Operation, Calibration & Troubleshooting Manual For Greer LMI System With MG6 Computer & TS7 Display

GREER COMPANY® by TWG a DOVER company

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Section 1: Operation

1. Introduction

The Greer LMI System with MG6 Computer & TS7 Display is an aid to crane operation. It is hereinafter referred to as the "system".

Do not use this system without a properly trained operator. The operator must be knowledgeable in safety guidelines, crane capacity information, and the crane manufacturer's specifications.

This manual describes the operation of the system. Please read, understand, and follow the contents and instructions contained in this manual.

⚠ WARNING

The Greer LMI System is an operational aid that only provides information to the operator. It *is not* a load limiter, and it will not automatically prevent unsafe operations. The operator is solely responsible for operating the equipment consistent with the manufacturer's instructions and specifications, the equipment's rated capacity, applicable codes and laws, and industry safe practices.
Thoroughly review the Operation, Calibration and Troubleshooting Manual before operating the Greer LMI System.
FAILURE TO FOLLOW THE MANUAL AND OTHER MISUSE OF THIS PRODUCT CAN RESULT IN PROPERTY DAMAGE, SERIOUS INJURY, AND DEATH.

2. Technical Support

For technical support specifically relating to the Greer LMI System, please contact the Greer/TWG Service Department:

Phone: (918) 298-8300
Fax: (918) 298-8301
Address: 11135 S James Ave, Jenks, OK, 74037

3. Outline of Operation

The system is an aid to crane operation. Crane functions are monitored by a variety of sensors.

The system compares the load suspended below the boom head to the crane capacity chart stored within the computer's memory.

At approach to overload, the system can send audible and visual warning signals, when it is connected to the appropriate devices. The system can be configured to cause function kick-out by sending a signal to function disconnect solenoids.

3.1 System Components

- TS7 Display Unit
- MG6 Computer Unit
- Pressure Transducers (Qty. 2)
- Reeling Drum Assembly, with Extension and Angle Sensors
- Swing Sensor (Might not be supplied by Greer)
- Anti-Two-Block Switches
- Cables
- Audible Alarm (Might not be supplied by Greer)
- Operation Manual & Calibration/Troubleshooting Manual

3.1.1 TS7 Display Unit

The display unit provides the operator with:

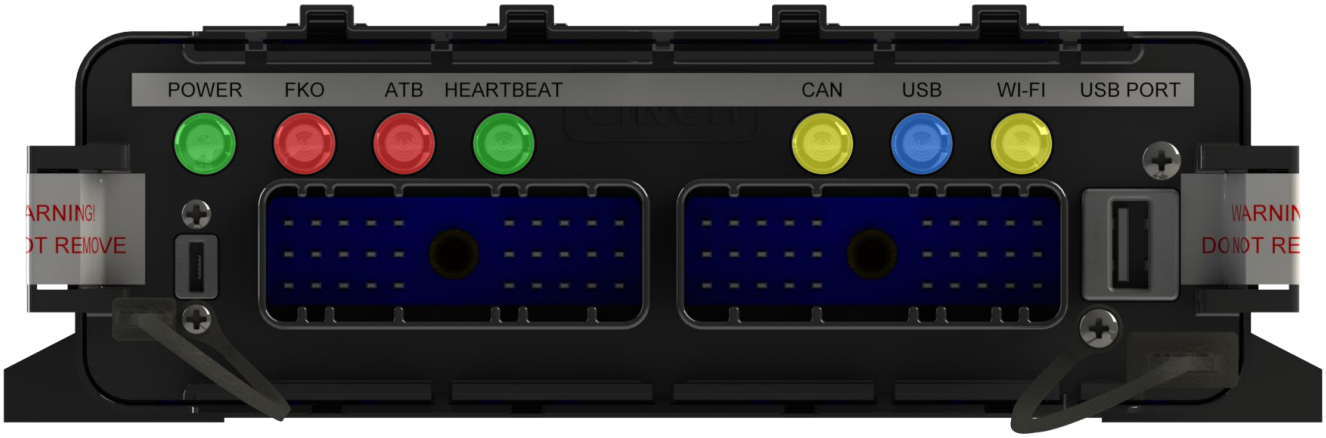
- Rated Capacity
- Actual Load
- Bar graph representation of Actual Load vs. Rated Capacity
- Radius of the Load
- Boom Angle
- Main Boom Length
- Swing Angle
- Boom Height
- Working Area
- Crane Configuration
- Frame-Level Sensor Screen (If Equipped)

3.1.2 MG6 Computer Unit

The MG6 Computer is the center of the system. It reads the sensors, controls computations and disconnect functions, and communicates with the display.

The front panel of the MG6 Computer contains the following:

1. Electrical Connectors (Qty. 2)
2. USB Port, with dust cover
3. LED Indicators
4. Micro-USB Port, with dust cover (For Use by Greer/TWG Service Technicians Only)



3.1.3 Pressure Transducers

There are two pressure transducers which measure pressure in the boom hoist cylinder. One transducer measures the rod-side pressure and one transducer measures the piston-side pressure.

The pressure transducers used with the MG6 Computer system are located outside of the computer enclosure. Each is connected to the computer by a cable and communicates using CAN J1939.

Each transducer is calibrated by the manufacturer and may be replaced independently from the computer. This is different from the pressure transducers used with the MG5 Computer, which were located inside the computer enclosure and could not be replaced.

3.1.4 Reeling Drum Assembly

The reeling drum assembly consists of the reeling drum and reeling drum cable, the boom angle sensor, and the extension sensor.

3.1.5 Boom Angle Sensor

The boom angle is measured by a potentiometer/pendulum assembly. It provides a voltage proportional to boom angle. This sensor is mounted inside the cable reeling drum assembly.

3.1.6 Extension Sensor

The extension sensor provides a voltage proportional to the extension of the boom. The extension sensor is mounted inside the cable reeling drum assembly.

3.1.7 Swing Sensor

The swing sensor measures the angle of the boom relative to the chassis.

3.1.8 Anti-Two-Block (ATB)

The ATB switch monitors the approach of the hook block or overhaul ball to the boom head. The switch is held in the normal position until the hook block or overhaul ball raises a weight that is mounted around the hoist rope. When the weight is raised it opens the switch. The resultant switch open signal is sent to the computer via the reeling drum. This results in the ATB alarm operating and a function kick-out to occur.

3.1.9 Function Kick-Out (FKO)

Electrically-operated hydraulic solenoids (not provided by Greer) disable the functions for boom hoist lower, telescope out, and winch up when an overload or ATB alarm condition occurs.

3.1.10 Operator Programmable Alarms

These alarms, when properly set by the operator, define the operating range. These alarms are programmable for each job site and allow the operator to work in a defined area.

- Minimum Boom Angle Alarm
- Maximum Boom Angle Alarm
- Maximum Boom Length Alarm
- Maximum Tip Height Alarm
- Left and Right Swing Alarm
- Work Area Alarm

3.1.11 Outrigger Position Sensing (If Equipped)

This alarm alerts the operator, audibly and visually, when the selected outrigger position does not match the detected outrigger position.

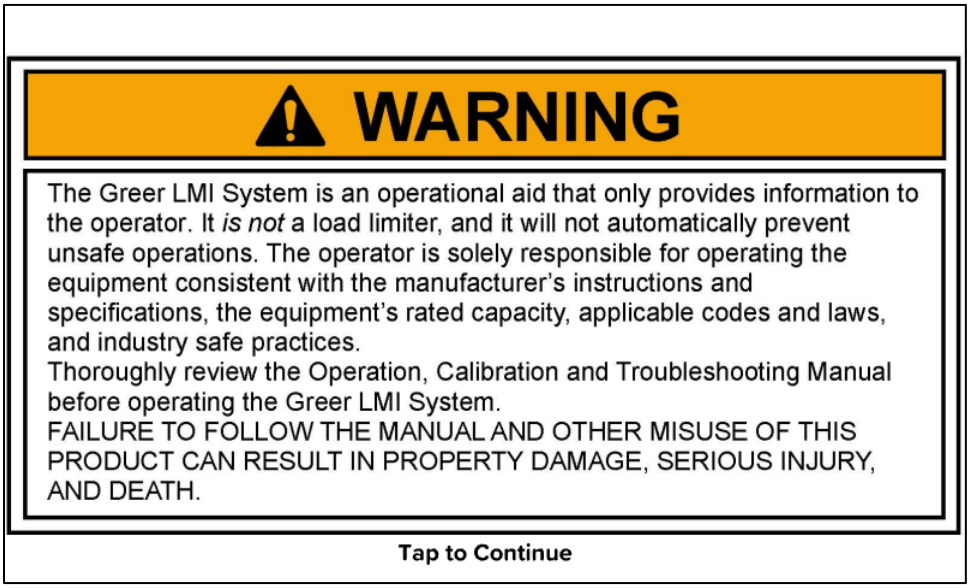
3.1.12 Electronic Frame-Level Sensor (If Equipped)

The sensor and display screen show the crane’s position on the X-axis and Y-axis relative to the 0.0° preset at the factory.

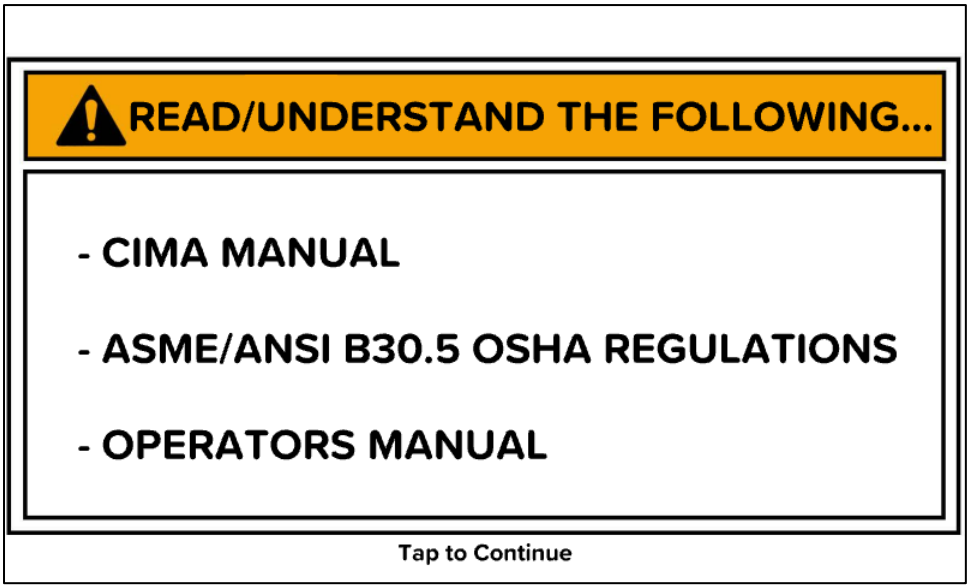
4. System Self-Test

Immediately following system power up, or upon entering calibration mode, the system performs a self-test which verifies that the computer, display console, cables, and sensors are working properly. The test lasts for approximately 10 seconds. During this time, crane motions are disabled by the system function kick-out.

When the warning message appears, read it and tap the screen to acknowledge the message and allow the system to start normal operation.



When the display shows the following message, read it and tap the screen to continue.



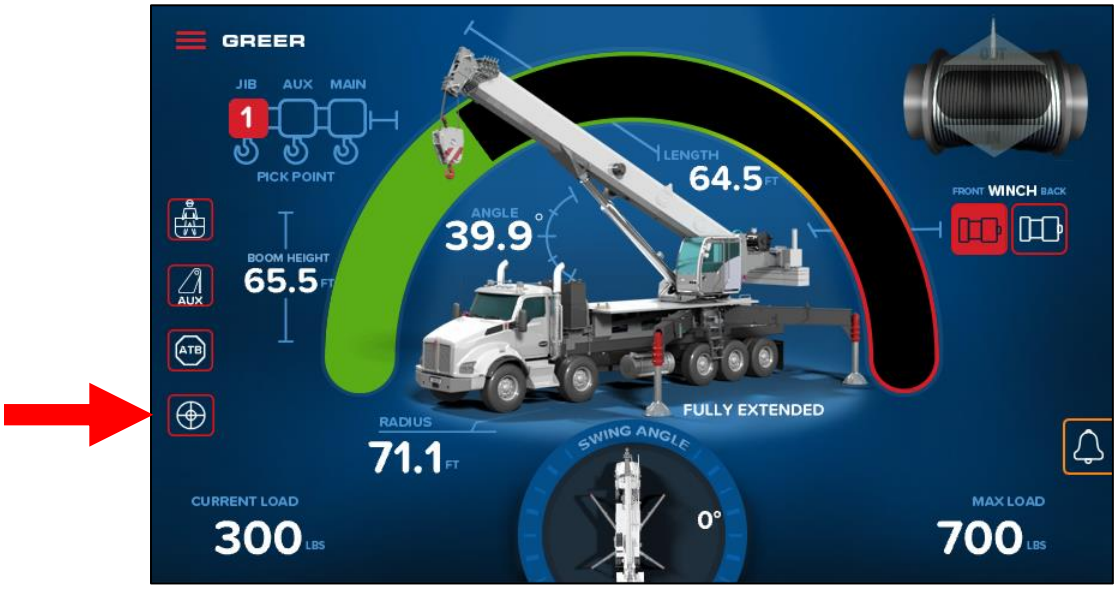
If the above does not occur, see the **Calibration & Troubleshooting Manual** section **TS7 Display Console Problems**.

5. System Setup

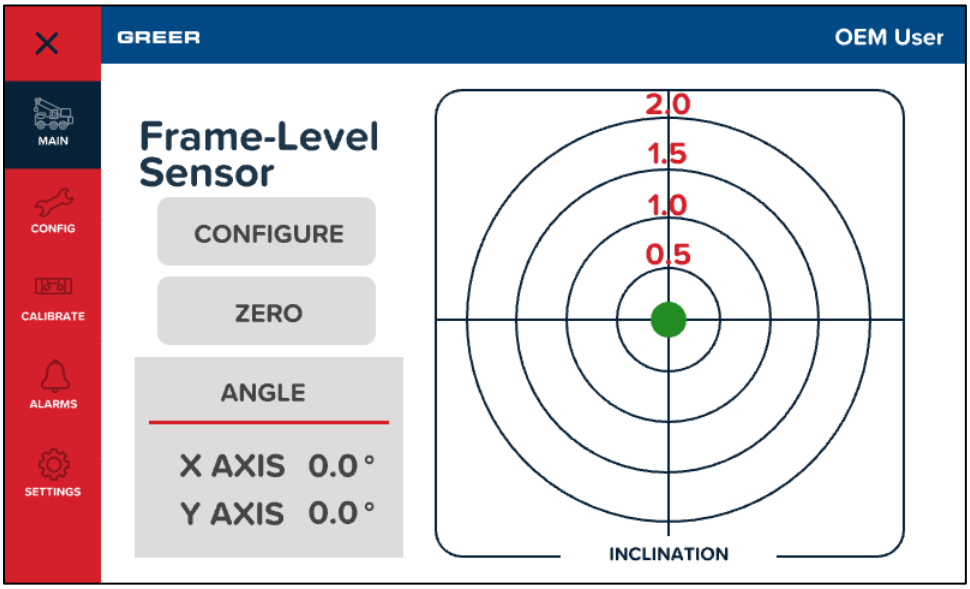
5.1 Frame-Level Screen (If Equipped)

If the machine is equipped with a Frame-Level sensor, tap the frame icon shown below to access the Frame Level screen.

NOTE: *This icon will not appear on machines without a Frame-Level sensor installed.*

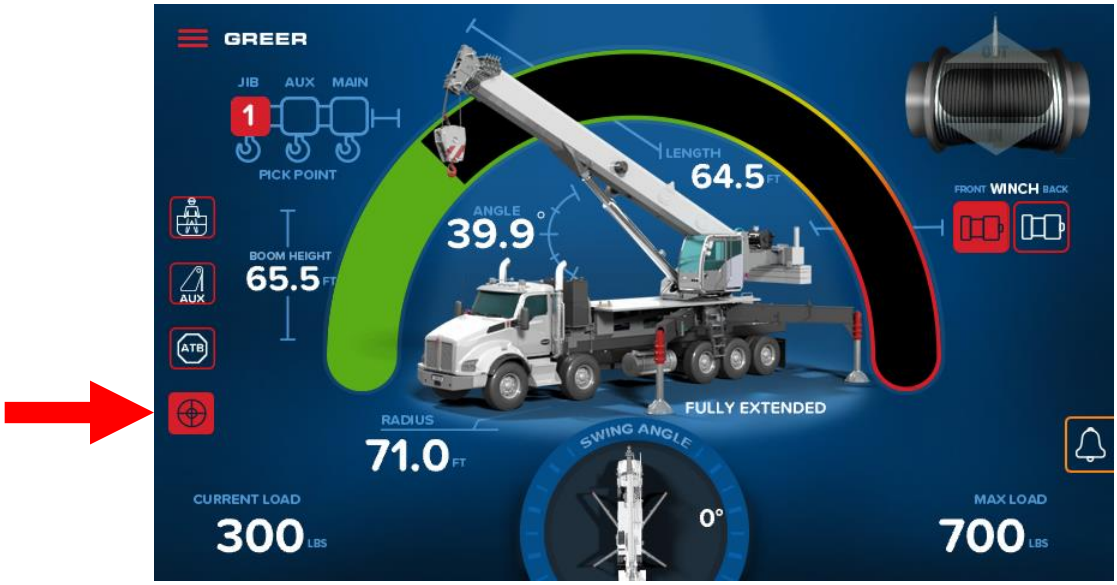


Use the Frame-Level screen to ensure the machine is properly leveled.

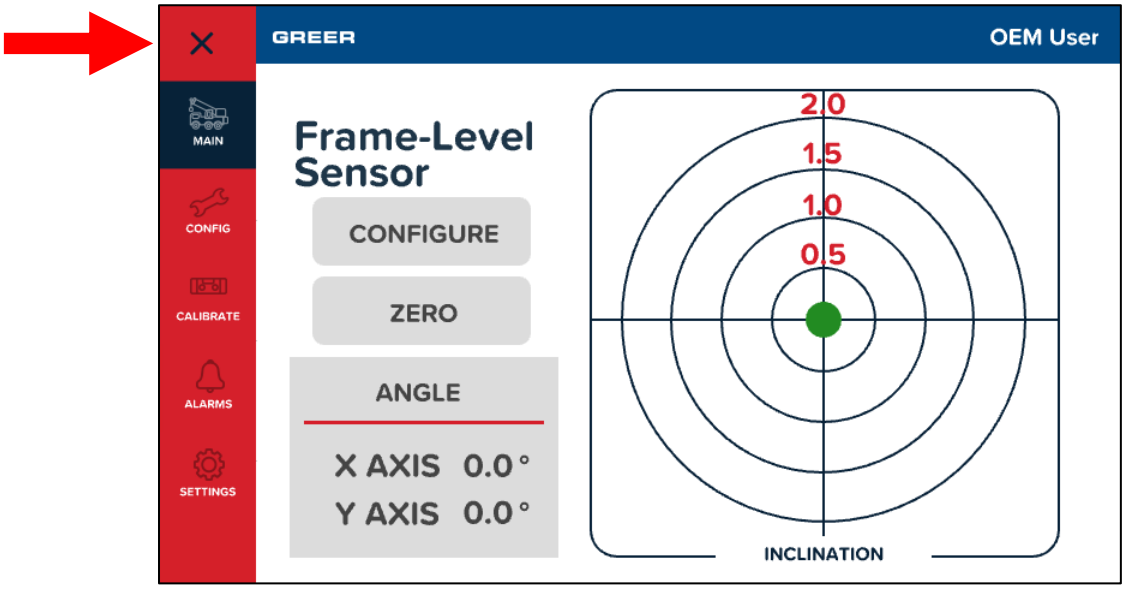


Machine angle from level	Dot Indicator
0°-0.9° on either axis	Green
1°-1.9° on either axis	Yellow
2°+ on either axis	Red

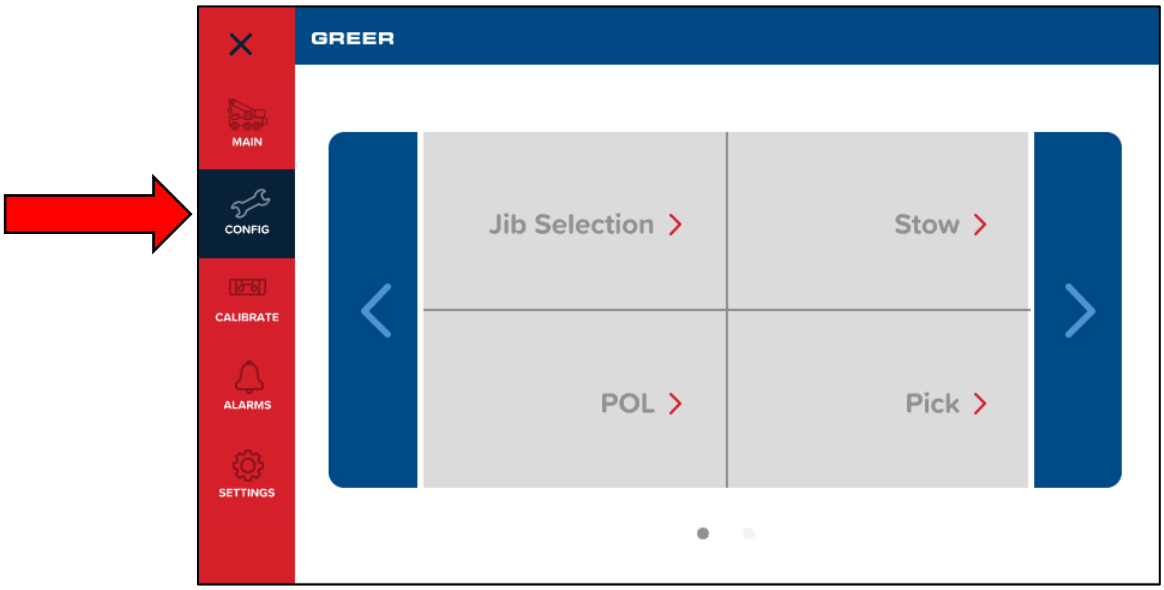
If the Frame-Level sensor (or its connection) malfunctions, the frame sensor icon on the home screen will display in red.



To exit the screen, tap the ***Close (X)*** button in the upper left corner.



5.2 Accessing the Configuration Screen



NOTE: *Tap the* ***CONFIG*** *icon to access the* ***Configuration*** *screen.*

The system will remember all previously set data, including after the system is powered off and powered on.

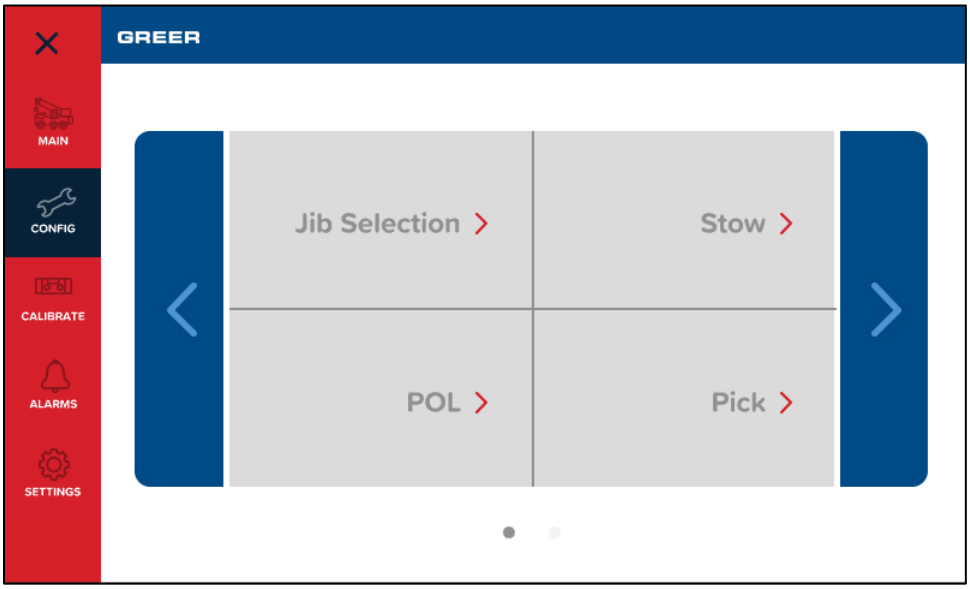
After the configuration has been set, the operator must choose the winch in use. Changing the winch will automatically change the lifting point and the parts of line to the previously set data for the selected winch.

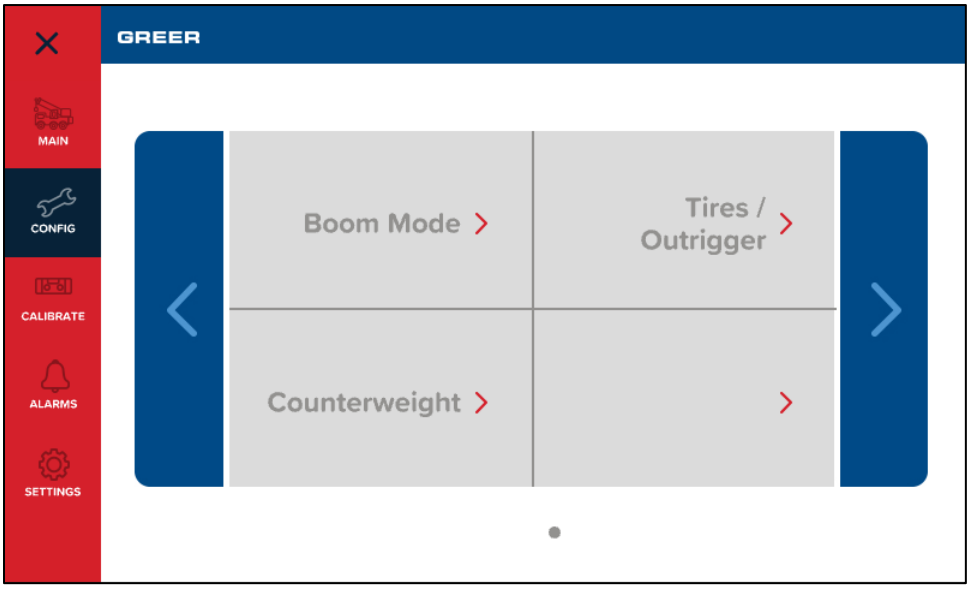
NOTE: *Always check the point of lift and parts of line following selection of the winch.*

⚠WARNING

WARNING! THE DISPLAYED LOAD AND CAPACITY ARE BASED UPON THE CURRENT SELECTED POINT OF LIFT. NEITHER THE GREER LMI SYSTEM, NOR THE CRANE CAPACITY CHART ALLOWS FOR LIFTING FROM MORE THAN ONE HOOK AT A TIME.

6. The Configuration Screens

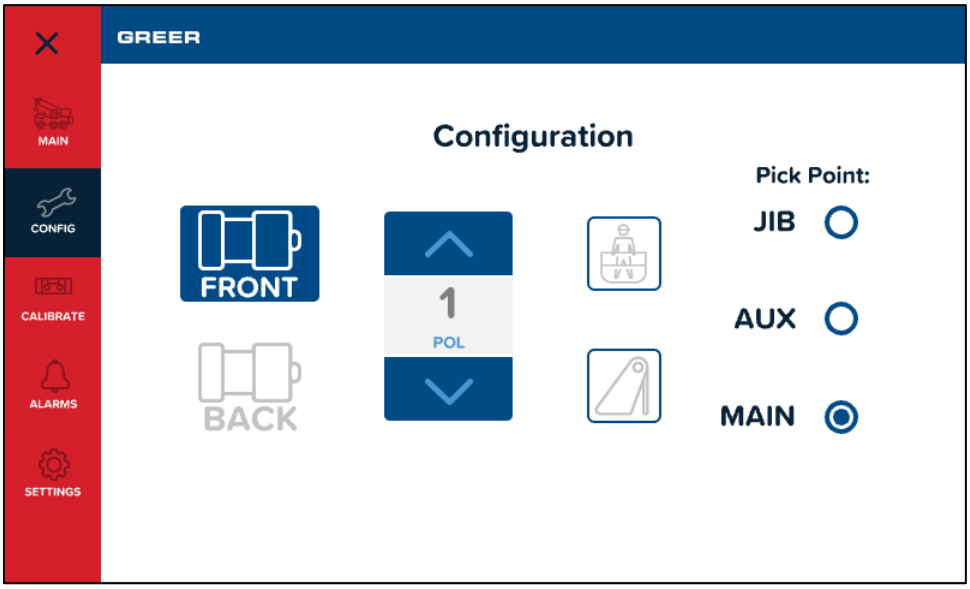




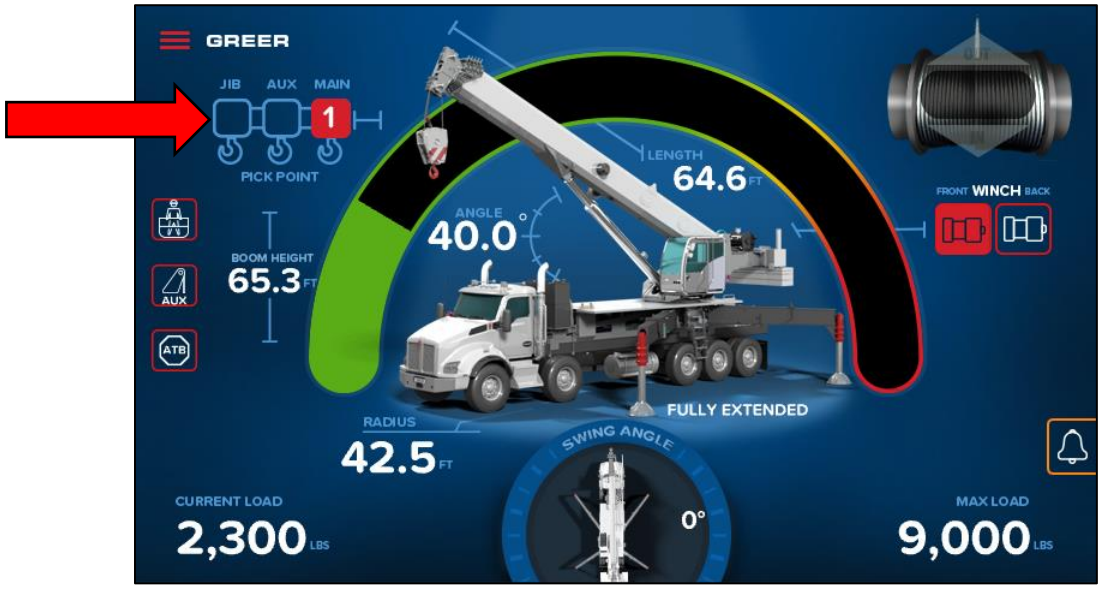
The **Configuration** screens represent the current setup of the system and can also be used to change the setup.

6.1 Pick Point

The ***Pick Point*** menu contains three configuration options: Jib, Auxiliary, and Main. The circled dot indicates the current point of lift. Tap the options given under ***Pick Point*** to change the current selection.

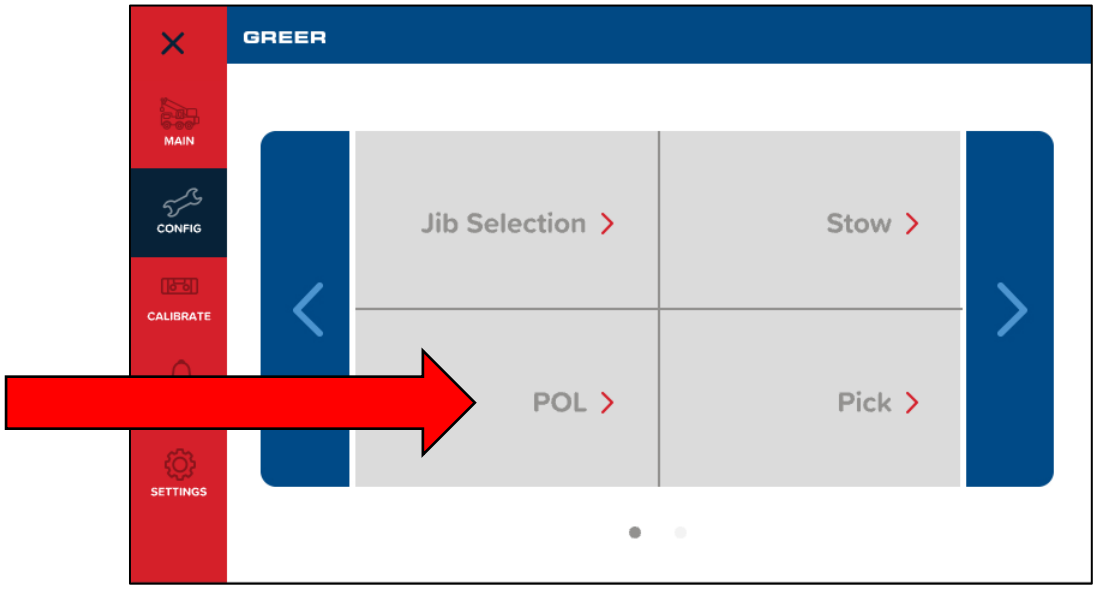


Once the selection is made, a single red indicator will illuminate on the top left corner of the main screen to show the point of lift. The red arrow in the figure below shows the location of the pick point selection status.

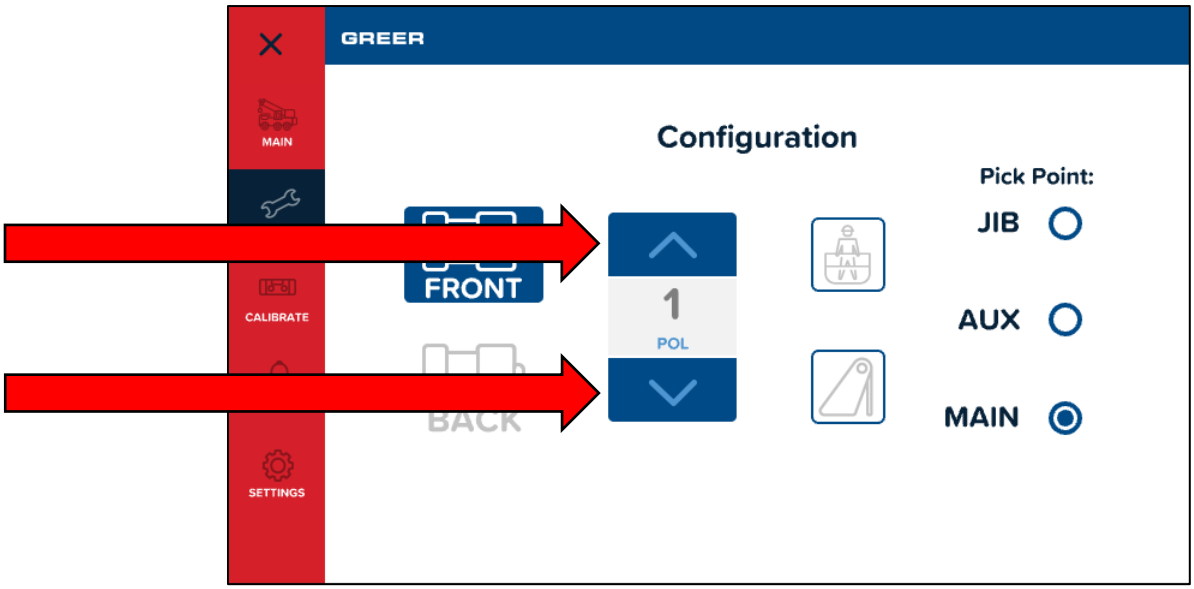


6.2 Parts of Line (POL)

The ***POL*** menu allows the operator to view or change the current number of parts of line in use.

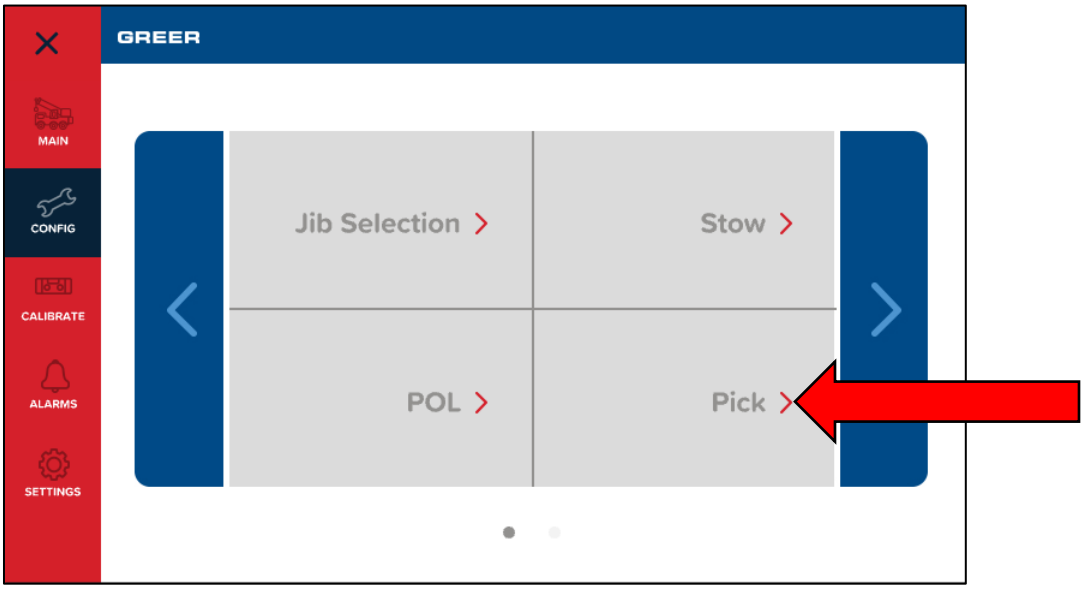


The Up Arrow increments the POL value and the Down Arrow decrements the value.

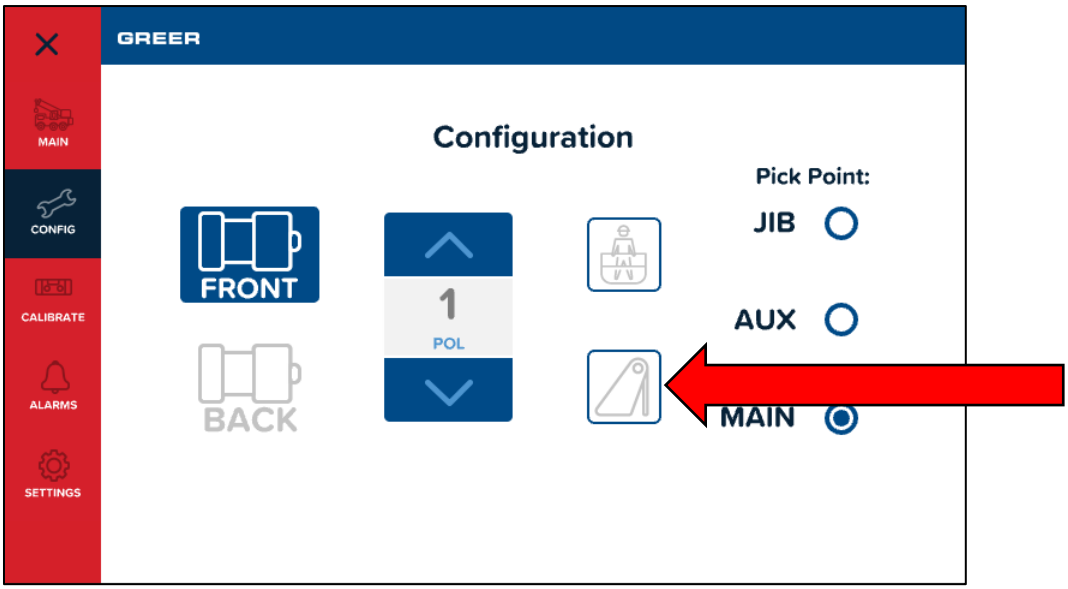


6.3 Aux Head

Tap the Pick area, shown below, to make an ***Aux Head*** selection when the aux head is fitted.

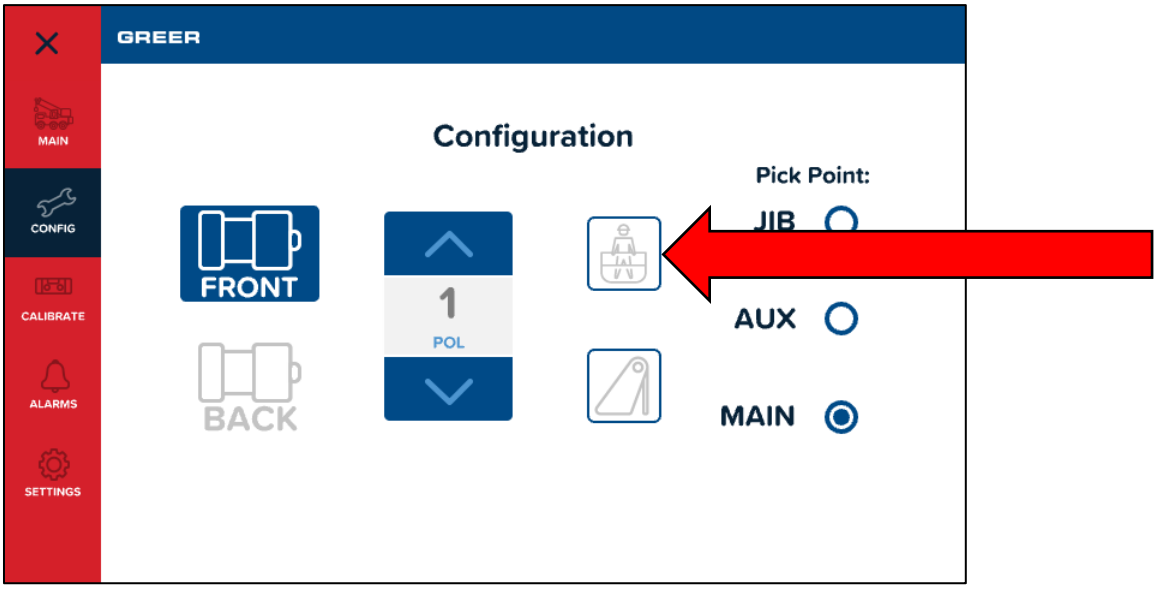


Tap the Aux Head symbol, indicated below by the red arrow, to select / deselect the Aux Head option.



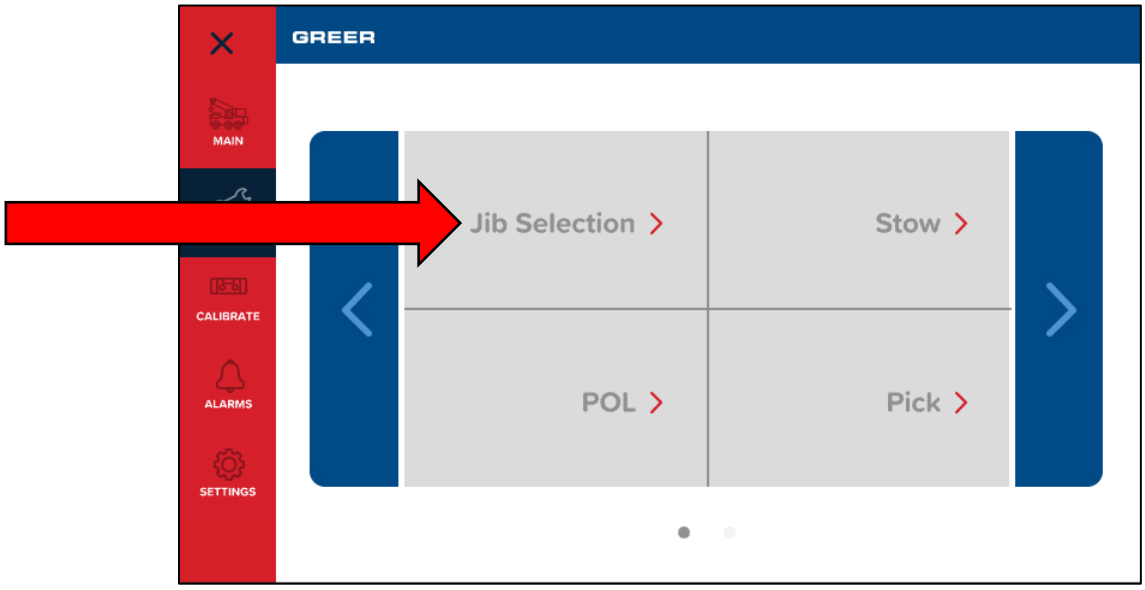
6.4 Man Basket

The ***Man Basket*** icon, shown below, enables the optional Personnel Platform, if equipped. The Man Basket symbol on the main screen would glow RED to indicate this selection made in the configuration screen.

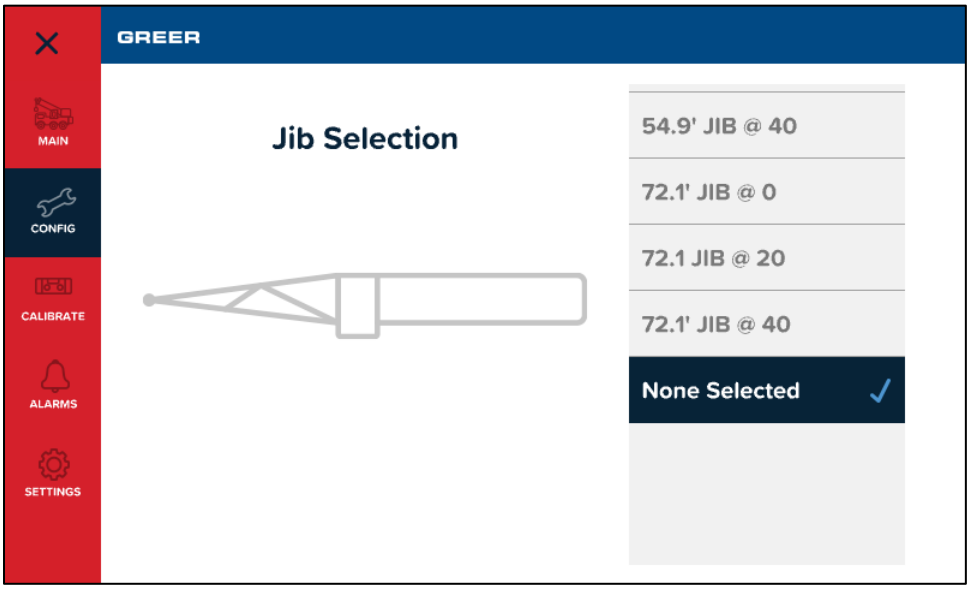


6.5 Jib

Tap the ***Jib Selection*** area to access the different options.



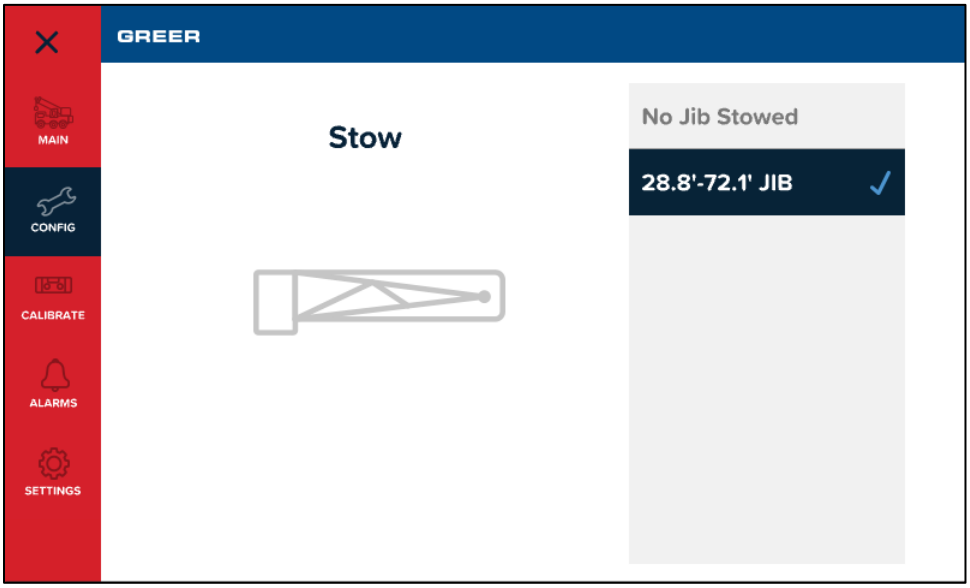
The options indicate the length and offset of the jib in use. If there are more selections which do not fit the current view, they can be accessed by scrolling up or down. Tap the appropriate jib and ensure that a check mark appears beside the selected jib.



