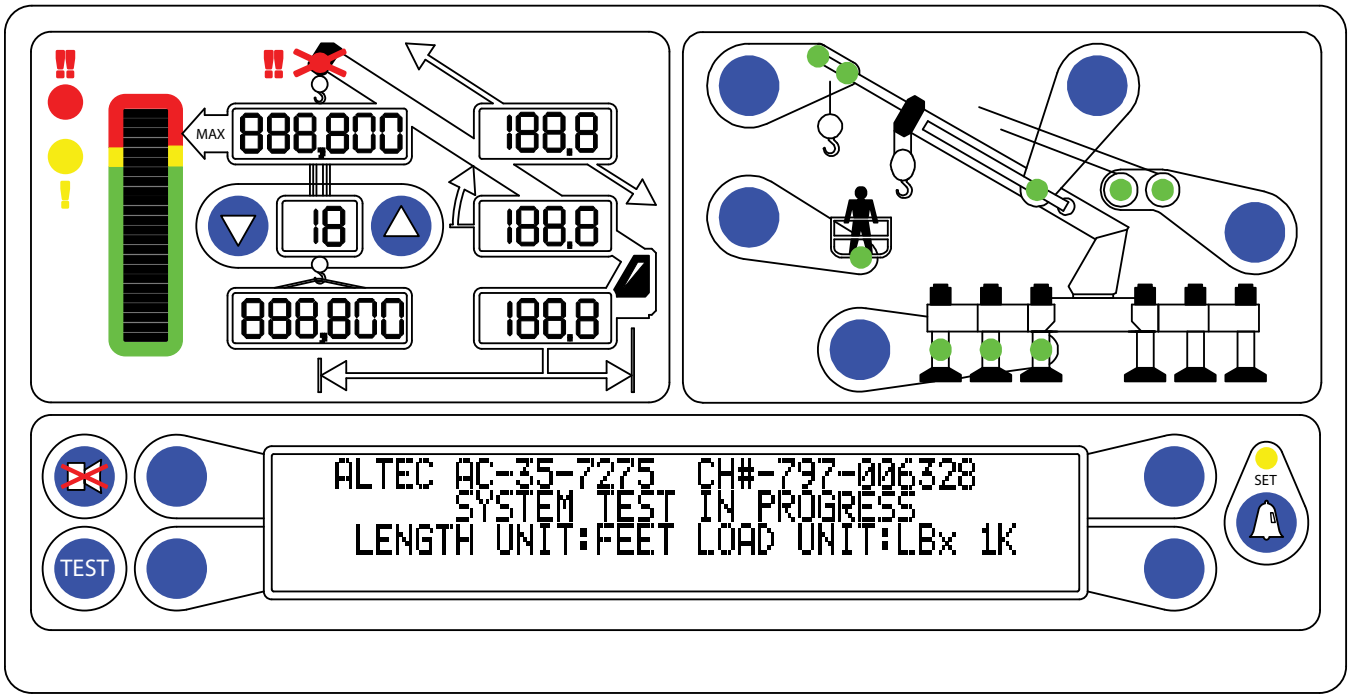


LMAP Calibration and Troubleshooting Manual

GREER COMPANY ®

TABLE OF CONTENTS

Introduction

This manual provides information and methods for isolating problems that may occur during operation of the system. Some problems can be corrected in the field. Other problems may require certain parts to be replaced or returned to the factory for servicing. Service personnel should have prior training and experience in the procedure for operation and setup of this system.

1.1 Required Tools

When possible, the procedures in this manual are based on crane operation and function. A basic tool kit consisting of wrenches and screwdrivers will be required to remove covers for unit inspection. A digital multimeter (DMM) may be required. The DMM must be capable of measuring DC voltage with a range of 0 volts to ±50 volts with a resolution of 0.1 volts. Resistance range is 0 ohms to 2 megohms. Low-cost analog meters are not appropriate since the input impedance of these meters can give false readings.

1.2 Outline of Operation

The system is intended to aid the crane operator by monitoring the load and warning of an overload or two-block condition. Crane functions are monitored by a variety of sensors.

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

At approach to overload, the system sends audible and visual warning signals. The system can be configured to cause function kick-out by sending a signal to function disconnect solenoids.

System Components

- Display Unit
- Computer Unit
- Pressure Sensors
- Reeling Drum Assembly, with Extension and Angle Sensors
- Anti-Two-Block Switches
- Cables
- Audible Alarm
- Installation/Operator Manuals

Display Unit

The display unit provides the operator with:

- Rated Capacity
- Actual Load
- Bar graph representation of Actual Load vs. Rated Capacity
- Radius of the Load
- Boom Angle
- Main Boom Length
- Working Area
- Crane Configuration

Reeling Drum Assembly

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

Pressure Sensors

There are two pressure sensors which measure pressure in the boom hoist cylinder. One sensor measures the rod-side pressure and one sensor measures the piston-side pressure. The pressure sensors are located in the computer unit.

Anti-Two-Block (ATB)

A switch monitors the approach of the hook block or overhaul ball to the boom head. The switch is held in the normal position until the hookblock or overhaul ball raises a weight mounted around the hoist rope, opening the switch. The signal is sent to the computer via the reeling drum causing an ATB alarm and function kick-out to occur.

Function Kick-Out

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

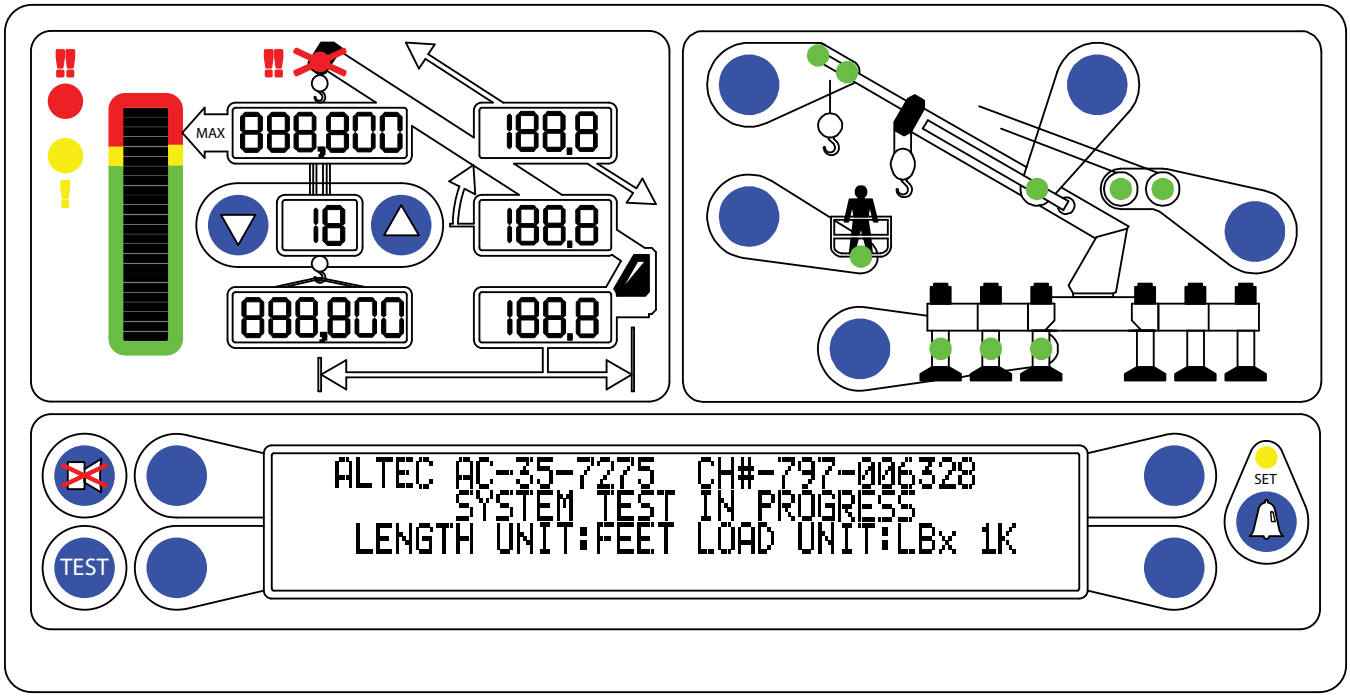
Operator Programmable Alarms

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

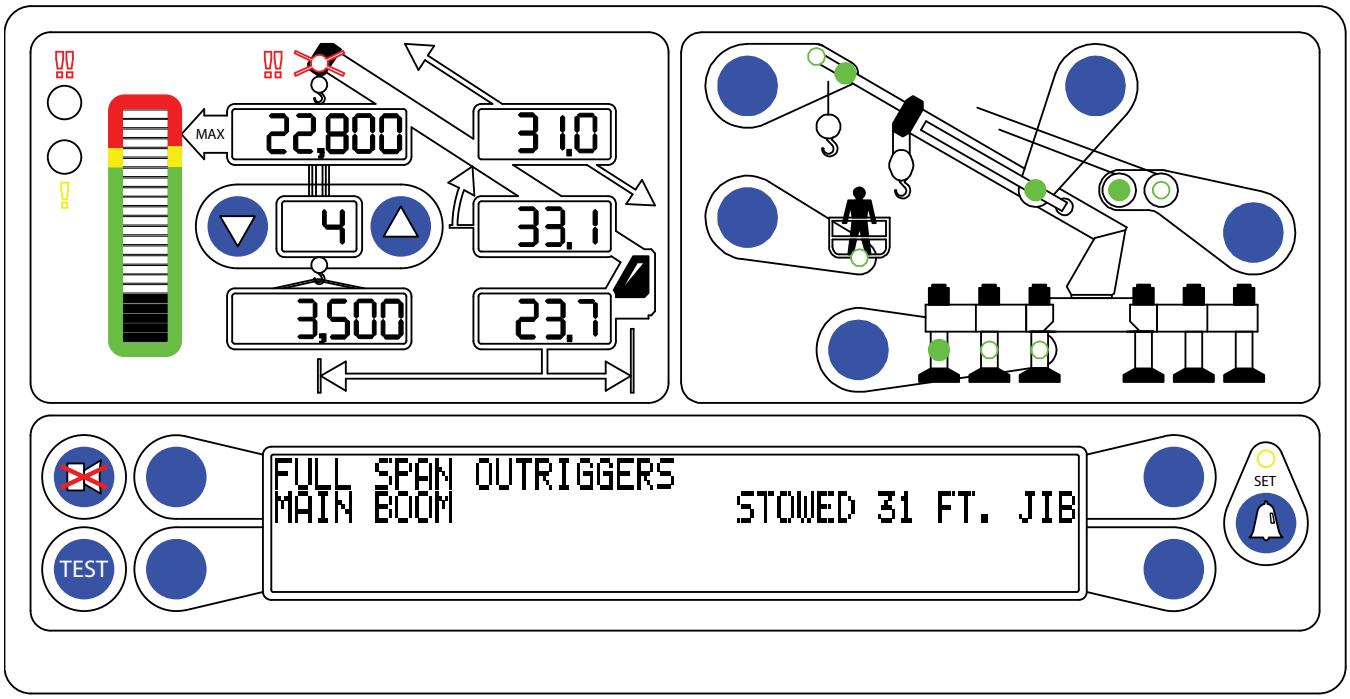
- Minimum Boom Angle Alarm
- Maximum Boom Angle Alarm
- Maximum Boom Length Alarm
- Maximum Boom-Tip Height Alarm
- Left and Right Swing Alarm
- Work Area Alarm

2.1 System Self-Test

When the power is turned on, the system performs a self-test. This verifies the computer, display console, cable, and sensors are working properly. During the self-test, the display will show the expected crane model, load chart number and units of measurement.



