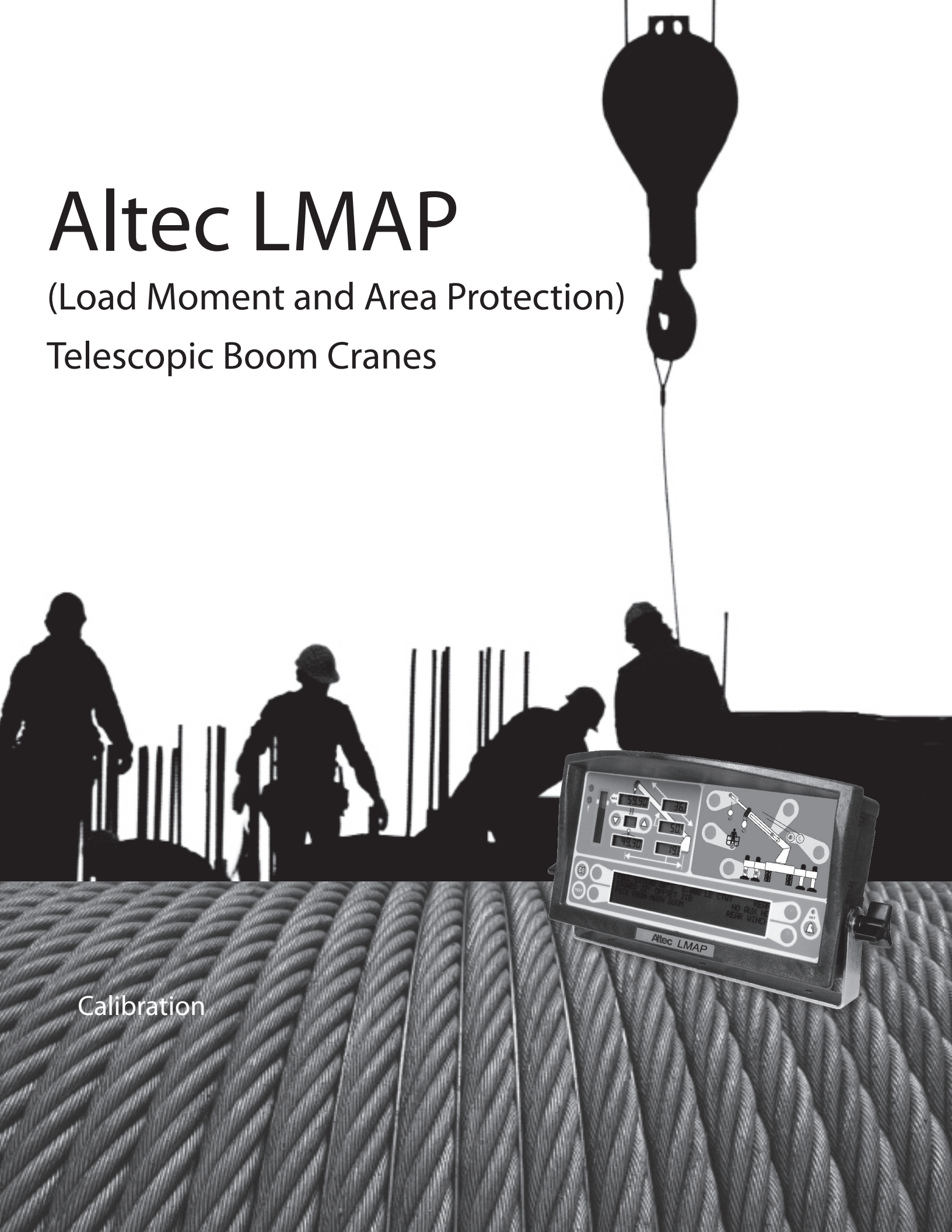
Altec LMAP

(Load Moment and Area Protection)

Telescopic Boom Cranes



Calibration

Contents

Introduction

System Components

- LMAP Display Unit
- LMAP Computer Unit
- Pressure Transducers
- Extension Reel with length and angle sensors
- Anti Two-Block (ATB) switches
- Cables

The Load Moment Area Protection (LMAP) system is intended to aid the crane operator by continuously monitoring the load and warning of an approach to an overload or two-block condition. Crane functions are monitored by means of high accuracy sensors. The system continuously compares the load suspended below the boom head with the crane capacity chart stored in the computer memory. At approach to overload, the system warns by means of audible and visual alarms. The system can be configured to cause function kick-out by sending a signal to function disconnect solenoids.