6.6 Stow

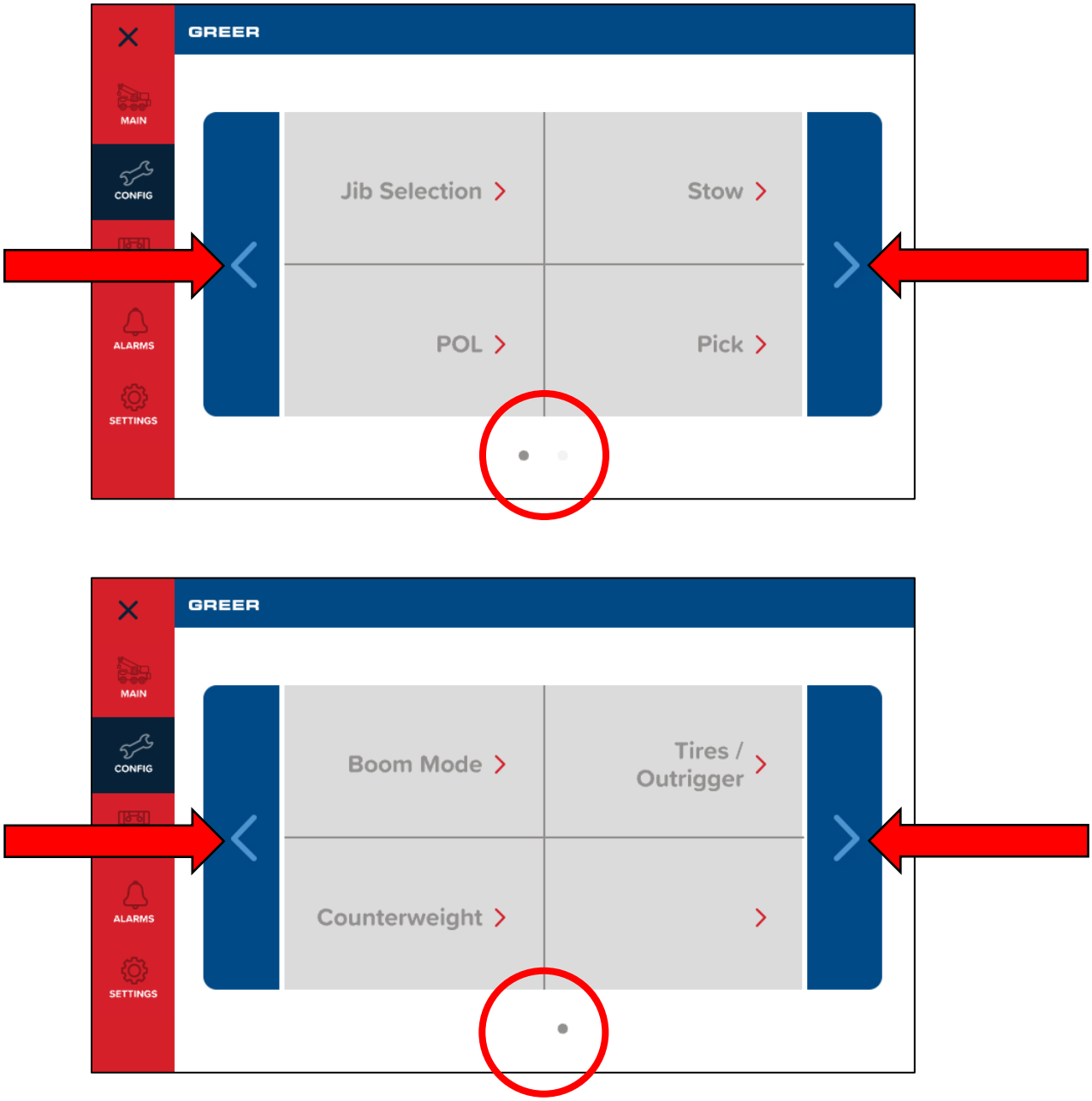
Select the stow menu on the first page of the configuration screen.

When a jib is stowed on the boom, tap the appropriate jib option and the selection is confirmed by a blue check mark.



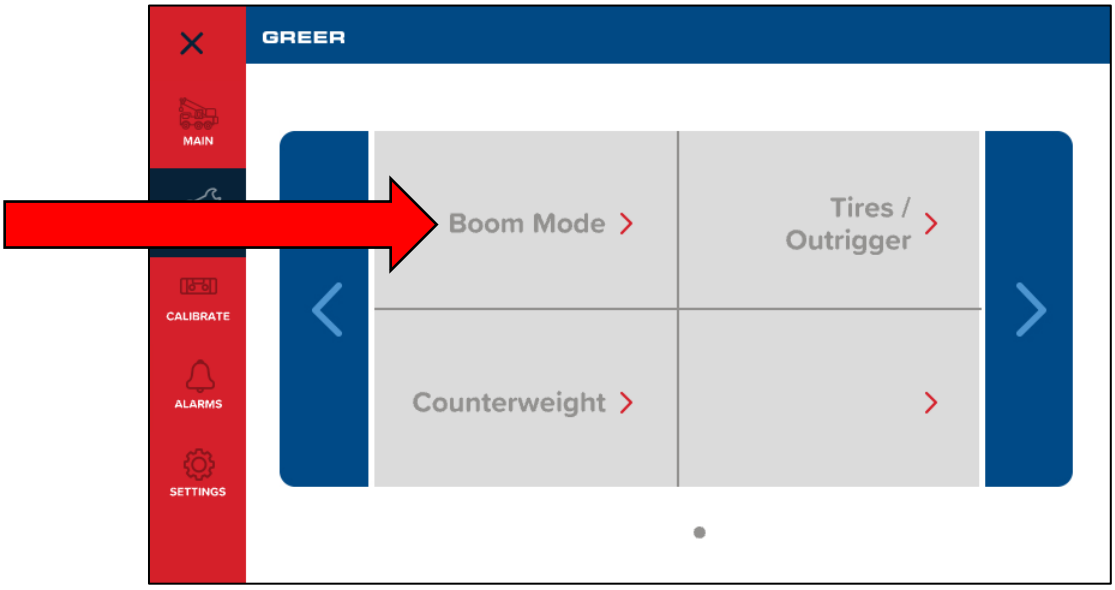
6.7 Left and Right Arrows

The ***Left and Right Arrows*** are used to move to the previous and next configuration screen, respectively. The dark grey dot at the bottom of the screen, shown encircled below, moves in synchronism with the page.



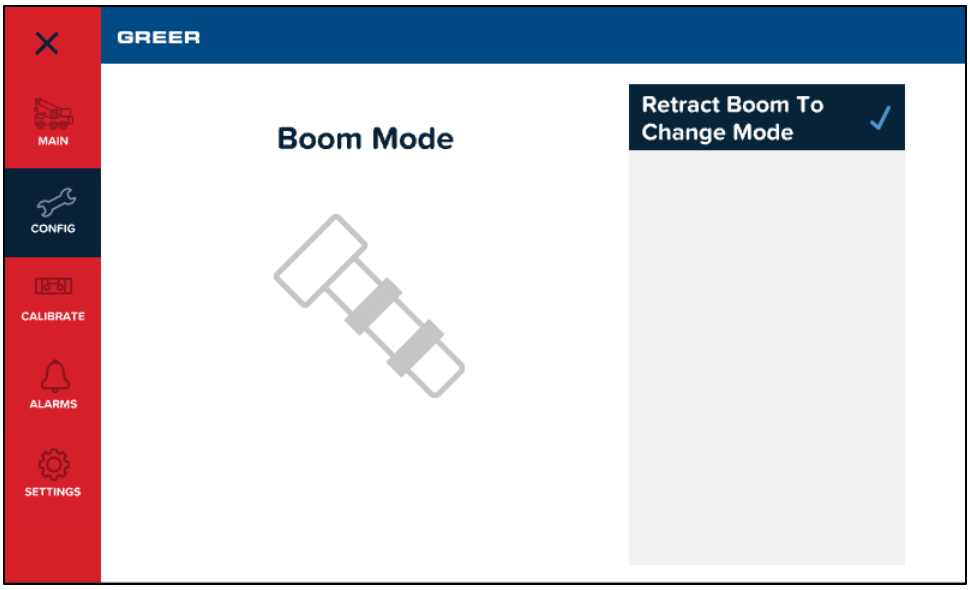
6.8 Boom Mode

The ***Boom Mode*** group contains options for machines with pinned extensions or active boom tip.

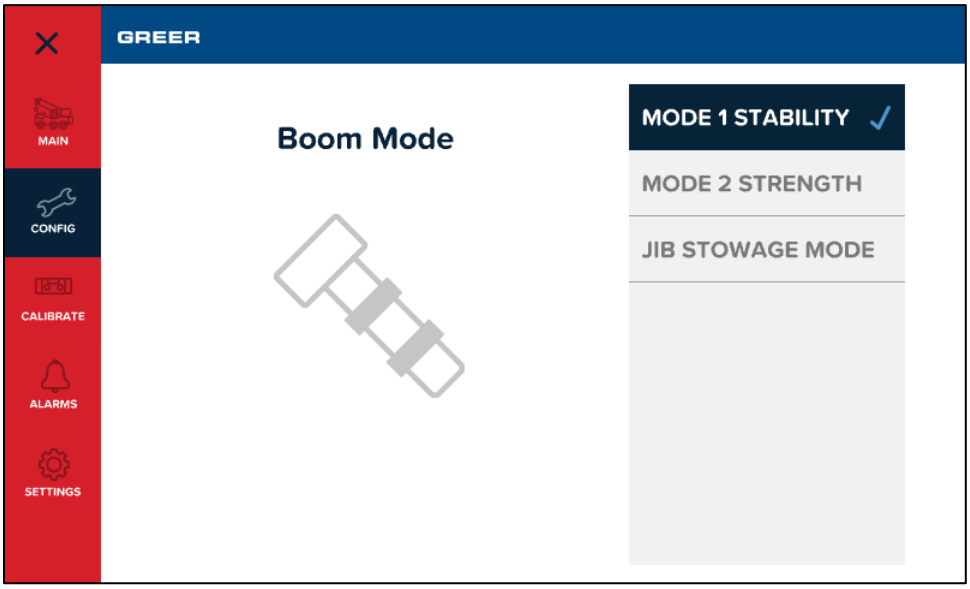


NOTE: *The boom must be within 0.5 feet of fully retracted in order to change boom mode*.

If the boom is not fully retracted, then the following screen appears. Fully retract the boom to be able to change the boom mode.

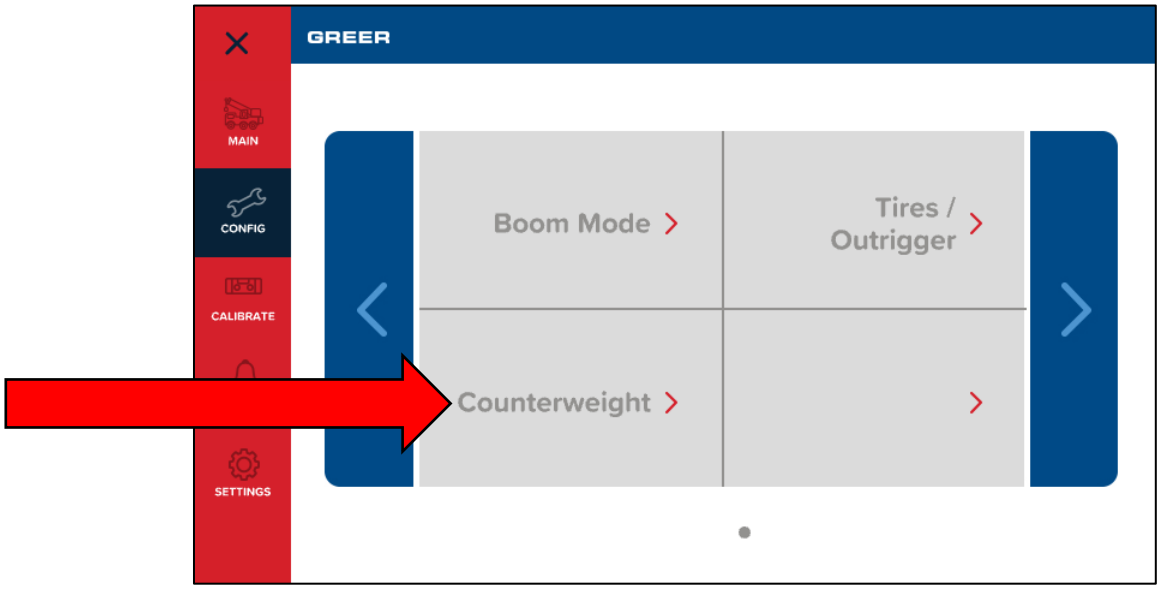


Choose the boom mode in use and the selection is confirmed by a blue check mark.

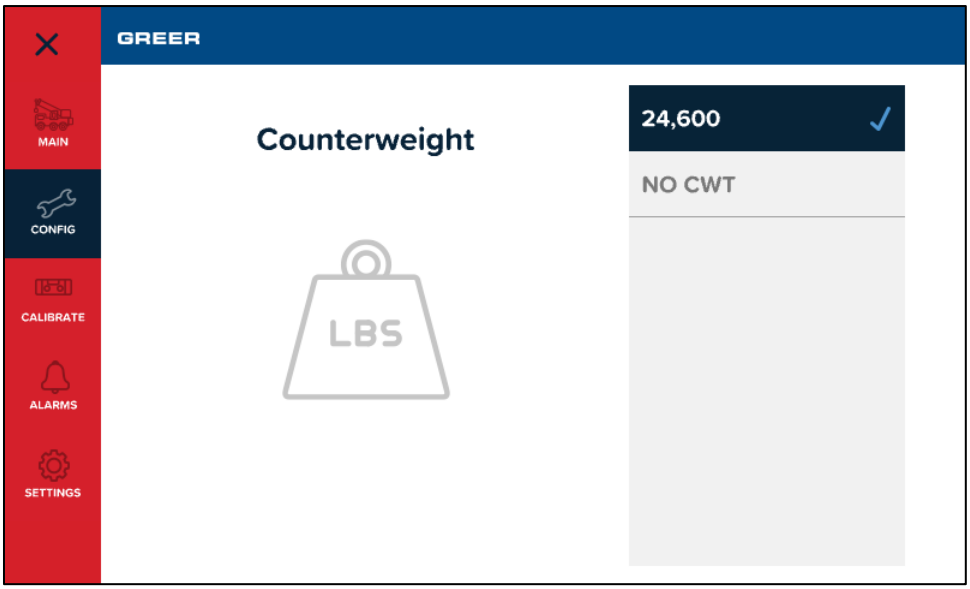


6.9 Counterweight

Tap the ***Counterweight*** group to access the counterweight options.

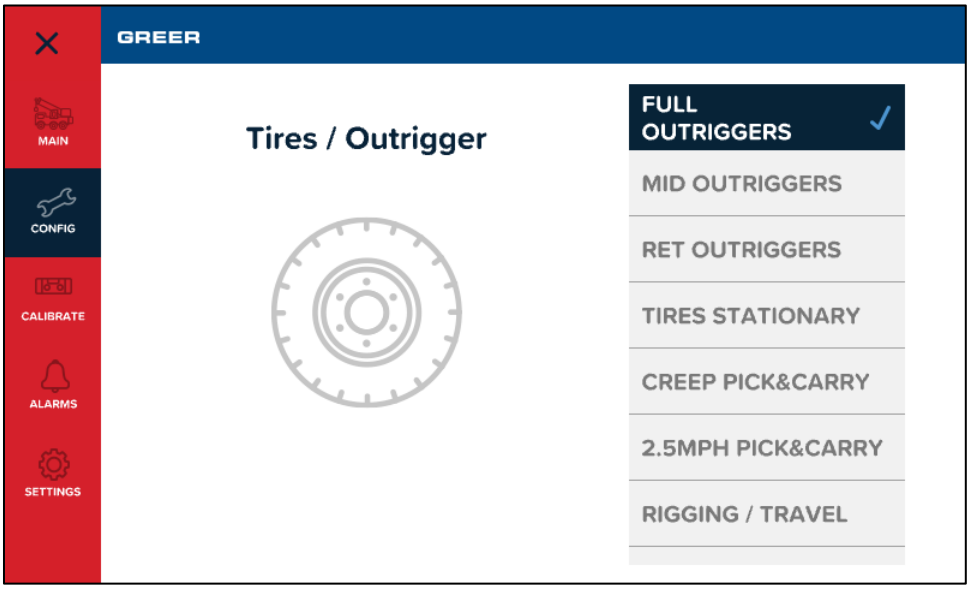


Choose the appropriate counterweight and verify that a check mark appears beside the selection made.



6.10 Tires/Outrigger

The ***Tires/Outrigger*** menu contains options for choosing outriggers, tires, and rigging/travel modes. The outriggers could be full, intermediate, or retracted. Ensure the selection matches the current crane setup. For machines with more than one tire option, it is important that the operator selects the tire configuration for the tire chart used. Select ***RIGGING/TRAVEL*** mode when the machine is in the rigging process or is a rough terrain crane traveling between jobs. When in ***RIGGING/TRAVEL*** mode all other functions are disabled. The selection made is verified by a check mark.

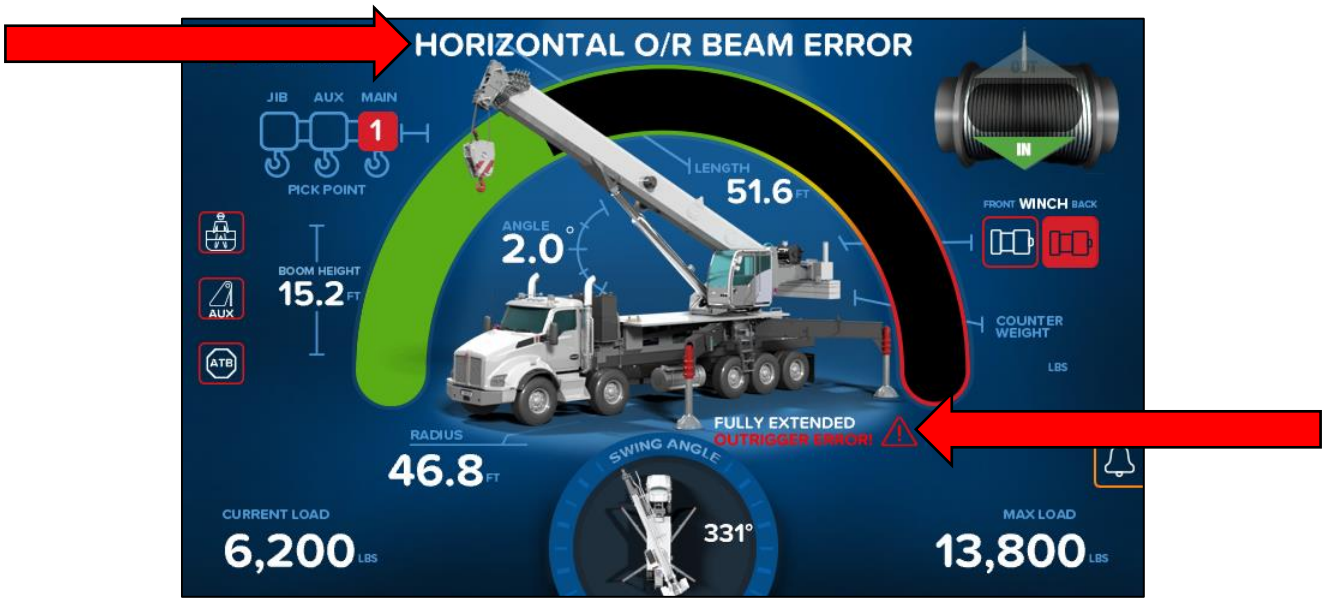


6.10.1 Outrigger Position Sensing (If Equipped)

The operator will be warned if the selected outrigger position does not match the detected outrigger position.

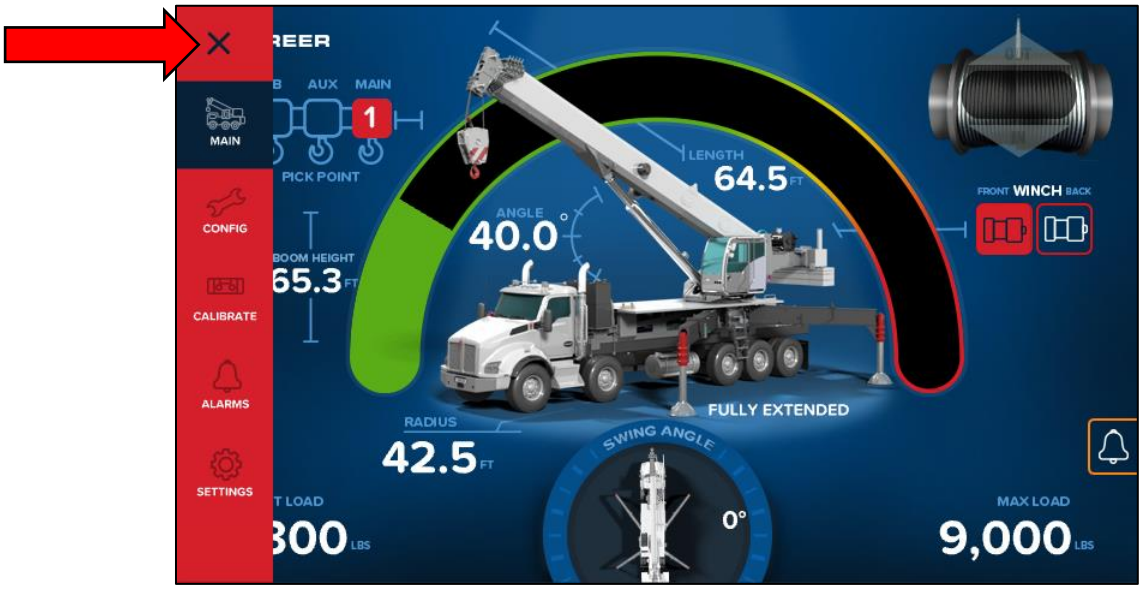
Correct Selection: When the selected and detected outrigger positions match, there will not be any error message in the main screen.

Incorrect Selection: An error message will flash on the main screen if there is a mismatch between the selected and detected outrigger position. The arrows in the figure below indicate the error text messages.



6.11 Home

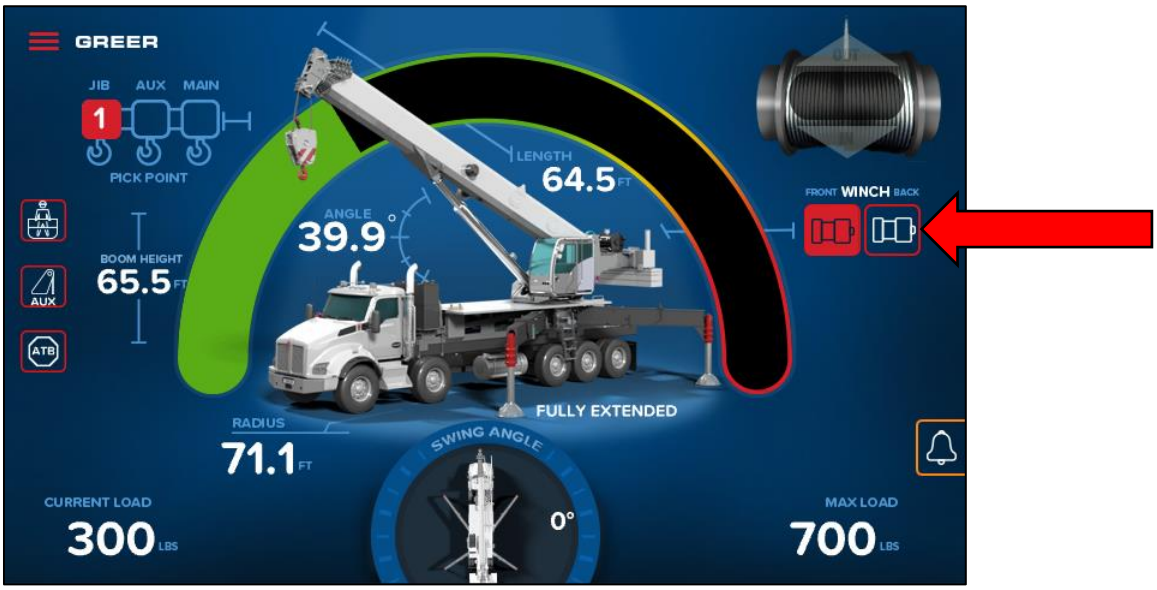
Tapping the ***Close (X)*** button returns the display to the Home screen.

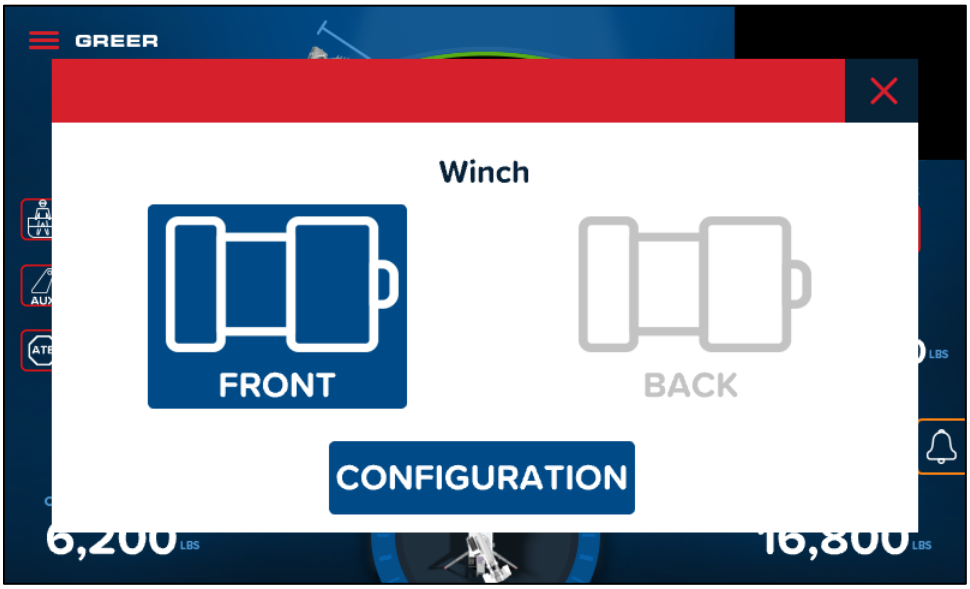


6.12 Winch

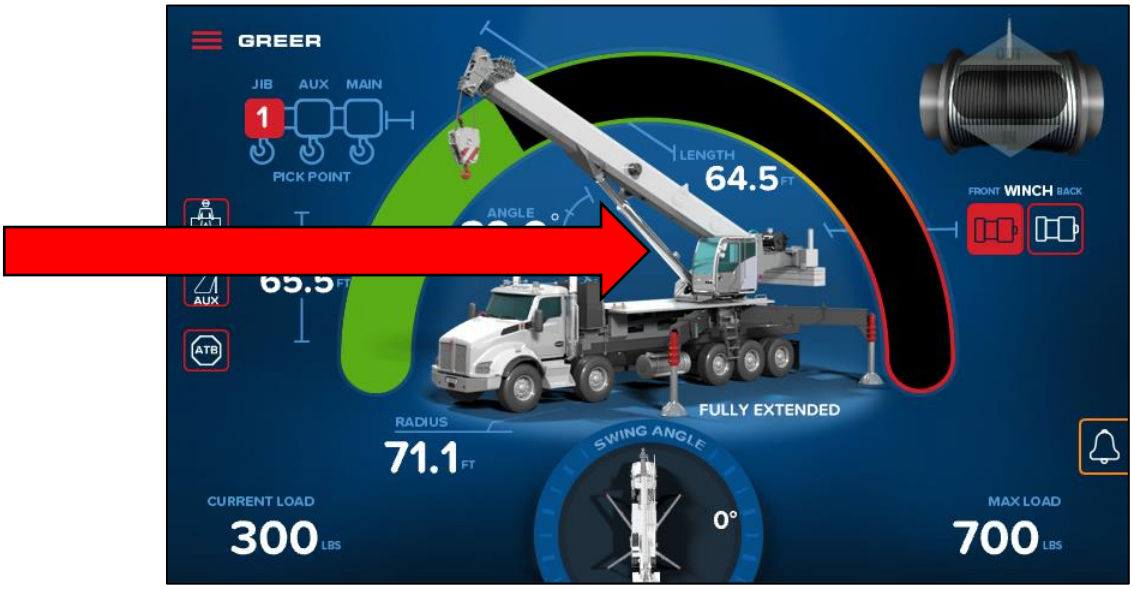
The ***Winch*** group contains two symbols, which indicate the front and rear winch. The front or back winch is selected by tapping the symbol below the corresponding name.

NOTE: *If the crane is equipped with two winches, always select the winch to be used for the lift prior to the point of lift and parts of line.*





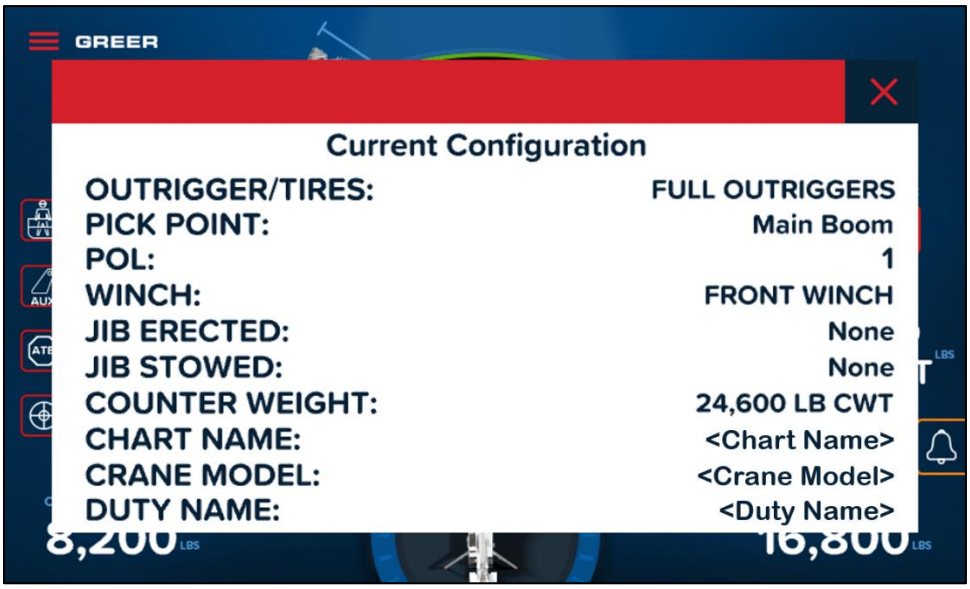
7. The Home Screen



The **Home Screen** shows the LMI window, which displays information such as the Actual Load, Angle, Load Radius, etc. The Crane Configuration is pictorially represented by suitable graphic symbols.

7.1 Crane Configuration Window

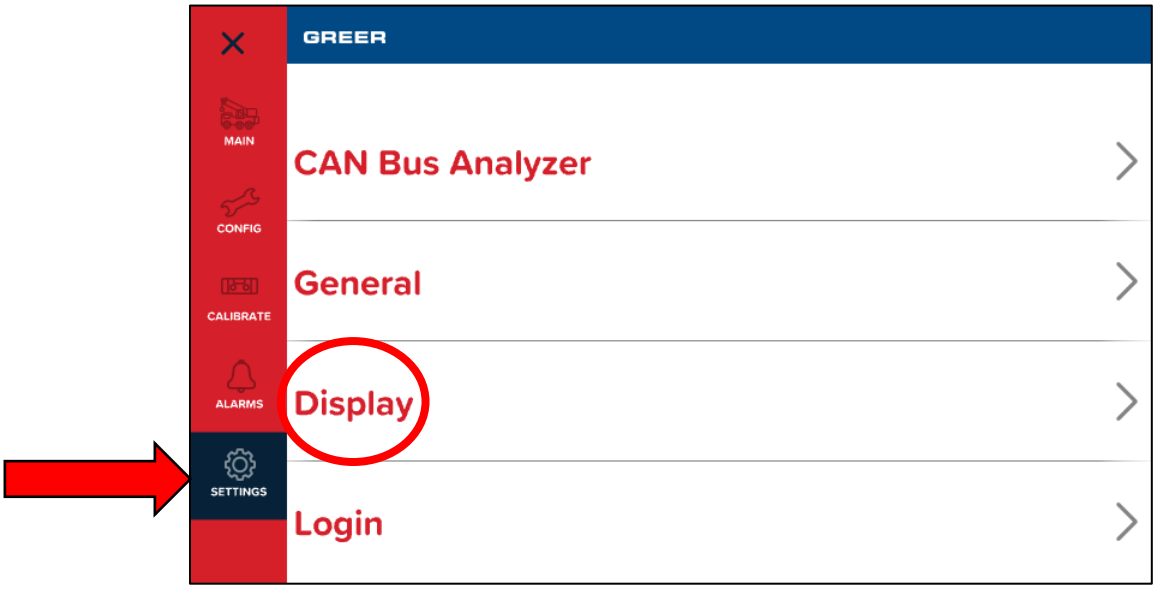
The ***Crane Configuration*** window can be pulled up by tapping the crane image on the main screen, indicated by a red arrow in the figure above. It provides a textual representation of the current Crane Configuration. A generic example of the ***Crane Configuration*** window is shown below.



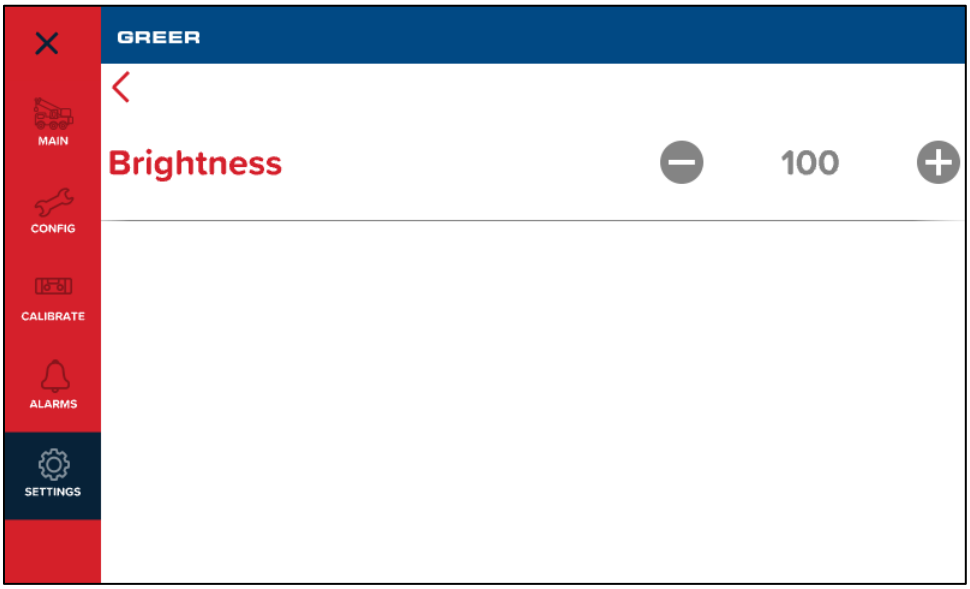
NOTE: *Configuration options are crane dependent. This is a generic example.*

7.2 Adjusting the Brightness of the Display

1. Tap the ***Main Menu*** symbol ( )on the main page and then the ***Settings*** option (indicated by the arrow in the figure below) to access the ***Display*** options (shown encircled below).

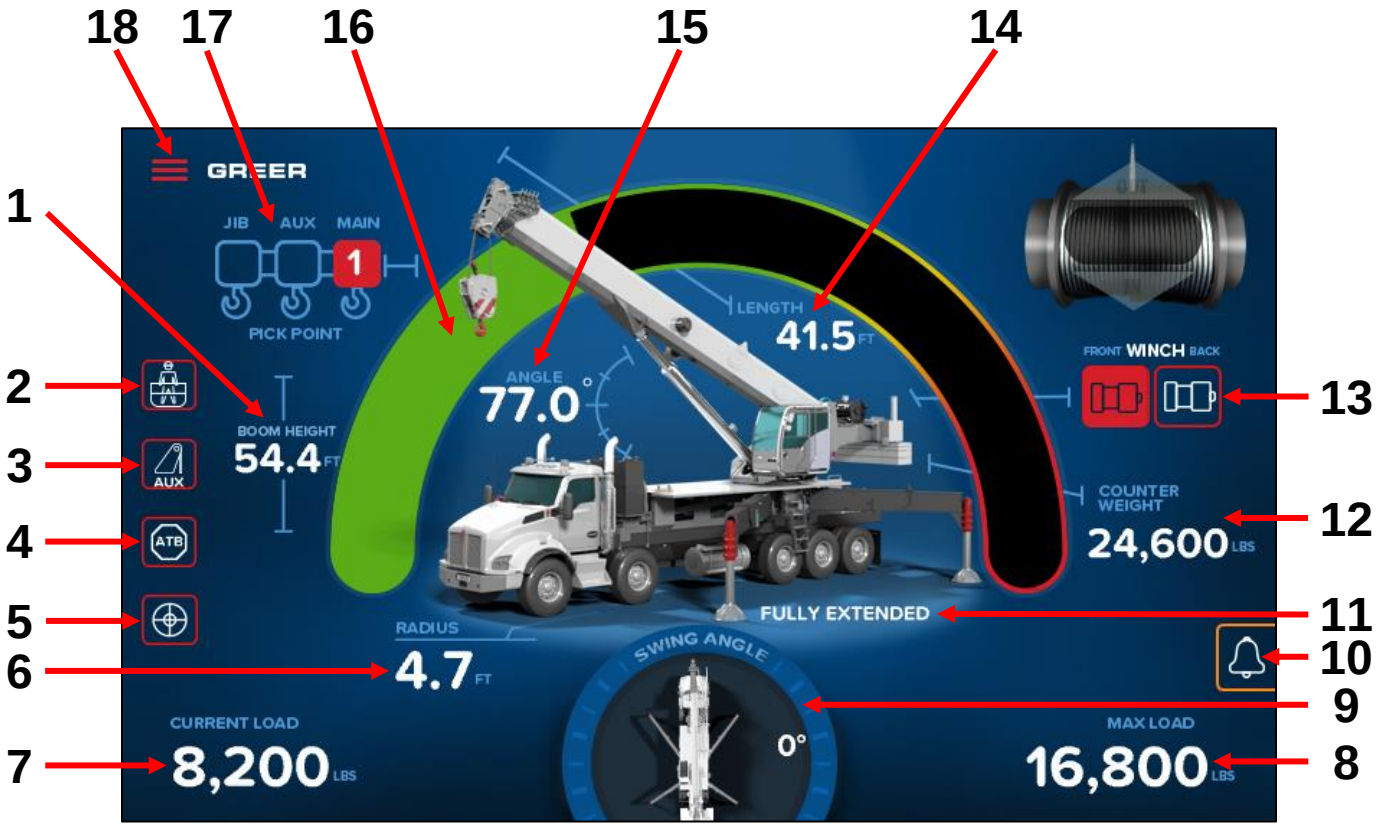


2. Tap the **–** and **+** buttons to adjust the display to match the current conditions.



3. Tap the ***Close (X)*** button when finished. The display will return to the ***Home*** screen.

7.3 LMI Window



1. ***BOOM HEIGHT –*** This displays the current height of the boom.
2. ***MAN BASKET INDICATOR –*** This red indicator illuminates when a personnel platform has been enabled.
3. ***AUX HEAD INDICATOR –*** This red indicator illuminates when an auxiliary head is fitted and enabled.
4. ***ANTI-TWO-BLOCK –*** This red indicator illuminates when the ATB switch detects an approach to a two-block condition.
5. ***FRAME SENSOR –*** This indicator appears only when a frame level sensor is fitted. This red indicator illuminates when the frame level sensor malfunctions.
6. ***LOAD RADIUS –*** This displays the current radius of the load.
7. ***ACTUAL LOAD –*** This displays the total load suspended below the lifting point including slings, hooks, etc.
8. ***RATED CAPACITY –*** This displays the maximum capacity of the crane in the current configuration.
9. ***SWING ANGLE –*** This displays the swing angle of the turret relative to chassis.
10. ***ALARM BUTTON –*** Tap this icon to cancel any active alarms. The ***ALARM BUTTON*** is an indicator for Alarms, Operator Alarms and Faults. For descriptions of possible alarms and how they are indicated, see the following section, **Indicators for Alarms and Faults**.
11. ***OUTRIGGER INDICATOR –*** This displays the selected outrigger.

12. ***COUNTERWEIGHT –*** This displays the selected counterweight. It appears only when a counterweight is selected.
13. ***WINCH BUTTON / INDICATOR –*** This displays the selected winch. Also tap this button to change the winch selection.
14. ***BOOM EXTENSION –*** This displays the current extended length of the boom.
15. ***BOOM ANGLE –*** This displays the current angle of the boom relative to horizontal.
16. ***BAR GRAPH –*** This displays the ***ACTUAL LOAD*** relative to the ***RATED CAPACITY***.
17. ***PICK POINT –*** The red indicator shows the selected pick point.
18. ***MAIN MENU BUTTON –*** Tap this button to access the main menu, configuration screen, calibration screen, alarm screen, and settings screen.

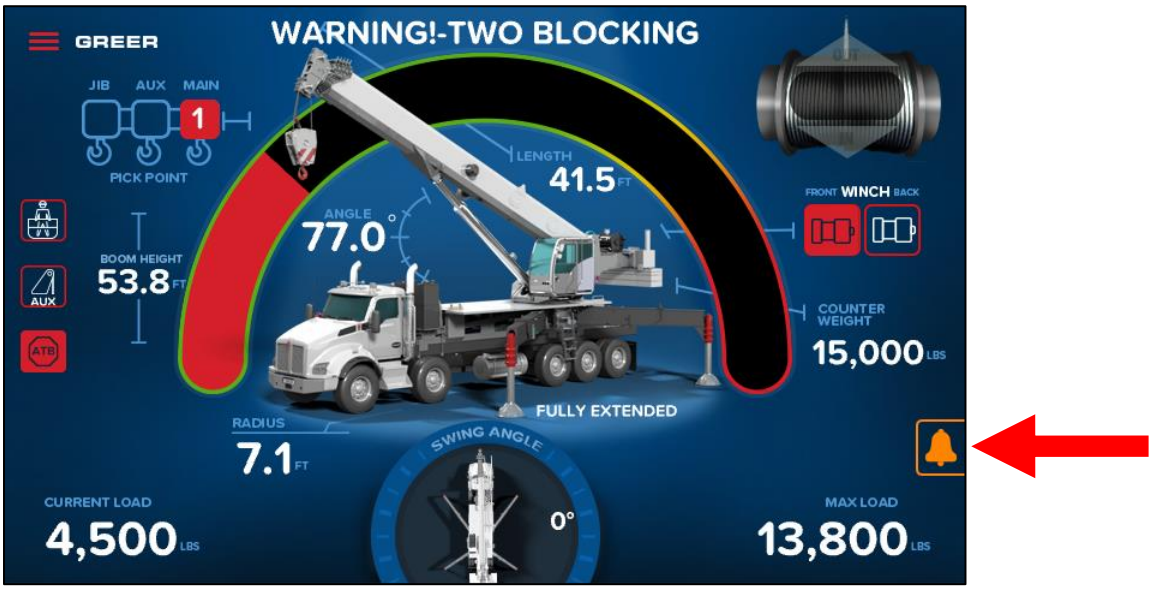
7.3.1 Indicators for Alarms and Faults

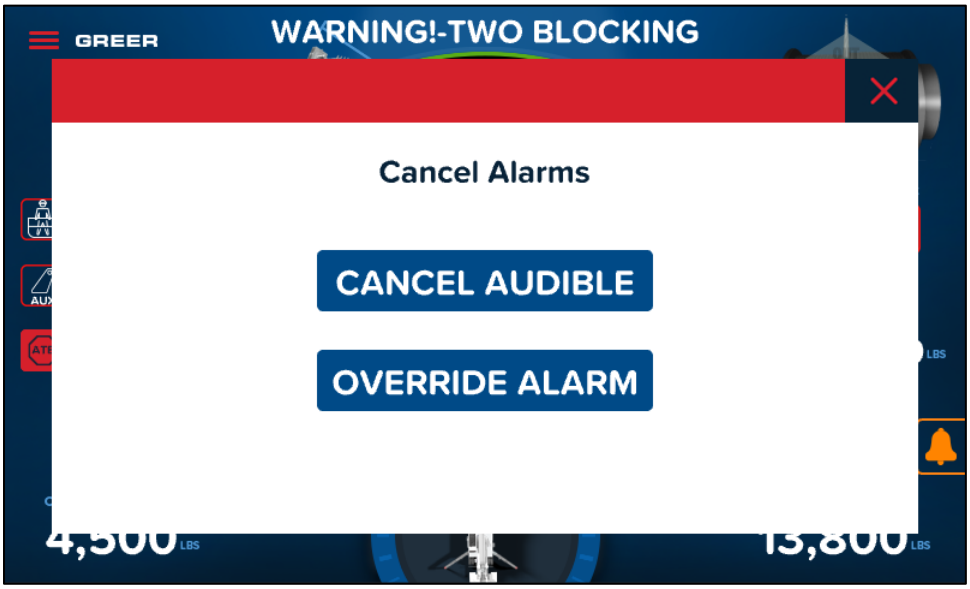
The ***ALARM BUTTON*** is an indicator for Alarms, Operator Alarms and Faults. The table below lists the alarms and shows how they are indicated.

Indicator(s)	Description
	The bell turns orange when there is an Alarm. Touching this will bring up the Cancel Alarms window.
	This symbol appears if there is a Minimum or Maximum Boom Length Alarm. Touching this will bring up the Operator Alarms Boom Length window.
	This symbol appears if there is a Minimum or Maximum Boom Angle Alarm. Touching this will bring up the Operator Alarms Boom Angle window.
	This symbol appears if there is a Swing Angle Alarm. Touching this will bring up the Operator Alarms Swing Angle window.
	These symbols appear if there is a Tip Height Alarm.
	This symbol appears if there is a Work Area Alarm.
	This symbol appears if there is a fault. Touching this will display the current faults.

8. Cancel Alarm Button

The ***Cancel Alarm*** button is used to silence the audible alarm. When an alarm is active, the bell icon, shown by the arrow in the figure below, appears shaded orange. Tapping the button will bring up the ***Cancel Alarm*** screen, which can be used to silence the audible alarm and override it.





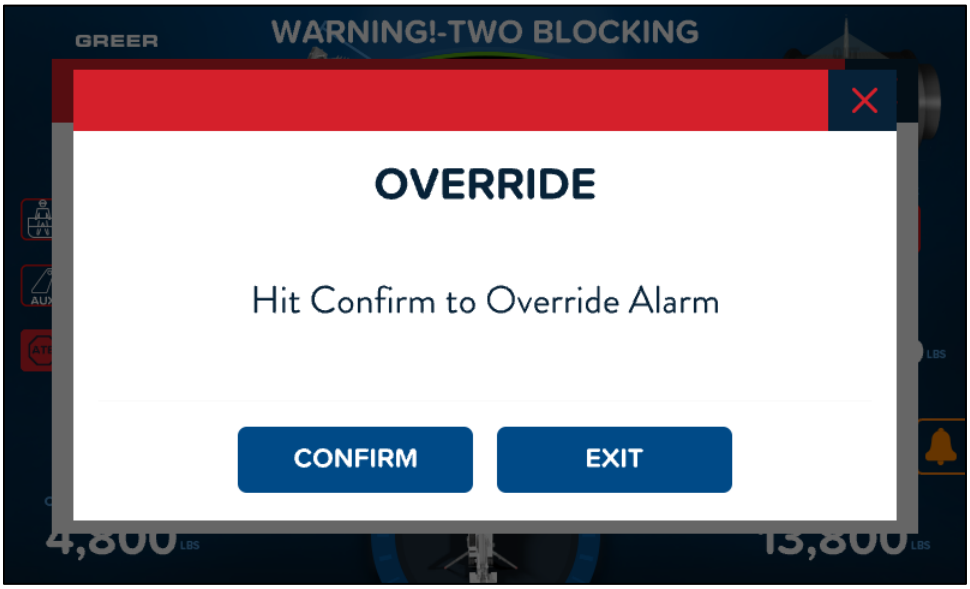
The alarm could be caused by an:

- Overload
- ATB Alarm
- Operator Programmable Alarm
- Outrigger Horizontal Position Mismatch

The audible alarm will remain cancelled until the condition which caused the alarm has been resolved.

8.1 Reset Function Kick-Out

When rigging the machine, it may be necessary to place the boom in a position that could cause a function kick-out (FKO). In this situation, tap the ***Cancel Alarm*** button. When the ***Cancel Alarms*** screen pops up, tap the ***Override Alarm*** button. An override screen will pop up – tap the ***Confirm*** option to override the FKO.



When the condition which caused the FKO is no longer present, the function disconnect relay will reset to the normal condition. If a different alarm condition occurs while the relay is over-ridden, the new alarm condition will cause another FKO.

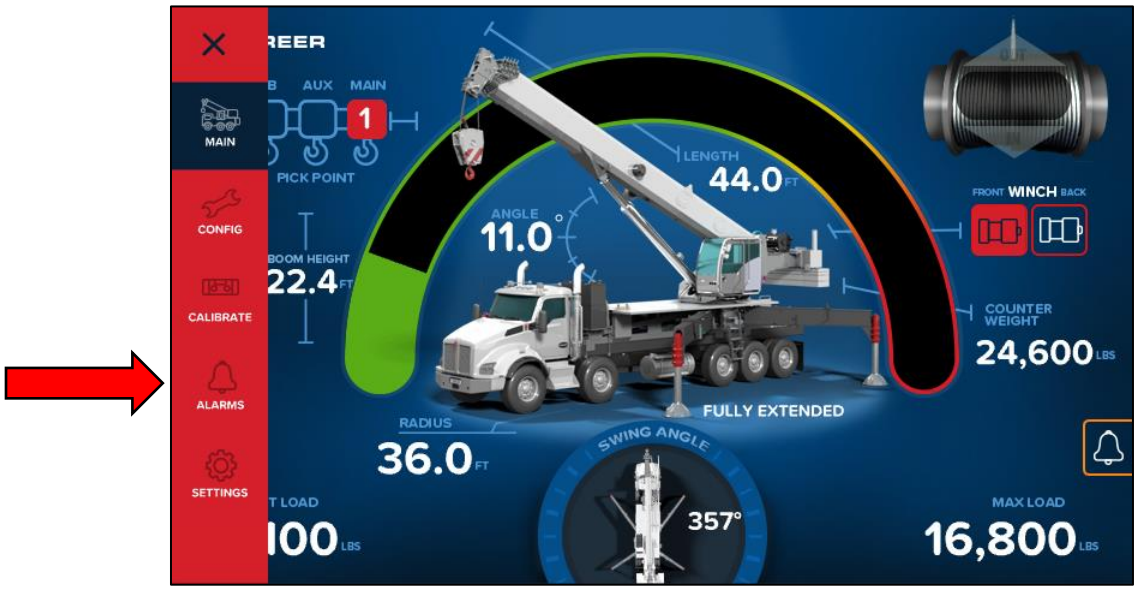
WARNING

WARNING! WHEN THE FUNCTION DISCONNECT RELAY IS RESET USING THE CANCEL ALARM BUTTON, THERE IS NO LONGER PROTECTION AGAINST THE CONDITION THAT CAUSED THE FUNCTION KICK-OUT.

