right window of the upper operator's cab and at each ground control station to assist in determining when the crane is level.

   b. If using the Wireless Rigging Remote, press the Mode Selector Button, as required, to display the Crane Level Screen. Press and hold the desired outrigger beam/jack button and the Up Button . Refer to Figure 1–95.

      Note: The Crane Level Screen on the Wireless Rigging Remote can assist in determining when the crane is level.

WARNING

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

2. Extend jack until the pontoon just contacts the ground and release both switches on any outrigger control box, or release one or both buttons on the Wireless Rigging Remote.

3. Repeat Steps 1 and 2 for each outrigger jack, as required.

   Note: As conditions warrant, a proficient crane operator may operate both jacks on one side at the same time.

4. Extend the jack cylinders until all tires are clear of the ground.
5. The crane is equipped with an axle retract system that can be used to gain additional ground clearance for the tires when the crane is on outriggers:
   a. If using an outrigger control box, press the axle retract switch and hold until the axles are fully retracted. Refer to Figure 1−93 and Figure 1−94.
   b. If using the Wireless Rigging Remote, press the Mode Selector Button, as required, to display the Crane Level Screen. Press and hold the Axle Retract Button until the axles are fully retracted. Refer to Figure 1−95.
6. Raise or lower jacks, as required, to level the crane.
7. Check that 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.

8. Ensure that the Rated Capacity Limiter is set to the proper setting to match the position of the outrigger beams.

All Jacks Extend Feature

All 4 jacks can be extended simultaneously using the All Jacks Extend Feature. Release the switch after all 4 main jacks are fully extended.

WARNING

When using the all jacks extend feature, ensure the jacks are raising the crane within a range so that the crane tilt angle does not exceed 1°. If the tilt angle exceeds 1°, the crane may tip over.

- If using an outrigger control box, double click and hold the beam/jack extend switch until all the jacks have reached the desired position. Refer to Figure 1−93 and Figure 1−94.

  Note: The indicator lights on the beam/jack extend switch will flash and the indicator lights on all outrigger jack switches will illuminate as the jacks extend.

- If using the Wireless Rigging Remote, press the Mode Selector Button, as required, to display the Crane Level Screen. Double click and hold the Up Button until all the jacks have reached the desired position. Refer to Figure 1−95.

Note: The all jacks extend feature works best if the crane is parked on a firm level surface to within 1.0 degree. If this is not possible, use the axle inclination system to level the carrier deck within 1.0 degree before setting up cribbing and activating the all jacks extend feature. Once the all jacks extend function is complete, use the axle lift system to gain the necessary ground clearance.

Note: If during the all jacks extend function, one or a pair of jacks are extending slower than the others, the operator can can continue to press the beam/jack extend switch (on the outrigger control box) or down button (on the wireless rigging remote) while also pressing a single or pair of beam/jack extend switch(es)/button(s) (this overrides the all jacks extend function) to force the slower jack(s) to catch up. Once the beam/jack extend switch(es)/button(s) is/are released, the all jacks extend function will continue.

Note: When setting up crane for craning operation if jack cylinders are fully extended, retract jack cylinder by at least 0.39 in (*10mm*).

Outrigger Auto Level

The outrigger system is equipped with an automatic leveling feature "Auto Level". After all the outrigger beams are properly extended and all main pontoons are set on a smooth, solid surface flush with the ground or mats with no hills or valleys under them and all tires clear of the ground, the auto level can be used to level the crane.

Note: High engine idle will disengage during auto level routine.

WARNING

When using the auto level feature, ensure the jacks are raising the crane within a range so that the crane tilt angle does not exceed 1 degree. If the tilt angle exceeds 1 degree, the crane may tip over.

- If using an outrigger control box, press and hold the Auto Level switch AUTO until the crane is leveled. Refer to Figure 1−93 and Figure 1−94. Observe the following during Auto Level operation:
  - All indicator lights will be illuminated if the crane is more than 1° out of level.
  - The two left side (ground control switch) indicator lights or two top (upper cab control switch) indicator lights will be illuminated if the crane is 0.5° − 1° out of level.
  - Only the far left (ground control switch) indicator light or topmost (upper cab control switch) indicator light will be illuminated if the crane is 0.5° out of level.
  - No indicator lights will be illuminated if the crane is within 0.25° out of level.
- If using the Wireless Rigging Remote, press the Mode Selector Button, as required, to display the Crane Level Screen. Press and hold the Auto Level Button. AUTO Until the crane is leveled. Refer to Figure 1−95 and "Crane Level Screen" in this section of this Operator's Manual.

To Retract Outrigger Jacks — Lower The Crane

It is recommended that lowering the crane be done from the ground control stations.

1. Fully retract the boom, swing the upper over the front of the carrier, and engage the travel swing lock.
2. Boom down and set boom on boom rest.
3. Engage the park brake. Ensure Travel Mode is set using the switch in the carrier cab.

WARNING

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

4. Retract the outrigger jack:
   a. If using an outrigger control box, press and hold the desired outrigger jack switch and the beam/jack retract switch . Refer to Figure 1—93 and Figure 1—94.

      Note: The indicator lights on both switches will flash as the jack retracts.

   b. If using the Wireless Rigging Remote, press the Mode Selector Button, as required, to display the Crane Level Screen. Press and hold the desired outrigger beam/jack button and the Down Button . Refer to Figure 1—95.

      Note: The Crane Level Screen on the Wireless Rigging Remote can assist in determining when the crane is level.

5. Retract jack until the pontoon just clears the ground and release both switches on any outrigger control box, or release one or both buttons on the Wireless Rigging Remote.
6. Repeat Steps 4 and 5 for each outrigger jack, as required.

   Note: As conditions warrant, a proficient crane operator may operate both jacks on one side at the same time.

7. Fully retract all jacks.

All Jacks Retract Feature

All 4 jacks can be retracted simultaneously using the All Jacks Retract Feature. Release the switch after all 4 main jacks are fully retracted.

WARNING

When using the all jacks retract feature, ensure the jacks are lowering the crane within a range so that the crane tilt angle does not exceed 1°. If the tilt angle exceeds 1°, the crane may tip over.

- If using an outrigger control box, double click and hold the beam/jack retract switch until all the jacks have reached the desired position. Refer to Figure 1—93 and Figure 1—94.

  Note: The indicator lights on the beam/jack retract switch will flash and the indicator lights on all outrigger jack switches will illuminate as the jacks retract.

- If using the Wireless Rigging Remote, press the Mode Selector Button, as required, to display the Crane Level Screen. Double click and hold the Down Button until all the jacks have reached the desired position. Refer to Figure 1—95.

  Note: When setting up crane for craning operation if jack cylinders are fully retracted, extend jack cylinder by at least 0.39 in (*10mm*).

To Retract Outrigger Beams

WARNING

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

The outrigger beams should not be retracted or extended with its corresponding jack extended. Jacks must be completely retracted before any beam operation.

8. Retract the outrigger beam:
   a. If using an outrigger control box, press and hold the desired outrigger beam switch and the beam/jack retract switch . Refer to Figure 1−93 and Figure 1−94.

      Note: The indicator lights on both switches will flash as the beam retracts.

      Note: A bubble level is provided on the upper frame visible through the right window of the upper operator's cab and at each ground control station to assist in determining when the crane is level.

   b. If using the Wireless Rigging Remote, press the Mode Selector Button, as required, to display the Outrigger Beam Control Screen. Press and hold the desired outrigger beam/jack button and the Down Button . Refer to Figure 1−95.

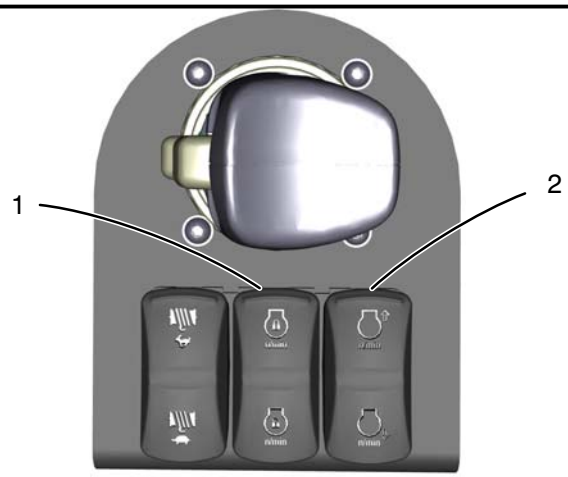
      Note: Pressing the Mode Selector Button on the Wireless Rigging Remote toggles between the Outrigger Beam Control Screen and the Crane Level Screen. The Crane Level Screen on the Wireless Rigging Remote can assist in determining when the crane is level.

9. When the beam reaches the selected position, release both switches on any outrigger control box, or release one or both buttons on the Wireless Rigging Remote.
10. Repeat Steps 8 and 9 for each outrigger beam, as required.

    Note: As conditions warrant, a proficient crane operator may operate both beams on one side at the same time.

11. Store all pontoons in the self stored position. Refer to Figure 1−96. Properly install all hitch pins in their proper locations with the pontoons in the self stored position.
12. Store all the extend position pins in the fully retracted position.

Figure 1–98
Keep Clear of Pinch Points



1. Throttle Lock/Unlock Switch
2. Throttle Speed Adjustment Switch

Figure 1–99
Throttle Lock Switches

Crane System Controls

The following pages, along with Figure 1–100, 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 1–99. The engine should continue to run at a constant speed when the throttle pedal is released.

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.

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

Auto Idle System

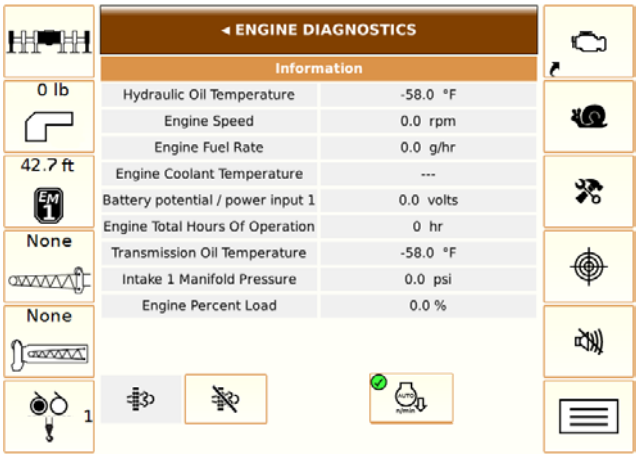
When ON (function is ON by default) and with engine coolant temperature above 150 deg F and throttle lock set: The auto idle indicator will begin blinking after 10 seconds of all crane functions becoming neutral. Once the crane functions are neutral for 15 seconds, the light will illuminate green, at 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.

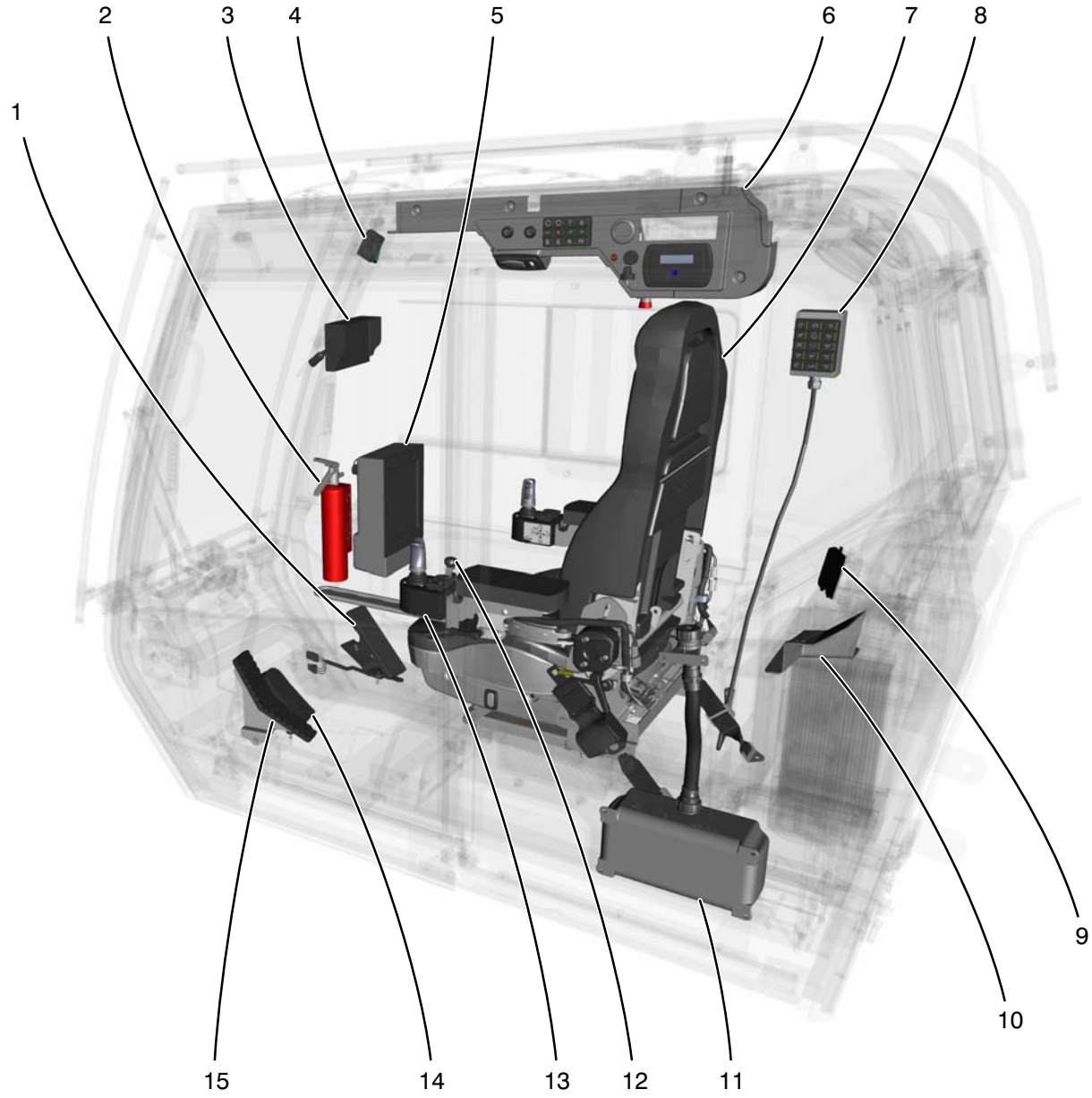
To Activate Or Deactivate Auto Idle:

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.





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

Figure 1–100
Operator's Cab

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.

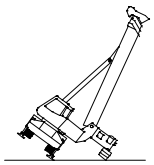
Swing Brake Pedal

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 pedal. To release the swing brake, release the swing brake 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 in the Crane Rating Manual. Crane can tip over backwards when not on fully extended outriggers.

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

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 personnel injury or equipment damage.

To Stop Upper Swing

1. Ease the 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 and/or swing lock(s) as required.
4. Check engagement of the swing park brake by trying to swing right, then left. The upper should not swing.

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 1–81. 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 when traveling or transporting 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—100.
2. Press the swing park brake button/toggle switch on the swing control lever in the left console. Refer to Figure 1—101. The swing park brake indicator light on the Pulse Crane Control System Display will go out.

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—100.
2. Press the swing park brake button/toggle switch on the swing control lever in the left console. Refer to Figure 1—101. 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 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 personnel injury or equipment damage.

360° Swing Lock (If Equipped)

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 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.

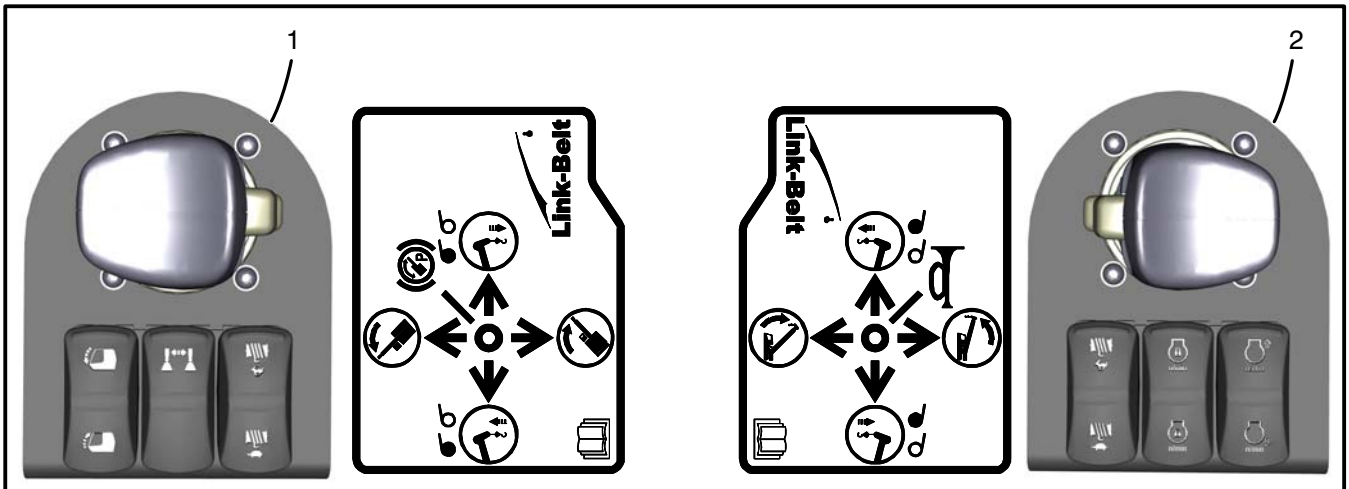
CAUTION

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.

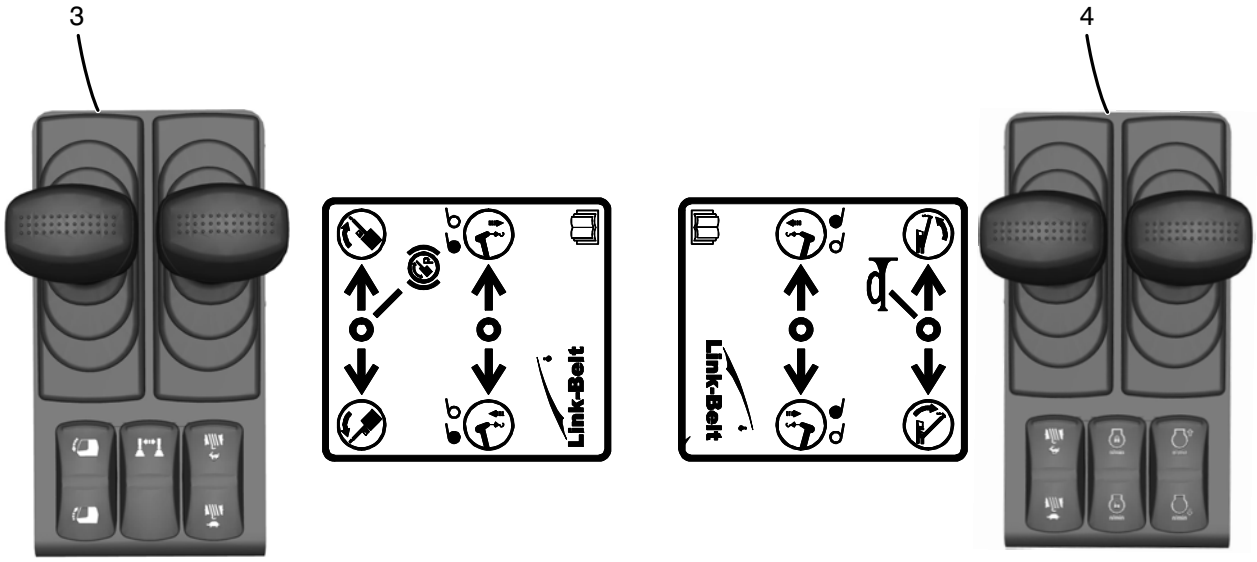
2. Press the 360°swing lock switch. All LED indicators on the switch will illuminate. The 360° swing lock indicator on the Pulse Crane Control System Display will illuminate.

   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.



Dual Axis Controls (If Equipped)



Single Axis Controls (If Equipped)

1. Left Console (Swing/ Front Winch Control Lever)
2. Left Console (Boom Hoist/Rear Winch Control Lever)
3. Left Console (Swing/ Front Winch Control Levers)
4. Right Console (Boom Hoist/Rear Winch Control Levers)

Figure 1–101
Seat Console Controls

Wire Rope Winch System

This system controls raising and lowering the winch wire rope(s). 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—100 and Figure 1—101. Refer to the following for control descriptions and brief summary of operation.

The front and rear winches can also be controlled remotely with the Wireless Rigging Remote for crane setup. The Wireless Rigging Remote can not be used to lift a load. If using the Wireless Rigging Remote for winch function, press the Mode Selector Button, as required, to display the Crane Level Screen. Refer to "Wireless Rigging Remote" in this section of this Operator's Manual for general Wireless Rigging Remote instructions.

Note: Pressing the Mode Selector Button on the Wireless Rigging Remote toggles between the Outrigger Beam Control Screen and the Crane Level Screen.

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.

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 upper engine to run at idle speed, with the winch control lever(s) in neutral, for several minutes. Once the hydraulic oil begins to warm, operate the winch(es) at low speed, with no load, lifting and lowering only the hook block or hook ball until warm oil circulates throughout the winch(es).

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, or load contacts the head machinery. "Two blocking" could damage the hook block, hook ball, and/or the head machinery. Always keep the hook block, hook ball, and load a safe distance from the boom.

Front Winch Control

The the front winch drum can be controlled with the right control lever. 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" in this Section of this Operator's Manual for more specific instructions. If using the Wireless Rigging Remote to control the front winch for crane setup, press and hold the front winch button and the up (lift) or down (lower) button, as required.

Rear Winch Control (If Equipped)

The rear winch drum can be controlled with the left control lever. 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" in this Section of this Operator's Manual for more specific instructions. If using the Wireless Rigging Remote to control the rear winch for crane setup, press and hold the rear winch button and the up (lift) or down (lower) button, as required.

Winch Operation

The following is a brief description of the basic procedure for operating the wire rope winch(es). Crane operations are to be performed only by a qualified operator who has read and fully understands the entire contents of this Operator's Manual.

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

Note: When lifting a load, booming up may be required to maintain load radius.

Note: When both winch levers are activated simultaneously, the winch 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 the neutral position to stop the load.

Winch Control Switch(es)

A switch for each drum is used to control engaging/disengaging the high/low speed hoist and disabling the front or rear winch(es). The switches are deactivated when using the Wireless Rigging Remote.

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(es) to the high speed ( ) position. Move the control lever to the or position. The high speed hoist will activate after engaging the control lever(s). Refer to Figure 1—100.

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 ( ) position. Move the control lever to the or position. Standard winch mode will activate after engaging the control lever(s).

Winch Disable

Press the winch control switch(es) to the disable (⃠) position to disable the winch(es) to prevent inadvertent operation of the winch(es) while using the control levers to perform other operations.

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 1−81), 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 (If Equipped)

The crane may be equipped with a first layer/third wrap indicator 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 RCL Display to alert the operator when the wire rope is down to the first layer on the winch drum(s). An audible alarm will sound continuously, and "Third Wrap" will appear in the Pulse Crane Control System Display to alert the operator when the wire rope is down to the third wrap. If enabled the winch function will also cutout with the third wrap alarm.

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.

In order for this system to function correctly, it must be properly calibrated using the controls on the Crane Control Module. Refer to "First Layer/Third Wrap Calibration" in Section 3 of this Operator's Manual. 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).

Boom Hoist System

Raising and lowering the boom is controlled by the boom hoist control lever on the right arm rest. Refer to Figure 1−100 and Figure 1−101.

The boom hoist function can also be controlled remotely with the Wireless Rigging Remote for crane setup. If using the Wireless Rigging Remote for boom hoist function, press the Mode Selector Button, as required, to display the Crane Level Screen. Refer to "Wireless Rigging Remote" in this section of this Operator's Manual for general Wireless Rigging Remote instructions.

Note: Pressing the Mode Selector Button on the Wireless Rigging Remote toggles between the Outrigger Beam Control Screen and the Crane Level Screen.

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.

WARNING

Avoid sudden starts or stops when booming up or down. This causes shock loadings which can damage the boom or create a tipping condition. Always ease the boom hoist control into position.

To Raise The Boom (Boom Up): Move the boom hoist control lever to the "Boom Up" position. If using the Wireless Rigging Remote to boom up for crane setup, press and hold the boom hoist button and the up button, as required.

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 the boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the winch drum(s) to prevent tension on the wire rope(s).

To Lower The Boom (Boom Down): Move the boom hoist control lever to the "Boom Down" position. If using the Wireless Rigging Remote to boom down for crane setup, press and hold the boom hoist button and the down button, as required.

CAUTION

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

To Stop The Boom: Ease the boom hoist control lever into the neutral position. If using the Wireless Rigging Remote for crane setup, release the boom hoist button and/or the up or down button.

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.

One telescope cylinder, one pinning cylinder, and one latching cylinder are used to sequentially telescope one section at a time and pin that section to the next adjacent section from 0% up to 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 (based on boom mode selected by the operator), all pinning and unpinning operations, all latching and unlatching operations, telescope cylinder 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 (except when the computer takes control of speed during the pinning/unpinning and latching/unlatching operations).

The telescope feature has seven modes of operation and one travel mode:

- EM1 extends all sections 100% for a max boom length of 197.3 ft (*60.1m*).
- EM2 extends the T1, T2, T3, and T4 sections to 100%, and the T5 to 50% for a max boom length of 182.7 ft (*55.7m*).
- EM3 extends T1, T4, and T5 sections to 100% and T2, and T3, sections 50% for a max boom length of 165.9 ft *(51.4m*).
- EM4 extends the T1 and T5 sections to 100%, and the T2, T3, and T4 sections to 50% for a max boom length of 150.9 ft (*45.9m*).
- EM5 extends the T1 section to 100%, and the T2, T3, T4, and T5 sections to 50%, for a max boom length of 136.3 ft (*41.5m*).
- EM6 extends the T1 section to 100%, and the T2, T3, and T4 sections to 50% and the T5 section remains fully retracted for a max boom length of 121.8 ft (*37.1m*).
- EM7 extends the T1 section to 100%, and the T2, and T3, sections to 50% and the T4 and T5 sections remain fully retracted for a max boom length of 106.7 ft (*32.5m*).

Note: Ensure the boom sections are pinned together before lifting the maximum allowable capacities. Refer to the "Unpinned" capacities when section are not pinned. Utilize the boom pinning information in boom telescope animation display on the RCL main working screen to confirm a "Pinned" condition.

- Travel Mode extends only the T1 section from 0—100%. The travel mode is not required to travel the crane on the highway. It is for use only when the boom needs to be telescoped to transfer axle loading for travel. (An example would be to extend the boom to transfer the boom weight on a boom dolly/trailer.) The anti two-block system is disabled and no capacities are available in this mode.

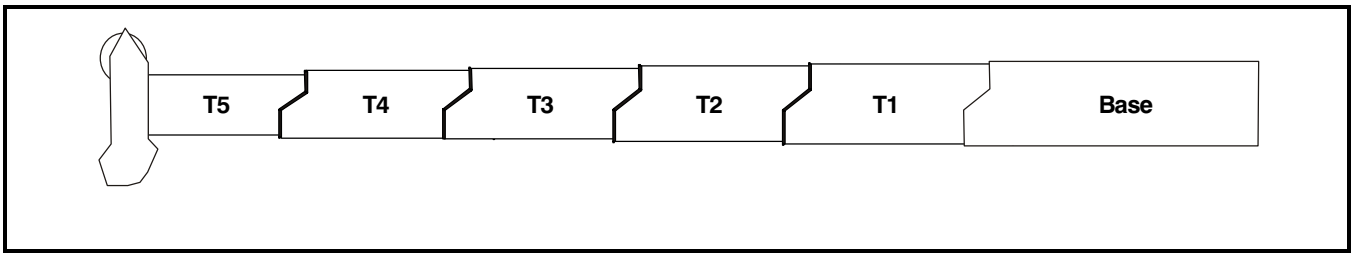
Note: In boom modes EM5, EM6, and EM7, the T1 section will first automatically pin it at 50%. If 100% extension of the T1 section is desired, continue to depress the telescope extend pedal.

Boom Telescope Mode Selection

The boom modes can be changed only when the boom is 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. When a boom mode is selected and the boom telescope pedal is pressed and held, the telescope controller's first command is 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 continue to completion before any other telescope function can happen. This movement is most noticeable when Travel Mode is selected because the cylinder has to travel from either the T3, T4, or T5 section to the T1 section, therefore taking more time to complete. Be patient and allow the system to complete these functions before attempting other functions.

Note: When changing from Travel Mode to Rigging mode, an outrigger selection and boom mode selection must be made prior to selecting rigging mode.

Boom Extend Modes



EM 1

Boom Length		Telescope Length				
ft	*m*	T5	T4	T3	T2	T1
42.7	*13.03*					
71.9	*21.91*	100%				
101.9	*31.07*	100%	100%			
132.8	*40.49*	100%	100%	100%		
164.6	*50.18*	100%	100%	100%	100%	
180.0	*54.86*	100%	100%	100%	100%	47%
197.3	*60.13*	100%	100%	100%	100%	100%

EM 2

Boom Length		Telescope Length				
ft	*m*	T5	T4	T3	T2	T1
42.7	*13.03*					
57.3	*17.47*	50%				
87.4	*26.63*	50%	100%			
118.3	*36.05*	50%	100%	100%		
150.1	*45.74*	50%	100%	100%	100%	
165.0	*50.29*	50%	100%	100%	100%	46%
182.7	*55.69*	50%	100%	100%	100%	100%

EM 3

Boom Length		Telescope Length				
ft	*m*	T5	T4	T3	T2	T1
42.7	*13.03*					
71.9	*21.91*	100%				
101.9	*31.07*	100%	100%	0%		
117.4	*35.78*	100%	100%	50%		
133.3	*40.62*	100%	100%	50%	50%	
150.0	*45.27*	100%	100%	50%	50%	51%
165.9	*50.57*	100%	100%	50%	50%	100%

EM 4

Boom Length		Telescope Length				
ft	*m*	T5	T4	T3	T2	T1
42.7	*13.03*					
71.9	*21.91*	100%				
86.9	*26.49*	100%	50%			
102.4	*31.20*	100%	50%	50%		
118.3	*36.04*	100%	50%	50%	50%	
135.0	*41.15*	100%	50%	50%	50%	51%
150.9	*45.99*	100%	50%	50%	50%	100%

EM 5

Boom Length		Telescope Length				
ft	*m*	T5	T4	T3	T2	T1
42.7	*13.03*					
57.3	*17.47*	50%				
72.3	*22.05*	50%	50%			
87.8	*26.76*	50%	50%	50%		
103.7	*31.60*	50%	50%	50%	50%	
120.0	*36.58*	50%	50%	50%	50%	50%
136.3	*41.55*	50%	50%	50%	50%	100%

EM 6

Boom Length		Telescope Length				
ft	*m*	T5	T4	T3	T2	T1
42.7	*13.03*					
57.8	*17.61*		50%			
73.2	*22.32*		50%	50%	0%	
89.1	*27.16*		50%	50%	50%	
105.4	*32.00*		50%	50%	50%	50%
121.8	*37.11*		50%	50%	50%	100%

EM 7

Boom Length		Telescope Length				
ft	*m*	T5	T4	T3	T2	T1
42.7	*13.03*					
58.2	*17.74*			50%		
74.1	*22.58*			50%	50%	
90.4	*27.56*			50%	50%	50%
106.7	*32.53*			50%	50%	100%

Boom Telescope Pedal

The boom telescope pedal is mounted on the floor of the upper operator's cab as shown in Figure 1—100. Depress the toe of the boom telescope pedal to extend the boom. Depress the heel of the boom telescope 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 boom 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 the boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the winch drum(s) to prevent tension on the wire rope(s).

CAUTION

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

4. If the boom mode was changed, press and hold the toe of the boom telescope pedal to move the telescope cylinder into alignment with the first section to be extended. Allow this operation to finish before continuing.

   Note: Boom operation and boom functions can be monitored on telescope animation display on the RCL main working screen. Refer to Rated Capacity Limiter in this Section of the Operator's Manual for normal boom operation and fault messages.

5. Depress the toe of the boom telescope pedal to extend the boom. Allow time for the boom telescope cylinder to latch to the correct section and pull the pin between sections. The computer will then accelerate the boom telescope extend cylinder to a speed proportional to the upper engine speed and the amount the boom telescope pedal is depressed. Removing your foot from the boom telescope pedal will stop telescope operation.

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

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

6. Depressing the toe of the boom telescope 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 boom telescope cylinder. It is not necessary to remove your foot from the boom telescope pedal or reduce the amount the boom telescope pedal is depressed, this is done automatically. The boom section will actually be extended slightly past the pinning point and then will slowly reverse direction to gently load up the pin and unload the latches that attach the boom telescope cylinder to the boom section being extended.

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.

7. Continue to depress the toe of the boom telescope pedal until the desired boom length is achieved. When the desired boom length is achieved remove your foot from the boom telescope pedal. The last section extended can be telescoped until the cylinder is pinned to eliminate boom length changes due to thermal changes in the hydraulic oil in the cylinder or leakage in the extend system valves. The cylinder will remain latched to the boom section.

To Retract The Boom Sections

1. Depress the heel of the boom telescope pedal.

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

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

Boom Operating And Error Messages

The boom controller message area on the RCL main working screen will display normal boom operating messages and any active error message. Refer to "Rated Capacity Limiter" in this Section of the Operator's Manual

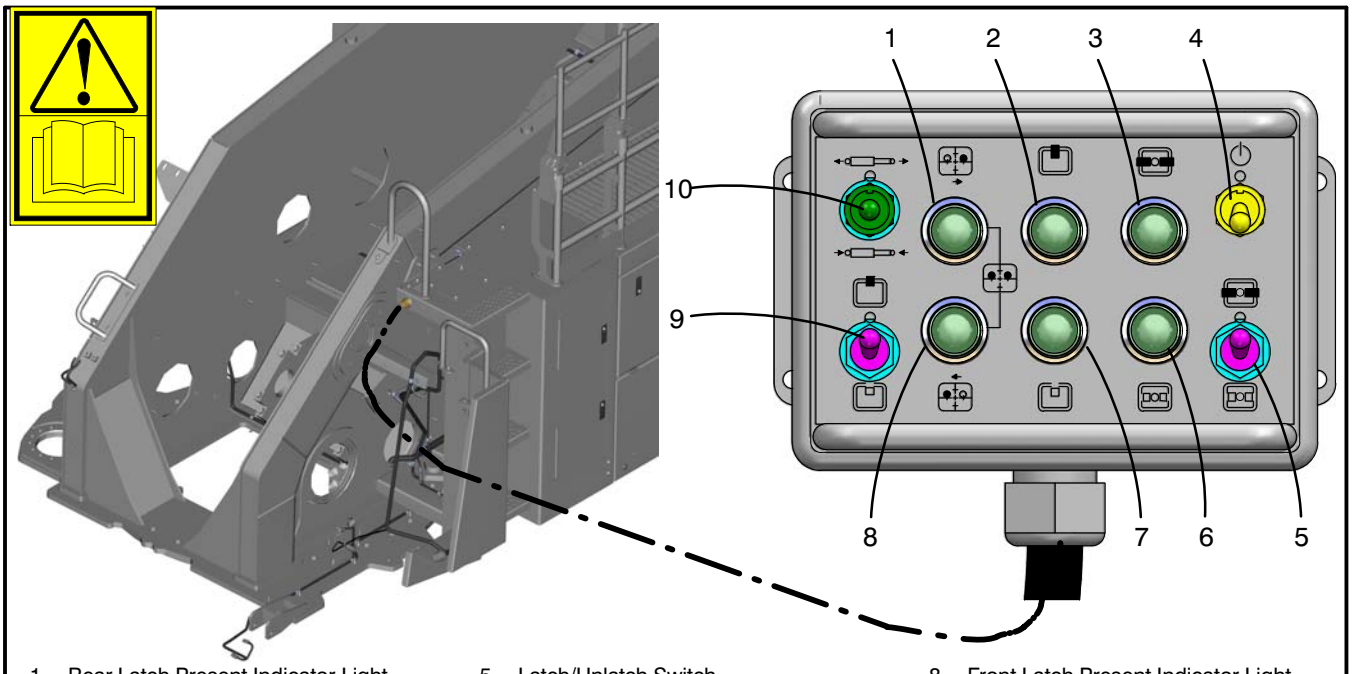
Emergency Telescope Operation

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 serious personal injury.

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

- Do not telescope the boom in manual mode with a load on the hook. Set the load down before telescoping.
- When possible, 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. This is important as one or more of the input sensors to the telescope system may be malfunctioning.
- 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.



1. Rear Latch Present Indicator Light
2. Pinned Indicator Light
3. Latched Indicator Light
4. Activate Switch
5. Latch/Unlatch Switch
6. Not Latched Indicator Light
7. Not Pinned Indicator Light
8. Front Latch Present Indicator Light
9. Pin/Unpin Switch
10. Telescope Extend/Retract Switch

Figure 1—102
Emergency Telescope Control Switches

The emergency telescope control switches are on a remote control box (manual boom telescope controller). It is stored behind the seat in the upper operator's cab. Refer to Figure 1—100. To use the manual controls, connect the cord on the manual boom telescope controller box to the electrical connector behind the upper operator's cab. Refer to Figure 1—102. To enable the telescope extend/retract, pin/unpin, and latch/unlatch switches, move the activate switch to the "ACTIVATE" position.

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 manual telescope controller 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 system is in the Rigging Mode.

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 you Link-Belt distributor to properly zero the cylinder.

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 serious personal injury.

Refer to Figure 1–102.

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 and hold the Telescope Extend/Retract switch to telescope the cylinder until the latches align with the holes in the rear of the section to be retracted. The FRONT LATCH PRESENT and REAR LATCH PRESENT indicator lights will illuminate when the latches are centered with the latch holes. Refer to the following chart for approximate boom telescope cylinder positions.

Extend Mode	Boom Length	Telescope Cylinder Length
	±0.25 ft	±3 in
EM1	197.3	392.8
	164.6	392.9
	132.9	392.9
	101.9	392.9
	71.9	392.8
EM2	182.7	392.8
	150.1	392.9
	118.3	392.9
	87.4	392.9
	57.3	217.7
EM3	165.9	392.8
	133.3	202.2
	117.4	207.4
	101.9	392.9
	71.9	392.8
EM4	150.9	392.8
	118.3	202.2
	102.4	207.4
	86.9	212.5
	71.9	392.8
EM5	136.3	392.8
	120.0	197.0
	103.7	202.2
	87.8	207.4
	72.3	212.5
	57.3	217.7
EM6	121.8	392.8
	105.4	197.0
	89.1	202.2
	73.2	207.4
	57.8	212.5
EM7	106.7	392.8
	90.4	197.0
	74.1	202.2
	58.2	207.4

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 Telescope Extend/Retract switch to telescope the cylinder out slightly as needed to allow the latches to fully engage the section.
6. When the latches are fully engaged (LATCHED indicator light illuminated), push and hold the Telescope Extend/Retract switch to telescope the cylinder out 1–2 in *(2.5–5.1cm)* 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. Push and hold the Telescope Extend/Retract switch to retract the section. Winch up while retracting the section to maintain tension on the winch wire rope(s) so the wire rope will spool correctly on the winch drum(s).
9. When the section is fully retracted, push the Pin/Unpin switch to the PIN position. PINNED indicator light should illuminate.

10. Extend the telescope cylinder using the Telescope Extend/Retract switch until the FRONT LATCH PRESENT and REAR LATCH PRESENT 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 and store the remote control box and return the RCL System to normal operation before operating the crane.

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 serious personal injury.

Refer to Figure 1–102.

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 and hold the Telescope Extend/Retract switch to telescope the cylinder until the latches align with the holes in the rear of the section to be extended. The FRONT LATCH PRESENT and REAR LATCH PRESENT indicator lights will illuminate when the latches are centered with the latch holes. Refer to the following chart for approximate boom telescope cylinder positions.

Extend Mode	Boom Length	Telescope Cylinder Length
	±0.25 ft	±1 in
EM1	42.7	42.48
	71.9	31.48
	101.9	21.10
	132.9	10.71
	164.6	0.33
EM2	42.7	42.48
	57.3	31.48
	87.4	21.10
	118.3	10.71
	150.9	0.33
EM3	42.7	42.48
	71.9	31.48
	101.9	21.10
	117.4	10.70
	133.3	0.33
EM4	42.7	42.48
	71.9	31.48
	86.9	21.10
	102.4	10.71
	118.3	0.33
EM5	42.7	42.48
	57.3	31.48
	72.3	21.10
	87.8	10.70
	103.7	0.33
EM6	42.7	31.48
	57.8	21.10
	73.2	10.70
	89.1	0.33
EM7	42.7	21.10
	58.2	10.70
	74.1	0.33

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 Telescope Extend/Retract switch to telescope the cylinder in or out slightly as needed to allow the latches to fully engage the section.
6. When the latches are fully engaged (LATCHED indicator light illuminated), push and hold the Telescope Extend/Retract switch to 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.

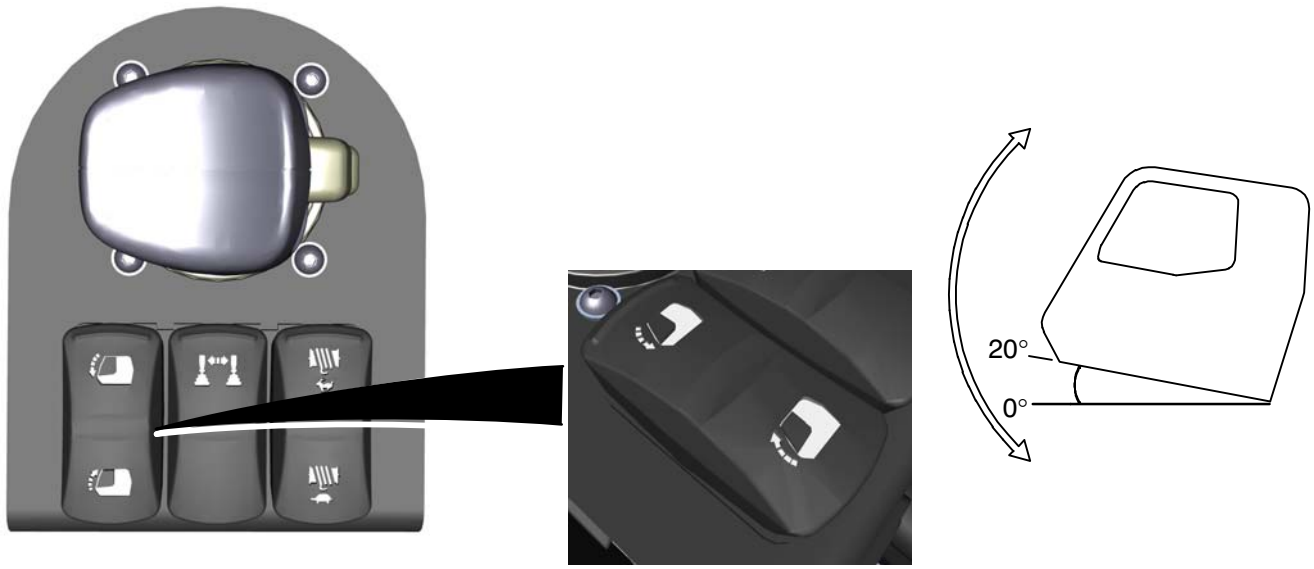
CAUTION

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. Push and hold the Telescope Extend/Retract switch to extend the section. Winch down while extending the section to avoid two blocking the winch wire rope(s).
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	Telescope Cylinder Length
	±0.25 ft	±3 in
EM1	200.0	398.0
	183.6	199.0
	167.1	398.0
	134.9	398.0
	103.8	398.0
	73.5	398.0
EM2	185.5	398.0
	169.0	199.0
	152.4	398.0
	120.3	398.0
	89.1	398.0
	58.9	222.0
EM3	168.5	398.0
	152.0	199.0
	135.4	205.0
	119.3	211.0
	103.8	398.0
	73.5	398.0
EM4	153.4	398.0
	136.8	199.0
	120.3	205.0
	104.2	211.0
	88.6	216.0
	73.5	398.0
EM5	122.2	199.0
	105.7	205.0
	89.6	211.0
	74.0	216.0
	58.9	222.0
EM6	124.1	398.0
	107.6	199.0
	91.0	205.0
	75.0	211.0
	59.4	216.0
EM7	92.5	199.0
	75.9	205.0
	59.9	211.0

10. Visually check to verify that the pin has fully engaged the pin hole. If it has not engaged the pin hole, push and hold the Telescope Extend/Retract switch to extend or retract the telescope 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 and hold the Telescope Extend/Retract switch to telescope the cylinder until the latches align with the holes in the rear of the section just extended. The FRONT LATCH PRESENT and REAR LATCH PRESENT indicator lights will illuminate when the latches are centered with the latch holes.
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 and store the remote control box and return the RCL System to normal operation before operating the crane.



Left Seat Console

Figure 1—103
Upper Operator's Cab Tilt Control Switch

Cab Tilt

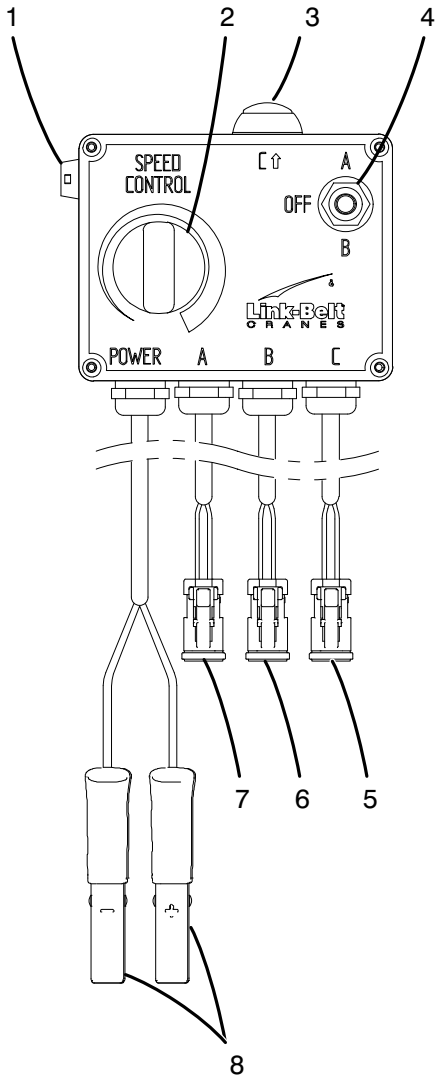
The upper operator's cab tilts up from 0 to 20 degrees above horizontal to improve vertical visibility and help to reduce operator fatigue due to neck strain when at high boom angles. Use the three position momentary switch located on the left seat console to operate the cab tilt function. Refer to Figure 1—103.

Cab must be returned to its horizontal 0 degree position before exiting the cab.

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

Tilting the Upper Operator's Cab

- Actuate top part of the rocker switch and hold to lower the cab. Release switch to stop.
- Actuate bottom part of the rocker switch and hold to raise the cab. Release switch to stop.



1. 5 Amp Glass Fuse
2. Speed Control Dial
3. Momentary Button
4. Activate Switch
5. Plug C
6. Plug B
7. Plug A
8. +/– Battery Clips

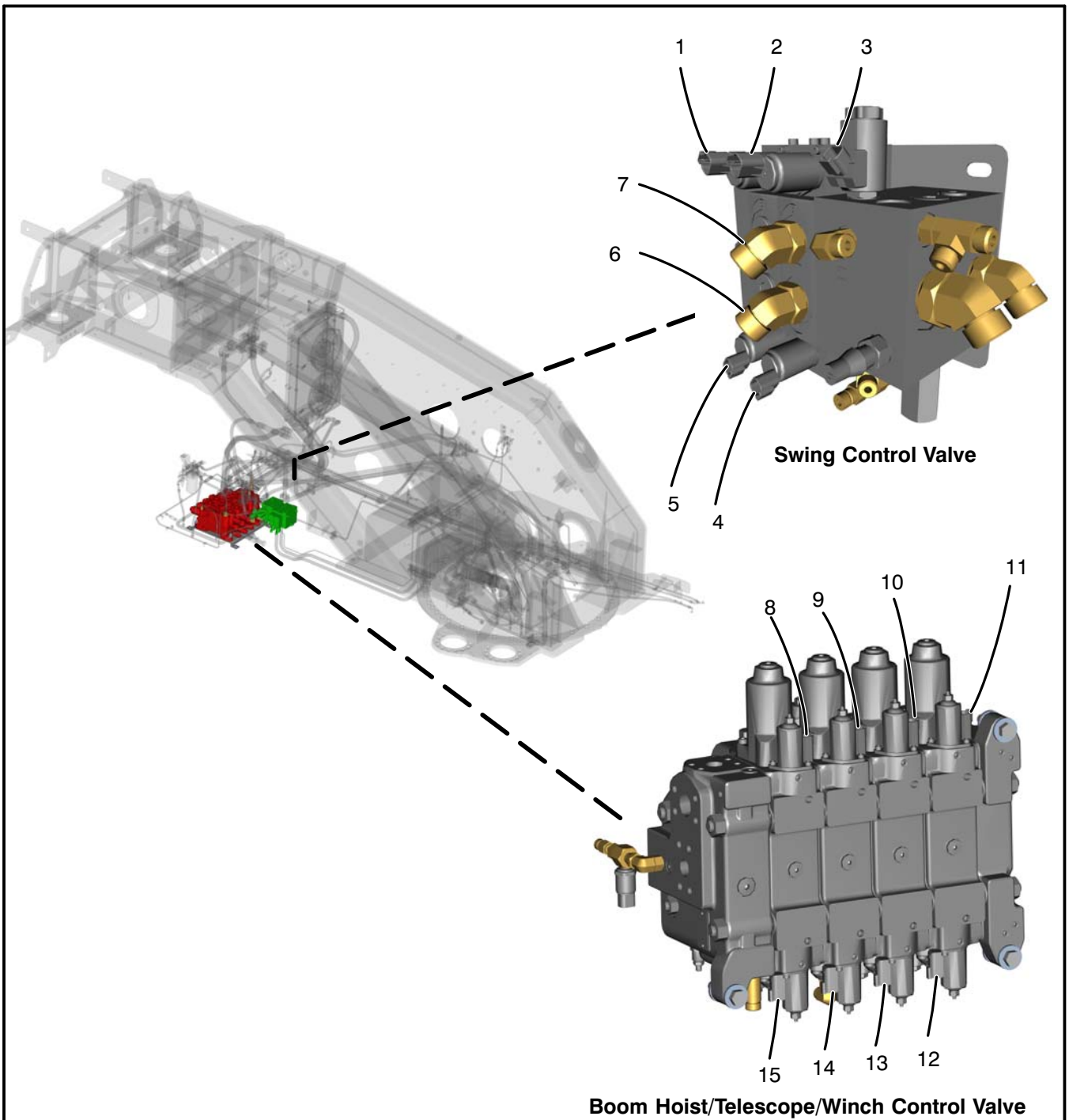
Figure 1–104
Emergency Function Controller

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. The controller is stored under the operator's cab seat.

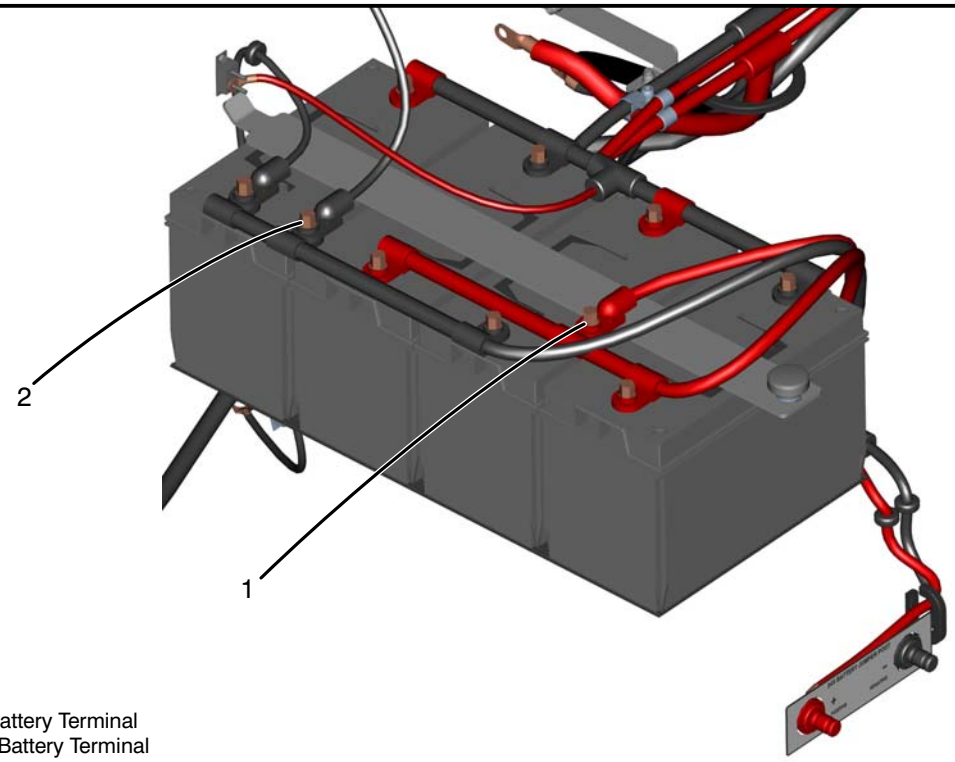
⚠ WARNING

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.



1. Swing Right Discharge Connector
2. Swing Left Connector
3. Swing Park Brake Connector
4. Swing Right Connector
5. Swing Left Discharge Connector
6. Swing Left Connector
7. Swing Right Connector
8. Boom Extend
9. Boom Hoist Up
10. Front Winch Down
11. Rear Winch Down
12. Rear Winch Up
13. Front Winch Up
14. Boom Hoist Down
15. Boom Retract

Figure 1–105
Electrical Connections for Major Crane Functions: Main Control Valve And Swing Pump



1. Positive Battery Terminal
2. Negative Battery Terminal

Figure 1—106
Battery Connections

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—106.
2. Connect plug A and/or plug B to the electrical connector for the desired function(s). Refer to Figure 1—105.
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 Seat

This 6-way adjustable seat is controlled by manual controls. Refer to Figure 1—107.

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.

4. 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.

3. 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.

2. Operator's Manual And CRM Storage

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

1. 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.

5. 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.

6. 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.

7. 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.

9. Seat Arm Lock Up Release Lever

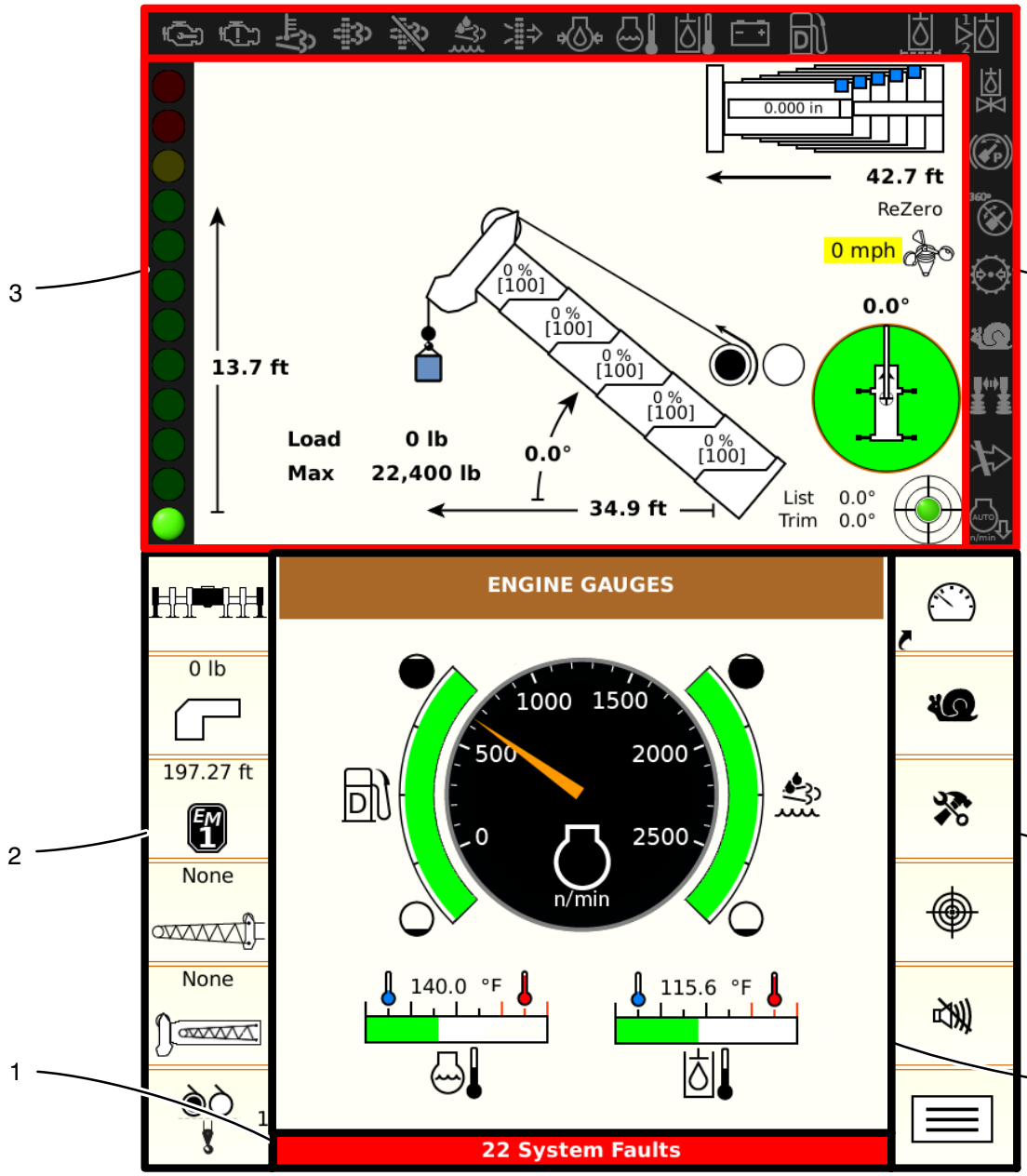
   When the arm rest is raised to exit the cab, the seat arm will lock in the upward position. To move the arm rest to the operating position, hold the arm rest with one hand, and push the arm lock up release lever downward and lower the arm rest to the operating position.

10. 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.

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

Figure 1—107
Operator's Seat



1. Message Area
2. RCL Configuration Buttons
3. RCL Working Screen
4. Indicator Light Panel
5. Pulse Feature Buttons
6. Pulse Feature And RCL Configuration Area

Figure 1—108
Pulse Crane Control System Display

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.

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

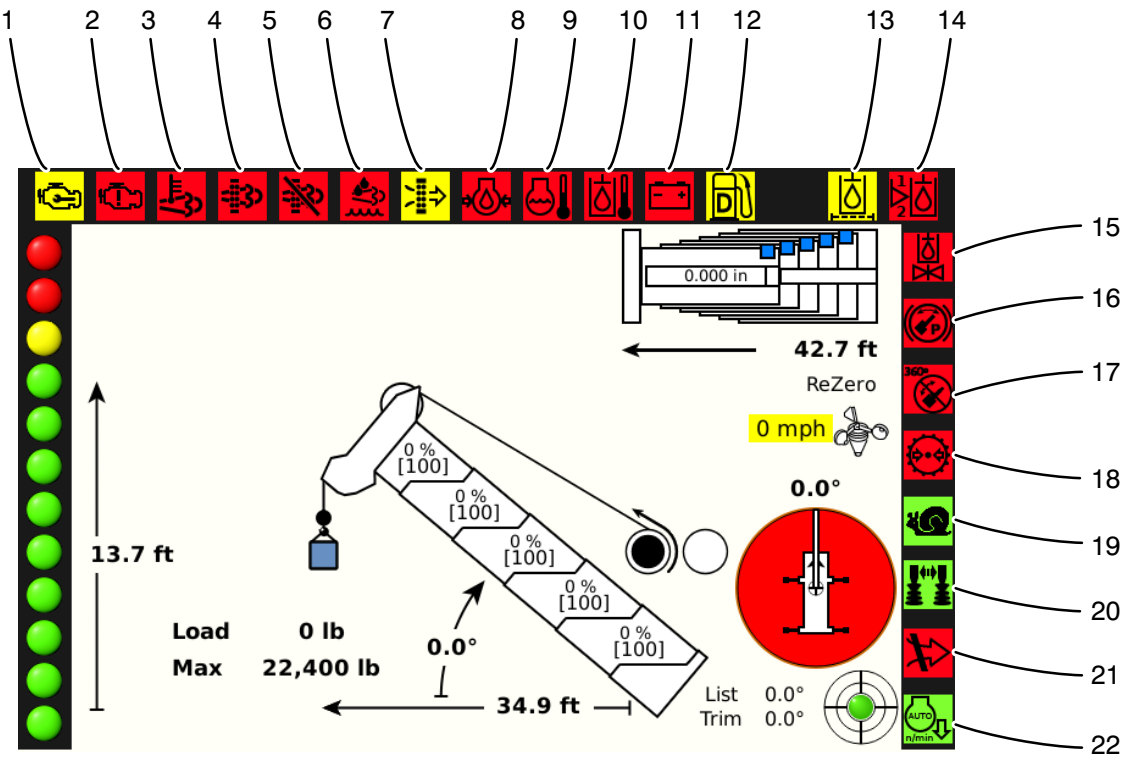
   The Indicator Light Panel contains crane system indicator and warning lights. Refer to "Indicator Light Panel" in this section of this Operator's Manual.

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.



1. Check Engine Indicator Light
2. Stop Engine Indicator Light
3. High Exhaust System Temperature Indicator Light
4. Exhaust System Cleaning (Regen) Required Indicator Light
5. Exhaust System Cleaning (Regen) Inhibit Indicator Light
6. Diesel Exhaust Fluid Level Indicator Light
7. Air Filter Status Indicator Light
8. Engine Oil Pressure Indicator Light
9. Engine Coolant Temperature Indicator Light
10. Hydraulic Oil Temperature Indicator Light
11. Electrical System Voltage Indicator Light
12. Diesel Fuel Level Indicator Light
13. Hydraulic Oil Filter Indicator Light
14. Hydraulic Oil Level Indicator Light
15. Hydraulic Reservoir Shutoff Indicator Light
16. Swing Park Brake Indicator Light
17. 360° Swing Lock Indicator Light
18. Transmission Low Air Pressure Indicator Light
19. Fine Metering Indicator Light
20. Control Lever Function Change Indicator Light
21. Emergency Air Shutoff Indicator Light
22. Auto Idle Indicator Light

Figure 1–109
Indicator Light Panel

Indicator Light Panel

The following is a description of the indicator lights on the Pulse Crane Control System Display. Use them along with Figure 1–109.

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. 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.

9. 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.

10. 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.

11. 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.

12. 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.

13. Hydraulic Oil Filter Indicator Light

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

14. Hydraulic Oil Level Indicator Light

This red indicator light will illuminate to alert the operator that the upper and carrier hydraulic oil levels are critically low and to stop operation immediately. If one level is low, but the other is critically low, this indicator light will illuminate red until the critically low level is resolved, the light will then illuminate yellow until the low level is resolved.

This red indicator light will illuminate to alert the operator that the upper hydraulic oil level is critically low and to stop operation immediately.

This red indicator light will illuminate to alert the operator that the carrier hydraulic oil level is critically low and to stop operation immediately.

This yellow indicator light will illuminate to alert the operator that the upper and carrier hydraulic oil levels are low. If one level is low, but the other is critically low, this indicator light will illuminate red until the critically low level is resolved, the light will then illuminate yellow until the low level is resolved.

This red indicator light will illuminate to alert the operator that the upper hydraulic oil level is low.

This red indicator light will illuminate to alert the operator that the carrier hydraulic oil level is low.

15. Hydraulic Reservoir Shutoff Indicator Light

This red indicator light illuminates when any of the upper hydraulic reservoir valves are not in the open position.

16. 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.

17. 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.

18. Transmission Low Air Pressure Indicator Light

This red indicator light will illuminate to alert the operator that the transmission air pressure is low.

19. 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.

20. Control Lever Function Change Indicator Light

This green indicator light will illuminate when the the control lever change function has been activated. The control lever change function is activated and deactivated by pressing the Control Lever Mode Switch on the left seat console. Refer to Figure 1–81.

21. 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.

22. 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.

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 located in the upper power panel behind the operator's cab, to bypass the system. Refer to Figure 1—110. 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.

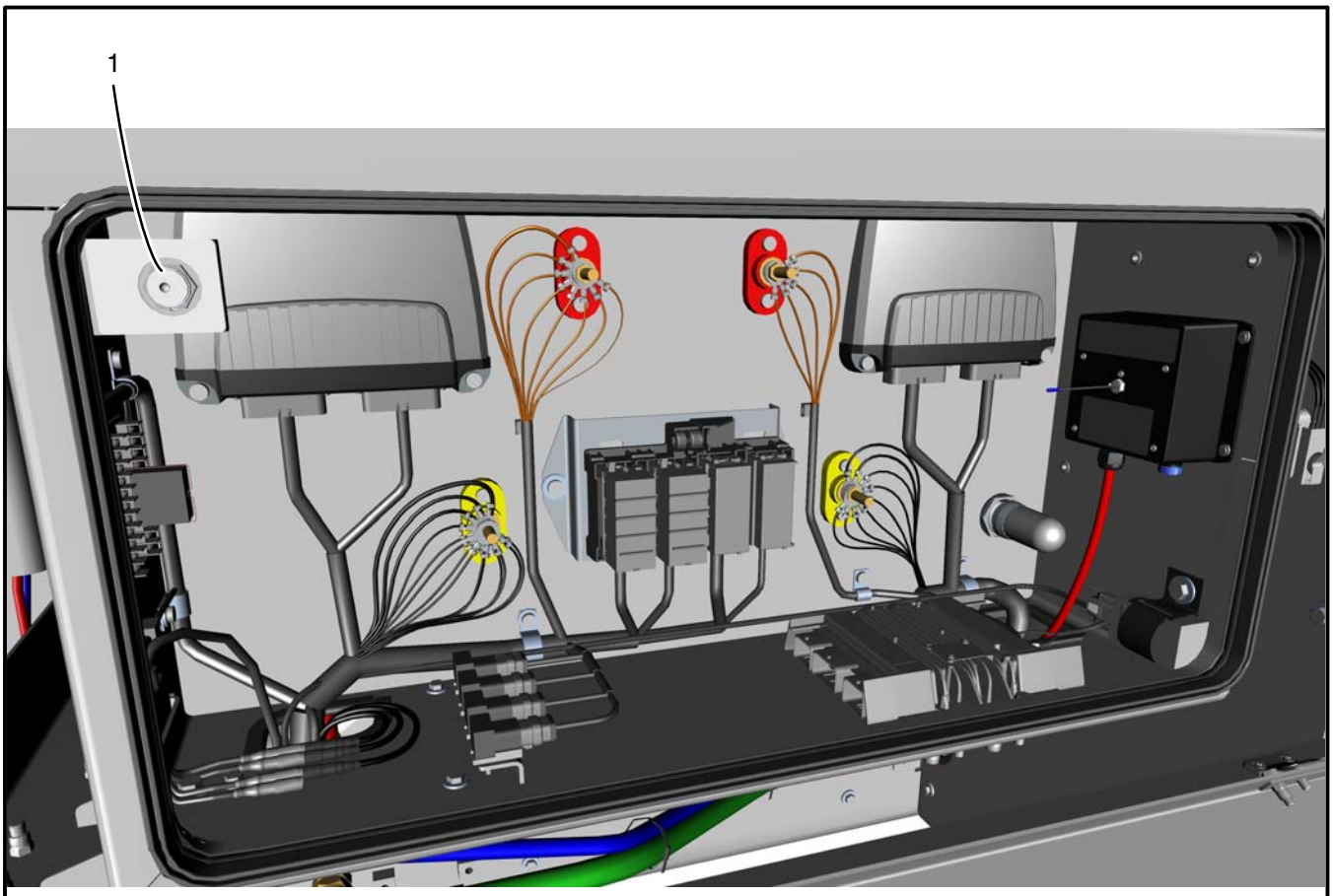
WARNING

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

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.



1. RCL Bypass Keyswitch

Figure 1—110
Rated Capacity Limiter Bypass Keyswitch

RCL Bypass Keyswitch

The RCL Bypass Keyswitch is located in the upper power panel behind the cab. Refer to Figure 1—110.

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.

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.

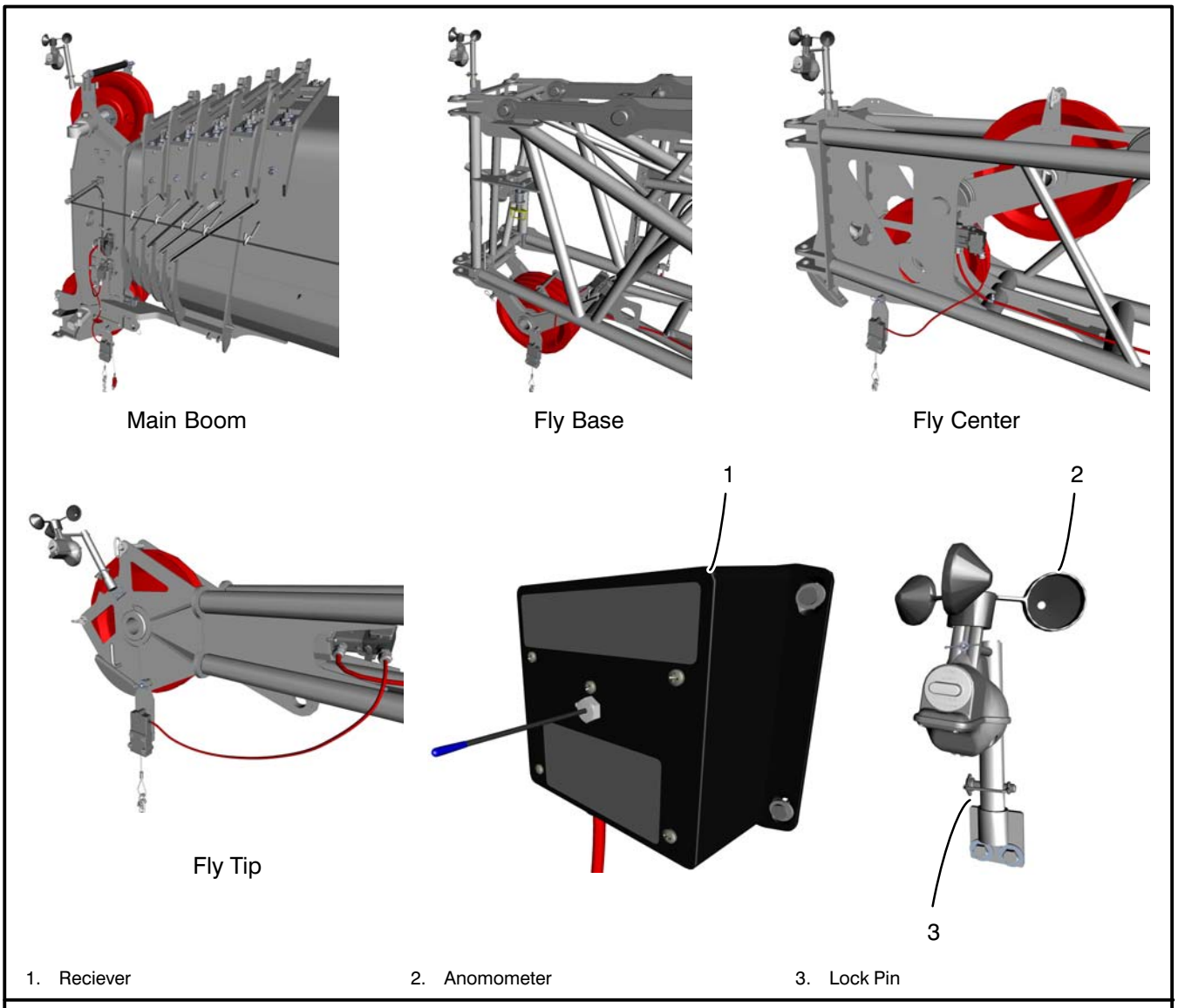


Figure 1–111
Wind Speed Indicator

Wind Speed Indicator

The crane is 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 1–111. An anemometer mounted on the boom or fly head transmits wind speed data to the RCL Working Screen on the Pulse Crane Control System Display in the operator's cab. Refer to "Wind Restrictions Guide" 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.

Wind Speed Indicator And ATB Storage

The wind speed indicator, ATB switch, and ATB weights are stored in the carrier cab. Refer to "Carrier Cab Passenger Seat Storage" and "ATB Weight Storage" in this section of this Operator's Manual.

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				

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

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 ft^2 per 1000 lbs or Wind Coefficient, C_f > 1.2) by the following formula:

$$v_r = v\sqrt{\frac{(K)W}{CfA}}$$

K = .00586 ft^2/lb [*.0012 m^2/kg*]
Cf = Wind coefficient of load
W = Rated lifting capacities (lbs) (*kg*)
Wr = 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 lbs [*22 650kg*]
Actual load = 45,000 lbs [*20 400kg*]
Maximum wind speed, v = 20 mph [*9m/s*]
Actual wind coefficient, Cf = 1.6
Actual wind sail area of load, A = 300ft^2 [*27.9m^2*]

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

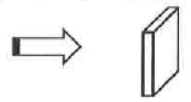
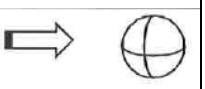
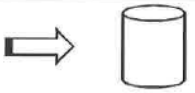
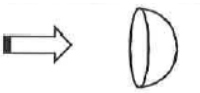
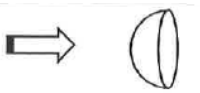
$$v_r = 9\sqrt{\frac{(.0012)(22650)}{(1.6)(27.9)}} = 7.0 \text{m/s}$$

Example 2: 40% Capacity Deduction

Rated lifting capacities, W = 50,000 lbs [*22 650kg*]
Actual load = 25,000 lbs [*11 300kg*]
Maximum wind speed, v = 20 mph [*9m/s*]
40% Capacity Reduction, Wr = 30,000 lbs [*13 600kg*]
Max wind speed w/ Capacity Reduction, v_r = 29 mph [*13m/s*]
Actual wind coefficient, Cf = 1.6
Actual wind sail area of load, A = 300 ft^2 [*27.9m^2*]

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

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		

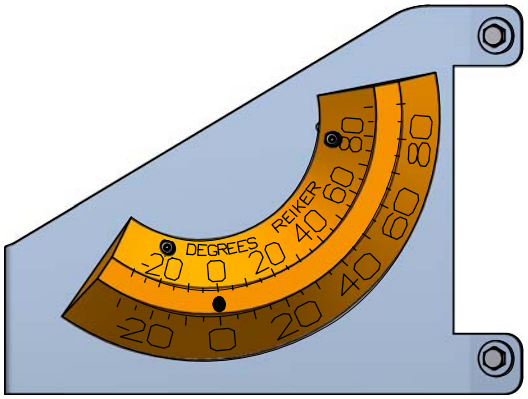


Figure 1—112
Boom Angle Indicator

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—112. 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—113 and Figure 1—108. The auxiliary ATB switch and ATB weight(s) are stored in the carrier cab. Refer to "Carrier Cab Passenger Seat Storage" and "ATB Weight 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.

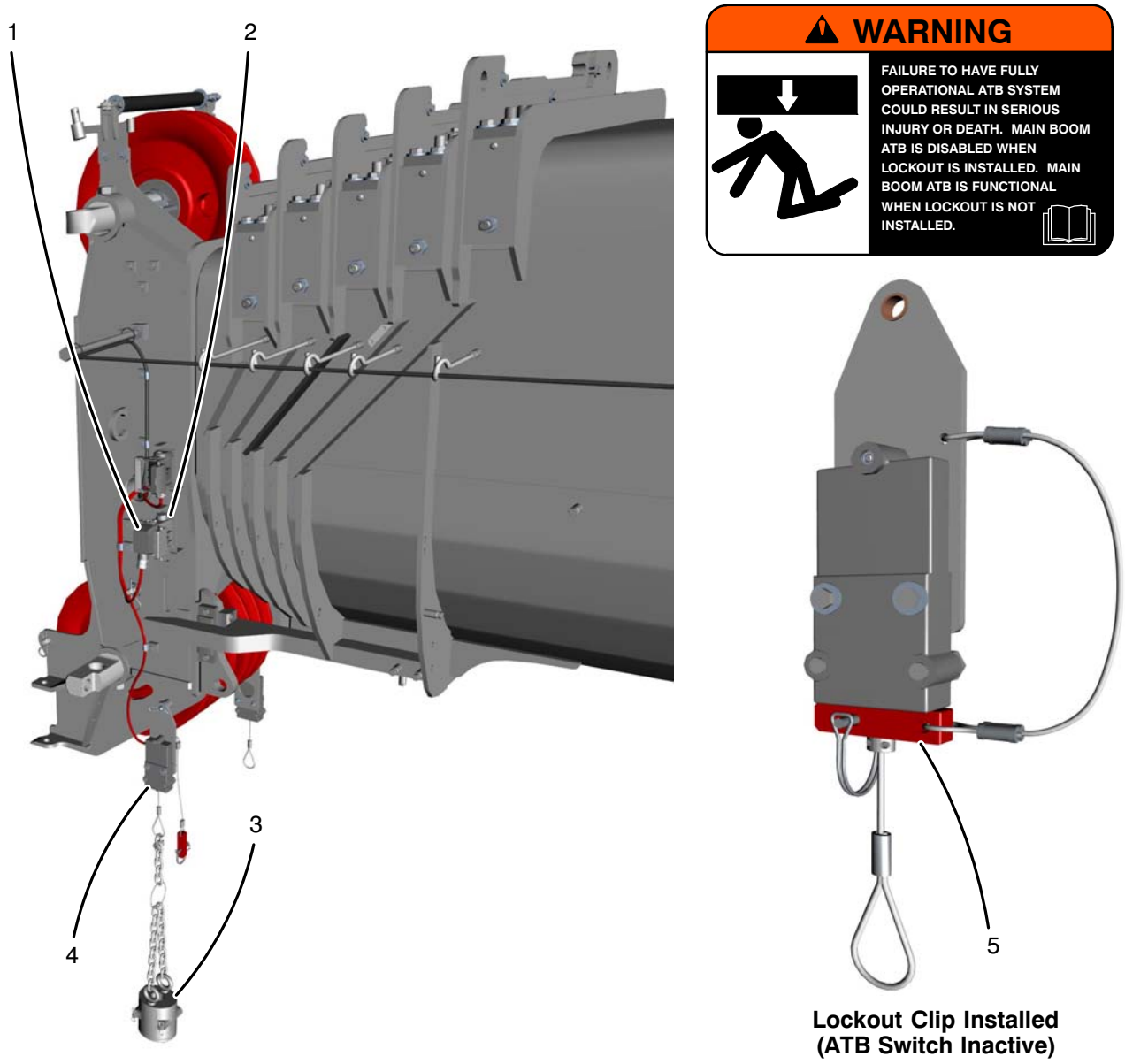
The added feature of hydraulic function limiters, prevents the operator from continuing crane functions which will cause a two block situation to occur. The crane functions of winch up, boom down, and boom extend are disabled when the anti-two block weight is lifted. These functions will remain disabled 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.



1. Plug Assembly
2. Jumper Assembly
3. Anti-Two Block Weight
4. Anti-Two Block Switch
5. Lockout Clip

Figure 1–113
Anti-Two Block Weights And Switches

Lockout Clip

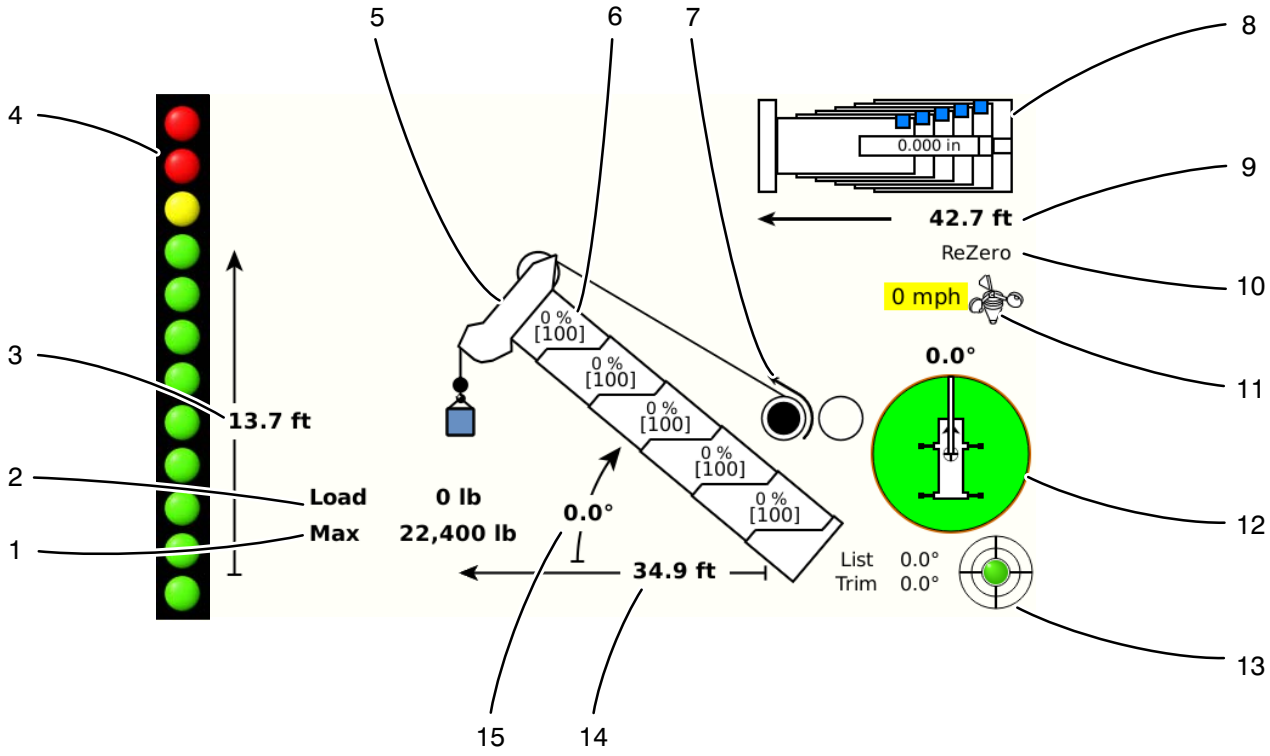
The lockout clip is used to hold the main boom anti-two block switch in the "inactive" position.

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 1–113.

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.



1. Maximum Rated Capacity Display
2. Actual Load Display
3. Boom Head Height Display
4. RCL Light Bar
5. Crane Representation Image
6. Boom Section Length Display
7. Winch Wire Rope Direction Indicator
8. Boom Telescope Animation Display
9. Boom Length Display
10. Boom Message Area
11. Wind Speed Display
12. Working Area Display
13. Level Display
14. Load Radius Display
15. Boom Angle Display

Figure 1–114
RCL Working Screen

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.

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, in brackets, the maximum length for each section according to the current boom mode. The Boom Section Length Display also 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.

9. 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

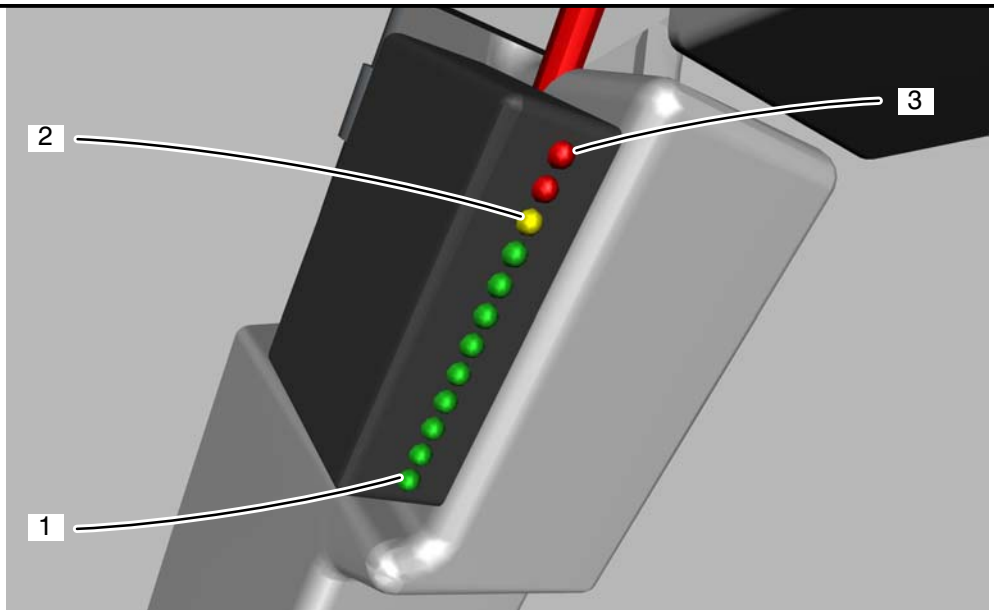
The Level Indicator is a digital display of the crane's level.

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.

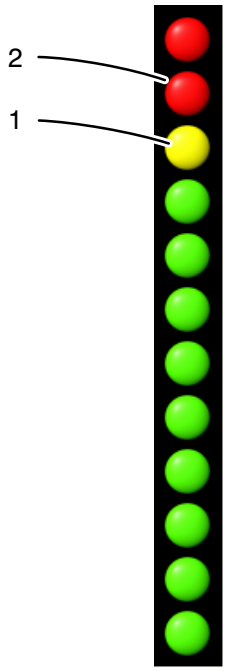
15. Boom Angle Display

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



1. Green Lights – Percentage of Rated Load
2. Yellow/Amber Lights – Approaching Overload
3. Red Lights – Overload

Figure 1–115
Overhead RCL Light Bar And External Light Bar (If Equipped)



1. Pre-Alarm Indicator
2. Overload Indicator

Figure 1–116
RCL Light Bar

RCL Light Bar

The following is a description of the RCL bar graph indicators on the Pulse Crane Control System Display. Refer to Figure 1–116.

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 1–115.

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.

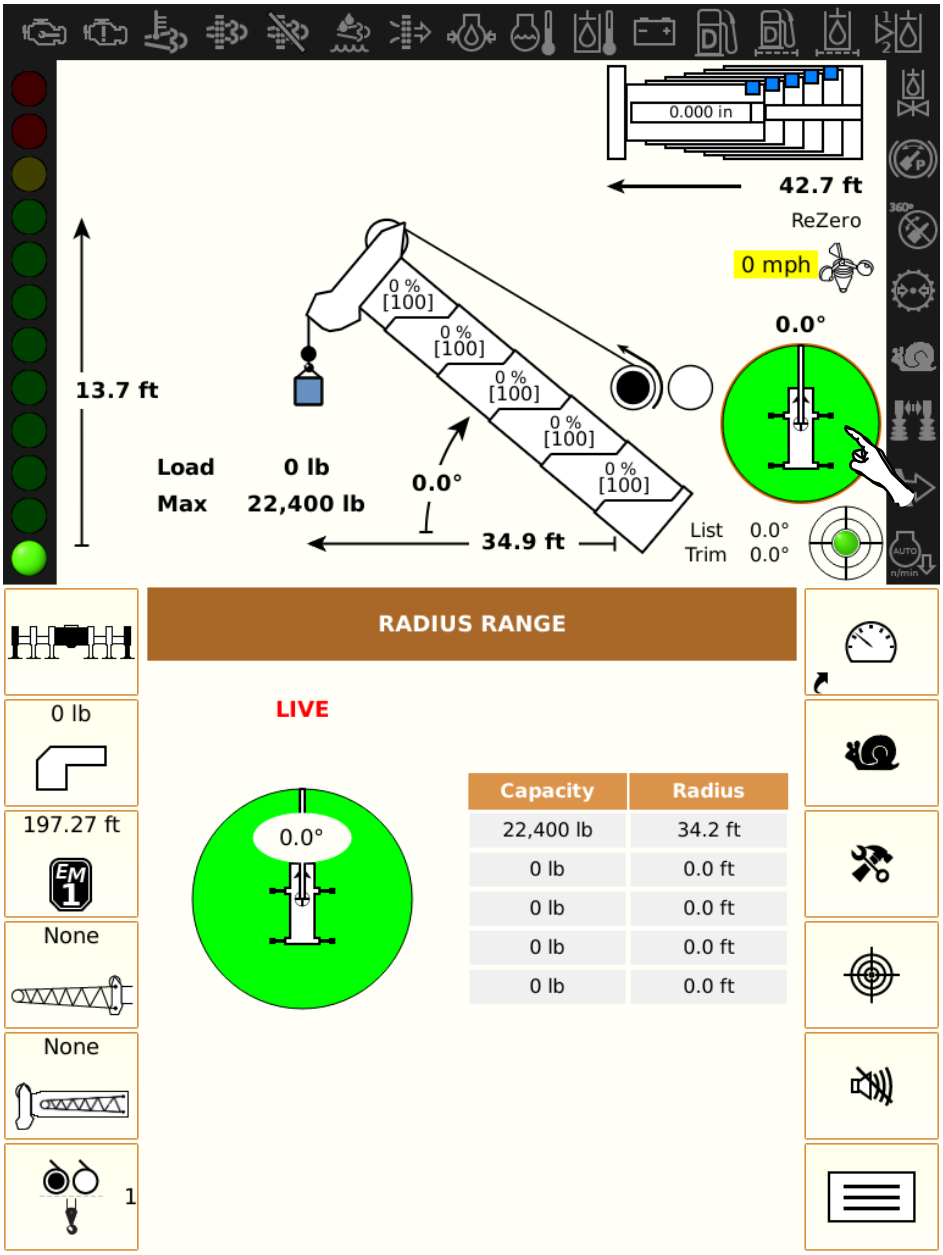
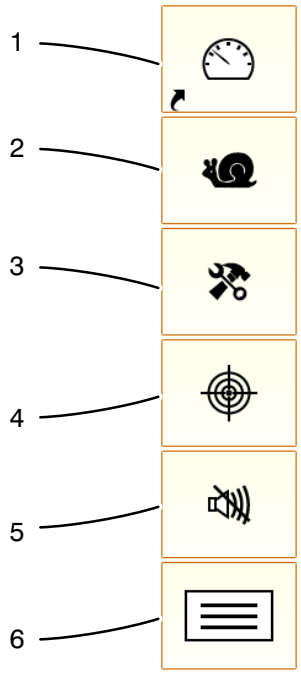


Figure 1—117
Radius Range

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—117.
2. Press any RCL Configuration Button or Pulse Feature Button to navigate to the corresponding menu or screen.



1. Shortcut Button
2. Fine Metering Pulse Feature Button
3. Diagnostic Pulse Feature Button
4. Level Indicator Pulse Feature Button
5. Cancel Alarm Button
6. Main Menu Button

Figure 1–118
Pulse Feature Buttons

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 1–118.

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.

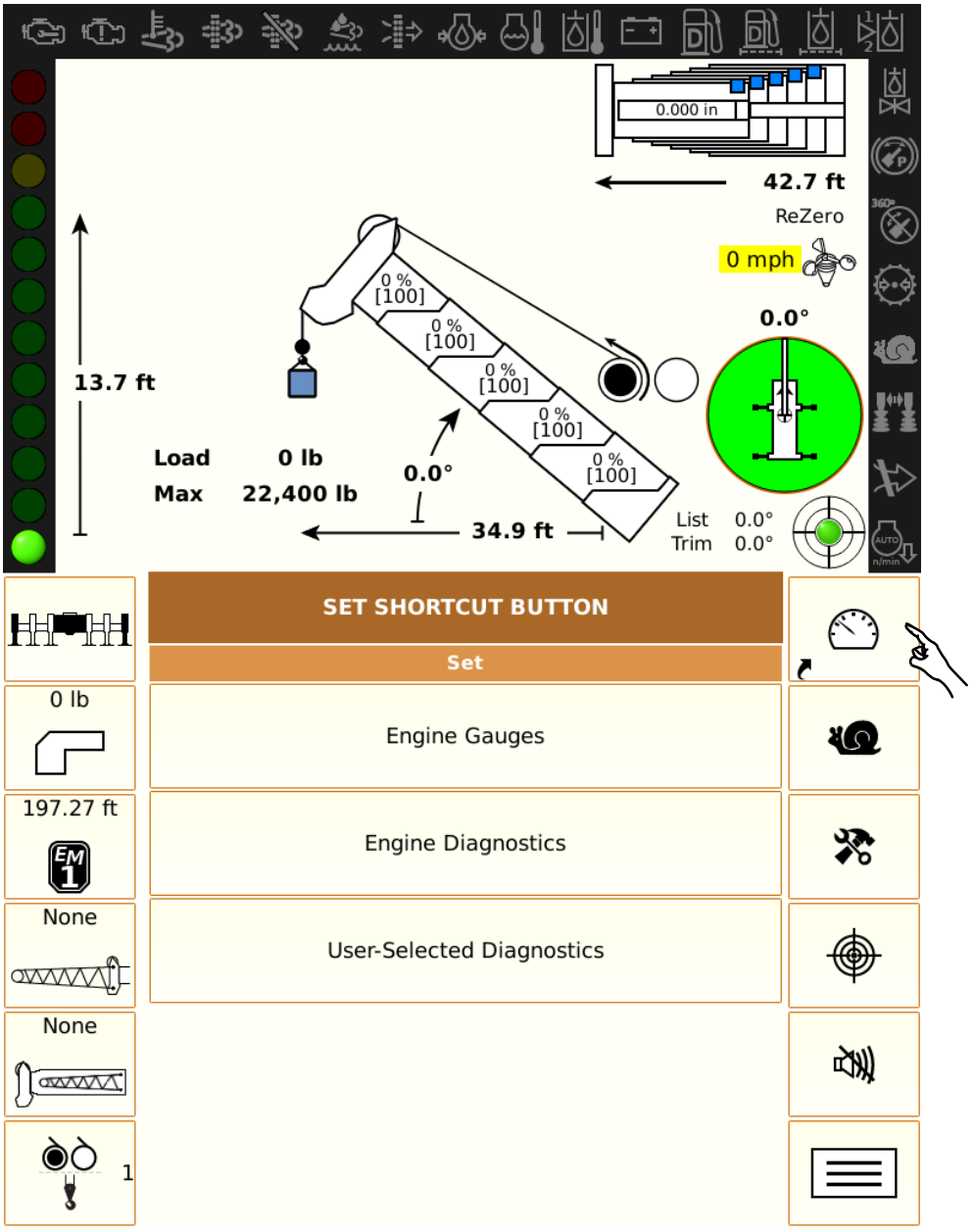


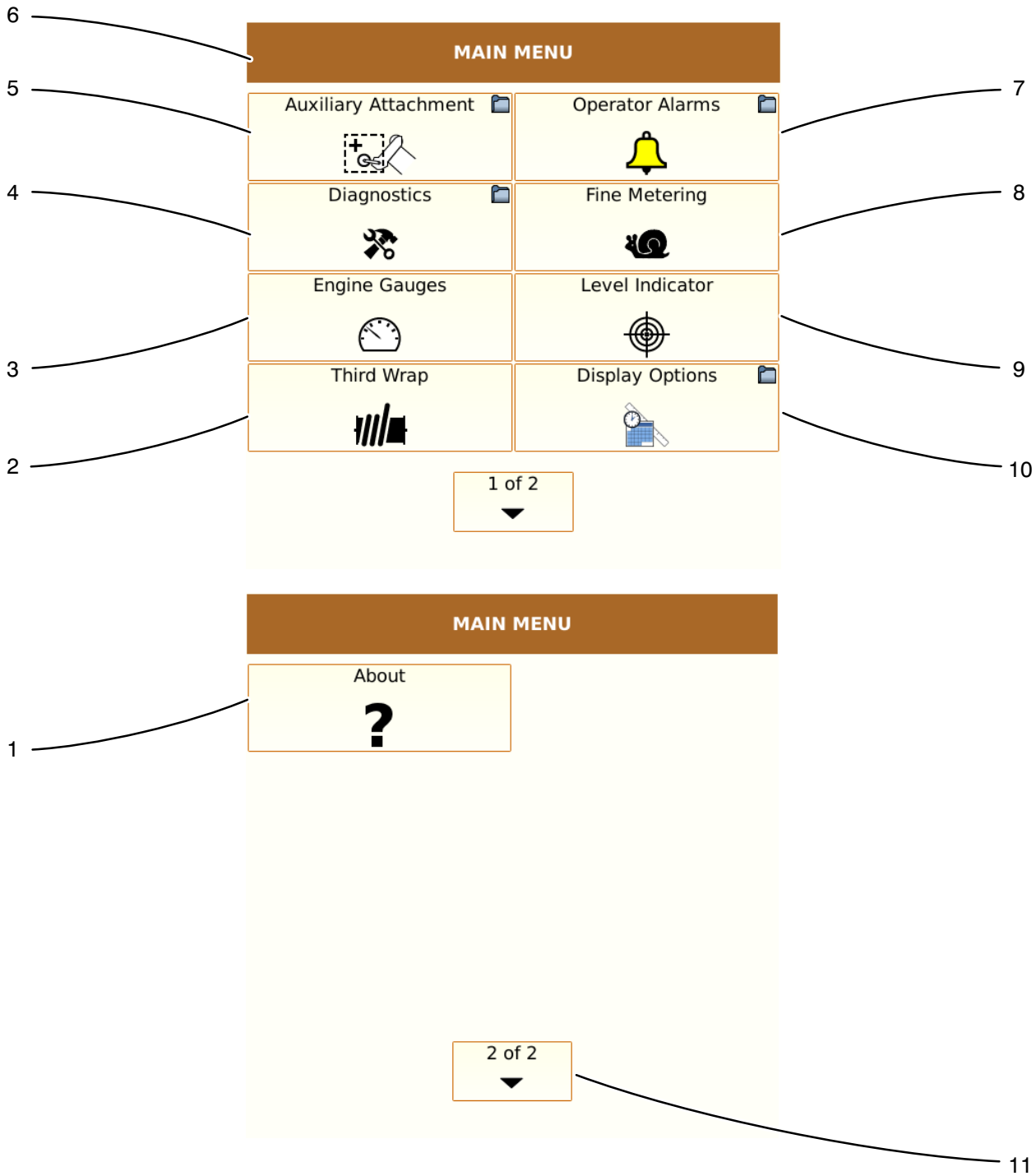
Figure 1—119
Shortcut Button

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—119.

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.



1. About Button
2. Third Wrap Button
3. Engine Gauges Button
4. Diagnostics Button
5. Auxiliary Attachment Button
6. Screen Header
7. Operator Alarms Button
8. Fine Metering Button
9. Level Indicator Button
10. Display Options Button
11. Page Toggle Button

Figure 1–120
Pulse Feature And RCL Configuration Area – Main Menu Screen

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 1−120.

1. About Button

   This button navigates to the About Screen. Refer to "About" in this section of this Operator's Manual.

2. Third Wrap Button

   This button navigates to the 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.

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 1−120.

   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 1−141.

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. 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 1−121.

11. Page Toggle Button

    This button allows the user to navigate through menu pages, as required.

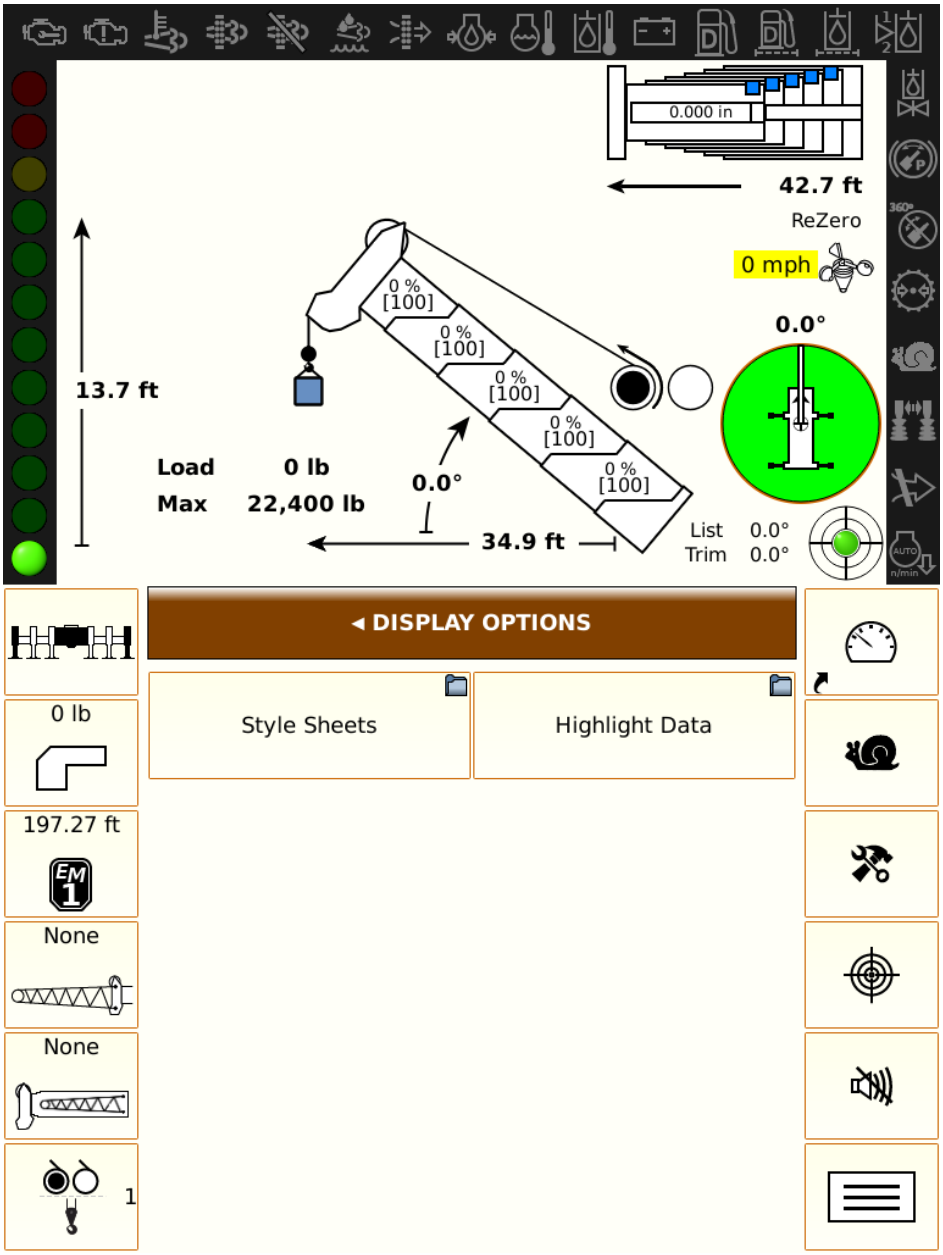


Figure 1—121
Display Options

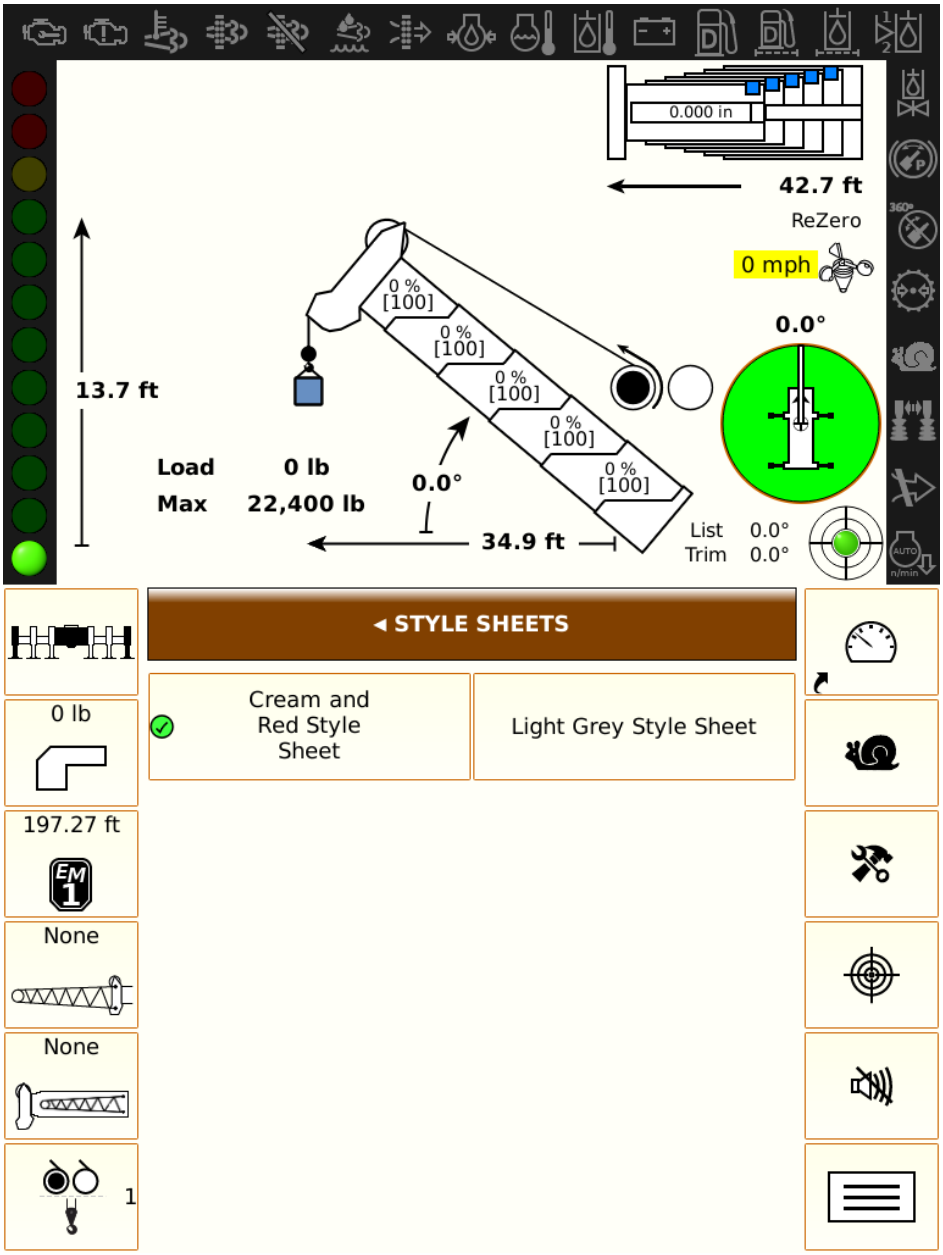


Figure 1—122
Display Options — Style Sheets

Style Sheets

1. From the Main Menu Screen, press the Display Options Button . Refer to Figure 1—120.
2. The Display Options Menu will appear. Press the Style Sheets Button. Refer to Figure 1—121.
3. The Style Sheets Menu will appear. Press the button for the desired style sheet. Refer to Figure 1—122 and Figure 1—123.

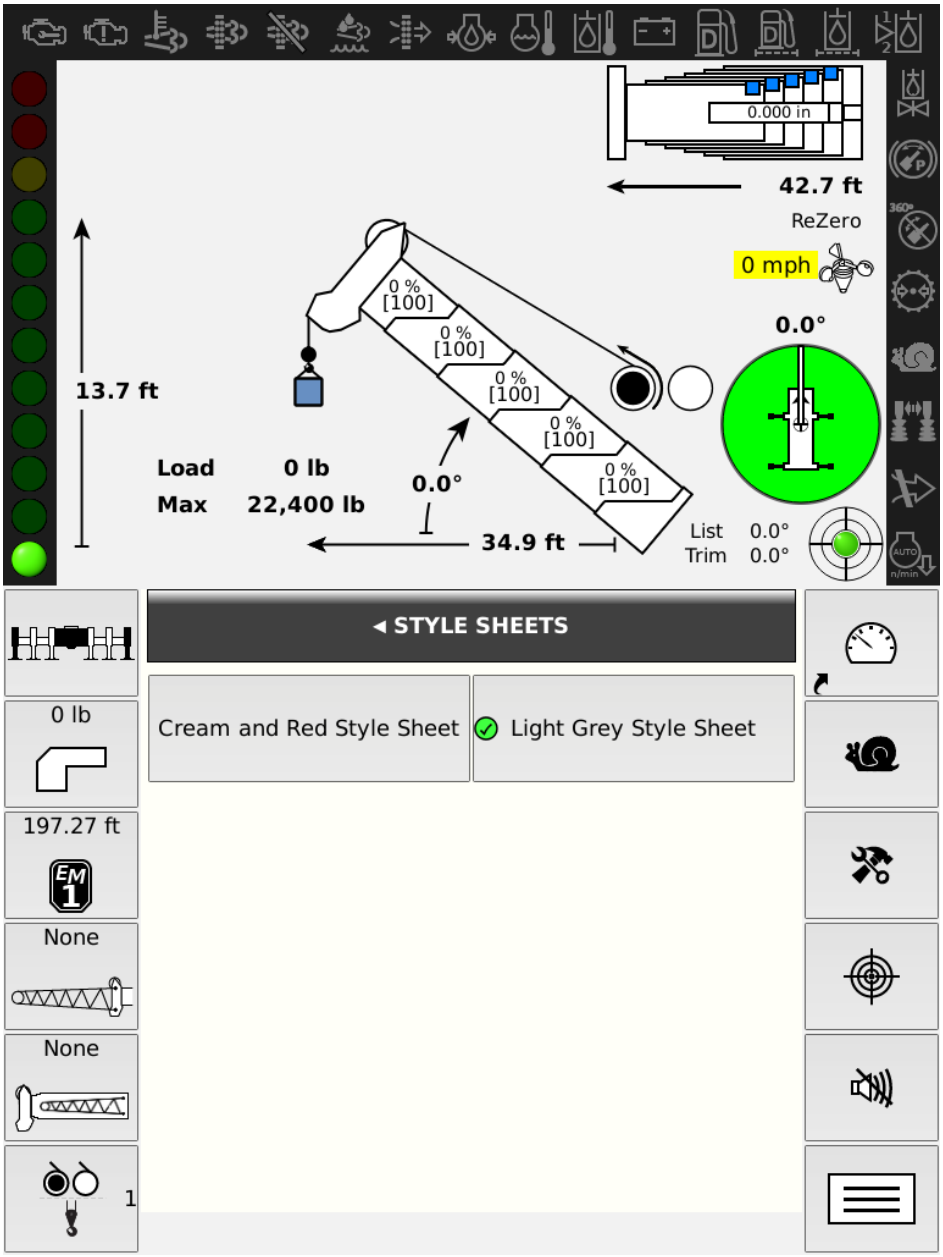


Figure 1—123
Display Options — Style Sheets — Light Grey

Note: The default Style Sheet is Cream Red Style Sheet. Refer to Figure 1—122. Refer to Figure 1—123 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.

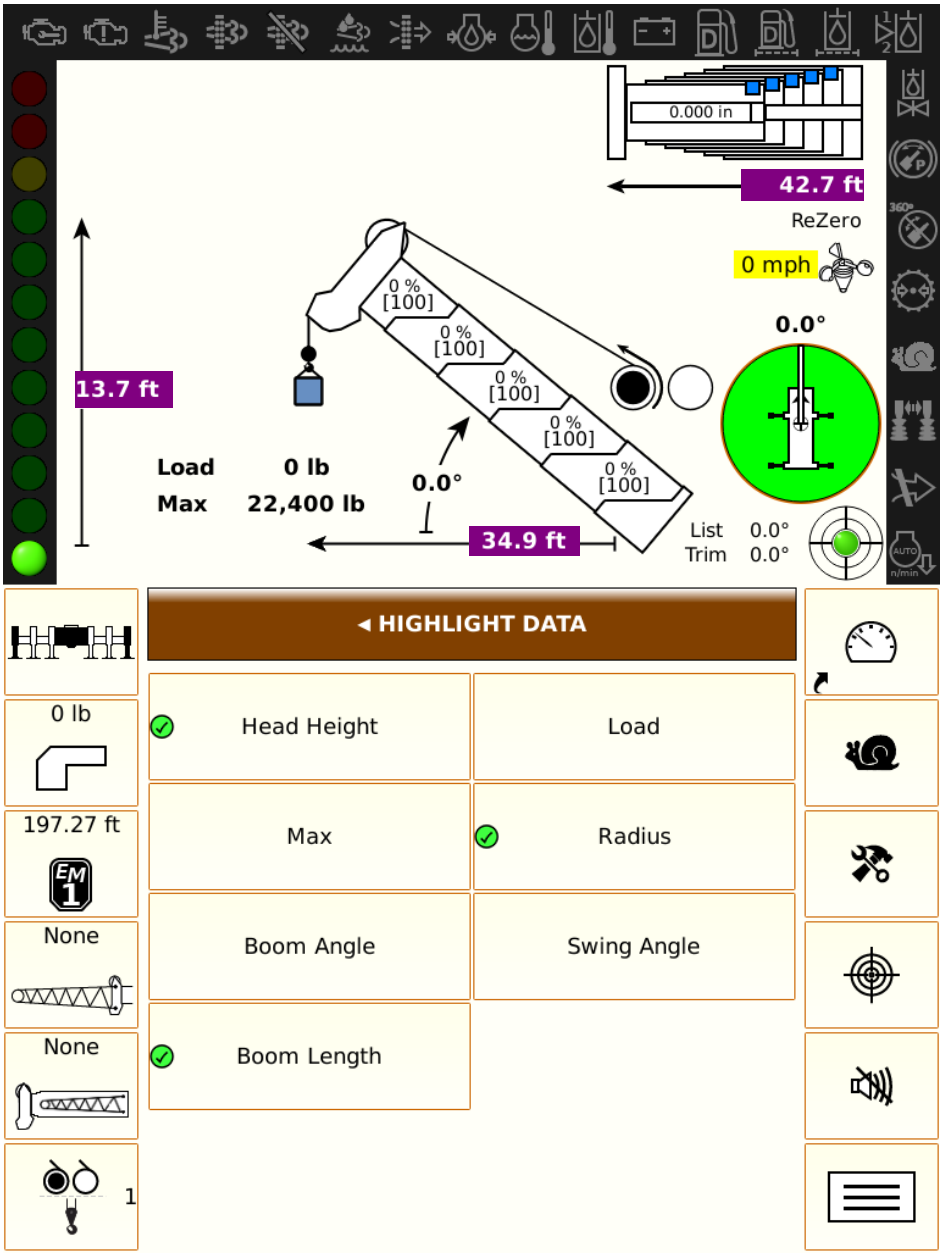


Figure 1—124
Display Options — Highlight Data

Highlight Data

1. From the Main Menu Screen, press the Display Options Button. Refer to Figure 1—120.
2. The Display Options Menu will appear. Press the Highlight Data Button. Refer to Figure 1—121.
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—124.
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.

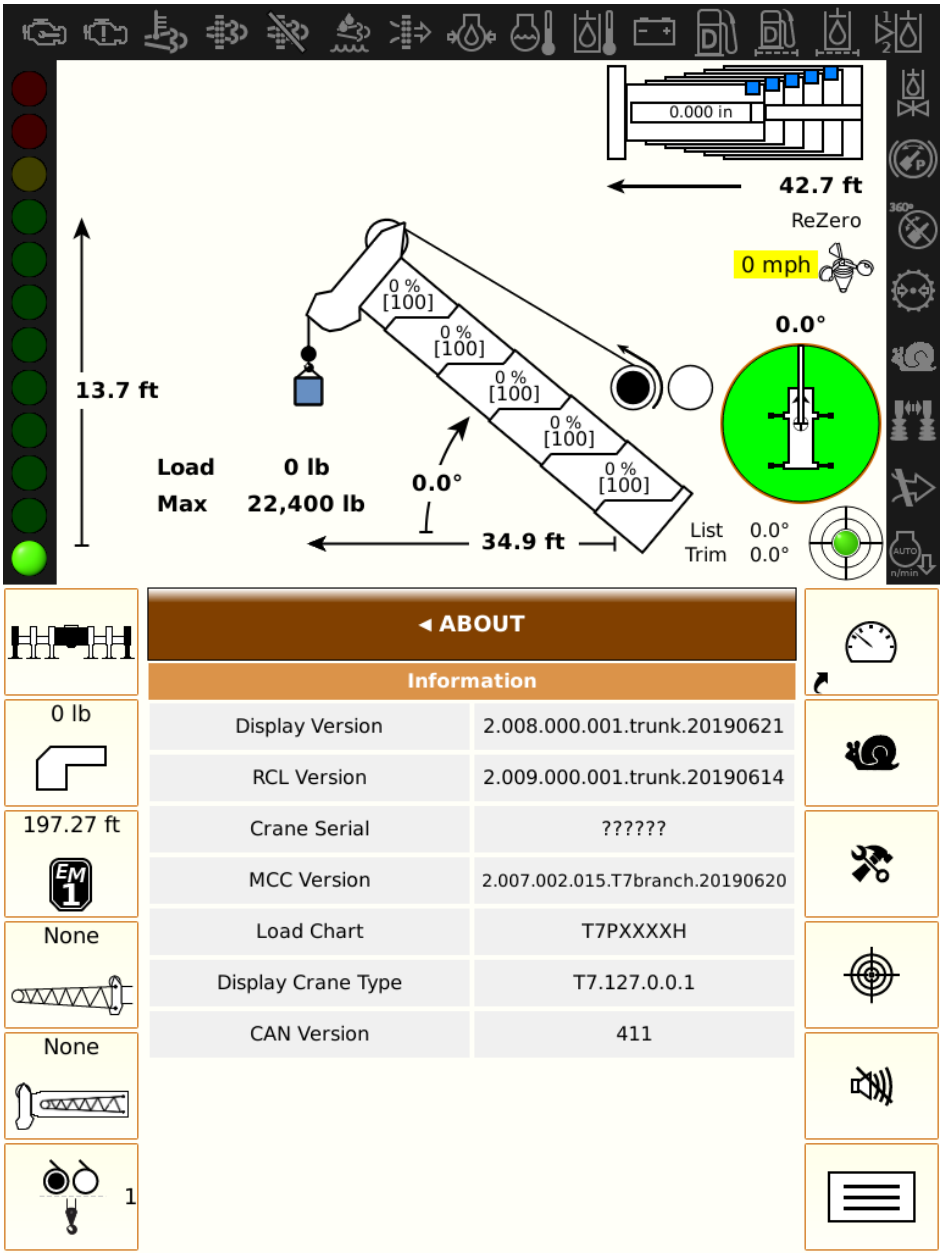
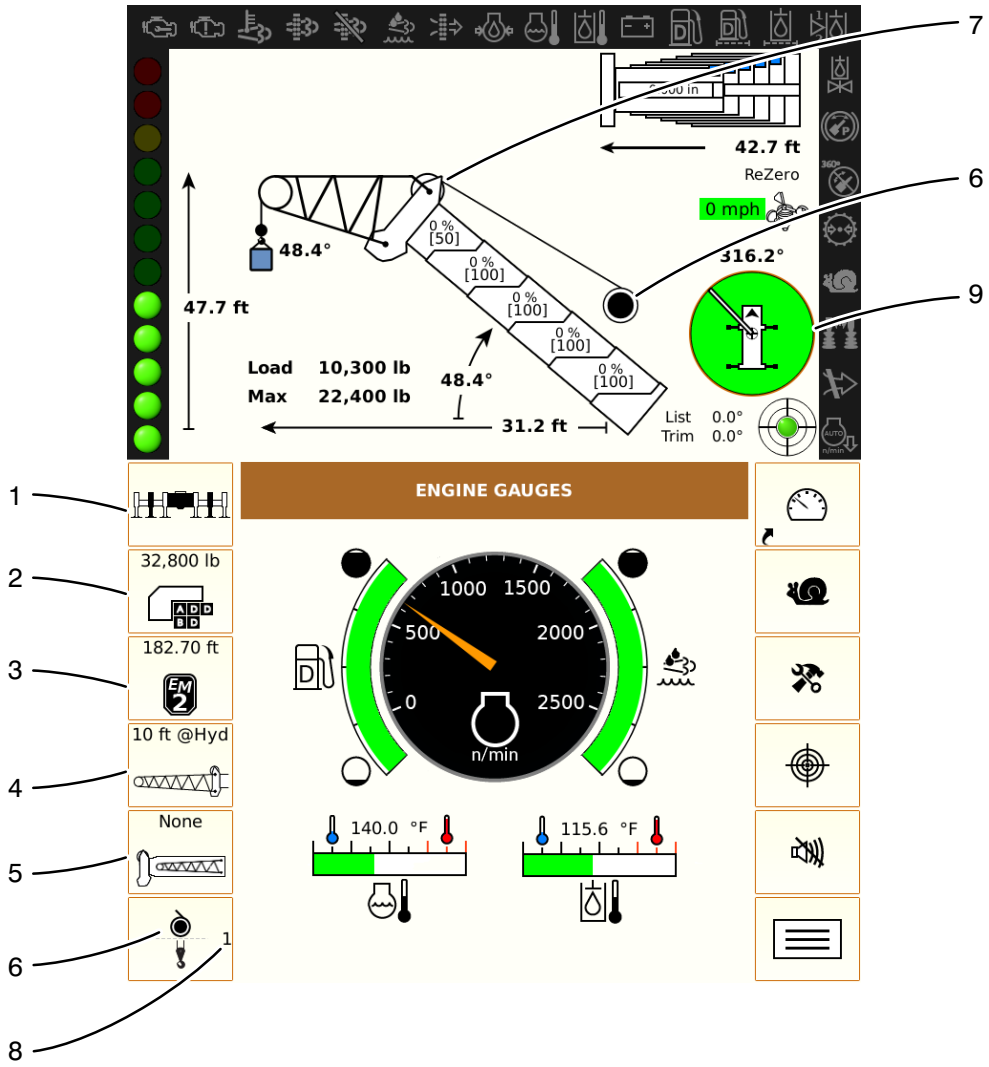


Figure 1—125
About

About

The About Screen indicates which version of the Display, ECM, and Boom Controller software is currently installed and the crane serial number. Refer to Figure 1—125.

1. From the Main Menu Screen, press the About Button ? . Refer to Figure 1—120.
2. The About Screen will appear. Refer to Figure 1—125.
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.



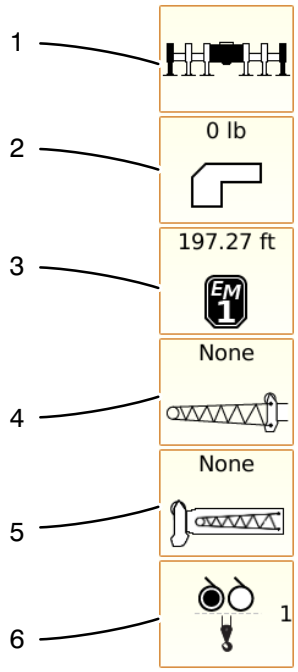
In this example the crane is setup on intermediate outriggers (1), 32,800 lb counterweight (2), boom mode EM2 (3), 10 ft fly erected (4), no stowed attachment (5), the front winch selected (6), with the winch wire rope reeved over the main boom head (7), with one part of line (8), and 360° capacities with the boom currently positioned at 316.2° (9).

Figure 1–126
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.



1. Base Configuration Button
2. Counterweight Configuration Button
3. Boom Extension Mode Button
4. Erected Attachment Configuration Button
5. Stowed Attachment Configuration Button
6. Winch Setup Button

Figure 1—127
RCL Configuration Buttons

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—127.

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 VCALC. 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.

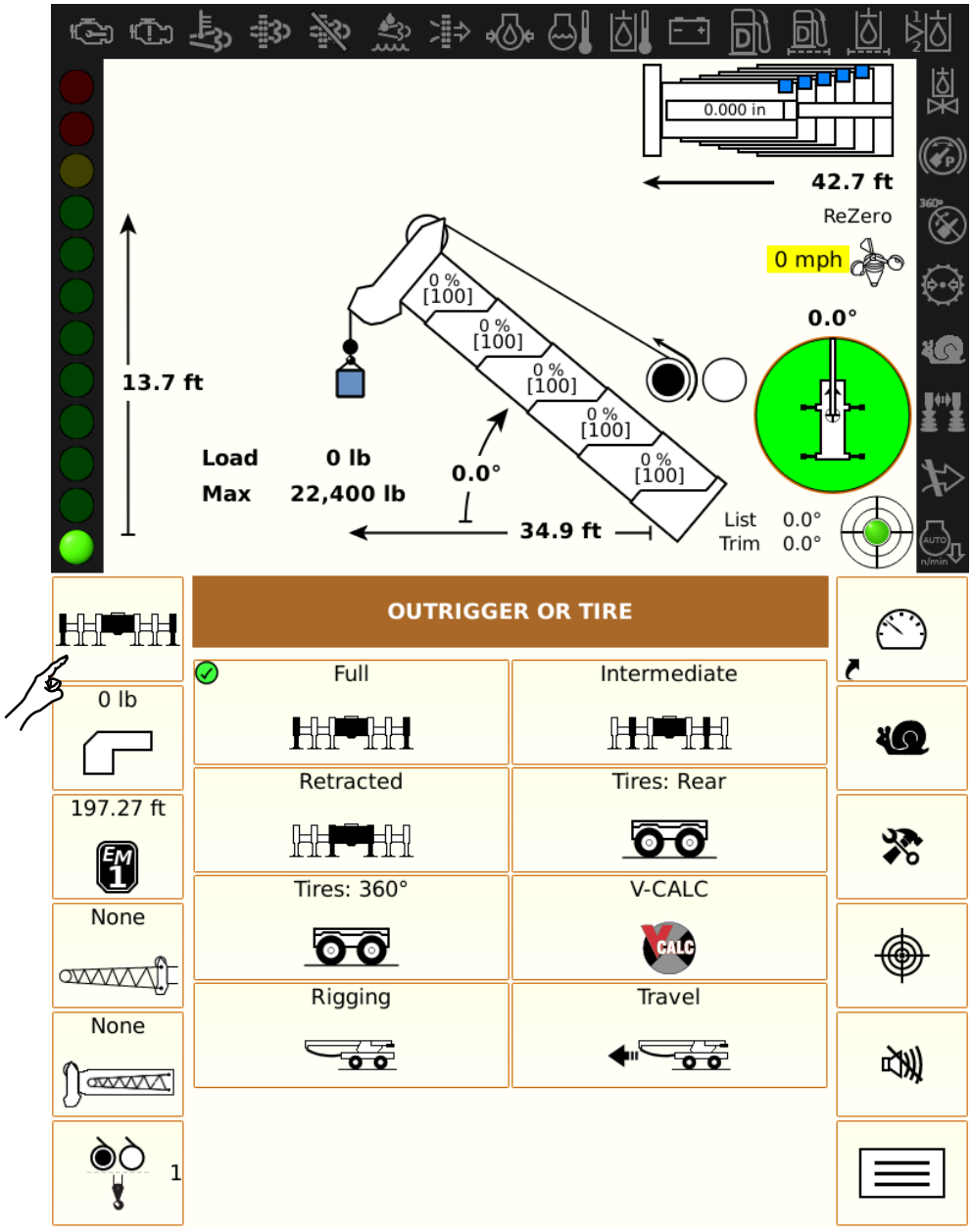


Figure 1—128
Base Configuration

Base Configuration

1. Press the Base Configuration Button. Refer to Figure 1—127.
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 1 of 2 to toggle between pages, as required. Refer to Figure 1—128 and Figure 1—129.

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.

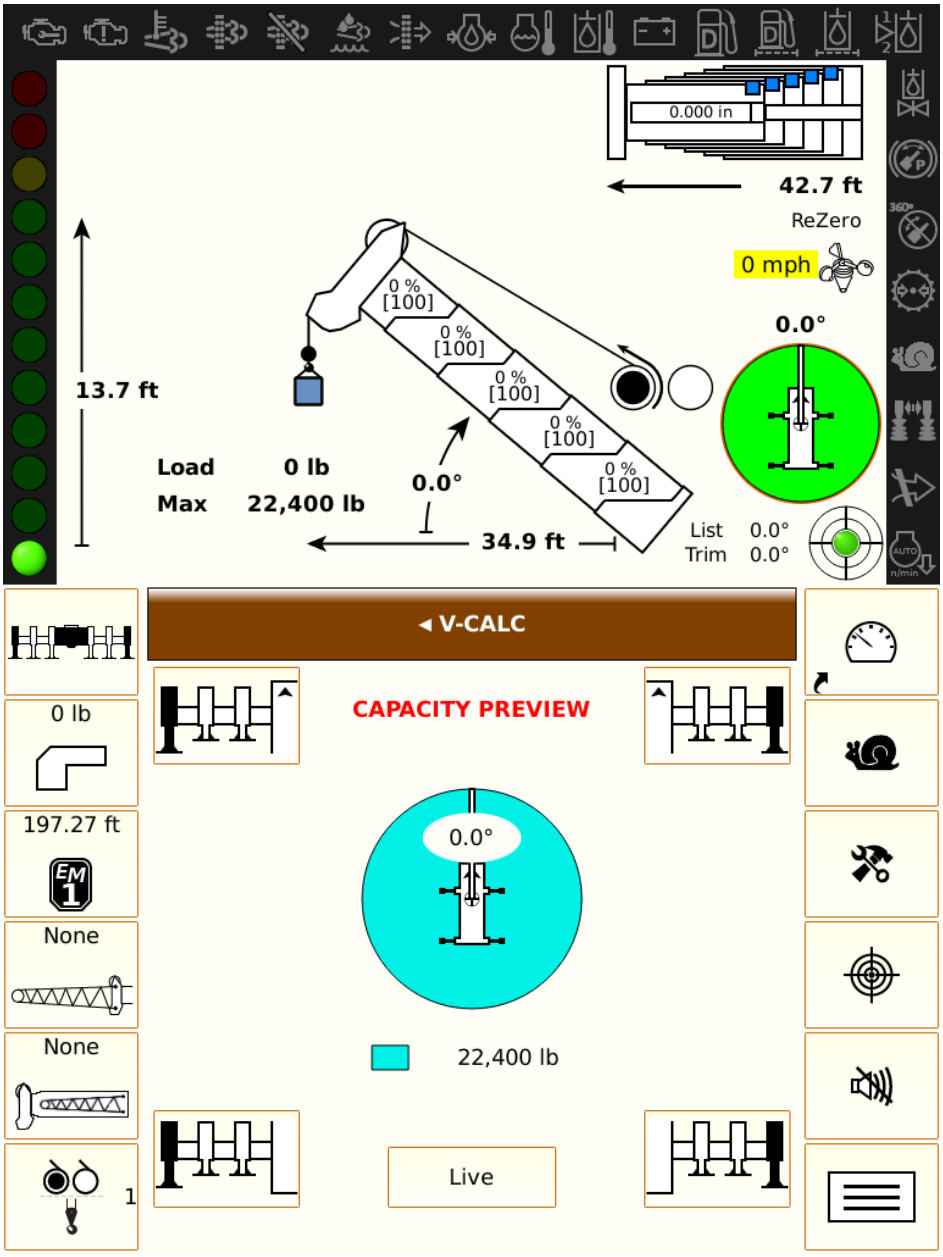


Figure 1—129
Base Configuration — V-CALC — Capacity Preview

b. If V-CALC is selected, the V-CALC Capacity Preview Display will appear. Press the Screen Header ◂ to return to the previous menu, as required. Refer to Figure 1—129.

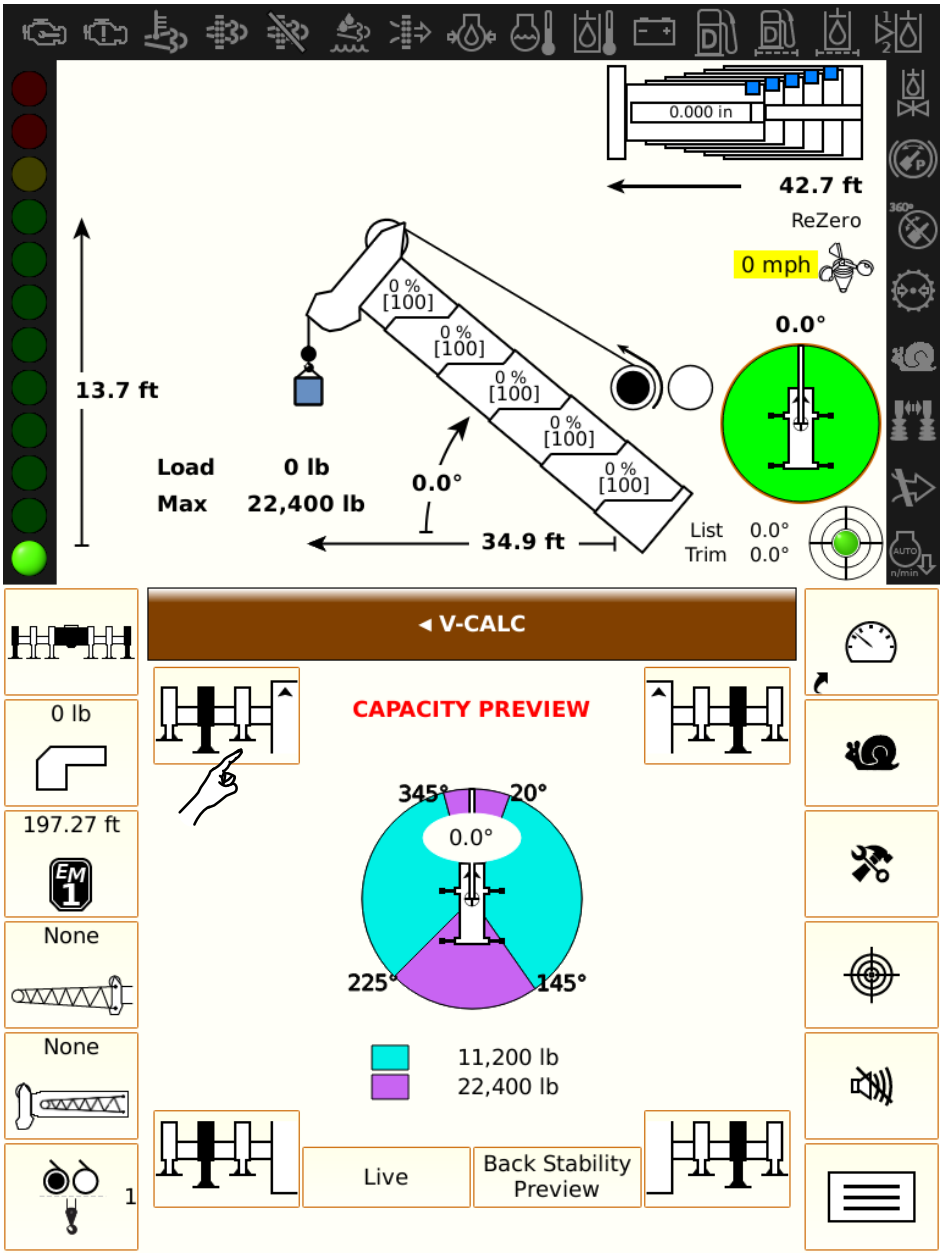


Figure 1—130
Base Configuration — V-CALC — Outrigger Configuration

c. Press the Outrigger Toggle Buttons corresponding to the outriggers being configured until the actual V-CALC configuration is obtained. Refer to Figure 1—129 and Figure 1—130.

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.

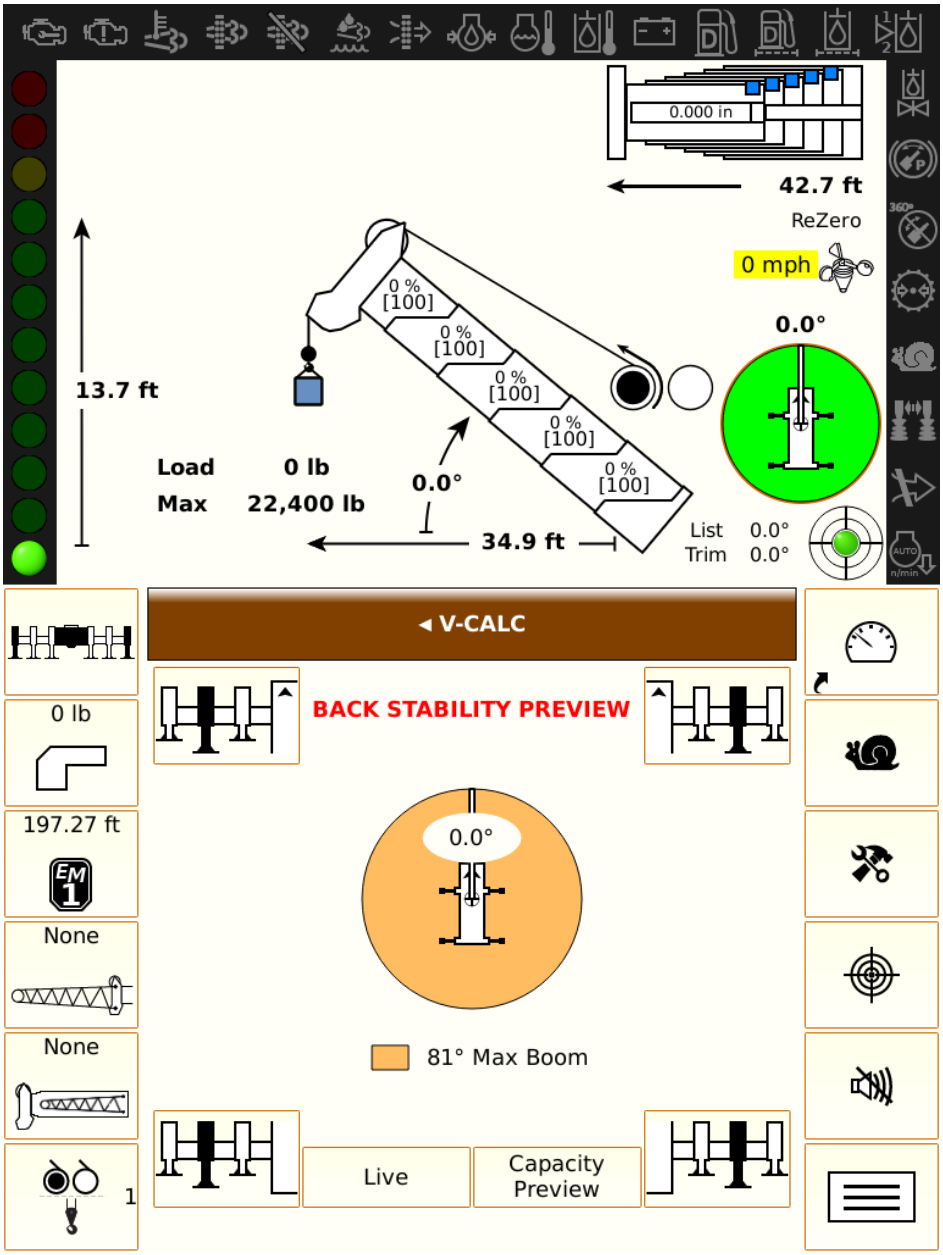


Figure 1—131
Base Configuration — VCALC — Back Stability Preview

d. Press the Live Button or Back Stability Preview Button under the Capacity Preview Display, as required. Refer to Figure 1—130.

Note: In the Back Stability Preview Display, different colors represent maximum allowable boom angles. Refer to the legend for actual boom angle values.

- If the Back Stability Preview Button was pressed, the display will change and graphically display the Back Stability Preview Display. Press the Outrigger Toggle Buttons , Live Button, or Capacity Preview Button, as required. Refer to Figure 1—131.

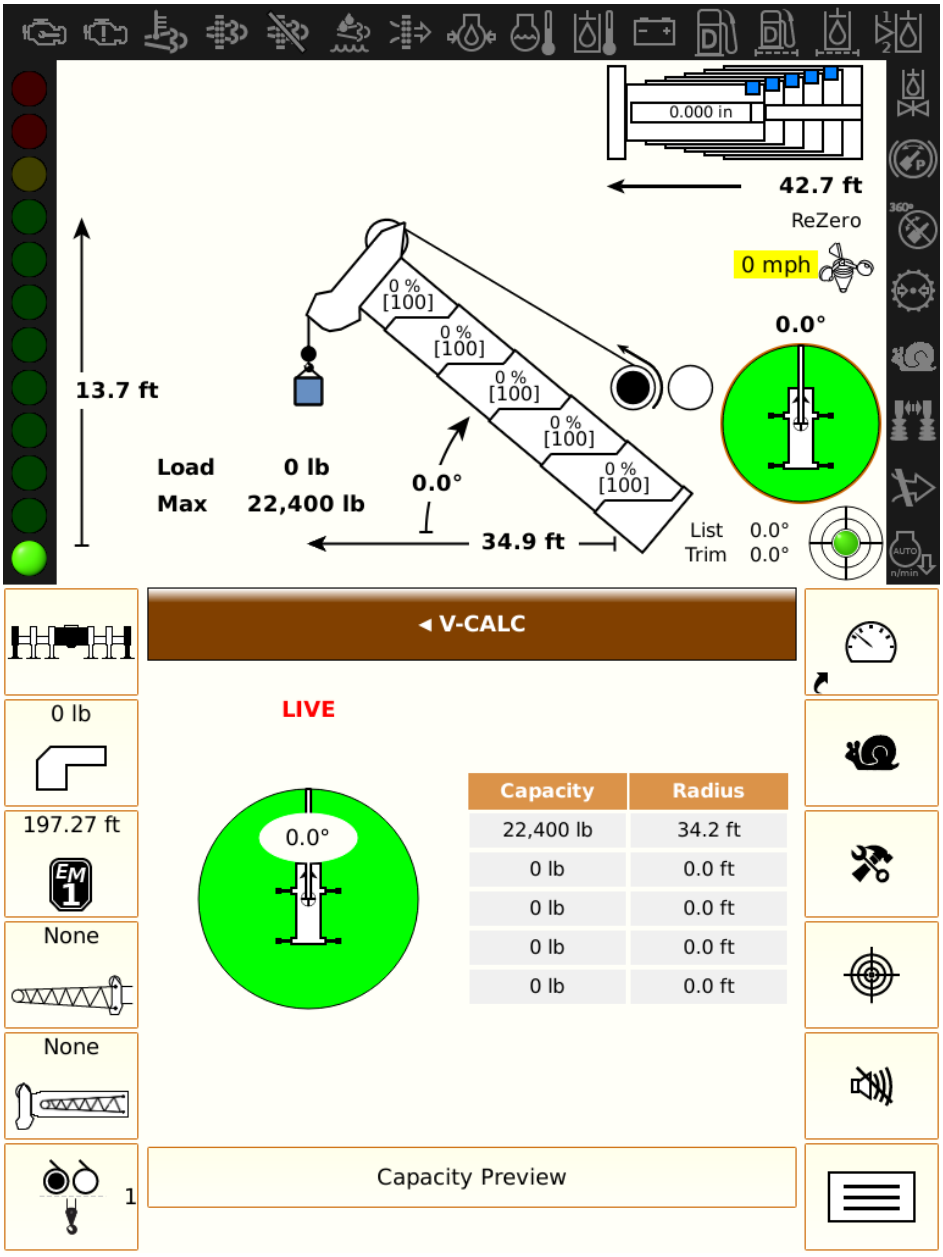


Figure 1—132
Base Configuration — VCALC — Live Working Radius

- If the Live Button was pressed, the display will change and graphically display the Live Radius Range Display. Press the Capacity Preview Button, as required. Refer to Figure 1—132.

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.

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.

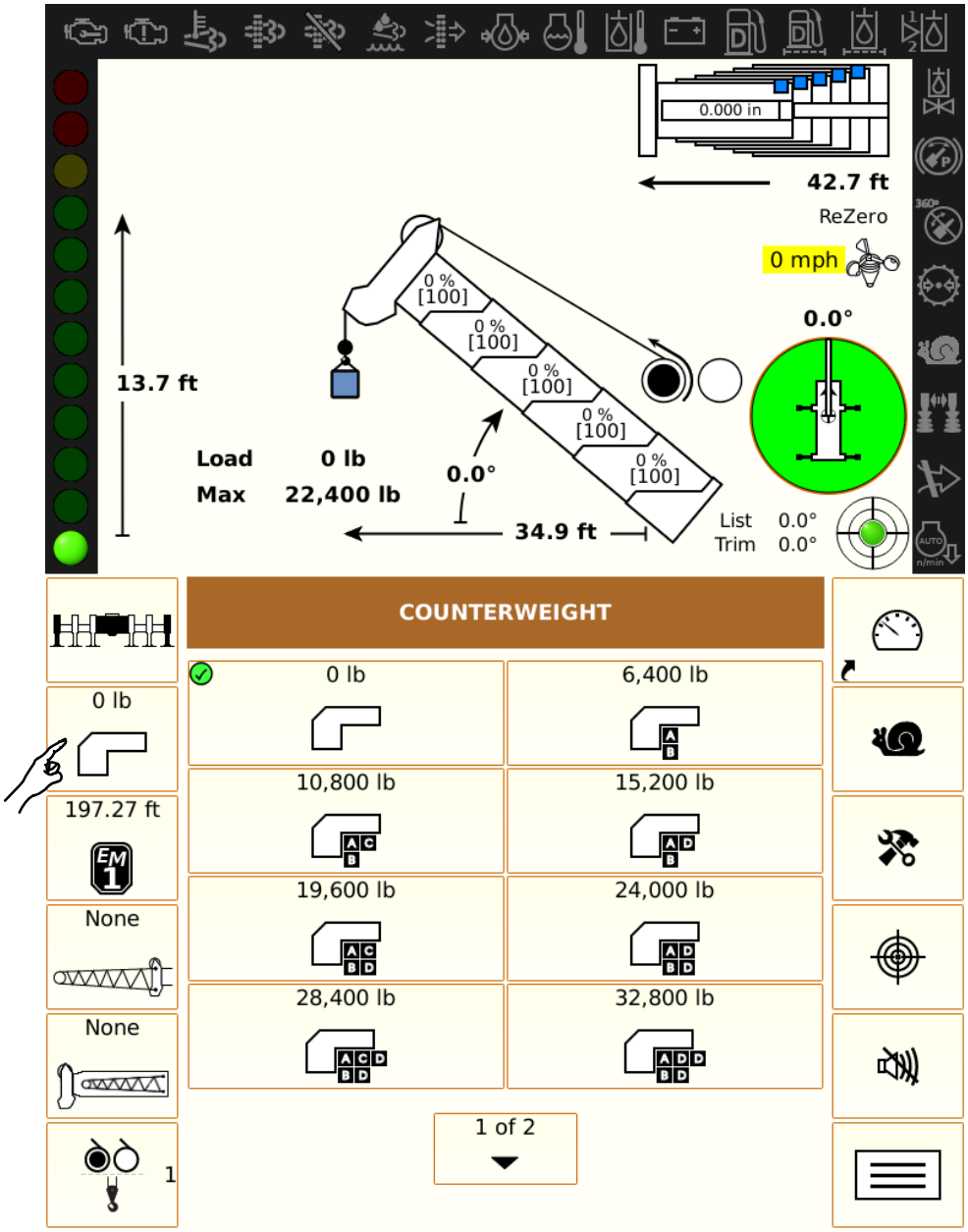


Figure 1–133
Counterweight Configuration

Counterweight Configuration

1. Press the Counterweight Configuration Button . Refer to Figure 1–127.
2. The Counterweight Menu will appear. The activation icon will be present on the button of the previously set configuration. Press the Page Toggle Button to toggle between Counterweight Configuration Menu pages. Refer to Figure 1–133.
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.

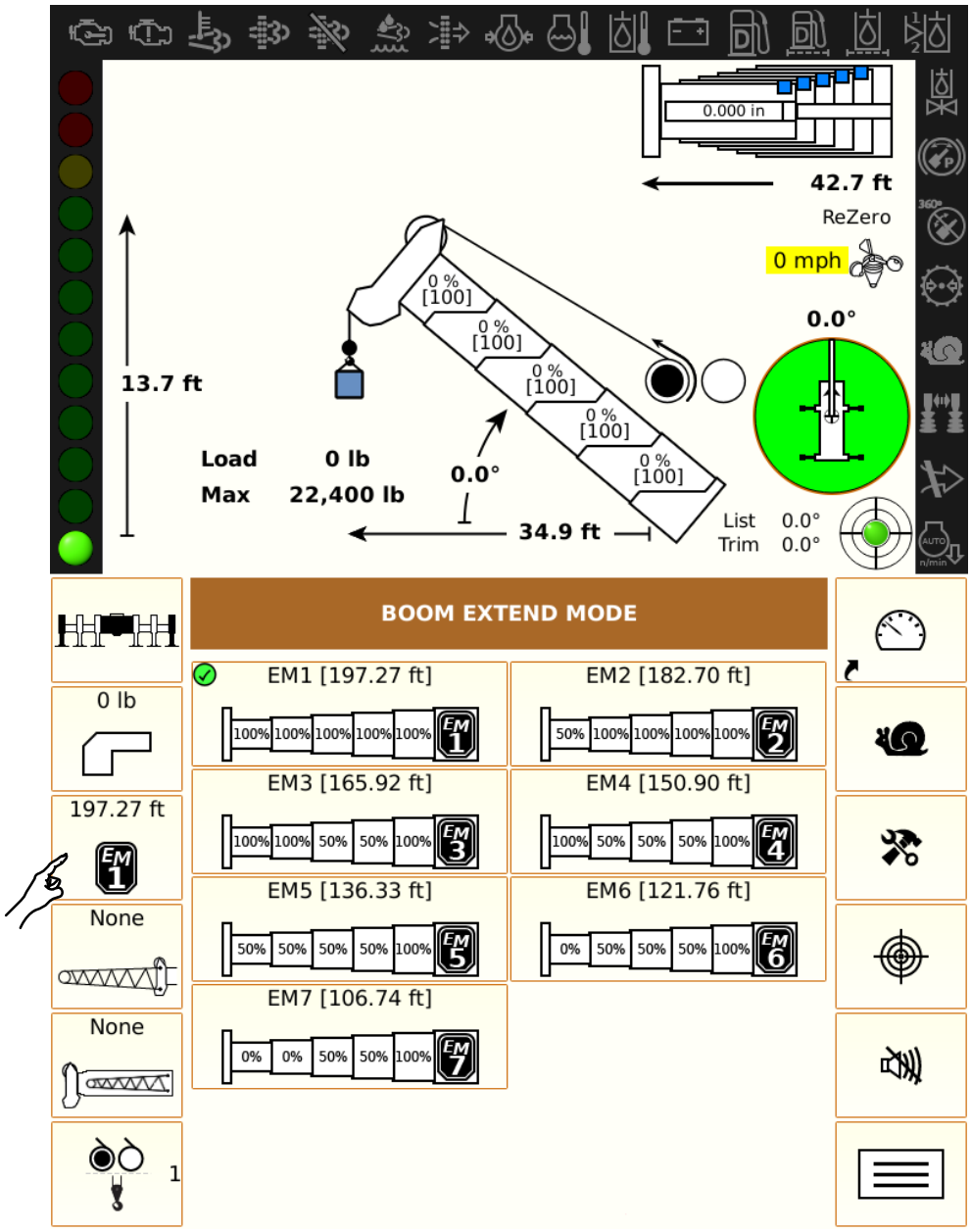


Figure 1—134
Boom Extension Mode

Boom Extension Mode

1. Press the Boom Extension Mode Button . Refer to Figure 1—127.
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—134.

   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.

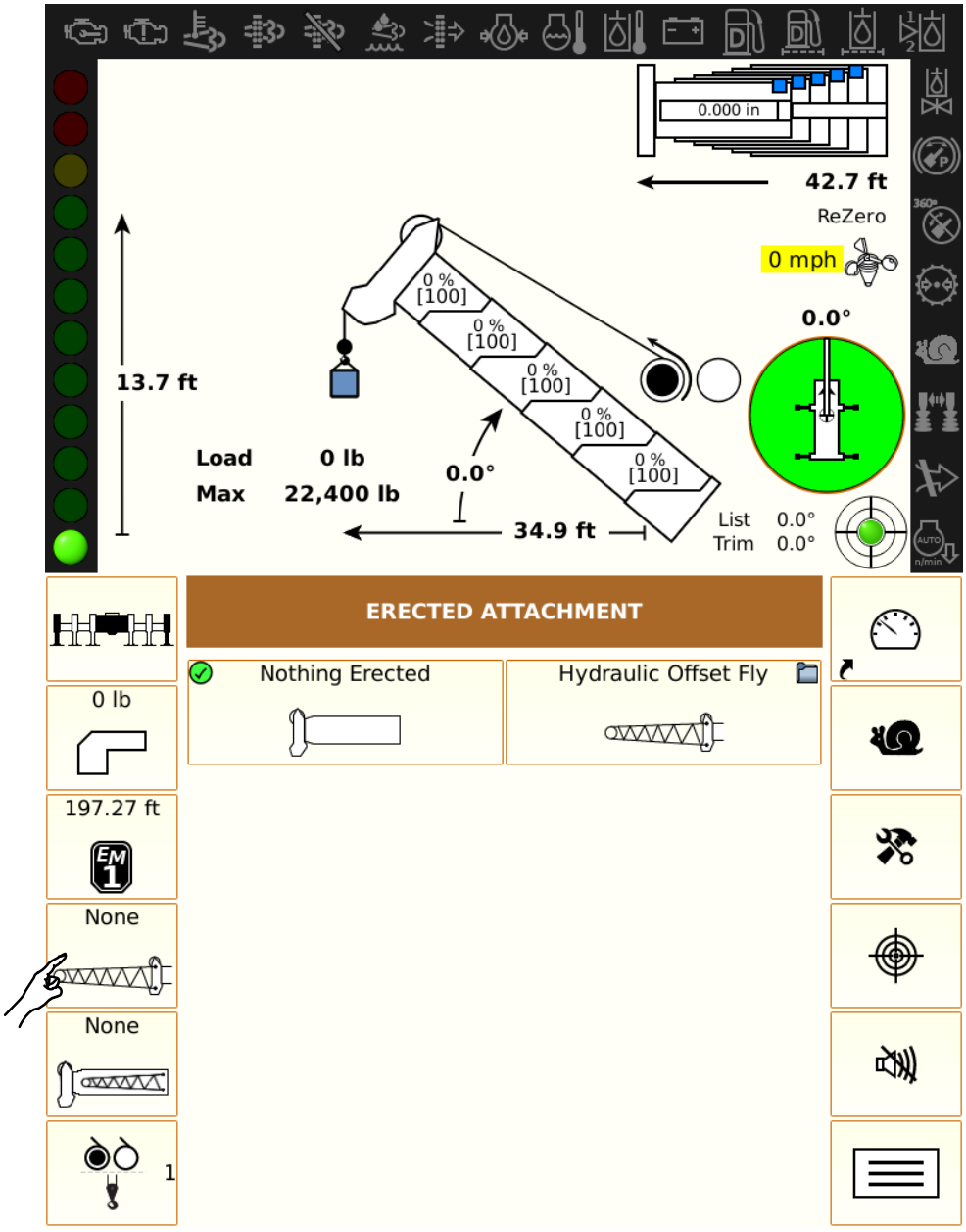


Figure 1—135
Erected Attachment Configuration

Erected Attachment Configuration

1. Press the Erected Attachment Configuration Button . Refer to Figure 1—127.
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—135.

Note: The Offset Fly Button will reflect the type of fly (manual or hydraulic) is equipped with the crane. If the boom is not fully retracted, menu options will not be available.

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.

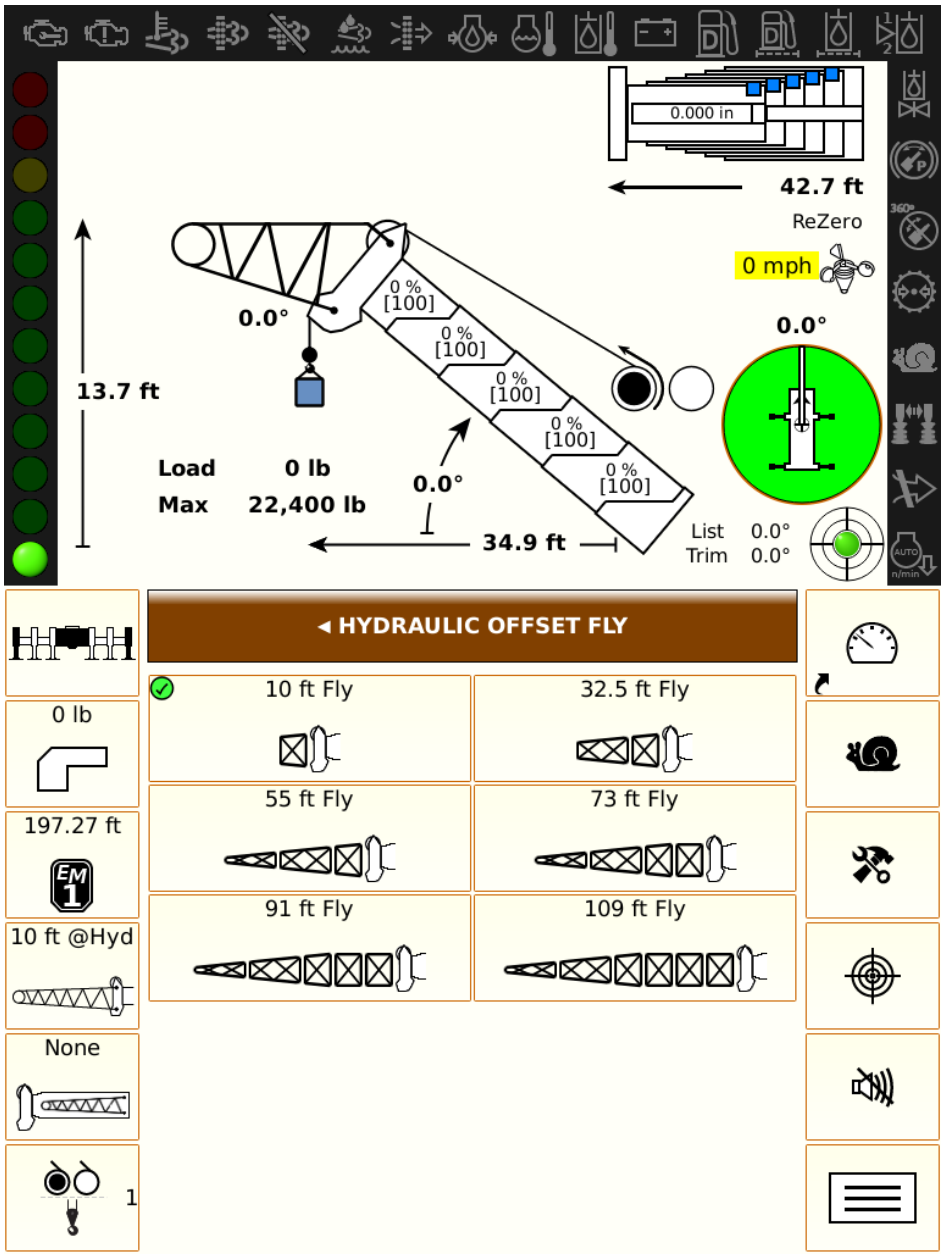


Figure 1—136
Erected Attachment Offset Configuration

b. If an Erected Attachment is selected, a Hydraulic Offset Fly Menu 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—136.

Note: If a fixed offset fly angle is selected, the fly angle will appear on the Erected Attachment Configuration Button. Refer to Figure 1—136.

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.

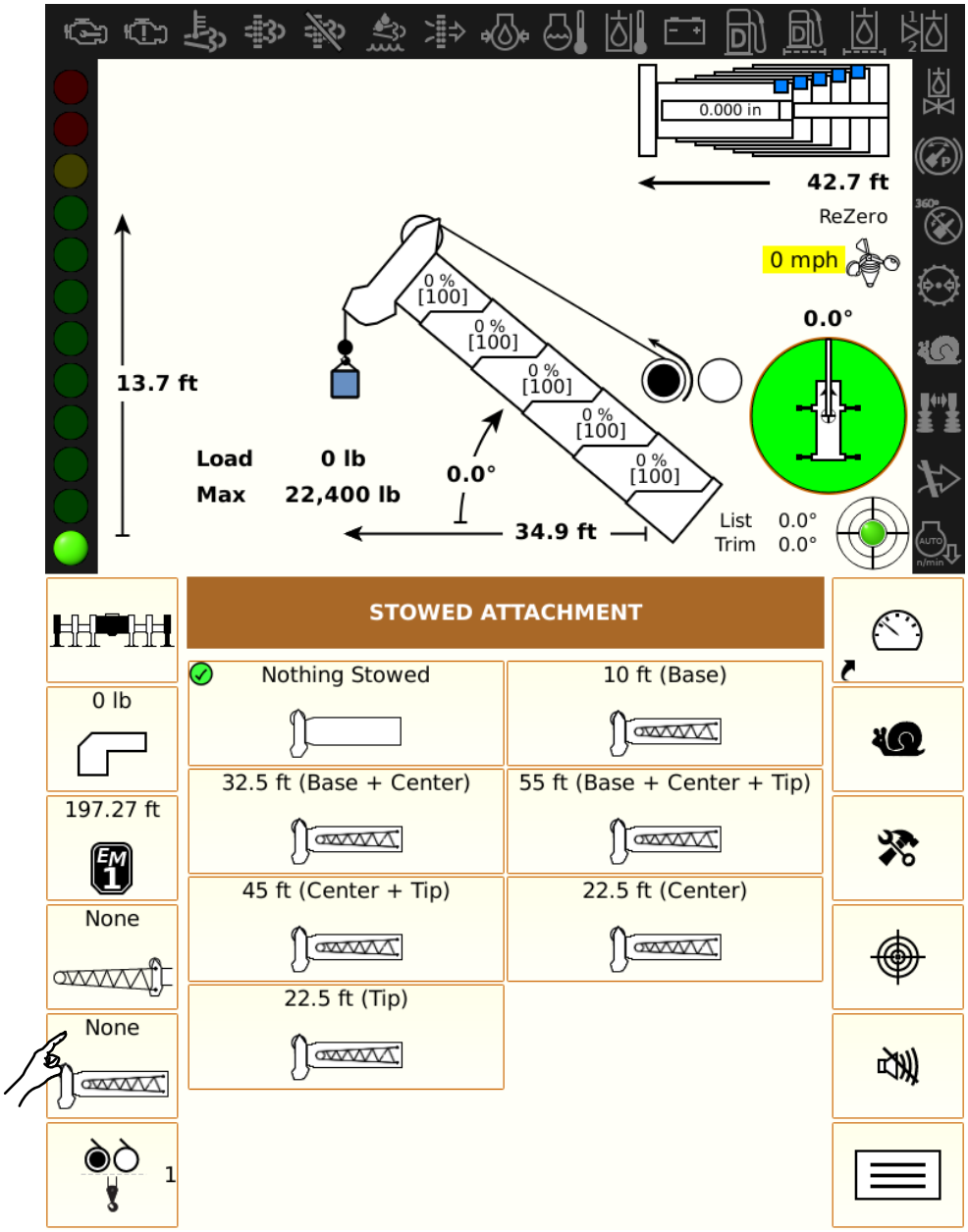
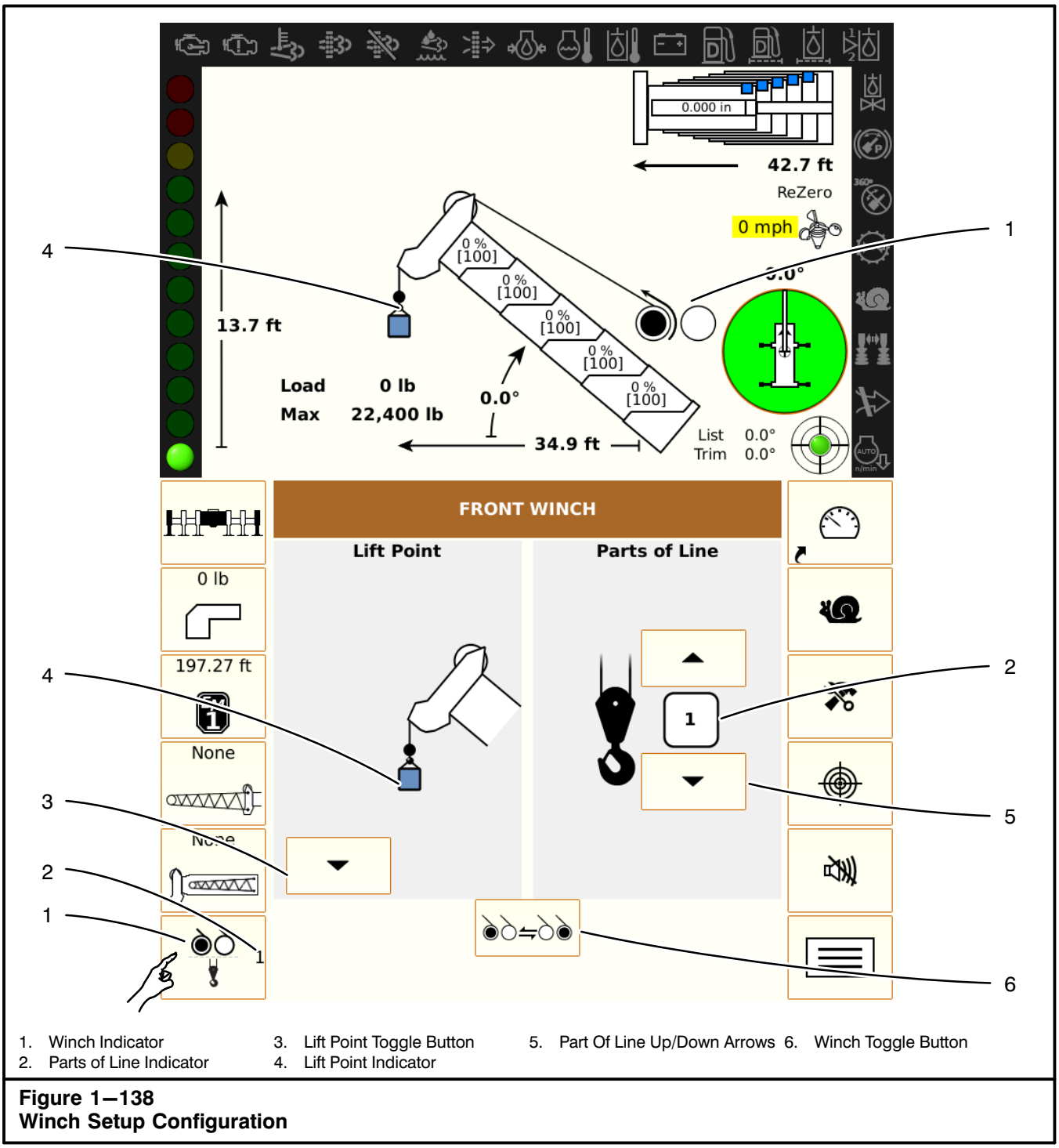


Figure 1—137
Stowed Attachment Configuration

Stowed Attachment Configuration

1. Press the Stowed Attachment Configuration Button . Refer to Figure 1—127.
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—137.
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.



1. Winch Indicator
2. Parts of Line Indicator
3. Lift Point Toggle Button
4. Lift Point Indicator
5. Part Of Line Up/Down Arrows
6. Winch Toggle Button

Figure 1—138
Winch Setup Configuration

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—138.

1. Press the Winch Setup Button . Refer to Figure 1—127.
2. The Winch Setup Screen will appear for the active winch. Refer to Figure 1—138.
   a. Activate the desired winch by pressing the Winch Toggle Button until the desired winch is displayed on the menu header.
   b. Select the desired lift point by pressing the Down Arrow Button below the Lift Point Indicator until the desired lift point is displayed.

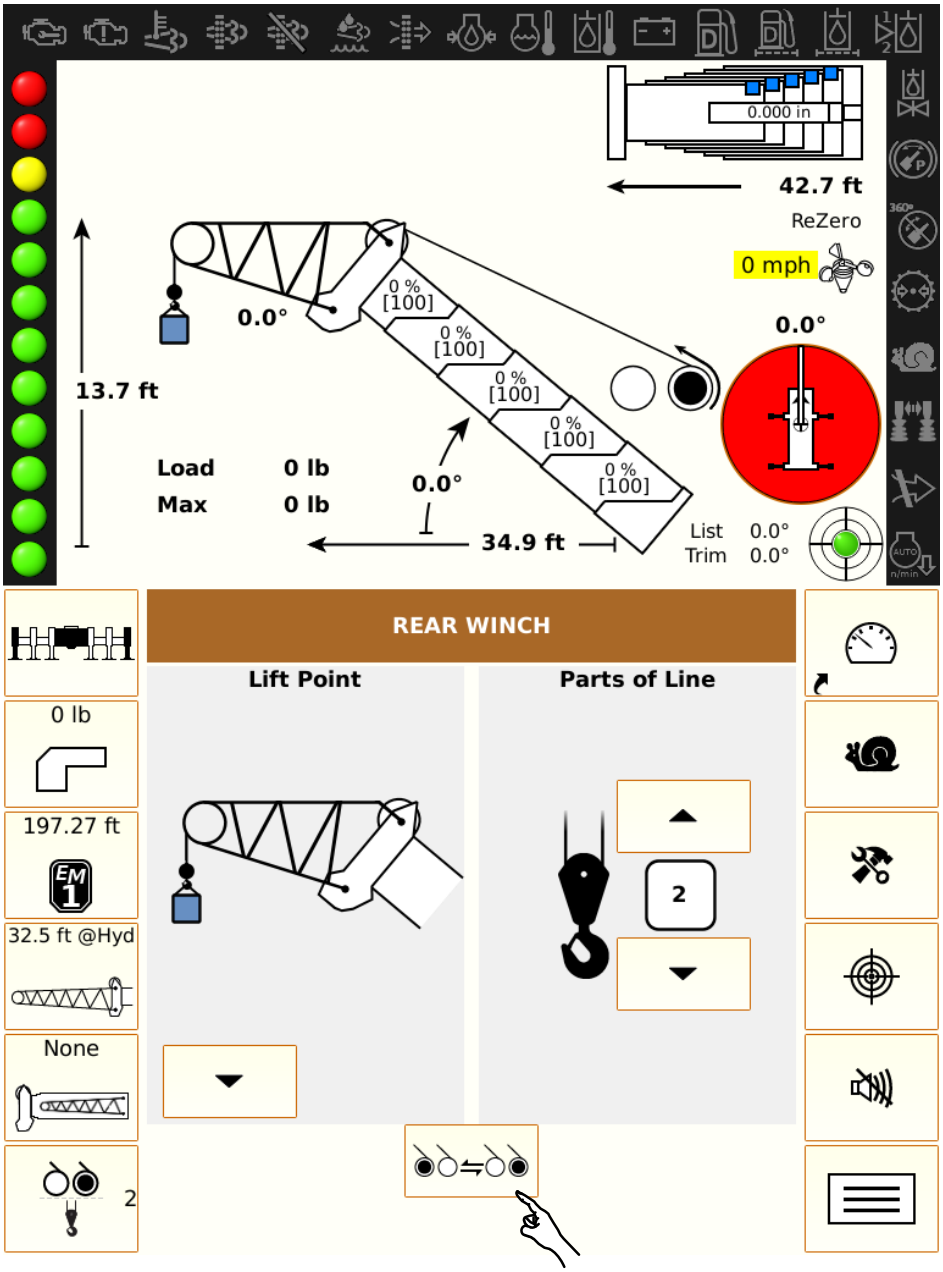


Figure 1—139
Winch Setup Configuration Continued

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—139.

Note: Figure 1—139 is an example of a rear winch configuration in which there are two parts of line and the lift point is at the head of the installed 32.5 ft 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.

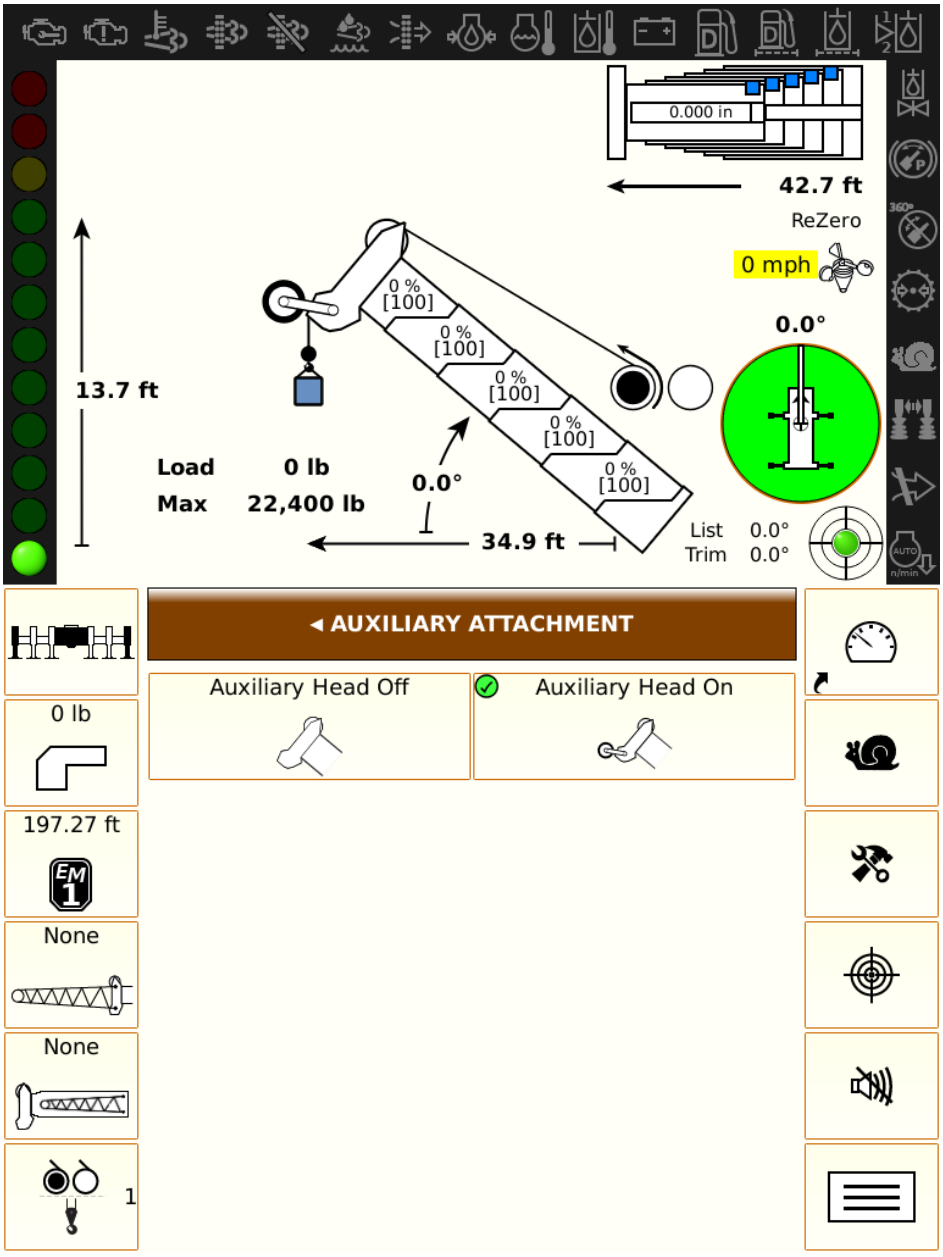


Figure 1—140
Auxiliary Attachment

Auxiliary Attachment

1. From the Main Menu Screen, press the Auxiliary Attachment Button. Refer to Figure 1—120.
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—140.
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—140.

