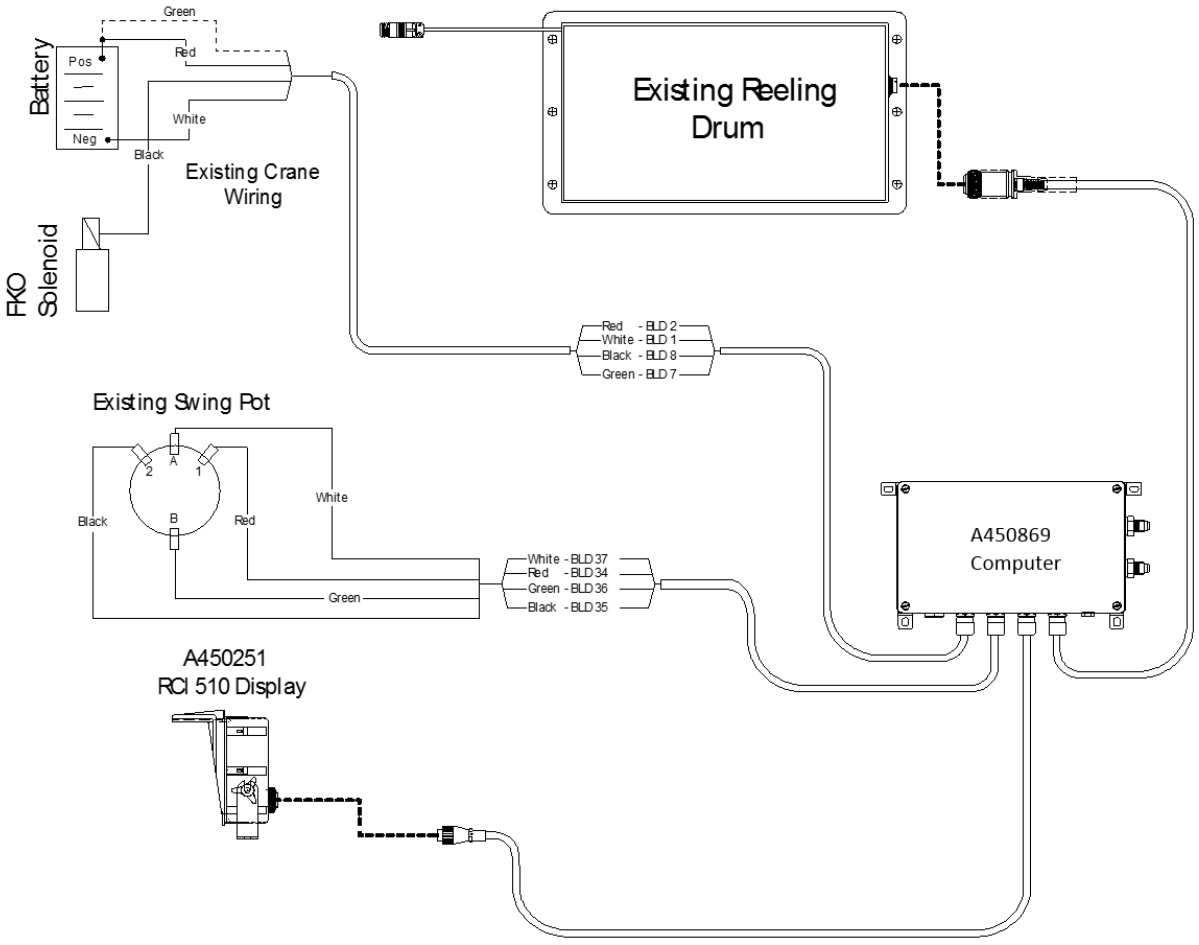
MicroGuard 510
Retrofit for Terex



Installation, Calibration and Troubleshooting Manual

GREER COMPANY® by a DOVER company

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1.0 Installation

1.0 Introduction

The MicroGuard MG510 replaces the previous Terex MG404, 414, and RCI 500 system currently using the obsolete MG400 computer. This section will cover the necessary installation instructions for the MicroGuard 510 using the new 500 series computer.

Please read the Operator's Manual carefully 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, Greer Company recommends the exisiting rectangular shaped reeling drum be replaced with our current production reeling drum, A240690. The rectangular shaped reeling drum is obsolete. There is no longer field support for this product.

Installing the new reeling drum will ensure field support and parts support in the future. The A240690 reeling drum is equipped with mounting brackets and electrical fittings to be a direct replacement.

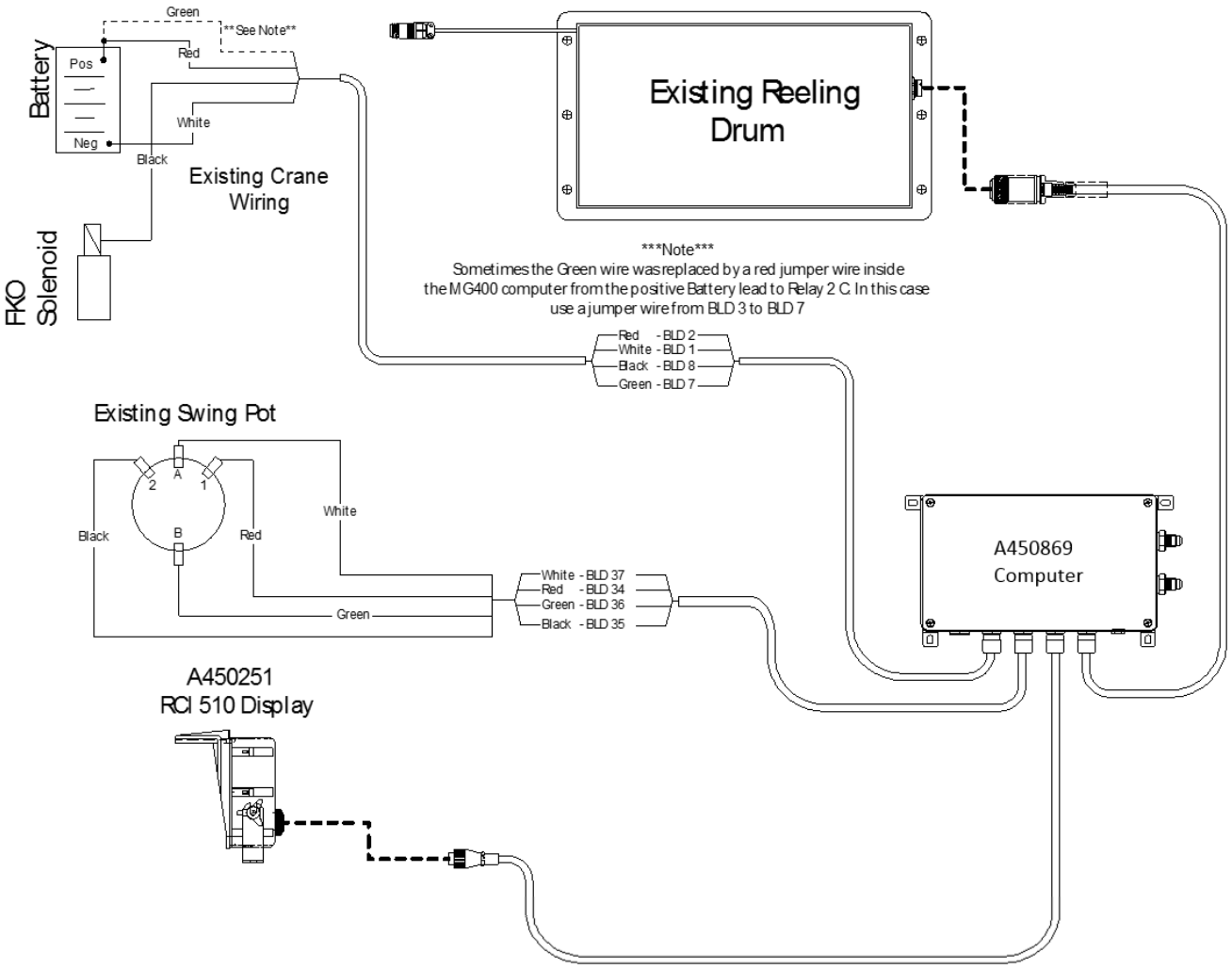
The new computer uses Flash RAM technology for loading the Duty Files. If known at the time of purchase, the proper Duty File will be loaded on your computer before being shipped.

Kit K758746 is available for preparing the new flash-style computer for use. The kit contains a programming cable, a CD with the necessary software, and a PDF copy of the instruction manual to allow the installer to load the correct Duty File on the computer.

1.2 Upgrade Parts

1.2.1 A450869 Computer Assembly

Where applicable, the computer assembly includes a wiring harness designed to integrate with the existing Terex crane wiring harness where applicable. Refer to the installation drawing below.

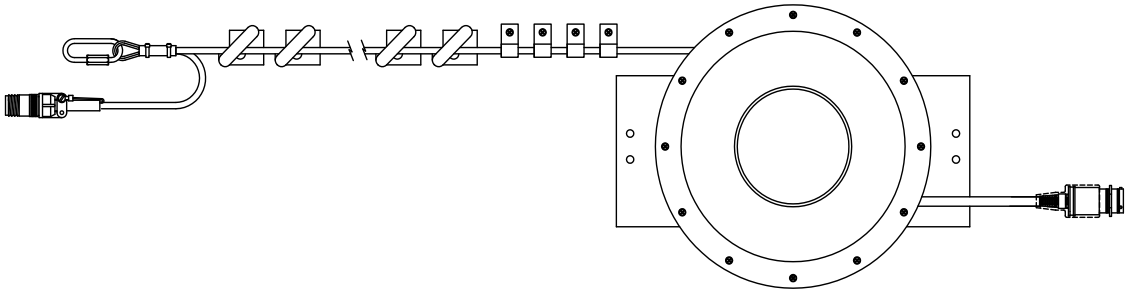


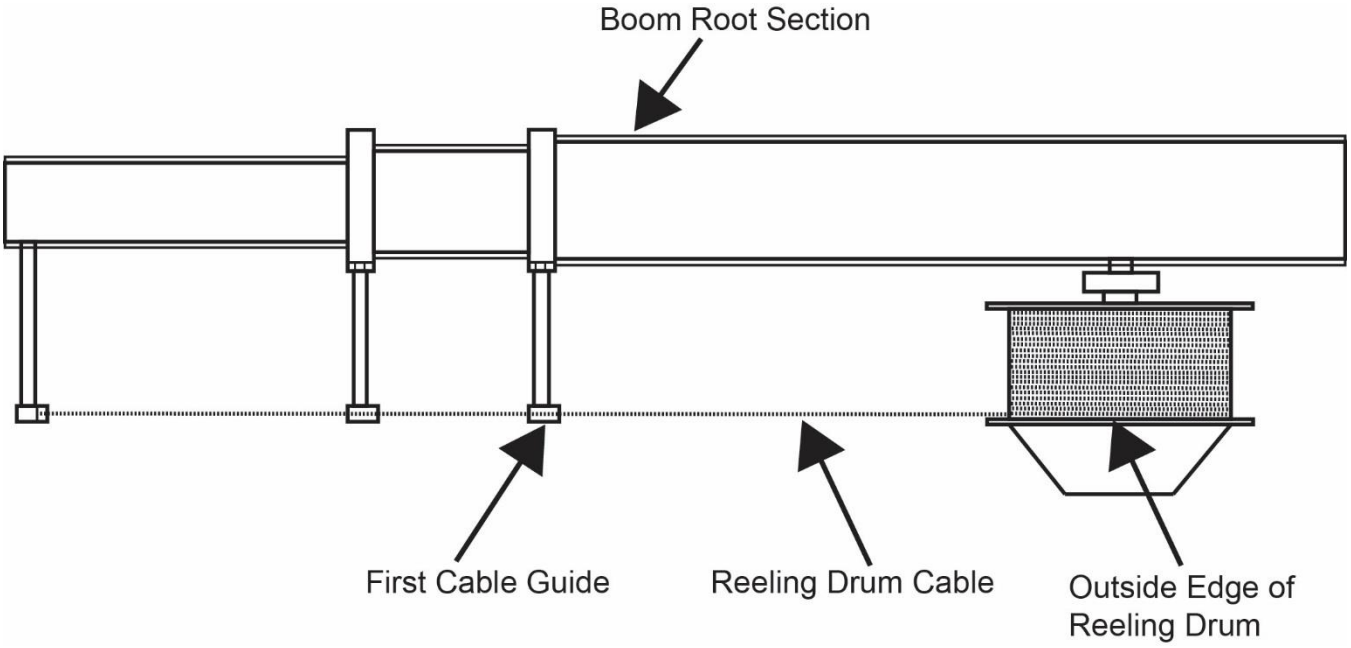
1.2.2 A450251 RCI 510 Display

The display is designed specifically for upgrading Terex cranes and operates with Terex-style menus.

1.2.3 **A240690 Reeling Drum**

If you replace the exisiting reeling drum with A240690, the installer must replace the guides for the Anti-Two-Block cabling. The guides support the level wind system fo the reeling drum. The part number for the new guide kit is K056005 and includes the new guides and installation instructions. The instructions detail how to obtain the best reeling drum performance.

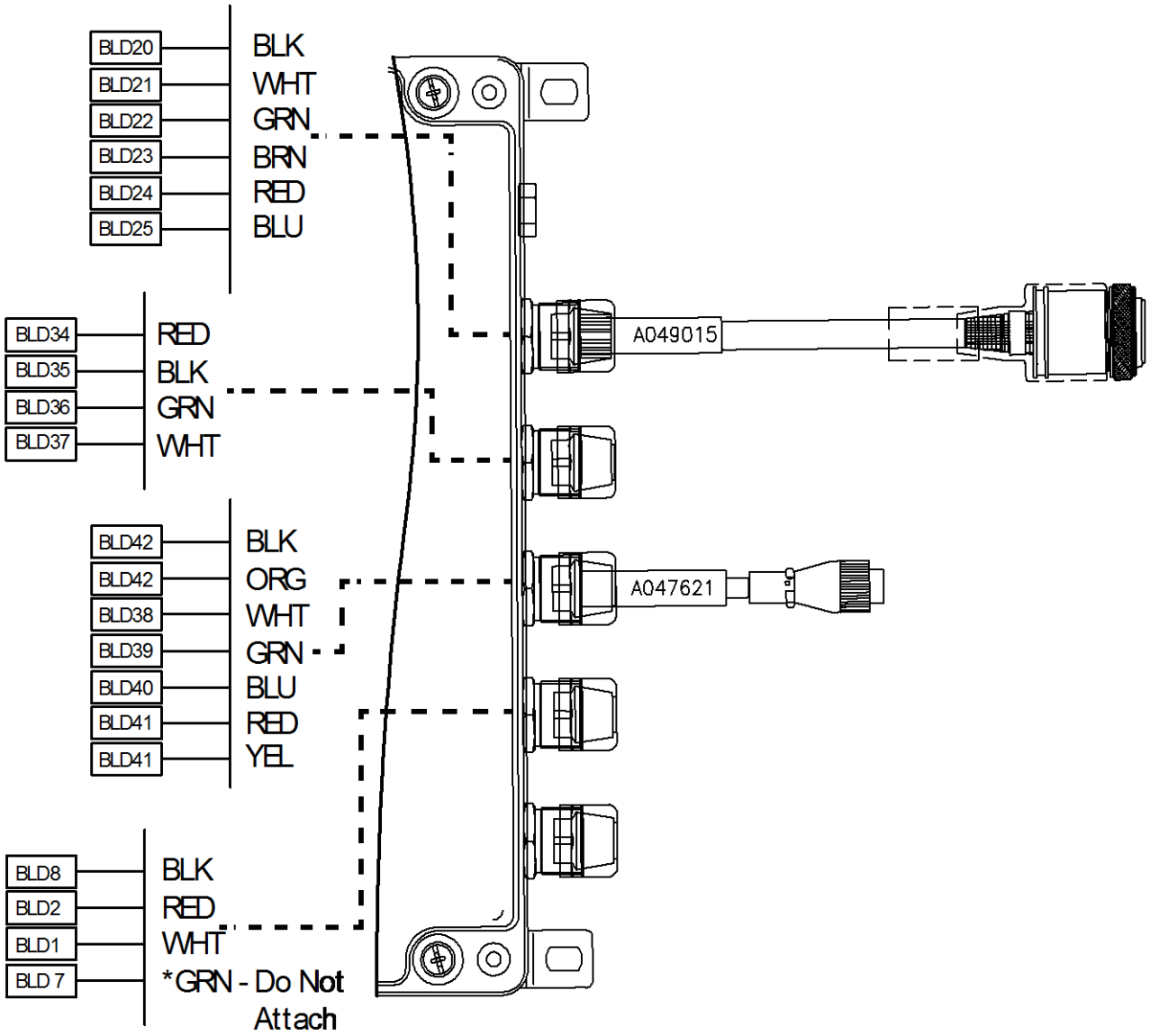




1.3 Computer Wiring

The RCI 510 System is based on the original wiring done by the factory. Greer Company cannot ssume responsibility for color codes used on wiring done at the time of origin.

We have identified the wiring inside and outside of our computer to assist with the installation. It is the responsibility of the installer to properly identify the correct wires and routings on the crane for connections to the MG510 computer. Please reference the wiring diagram below.