9. Operator Programmable Alarms

9.1 Accessing the Operator Alarms

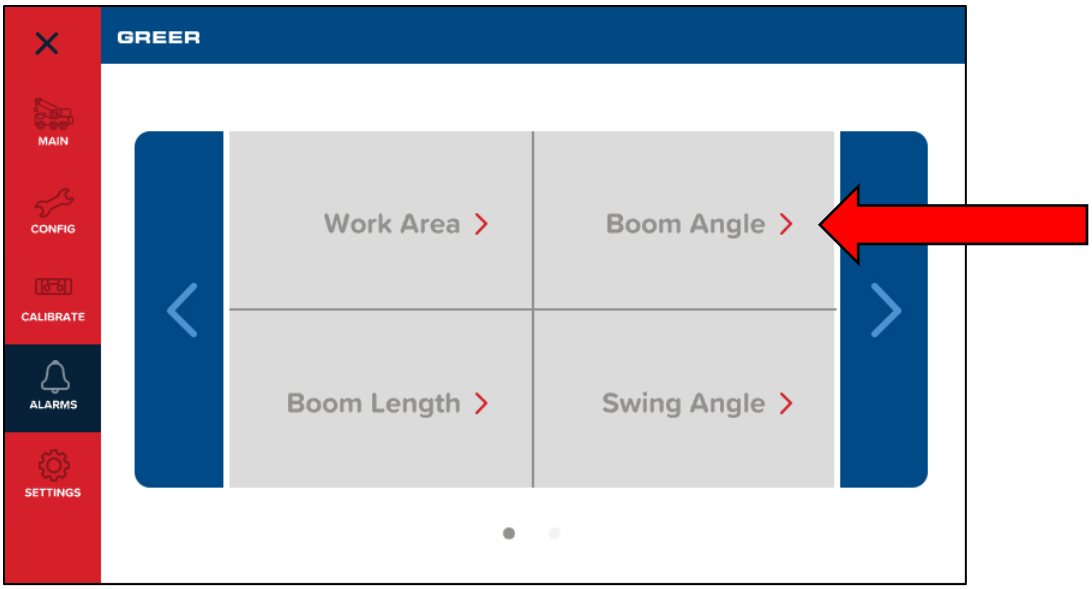
Tap the ***Main Menu*** symbol ( ) on the main page and then the ***Alarms*** button (indicated by the arrow in the figure below) to access the ***Operator Alarms*** screen.



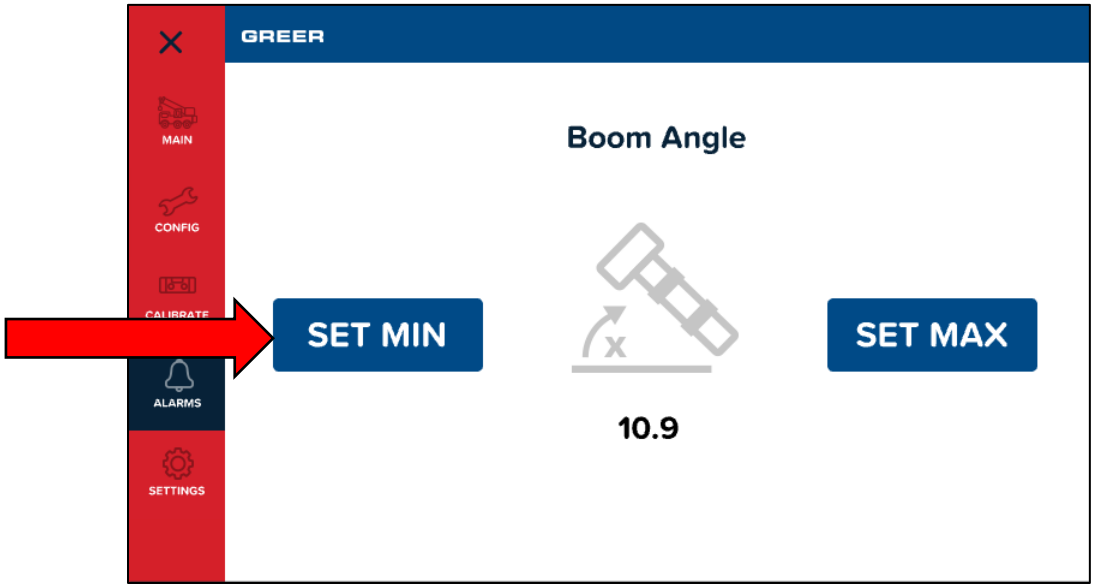
The ***Operator Alarms*** screen shows the various alarms that can be set or reset. There are two screens with five sub-menus: Work Area, Boom Angle, Boom Length, Swing Angle and Tip Height. Each menu relates to the indicated alarm. By entering each menu, the corresponding alarm may be turned ON or turned OFF. In addition, when turning ON an alarm, some parameters need to be set correctly.

9.2 Setting the Minimum Boom Angle Alarm

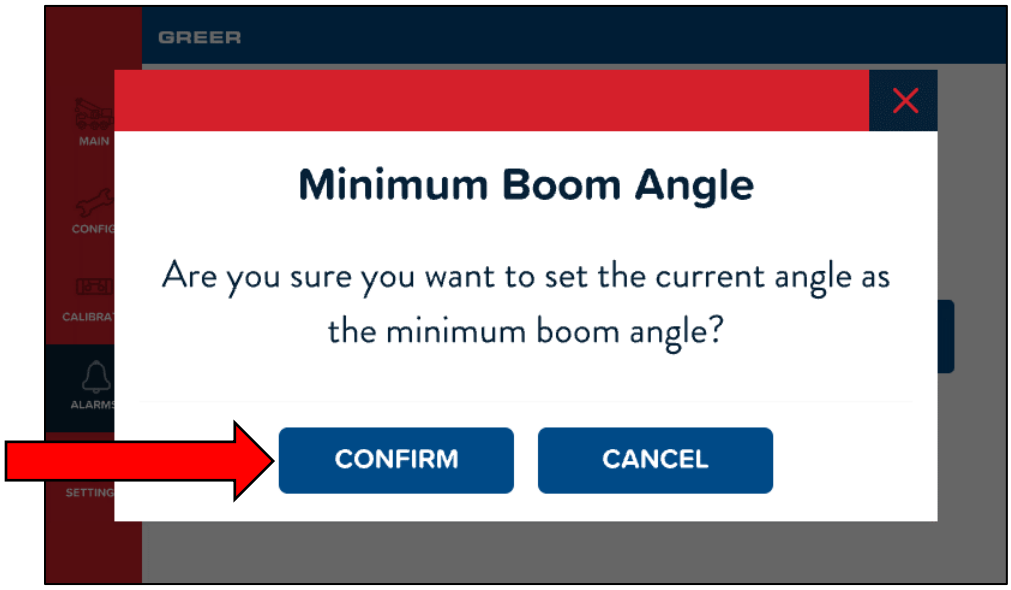
1. Move the boom to the desired minimum angle, in this example, 10.9°.
2. Access the ***Operator Alarms*** screen, then tap the ***Boom Angle*** option.



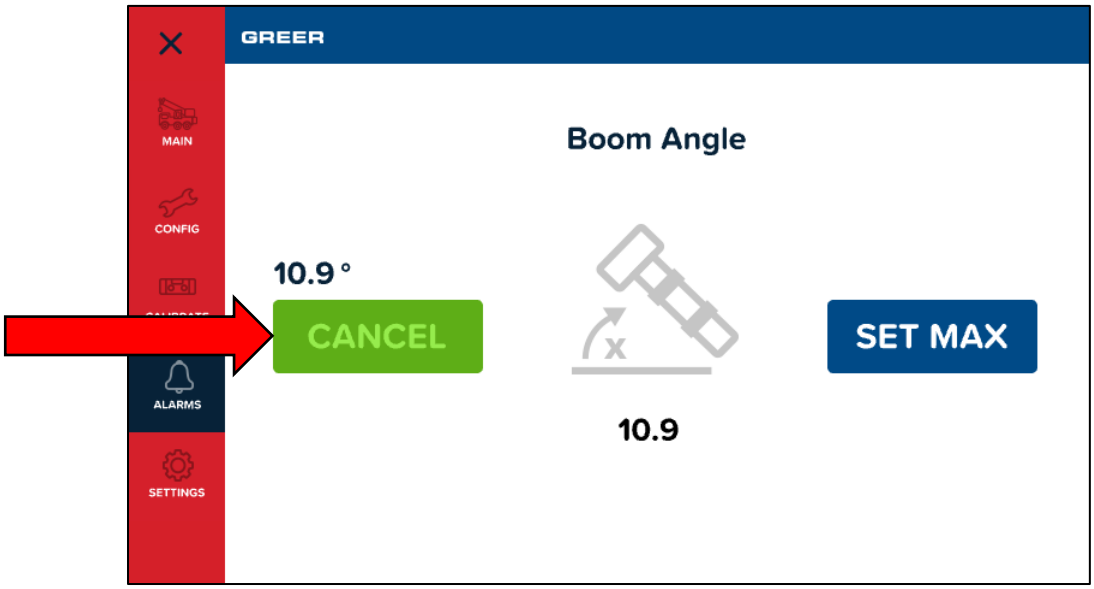
3. Tap the ***SET MIN*** button. In this example, the screen shows an angle of ***10.9*** degrees.



4. A Minimum Boom Angle screen pops up with a Confirm option. Tap the ***CONFIRM*** button for the Minimum Boom Angle setting to take effect.

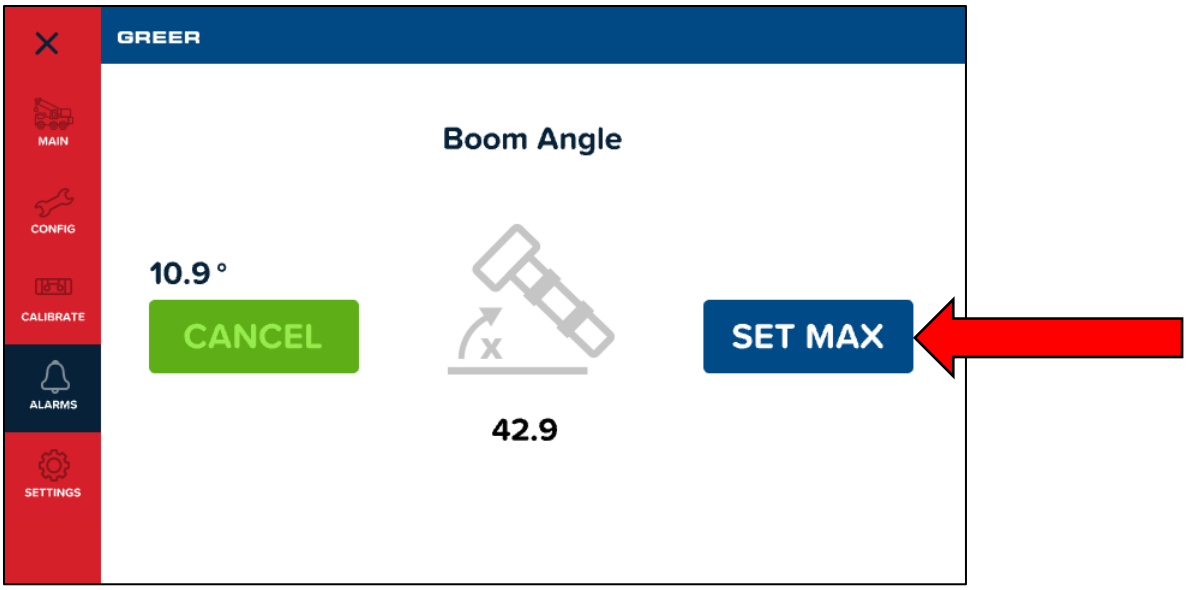


5. After a Minimum Boom Angle Alarm is set, it can be cancelled by selecting the ***CANCEL*** option as shown below.

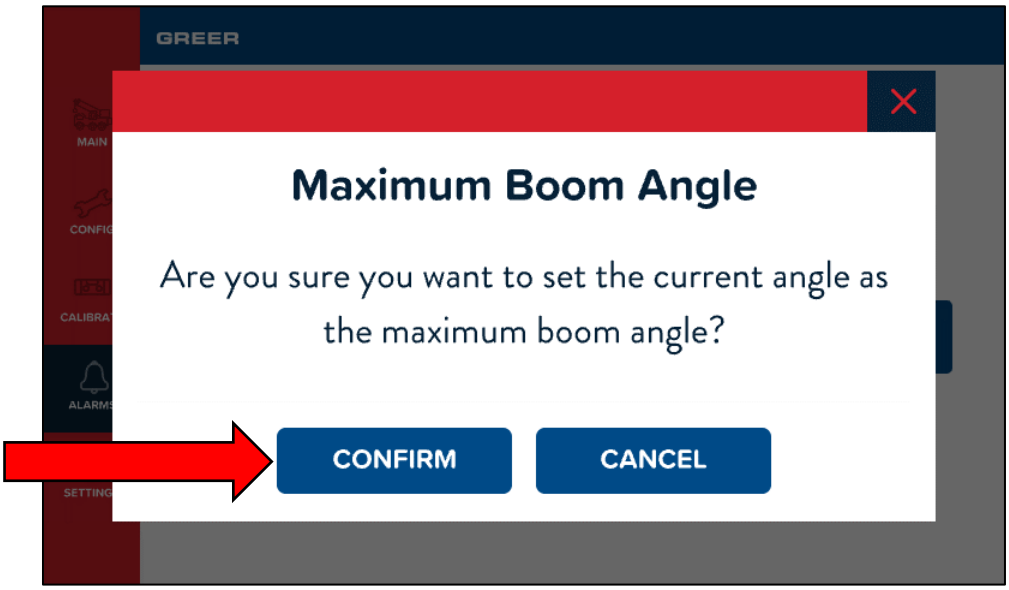


9.3 Setting the Maximum Boom Angle Alarm

1. Move the boom to the desired maximum angle, in this example, 42.9°.
2. Tap the ***SET MAX*** button. In this example, the screen shows an angle of ***42.9*** degrees.



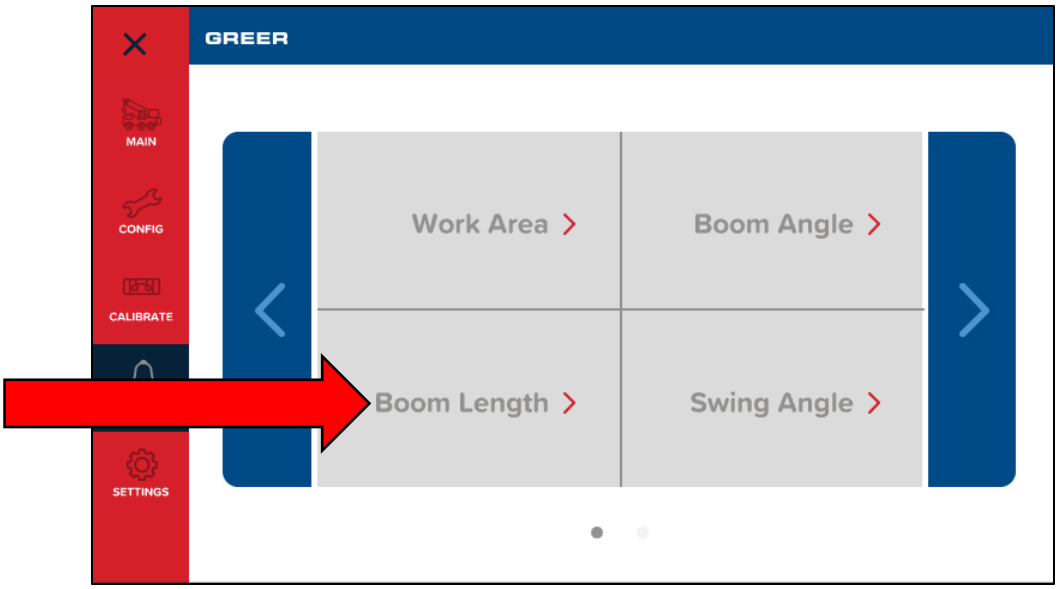
3. A Maximum Boom Angle screen pops up with a Confirm option. Tap the ***CONFIRM*** button for the Maximum Boom Angle setting to take effect.



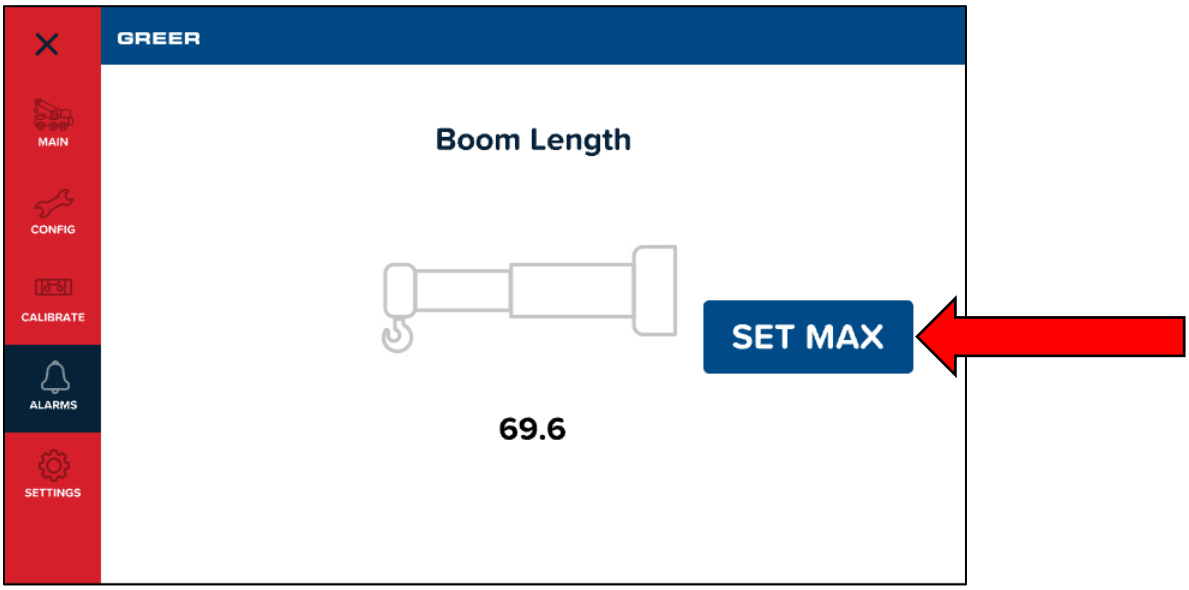
4. After a Maximum Boom Angle Alarm is set, it can be cancelled by selecting the ***CANCEL*** option.

9.4 Setting the Maximum Boom Length Alarm

1. Move the boom to the desired maximum length, in this example, 69.6 ft.
2. Access the ***Operator Alarms*** screen, then tap the ***Boom Length*** option.

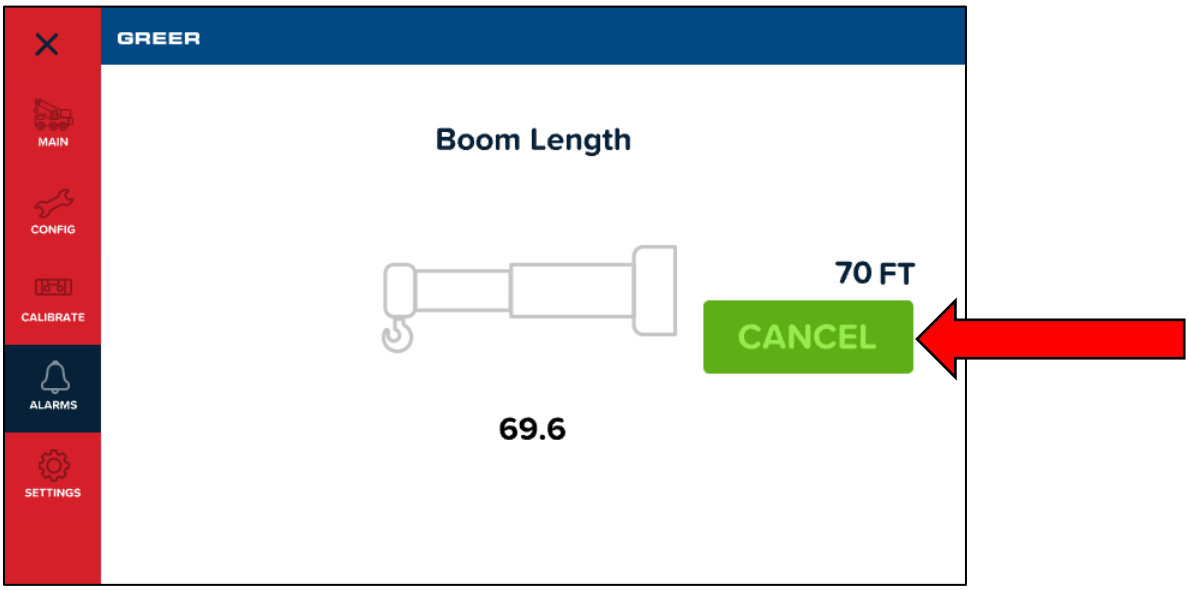


3. Tap the ***SET MAX*** button. In this example, the screen shows a length of ***69.6*** feet.



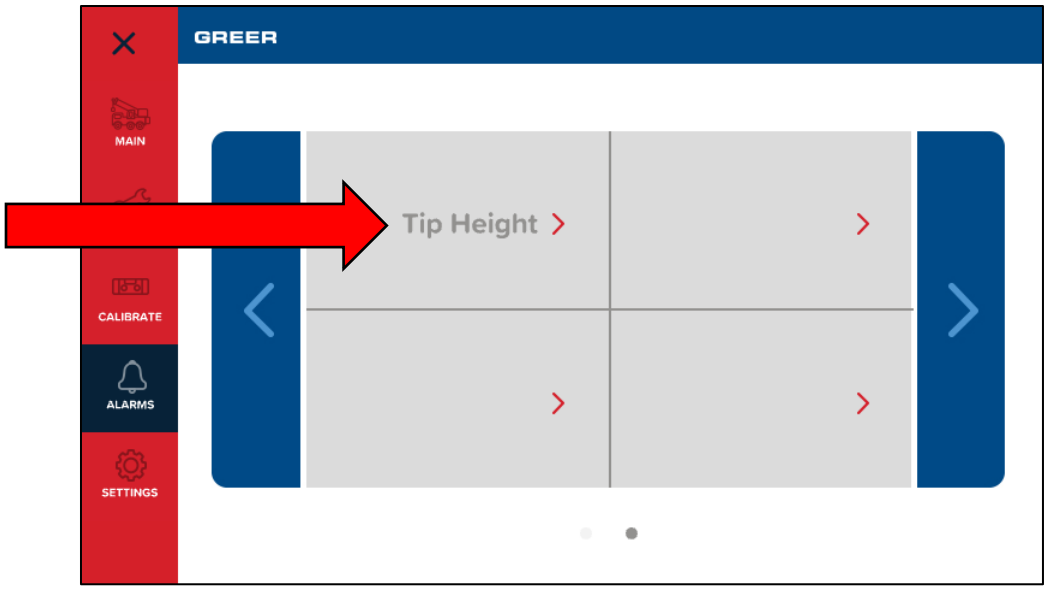
4. A Maximum Boom Length screen pops up with a Confirm option. Tap the ***CONFIM*** button for the Maximum Boom Length setting to take effect.

5. After a Maximum Boom Length Alarm is set, it can be cancelled by selecting the ***CANCEL*** option as shown below.

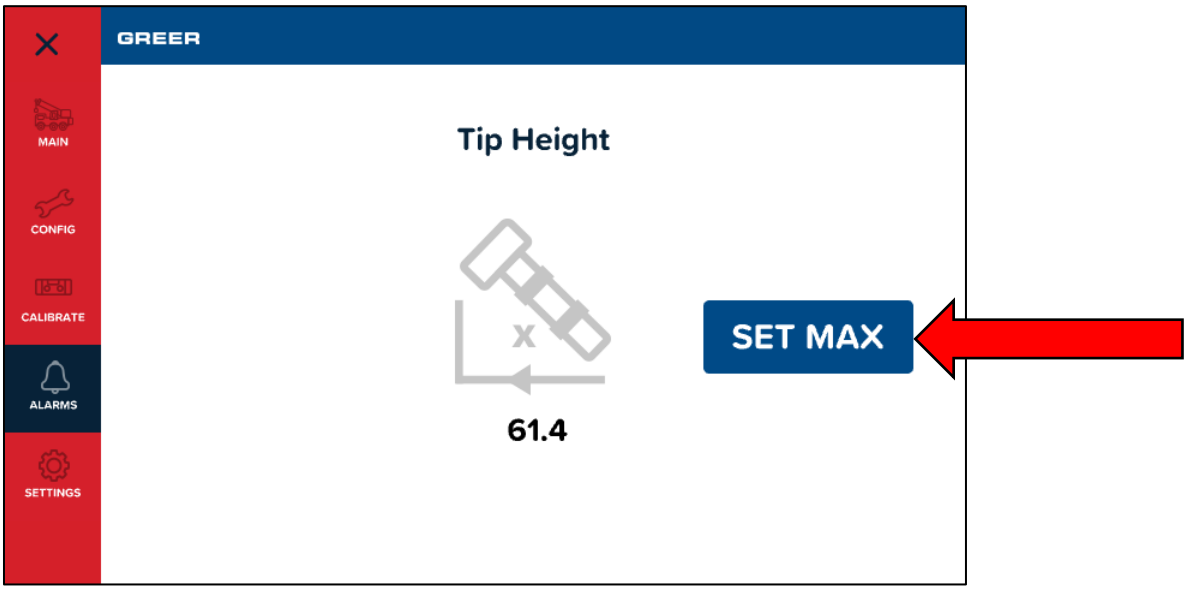


9.5 Setting the Maximum Tip Height Alarm

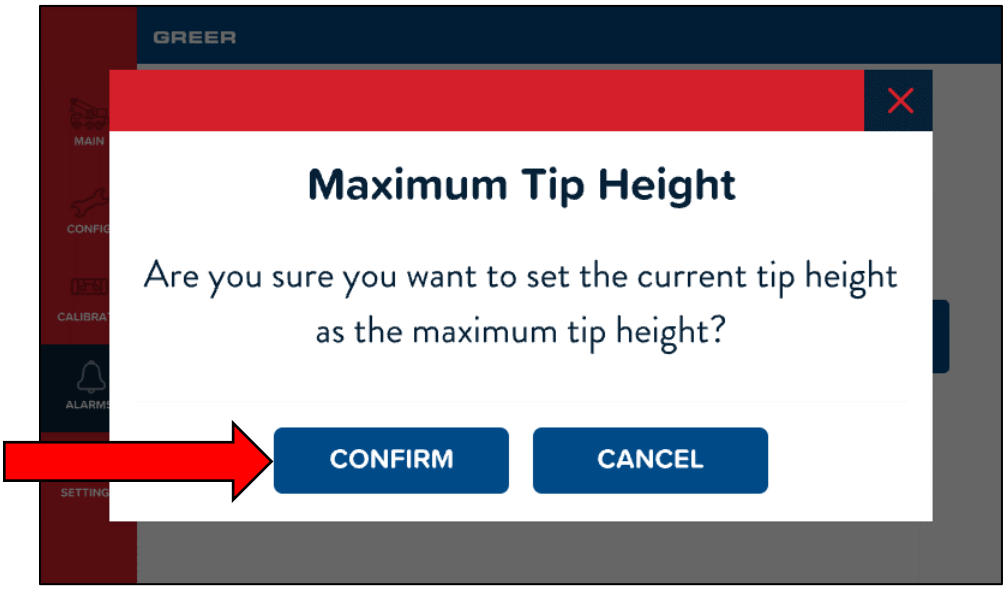
1. Move the boom tip to the desired maximum height, in this example, 61.4 ft.
2. Access the ***Operator Alarms*** screen, move to the second page, then tap the ***Tip Height*** option.



3. Tap the ***SET MAX*** button. In this example, the screen shows a height of ***61.4*** feet.



6. A Maximum Tip Height screen pops up with a Confirm option. Tap the ***CONFIRM*** button for the Maximum Tip Height setting to take effect.



7. After a Maximum Tip Height Alarm is set, it can be cancelled by selecting the ***CANCEL*** option.

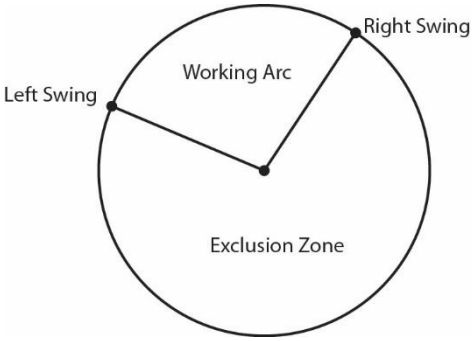
9.6 Swing Alarms Overview

These alarms permit the operator to define a Working Arc and an Exclusion Zone by two set points. The following diagram illustrates the Working Arc and Exclusion Zone.

A left swing alarm is activated when swinging to the left.

A right swing alarm is activated when swinging to the right.

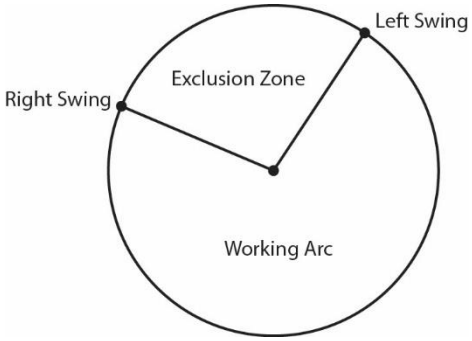
In this example the Working Arc is the smaller piece of the pie.



A left swing alarm is activated when swinging to the left.

A right swing alarm is activated when swinging to the right.

In this example the Working Arc is the larger piece of the pie.



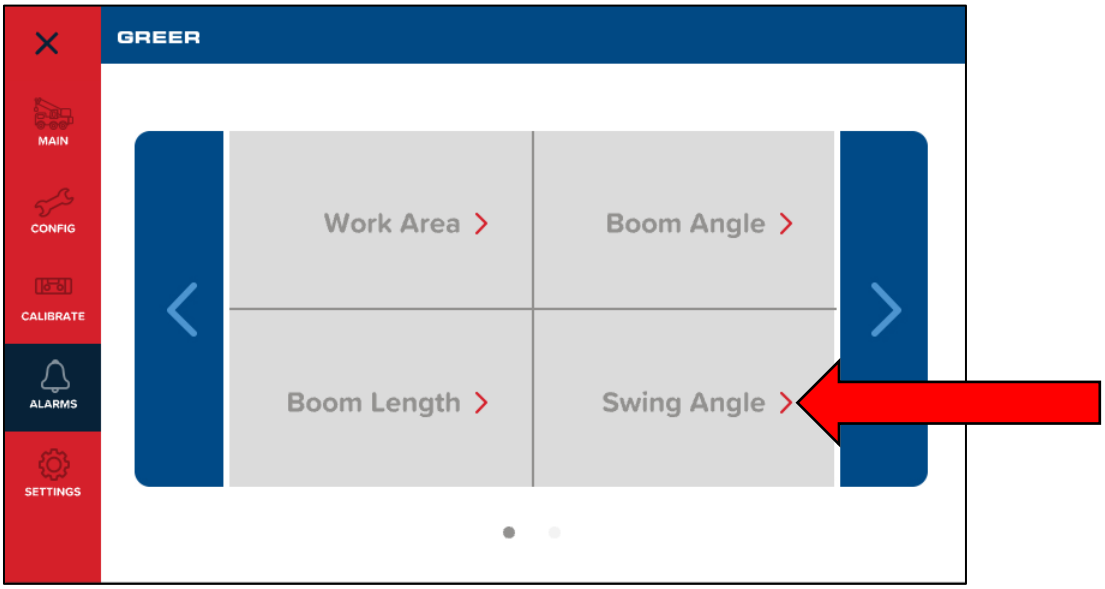
WARNING! THE OPERATOR DEFINED SWING ALARM IS A WARNING DEVICE. ALL FUNCTIONS REMAIN OPERATIONAL WHEN ENTERING THE OPERATOR DEFINED EXCLUSION ZONE. IT IS THE RESPONSIBILITY OF THE OPERATOR TO SET SWING ALARMS THAT ENSURE THE CRANE'S BOOM, ATTACHMENT, LOAD, RIGGING, ETC. MAINTAIN A SAFE WORKING DISTANCE FROM THE OBSTACLE.

AVOID POSITIONING THE BOOM, ATTACHMENT, LOAD, RIGGING, ETC. IN THE EXCLUSION ZONE WHEN MOVING TO THE LEFT AND RIGHT SWING POINTS. WHEN SELECTING LEFT AND RIGHT SWING POINTS, ENSURE THE LOAD WILL MAINTAIN A SAFE DISTANCE FROM THE OBSTACLE. RESET THE SWING ALARMS IF THE CRANE OR OBSTACLE IS MOVED OR IF A DIFFERENT SIZE LOAD IS LIFTED.

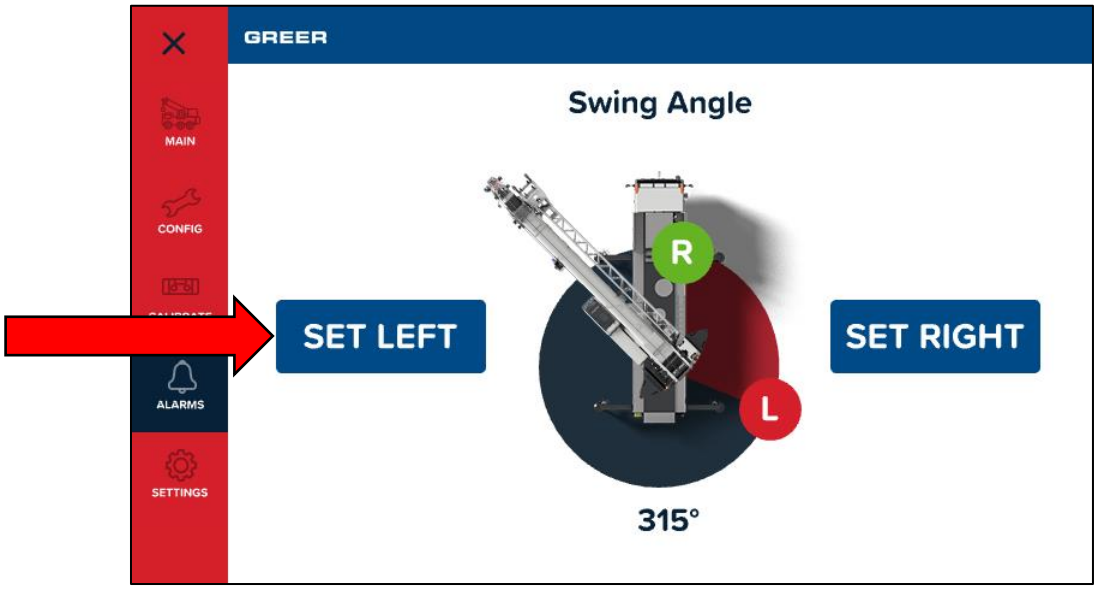
9.7 Setting the Swing Alarms

NOTE: *The Left and Right Swing Alarms must be set for the alarm to operate correctly. The red warning indicator will flash and the alarm will sound whenever only one of the swing limits is set.*

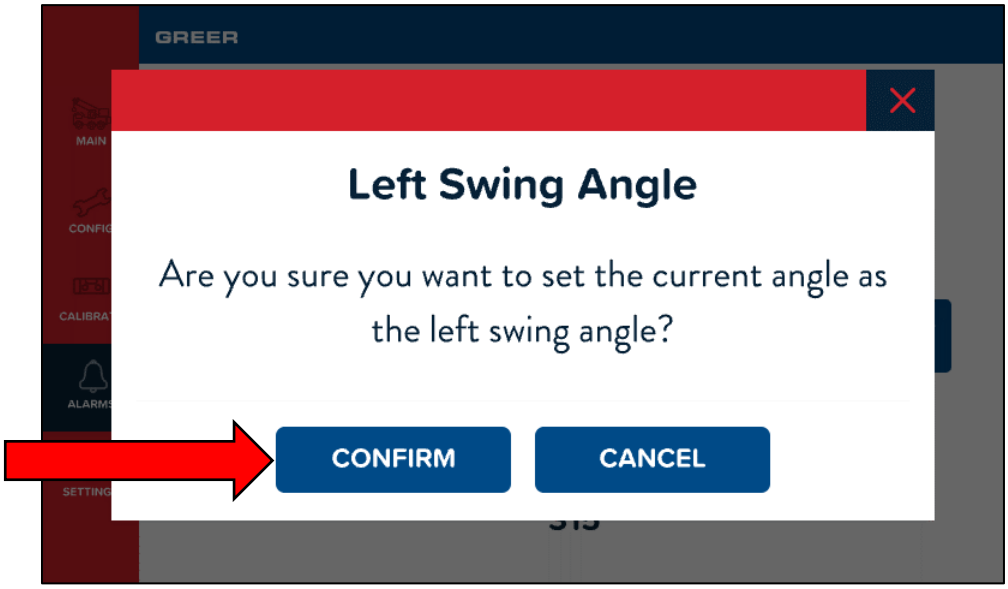
1. Swing the boom to the desired left swing limit, for example, 315°.
2. Access the ***Operator Alarms*** screen, then tap the ***Swing Angle*** option.



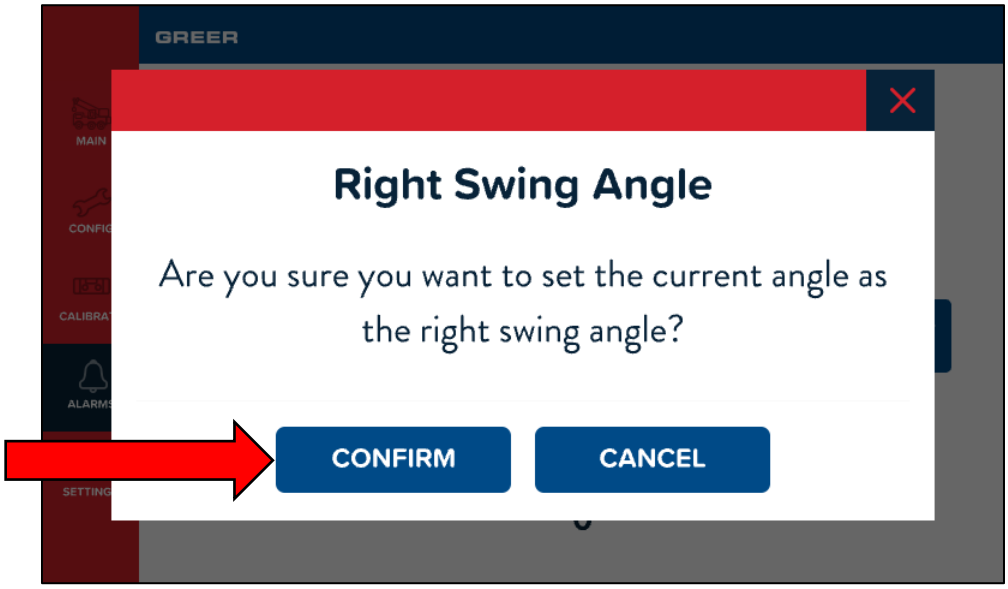
3. Tap the ***SET LEFT*** button. The screen shows an angle of ***315*** degrees.



4. Confirm the setting by tapping the ***CONFIRM*** button.

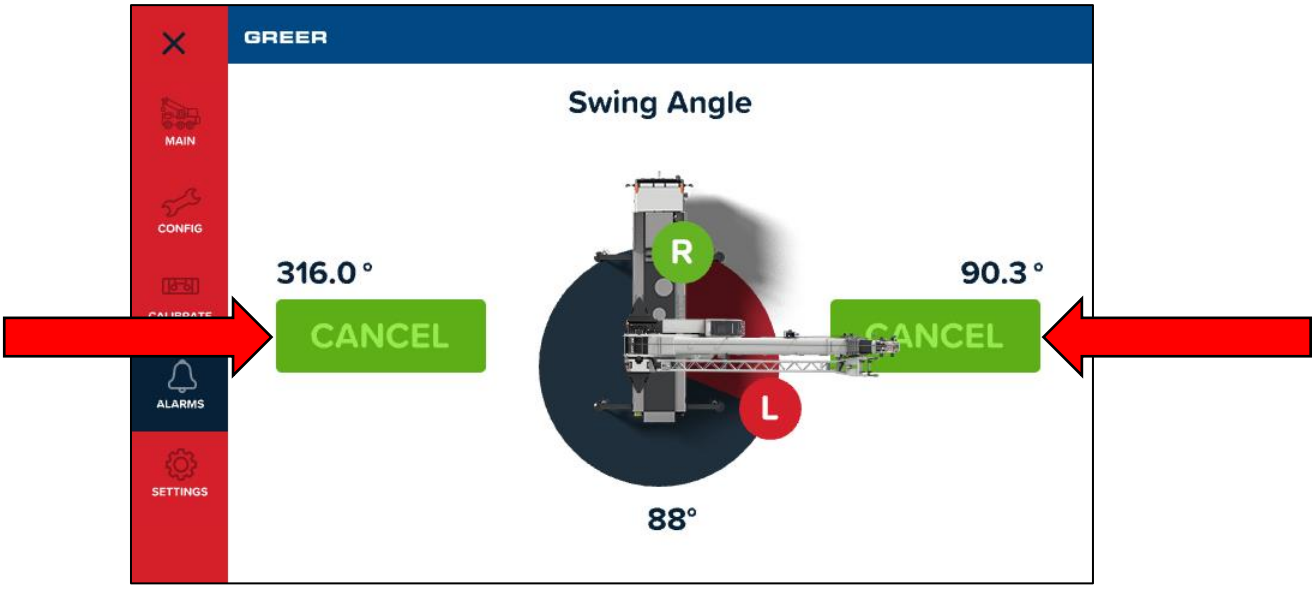


5. Move the boom to the desired right swing limit, for example, 90°.
6. Tap the ***SET RIGHT*** button. The screen shows an angle of ***90*** degrees.
7. Confirm the setting by tapping the ***CONFIRM*** button.



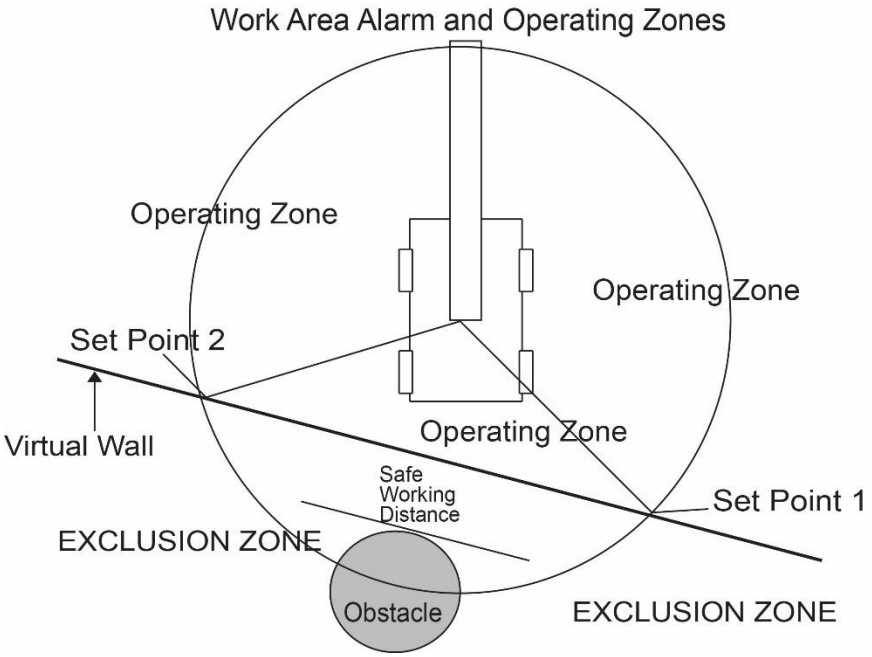
8. The swing alarms have been set. A warning message will flash and the alarm will sound whenever the boom swings past the preset limits.

9. Touching both the ***CANCEL*** buttons, shown below, will disable the Swing Alarm.



9.8 Work Area Alarms Overview

This alarm permits the operator to define an Operating Zone by only two set points. The use of this method results in an enhanced working area and defines the Exclusion Zone area more simply. The following diagram illustrates the Operating Zone and the Exclusion Zone.



The operator defined work area alarm will define an imaginary vertical plane between two set points. When passing the plane the red warning lamp will illuminate, the alarm will sound and the message “EXCLUSION ZONE” will flash on the display.

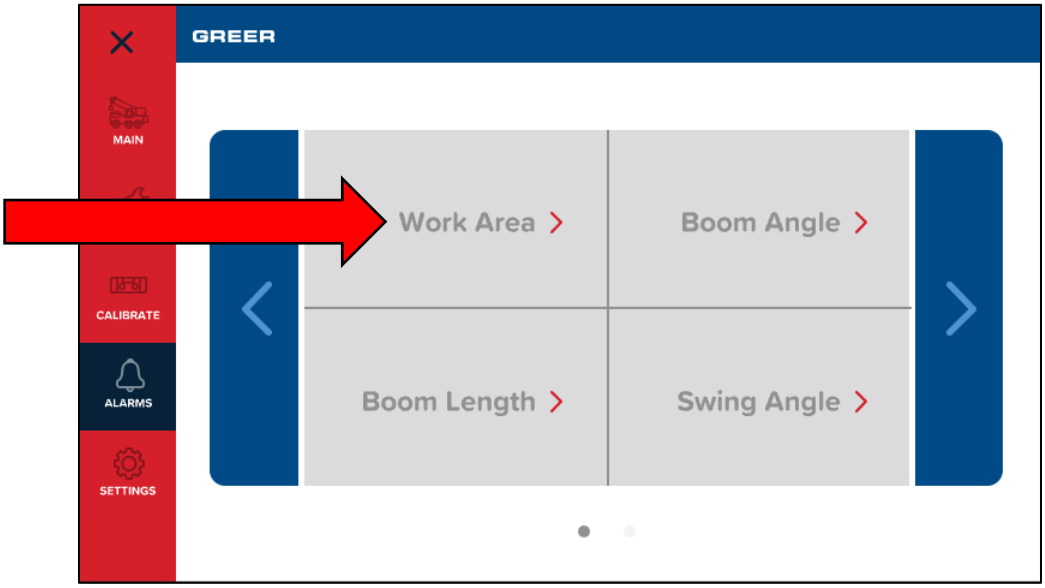
WARNING! THE OPERATOR DEFINED WORK AREA ALARM IS A WARNING DEVICE. ALL FUNCTIONS REMAIN OPERATIONAL WHEN ENTERING THE OPERATOR DEFINED EXCLUSION ZONE. “SAFE WORKING DISTANCE” IS THE TIME IT WOULD TAKE AN OPERATOR TO REACT TO AN ALARM AND FOR THE MACHINE MOTION TO BE HALTED BEFORE ENTERING THE EXCLUSION ZONE. IT IS THE RESPONSIBILITY OF THE OPERATOR TO SET POINTS THAT ENSURE THAT THE CRANE’S BOOM, ATTACHMENT, LOAD, RIGGING, ETC. MAINTAINS A SAFE WORKING DISTANCE FROM THE OBSTACLE.

DO NOT POSITION THE BOOM, ATTACHMENT, LOAD, RIGGING, ETC. IN THE EXCLUSION ZONE WHEN MOVING TO SET POINTS 1 AND 2. WHEN SELECTING THE LEFT POINT AND RIGHT POINT, ENSURE THE LOAD WILL MAINTAIN A SAFE DISTANCE FROM THE OBSTACLE. RESET THE WORK AREA ALARM IF THE CRANE OR OBSTACLE IS MOVED, OR IF A DIFFERENT SIZE LOAD IS LIFTED.

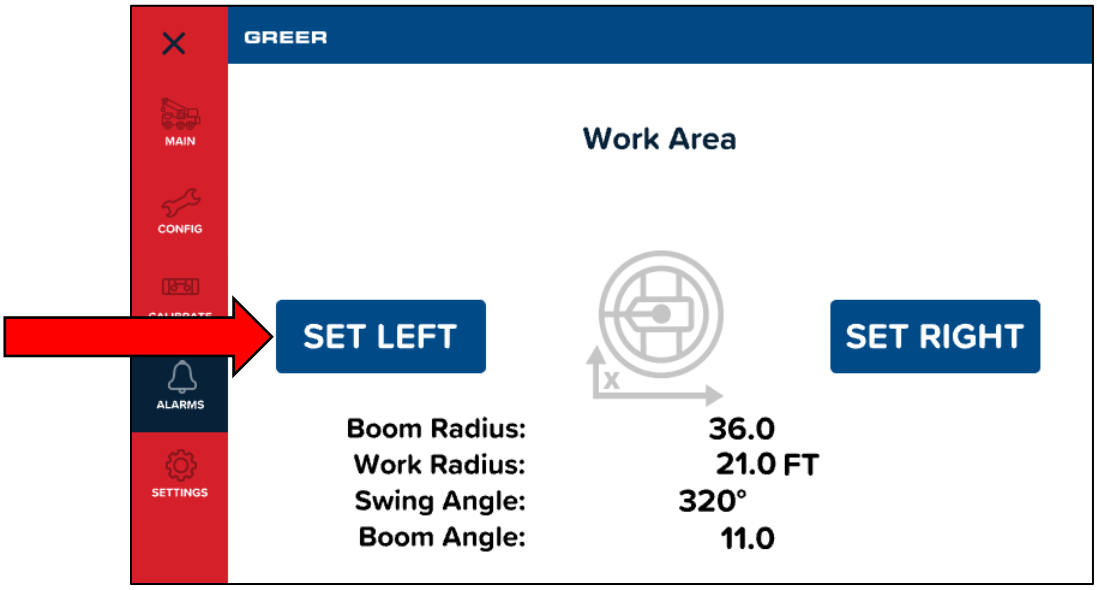
9.9 Setting the Work Area Alarm

NOTE: *The Left and Right Points must be set for the system to operate correctly. The red warning light will flash and the audible alarm will sound whenever only one of the left/right swing limits is set.*

1. Access the ***Operator Alarms*** screen, then tap the ***Work Area*** option.

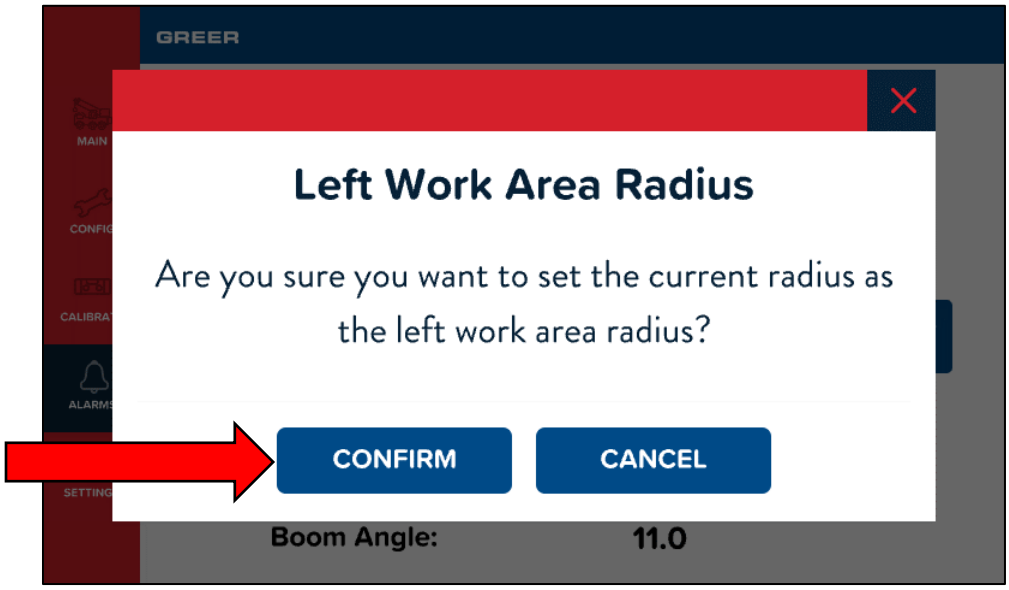


2. Move the boom, attachment, load, rigging, etc. to the desired left set point. The display will show the left set point in terms of Boom Radius, Work Radius, Swing Angle, and Boom Angle.