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.

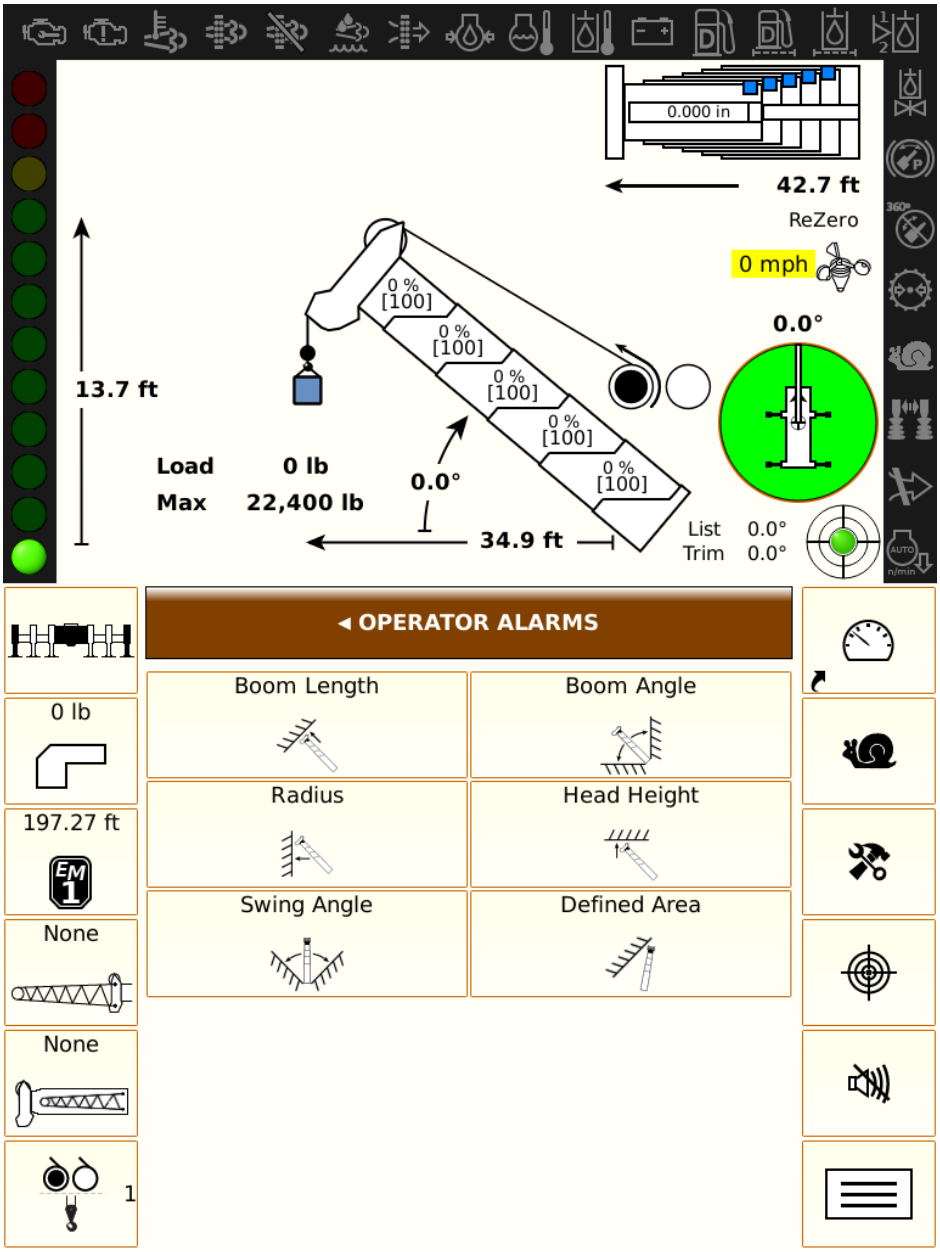


Figure 1—141
Operator Alarms

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 1–120.

   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 ground.

2. The Operator Alarms Menu will appear. Press the button for the desired operator alarm. Refer to Figure 1–141.
   a. The selected operator alarm display will appear. Refer to Figure 1–142 through Figure 1–153.

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.

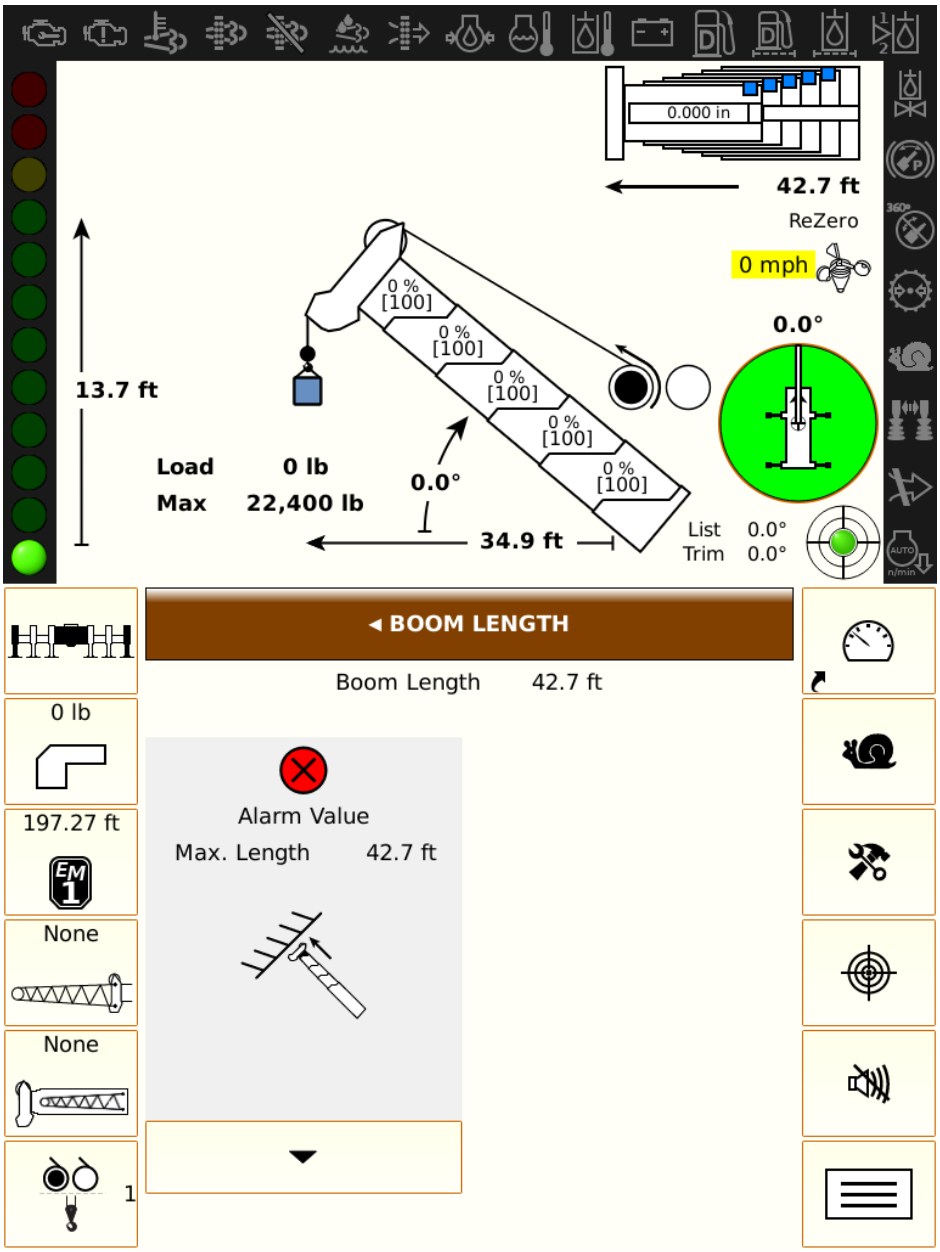


Figure 1—142
Operator Alarms — Boom Length

To Set Maximum Boom Length Alarm (Example)

Example: To have an alarm whenever the boom length reaches 42.7 feet *(13.02m)*, use the following procedure:

1. From the Main Menu Screen, press the Operator Alarms Button. Refer to Figure 1—120.
2. The Operator Alarms Menu will appear. Press the Boom Length Button. Refer to Figure 1—141.
3. The Boom Length Screen will appear. Refer to Figure 1—142.
4. Extend the boom to the length of 42.7 feet *(13.02m)*.
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—143.

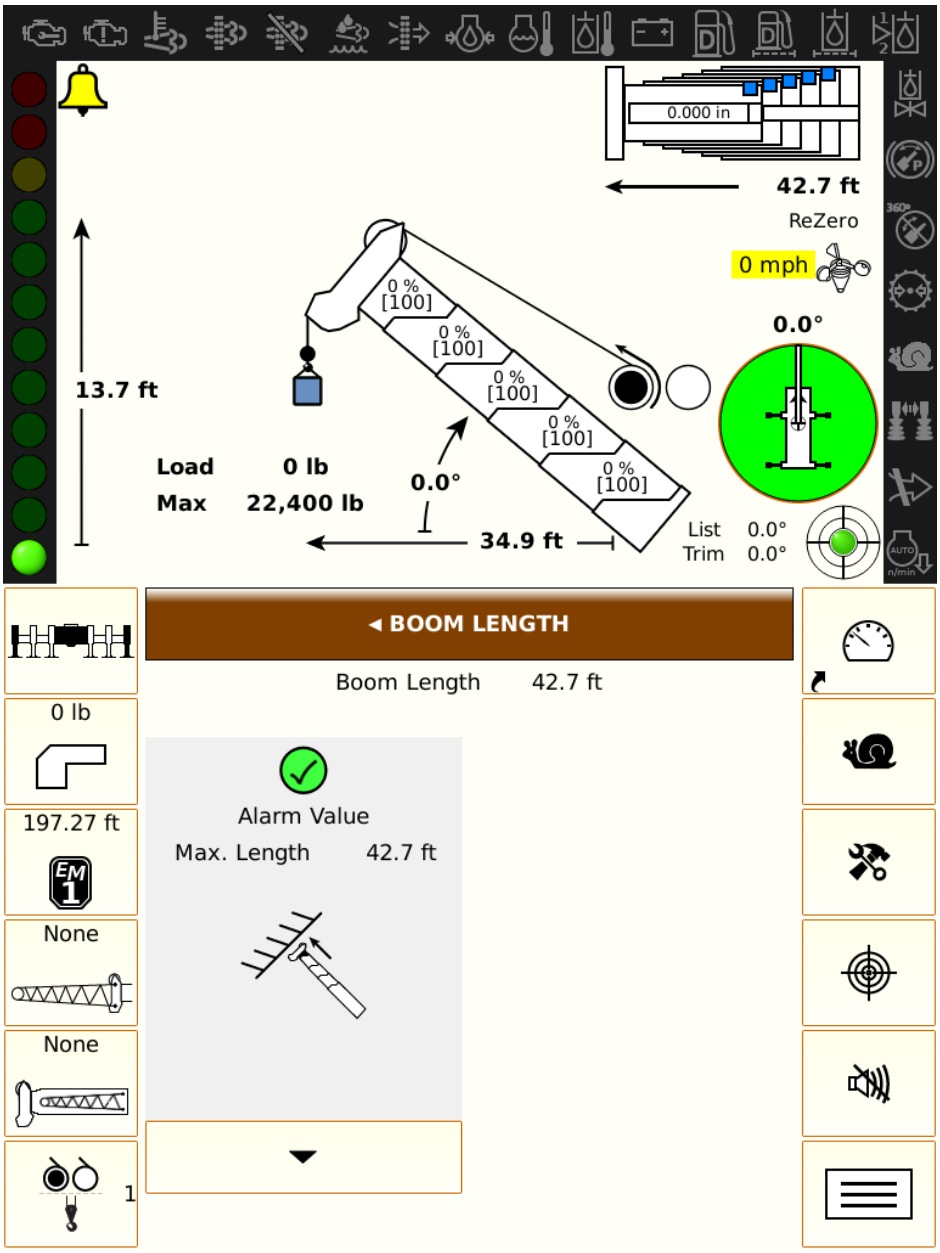


Figure 1—143
Operator Alarms — Boom Length Activated

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.

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 42.7 foot *(13.02m)* boom length, the audio alarm will sound intermittently and "Approaching Maximum Length" will appear in the Message Area. If the boom length reaches 42.7 feet *(13.02m),* the audible alarm will sound continuously, the function limiters will activate, and "Maximum Length" will appear in the Message Area. Refer to Figure 1—108.

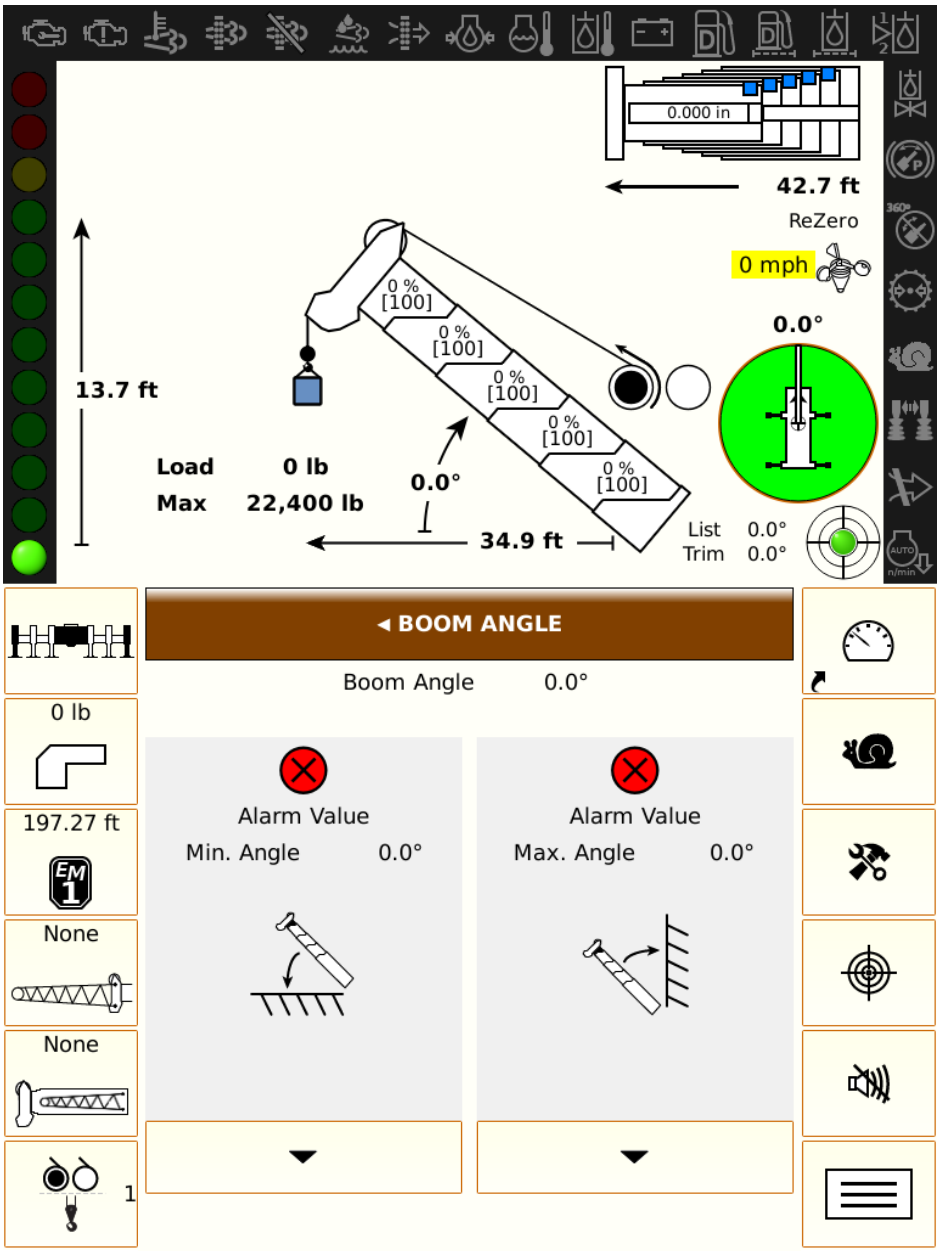


Figure 1—144
Operator Alarms — Boom Angle

To Set Minimum and Maximum Boom Angle Alarms (Example)

Example: To have an alarm whenever the boom is at a 12.9° minimum angle or a 62.2° maximum angle, use the following procedure:

1. From the Main Menu Screen, press the Operator Alarms Button. Refer to Figure 1—120.
2. The Operator Alarms Menu will appear. Press the Boom Angle Button. Refer to Figure 1—141.
3. The Boom Angle Screen will appear. Refer to Figure 1—144.
4. Raise the boom to a 12.9° angle.

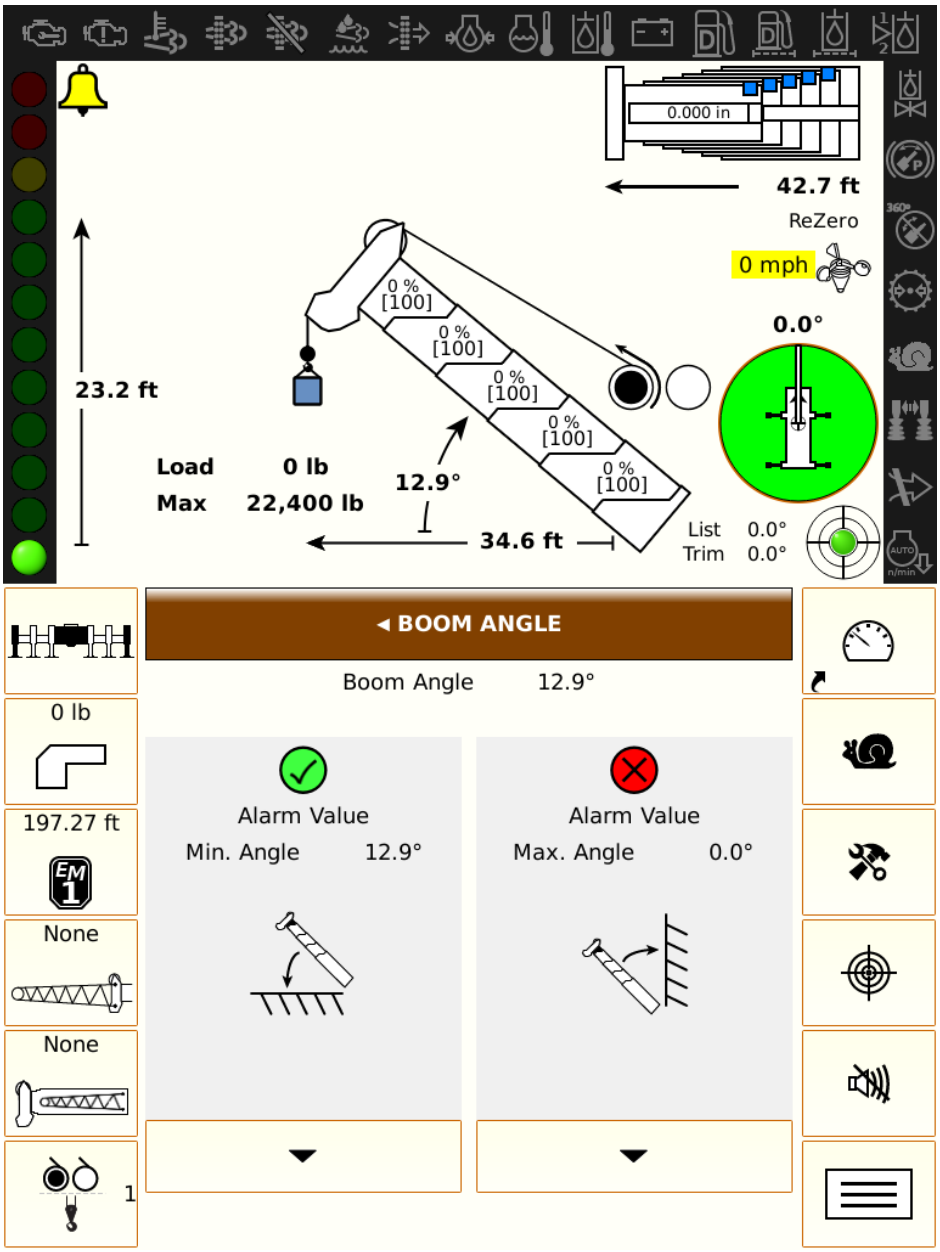


Figure 1—145
Operator Alarms — Boom Angle Minimum

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—145.
6. Raise the boom to a 62.2° 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—146.

Note: Both the minimum and maximum boom angle alarms must be set for the system to determine the operator set working area.

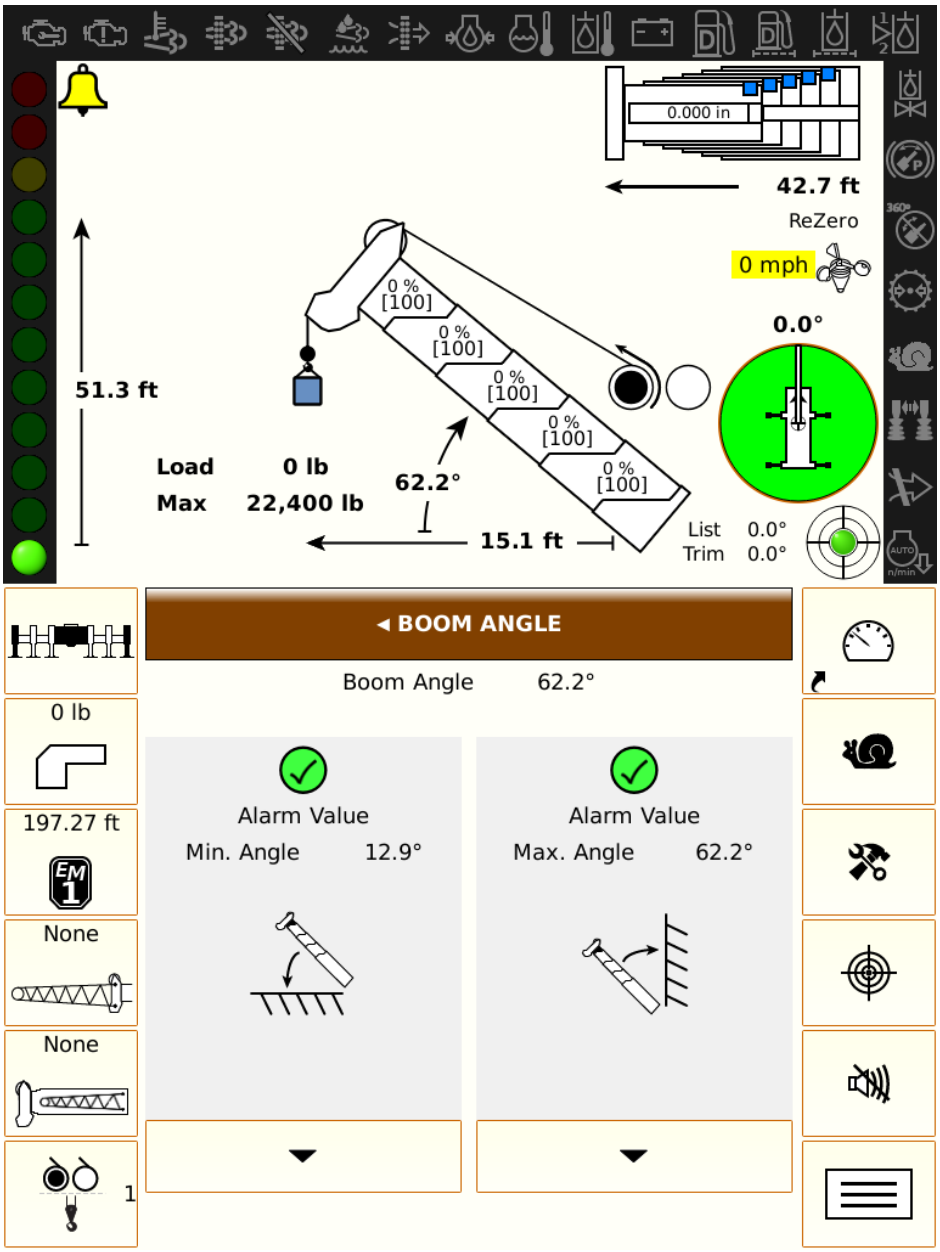


Figure 1—146
Operator Alarms — Boom Angle Activated

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 12.9° minimum or 62.2° 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 12.9° or 62.2°, 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—108.

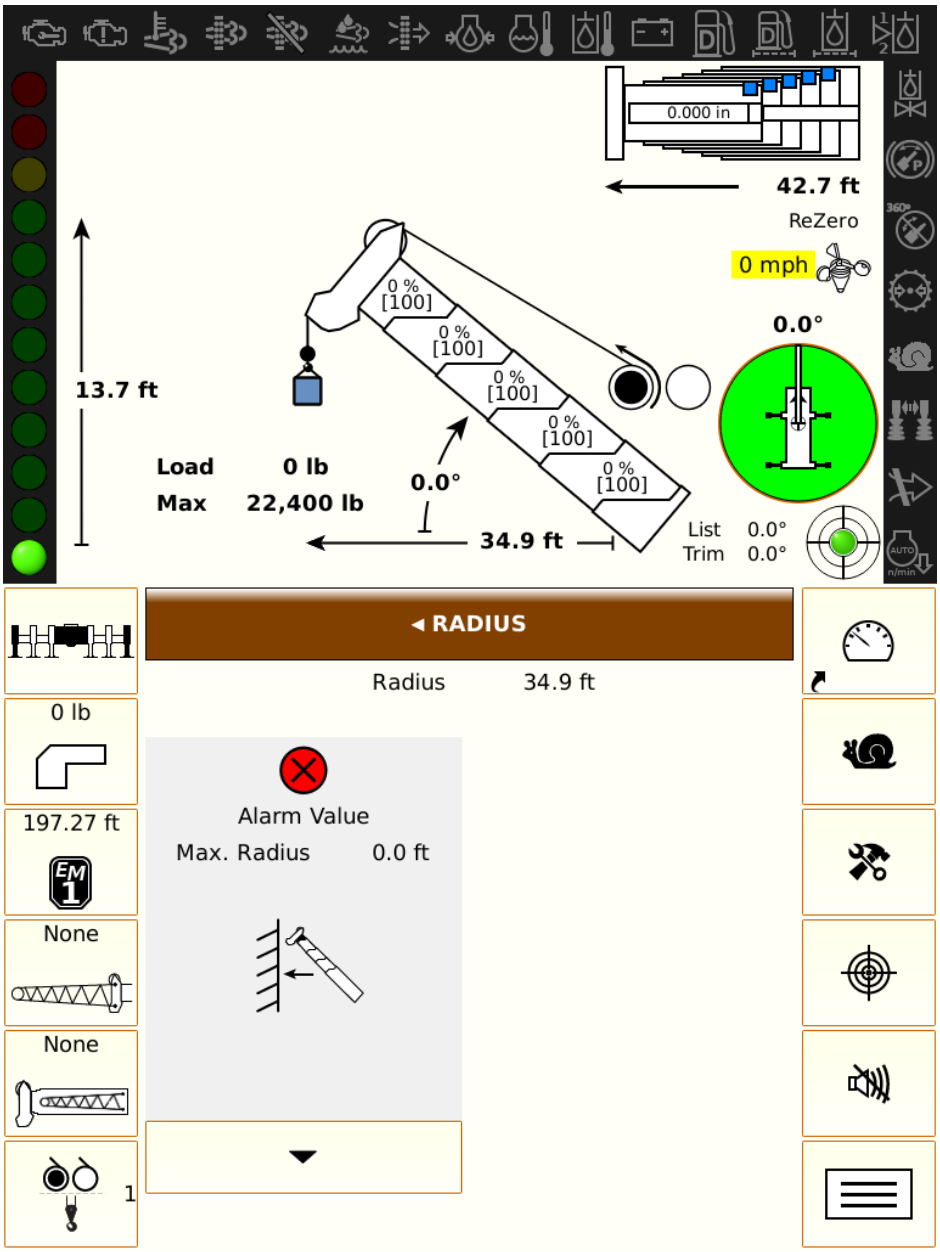


Figure 1—147
Operator Alarms — Radius

To Set Maximum Radius Alarm (Example)

Example: To have an alarm whenever the boom radius reaches 30.4 feet *(9.27m)*, use the following procedure:

1. From the Main Menu Screen, press the Operator Alarms Button. Refer to Figure 1—120.
2. The Operator Alarms Menu will appear. Press the Radius Button. Refer to Figure 1—141.
3. The Radius Screen will appear. Refer to Figure 1—147.
4. Extend the boom and/or adjust the boom angle to the radius of 30.4 feet *(9.27m)*.
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—148.

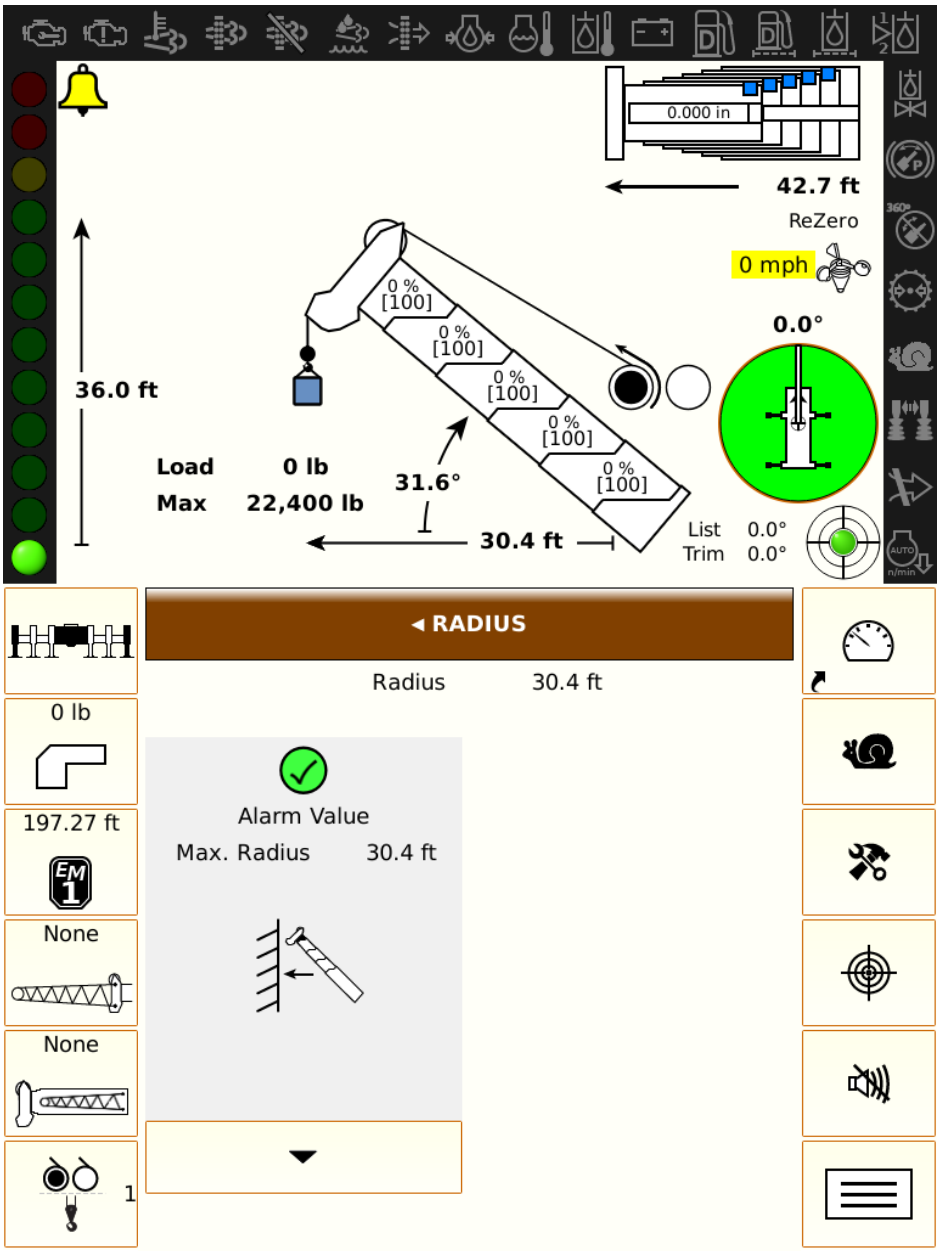


Figure 1—148
Operator Alarms — Radius Activated

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.

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 30.4 foot *(9.27m)* boom radius, the audio will sound intermittently and "Approaching Maximum Radius" will appear in the Message Area. If the boom radius reaches 30.4 feet *(9.27m),* the audible alarm will sound continuously, the function limiters will activate, and "Maximum Radius" will appear in Message Area. Refer to Figure 1—108.

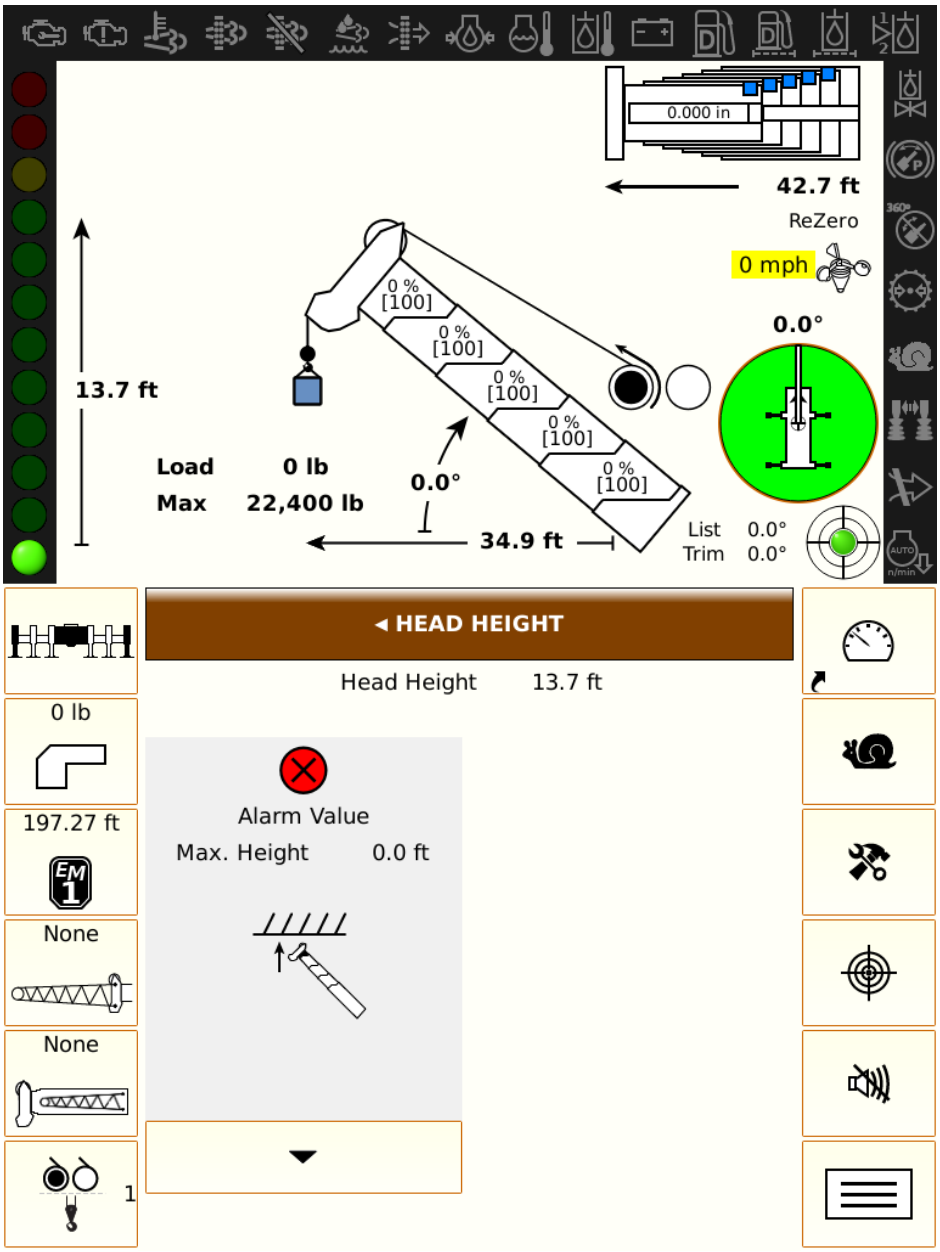


Figure 1—149
Operator Alarms — Head Height

To Set Maximum Head Height Alarm (Example)

Example: To have an alarm whenever the boom tip height reaches 50 feet *(15.24m)* from the carrier deck, use the following procedure:

1. From the Main Menu Screen, press the Operator Alarms Button. Refer to Figure 1—120.
2. The Operator Alarms Menu will appear. Press the Head Height Button. Refer to Figure 1—141.
3. The Head Height Screen will appear. Refer to Figure 1—149.
4. Extend the boom and/or adjust the boom angle to the head height of 50 feet *(15.24m)*.
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—150.

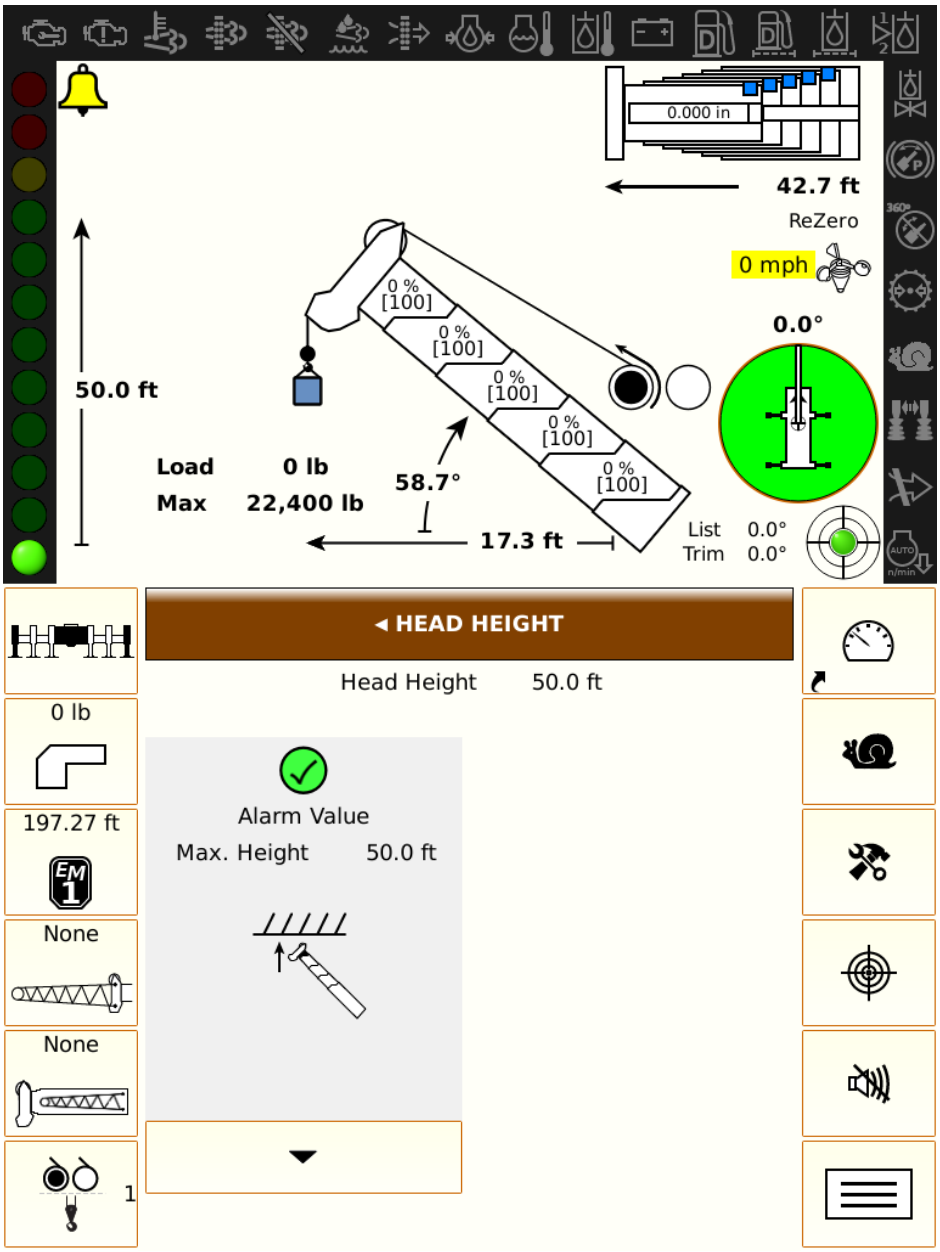


Figure 1—150
Operator Alarms — Head Height Activated

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 50 foot *(15.24m)* 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 50 feet *(15.24m),* the audible alarm will sound continuously, the function limiters will activate, and "Maximum Height" will appear in the Message Area. Refer to Figure 1—108.

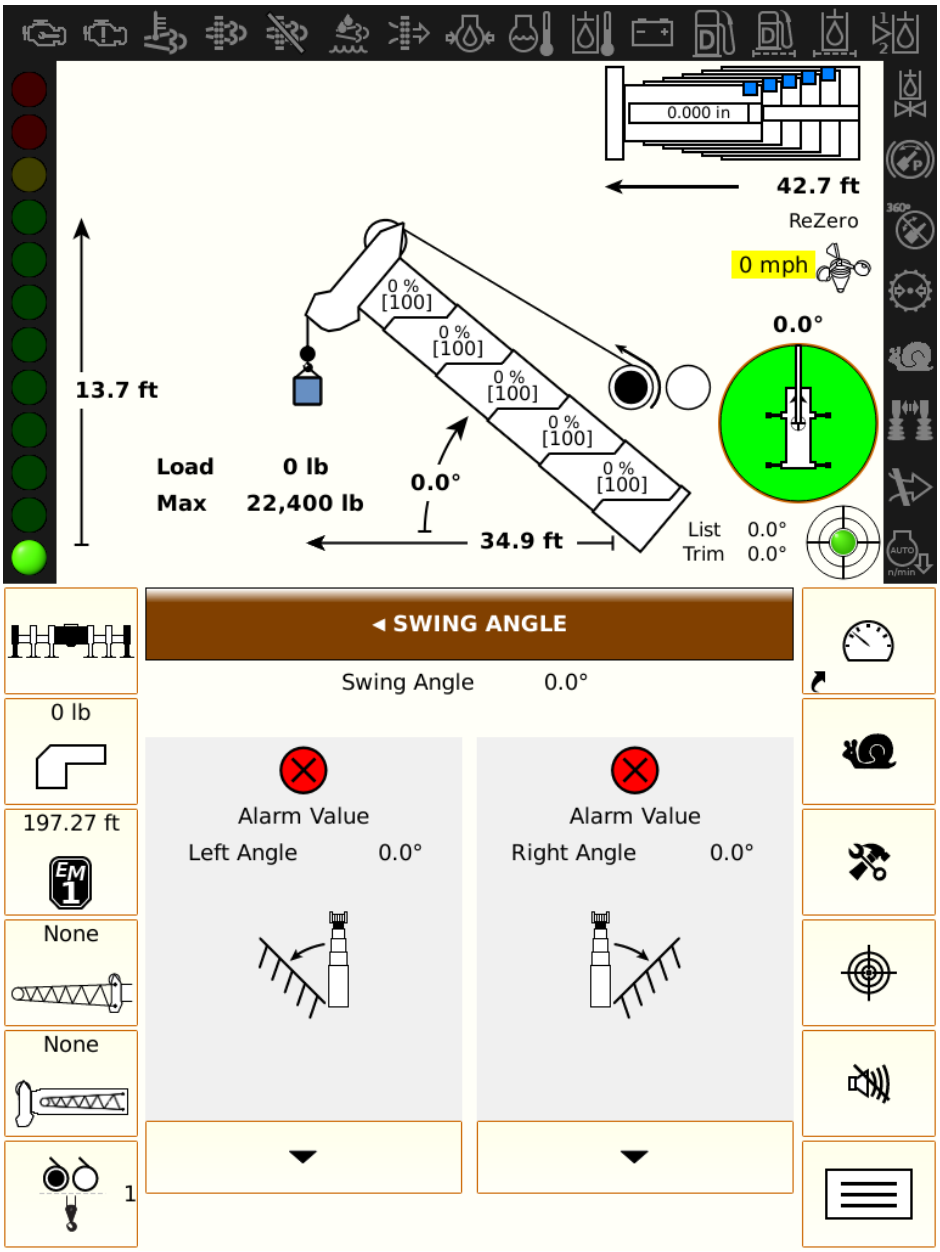


Figure 1—151
Operator Alarms — Swing Angle

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—120.
2. The Operator Alarms Menu will appear. Press the Swing Angle Button. Refer to Figure 1—141.
3. The Swing Angle Screen will appear. Refer to Figure 1—151.

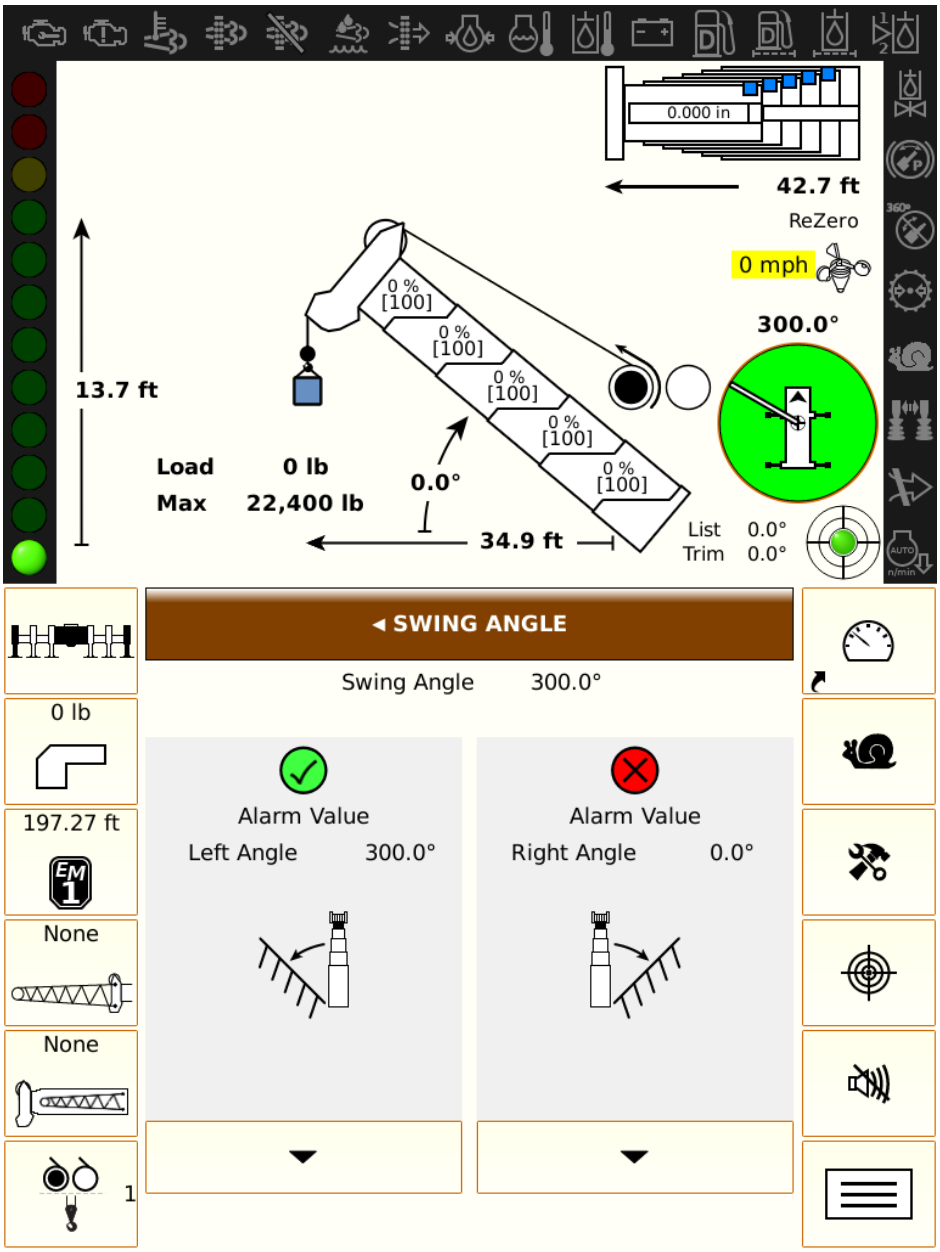


Figure 1—152
Operator Alarms — Swing Angle Left

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—152.
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—153.

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.

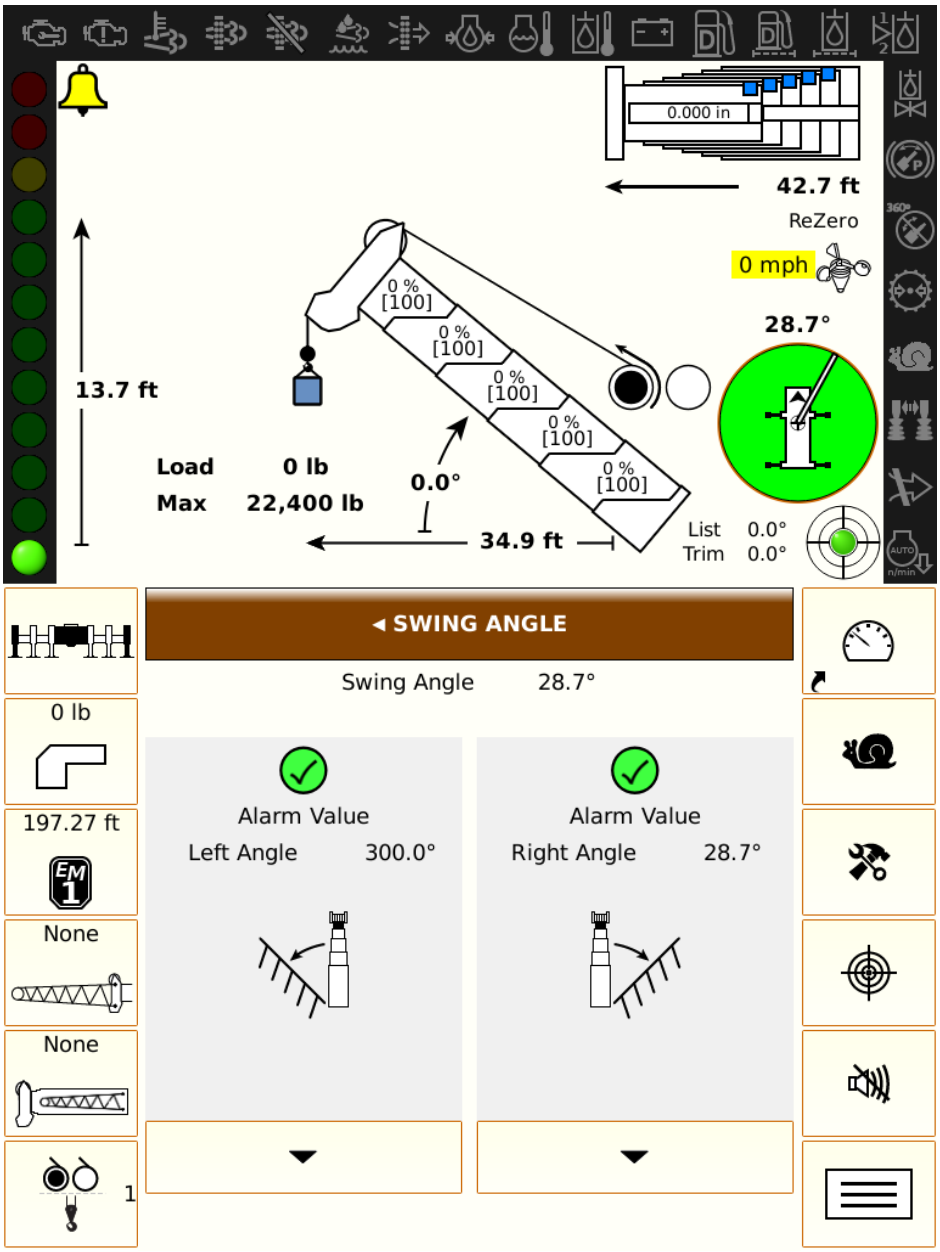


Figure 1—153
Operator Alarms — Swing Angle Activated

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—108.

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 1–120.
3. The Operator Alarms Menu will appear. Press the Defined Area Button. Refer to Figure 1–141.
4. The Defined Area Screen will appear. Refer to Figure 1–154.

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 1–155.
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 1–156.

   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.

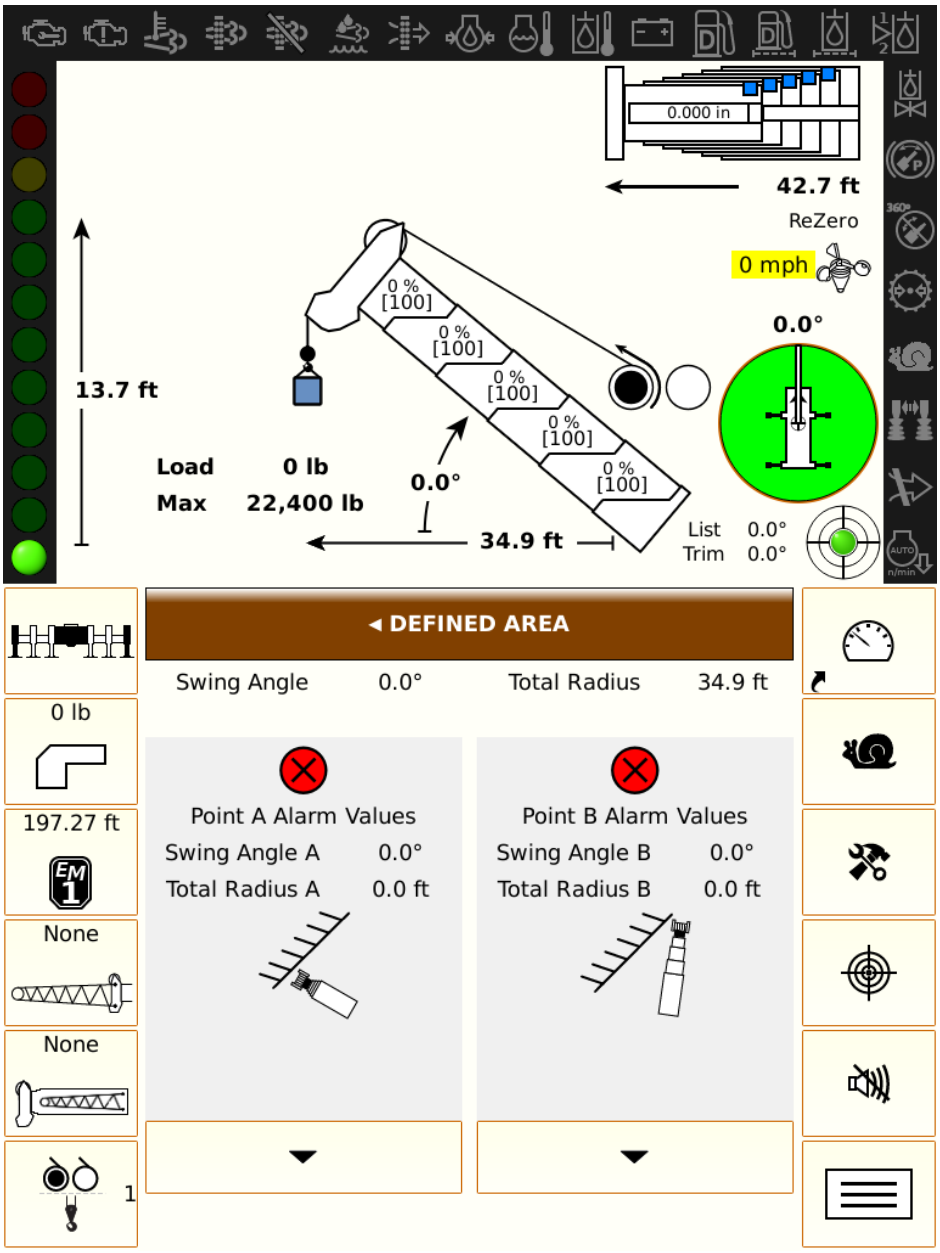


Figure 1—154
Operator Alarms — Defined Area

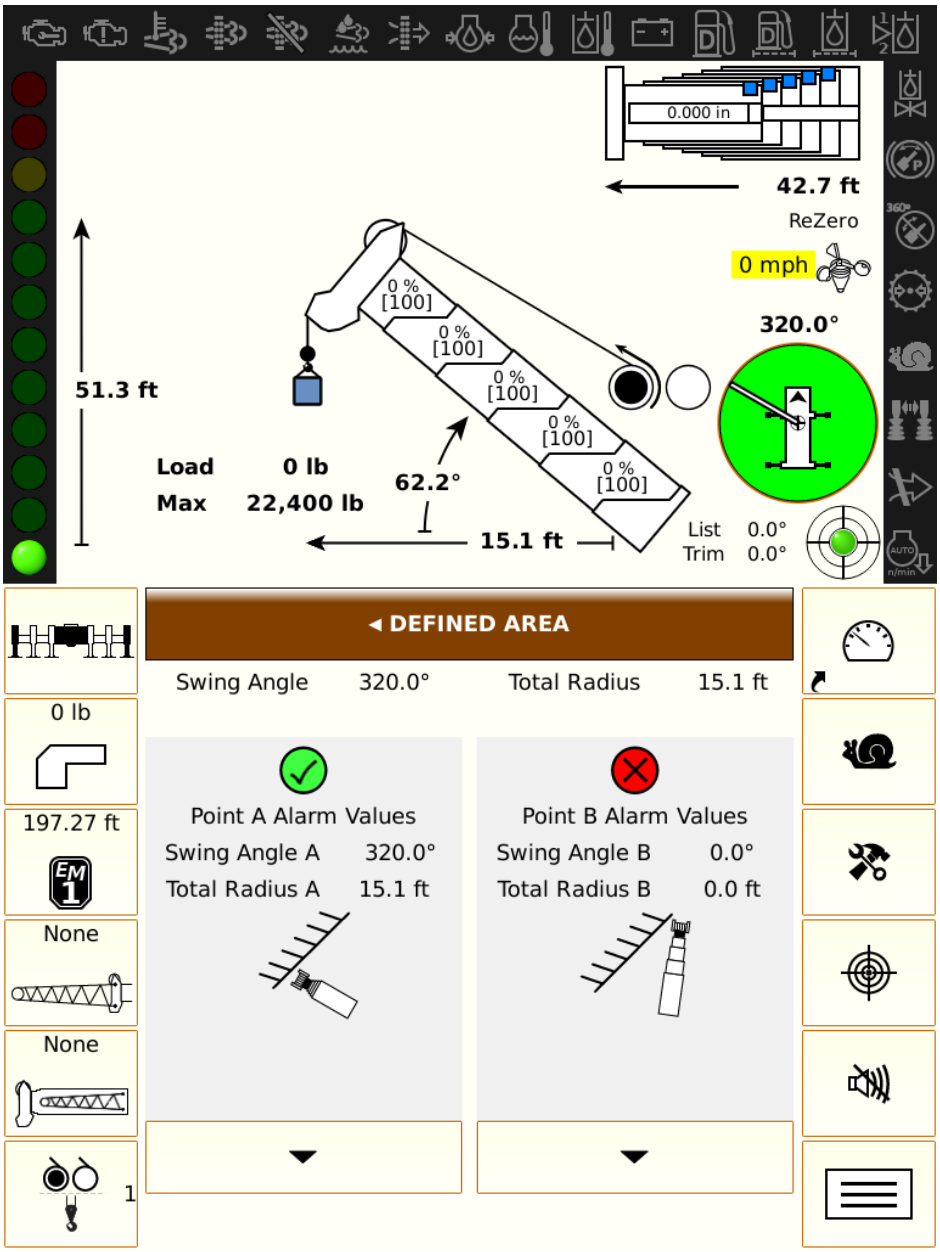


Figure 1—155
Operator Alarms — Defined Area Point A

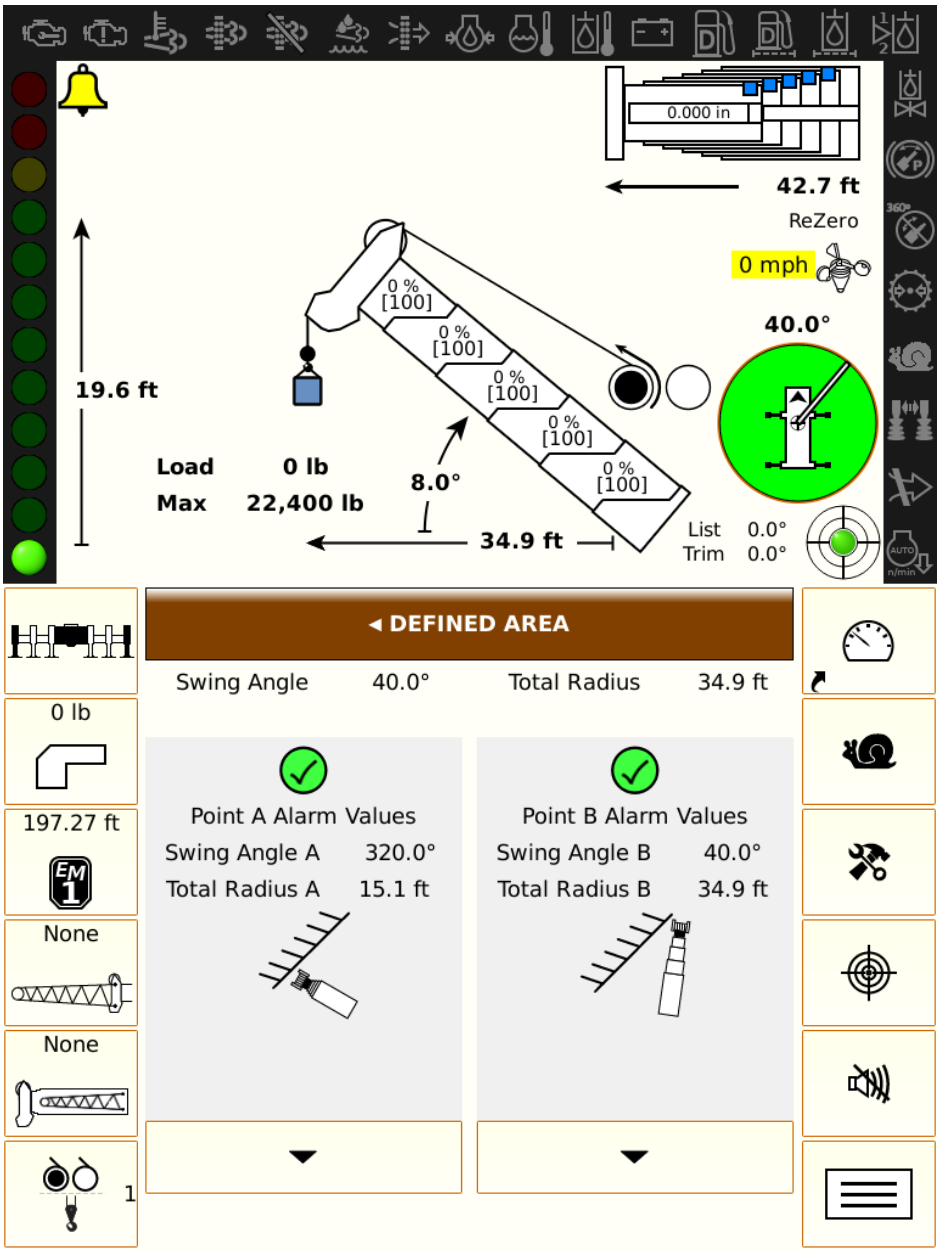


Figure 1—156
Operator Alarms — Defined Area Activated

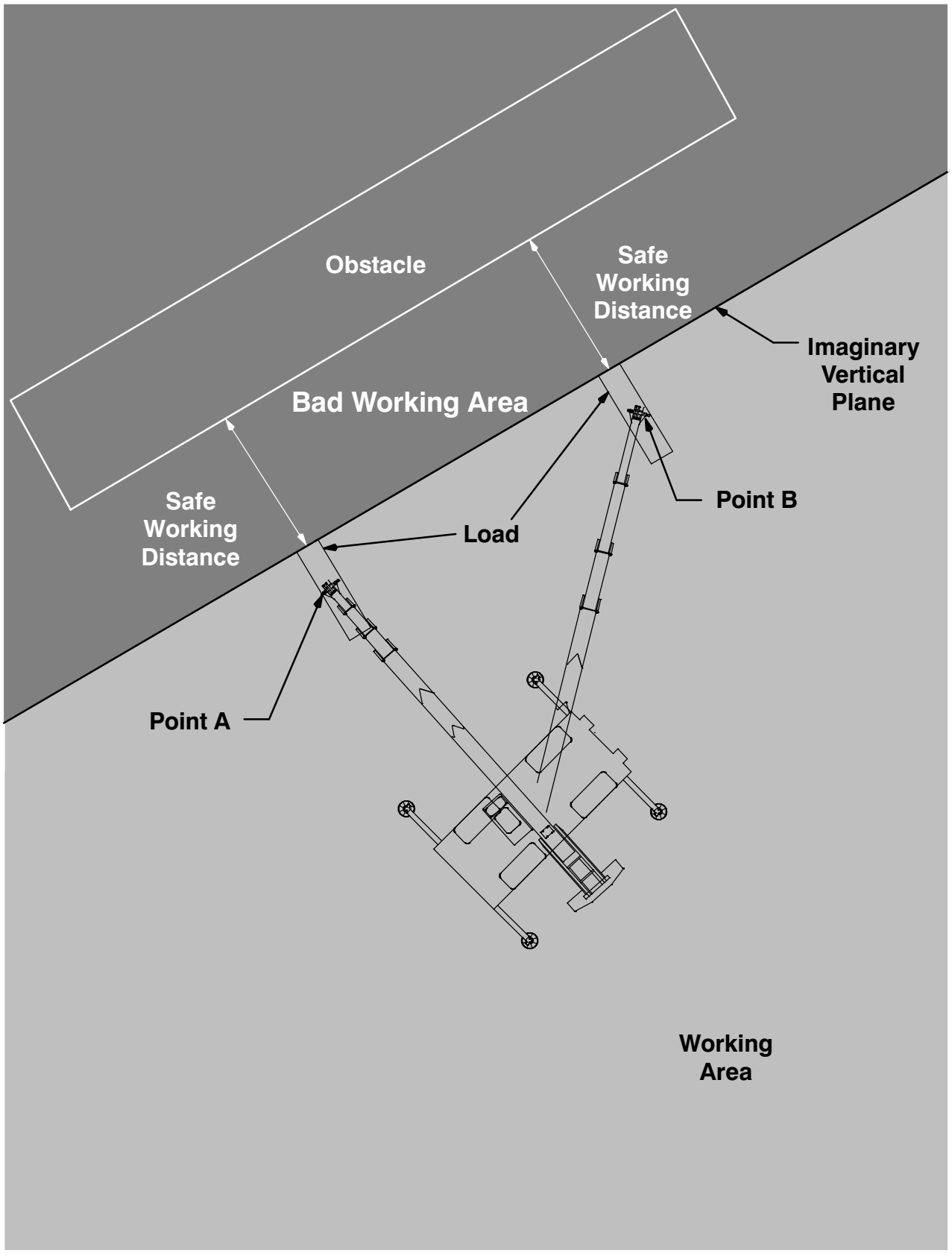


Figure 1–157
Operator Defined Area Alarm

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 1−120.
2. The Operator Alarms Menu will appear. Press the button for the desired operator alarm to be disabled. Refer to Figure 1−141.
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.

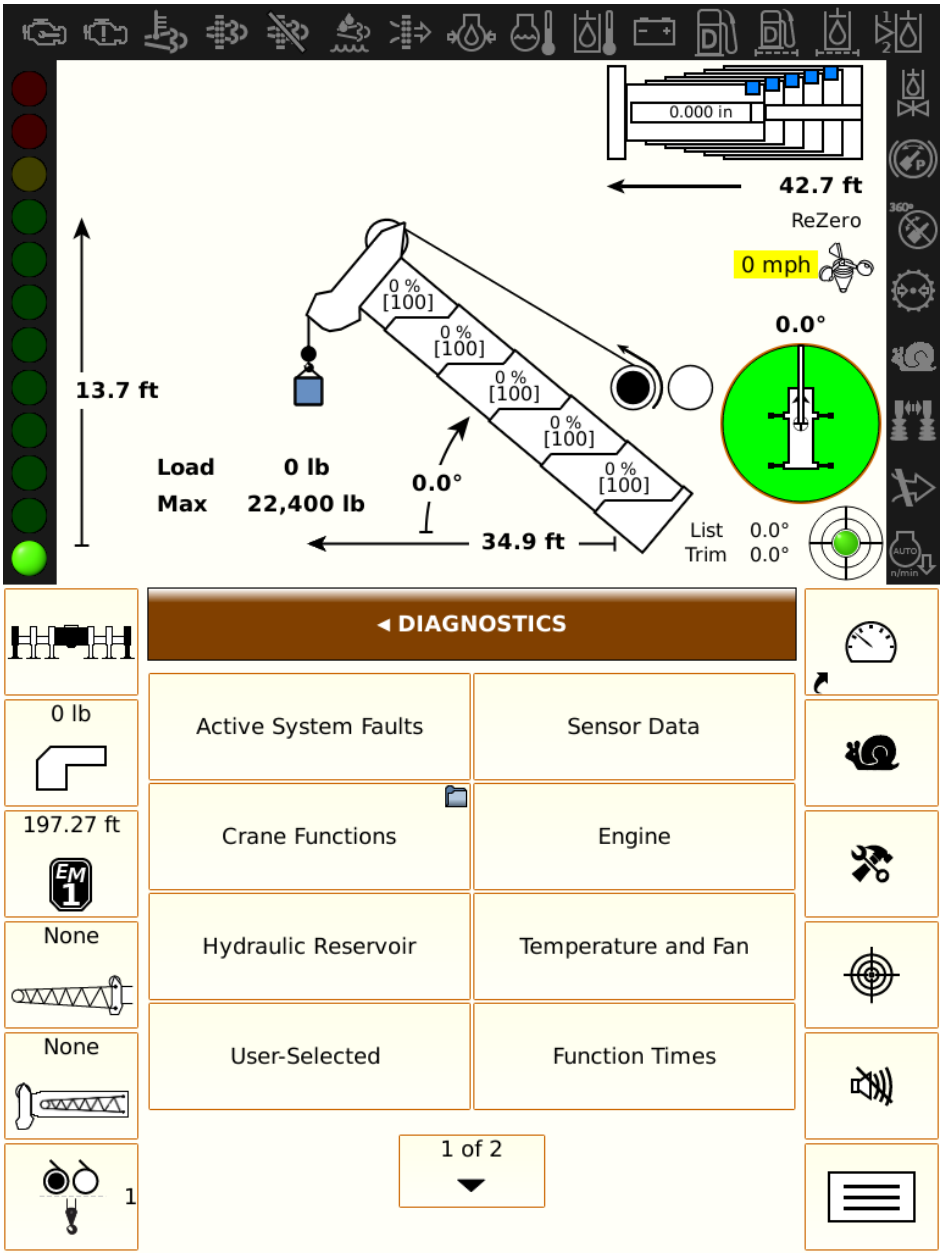


Figure 1—158
Diagnostics

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.

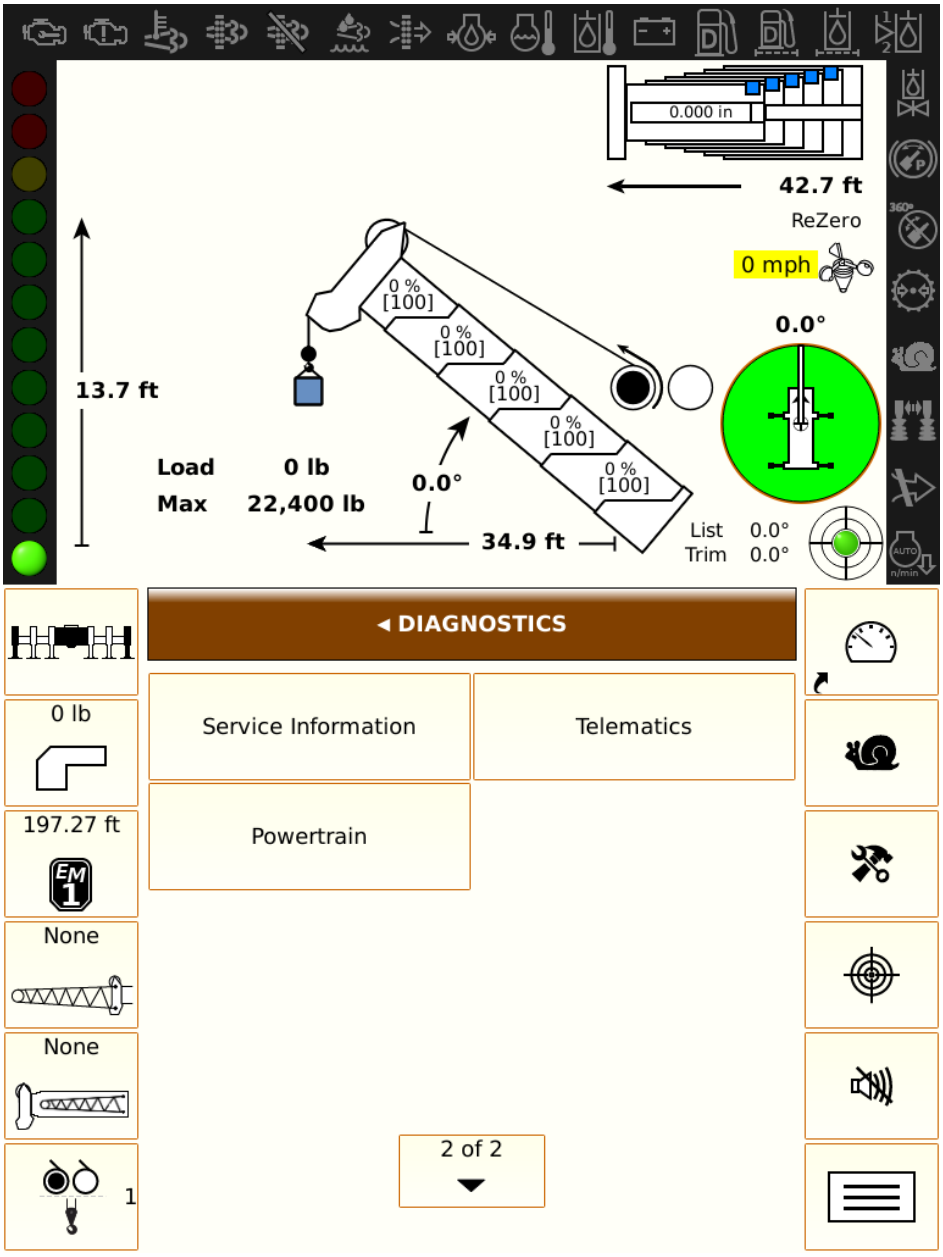
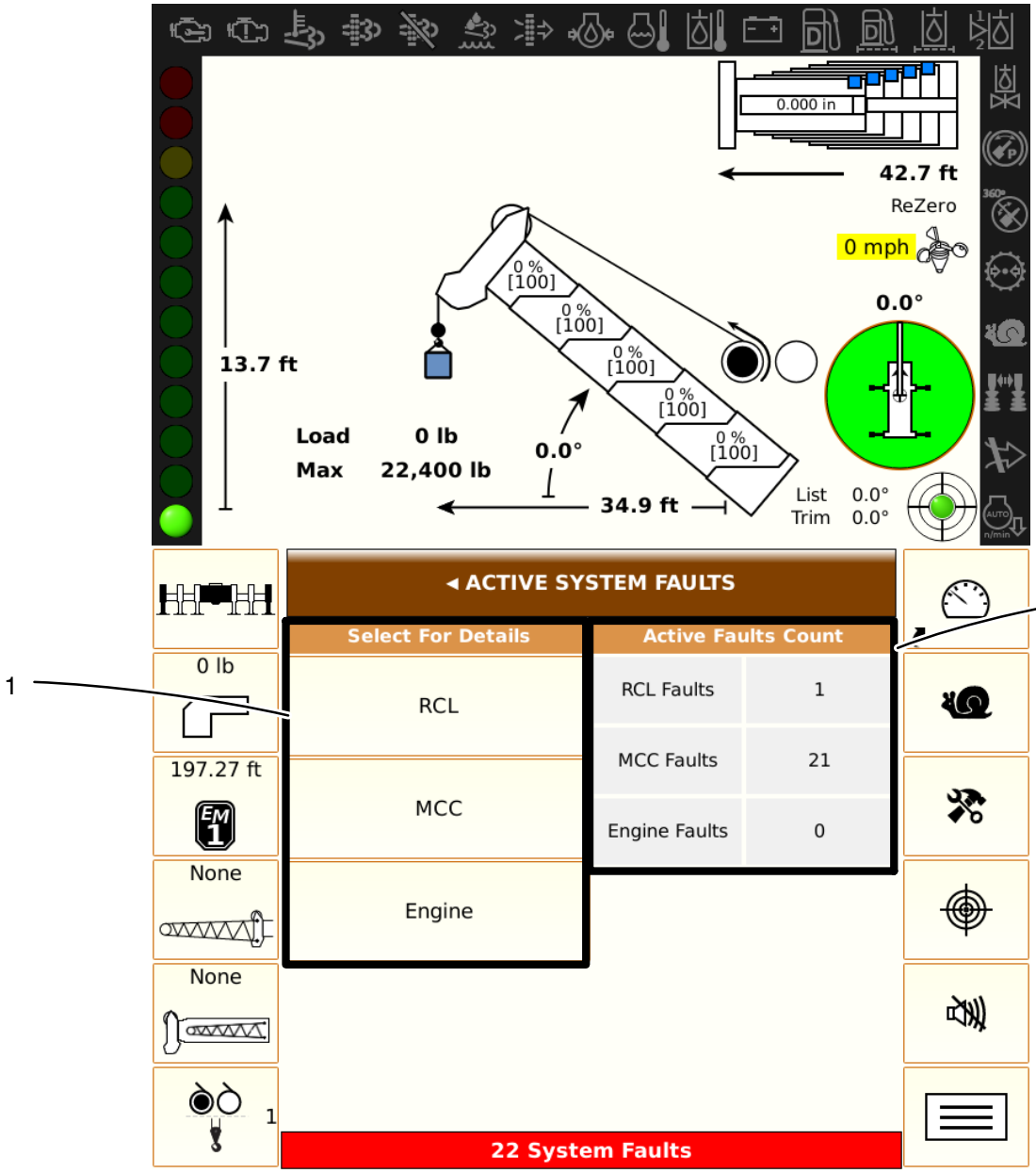


Figure 1—159
Diagnostics



1. Active System Faults Menu
2. Active Faults Count Display

Figure 1—160
Diagnostics — Active System Faults

Active System Faults

The Active System Faults menu displays current system faults. Refer to Figure 1—160.

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—160.
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.

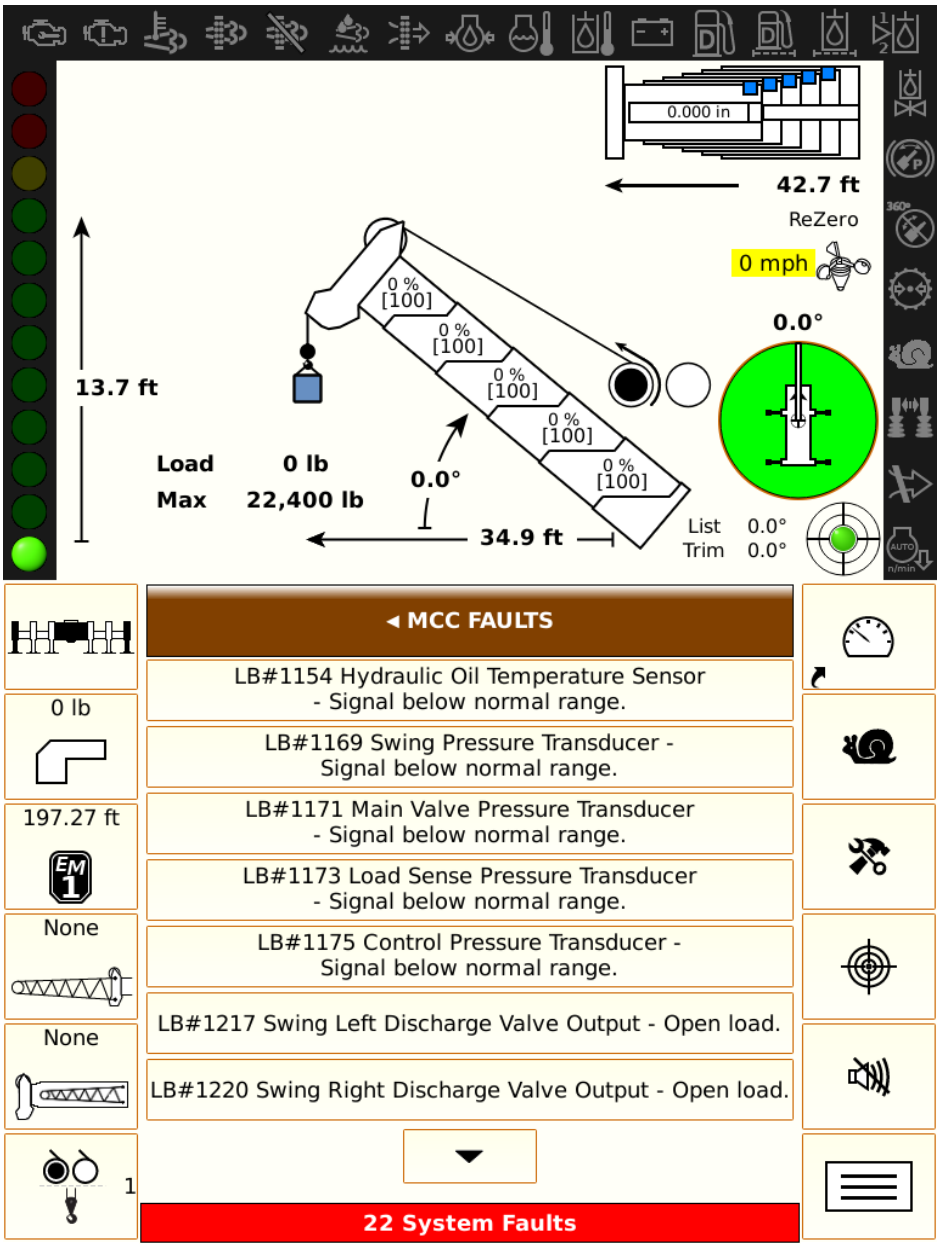


Figure 1—161
Diagnostics — Active System Faults — MCC Faults

5. 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—161.

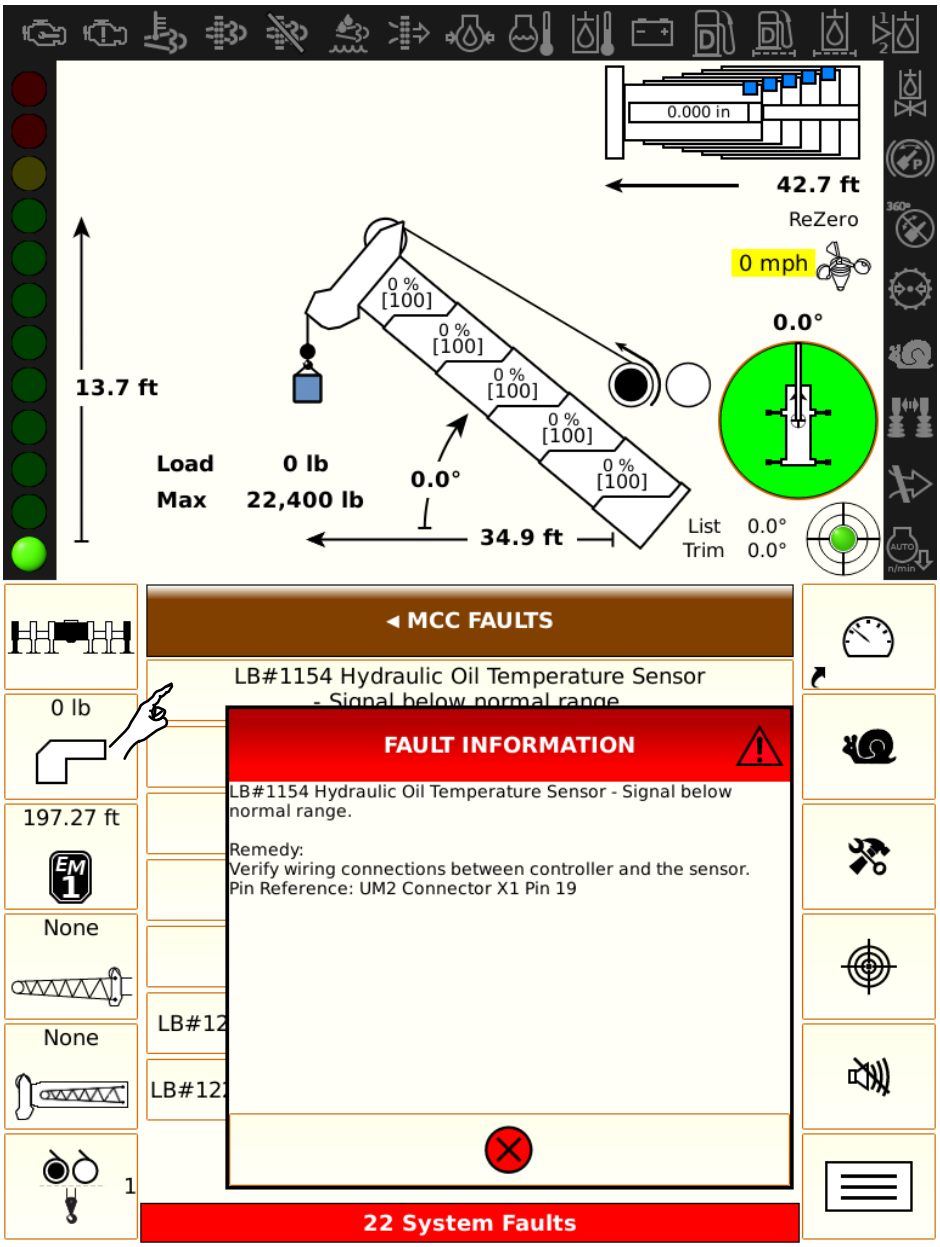


Figure 1—162
Diagnostics — Active System Faults — MCC Faults

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—162.
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.

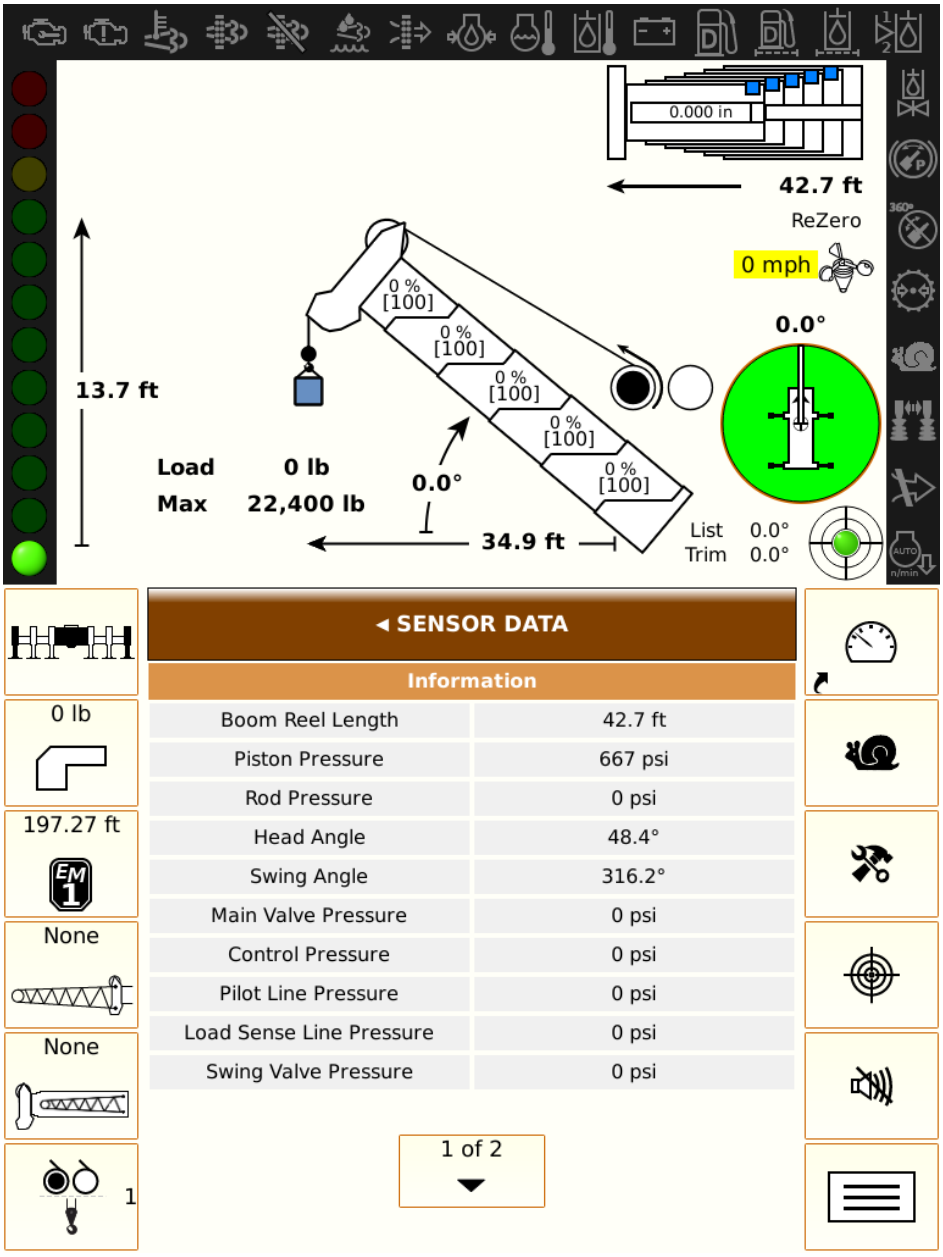


Figure 1—163
Diagnostics — Sensor Data

Sensor Data

The Sensor Data Screen displays data being read by various sensors on the crane. Refer to Figure 1—163.

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—163. Press the Page Toggle Button 1 of 2 to toggle between Sensor Data Menu pages.
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.

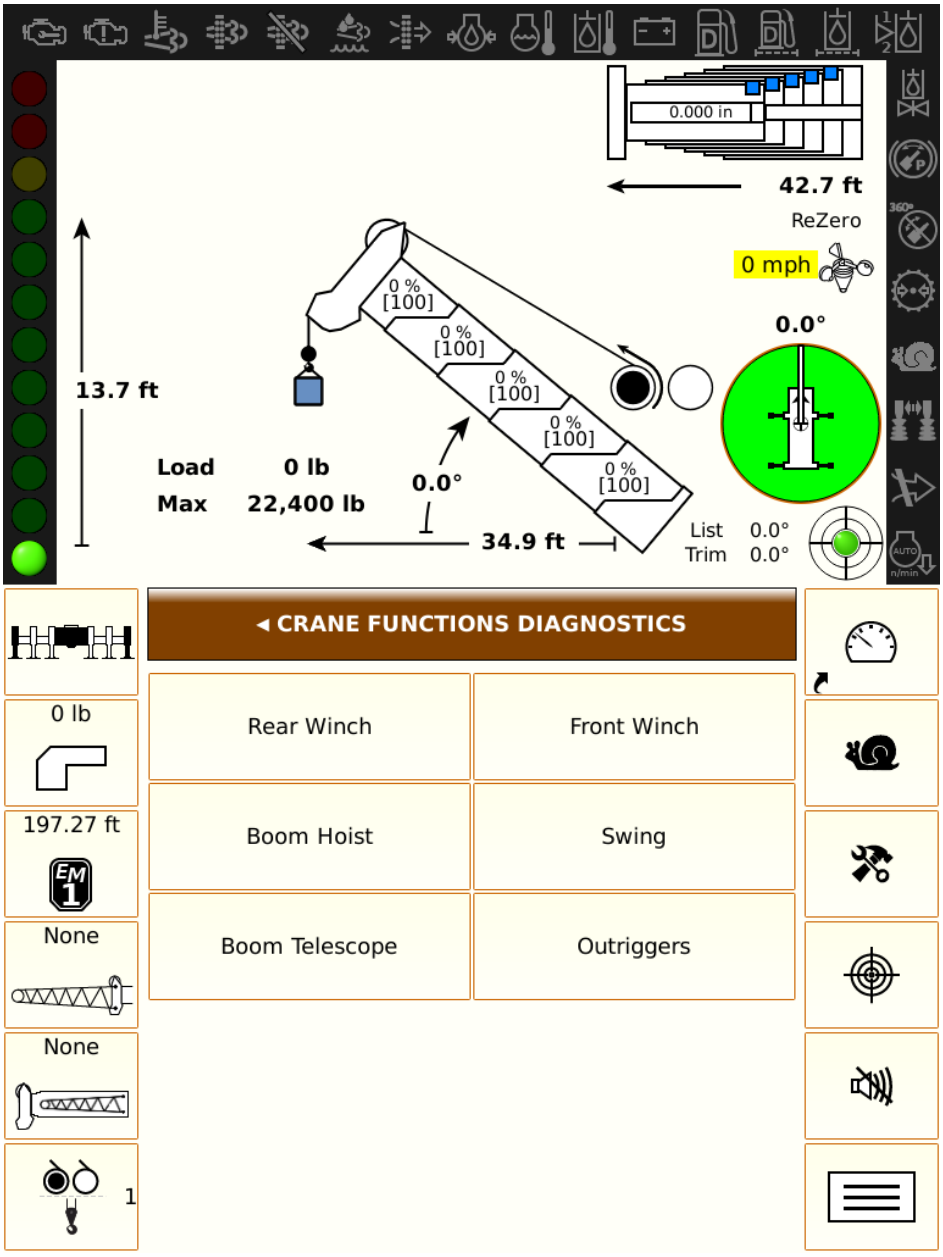


Figure 1—164
Diagnostics — Crane Function

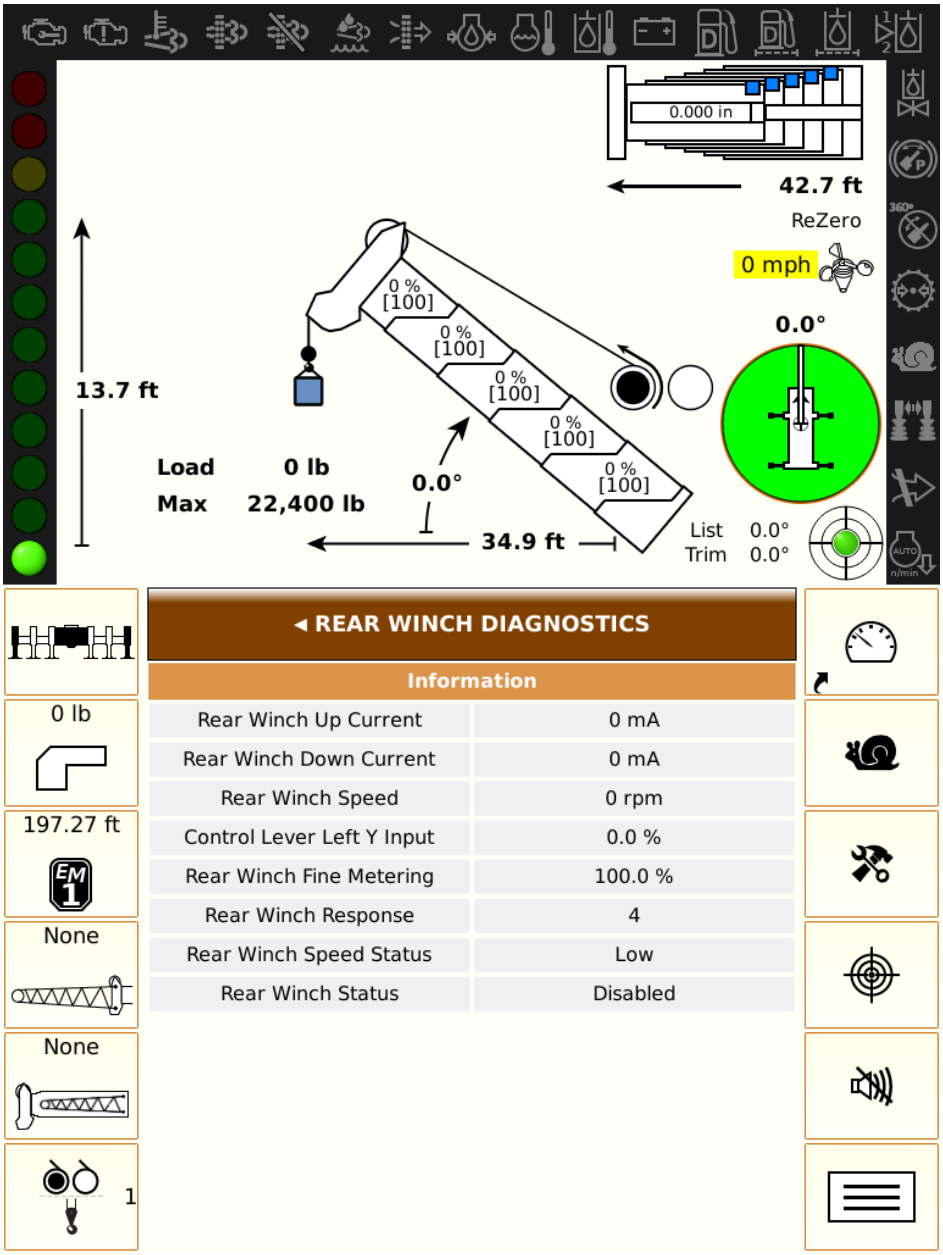


Figure 1—165
Diagnostics — Crane Function — Rear Winch

Rear Winch Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—164.
4. The Rear Winch Diagnostics Screen will appear. Refer to Figure 1—165.
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.

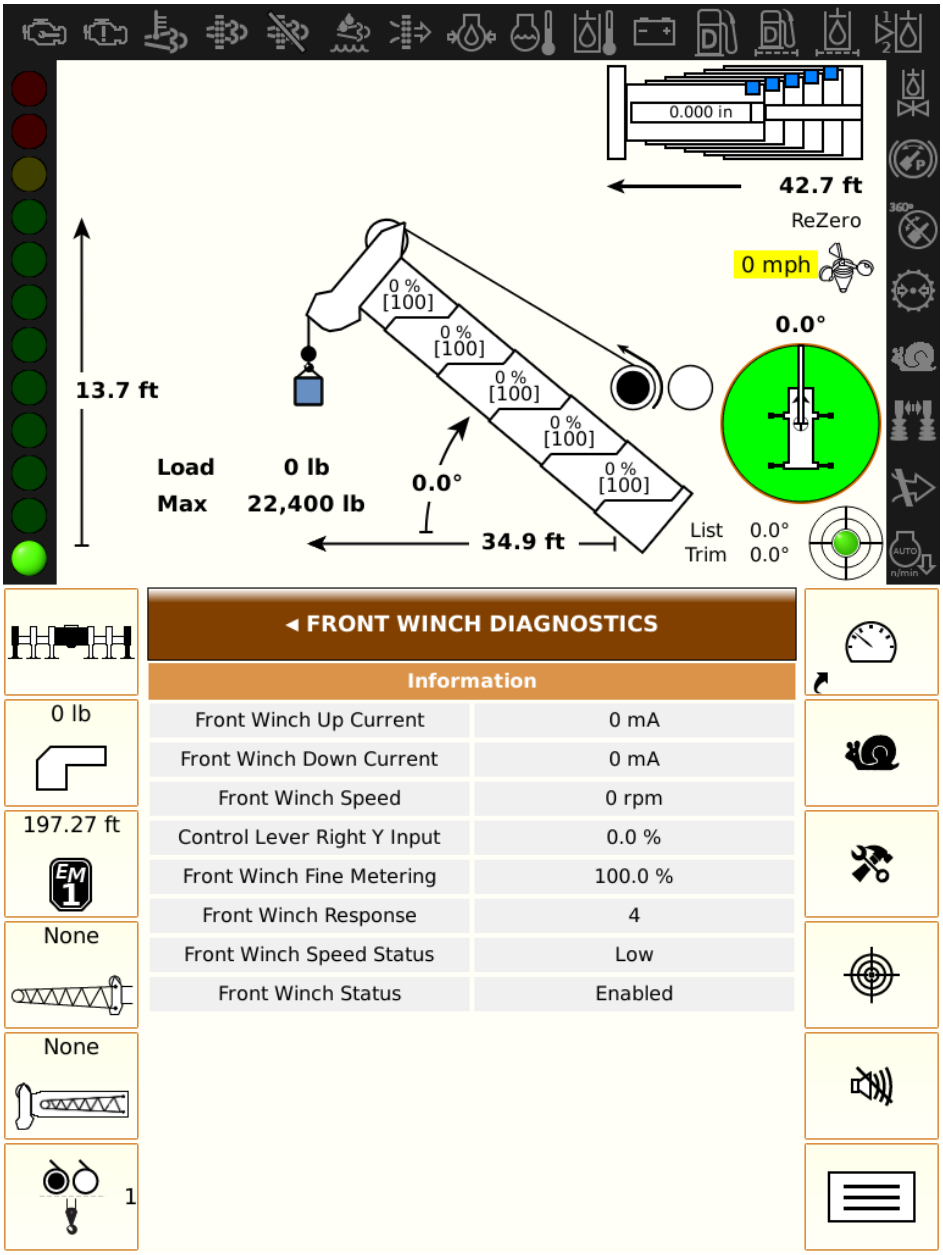


Figure 1—166
Diagnostics — Crane Function — Front Winch

Front Winch Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—164.
4. The Front Winch Diagnostics Screen will appear. Refer to Figure 1—166.
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.

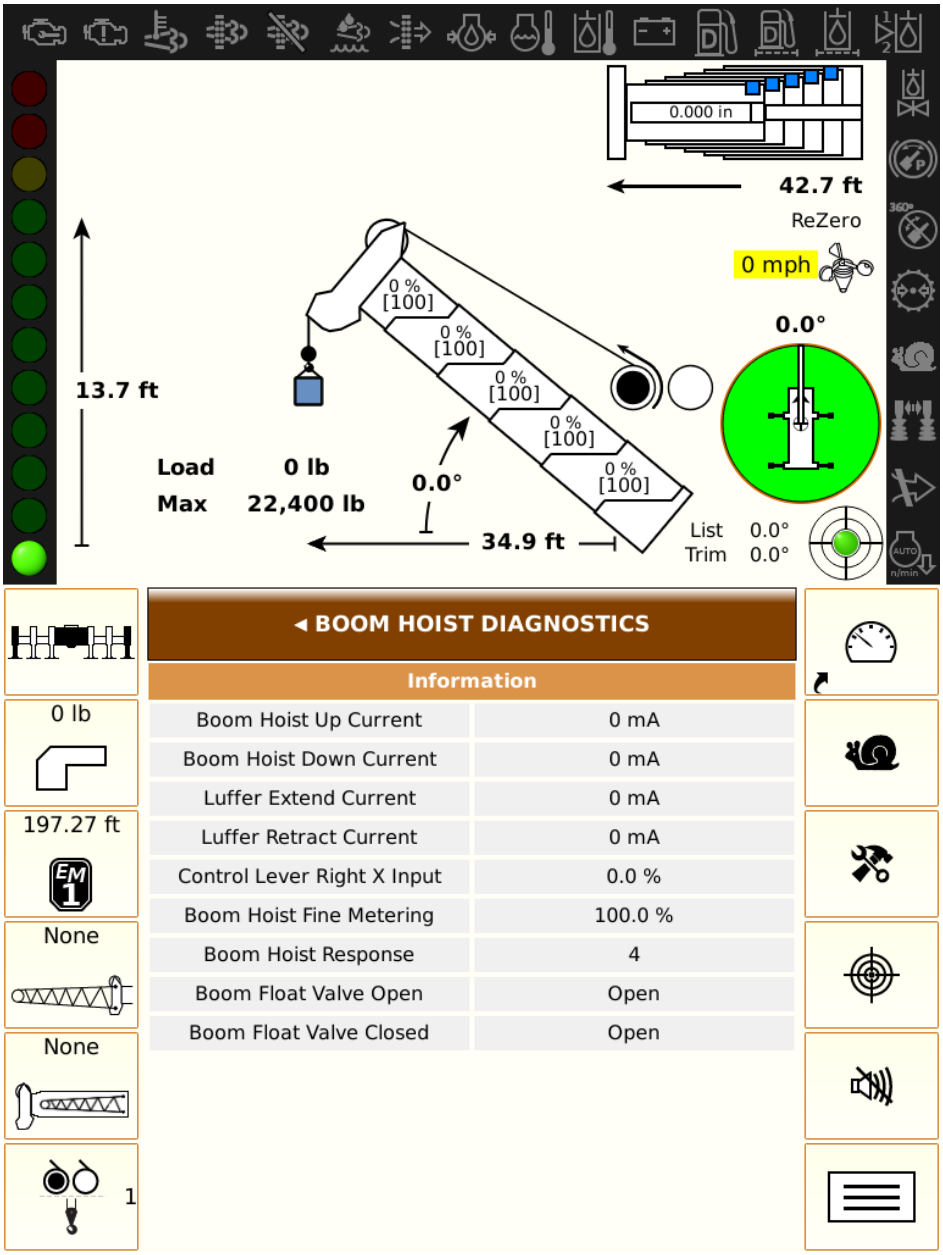


Figure 1—167
Diagnostics — Crane Function — Boom Hoist

Boom Hoist Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—164.
4. The Boom Hoist Diagnostics Screen will appear. Refer to Figure 1—167.
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.

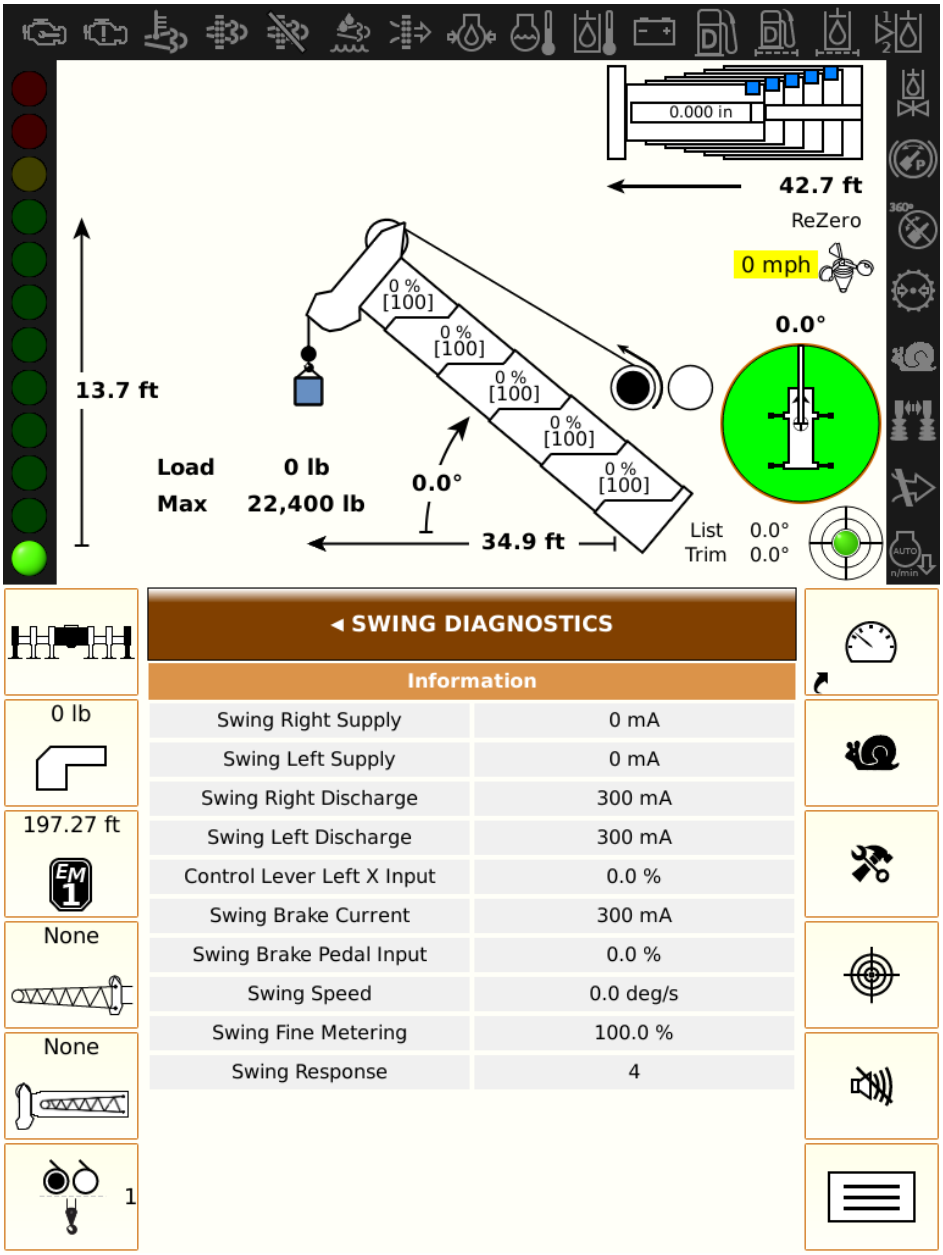


Figure 1—168
Diagnostics — Crane Function — Swing

Swing Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—164.
4. The Swing Diagnostics Screen will appear. Refer to Figure 1—168.
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.

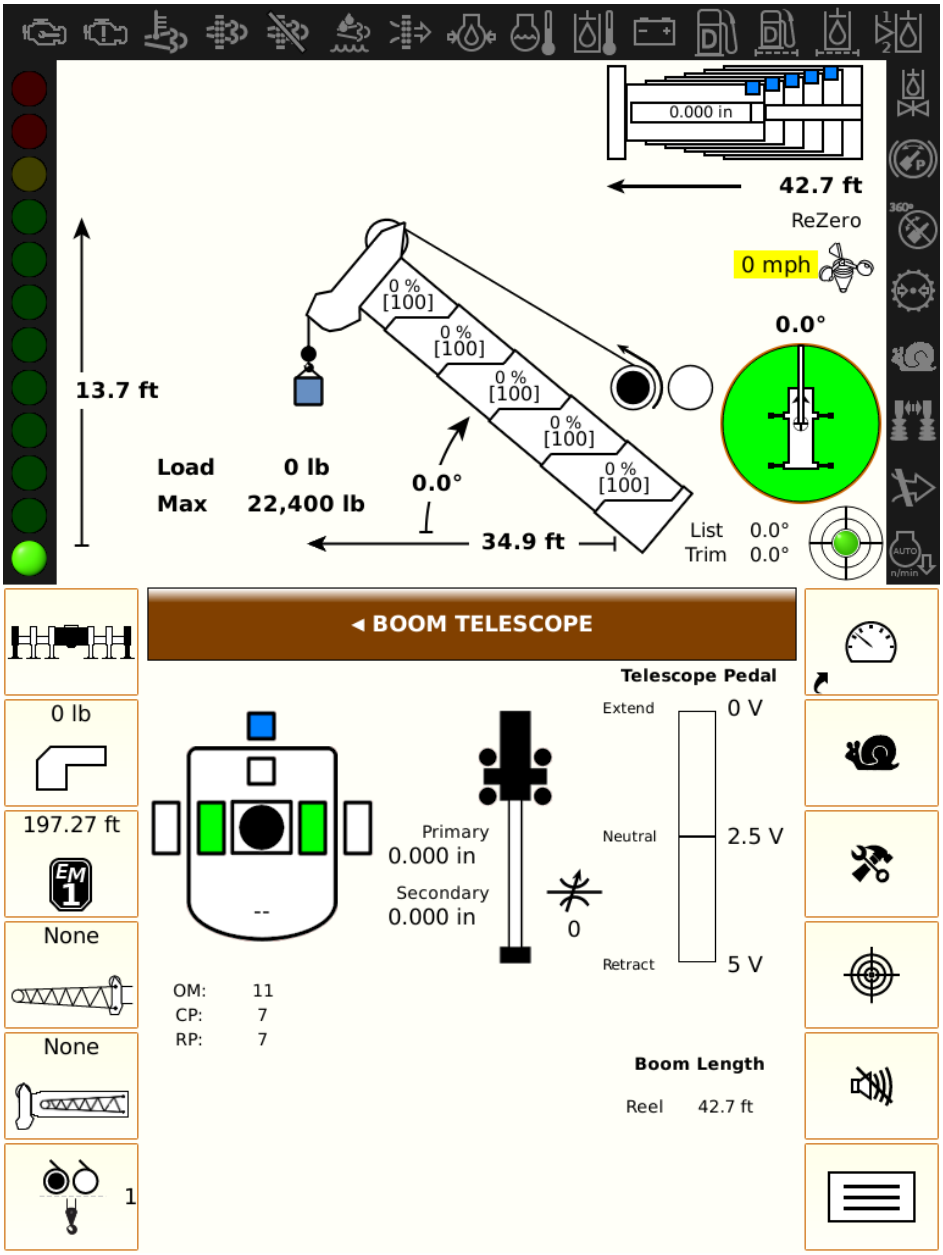
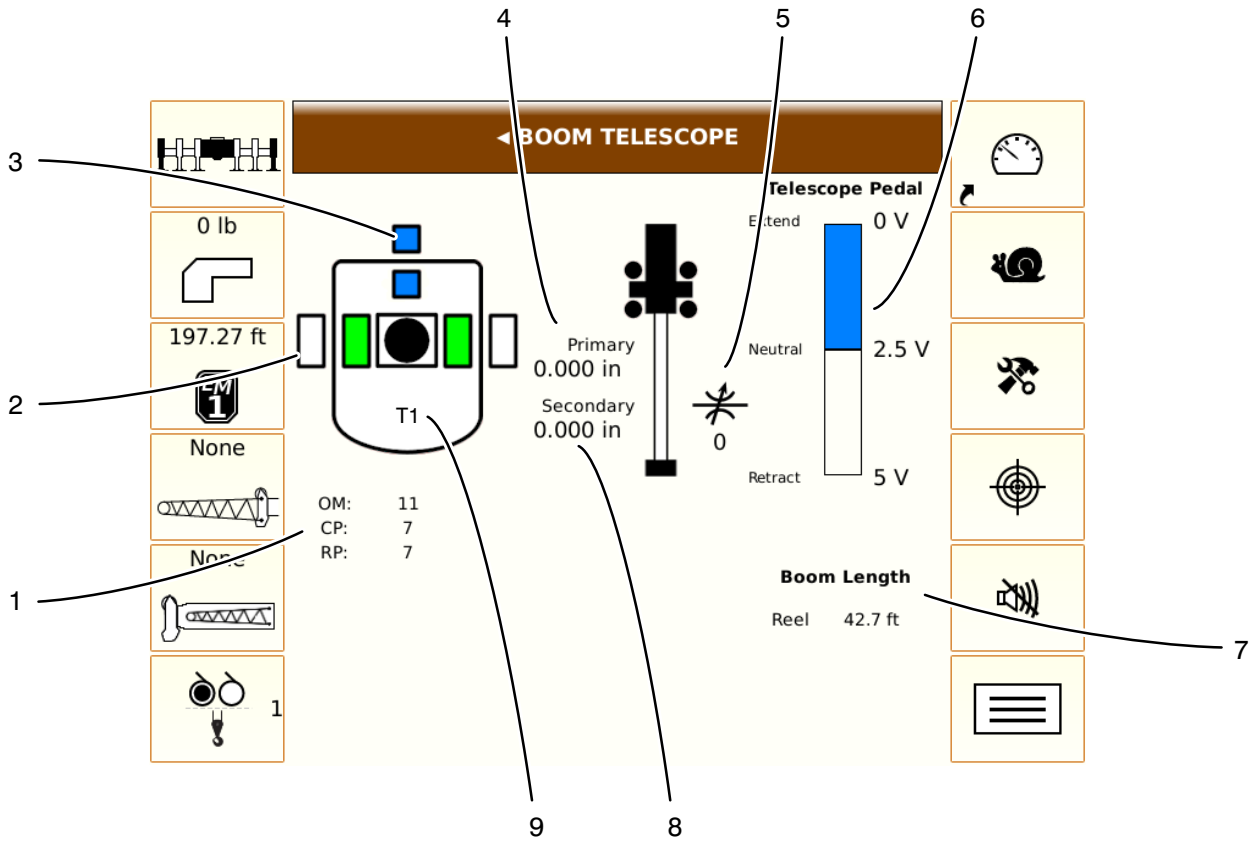


Figure 1—169
Diagnostics — Crane Function — Boom Telescope

Boom Telescope Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—164.
4. The Boom Telescope Screen will appear. Refer to Figure 1—169 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.



1. Latching Telescope Program State
2. Latched/Not Latched Status
3. Pinned/Not Pinned Status
4. Primary Telescope Cylinder Length
5. Hydraulic Oil Flow Indicator
6. Telescope Pedal Status
7. Boom Length – Reel
8. Secondary Telescope Cylinder Length
9. Boom Section

Figure 1–170
Boom Telescope Diagnostic Screen

Boom Telescope Diagnostics Screen

The following are descriptions of the Boom Telescope Diagnostic Screen components. Refer to Figure 1–170.

1. Latching Telescope Program State

This displays the current state of the telescope controller program. OM=Operation Mode, CP=Current Phase, and RP=Resume Phase.

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.

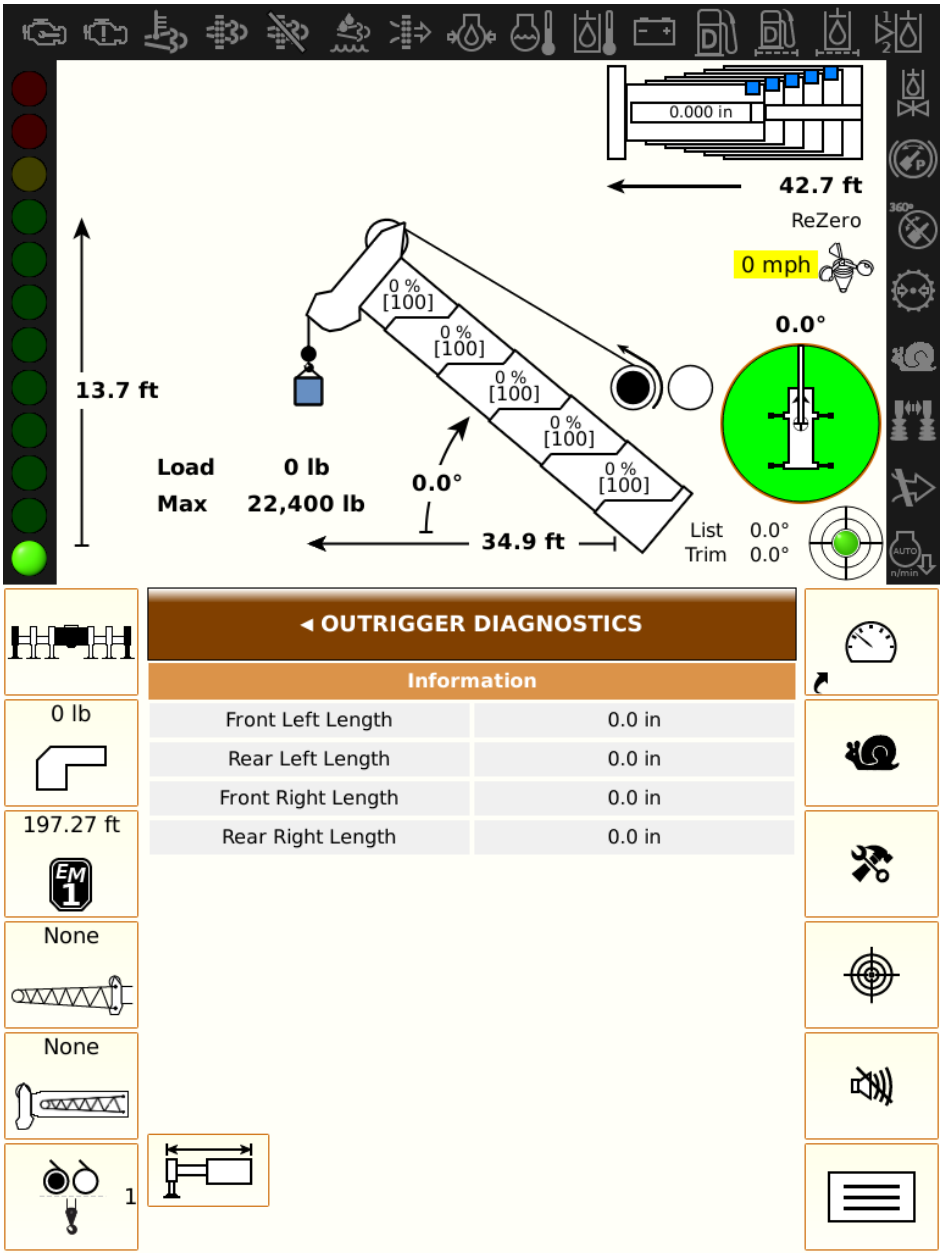


Figure 1—171
Diagnostics — Crane Function — Outrigger

Outrigger Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—164.
4. The Outrigger Diagnostics Screen will appear. Refer to Figure 1—163. Press the Page Toggle Button 1 of 2 to toggle between Outrigger Diagnostics Display pages. Refer to Figure 1—171.
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.

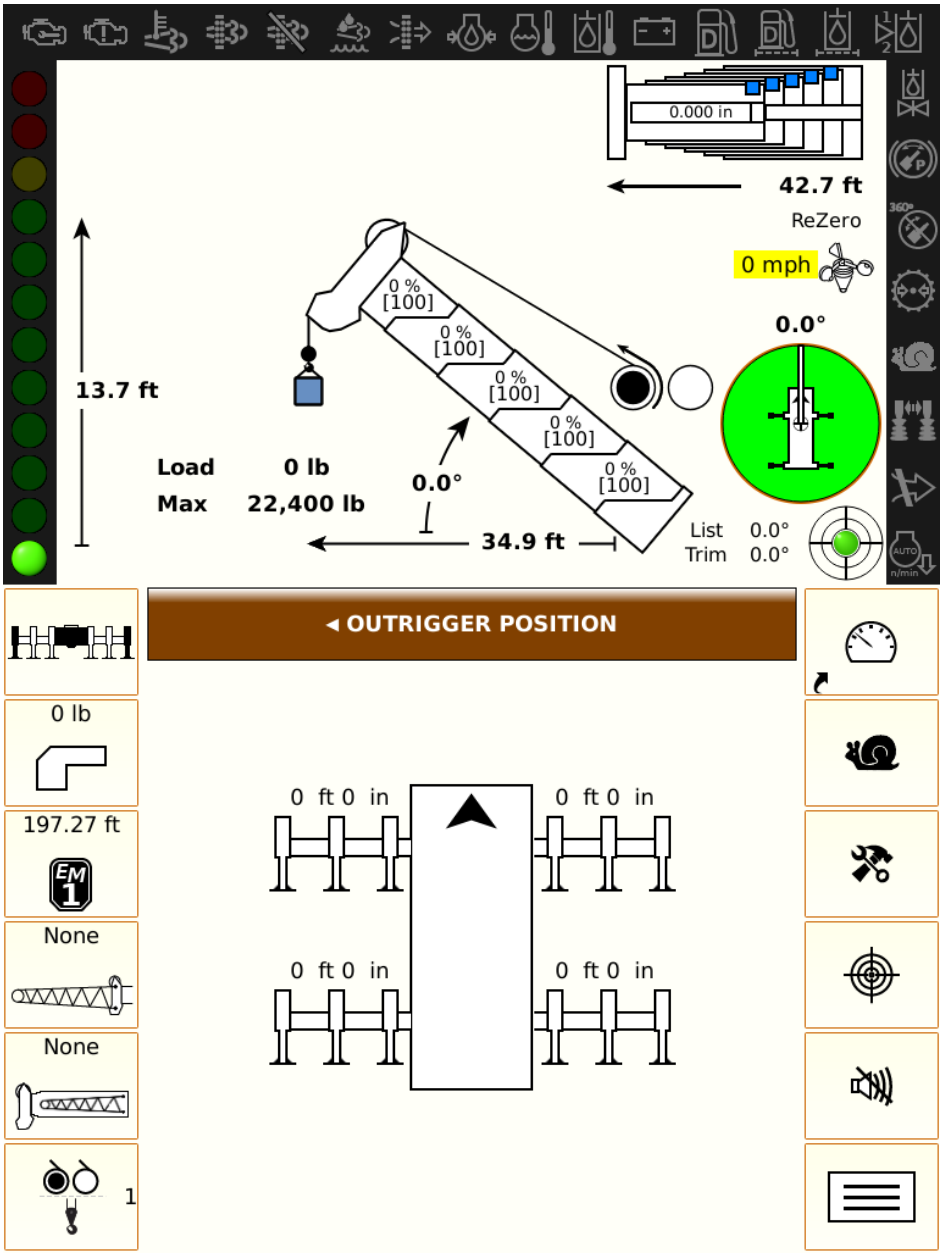
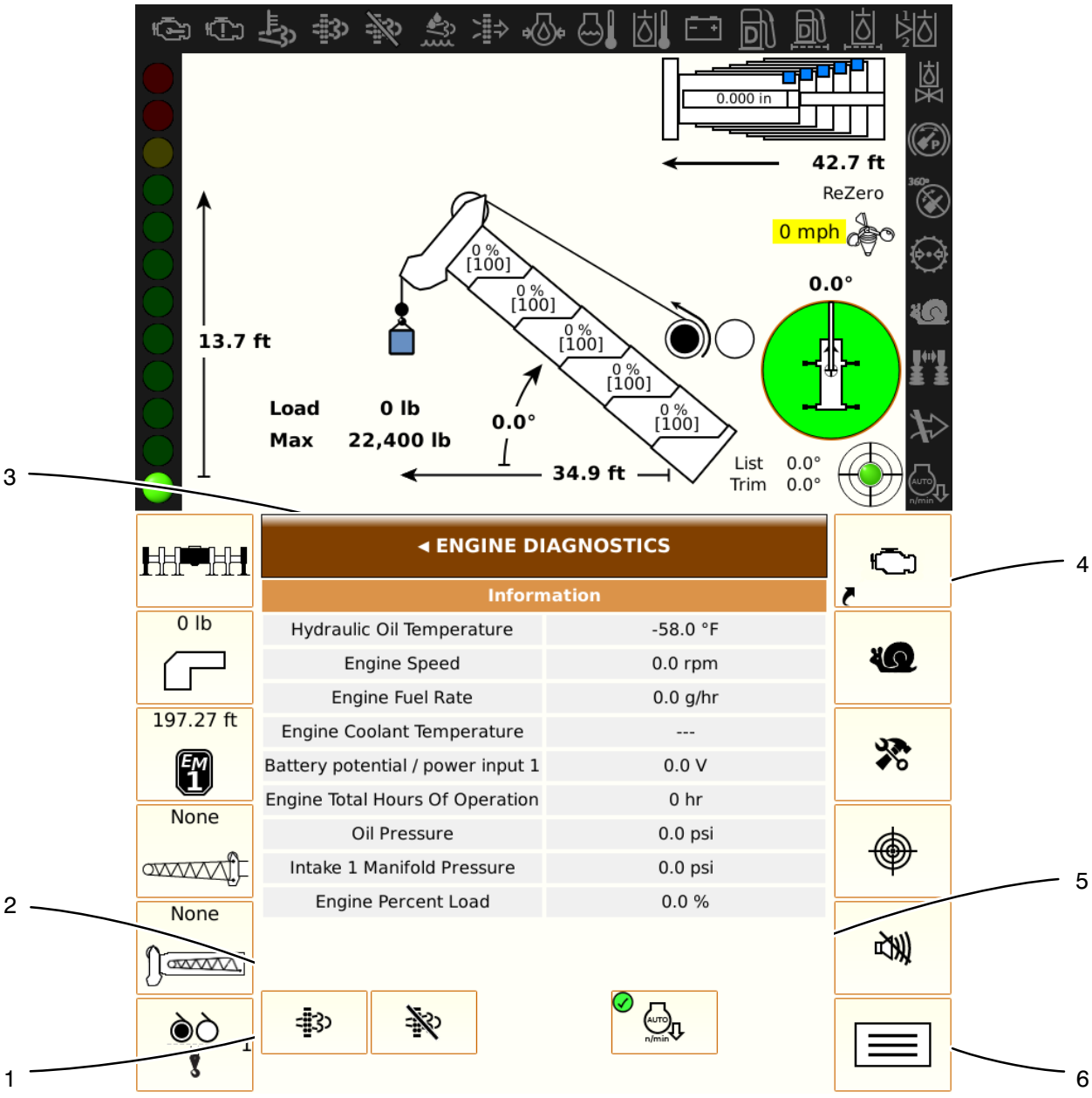


Figure 1—172
Diagnostics — Crane Function — Outrigger Position

Outrigger Position

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—164.
4. The Outrigger Diagnostics Screen will appear. Press the Outrigger Position Button to access the Outrigger Position Screen. Refer to Figure 1—171.
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.



1. Exhaust System Cleaning Required Button
2. Exhaust System Cleaning Inhibit Button
3. Back Menu Arrows
4. Shortcut Button
5. Auto Idle Button
6. Main Menu Button

Figure 1–173
Diagnostics — Engine

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 1−120.
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 1−173.
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) Inhibit 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 1−173 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.

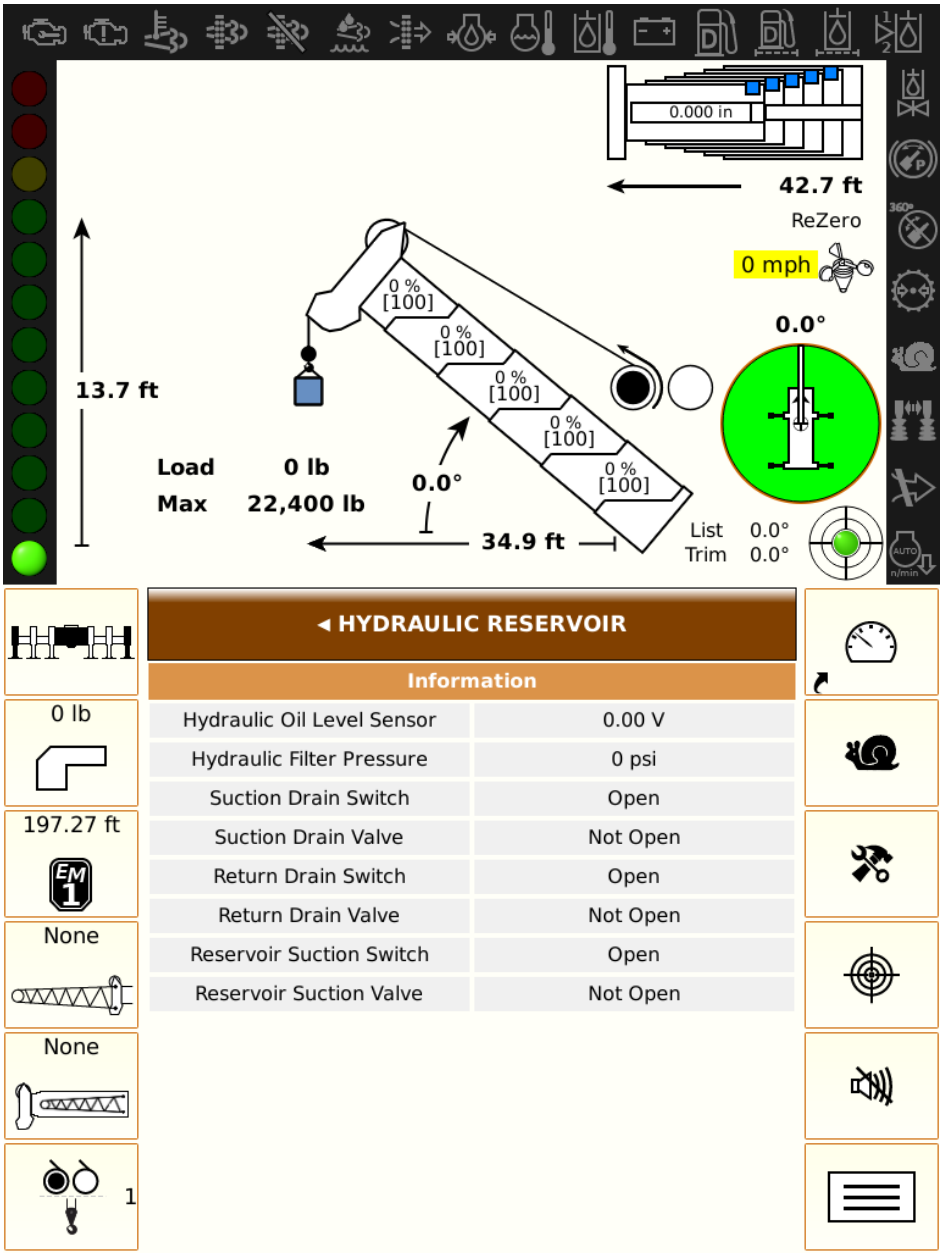


Figure 1—174
Diagnostics — Hydraulic Reservoir

Hydraulic Reservoir Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
2. The Diagnostics Menu will appear. Press the Hydraulic Reservoir Button. Refer to "Diagnostics Menu" in this section of this Operator's Manual.
3. The Hydraulic Reservoir Diagnostics Screen will appear. Refer to Figure 1—174.
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.

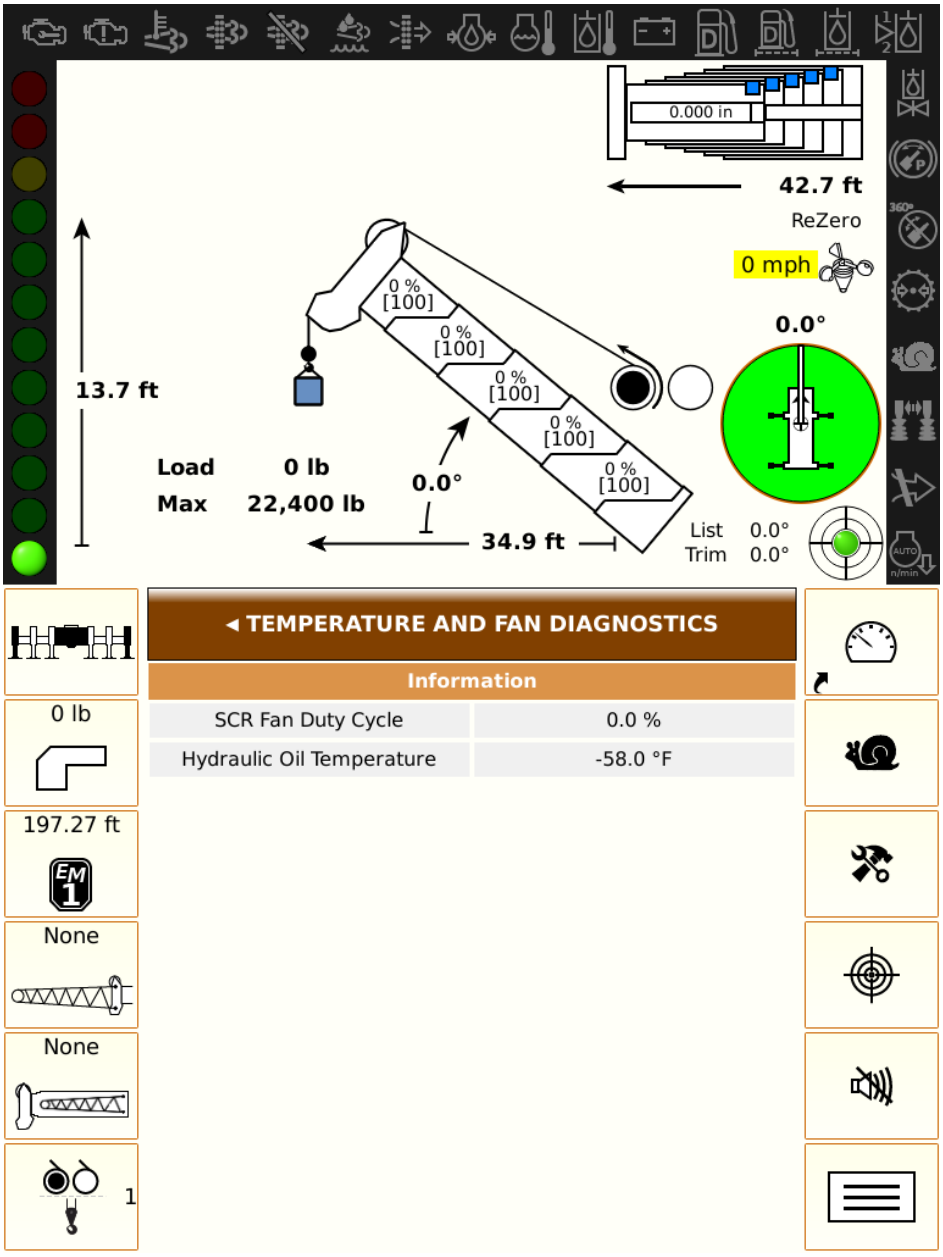


Figure 1—175
Diagnostics — Temperature And Fan

Temperature And Fan Diagnostics

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
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—175.
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.

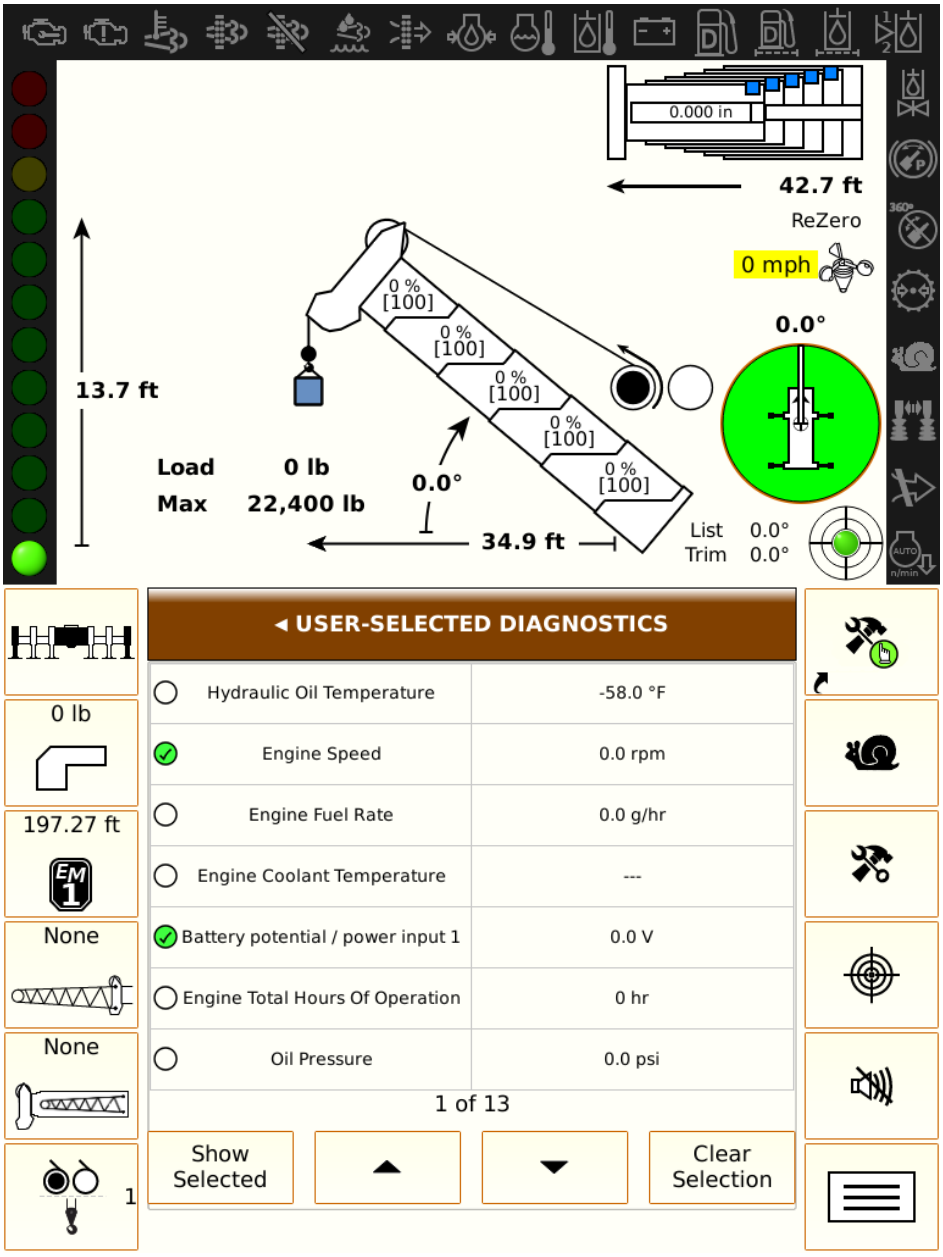


Figure 1—176
Diagnostics — User-Selected Options

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—120.

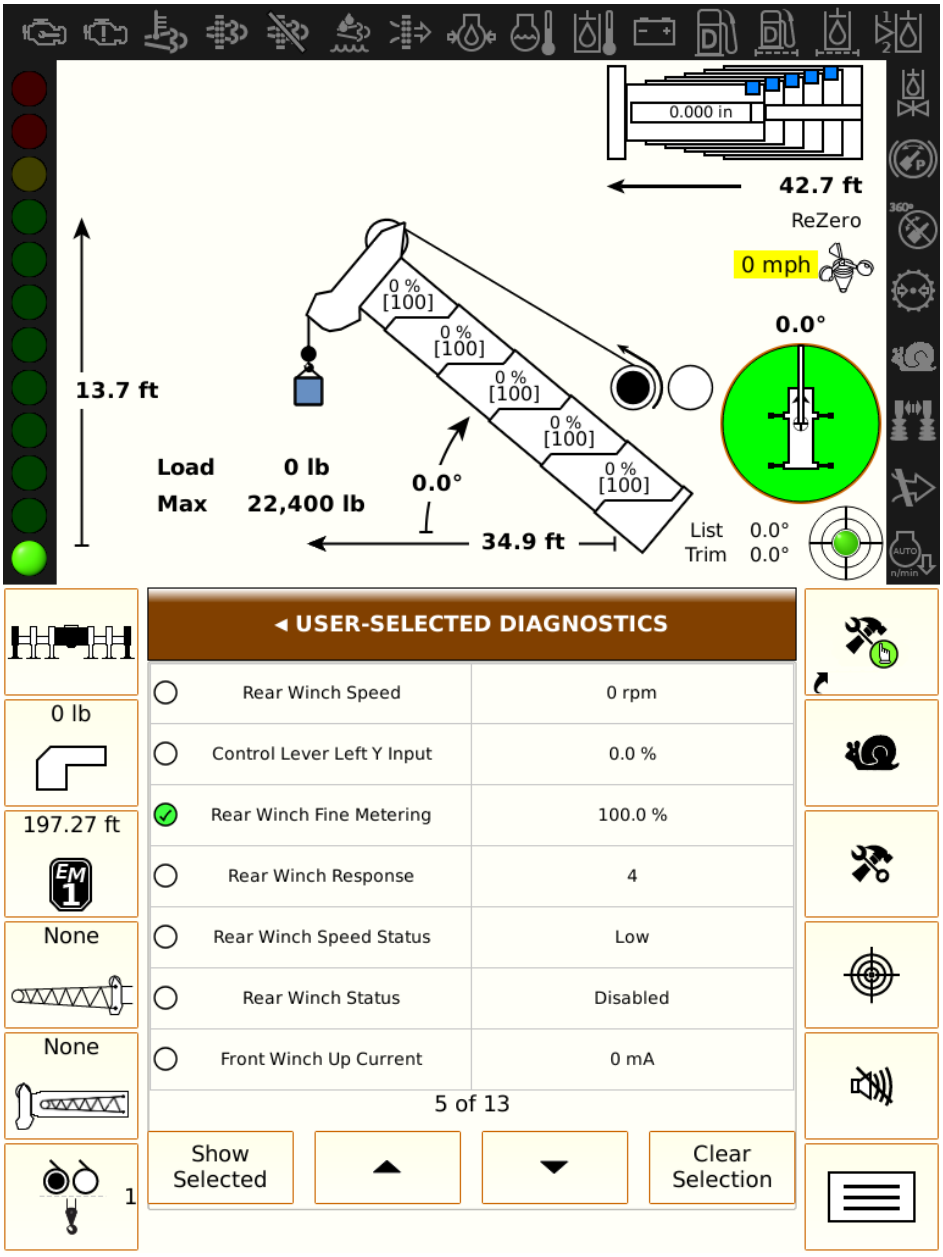


Figure 1—177
Diagnostics — User-Selected Options Continued

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—176.
4. Press the Up/Down Arrow Buttons ▲▼ to navigate through additional pages of the selection display. Refer to Figure 1—176 through Figure 1—178.
5. Select, deselect, or clear all diagnostic selections, as required, to configure desired user-selected diagnostics.

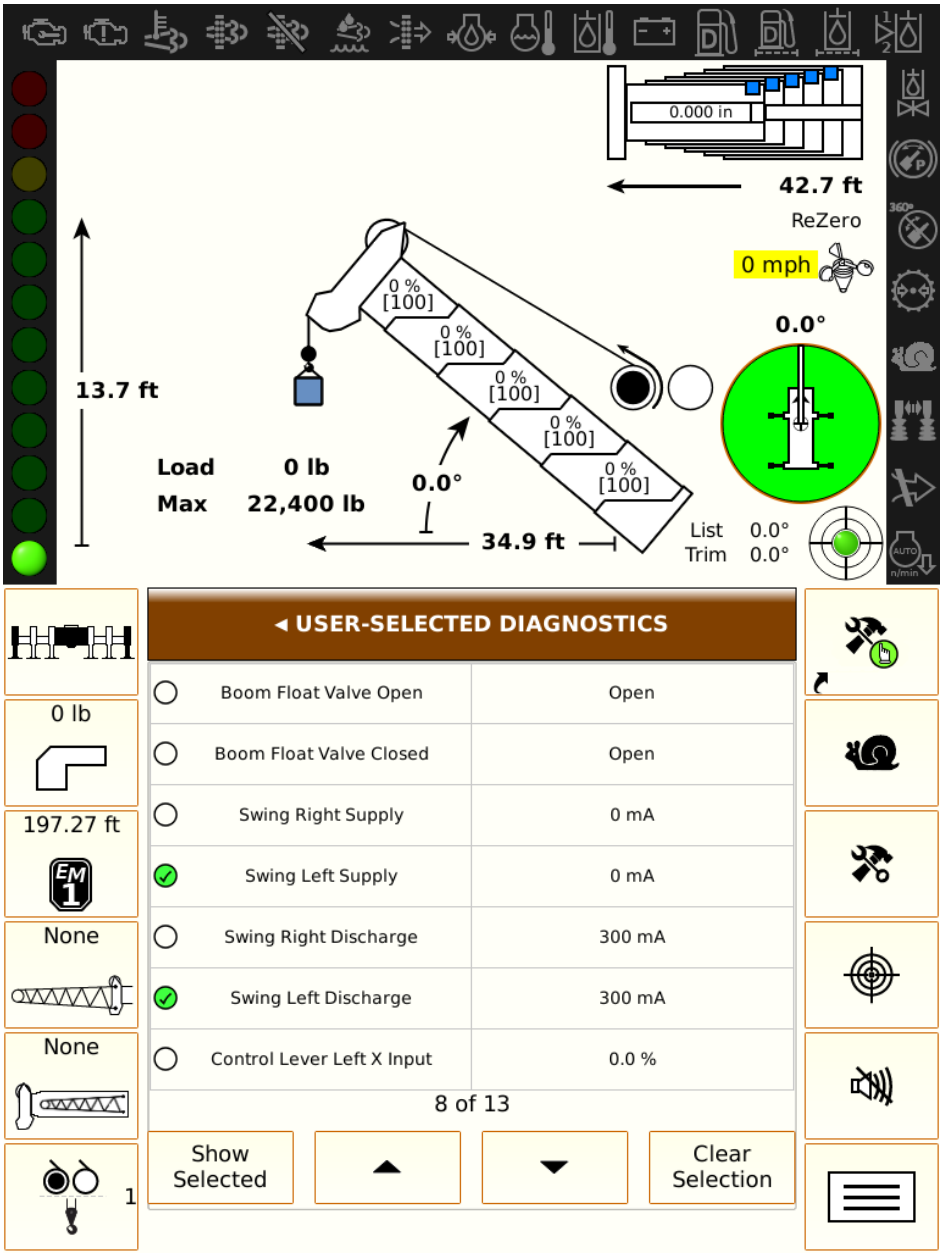


Figure 1—178
Diagnostics — User-Selected Options Continued

a. To select diagnostics, press the deactivated Activation Toggle ◯ to the left of the associated diagnostic. The Activation Toggle will toggle from deactivated ◯ to activated ✓.
b. To deselect diagnostics, press the activated Activation Toggle ✓ to the left of the associated diagnostic. The Activation Toggle will toggle from activated ✓ to deactivated ◯.
c. To clear all diagnostic selections, press the Clear Selections Button.

6. Once the desired diagnostics have been selected, press the Show Selected Button.

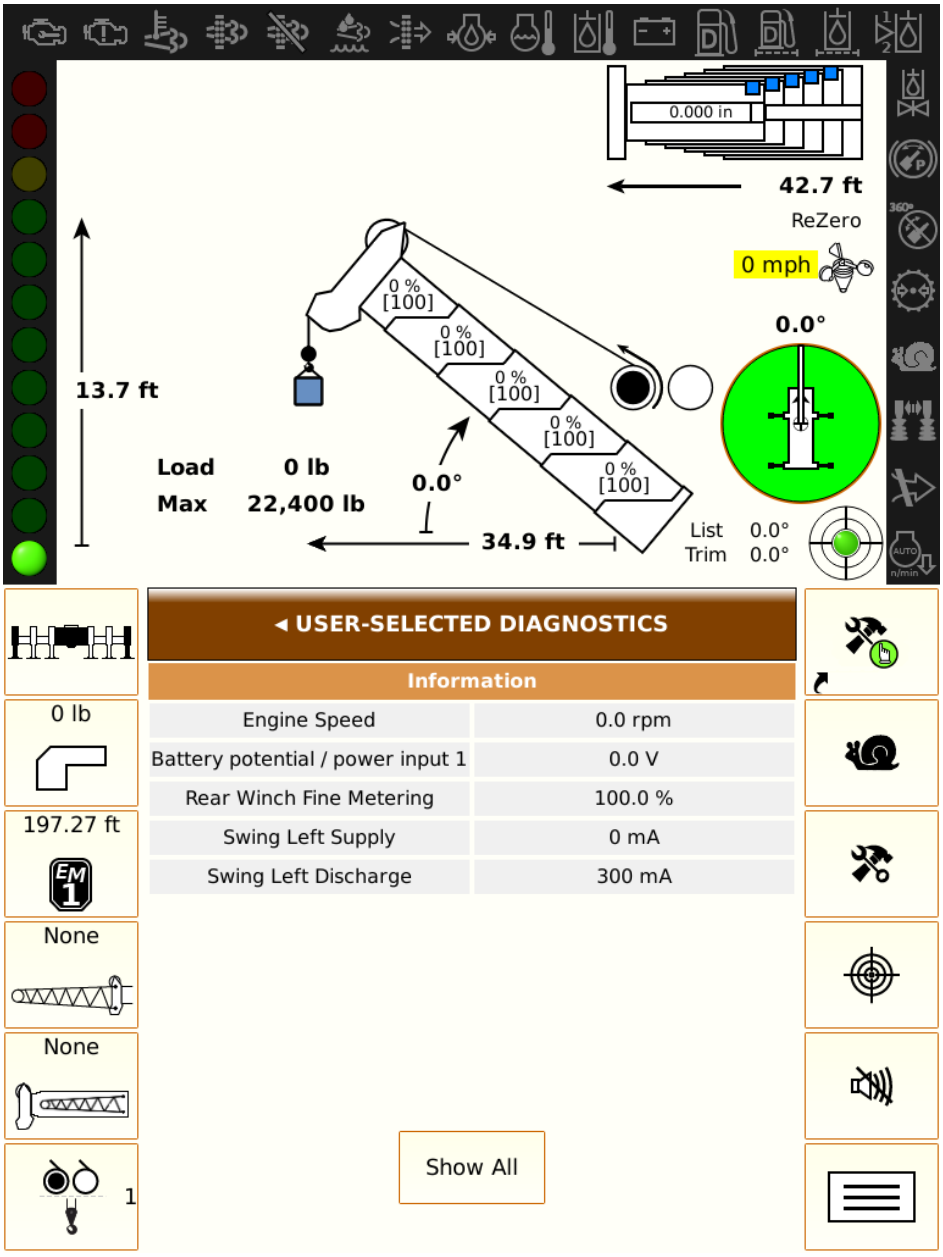


Figure 1—179
Diagnostics — User-Selected

7. The User-Selected Diagnostics Screen will change to show the user selections. Refer to Figure 1—179.
8. If further configuration is required, press the Show All Button Show All 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.

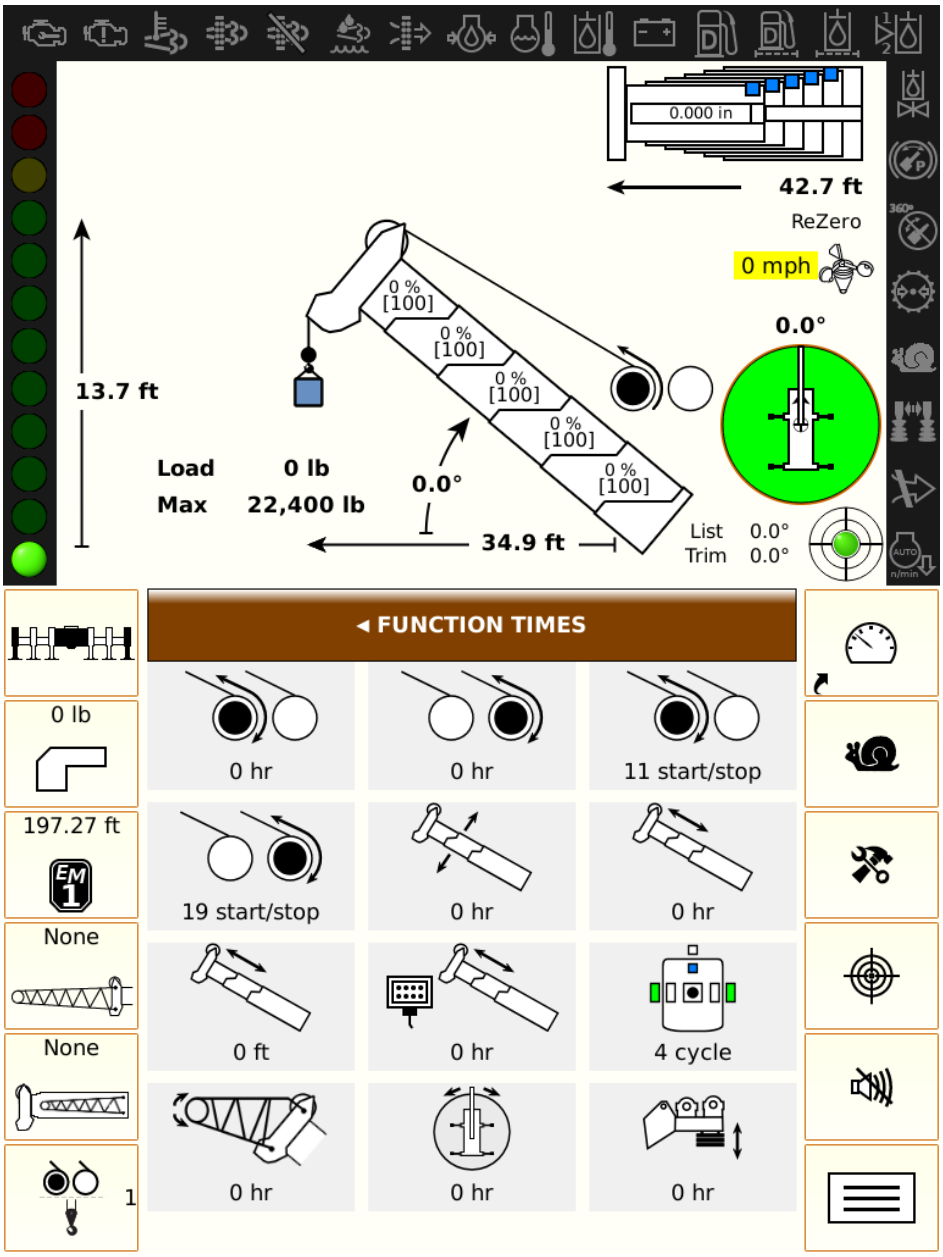


Figure 1—180
Diagnostics — Function Times

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—120.
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—180.
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.

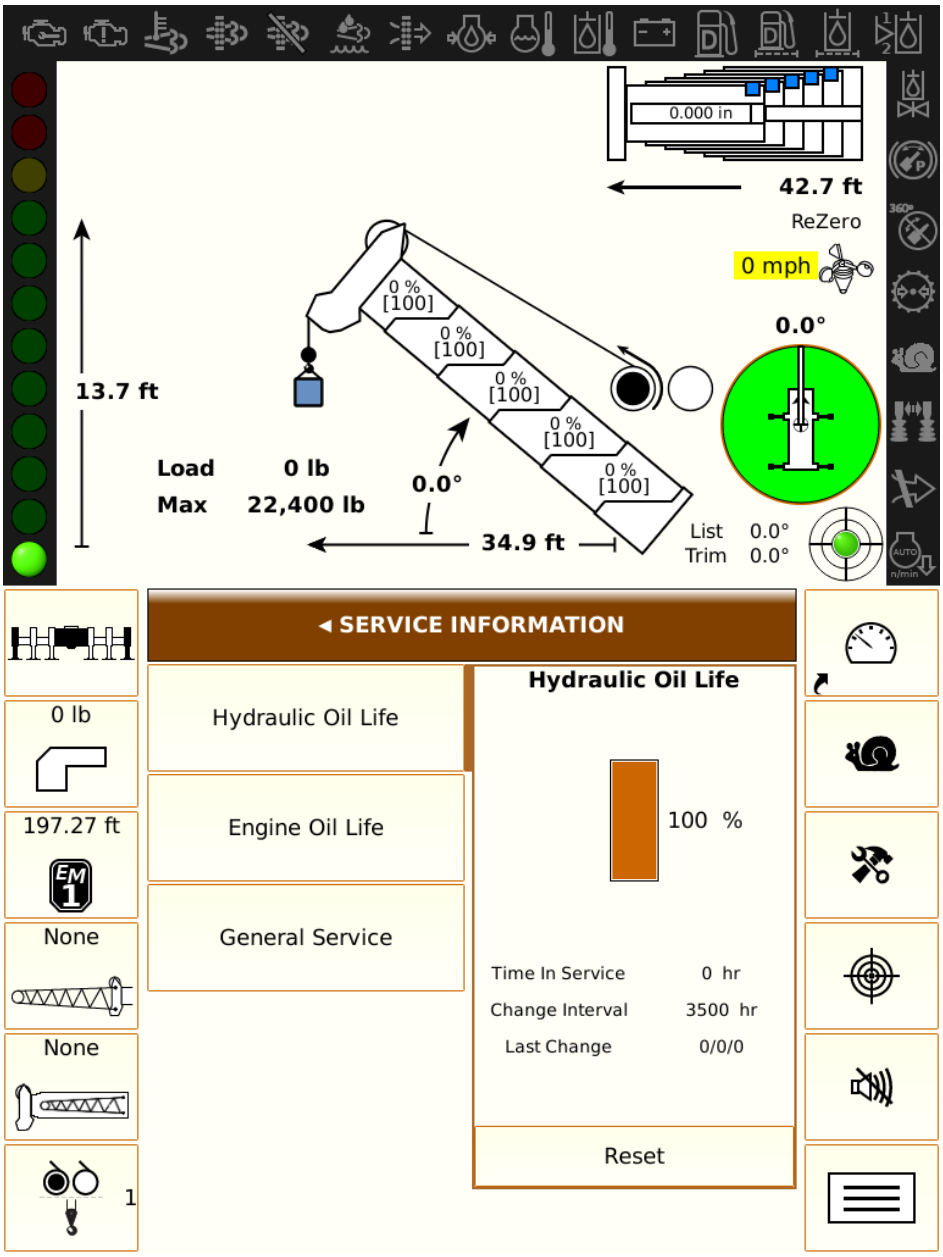


Figure 1—181
Diagnostics — Service Information

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—120.
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—181.
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.

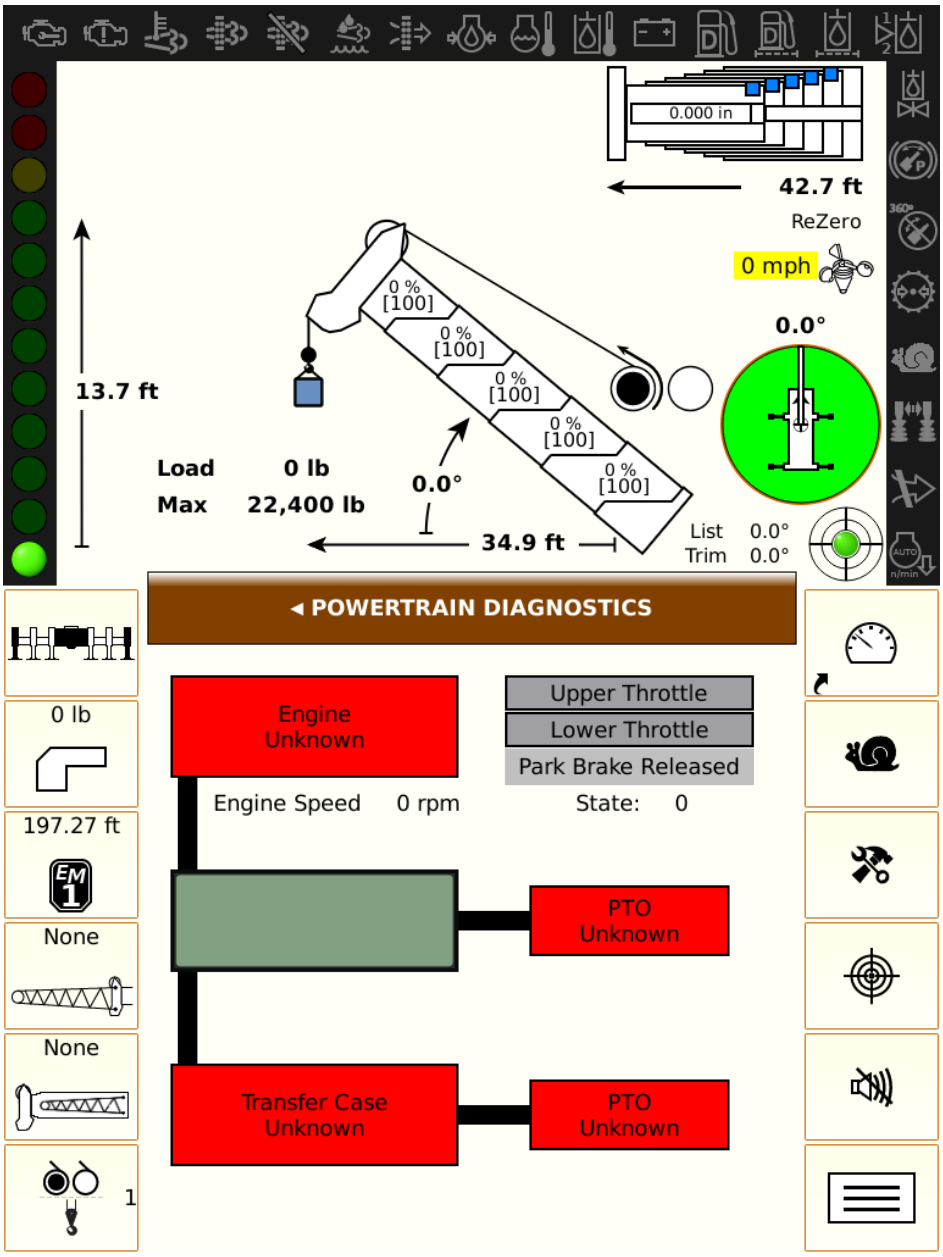


Figure 1—182
Diagnostics — Powertrain

Powertrain Diagnostics

The powertrain diagnostics screen displays the status of the powertrain system. The PTO and transfer case status and whether the powertrain is in upper mode or lower mode is displayed on this screen.

1. From the Main Menu Screen, press the Diagnostics Button. Refer to Figure 1—120.
2. The Diagnostics Menu will appear. Press the Powertrain Diagnostics Button. Refer to "Diagnostics Menu" in this section of this Operator's Manual.
3. The Powertrain Diagnostics Screen will appear. Refer to Figure 1—182.
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.

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—120.
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—181.
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—184.
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—185.
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.

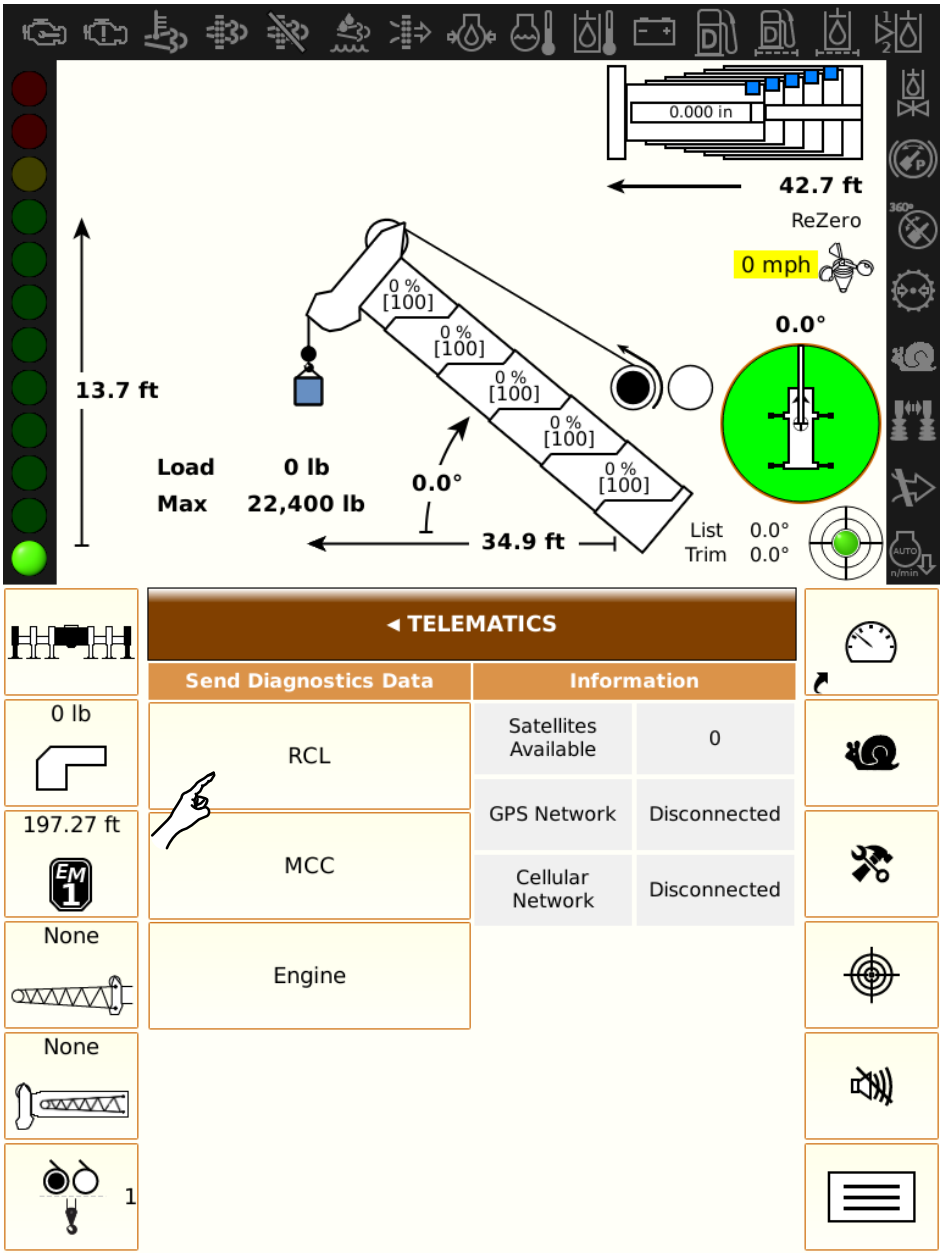


Figure 1—183
Diagnostics — Telematics

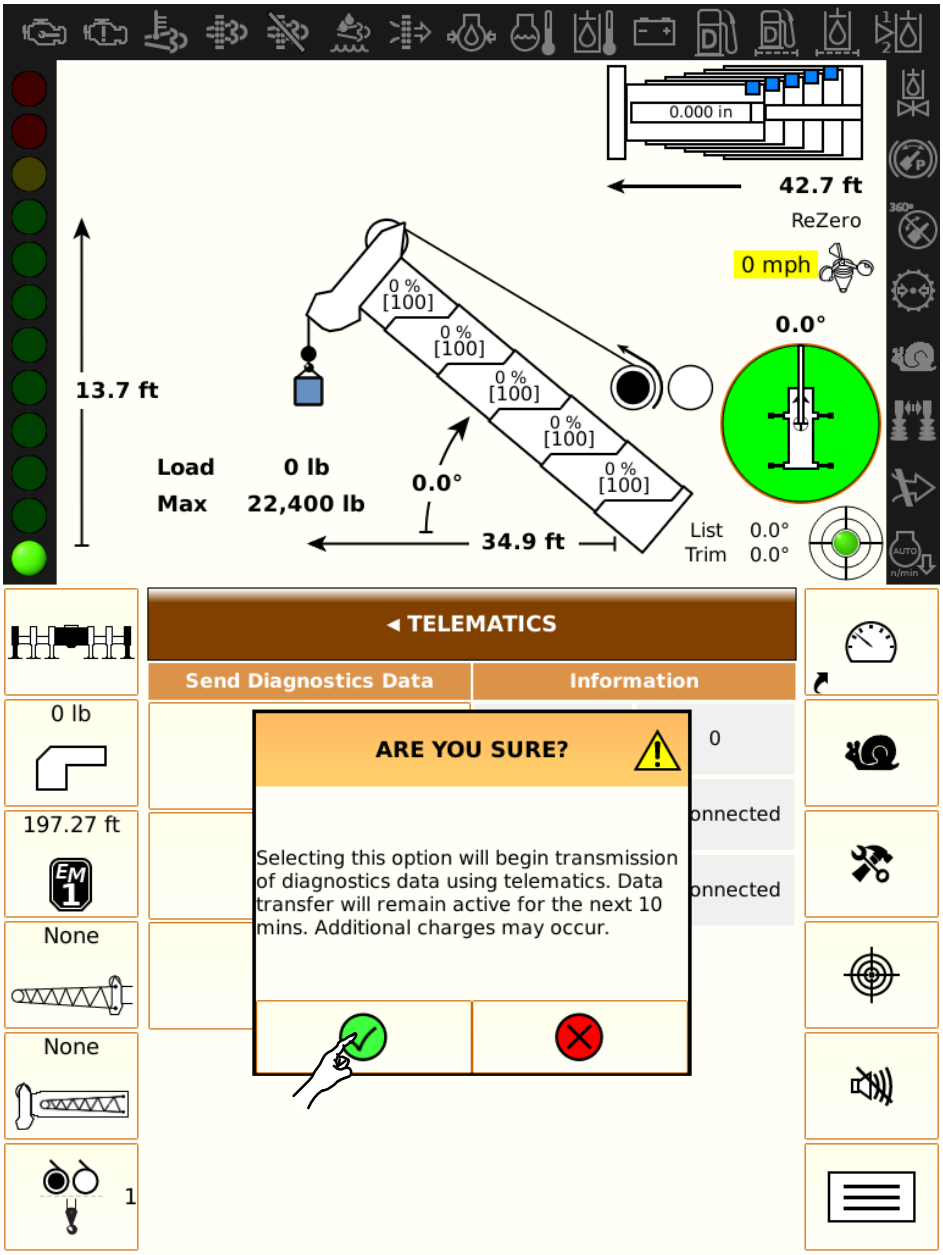


Figure 1—184
Diagnostics — Telematics — Confirmation Screen

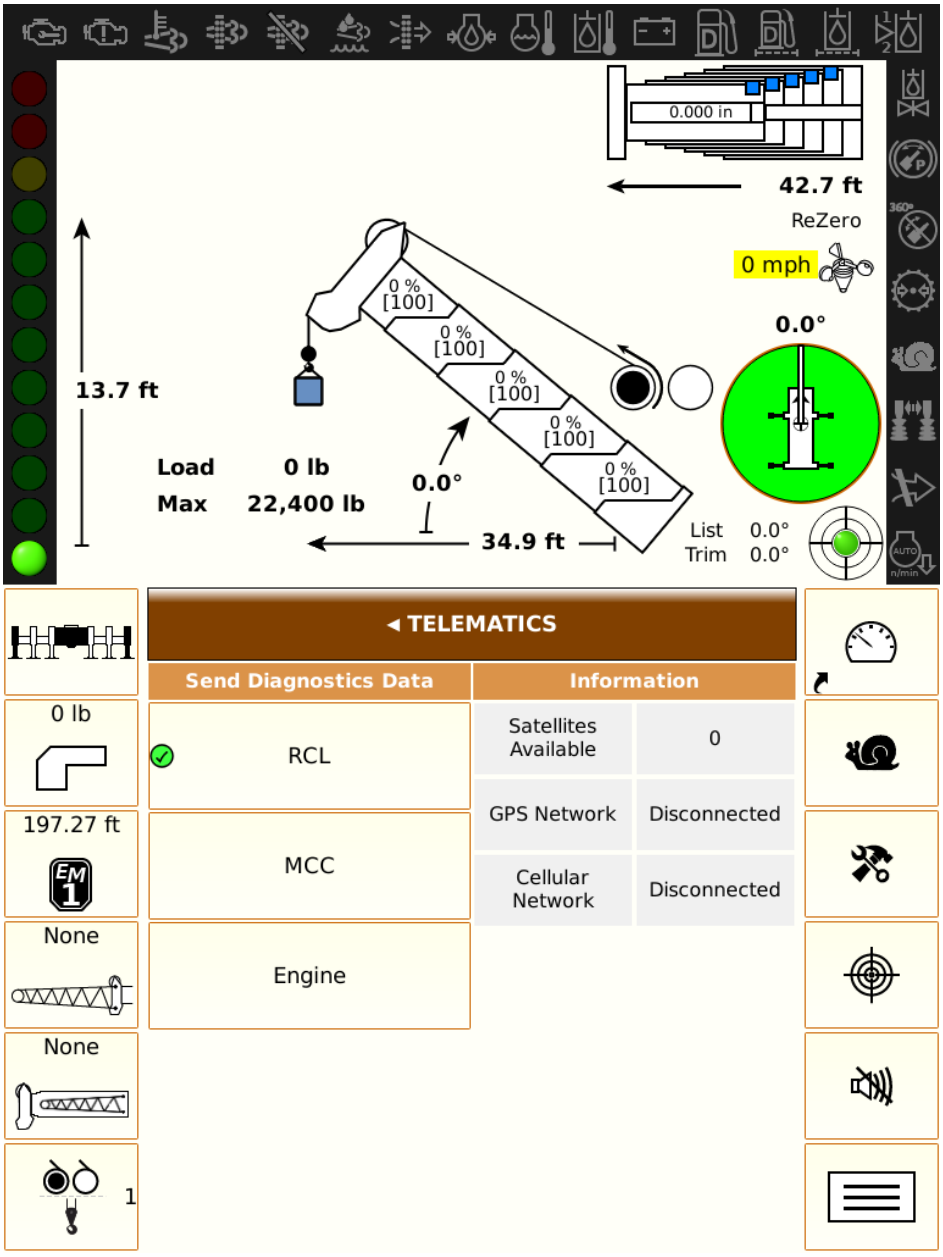


Figure 1—185
Diagnostics — Telematics — Sending

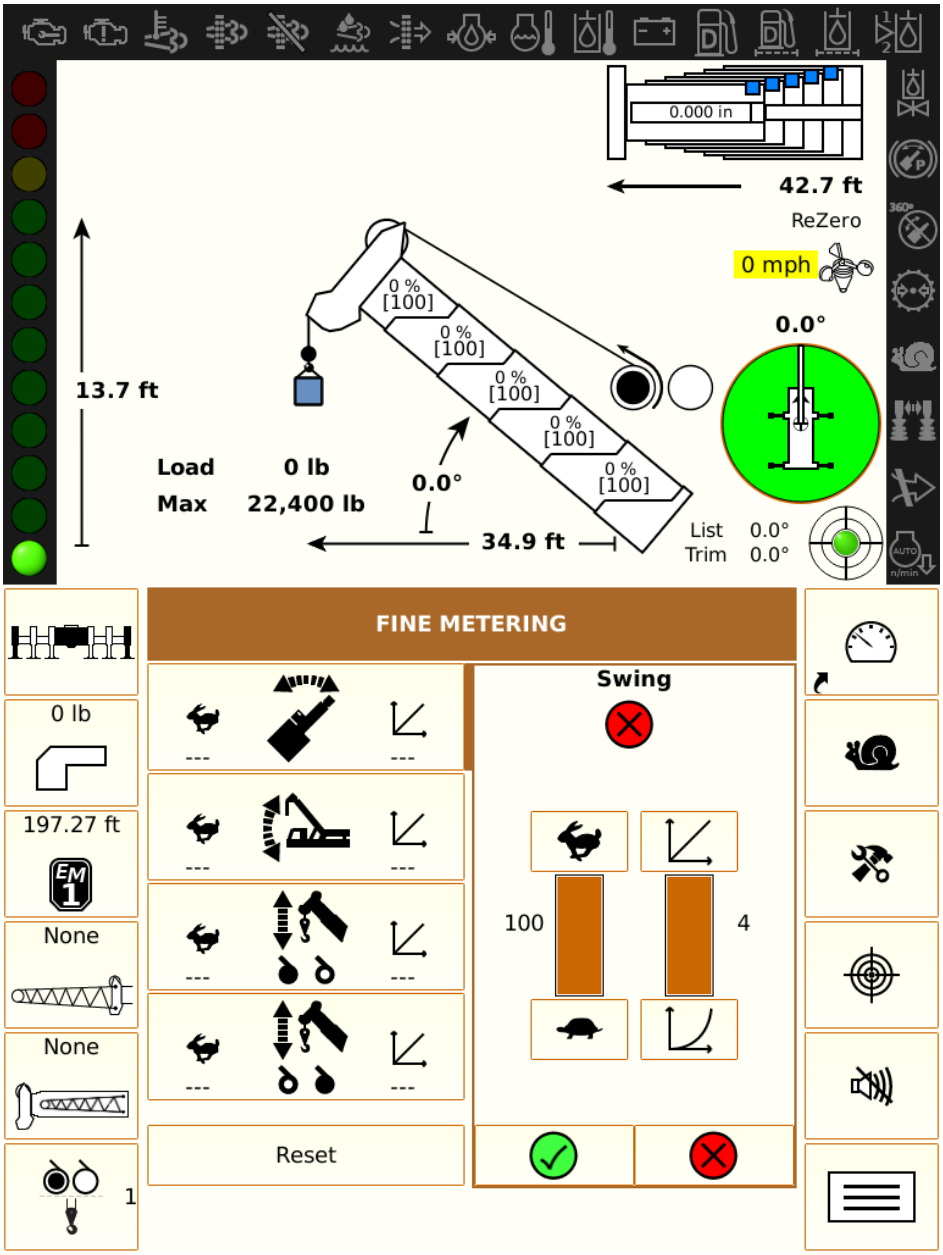


Figure 1—186
Fine Metering

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—120.

