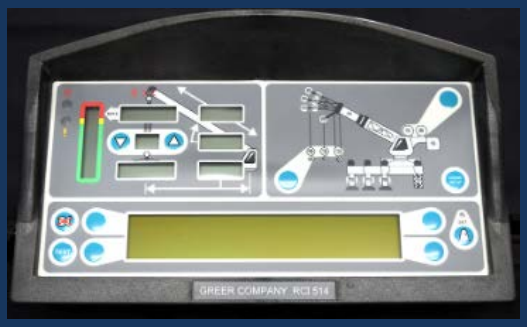
SkyAzúl
EQUIPMENT SOLUTIONS

Greer – MG514 Retrofit



Installation, Calibration, and Service Manual

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SkyAzúl, Inc.
16 Walnut Street
Middletown, MD 21769
Fax 301-371-0029
info@skyazul.com

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1.0 Introduction

The MicroGuard MG514 replaces the previous Link Belt MG404, 414, and 434 systems currently in use. This chapter will cover information necessary for installing the MicroGuard 514 system.

Please read the Operator's Manual before operating the system. The system installer must be knowledgeable in safety guidelines, crane capacity information, and the crane manufacturer's specifications.

For questions about Installation, please contact Technical Support:
Greer Company Service:
Jenks, OK
Telephone: (918) 298-8300
FAX: (918) 298-8301

1.1 System Information

When installing the new computer and display system, Greer Company recommends the existing rectangular shaped reeling drum be replaced with our current production reeling drum, A240690. The rectangular shaped reeling drum has been classed obsolete. There is no longer field support for this product.

Upgrading the reeling drum will ensure you have both field support and parts support in the future. The A240690 Reeling Drum is equipped with the necessary parts to be a direct replacement for the obsolete part.

The new computer uses Flash RAM technology for loading the Duty Files. If known at the time of purchase, the proper Duty File will be loaded on your computer before installation.

If you are unfamiliar with preparing the computer for use, kit K758746 is available from Greer Company. The kit contains a programming cable and a CD with software, drivers, and the "Greer Mini Loader" program.

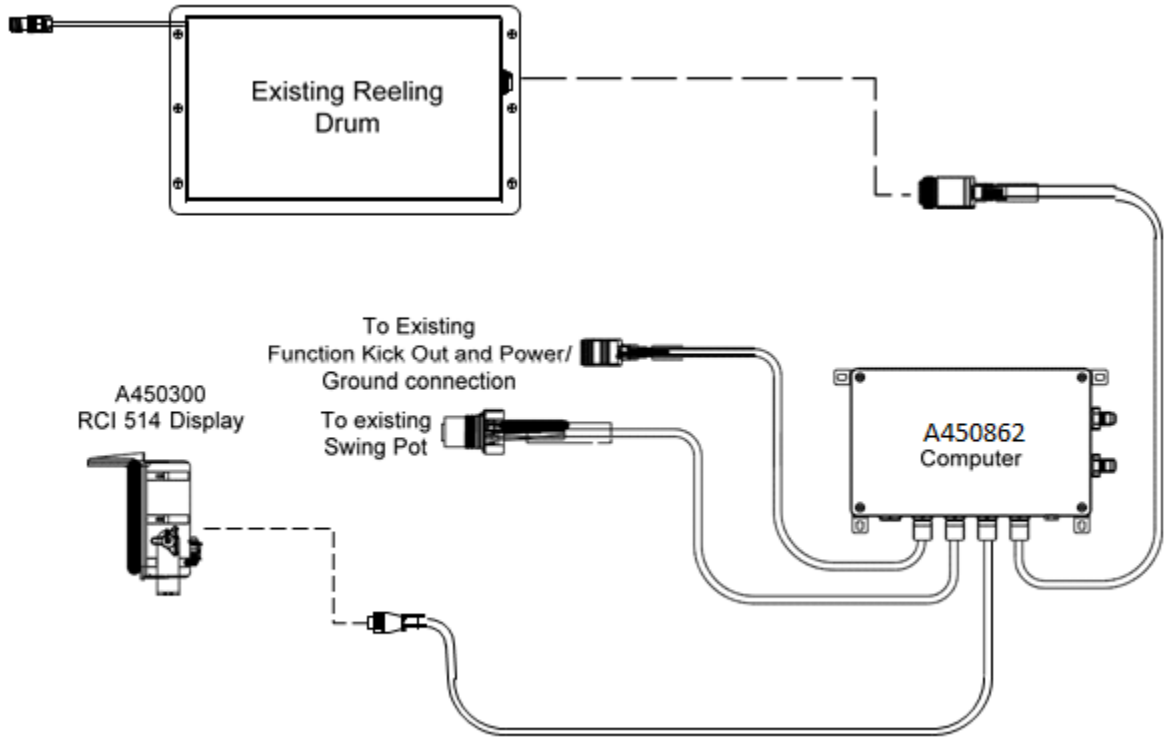
1.2 Upgrade Parts

1.2.1 A450862 Computer Assembly

The computer assembly includes a wiring harness adapted to integrate with the existing Link Belt crane wiring harness. Refer to the installation drawing below.

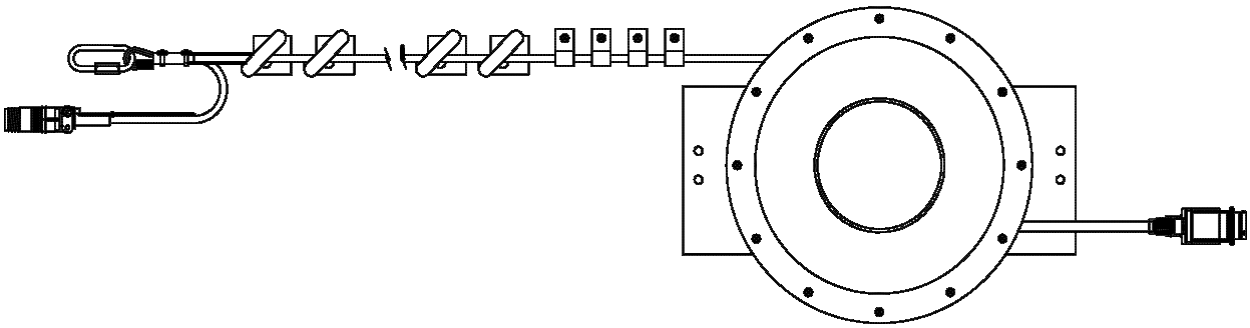
1.2.2 A450300 RCI 514 Display Module

This display module is designed specifically for upgrading Link Belt cranes and operates with Link Belt-style menus.



1.2.3 A240690 Reeling Drum

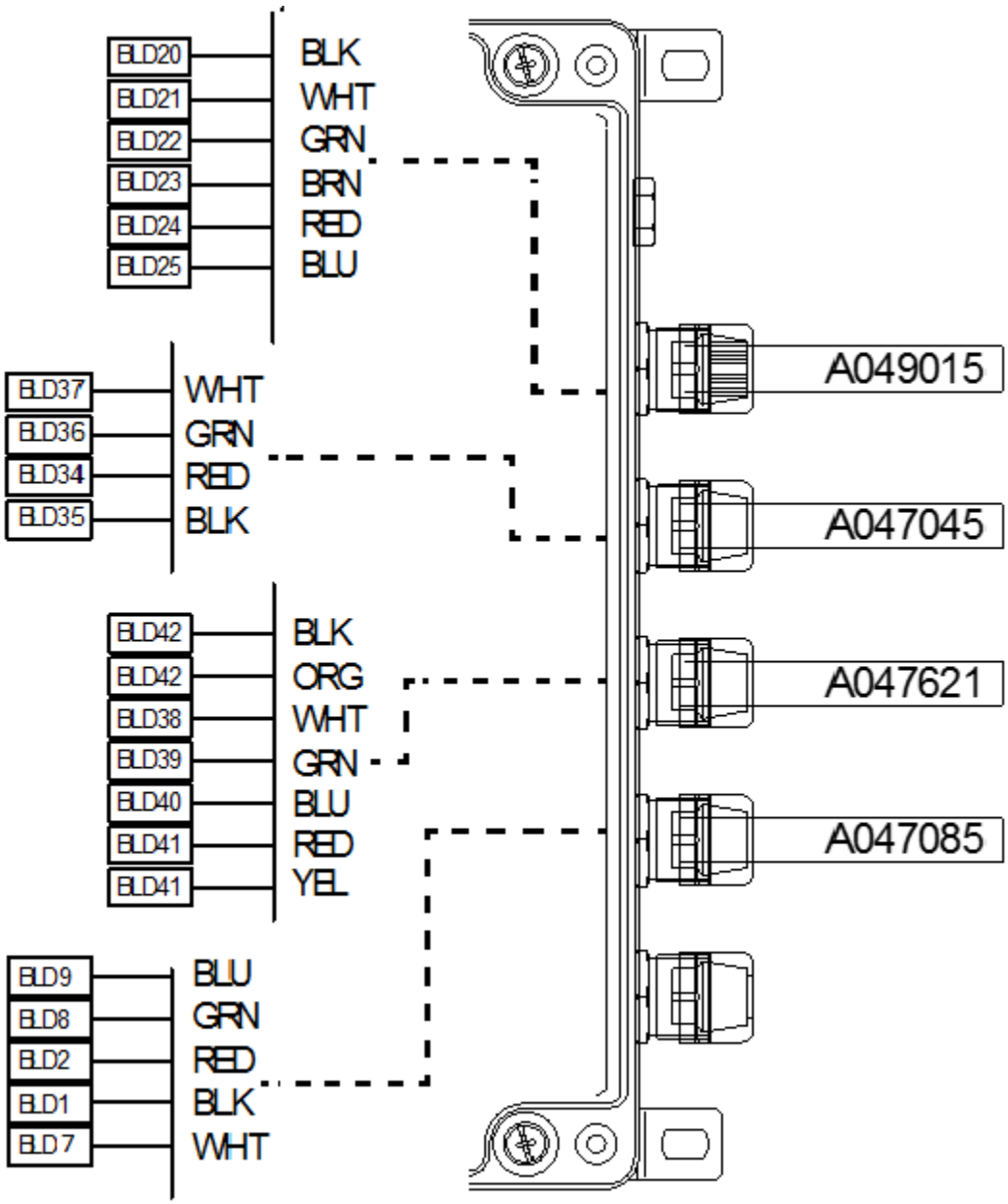
If you replace the existing reeling drum with A240690, you must also replace the guides for the Anti-Two-Block cabling. The guides support the level wind system of the reeling drum. The part number for the guides is K056005. This kit contains a brochure, W056005, explaining how to install the guides and obtain the best reeling drum performance.



1.3 Computer Wiring

The RCI 514 system wiring is based on the original wiring done by the factory. Greer Company cannot assume responsibility for color codes used on wiring done at the time of origin.

We have identified the wiring inside and outside of our computer module to assist in the wiring connections. It is the responsibility of the installer to identify the proper wire identifications and routings on the crane for connecting to the MG514 computer. Please reference the wiring diagram below for wiring designations



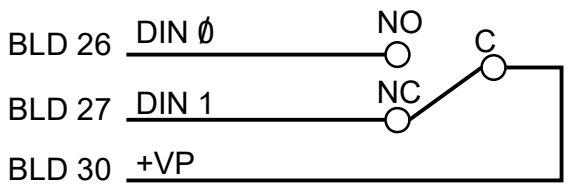
NOTICE: The white (WHT) wire on BLD7 is not required if the jumper wire between BLD3 and BLD7 is present.

S450612	A450862	Work Instruction
Connection	**Connection**	
JP3-1Battery 0V	BLD 1 Battery -VE	Connect to Frame Ground
System Power JP3-2	BLD 2 Battery +VE	Connect to Crane Power 12V - 36V (Fused at 10 Amp power source)
JP 5-1 Function Kick Out (FKO) Feed	BLD 7 FKO Feed	Incoming Crane Power for Function Kickout
JP 5-2 Solenoid Output	BLD 8 Solenoid Output	Power to Function Kick Out Solenoids on Crane
JP 5-3 Solenoid Output	BLD 9 Boom Mode	Power to Boom Mode
Connection	**Connection**	**Work Instructions**
JP 12-1 (Data "A")	BLD 38 (Data "A")	Display Communication connection
JP 12-2 (Data "B")	BLD 39 (Data "B")	Display Communication connection
JP 12-3 Reset	BLD 40 Reset	Reset line…..Usually Blue
JP 12-4 Display Power	BLD 41 Power	12V Power for Display
JP 12-5	BLD 42	Display Ground Wire
Connection	**Connection**	**Work Instructions**
JP9-1	BLD 26	Digital Input (12V)
JP9-2	BLD 27	Digital Input (12V)
JP9-3	BLD 28	Digital Input (12V)
JP9-4	BLD 29	Digital Input (12V)
	BLD30	12V Power Supply
Connection	**Connection**	**Work Instructions**
JP11-1	BLD 34	Drive Voltage for Swing Pot
JP 11-2	BLD 35	Ground Signal for Swing Pot
JP 11-3	BLD 36	Communication Connection
JP 11-4	BLD 37	Communication Connection
Connection	**Connection**	**Work Instructions**
JP8-1	BLD 20	Monitored Voltage Signal Anti 2 Block
JP8-2	BLD 21	Analog Signal from Ext. to Computer
JP8-3	BLD 22	Analog Signal from Angle to Computer
JP8-4	BLD 23	Monitored Voltage Signal Anti 2 Block
JP8-5	BLD 24	Protected 5 Volts (Drive Voltage)
JP8-6	BLD 25	Internal Ground (Drive Voltage)

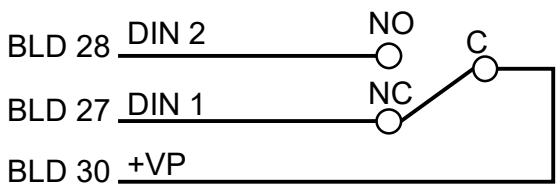
1.4 Units with Swing Switches

Some older units in the field may use swing switches instead of swing potentiometers, use the appropriate work area schematic.

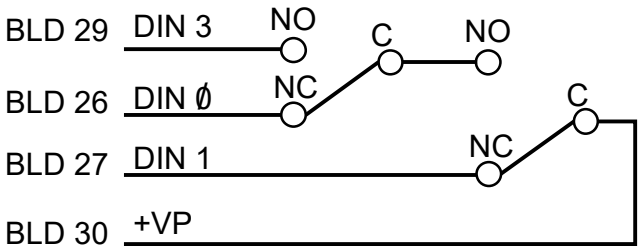
Description	Connection A450763		Work Instruction
Rear	BLD 26	DIN 0	Over Rear
Side	BLD 27	DIN 1	Over Side Chart
Front	BLD 28	DIN 2	Over Front Chart
Between Tires	BLD 29	DIN 3	Between Tires Chart
Power	BLD 30	VP+	Switched Power



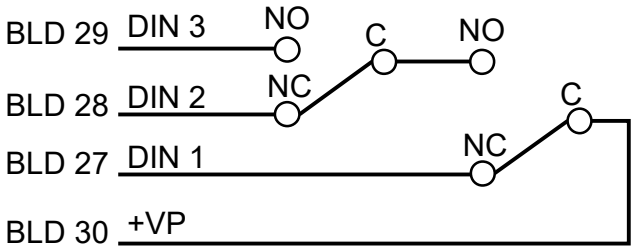
OVER REAR / 360



OVER FRONT / 360



INLINE / OVER REAR / 360



INLINE / FRONT / 360

1.5 Removal and Installation

1. Place the crane in rigging mode and raise the boom. This will allow access to the hose fittings and wiring harness connections.

NOTE: *Leave the Power and FKO cable connected to allow movement of the boom during the removal and installation process.*

2. Disconnect the reeling drum cable.
3. Disconnect the swing sensor.
4. Remove the display.
5. Remove the display cable.
6. Unscrew the four bolts and remove the old computer from its mounting and place computer on the deck.

NOTE: *Do not disconnect the power and FKO cables.*

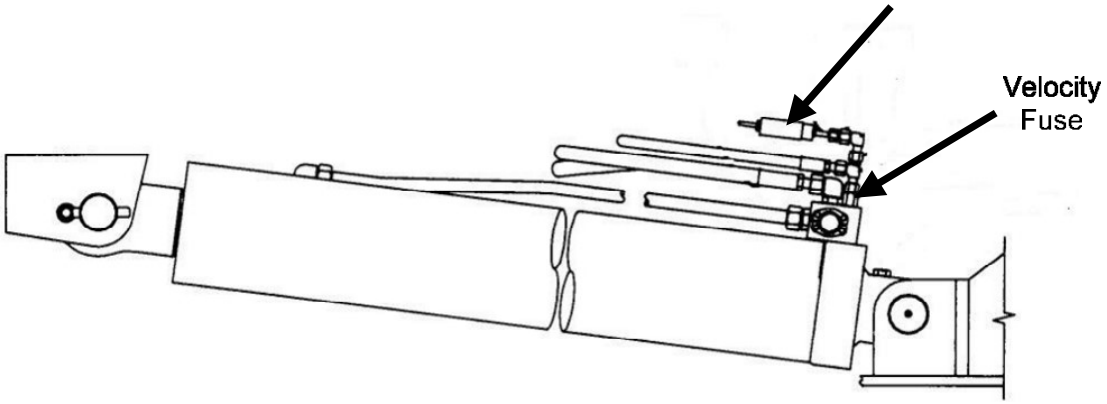
7. The new computer is smaller than the existing one. Mount the new computer using one of the existing bolt holes. Use the new computer as a template to drill three new mounting holes.
8. Screw in the remaining 3 bolts and ensure the computer is firmly attached.
9. Lower the boom completely. Remove the existing pressure sensors.
10. Install the new pressure hoses and retain the velocity fuses.

NOTE: *Install the velocity fuse In-line with base side pressure sensor. Ensure there is sufficient length for boom travel without stretching or damaging hoses.*

NOTE: *Install bleeder fittings at the cylinder. Obtain the fittings from your hose dealer.*

WARNING!

Failure to ensure the velocity fuse is correctly installed may cause a dangerous uncontrolled, downward movement of the boom in the case of hose failure.



11. Connect the new pressure hoses to the new computer.
12. Raise the boom.
13. If using the existing reeling drum, disconnect the reeling drum cable and remove. The new computer is wired with a new cable and only needs to be attached to the reeling drum. Install the display.
14. Install the display cable.

15. Install the power and FKO cables to the new computer.
16. Slowly elevate the boom to its Maximum Angle to ensure the pressure hoses and electrical cables are routed properly.

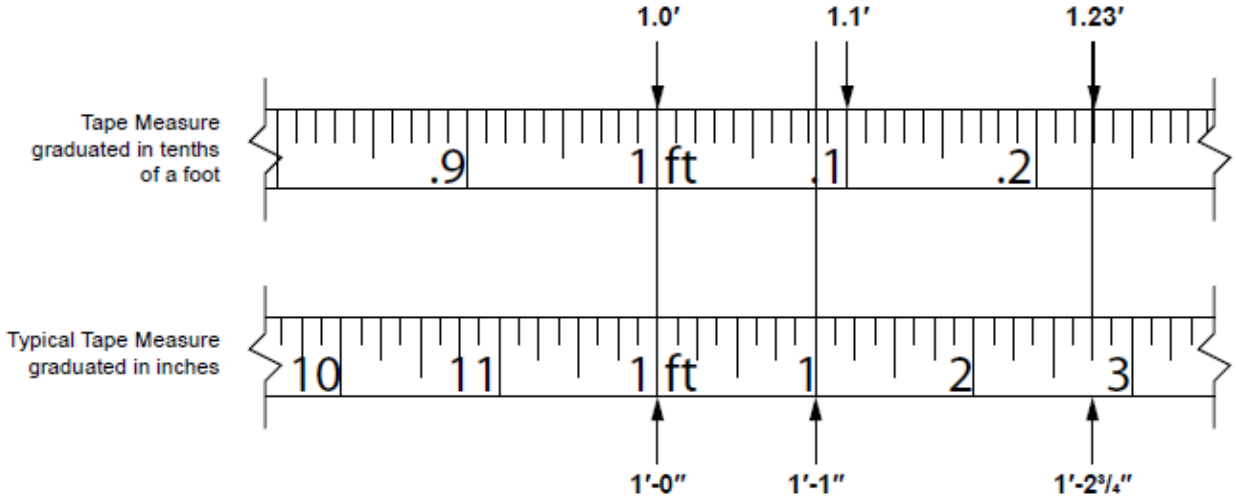
ATTENTION!

It is easy to misroute the pressure hoses and electrical cables. If misrouted, when the boom is raised the 1st time the hoses/cables can be damaged or destroyed. Use caution.

2.0 Calibration

2.1 Required Tools

- 1/4” nut driver or T15 Torx driver
- Digital or bubble level calibrated and accurate to 0.1° at level
- Digital volt/Ohm Meter capable of measurements to three decimal places
- 100 foot measuring tape: fiber type graduated in tenths of feet



NOTE: *The computer calculates measurements in feet and tenths of a foot, so using the correct tape measure is essential for entering the measurements.*

2.2 Number Conversion

If a standard tape measure is being used, convert the measurement into feet and tenths of a foot. For example: a distance of 35’–6” would be entered into the system as 35.5 feet. Whole inches can be easily converted by dividing by 12 (6/12=.5). Fractions of an inch are converted by dividing the numerator by the denominator.

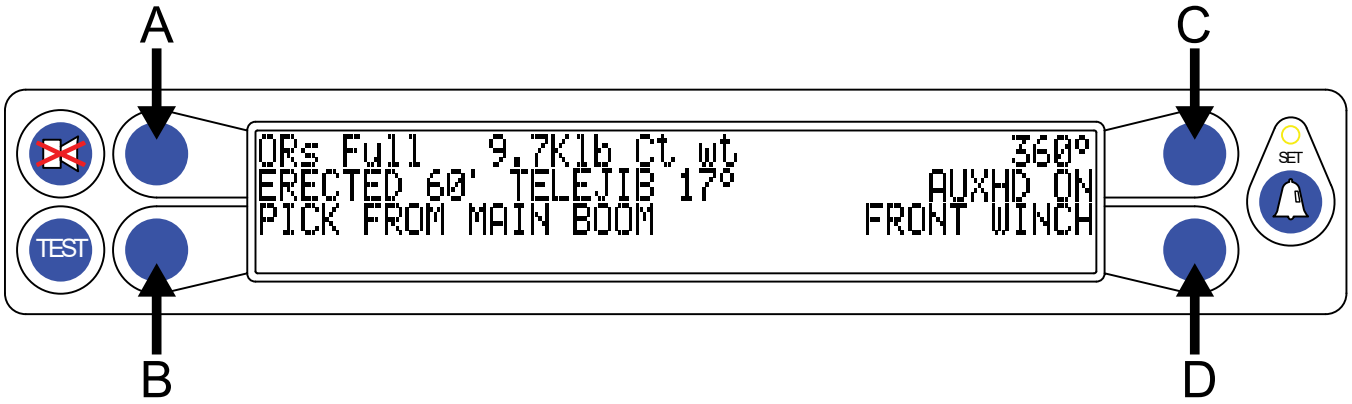
For example: 1/4 inches would be entered as .25 (1/4=.25). Conversion of whole inches and fractions of an inch (for example 6-1/4”) are converted by first converting the fraction to a decimal and then dividing by 12. In this case 6-1/4” is converted to 6.25 and then divided by 12 which equals 0.520. Refer to the Fraction to Decimal Conversion Chart.

When entering weights, convert the number by moving the decimal three places to the left. For example: enter 1,400 pounds as 1.4, enter 300 pounds as .300.

2.3 The MicroGuard 514 Display

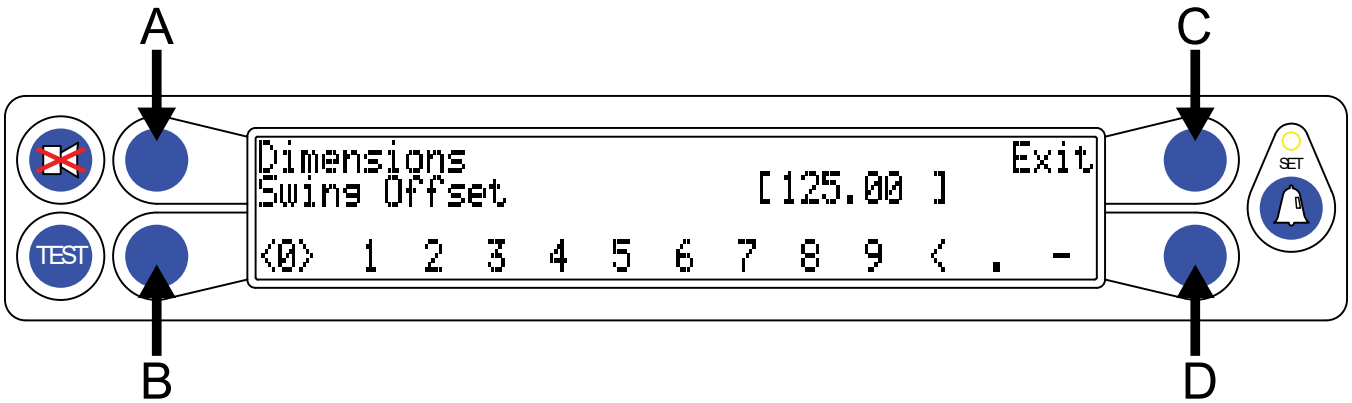
2.3.1 Command Entry

The ***A***, ***B***, ***C***, and ***D*** buttons are used most for the procedures described in this document and their function will vary depending on the routine being performed. Commands for each routine will show in the information window as text adjacent to the buttons. Follow the directions for each routine carefully.