***NOTE:** The Green wire may have been replaced by a jumper wire inside the MG400 computer from B+ to Relay 2 C. In this case, use a jumper wire from BLD 3 to BLD 7.*

Computer Wiring Connections

Connection A450663	Connection A450869	Work Instruction
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 Relay Power Feed	BLD 7 Relay Power Feed	Power for Function Kickout
JP 5-2 Solenoid Output	BLD 8 Solenoid Output	Power to Function Kick Out Solenoids on Crane

Connection A450663	Connection A450869	Work Instruction
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 Ground	Display Ground Wire

Connection A450663	Connection A450869	Work Instruction
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)
	BLD 30	12V Power Supply

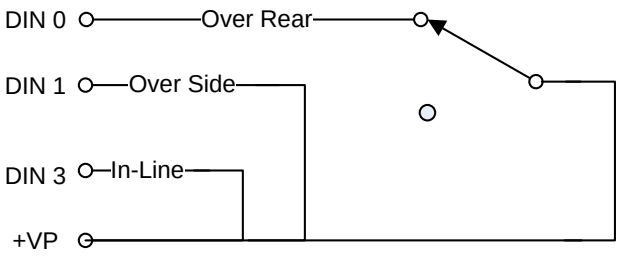
Connection A450663	Connection A450869	Work Instruction
JP11-1	BLD 34	Drive Voltage for Swing Pot
JP 11-2	BLD 35	Ground Signal for Swing Pot
JP 11-3	BLD 36	Communication Connection
JP 11-4	BLD 37	Communication Connection

Connection A450663	Connection A450869	Work Instruction
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)

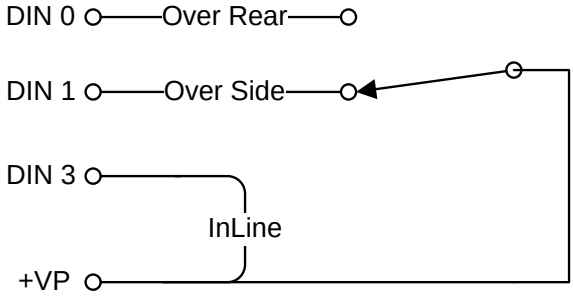
1.4 Units with Swing Switches

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

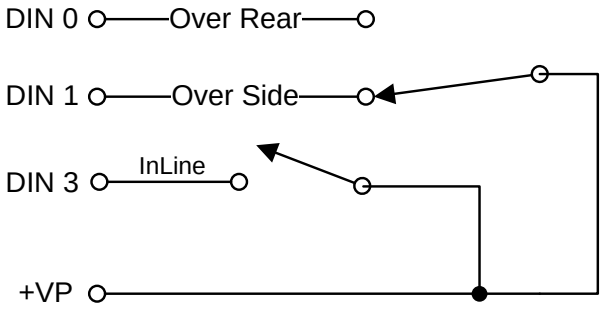
Description	Connection A450869		Work Instructions
Rear	BLD 20	DIN 0	Digital 0V
Side	BLD 27	DIN 1	Over Side Chart
Front	BLD 28	DIN 2	Over Front Chart
Between Tires	BLD 29	DIN 3	Between Tires Chart
Power	BLD 30	VP+	Switched Power



Over Rear



Over Rear / Over Side



Over Rear / Over Side and Over Front

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 cables connected to allow movement of the boom during the removal and installation process.*

2. Disconect 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 place. Place the computer on the deck.

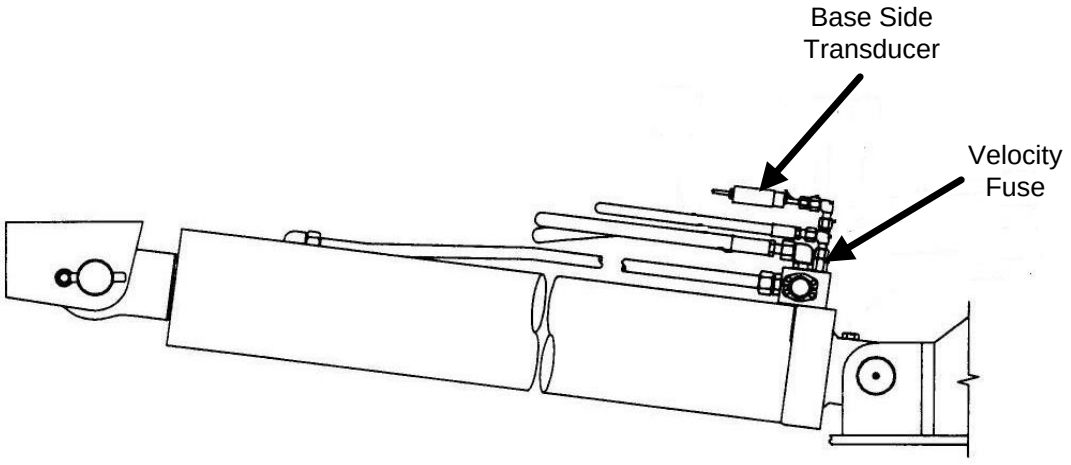
NOTE: *Do not disconnect the power and FKO cables.*

1. The new computer is smaller than the existing one. Use the new computer as a template to drill new mounting holes. **NOTE: Do not mount the new MG500 Series computer inside the cab of the crane!!**.
2. Ensure the computer is securely attached.
3. Lower the boom completely.
4. Install the new pressure hoses.

NOTE: *Install the velocity fuse in-line with the 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.



5. Connect the new pressure hoses to the new computer.
6. Raise the boom.

7. If using the retangular 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.
8. Install the display.
9. Install the display cable.
10. Install the power and FKO cables to the new computer.
11. Slowly elevate the boom to its maximum angle to ensure the pressure hoses and electrical cables are properly routed.

WARNING!

ENSURE THE PRESSURE HOSES AND ELECTRICAL CABLES ARE ROUTED PROPERLY. IF MISROUTED, WHEN THE BOOM IS RAISED THE 1ST TIME THE HOSES/CABLES CAN BE DAMAGED OR DESTROYED.

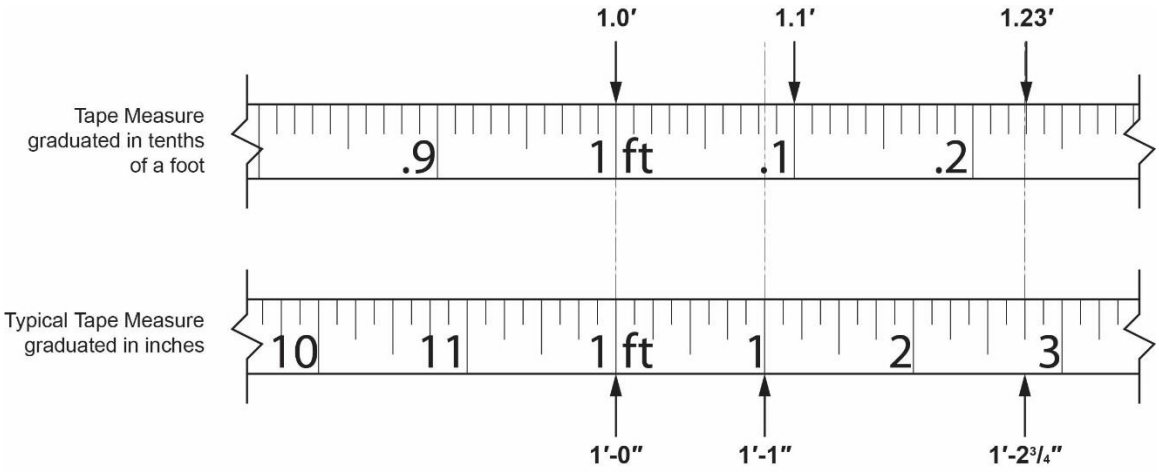
2.0 Calibration For E510XXX Duty Files

2.0 Introduction

The Greer Company is dedicated to the design and manufacturing of electronic parts created to aid in crane operation. This section was developed to assist Service Personnel understand, locate, and identify problems that may arise during the operation of the Greer System. The crane operator must be knowledgeable in safety guidelines, crane capacity information, and the crane manufacturer's specifications.

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 a foot



NOTE: *The computer calculates measurements in feet and tenths of a foot. Using the correct tape measure is critical for entering the measurements.*

If a standard tape measure is being used, convert the measurements into feet and tenths of a foot. For example: Enter 35'-6" into the system as 35.5 feet. To convert whole inches, divide by 12 (6/12 = .5). Fractions of an inch are converted by dividing the numerator by the denominator.

Enter 1/4" inch as .25 (1/4 = .25). Convert whole inches and fractions of an inch, for example 6-1/4", by converting the fraction to a decimal then dividing by 12. In this case, 6-1/4" is converted to 6.25 and then divided by 12, which equals 0.520.

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

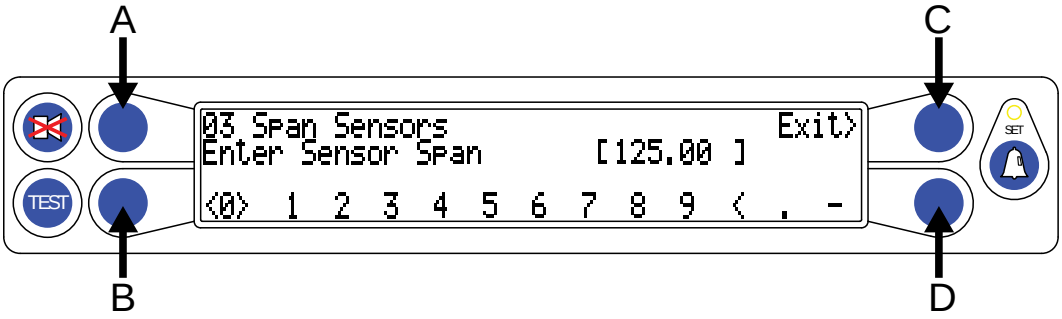
2.2 The MicroGuard 510 Display

2.2.1 Command Entry

The buttons that are identified as ***A***, ***B***, ***C***, and ***D*** will be 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 directions for each routine carefully.

2.2.2 Number Entry

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



Use the ***B*** and ***D*** buttons to scroll left and right. The “cursor” will appear as flashing < > brackets on either side of the number. Use the ***A*** button to enter the number. Use the ***C*** button 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 (125.00 in this example). Up to five numbers may be entered. When entering a negative value, enter the numbers and decimal first, then enter the minus sign. When all digits are correct, press button ***C*** to enter 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.
6. The value is now stored in the system.

2.3 Entering Calibration Data

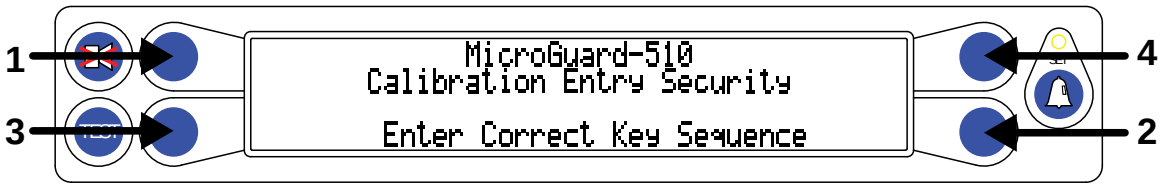
WARNING!

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 OF THE SYSTEM.

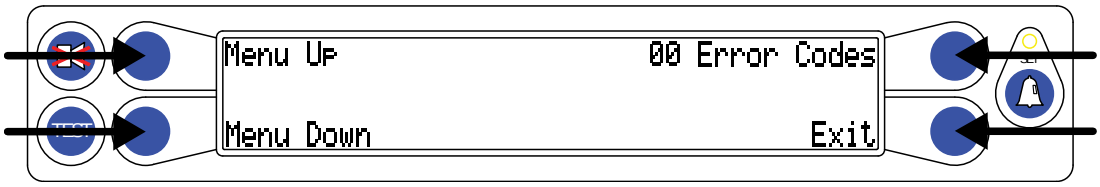
To enter calibration data it is necessary to put the system in calibration mode.

To access calibration mode:

1. Hold down the ***TEST*** and ***SET*** buttons simultaneously. The audible alarm will sound and you will be prompted to enter the security code. You will have five (5) seconds to enter the security key sequence
2. Enter the security code in order (1, 2, 3, 4) as shown below.

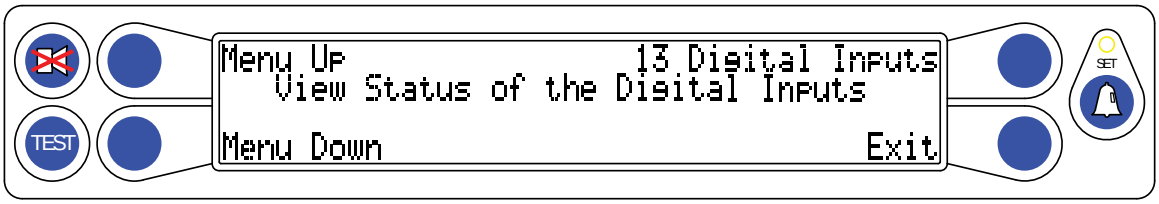


3. The system is now in calibration mode and ready to receive calibration data.
4. Use the buttons adjacent to the titles ***Menu Up*** and ***Menu Down*** to scroll through the following menus:



2.4 Installation Checks

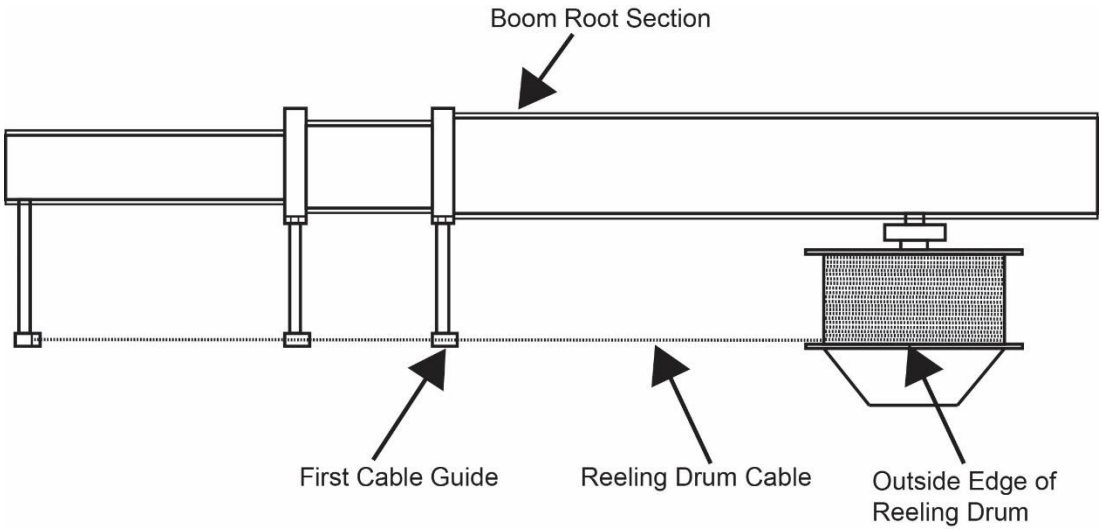
1. Check the wiring and EPROM installations.
2. Check the swing switches, if fitted. Use the digital monitor screen (located under Menu 13 – Digital Inputs) on the MG510 to ensure that the switches operate properly. Digital input information for the wiring is located in the installation guide.



2.4.1 Attaching the Anti-Two Block (ATB) Cable and Setting Reeling Drum Spring Tension

Ensure the reeling drum spring is properly pre-tensioned by following the procedure below:

1. Fully retract the boom assembly and remove the reeling drum cover.
2. Slowly rotate the Reeling Drum clockwise until you hear a “click”, indicating 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 (about three wraps = 10 feet) to reach the boom tip. Leave enough extra cable to reach the Anit-Two-Block hardwire and relieve the strain on the cable.
5. Pre-tensioning of the Reeling Drum is complete.



2.5 Calibration For E510XXX Duty File (OEM)

If the system is equipped with an E510XXX series duty file it is noted as a “Fast Cal” operation.

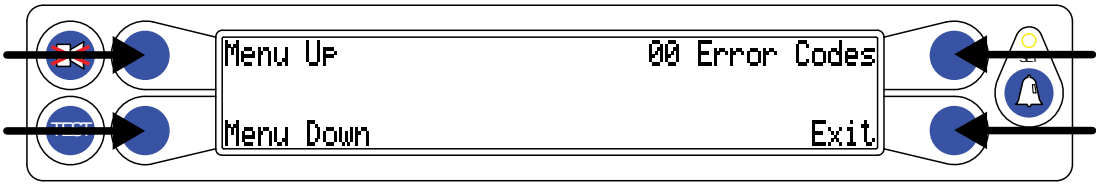
“Fast Cal” means that all calibration and geometry data was available for this unit, and factory calibration instructions will be followed providing only zero and span instructions for the sensors. Resetting of the personality is done, so the crane data reset menu will not be used in this software.

2.5.1 Calibration Menus

After entering the calibration menu, scroll through the menu options by pressing the “Menu Up” or

“Menu Down” buttons. To select an item, press the button adjacent to the menu listing as shown in the

example.



The main menu items used to calibrate the system are:

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

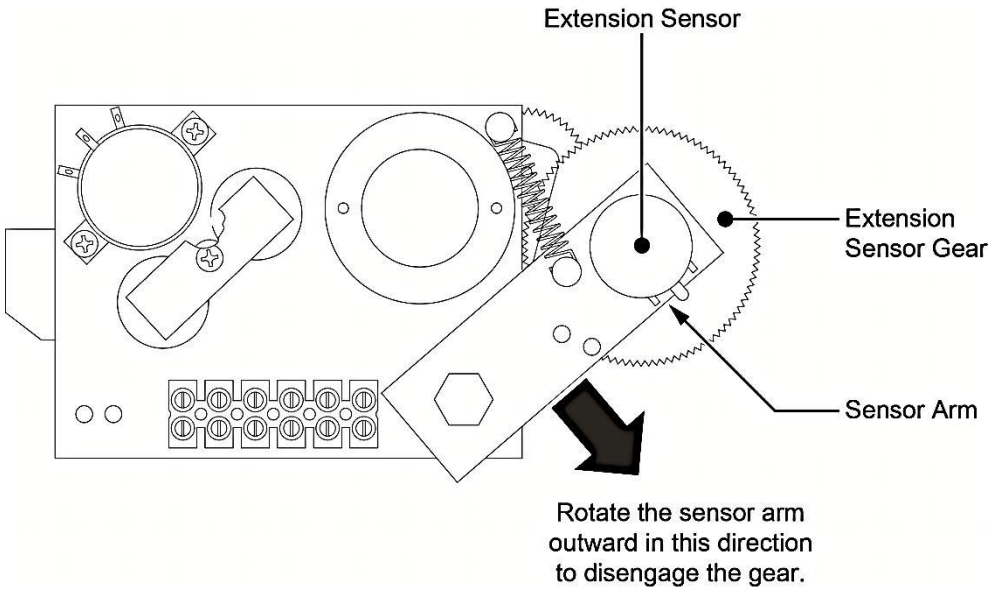
The only calibrations needed are for boom extension and boom angle. They must be properly set to zero.

The system is also equipped with a swing potentiometer. This is designed to track the turret in relation to the chassis.