   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.

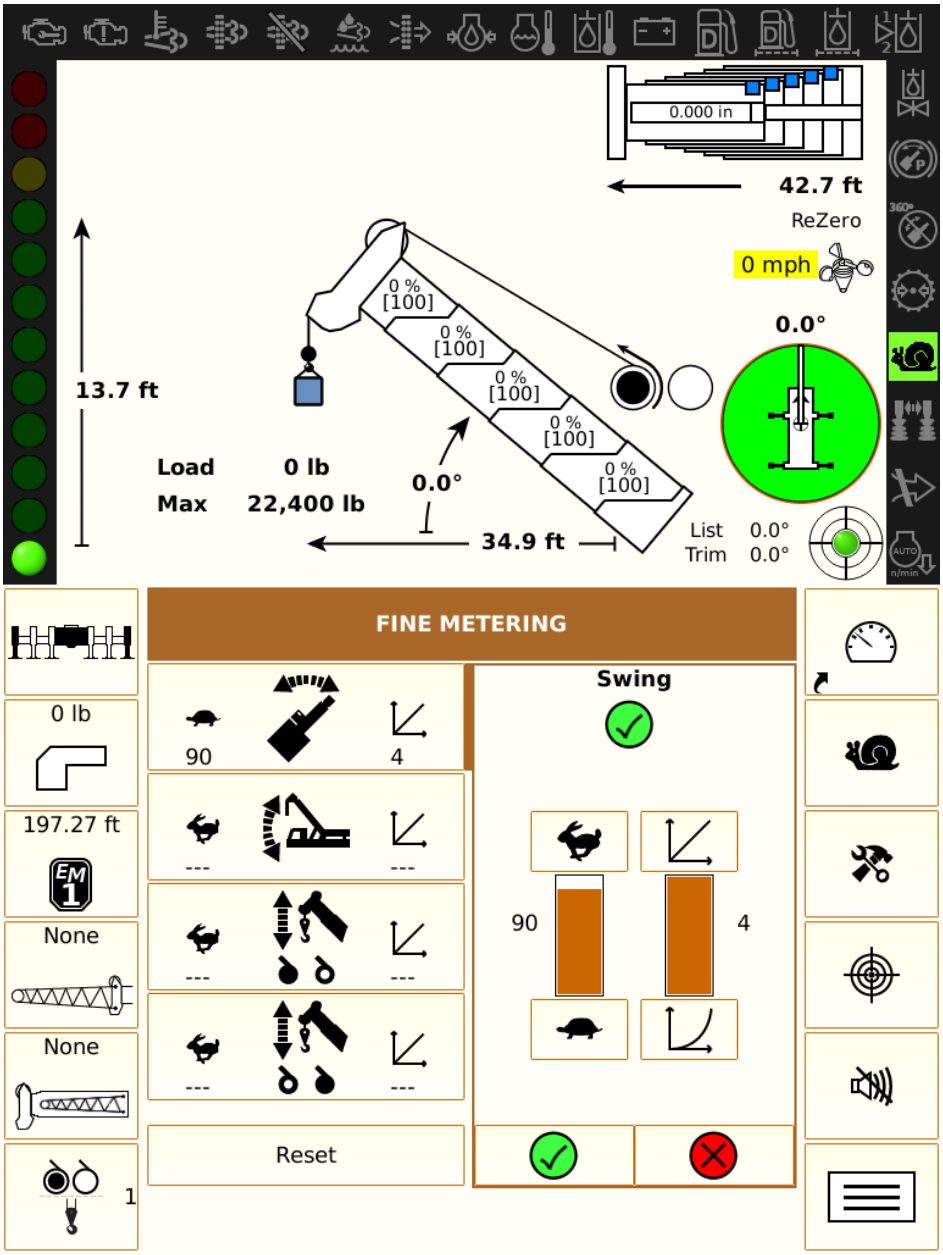


Figure 1—187
Fine Metering — High And Low Speed

2. The Fine Metering Screen will appear. Refer to Figure 1—186.
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—187.

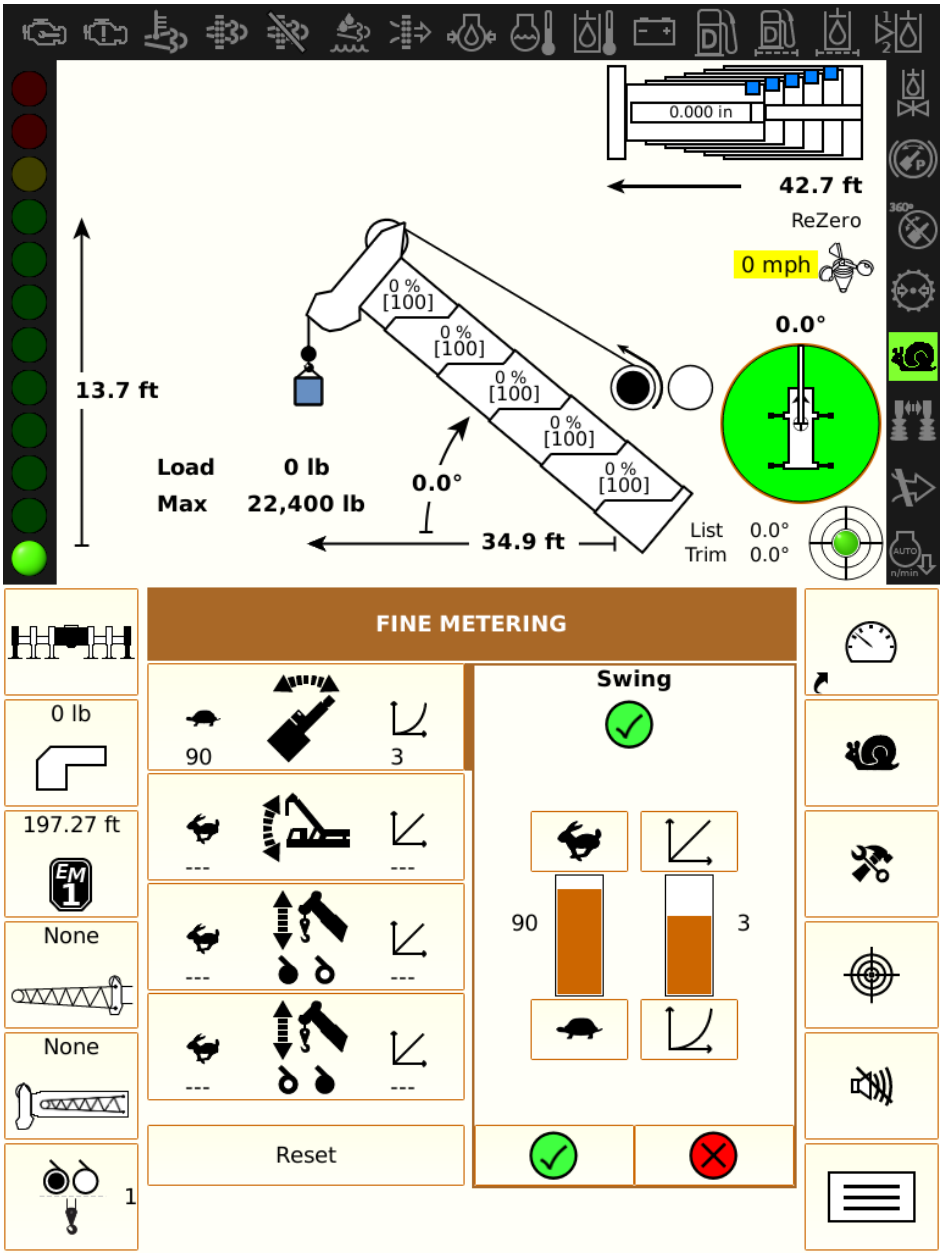


Figure 1—188
Fine Metering — Greater And Lesser Function Response

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—188.
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.
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.

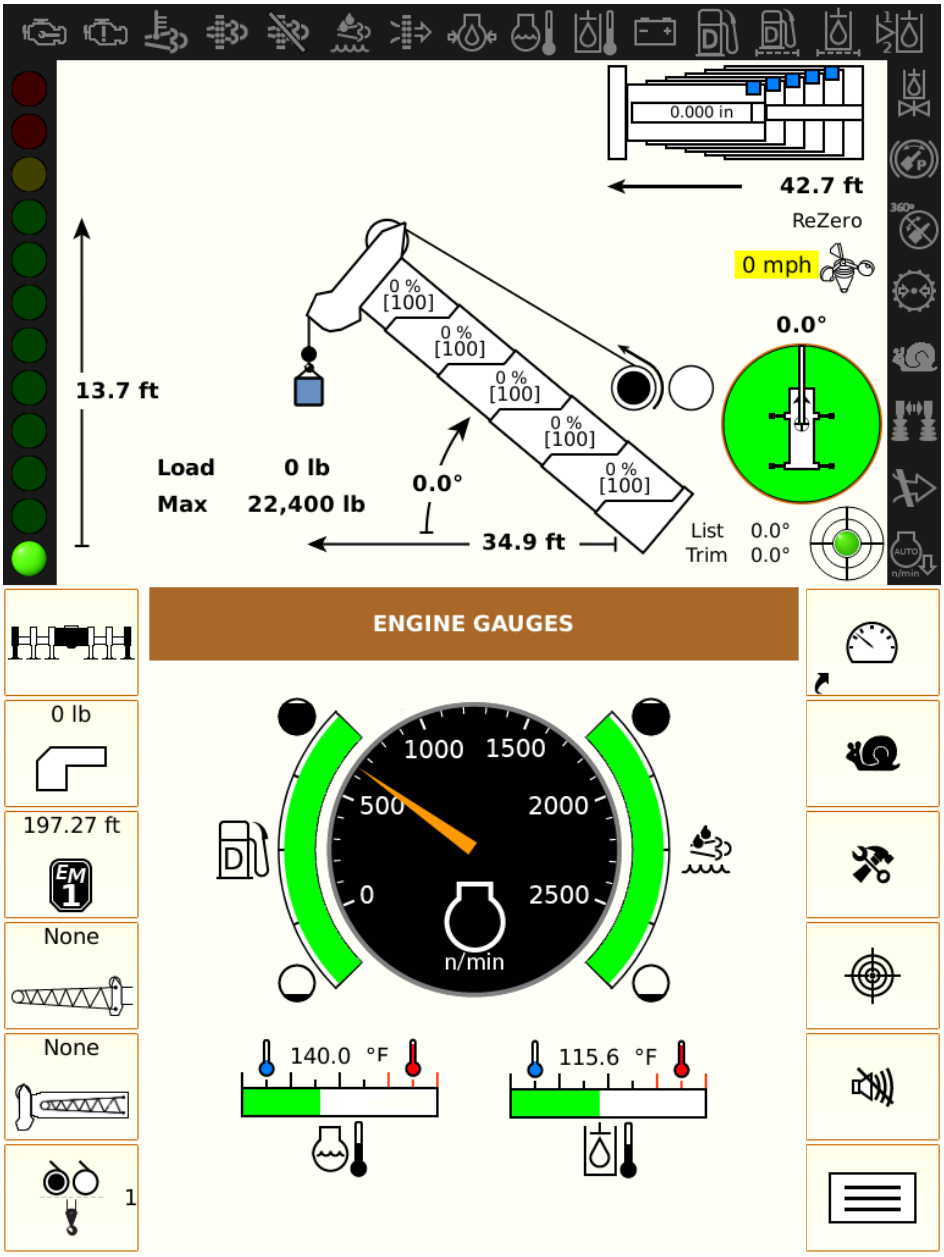


Figure 1—189
Engine Gauges

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—120.
2. The Engine Gauges Screen will appear. Refer to Figure 1—189.
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.

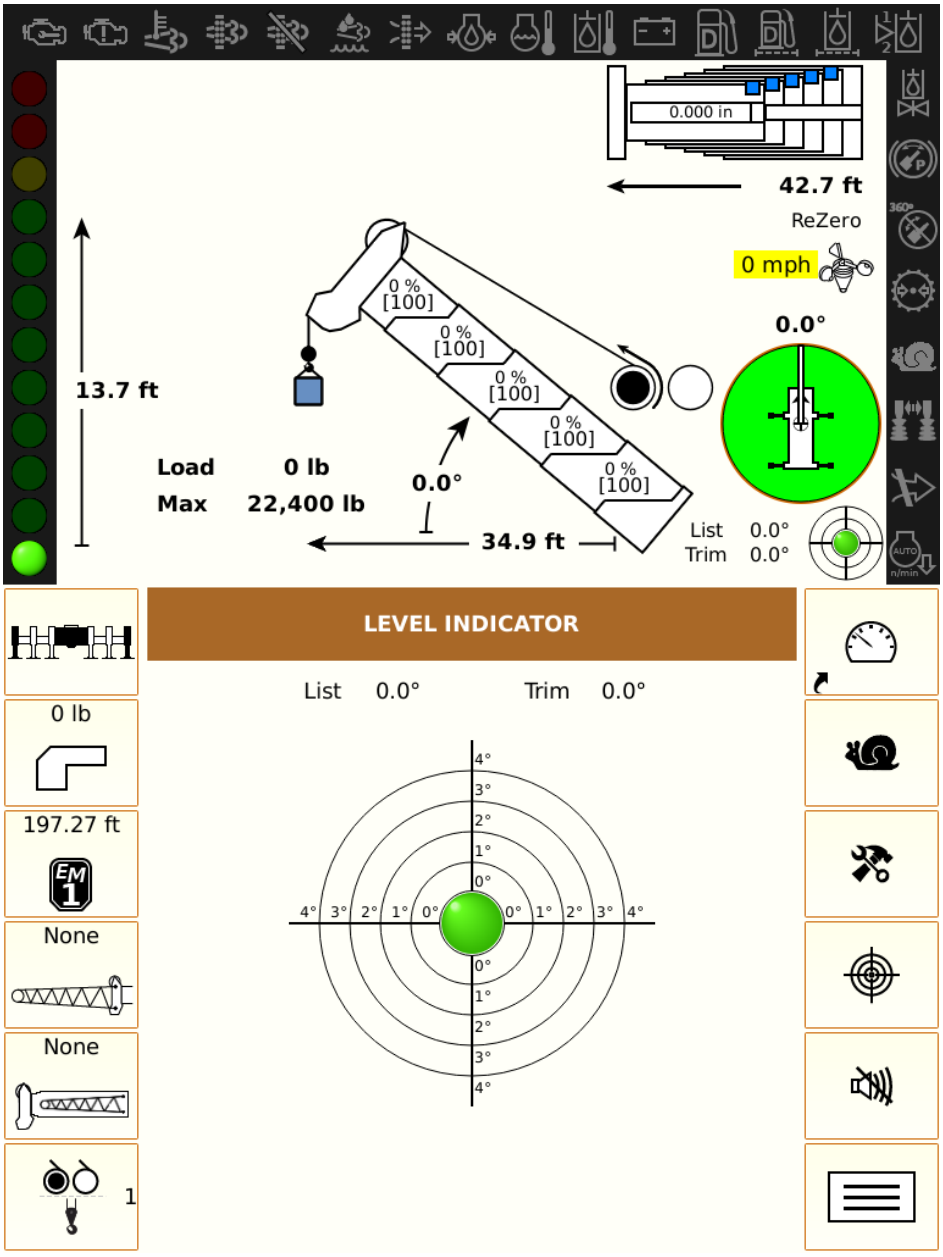


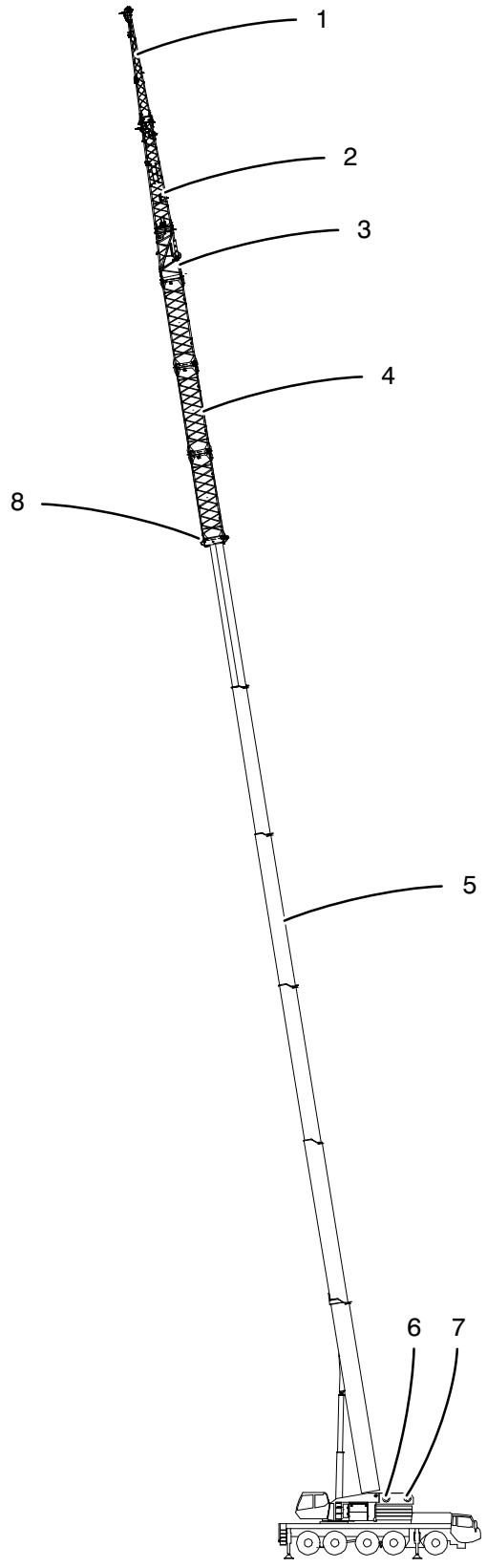
Figure 1—190
Level Indicator

Level Indicator

1. From the Main Menu Screen, press the Level Indicator Button. Refer to Figure 1—120.

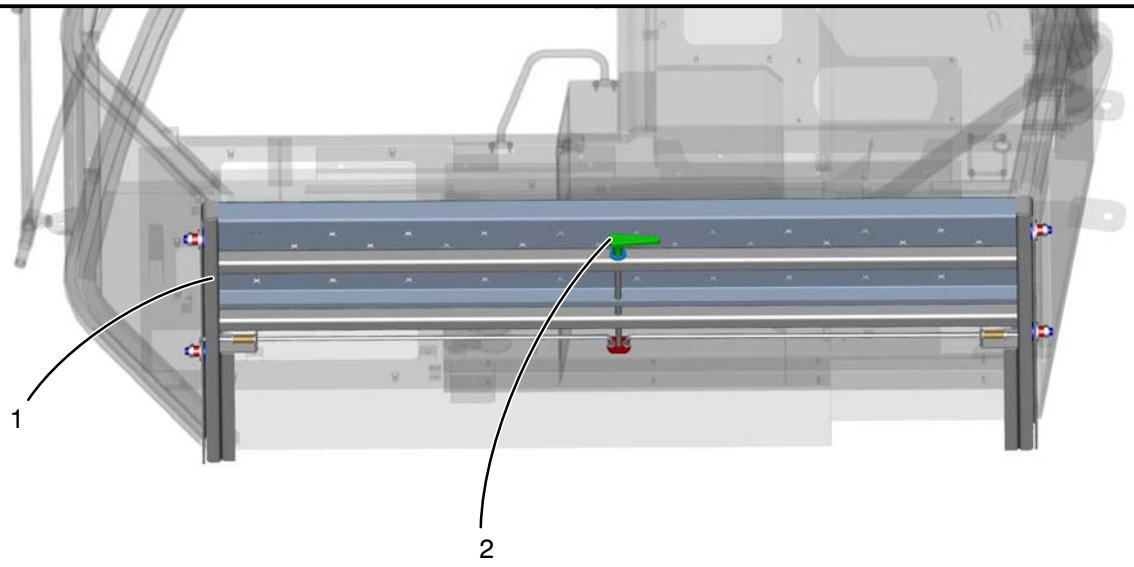
   Note: The Level Indicator Pulse Feature Button can be used to access the Level Indicator Screen from any screen. Refer to "Pulse Feature Buttons" in this section of this Operator's Manual.

2. The Level Indicator Screen will appear. Refer to Figure 1—190.
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.



1. Offset Lattice Fly Tip Section
2. Offset Lattice Fly Center Section
3. Offset Lattice Fly Base Section
4. Fly Extensions
5. Six Section Boom
6. Front Winch
7. Rear Winch
8. Auxiliary Lifting Sheave

Figure 1–191
Typical Crane Attachment Setup (Provided for correct identification of attachments)



1. Cab Walk
2. Release Handle

Figure 1–192
Cab Walk

Entering And Exiting The 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. A cab walk assembly is mounted under the operator's cab and should be extended when entering/exiting the operator's cab. Refer to Figure 1–192. Turn the release handle to extend/retract the cab walk assembly. (Retract the cab walk anytime the crane is traveled, lifted, or transported.) 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.

Note: Do no attempt to enter or exit the cab while it is tilted.

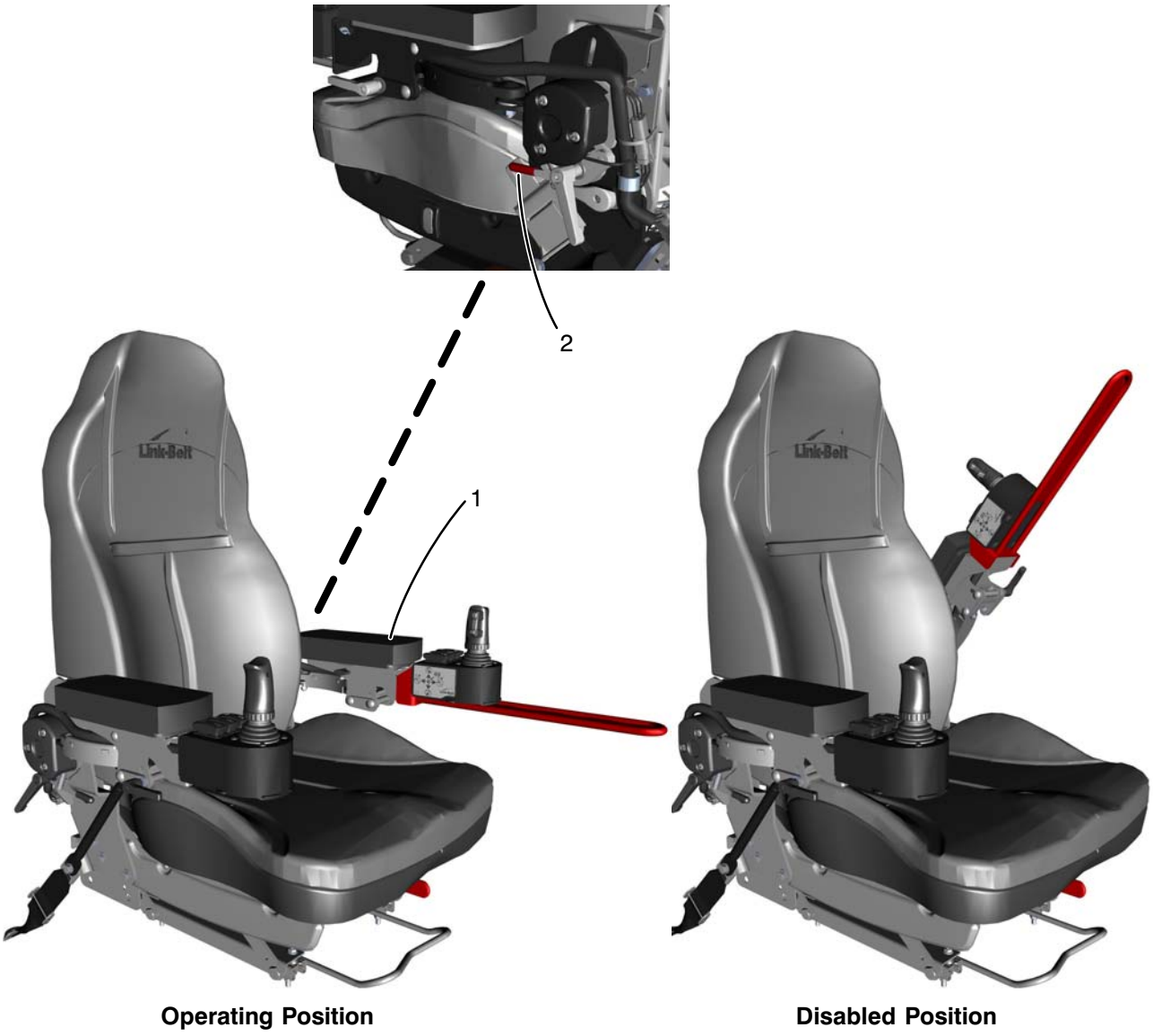
1. Function Lockout Switch

Figure 1–193
Function Lockout Switch

Inside the cab, two separate features are provided to prevent accidental operation of the hydraulic controls while entering or exiting the operator's seat.

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 1–193. 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. This switch must always be in the "DISABLE" position before entering or exiting the operator's seat.



1. Left Side Armrest
2. Seat Arm Lock Up Release Lever

Figure 1–194
Movable Left Side Console

Movable Left Side Console

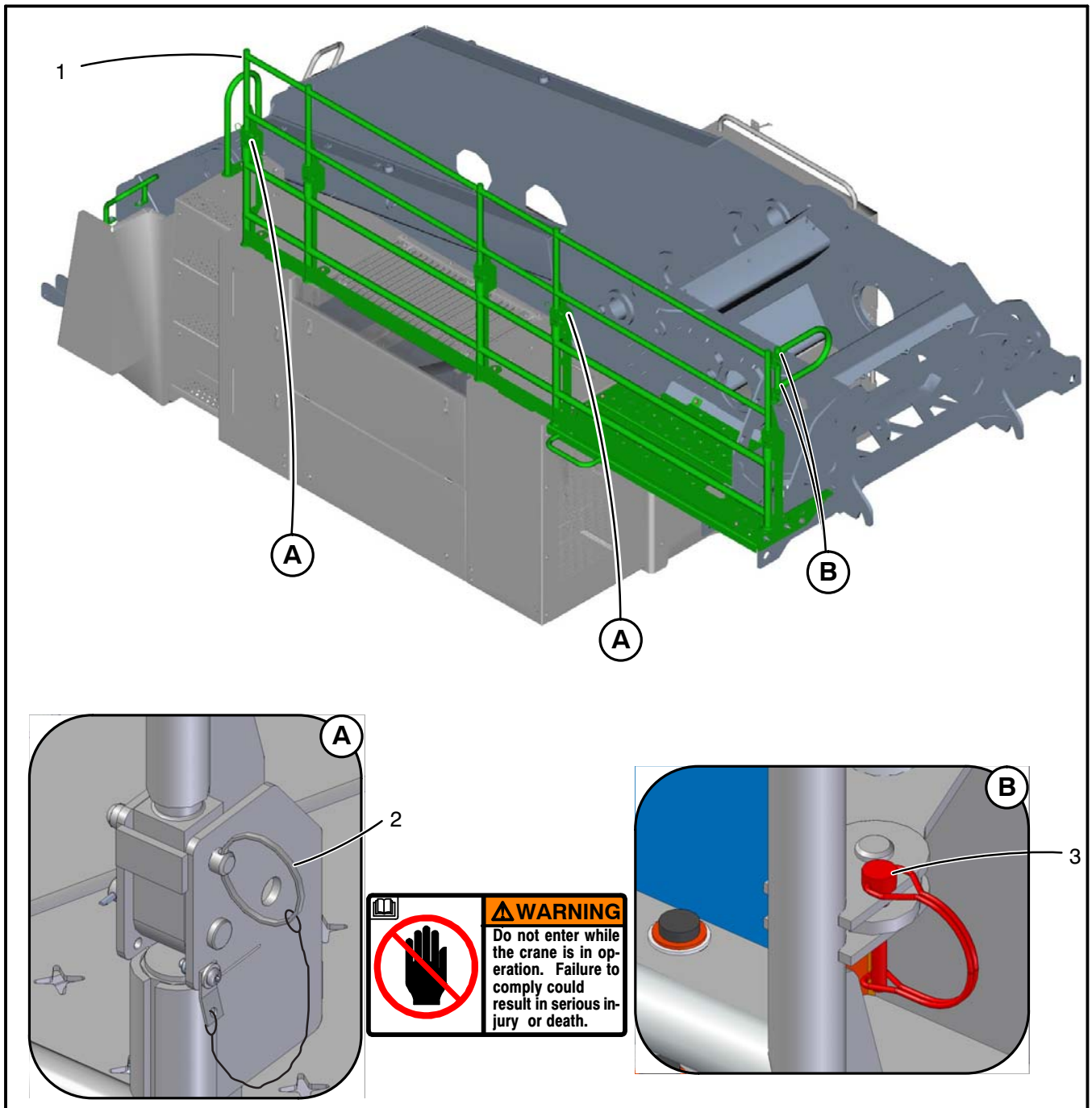
The left side armrest is hinged at the rear to allow the operator to lift the armrest up, out of the way while entering or exiting the upper operator's cab. Refer to Figure 1–194.

WARNING

To prevent personal injury do not attempt to enter operator's cab prior to raising the left console stand.

Lifting the left side armrest 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 armrest is lifted up, out of the way before attempting to enter or exit the upper operator's cab.

The left armrest also has a locking feature in the disabled position. Pull the release lever on the left of the armrest base to release the locking mechanism and allow the armrest to return to the operating position. Refer to "Operator's Seat" in this section of this Operator's Manual.

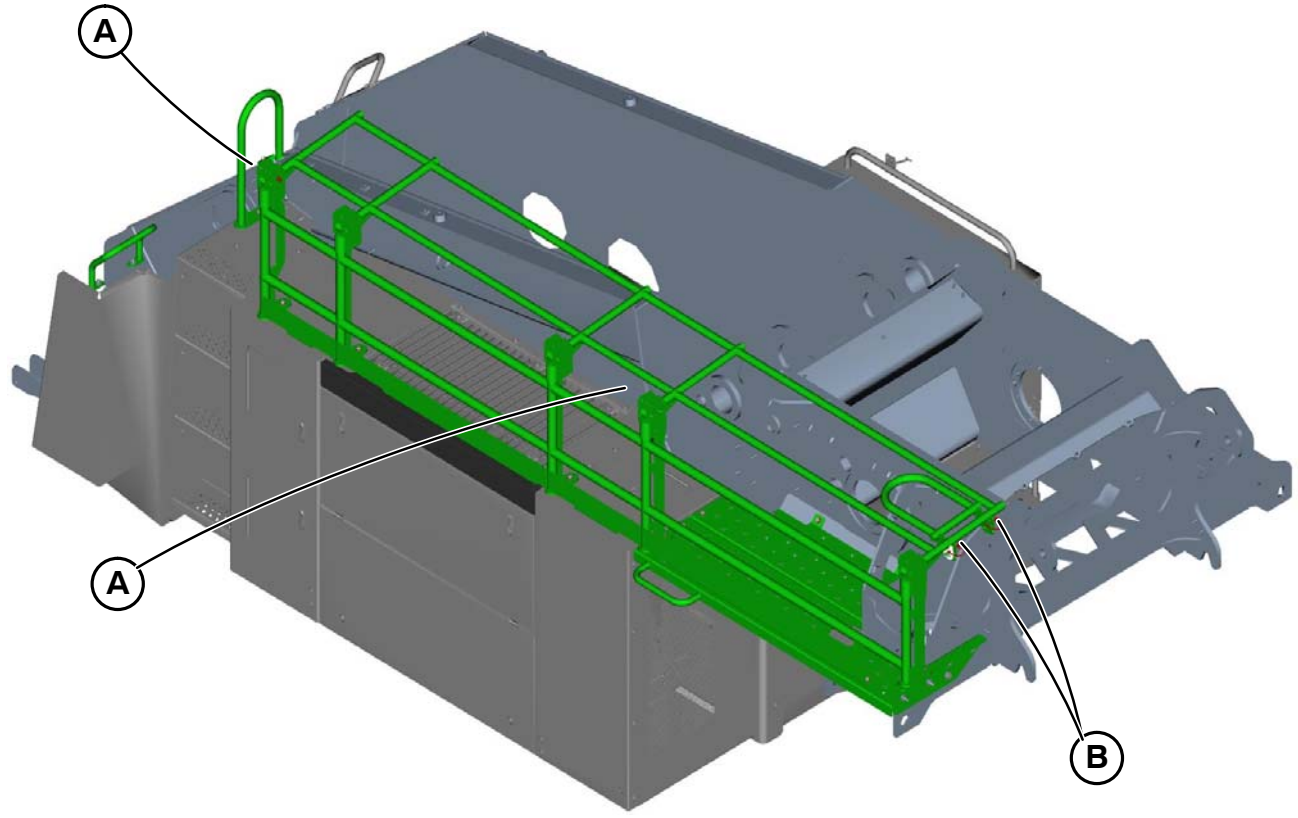


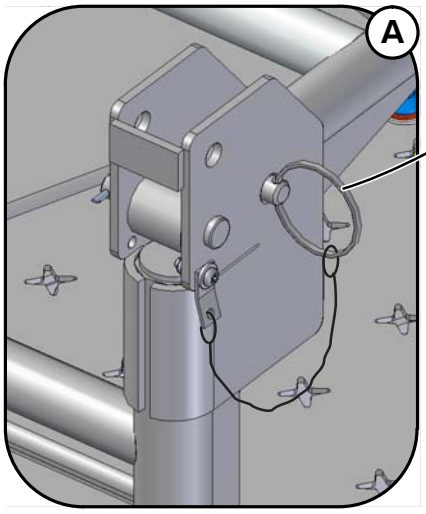
1. Upper Guard Rail
2. Quick Release Pin
3. Keeper Pin

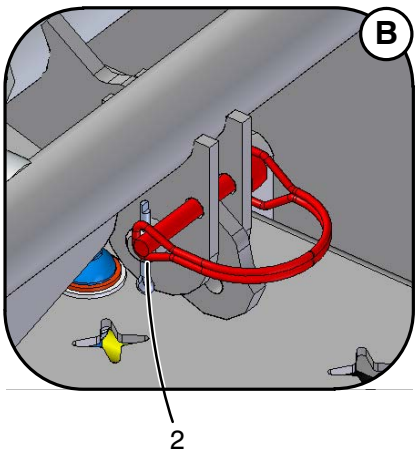
Figure 1–195
Upper Guard Rail – Working Position

Upper Guard Rails And Walkways

The crane is equipped with guard rails and walkways on the upper to make access to upper components safer when servicing the crane. The rails and walkways should remain in the working position at all times except when traveling or transporting the crane on highway or when lifting the crane. Position the rails in the travel/transport position for these operations. Refer to Figure 1–195 and Figure 1–196.







1. Quick Release Pin
2. Keeper Pin

Figure 1–196
Upper Guard Rail – Travel/Transport Position

Before Starting Operations

Before starting daily operations, make the following checks and inspections.

Engine(s)

Check fuel, oil, and cooling systems for proper fluid levels. Check for leaks. Repair or fill as required. Refer to engine manufacturer's manuals 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. Refer to Section 2 of this Operator's Manual for additional information.

Lubrication

Lubricate the crane as outlined in Section 2 of this Operator's Manual.

Note: Drivers/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 driver/operator more aware of malfunctions in the crane so repairs can be made with a minimum of downtime.

Tires And Wheels

Check tire inflation. Tire pressures can be monitored using the tire pressure monitoring screen in the carrier cab. Inflate to pressures per the Gross Axle Weight Rating plate for highway travel, or per the Crane Rating Manual for pick and carry operations. Check wheel lug nut torque, each day, for the first five (5) days of operation, and periodically thereafter. Refer to Section 3 of this Operator's Manual for additional information.

Wire Rope And Sheaves

Inspect all wire rope and sheaves for damage or deterioration. Replace as necessary. Refer to Section 5 of this Operator's Manual for additional information.

General Inspection

Visually inspect the entire crane for loose or missing cotter pins and bolts, and 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 carrier and allow the air system pressure to reach its normal operating range, 105—115 psi (*724—793kPa*). Check park brake and service brake operations. Adjust or repair as needed.

Controls

Check all controls for proper operation and adjustment. Repair as needed.

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 flys 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.

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, trouble-free performance.

Engine Starting And Shutdown Procedure

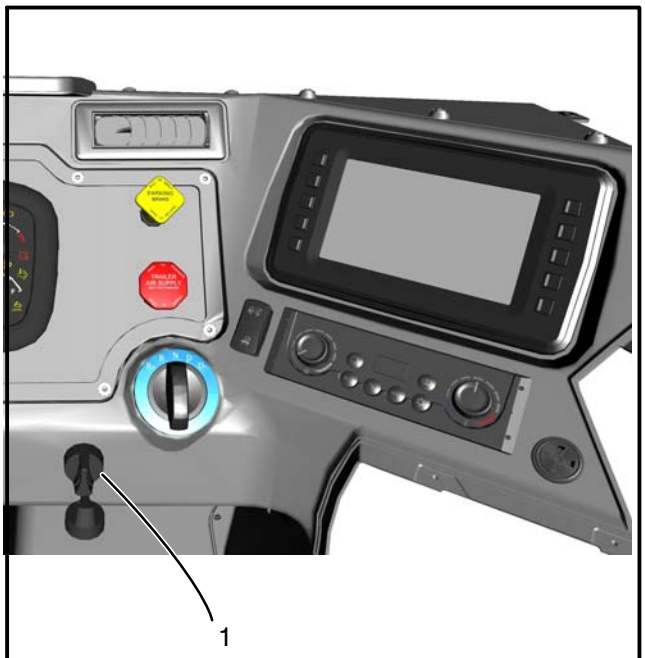
WARNING

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 driver/operator must carefully read and understand the engine starting instructions in the engine manufacturer's manuals and this Operator's Manual. Attempting to start or run the engine before studying these instructions may result in engine damage. The driver/operator must learn and obey all applicable "Rules of the Road" and if not already a competent driver/operator, obtain instructions to attain these necessary skills. With the crane fully serviced and the driver/operator familiar with all gauges, switches, controls, and having read and fully understood this entire Operator's Manual and the engine manufacturer's manual, start the engine(s) using one of 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. Engine Ignition Switch

Figure 1–197
Carrier Cab Engine Ignition Switch

To Start The Engine From The Carrier Cab

1. Walk around the crane to verify that there are no persons under, or in close proximity to the crane.
2. Engage the park brake.
3. Shift the transmission to neutral. (The carrier engine will not start unless the transmission is in neutral.)
4. 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.
5. Turn the carrier ignition switch to the "On" position to energize the carrier engine electrical system and allow the gauges to go through their self-test routine.

   Note: Repair any gauges and indicator lights if they are not functioning normally.

6. Turn the carrier ignition switch to the "Start" position. Release the carrier ignition switch immediately after the carrier engine starts. If the carrier engine fails to start in 30 seconds, release the carrier ignition switch and allow the starter motor to cool a few minutes before trying to start again. If the carrier engine fails to start after four attempts, refer to carrier engine manufacturer's manual for instructions.

7. Position the upper throttle control switch to the down position to activate throttle control to the carrier.
8. Warm Up – Run the carrier engine at low throttle with no load while carrier engine is warming up.

   The crane/engine is equipped with the "Adjustable Idle Feature". The Adjustable Low Idle Speed feature allows the low idle engine speed to be adjusted within a calibrated range. This feature can be used to warm the engine up quicker. The cruise set speed button is used to accelerate the engine speed and the cruise resume button is used to decelerate the engine speed. The speed will return to the original low idle speed after a key cycle has been performed.

   Observe the following instruments for proper indications.
   a. Carrier Engine Oil Pressure – If there is no carrier engine oil pressure after 10–15 seconds of running time, shutdown the carrier engine immediately and repair the problem to avoid major carrier engine damage. Refer to carrier engine manufacturer's manual for proper oil pressure operating range.
   b. Carrier Battery Gauge – Observe indicator to ensure the carrier battery and electrical system is working properly. The carrier battery gauge should indicate 26.5 to 28.5 volts while the carrier engine is running. (It should read 24.0 volts when the carrier ignition switch is on, without the carrier engine running.)
   c. Carrier Air Pressure Warning Light – Normal operating range is 105–115 psi (*724–793kPa*). When air pressure is sufficient for safe carrier operations, the low air pressure warning light and alarm will turn off. Do not attempt to operate crane until the carrier air pressure warning light and alarm are off.
9. When the carrier 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 From The Carrier Cab

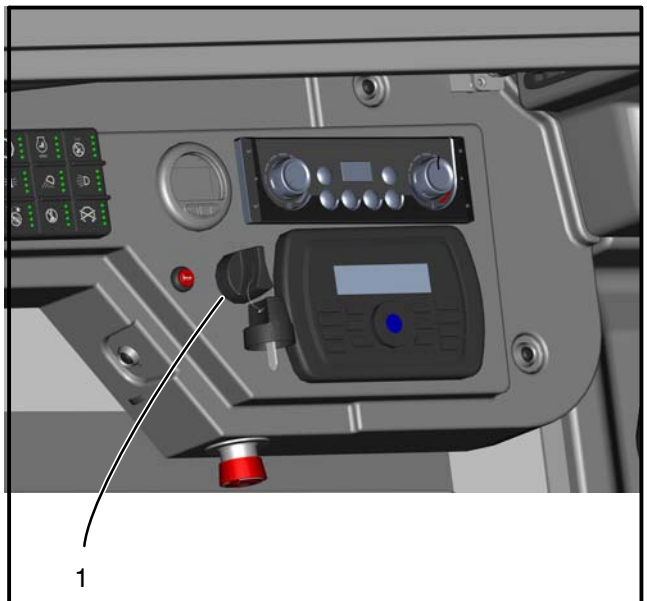
1. Throttle the engine back to idle. Engage the park brake and shift the transmission to neutral.
2. Allow the engine to idle 3 to 5 minutes to allow the engine to cool gradually and uniformly.
3. Turn the carrier ignition switch to the "Off" position.

   Note: If the carrier ignition switch is in the "On" position in the upper operator's cab, it must be moved to the "Off" position before the carrier engine will shutdown.

4. Remove the keys from both cabs and lock the doors if the crane is to be left unattended.

To Start The Engine From The Upper Operator's Cab

1. Walk around the crane to verify that there are no persons under, or in close proximity to the crane.
2. Check the carrier cab to ensure that the transmission is in neutral, the park brake is engaged, and the carrier ignition switch is in the "LOCK" position.
3. In the carrier cab, position the upper throttle control switch to the up position to activate throttle control to the upper.
4. 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.
5. In the upper operator's cab, turn the upper ignition switch to the "On" position to energize the engine electrical system and allow the gauges to go through their self-test routine.
6. Turn the upper ignition switch to the "Start" position. Release the upper ignition switch when the engine starts. If the engine fails to start in 30 seconds, release the upper 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 engine damage. Refer to the engine manufacturer's manual for proper oil pressure operating range.
   a. Carrier Engine Oil Pressure — If there is no carrier engine oil pressure after 10—15 seconds of running time, shutdown the carrier engine immediately and repair the problem to avoid major carrier engine damage. Refer to carrier engine manufacturer's manual for proper oil pressure operating range.
   b. Carrier Battery Gauge — Observe indicator to ensure the carrier battery and electrical system is working properly. The carrier battery gauge should indicate 26.5 to 28.5 volts while the carrier engine is running. (It should read 24.0 volts when the carrier ignition switch is on, without the carrier engine running.)



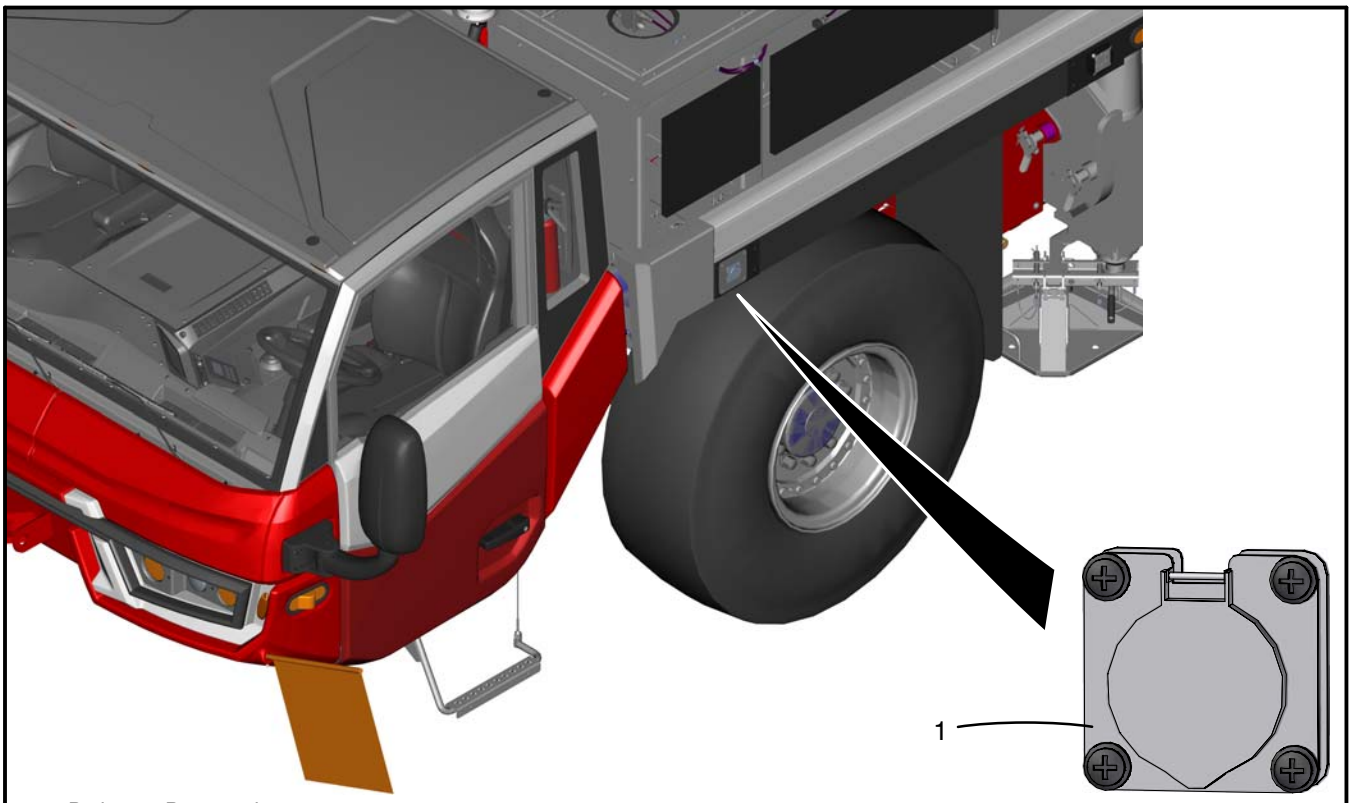
1. Engine Ignition Switch

Figure 1—198
Upper Operator's Cab Engine Ignition Switch

   c. Carrier Air Pressure Warning Light — Normal operating range is 105—115 psi (*724—793kPa*). When air pressure is sufficient for safe carrier operations, the low air pressure warning light and alarm will turn off. Do not attempt to operate crane until the carrier air pressure warning light and alarm are off.
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 From The Upper Operator's Cab

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 upper engine to idle 3 to 5 minutes to allow the engine to cool gradually and uniformly.
5. Turn the upper ignition switch to the "Off" position.
6. Remove the keys from both cabs and lock the doors if the crane is to be left unattended.



1. Preheater Receptacle

Figure 1–199
Carrier Engine Block Preheater

Cold Weather Starting Aids

The crane is equipped with starting aids to assist in starting engine(s) in cold ambient conditions. Refer to the engine manufacturer's manuals and the following before starting the engine(s) in cold ambient conditions.

Engine Block Preheater

The engine block preheater uses electrical power to heat the coolant and circulate it through the carrier engine. The carrier engine block preheater electrical receptacle is on the left side of the carrier fender behind the carrier cab. Refer to Figure 1–199.

To Start The Engine Block Preheater

1. Park the crane in a suitable area for storage, engage the park brake, position the transmission shifter to neutral, and shutdown the carrier engine.
2. Plug an approved extension cord into the preheater receptacle. Plug the other end into a 110V to 120V electrical source.

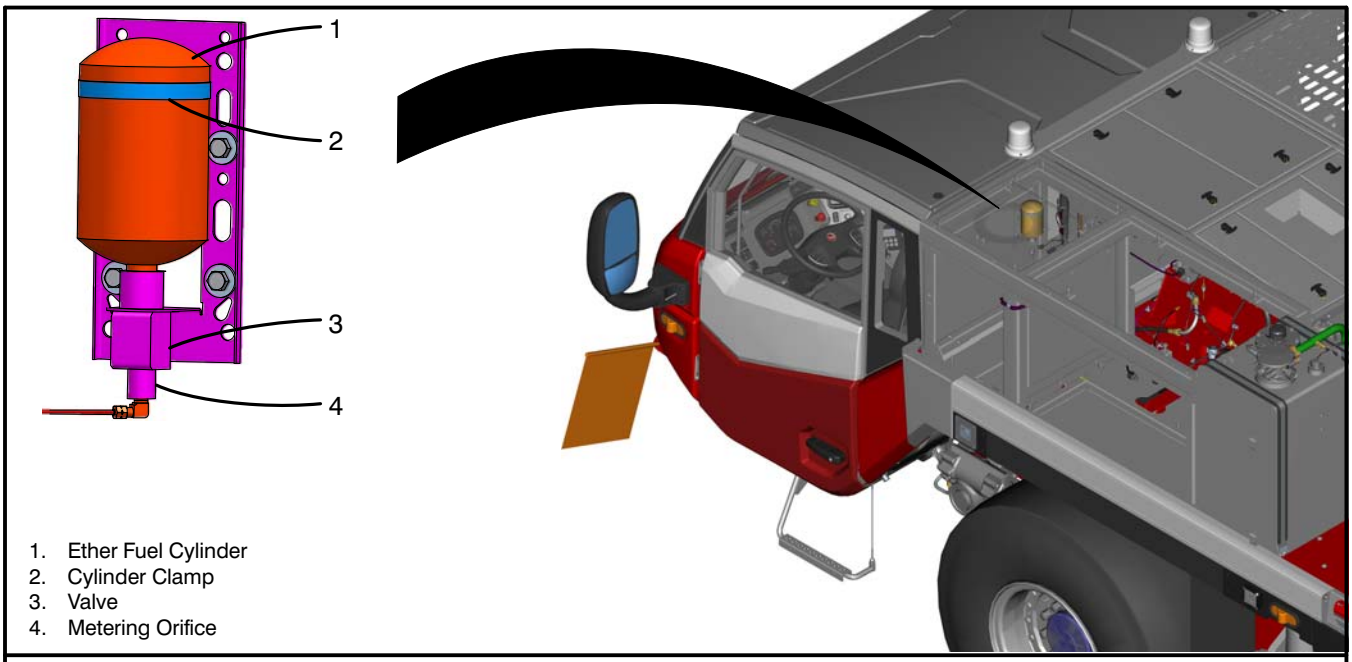
⚠ WARNING

Areas adjacent to the preheater must be clean and free of oil and debris to avoid possible fire hazard.

Note: Unplug the engine block preheater before starting the carrier engine.

To Stop Engine Block Heater

1. Unplug extension cord from the electrical source and the preheater receptacle.
2. Store the extension cord.



1. Ether Fuel Cylinder
2. Cylinder Clamp
3. Valve
4. Metering Orifice

Figure 1—200
Ether Start System

Carrier Engine Ether Start System (If Equipped)

The ether start system is a fully-automatic carrier engine starting fluid system designed to spray a controlled amount of ether into the carrier engine intake system during and immediately after cranking. The carrier engine control module (ECM) determines when the system should function. Whenever the carrier engine does not start within a normal period of cranking the ether fuel cylinder may be empty. Replace the cylinder as required. Refer to "Changing The Ether Fuel Cylinder" in this Section of this Operator's Manual. The ether fuel cylinder is behind and to the left of the carrier cab. Refer to Figure 1—200.

⚠ WARNING

When maintaining or troubleshooting ether start system, always ensure the area is well ventilated and away from heat, open flames, or sparks. Wear goggles to avoid eye injury. When opening ether fuel line or disconnecting atomizer, ensure it is pointed away from you. The ethyl ether fuel used in this system is extremely flammable, toxic, harmful, and can be fatal.

Changing The Ether Fuel Cylinder

1. Park the crane on a firm level surface, engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. Clean all dirt from the neck of the ether fuel cylinder and top of the valve. Refer to Figure 1—200.
3. Loosen the cylinder clamp.
4. Turn the fuel cylinder counterclockwise to remove the cylinder from the valve. Remove the old gasket from the valve and properly discard.
5. Install the protective cap to protect the top of the valve from dirt after removal.
6. Locate the new gasket inside the thread protective white cap on the new fuel cylinder.
7. Install the new gasket into the valve.

   Note: Replace gasket inside valve each time a cylinder is replaced. Read the entire cylinder label for additional information on cylinder and valve gasket installation.
8. Coat the new cylinder's threads with clean engine oil.
9. Install the cylinder by turning the cylinder clockwise until the cylinder dirt and moisture seal o-ring contacts the valve.
10. Tighten an additional 1 and 1/2 turns. Do not overtighten.

CAUTION

Do not over-tighten the cylinder. Over-tightening may damage the valve or the cylinder.

11. Tighten the cylinder clamp.

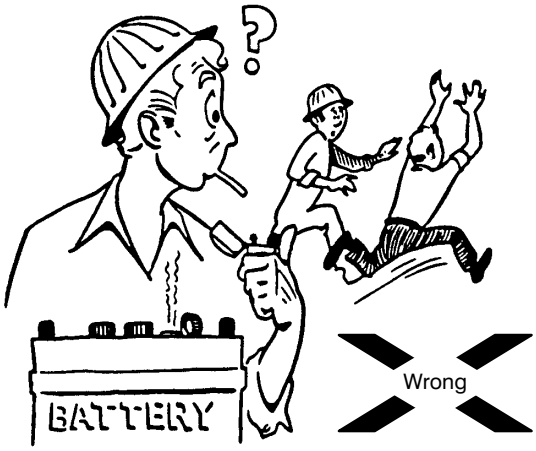


Figure 1–201
Do not use an open flame near the battery.

Jump Starting The Engine(s)

The crane has four (4) 12V batteries, located on the right side behind the carrier cab. The batteries are arranged to provide 24V, but a battery equalizer is included for maintaining optimum battery health and to allow charging and/or jump starting using a 12V or 24V source.

⚠ 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.

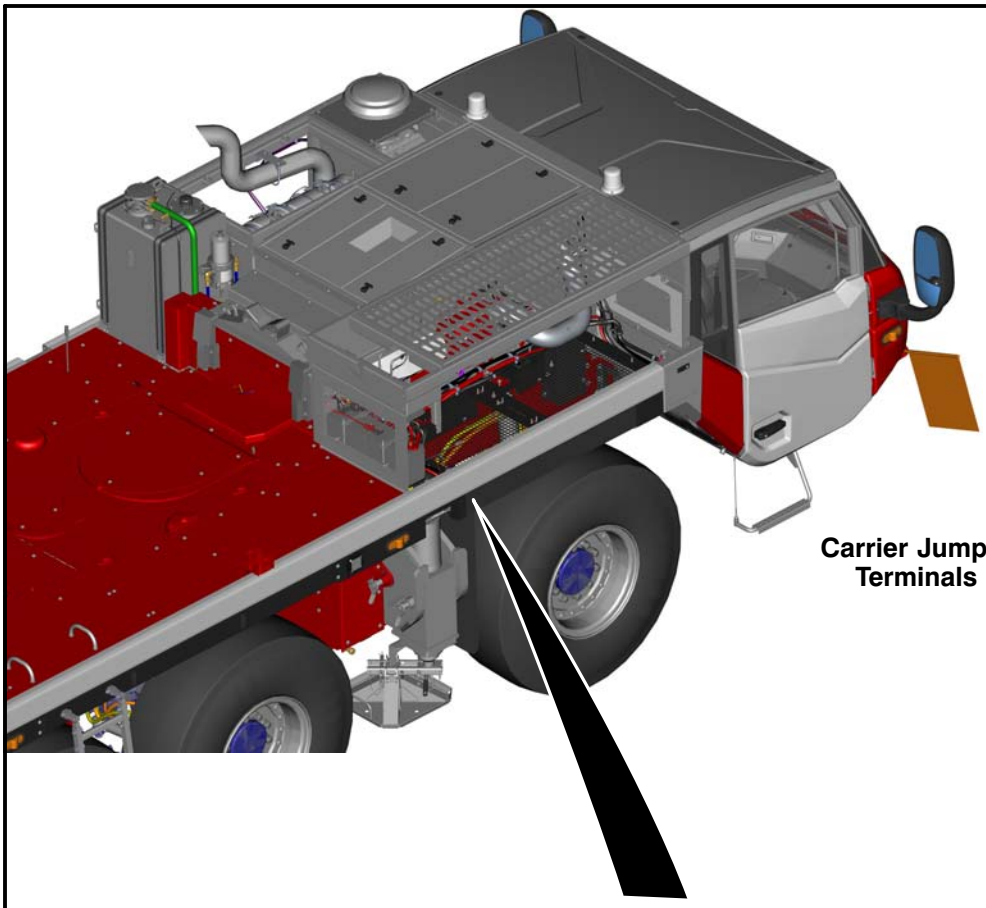
Do not jump start a damaged battery. Ensure vent caps are tight and level. If another vehicle is used, ensure booster vehicle and crane are not touching.

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.

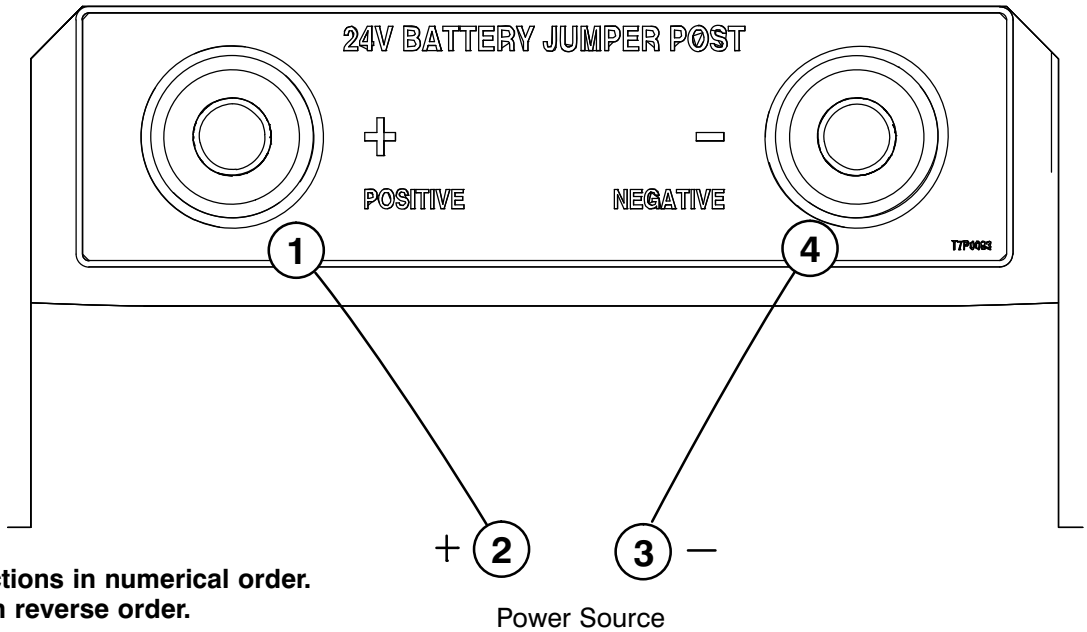
Battery posts, terminals, and related accessories contain lead and lead compounds. Wash hands after handling.

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 (+) jumper post. Figure 1–202.
3. Connect the other end of the first cable to the positive (+) terminal of the power source or booster battery.
4. Connect one end of the second jumper cable to the negative (–) terminal of the power source or booster battery.
5. Connect the other end of the second cable to the negative (–) jumper post to jump start the engine.
6. If another vehicle is used to jump start the engine, start the booster vehicle. Run the booster vehicle's engine at a moderate engine speed.
7. Turn on the ignition switch to allow discharged batteries to charge for a few minutes prior to attempting to start the disabled engine.
8. Start the disabled engine. After the engine is started, remove jumper cables in reverse order as given in Steps 2 through 5.
9. Let the engine run for a few minutes to charge the discharged batteries.
10. Check the battery gauge in the carrier cab. The gauge reading should be increasing toward 28 volts.

Note: If the batteries are extremely discharged, voltage may increase slowly.



Carrier Jumper Terminals



Power Source

Make connections in numerical order.
Disconnect in reverse order.

Figure 1–202
Battery Cable Connections

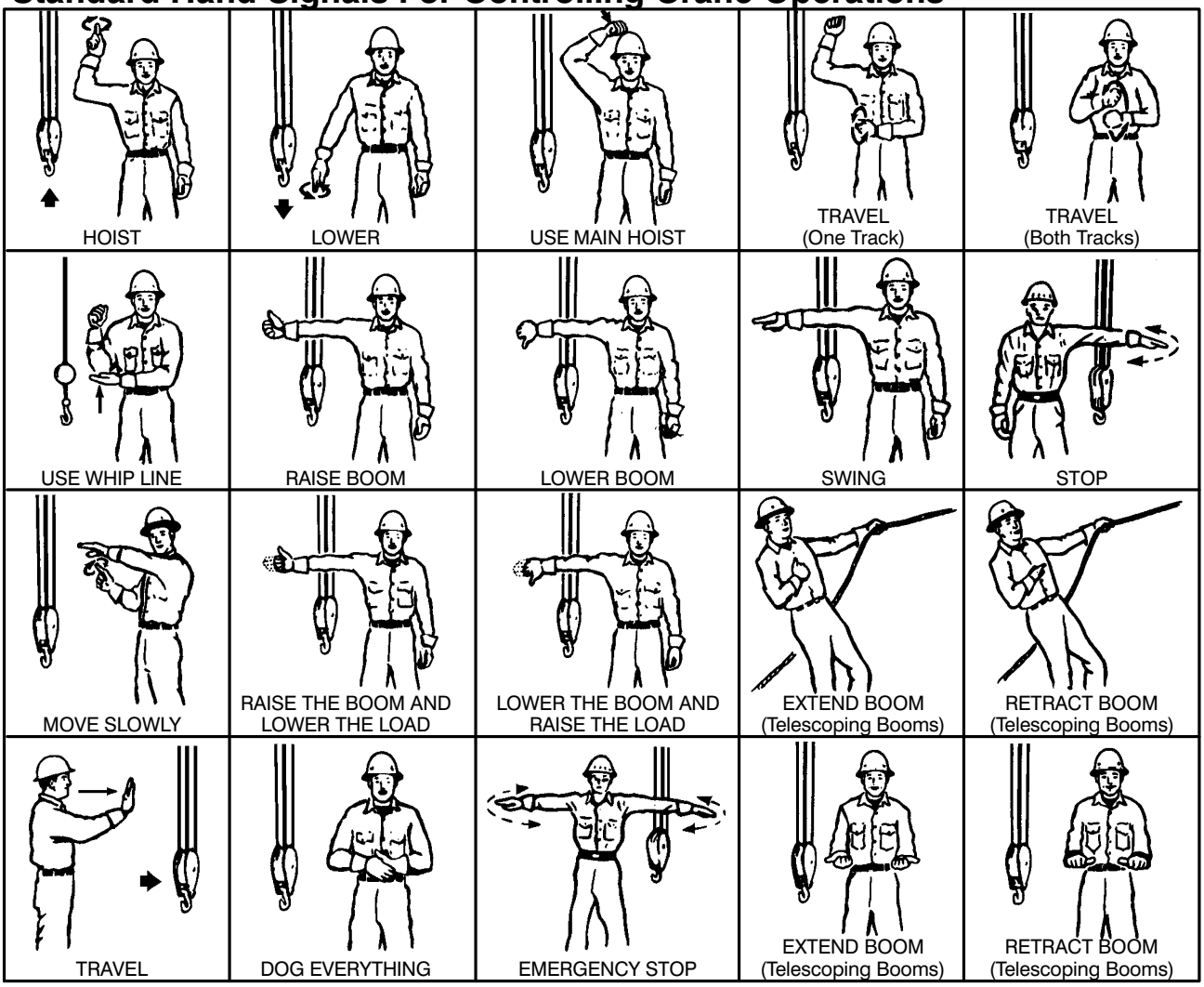


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Figure 1–203
Hand Signals

Hand Signals

Hand Signals are important for communications between the designated signal person and the driver/operator. A Hand Signals Chart is shown in Figure 1–203. A Hand Signals Chart is also on the right window of the upper operator's cab. Another one is on the right rear corner of the rear outrigger box.

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 driver/operator. Obey a stop signal from anyone.

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 review and confirm compliance with all local, state, and federal laws.

1. Determine weight to be lifted. Always add the weight of the hook block, hook ball, slings, rigging, fly, etc. Determine height to which the load must be lifted.
2. Refer to the proper capacity chart, Wire Rope Strength chart, Working Areas chart, and Working Range diagram in the Crane Rating Manual. Find the shortest boom length and load radius that will accomplish the job.
3. Do not swing upper while on tires with any counterweight installed, use outriggers. Refer to the Crane Rating Manual for approved specifications. Position crane so a minimum swing is necessary.
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 major crane damage or a serious accident. If the ground is soft, use mats.
5. When making lifts on tires, all tires must be inflated to pressures as listed in the Crane Rating Manual. Do not make lifts which exceed Crane Rating Manual specifications.
6. Ensure the Rated Capacity Limiter is properly set to match the crane configuration.
7. If outriggers are used, the following points must be observed:
   a. The outrigger beams must extended equally, or in accordance with the V−CALC (Variable Confined Area Lifting Capacities) to lift the loads shown in the Crane Rating Manual. Major reductions in lifting capacity will result if all beams are not in the same position and this could lead to major crane damage or a serious accident.
   b. Outrigger pontoons must be pinned to the jacks. The outrigger pontoons must be on a 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 on the upper frame visible through the right window of the upper operator's cab and at each ground control outrigger station to assist the operator in determining when the crane is level.
8. Raise the boom and swing over the load. Extend the boom to the desired length.
9. Lower the hook block 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 the Wire Rope Capacity Chart in the Crane Rating Manual 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 load a few inches *(centimeters)* off the ground and hold to check the winch brakes.
10. As the load is lifted the boom may deflect, increasing the radius, especially with longer boom lengths. Use the boom hoist to keep the head machinery directly over the load to prevent the load from swinging out.
11. Lift the load to the desired height. Boom to the desired angle. Be careful when booming down or swinging the load, 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.
12. 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.

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 or loss of power, or bad response to control of the crane. Watch the engine(s) oil pressure and coolant temperature gauges for proper operating ranges.
2. Watch the hydraulic system oil temperature gauge. If the temperature exceeds maximum temperature, shutdown the crane until the problem is corrected. (Refer to "Hi Performance Hydraulic Oil" chart in 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, or the speed reducers. If any, correct problem.
4. Watch for oil leaks or any loss of control. If any develop, correct before continuing operation.
5. Confirm that 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 without outriggers, confirm that the tires are inflated to the proper pressure. When on tires with zero counterweight, the boom can only be lowered to zero degrees when directly over the front. If counterweight is installed and outriggers are not being used, ensure the boom is positioned directly over the rear of the carrier with the travel swing lock engaged and the travel mode switch in the carrier cab is set to "Job Site". (Refer to the Crane Rating Manual for proper tire pressure.)
7. Heed all warning and caution labels. Observe good safety practices at all times.

Traveling The Crane

All terrain cranes are designed for highway and job site travel. Certain conditions must be met for safe travel. Refer to the following outlined procedures before traveling the crane.

⚠ WARNING

Do not travel above the maximum speeds listed. Major crane damage, property damage, and/or serious personal injury may result.

Highway Travel

Highway travel is considered to be any travel of the crane over 5.0 mph (*8.0km/h*). The following conditions and precautions must be met for all highway travel.

Note: If road weight or axle load limitations are a factor, the crane is equipped with removable counterweights. Use this system as necessary to meet road weight or axle load limitations. Refer to the Gross Axle Weight Rating (GAWR) plate for axle load limits, tire pressures, and maximum speed.

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 must be secured in the stored position on the boom or removed and transported separately.
3. Position the upper guard rails to the travel/transport position. Refer to Figure 1−196.
4. Retract the upper cab walk to its stored position. Refer to Figure 1−192.
5. Inflate the tires to pressure listed on the Gross Axle Weight Rating (GAWR) plate for speeds over 5.0 mph (*8.0km/h*). Refer to Section 3 of this Operator's Manual for correct procedure.
6. The suspension must be adjusted to ride height using the ride height suspension switch in the carrier cab. Refer to "Changing The Travel Mode Or Setting The Ride Height" in this Section of this Operator's Manual.
7. Ensure the travel mode switch in the carrier cab is set in the "Highway Travel" mode.

   Note: If changing from Job Site Travel Mode to Highway Travel mode mode, it is required to retract the suspension cylinders before raising to ride height in Highway Travel mode .

8. The boom must be fully retracted, over the front of the crane, and in the boom rest, (unless a boom dolly/trailer is being used), with the travel swing lock engaged. Release the swing park brake and/or 360° swing lock, if equipped.

   If the boom Dolly/trailer is used, the boom must be adjusted to the proper length and pinned into the boom Dolly/trailer. The travel swing lock, swing park brake and/or 360° swing lock must be disengaged. Refer to Boom Dolly Trailer section in this Operator's Manual.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during highway travel. Failure to release these devices during this operation may result in damage to the swing speed reducer.

9. All outriggers must be fully retracted (jacks and beams) with all outrigger position pins in the retracted position. All main outrigger pontoons must be in the self stored position or removed from jacks and properly stored on the crane.
10. Secure 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.

11. All upper control levers must be in the neutral position. The upper ignition switch must be turned off, key removed, and all doors and windows locked.
12. Obey all "Rules of the Road" and travel carefully.

Highway Travel With Third Axle Lifted (If Equipped)

Highway travel is considered to be any travel of the crane over 5.0 mph (*8.0km/h*). The following conditions and precautions must be met for all highway travel with the third axle lifted.

1. Properly park the crane on a firm level surface.
2. Properly connect the crane to a boom dolly. Refer to "Boom Dolly/Trailer" in this Section of this Operator's Manual.

WARNING

Do not raise the third axle when the crane is not in the dolly/trailer or for jobsite travel.

3. Check the area around and beneath the crane for personnel/obstructions. Engage the park brake and fully retract the suspension. Refer to "Carrier Suspension" in this Section of this Operator's Manual.
4. Remove the fly tool from storage and install the 10.0" extension and the 8-point socket.
5. Using the fly tool, close the two ball valves located on the right and left suspension cylinders on axle 3.
6. Properly store the fly tool.
7. In the carrier cab, raise the suspension to ride height. Refer to "Carrier Suspension" in this Section of this Operator's Manual.
8. Ensure that both sides of axle 3 are in the fully raised position (approximately 3.0" off the ground).

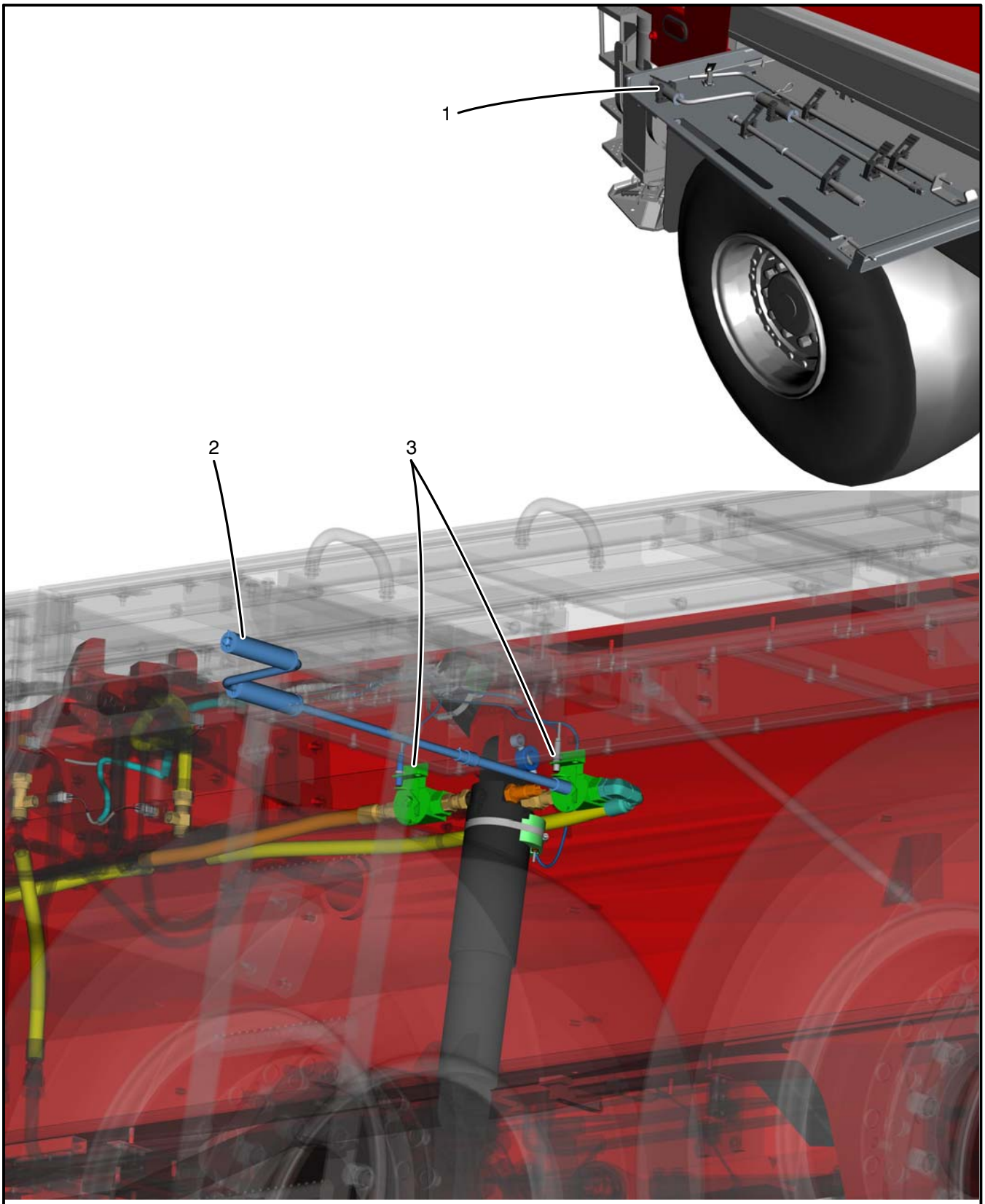
WARNING

Ensure that both sides of axle 3 are in the fully raised position. Driving instability may occur if both side are not in the fully raised position.

9. For troubleshooting, navigate to the diagnostic screen in the Carrier Cab Control Display and select Third Axle Lift Diagnostics. Refer to Figure 1—205. This screen shows the status (open/closed) of all four ball valves along with the status of the axle 3 suspension cylinders (fully retracted/not fully retracted).

WARNING

The third axle is a steering axle. Stay clear of the third axle during static steering operation.



1. Fly Tool Storage
2. Fly Tool
3. Ball Valves

Figure 1–204
Third Axle Lift

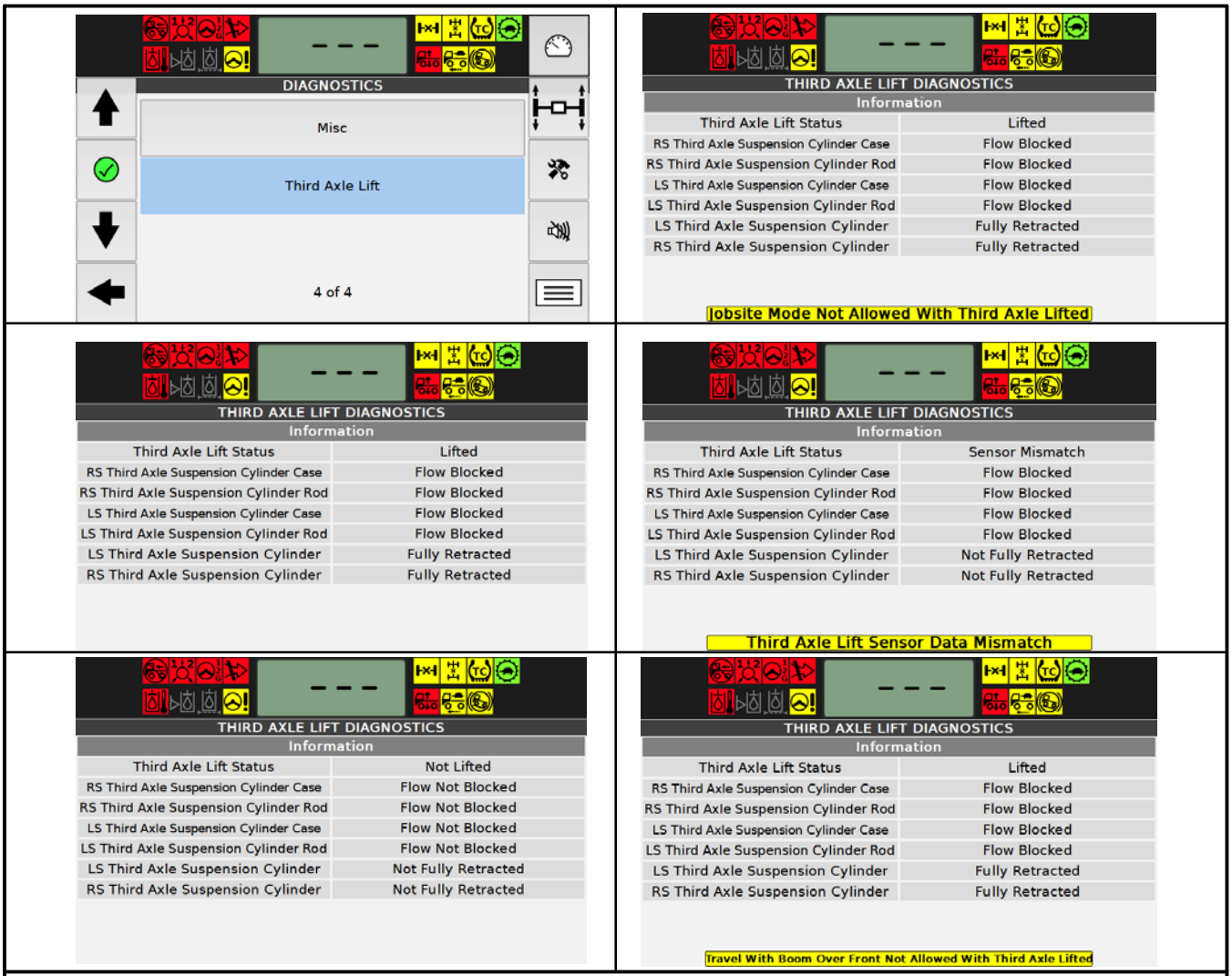


Figure 1–205
Carrier Cab Control Display – Third Axle Lift Diagnostic Screens

Return to Five Axle Travel

1. Properly park the crane on a firm level surface.
2. Check the area around and beneath the crane for personnel/obstructions. Engage the park brake and fully retract the suspension. Refer to "Carrier Suspension" in this Section of this Operator's Manual.
3. Remove the fly tool from storage and install the 10.0" extension and the 8-point socket.
4. Using the fly tool, open the two ball valves located on the right and left suspension cylinders on axle 3.

WARNING

Do not open the ball valve with the third axle lifted off the ground. The axle can drop causing personal injury.

5. Properly store the fly tool.
6. In the carrier cab, raise the suspension to ride height. Refer to "Carrier Suspension" in this Section of this Operator's Manual.

CAUTION

The ball valves should never be closed when the third axle is not fully retracted. This could create a solid suspension and lead to crane damage when driving.

Never attempt to retract the suspension if any ball valve is closed when the third axle is not fully retracted.

Anytime the crane is parked for extended periods of time, the third axle should not be left in the raised position.

Job Site Travel

Job site travel is limited to speeds of 5 mph (*8km/h*) or less on a firm, smooth, and level surface. 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. Inflate the tires to the pressure listed on the Gross Axle Weight Ratings (GAWR) plate or the Tire Inflation chart in the Crane Rating Manual for job site travel speeds. Refer to Section 3 of this Operator's Manual for correct procedure.
3. Level the crane on fully extended outriggers.
4. Position the upper and attachments according to one of the "Job Site Travel" charts in this Section of this Operator's Manual. Elevate the boom only as high as needed within the permissible range in the chart.
5. Engage the travel swing lock. Release the swing park brake and/or 360° swing lock, if equipped.

CAUTION

Do not leave the swing park brake or 360° swing lock, if equipped, in the engaged position during job site travel. Failure to release these devices during this operation may result in damage to the swing speed reducer.

6. Retract all outrigger jacks just clear of the ground.
7. Set the suspension to ride height using the ride height suspension switch in the carrier cab. Refer to "Changing The Travel Mode Or Setting The Ride Height" in this Section of this Operator's Manual.
8. Ensure the travel mode switch in the carrier cab is set to the "Job Site" mode.
9. Shift the transfer case to the position.

   Note: Anytime the transfer case is in low gear the main transmission is limited to 11th gear.

Transmission Gear Travel Speeds

Gear		Ratio	Governed Speed	
			mph	*Km/h*
3.12 Transfer Case	7th	2.831	4.33	*6.94*
	6th	3.526	3.48	*5.60*
	5th	4.565	2.68	*4.31*
	4th	5.938	2.06	*3.31*
	3rd	7.688	1.59	*2.56*
	2nd	9.982	1.23	*1.98*
	1st	12.924	0.95	*1.53*
	Rev 1	12.033	1.02	*1.64*
	Rev 2	9.293	1.32	*2.12*

10. Shift the transmission to manual mode. Move the transmission gear selector to one of the following depending upon the "Job Site Travel" chart used. Also refer to the "Transmission Gear Travel Speeds" chart to ensure maximum gear is not exceeded.
    a. Move transmission gear selector to DM (maneuver mode) for short distances up to 1 mph (*1.6km/h*) travel speed in 1st gear maximum.

       Note: When using Maneuver mode refer to "Maneuver Mode" in this section of this Operator's Manual.

    b. Move transmission gear selector to D (Drive) for up to 5 mph (*8km/h*) travel speed and up to 7^{th} gear maximum.
11. Carefully travel at no more than the specified speed in accordance with the applicable "Job Site Travel" charts on the following page. Take extra care due to the increased overall width caused by the extended outrigger beams. Use extreme care that the outriggers or pontoons are not allowed to hit any obstructions. Maintain a safe distance from all personnel, obstructions, structures, and power lines.
12. If traveling on a slope, travel directly up or down the slope, position the crane as follows:
    a. The upper directly over the front with the in rest.
    b. All counterweight and fly extension removed.
    c. Boom fully retracted with the fly base and tip stored.

Job Site Travel, No Load Upper Over the Rear, Boom Retracted 5 MPH (*8.0km/h*) Maximum							
Counterweight (lb) Installed on Upper	Maximum Boom Angle (°)						
	55 Ft Fly Stored or Removed	10 Ft Fly Erected (0° Offset)	32.5 Ft Fly Erected (0° Offset)	55 Ft Fly Erected (0° Offset)	73 Ft Fly Erected (0° Offset)	91 Ft Fly Erected (0° Offset)	109 Ft Fly Erected (0° Offset)
0–90,000	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED

Job Site Travel, No Load Upper Over the Front, Boom Retracted 5 MPH (*8.0km/h*) Maximum							
Counterweight (lb) Installed on Upper	Maximum Boom Angle (°)						
	55 Ft Fly Stored or Removed	10 Ft Fly Erected (0° Offset)	32.5 Ft Fly Erected (0° Offset)	55 Ft Fly Erected (0° Offset)	73 Ft Fly Erected (0° Offset)	91 Ft Fly Erected (0° Offset)	109 Ft Fly Erected (0° Offset)
0–15,200	0–20	0–20	0–20	0–20	PROHIBITED	PROHIBITED	PROHIBITED
19,600–90,000	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED

Job Site Travel, No Load Upper Over the Rear, Boom Retracted 1 MPH (*1.6km/h*) Maximum							
Counterweight (lb) Installed on Upper	Maximum Boom Angle (°)						
	55 Ft Fly Stored or Removed	10 Ft Fly Erected (0° Offset)	32.5 Ft Fly Erected (0° Offset)	55 Ft Fly Erected (0° Offset)	73 Ft Fly Erected (0° Offset)	91 Ft Fly Erected (0° Offset)	109 Ft Fly Erected (0° Offset)
0–10,800	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
15,200–19,600	45–65	45–65	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
24,000–32,800	45–65	45–65	45–65	45–65	PROHIBITED	PROHIBITED	PROHIBITED
37,200–41,600	25–65	25–65	45–65	45–65	PROHIBITED	PROHIBITED	PROHIBITED
46,000–54,800	0–65	0–65	25–65	45–65	45–65	45–65	55–65
63,600–72,400	0–65	0–65	0–65	0–65	25–65	45–65	45–65
81,200–90,000	0–65	0–65	0–65	0–65	0–65	45–65	45–65

Job Site Travel, No Load Upper Over the Front, Boom Retracted 1 MPH (*1.6km/h*) Maximum							
Counterweight (lb) Installed on Upper	Maximum Boom Angle (°)						
	55 Ft Fly Stored or Removed	10 Ft Fly Erected (0° Offset)	32.5 Ft Fly Erected (0° Offset)	55 Ft Fly Erected (0° Offset)	73 Ft Fly Erected (0° Offset)	91 Ft Fly Erected (0° Offset)	109 Ft Fly Erected (0° Offset)
0–10,800	0–25	0–40	0–40	0–40	PROHIBITED	PROHIBITED	PROHIBITED
15,200–24,000	0–20	0–20	0–20	0–20	PROHIBITED	PROHIBITED	PROHIBITED
28,400–32,800	PROHIBITED	0–20	0–20	0–20	PROHIBITED	PROHIBITED	PROHIBITED
37,200–90,000	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED

Boom Dolly/Trailer

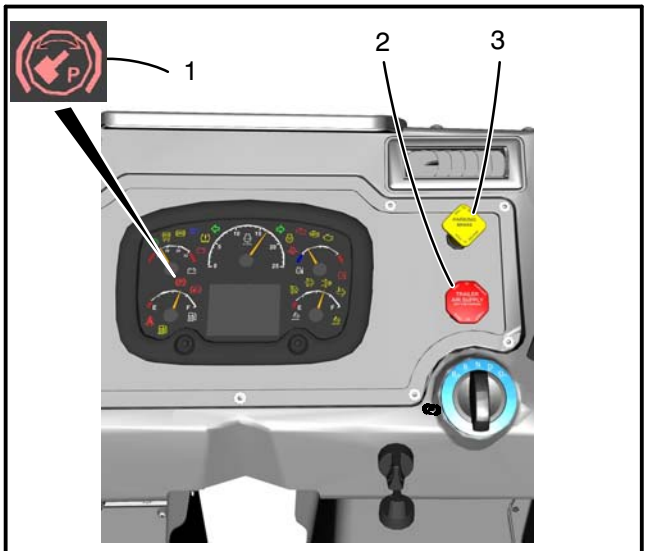
A boom dolly/trailer can be used to reduce the weight on each of the carrier axles by supporting a portion of the weight of the boom during highway travel, if highway codes allow the use of this equipment. The fly will also be partially supported by the boom dolly/trailer if it is properly stored on the boom. The crane is equipped with a boom dolly/trailer kit to provide the necessary hydraulic plumbing required to allow the boom to float freely on the boom dolly/trailer. The boom dolly/trailer is for highway use only. When traveling the crane with the boom on a boom trailer/dolly, the swing park brake light on the carrier control display will illuminate to alert the operator that the swing park brake is applied due to loss of hydraulic pressure.

WARNING

When initiating a turn with the boom dolly/trailer, the tip of the boom and rear of the upper may swing outside the turning radius of the boom dolly/trailer axles. In some cases the tip of the boom and rear of the upper will move into the line of oncoming traffic. The tip of the boom must be properly flagged before roading the crane. Allow ample time to complete a turn before oncoming traffic approaches.

The boom dolly/trailer must be equipped with an air brake system. Pressurized air for this system is supplied to the boom dolly/trailer through outlets on the rear of the carrier. Push in on the boom dolly/trailer air control valve knob, on the carrier cab dash, to pressurize the outlets. Pull it out to shutoff the air supply to the boom dolly/trailer. Refer to Figure 1–206. Electrical hook-ups for lights, ABS/TPMS, and a cable hook up for the trailer rear view camera (if equipped) are also available with the boom dolly/trailer kit. These hook ups provide the electric and the camera display capabilities for the boom dolly/trailer on the rear of the carrier.

Note: The trailer rear view camera cable hook up is made of plastic and the electrical hook up is made of metal. Ensure the proper connections are made to the hook ups or damage to the hook ups and/or connectors may occur.



1. Swing Park Brake Indicator Light
2. Trailer Air Control Valve
3. Park Brake Control Valve

Figure 1–206
Boom Dolly/Trailer Air Supply Control

WARNING

The counterweights must be removed from the upper when traveling the crane with a boom dolly/trailer. Crane may tip over when initiating a turn if the counterweights are left installed on the upper. The counterweights may be transported on the carrier deck or on the boom dolly/trailer. If the counterweights are transported on the boom dolly/trailer, refer to the boom dolly/trailer manufacturer to ensure that the counterweights are properly stored and secured.

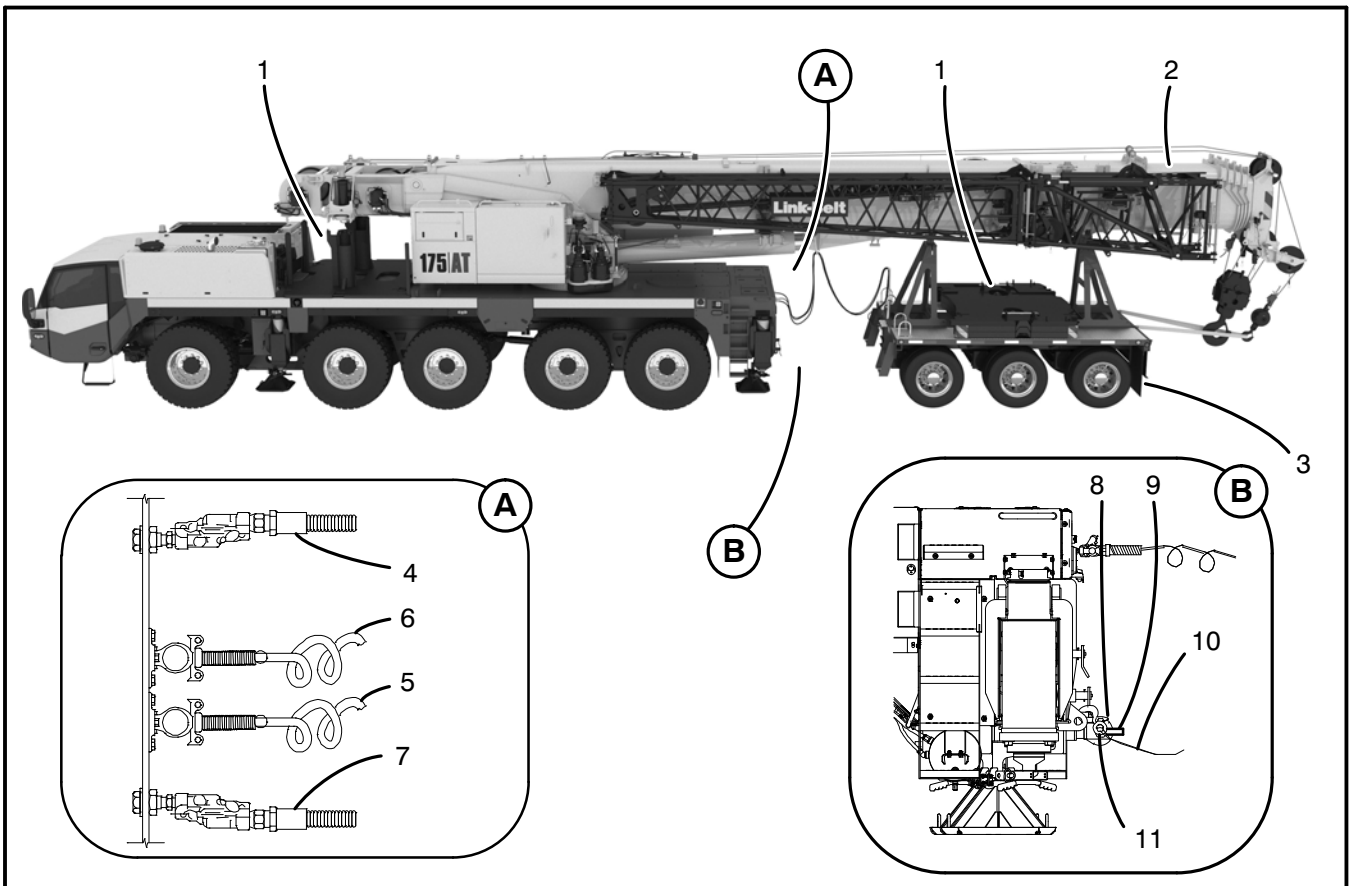
Boom Dolly/Trailer Installation

1. Remove counterweights from the upper.
2. Properly prepare the crane for highway travel. See "Traveling the Crane", in this Section of this Operator's Manual for instructions.
3. If installing a boom trailer:
   a. Open the pintle hook latch on the rear of crane.
   b. Using a signal person, back up the crane to the boom dolly/trailer and engage the tongue of the boom dolly/trailer with the pintle hook.
   c. Latch the pintle hook, and lock it closed with the cotter pin.
   d. Hook the safety chain to the safety chain ring on the rear of the crane. Ensure the latch on the hook is closed.
4. Hook up the air lines and plug in the electrical cable. Plug in the camera cable and trailer ABS/TPMS cable, if equipped. Refer to Figure 1−207.
5. Push the boom dolly/trailer air control valve on the carrier dash in to supply air to the trailer. Refer to Figure 1−206.
6. Make necessary preparations on the boom and boom dolly/trailer to allow the connection.
7. Level the crane on outriggers. With the boom fully retracted and positioned at a 55° angle, swing the boom over the boom dolly/trailer as required. Carefully lower the boom onto the boom dolly/trailer.

WARNING

When swinging over the side on retracted outriggers, maintain 55° boom angle with boom fully retracted. Crane may tip over causing serious personal injury and/or major crane damage.

8. Make all necessary boom connections to the boom dolly/trailer. Contact the boom dolly/trailer manufacturer for instructions.



1. Counterweight Storage Locations
2. Boom
3. Boom Dolly/Trailer
4. Control Air Line (Blue)
5. Boom Dolly Camera Cable
6. Electrical Cable
7. Supply Air Line (Red)
8. Pintle Hook
9. Boom Dolly/Trailer Tongue
10. Safety Chain
11. Safety Chain Ring

Figure 1–207
Typical Boom Dolly/Trailer

9. Secure or remove hook block and/or hook ball.
10. Set the RCL System to rigging mode.

Note: The RCL System can be set to Travel mode if the boom needs to be telescoped to transfer more boom weight to the boom dolly/trailer. Travel mode extends only the T1 section from 0–100%. Travel mode is not required to travel the crane on the highway.

CAUTION

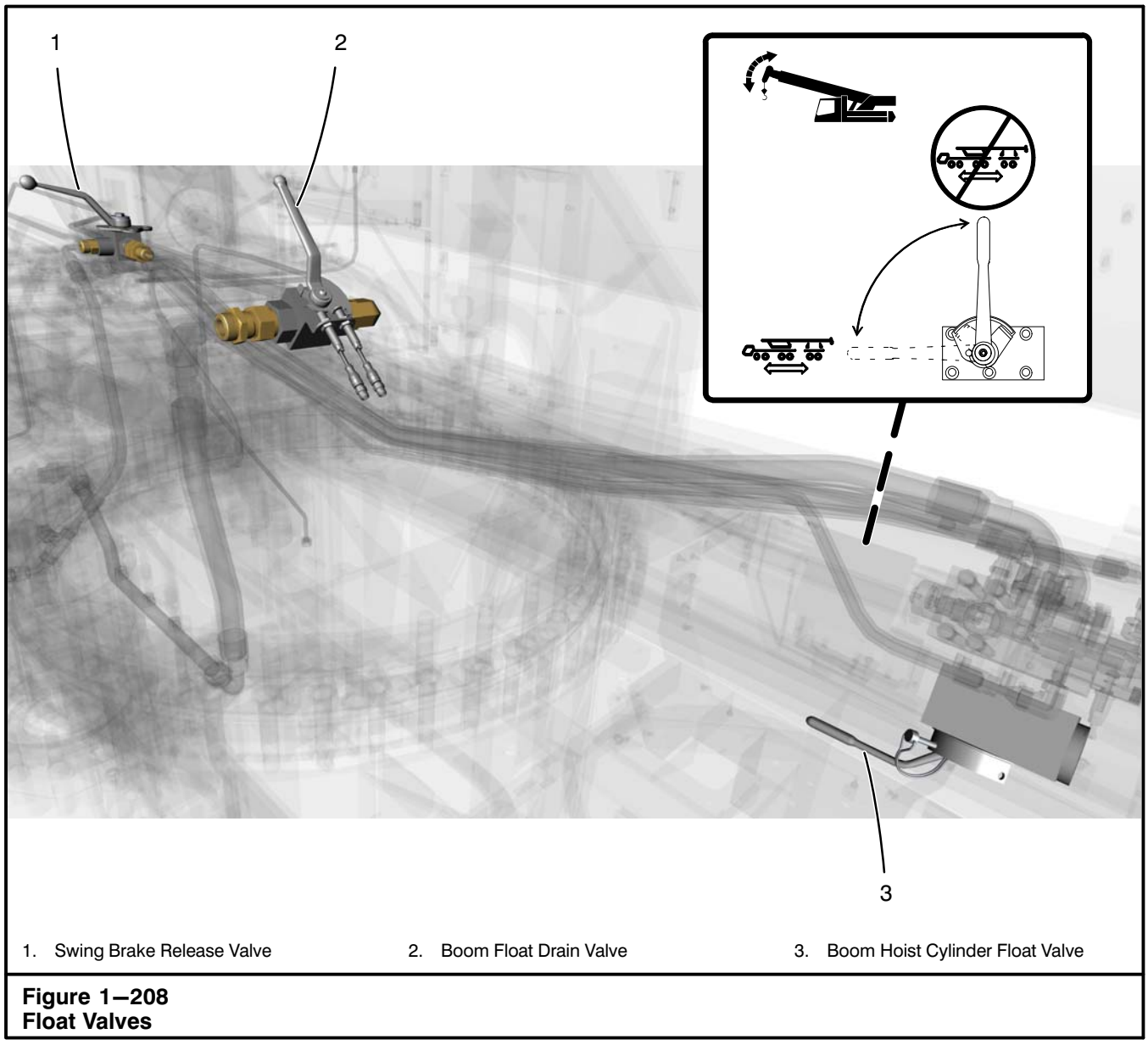
Do not leave any swing lock device in the engaged position when traveling the crane with a boom dolly/trailer. Failure to release these devices during this operation may result in major damage to the swing speed reducer.

11. Disengage the travel swing lock, the swing park brake, and/or 360 degree swing lock, if equipped.

WARNING

Check that the boom is properly supported by the boom dolly/trailer before opening the float valves. The boom could drop suddenly causing major damage or serious injury.

The float valve must be in the travel position before traveling the crane with a boom dolly/trailer. Major crane damage could result.



1. Swing Brake Release Valve
2. Boom Float Drain Valve
3. Boom Hoist Cylinder Float Valve

Figure 1–208
Float Valves

12. Turn the float valves to the travel position to allow the boom to float freely on the boom dolly/trailer. Refer to Figure 1–208.

    Note: If the float valves are not in the travel position and the boom is not in the boom rest, the travel warning light on the carrier cab control display will illuminate.

13. Flag the end of the boom before roading the crane.

    Note: If the boom dolly/trailer air system is not already pressurized, allow ample time for the system to charge before attempting to move the boom dolly/trailer. The system must have sufficient air pressure before the boom dolly/trailer's park brake will release.

Boom Dolly/Trailer Removal

1. Park the boom dolly/trailer where desired and apply the park brake. Shutdown the engine. Block the wheels of the boom dolly/trailer so that it is restrained in both directions.
2. Turn the float valves to the crane operation position to allow normal operation of the boom hoist function. Refer to Figure 1−208.

WARNING

The float valve on the boom hoist cylinder must be in the crane operating position before operating the boom hoist system. The boom could fall causing major damage or serious personal injury.

3. Start the engine. Pull the boom dolly/trailer air control valve on the carrier cab dash, out to stop the air supply to the trailer. Refer to Figure 1−206.
4. Disconnect the boom from the boom dolly/trailer.
5. Level the crane on outriggers. Raise the boom off the boom dolly/trailer and to a 55° angle. Fully retract the boom, swing the upper directly over the front, and carefully lower it on the boom rest. Engage the travel swing lock.

WARNING

When swinging over the side on retracted outriggers, maintain 55° boom angle with boom fully retracted. Crane may tip over causing serious personal injury and/or major crane damage.

6. Disconnect the electrical cables and air lines from the rear of the carrier. Cap the outlets and the air hoses using the storage hardware and brackets provided.
7. Unhook the safety chain from the rear of the carrier. Remove the cotter pin from the pintle hook and open the pintle hook.
8. Carefully pull the crane away from the boom dolly/trailer.

Boom Dolly/Trailer Park Brake

The boom dolly/trailer is equipped with a spring applied air released park brake. When the boom dolly/trailer is installed on the crane, the same control knob used to operate the carrier park brake, also controls the boom dolly/trailer park brake simultaneously.

When the boom dolly/trailer is not connected to the carrier air system, an air control valve on the front of the boom dolly/trailer is used to control the park brake. The blue and red air lines to the carrier must be disconnected before the boom dolly/trailer park brake control will operate independently from the carrier park brake control.

WARNING

Block the wheels of the boom dolly/trailer before releasing the park brake. Boom dolly/trailer will roll if not restrained by some means. Use blocking of adequate size and place it so that boom dolly/trailer is restrained in both directions.

Push the dolly/trailer park brake control knob in to release the brake. Pull it out to apply the brake.

Note: The boom dolly/trailer air system must have sufficient pressure to release the park brake. A fully charged air tank will allow release of the brake approximately twelve times.

Counterweight Packages			37,200 lb *(17.0t)* – Standard								
			90,000 lb *(41.0t)* – Optional								
Counterweight Modules			**A** 2,000 lb *(1.0t)*	**B** 4,400 lb *(2.0t)*	**C** 4,400 lb *(2.0t)*	**D** 8,800 lb *(4.0t)*	**D** 8,800 lb *(4.0t)*	**D** 8,800 lb *(4.0t)*	**E*** 17,600 lb *(8.0t)*	**E** 17,600 lb *(8.0t)*	**E** 17,600 lb *(8.0t)*
Counterweight Usage Configurations	0/A	0/2,000 lb *(0/1.0t)*	X								
	A,B	6,400 lb *(3.0t)*	X	X							
	A,B,C	10,800 lb *(5.0t)*	X	X	X						
	A,B,D	15,200 lb *(7.0t)*	X	X		X					
	A,B,C,D	19,600 lb *(9.0t)*	X	X	X	X					
	A,B,E	24,000 lb *(11.0t)*	X	X					X		
	A,B,C,D,D	28,400 lb *(13.0t)*	X	X	X	X	X				
	A,B,D,E	32,800 lb *(15.0t)*	X	X		X			X		
	A,B,C,D,E	37,200 lb *(17.0t)*	X	X	X	X			X		
	A,B,E,E	41,600 lb *(19.0t)*	X	X					X	X	
	A,B,C,D,D,E	46,000 lb *(21.0t)*	X	X	X	X	X		X		
	A,B,C,D,E,E	54,800 lb *(25.0t)*	X	X	X	X			X	X	
	A,B,C,D,D,E,E	63,600 lb *(29.0t)*	X	X	X	X	X		X	X	
	A,B,C,D,E,E,E	72,400 lb *(33.0t)*	X	X	X	X			X	X	X
	A,B,C,D,D,E,E,E	81,200 lb *(37.0t)*	X	X	X	X	X		X	X	X
	A,B,C,D,D,D,E,E,E	90,000 lb *(41.0t)*	X	X	X	X	X	X	X	X	X

* Counterweight E Can be used in place of two D weights.

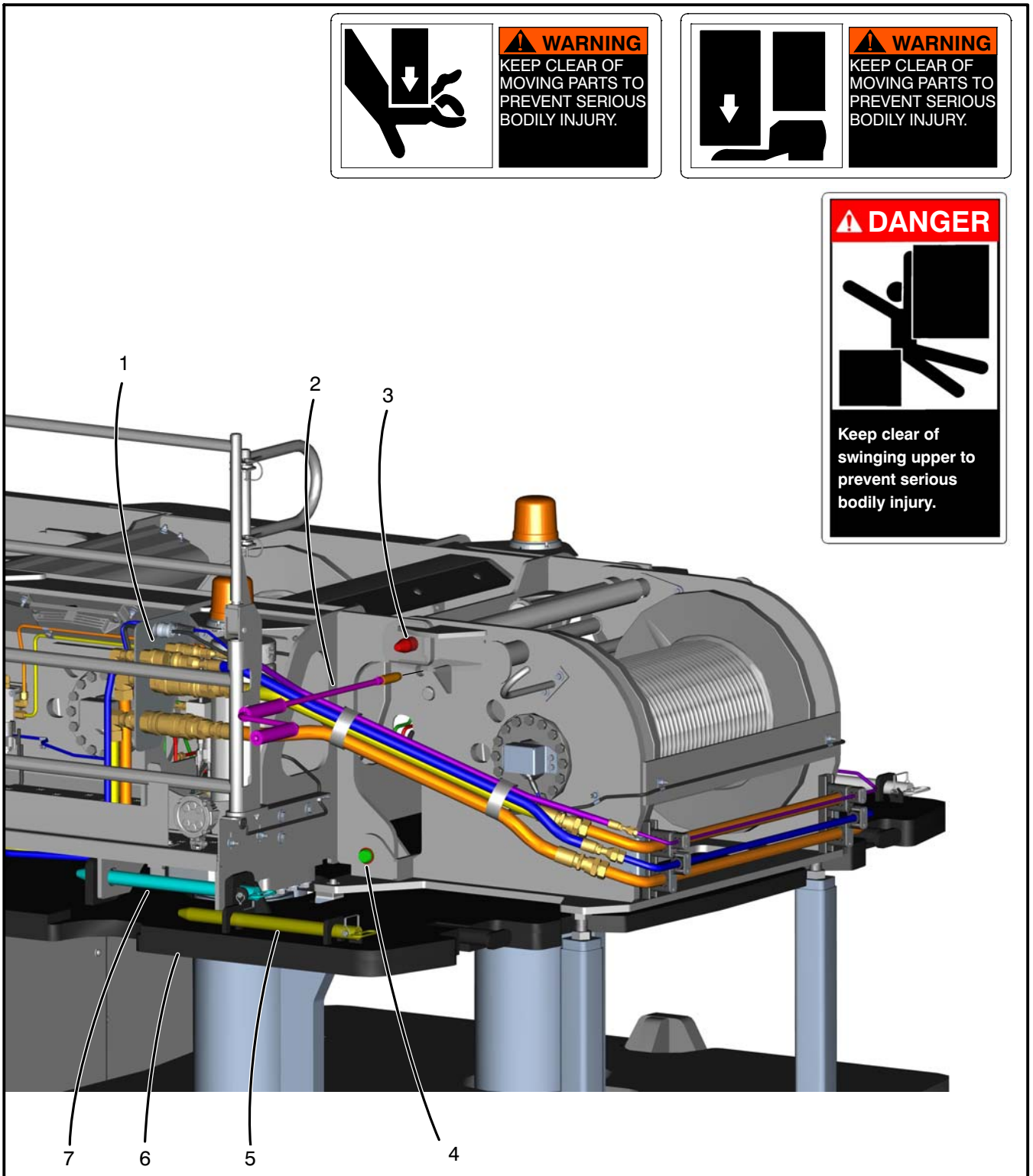
Counterweight Removal And Installation

Access to certain job sites may require the crane to travel on roads with strict weight restrictions. In order to meet such weight restrictions the crane is designed so the counterweights can be lowered onto the carrier deck and then removed and transported separately. The crane can be configured with several counterweight options. Removing the counterweights can reduce the weight of the crane by as much as 90,000 lb (*41.0t*). Refer to Figure 1–209.

The left and right control levers are used as the counterweight removal controls. Actuating the control lever mode switch on the left seat console, and selecting "Counterweight Mode" on the display, changes the function of the left control lever from operating the rear winch functions to operating the counterweight raise and lower functions. Pull the control lever back, toward the operator to raise the counterweight. Push the control lever forward, away from the operator to lower the counterweight. The right control lever changes from operating boom hoist to counterweight "lock" and "unlock" functions. Move the control lever to the left to "unlock" the counterweight or to the right to "lock" the counterweight. [If equipped with single axis controls, pull the right (boom hoist) control lever back to "unlock" the counterweight, or push it forward to "lock" the counterweight.]

Also the Pulse Crane Control System Display changes screens to display the location of the counterweight lift cylinder rods to alert the operator of counterweight status and to show the function and direction of movement of the control levers.

The counterweight controls are only active in the swing angle range of 176°–181°. If rotated outside this range, the counterweight and pinning cylinders will not extend or retract.



1. Rear Winch Hydraulic Hose Quick Disconnects
2. 1/2" Socket Wrench (Assembled)
3. Top Lock Pin Assy – Winch To Upper Frame
4. Bottom Connecting Pins With Snap Rings – Winch To Upper Frame
5. Connecting Pins With Lock Pins – Top Counterweight to Upper Frame – Storage Location
6. Counterweight(s) Installed
7. Connecting Pins With Lock Pins – Top Counterweight to Upper Frame

Figure 1–209
Counterweight Removal System

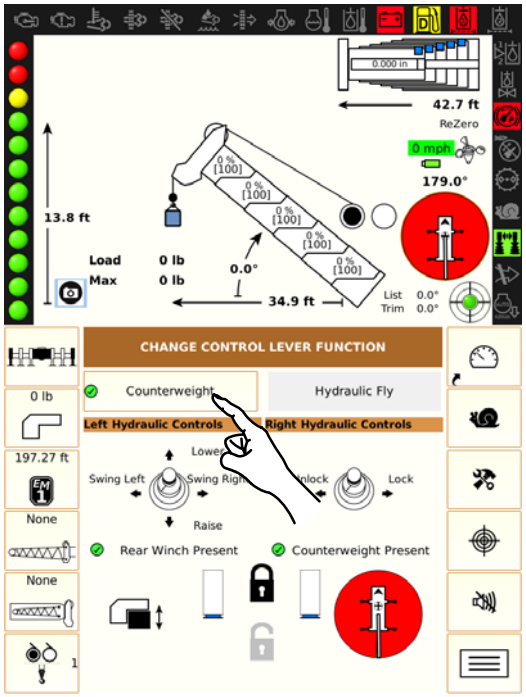
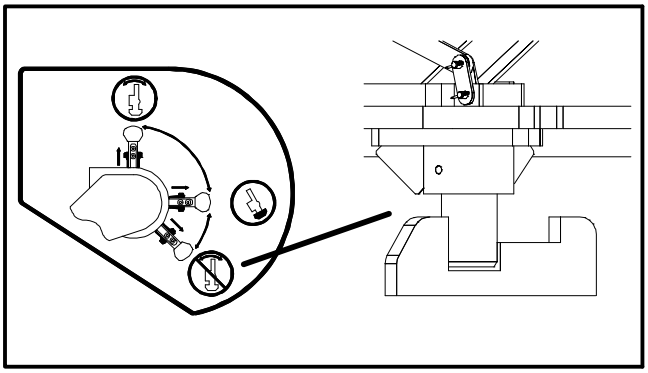


Figure 1–210
Change Control Lever Function

To Remove The Counterweights

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 full extended outriggers with the tires clear of the ground.
3. Fully retract all boom sections. If equipped, properly store the fly on the boom.
4. Boom up to 30°. Swing the upper directly over the rear of the carrier. Engage the travel swing lock in the directly over rear position.



WARNING

To avoid personal injury, do not stand under counterweights during lowering or raising of the counterweights.

5. If removing the rear (auxiliary) winch with the counterweight:
   a. Remove hook block/ball from the winch and spool all wire rope onto the winch.
   b. Remove all hydraulic lines at the quick disconnect fittings at the bulkhead above the upper catwalk.
   c. Disconnect the rear winch wire harness from the upper wire harness.
   d. Fully retract the top lock pin assembly, using a 1/2" socket wrench, supplied with the fly tools located right rear fender, and remove the winch from the upper frame. Refer to Figure 1–209.

   Note: The counterweight may have to be raised (cylinders retracted) to relieve pressure on the connecting pins to ease removal.

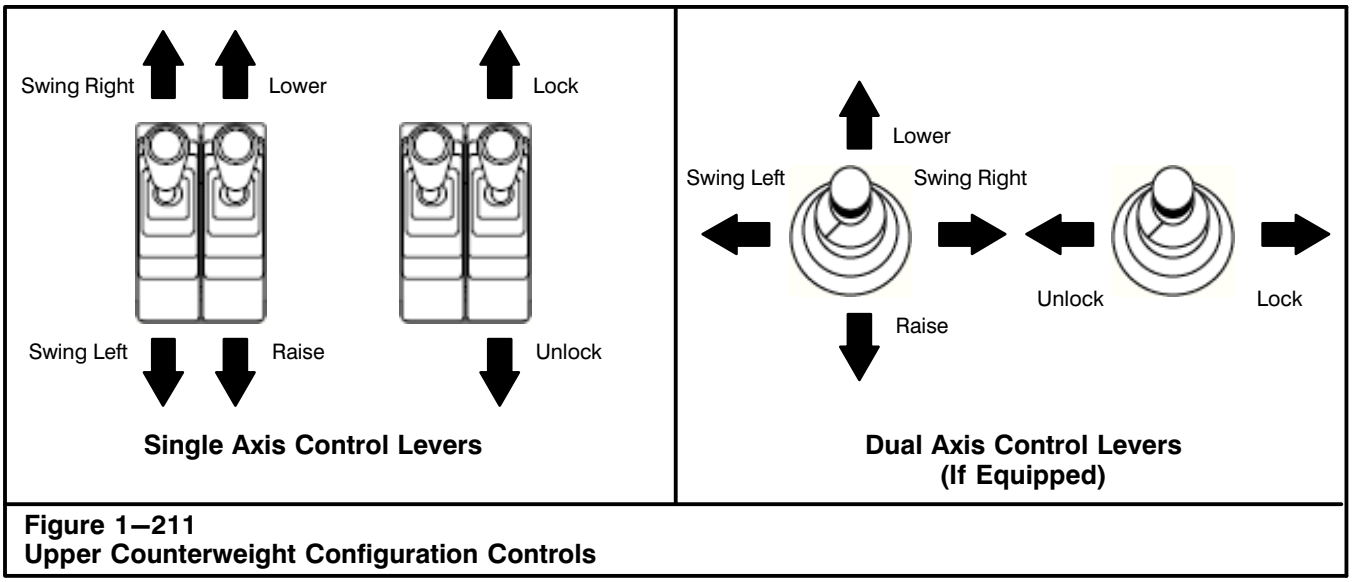
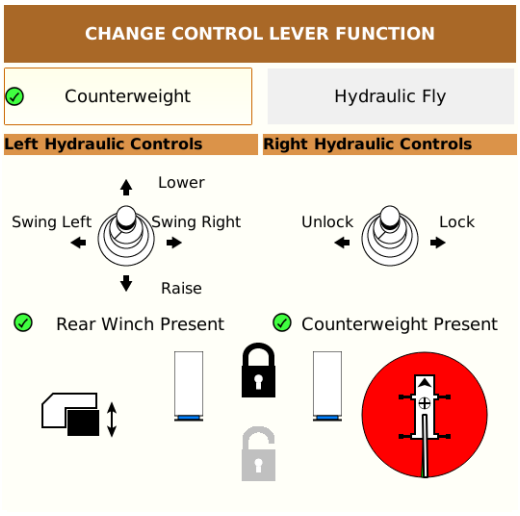


Figure 1–211
Upper Counterweight Configuration Controls

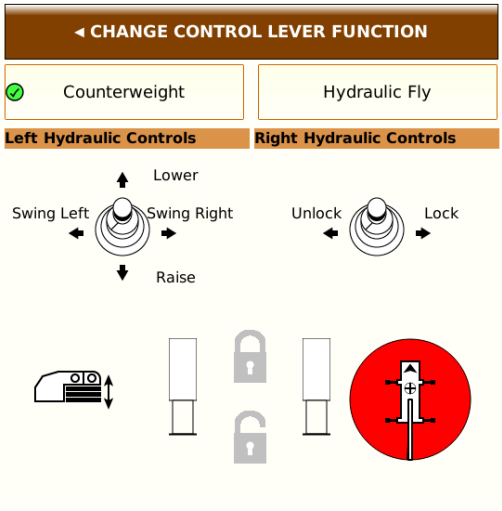
6. Push the Control Lever Mode Switch, then push the Counterweight Button on the Change Control Lever Function Screen of the Pulse Crane Control System Display to activate the left and right control levers to be used as counterweight controls. Once the Counterweight Mode is selected, the Change Control Lever Function Screen will display operation and status of counterweight. Refer to Figure 1–210 and Figure 1–211.

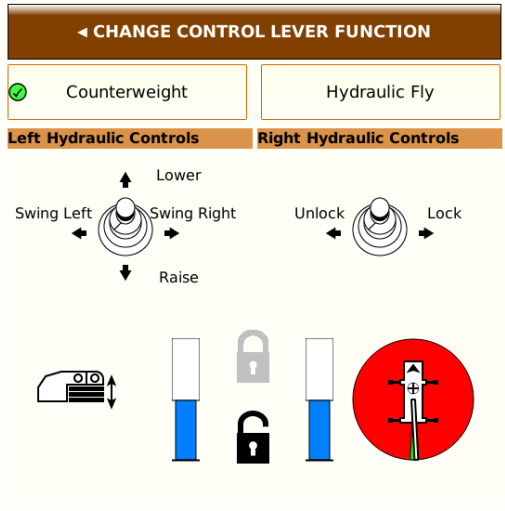
   Note: If the upper is not positioned within a range of 176°–181° (green range), the counterweight should not be operated.

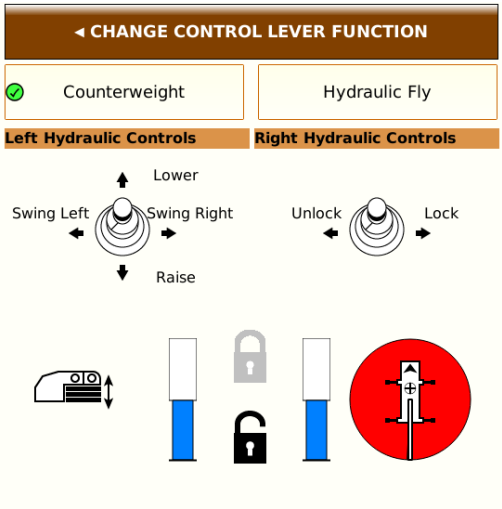


7. Move the left control lever to the "Raise" position to relieve the weight from the counterweight locking plates.
8. Move the right control lever to the "Unlock" position to retract the locking cylinder and counterweight locking plates, disconnecting the counterweight from the upper frame. The unlock symbol on the screen will go from gray to black when fully unlocked.

   Note: If both lock and unlock symbols are grayed out, the locking cylinder is between positions. The locking cylinder must be left in either the lock or unlock position.





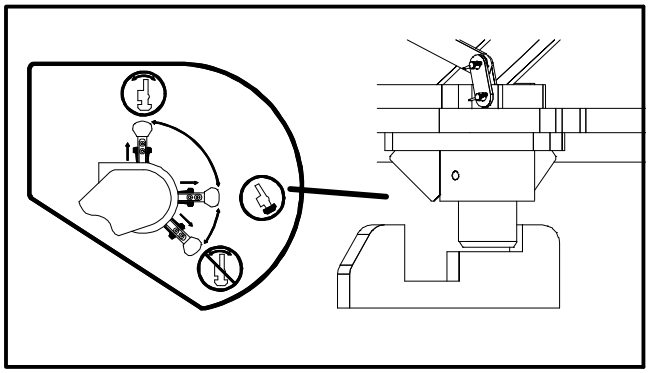


9. Move the left control lever to the "Lower" position to extend the counterweight removal cylinders and lower the counterweights until the counterweights engage the locator brackets and rest on the lower counterweight. The display will show the cylinder rods extending. The rods will turn blue when fully extended.

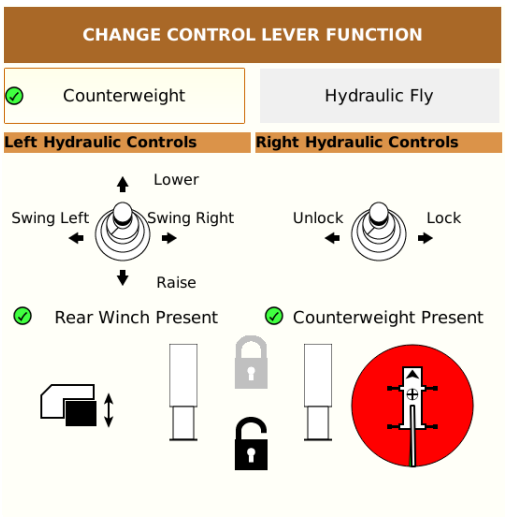
WARNING

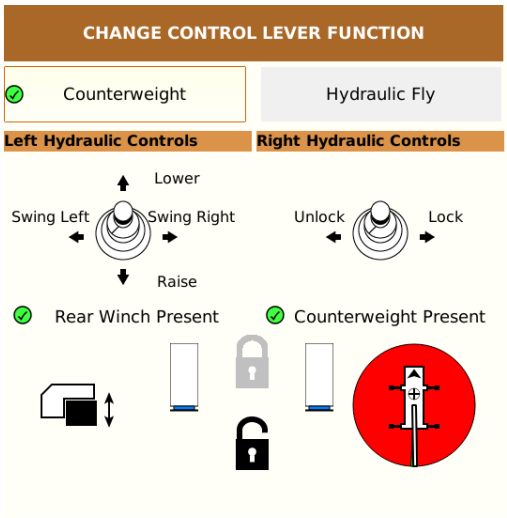
To avoid personal injury, do not stand under counterweights during lowering or raising of the counterweights.

10. Move the travel swing lock lever to the middle detent position. Carefully swing the upper to the left approximately 3° (177°) to disengage the cylinder rods from the slots in counterweight tray. Continue to swing until the travel swing lock contacts the counterweight positioning stop. Engage the swing park brake.



Note: Utilize the middle detent position of the travel swing lock to limit swing position. The degree of rotation shown on the Pulse Crane Control System Display should be used as an indicator only.





11. Move the left control lever to the "Raise" position to retract (raise) the counterweight removal cylinders until they are fully retracted. The display will show the cylinder rods retracting. The rods will show a thin blue line when fully retracted.
12. Push the Control Lever Mode switch to reactivate the left and right control levers for normal crane use.
13. The Counterweight Configuration Menu will appear on the Pulse Crane Control Display. Select the actual counterweight configuration. Refer to "Counterweight Configuration" in this section of this Operator's Manual.
14. Remove the counterweights from the carrier deck. The boom or an auxiliary lifting device of suitable size and strength may be used to lift the counterweights from carrier deck. Refer to the Crane Rating Manual for lifting capacities with no counterweight.

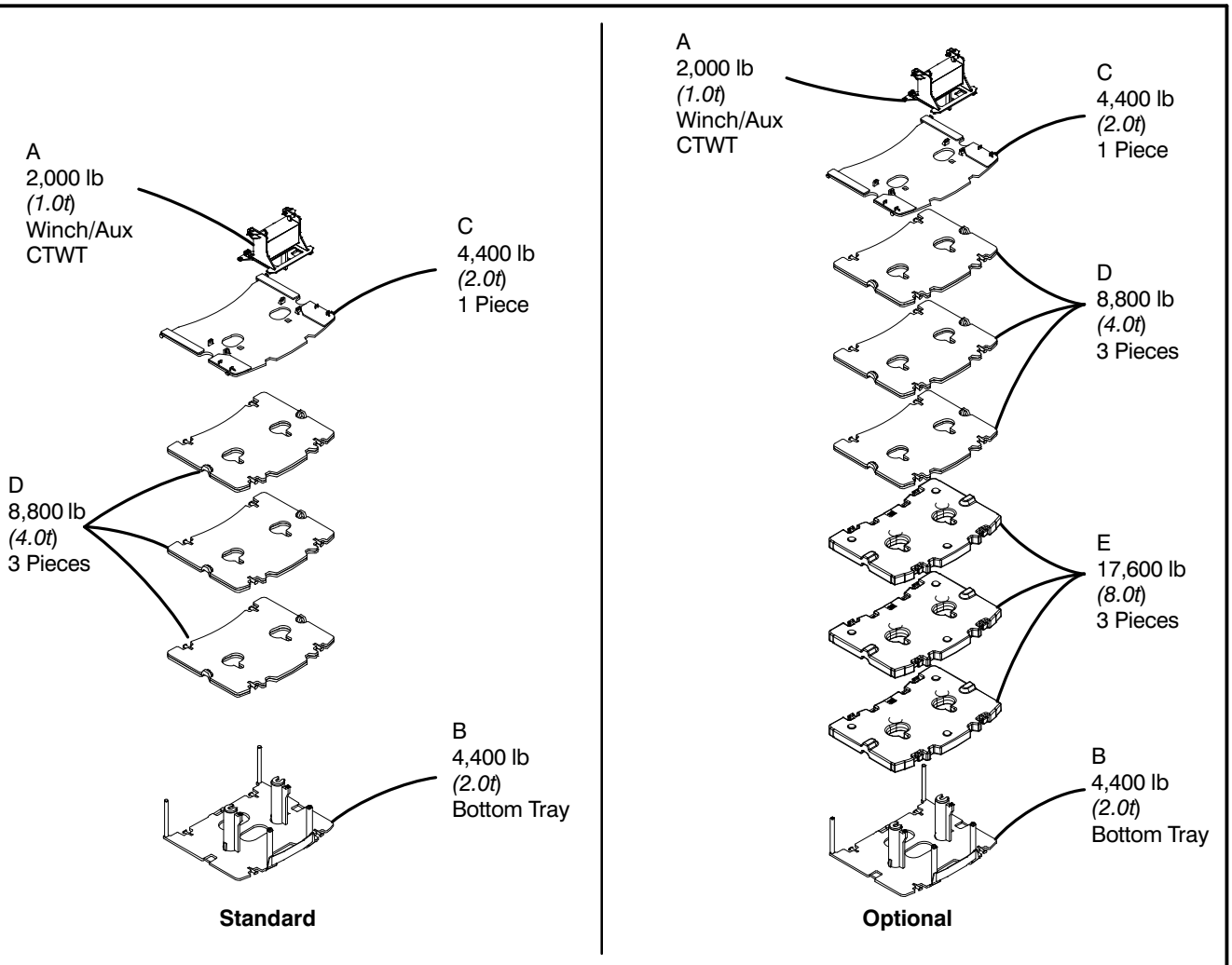


Figure 1–212
Counterweight Packages

Allowable Counterweight Installation/Removal Configurations

Counterweight Package			A 2,000 lb (*1.0t*) Winch/Aux CTWT	B 4,400 lb (*2.0t*) Bottom Tray	C 4,400 lb (*2.0t*) 1 Piece	D 8,800 lb (*4.4t*) 3 Pieces	D 8,800 lb (*4.4t*) 3 Pieces	E 17,600 lb (*8.8t*) 3 Pieces	E 17,600 lb (*8.8t*) 3 Pieces
Standard Counterweight Installation/ Removal Configurations	A	2,000 lb (*1.0t*)	X						
	C	4,400 lb (*2.0t*)			X				
	B,D	13,200 lb (*6.4t*)		X		X			
	D,D	17,600 lb (*8.8t*)				X	X		
Optional Counterweight Installation/ Removal Configurations	A	2,000 lb (*1.0t*)	X						
	B	4,400 lb (*2.0t*)		X					
	C,D	13,200 lb (*6.4t*)			X	X			
	D,D,E	35,200 lb (*17.6t*)				X	X	X	
	E,E	35,200 lb (*17.6t*)						X	X

To Install The Counterweights

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.

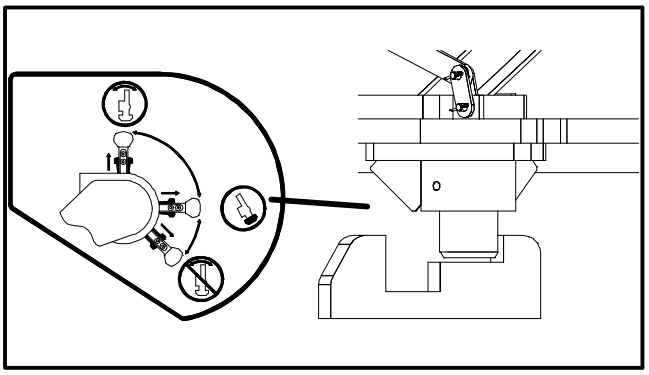
   Note: Ensure a maximum boom angle of 30° before swinging the upper over counterweights.

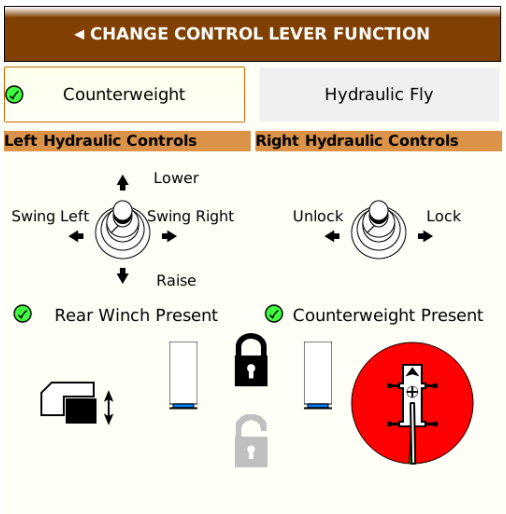
3. If required, install the counterweights onto the carrier deck. The boom or an auxiliary lifting device of adequate size may be used to lift the counterweights onto carrier deck. Refer to the Crane Rating Manual for lifting capacities with no counterweight. Stack the counterweights in the desired combination. The bottom counterweight tray must always be on the bottom and the top plate counterweight must always be on the top.
4. Install the rear winch on the counterweight tray if required.

   Note: If the rear winch is being installed onto the counterweight tray with the rope already on its drum, it may be necessary to repeat the counterweight sensing operation again after the winch has been pinned to the upper frame to ensure that the weight of the rope is not counted towards the end calculation.

5. Push the Control Lever Mode switch, then push the Counterweight Button on the Change Control Lever Function Screen of the Pulse Crane Control System Display to activate the left and right control levers to be used as counterweight controls. Once the Counterweight Mode is selected, the Change Control Lever Function Screen will display operation and status of counterweight. Refer to Figure 1−210 and Figure 1−211.

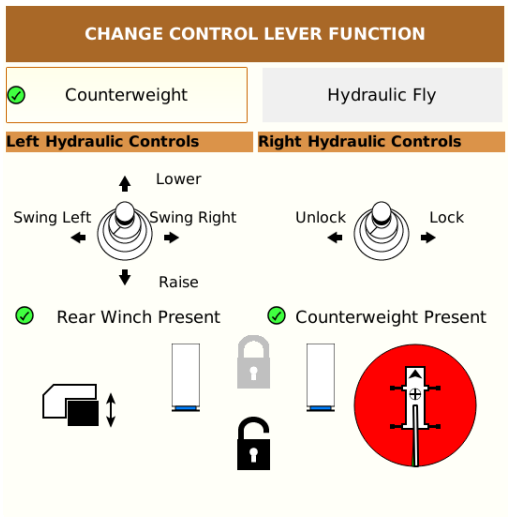
   Note: If the upper is not positioned within a range of 176°−181° (green range), the counterweight should not be operated.

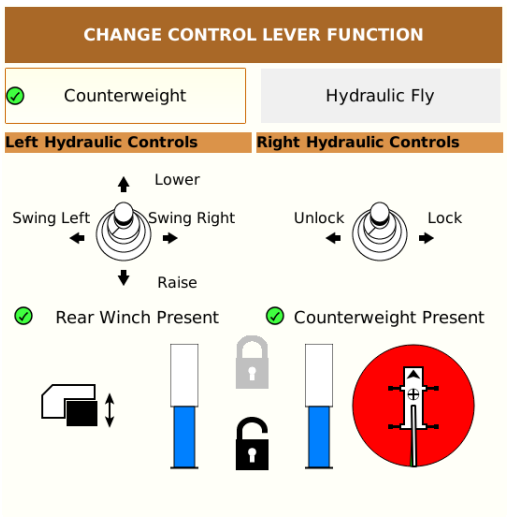




6. Move the travel swing lock lever to the middle detent position. Carefully swing the upper to the left approximately 3° (177°) from centered over the rear of the lower. Continue to swing until the travel swing lock contacts the counterweight positioning stop. Engage the swing park brake.

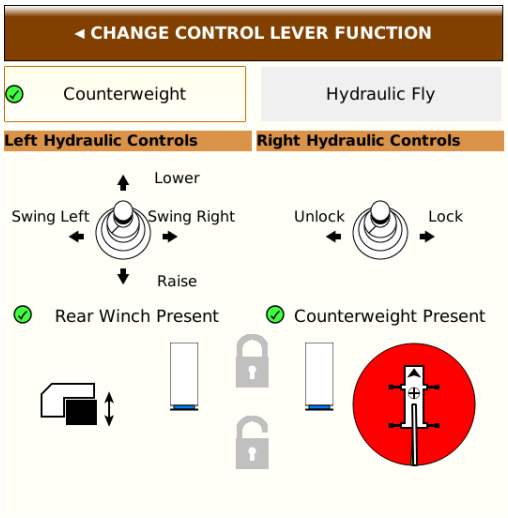
   Note: Utilize the middle detent position of the travel swing lock to limit swing position. The degree of rotation shown on the Pulse Crane Control System Display should be used as an indicator only.



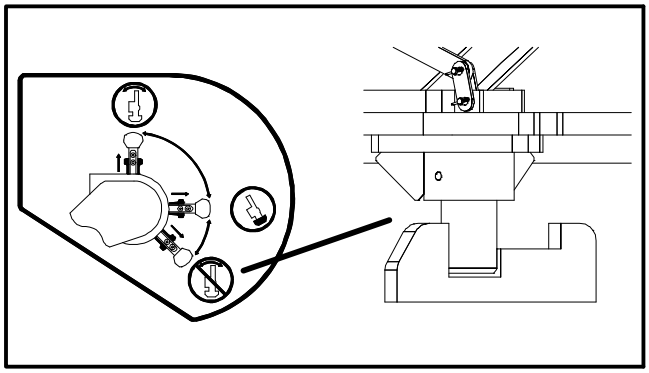


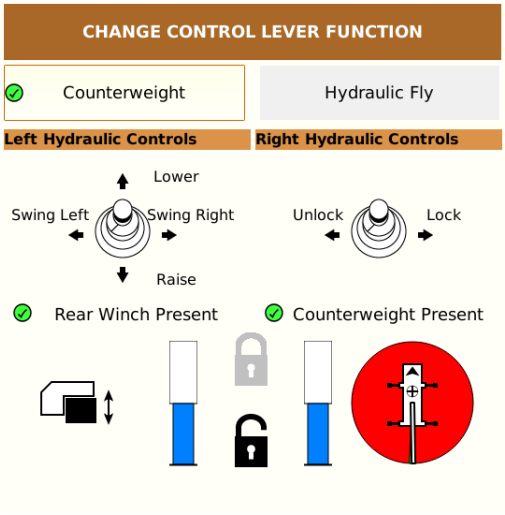
7. Move the right control lever to the "Unlock" position to retract the locking cylinder and counterweight locking plates. The unlock symbol on the screen will go from gray to black when fully unlocked.

   Note: If both lock and unlock symbols are grayed out, the locking cylinder is between positions. The locking cylinder must be left in either the lock or unlock position.

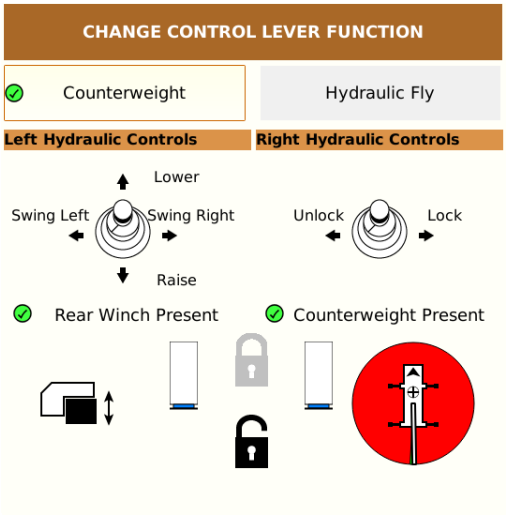


8. Move the left control lever to the "Lower" position to extend (lower) the counterweight removal cylinders. The display will show the cylinder rods extending. The rods will turn blue when fully extended.
9. Move the travel swing lock lever to the bottom detent position. Release swing park brake.





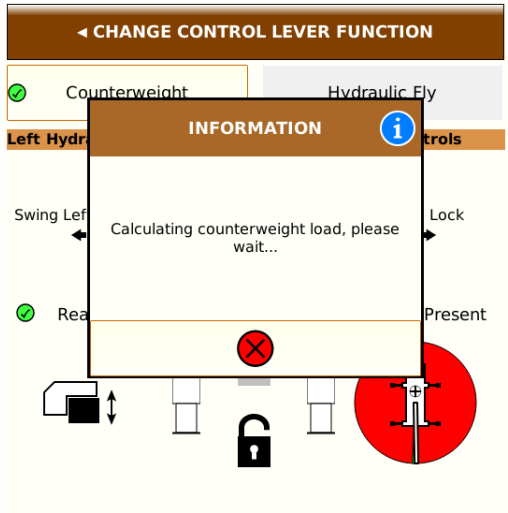
10. Carefully swing the upper to the right until the travel swing lock contacts the stop and drops into position. In this position, the cylinder rods will be engaged in the slots on the top of the counterweight tray.

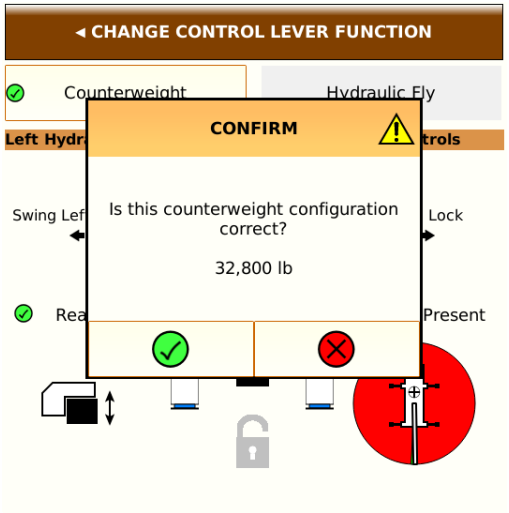


11. Move the left control lever to the "Raise" position to retract the counterweight removal cylinders and lift the counterweights. The display will show the cylinder rods retracting. The rods will show a thin blue line when fully retracted.

WARNING

To avoid personal injury, do not stand under counterweights during lowering or raising of the counterweights.



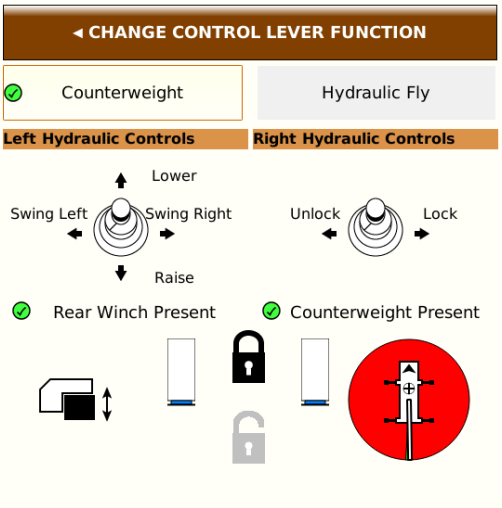


12. Continue holding the controller in the raise position or release the controller and wait for the counterweight load calculation pop-up window to appear.

Once the counterweights are fully raised, the pulse system will prompt the operator to confirm that the counterweight detected matches the actual counterweight installed. Press yes to confirm. If the counterweight detected doesn't match the actual counterweight installed, press No. If No is pressed, the counterweight menu will appear in the display. Select the correct counterweight configuration.

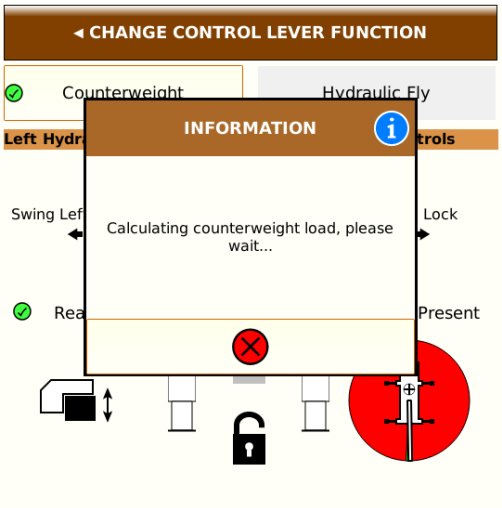
Note: If rear winch is not detected at the end of the counterweight sensing process, its icon "A" on the counterweight tab/screen will be grayed out. A capacity deduction will be applied. That same icon will be colored in black when the rear winch has been detected at the end of the counterweight sensing process. A capacity deduction will not be applied.

Note: If the rear winch is removed, if not already done so, the counterweight sensing process will need to be completed again.

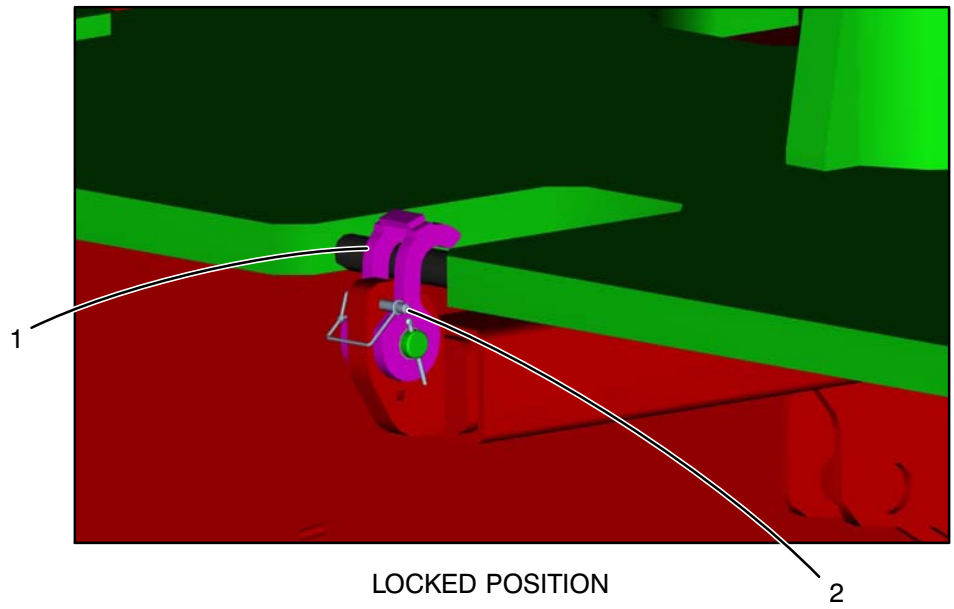


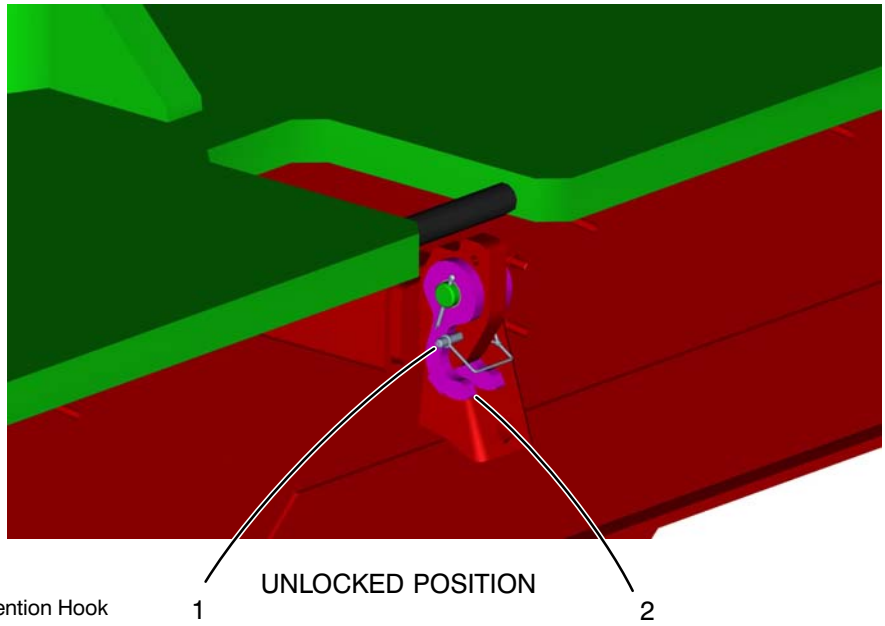
13. Move the right control lever to the "Lock" position to extend the locking cylinder and counterweight locking plates, connecting the counterweights to the upper frame. The lock symbol on the screen will go from gray to black when fully locked.

    Note: If both lock and unlock symbols are grayed out, the locking cylinder is between positions. The locking cylinder must be left in either the lock or unlock position.



14. If the rear winch was installed with the counterweight, fully extend the lock pin assembly, using a 1/2" socket wrench, supplied with the fly tools located in the right rear fender, to secure the winch to the upper frame. Connect all electrical connections and hydraulic lines. Refer to Figure 1–209.
15. Push the Control Lever Mode switch to reactivate the left and right control levers for normal crane use.
16. Make all electrical connections and install all hydraulic lines at the quick disconnect fitting at the bulkhead. Ensure the yellow o-ring of each quick disconnect fitting is completely covered when they are connected.
17. If the rear winch was installed, reeve the boom with the wire rope.





1. Counterweight Retention Hook
2. Locking Pin

Figure 1–213
Counterweight Tray Storage

Counterweight Tray Storage

The counterweight tray can be stored on the carrier deck. The counterweight retention hooks must be in the locked position and secured with locking pins at all times when the counterweight tray is stored on the carrier deck.

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 shackles are the recommended tie down points. If the crane is not equipped with shackles, chains may be looped around the axle housings and used to secure the crane down.

CAUTION

If chains are wrapped around the axle housing, ensure that the chains will not damage the tie rods, brake lines, steering cylinders, steering lines, etc..

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 on the boom or remove it from the crane and transport it separately.
2. The boom must be fully retracted and over the front of the crane in the boom rest with the travel swing lock engaged. Release the swing park brake and/or 360° swing lock.

CAUTION

Do not leave the swing park brake and/or 360° swing lock engaged when transporting the crane. Failure to release the swing park brake and/or 360° swing lock during this operation may result in major damage to the swing mechanism.

3. Secure the hook block and/or hook ball to prevent excessive swinging.

CAUTION

When the hoist wire rope(s) is/are 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 the boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum(s) to prevent tension on the wire rope(s).

4. All outriggers must be fully retracted (jacks and beams) with all outrigger position pins in the retracted position. All main outrigger pontoons must be in the self stored position or removed from jacks and properly stored on the crane.
5. Engage the park brake and shift the transmission to neutral.
6. All control levers in the upper operator's cab must be in the neutral position.
7. 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.

8. Position the upper guard rails to the travel/transport position. Refer to Figure 1−196.
9. Retract the upper cab walk to its stored position. Refer to Figure 1−192.
10. Remove the keys from the crane. Lock all windows and doors.
11. Depending on the specific situations, further preparations may be needed to protect the crane from the environment or vandalism. See "Crane Storage" for further suggestions.

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, steering cylinders, and steering lines.

Always exercise safety and follow all local codes when towing the crane.

In the event of an engine failure, the cranes emergency steering pump will provide "stiff" steering when moving above 1mph. Always use caution when towing the crane without the engine running.

The towing vehicle will provide the only braking action if damage to the service brake system has occurred. Tow the crane with extreme caution.

A special "breakdown" truck must be used to tow the crane if the engine, steering, or brake systems are no longer functioning properly.

The front towing lug is designed for a total maximum tractive force of 25,000 (12.2t). This force can be applied either straight forward or up to 45° to both sides.

Towing speed should not exceed 10 mph. Maximum towing distance is 65 miles (*100 km*).

Conventional Towing & Flat Towing

1. Conventional towing utilizes a tow vehicle to lift one end of the crane while towing.
2. Flat towing requires that a "tow bar" arrangement be attached between the crane and towing vehicle. The crane must not lifted and all wheels must remain on the ground.

Prepare The Crane For Towing.

1. If equipped, store the fly on the boom.
2. The boom must be over the front of the crane in the boom rest, or over the rear of the crane in a boom dolly/trailer.
   a. If the boom is over the front:
      1. The boom must be fully retracted.
      2. Travel swing lock must be engaged. Disengage the swing park brake and/or 360° mechanical swing lock.
      3. The crane can be flat towed from the front using the front center tow lug as long as the maximum allowable force of 25,000 pounds (12.2t) is not exceeded.
      4. The crane can be conventionally towed from the rear using the rear tow lugs and spreader bar as long as a combined maximum allowable force, at no more than 45 degrees from horizontal, of 25,000 pounds (12.2t) is not exceeded.
   b. If the boom is over the rear:
      1. The boom should stay at the desired length for axle loadings.
      2. Travel swing lock must be disengaged. Release the swing park brake and/or 360° mechanical swing lock.
      3. The crane can be flat towed from the front using the center front tow lug as long as the maximum allowable force of 25,000 pounds (12.2t) is not exceeded.

CAUTION

Do not leave the swing park brake and/or 360° swing lock engaged when towing the crane. Failure to release the swing park brake and/or the 360 degree swing lock during this operation may result in major damage to the swing mechanism.

3. Secure the hook block and/or hook ball to prevent excessive swinging.

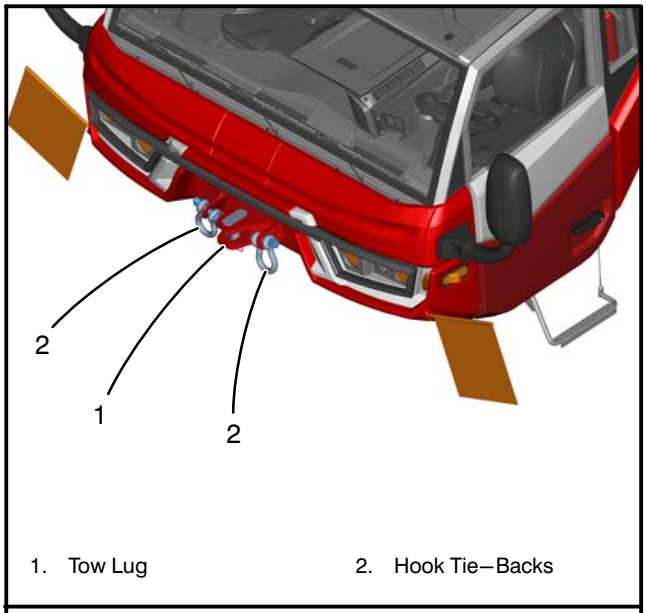
CAUTION

When the hoist wire rope(s) is/are 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 the boom, raise or lower the boom, or raise the crane on outriggers unless wire rope is spooled off the drum(s) to prevent tension on the wire rope(s).

4. All outriggers must be fully retracted (jacks and beams) with all outrigger position pins in the retracted position. All main outrigger pontoons must be in the self stored position or removed from jacks and properly stored on the crane.
5. All control levers in the upper operator's cab must be in the neutral position.
6. Retract the upper cab walk to its stored position.
7. Store upper guard rails to their transport position.
8. Connect crane to towing vehicle. Tow bars can only be connected to the towing lugs on the front bumper of the crane. Allowable loads are listed in the "Towing The Crane" section.
9. Connect the air and electrical supply from towing vehicle to the crane. The pneumatic connection can be made at the inlet port (braided line) on the air dryer. Monitor the crane air gauges to verify that a pressure range of 85psi to 100psi can be maintained for the braking system. Electrical connections are usually temporary light bars at the rear of the crane connected to the towing vehicle.
10. With the carrier park brake engaged, shift the transmission to neutral.
11. Deactivate all axle differentials and cross locks.
12. Remove the drive tube:
    a. For Conventional Towing
        1. If front of crane is being lifted, remove the rear drive shaft at the transfer case. (Emergency steering circuit will not operate)
        2. If rear of crane is being lifted, remove the front drive shaft at the transfer case. (Emergency steering circuit will not operate)
    b. For Flat towing
        1. Drive shaft removal is not required. (Emergency steering will operate)

CAUTION

During a "Flat Towing" operation, the transmission temperature must be monitored and cannot exceed 230°F. Major transmission damage can occur if this temperature is exceeded.



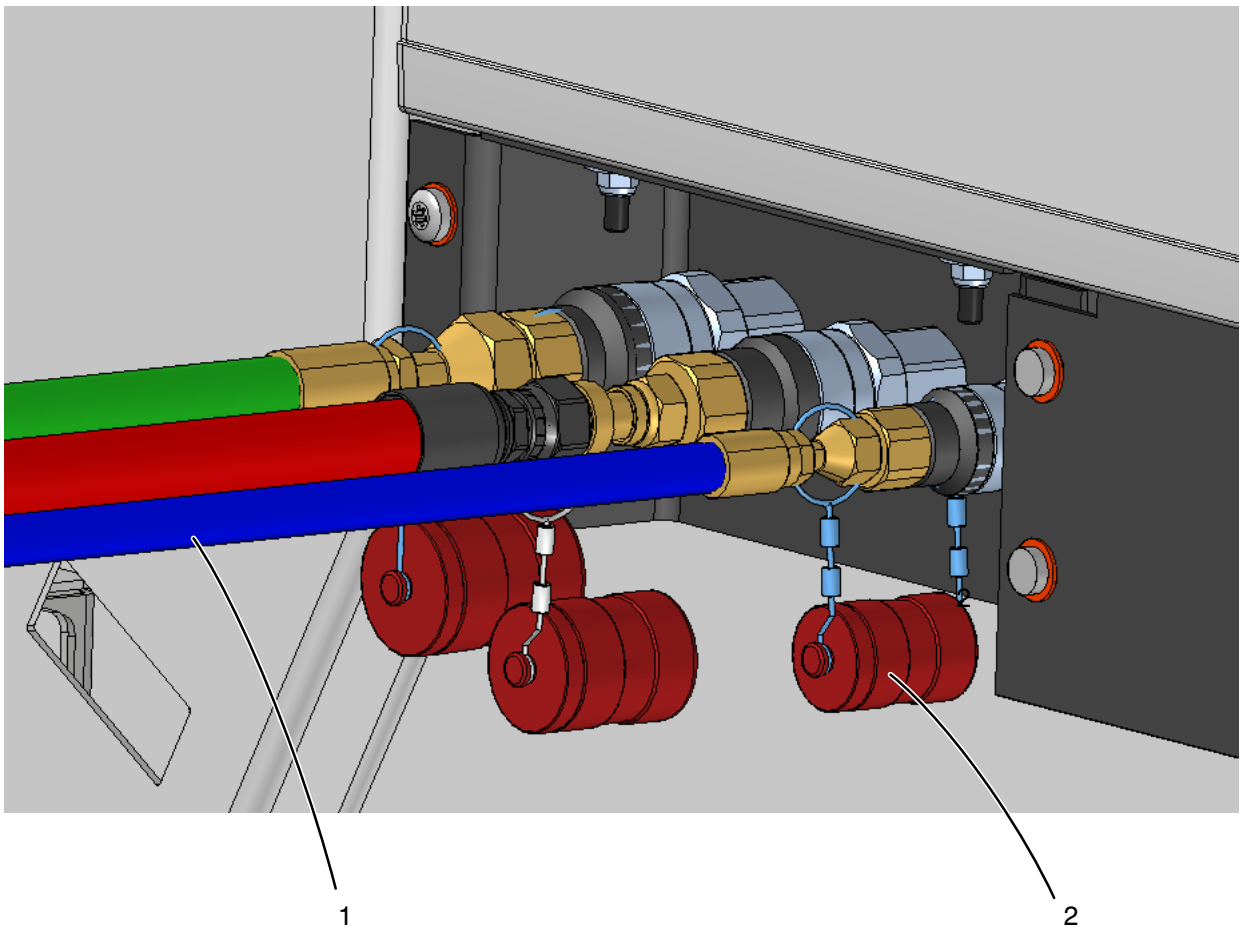
1. Tow Lug
2. Hook Tie–Backs

Figure 1–214
Front Tow Lug

13. Turn on the hazard flashers and beacons.
14. After the crane is properly prepared and attached to the towing vehicle, release the carrier parking brake. If the pneumatic system will not release the parking brake, it can be manually released (caged) for towing.

CAUTION

Manually releasing (caging) the parking brake should only be performed by trained and qualified personnel. The parking brakes must be reapplied (uncaged) immediately after towing the vehicle.



1. Hydraulic Lines
2. Caps

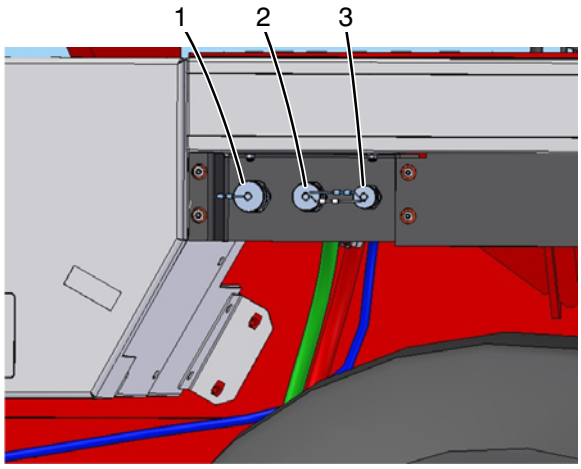
Figure 1–215
Auxiliary Power Emergency System (A.P.E.S.)

Auxiliary Power Emergency System (A.P.E.S.)

The auxiliary power emergency system (A.P.E.S.) provides an output flow of 12.57 gpm limited to 3,000 psi (*20 684kPa*) to provide hydraulic power to another crane allowing hydraulic function of the other crane in the event of a complete powertrain, electrical, or controls failure. In the event of such a failure on another crane equipped with a compatible emergency system (it must be verified that the flow and pressure provided meets system requirements), the crane can be parked next to the inoperable crane and used as a hydraulic power supply by connecting the pressure, return, and case drain ports on both cranes together to assist in getting the load out of the air and safely on to the ground.

Hoses with quick disconnects are provided with the option. However, adapters may be required based on the connectors of the broken down crane.

Note: Always screw caps together during usage of the A.P.E.S. to avoid contamination.



1. Auxiliary Supply Return
2. Auxiliary Supply Pressure
3. Auxiliary Case Drain

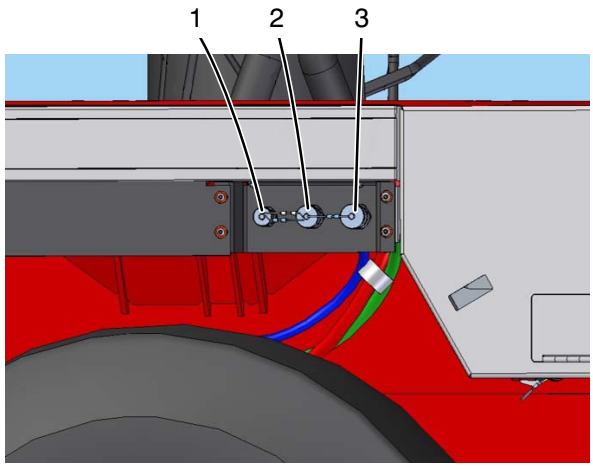
Figure 1–216
Carrier Left Side – Auxiliary Power Supply

Power Supply:

Note: This side provides hydraulic power to disabled crane.

1. Pumps – 12.57 gpm (*47.6lpm*) gear pump provides output flow to a quick disconnect located on the left hand side of the crane.
2. Valves:
   a. A relief valve set at 3,000 psi (*20 684kPa*) limits the pressure of the output flow from the pump.
   b. A 2–way/2 position solenoid blocking valve blocks pump flow to the outriggers/suspension and directs it toward the pressure quick disconnect.

Once parked and hooked up to the broken down crane, the auxiliary power emergency system output flow is turned on by selecting the option from the display menu in the carrier cab. Once activated, the engine idles at 1,600 rpm, the outriggers/suspension functions are disabled, and 12.57 gpm at 3,000 psi (*20 684kPa*) is provided to the broken down crane.



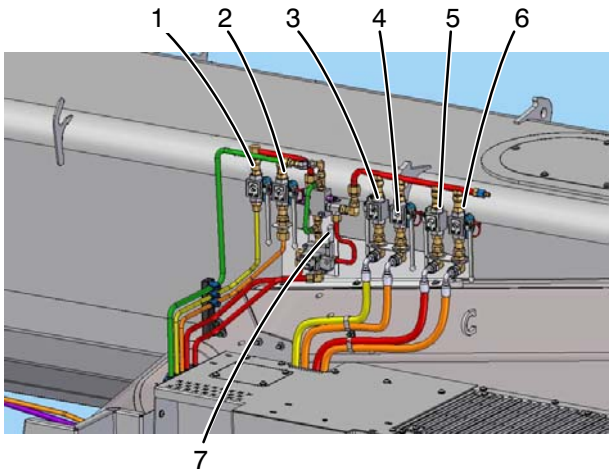
1. Case Drain
2. Supply Pressure
3. Supply Return

Figure 1–217
Carrier Right Side – Emergency Power Supply

Emergency Function:

Note: This side receives hydraulic power for emergency operation.

1. Hydraulic Transformer – Gear pump directly coupled to a gear motor provides 9.0 gpm for emergency operations when the motor receives 12.57 gpm. Hydraulic power supplies that are hooked up are not to exceed a flow of 12.6 gpm or a pressure of 3,000 psi (*20 684kPa*). Quick disconnects on the right hand side of the carrier provide connections to the pressure, return and case drain of the motor. The transformer allows for circuit separation from the hydraulic oil in the crane or hydraulic power supply that is attached.
2. Valves:
   a. A lever operated directional control valve located on the upper catwalk is used to control the flow for all emergency functions.
   b. Six lockable 2–way ball valves direct flow to the circuits for each of the available emergency functions. Only one ball valve is to be opened at a time during operation.
   c. A valve for boom up, boom down, main winch up, and main winch down emergency functions.
   d. A control valve set to 1.5 gpm limits the flow for swing left and swing right functions.
   e. A relief valve for swing left and swing right functions.
   f. A pressure reducing valve releases the swing park brakes during swing left or swing right emergency operation.



1. Swing Left
2. String Right
3. Front Winch Up
4. Front Winch Down
5. Boom Down
6. Boom Up
7. Metering Valve

Note: All valves shown are in the closed position

Figure 1–218
A.P.E.S. – Valves & Functions

g. A pressure reducing valve for boom down operation.

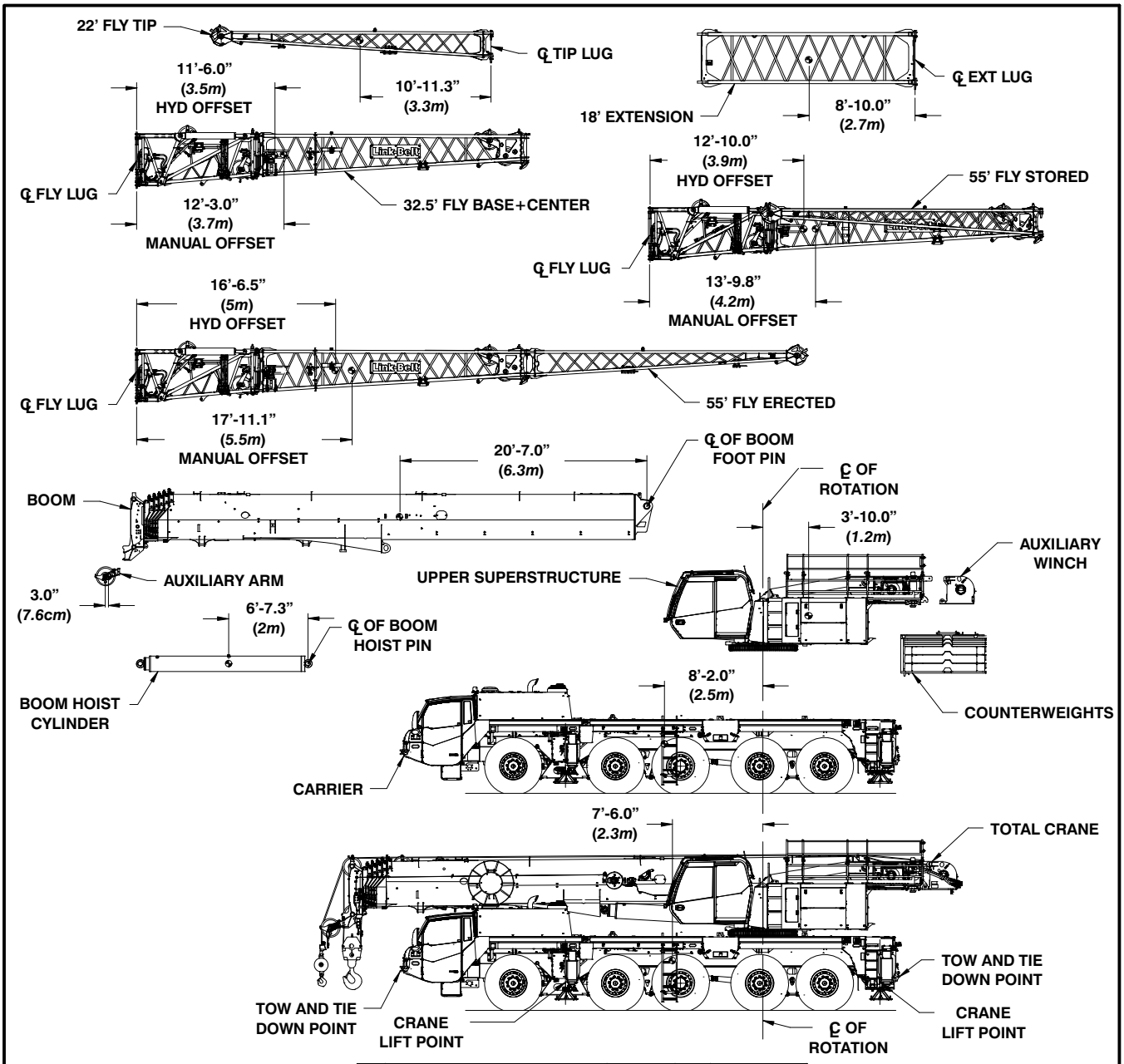
h. Four 3–way/2 position pilot operated valves are used during main winch up, main winch down, swing left, and swing right operation. These valves tie into the working lines for each respective function. In neutral position (un–piloted) they provide for normal operation of the crane. When operating one of these emergency functions, the valves are pilot shifted to direct flow from the emergency system to the working line of that particular function.

Operation:

The auxiliary power emergency system option provides hydraulic functionality of boom up, boom down, main winch up, main winch down, swing left and swing right (full 360° swing capable) in the event of a powertrain, electrical, or controls failure. All functions are provided at a reduced speed that is less than 15% of the maximum normal operating speeds.

During a failure event, an external hydraulic power supply is connected to the quick disconnects on the right hand side of the carrier. Hoses with quick disconnects are provided with the option but adapters may be needed depending on the hydraulic power supply ports. The hydraulic power supply must not provide more than 12.6 gpm and its relief must be set to 3,000 psi (*20 684kPa*).

Once connected, the operator selects one function to perform at a time by opening the ball valve of the desired function and then operating the lever of the control valve located on the upper catwalk. The ball valves are labeled to provide for easy selection. Only one ball valve is to be opened at a time. The operator can use these functions to maneuver a small load (less than 9,000 lb (*4 082kg*) of line pull) to a safe location. There is no RCL during emergency operation so the load charts/operator manual instructions must be adhered to throughout the entire maneuvering of the load.



DESCRIPTION	WEIGHT	
CARRIER	58,390 lbs	(26 485kg)
UPPER SUPERSTRUCTURE	18,912 lbs	(8 578kg)
BOOM HOIST CYLINDER	4,044 lbs	(1 834kg)
BOOM W/ FOOT PIN	31,755 lbs	(14 404kg)
AUXILIARY ARM	109 lbs	(49kg)
HOOKBALL AND BLOCK	4,011 lbs	(1 819kg)
AUXILIARY WINCH+ROPE	3,249 lbs	(1 474kg)
TOTAL CRANE	120,470 lbs	(54 644kg)
COUNTERWEIGHTS (ALL)	90,000 lbs	(40 823kg)
FLY BASE + CENTER (HYD)	3,470 lbs	(1 574kg)
FLY BASE + CENTER (MANUAL)	3,064 lbs	(1 390kg)
FLY TIP	708 lbs	(321kg)
18' FLY EXTENSION	982 lbs	(445kg)

Figure 1–219
Lifting The Crane

Lifting The Crane

The entire crane (except the fly base, fly tip, and counterweights) can be lifted or the components may be removed from the crane and lifted individually. Refer to Figure 1−219 for the centers of gravity and weights for the 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, the travel swing lock engaged, the swing park brake and/or 360° swing lock released, and the boom positioned in the boom rest.
2. Position the upper guard rails to the travel/transport position. Refer to Figure 1−196.
3. Retract the upper cab walk to its stored position. Refer to Figure 1−192.
4. Use lifting equipment, shackles, chains, slings, 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.

WARNING

Do not use the towing shackles as a means of lifting the crane. These shackles are not intended to be used to lift the crane and may break if subjected to the entire weight of the crane. Serious personal injury or major equipment damage may result from this practice.