Anti Two Block (ATB)

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

Area Alarm

When set, this alarm permits the operator to define the operating zone by only two set points. The use of this method of setting results in a greatly enhanced working area, and also clearly defines the operating zone.

Boom Angle Sensor

Boom angle is measured by means of a high accuracy potentiometer, a magnetically dampened pendulum to prevent erratic voltage changes. It provides a voltage proportional to boom angle. The boom angle sensor is mounted inside the cable extension reel assembly.

Display

The operator is provided with a continuous display of:

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

On-screen messages provide the operator with visual warnings of conditions that occur during operation of the system.

Extension Sensor

The extension sensor provides an increasing voltage proportional to the extension of the boom. A cable attached to the boom head provides a low current electrical path for the ATB signal.

Function Kick-Out

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

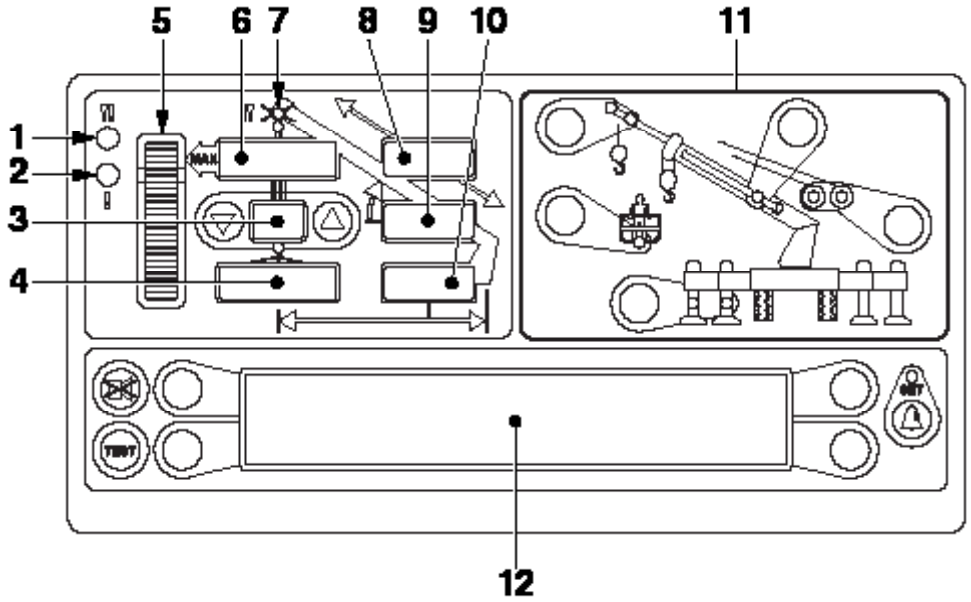
Pressure Transducers

Two pressure transducers measure the pressure in the boom hoist cylinder. The resultant Total Moment signal is processed to provide a continuous display of the load suspended below the point of lift.

