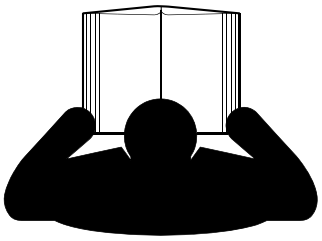
OPERATOR MANUAL

Supplement

Crane Warm-up Procedures



⚠DANGER

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

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

Published 3-30-2017, Control # 516-04

OPERATOR MANUAL

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

RT540E

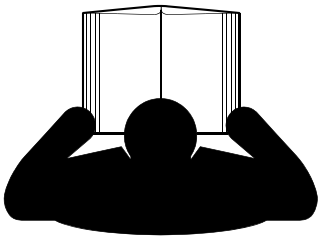
Crane Model Number

This Manual is divided into the following sections:

NOTICE

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

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



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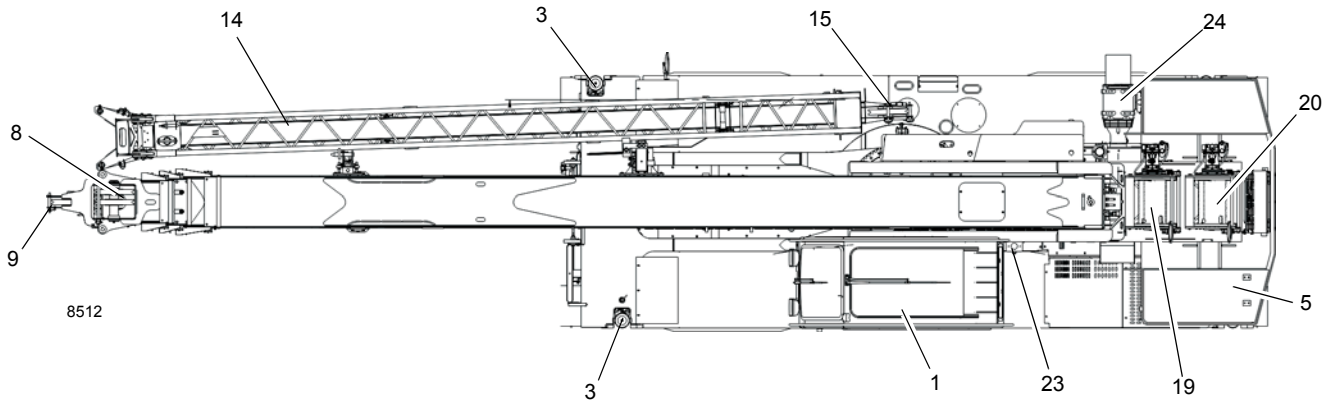
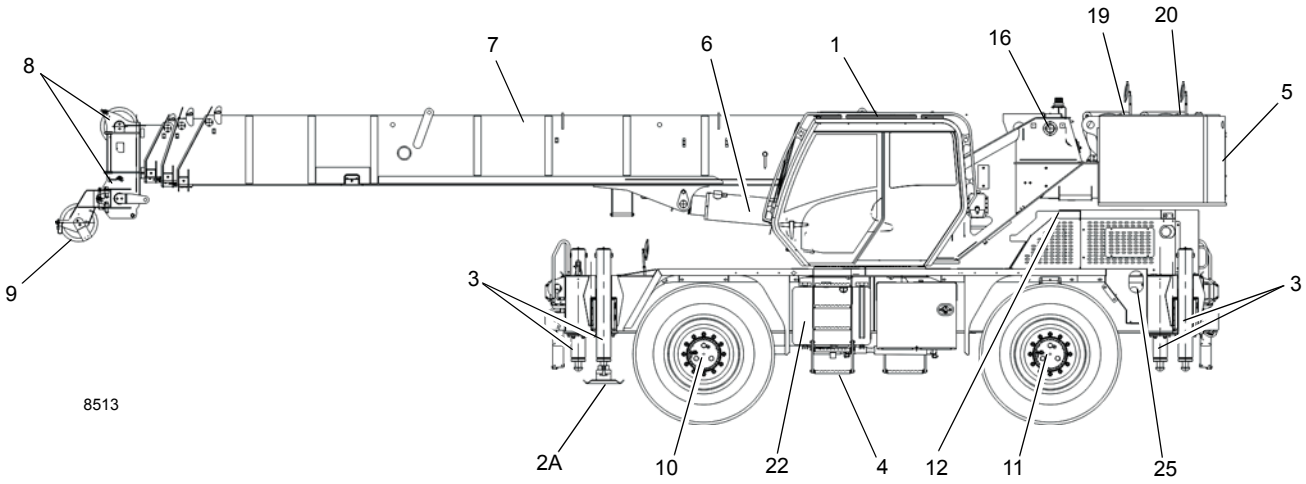
Published 01-15-2016, Control # 526-01