5. The weights and locations of all centers of gravity include all possible options (heaviest crane) except the fly base, fly tip, and counterweights. Use the centers of gravity as a starting point. Center hoist line on the center of gravity, lift a few inches *(centimeters)*, and adjust the hoist line as required to keep the crane/components level at all times.
6. Removal of any components from the crane will shift the center of gravity of the entire crane. Adjust the hoist line as required to account for the removal of any component.
7. The hook block and/or hook ball are assumed to be tied off to the front of the crane.
8. When lifting the entire crane, extend outriggers beams to the intermediate position and install slings around the beams. Protect slings from any sharps edges.
9. Use only nylon straps to lift fly base, fly tip, or the fly extensions to prevent damage to them. Protect the straps from sharp edges. It is recommended that the lifting lugs be used as lifting points. However it is permissible to use the connecting lugs, at each end of the sections, or nylon straps around all four main chords as the lifting points.
10. Do not allow the hoist wire rope(s) to contact boom while lifting crane. Major damage to the boom may result.

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. Thoroughly clean the crane.
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. 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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Notes:

General Lubrication Information

The crane should be regularly and systematically lubricated in accordance with the Lubrication Chart shown on the following pages. Refer to Figure 2−1. Another copy of the chart is on the the carrier. The time intervals shown on the Lubrication Chart 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 his best judgment and work out his own lubrication schedule.

In addition to the points on the Lubrication Chart, all movable linkages and control cables should be periodically lubricated to resist wear.

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 and/or air pressure before opening or removing a line or fitting.
6. Replace all guards and panels 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 grease guns clean. Wipe all fittings before lubrication. Raise the crane on outriggers, or block the wheels, and shutdown the engine(s) before working on the crane. Replace all guards and panels before operating the crane.

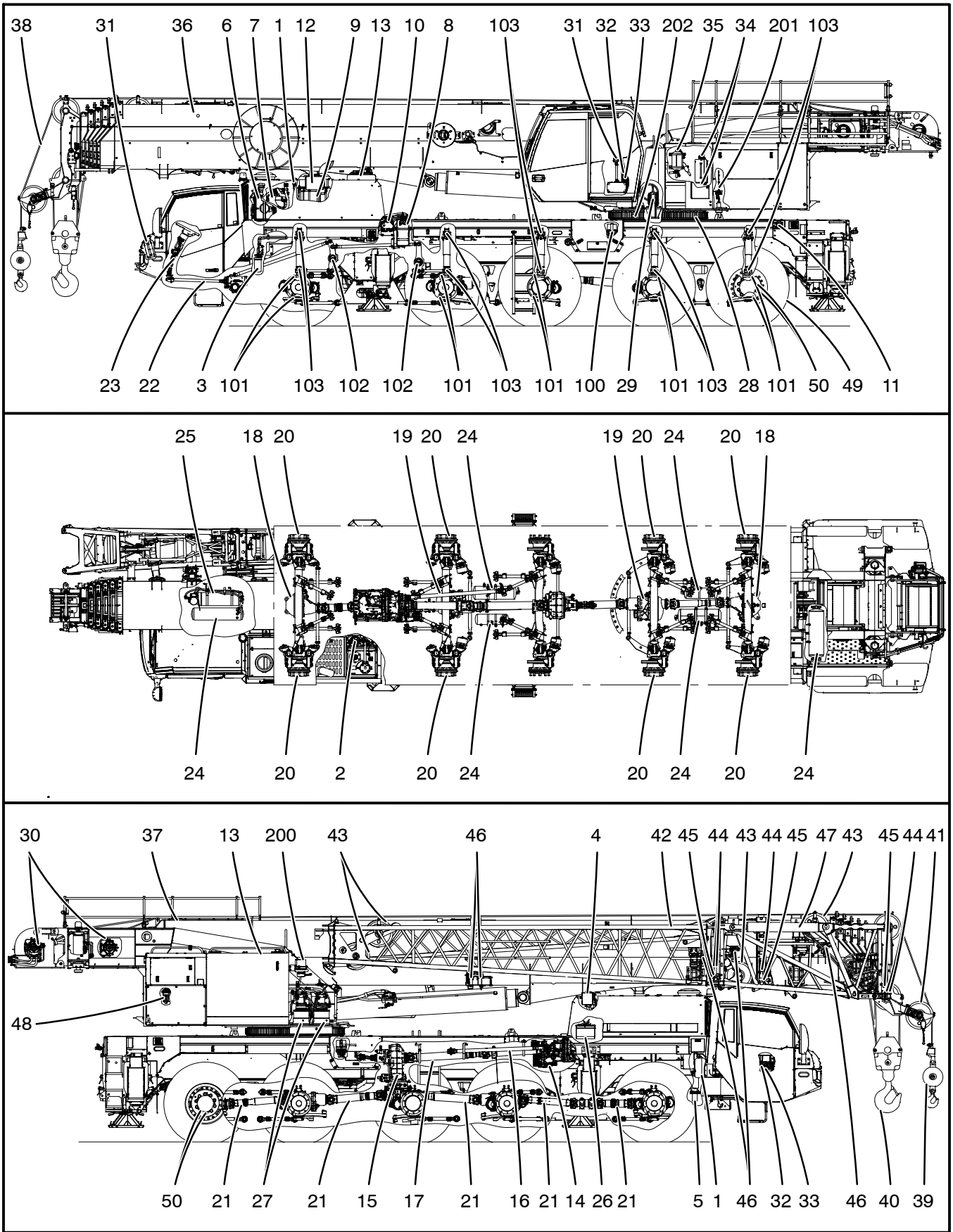


Figure 2–1
Maintenance And Lubrication Chart

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 Carrier		Capacity Upper	
		8 Daily	40 Weekly	150 Monthly	250 6 Weeks	500 3 Months	1,000 6 Months	2,000 Annual				GAL.	LITERS	GAL.	LITERS
Engine Oil System	1	✓							✓			12.0	45.4	–	–
Primary Fuel Filter, Water Separator	2	✓				●						–	–	–	–
Secondary Fuel Filter	3								●			–	–	–	–
Engine Cooling System	4	✓							✓			25.5	96.5	–	–
Engine Coolant Filter–Carrier	5								●			–	–	–	–
Engine Air Cleaner/Air System	6	✓			✓							–	–	–	–
Engine Crankcase Filter	7								●			–	–	–	–
Diesel Exhaust Fluid (DEF) System	8	✓										10.0	37.9	–	–
Aftertreatment - Diesel Particulate Filter (DPF)	9											–	–	–	–
Dosing Module Filter	10								●			–	–	–	–
Fuel Tank	11	✓										117.0	442.9	–	–
Spark Arrestor If Equipped	12						✓					–	–	–	–
Hydraulic Reservoir/(System)	13	✓ ✓	✳ ●			●				✓		43.0 (65.0)	162.8 (246.1)	160.9 (265.0)	609.1 (1003.1)
Transmission W/Indtarder	14			✓						✓		6.2	23.5	–	–
Transfer Case	15		✓							✓		3.3	12.5	–	–
Transmission Drive Tubes/U–Joints	16				✓						3	–	–	–	–
Transfer Case Drive Tubes/U–Joints	17				✓						3	–	–	–	–
Axle Differentials 1 & 5	18		✓							✓		10.0	37.9	–	–
Axle Differentials 2 & 4	19		✓							✓		10.8	40.9	–	–
Planetary Wheel Ends (Each)	20		✓							✓		0.4	1.6	–	–
Axle Drive Tubes/U–Joints	21				✓						13	–	–	–	–
Steering Drive Shafts/U–Joints	22						✓				3	–	–	–	–
Steering Column U–Joints	23						✓				1	–	–	–	–
Air Reservoirs	24		✓								6	–	–	–	–

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 Carrier		Capacity Upper	
		8 Daily	40 Weekly	150 Monthly	250 6 Weeks	500 3 Months	1,000 6 Months	2,000 Annual				GAL.	LITERS	GAL.	LITERS
Air Dryer	25										1	–	–	–	–
Batteries	26											–	–	–	–
Swing Speed Reducer (Each)	27		✔	✳								–	–	0.9	3.3
Turntable Gear Teeth	28										ALL	–	–	–	–
360 Degree Swing Lock–If Equipped	29										4	–	–	–	–
Winch Drums (Each)	30		✔	✳								–	–	5.0	18.9
Windshield Washer Reservoirs	31	✔										2.6	9.7	1.3	4.7
Cabin Filter	32											–	–	–	–
Cabin Recirculation Air Filter	33											–	–	–	–
Cab Heater Fuel Tank & Filter	34	✔										–	–	6.4	24.2
Cab Heater Coolant Tank	35		✔									–	–	1.8	6.6
Boom	36											–	–	–	–
Boom Locking Pins	37										5	–	–	–	–
Wire Rope	38											–	–	–	–
Hook Ball	39										1	–	–	–	–
Hook Block & Sheaves	40										ALL	–	–	–	–
Auxiliary Lifting Sheave	41										1	–	–	–	–
Fly	42											–	–	–	–
Boom & Fly Sheaves	43										ALL	–	–	–	–
Fly Pinning Screws	44										5	–	–	–	–
Fly Pinning Bearings	45										9	–	–	–	–
Fly Storage Retaining Pins	46										All	–	–	–	–
Hyd Offset Fly Cylinder–If Equipped	47										2	–	–	–	–
Hydraulic Pilot Flow Filter	48		✳									–	–	–	–
Tires/TPMS	49											–	–	–	–
Lug Nut Torque Indicators	50											–	–	–	–

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 Carrier		Capacity Upper	
		8 Daily	40 Weekly	150 Monthly	250 6 Weeks	500 3 Months	1,000 6 Months	2,000 Annual				GAL.	LITERS	GAL.	LITERS
Carrier Auto Lube System	100	✓	🔍									0.8	3.0	–	–
Upper Auto Lube System	200	✓	🔍									–	–	0.8	3.0

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	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	Engine Coolant	835006	Cummins Fleet Guard ES Compleat OAT	50/50 or 60/40 Mix***	
13	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		
14	Transmission Fluid	830349	Castrol Syntrans Z Long Life 75W−80	Synthetic	SAE 75W−80
18,19 15 20 27	Axle Differential Oil Transfer Case 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 GL−5 & MT−1
30	Winch Drum Oil	830342	Shell Omala S4 GX Conoco Syncon EP Plus Mobil SHC Or Equivalent	ISO 150	AGM No. 4 EP
16,17,21, 22,23,29, 37,39,40, 44,45,46, 47, 100,200	Grease, Multipurpose	830002	Conoco Kendall L-427 Super Blu Or Equivalent	NLGI−2	

Location Number	Lubricant/Fluid	Link-Belt-Spec.	Accepted Lubricants	Grade	Classification
28	Turntable Gear Teeth Open Gear Lube	830013	Shell Gadus S2 A1000XD 2 Or Equivalent		
31	Windshield Washer Reservoir Fluid	835002	Gold Eagle Redi-Mix Coolnts + CP Wndshld Wshr Fluid-25 (blue) Or Equivalent		

* Oil type filled from the factory is indicated on the hydraulic information label. Refer to Figure 2−21. 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. For temperatures outside this range, refer to the engine maintenance manual.

Link-Belt Preferred Hydraulic Oil

Important:

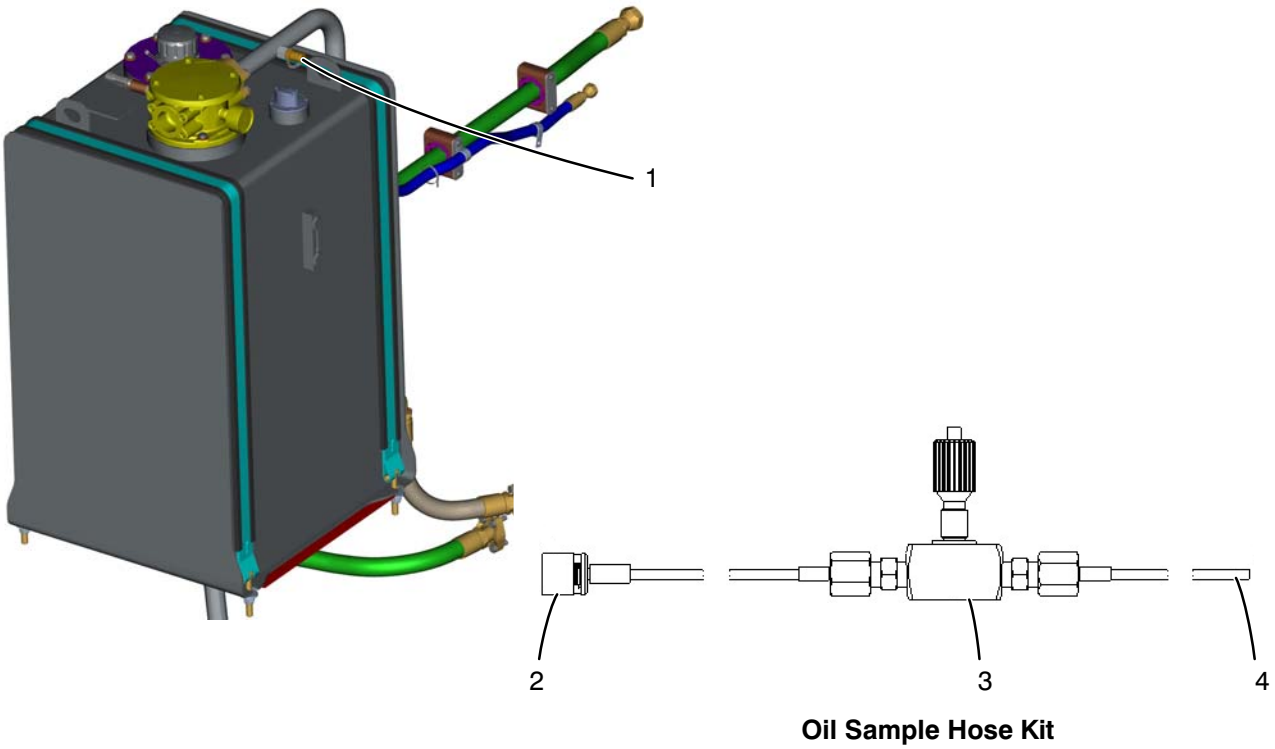
- Use only pre-filtered hydraulic oil.
- Change interval based on normal operating conditions. Extreme conditions may shorten life. Extended change intervals may be possible for light duty conditions. Oil analysis is recommended at 500 hour intervals and at every oil change to determine fluid health.
- 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 2−21. 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 2−2
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.



1. M16 x 2 Oil Sample Port
2. Test Point Coupling
3. 5,000 psi Needle Valve
4. Open Hose End

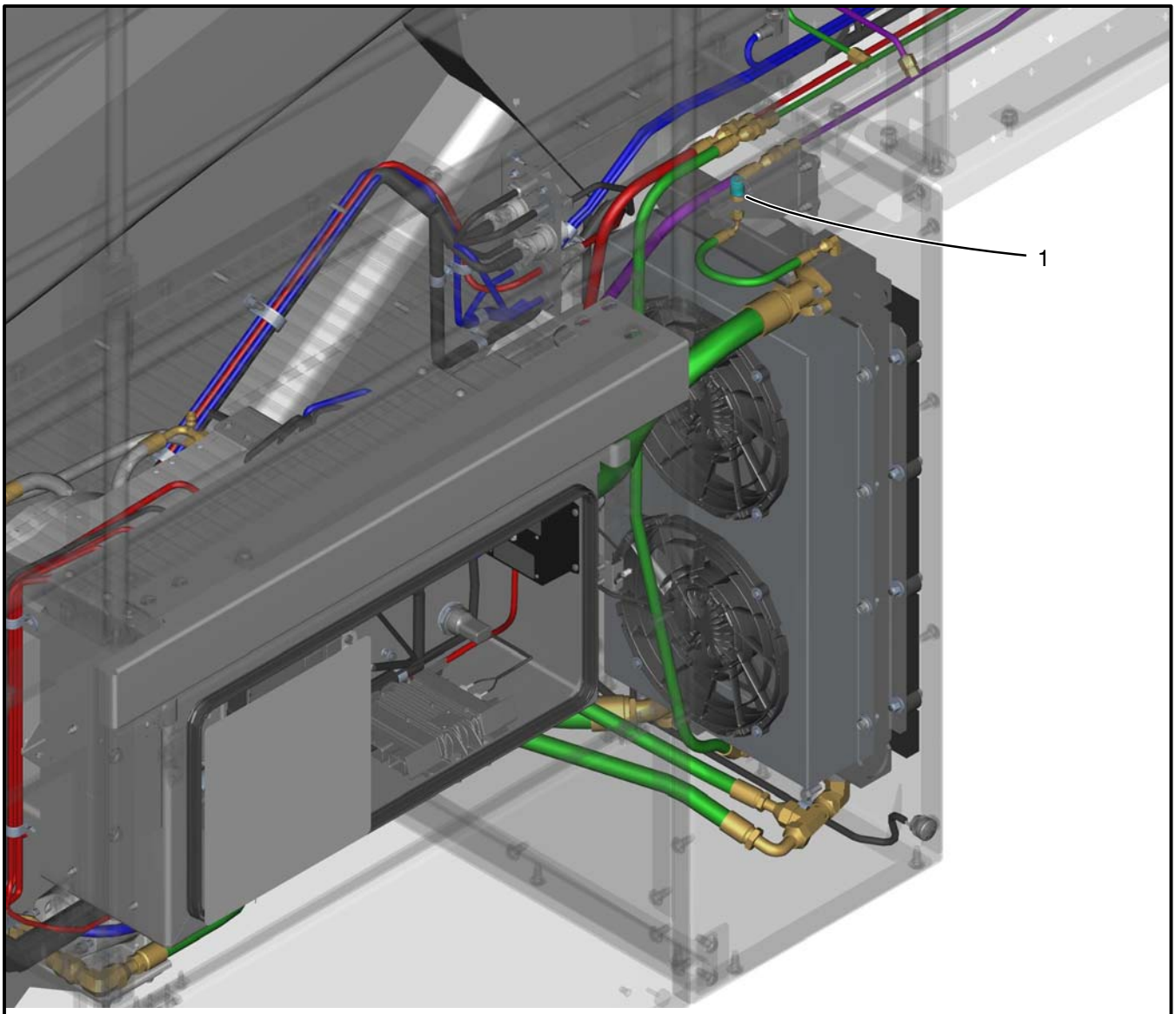
Figure 2—3
Carrier Hydraulic Oil Sampling

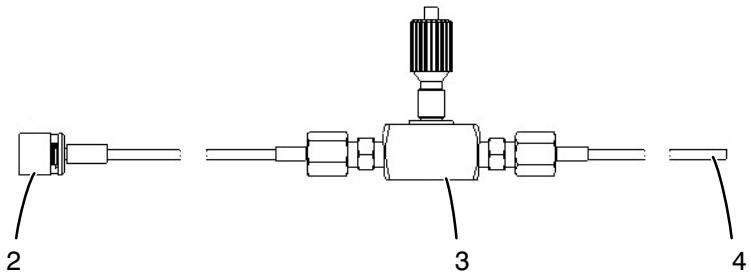
Hydraulic Oil Sampling

Hydraulic oil analysis is recommended at 500 hour intervals to determine fluid health. For hydraulic oil sampling, the crane is equipped with a dedicated sample port located on top of the upper hydraulic oil cooler.

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—3 and 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.
9. Check the oil level in the hydraulic reservoir before beginning operation of the crane. Add oil if necessary. Refer to "Hydraulic Reservoir Oil Level Check" and "Adding Oil To The Hydraulic Reservoir" in this Section of this Operator's Manual.

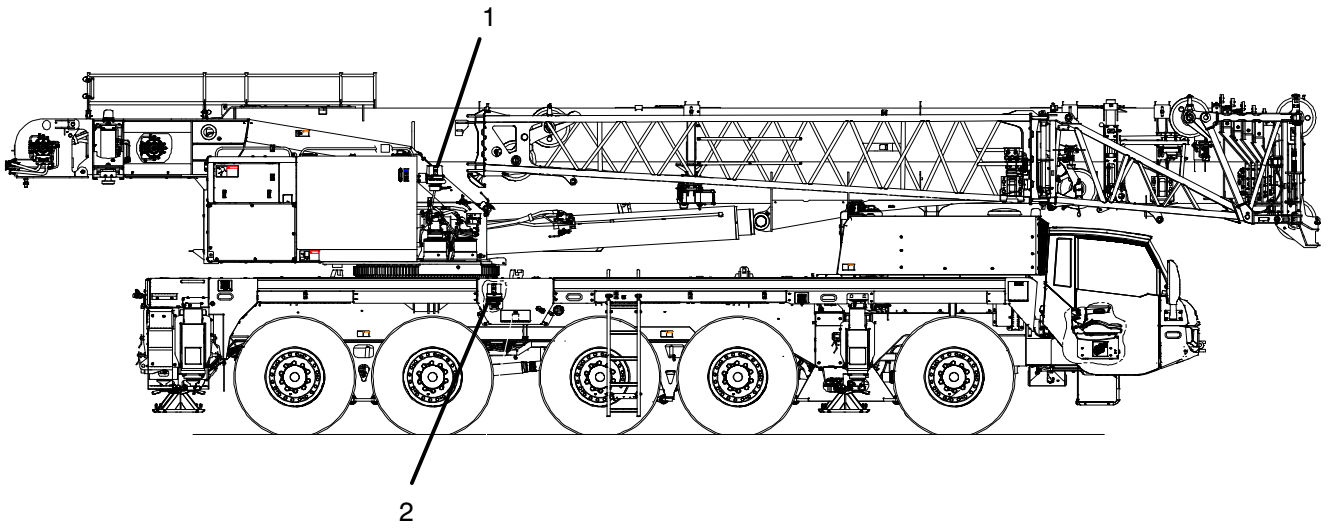




Oil Sample Hose Kit

1. M16 x 2 Oil Sample Port
2. Test Point Coupling
3. 5,000 psi Needle Valve
4. Open Hose End

Figure 2–4
Upper Hydraulic Oil Sampling



1. Upper Auto Lube Reservoir
2. Carrier Auto Lube Reservoir

Figure 2–5
Auto Lube Reservoir Locations

Auto Lubrication System

The crane is equipped with two automatic lubrication reservoirs to provide grease to various components on the crane. One is on the upper and one is on the carrier. Refer to Figure 2–5. Due to the importance of providing grease to these components, check the grease level in the reservoirs daily or every 10 hours of operation whichever occurs first.. Refer to the Lubrication Specifications for the correct lubricant.

CAUTION

Do not use heavy, tacky greases or bentone (clay based) high temperature grease. Use only the grease specified on the Lubrication Chart.

The auto lubrication system includes the following components:

- Pump with integral reservoir
- Lubricant injectors
- Tubing to the lubrication points
- Fittings at the lubrication points

The auto lubrication system has a radial manifold with 48 ports (15 used & 33 plugged) on the upper unit and 48 ports (40 used & 8 plugged) on the carrier unit. Each port can be fitted with a positive displacement lubricant injector. Each lubricant injector is dedicated to a single lubrication point.

The lubricant injector is connected to the lube point with tubing and a tube connector. Numbered sleeves are placed on the tubing at both the lubricant injector and lube point to assure accurate installation and identification. Refer to Grease Line Identification chart.

Six different lubricant injector output capacities are available to match the lube point volume requirements. Lubricant injectors are color coded for easy identification. Unused pump manifold ports are plugged.

The auto lubrication system pump is equipped with one or more cams that operate the lubricant injectors as the cams(s) are rotated by the motor.

Component Operation

Pump Operation

The auto lubrication system has been designed to provide reliable and virtually maintenance free service in the most demanding applications. The system comprises an electrically operated 24V pump with integral controller, and a loom of tubing which connects each chassis bearing directly to its own respective pumping unit. Each bearing is fed independently, meaning that points can be individually calibrated, and also damage to one line does not affect the rest of the system. The system has a 6.6 lb (*3 liter*) reservoir and has the motor and controller housed in the base. The motor drives the impeller, which draws grease into the pumping chamber and also gives a visual indication of cam rotation. It also drives the cam, which operates the individual pumping units, and feeds grease into the tubing.

The reservoir paddle is also rotated by the cam assembly. Paddle rotation ensures positive lubricant flow to the lubricant injectors.

The cam assembly consists of one or more cams in an offset configuration, with each cam dedicated to a row of lubricant injectors. As the cam assembly rotates, the cam lobe actuates the injectors and lubricant is dispensed.

Each lubricant injector is actuated by its cam only once per 360° revolution.

Filling The Reservoir

CAUTION

Do not overfill the reservoir. Fill only to Max Level label.

To ensure proper operation of the lubrication system, fill the reservoir only with fresh clean lubricant.

Fill the reservoir through the fill grease fitting with clean grease to minimize any contaminates from entering the reservoir. Refer to the Lubrication Specifications for the correct lubricant.

Note: Be certain to clean the fill grease fitting before filling. Place the dirt cap back on the fitting after any service procedures.

CAUTION

Ensure the reservoir breather tube mounted on the reservoir adjacent to the mounting bracket is clear at all times. On particularly dirty applications, it may be advisable to drill a small hole on the face of the breather about mid way up the reservoir.

Programming Auto Lube System

The cycle times are programmed at the factory. Cycle times can be adjusted to meet a particular working environment using the 10 position rotary switch. Regular inspections are necessary to determine and calculate if any adjustments are needed to meet an individual application.

Remove sealing plug and change setting on the rotary switch using a small screwdriver. Refer to Figure 2–6. Replace plug and tighten.

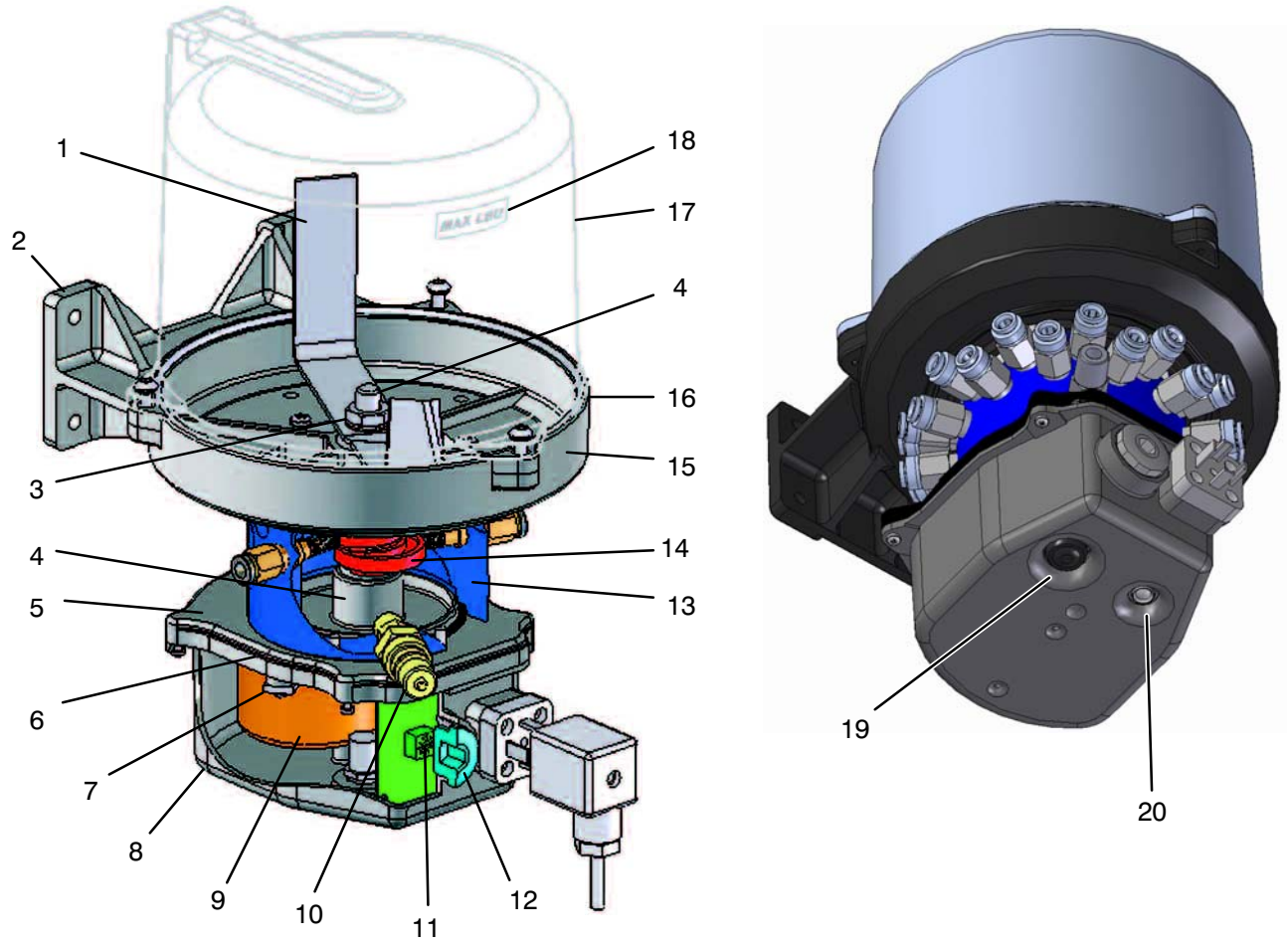
CAUTION

Lubricant injector capacity and cycle time setting determines the quantity of lubricant fed to individual lubricant points. Major damage to the components can result from incorrect cycle settings.

Switch Position	Cycle Time
0	Continuous double speed – 1.8 rpm
1	Continuous normal speed – 0.9 rpm
2	3 minute delay
3	7 minute delay
4	11 minute delay
5	15 minute delay
6	19 minute delay
7	24 minute delay
8	30 minute delay
9	36 minute delay

Manual Override

Press and release the Manual Override Button mounted on the bottom of the base. During manual override operation, the indicator light should flash slowly. A faster flashing indicator light indicates a motor failure.



1. Paddle Blade
2. Mounting Bracket
3. Paddle Blade Retaining Nut And Washer
4. Drive Shaft
5. Motor Housing
6. O-Ring
7. Retaining Plate
8. Motor Cover
9. Motor
10. Fill Grease Fitting
11. Rotary Switch
12. Sealing Plug
13. Carcass Ring
14. Cam
15. Pump Body
16. O-ring
17. Reservoir
18. Fill Level Indicator
19. Manual Override Button
20. Indicator Light

Figure 2–6
Auto Lube Reservoir

Lubricant Injector Operation

Each lubricant injector is a positive displacement device to meter lubricant to a single lubrication point on the vehicle. The lubricant injector is calibrated to deliver a precise volume of lubricant each time it is actuated.

There is a color-coded ring on the injector for ease of identifying output capacity.

Color	Stroke Output (cc)
Red	0.010
Green	0.015
Yellow	0.025
Blue	0.040
Grey	0.060
Black	0.100

Lubricant enters the lubricant injector through the priming port and fills the lube chamber. As the cam lobe is rotated, the lube piston is pushed forward, sealing off the priming port. As the lubricant in the chamber is pressurized, the check valve piston is unseated, allowing the lubricant to flow through the outlet to the lubrication point.

As the cam lobe is indexed the lube piston is pushed back, allowing the lubricant injector to prime. At the same time, the check valve spring returns the check valve piston, preventing any back flow.

Grease Line Identification			
UPPER			
Line No.	**Bearing Description**	**Injector Color**	**Line Length ft *(m)***
1	Turntable Bearing	Black	6 *(1.8)*
2	Turntable Bearing	Black	7 *(2.1)*
3	Turntable Bearing	Black	8 *(2.4)*
4	Turntable Bearing	Black	8.5 *(2.6)*
5	Turntable Bearing	Black	10 *(3.0)*
6	Turntable Bearing	Black	10.5 *(3.2)*
7	Turntable Bearing	Black	11.5 *(3.5)*
8	Turntable Bearing	Black	6 *(1.8)*
9	Turntable Bearing	Black	6.5 *(1.9)*
10	Turntable Bearing	Black	7.5 *(2.3)*
11	Turntable Bearing	Black	9 *(2.7)*
12	Turntable Bearing	Black	9.5 *(2.9)*
13	Turntable Bearing	Black	10.5 *(3.2)*
14	Turntable Bearing	Black	11.5 *(3.5)*
15	Two Position Swing Lock	Red	17.5 *(5.3)*
CARRIER			
1	#1 Axle R Suspension Cyl Upper	Yellow	22.5 *(6.8)*
2	#1 Axle R Suspension Cyl Lower	Yellow	23 *(7.0)*
3	#1 Axle R Upper King Pin	Blue	23.5 *(7.2)*
4	#1 Axle R Lower King Pin	Blue	25 *(7.6)*
5	#2 Axle R Suspension Cyl Upper	Yellow	13.5 *(4.1)*
6	#2 Axle R Suspension Cyl Lower	Yellow	15 *(4.6)*
7	#2 Axle R Upper King Pin	Blue	15 *(4.6)*
8	#2 Axle R Lower King Ping	Blue	16.5 *(5.0)*
9	#3 Axle R Suspension Cyl Upper	Yellow	8 *(2.4)*
10	#3 Axle R Suspension Cyl Lower	Yellow	9.5 *(2.9)*
11	#3 Axle R Upper King Pin	Blue	9.5 *(2.9)*
12	#3 Axle R Lower King Pin	Blue	11 *(5.2)*
13	#4 Axle R Suspension Cyl Upper	Yellow	6.5 *(5.9)*
14	#4 Axle R Suspension Cyl Lower	Yellow	8 *(6.2)*
15	#4 Axle R Upper King Pin	Blue	7.5 *(6.2)*
16	#4 Axle R Lower King Pin	Blue	9.5 *(2.9)*
17	#5 Axle R Suspension Cyl Upper	Yellow	11.5 *(3.5)*
18	#5 Axle R Suspension Cyl Lower	Yellow	13.5 *(4.1)*
19	#5 Axle R Upper King Pin	Blue	13 *(3.9)*
20	#5 Axle R Lower King Pin	Blue	15 *(4.6)*
21	#1 Axle L Suspension Cyl Upper	Yellow	30.5 *(9.3)*
22	#1 Axle L Suspension Cyl Lower	Yellow	31 *(9.4)*
23	#1 Axle L Upper King Pin	Blue	31.6 *(9.4)*
24	#1 Axle L Lower King Pin	Blue	33 *(10.0)*
25	#2 Axle L Suspension Cyl Upper	Yellow	21.5 *(6.5)*
26	#2 Axle L Suspension Cyl Lower	Yellow	22.5 *(6.8)*
27	#2 Axle L Upper King Pin	Blue	22.5 *(6.8)*
28	#2 Axle L Lower King Pin	Blue	23 *(7.0)*
29	#3 Axle L Suspension Cyl Upper	Yellow	16 *(4.9)*
30	#3 Axle L Suspension Cyl Lower	Yellow	17.5 *(5.3)*
31	#3 Axle L Upper King Pin	Blue	17 *(5.2)*
32	#3 Axle L Lower King Pin	Blue	18 *(5.5)*
33	#4 Axle L Suspension Cyl Upper	Yellow	13.5 *(4.1)*
34	#4 Axle L Suspension Cyl Lower	Yellow	15 *(4.6)*
35	#4 Axle L Upper King Pin	Blue	15 *(4.6)*
36	#4 Axle L Lower King Pin	Blue	16 *(4.9)*
37	#5 Axle L Suspension Cyl Upper	Yellow	19 *(5.8)*
38	#5 Axle L Suspension Cyl Lower	Yellow	21 *(6.4)*
39	#5 Axle L Upper King Pin	Blue	20.5 *(6.2)*
40	#5 Axle L Lower King Pin	Blue	22 *(6.7)*
1	Plug	–	–
2	Plug	–	–
3	Plug	–	–
4	Plug	–	–
5	Plug	–	–
8	Plug	–	–
14	Plug	–	–
15	Plug	–	–
16	Plug	–	–

Recommended Preventative Maintenance

Perform all of the following preventive maintenance checks every 50 hours of operation or weekly, whichever occurs first, to verify that the lubrication system is operating properly.

Inspection Procedures

The following inspection procedures are recommended to help ensure proper operation of the auto lubrication system.

1. Inspect all lubrication points for signs of FRESH grease.
2. Check the condition of all fittings and connections. Tighten or replace loose or damaged fittings.
3. Check all lubrication lines; make certain that there are not any breaks. Check for wear or chaffing that may be leaking or may lead to leakage.
4. Check pump operation using the Manual Override and indicator light flashes.

Troubleshooting

PROBLEM	POSSIBLE CAUSE	REMEDY
A..All lubrication points appear dry.	1. Empty reservoir. 2. Inoperative pump. 3. Time between lube cycle is too long. 4. Reservoir has been filled with an unsuitable lubricant.	1. Refill the reservoir, using the correct lubricant. 2. Refer to **PROBLEM** "E.". 3. Adjust pump **CYCLE TIME** setting. 4. Remove the lubricant and replace with correct grade of lubricant.
B..One or more lubrication points appear dry while others receive sufficient lubrication.	1. Broken or cut lube lines. 2. Inoperative injector. 3. Injector is undersized. 4. Injectors have been switched.	1. Determine cause, and if necessary, re-route, or protect the lines to avoid a recurrence. Use a connector to reconnect the line. 2. Refer to **PROBLEM** "G.". 3. Replace with a larger capacity injector. 4. Check the lube schematic or installation record, ensuring the correct injector is supplying the lube point.
C..All lubrication points are over-lubricated.	1. Time between lube cycles is too short.	1. Adjust pump **CYCLE TIME** setting.
D..One or more lubrication points are over-lubricated.	1. Injector(s) is/are oversized.	1. Replace the injector(s) with a smaller capacity injector.
E..Inoperative pump.	1. No input power. 2. Fuse is blown. 3. Loose wire connection inside the pump. 4. Defective PCB. 5. Camshaft is worn of broken. 6. Inoperative injector.	1. Check for power to the pump. 2. Check in-line fuse. Replace if necessary. 3. Check all wires and connections in the pump. 4. Replace PCB. 5. Inspect the camshaft. Replace if necessary. 6. Refer to **PROBLEM** "G"
F.. Reservoir Paddle is not rotating.	1. Bolt securing the paddle to the camshaft is loose.	1. Tighten the bolt.
G.. Inoperative injector causing the pump to stall.	1. Lube piston cannot dispense lubricant. 2. Lube piston is frozen.	1. Loosen the line fittings individually from the injectors. Actuate the **MANUAL OVERRIDE** button to identify the stalled injector. Trace the line and check for: A. Clogged bearing. B. Crimped line. C. Blocked line. 2. Loosen the injectors individually from the pump body. Actuate the **MANUAL OVERRIDE** button to identify which injector frees the system. Replace the injector. Check for contaminates in the reservoir. Replace the lubricant if contaminates are found.
H.. Inoperative injector but the pump is able to operate.	1. Return spring on the injector is not attached. 2. Lube piston is missing. 3. Outlet check valve is not seating properly.	1. Secure the return spring to the lube piston and injector body. 2. Replace the injector. 3. Remove and clean the injector. If this does not remedy the problem, replace the injector. Check for contaminates in the reservoir. Replace the lubricant if contaminates are found.
I.. Lubricant is coming out of the tape/harness.	1. Broken or cut line.	Refer to **PROBLEM** "B.", **REMEDY** 1.

Transmission Lubrication

The transmission is designed so that internal parts operate in a bath of oil circulated by the motion of gears and shafts. Some internal parts are equipped with built in channels to ensure that the bearings and shafts are properly lubricated.

Change the transmission oil and filter every 10,000 hours or two years. The oil level should be checked every 10,000 miles (*16 090km*) or monthly, whichever occurs first.

Transmission Oil Level Check

1. Park the crane on a firm, level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.

   Note: To check the oil level, the intarder must not be actuated immediately prior to parking the crane. This ensures that the correct oil quantity is set in the transmission.

2. From the underside of the carrier, locate the check/fill plug on the side of the transmission housing. Refer to Figure 2−7.
3. Clean the transmission housing around the check/fill plug to prevent entry of foreign material into the transmission.
4. Remove the check/fill plug. The oil must be level with the bottom of the hole.
5. Add oil as required through the check/fill hole to bring the oil to the proper level. Install the check/fill plug. Refer to the Lubrication Specifications for the correct grade of oil.

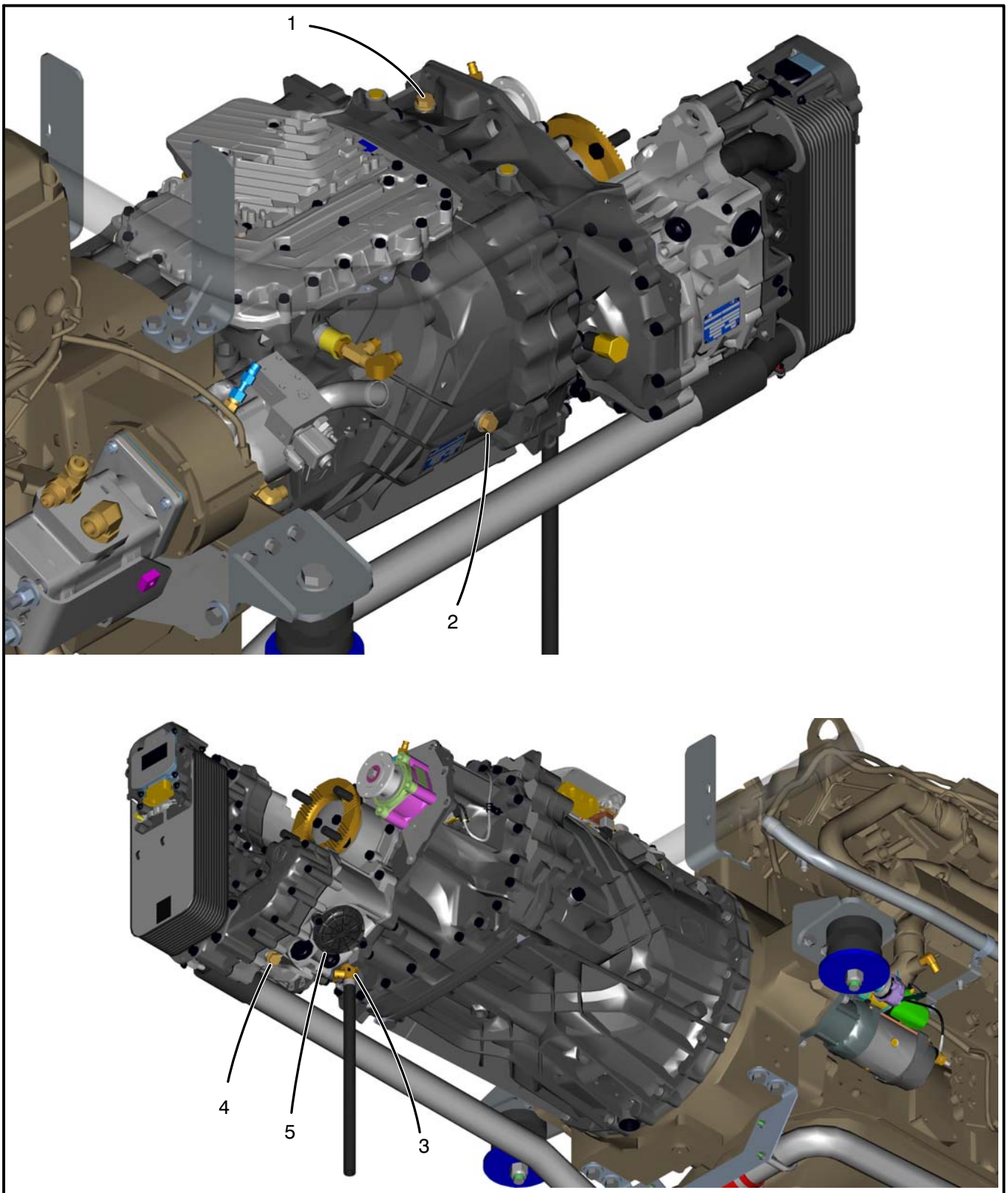
   Note: Do not overfill. Overfilling the transmission will cause oil to be forced out of the case through the main shaft opening.

   Note: The transmission manufacturer recommends that types and brands of oil not be intermixed because of possible incompatibility.

Transmission Oil Change

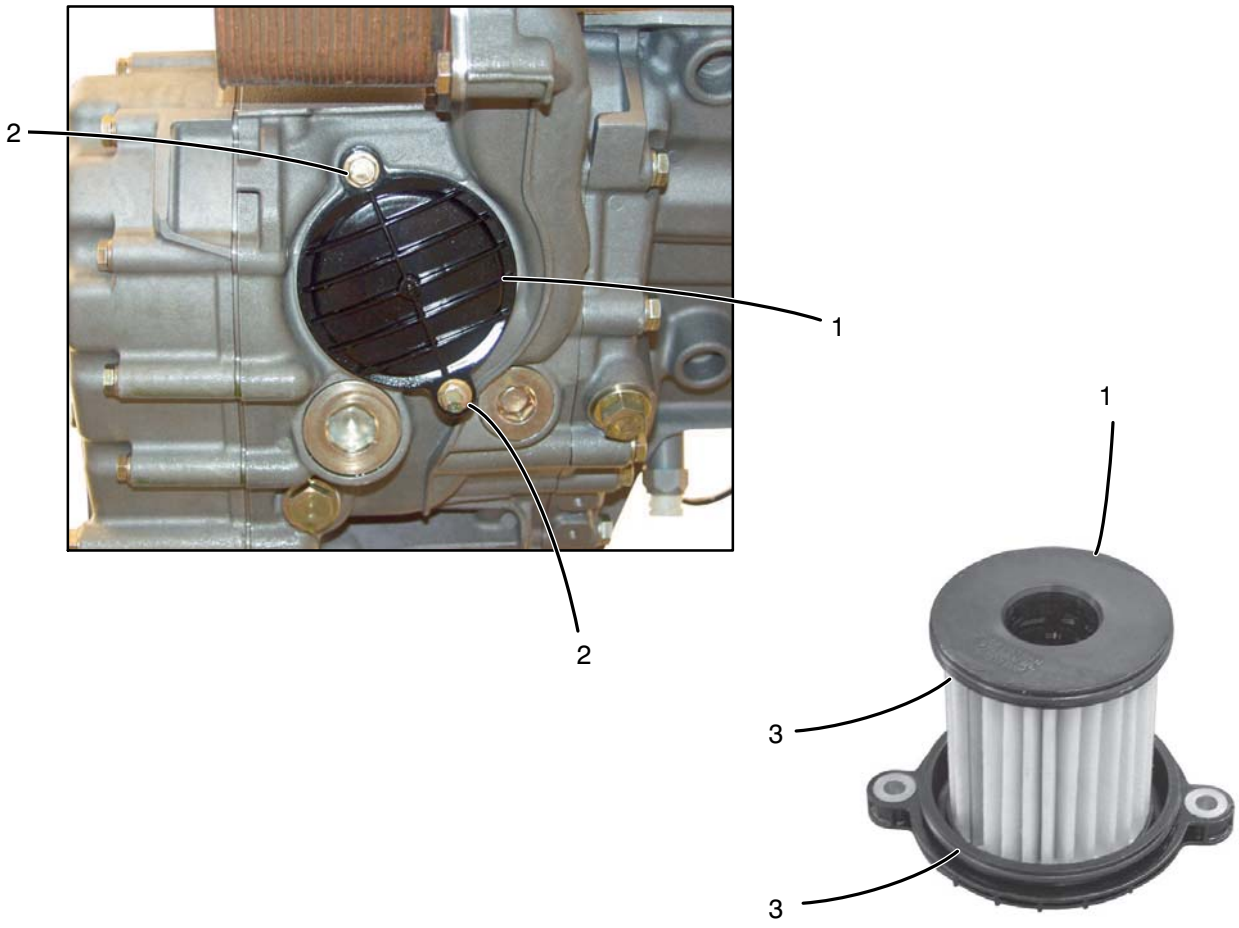
The best time to change transmission oil is just after the crane has been road driven. The oil will be warm and any foreign particles will be suspended in the oil. This is especially desirable in cold weather conditions.

1. Park the crane on a firm, level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. From the underside of the carrier, locate the check/fill plug on the side of the transmission housing. Refer to Figure 2−7. Locate the transmission drain valve and the intarder drain plug on the bottom of the transmission and intarder.
3. Clean the transmission housing around the check/fill plugs. Remove the check/fill plug. Open the transmission drain valve and remove the intarder drain plug. Allow the oil to drain into a suitable container. Inspect the intarder drain plug and oil for large quantities of metal particles. After the initial oil change, these are signs of damage or extreme wear in the transmission and inspection of the entire unit may be necessary.
4. Change the transmission oil filter. Refer to "Transmission Instarder Filter Change" in this Operator's Manual.
5. After the transmission and intarder have thoroughly drained, close the drain valve and install the drain plug.
6. Add oil through the check/fill hole until it is level with the bottom of the hole.
7. Clean and install the check/fill plug. Tightening torque: 44 ft lb (*60Nm*). Properly dispose of the used oil.
8. Perform test drive: Distance 1−3 miles (*2−5km*).
9. During test drive, switch off the intarder activation by the foot brake. Do not actuate the intarder during test drive.
10. End of test drive: Park the crane on a firm, level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
11. Check oil level. Add oil as required.



1. Fill Plug (For Initial Fill & Following Repair)
2. Check/Fill Plug
3. Transmission Drain Valve
4. Intarder Drain Plug
5. Transmission Intarder Filter

Figure 2–7
Transmission Lubrication



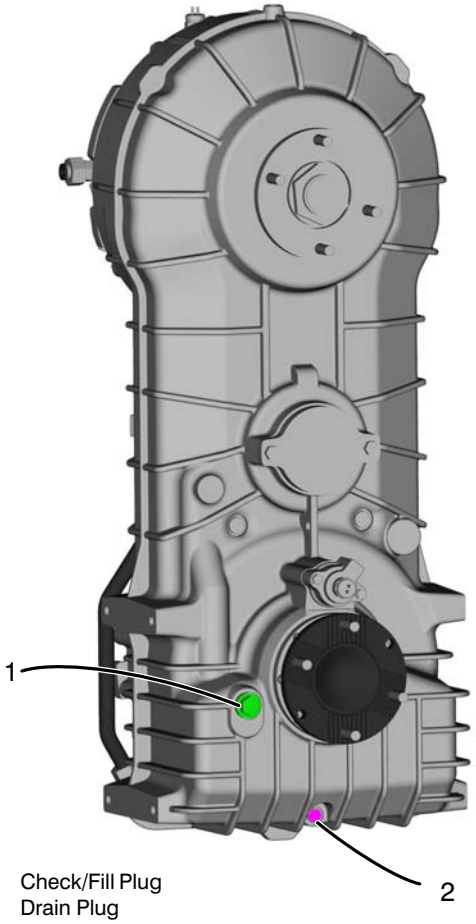
1. Transmission Intarder Filter
2. Screws
3. O−rings

Figure 2−8
Transmission Intarder Filter

Transmission Intarder Filter Change

Change transmission intarder filter at every oil change.

1. Drain Transmission oil.
2. Clean the area around the filter.
3. Remove the two screws from the filter.
4. Pull the filter from the intarder housing and properly discard.
5. Apply clean transmission oil to the o−rings of the new filter.
6. Insert new filter into intarder housing.
7. Secure filter with two screws. Tightening torque 17 ft lb (*23Nm*)



1. Check/Fill Plug
2. Drain Plug

Figure 2–9
Transfer Case Lubrication

Transfer Case Lubrication

The transfer case is designed so that internal parts operate in a bath of oil circulated by the motion of gears and shafts. Some internal parts are equipped with built in channels to ensure that the bearings and shafts are properly lubricated.

For troublefree operation, over a period of years, the transfer case must be properly lubricated. Check the oil level in transfer case every 50 hours of operation or monthly, whichever occurs first. Change the oil initially after 100 hours of operation or 600 miles (*1 000km*), whichever occurs first. Thereafter, change the oil every 1,000 hours or 6,000 miles (*10 000km*) or annually, whichever occurs first.

Transfer Case Oil Level Check

1. Park the crane on a firm, level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. From the underside of the carrier, locate the check/fill plug on the transfer case housing. Refer to Figure 2–9.
3. Clean the transfer case housing around the check/fill plug to prevent entry of foreign material into the transfer case.
4. Remove the check/fill plug. The oil must be level with the bottom of the hole.
5. Add oil as required through the check hole to bring the oil to the proper level. Install the check/fill plug. Refer to the Lubrication Specifications for the correct grade of oil.

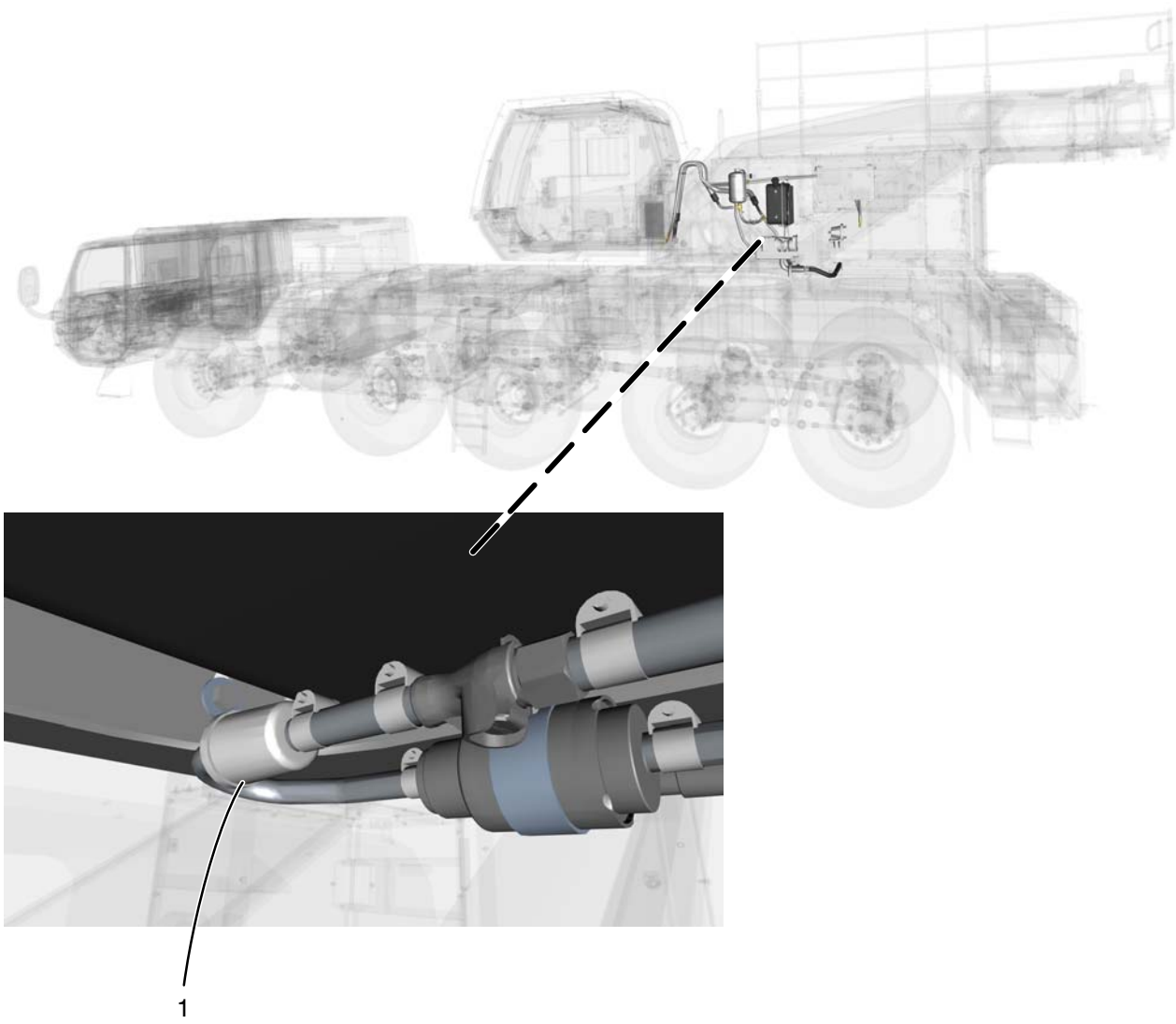
   Note: Do not overfill. Overfilling the transfer case will cause oil to be forced out of the case through the main shaft opening.

   Note: The transfer case manufacturer recommends that types and brands of oil not be intermixed because of possible incompatibility.

Transfer Case Oil Change

The best time to change transfer case oil is just after the crane has been road driven. The oil will be warm and any foreign particles will be suspended in the oil. This is especially desirable in cold weather conditions.

1. Park the crane on a firm, level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. From the underside of the carrier, locate the check/fill plug on transfer case housing. Refer to Figure 2–9. Locate the drain plug on the bottom of the transfer case.
3. Clean the transfer case housing around the drain and check/fill plugs. Remove the drain and check/fill plugs. 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, these are signs of damage or extreme wear in the transfer case and inspection of the entire unit may be necessary.
4. After the transfer case has thoroughly drained, install the drain plug and fill the transfer case with light flushing oil or kerosene.
5. Remove drain plug and drain flushing solution into a suitable container.
6. Clean and install the drain plug. Add oil through the fill hole until it is level with the bottom of the check hole.
7. Clean and install the check/fill plug. Properly dispose of the used oil and flushing solution.



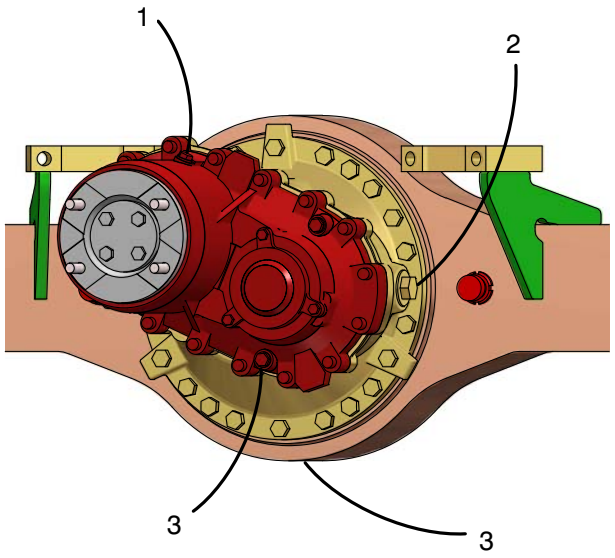
1. Diesel Fired Cab Heater Fuel Filter

Figure 2–10
Diesel Fired Cab Heater Fuel Filter

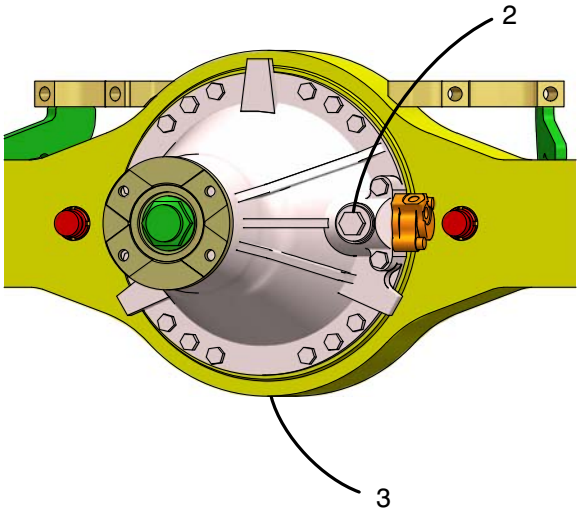
Diesel Fired Cab Heater Fuel Filter

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 2 & 4



Axles 1 & 5

1. Fill Plug
2. Check/Fill Plugs
3. Drain Plugs

Figure 2–11
Rear Axle Differentials

Axle Differential Lubrication

For troublefree operation, over a period of years, the differentials must be properly lubricated. Check the oil level in axle differentials every 50 hours of operation or monthly, whichever occurs first. Change the oil initially after 100 hours of operation or 600 miles (*1 000km*), whichever occurs first. Thereafter, change the oil every 1,000 hours or 6,000 miles (*10 000km*) or annually, whichever occurs first.

Axle Differentials Oil Level Check

1. Park the crane on a firm, level surface, engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. From the underside of the carrier, locate the check/fill plug on the differential. Refer to Figure 2–11.

CAUTION

Do not tamper with the pinion drive gear backlash adjusting screw on the opposite side of the axle from the check/fill plug. Tampering with this screw may result in differential damage.

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.
5. Add oil, as required, until it begins to flow from the check/fill hole. Refer to Lubrication Chart for correct grade of oil.

   Note: The axle manufacturer recommends that types and brands of oil not be intermixed because of possible incompatibility.

   Note: When checking oil levels in the axle differentials, also check and clean axle housing breather, on the top of the drive shaft idler on axle3.

6. Clean and install the check/fill plug.
7. Repeat procedure for each rear axle differential.

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.

1. Park the crane on a firm, level surface, engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. From the underside of the carrier, locate the drain plug in the bottom of the differential. Refer to Figure 2−11.
3. Clean the area around the drain plug, before removing it.
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. Clean the drain plug and install it after the oil has thoroughly drained.
5. Locate and remove the check/fill plug.

CAUTION

Do not tamper with the pinion drive gear backlash adjusting screw on the opposite side of the axle from the check/fill plug. Tampering with this screw may result in differential damage.

6. Fill the differential with oil until it is level with the bottom of the check/fill hole. Refer to the Lubrication Specifications for correct quantity and grade of oil.

   Note: The axle manufacturer recommends that types and brands of oil not be intermixed because of possible incompatibility.

7. Clean and install check/fill plug.
8. Repeat procedure for each rear axle differential. Properly dispose of the used oil.

Axle Planetary Wheel End Lubrication

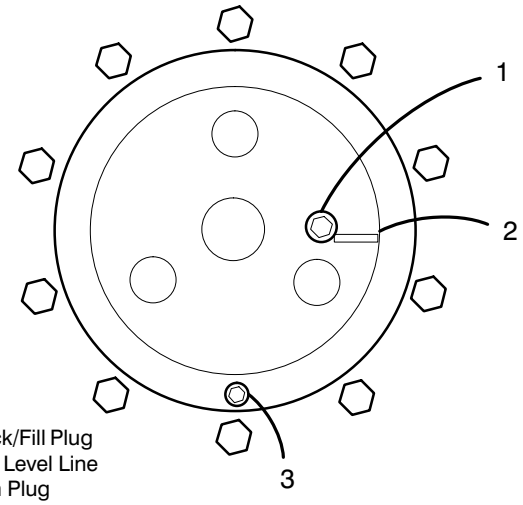
Check the oil level in the planetary of axle 1, 4, and 5 every 50 hours of operation or monthly, whichever occurs first. Change the oil initially after 100 hours of operation or 600 miles (*1 000km*), whichever occurs first. Thereafter, change the oil every 1,000 hours or 6,000 miles (*10 000km*) or annually, whichever occurs first. Use the following procedures to properly lubricate the planetary wheel ends:

Planetary Wheel End Oil Level Check

1. Park the crane on a firm, level surface. Shift the transmission to neutral.
2. Properly level the crane on outriggers, disengage the park brake, and shutdown the engine.
3. Rotate the wheel end until the drain plug is positioned at the bottom of the wheel and the line next to the check/fill plug is in the horizontal position. Refer to Figure 2−12.
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.
6. Add oil, as required, until it begins to flow from the hole. Refer to the Lubrication Specifications for the correct quantity and grade of oil. Do not overfill.

   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. Always engage the park brake before lowering the crane from the outriggers.



1. Check/Fill Plug
2. Fluid Level Line
3. Drain Plug

Figure 2–12
Wheel End Planetary

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 crane for 5 minutes to agitate and warm the oil.
2. Park the crane on a firm, level surface, apply the park brake, and shift the transmission to neutral.
3. Properly level the crane on outriggers, disengage the park brake, and shutdown the engine.
4. Rotate the wheel end until the drain plug is positioned at the bottom of the wheel and the line next to the check/fill plug is in the horizontal position. Refer to Figure 2–12.
5. Clean area around check/fill and drain plugs to prevent foreign material from entering wheel end.

WARNING

Oil draining from the planetary may be hot and could cause serious burns. Use care when removing the plug.

6. Remove the check/fill and drain plugs and allow the oil to drain into suitable containers.
7. After thoroughly draining the oil, the wheel ends should be flushed.
   a. Clean and install the drain plugs.
   b. Fill the wheel ends with a light flushing oil or kerosene and install the check/fill plugs.

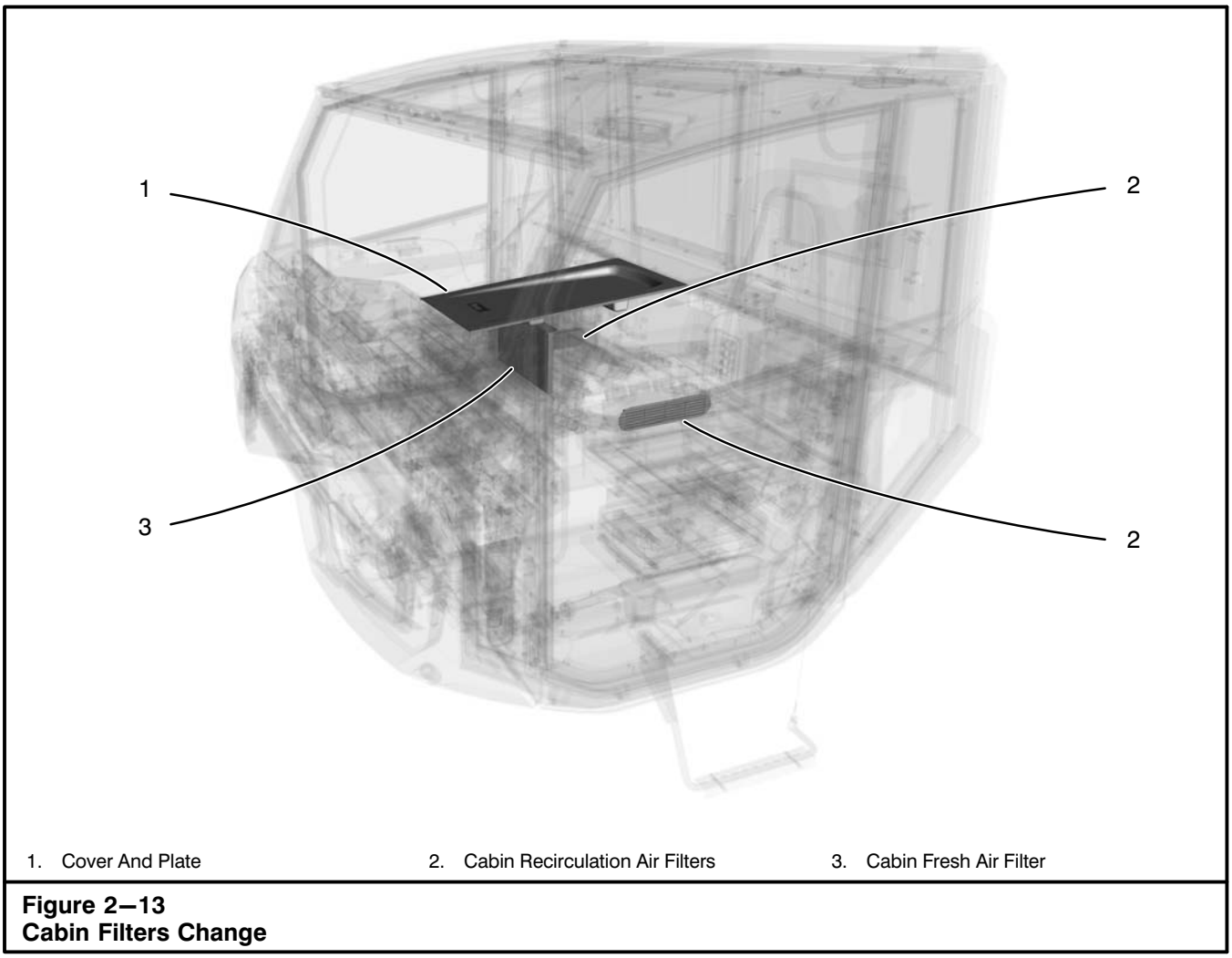
WARNING

When the crane is on outriggers and the transmission is shifted into gear, the axles may drop. Stay clear of the axles and tires when engaging the transmission to avoid injury.

   c. Start the engine and operate the wheel end for a short period of time at a very low speed.
   d. Properly shutdown the engine.
   e. Rotate the wheel end until the drain plug is positioned at the bottom of the wheel and the line next to the check/fill plug is in the horizontal position.
   f. Remove the check/fill and drain plugs and allow all the flushing solution to drain into suitable containers.
8. Clean and install the drain plugs.
9. Fill the wheel ends with oil until it begins to flow from the check/fill holes. Refer to the Lubrication Specifications for the correct quantity and grade of oil. Do not overfill.

   Note: It is recommended that types and brands of oil not be intermixed because of possible incompatibility.

10. Clean and install the check/fill plugs.
11. Properly dispose of the used oil and flushing solution.
12. Always engage the park brake before lowering the crane from outriggers.



1. Cover And Plate
2. Cabin Recirculation Air Filters
3. Cabin Fresh Air Filter

Figure 2–13
Cabin Filters Change

Carrier Cab Cabin Filters

Cabin Fresh Air Filter Change

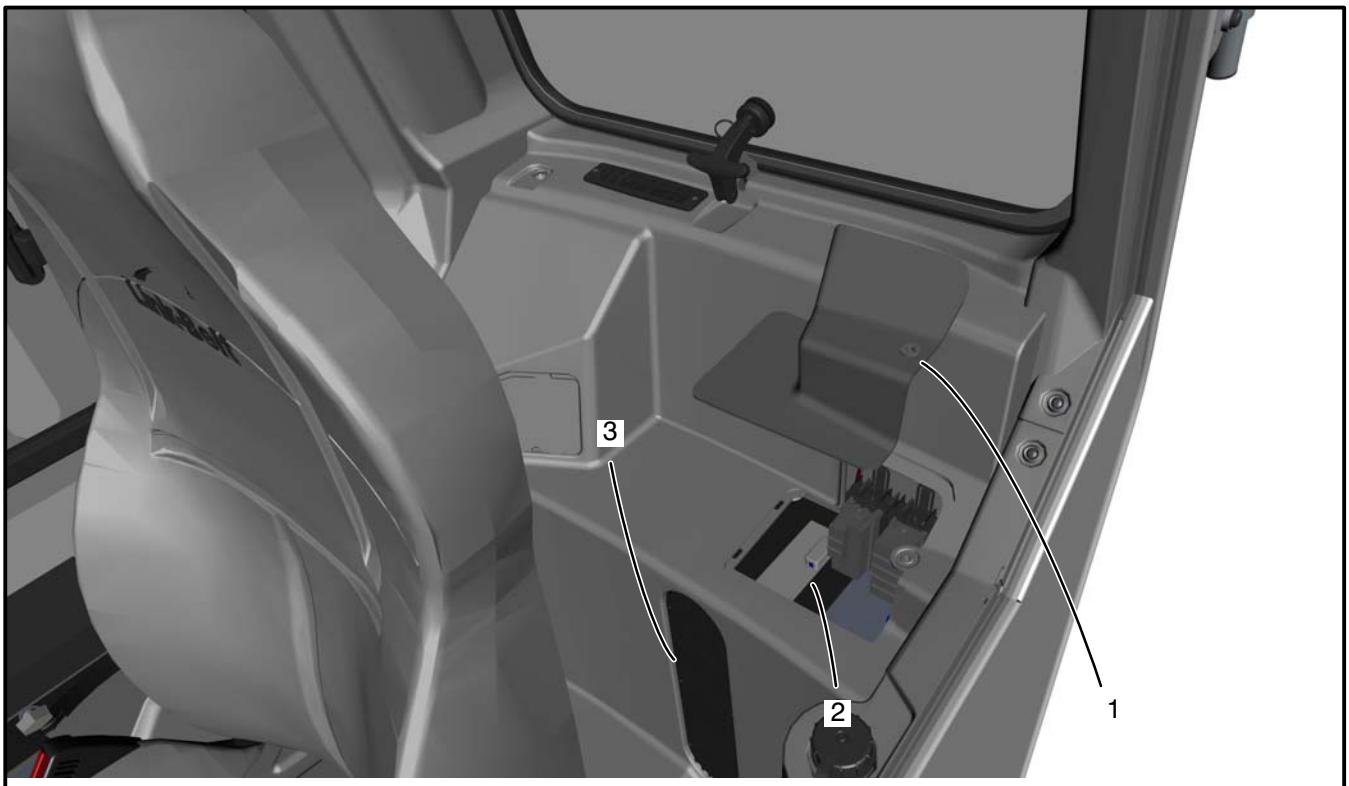
A cabin fresh air filter is located in the center console of the operator's carrier cab. Refer to Figure 2–13. The cabin fresh air filter must be checked monthly and changed at 6 month intervals.

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 and plate in the center of the cab.
3. Remove the cabin fresh air filter and replace.
4. Install the plate and cover.

Cabin Recirculation Air Filter Change

Cabin recirculation filters are located on either side of the center console of the operator's carrier cab. Refer to Figure 2–13. The cabin recirculation air filters 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 screws securing the cabin recirculation air filters to the HVAC unit.
3. Install the new cabin recirculation air filters and secure with screws.



1. Cover
2. Cabin Fresh Air Filter
3. Cabin Recirculation Air Filter

Figure 2–14
Cabin Filters Change

Upper Cab Cabin Filters

Cabin Fresh Air Filter Change

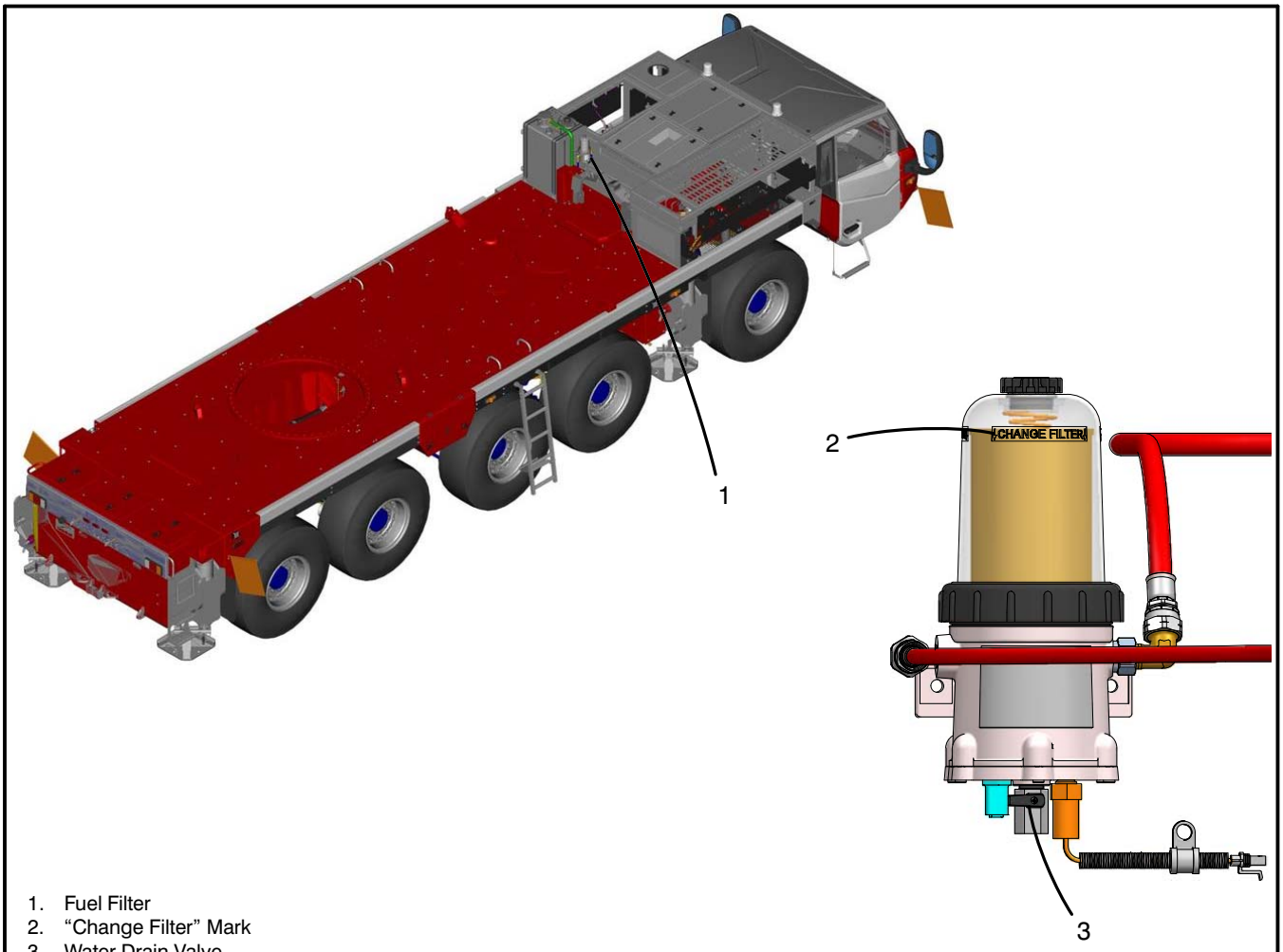
A cabin fresh air filter is located behind the seat in the operator's upper cab. The cabin fresh air filter must be checked monthly and changed at 6 month intervals.

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 2–14.
3. Remove the cabin fresh air filter 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 upper 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 2–14.
3. Install the new cabin recirculation air filter and secure with existing six screws.



1. Fuel Filter
2. "Change Filter" Mark
3. Water Drain Valve

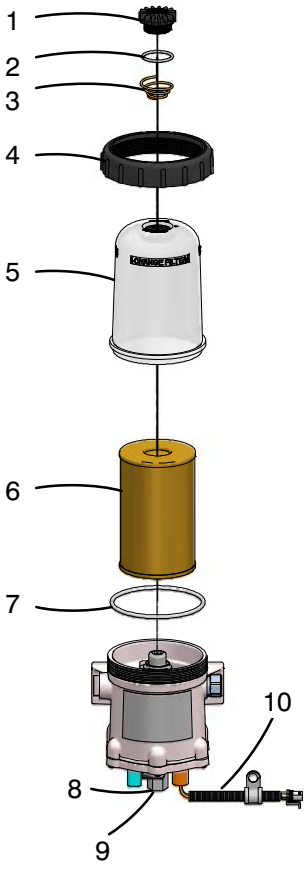
Figure 2—15
Carrier Fuel Filter

Carrier Fuel Filter

The fuel filter/water separator is located on the front left of the carrier. Refer to Figure 2—15. The function of the filter is to remove water and contaminants from the fuel before they enter the fuel system. Providing clean, dry fuel is important for troublefree operation and long life of the carrier engine. Water should be drained daily before start-up. Change the fuel filter when the fuel level has risen to the "change filter" mark on the clear filter cover or every 500 hours of operation whichever occurs first.

Fuel Filter Water Drain

1. Park the crane on a firm, level surface, shift transmission to neutral, engage park brake, and shutdown the carrier engine.
2. Open the filter vent.
3. Place a suitable container under the water drain valve. Open the water drain valve. Refer to Figure 2—16.
4. Continue draining until clean fuel is visible.
5. Close the drain valve.
6. Close the filter vent.
7. Start the engine. Raise the RPM for one minute to purge the air from the system.
8. Properly dispose of contaminated fuel.



1. Filter Vent Cap
2. Vent Cap O-Ring Seal
3. Holddown Spring
4. Collar
5. Clear Cover
6. Filter Element
7. Cover O-Ring Seal
8. Water Drain Valve
9. Water In Fuel Separator
10. Fuel Heater Connection

Figure 2–16
Primary Filter/Separator

⚠ WARNING

Do not service the fuel filter until the fuel has cooled. When the temperature of diesel fuel is elevated, as occurs when the fuel is circulated through an operating engine, it may pose the following hazards which should be guarded against.

Heated liquid fuel may cause scalding if allowed to come in contact with the skin.

Heated diesel fuel can form combustible vapor mixtures in the area around the fuel source.

The following precautions should be taken to minimize the possibility of injuries from heated diesel fuel:

1. **Whenever possible, the engine and fuel should be given an opportunity to cool down to ambient temperature before performing service operations that could result in the spillage of fuel from the engine or fuel system. When this is not possible, protective clothing (face shield, insulated gloves, apron, etc.) should be worn when performing these operations.**
2. **Keep open flames, sparks, or other potential ignition sources away and do not smoke during refueling and service operations which could result in the escape of liquid or vaporized diesel fuel.**
3. **Fuel system service operations should be performed in a well ventilated area.**

Fuel Filter Change

1. Park the crane on a firm, level surface, shift transmission to neutral, engage park brake, and shutdown the carrier engine.
2. Remove the vent cap from the top of the clear cover by turning the vent cap counterclockwise. Open the drain valve and drain the fuel level below the collar, then close the drain valve.
3. Remove the clear cover from the fuel filter by removing the collar. Remove and properly discard the o-ring from the base of the cover. (A new o-ring seal is supplied with the new filter.) Remove the filter element from the filter base by pulling upward and twisting slightly. Ensure the sealing grommet is removed from the center stud.

4. Install the new filter element (supplied with a Sealing Grommet already inserted into the element) on the center stud by pushing down and twisting slightly. After checking to ensure the new o-ring seal (supplied with the filter) at the base of the cover is in place, install the cover and collar. Hand tighten the collar until seated. Do not use tools to tighten.
5. Fill the clear cover with enough clean fuel to cover the bottom half of the filter element. Ensure the new o-ring (supplied with the filter) is installed on the vent cap. Reinstall the vent cap and tighten by hand only.
6. Start the engine. When the engine lubrication system reaches its normal operating pressure, increase engine RPM for one minute.

   Note: The clear filter cover will not fill completely during engine operation. It will gradually fill over time as the filter becomes clogged. The filter element does not need to be changed until the fuel level has risen to the "change filter" mark on the clear filter cover.

Priming The System

1. Park the crane on a firm, level surface, shift transmission to neutral, engage park brake, and shutdown the carrier engine.
2. Ensure the drain valve is closed.
3. Remove the vent cap from the top of the clear cover. Fill the clear cover full of clean fuel. Reinstall the vent cap and tighten by hand only.
4. Start the carrier engine. When the lubrication system reaches its normal operating pressure, increase engine speed to high idle for one to two minutes. After the air is purged, loosen the vent cap until the fuel level lowers to just above the bottom of the collar. Tighten the vent cap by hand only.

   Note: The clear filter cover will not fill completely during engine operation. It will gradually fill over time and the fuel level will rise as the filter becomes clogged.

5. Hand tighten the collar again while the engine is running. To avoid damage, do not use tools to tighten the collar.

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 on the dosing module mounted to the frame near the DEF tank. Refer to Figure 2−17. Refer to engine manufacturer's manuals for proper maintenance and additional information.

DEF Strainer Insert

Replace the strainer insert, as required. Refer to Figure 2−17. 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

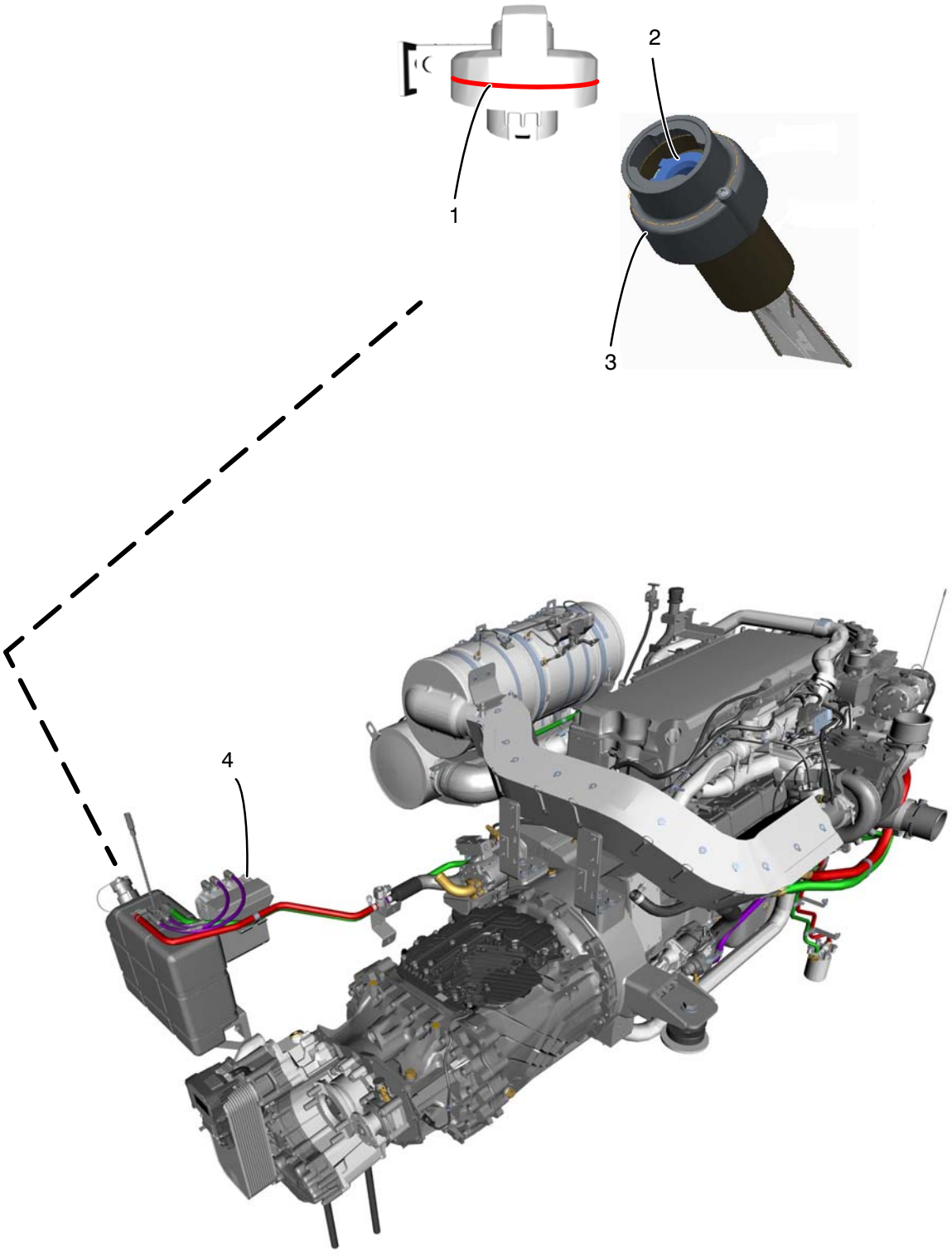
To prevent debris contamination, ensure the DEF tank is clean before and after the strainer insert replacement procedure.

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 2−17 (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.

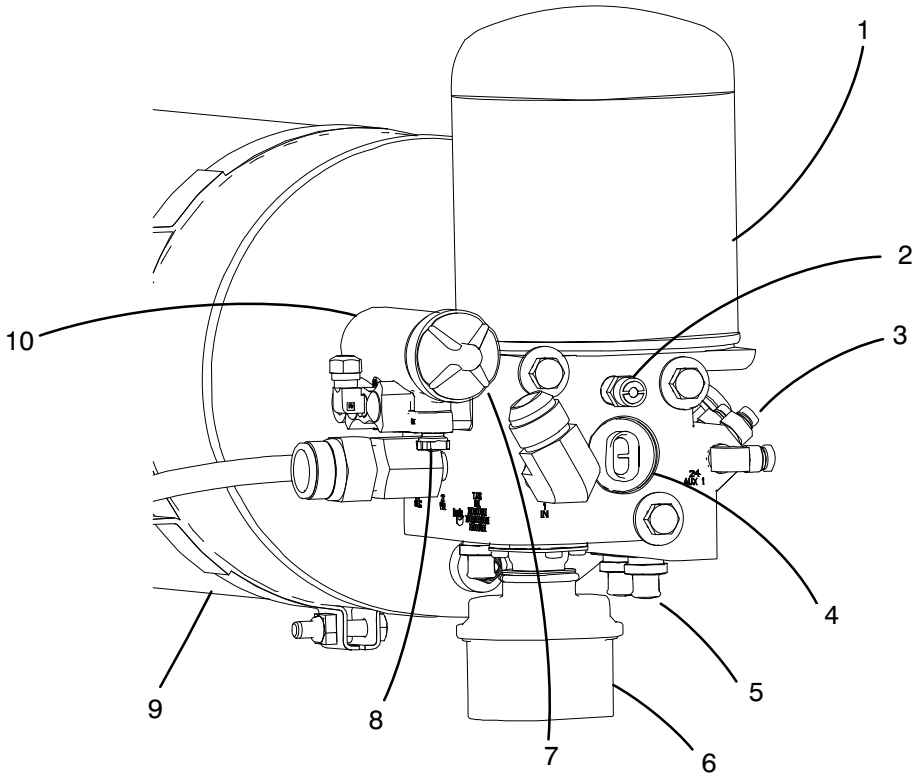
CAUTION

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. Strainer Insert
3. Adapter
4. Dosing Module Filter

Figure 2–17
Diesel Exhaust Fluid (DEF) System



1. Desiccant Cartridge
2. Safety Valve
3. Auxiliary Delivery Ports
4. Heater/Thermostat
5. Pressure Protection Valves
6. Purge Valve
7. Governor
8. Governor Exhaust
9. Purge Reservoir
10. Governor Unloader

Figure 2–18
Air Dryer

Carrier Air System

The air system is equipped with an air dryer which removes water, oil, and dirt from the system. The air dryer provides clean, dry air to the air system components. Every 50 hours or weekly, whichever occurs first, ensure the air dryer is functioning properly. Open the air reservoir drain valves and check for moisture in the system. If moisture is present, the desiccant cartridge may require replacement; however, the following conditions can also cause water accumulation and should be considered before replacing the desiccant cartridge:

1. An outside air source has been used to charge the system. This air did not pass through the air dryer.
2. In areas where more than a 30 degree range of temperature occurs in one day, small amounts of water can accumulate in the system due to condensation.
3. Air usage is high. Check the entire system for leaks. Perform the "Operation And Leak Test" in this Section of this Operator's Manual.

Note: A small amount of oil in the system is normal and should not be considered as a reason to replace the desiccant cartridge. Some oil at the dryer exhaust is normal.

CAUTION

This air dryer and reservoir system is intended to remove moisture and other contaminants normally found in the air brake system. Do not inject alcohol, antifreeze, or other de-icing substances into or upstream of the air dryer and reservoir system. Alcohol is removed by the dryer, but reduces the effectiveness of the device to dry air. Use of these or other substances can damage the air dryer and reservoir system and may void the warranty.

Air Dryer Desiccant Cartridge Change

The air dryer contains a desiccant cartridge which must be changed every 2,000 hours or annually, whichever occurs first. Refer to Figure 2−18.

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.

⚠ WARNING

Air lines may contain high pressure. Opening lines and fittings before relieving air pressure may result in serious injury. Shutdown the engine and drain the air system reservoirs before opening any line or fitting.

3. Open the drain valves on the air system reservoirs to relieve the air system pressure.
4. When pressure is fully relieved, close the drain valves on the air system reservoirs.
5. Remove the desiccant cartridge using a strap wrench and properly discard the used cartridge.
6. Lubricate the new cartridge seal with clean engine oil. Install the new cartridge.

Operation & Leak Test

1. Check all lines and fittings leading to and from the air dryer and reservoir system for leaks and integrity. Repair any leaks found.

⚠ WARNING

Air lines may contain high pressure. Opening lines and fittings before relieving air pressure may result in serious injury. Shutdown the engine and drain the air system reservoirs before opening any line or fitting.

2. Build up system pressure to governor cut-out and note that the air dryer and reservoir system purges with an audible escape of air. Watch the system pressure gauges and note the pressure fall-off for a ten minute period. If pressure drop exceeds 1 psi/minute from either service reservoir, inspect the vehicle air systems for sources of leakage and repair them. Refer to the Troubleshooting Chart, Symptoms 1 and 4 in this Section of this Operator's Manual.

CAUTION

Always wear safety glasses in case of a purge blast.

3. Check for excessive leakage around the purge valve with the compressor in the loaded mode (compressing air). Apply a soap solution to the purge valve exhaust port and observe that leakage does not exceed a 1" bubble in 1 second. If the leakage exceeds the maximum specified, refer to the Troubleshooting Chart, Symptom 4.
4. Build up system pressure to governor cut-out and note that the air dryer and reservoir system purges with an audible burst of air, followed immediately by approximately 30 seconds of air flowing out of the purge valve. "Fan" the service brakes to reduce system air pressure to governor cut-in. Note that the system once again builds to full pressure and is followed by an air dryer and reservoir system purge. If system does not follow this pattern, refer to the Troubleshooting Chart, Symptoms 5 and 6.

5. Check the operation of the end cover heater and thermostat assembly during cold weather operation as follows:
   a. Electric Power to the Dryer

      With the carrier engine ignition switch in the RUN position, check for voltage to the heater and thermostat assembly using a voltmeter or test-light. Unplug the electrical connector at the air dryer and reservoir system and place the test leads on each of the connections of the female connector on the vehicle power lead. If there is no voltage, look for a blown fuse, broken wires, or corrosion in the wiring harness. Check to see if a good ground path exists.
   b. Thermostat and Heater Operation

      Note: These tests are not possible except in cold weather operation.

      Turn off the ignition switch and cool the thermostat and heater assembly to below 40 degrees Fahrenheit. Using an ohmmeter, check the resistance between the electrical pins in the air dryer and reservoir system connector half. The resistance should be 6.0 to 9.0 ohms for the 24 volt heater assembly. Warm the thermostat and heater assembly to approximately 90 degrees Fahrenheit and again check the resistance. The resistance should exceed 1,000 ohms. If the resistance values obtained are within the stated limits, the thermostat and heater assembly is operating properly. If the resistance values obtained are outside the stated limits, replace the heater and thermostat assembly.

6. Pressure Protection Valves. Observe the system pressure gauges as pressure builds from zero. The primary or secondary gauge should rise until it reaches approximately 106 psi ±6 psi (*730.9kPa ±41.3*), then level off (or a momentary slight fall) as the next pressure protection valve opens supplying its reservoir. When that pressure gauge passes through approximately 106 psi ±6 psi (*730.9kPa ±41.3*) there should be an associated leveling off (or momentary slight fall) of pressure as the third and fourth pressure protection valves open. Then the primary and secondary gauges should increase together until they reach their full pressure of approximately 130 psi ±5 psi (*896.3kPa ±34.4*).

   If the air dryer and reservoir system does not perform within the pressure ranges as described above, recheck using gauges known to be accurate. If the readings remain outside of the ranges outlined above, replace the air dryer and reservoir system.

   Note: There are no kits available for the servicing of the pressure protection valves.

WARNING

Do not attempt to adjust or service the pressure protection valves — incorrect pressure protection valve settings can result in automatic application of the vehicle spring brakes without prior warning in the event one of the supply circuits experiences rapid pressure loss.

Air Dryer And Reservoir System Troubleshooting Chart

SYMPTOM	CAUSE	REMEDY
1. Dryer is constantly "cycling" or purging.	A. Excessive system leakage.	A. Test for excessive system leakage. Allowable leakage observed at dash gauge: 3 psi/minute. Using soap solution, test vehicle for leakage at fittings, drain valves, and system valves. Repair or replace as necessary.
	B. Defective delivery check valve.	B. Build system pressure to governor cut-out. Wait 1 minute for completion of purge cycle. Using soap solution at exhaust of purge valve, leakage should not exceed a 1" *(2.54cm)* bubble in less than 5 seconds. If a rapid loss of pressure is found, the following procedure will determine if the delivery check valve is malfunctioning: Build system pressure to governor cut-out and allow a full minute for the normal dryer purge cycle to empty the purge reservoir. Shutdown the engine and "fan" the brakes so that the system pressure reaches governor cut-in. The purge valve will return to its closed position. The purge reservoir has a drain valve which is opened by moving the center lever away from its closed position. Open the drain valve and wait 10 seconds to allow any residual purge pressure to be released. Release the lever, closing the drain valve. Carefully remove the air dryer cartridge using a strap wrench and then test for air leaking through the center of the threaded boss by applying a soap solution to the boss. Replace the delivery check valve if there is excessive leakage [exceeding a 1" *(2.54cm)* bubble in 5 seconds]. Grease the seal on the air dryer cartridge before installation. Ensure the drain valve on the purge reservoir is not leaking before restoring crane to service.
	C. Defective governor.	C. Check governor at both "cut-in" and "cut-out" position for (1) proper pressures and (2) leakage at fittings and exhaust.
	D. Compressor unloader mechanism leaking excessively.	D. Remove air strainer or fitting from compressor inlet cavity. With compressor unloaded, check for unloader piston leakage. Slight leakage is permissible.

Air Dryer And Reservoir System Troubleshooting Chart		
SYMPTOM	**CAUSE**	**REMEDY**
2. Water in crane air reservoirs.	A. Maximum air dryer inlet temperature is exceeded due to improper discharge line length.	A. Check for excessive carbon build up in compressor discharge line. Replace if required. Confirm that discharge line length is at least 6 ft *(1.8m)* long. Increase discharge line length and/or diameter to reduce air dryer inlet temperature.
	B. Air system charged from outside air source (outside air not passing through air dryer).	B. If system must have outside air fill provision, outside air should pass through air dryer.
	C. Desiccant cartridge requires replacement.	C. Replace desiccant cartridge assembly.
	D. Air bypasses desiccant cartridge assembly.	D. If Holset compressor is used, inspect feedback check valve for proper installation and operation.
	E. Air dryer not purging.	E. Refer to Symptom 6.
	F. Purge (air exhaust) time insufficient due to excessive system leakage.	F. Refer to Symptom 1.
3. Safety valve on air dryer "popping off" or exhausting air.	A. Defective air dryer and reservoir system delivery check valve.	A. Test to determine if air is passing through check valve. Repair or replace. Refer to Symptom 1, Remedy B.
	B. Safety valve setting too low [<150 psi *(1 034kPa)].*	B. Replace safety valve.
	C. System pressure too high [>135 psi (*931kPa*]	C. Test with accurate gauge. Replace governor if necessary.
	D. Excessive pressure pulsations from compressor. (Typical single cylinder type).	D. Increase volume in discharge line. This can be accomplished by adding a 90 cubic inch *(1 475 cubic centimeter*, or larger, reservoir between the compressor and the air dryer and reservoir system.

Air Dryer And Reservoir System Troubleshooting Chart

SYMPTOM	CAUSE	REMEDY
4. Constant exhaust of air at air dryer purge valve exhaust or unable to build system pressure. (Charge mode.)	A. Air dryer purge valve leaking excessively.	A. With compressor loaded, apply soap solution on purge valve exhaust, to test for excessive leakage. Repair or replace purge valve as necessary.
	B. Purge valve stuck open - faulty heater and thermostat, wiring, blown fuse.	B. Refer to Step 5 of Operation and Leak Test for heater and thermostat test.
	C. Defective air dryer delivery check valve.	C. Refer to Symptom 1, Remedy B..
	D. Leaking Turbo Cut-Off valve.	D. Repair or replace purge valve assembly.
	E. Defective governor.	E. Check governor at both "cut-in" and "cut-out" positions for (1) proper pressures and (2) excessive leakage at fittings and exhaust.
	F. Leaking purge valve control piston quad-ring.	F. Repair or replace purge valve assembly.
5. Cannot build system air pressure.	A. Kinked or blocked (plugged) discharge line.	A. Check to determine if air passes through discharge line. Check for kinks, bends, excessive carbon deposits, or ice blockage.
	B. Excessive bends in discharge line (water collects and freezes).	B. Discharge line should be constantly sloping downward from compressor to air dryer with as few bends as possible.
	C. Pressure protection valve(s) in air dryer will not open.	C. Replace air dryer (pressure protection valves are not serviceable).
	D. Refer to Symptom 4.	D. Refer to Symptom 4, Remedy A..
	E. Refer to Symptom 7.	E. Refer to Symptom 7, Remedies A. and B..
6. Air dryer does not purge or exhaust air.	A. Faulty air dryer purge valve.	A. After determining air reaches purge valve control port by installing a T-fitting with a pressure gauge into the governor unloader port, repair purge valve if necessary.
	B. See Causes B, E, and F for Symptom 4.	B. Refer to Symptom 4, Remedies B., E., and F.. Also refer to Symptom 1, Remedy B.
7. Desiccant material being expelled from air dryer purge valve exhaust (may look like whitish liquid, paste, or small beads.)	A. Faulty dryer cartridge.	A. Replace air dryer cartridge and/or air dryer.
	B. Excessive air dryer vibration.	B. Check the air dryer mounting to ensure it is tight and not damaged. Repair mounting and replace cartridge.
8. Unsatisfactory desiccant life.	A. Excessive system leakage.	A. Refer to Symptom 1, Remedy A.
	B. Compressor passing excessive oil.	B. Check for proper compressor installation; if symptoms persist, replace compressor.

Air Dryer And Reservoir System Troubleshooting Chart		
SYMPTOM	**CAUSE**	**REMEDY**
9. "Pinging" noise excessive during compressor loaded cycle.	A. Single cylinder compressor with high pulse cycles.	A. A slight "pinging" sound may be heard during system build up when a single cylinder compressor is used. If this sound is deemed objectionable, it can be reduced substantially by increasing the discharge line volume. This can be accomplished by adding a 90 cubic inch *(1 475 cubic centimeter)*, or larger, reservoir between the compressor and the air dryer and reservoir system.
10. The air dryer purge piston cycles rapidly in the compressor unloaded (non-compressing) mode.	A. Compressor fails to "unload".	A. Check air hose from governor to compressor for a missing, kinked, or restricted line. Install or repair air hose. Repair or replace compressor unloader.

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. The engine manufacturer recommends Cummins ES Compleat™ OAT (Organic Acid Technology) extended life coolant/antifreeze be used in the cooling systems. Refer to engine manufacturer's manuals for extended life coolant specifications.

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.

CAUTION

Overconcentration of antifreeze or use of high-silicate antifreeze can cause damage to the engine(s)..

Engine Cooling Systems Test

Check the antifreeze concentration and the freezing point protection as outlined in the engine manufacturer's manuals.

Testing the engine(s) coolant is important to ensure that the engine(s) is/are protected from internal cavitation and from corrosion. Refer to engine manufacturer's manuals for additional information on coolant system analysis.

Engine Cooling System Level Check

Check the coolant level in surge tank every 10 hours of operation.

1. Park the crane on a firm, level surface, shift the transmission to neutral, apply the park brake, and shutdown the carrier 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 2–19.

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 carrier 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.

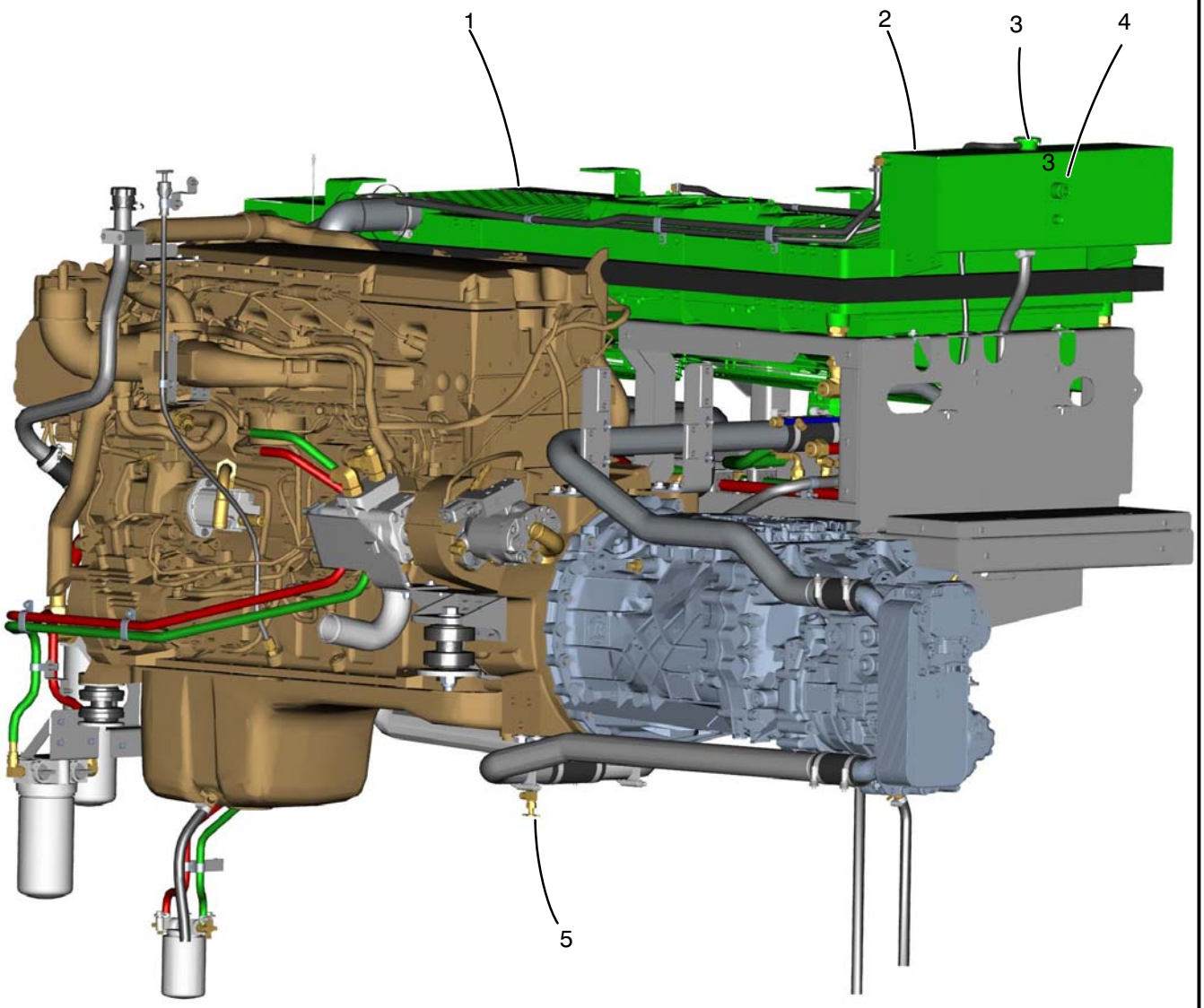
Do not use a sealing additive to stop leaks in the cooling system. This can result in cooling system plugging and inadequate coolant flow, causing the engine to overheat.

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 premixed solution per the carrier engine manufacturer's specification. Refer to the carrier 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 the fill cap.
6. Inspect and clean any debris from the radiator fins.
7. Start the carrier engine and let it run until it reaches normal operating temperature. Shutdown the carrier engine and repeat Step 2.



1. Cooling Package
2. Surge Tank
3. Fill Cap
4. Sight Gauge
5. Drain Valve

Figure 2–19
Carrier Engine Radiator Assembly

Cooling System Coolant Change

The engine manufacturer recommends Cummins ES Compleat™ OAT (Organic Acid Technology) extended life coolant/antifreeze be used in the engine cooling system. Drain, flush, and fill the engine cooling system per the engine manufacturer's maintenance interval and specifications for extended life coolant.

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 carrier engine.
2. Allow the carrier 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 lower radiator tube. Refer to Figure 2–19. 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. Close the drain valve on the lower radiator tube.
6. Inspect and remove any debris from the radiator fins.
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 drained water is clean. Close drain valves.

CAUTION

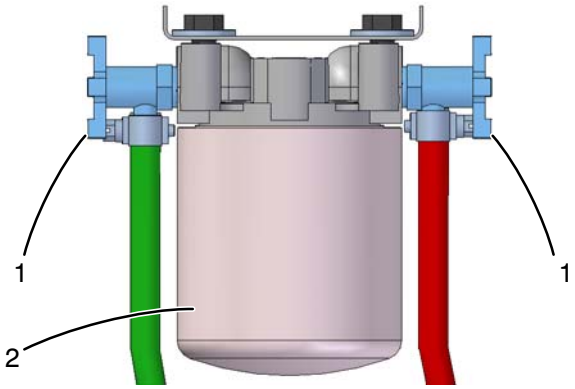
During filling, air must be vented from the engine coolant passages. Wait 2 to 3 minutes to allow air to be vented. Air trapped in the system may cause damage to the engine.

10. Fill the system with extended life coolant/antifreeze per the carrier engine manufacturer's specifications. Continue filling until system is full. Do not fill the system any faster than 5 gallons (*19L*) per minute to avoid air locks. Do not install the fill cap.
11. Start the engine and let it run until it reaches normal operating temperature to purge trapped air from the system. Check system for leaks.

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.

12. Check the coolant level to confirm that the coolant level is visible in the sight gauge on the side of the surge tank. Refer to "Carrier Engine Cooling System Level Check" in this Section of this Operator's Manual. Add coolant as required.
13. Install the fill cap on the surge tank.



1. Shutoff Valves
2. Coolant Filter

Figure 2–20
Coolant Filter

Engine Coolant Filter Change

The coolant filter is on the inside of the right carrier frame rail and is accessible from the underside of the carrier. Refer to Figure 2–20. Change the coolant filter per the engine manufacturer's maintenance interval schedule.

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 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. Remove the fill cap.
4. Turn the shutoff valves to the OFF position.

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.

5. Remove the spin-on type filter. Clean the gasket surface on the filter head.
6. Apply a thin coating of clean engine oil to the filter gasket surface.
7. Install the filter on the filter head. Turn the filter until the gasket contacts the filter head surface. Tighten the filter an additional 1/2 to 3/4 turn or as specified by the filter manufacturer.
8. Turn the shutoff valves to the ON position.
9. Install the fill cap.
10. Operate the engine until the coolant temperature is above 180°F (82°C) and check for leaks.
11. After air has been purged from the system, check the coolant level to ensure that the coolant level is visible in the sight gauge on the side of the surge tank. Refer to "Engine Cooling System Level Check" in this Section of this Operator's Manual.

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.

Replace any damaged hose assemblies, hose end mating fittings, and seals as required.

Carrier Hydraulic Reservoir

The carrier hydraulic reservoir is used to supply and store hydraulic oil needed to operate all carrier hydraulic functions of the crane. Refer to Figure 2−21. The system requires periodic maintenance to keep the system clean and in top operating condition.

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 system's hydraulic components.

1. Park the crane on a firm, level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. Relieve any trapped hydraulic system pressure by loosening the breather/filler dipstick, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved.

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. Loosen the water drain plug and allow the water to drain into a suitable container. The water drain plug is slotted and does not need to be completely removed to drain the water. Refer to Figure 2−21.
4. When a clean flow of hydraulic oil begins to drain from the water drain plug, tighten the plug.
5. Check the oil level in the hydraulic reservoir before beginning operation of the crane. Add oil if necessary. Refer to "Hydraulic Reservoir Oil Level Check" and "Adding Oil To The Hydraulic Reservoir" in this Section of this Operator's Manual. Properly dispose of the contaminated oil.

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. With all hydraulic cylinders fully retracted , park the crane on a firm level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. Check that the oil is visible within the middle of the sight gauge. If the oil level is not visible within middle of the sight gauge, add hydraulic oil as necessary until the oil is visible within the middle of the sight gauge. The proper level must be maintained at all times. Use only Hi Performance Hydraulic Oil or an approved substitute. Do Not Overfill.

Adding Oil To The Hydraulic Reservoir

1. Park the crane on a firm, level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. Relieve any trapped hydraulic system pressure by loosening the breather/filler, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2−21.

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.

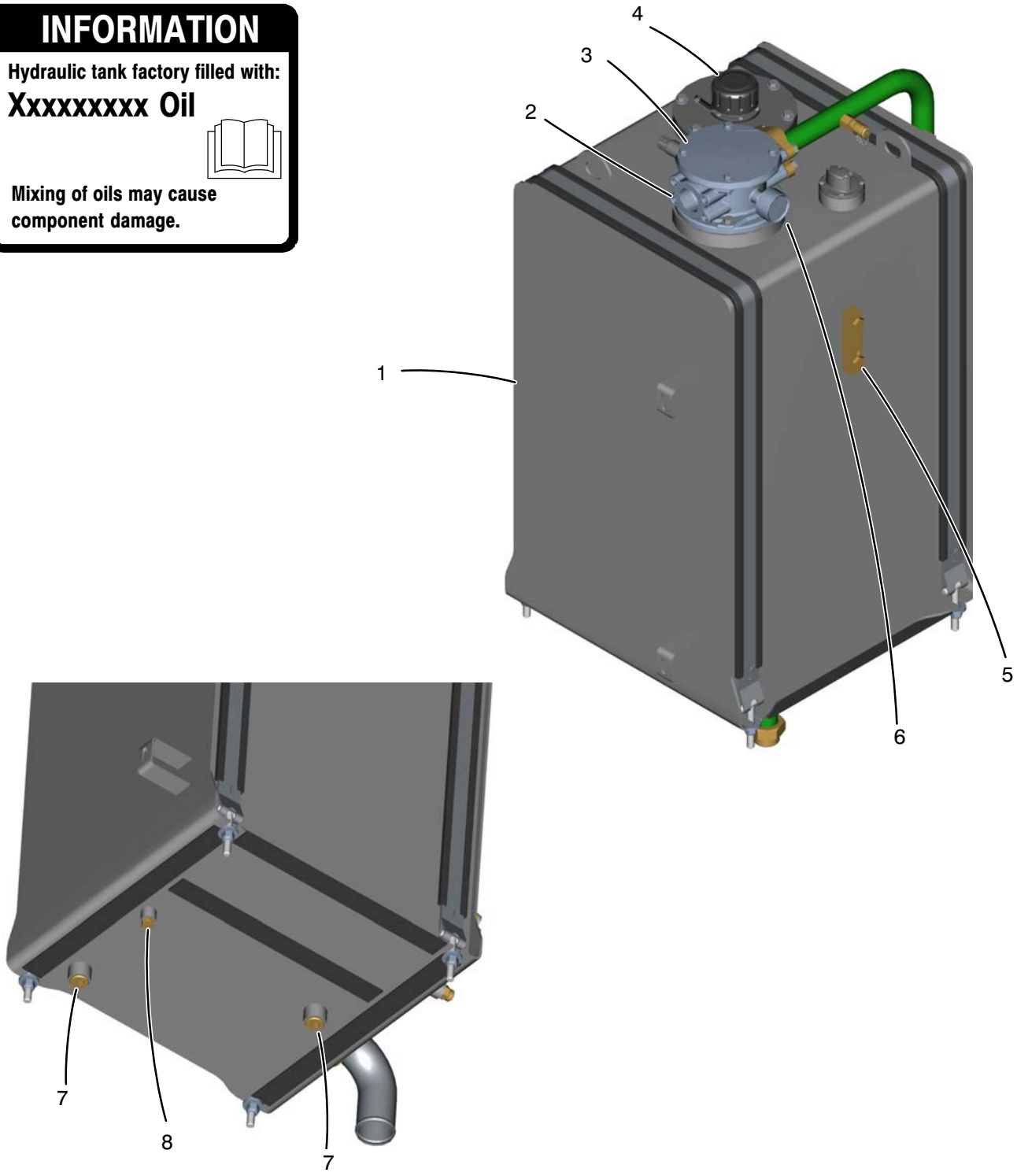
3. Clean the top of the hydraulic reservoir and the breather filler to prevent foreign material from entering the hydraulic system.
4. Remove the breather/filler and add hydraulic oil as necessary until the oil is visible within the middle of the sight gauge. Refer to "Link-Belt Preferred Hydraulic Oil" and hydraulic oil information label for proper oil grade. Do not overfill. Refer to Figure 2−21 for hydraulic oil information label.
5. Install the breather/filler.

INFORMATION

Hydraulic tank factory filled with:

Xxxxxxxxx Oil

Mixing of oils may cause component damage.



1. Hydraulic Reservoir
2. Filter Housing
3. Filter Housing Cover
4. Breather/Filler Cap
5. Sight Gauge
6. Contamination Indicator
7. System Drain Plugs
8. Water Drain Plug

Figure 2–21
Carrier Hydraulic Reservoir

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. With all hydraulic cylinders fully retracted, park the crane on a firm, level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. Relieve any trapped hydraulic system pressure by loosening the breather/filler, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2−21.

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 and cover. Pump the hydraulic oil into suitable containers. Refer to the Lubrication Specifications 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 filter cover and the filter element. Properly dispose of the filter element.
7. Clean the interior of the hydraulic reservoir with clean diesel fuel or kerosene.
8. 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.
9. Clean and install the system and water drain plugs.
10. Clean the filter housing. Install a new filter element.
11. Remove the sponge filter inside the breather/filler cap. Replace the sponge filter and install it inside the breather/filler cap.
12. Using clean, uncontaminated oil, fill the reservoir through the filter element until it is visible within the middle of the sight gauge. Refer to "Link-Belt Preferred Hydraulic Oil" and hydraulic oil information label for proper oil grade. Do not overfill. Refer to Figure 2−21 for hydraulic oil information label.
13. Install the filter housing and breather/filler to the reservoir.
14. Start the carrier engine and engage the main pump. Allow the carrier engine to idle several minutes to ensure oil is being cycled properly. Check for any leaks.

    Note: Hydraulic components may not operate smoothly after an oil change. To alleviate this, oil additive Renolin Anti-Stick-Slip (Link-Belt part No 3P 1139) can be added at approximately 2% of the quantity of oil.

15. 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. Properly dispose of the used oil and cleaning solution.

    Note: In case of hydraulic system component failure, a more thorough oil change procedure is required. Contact a Link-Belt Distributor for this procedure.

Hydraulic Reservoir Filter Change

Change the elements in the hydraulic reservoir filters after the initial 40 hours of operation and every 500 hours of operation thereafter. Change the filter elements immediately if the contamination indicator is in the "Change" position after the oil has reached operating temperature.

1. Park the crane on a firm, level surface. Engage park brake, shift the transmission to neutral, and shutdown the carrier engine.
2. Relieve any trapped hydraulic system pressure by loosening the breather/filler, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2−21.

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 filter head assembly and adjacent areas to prevent foreign material from entering the hydraulic system.
4. Remove the the filter housing from the filter head.
5. Remove used 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. Lubricate the gasket ring on the new element with clean hydraulic oil. Install the new filter element on filter head locator.
7. Install filter housing on filter head and torque to 25−30 ft lb (*33.9−40.7Nm*).
8. Tighten breather/filler cap.
9. Start the engine and check the filter housing for leaks.
10. 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. Properly dispose of the used oil and cleaning solution.

Upper Hydraulic Reservoir

The hydraulic reservoir is used to store and supply hydraulic oil needed to operate all hydraulic functions of the crane. The hydraulic reservoir, as shown in Figure 2−22, 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 hydraulic components.

1. Relieve any trapped hydraulic system pressure by loosening the breather/filler cap, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2−22.

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 does not need to 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. Refer to "Adding Oil To The Hydraulic Reservoir" in this section of this Operator's Manual. Properly dispose of the contaminated oil.

Butterfly Valve

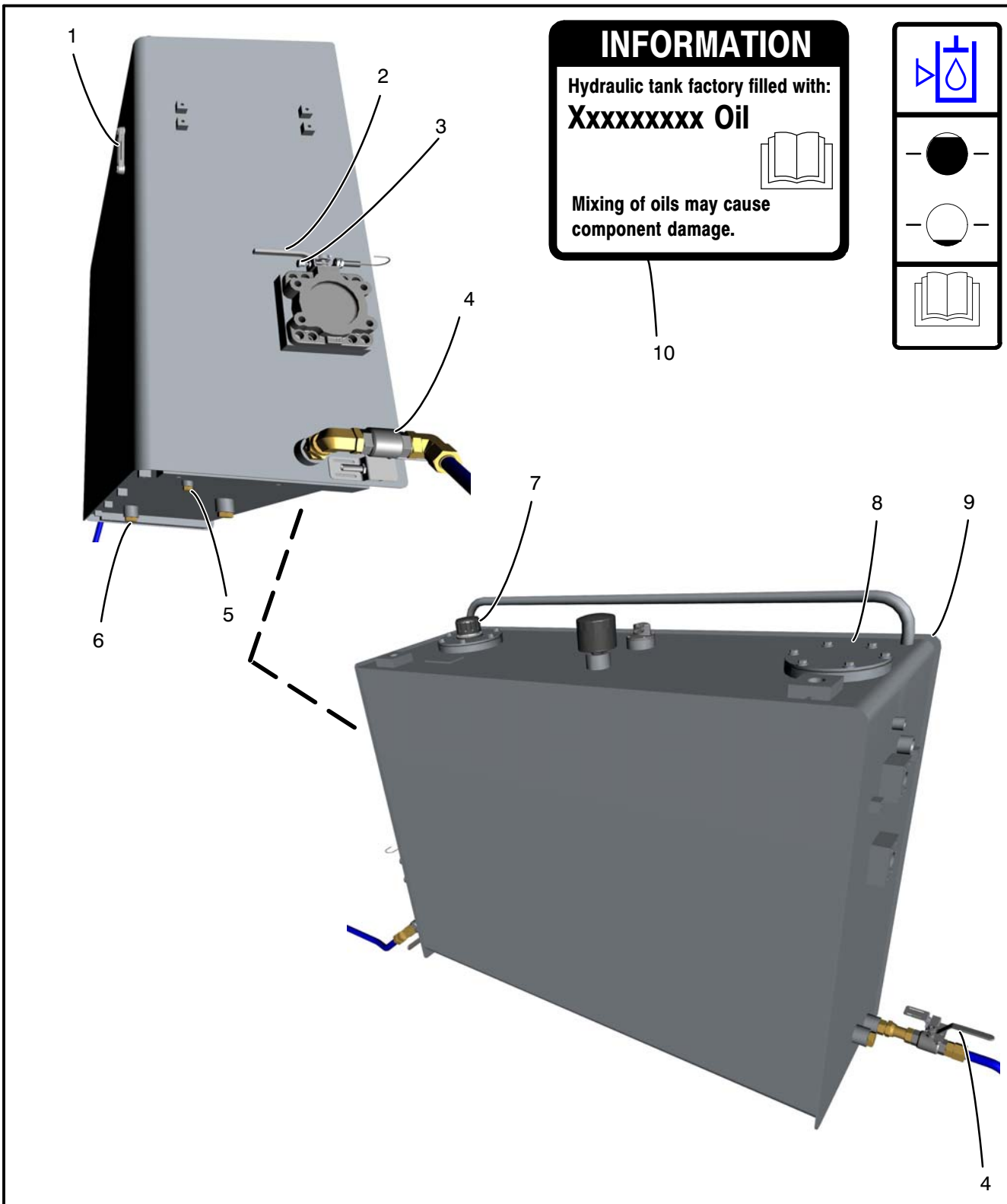
This crane is equipped with a butterfly shut off valve on the suction line to minimize oil spillage when working on components of the hydraulic system. The butterfly valve can be moved to the closed position when any maintenance is performed on the hydraulic system, but must be opened prior to starting the engine to prevent damage to the hydraulic pumps. To operate valve, pull out on the plunger and rotate handle. Refer to Figure 2−22.

WARNING

Do not attempt to start engine with hydraulic butterfly valve in closed position. Damage to hydraulic pumps may occur.

Case Drain Ball Valves

This crane is equipped with ball shut off valves located on the case drain lines on both sides of the hydraulic reservoir to minimize oil spillage when working on components of the hydraulic system. Both valves must be open (inline) for crane operations. Refer to Figure 2−21.



1. Sight Gauge
2. Butterfly Valve (Open)
3. Plunger
4. Case Drain Ball Valve
5. Water Drain Plug
6. System Drain Plug
7. Breather/Filler Cap
8. Filter Cover
9. Hydraulic Reservoir
10. Hydraulic Oil Information Label

Figure 2–22
Upper Hydraulic Reservoir

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. With all hydraulic cylinders fully retracted, park the crane on a firm level surface, 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 2−21. The proper level must be maintained at all times. Add hydraulic oil as necessary to bring the oil level between the "HIGH" and "LOW" 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 over fill.

Adding Oil To The Hydraulic Reservoir

1. Park the crane on a firm level surface. Position the upper directly over the front or rear of the lower.
2. Engage the travel swing lock and shutdown the engine.
3. Relieve any trapped hydraulic system pressure by loosening the breather/filler cap, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2−22.

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.

4. Clean the top of the hydraulic reservoir, the breather/filler cap, and breather/filler cover to prevent foreign material from entering the hydraulic system.
5. Remove the breather/filler cap.
6. Add oil as required to bring the oil level to the "FULL" mark. Refer to "Link−Belt Preferred Hydraulic Oil" and the hydraulic oil information in Figure 2−22 for the proper grade of oil.
7. Install breather/filler cap.

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. With all hydraulic cylinders fully retracted, park the crane on a firm level surface. Position the upper directly over the front or rear of the lower.
2. Engage the travel swing lock and shutdown the engine.
3. Relieve any trapped hydraulic system pressure by loosening the breather/filler cap, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2−22.

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.

4. 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.
5. Remove the filter cover and pump the hydraulic oil into suitable containers. Refer to the "Maintenance And Lubrication Chart" to determine the volume of oil to be removed.

WARNING

Do not remove the bottom access panel before the hydraulic reservoir has completely drained. A large volume of hot oil may suddenly be released resulting in personal injury and/or property damage. Drain the oil from the hydraulic reservoir before removing the bottom access panel.

Note: If a pump is not available to remove the oil from the reservoir, place a suitable container under the system drain valve. Open the drain valve and drain one container full at a time, until the oil has thoroughly drained from the reservoir. To drain the remaining oil in the bottom of the reservoir, place a suitable container under the system drain plug. Open the drain plug and drain the remaining oil from the reservoir. Do not remove bottom access panel to drain reservoir.

6. Remove the filter cover, the filter element and system drain plugs. Properly dispose of the filter element.
7. Clean the interior of the hydraulic reservoir with clean diesel fuel or kerosene.
8. 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.
9. Clean and install the system drain plugs.
10. Install a new filter element.
11. Using clean, uncontaminated oil, fill the reservoir through the filter element until it reaches the full mark in the sight gauge. Refer to "Link−Belt Preferred Hydraulic Oil" and the hydraulic oil information in Figure 2−22 for the proper grade of oil.
12. Install the filter cover.
13. Remove the breather/filler cap from the breather/filler cover. Replace the sponge filter inside the breather/filler cap.
14. Install the breather/filler cover on the reservoir.
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. 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.

Hydraulic Reservoir Filter Change

Change hydraulic reservoir filter element after the initial 40 hours of operation and every 500 hours of operation thereafter. Change the filter element immediately any time the service indicator light illuminates.

1. Park the crane on a firm level surface. Position the upper directly over the front or rear of the lower.
2. Engage the travel swing lock and shutdown the engine.
3. Relieve any trapped hydraulic system pressure by loosening the breather/filler cap, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2−22.

WARNING

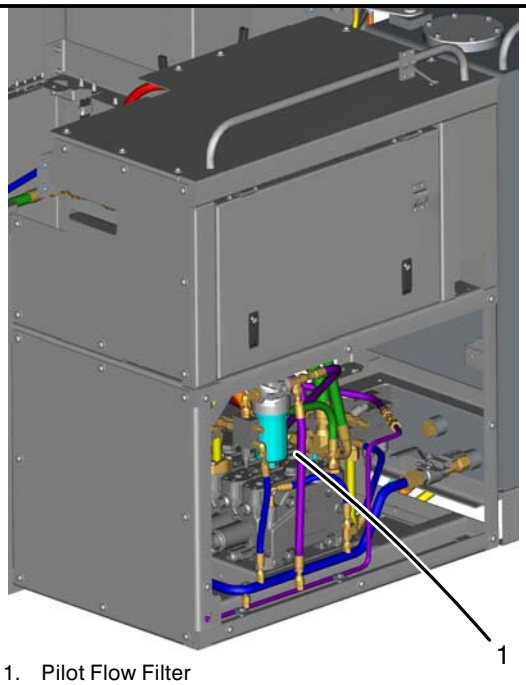
All trapped hydraulic pressure must be exhausted from the system before removing any plug or cover. A sudden release of hot oil could cause burns or other serious injury.

4. Clean the top the the hydraulic reservoir, and filter cover to prevent foreign material from entering the hydraulic system.
5. Remove the filter cover.
6. 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.
7. Install new filter element and the filter cover.
8. Start engine and check the filter housing for leaks.
9. 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.

Pilot Flow Filter Change

Change pilot flow filter element after the initial 40 hours of operation and every 500 hours of operation thereafter. Change the filter element immediately any time the service indicator light illuminates.

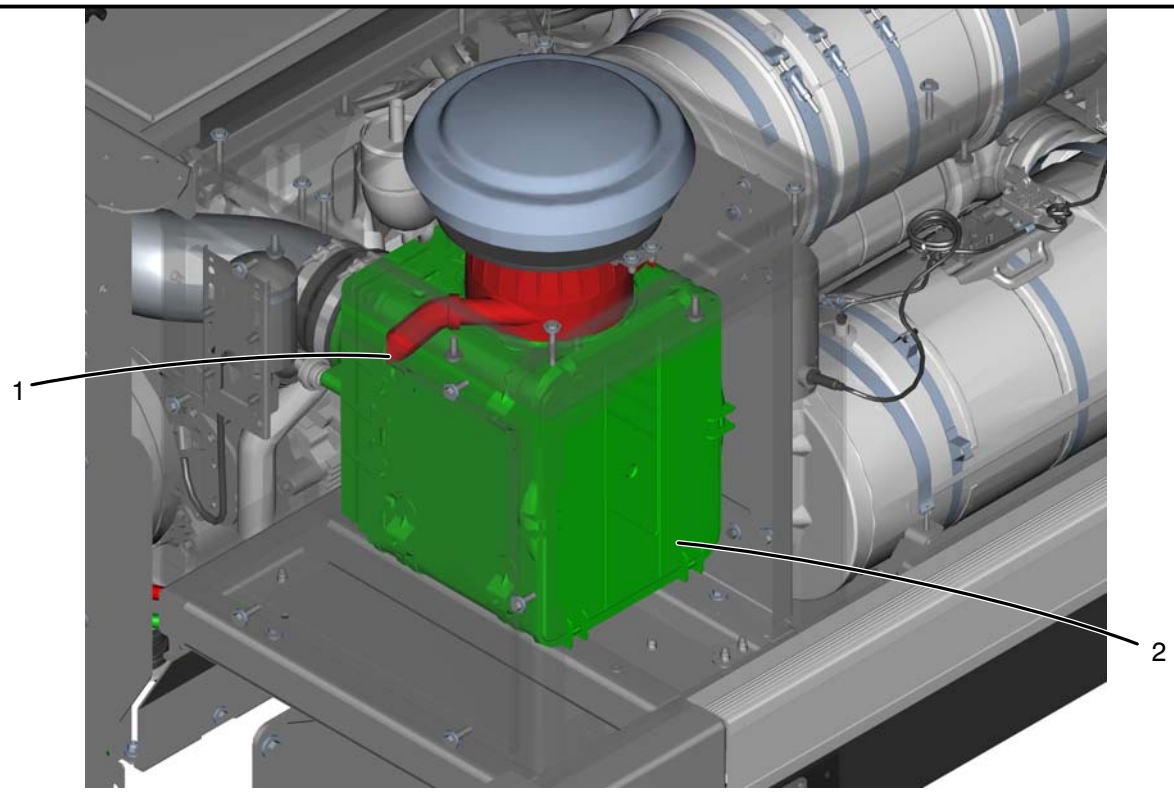
1. Park the crane on a firm level surface. Position the upper directly over the front or rear of the lower.
2. Engage the travel swing lock and shutdown the engine.
3. Relieve any trapped hydraulic system pressure by loosening the breather/filler cap, on the hydraulic reservoir, 1/4 turn until pressure is fully relieved. Refer to Figure 2−22.
4. 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.



1. Pilot Flow Filter

Figure 2−23
Pilot Flow Filter

5. Install new filter element and the filter housing.
6. Start engine and check the filter housing for leaks.
7. 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.



1. Dust Exhaust Valve
2. Air Cleaner Access Cover

Figure 2–24
Carrier Engine Air Cleaner

Engine Air System Inspection

It is recommended that the engine(s) air system be inspected every 10 hours or daily. Inspect the air system pipes, hoses, air compressor, and turbocharger systems, as equipped. (Always inspect all the pipes and hoses associated with the air compressor, 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(s). 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.

Carrier Engine Air Cleaner

Variations in job site conditions prevent establishing a set interval for air cleaner servicing. For this reason an indicator light will illuminate on the crane control display to determine the condition of the air cleaner element. Refer to Figure 2–24. Anytime the yellow indicator light illuminates, service the air cleaner immediately. Service the engine air cleaner as follows.

Dust Exhaust Valve

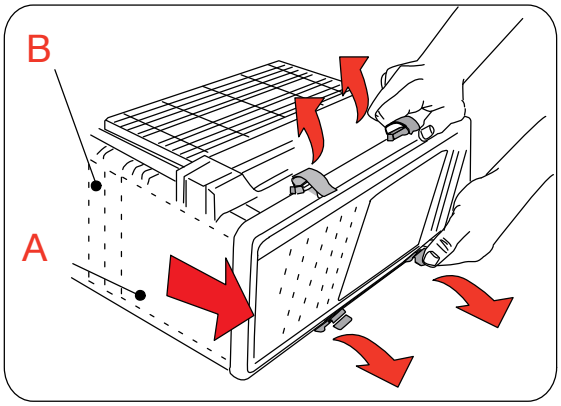
The dust exhaust valve (dust ejection valve) should be purged of dust daily by squeezing the valve near the end to open and let the dust/dirt fall out.

Changing The Carrier Air Cleaner Filter

1. Park the crane on a firm level surface, shift the transmission to neutral, engage the park brake, and shutdown the carrier engine.

Refer to Figure 2–25

2. Unlatch and remove the service cover from the air cleaner body.
3. Remove primary filter (A) from the air cleaner body.
4. Remove secondary filter (B) from the air cleaner body.
5. Install secondary and primary filters in same order and latch service cover.
6. Remove the dust exhaust valve and inspect it for damage or wear. Replace it if required. Refer to Figure 2–24.



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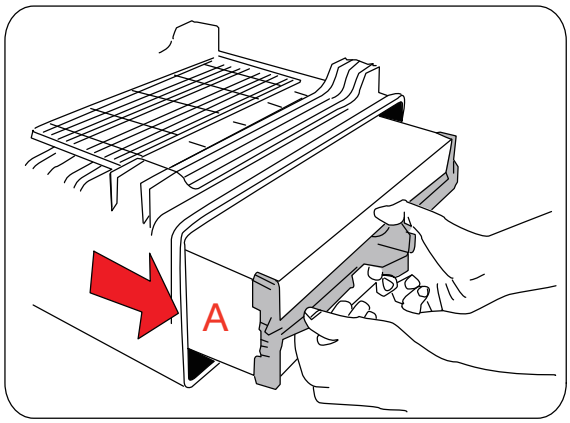

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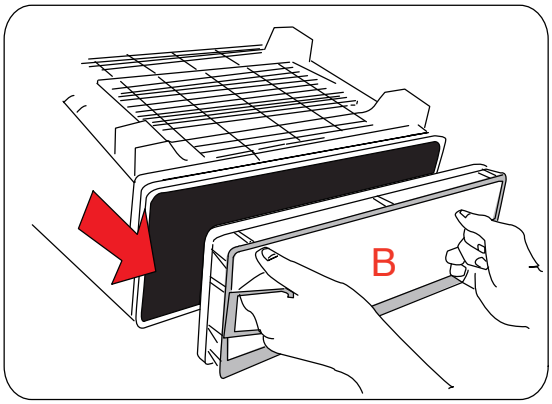

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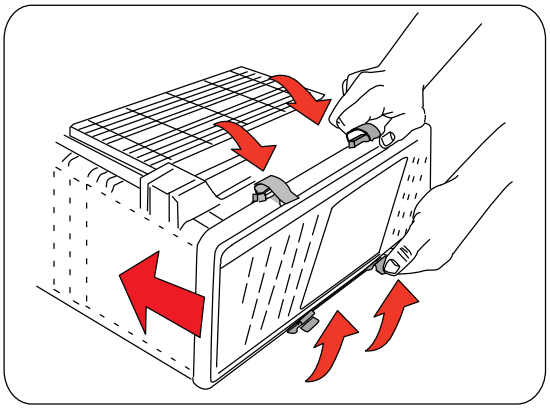

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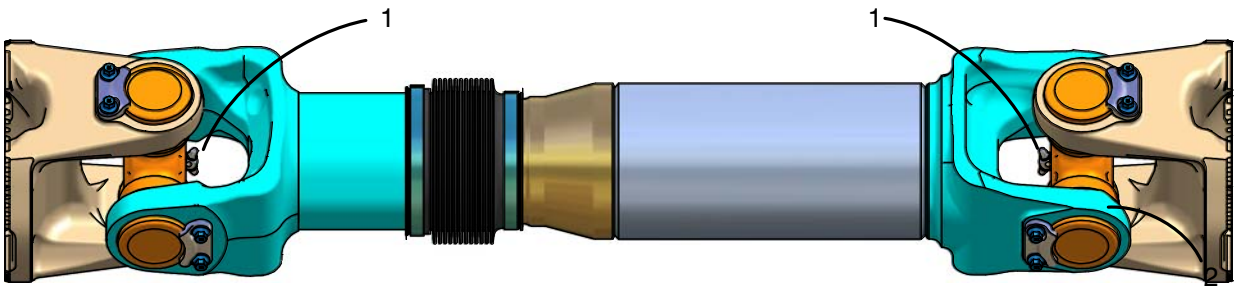
Figure 2–25
Changing The Air Cleaner Filters



1. U-joint Fitting (Each End)

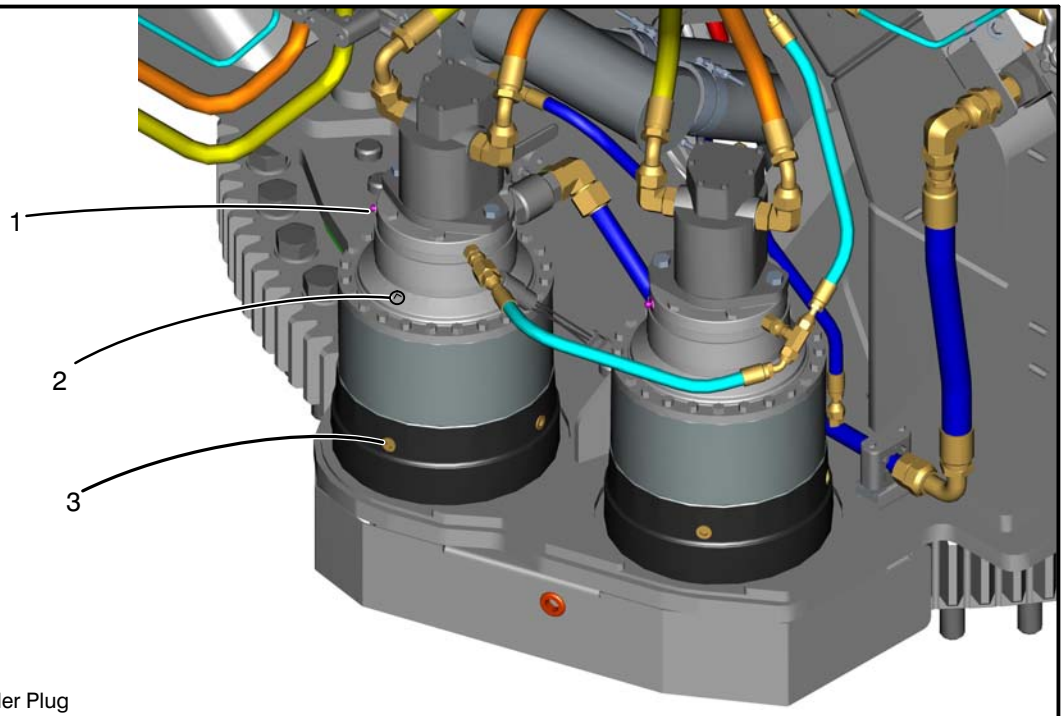
Figure 2–26
Drive Tube And U-joint Lubrication

PTO Drive Tube And U-Joint Lubrication

Drive tubes and u-joints are used to transmit torque from one drive line component to another. They also help absorb shock loadings. Because they are so critical to crane operation, thorough lubrication is necessary. Lubricate every 250 hours.

Lubrication Procedure For Drive Tubes/U-Joints

1. Park the crane on a firm, level surface. Engage the park brake, shift the transmission to neutral, and shutdown the carrier engine. Follow Steps 2 through 6 on each drive tube.
2. Check the slip yoke for looseness or side play.
3. Check each u-joint for looseness.
4. Apply grease through the fitting on each u-joint until all the old grease is purged. Purging should occur at all four seals on each u-joint. Refer to Figure 2–26 for grease fitting locations.
5. If grease does not purge from each seal, manipulate the u-joint until purging occurs.
6. If the above is not successful, remove the u-joint and inspect it. If the grease is rusty, gritty, or burnt, replace the u-joint.



1. Swing Park Brake Bleeder Plug
2. Swing Unit Check/Fill Plug
3. Swing Unit Drain Plug

Figure 2–27
Swing Speed Reducers

Swing Speed Reducer Lubrication

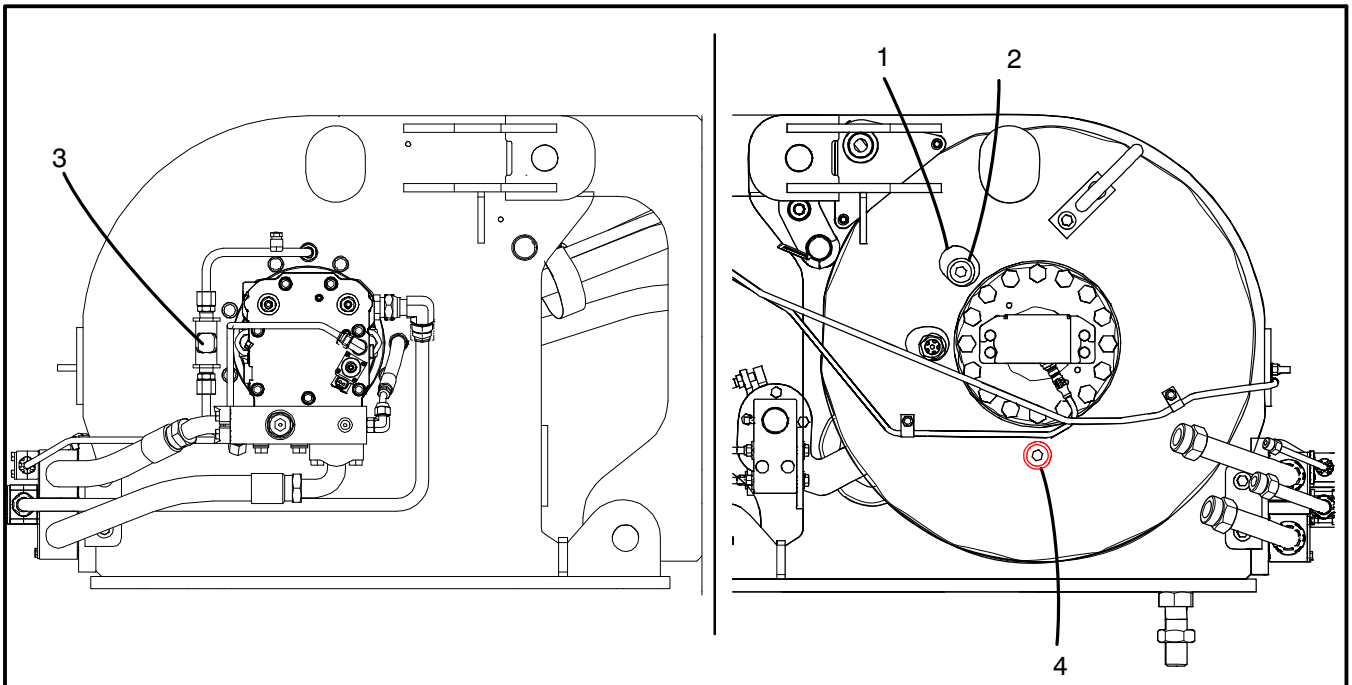
Check the oil level in the swing speed reducer after every 40 hours of operation. The oil in a new or rebuilt swing speed reducer should be changed after the initial 150 hours of operation. Thereafter, change the oil with each 2,000 hours of operation or annually, whichever occurs first.

Swing Speed Reducer Oil Level Check

1. Park the crane on a firm, level surface, shift the transmission to neutral, engage the park brake, and shutdown the carrier engine.
2. Engage the travel swing lock and shutdown the upper engine. Refer to Figure 2–27.
3. Clean the speed reducer around the check/fill plug to prevent contamination from entering the system. Remove the check/fill plug.
4. Oil should be within 0.5 in (*13mm*) 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(s).
4. Thoroughly clean the exterior surface of the swing speed reducer around the check/fill and drain plugs to prevent contamination from entering the unit. Refer to Figure 2–27.
5. Remove the check/fill and drain plugs 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 check/fill plug hole, until the oil is within 0.5 in (*13mm*) of the bottom of the threads. For the correct grade and quantity of oil, Refer to the Lubrication Specifications.
8. Clean and install the check/fill plug. Properly dispose of the used oil.
9. Repeat for the other swing speed reducer.



1. Fill Alignment Hole
2. Fill/Drain Plug
3. Sight Gauge
4. Drain Position

Figure 2–28
Winch Drum Lubrication

Winch Drum Lubrication

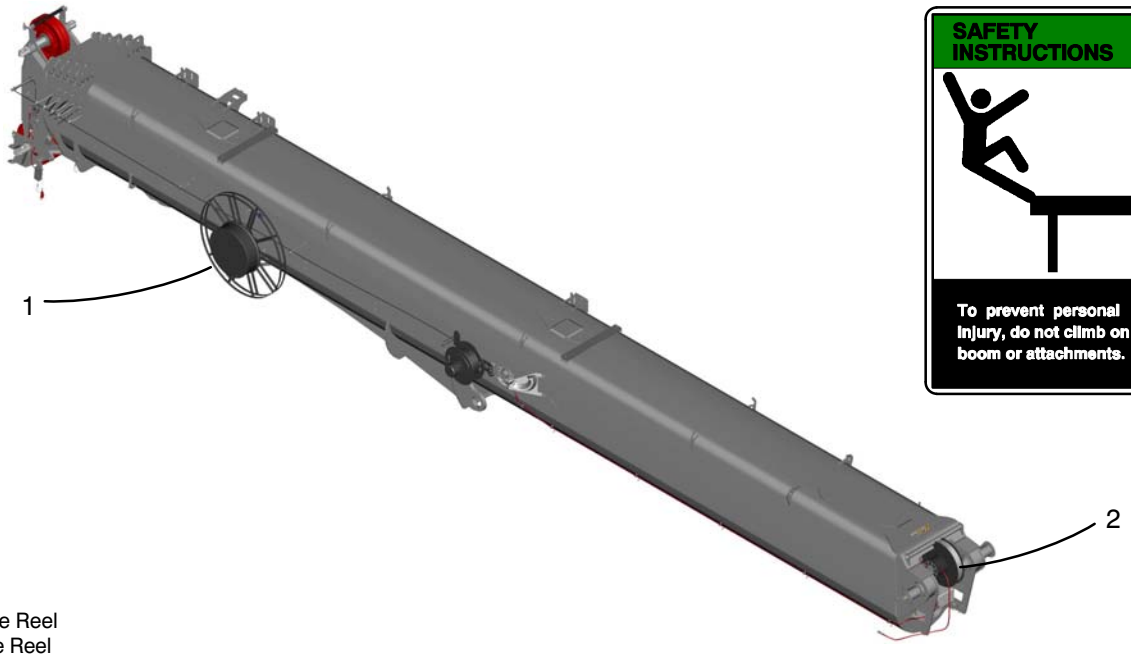
For maximum operating efficiency and service life of the winch drum, check the oil level after every 40 hours of operation. The oil, in a new or rebuilt winch drum, should be changed after the initial 150 hours of operation. Thereafter, change the oil with each 2,000 hours of operation or annually, whichever occurs first. It is also recommended that every 2,000 hours of winch operation, the winch should be disassembled and thoroughly inspected for damaged or worn parts. Replace damaged or worn parts as required. Refer to "Diagnostics – Function Times" in Section 1 of this Operator's Manual for total of winch operating hours.

Winch Drum Oil Level Check

1. Park the crane on a firm, level surface, position the transmission shifter to neutral, engage the park brake.
2. Observe the oil level within the sight gauge. Oil should be half full within the sight gauge. Refer to Figure 2–28.

Winch Drum Oil Change

1. Park the crane of a firm, level surface, shift the transmission to neutral, and engage 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 2–28.
4. Engage the travel swing lock and shutdown the engine.
5. Thoroughly clean the exterior surface of the winch around the fill/drain plugs to prevent contamination from entering the unit.
6. Remove the fill/drain plug.
7. Position a suitable container under the winch drum.
8. Start the engine. Rotate the drum until the fill/drain port is in the bottom vertical drain position. Shutdown the engine. Remove drain plug 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 upper engine.
10. Fill the unit with oil through the fill/drain port, until oil is half full within the sight gauge. For the correct grade and quantity of oil, Refer to the Lubrication Specifications.
11. Clean and install the vent and fill/drain plugs. Properly dispose of the used oil.
12. Repeat procedures for the other drum, if equipped.



1. Boom Cable Reel
2. Boom Hose Reel

Figure 2—29
Boom Assembly

Boom Inspection And 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.

Boom Hose And Cable Reel Inspection

Inspect the hose and cable reels and associated parts weekly. Boom up to maximum boom angle and fully extend the T5 (tip) section. Inspect all hydraulic hose assemblies per "Hydraulic Hose Assembly Inspection" in this Section of this Operator's Manual. Inspect the reels for leaks, loose fittings, or hardware. Observe clearances around reels to ensure that nothing drags on the reel or hoses that would prevent proper operation of the reels.

Fly 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.

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.

Wire Rope Lubrication

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.

Most wire ropes are lubricated during manufacture, but the lubricant does not last the life of the rope. The lubricant is squeezed out of the wire rope as it runs over sheaves under tension, or 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 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 lubricating them. Use a wire brush and compressed air to clean the rope. All possible foreign material and old lubricant should be removed from the wire rope before 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 hook 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 Hook Balls, Swivel Hook Balls	14 days	24 hours
Hook Blocks with Bronze Bushed Sheaves	14 days	8 hours
Hook 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 major 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 major, 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 major, 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

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 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 (RCL) 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 mounted on the upper frame behind the cab and the connecting hoses for oil leaks.
8. Test that the function limiters activate properly by two blocking the crane. (Do this by manually lifting the ATB weight.) The functions of boom down, boom extend, and winch up should be disabled.
9. 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.
10. If a known test weight is available, 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.

    Note: Displayed load on hook is most accurate when near the crane's rated capacity.

11. 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.

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/repaired as soon as possible. If necessary to continue crane operations, refer to "System Inoperative Or Malfunctioning" in Section 1 of this Operator's Manual.

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 a 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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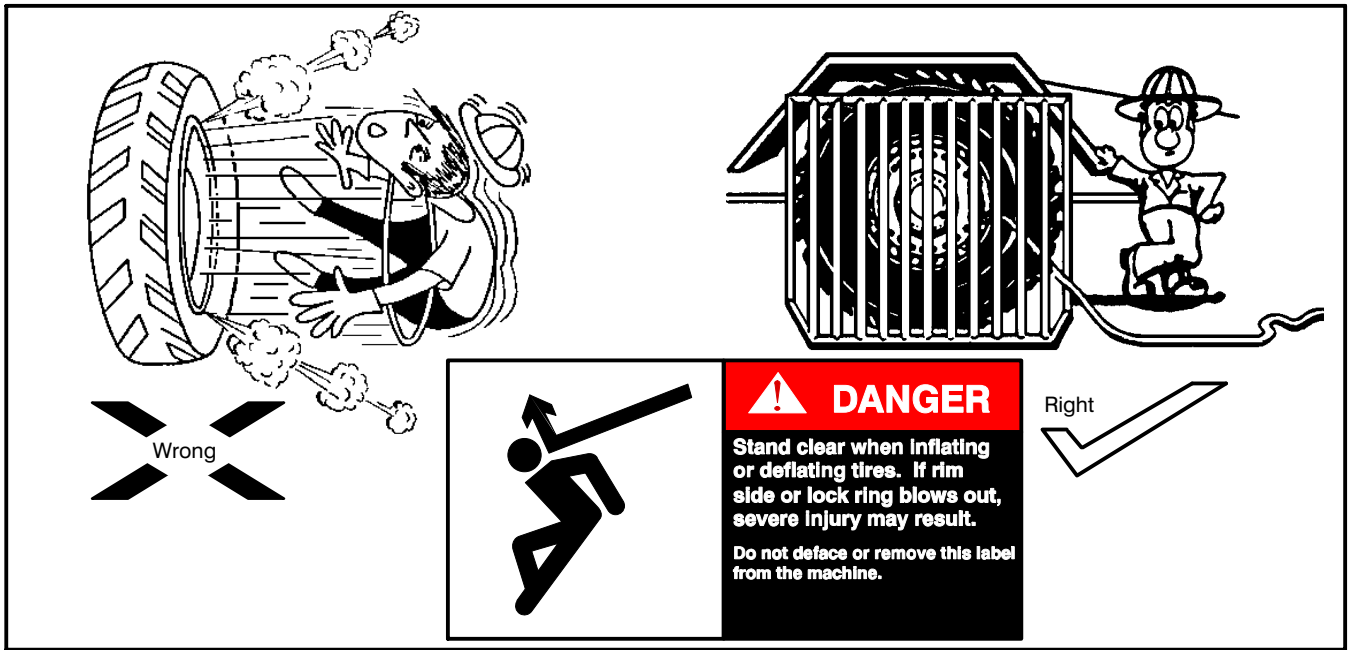


Figure 3–1
Tire Inflation Warning

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.

Replace any tire that shows any wear indicator. Because tires may wear unevenly, it may be necessary to replace them before the wear indicator appears across the entire tread. When replacing tires, all tires should be of the same manufacturer, size, type, load rating, and construction. Do not mix bias-belted and radial tires. Refer to the tire manufacturer and follow all recommendations regarding tire inspection and replacement.

Tire Inflation

Check the tire inflation pressures daily when the tires are cold. This crane is equipped with Tire Pressure Monitoring System (TPMS). Tire pressure can be monitored from the screen on the carrier cab display. The tire inflation pressures are listed on the Gross Axle Weight Rating plate and in the Crane Rating Manual.

All tires of the same weight and size are interchangeable. Inspect the wheel rims, nuts, studs, etc., on a weekly basis. If any damage is apparent, repair or replace before operating the crane.

A rim cage should be used when deflating or inflating tires to protect against personal injury. Refer to Figure 3–1.

DANGER

A damaged or improperly assembled tire and rim assembly may explode while inflating or deflating tires. Serious personal injury may result if tire and rim assembly explodes. Always use a rim cage and stand clear of the tire while inflating or deflating it.

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.

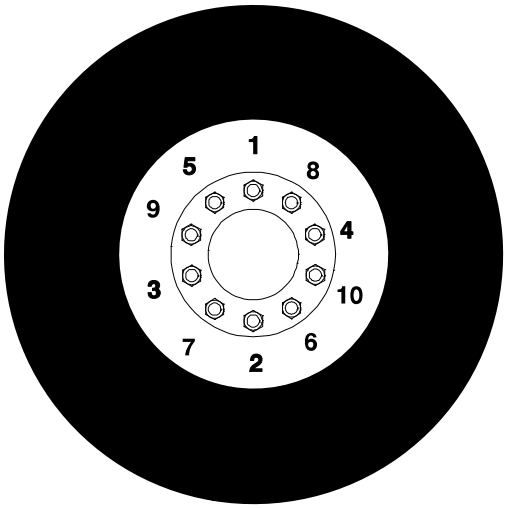


Figure 3—2
Lug Nut Torquing Sequence

Tire And Rim Safety Instructions

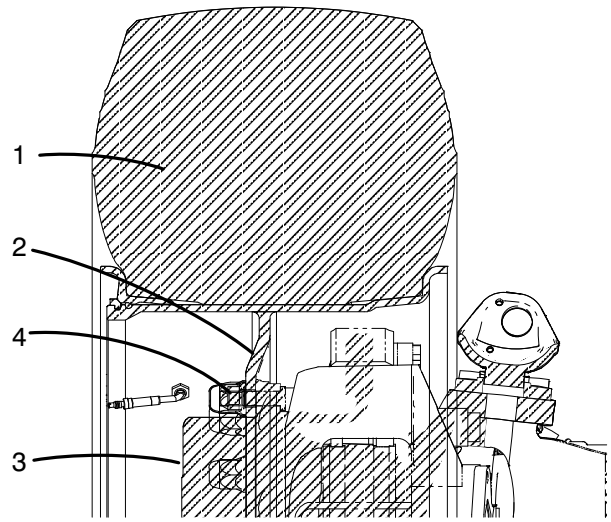
1. Always remove the valve cores, and exhaust all air pressure from the tire, prior to removing any rim or wheel components.
2. Use a rim cage and stand clear when deflating and inflating tires. A damaged rim may burst. The operator should stand well away from the potentially explosive force. Refer to Figure 3—1.
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 inflate a tire that has been run flat or extremely under inflated. Demount the tire and inspect it and the rim and wheel assembly for damage. These components may have been damaged or dislocated during the time the tire was under inflated.
5. Exercise caution when removing the lug nuts.
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 double check to ensure rim components are properly installed before inflating the tire. Improperly assembled parts could fly off during inflation.
8. Clean and inspect all parts prior to assembly. Do not use bent, worn, damaged, or rusted parts.
9. When inflating a tire, use an 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.
10. 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.
11. Always check rims and wheels 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 injury.

Tire And Rim Removal And Installation

Carefully read and understand the safety instructions in this Section of this Operator's Manual.

Tire And Rim Removal

1. Properly park the crane, shift the transmission to neutral, and engage the park brake.
2. Loosen each of the lug nuts to be removed by one half turn. Refer to Figure 3—3.
3. Level the crane on outriggers and shutdown the engine.
4. Adequately support the tire and rim assembly with an appropriate lifting device.
5. Loosen the lug nuts until the outer surface of each lug nut is flush with the end of the studs. Do not completely remove the lug nuts.
6. Unseat the rim.
7. Remove the lug nuts from the studs.
8. Carefully remove the tire and rim assembly from the wheel.



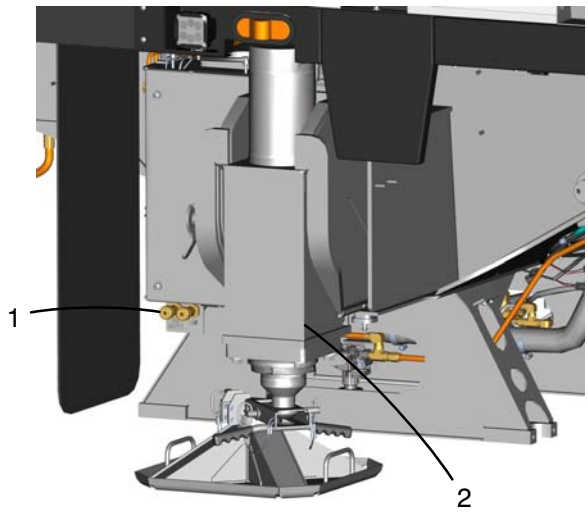
1. Tire And Rim
2. Brake Disc
3. Hub
4. Lug Nut

Figure 3—3
Tire And Rim Assembly

Tire And Rim Installation

The correct installation and tightening of the tire and rim assembly is one of the most important operations in wheel maintenance. When tire, rim, or wheel 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. Using a wire brush, thoroughly clean the mounting surfaces of the wheel and tire and rim assembly. Surfaces should be free of rust, dirt, and excess paint. Refer to Figure 3—3.
2. Slide the tire and rim assembly over the wheel, and push it into position against the tapered mounting surfaces of the wheel.
3. Install the lug nuts on each stud and hand tighten them.



1. Tire Inflation Service Port
2. Front Outrigger

Figure 3—4
Tire Inflation Service Port

4. Tighten the lug nuts, one turn at a time, following the criss-cross sequence shown in Figure 3—2. Always rotate the lug nut to be tightened to the top position. This will ensure even tightening and proper alignment of the tire and rim assembly. Tighten the lug nuts in this manner until all lug nuts are torqued to 450—500 ft lb *(610—678Nm).*

CAUTION

Improper torque can cause damage to components, rim slippage, or alignment problems. Tighten the lug nuts to the specified torque only.

5. Check the tire and rim assembly to ensure the tire is properly inflated. Correct tire pressures are listed in the Crane Rating Manual.

   Note: The air system of the crane is equipped with a tire inflation service port which may be used to supply air pressure to inflate tires. The ports are mounted on either side of the carrier on the front lower portion of the front outrigger boxes and are capable of supplying 130 psi (*896kPa*) of air pressure. Refer to Figure 3—4.

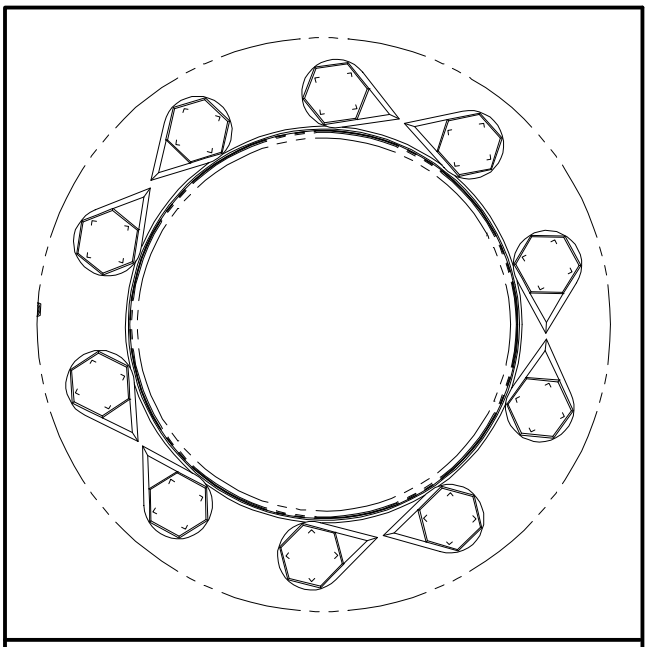


Figure 3—5
Lug Nut Torque Indicator Installation

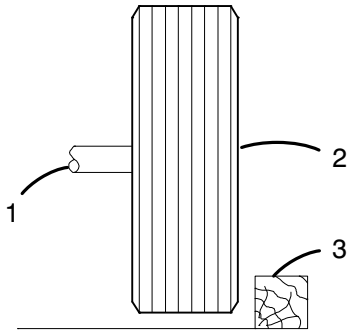
6. Start the engine, fully retract the outrigger jacks and beams, and drive the crane approximately 1 mile *(1.6 km)*. Tighten the lug nuts again using the proper torquing sequence (Figure 3—2) and recommended torque value (Step 4).
7. Install the torque indicator so that they are aligned point to point. Refer to Figure 3—5. It is recommend that there should not be more than 6 to 12 degrees misalignment.

   Note: Lug nut torque indicators should be checked every 10 hours, for the first 50 hours of operation, after any tire and rim assembly is installed. Tighten any lug nuts, as required, to the recommended torque value. Check the lug nut torque indicators every 50 hours of operation thereafter. It is recommend that misalignment should be reported from 45 degrees misalignment of the pointers on the torque indicators. An additional feature of the lug nut torque indicator is to indicate overheating; they will melt at temperatures in excess of 329° F (*165*° *C*).

Front Wheel Alignment

The wheel alignment should be checked seasonally. The best way to determine proper alignment is by evaluating tire wear. If the tires are wearing correctly, the alignment should be correct. If the tires are not wearing correctly, the following procedure can be used to give an approximately correct alignment. Professional laser type alignment equipment should be used to achieve the best accuracy. If assistance is needed in finding service facilities capable of doing this alignment, contact a Link-Belt Distributor. After completing the mechanical adjustments of the front axle(s) steering linkage, the electronic elements of the system will need calibration. Refer to crane's Shop Manual for the calibration procedure.

1. Park crane on a firm, level surface, shift the transmission to neutral, and engage the park brake.
2. Raise the crane on outriggers to get the tires off the ground. Release the park brake.
3. Scribe a line on the approximate center of each tire by bringing a pointed, stationary object into contact with the tread while rotating the wheel. Refer to Figure 3—7. The line must begin and end at the same point on the tread.
4. Apply park brake and retract outriggers to allow the entire weight of the crane to rest on the tires.



1. Axle
2. Tire
3. Stationary Object

Figure 3–6
Single Tire And Rim Alignment

5. Turn the wheels to align the left wheel parallel with the carrier frame. This can be done by equalizing the distances at "A", Figure 3–7.

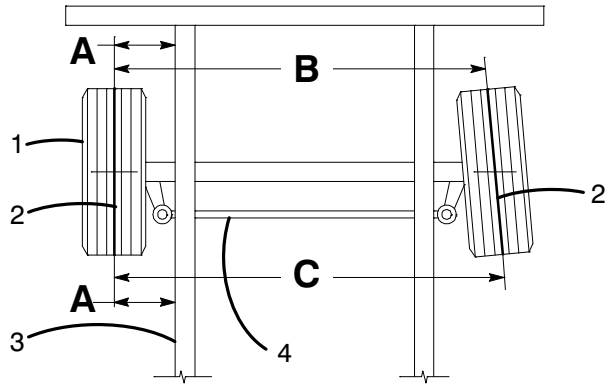
DANGER

Use extreme caution when operating the steering with someone under the carrier. The hydraulic force behind the steering components is capable of seriously injuring anyone caught in the steering linkage or trapped behind a tire. Post a signalman to watch carefully to ensure the safety of the person under the carrier.

6. Shutdown the carrier engine. Confirm that distance "A" has not changed after carrier engine was shutdown.
7. Measure the distances from the scribed line of one tire to the scribed line of the other, at the front and rear of the tire, "B" and "C", Figure 3–7.

   Note: Measurement must be made with the weight of the crane on the tires.

8. Proper toe-in requires the distance at the rear "C" be 0.06–0.25 in (*1.5–6.4mm*) greater than at the front "B".

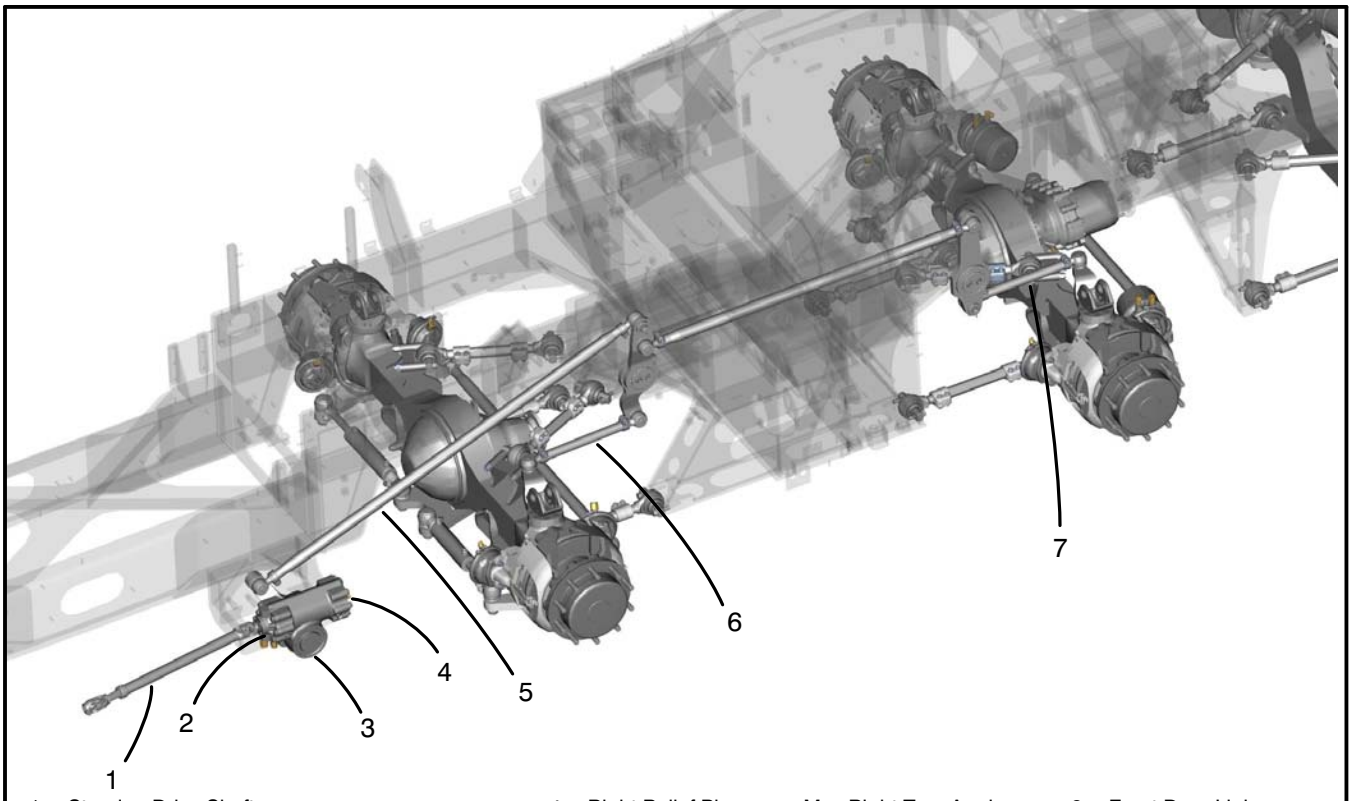


1. Tire
2. Scribed Lines
3. Carrier Frame
4. Tie Rod

Figure 3–7
Front Wheel Alignment

9. If adjustment is required, loosen the clamps on each end of the tie rod and adjust the length of the tie rod to obtain the proper "B" and "C" dimensions. Tighten the clamps.
10. Roll the crane forward at least 50 ft (*15m*) and repeat Steps 2 through 9 to check the adjustment.
11. Repeat Steps 2 through 10 for the second axle. The toe-in is now properly adjusted on both axles.
12. With the distances at "A" equal on the first axle, check the the distances at "A" on the second axle. If the distances at "A" are equal proceed with Step 13. If the distances at "A" are not equal proceed with the following:
    a. Loosen the clamps on each end of the right drag link on the second axle. Refer to Figure 3–8.
    b. Adjust the length of the drag link to equalize the distances at "A". Tighten the clamps.
13. Turn the wheels full left and full right and check all clearances of the wheels, linkages, and other crane components.
14. Adjust the axle stop bolts on the steering knuckle as required to prevent any interference between the wheels, linkages, and other crane components.
15. With the entire weight of the crane on the tires, turn the wheels full left and then full right and check that the steering gear goes over relief just before the wheels contact the axle stop bolts.

    Note: The steering gear will make a hissing sound when it is going over relief.



1. Steering Drive Shaft
2. Left Relief Plunger — Max Left Turn Angle
3. Steering Gear
4. Right Relief Plunger — Max Right Turn Angle
5. Main Drag Link
6. Front Drag Link
7. Rear Drag Link

Figure 3—8
Steering Linkage

16. If steering gear goes over relief just before the wheels contact the axle stop bolts, go to Step 17. If the steering gear does not go over relief just before the wheels contact the axle stop bolts, proceed with the following:

⚠ WARNING

Do not loosen the relief plungers beyond flush with the end cap. The relief plunger could eject from the end cap causing a sudden release of hot oil which could cause burns or other serious injury.

   a. Turn the wheels full right. On the left side of the crane adjust the right relief plunger on the steering gear until the steering gear goes over relief just before the wheels contact the axle stop bolts. Refer to Figure 3—8.

      Note: Turn relief plunger clockwise to reduce maximum turn angle, turn counterclockwise to increase angle.

   b. Turn the wheels full left. On the left side of the crane adjust the left relief plunger on the steering gear until the steering gear goes over relief just before the wheels contact the axle stop bolts.

17. Check that the steering wheel is centered when the wheels are positioned straight ahead. If the steering wheel is centered when the wheels are positioned straight ahead, go to Step 18. If the steering wheel is not centered when the wheels are positioned straight ahead, proceed with the following:
   a. Position the wheels so they are straight ahead.
   b. Loosen the steering shaft clamp bolt at the front of the steering gear and disconnect the steering shaft from the steering gear.
   c. Rotate the steering shaft as necessary to center the steering wheel. Do not allow the steering shaft to rotate more than half a revolution, otherwise steering column clock spring damage may occur.
   d. Reinstall steering shaft to steering gear and torque steering shaft clamp bolt.
18. Test all steering functions before placing the crane in service.

Rear Wheel Alignment

The wheel alignment should be checked seasonally. The best way to determine proper alignment is by evaluating tire wear. If the tires are wearing correctly, the alignment should be correct. If the tires are not wearing correctly, follow the procedure in the crane's Shop Manual to give an approximately correct alignment. Professional laser type equipment should be used to achieve the best alignment. If assistance is needed in finding service facilities capable of doing this alignment, contact a Link-Belt Distributor.

After completing the mechanical adjustments of the rear axle steering linkage, the electronic elements of the system will need calibration. Refer to crane's Shop Manual for the calibration procedure.

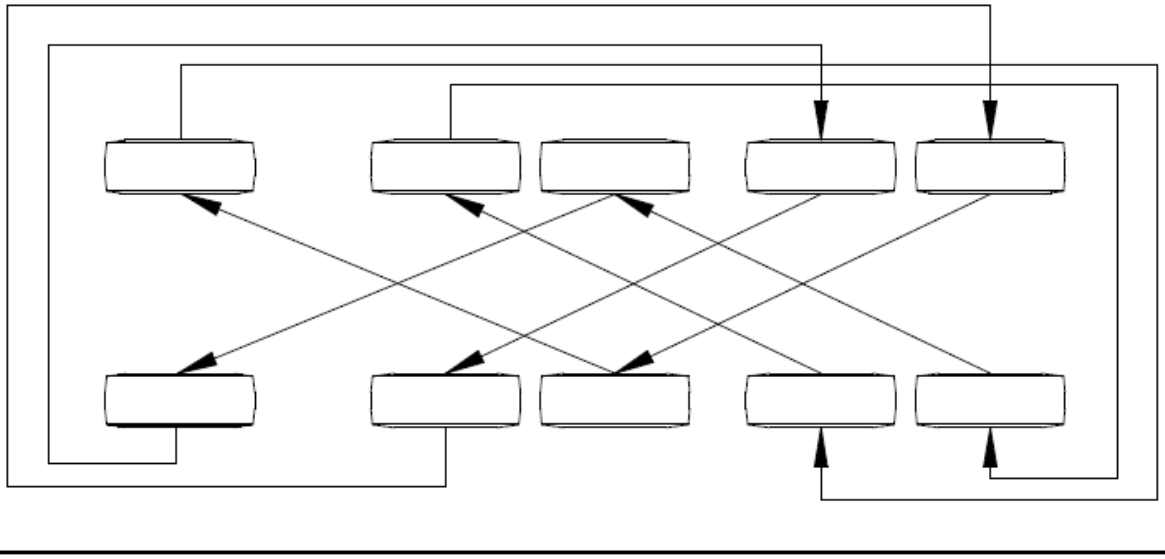


Figure 3—9
Tire Rotation Diagram

Tire Rotation

It is recommended that a tire rotation plan based on a 12-month all-conditions rolling average be utilized to maximize the the life of the tires. If the TPMS sensors are not properly re—calibrated after tire rotation, tire pressures and temperatures readings will be in the wrong location in the diagnostics displays of the Carrier Cab Control Display. Refer to "TPMS Sensor Calibration" in this section of this Operator's Manual for additional information. The most common methods of tire rotation are:

- Tread-Based Rotation: Rotate all axle positions when tread depth on any tire reaches approximately 25% worn (or some other percentage). Based on a 525/80R25 XCrane AT+ the initial rotation should occur at 26/32nds or 21mm (Original tread depth 35/32nds or 28 mm.
- Performance-Based Rotation: Rotate all axle positions when they reach approximately 15,000 miles of average performance (equivalent miles based on 25% wear rate). Assuming annual usage of 10,000 miles.

