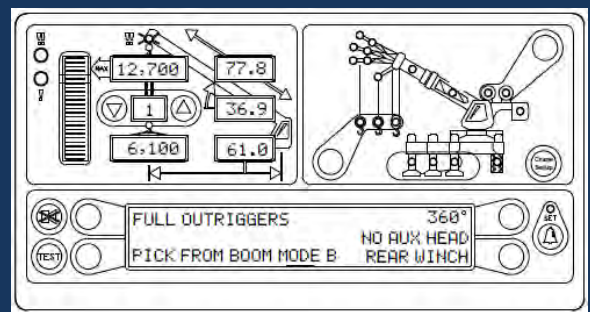




MicroGuard 514 Rated Capacity Limiter



Operator's Manual

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Introduction

The RCI 514 System (hereinafter referred to as the “System”) is designed as an aid to crane operation.

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 within this manual.

OUTLINE OF OPERATION

SYSTEM COMPONENTS

- MicroGuard Display Unit
- MicroGuard Computer Unit
- Reeling Drum, with Length and Angle Sensors
- Anti Two-Block Switches
- Cables
- Installation/Operator Manuals.

The system is intended to aid the crane operator by monitoring the load and warning of an overload or two-block condition. 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 sends audible and visual warning signals. The system can be configured to cause function kick-out by sending a signal to function disconnect solenoids.

DISPLAY

The operator is provided with a display of:

- Rated Load
- Actual Load
- Bar graph showing Percentage of Rated Load
- Radius of the Load
- Boom Angle
- Main Boom Length
- Working Area
- Crane Configuration

On screen communications provide the operator with visual warnings of conditions which may occur during operation of the system.

OUTLINE OF OPERATION

BOOM ANGLE SENSOR

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

EXTENSION SENSOR

The extension sensor provides an increasing voltage proportional to the extension of the boom. A cable attached to the boom head provides a low current electrical path for the A2B signal. The extension sensor is mounted inside the cable reeling drum assembly.

PRESSURE SENSORS

There are two pressure sensors which measure pressure in the boom hoist cylinder. One sensor for the rod-side pressure and one sensor for the piston-side pressure.

ANTI TWO BLOCK (A2B)

A switch monitors the approach of the hookblock or overhaul ball to the boom head. The switch is held in the normal position until the hookblock or overhaul ball raises a weight that is mounted around the hoist rope. When the weight is raised it operates the switch. The resultant signal is sent to the computer via the reeling drum causing an A2B alarm and function kick-out to occur.

FUNCTION KICK-OUT

Electrically-operated hydraulic solenoids disconnect the control lever functions for boom hoist lower, telescope out, and winch up when an overload or A2B alarm condition occurs.

OPERATOR PROGRAMMABLE ALARMS

These alarms, when properly set by the operator, define the operating range:

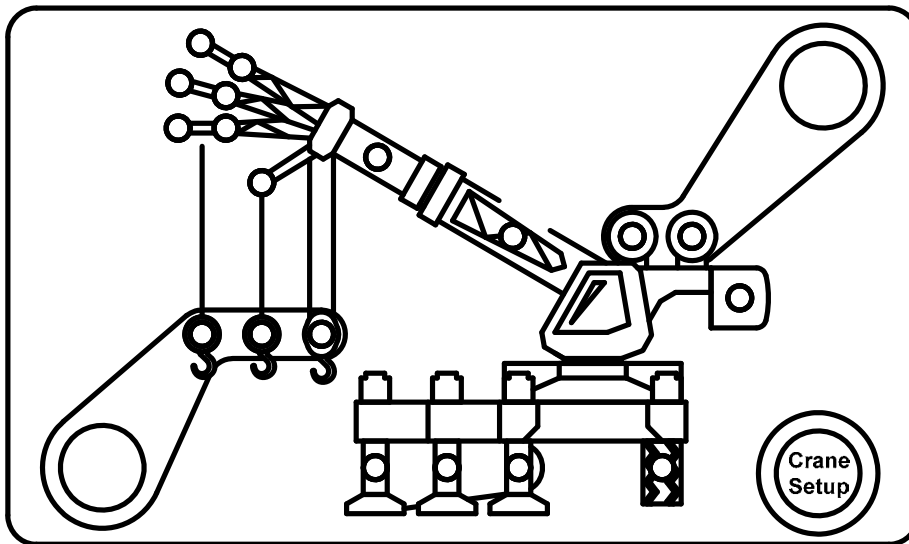
- Minimum and maximum angle
- Maximum height and/or maximum length.

These alarms are programmable for each job site and allow the operator to work in a defined area.

AREA ALARM

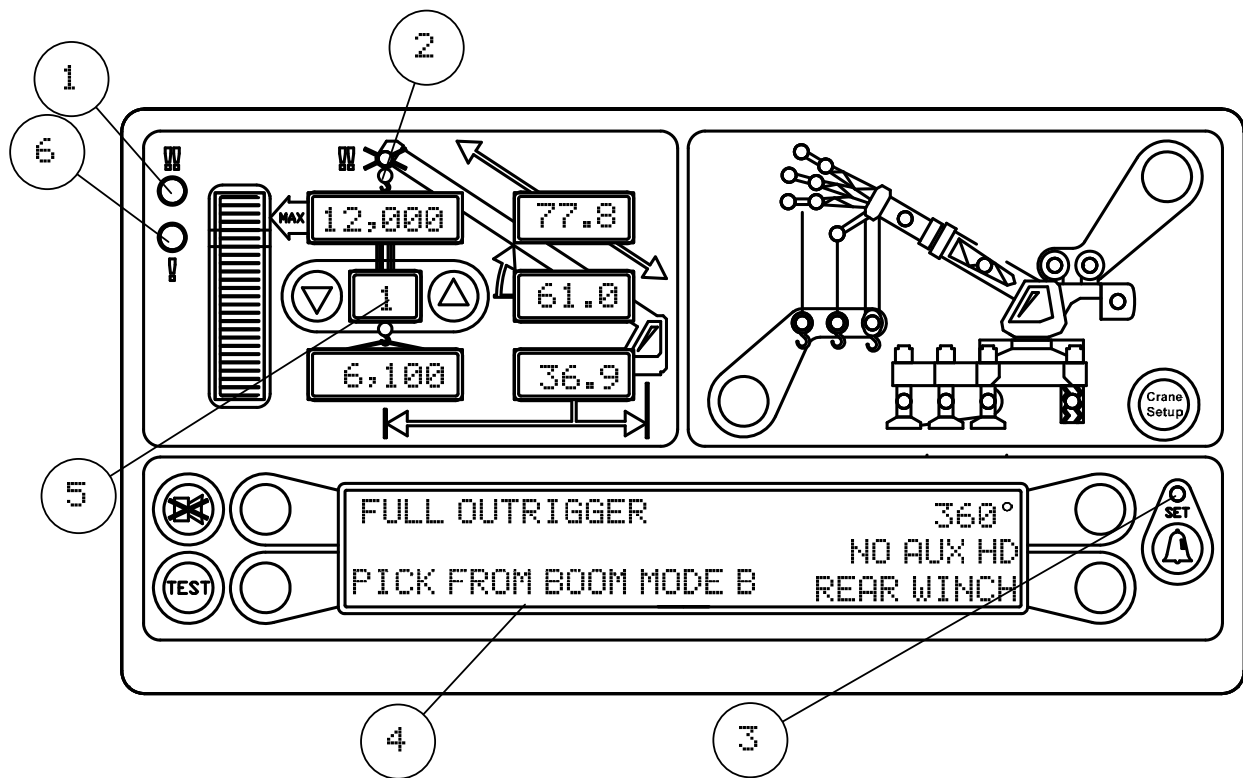
This alarm permits the operator to define the operating zone by only two set points. The use of this method results clearly defines the operating zone.

THE PICTOGRAPH



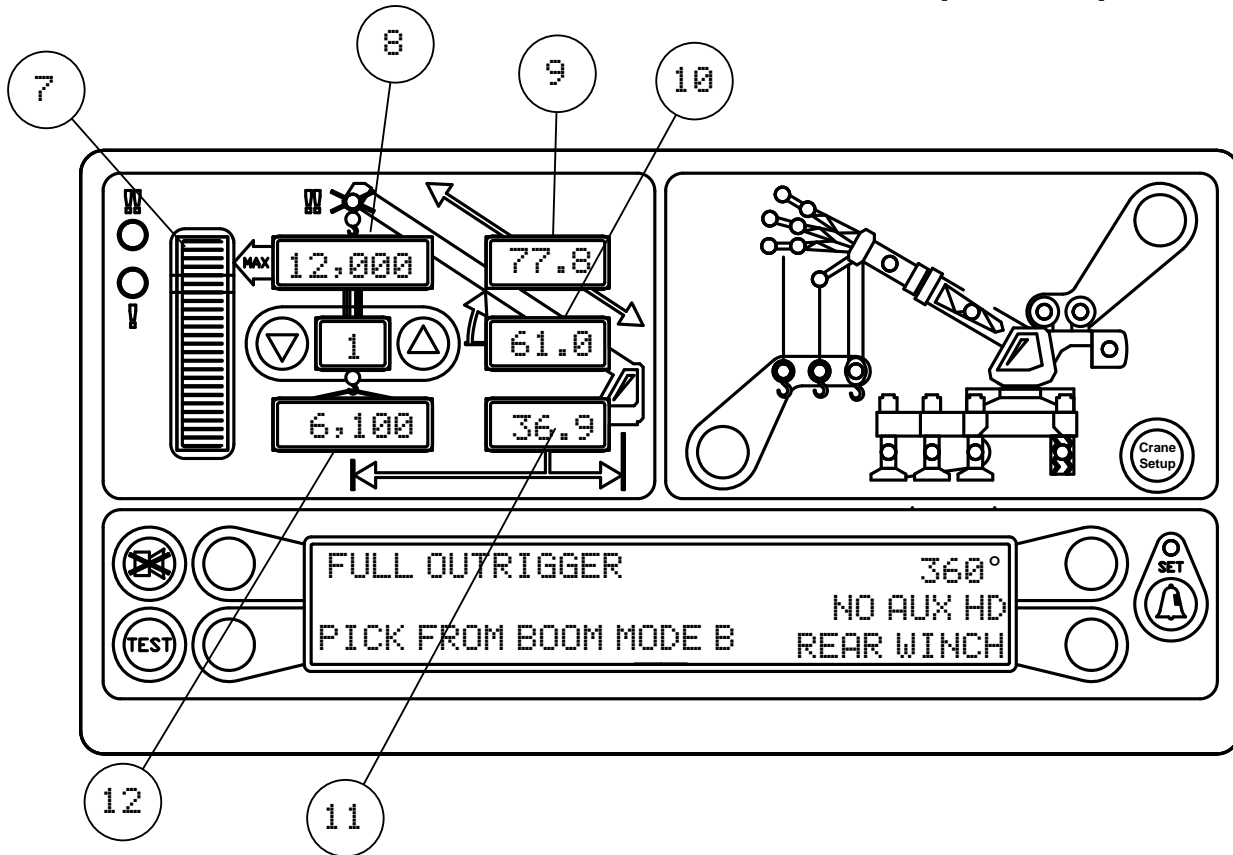
1. The PICTOGRAPH gives a pictorial representation of the current set up of the system with LEDs. Most of these LED's are operated through the menu driven "Crane Setup" button
2. The 2 shaded areas (picking point and winch selection) contain a group of one or more LEDs and a button which is pressed to change the setup selection. In groups where there are multiple options, LEDs illuminate one at a time after the selection is made.
3. The OUTRIGGER group contains three LEDs. They indicate the selection of either full outriggers, intermediate or retracted outriggers.
4. The TIRE group contains one LED. When operation on tires is selected, the outrigger LED will turn off, and the tire LED will illuminate.
5. The COUNTERWEIGHT group contains one LED. It is only active on machines that have counterweight options.
6. The WINCH group contains two LEDs. They indicate the selection of FRONT or REAR winch.
7. The STOWED JIB group contains one LED. This will illuminate when the jib is stowed on the boom.
8. The MANUAL SECTION group contains one LED. It is active on machines that have pinned extensions or active tip boom options.
9. The JIB group contains 6 LEDs. They indicate the length and offset of the jib in use.
10. The AUX HEAD group contains one LED that will illuminate when the AUX HEAD is fitted.
11. The POINT OF LIFT group contains three LEDs. A single LED will illuminate to show the point of lift.