The LMAP will then display the main operating screen.



If this does not occur, refer to **Display Console Problems**.

2.2 Display Console Problems

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

To solve problems using the display indicators, observe the display at “Power On” and through the self-test. Use the following chart to help with the diagnosis.

Problem	Action
There are no display indications in any of the windows when the power is turned on.	Refer to **Computer Internal Status Indicators**.
The load, angle, radius, length, and rated capacity windows do not show “188.8” and the bar graph is not fully illuminated during the self-test.	Refer to **Replacing the Display Console**.
The red and yellow indicators do not illuminate during the self-test.	Refer to **Replacing the Display Console**.
The display unit does not cycle through the self-test. The data in the display windows appears jumbled with missing segments.	Refer to **Replacing the Display Console**.
The display lights are illuminated. Load, angle, radius, length, and rated capacity show “188.8” or “888.800” for load and capacity, but the display shows: “Bad communications with main computer”	Display console is OK. Check the connectors on the back of the display console. Refer to **The COMM Indicator**.

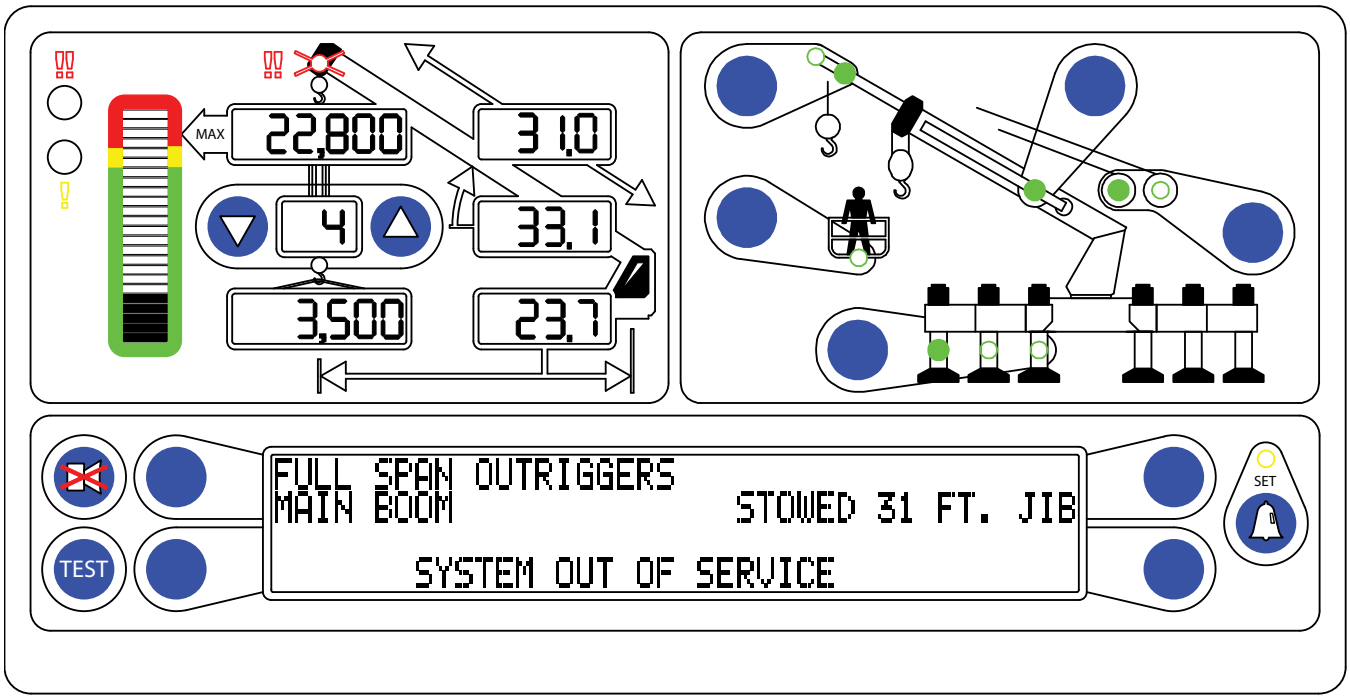
2.3 Fault Reporting and Fault Codes

System fault codes provide ways to locate and assess problems within the LMAP system.

Each time the system is turned on, it performs a self-test that lasts approximately 6 seconds. Many fault conditions are detected without a system self-test.

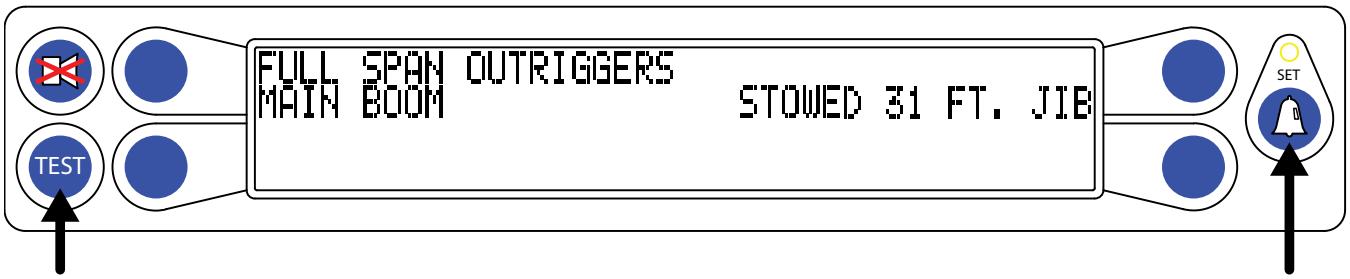
Faults detected during the self-test are indicated on the display console:

- The red overload indicator will illuminate.
- The ALARM will sound.
- “WARNING SYSTEM FAULT!” or “SYSTEM OUT OF SERVICE” will display at the bottom of the text window.

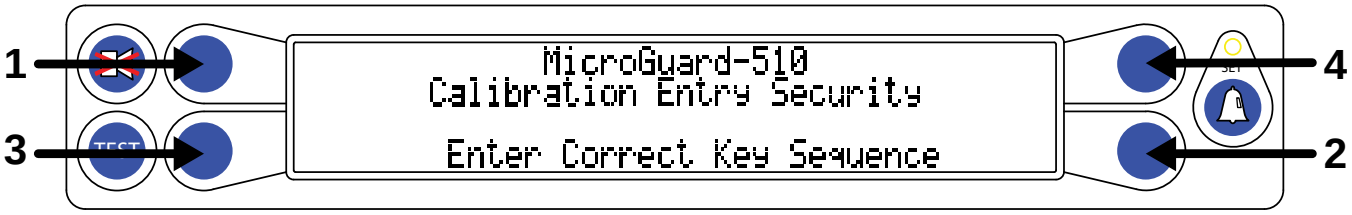


To view specific error codes, the operator can press and hold the “TEST” button until the error codes appears at the bottom of the screen, or enter the Calibration Menu.

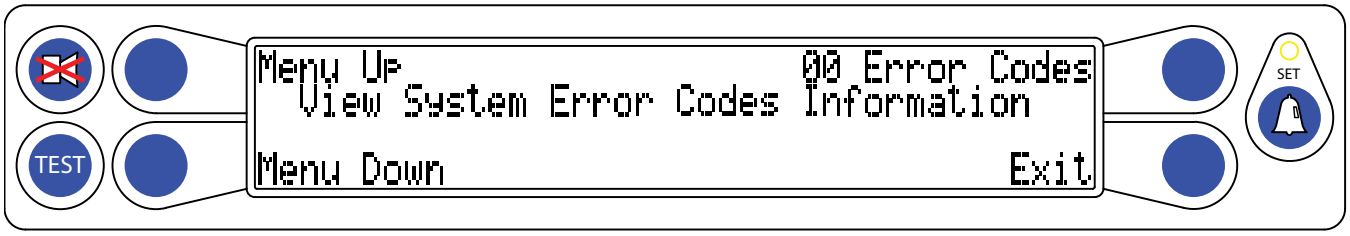
1. To enter the calibration menu, the display must be in “Normal Operating” mode.
2. Press and hold the Test and Alarm buttons simultaneously until the display prompts the user for the security code.



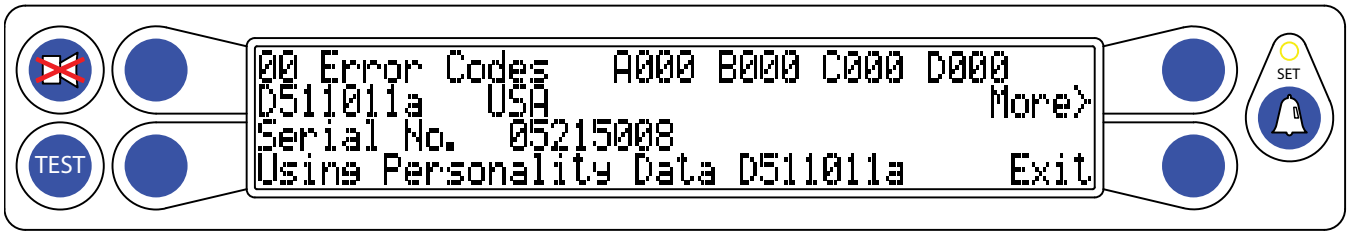
3. Enter the security code within 5 seconds, or the system will revert to the “Normal Operating” mode. Press the buttons in the numerical order displayed.



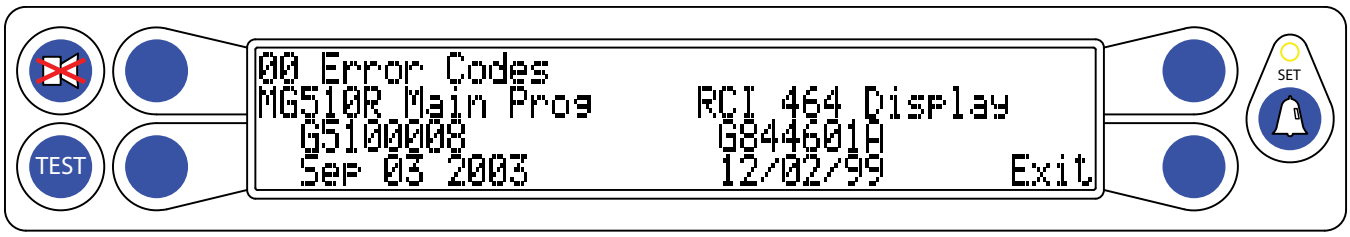
4. The system will execute a brief self-test and display the following in the information window.



5. Press the “00 Error Codes” button to display:
   a. System Error Codes
   b. Computer serial number (should match the number on the enclosure label).



6. Press the “More” button to view additional system information.



7. When you have finished, press the “Exit” button to leave

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 “B” and “C” faults before continuing with “A” and “D” faults.

2.3.1 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	Refer to Replacing the Computer.
002				X		
003				X	X	
004			X			Refer to the Calibrating the Extension Sensor Zero.
008		X				Refer to Calibrating the Angle Sensor Zero.
012		X	X			Refer to Calibrating the Extension Sensor Zero and Calibrating the Angle Sensor Zero.
016	X					Refer to Calibration the Swing Potentiometer.

2.3.2 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	DISPLAY CONSOLE	ADC 2 INTERNAL FAULT	ADC 1 INTERNAL FAULT	ACTION
016	X					Check the Crane Circuit Breakers

2.3.3 Group “C” Fault Codes

NOTE: 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 EEPROM	CRANE DATA	RAM	DUTY DATA	PROGRAM	ACTION
000	NO FAULT FOUND					NONE
008		X				Erase crane data.
016	X					Refer to Replacing the Computer.