2.3.2 Number Entry

The display does not have a numerical keypad so when numbers are required, the display will change to enable number entry.



Buttons ***B*** and ***D*** are used to scroll left and right. The “cursor” will appear as flashing < > brackets on either side of the number. Button ***A*** is used to enter the number. Button ***C*** is used to exit the number entry subroutine.

As each number is selected, press Button ***A*** to enter it into the system. The number will then appear in the [ ] brackets. Up to five numbers may be entered. When entering a negative value, enter the minus sign first, then enter the numbers and decimal. When all numbers are correct, press the ***C*** button to calibrate the complete number.

Example: To enter the value “-2.98”:

1. Press button ***B*** or ***D*** until the number “2” is selected (indicated by flashing < > brackets) and then press button A to enter the number.

NOTE: *If a number is entered incorrectly, select the backspace "<" and press button* ***A****.*

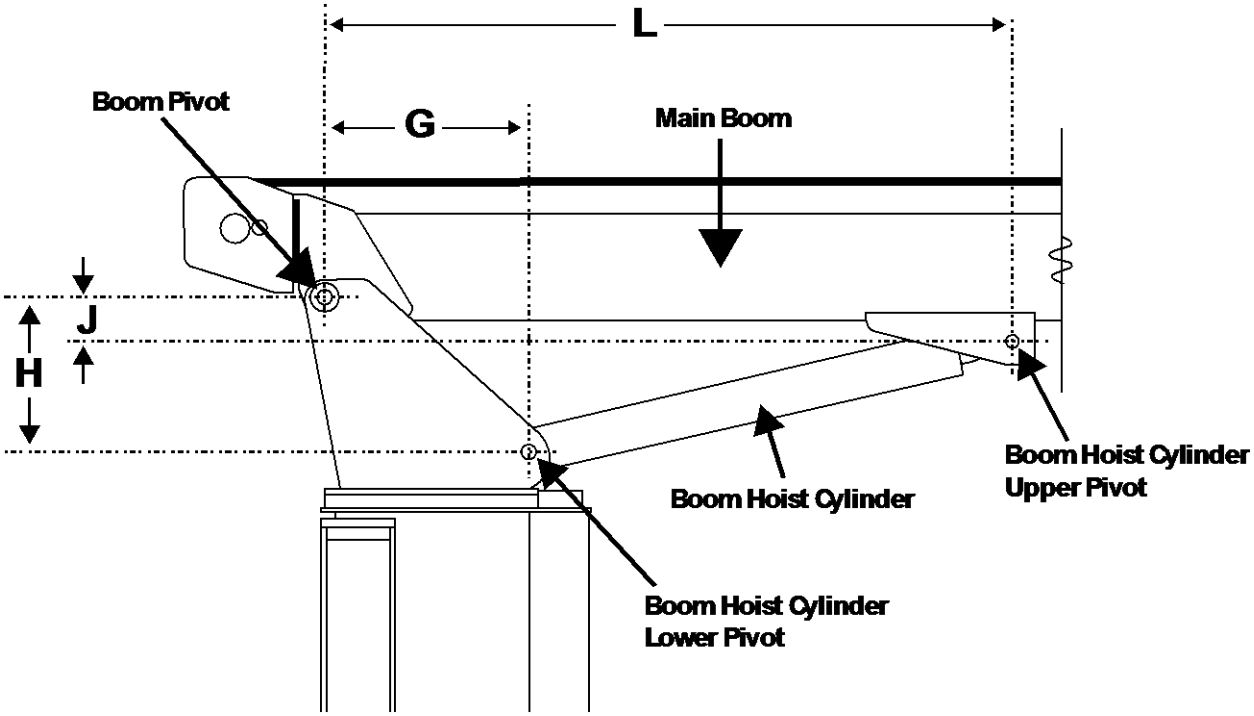
2. Select the decimal "." then press button ***A***.
3. Repeat steps 1 and 2, to enter the numbers "9" and "8".
4. After the numbers are entered, press button ***B*** or ***D*** until the minus sign "-" is selected and then press button ***A***.
5. If the value is correct, press button ***C*** to exit.

2.4 Preliminary Checks and Measurements

Record the following measurements and enter them into the system. Validate any data supplied by the crane manufacturer before calibration begins. Enter all dimensions into the computer in feet and tenths of a foot.

2.4.1 Boom Pivot Dimensions

The boom must be in a horizontal position (0°) when taking the following measurements. Use the space provided in Appendix A to record the measurements.



Dimension "L" – The horizontal distance between the center of the boom pivot and the center of the boom hoist cylinder upper pivot.

Dimension "J" – The vertical distance between the center of the boom pivot and the center of the boom hoist cylinder upper pivot.

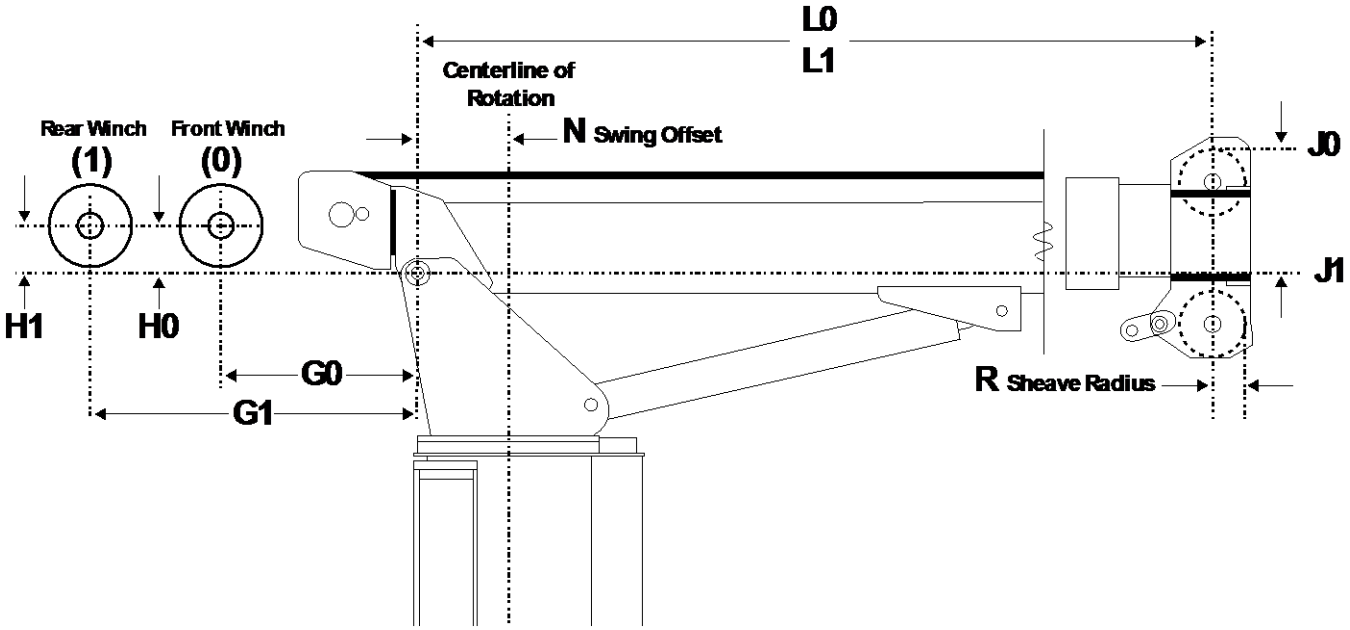
NOTE: *If the boom pivot is above the boom hoist cylinder upper pivot the dimension is negative (-).*

Dimension "G" – The horizontal distance between the center of the boom pivot and the center of the boom hoist cylinder lower pivot.

Dimension "H" – The vertical distance between the center of the boom pivot and the center of the boom hoist cylinder lower pivot.

USE THE SPACE PROVIDED IN APPENDIX A TO RECORD THE MEASUREMENTS.

2.4.2 Winch Dimensions



Dimension "G0" and "G1" – The horizontal distance between the center of the front and rear winch, and the center of the boom pivot.

Dimension "H0" and "H1" – The vertical distance between the center of the front and rear winch and the center of the boom pivot.

Dimension "J0" and "J1" – The distance between the top sheave and the centerline of the boom pivot parallel to the horizontal boom plane, (measurement may be identical).

NOTE: *If the boom pivot is above the boom hoist cylinder upper pivot as shown in the illustration, dimension "J" will be negative. It is important to indicate a positive (+) or negative (-) value.*

Dimension "L0" and "L1" – The distance between the centerline of the boom pivot perpendicular to the horizontal boom plane and the center of the bottom sheave (measurement may be identical).

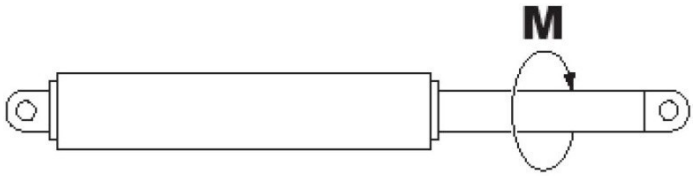
Dimension "N" Swing Offset – The horizontal distance between the center of the boom pivot and the centerline of rotation.

NOTE: *If the centerline of rotation is ahead of the boom pivot as shown in the illustration, the dimension will be negative. It is important to indicate a positive (+) or negative (-) value.*

Dimension "R" Sheave Radius – The distance between the center and the outside edge of the bottom sheave.

USE THE SPACE PROVIDED IN APPENDIX A TO RECORD THE MEASUREMENT.

2.4.3 Boom Cylinder Dimensions



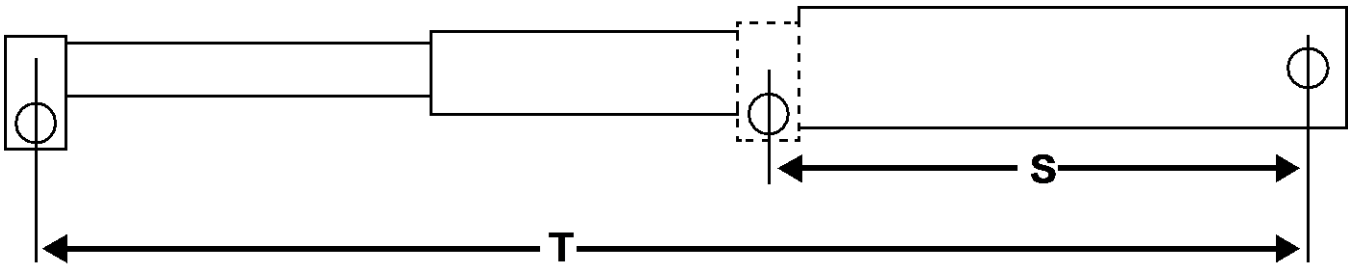
Dimension "M" – This is the distance measured around the outside of the cylinder rod, divided by 12. Then divide this number by 3.14. Record this number for entry into the system.

USE THE SPACE PROVIDED IN APPENDIX A TO RECORD THE MEASUREMENT.

2.4.4 Span Dimensions

WARNING!

SETTING SPANS ON THE CRANE WILL REQUIRE FULL EXTENSION OF THE BOOM. ENSURE THE CRANE IS SETUP ACCORDING THE MANUFACTURER'S OPERATION MANUAL TO ENSURE MAXIMUM STABILITY. ENSURE ALL BOOM EXTENSIONS AND LOADS ARE LIFTED WITHIN THE APPROPRIATE LOAD CHARTS AND LIMITS. FAILURE TO COMPLY WITH THESE LIMITS MAY RESULT IN SERIOUS INJURY OR DEATH.



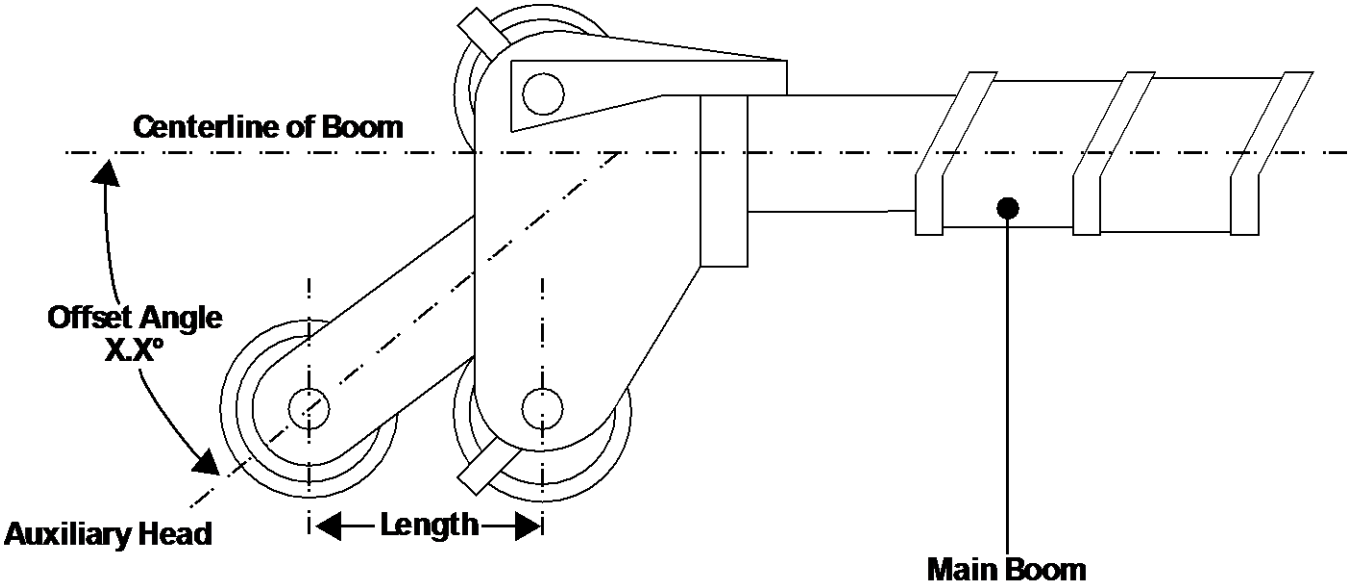
Dimension "S" – This is the distance between the center of the boom pivot and the center of the sheave with the boom fully retracted.

Dimension "T" – This is the dimension between the center of the boom pivot and the center of the sheave with the boom fully extended.

The span of the boom is calculated by subtracting **Dimension "S"** from **Dimension "T"** (T - S = span).

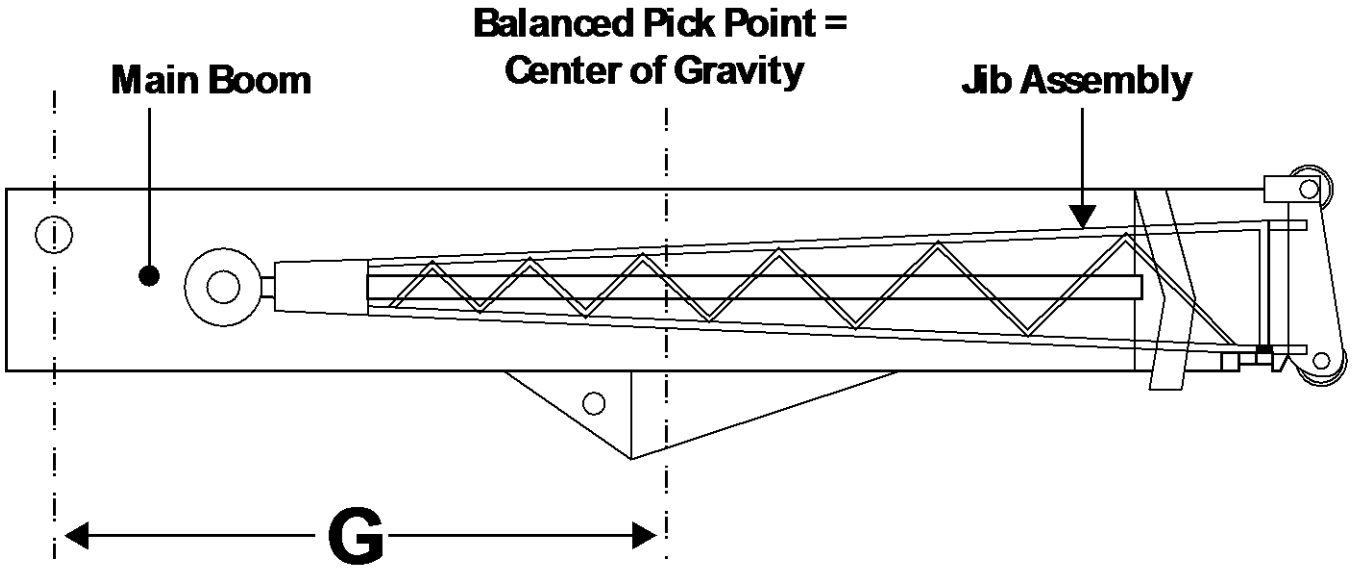
USE THE SPACE PROVIDED IN APPENDIX A TO RECORD THE MEASUREMENT.

2.4.5 Auxiliary Head Dimensions



USE THE SPACE PROVIDED IN APPENDIX A TO RECORD THE MEASUREMENT.

2.4.6 Stowed Jib Dimensions



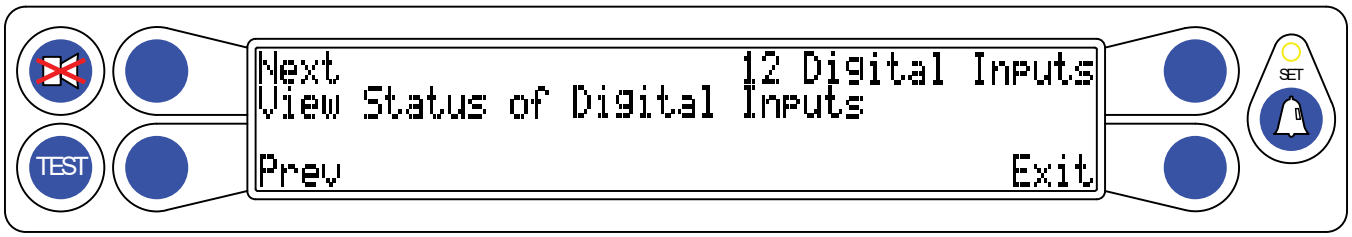
Dimension "G" – This is the distance between the center of the boom pivot and the center of gravity of the stowed jib.

USE THE SPACE PROVIDED IN APPENDIX A TO RECORD THE MEASUREMENTS.

2.5 Installation Checks

See programming publication W450700 for programming instructions.

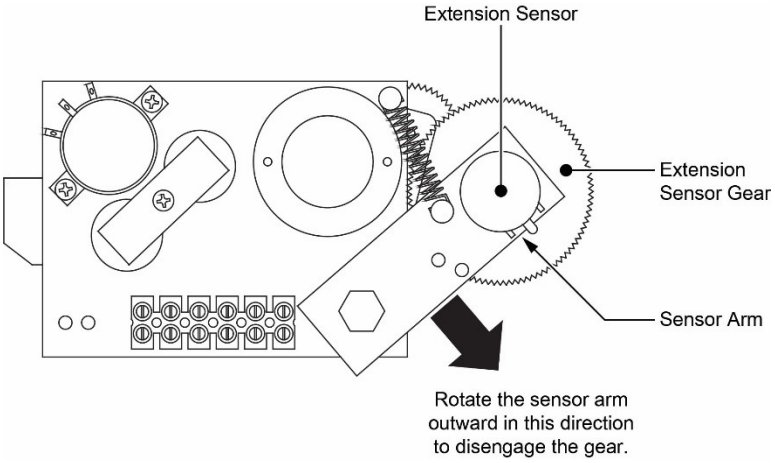
Check swing switches, if fitted. Use the digital monitor screen (located under **Menu 12 – Digital Inputs**) to ensure the switches operate properly.



2.5.1 Attaching the Anti-Two-Block (ATB) Cable and Extension Sensor Zero

Ensure the extension sensor clutch is properly set for “0”, and the spring is properly pre- tensioned by following this procedure:

1. Fully retract the boom assembly and remove the reeling drum cover.
2. Slowly rotate the reeling drum clockwise until a “click” is heard, indicating that the power spring clutch is engaged.
3. Turn the reeling drum counterclockwise five (5) complete turns and physically restrain it from moving.
4. Remove enough cable from the drum (three wraps = 10 feet) to reach the boom tip, leaving enough extra cable to reach the Anti-Two-Block hardwire.
5. Install a strain relief on the cable.
6. Pull the extension potentiometer downward against the tension spring enough to rotate the gear clockwise. Continue until the potentiometer reaches the end of the travel and the clutch drags.
7. Pre-tensioning of the reeling drum is complete, and the extension sensor is properly set for calibration.



2.6 Entering Calibration Data

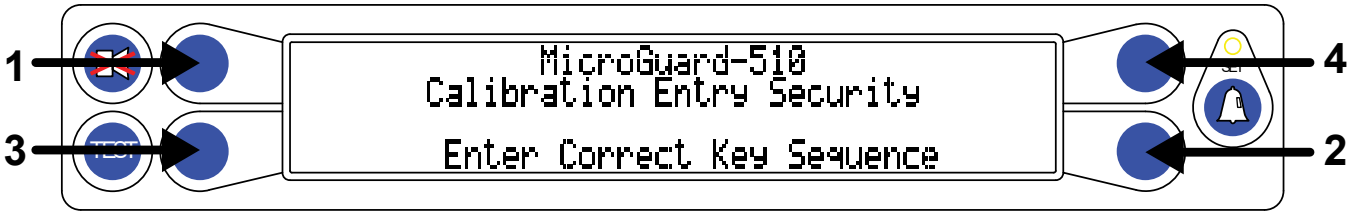
WARNING!

WHEN THE SYSTEM IS IN CALIBRATION MODE, AUTOMATIC OVERLOAD CONTROLS ARE DISABLED. THE CRANE OPERATOR IS RESPONSIBLE FOR PROPER LOADING OF THE CRANE WHILE PERFORMING CALIBRATION.

To enter the calibration data, it is necessary to put the system in calibration mode. Once in calibration mode, there is only five (5) seconds to enter the security code sequence.

To enter the calibration mode:

1. Simultaneously press the ***TEST*** and ***SET*** buttons. The audible alarm will sound and the user will be prompted to enter the security code.
2. Enter the security code in the order shown:



3. The system is now in calibration mode and ready to receive calibration data. Use the ***Next*** and ***Prev*** buttons to scroll through the following menus:

00 Error codes – Displays system information and error codes.

01 Crane Data – Used to reset the crane personality data.

02 Dimensions – Used to enter the crane geometry dimensions previously recorded.

03 Zero Sensor – Used to set the zero point for extension and angle sensors.

04 Span Sensors – Used to insert numbers for extension and angle sensors.

05 Swing Potentiometer – Used to set the zero point and direction for the swing potentiometer.

06 Pressure – Used to calibrate the lift cylinder dimensions and load.

07 Radius/Moment – Used to calibrate the radius and moment for the main boom.

08 Boom Deflection – Used to calibrate deflection for the main boom and attachments.

09 Head Angle – Used to enter boom head angles.

10 Erected Attachments – Used to calibrate the erected attachments.

11 Enable Winches – Used to enable and disable winches.

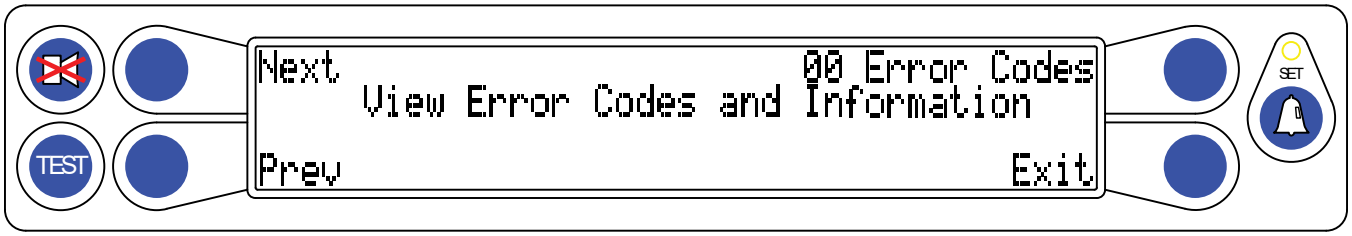
12 Digital Inputs – Used to view status of digital inputs.