Link-Belt recommends the performance base rotation plan as it is the most effective and responsive to changing operational conditions.

Note: The tires may not achieve 25% wear during the first rolling 12 month period, rotating the tires during the first annual inspection when the tires are new is an important factor for helping to reduce the initiation of irregular tire wear.

The Performance-Based method requires that:

- the customer (or tire manufacturer representative) tracks and records tire performance.
- the customer and tire manufacturer representative set a percentage of spares necessary to meet the fleet's needs.
- the updated rotation point is incorporated into tire rotation planning.

1. Antenna
2. Display
3. Escape Button
4. Enter Button
5. Arrow Buttons
6. Cable Connectors
7. Power Adapter Connector
8. Power Button

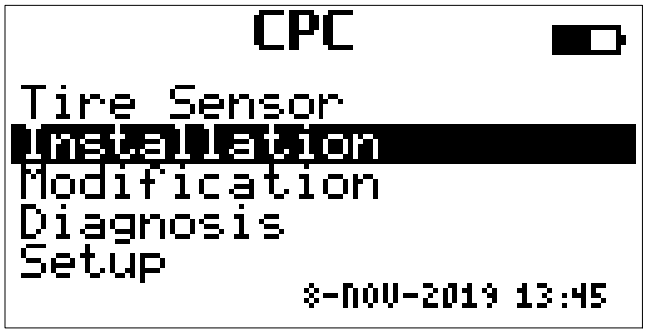
Figure 3—10
Calibration Tool

TPMS Sensor Calibration

After the tires are rotated, the sensors within the tires must be reprogrammed to the new tire location to ensure accurate tire pressure diagnostics on the Carrier Cab Control Display. Refer to "Carrier Cab Control Display Diagnostic Menu" in Section 1 of this Operator's Manual for additional information.

Note: This procedure is written for tires equipped with Continental TPMS sensors. Contact your Link-Belt Distributor to obtain the Continental Calibration Tool (Part Number 3A 28567).

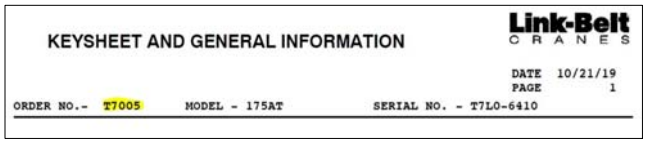
1. Power on the Calibration Tool by pressing the Power Button Refer to Figure 3—10.
2. Using the up/down Arrow Buttons, highlight "Installation" on the CPC Menu and press the Enter Button.



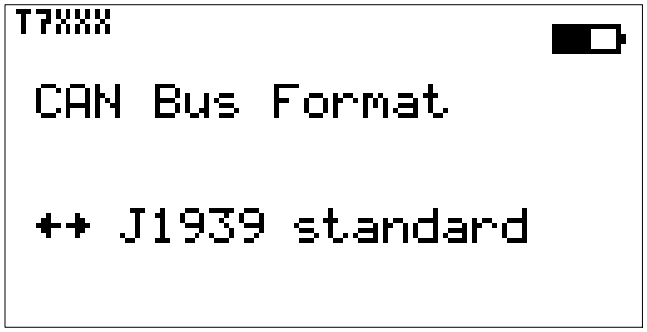
3. Using the up/down Arrow Buttons, highlight "New Installation" from the Installation Menu and press the Enter Button.

4. Enter the crane build number. Using the Arrow Buttons, highlight the desired character on the keypad and press the Enter Button. Once the crane build number has been entered, highlight "OK" and press the Enter Button.

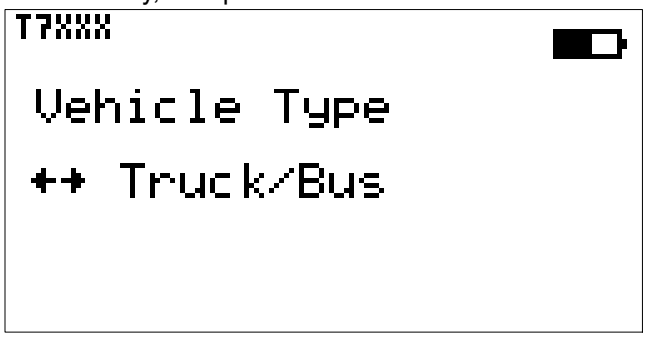
Note: The Crane Order Number can be found on the "Keysheet And General Information" page in the crane's "Parts Manual". The image below should only be used as a reference to show the location of a Crane Order Number in the "Parts Manual".

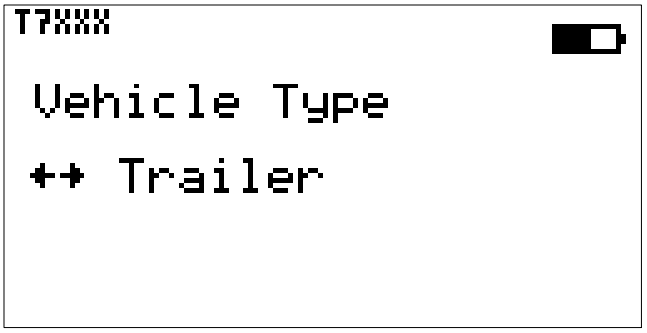


5. For "CAN BUS Format", use the left/right Arrow Buttons to scroll to "J1939 standard" and press the Enter Button.

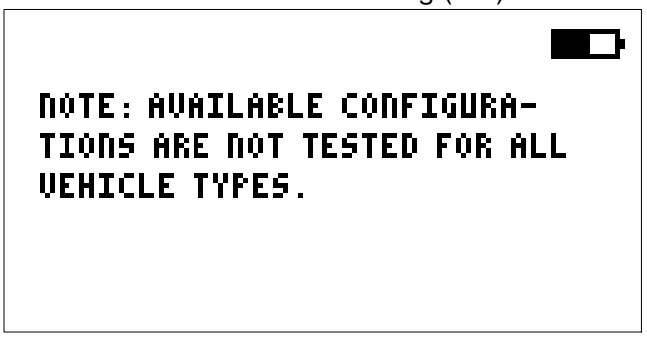


6. For "Vehicle Type", use the left/right Arrow Buttons to scroll to "Truck/Bus" for the crane, or "Trailer" for the dolly, and press the Enter Button.



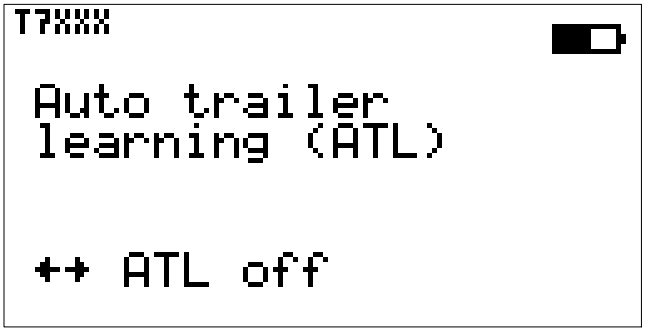


7. Press the Enter Button to advance through the Note to the "Auto trailer learning (ATL)" screen.



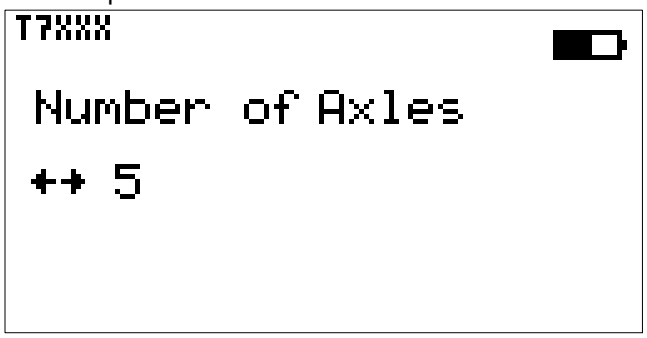
8. For "Auto trailer learning (ATL)", use the left/right Arrow Buttons to scroll to "ATL off" and press the Enter Button.

Note: ATL is not an option for the dolly.

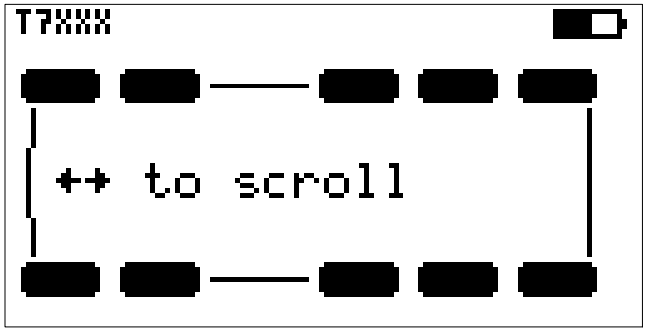


9. For "Add. Receiver", use the left/right Arrow Buttons to scroll to "No" and press the Enter Button.

10. For "Number of Axles", use the left/right Arrow Buttons to scroll to the correct number of axles for the vehicle type (crane or dolly as entered in Step 6) and press the Enter Button.

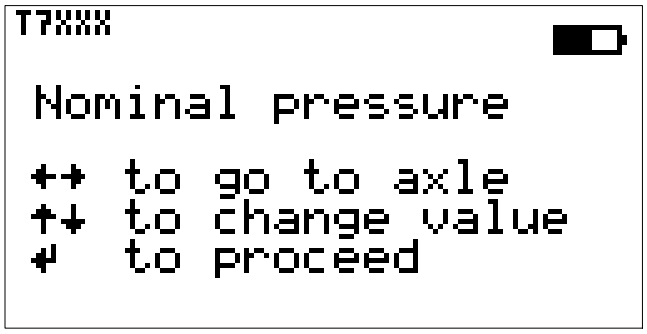


11. Using the left/right Arrow Buttons, scroll to the correct tire configuration for the vehicle type (crane or dolly as entered in Step 6) and press the Enter Button.



12. Press the Enter Button to advance through the "Nominal pressure" screen to the "Nominal pressure" display.

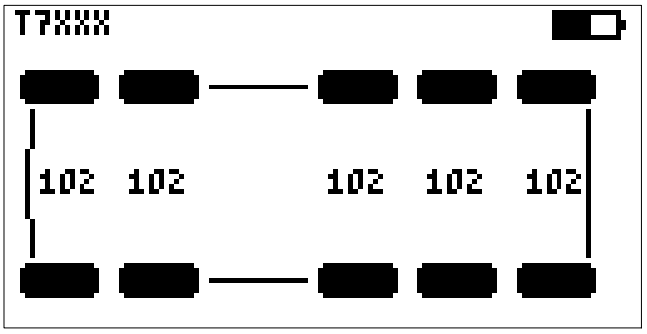
    Note: The "Nominal pressure" screen is a legend showing which buttons to use when navigating through the "Nominal pressure" display.



13. Enter the nominal pressure for the tire type:

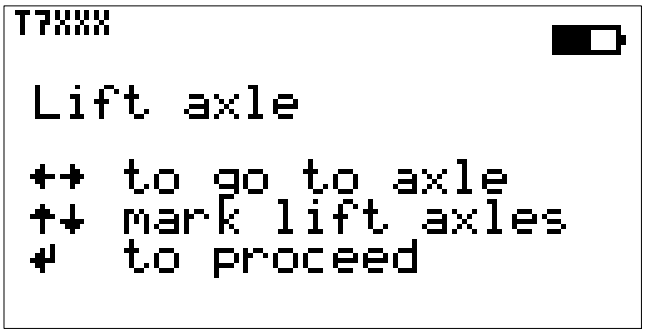
    Note: Nominal pressure for 525/80R25 tires (standard) is 102 psi. Nominal pressure for 445/95R25 tires is 131 psi. Nominal pressure for dolly tires is listed on the label on the front of the dolly.

    a. Using the left/right Arrow Buttons, select an axle.
    b. Using the up/down Arrow Buttons, scroll though the values for the selected axle until the correct value is displayed.
    c. Repeat Steps 13a and 13b until each axle displays the correct nominal pressure and press the Enter Button.



14. Press the Enter Button to advance through the "Lift axle" screen to the "Lift axle" display.

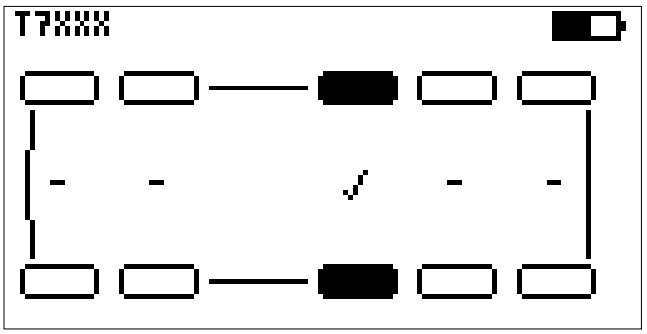
    Note: The "Lift axle" screen is a legend showing which buttons to use when navigating through the "Lift axle" display.



15. Select the correct lift axle for the vehicle type:

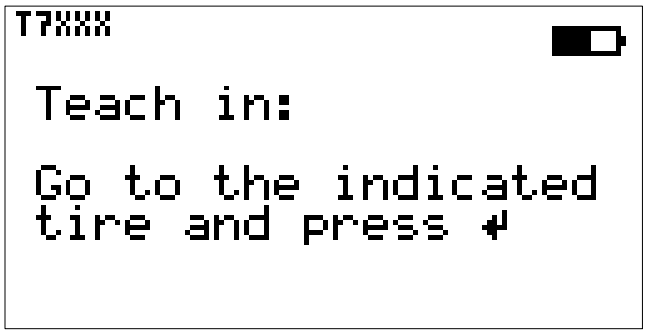
    Note: If the vehicle does not have a lift axle, press the Enter Button to advance through the "Lift axle" display.

    a. Using the left/right Arrow Buttons, select the correct lift axle.
    b. Using the up/down Arrow Buttons, mark the axle with a check mark and press the Enter Button.

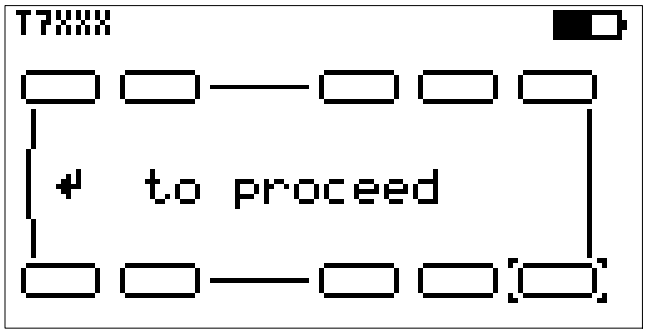


16. Press the Enter Button to advance through the "Teach in" screen to the "Teach in" display.

    Note: The "Teach in" screen is a legend showing which buttons to use when navigating through the "Teach in" display.

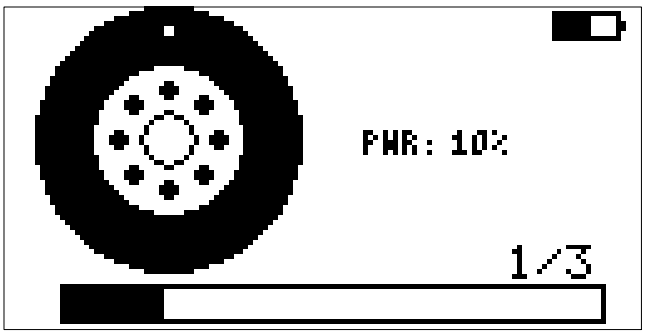


17. Use the antenna to scan each tire of the vehicle in the position that appears on the display.
    a. Go to the tire selected (bottom right on the display shown below) on the "Teach in" display and press the Enter Button to begin the scan.

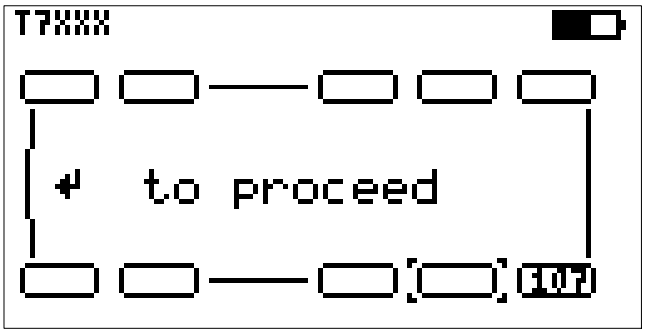


    b. Slowly move the Calibration Tool in a circular motion around the selected tire until the Calibration Tool detects the TPMS sensor.

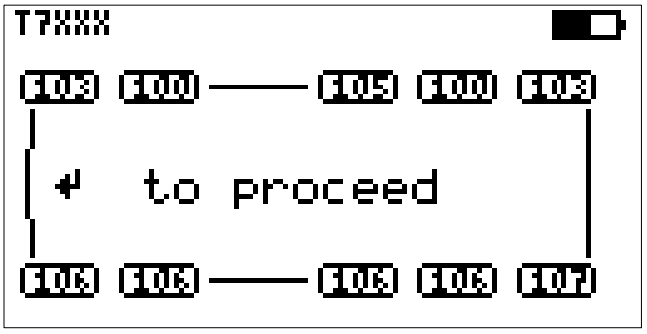
       Note: Point the antenna of the Calibration tool directly toward the sensor. Refer to Figure 3—10. TPMS sensors are located near the tire serial number on crane tires.

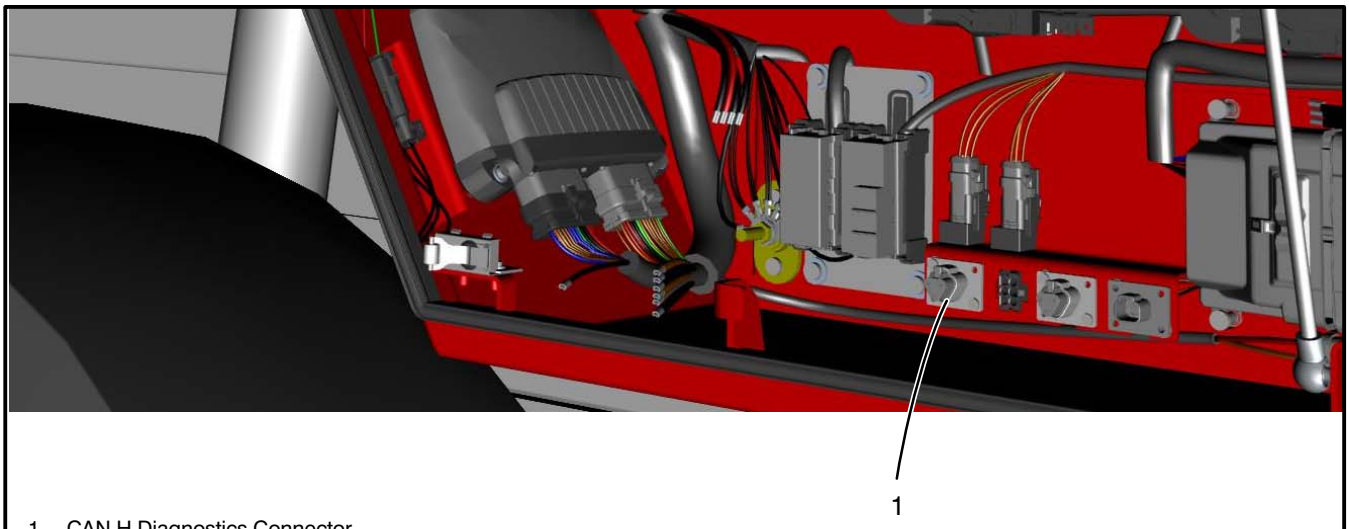


    c. Once the Calibration tool detects the TPMS sensor, the Calibration tool will vibrate and audibly buzz. Hold the Calibration Tool in place until the "Teach in" display appears with a tire pressure value in the selected tire. The next tire will now be selected.



    d. Repeat Steps 17b and 17c until each tire displays a tire pressure and press the Enter Button.

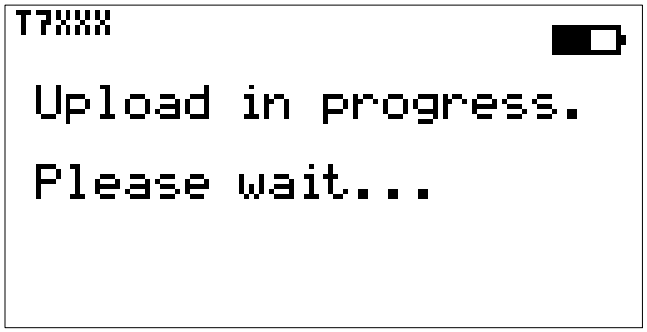




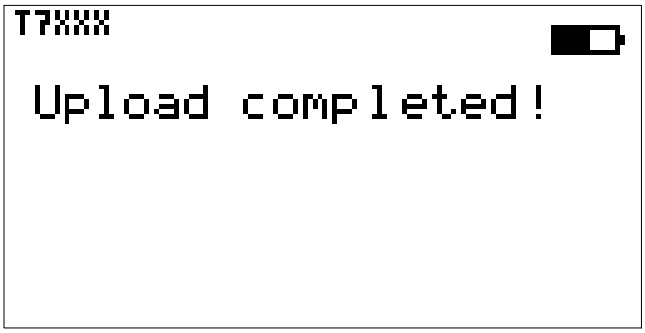
1. CAN H Diagnostics Connector

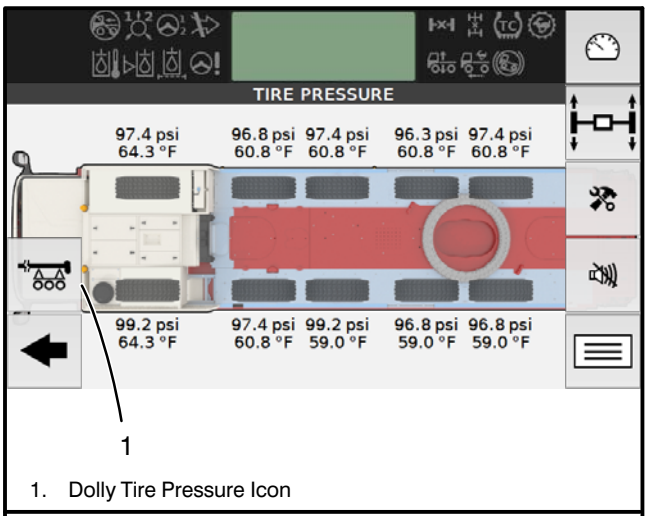
Figure 3–11
Calibration Tool Connections

18. Upload calibration data to the crane:
    a. Ensure the crane is keyed on.
    b. Using the cables and adapters supplied with the Calibration Tool, connect the Calibration Tool to the CAN H Diagnostics Connector in the Rear Carrier Electrical Center on the left side of the crane. Refer to Figure 3–11.
    c. Press the Enter Button on the Calibration Tool to upload the tire data.



    d. Press the Enter Button to advance through the "Report File Stored" screen to the "Upload Completed" screen.





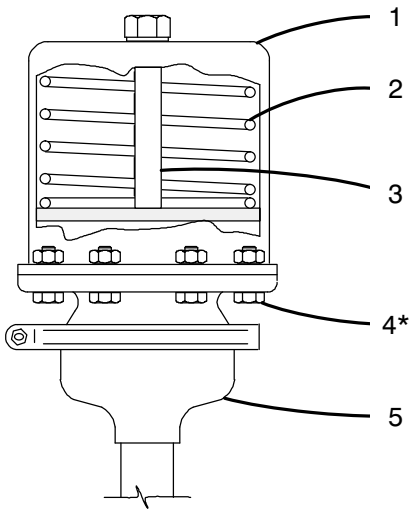
1. Dolly Tire Pressure Icon

Figure 3—12
Tire Pressure Diagnostic Screen

19. Ensure the tire pressure and temperature data displays on the Tire Pressure Diagnostics Screen of the Carrier Crane Control Display:
    a. To access the Tire Pressure Diagnostic Screen on the Carrier Cab Control Display, navigate to the Diagnostic Menu, then use the buttons corresponding to the arrow icons to highlight "Tire Pressure". Press the button corresponding to the selection icon . Refer to "Carrier Cab Control Display Diagnostic Menu" in this section of this Operator's Manual and Figure 3—12.
    b. To access the Tire Pressure Diagnostic Screen for the dolly, press the button corresponding to the dolly tire pressure icon . Press the crane tire pressure icon to return to the crane Tire Pressure Diagnostic Screen.

    Note: It may take a few minutes for all TPMS sensors to register on the Tire Pressure Diagnostics Screen.

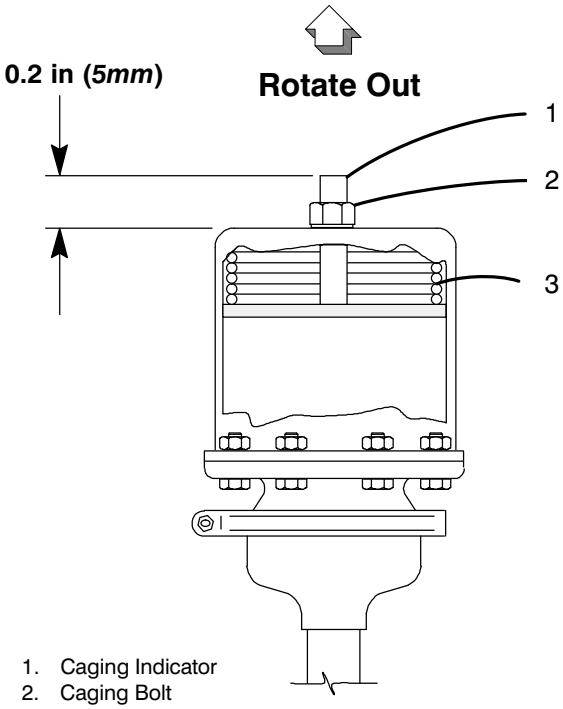
20. Adjust the tire pressure, as required.



Note: * Do not remove until power spring is caged.

1. Park Brake Chamber
2. Power Spring
3. Caging Bolt
4. Capscrews*
5. Service Brake Chamber

Figure 3—13
Air Brake Chamber — Power Spring Free



1. Caging Indicator
2. Caging Bolt
3. Power Spring

Figure 3—14
Air Brake Chamber — Power Spring Caged

Carrier Brakes

DANGER

Removal of the capscrews holding the dual air brake chambers together, before caging the power spring, will result in the chamber and its internal parts being rapidly and forcefully ejected. This may result in serious personal injury. Always cage the power spring before attempting any brake or air chamber adjustment or repair. If any doubt exists as to whether a potential safety hazard exists, contact your Link-Belt Distributor before repairs are attempted.

Caging Dual Air Brake Chambers

A dual air brake chamber is a brake system component that uses two internal air chambers to control the functions of the service and park brakes. This particular crane only uses dual air brake chambers on the rear brakes.

The chamber closest to the wheel end controls the service brake. The other chamber controls the application of the park brake. The park brake chamber contains a large, high force (power) spring that will cause the unit to literally "explode" if it is not caged prior to disassembly. Refer to Figure 3—13. Caging compresses and restrains the power spring. Use the following procedure to cage the power spring.

1. Park the crane on a firm, level surface, apply the park brake, and shift the transmission to neutral.
2. Level the crane on fully extended outriggers, (or block the wheels) release the park brake, and shutdown the engine.
3. Rotate the caging bolt out of the air brake chamber until the indicator extends (0.2 in *(5mm)* beyond the end of the caging bolt. Refer to Figure 3—14.

   Note: If the cranes air system is inoperative and the park brake is applied, tightening the caging bolt will be more difficult than if the park brake is released.
4. The power spring has now been caged. Continue with any necessary repair or adjustments. Repeat the above procedure for each brake to be serviced.

Releasing A Caged Dual Air Brake Chamber

The park brake chamber contains a large, high force (power) spring that will cause the unit to literally "explode" if it is not caged prior to disassembly. Caging compresses and restrains the power spring. After installing the air brake chamber on the crane, the power spring must then be released in order for the park brake feature of the brake chamber to function. Use the following procedure to release the caged power spring once the unit is installed on the crane or after making a brake adjustment.

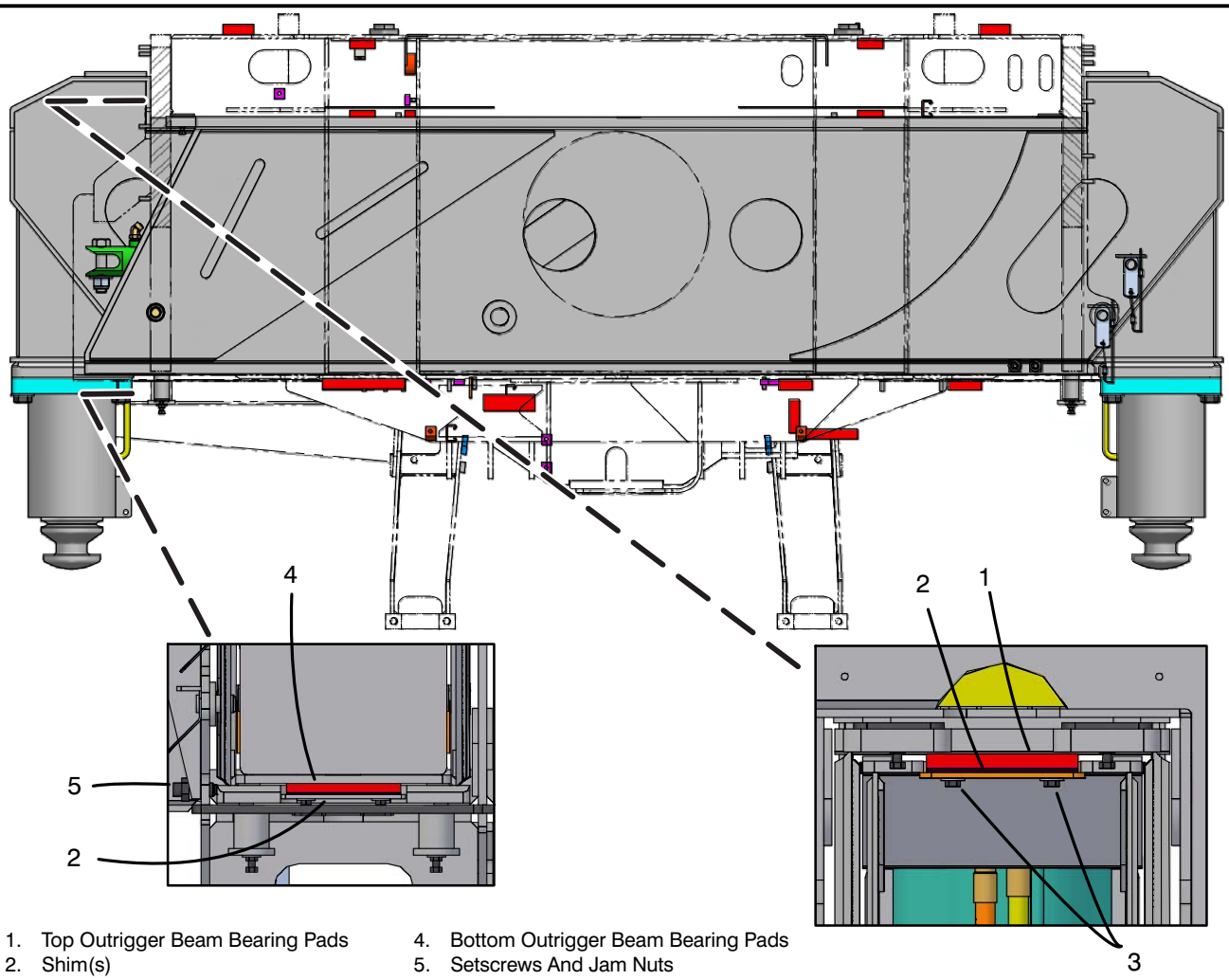
1. Park the crane on a firm, level surface, apply the park brake, and shift the transmission to neutral.
2. Level the crane on fully extended outriggers, (or block the wheels) release the park brake, and shutdown the engine.

   Note: If the cranes air system is inoperative and the park brake is applied, tightening the caging bolt will be more difficult than if the park brake is released.

3. Slowly rotate the caging bolt to release the power spring until the caging indicator is flush with the top of the air caging bolt. Refer to Figure 3—13.

Front & Rear Brake Inspection

The rear brakes are equipped with automatic adjusters to compensate for brake pad wear. They should be checked periodically to ensure they are working properly and that the brake pads are not worn out. Remove the wheel and check the brake pads, as required, to ensure proper brake operation. After inspection, test all brake functions before operating.



1. Top Outrigger Beam Bearing Pads
2. Shim(s)
3. Capscrew And Washer
4. Bottom Outrigger Beam Bearing Pads
5. Setscrews And Jam Nuts

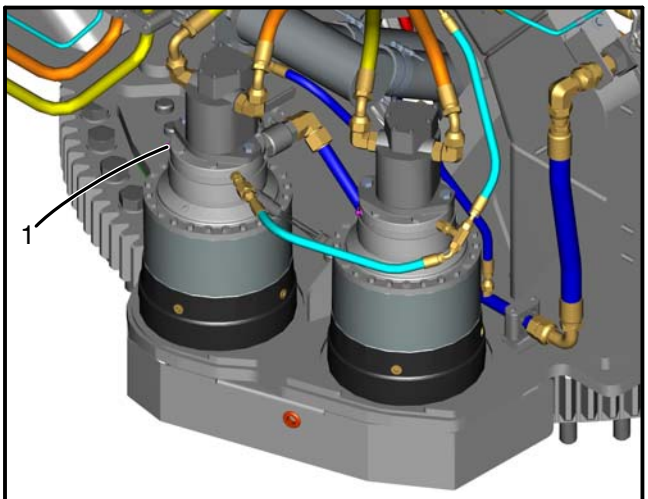
Figure 3—15
Outrigger Beam Bearing Pads

Outrigger Beam Bearing Pad Adjustment

Bearing pads are provided on the outrigger beams as a means of keeping the outrigger beams working smoothly. They must be adjusted periodically to prevent excessive deflection of the beams. Refer to Figure 3—15.

1. Park crane on a firm, level surface. Extend the outrigger beams approximately 4 in (*10.1cm*).
2. Place a 0.25 in (*6.35mm*) shim on top of the inner outrigger beam and between the beam and outrigger box. Refer to Figure 3—15. Do this on all four outrigger beams.
3. Extend the outrigger jacks until the beams contact the shims. Do not raise the crane off the ground.
4. Remove all outrigger box covers. Remove capscrews and washers. Add shim(s) under the top and bottom bearing pads, as required, to maintain 0.25 in (*6.35mm*) clearance. Install capscrews and washers.

   Note: If clearance cannot be obtained due to bearing pad wear, replace the bearing pads as required.
5. Fully retract the outrigger jacks.
6. Remove shims from the top of the beams.
7. Fully extend outrigger beams and check that there is 0.06 in (*1.5mm*) maximum clearance between the top of the inner outrigger beam and outrigger box.
8. Make the side to side adjustment by loosening jam nut and tightening setscrew until it makes contact with beam. Back setscrew off one-half turn and tighten jam nut. Do this on all four outrigger beams.



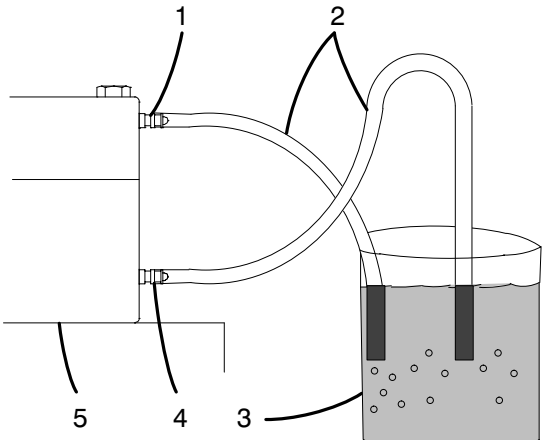
1. Swing Park Brake Bleeder Plug

Figure 3—16
Swing Unit

Swing Brake Bleeding

Bleed the swing brake whenever a hydraulic line is removed from the swing unit to remove any air that may have been trapped in the circuit. Removal of any trapped air within the brake assembly is essential for proper operation of the swing and service park brake. The following procedure requires two people.

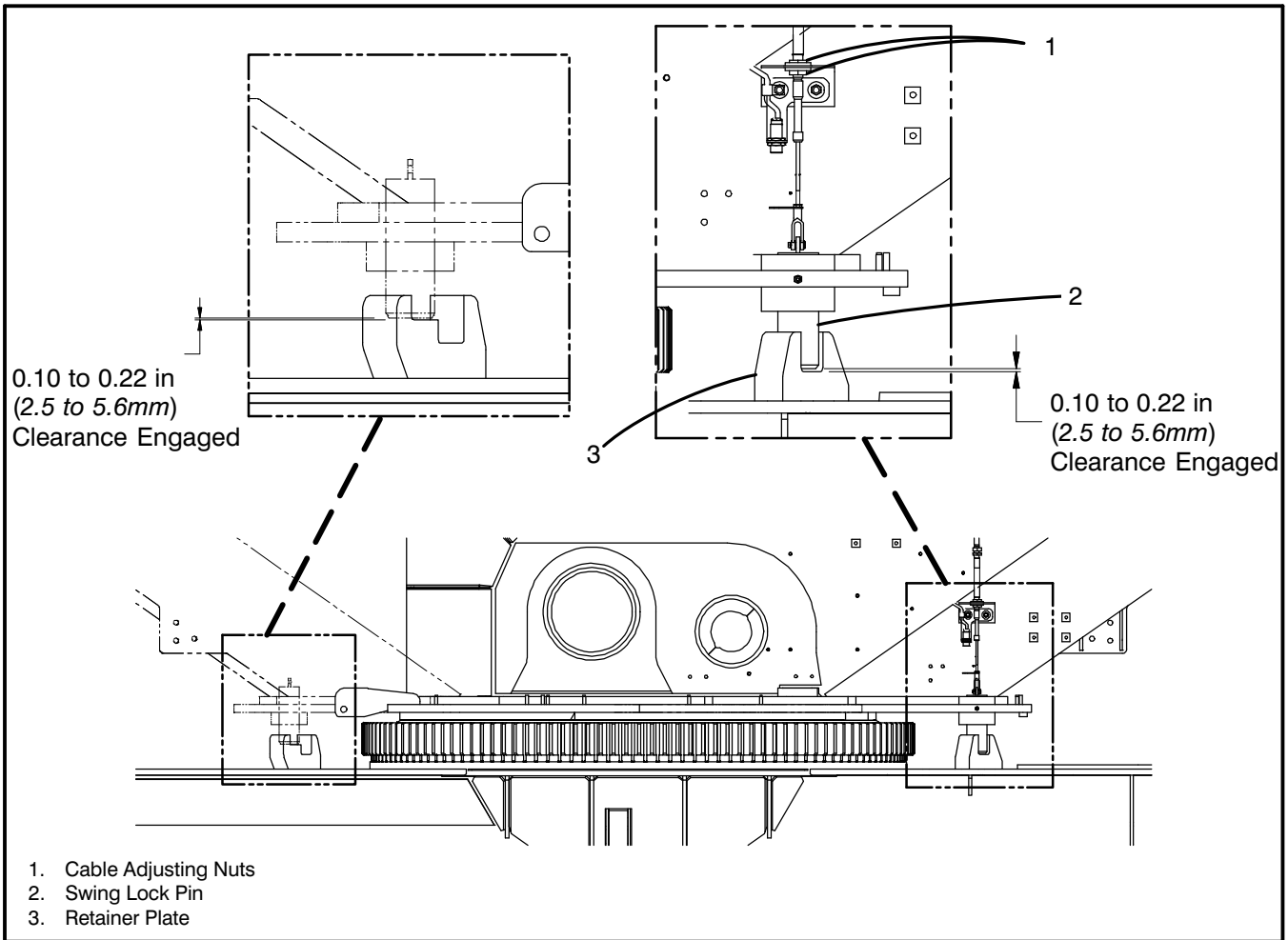
1. Park the crane on a firm level surface and engage the travel swing lock.
2. Check that all control levers are in the neutral position and move the function lockout switch to the "DISABLE" position.
3. Shutdown the engine.
4. Thoroughly clean the bleed plug and surrounding area with an approved cleaning solvent to prevent contamination from entering the oil circuits. Allow the area to air dry.
5. Attach one end of a rubber hose to the bleeder plug. Refer to Figure 3—17. Ensure that the rubber hose fits securely on the bleeder plug.
6. Fill a clean, clear container with clean hydraulic oil, and place the open end of the 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.



1. Bleeder Plug — Parking Brake
2. Rubber Hose
3. Container
4. Bleeder Plug — Service Brake
5. Swing Brake

Figure 3—17
Swing Brake Bleeding Procedure

8. With the engine running at idle speed, apply the swing park brake and slowly loosen the bleeder plug.
9. With one person stationed in the operator's cab and another observing the container, the person in the cab should apply and release the swing brake, utilizing the swing park break switch, while the other observes the container for air bubbles after loosening bleeder plug. Repeat the process until no air bubbles are observed.
10. 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. Test all swing brake functions before operating the crane.
14. Properly dispose of used oil.



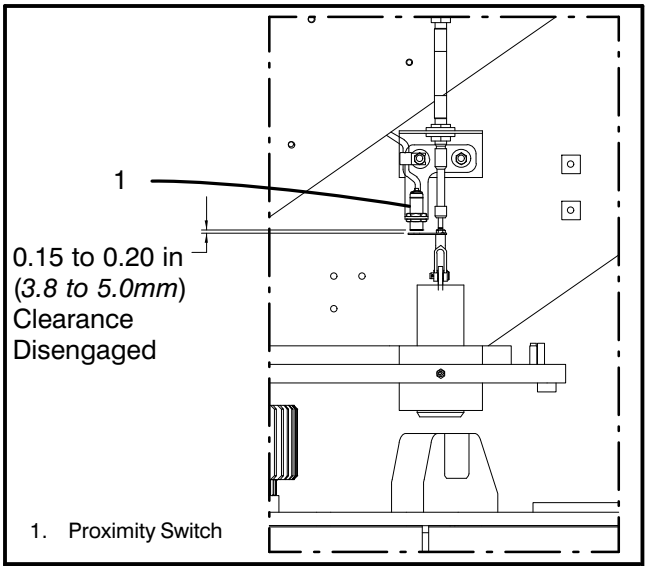
1. Cable Adjusting Nuts
2. Swing Lock Pin
3. Retainer Plate

Figure 3—18
Travel Swing Lock Adjustment

Travel Swing Lock Adjustment

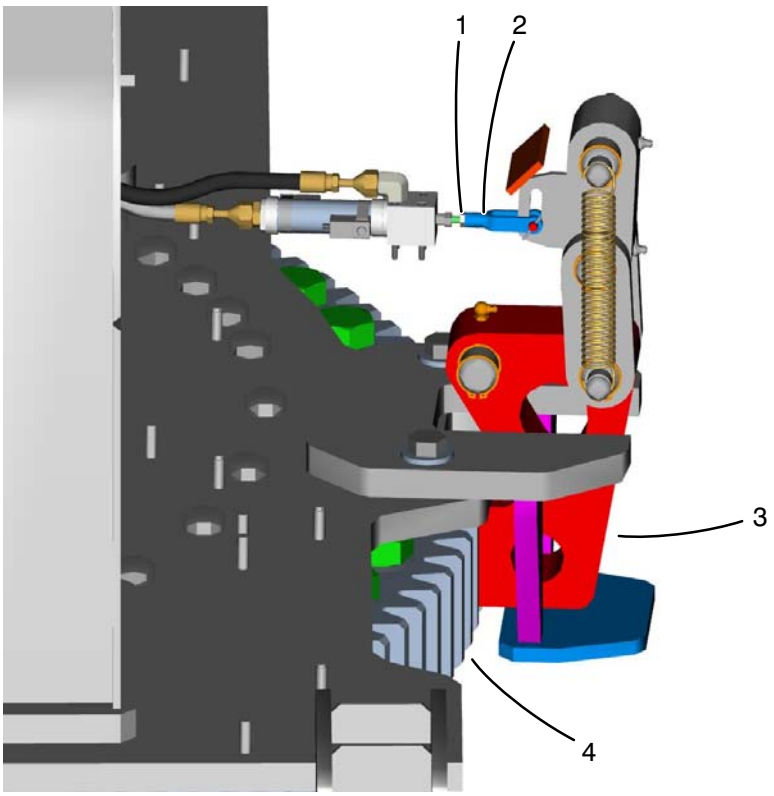
The travel swing lock is a two position, positive lock of the upper over the carrier to prevent swinging of the upper. The travel swing lock must be kept adjusted.

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(s). Refer to Figure 3—18.
3. Check the engagement of the swing lock pin in the retainer plate. The pin should extend in the retainer plate to within 0.10 to 0.22 in (*2.5 to 5.6mm*) from the bottom of the retainer plate.
4. Adjust the stroke of the swing lock as required by using the cable adjusting nuts.
5. With the swing lock in the disengaged position, adjust proximity switch to 0.15 to 0.20 in (*3.8 to 5.0mm*) clearance. Refer to Figure 3—19.
6. Test the swing lock in each working position before operating the crane.



1. Proximity Switch

Figure 3—19
Swing Lock Proximity Switch Adjustment



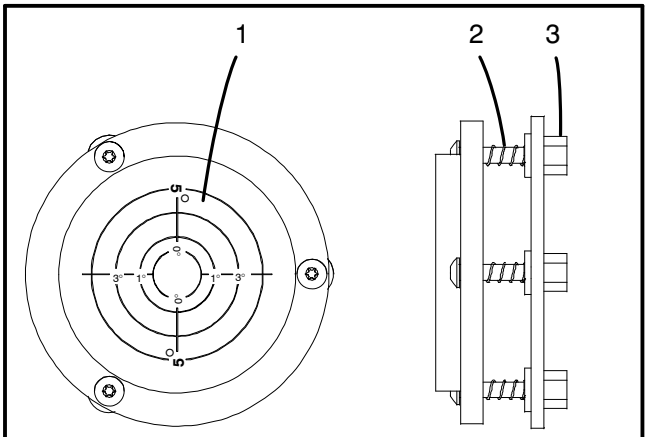
1. Jam Nut
2. Cylinder Clevis
3. Swing Lock Pawl
4. Turntable Bearing Gear Teeth

Figure 3–20
360° Swing Lock Adjustment

360° Swing Lock System Inspection And Adjustment (If Equipped)

The 360° swing lock system, if equipped, functions to prevent rotation of the upper over the carrier. The 360° swing lock functions by engaging a pawl in the external turntable bearing gear teeth. The swing lock must be correctly adjusted in order to operate properly. Use the following procedures to properly inspect and adjust the 360°swing lock.

1. Park the crane on a firm, level surface, shift the transmission to neutral, and engage the park brake. Level the crane on outriggers.
2. Engage the travel and 360° swing locks. Shut-down the engine(s).
3. Visually inspect the 360° swing lock pawl. The pawl should be fully engaged with the linkage just over center. Refer to Figure 3–20.
4. If the pawl is not fully engaged and the linkage is not just over center, adjust the cylinder clevis to correctly position it. Loosen the jam nut on the clevis. Adjust clevis and tighten jam nut
5. Test the 360° swing lock before operating the crane.



1. Glass Vial
2. Spring
3. Adjusting Nut

Figure 3–21
Bubble Level – Upper Cab

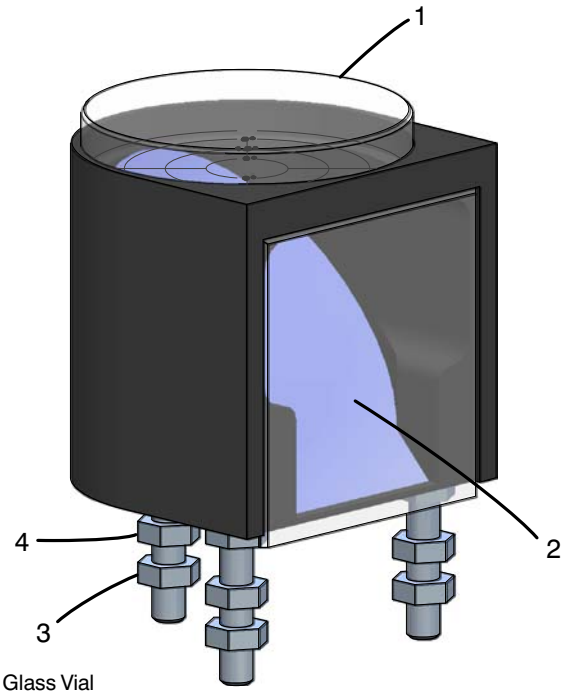
Bubble Level Adjustment

A bubble level, for leveling the crane on outriggers, is mounted on the upper frame visible through the right side upper cab window and at each ground controlled outrigger station. They 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. With the boom fully retracted and at counterweight and boom angles listed in the chart below, level the upper frame with the outriggers jacks.

Counterweight on Upper	Retracted Boom Angle
0	68°
2,000	64°
6,400	62°

3. Verify the crane is level by placing a carpenter's level across the the turntable bearing just in front of upper frame. Check levelness with the upper at any swing position (swing the upper 360° to verify a level reading at all positions). Adjust the outriggers as necessary.



1. Glass Vial
2. Mirror
3. Bottom Nut
4. Adjusting Nut

Figure 3–22
Side View Bubble Level – Ground Controlled Outrigger Station

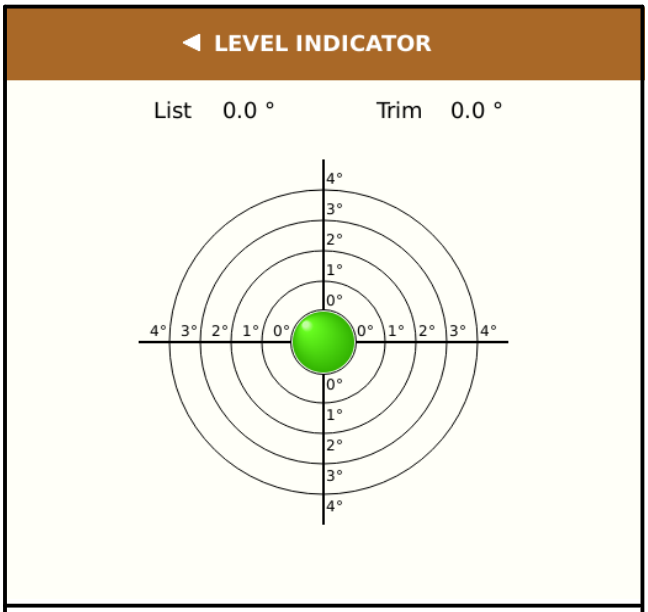


Figure 3–23
Level Indicator Screen

4. To adjust upper cab bubble level, rotate the adjusting nuts as required until the bubble is centered within the vial. Refer to Figure 3—21.

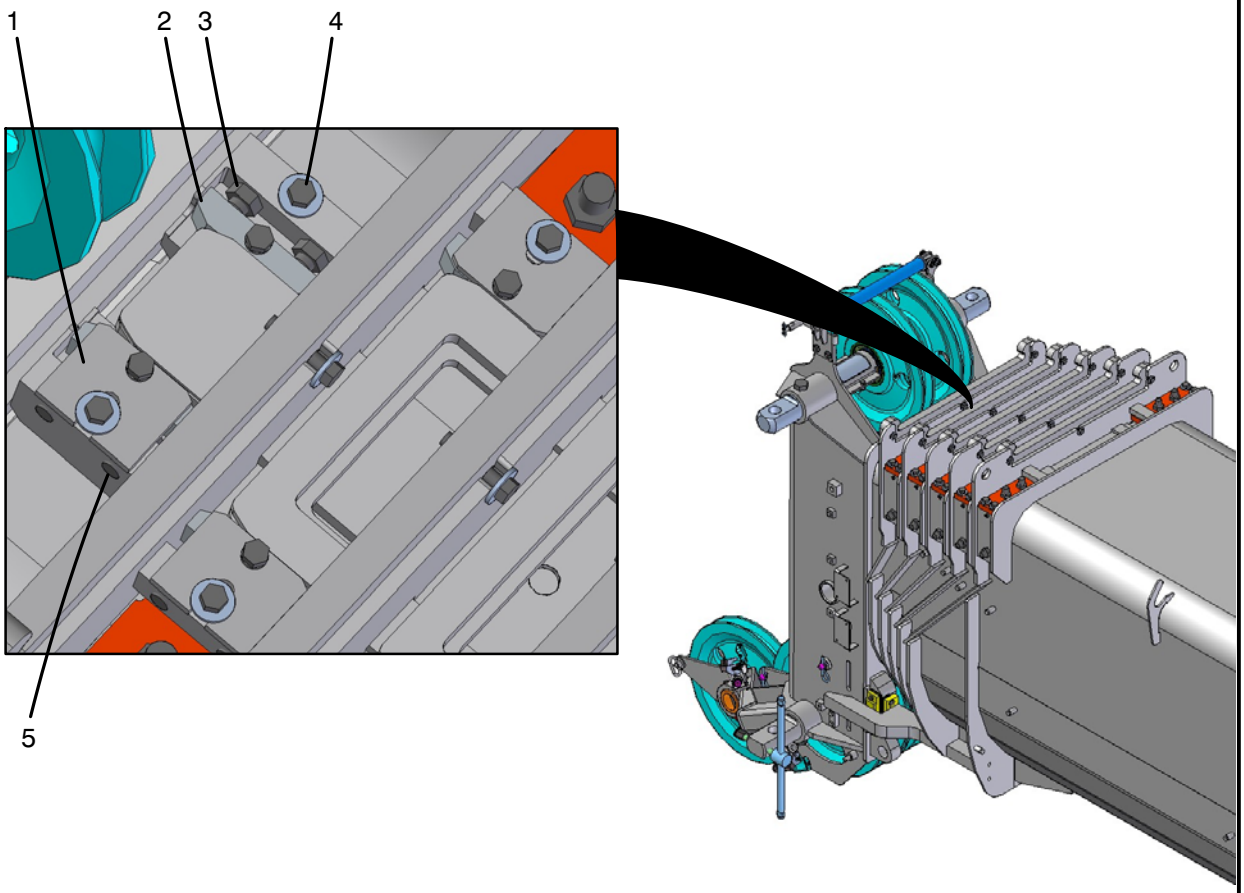
   Note: Do not flatten out the springs under the bubble level. Loosen rather that overtighten the adjustment nuts to gain the necessary adjustment.

5. To adjust side view level at the ground control outrigger stations, loosen bottom nuts and rotate adjusting nuts as required until the bubble is centered within the vial. Tighten bottom nuts.
6. Once all bubble levels are correctly adjusted, go to the outrigger level screen on the upper crane control display in the upper cab to verify that the electronic outrigger level is indicating the crane is level. Refer to Section 1 of this Operator's Manual to access the O/R (Outrigger) Level screen.
7. If the center indicator light is not illuminated green, the outrigger level sensor must be calibrated. Refer to the crane's Shop Manual for the calibration procedure. Contact your Link-Belt distributor to calibrate the inclinometer. Refer to Figure 3—23.

Crane Monitoring System

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.



1. Plates
2. Blocks
3. Jam Nuts
4. Capscrews & washers
5. Setscrews

Figure 3—24
Boom Section Anti-Rotation Adjustment

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 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.
2. Fully extend outriggers. Position the upper facing directly over the rear of the carrier and engage the travel swing lock.
3. Fully retract the boom and place it at 0 degrees.
4. Adjust the setscrews to maintain the boom sections in a vertical position. Refer to Figure 3—24.
5. Adjust setscrews as follows:
   a. Remove the capscrews and washers and remove the plates.
   b. Loosen the jam nuts and adjust the setscrews until the blocks fit snug against the boom sections.
   c. Tighten jam nuts.
   d. Position the plates and install the capscrews and washers.

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 3−25.

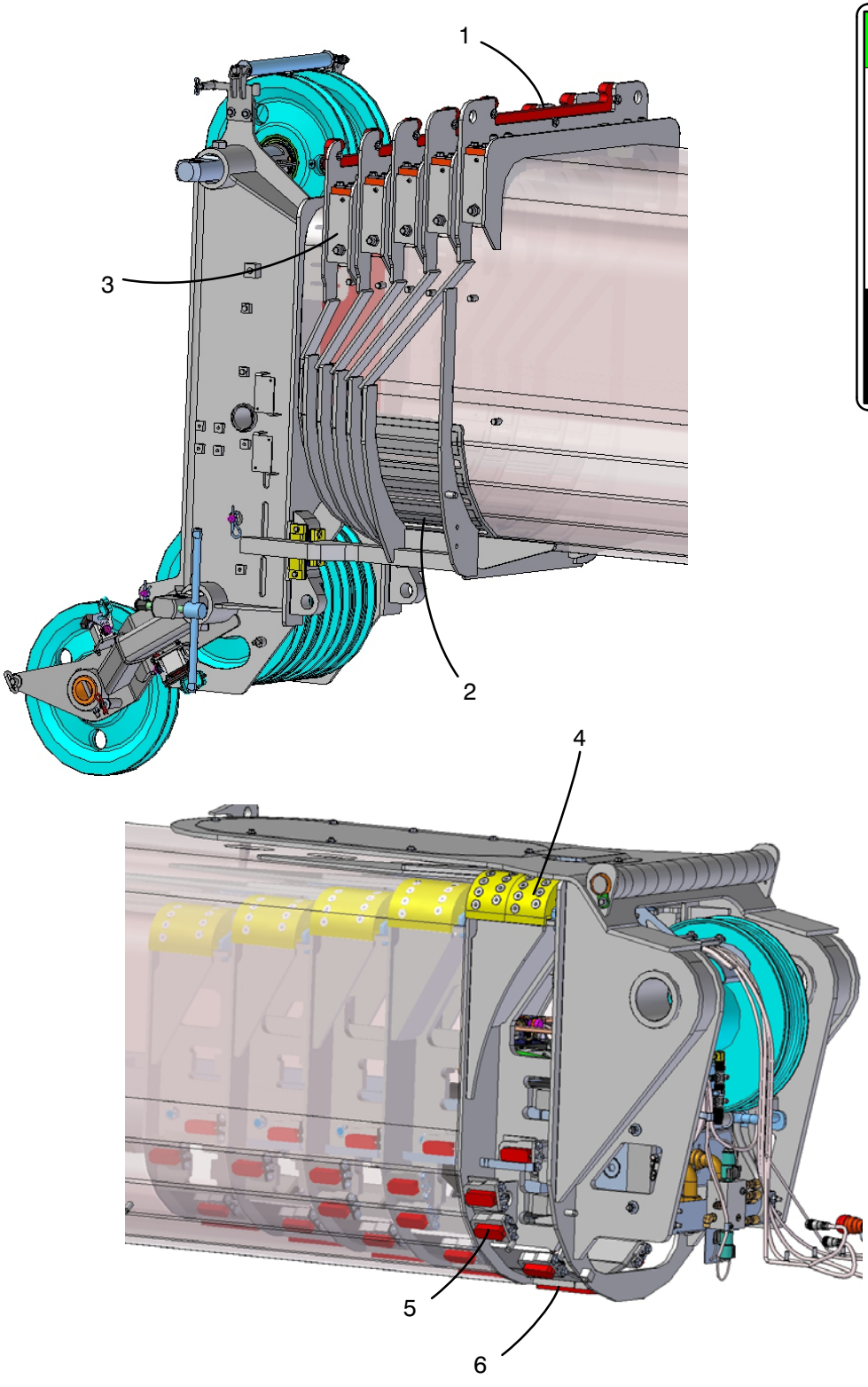
1. Park the crane on firm, level surface, shift the transmission to neutral, and engage the park brake.
2. Level the crane on fully extended outriggers.
3. Ensure all crane movements keep the crane within capacity as listed in the Crane Rating Manual.
4. Engage the travel swing lock with the upper directly over the rear of the carrier.
5. Lower the boom and extend each boom section as required to gain access to each wear shoe.

⚠ WARNING

To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device to reach necessary areas.

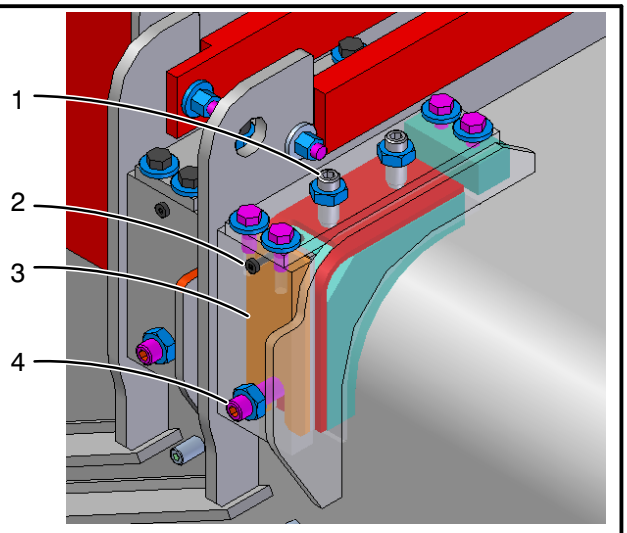
To prevent movement of individual boom sections, shutdown the engine and ensure that the operator has properly vacated the operators cab before putting hands or tools inside the boom. Unexpected movement of the boom sections could sever fingers, hands, arms, etc.

6. Check the thickness of the front bottom wear shoes . The wear shoes are to be replaced when the bottom most wear pads reach a minimum thickness of 1/2 in (*1.3cm*). To replace these shoes, extend the internal section out 3 ft, remove the front top wear shoes, lift up on the internal section, and remove and replace the shoes. Lower the internal section back down, reinstall and adjust the front top wear shoes.
7. 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 3−25 and Figure 3−26)
      1. There is a pair of front top wear shoes on the base, T1, T2, T3 and T4 boom sections. The front top wear shoes 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 shoes should contact the inside section on both sides. No clearance between wear shoe and boom section is required.
         For all sections, install as many horizontal shims as possible between the wear shoe backer plate and the boom plate. Attach the shims to the boom plate with the retaining screw. Back off the adjustment setscrews one complete turn and torque the jam nuts to 150-175 ft lb (*204-237Nm*).



1. Wire Rope Wear Bars (5 Places)
2. Front Bottom Wear Shoes — (30 Places)
3. Front Top Wear Shoes — (10 Places)
4. Rear Top Wear Shoes (20 Places)
5. Rear Side Wear Shoes (22 Places)
6. Rear Bottom Wear Shoes (5 Places)

Figure 3—25
Boom Wear Shoe Adjustment And Inspection



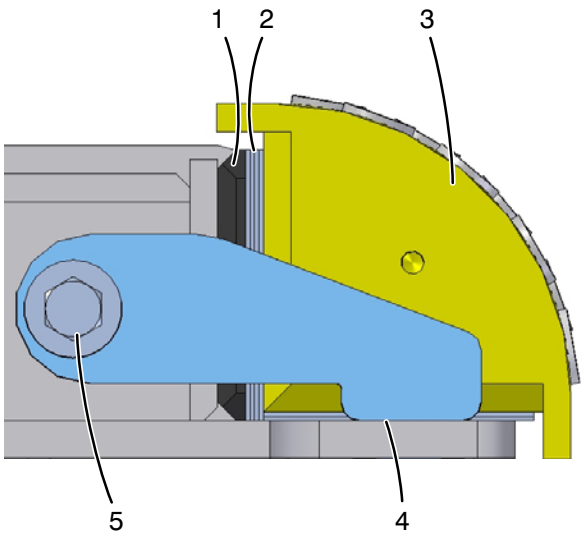
1. Vertical Adjustment Setscrew
2. Retaining Screw
3. Horizontal Adjustment Shims
4. Horizontal Adjustment Setscrew

Figure 3–26
Front Top Wear Shoe

2. Vertical adjustment is used to hold the wear shoe down against the top of the inside boom section. Adjust these so that there is no clearance between wear shoes and boom section. Torque the jam nuts to 150-175 ft lb (*204-237Nm*).
3. Replace when shoe is worn to 0.375 in (*0.95cm*) minimum thickness or when adjustment is used up whichever comes first.

b. Rear Top Wear Shoes
(Refer to Figure 3–25 and Figure 3–27)

1. There is a pair of rear top wear shoes on each side of the T5, T4, T3, T2, and T1 boom sections. Adjustment of these wear shoes is accomplished through holes in the side and top of the adjacent boom section. Extend only the boom sections required, and just far enough, until the horizontal adjustment shims are accessible through the holes in the sides of the adjacent section. Leave the other inner sections fully retracted at this point.
2. For proper inspection, the rear top wear shoes must be removed and measured. Access through the sides of the boom and remove the capscrews and washers which secure the rear top wear shoes keeper plates. Remove the keeper plates.



1. Spacer
2. Horizontal Adjustment Shims
3. Rear Top Wear Shoe
4. Keeper Plate
5. Capscrew And Washer

Figure 3–27
Rear Top Wear Shoe

3. Remove horizontal adjustment shims as needed.
4. Remove and inspect the height of the rear top wear shoes. Minimum wear shoe height is 4-15/16 in (*125.4mm*). Wear shoes worn to less than this dimension must be replaced.

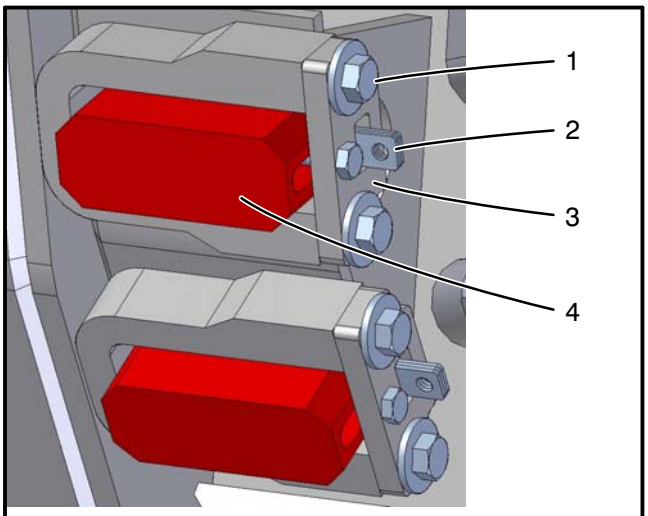
   Note: It will be necessary to lift the extended boom sections, with an appropriate auxiliary lifting device, in order to relieve pressure on the wear shoe for removal and adjustment.
5. Lift the boom section until it just contacts the bottom center wear pad. Install the rear top wear shoes back into their proper location. Note the orientation of the wear shoes with the large chamfers towards either end. If new wear shoes are being installed, the horizontal shims may need to be removed to allow room for the larger new shoes.

6. Horizontal adjustment of the rear top wear shoes is accomplished with the adjustment shims. This adjustment is used to align one section inside another. The straightness of the boom is dependent on this adjustment. Small holes in the sides of the boom sections allow measurements between sections. Set the gap between the sections equal on both sides to ensure boom straightness.
7. Install as many horizontal shims to fill the gap between the spacer and the rear top wear shoe.
8. Apply Loctite® 242 to the capscrews used to secure the keeper plates.
9. Install the keeper plates and secure them with the capscrews and washers.

c. Rear Side & Bottom Wear Shoes
(Refer to Figure 3—25 and Figure 3—28)
1. The rear side and bottom wear shoes are adjustable. Shims should be added to the rear side and bottom 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 ensure the shoe is tight against the outer section will not fit through the hole in the retainer plate.

2. For inspection, 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.
3. For proper inspection, the rear side and bottom wear shoes must be removed. Remove the capscrews and washers which secure the retaining plates. Remove the retaining plates. If necessary, 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 (*3.2cm*) for the side and diagonal wear shoes. Wear shoes worn to less than this dimension must be replaced.



1. Capscrews And Washers
2. Shims
3. Retaining Plates
4. Wear Shoes

Figure 3—28
Rear Bottom Side & Diagonal Wear Shoes

5. Install the rear side and bottom wear shoes back into their pockets and install shims until the wear shoes are tight against the larger outer section.
6. Apply Loctite® 242 to the capscrews used to secure the retaining plates.
7. Install the retaining plates and secure them with the capscrews and washers.

8. 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.

Hydraulic System Pressures Check And Adjustment

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.

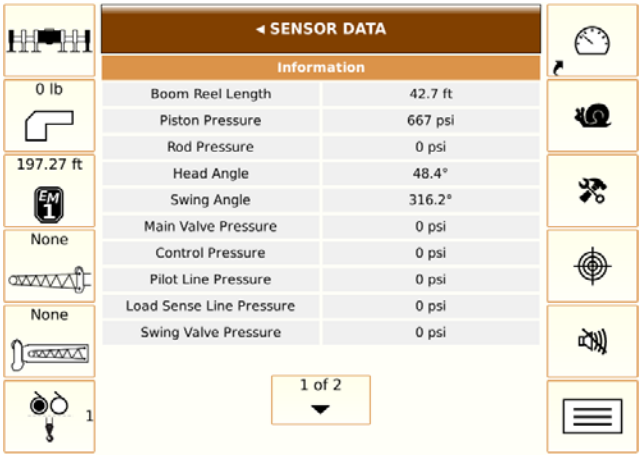
If a new or rebuilt pump is installed, all relief valve pressures must be backed off and reset, as outlined in this Section of this Operator's Manual before putting the crane in operation. The purpose of this is to avoid the possibility of damaging the new pump from over pressurization if relief valves 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.



Hydraulic pressure values will display on the sensor data screen on the Pulse Crane Control System Display in the upper cab. Refer to "Diagnostics Menu" in Section 1 of this Operator's Manual.

Preparing The Crane For Checking Relief Pressures

1. Park the crane on firm, level surface, shift the transmission to neutral, and engage the park brake.
2. Level the crane on outriggers and operate the hydraulic functions, as required, to bring the hydraulic oil temperature to its normal operating range. Refer to "Hi Performance Hydraulic Oil" chart in Section 2 of this Operator's Manual for oil operating temperature ranges.
3. Ensure all crane movements keep the crane within capacity as listed in the Crane Rating Manual.
4. Engage the travel swing lock with the upper directly over the rear of the carrier.
5. Fully retract and lower the boom. Shutdown the engine(s).

   Note: Checking relief valve pressures is simplified by using two persons, one in the operator's cab to operate the controls and one to check and adjust the relief valves.

Relief Valve Pressure Checking Instructions

1. 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.
2. With the ignition on but engine off, release the hydraulic system precharge pressure and work the control, for the circuit being checked, back and forth to relieve any trapped hydraulic pressure.

   Note: For functions which are operated by a toggle switch, the ignition switch must be in the "ON" position but do not start the engine(s).

WARNING

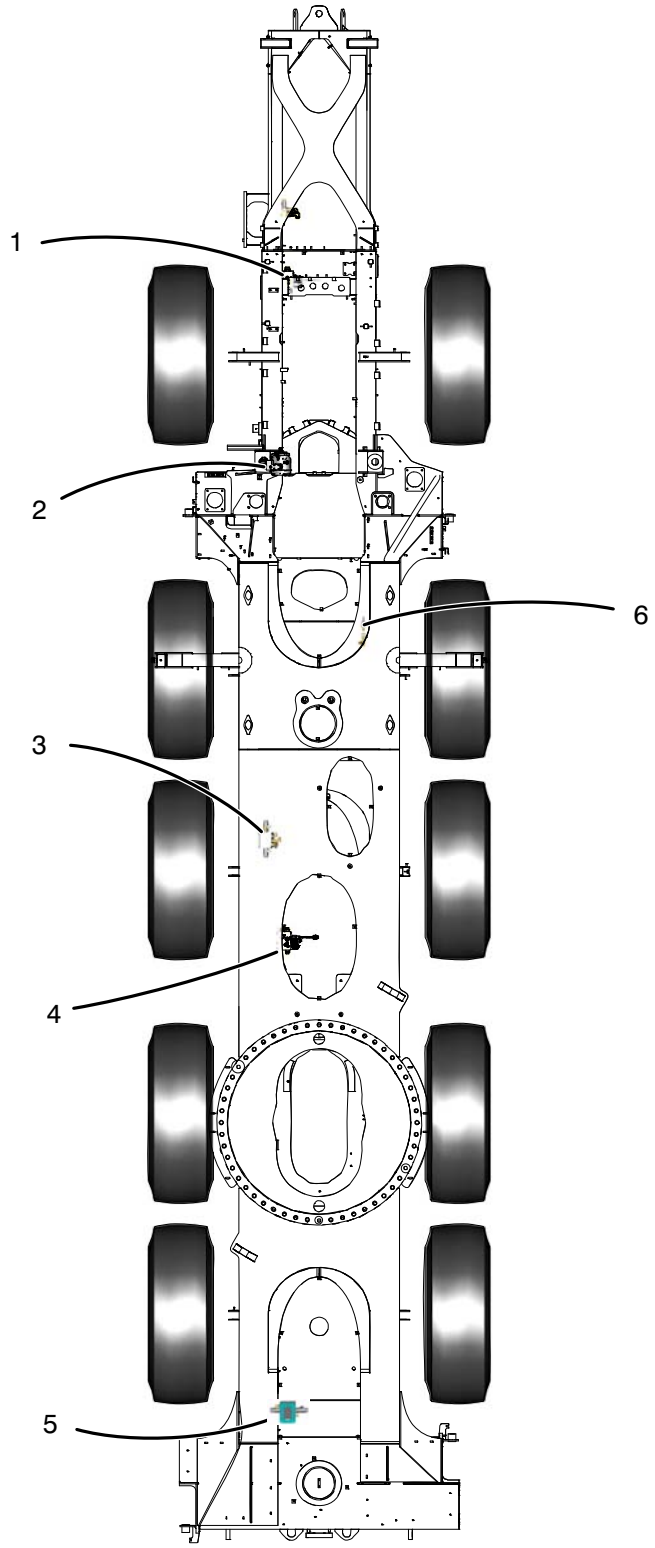
All trapped hydraulic pressure must be exhausted from the system before installing a gauge in any quick disconnect. A sudden release of hot oil could cause burns or other serious injury.

3. Install the pressure gauge on the quick disconnect fitting.
4. Refer to "Hydraulic Pressure Settings" chart to determine the correct pressure setting for the circuit being checked. Also, review the procedure for checking that particular circuit outlined in the chart.
5. Start the engine(s).
6. If applicable, fully engage the control for the circuit being checked and hold it in that position.
7. With the engine(s) running at the speed specified in the "Hydraulic Pressure Settings" chart, check the gauge for the correct reading, adjust as required.

   Note: Obtain each final pressure by bringing the pressure up to the proper setting, not by backing down to it.

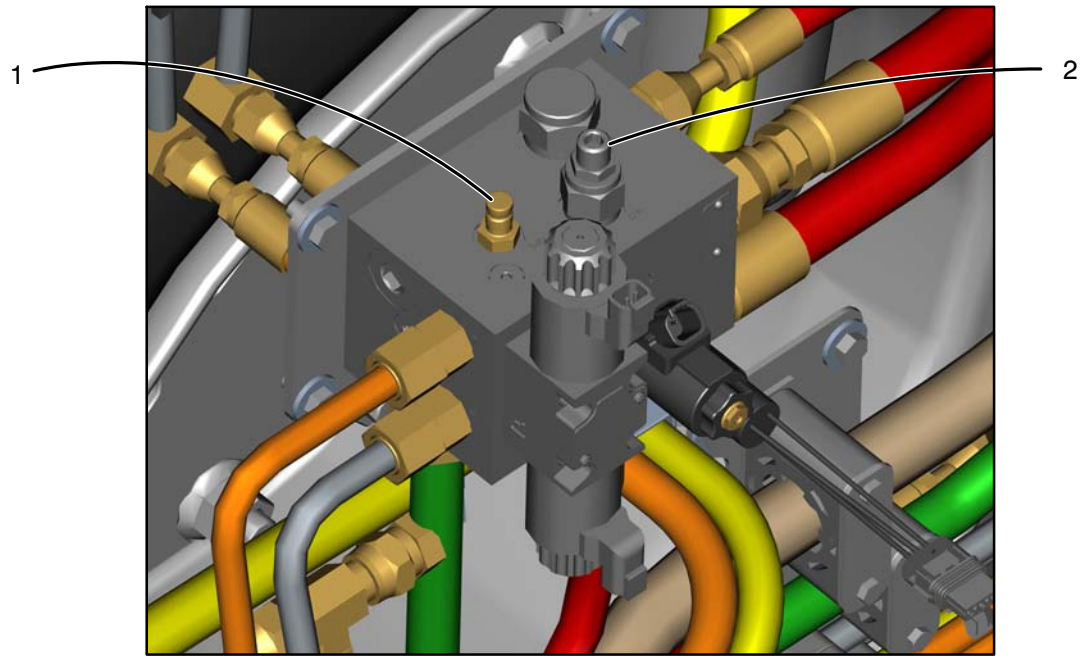
8. Allow the engine(s) to return to idle before shutting it (them) down.
9. Release the hydraulic system precharge pressure and work the control back and forth to relieve any hydraulic pressure before removing pressure gauge from the quick disconnect fitting.

Hydraulic Pressure Settings — Carrier		
Hydraulic Circuit	**Quick Disconnect & Adjustment Location**	**Relief Valve Setting**
Outrigger & Suspension	Figure 3—30	3,000 psi (*20 684kPa*)
Steering (Axle 1 & 2)	Figure 3—31	1,750 psi (*12 066kPa*)
Steering (Axle 3 & 4)	Figure 3—32	2,400 psi (*16 547kPa*)
Steering (Axle 5)	Figure 3—33	2,500 psi (*17 237kPa*)
Engine Cooling Fan Pump	Figure 3—34	3,400 psi (*23 442kPa*)
Swing Brake Release Pressure Reducing Valve	Figure 3—35	425 psi±25 psi (*2 930±172kPa*)
Note: Adjust All Pressures to Within ±50 psi (*344 kPa*) Except Where Noted.		



1. Steering (Axle 1)Relief Valve
2. Engine Cooling Fan Pump Pressure Compensator
3. Steering (Axle 3&4) Relief Valve
4. Outrigger & Suspension Relief Valve
5. Steering (Axle 5)Relief Valve
6. Swing Brake Release Reducing Valve

Figure 3–29
Carrier Relief Valves



1. Quick Disconnect Fitting
2. Relief Valve Adjuster

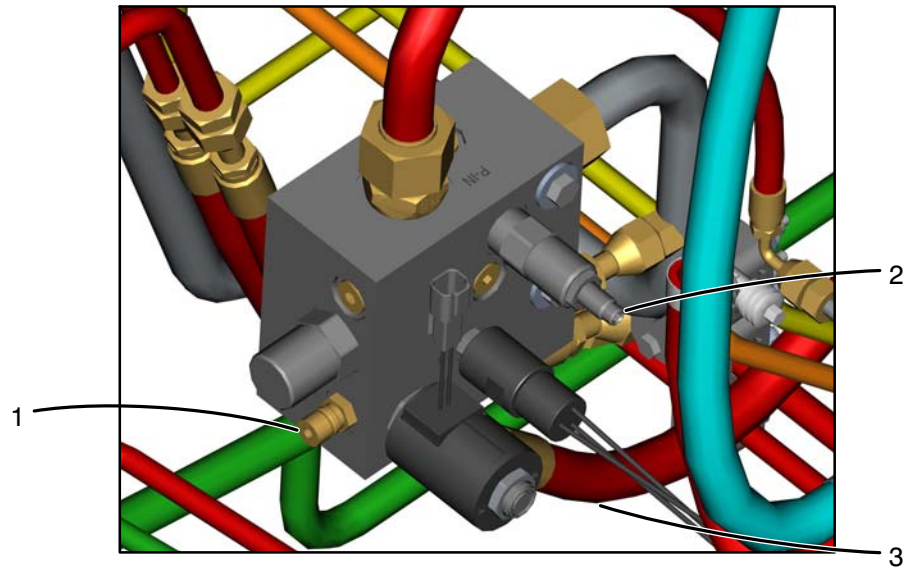
Figure 3–30
Outrigger Circuit Relief Valve

Outrigger & Suspension 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. Boom over front, fully retracted, travel swing lock engaged, crane on tires.
3. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3–30.
4. Start the engine and maintain idle speed.
5. Fully retract an outrigger beam and hold. Check pressure.
6. Adjust pressure as required to 3,000 psi (*20 684kPa*).
7. Relieve hydraulic system pressure.
8. Remove the pressure gauge from the quick disconnect fitting.



1. Quick Disconnect Fitting
2. Relief Valve Adjuster
3. Steer Pressure Supply Hose

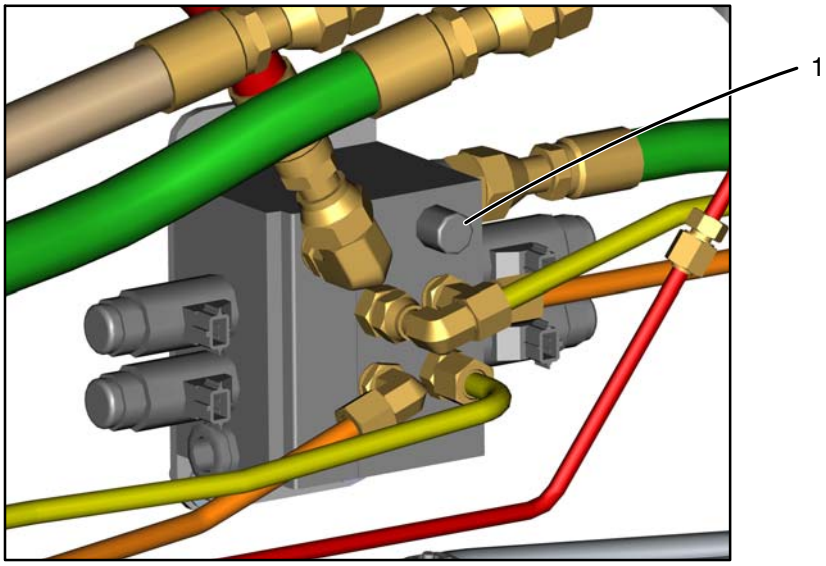
Figure 3–31
Front Steering Relief Valve

Steering (Axle 1 & 2) 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. Boom over front, fully retracted, travel swing lock engaged, crane on tires.
3. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3–31.
4. Remove the steer pressure supply hose on the bottom of the steering valve. Plug both the hose and the open valve.
5. Start the engine and maintain idle speed.
6. Check pressure.
7. Adjust pressure as required to 1,750 psi (*12 066kPa*).
8. Shutdown the engine.
9. Relieve hydraulic system pressure.
10. Remove the pressure gauge from the quick disconnect fitting.
11. Reinstall hose.



1. Relief Valve Adjuster

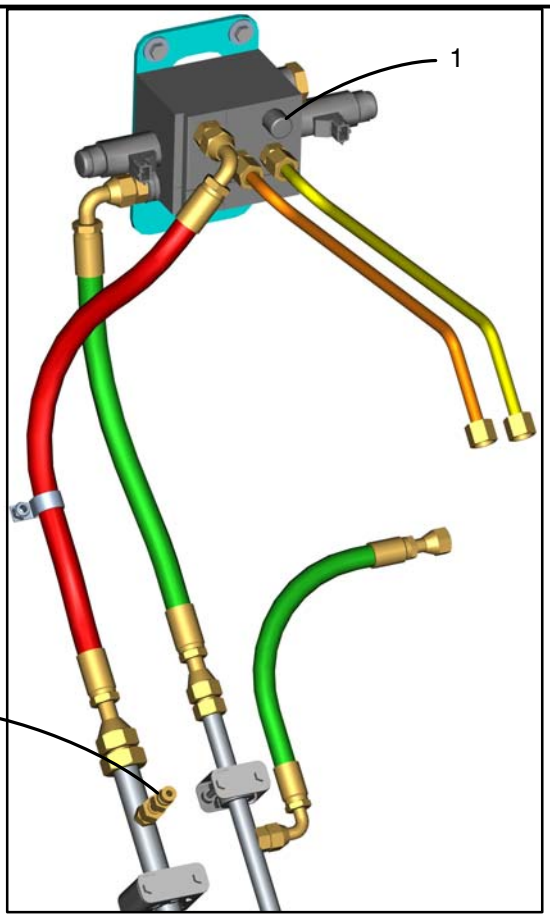
Figure 3–32
Steering (Axle 3 & 4) Relief Valve

Steering (Axle 3 & 4) 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. Boom over front, fully retracted, travel swing lock engaged, crane on tires.
3. Install the pressure gauge on the quick disconnect fitting on the outrigger circuit relief valve. Refer to Figure 3–30.
4. Start the engine and maintain idle speed.
5. Steering Selection Switch in the OFFROAD position.
6. Using the manual steer switch, turn steering wheel full right or left and hold. Check pressure.
7. Adjust pressure as required to 2,400 psi (*16 547kPa*). Refer to Figure 3–32.
8. Shutdown the engine.
9. Relieve hydraulic system pressure.
10. Remove the pressure gauge from the quick disconnect fitting. Refer to Figure 3–30.



1. Relief Valve Adjuster
2. Quick Disconnect Fitting

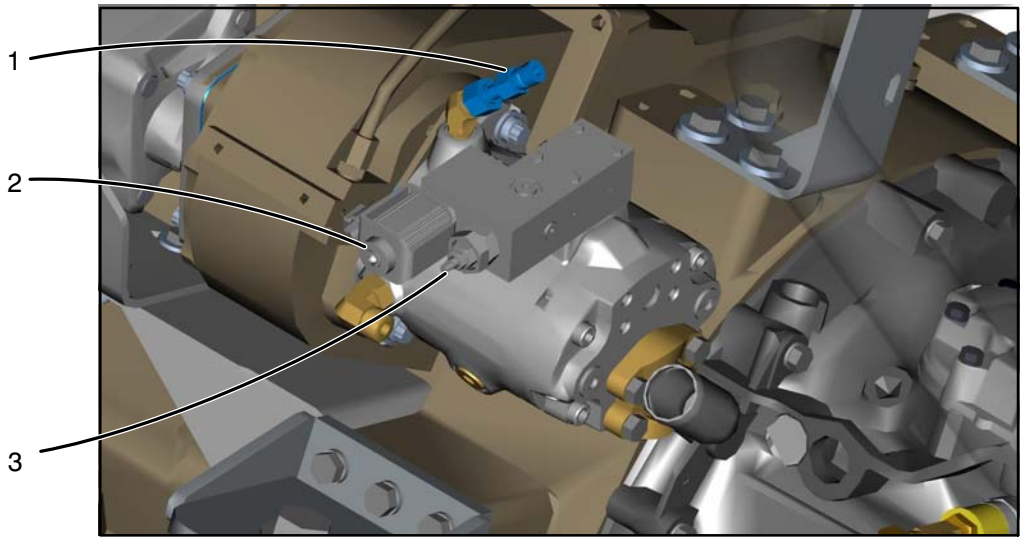
Figure 3–33
Steering (Axle 5) Relief Valve

Steering (Axle 5) 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. Boom over front, fully retracted, travel swing lock engaged, crane on tires.
3. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3–33.
4. Start the engine and maintain idle speed.
5. Steering Selection Switch in the OFFROAD position.
6. Using the manual steer switch, turn steering wheel full right or left and hold. Check pressure.
7. Adjust pressure as required to 2,500 psi (*17 237kPa*).
8. Shutdown the engine.
9. Relieve hydraulic system pressure.
10. Remove the pressure gauge from the quick disconnect fitting.

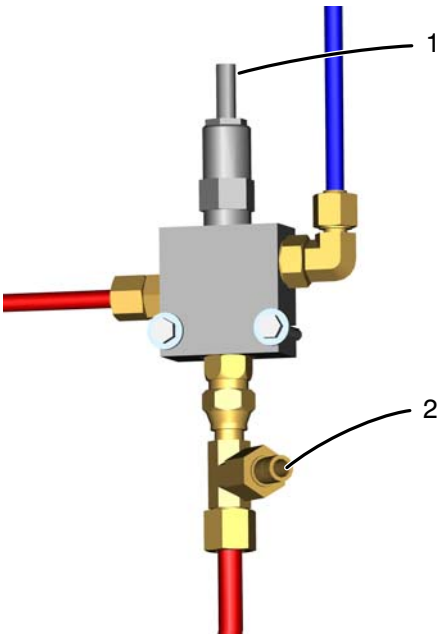


1. Quick Disconnect Fitting
2. Pump Solenoid
3. Pressure Compensator Adjuster

Figure 3–34
Engine Cooling Fan Pressure Adjustment

Engine Cooling Fan Pressure 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".
2. Unplug pump solenoid electrical wires. Refer to Figure 3–34.
3. Install the pressure gauge on the quick disconnect fitting.
4. Start the engine and gradually increase the engine speed to full throttle.
5. Check pressure.
6. Adjust pressure as required to 3,400 psi (*23 442kPa*).
7. Return engine to idle speed and shutdown.
8. Relieve hydraulic system pressure.
9. Remove the pressure gauge from the quick disconnect fitting.
10. Reconnect pump solenoid electrical wires.



1. Pressure Reducing Valve Adjuster
2. Quick Disconnect Fitting

Figure 3–35
Boom Float Reducing Valve

Swing Brake Release Pressure Reducing Valve

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".

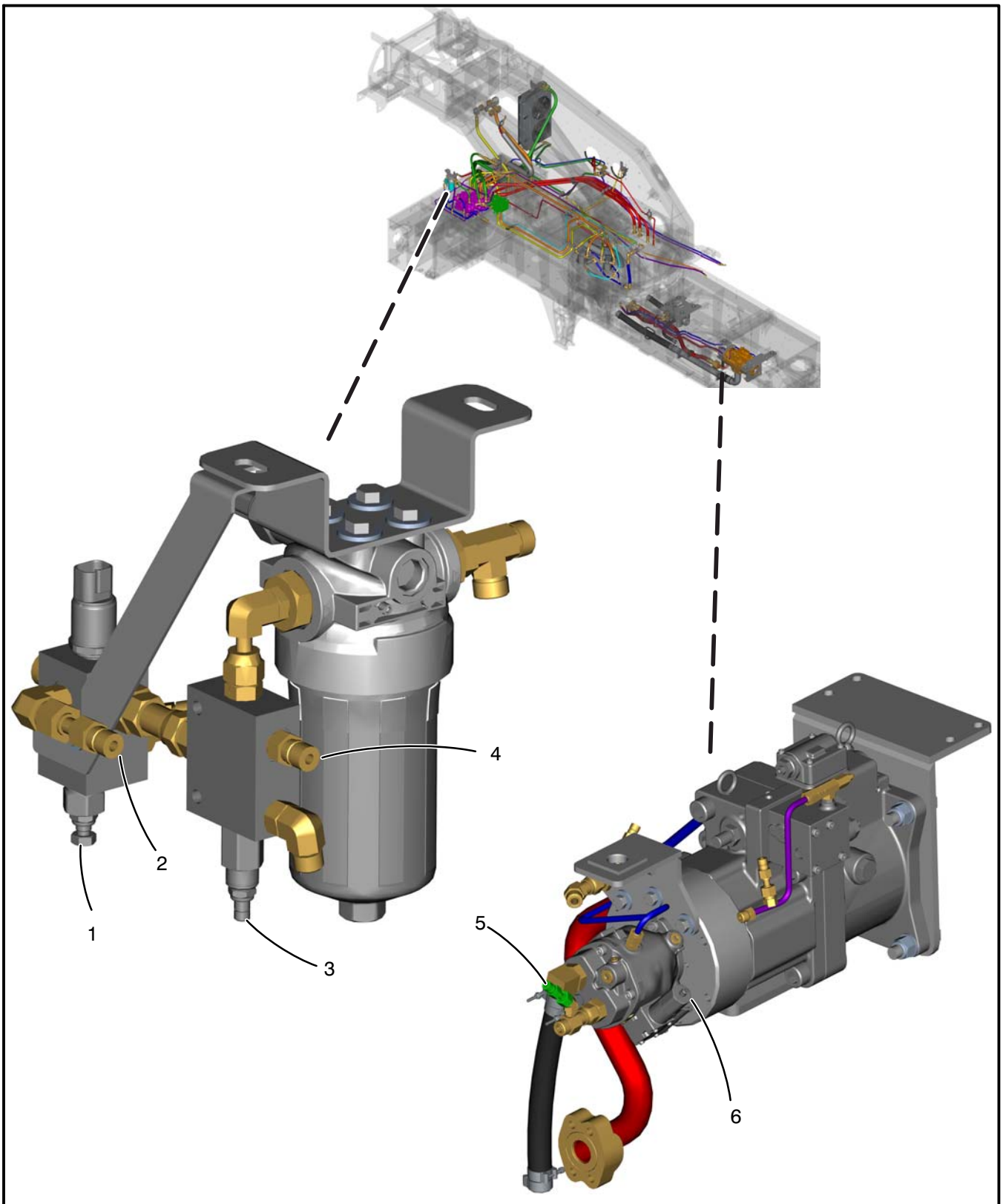
   Note: Idle speed must be maintained in order to obtain an accurate reading.

2. Boom over front, fully retracted, travel swing lock engaged, crane on tires.
3. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3–35.
4. Unscrew adjuster until it reaches the screw stop.
5. Start the engine and maintain idle speed.
6. Adjust as required to 425 psi±25 psi (*2 930±172kPa*).

   Note: Valve assembly contains a check valve that can trap pressure. This trapped pressure must be relieved if the pressure reducing valve setting must be lowered.

7. Relieve hydraulic system pressure.
8. Remove the pressure gauge from the quick disconnect fitting.

Hydraulic Pressure Settings — Upper		
Hydraulic Circuit	**Quick Disconnect And Adjustment Location**	**Relief Valve Setting**
Pilot Control	Figure 3—36	500±25 psi (*3 447±172kPa*)
Controls		3,700 psi *(25 511kPa*
Control Pump Pressure Compensator		3,500 psi (*24 132kPa*)
Boom Pinning/Latching	Figure 3—37	750±25 psi (*5 171±172kPa*)
Boom Pinning Cylinder Pinned	Figure 3—38	100 psi±10 *(689±68.9kPA)*
Swing	Figure 3—39	2,000 psi (*13 789kPa*)
Counterweight Cylinder Extend	Figure 3—40	1,000 psi (*6 895kPa*)
Air Conditioner	Figure 3—41	2,000 psi (*13 789kPa*)
Boom Hoist/Telescope		
Load Sense Relief	Figure 3—42	4,600 psi (*31 716kPa*)
Telescope Extend Port Relief		2,800 +50 −0 psi (*19 305 +344 −0kPa*)
Boom Hoist Retract Port Relief		290±10 psi (*1 999±68.9kPa*)
Fly Storage Cylinder Reducing Valve	Figure 3—43	1,250 psi (*8 618kPa*)
Fly Storage Cylinder Extend	Figure 3—44	750 psi (*5 171kPa*)
Hydraulic Offset Fly Cylinder Extend	Figure 3—45	2,300 psi (*15 858kPa*)
Note: Adjust all pressures to within ±50 psi (*344kPa*) except where noted.		



1. Control Pressure Relief Valve Adjuster
2. Control Pressure Relief Valve Quick Disconnect Fitting
3. Pilot Pressure Reducing Valve Adjuster
4. Pilot Pressure Quick Disconnect Fitting
5. Control Pump Pressure Quick Disconnect Fitting
6. Control Pump Pressure Compensator Adjuster

Figure 3–36
Pilot Pressure & Controls Relief Valves

Control 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.

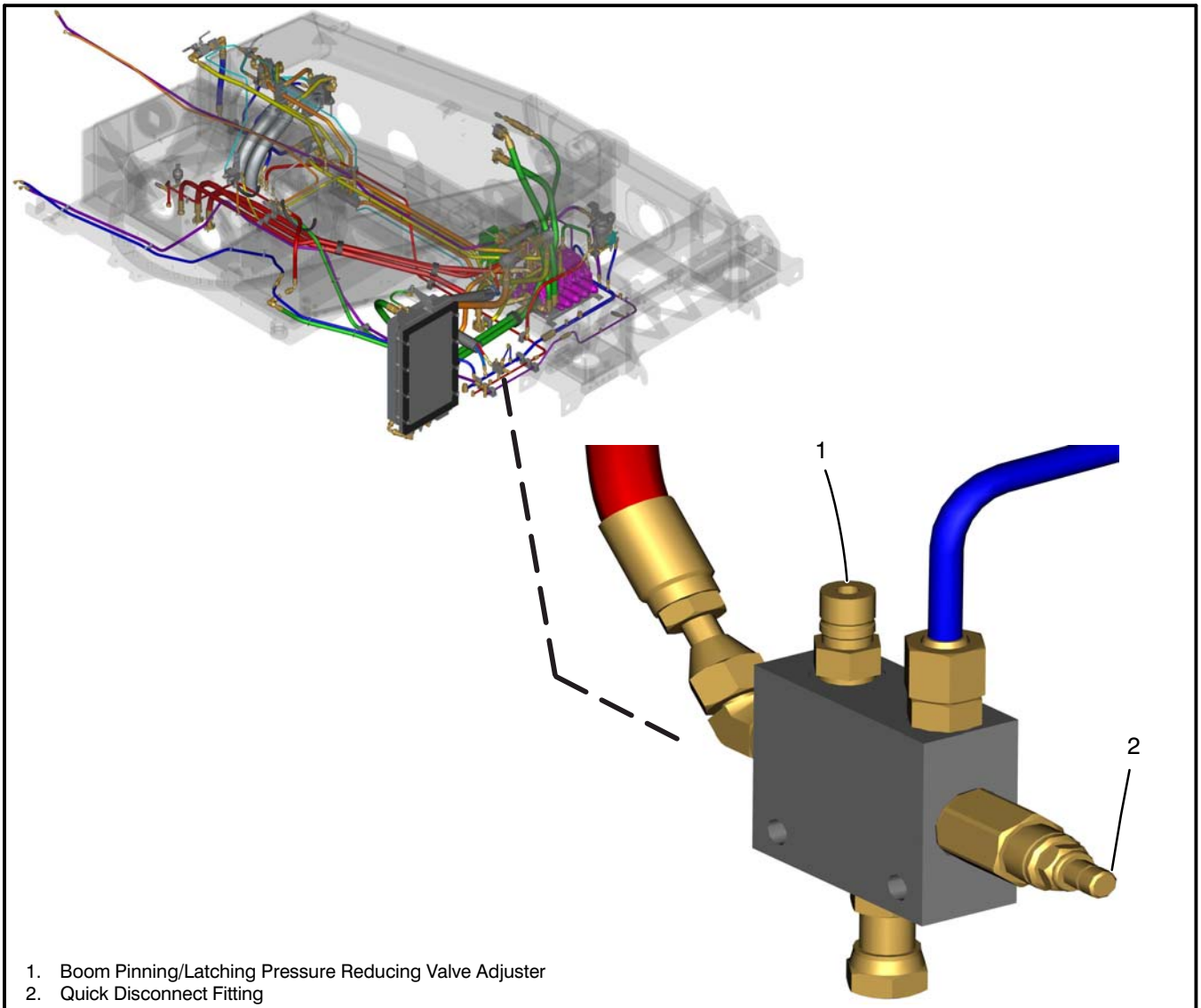
2. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3—36.
3. Start the engine and maintain idle speed.
4. Set control pump pressure compensator to maximum setting.
5. Check pressure.
6. Adjust pressure as required to 3,700 psi *(25 511kPa)*.
7. Reset control pressure pump to 3,500 psi (*24 132kPa*).
8. Shutdown engine.
9. Relieve hydraulic system pressure.
10. Remove the pressure gauge from the quick disconnect fitting.

Pilot Pressure 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. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3—36.
3. Start the engine and maintain idle speed.
4. Adjust pressure as required to 500±25 psi (*3 447±172kPa*).
5. Shutdown the engine.
6. Relieve hydraulic system pressure.
7. Remove the pressure gauge from the quick disconnect fitting.



1. Boom Pinning/Latching Pressure Reducing Valve Adjuster
2. Quick Disconnect Fitting

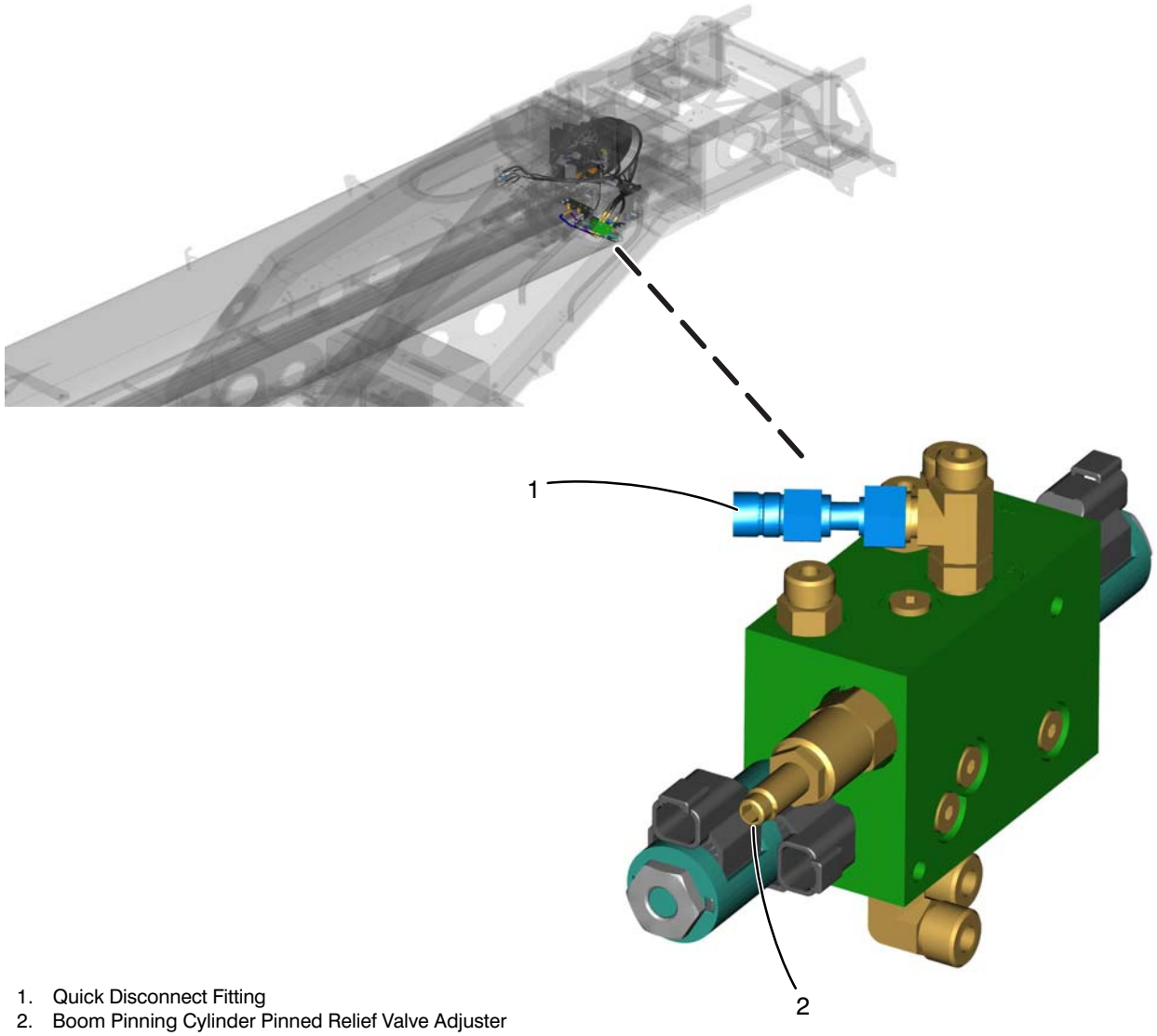
Figure 3–37
Boom Pinning/Latching Pressure Reducing Valve

Boom Pinning/Latching 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. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3–37.
3. Start the engine and maintain idle speed.
4. Check pressure. Adjust pressure as required to 750±25 psi (*5 171±172kPa*)).
5. Shutdown the engine.
6. Relieve hydraulic system pressure.
7. Remove the pressure gauge from the quick disconnect fitting.



1. Quick Disconnect Fitting
2. Boom Pinning Cylinder Pinned Relief Valve Adjuster

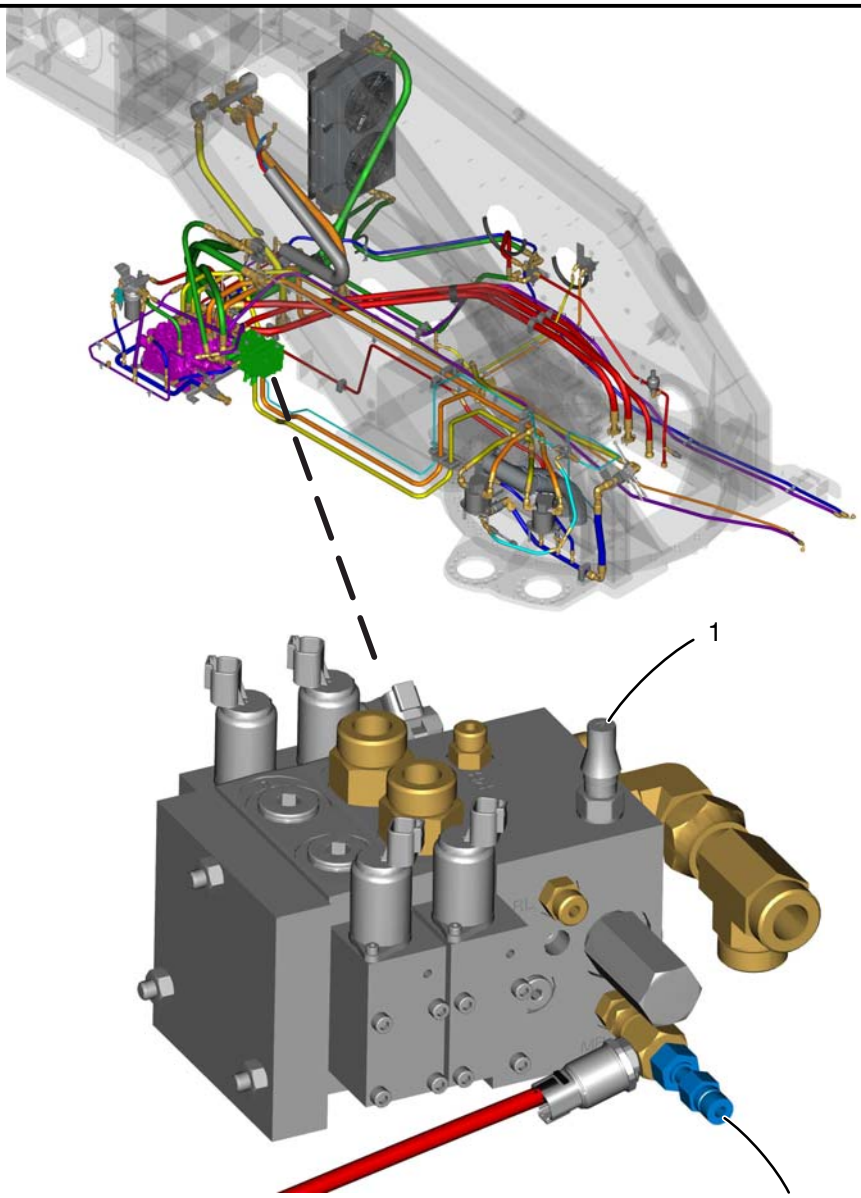
Figure 3—38
Boom Pinning Cylinder Pinned Relief Valve

Boom Pinning Cylinder Pinned 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. Refer to Figure 3—38.
4. Start the engine and maintain idle speed.
5. Using the manual telescope control box, press and hold the pin/unpin switch in the pin position. Refer to "Emergency Telescope Operation" in Section 01 of this Operator's Manual for manual control box operation. Check pressure. Adjust pressure as required to 100 psi±10 *(689±68.9kPA).*
6. Shutdown the engine.
7. Relieve hydraulic system pressure.
8. Remove the pressure gauge from the quick disconnect fitting.



1. Relief Adjuster
2. Quick Disconnect Fitting

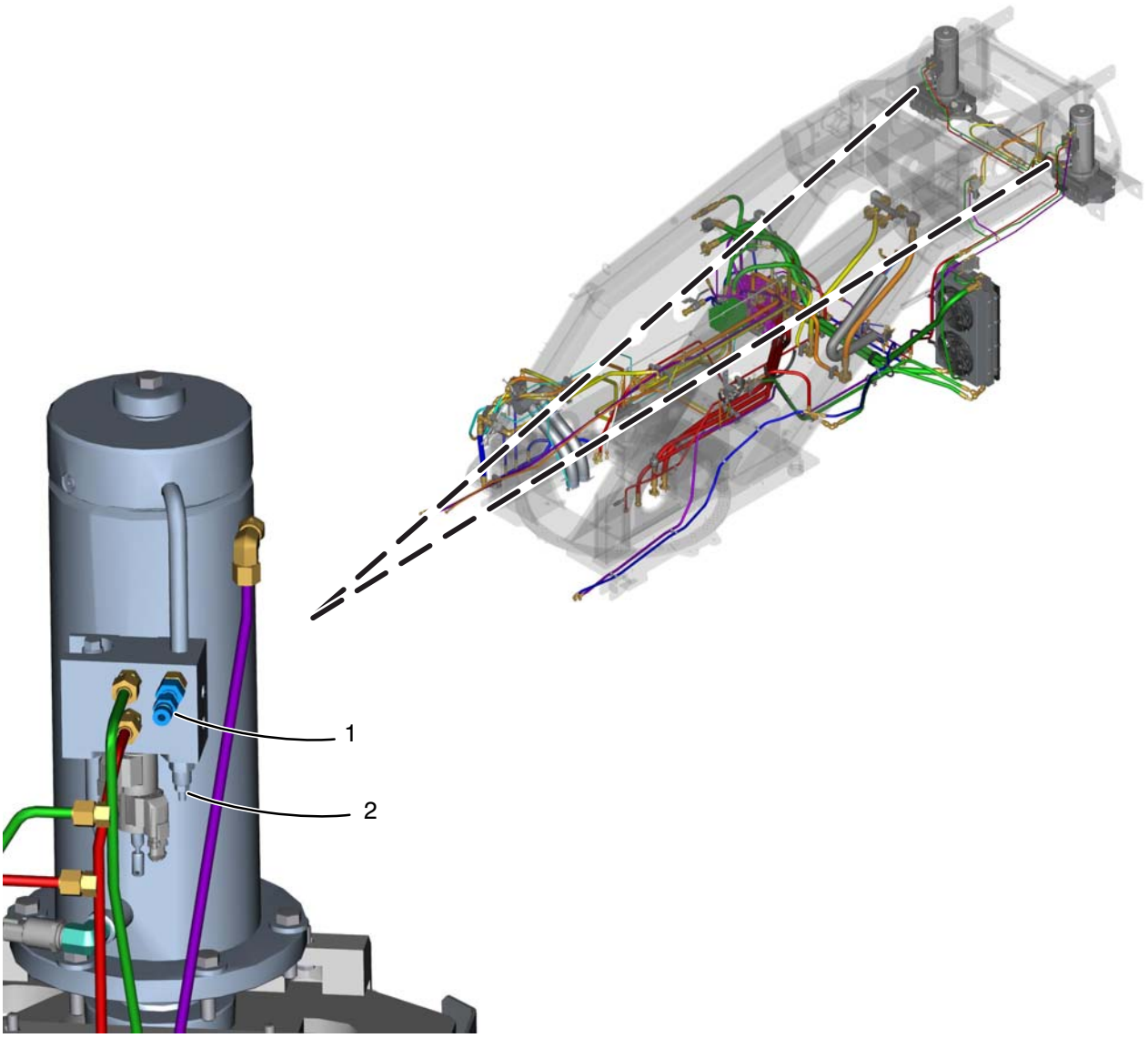
Figure 3—39
Swing Pressure Relief Valve

Swing 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. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3—39.
3. Engage travel swing lock.
4. Swing left and hold. Check pressure.
5. Swing right and hold. Check pressure.
6. Check Pressure. Adjust pressure as required to 2,205 psi (*15 203kPa*).
7. Shutdown the engine.
8. Relieve hydraulic system pressure.
9. Remove the pressure gauge from the quick disconnect fitting.



1. Quick Disconnect Fitting
2. Counterweight Cylinder Extend Relief Valve Adjuster

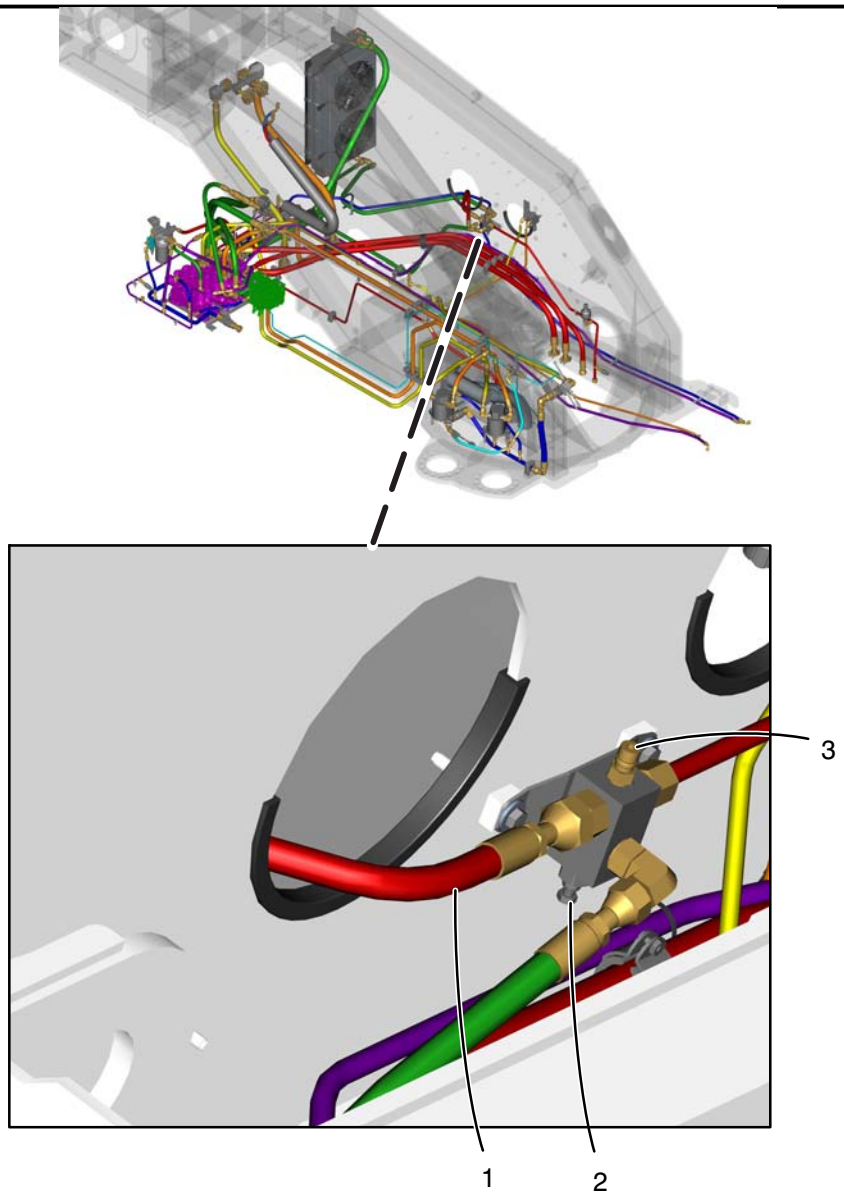
Figure 3—40
Counterweight Cylinder Extend Relief Valve

Counterweight Cylinder Extend Circuit Adjusting Procedure

1. Remove the counterweights from the upper. Refer to Section 1 of this Operator's Manual for correct procedures.
2. 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.

3. Install the pressure gauge on the quick disconnect fittings. Refer to Figure 3—40.
4. Start the engine and maintain idle speed.
5. Extend counterweight cylinders and hold. Adjust pressure as required to 1,000 psi (*6 895kPa*).
6. Shutdown the engine.
7. Relieve hydraulic system pressure.
8. Remove the pressure gauge from the quick disconnect fitting.
9. Repeat procedure for the other counterweight cylinder.

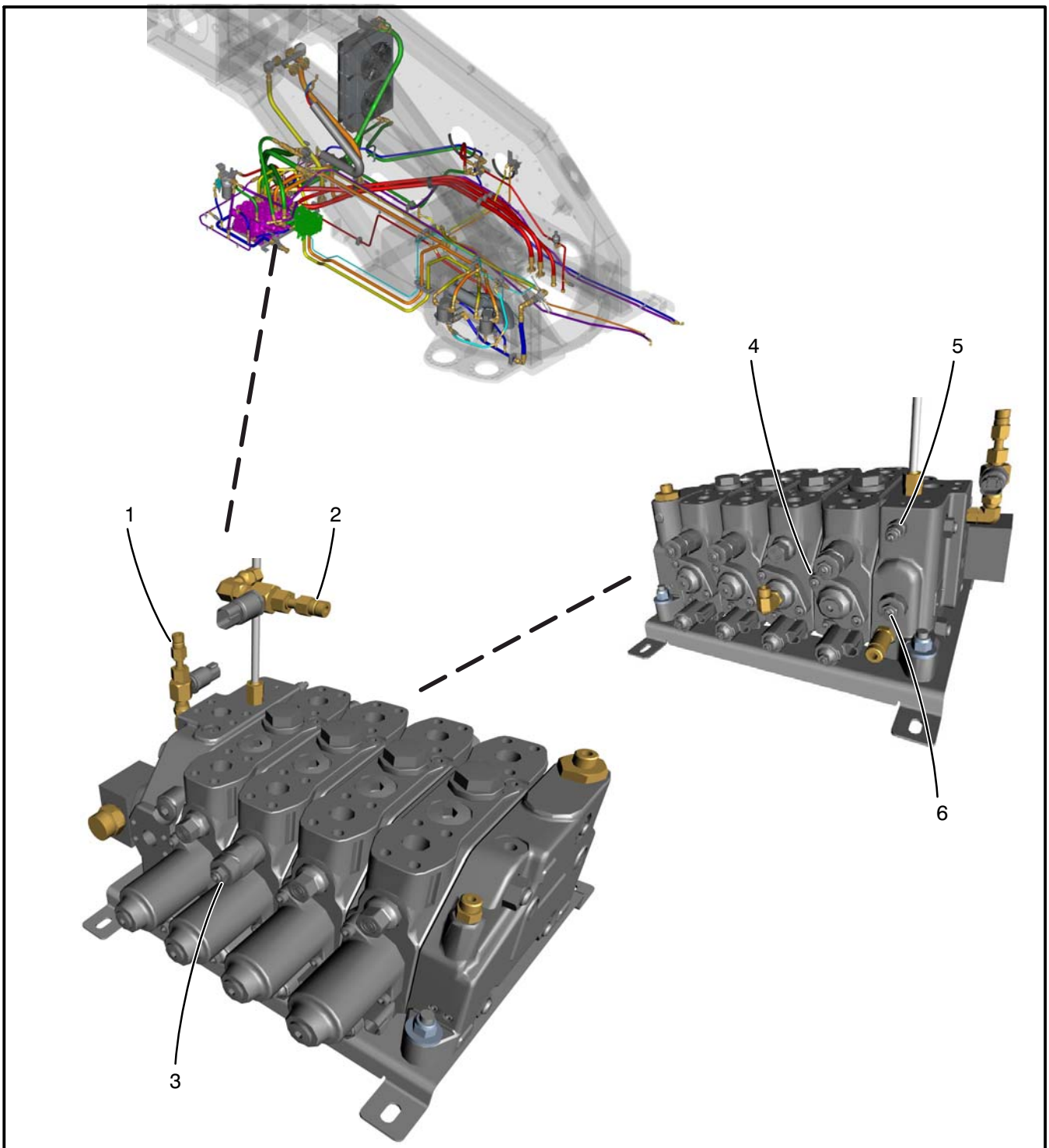


1. Hydraulic Hose
2. Relief Valve Adjuster
3. Quick Disconnect Fitting

Figure 3—41
Air Conditioner Relief Valve

Air Conditioner Relief 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".
2. Remove the hydraulic hose between motor and relief valve. Cap the hose and block the port. Refer to Figure 3—41.
3. Install the pressure gauge on the quick disconnect fitting.
4. Start the engine and gradually increase to full throttle.
5. Adjust cutoff pressure as required to 2,000 psi (*13 789kPa*).
6. Shutdown the engine.
7. Relieve hydraulic system pressure.
8. Remove the pressure gauge from the quick disconnect fitting.
9. Install hydraulic hose.

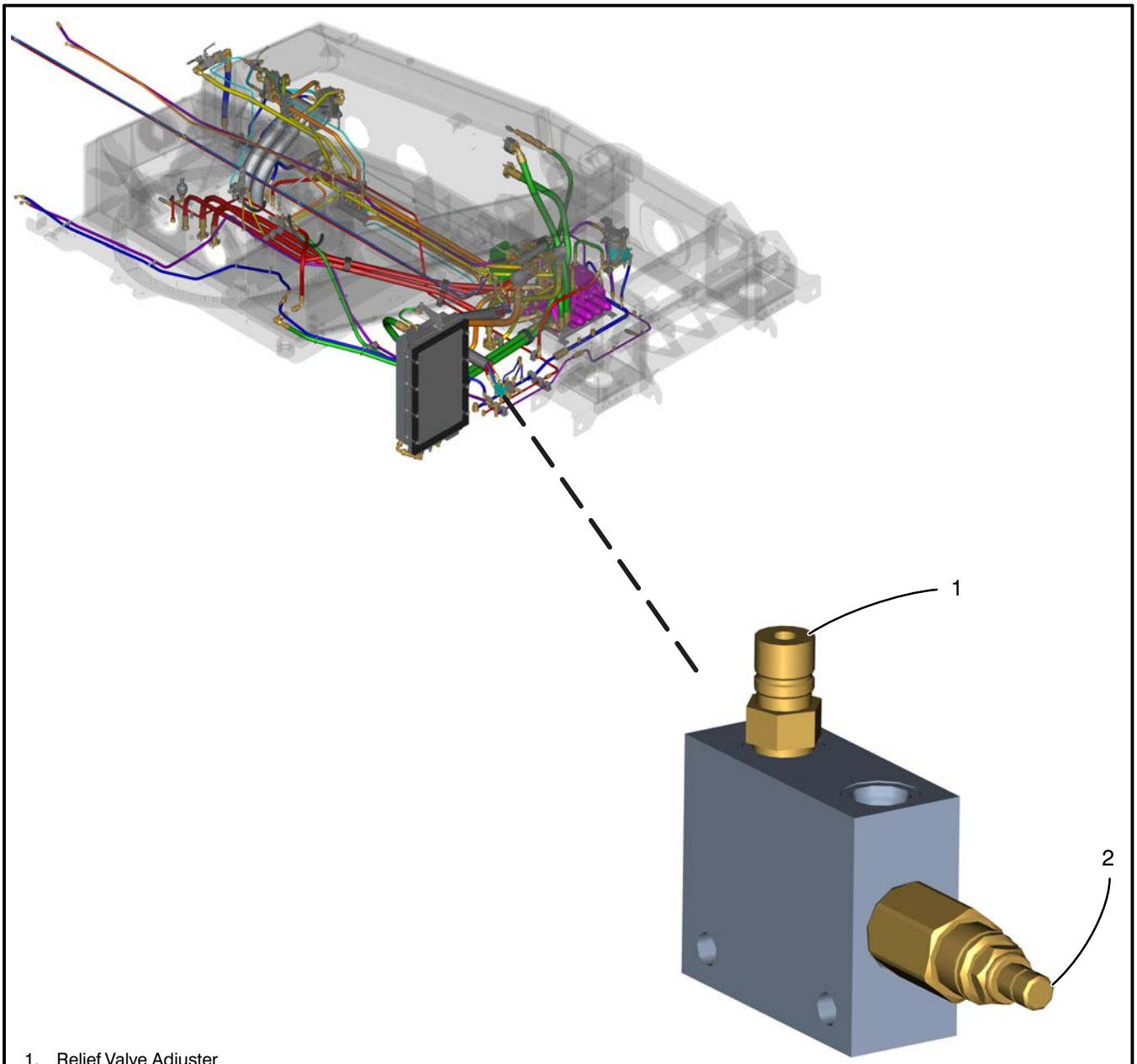


1. Main Control Valve Inlet Quick Disconnect Fitting
2. Load Sense Quick Disconnect Fitting
3. Boom Hoist Retract Port Relief Adjuster
4. Telescope Extend Port Relief Adjuster
5. Load Sense Pressure Relief Adjuster
6. Main Pressure Relief Adjuster
7. Work Ports Blocked

Figure 3–42
Main Control Valve Relief

Boom Hoist/Telescope/Winch 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".
2. Install the pressure gauge on the on the valve inlet pressure disconnect. Refer to Figure 3—42.
3. With both boom hoist cylinder work ports blocked, extend the boom hoist cylinder at full engine throttle. Set the load sense pressure relief valve to 4,600 psi (*31 716kPa*) -0/+50 psi (*345kPa*).
4. Install the pressure gauge on the load sense pressure disconnect.
5. With both boom hoist cylinder work ports blocked, retract the boom hoist cylinder at full engine throttle. Set the boom hoist cylinder retract work port relief valve to 290 psi (*1 999kPa*) $\pm$10 psi (*69kPa*).
6. With both telescope cylinder work ports blocked, extend the telescope cylinder at full engine throttle. Set the telescope cylinder extend work port relief valve to 2,800 psi (*19 305kPa*) -0/+50 psi (*345kPa*).
7. Shut off engine and remove pressure gauge.



1. Relief Valve Adjuster
2. Quick Disconnect Fitting

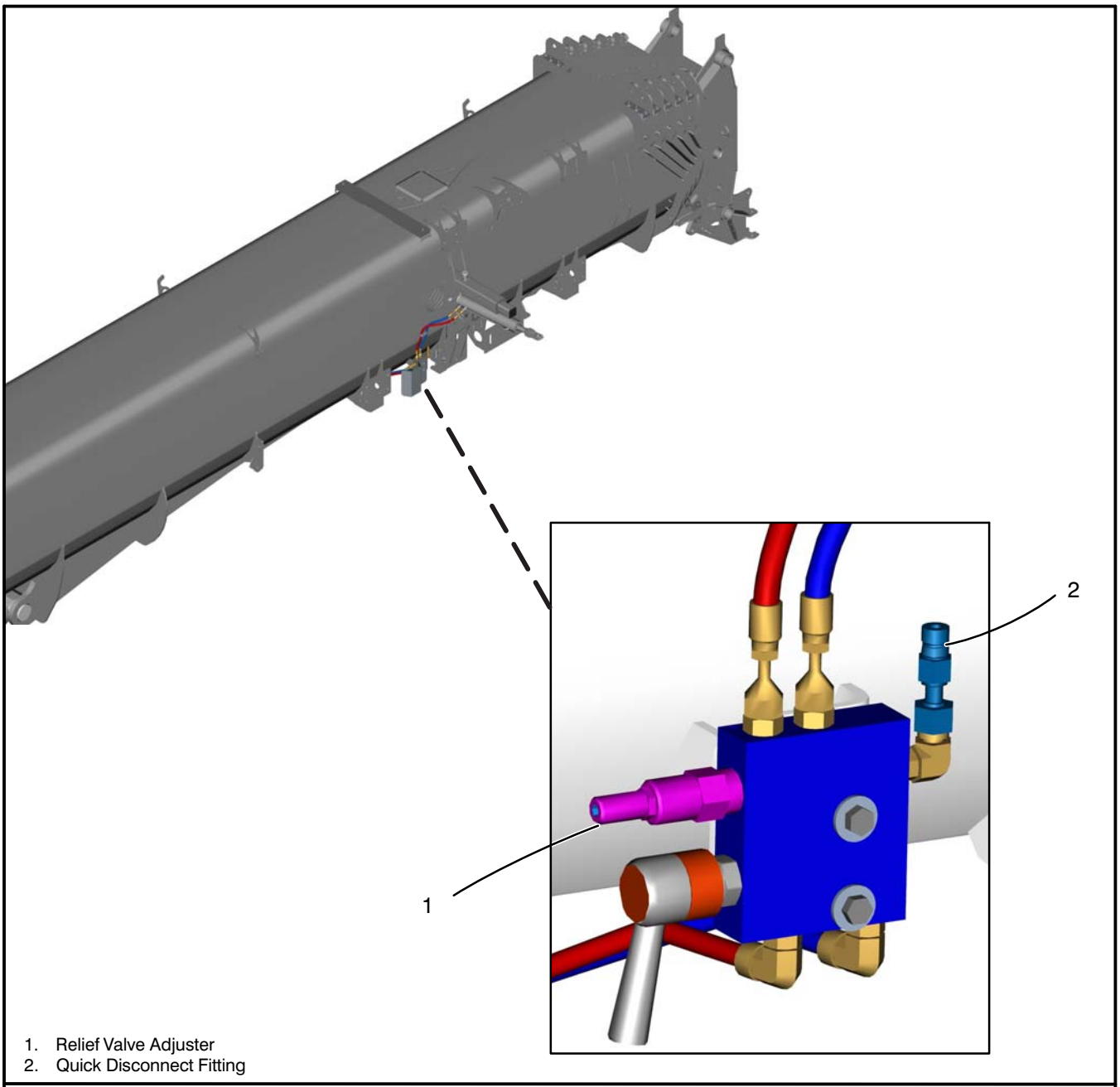
Figure 3—43
Fly Storage Circuit Relief Valve

Fly Storage 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. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3—43.
3. Start the engine and maintain idle speed.
4. Check pressure.
5. Adjust pressure as required to 750 psi (*5 171kPa*).
6. Return engine to idle speed and shutdown.
7. Relieve hydraulic system pressure.
8. Remove the pressure gauge from the quick disconnect fitting.



1. Relief Valve Adjuster
2. Quick Disconnect Fitting

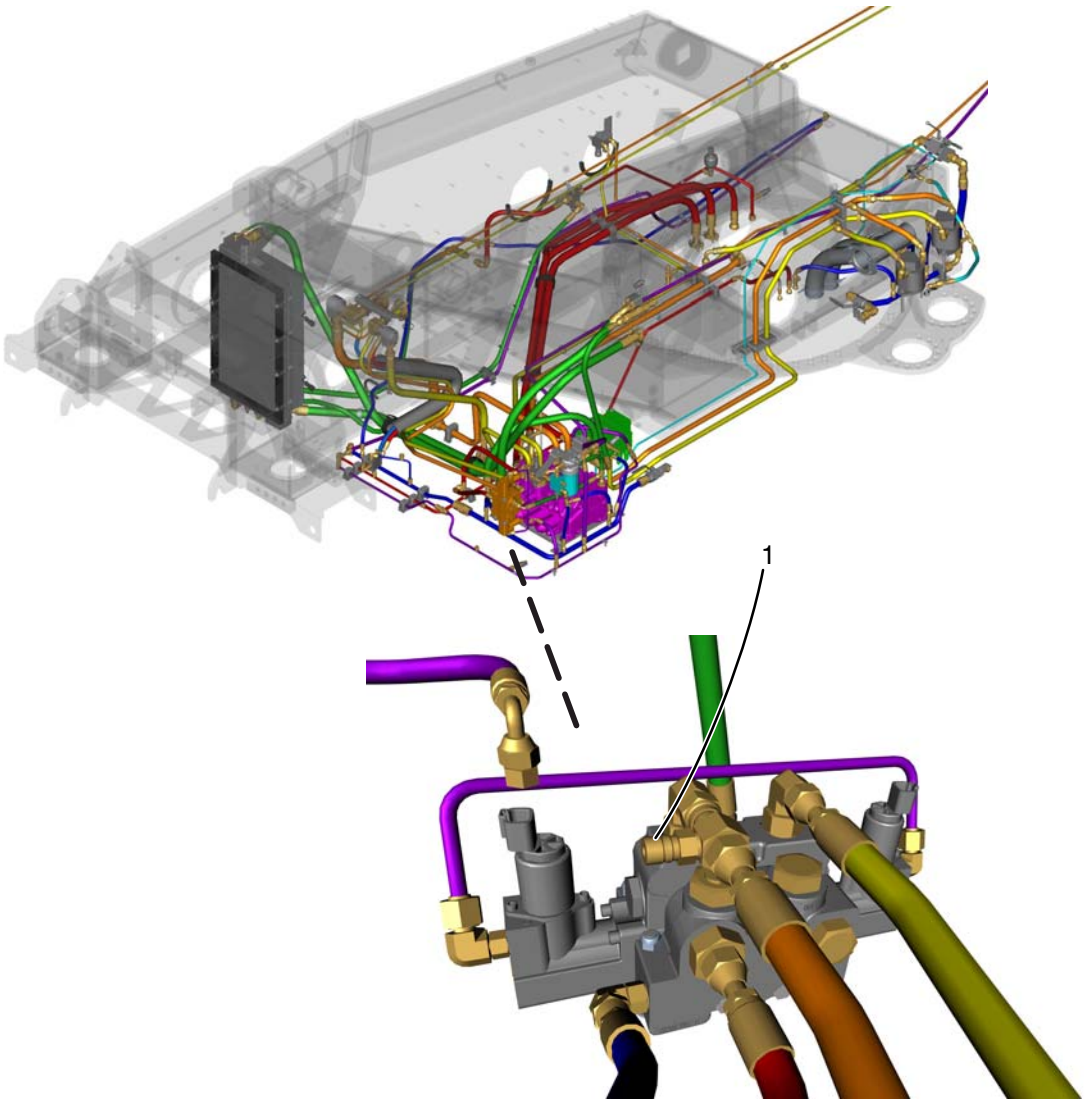
Figure 3—44
Fly Storage Cylinder Extend Circuit Relief Valve

Fly Storage 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. Install the pressure gauge on the quick disconnect fitting. Refer to Figure 3—44.
3. Start the engine and maintain idle speed.
4. Extend fly storage cylinder over relief. Check pressure.
5. Adjust pressure as required to 600±25 psi (*4 137±175kPa*).
6. Return engine to idle speed and shutdown.
7. Relieve hydraulic system pressure.
8. Remove the pressure gauge from the quick disconnect fitting.



1. Quick Disconnect Location

Figure 3—45
Hydraulic Offset Fly Cylinder Relief Valve

Hydraulic Offset Fly Extend Cylinder Circuit Pressure Checking Procedure

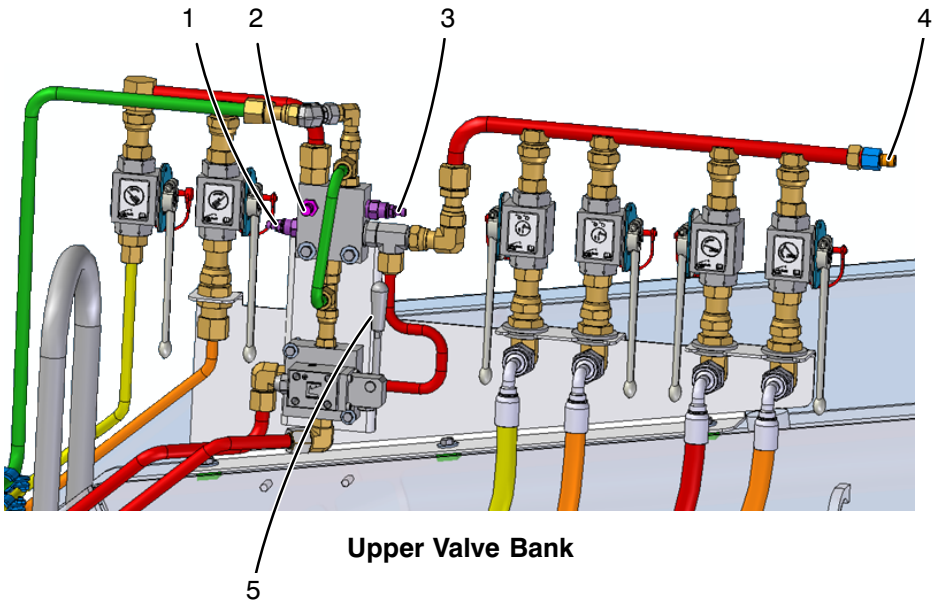
1. Remove the counterweights from the upper. Refer to Section 1 of this Operator's Manual for correct procedures.
2. Review all the general instructions in this Section of this Operator's Manual per "Preparing The Crane For Checking Relief Pressures" and "Relief Valve Pressure Checking Instructions".

   Note: Idle speed must be maintained in order to obtain an accurate reading.

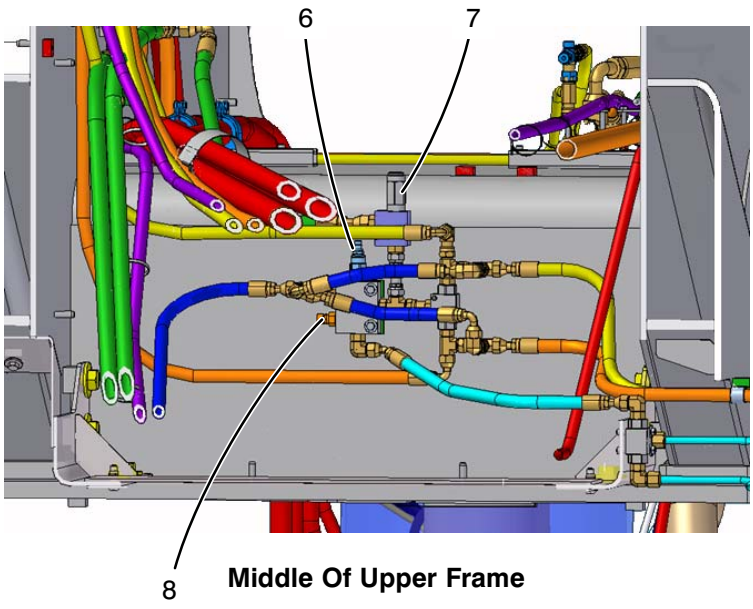
3. Start the engine and maintain idle speed.
4. Extend cylinder and hold. Check pressure. Pressure be 2,300 psi (*15 858kPa*). Refer to Figure 3—45.

   Note: Hydraulic offset fly extend relief is not adjustable.

5. Shutdown the engine.
6. Relieve hydraulic system pressure.
7. Remove the pressure gauge from the quick disconnect fitting.



Upper Valve Bank



Middle Of Upper Frame

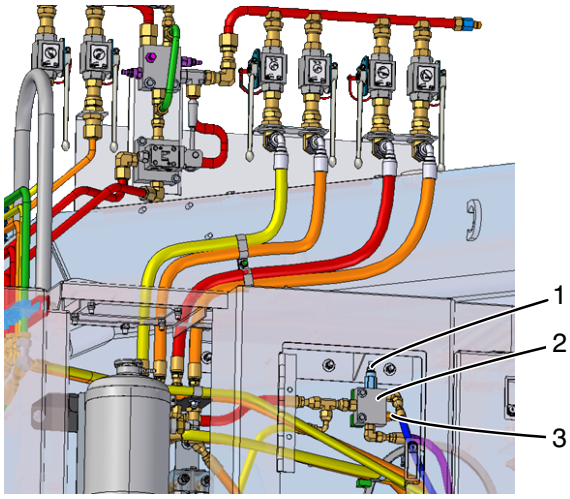
1. Swing Priority Flow Setting
2. Swing Circuit Quick Disconnect
3. System Pressure Relief Setting
4. System Circuit Service Quick Disconnect
5. Metering Valve
6. Swing Park Brake Pressure Reduction Valve
7. Swing Relief Valve
8. Swing Park Bake Service Quick Disconnect

Figure 3–46
Auxiliary Power Emergency System (A.P.E.S.) Valve Banks

A.P.E.S. System – Pressure Setting

The crane may be equipped with an Auxiliary Power Emergency System (A.P.E.S). For operation of A.P.E.S. system refer to Section 1 of this Operator's Manual.

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".



1. Boom Hoist Down Pressure Reducing Valve Setting
2. Boom Hoist Down Pressure Reducing Valve
3. Boom Hoist Down Pressure Service Quick Disconnect

Figure 3–47
Boom Hoist Down

Pressure Setting –System Pressure

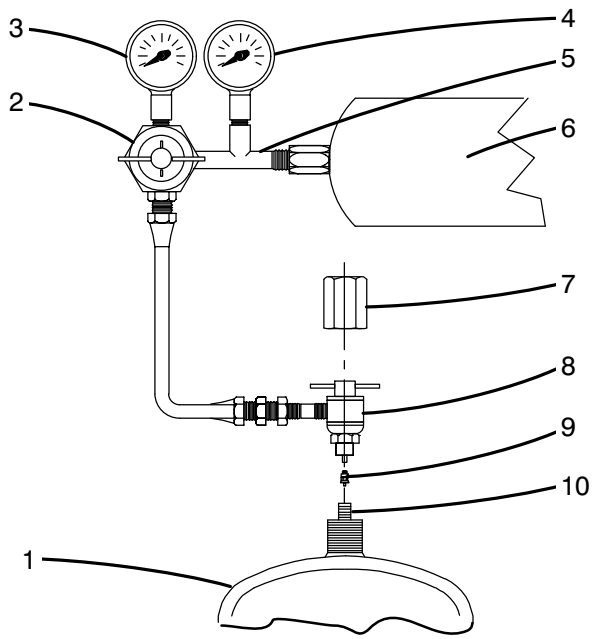
2. Make sure the crane is safe to swing. The A.P.E.S. system bypasses the RCL so make sure the boom position and the counterweight are within safe parameters.
3. Place a pressure gauge on the system circuit service quick disconnect (4) that is capable of reading more than 3,000 psi (*20 684kPa*). Refer to Figure 3–46.
4. To set the system relief pressure: With the helper crane engaged in the A.P.E.S. auxiliary power mode, and all the emergency valves in the closed position, actuate the metering valve. Adjust the system pressure relief valve to obtain 3,000–3,050 psi (*20 684–21 029kPa*). After setting the relief, return the metering valve to the neutral position.

Pressure Setting – Swing System

1. Make sure the crane is safe to swing. The A.P.E.S. system bypasses the RCL so make sure the boom position and the counterweight are within safe parameters.
2. Place a pressure gauge on the swing park brake service quick disconnect that is capable of reading 500 psi (*3 447kPa*). Refer to Figure 3–46.
3. Engage the upper house lock to prevent the upper from swinging.
4. Back off the swing park brake reducing valve by one–half turn.
5. Open either the left or right swing emergency ball valves. Only open one valve. Fully actuate the metering valve to actuate the swing system. Adjust the swing park brake reducing valve to obtain 425 psi (*2 930kPa*) ±25 psi (*172kPa*) on the pressure gauge. Return metering valve back to the neutral position and return the swing emergency ball valve back to the closed position.
6. Place a pressure gauge on the swing circuit service quick disconnect that is capable of reading 3,000 psi (*20 684kPa*).
7. Engage the upper house lock to prevent the upper from swinging.
8. Open either the left or right swing emergency ball valves. Only open one valve. Fully actuate the metering valve to actuate the swing system. Check the pressure. It should be between 2,175 – 2,225 psi (*14 996 – 15 341kPa*). This valve is non–adjustable. Return metering valve back to the neutral position and return the swing emergency ball valve back to the closed position.
9. To check and set the priority flow valve, open one of the swing ball valves.
10. Fully open the metering valve and time how long it takes to swing a half revolution. Get a running start with the swing before timing. Adjust the priority flow valve to obtain a time of 3:50 to 4:00 minutes.

Pressure Setting – Boom Hoist Down

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".
2. Place a pressure gauge capable of reading 250 psi (*1 724kPa*) on the boom hoist down pressure service quick disconnect. Refer to Figure 3–47.
3. Back off the adjustment of the boom hoist down pressure reducing valve one full turn.
4. Move the boom hoist down ball valve to the open position.
5. Open the metering valve to begin bringing the boom down. Adjust the boom hoist down pressure reducing valve to obtain a pressure between 210–225 psi (*1 448–1 551kPa*).
6. After setting, return the metering valve to the neutral position and close the boom hoist down ball valve.



1. Accumulator
2. Regulator Valve
3. Regulator Gauge
4. Supply Gauge
5. Regulator Assy
6. Dry Nitrogen Tank
7. Cap
8. Chuck
9. Adaptor *
10. Charging Valve

*** An Adaptor May Be Required To Connect Chuck To Valve.**

Figure 3—48
Typical Accumulator Charging Regulator Arrangement

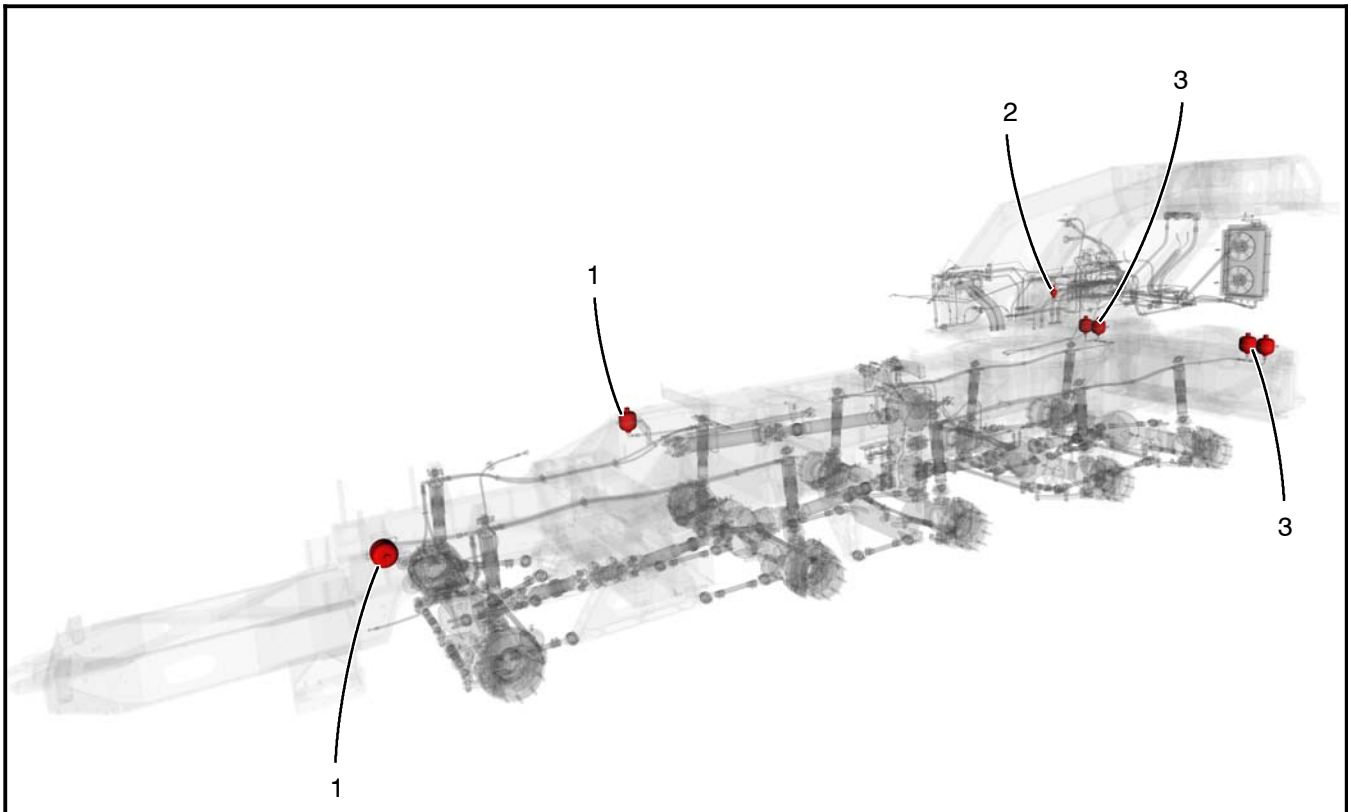
Accumulator Check/Charging

The crane may be equipped with up to six 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 six diaphragm type accumulators in the carrier hydrogas suspension circuit. There is one diaphragm style accumulator in the upper hydraulic air conditioner circuit.

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 travel 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.
3. Shutdown the engine and disengage the main hydraulic pump.



1. Front Accumulator - 600 psi (*4 137kPa*)
2. Air Conditioner Accumulator - 650 psi (*4 481kPa*)
3. Rear Accumulators - 525 psi (*3 620kPa*)

Figure 3- 49
Accumulator Locations

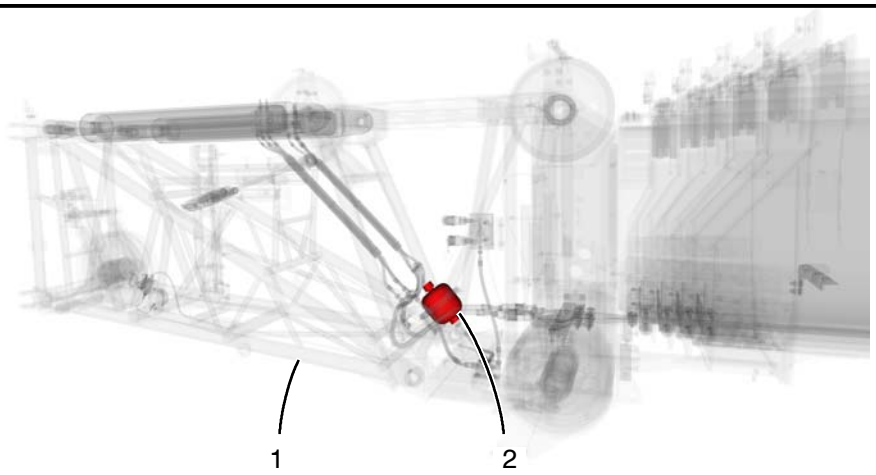
WARNING

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(s) and exhaust all trapped hydraulic pressure from the system before removing any line or component.



Hydraulic Offset Fly Option

1. Hydraulic Offset Fly
2. Hydraulic Offset Fly Accumulator - 500 psi (*3 447kPa*)

Figure 3- 50
Optional Accumulator Locations

5. To relieve hydraulic system pressure:
   a Turn the ignition switch to **"ON"**, but **DO NOT START THE ENGINE.** Move the function lockout switch to the "OPERATE" position.
   b Work the crane control levers and outrigger switches back and forth several times.
   c 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.)
   d Loosen the filler/breather cap on the hydraulic reservoir 1/4 turn until all pressure is fully relieved.
   e Turn ignition switch to the **"OFF"** position.
6. Check that all control levers are in the neutral position and move the function lockout switch to the "DISABLE" position.
7. Remove cap (7) from the accumulator. Refer to Figure 3- 48.
8. Close the regulator valve (2) and the valve on the dry nitrogen tank (6).
9. Connect the regulator assembly (5) to the dry nitrogen tank (6).
10. 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).
11. Note the reading on the supply gauge (4). The dry nitrogen tank must contain sufficient volume and pressure to charge the accumulator.
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 Figure 3- 49 for the correct pressure.
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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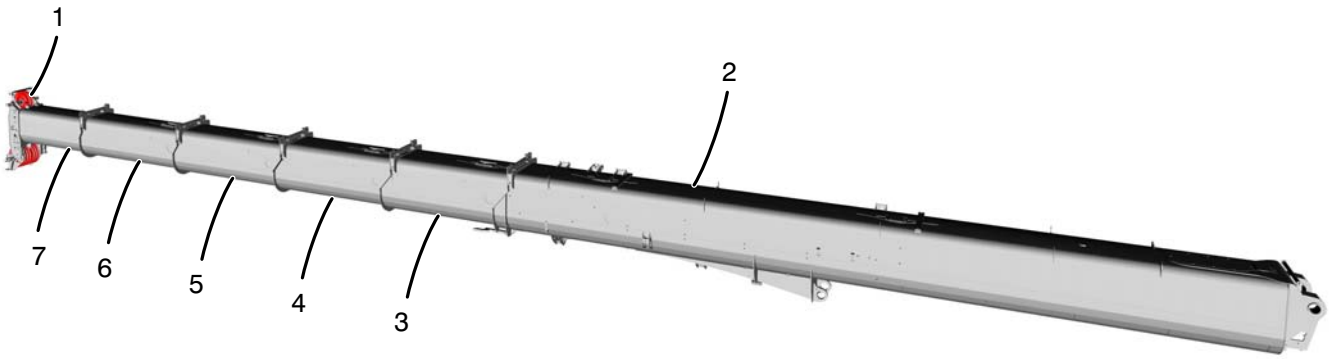


1. Boom Head Machinery
2. Base Section
3. T1 Section
4. T2 Section
5. T3 Section
6. T4 Section
7. T5 Section

Figure 4—1
Boom Nomenclature

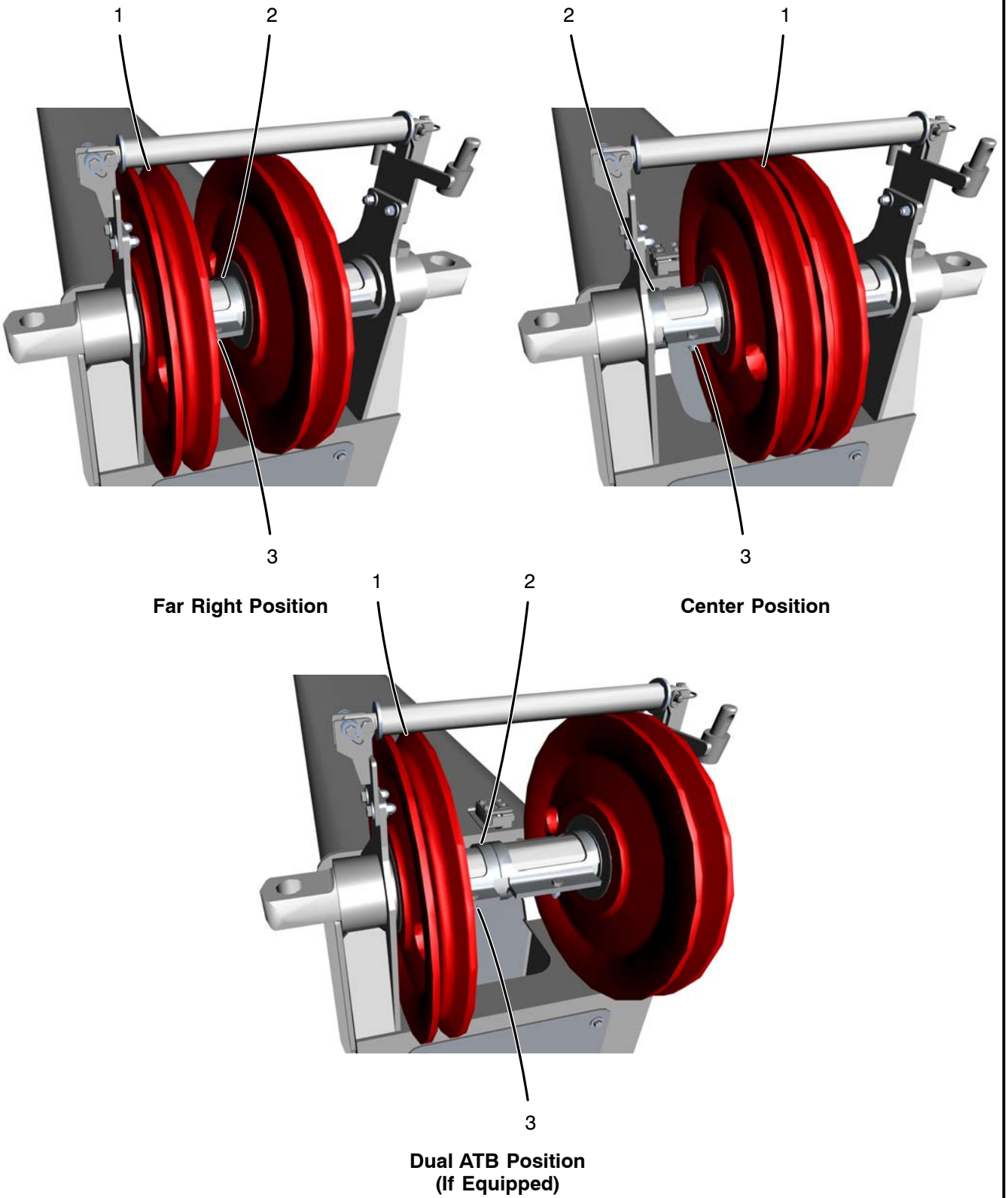
Boom

The boom is a six section latching boom. It consists of six 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 frame. The boom is raised and lowered by the boom hoist cylinder. Refer to Section 1 of this Operator's Manual for boom operating instructions.

Adjustable Boom Head Deflector Sheave

The position of both deflector sheaves on the boom head machinery are adjustable. Refer to Figure 4—2. The purpose is to keep the wire rope(s) as near the center of the boom as possible to reduce side pull on the boom.

In general the sheave should be kept in the position nearest the center of the boom. If 4 or more parts of line are reeved on the main boom head, the top right sheave can be moved to the right side of the boom head by removing the capscrew and locknut from the split spacer on the top head shaft. Slide the sheave to the right and then install the split spacer between the sheaves. Secure split spacer with the capscrew and locknut.

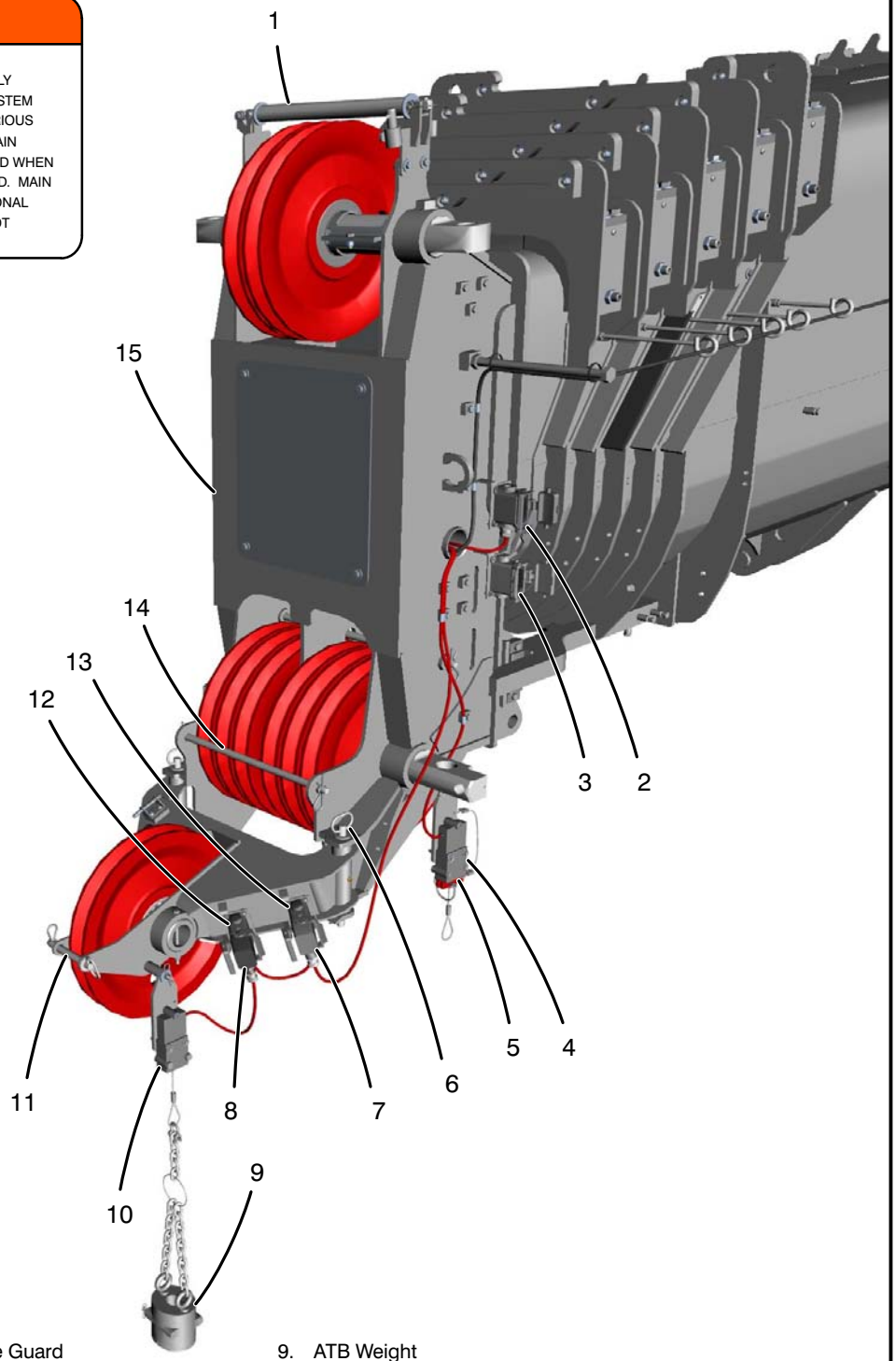


1. Adjustable Right Deflector Sheave
2. Split Spacer
3. Capscrew And Locknut

Figure 4–2
Adjustable Boom Head Deflector Sheave

⚠ 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. Boom Deflector Sheave Wire Rope Guard
2. Secondary Activation Connector
3. Jumper Assembly
4. Boom Head ATB Switch
5. Lockout Clip (Installed – ATB Switch Inactive)
6. Hitch Pin And Cotter Pin
7. Boom Head Plug
8. Secondary ATB Switch Plug
9. ATB Weight
10. Secondary ATB Switch
11. Auxiliary Lifting Sheave Wire Rope Guard
12. Front Auxiliary Connector
13. Rear Auxiliary Connector
14. Boom Head Sheave Wire Rope Guard
15. Main Boom Head

Figure 4–3
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—3. It is used for reeving winch wire rope for the second winch drum. Once installed, the unit may be put in storage on the boom head 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 engage park brake.
2. Fully retract the boom and position the upper over the rear of the carrier. Engage the 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. Adequately support the auxiliary lifting sheave with an appropriate lifting device. It weighs approximately 108 lb (*49kg*). Position and align the holes in the auxiliary lifting sheave frame with the lugs in the main boom and install hitch pins. Secure hitch pins with cotter pins. Refer to Figure 4—3.
5. Remove the wire rope guard from the auxiliary lifting sheave. Reeve the wire rope from the boom deflector sheave over 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 (ATB) system as follows:
   a. Install the lockout clip on the boom head ATB switch cable. Refer to Figure 4—3.
   b. Disconnect the boom head plug from the jumper assembly and connect it to the rear auxiliary connector.
   c. Disconnect and remove the secondary ATB switch from the right side of the boom head. Install the secondary ATB switch on the auxiliary lifting sheave and connect the secondary ATB switch plug to the front auxiliary connector.
   d. Remove the ATB weight from the boom head ATB switch cable and install it on the secondary ATB switch 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

Do not lift from the 10 ft (3.05m) fly with the auxiliary lifting sheave erected. Wire rope may contact auxiliary lifting sheave. Auxiliary lifting sheave must be removed or stored to eliminate possible interference.

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.

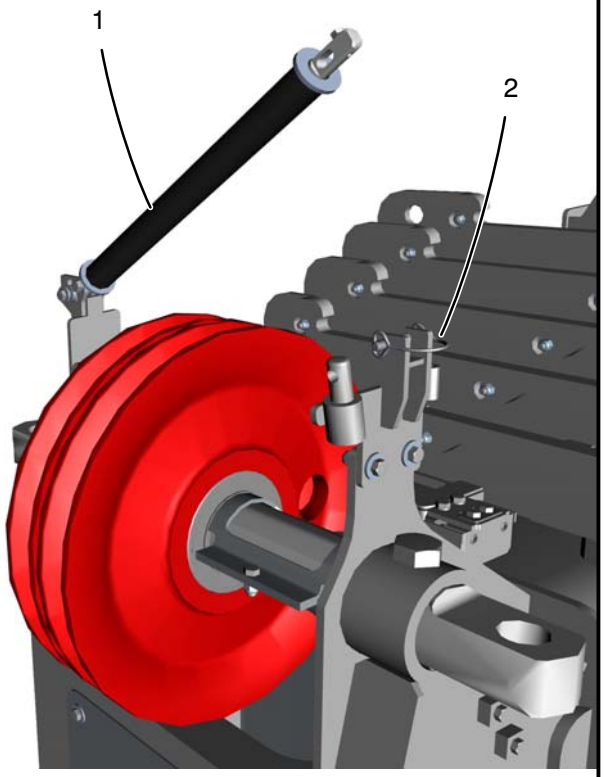
Auxiliary Lifting Sheave Removal

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 rear 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.

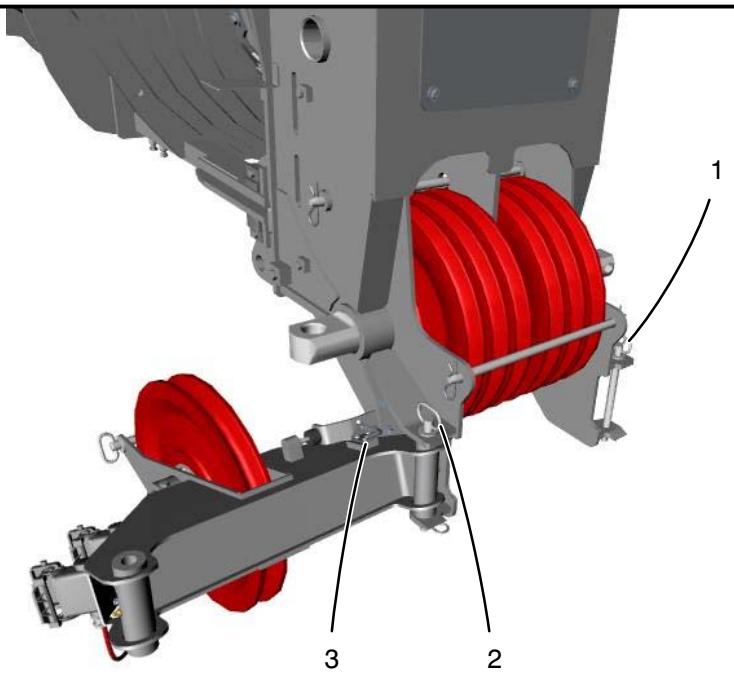
4. Properly disconnect the anti-two block (ATB) system as follows:
   a. Remove the ATB weight from the secondary ATB switch cable and install it on the boom head ATB switch cable. Refer to Figure 4—3.
   b. Disconnect the secondary ATB switch plug from the front auxiliary connector and remove the secondary ATB switch from the auxiliary lifting sheave. Install and connect the secondary ATB switch to the right side of the boom head.
   c. Disconnect the boom head plug from the rear auxiliary connector and connect it to the jumper assembly on the main boom head.
   d. Remove the lockout clip from the boom head ATB switch cable.
5. Remove the wire rope guard from the auxiliary lifting sheave. Remove the wire rope from the auxiliary lifting sheave and lay it aside to prevent damage to it during auxiliary lifting sheave removal. Install the wire rope guard on the auxiliary lifting sheave for storage. Refer to Figure 4—3.
6. Adequately support the auxiliary lifting sheave. It weighs approximately 108 lb (*49kg*). Remove the cotter pins and hitch pins. Remove the auxiliary lifting sheave from the main boom head.
7. Remove the wire rope guard from the boom head sheave, as required. Reeve the wire rope from the boom deflector sheave over the boom head sheave. Install the wire rope guard. Refer to Figure 4—4.



1. Boom Deflector Sheave Wire Rope Guard
2. Keeper Pin

Figure 4—4
Boom Deflector Sheave Wire Rope Guard

8. Properly store the auxiliary lifting sheave, the capscrews, locknuts, and washers and the wire rope which was used on the auxiliary lifting sheave.
9. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to Section 1 of this Operator's Manual.



1. Left Side Hitch Pin And Cotter Pin
2. Right Side Hitch Pin And Cotter Pin
3. Storage Latch

Figure 4—5
Auxiliary Lifting Sheave Storage

Auxiliary Lifting Sheave Storage

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 rear of the carrier. Engage travel swing lock.
3. Boom down and/or extend the boom, as required, to ease access to the head machinery.

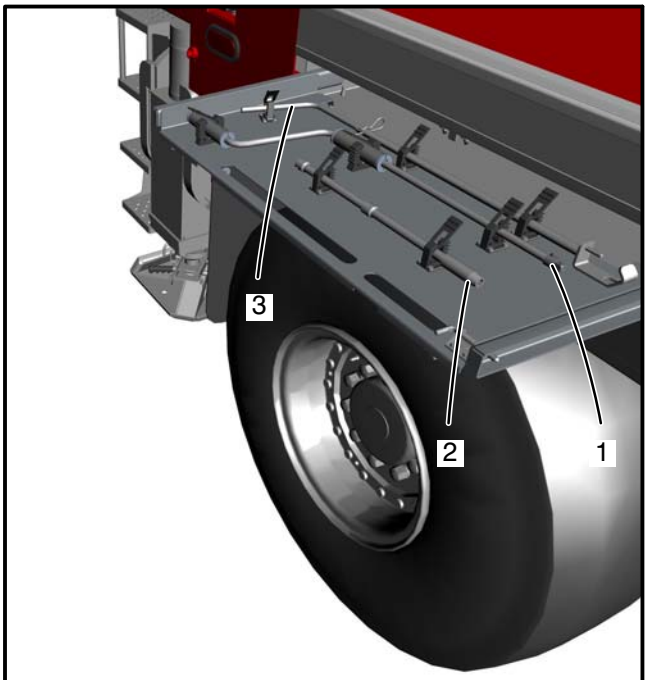
⚠ WARNING

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 (ATB) system as follows:
   a. Remove the ATB weight from the secondary ATB switch cable and install it on the boom head ATB switch cable. Refer to Figure 4—3.
   b. Disconnect the secondary ATB switch plug from the front auxiliary connector and remove the secondary ATB switch from the auxiliary lifting sheave. Install and connect the secondary ATB switch to the right side of the boom head.
   c. Disconnect the boom head plug from the rear auxiliary connector and connect it to the jumper assembly on the main boom head.
   d. Remove the lockout clip from the boom head ATB switch cable.
5. Remove the wire rope guard from the auxiliary lifting sheave. Remove the wire rope from the auxiliary lifting sheave and lay it aside to prevent damage to it during auxiliary lifting sheave storage. Install the wire rope guard on the auxiliary lifting sheave for storage. Refer to Figure 4—3.
6. Remove the left side cotter pin and hitch pin. Refer to Figure 4—5.
7. Rotate auxiliary sheave around to the right side of boom head until latch engages with the striker plate.
8. Install left side hitch pin in its original location for storage. Secure the hitch pin with the cotter pin.

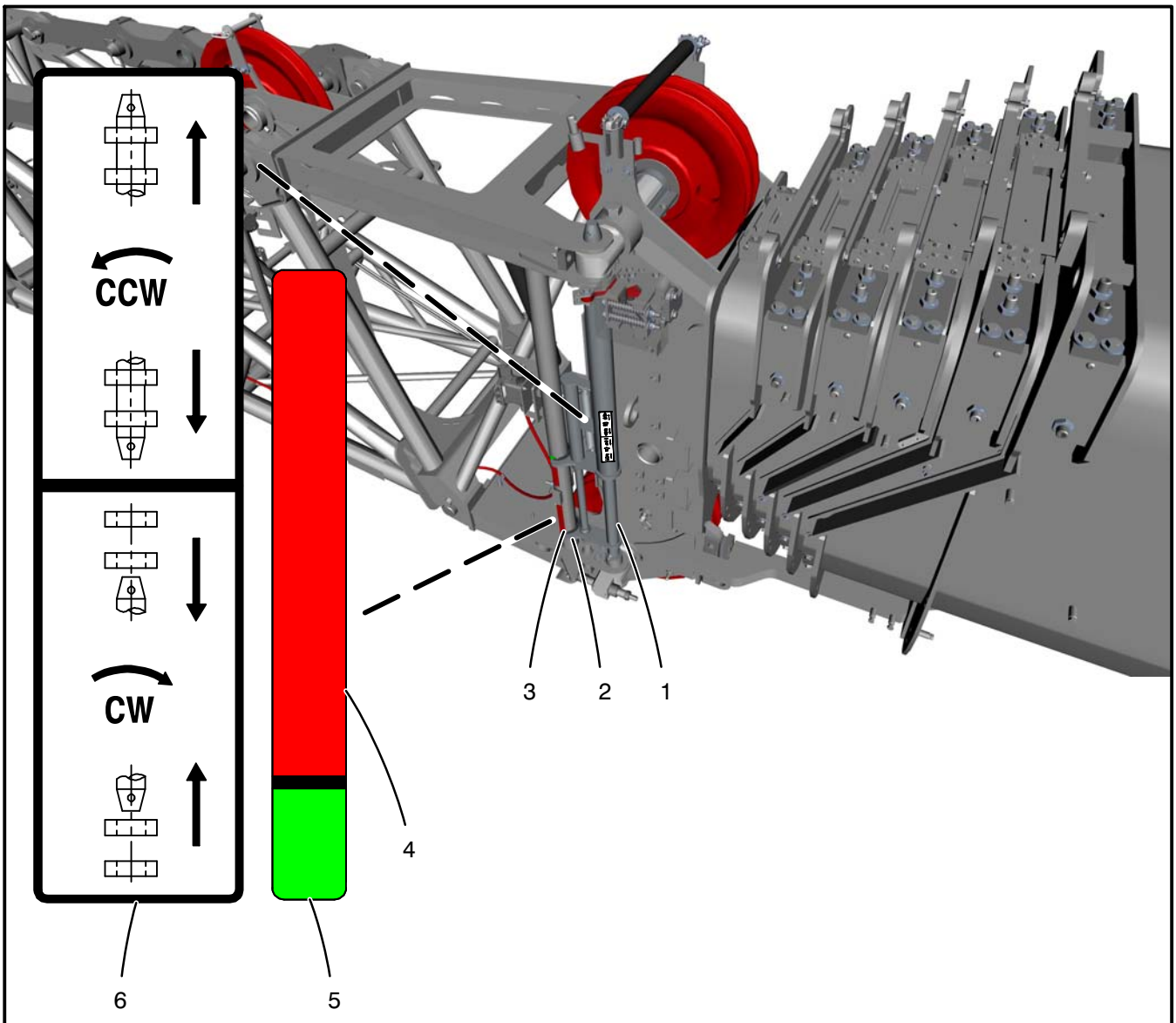
Fly Tools

The fly comes equipped with fly tools to aid in fly configuration. The fly tools are located in the access panel above the rear right tire, and include a hand crank and an impact extension socket. Refer to Figure 4—6.