CONSOLE DISPLAY OVERVIEW



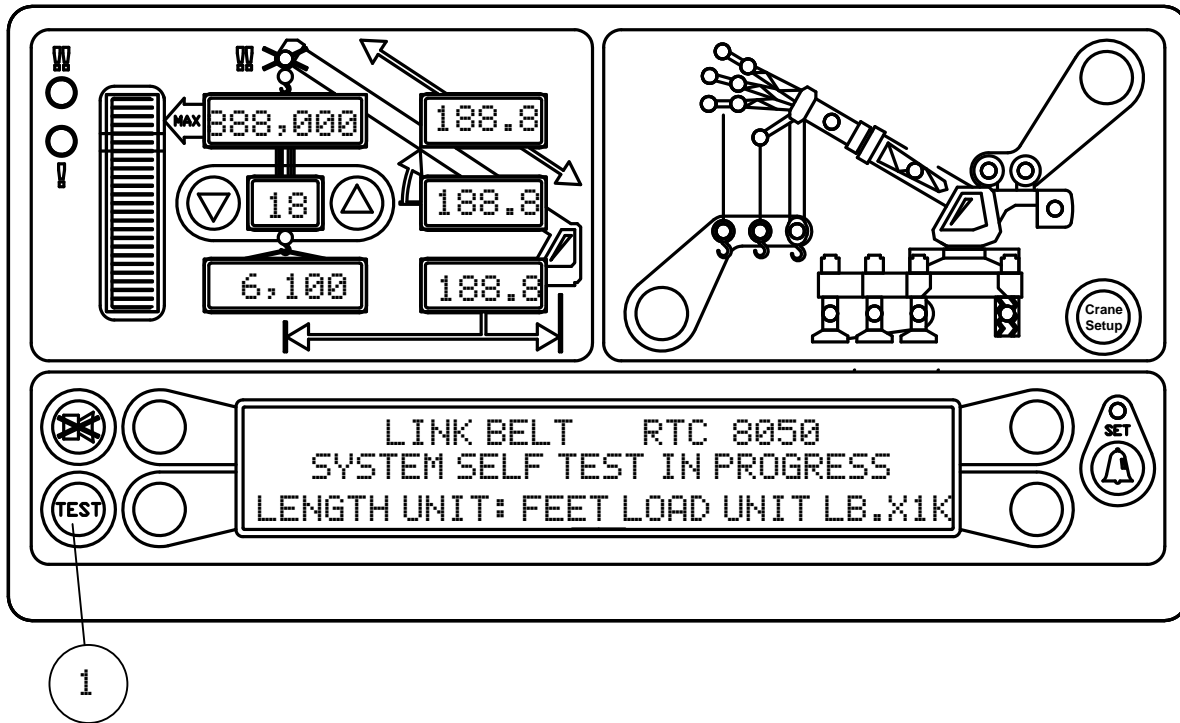
1. The OVERLOAD INDICATOR (RED) illuminates at a preset value of 100% of Rated Capacity and provides a visual indication of Maximum Allowed Load.
2. The ANTI TWO-BLOCK lamp illuminates when the A2B limit switch detects approach to a two-block condition.
3. The OPERATOR ALARM lamp illuminates when operator alarms have been set.
4. The INFORMATION SCREEN contains details of the currently selected configuration.
5. PARTS OF LINE displays the parts of line currently selected.
6. The PRE-ALARM (AMBER) indicator illuminates at a preset value of 90% of Rated Capacity and provides a visual indication of approach to overload.

CONSOLE DISPLAY OVERVIEW (CONT.)



7. The BAR GRAPH indicates the ACTUAL LOAD as a PERCENTAGE OF RATED CAPACITY.
8. RATED CAPACITY display shows the RATED CAPACITY of the machine in the current configuration.
9. The LENGTH display shows the length of the main boom from the boom foot pin to the sheave pin of the main boom head.
10. The ANGLE display indicates, in degrees, the angle of the main boom relative to horizontal.
11. The RADIUS display shows radius of the load. Radius is defined as the horizontal distance from the centerline of rotation to the centerline of the lifting point.
12. ACTUAL LOAD display shows total load, including load, slings etc., suspended below the lifting point.

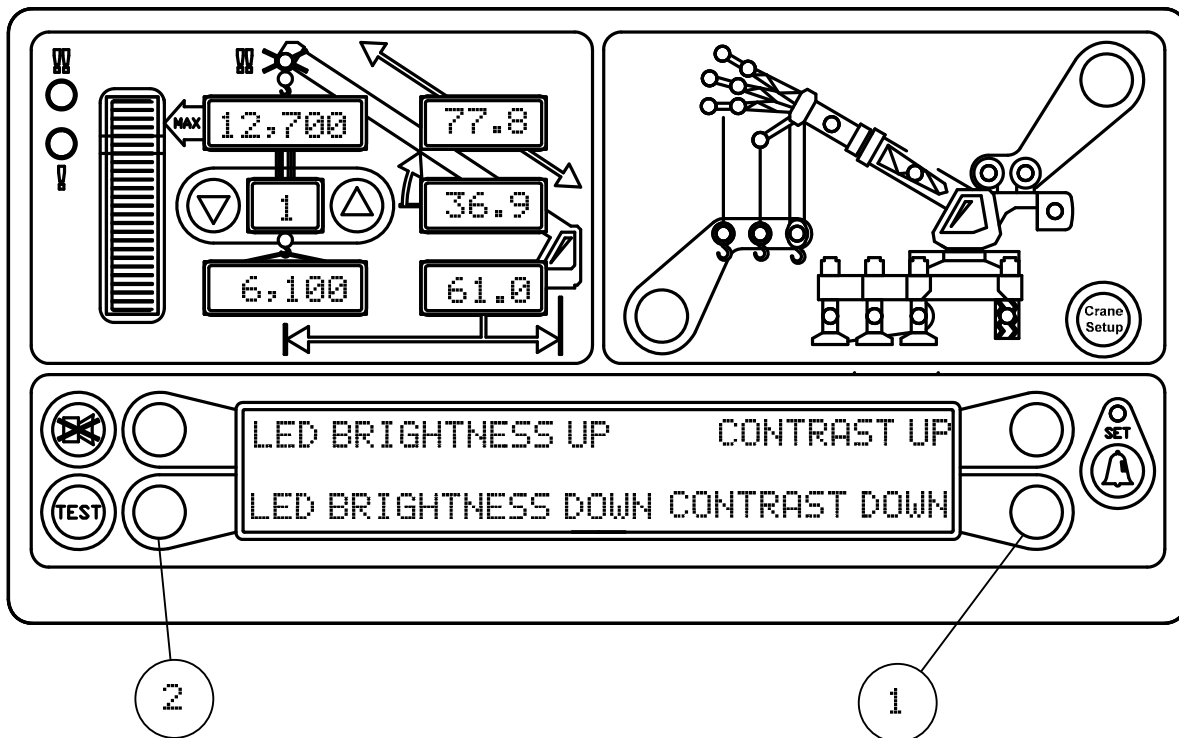
POWER UP SELF TEST



Immediately following electrical power up or following operation of the TEST switch (Item 1), the system executes a self-test which lasts for three seconds.

1. During this time the numerical display segments and bar graph segments are all turned on, the audible alarm will sound and alarm indicator lights are illuminated.
2. The information display shows the machine model and units of measure.
3. Upon completion of this test, the display will initiate the last known operator setup.

BRIGHTNESS AND CONTRAST CONTROLS

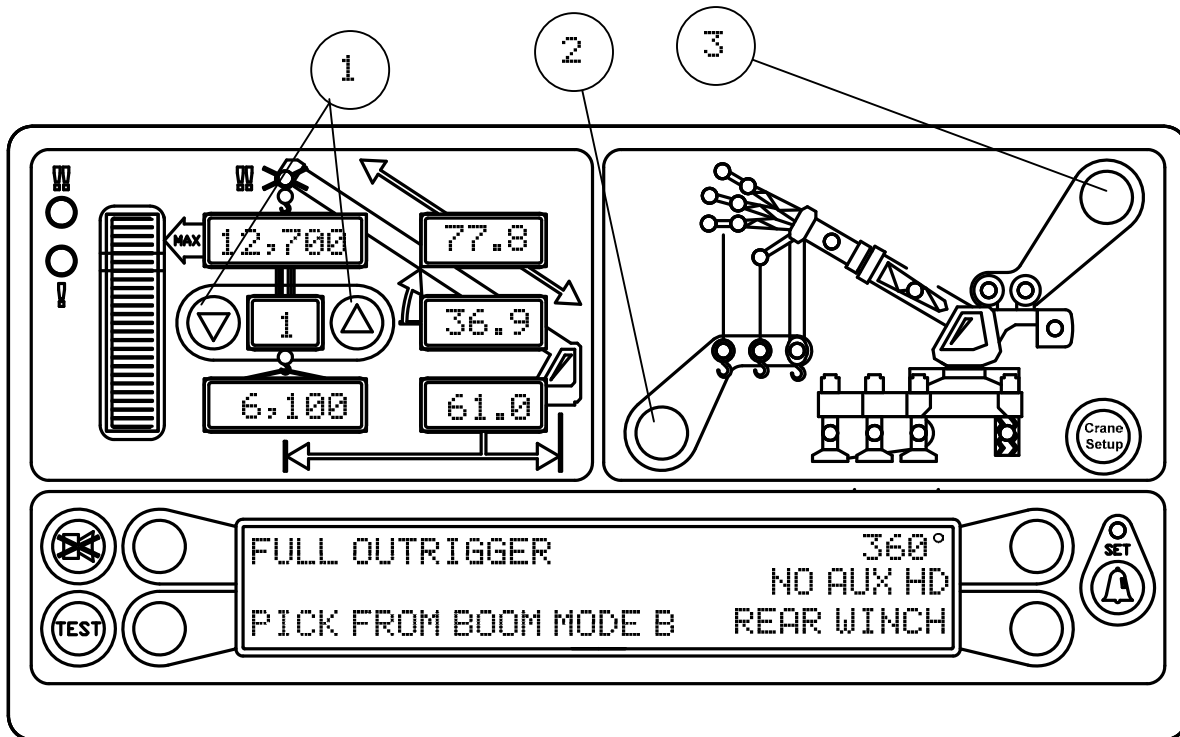


Immediately following the self test and the start up screens, the information display will display a three second reminder of the brightness and contrast control functions.