13 Pressure Monitor – Used to view cylinder pressures in PSI.

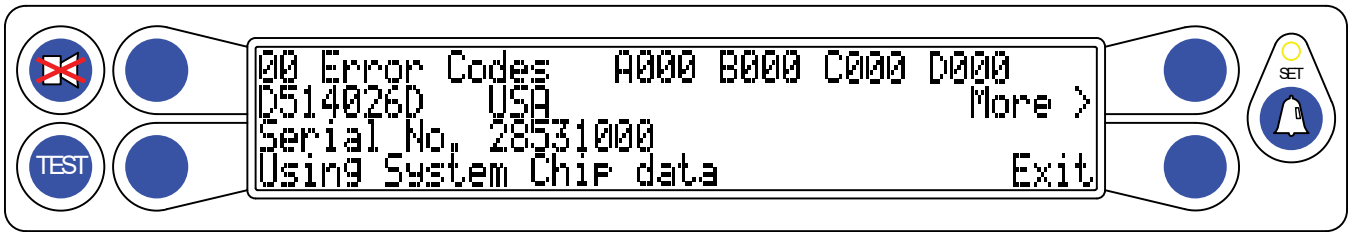
2.6.1 Menu 00 – Error Codes

This menu displays error code and system information

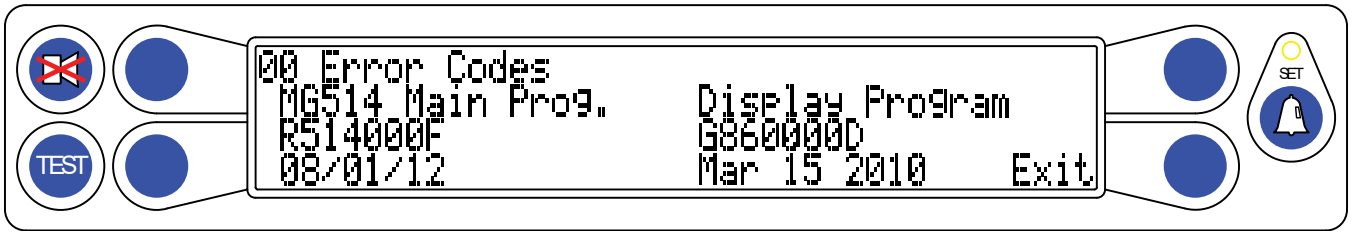
1. Press the ***Next*** or ***Prev*** button until “00 Error Codes” appears at the right of the information window.



2. Press the ***00 Error Codes*** button to enter the routine. The following information is displayed:
   a. System error codes.
   b. Computer serial number (should match the number on the label on the enclosure).
3. Press the ***Exit*** button to leave the routine or press the ***More*** button to view additional system information. The following crane specific file codes are displayed:



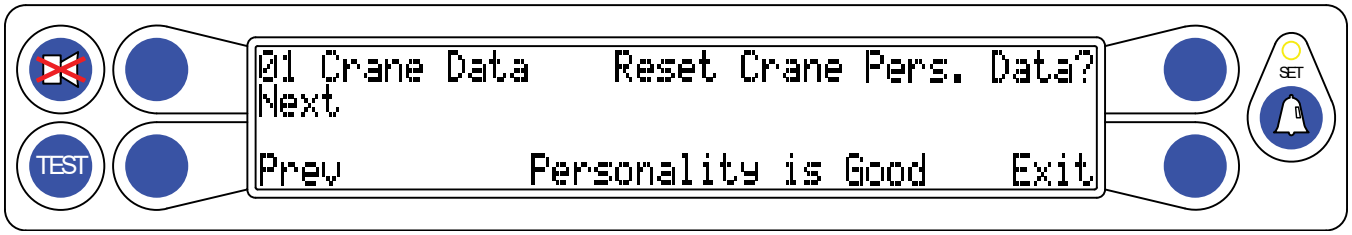
4. When you have finished, press the ***Exit*** button to leave the routine



2.6.2 Menu 01 – Crane Data

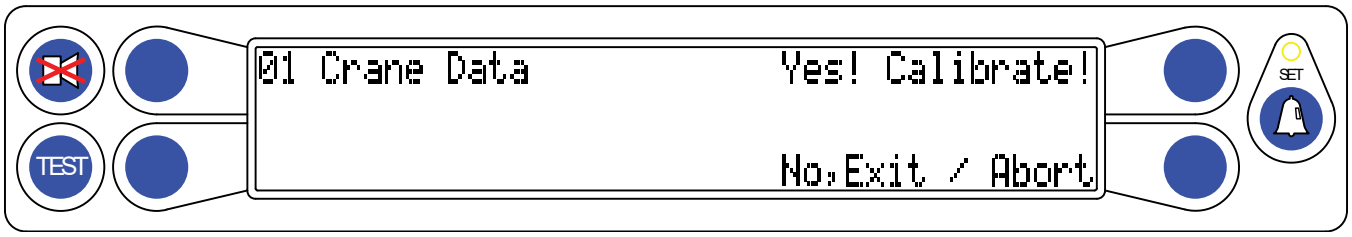
This menu displays the personality data.

1. Press the ***Next*** or ***Prev*** button until “01 Crane Data” appears at the right of information window.
2. Press the ***01 Crane Data*** button to enter the routine.
3. If the system has been reset and is functioning correctly, the display will read “Personality is good.” If there is no crane data present, or if the system has become corrupt, the display will read “Personality not in use.”
4. To reset the entire system, press the ***Reset Crane Data*** button. This function will erase the personality memory which stores crane specific information and dimensions. It will also copy any known data from the flash applications file to the working memory for use by the system.



NOTE: *No calibration may be modified unless “Personality is good” is displayed.*

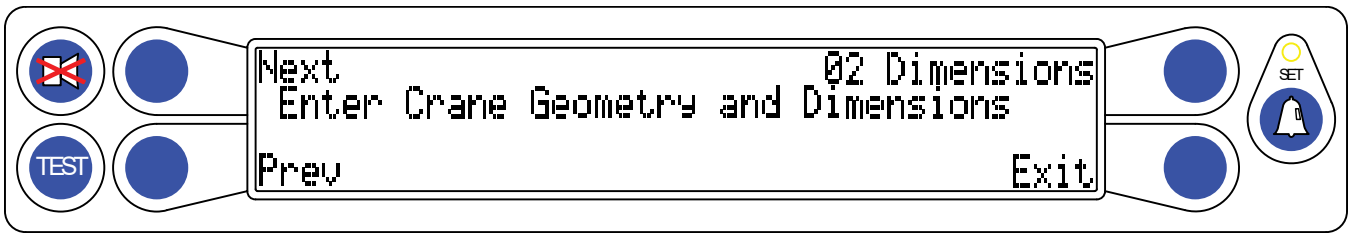
5. To reset crane data, press the ***Reset Crane Data?*** button.
6. Then, press the ***Yes! Calibrate!*** button, or to exit without resetting, press the ***No, Exit/Abort*** button.



7. The system will prompt the user to “Enter Cal Seq...”, this is the same button combination used to enter calibration mode. The display will show “Calibrating...”.
8. When it has finished, it will return to the main routine menu. The display will read “Personality is good”, indicating a successful transfer of data.

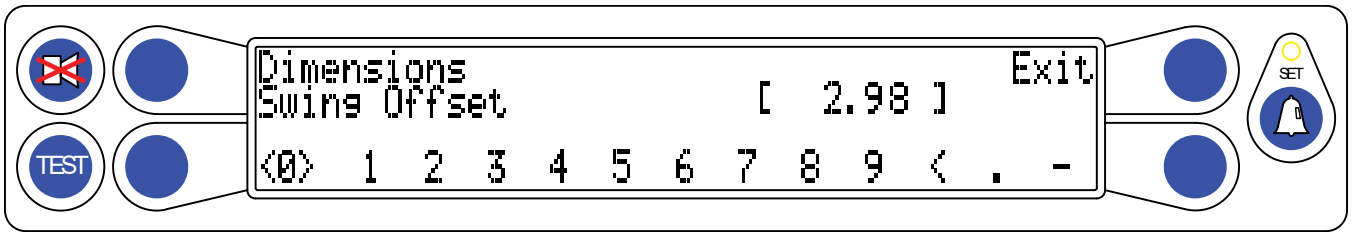
2.6.3 Menu 02 - Dimensions

Use this menu to enter the previously recorded physical dimensions of the crane.



1. Press the ***Next*** or ***Prev*** button until “02 Dimensions” appears in the right of the information window.
2. Press the ***02 Dimensions*** button to enter the routine.
3. Press the ***Swing Offset X.X*** button.
4. Enter the value for the swing offset. The only time this measurement will be positive, is if the boom pivot pin is in front of the center of rotation.
5. Use the buttons adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number.
6. Use the ***Swing Offset*** button to enter the number. When complete, the menu will automatically change to enter the next value.
7. To skip to the next value, press the ***Exit*** button.

NOTE: *Enter numbers in feet and tenths (XX.XX). Enter negative values when appropriate.*

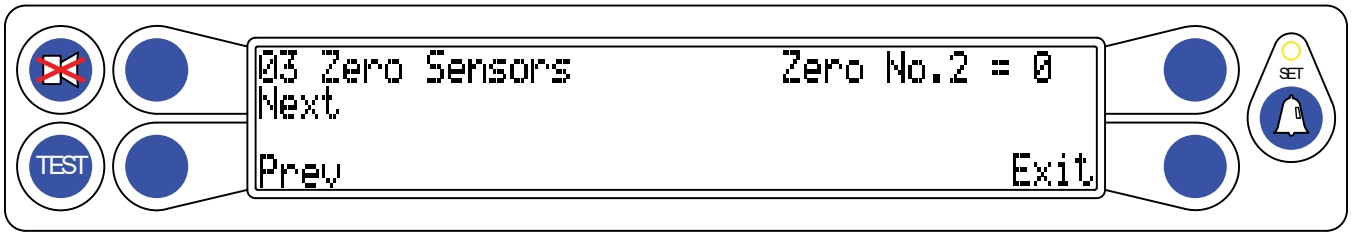


8. Enter the remaining values. After each value is entered, the menu will automatically change to enter the next value. When all values have been entered, the main menu will be displayed.

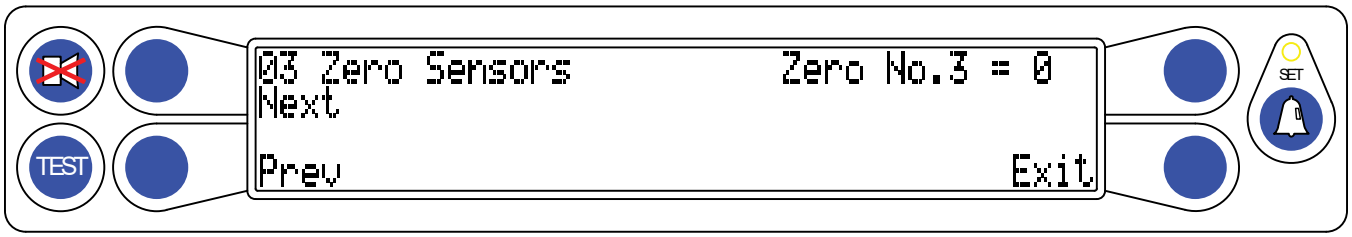
2.6.4 Menu 03 - Zero Sensors

This menu allows the user to enter the zero point of the extension sensor.

1. Ensure the boom is completely retracted and at 0°. Verify with a digital level.
2. Press the ***Next*** or ***Prev*** button until “03 Zero Sensors” appears in the right of the information window.
3. Press the ***03 Zero Sensor*** button to enter the routine.
4. Press the ***Zero Extension? = XXX*** button.
5. The extension sensor will now show “Zero No.2 = 0”.



6. Press the ***Next*** button to enter the zero point for the angle sensor. This is done using the digital level.
7. Press the ***Zero No. 3 =X.XX*** button.
8. The angle sensor will now show “Zero No. 3 = 0”



2.6.5 Menu 04 - Span Sensor

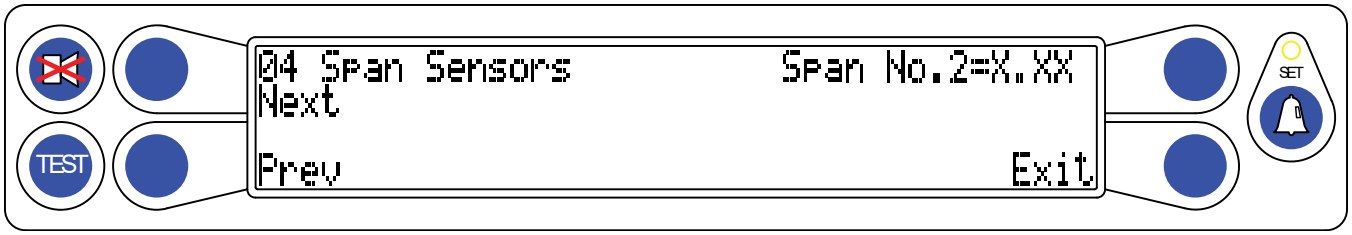
This menu allows the user to enter the values for the Span Sensor and Angle Span.

1. Press the ***04 Span Sensors*** button to enter the routines for spanning the Angle and Extension Sensors.

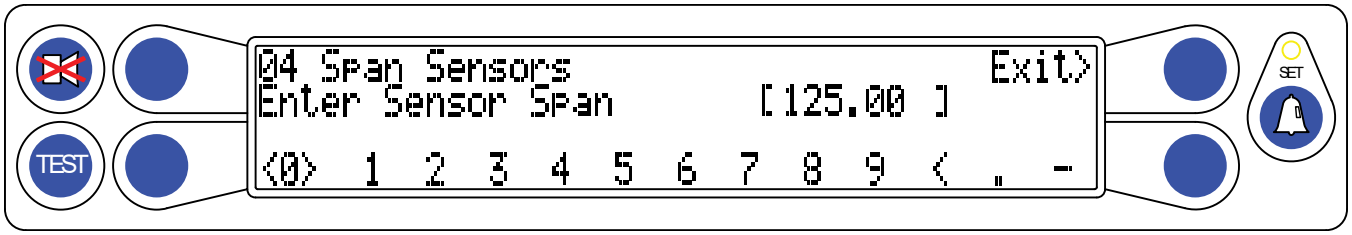
WARNING!

ENSURE THE AREA AROUND THE CRANE IS SAFE PRIOR TO EXTENDING THE BOOM.

2. Raise the boom to at least a 60° angle. Verify with a digital level.
3. Ensure the crane setup is adequate, then raise the boom and fully extend the boom sections.
4. Press the ***Next*** button to access the "No. 2 = XX.XX." Press the ***No. 2 = XX.XX*** button to calibrate the span for No. 2.



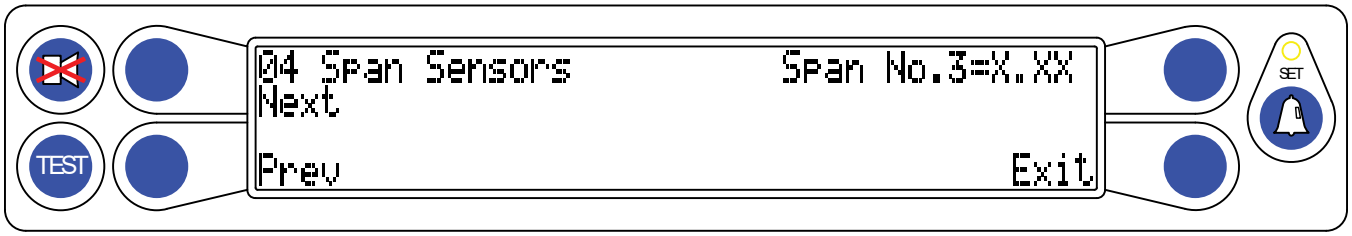
5. Press the ***Yes! Calibrate!*** button to access the Number Entry screen for Extension Span.
6. Enter the Span Number for extension using the numbers calculated from the pin-to-pin boom measurement.



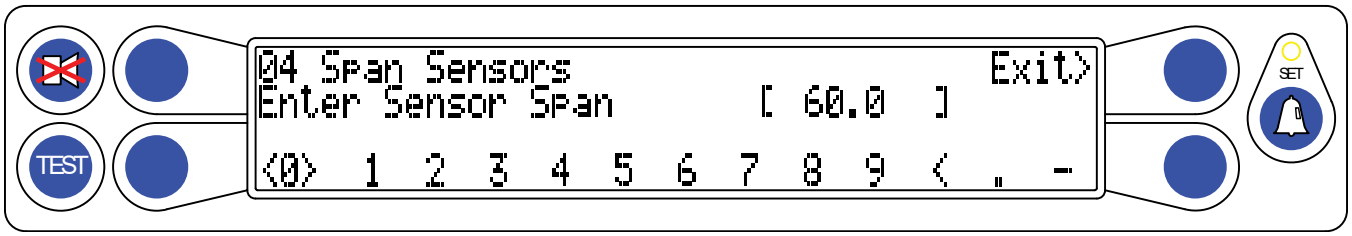
7. After number entry, press the ***Exit*** button and the display will return to the span No. 2 Menu.

2.6.5.1 Angle Span

1. Press the ***Next*** button on the left hand side of the screen to span the angle sensor.
2. With the boom still elevated to 60+ degrees, Press the ***Span No. 3 =*** button and after verification, the display will access the number entry screen for Angle Span.



3. Take the angle span number from the digital level and enter into the system. After entry, the boom angle screen should be in agreement with the digital level.

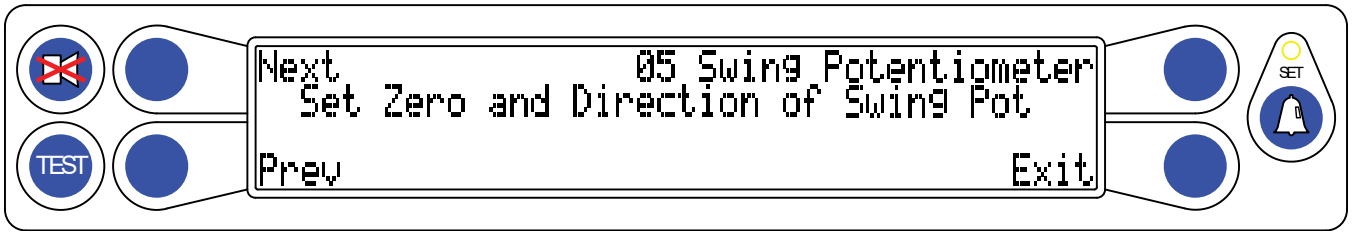


4. When entry is complete, press the ***Exit*** button twice to return to the main calibration menu.

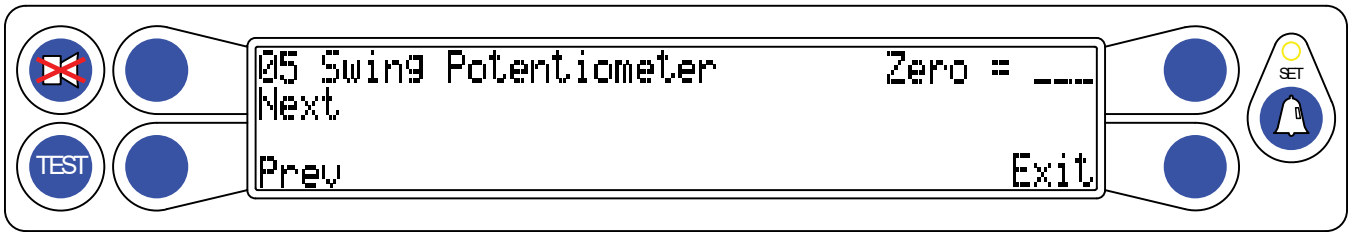
2.6.6 Menu 05 - Swing Potentiometer (If Equipped)

This menu is used to enter the zero point and the swing direction of the swing potentiometer (if equipped). The swing potentiometer is located in the collector ring assembly under the hydraulic swivel. The job of the potentiometer is to track the movement of the upper half of the crane all the way around the swing circle. This function can only be zeroed in the stowed, or house lock positions, and the numbers should count up, when rotating to the right or in a clockwise direction. If no swing potentiometer is present, calibration is not required.

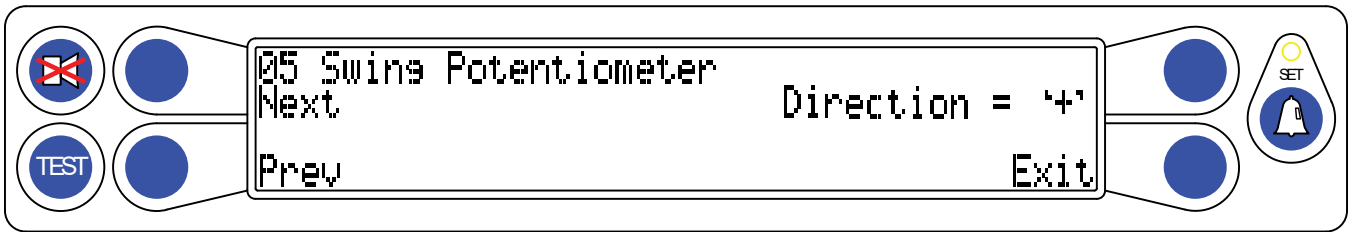
1. Press the ***Next*** or ***Prev*** button until “05 Swing Potentiometer” appears in the information window at the right.
2. Press the ***05 Swing Potentiometer*** button to enter the routine.



3. Stow the boom in “road travel” mode. Press the ***Zero = ----*** button.



4. The swing is now zeroed.
5. Next, raise the boom out of the rest and rotate to the right. The number by “Zero = 0” should increase.
    a. If not, press the **Next** button and then press ***Direction =*** button and the “+” will change to a “-” and the direction will be reversed.



6. Press the ***Next*** button to view the Remove Swing pot command. Use this command to remove the swing pot if the crane is equipped with swing switches. It may be used as a troubleshooting tool and is not part of the calibration routine.
7. Press the ***Exit*** button to return to the main menu.

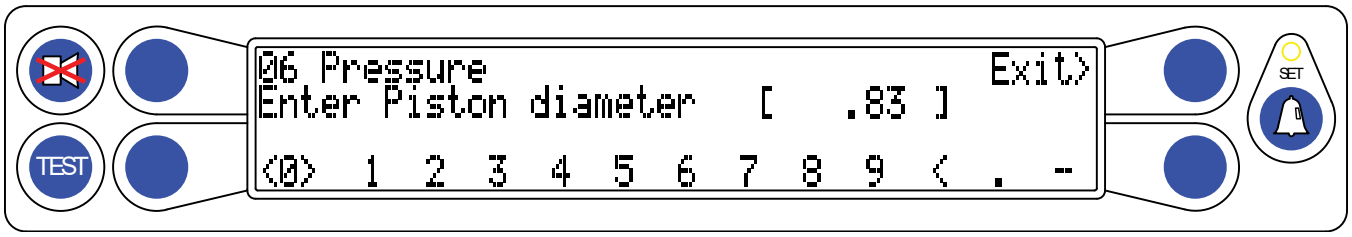
2.6.7 Menu 06 - Pressure

This menu is used to determine the pressure of the boom hoist cylinder. A calibrated load is needed to calculate the diameter of the boom hoist cylinder. Use a load approximately 80% of the single part load rating. If a smaller weight is all that is available, extend and/or lower the boom to about 55° to induce higher pressure in the base of the cylinder.

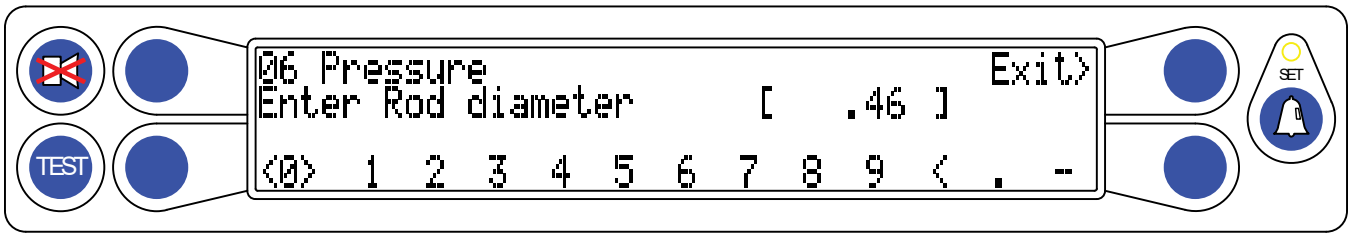
1. Press the ***Next*** or ***Prev*** button until “06 Pressure” appears in the information window at the right.

NOTE: *Pressure cannot be calibrated until the L, J, G, and H dimensions have been calculated and entered into the system.*

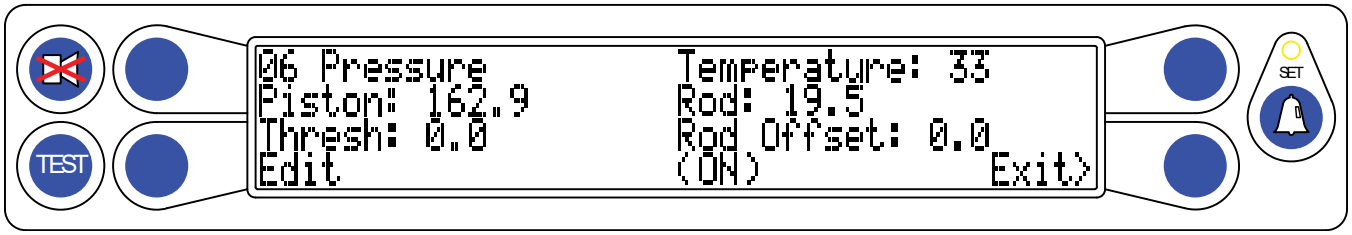
2. Press the ***06 Pressure*** button to enter the routine.
3. Enter the piston diameter. If not, press the ***Exit*** button.