1

COMPONENT LOCATIONS



Top View

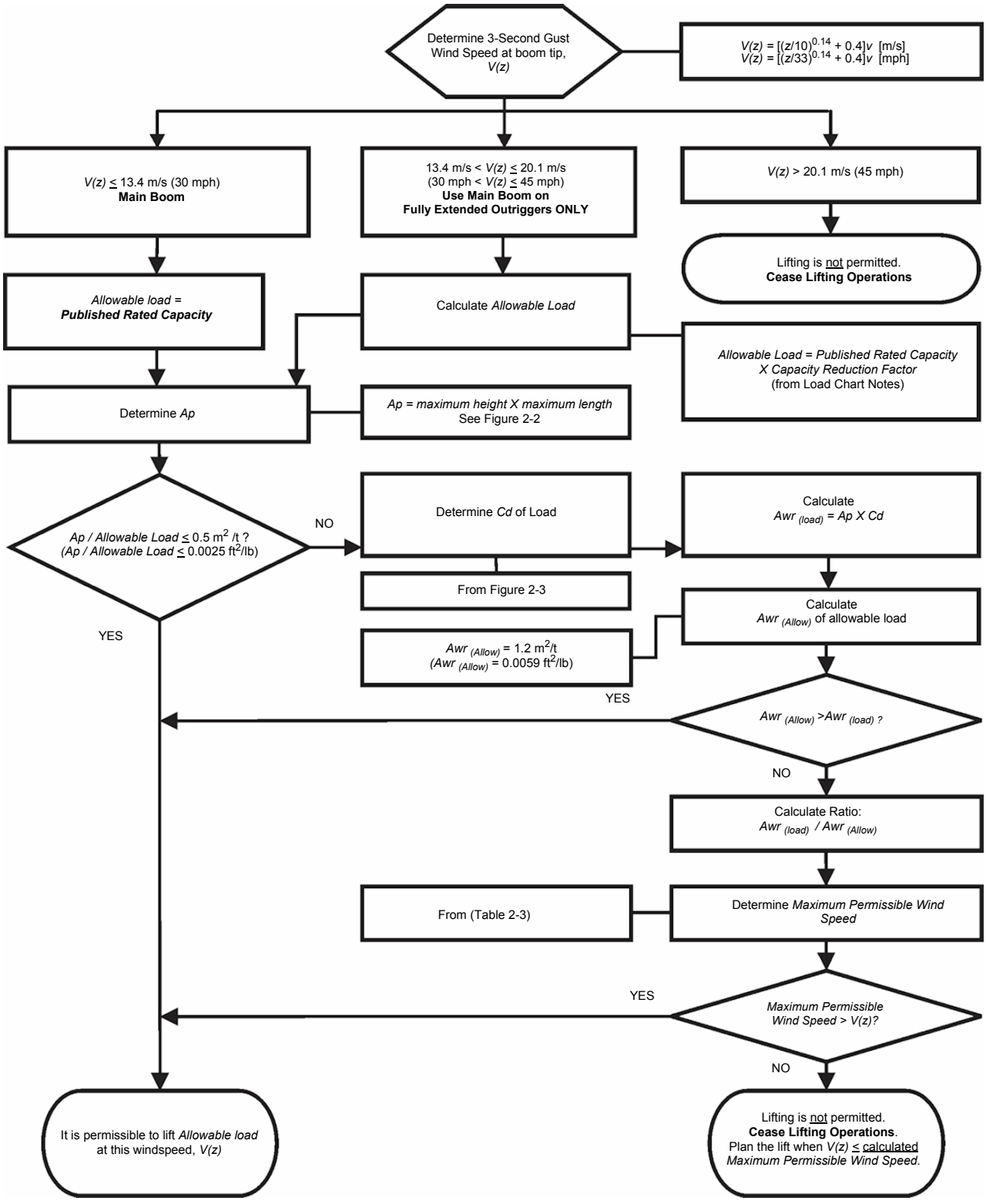


Left Side View

FIGURE 1-3

1	Cab	13	Boom Extension Mast Sheave
2A	Outrigger Float (Installed)	14	Boom Extension
2B	Outrigger Float (Stowed)	15	Boom Extension Nose
3	Outrigger Jack Cylinder	16	Boom Pivot
4	Steps	17	Hydraulic Tank
5	Counterweight	18	Hydraulic Filter
6	Lift Cylinder	19	Main Hoist
7	Boom	20	Auxiliary Hoist
8	Boom Nose Sheaves	21	Hookblock
9	Auxiliary Boom Nose	22	Fuel Tank
10	Front Axle	23	Windshield Washer Fluid Container
11	Rear Axle	24	Air Cleaner
12	Engine (Under hood)	25	Diesel Exhaust Fluid (DEF) Tank

Simplified Method to Determine Maximum Permissible Wind Speed



V(z) = 3 second gust wind speed at boom tip, m/s (mph)
Ap = Projected Wind Area of Load, m^2 (ft^2)

Awr (load) = Actual Wind Resistance Area for the Load, m^2(ft)
Awr (Allow) = Allowable Wind Resistance Area of the Load, m^2 (ft2
Cd = air drag coefficient of load

FIGURE 2-1

Lifting Limits at wind speed V(z) **> 30 mph and ≤ 45 mph** at this configuration:

- Maximum load 20,160 lb
- Maximum wind resistance area of load 119 ft^2

Example, wind speeds greater than 13.4 m/s is NOT permissible to lift a load greater than 20,160 lb, even if the wind resistance area of the load is less than 119 ft^2.

Refer to the above crane configuration for the following load conditions:

Load example 2.1:

With known Wind Drag Coefficient of the load ***Cd***,

- load to be lifted of 19,500 lb,
- Projected Wind Area ***Ap*** = 70 ft^2,
- Wind Drag Coefficient ***Cd*** = 1.5

then the wind resistance area of load can be estimated as

$Awr_{(load)}$ = ***Ap*** x ***Cd*** = 70 x 1.5 = 105 ft^2

Refer to the above ***Lifting Limits at wind speed V(z) > 30 mph and ≤ 45 mph***. Comparing the load and wind resistant area to the allowable:

- Is the load to be lifted less than allowable load?
  19,500 lb ≤ 20,160 lb YES
- Is $Awr_{(load)}$ less than $Awr_{(allow)}$?
  105 ft^2 ≤ 119 ft^2 YES

Conclusion: This load is permissible to lift in wind speed up to 45 mph.

Load example 2.2:

With unknown Wind Drag Coefficient of the load ***Cd***,

- Load to be lifted of 18,000 lb,
- Projected Wind Area ***Ap*** = 45 ft^2,
- Wind Drag Coefficient ***Cd*** = unknown

NOTE: If exact Wind Drag Coefficient is not known, it shall be assumed as 2.4.

the wind resistance area of load can be estimated as

$Awr_{(load)}$ = ***Ap*** x ***Cd*** = 45 x 2.4 = 108 ft^2

Refer to the above ***Lifting Limits at wind speed V(z) > 30 mph and ≤ 45 mph***. Comparing the load and wind resistant area to the allowable:

- Is the load to be lifted less than allowable load?
  18,000 lb ≤ 20,160 lb YES
- Is $Awr_{(load)}$ less than $Awr_{(allow)}$?
  108 ft^2 ≤ 119 ft^2 YES

Conclusion: This load is permissible to lift in wind speed up to 45 mph.

Load example 2.3a:

With large wind resistance area of the load $Awr_{(load)}$,

- Load to be lifted of 22,000 lb,
- Projected Wind Area ***Ap*** = 180 ft^2,
- Wind Drag Coefficient ***Cd*** = 1.2

the wind resistance area of load can be estimated as:

$Awr_{(load)}$ = ***Ap*** x ***Cd*** = 180 x 1.2 = 216 ft^2

Refer to the above ***Lifting Limits at wind speed V(z) > 30 mph and ≤ 45 mph***. Comparing the load to the allowable:

- Is the load to be lifted less than allowable load?
  22,000 lb ≤ 20,160 lb NO

Conclusion: This load is NOT permissible to lift in wind speed up to 45 mph.