Buttons to the left and right (Items 1 and 2) of the information display allow the brightness of all LEDs on the display panel to be adjusted up or down at any time during operation of the system unless operator alarms are being set.

During adjustment of the contrast or brightness, the information window will automatically display the reminder window shown.

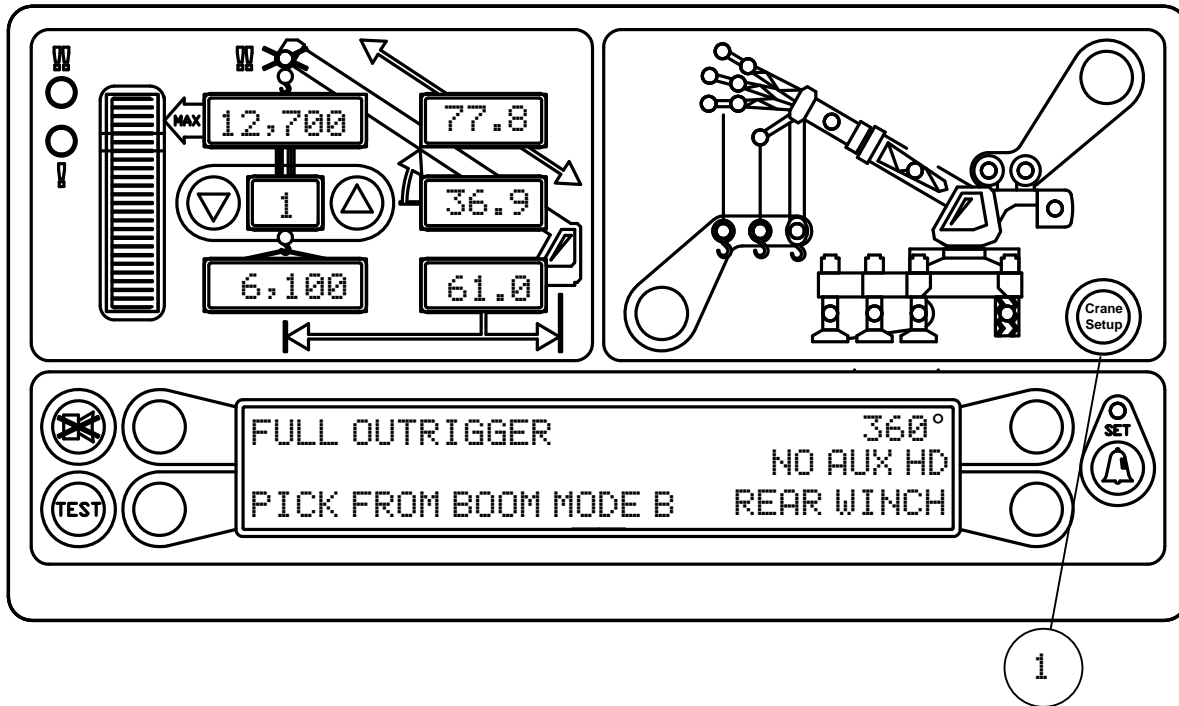
SYSTEM SETUP



NOTE: The operator may adjust the following settings at any time from the main screen.

1. **Parts of Line** - Set the PARTS OF LINE for the currently selected winch by pressing the UP or DOWN arrow as appropriate.
 - a. When another winch is selected it may be necessary to reset the parts of line for the other winch.
 - b. When the number of parts of line on the machine is changed it will be necessary to reset the parts of line on the display.
2. **Picking Points** - Before choosing the point of lift, ensure the correct winch has been selected.
 - a. Always check the point of lift selection following selection of the winch.
 - b. Adjust Pick Points in relation to where the load is being picked from (Main Boom, Auxiliary Head, or Jib).
 - c. Adjust this by pressing the Load Pick Points” button. Each time the button is pressed, the selection will go to the next available pick point.
3. **Winch Selection** - You may select the front or rear Winch by pressing the button adjacent to the winch.

SYSTEM SETUP

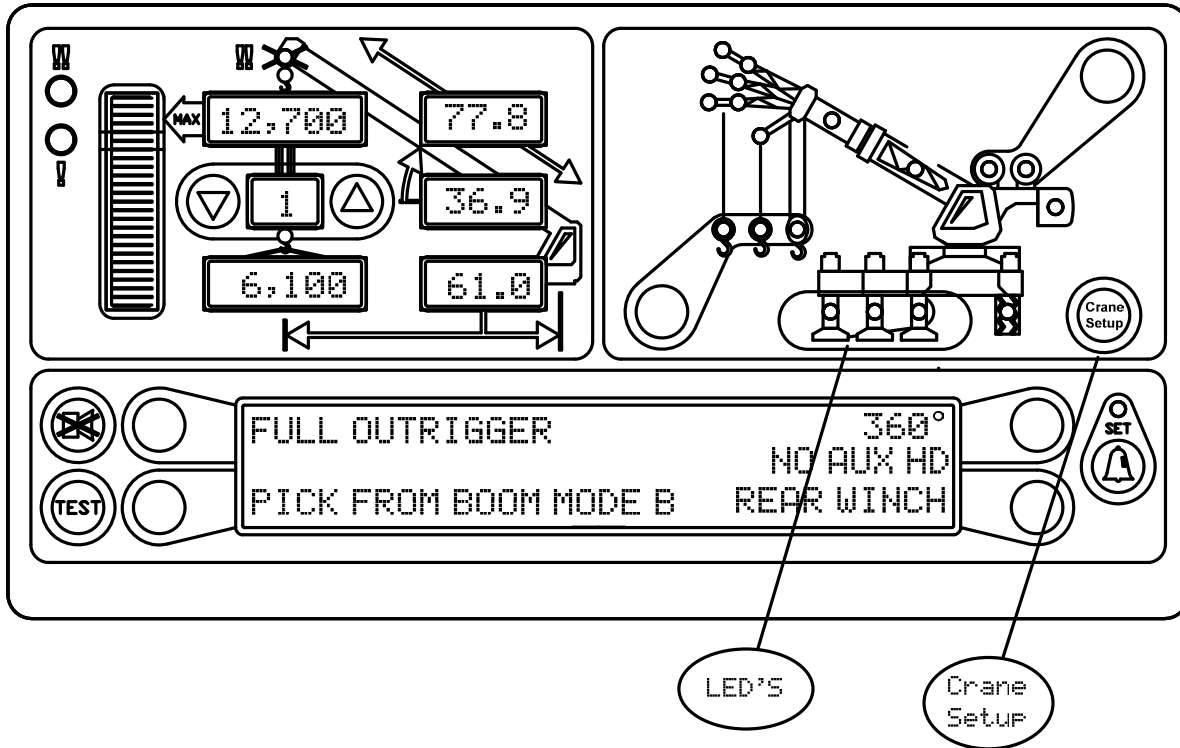


The remainder of the setup must be done by pressing the Crane Setup button (Item 1). Pressing the Crane Setup button will access the menus used for crane setup. The setup sequence is as follows:

1. **Outrigger Setup** - Choose between Full, Mid, and Retracted Outriggers. Press “Next” for the second menu of choices. Tire and Rigging and Travel Modes.
2. **Counterweight** - Will display a menu of counterweights available. If no counterweights are available, “NO CTRWT” will be displayed on the screen.
3. **Boom Mode Selection** - This menu will let you select Boom Modes “A” or “B” or Manually Extendable Booms, if so equipped.
4. **Auxiliary Head** - Menu gives a selection of “AUXILIARY HEAD” or “NO AUX HD”.
5. **Erected Jib or Fly** - Gives the option of having no erected jib, or selecting any jib that has not been hidden in the system calibration. If there is a “Next” selection, there is another page of selection options. Stowed Jib or Fly- Gives the option of stowing unused jib sections on the side of the boom.

NOTE: When menu selections are completed, the selections will update in the information window as above.

SYSTEM SETUP SELECTION OF OUTRIGGERS

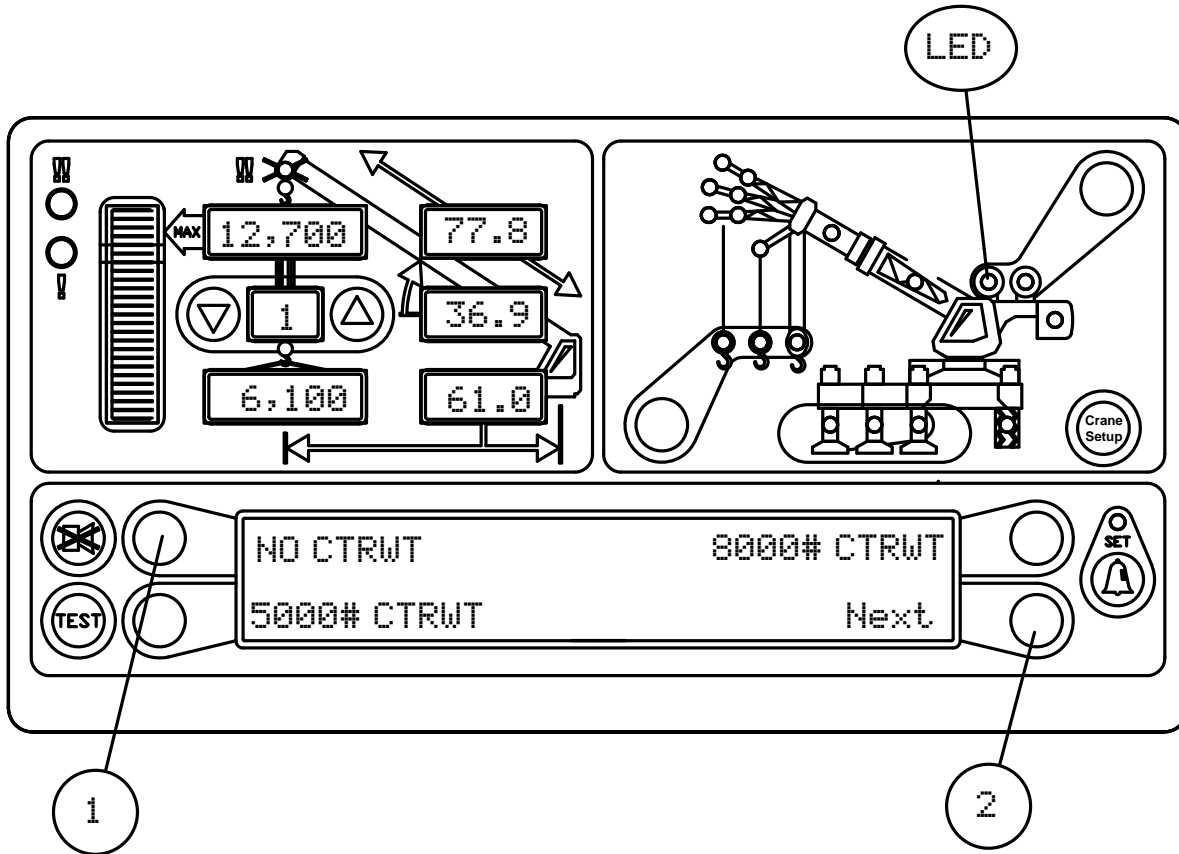


The operator must tell the system which outrigger position is in use.