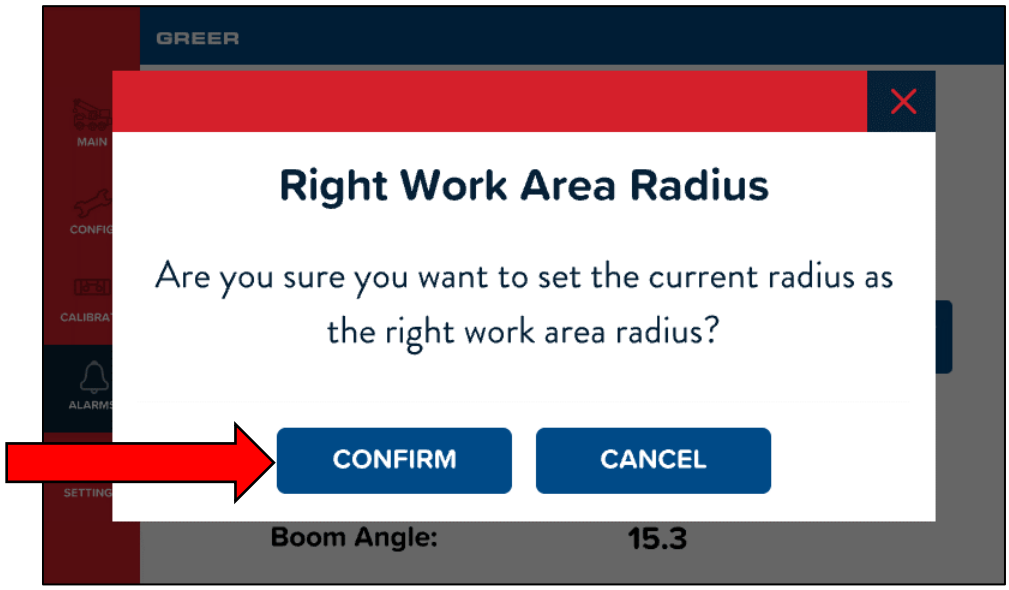


3. Tap the ***SET LEFT*** button.

4. Confirm the setting by tapping the ***CONFIRM*** button.

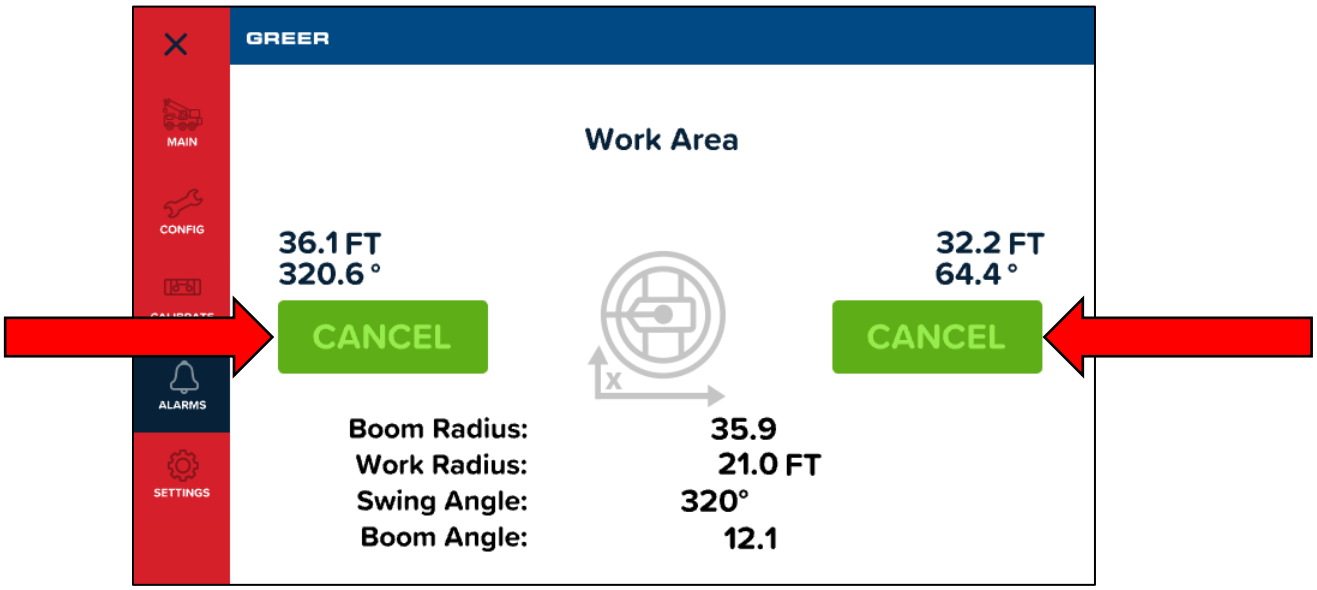


5. Move the boom, attachment, load, rigging, etc. to the desired right set point.
6. Tap the ***SET RIGHT*** button.
7. Confirm the setting by tapping the ***CONFIRM*** button.



8. The Work Area Alarm has been set. A warning message will flash and the audible alarm will sound whenever the boom tip penetrates the exclusion zone.

9. Touching the ***CANCEL*** buttons, shown below, will disable the Work Area Alarm, and the display will show ***SET LEFT*** and ***SET RIGHT*** buttons again.

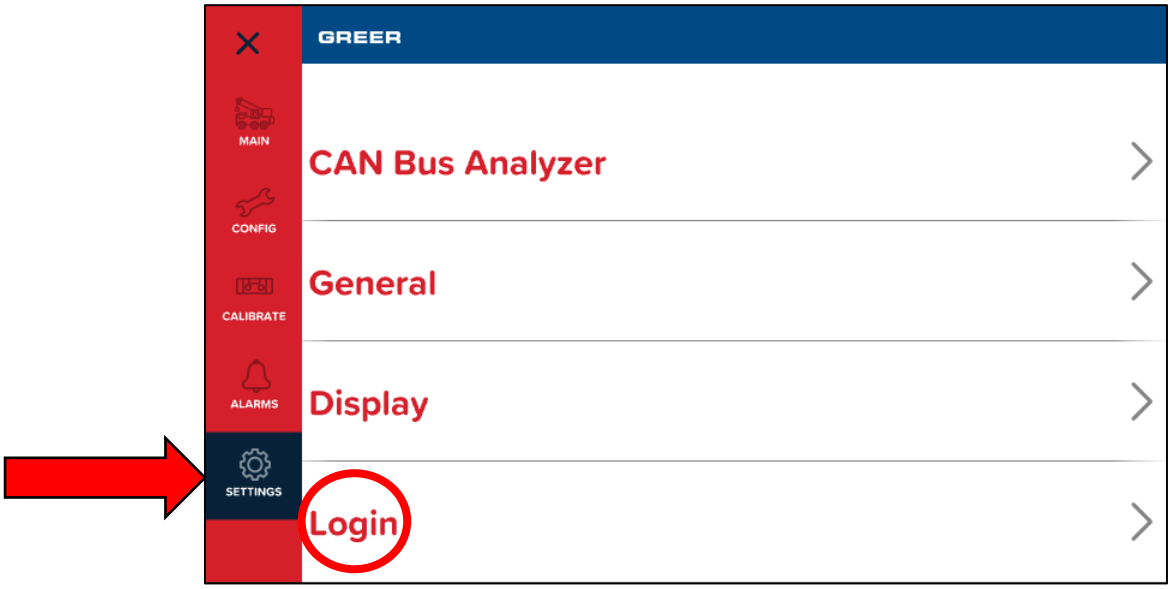


10. Procedure for Updating MG6 Computer Program and/or Duty File

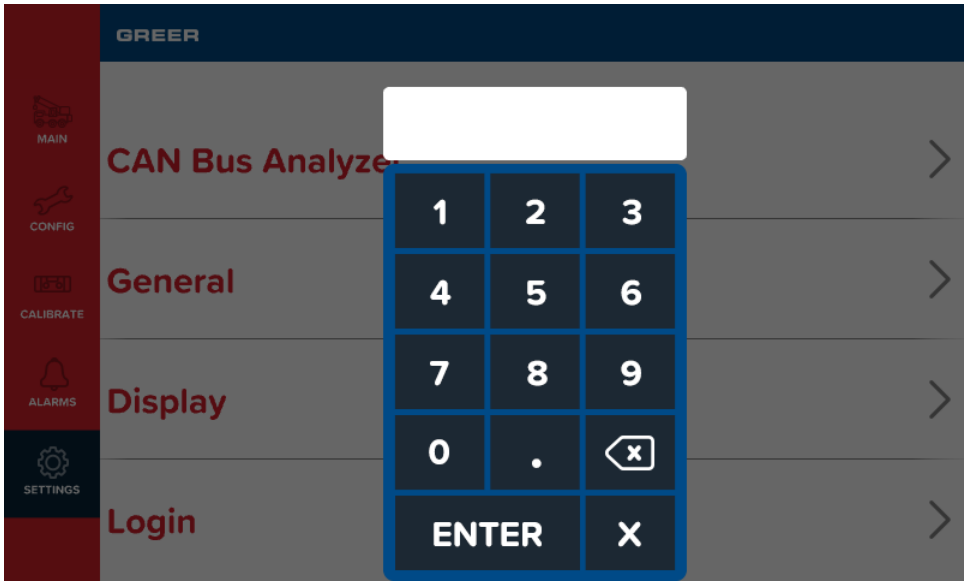
This section explains how to update the MG6 Computer with a new program and/or duty file, using an update package file saved on a USB flash drive. The update package file format is .mg6.

1. Save the update package file onto a USB flash drive. If multiple update package files are saved on one flash drive, you will be able to select which one you want to load from the menu.
   NOTE: *USB Flash Drive must be formatted FAT32.*

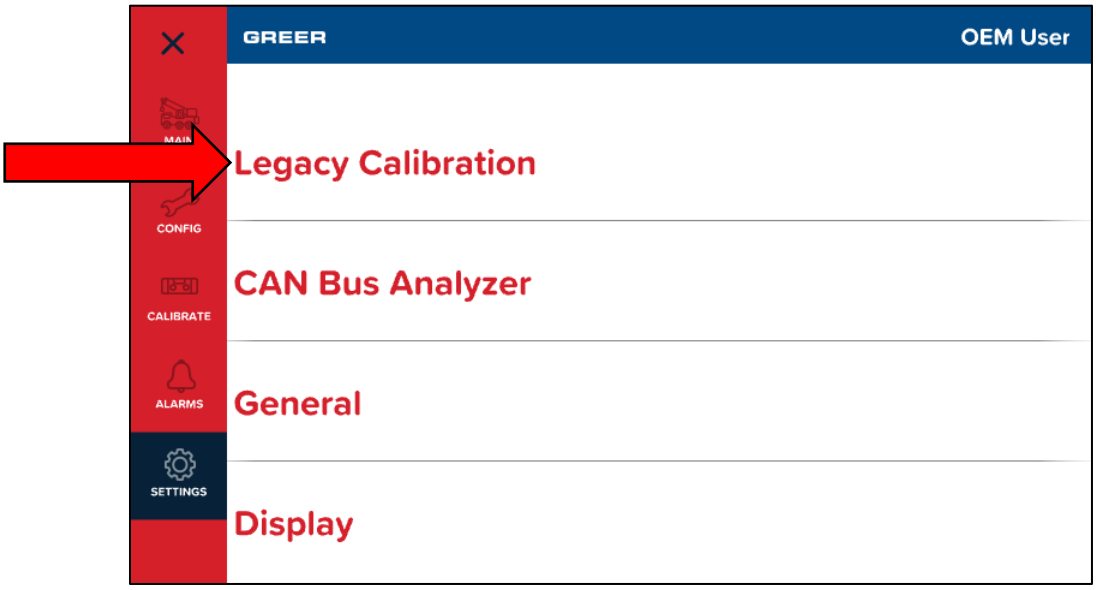
2. On the TS7 Display, enter Legacy Calibration Mode by tapping the Main Menu button, and then selecting the ***Settings*** option. In the Settings screen, tap the ***Login*** option shown encircled below.



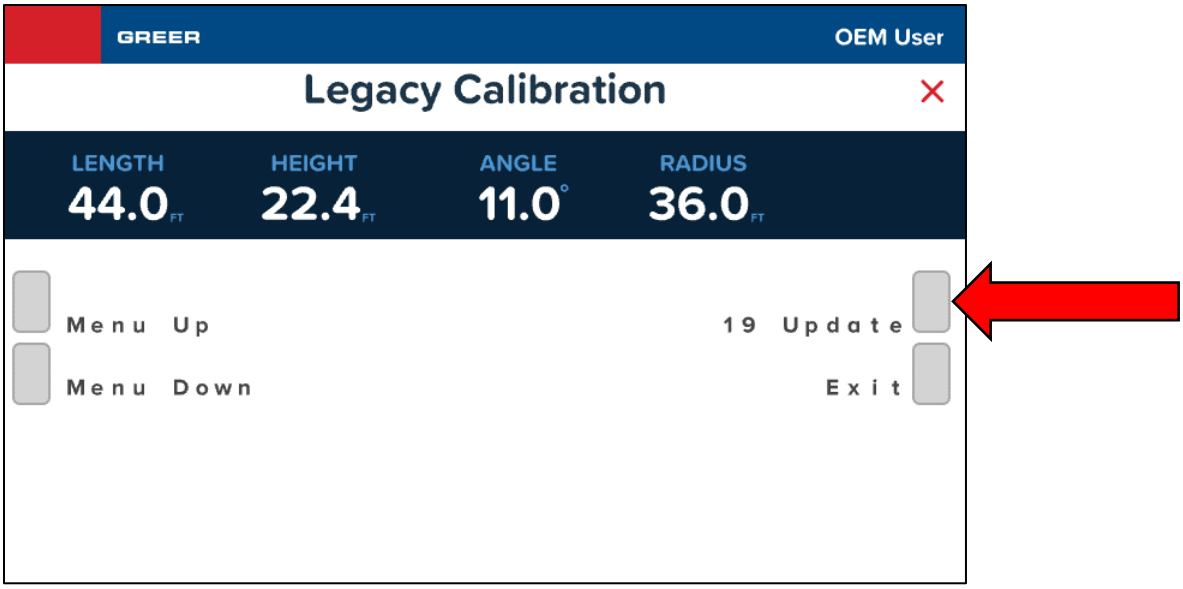
3. The display will request for the security code. Enter the security code, 6638.



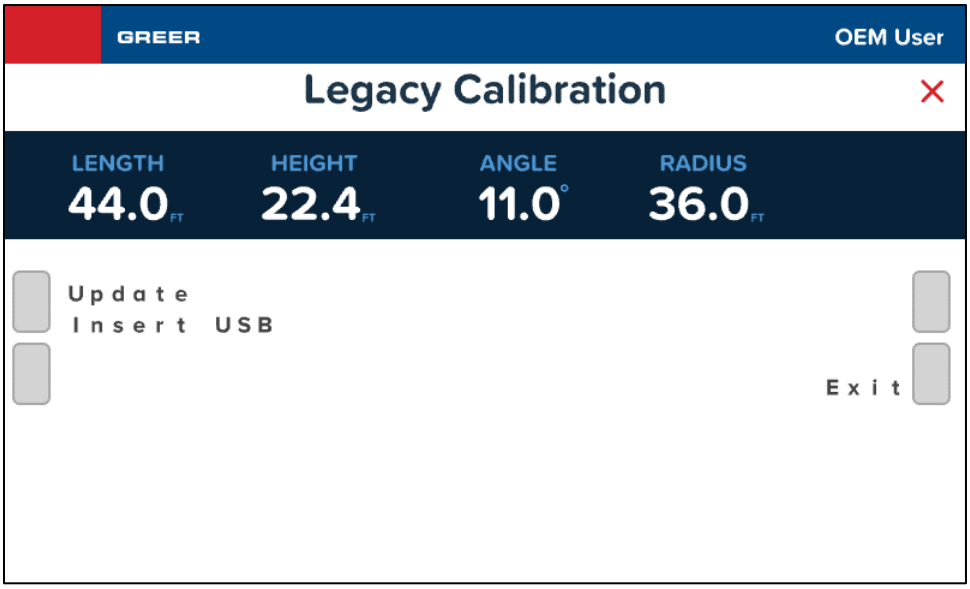
4. Once the security code is correctly entered, the display enters the OEM User mode. Now, select the Legacy Calibration option shown below.



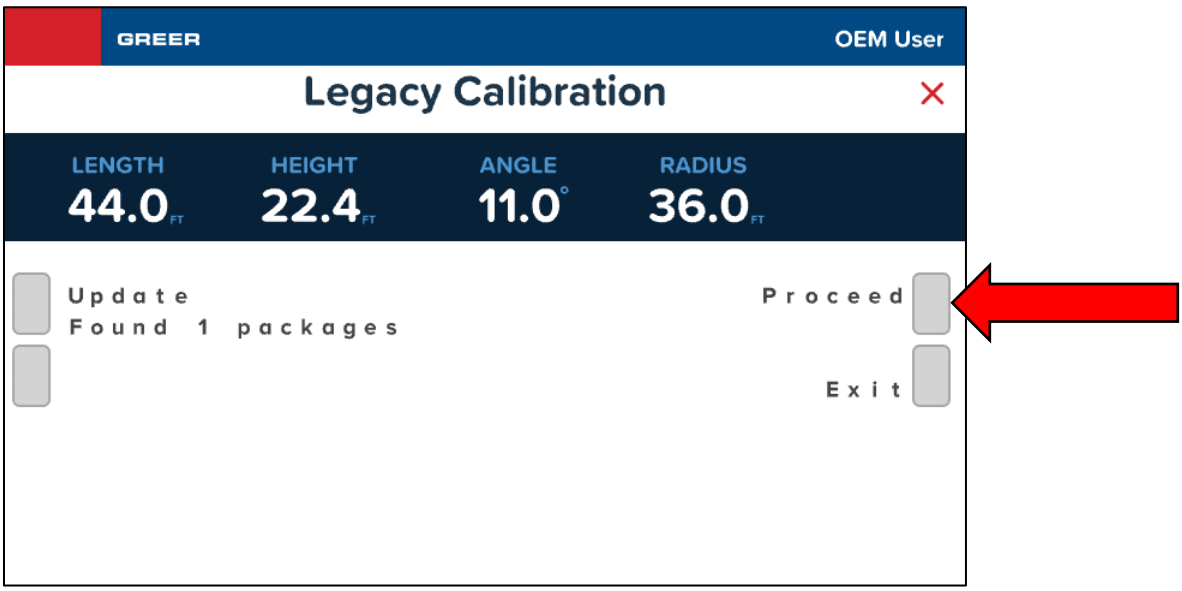
5. In the Calibration menu screen, tap the ***Menu Up*** or ***Menu Down*** buttons until you reach the item called **Update**. The item number may vary based on how many other options are available for a particular crane. In this example, it is number 19. Tap the ***Update*** button.



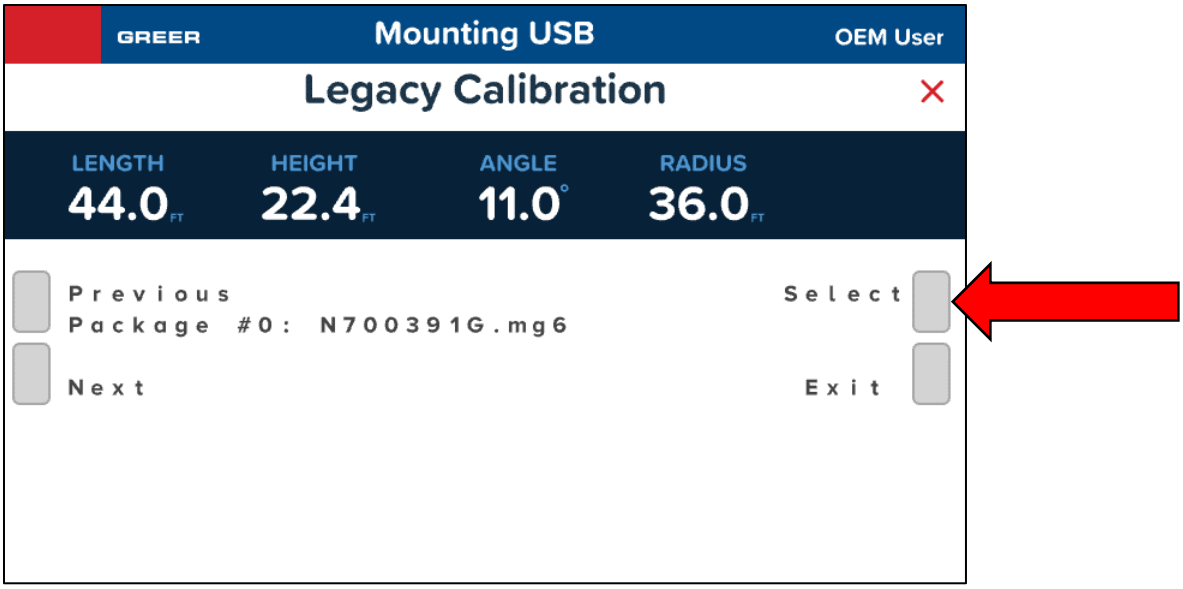
6. The message **Insert USB** will appear. Insert the USB flash drive into the USB Port on the front panel of the MG6 Computer. If you already inserted the flash drive before this step, the computer will automatically skip this step and proceed to the next step.
NOTE: *USB Flash Drive must be formatted FAT32.*



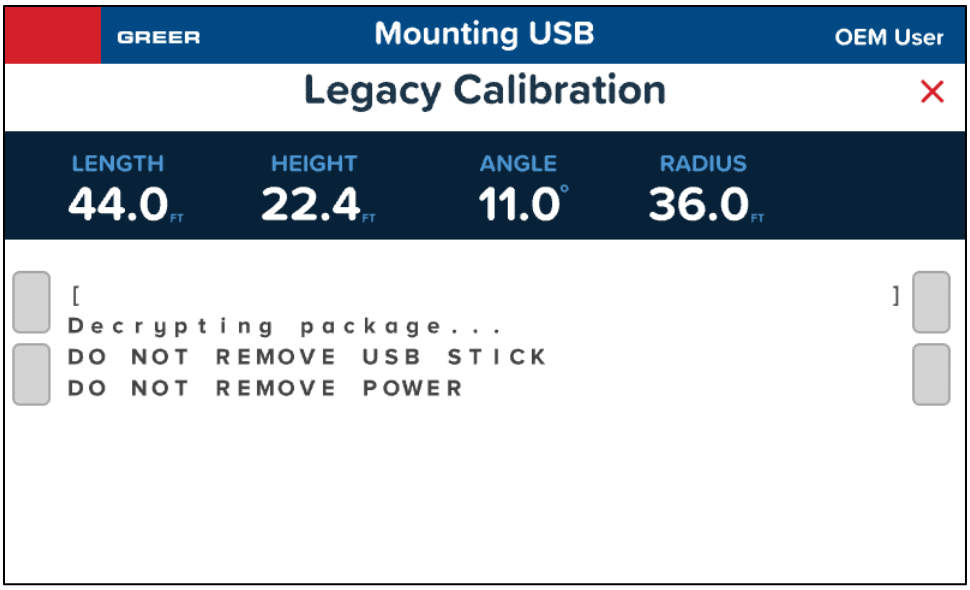
7. The computer searches for update package files on the flash drive and displays the number of packages it finds. In this example it has found 1 package. Touch the ***Proceed*** button.



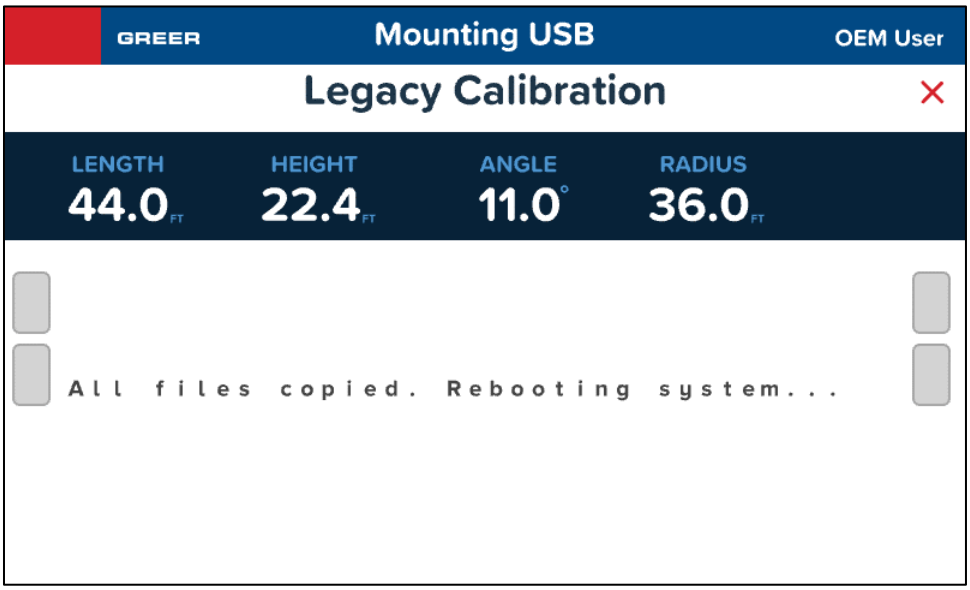
8. The screen will display the name of the selected package. Scroll between any available packages with the ***Previous*** or ***Next*** buttons. Then, when the correct package is reached, touch the ***Select*** button.



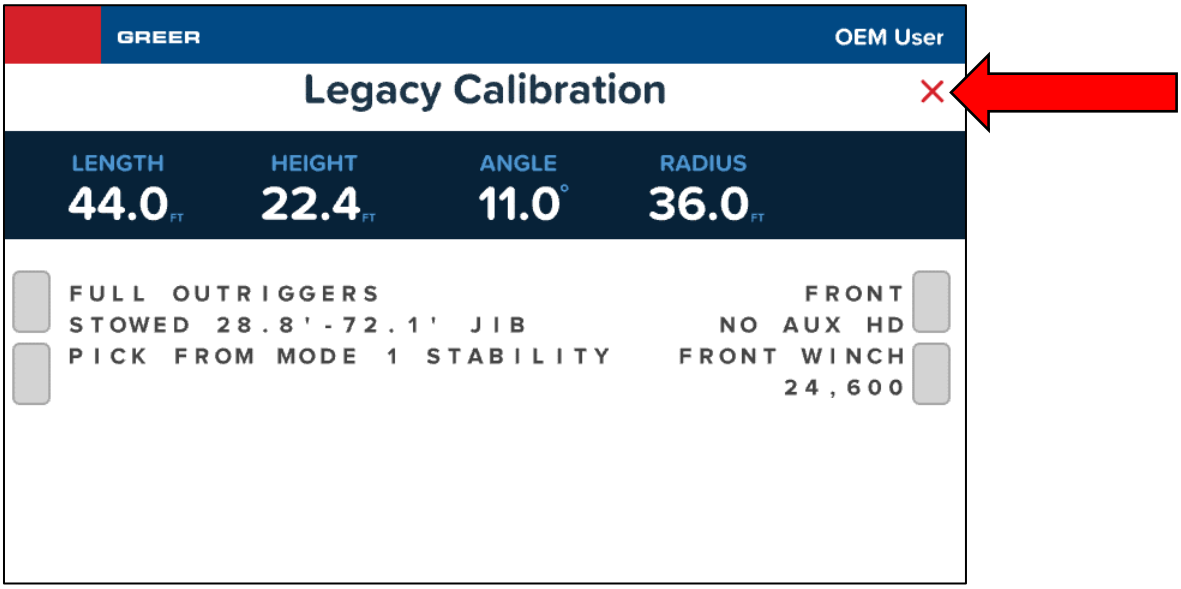
9. The computer will decrypt the update package file. Depending on the size of the update package, this could take from a few seconds to a few minutes. While this is happening, it displays the warnings **DO NOT REMOVE USB STICK** and **DO NOT REMOVE POWER**. The progress bar is displayed on screen.



10. After the file is copied, the system will reboot.



11. Once the reboot is over, the system starts the MG6 application. The update is complete. You can now remove the USB flash drive and tap the ***Close (X)*** button shown below.



11. MG6 Computer Data-Logging Functionality

11.1 Overview

The MG6 Computer records data including crane metrics, crane configurations, and alarm states. The data is saved internally in the computer's memory. This data can be downloaded onto a USB flash drive through a menu on the display. This section explains what data is recorded, which events and conditions cause data to be recorded, the log file characteristics, and other details about the data-logging functionality. For detailed step-by-step instructions on how to download the data log files, see the section **Procedure for Downloading Data Log Files**.

11.2 Alarm Logging

11.2.1 Alarm Logging Behavior

All alarm states are logged when any alarm changes state. This also will trigger data record logging.

11.2.2 Alarms Logged

Alarm	Description
Faults	Fault Codes (See following section, **Fault Codes Logged**)
A2B	Anti-Two-Block
SWLAL0	FKO
SWLAL1	Set Relay 3, Audible Alarm
Operator Override Audible	Audible Alarm Overridden
Operator Override FKO	Operator has Overridden FKO
Outrigger Alarm	Outriggers are not extended
External Bypass	External Bypass Engaged
Approaching Overload	Load is greater than or equal to 90% of the rated capacity
Overload	Load is greater than or equal to 100% of the rated capacity

11.2.3 Fault Codes Logged

Fault Codes for Multiple Faults

If the displayed fault code is not listed in the tables below, it could be a combination of multiple other fault codes. The displayed fault code is the sum of all the fault codes in the group (A, B, C, or D) that have been detected.

***EXAMPLE**: Fault code A015 indicates that faults A001, A002, A004, and A008 have been detected.*

***EXAMPLE**: Fault code B024 indicates that faults B008 and B016 have been detected.*

The following charts list the possible fault codes in the left column and the description in the right column. If the displayed fault code is not listed here, see section **Fault Codes for Multiple Faults.**

A Group Fault Codes	
Fault Code	**Description**
A000	No Fault Found
A001	Piston Pressure: ADC Fault
A002	Rod Pressure: ADC Fault
A004	Boom Extension: Extension value is not valid
A008	Boom Angle: Angle value is not valid
A016	Swing Sensor: Any one of 4 swing potentiometer values is bad (all 4 wires are required for proper operation of the swing potentiometer sensor). ISS is different but still throws this error if there is a problem.
A032	Temperature Sensor Fault

B Group Fault Codes	
Fault Code	**Description**
B000	No Fault Found
B001	Piston ADC is not responding
B002	Rod ADC is not responding
B004	ATB Feed: Error thrown if the ATB Feed status is not read correctly or goes out
B008	FKO Feed: Error thrown if the FKO Feed status is not read correctly or goes out
B016	Error thrown if the FKO Feed status does not read correctly or goes out
B032	External Bypass On

C Group Fault Codes	
Fault Code	**Description**
C000	No Fault Found
C001	Program Checksum is incorrect (memory corrupted)
C002	Chart Data not found
C004	RAM or cache is corrupt
C008	Personality file checksum failed
C016	Serial EEPROM is corrupted (configuration information)
C032	Serial EEPROM has failed

D Group Fault Codes	
Fault Code	**Description**
D000	No Fault Found
D001	If the duty file doesn't have the valid ID number or the file currently being used is a generic file, this error will occur
D002	If the current length value doesn't have a chart associated with it, this error will be shown (i.e. max length = 100', and currently displaying 105')
D004	If there is no chart available for the current swing/slew area defined (i.e. no 360° chart)
D008	Interlocks are used for stowed jib deductions. If there are no defined interlocks for a stowed jib option in the chart, this error will occur

11.3 Configuration Logging

11.3.1 Configuration Logging Behavior

All configuration states are logged any time the crane is reconfigured.

11.3.2 Configuration Settings Logged

Configuration Setting	Description
Counterweight	Is Counterweight present?
Chassis	Specifies the chassis that's selected for the current configuration
Main Boom	Is Main Boom the pick point?
Aux Head	Is the Auxiliary Head the pick point?
Jib A	Is Jib A installed?
Jib B	Is Jib B installed?
Winch	Specifies the Winch that's selected for operation.
Stowed Jib	Specifies the type of Jib that is stowed.
Parts of Line	Indicates Parts of Line for current configuration
Pick Point	Indicates configured Pick Point
Outriggers	Specifies the current extension of the Outriggers
Fly Jib	Indicates whether a Fly Jib is in use
Stowed	Indicates whether any Jib is stowed
Pick	Specifies whether picking from Boom or Jib

11.4 Data Logging

11.4.1 Data Logging Behavior

Data is logged when an alarm, above, changes state or the load is above 70% of the capacity. Data is logged at ~2Hz.

11.4.2 Crane Metrics Logged

Crane Metric	Description
Length	Boom Length
Angle	Boom Angle
Radius	Boom Radius at current Angle and Extension
Load	Weight on Boom
Capacity	Weight that Boom, Winch, and Rope can safely pick
Load % Capacity	Load as a percentage of capacity
Swing Angle	Angle of Boom from 0° position
Swing Area	Area defined by Swing Angle limits and Boom radius
Parts of Line	Number of Parts of Line
LED2	State of Display Virtual LEDs (Configuration and Alarm States) Long Fly Angle 2* | Short Fly Angle 1* | Long Fly Angle 1* | Short Fly Angle 0* | Long Fly Angle 0* | ATB | Overload | Pre-alarm
LED1	State of Display Virtual LEDs (Configuration) Short Fly Angle 2* | Rear Winch | Front Winch | Counterweight | Stowed | Boom Mode | Aux Head | Alarm Set
LED0	State of Display Virtual LEDs (Configuration) Tires | Retracted | Half | Extended | Pick Main Boom | Pick Aux | Pick Fly | Basket

*Angle 0, Angle 1, and Angle 2 are different Fly angles for the Short Fly and Long Fly. Their exact angle depends on the particular crane, but they often correspond with Angle 0 = 0°, Angle 1 = 15°, Angle 2 = 30°.

11.5 Files and Logging Behavior

11.5.1 File Characteristics

File Type

File extension .csv is used for log files. It is a comma delimited text file that is readily imported into Excel.

File Size

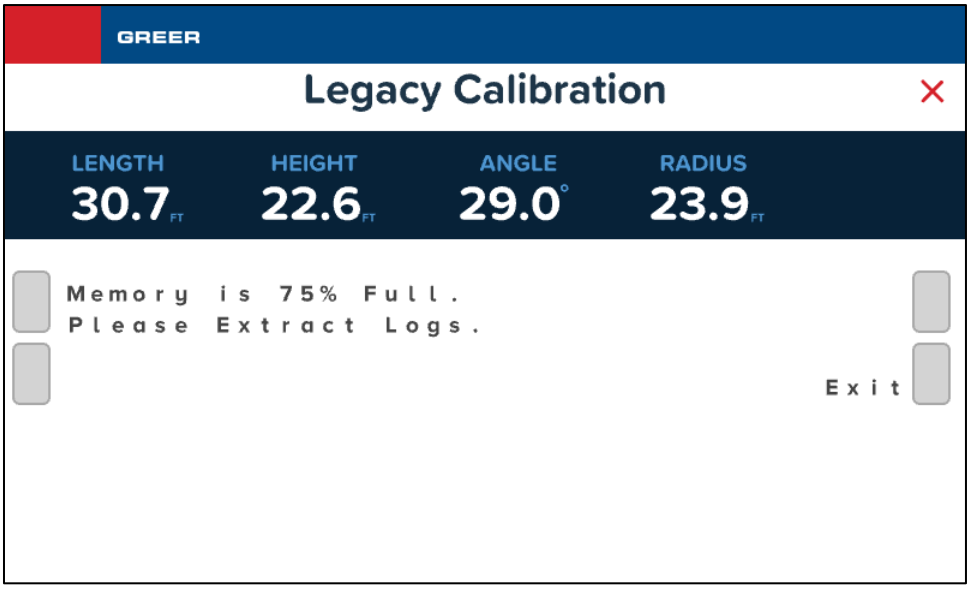
Files are limited to 5Mbytes. A new file will be started when the current log file reaches the size limit. This helps to control any file corruption to a smaller portion of data.

File Name Convention

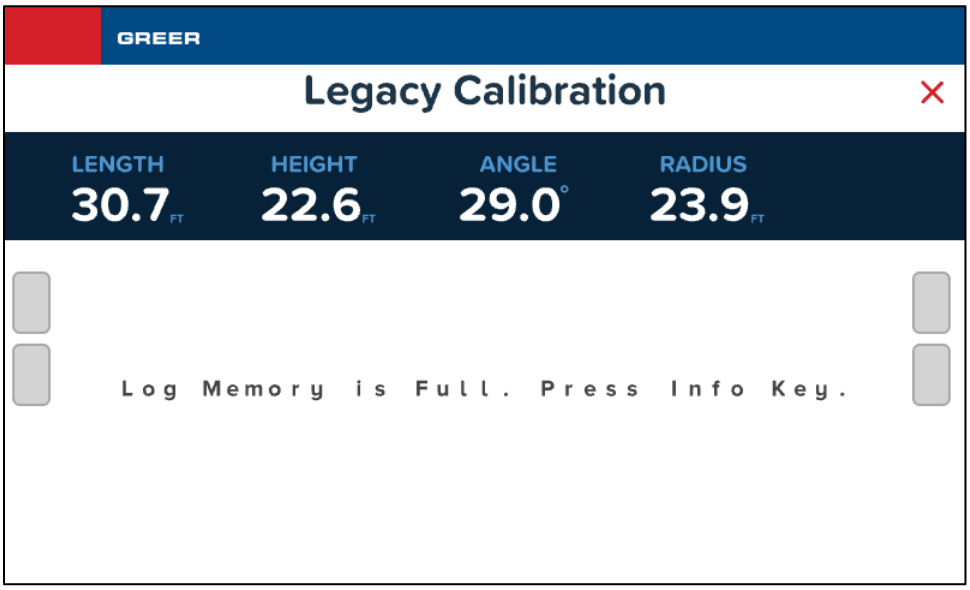
The log file name is based on the time it was created. The name will start with the word “Log”, the remaining portion reflects the date and time. It is formatted as month, day, year, hour, minute.

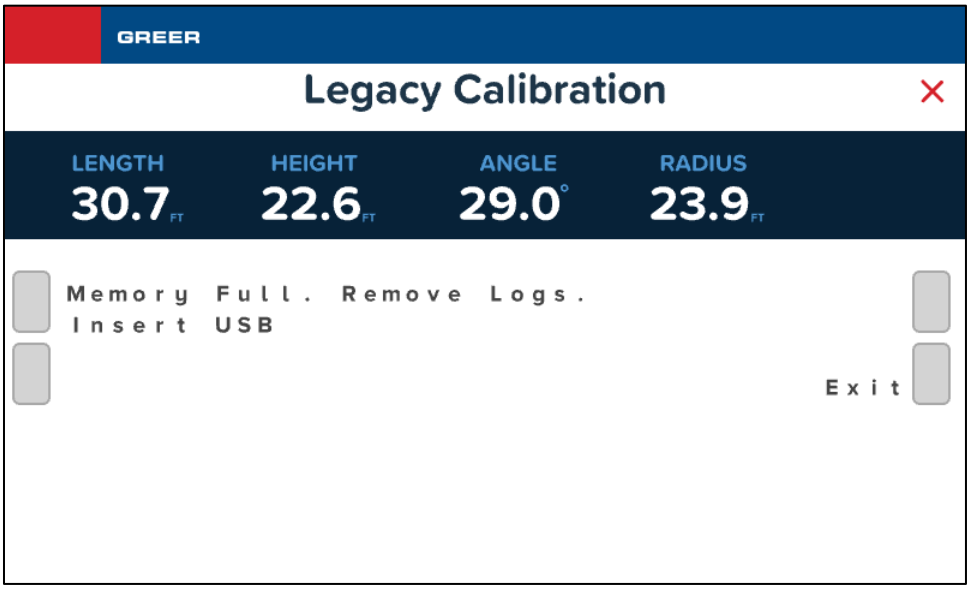
11.5.2 Memory Full Warning

While booting up, if the internal Log memory is 75% full, the MG6 will pause and warn the operator that is almost full and to remove some log files. This warning must be acknowledged by the operator. The warning is then recorded to the transaction log.



On boot up, when the log memory is 85% full, the MG6 will alert the operator that log files should be removed and initiate the dialog to do so. The operator can either insert a USB memory device and copy or move logs to the USB device or tap the **Exit** button. In any case, the transaction log will record the operator's choice and the log files that were affected. For instructions on how to download the log files, see the section **Procedure for Downloading Data Log Files**.





11.5.3 Transaction Log

The "LogTransactionFile.txt" maintains a file disposition account. All log file interactions by the operator are logged to the comma delimited text file. Each record is timestamped.

11.5.4 Move Files

When the operator requests the log files to be moved, they are copied to the USB device and removed from the internal log memory. The transaction is then logged to the transaction log file. A copy of the current transaction log file is also placed on the USB device.

11.5.5 Copy Files

When the operator selects “Copy” from the Extraction dialog, the log file is left in internal memory and it is also copied to the USB memory device. The transaction is also logged to the transaction log file. A copy of the current transaction log file is also placed on the USB device.

11.5.6 File Viewing

Headers

Each record type, DATA, ALARM, CONFIGURATION will have a header at the top of the log file. When using the Excel filter feature the appropriate header will be displayed for the selected record type. If multiple record types are selected a header for each is displayed.

Excel Filters

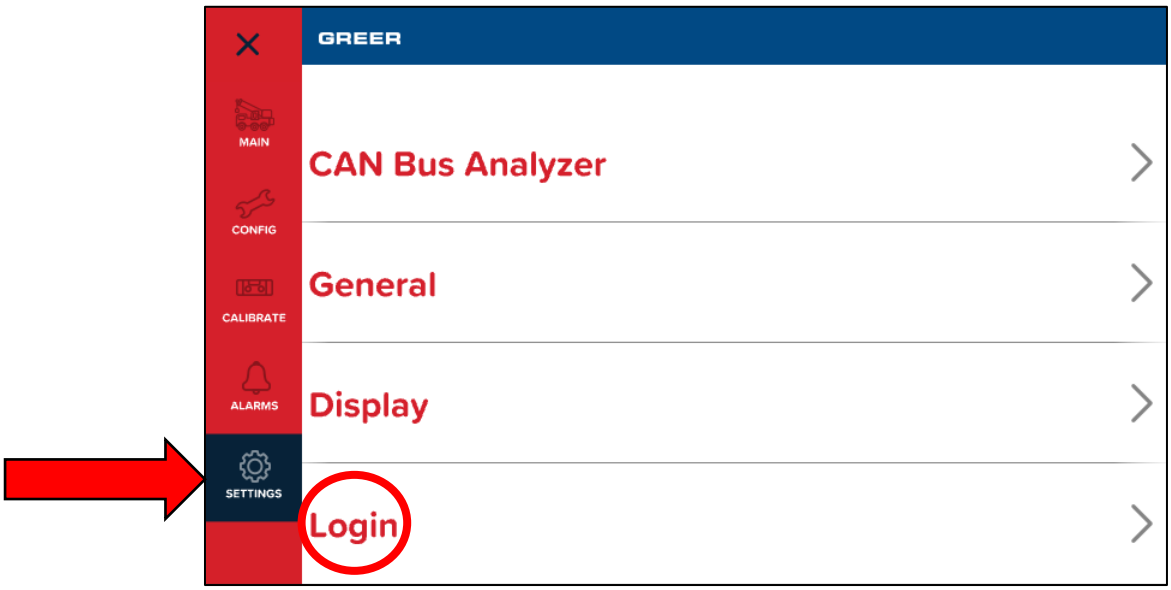
If the log file type of “csv” is associated with Excel, when a log file is double clicked Excel will open and parse the log file. Once open, the third cell contains the word FILTER. If the filter feature is activated on this cell the user will be able to use filter to view the record types individually.

11.6 Procedure for Downloading Data Log Files

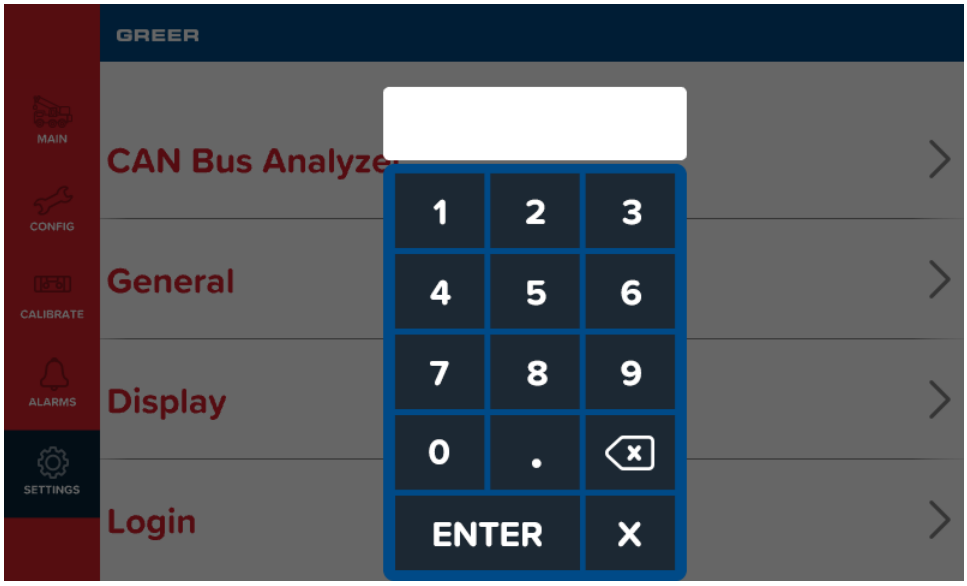
This section explains how to download log files from the MG6 Computer to a USB flash drive. When a log file is **Copied**, a copy of the file is saved to the flash drive and the original file remains in the MG6 Computer's memory. In contrast, when a log file is **Moved**, a copy of the file is saved to the flash drive and the original file is *removed* from the MG6 Computer's memory, thereby freeing up space. It may be necessary to **Move** log files when the storage is almost full. As outlined in the section **Files and Logging Behavior**, the MG6 Computer warns the user when its memory storage space is almost full.

NOTE: *USB Flash Drive must be formatted FAT32.*

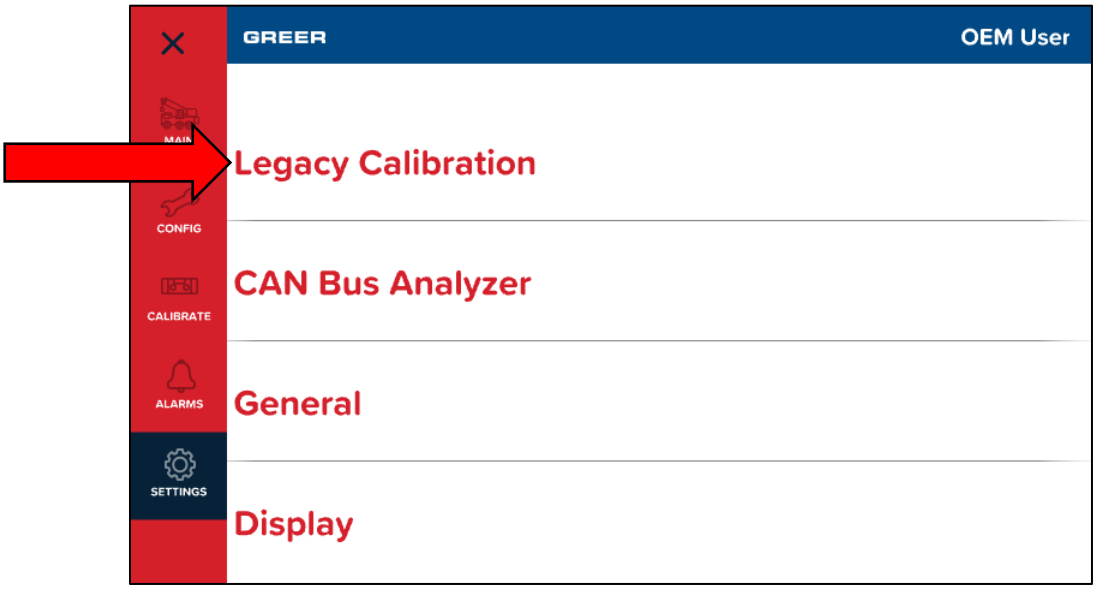
1. On the TS7 Display, enter Legacy Calibration Mode by tapping the Main Menu button, and then selecting the ***Settings*** option. In the Settings screen, tap the ***Login*** option shown encircled below.