Refer to the above ***Lifting Limits at wind speed V(z) up to 30 mph***. Comparing the load to the allowable:

Is the load to be lifted less than allowable load?
22,000 lb ≤ 25,200 lb . . . . . YES

The permissible wind speed for this load is 30 mph, depending on the wind resistance area of the load.

- Is $Awr_{(load)}$ less than $Awr_{(allow)}$,?
  216 ft^2 ≤ 149 ft^2 . . . . . NO

Conclusion: This load is NOT permissible to lift in wind speed at 30 mph, but permitted to lift at a reduced wind speed calculated as follows:

$$\text{Ratio } \frac{Awr_{(load)}}{Awr_{(allow)}} = \frac{216}{149} = 1.45$$

From Table 2-7, the maximum permissible wind speed at ratio of 1.45 (rounded to next higher table value of 1.6) is 23.7 mph.

Conclusion: This load is permissible to lift in wind speed up to 23.7 mph only.

Load example 2.3b:

With large wind resistance area of the load $Awr_{(load)}$,

- Load to be lifted of 12,000 lb,
- Projected Wind Area ***Ap*** = 125 ft^2,
- Wind Drag Coefficient ***Cd*** = 1.3

the wind resistance area of load can be estimated as:

$Awr_{(load)}$ = ***Ap*** x ***Cd*** = 125 x 1.3 = 162 ft^2

- Any kinking, bird caging, crushing, corrosion, or other damage resulting in distortion of the rope structure.
- Rope that has been in contact with a live power line or has been used as a ground in an electric circuit (eg. welding) may have wires that are fused or annealed and must be removed from service.
- In standing ropes, more than three (3) breaks in one rope lay in sections beyond the end connection or more than two (2) broken wires at an end connection.
- Core deterioration, usually observed as a rapid reduction in rope diameter, is cause for immediate removal of the rope.

The following is a brief outline of the basic information required to safely use wire rope.

- Wire ropes wear out. The strength of a wire rope begins to decrease when the rope is put to use and continues to decrease with each use. Wire rope will fail if worn-out, overloaded, misused, damaged or improperly maintained.
- The nominal strength, sometimes called catalog strength, of a wire rope applies only to a new, unused rope.
- The nominal strength of a wire rope should be considered the straight line pull which will actually break a new unused rope. The nominal strength of a wire rope should never be used as its working load.
- Each type of fitting attached to a wire rope has a specific efficiency rating which can reduce the working load of the wire rope assembly or rope system.
- Never overload a wire rope. This means never use the wire rope where the load applied to it is greater than the working load determined by the rope manufacturer.
- Never “shock load” a wire rope. A sudden application of force or load can cause both visible external and internal damage. There is no practical way to estimate the force applied by shock loading a rope. The sudden release of a load can also damage a wire rope.
- Lubricant is applied to the wires and strands of a wire rope when it is manufactured. The lubricant is depleted when the rope is in service and should be replaced periodically. Refer to the *Service Manual* for more information.
- In the U.S.A., regular inspections of the wire rope and keeping of permanent records signed by a qualified person are required by OSHA for almost every wire rope application. The purpose of the inspection is to determine whether or not a wire rope may continue to be safely used on the application. Inspection criteria, including number and location of broken wires, wear and elongation, have been established by OSHA, ANSI, ASME and similar organizations. See the *Service Manual* for inspection procedures.

  When inspecting ropes and attachments, keep all parts of your body and clothing away from rotating hoist drums and all rotating sheaves. Never handle the rope with bare hands.

  Some conditions that lead to problems in wire rope systems include:

  - Sheaves that are too small, worn or corrugated cause damage to a wire rope.
  - Broken wires mean a loss in strength.
  - Kinks permanently damage a wire rope and must be avoided.
  - Wire ropes are damaged by knots. Wire rope with knots must never be used.
  - Environmental factors such as corrosive conditions and heat can damage a wire rope.
  - Lack of lubrication can significantly shorten the useful life of a wire rope.
  - Contact with electrical wires and resulting arcing will damage a wire rope.
- An inspection should include verification that none of the specified removal criteria for this usage are met by checking for such things as:
  - Surface wear; nominal and unusual.
  - Broken wires; number and location.
  - Reduction in diameter.
  - Rope stretch (elongation).
  - Integrity of end attachments.
  - Evidence of abuse or contact with another object.
  - Heat damage.
  - Corrosion.

NOTE: A more detailed wire rope inspection procedure is given in the *Service Manual*.

- When a wire rope has been removed from service because it is no longer suitable for use, it must not be reused on another application.

When installing a new rope:

- Keep all parts of your body and clothing away from rotating hoist drums and all rotating sheaves.
- Never handle the wire rope with bare hands.
- Follow proper instructions for removing rope from a reel.
- Apply back tension to the storage/payoff reel of the new rope to insure tight, even spooling onto the hoist drum.

Table 2-8: Boom Drift Chart (Cylinder length change in inches)

Coeff. =	0.00043	(in^3/in^3/ °F)								
STROKE	Temperature Change (°F)									
(FT.)	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
45	2.32	4.64	6.97	9.29	11.61	13.93	16.25	18.58	20.90	23.22
50	2.58	5.16	7.74	10.32	12.90	15.48	18.06	20.64	23.22	25.80
55	2.84	5.68	8.51	11.35	14.19	17.03	19.87	22.70	25.54	28.38
60	3.10	6.19	9.29	12.38	15.48	18.58	21.67	24.77	27.86	30.96
Length change in inches = Stroke (Ft.) X Temperature Change (°F) X Coeff. (in^3/in^3/ °F) X 12 in/ft										

Table 2-9 Boom Drift Chart (Cylinder length change in millimeters)

Coeff. =	0.000774	(1/ °C)			***Metric***						
STROKE	Temperature Change (°C)										
(m)	5	10	15	20	25	30	35	40	45	50	55
1.5	6	12	17	23	29	35	41	46	52	58	64
3	12	23	35	46	58	70	81	93	104	116	128
4.5	17	35	52	70	87	104	122	139	157	174	192
6	23	46	70	93	116	139	163	186	209	232	255
7.5	29	58	87	116	145	174	203	232	261	290	319
9	35	70	104	139	174	209	244	279	313	348	383
10.5	41	81	122	163	203	244	284	325	366	406	447
12	46	93	139	186	232	279	325	372	418	464	511
13.5	52	104	157	209	261	313	366	418	470	522	575
15	58	116	174	232	290	348	406	464	522	581	639
16.5	64	128	192	255	319	383	447	511	575	639	702
18	70	139	209	279	348	418	488	557	627	697	766
Length change in mm = Stroke (m) X Temperature Change (°C) X Coeff. (1/ °C) X 1000 mm/m											

Turn Signal Lever and Windshield Wiper/ Washer/Horn Controls

The Turn Signal Lever, Horn and Windshield Wiper/Washer Controls (1) (Figure 3-2) are located on the left side of the steering column. Pushing the turn signal lever down causes the left front and left rear turn signals to flash. Pushing the turn signal lever up causes the right front and right rear turn signals to flash.