1. Hand Crank
2. Impact Extension Socket
3. Fly Tool

Figure 4—6
Fly Tools



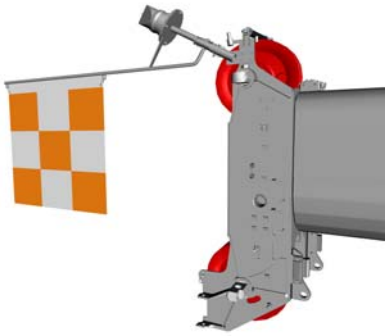
1. Boom Head Pins
2. Position Indicator
3. Pinning Decals
4. Pin Not Properly Installed
5. Pin Properly Installed
6. Fly Screws Rotation Label

Figure 4–7
Boom Head & Fly Connecting Pins

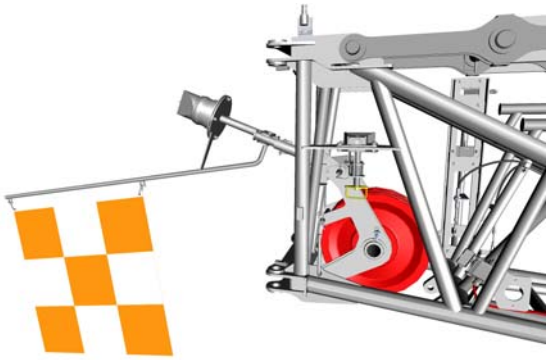
Boom Head & Fly Connecting Pins

The boom head and fly connecting pins have to be properly installed for the 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.

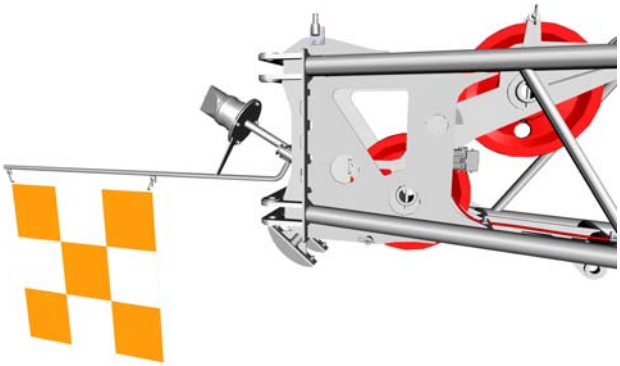
Note: Boom head pins do not require keeper pins.



Main Boom



Fly Base



Fly Center

Fly Tip

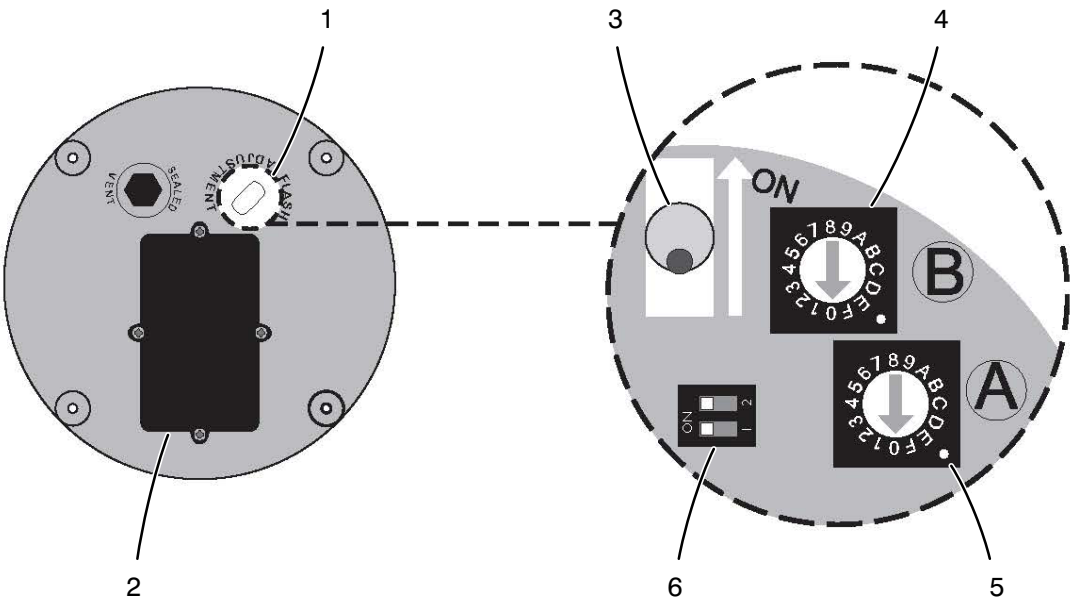
Figure 4—8
Warning Light Installation

Warning Light

A warning light is supplied with the crane and can be mounted at the peak of any boom or fly attachment configuration. Refer to Figure 4—8. Check national, regional, and local regulations for specifications and requirements of warning lights to ensure compliance prior to use. The light may be placed inside the carrier cab or upper cab when not in use. Refer to "Long Term Storage" in this section of this Operator's Manual if storing longer than 5 months.

Installation

The light should be left in the sun for 2—3 days to ensure the battery is fully charged before first use. Check the battery voltage regularly during charging to ensure unit is charging properly. Refer to "Battery Replacement" in this section of this Operator's Manual for proper battery voltage. The light will charge whether toggled on or off. For best light performance, ensure solar modules are unobstructed.



1. Flash Adjustment Cover
2. Battery Cover And Screws
3. ON/OFF Switch
4. Rotary Switch B
5. Rotary Switch A
6. Intensity/Power Setting DIP Switches

Figure 4—9
Warning Light

Light Operation

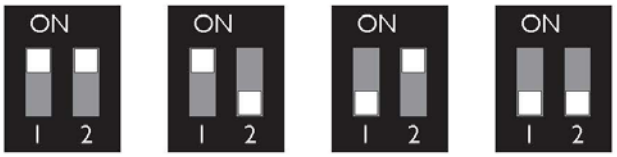
The light is activated by toggling the ON/OFF switch. Intensity and flash settings must be set prior to installation for operation. Figure 4—9.

1. Remove the Flash Adjustment Cover at the base of the light to access setting switches.
2. Switch the light on using the ON/OFF Switch.
3. Set the intensity/power using the Intensity/Power Setting DIP Switches. Refer to "Intensity /Power Setting" in this section of this Operator's Manual.
4. Set the flash code using the Rotary Switches. Refer to "Flash Code Selection" in this section of this Operator's Manual.
5. Test the settings in a dark environment, and adjust, as required. Replace the Flash Adjustment Cover.

Note: The sealed vent on the light base should not be disturbed.

Intensity/Power Setting

The Intensity/Power Setting DIP Switches may be used to reduce the power consumption and intensity of the lantern. Figure 4—9. Setting the switches to 25% will reduce the power consumption and lantern range to 25%. This setting can be used to adjust the current power consumption, in accordance with local sunlight conditions. The DIP switches can be set as follows:



100% 75% 50% 25%

Intensity/Power Settings	
Intensity Setting	**Power (mAh)**
100%	34—36
75%	26—27
50%	17—18
25%	8—9

Flash Code Selection

The flash code can be set by rotating the arrows on the rotary switches to the desired selections. Figure 4—9. Flash codes may take up to one minute to activate after setting.

Flash Code Legend

FL	Flash
F	Fixed (steady light)
Q	Quick flash
VQ	Very quick flash
OC	Occulting (greater period on than off)
ISO	Isophase (equal periods on and off)
LFL	Long flash

Example:
Flash code setting **D3** (Rotary Switch A set to "D" and Rotary Switch B set to "3") in the Flash Codes Table shows Flash Code **VQ 0.5 S**. **VQ** signifies the flash code "very quick flash" and **0.5 S** signifies the flash cycle of 0.5 seconds. The Light Status per Cycle shows that the light is on for 0.2 seconds and the light is off 0.3 seconds of the total 0.5 second cycle.

Flash Codes

Switch Settings		Flash Code	Light Status per Cycle	
A	B		ON	OFF
0	0	F		
D	3	VQ 0.5 S	0.2	0.3
E	3	VQ 0.6 S	0.2	0.4
F	3	VQ 0.6 S	0.3	0.3
7	3	Q 1 S	0.2	0.8
8	3	Q 1 S	0.3	0.7
9	3	Q 1 S	0.4	0.6
A	3	Q 1 S	0.5	0.5
8	4	Q 1 S	0.8	0.2
B	3	Q 1.2 S	0.3	0.9
9	4	Q 1.2 S	0.5	0.7
C	3	Q 1.2 S	0.6	0.6
F	4	FL 1.5 S	0.2	1.3
1	0	FL 1.5 S	0.3	1.2
0	5	FL 1.5 S	0.4	1.1
0	4	FL 1.5 S	0.5	1.0
2	0	FL 2 S	0.2	1.8
3	0	FL 2 S	0.3	1.7

Flash Codes

Switch Settings		Flash Code	Light Status per Cycle	
A	B		ON	OFF
4	0	FL 2 S	0.4	1.6
5	0	FL 2 S	0.5	1.5
6	0	FL 2 S	0.7	1.3
7	0	FL 2 S	0.8	1.2
1	2	ISO 2 S	1.0	1.0
8	0	FL 2.5 S	0.3	2.2
9	0	FL 2.5 S	0.5	2.0
D	6	FL 2.5 S	1.0	1.5
1	5	FL 3 S	0.2	2.8
A	0	FL 3 S	0.3	2.7
2	5	FL 3 S	0.4	2.6
B	0	FL 3 S	0.5	2.5
3	5	FL 3 S	0.6	2.4
C	0	FL 3 S	0.7	2.3
D	0	FL 3 S	1.0	2.0
2	2	ISO 3 S	1.5	1.5
5	4	OC 3 S	2.0	1.0
E	2	OC 3 S	2.5	0.5
4	6	OC 3.5 S	2.5	1.0
4	5	FL 4 S	0.2	3.8
5	5	FL 4 S	0.3	3.7
E	0	FL 4 S	0.4	3.6
F	0	FL 4 S	0.5	3.5
6	5	FL 4 S	0.6	3.4
0	1	FL 4 S	0.8	3.2
1	1	FL 4 S	1.0	3.0
2	1	FL 4 S	1.5	2.5
3	2	ISO 4 S	2.0	2.0
3	6	OC 4 S	2.5	1.5
F	2	OC 4 S	3.0	1.0
3	1	FL 4.3 S	1.3	3.0
8	5	FL 5 S	0.2	4.8
4	1	FL 5 S	0.3	4.7
5	1	FL 5 S	0.5	4.5
9	5	FL 5 S	0.9	4.1
6	1	FL 5 S	1.0	4.0
7	1	FL 5 S	1.5	3.5
4	2	ISO 5 S	2.5	2.5
8	2	LFL 5 S	2.0	3.0

Flash Codes				
Switch Settings		Flash Code	Light Status per Cycle	
A	B		ON	OFF
0	3	OC 5 S	3.0	2.0
1	3	OC 5 S	4.0	1.0
2	3	OC 5 S	4.5	0.5
C	6	FL 6 S	0.2	5.8
B	5	FL 6 S	0.3	5.7
C	5	FL 6 S	0.4	5.6
8	1	FL 6 S	0.5	5.5
9	1	FL 6 S	0.6	5.4
A	1	FL 6 S	1.0	5.0
7	5	FL 6 S	1.2	4.8
B	1	FL 6 S	1.5	4.5
5	2	ISO 6 S	3.0	3.0
9	2	LFL 6 S	2.0	4.0
6	4	OC 6 S	4.0	2.0
3	3	OC 6 S	4.5	1.5
4	3	OC 6 S	5.0	1.0
A	4	FL 7 S	1.0	6.0
9	6	FL 7 S	2.0	5.0
5	6	OC 7 S	4.5	2.5
D	5	FL 7.5 S	0.5	7.0
C	1	FL 7.5 S	0.8	6.7
E	5	FL 8 S	0.5	7.5
B	4	FL 8 S	1.0	7.0
6	2	ISO 8 S	4.0	4.0
A	2	LFL 8 S	2.0	6.0
6	6	OC 8 S	5.0	3.0

Flash Codes				
Switch Settings		Flash Code	Light Status per Cycle	
A	B		ON	OFF
B	2	LFL 8 S	3.0	5.0
F	5	FL 9 S	0.9	8.1
C	4	FL 9 S	1.0	8.0
7	6	OC 9 S	6.0	3.0
0	6	FL 10 S	0.2	9.8
1	6	FL 10 S	0.3	9.7
D	1	FL 10 S	0.5	9.5
2	6	FL 10 S	0.8	9.2
E	1	FL 10 S	1.0	9.0
1	4	FL 10 S	1.5	8.5
C	2	LFL 10 S	2.0	8.0
D	2	LFL 10 S	3.0	7.0
7	2	ISO 10 S	5.0	5.0
2	4	LFL 10 S	4.0	6.0
8	6	OC 10 S	6.0	4.0
5	3	OC 10 S	7.0	3.0
6	3	OC 10 S	7.5	2.5
F	1	FL 12 S	1.2	10.8
D	4	FL 12 S	2.5	9.5
3	4	LFL 12 S	2.0	10.0
0	2	FL 15 S	1.0	14.0
4	4	LFL 15 S	4.0	11.0
7	4	OC 15 S	10.0	5.0
A	6	LFL 20 S	2.0	18.0
E	4	FL 26 S	1.0	25.0

Power Consumption Calculator

Calculator Legend

Light Status per Cycle "ON"	Amount of seconds the light is on during a flash code cycle (Refer to "Flash Code Selection" in this section of this Operator's Manual for "Light Status per Cycle ON" in Flash Codes Table)
Light Status per Cycle "OFF"	Amount of seconds the light is off during a flash code cycle (Refer to "Flash Code Selection" in this section of this Operator's Manual for "Light Status per Cycle OFF" in Flash Codes Table)
Operating Cycle	Amount of hours the light is in operation (use 13.7 if unknown)
Power (mAh)	The amount of milliamps the light uses per hour (Refer to "Intensity/Power Setting" in this section of this Operator's Manual for "Power" in Intensity/Power Settings Table)

Light Status per Cycle "ON" (seconds)		**Light Status per Cycle "OFF"** (seconds)		**Duty Cycle** (e.g. 20% = 0.2)
	/		=	

Operating Cycle (hours)		**Power** (mAh)		**Duty Cycle** (e.g. 20% = 0.2)		**Total Power Used During Operating Cycle** (mAh)
	X		X		=	

Total Power Used During Operating Cycle (mAh)		**Solar Panel Charge** (mA)		**Charge Time Required** (hours)
	/	**279**	=	

Note: If the amount of available full sunlight hours (charge time) is less than 2.5—3.0 hours, reducing the intensity (power) or duty cycle is suggested.

Note: It is suggested that the light should operate at the lowest duty cycle required for the current application. In applications operating with a duty cycle above 30%, a reduction in light intensity is recommended.

Warning Light Maintenance

On occasion the light solar panels should be cleaned to ensure proper battery and light functions. To clean the solar panels, use a cloth and warm soapy water, wipe away any debris, then rinse with fresh water.

Long Term Storage

If the light is to be stored for a period longer than 5 months, prepare the light for storage as follows:

1. Ensure the battery is fully charged.
2. Remove the Flash Adjustment Cover at the base of the light. Refer to Figure 4—9. Switch the light off using the ON/OFF Switch.
3. Remove the Screws and Battery Cover. Disconnect the positive battery terminal. Ensure the positive battery terminal is positioned away from the negative battery terminal.
4. Install the Battery Cover and secure with Screws. Install the Flash Adjustment Cover.

Note: The battery will discharge over time. In temperatures over 104°F (*40°C*) the battery will discharge at a greater rate. Check the charge of the battery every 3—6 months while in storage and charge, as required, to maintain a full charge.

Recharging The Battery

Prior putting the light into operation after a period of long term storage, the battery must be fully charged. Recharge the battery as follows:

1. Remove the Screws and Battery Cover. Connect the positive battery terminal. Refer to Figure 4—9.
2. Remove the Flash Adjustment Cover at the base of the light. Switch the light on using the ON/OFF Switch.
3. Place the unit under a light source. The unit may be placed in the sun for 2—4 days OR under a halogen lamp for 2—3 days.

CAUTION

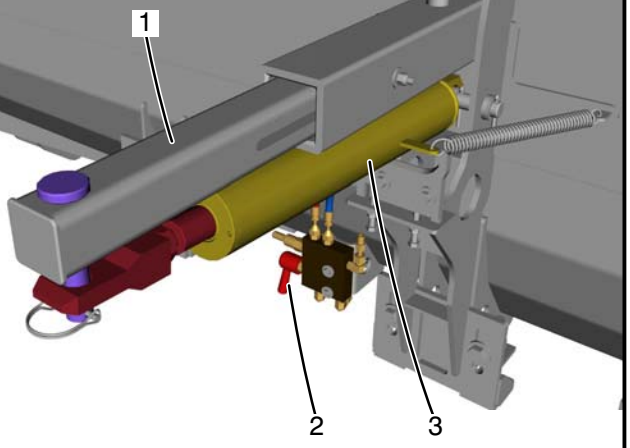
If the light is placed under a halogen lamp during battery recharge, ensure the solar panel is not placed too close to the lamp. Failure to maintain a proper distance of the solar panel from a halogen lamp could cause overheating of the panel.

4. Check the battery voltage regularly during charging to ensure the unit is charging properly.
5. Once the battery is fully charged, test the light in a dark environment to ensure proper light function.
6. Switch the light off using the ON/OFF Switch. Install the Flash Adjustment Cover.

Battery Replacement

The battery should be inspected a minimum of every three years to ensure the charger, battery, and ancillary electronics are functioning correctly. Ensure all terminals are clear of debris. Using a voltage meter, ensure the battery voltage is at least 3.6 volts under 100mA load. If required, replace the battery as follows:

1. Remove the Flash Adjustment Cover at the base of the light. Refer to Figure 4—9. Switch the light off using the ON/OFF Switch.
2. Remove the Screws and Battery Cover.
3. Remove the battery from the light and disconnect the positive and negative battery terminals. Properly dispose of the used battery.
4. Connect the positive and negative terminals on the new battery and install the battery in the light.
5. Install the Battery Cover and secure with Screws.
6. Switch the light on using the ON/OFF Switch.
7. Test the light in a dark environment to ensure proper battery installation. Install the Flash Adjustment Cover.



1. Fly Storage Pin
2. Fly Cylinder Valve
3. Fly Storage Cylinder

Figure 4—10
Fly Cylinder Valve

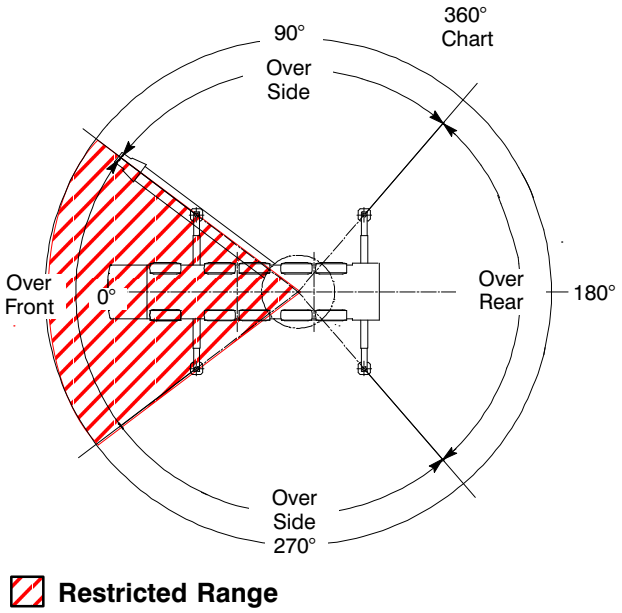


Figure 4—11
Fly Configuration Working Range

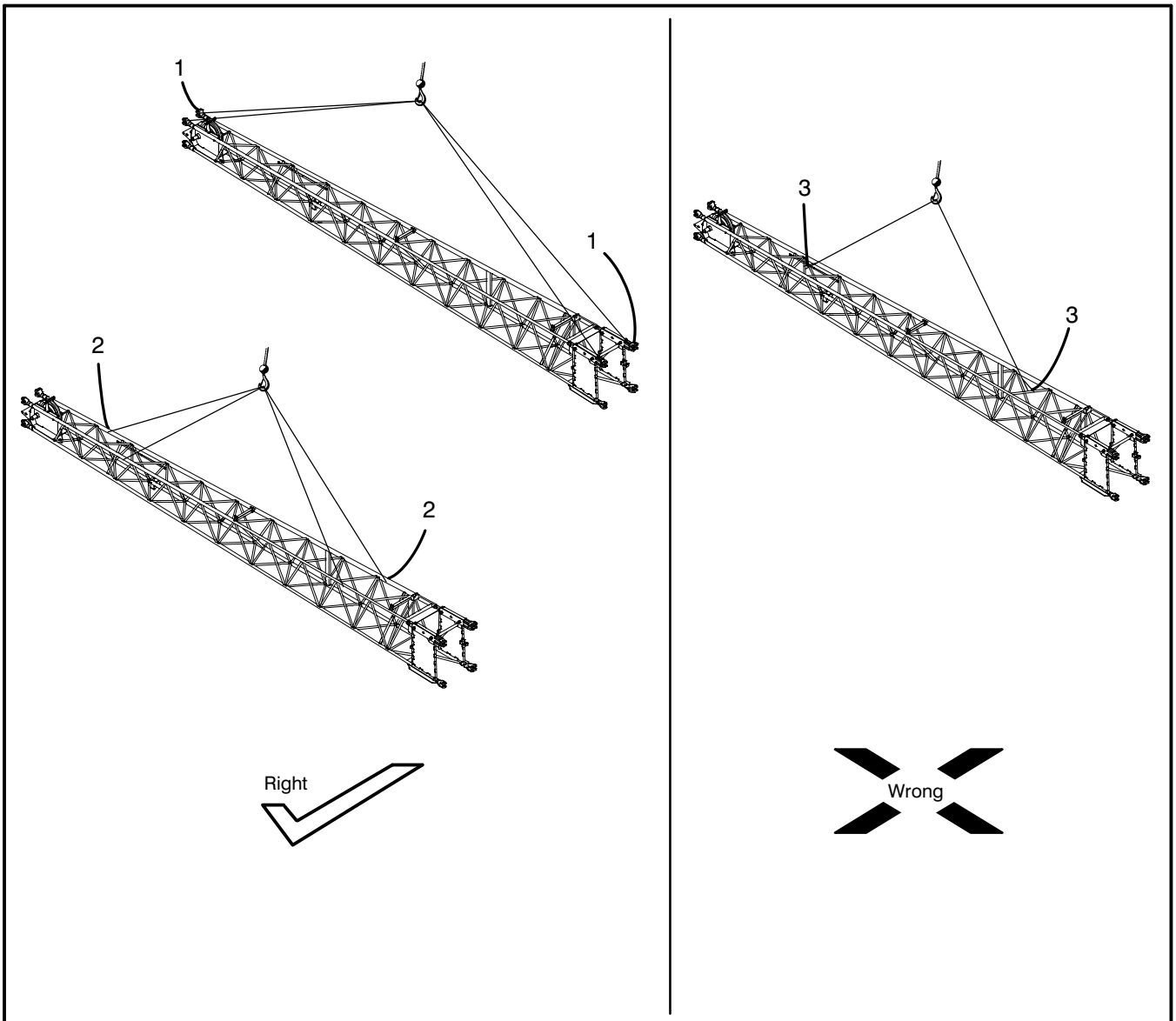
Fly Cylinder Valve

The fly mes equipped with a fly storage cylinder on the right side of the boom base section. The fly storage cylinder is to be used in storing and erecting the fly. The fly cylinder valve is used to extend and retract the fly storage cylinder. To extend the cylinder, rotate the valve away from the boom. To retract the cylinder, rotate the valve toward the boom. Refer to Figure 4—10.

Note: Fly storage cylinder must be free of cylinder storage pin to operate.

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—11.



1. Use The Connecting Lugs And/Or Fly Head Machinery Cross Shaft(s) 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—12
Handling The Fly Sections.

Offset Lattice Fly

The crane may be equipped with one of the following offset fly arrangements:

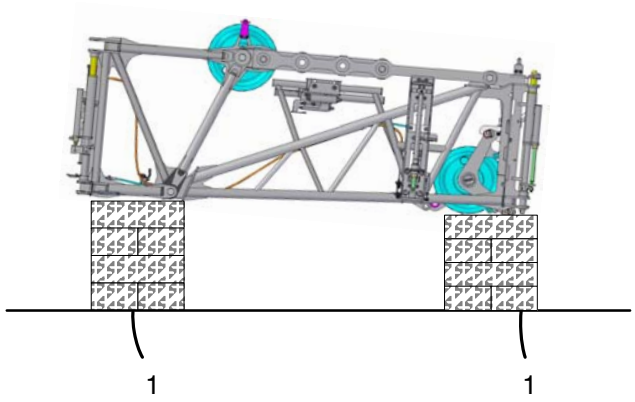
- 10 ft *(3.05m)* single piece lattice fly, stowable, manually offsettable to 0°, 15°, 30°, and 45°.
- 10-32.5 ft *(3.05-9.91m)* two piece lattice fly, stowable, manually offsettable to 0°, 15°, 30°, and 45°.
- 10-32.5-55 ft *(3.05-9.91-16.76m)* three piece bi-fold lattice fly, stowable, manually offsettable 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 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, storing, erecting, 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 that the connecting lugs and/or fly head machinery cross shaft(s) be used as the lifting points. However, it is permissible to attach nylon straps around all four main chords. Refer to Figure 4—12.
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. Fully retract the boom and position it to 0° angle before swinging any fly section(s) around to the side of the boom/fly sections during fly erection and/or fly storage. Fly and/or boom damage could occur.
7. Use a hand line to control fly section(s) swing while swinging fly section(s) during erection and storage procedures.
8. The fly adaptor lug and offset connecting pins must be in the 0° offset position to install, remove, erect, or store, the offset fly.
9. Before operating or traveling the crane, ensure all fly connecting pins and storage mechanisms are properly installed. The fly could fall causing serious personal injury, and/or major fly and/or boom damage.
10. Stay clear of pinch points when aligning fly section connecting points. Never place your fingers in connecting pin holes.
11. Fully assemble the fly before installing it on the boom.



1. Blocking

Figure 4—13
Installation And Removal Of The 10 Ft *(3.05m)* Offset Lattice Fly

10 Ft *(3.05m)* Offset Lattice Fly

The crane may be equipped with a two piece 10 ft (*3.05m*) offset lattice fly. The offset lattice fly, as shown in Figure 4—14, connects to the main boom head. It can be used 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. The fly is equipped with assist tools which include a 1/2 in (*13mm*) hex socket and extensions.

10 Ft (*3.05m*) Fly Installation

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

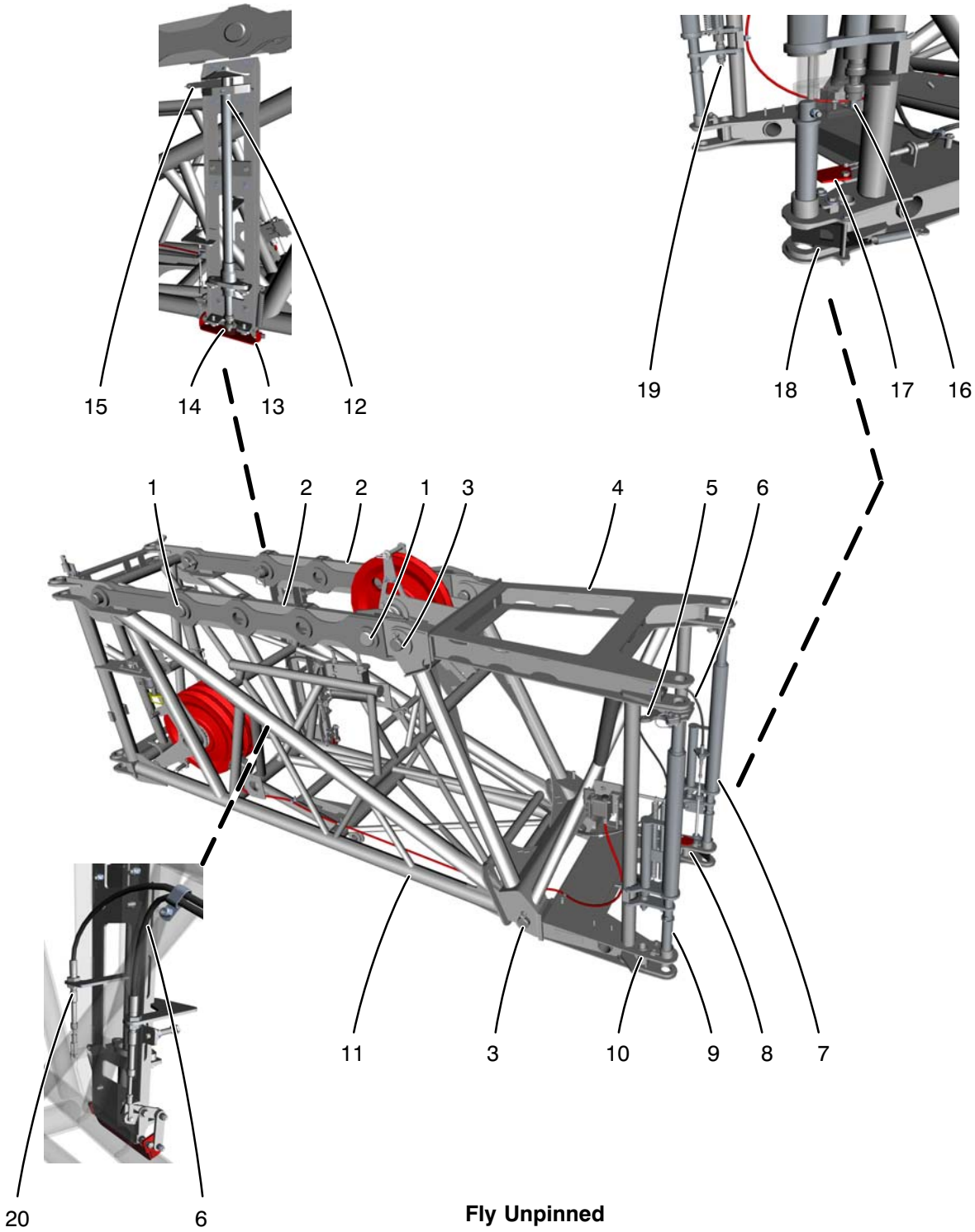
WARNING

Install the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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.

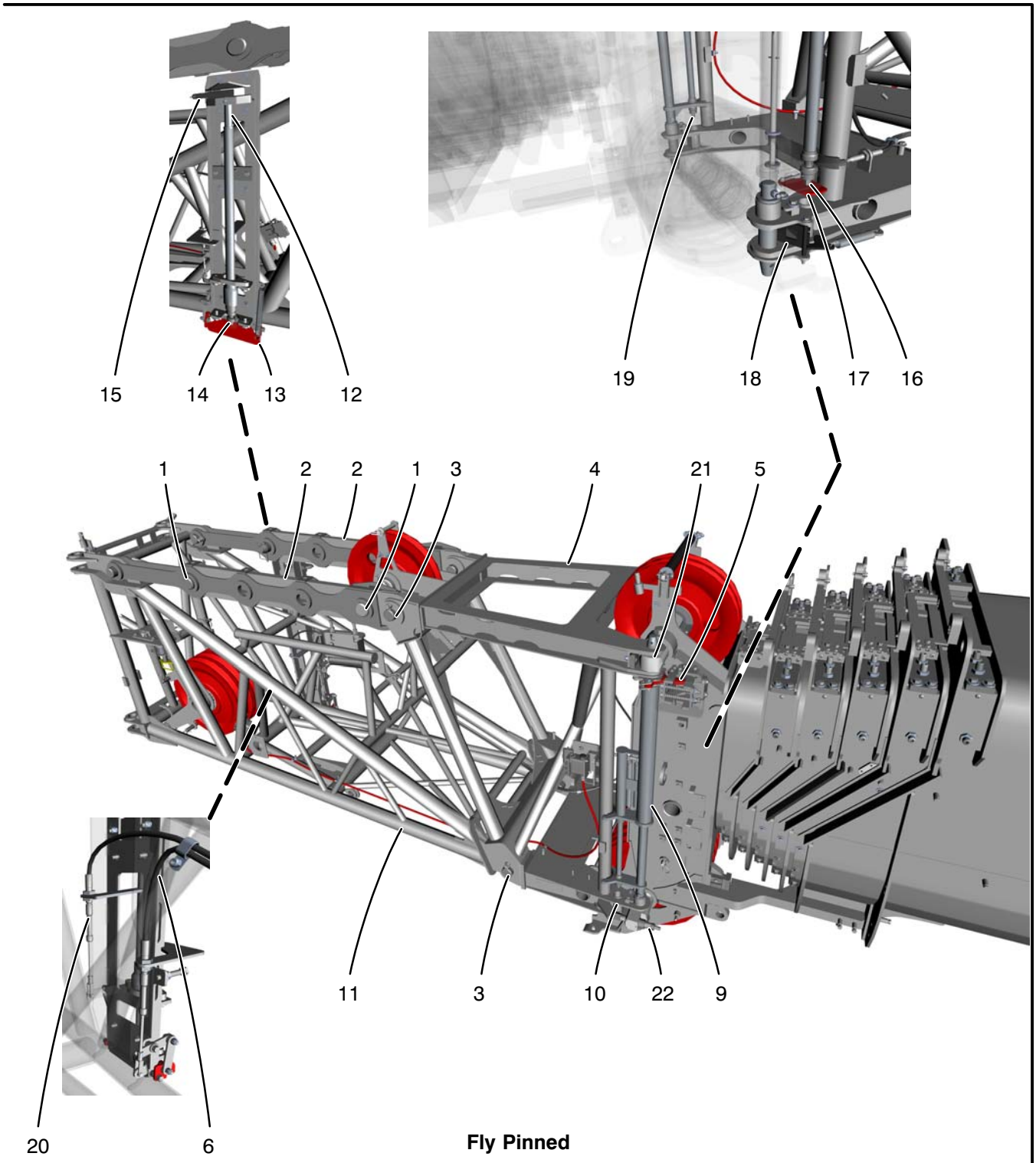
Failure to do the above could result in personal injury and/or the crane tipping.



Fly Unpinned

1. Offset Connecting Pins (Both Sides – 0° Position Shown)
2. Fly Adapter Lugs (Both Sides – 0° Position Shown)
3. Fly Base Connecting Pins (Both Sides)
4. Fixed Fly Base
5. Fly Catch
6. Boom Head Pin Push Pull Cable
7. Right Side Boom Head Pin
8. Right Side Access Tube
9. Left Side Boom Head Pin
10. Left Side Access Tube
11. 8 Ft (*2.44m*) Offset Fly Base Section
12. Secondary Pivot Pin

Figure 4–14
10 Ft *(3.05m)* Offset Lattice Fly



Fly Pinned

13. Pivot Pin Access Cover
14. Pivot Pin Speed Screw
15. Pivot Pin Block Plate
16. Right Side Fly Base Speed Screw
17. Boom Head Pin Access Cover
18. Boom Head Pin Block Plate
19. Left Side Fly Base Speed Screw
20. Pivot Pin Push Pull Cable
21. Boom Head Machinery Cross Shafts
22. Pusher Block

Figure 4—14 Continued
10 Ft *(3.05m)* Offset Lattice Fly

5. Ensure the auxiliary lifting sheave is properly stored on the boom head. Refer to "Auxiliary Lifting Sheave Storage" in this section of this Operator's Manual.
6. Ensure the fixed fly base is properly pinned to the 8 ft (*2.44m*) offset fly base section with fly base connecting pins. Refer to Figure 4—14.
7. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—14 and Figure 4—93. If required, change the fly offset to the 0° or locked position. Refer to "Changing The Fly Offset" in this section of this Operator's Manual for detailed instructions.
8. Ensure the fly base head sheave is in the stored position. Refer to Figure 4—19.
9. Position the fly on secure blocking. Refer to Figure 4—13. The 10 ft (*3.05m*) fly weighs approximately 1,714 lb (*778kg*).
10. Raise and extend the boom to allow enough rope to reeve the fly. Lower the hook block or hook ball (to be used on the fly) to the ground. Fully retract the boom.
11. 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.

12. Remove the wire rope guard and wire rope from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4—3. 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.
13. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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.

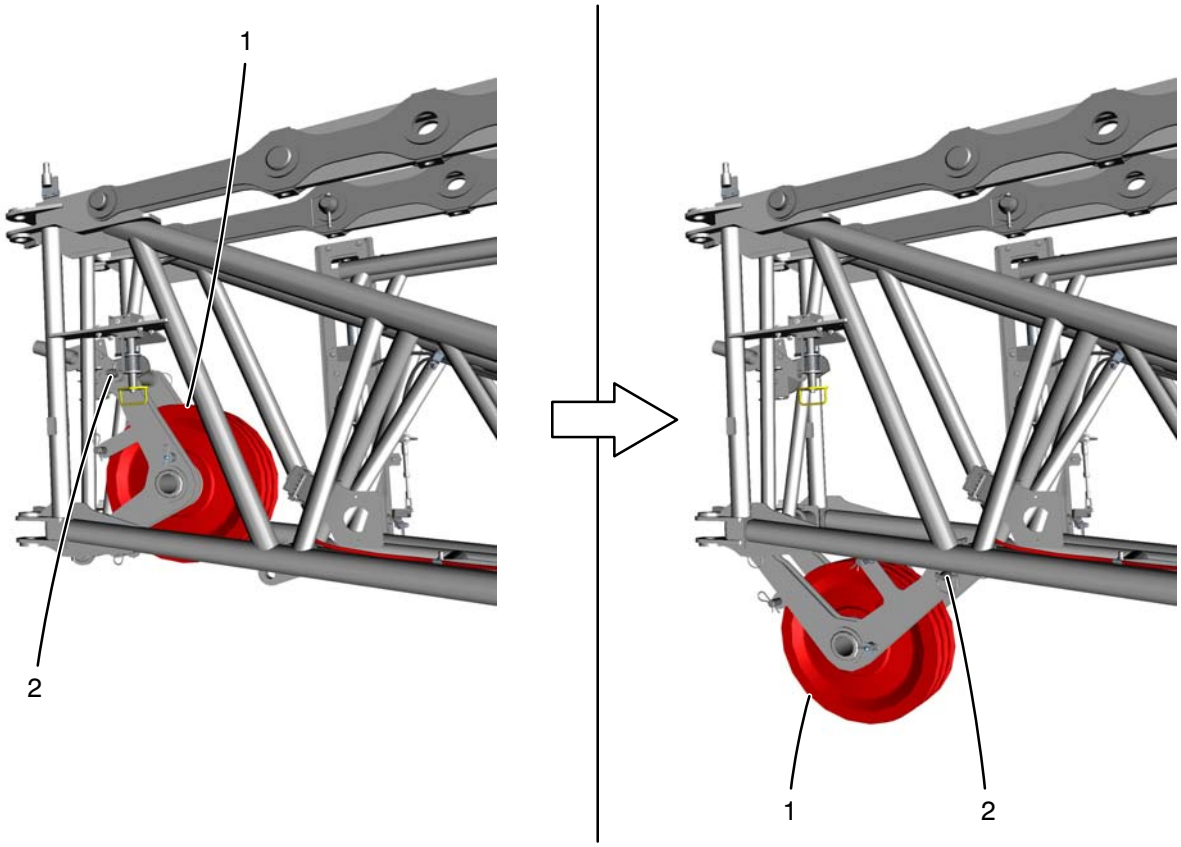
    Note: The push pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. Refer to Figure 4—14. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open.

14. 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—14. 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.
15. 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. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.
16. Using the appropriate tools, rotate the right side fly base 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.
17. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the top left side boom head pin.
18. Using the appropriate tools, rotate the pusher block, 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 fly base speed screw through the left side access tube to fully extend the bottom left side boom head pin.
20. Back off the pusher block 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.

21. 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.



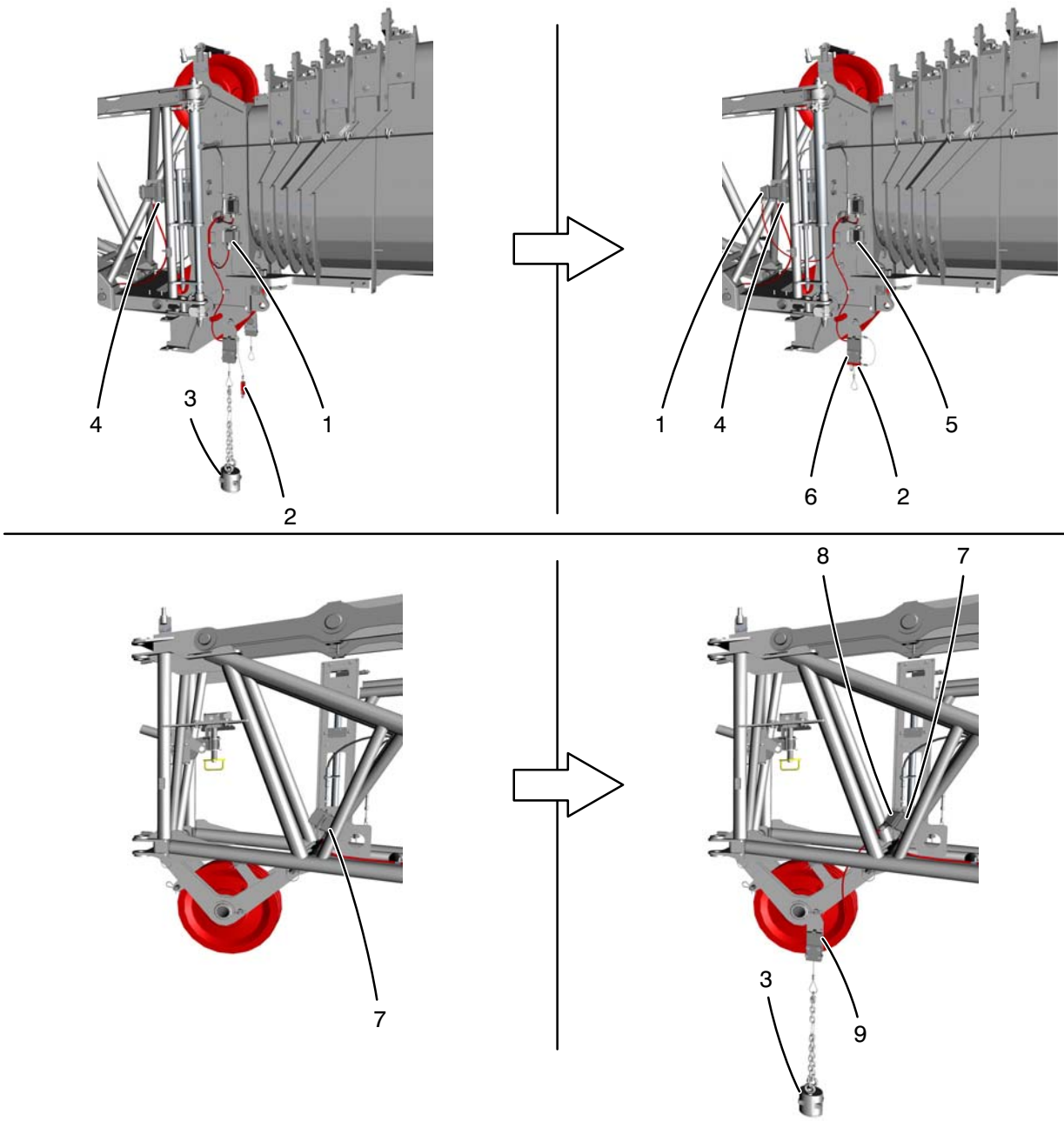
1. Fly Base Head Sheave
2. Fly Base Head Sheave Pin

Figure 4—15
Fly Base Head Sheave — Working Position

22. Remove the fly base head sheave pin securing the fly base head sheave to the fly bracket and rotate the fly base head sheave into the working position. Refer to Figure 4—15. Install the fly base head sheave pin to secure the fly base head sheave to the lugs on the bottom of the fly head.
23. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
24. Remove the wire rope guards from the fly base deflector sheave. Refer to Figure 4—30. Reeve the wire rope from the boom deflector sheave over the fly base deflector sheave. Install the wire rope guards, and secure with keeper pins.
25. Remove the wire rope guard from the fly base head sheave. Reeve the wire rope from the fly base deflector sheave (under the fly base crossbar) over the fly base head sheave. Install the wire rope guard, and secure with keeper pin.

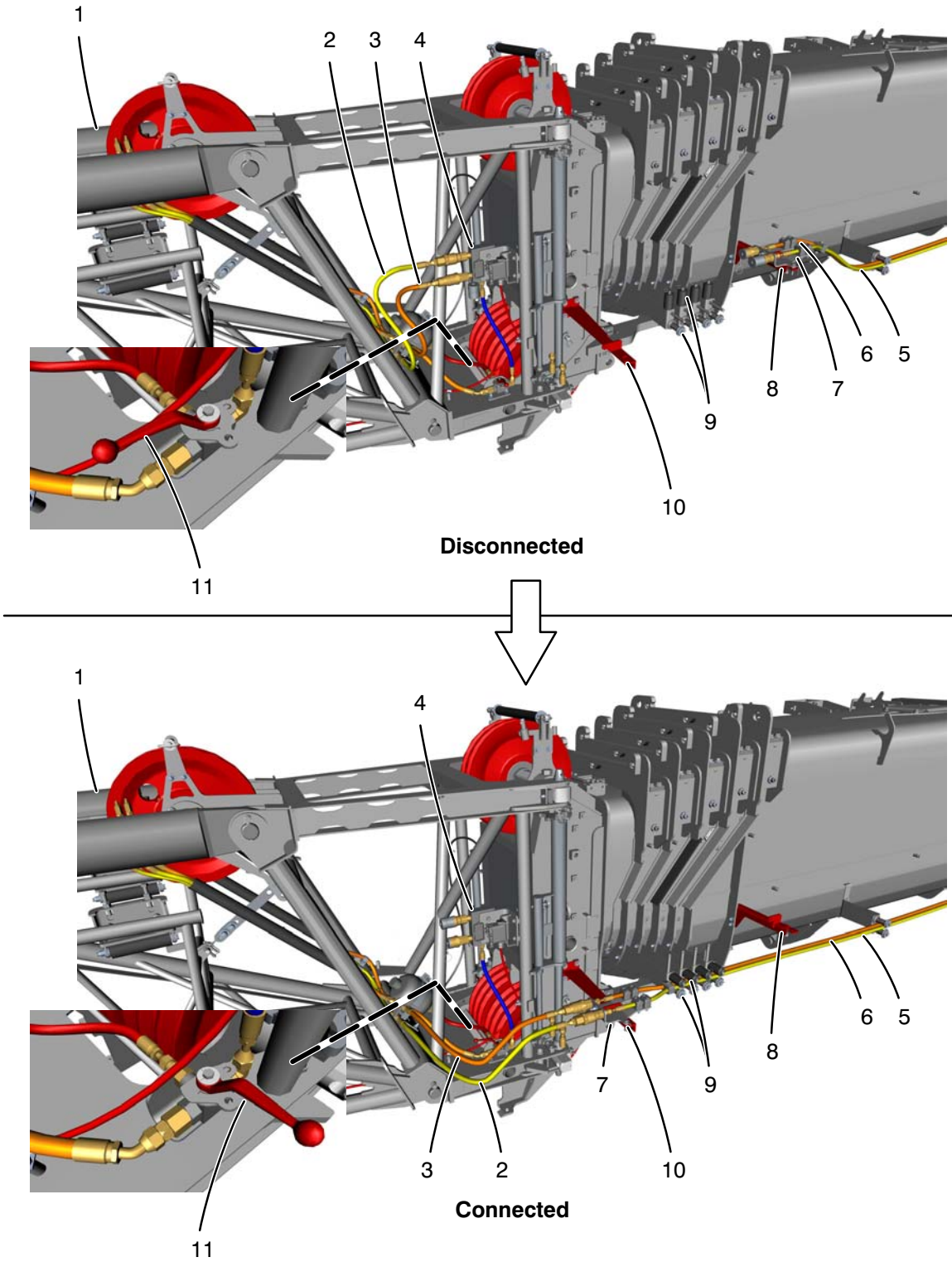
CAUTION

All wire rope guards must be in proper position during operation.



1. Boom Head Plug
2. Lockout Clip
3. ATB Weight
4. Fly Base Connector
5. Jumper Assembly
6. Boom Head ATB Switch
7. Fly Head Connector
8. Secondary ATB Switch Plug
9. Secondary ATB Switch

Figure 4–16
Anti-Two Block (ATB) Connections



1. Hydraulic Cylinders
2. Hydraulic Offset Retract Hose
3. Hydraulic Offset Extend Hose
4. Quick Disconnect Manifold
5. Boom Offset Retract Hydraulic Hose
6. Boom Offset Extend Hydraulic Hose
7. Hydraulic Hose Bracket
8. Storage Bracket
9. Rollers
10. Working Bracket
11. Accumulator Ball Valve

Figure 4–17
Hydraulic Hose Connection – Connected (If Equipped)

26. 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—16.
    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 and remove the secondary ATB switch from the right side of the boom head. Install the secondary ATB switch on the fly head and connect the secondary ATB switch plug to the fly head connector.
    e. Install the ATB weight on the secondary 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.

27. If the crane is equipped with the hydraulic fly base, connect the hydraulic hoses as follows:
    a. Remove the keeper pin and hydraulic hose bracket from the storage bracket. Refer to Figure 4—17.
    b. Route the boom offset extend and retract hydraulic hoses through the rollers on the boom. If required, remove the top rollers from the stored position and install them in the working position. Align the hydraulic hose bracket on the working bracket and secure with the keeper pin.
    c. Disconnect the hydraulic offset extend and retract hoses from the quick disconnect manifold and connect to the boom offset extend and retract hydraulic hoses. Ensure o-ring of each quick disconnect fitting is completely covered.
    d. Rotate the accumulator ball valve into the working position.
    e. Ensure the quick disconnect fittings are capped.

    Note: If the crane is equipped with the hydraulic fly base, the offset fly must be put into the operating position before operating with the fly. Refer to "Changing The Fly Offset Angle" in this section of this Operator's Manual.

28. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
29. Check the Crane Rating Manual, in the operator's cab, for deductions from the lifting capacities with the fly installed before continuing operations.

WARNING

Do not lift from the 10 ft (3.05m) fly with the auxiliary lifting sheave erected. Wire rope may contact auxiliary lifting sheave. Auxiliary lifting sheave must be removed or stored to eliminate possible interference.

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.

10 Ft (*3.05m*) Fly Removal

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

WARNING

Remove the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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.

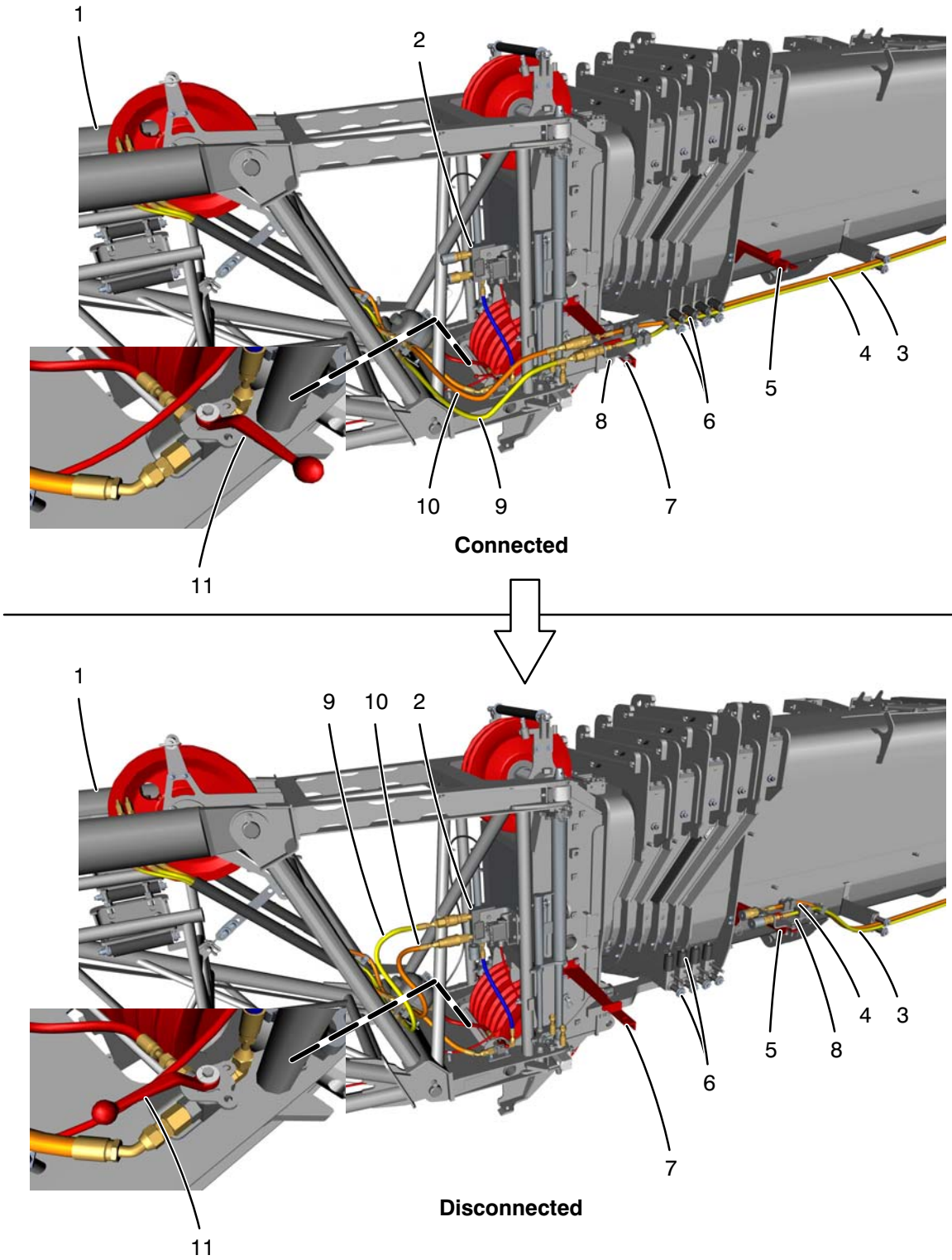
Failure to do the above could result in personal injury and/or the crane tipping.

5. If the fly is not in the erected position, erect it per "Erection Of The 10 Ft (*3.05m*) 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, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—14 and Figure 4—93. If required, change the fly offset to the 0° or locked position. Refer to "Changing The Fly Offset" in this section of this Operator's Manual for detailed instructions.
7. Boom down fully.

WARNING

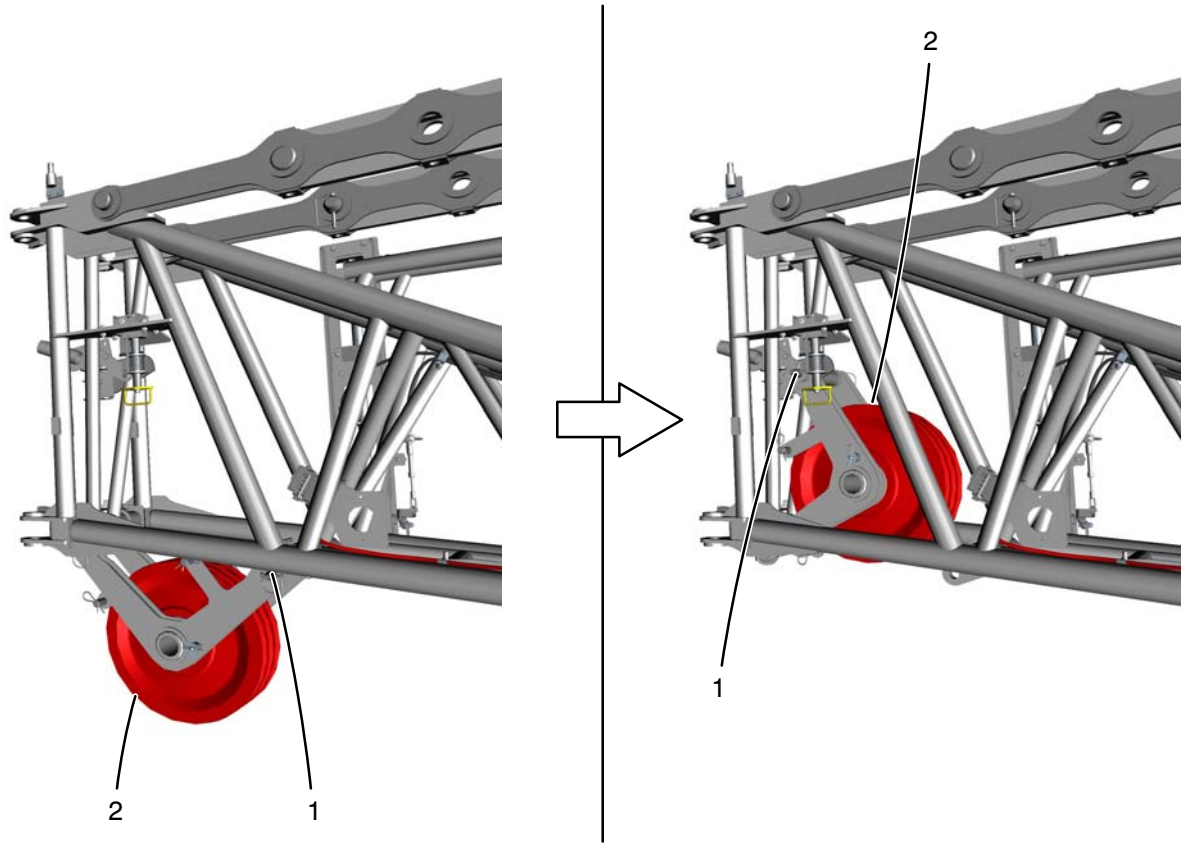
To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

8. If the crane is equipped with the hydraulic fly base, disconnect the hydraulic hoses as follows:
   a. Rotate the accumulator ball valve into the stored position. Refer to Figure 4—18.
   b. Disconnect the hydraulic offset extend and retract hoses from the boom offset extend and retract hydraulic hoses and connect to the quick disconnect manifold. Ensure o-ring of each quick disconnect fitting is completely covered.
   c. Remove the keeper pin and hydraulic hose bracket from the working bracket.
   d. Remove the boom offset extend and retract hydraulic hoses from the rollers on the boom. If required, remove the top rollers from the working position and install them in the stored position. Align the hydraulic hose bracket on the storage bracket and secure with the keeper pin.
   e. Ensure the boom extend and retract hydraulic hoses are capped.
9. Properly disconnect the anti-two block (ATB) system as follows:
   a. Remove the ATB weight from the secondary ATB switch cable. Refer to Figure 4—20.
   b. Disconnect the secondary ATB switch plug from the fly head connector and remove the secondary ATB switch from the fly head. Install and connect the secondary ATB switch on the right side of the boom head.
   c. Disconnect the boom head plug from the fly base connector and connect it to the jumper assembly on the main boom head.
   d. Install the ATB weight on the boom head ATB switch cable.
   e. Remove the lockout clip from the boom head ATB switch cable.
10. Properly store wire rope which was used on fly, as required.



1. Hydraulic Cylinders
2. Quick Disconnect Manifold
3. Boom Offset Retract Hydraulic Hose
4. Boom Offset Extend Hydraulic Hose
5. Storage Bracket
6. Rollers
7. Working Bracket
8. Hydraulic Hose Bracket
9. Hydraulic Offset Retract Hose
10. Hydraulic Offset Extend Hose
11. Accumulator Ball Valve

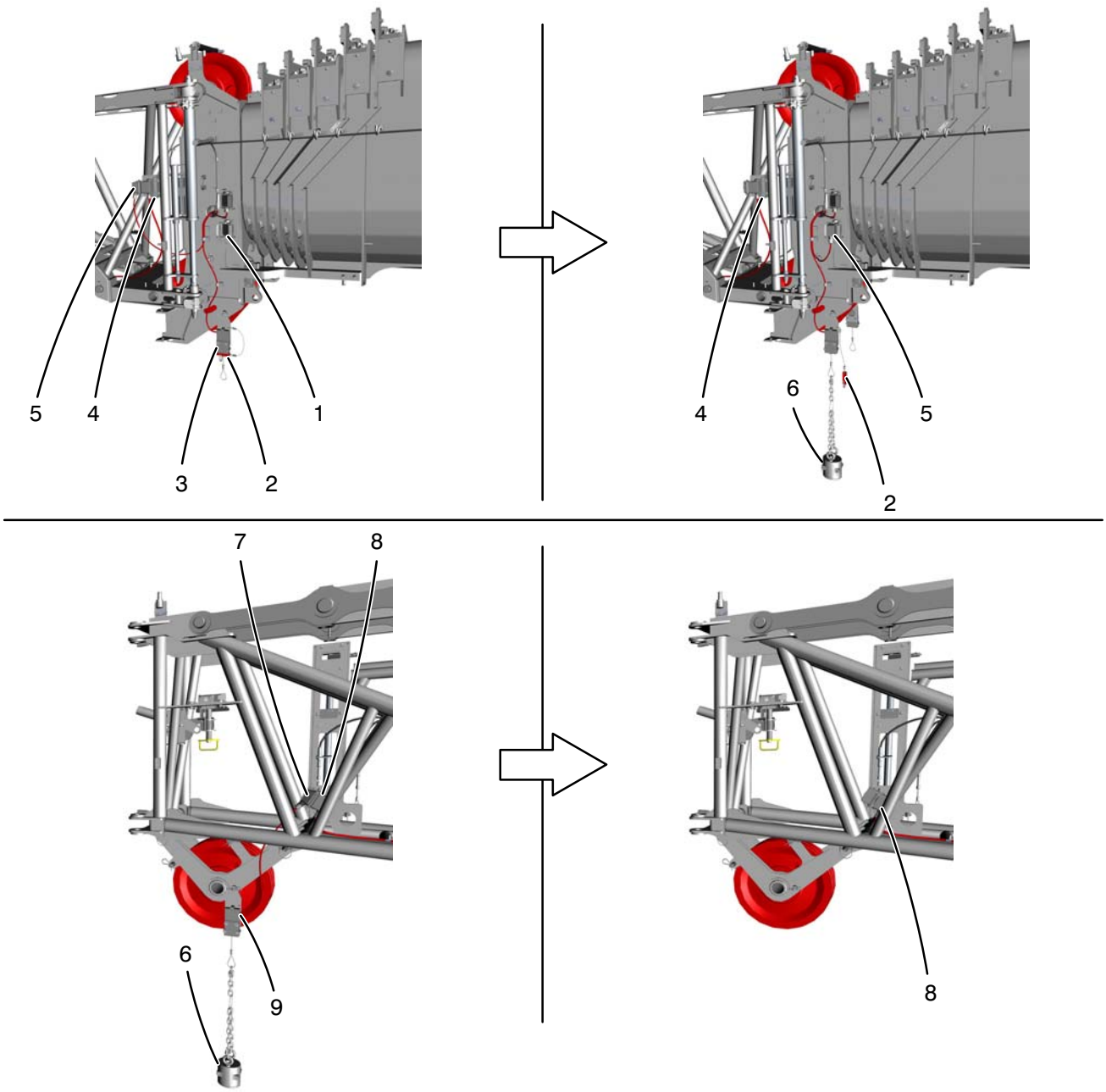
Figure 4–18
Hydraulic Hose Connection – Connected (If Equipped)



1. Fly Base Head Sheave Pin
2. Fly Base Head Sheave

Figure 4—19
Fly Base Head Sheave — Stored Position

11. Remove the wire rope guard from the fly base head sheave. Refer to Figure 4—30. 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, and secure with keeper pin.
12. Remove the wire rope guards from the fly base deflector sheave. Remove wire rope (through the fly base) from the fly base deflector sheave and lay it aside to prevent damage to it during fly removal. Install the wire rope guards, and secure with keeper pins.
13. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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. Remove the fly base head sheave pin securing the fly base head sheave to the lugs on the bottom of the fly head and rotate the fly base head sheave into the stored position. Refer to Figure 4—19. Install the fly base head sheave pin to secure the fly base head sheave to the fly bracket.
15. Properly store wire rope which was used on fly, as required.



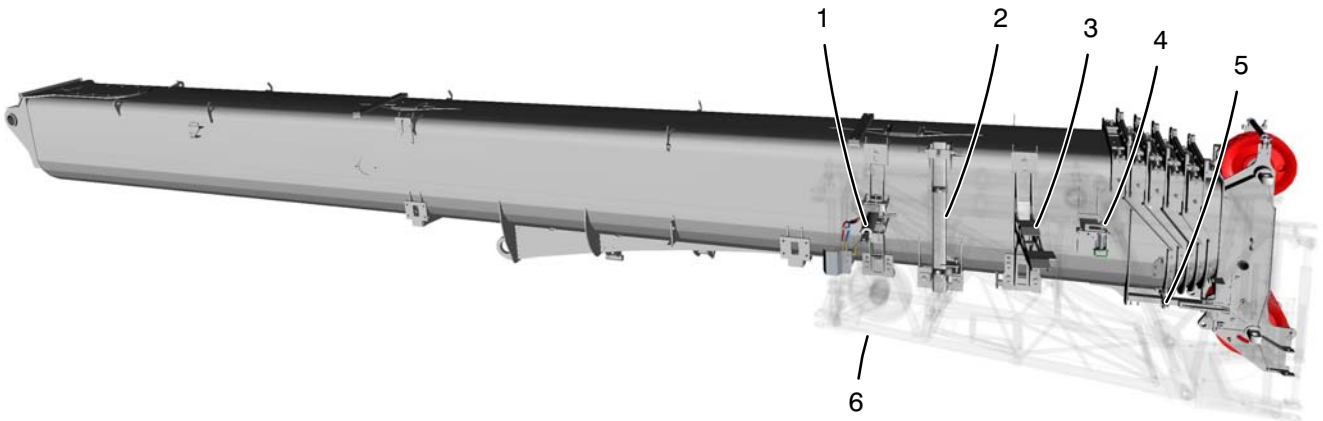
1. Jumper Assembly
2. Lockout Clip
3. Boom Head ATB Switch
4. Fly Base Connector
5. Boom Head Plug
6. ATB Weight
7. Secondary ATB Switch Plug
8. Fly Head Connector
9. Secondary ATB Switch

Figure 4–20
Anti-Two Block (ATB) Connections

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.

16. Carefully extend the boom until the bottom lugs of the fly head rest on the ground. Use a signal person to alert the operator when the fly head lugs are resting on the ground.
17. Securely block up the fly to support it. Refer to Figure 4—13. The 10 ft (*3.05m*) fly weighs approximately 1,714 lb (*778kg*).
18. Using the appropriate tools, rotate the pusher block, 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 fly base speed screw through the left side access tube to fully retract the bottom left side boom head pin.
20. Back off the pusher block 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 fly base speed screw through the left side access tube to fully retract the top left side boom head pin.
22. Using the appropriate tools, rotate the right side fly base speed screw through the right side access tube to fully retract the right side boom head pins 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—4. 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—3. 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.



1. Fly Storage Cylinder
2. Fly Base Storage Bracket
3. Fly Base Ramp
4. Fly Base Retainer Pin
5. Fly Base Stabilizer Link
6. 35 Ft (*10.67m*) Fly Base

Figure 4–21
10 Ft *(3.05m)* Offset Lattice Fly (Stored)

Erection Of The10 Ft (*3.05m*) Fly From The Stored Position

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

⚠ WARNING

Erect the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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 personal injury and/or the crane tipping.

5. Ensure the auxiliary lifting sheave is properly stored on the boom head. Refer to "Auxiliary Lifting Sheave Storage" 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, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—14 and Figure 4—93. If required, change the fly offset to the 0° or locked position. Refer to "Changing The Fly Offset" in this section of this Operator's Manual for detailed instructions.
7. Ensure the fly base head sheave is in the stored position. Refer to Figure 4—19.
8. 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.

CAUTION

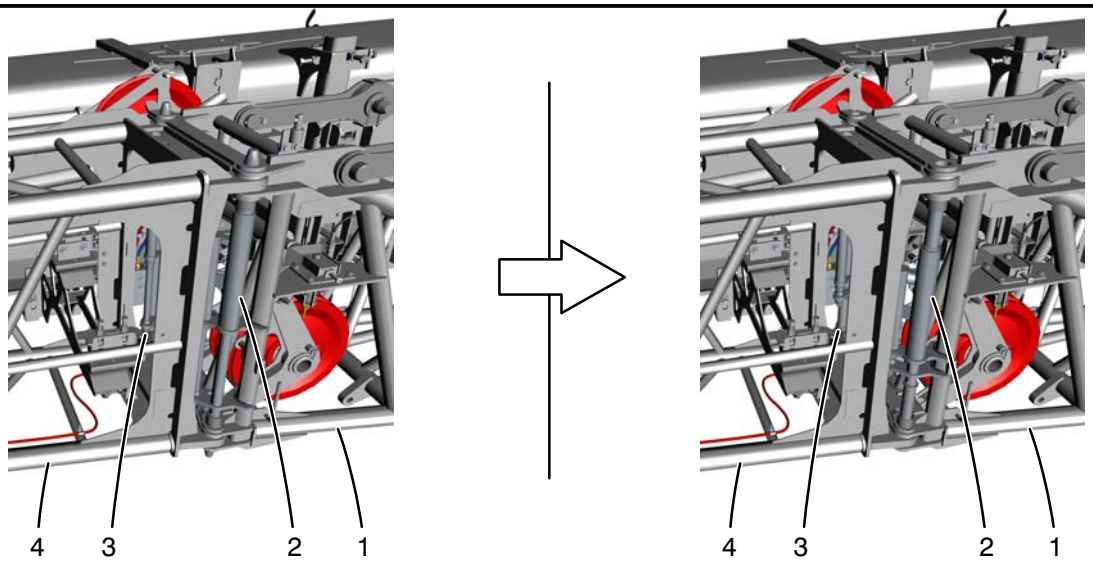
Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

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—3. 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.
11. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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.



1. 10 Ft (*3.05m*) Fly Base Section
2. Fly Center Connecting Pins
3. Fly Center Speed Screw
4. 22.5 Ft (*6.86m*) Fly Center Section

Figure 4–22
Storage of the 22.5 Ft (*6.86m*) Fly Center Section – Disengaged

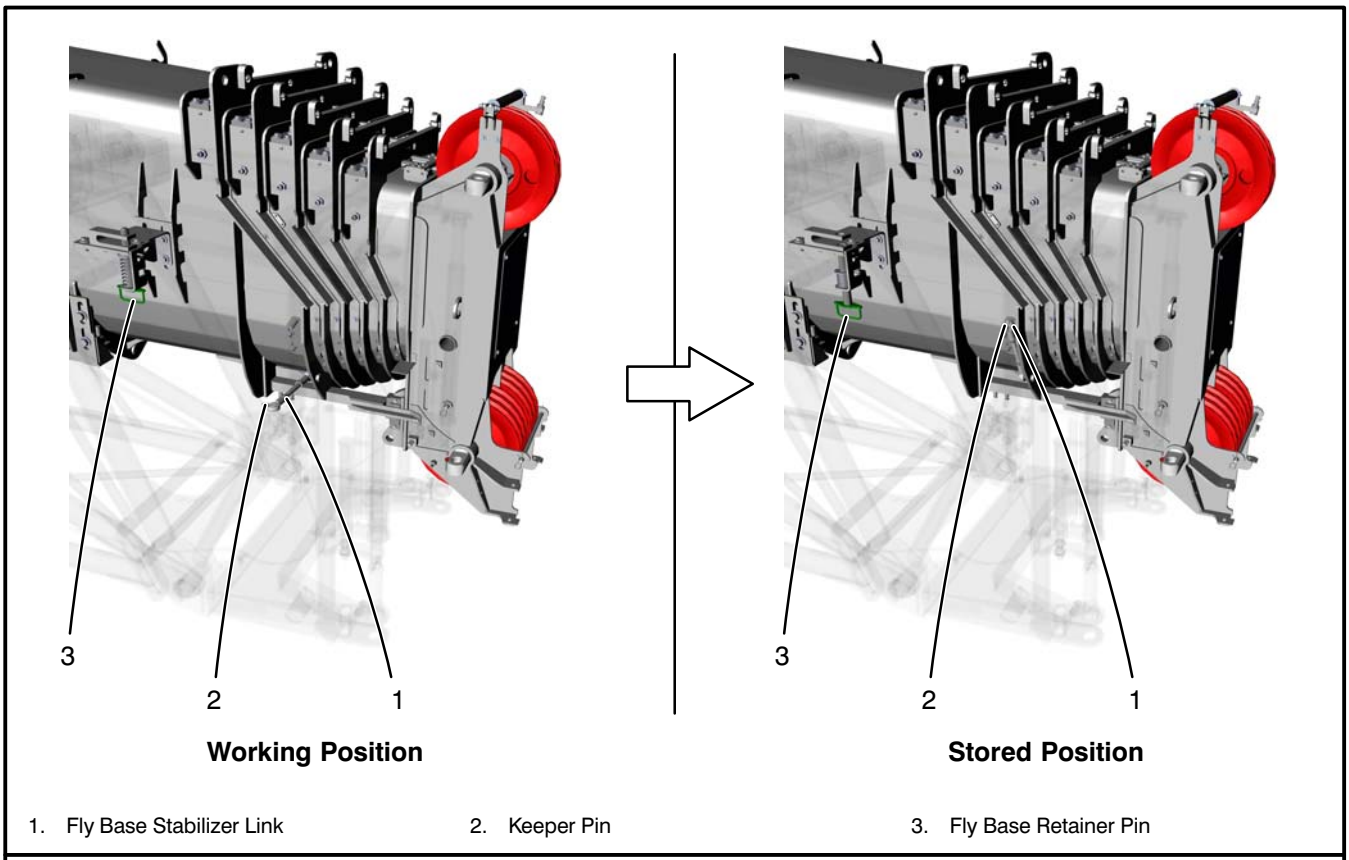
Note: If the fly center section is stored on the boom, disengage the 22.5 ft (*6.86m*) fly center section from the 10 ft (*3.05m*) fly base section:

Ensure the 22.5 ft (*6.86m*) fly center section is properly stored on the boom with the fly center front and rear retainer pins. Refer to Figure 4–43.

WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

Using the appropriate tools, rotate the fly center speed screws to fully retract both fly center connecting pins. Refer to Figure 4–22.



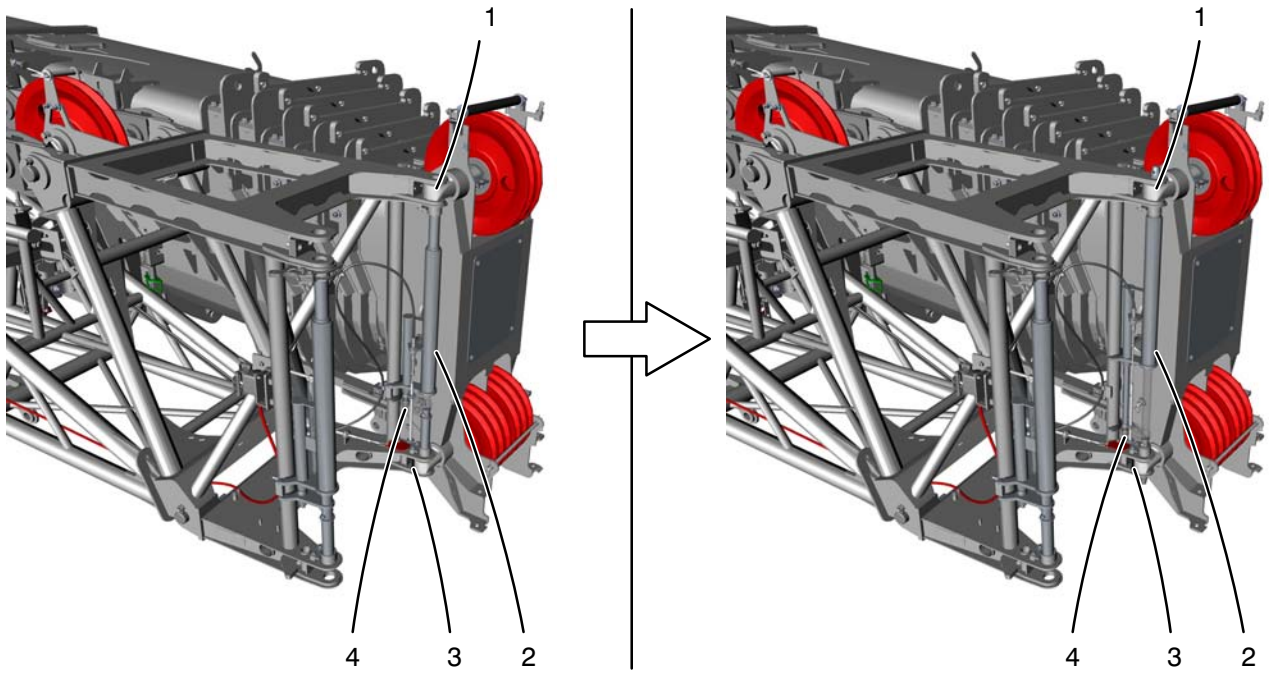
1. Fly Base Stabilizer Link
2. Keeper Pin
3. Fly Base Retainer Pin

Figure 4—23
Fly Base Stabilizer Link — Stored Position

WARNING

Ensure the hydraulic cylinders have been properly filled with oil and bled of air before erecting the hydraulic fly, if equipped. The fly may drop when erecting if not properly filled with oil before erecting the fly. Refer to the Service Manual for proper procedure.

12. Attach a hand line to the tip of the fly base.
13. Remove the keeper pin securing the fly base stabilizer link on the fly base. Refer to Figure 4—23. Rotate the fly base stabilizer link up into the stored position on the side of the boom. Secure the fly base stabilizer link on the boom with the keeper pin.
14. Using the appropriate tools, pull, rotate, and disengage the fly base retainer pin.



Disengaged **Engaged**

1. Boom Head Machinery Cross Shafts
2. Right Side Boom Head Pin
3. Boom Head Pin Block Plate
4. Right Side Fly Base Speed Screw

Figure 4—24
Right Side Fly Boom Head Pin — Engaged

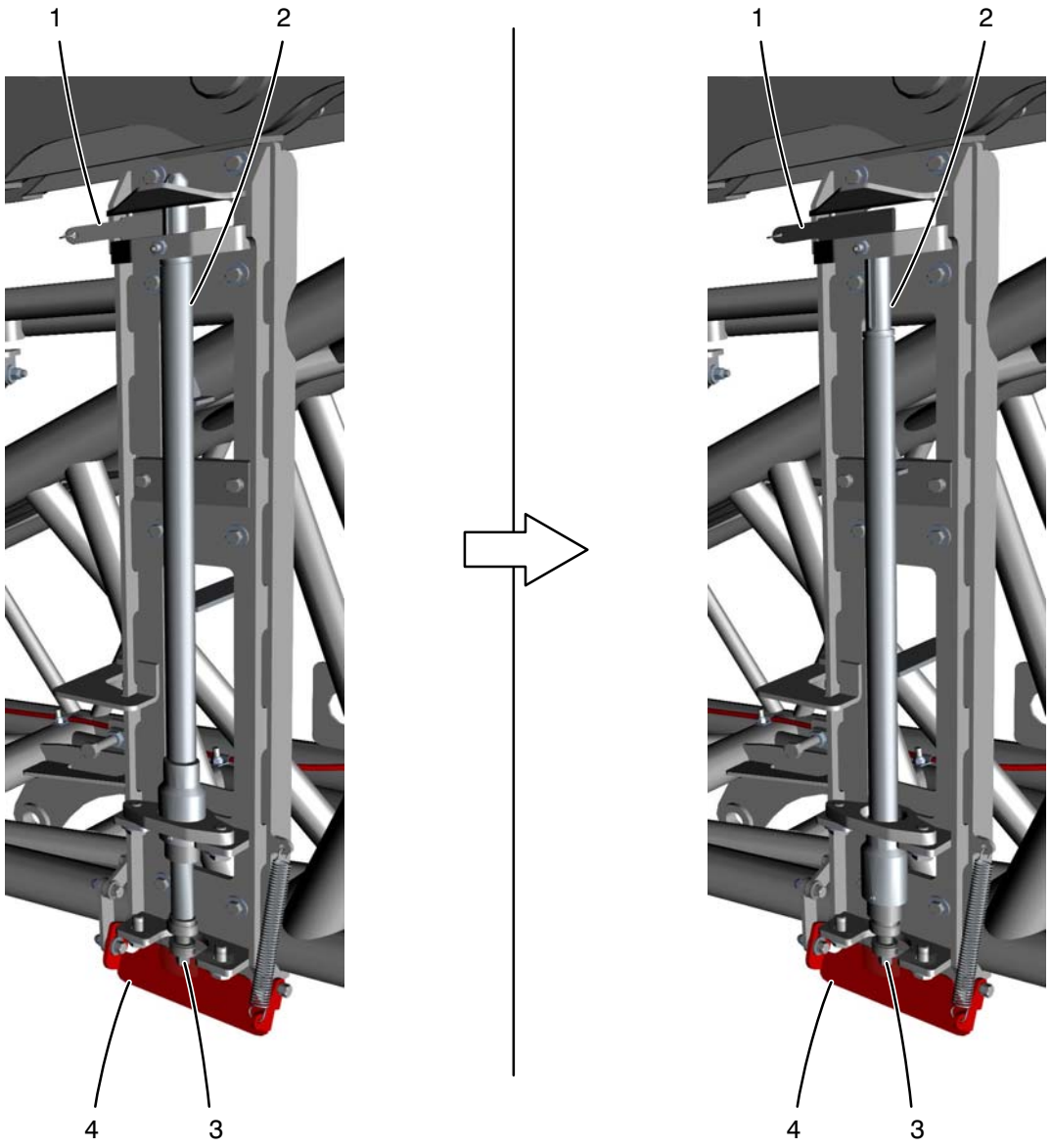
15. Boom up to 0°.

    Note: The wireless rigging box may be used to boom up and down.

16. Actuate the fly storage cylinder, as required, to align the right side fly lugs with the right side of the boom head machinery cross shafts. Refer to Figure 4—24. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.
17. Boom down fully.

    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. Refer to Figure 4—14. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open.

18. Using the appropriate tools, rotate the right side fly base 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.



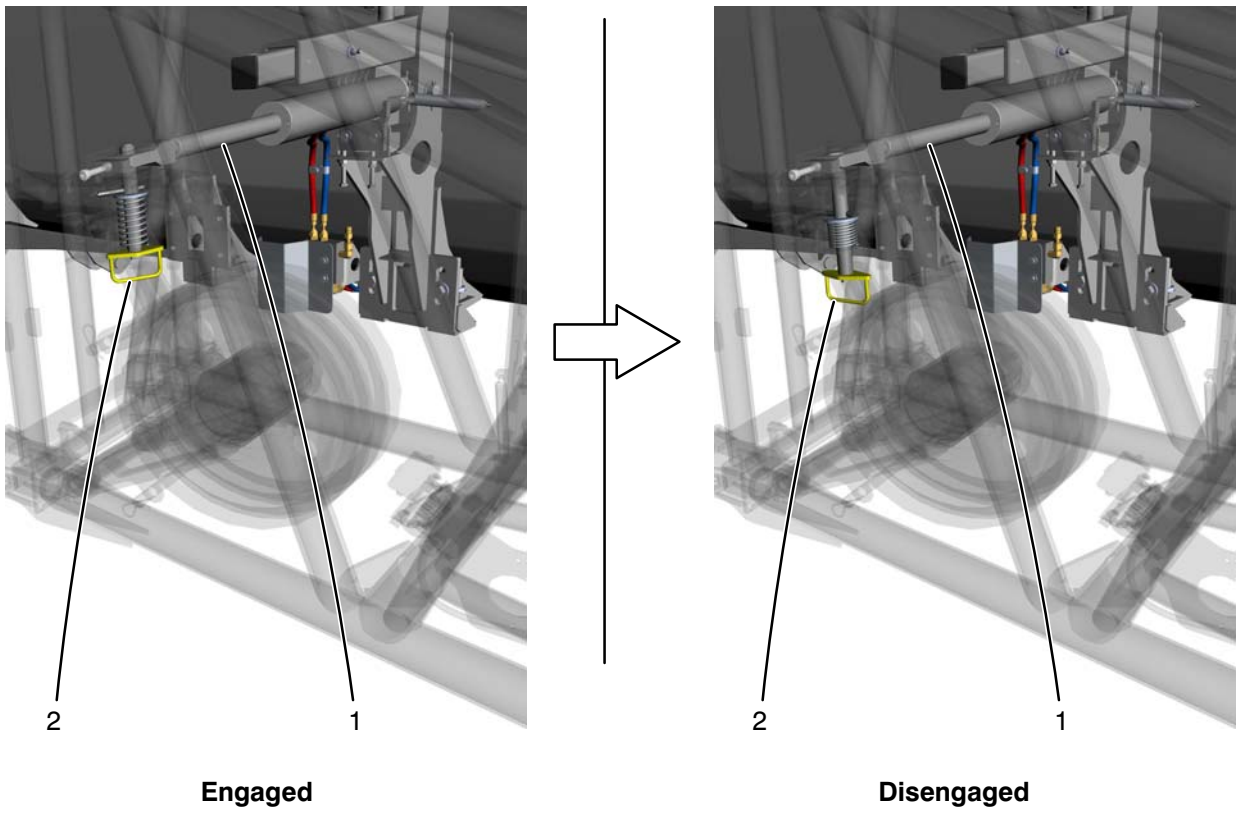
1. Pivot Pin Block Plate
2. Secondary Pivot Pin
3. Pivot Pin Speed Screw
4. Pivot Pin Access Cover

Figure 4–25
Secondary Pivot Pin – Disengaged

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.

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. Refer to Figure 4–25.
20. Boom up to 0°.



1. Fly Storage Cylinder
2. Fly Storage Cylinder Connecting Pin

Figure 4—26
Fly Storage Cylinder — Disengaged

21. Extend the fly storage cylinder to pivot the fly off the fly base ramp. Refer to Figure 4—21.

22. 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 10 ft (*3.05m*) fly section. Refer to Figure 4—26.

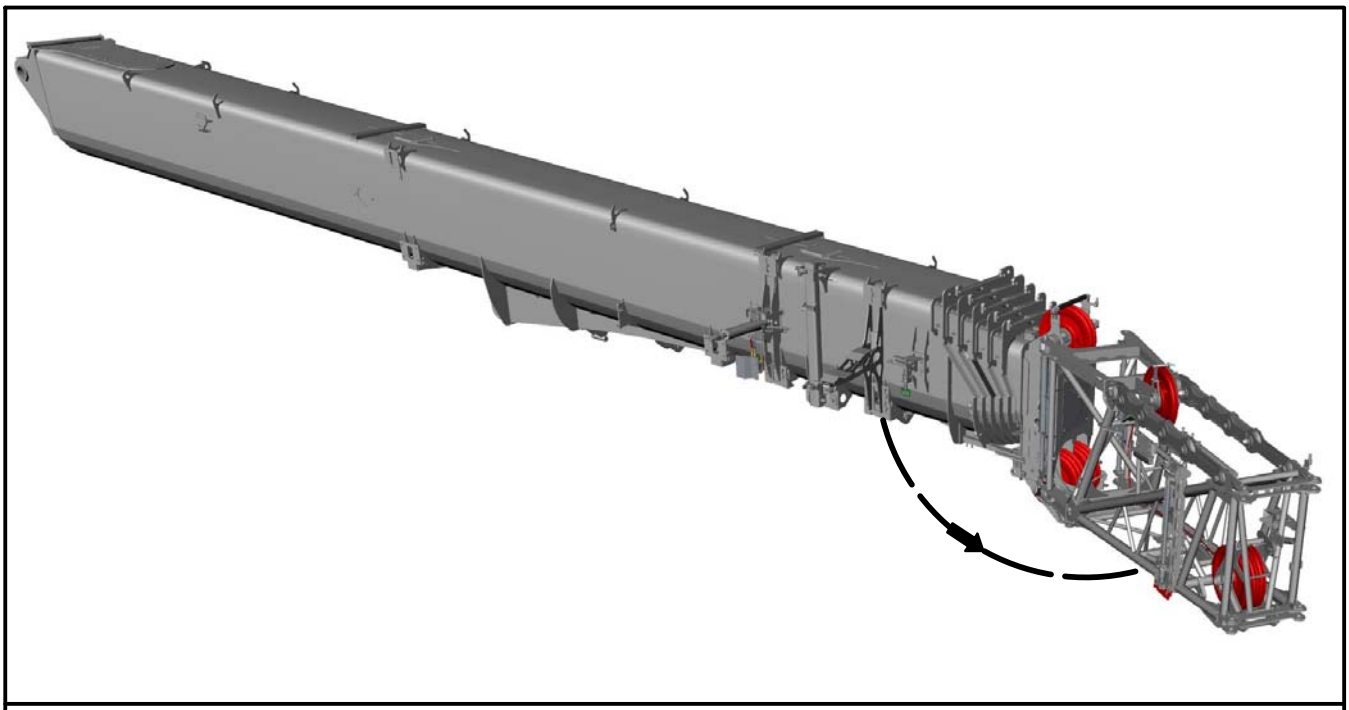


Figure 4—27
Swinging The Fly

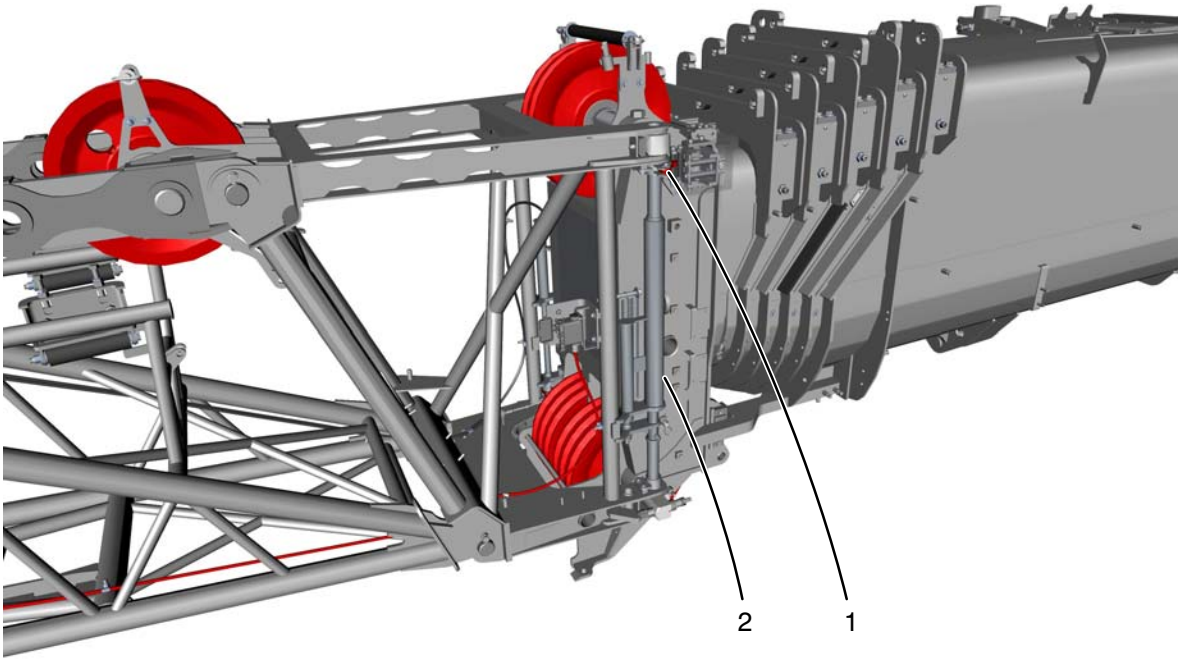
WARNING

Use a hand line to control fly swing. The fly could swing rapidly. Keep all personnel clear of swing path to avoid personal injury.

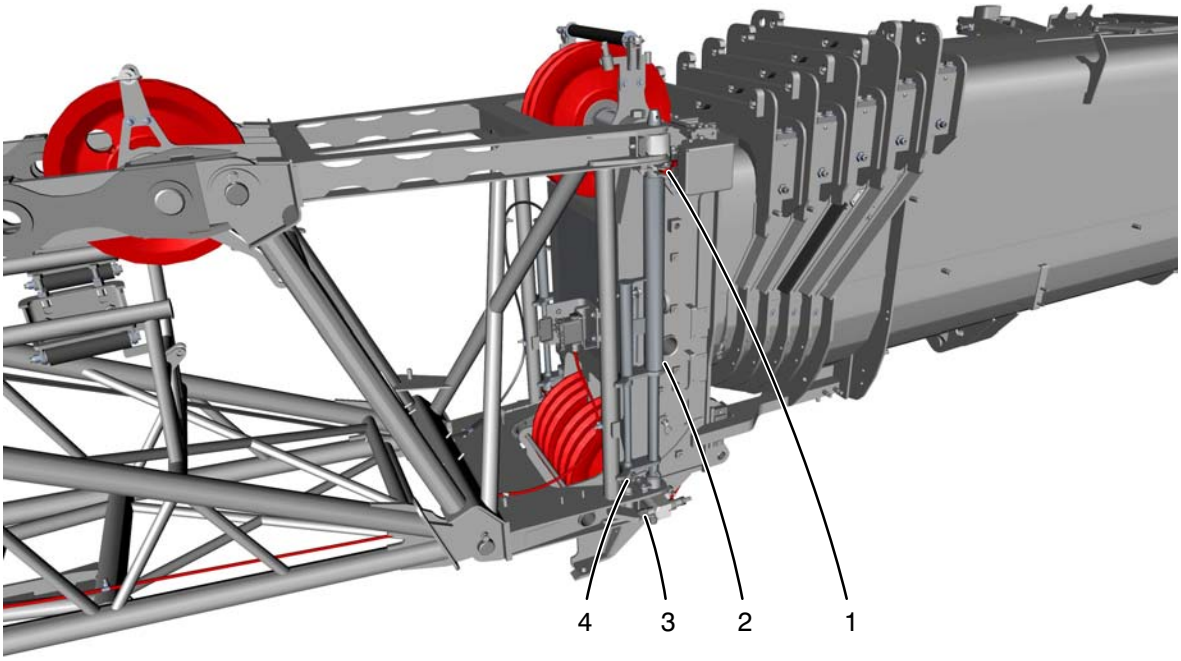
23. Use the hand line attached to the 10 ft (*3.05m*) fly section to begin swinging the fly around the boom head. Refer to Figure 4—27.
24. Continue swinging the fly until the fly catch engages with the boom head and align the top left fly lug with the left side of the top boom head machinery cross shaft. Refer to Figure 4—28.
25. Boom down fully.
26. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the top left side boom head pin.
27. Using the appropriate tools, rotate the pusher block, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
28. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the bottom left side boom head pin.
29. Back off the pusher block 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.



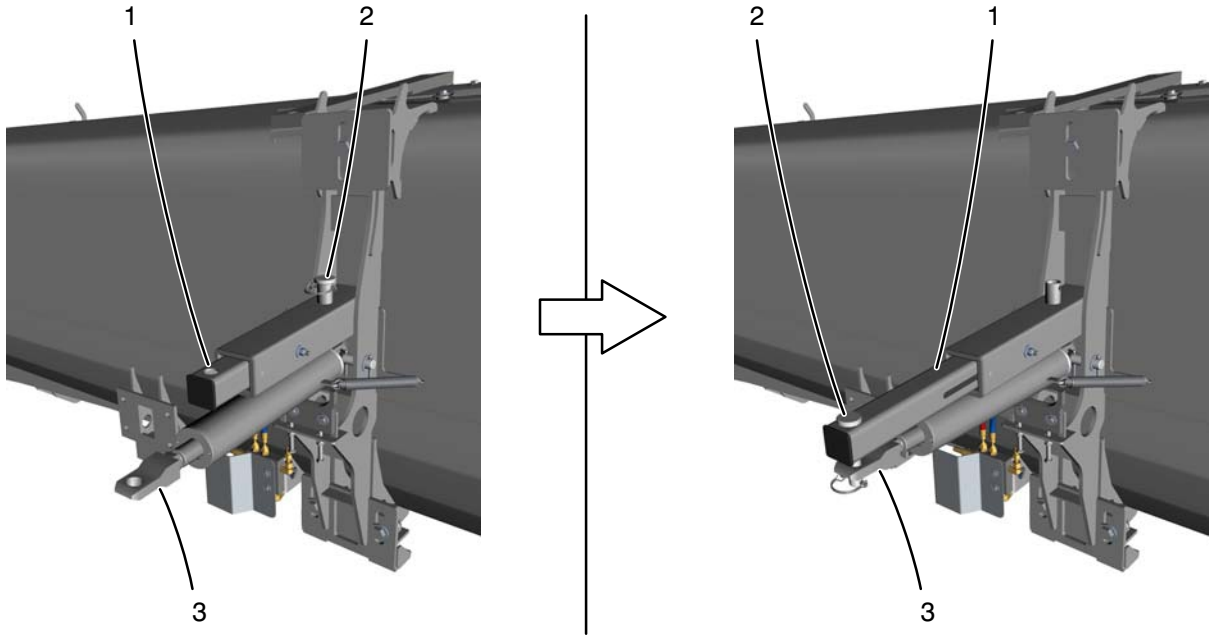
Disengaged



Engaged

1. Fly Catch
2. Left Side Boom Head Pin
3. Pusher Block
4. Left Side Fly Base Speed Screw

Figure 4–28
Left Side Fly Boom Head Pin – Engaged



1. Fly Storage Cylinder Bracket
2. Fly Storage Cylinder Pin And Keeper
3. Fly Storage Cylinder

Figure 4—29
Fly Storage Cylinder — Stored

30. Remove the hand line from the tip of the fly base.
31. Remove the fly base head sheave pin securing the fly base head sheave to the fly bracket and rotate the fly base head sheave into the working position. Refer to Figure 4—15. Install the fly base head sheave pin to secure the fly base head sheave to the lugs on the bottom of the fly head.
32. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
33. Remove the wire rope guards from the fly base deflector sheave. Refer to Figure 4—80. Reeve the wire rope from the boom deflector sheave over the fly base deflector sheave. Install the wire rope guards, and secure with keeper pins.
34. Remove the wire rope guard from the fly base head sheave. Reeve the wire rope from the fly base deflector sheave (under the fly base crossbar) over the fly base head sheave. Install the wire rope guard, and secure with keeper pin.

CAUTION

All wire rope guards must be in proper position during operation.

35. Fully retract the fly storage cylinder.
36. Remove the fly storage cylinder keeper and pin from the cylinder bracket. Adjust the cylinder bracket and/or actuate the fly storage cylinder to align the holes for the storage cylinder pin. Refer to Figure 4—29. Install the fly storage cylinder pin and secure with keeper.

37. 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—16.
    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 and remove the secondary ATB switch from the right side of the boom head. Install the secondary ATB switch on the fly head and connect the secondary ATB switch plug to the fly head connector.
    e. Install the ATB weight on the secondary 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.

38. If the crane is equipped with the hydraulic fly base, connect the hydraulic hoses as follows:
    a. Remove the keeper pin and hydraulic hose bracket from the storage bracket. Refer to Figure 4—17.
    b. Route the boom offset extend and retract hydraulic hoses through the rollers on the boom. If required, remove the top rollers from the stored position and install them in the working position. Align the hydraulic hose bracket on the working bracket and secure with the keeper pin.
    c. Disconnect the hydraulic offset extend and retract hoses from the quick disconnect manifold and connect to the boom offset extend and retract hydraulic hoses. Ensure o-ring of each quick disconnect fitting is completely covered.
    d. Rotate the accumulator ball valve into the working position.
    e. Ensure the quick disconnect fittings are capped.

    Note: If the crane is equipped with the hydraulic fly base, the offset fly must be put into the operating position before operating with the fly. Refer to "Changing The Fly Offset Angle" in this section of this Operator's Manual.

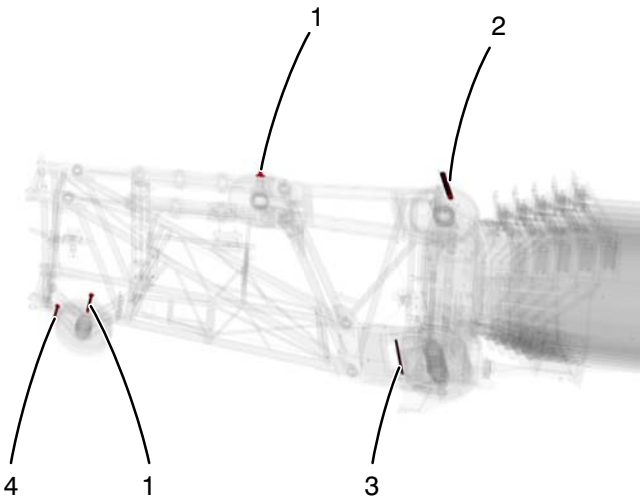
39. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
40. Check the Crane Rating Manual, in the operator's cab, for deductions from the lifting capacities with the fly installed before continuing operations.

WARNING

When making lifts from the 10 ft (*3.05m*) fly at 0° offset and 70 degree boom angle or higher, 2 parts of line is the maximum with the auxiliary sheave erected. Wire rope may contact auxiliary lifting sheave. Auxiliary lifting sheave may be removed to eliminate the possible interference. A warning will be shown on the RCL display if the configuration can result in wire rope contacting the auxiliary lifting sheave.

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.



1. Fly Base Deflector Sheave Wire Rope Guards
2. Boom Deflector Sheave Wire Rope Guard
3. Boom Head Sheave Wire Rope Guard
4. Fly Base Head Sheave Wire Rope Guard

Figure 4—30
10 Ft (*3.05m*) Fly Wire Rope Guards

Storage Of The10 Ft (*3.05m*) Fly From The Erected Position

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

WARNING

Store the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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 personal injury and/or the crane tipping.

5. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—14 and Figure 4—93. If required, change the fly offset to the 0° or locked 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.

CAUTION

Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

7. Boom down fully.

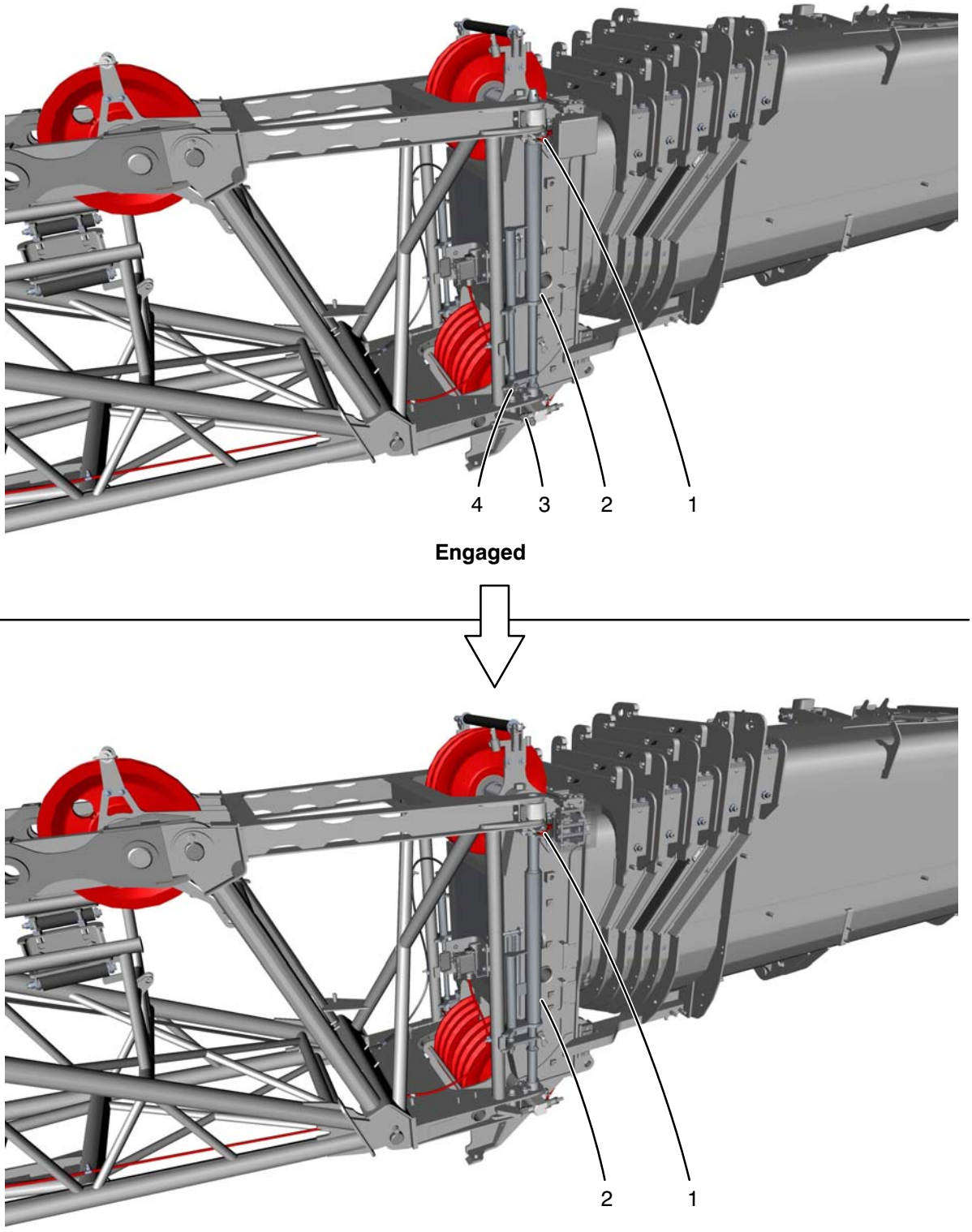
WARNING

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 crane is equipped with the hydraulic fly base, disconnect the hydraulic hoses as follows:
   a. Rotate the accumulator ball valve into the stored position. Refer to Figure 4—18.
   b. Disconnect the hydraulic offset extend and retract hoses from the boom offset extend and retract hydraulic hoses and connect to the quick disconnect manifold. Ensure o-ring of each quick disconnect fitting is completely covered.
   c. Remove the keeper pin and hydraulic hose bracket from the working bracket.
   d. Remove the boom offset extend and retract hydraulic hoses from the rollers on the boom. If required, remove the top rollers from the working position and install them in the stored position. Align the hydraulic hose bracket on the storage bracket and secure with the keeper pin.
   e. Ensure the boom extend and retract hydraulic hoses are capped.
9. Properly disconnect the anti-two block (ATB) system as follows:
   a. Remove the ATB weight from the secondary ATB switch cable. Refer to Figure 4—20.
   b. Disconnect the secondary ATB switch plug from the fly head connector and remove the secondary ATB switch from the fly head. Install and connect the secondary ATB switch on the right side of the boom head.
   c. Disconnect the boom head plug from the fly base connector and connect it to the jumper assembly on the main boom head.
   d. Install the ATB weight on the boom head ATB switch cable.
   e. Remove the lockout clip from the boom head ATB switch cable.
10. Remove the wire rope guard from the fly base head sheave. Refer to Figure 4—30. 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, and secure with keeper pin.
11. Remove the wire rope guards from the fly base deflector sheave. Remove wire rope (through the fly base) from the fly base deflector sheave and lay it aside to prevent damage to it during fly storage. Install the wire rope guards, and secure with keeper pins.
12. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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.
13. Remove the fly base head sheave pin securing the fly base head sheave to the lugs on the bottom of the fly head and rotate the fly base head sheave into the stored position. Refer to Figure 4—19. Install the fly base head sheave pin to secure the fly base head sheave to the fly bracket.
14. Properly store wire rope which was used on fly, as required.
15. If the crane is equipped with the hydraulic fly base, properly fill with oil and bleed air from the hydraulic cylinders. Refer to the Service Manual for proper procedure.

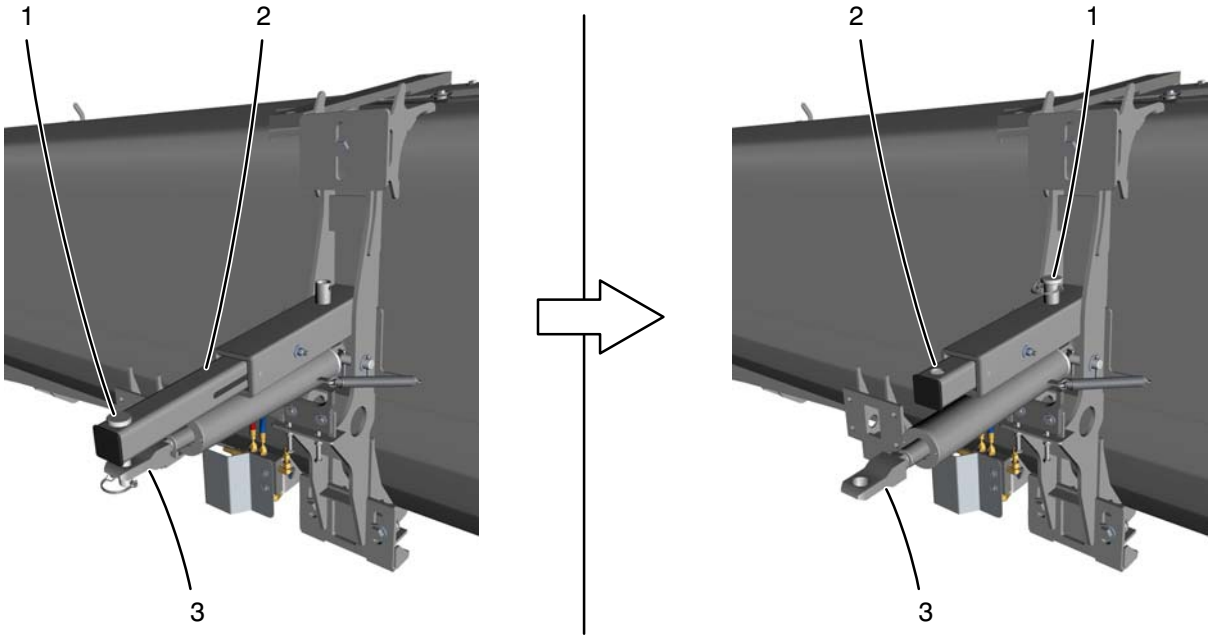
⚠ WARNING

Ensure the hydraulic cylinders have been properly filled with oil and bled of air before storing the hydraulic fly, if equipped. The fly may drop when erecting if not properly filled with oil before storing the fly. Refer to the Service Manual for proper procedure.



1. Fly Catch
2. Left Side Boom Head Pin
3. Pusher Block
4. Left Side Fly Base Speed Screw

Figure 4–31
Left Side Fly Boom Head Pin – Disengaged



1. Fly Storage Cylinder Pin And Keeper
2. Fly Storage Cylinder Bracket
3. Fly Storage Cylinder

Figure 4—32
Fly Storage Cylinder — Stored

16. Attach a hand line to the tip of the fly base.
17. Remove the fly storage cylinder keeper and pin securing the fly storage cylinder to the cylinder bracket. Refer to Figure 4—32. Store the fly storage cylinder pin in the fly storage cylinder bracket and secure with keeper.
18. Fully extend the fly storage cylinder.
19. Using the appropriate tools, rotate the pusher block, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft. Refer to Figure 4—31.
20. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully retract the bottom left side boom head pin.
21. Back off the pusher block until a clearance of at least 1/2 in (*1.3cm*) from the left fly lug is obtained.
22. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully retract the top left side boom head pin.
23. Boom up to a boom angle of 0°.
24. Use the appropriate tools to pull and rotate the fly storage cylinder connecting pin into detent position. Refer to Figure 4—26.

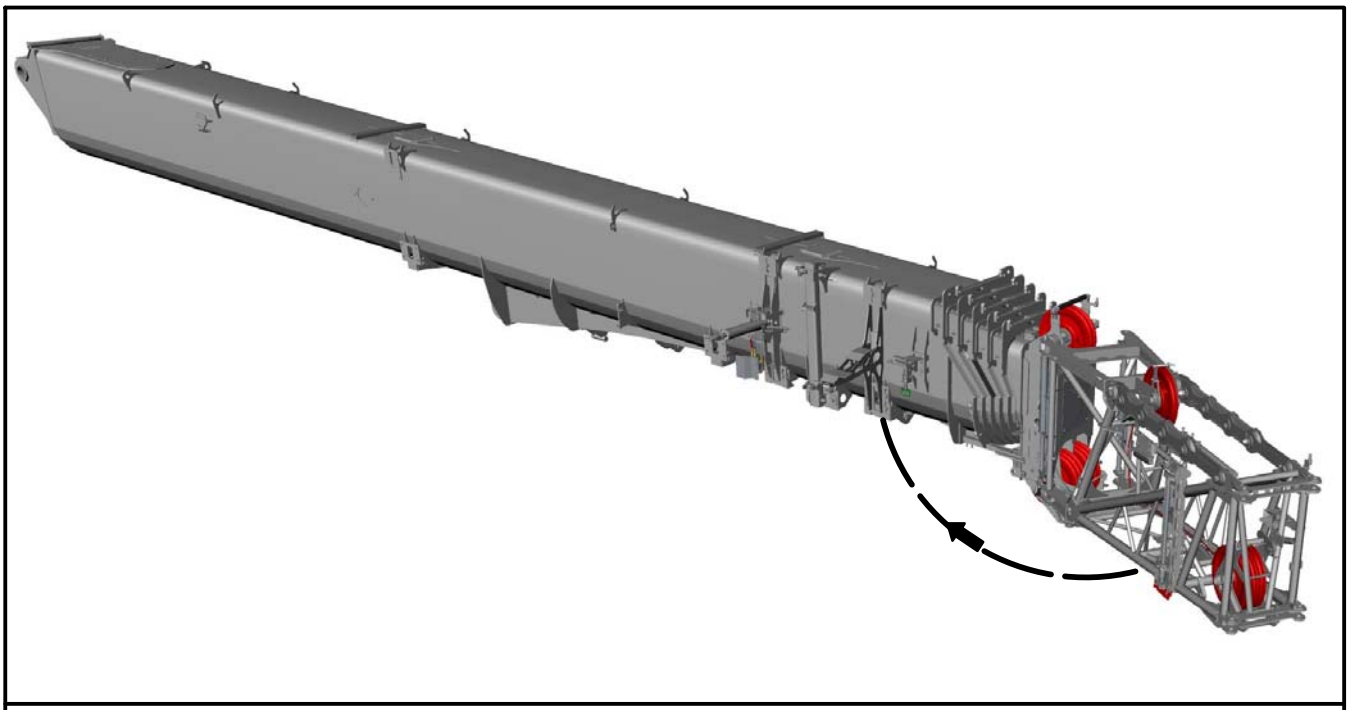
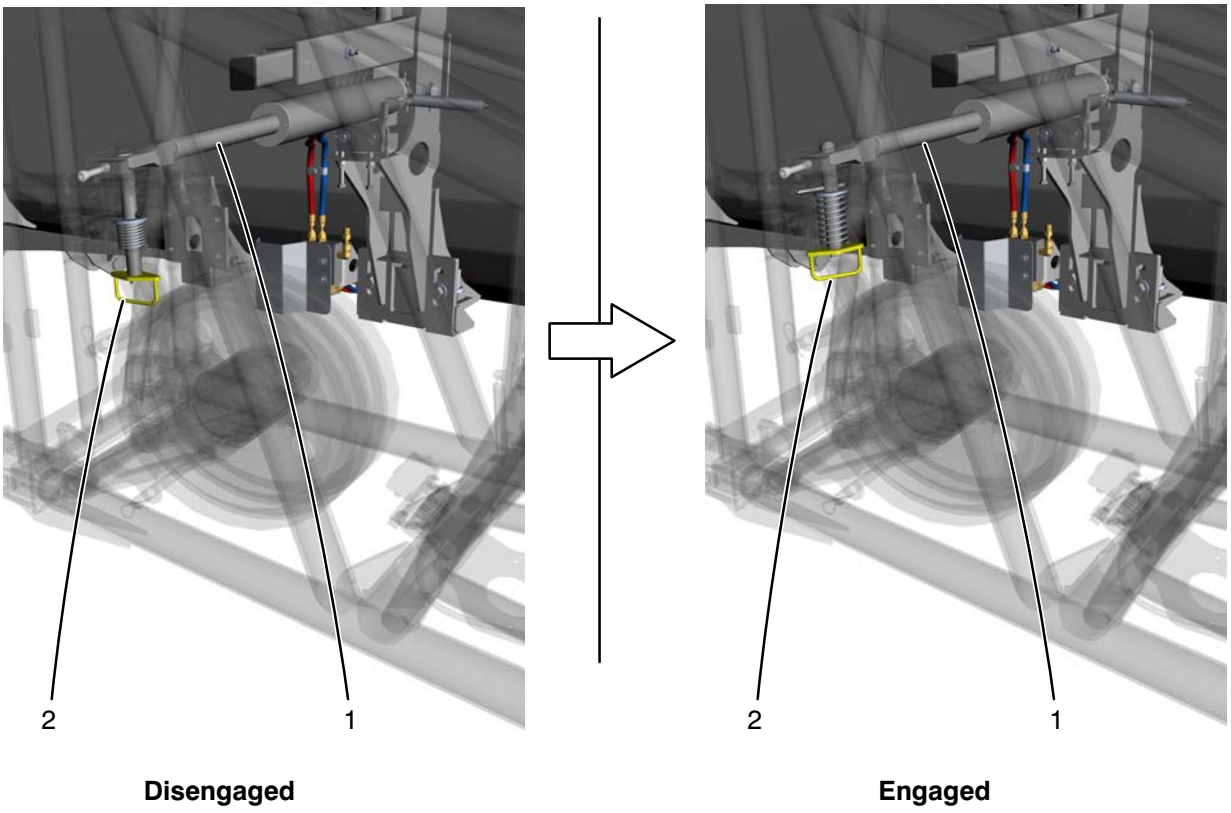


Figure 4—33
Swinging The Fly

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.

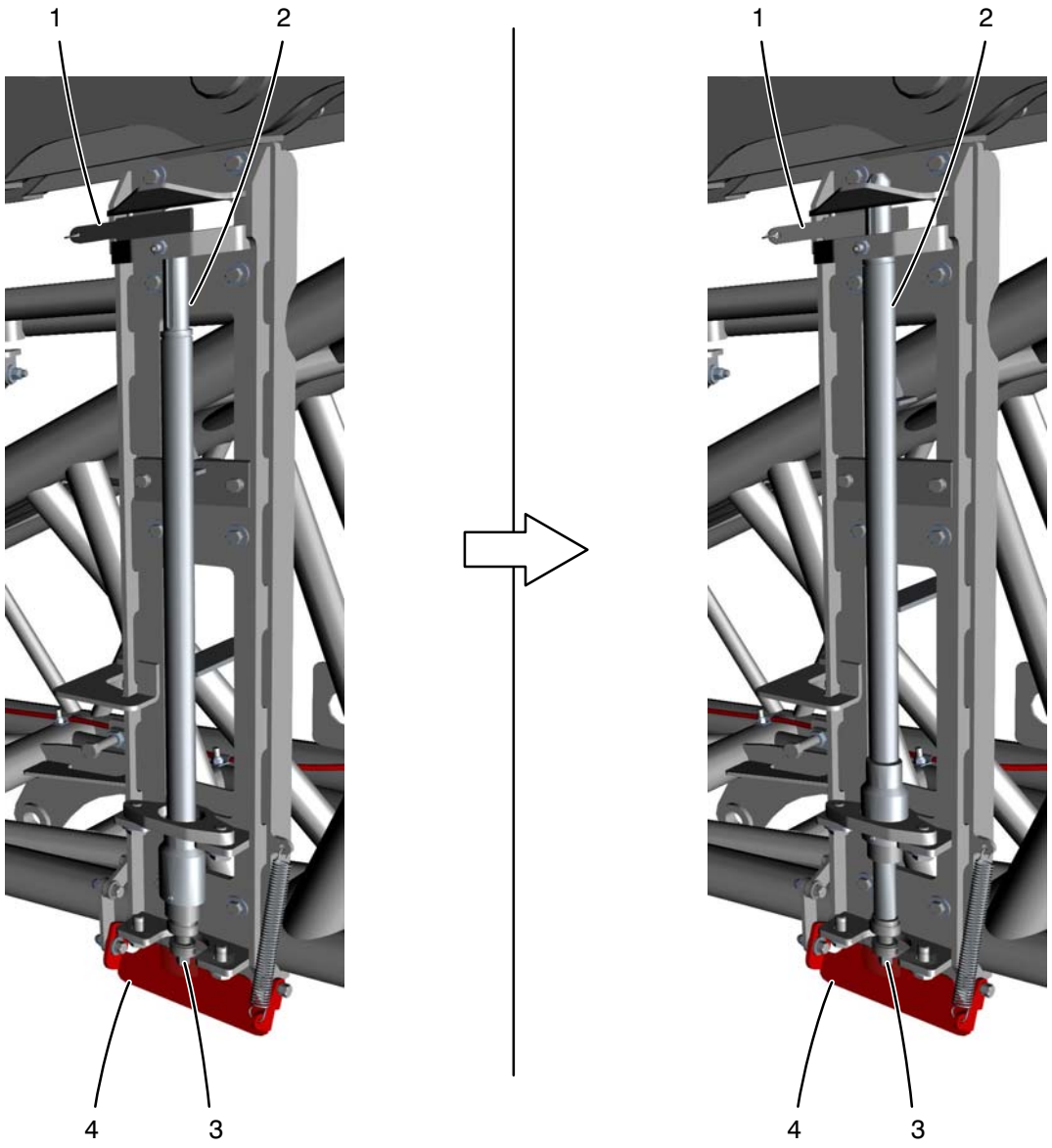
25. While holding the hand line begin swinging the fly around to the right side of the boom. Swinging the fly will disengage the fly catch. Refer to Figure 4—33.



1. Fly Storage Cylinder
2. Fly Storage Cylinder Connecting Pin

Figure 4—34
Fly Storage Cylinder — Engaged

26. 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—34.
27. Retract the fly storage cylinder, as required, to pivot the fly onto the fly base ramp.
28. Boom down fully.

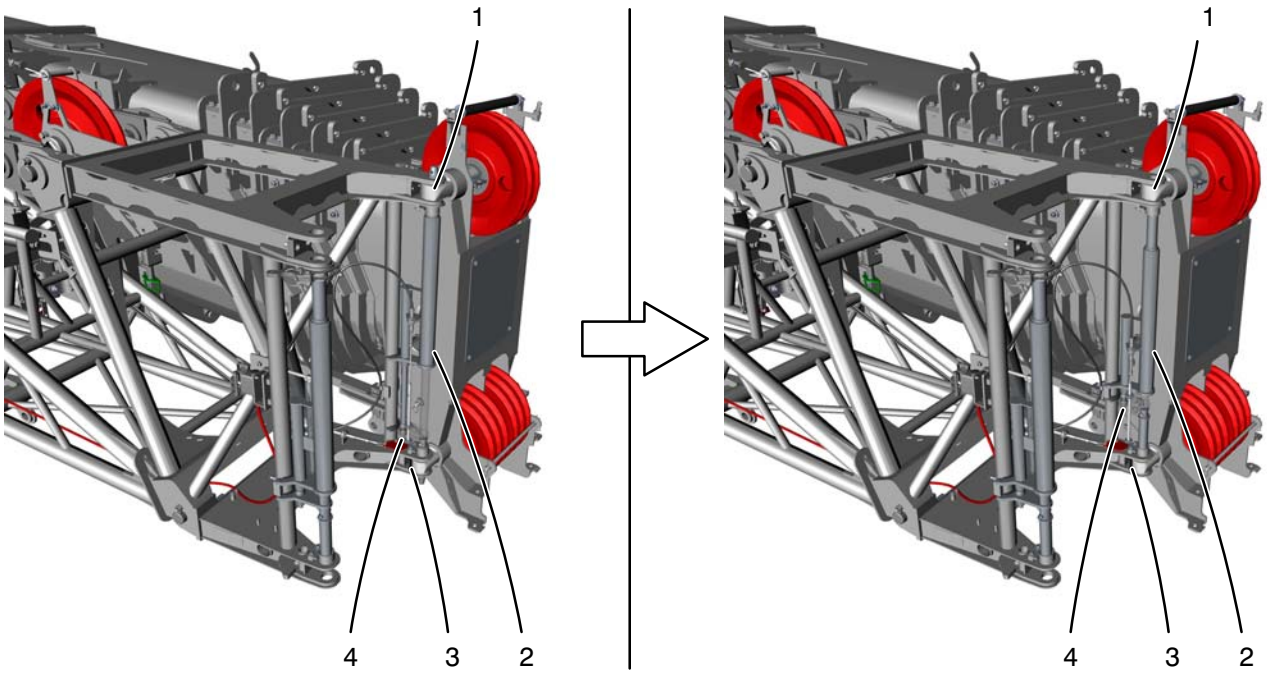


1. Pivot Pin Block Plate
2. Secondary Pivot Pin
3. Pivot Pin Speed Screw
4. Pivot Pin Access Cover

Figure 4—35
Secondary Pivot Pin — Engaged

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—14.

29. Using the appropriate tools, rotate the pivot pin speed screw to fully extend the secondary pivot pin. Refer to Figure 4—35.



Engaged **Disengaged**

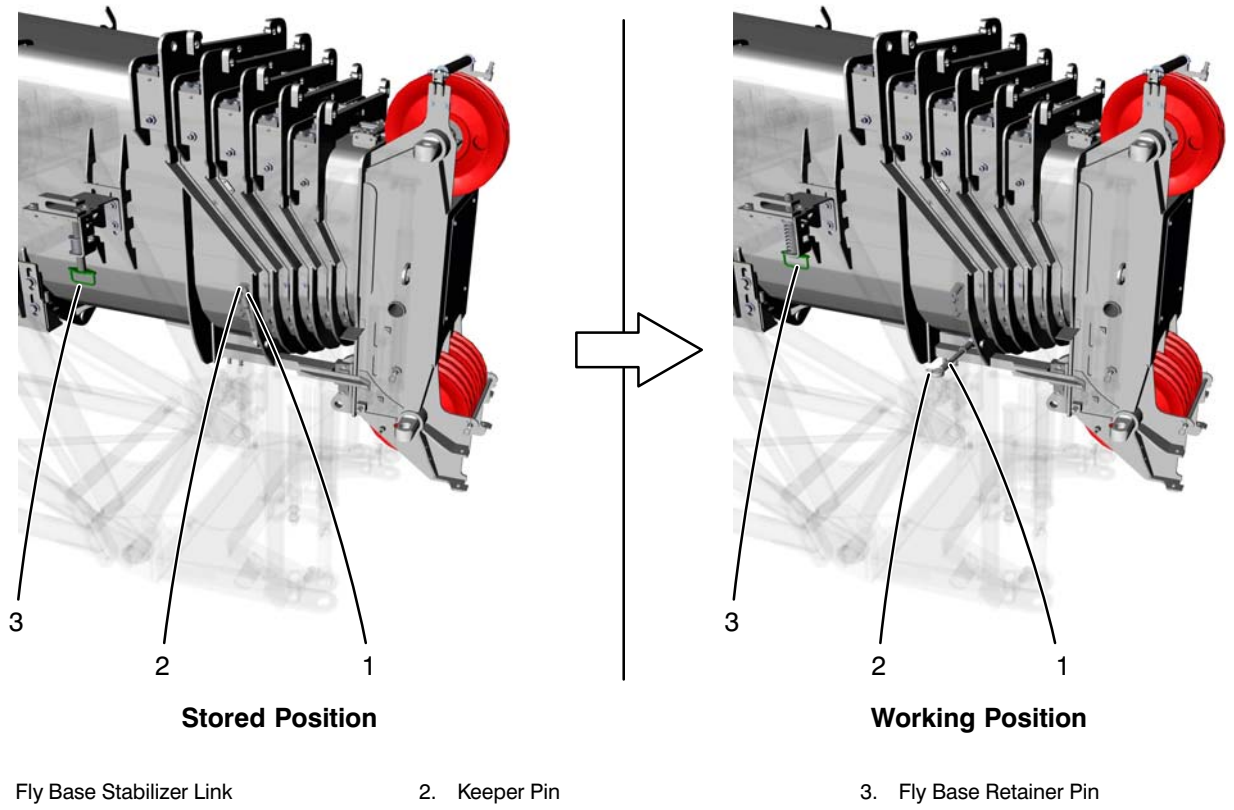
1. Boom Head Machinery Cross Shafts
2. Right Side Boom Head Pin
3. Boom Head Pin Block Plate
4. Right Side Fly Base Speed Screw

Figure 4—36
Right Side Fly Boom Head Pin — Disengaged

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 fly base 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.

30. Using the appropriate tools, rotate the right side fly base 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—36.
31. Actuate the fly storage cylinder to pull the fly onto the fly base ramp and align the fly with the fly base retainer pin.

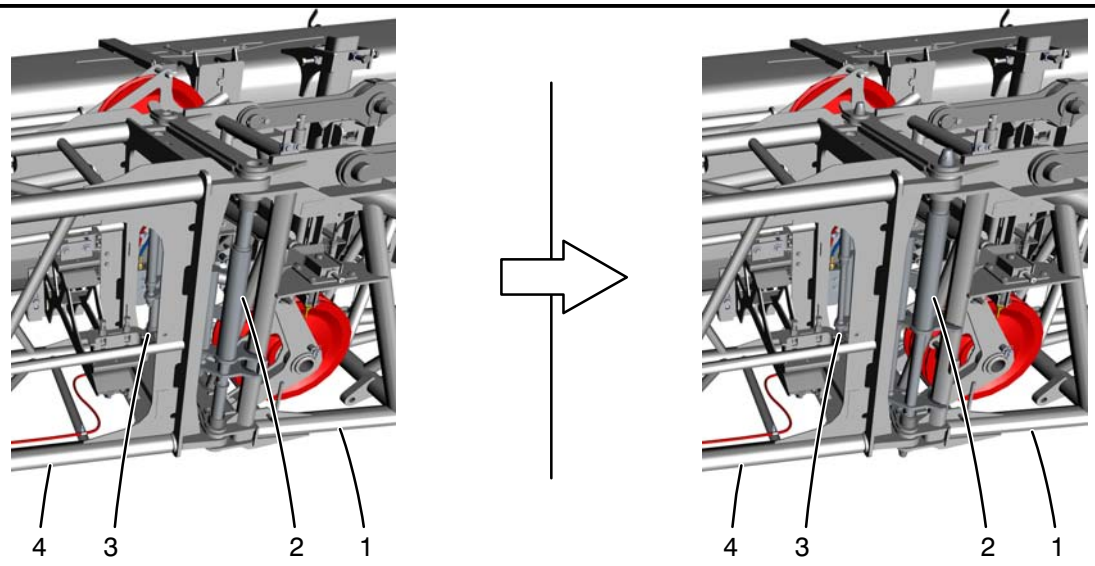


1. Fly Base Stabilizer Link
2. Keeper Pin
3. Fly Base Retainer Pin

Figure 4–37
Fly Base Stabilizer Link – Working Position

32. Using the appropriate tools, pull, rotate, and engage the fly base retainer pin. Refer to Figure 4–37.

33. Remove the keeper pin securing the fly base stabilizer link on the boom. Rotate the fly base stabilizer link down into the working position on the side of the fly base. Secure the fly base stabilizer link on the fly base with the keeper pin.



1. 10 Ft (*3.05m*) Fly Base Section
2. Fly Center Connecting Pins
3. Fly Center Speed Screw
4. 22.5 Ft (*6.86m*) Fly Center Section

Figure 4–38
Storage of the 22.5 Ft (*6.86m*) Fly Center Section – Disengaged

Note: If the fly center section is stored on the boom, engage the 22.5 ft (*6.86m*) fly center section from the 10 ft (*3.05m*) fly base section:

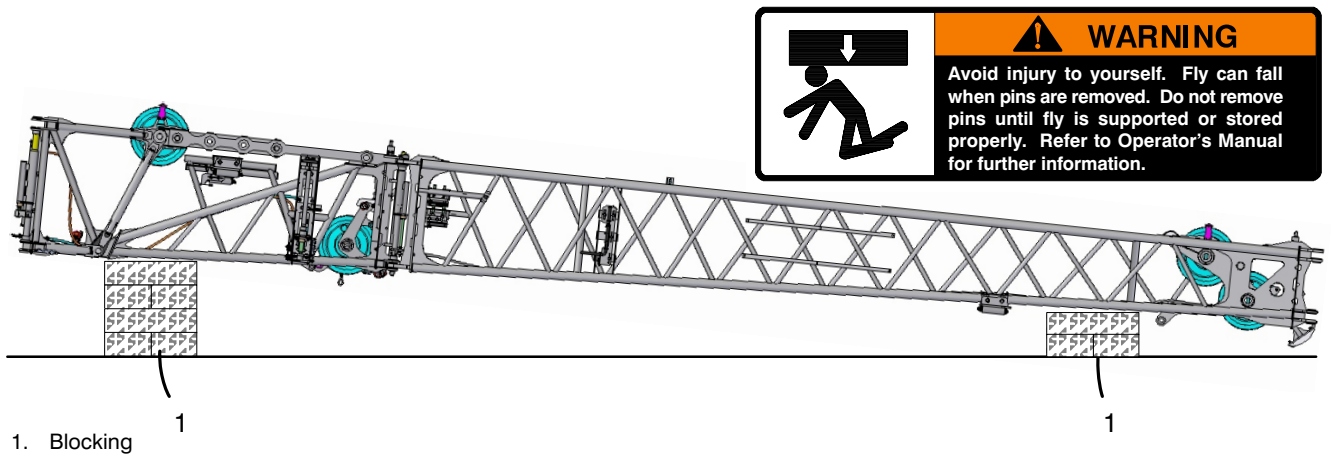
Ensure the 22.5 ft (*6.86m*) fly center section is properly stored on the boom with the fly center front and rear retainer pins. Refer to Figure 4–43.

WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

Using the appropriate tools, rotate the fly center speed screws to fully extend both fly center connecting pins. Refer to Figure 4–22.

34. Remove the hand line from the tip of the fly base.
35. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
36. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4—3. 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.
37. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
38. Check the Crane Rating Manual, in the operator's cab, for lifting capacities with the fly in the stored position before continuing operations.



1. Blocking

Figure 4—39
Installation And Removal Of The 10—32.5Ft *(3.05—9.91m)* Offset Lattice Fly

10—32.5Ft *(3.05—9.91m)* Offset Lattice Fly

The crane may be equipped with a three piece 10—32.5 ft (*3.05—9.91m*) offset lattice fly. It consists of the two piece 10 ft (*3.05m*) fly base section and a 22.5 ft (*6.86m*) fly center section. The offset lattice fly, as shown in Figure 4—40, connects to the main boom head. It can be used 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. The fly is equipped with assist tools which include a 1/2 in (*13mm*) hex socket and extensions.

10—32.5Ft (*3.05—9.91m*) Fly Installation

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

WARNING

Install the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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 personal injury and/or the crane tipping.

5. Ensure the auxiliary lifting sheave is properly stored on the boom head. Refer to "Auxiliary Lifting Sheave Storage" in this section of this Operator's Manual.
6. Ensure the fixed fly base is properly pinned to the 8 ft (*2.44m*) offset fly base section with fly base connecting pins. Refer to Figure 4—40.

7. Ensure the 10 ft (*3.05m*) fly base section is properly pinned to the 22.5 ft (*6.86m*) fly center section with fly center connecting pins. If required, pin the 22.5 ft (*6.86m*) fly center section to the 10 ft (*3.05m*) fly base section. Engage the fly center lugs with the fly base lugs. Using the appropriate tools, rotate the fly center speed screw to fully extend both fly center connecting pins.
8. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—40 and Figure 4—93. If required, change the fly offset to the 0° or locked position. Refer to "Changing The Fly Offset" in this section of this Operator's Manual for detailed instructions.
9. Ensure the fly base head sheave is in the stored position. Refer to Figure 4—19.
10. Position the fly on secure blocking. Refer to Figure 4—13. The 10—32.5 ft (*3.05—9.91m*) fly weighs approximately 2,969 lb (*1,347kg*).
11. Raise and extend the boom to allow enough rope to reeve the fly. Lower the hook block or hook ball (to be used on the fly) to the ground. Fully retract the boom.
12. 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.

13. Remove the wire rope guard and wire rope from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4—3. 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.
14. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly installation. Install the wire rope guard and secure with keeper pin.

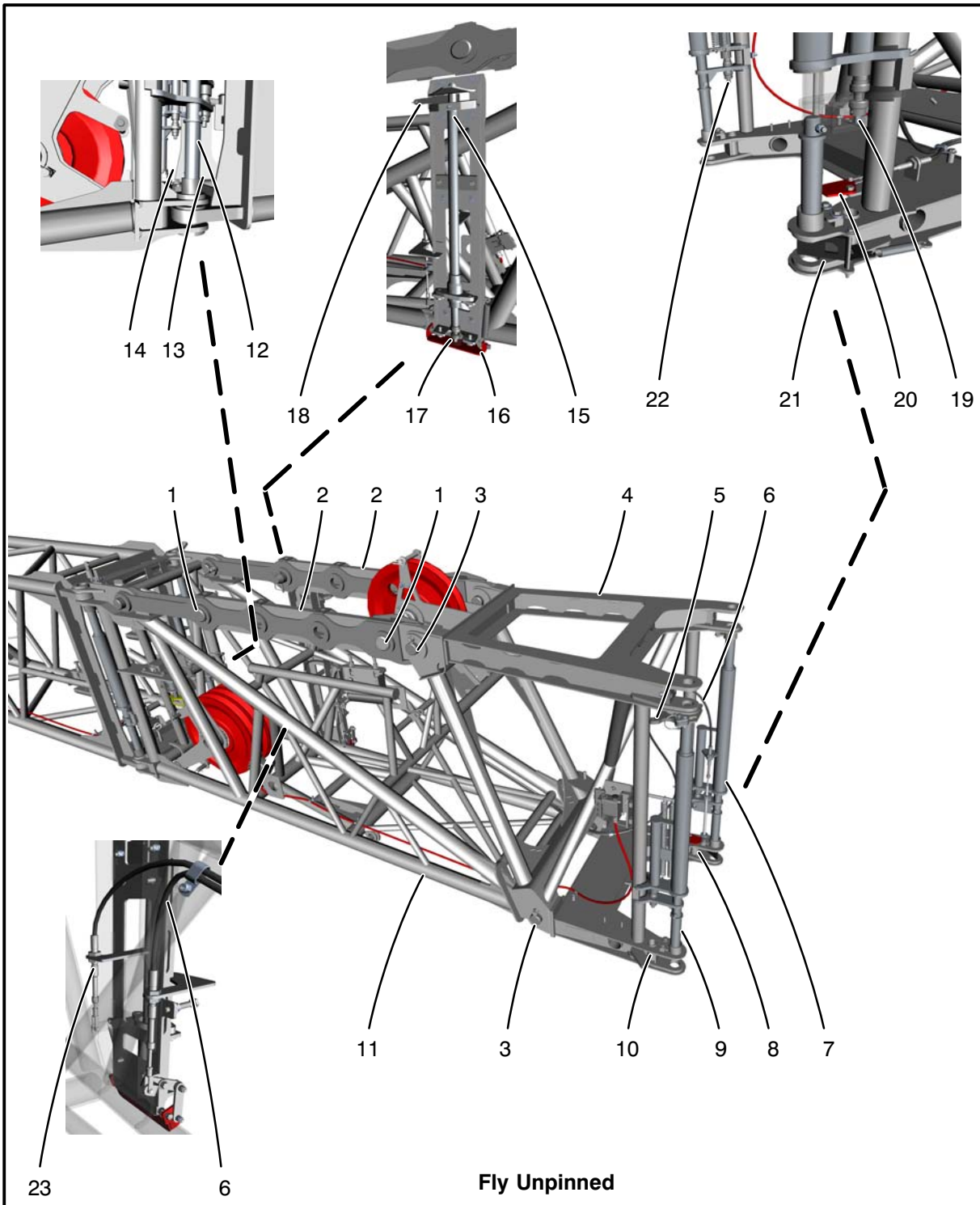
Note: The push pull cables connect the right side boom head pin to the pivot pin access cover and the secondary pivot pin to the boom head pin access cover. Refer to Figure 4—40. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open.

15. 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—40. If required, extend the secondary pivot pin. Provide clearance by pinning 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.
16. 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. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.
17. Using the appropriate tools, rotate the right side fly base 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.
18. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the top left side boom head pin.
19. Using the appropriate tools, rotate the pusher block, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
20. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the bottom left side boom head pin.
21. Back off the pusher block 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 and fly center 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.

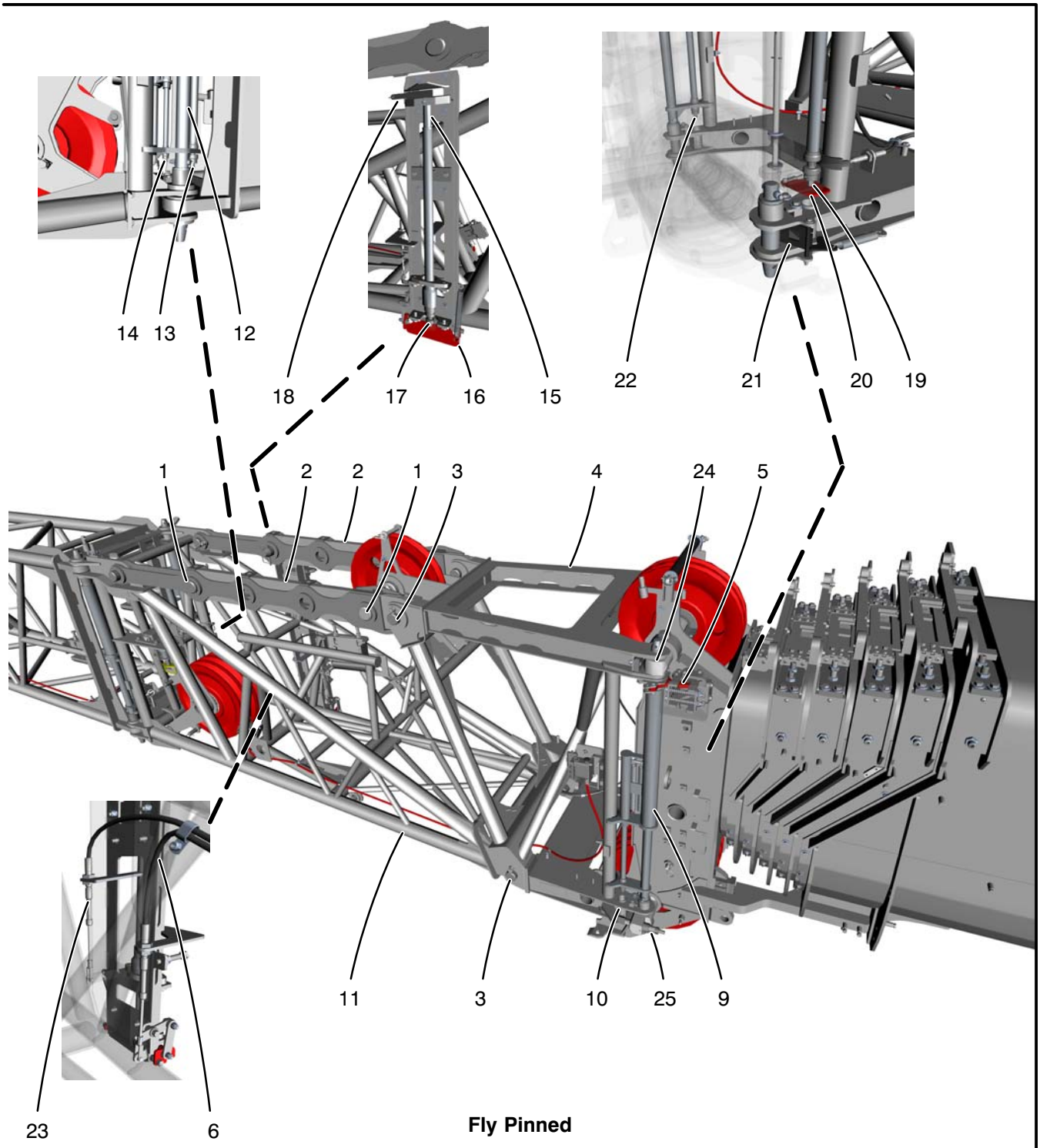
22. Using the appropriate tools, rotate the pivot pin speed screw to fully retract the secondary pivot pin and close the boom head pin access cover.



Fly Unpinned

1. Offset Connecting Pins (Both Sides — 0° Position Shown)
2. Fly Adapter Lugs (Both Sides — 0° Position Shown)
3. Fly Base Connecting Pins (Both Sides)
4. Fixed Fly Base
5. Fly Catch
6. Boom Head Pin Push Pull Cable
7. Right Side Boom Head Pin
8. Right Side Access Tube
9. Left Side Boom Head Pin
10. Left Side Access Tube
11. 8 Ft (*2.44m*) Offset Fly Base Section
12. Fly Center Connecting Pins (Both Sides)
13. Right Side Fly Center Speed Screw

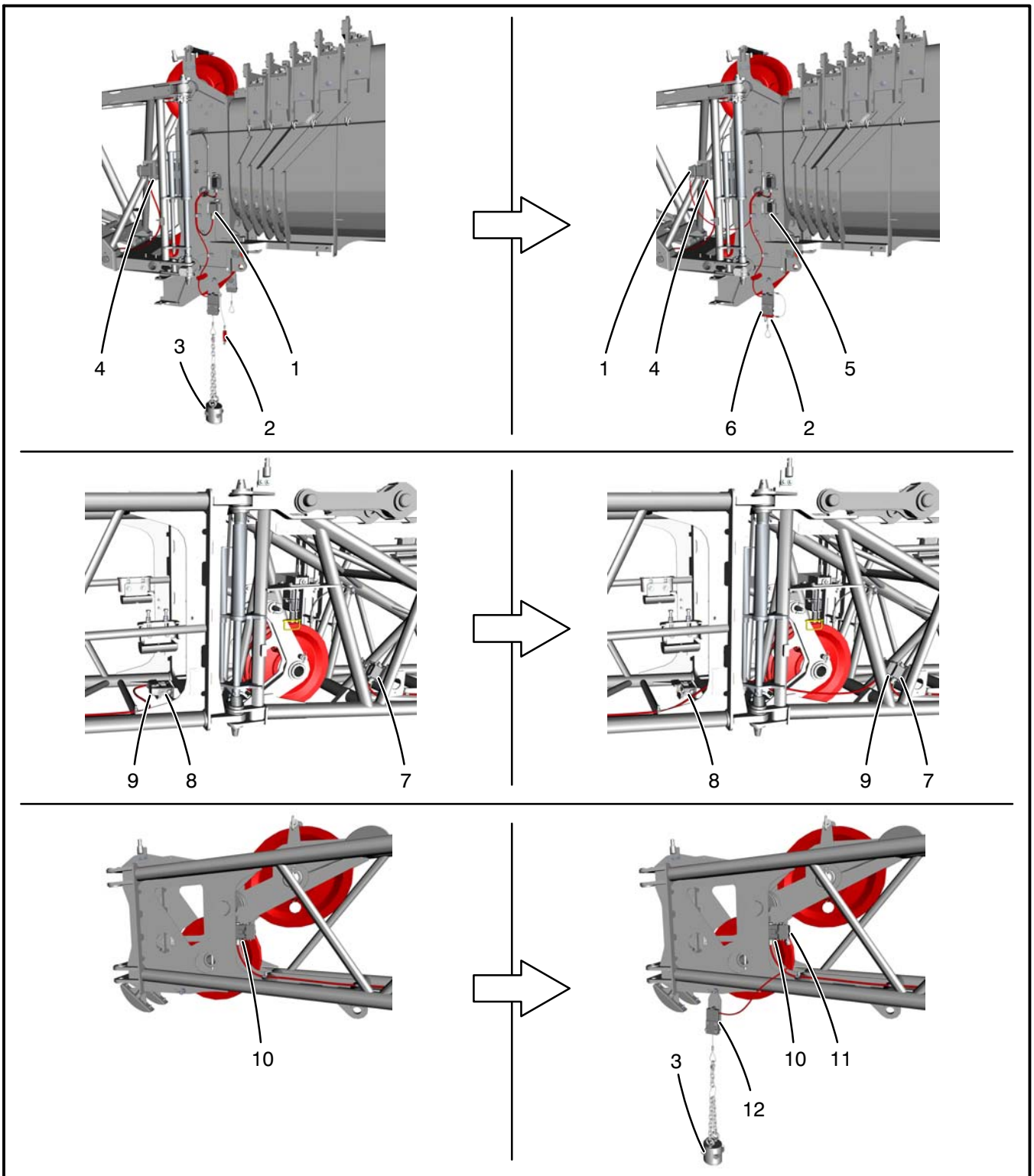
Figure 4—40
10—32.5Ft *(3.05—9.91m)* Offset Lattice Fly



Fly Pinned

14. Left Side Fly Center Speed Screw
15. Secondary Pivot Pin
16. Pivot Pin Access Cover
17. Pivot Pin Speed Screw
18. Pivot Pin Block Plate
19. Right Side Fly Base Speed Screw
20. Boom Head Pin Access Cover
21. Boom Head Pin Block Plate
22. Left Side Fly Base Speed Screw
23. Pivot Pin Push Pull Cable
24. Boom Head Machinery Cross Shafts
25. Pusher Block

Figure 4—40 Continued
10—32.5Ft *(3.05—9.91m)* Offset Lattice Fly



1. Boom Head Plug
2. Lockout Clip
3. ATB Weight
4. Fly Base Connector
5. Jumper Assembly
6. Boom Head ATB Switch
7. Fly Base Head Connector
8. Fly Center Storage Connector
9. Fly Center Base Plug
10. Fly Center Head Connector
11. Secondary ATB Switch Plug
12. Secondary ATB Switch

Figure 4–41
Anti-Two Block (ATB) Connections

23. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
24. Remove the wire rope guards from the fly deflector sheaves. Refer to Figure 4—52. Reeve the wire rope from the boom deflector sheave over the fly deflector sheaves. Install the wire rope guards, and secure with keeper pins.
25. Remove the wire rope guard from the fly center head sheave. Reeve the wire rope from the fly deflector sheaves (under the fly center crossbar) over the fly center head sheave. Install the wire rope guard, and secure with keeper pin.

CAUTION

All wire rope guards must be in proper position during operation.

26. 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—41.
    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 center base plug from the fly center storage connector and connect it to the fly base head connector.
    e. Disconnect and remove the secondary ATB switch from the right side of the boom head. Install the secondary ATB switch on the fly head and connect the secondary ATB switch plug to the fly center head connector.
    f. Install the ATB weight on the secondary 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.

27. If the crane is equipped with the hydraulic fly base, connect the hydraulic hoses as follows:
    a. Remove the keeper pin and hydraulic hose bracket from the storage bracket. Refer to Figure 4—17.
    b. Route the boom offset extend and retract hydraulic hoses through the rollers on the boom. If required, remove the top rollers from the stored position and install them in the working position. Align the hydraulic hose bracket on the working bracket and secure with the keeper pin.
    c. Disconnect the hydraulic offset extend and retract hoses from the quick disconnect manifold and connect to the boom offset extend and retract hydraulic hoses. Ensure o-ring of each quick disconnect fitting is completely covered.
    d. Rotate the accumulator ball valve into the working position.
    e. Ensure the quick disconnect fittings are capped.

    Note: If the crane is equipped with the hydraulic fly base, the offset fly must be put into the operating position before operating with the fly. Refer to "Changing The Fly Offset Angle" in this section of this Operator's Manual.

28. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
29. 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.

10—32.5Ft (*3.05—9.91m*) Fly Removal

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

WARNING

Remove the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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.

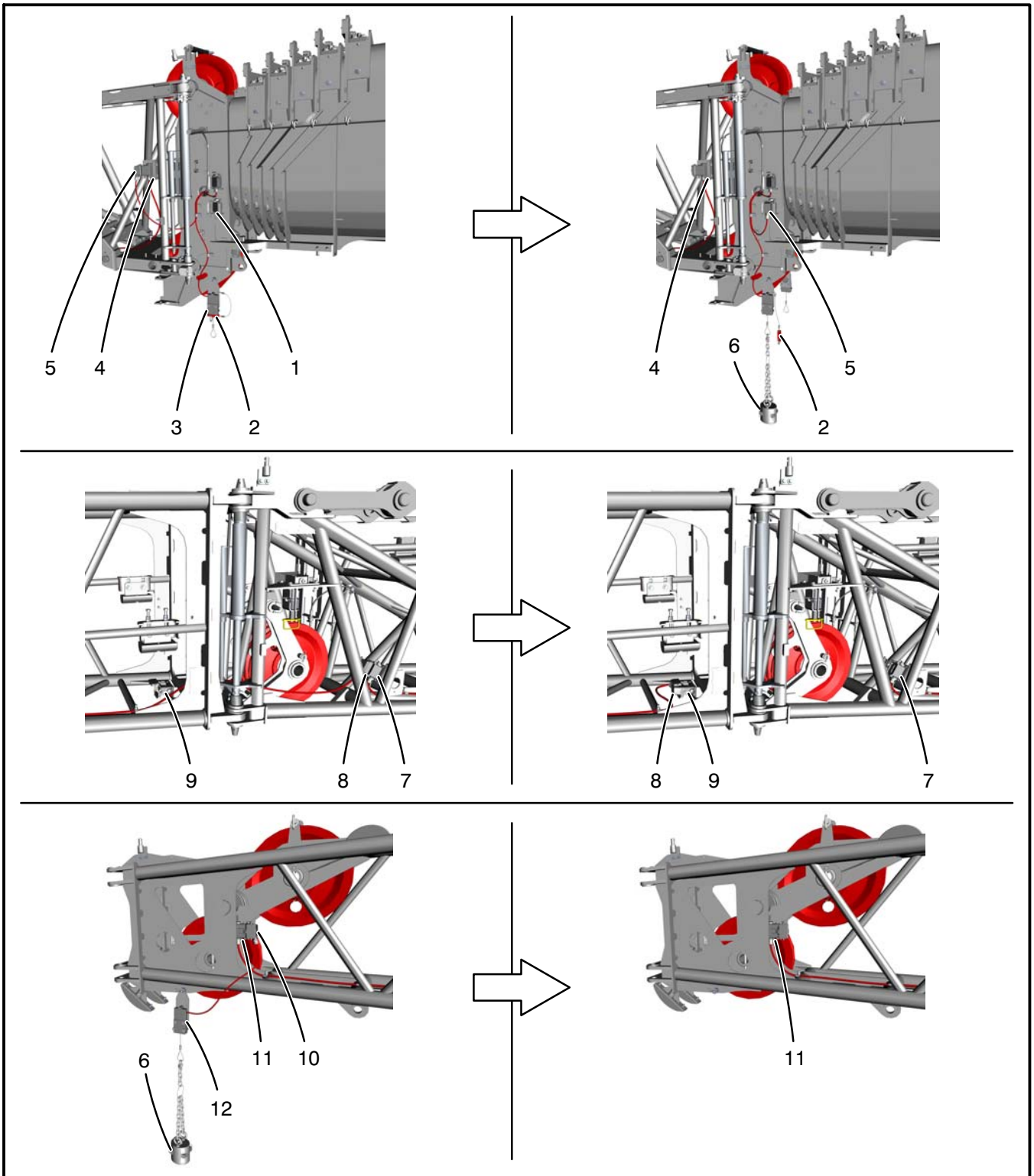
Failure to do the above could result in personal injury and/or the crane tipping.

5. If the fly is not in the erected position, erect it per "Erection Of The 10—32.5Ft (*3.05—9.91m*) 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, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—40 and Figure 4—93. If required, change the fly offset to the 0° or locked 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. If the crane is equipped with the hydraulic fly base, disconnect the hydraulic hoses as follows:
   a. Rotate the accumulator ball valve into the stored position. Refer to Figure 4—18.
   b. Disconnect the hydraulic offset extend and retract hoses from the boom offset extend and retract hydraulic hoses and connect to the quick disconnect manifold. Ensure o-ring of each quick disconnect fitting is completely covered.
   c. Remove the keeper pin and hydraulic hose bracket from the working bracket.
   d. Remove the boom offset extend and retract hydraulic hoses from the rollers on the boom. If required, remove the top rollers from the working position and install them in the stored position. Align the hydraulic hose bracket on the storage bracket and secure with the keeper pin.
   e. Ensure the boom extend and retract hydraulic hoses are capped.
10. Properly disconnect the anti-two block (ATB) system as follows:
    a. Remove the ATB weight from the secondary ATB switch cable. Refer to Figure 4—42.
    b. Disconnect the secondary ATB switch plug from the fly head connector and remove the secondary ATB switch from the fly head. Install and connect the secondary ATB switch on the right side of the boom head.
    c. Disconnect the fly center base plug from the fly base head connector and connect it to the fly center storage connector.
    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.
11. Properly store wire rope which was used on fly, as required.



1. Jumper Assembly
2. Lockout Clip
3. Boom Head ATB Switch
4. Fly Base Connector
5. Boom Head Plug
6. ATB Weight
7. Fly Base Head Connector
8. Fly Center Base Plug
9. Fly Center Storage Connector
10. Secondary ATB Switch Plug
11. Fly Center Head Connector
12. Secondary ATB Switch

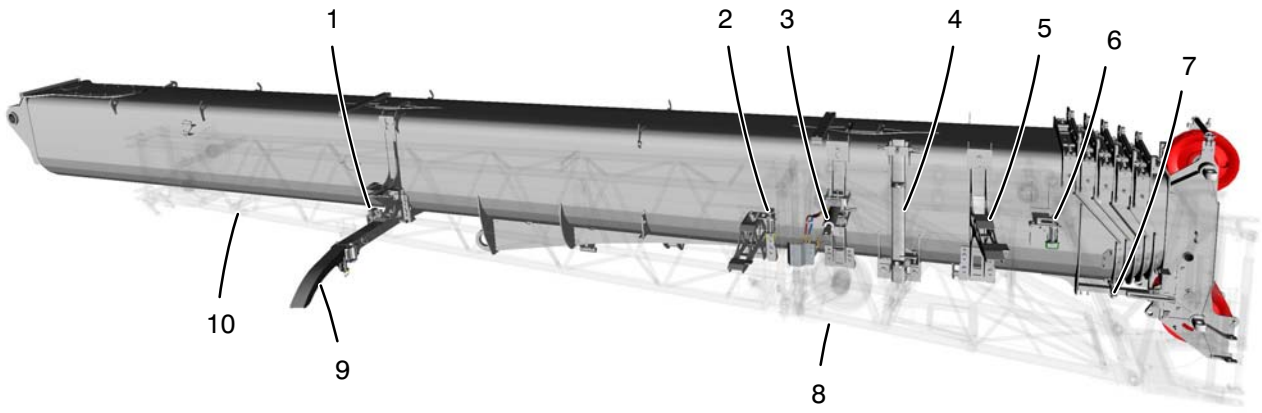
Figure 4–42
Anti-Two Block (ATB) Connections

12. Remove the wire rope guard from the fly center head sheave. Refer to Figure 4—52. Remove wire rope from the fly center head 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 wire rope guards from the fly deflector sheaves. Remove wire rope (through the fly canter) from the fly deflector sheaves and lay it aside to prevent damage to it during fly removal. Install the wire rope guards, and secure with keeper pins.
14. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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.

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—13. The 10—32.5 ft (*3.05—9.91m*) fly weighs approximately 2,969 lb (*1,347kg*).
17. Using the appropriate tools, rotate the pusher block, 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 fly base speed screw through the left side access tube to fully retract the bottom left side boom head pin.
19. Back off the pusher block until a clearance of at least 1/2 in (*1.3cm*) from the left fly lug is obtained.
20. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully retract the top left side boom head pin.
21. Using the appropriate tools, rotate the right side fly base speed screw through the right side access tube to fully retract the right side boom head pins and disengage from the right side of the boom head machinery cross shafts.
22. Carefully retract the boom away from the fly.
23. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
24. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4—3. 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.
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. Properly store the fly to prevent damage to it.



1. Fly Center Rear Retainer Pin
2. Fly Center Front Retainer Pin
3. Fly Storage Cylinder
4. Fly Base Storage Bracket
5. Fly Base Ramp
6. Fly Base Retainer Pin
7. Fly Base Stabilizer Link
8. 10 Ft (*3.05m*) Fly Base
9. Pivoting Ramp
10. 22.5 Ft (*6.86m*) Fly Base

Figure 4—43
10—32.5Ft *(3.05—9.91m)* Offset Lattice Fly (Stored)

Erection Of The10—32.5Ft (*3.05—9.91m*) Fly From The Stored Position

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

⚠ WARNING

Erect the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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 personal injury and/or the crane tipping.

5. Ensure the auxiliary lifting sheave is properly stored on the boom head. Refer to "Auxiliary Lifting Sheave Storage" 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, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—40 and Figure 4—93. If required, change the fly offset to the 0° or locked 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 reeve the fly. Lower the hook block or hook ball (to be used on the fly) to the ground. Fully retract the boom.

CAUTION

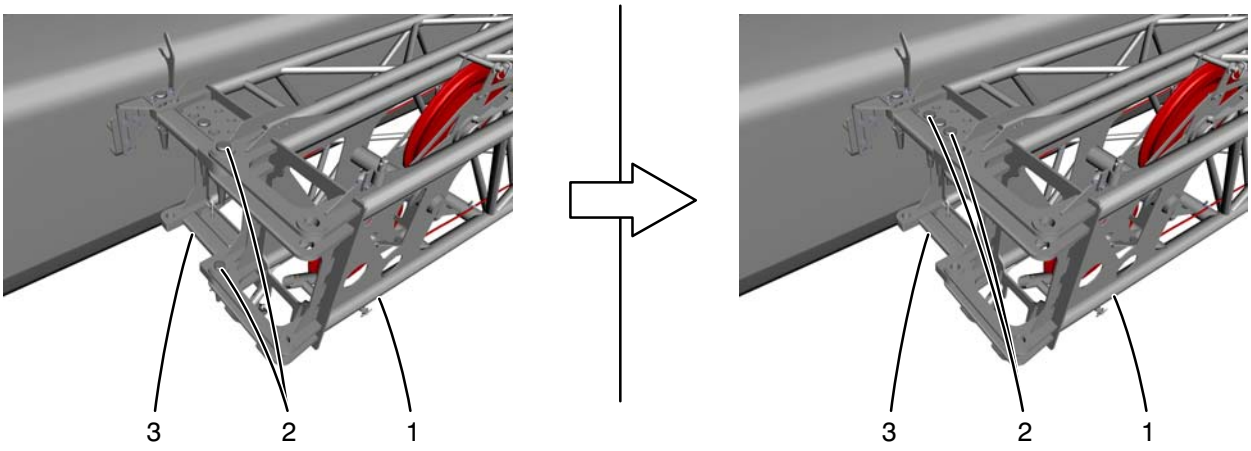
Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

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—3. 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.
10. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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.



Engaged **Disengaged**

1. 22.5 Ft (*6.86m*) Fly Center Section
2. Fly Tip Connecting Pins
3. 22.5 Ft (*6.86m*) Fly Tip Section

Figure 4—44
Storage of the 22.5 Ft (*6.86m*) Fly Tip Section — Disengaged

Note: If the fly tip section is stored on the boom, disengage the 22.5 ft (*6.86m*) fly tip section from the 22.5 ft (*6.86m*) fly center section:

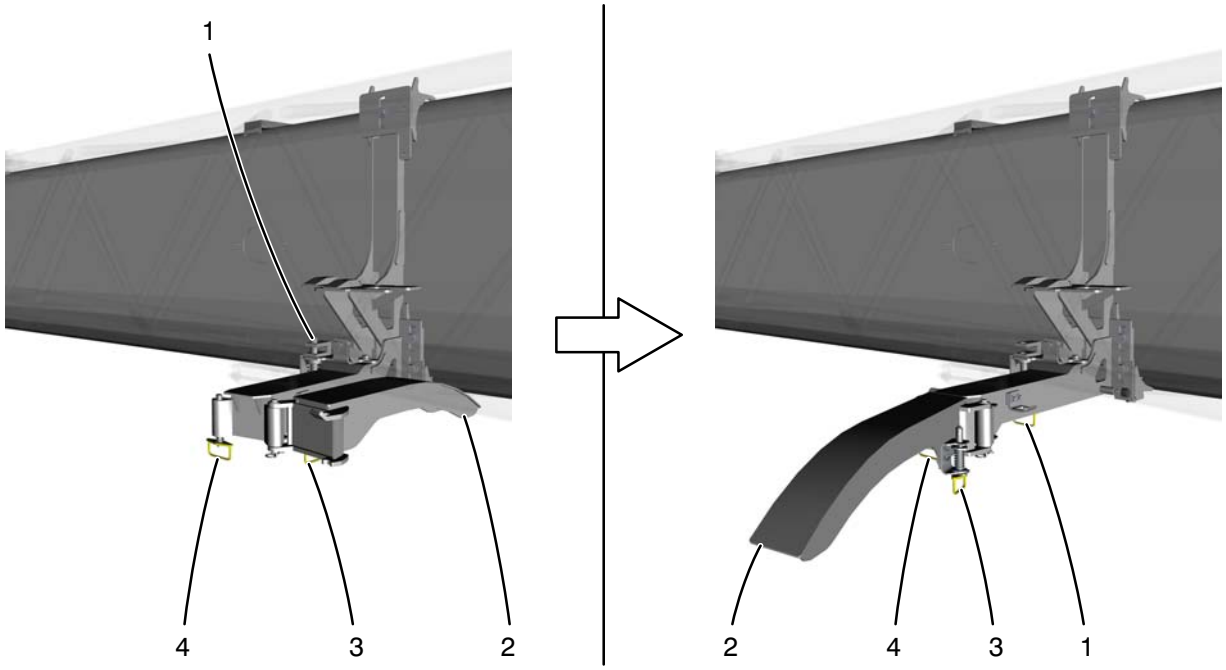
Ensure the 22.5 ft (*6.86m*) fly tip section is properly stored on the boom with the fly tip front and rear retainer pins and the fly tip connecting pin securing the fly tip to the fly tip storage bracket. Refer to Figure 4—67.

Disengage the fly tip hitch pin. Refer to Figure 4—77.

WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

Remove the connecting pins securing the 22.5 ft (*6.86m*) fly tip section to the 22.5 ft (*6.86m*) fly center section and store the connecting pins in the rear of the fly tip. (Install the pins with the head on top and keeper on the bottom.) Secure connecting pins with keeper pins. Refer to Figure 4—44.



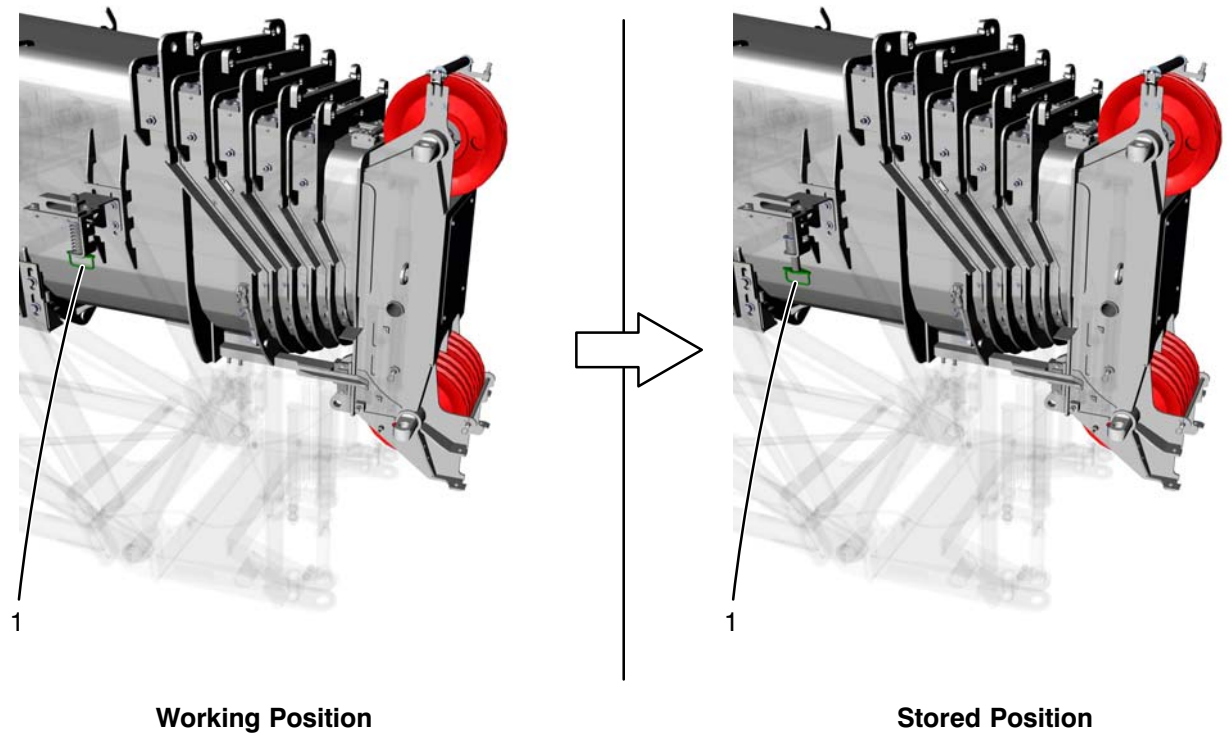
1. Fly Center Rear Retainer Pin
2. Pivoting Ramp
3. Ramp Storage Pin
4. Ramp Working Pin

Figure 4—45
Pivoting Ramp — Working

WARNING

Ensure the hydraulic cylinders have been properly filled with oil and bled of air before erecting the hydraulic fly, if equipped. The fly may drop when erecting if not properly filled with oil before erecting the fly. Refer to the Service Manual for proper procedure.

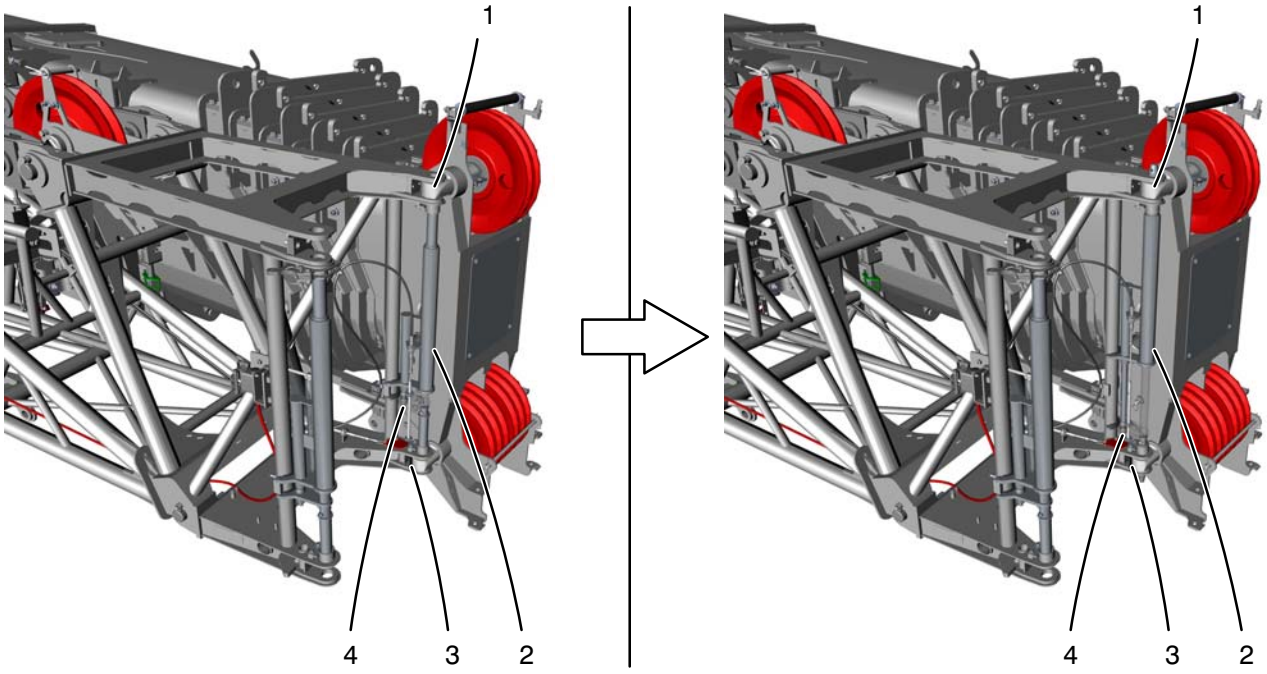
11. Attach a hand line to the tip of the fly center.
12. Using the appropriate tools, pull the ramp storage pin. Refer to Figure 4—45. Rotate the pivoting ramp into the working position until ramp working pin catches.
13. Using the appropriate tools, pull, rotate, and disengage the fly center rear retainer pin.
14. Using the appropriate tools, pull, rotate, and disengage the fly center front retainer pin. Refer to Figure 4—43.



1. Fly Base Retainer Pin

Figure 4–46
Fly Base Retainer Pin – Stored Position

15. Using the appropriate tools, pull, rotate, and disengage the fly base retainer pin. Refer to Figure 4–46.



Disengaged **Engaged**

1. Boom Head Machinery Cross Shafts
2. Right Side Boom Head Pin
3. Boom Head Pin Block Plate
4. Right Side Fly Base Speed Screw

Figure 4—47
Right Side Fly Boom Head Pin — Engaged

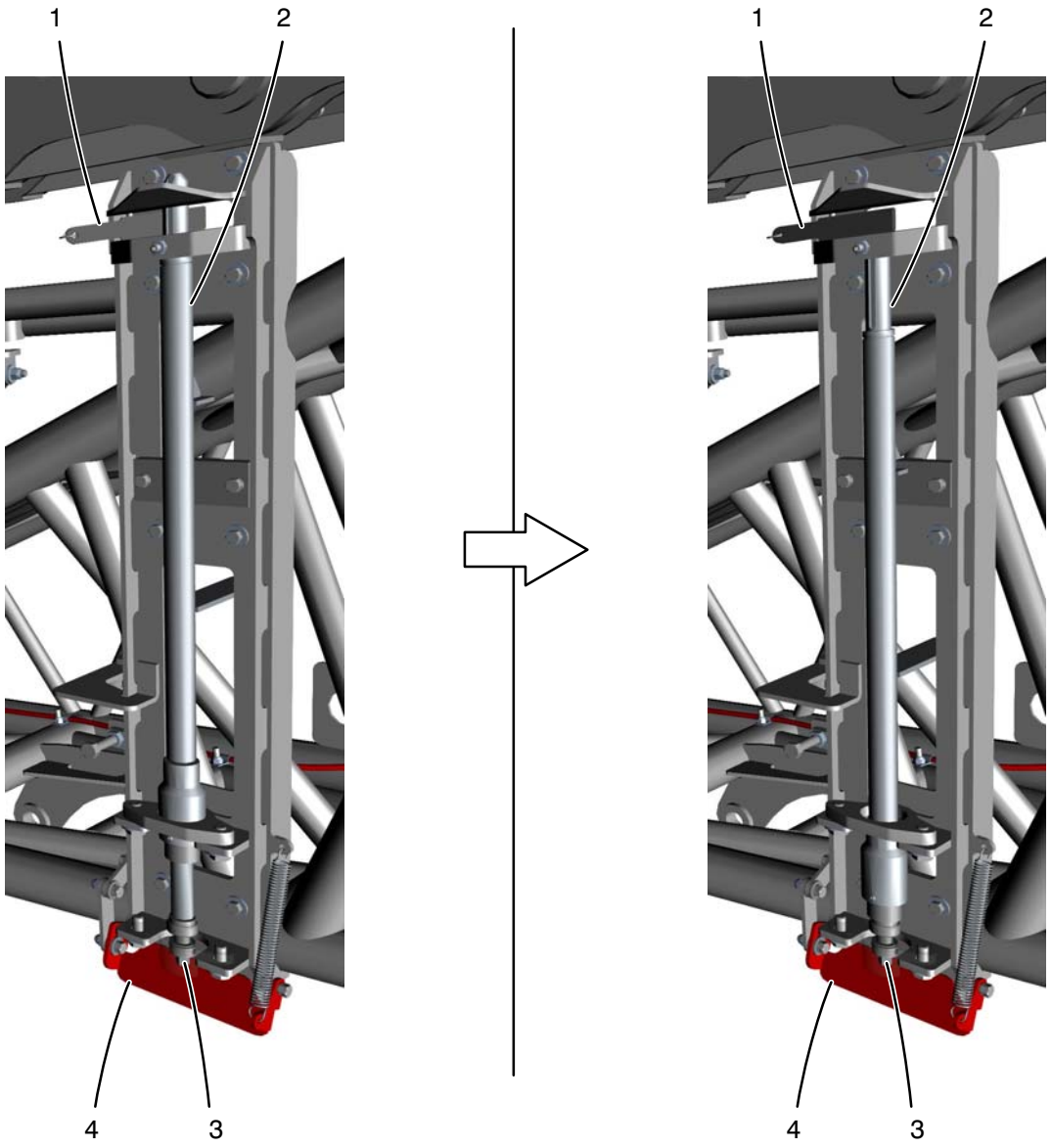
16. Boom up to 0°.