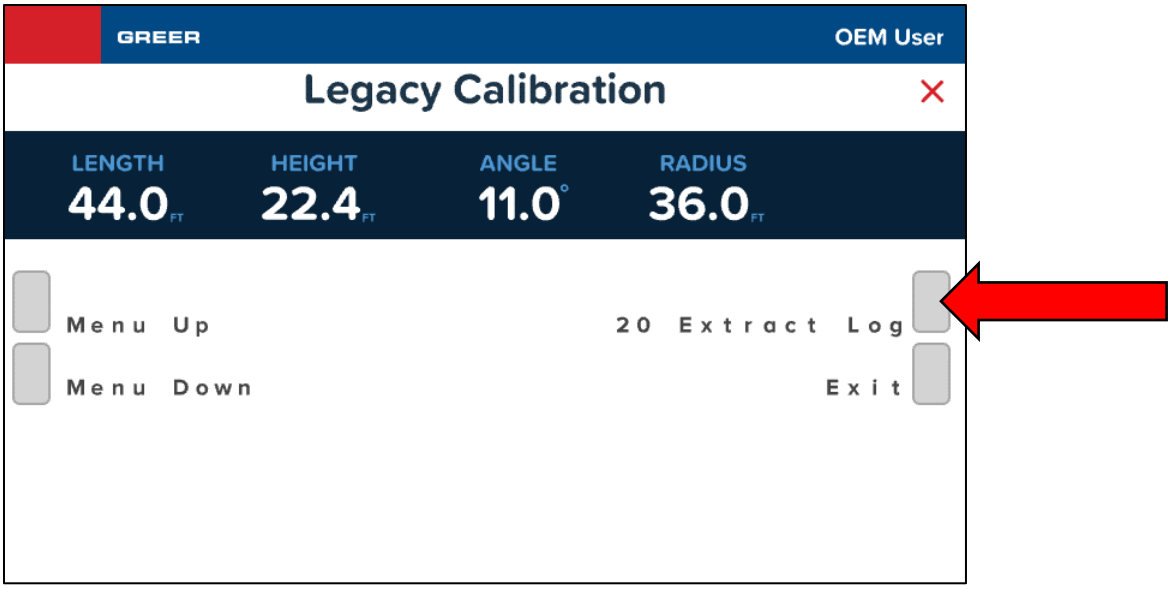
2. The display will request for the security code. Enter the security code, 6638.



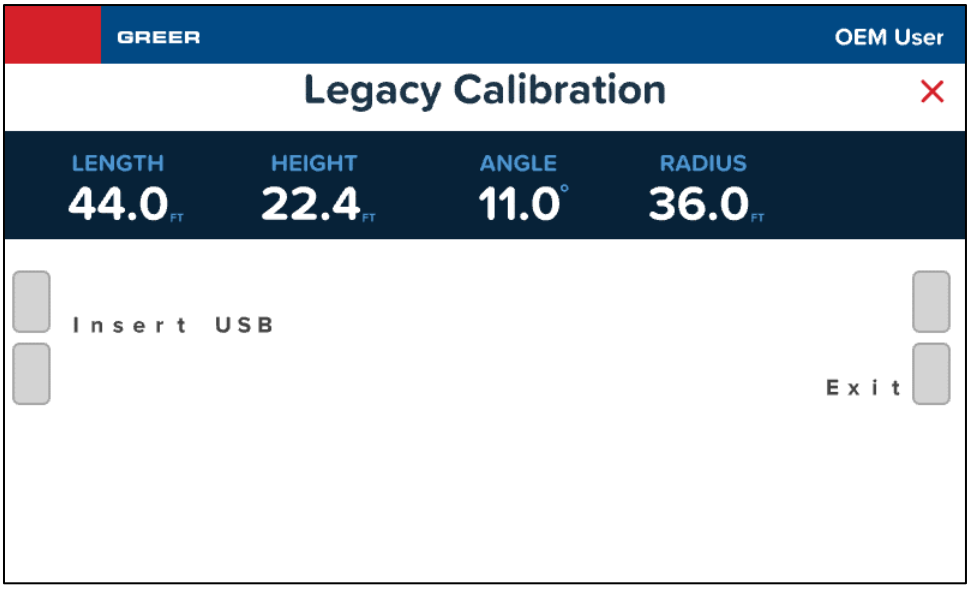
3. Once the security code is correctly entered, the display enters the OEM User mode. Now, select the Legacy Calibration option shown below.



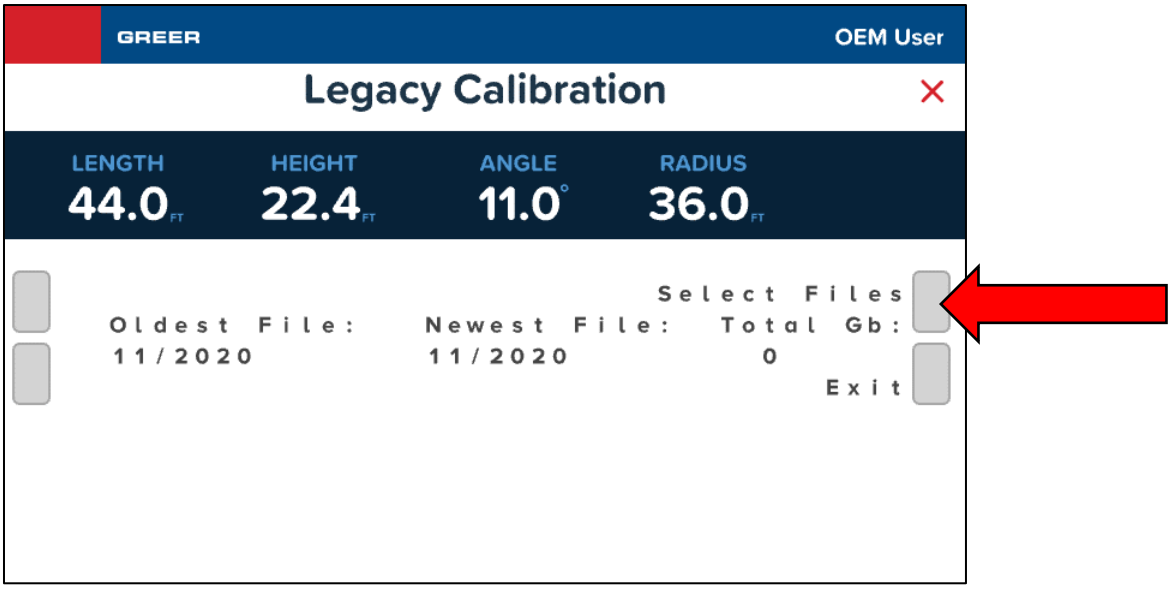
4. In the Legacy Calibration screen, tap ***Menu Up*** or ***Menu Down*** until you reach the item called **Extract Log**. The item number may vary based on how many other options are available for a particular crane. In this example, it is number 20. Tap the ***Extract Log*** button.



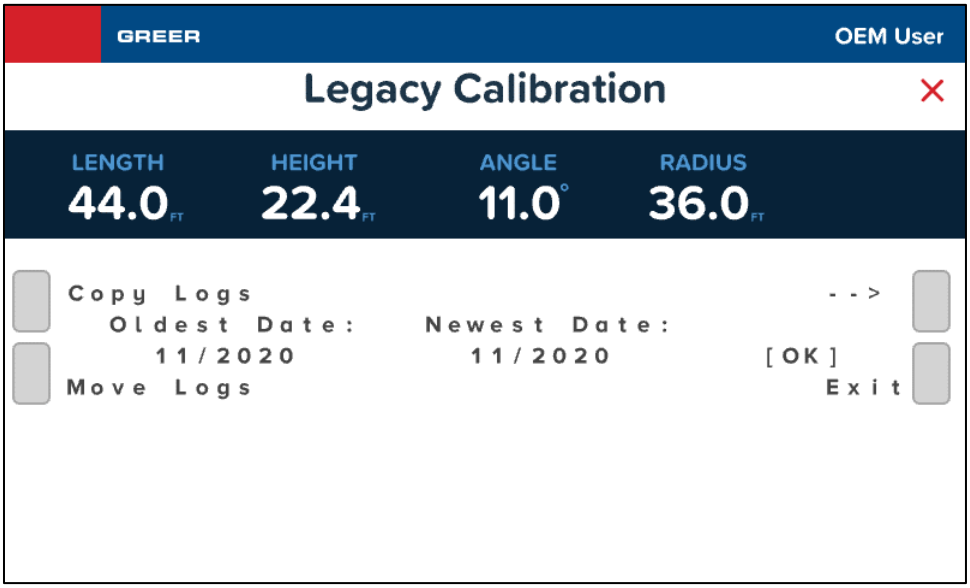
5. The message **Insert USB** will appear. Insert the USB flash drive into the USB Port on the front panel of the MG6 Computer. If you already inserted the flash drive before this step, the computer will automatically skip this step and proceed to the next step.
NOTE: *USB Flash Drive must be formatted FAT32.*



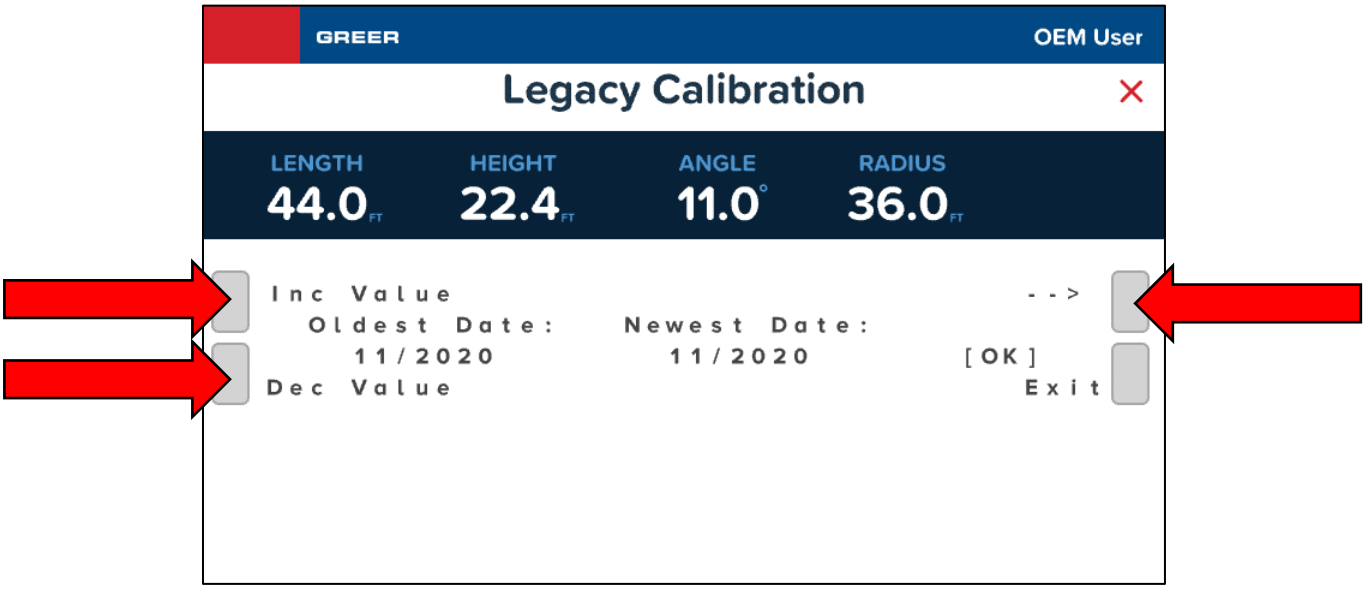
6. The MG6 Computer searches its memory for log files and displays how many it found. Then, it displays the date range of the oldest and newest files in memory, and the total file size. Tap the ***Select Files*** button to proceed.



7. This menu allows you to either **Copy** or **Move** logs that are within the range of dates defined by the filter. The currently selected field on-screen is indicated by flashing text. When the **[OK]** field is selected, the ***Copy Logs*** and ***Move Logs*** buttons are available. Note, the initial filter is the *entire* date range (from the oldest date to the newest date in memory), meaning it includes all log files on the MG6 Computer. If you don't wish to change the filter, you can skip the next step, and proceed to ***Copy Logs*** or ***Move Logs*** immediately.

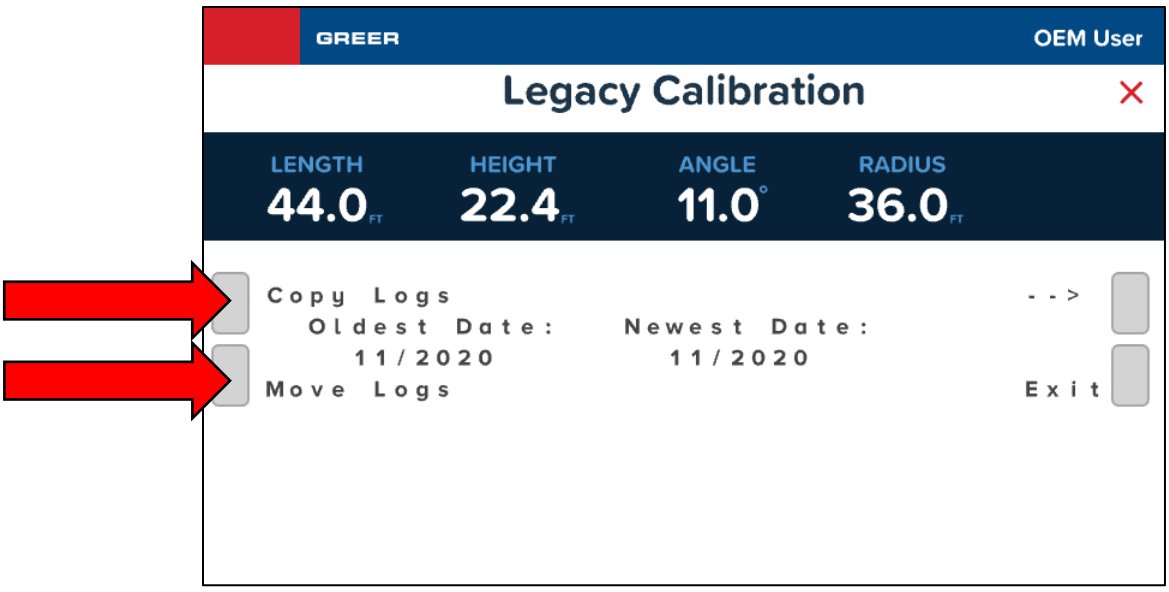


8. If you want to download only a portion of the data logs from the MG6 Computer's memory, you can narrow the date range of the filter. Tap the *"**-->**"* button to cycle the selection focus between **Oldest Date Month**, **Oldest Date Year**, **Newest Date Month**, **Newest Date Year**, and **[OK]**. Whenever the selection focus is on a month or year, the ***Inc Value*** and ***Dec Value*** buttons are available.

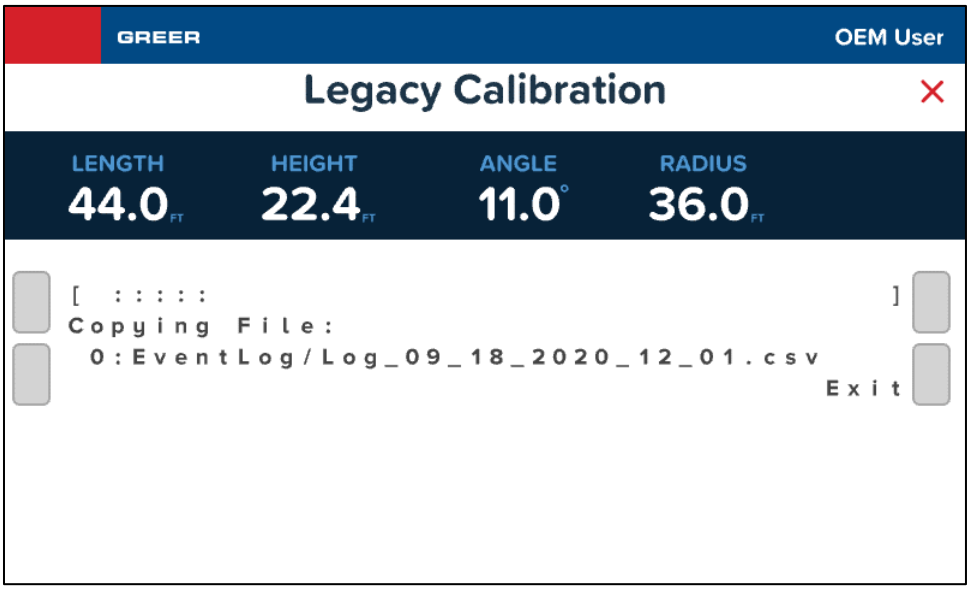


9. When the desired date range of the filter is set, and the **[OK]** field is selected, tap either the ***Copy Logs*** or ***Move Logs*** button.

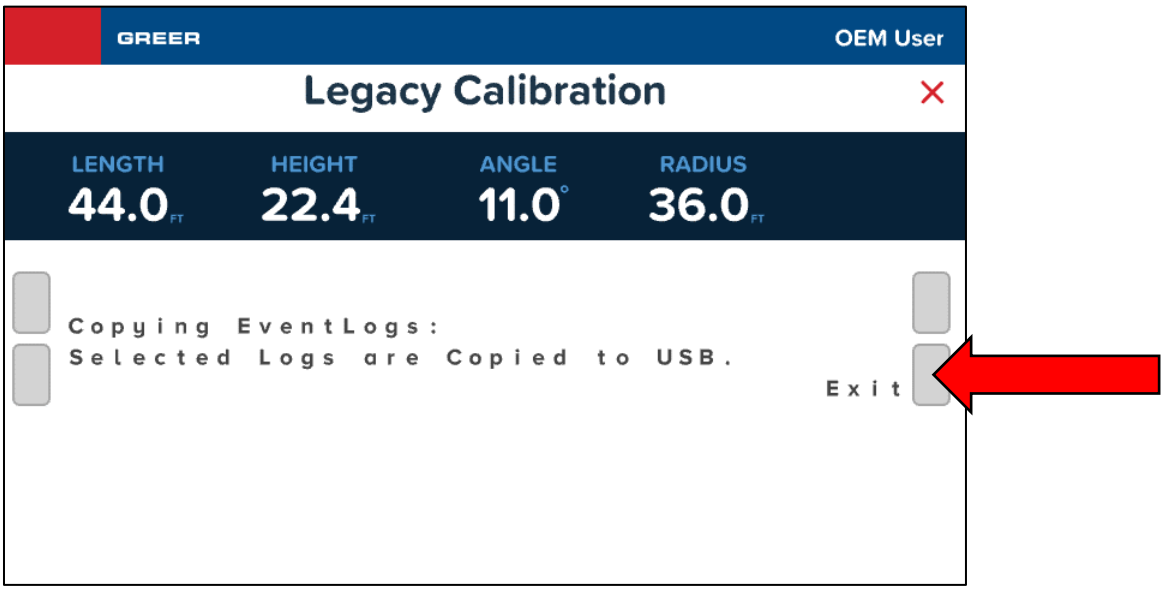
   NOTICE: When Logs are **Copied**, the selected log files are copied to the USB flash drive and remain in the MG6 Computer's memory.
   NOTICE: When Logs are **Moved**, the selected log files are copied to the USB flash drive and are *cleared* from the MG6 Computer's memory.



10. The progress of copying log files to the USB flash drive is indicated by the progress bar on screen.



11. After the logs have been downloaded, the screen will display "**Selected Logs are Copied to USB.**" You can now remove the USB flash drive. Touch the ***Exit*** button.



Section 2: Calibration & Troubleshooting

12. Introduction

The Greer LMI System with MG6 Computer & TS7 Display is an aid to crane operation. It is hereinafter referred to as the "system".

Do not use this system without a properly trained operator. The operator must be knowledgeable in safety guidelines, crane capacity information, and the crane manufacturer's specifications.

This manual describes the setup, operation, maintenance, calibration and troubleshooting of the system. Please read, understand, and follow the contents and instructions contained in this manual.

⚠ WARNING

The Greer LMI System is an operational aid that only provides information to the operator. It *is not* a load limiter, and it will not automatically prevent unsafe operations. The operator is solely responsible for operating the equipment consistent with the manufacturer's instructions and specifications, the equipment's rated capacity, applicable codes and laws, and industry safe practices.
Thoroughly review the Operation, Calibration and Troubleshooting Manual before operating the Greer LMI System.
FAILURE TO FOLLOW THE MANUAL AND OTHER MISUSE OF THIS PRODUCT CAN RESULT IN PROPERTY DAMAGE, SERIOUS INJURY, AND DEATH.

13. Overview and Preparation

This manual provides general information and methods for isolating problems which may occur during operation. Service personnel should have previous training and experience in the procedure for setup and operation of this system. Some problems may require the replacement of parts or the return of parts to the factory for servicing.

Required Tools:

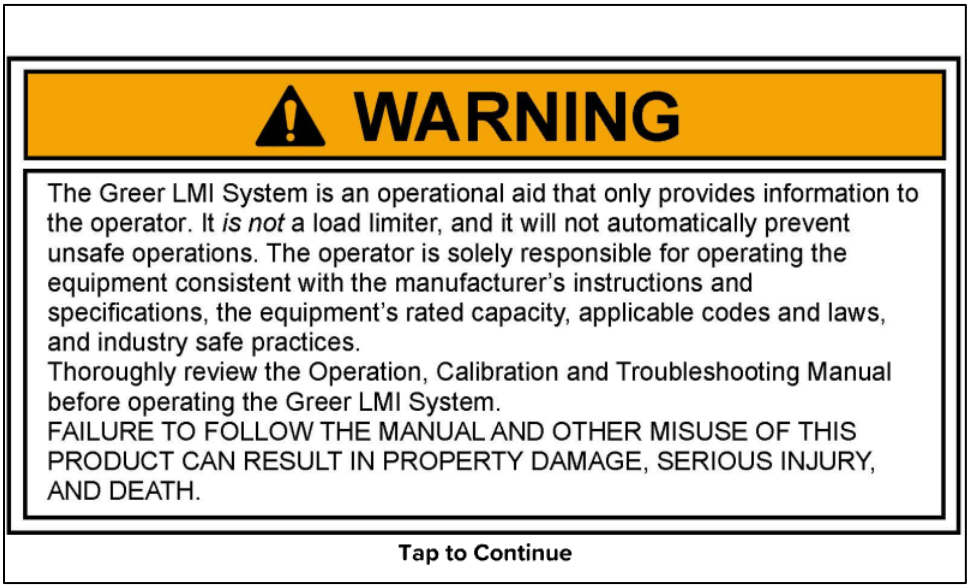
- Tool kit consisting of wrenches and screwdrivers (flat and Phillips)
- Digital level accurate to 0.1°
- 150-200 ft tape measure graduated in tenths of a foot
- Digital multimeter

NOTE: *Low-cost analog multimeters are not appropriate; their input impedance may give inaccurate readings.*

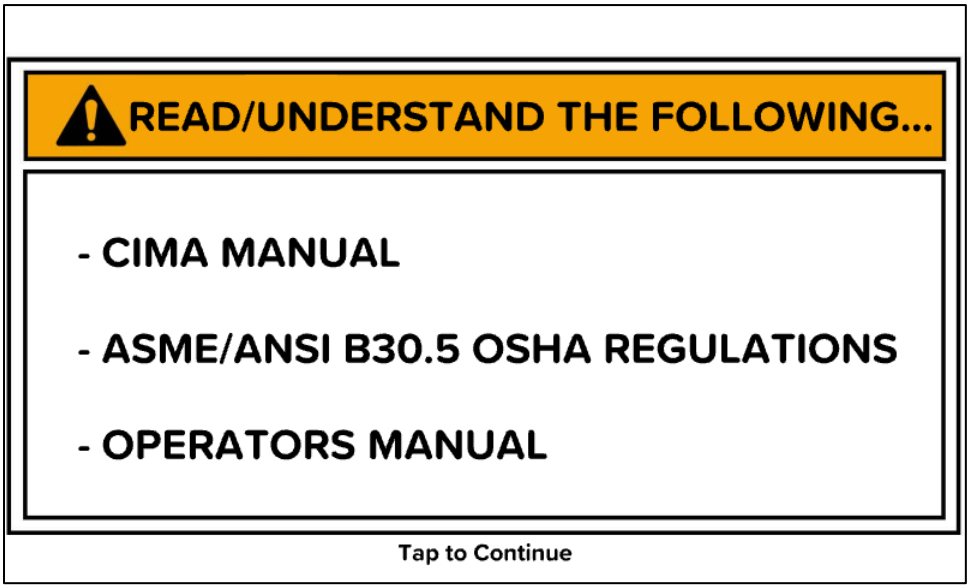
14. System Self-Test

Immediately following system power up, or upon entering calibration mode, the system performs a self-test which verifies that the computer, display console, cables, and sensors are working properly. The test lasts for approximately 10 seconds. During this time, crane motions are disabled by the system function kick-out.

When the warning message appears, read it and tap the screen to acknowledge the message and allow the system to start normal operation.



When the display shows the following message, read it and tap the screen to continue.



If the above does not occur, see the **Calibration & Troubleshooting Manual** section **TS7 Display Console Problems**.

15. TS7 Display Console Problems

Display console problems can be difficult to isolate due to the interaction between the display and the computer unit. Failure of either unit or the cabling connecting the units can cause a malfunction.

To solve problems using the display indications, observe the display at power up and through the self-test. Use the following chart to help diagnose display console problems.

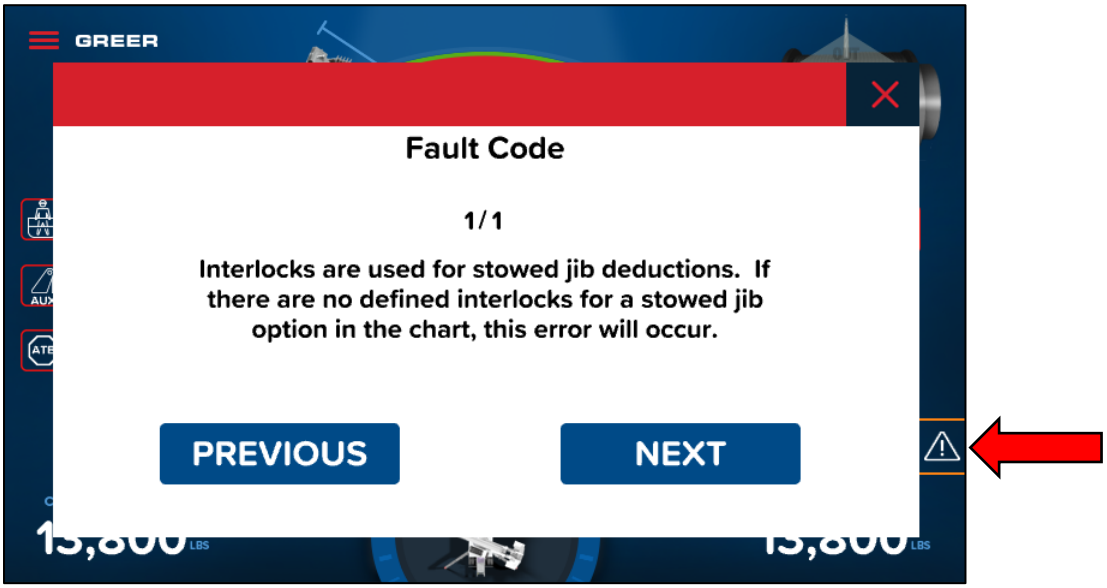
Problem	Action
There are no display indications in any of the windows when the power is turned on.	See **LED Status Indicators**.
The load, angle, radius, length, and rated capacity windows do not show “188.8” and the bar graph is not fully illuminated during the self-test.	See **Replacing the Display Console**.
The display unit does not cycle through the self-test. The data in the display windows appears jumbled with missing segments.	See **Replacing the Display Console**.
The display lights are illuminated. Load, angle, radius, length, and rated capacity show “188.8” or “888.800” for load and capacity, but the display shows: “Lost communications with main computer”	Display console is OK. Check the connectors on the back of the display console. See **LED Status Indicators**. Confirm that the CAN LED indicator is blinking.

16. Fault Reporting and Fault Codes

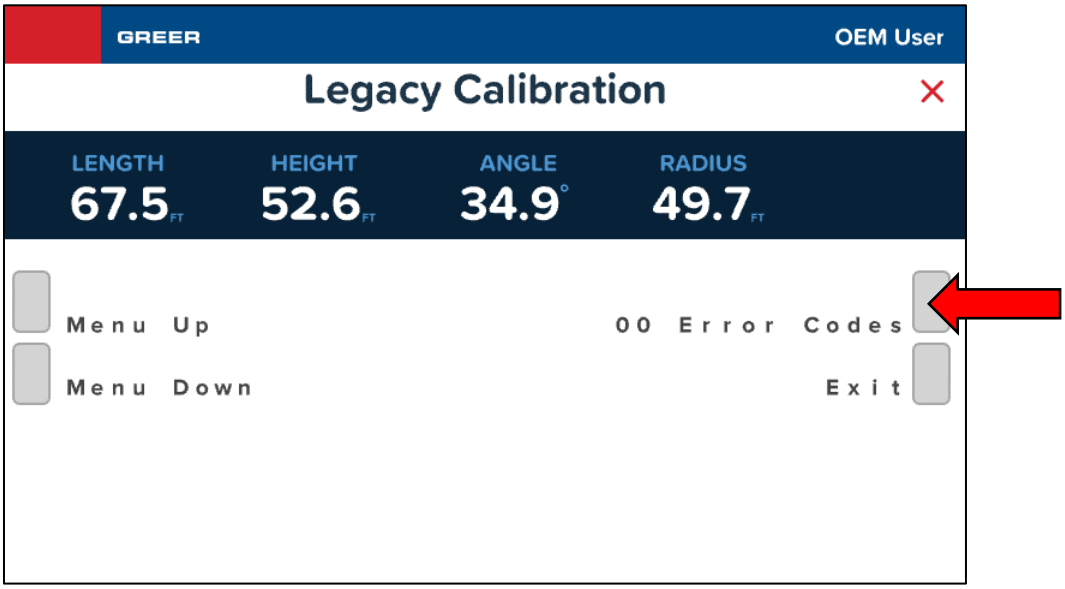
System fault codes provide a way to locate and assess problems within the system. The system performs a brief self-test each time it is powered on. Many fault conditions are detected without a system self-test.

Faults that have been detected are indicated in the following ways:

- The ALARM will sound
- Fault icon will appear, as shown in the figure below



To view the fault codes, go to the ***Legacy Calibration*** screen and tap the ***Error Codes*** button as shown below. Refer to the section ***Entering the Calibration Mode*** for the procedure to access the ***Legacy Calibration*** screen.



There are four groups of fault codes: A, B, C & D. The function of these groups and a complete listing of each code are provided on the following pages.

NOTE: *Always investigate "B" and "C" faults before continuing with "A" and "D" faults.*

16.1 Fault Codes for Multiple Faults

If the displayed fault code is not listed in the tables below, it could be a combination of multiple other fault codes. The displayed fault code is the sum of all the fault codes in the group (A, B, C, or D) that have been detected.

EXAMPLE*: Fault code A015 indicates that faults A001, A002, A004, and A008 have been detected.*

EXAMPLE*: Fault code B024 indicates that faults B008 and B016 have been detected.*

16.2 Group "A" Fault Codes

Group "A" fault codes represent faults detected for analog sensors.

NOTE: *Check and repair "B" and "C" group faults before proceeding to group "A" faults.*

The following chart lists the possible fault codes in the left column and the actions to take in the right column. If the displayed fault code is not listed here, see section **Fault Codes for Multiple Faults.**

Group A Fault Codes		
Fault Code	**Description**	**Action**
A000	No Fault Found	None
A001	Piston Pressure: ADC Fault	Reseat pressure transducer cable. If the error is not resolved, replace the transducer.
A002	Rod Pressure: ADC Fault	Reseat pressure transducer cable. If the error is not resolved, replace the transducer.
A004	Boom Extension: Extension value is not valid	Refer to **Calibrating the Extension Sensor Zero**, **Calibrating Span of Extension and Angle**, and **Reeling Drum Voltage Checks**.
A008	Boom Angle: Angle value is not valid	Refer to **Calibrating the Angle Sensor Zero**, **Calibrating Span of Extension and Angle**, and **Reeling Drum Voltage Checks**.
A016	Swing Sensor: Any one of 4 swing potentiometer values is bad (all 4 wires are required for proper operation of the swing potentiometer sensor). ISS is different but still throws this error if there is a problem.	Refer to **Calibrating the Swing Sensor.** If the system is equipped with a swing potentiometer, refer to **Swing Potentiometer Overview** and check the swing potentiometer voltages. If the system is equipped with an Integrated Swing Sensor (ISS), refer to **Integrated Swing Sensor (ISS) Overview**.
A032	Temperature Sensor Fault	Replace the computer

16.3 Group “B” Fault Codes

Group “B” fault codes represent faults detected for internal analog functions and power feeds to the function kickout and anti-two-block switches.

The following chart lists the possible fault codes in the left column and the actions to take in the right column. If the displayed fault code is not listed here, see section **Fault Codes for Multiple Faults.**

Group B Fault Codes		
Fault Code	**Description**	**Action**
B000	No Fault Found	None
B001	Piston ADC is not responding	Reseat pressure transducer cable. If the error is not resolved, replace the transducer.
B002	Rod ADC is not responding	Reseat pressure transducer cable. If the error is not resolved, replace the transducer.
B004	ATB Feed: Error thrown if the ATB Feed status is not read correctly or goes out	Refer to **Checking the Reeling Drum Cable** and **Checking the Anti-Two-Block Circuit** for troubleshooting information. Check the cables/wiring harness to ensure that no connections are loose.
B008	FKO Feed: Error thrown if the FKO Feed status is not read correctly or goes out	Check for a short. If a short is not present, or removing the short does not resolve the issue, replace the computer. Check the cables/wiring harness to ensure that no connections are loose.
B016	Error thrown if the FKO Feed status does not read correctly or goes out	Check for a short. If a short is not present, or removing the short does not resolve the issue, replace the computer. Check the cables/wiring harness to ensure that no connections are loose.
B032	External Bypass On	Check the bypass switch. If this does not resolve the issue, replace the computer.

16.4 Group “C” Fault Codes

Group “C” fault codes represent faults detected for internal computer memories.

The following chart lists the possible fault codes in the left column and the actions to take in the right column. If the displayed fault code is not listed here, see section **Fault Codes for Multiple Faults.**

Group C Fault Codes		
Fault Code	**Description**	**Action**
C000	No Fault Found	None
C001	Program Checksum is incorrect (memory corrupted)	Re-program the computer with the correct program & duty file. If this does not resolve the issue, have the computer serviced by Greer/TWG
C002	Chart Data not found	Have the computer serviced by Greer/TWG
C004	RAM or cache is corrupt	Have the computer serviced by Greer/TWG
C008	Personality file checksum failed	Erase Crane Data
C016	Serial EEPROM is corrupted (configuration information)	Have the computer serviced by Greer/TWG
C032	Serial EEPROM has failed	Replace the computer

16.5 Group “D” Fault Codes

Group “D” fault codes represent faults detected for capacity chart selection.

NOTE: *Check and repair “B” and “C” group faults before proceeding to group “D” faults.*

The following chart lists the possible fault codes in the left column and the actions to take in the right column. If the displayed fault code is not listed here, see section **Fault Codes for Multiple Faults.**

Group D Fault Codes		
Fault Code	**Description**	**Action**
D000	No Fault Found	None
D001	If the duty file doesn't have the valid ID number or the file currently being used is a generic file, this error will occur.	Update the computer with the correct program & duty file.
D002	If the current length value doesn't have a chart associated with it, this error will be shown (i.e. max length = 100', and currently displaying 105').	Boom length is out of range for selected chart. Check crane setup, boom length and extension.
D004	If there is no chart available for the current swing/slew area defined (i.e. no 360° chart).	Swing to correct working area to select chart. Check swing sensor zero position.
D008	Interlocks are used for stowed jib deductions. If there are no defined interlocks for a stowed jib option in the chart, this error will occur.	Contact Greer/TWG Service to troubleshoot this issue related to the program or duty file.

17. Problems Not Reported by Fault Code System

This section addresses problems that are not reported by the computer fault code system.

17.1 Anti-Two-Block Alarm (ATB)

The purpose of this section is to help diagnose ATB alarm problems. For detailed information, schematic, and voltages, refer to **Anti-Two-Block Function Overview**.

PROBLEM:

- *The Anti-Two-Block alarm is continuously ON. Operating the switch at the boom head does not deactivate the alarm.*

This problem suggests an open circuit between the computer ATB input and the ATB switch, or an open circuit between the computer ATB feed and the ATB switch. Check the reeling drum cable for damage. Ensure the two-block switches are correctly connected. Check the slip-ring and wiring inside the extension reel. Check the reel-to-computer cable. Check the connectors.

PROBLEM:

- *The Anti-Two-Block alarm is continuously OFF (safe). Opening the switch at the boom head, by lifting the ATB weight does not activate the alarm.*

This problem suggests a short circuit between the computer ATB input and the computer ATB feed somewhere between the computer and the ATB switch. Check the reeling drum cable for damage. Ensure the two-block switches are correctly connected. Check the slip-ring and wiring inside the extension reel. Check the signal cable from the reel to the computer. Check the connectors.

17.2 Displayed Load or Radius Errors

The purpose of this section is to help diagnose load and radius errors. Load or radius errors can cause early or late tripping of overload alarms. Accuracy of load is governed by the radius accuracy, and the extension, angle, and pressure sensors. Accuracy of radius (unloaded) is governed by the extension and angle sensors.

Ensure there are no system faults before continuing.

17.2.1 Check Boom Extension

1. Ensure the boom is fully retracted.
2. Ensure the reeling drum cable is correctly layered as a single layer across the extension reel surface. Any stacking of the cable will cause extension errors. This will cause the System to exceed the 0.5 ft tolerance allowed by the computer for boom mode selection. If the reeling drum cable is stacking on the reel, refer to **Checking the Reeling Drum Cable Layering**.

3. Check the zero of the extension sensor with the boom fully retracted. Enter the Calibration Mode and use the “SPAN” command. Select sensor No. 2 to view the extension value in feet. The value of extension must be between -0.2 and +0.2, with the boom fully retracted. If the extension value is incorrect, refer to **Calibrating the Extension Sensor Zero**. Fully telescope the boom and ensure the displayed boom length value matches the maximum length of the boom. If the length value is incorrect, follow the Extension Span procedure in **Calibrating Span of Extension and Angle**.

17.2.2 Check Main Boom Radius

NOTE: *The required accuracy of taped radius measurements is within 0.1 feet. When taking radius measurements use a good quality tape that does not stretch. The tape should be graduated in feet and tenths of a foot. Always measure between the swing center of the crane and the hook line, using a single part of line with the crane centered over front (rough terrain) or centered over rear (truck crane).*

1. Fully retract the boom and ensure the crane configuration is correctly set up.
2. Raise the boom to about 45° and measure the radius. The measured radius must match the displayed radius within +/- 0.1 ft. If it does not match, refer to **Calibrating the Angle Sensor Zero**.
3. Raise the boom to a high angle (at least 70°) and measure the angle with the inclinometer. Ensure the displayed angle matches the inclinometer reading within 0.2°. If the displayed angle is incorrect, follow the angle span calibration procedure in **Calibrating Span of Extension and Angle**.

17.2.3 Check Boom Angle

NOTE: *The required accuracy of measured angles is within 0.2°. When taking boom angle measurements use a good quality inclinometer. Many inclinometers are only accurate near 0° (level). Ensure the digital inclinometer is securely mounted to the boom.*

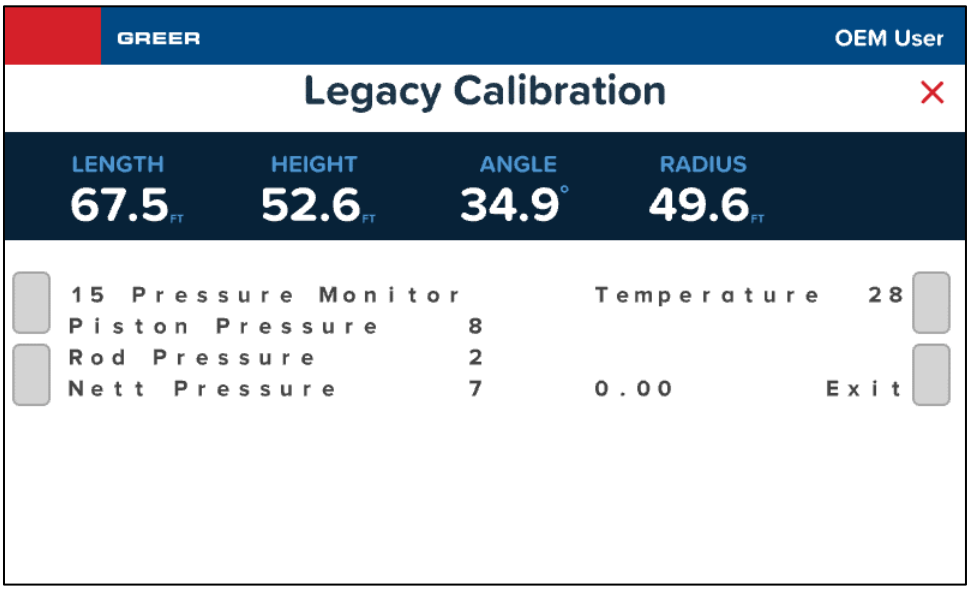
1. Fully retract the boom.
2. Using an inclinometer, set the boom to 0° and ensure the displayed boom angle value is 0.0°. If the angle value is not 0.0°, refer to **Calibrating the Angle Sensor Zero.**
3. Raise the boom to a high angle (at least 70°) and measure the angle with the inclinometer. Ensure the displayed angle matches the inclinometer reading within 0.2°. If the displayed angle is incorrect, refer to **Calibrating Span of Extension and Angle**.

17.2.4 Check Pressure Transducers

There are two pressure transducers installed as part of the system. Both pressure transducers are mounted outside the computer unit. One is connected to the piston side of the boom hoist cylinder; the other is connected to the rod side of the boom hoist cylinder.

The pressure transducer located on the piston side is subject to the hydraulic pressure needed to support the weight of the boom, any attachments, and the load. The pressure transducer on the rod side monitors the pressure necessary to control the down motion of the boom. The computer unit uses this information (along with other sensors such as extension, length, and angle), to compute the weight of the suspended load. Each pressure transducer is calibrated by the manufacturer. Pressure transducers can be individually replaced.

1. Lower the boom until the boom hoist cylinder is fully retracted and on its stop.
2. Loosen the hydraulic connections to the pressure transducers to ensure zero pressure is present on the sensors.
3. Enter the calibration mode and tap “Menu Up” to access “15 PRESSURE MONITOR” to view both sensor pressures and net pressure.
4. Check the pressure values of both sensors. The pressure values should be between 0 and +10 psi. If not, replace any pressure transducer out of tolerance.
5. Check the net pressure values of the sensors. This should be between -10 and +10 psi. If not, replace any pressure transducer out of tolerance.



NOTICE!

BOTH PRESSURE TRANSDUCERS ARE PRE-CALIBRATED FROM THE FACTORY AND ARE SUPPLIED SEPARATELY FROM THE COMPUTER. THE MG6 PRESSURE TRANSDUCERS CAN BE INDEPENDENTLY REPLACED. THIS IS DIFFERENT FROM THE MG5 PRESSURE TRANSDUCERS, WHICH COULD NOT BE REPLACED.

18. MG6 Computer Unit Overview

The computer unit is the center of the system. It reads the sensors, controls computations and disconnect functions, and communicates with the display.

The front panel of the MG6 Computer contains the following:

1. Electrical Connectors (Qty. 2)
2. USB Port, with dust cover
3. LED Indicators
4. Micro-USB Port, with dust cover (For Use by Greer/TWG Service Technicians Only)

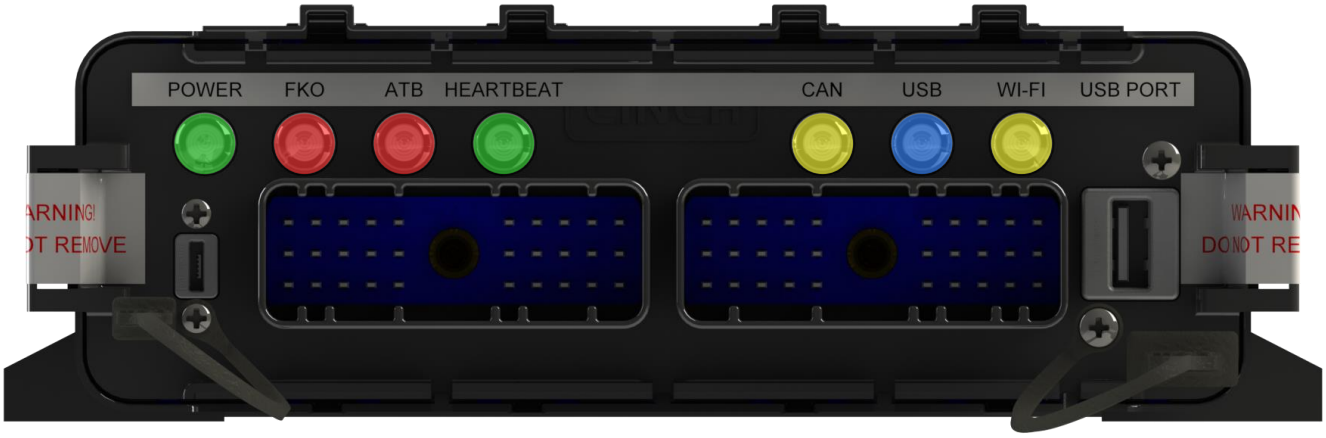
NOTICE: THE MG6 COMPUTER IS NOT SERVICEABLE EXCEPT BY GREER/TWG SERVICE TECHNICIANS.

IF THERE IS A PROBLEM THAT REQUIRES SERVICING THE MG6 COMPUTER, CONTACT GREER/TWG SERVICE AND SEND IT IN FOR REPAIR.

DO NOT ATTEMPT TO SERVICE THE COMPUTER YOURSELF. DO NOT ATTEMPT TO OPEN THE COMPUTER ENCLOSURE AND DO NOT REMOVE THE WARNING LABELS AFFIXED TO THE LATCHES ON EACH SIDE OF THE COMPUTER. DOING SO COULD VOID YOUR COMPUTER'S WARRANTY.

18.1 LED Status Indicators

The front panel of the MG6 Computer contains a row of LED indicators for checking computer operation.



The table below describes the behavior of the LEDs if the system is operating normally. If an LED is not lighting when it should, there may be a problem with the system. Contact Greer/TWG Service if this occurs.

LED Status Indicators		
LED Label	**Color**	**Signification**
Power	Green	Lights (Solid) when the computer is powered
FKO	Red	Lights (Solid) when the system is in Function Kick Out (FKO)
ATB	Red	Lights (Solid) when the Anti-Two-Block (ATB) alarm is active
Heartbeat	Green	Lights (Blinking) when the computer is running a program
CAN	Yellow	Lights (Blinking) when there is communication on the CANBus
USB	Blue	Lights (Solid) when a USB stick is inserted into the USB Port Lights (Blinking) when data is being transferred through the USB Port
Wi-Fi	Yellow	Notice: Wi-Fi is not currently supported. At this time, the light does not signify anything.

18.2 Function Kickout Fuse

The MG6 Computer contains a 5 amp resettable circuit breaker. The circuit breaker protects the function kickout circuit and relay contacts, if a short circuit occurs across the crane kickout solenoids.

If the system displays error codes B008 or B016, which indicate that the function kickout power feed is missing, remove power to the computer. This will reset the circuit breaker.

NOTE: *Ensure any electrical shorts which may have caused the circuit breaker to trip have been removed, before re-applying power*.

18.3 Replacing the Computer Unit

18.3.1 Computer Removal

1. Disconnect all electrical connectors at the computer unit.
2. Remove the hardware securing the computer to its mounting surface.

18.3.2 Computer Installation

1. Secure the computer unit to the mounting surface with the mounting hardware.
2. Ensure the electrical connections face downward.
3. Connect all electrical connectors.

18.4 Replacing the Pressure Transducers

18.4.1 Pressure Transducer Removal

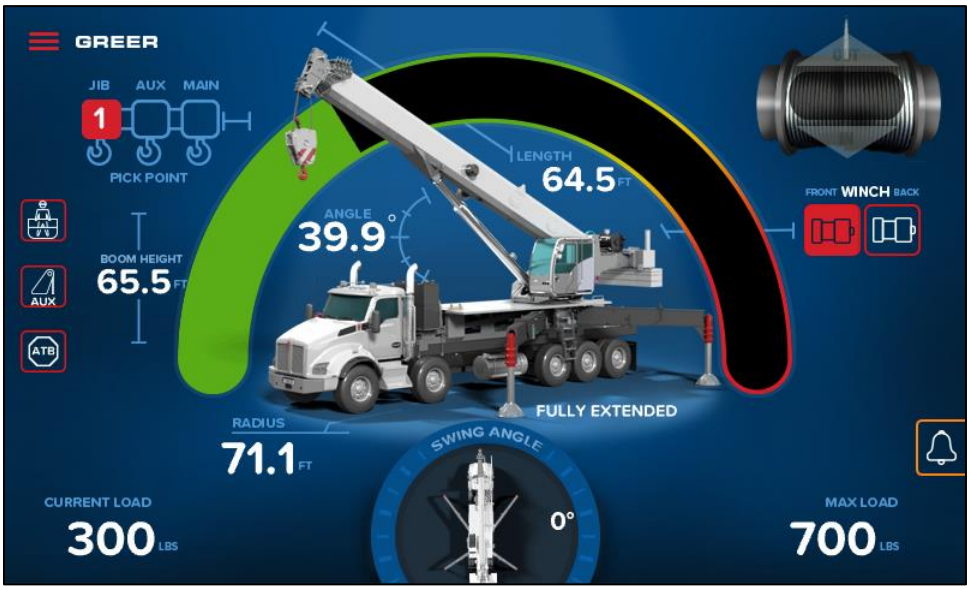
1. Lower the boom until the boom hoist cylinder is completely retracted and on its stop, or the boom is firmly in the boom rest.
2. Disconnect the pressure transducer hydraulic connections.