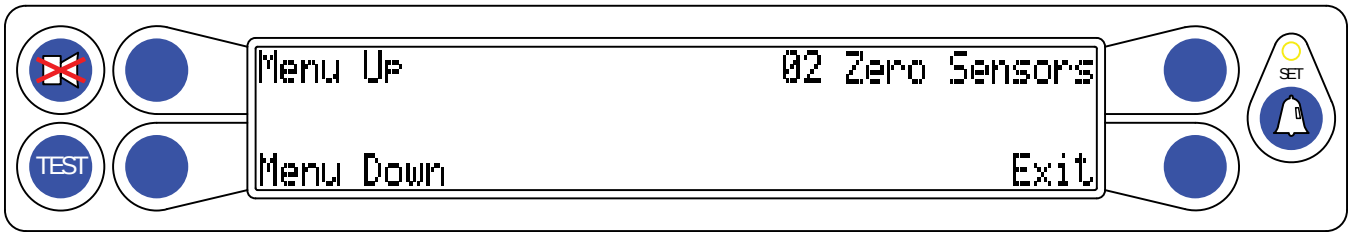
Boom extension and angle readings are dependent on the correct span values to be entered into the system. These span values are determined by using a digital level on the boom angle, and measuring the span of boom extension.

2.6 Zeroing the Extension and Angle Sensors

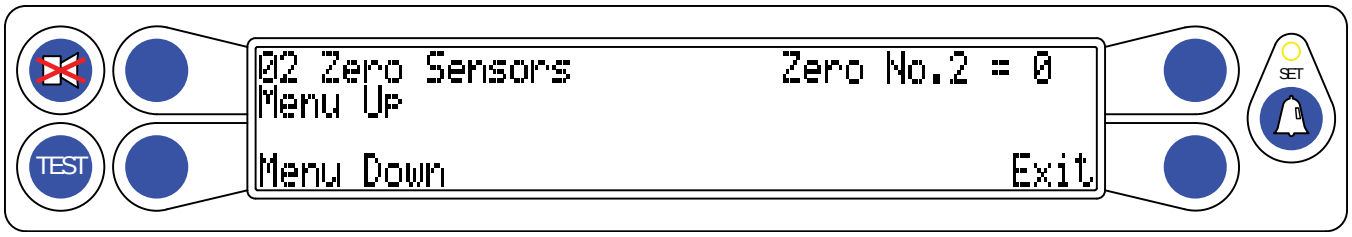
NOTE: Prior to zeroing the sensors, remove the reeling drum cover to reveal the length and angle sensors.



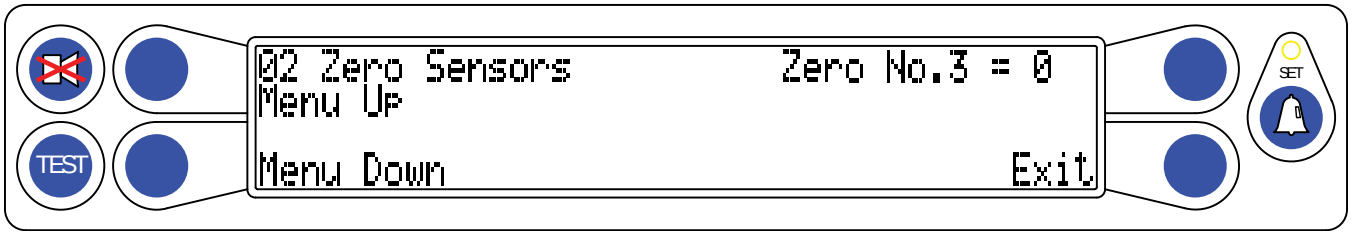
1. Fully retract the boom and place at 0.0°. Verify with a digital inclinometer.
2. Rotate the extension sensor gear clockwise until it stops against the clutch in the potentiometer.
3. Rotate the gear counter-clockwise 1/2 turn and let the spring pull it back to engage with the drum gear.
4. Press the “Menu Up” button until the “02 Zero Sensor” option is on the screen.



5. Press the “02 Zero Sensor” button.
6. Press the “Zero No. 2 = ” button to zero the extension sensor. This will change the display to read “Zero No. 2 = 0”.



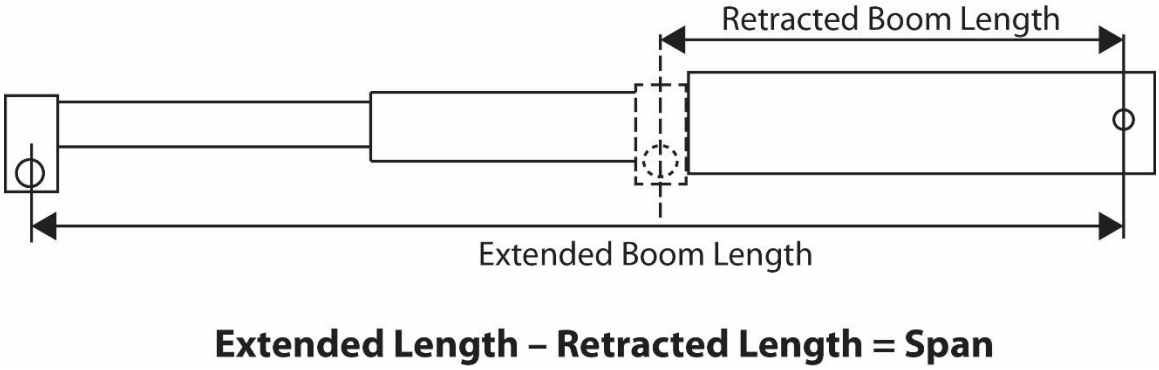
7. With the boom still at 0.0°, press the “Menu Up” button.
8. The screen will advance to “Zero No. 3 = ”.
9. Press the “Zero No. 3 = ” button to zero the angle sensor. The display will now read “Zero No. 3 = 0”.
10. Zero calibration is now complete.



2.7 Calibrating Span of Extension and Angle

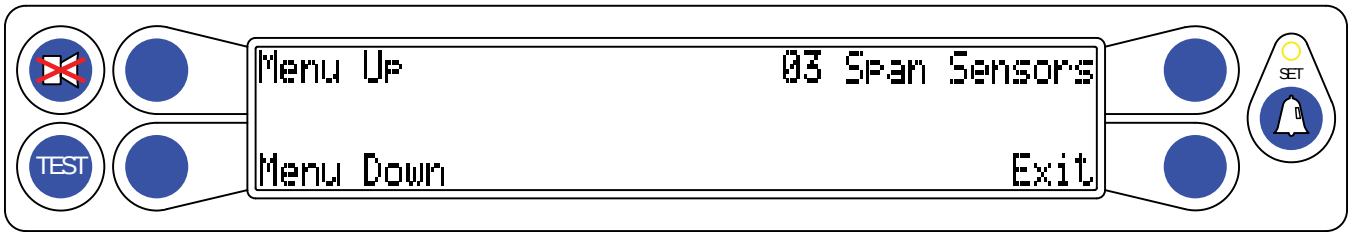
WARNING!

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

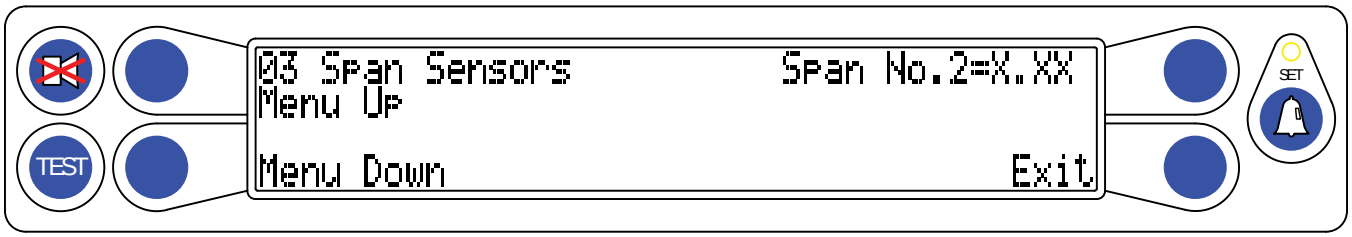


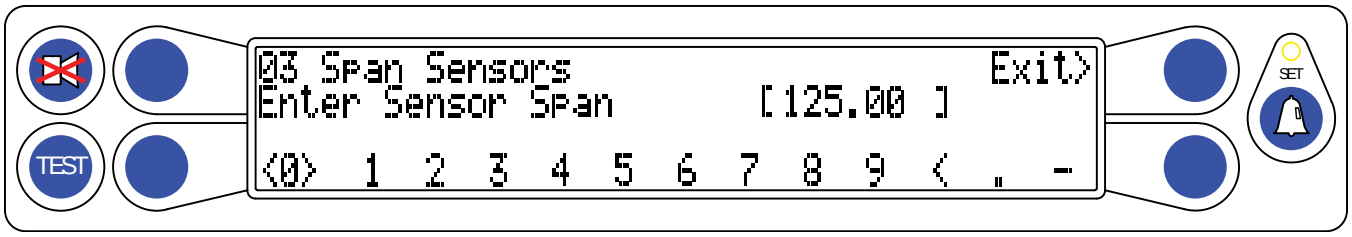
Spanning the sensors defines in the computer the angle and extension of the boom. In order to set the angle span, the information from the digital level must be used to enter the number. The boom extension span number is the Extended Length – Retracted Length = Span. The above graphic demonstrates how to properly measure the span.

1. Fully extend the boom and raise the boom to at least 60°.
2. From the Calibration Menu, press the “Menu Up” button to display the “03 Span Sensors” option.

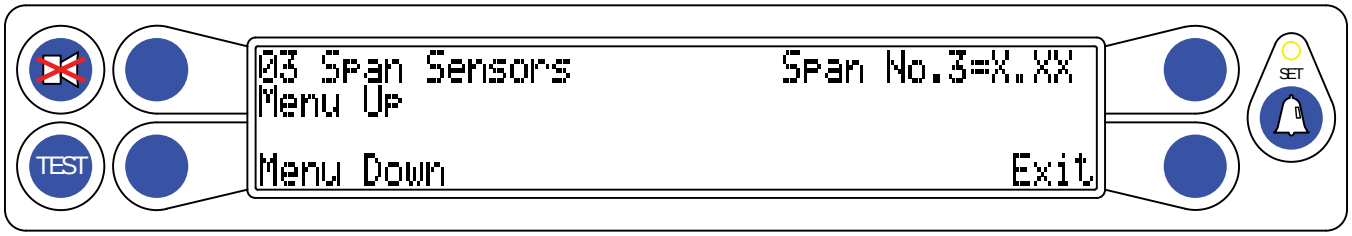


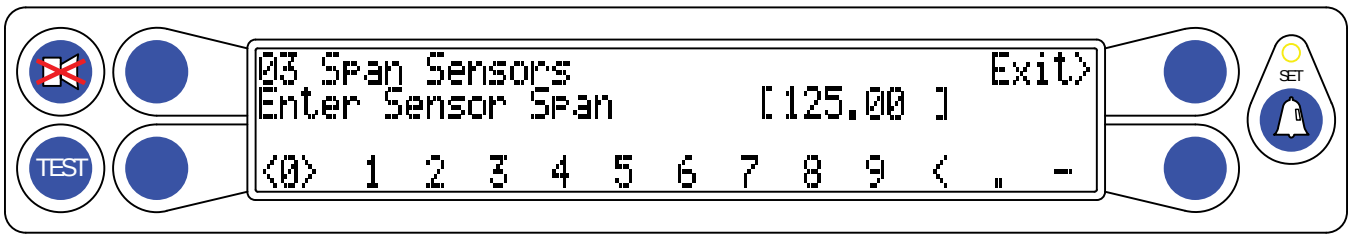
3. Press the “03 Span Sensors” button.
4. Press the “Span No 2= X.XX” button to access the number entry screen.





5. The lower left and right buttons move the cursor left or right for number selection. The upper left button enters each digit inside the brackets. The reverse cursor will allow you to erase the numbers entered, one at a time.
6. Enter the Extension Span (**Extended Length – Retracted Length = Extension Span**).
7. Press the upper right button when the number is complete. This will save the number to the system memory. The extension span is now complete.
8. Press the “Menu Up” button to display “Span No 3=X.XX”.
9. Press the “Span No 3=X.XX” button to access the number entry screen.





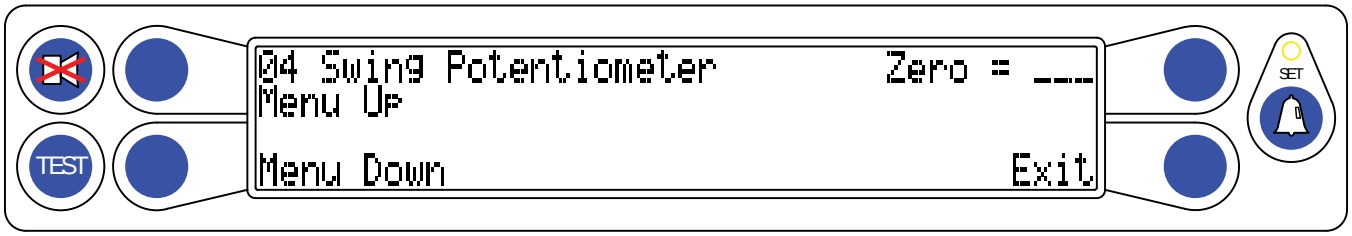
10. The lower left and right buttons move the cursor left or right for number selection. The upper left button enters each digit inside the brackets. The reverse cursor will allow you to erase the numbers entered, one at a time.
11. Enter the angle from the digital level on the boom.
12. Press the upper right button when the number is complete. This will save the number to the system memory.
13. The angle span is now complete.

NOTE: All numbers can be changed if entered incorrectly. If 9.99 is entered mistakenly instead of 99.9, the sensor can be re-calibrated and the information will be overwritten.

2.8 Calibrating the Swing Potentiometer

The system uses a 360° circle for determining the location of the swing. The swing must have a Zero point set so the system knows where to begin counting. The stowed boom position is over the front of the vehicle. When the boom is placed over front, set the house lock. This is important because the pick and carry tolerance is very close. If the house lock is not set, the user may not be able to gain the "LINE" work area needed to pick and carry.

1. From the Calibration Menu, press the "Menu Up" button to display "04 Swing Potentiometer".
2. Press the "04 Swing Potentiometer" button.
3. The --- lines mean the potentiometer is not recognized by the system and has not had the Zero point set.



4. Press the "Zero = ___" button to set the Zero point. The system will recognize the swing pot and have the needed "starting point."
5. Lift the boom and rotate to the right (clockwise). The numbers should count up, 1°, 2° to 360°. If the numbers are not going up, change the direction of the swing.
6. The Swing zero has been set. Press the "Exit" button.

2.9 Calibrating Swing Direction

1. While still in the "04 Swing Potentiometer", press the "Menu Up" button until "Direction = +/-" is displayed.

2. Press the "Direction = +/-" button to change the direction of the swing.

The system is now calibrated. Normal production test procedures may be performed on the unit.

3.0 Calibration For E511XXX Duty Files

3.1 Calibration Menus For E511XXX Duty Files

00 Error codes – Displays system information and error codes.

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

03 Extension Sensor – Used to set the zero point and span of the extension sensor.

04 Angle Sensor – Used to set the zero point and span point for the angle sensor.

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

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 Compensation – Sets rod side pressure compensation when booming down.

10 Erected Attachments – Used to calibrate the radii, moments, and dimensions of erected attachments.

The above list of are menus commonly used for calibration of the E511XXX series duty file. Optional menus that are not commonly used in this application are listed in the rear of the manual with instructions.

3.2 Menu 01 – Resetting Crane Data for Duty Files E511XXX

This menu displays the status of the personality. In order to use the Radius Moment routine, the system must have a personality installed using this routine. After the routine, the Crane Data screen should read ***"Personality is good"***.

1. Press the ***Menu Up*** or ***Menu Down*** button until **"01 Crane Data"** appears in the information window at the right.
2. Press the ***C*** button adjacent to **"01 Crane Data"** to enter the routine.

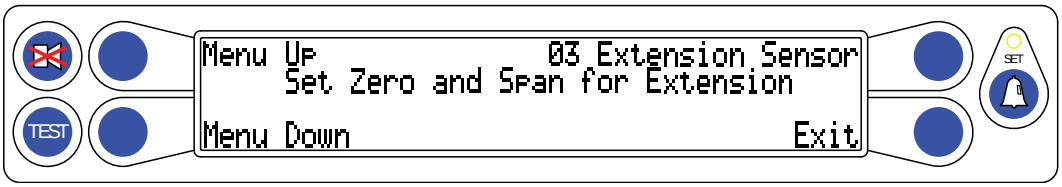
3. If there is no crane data present, or if the system has become corrupt, the display will read ***"Personality not in use"***. In this case, proceed with the Crane data reset routine and reset the data.
4. To reset the data press ***01 Crane Data*** button and the system will prompt you with ***"Yes! Calibrate!"***.

5. Press the ***Yes*** button to complete the crane data reset. The system will prompt you for the security code. Use the security code used to access the Calibration Menu. Press the ***No*** button to exit the routine.
6. Upon entry of the correct calibration sequence the display will then read ***"Calibrating"***. Following this operation the screen should now read ***"Personality Good".***

3.3 Menu 03 - Extension Sensor

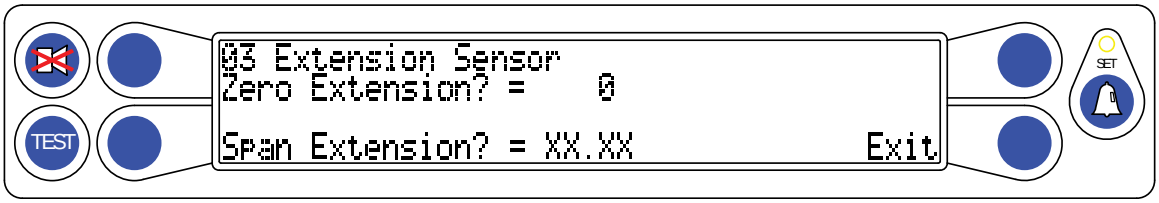
This menu allows for entering the zero point and span of the extension.

1. Press the ***Menu Up*** or ***Menu Down*** button until **"03 Extension Sensor"** appears in the information window at the right.
2. Press the ***03 Extension Sensor*** button to enter the routine.