The windshield wiper switch is incorporated in the turn signal lever. The knob of the lever has four positions: O, I, II and interval wiping. Pushing the button in the end of the knob energizes the windshield washer pump to spray washer fluid on the windshield. Positioning the knob to I operates the wiper at low speed and positioning the knob to II operates the wiper at high speed. Positioning the knob to O turns the wiper motor off and automatically returns the wiper to the parked position.

Pushing the small button on the end of the lever sounds the horn.

Steering Column Tilt Lever

The steering control column can be rotated rearward approximately 30° and raised approximately 60 mm (2.3 in). Rotate the control lever (2) (Figure 3-2) down to lock the steering column in place; rotating the lever up releases the steering column for adjustment.

Park Brake Control Switch

The Park Brake Control Switch (3) (Figure 3-2) is located on the front of the steering column. The switch is illuminated when the key is in the ON or Start position. This two-position rocker switch (ON/OFF) is used to apply and release the parking brake on the drive line. The red Park Brake Indicator light on the CCS display is illuminated when the pressure switch in the brake release system is active and the brake is applied.

Headlights Switch

The Headlights Switch (4) (Figure 3-2) is located on the front of the steering column. This three-position rocker switch (OFF/Park/Headlight) controls operation of the instrument lights, switch LED's, and the marker lights on the front, rear, and side of the crane. The switch is illuminated when the key is in the ON or Start position.

Drive Axle Selector Switch

The Drive Axle Selector Switch (5) (Figure 3-2) is located on the front of the steering column. This two-position rocker switch is used to select either two-wheel drive (high range) or four-wheel drive (low range). The switch controls a solenoid valve (energized for two-wheel drive) that operates the speed range and axle disconnect cylinders on the transmission. The icon background on the CCS operating display turns yellow when the crane is in four-wheel drive mode. This icon will flash if, while the engine is running, the switch position is changed when the transmission is not in Neutral and the brake pedal is not pressed. The drive axle can only be changed when the gearshift is in Neutral and the brake pedal is pressed. The switch is illuminated when the key is in the ON or Start position.

Hazard Lights Switch

The Hazard Lights Switch (6) (Figure 3-2) is located on the front of the steering column. The switch is a two-position rocker switch (ON/OFF) that causes the four turn signal lights to flash at the same time when the switch is positioned to ON. When the switch is positioned to ON, the turn signal indicator lights on the steering column will flash.

Increment/Decrement Switch

The Increment/Decrement Switch (7) (Figure 3-2) is a three position momentary rocker switch with center maintained position being off. Use this switch to adjust engine speed. Press the top or bottom of the Increment/Decrement Switch to increase or decrease the low engine idle.

The Increment/Decrement Switch is used to adjust engine rpm. Quickly press the top of the switch once to go to full engine rpm; quickly press the bottom of the switch once to return to low engine idle. If the engine speed is below the maximum rpm setting, pressing and holding the top of the switch will cause the engine rpm to slowly increase; release the switch when the desired rpm is attained. If the engine speed is above the minimum rpm setting, pressing and holding the bottom of the switch will cause the engine rpm to slowly decrease; release the switch when the desired rpm is attained.

Ignition Switch

The Ignition Switch (8) (Figure 3-2) is on the right side of the steering column under the transmission shift lever (9).

The switch is key-operated and has three positions: OFF [0], RUN [1], and START [2]. In the OFF position, all electrical power is off except for lights controlled by the Headlights Switch, turn/hazard/stop lights, dome light, and work light. Positioning switch to RUN energizes the ignition circuit and all electrical components except for the start solenoid. Positioning the switch to START energizes the start relay, which in turn energizes the cranking motor solenoid and cranks the engine for starting. The switch is spring returned from START to RUN. To shut down the engine, position switch to OFF.

The Ignition switch has a mechanical anti-restart built into it. If the engine does not start after the first attempt, the key switch must go to the OFF position and then back to START in order to try and start the engine another time

reaches at least 10°C (50°F). It is then recommended that all crane functions be cycled to remove cold fluid from all components and cylinders of the hydraulic system. If there is any unusual sound coming from the crane's hydraulic pumps or motors, stop the operation and engine immediately and contact a Manitowoc distributor.

- **From 10°C to 4°C (50°F to 40°F):** Crane operation with a load is allowed with medium engine RPM and medium function speed (joystick position) until the fluid reaches at least 10°C (50°F).
- **From 95°C to 10°C (200°F to 50°F):** Crane operation with a load is allowed with no restrictions.
- **Above 95°C (200°F):** No crane operation is allowed. Let the crane's hydraulic oil cool by running the engine at idle with no functions actuated.

Engine Operation

Start-up and shutdown procedures for most diesel engines are generally the same. Therefore, the following procedures can be applied, except where specific differences are noted. (Refer to the applicable engine manufacturer's manual for detailed procedures).

Start-Up Procedure

Make an under-the-hood inspection for fuel, oil, and coolant leaks, worn drive belts, and trash build-up.

DANGER

Diesel engine exhaust can be harmful to your health. Only operate the engine in a well ventilated area or vent exhaust outside.

CAUTION

Never crank engine for more than 30 seconds during an attempted start. If engine does not start after 30 seconds, allow starter motor to cool for two minutes before attempting another start.

CAUTION

If engine does not start after four attempts, correct malfunction before attempting another start.

Use the correct grade of oil for the prevailing temperature in the crankcase to prevent hard cranking. Diesel fuel should have a pour point of 5°C (10°F) less than the lowest expected temperature. In case of an emergency, white kerosene can be added to the fuel to bring the pour point down to the required temperature. This will prevent clogging of filters and small passages by wax crystals. The addition of kerosene is NOT recommended for general use.