    Note: The wireless rigging box may be used to boom up and down.

17. Actuate the fly storage cylinder, as required, to align the right side fly lugs with the right side of the boom head machinery cross shafts. Refer to Figure 4—47. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.
18. Boom down fully.

    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. Refer to Figure 4—40. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open.

19. Using the appropriate tools, rotate the right side fly base 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.



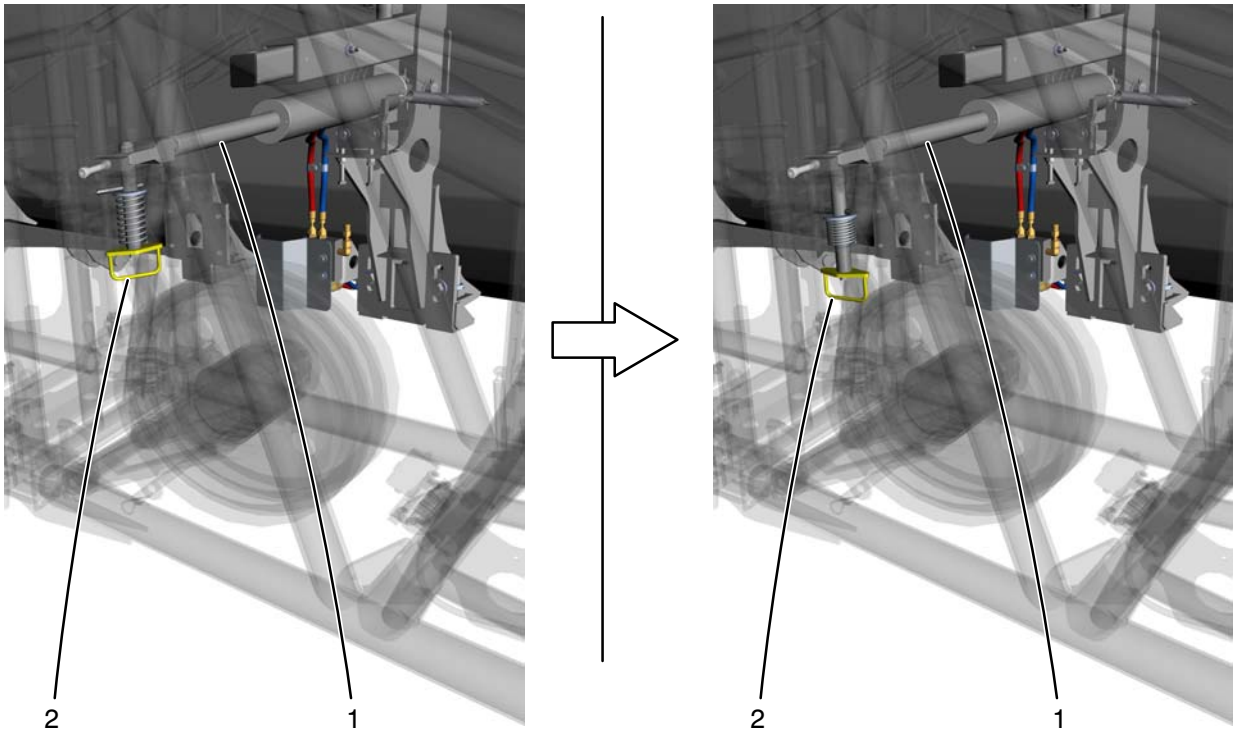
1. Pivot Pin Block Plate
2. Secondary Pivot Pin
3. Pivot Pin Speed Screw
4. Pivot Pin Access Cover

Figure 4–48
Secondary Pivot Pin – Disengaged

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.

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. Refer to Figure 4–48.
21. Boom up to 0°.



1. Fly Storage Cylinder
2. Fly Storage Cylinder Connecting Pin

Figure 4—49
Fly Storage Cylinder — Disengaged

22. Extend the fly storage cylinder, as required, to pivot the fly off the pivoting ramp. Refer to Figure 4—43.

23. 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 10—32.5 ft (*3.05—9.91m*) fly section. Refer to Figure 4—49.

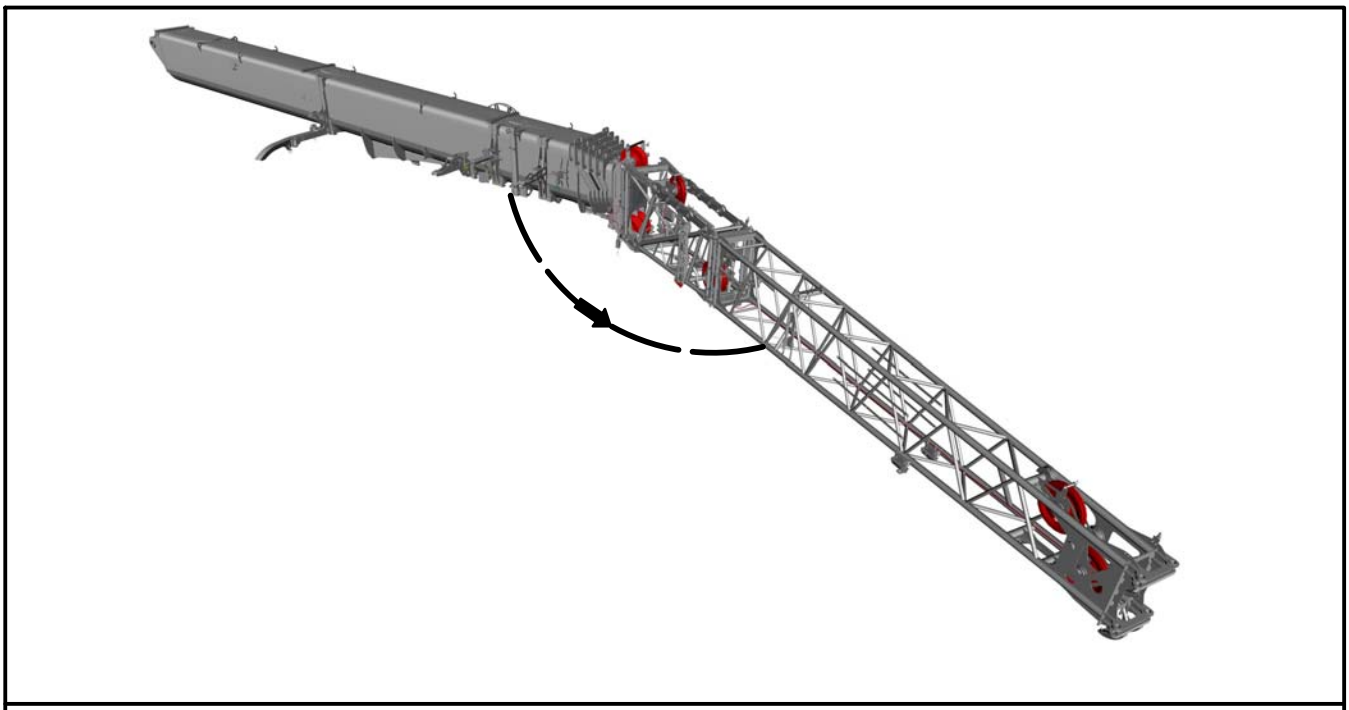


Figure 4—50
Swinging The Fly

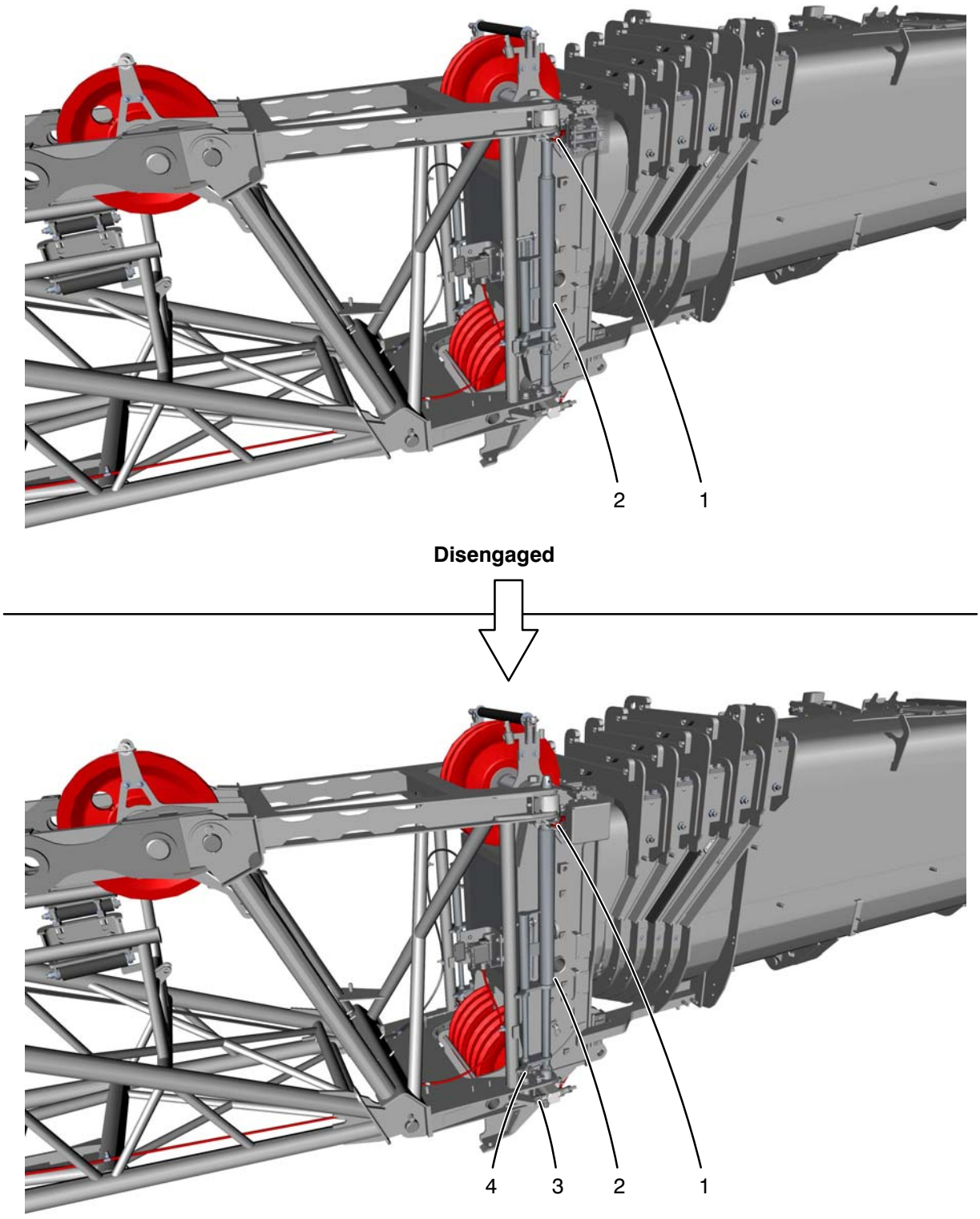
WARNING

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. Use the hand line attached to the 22.5 ft (*6.86m*) fly section to begin swinging the fly around the boom head. Refer to Figure 4—50.
25. 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—51.
26. Fully retract the fly storage cylinder and boom down fully.
27. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the top left side boom head pin.
28. Using the appropriate tools, rotate the pusher block, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
29. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the bottom left side boom head pin.
30. Back off the pusher block 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 and fly center 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.



1. Fly Catch
2. Left Side Boom Head Pin
3. Pusher Block
4. Left Side Fly Base Speed Screw

Figure 4–51
Left Side Fly Boom Head Pin – Engaged

31. Remove the hand line from the tip of the fly center.
32. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
33. Remove the wire rope guards from the fly deflector sheaves. Refer to Figure 4—52. Reeve the wire rope from the boom deflector sheave over the fly deflector sheaves. Install the wire rope guards, and secure with keeper pins.
34. Remove the wire rope guard from the fly center head sheave. Reeve the wire rope from the fly deflector sheaves (under the fly center crossbar) over the fly center head sheave. Install the wire rope guard, and secure with keeper pin.

CAUTION

All wire rope guards must be in proper position during operation.

35. Using the appropriate tools, pull the ramp working pin. Refer to Figure 4—59. Rotate the pivoting ramp into the storage position until ramp working pin catches.
36. 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—41.
    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 center base plug from the fly center storage connector and connect it to the fly base head connector.
    e. Disconnect and remove the secondary ATB switch from the right side of the boom head. Install the secondary ATB switch on the fly head and connect the secondary ATB switch plug to the fly center head connector.

    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.

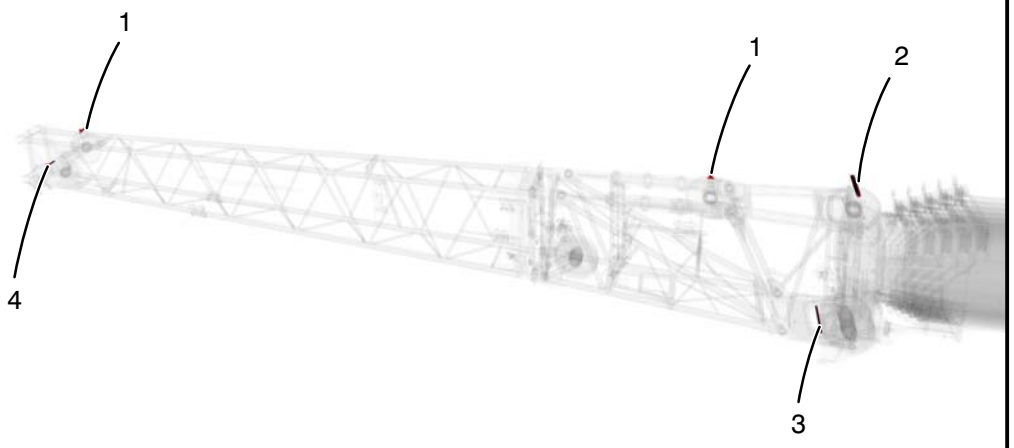
37. If the crane is equipped with the hydraulic fly base, connect the hydraulic hoses as follows:
    a. Remove the keeper pin and hydraulic hose bracket from the storage bracket. Refer to Figure 4—17.
    b. Route the boom offset extend and retract hydraulic hoses through the rollers on the boom. If required, remove the top rollers from the stored position and install them in the working position. Align the hydraulic hose bracket on the working bracket and secure with the keeper pin.
    c. Disconnect the hydraulic offset extend and retract hoses from the quick disconnect manifold and connect to the boom offset extend and retract hydraulic hoses. Ensure o-ring of each quick disconnect fitting is completely covered.
    d. Rotate the accumulator ball valve into the working position.
    e. Ensure the quick disconnect fittings are capped.

    Note: If the crane is equipped with the hydraulic fly base, the offset fly must be put into the operating position before operating with the fly. Refer to "Changing The Fly Offset Angle" in this section of this Operator's Manual.

38. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
39. 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.



1. Fly Deflector Sheave Wire Rope Guards
2. Boom Deflector Sheave Wire Rope Guard
3. Boom Head Sheave Wire Rope Guard
4. Fly Center Head Sheave Wire Rope Guard

Figure 4—52
10—32.5Ft (*3.05—9.91m*) Fly Wire Rope Guards

Storage Of The10—32.5Ft (*3.05—9.91m*) Fly From The Erected Position

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

WARNING

Store the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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 personal injury and/or the crane tipping.

5. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—40 and Figure 4—93. If required, change the fly offset to the 0° or locked 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.

CAUTION

Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

7. Boom down fully.

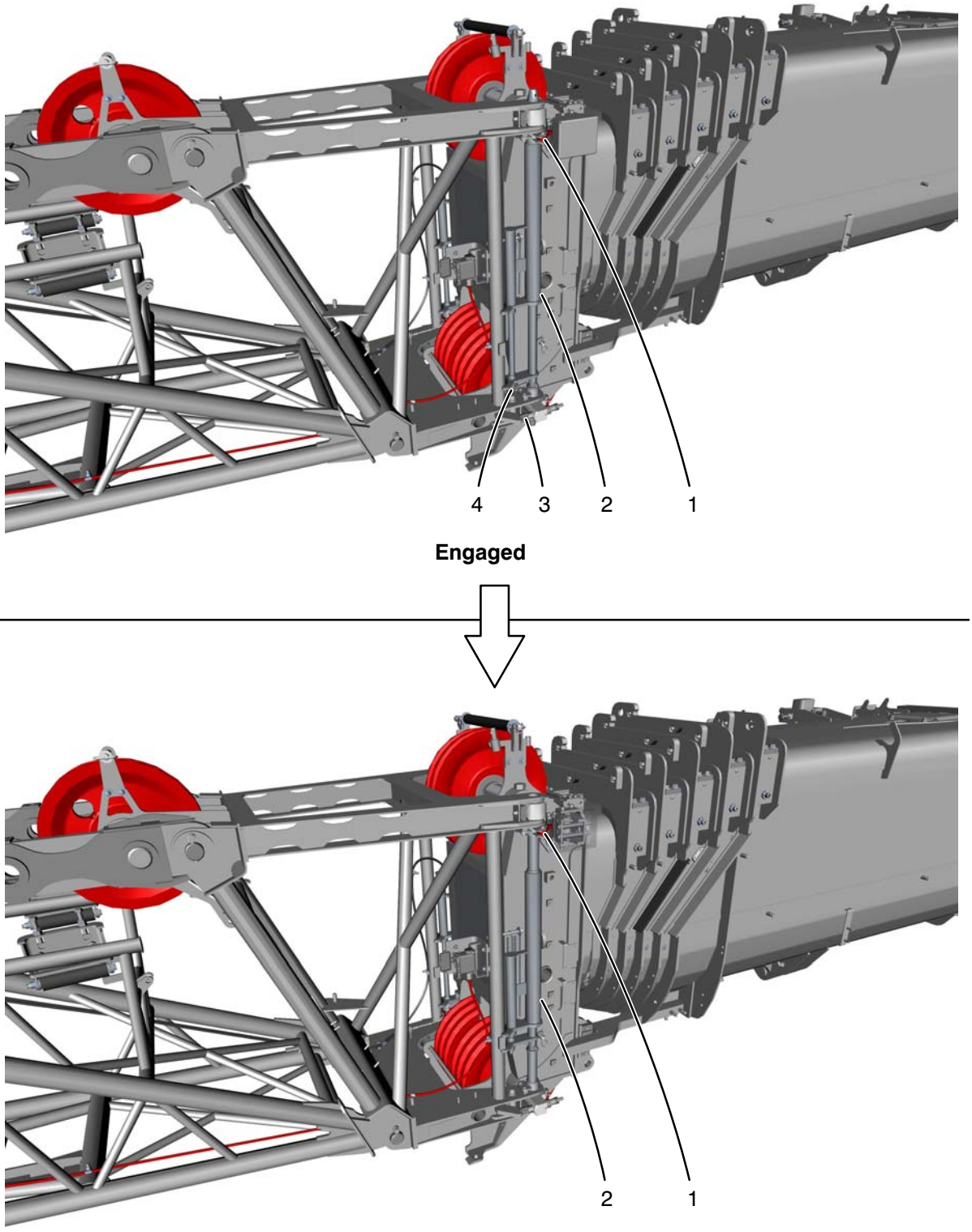
WARNING

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 crane is equipped with the hydraulic fly base, disconnect the hydraulic hoses as follows:
   a. Rotate the accumulator ball valve into the stored position. Refer to Figure 4—18.
   b. Disconnect the hydraulic offset extend and retract hoses from the boom offset extend and retract hydraulic hoses and connect to the quick disconnect manifold. Ensure o-ring of each quick disconnect fitting is completely covered.
   c. Remove the keeper pin and hydraulic hose bracket from the working bracket.
   d. Remove the boom offset extend and retract hydraulic hoses from the rollers on the boom. If required, remove the top rollers from the working position and install them in the stored position. Align the hydraulic hose bracket on the storage bracket and secure with the keeper pin.
   e. Ensure the boom extend and retract hydraulic hoses are capped.
9. Properly disconnect the anti-two block (ATB) system as follows:
   a. Remove the ATB weight from the secondary ATB switch cable. Refer to Figure 4—42.
   b. Disconnect the secondary ATB switch plug from the fly head connector and remove the secondary ATB switch from the fly head. Install and connect the secondary ATB switch on the right side of the boom head.
   c. Disconnect the fly center base plug from the fly base head connector and connect it to the fly center storage connector.
   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.
10. Using the appropriate tools, pull the ramp storage pin. Refer to Figure 4—45. Rotate the pivoting ramp into the working position until ramp working pin catches.
11. Remove the wire rope guard from the fly center head sheave. Refer to Figure 4—52. Remove wire rope from the fly center head sheave and lay it aside to prevent damage to it during fly storage. Install the wire rope guard, and secure with keeper pin.
12. Remove the wire rope guards from the fly deflector sheaves. Remove wire rope from the fly deflector sheaves (through the fly center) and lay it aside to prevent damage to it during fly storage. Install the wire rope guards, and secure with keeper pins.
13. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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.
14. Properly store wire rope which was used on fly, as required.
15. If the crane is equipped with the hydraulic fly base, properly fill with oil and bleed air from the hydraulic cylinders. Refer to the Service Manual for proper procedure.

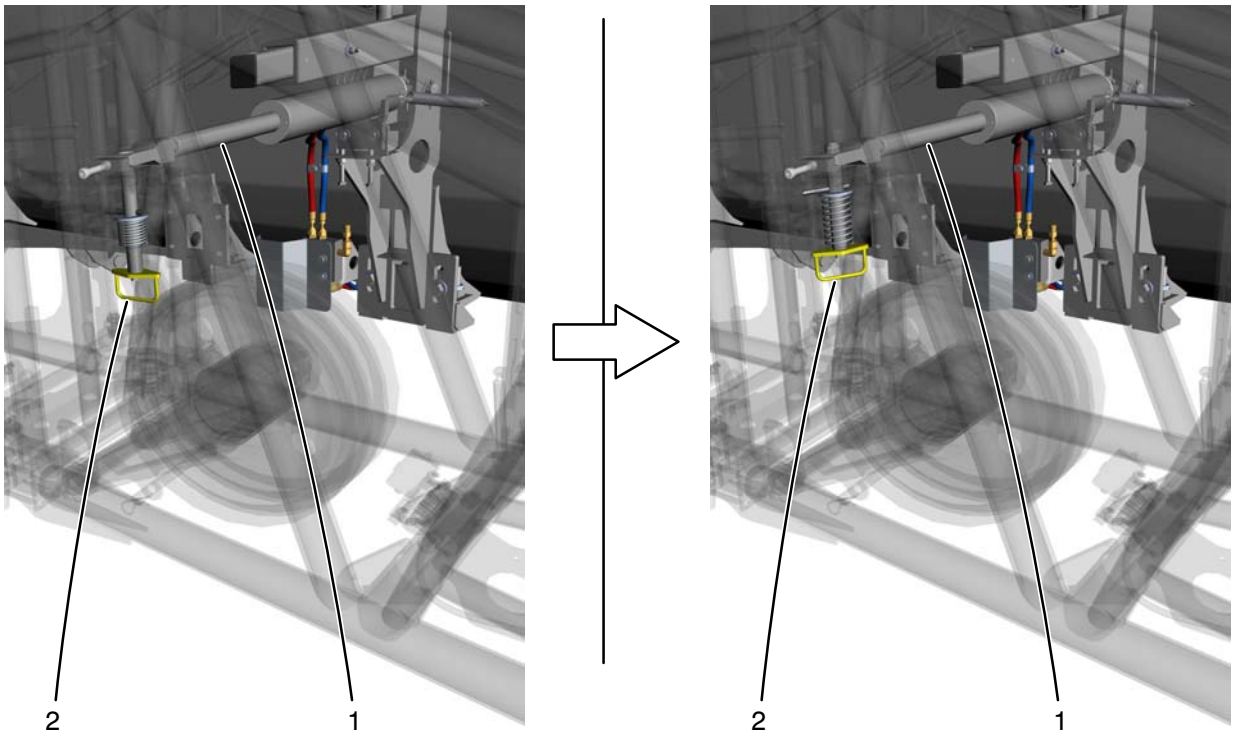
⚠ WARNING

Ensure the hydraulic cylinders have been properly filled with oil and bled of air before storing the hydraulic fly, if equipped. The fly may drop when erecting if not properly filled with oil before storing the fly. Refer to the Service Manual for proper procedure.



1. Fly Catch
2. Left Side Boom Head Pin
3. Pusher Block
4. Left Side Fly Base Speed Screw

Figure 4–53
Left Side Fly Boom Head Pin – Disengaged



1. Fly Storage Cylinder
2. Fly Storage Cylinder Connecting Pin

Figure 4—54
Fly Storage Cylinder — Engaged

16. Attach a hand line to the tip of the fly center.
17. Ensure all fly retainer pins are disengaged prior to swinging the fly. If required, use the appropriate tools to pull, rotate, and disengage the fly retainer pins. Refer to Figure 4—43.
18. Remove the fly storage cylinder keeper and pin securing the fly storage cylinder to the cylinder bracket. Refer to Figure 4—32. Store the fly storage cylinder pin in the fly storage cylinder bracket and secure with keeper.
19. Fully extend the fly storage cylinder.
20. Using the appropriate tools, rotate the pusher block, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft. Refer to Figure 4—53.
21. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully retract the bottom left side boom head pin.
22. Back off the pusher block until a clearance of at least 1/2 in (*1.3cm*) from the left fly lug is obtained.
23. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully retract the top left side boom head pin.
24. Boom up to a boom angle of 0°.
25. Use the appropriate tools to pull and rotate the fly storage cylinder connecting pin into detent position. Refer to Figure 4—49.

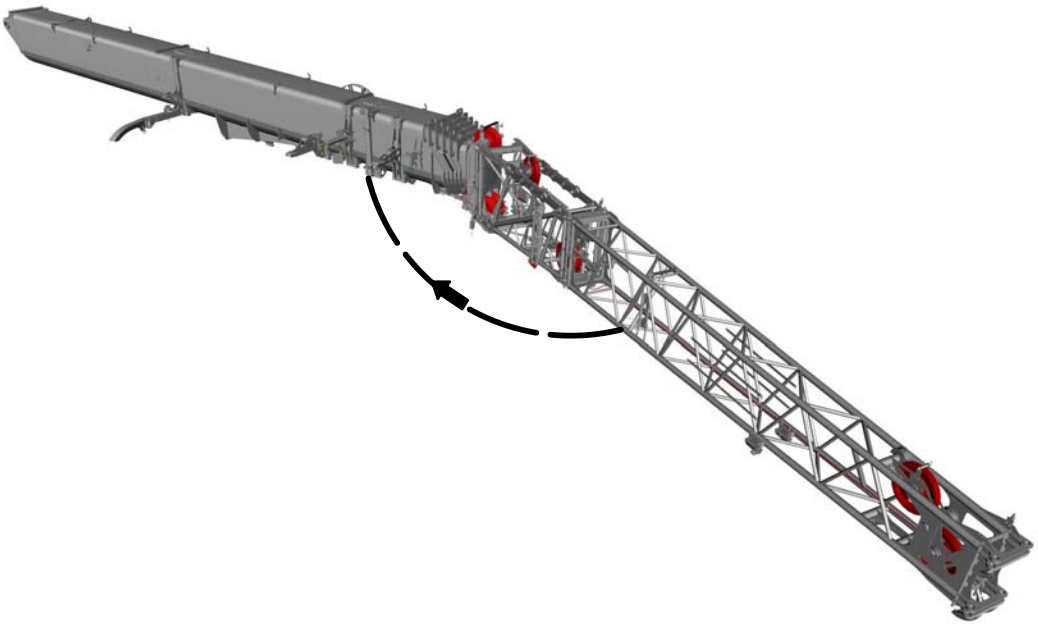
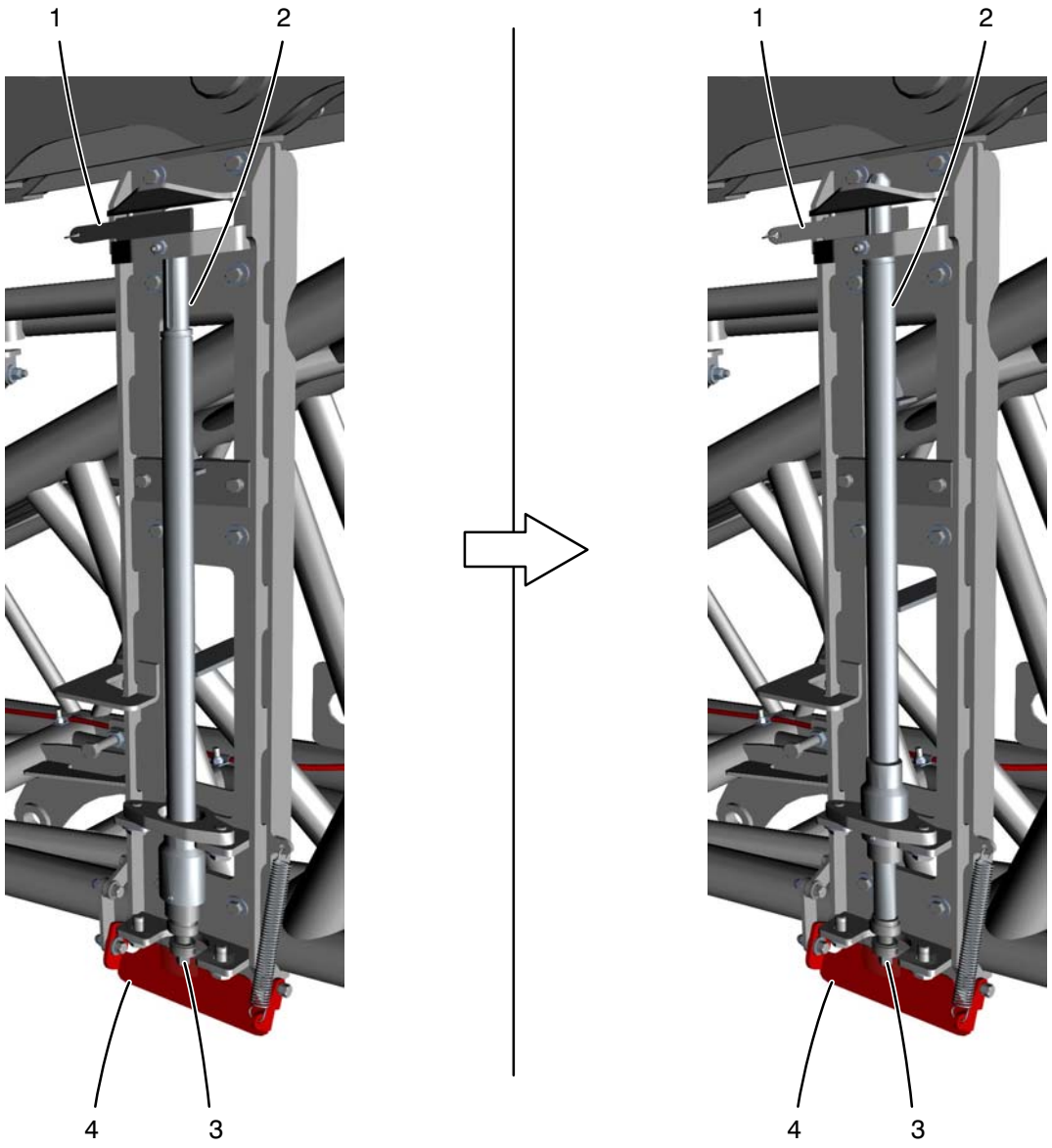


Figure 4—55
Swinging The Fly

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. While holding the hand line begin swinging the fly around to the right side of the boom. Swinging the fly will disengage the fly catch. Refer to Figure 4—55.
27. 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—54.
28. Retract the fly storage cylinder, as required, to pivot the fly onto the pivoting ramp. Refer to Figure 4—43.
29. Boom down fully.

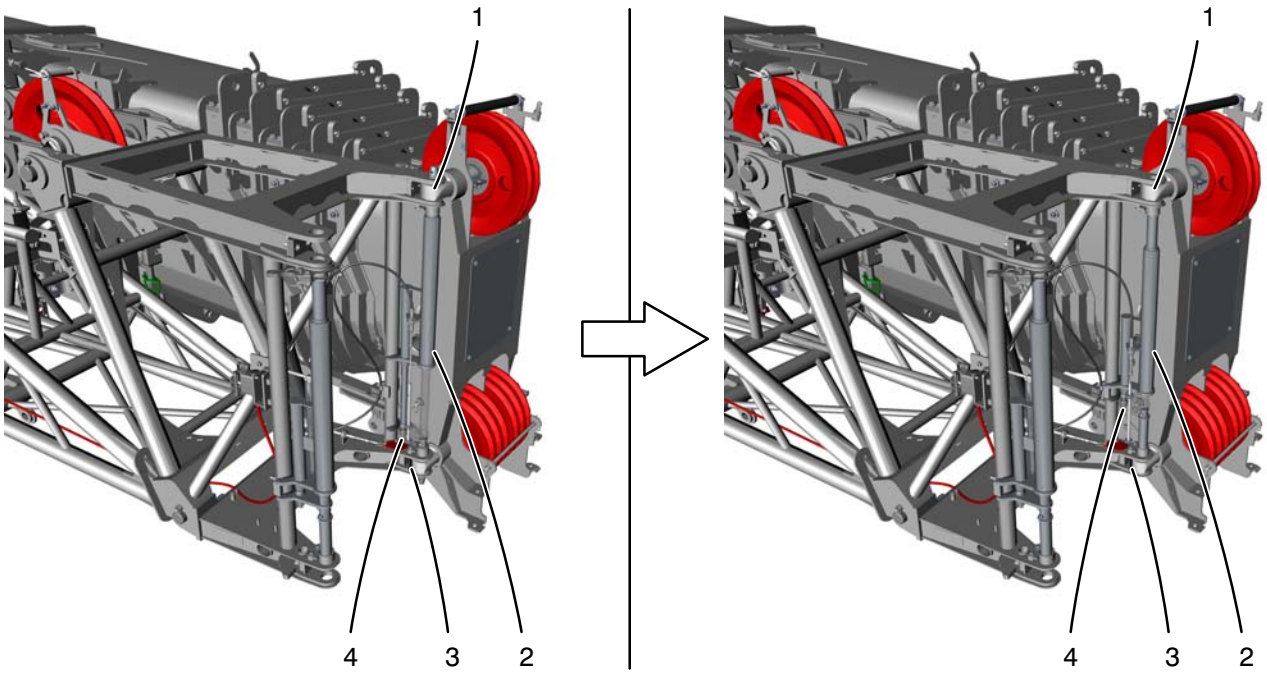


1. Pivot Pin Block Plate
2. Secondary Pivot Pin
3. Pivot Pin Speed Screw
4. Pivot Pin Access Cover

Figure 4—56
Secondary Pivot Pin — Engaged

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—40.

30. Using the appropriate tools, rotate the pivot pin speed screw to fully extend the secondary pivot pin. Refer to Figure 4—56.



Engaged **Disengaged**

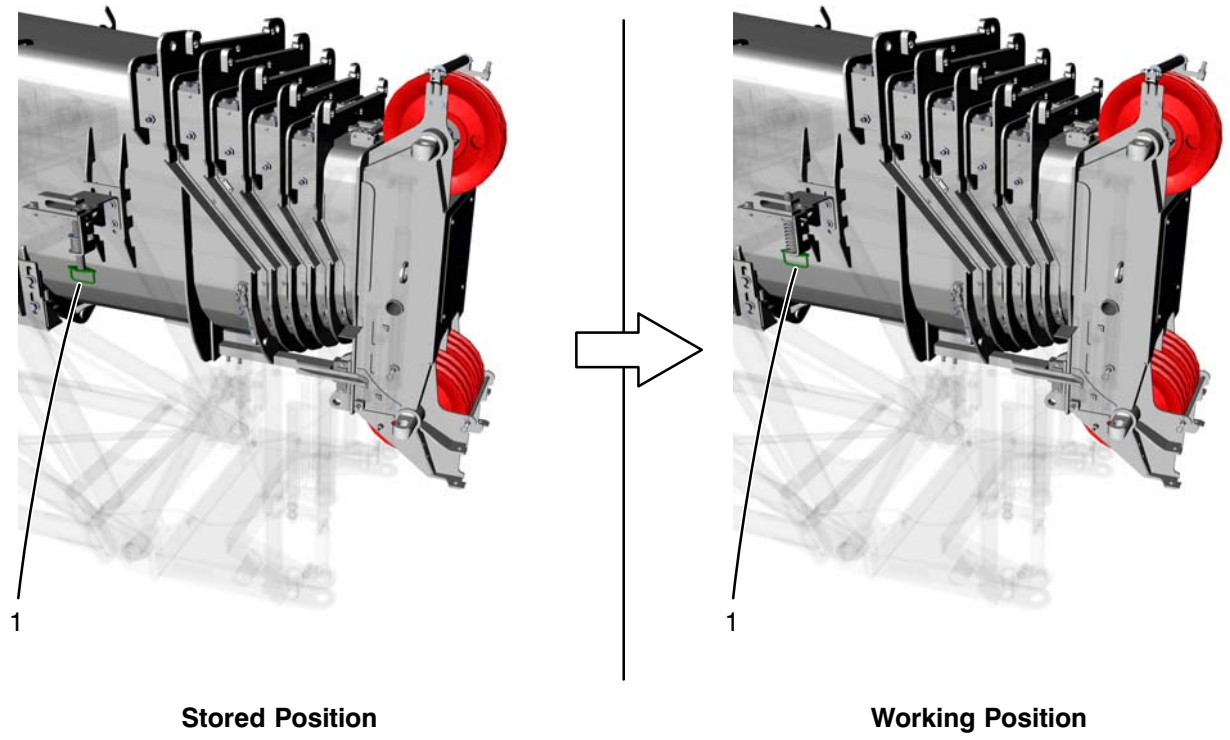
1. Boom Head Machinery Cross Shafts
2. Right Side Boom Head Pin
3. Boom Head Pin Block Plate
4. Right Side Fly Base Speed Screw

Figure 4—57
Right Side Fly Boom Head Pin — Disengaged

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 fly base 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.

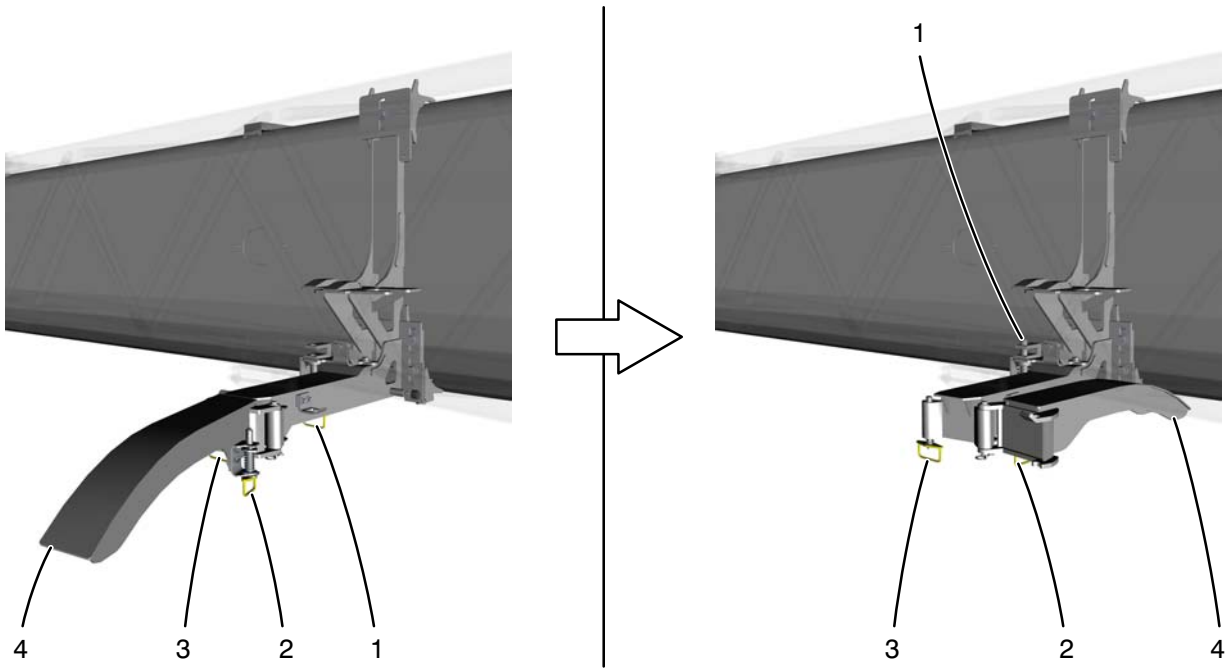
31. Using the appropriate tools, rotate the right side fly base speed screw through the right side access tube to retract both right side boom head pins and fully disengage from the right side of the boom head machinery cross shafts. Refer to Figure 4—57.
32. Actuate the fly storage cylinder to pull the fly onto the pivoting ramp and align the fly with the fly base retainer pin.



1. Fly Base Retainer Pin

Figure 4–58
Fly Base Retainer Pin – Working Position

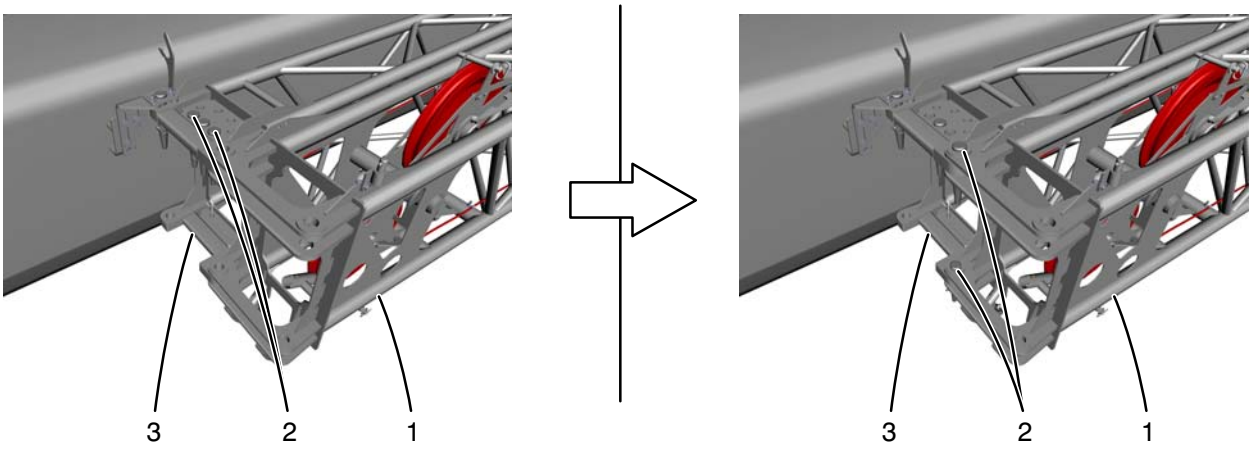
33. Using the appropriate tools, pull, rotate, and engage the fly base retainer pin. Refer to Figure 4–58.



1. Fly Center Rear Retainer Pin
2. Ramp Storage Pin
3. Ramp Working Pin
4. Pivoting Ramp

Figure 4—59
Pivoting Ramp — Stored

34. Using the appropriate tools, pull, rotate, and engage the fly center front retainer pin. Refer to Figure 4—43.
35. Using the appropriate tools, pull, rotate, and engage the fly center rear retainer pin. Refer to Figure 4—59.
36. Using the appropriate tools, pull the ramp working pin. Rotate the pivoting ramp into the storage position until ramp working pin catches.



Disengaged **Engaged**

1. 22.5 Ft (*6.86m*) Fly Center Section
2. Fly Tip Connecting Pins
3. 22.5 Ft (*6.86m*) Fly Tip Section

Figure 4—60
Storage of the 22.5 Ft (*6.86m*) Fly Tip Section — Engaged

Note: If the fly tip section is stored on the boom, engage the 22.5 ft (*6.86m*) fly tip section with the 22.5 ft (*6.86m*) fly center section:

Ensure the 22.5 ft (*6.86m*) fly tip section is properly stored on the boom with the fly tip front and rear retainer pins and the fly tip connecting pin securing the fly tip to the fly tip storage bracket. Refer to Figure 4—67.

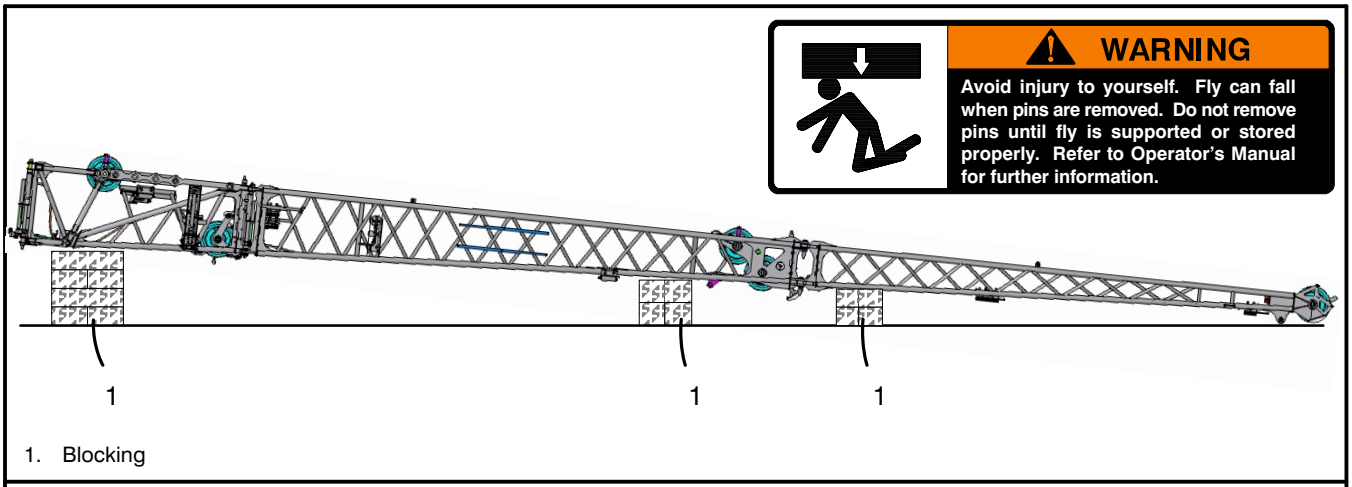
Align the fly center section with the fly tip section and engage the fly tip hitch pin. Refer to Figure 4—83.

⚠ WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

Remove the connecting pins from the storage location at the rear of the fly tip and secure the 22.5 ft (*6.86m*) fly center section to the 22.5 ft (*6.86m*) fly tip section with the connecting pins. (Install the pins with the head on top and keeper on the bottom.) Secure connecting pins with keeper pins. Refer to Figure 4—60.

37. Boom down fully.
38. Remove the hand line from the tip of the fly center.
39. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
40. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4—3. 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.
41. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
42. Check the Crane Rating Manual, in the operator's cab, for lifting capacities with the fly in the stored position before continuing operations.



1. Blocking

Figure 4—61
Installation And Removal Of The 10—32.5—55Ft *(3.05—9.91—16.76m)* Offset Lattice Fly

10—32.5—55Ft *(3.05—9.91—16.76m)* Offset Lattice Fly

The crane may be equipped with a four piece 10—32.5—55 ft (*3.05—9.91—16.76m*) offset lattice fly. It consists of the two piece 10 ft (*3.05m*) fly base section, a 22.5 ft (*6.86m*) fly center section, and a 22.5 ft (*6.86m*) fly tip section. The offset lattice fly, as shown in Figure 4—62, connects to the main boom head. It can be used 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. The fly is equipped with assist tools which include a 1/2 in (*13mm*) hex socket and extensions.

10—32.5—55Ft (*3.05—9.91—16.76m*) Fly Installation

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

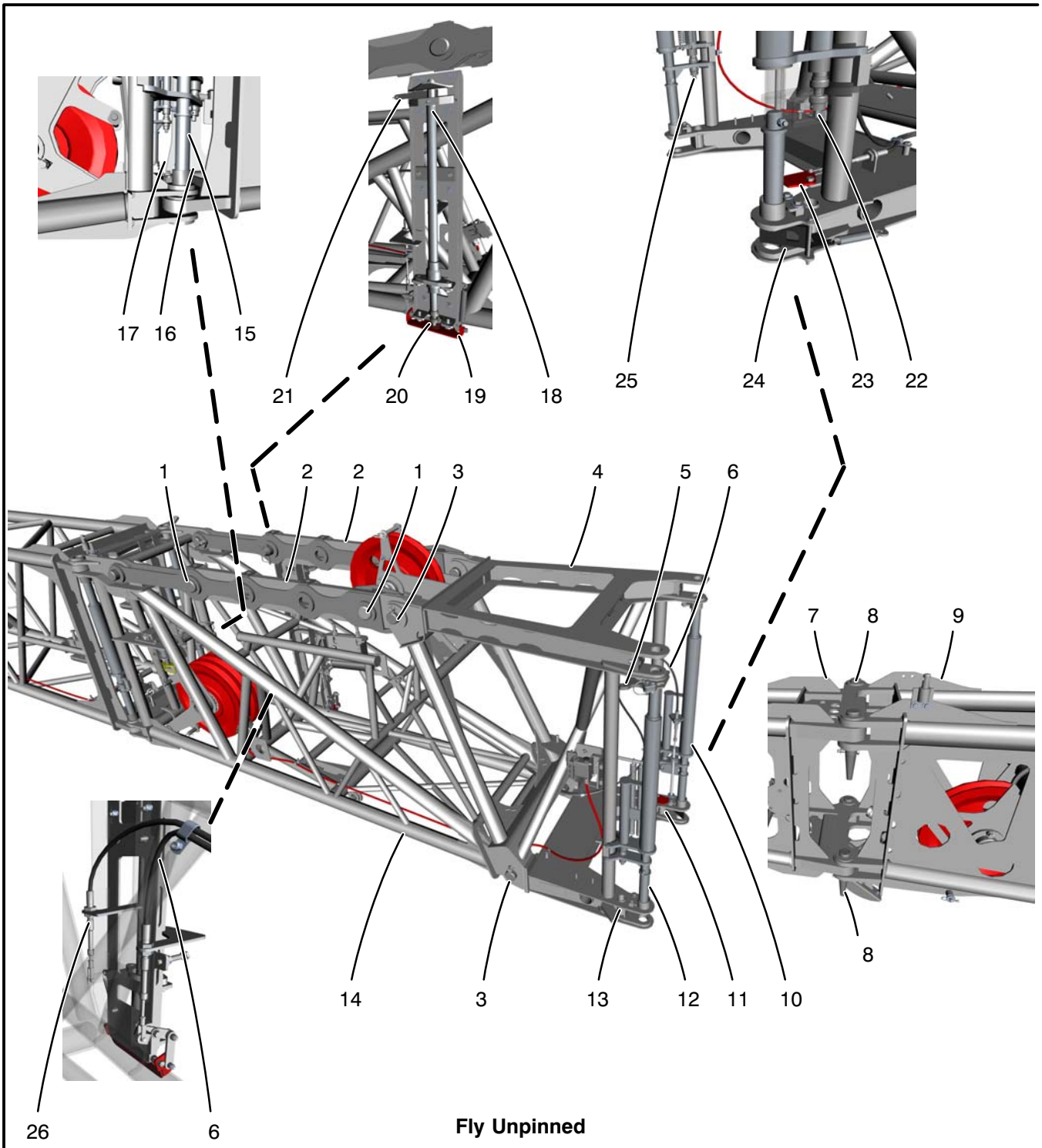
WARNING

Install the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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.

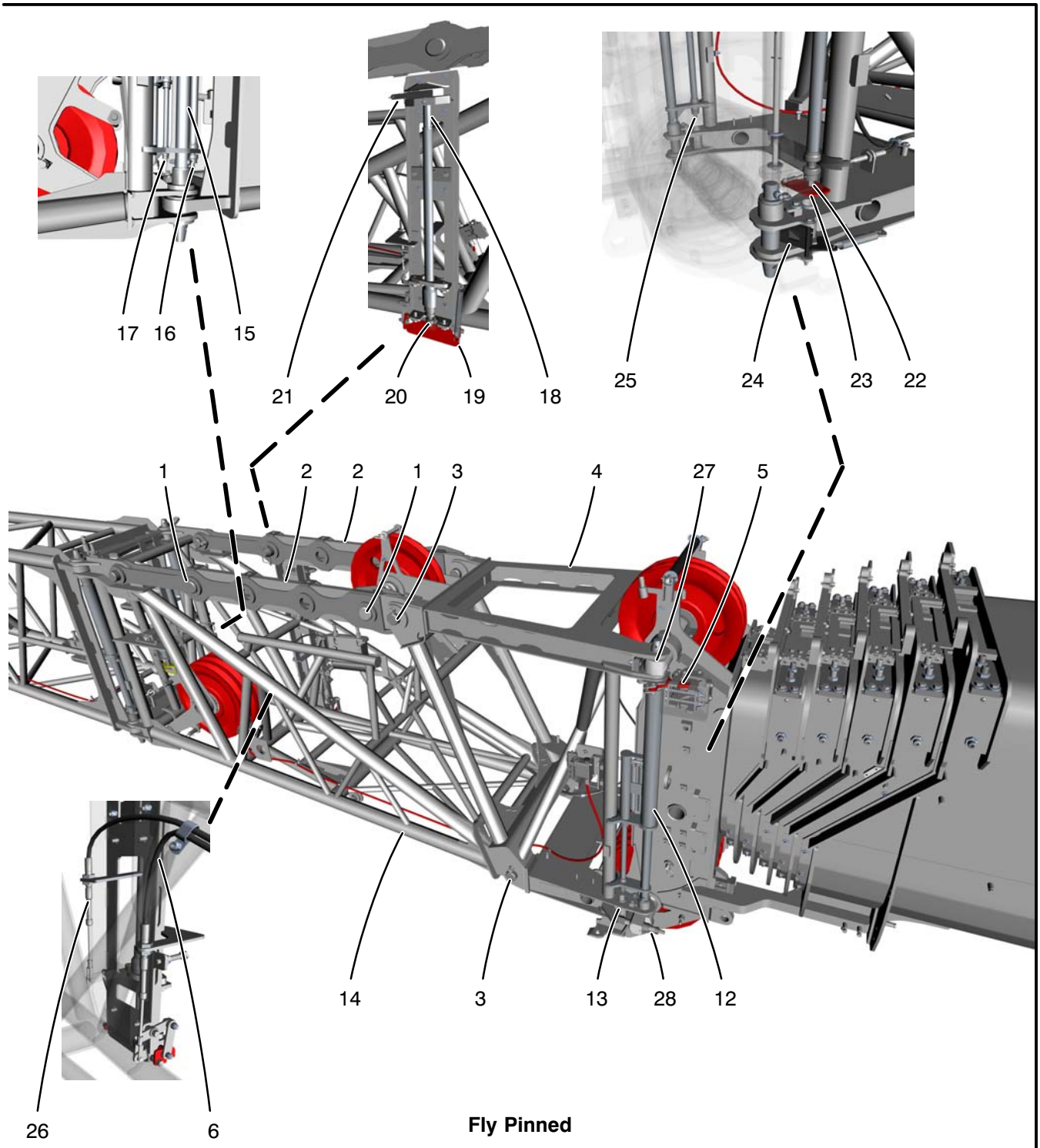
Failure to do the above could result in personal injury and/or the crane tipping.



Fly Unpinned

1. Offset Connecting Pins (Both Sides – 0° Position Shown)
2. Fly Adapter Lugs (Both Sides – 0° Position Shown)
3. Fly Base Connecting Pins (Both Sides)
4. Fixed Fly Base
5. Fly Catch
6. Boom Head Pin Push Pull Cable
7. 22.5 Ft (*6.86m*) Fly Tip Section
8. Fly Tip Connecting Pins (Both Sides)
9. 22.5 Ft (*6.86m*) Fly Center Section
10. Right Side Boom Head Pin
11. Right Side Access Tube
12. Left Side Boom Head Pin
13. Left Side Access Tube
14. 8 Ft (*2.44m*) Offset Fly Base Section

Figure 4–62
10–32.5–55Ft *(3.05–9.91–16.76m)* Offset Lattice Fly



Fly Pinned

15. Fly Center Connecting Pins (Both Sides)
16. Right Side Fly Center Speed Screw
17. Left Side Fly Center Speed Screw
18. Secondary Pivot Pin
19. Pivot Pin Access Cover
20. Pivot Pin Speed Screw
21. Pivot Pin Block Plate
22. Right Side Fly Base Speed Screw
23. Boom Head Pin Access Cover
24. Boom Head Pin Block Plate
25. Left Side Fly Base Speed Screw
26. Pivot Pin Push Pull Cable
27. Boom Head Machinery Cross Shafts
28. Pusher Block

Figure 4—62 Continued
10—32.5—55Ft *(3.05—9.91—16.76m)* Offset Lattice Fly

5. Ensure the auxiliary lifting sheave is properly stored on the boom head. Refer to "Auxiliary Lifting Sheave Storage" in this section of this Operator's Manual.
6. Ensure the fixed fly base is properly pinned to the 8 ft (*2.44m*) offset fly base section with fly base connecting pins. Refer to Figure 4—62.
7. Ensure the 10 ft (*3.05m*) fly base section is properly pinned to the 22.5 ft (*6.86m*) fly center section with fly center connecting pins. Refer to Figure 4—62. If required, pin the 22.5 ft (*6.86m*) fly center section to the 10 ft (*3.05m*) fly base section. Engage the fly center lugs with the fly base lugs. Using the appropriate tools, rotate the fly center speed screw to fully extend both fly center connecting pins.
8. Ensure 22.5 ft (*6.86m*) fly center section is properly pinned to the 22.5 ft (*6.86m*) fly tip section with fly center connecting pins. If required, pin the 22.5 ft (*6.86m*) fly tip section to the 22.5 ft (*6.86m*) fly center section. Engage the fly tip lugs with the fly center lugs. Remove the connecting pins from the storage location at the rear of the fly tip and secure the 22.5 ft (*6.86m*) fly tip section with the 22.5 ft (*6.86m*) fly center section with the connecting pins and keeper pins.
9. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—62 and Figure 4—93. If required, change the fly offset to the 0° or locked position. Refer to "Changing The Fly Offset" in this section of this Operator's Manual for detailed instructions.
10. Ensure the fly base head sheave is in the stored position. Refer to Figure 4—19.
11. Position the fly on secure blocking. Refer to Figure 4—13. The 10—32.5—55 ft (*3.05—9.91—16.76m*) fly weighs approximately 3,696 lb (*1,677kg*).
12. Raise and extend the boom to allow enough rope to reeve the fly. Lower the hook block or hook ball (to be used on the fly) to the ground. Fully retract the boom.
13. 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.

14. Remove the wire rope guard and wire rope from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4—3. 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.
15. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly installation. 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. Refer to Figure 4—62. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open.

16. 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—62. If required, extend the secondary pivot pin. Provide clearance by pinning 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.
17. 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. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.

18. Using the appropriate tools, rotate the right side fly base 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.
19. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the top left side boom head pin.
20. Using the appropriate tools, rotate the pusher block, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
21. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the bottom left side boom head pin.
22. Back off the pusher block 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, fly center, 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.

23. 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.
24. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
25. Remove the wire rope guards from the fly deflector sheaves. Refer to Figure 4—80. Reeve the wire rope from the boom deflector sheave over the fly deflector sheaves. Install the wire rope guards, and secure with keeper pins.
26. Remove the wire rope guard from the fly tip head sheave. Reeve the wire rope from the fly deflector sheaves over the fly tip head sheave. Install the wire rope guard, and secure with keeper pin.

CAUTION

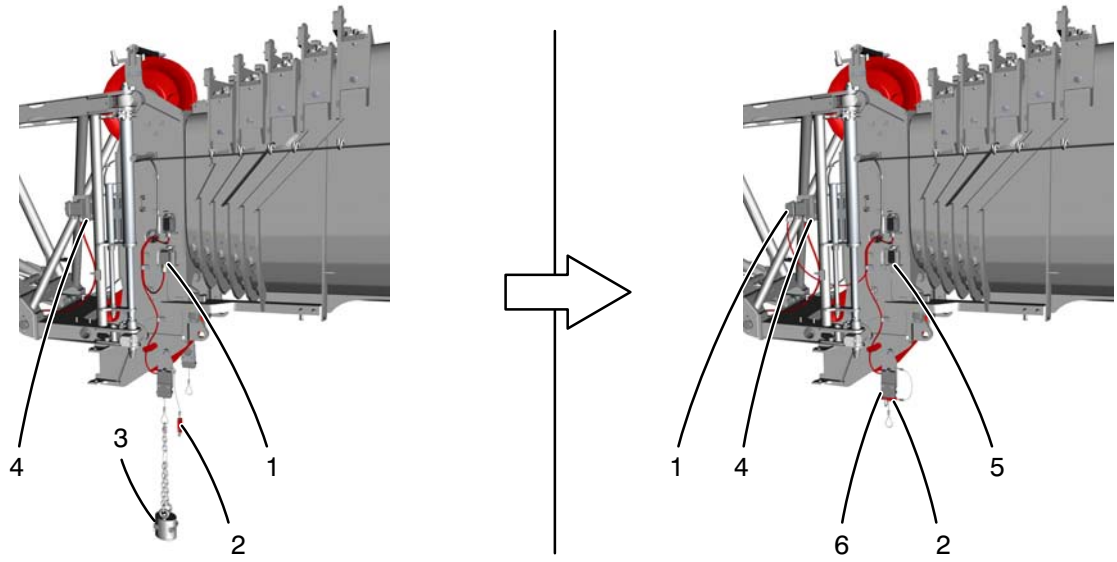
All wire rope guards must be in proper position during operation.

27. 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—63.
    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 center base plug from the fly center storage connector and connect it to the fly base head connector. Refer to Figure 4—64.
    e. Disconnect the fly tip base plug from the fly tip storage connector and connect it to the fly center head connector.
    f. Disconnect and remove the secondary ATB switch from the right side of the boom head. Install the secondary ATB switch on the fly head and connect the secondary ATB switch plug to the fly tip head connector.
    g. Install the ATB weight on the secondary 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.

28. Boom up to a boom angle of 0°.



1. Boom Head Plug
2. Lockout Clip
3. ATB Weight
4. Fly Base Connector
5. Jumper Assembly
6. Boom Head ATB Switch

Figure 4—63
Anti-Two Block (ATB) Connections — Boom Head

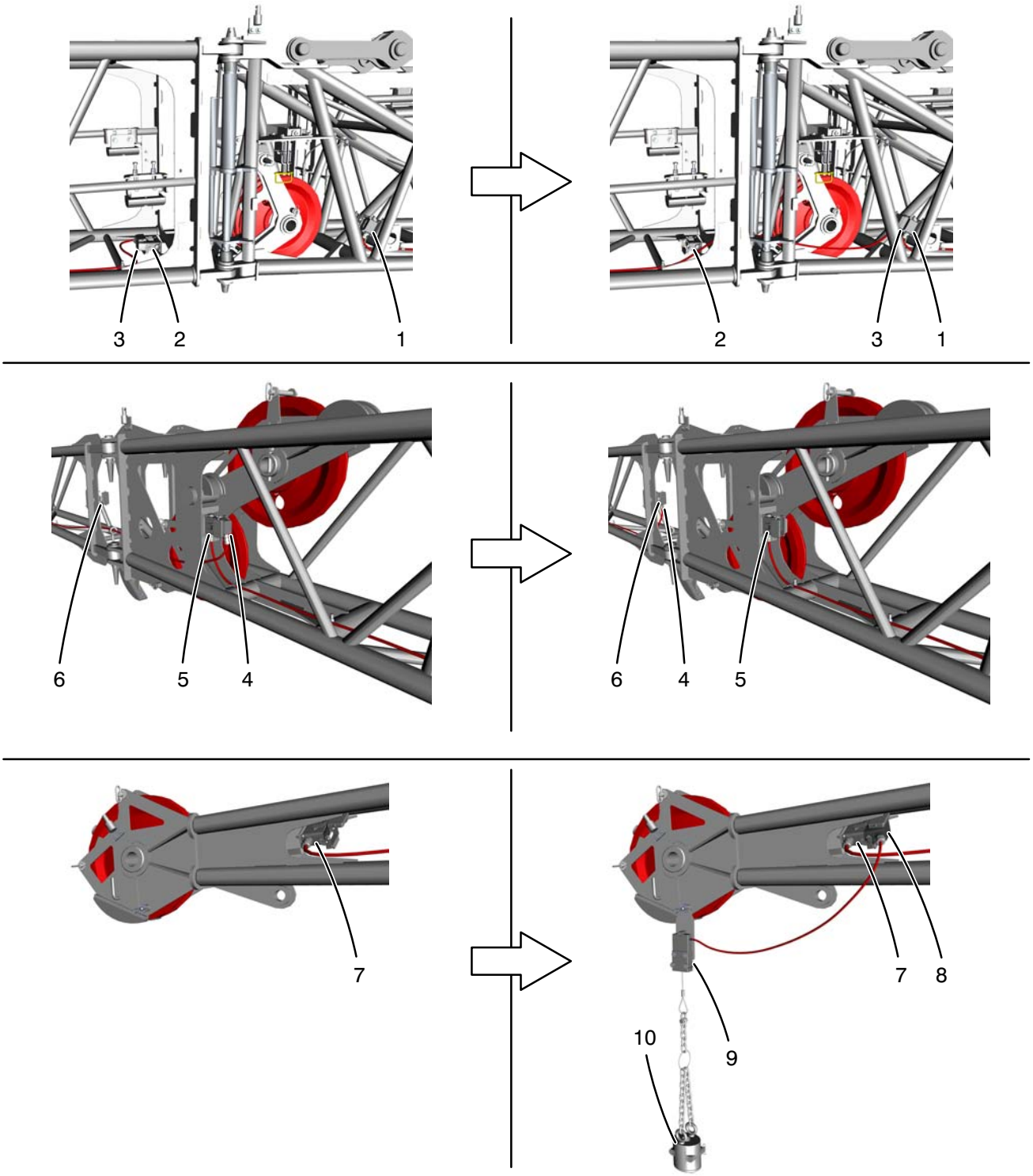
29. If the crane is equipped with the hydraulic fly base, connect the hydraulic hoses as follows:
    a. Remove the keeper pin and hydraulic hose bracket from the storage bracket. Refer to Figure 4—17.
    b. Route the boom offset extend and retract hydraulic hoses through the rollers on the boom. If required, remove the top rollers from the stored position and install them in the working position. Align the hydraulic hose bracket on the working bracket and secure with the keeper pin.
    c. Disconnect the hydraulic offset extend and retract hoses from the quick disconnect manifold and connect to the boom offset extend and retract hydraulic hoses. Ensure o-ring of each quick disconnect fitting is completely covered.
    d. Rotate the accumulator ball valve into the working position.
    e. Ensure the quick disconnect fittings are capped.

Note: If the crane is equipped with the hydraulic fly base, the offset fly must be put into the operating position before operating with the fly. Refer to "Changing The Fly Offset Angle" in this section of this Operator's Manual.

30. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
31. 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.



1. Fly Base Head Connector
2. Fly Center Storage Connector
3. Fly Center Base Plug
4. Fly Tip Base Plug
5. Fly Center Head Connector
6. Fly Tip Storage Connector
7. Fly Tip Head Connector
8. Secondary ATB Switch Plug
9. Secondary ATB Switch
10. ATB Weight

Figure 4—64
Anti-Two Block (ATB) Connections

10—32.5—55Ft (*3.05—9.91—16.76m*) Fly Removal

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

⚠ WARNING

Remove the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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.

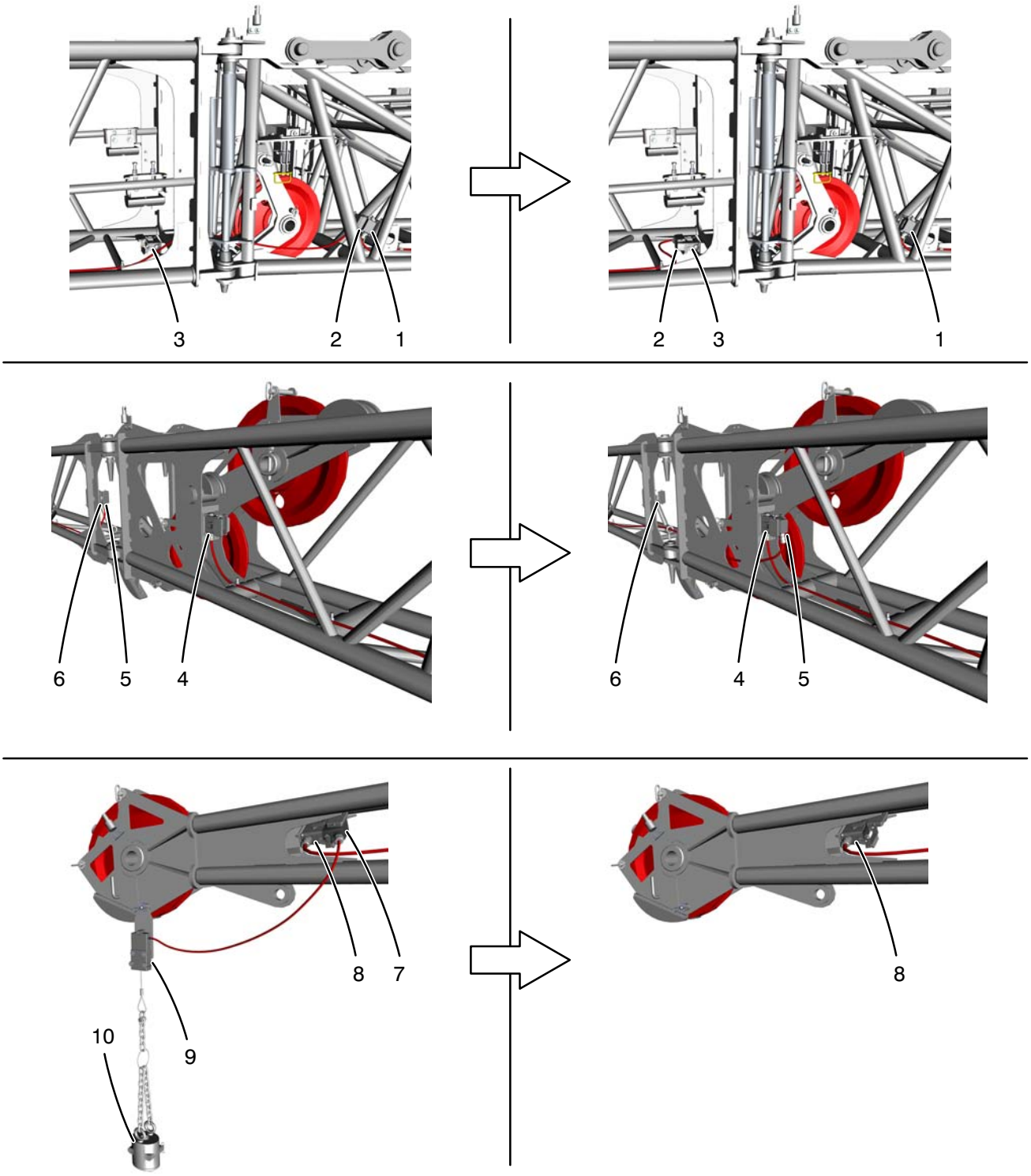
Failure to do the above could result in personal injury and/or the crane tipping.

5. If the fly is not in the erected position, erect it per "Erection Of The 10—32.5—55Ft (*3.05—9.91—16.76m*) 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, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—62 and Figure 4—93. If required, change the fly offset to the 0° or locked 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

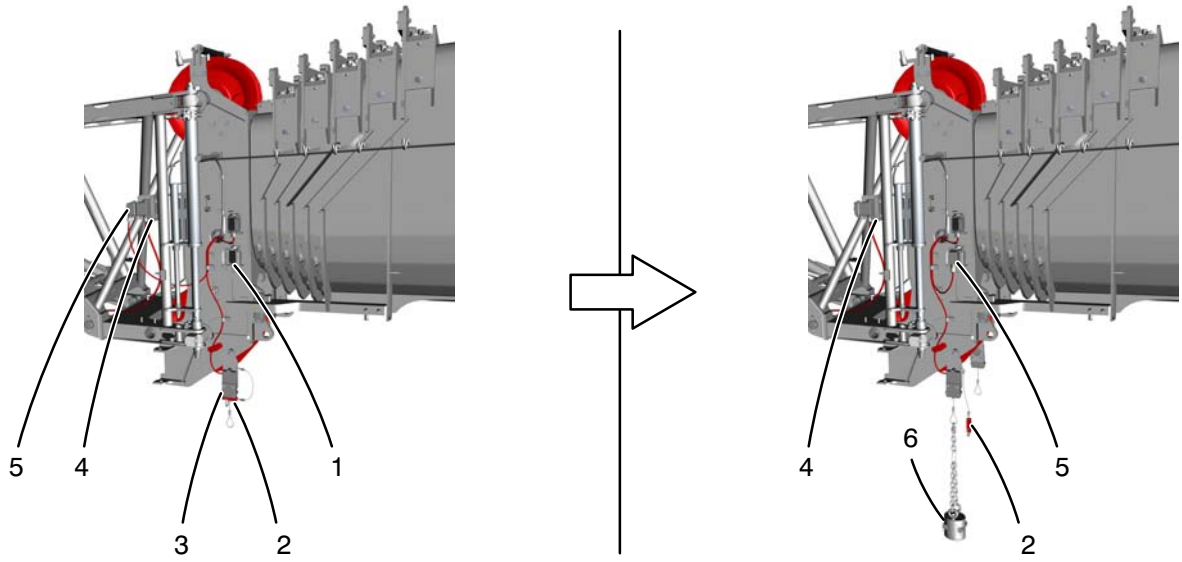
To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

9. If the crane is equipped with the hydraulic fly base, disconnect the hydraulic hoses as follows:
   a. Rotate the accumulator ball valve into the stored position. Refer to Figure 4—18.
   b. Disconnect the hydraulic offset extend and retract hoses from the boom offset extend and retract hydraulic hoses and connect to the quick disconnect manifold. Ensure o-ring of each quick disconnect fitting is completely covered.
   c. Remove the keeper pin and hydraulic hose bracket from the working bracket.
   d. Remove the boom offset extend and retract hydraulic hoses from the rollers on the boom. If required, remove the top rollers from the working position and install them in the stored position. Align the hydraulic hose bracket on the storage bracket and secure with the keeper pin.
   e. Ensure the boom extend and retract hydraulic hoses are capped.



1. Fly Base Head Connector
2. Fly Center Base Plug
3. Fly Center Storage Connector
4. Fly Center Head Connector
5. Fly Tip Base Plug
6. Fly Tip Storage Connector
7. Secondary ATB Switch Plug
8. Fly Tip Head Connector
9. Secondary ATB Switch
10. ATB Weight

Figure 4–65
Anti-Two Block (ATB) Connections



1. Jumper Assembly
2. Lockout Clip
3. Boom Head ATB Switch
4. Fly Base Connector
5. Boom Head Plug
6. ATB Weight

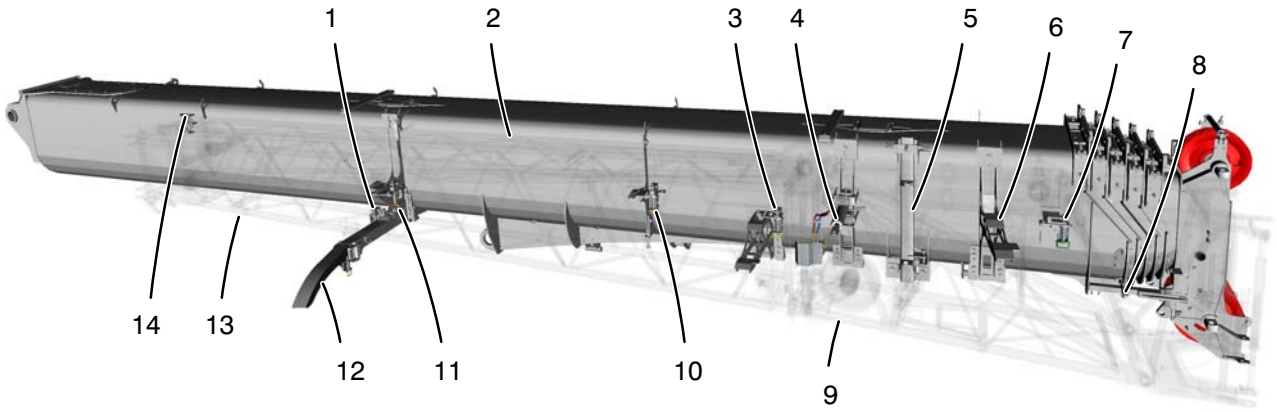
Figure 4—66
Anti-Two Block (ATB) Connections — Boom Head

10. Properly disconnect the anti-two block (ATB) system as follows:
    a. Remove the ATB weight from the secondary ATB switch cable. Refer to Figure 4—64.
    b. Disconnect the secondary ATB switch plug from the fly tip head connector and remove the secondary ATB switch from the fly head. Install and connect the secondary ATB switch on the right side of the boom head.
    c. Disconnect the fly tip base plug from the fly center head connector and connect it to the fly tip storage connector.
    d. Disconnect the fly center base plug from the fly base head connector and connect it to the fly center 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. Refer to Figure 4—66.
    f. Install the ATB weight on the boom head ATB switch cable.
    g. Remove the lockout clip from the boom head ATB switch cable.
11. Remove the wire rope guard from the fly tip head sheave. Refer to Figure 4—80. 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 guard, and secure with keeper pin.
12. Remove the wire rope guards from the fly deflector sheaves. Remove wire rope from the fly deflector sheaves and lay it aside to prevent damage to it during fly removal. Install the wire rope guards, and secure with keeper pins.
13. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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. Properly store wire rope which was used on fly, as required.

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—13. The 10—32.5—55 ft (*3.05—9.91—16.76m*) fly weighs approximately 3,696 lb (*1,677kg*).
17. Using the appropriate tools, rotate the pusher block, 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 fly base speed screw through the left side access tube to fully retract the bottom left side boom head pin.
19. Back off the pusher block until a clearance of at least 1/2 in (*1.3cm*) from the left fly lug is obtained.
20. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully retract the top left side boom head pin.
21. Using the appropriate tools, rotate the right side fly base speed screw through the right side access tube to fully retract the right side boom head pins and disengage from the right side of the boom head machinery cross shafts.
22. Carefully retract the boom away from the fly.
23. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
24. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4—3. 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.
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. Properly store the fly to prevent damage to it.



1. Fly Center Rear Retainer Pin
2. 22.5 Ft (*6.86m*) Fly Tip
3. Fly Center Front Retainer Pin
4. Fly Storage Cylinder
5. Fly Base Storage Bracket
6. Fly Base Ramp
7. Fly Base Retainer Pin
8. Fly Base Stabilizer Link
9. 10 Ft (*3.05m*) Fly Base
10. Fly Tip Front Retainer Pin
11. Fly Tip Rear Retainer Pin
12. Pivoting Ramp
13. 22.5 Ft (*6.86m*) Fly Base
14. Fly Tip Storage Bracket

Figure 4—67
10—32.5—55Ft *(3.05—9.91—16.76m)* Offset Lattice Fly (Stored)

Erection Of The10—32.5—55Ft (*3.05—9.91—16.76m*) Fly From The Stored Position

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

⚠ WARNING

Erect the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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 personal injury and/or the crane tipping.

5. Ensure the auxiliary lifting sheave is properly stored on the boom head. Refer to "Auxiliary Lifting Sheave Storage" 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, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—62 and Figure 4—93. If required, change the fly offset to the 0° or locked 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 reeve the fly. Lower the hook block or hook ball (to be used on the fly) to the ground. Fully retract the boom.

CAUTION

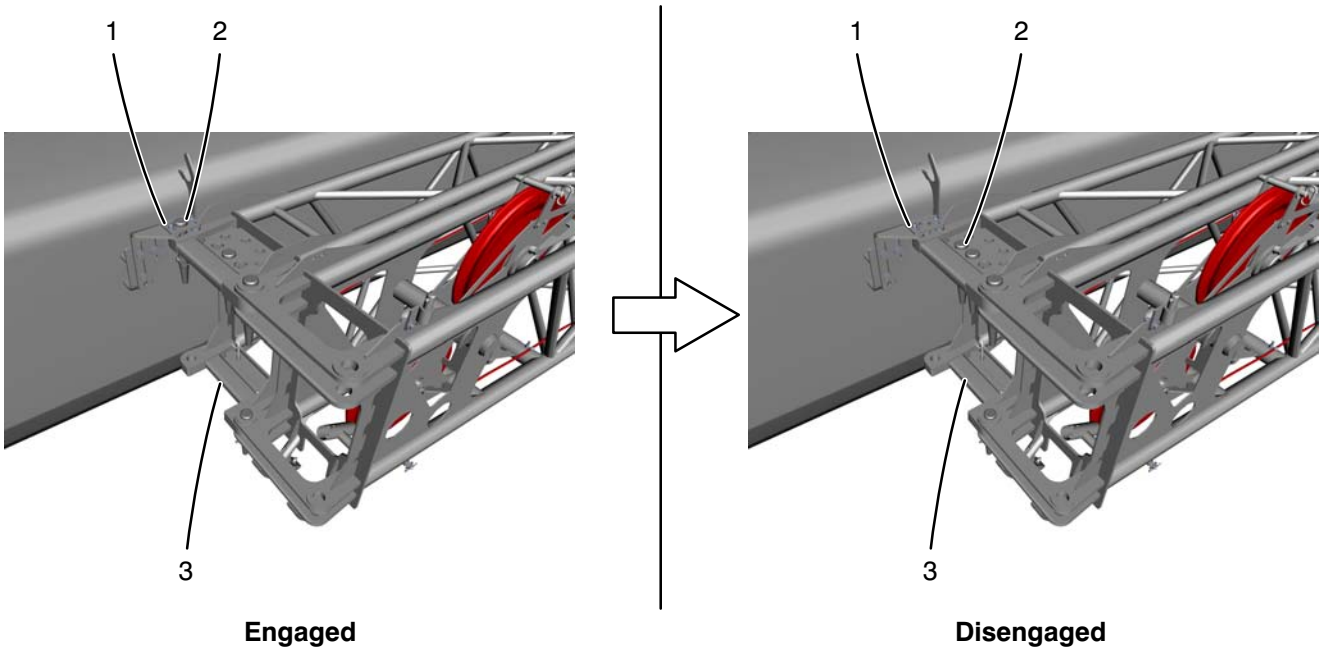
Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

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—3. 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.
10. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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.



1. Fly Tip Storage Bracket
2. Fly Tip Connecting Pin
3. Fly Tip Section

Figure 4—68
Fly Tip Storage Bracket — Disengaged

WARNING

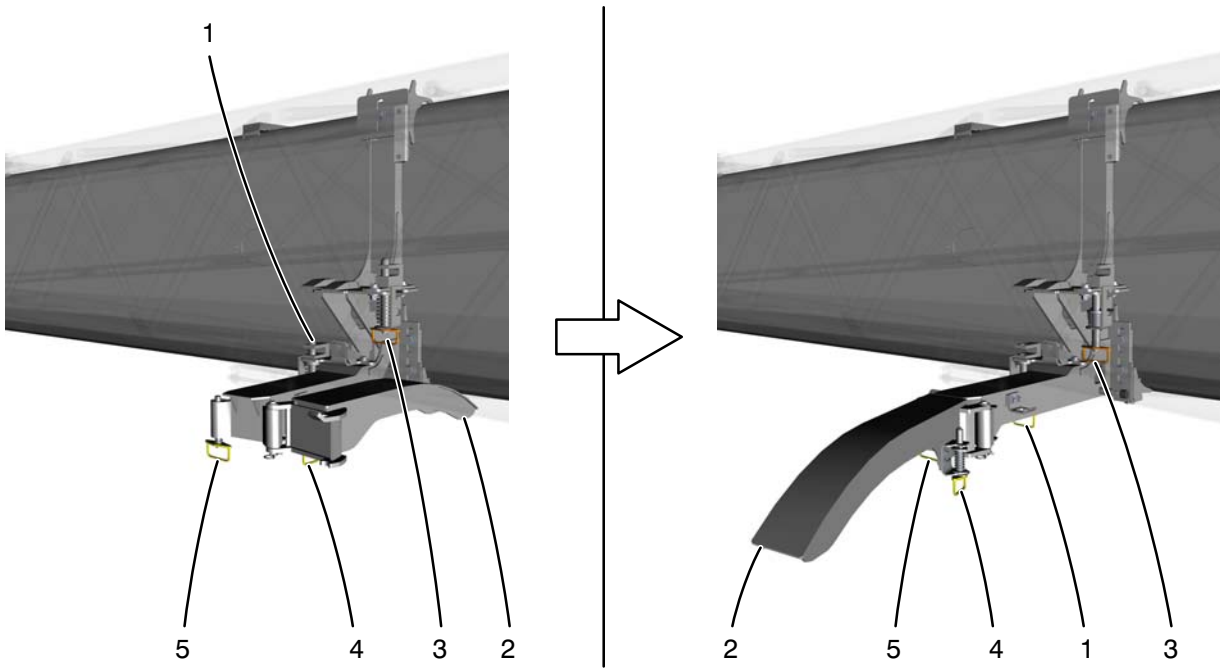
Ensure the hydraulic cylinders have been properly filled with oil and bled of air before erecting the hydraulic fly, if equipped. The fly may drop when erecting if not properly filled with oil before erecting the fly. Refer to the Service Manual for proper procedure.

11. Attach a hand line to the tip of the fly center.

WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

12. Remove the fly tip connecting pin from the fly tip storage bracket. Refer to Figure 4—68. Install the connecting pin in the storage location at the rear of the fly tip and secure with keeper pin.

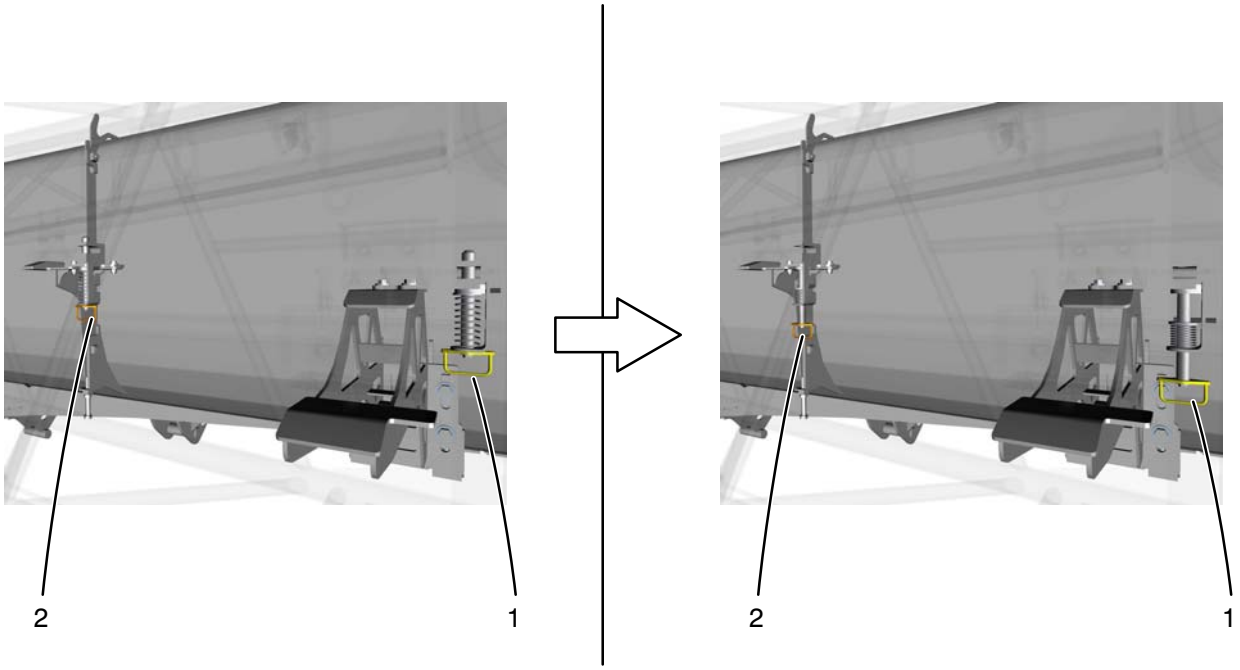


1. Fly Center Rear Retainer Pin
2. Pivoting Ramp
3. Fly Tip Rear Retainer Pin
4. Ramp Storage Pin
5. Ramp Working Pin

Figure 4–69
Pivoting Ramp – Working

13. Using the appropriate tools, pull the ramp storage pin. Refer to Figure 4–69. Rotate the pivoting ramp into the working position until ramp working pin catches.

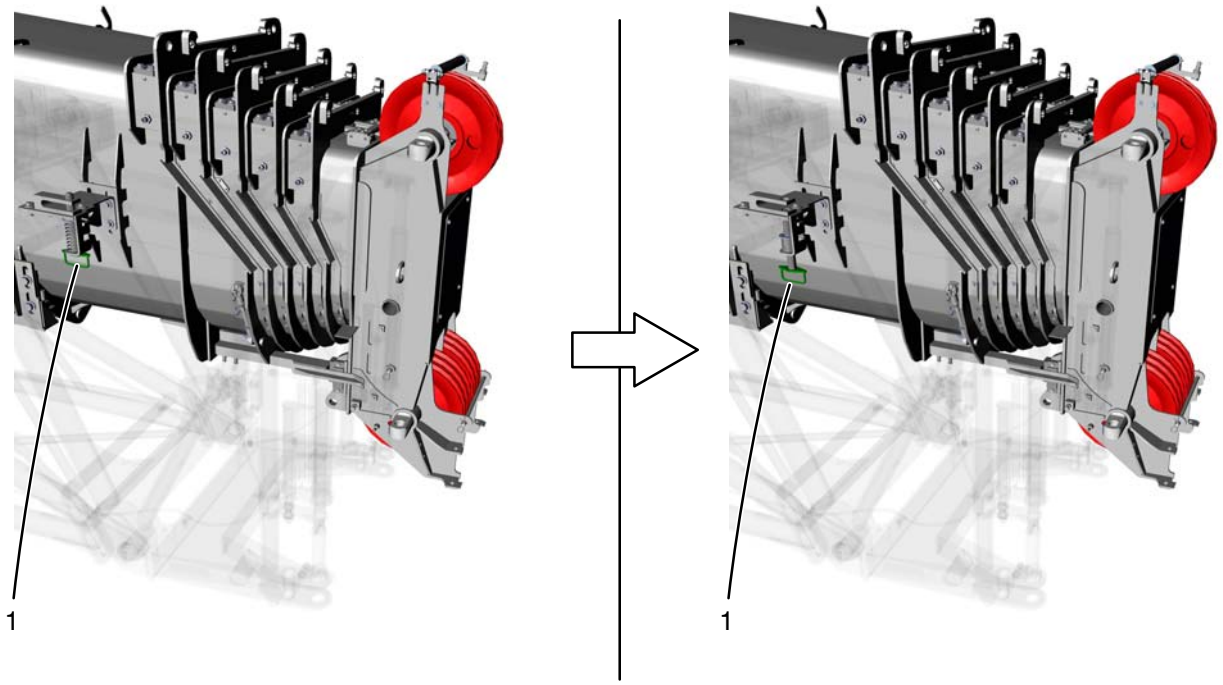
14. Using the appropriate tools, pull, rotate, and disengage the fly center and tip rear retainer pins.



1. Fly Center Front Retainer Pin
2. Fly Tip Front Retainer Pin

Figure 4—70
Fly Center And Tip Front Retainer Pins — Disengaged

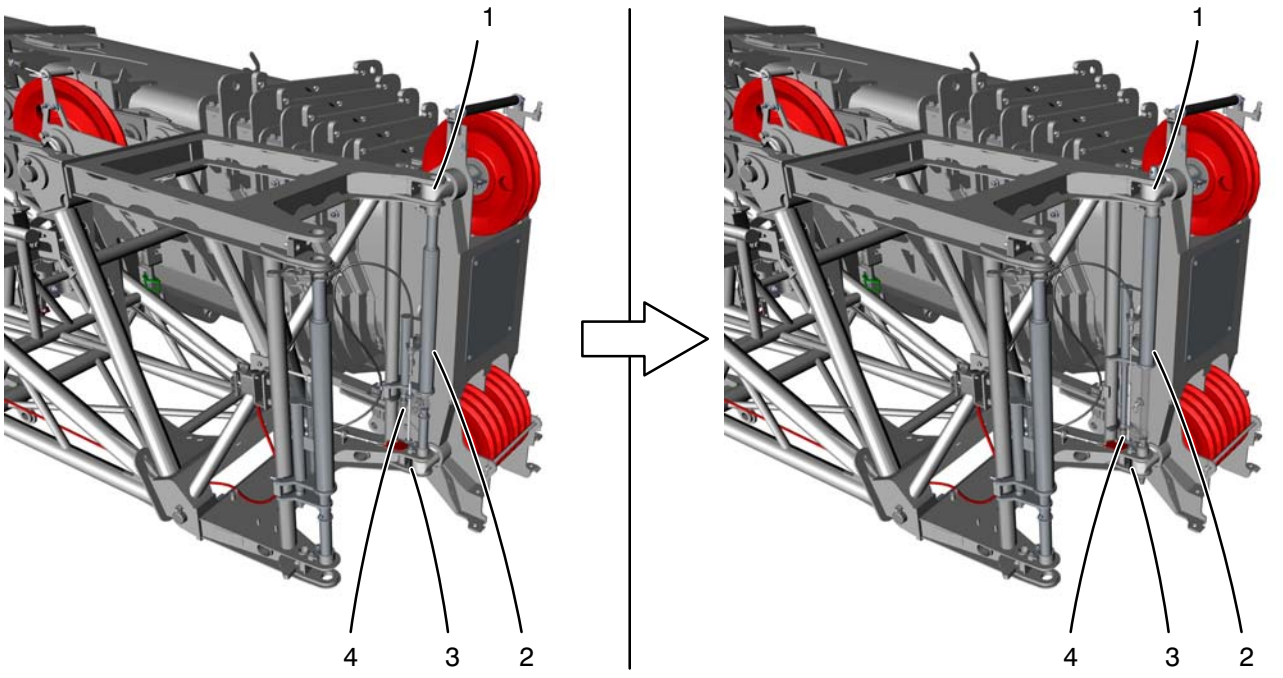
15. Using the appropriate tools, pull, rotate, and disengage the fly center and tip front retainer pins. Refer to Figure 4—70.



1. Fly Base Retainer Pin

Figure 4–71
Fly Base Retainer Pin – Stored Position

16. Using the appropriate tools, pull, rotate, and disengage the fly base retainer pin. Refer to Figure 4–71.



Disengaged **Engaged**

1. Boom Head Machinery Cross Shafts
2. Right Side Boom Head Pin
3. Boom Head Pin Block Plate
4. Right Side Fly Base Speed Screw

Figure 4—72
Right Side Fly Boom Head Pin — Engaged

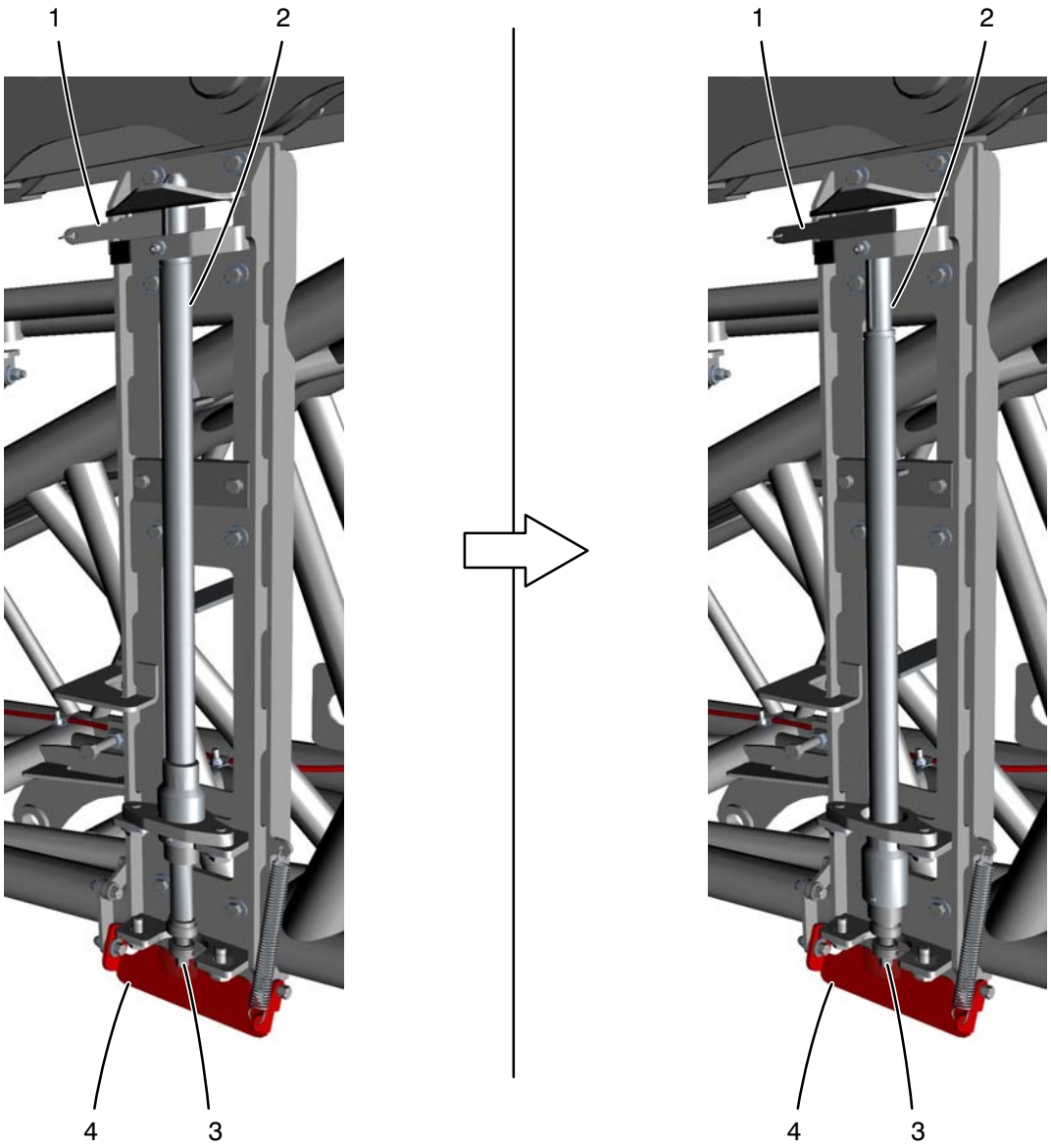
17. Boom up to 0°.

    Note: The wireless rigging box may be used to boom up and down.

18. Actuate the fly storage cylinder, as required, to align the right side fly lugs with the right side of the boom head machinery cross shafts. Refer to Figure 4—72. Ensure the boom head pin block plate is pushed into the bottom right side fly lugs while the fly is engaged.
19. Boom down fully.

    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. Refer to Figure 4—62. If the pin is retracted, the corresponding access cover will close. If the pin is extended, the corresponding access cover will open.

20. Using the appropriate tools, rotate the right side fly base 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.



Engaged **Disengaged**

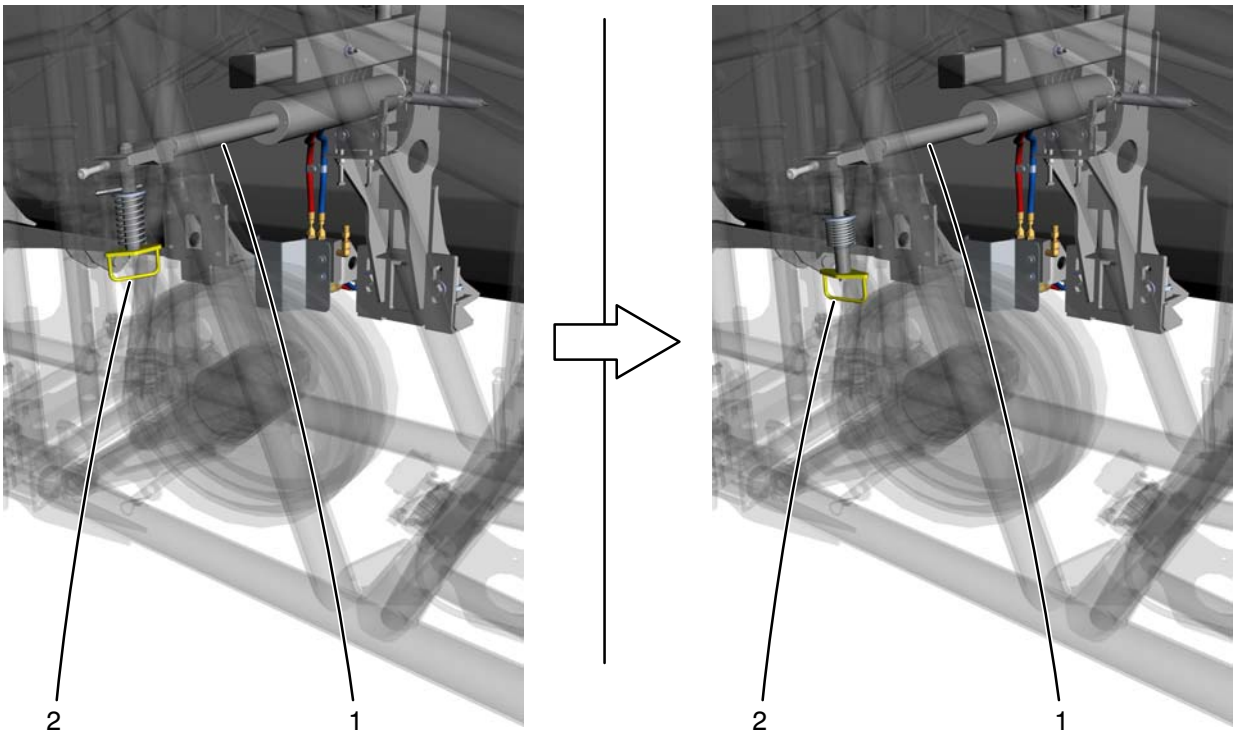
1. Pivot Pin Block Plate
2. Secondary Pivot Pin
3. Pivot Pin Speed Screw
4. Pivot Pin Access Cover

Figure 4–73
Secondary Pivot Pin – Disengaged

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.

21. 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 4–73.
22. Boom up to 0°.



1. Fly Storage Cylinder
2. Fly Storage Cylinder Connecting Pin

Figure 4—74
Fly Storage Cylinder — Disengaged

23. Extend the fly storage cylinder to pivot the fly off the pivoting ramp. Refer to Figure 4—67.

24. 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 10—32.5—55 ft (*3.05—9.91—16.76m*) fly section. Refer to Figure 4—74.

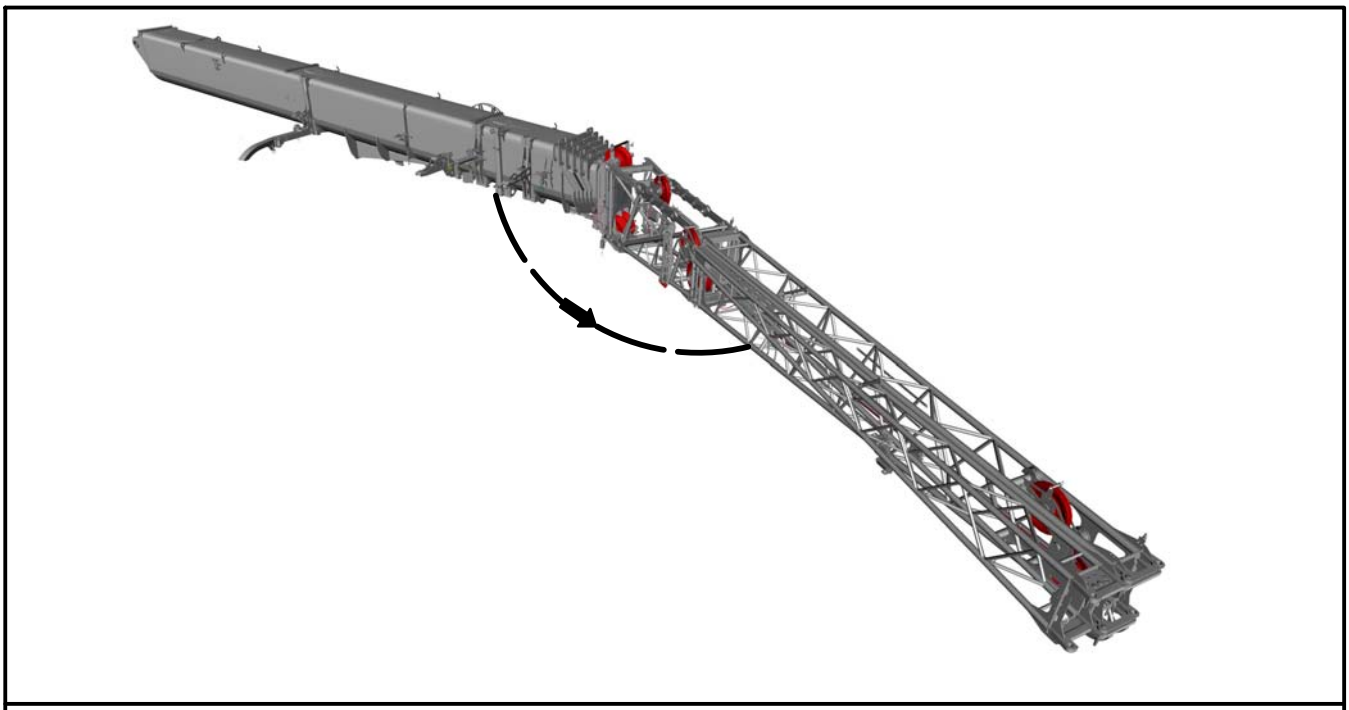


Figure 4—75
Swinging The Fly

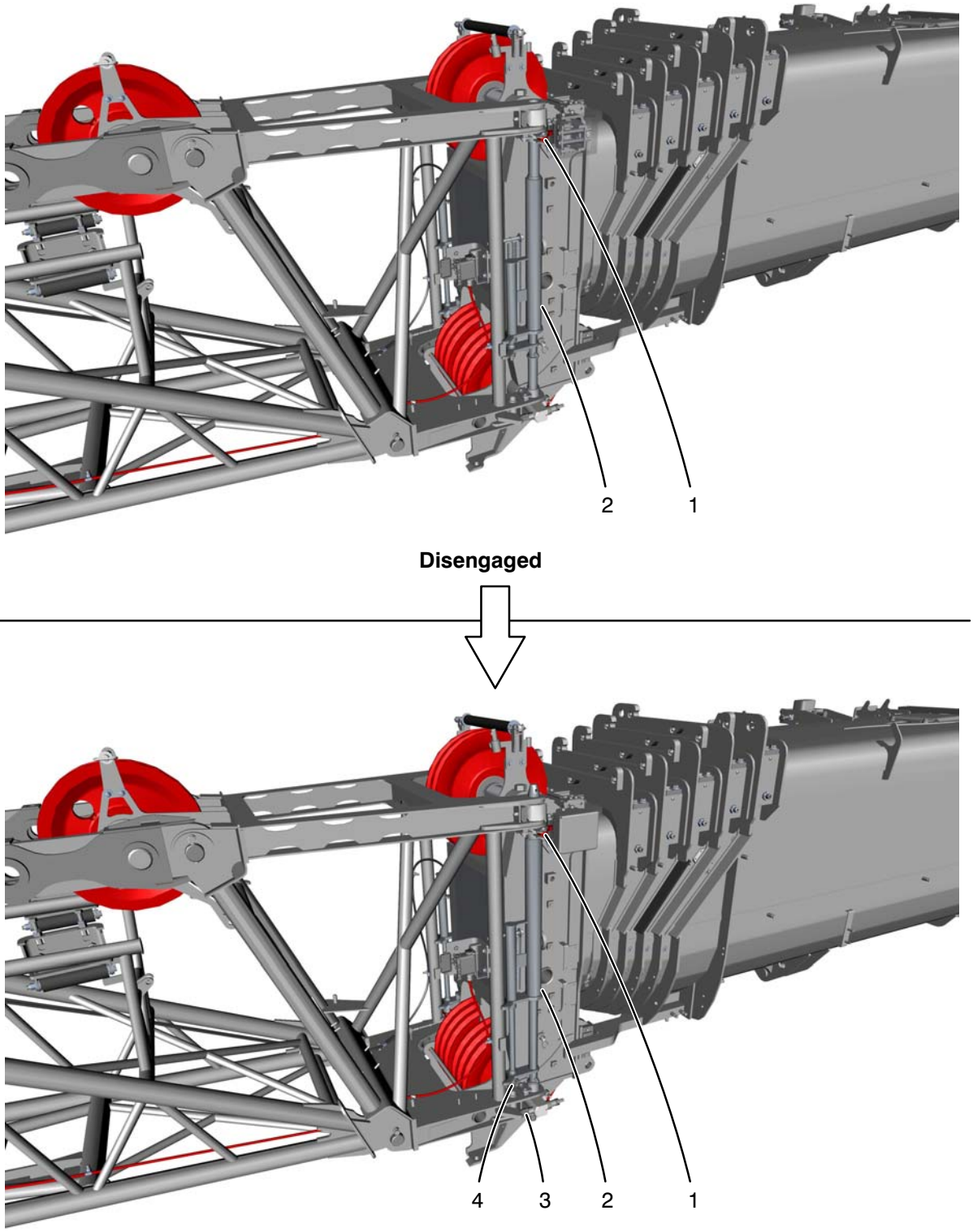
WARNING

Use a hand line to control fly swing. The fly could swing rapidly. Keep all personnel clear of swing path to avoid personal injury.

25. Use the hand line attached to the 22.5 ft (*6.86m*) fly section to begin swinging the fly around the boom head. Refer to Figure 4—75.
26. 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—76.
27. Boom down fully.
28. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the top left side boom head pin.
29. Using the appropriate tools, rotate the pusher block, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft.
30. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully extend the bottom left side boom head pin.
31. Back off the pusher block until a clearance of at least 1/2 in (*1.3cm*) from the left fly lug is obtained.

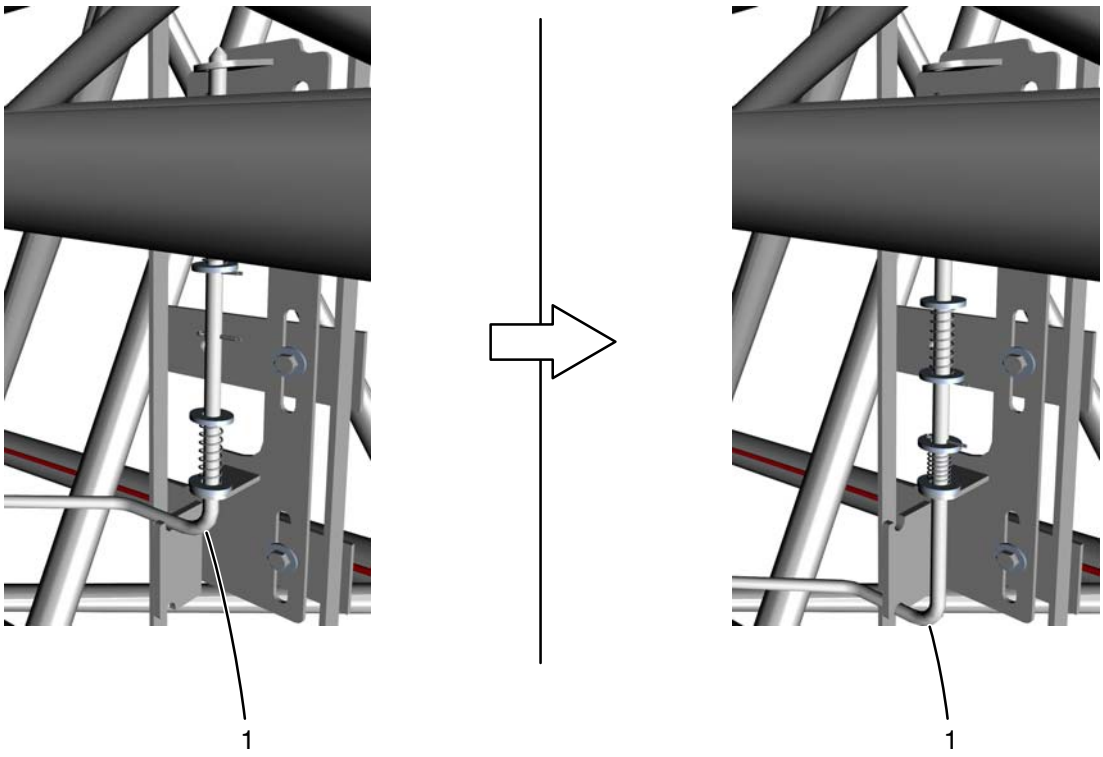
WARNING

All boom head pins and all fixed fly base, fly center, 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.



1. Fly Catch
2. Left Side Boom Head Pin
3. Pusher Block
4. Left Side Fly Base Speed Screw

Figure 4–76
Left Side Fly Boom Head Pin – Engaged



1. Fly Tip Hitch Pin

Figure 4—77
Fly Tip Hitch Pin — Disengaged

32. Remove the hand line from the tip of the fly center and attach it to the head of the fly tip.
33. Pull, rotate, and disengage the fly tip hitch pin. Refer to Figure 4—77.
34. Boom up to a boom angle of 0°.

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.

35. Use the hand line attached to the 22.5 ft (*6.86m*) fly tip to begin swinging the fly around the head of the fly center section. Refer to Figure 4—78.
36. Continue swinging the fly until the fly tip lugs engage with the fly center lugs. Refer to Figure 4—79.

WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

37. Remove the fly tip connecting pins from the storage location at the rear of the fly tip and install in the fly tip lugs. (Install the pins with the head on top and keeper on the bottom.) Secure connecting pins with keeper pins.
38. Remove the hand line from the head of the fly tip.

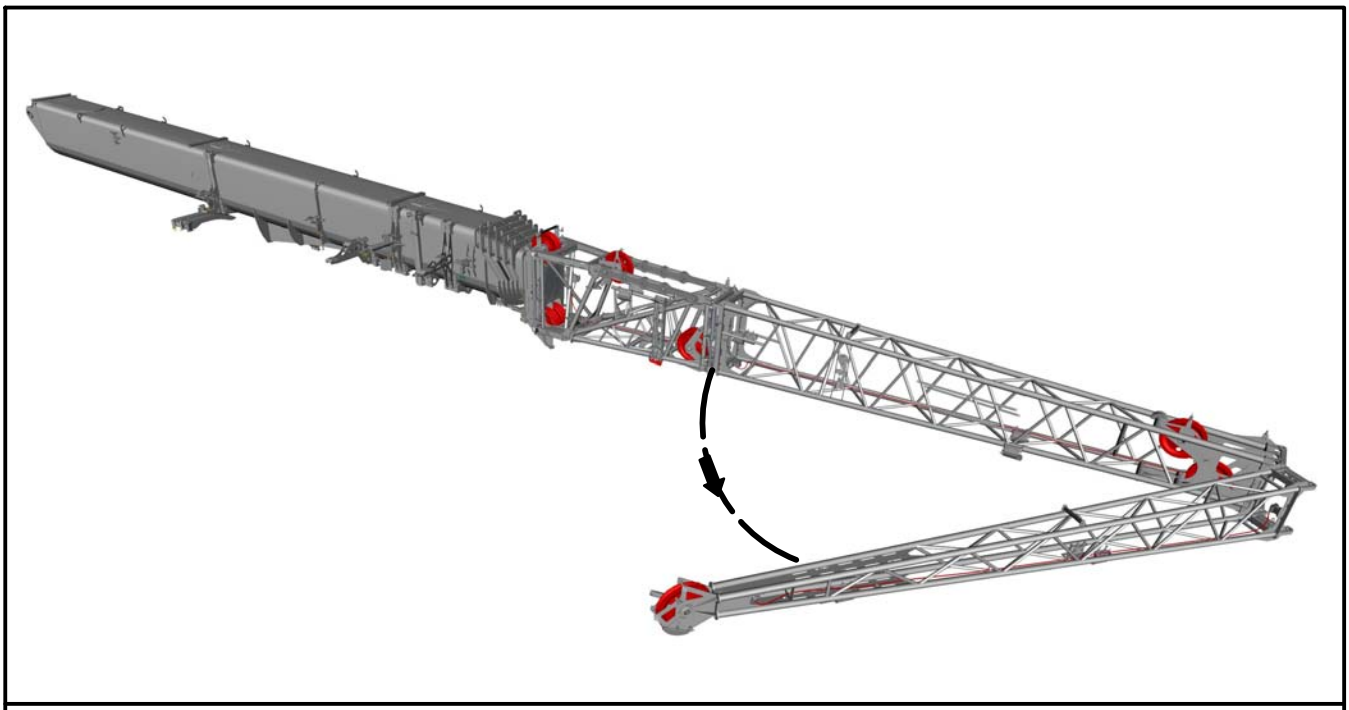


Figure 4—78
Swinging The Fly

39. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
40. Remove the wire rope guards from the fly deflector sheaves. Refer to Figure 4—80. Reeve the wire rope from the boom deflector sheave over the fly deflector sheaves. Install the wire rope guards, and secure with keeper pins.
41. Remove the wire rope guard from the fly tip head sheave. Reeve the wire rope from the fly deflector sheaves over the fly tip head sheave. Install the wire rope guard, and secure with keeper pin.

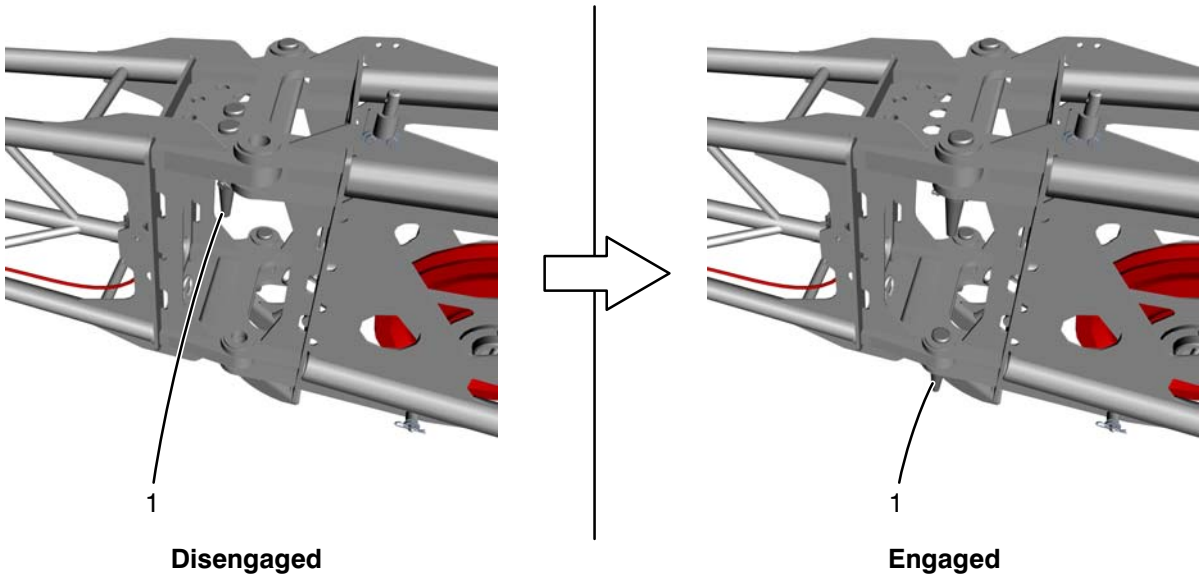
CAUTION

All wire rope guards must be in proper position during operation.

42. Using the appropriate tools, pull the ramp working pin. Refer to Figure 4—59. Rotate the pivoting ramp into the storage position until ramp working pin catches.
43. 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—63.
    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 center base plug from the fly center storage connector and connect it to the fly base head connector. Refer to Figure 4—64.
    e. Disconnect the fly tip base plug from the fly tip storage connector and connect it to the fly center head connector.
    f. Disconnect and remove the secondary ATB switch from the right side of the boom head. Install the secondary ATB switch on the fly head and connect the secondary ATB switch plug to the fly tip head connector.
    g. Install the ATB weight on the secondary 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.



1. Fly Tip Connecting Pins

Figure 4—79
Fly Connecting Pins — Engaged

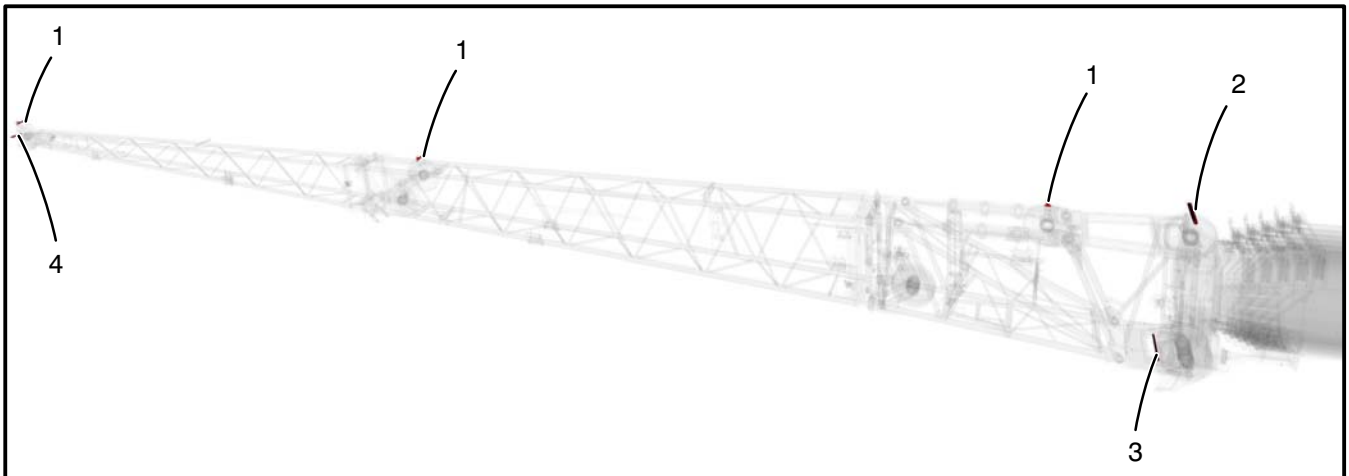
44. If the crane is equipped with the hydraulic fly base, connect the hydraulic hoses as follows:
    a. Remove the keeper pin and hydraulic hose bracket from the storage bracket. Refer to Figure 4—17.
    b. Route the boom offset extend and retract hydraulic hoses through the rollers on the boom. If required, remove the top rollers from the stored position and install them in the working position. Align the hydraulic hose bracket on the working bracket and secure with the keeper pin.
    c. Disconnect the hydraulic offset extend and retract hoses from the quick disconnect manifold and connect to the boom offset extend and retract hydraulic hoses. Ensure o-ring of each quick disconnect fitting is completely covered.
    d. Rotate the accumulator ball valve into the working position.
    e. Ensure the quick disconnect fittings are capped.

Note: If the crane is equipped with the hydraulic fly base, the offset fly must be put into the operating position before operating with the fly. Refer to "Changing The Fly Offset Angle" in this section of this Operator's Manual.

45. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
46. 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.



1. Fly Deflector Sheave Wire Rope Guards
2. Boom Deflector Sheave Wire Rope Guard
3. Boom Head Sheave Wire Rope Guard
4. Fly Tip Head Sheave Wire Rope Guard

Figure 4—80
10—32.5—55Ft (*3.05—9.91—16.76m*) Fly Wire Rope Guards

Storage Of The10—32.5—55Ft (*3.05—9.91—16.76m*) Fly From The Erected Position

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 or intermediate extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

WARNING

Store the offset fly with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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 personal injury and/or the crane tipping.

5. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—62 and Figure 4—93. If required, change the fly offset to the 0° or locked 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.

CAUTION

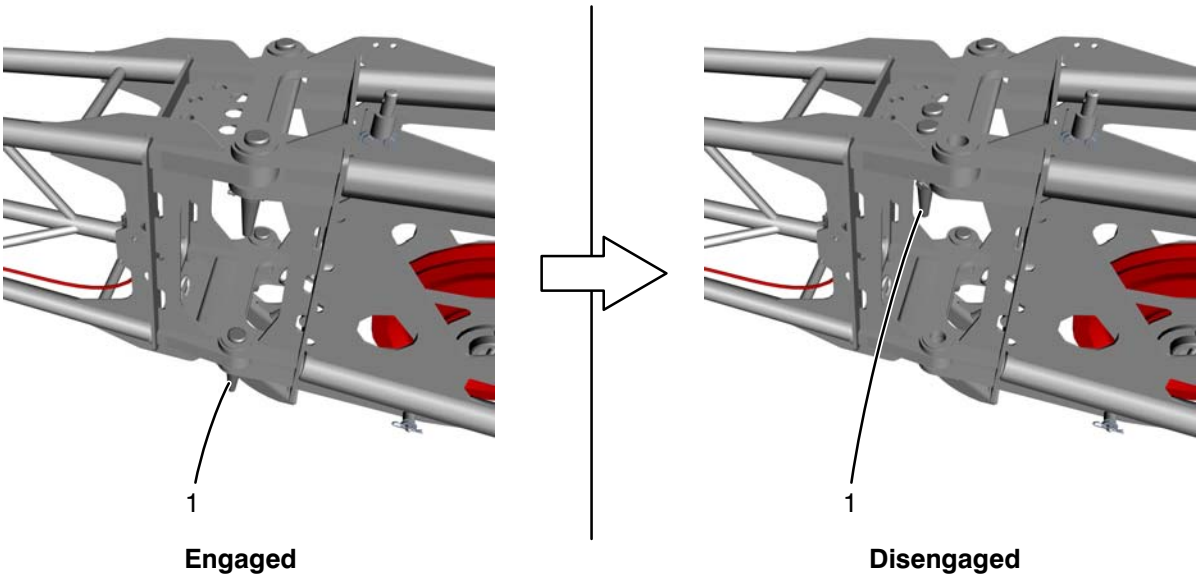
Fully retract the boom before swinging the fly. Failure to do so could cause fly damage.

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 crane is equipped with the hydraulic fly base, disconnect the hydraulic hoses as follows:
   a. Rotate the accumulator ball valve into the stored position. Refer to Figure 4—18.
   b. Disconnect the hydraulic offset extend and retract hoses from the boom offset extend and retract hydraulic hoses and connect to the quick disconnect manifold. Ensure o-ring of each quick disconnect fitting is completely covered.
   c. Remove the keeper pin and hydraulic hose bracket from the working bracket.
   d. Remove the boom offset extend and retract hydraulic hoses from the rollers on the boom. If required, remove the top rollers from the working position and install them in the stored position. Align the hydraulic hose bracket on the storage bracket and secure with the keeper pin.
   e. Ensure the boom extend and retract hydraulic hoses are capped.
9. Properly disconnect the anti-two block (ATB) system as follows:
   a. Remove the ATB weight from the secondary ATB switch cable. Refer to Figure 4—64.
   b. Disconnect the secondary ATB switch plug from the fly tip head connector and remove the secondary ATB switch from the fly head. Install and connect the secondary ATB switch on the right side of the boom head.
   c. Disconnect the fly tip base plug from the fly center head connector and connect it to the fly tip storage connector.
   d. Disconnect the fly center base plug from the fly base head connector and connect it to the fly center 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. Refer to Figure 4—66.
   f. Install the ATB weight on the boom head ATB switch cable.
   g. Remove the lockout clip from the boom head ATB switch cable.



1. Fly Tip Connecting Pins

Figure 4—81
Fly Connecting Pins — Disengaged

10. Using the appropriate tools, pull the ramp storage pin. Refer to Figure 4—69. Rotate the pivoting ramp into the working position until ramp working pin catches.
11. Remove the wire rope guard from the fly tip head sheave. Refer to Figure 4—80. Remove wire rope from the fly tip head sheave and lay it aside to prevent damage to it during fly storage. Install the wire rope guard, and secure with keeper pin.
12. Remove the wire rope guards from the fly deflector sheaves. Remove wire rope from the fly deflector sheaves and lay it aside to prevent damage to it during fly storage. Install the wire rope guards, and secure with keeper pins.
13. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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.
14. Properly store wire rope which was used on fly, as required.
15. If the crane is equipped with the hydraulic fly base, properly fill with oil and bleed air from the hydraulic cylinders. Refer to the Service Manual for proper procedure.

⚠ WARNING

Ensure the hydraulic cylinders have been properly filled with oil and bled of air before storing the hydraulic fly, if equipped. The fly may drop when erecting if not properly filled with oil before storing the fly. Refer to the Service Manual for proper procedure.

16. Attach a hand line to the head of the fly tip.

⚠ WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

17. Remove the fly tip connecting pins from the fly tip lugs and install in the storage location at the rear of the fly tip. Refer to Figure 4—81. (Install the pins with the head on top and keeper on the bottom.) Secure connecting pins with keeper pins.

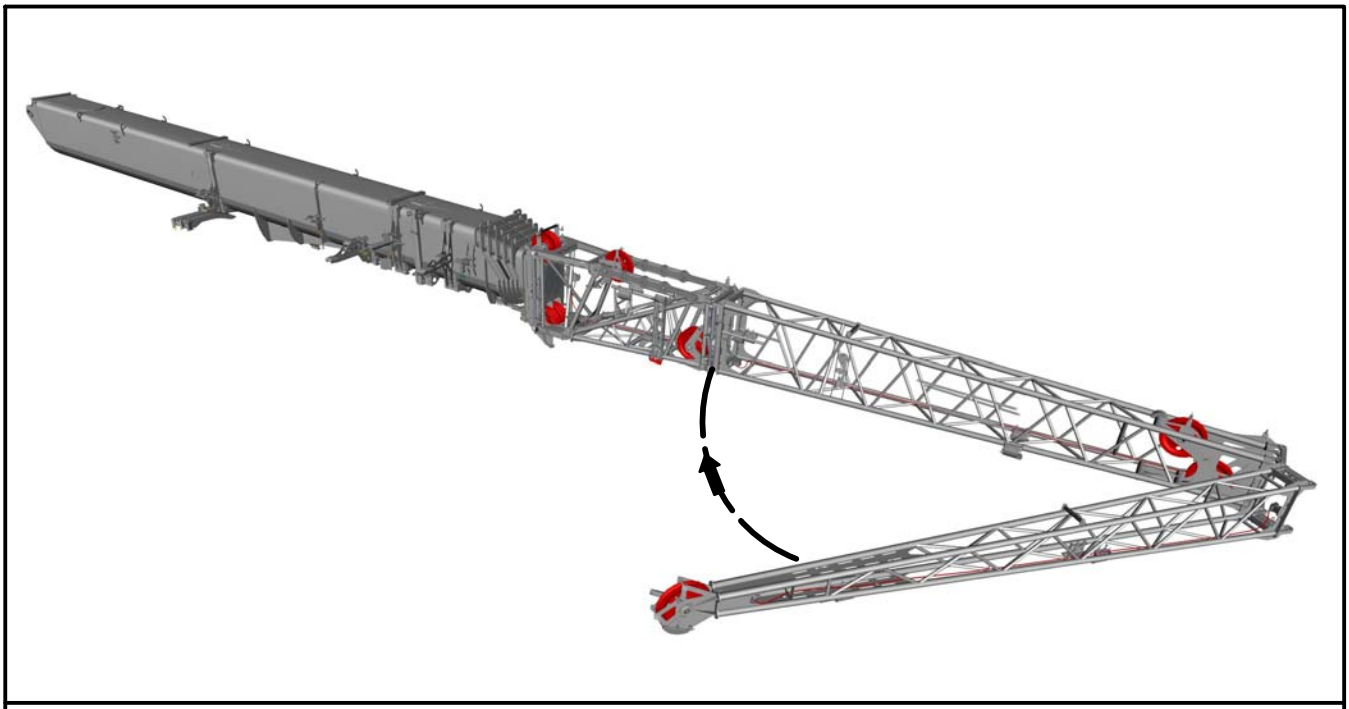
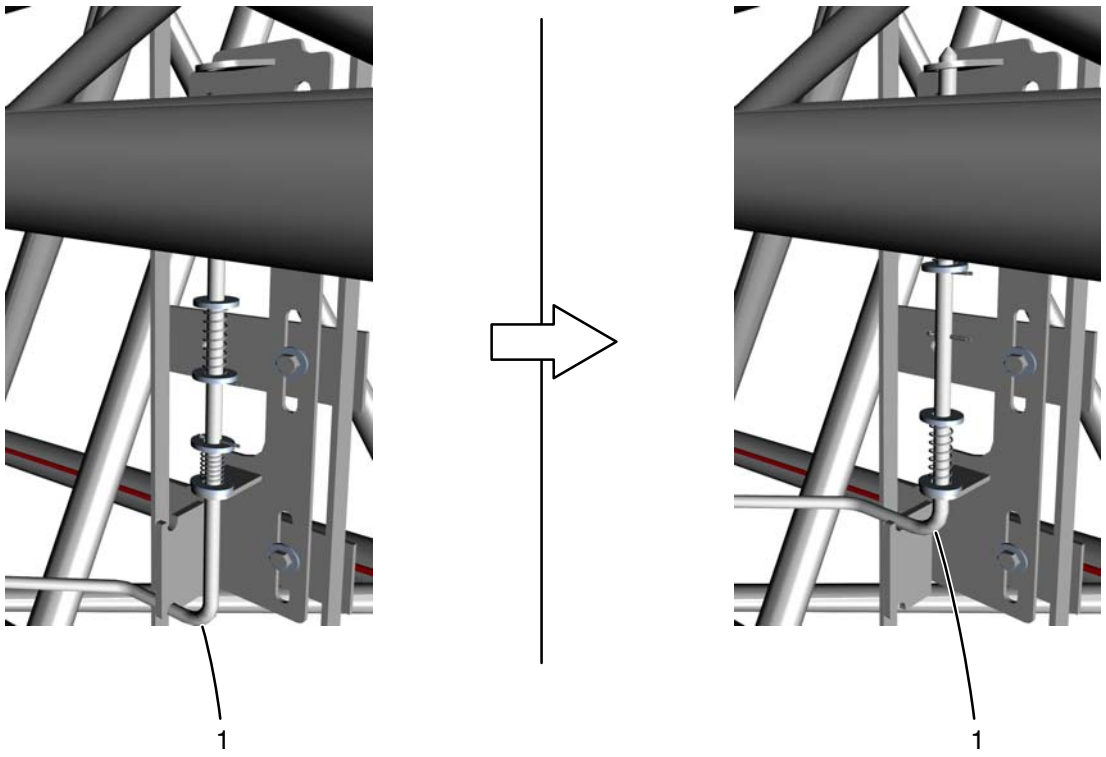


Figure 4—82
Swinging The Fly

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.

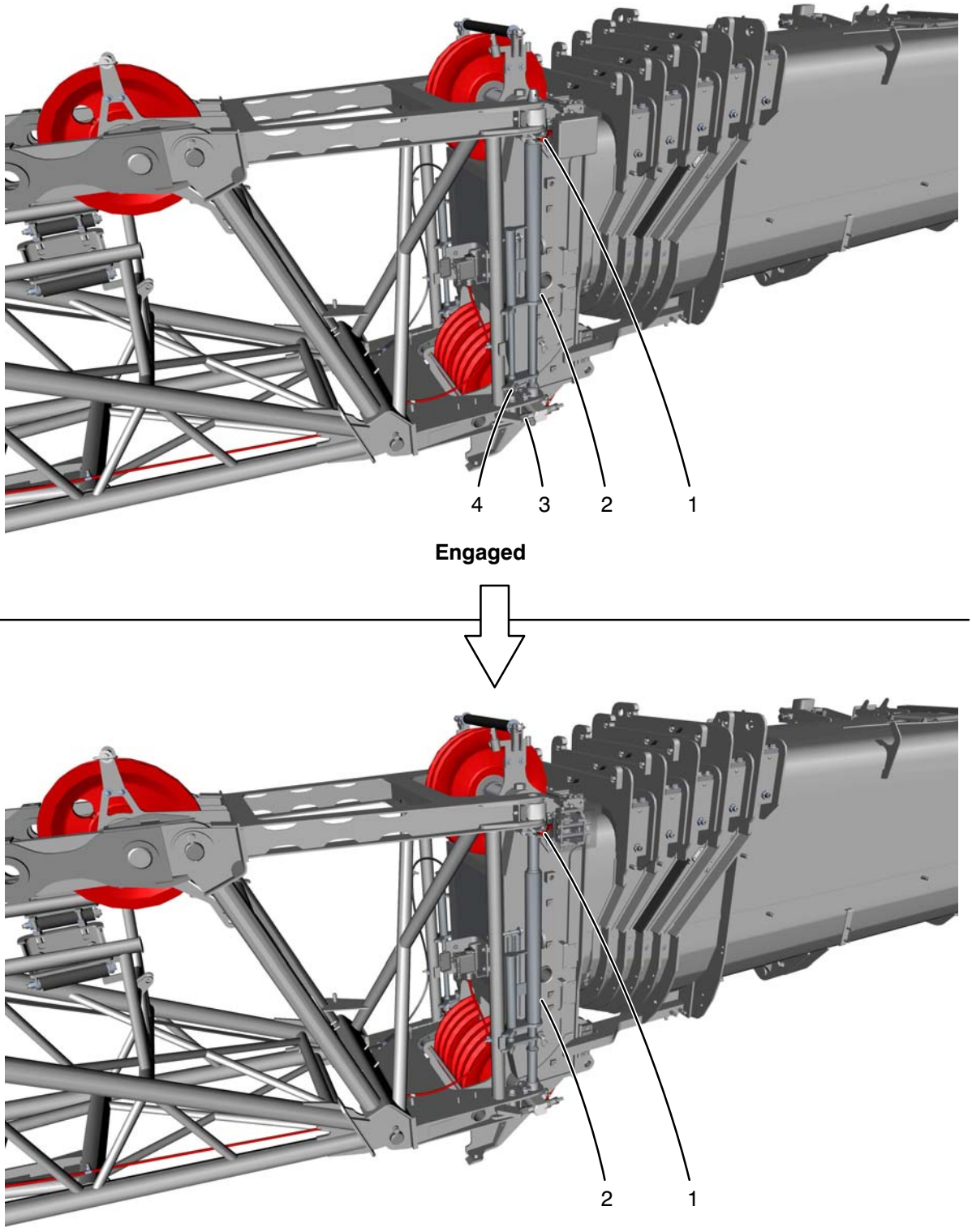
18. Ensure all fly retainer pins and the tip hitch pin are disengaged prior to swinging the fly. If required, use the appropriate tools to pull, rotate, and disengage the fly retainer pins. Refer to Figure 4—67 and Figure 4—77.
19. Use the hand line attached to the 22.5 ft (*6.86m*) fly tip to begin swinging the fly around the head of the fly center section until the fly tip aligns with the fly tip hitch pin. Refer to Figure 4—82.
20. Boom down fully.



1. Fly Tip Hitch Pin

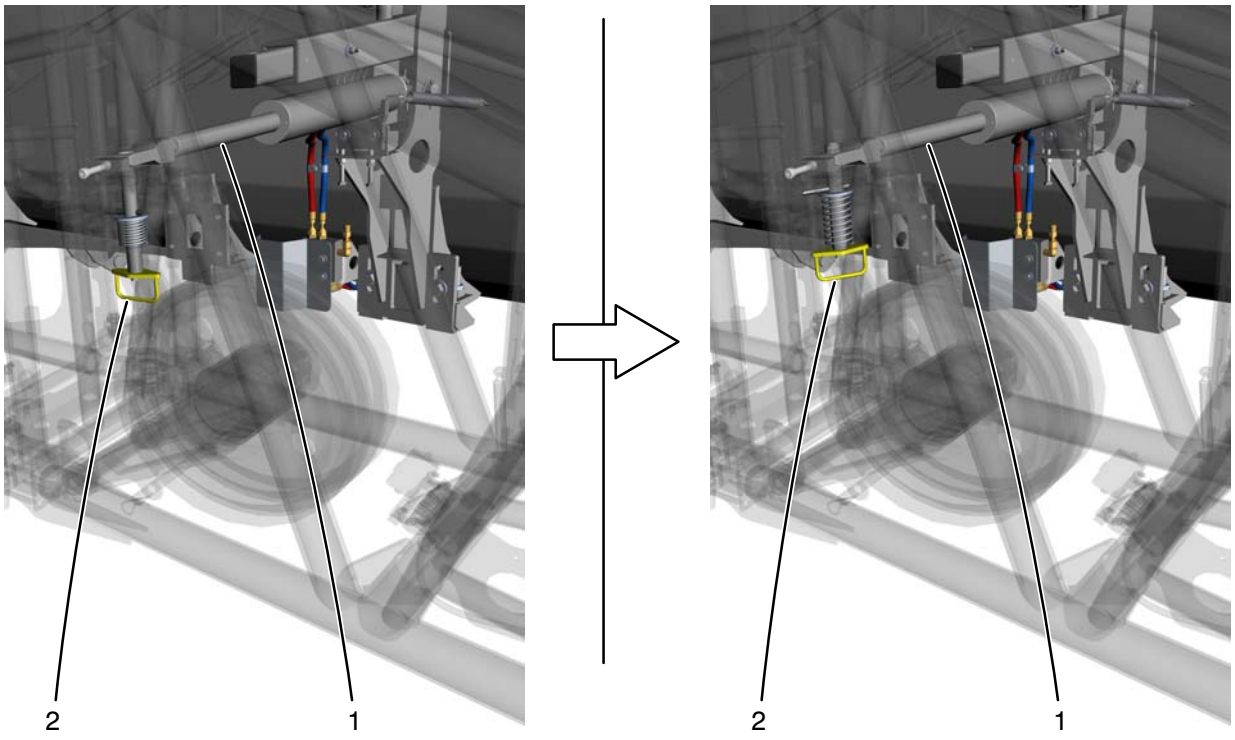
Figure 4—83
Fly Tip Hitch Pin — Engaged

21. Pull, rotate, and engage the fly tip hitch pin. Refer to Figure 4—83.
22. Remove the hand line from the head of the fly tip and attach it to the tip of the fly center.



1. Fly Catch
2. Left Side Boom Head Pin
3. Pusher Block
4. Left Side Fly Base Speed Screw

Figure 4–84
Left Side Fly Boom Head Pin – Disengaged



1. Fly Storage Cylinder
2. Fly Storage Cylinder Connecting Pin

Figure 4—85
Fly Storage Cylinder — Engaged

23. Remove the fly storage cylinder keeper and pin securing the fly storage cylinder to the cylinder bracket. Refer to Figure 4—32. Store the fly storage cylinder pin in the fly storage cylinder bracket and secure with keeper.
24. Fully extend the fly storage cylinder.
25. Using the appropriate tools, rotate the pusher block, as required, to push and align the bottom left fly lug to the bottom boom head machinery cross shaft. Refer to Figure 4—84.
26. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully retract the bottom left side boom head pin.
27. Back off the pusher block until a clearance of at least 1/2 in (*1.3cm*) from the left fly lug is obtained.
28. Using the appropriate tools, rotate the left side fly base speed screw through the left side access tube to fully retract the top left side boom head pin.
29. Boom up to a boom angle of 0°.
30. Use the appropriate tools to pull and rotate the fly storage cylinder connecting pin into detent position. Refer to Figure 4—74.

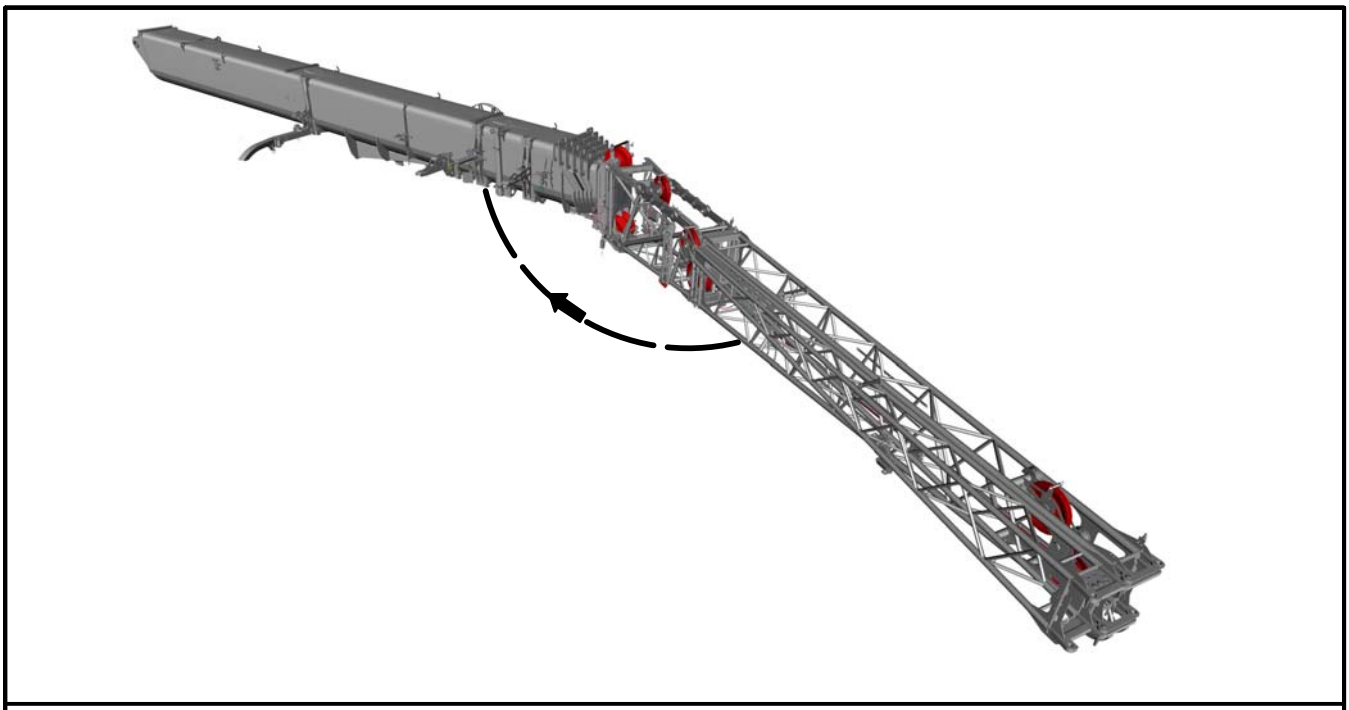
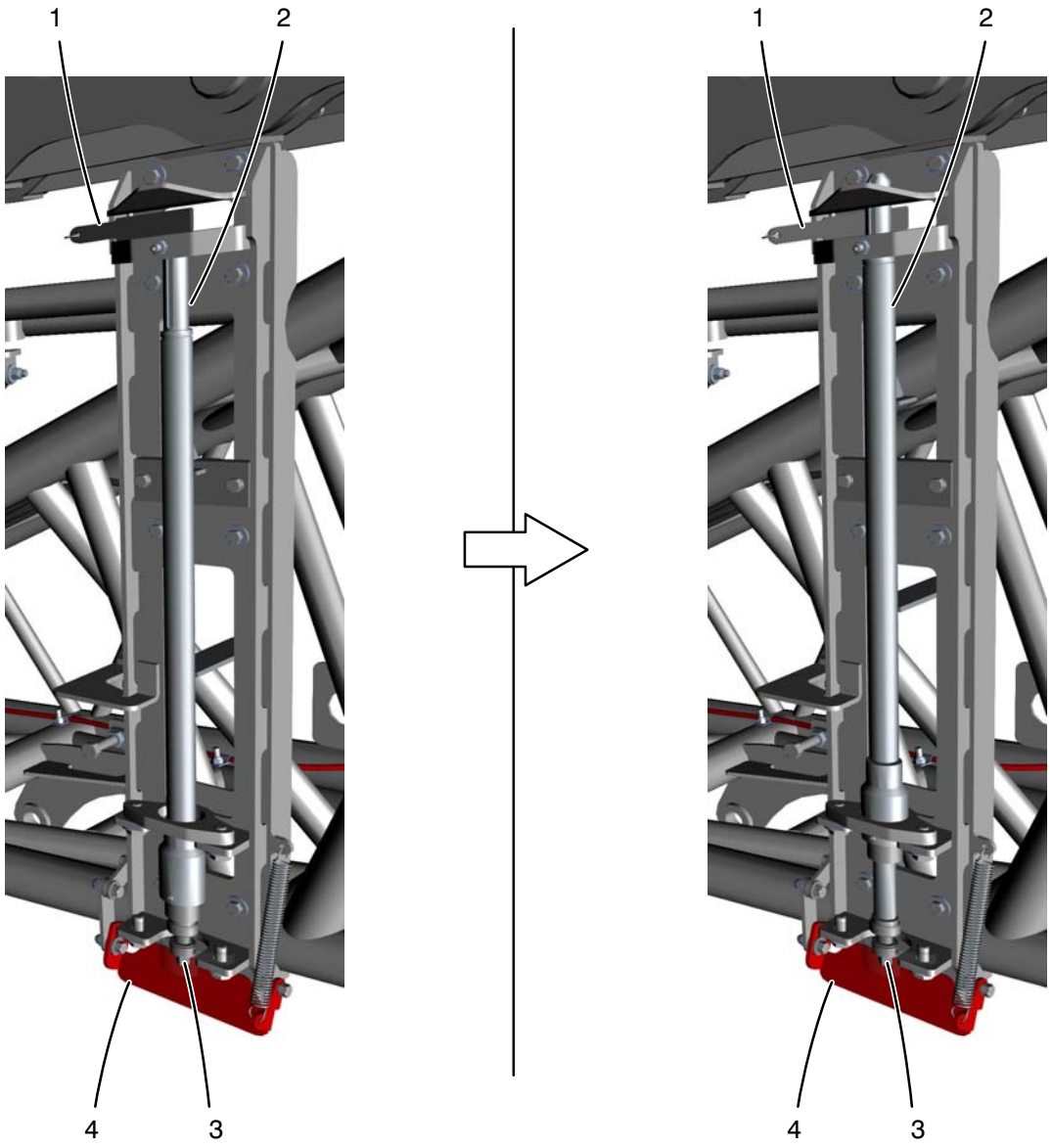


Figure 4—86
Swinging The Fly

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.

31. While holding the hand line begin swinging the fly around to the right side of the boom. Swinging the fly will disengaged the fly catch. Refer to Figure 4—86.
32. 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—85.
33. Retract the fly storage cylinder, as required, to pivot the fly onto the pivoting ramp. Refer to Figure 4—67.
34. Boom down fully.

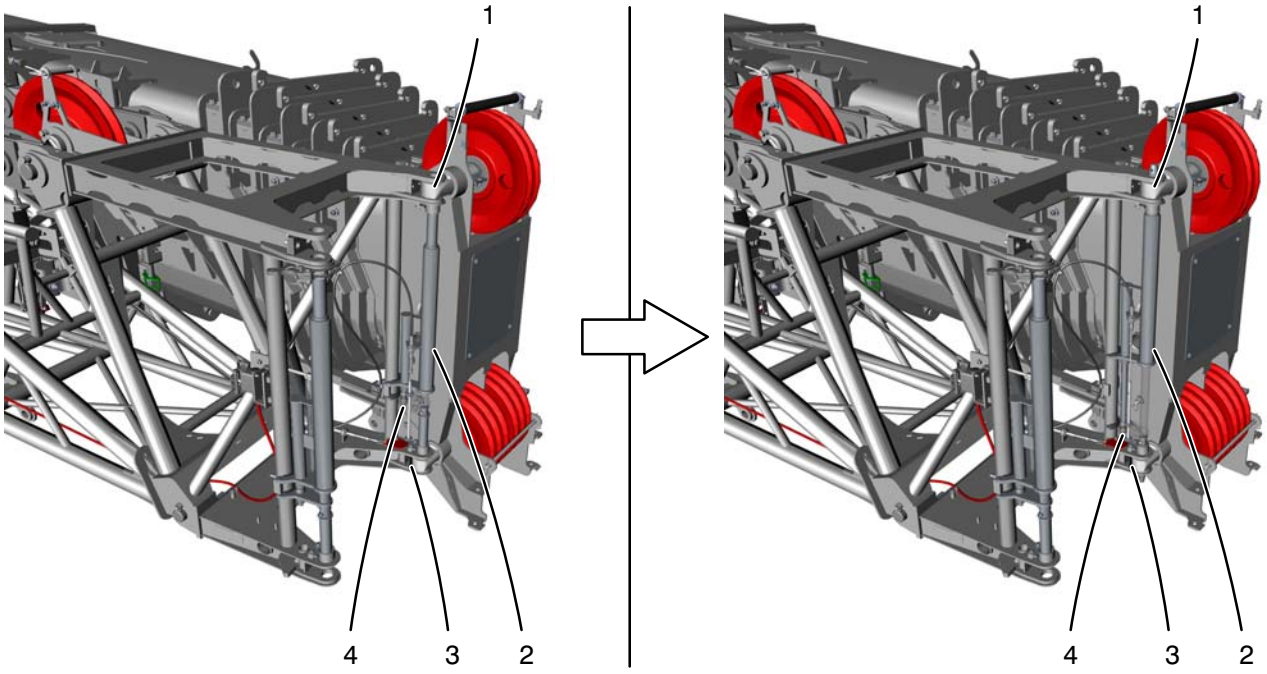


1. Pivot Pin Block Plate
2. Secondary Pivot Pin
3. Pivot Pin Speed Screw
4. Pivot Pin Access Cover

Figure 4—87
Secondary Pivot Pin — Engaged

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—62.

35. Using the appropriate tools, rotate the pivot pin speed screw to fully extend the secondary pivot pin. Refer to Figure 4—87.



Disengaged **Engaged**

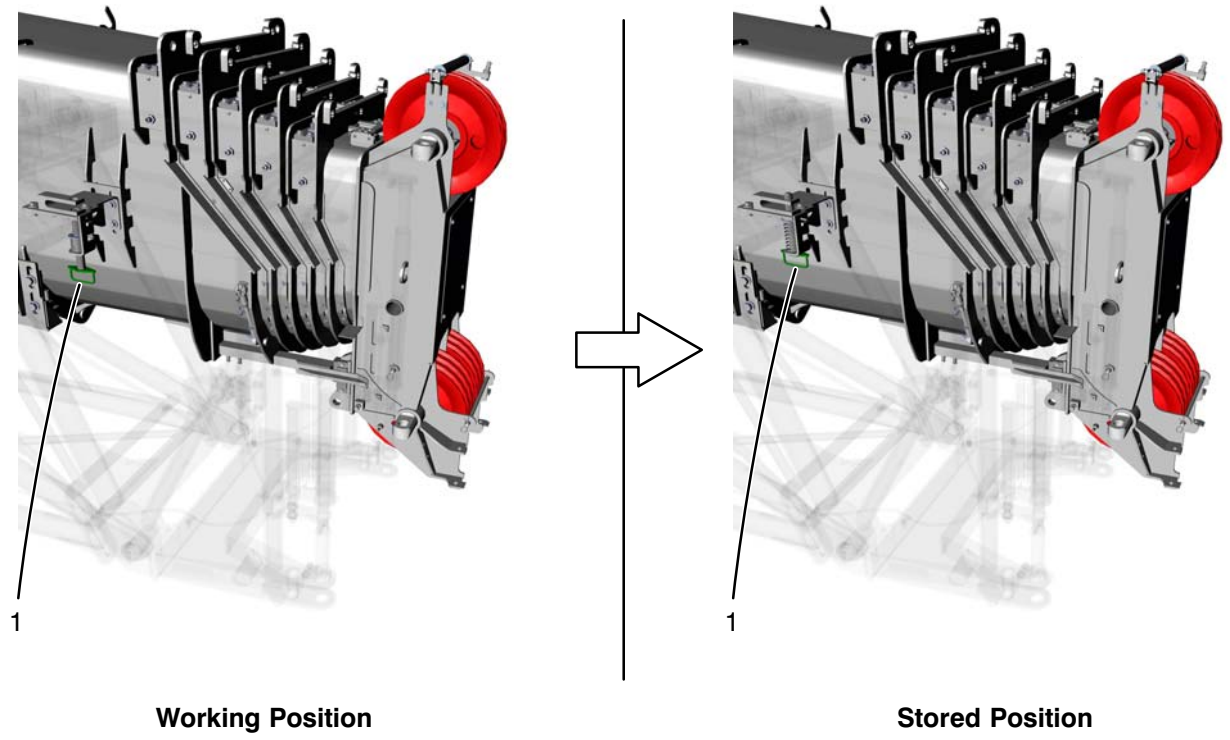
1. Boom Head Machinery Cross Shafts
2. Right Side Boom Head Pin
3. Boom Head Pin Block Plate
4. Right Side Fly Base Speed Screw

Figure 4—88
Right Side Fly Boom Head Pin — Engaged

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 fly base 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.

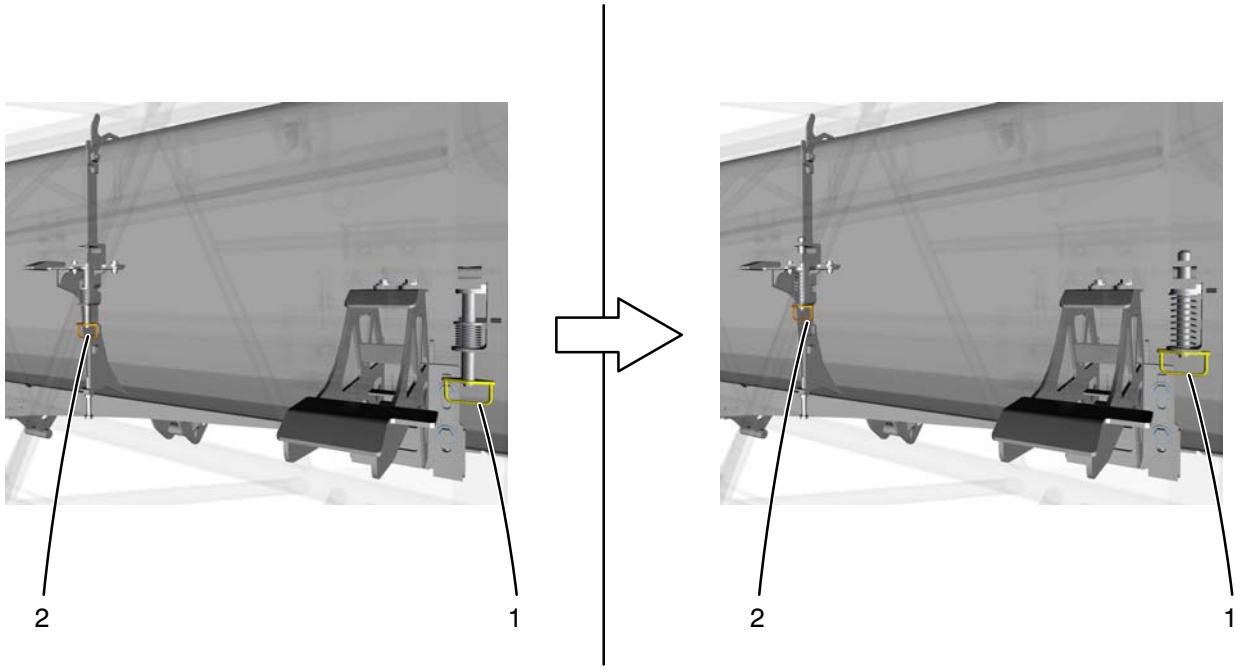
36. Using the appropriate tools, rotate the right side fly base speed screw through the right side access tube to retract both right side boom head pins and fully disengage from the right side of the boom head machinery cross shafts. Refer to Figure 4—88.
37. Boom up to 10°, to ease accessibility.
38. Actuate the fly storage cylinder to pull the fly onto the pivoting ramp and align the fly with the fly base retainer pin.



1. Fly Base Retainer Pin

Figure 4—89
Fly Base Retainer Pin — Stored Position

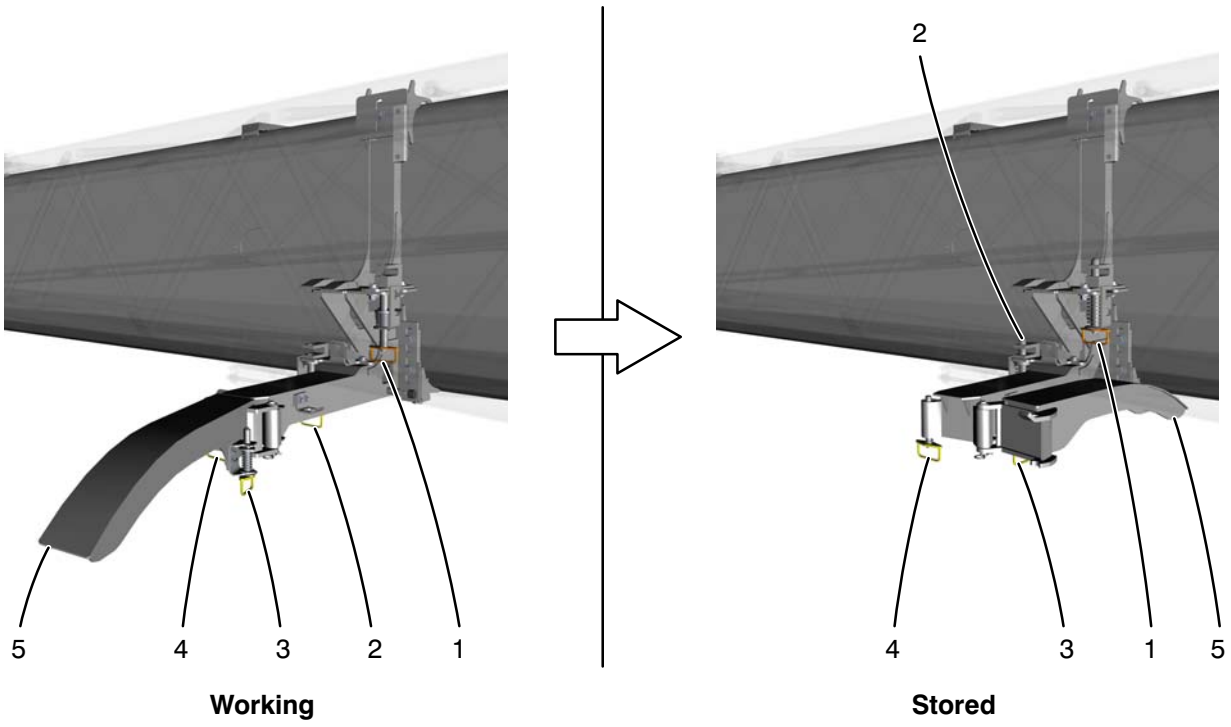
39. Using the appropriate tools, pull, rotate, and engage the fly base retainer pin. Refer to Figure 4—89.



1. Fly Center Front Retainer Pin
2. Fly Tip Front Retainer Pin

Figure 4—90
Fly Center And Tip Front Retainer Pins — Engaged

40. Using the appropriate tools, pull, rotate, and engage the fly center and front retainer pins. Refer to Figure 4—90.

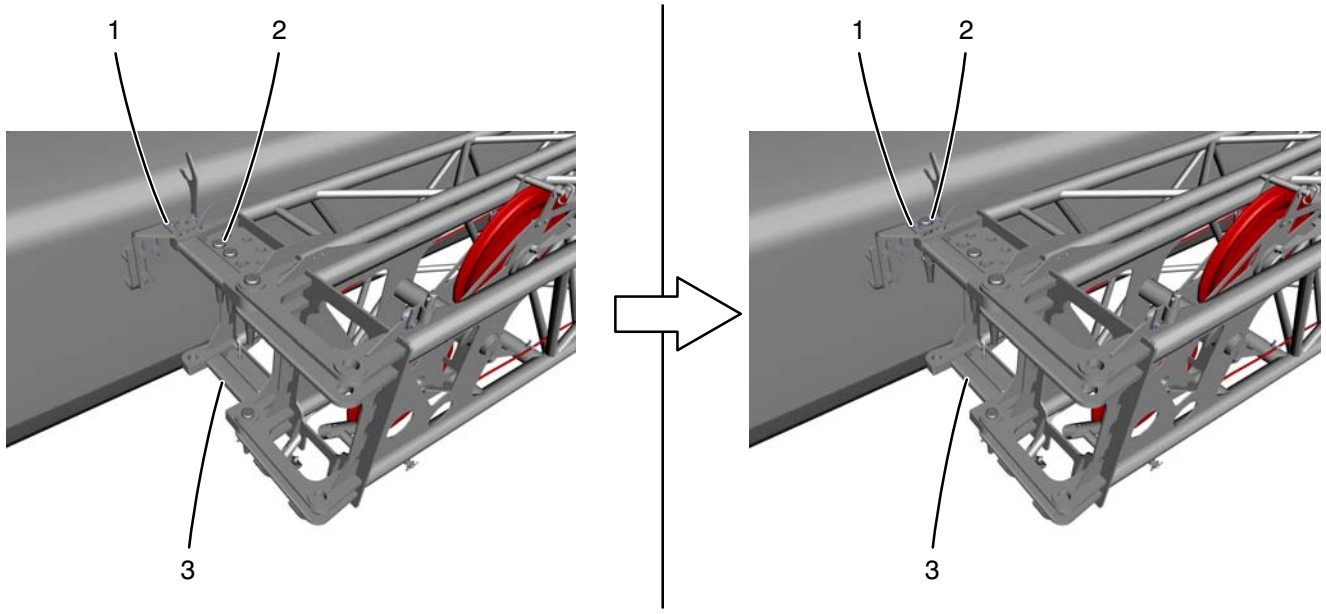


1. Fly Tip Rear Retainer Pin
2. Fly Center Rear Retainer Pin
3. Ramp Storage Pin
4. Ramp Working Pin
5. Pivoting Ramp

Figure 4—91
Pivoting Ramp — Stored

41. Using the appropriate tools, pull, rotate, and engage the fly center and tip front retainer pins. Refer to Figure 4—91.

42. Using the appropriate tools, pull the ramp working pin. Rotate the pivoting ramp into the storage position until ramp working pin catches.



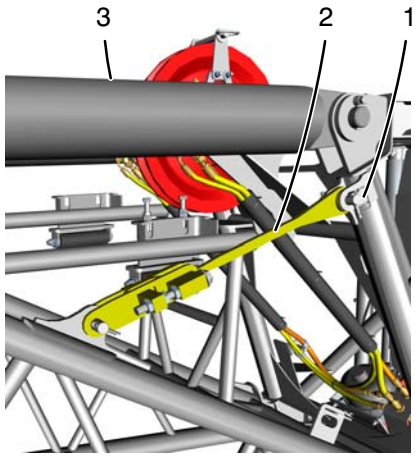
1. Fly Tip Storage Bracket
2. Fly Tip Connecting Pin
3. Fly Tip Section

Figure 4—92
Fly Tip Storage Bracket — Engaged

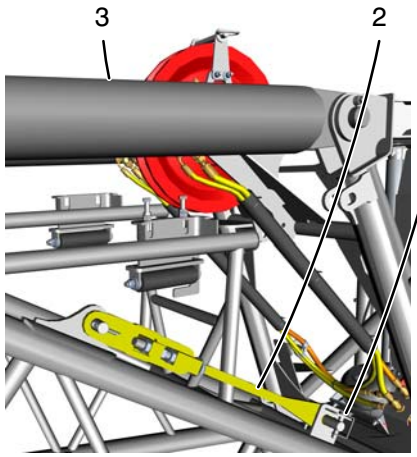
WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

43. Remove the fly tip connecting pin from the storage location at the rear of the fly tip. Refer to Figure 4—92. Install the connecting pin in the fly tip storage bracket. (Install the pin with the head on top and keeper on the bottom.) Secure connecting pin with keeper pins.
44. Boom down fully.
45. Remove the hand line from the tip of the fly center.
46. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
47. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4—3. 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.
48. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
49. Check the Crane Rating Manual, in the operator's cab, for lifting capacities with the fly in the stored position before continuing operations.



Locked Position — 0° Offset



Operating Position — 0°, 15°, 30°, 45° Offsets

1. Catch Arm Pin And Keeper Pin
2. Catch Arm
3. Hydraulic Fly Base

Figure 4—93
Hydraulic Fly Catch Arm

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, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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.

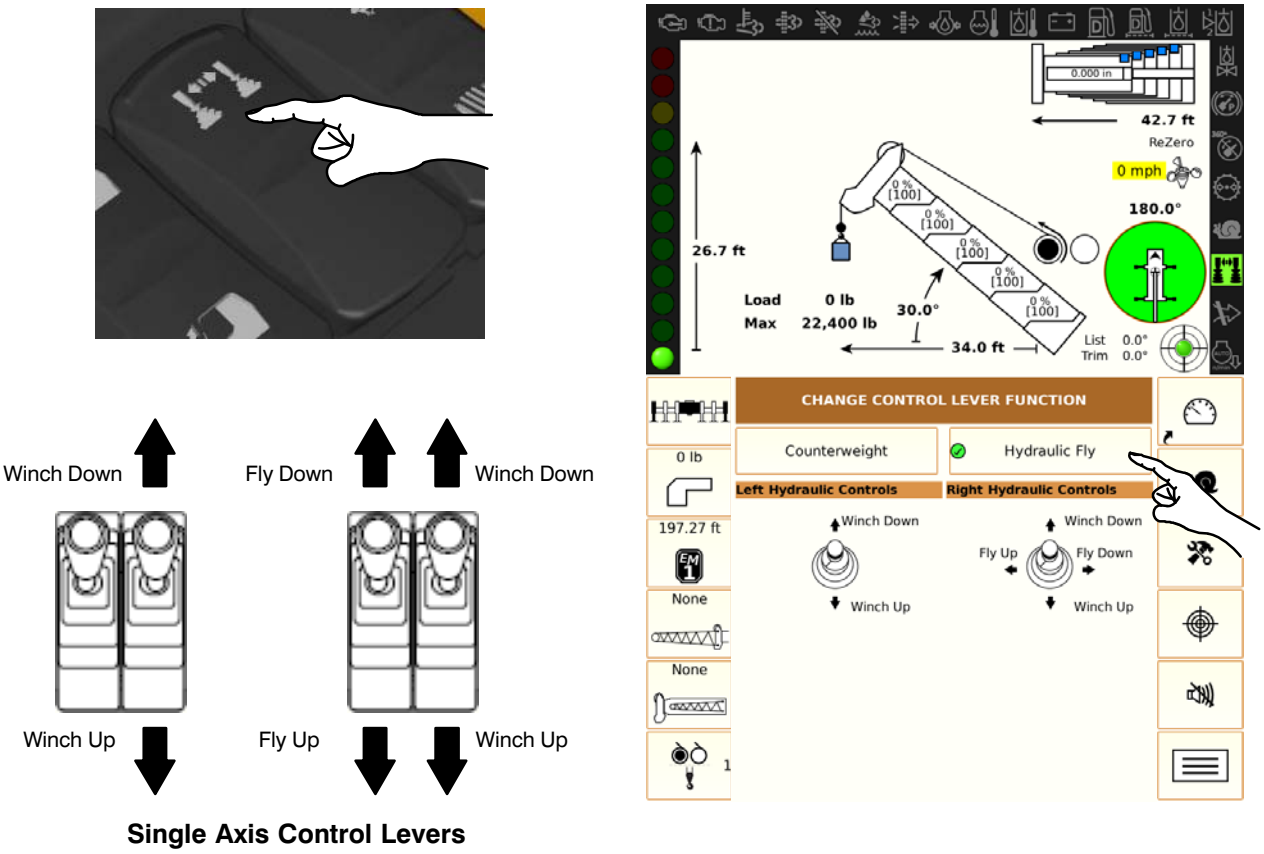
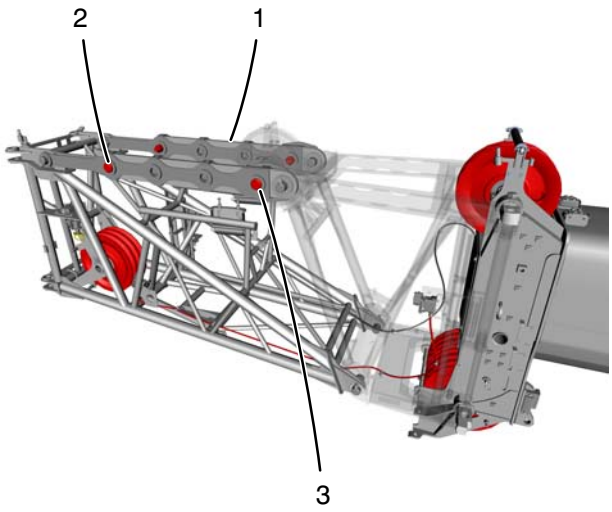
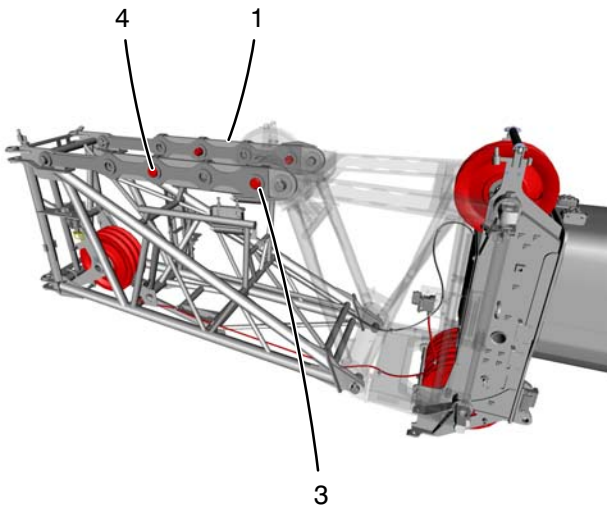


Figure 4—94
Change Control Lever Function

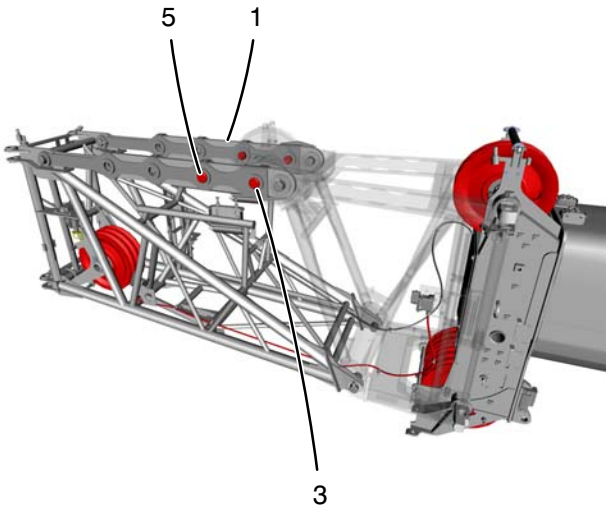
7. If the the crane is equipped with the hydraulic fly base, change the offset fly as follows:
   a. Press the Control Lever Mode Switch, then press the Hydraulic Fly Button on the Change Control Lever Function Screen of the Pulse Crane Control System Display to activate the left and right control levers to be used as hydraulic fly controls. Once the Hydraulic Fly Mode is selected, the Change Control Lever Function Screen will display operation and status of hydraulic fly. Refer to Figure 4—94.
   b. For installing, removing, erecting, or storing the fly, or for traveling with the fly erected, put the offset fly in the locked position as follows:
      1. Carefully raise the hydraulic offset fly to 0°. Refer to Figure 4—93.
      2. Remove the keeper pin and catch arm pin.
      3. Rotate the catch arm up into the locked position.
      4. Secure the catch arm to the offset fly base section with the catch arm pin and keeper pin.
      5. Press the Hydraulic Fly Button on the Change Control Lever Function Screen of the Pulse Crane Control System Display then press the Control Lever Mode Switch to deactivate the hydraulic fly controls. Refer to Figure 4—94.
   c. For fly operation, put the offset fly in the operating position as follows:
      1. Carefully raise the hydraulic offset fly slightly to relieve pressure from the catch arm pin. Refer to Figure 4—93.
      2. Remove the keeper pin and catch arm pin.
      3. Rotate the catch arm down into the operating position.
      4. Secure the catch arm to the offset fly base section with the catch arm pin and keeper pin.