4. Enter the rod diameter. If not, press the ***Exit*** button.

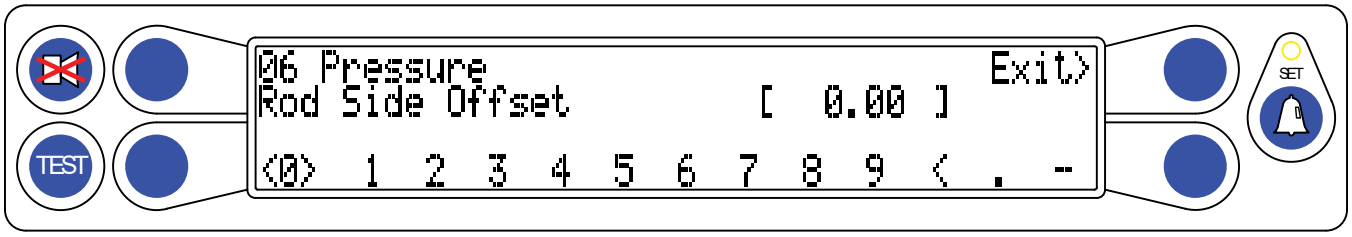


5. Press the ***Pressure Monitor*** button.
6. With the boom slightly raised, examine the piston and rod side pressures. The rod pressure should be close to zero with the piston pressure indicating a higher value. When lowering the boom, the base pressure should be close to zero with the rod pressure indicating a higher value.

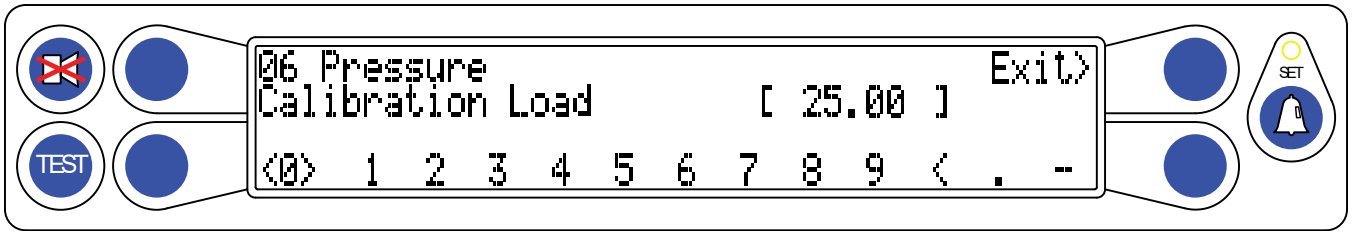


7. Press the ***Edit*** button if the Pressure Threshold or Rod Side Offset need to be adjusted.

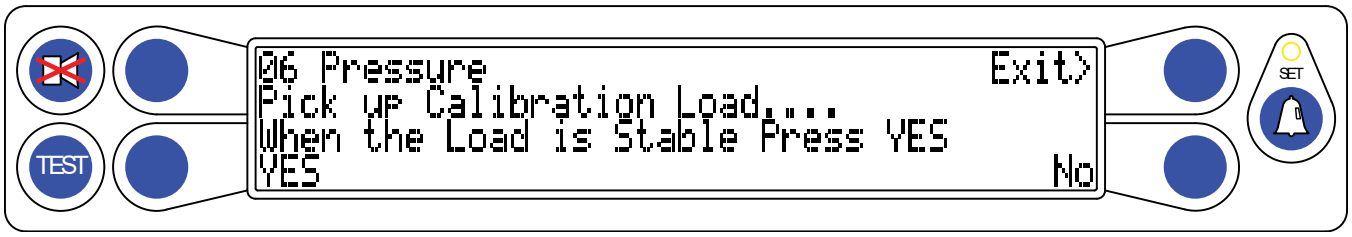
8. Press ***Exit*** to return to the top menu.
9. When finished with the Pressure Threshold, press the ***Exit*** button to access the Rod Side Offset.



10. Press the ***Exit*** button to return to the top menu.
11. Press the ***06 Pressure*** button.
12. Press the ***Calibrate*** button.
13. Enter the weight of the calibration load including all shackles and hook weights, in thousandths of pounds. Example: Enter 1,400 pounds as 1.4.



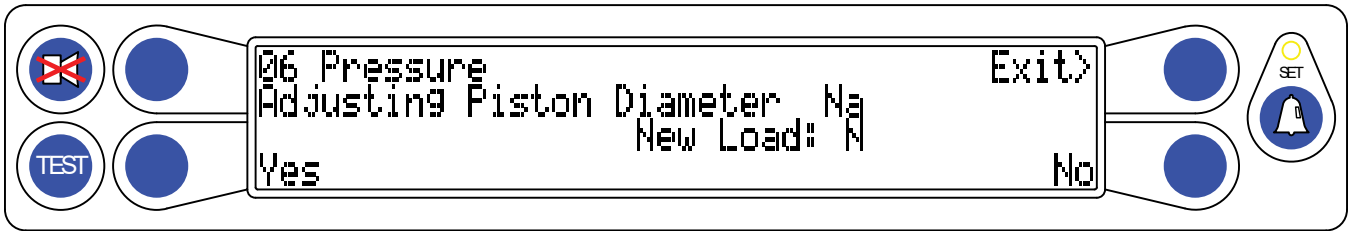
14. Pick up the calibration load and allow it to settle. Press the ***Yes*** button to continue. (Pressing the ***No*** button will exit the routine.)



15. Measure the radius of the suspended load and enter the measurement.
16. Set down the calibration load, hook block and load handling equipment. Allow it to settle and press the ***Yes*** button. Pressing the ***No*** button will exit the routine.

17. Pick up the calibration load and allow it to settle. Press the ***Yes*** button to continue. Press the ***No*** button to exit the routine.

NOTE: *The following screen will only appear briefly while calibration is completed, unless there is an error as shown here. If there are no errors, the top level menu will appear next.*



18. If the proper result is not achieved and the dimensions are correct, adjust the piston diameter to achieve the proper weight. Note the existing diameter.

2.6.8 Menu 07 - Radius/Moment

This menu is used to calibrate the radius and moment of the boom.

1. Press the ***Next*** or ***Prev*** buttons until “07 Radius/Moment” appears in the information window at the right.

WARNING

ENSURE THE CRANE IS SET UP IN ACCORDANCE WITH THE MANUFACTURER’S OPERATION MANUAL FOR MAXIMUM STABILITY. ENSURE THAT ALL BOOM EXTENSIONS AND LOADS LIFTED ARE WITHIN THE APPROPRIATE LOAD CHARTS AND LIMITS. FAILURE TO COMPLY WITH MANUFACTURER’S LIMITS MAY RESULT IN SERIOUS INJURY OR DEATH.

IMPORTANT!

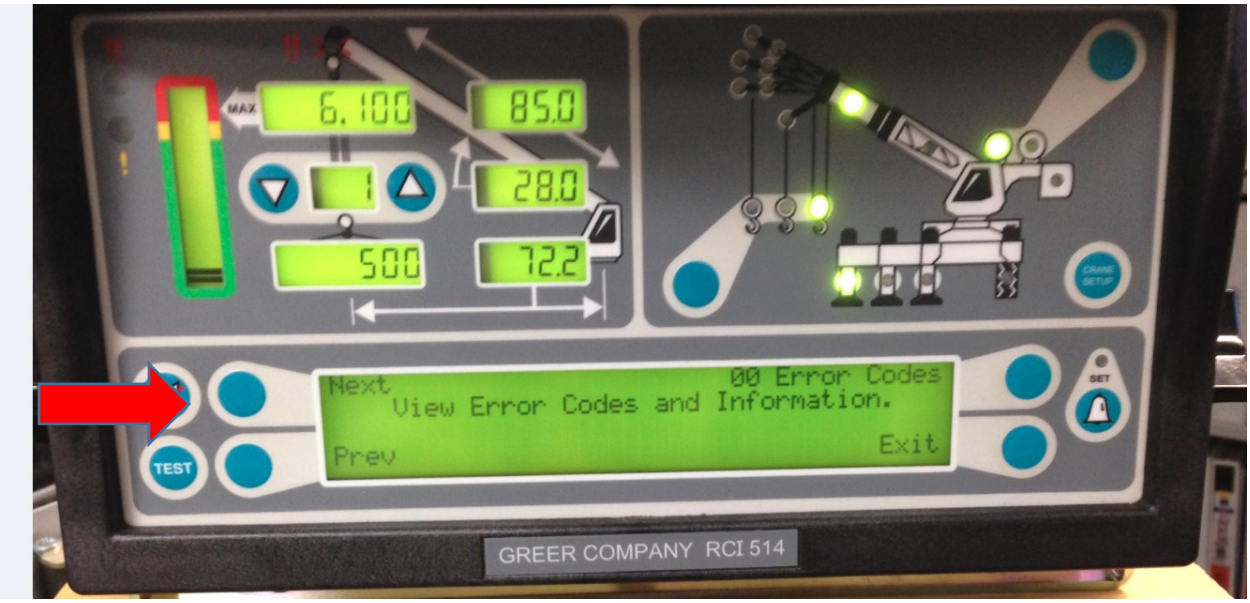
ANY ATTACHMENTS ON THE SIDE OR TIP OF THE BOOM DURING THESE TESTS CAN CAUSE INACCURACY IN THE MAIN BOOM MOMENT IF THE SETUP OR STORED INFORMATION IS INCORRECT.

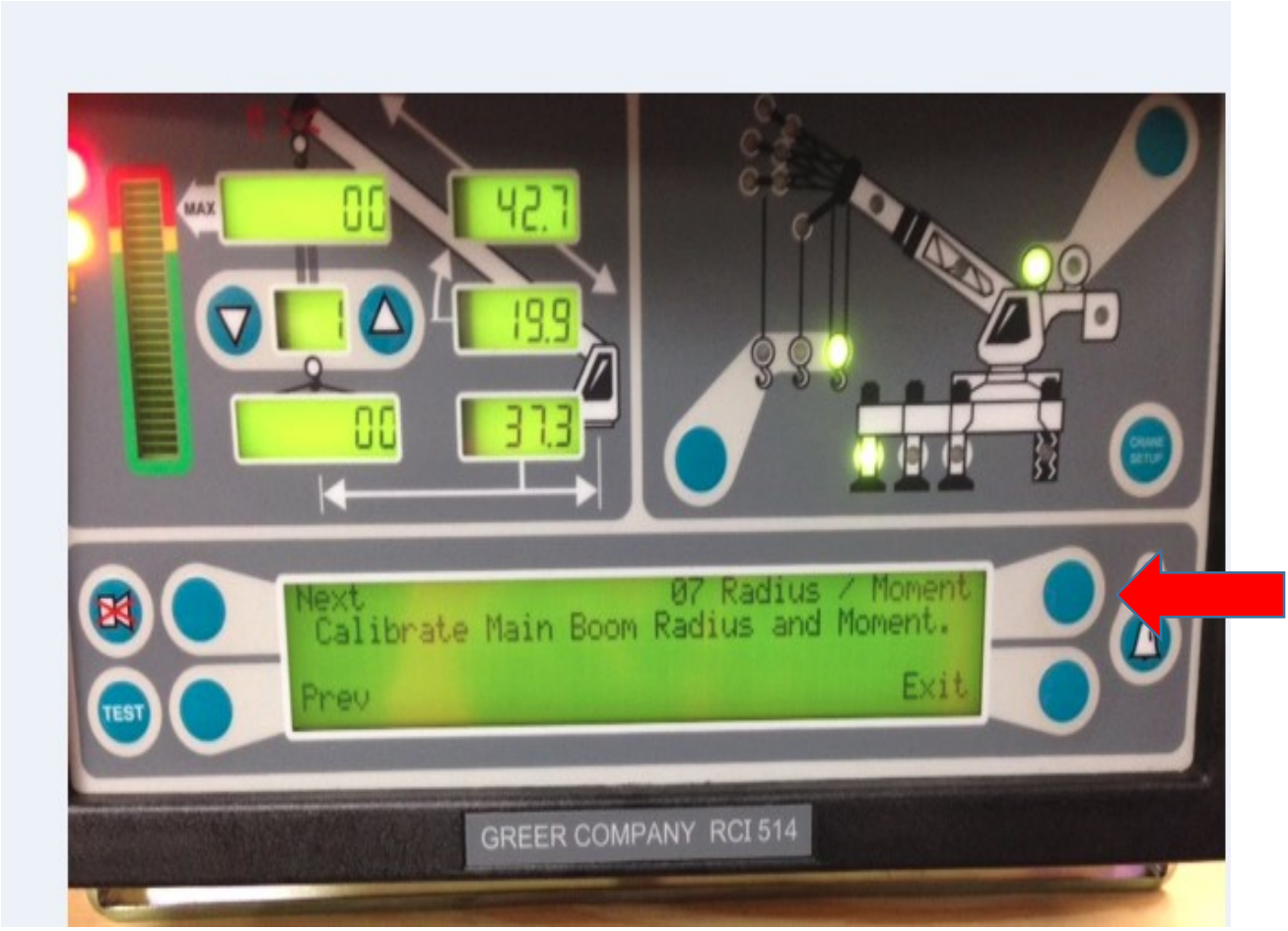
RCI514 Radius Moment Calibration

BOOM MODE A: Perform two Radius Moments, fully retracted and fully extended.

BOOM MODE B: Perform four Radius Moments at fully retracted, ½ Boom Length, ¾ Boom Length and fully extended.

Enter Calibration Mode and press Next button to menu to 07 Radius / Moment



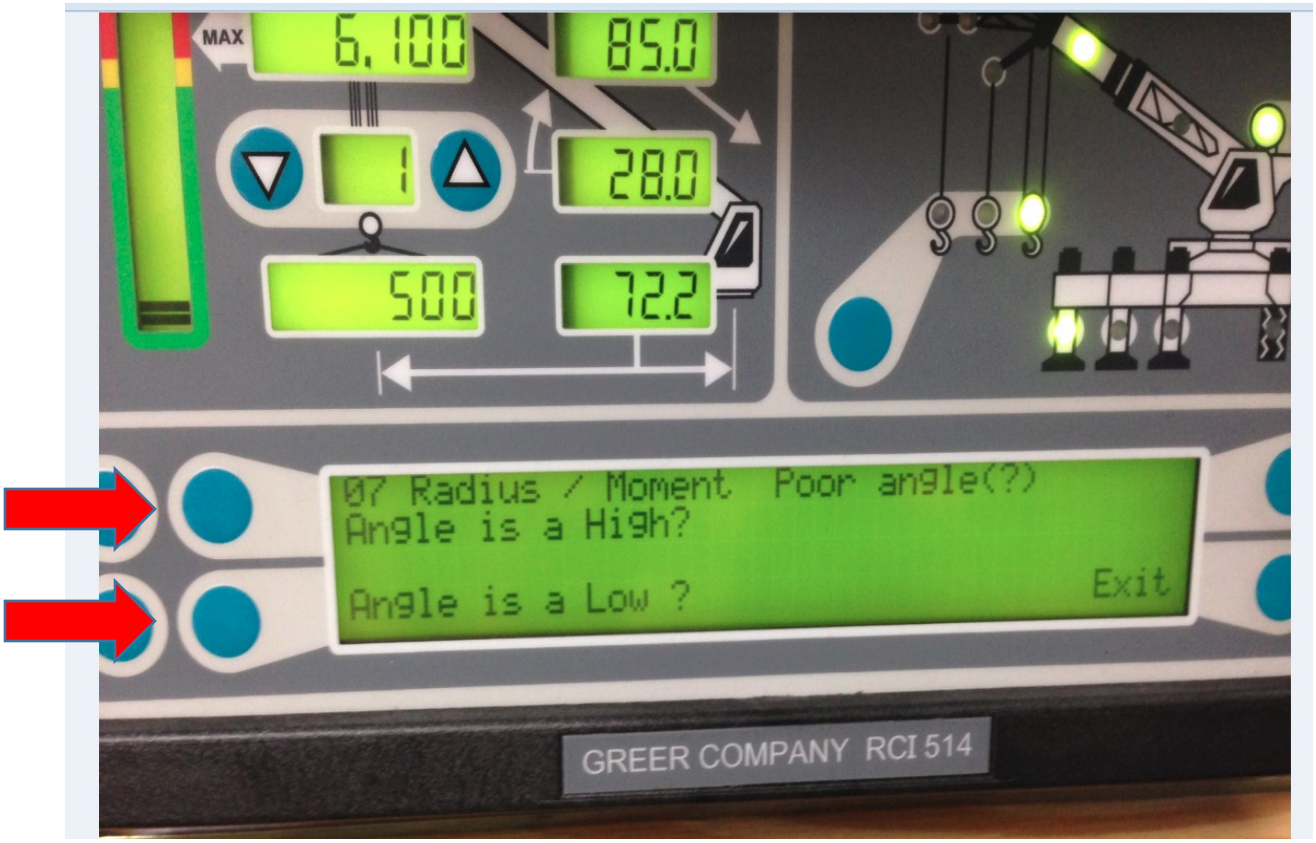


Press 07 Radius / Moment button

Enter Tare load (1.1 is 1100lbs) and press Exit. (Buttons 1 & 2 will be used to select the number and button 3 will be used to enter the number)

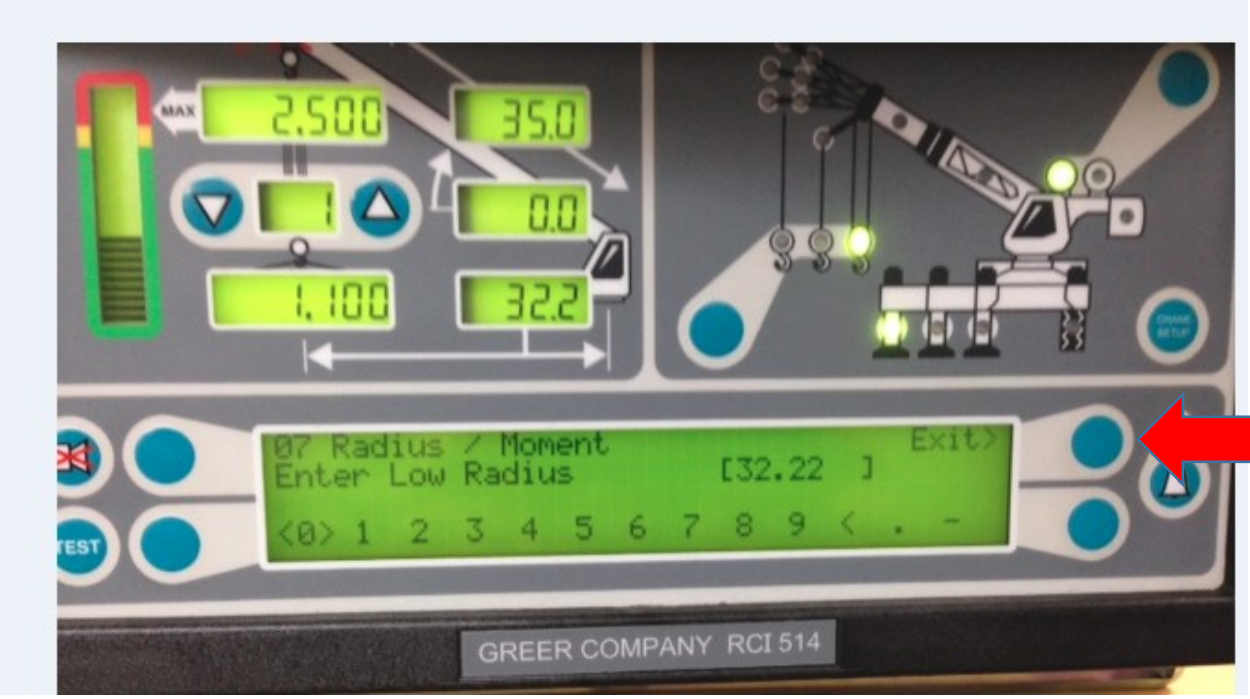
Press the exit button to begin the Radius Moment.

If you see this message. Boom to an angle below 20 degrees or above 70 degrees and Press Angle is a High? or Angle is a Low?



Radius Moment #1 extension

Boom to 0 degrees or as the Load Chart will allow. Fully retract the BOOM and Press Bas.0 ( )
Measure radius from center of pivot pin to load rope and enter as low radius and Press Exit

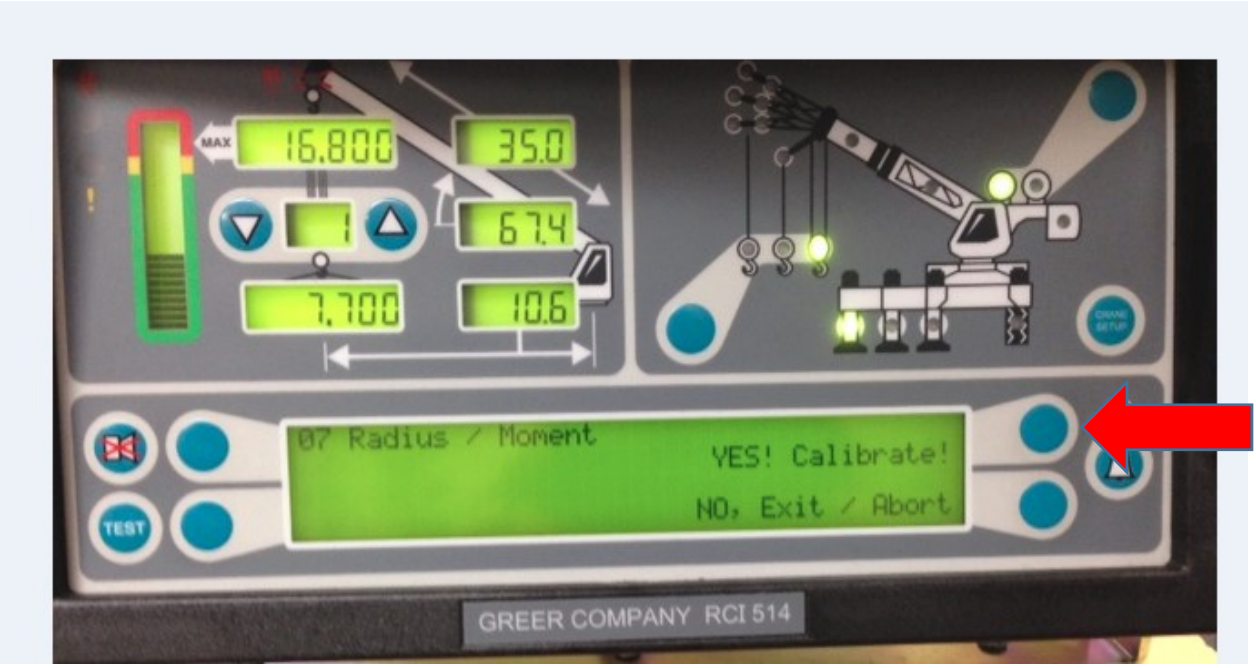


Boom to 70 degrees or as the Load Chart will allow. Remain fully retracted and Press Bas.0 (D)

Measure radius from center of pivot pin to load rope and enter as high radius and Press Exit

Press Bas.0 (DU)

Press YES! Calibrate!



Radius Moment #1 extension complete. Extend the boom to the next extension and repeat the above.

USE THE SPACE PROVIDED IN APPENDIX A TO RECORD THE MEASUREMENTS.

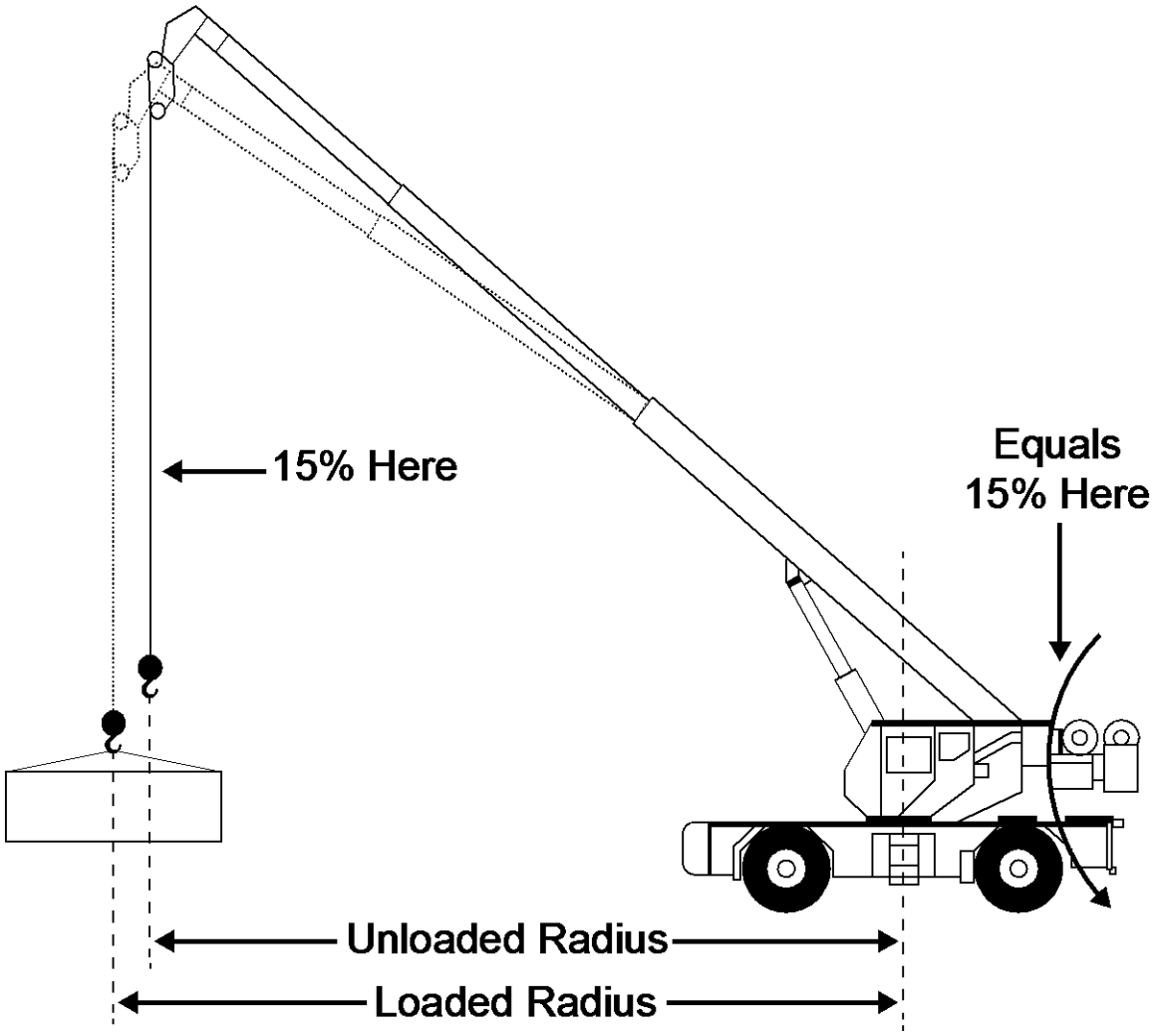
2.6.9 Menu 08 - Boom Deflection

This menu is used to enter the deflection of the main boom under the weight of a calibrated load.