1. To start the choices press the “Crane Setup” button. This will initiate the setup menu and outrigger settings are the first menu.
2. Choose between Full, Mid and Retracted outriggers. Once a selection is made, an LED will illuminate showing the choice.
3. Press “NEXT” to access Rigging and Travel Modes.

SYSTEM SETUP

COUNTER WEIGHT SELECTION



After completion of the Outrigger set up, the display will move to the Counter Weight selection. For Machines having counterweight options, the operator must tell the MicroGuard system which counterweight is currently fitted.

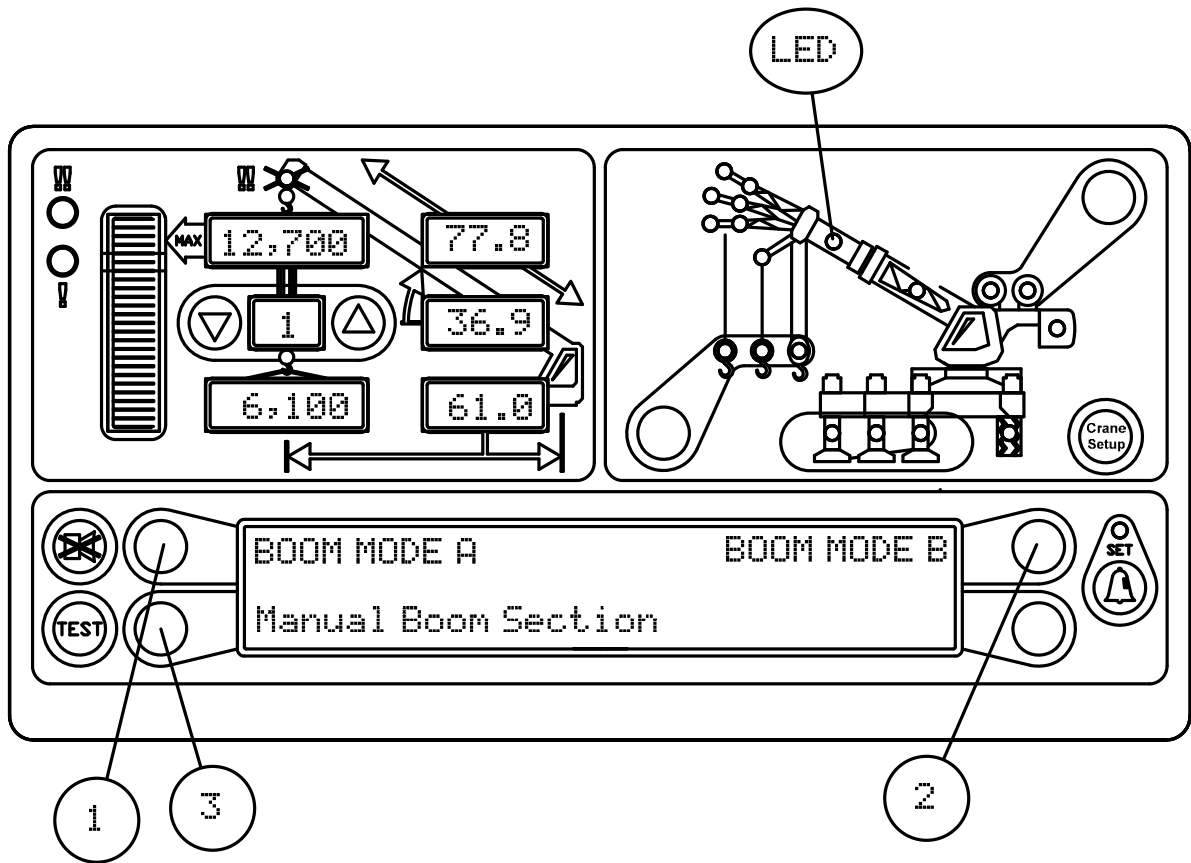
If no counterweights are used, the system will display “NO CTRWT” and pressing the button (Item 1) will cause the system to move on to the next selection.

Allowable counterweights will be shown in the information screen as above. Using the button marked (Item 1) would select no counterweight. If there is more than one page of counterweights, the button marked (Item 2) will switch to the next menu.

When the selection is completed and a counterweight has been selected, the LED will light up displaying this choice. If there is no counter weight selected, the LED will remain in the off position.

SYSTEM SETUP

SELECTING BOOM MODES



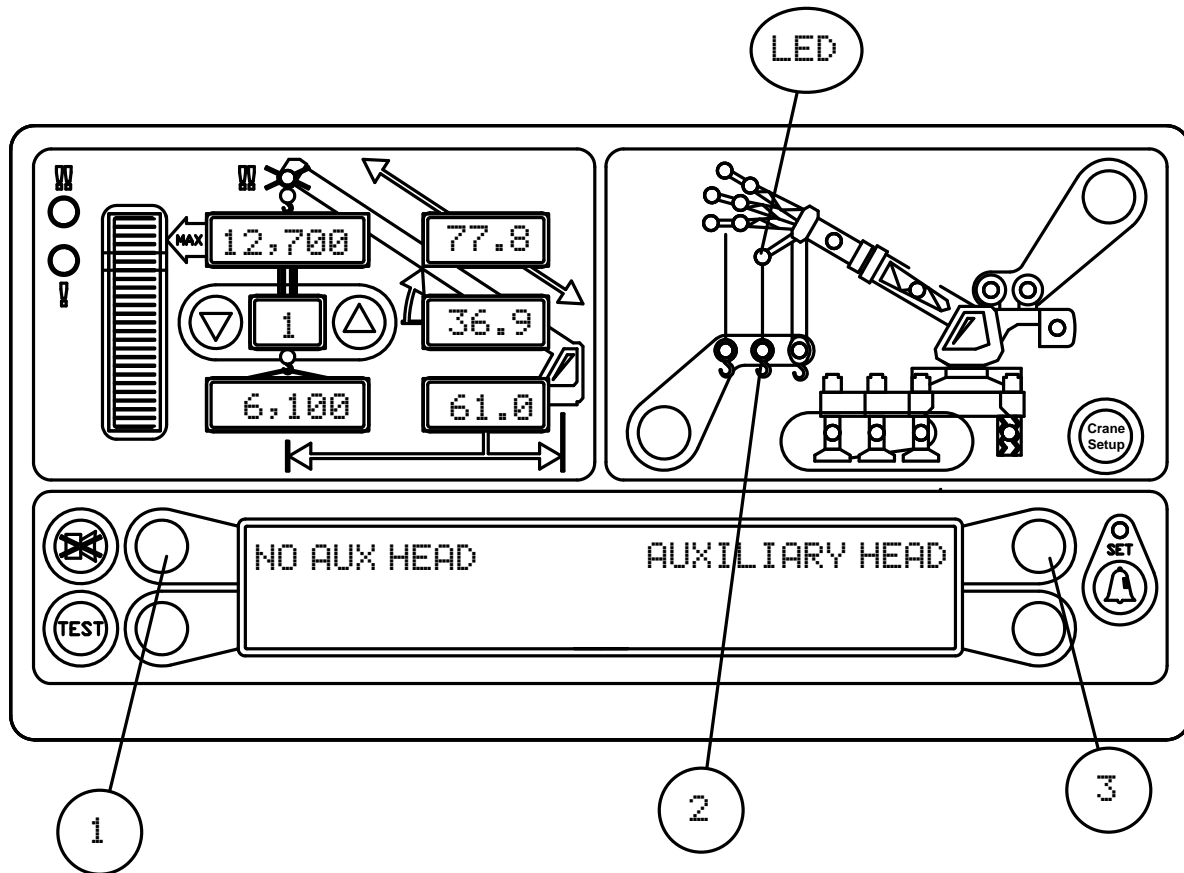
After counter weight choices are made, there are 3 possible boom configurations.

1. **Boom Mode A** - Short boom "heavy pick" mode.
2. **Boom Mode B** - Use of all boom sections proportionally extended.
3. **Manual Boom Mode** - Supports the use of a manually extendable boom section.

In order to select the proper boom mode, press the button adjacent to the selection. The LED on the on the display will light up.

SYSTEM SETUP

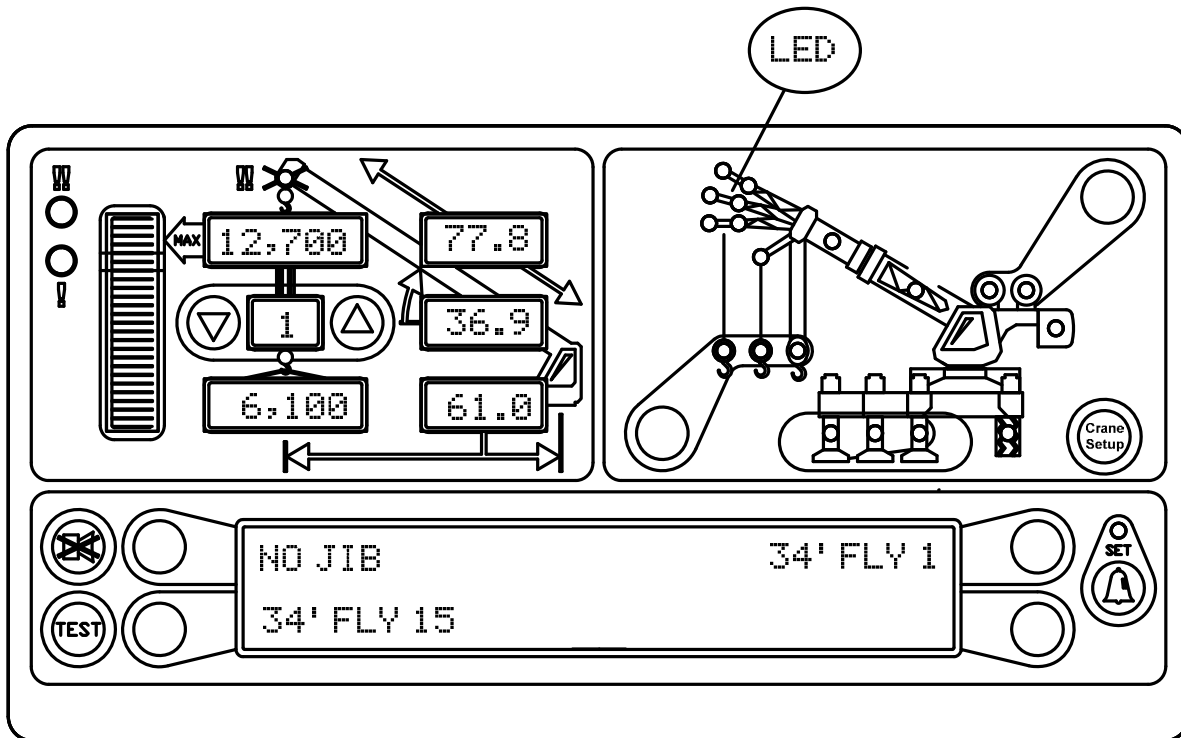
SELECTION OF AUXILIARY HEAD



After selection of the boom mode, you will need to set up an Auxiliary head, if available. The menu item will appear as above.