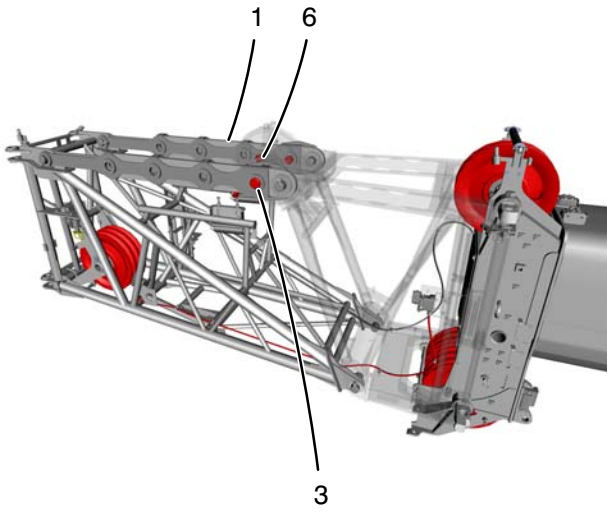
0° Offset



15° Offset



30° Offset



45° Offset

1. Fly Adaptor Lugs (Both Sides)
2. Offset Connecting Pins (0° Position) (Both Sides)
3. Stationary Connecting Pins (Both Sides)
4. Offset Connecting Pins (15° Position) (Both Sides)
5. Offset Connecting Pins (30° Position) (Both Sides)
6. Offset Connecting Pins (45° Position) (Both Sides)

Figure 4–95
Changing The Fly Offset Angle

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.

8. If the the crane is equipped with the manual fly base, change the offset fly as follows:
   a. Remove the offset connecting pins from the fly adaptor lugs, as required.
   b. 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 4–95.
   c. Ensure that the offset connecting pins are properly located on both sides of the fly and that the keeper pins are securely installed.
9. Slowly boom up to allow the fly to adjust itself to the desired offset angle.
10. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
11. Check the Crane Rating Manual, in the operator's cab, for lifting capacities with the fly in the stored position before continuing operations.

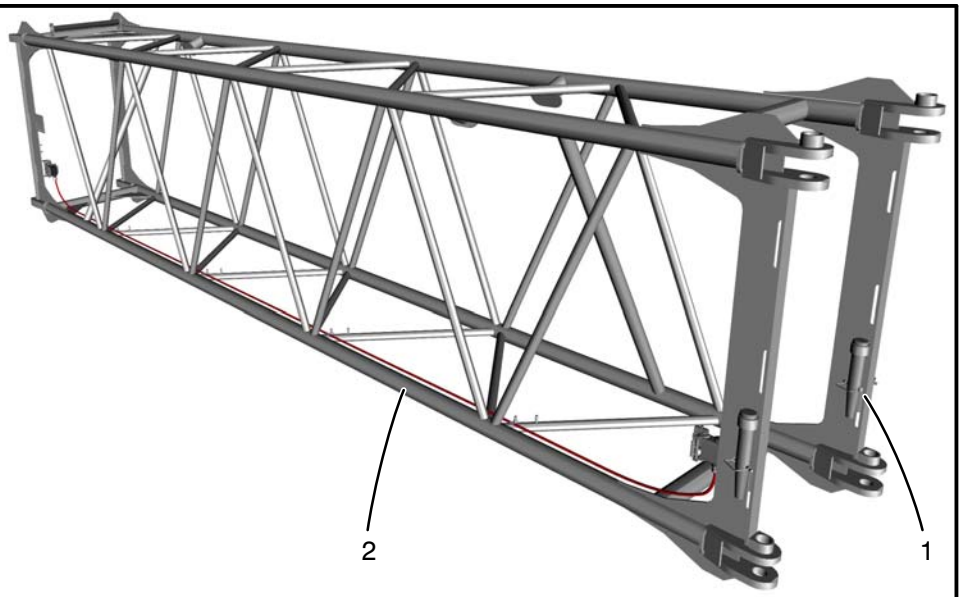
WARNING

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.

CAUTION

Do not erect the fly extension with the offset fly in the stored position on the boom

Damage may occur.



1. Fly Connecting Pins In Storage Locations (Both Sides)
2. 18 Ft (*5.49m*) Fly Extension

Figure 4—96
Fly Extension

Fly Extensions

If the crane is equipped with an offset lattice fly, extensions are available to extend the overall fly length from 55 ft (*16.76m*) to 73 ft (*22.25m*), 91 ft (*27.74m*), or 109 ft (*33.22m*). These extensions pin between the boom head and 55 ft (*16.76m*) fly. All fly sections must be removed from the crane before adding or removing the fly extension(s). Refer to Figure 4—96.

CAUTION

Do not erect the fly extension with any offset fly in the stored position on the boom. Boom and/or fly damage may occur.

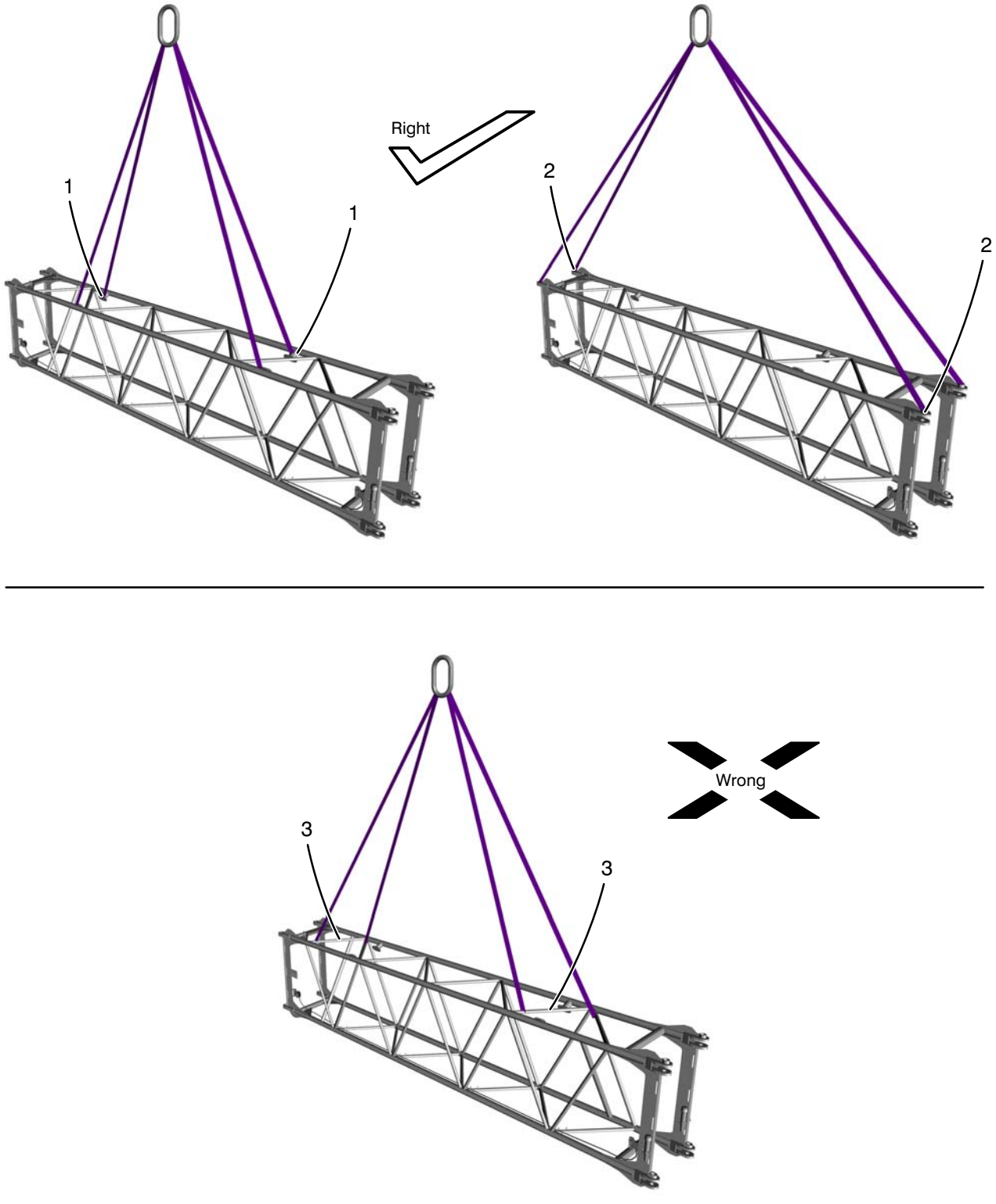
DANGER

To avoid serious injury, carefully read and understand all safety instructions in this Operator's Manual. Failure to follow these instructions could result in serious personal injury or death.

Safety Instructions

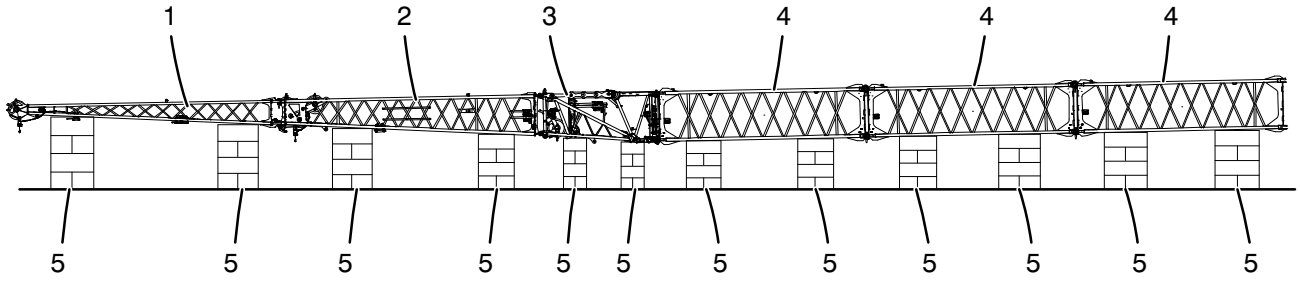
The following points must be observed while performing any fly assembly or disassembly:

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 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 be used as the lifting points. However, it is permissible to attach nylon straps around connecting lugs, or 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.



1. Lifting Lugs
2. Connecting Lugs
3. Do Not Attach Slings To Lattices, They Will Bend.

Figure 4–97
Handling The Fly Extension

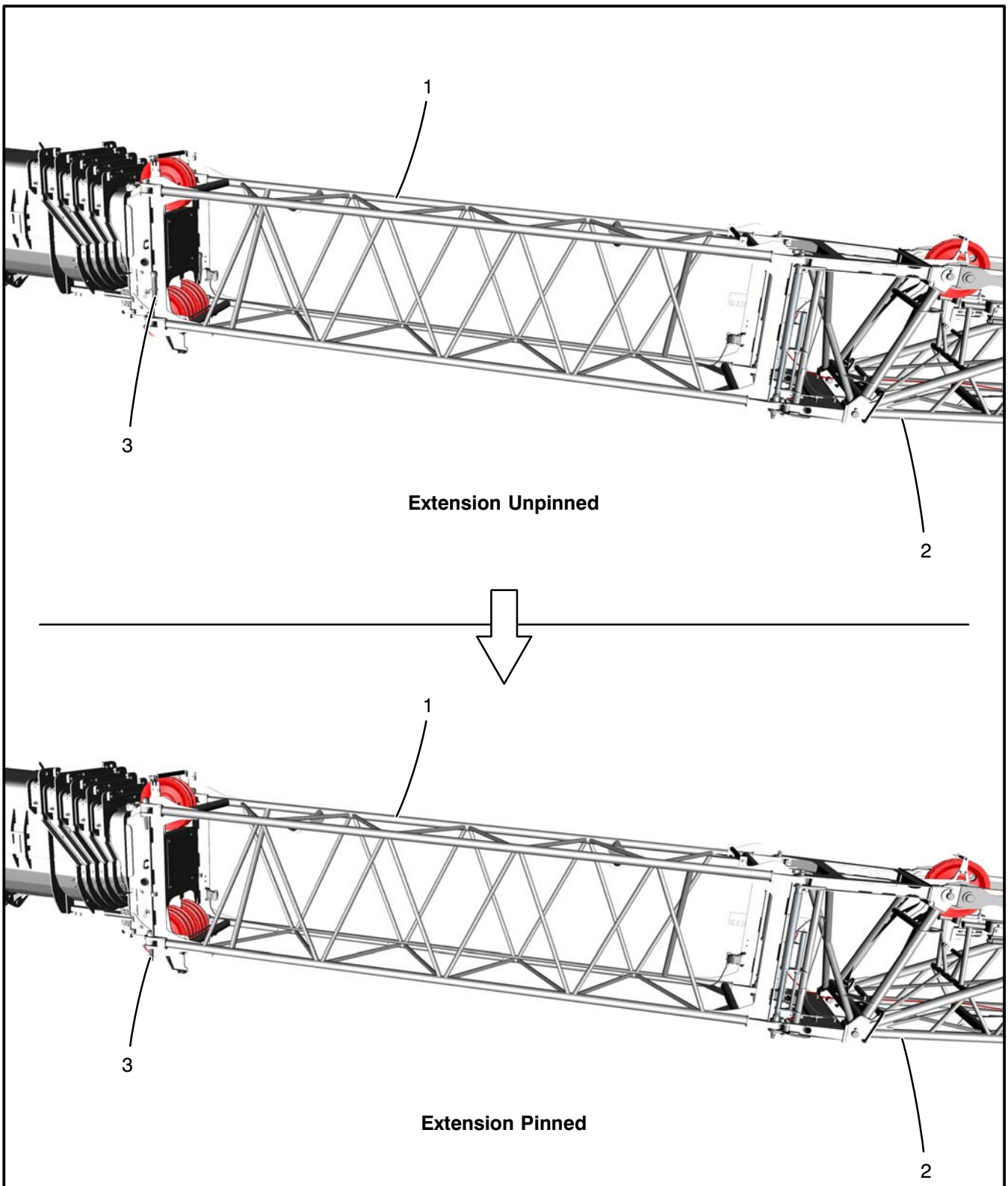


1. Fly Tip
2. Fly Center
3. Fly Base
4. Fly Extensions
5. Blocking

Figure 4–98
Fly Assembly On Blocking

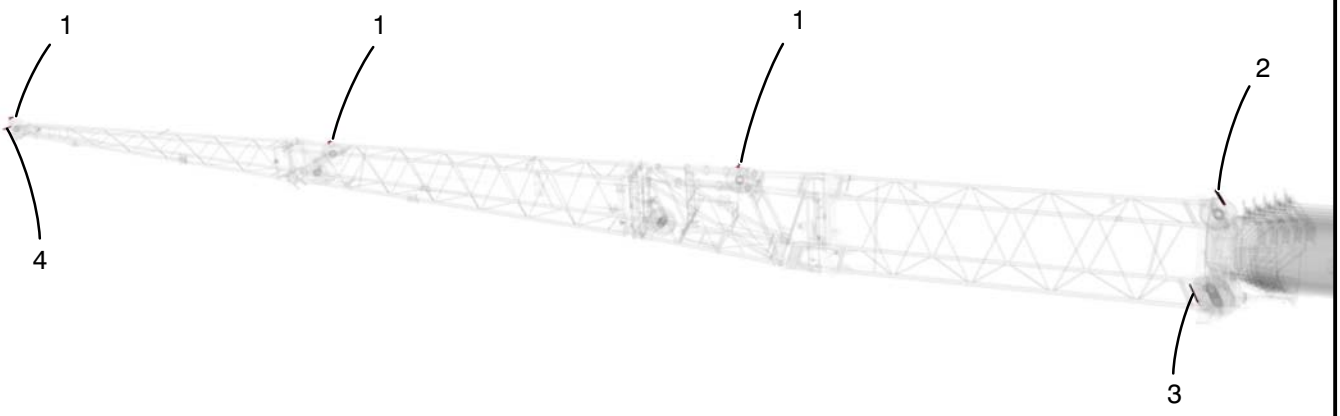
18 Ft (*5.49m*) Fly Extension

The 18 ft (*5.49m*) fly extension must be pinned between the boom head and the 10–32.5–55 ft (*3.05–9.91–16.76m*) offset fly to obtain a 73 ft (*22.25m*) fly. The 18 ft (*5.49m*) fly extension weighs approximately 938 lb (*426kg*). Refer and Figure 4–98.



1. 18 Ft (*5.49m*) Fly Extension
2. 10–32.5–55 Ft (*3.05–9.91–16.76m*) Fly
3. Connecting Pins

Figure 4–99
73 Ft (22.56) Offset Lattice Fly



1. Fly Deflector Sheave Wire Rope Guards
2. Boom Deflector Sheave Wire Rope Guard
3. Boom Head Sheave Wire Rope Guard
4. Fly tip Head Sheave Wire Rope Guard

Figure 4—100
73 Ft (*22.56m*) Wire Rope Guards

FLY ARRANGEMENTS								
Fly		Components Required				Figure #	Detail
		10' Fly Base	22.5' Fly Center	22.5' Fly Tip	18' Fly Ext		
10—73' Fly	10'	●				Figure 4—107	A
	32.5'	●	●			Figure 4—107	B
	55'	●	●	●		Figure 4—107	C
	73'	●	●	●	●	Figure 4—107	D
	91'	●	●	●	● ●	Figure 4—107	E
	109'	●	●	●	● ● ●	Figure 4—107	F

Adding Fly Extension(s)

All fly sections must be removed from the crane before adding the fly extension. Refer to "10 Ft (*3.05m*) Fly Removal", "10—32.5 Ft (*3.05—9.91m*) Fly Removal", or "10—32.5—55 Ft (*3.05—9.91—16.76m*) Fly Removal" in this section of this Operator's Manual, as required.

Note: Before installing the 18 ft (*5.49m*) fly extension, change the boom mode to EM1 or EM2.

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 the 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. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

WARNING

Install the fly extension with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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 personal injury and/or the crane tipping.

5. Ensure the 18 ft (*5.49m*) extension, the 10 ft (*3.05m*) fly base, the 22.5 ft (*6.86m*) center section, and 22.5 ft (*6.86m*) fly tip section are properly pinned together with connecting pins.
6. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—95 and Figure 4—93. If required, change the fly offset to the 0° or locked position. Refer to "Changing The Fly Offset" in this section of this Operator's Manual for detailed instructions.
7. Position the fly assembly on secure blocking. Refer to Figure 4—98. The 73 ft (*22.25m*) fly assembly with extension weighs approximately 4,634 lb (*2 102kg*).
8. Raise and extend the boom to allow enough rope to reeve the fly. Lower the hook block or 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—3. 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—4. Remove wire rope from the boom deflector sheave and lay it aside to prevent damage to it during fly installation. Install the wire rope guard and secure with keeper pin.
12. Carefully extend the boom head to the fly assembly. Slowly raise or lower the boom, as required, to engage the fly extension lugs with the head machinery cross shafts. Refer to Figure 4—99.

WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

13. Remove the fly extension connecting pins from the storage locations on the rear of the 18 ft (*5.49m*) 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.) Secure connecting pins with keeper pins.
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.) Secure connecting pins with keeper pins.

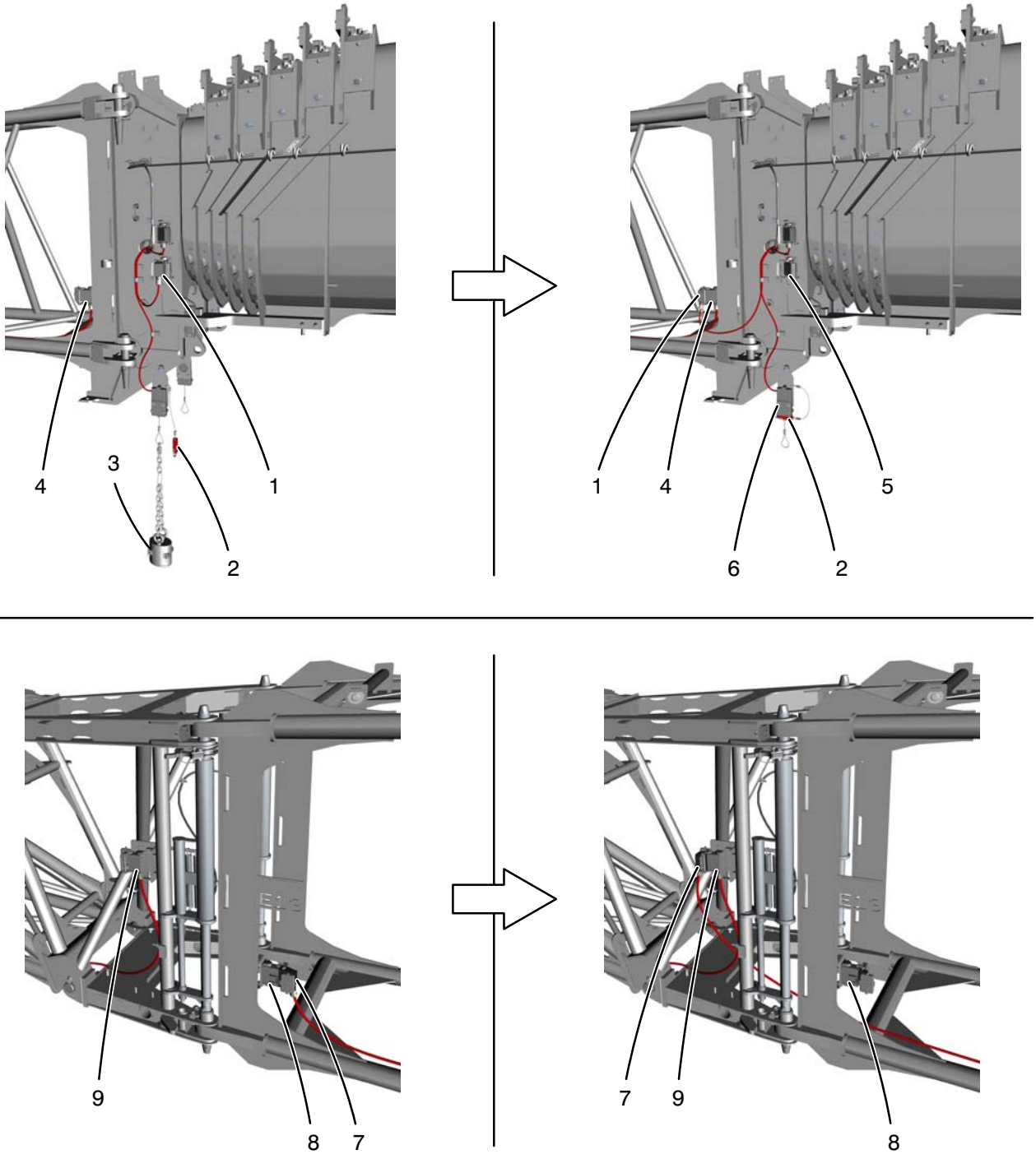
WARNING

All boom head pins and all fly extension, fixed fly base, fly center, 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 keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
16. Remove the wire rope guards from the fly deflector sheaves. Refer to Figure 4—100. Reeve the wire rope from the boom deflector sheave over the fly deflector sheaves. Install the wire rope guards and secure with keeper pins.
17. Remove the wire rope guard from the fly tip head sheave. Reeve the wire rope from the fly deflector sheaves over the fly tip head sheave. Install the wire rope guards.

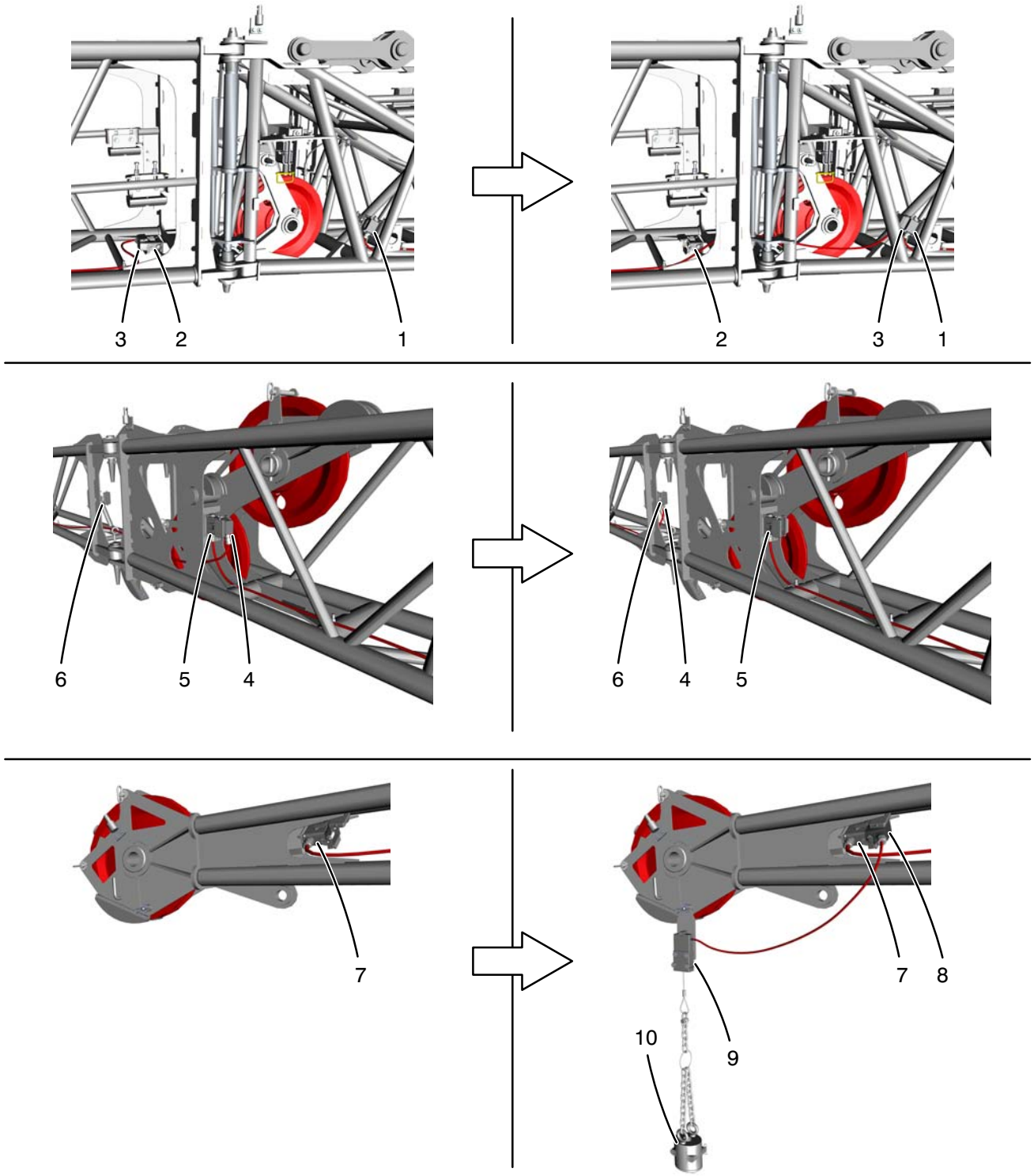
CAUTION

All wire rope guards must be in proper position during operation.



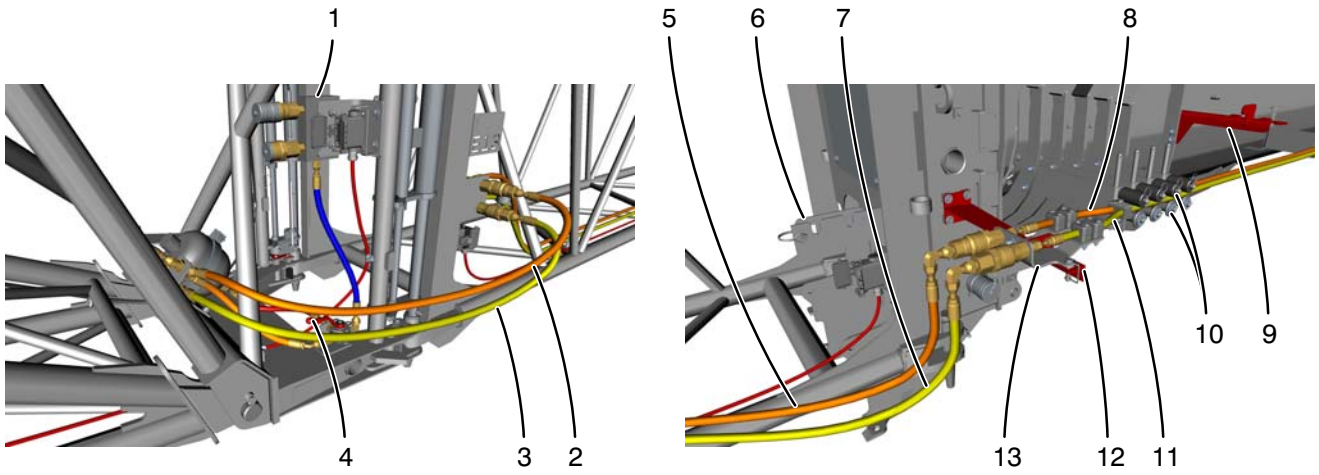
1. Boom Head Plug
2. Lockout Clip
3. ATB Weight
4. Fly Extension Connector
5. Jumper Assembly
6. Boom Head ATB Switch
7. Fly Extension Head Plug
8. Fly Extension Head Connector
9. Fly Base Connector

Figure 4–101
Anti-Two Block (ATB) Connections



1. Fly Base Head Connector
2. Fly Center Storage Connector
3. Fly Center Base Plug
4. Fly Tip Base Plug
5. Fly Center Head Connector
6. Fly Tip Storage Connector
7. Fly Tip Head Connector
8. Secondary ATB Switch Plug
9. Secondary ATB Switch
10. ATB Weight

Figure 4–102
Anti-Two Block (ATB) Connections



Extension Head

1. Quick Disconnect Manifold
2. Hydraulic Offset Extend Hose
3. Hydraulic Offset Retract Hose
4. Accumulator Ball Valve
5. Extension Extend Hydraulic Hose
6. Extension Hydraulic Hose Bracket
7. Extension Retract Hydraulic Hose

Extension Base

8. Boom Offset Extend Hydraulic Hose
9. Storage Bracket
10. Rollers
11. Boom Offset Retract Hydraulic Hose
12. Hydraulic Hose Bracket
13. Working Bracket

Figure 4—103
73 Ft (*22.56m*) Hydraulic Hose Connections — Connected (If Equipped)

18. 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—101.
    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 head plug from the fly extension head connector and connect it to the fly base connector.
    e. Disconnect the fly center base plug from the fly center storage connector and connect it to the fly base head connector. Refer to Figure 4—102.
    f. Disconnect the fly tip base plug from the fly tip storage connector and connect it to the fly center head connector.
    g. Disconnect and remove the secondary ATB switch from the right side of the boom head. Install the secondary ATB switch on the fly head and connect the secondary ATB switch plug to the fly tip head connector.
    h. Install the ATB weight on the secondary 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.

19. If the crane is equipped with the hydraulic fly base and extension, connect the hydraulic hoses as follows:
    a. Remove the keeper pin and hydraulic hose bracket from the storage bracket. Refer to Figure 4—103.
    b. Route the boom offset extend and retract hydraulic hoses through the rollers on the boom. If required, remove the top rollers from the stored position and install them in the working position. Align the hydraulic hose bracket on the working bracket and secure with the keeper pin.
    c. Remove the keeper pin and pivot up the extension hydraulic hose bracket. Remove the extension hydraulic extend and retract hoses from the extension hydraulic hose bracket and connect to the boom offset extend and retract hydraulic hoses. Ensure o-ring of each quick disconnect fitting is completely covered. Secure the extension hydraulic hose bracket with the keeper pin.
    d. Disconnect the hydraulic offset extend and retract hoses from the quick disconnect manifold and connect to the extension hydraulic extend and retract hoses. Ensure o-ring of each quick disconnect fitting is completely covered.
    e. Rotate the accumulator ball valve into the working position.
    f. Ensure the quick disconnect fittings are capped.

Note: If the crane is equipped with the hydraulic fly base, the offset fly must be put into the operating position before operating with the fly. Refer to "Changing The Fly Offset Angle" in this section of this Operator's Manual.

20. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
21. 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.

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 the 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. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.
4. Fully retract the boom and position the upper directly over the rear of the carrier. Engage the travel swing lock.

WARNING

Remove the fly extension with the crane level on fully or intermediate extended outriggers, all tires clear of the ground, the correct boom mode selected, the upper directly over the rear 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.

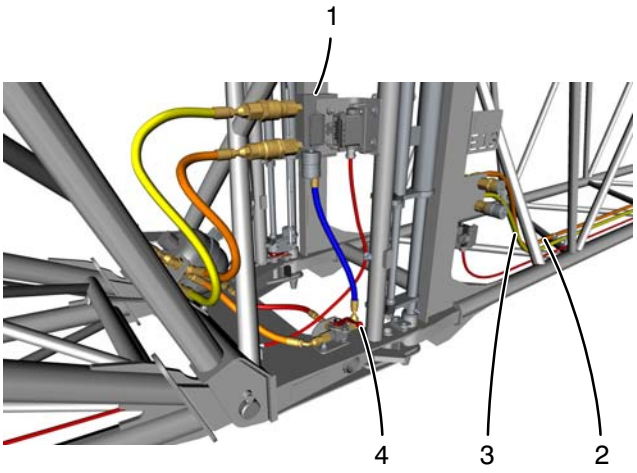
Failure to do the above could result in personal injury and/or the crane tipping.

5. Ensure the fly adaptor lugs and offset connecting pins are installed in the 0° offset position, or the hydraulic fly is in the locked position, as equipped. Refer to Figure 4—95 and Figure 4—93. If required, change the fly offset to the 0° or locked 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 fully.

WARNING

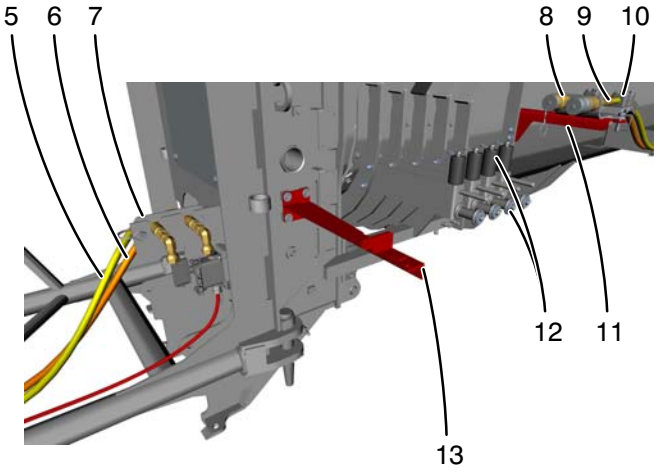
To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

8. If the crane is equipped with the hydraulic fly base and extension, disconnect the hydraulic hoses as follows:
   a. Rotate the accumulator ball valve into the stored position. Refer to Figure 4—104.
   b. Disconnect the hydraulic offset extend and retract hoses from the extension hydraulic extend and retract hydraulic hoses and connect to the quick disconnect manifold. Ensure o-ring of each quick disconnect fitting is completely covered.
   c. Remove the keeper pin and pivot up the extension hydraulic hose bracket. Disconnect the extension hydraulic extend and retract hoses from the boom offset extend and retract hydraulic hoses and install in the extension hydraulic hose bracket. Secure the extension hydraulic hose bracket with the keeper pin.
   d. Remove the keeper pin and hydraulic hose bracket from the working bracket.
   e. Remove the boom offset extend and retract hydraulic hoses from the rollers on the boom. If required, remove the top rollers from the working position and install them in the stored position. Align the hydraulic hose bracket on the storage bracket and secure with the keeper pin.
   f. Ensure the boom extend and retract hydraulic hoses are capped.



Extension Head

1. Quick Disconnect Manifold
2. Hydraulic Offset Extend Hose
3. Hydraulic Offset Retract Hose
4. Accumulator Ball Valve
5. Extension Retract Hydraulic Hose
6. Extension Extend Hydraulic Hose
7. Extension Hydraulic Hose Bracket

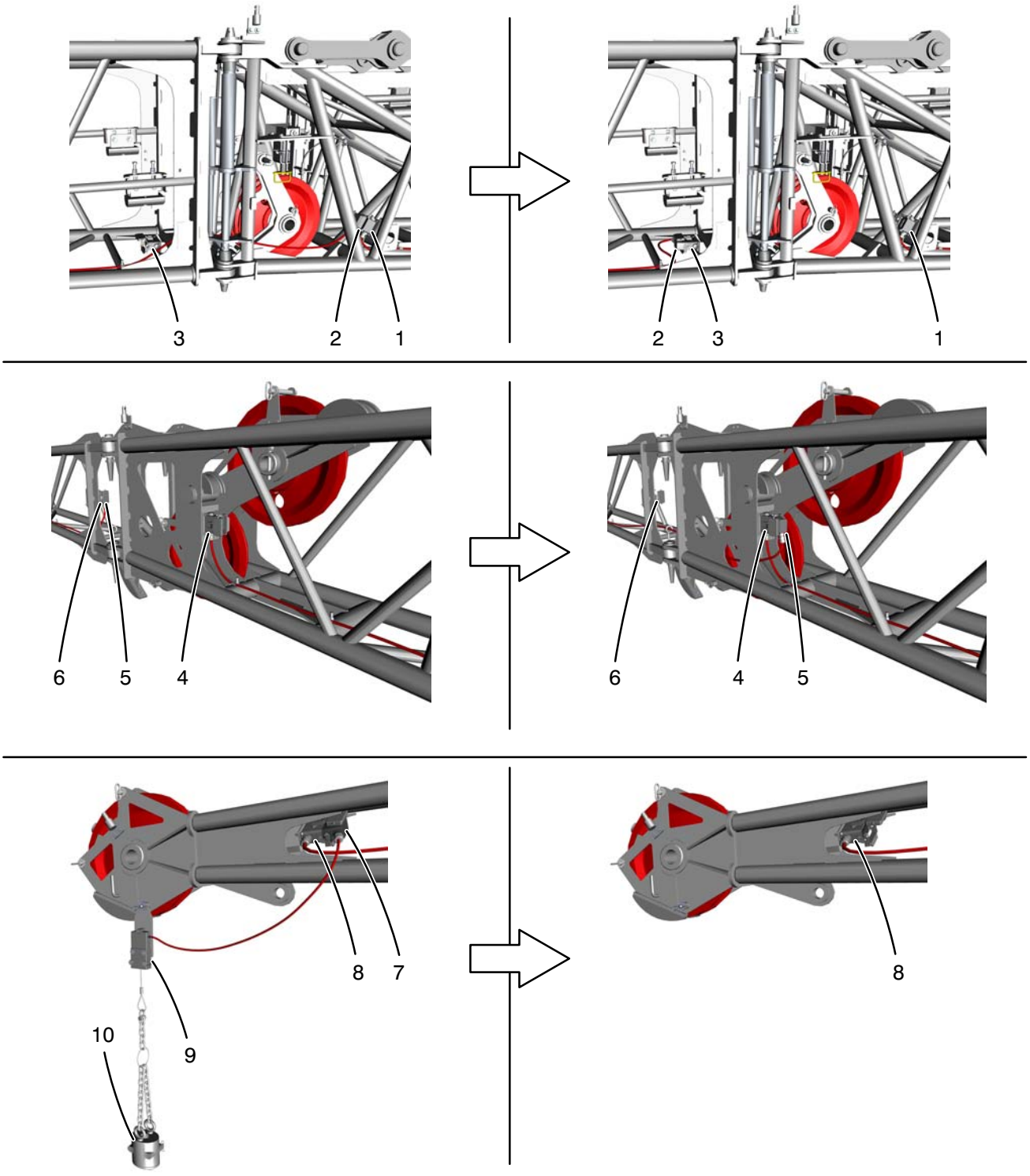


Extension Base

8. Boom Offset Extend Hydraulic Hose
9. Boom Offset Retract Hydraulic Hose
10. Working Bracket
11. Storage Bracket
12. Rollers
13. Hydraulic Hose Bracket

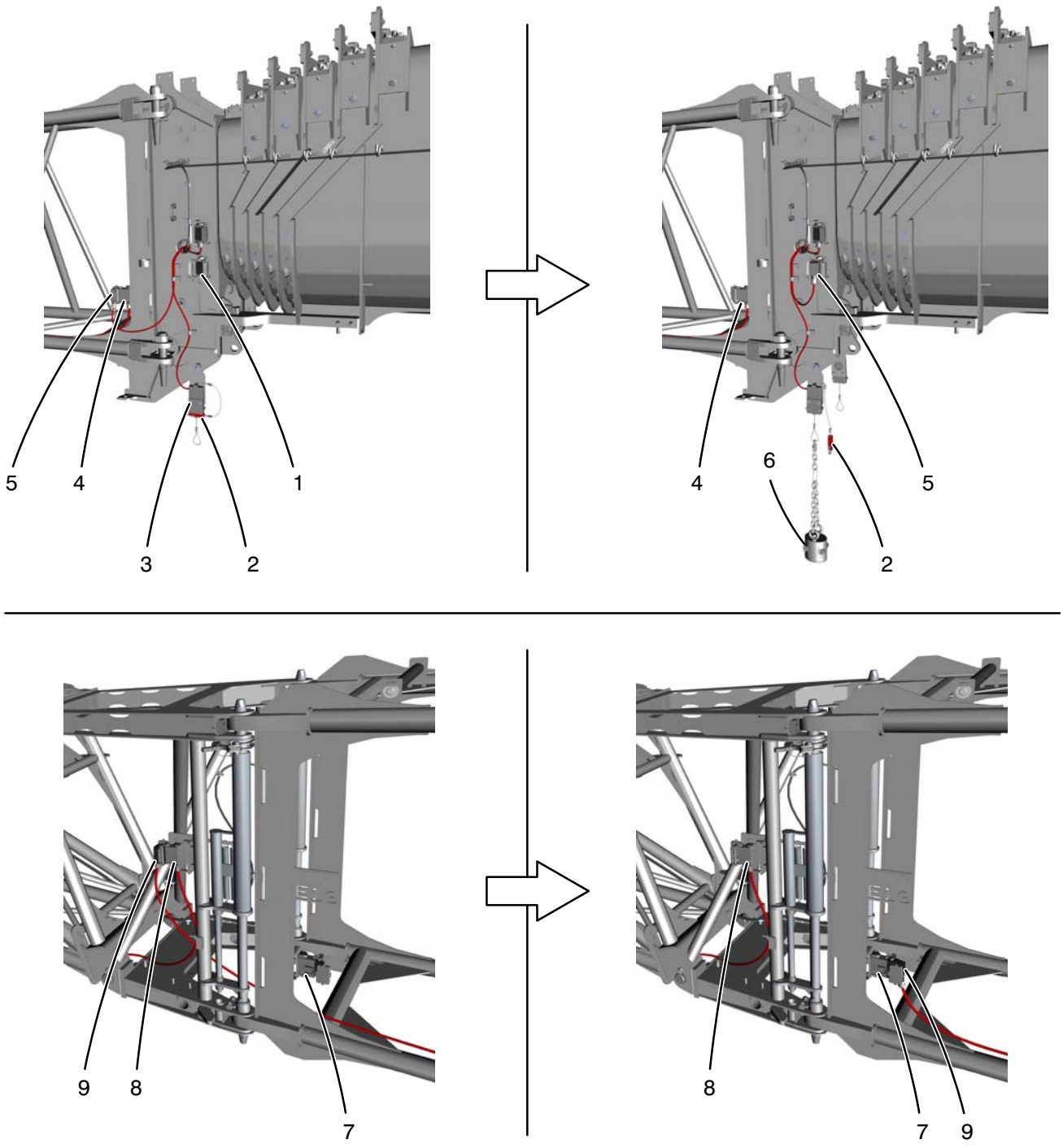
Figure 4—104
73 Ft (*22.56m*) Hydraulic Hose Connections — Disconnected (If Equipped)

9. Properly disconnect the anti-two block (ATB) system as follows:
   a. Remove the ATB weight from the secondary ATB switch cable. Refer to Figure 4—105.
   b. Disconnect the secondary ATB switch plug from the fly tip head connector and remove the secondary ATB switch from the fly head. Install and connect the secondary ATB switch on the right side of the boom head.
   c. Disconnect the fly tip base plug from the fly center head connector and connect it to the fly tip storage connector.
   d. Disconnect the fly center base plug from the fly base head connector and connect it to the fly center storage connector.
   e. Disconnect the fly extension head plug from the fly base connector and connect it to the fly extension head connector. Refer to Figure 4—106.
   f. Disconnect the boom head plug from the fly extension connector and connect it to the jumper assembly on the main boom head.
   g. Install the ATB weight on the boom head ATB switch cable.
   h. Remove the lockout clip from the boom head ATB switch cable.



1. Fly Base Head Connector
2. Fly Center Base Plug
3. Fly Center Storage Connector
4. Fly Center Head Connector
5. Fly Tip Base Plug
6. Fly Tip Storage Connector
7. Secondary ATB Switch Plug
8. Fly Tip Head Connector
9. Secondary ATB Switch
10. ATB Weight

Figure 4—105
Anti-Two Block (ATB) Connections



1. Jumper Assembly
2. Lockout Clip
3. Boom Head ATB Switch
4. Fly Extension Connector
5. Boom Head Plug
6. ATB Weight
7. Fly Extension Head Connector
8. Fly Base Connector
9. Fly Extension Head Plug

Figure 4—106
Anti-Two Block (ATB) Connections — 18' (*5.49m*) Extension

10. Remove the wire rope guard from the fly tip head sheave. Refer to Figure 4—100. 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 guard, and secure with keeper pin.
11. Remove the wire rope guards from the fly deflector sheaves. Remove wire rope from the fly deflector sheaves and lay it aside to prevent damage to it during fly removal. Install the wire rope guards, and secure with keeper pins.
12. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. 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. Properly store wire rope which was used on fly, as required.

CAUTION

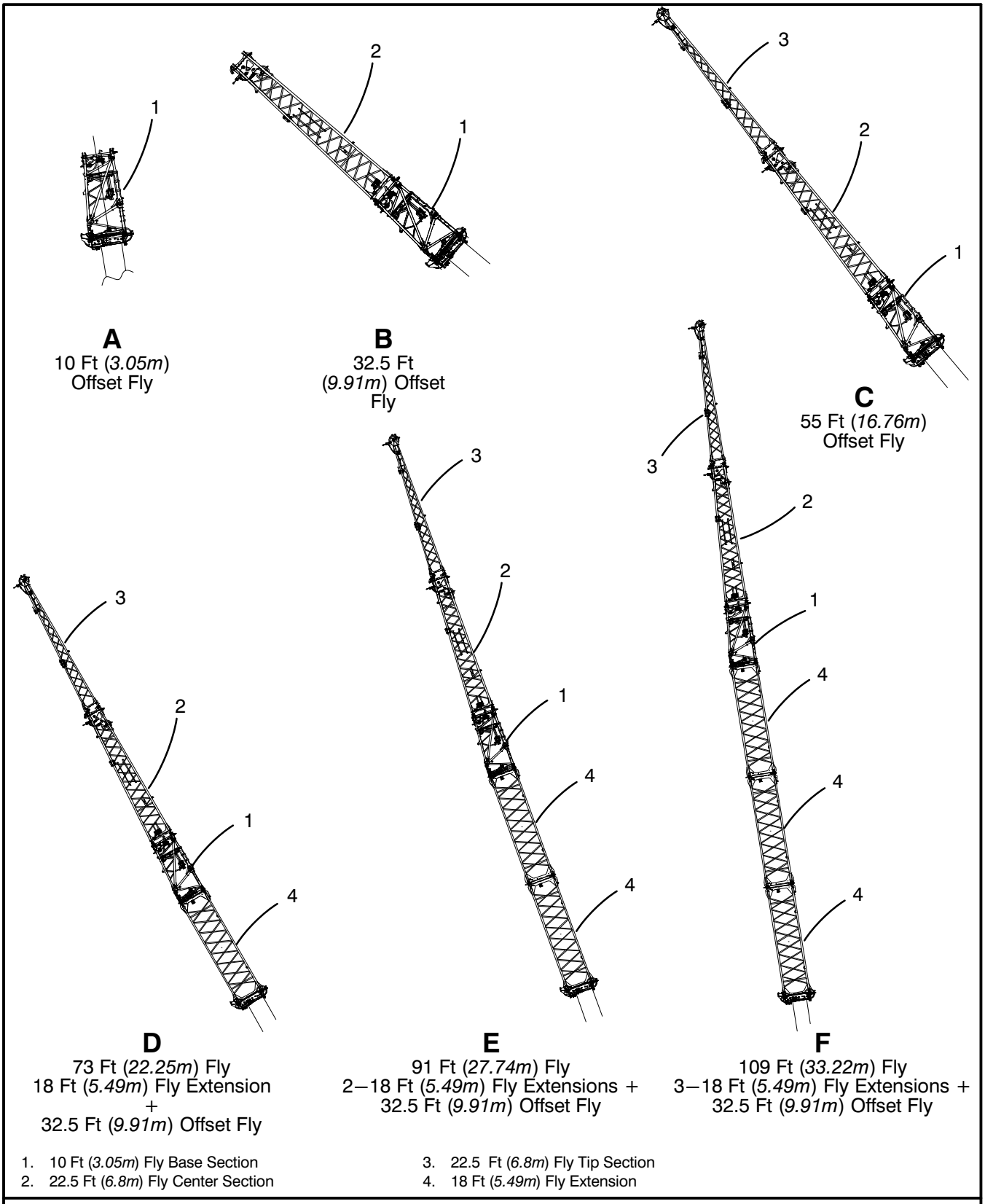
Do not extend the boom or boom down to the point of over stressing the fly section. Structural damage to the fly could occur if care is not taken. Use a signal person to aid the operator in lowering the fly head wear pads to the ground.

14. 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.
15. Securely block up the fly to support it. Refer to Figure 4—98. The 73 ft (*22.25m*) fly assembly with extension weighs approximately 4,634 lb (*2 102kg*), the 91 ft (*27.74m*) fly assembly weighs approximately 5,572 lb (*2 527kg*), and the 109 ft (*33.22m*) fly assembly weighs approximately 6,510 lb (*2 953kg*).

WARNING

Use extreme care when removing the tapered fly connecting pins. They could pop out suddenly causing serious personal injury.

16. Remove the connecting pins securing the 18 ft (*5.49m*) extension to the boom head and store the connecting pins in the storage locations at the rear of the fly extension. (Install the pins with the head on top and keeper on the bottom.) Secure connecting pins with keeper pins. Refer to Figure 4—99.
17. Remove the connecting pins securing the 18 ft (*5.49m*) extension to the boom head and store the connecting pins in the storage locations at the rear of the fly extension. (Install the pins with the head on top and keeper on the bottom.) Secure connecting pins with keeper pins.
18. Carefully retract the boom away from the fly.
19. Remove the keeper pin and pivot up the wire rope guard on the boom deflector sheave. Refer to Figure 4—4. Reeve the wire rope over the boom deflector sheave. Install the wire rope guard and secure with keeper pin.
20. Remove the wire rope guard from the boom head sheave or auxiliary lifting sheave, as required. Refer to Figure 4—3. 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.
21. Properly set the Rated Capacity Limiter to the correct crane configuration. Refer to "Erected Attachment Configuration" in this section of this Operator's Manual.
22. Properly store the fly and/or fly extension to prevent damage to it.



A
10 Ft (*3.05m*)
Offset Fly

B
32.5 Ft
(*9.91m*) Offset
Fly

C
55 Ft (*16.76m*)
Offset Fly

D
73 Ft (*22.25m*) Fly
18 Ft (*5.49m*) Fly Extension
+
32.5 Ft (*9.91m*) Offset Fly

E
91 Ft (*27.74m*) Fly
2−18 Ft (*5.49m*) Fly Extensions +
32.5 Ft (*9.91m*) Offset Fly

F
109 Ft (*33.22m*) Fly
3−18 Ft (*5.49m*) Fly Extensions +
32.5 Ft (*9.91m*) Offset Fly

1. 10 Ft (*3.05m*) Fly Base Section
2. 22.5 Ft (*6.8m*) Fly Center Section
3. 22.5 Ft (*6.8m*) Fly Tip Section
4. 18 Ft (*5.49m*) Fly Extension

Figure 4−107
10−32.5−55 (*3.05−9.91−16.76m*) Ft Fly And Extension Arrangements

Two Load Line Lifting (If Equipped)

If equipped with dual anti-two block switches and weights, two load lines can be used off of the main boom to make a single lift. During the two load line lifting application, a single load is allowed on both of the wire ropes at the same time provided all lifting guidelines given here are followed. Refer to Figure 4—108.

Before making any two load line lifts, refer to the Crane Rating Manual to confirm that the load is within the rated capacity.

WARNING

Do not simultaneously lift separate loads with the two load lines over 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 two load line lifting applications, if both hooks are attached to a single load, this is considered one load.

Two Load Line Lifting Installation

1. Park the crane on a firm, level surface. Fully retract the boom and position the upper directly over the front or rear of the lower. Engage the travel swing lock.
2. Level the crane on fully extended outriggers with all tires clear of the ground.
3. Ensure the correct amount of counterweight is installed on the upper. Refer to the Crane Rating Manual for the correct counterweight configuration per the current fly arrangement.

WARNING

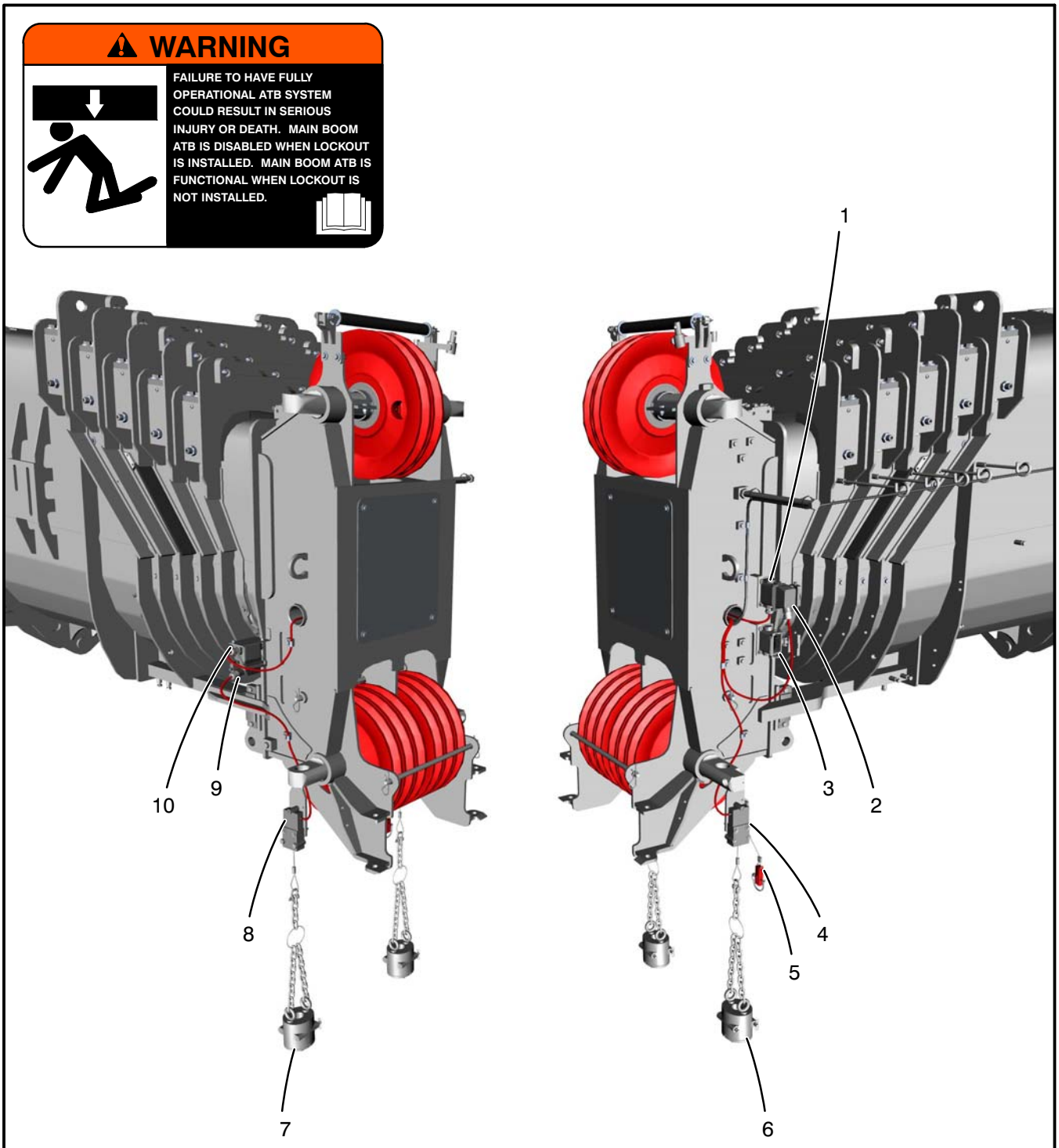
To avoid personal injury, do not climb, stand, or walk on the boom. Use a ladder or similar device as required to reach necessary areas.

4. Properly change the anti-two block system connections as follows:
   a. Install the secondary ATB switch on the right side of the boom head. Connect the secondary ATB switch plug to the right side two load line jumper assembly. Refer to Figure 4—108.
   b. Install the secondary ATB weight on the secondary ATB switch.
   c. Ensure the ATB weight is installed on the boom head ATB switch and the lockout clip is removed from the boom head ATB switch cable.
   d. Disconnect the boom head plug from the jumper assembly and connect it to the left side two load line jumper assembly.
5. Configure the boom head deflector sheaves into dual ATB position. Refer to Figure 4—2.

Two Load Line Lifting Guidelines

Certain guidelines must be followed when making a two load line lift. The following are the guidelines that must be followed unless otherwise stated in the Crane Rating Manual:

1. A single object with two hooks attached is considered one load for this application.
2. The Rated Capacity Limiter (RCL) and anti-two block (ATB) systems shall remain fully functional at all times. The RCL will display approximately the total load lifted (the sum of the two lines).
3. 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.
4. Lifting and placement of a load 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 load lifting and placement applications.
5. 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.
6. When rigging two hooks on an object, each hook or rigging device shall be capable of handling the entire weight of the load being lifted.
7. Both load lines must remain in the vertical plane of the crane boom (no side load). The load being lifted must also be in the same vertical plane as the crane boom.
8. The off-lead angle of the wire rope from true vertical must be minimized when initially lifting a load 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 load being lifted.



1. Two Load Line Jumper Assembly (Left Side)
2. Boom Head Plug
3. Jumper Assembly
4. Boom Head ATB Switch
5. Lockout Clip
6. ATB Weight
7. Secondary ATB Weight
8. Secondary ATB Switch
9. Secondary ATB Switch Plug
10. Two Load Line Jumper Assembly (Right Side)

Figure 4—108
Dual Anti-Two Block Weights And Switches (If Equipped)

10 ft *(3.05m)* Manual Fly Base Panel Lifting

The 10 ft *(3.05m)* manual fly base can be used for precast 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 10 ft *(3.05m)* offset fly base wire ropes at the same time provided all panel lifting guidelines given here are followed.

Before making any lifts with the 10 ft *(3.05m)* manual or hydraulic offset fly base, refer to the Crane Rating Manual to confirm that the load is within the rated capacity for the appropriate 10 ft *(3.05m)* offset fly base (manual or hydraulic offset, as applicable).

The 10 ft *(3.05m)* offset fly base adds weight to the boom which must be considered in lifting capacities. When making lifts from the main boom wire rope with the 10 ft *(3.05m)* offset fly base installed, refer to the Crane Rating Manual for the appropriate deductions from lifting capacities.

⚠ WARNING

Do not simultaneously lift separate loads with the 10 ft *(3.05m)* offset fly base 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 10 ft *(3.05m)* offset fly base hooks are attached to a single panel, this is considered one load.

⚠ WARNING

When making lifts from the 10 ft (*3.05m*) fly at 0° offset and 70 degree boom angle or higher, 2 parts of line is the maximum with the auxiliary sheave erected. Wire rope may contact auxiliary lifting sheave. Auxiliary lifting sheave may be removed to eliminate the possible interference. A warning will be shown on the RCL display if the configuration can result in wire rope contacting the auxiliary lifting sheave.

Panel Lifting Guidelines

Certain guidelines must be followed when using 10 ft *(3.05m)* offset fly base in panel lifting applications. The following are the guidelines that must be followed unless otherwise stated in the Crane Operator's or Crane Rating Manual:

1. A single panel with two hooks (main boom and 10 ft *(3.05m)* offset fly base hooks) attached is considered one load for this application.
2. Follow all 10 ft *(3.05m)* offset fly base notes for General Operation listed in the Crane Rating Manual.
3. The Rated Capacity Limiter (RCL) and anti-two block (ATB) systems shall remain fully functional at all times. Select the 10 ft *(3.05m)* offset fly base 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 10 ft *(3.05m)* offset fly base 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 10 ft *(3.05m)* offset fly base, whichever is less. (The main boom capacity in this condition will be the main boom rated load less the deduct for "10 ft *(3.05m)* offset fly base erected but not used" to account for the 10 ft *(3.05m)* offset fly base 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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Notes:

Crane Rating Manual And Serial Number

The Crane Rating Manual is in the lower right interior of the upper operator's cab. The Crane Rating Manual has the crane serial number on it. The serial number and a Vehicle Identification Number (VIN) is also stamped on a plate on the front center of the carrier cab dash. The serial number must be used with any correspondence with the Link-Belt Distributor of 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 manual can be ordered through your 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 strength. A typical example is shown in Figure 5—1. The actual chart 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 strength 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 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 than is needed to make the lift, remember to add the weight of the 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 the Wire Rope Capacity Chart in the Crane Rating Manual for the weight of the wire rope.

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 Capacity

Maximum Lifting Capacities Based On Wire Rope Strength

Parts of Line	19mm Type KC	19mm Type YB	19mm 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
14	224,000	224,000	240,240
18	288,000	288,000	308,880
21	336,000	336,000	360,360
Rope Weight - Pounds Per Foot	1.2	1.2	1.2

Rope 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:
1. Capacities shown are in pounds and working loads must not exceed the ratings on the capacity charts in this Crane Rating Manual.
2. Capacity deducts for auxiliary lifting devices do not apply for wire rope strength capacities.
3. Special reeving, using the auxiliary sheave, is required when using more than 12 parts of line. Special equipment is required for greater than 14 part of line.
4. Consult Operator's Manual for wire rope inspection procedures, single part of line applications, and reeving diagrams.

Note: The Wire Rope Capacity Chart depicted above is shown as an example only. Use the official Wire Rope Capacity Chart in the Crane Rating Manual. Use it to determine the correct parts of line required for the given wire rope type and diameter.

Note: Always refer to the crane's Parts Manual when ordering wire rope.

Figure 5–1
Typical Wire Rope Capacity Chart (Example Only)

EXAMPLE ONLY

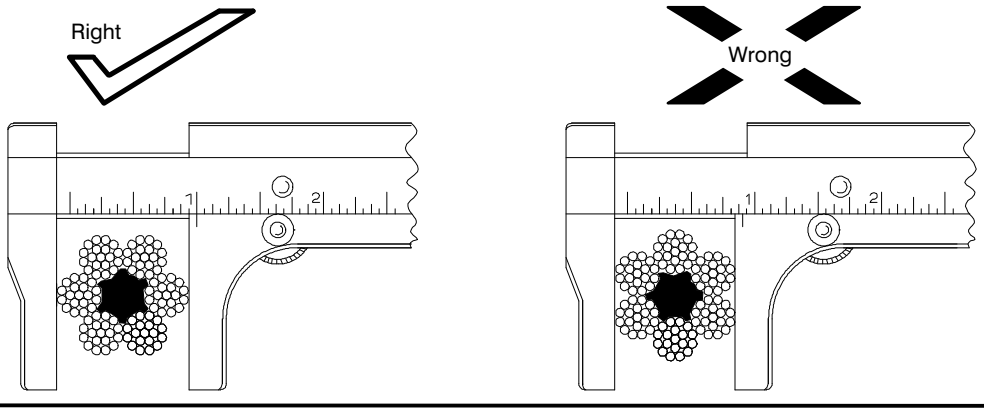


Figure 5—2
Measuring Wire Rope Diameter

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*)	—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—5. It should always be measured across the largest diameter that will fit inside a true circle. Refer to Figure 5—2.

WIRE ROPE INSPECTION REPORT

Crane S/N _____ Owned By _____ Crane Location _____

Date of Inspection _____ Rope Application _____ Rope Description _____

Manufacturer's Ident. No. _____ Applicable Standards _____

Criteria for Removal				1/3 of outside wire dia.	1							
Location on Rope	Measured Diameter	Broken Wires: In 1 Rope Lay	Broken Wires: In 1 strand of 1 Lay	Excessive Wear	End Attachments: Broken Wires	End Attachments: Corrosion of Rope	End Attachments: Fitting Condition	Rope Damage	Sheave Condition	Drum Condition		Rope Lay Measurement

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.)

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 likely 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 major 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.

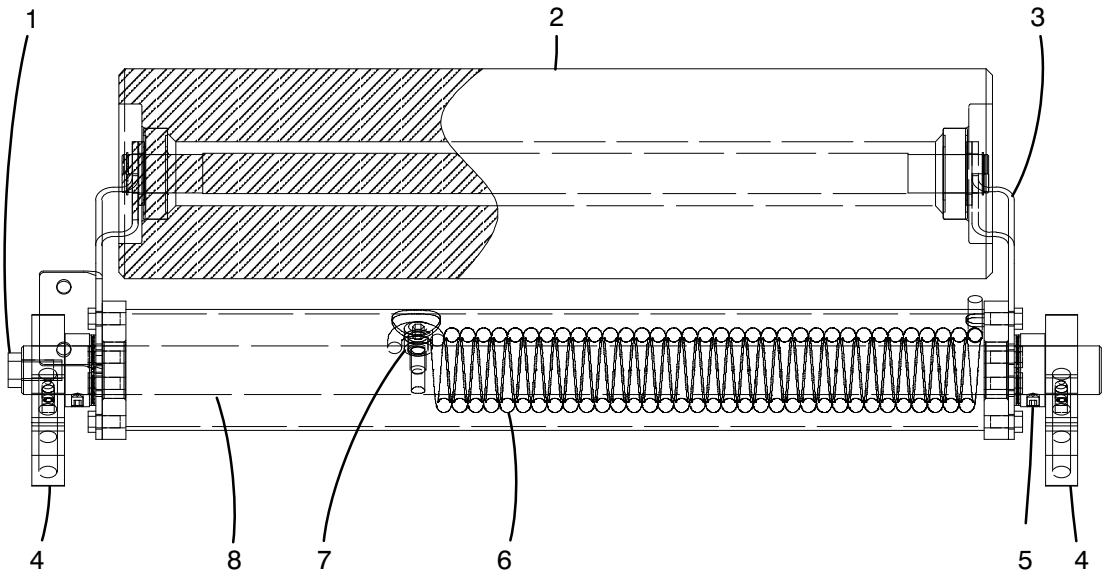
   For rotation resistant wire ropes, two randomly distributed broken wires in six wire rope diameters, or four randomly distributed broken wires in thirty wire rope diameters.
2. In pendants or standing wire ropes, evidence of more than two broken wires in one lay in sections beyond end connections or 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" (*0.4mm*)	up to and including 5/16" (*8mm*)
1/32" (*0.79mm*)	over 5/16" (*8mm*) 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 procedures to install the wire rope on the crane.



1. Capscrew
2. Roller
3. Roller Arm
4. Setscrew
5. Setscrew
6. Torsion Spring
7. Bolt
8. Torque Shaft

Figure 5—4
Winch Roller Adjustment

Winch Roller Adjustment

Before installing wire rope on the drum, adjust the drum roller. Refer to Figure 5—4.

1. Check that the roller is centered between the drum flanges. If not, loosen setscrews, center roller, and tighten setscrews.

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.

2. Properly release torsion spring 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 is tightened securely in torque shaft.
   b. Using a breaker bar or long handle wrench, hold tension on torsion spring while loosening the setscrews on both ends of torque shaft.
   c. Allow torque shaft to rotate counterclockwise, as far as possible while maintaining control of the torque shaft, then securely tighten setscrews.
   d. Reposition breaker bar or wrench on capscrew.
   e. Repeat Steps b thru d until tension is fully relieved from torsion spring.
3. Turn the capscrew, which will rotate the torque shaft, until the bolt through the torque shaft contacts the torsion spring.

CAUTION

Do not overtighten the spring. Damage to the wire rope may occur.

4. With the roller arms resting against the stops and the bolt through the torque shaft just contacting the torsion spring, rotate the torque shaft one complete turn (360°) to preload the torsion spring. The torque required to turn the shaft 360° is approximately 105 ft lb (*142Nm*).
5. Tighten setscrews. The roller should roll freely when the drum rotates.

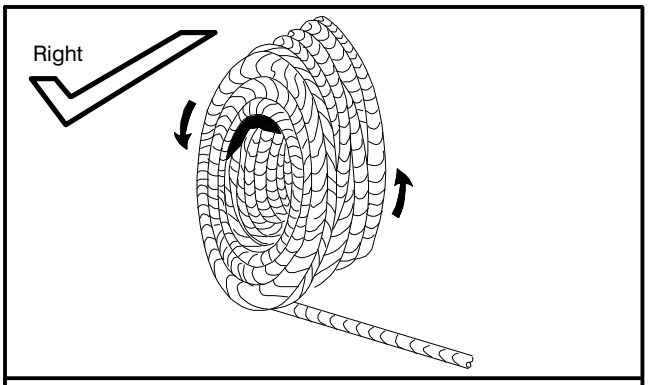


Figure 5—5
Uncoiling Wire Rope

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 unreeled 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.

   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 "Wire Rope Break-In" in this Section of this Operator's Manual.

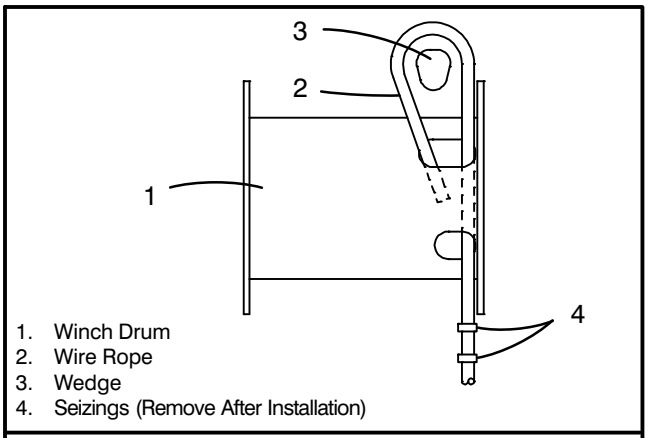


Figure 5—6
Anchoring Wire Rope To Drum

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.

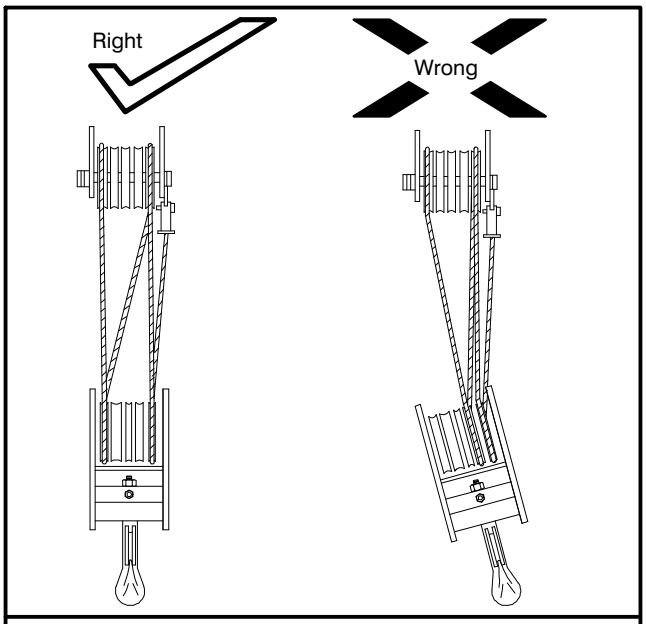


Figure 5—7
Hook Block Reeving

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 cause major damage to the wire rope.) The tensioning load should range from 1 to 2% of the wire rope's nominal strength.

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.

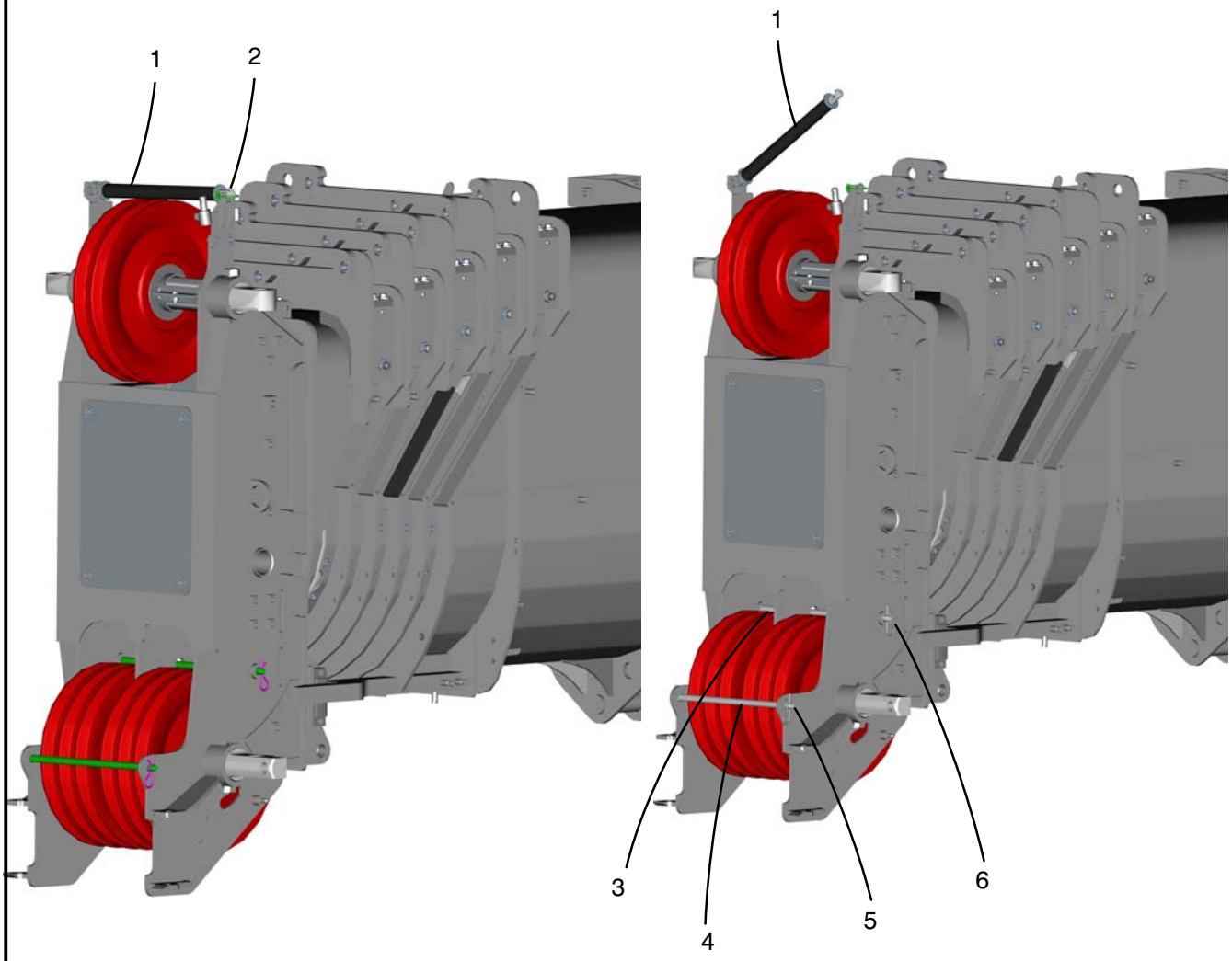
Only if certain criteria are met, a swivel hook ball may be used with rotation resistant wire rope. Refer to "Hook Ball Usage With Rotation Resistant Wire Rope" in this Operator's Manual.

The crane can use multiple parts of line when reeving the main or auxiliary 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 and even parts dead end at the boom head. The auxiliary lifting sheave may be reeved with either one or two parts of line.

The fly section may be reeved with multiple parts of line for better line control. Figure 5—22 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: Do not use a swivel at the dead end of multi-part reeving.

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.



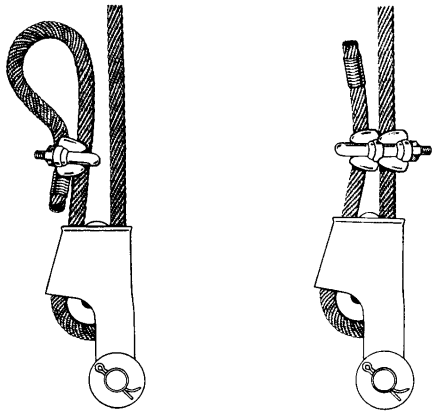
Deflector Sheave in Working Position

Deflector Sheave in Reeving Position

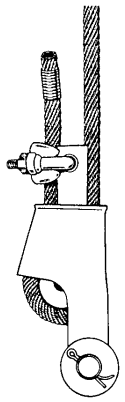
1. Deflector Sheave Wire Rope Guard
2. Retaining Pin
3. Head Sheave Wire Rope Guard
4. Head Sheave Wire Rope Guard
5. Retaining Pin
6. Retaining Pin

Figure 5—8
Boom Head Wire Rope Guards

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.

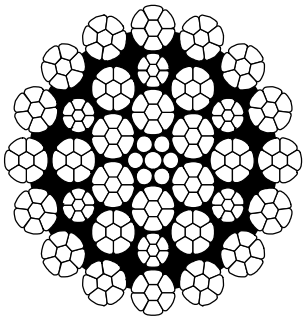


Socket And Wedge
Without Extended Wedge
Refer to page 5—12

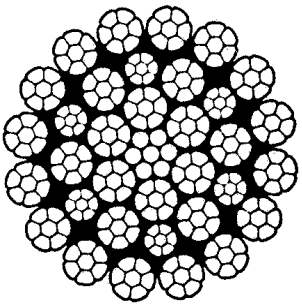


Socket And Wedge
With Extended Wedge
Refer to page 5—13

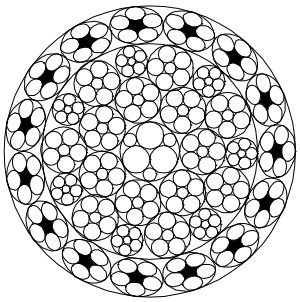
Figure 5—9
Sockets And Wedges



Type KC



Type YB



Type CC

Figure 5—10
Wire Rope Identification

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.

Wire Rope, Wedge and Socket Compatibility					
	Socket				
Wedge	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

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—19. 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.

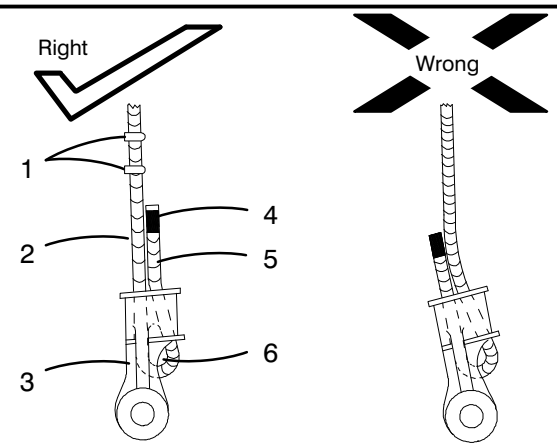
CAUTION

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.

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



1. Seizing(Remove after installation)
2. Wire Rope Live End
3. Socket
4. Dead End Seizing
5. Tail Length — 20 Wire Rope Diameters Minimum for Rotation Resistant Wire Ropes, 6 Wire Rope Diameters Minimum for 6 to 8 Strand Wire Rope
6. Wedge

Figure 5—13
Socket And Wedge Connections

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.

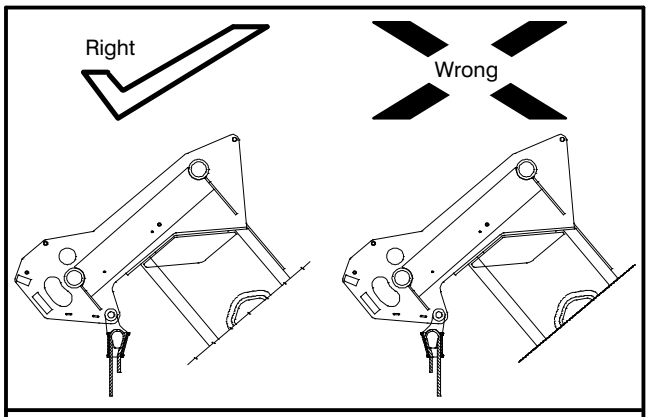


Figure 5—14
Socket And Wedge Installation

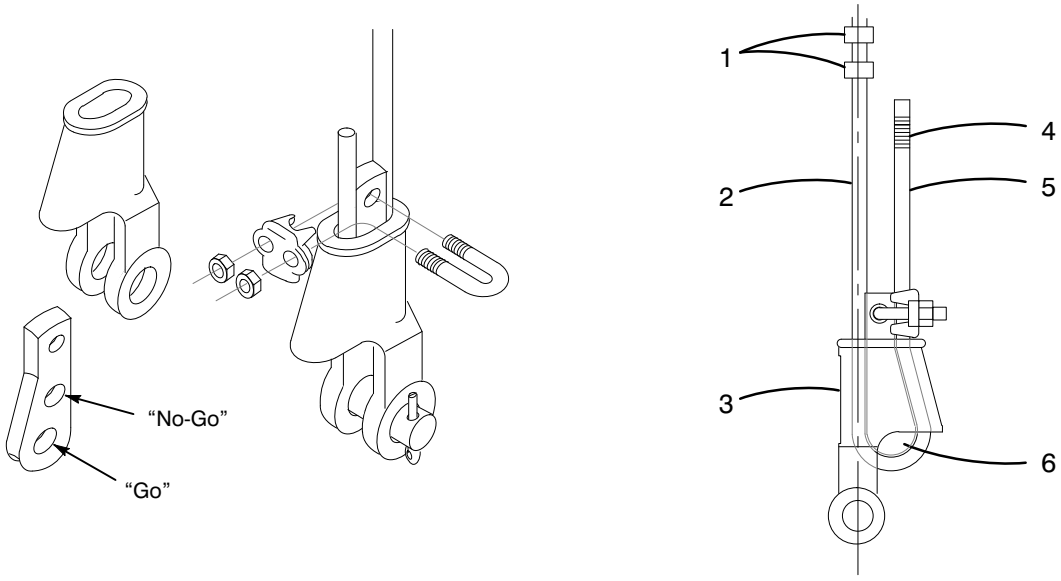
Note: Refer to Figure 5—10 to identify which type of wire rope is installed on the crane.

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, make sure 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.



1. Seizing (Remove after installation)
2. Wire Rope Live End
3. Socket
4. Dead End Seizing
5. Tail Length — 20 Wire Rope Diameters Minimum for Type GC (4-Strand) or Rotation Resistant Wire Ropes, 6 Wire Rope Diameters Minimum for 6 to 8 Strand Wire Rope
6. Extended Wedge

Figure 5—15
Socket & Wedge Assembly — With Extended Wedge

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—19. 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. Consult the Parts Manual for confirmation. If there is any doubt as to the mating of the socket and wedge, consult your Link-Belt Distributor.

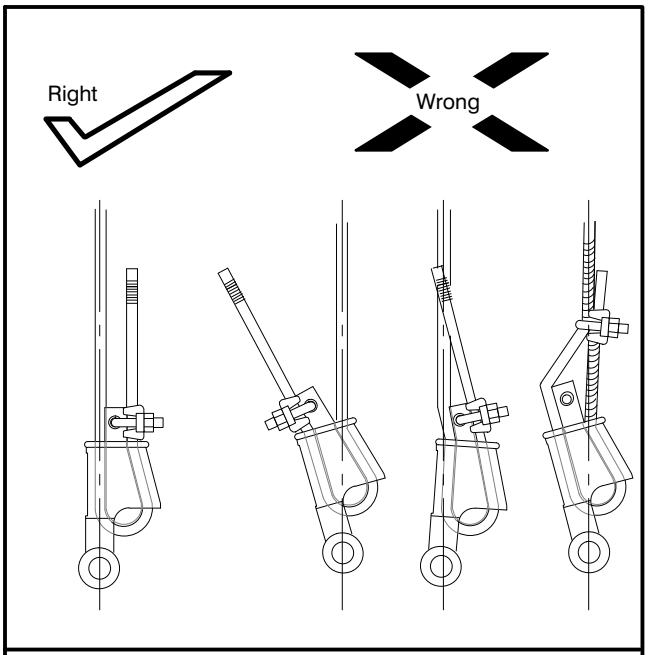


Figure 5—16
Socket & Wedge Connections

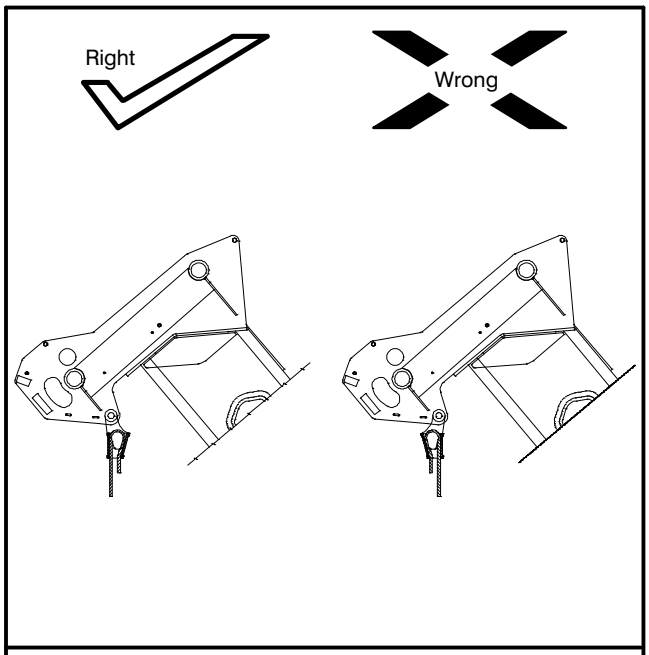


Figure 5—17
Socket & Wedge Installation

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, make sure 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.

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. Swing 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, rollers, etc. to make certain that the wire rope runs freely, and without any possible 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 wire rope on the drum.

4. If no problems appear in running the wire rope, repeat procedure with an increased load, maintaining tension of at least 2.5 to 5% of the wire rope's minimum breaking force.

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.

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.

WARNING

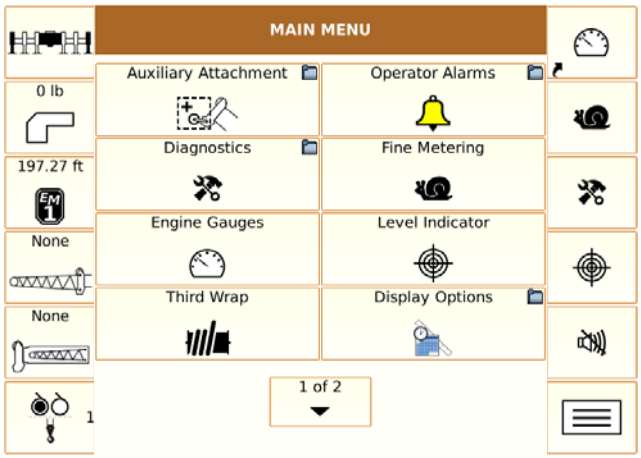
The first layer/third wrap system will not function properly if the live end of the hoist wire rope is wound past the winch drum(s). Wire rope failure may occur. Recalibrate the first layer/third wrap system so that three (3) full wraps of wire rope are maintained on the winch drum(s) at all times during operation.

1. Park the crane on a firm level surface.
2. Set the RCL System to Rigging Mode.

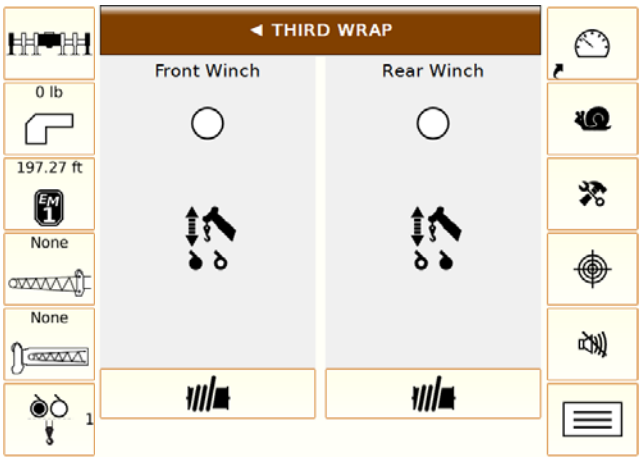
WARNING

The RCL is not operational when in the Rigging Mode. Return the RCL to normal operation before operating the crane.

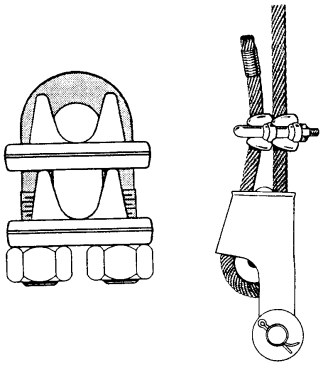
3. Wind wire rope off the drum until only four full wraps are left on the drum. Or if installing wire rope on the drum, properly install the drum wedge to anchor the wire rope to the drum. Refer to "Anchoring Wire Rope To Drum" and "Winding Wire Rope On Drum" in this section of this Operator's Manual for instructions. Properly wind four full wraps on the drum.
4. Visually verify that four full wraps are on the drum before proceeding.



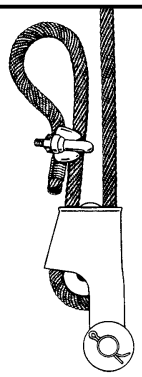
5. From the Main Menu of the Pulse Crane Control System Display, press the Third Wrap Button. The Third Wrap Screen will appear.



6. 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.



The Double-Saddle-Clip Method



The Loop Back Method

Figure 5—18
Wire Rope Socket With Clip

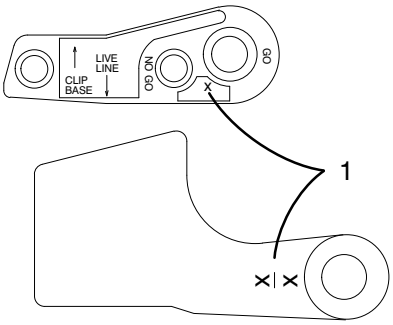
Wire Rope Sockets With Clips

Some codes require the use of a wire rope clip in conjunction with a socket and wedge connection. Figure 5—18 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.

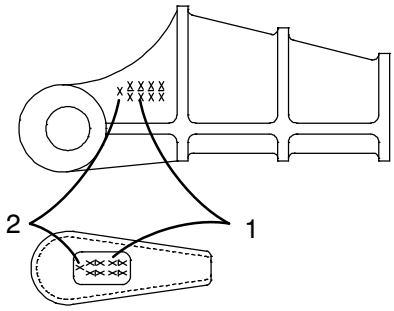
WARNING

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.



Extended Wedge



Non-Extended Wedge

1. Wire Rope Sizes (fractional inches)
2. Pairing Designator

Figure 5—19
Examples Of Typical Socket & Wedge Identifiers

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*
7/8	*22.0*	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

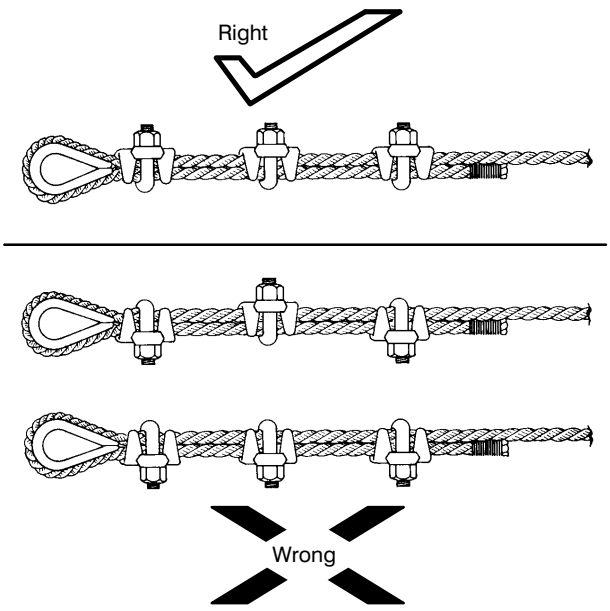


Figure 5–21
Wire Rope Clip Installation

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 wire rope must be fuse welded and the tail length of the dead end must be a minimum of 20 wire rope diameters [15" *(0.38m)* 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.

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 strength 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.

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 type ZB wire rope.

Single Part Line Hoisting

Rotation-resistant category 1 per ASTM A1023/A1023M type ropes are recommended for single part of line applications.

- This is utmost importance for long fall. [Link-Belt general guideline: Long Fall $\geq$ 120ft (36.6m)]
- Link-Belt type "KC", "YB", "CC", and "ZB" are examples of wire ropes recommended for single part of line hoisting.

Wire ropes not classified as "Category 1" per ASTM A1023/A1023M (such as Link-Belt type "N", "DB", "RB" or "LB") may be used for single part line hoisting if no swivel is used and the load is controlled from rotating with a tagline. They are not recommended for single part of line hoisting with a swivel or a load without a tagline.

- If the load or the wire rope is allowed to rotate, the crane and/or wire rope can be damaged. The anti-two block weight may become entangled with the wire rope and could damage the anti-two block system, wire rope, and/or head machinery.

Non-Category 1 per ASTM A1023/A1023M wire ropes will have reduced service life when used for single part hoist line applications with a swivel or with a load without a tagline, but **may** be used where operating requirements or job applications **demand if the following conditions are met**:

- The wire rope is not shock loaded or overloaded.
- The wire rope is inspected daily as outlined in this Operator's Manual.
- The wire rope is used in short falls of less than 120 ft (*36.6m*).

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, 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.

Rotation Resistant Wire Rope Inspection

For rotation resistant wire rope, refer to "Wire Rope Inspection" and "Wire Rope Replacement" in this Section of this Operator's Manual and the following information.

Using wire ropes not recommended for use with swivels or single part line hoisting without use of a tagline can allow the rope to rotate. Rotation of the rope will reduce the service life of the wire rope. It is of utmost importance to perform wire rope inspection on wire ropes being used in not recommended applications. The entire length of wire rope must be inspected including at the drum and especially near the termination because it is more prone to rotation.

The wire rope must be inspected daily as outlined in the "Wire Rope Inspection" and "Wire Rope Replacement" section of this Operator's Manual.

Refer to the Wire Rope Capacity Chart in the Crane Rating Manual for wire rope types and specifications used on this crane. For additional information, contact the wire rope manufacturer.

Hook Ball Usage With Rotation Resistant Wire Rope

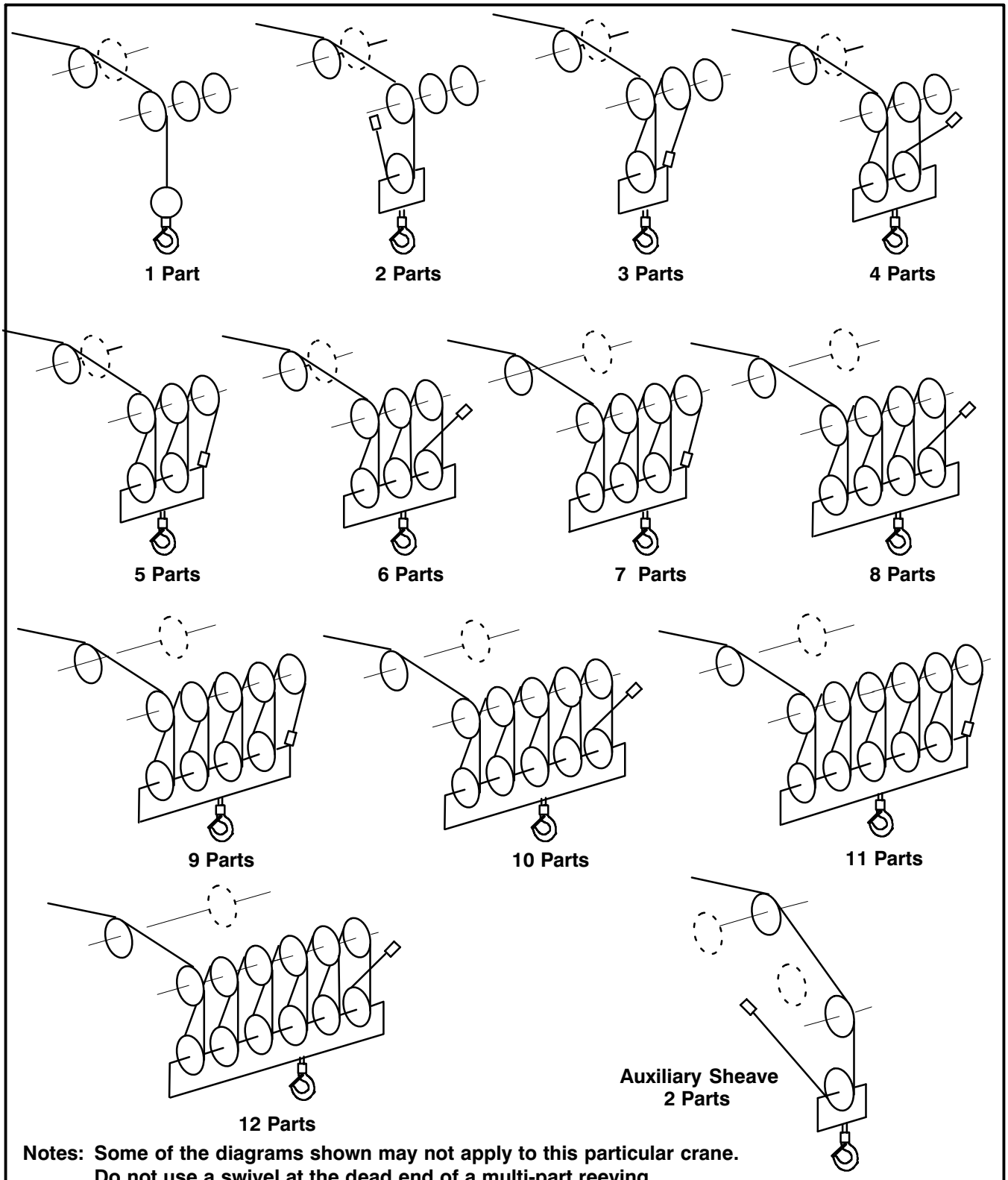
Non-Swivel Usage

A Non-swivel hook ball in conjunction with a tagline or other device to control load spin **is recommended** when the crane is equipped with any Link-Belt wire rope not classified as "Category 1" per ASTM A1023/A1023M. This is to prevent unrestrained rotation of the wire rope.

Swivel Usage

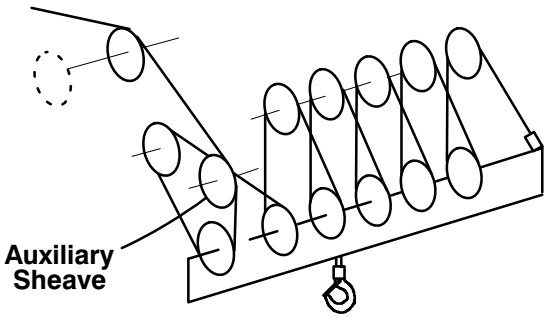
Using a swivel hook ball or swivel termination with any Link-Belt wire rope not classified as "Category 1" per ASTM A1023/A1023M will allow the rope to rotate. Rotation of the rope can cause the wire rope to unlay (unwrap) causing distortion, a decrease in breaking strength, and will reduce the service life of the wire rope. 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 if**:

1. The wire rope is not shock loaded or overloaded.
2. The wire rope is inspected frequently as outlined above and as per "Wire Rope Inspection And Replacement Recommendations" in this Section of this Operator's Manual.

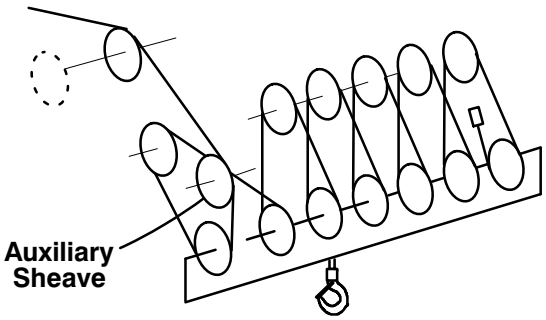


Notes: **Some of the diagrams shown may not apply to this particular crane.**
Do not use a swivel at the dead end of a multi-part reeving.
Refer to Section 4 of this Operator's Manual for positioning of adjustable sheave.
Reeve the wire rope to equalize the loading on the boom head sheaves.
Reeving shown is typical.

Figure 5–22
Wire Rope Reeving Diagrams



13 Parts



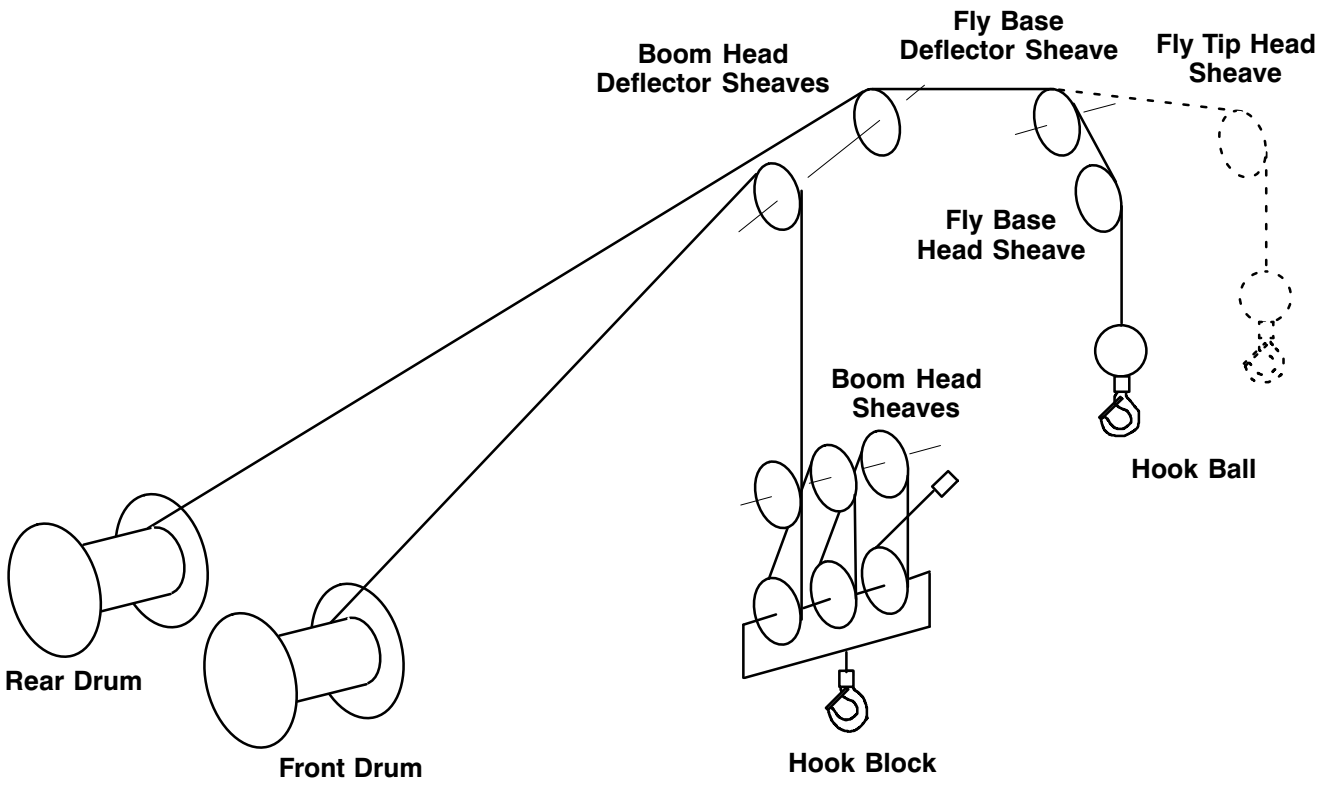
14 Parts

CAUTION

These reevings are only applicable for maximum rated capacity lifts that require additional parts of line to maintain the required wire rope safety factor.

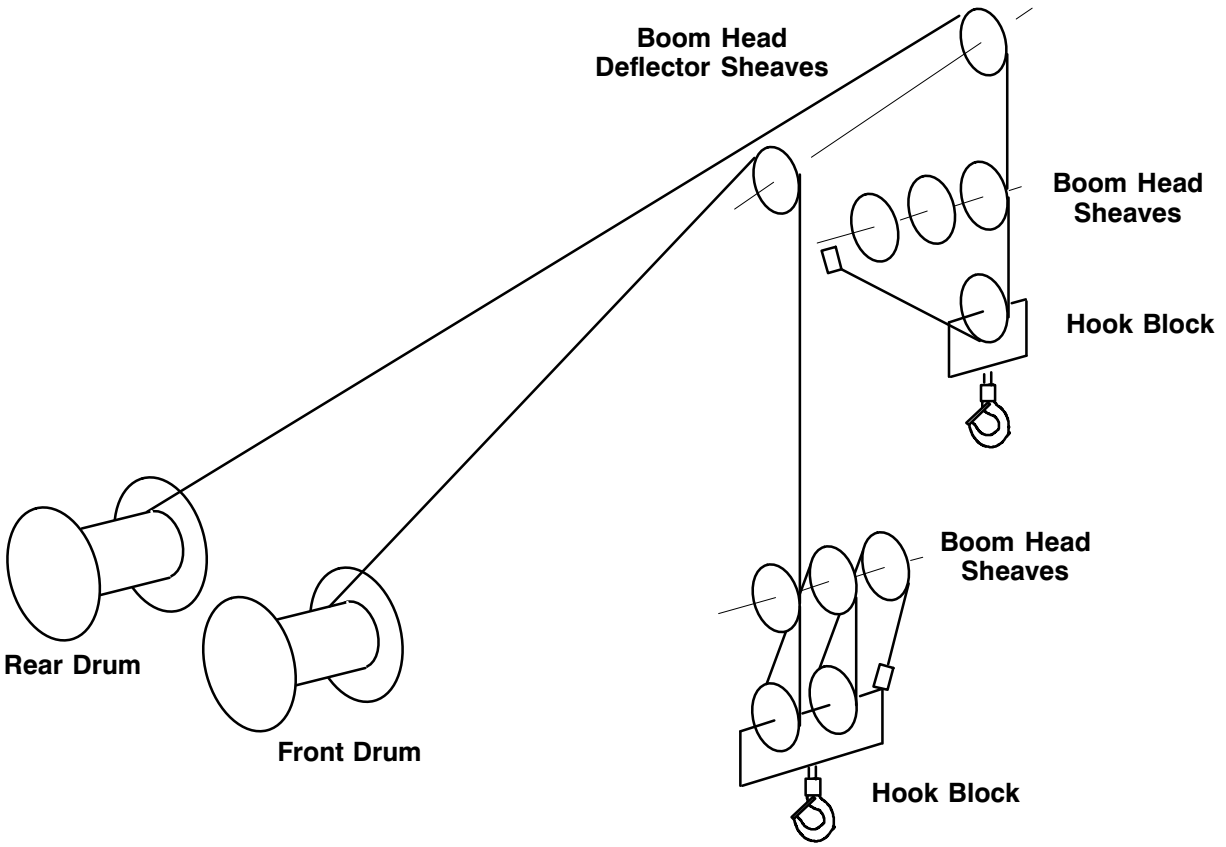
Notes: Some of the diagrams shown may not apply to this particular crane.
Reeve the wire rope to equalize the loading on the boom head sheaves.
Do not use a swivel at the dead end of a multi-part reeving.
Refer to Section 4 of this Operator's Manual for positioning of adjustable sheave.
Reeving shown is typical.

Figure 5–23
Wire Rope Reeving Diagrams



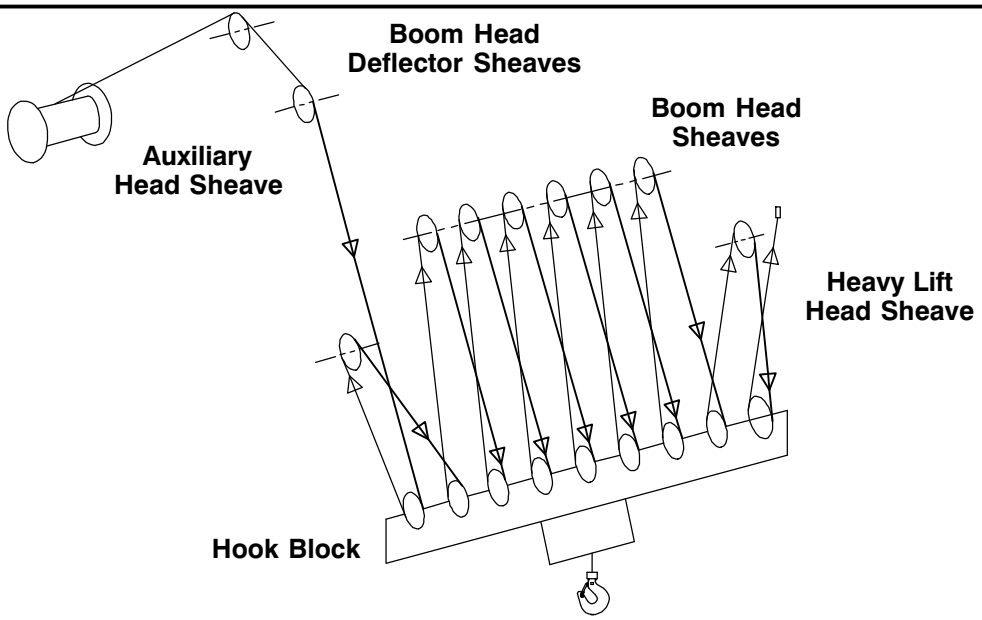
Note: Reeving shown is typical. Either drum may be reeved over boom sheaves or fly sheave.

Figure 5—24
Wire Rope Reeving Diagrams



Notes: **Some of the diagrams shown may not apply to this particular crane.**
Reeve the wire rope to equalize the loading on the boom head sheaves.
Do not use a swivel at the dead end of a multi-part reeving.
Refer to Section 4 of this Operator's Manual for positioning of adjustable sheave.
Reeving shown is typical.
When reeving wire rope for a two load line lift, if more than two parts of line are to be used, ensure that one of the lines ends on the hook block.

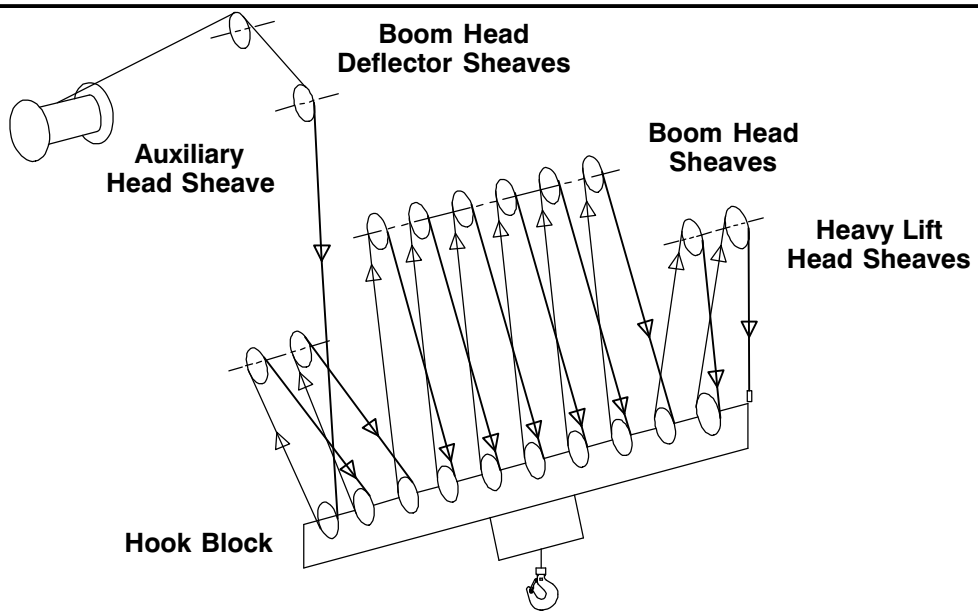
Figure 5–25
Two Load Line Lifting Wire Rope Reeving Diagram



CAUTION

These reevings are only applicable for maximum rated capacity lifts that require additional parts of line to maintain the required wire rope safety factor.

Figure 5—26
18 Parts of Line Heavy Lift Wire Rope Reeving Diagram



CAUTION

These reevings are only applicable for maximum rated capacity lifts that require additional parts of line to maintain the required wire rope safety factor.

Figure 5—27
21 Parts of Line Heavy Lift Wire Rope Reeving Diagram

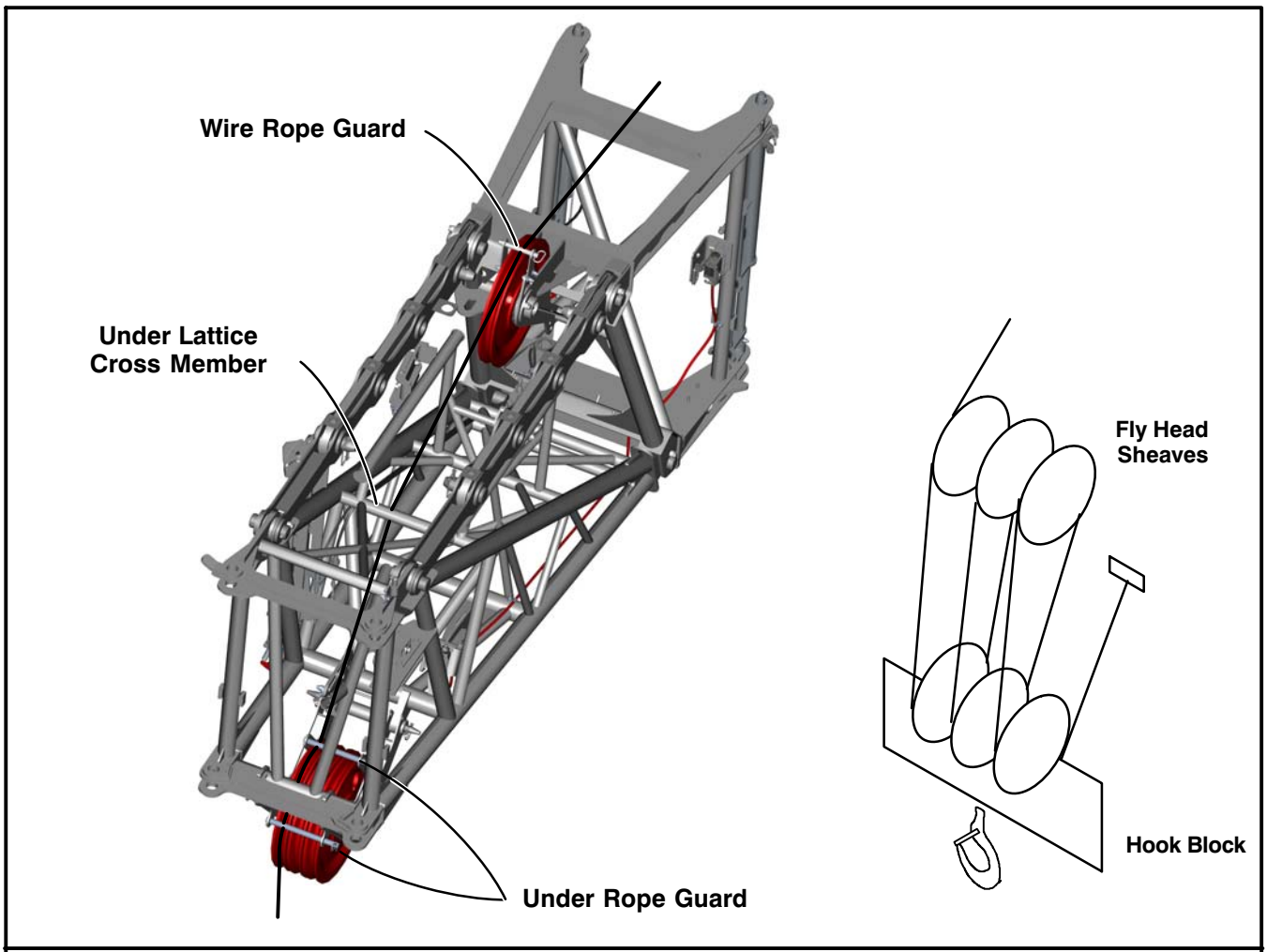


Figure 5–28
12 Ft (*3.65m*) Fly Section Wire Rope Reeving

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.

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 the 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 – action, single stage hydraulic cylinder with integral holding valves.

Boom

- 42.7 – 197.3 ft *(13 – 60.1m)* six section boom
- Integral boom dolly connection
- Three pinned positions of 0%, 50%, and 100% on each boom section
- Mechanical boom angle indicator
- Wind speed indicator
- Seven boom extend modes (EM1 – EM7), controlled from the operator's cab, provide superior capacities by varying the extension of the telescoping sections:
  - EM1 extends to 197.3 ft *(60.1m)*
  - EM2 extends to 182.7 ft *(55.7m)*
  - EM3 extends to 165.9 ft *(50.6m)*
  - EM4 extends to 150.9 ft *(46.0m)*
  - EM5 extends to 136.3 ft *(41.6m)*
  - EM6 extends to 121.8 ft *(37.1m)*
  - EM7 extends to 106.7 ft *(32.5m)*
- Maximum tip height for each extend mode is:
  - EM1 is 207 ft *(63.1m)*
  - EM2 is 192.6 ft *(58.7m)*
  - EM3 is 176 ft *(53.7m)*
  - EM4 is 161.2 ft *(49.1m)*
  - EM5 is 146.8 ft *(44.8m)*
  - EM6 is 132.4 ft *(40.4m)*
  - EM7 is 117.6 ft *(35.9m)*

Boom Wear Pads

- Wear pads with Teflon inserts that self – lubricate the boom sections, inserts are universal for the boom.
- Bottom rear wear pads are universal for all boom sections.
- Bottom front wear pads are common for base, T1, and T2 boom sections.
- Bottom front wear pads are common for T3 and T4 boom sections.
- Top front wear pads are universal for all boom sections.
- Top rear wear pads are common for T2, T3, T4, and T5 boom sections.

Boom Head

- Six 16.5 in *(41.9cm*) root diameter nylon sheaves to handle up to 14 parts of line with auxiliary lifting sheave
- Easily removable hinged wire rope guards
- Rope dead end lugs on either side of the boom head
- Boom head is designed for quick—reeve of the hook block

Boom Elevation

- One hydraulic cylinder with integral holding valve
- Boom elevation: —2.1° to 81°

Auxiliary Lifting Sheave — Optional

- 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
- Can be stored on right side of the boom without removal

Hook Blocks and Balls — Optional

- 27 ton *(24.5t)* 1 sheave quick—reeve hook block with safety latch
- 60 ton *(54.4t)* 3 sheave quick—reeve hook block with safety latch
- 88 ton *(79.8t)* 5 sheave quick—reeve hook block with safety latch
- 110 ton *(99.8t)* 6 sheave quick—reeve hook block with safety latch
- 176 ton *(159.6t)* 10 sheave quick—reeve twin hook block with safety latch
- 10 ton *(9.07t)* swivel hook ball with safety latch
- 8.5 ton *(7.7t)* swivel hook ball with safety latch

Fly — Optional

- 10-32.5-55 ft *(3-9.9-16.8m)* three piece bi-fold lattice fly, stowable, offsettable to 0°, 15°, 30°, and 45°. Maximum tip height is 261.9 ft *(79.8m)*. Minimum of 10,800 lb *(5mt)* of counterweight required.
- 10-32.5-55 ft *(3-9.9-16.8m)* three piece bi-fold lattice fly, stowable hydraulically offsettable to 0° through 45°. Maximum tip height is 261.9 ft *(79.8m)*. Minimum of 10,800 lb *(5mt)* of counterweight required.

Fly Extensions — Optional

- One 18 ft *(5.5m)* lattice extension to be mounted between the boom head and fly options. Maximum tip height of 279.6 ft *(85.2m)*. Minimum of 37,200 lb *(17mt)* of counterweight required.
- Two 18 ft *(5.5m)* lattice extensions to be mounted between the boom head and fly options. Maximum tip height of 297.4 ft *(90.6m)*. Minimum of 37,200 lb *(17mt)* of counterweight required.
- Three 18 ft *(5.5m)* lattice extensions to be mounted between the boom head and fly options. Maximum tip height of 315.1 ft *(96.1m)*. Minimum of 37,200 lb *(17mt)* of counterweight required.

■ Upper 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
- Sliding right side window and pop–out rear window for ventilation
- Six way adjustable, cushioned seat with seat belt and storage compartment
- 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 Bluetooth radio

Armrest Controls – Two dual axis electronic joystick controllers or optional single axis electronic controllers for:

- Swing hoist
- Boom hoist
- Main (front) winch
- Auxiliary (rear) winch – optional
- Winch high/low speed switch(es)
- Warning horn button
- Swing park brake switch
- Engine throttle lock switch
- Engine set/resume switch
- Cab tilt
- Counterweight removal
- Hydraulic offset fly – optional

Foot Controls

- Boom telescope
- Swing brake
- Engine throttle

Upper Right Console – Controls and indicators for:

- Engine ignition
- Engine stop
- Function lockout
- Front windshield wiper optional and washer
- Cab lights and upper frame lights
- Horn
- Dome light with switch
- E–stop switch
- Radio
- DRI on/off selection
- HVAC controller
- 360 swing lock –
- Boom floodlights
- Rotating beacon/Strobe light
- Top hatch wiper washer
- Winch(es) disable
- Engine indicator gauge

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

Diagnostic Center – Located on the right rear wall behind the seat.

- Engine diagnostic
- RCL CANBUS diagnostic
- Boom CANBUS diagnostic
- Outrigger 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 percent 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
  - Outrigger position sensing
  - Drum rotation direction indication
  - Third wrap indicator – optional
  - Diagnostics
  - Counterweight detection system
  - Operator settable alarms (include):
    - Maximum and minimum boom angles
    - Maximum tip height
    - Maximum boom length
    - Swing left/right positions
    - Operator defined area (imaginary plane)
- **Cab Instrumentation**
  - Tachometer
  - Engine water temperature
  - Fuel level
  - Hydraulic oil temperature
  - Stop engine
  - Check engine
  - Wait to start
  - Swing park brake light
  - Engine speed
  - Engine oil pressure
  - Battery voltage
  - Fuel rate (gal/hr)
  - Engine load
  - Engine Diagnostics
  - Diesel exhaust fluid (DEF) level
  - Engine air filter high restriction light
  - Regeneration light
  - Regeneration inhibit switch
  - Regeneration initiate switch
  - High exhaust temperature light
  - Regeneration disabled light

- **Telematics** – Cellular based data logging and monitoring system that provides:
  - Location and operational settings
  - Routine maintenance
  - Crane and engine monitoring
  - Diagnostic and fault codes

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.

■ Swing

Motor/Planetary – Two bi-directional hydraulic swing motors mounted to planetary reduction units for 360° continuous smooth swing at 1.5 rpm.

Swing Park Brake – 360°, electric over hydraulic, (spring applied/hydraulic released) multi–disc brake mounted between the speed reducer and the motor. Operated by a switch in the operator's cab.

Swing Brake – 360°, foot operated, hydraulic.

Swing Lock – Two – position swing lock (boom over the front or rear) operated from the operator's cab.

360° Positive Swing Lock — Optional – Meets New York City requirement.

■ Central Lubrication System

Automated lubrication unit that injects grease into the turntable bearing, house lock (2–position). Activated by a timer on the ignition switch.

■ Electrical

Swing Alarm – Audio/Visual warning device signals when the upper is swinging.

Lights

- Two LED working lights on the front of the cab
- Work Lighting Package
  Includes six (6) LED lights
  - Working light on top of the cab
  - Right side of superstructure facing forward
  - Left upper work platform
  - Left & right sides of superstructure facing down
- Two amber strobe beacons on top of the upper rear winches
- Boom floodlight – Dual
- Boom floodlight – High intensity wirelessly remote controlled

Power Panel – Sealed power panel containing:

- Fuses, circuit breakers, relays, diodes, resistors
- Control modules

■ Hydraulic System

Main Pumps

- One piston pump for boom hoist, telescope, and main and auxiliary winches
- One pump for swing gear
- One piston pump for counterweight removal, hydraulic fly option, cab tilt, and fly storage
- One gear pump for cab A/C

Hydraulic Reservoir – 161 gal *(609L)* capacity equipped with sight level gauge and magnetic drain plug.

Filtration

- One, 5 – micron filter inside hydraulic reservoir, accessible for easy replacement with an in–cab indicator light.
- One, 3 - micron filter for the pilot circuit located in the main valve area with an in-cab indicator light.

Load Holding Valves – Boom extend cylinder and boom hoist cylinder are equipped with load holding valves to provide load lowering and prevents accidental load drop when hydraulic power is suddenly reduced.

Hydraulic Oil Cooler – Mounted on left side. Removes heat from the hydraulic oil.

Boom Hoist Float Valves – For transporting the boom over the rear of the crane with a boom dolly. Allows hydraulic oil within the boom hoist cylinder to flow between piston side and case side.

Swing Brake Release Valve – For transporting the boom over the rear of the crane with a boom dolly. Holds the 360° swing park brake in the released position allowing free rotation of the upper structure.

■ Pump Drive

All pumps are mechanically driven by the diesel engine in the lower.

■ Load Hoist System

Load Hoist Performance

Main (Front) and Auxiliary (Rear) Winches — 3/4 in (*19mm*) Rope										
	Maximum Line Pull		Normal Line Speed		High Line Speed		Layer		Total	
Layer	lb	*kN*	ft/min	*m/min*	ft/min	*m/min*	ft	*m*	ft	*m*
1	23,622	*105.1*	169	*51.5*	271	*82.6*	144	*43.9*	144	*43.9*
2	21,606	*96.1*	184	*56.1*	296	*90.2*	157	*47.9*	300	*91.4*
3	19,908	*88.6*	200	*61.0*	321	*97.8*	170	*51.8*	471	*143.6*
4	18,457	*82.1*	216	*65.8*	347	*105.8*	184	*56.1*	654	*199.3*
5	17,203	*76.5*	232	*70.7*	372	*113.4*	197	*60.0*	852	*259.7*
6	16,109	*71.7*	247	*75.3*	397	*121.0*	210	*64.0*	1,062	*323.7*

Wire Rope Application		Diameter		Type	Maximum Permissible Load	
		in	*mm*		lb	*kN*
Main	Standard	3/4	*19*	37x7 rotation resistant — right regular lay (Type KC)	16,000	*71.18*
	Optional	3/4	*19*	34x7 rotation resistant — right regular lay (Type YB)	16,000	*71.17*
	Optional	3/4	*19*	35x7 rotation resistant — right regular lay (Type CC)	17,160	*76.33*
Auxiliary	Standard	3/4	*19*	37x7 rotation resistant — right regular lay (Type KC)	16,000	*71.18*
	Optional	3/4	*19*	34x7 rotation resistant — right regular lay (Type YB)	16,000	*71.17*
	Optional	3/4	*19*	35x7 rotation resistant — right regular lay (Type CC)	17,160	*76.33*

Main (Front) and Optional Auxiliary (Rear) Winches

- Axial piston, full and half displacement (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 followers — optional
- Drum rotation indicators
- Drum diameter: 15 in (*38.1cm*)
- Rope diameter: 3/4 in (*19mm*)
- Rope length:
  - Main (Front) 900 ft (*274.3m*)
  - Auxiliary (Rear) 670 ft (*204.2m*) or 900 ft (*274.3m*) — optional
- Maximum rope storage: 1,062 ft (*323.7m*)
- Terminator style socket and wedge
- Last layer and third wrap function kick-out

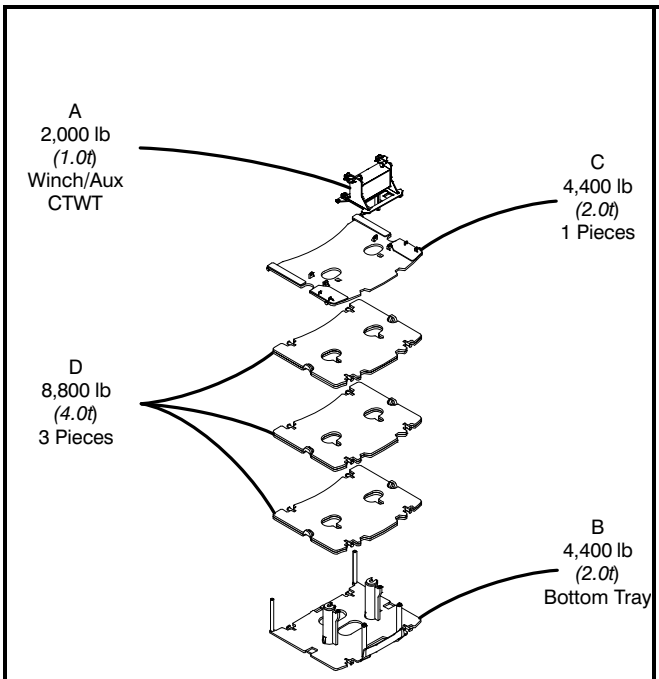
■ Counterweight

Standard — Total of 37,200 lbs *(17.0t)* of total counterweight consisting of auxiliary winch or 2,000 lb (*1.0t*) counterweight and four hydraulically removable counterweights. Assembled and disassembled by hydraulic cylinders controlled from the operator's cab with capacities for:

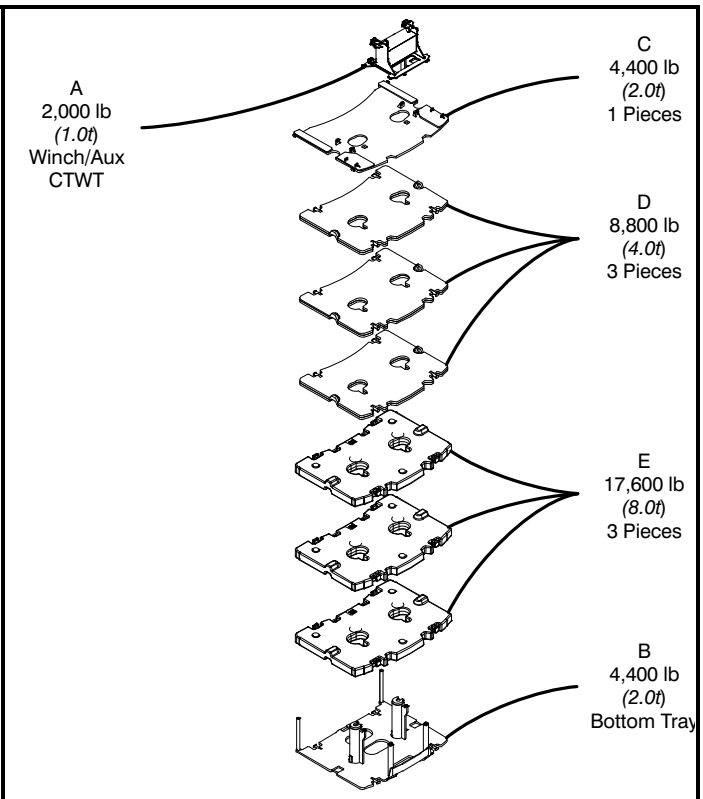
- 0 lb (*0t*) or 2,000 lb (*1.0t*) counterweight
- 6,400 lb (*3.0t*) counterweight
- 10,800 lb (*5.0t*) counterweight
- 15,200 lb (*7.0t*) counterweight
- 19,600 lb (*9.0t*) counterweight
- 24,000 lb (*11.0t*) counterweight
- 28,400 lb (*13.0t*) counterweight
- 32,800 lb (*15.0t*) counterweight
- 37,200 lb (*17.0t*) counterweight

Optional — 52,800 lb (*24.0t*) in addition to standard counterweight for a total of 90,000 lb (*41.0t*) counterweight for additional capacities for:

- 41,600 lb (*19.0t*) counterweight
- 46,000 lb (*21.0t*) counterweight
- 54,800 lb (*25.0t*) counterweight
- 63,600 lb (*29.0t*) counterweight
- 72,400 lb (*33.0t*) counterweight
- 81,200 lb (*37.0t*) counterweight
- 90,000 lb (*41.0t*) counterweight



Standard



Optional

Counterweight Packages			37,200 lb *(17.0t)* — Standard								
			90,000 lb *(41.0t)* — Optional								
Counterweight Modules			**A** 2,000 lb *(1.0t)*	**B** 4,400 lb *(2.0t)*	**C** 4,400 lb *(2.0t)*	**D** 8,800 lb *(4.0t)*	**D** 8,800 lb *(4.0t)*	**D** 8,800 lb *(4.0t)*	**E*** 17,600 lb *(8.0t)*	**E** 17,600 lb *(8.0t)*	**E** 17,600 lb *(8.0t)*
Counterweight Usage Configurations	0/A	0/2,000 lb *(0/1.0t)*	X								
	A,B	6,400 lb *(3.0t)*	X	X							
	A,B,C	10,800 lb *(5.0t)*	X	X	X						
	A,B,D	15,200 lb *(7.0t)*	X	X		X					
	A,B,C,D	19,600 lb *(9.0t)*	X	X	X	X					
	A,B,E	24,000 lb *(11.0t)*	X	X					X		
	A,B,C,D,D	28,400 lb *(13.0t)*	X	X	X	X	X				
	A,B,D,E	32,800 lb *(15.0t)*	X	X		X			X		
	A,B,C,D,E	37,200 lb *(17.0t)*	X	X	X	X			X		
	A,B,E,E	41,600 lb *(19.0t)*	X	X					X	X	
	A,B,C,D,D,E	46,000 lb *(21.0t)*	X	X	X	X	X		X		
	A,B,C,D,E,E	54,800 lb *(25.0t)*	X	X	X	X			X	X	
	A,B,C,D,D,E,E	63,600 lb *(29.0t)*	X	X	X	X	X		X	X	
	A,B,C,D,E,E,E	72,400 lb *(33.0t)*	X	X	X	X			X	X	X
	A,B,C,D,D,E,E,E	81,200 lb *(37.0t)*	X	X	X	X	X		X	X	X
	A,B,C,D,D,D,E,E,E	90,000 lb *(41.0t)*	X	X	X	X	X	X	X	X	X

* Counterweight E Can be used in place of two D weights.

Carrier

■ General

- 9.02 ft (*2.75m*) wide (445/95R25 tires)
- 28 ft 9 in (*8.76m*) wheel base (centerline of first axle to centerline of fifth axle)
- **Frame** – Box – type, torsion resistant, welded construction made of high tensile steel. Equipped with front and rear tie – down lugs and four carrier access ladders; two fixed, and two folding.

■ Outriggers

Boxes – Two double box, front and rear welded to the carrier frame

Beams and Jacks – Four dual stage beams hydraulically controlled from both sides of the crane or wireless rigging remote control. Jacks with integral check valves, hydraulically controlled from both sides of the crane or the wireless rigging remote control.

V–CALC – Variable confined area lifting capabilities that are incorporated into Pulse 2.0 display allowing multiple outrigger configurations of fully extended, intermediate, and fully retracted in 81 combinations, with live on screen working radii, utilizing 360° charts and swing arrest.

Pontoons

- **Main** – Four stow'n go, 22.25 in (*56.52cm*) square steel pontoons with a contact area of 385 in^2 (*2 483.8cm^2*) can be stored for road travel under the outrigger boxes

Outrigger Work Station Floodlights – LED Flood lights are mounted at each outrigger beam.

Jack Reaction

- **Main** – 189,800 lb (*844.3kN*) force and 492 psi (*3 392.2kPa*) ground bearing pressure. Consult factory for base rating ground bearing pressure information.

■ Steering and Axles

- Full integral master gear/relay arm steering system provides hydraulic assisted steering with mechanical link between steering wheel and wheels.

On Highway (Primary) Steering Mode – Axles 3, 4, and 5 will automatically steer in combination with axles 1 and 2 based on travel speed:

On–Highway (Primary)			
Speed	Less than 18.6 mph *(30km/h)*	18.6-31 mph *(30-50km/h)*	Greater than 31 mph *(50km/h)*
Axle 1	Steered	Steered	Steered
Axle 2	Steered	Steered	Steered
Axle 3	Steered	Locked	Locked
Axle 4	Steered	Locked	Locked
Axle 5	Steered	Steered	Locked

Off Road (Auxiliary) Steering Modes – Four independent modes consisting of:

- **All Wheel**: Axles 1, 2, 3, 4, and 5
- **Diagonal (Crab)**: Axles 1, 2, 3, 4, and 5
- **Independent Rear**: Axles 3, 4, and 5
- **Drive Away From Walls**: Temporary crab

The front, all wheel, and diagonal (crab) steering modes are controlled from the steering wheel and are selected by controls in the driver's cab. Switches in the driver's cab control the rear steering mode through the steering module display.

- **Emergency Steering** – A pump is flange-mounted to the transfer case and provides hydraulic pressure to the steering circuit as long as the crane is in motion
- **Drive** – 10 x 8 for on/off–highway travel
- **Axle 1** – Steered, driven
- **Axle 2** – Steered, driven
- **Axle 3** – Steered
- **Axle 4** – Steered, driven
- **Axle 5** – Steered, driven
- **Inter–Axle Differential Lock** – Traction aiding device that locks axles 1, 2, 4, and 5. Operated by a switch in the carrier cab.
- **Transverse (Cross–Axle) Differential Locks** – Traction aiding device that locks differentials within axles 1, 2, 4, and 5. Operated by a momentary switch in the carrier cab.

■ Suspension

Hydro – pneumatic, lockable with level adjustment and automatic ride height leveling. All axles have longitudinal and transverse trailing arms with leveling adjustment and lockable cylinders. The carrier can be raised, lowered, and tilted side to side by controls in the carrier cab that adjust the suspension cylinders to aid in machine setup.

- Cylinder stroke: –4.5 in *(–11.43cm)*/+3.5 in *(8.89cm)* at ride height

■ Ground Control Outrigger/Suspension Controls

Environmentally sealed and ergonomically positioned, control stations located on both sides of the carrier with controls for crane operations including:

- Start and stop carrier engine
- Throttle carrier engine up and down
- Raise suspension on outriggers
- Outrigger operation including:
  - Extends and retracts two beams together
  - Extends and retracts all main jacks together
  - Automatic leveling on outriggers
- Outrigger lighting
- Bubble level

■ Tires and Wheels

Standard – Ten (single) 525/80R25 tires on aluminum disc wheels
- Lug nut torque indicator
- Tire pressure and temperature monitoring

Optional – Ten (single) 445/95R25 tires on aluminum disc wheels
- Tire inflation kit – optional
- Spare tires and wheels – optional

■ Brakes

Service – Air anti–lock (ABS) braking system. Disc brakes on all wheel ends. Dual circuit compressed air system with air dryer.

Parking/Emergency – Spring loaded type, acting on 2nd, 3rd, 4th, and 5th axles automatically apply when air pressure drops below 40 psi (*275kPa*) in both circuits.

Intarder – Hydrodynamic driveline brake that is integral to the transmission. Activated by a switch in the carrier cab and controlled by paddle shifters on the steering wheel.

Traction Control – ABS activated traction control to limit wheel slip of axles 1, 2, 4, and 5.

■ Central Lubrication System

Automated lubrication unit that injects grease into the steering gear arms, steering knuckles, axle king pins, and suspension cylinders. Activated by a timer on the ignition switch.

■ Electrical

Battery – Four batteries provide 24 volt starting and operation, easily accessible battery disconnects, and battery jumping posts

Lights
- Front lighting includes two main daytime running/ headlights, two high beam lights, two LED parking/ directional indicators, and five LED cab marker lights
- Side lighting includes four parking/directional indicators per side
- LED rear lighting includes two parking/directional indicators, two parking/brake lights, two reverse lights, three marker lights, and a license plate light
- Other equipment includes hazard/warning system, cab LED light, instrument panel light, signal horn, and two outrigger LED lights on each side
- Two amber strobe beacon behind the cab

■ Transmission

Main Transmission – Automated – ZF TraXon (no clutch pedal) manual transmission with 12 forward gears and 2 reverse gears.

2–Speed Transfer Case – Air actuated manual transmission with high/low/neutral range.

■ Fuel Tank

- One 117 gal (*442.9L*) capacity aluminum fuel tank
- One 10 gal (*37.8L*) capacity diesel exhaust fluid (DEF) plastic tank

■ Engine

Specification	Cummins QSX 15
Emission Compliance Level:	Tier 4F / Stage V
Maximum Allowable Sulfur Content of Fuel (PPM):	15
Numbers of cylinders	6
Cycle	4
Bore and Stroke: inch (*mm*)	5.39 x 6.65 (*136.9x169*)
Piston Displacement: in^3 (cm^3)	912 (*14 945*)
Max. Brake Horsepower: hp (*kW*)	548 (*409*) @ 2,000 rpm 580 (*432*) @ 1,800 rpm
Peak Torque: ft lb (*Nm*)	1,950 (*2 644*) @ 1,400 rpm
Alternator: volts – amps	24 – 200
Crankcase Capacity: qt (*L*)	48 (*45.4*)

- Cruise control
- Three stage engine compression brake
- Thermostatically controlled, hydraulically driven radiator fan
- 120 volt engine block heater
- Ether injection system – optional
- Emergency shut–off valve – optional
- Spark arrestor – optional
- Air shut–off valve – optional
- Spark Arrestor – optional

■ Hydraulic System

Main Pumps
- Two section fixed displacement gear pump for 1st and 2nd axle steering circuits, suspension, outriggers, and 3rd and 4th axle steering circuits
- One fixed displacement gear pump for 5th axle steering circuit
- One variable displacement piston pump for cooling fan circuit

Hydraulic Reservoir – 43 gal *(163L)* capacity equipped with sight level gauge.

Filtration – One 5 micron filter inside hydraulic reservoir. Accessible for easy filter replacement.

■ Pump Drive

- Engine fan, outriggers, steering, and suspension pumps mounted to the engine
- Rear steering pump mounted to back of air compressor
- Ground driven pump mounted to back of transfer case

■ Carrier Speeds and Gradeability

ZF TraXon Transmission		Speed				Gradeability (@ peak torque Except Creep @ Idle)	
Gear	Ratio	High Range (0.75)		Low Range (3.12)		% Grade	
		mph	*km/h*	mph	*km/h*	Min.	Max.
12th	0.77	55.00	*88.51*	15.88	*25.55*	1.29	9.85
11th	1.00	50.98	*82.04*	12.26	*19.73*	2.25	12.99
10th	1.30	39.19	*63.06*	9.42	*15.16*	3.37	17.12
9th	1.68	30.28	*48.73*	7.28	*11.71*	4.72	22.37
8th	2.19	23.31	*37.51*	5.60	*9.01*	6.43	29.25
7th	2.83	18.01	*28.98*	4.33	*6.97*	8.59	38.06
6th	3.53	14.46	*23.27*	3.48	*5.60*	10.90	47.56
5th	4.57	11.17	*17.97*	2.68	*4.31*	14.33	61.76
4th	5.78	8.59	*13.82*	2.06	*3.31*	18.85	80.52
3rd	7.69	6.63	*10.67*	1.59	*2.56*	24.61	104.44
2nd	9.98	5.11	*8.22*	1.23	*1.98*	30.41	128.52
1st	12.92	3.94	*6.34*	0.95	*1.53*	30.32	128.12
Reverse (1)	12.03	4.24	*6.82*	1.02	*1.64*	30.35	128.26
Reverse (2)	9.29	5.49	*8.83*	1.32	*2.12*	29.89	126.37
1st @ 700 rpm	12.92	1.31	*2.11*	0.32	*0.52*		
Reverse (1) @ 700 rpm	12.03	1.41	*2.27*	0.34	*0.55*		
Reverse (2) @ 700 rpm	9.29	1.83	*2.95*	0.44	*0.71*		
Based on a gross vehicle weight of 135,000 lb (*61 235kg*) using 525/80R25 tires							

■ Lower Cab and Controls

Environmental Cab – Fully enclosed, dual occupancy cab of aluminum constructed with acoustical insulation. Equipped with:
- Tinted and tempered glass windows
- Power left and right door windows for ventilation
- Intermittent windshield wiper and washer
- Six way adjustable and air suspended heated and ventilated driver's seat with seat belt
- Passenger seat with integrated storage
- Two heated and electrically adjustable side view mirrors with passenger infrared camera
- Engine dependent warm–water heater with air ducts for chest/face, foot, and windshield defroster
- Adjustable sun visor
- LED dome lights
- Fire extinguisher

Air Conditioning – Integral with cab heating system utilizing the same ventilation outlets
- Automatic temperature control

Overhead Console – Located above the sun visor
- AM/FM Bluetooth radio
- Dome light switch
- 12V accessory power outlet

Camera Display – Integrated with right side LCD display
- Displays right side of machine
- Displays rear view
- Displays dolly rear view

Cab Instrumentation – Ergonomically positioned instrumentation for driving including:
- Digital speedometer with odometer, hour meter, trip meter, clock and outside temperature.
- Tachometer
- Fuel and diesel exhaust fluid (DEF) level with warning indicator

Indicator Lights
- Regeneration inhibit
- Check engine
- Stop engine
- Exhaust regeneration
- High exhaust temperature
- Engine air filter high restriction light
- Cruise
- Park brake
- Tire pressure warning
- ABS
- Trailer ABS
- Steer computer
- Steer pump
- Steer hydraulic oil level
- Intarder level
- Engine brake level
- Transaxle (cross–axle) differential lock
- Inter–axle differential lock
- Transfer case
- Travel mode
- Ride height
- Diesel Exhaust Fluid (DEF)
- Seat belt
- Traction control
- Hill hold start

Dash Mounted Controls For:
- Carrier lights
- Console dimmer switch
- Remote mirror control switches
- Mirror heating switch
- Cab heater/air conditioning switch
- Fresh/Recirculation air switch
- Park brake air valve
- Trailer brake air valve
- Carrier engine ignition switch

Dash Mounted Indicators For:
- Turn signal indication
- High beam headlights

Right Side LCD Display – Ergonomically positioned on the right of driver's dash panel, digital instrumentation and indicators for crane operations including:
- Transmission digital readout
- **Gauges**
  - Engine water temperature
  - Engine oil pressure

Diagnostic Screens
- Engine
- After treatment
- Suspension/Outriggers
- Intarder
- Tire Pressure Monitoring Screen (TPMS)

Right Side Console – Controls and indicators for:
- Transmission gear shifting
- Steering electronic control panel
- Auxiliary transmission range selector switch
- Intarder on/off switch
- Diesel particulate filter switch
- Regeneration inhibit switch
- Fan override switch
- ABS Traction control switch
- Transaxle (cross–axle) differential lock switch with indicator light
- Inter–axle differential lock switch with indicator light
- Travel mode switch
- Front axles (axles 1 & 2) suspension height switch
- Rear axles (axles 3–5) suspension height switch
- Ride height switch
- Hill hold disable switch

Steering Column/Wheel Controls For:
- Turn signal switch
- High beam switch
- Tilt/telescope adjustments
- Cruise Control
- Engine brake control
- Warning horn
- Hazard light switch
- Intarder brake control
- Intermittent windshield wiper and washer

Foot Controls For:
- Carrier service brakes
- Engine throttle

Carrier Fuse & Relay Center – Located inside cab passenger dash contains:
- Fuses and relays for carrier functions

Diagnostic Ports – Located under dash to left of steer column:
- OBD
- Transmission
- CANBUS

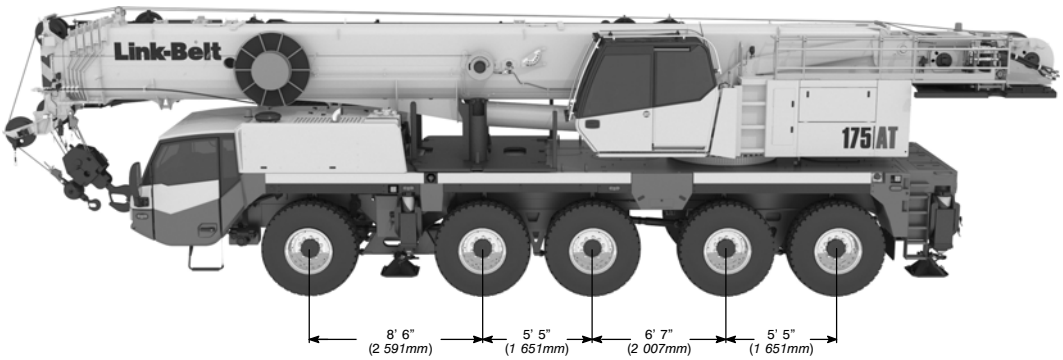
■ Additional Equipment

Standard:
- Aluminum full deck fenders
- Three storage box on rear carrier deck
- Air hose connection ports
- Clearance flags
- Front and rear anchor shackles
- Pneumatic and electrical quick disconnect connections mounted to the rear for trailer or boom dolly brakes and lights

Optional:
- Rear mounted pintle hook

Transport Scenarios — Axle Loads

Machine Configuration:
Base crane equipped with rear pintle hook, pneumatic and electrical connectors for trailer or boom dolly, hoist drum followers (main and auxiliary winch), 3—piece hydraulic offsettable bi—fold 55' (*16.7m*) lattice fly stowed, auxiliary winch with 670 ft (*204.2m*) KC wire rope, 27 ton (*24.5mt*) 1—sheave hook block at front bumper, 10 ton (*9.1mt*) hook ball at front bumper, full tank of fuel, and 250 lb driver in cab, 250 lb passenger, and storage boxes at maximum capacity (500 lb).

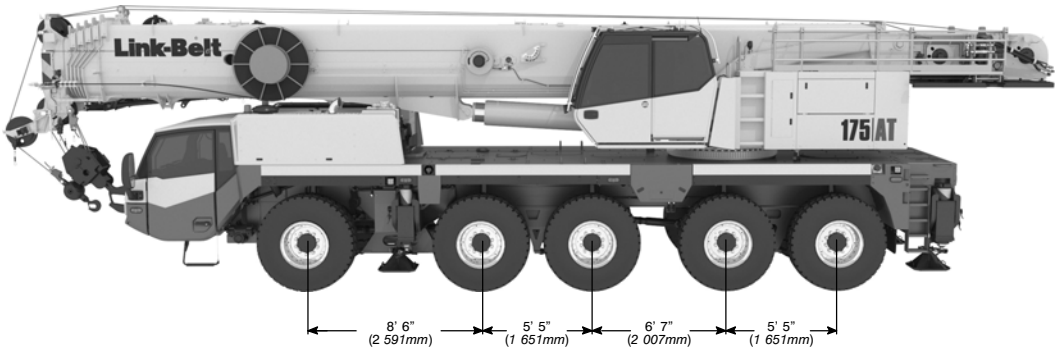


Axle 1	Axle 2	Axle 3	Axle 4	Axle 5
26,647 lbs	26,718 lbs	25,614 lbs	26,270 lbs	26,119 lbs
12.1mt	*12.1mt*	*11.6mt*	*11.9mt*	*11.8mt*

10,800 lbs (5 mt)

Upper
4,400 lbs
2.0mt
Deck
4,400 lbs
2.0mt

GVW
131,158 lbs
59 492kg

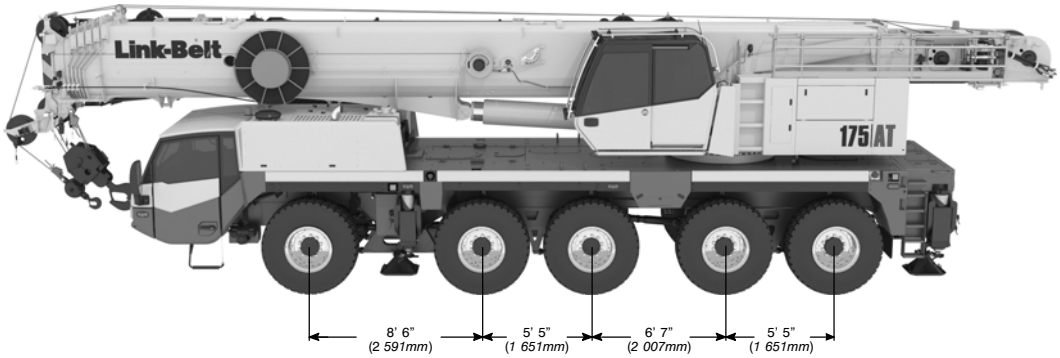


Axle 1	Axle 2	Axle 3	Axle 4	Axle 5
24,969 lbs	25,040 lbs	25,231 lbs	25,887 lbs	25,736 lbs
11.3mt	*11.4mt*	*11.4mt*	*11.7mt*	*11.7mt*

6,400 lbs (3 mt)

Upper
4,400 lbs
2.0mt
Deck
0 lbs
0mt

GVW
126,863 lbs
57 544kg



Axle 1	Axle 2	Axle 3	Axle 4	Axle 5
26,864 lbs	26,935 lbs	22,479 lbs	23,135 lbs	22,984 lbs
12.2mt	*12.2mt*	*10.2mt*	*10.5mt*	*10.4mt*

2,000 lbs (1 t)

Upper
0 lbs
0mt
Deck
0 lbs
0mt

GVW
122,397 lbs
55 518kg

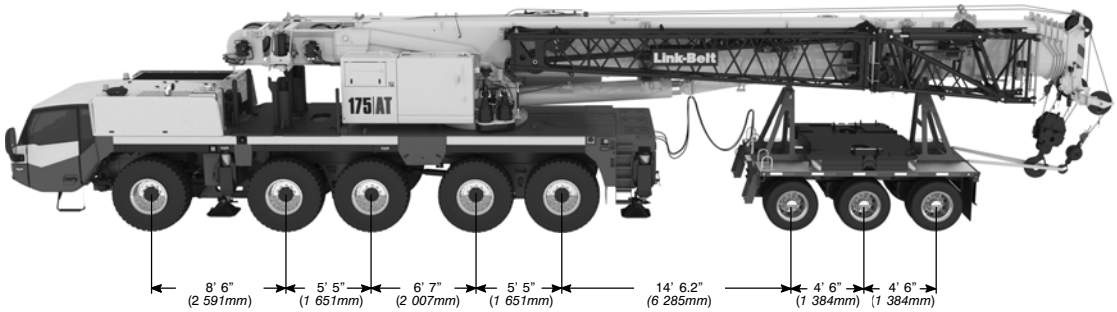
Axle Load Transfer Option Substitution (Boom Over the Front)		Axle 1	Axle 2	Axle 3	Axle 4	Axle 5
Remove 55' (*16.8m*) hyd. Offsettable, three-piece (bi-fold) lattice fly	lb *mt*	−2,737 *−1.24*	−2,737 *−1.24*	439 *0.20*	439 *0.20*	439 *0.20*
10 ft (*3.0m*) hyd. Offsettable lattice fly - stowed in place of three- piece 55' (*16.8m*) fly	lb *mt*	−698 *−0.32*	−698 *−0.32*	159 *0.07*	159 *0.07*	41 *0.02*
10 - 32.5 ft (*3.0 - 9.9m*) hyd offsettable, two -piece lattice fly - stowed in place of stowed three-piece 55' (*16.8m*) fly	lb *mt*	−261 *−0.12*	−261 *−0.12*	57 *0.03*	57 *0.03*	57 *0.03*
Remove auxiliary winch with 670 ft (*204.2m*) of wire rope and hoist drum follower	lb *mt*	1,441 *0.65*	1,441 *0.65*	−1,939 *−0.88*	−1,939 *−0.88*	−1,939 *−0.88*
60 Ust (54.4mt) 3-sheave hook block at front bumper {replaces 27 Ust (*24.5mt*) 1-sheave hook block}	lb *mt*	522 *0.24*	523 *0.24*	−164 *−0.07*	−164 *−0.07*	−164 *−0.07*
88 USt (79.8mt) 5-sheave hook block at front bumper {replaces 27 Ust (*24.5mt*) 1-sheave hook} block}	lb *mt*	1,060 *0.48*	1,060 *0.48*	−333 *−0.15*	−333 *−0.15*	−333 *−0.15*
Remove 12 USt (*10.89mt*) hook ball at front bumper	lb *mt*	−548 *−0.25*	−548 *−0.25*	172 *0.08*	172 *0.08*	172 *0.08*

Transport Scenarios — 3—Axle Boom Dolly

Machine Configuration:

Base crane equipped with rear pintle hook, pneumatic and electrical connectors for trailer or boom dolly, air ride lift system (rear axles), ether injection, hoist drum followers (main and auxiliary winch), 3—piece bi—fold 55' (*16.7m*) lattice fly stowed, auxiliary winch with 670 ft (204.2*m*) KC wire rope, 60 ton (*54.4mt*) 3—sheave hook block (4 cheek weights) at dolly, 12 ton (*10.9mt*) hook ball at dolly, full tank of fuel, 250 lb driver in cab. 250 lb passenger in cab, and storage boxes full. Boom Dolly: Nelson Manufacturing 3—axle close couple dolly with 4 ft 6 (*1.37m*) axle spacing, center lift axle. Weight: 9,000 lbs (*4 082 kg*)

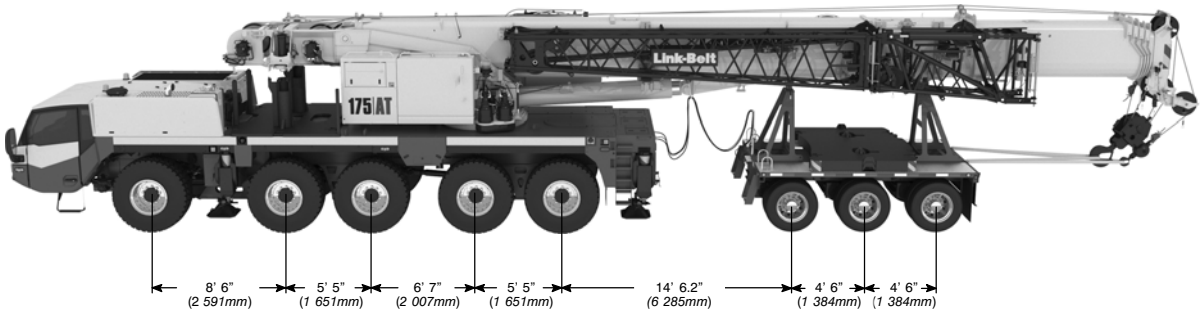
≤ 23,000 Per Axle Scenario:



Axle 1	Axle 2	Axle 3	Axle 4	Axle 5	Dolly
21,190 lbs *9.6mt*	21,261 lbs *9.6mt*	17,321 lbs *7.9mt*	17,977 lbs *8.2mt*	17,826 lbs *8.1mt*	62,644 lbs *28.4mt*

Crane	GVW
4,400 lbs *2.0mt* **Dolly** 22,000 lbs *10.0mt*	158,221 lbs *71 768kg*

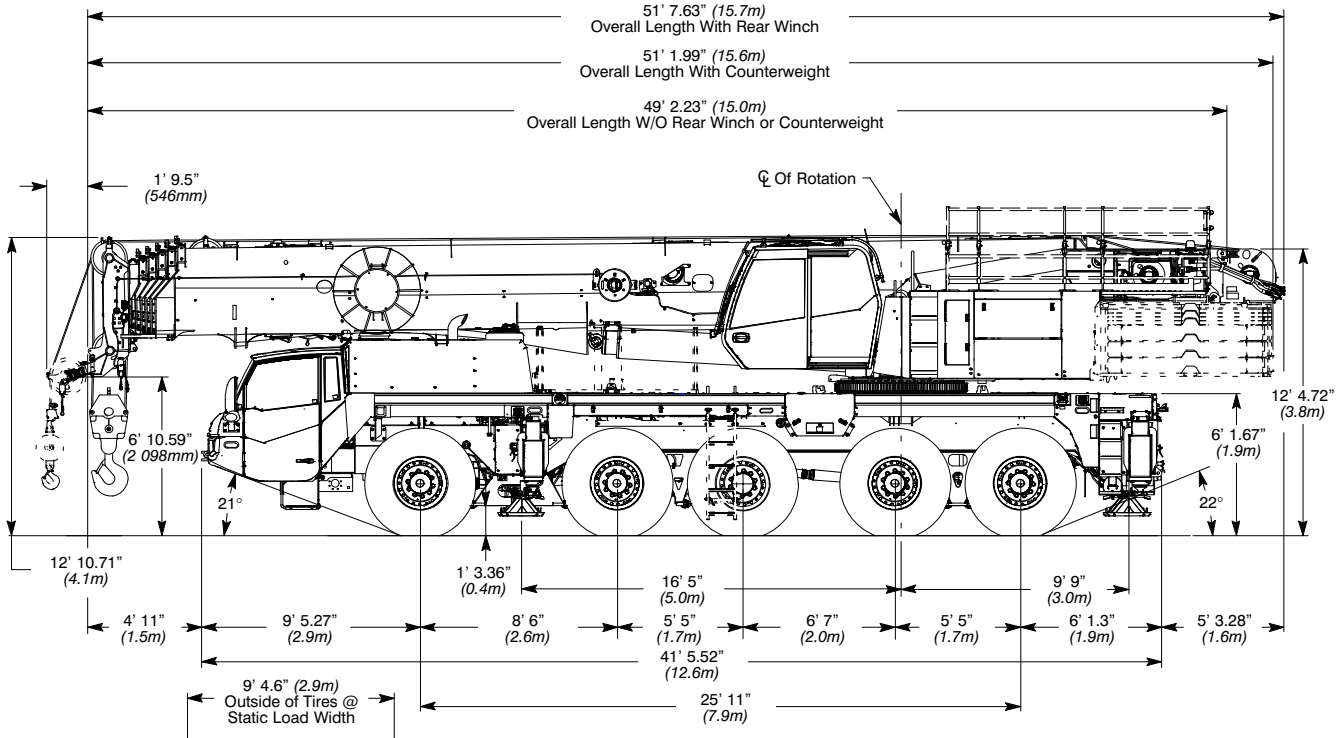
≤ 20,000 Per Axle Scenario:

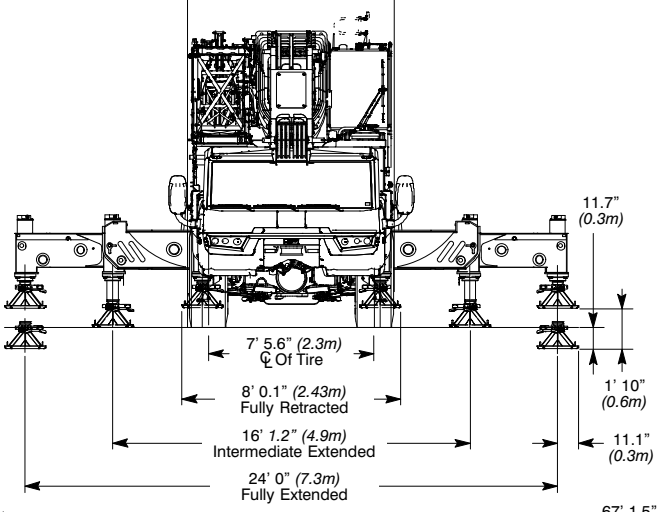


Axle 1	Axle 2	Axle 3	Axle 4	Axle 5	Dolly
19,902 lbs *9.0mt*	19,973 lbs *9.1mt*	16,458 lbs *7.5mt*	17,114 lbs *7.8mt*	16,963 lbs *7.7mt*	59,131 lbs *26.8mt*

Crane	GVW
4,400 lbs *2.0mt* **Dolly** 13,200 lbs *6.0mt*	149,541 lbs *67 831kg*

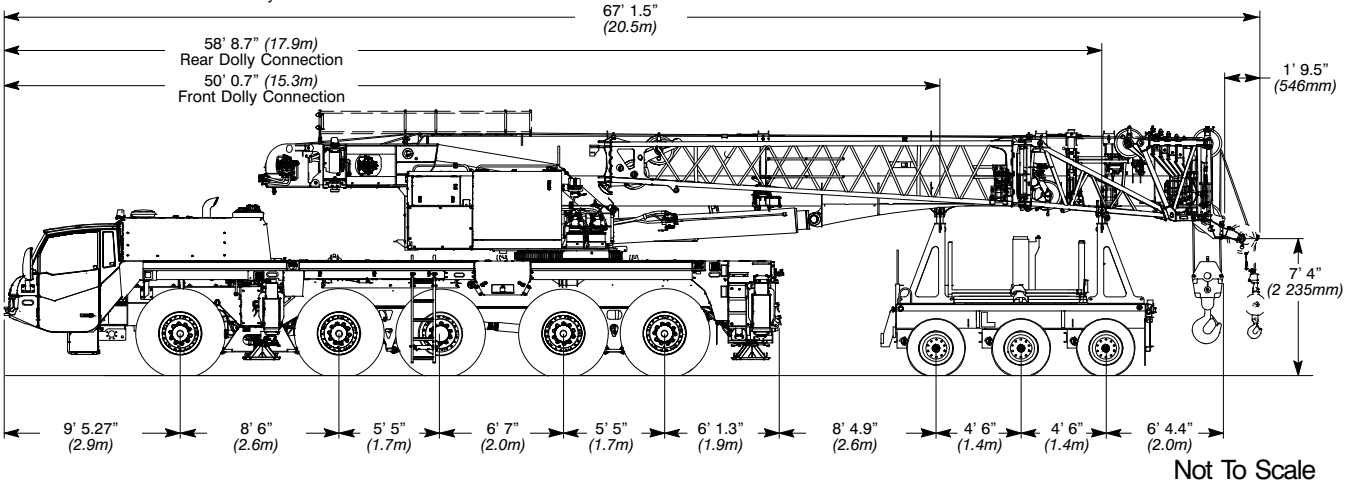
General Dimensions





Turning Radius	525/80R25	
	English	*Metric*
Wall to wall over carrier	37' 0"	*11.3m*
Wall to wall over boom	38' 5"	*11.7m*
Wall to wall over boom attachment	40' 4"	*12.3m*
Curb to curb	32' 10"	*10.0m*
Centerline of tire	31' 11"	*9.7m*

Tail Swing	English	*Metric*
With auxiliary winch	16' 7"	*5.1m*
Without auxiliary winch	14' 2"	*4.3m*
With Counterweight	16' 1"	*5.0m*



Not To Scale

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Fundamental Terms **6–1**

Notes:

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 this Operator's Manual and how they fit this particular crane.

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.

Anemometer: An instrument for measuring the direction and force, or velocity, of the wind; a wind gauge.

Annually: Once a year.

Anti-Two Block System: A system of electromechanical devices used to alert or prevent the crane operator from two blocking the crane. See "Two Block".

ATC: All terrain crane. Used on and off highway.

Attachment: The boom assembly, offset fly section(s), auxiliary lifting sheave, or a combination of these.

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 Limiter".

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 and is used for reeving winch wire rope for a second (auxiliary) winch drum.

Backward Stability: Resistance to overturning of the crane in rearward direction.

Base Section: The segment of the boom which attaches to the upper frame by the boom foot pin.

Boom: The assembly of the base, T1, T2, T3, T4, T5, and T6 sections used as the telescoping extension.

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 Foot: Base of boom where it attaches to the upper revolving frame.

Boom Hoist: The hydraulic method of raising and lowering the boom to different boom angles.

Boom Length: The 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: The base, T1, T2, T3, T4, T5, and T6 segments which are used as the telescoping extension.

Bumper (5th) Outrigger: An outrigger mounted on the front of the carrier that provides additional stability for all "On Outrigger" capacities.

Bypass: A secondary passage of fluid flow, in addition to the main flow path.

Capacity Chart: The chart(s) in the Crane Rating Manual in the crane which gives rated lifting capacities for the crane under different load conditions.

Carrier: The portion of the crane below the turntable bearing.

Carrier Cab: A housing which covers the driver's station on the carrier of the crane.

Carrier Frame: The main structure of the carrier section of the crane.

Cavitation: A condition where air is induced into a cavity, line, or chamber normally filled with oil. This condition can cause damage to pumps, cylinder walls, etc.

Check Valve: A valve which permits flow in one direction only.

Circuit: A complete or partial path over which current or fluid may flow.

Closed Center Circuit: The condition 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.

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 fluid when it is subjected to a unit change in pressure.

Counterbalance Valve (Holding Valve): A valve which regulated 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, 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 Areas 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.

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.

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*).

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.

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.

Filter: A device which functions to remove insoluble contaminants from a fluid by a porous media.

Flow Divider: A valve which divides a flow of oil into two streams.

Fly Base Section: Boom tip extension supported only at its base.

Fly Center Section: The middle section of a three piece fly.

Fly Extension: A fly section, other than the base, center, or tip section, used to increase the overall length of the fly.

Fly Tip Section: The outermost section of a two or three piece fly.

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. (Formula — F = P X A)

Frame: Structure on which either upper or carrier machinery is attached.

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.

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.

Function Limiter (Function Lockout, Hydraulic Cutouts, Hydraulic Kickouts): Devices incorporated into the anti-two block system or rated capacity limiter 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.

Gradablity: 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.

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.

Hoist: Function of lifting and lowering loads.

Hoist Drum: See "Winch Drum".

Hoist Rope: The wire rope used to reeve the winch and the attachments for lifting loads.

Holding Valve (Counterbalance Valve): A valve which regulates fluid flow by maintaining resistance in one direction, but allows free flow in the other direction.

Hook Ball: Ball with hook attached used in 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.

Hydraulic Reservoir: The storage tank for hydraulic fluid.

Instability: A "tipping condition" in which the moments acting to overturn a crane exceed the moments acting to resist overturning.

Lifting Capacity: The rated load for any given load radius and boom angle under specified operating conditions.

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.

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 Radius: The horizontal distance from the centerline of rotation of the upper to the center of gravity of a suspended load.

Loaded Boom Angle: The angle between the boom base section and horizontal with a freely suspended load at the rated radius.

Mat: Support, usually of timber or wire construction, for supporting the pontoons on soft surfaces where the pontoon areas are not large enough to support the load without settling.

Motor (Hydraulic): A rotary motion device which changes hydraulic energy into mechanical energy, 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 hydraulic crane fly section that is capable of being offset at different angles. The angles can be changed manually or by use of 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 upper operator's station.

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 that telescopes vertically to raise and lower the crane.

Pick And Carry: The crane operation of lifting a load and traveling with it suspended.

Pilot Pressure: Auxiliary 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 a 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: 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.

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.

Pump (Hydraulic): A device which converts mechanical force and motion into hydraulic fluid power.

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 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.

Reeving: Passing of wire ropes over pulleys or sheaves.

Relief Valve: A pressure operated valve which bypasses pump delivery to the reservoir, limiting system pressure to a predetermined maximum valve.

Reservoir: A container for storage of fluid in a fluid power system.

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 between a stationary and a rotating member.

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.

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.

Should: The word should is to be understood as advisory.

Side Loading: A load applied at an angle to the vertical plane of the boom.

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.

Spool: Term applied to almost any moving cylindrically shaped part of a hydraulic component which moves to direct flow through the component.

Strainer: A filtering device for the removal of coarse solids from a fluid.

Stroke: The length of travel of a piston or spool.

Suction Line: The hydraulic line connecting the pump inlet port to the hydraulic reservoir.

Sump Tank: See "Hydraulic Reservoir".

Surge: A very sudden rise in hydraulic pressure in a circuit.

Swing: The rotation of the upper with the carrier remaining stationary.

Swing Brake: A brake which is used to resist the rotation of the upper during normal, stationary crane operations.

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: The segment of the boom that is attached between the base and T2 sections.

T2 Section: The segment of the boom that attaches to the T1 and T3 sections.

T3 Section: The segment of the boom which is attached between the T2 and T4 sections.

T4 Section: The segment of the boom which is attached between the T3 and T5 sections.

T5 Section: The segment of the boom which is attached between the T4 and T6 sections.

T6 Section: The outer most segment of the telescopic boom. It is attached to the T5 section and contains the head machinery of the attachment.

Tailswing: The swing radius from the centerline of rotation of the upper frame to the extreme rear edge of the counterweight or most reward part of the upper.

Tip Section (Boom Tip Section): See "T6 Section".

Torque: Turning or twisting force usually measured in foot pounds (ft lb) or Newton meters (*Nm*).

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.

Turntable Bearing: A large bearing which attaches the upper to the carrier allowing the upper to rotate on the carrier.

Two Block: The condition when the crane's hook block, hook ball, any other load attachment means, or the load itself, comes into contact with any of the attachment's load sheaves or other physical entity on the attachment.

Two Block Warning System: A system of electromechanical devices used to warn the crane operator of an impending two block condition.

Unloading Valve: A valve which by-passes flow to tank when a set pressure is maintained on its pilot port.

Upper: The portion of the crane above the turntable bearing.

Upper Operator's 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 in the upper section.

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.

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 with the winch.

Winch Rope: The wire rope used to reeve the winch and the attachments for lifting loads.

Wire 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 that includes all the devices in an electrical system and shows their functional relationships to each other. Such a diagram gives the necessary information for actual wiring or physically tracing circuits when troubleshooting is necessary.

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.

360° Swing Lock: A positive mechanical lock against rotation of the upper over the carrier during normal, stationary crane operations.

Notes:

Link- Belt Cranes
2651 Palumbo Drive
Lexington, Kentucky 40509
(859)- 263- 5200
http://www.linkbelt.com

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*

®Link- Belt is a registered trademark.