2.3.4 Group “D” Fault Codes

NOTE: 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.
005	X		X	Swing to correct working area to select chart. Check swing sensor zero position.
006	X	X		Check other sensor faults first, Re-select CRANE SETUP
007	X	X	X	Check other sensor faults first, Re-select CRANE SETUP

2.4 “NO FAULT CODE” PROBLEMS

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

2.4.1 ANTI-TWO-BLOCK ALARM (ATB)

This section gives direction to fault diagnosis of ATB alarm problems. For detailed information, schematic, and voltages, refer to **ANTI-TWO-BLOCK FUNCTION OVERVIEW**.

PROBLEM:

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

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

2.4.2 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 is governed by the radius accuracy, and the extension, angle, and pressure sensors. The accuracy of the radius (unloaded) value is governed by the extension and angle sensors.

Ensure there are no system faults before continuing.

2.4.2.1 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 extension reel 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, refer to **CHECKING THE REELING DRUM CABLE LAYERING**.

3. Check the zero of the extension sensor with the boom fully retracted. Enter the Calibration Mode and use the “SPAN” command. Select sensor No. 2 to view the extension value in feet. The value of extension must be between -0.2 and +0.2, with the boom fully retracted. If the extension value is incorrect, refer to **CALIBRATING EXTENSION SENSOR ZERO**. Fully telescope the boom and ensure the displayed boom length value matches the maximum length of the boom. If the length value is incorrect, refer to **CALIBRATING SPAN OF EXTENSION AND ANGLE**.

2.4.2.2 CHECK MAIN BOOM RADIUS

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

1. Fully retract the boom and ensure the crane configuration is correctly set up.
2. Raise the boom to about 45° and measure the radius. The measured radius must match the displayed radius within +/- 0.2 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 65° and measure the angle with the inclinometer. Ensure the displayed angle matches the inclinometer reading within 0.1°. If the displayed angle is incorrect, follow the angle span calibration procedure in **CALIBRATING SPAN OF EXTENSION AND ANGLE**.

2.4.2.3 CHECK BOOM ANGLE

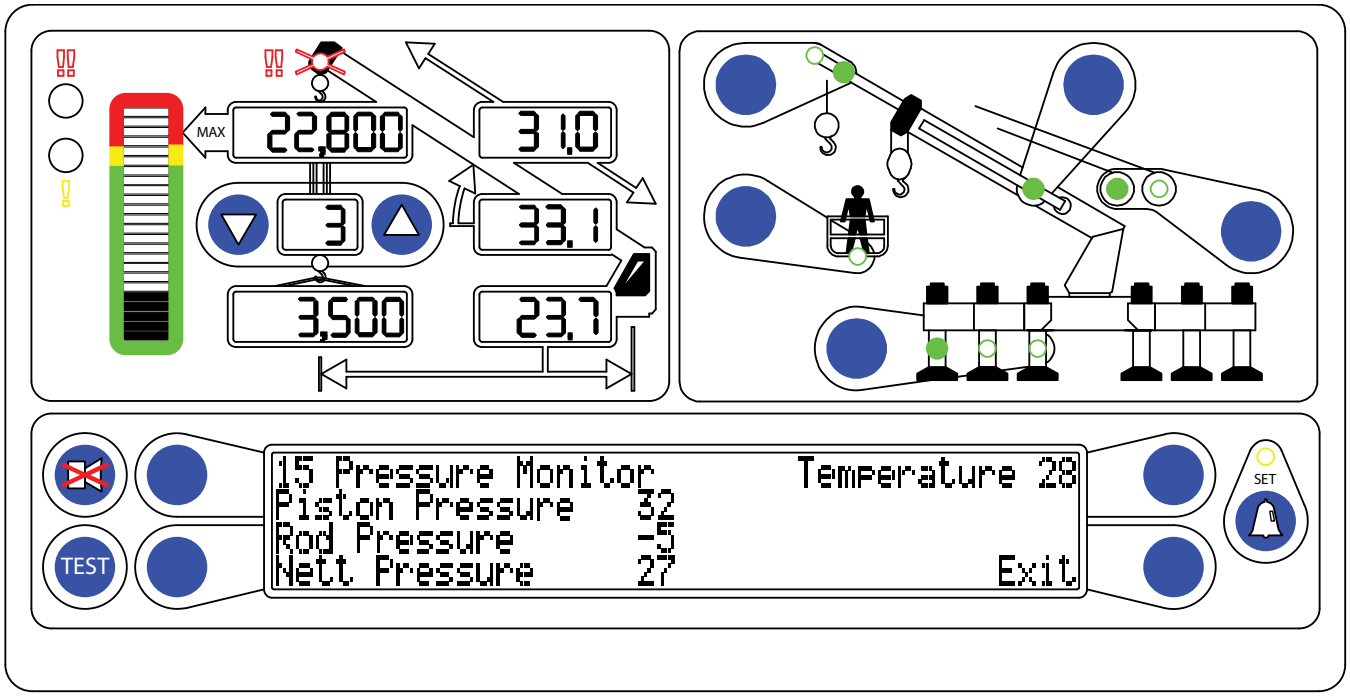
NOTE: The required accuracy of measured angles is within 0.2°. When taking boom angle measurements use a good quality inclinometer. Many inclinometers are only accurate at 0° (level). Ensure the digital inclinometer is securely mounted to the boom.

1. Fully retract the boom.
2. Using an inclinometer set the boom to 0° and ensure the displayed boom angle value is 0.0°. If the angle value is not 0.0°, refer to **CALIBRATING THE ANGLE SENSOR ZERO.**
3. Raise the boom to a high angle (at least 70°) and measure the angle with the inclinometer. Ensure the displayed angle matches the inclinometer reading within 0.2°. If the displayed angle is incorrect, refer to **CALIBRATING SPAN OF EXTENSION AND ANGLE**.

2.4.2.4 CHECK PRESSURE SENSORS

The pressure sensing system is calibrated at the factory. Pressure sensors may not be individually replaced. For any serious problem, contact your service representative.

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 proceed to “15 Pressure Monitor” and enter the menu.
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 value. This should be between -35 and +35 psi. If not, replace the computer unit.



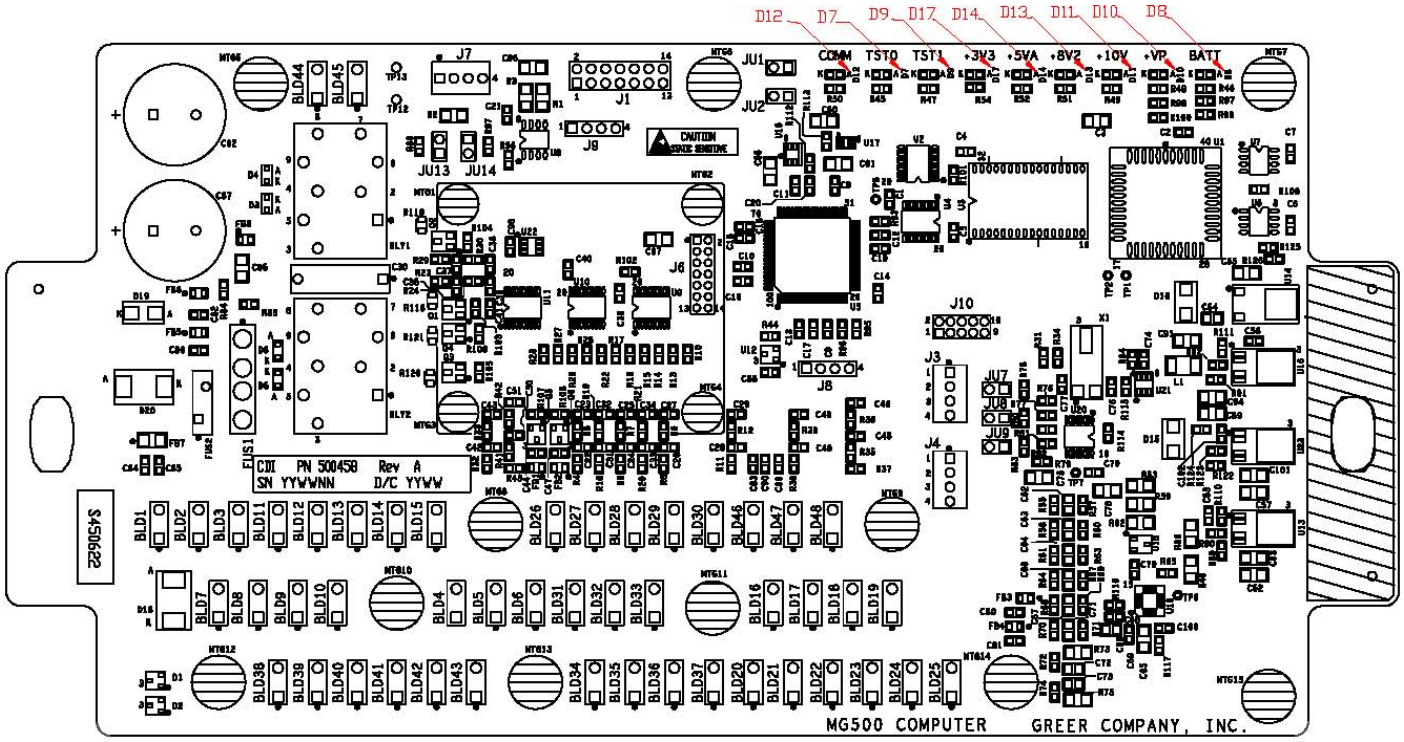
3.1 Computer Unit Overview

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

3.2 Computer Unit Layout

NOTE: Due to differences in computer unit configurations, the locations of board components may vary.



3.3 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 preceding images for LED location.

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

3.4 Function Kickout Fuse (FUS1)

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

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.

3.5 Pressure Sensors

There are two pressure sensors installed as part of the 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.

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.