1. Press the button (Item 1 or 3) adjacent to the desired selection to set up the option. The LED on the Auxiliary head will light up showing the selection is available to use.
2. Choose the picking point (item 2) and the picking point selection will light up the small LED.

SYSTEM SETUP ERECTING A JIB OR FLY



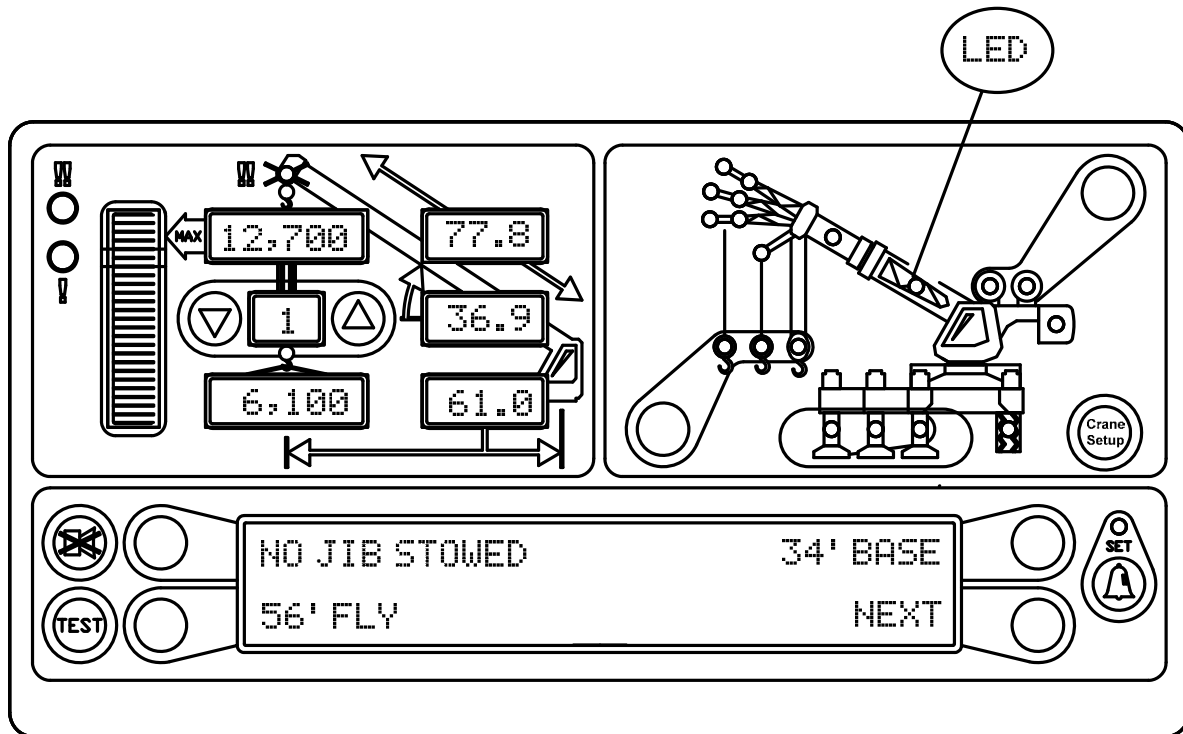
On machines that have more than one jib option, fixed, offset, telejib, etc., the operator must select the proper jib to be used.

1. Press the button adjacent to the desired selection.
2. If there are more options available, the menu will show “NEXT” at the bottom right of the screen. Pressing the “NEXT” button will go to page 2 of the menu and show the remaining options.
3. The LED for that jib and position will light up when the selection is made.

NOTE: Before lifting with the jib selection, you must return to the main screen and reset the picking point option to select the jib.

SYSTEM SETUP

STOWING A JIB OR FLY

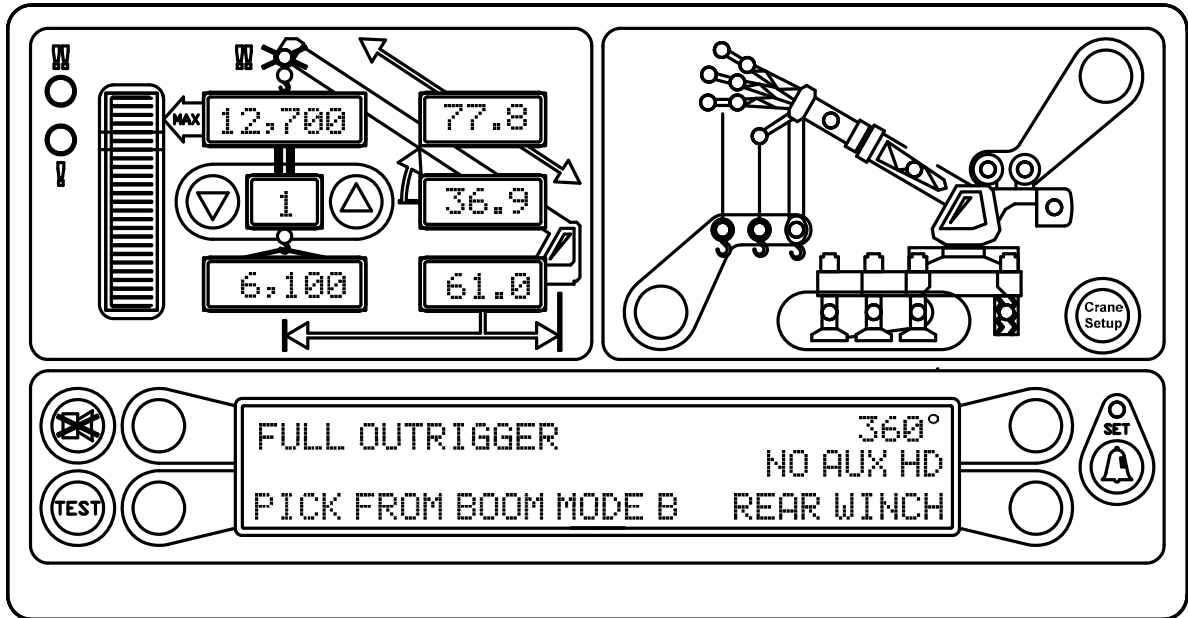


The final step in the operator setup is showing any stowed jib or fly.

1. If there are jib groups to support it, it is permissible to have both an erected and a stowed jib. This must be properly reported so the computer can make the proper adjustments to ensure an accurate load.
2. If more options are available, press the "NEXT" button and they will have the capability to have one part of the jib erected and another part of the jib stowed.

NOTE: In the picture above, that there are both a 34' and a 56' jib available as stowed jibs.

SYSTEM SETUP CONFIGURATION DATA



The system has the capability of remembering all configuration data previously set.

After removing power to the system, and then re-powering, the settings remain intact until reset by the operator.

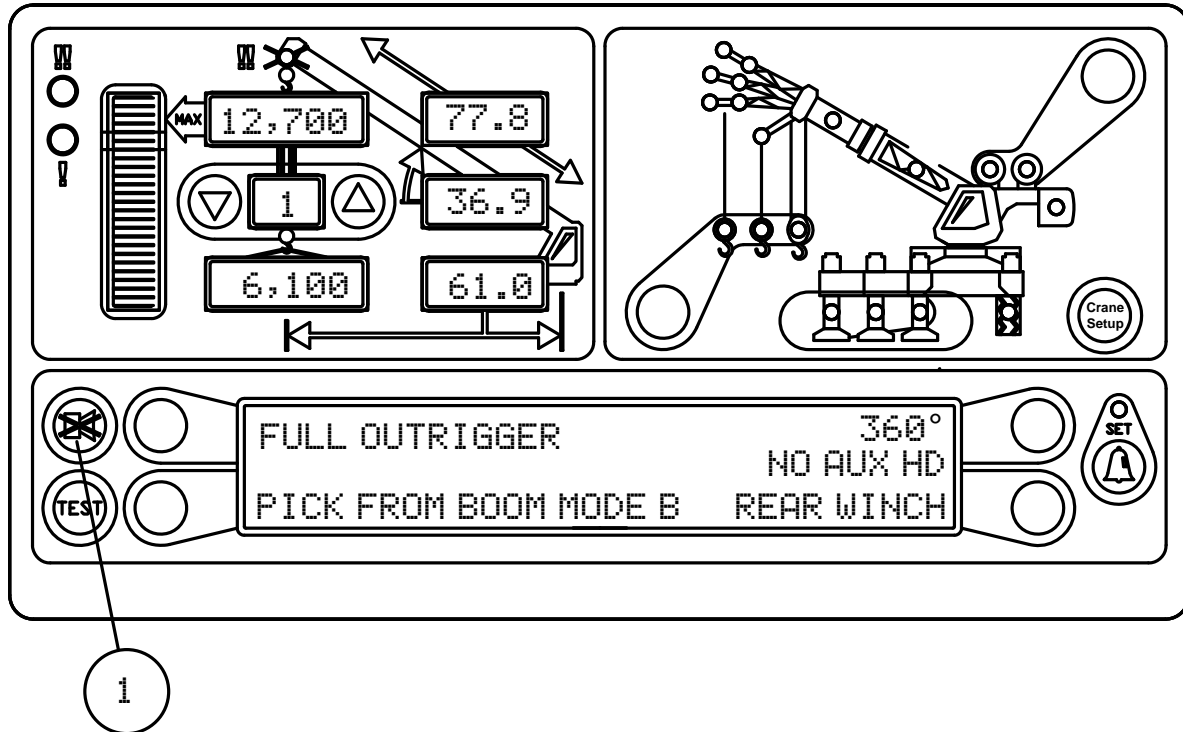
After setting the configuration, the operation of the system depends only on selecting which winch is in use. Changing the winch will automatically change the lifting point and the parts of line to the values previously set for the selected winch.

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

WARNING!

The displayed load and capacity are based upon the current selected point of lift. Neither the RCI 514 system, nor the crane capacity chart, allows for lifting from more than one hook at a time.