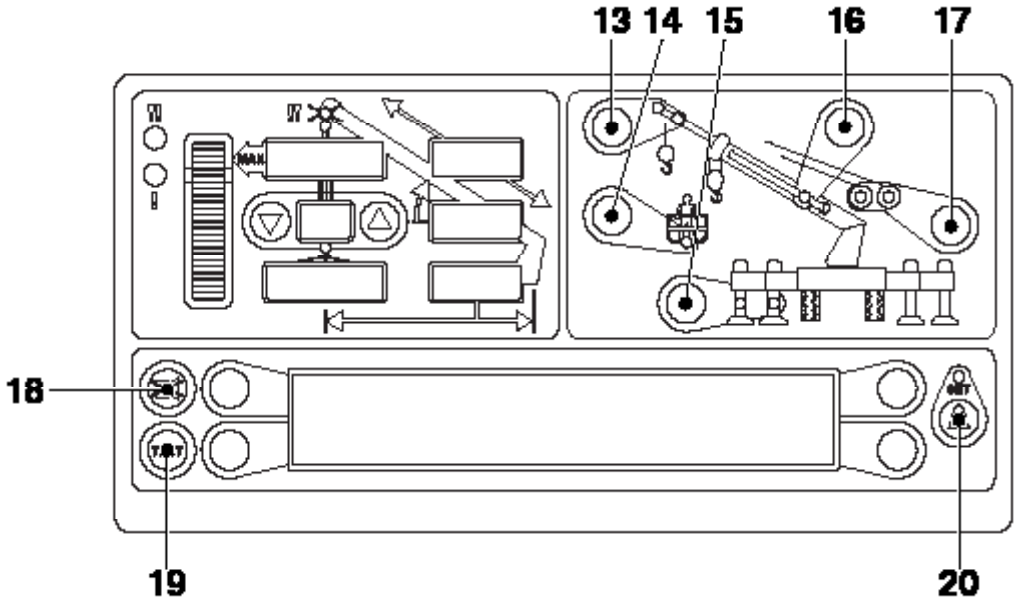
Operator Alarms

These alarms, when properly set by the operator, define the operating range. This is achieved by means of minimum and maximum angle, maximum height, and/or maximum length. These alarms can be programmed for each job site and allow the operator to work in a defined area.

LMAP Display



1. Overload Warning – This red LED illuminates when you reach or exceed 100% of rated capacity. It is accompanied by solid tone alarm and when maximum rated capacity is exceeded will result in boom function lockout.
2. Approaching Overload Warning – This amber LED Illuminates when you reach or exceed 90% Rated Capacity. It will be accompanied by a beeping alarm.
3. Parts of Line – Displays current number of parts of line in use.
4. Load on Hook – Displays the entire hook load weight under the head of the boom, including cable, load block, load handling equipment, and weight of load hanging on hook.
5. Percent of Rated Capacity Meter - Shows the load as a percentage of rated capacity. As the load increases, the meter level increases to represent the percentage of the rated capacity of the crane.
6. Rated Capacity – Displays the rated capacity in the current configuration based on the crane load capacity chart.
7. ATB Warning – Warns of a potential two-block condition with flashing LED and audible alarm.
8. Boom Length – Displays the current boom length in feet and tenths of a foot.
9. Boom Angle – Displays the current boom angle in degrees and tenths of a degree.
10. Load Radius – Displays the load radius from centerline of rotation.
11. Crane Setup – These keys are used in the setup process to configure the LMAP system to match the current configuration of the crane.
12. Information Window – Displays crane setup and calibration information as well as warning messages.



13. Erected Jib – Enables the selection of the jib to be used on the boom. Selects extended or retracted jib when crane is equipped with two stage jib.
14. Basket Operation – Enables the selection of the platform for man basket operation.
15. Outrigger Configuration – Enables the selection between full and mid span outriggers.
16. Stowed Jib – Enables the selection of the jib stowed on the boom. Also used to stow the erected jib.
17. Winch Selection – Enables the selection of the winch if the crane is equipped with an optional second winch.
18. Alarm Cancel – Disables audible alarm. Holding down this key overrides function kick-out.
19. Test Button – Press and hold the test button to initiate a system self test and run diagnostics.
20. Operator Alarm Set – Enables operator alarms. When an alarm has been set, the LED above this button will illuminate yellow.

WARNING

YOU MUST USE THE CRANE SETUP MODE TO CORRECTLY SET THE LMAP SYSTEM FOR PROPER OPERATION. THE LMAP SYSTEM SETUP MUST MATCH THE ACTUAL CONFIGURATION OF THE CRANE SO THAT IT WILL INDICATE THE CORRECT HOOK LOAD AND LIFTING CAPACITY OF THE CRANE.

Calibration

The LMAP system contains a setup calibration mode that operates through the system display console. The setup mode provides a means of ensuring that the system sensors are correctly positioned and adjusted following system installation or parts replacement.

This procedure assumes that installation of system components, cabling, and hydraulic connections have been successfully completed and checked.

The setup procedure involves only the sensors mounted within the extension reel on the side of the boom.