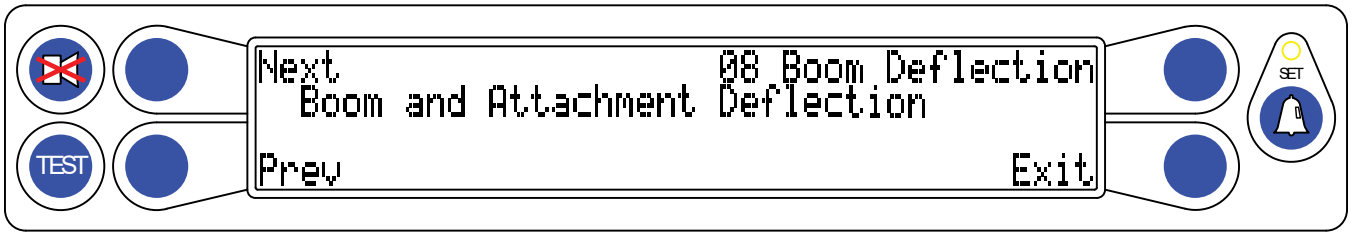
WARNING

MAKE SURE THE CRANE IS SET UP ACCORDING TO THE MANUFACTURER'S OPERATION MANUAL TO ENSURE MAXIMUM STABILITY. ALSO MAKE SURE ALL BOOM EXTENSIONS AND LOADS ARE LIFTED WITHIN THE APPROPRIATE LOAD CHARTS AND LIMITS. FAILURE TO COMPLY WITH MANUFACTURER'S LIMITS MAY RESULT IN SERIOUS INJURY OR DEATH.

NOTE: *Boom deflection is a natural occurrence and can have a significant effect on the boom radius under load (see the figure shown below). To calculate boom deflection:*



1. Press the ***Next*** or ***Prev*** button until “08 Boom Deflection” appears in the information window at the right.
2. Press the ***08 Boom Deflection*** button to enter the routine.

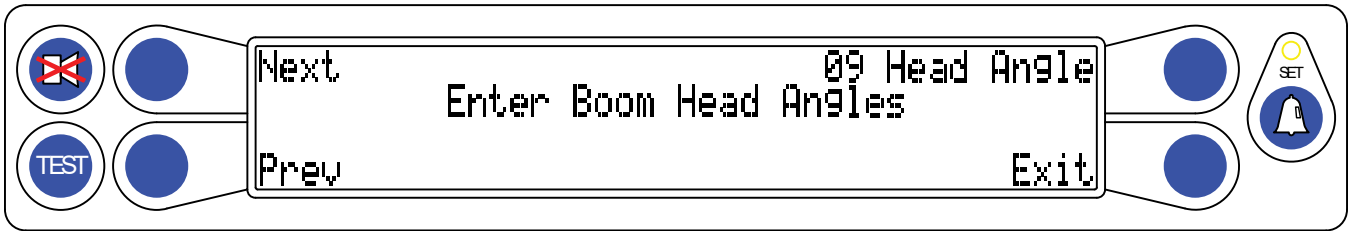


3. Fully extend the boom at an angle greater than 60°.
4. Lift a suitable calibration load, 85-100% of rated capacity. The load should induce significant deflection in the boom.
5. Begin the calibration by pressing ***Edit*** button.
6. Measure the loaded main boom radius and enter the value. Use the buttons adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Press the ***Enter On-Load Radius*** button to enter the number.
7. When complete, the menu will automatically change to the previous menu. It is useful to add .1 ft. to the radius when entering the radius for boom deflection. This will create a slightly positive radius for most boom operating conditions.
8. Ensure the new displayed radius matches or slightly exceeds the actual measured radius.
9. When all measurements have been recorded, press the ***Exit*** button to move onto the next menu item.

2.6.10 Menu 09 - Head Angle

This menu is used to enter data on boom head angles.

1. Measure the boom head angle on a new jib installation to ensure the jib radius displays correctly. Take this measurement in increments similar as used on the boom moments.
2. Take these measurements from the boom head after the boom angle has been zeroed and spanned. Set the angle of the boom to “0” on the display and the boom extended in increments. Do not change the angle of the boom during this process.
3. Use a digital level on the top of the boom head section to enter the angle readings into the calibration.
4. Press the ***09 Head Angle*** button to enter the head angle readings from the boom extensions.



5. With the boom fully retracted, take a reading from the digital level. Press the ***Edit*** button to cycle the display through two options:
   a. **Enter New Extension** - If no entry is needed, press the ***Exit*** button and advance to the next setting.
   b. **Enter New Head Angle** - Enter the new head in degrees and tenths, using the number entry procedure from the front of the manual.
6. Follow this procedure for the remaining boom extensions.

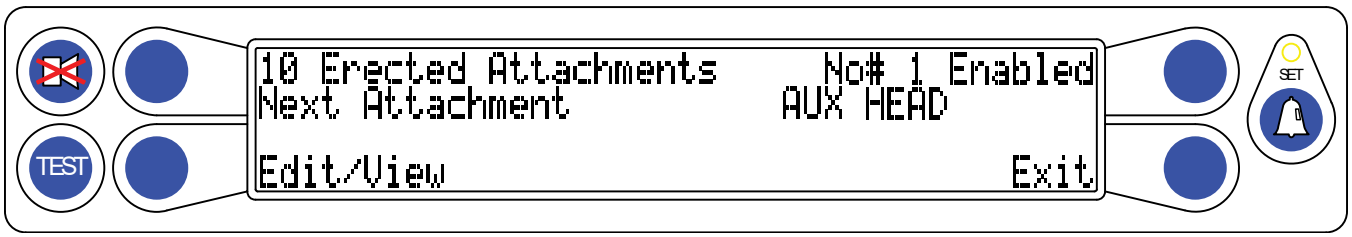
2.6.11 Menu 10 - Erected Attachments

This menu is used to:

- Hide and Unhide attachments
- Enter and Adjust geometric data and moment data for the jib.

1. Press the ***10 Erected Attachments*** button to allow the “Unhiding” of attachments. You will be able to enter or edit geometric data for the attachments.
2. Press the ***No#1 Enable*** button to unhide an attachment.

NOTE: *This is a toggle function. If enabled, press the button to hide it, if hidden; press the button to unhide it.*

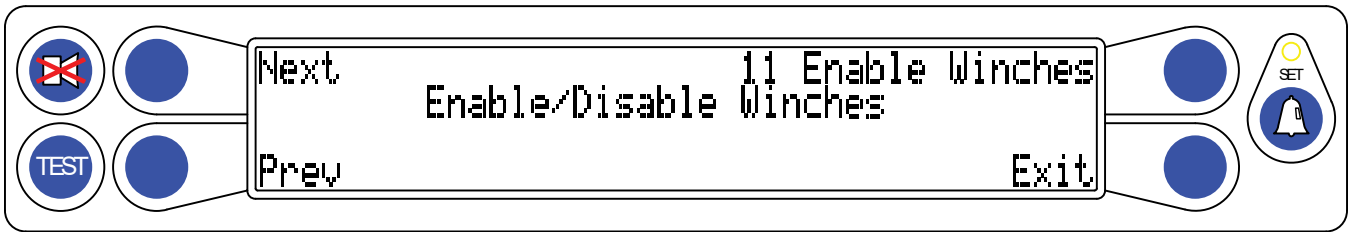


3. To view geometric and weight data on the attachment, press the ***Edit/View*** button. The menu items will scroll up one at a time and give you the opportunity to enter new information or edit existing information.
4. If adjustments are needed to the geometric or weight data, use the following guidelines:
    a. Increase the weight of the attachment to decrease hook load.
    b. Decrease the weight of the attachment to increase hook load.
    c. Increase the length of the attachment to increase the radius.
    d. Decrease the length of the attachment to decrease the radius.
    e. The offset number affects the radius more at increased angles. The higher the offset number, the more it will increase the radius at high angles.

2.6.12 Menu 11 - Enable Winches

This menu is used to enable or disable available winches in the system.

1. Press the ***Next*** or ***Prev*** button until “11 Enable Winches” appears in the information window at the right.
2. Press the ***11 Enable Winches*** button to enter the routine.

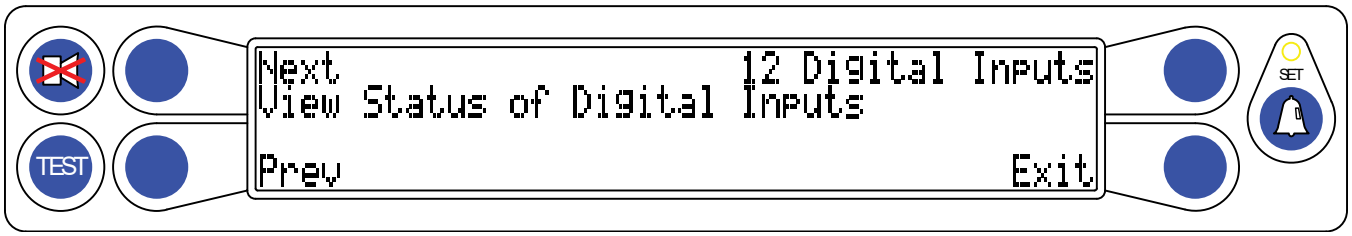


NOTE: *There must be at least one winch enabled on the crane. The system will not allow the user to disable all winches on the crane.*

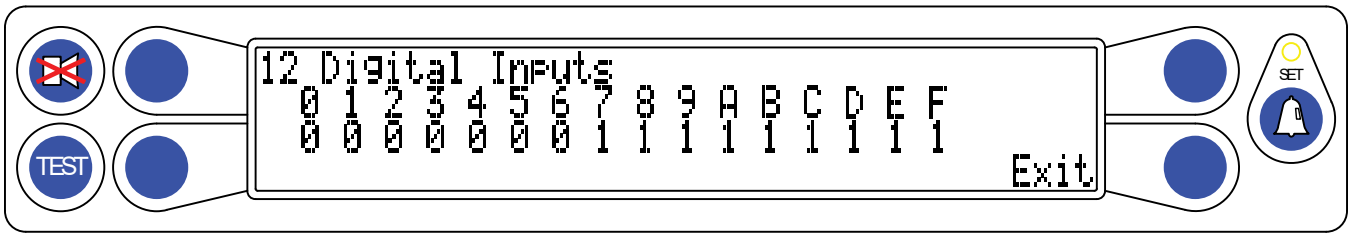
2.6.13 Menu 12 - Digital Inputs

This menu allows the user to view the status of the digital inputs.

1. Press the ***Next*** or ***Prev*** button until “12 Digital Inputs” appears in the information window at the right.
2. Press the ***12 Digital Inputs*** button to enter the routine.



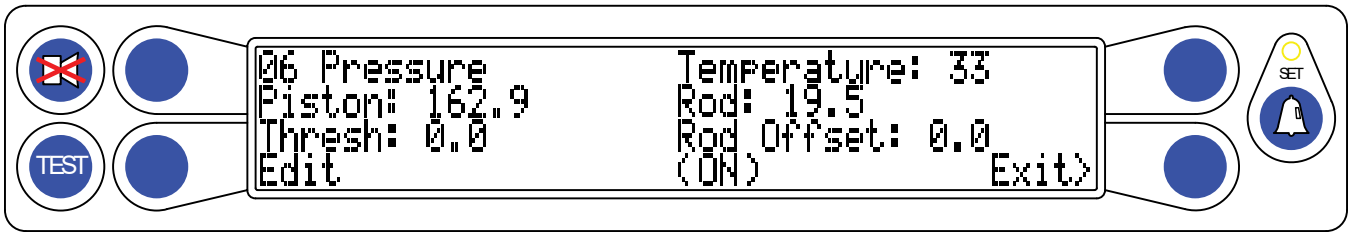
3. When viewing is complete, press the ***Exit*** button.



2.6.14 Menu 13 - Pressure Monitor

This menu is used to view the pressure data from **“Menu 06 Pressure”** without the need to set the Rod Diameter first.

1. Press the ***Next*** or ***Prev*** button until “13 Pressure Monitor” appears in the information window at the right.
2. Press the ***View Cylinder Pressures*** button.
3. Pressure data is displayed.



2.6.15 APPENDIX A – Measurement Records

Use the space provided below to enter the necessary dimensions. Record the measurements in feet and tenths of a foot.

Callout	Dimensions	Measurement
BOOM PIVOT DIMENSIONS		
L	The horizontal distance between the center of the boom pivot and the center of the boom hoist cylinder upper pivot.	
J	The vertical distance between the center of the boom pivot and the center of the boom hoist cylinder upper pivot. ***NOTE:*** *If the boom pivot is above the boom hoist cylinder upper pivot the dimension is negative*.	
G	The horizontal distance between the center of the boom pivot and the center of the boom hoist cylinder lower pivot.	
H	The vertical distance between the center of the boom pivot and the center of the boom hoist cylinder lower pivot.	
WINCH DIMENSIONS		
G0	The horizontal distance between the center of the front winch and the center of the boom pivot.	
G1	The horizontal distance between the center of the rear winch and the center of the boom pivot.	
H0	The vertical distance between the center of the front winch and the center of the boom pivot.	
H1	The vertical distance between the center of the rear winch and the center of the boom pivot.	
J0	The distance between the top sheave and the centerline of the boom pivot parallel to the horizontal boom plane.	
J1	The distance between the top sheave and the centerline of the boom pivot parallel to the horizontal boom plane.	
L0	The distance between the centerline of the boom pivot perpendicular to the horizontal boom plane and the center of the bottom sheave.	
L1	The distance between the centerline of the boom pivot perpendicular to the horizontal boom plane and the center of the bottom sheave.	
N	Swing Offset – The horizontal distance between the center of the boom pivot and the centerline of rotation.	
R	Sheave Radius – The distance between the center and the outside edge of the bottom sheave.	

BOOM HOIST CYLINDER DIMENSIONS		
M	The distance measured around the outside of the cylinder rod, divided by 12.	
	Number of cylinders	
SPAN DIMENSIONS		
T	The dimension between the center of the boom pivot and the center of the sheave with the boom fully extended.	
S	The distance between the center of the boom pivot and the center of the sheave with the boom fully retracted.	
	Boom span (T - S)	
AUXILIARY HEAD DIMENSIONS		
	Auxiliary Head Weight	
	Auxiliary Head Offset Angle	
	Auxiliary Head Center of Gravity	
	Auxiliary Head Length	
STOWED JIB DIMENSIONS		
G	This is the distance between the center of the boom pivot and the center of gravity of the stowed jib.	

RADIUS/MOMENT DATA							
EXTN							
LEN-S							
WT							
WG							

LOAD VERIFICATIONS								
Test #	Displayed Length	Displayed Angle	Displayed Radius	Measured Radius	Radius Error	Displayed Load	Actual Load	Load Error

Fraction-to-Decimal Conversion Chart

Fraction	Decimal	Fraction	Decimal
1/64	.015625	33/64	.515625
1/32	.03125	17/32	.53125
3/64	.046875	35/64	.546875
1/16	.0625	9/16	.5625
5/64	.078125	37/64	.578125
3/32	.09375	19/32	.59375
7/64	.109375	39/64	.609375
1/8	.125	5/8	.625
9/64	.140625	41/64	.640625
5/32	.15625	21/32	.65625
11/64	.171875	43/64	.67185
3/16	.1875	11/16	.6875
13/64	.203125	45/64	.703125
7/32	.21875	23/32	.71875
15/64	.234375	47/64	.734375
1/4	.25	3/4	.75
17/64	.265625	49/64	.765625
9/32	.28125	25/32	.78125
19/64	.296875	51/64	.796875
5/16	.3125	13/16	.8125
21/64	.328125	53/64	.828125
11/32	.34375	27/32	.84375
23/64	.359375	55/64	.859375
3/8	.375	7/8	.875
25/64	.390625	57/64	.890625
13/32	.40625	29/32	.90625
27/64	.421875	59/64	.921875
7/16	.4375	15/16	.9375
29/64	.453125	61/64	.953125
15/32	.46875	31/32	.96875
31/64	.484375	63/64	.984375
1/2	.50	1	1.00

3.0 Troubleshooting

The Greer Company is dedicated to the design and manufacture of electronic parts created to aid in crane operation and in the protection of crane operators and associated personnel. The following manual has been developed to assist Service Personnel in understanding, locating, and identifying problems during the operation of the MicroGuard® RCI-514 Rated Capacity Limiter System. Do not use this system without an operator who is knowledgeable in safety guidelines, crane capacity information, and the crane manufacturer's specifications. Use of calibration routines, without consultation with the Greer Company, invalidates the warranty.

Where to go for help:

When field repairs cannot be made without replacement of a part, or when troubleshooting advice is needed, contact:

Greer Company Service:

Jenks, OK

Telephone: (918) 298-8300

FAX: (918) 298-8301

Information provided to support personnel must be accurate and complete. Have your crane Model Number and Serial Number ready. Carefully describe the problem, noting any unusual system responses that may help us to quickly and effectively solve your problem.

3.1 Overview & Preparation

This Troubleshooting Manual for the MicroGuard® RCI-514 Rated Capacity Limiter System provides information and methods for isolating problems that may occur during operation of the System. Some of these problems can be corrected in the field. Other problems may require replacement of parts or the return of a part to the factory for servicing. Service personnel should have prior training and experience in the procedure for operation and setup of this System.

The procedures in this manual are based on crane operation and function, when possible. A basic tool kit consisting of wrenches and screwdrivers (flat and Phillips' blades) is required to remove covers and units for inspection. A digital multimeter (DMM) is required for certain troubleshooting procedures. The DMM must be capable of measuring DC voltage with a range of 0 volts to ± 50 volts and resolution of 0.1 volts. Resistance range is 0 ohms to 2 megaohms. Low cost analog meters are not appropriate because the input impedance of these meters can give false readings.

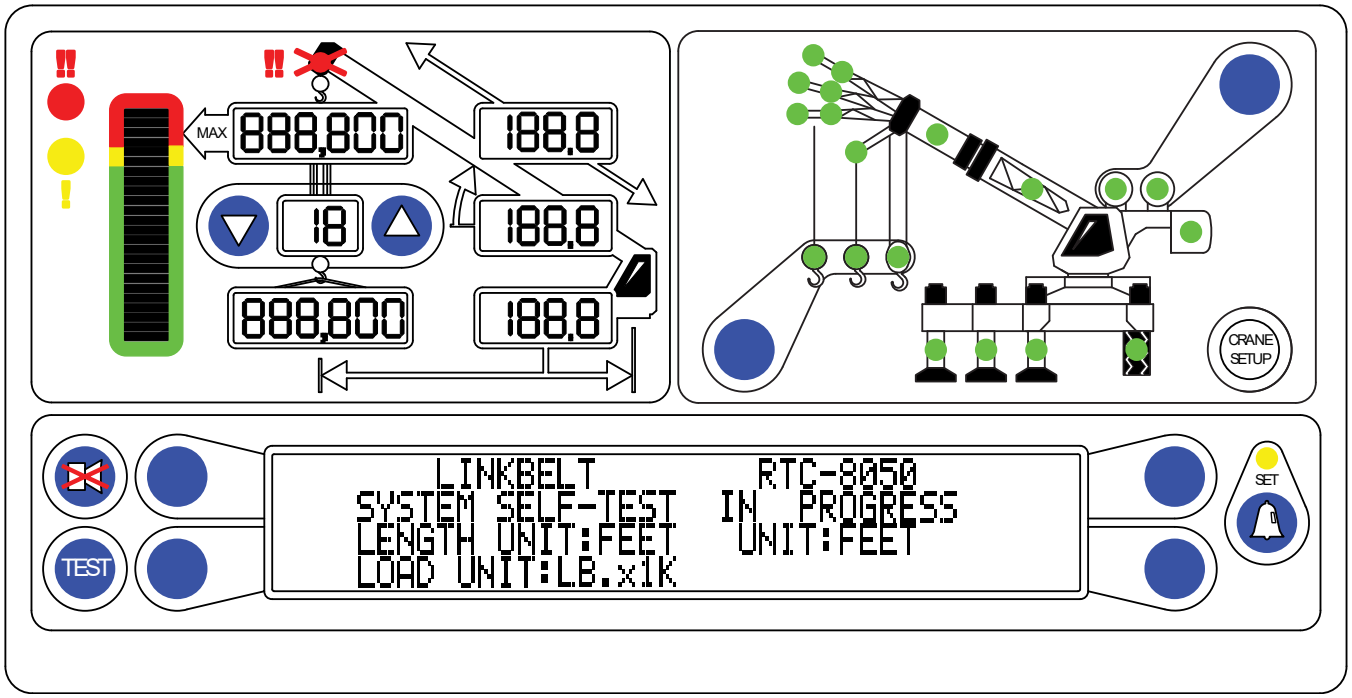
3.2 System Self-Test

The system will perform a “SELF-TEST” when the power is turned on or when the ***TEST*** button is pressed during operation. This will verify the computer, display console, cables, and all remote sensors are working properly.

During the “SELF-TEST,” all display functions are activated, allowing the operator to ensure all indicators are functional.

NOTE: *It is important the indications shown during the Self-Test are recognized and understood by the operator. This will aid in correctly determining computer and display communication problems.*

For six seconds following “power on” or pressing the ***TEST*** button, the display will show the following indications:



- All display segments of the bar graph display (B) will be black (ON).
- All display segments of the load, angle, radius, length, and rated capacity windows will be black (ON), showing “188.8” or “888,800” for load and capacity.
- All green configuration lamps will be illuminated.
- The red LED indicators for overload and Anti Two-Block will be illuminated.
- The yellow LED indicator for pre-warning will be illuminated.
- The audible alarm will sound in the crane cab.
- The display will now show the crane model/chart number and the units of measurement along with the message: “SYSTEM SELF-TEST IN PROGRESS.”

3.2.1 Display Console Problems

DISPLAY CONSOLE PROBLEMS are difficult to isolate because of the interaction between the display console and the computer unit. Failure of either unit, or interconnection of the two units, will cause a malfunction of the display console indications. No “FAULT” diagnoses of other system problems can be carried out without the proper function of the display console and its communication with the computer unit.

To solve problems using display console indications, carefully observe the display console at “power on” and through self-test. Next, use the charts in SECTIONS 2.3.1-2.3.4 to help decide the course of action.

3.3 Fault Reporting and Fault Codes

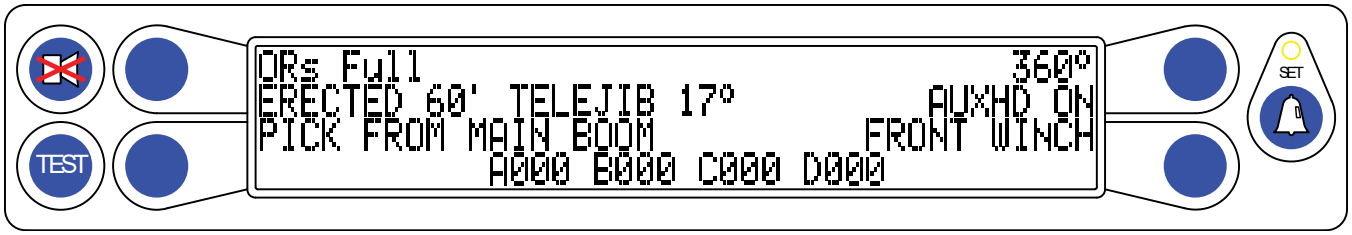
The system performs a self-testing process lasting approximately six seconds that automatically detects most faults in the system. During normal operation, a self-test can be initiated at any time by pressing the TEST button on the display console. Many fault conditions are detected without a system self-test.

Faults detected in the system during the self-test, are indicated on the display console in the following ways:

The RED OVERLOAD LAMP will illuminate. The AUDIBLE ALARM will sound.

“WARNING SYSTEM FAULT!” will be displayed at the bottom of the text window.

Fault codes may be displayed on the display console. To view the codes, press the ***TEST*** button and wait for the system to complete the self-test.



Fault code display shown in lower portion of text display window.

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

NOTE: *Always investigate faults in the “B” and “C” groups before continuing with “A” and finally “D” group faults.*

3.3.1 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 with group “A” fault finding sensors.*

The following chart details all the available codes in the left column and the actions to take in the right column.