SYSTEM SETUP CANCEL ALARM BUTTON



The Cancel Alarm button (Item1) is used to silence the audible alarm. Pressing this button once will cancel an audible alarm which has occurred as a result of an:

- Overload
- A2B Alarm
- Operator Programmable Alarm

The audible alarm remains cancelled until the condition that caused the alarm has been removed.

For example, if the audible alarm sounded because of an overload condition it will remain cancelled until the overload condition has been removed.

If another alarm condition that normally causes an alarm to sound, such as an A2B, occurs while the audible alarm is cancelled or if the previous condition (overload) is removed and then reoccurs, the new alarm condition will cause the audible alarm to sound again.

The Cancel Alarm button may also be used to reset the function kick-out relay. It may be necessary to override a function kick-out to clear the fault condition.

For example, if the boom hoist cylinder is fully extended the pressure will increase enough to create a false overload and the FKO will not allow the operator to lower the boom. Using the bypass will allow the operator to retract the boom hoist cylinder and clear the alarm condition.

When the machine is to be rigged it is often necessary to put the boom in a position which could cause function kick-out. Using the bypass is necessary in this situation.

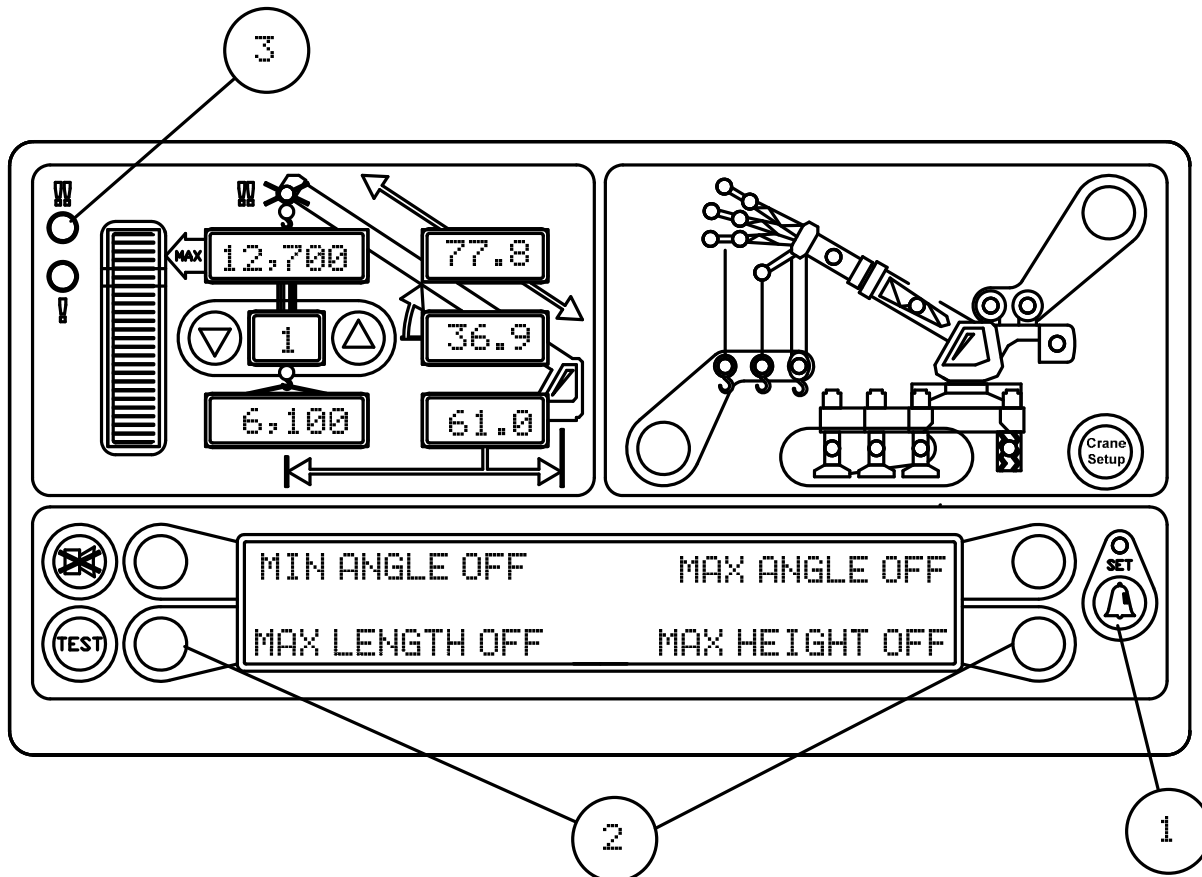
Pressing and holding the CANCEL ALARM button for approximately 5 seconds resets the relay. At this time, a second beep is heard confirming the bypass. When the condition which caused the alarm is no longer present, the function disconnect relay will reset to the normal condition. If a different alarm condition occurs while the relay is over-ridden, the new alarm condition will cause the controls to disconnect again.

WARNING!

WHEN THE FUNCTION DISCONNECT RELAY IS RESET BY MEANS OF THE CANCEL ALARM BUTTON THERE IS NO LONGER PROTECTION AGAINST THE CONDITION THAT CAUSED THE FUNCTION KICK-OUT.

SYSTEM SETUP

OPERATOR PROGRAMMABLE ALARMS



To gain access to the Operator Alarms from the main working screen press the OPERATOR ALARM button (Item 1).

The Information Screen will show the current status of the OPERATOR ALARMS.

There are four buttons (Item 2). Each button relates to the displayed alarm.

Each button operates as a toggle switch. If the alarm is OFF, pressing the button will turn the alarm ON. If the alarm is ON, pressing the button will turn the alarm OFF.

There are four operator alarms available:

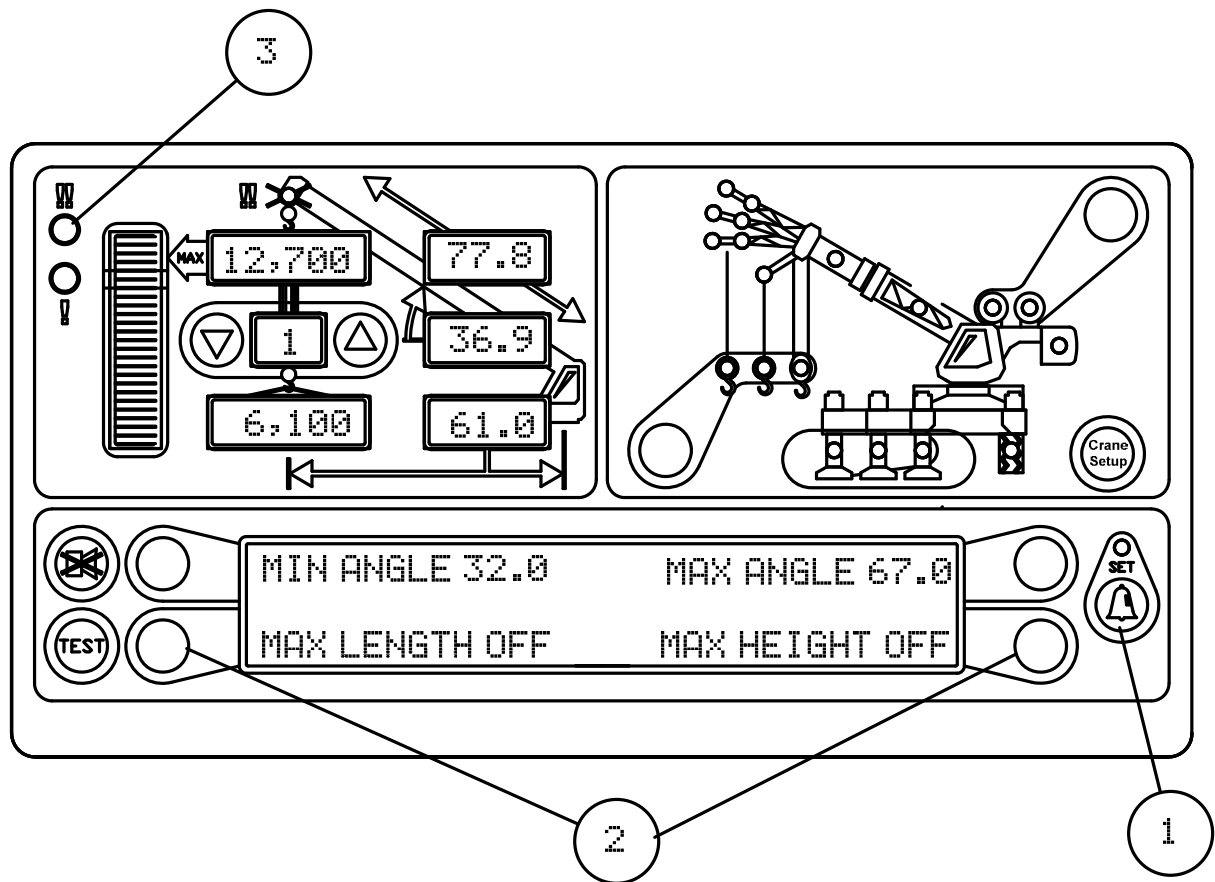
- Minimum Boom Angle (MIN ANGLE)
- Maximum Boom Angle (MAX ANGLE)
- Maximum Boom Length (MAX LENGTH)
- Maximum Tip Height (MAX HEIGHT)

When Operator Alarms are set, the LED in the button (Item 1) will illuminate.

Return to the main screen by pressing button (Item 1) twice.