3.6 Replacing the Computer Unit

Computer Removal

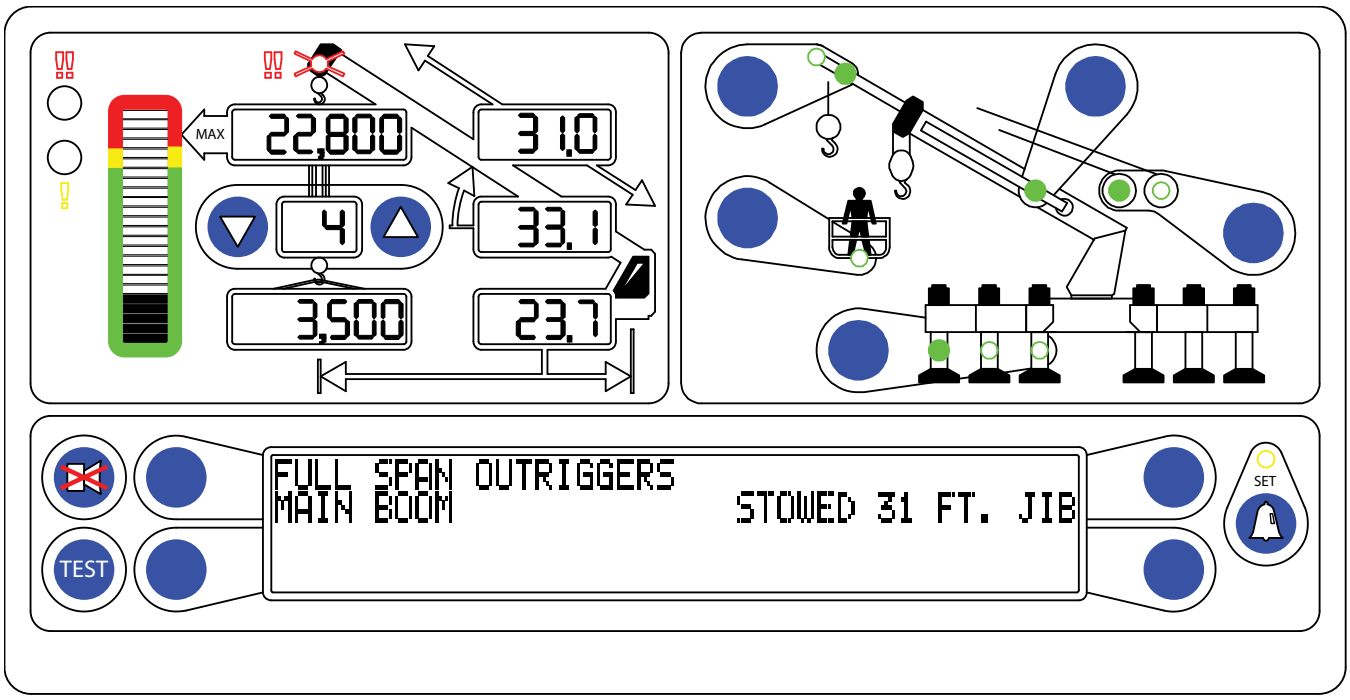
1. Lower the boom until the boom hoist cylinder is completely retracted and on its stop or the boom is firmly in the boom rest.
2. Disconnect the hydraulic connections at the computer unit.
3. Disconnect both electrical connectors at the computer unit.
4. Remove the hardware securing the computer to the cab wall.

Computer Installation

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

4.1 Display Console Overview

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



4.2 Checking the Display Console

If the console is damaged, the damage is not always apparent. To help identify subtle faults that are sometimes difficult to find, please review the following comments.

4.3 Reading the Liquid Crystal Displays

The most commonly encountered problems with viewing the display is caused by reflections. Use the contrast and brightness adjustment controls to adjust the display to the current lighting condition. Or reposition the display console so that sunlight or bright light is not shining directly on it.

4.4 Unresponsive Buttons

All button options are not available for use at all times. Ensure the non-responsive button is programmed to respond during the operation of the system. Press the button in the center to activate the switch underneath. Buttons that are damaged may not operate the switch properly. In this case, refer to **REPLACING THE DISPLAY CONSOLE**.

4.5 Connectors

A single circular connector is positioned on the rear of the display console. This connector carries power and signals from the computer unit to the display console. Examine this connector for damage. The connector is “keyed” so that it can only be inserted in one direction. It is possible to damage the pins and sockets if the connector is forced onto the housing.

4.6 Horn

The horn is built-in to the LMAP display console. If the horn fails, please contact Technical Support.

4.7 Moisture

The display console offers protection against dust and water, when correctly installed.

4.8 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.

5.1 Calibration Menu

The system is an aid to crane operation. Do not use this system in place of an operator trained in safety guidelines, crane capacity information, and the crane manufacturer's specifications.

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

Tools Needed:

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

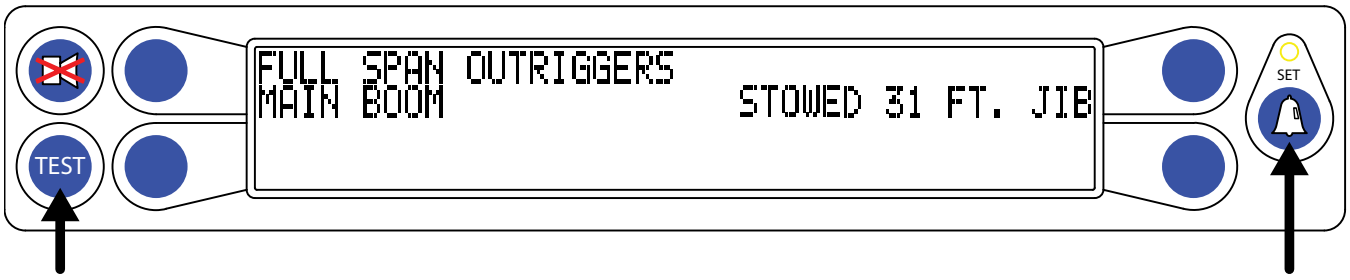
Pre-Requisites for Calibration

- The crane must be properly set on level ground per the manufacturer's specifications.
- Maximum boom height will be necessary for calibration. Ensure the area is free of overhead obstructions.
- All options such as jibs, fly's, auxiliary heads, etc. must be set in the greer system to match the crane's configuration.

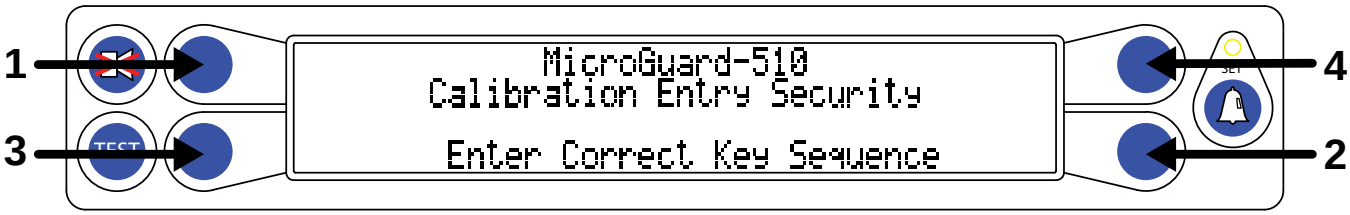
5.2 Entering the Calibration Menu

Follow the steps below to ensure proper calibration of the LMAP unit. The actual crane setup must be reflected on the display. Check the **LMAP Operator's Manual** for proper setup of the display unit.

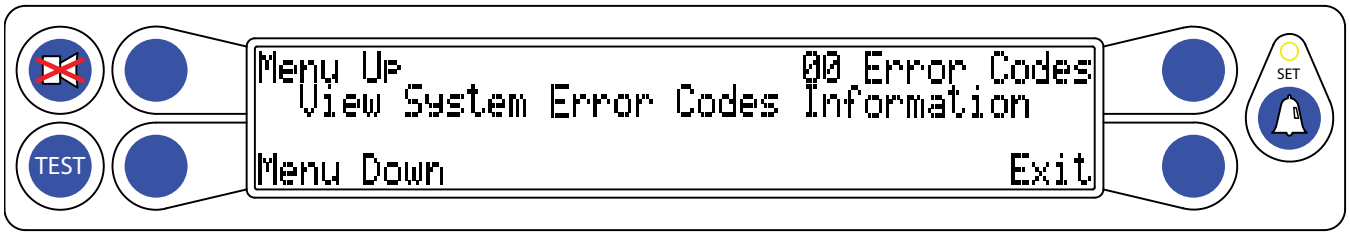
1. To enter calibration mode, the display must be in "Normal Operating" mode.
2. Press and hold the Test and Alarm buttons simultaneously until the display asks the user for the security code.



3. Quickly enter the security or the system will revert to the "Normal Operating" mode. Press the buttons in numerical order.



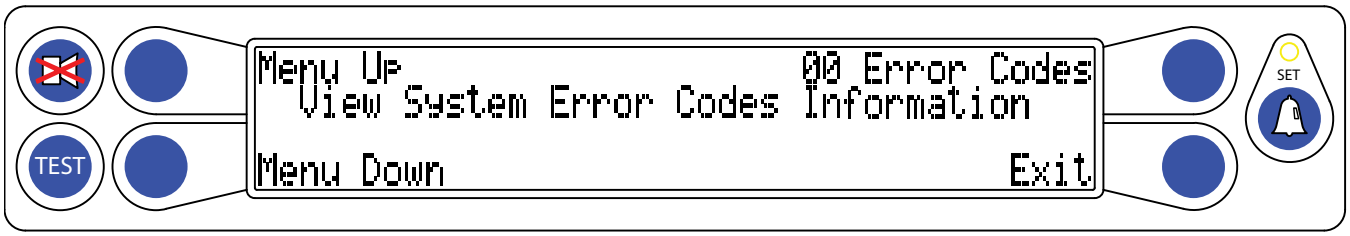
4. The system will execute a brief self-test and display the following in the information window.



5. You are now in the Calibration menu. Press the "Menu Up" or "Menu Down" buttons to access the desired menu option.

5.3 Calibration Menus

Once the security code has been entered, the display will show the following menu.



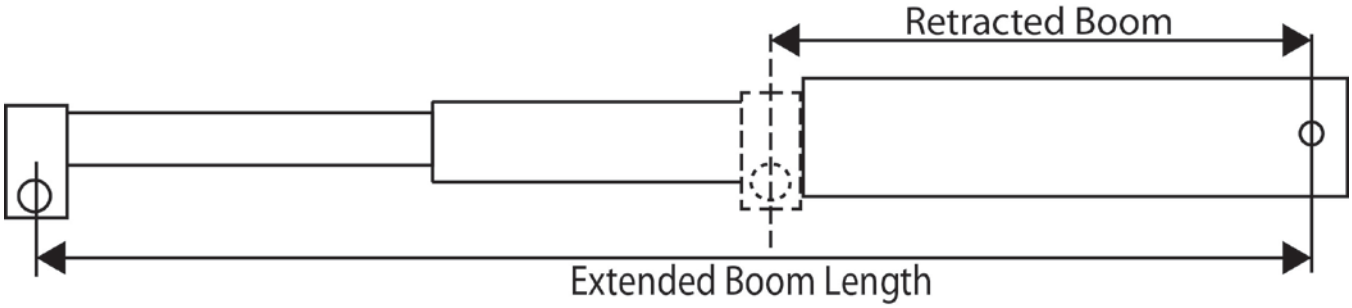
The main menu items used to calibrate the system are:

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

Calibrations are needed for the boom extension function and the boom angle function. 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.

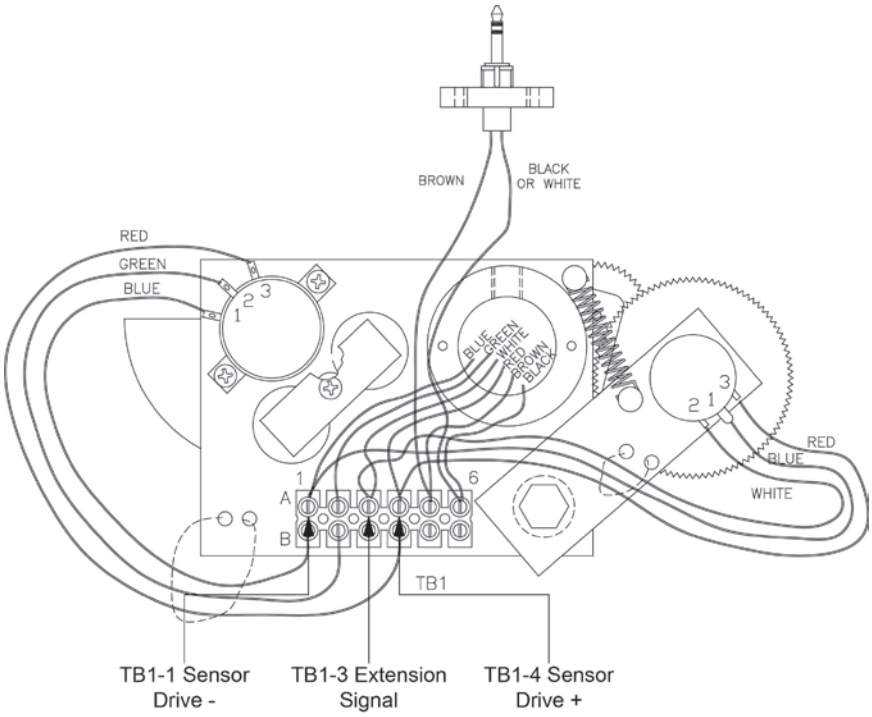
Boom extension and angle readings are dependent on the correct span values to be entered into the system. These span values are determined by using a digital level on the boom angle, and measuring the span of boom extension.