FAULT CODE	SWING SENSOR	BOOM ANGLE SENSOR	EXTENSION SENSOR	Tdx 1 ROD PRESSURE	Tdx 0 PISTON PRESSURE	ACTION
000	No Fault Found					NONE
001					X	Replace Computer
002				X		
003				X	X	
004			X			Follow SECTION 3.8.3
005			X		X	Replace Computer
006			X	X		
007			X	X	X	
008		X				Follow SECTIONS 3.8.5-3.8.7
009		X			X	Replace Computer
010		X		X		
011		X		X	X	
012		X	X			Follow SECTION 3.8.2
013		X	X		X	Replace Computer
014		X	X	X		
015		X	X	X	X	

Group “A” Fault Codes - Continued

FAULT CODE	SWING SENSOR	BOOM ANGLE SENSOR	EXTENSION SENSOR	Tdx 1 ROD PRESSURE	Tdx 0 PISTON PRESSURE	ACTION
016	X					Follow SECTION 3.10
017	X				X	Replace Computer
018	X			X		
019	X			X	X	
020	X		X			Follow SECTIONS 3.8.2, 3.8.3,
021	X		X		X	Replace Computer
022	X		X	X		
023	X		X	X	X	
024	X	X				Follow SECTIONS 3.8.6, 3.8.7,
025	X	X			X	Replace Computer
026	X	X		X		
027	X	X		X	X	
028	X	X	X			Follow SECTIONS 3.8.2, 3.8.3,
029	X	X	X		X	Replace Computer
030	X	X	X	X		
031	X	X	X	X	X	

3.3.2 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 details all of the available codes in the left column and the actions to take in the right column.

FAULT CODE	FKO POWER FEED	A2B POWER FEED	ACTION
000	No Fault Found		Follow SECTION 3.10
008		X	Follow SECTION 3.9
016	X		Follow SECTION 3.5.3
024	X	X	Check crane circuit breakers, then Follow

3.3.3 Group “C” Fault Codes

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

The following chart details all the available codes in the left column and the actions to take in the right column.

FAULT CODE	SERIAL EPROM	DUTY DATA	PROGRAM	ACTION
000	No Fault Found			NONE
001			X	Contact Technical Support
002		X		
003		X	X	
005			X	
006		X		
007		X	X	
009			X	
010		X		
011		X	X	
013			X	
014		X		
015		X	X	
016	X			Re-select crane setup/configuration If not resolved, Contact Technical Support
017	X		X	Contact Technical Support
018	X	X		
019	X	X	X	
020	X			
021	X		X	
022	X	X		
023	X	X	X	
024	X			Re-select crane setup/configuration If not resolved, Contact Technical Support
025	X		X	Contact Technical Support
026	X	X		
027	X	X	X	
028	X			
029	X		X	
030	X	X		
031	X	X	X	

3.3.4 Group “D” Fault Codes

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

The following chart details all the available codes in the left column and the actions to take in the right column.

FAULT CODE	WRONG SWING AREA	WRONG BOOM LENGTH	CHART NOT FOUND	ACTION
000	No Fault Found			NONE
001			X	Check other sensor faults first, Re-select CRANE CONFIGURATION
002		X		Boom length is out of range for selected chart. Check crane setup, boom length and
003		X	X	Check other sensor faults first, Re-select CRANE CONFIGURATION
004	X			Swing to correct working area to select chart. Check swing sensor zero position.
005	X		X	Swing to correct working area to select chart. Check swing sensor zero position.
006	X	X		Check other sensor faults first, Re-select CRANE CONFIGURATION
007	X	X	X	Check other sensor faults first, Re-select CRANE CONFIGURATION

3.3.5 “No Fault Code” Problems

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

3.3.5.1 Anti-Two-Block Alarm (ATB)

This section gives direction to fault diagnosis of ATB alarm problems. For detailed information, schematic, and voltages, refer to SECTION 3.9 - 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(es), or an open circuit between the computer ATB feed and the ATB switch(es).

- Check the extension reel-off 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 reeling drum to the computer.
- Check the connectors.

PROBLEM:

• The Anti-Two-Block alarm is continuously OFF. Operating 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(es).

- Check the extension reel-off 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.

3.3.5.2 Displayed Load or Radius Errors

This section gives direction to fault diagnosis of load and radius errors. Load or radius errors can cause early or late tripping of overload alarms. Accuracy of load, radius, length, and angle is determined by the correct installation and maintenance of the system sensors. 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.

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 reeling drum surface. Any stacking of the cable will cause extension errors when the boom is fully retracted. 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, see SECTION 3.8.1 CHECKING THE REELING DRUM CABLE LAYERING.
3. Check the zero of the extension sensor with the boom fully retracted. Enter the Calibration Menu 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 CHAPTER 2 - CALIBRATION. 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 SECTION 3.10.4 SPAN CALIBRATION.

Check Main Boom Radius

1. Fully retract the boom and ensure the crane configuration is correctly set up.

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).*

2. Raise the boom to about 45° and measure the radius. The measured radius must match the displayed radius within +/- 0.2 ft. If it does not match, continue to the “CHECK BOOM ANGLE” procedure. If it does match, continue to “CHECK PRESSURE SENSORS.”
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 SECTION 3.10.4 SPAN CALIBRATION.

Check Boom Angle

1. Fully retract the boom.

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 at 0° (level). Ensure a reliable position on the top of the boom is used to measure the angle and that the inclinometer will provide an accurate reading at 0° (zero) and at 70°.*

2. Using an inclinometer set the boom to 0° (zero) and ensure the displayed boom angle value is 0.0°. If the angle value is not 0.0°, follow SECTION 3.8.5 CHECKING THE ANGLE SENSOR PENDULUM.
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 SECTION 3.10.4 SPAN CALIBRATION.

Check Pressure Sensors

The pressure sensing system is calibrated at the factory. Pressure sensors are not able to be replaced. Any serious problem will necessitate changing the entire computer unit.

1. Lower the boom until the boom hoist cylinder is fully retracted and on its stop.
2. Loosen the hydraulic connections to the pressure sensors to ensure zero pressure is present on the sensors.
3. Enter the CALIBRATION MODE and use the “PRESSURE MONITOR” command to view both sensor pressures and net pressure.
4. Check the PRESSURE values of both sensors. The PRESSURE values should be between -75 and +75 PSI. If not, replace the computer unit.
5. Check the NETT pressure values of both sensors. This should be between -35 and +35 psi. If not, replace the computer unit.

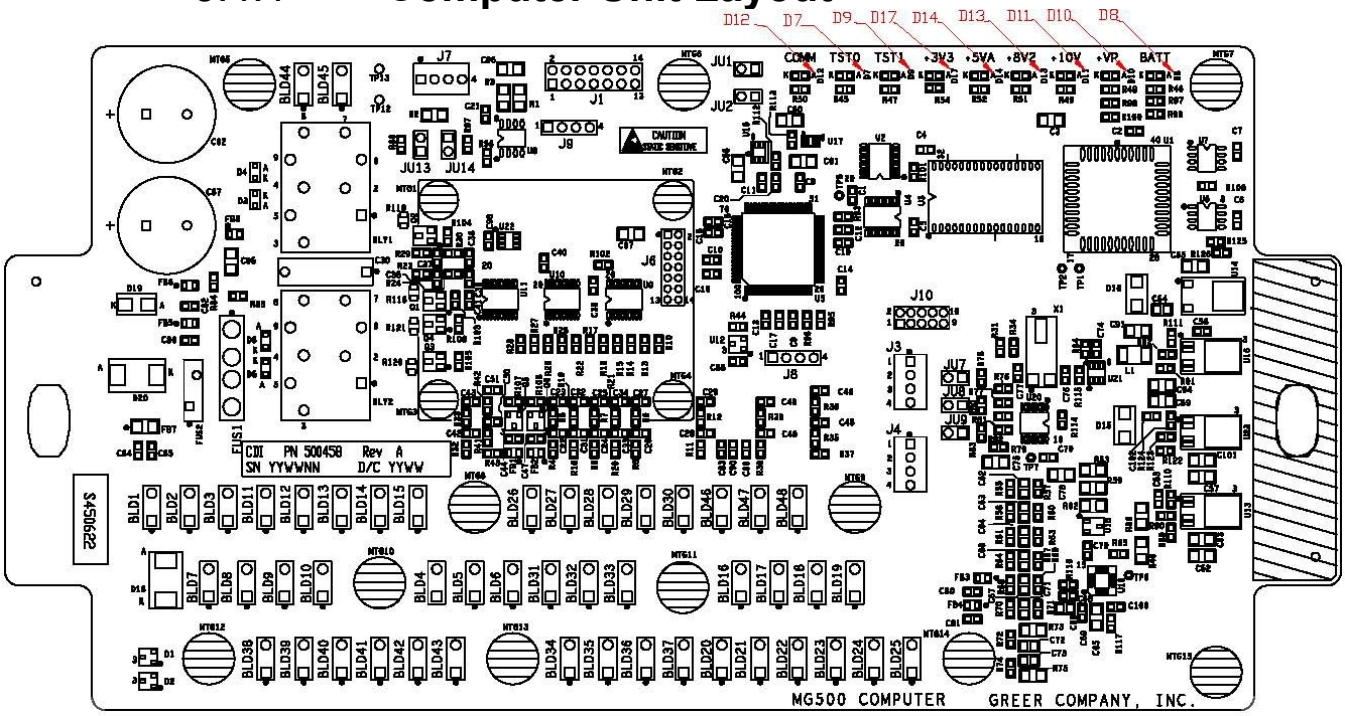
3.4 Computer Unit Overview

The COMPUTER UNIT is the center of the System. It reads the sensors, controls computations and disconnect functions, and communicates with the display console/internal bar graph.

The computer unit connects to the crane wiring harness via 60-way bulkhead connector. There are no wiring connections or screw terminals within the unit.

The two hydraulic pressure sensors required to sense pressure within the boom hoist cylinder are contained within the unit. These sensors, as well as the computer are factory pre-calibrated and may not be separately replaced in the field.

3.4.1 Computer Unit Layout



3.4.2 Internal Status Indicators

The computer unit contains a row of LED indicators for checking computer operation. During normal operation, all LEDs will be illuminated with the COMM indicator blinking. If not, please contact Technical Support for assistance. Use the following chart and Figure 3.4.1 for LED location.

LED Indicator	Function
D7	Communication Indicator TST0
D8	Battery Power POS
D9	Communication Indicator TST1
D10	+VP
D11	+10V
D12	COMM (Communication Indicator)
D13	+8V2
D14	+5V
D17	+3V3

3.4.3 Pressure Sensors

There are two pressure sensors installed as part of a MicroGuard® RCI-514 System. Both pressure sensors are mounted within the computer unit. One is connected to the PISTON side of the boom hoist cylinder via flexible hose; the other is connected to the ROD side of the boom hoist cylinder via flexible hose. Both hoses are protected by velocity fuses within the boom hoist cylinder valve block on the end of the cylinder(s).

The pressure sensor 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 sensor 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. The maximum continuous working pressure for the sensors is 250 bar (3625 PSI).

WARNING!

BOTH PRESSURE SENSORS ARE PRE-CALIBRATED FROM THE FACTORY AND SUPPLIED AS PART OF THE COMPUTER. THE PRESSURE SENSORS MAY NOT BE INDIVIDUALLY REPLACED. REMOVAL OR REPLACEMENT OF THE PRESSURE SENSORS FROM THE COMPUTER INVALIDATES THE WARRANTY AND WILL ADVERSELY AFFECT THE PRESSURE CALIBRATION. ANY SERIOUS PROBLEM WILL NECESSITATE CHANGING THE ENTIRE COMPUTER UNIT.

CHECKING PRESSURE SENSORS

1. Lower the boom until the boom hoist cylinder is completely retracted and on its stop.
2. Loosen both hydraulic connections to the pressure sensors to ensure zero pressure is present on the sensors.
3. Enter the CALIBRATION MODE and use the “PRESSURE MONITOR” command to view both sensor pressures and net pressure.
4. Check the PRESSURE values of both sensors. They should be between -75 and + 75PSI. If not, replace the computer unit.

5. Check the NETT pressure values of both sensors. This should be between -35 and +35PSI. If not, replace the computer unit.

3.4.4 Replacing the Computer Unit Computer 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 hydraulic connections at the computer unit.
3. Disconnect both electrical connectors at the computer unit.
4. Remove the hardware securing the computer to the cab wall.

COMPUTER INSTALLATION

1. Secure the computer unit to the cab wall with the mounting hardware.
2. Ensure the electrical connections face downward.
3. Connect the electrical connectors.
4. Remove the protective caps from the hydraulic ports.
5. Connect the base-side pressure (GREEN P on the enclosure) hose to the piston pressure port.
6. Connect the rod-side pressure (RED R on the enclosure) hose to the rod pressure port.

POWER UP AND CALIBRATION

NOTE: *Switch the crane power on and verify the LED check lights within the computer unit are illuminated. Ensure the communication LEDs are flashing and the display console is operating.*

CHECKS:

1. Use an inclinometer to, check the accuracy of the boom angle and the radius measurements and tape at four or five points.
2. Ensure the hydraulic connections are secure and not leaking at the computer unit.
3. Secure the computer lid and rain cover.
4. Refer to **Chapter 2 - Calibration** for more information.

3.5 Display Console Overview

The OPERATOR'S DISPLAY CONSOLE allows the user to see the crane values (angle, radius, load, etc.) and crane configuration selection. The display also provides calibration functions used for testing and fault diagnosis.

When operated for extended periods, 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 comments.

3.5.1 Unresponsive Buttons

Please note that all button options are not available for use at all times. It is important to verify that the non-responsive button is programmed to respond during the operation of the System. Press the button in the center. Pressing the printed symbol 'at one end' may not activate the switch underneath. Buttons that are damaged or have a surface that is worn may cause the switch underneath to operate improperly. In this case, refer to SECTION 3.6.5 REPLACING THE DISPLAY CONSOLE.

3.5.2 Connectors

A single circular connector, common to all display models, is positioned on the rear of the display console. For bracket-mounted applications, it is clearly visible on the rear of the housing. On flush-mounted versions, it is "hidden" behind the panel, within the dash assembly. This connector carries power and signals from the computer unit to the display console. Examine this connector carefully, it is possible for the pins and sockets within the connector halves to bend, break, or "be pushed back" inside the housing.

On flush-mounted display consoles (vertical model), one additional connection, besides the circular connector is required: The horn drive wire is a single black lead that should be attached to the black terminal on the rear of the display console housing.

3.5.3 Horn

On vertical FLUSH-MOUNTED CONSOLES, the HORN is outside the housing. If there is a problem with the horn, ensure the HORN DRIVE WIRE is connected correctly to the black terminal on the rear of the display console housing. Release the display console from its connections and pull it gently forward. If the wire is intact, connected correctly, and the horn is still not operating properly, the horn may need to be replaced.

3.5.4 Moisture

The DISPLAY CONSOLE offers protection against dust and water, when correctly installed.

3.5.5 Replacing the Display Console

REMOVAL

1. Disconnect the electrical cable from the rear of the OPERATOR'S DISPLAY CONSOLE.
2. Remove the knob on each side of the console and retain for future use.
3. Remove the defective display console from the bracket in the cab.

INSTALLATION

1. Put the OPERATOR'S DISPLAY CONSOLE on the bracket located in the cab, by positioning it between the bracket legs.
2. Insert and tighten the knob on each side of the console.
3. Connect the electrical cable to the rear of the console.

3.6 Remote Bar Graph Overview

The REMOTE BAR GRAPH, shown below, displays the percentage of rated capacity of the crane. The remote bar graph is mounted at the top of the cab front window, in the operator's line of sight. There are multiple brightness levels available on the device. The remote bar graph is optional and is not used on all cranes.

NOTE: *Defective remote bar graphs are not a serviceable item.*

FIGURE 3.6 - REMOTE BAR GRAPH

3.6.1 Checking the Remote Bar Graph

The REMOTE BAR GRAPH is very reliable. However, when operated for extended periods, under extreme conditions, the device may become damaged. The damage is not always apparent. To help identify subtle faults that are sometimes difficult to find, please review the following comments:

3.6.2 LEDs

The operator may check the LED operation at any time by pressing the test button on the operator's display console.

With the System powered, there should always be at least one (GREEN) LED lit. The REMOTE BAR GRAPH LEDs should 'track' or 'echo' the bar graph on the operator's display console at all times.

NOTE: *Always replace the entire bar graph unit if faulty.*

3.6.3 Brightness Control

There are four brightness levels. Press the BRIGHTNESS CONTROL BUTTON continuously to 'cycle' through the available levels. Release the button at any time to select the desired setting. Or press and release the button to cycle through the four levels in sequence, one at a time. It is not possible to 'switch-off' the LEDs using this control.

NOTE: *Set the brightness level when powering up the system. The previous setting is not stored in the MicroGuard system. The remote bar graph always starts with the LEDs set to maximum brightness.*

3.6.4 Cable and Connector

The REMOTE BAR GRAPH uses a single cable to communicate with and receive power from the computer unit. The cable is not removable and is a fixed length. Do not discard the excess cable when the unit is installed. Extending this cable is not recommended.

There is a single connector on the far end of the cable. It is possible for the pins and sockets within the connector to be damaged. A pin may be bent, broken, or “pushed back” inside the housing.

3.6.5 Moisture

The REMOTE BAR GRAPH protects against dust and water when correctly installed. It is not possible to fully protect the sensitive electronic assembly inside against pressure-washing or heavy rainfall. If this occurs, replace the remote bar graph.

3.6.6 Remote Bar Graph Replacement

Removal of Remote Bar Graph

1. Turn off the power.
2. Remove the display console in order to access the cabling and connectors.
3. Disconnect the remote bar graph cable, from the display console wire harness, at the rear of the display console.
4. Remove the remote bar graph from its bracket by loosening and removing the knob at each end of the remote bar graph. Retain the knobs for reuse.

Installation of Remote Bar Graph

1. Position the new remote bar graph on the bracket
2. Connect and tighten the knobs at each end.
3. Route the cable to the display console and connect the cable.
4. Turn the power on, and verify that the bar graph is operating correctly.

3.7 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 includes an angle sensor to measure the main boom angle, and an electrical slip-ring which transfers the Anti-Two-Block signal from the reeling drum cable to the system computer.

Complete the setup and maintenance of these devices using the following procedures. Incorrect setup will result in system calculation errors.

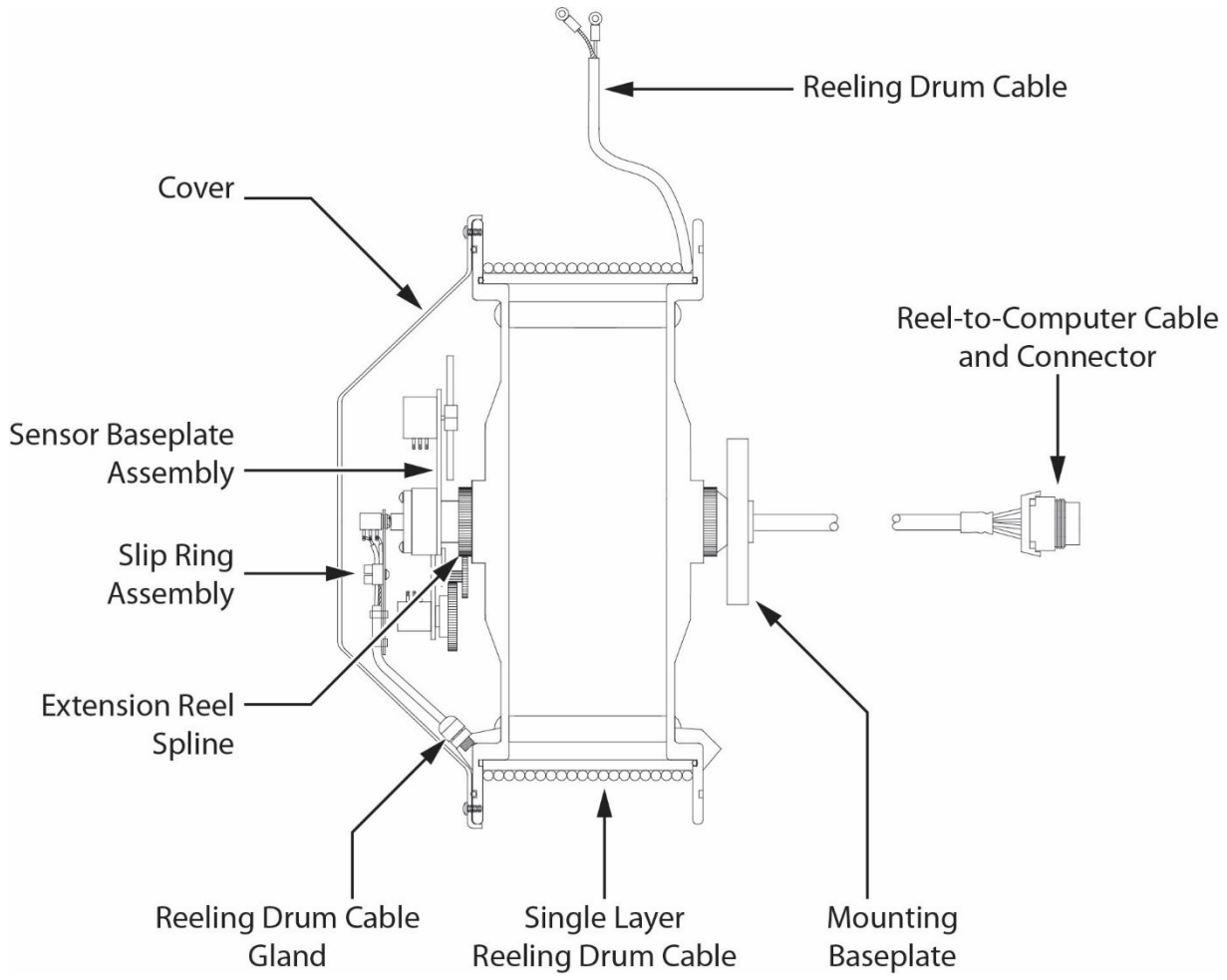


FIGURE 3.7 - REELING DRUMCUT-AWAY DRAWING

3.7.1 Checking the Reeling Drum Cable Layering

The reeling drum 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 reeling drum 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. Check that the reeling drum cable forms a flat single layer across the surface of the extension reel, with each successive turn of cable laying 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 reel-off cable, and lubricate it with a silicone spray, as shown in Figure 3.7.1 below.*

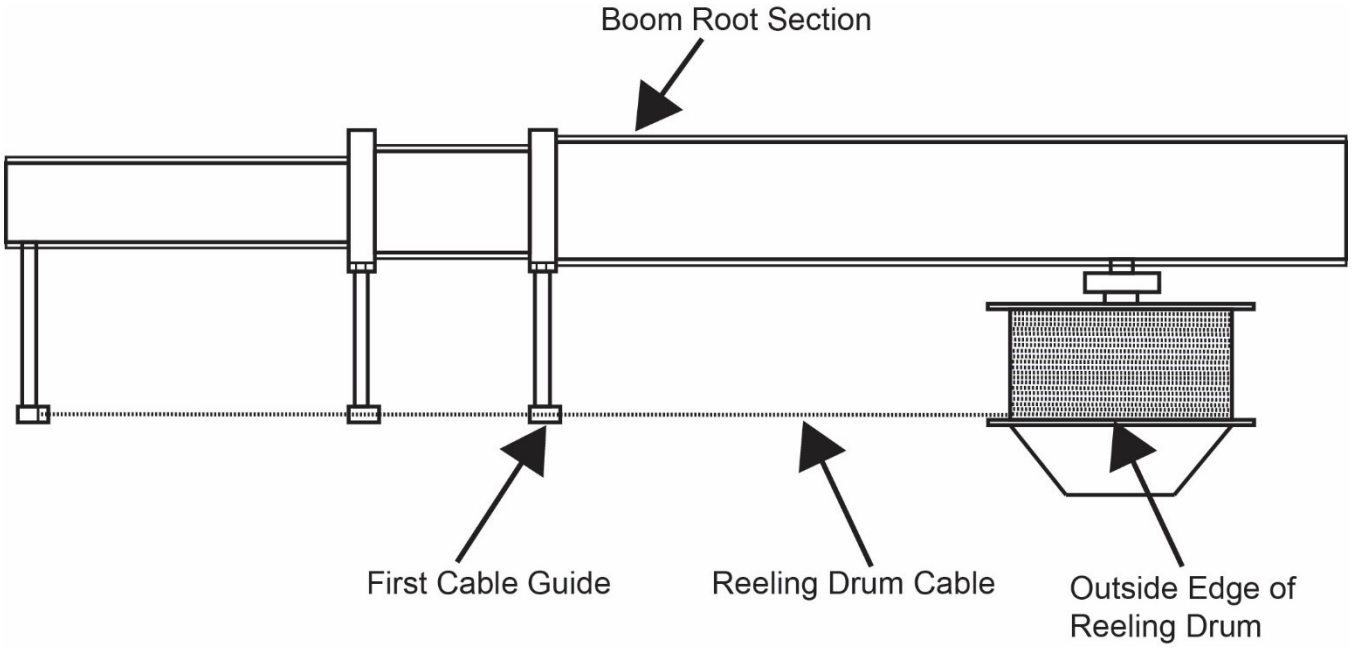


FIGURE 3.7.1 - REELING DRUM VIEWED FROM ABOVE

3.7.2 Checking the Extension Sensor Drive Voltage

1. Remove the reeling drum cover.
2. Use a digital voltmeter to measure the voltage between the RED (TB1-4) and BLUE (TB1-1) wires at the terminal block mounted on the sensor baseplate assembly.
3. Ensure the voltage is between 4.7 and 5.3 volts.