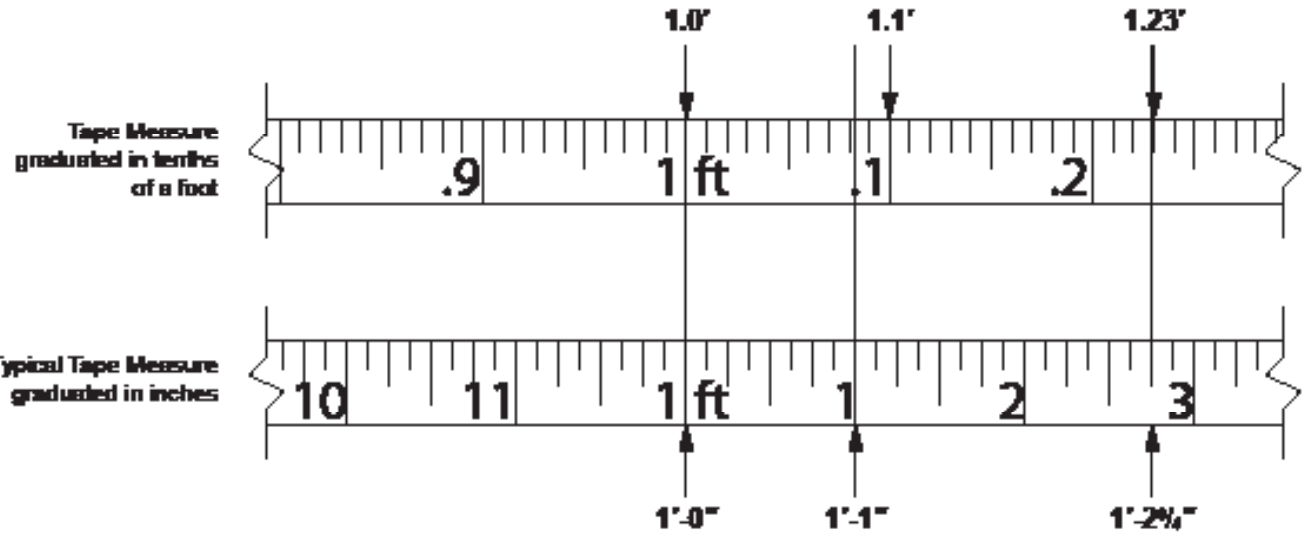
It is important that each step of this procedure is properly followed for the system to accurately provide load, rated capacity, warnings, and kick-out functions.

WARNING

AT ALL TIMES, OBSERVE SAFE PRACTICES. MAKE SURE THAT CRANE CAPACITY LIMITATIONS ARE UNDERSTOOD, AND THAT THE CRANE CAPACITY PLATE IS FOLLOWED. DO NOT EXCEED MANUFACTURER'S SPECIFIED LIFTING LIMITATIONS.

Required Tools

- Phillips Screwdrivers
- Digital Level – Accurate to 0.1° at level
- Measuring tape (100 feet) – fiber-type in tenths of feet



- Digital Voltmeter

Crane Configuration

Before starting the system setup, position the crane on firm and level ground with the outriggers properly extended and set. It is recommended that the crane be configured with no stowed or erected jib (bare boom) and reeved with a single part-of-line.

Fully retract the boom and set it to zero degrees (±0.1°) using a digital level.

Remove the reeling drum cover to expose the length and angle sensors.

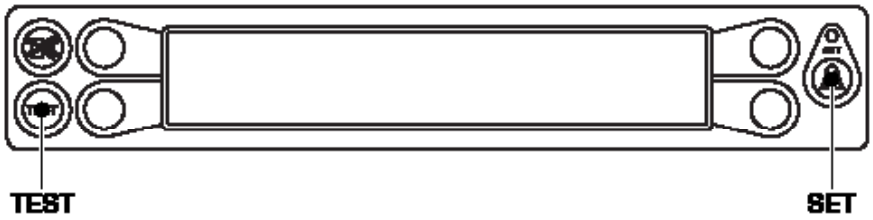
Entering Calibration Mode

The display will step through each setup operation, as required by the user. During the setup procedure, the display console should be placed in a position that allows easy viewing while adjustments are being made within the boom extension reel, and allows for operation of the display buttons.

To enter setup data it is necessary to put the system in calibration mode. Once in calibration mode, you will have five (5) seconds to enter the security key sequence.

To access calibration mode:

1. Hold down the TEST and SET keys simultaneously. The audible alarm will sound and you will be prompted to enter the security key code.