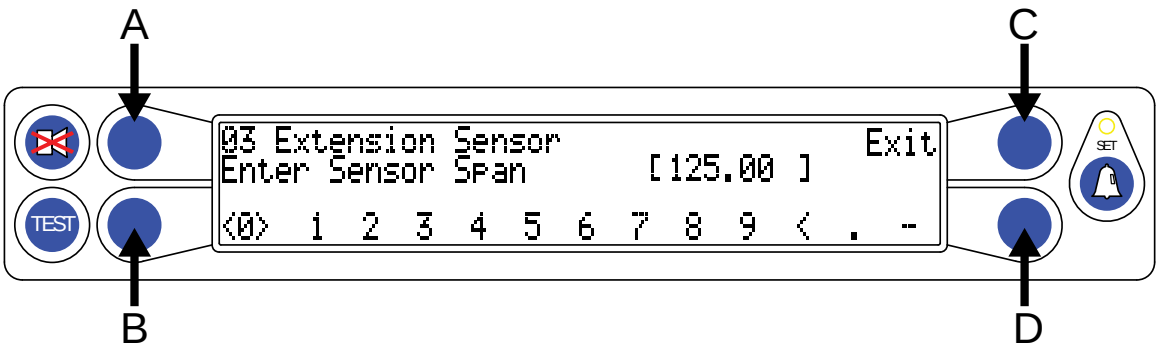


3. With the cover removed from the reeling drum, rotate the extension gear clockwise until it stops. Rotate the gear counterclockwise exactly ½ turn and stop.
4. Press the ***Zero Extension? = XXX*** button.

WARNING!
BEFORE EXTENDING THE BOOM, MAKE SURE THE AREA AROUND THE CRANE IS STABLE AND SAFE. MANY CRANES WILL TIP OVER IF THE BOOM IS EXTENDED HORIZONTALLY!!



1. Fully extend the boom and then enter the value for the span. (Extended Boom - Retracted Boom = Span).
2. Press the ***Span Extension? = XX.XX*** button.



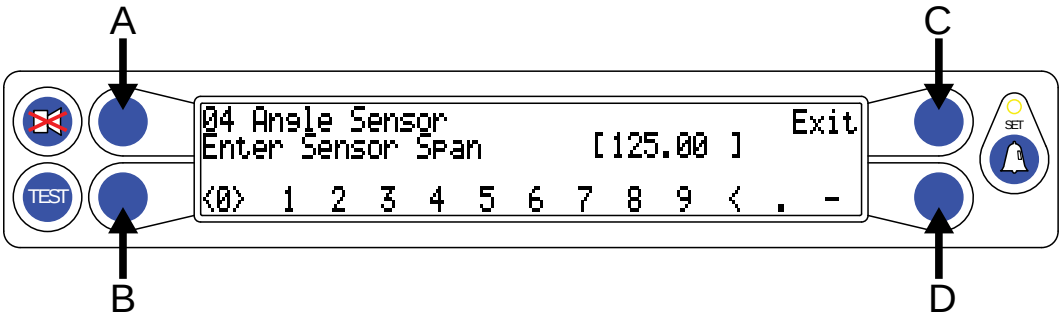
3. Use the buttons adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the ***Enter Sensor Span*** button to enter the number in the brackets.
4. When complete, the menu will automatically change to 03 Extension Sensor menu. To exit the routine and go to the main menu, press the ***Exit*** button.

3.4 Menu 04 – Angle Sensor

This menu is used to enter the zero point and span for the angle sensor.

1. Press the ***Menu Up*** or ***Menu Down*** buttons until **"04 Angle Sensor"** appears in the information window at the right.
2. Press the ***04 Angle Sensor*** button to enter the routine.

3. With the boom in a horizontal position, press the ***Zero Angle? = XXX*** button.
4. Press the ***Span Angle? X.X*** button.
5. Raise the boom until the inclinometer reads 60° or slightly higher. Enter the value for the angle from the inclinometer.
6. Use the ***B*** and ***C*** buttons adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number.



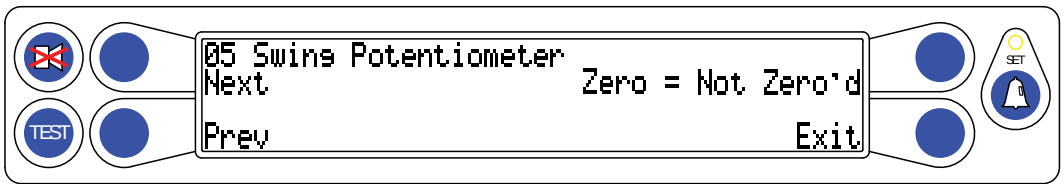
7. Use the ***A*** button to enter the number. When complete, the menu will automatically change to the previous menu.
8. When you have finished, press ***Exit*** button to return to the main menu.

NOTE: *Enter measurements in degrees and tenths (xx.xx). If necessary, convert recorded measurements to tenths before starting.*

3.5 Menu 05 – Swing Potentiometer (If Equipped)

This menu is used to enter the zero point and the swing 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 = Not Zero'd*** button.



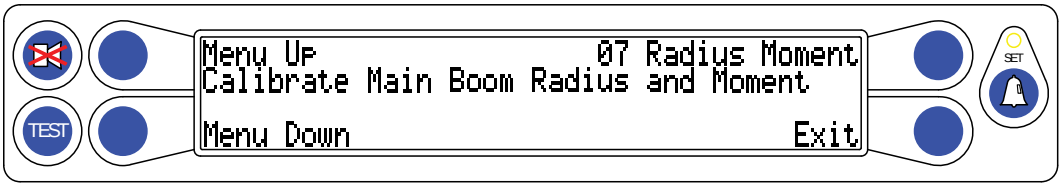
4. The swing is now zeroed.
5. Next, raise the boom out of the rest and rotate to the right. The number by "Zero = 0" should increase. If not, press the ***Next*** button and then press ***Direction = '+'*** button and the "+" will change to a "-" and the direction will be reversed.

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

3.6 Menu 07 – Radius/Moment

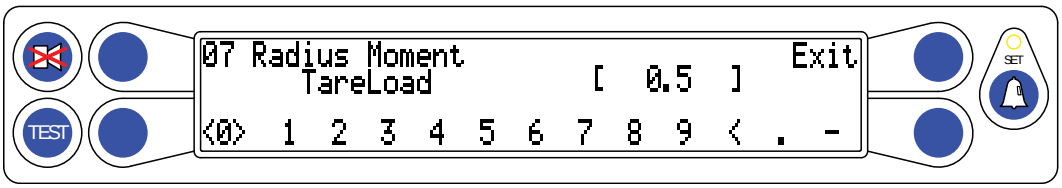
This menu is used to calibrate the radius and moment of the boom.

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



2. Press the ***07 Radius Moment*** button will give you a chance to enter an existing calibration in the edit mode, or start a brand new calibration. Press the ***Yes*** button to delete old calibration information and start a new calibration.

3. Press the ***07 Radius/Moment*** button will enter the Tare Load screen. Enter the weight of the downhaul. When entering the Tare load in the calibration routine, adding 100 pounds (0.1) to the actual weight will guarantee a slightly positive load reading in all operating configurations.

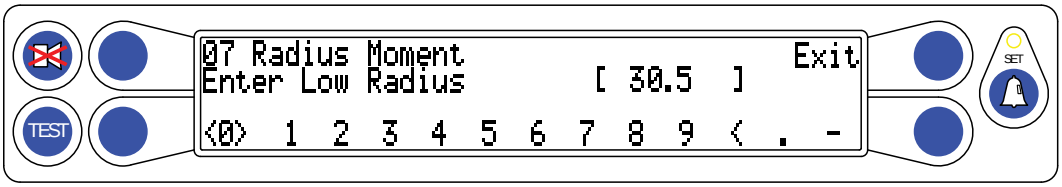


4. Up to seven Radius Moment points may be stored and must include:
   a. Boom fully retracted.
   b. Boom fully extended.

NOTE: *Intermediate points should include individual boom sections extended and/or other individual boom sections that stop telescoping as the boom is extended. Some booms will exhibit a deflection or droop when nearing full extension.*

NOTE: *This is due to the design and fitting of wear pads inside the boom, which allows sections to hang on each other when nearing full extension. Though this has little effect on main boom radius accuracy, the radius of a fly or jib may be affected. It is recommended to add an extra calibration point at 90% of the boom extension.*

5. For each extension calibration, the system requires a stable measure of the moment (taken from its own pressure sensors) and radius (taken from manual measurements) at both high and low boom angles. Enter the corrected radius at this point per the number entry instruction.



6. Select angles of between 60° and 70° for high boom angles, and as close to zero degrees as possible for low boom angles. Ensure accurate measurements of the radius at each calibration point.
7. Upon entering the radius moment the system will prompt you start a new calibration.
8. Choose ***Yes*** to erase all existing calibration data and start a new calibration. Choose ***No*** to allow calibration of certain radius moment points already in the system.
9. The first screen will ask that you enter the tare weight of the hook block. This weight is normally located on a metal tag attached directly to the load block. If the load block weighs 200 pounds it is usually advantageous to enter 100 pounds over the nominal weight. The objective is to maintain a positive hook weight after the calibration is complete. Remember to enter the load in tenths. For example: Enter 300 pounds as .300.
10. After the tare load is entered press **Exit** to enter the load into the calibration procedure.
11. After telescoping to the proper length and press ***OK***. The system will prompt for high or low boom angle. When the boom is properly positioned the system will recognize whether it is a high or low boom angle.

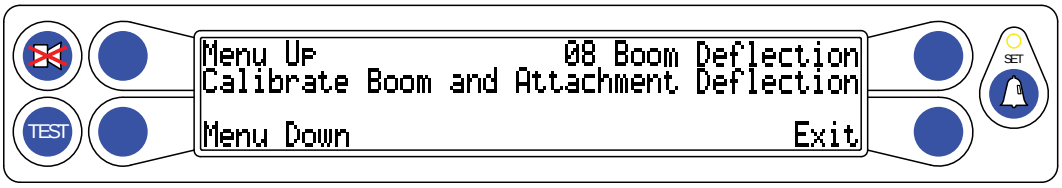
12. You will then be prompted to enter high or low radius, this depends on the current boom position. After entering the radius, press ***Exit*** to go to the next boom angle. If the first measurement was done at low angle the system will automatically prompt to do high angle on the next step.
13. After entering the second calibration point, press ***Yes*** to automatically save the information into the computer memory. Press ***No*** to reject the entries and start over.

After saving the final calibration point the radius moment calibration is complete. Press the ***Exit*** button will take you back to the main calibration menu. It is advisable at this point to select several points in the boom length and checked radius and empty hook load at several different angles for each length comparing these results against the display. Although the hook load will never be totally accurate it should weigh a little heavy and be as consistent as possible. Consistency in the hook load is a sign of a good radius moment.

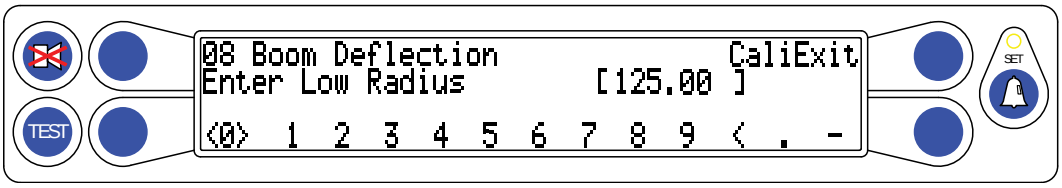
3.7 Menu 08 – Boom Deflection

This menu is used to enter the deflection of the main boom under the weight of a calibrated load. Boom deflection is a natural occurrence and can have a significant effect on the boom radius under load. In order to properly calibrate boom deflection the boom needs to be fully extended at an approximate 65° angle. The load used should be approximately 80% of rated capacity for the single part line. Generally this capacity will be approximately 7000 to 8000 pounds.

1. Press the ***Next*** or ***Prev*** button until **"08 Boom Deflection"** appears in the information window at the right.



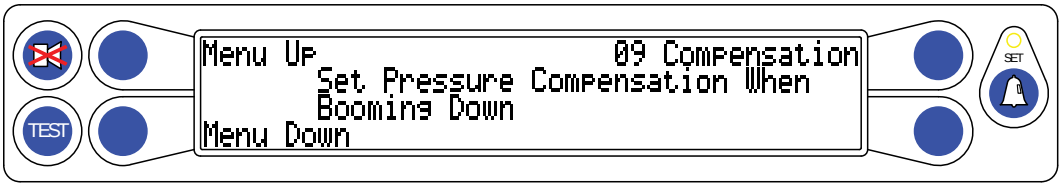
2. Press the ***08 Boom Deflection*** button to enter the routine and display the current **"F"** Factor in the center of the screen. The system will offer the opportunity to edit the existing **"F"** Factor or calibrate a new **"F"** Factor. It is not advisable to use the adjustment routine.
3. Pressing the ***Calibrate*** button to initiate a request for a radius measurement. Carefully raise the load and allow it to settle to ensure a good measurement.



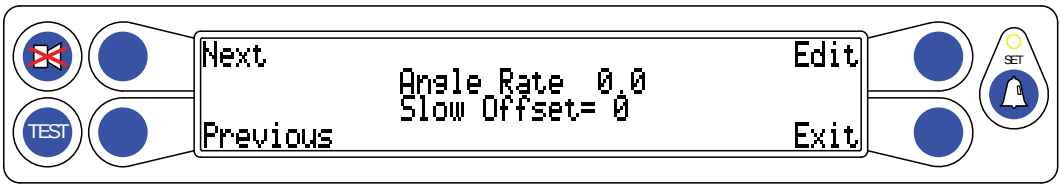
4. The measurements should be taken and entered in the space between the brackets.
5. Press CaliExit and the system will calculate a new **"F"** Factor and exit the calibration routine.
6. The system will then display the new **"F"** factor.
7. Press ***Exit*** to leave routine and return to the main menu.

3.8 Menu 09 – Compensation

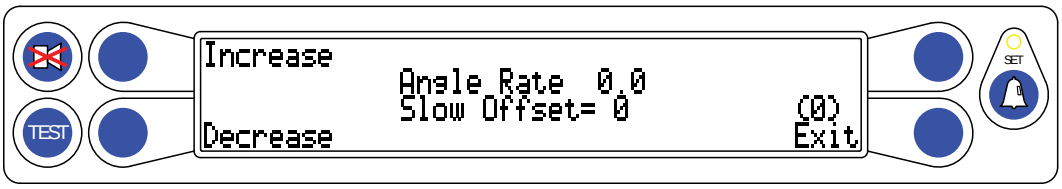
The purpose of the compensation system is to ensure during boom down operations the hook load remains accurate. It is not uncommon, when boom down operations begin, to see a slight dip in the hook load. But if properly adjusted, the load compensation system will more accurately display the load.



1. To get into the compensation menu press the ***09 Compensation*** button. This will take you into a new window that looks like this:



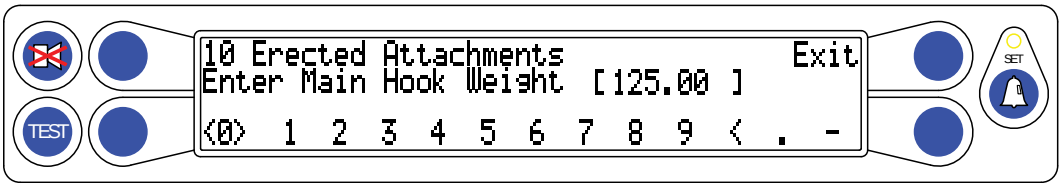
   There are **Next** and **Previous** menus which allow the adjustment for the slow and fast angle rate.
2. It is recommended to adjust the slow offset first. To adjust the compensation, extend the boom approximately halfway out using a load of say 2000 pounds and lowering the boom at a slow rate. If the displayed load diminishes or disappears during this operation, press ***Edit*** to enter the menu allowing you to increase of decrease the amount of offset. This adjustment must be done while the boom is in motion. Press the ***Decrease*** button to cause the offset number to display negative. Press the ***Increase*** button to cause the number to become a positive number.
3. Once the load is satisfactory on the slow offset, press the ***Exit*** button to return to the previous menu. Press the ***Next*** button to access the fast offset. Use the same procedure as the slow offset, except boom down more quickly. When finished, press the ***Exit*** button on the lower right to return to the main menu.



3.9 Menu 10 – Calibrating Erected Attachments

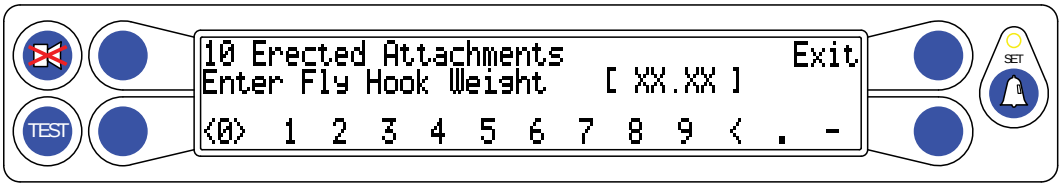
NOTE: *When an "Uncalibrated Jib Attachment" is erected there will be a warning at the bottom of the information screen that reads* ***"WARNING – JIB NOT CAL'D".***

1. Erect the jib attachment to be calibrated in the operator set up and set the pick point. Once the setup is completed, enter the calibration menu and press the ***Menu Up*** button until **"10 Erected Attachments"** is displayed.
2. Press the ***10 Erected Attachments*** button to access the menu asking to input the main hook weight.

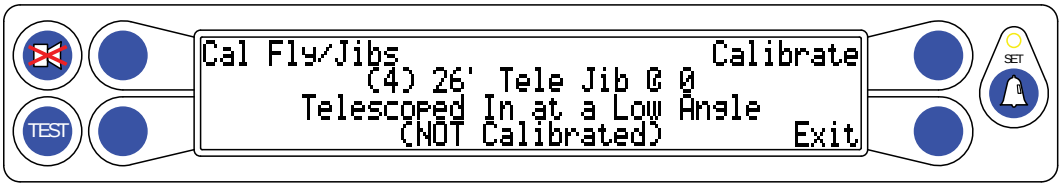


NOTE: *Do not have a hook weight on the main boom while calibrating the jib, however, if this is unavoidable you must enter this hook weight. If the main hook weight has been removed, enter 0.00.*

3. Press the ***Exit*** button to access the menu asking for the fly hook weight. Enter the fly hook weight and press the ***Exit*** button and the system will take you to the calibrate screen.