Ensure Battery Disconnect Switch handle (1) (Figure 3-7) is in the ON position (handle shown in the OFF position)

8013-1 **FIGURE 3-7**

Cold Engine

The engine warning and engine stop indicators will illuminate and go off in sequence after about two seconds (as a check) when the key is first turned on. If an indicator comes on and continues to blink after initial start-up, there is a problem that needs to be corrected. If the engine warning icon is selected, a screen will open listing the engine error codes.

An engine block heater and grid heater are provided to aid in cold-starting.

1. Ensure the emergency stop switch is not pressed.
2. Set the parking brake to ON and position the transmission shift lever to neutral.

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

NOTE: The engine "wait to start" indicator located on the top left side of the front console illuminates amber for a period of time when the ignition is turned to the on position. The engine should not be cranked until the indicator turns off.

3. Turn the key to the first position. The CCS screen will provide data for the various engine systems and alert the operator to any detected fault codes. Sound the horn (left of steering wheel) once.

3. If extending the outrigger to the mid-extend or fully extended position, use the Outrigger Function Enable Switch and the CCS menu with either the CCS display buttons or the jog dial to select the outrigger. The appropriate outrigger beam will extend. Refer to *Engaging the Mid Extend Lock Pin*, page 3-22 if the crane is to be operated with any outrigger at the mid-extend position.

WARNING

Tipping Hazard!

All four outrigger beams must be deployed to one of three positions before beginning operation, which include fully retracted, mid-extend, or fully extended; do not operate the crane with the outriggers in any other position.

NOTE: More than one outrigger beam can be extended at a time. However, to ensure that each outrigger is fully extended, repeat step 3 for each outrigger after a multi-outrigger extension.

4. After deploying the four outrigger beams to one of the three proper positions (fully retracted, mid-extend, fully extended), navigate to the jack operation on the CCS screen and select the jack extend function on the Outrigger Function Enable Switch.

   Extend each jack, using either the CCS display buttons or the jog dial, positioning the float as necessary, until the locking levers of the float engage the jack cylinder barrel.

NOTE: More than one jack can be extended at a time.

5. Extend the front jacks approximately 3 to 4 in (8 to 10 cm).

6. Extend the rear jacks approximately 3 to 4 in (8 to 10 cm).

NOTE: If crane is equipped with tilting cab, ensure cab is in the lowered position before leveling machine.

7. Repeat step 4 until all wheels are clear of the ground and the crane is level as indicated by the level indicator located on the right side of the cab.

NOTE: If it is suspected that the level indicator is out of adjustment, verify and adjust the level using the procedures under *Level Indicator Adjustment*, page 3-21.

WARNING

Tipping Hazard!

The mid-extend outrigger beam lock pin must be engaged before operating on any beam from the mid-extend position.

For cranes not equipped with an Outrigger Monitoring System (OMS), the operator must select the proper rigging code from the load chart and RCL program for the outrigger position selected. The OMS will NOT change the rigging code to match the existing outrigger position.

Outrigger Monitoring System (OMS) (Optional—Standard in North America)

The Outrigger Monitoring System (OMS) aids the operator in accurately programming the Rated Capacity Limiter (RCL) by automatically identifying the horizontal position of each outrigger beam. The OMS uses four sensors, one per outrigger beam, to indicate when an outrigger beam is positioned to one of three pre-defined locations, including fully retracted, mid-extend, and fully extended.

Set up of the outriggers is the same for cranes equipped with OMS; refer to *The crane also allows operations with the outriggers fully retracted.*, page 3-21.

If the crane is setup on outriggers and “On Outriggers” is chosen when programming the RCL, then the OMS indicates to the RCL the horizontal position of each of the four outrigger beams. When the outriggers are at the proper position, the screen icon is transparent; if an outrigger is not in the proper position it will be shown as red The RCL does not lock out the crane or select a different chart based on outrigger position.

Engaging the Mid Extend Lock Pin

NOTE: It may be necessary to jog the outrigger extension/retraction switch slightly to ensure proper pin engagement.

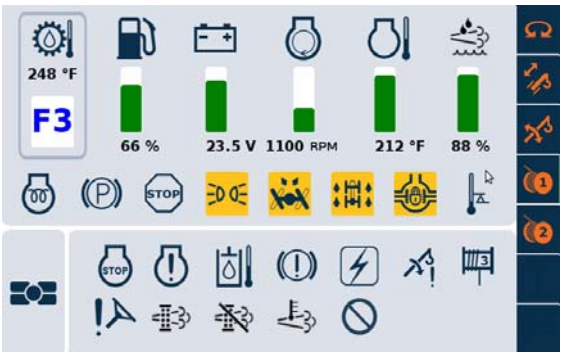
1. With the outriggers fully retracted, turn the locking pin 90° from its stowed position and allow the pin to slip into the lug on the jack beam. If the pin will not slip into the lug, slowly extend or retract the outrigger beam, allowing the locking pin to drop into the lug.

2. Slowly extend or retract the outrigger beam, allowing the locking pin to drop into the hole in the top of the outrigger beam, engaging the outrigger beam at the desired length.

CCS Operation Display

There are three different levels: The Main Screen, the Menu Screen and the Sub Level menus.

The main screen (below) appears on the operating display (lower screen) when the key is turned on. The main screen displays the status of the crane systems. The amber lit icons are enabled. It also displays data from codes on other screens. The operator can choose and activate areas from this screen. The Escape Button (1) (Figure 3-13) defaults back to the main screen.



When one of the icons on the right side vertical bar is flashing, it indicates that the joystick was not at a zero position when either the function enable button or the all crane functions button was pressed. To enable the function, the operator must move the joystick to the center/no motion position, then try to enable the function again.