18.4.2 Pressure Transducer Installation

1. Remove the protective caps from the hydraulic ports.
2. Connect the piston-side pressure transducer to the piston pressure port.
3. Connect the rod-side pressure transducer to the rod pressure port.

19. TS7 Display Console Overview

The TS7 Display console allows the user to see the crane values and crane configuration selection. The display also provides calibration functions used for testing and fault diagnosis.

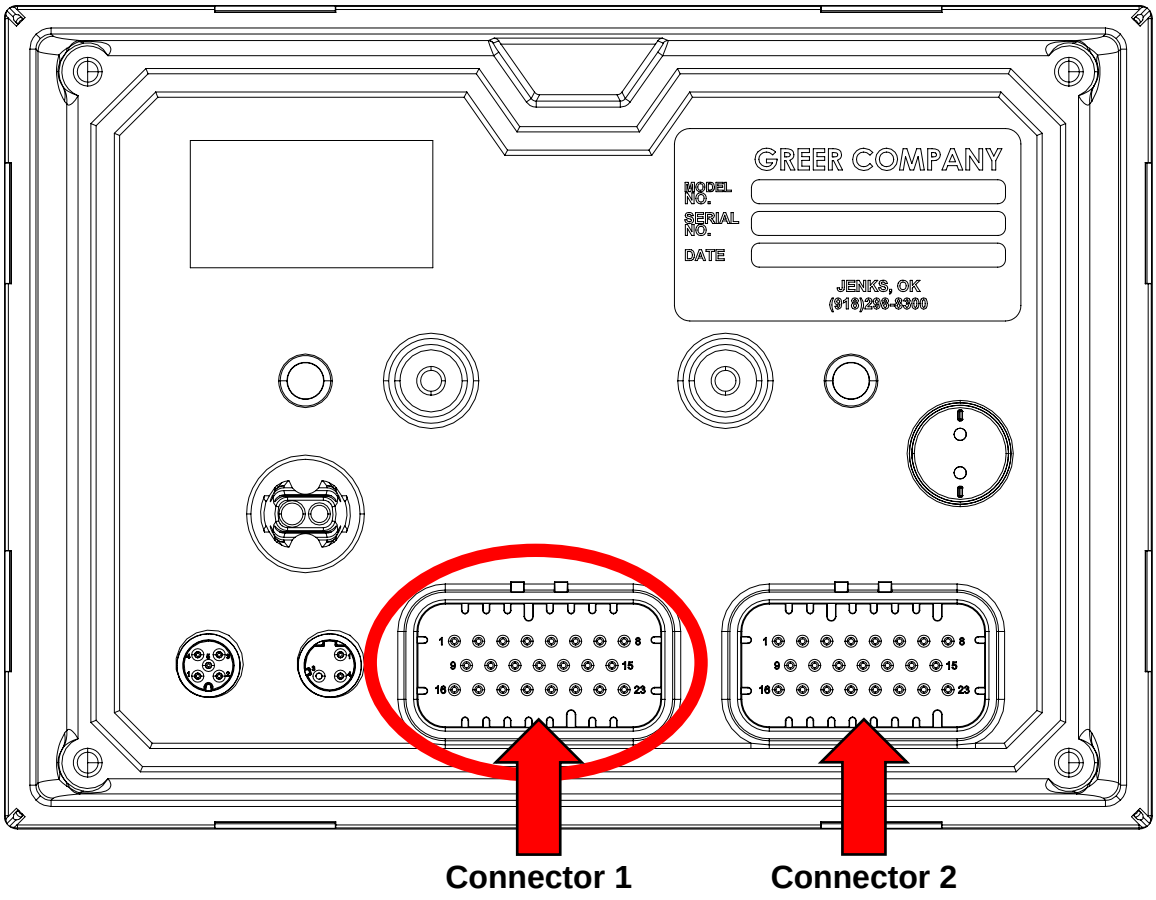


19.1 Checking the Display Console

When operated under extreme conditions the console can become damaged. The damage is not always apparent. To help identify subtle faults that are sometimes difficult to find, please review the following sections.

19.2 Connectors

The AMP connector on the display interface cable from the computer plugs into Connector 1 (shown encircled in the figure below) on the back of the display.



19.3 Horn

Ensure the horn is connected to the wiring harness via the two-pin Deutsch connector.

19.4 Ingress Protection Rating

The display console conforms to IP66 and IP69K in protection against dust and water, when correctly installed.

19.5 Replacing the Display Console

19.5.1 Removal

1. Disconnect the electrical cable from the rear of the operator’s display console.
2. Loosen the knob of the ram mount and remove the display.
3. Remove the defective display console from the bracket in the cab.
4. Remove the two screws attaching the ball mount to the display.

19.5.2 Installation

1. Install the ball mount to the display using the two screws.
2. Place the ball mount into the ram mount and tighten the knob to tighten the mount.
3. Connect the electrical cable to the rear of the console.

20. Calibration Mode

The Greer LMI System is an aid to crane operation. Only use this system with an operator trained in safety guidelines, crane capacity information, and the crane manufacturer's specifications.

When the computer is new, it has no zero or span calibrations. It is necessary to enter zero and span settings for accurate length and angle calculations.

Tools Needed:

- Digital level accurate to 0.1°
- 150-200ft. tape measure graduated in tenths of a foot
- Digital multimeter

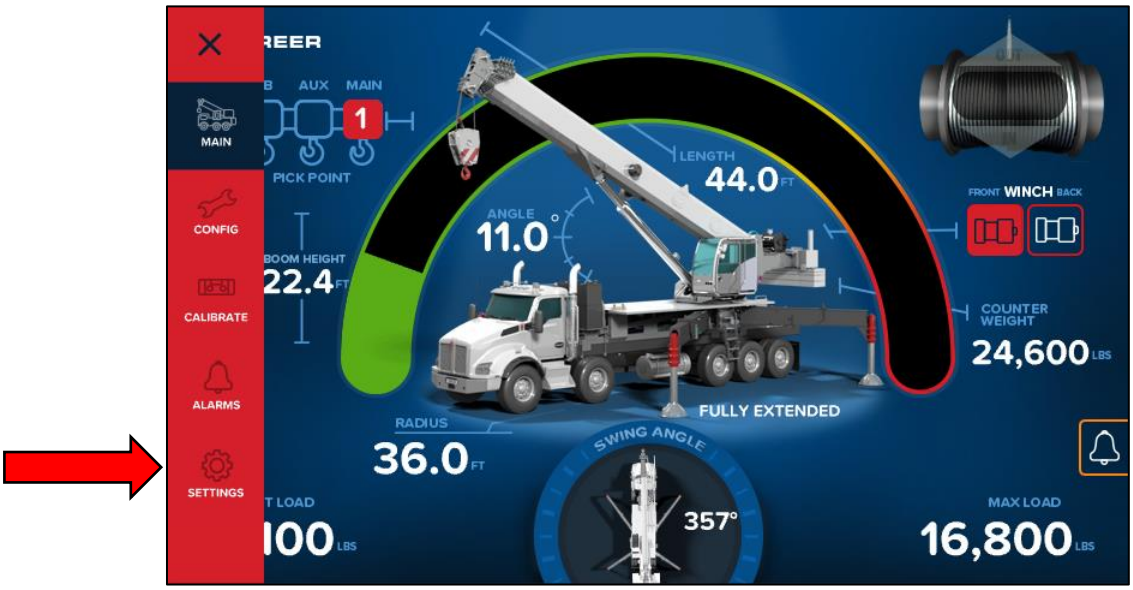
Pre-Requisites for Calibration:

- The crane must be properly set on level ground per the manufacturer's specifications.
- Maximum boom height will be needed. Ensure the area is free of overhead obstructions.
- All options such as jibs, flys, auxiliary heads, etc. must be configured in the computer.

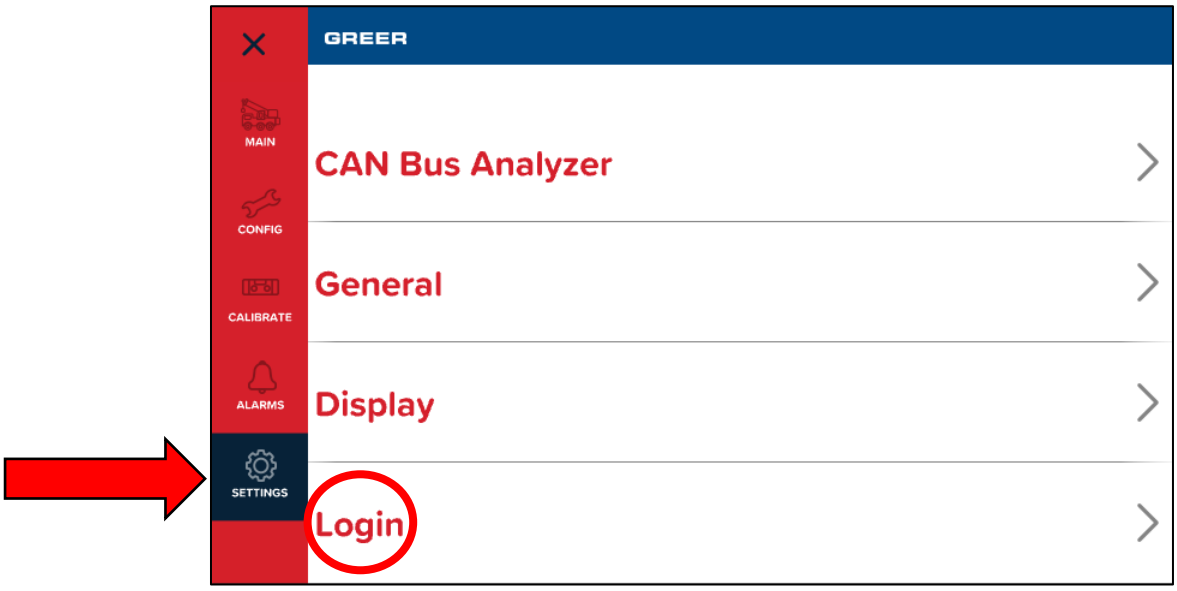
20.1 Entering the Calibration Mode

Follow the steps below to ensure proper calibration of the system. Ensure the actual crane setup is reflected on the display. See the **Operation Manual** for proper crane configuration after the calibration.

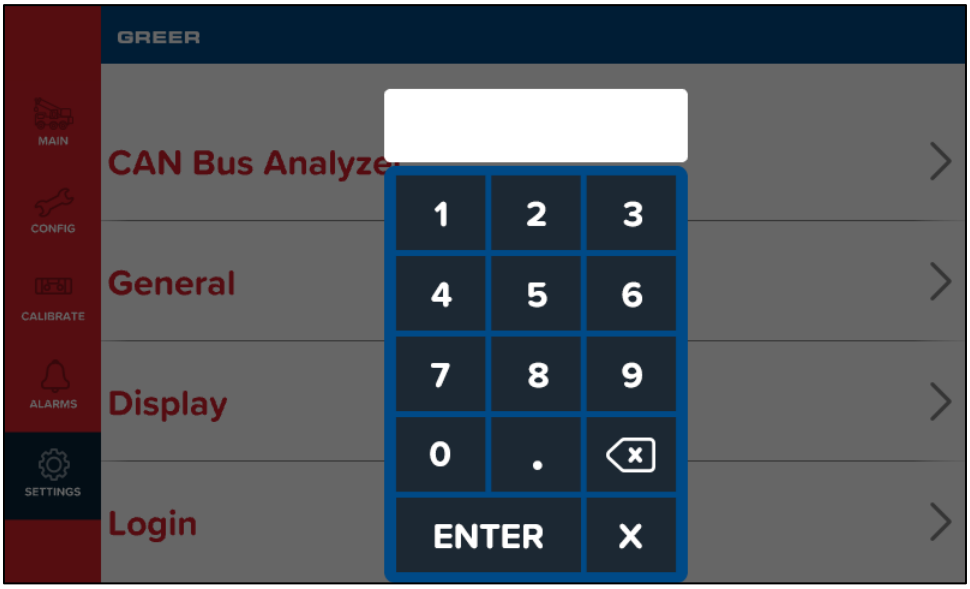
1. To enter ***Calibration Mode***, the display must be on the ***Home*** screen.
2. Tap the ***Main Menu*** button and in the options that appear, select the ***Settings*** item as shown below.



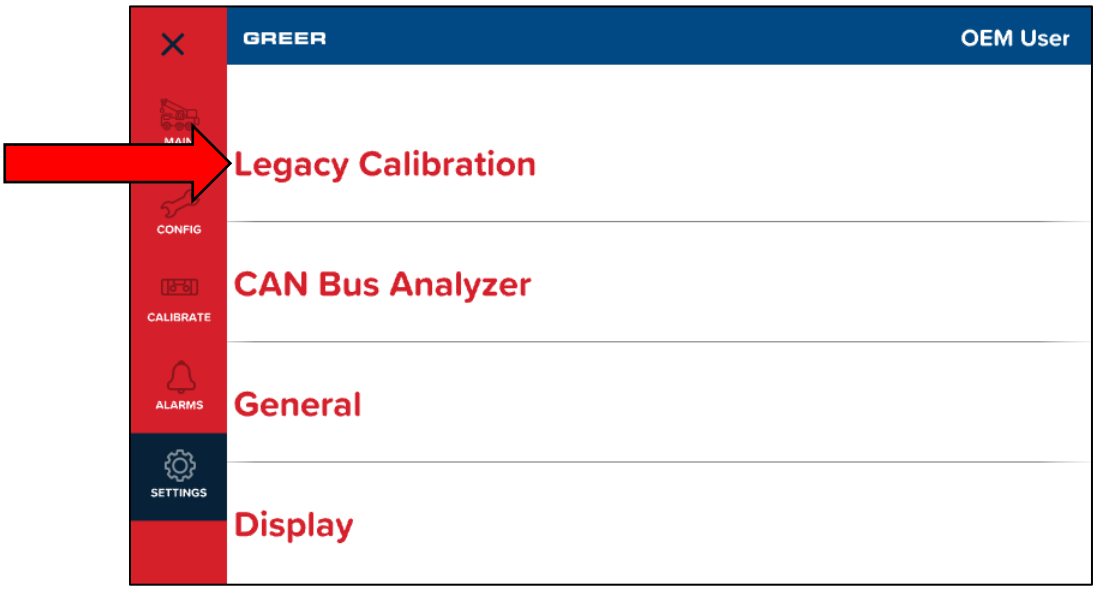
3. In the ***Settings*** screen, tap the ***Login*** option shown encircled below.



4. The display will request for the security code. Enter the security code, 6638.

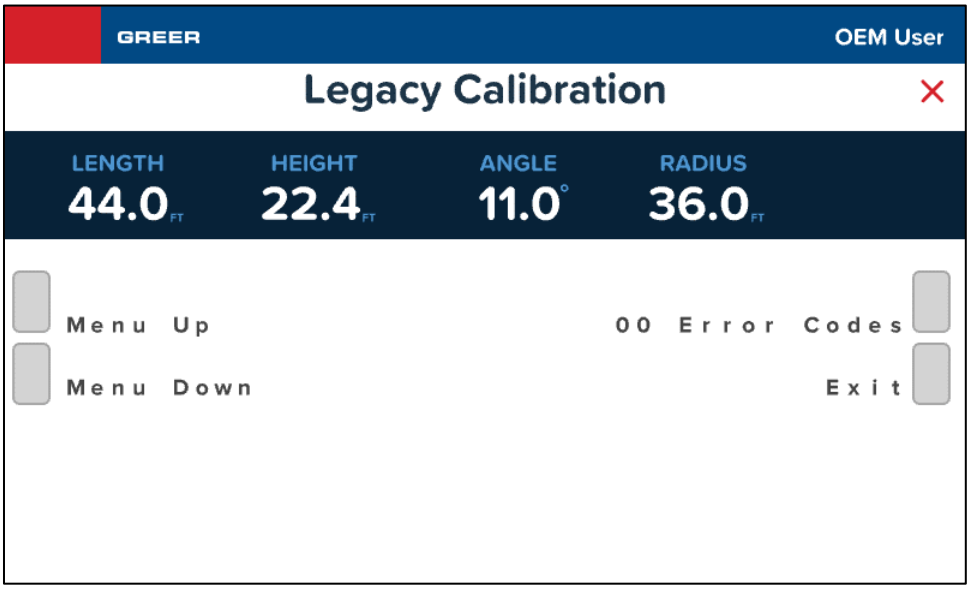


5. Once the security code is correctly entered, the display enters the OEM User mode. Now, select the ***Legacy Calibration*** option shown below.



20.2 Calibration Menus

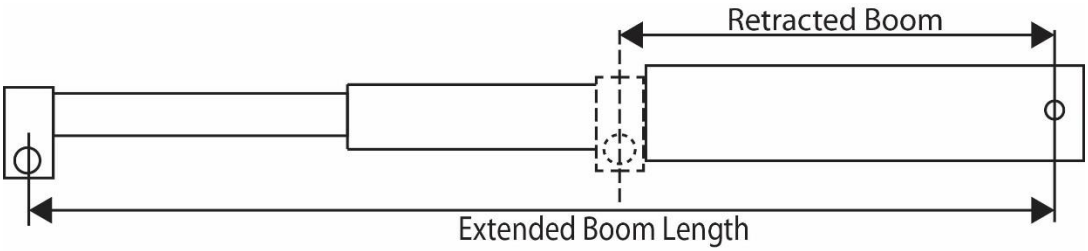
The Legacy Calibration screen is shown in the figure below.



The main menu items used to calibrate the system are:

- 02 Zero Sensors
- 03 Span Sensors
- 04 Swing Potentiometer

The boom extension and the boom angle must be calibrated by being properly set to zero and spanned. Boom extension and angle readings are dependent on the correct span values to be entered into the system. These span values are determined by using a digital level on the boom angle, and measuring the span of boom extension. Refer to **Calibrating the Extension Sensor Zero**, **Calibrating the Angle Sensor Zero**, and **Calibrating Span of Extension and Angle**.



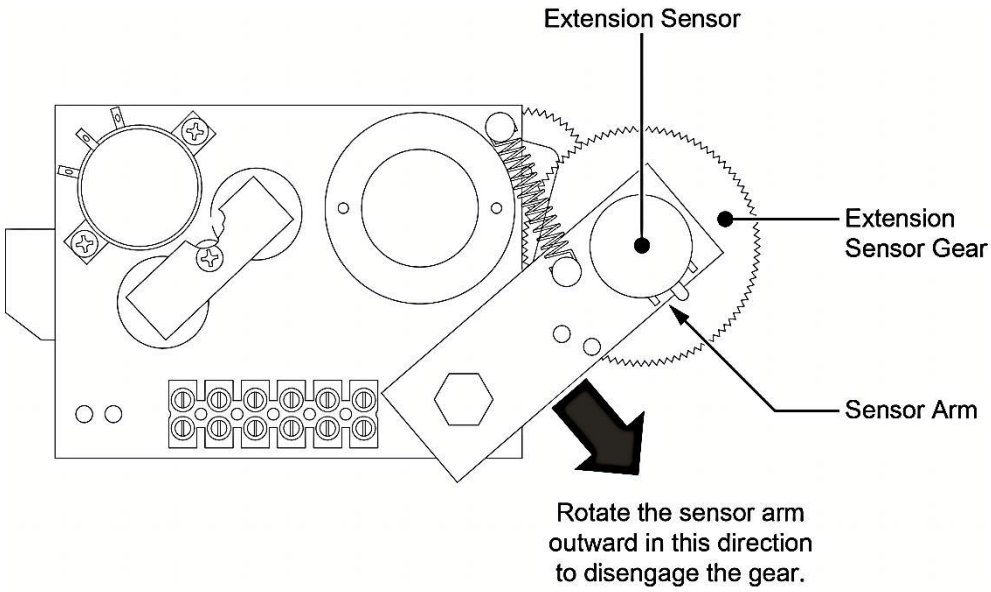
Extended Length – Retracted Length = Span

The system is also equipped with a swing sensor. This tracks the turret in relation to the chassis. Refer to **Calibrating the Swing Sensor**.

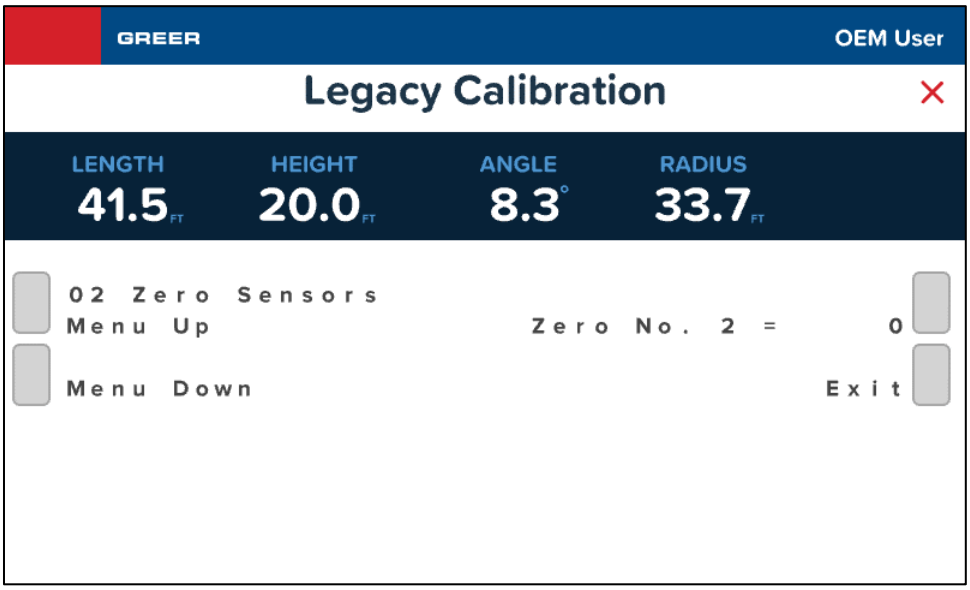
On cranes with string potentiometer style outrigger position sensors, if a sensor is replaced, it will need to be calibrated. Refer to **Calibrating the Outrigger Position Sensors**.

20.3 Calibrating the Extension Sensor Zero

1. Fully retract and lower the boom to 0.0°. Verify using a digital level.
2. Remove the cover from the reeling drum to expose the baseplate sensor assembly.
3. Rotate the extension sensor gear clockwise until the clutch drags/clicks, then rotate ½ turn counterclockwise.
4. The voltage reading between the blue wire TB1-1 and the white wire TB1-3 on the terminal block should measure 0.15V to 0.35V. If outside this voltage, rotate the gear to attain proper voltage with the boom fully retracted.



5. Tap the ***Menu Up*** button until ***02 Zero Sensors*** is reached.
6. Tap the ***02 Zero Sensors*** button.
7. Tap the ***Zero No. 2 =*** to be prompted with ***Yes! Calibrate!***
8. Tap the button a second time to calibrate the zero.

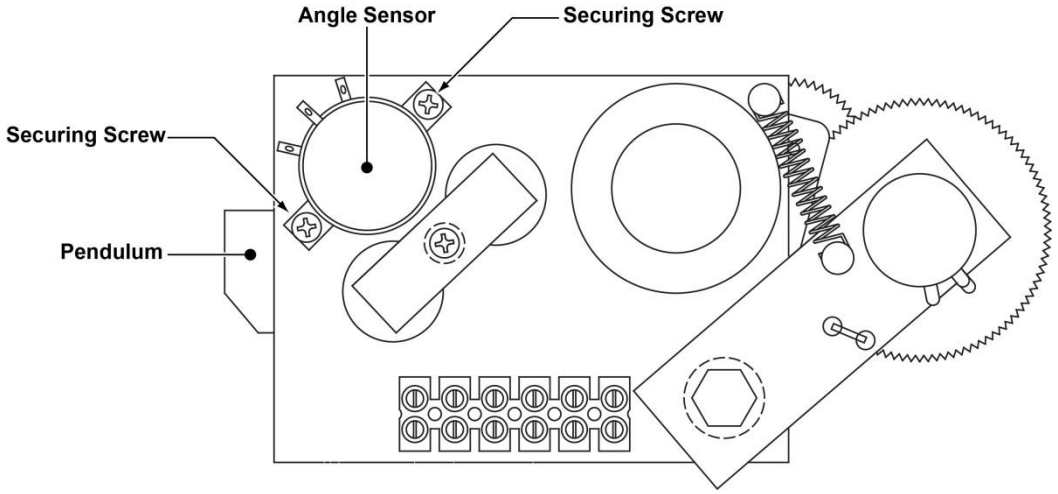


9. The display will then read ***Zero No. 2 = 0*** as shown. The retracted boom length will be displayed in the boom length window. Extension sensor zero calibration is complete.

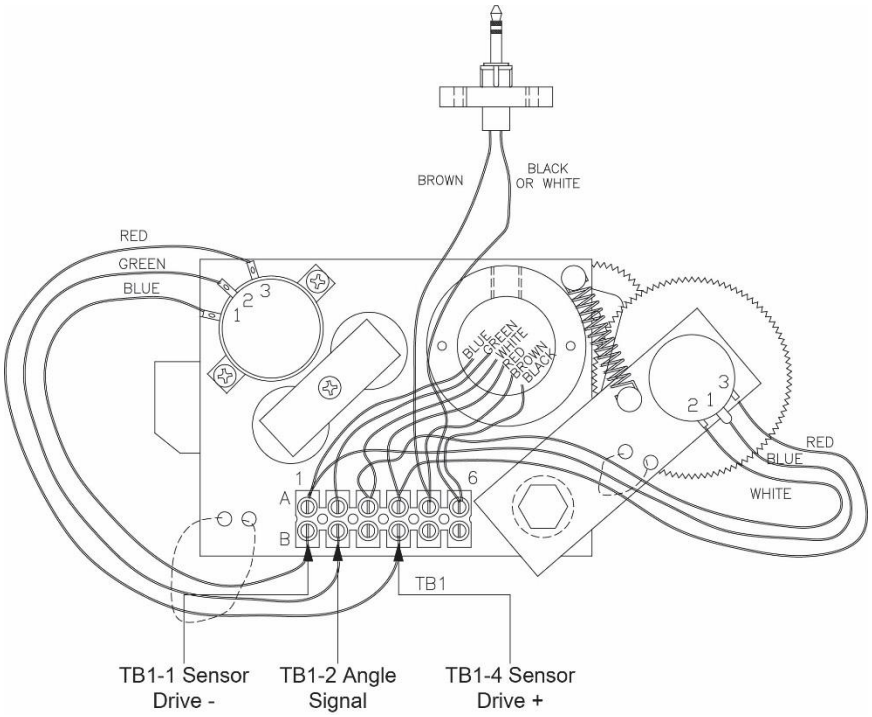
20.4 Calibrating the Angle Sensor Zero

The angle sensor is preset to zero on the potentiometer before leaving the factory. If the potentiometer is disturbed, the zero setting can be affected. If this happens, the angle sensor will be inaccurate.

If the factory setting has been disturbed, reestablish it by loosening the attaching screws, and rotating the pot until the desired voltage reading is attained.



1. Place the boom at 0.0 degrees. Verify using a digital level.
2. Check the voltage between TB1-1 and TB1-2. It should measure between 0.4V and 0.6V in the correct position.
3. Enter the ***02 Zero Sensors*** menu. Tap the ***Menu Up*** button to display ***Zero No. 3 = 0***. The calibration and boom angle window should read 0.0.
4. Tap the ***Zero No. 3 =*** button to be prompted with ***Yes! Calibrate!*** Tap the button a second time to calibrate the zero. The angle sensor zero routine is complete.



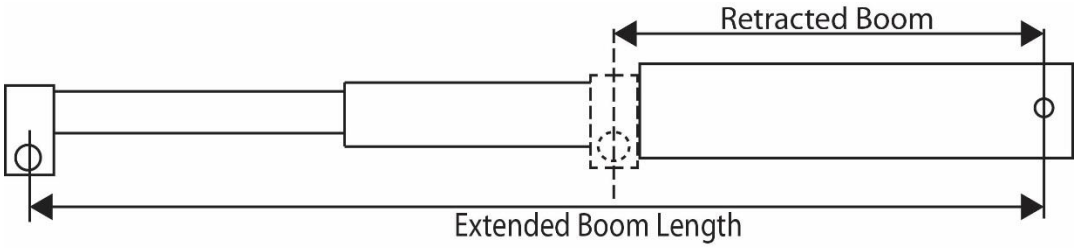
20.5 Calibrating Span of Extension and Angle

WARNING

WARNING! THE AREA OVERHEAD ABOVE THE CRANE MUST BE CLEAR OF OBSTRUCTIONS PRIOR TO CALIBRATING SPAN OF EXTENSION AND ANGLE!

In order for the system to properly calculate the boom length and the boom angle, the “Span Number” must be entered into the system. Obtain the Span Number with the following steps:

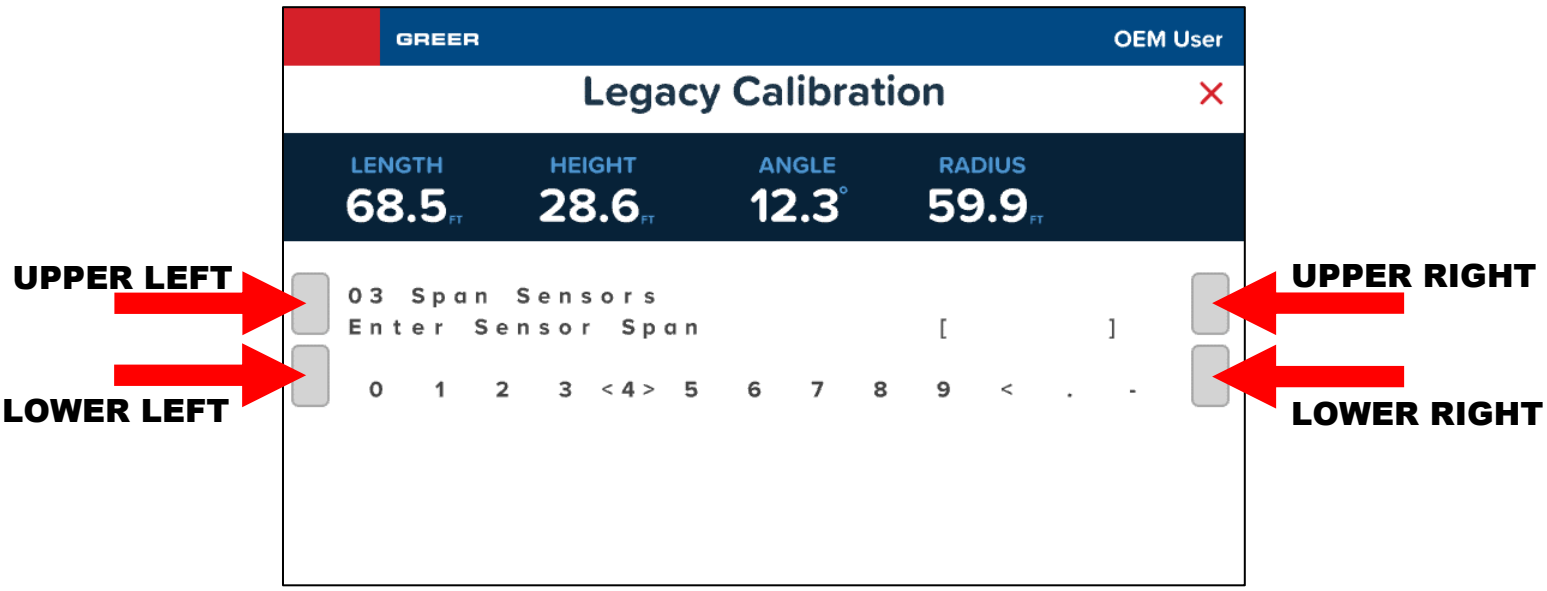
1. Measure the boom from the base foot pin to the center of the head sheave pin. Record this measurement.



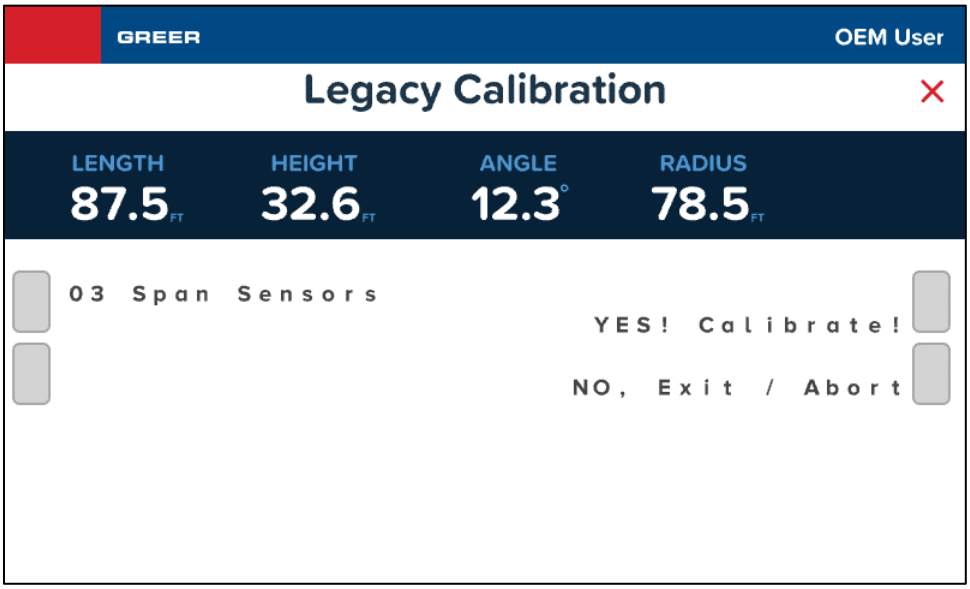
Extended Length – Retracted Length = Span

2. Raise the boom to between 60-65° and fully extend the boom. Record the measurement from the digital level for entry into the system later in this procedure.
3. From the calibration menu screen, tap the ***Menu Up*** button until ***03 Span Sensors*** is reached and tap the button.
4. Tap the ***Span No. 2 = X.X*** button.
5. Tap the button again to be prompted with ***Yes! Calibrate!***
6. Tap the ***Yes! Calibrate!*** button.

7. Use this screen to enter the span (Extended Length – Retracted Length = Span). The lower left and lower right buttons are used to select the number. The number inside the brackets is the current selection. In the image below, the number 4 is between the brackets.



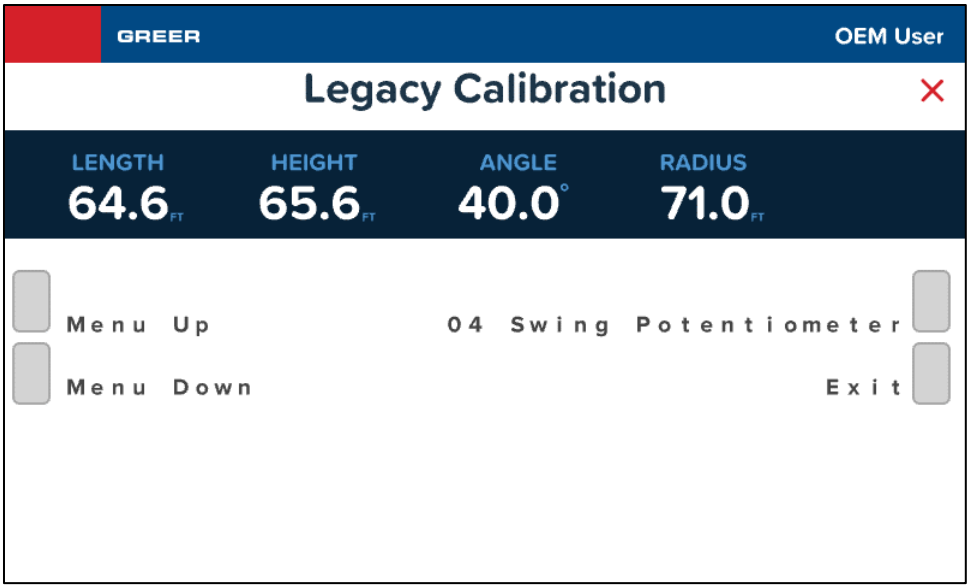
8. Use the upper left button to enter the numbers one at a time.
9. When the number is entered, tap the upper right button to enter the number into the system memory. Span of extension is now complete.
10. Tap the ***Menu Down*** button to display ***Span No. 3 = xx.xx***.
11. Tap the ***Span No. 3 = xx.xx*** button.
12. Tap the ***Yes! Calibrate!*** button.



13. You will be prompted with the same screen from step 7. Use this screen to enter the span of angle measurement from the digital level.
14. This calibration routine is now complete. Tap the ***Exit*** button to return to the calibration menu.

20.6 Calibrating the Swing Sensor

After completing the extension and angle span, exit back to the main calibration screen. Tap the ***Menu Up*** button until ***04 Swing Potentiometer*** is reached.



This menu allows the operator to configure the system to either use a swing sensor or disable swing sensing. The menu also allows the operator to set the 0.0° point on the swing circle and set which rotation direction is defined as positive.

The system has the following options for setting up swing sensors:

- Swing Potentiometer
- Integrated Swing Sensor (ISS)
- None (Crane has no swing sensors)
- *Swing Switches

*Cranes with swing switches are set up in this menu by disabling swing sensing. This is because the system reads swing switches as *digital inputs*, which are handled differently than the other types of swing sensors.

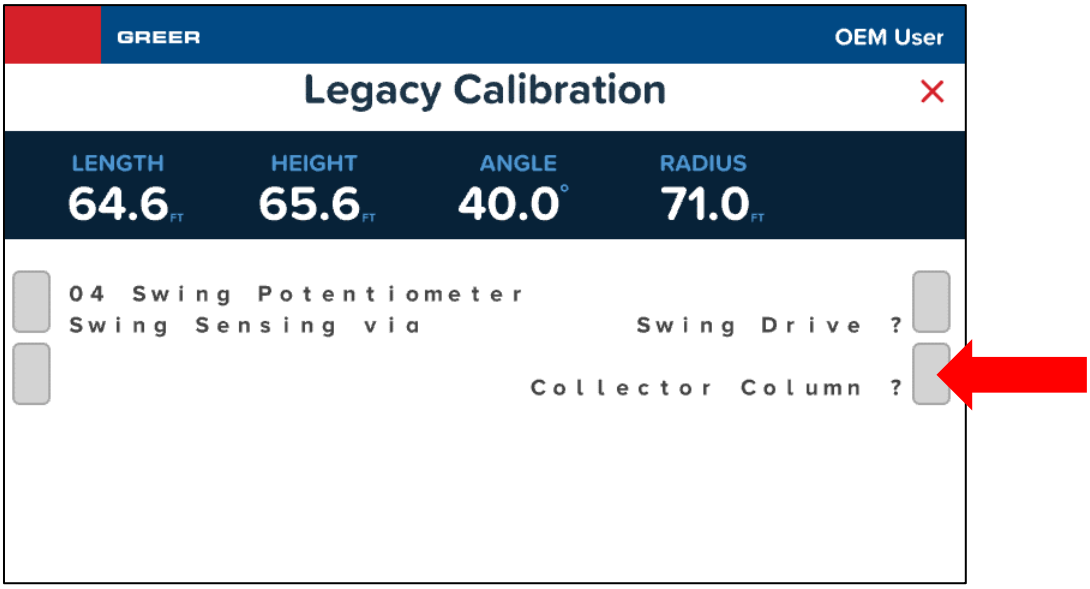
This section will outline the process for setting up the system for each of the swing sensor options.

NOTE: *The swing must be in the stowed position and the house lock engaged.*

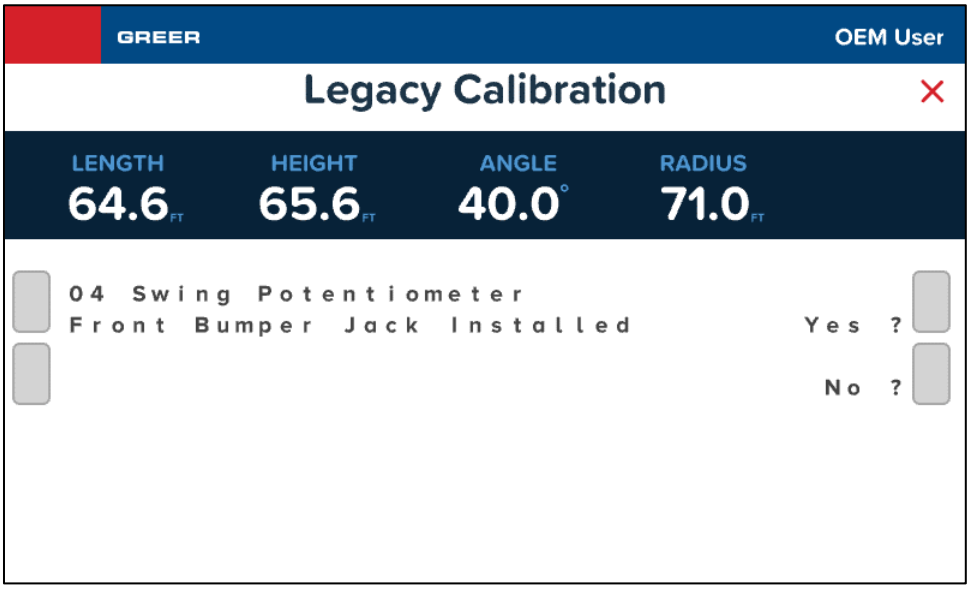
NOTE: *Inaccuracy in the swing zero setting may result in the loss of load chart for pick and carry.*

20.6.1 Setup for Cranes With a Swing Potentiometer

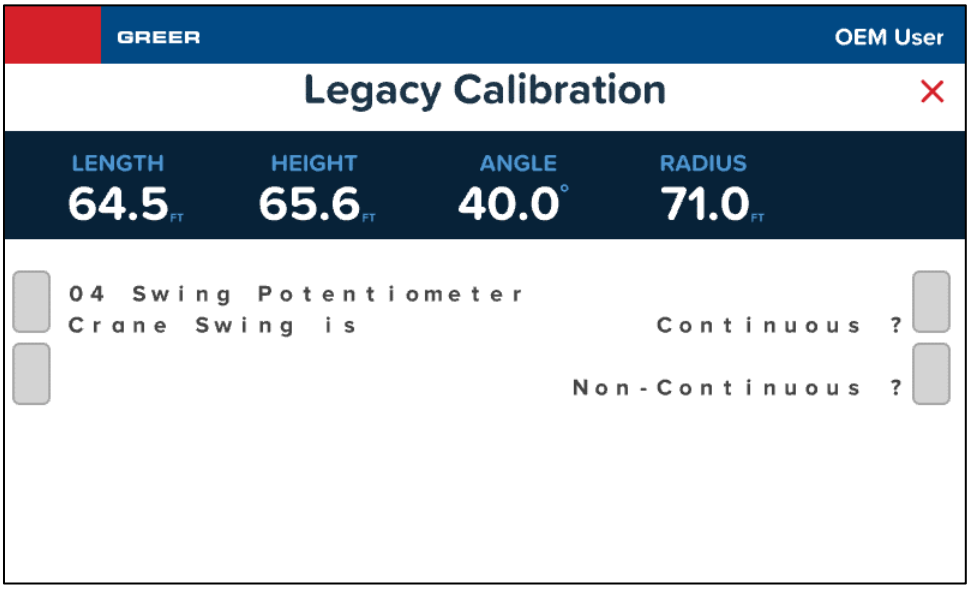
1. Tap the ***Collector Column*** button.



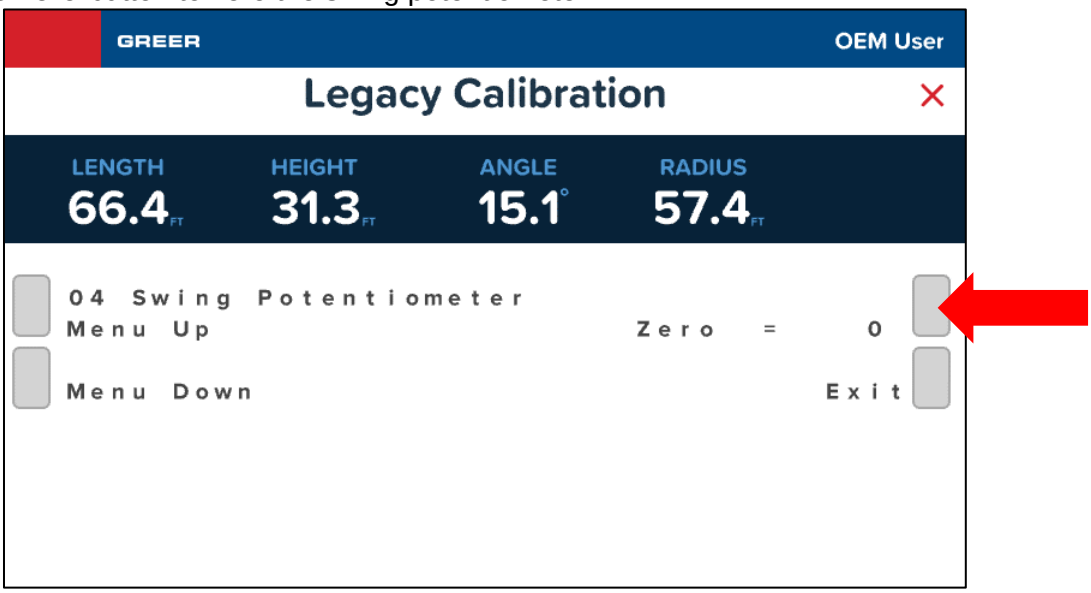
2. When prompted about whether there is a front bumper jack installed, choose either ***Yes*** or ***No***.



3. When prompted about whether crane swing is continuous or non-continuous, choose either ***Continuous*** or ***Non-Continuous***.
   - **Continuous Swing** is when the turret can rotate through any number of turns relative to the chassis without having to stop, and rotation is not limited by the structure of the crane.
   - **Non-Continuous Swing** is when the turret can only rotate within specific areas, because rotation is restricted by the structure of the crane.



4. Tap the ***Zero*** button to zero the swing potentiometer.

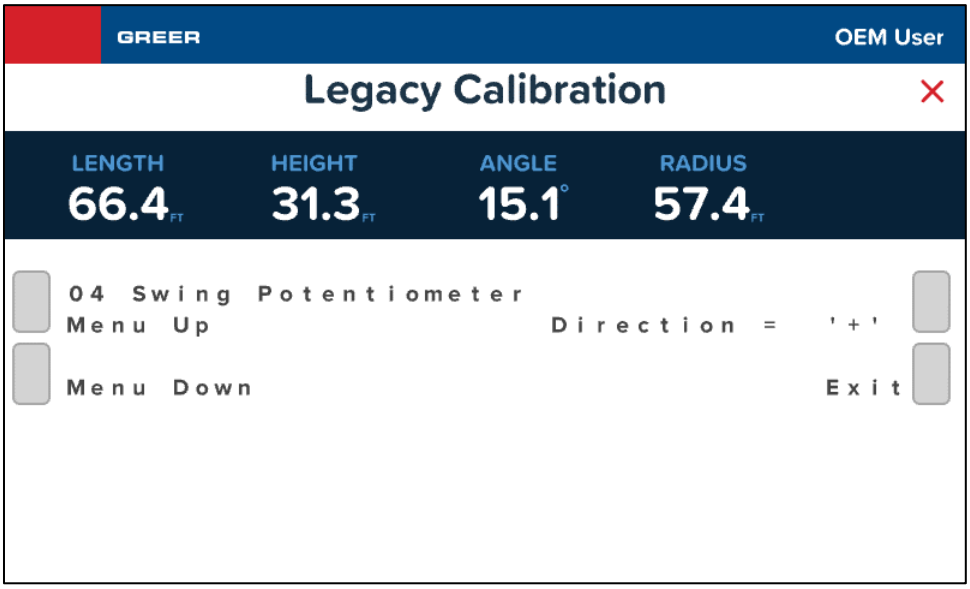


5. The swing potentiometer is now set up and zeroed.

20.6.1.1 Changing Swing Potentiometer Direction

For consistency, the swing angle should count upwards (0, 1, 2, 3, etc.) when rotating clockwise. The direction of the swing can be changed.

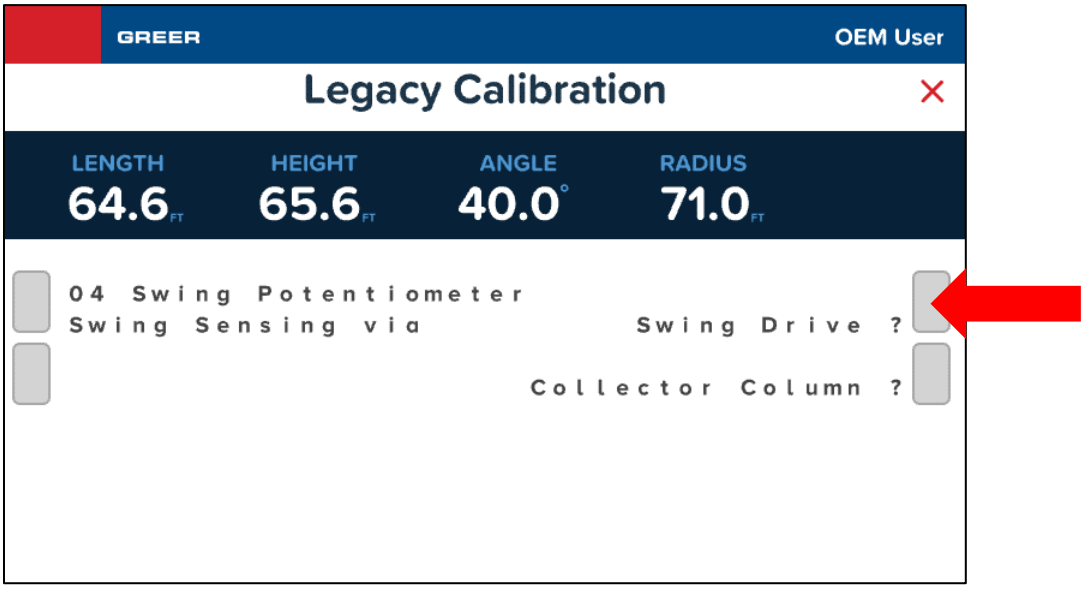
1. Tap ***Menu Up*** or ***Menu Down*** until "**Direction =**" is visible.