NOTE: *Voltages outside the range specified indicates a connection problem between the reeling drum and the computer or, a short circuit within the extension reel. Check the reeling drum wiring within the reel and at connector j305.*

3.7.3 Checking the Boom Extension Sensor Voltage

1. Fully retract the boom.
2. Remove the reeling drum cover.
3. With a digital voltmeter, measure the voltage between the BLUE wire (TB1-1) and the WHITE wire (TB1-3).
4. With the boom fully retracted, the voltage should be between 0.1 and 0.3 volts. If the voltage is incorrect, refer to CHAPTER 2 - CALIBRATION.
5. Measure the voltage at TB1-1 and TB1-3, extend the boom out and ensure the potentiometer is operating by verifying the voltage increases.

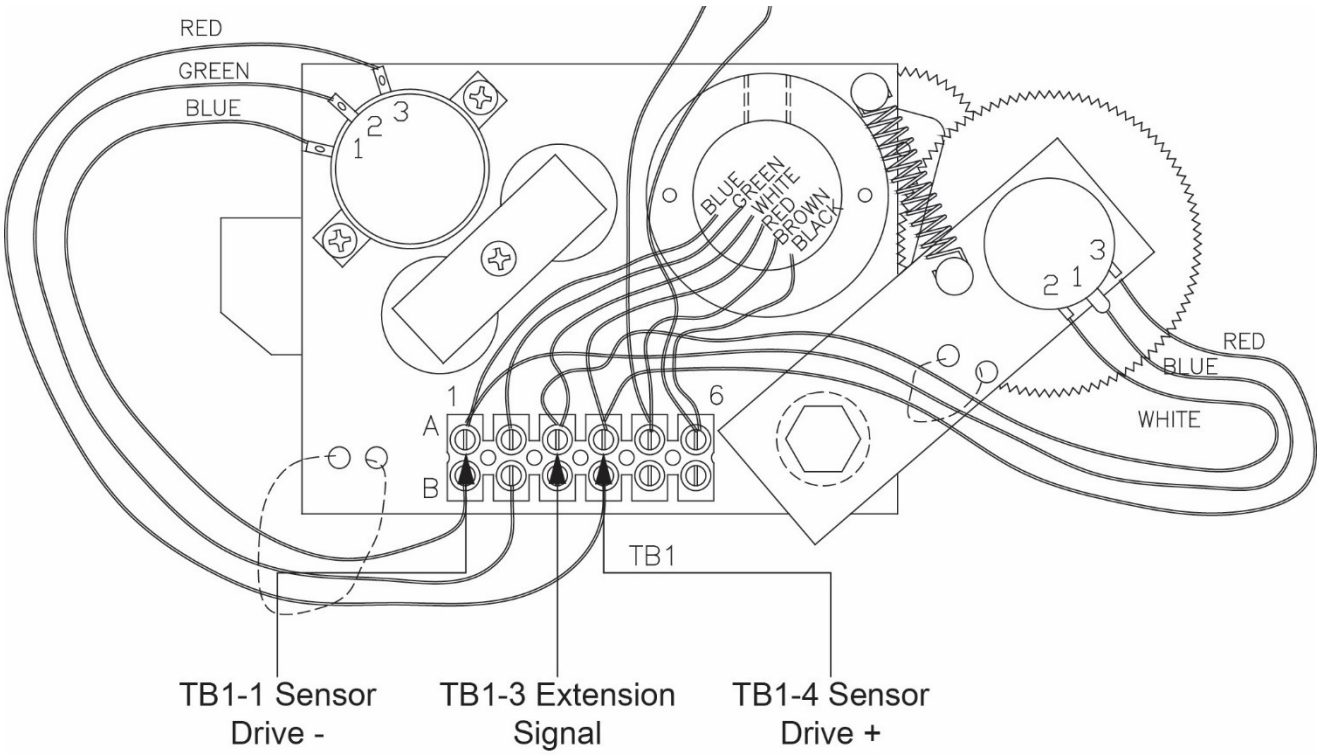
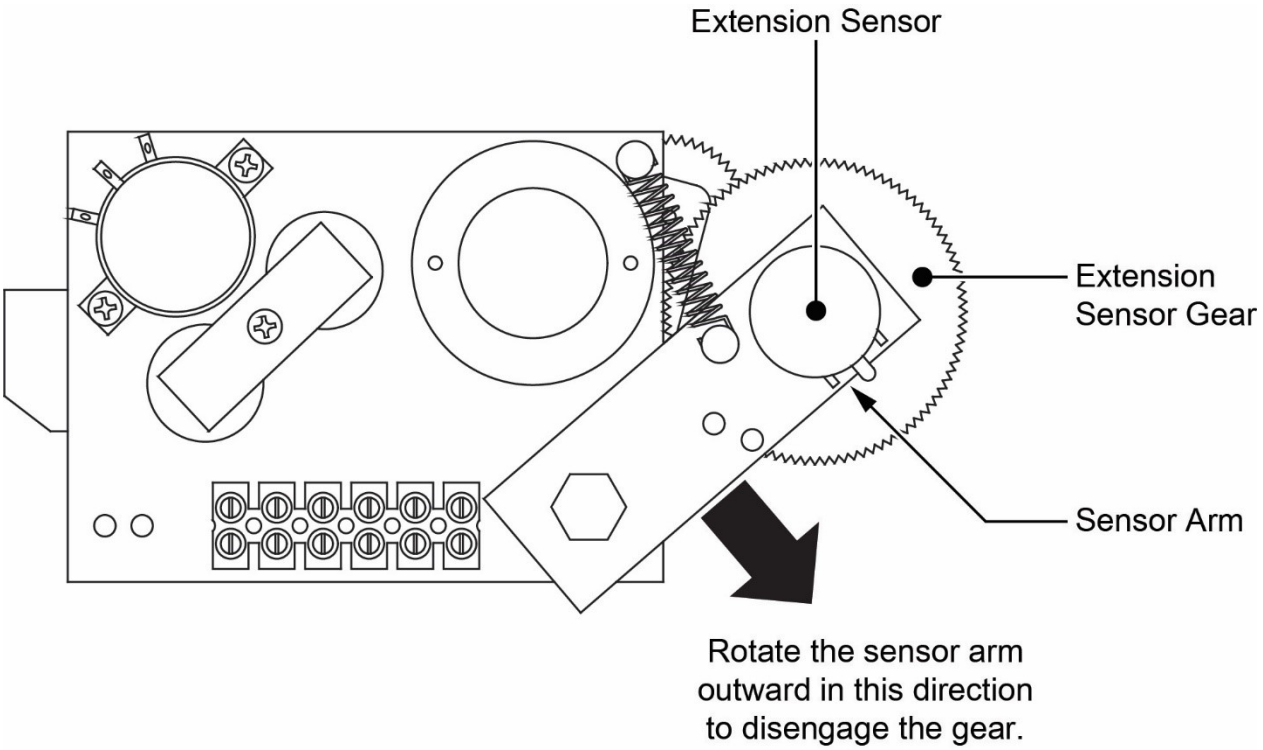


FIGURE 3.7.3 SENSOR BASEPLATE ASSEMBLY

3.7.4 Physical Zero

Ensure the extension sensor potentiometer is correctly set to its minimum “zero” setting when the boom is fully retracted. This ensures the sensor will correctly measure over the full telescoping range of the boom.

1. Fully retract the boom.
2. Remove the reeling drum cover.
3. Disengage the main gear wheel connected to the extension sensor by pulling the sensor arm in the direction shown.
4. Rotate the gear clockwise until the sensors clutch starts to drag. At the next click, stop rotating the gear.
5. Measure the voltage between TB1-3 and TB1-1 (Figure. 3.7.3).

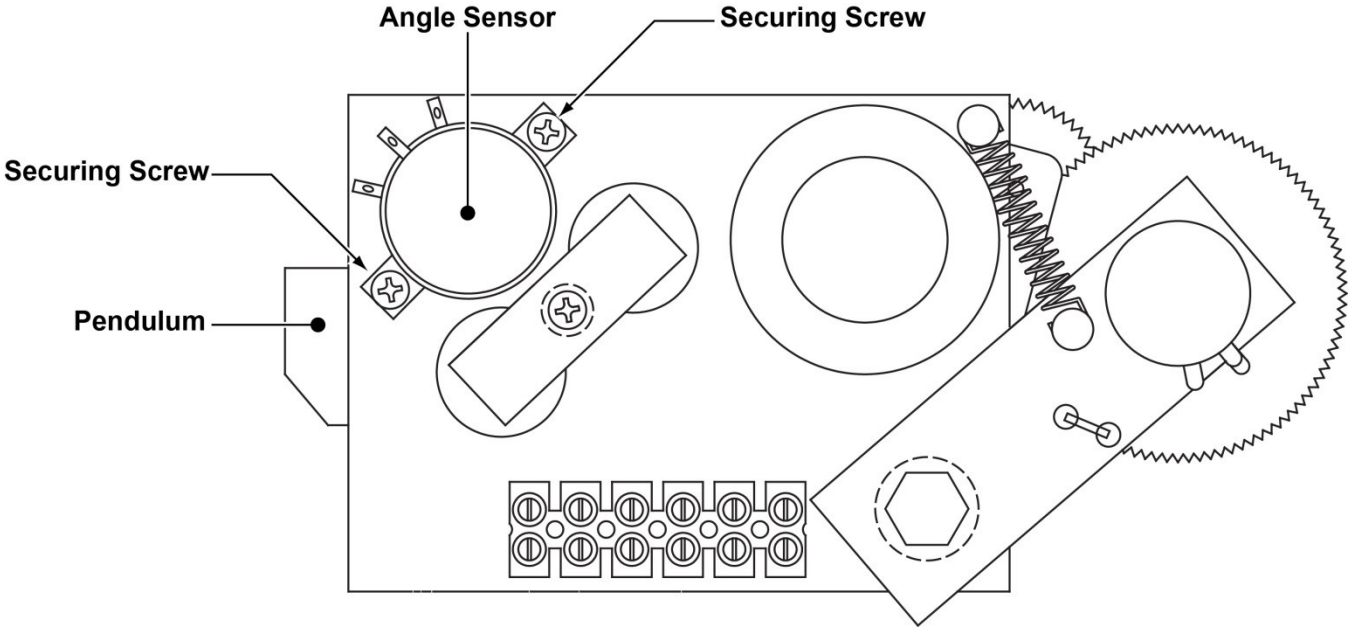


6. Rotate the gear counterclockwise about half a turn setting the voltage to 0.2 volts. Then, carefully release the sensor arm, ensuring the voltage remains at 0.2 volts as the gears re-engage.

3.7.5 Checking the Angle Sensor Pendulum

The ANGLE SENSOR uses a copper pendulum, mounted behind the sensor assembly. In order to stop the pendulum from swinging uncontrollably during movements of the boom, two magnets provide damping. If problems with the angle sensor are suspected, ensure the pendulum and potentiometer are operating without restriction. Then continue to check electrical operation before performing any calibration.

1. Remove the reeling drum cover.
2. Locate the pendulum. Refer to Figure 3.7.5 below.
3. Push the pendulum downwards and ensure it moves freely. Some resistance of movement may be encountered as the pendulum is moved; however, this is due to the magnets that provide the damping.
4. Release the pendulum and make sure that it returns with free, but controlled movement, directly back to its original position. Repeat this step a few more times, ensuring it always returns to its original position.



NOTE: *If the pendulum "sticks" while performing the above checks, ensure there are no wires touching the pendulum, or that no other obvious problems are present. If not, it will be necessary to replace the sensor baseplate assembly.*

FIGURE 3.7.5 - SENSOR BASEPLATE ASSEMBLY

3.7.6 Checking the Angle Sensor Drive Voltage

1. Remove the reeling drum cover.
2. Use a digital voltmeter to measure the voltage between the RED (TB1-4) and BLUE (TB1-1) wires at the terminal block mounted on the sensor baseplate assembly.
3. Ensure the voltage is between 4.7 and 5.3 volts.

NOTE: *Voltages outside the range specified indicate a connection problem between the reeling drum and the computer or, a short circuit within the extension reel. Check reeling drum wiring within the reel and at the boom foot base connector.*

3.7.7 Checking the Angle Sensor Voltage

1. Using an inclinometer for verification, place the main boom at a 0° (zero) angle; then remove the reeling drum cover.
2. Use a digital voltmeter to measure the voltage between the BLUE wire (TB1-1) and the GREEN wire (TB1-2). With the boom horizontal, the voltage should be between 0.3 and 0.5 volts. If the voltage is incorrect, follow the ANGLE SENSOR SETUP PROCEDURE.
3. Measure the voltage at TB1-1 and TB1-1, move the exposed side of the angle sensor pendulum downwards, and ensure the potentiometer is operating by verifying the voltage increases. Ensure the pendulum moves freely and when released falls smoothly back to the original 0° (zero) voltage reading.

3.7.8 Reeling Drum Replaceable Parts

The following parts of the reeling drum, are field-replaceable:

- Reeling Drum Cable Assembly
- Slip-Ring Assembly
- Sensor Baseplate Assembly
- Cable Tail Assembly (Signal Cable)
- Cover

The spring chamber/reeling drum surface and shaft assembly are not replaceable in the field. Failure of the recoil spring, damage to the shaft or reel surface and side plates requires complete replacement of the reeling drum.

3.7.8.1 Reeling Drum Cable

The REELING DRUM CABLE carries the Anti-Two-Block signal from the switches at the main boom head, aux head and erected jib/fly. The cable is made from stainless steel wire and a durable outer sheath. Damage to the cable will often result in bad Anti-Two-Block signals or bad measurement of boom extension. If the cable has been broken or damaged in any way, it can be replaced in the field.

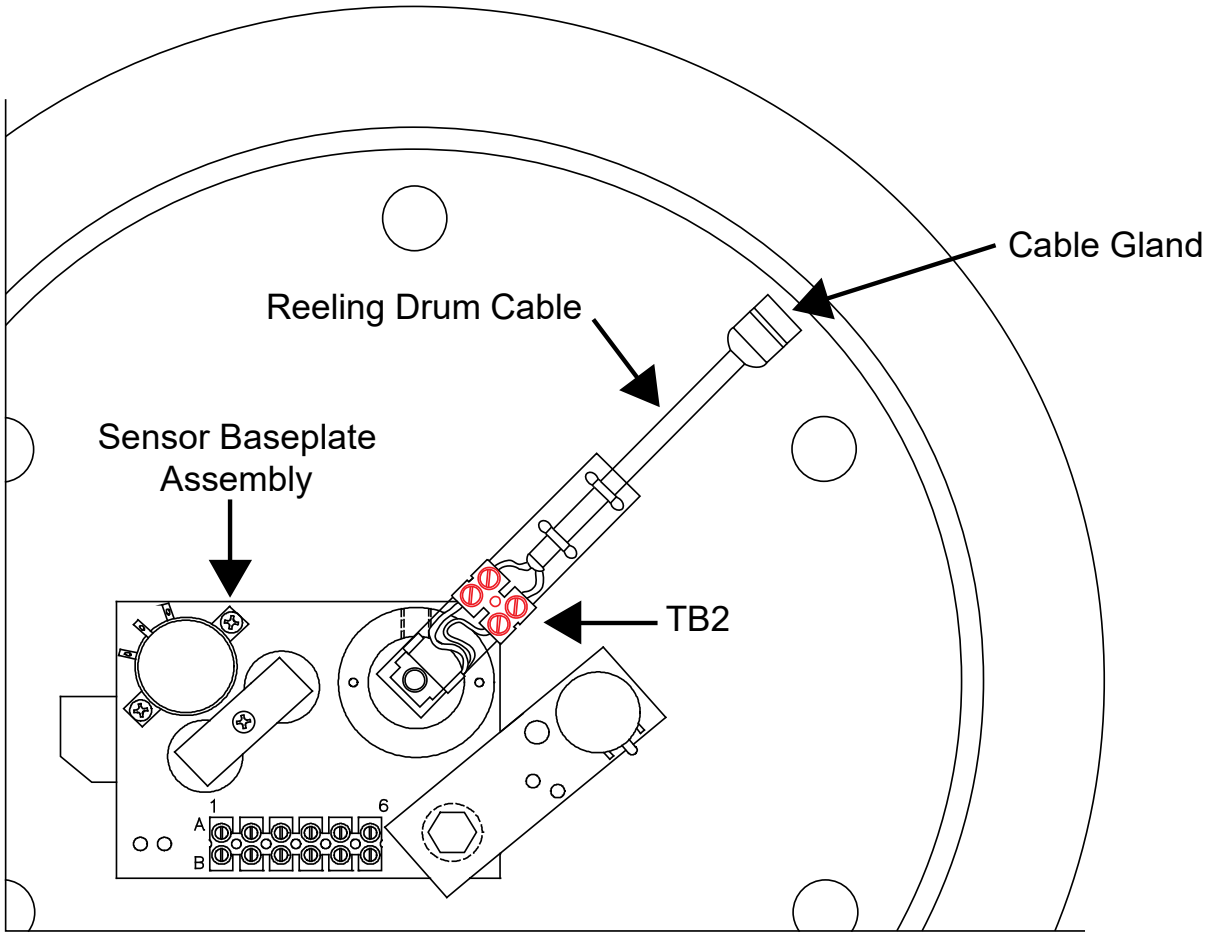


FIGURE 3.7.8.1 REELING DRUM CONNECTIONS ON

Removing the Reeling Drum Cable

1. Fully retract and lower the boom. Disconnect the REELING DRUM CABLE from the Anti-Two-Block switch or connector.
2. Grip the cable firmly and release it from the tie-off post.
3. Continue to grip the cable firmly while allowing it to fully wind back onto the reeling drum.
4. Remove the reeling drum cover.
5. Cut the 2 tie-wraps that secure the reeling drum cable to the slip-ring support arm.
6. Unscrew the reeling drum cable from the terminal block on the slip-ring support arm.
7. Loosen the gray cable gland mounted on the cheekplate.
8. Pull the existing reeling drum cable out through the cable gland.

Installing the Reeling Drum Cable

1. Loosen the strain relief on the cheekplate and feed the REELING DRUM CABLE through the wall of the cheekplate. Leave enough slack to work easily with the cable.
2. If not already stripped, remove 1” of the outer jacket of the cable with an X-ACTO knife.
3. Unravel the stainless steel braid and twist it into a single wire.
4. Remove 1/4” insulation from the center wire. The insulation bonded to the center wire is difficult to remove. Remove small increments about 0.1” at a time with wire strippers.
5. Connect the reeling drum cable to TB2 on the arm of the slip-ring. The braided wire connects to the black wire and the center core connects to the brown wire. Using two cable ties, tie the cable to the arm of the slip-ring.
6. Secure the reeling drum cable to the arm of the slip-ring with two tie-wraps.
7. Adjust the cable to bend slightly from the strain relief to the slip-ring. Rotate the reeling drum. Ensure the path of the new cable is unimpeded; then, tighten the strain relief.
8. Wind the reeling drum cable onto the reeling drum in a single layer.
9. Set pre-tension (5 turns counterclockwise). Thread the reeling drum cable through the cable guides. Attach the cable to the boom tie-off-post and connect it to the Anti-Two-Block switch.
10. To set the potentiometer to zero, refer to CHAPTER 2 - CALIBRATION. Recalibration of the extension span should not be necessary.
11. Fully telescope the boom in and out at least twice. Ensure the reeling drum cable remains in a single flat layer on the drum surface and the length display on the display console is accurate with a fully extended or fully retracted boom. Any stacking of the cable on the reeling drum surface will cause measurement errors. If this is the case, it may be necessary to check that the first cable guide aligns correctly with the outside edge of the reeling drum surface.
12. Install the reeling drum cover, ensuring the O-ring on the inside of the REELING DRUM is intact.

3.7.8.2 Slip-Ring Assembly

The main purpose of the SLIP-RING ASSEMBLY is to provide an electrical path for the feed and switch signal return, between the Two-Block switch and the system computer. If replacement becomes necessary, replace the upper and lower halves of the slip-ring assembly at the same time. Failure of the slip-ring assembly will most likely result in a continuous Anti-Two-Block alarm. For information on testing and checking the slip-ring assembly, refer to SECTION 3.9 ANTI TWO-BLOCK FUNCTION OVERVIEW.

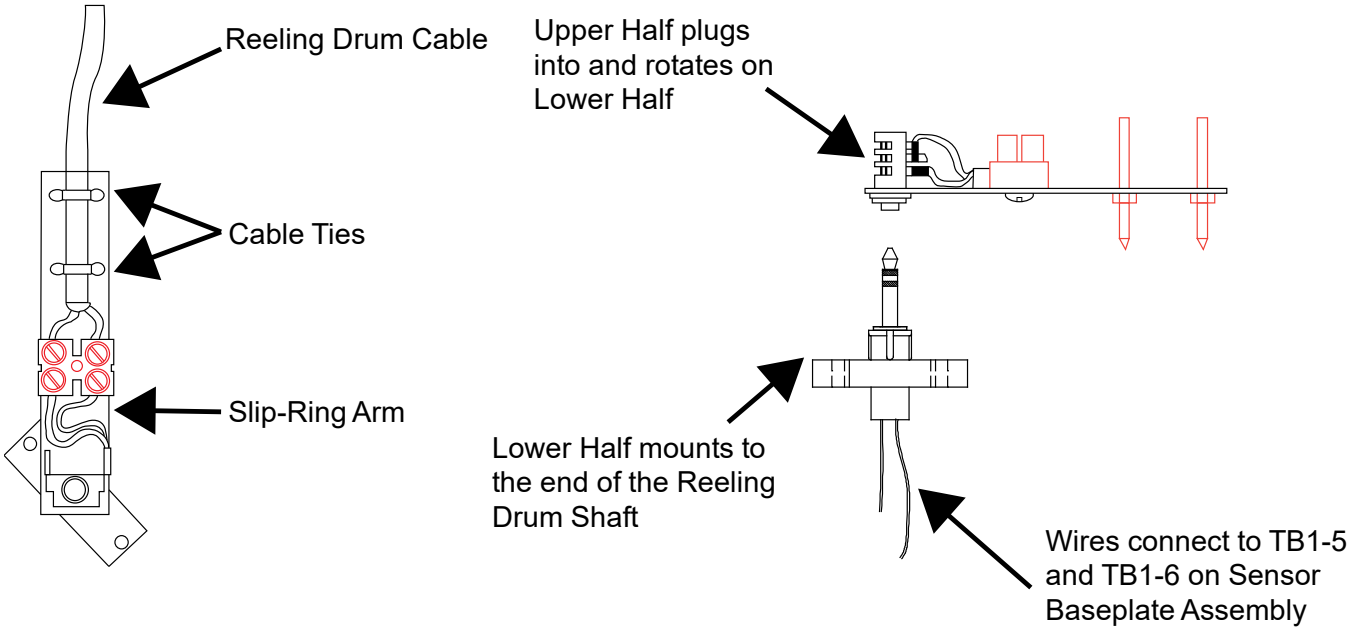


FIGURE 3.7.8.2 - SLIP-RING ASSEMBLY

Removing the Slip-Ring Assembly

1. Remove the reeling drum cover.
2. Hold the reeling drum cable on the arm of the slip-ring and cut the tie wraps.
3. Unscrew the reeling drum cable from TB2 on the arm of the slip-ring.
4. Unscrew both Phillips screws that hold the lower half of the slip-ring on the shaft and remove the slip-ring.
5. Disconnect the two wires connecting the lower half of the slip-ring assembly at TB1-5 and TB1-6 on the sensor baseplate assembly.

Installing the Slip-Ring Assembly

1. The new SLIP-RING ASSEMBLY is pre-lubricated with grease. Do not wipe off lubrication.
2. Attach the brown slip-ring wire from the lower half of the new slip-ring to TB1-5 on the sensor baseplate assembly. Ensure the brown signal wire is also correctly connected.
3. Attach the black (or white) slip-ring wire from the lower half of the new slip-ring to TB1-6 on the sensor baseplate assembly. Ensure the black signal cable wire is also correctly connected.