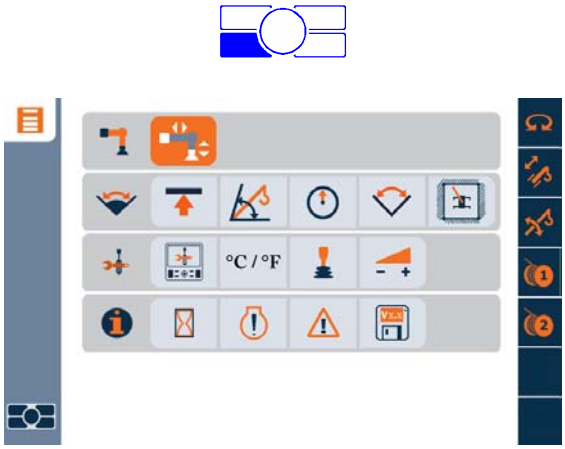
For example, if the Swing Enable icon is flashing, it is NOT enabled. To enable swing, the operator must allow the Swing Enable joystick to move to the center/no motion position, then try to enable the swing function again

Menu Screen

When the menu button on the jog dial (3) (Figure 3-13) or control panel of the CCS is pressed, the overview of the menu groups appears, for opening menus and submenus.

The menu buttons are categorized by groups. Each group has its own group icon that is displayed at the beginning of each group bar. Each group has its own member buttons, such as telescope group has 3 member buttons.

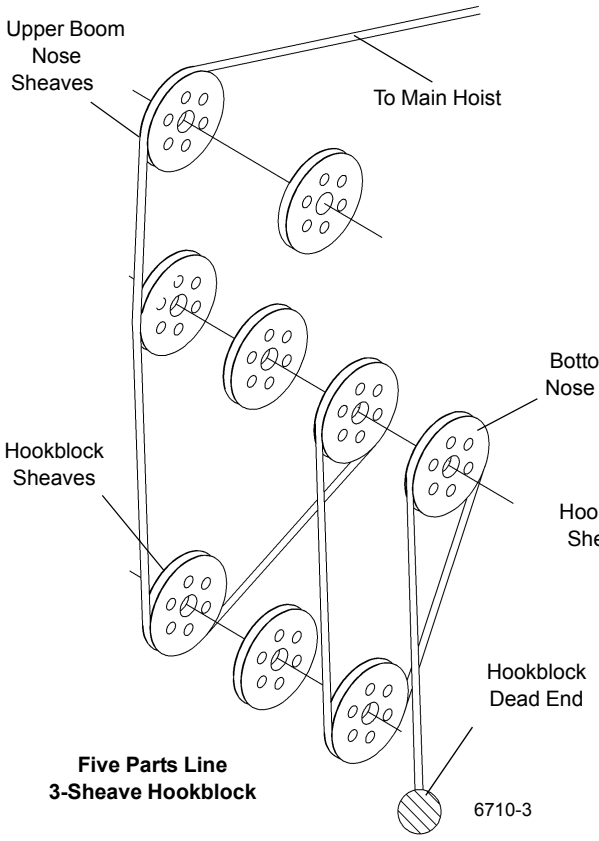
A symbol is selected with the jog dial or the arrow keys to call up a menu. The selected symbol is shown in orange. A menu is opened by pressing the jog dial or the OK button on the control panel. There is always one symbol shown selected. In this case, it is the outrigger function. Press the jog dial enter button for the Outrigger Operation Menu.



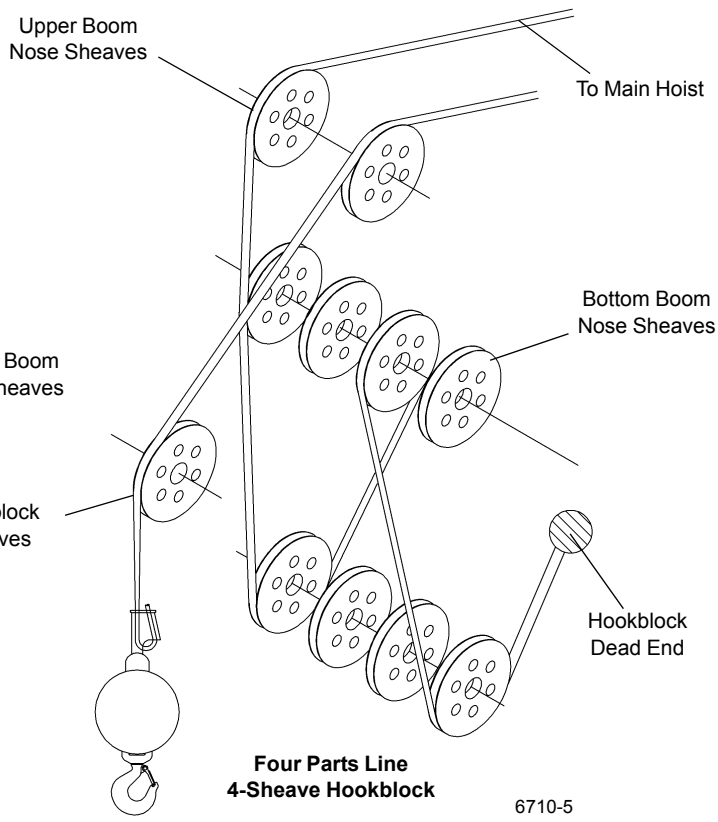
Appendix A: Crane Control System (CCS) Symbols and Icons

Symbol	Description
	3rd Wrap Warning
	4-Wheel Drive
	Auxiliary Hoist Status
	Auxiliary Hoist Disabled
	Auxiliary Hoist Enabled
	Auxiliary Hoist Raise
	Auxiliary Hoist Not In Use
	Auxiliary Hoist Lower
	Battery Voltage
	Boom Lift Status
	Boom No Load Chart
	Bypass 1 Active
	Bypass 2 Active
	Bypass 3 Active
	Bypass 1 Pressed
	Bypass 2 Pressed