SYSTEM SETUP

OPERATOR PROGRAMMABLE ALARMS



SETTING MINIMUM BOOM ANGLE ALARM

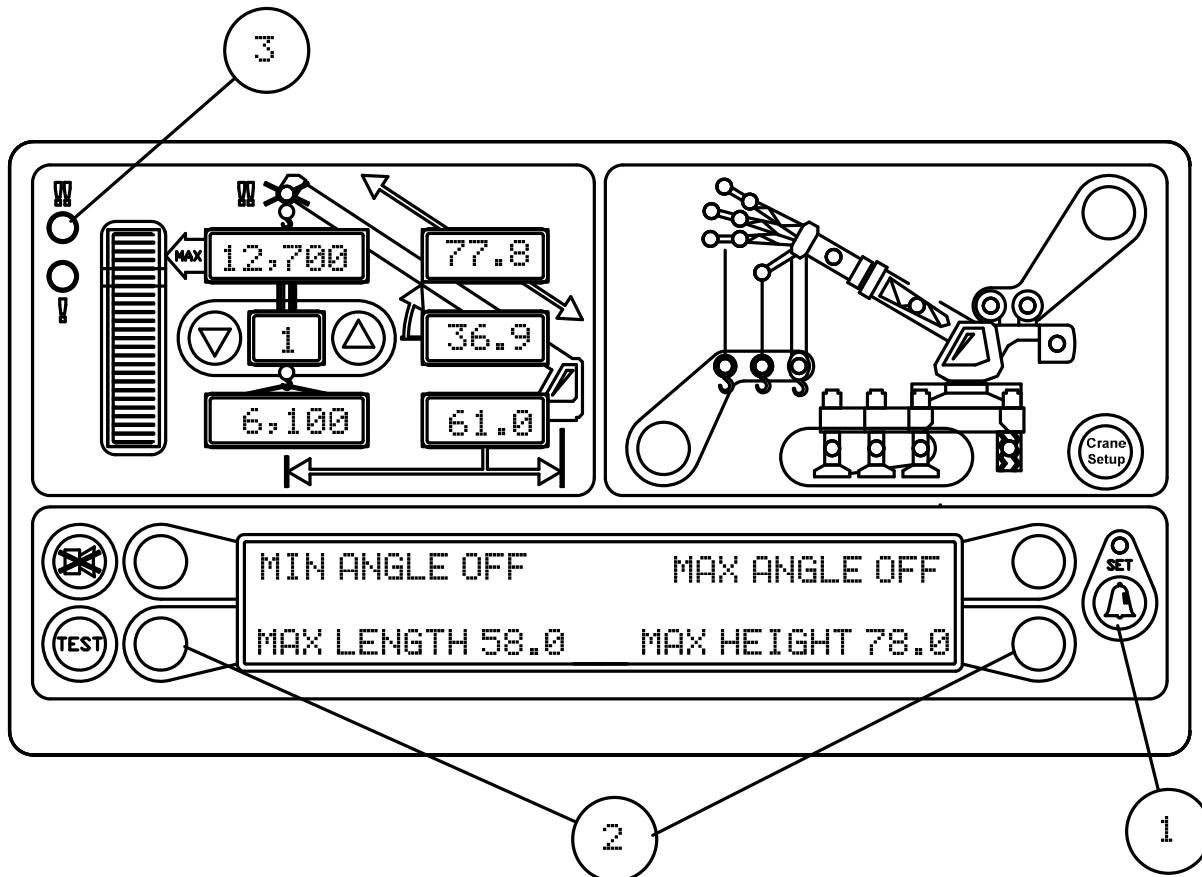
1. Move the boom to the desired minimum angle, in this example, 32°.
2. Press the operator alarm button (Item 1) to access the operator alarm screen.
3. Press the “MIN ANGLE” button. In this example, the display will read MIN ANGLE 32°.
4. The red warning light (Item 3) will flash and the alarm will sound when the boom angle is below 32°.
5. Press the “MIN ANGLE” button to cancel the alarm and the display will read MIN ANGLE OFF

SETTING MAXIMUM BOOM ANGLE ALARM

1. Move the boom to the desired maximum angle, in this example 67°.
2. Press the operator alarm button (item 1) to access the operator alarm screen.
3. Press the “MAX ANGLE” button. In this example the display will read MAX ANGLE 67°.
4. The red warning light (item 3) will flash and the alarm will sound whenever the boom angle is above 67°.
5. Press the “MAX ANGLE” button to cancel the alarm and the display will read MAX ANGLE OFF.

SYSTEM SETUP

OPERATOR PROGRAMMABLE ALARMS



SETTING MAXIMUM BOOM LENGTH ALARM

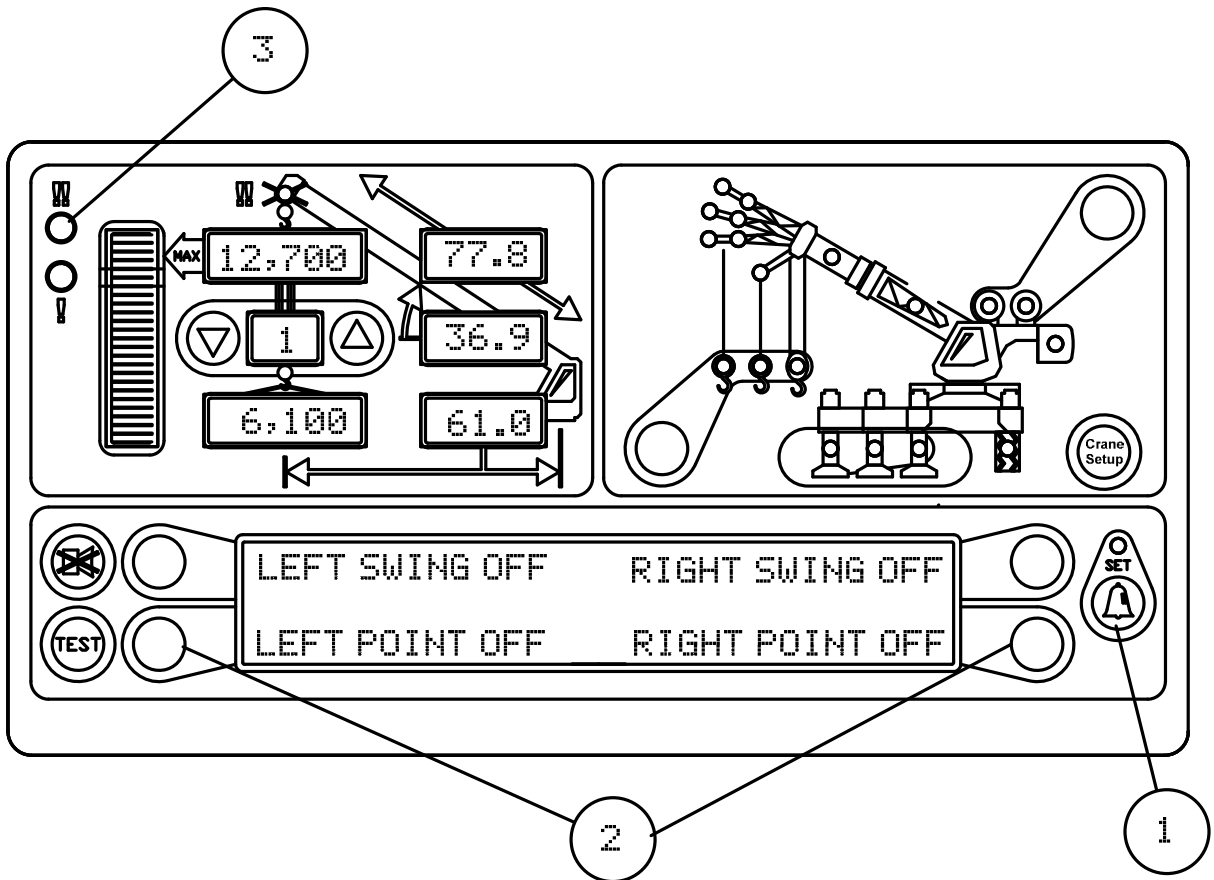
1. Move the boom to the desired maximum length, in this example 58ft.
2. Press the operator alarm button (Item 1) to access the operator alarm screen.
3. Press the “MAX LENGTH” button. In this example the display will read MAX LENGTH 58FT.
4. The red warning light (Item 3) will flash and the alarm will sound whenever the boom length exceeds 58ft.
5. Press the “MAX LENGTH” button to cancel the alarm and the display will read MAX LENGTH OFF

SETTING MAXIMUM TIP HEIGHT ALARM

1. Move the boom to the desired maximum height, in this example, 78ft.
2. Press the operator alarm button (item 1) to access the operator alarm screen.
3. Press the “MAX HEIGHT” button. In this example the display will read MAX HEIGHT 78FT.
4. The red warning light (item 3) will flash and the alarm will sound whenever the boom tip height exceeds 78ft.
5. Press the “MAX HEIGHT” button to cancel the alarm and the display will read MAX HEIGHT OFF.

OPERATOR PROGRAMMABLE ALARMS

ACCESSING THE SWING AND WORK AREA ALARMS



Access to the SWING AND WORK AREA ALARMS from the main working screen is by pressing the OPERATOR ALARM button (Item 1) twice.

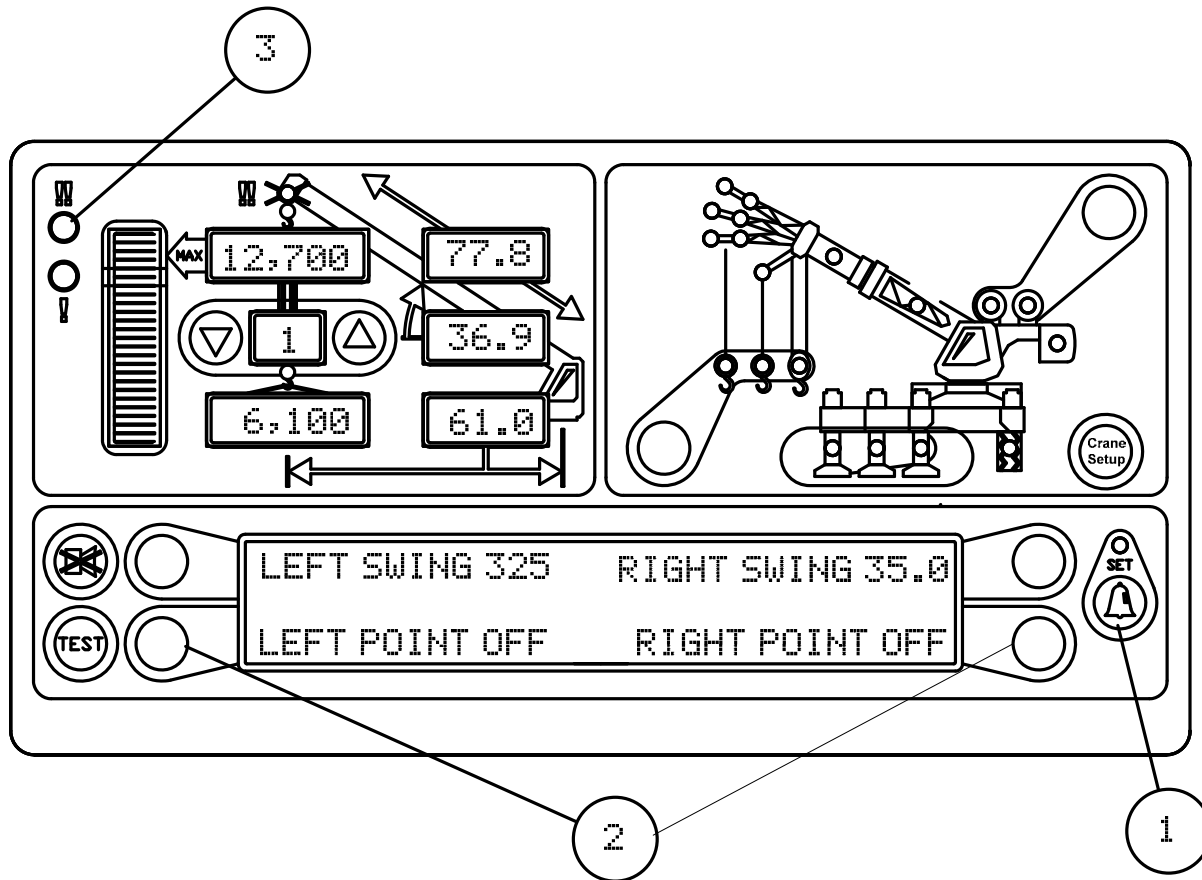
The Information Screen will show the current status of the Swing and Work Area Alarms. There are four buttons (Item 2). Each button relates to the alarm to which it is pointing.