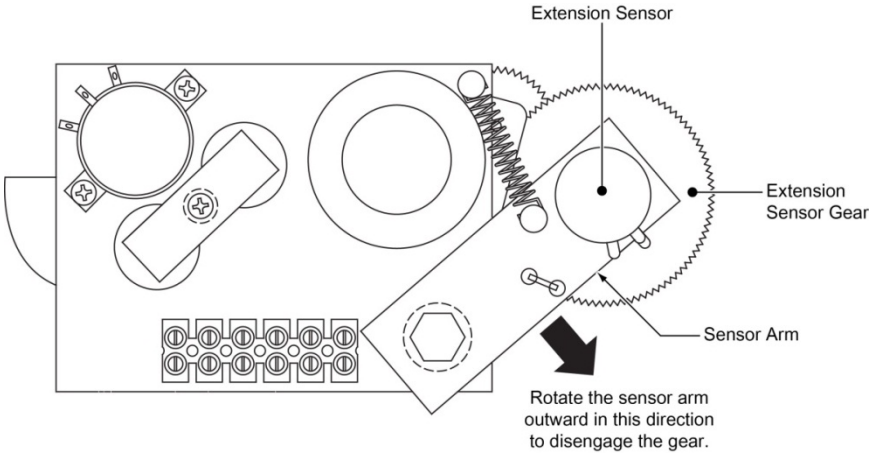
Extended Length – Retracted Length = Span

5.4 Calibrating the Extension Sensor Zero

1. Position the crane boom into the fully retracted position and set to 0.0° while using a digital level.
2. Remove the cover from the reeling drum to expose the baseplate sensory assembly.
3. Rotate the extension sensor gear clockwise until the clutch drags/clicks, and rotate another ½ turn counterclockwise.
4. The voltage reading between the blue wire and the white wire on the terminal block should measure 0.15 to 0.35 volts.

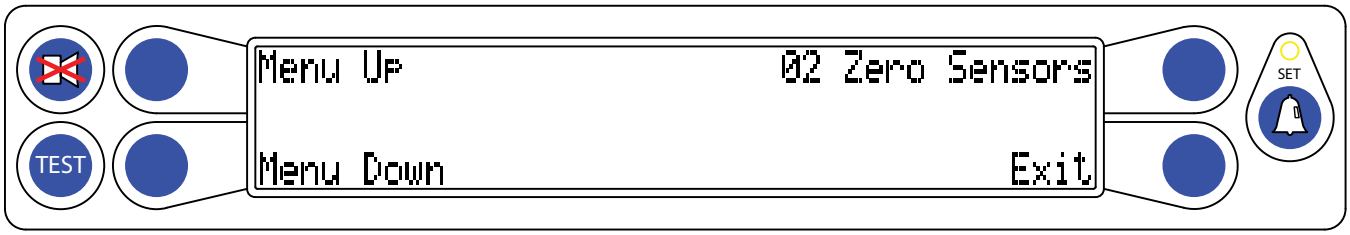


5. If necessary, rotate the gear to attain proper voltage with the boom fully retracted.

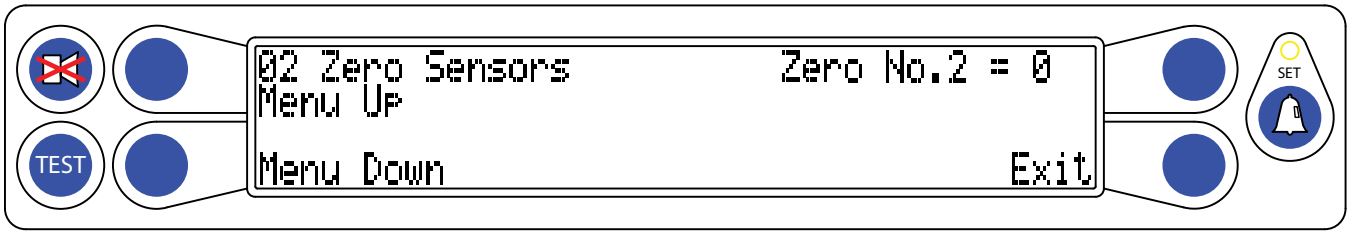


6. Enter the calibration menu and press the “Menu Up” button until “02 Zero Sensors” is displayed.

7. Press the “02 Zero Sensors” button.



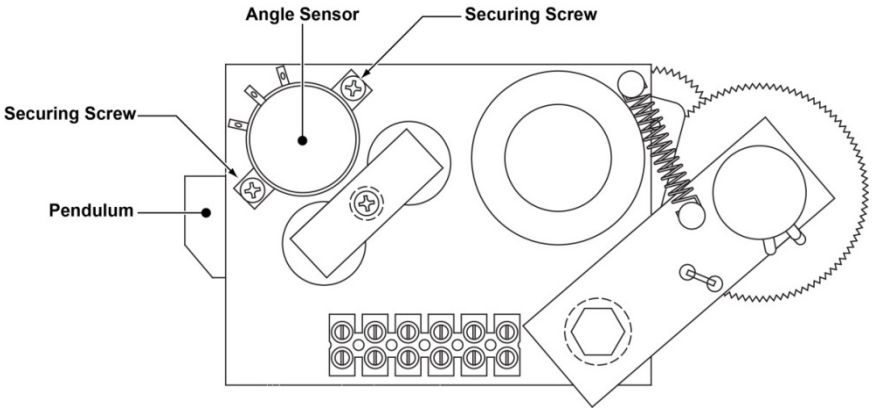
8. Press the “Zero No. 2 =” button to prompt with the question “Calibrate Yes?” Press the button a second time to calibrate the zero.
9. The display will then read “Zero No. 2 = 0” as shown. The retracted boom length will be displayed in the boom length window. Extension sensor zero calibration is complete.



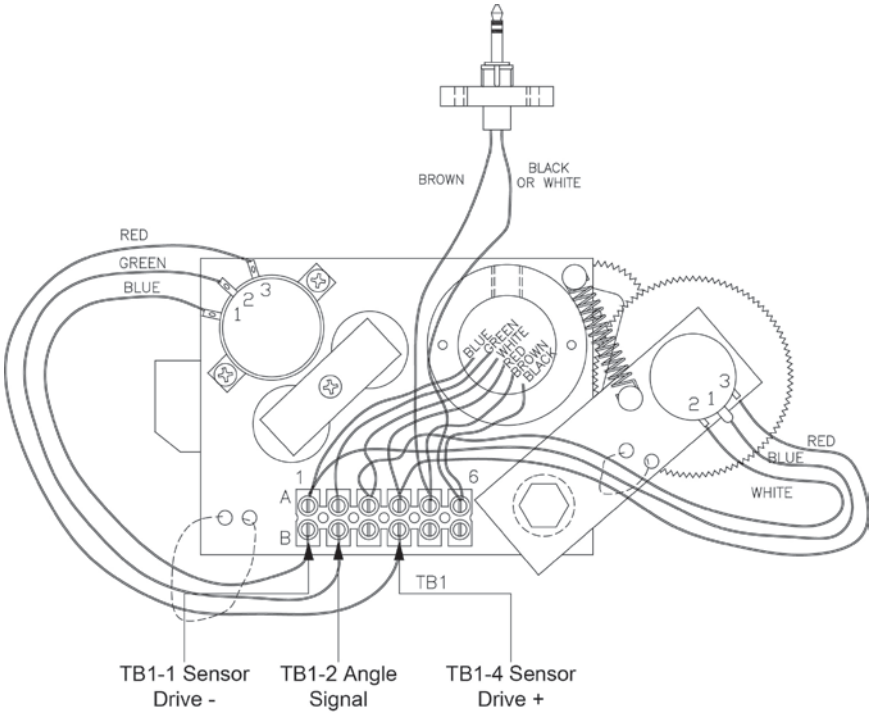
5.5 Calibrating the Angle Sensor Zero

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

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



1. Place the boom at 0.0 degrees. Verify using a digital level.
2. Check the voltage between the blue wire and green wire. It should measure between 0.4V and 0.6V in the correct position.
3. Enter the Calibration Mode and enter the “02 Zero Sensors” menu. Press the “Menu Up” button to display “Zero No.3 = 0”.
4. Press the “Zero No. 3 =” button to be prompted with “Yes! Calibrate!” Press the button a second time to calibrate the zero. Angle sensor zero calibration is complete.



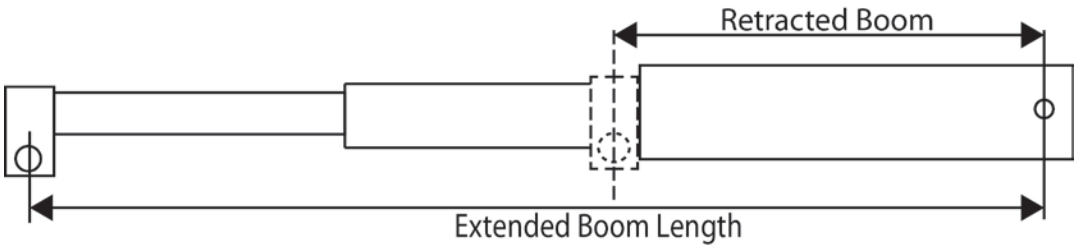
5.6 Calibrating Span of Extension and Angle

WARNING!

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

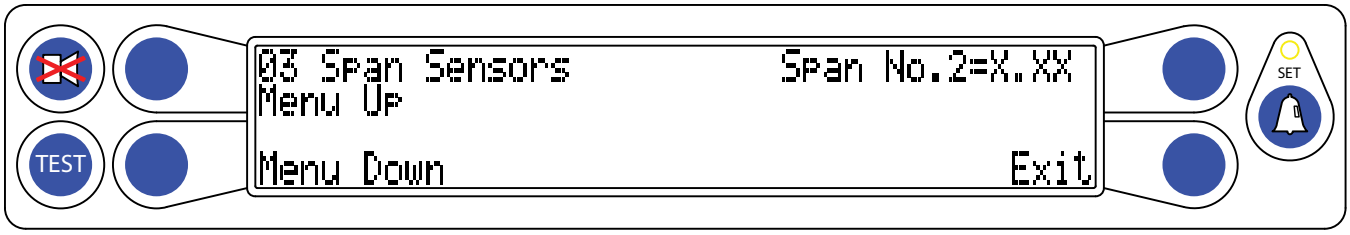
In order for the system to properly calculate the boom length and the boom angle, the span numbers must be entered into the system. Obtain the span numbers with the following steps:

1. For the Extension Span, measure the boom from the base foot pin to the center of the head sheave pin. Record this measurement.