2. Enter the security code in order (1, 2, 3, 4) as shown.

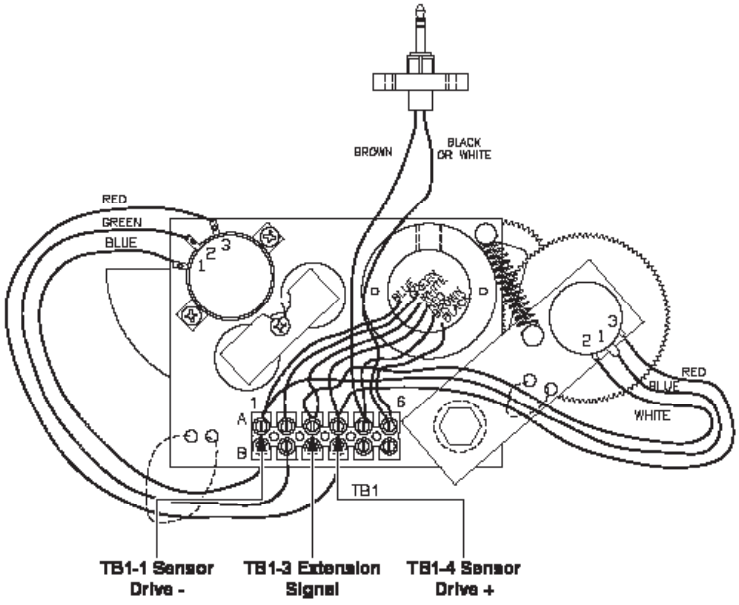
The computer will execute a brief self test and, when finished, enter calibration mode.

Checking Sensor Drive Voltage

IMPORTANT!
MAKE SURE TO MEASURE AND SET ALL VOLTAGES BEFORE CALIBRATING.

1. Remove the extension reel cover.
2. Using a digital voltmeter, measure the voltage between the RED (TB1-4) and BLUE (TB1-1) wires at the terminal block mounted on the sensor baseplate assembly.
3. Check that the voltage is between 4.7 and 5.3 volts.

Voltages outside the range specified above will indicate a voltage supply problem, or a connection or short circuit problem.



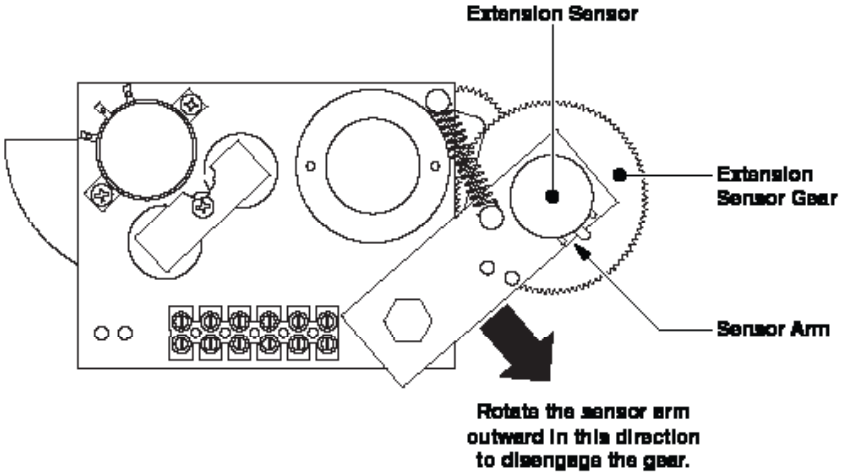
Extension Sensor Setup

The following procedures define how to reset and calibrate the extension sensor, if necessary. Before any of these procedures are used, check that the reel-off cable is layering correctly.

Physical Zero

It is necessary to ensure that the extension sensor potentiometer is correctly set to its minimum "zero" setting when the boom is fully retracted. This ensures that the sensor will correctly measure over the full telescoping range of the boom.

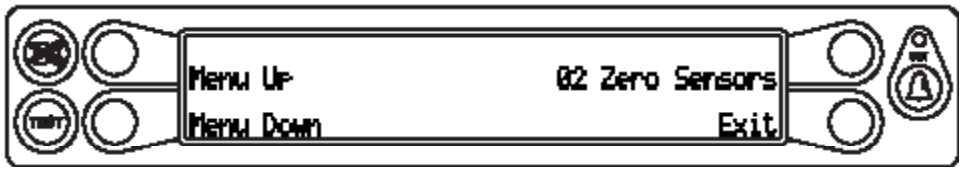
1. Disengage the main gear wheel connected to the extension sensor by pulling the sensor arm in the direction shown.



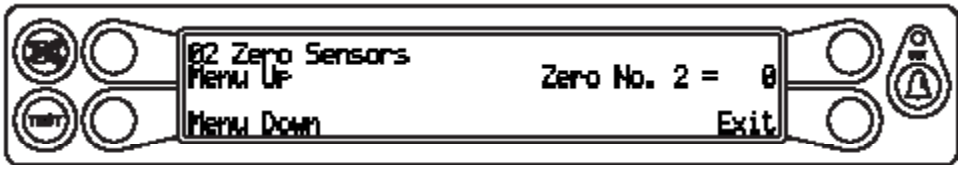
2. Rotate the gear clockwise until the sensor clutch drags or, if equipped with a "ball denten" type clutch, clicks.
3. Rotate the sensor counterclockwise exactly ½ turn and release the sensor arm to re-engage the gears on the sensor arm.
4. Rotate the gear counterclockwise about half a turn setting the voltage to 0.2 volts. Then, carefully release the sensor arm, ensuring that the voltage remains at 0.2 volts as the gears re-engage.