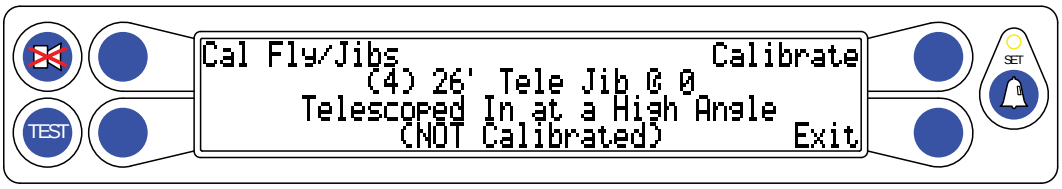


4. The system will store the jib configuration and the configuration of the boom at the time of calibration.
5. In the example, the system shows the boom was **"Telescoped in at a Low Angle"**.



6. Press the ***Calibrate*** button and the system will ask for the corrected radius for this configuration. Measure the current radius and enter in feet and tenths of a foot. Press the ***Exit*** button.

7. Raise the boom to 60° or higher. The system will display the configuration has been relocated at a high boom angle.



8. Press the ***Calibrate*** button then measure and enter the high angle radius in feet and tenths of a foot. Press the ***Exit*** button and the measurement will be stored.
9. Next move the boom back to a position above 65° and fully extend. Pressing the calibrate button again will prompt for a high angle radius. Enter the radius in feet and tenths. Pressing the exit button will store the measurement and allow for the last measurement which is low angle.
10. Lower the boom to the lowest angle allowing the system to display a maximum capacity. Press the ***Calibrate*** button and enter the low angle radius in feet and tenths of a foot. Press the ***Exit*** button.
11. The screen will display **"Finish Calibrating Attachment?"** Press the ***Calibrate*** button to save the jib calibration in the system.

12. Press ***Exit*** to return to the normal operation mode. The system should display the proper radius and hook load. This is a sign that the jib calibration was successful.

NOTE: *This procedure must be completed for each jib configuration. This includes angle offsets as well as jib extensions.*

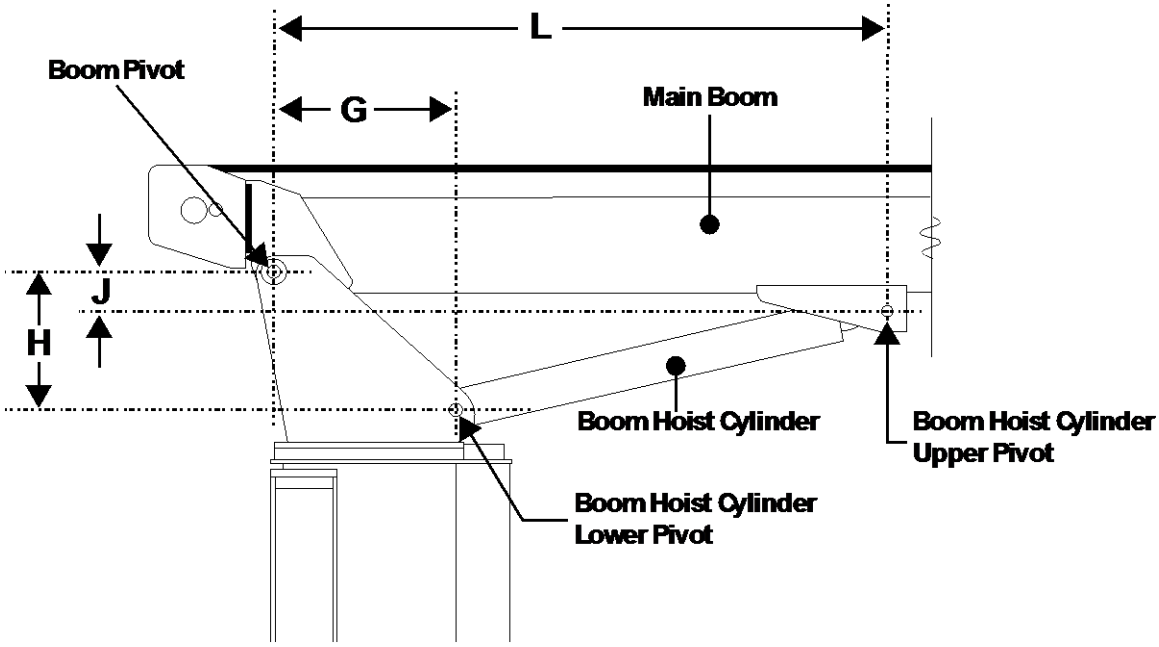
4.0 Optional Calibration/Measurements For E511XXX Duty Files

The following pages are instructions that could possibly be needed in the case where the unit chosen to upgrade has never been fitted or calibrated.

It is important to remember that all of these measurements are already installed in the software, but just in case of an exception, the following materials will serve as a guide to double check necessary any measurements you deem necessary.

4.1 RAM Dimensions

Place the boom at (0°) when taking the following measurements.



Record the following measurements and check for accuracy. If measurements exist in the system from a previous application, or if no measurements exist, enter the new measurements 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.

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.

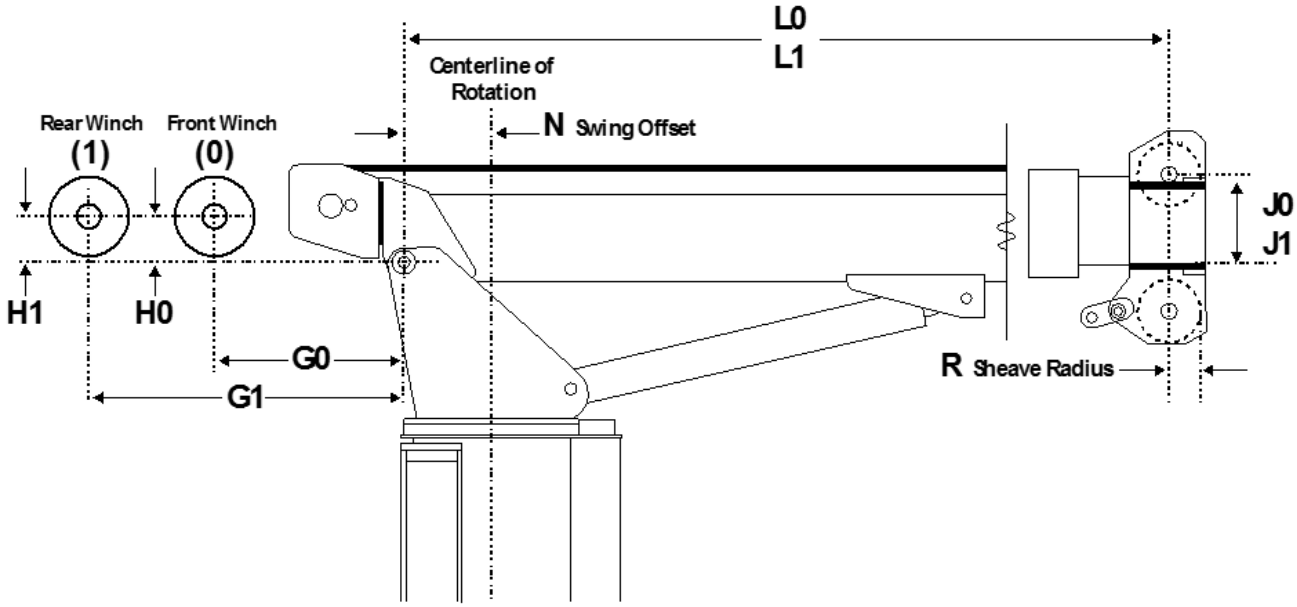
Dimension "J" - The vertical distance between the center of the boom pivot and the center of the boom hoist cylinder upper pivot.

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.

4.2 Winch Dimensions



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

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.*

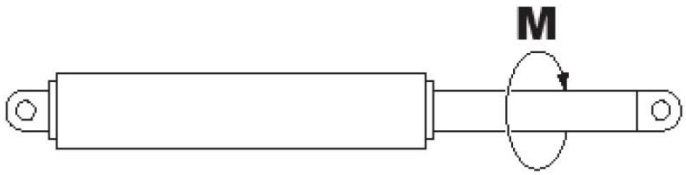
Dimension "L0" and "L1" - The distance between the centerline of the boom pivot perpendicular to the horizontal boom plane and the center of the bottom sheave (measurement may be identical).

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.

4.3 Boom Cylinder Dimensions

Used to calibrate the lift cylinder dimensions and load. (Only required when no cylinder dimensions are installed in the duty file.)



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

Dimension "M" - Use a pair of calipers large enough to measure the diameter of the cylinder rod. Then use this formula to calculation **Dimension "M"**.

Rod Diameter x 3.14 ÷ 12 = **Dimension "M"**.

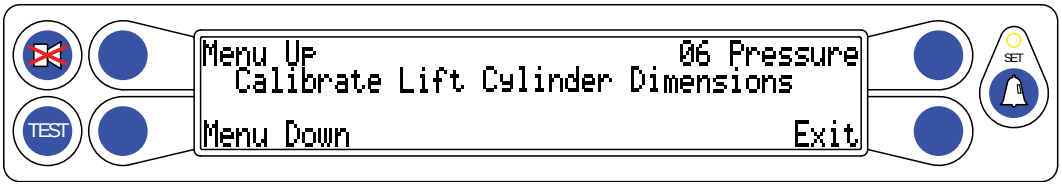
4.4 Menu 06 – Pressure

WARNING!

MAKE SURE 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!

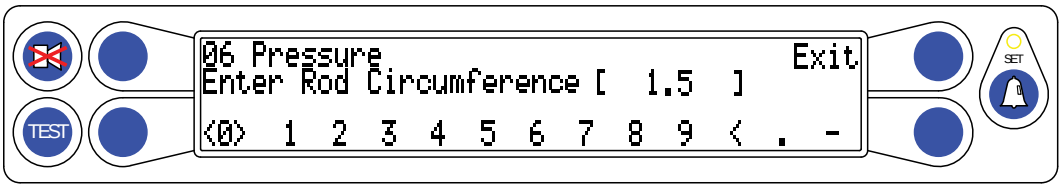
ANY ATTACHMENTS ON THE SIDE OR TIP OF THE BOOM DURING THESE TESTS CAN CAUSE INACCURACY IN THE MAIN BOOM MOMENT IF THE SETUP OR STORED INFORMATION IS INCORRECT.



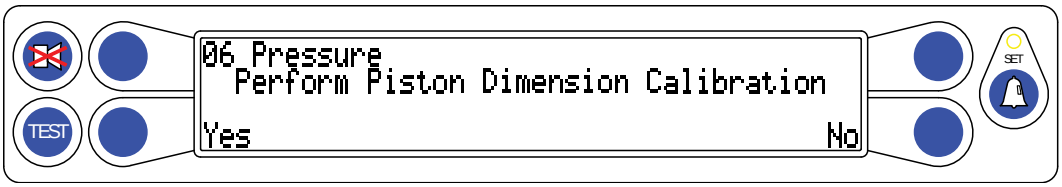
This menu is used to determine the pressure of the boom hoist cylinder. A calibrated load is needed to calculate the diameter of the boom hoist cylinder. Use a load approximately 80% of the single part load rating. If a smaller weight is all that is available, extend and/or lower the boom to about 55°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

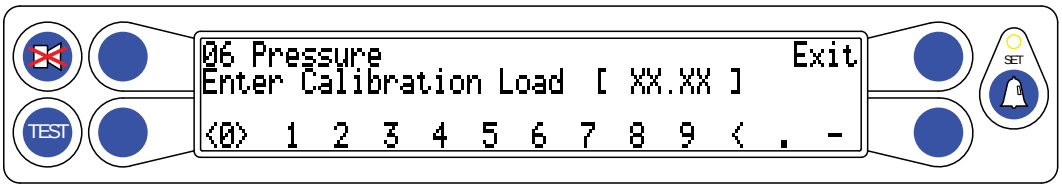
NOTE: *Pressure cannot be calibrated until the L, J, G, and H dimensions have been calculated and entered into the system.*



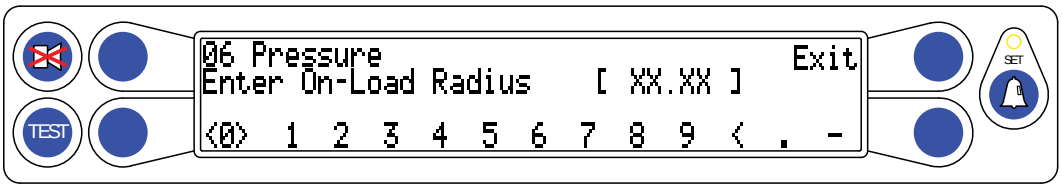
2. Press the ***06 Pressure*** button to enter the routine. Use the number entry sequence enter the circumference of the cylinder rod in feet and tenths.
3. Press the ***Exit*** button to prompt the next step in the calibration.
4. Perform Piston Calibration. Press the ***Yes*** or ***No*** button.



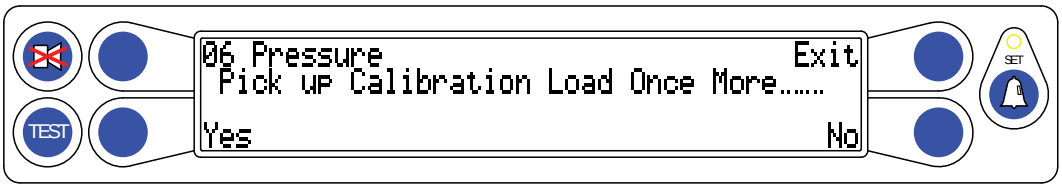
a. Press ***No*** to enter the known piston diameter. Press ***Yes*** to go to the screen to calibrate cylinder diameter.
b. Press ***Yes*** to calibrate the load. Enter the load in tenths, including the load, hook ball, and load handling slings. Press the ***Exit*** button to save the weight and go the next part of the routine.



5. Next the system will prompt for the load to be raised. Slowly raise the load clear of the ground and steady it. When you are ready to proceed with the calibration of the load, press ***Yes***.
6. The system will then prompt for the measured load radius measurement. Carefully measure from the center of the load to the centerline of rotation of the crane and enter the dimension in feet and tenths.

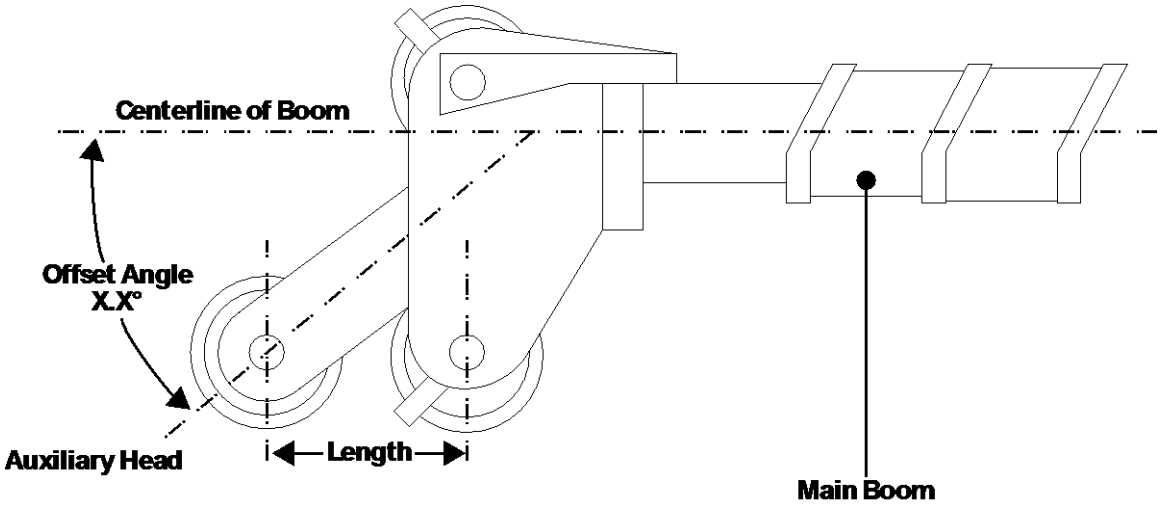


7. Press the ***Exit*** button to enter the corrected radius and prompt for the load to be put down. Ensure the load is completely on the ground and the hook back and load handling equipment is not hanging. When this is accomplished, press ***Yes***.
8. You will be prompted to again pick up the load.



9. Press ***Yes*** to calculate the piston diameter and revert back to the main menu **06 Pressure**. This pressure routine is complete.

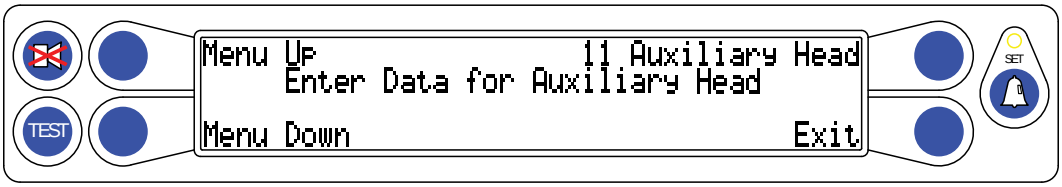
4.5 Menu 11 – Auxiliary Head Dimensions



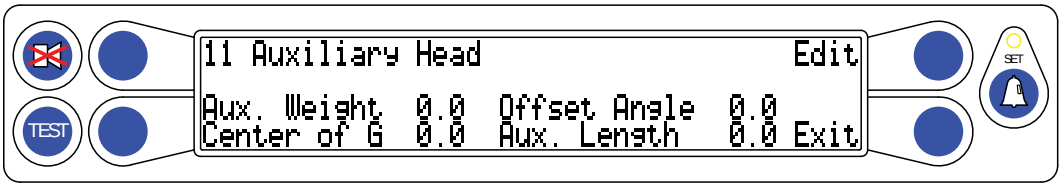
Length - Measure the distance between the Auxiliary Head sheave and the Main Head sheave.

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

This screen allows entry of auxiliary head dimensions, weights and CG.



1. Press the ***11 Auxiliary Head*** button. Press the ***Edit*** button to enter the dimensions screen. This screen allows the four displayed options to be entered or modified.