Each button operates as a toggle switch.

- If the alarm is OFF, pressing the button will turn the alarm ON.
- If the alarm is ON, pressing the button will turn the alarm OFF.
- When Operator Alarms are set the button (Item 1) will be illuminated.
- Return to the main screen by pressing the OPERATOR ALARM button (1).

OPERATOR PROGRAMMABLE ALARMS

SETTING THE SWING ALARMS



SETTING LEFT SWING ALARM

1. Swing the boom to the desired Left Swing Limit, for example, 325°.
2. Press the operator alarm button (Item 1) twice to access the swing alarm screen.
3. Press the “Left Swing” button. The display will read LEFT SWING 325°.

NOTE: Set the Left and Right Swing Alarms for the system to operate correctly. The red warning light (Item 3) will flash and the alarm will sound whenever only one of the swing limits is set.

SETTING RIGHT SWING ALARM

1. Move the boom to the desired Right Swing Limit, for example, 35°.
2. Press the “Right Swing” button. The display will read RIGHT SWING 35°.

The red warning light (Item 3) will flash and the alarm will sound whenever the boom swings past the preset limits.

Pressing the LEFT SWING and RIGHT SWING buttons again will cancel the alarm and the display will read LEFT SWING OFF RIGHT SWING OFF.

OPERATOR PROGRAMMABLE ALARMS

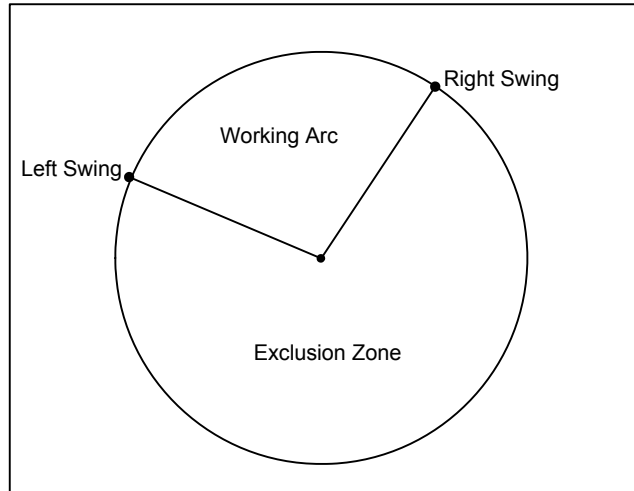
WORKING ARC AND EXCLUSION ZONE

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.

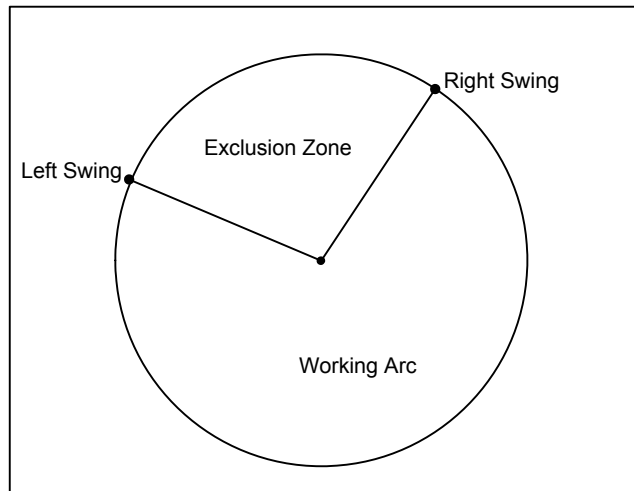
In this example the working arc is the smaller piece of the pie.



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.



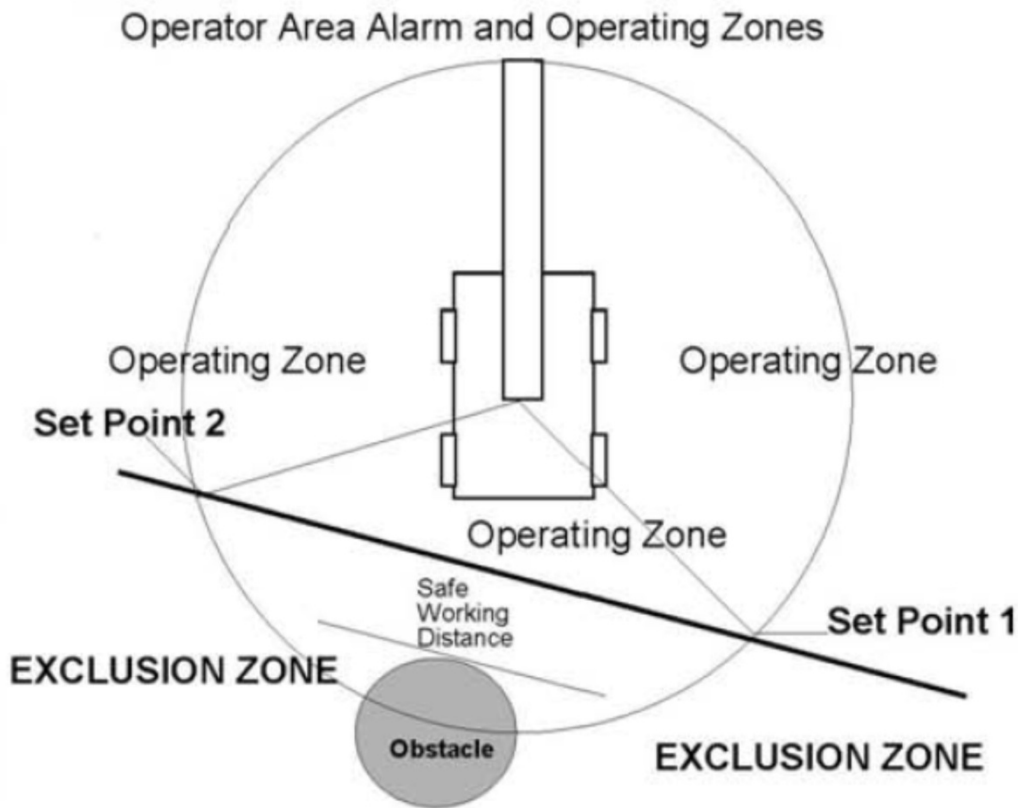
WARNING!

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 cranes 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.

OPERATOR PROGRAMMABLE ALARMS

WORK AREA SELECTION MODE

This alarm permits the operator to define an Operating Zone by only two set points. The use of this method of setting 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.



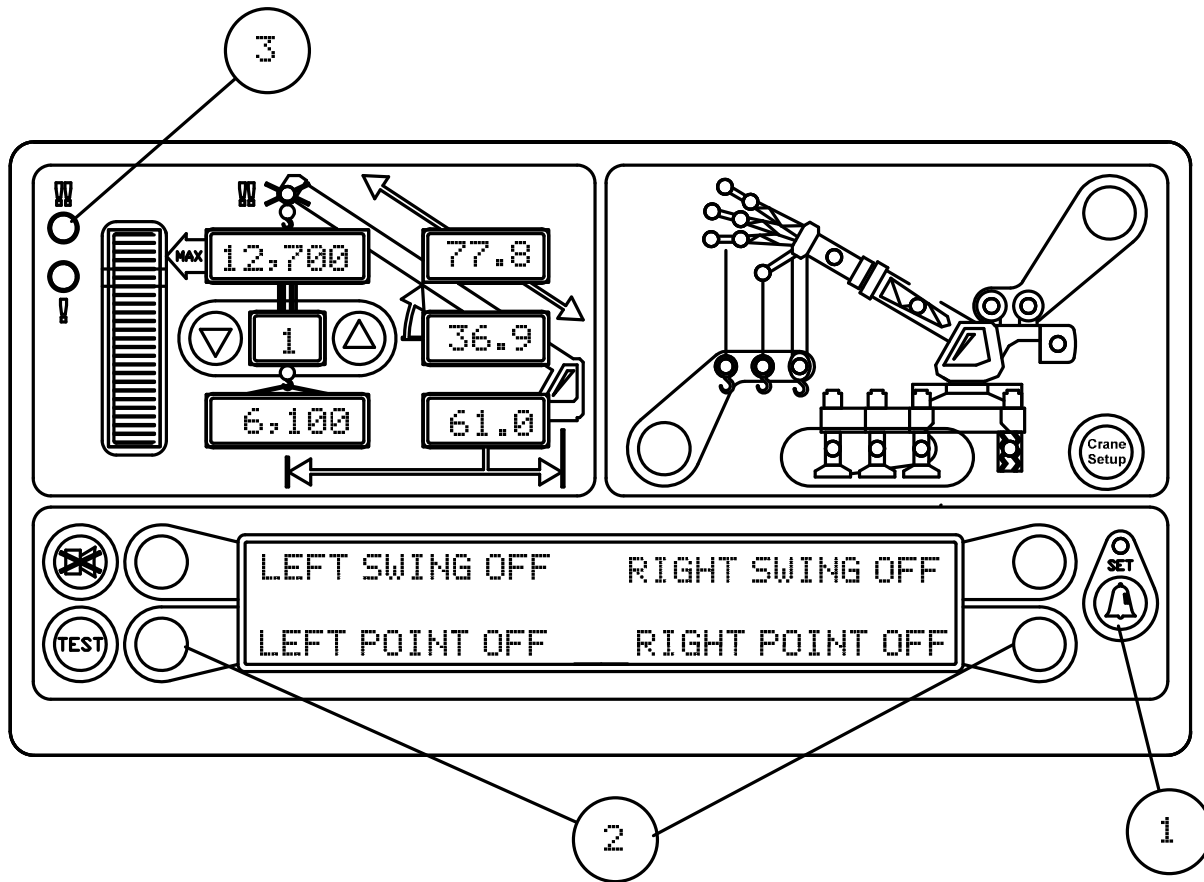
The operator defined work area alarm will define an imaginary vertical plane between two set points. When passing the plane the red warning lamp will illuminate, the alarm will sound and the message “EXCLUSION ZONE” will flash on the display.

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 cranes 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 Set Points 1 and 2, 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.



SETTING POINTS 1 AND 2

1. Press the operator alarm button (Item 1) twice to access the Work Area alarm screen.
2. Move the boom, attachment, load, rigging etc. to the desired LEFT SET POINT.
3. Press the “Left Point” button. The display will read LEFT POINT SET.

Note: Both Left and Right Points must be set for the system to operate correctly. The red warning light (item 3) will flash and the audible alarm will sound whenever only one of the left/right swing limits is set.

4. Move the boom, attachment, load, rigging etc. to the desired RIGHT SET POINT.
5. Press the “Right Point” button. The display will read RIGHT POINT SET.
6. The red warning light (item 5) will flash and the audible alarm will sound whenever the boom tip penetrates the exclusion zone.
7. Pressing the LEFT POINT and RIGHT POINT buttons again will cancel the alarm and the display will read LEFT POINT OFF RIGHT POINT OFF.



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