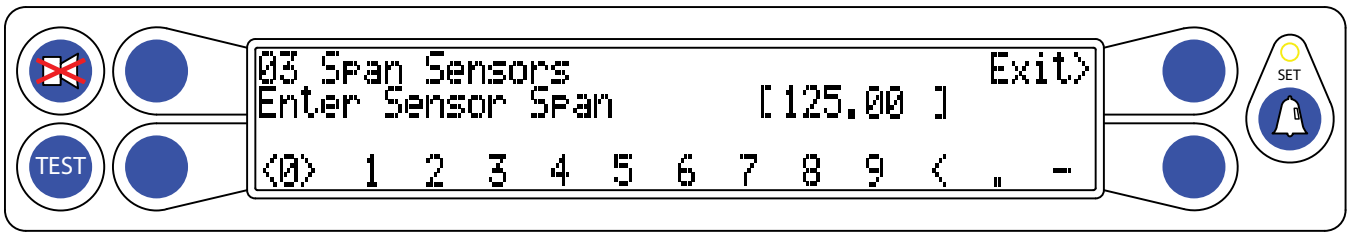


Extended Length – Retracted Length = Span

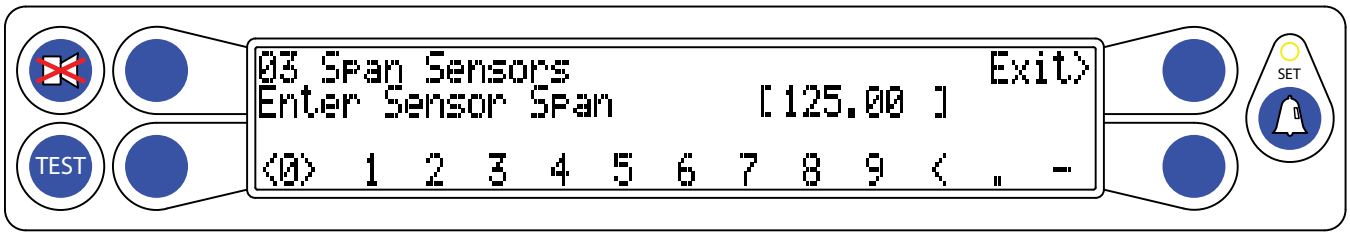
2. For the Angle span, raise the boom to between 60-65° and fully extend the boom.
3. From the calibration menu, press the “Menu Up” button until “03 Span Sensors” is displayed and then press the “03 Span Sensors” button.
4. Press the “Span No. 2 = X. X” button.



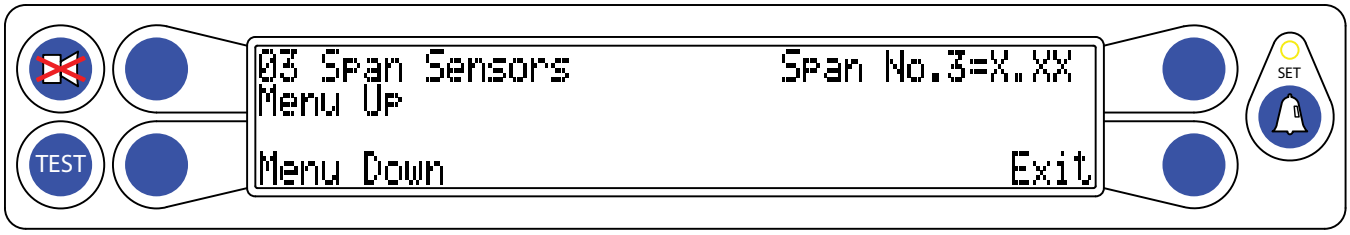
5. Press the button again to be prompted with “Yes Calibrate”. Press the “Yes! Calibrate!” button.
6. Use this screen to enter the span (Extended Length – Retracted Length = Span).



7. The lower left and lower right buttons are used to select the number. The number inside the brackets is the current selection, in the image below, the number 7 is between the brackets.



8. Use the upper left button to enter the selected number, one at a time.
9. When the complete number is entered, press the upper right button to save the number into the system memory. The span of extension routine is now complete.
10. Press the “Menu Up” button to display “Span No. 3 = X.X”.
11. Press the “Span No. 3 = X.X” button.



12. Press the “Yes! Calibrate!” button.
13. You will be prompted with the number entry screen from step 6. Use this screen to enter the current span of angle measurement from the digital level.
14. This calibration routine is now complete. Press the “Exit” button to return to the calibration menu.

5.7 Calibrating the Swing Potentiometer

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

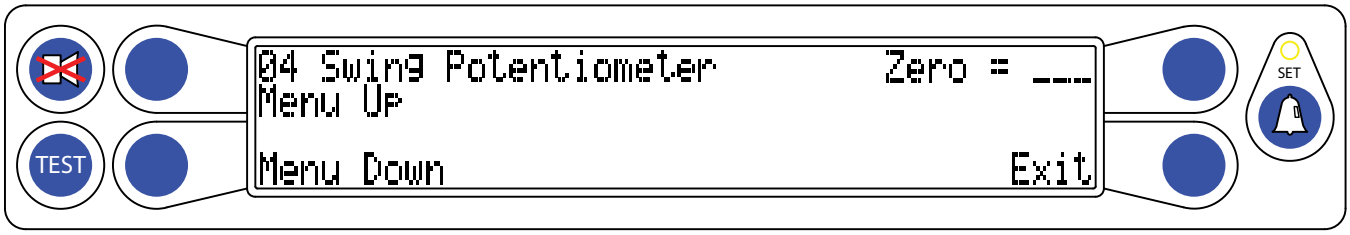
This menu will allow a zero point to be set on the swing circle and a direction for the system to track the rotation angle.

For swing sensor replacement procedures, consult factory service.

1. The swing must be in the stowed position and the house lock engaged.

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

2. Press the “Zero = ---” button to zero the swing.

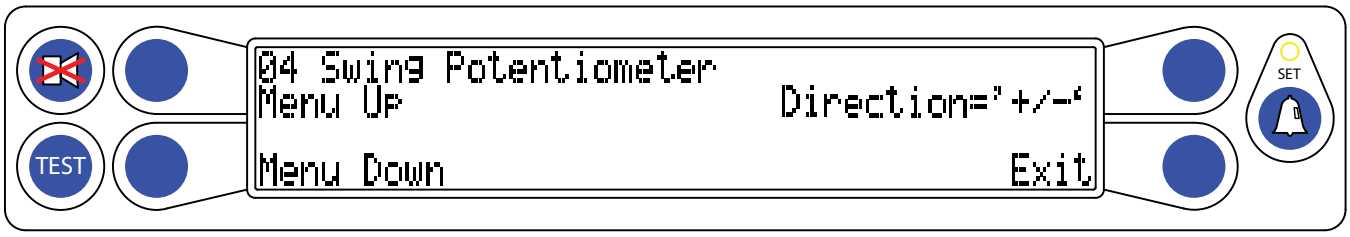


3. The swing potentiometer zero is now set.

5.7.1 Calibrating Swing Direction

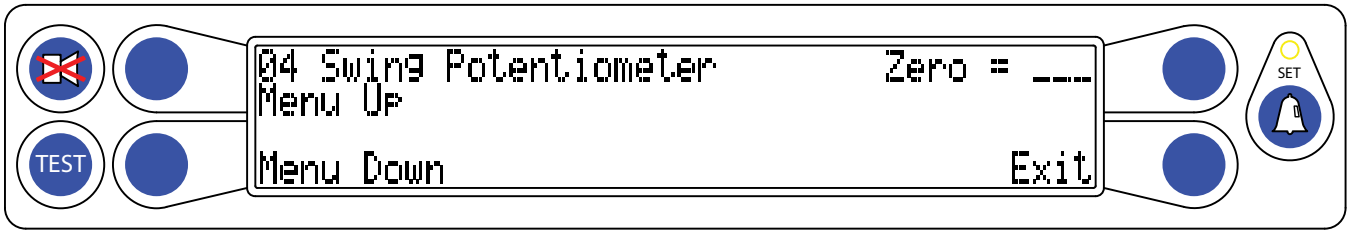
For consistency, the swing should count upwards (0, 1, 2, 3, etc) when rotating clockwise. The direction of the swing can be changed while using the LMAP display.

1. With the zero calibrated, if the swing direction is wrong, press the “Menu Up” button once.
2. Press the “Direction = ‘+‘” button to reverse the direction. This button will toggle between ‘+’ and ‘-‘ for the swing direction.



5.8 Enabling the Swing Potentiometer

1. While in the “04 Swing Potentiometer” menu, press the “Menu Up” or “Menu Down” button to display “Zero = ----” in the information window.
2. Press the “Zero = ----” button.



3. The swing potentiometer is now enabled. Refer to Section 5.7 for information on Calibrating the Swing Potentiometer.
4. When you have finished, press the “Exit” button to return to the main menu.

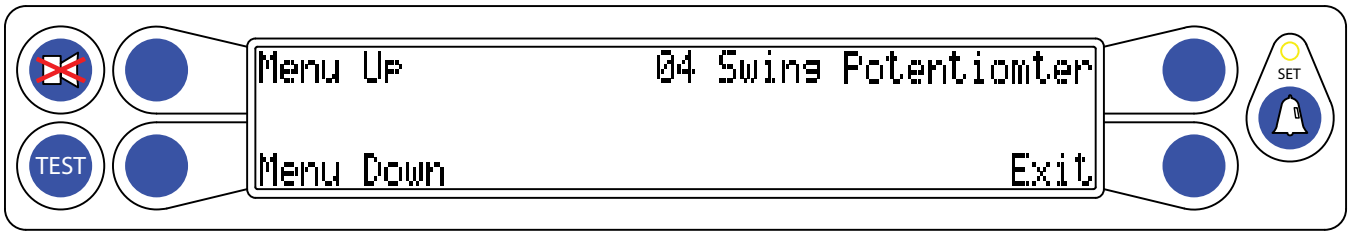
5.9 Disabling the Swing Potentiometer

In some cases, it may be necessary to disable to the swing potentiometer. If the swing potentiometer is malfunctioning, it can be disabled or “removed” from the system. The swing potentiometer is disabled so the computer does not receive false readings.

WARNING!

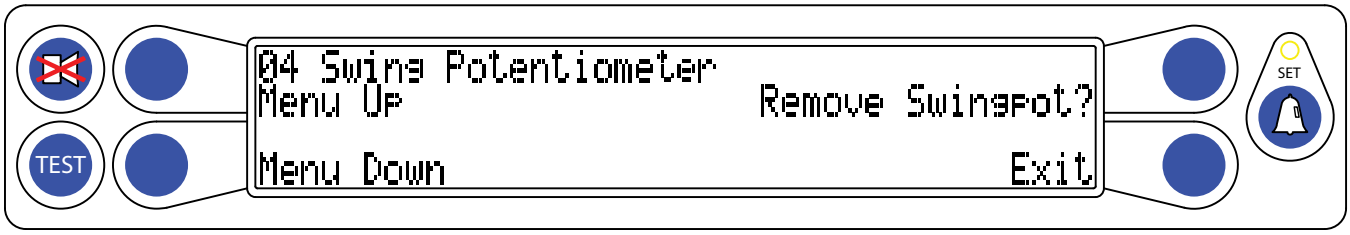
REMOVING THE SWING POTENTIOMETER IS A TEMPORARY SOLUTION AND WILL DISABLE ANY SWING OR WORKING AREA ALARMS.

1. From the calibration menu screen, press the “Menu Up” button until “04 Swing Potentiometer” is displayed.
2. Press the “04 Swing Potentiometer” button.