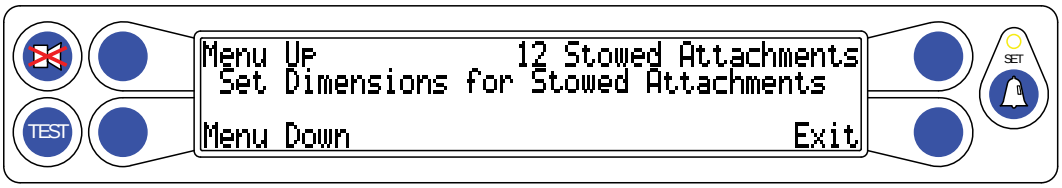


2. After entering the first dimension, press the ***Exit*** button to move to the next dimension, until all four items have dimensions.
3. When back at the edit screen, press the ***Exit*** button to return to the main menu.

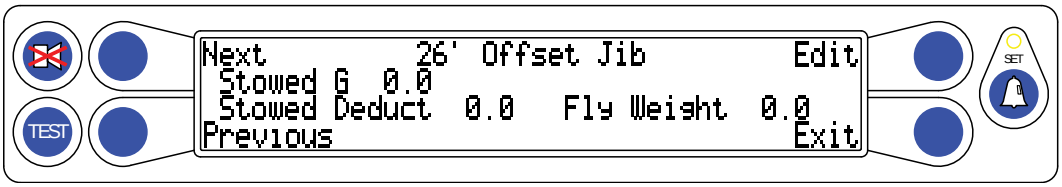
4.6 Menu 12 – Stowed Attachments

This screen allows the entry of Stowed attachments (jibs) dimensions, weights, and center of gravity.

1. Pressing the ***12 Stowed Attachments*** button to enter the edit menu.



2. Press the ***Edit*** button to access the dimensions screen. This screen allows the three displayed options to be entered or modified.

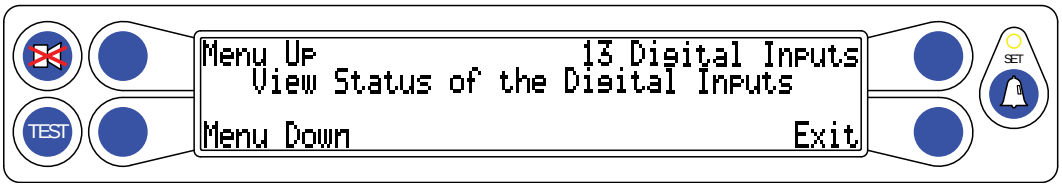


3. After entering the first dimension, press the ***Exit*** button to move to the next dimension, until all four items have dimensions.
4. When back at the edit screen, press the ***Exit*** button to return to the main menu.

4.7 Menu 13 – Digital Inputs

This menu is used to view digital inputs and outputs from functions like Anti-Two-Block and swing switches.

1. Press the ***13 Digital Inputs*** button will show the computer digital inputs as they are utilized.



4.8 Menu 14 – Enable Attachments

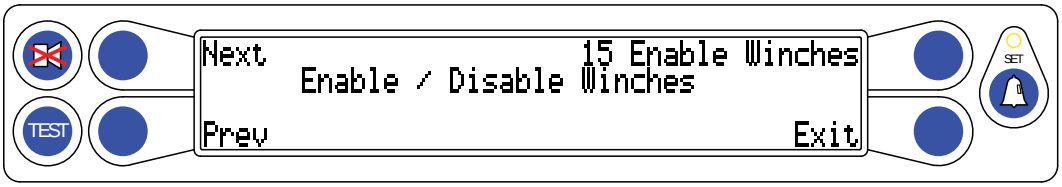
This screen is used to view attachments that are enabled or disabled in the system.

1. Press ***14 Enable Attachments*** button, the system will show all of the attachments in the system.
2. Use the ***Next Up*** button on the left to scroll through all of the available attachments and their status.
3. Press the button adjacent to the attachment you wish to enable or disable, will prompt a **"!!YES!! Calibrate!"** screen. When the approval is given, the attachment will become enabled or disabled.

4.9 Menu 15 – 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.



3. Press the ***Change Winch*** button to view the status of either winch or change between either winch.

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

4.10 Appendix A - Measurement Record

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

Callout	Description	Measurement
	RAM 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 (0,0)							
Boom Length	0.0 (fully retracted)						(fully extended)
S1							
S2							
WG							
WT							

Load Verification								
Test #	Displayed Length	Displayed Angle	Displayed Radius	Measured Radius	Radius Error	Displayed Load	Actual Load	Load Error

4.11 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

5.0 Troubleshooting

5.0 Introduction

The Greer Company is dedicated to the design and manufacture of electronic parts created as operational aids to 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-510 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 consulting the Greer Company, invalidates the warranty.

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.

5.1 Calibration Menus

This Troubleshooting Manual for the MicroGuard® RCI-510 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.

When appropriate, the procedures in this manual are based on crane operation and function. 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.

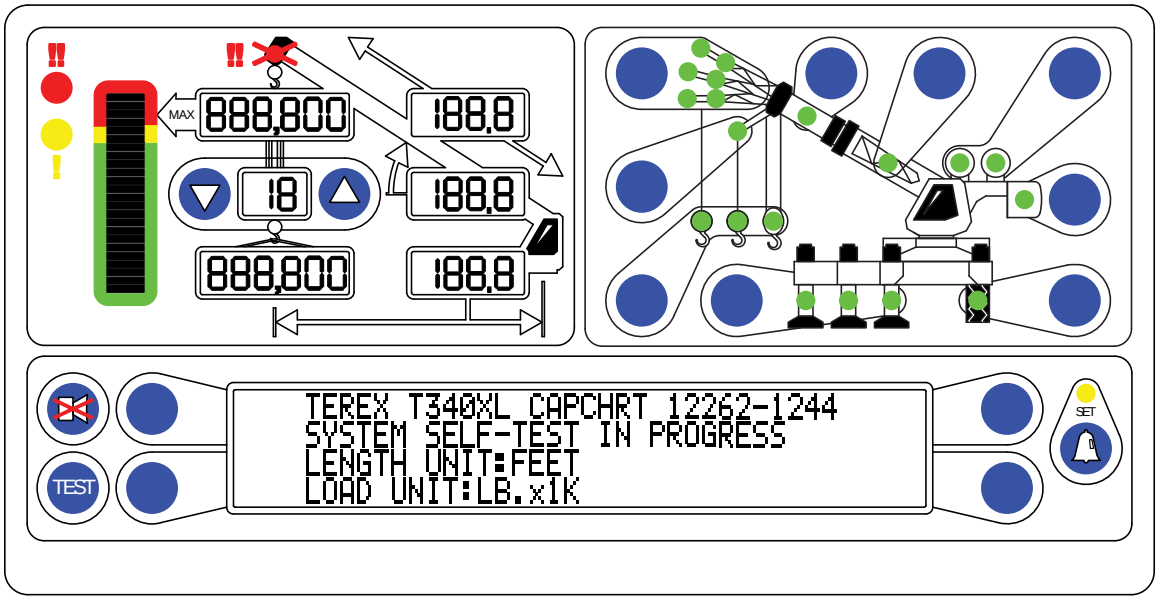
5.2 System Self-Test

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 display indicators are functional. The Self-Test lasts approximately 6 seconds.

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*.

After the system is powered up, or after pressing the ***TEST*** button (T), 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.”

5.2.1 **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 it’s communication with the computer unit.
To solve problems using display console indications, carefully observe the display console at “power on” and through the Self-Test. Next, use the charts in **SECTIONS 5.3.1-5.3.4** to help decide the course of action.

5.3 Fault Reporting and Fault Codes

System Fault Codes provide one of the most important ways to quickly locate and assess problems in the MicroGuard® System. Please review this section carefully. Each time the system is turned on, it completes a Self-Test 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.

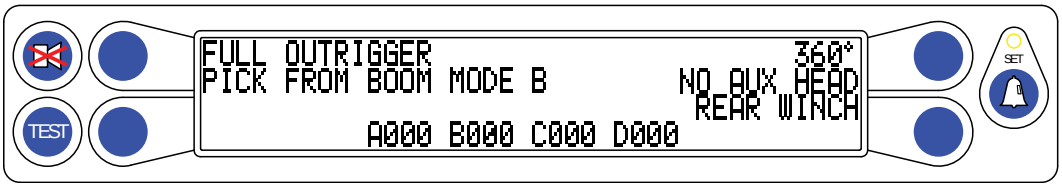


FIGURE 5.3
FAULT CODE DISPLAY SHOWN IN LOWER PORTION OF TEXT DISPLAY WINDOW

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.*

5.3.1 **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 5.7.3
005			X		X	Replace Computer
006			X	X		
007			X	X	X	
008		X				Follow SECTIONS 5.7.5-5.7.7
009		X			X	Replace Computer
010		X		X		
011		X		X	X	
012		X	X			Follow SECTION 5.7.2
013		X	X		X	Replace Computer
014		X	X	X		
015		X	X	X	X	
016	X					Follow SECTION 5.9
017	X				X	Replace Computer
018	X			X		
019	X			X	X	
020	X		X			Follow SECTIONS 5.7.2, 5.7.3, 3.9
021	X		X		X	Replace Computer
022	X		X	X		
023	X		X	X	X	
024	X	X				Follow SECTIONS 5.7.6, 5.7.7, 5.9
025	X	X			X	Replace Computer
026	X	X		X		
027	X	X		X	X	
028	X	X	X			Follow SECTIONS 5.7.2, 5.7.3, 5.7.6, 5.7.7, 5.9
029	X	X	X		X	Replace Computer
030	X	X	X	X		
031	X	X	X	X	X	

5.3.2 **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	ATB POWER FEED	ACTION
000	No Fault Found		Follow SECTION 5.9
008		X	Follow SECTION 5.8
016	X		Follow SECTION 5.5.3
024	X	X	Check crane circuit breakers, then Follow Section 5.5.3

5.3.3 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	

5.3.4 **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 SETUP
002		X		Boom length is out of range for selected chart. Check crane setup, boom length and extension.
003		X	X	Check other sensor faults first, Re-select CRANE SETUP
004	X			Swing to correct working area to select chart. Check swing sensor zero position. Follow SECTION 5.9.4
005	X		X	Swing to correct working area to select chart. Check swing sensor zero position. Follow SECTION 5.9.4
006	X	X		Check other sensor faults first, Re-select CRANE SETUP
007	X	X	X	Check other sensor faults first, Re-select CRANE SETUP

5.4 “No Fault Code” Problems

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

5.4.1 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 5.8 - 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 Reeling Drum cable for damage.
    - Ensure the Two-Block switches are correctly connected.
    - Check the slip-ring and wiring inside the Reeling Drum.
    - Check the signal cable from the Reeling Drum to the computer.
    - Check the connectors.

PROBLEM:

- *The Anti-Two-Block alarm is continuously OFF (safe). 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 Reeling Drum cable for damage.
    - Ensure the Two-Block switches are correctly connected.
    - Check the slip-ring and wiring inside the Reeling Drum.
    - Check the signal cable from the reel to the computer.
    - Check the connectors.

5.4.2 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.

5.4.2.1 Check Boom Extension

1. Ensure the boom is fully retracted.
2. Ensure the Reeling Drum cable is correctly layered as a single layer across the 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 5.8.1 CHECKING THE REELING DRUM CABLE LAYERING**.
3. Check the zero of the extension sensor with the boom fully retracted. Enter the Calibration Mode and use the “SPAN” command. Select sensor No. 2 to view the extension value in feet. The value of extension must be between -0.2 and +0.2, with the boom fully retracted. If the extension value is incorrect, refer to **CHAPTER 2 - CALIBRATION**. Fully extend the boom and ensure the displayed boom length value matches the maximum length of the boom. If the length value is incorrect, refer to **SECTION 2.7 EXTENSION SPAN CALIBRATION**.

5.4.2.2 Check Main Boom Radius

1. Ensure the correct crane configuration is in use and fully retract the boom.

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. Use a tape graduate 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 2.7 EXTENSION SPAN CALIBRATION**.

5.4.2.3 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°. 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° and at 70°*.

2. Using an inclinometer set the boom to 0° and ensure the displayed boom angle value is 0.0°. If the angle value is not 0.0°, follow **SECTION 5.7.5 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 2.7 ANGLE SPAN CALIBRATION**.

5.4.2.4 Check Pressure Sensors

The Pressure sensors are calibrated during production. Pressure sensors may not be individually 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 press the ***PRESSURE MONITOR*** button 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.

5.5 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 computer and the two hydraulic pressure sensors contained inside are calibrated during production. These sensors are unable to be replaced in the field.

5.5.1 **Computer Unit Layout**

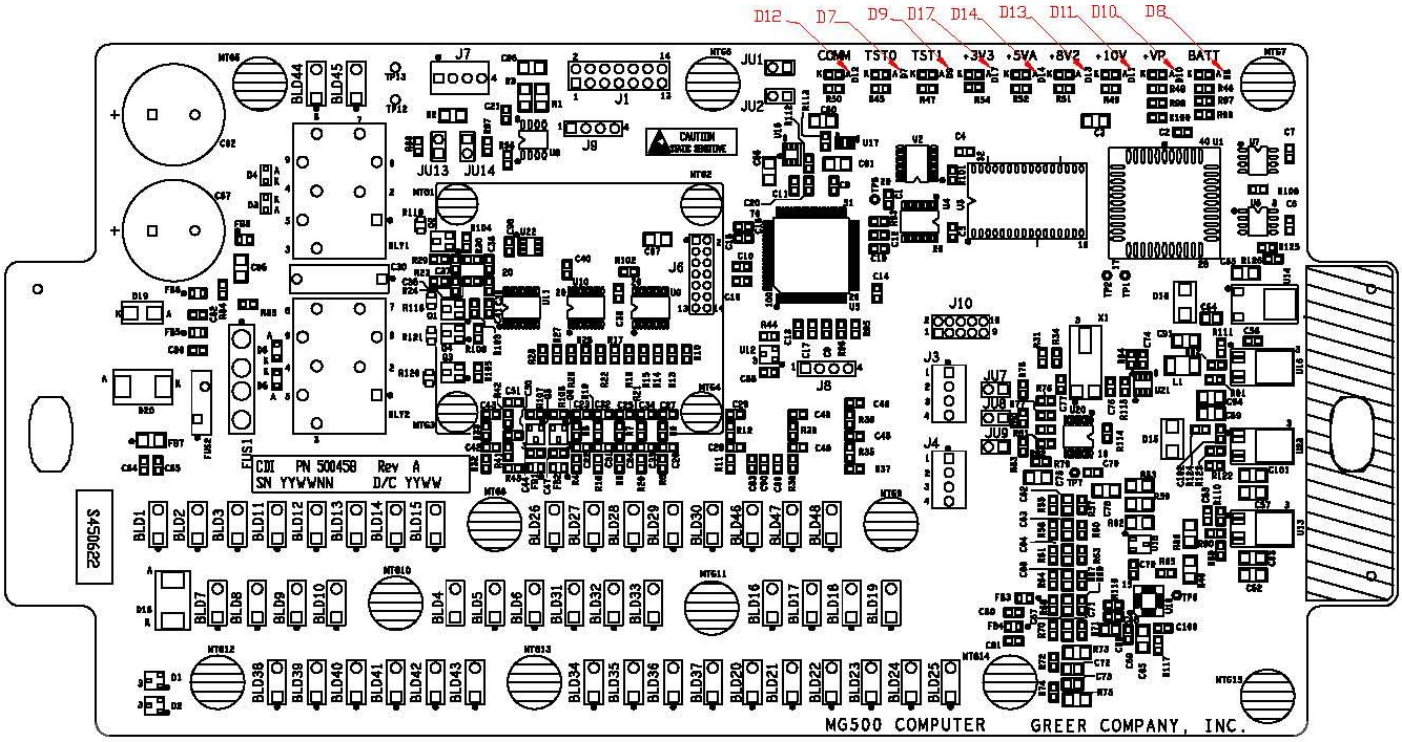


FIGURE 5.5.1 COMPUTER UNIT LAYOUT

5.5.2 **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 5.5.1 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

5.5.3 Function Kickout Fuse (Fus1)

The computer unit contains a standard 10 AMP replaceable fuse. The fuse protects the function kickout circuit and relay contacts, if a short circuit occurs across the crane kickout solenoids. Replace the fuse if the system error codes indicate that the function kickout power feed is missing. Ensure the crane circuit breaker is closed and power from the crane is present.

NOTE: *Prior to replacing the fuse, ensure any electrical shorts which may have caused the failure of the original fuse have been removed*.

5.5.4 Pressure Sensors

There are two pressure sensors installed as part of a MicroGuard® RCI-510 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 + 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.

5.5.5 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.
5. Place the computer on the deck.

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 band) hose to the piston pressure port.
6. Connect the rod-side pressure (red band) hose to the rod pressure port.

Power Up and Calibration

NOTE: *Switch the crane power on and 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.

5.6 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.

5.6.1 Checking the Display Console

To help identify subtle faults that are sometimes difficult to find, please review the following comments.

5.6.2 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 5.6.6 REPLACING THE DISPLAY CONSOLE**.

5.6.3 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.

5.6.4 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.

5.6.5 Moisture

The Display Console offers protection against dust and water, when correctly installed.

5.6.6 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.

5.7 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 reel-off cable to the system computer.