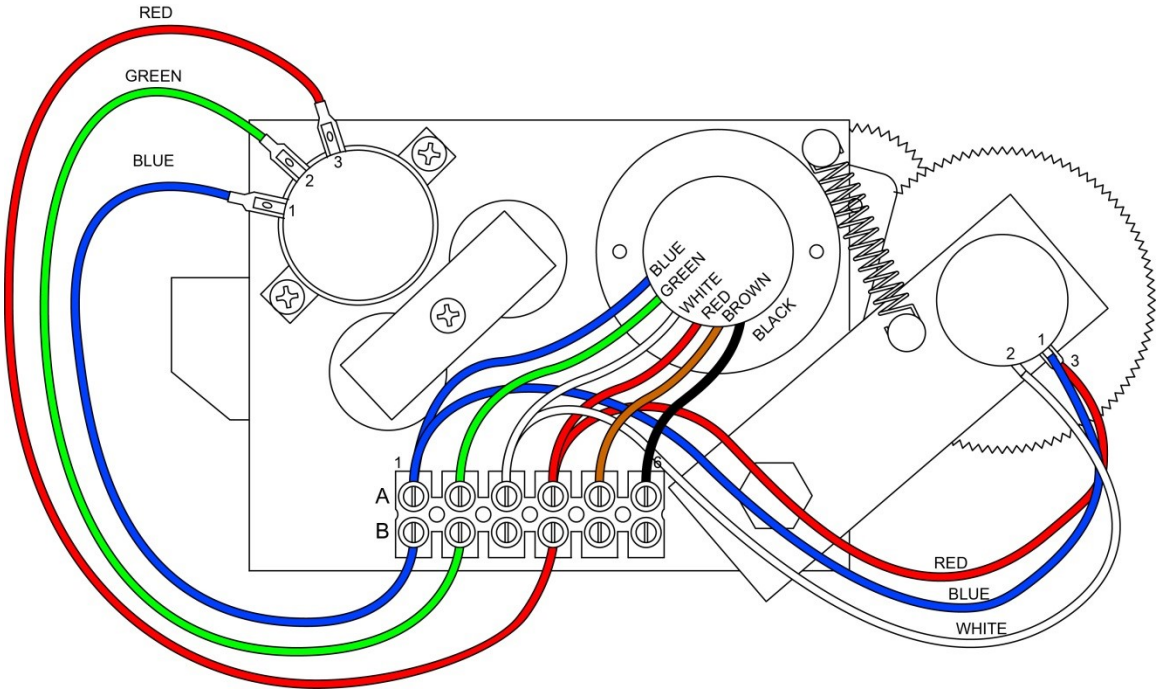
4. Screw the bottom half of the slip-ring to the shaft with the two Phillips screws. Ensure the wires exiting through the center of the shaft are not trapped.
5. Connect the extension reeling drum cable to TB2 on the arm of the slip-ring. The braided shield connects to the slip-ring TB2 black wire and the center of the cable connects to the slip-ring TB2 brown wire.
6. Secure the extension reeling drum cable to the arm of the slip-ring with two cable ties.
7. Ensure the slip-ring is plugged in all the way.
8. Replace the reeling drum cover.

3.7.8.3 Sensor Baseplate Assembly

The SENSOR BASEPLATE ASSEMBLY supports both the extension and angle sensors and connects the sensors, the Anti-Two-Block switch signal to the slip-ring, and the signal cable to the system computer.

Electrical or mechanical failure of either the angle sensor or the extension sensor potentiometers may not be field-repaired. 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. If either of these items fail, replace the whole sensor baseplate assembly.

The terminal block (TB1) provides wiring connection for all internal parts of the reeling drum and the signal cable connecting the reel to the system computer. Electrical diagnoses of the boom sensors may be made at this terminal block.



Removing the Sensor Baseplate Assembly

1. Remove the aluminum cover on the extension reel.
2. Remove the screws holding the slip-ring to the mounting ring of the SENSOR ASSEMBLY.
3. Disconnect the brown and black wires.
4. Disconnect the signal cable wires to terminal block TB1.
5. Using a 5/32” Allen wrench, loosen the set-screw that holds the baseplate on the shaft.
6. Remove the sensor assembly.

Installing the Sensor Baseplate Assembly

1. Place the boom in a horizontal position when installing the SENSOR ASSEMBLY.
2. Feed the wires coming out of the main shaft through the mounting collar on the sensor assembly.
3. While pulling both extension sensor gears out against the spring, slide the sensor assembly onto the shaft until the top of the shaft aligns with the top of the mounting collar. Align the top edge of the assembly parallel with the boom.
4. Tighten the set-screw and release the gears allowing them to mesh with the reeling drum spline. Route the wires to the terminal block and hook up the wires, as indicated below.

SIGNAL	BOOM POSITION/ ACTION	VOLTAGE		VOLTMETER CONNECTION	
		MIN	MAX	RED (+)	BLACK (-)
SENSOR DRIVE	-	+4.7V	+5.3V	TB1/4 - RED	TB1/1 - BLUE
ANGLE SENSOR OUTPUT	0 degrees	0.4V	0.6V	TB1/2 - GREEN	TB1/1 - BLUE
EXTENSION SENSOR OUTPUT	0 ft. FULL RETRACTED	0.15V	0.35V	TB1/3 - WHITE	TB1/1 - BLUE
TWO-BLOCK DRIVE	A2B WEIGHT DOWN	5.5V	7.5V	TB1/6 - BLACK	TB1/1 - BLUE
	A2B WEIGHT UP	9.5V	10.5V	TB1/6 - BLACK	TB1/1 - BLUE
TWO-BLOCK SIGNAL	A2B WEIGHT DOWN	5.5V	7.5V	TB1/5 - BROWN	TB1/1 BLUE
	A2B WEIGHT UP	0V	2V	TB1/5 - BROWN	TB1/1 - BLUE

5. Tuck the unconnected remaining yellow and orange wires down into the shaft.
6. Screw the slip-ring assembly to the sensor baseplate assembly.
7. Connect the brown wire on the slip-ring assembly to TB1-5; connect the black wire to TB1-6. Strip wires, if not already stripped.

NOTE: *Ensure the wires lay flat and there is enough space to allow the slip-ring arm to freely rotate.*

8. Check the wiring and then follow the procedures to set up both the angle and extension sensors.

3.7.8.4 Signal Cable Assembly

The SIGNAL CABLE ASSEMBLY connects the reeling drum sensors, the Anti-Two-Block switch and the system computer.

Removing the Reeling Drum from the Boom

1. Completely lower and retract the boom.
2. Disconnect the Reeling Drum Cable and the Anti-Two-Block switch.
3. Grip the Reeling Drum Cable firmly and remove it from the tie-off post.
4. Maintain a firm hold on the Reeling Drum Cable as it winds back onto the Reeling Drum.
5. Secure the end of the Reeling Drum cable to unwinding.
6. Disconnect the signal cable at the distal end.
7. Unbolt the Reeling Drum from the crane with a wrench.

Removing the Signal Cable from the Reeling Drum

1. Remove the cover from the Reeling Drum.
2. Remove the Slip-Ring on the sensor baseplate assembly.
3. Disconnect all wires from the sensor assembly except for the 6 wires leading to the Angle and Extension sensor potentiometers.
4. To protect the sensors within the Reeling Drum, use two screws to temporarily attach the cover of the Reeling Drum.
5. Turn over the Reeling Drum to expose the back of the device.
6. With the wires still disconnected, pull the Signal Cable out of the main shaft in the center of the Reeling Drum. This cable has a strain-relief encircled with an O-ring which creates a tight fit to prevent water intrusion.

NOTE: *If it is difficult to remove the cable, use the insertion/extraction tool from the front of the Reeling Drum to release the cable.*

Installing the Signal Cable

1. Ensure the O-ring on the strain-relief is greased.
2. With the back of the Reeling Drum exposed, insert the end of the Signal Cable with O-ring into the mounting plate and down the shaft in the center of the reeling drum.
3. Ensure the strain-relief is properly seated with the O-ring using the tool provided in the kit.
4. Bend the cable to the side and position the hollow section of the tool on the strain-relief plug at the top of the shaft.
5. With a hammer, gently tap the top of the tool forcing the strain-relief into the proper position in the shaft. Continue to tap gently until the strain-relief pull will not go any farther in the hole.
6. Turn over the Reeling Drum and remove the cover.
7. Connect the wires to the terminal block as indicated by the Sensor Baseplate Diagram.
8. Tuck the unconnected remaining yellow and orange wires down into the shaft.
9. Connect the brown wire from the Slip-Ring Assembly to TB1-5, connect the black wire to TB1-6.

10. Screw the Slip-Ring Assembly to the sensor baseplate assembly.

NOTE: *Ensure the wires lay flay and toward the terminal connectors. Ensure there is enough space to clear the wires when the arm of the Slip-Ring rotates.*

11. Replace the cover on the Reeling Drum.
12. Install the Reeling Drum on the boom.

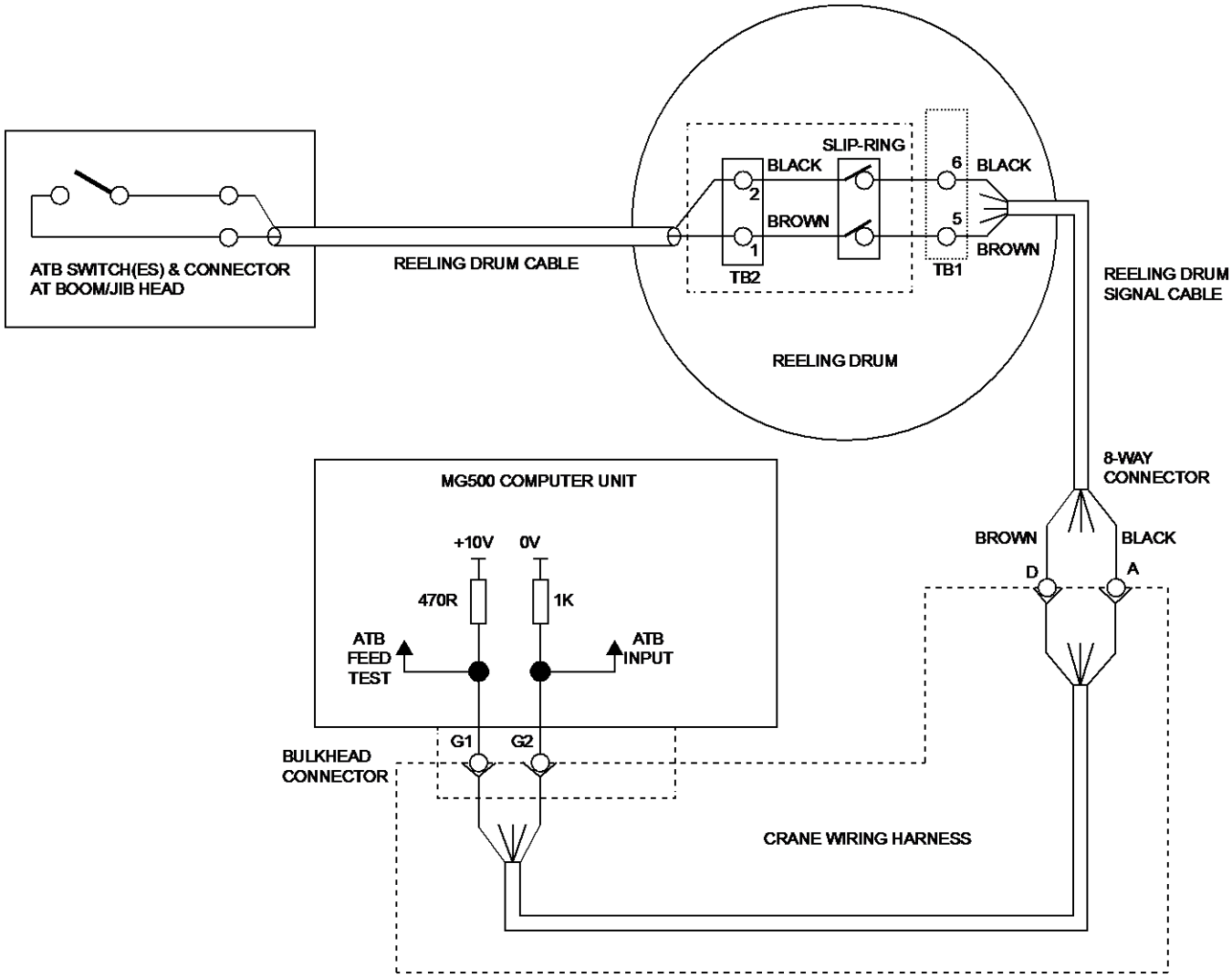
3.8 Anti Two-Block Function Overview

This section describes fault diagnoses of the Anti-Two-Block detection circuit.

The computer supplies a protected positive feed to the Anti-Two-Block switches at the boom/jib head via the reeling drum signal cable, slip-ring, and reeling drum cable. With the Anti-Two-Block weight hanging freely on the switch(es), the switch contact is closed and the signal return to the computer is high (6.25 volts). When the weight is lifted by the hook block, the switch contact is opened, and the computer will sense a low signal input (0 volts) 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 SECTION 3.3 FAULT REPORTING AND FAULT CODES.

Most problems with the ATB circuit may be identified through inspection of cables, switches, and the extension reel. Damage to these parts may result in continuous or intermittent A2B alarms.



3.8.1 Checking the Reeling Drum Cable

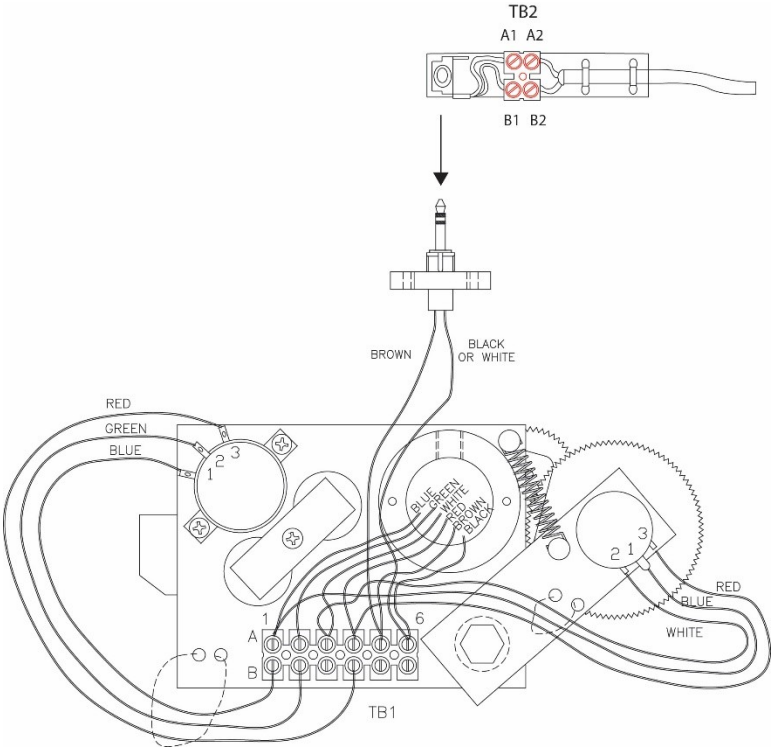
The outer braid of the cable carries the Anti-Two-Block feed to the switches. If the cable sheath is damaged, this may cause a short circuit to the boom/chassis and indicate a fault code above “B 8”(See SECTION 3.3.2 GROUP “B” FAULT CODES). The same fault code will be indicated if the ATB switch is closed 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.

3.8.2 Checking the Anti-Two-Block Circuit

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 reeling drum.
3. Close the ATB switch at the boom head by suspending the weight from it or pulling on the chain.
4. Measure the resistance between TB2-1 & TB2-2 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 between TB2-1 & TB2-2 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.

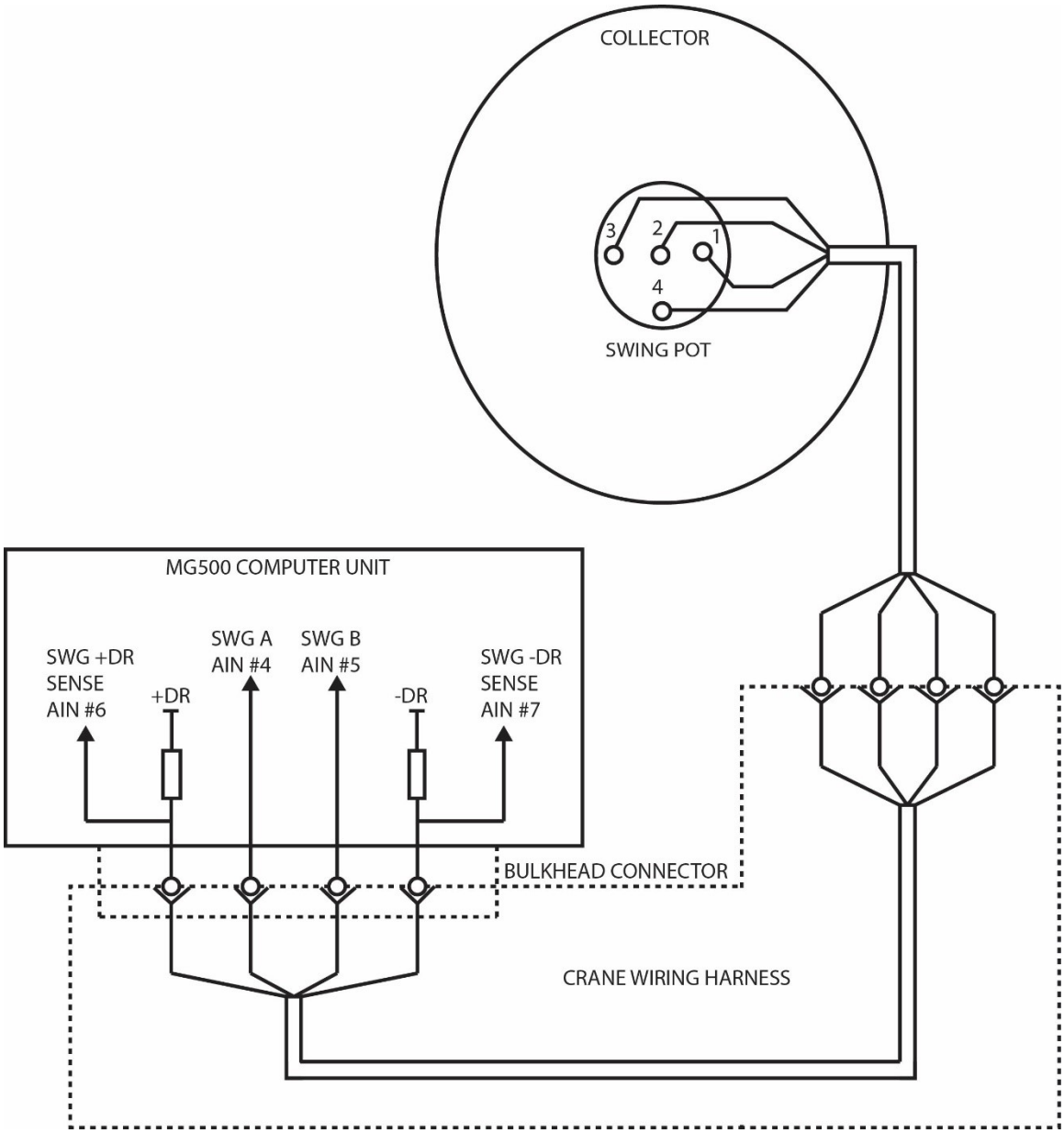


3.9 Swing Sensor Overview

The SWING SENSOR 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 sensor fails, the computer will be unable to select a valid capacity chart.

For fault diagnosis, access the swing sensor by removing the collector cover collector at the cranes swing center. Refer to Figure 3.9 below.

For swing sensor replacement procedures, consult factory service.



3.9.1 Checking the Swing Sensor Drive Voltage

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

NOTE: *Voltages outside of those shown in steps 2 and 3 indicate a problem with the swing sensor or cabling connections. If voltages are incorrect, proceed to SECTION 3.10.3 CHECKING THE SWING SENSOR RESISTANCE.*

3.9.2 Checking the Swing Sensor Output Voltage

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

NOTE: *Voltages outside of those shown in Steps 2 and 3 indicate a problem with the swing sensor or cabling connections. If voltages are incorrect, proceed to SECTION 3.10.3 CHECKING THE SWING SENSOR RESISTANCE.*

3.9.3 Checking the Swing Sensor Resistance

1. Disconnect the connector (behind the collector ring).
2. Measure the resistance between pins C and D of the connector on the swing sensor 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 sensor side. The resistance should be between 1800 and 2300 ohms.

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

3.9.4 Swing Sensor Setup and Checks

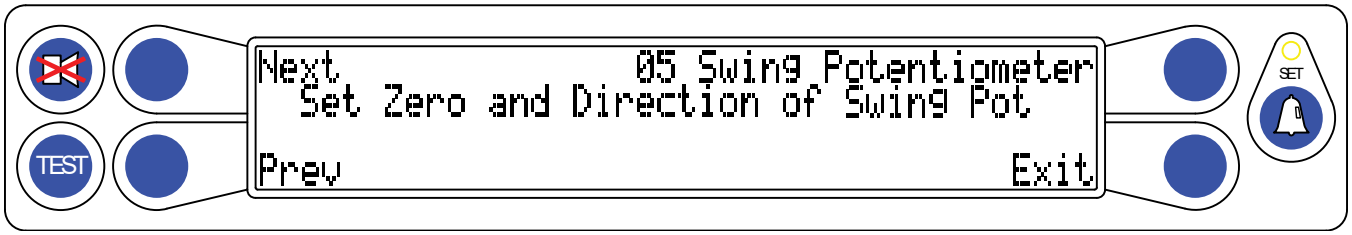
The following procedures may be used to check or setup the SWING SENSOR. Only two setup operations are required (ZERO and DIRECTION). Unlike other system sensors, the swing sensor does not require span calibration to operate. Span is automatically calculated by the computer.

The 0° (zero) angle of the upper structure should be set with the over the front RT's and over the rear for Truck Mounts. Before continuing, ensure the upper structure is correctly positioned and the house-lock is engaged.

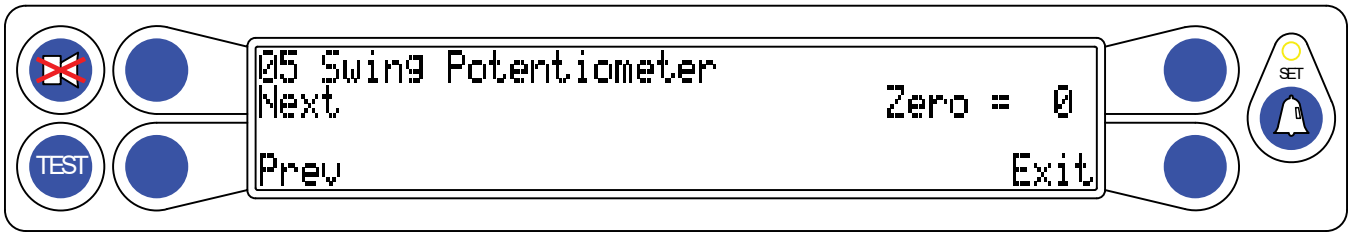
The swing potentiometer is located in the collector ring assembly under the hydraulic swivel.

The job of the potentiometer is to track the movement of the upper half of the crane all the way around the swing circle. This function can only be zeroed in the stowed, or house lock positions, and the numbers should count up, when rotating to the right or in a clockwise direction. If no swing potentiometer is present, calibration is not required.

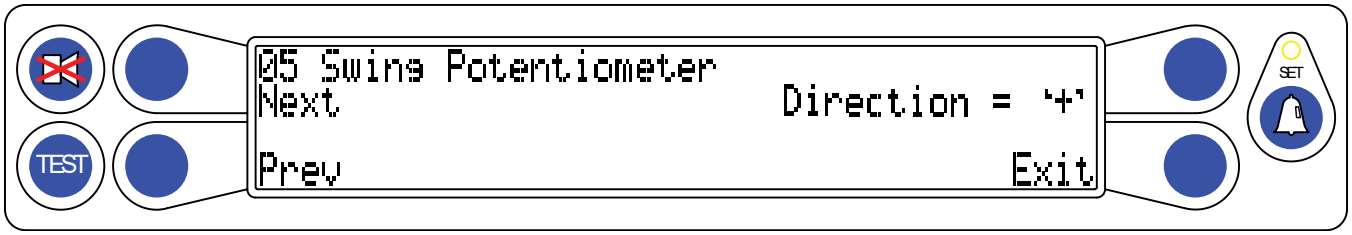
1. Press the ***Next*** or ***Prev*** button until “05 Swing Potentiometer” appears in the information window at the right.
2. Press the ***05 Swing Potentiometer*** button to enter the routine.



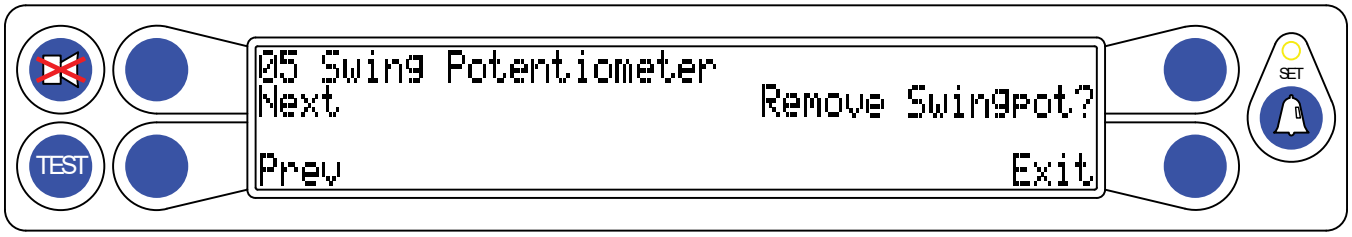
3. Stow the boom in “road travel” mode. Press the ***Zero = ----*** button.
4. The swing is now zeroed.



5. Next, raise the boom out of the rest and rotate to the right. The number by “Zero = 0” should increase. If not, press the ***Next*** button and then press ***Direction =*** button and the “+” will change to a “-” and the direction will be reversed.



6. Press the ***Next*** button to view the Remove Swing pot command. Use this command to remove the swing pot from the system. This is usually only used as a troubleshooting tool and is not part of the calibration routine.



7. Press the ***Exit*** button to return to the main menu.

SkyAzúl, Inc.
16 Walnut Street
Middletown, MD 21769
Phone 301-371-6126
Fax 301-371-0029
info@skyazul.com

www.skyazul.com