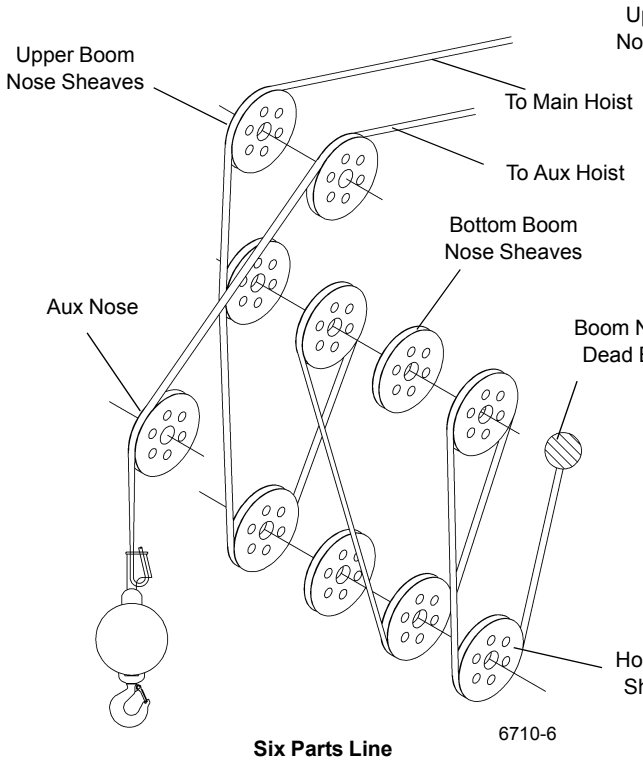
3



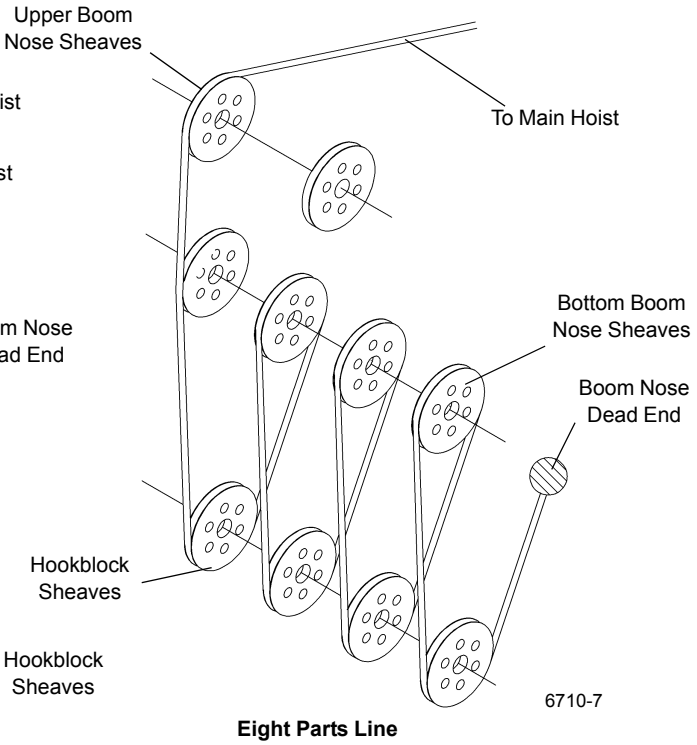
Five Parts Line
3-Sheave Hookblock



Four Parts Line
4-Sheave Hookblock



Six Parts Line
4-Sheave Hookblock



Eight Parts Line
4-Sheave Hookblock

FIGURE 4-6 continued

4

SECTION 5
LUBRICATION

SECTION CONTENTS

GENERAL

Following the designated lubrication procedures is important in ensuring maximum crane lifetime and utilization. The procedures and lubrication charts in this section include information on the types of lubricants used, the location of the lubrication points, the frequency of lubrication, and other information.

ENVIRONMENTAL PROTECTION

Dispose of waste properly! Improperly disposing of waste can threaten the environment.

Potentially harmful waste used in Manitowoc cranes includes — but is not limited to — oil, fuel, grease, coolant, air conditioning refrigerant, filters, batteries, and cloths which have come into contact with these environmentally harmful substances.

Handle and dispose of waste according to local, state, and federal environmental regulations.

When filling and draining crane components, observe the following:

- Do not pour waste fluids onto the ground, down any drain, or into any source of water.
- Always drain waste fluids into leak proof containers that are clearly marked with what they contain.
- Always fill or add fluids with a funnel or a filling pump.
- Immediately clean up any spills.

LUBRICATION INTERVALS

The service intervals specified are for normal operation where moderate temperature, humidity, and atmospheric conditions prevail. In areas of extreme conditions, the service periods and lubrication specifications should be altered to meet existing conditions. For information on extreme condition lubrication, contact your Manitowoc distributor or Manitowoc Crane Care.

CAUTION

Chassis grease lubricants must not be applied with air pressure devices as this lubricant is used on sealed fittings.

CAUTION

The multipurpose grease installed during manufacture is of a lithium base. Use of a non-compatible grease could result in damage to equipment.