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

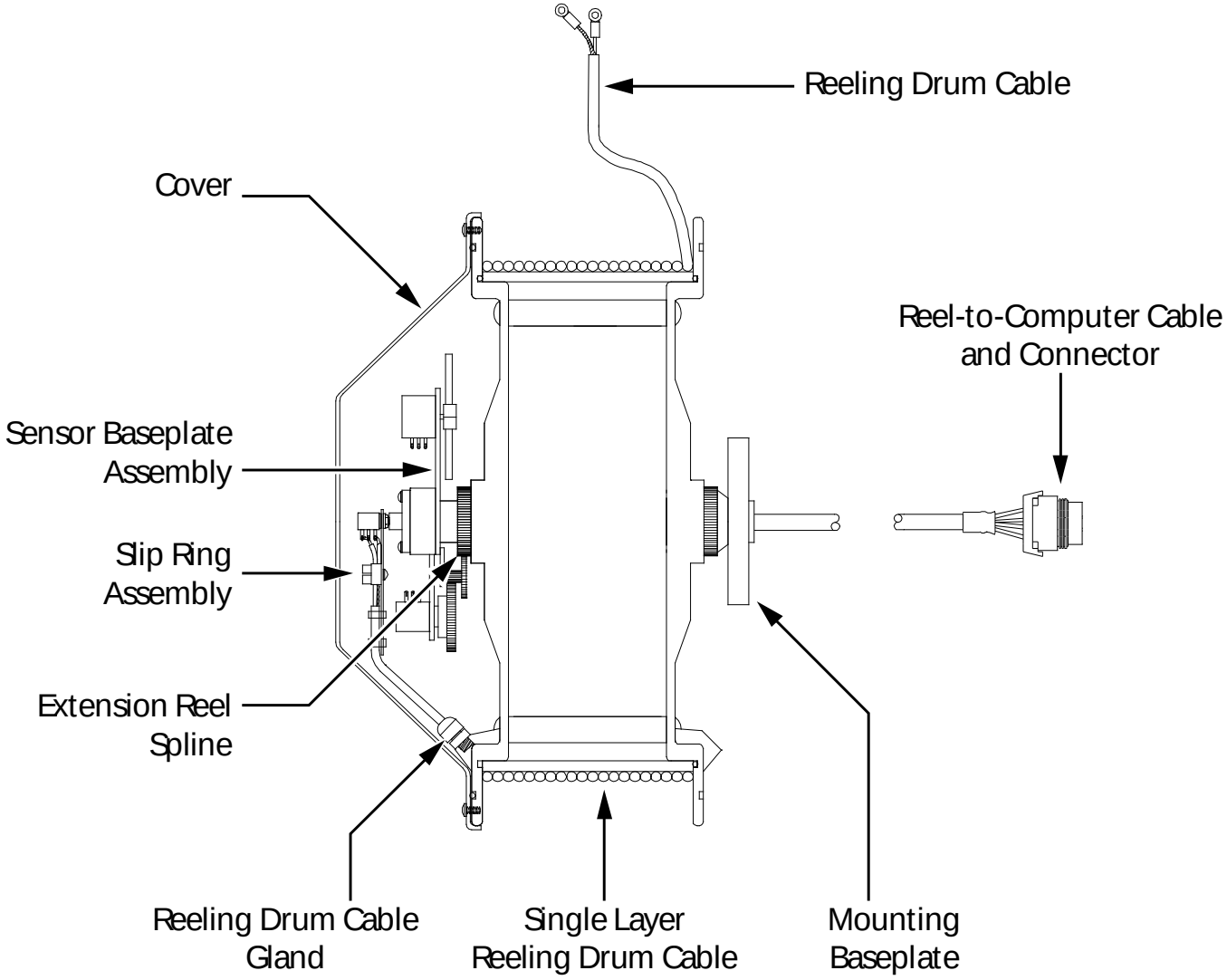


FIGURE 5.7 – REELING DRUM CUT-AWAY DRAWING

5.7.1 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 Reeling Drum, 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 Reeling Drum. Clean the reeling drum cable and lubricate it with a silicone spray.*

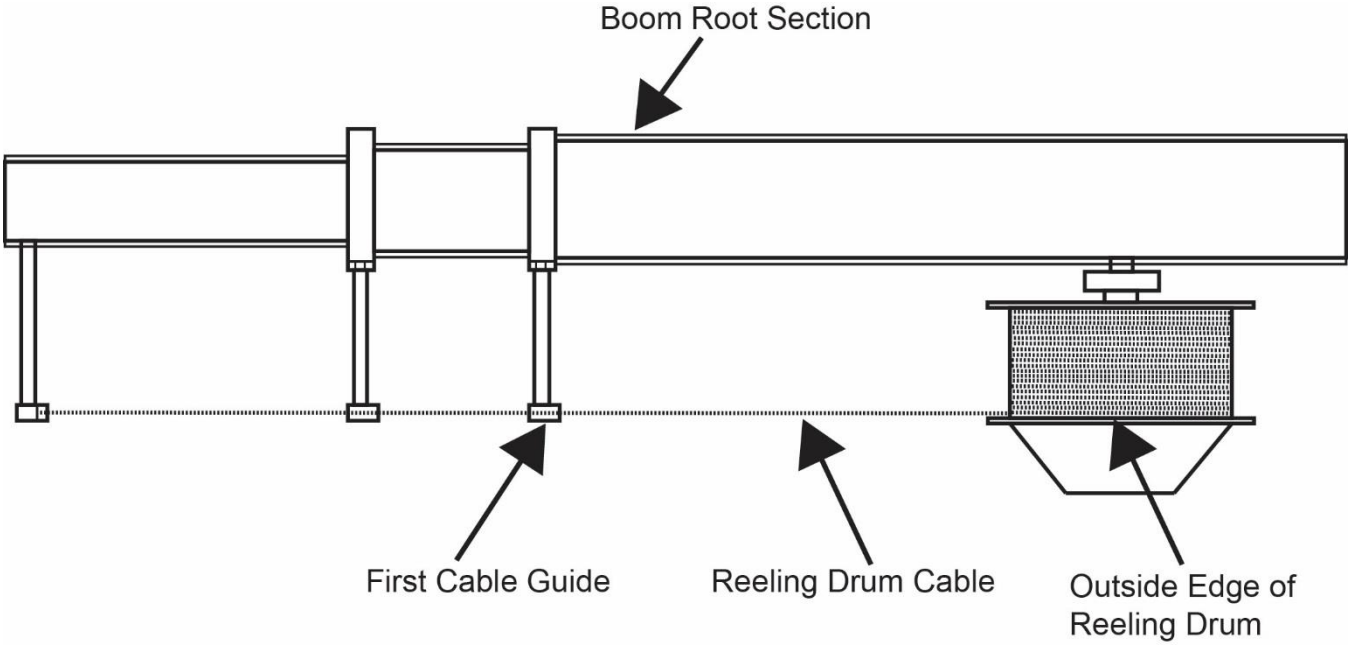


FIGURE 5.7.1 - REELING DRUM VIEWED FROM ABOVE

5.7.2 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 Reeling Drum. Check the Reeling Drum wiring within the reel and at connector J305.*

5.7.3 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.

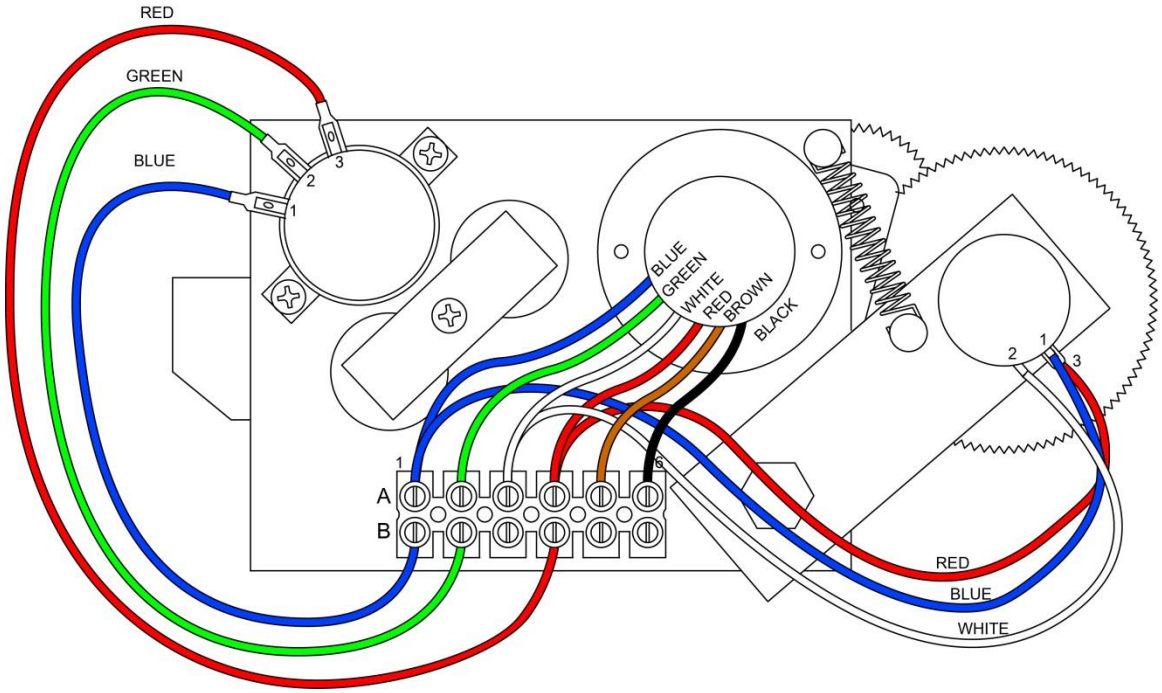


FIGURE 5.7.3 - SENSOR BASEPLATE ASSEMBLY WIRING

5.7.4 **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.

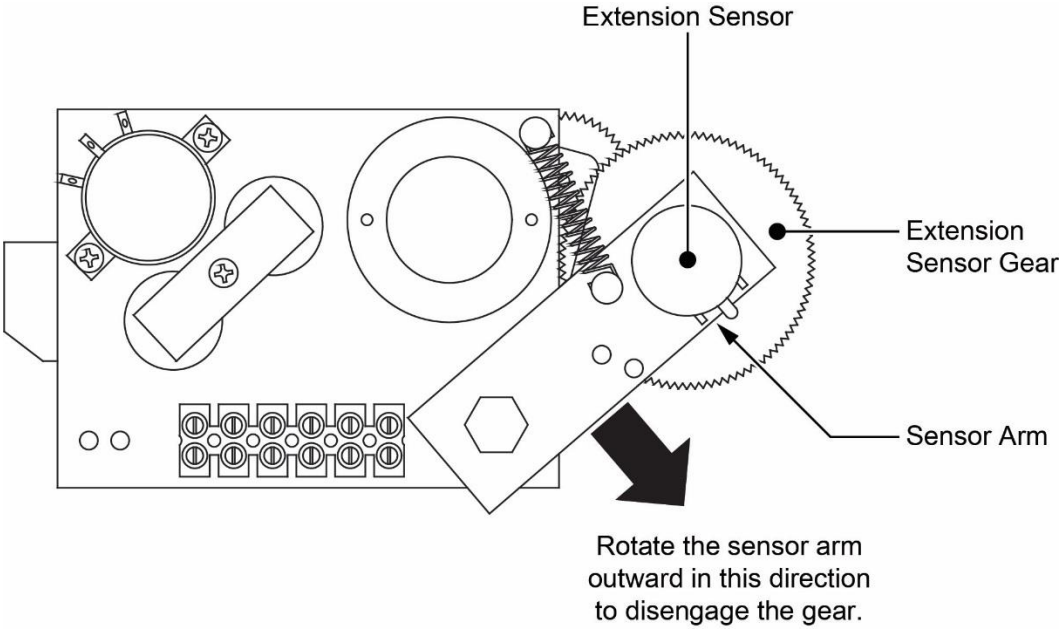


FIGURE 5.7.4 - SENSOR BASEPLATE ASSEMBLY

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. 5.7.3)
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.

5.7.5 Checking the Angle Sensor Pendulum

The Angle Sensor uses a copper pendulum, mounted behind the sensor assembly. In order to control the pendulum 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 5.7.5 below.
3. Push the pendulum downwards and ensure it isn't sticking. 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 ensure 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 assembly.*

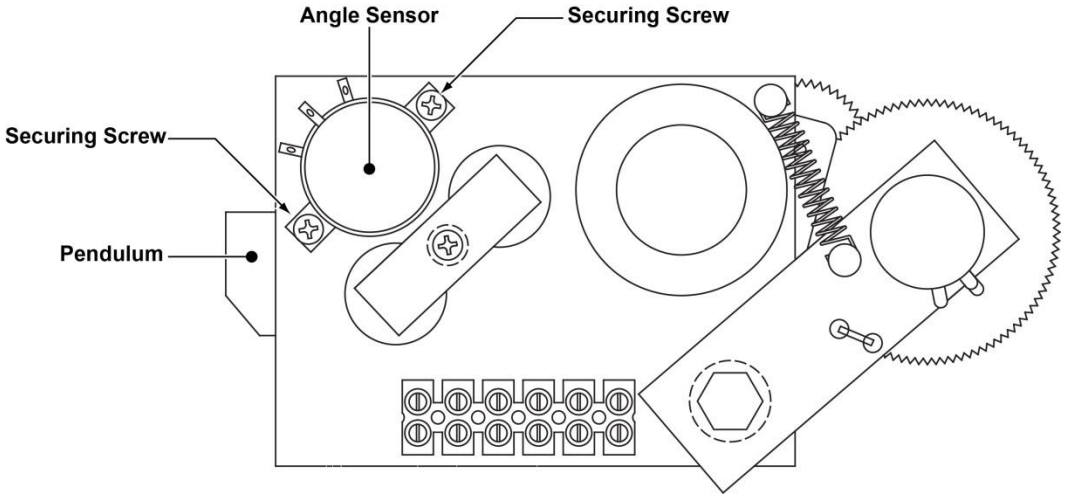


FIGURE 5.7.5 - SENSOR BASEPLATE ASSEMBLY

5.7.6 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 Reeling Drum. Check Reeling Drum wiring within the reel and at the boom foot base connector.*

5.7.7 Checking the Angle Sensor Voltage

1. Using an inclinometer for verification, place the main boom at a 0° 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, refer to **Chapter 3 – Menu 04 – Angle Sensor**.
3. Measure the voltage at TB1-1 and TB1-2, 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.

5.7.8 Reeling Drum Replaceable Parts

The following parts of the Reeling Drum are field-replaceable:

- Extension/Reel-Off Cable Assy
- Slip-Ring Assembly
- Sensor Baseplate Assembly
- Cable Tail Assembly (Signal Cable)
- Reeling Drum 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.

5.7.9 **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 can cause intermittent 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.

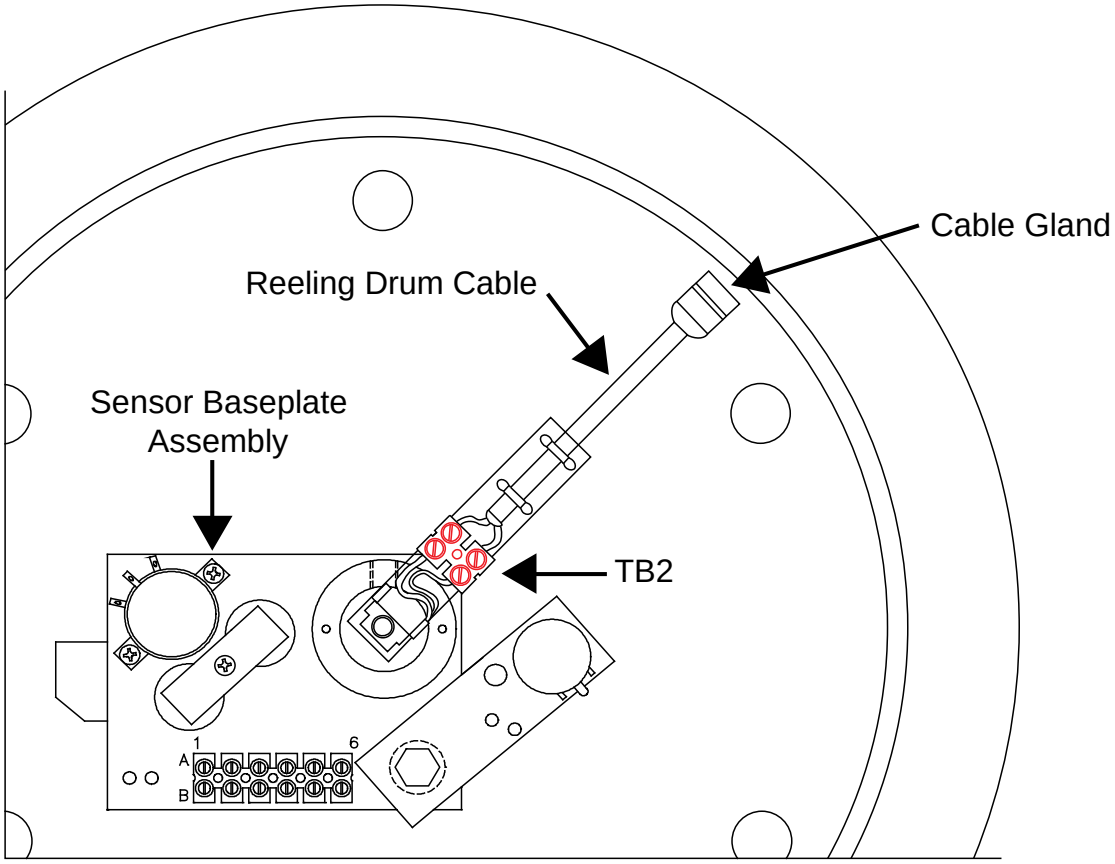


FIGURE 5.7.9 REELING DRUM CABLE CONNECTION ON THE REELING DRUM

5.7.9.1 Removing the Reeling Drum-Off 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-off 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.

5.7.9.2 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 extend and retract the boom 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.

5.7.10 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 Anti-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 5.8 ANTI-TWO-BLOCK FUNCTION OVERVIEW**.