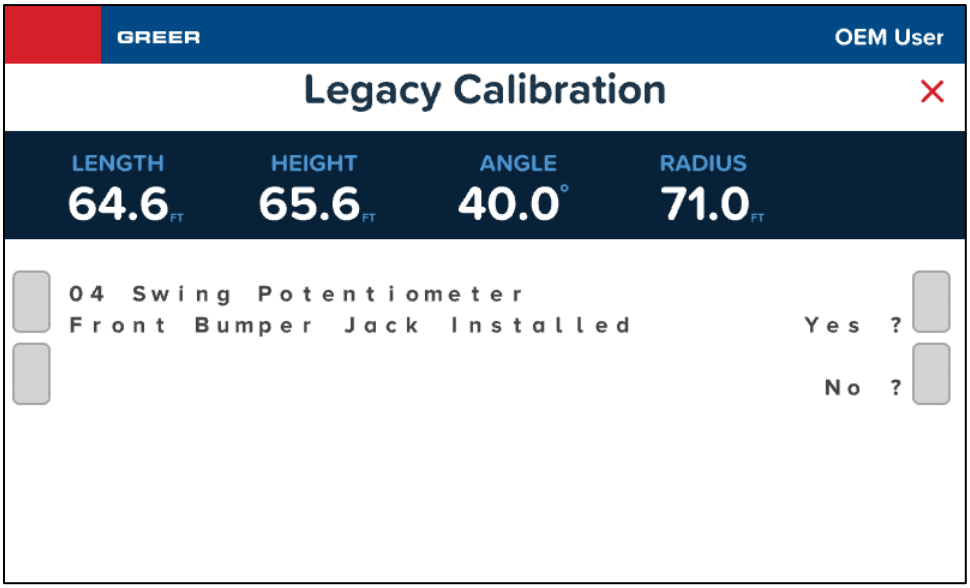
2. Tap the ***Direction =*** button to reverse the direction between "+" and "-".
3. When the correct swing direction is set, tap ***Exit***. The swing potentiometer setup is complete.

20.6.2 Setup for Cranes With an Integrated Swing Sensor (ISS)

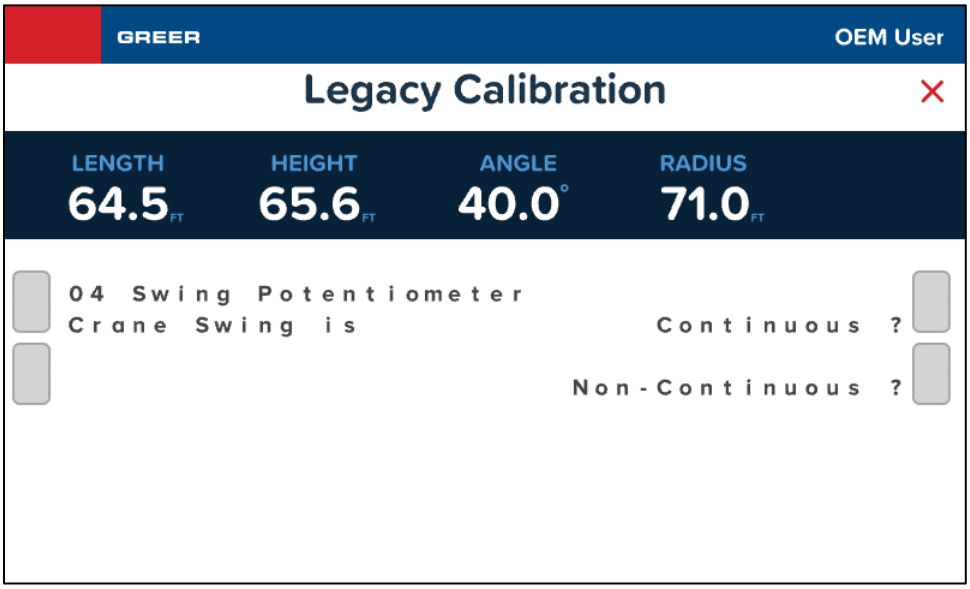
1. Tap the ***Swing Drive*** button.



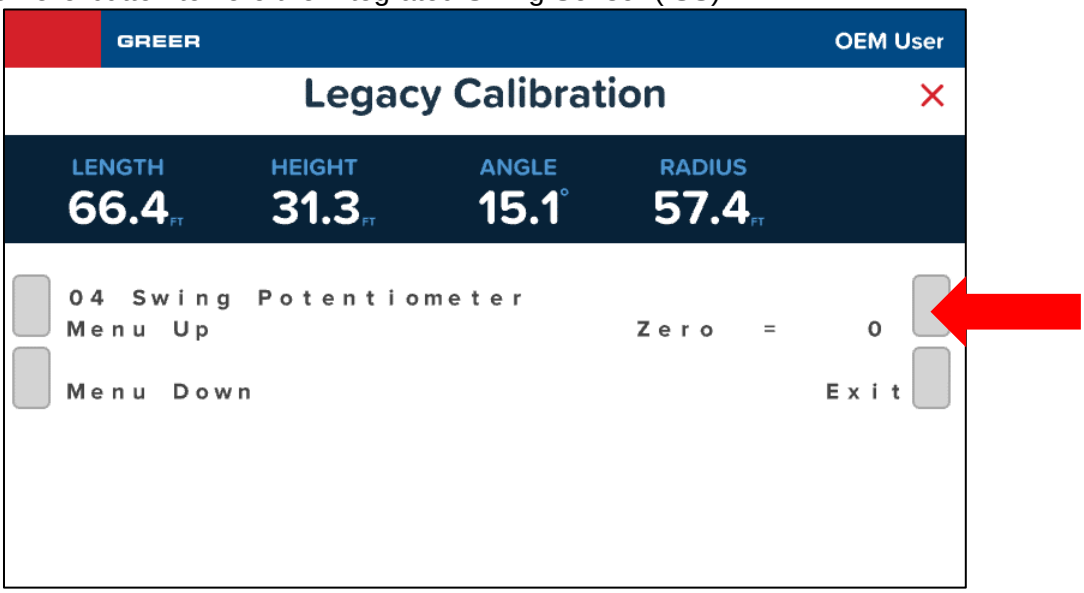
2. When prompted about whether there is a front bumper jack installed, choose either ***Yes*** or ***No***.



3. When prompted about whether crane swing is continuous or non-continuous, choose either ***Continuous*** or ***Non-Continuous***.
   - **Continuous Swing** is when the turret can rotate through any number of turns relative to the chassis without having to stop, and rotation is not limited by the structure of the crane.
   - **Non-Continuous Swing** is when the turret can only rotate within specific areas, because rotation is restricted by the structure of the crane.



4. Tap the ***Zero*** button to zero the Integrated Swing Sensor (ISS).

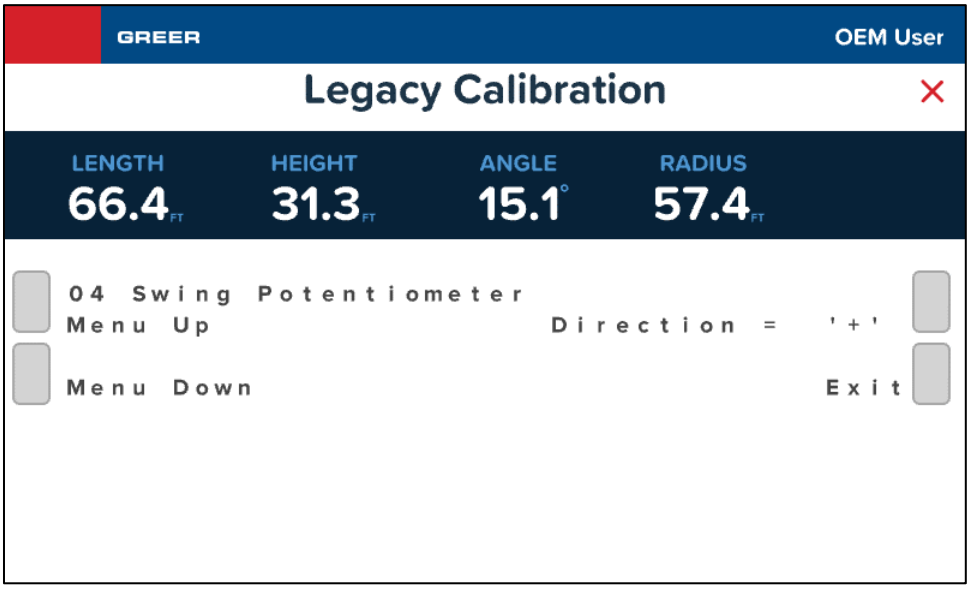


5. The Integrated Swing Sensor (ISS) is now set up and zeroed.

20.6.2.1 Changing Integrated Swing Sensor (ISS) Direction

For consistency, the swing angle should count upwards (0, 1, 2, 3, etc.) when rotating clockwise. The direction of the swing can be changed.

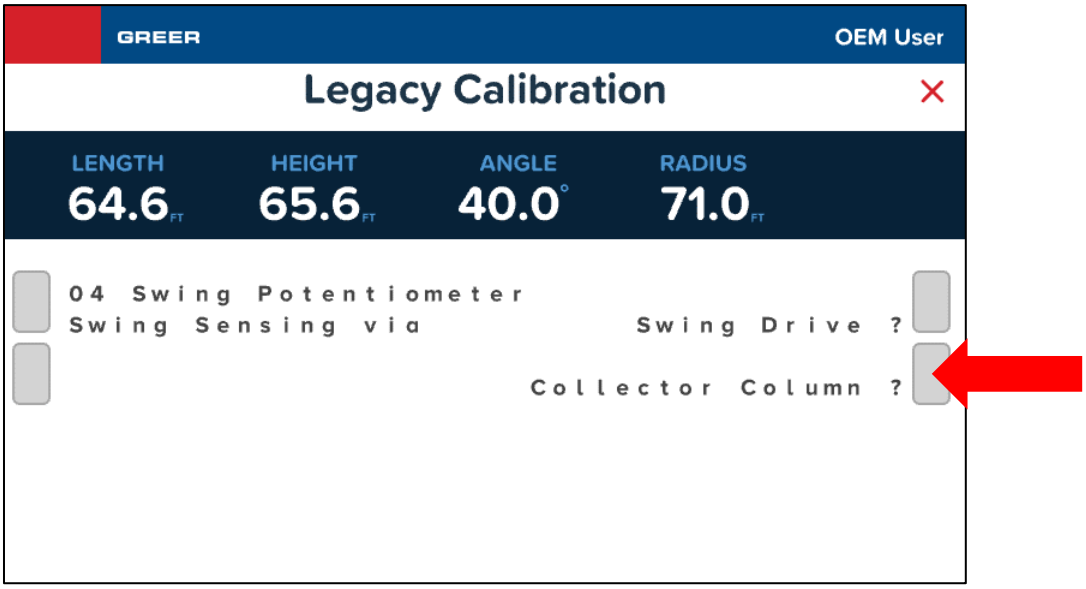
1. Tap ***Menu Up*** or ***Menu Down*** until "**Direction =**" is visible.



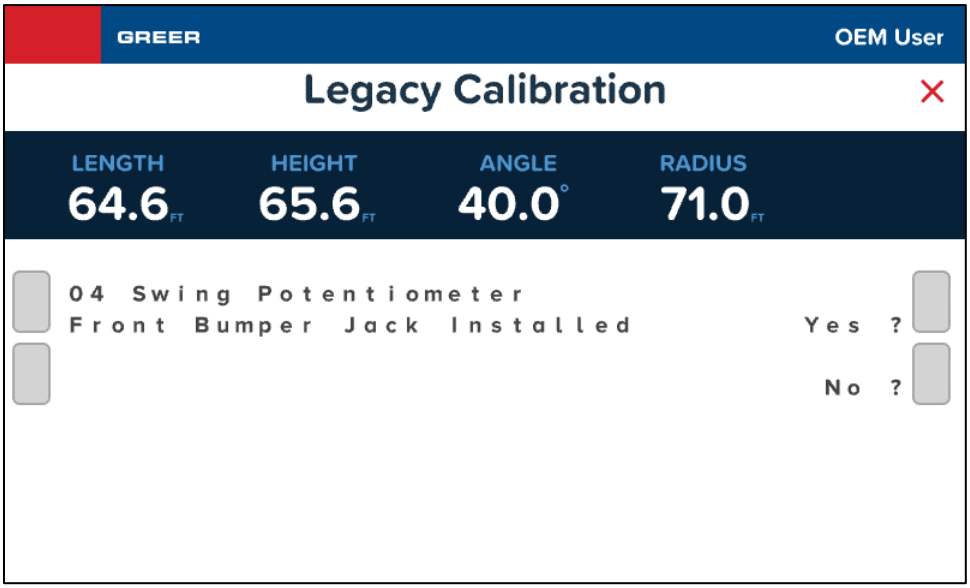
2. Tap the ***Direction =*** button to reverse the direction between "+" and "-".
3. When the correct swing direction is set, tap ***Exit***. The Integrated Swing Sensor (ISS) setup is complete.

20.6.3 Setup for Cranes With No Swing Sensor (Removing Swing Sensor)

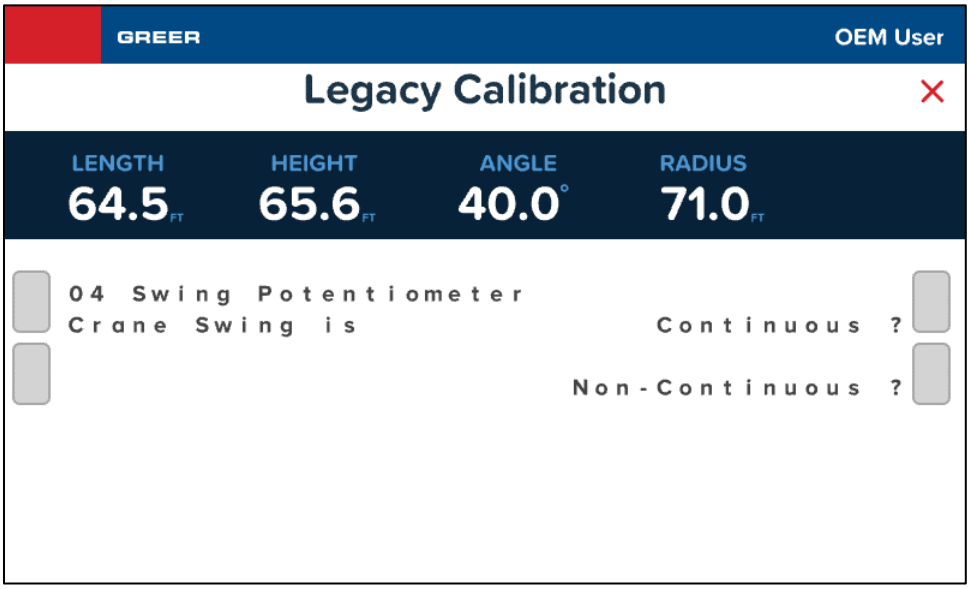
1. Tap the ***Collector Column*** button.



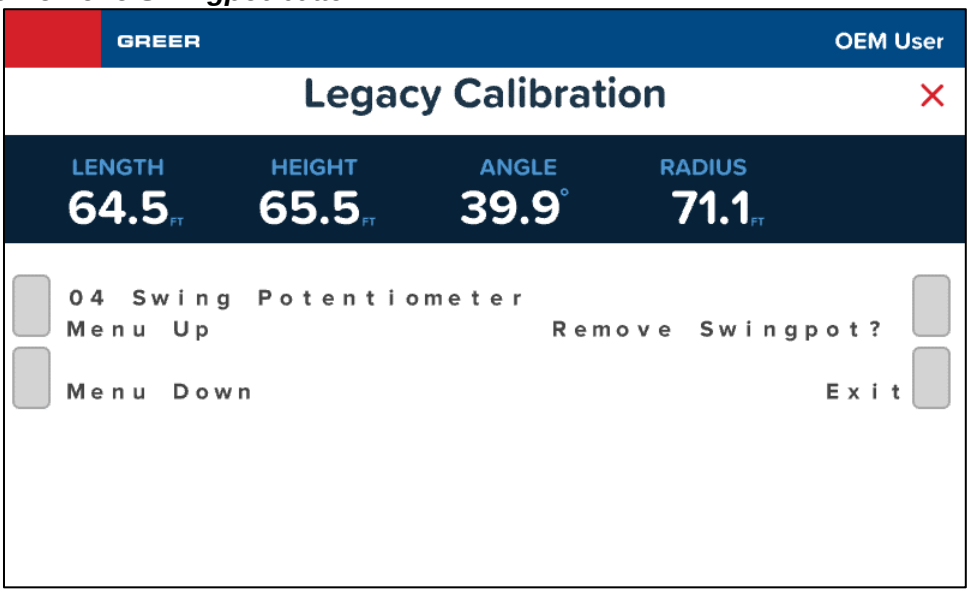
2. When prompted about whether there is a front bumper jack installed, choose either ***Yes*** or ***No***.



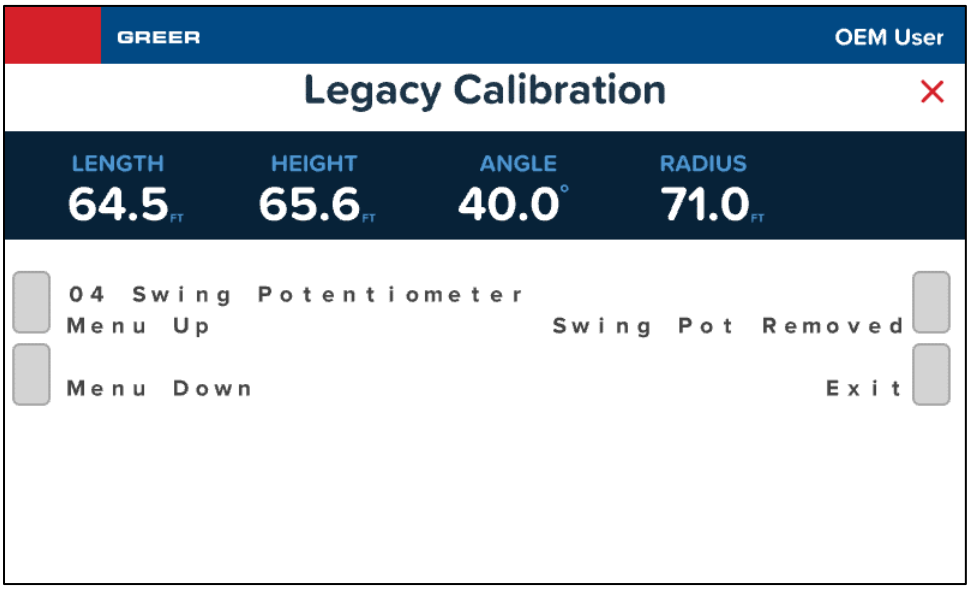
3. When prompted about whether crane swing is continuous or non-continuous, choose either ***Continuous*** or ***Non-Continuous***.
   - **Continuous Swing** is when the turret can rotate through any number of turns relative to the chassis without having to stop, and rotation is not limited by the structure of the crane.
   - **Non-Continuous Swing** is when the turret can only rotate within specific areas, because rotation is restricted by the structure of the crane.



4. Tap the ***Menu Up*** or ***Menu Down*** buttons until the option **Remove Swingpot?** is displayed. Tap the ***Remove Swingpot*** button.



5. Confirm the selection by tapping ***Yes***. The message shown below confirms the removal of the swing sensor.



20.6.4 Setup for Cranes With Swing Switches

Cranes with swing switches are set up in this menu by removing the swing sensor. This is because the system reads swing switches as *digital inputs*, which are handled differently than the other types of swing sensors. See the previous section, **Setup for Cranes with No Swing Sensor (Removing Swing Sensor)** for instructions on how to remove the swing sensor.

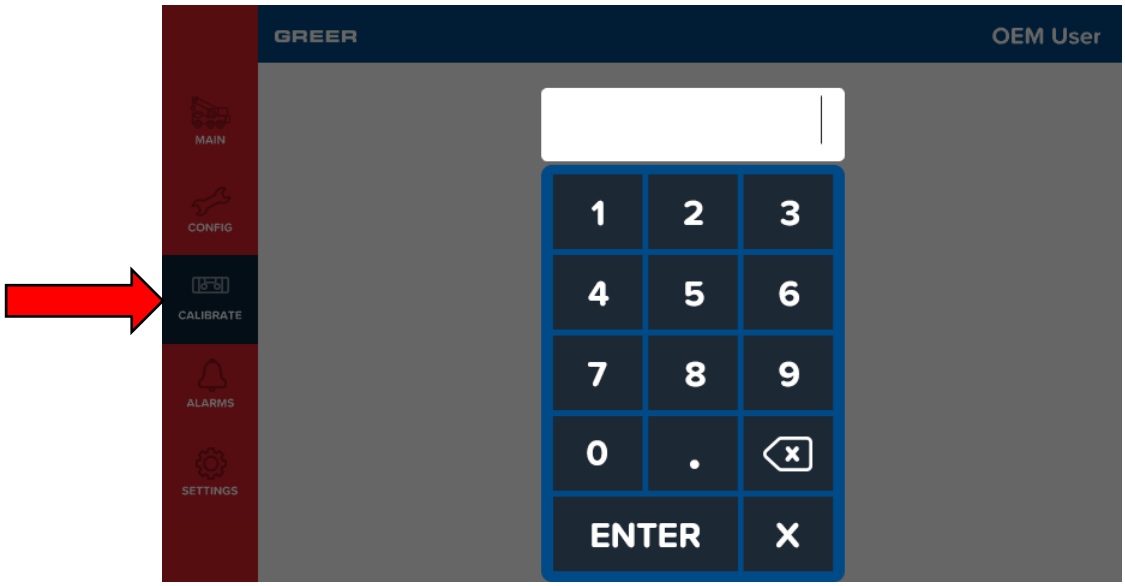
20.7 Calibrating the Outrigger Position Sensors

If an error code is displayed for a particular outrigger sensor, contact Greer/TWG Service for assistance.

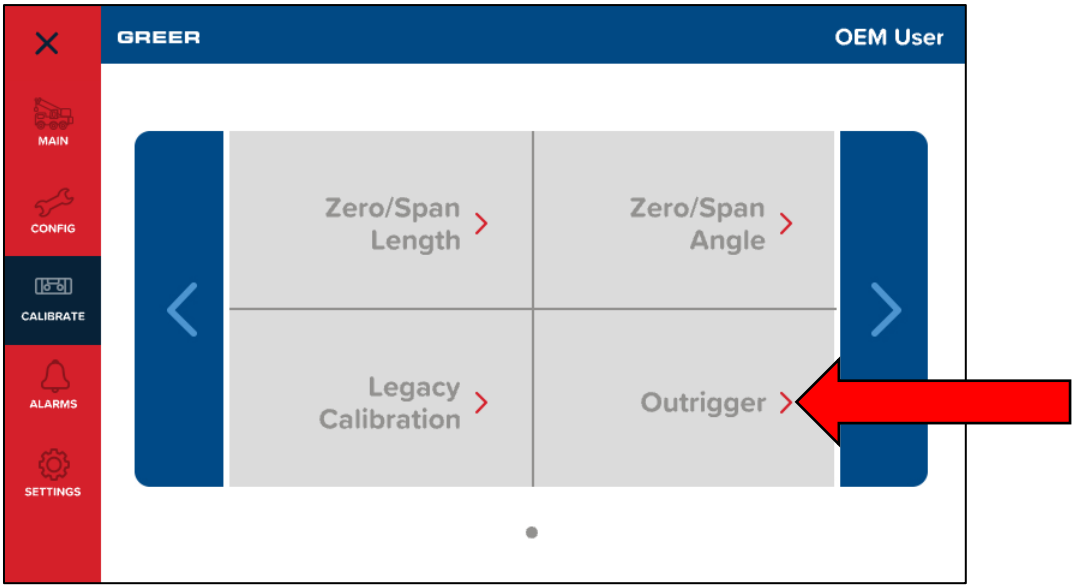
For cranes with digital switch outrigger position sensors, contact Greer/TWG Service for assistance. No calibration is needed.

When directed by Greer/TWG Service to replace the string potentiometer outrigger position sensors, calibration is needed.

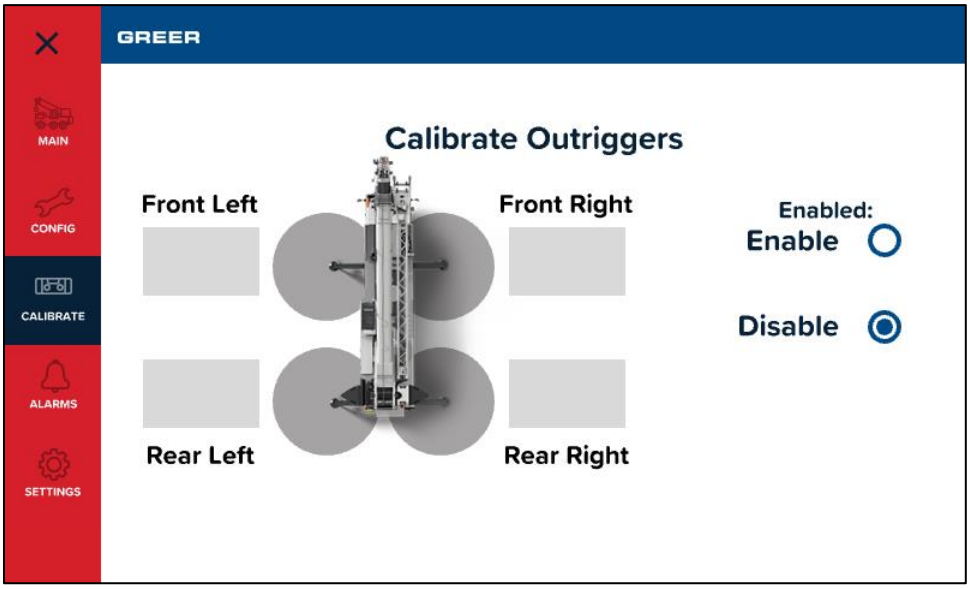
1. On the Main menu, tap the ***CALIBRATE*** option.
2. The display prompts for a security code. Enter the security code, 6638, using the keypad.



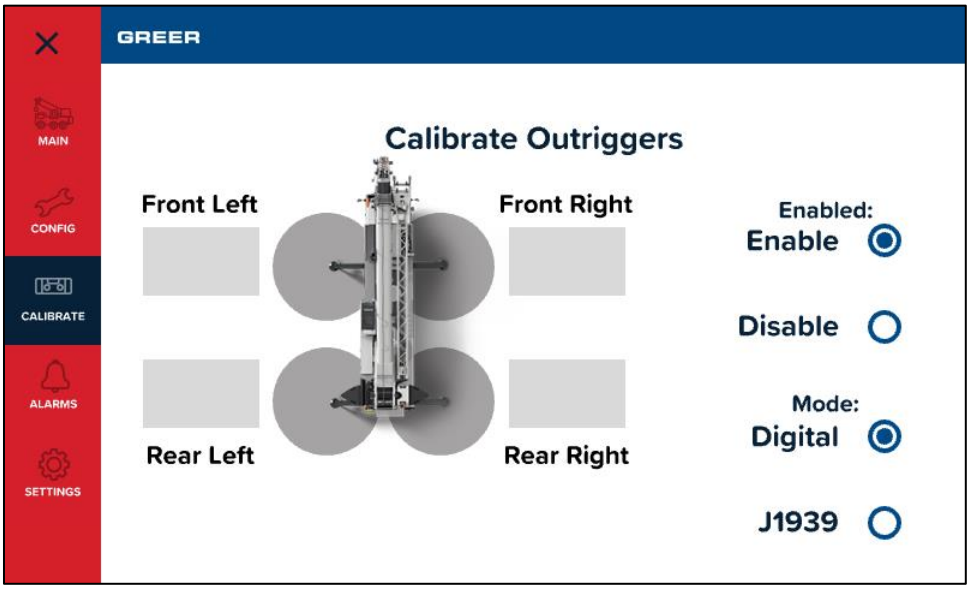
3. Enter the ***Outrigger Sensing*** calibration menu by tapping the ***Outrigger*** option, shown in the figure below.



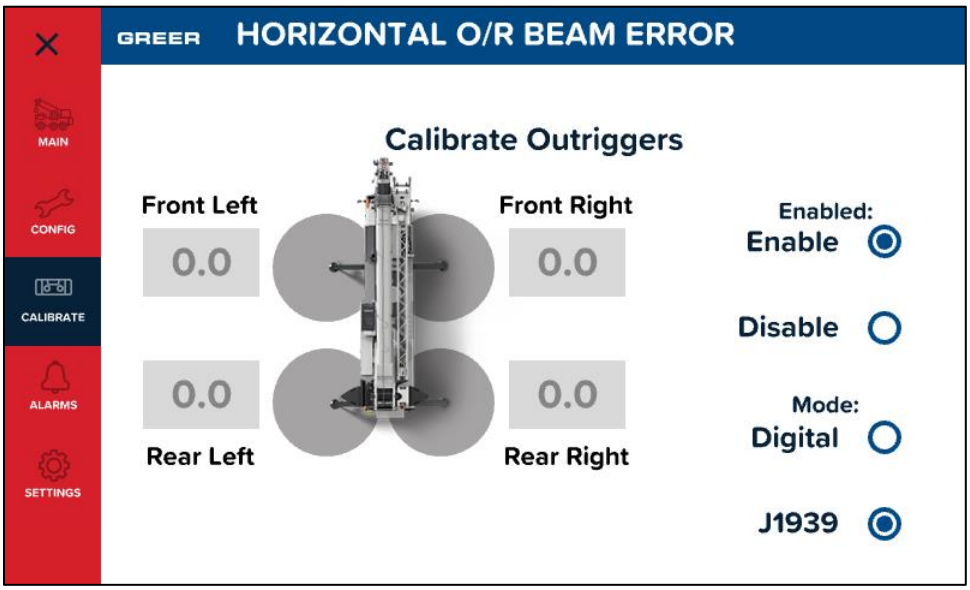
4. Initially, the outriggers are disabled as shown in the figure below.



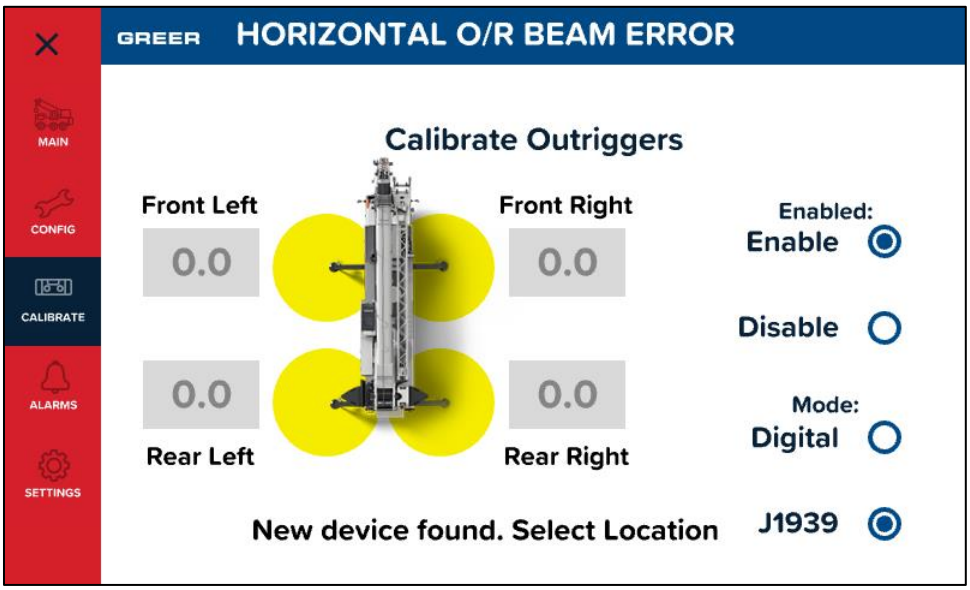
5. If digital switch outrigger position sensors are installed on the crane, select the ***Mode*** as ***Digital***.



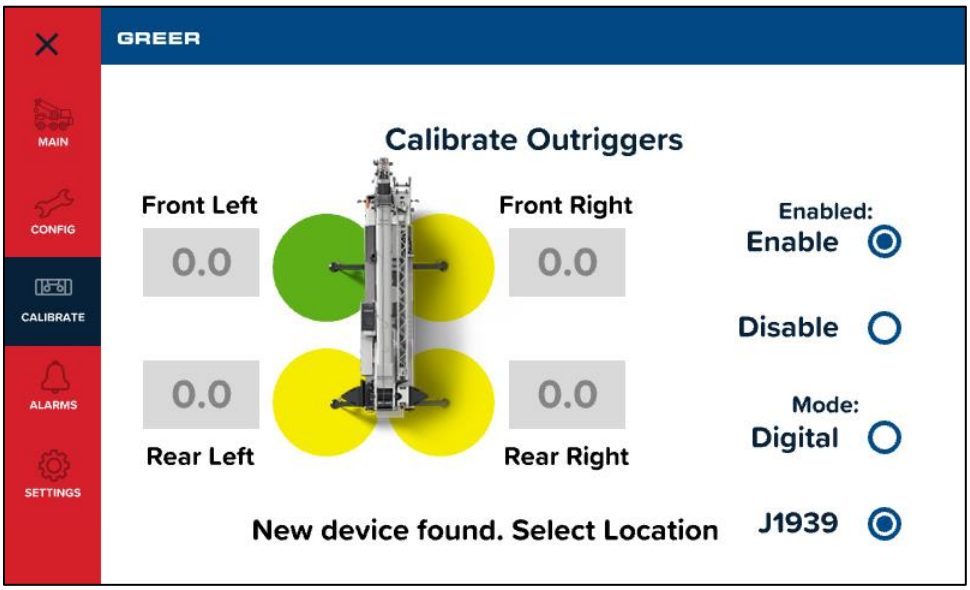
6. If outrigger position sensors with J1939 communication capability are installed on the crane, select the ***Mode*** as ***J1939***. Initially, the circles appear grey to indicate that no sensors are configured.



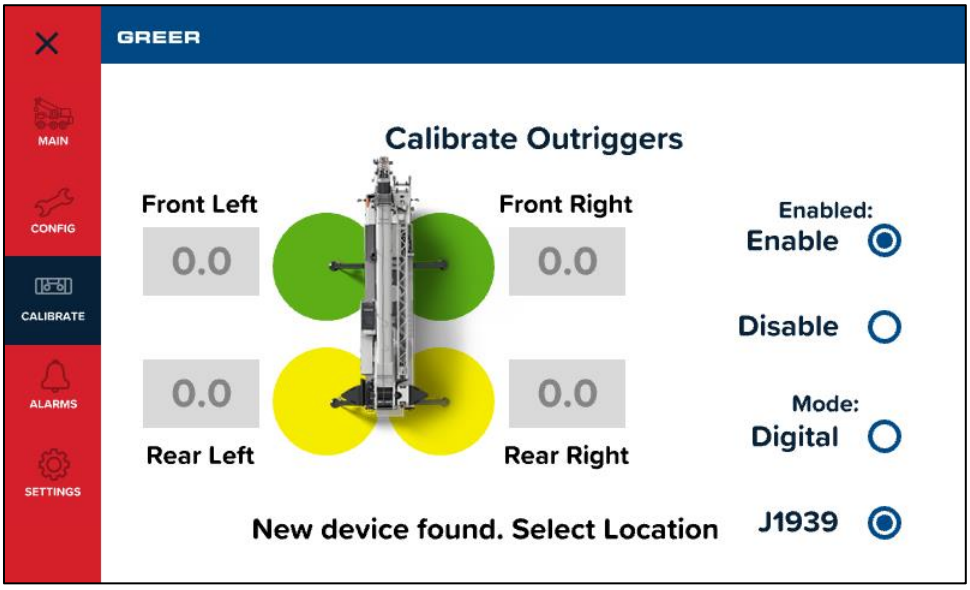
7. Install the outrigger sensors one at a time. Install the front left sensor. The message “New device found” will appear on the display. The circles turn yellow to indicate that an unconfigured sensor has been detected.



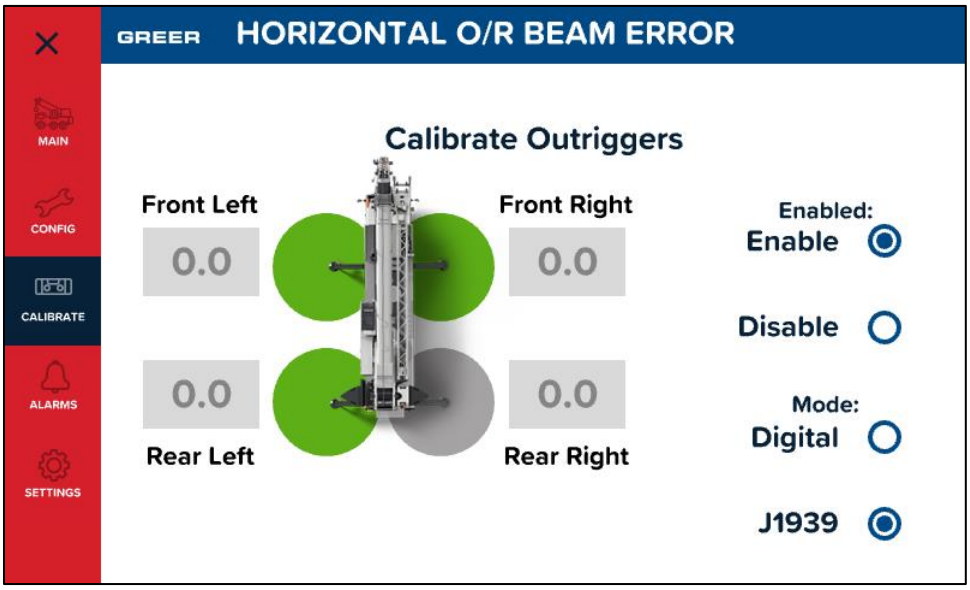
8. Tap the yellow circle beside the ***Front Left*** label to identify the new sensor location in the computer. After this, the corresponding circle turns green to indicate the sensor has been configured.



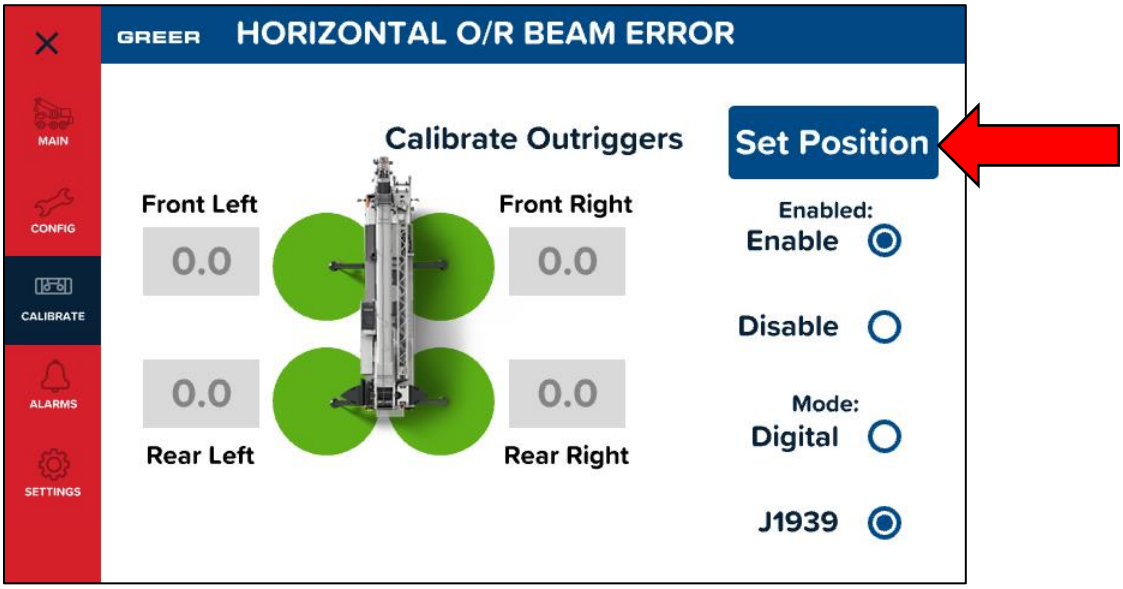
9. Next, install the front right sensor. The display appears as shown below.



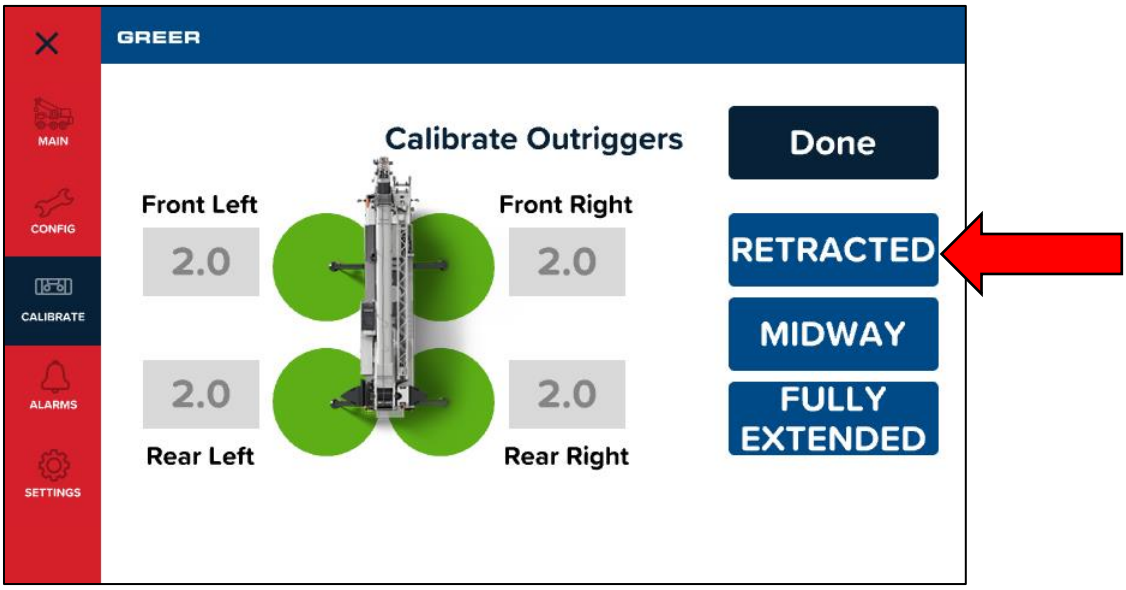
10. Install the rear left sensor. Now, with Rear Left, Front Left and Front Right configured, the display appears as shown below.



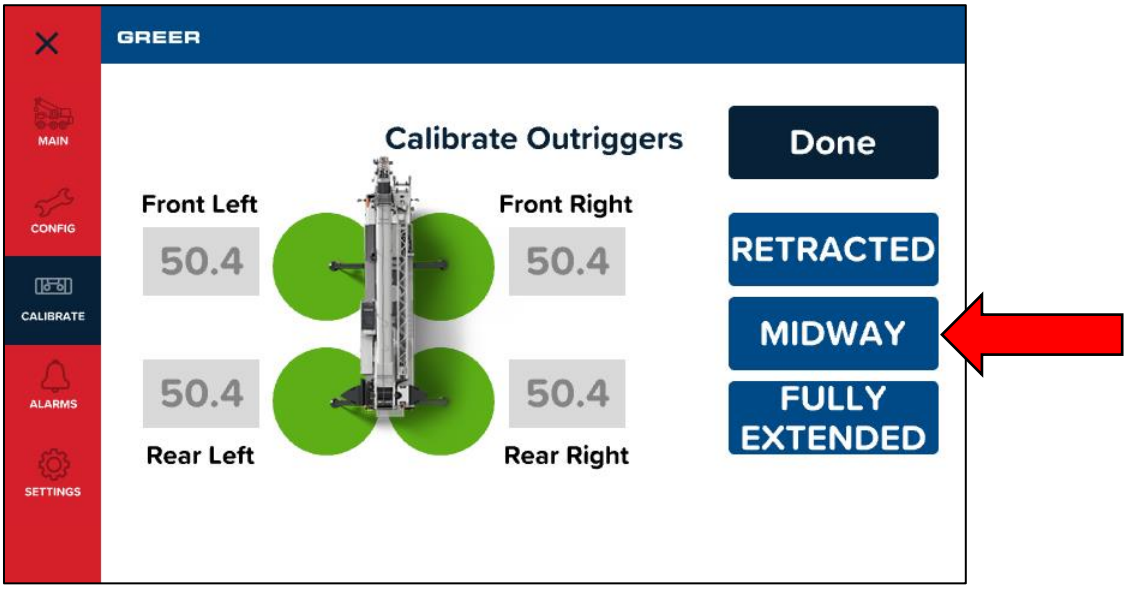
11. Install the rear right sensor. Now, with all the sensors installed, the display appears as shown below. Tap the ***Set Position*** button.



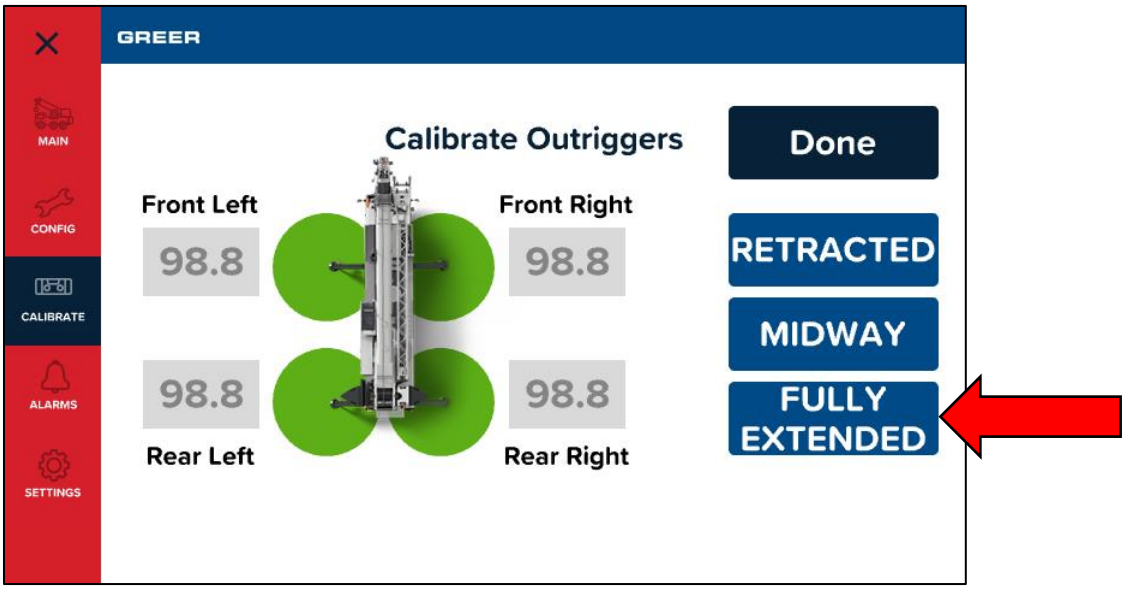
12. With all sensors installed, ensure the outriggers are in the fully retracted position. Tap the ***Retracted*** button to set the retracted position in the computer.



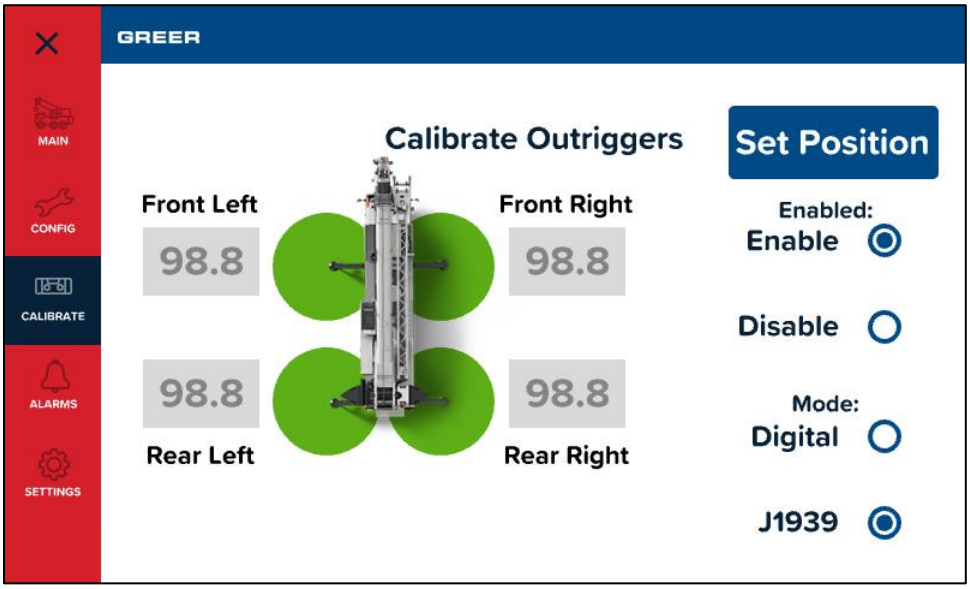
13. Move the outriggers to midway position and tap the ***Midway*** button to set the intermediate outrigger position.



14. Move the outriggers to fully extended position and tap the ***Fully Extended*** button to set the fully extended outrigger position.