5

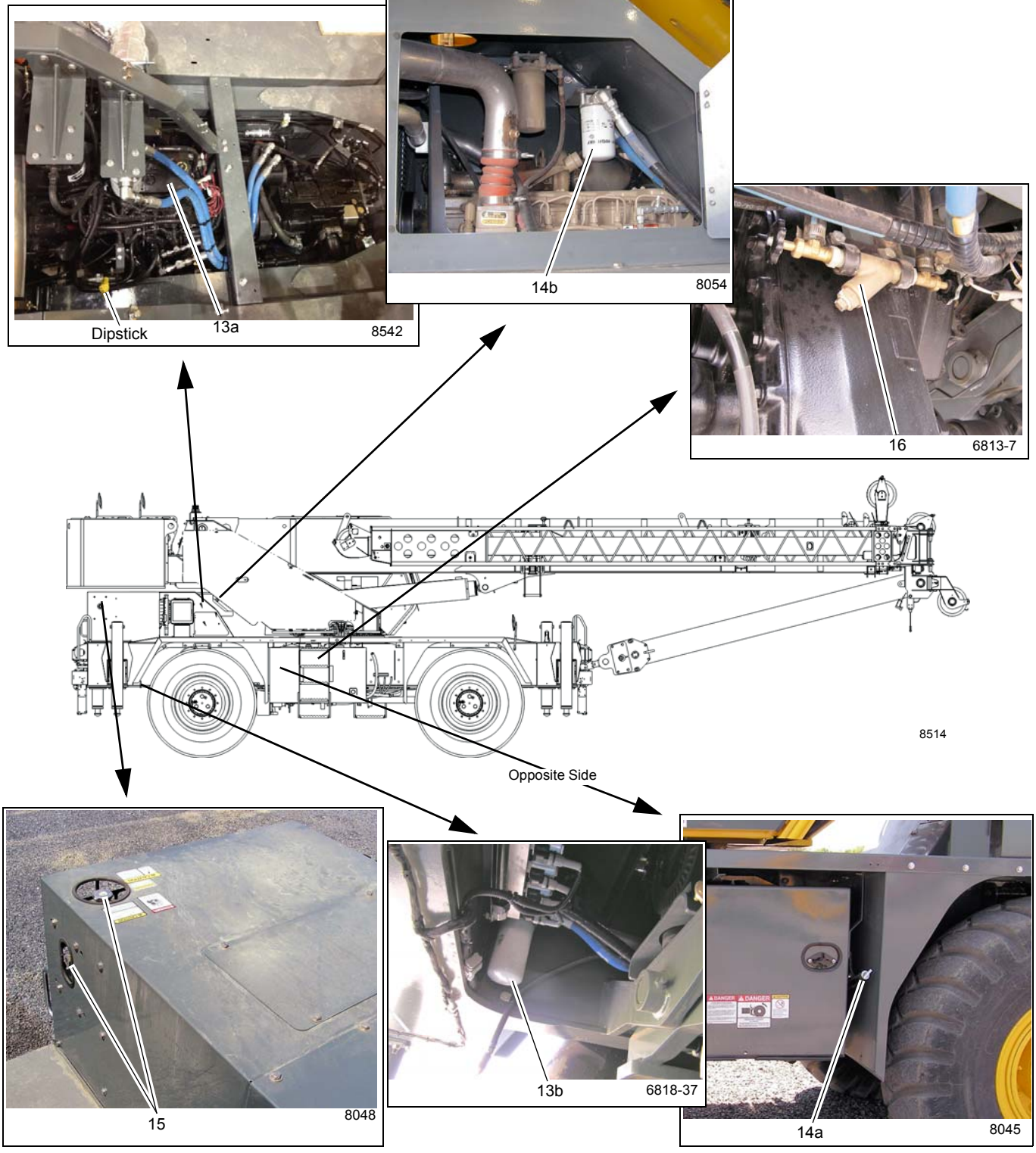
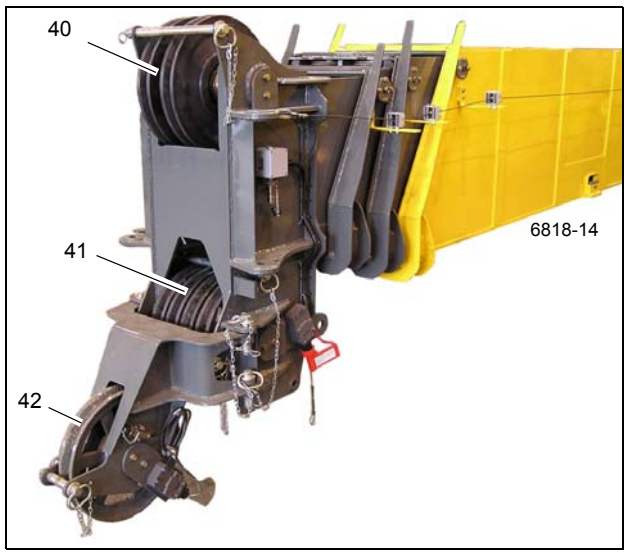

Dipstick
13a
8542
14b
8054
16
6813-7
8514
Opposite Side
15
8048
13b
6818-37
14a
8045

FIGURE 5-3

5


37
6818-17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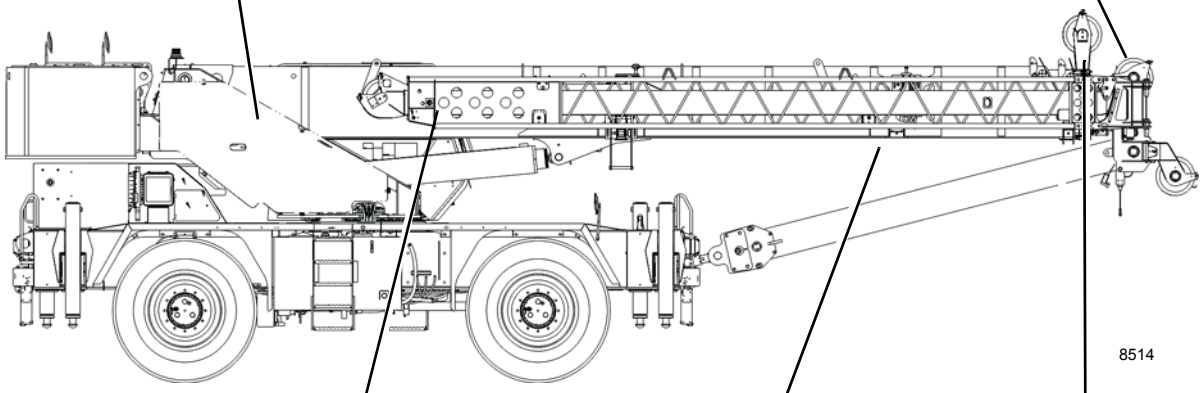
41
42
6818-14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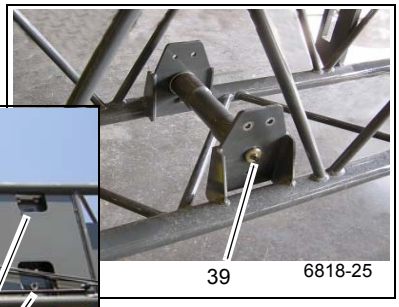
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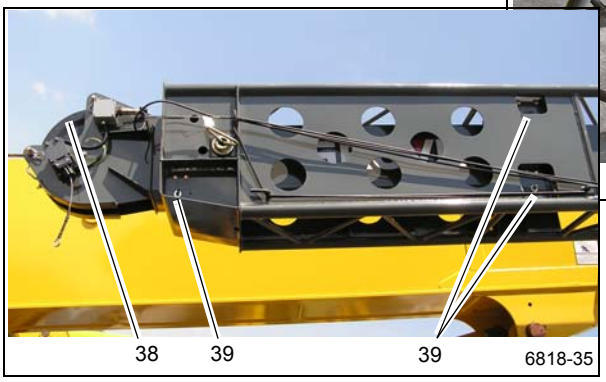
6818-25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39
39
6818-35

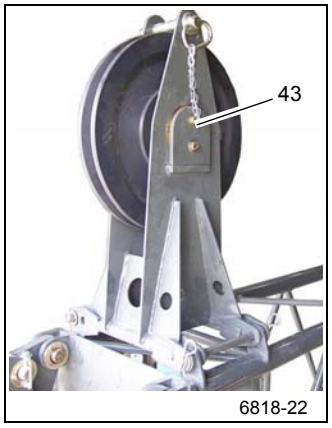
43
6818-22

FIGURE 5-8

5