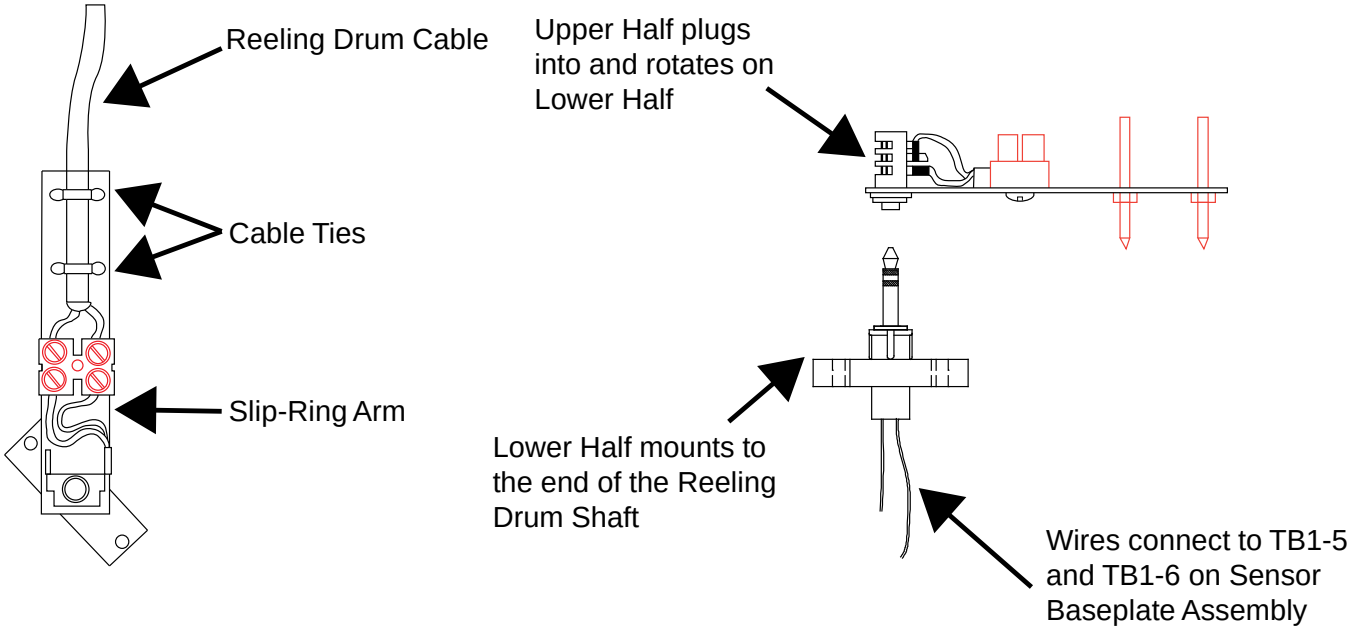


Figure 5.7.10 - Slip-Ring Assembly

5.7.10.1 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 attaching the lower half of the slip-ring on the shaft; 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.

5.7.10.2 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 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 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.

5.7.11 **Sensor Baseplate Assembly**

The Sensor Baseplate Assembly supports both the extension and angle sensors and connects the sensors, the 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 not field-repairable. If either item fails, 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.

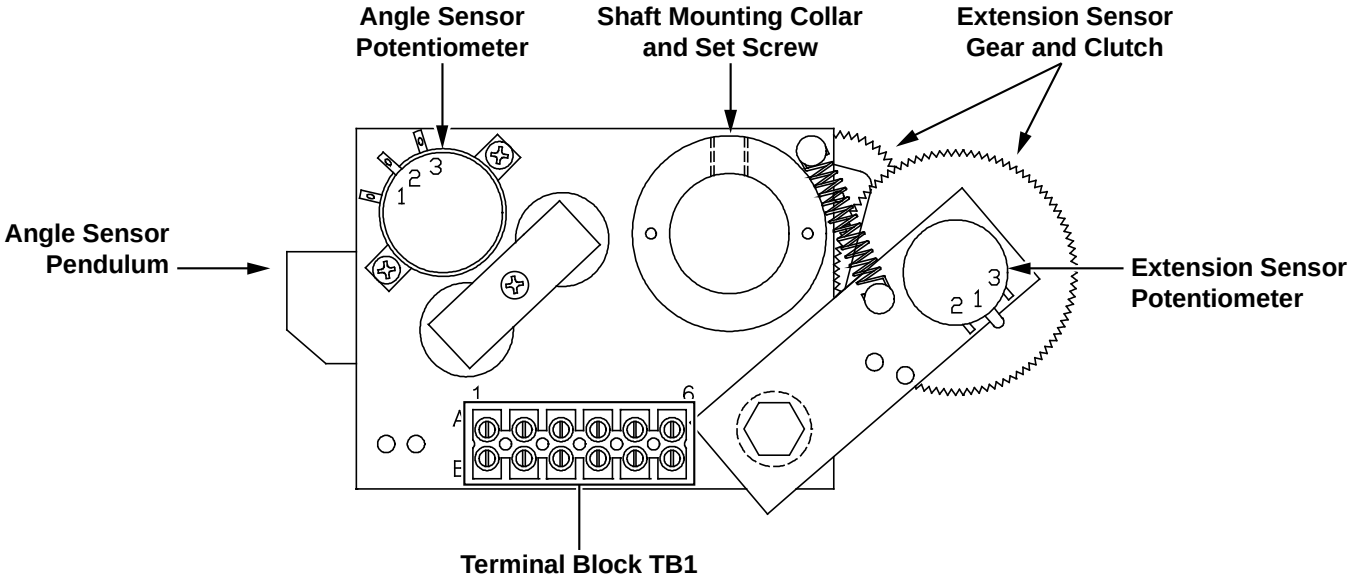


Figure 5.7.11 - SENSOR BASEPLATE ASSEMBLY

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

5.7.11.1 Removing the Sensor Baseplate Assembly

1. Remove the aluminum cover on the Reeling Drum.
2. Remove the screws holding the slip-ring to the mounting ring of the Sensor Baseplate Assembly.
3. Disconnect the brown and black wires.
4. Disconnect the signal cable wires to terminal block TB1.
5. Use a 5/32” Allen wrench to loosen the set-screw that holds the baseplate on the shaft.
6. Remove the Sensor Baseplate Assembly.

5.7.11.2 Installing the Sensor 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.
5. Tuck the unconnected remaining yellow and orange wires down into the shaft.
6. Screw the slip-ring assembly to the baseplate of the sensor 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 will be 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.

5.7.12 Signal Cable Assembly

The Signal Cable Assembly connects the Reeling Drum sensors, the Anti-Two-Block switch and the system computer.

5.7.12.1 Removing the Reeling Drum from the Boom

1. Fully lower and retract the boom.
2. Disconnect the Reeling Drum Cable from 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 the cable unwinds back onto the reel.
5. Secure the end of the Reeling Drum cable to prevent unwinding.
6. Disconnect the signal cable at the distal end.
7. Unbolt the Reeling Drum from the crane with a wrench.

5.7.12.2 Removing the Signal Cable from the Reeling Drum

1. Remove the cover from the Reeling Drum.
2. Remove the slip-ring on the baseplate of the sensor 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 reattach the cover of the Reeling Drum.
5. Turn over the Reeling Drum with cover attached, exposing 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 reel. This cable has a strain-relief encircled with an “O”-Ring, creating a tight fit that seals out water.

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*.

5.7.12.3 Installing the Signal Cable

1. Unpack the new Signal Cable and 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 the “O”-ring into the mounting plate and down the shaft in the center of the reel.
3. Seat the strain-relief, with attached “O”-ring using the tool provided in the kit.
4. Bend the cable to the side. Position the hollowed-out 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 proper position in the shaft. Continue to tap gently until the strain-relief plug will go no further.
6. Turn over the Reeling Drum and remove the cover.
7. Connect the wires to the terminal block on the baseplate, as indicated below.
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. Strip wires, if not already stripped.
10. Screw the slip-ring assembly to the baseplate of the sensor assembly.

NOTE: *Ensure the wires lay flat and toward the terminal connectors. Ensure there will be 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.

5.8 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 Reeling Drum. Damage to these parts may result in continuous or intermittent ATB alarms.

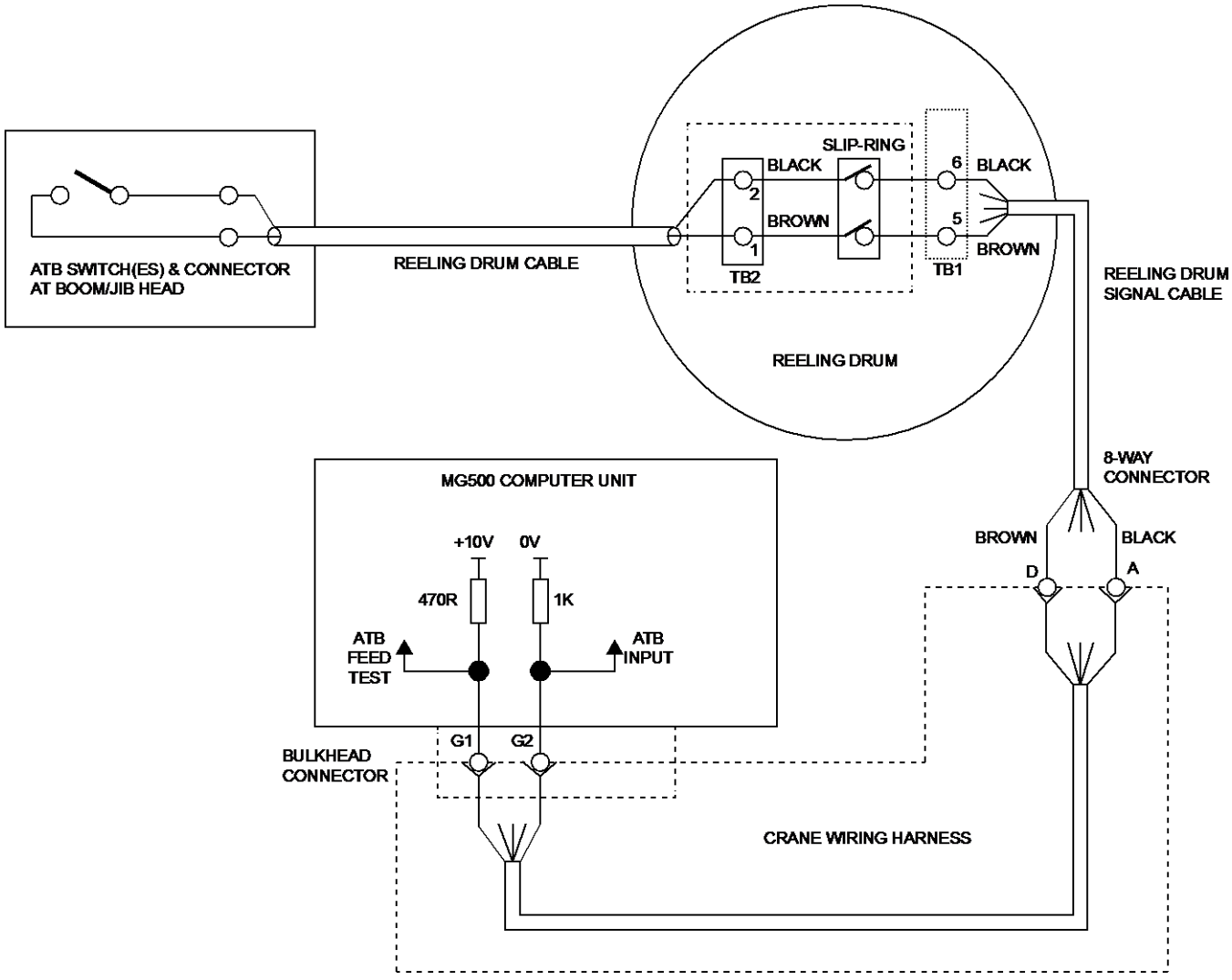


FIGURE 5.8 ANTI-TWO-BLOCK FUNCTION SCHEMATIC

5.8.1 **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.

5.8.2 **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.

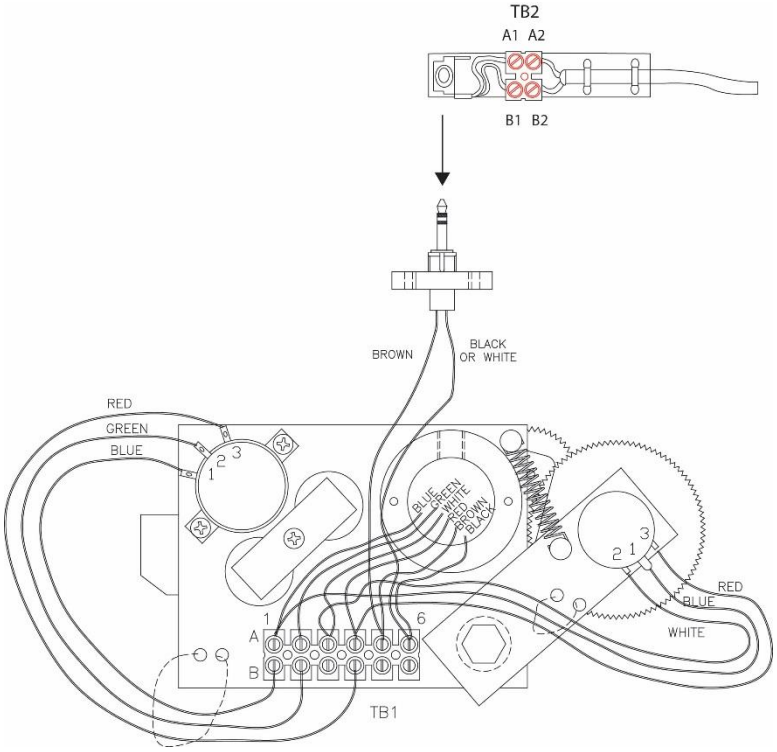


FIGURE 5.8.2 - CHECKING THE ANTI-TWO-BLOCK CIRCUIT

5.9 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. If this occurs, use the Cancel Alarm Button to lower the load to the ground.

For fault diagnosis, access the swing sensor by removing the collector cover collector at the cranes swing center. Refer to Figure 5.9 below.

For swing sensor replacement procedures, consult factory service.

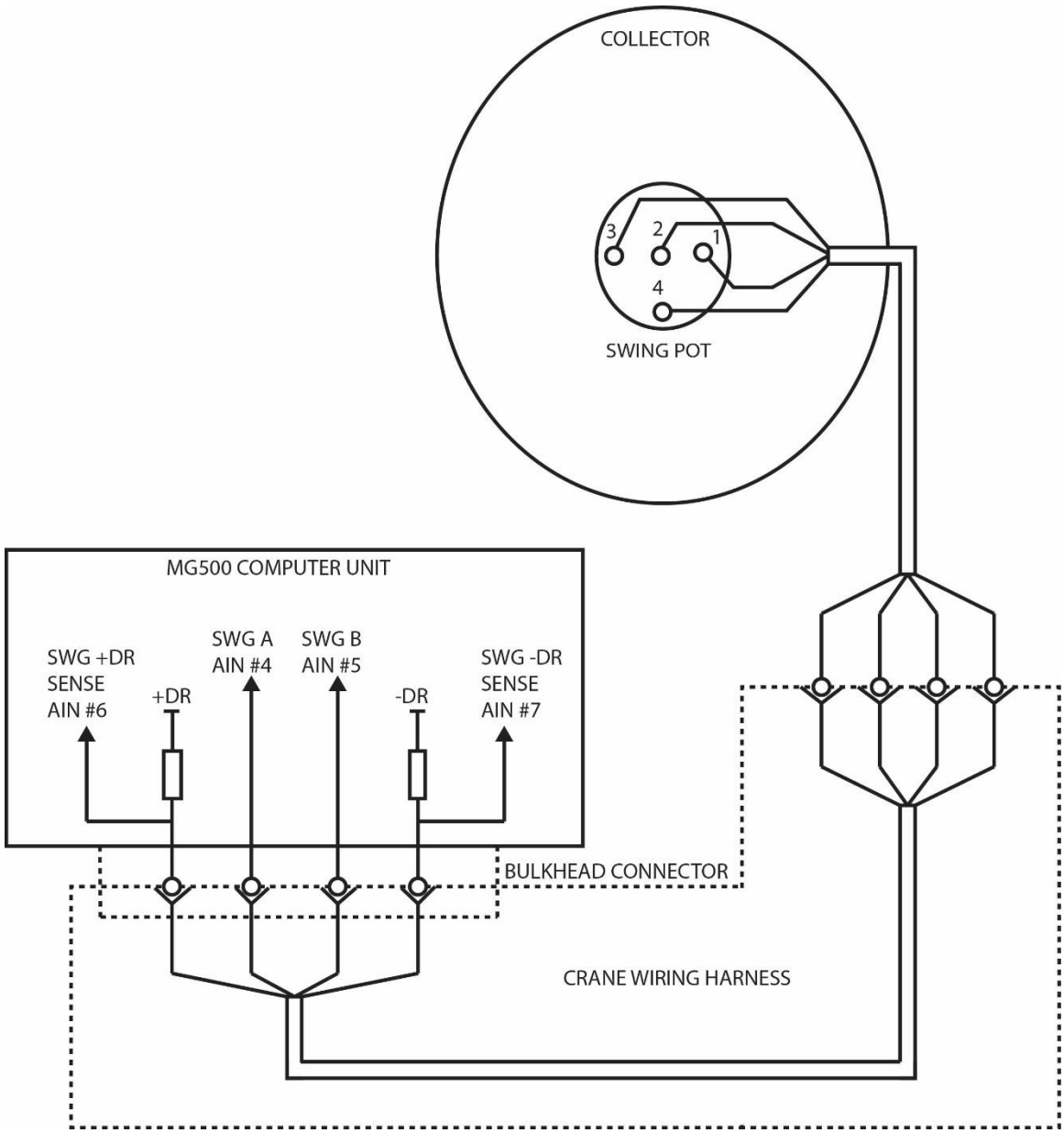


FIGURE 5.9 - SWING SENSOR SCHEMATIC

5.9.1 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 5.9.3 CHECKING THE SWING SENSOR RESISTANCE.***

5.9.2 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 5.9.3 CHECKING THE SWING SENSOR RESISTANCE****.*

5.9.3 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*.

5.9.4 Swing Sensor Setup and Checks

Use the following procedures to check or setup the Swing Sensor. Only two setup operations are required (Zero and Direction). The swing sensor does not require span calibration to operate. Span is automatically calculated by the computer.

The 0° angle of the upper structure should be set with the boom 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 sensor 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. Stow the boom in Road Travel mode.
2. Press the ***Next*** or ***Prev*** button until **"05 Swing Potentiometer"** appears in the information window at the right.
3. Press the **"05 Swing Potentiometer"** button to enter the routine.
4. Press the "Zero = ----" button.
5. The swing is now zeroed.
6. Next, raise the boom out of the rest and rotate to the right. The number by **"Zero = 0"** should increase.
7. If not, press the ***Next*** button and then press the ***Direction*** **=** button and the **"+"** will change to a **"-"** and the direction will be reversed.

NOTE: 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.

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

6.0 Revision History

REVISION	DATE ISSUED	DESCRIPTION OF CHANGE(S)	REVISED BY	ER
2	02/03/2016	Add note to pg. 10: Do not mount computer inside crane cab.	HAK	16-105
3	12/06/2017	Add separate sections for E510XXX & E511XXX duty files.	MJM	17-1124
4	05/15/2019	Update Sec. 4.1 title, Sec. 4.2 diagram, and 4.10 Table,Update A450769 to A450869,A450763 to A450869,AK758743 to K758746 in sec 1	EE	19-0517

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