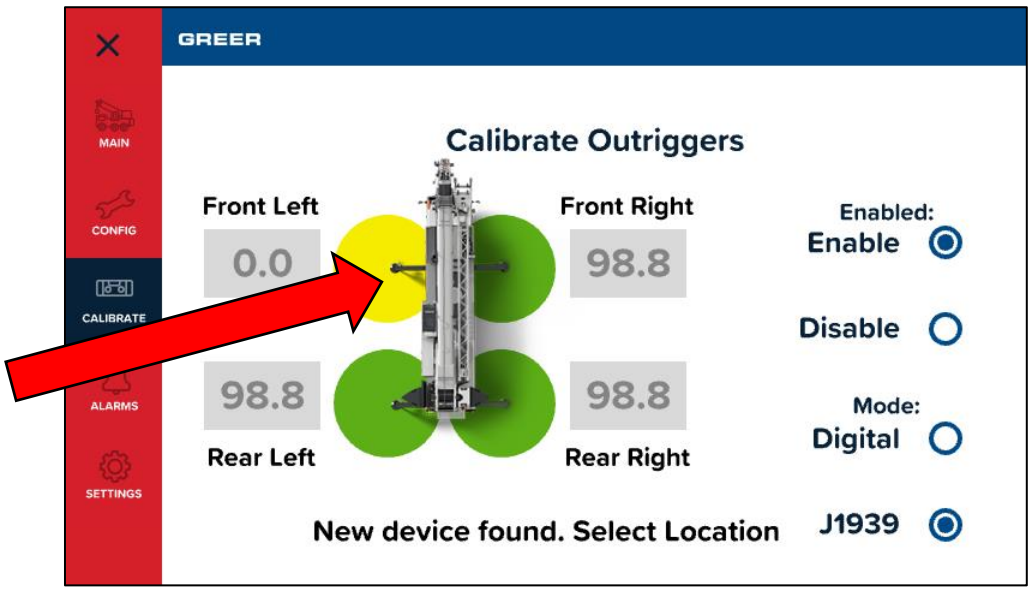


15. When all lengths are set, tap the ***Done*** button. The display appears as shown below. The outrigger position sensors are now calibrated.



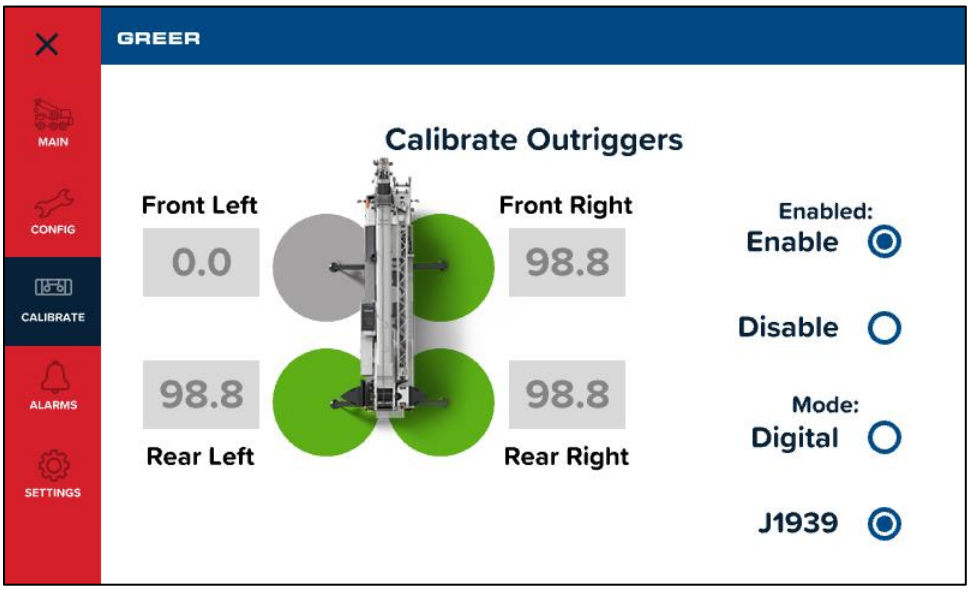
20.7.1 Resetting an Outrigger Position Sensor

A sensor can be reset by tapping its green button. For example, the figure below shows how tapping the green circle of the Front Left sensor resets it to an unconfigured sensor.



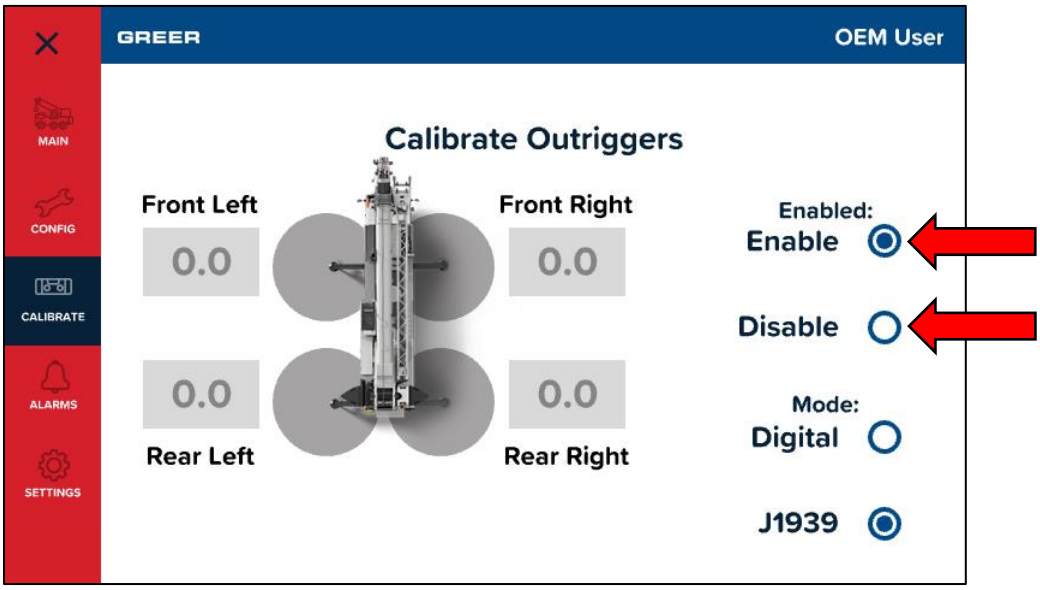
20.7.2 Disconnected Outrigger Position Sensor

If a sensor is disconnected (for example, the Front Left sensor), the display appears as shown below. The Front Left circle is now grey because it is not connected and there is no unconfigured sensor detected. Note that “New Device Found” is not displayed because there is no unconfigured sensor detected.



20.7.3 Enabling and Disabling the Outrigger Position Sensors

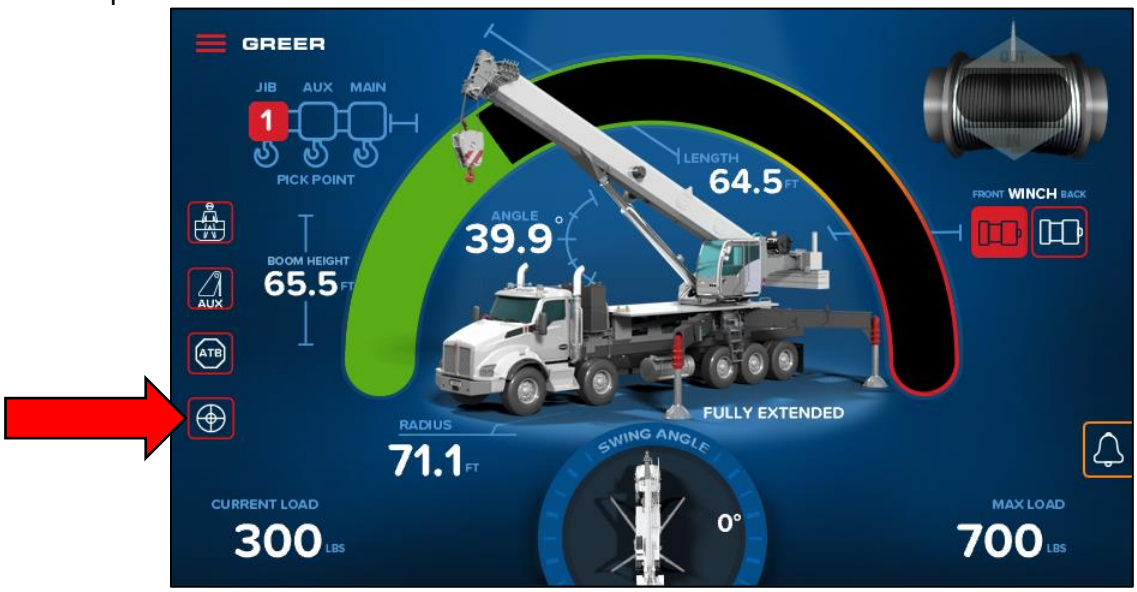
In the ***Calibrate Outriggers*** screen, the user can Enable or Disable the Outrigger Position Sensors. Tap one of the indicated buttons to choose between the two options.



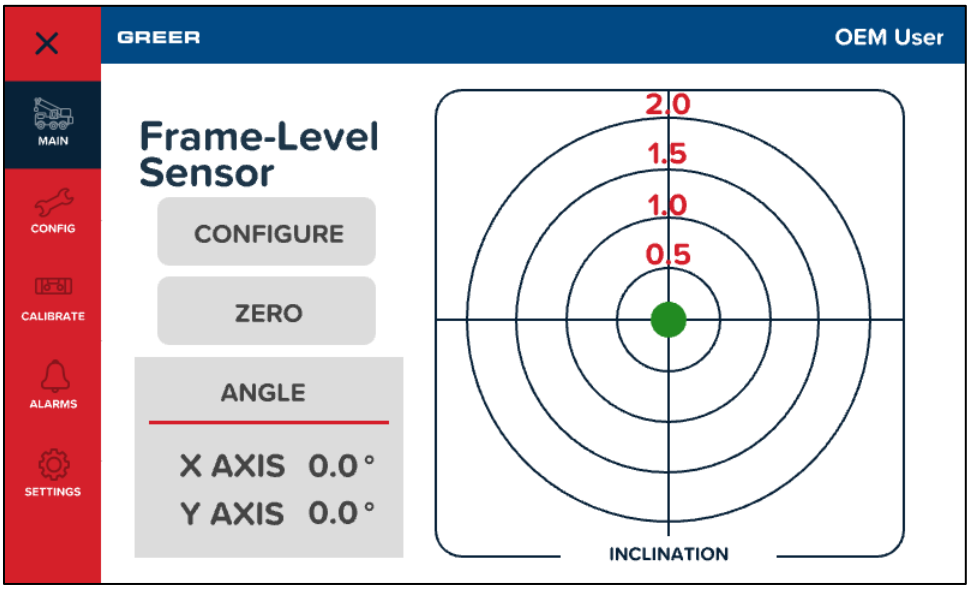
20.8 Calibrating the Frame-Level Sensor (If Equipped)

This is the procedure for calibrating the Frame-Level sensor on a new machine, or after replacing a faulty Frame-Level sensor. Ensure the sensor is mounted to a flat surface, this can affect the calibration.

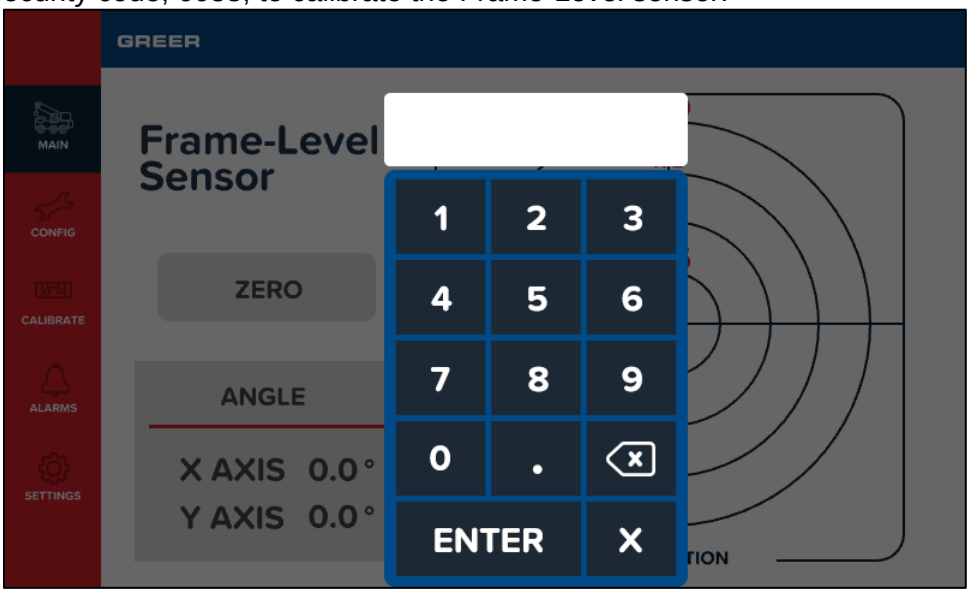
1. Tap the ***Menu*** button.
2. Tap the ***Frame-Level Sensor*** button.



3. This will access the Frame-Level screen.



4. Enter the security code, 6638, to calibrate the Frame-Level sensor.



5. Tap the ***Configure Sensor*** button to activate the sensor.

   NOTE: *To ensure proper operation, this must be done the first time the device is connected and powered on. This must also be performed with a replacement sensor, in the event of a failure.*

6. Using a method other than the Frame-Level sensor, ensure the machine is level on the X-axis and the Y-axis.
7. Tap the ***Zero*** button. The display will now show 0.0° for the X and Y-axis.
8. The Frame-Level sensor is now calibrated.

20.9 After the Calibration Routine

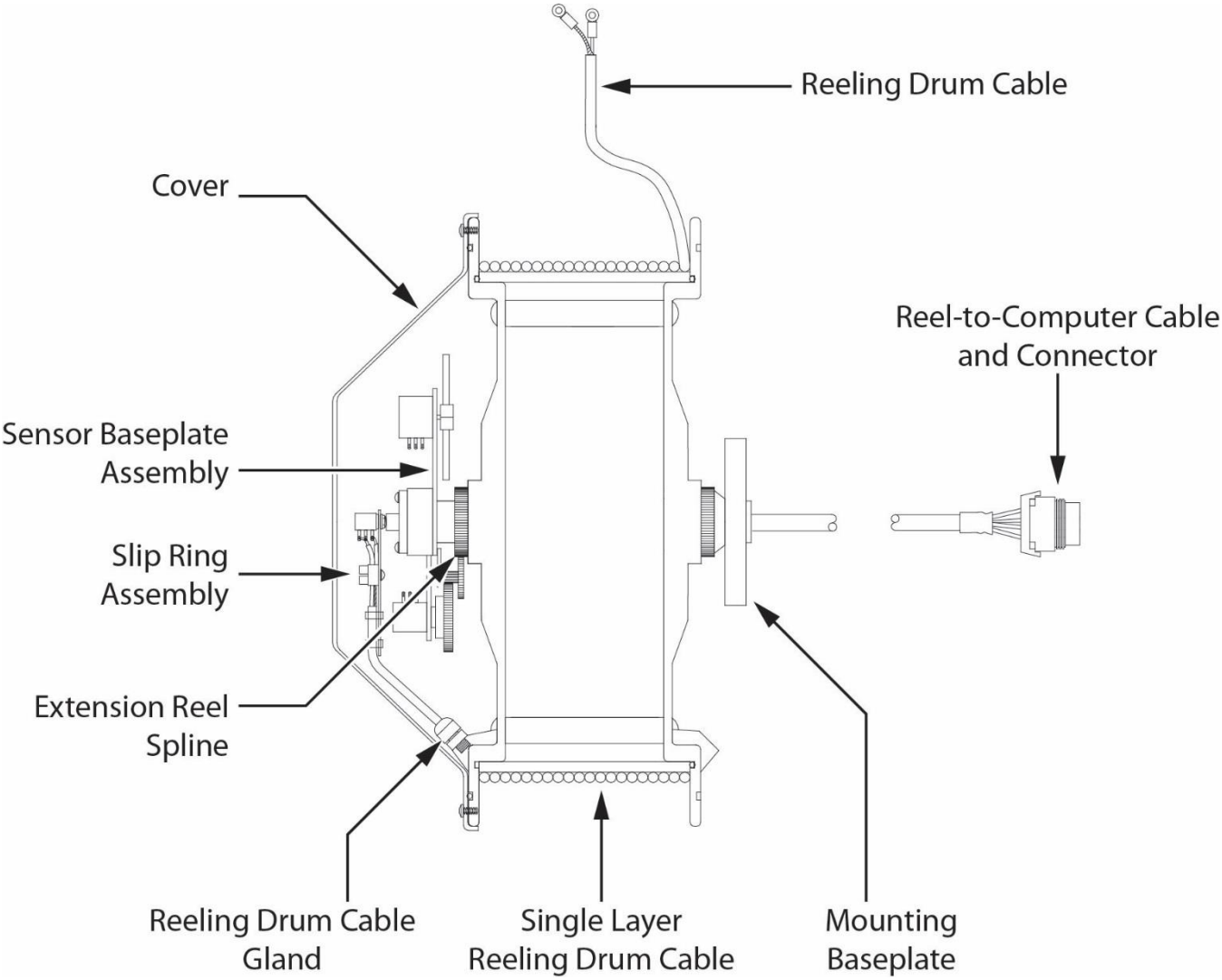
When the calibration routine is complete, thoroughly test the machine to ensure the radius on the unit is accurate to + 0.5 of a foot.

In order to perform load testing, a known weight is necessary. Perform testing from 2-3 different boom angles, as well as extensions.

The load shown must be within 0 to +10% when testing. If the load is outside these limits, the calibration should be rechecked for accuracy. The displayed load should not be lower than the actual weight.

21. Reeling Drum Overview

The primary operation of the reeling drum is to measure the extension of the telescoping sections of the main boom. The reeling drum also includes an angle sensor to measure the main boom angle along with an electrical slip-ring which transfers the two-block signal from the reeling drum cable to the system computer. It is important that the setup and maintenance of these devices is properly carried out per the procedures in this manual. Incorrect maintenance can result in system calculation errors.

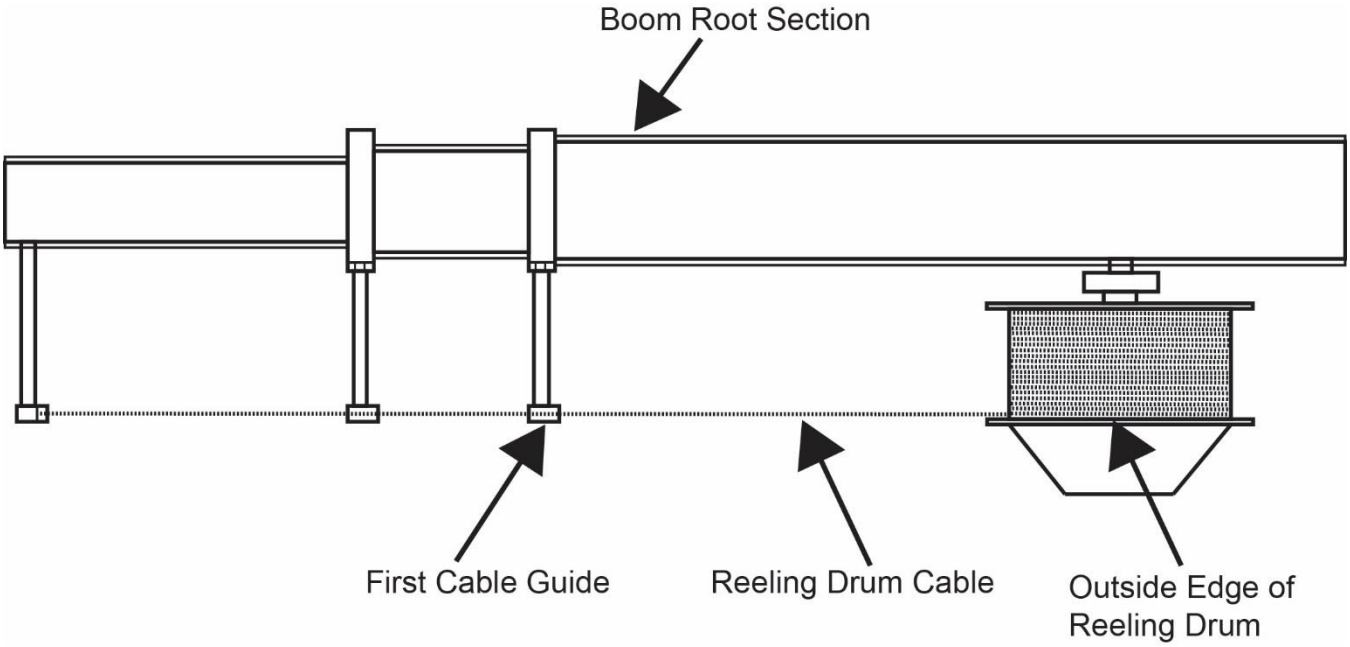


21.1 Checking the Reeling Drum Cable Layering

The extension reel is designed to provide accurate measurement of boom extension. To provide accurate measurement, the reeling drum cable must form a single flat layer across the surface of the extension reel as the boom is telescoped in and out. Any stacking of the cable will cause extension errors as the boom retracts.

1. Telescope the boom fully out and then fully in.
2. Ensure the reeling drum cable forms a flat single layer across the surface of the extension reel, with each successive turn of cable lying next to the last.

NOTE: *If any stacking or build up of the cable occurs, ensure the first cable guide at the top of the boom root section is correctly aligned with the outside edge of the extension reel. Clean the reeling drum cable and lubricate it with a silicone spray.*



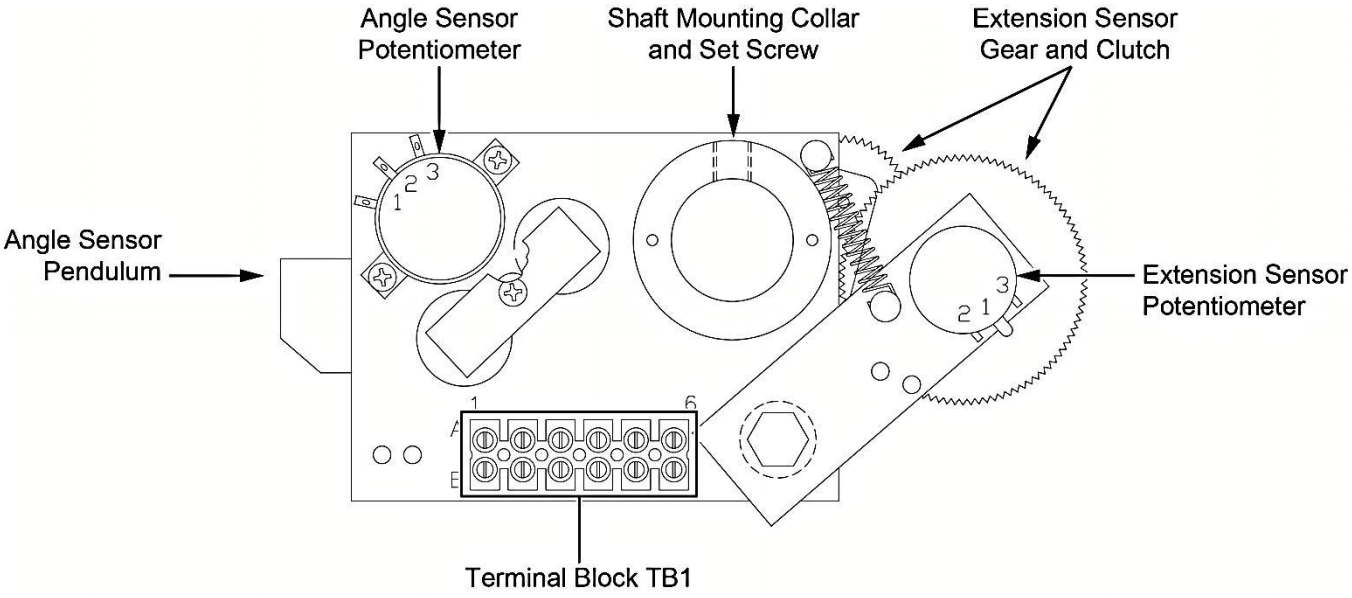
REELING DRUM VIEWED FROM ABOVE

21.2 Sensor Baseplate Assembly

The sensor baseplate assembly supports and connects the extension and angle sensors. It also supports the anti-two-block switch signal and signal cable to the computer.

Electrical or mechanical failure of either the angle sensor or the extension sensor potentiometers cannot be repaired in the field. The angle sensor pendulum is factory set on the potentiometer shaft and the extension potentiometer gear contains a protection clutch which is difficult to replace in the field. In the event of failure of either item, replace the entire sensor baseplate assembly.

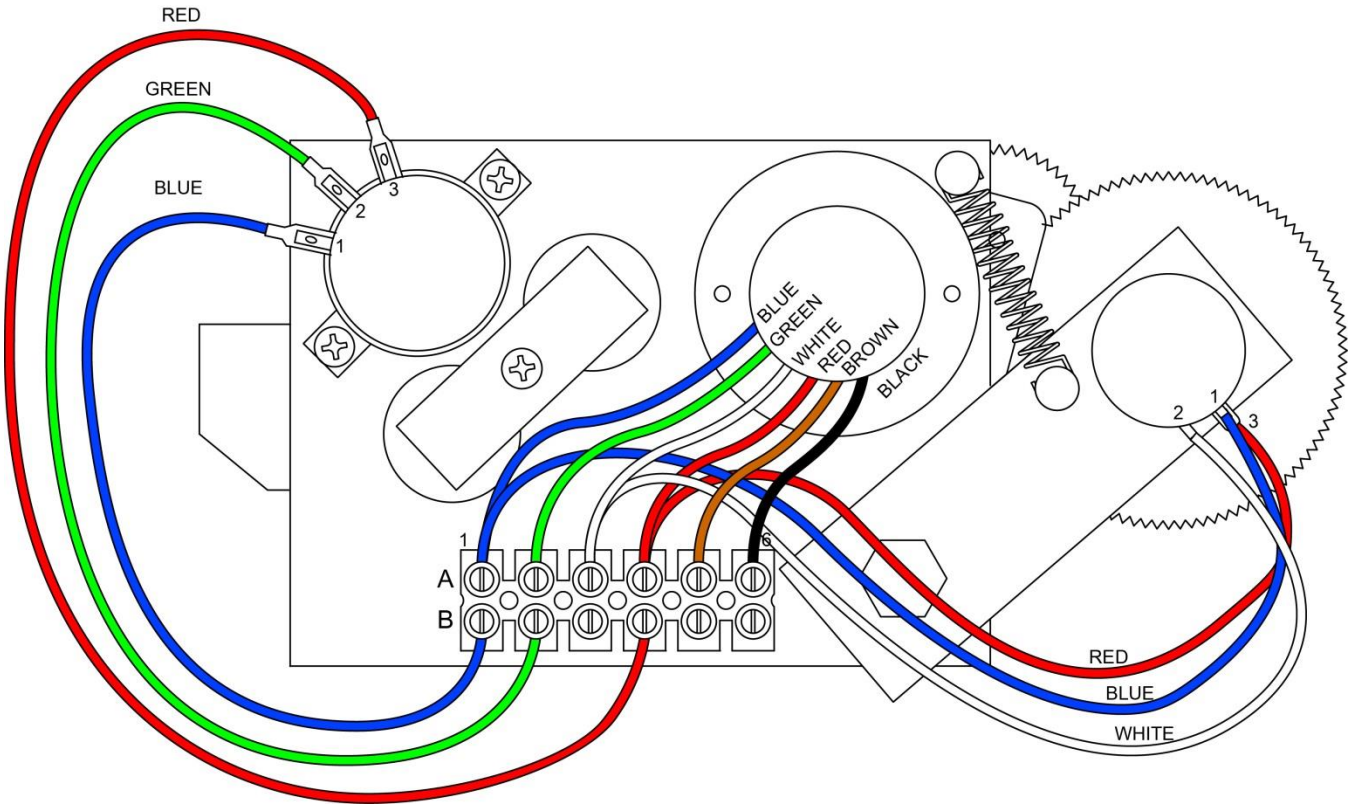
The terminal block (TB1) mounted on the assembly provides wiring connection for all internal parts of the reeling drum and Reel-to-Computer cable. Most electrical diagnoses of the boom sensors can be made at this terminal block.



21.3 Reeling Drum Voltage Checks

If problems occur with the two-block alarm operation, angle, or extension sensor, refer to the following chart. Follow the Boom Position/Action column before performing any voltage checks. Measure all voltages with a digital voltmeter set to DC volts range.

SIGNAL	BOOM POSITION/ ACTION	VOLTAGE		VOLTMETER CONNECTION	
		MIN	MAX	RED (+)	BLACK (-)
SENSOR DRIVE	-	+4.7V	+5.3V	RED (TB1/4)	BLUE (TB1/1)
ANGLE SENSOR OUTPUT	0 degrees	0.4V	0.6V	GREEN (TB1/2)	BLUE (TB1/1)
EXTENSION SENSOR OUTPUT	0 ft. FULL RETRACTED	0.15V	0.35V	WHITE (TB1/3)	BLUE (TB1/1)
TWO-BLOCK DRIVE	ATB WEIGHT DOWN	5.5V	7.5V	BLACK (TB1/6)	BLUE (TB1/1)
	ATB WEIGHT UP	9.5V	10.5V	BLACK (TB1/6)	BLUE (TB1/1)
TWO-BLOCK SIGNAL	ATB WEIGHT DOWN	5.5V	7.5V	BROWN (TB1/5)	BLUE (TB1/1)
	ATB WEIGHT UP	0V	2V	BROWN (TB1/5)	BLUE (TB1/1)



21.4 Anti-Two-Block Function Overview

The computer supplies a protected positive feed to the Anti-Two-Block switches at the boom/jib head via the reel-to-computer cable, slip-ring, and reeling drum cable. With the Anti-Two-Block weight hanging freely on the switch, the switch contact is closed and the signal return to the computer is high. When the weight is lifted by the hook block, the switch contact is opened, and the computer will sense a low signal input from the ATB signal return.

Since the computer checks the protected feed voltage internally, the system is capable of detecting a short circuit of the feed (or the ATB signal return when the switch is closed) to the crane chassis. Fault codes are defined in **Fault Reporting and Fault Codes**.

Most problems with the ATB circuit may be identified through inspection of cables, switches, and the reeling drum. Damage to these parts may result in continuous or intermittent ATB alarms.

21.5 Checking the Reeling Drum Cable

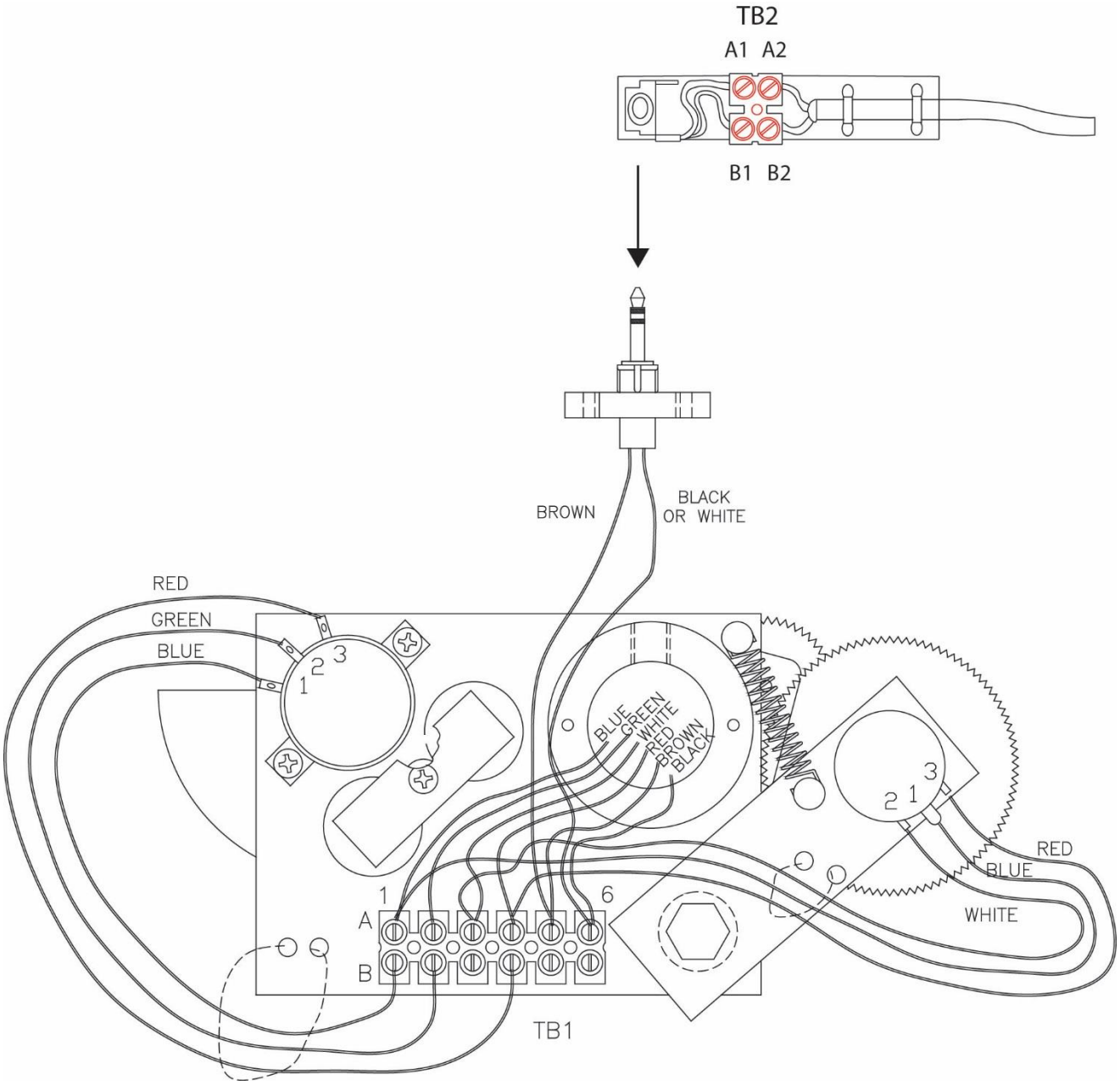
The outer braid of the cable carries the Anti-Two-Block feed to the switches. If the cable sheath is damaged, this may cause a short circuit to the boom/chassis and indicate a fault code of “B008” (Refer to **Group "B" Fault Codes**). The same fault code will be indicated if the ATB switch is closed and the inner core of the cable is shorted to the chassis at some point in the wiring.

1. Carefully inspect the reeling drum cable for wear.
2. Check for signs of damage to the outer sheath of the cable.
3. Check for any signs of severe “kinking” or crushing of the cable.

21.6 Checking the Anti-Two-Block Circuit

This procedure checks the ATB circuit when no power is applied to the circuit. Use the diagram on the following page. Before continuing, ensure the connectors are correctly connected to the ATB switches at the boom head/jib.

1. Remove the reeling drum cover.
2. Disconnect the slip-ring arm from the plug by pulling it away from the center of the reel.
3. Close the ATB switch at the boom head by suspending the weight from it or pulling on the chain.
4. Measure the resistance on TB2, between A2 & B2 terminal connections on the sensor arm.
5. With the ATB switch closed, the resistance should be less than 300 ohms. If not, inspect the reeling drum cable, ATB switch, and the boom head connectors for an open circuit.
6. Open the ATB switch at the boom head by lifting the weight.
7. Measure the resistance on TB2, between A2 & B2 terminal connections on the sensor arm.
8. With the ATB switch open, the resistance should be greater than 10,000 ohms. If not, inspect the reeling drum cable, ATB switch, and the boom head connectors for a short circuit.

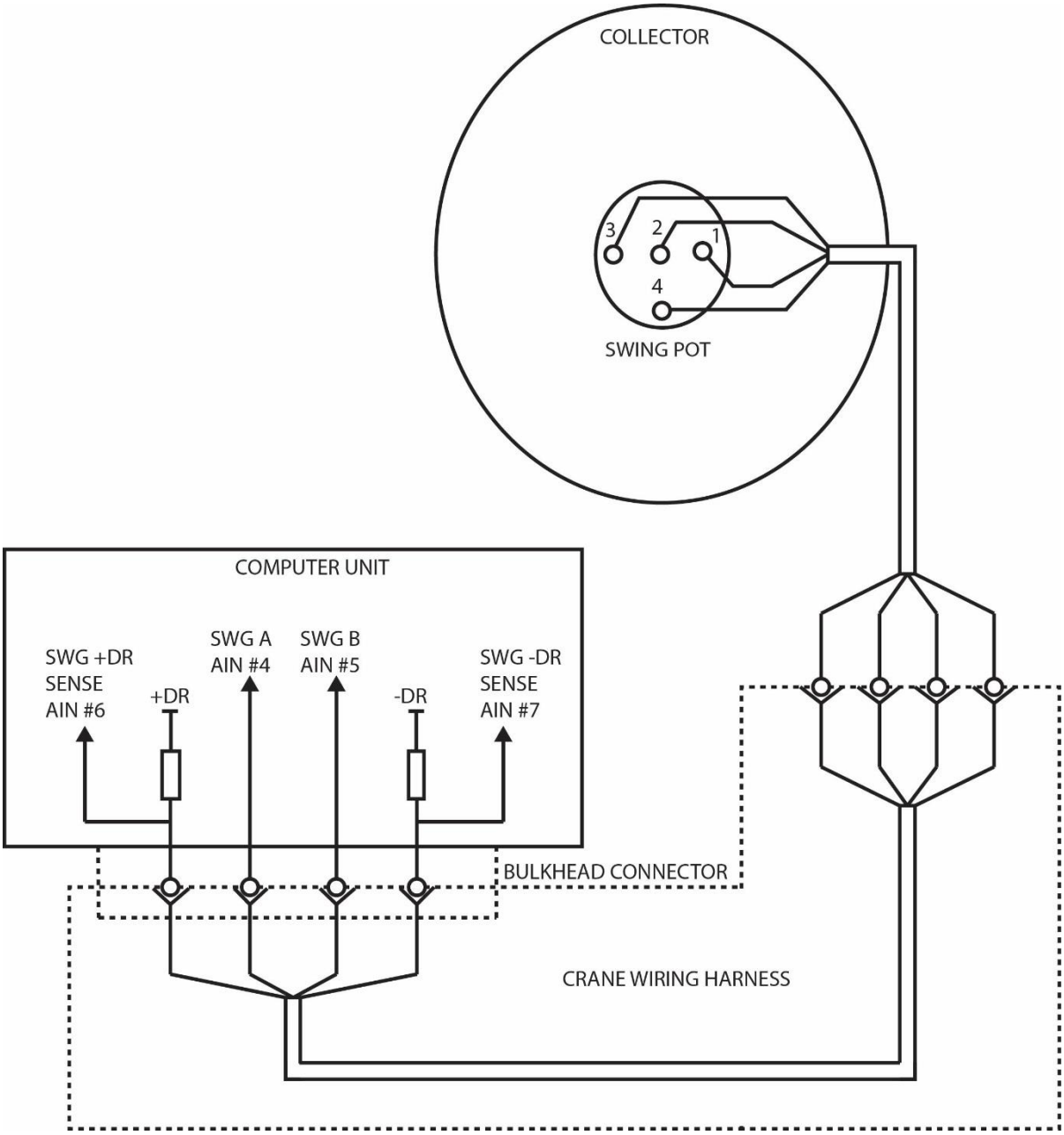

TB2
A1 A2
B1 B2
BROWN
BLACK
OR WHITE
RED
GREEN
BLUE
1
2
3
BLUE
GREEN
WHITE
RED
BROWN
BLACK
2
1
3
RED
BLUE
WHITE
1
6
A
B
TB1

22. Swing Potentiometer Overview (If Equipped)

The swing potentiometer measures the angle of the upper structure of the crane relative to its carrier. This angle is used to select capacity charts and operator swing alarms/working area alarms. If the swing potentiometer fails, the computer will be unable to select a valid capacity chart.

For fault diagnosis, access the swing potentiometer by removing the collector cover at the crane's swing center. Refer to the figure below.

For swing potentiometer replacement procedures, consult the crane manufacturer.



22.1 Checking the Swing Potentiometer Drive Voltage

1. Remove the collector ring cover to expose the swing potentiometer.
2. With the system power turned on, measure the voltage between Terminal 1 of the swing potentiometer and crane ground. The voltage should be between 4.4 and 4.8 volts.
3. Measure the voltage between Terminal 3 of the swing potentiometer and crane ground. The voltage should be between 0.2 and 0.5 volts.

NOTE: *Voltages outside of the ranges specified in steps 2 and 3 indicate a problem with the swing potentiometer or cabling connections. If voltages are incorrect, see* **Checking the Swing Potentiometer Resistance.**

22.2 Checking the Swing Potentiometer Output Voltage

1. Remove the collector ring cover to expose the swing potentiometer.
2. With the system power turned on, measure the voltage between Terminal 2 of the swing potentiometer and crane ground. The voltage should be between 0.2 and 4.8 volts.
3. Measure the voltage between Terminal 4 of the swing potentiometer and crane ground. The voltage should be between 0.2 and 4.8 volts.

NOTE: *Voltages outside the ranges specified in steps 2 and 3 indicate a problem with the swing potentiometer or cabling connections. If voltages are incorrect, see* **Checking the Swing Potentiometer Resistance***.*

22.3 Checking the Swing Potentiometer Resistance

1. Disconnect the connector located behind the collector ring.
2. Measure the resistance between pins C and D of the connector on the swing potentiometer side. The resistance should be between 2200 and 2800 ohms.
3. Measure the resistance between pins A and B of the connector on the swing potentiometer side. The resistance should be between 1800 and 2300 ohms.

NOTE: *Resistances outside of the ranges specified in steps 2 and 3 indicate a problem with the swing potentiometer or associated cable connections. If resistances are incorrect, replace the swing potentiometer and its cable*.

23. Integrated Swing Sensor (ISS) Overview (If Equipped)

23.1 Overview

The Integrated Swing Sensor (ISS) incoporates a sensor housed in the swing drive of the crane that measures the angle of the upper structure of the crane relative to its carrier. The sensor measures the angle by counting electronic pulses on the target gear relative from the zero point (set by the operator) in either a positive or negative direction. The conditioning box translates the signal so it can be processed by the computer and shown in the information window of the display console.

ISS Conditioning Box

The advantage of the ISS over a typical swing potentiometer is the swing potentiometer is housed in the collector column and maintenance and/or removal is difficult. The ISS is a small unit mounted directly onto the swing drive and is easily accessible.

During normal operation, faults detected with the ISS will be shown on the display unit. During such fault conditions the red “Overload” LED will flash accompanied by an intermittent audible beep. Additionally, the swing angle window will display “ERROR” as well as the information window showing an error condition message. All swing related operator alarms, work area alarms, etc, will be displayed.

23.2 ISS Troubleshooting Table

Error Message / Problem	Cause	Correction
“SWING SENSOR SIGNAL 1 ERROR!” “SWING SENSOR SIGNAL 2 ERROR!” “SWING SENSOR ERROR!” “SWING SENSOR LOGIC REPORT!”	Cable from sensor to conditioning box disconnected. Cable from sensor to conditioning box grounded.	Replace sensor.
“SWING SENSOR COMMS ERROR!”	Cable from conditioning box to computer disconnected at computer or conditioning box. Cable from conditioning box to computer grounded.	Check cable. Check connection at conditioning box and computer. Replace cable. If display shows load, angle, radius, etc, replace the conditioning box.
Intermittent, inaccurate, or no output activity	ISS too far from target within swing drive. ISS sensor too close to target within swing drive. ISS not responding normally but drawing normal current and providing normal outputs. ISS disconnected from computer.	Check sensor and sensor connection.

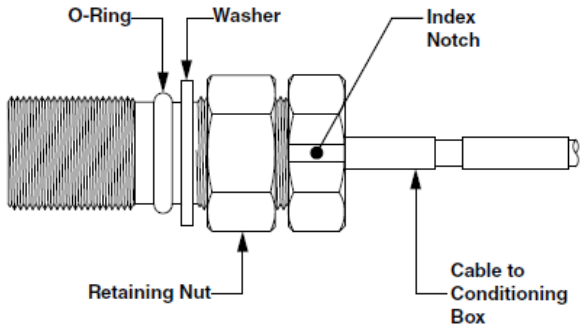
23.3 Replacing the Swing Sensor

23.3.1 Swing Sensor Removal

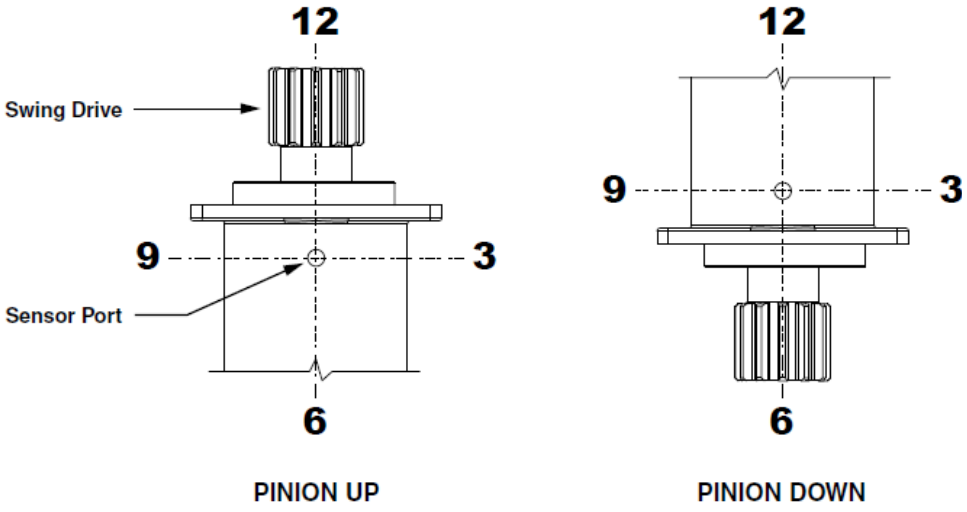
1. Place the boom in the rest (stowed position).
2. Turn off the power to the crane.
3. Disconnect the sensor cable from the conditioning box.
4. Loosen the sensor retaining nut.
5. Remove the sensor from the swing drive housing.

23.3.2 Swing Sensor Installation

1. Insert the threaded end of the sensor into the sensor port of the swing drive and screw it in until the end of the sensor contacts the gear inside the swing drive housing. Do not force the sensor any farther past this point.
2. Note the location of the index notch on the sensor. Rotate the sensor counterclockwise a ½ turn. (Illustrations below)
3. Note the position of the index notch on the sensor and continue to rotate counterclockwise until the index notch reaches the ‘three o’clock’ or ‘nine o’clock’ position.
4. If the initial 180° turn puts the index notch on the ‘three o’clock’ or ‘nine o’clock’ position, continue to rotate counterclockwise until the next ‘three o’clock’ or ‘nine o’clock’ position is reached.
5. For calibration instructions, refer to the section **Setup for Cranes With an Integrated Swing Sensor (ISS)**.

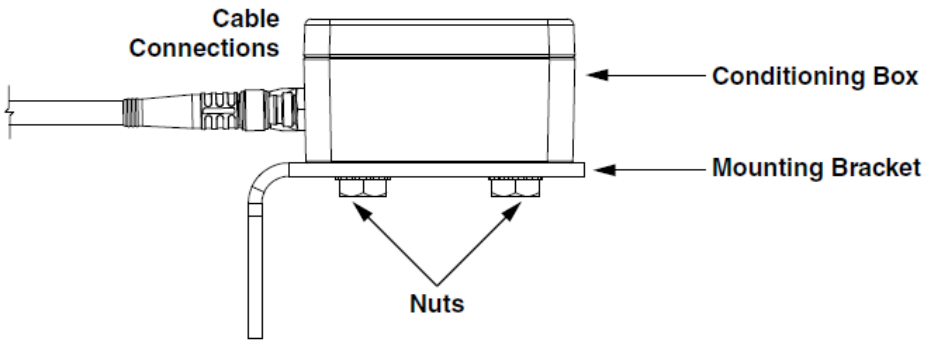


Swing Sensor Diagram



23.4 Replacing the Conditioning Box

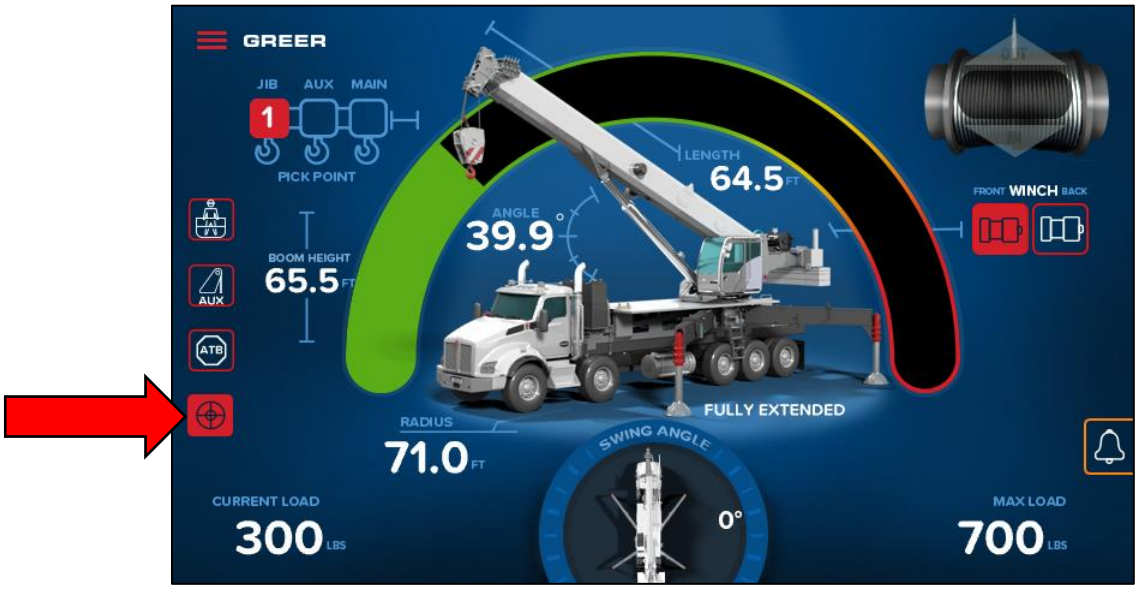
1. Place the boom in the rest (stowed position).
2. Turn off power to the crane.
3. Disconnect the cables from the conditioning box.
4. Remove the two nuts attaching the conditiong box to the mounting bracket.
5. Install the new conditioning box onto the mounting bracket.
6. Reconnect the cables to the new conditioning box.



24. Frame-Level Sensor Overview (If Equipped)

The Frame-Level sensor measures the angle of the chassis relative to 0.0°. It is important to have the machine level before performing a lift.

If the Frame-Level sensor fails, the indicator on the screen will turn red and no measurement will be available.



If the displays go red, indicating a problem with the Frame-Level sensor:

1. Check the cabling and connections between the sensor and the harness.
2. Replace the sensor.

25. Revision History

REVISION	DATE ISSUED	DESCRIPTION OF CHANGE(S)	REVISED BY	ER
0	01/25/2021	Release	HP	18-732

by

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