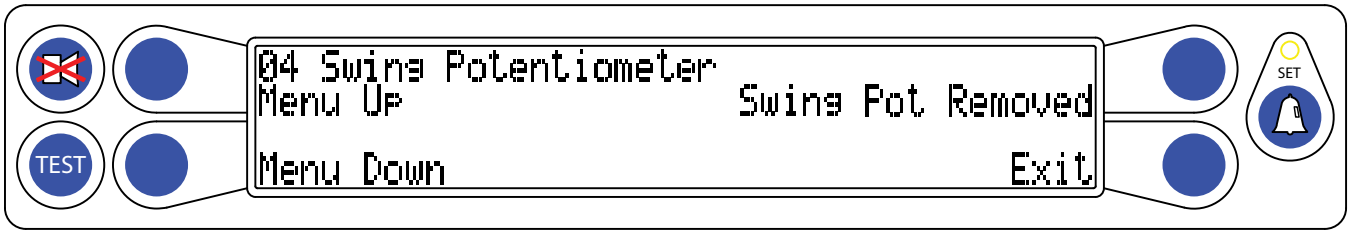


3. Press the “Menu Up” or “Menu Down” button to display “Remove Swingpot?”.

4. Press the “Remove Swingpot?” button.



5. The computer will ask for confirmation. Press the “Yes” button to remove the swingpot, or press the “No” button to cancel. Press the “Exit” button to return to the sub-menu.
6. Once removed the information window will display “Swing Pot Removed”.



7. When you have finished, press the “Exit” button to return to the main menu.

5.10 After the Calibration Routine

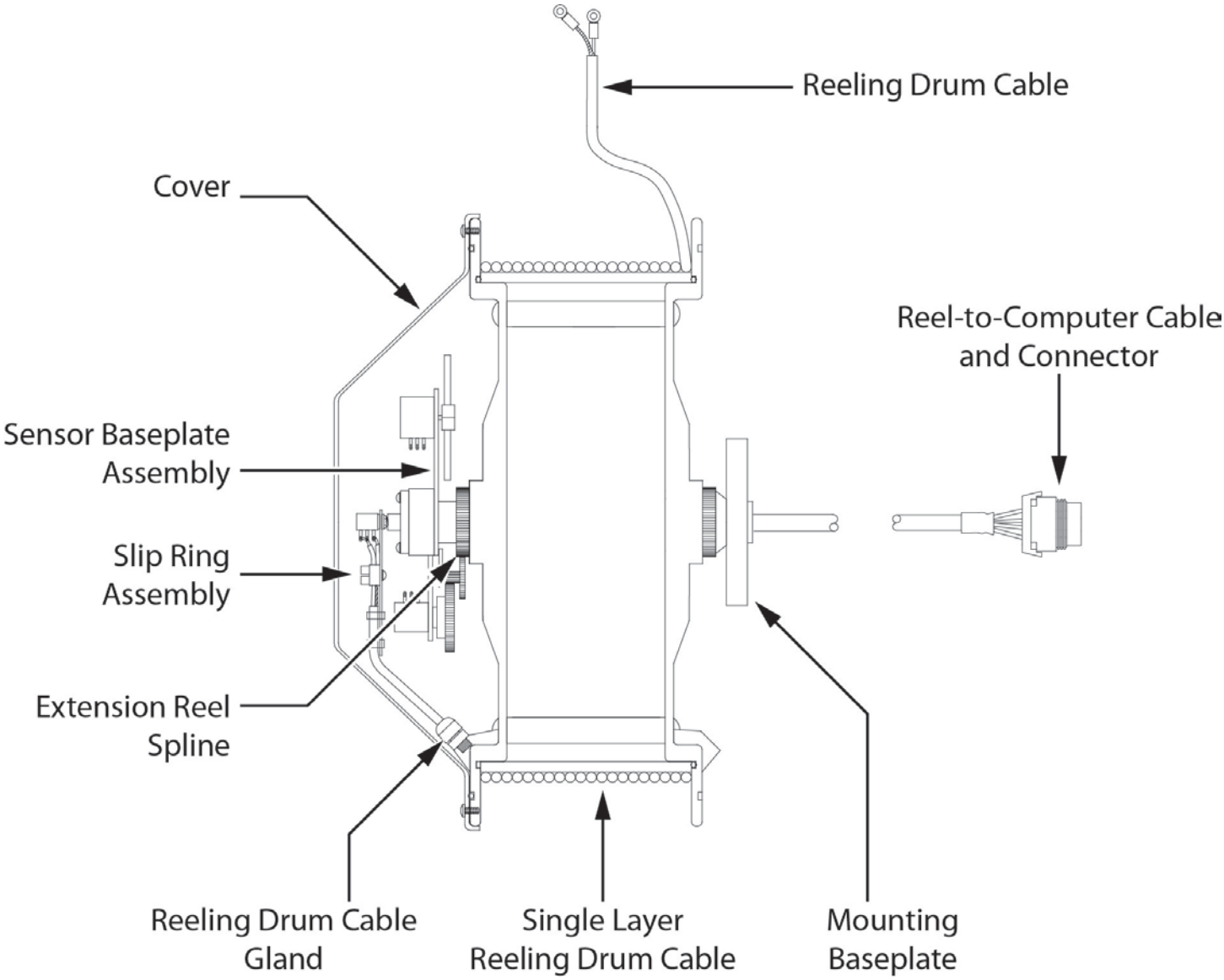
When the calibration routine is complete, thoroughly test the unit to ensure the radius on the unit is accurate to + 0.5 of a foot.

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

The load must be within 0 to +10% when testing. If the load is outside these limits, the calibration should be rechecked for accuracy.

6.1 Reeling Drum Overview

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

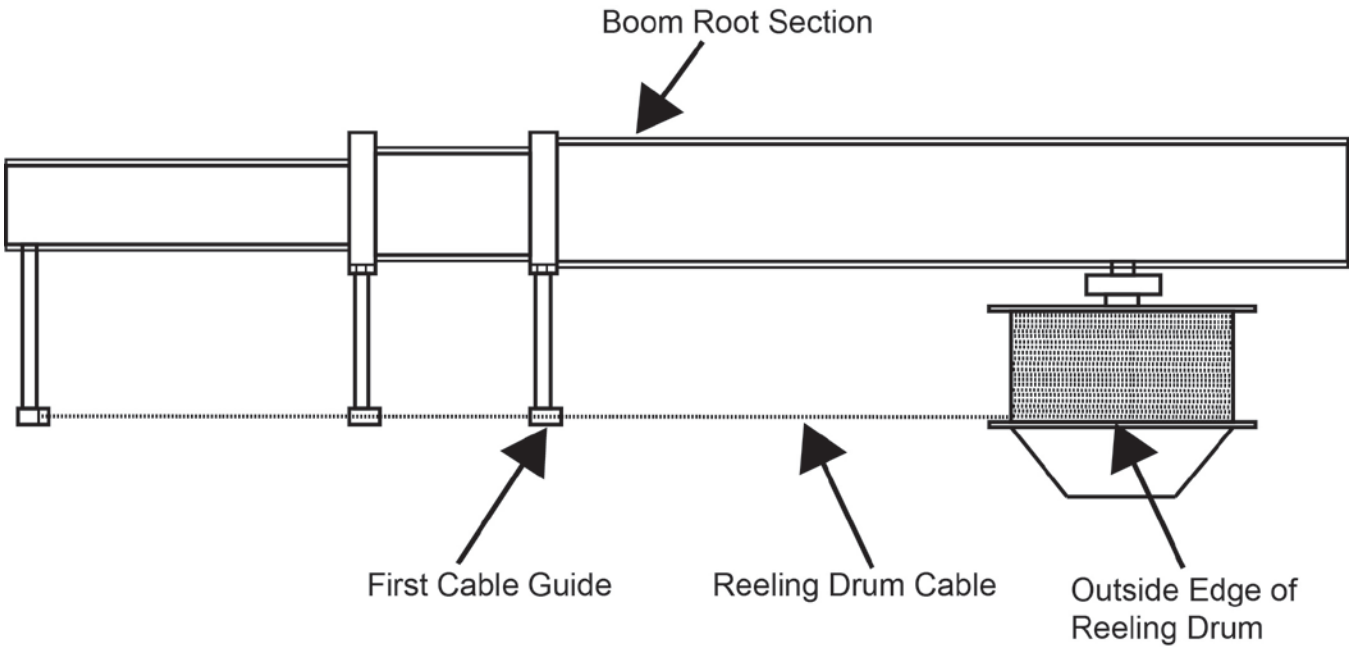


6.2 Checking the Reeling Drum Cable Layering

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

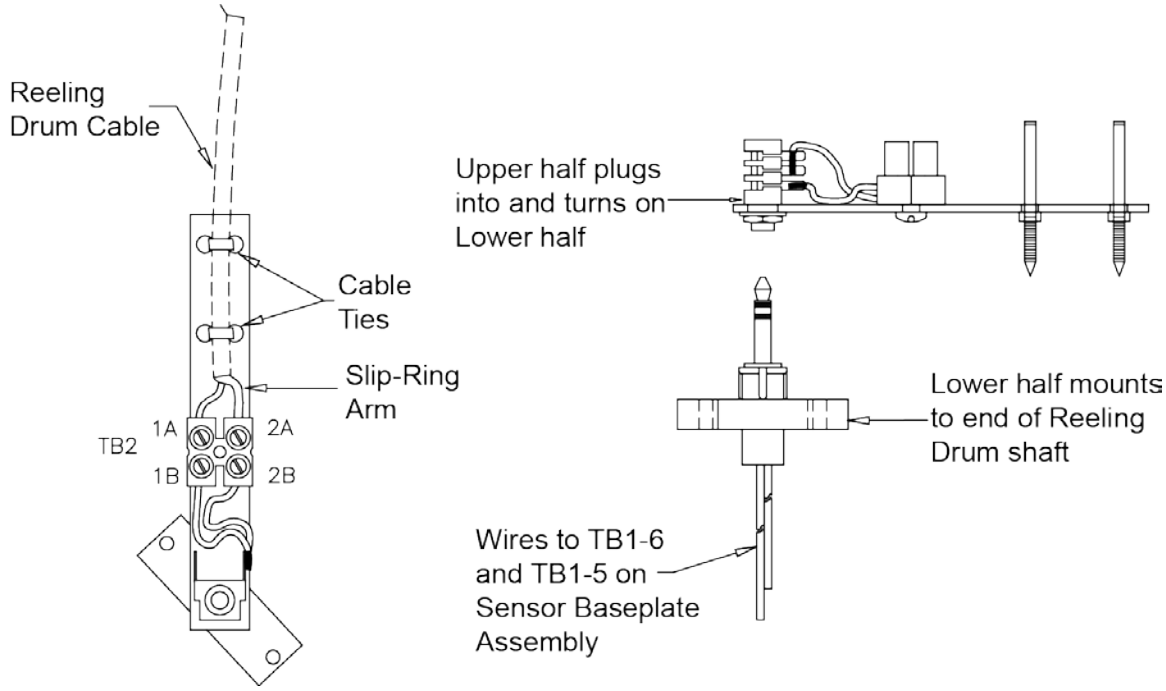
1. Telescope the boom fully out and then fully in.
2. Ensure the reeling drum cable forms a flat single layer across the surface of the extension reel, with each successive turn of cable lying next to the last.

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



6.3 Slip Ring Assembly

The slip-ring assembly provides an electrical path for the ATB circuit from the ATB switch to the system computer. If the slip-ring assembly must be replaced, the upper and lower halves must be replaced at the same time.



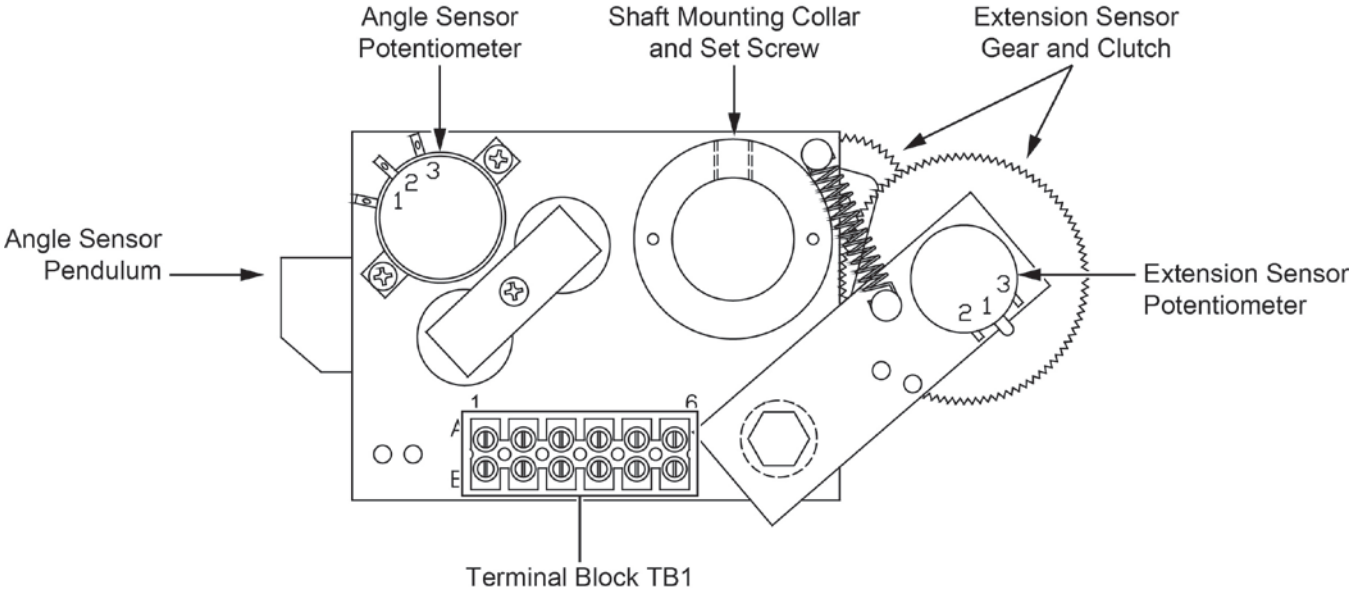
Failure of the slip-ring assembly will likely result in a continuous ATB alarm. For testing information, refer to sections 6.5, 6.6, and 6.7.

6.4 Sensor Baseplate Assembly

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

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

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



6.5 Checking the Reeling Drum Cable

The outer braid of the cable carries the anti-two-block feed to the switches. If the cable sheath is damaged, this may cause a short circuit to the boom or chassis and indicate a fault code above “B 8”(Refer to **GROUP “B” FAULT CODES**). The same fault code will be indicated if the ATB switch is closed and the inner core of the cable is shorted to the chassis at some point in the wiring.

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

6.6 Anti-Two-Block Function Overview

The computer supplies a protected positive feed to the anti-two-block switches at the boom/jib head via the extension reel signal cable, slip-ring, and reeling drum cable. With the anti-two-block weight hanging freely on the switch, the switch contact is closed and the signal return to the computer is high (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.

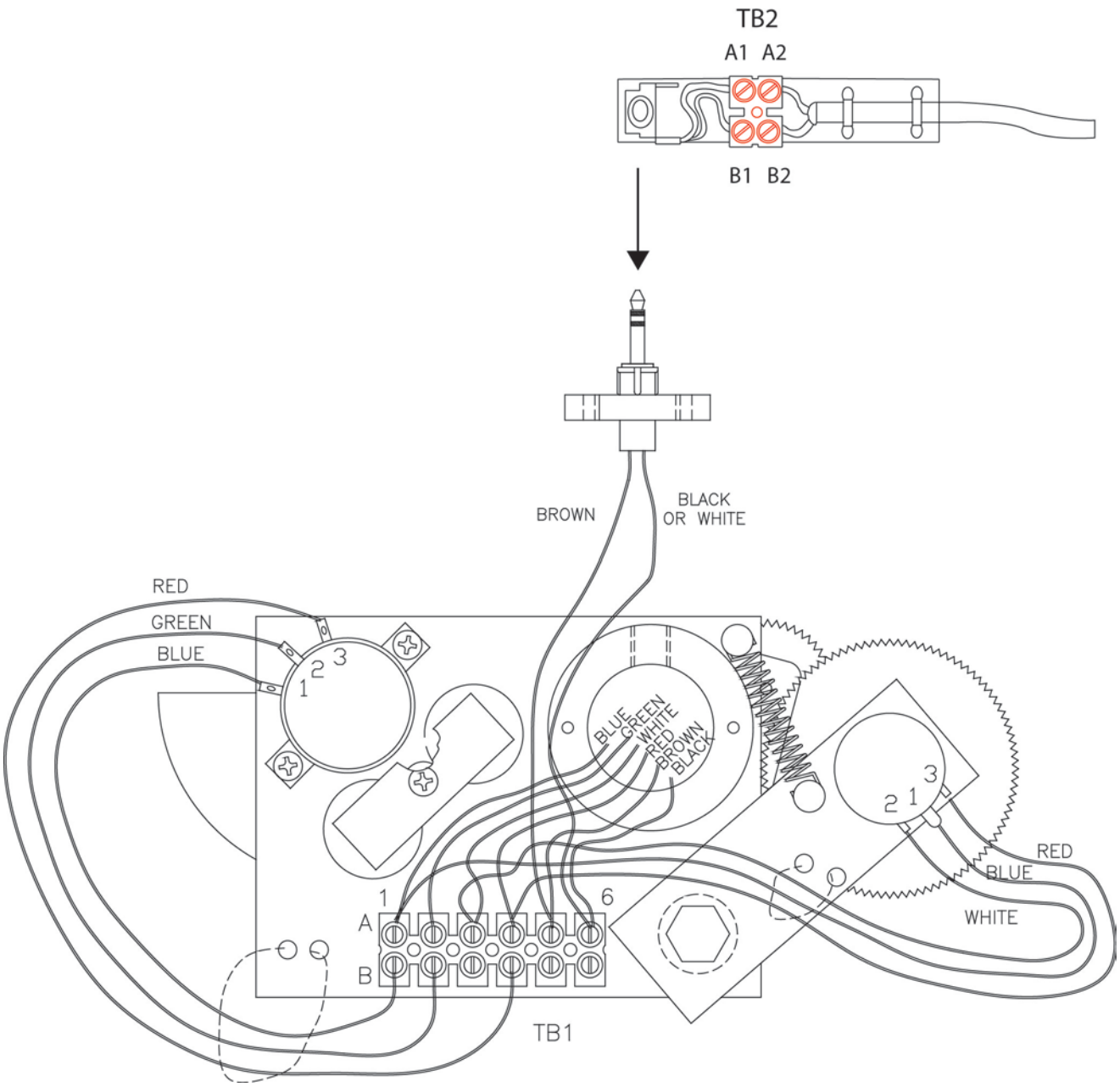
Since the computer checks the protected feed voltage internally, the system is capable of detecting a short circuit of the feed (or the ATB signal return when the switch is closed) to the crane chassis. Fault codes are defined in **FAULT REPORTING AND FAULT CODES**.

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

6.7 Checking the Anti-Two-Block Circuit

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

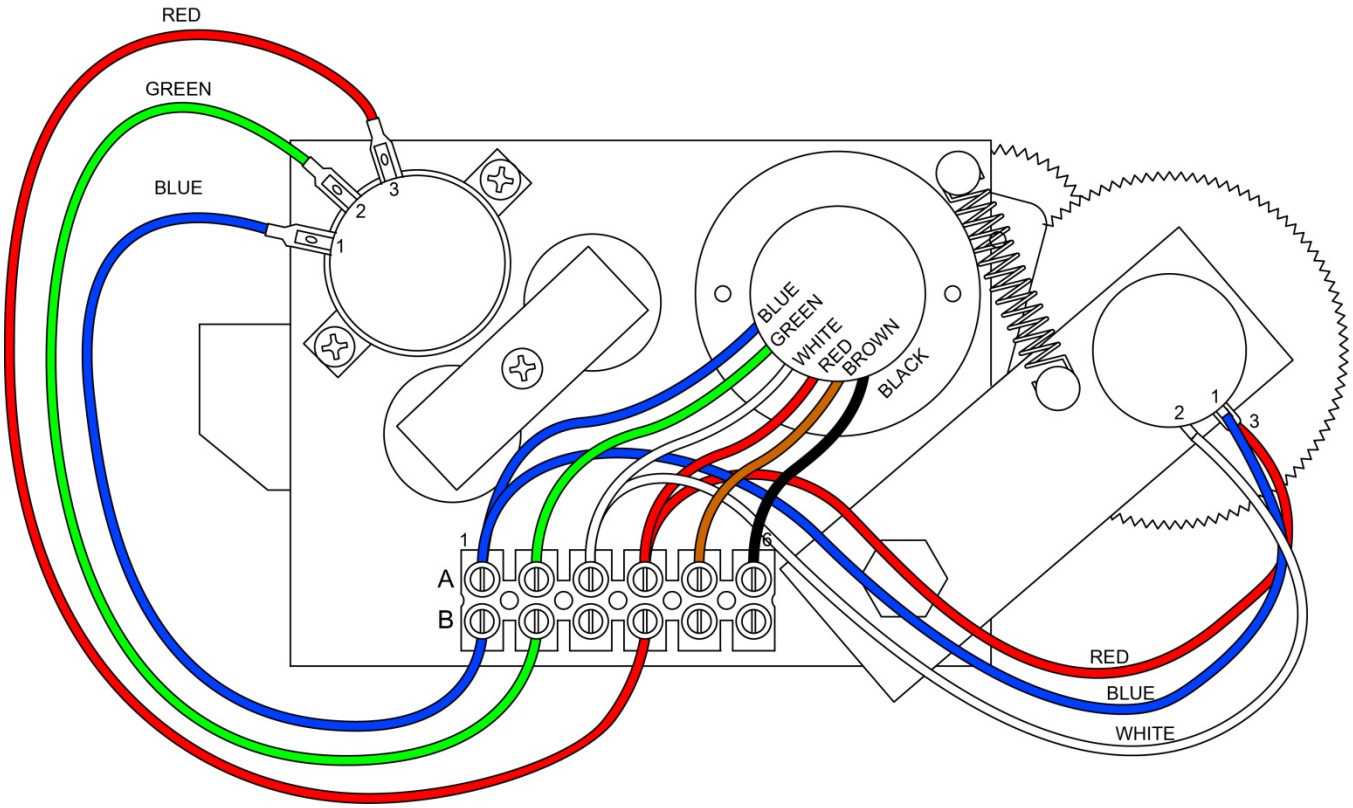
1. Remove the extension reel cover.
2. Disconnect the slip-ring arm from the plug by pulling it away from the center of the reel.
3. Close the ATB switch at the boom head by suspending the weight from it or pulling on the chain.
4. Measure the resistance on TB2, between the A2 & B2 terminal connections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


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

6.8 Reeling Drum Voltage Checks

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

SIGNAL	BOOM POSITION/ ACTION	VOLTAGE		VOLTMETER CONNECTION	
		MIN	MAX	RED (+)	BLACK (-)
SENSOR DRIVE	-	+4.7V	+5.3V	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


RED
GREEN
BLUE
1
2
3
BLUE
GREEN
WHITE
RED
BROWN
BLACK
1
6
A
B
2
1
3
RED
BLUE
WHITE

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