Zero Calibration

1. Enter calibration mode (see page 2).
2. Press the key adjacent to either "Menu Up" or "Menu Down" until "02 Zero Sensors" appears in the information window at the right.
3. Press the key adjacent to "02 Zero Sensors" to enter the routine.



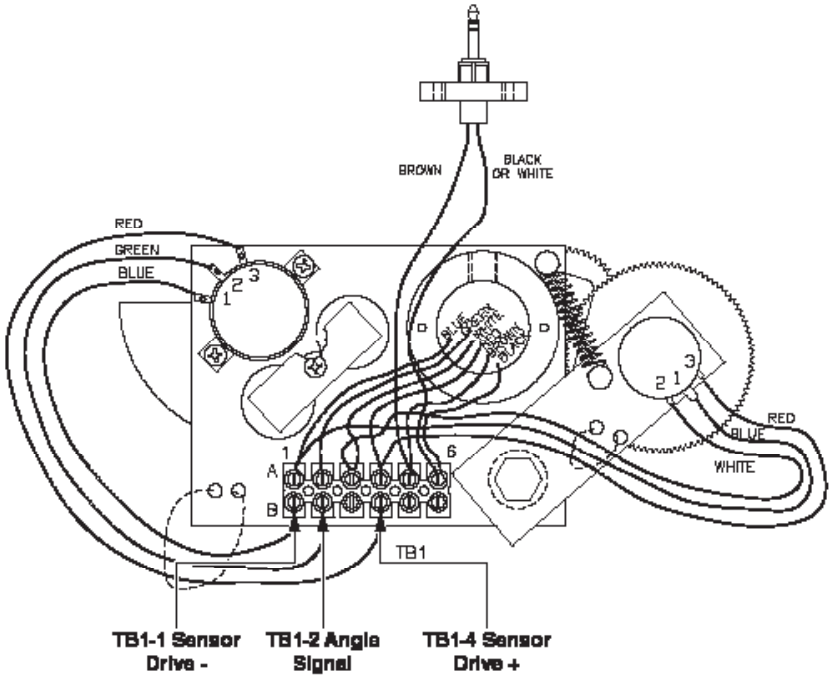
4. Press the key adjacent to "Zero No. 2 = XX" to zero the extension sensor.



5. Press the key adjacent to "YES! Calibrate!" to set the extension sensor to zero.
6. The retraced boom length should appear in the boom length window.

Checking The Angle Sensor Voltage

1. Verify the reading on the digital level is zero degrees (0°).
2. With a digital voltmeter, 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 "Angle Sensor Setup" on page 5.
3. Still measuring the voltage at the same points, move the exposed side of the angle sensor pendulum downwards, and check that the potentiometer is operating by verifying that the voltage increases.
4. Check that the pendulum moves freely, and when released, falls smoothly back to the original zero degrees (0°) voltage reading.



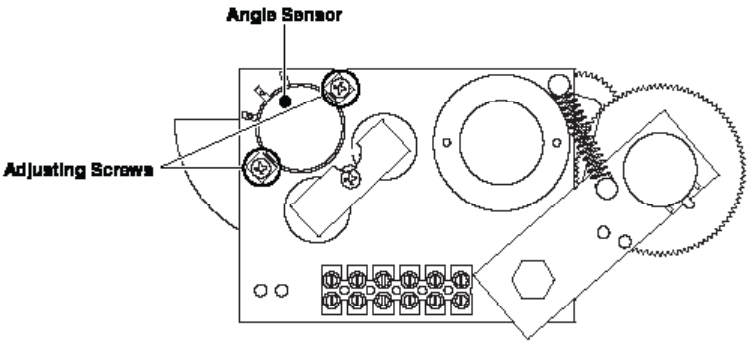
Angle Sensor Setup

The following procedures define how to reset and calibrate the angle sensor, as required.

Physical Zero

It may be necessary to ensure that the angle sensor potentiometer is correctly set to its physical "zero" setting with the boom at zero degrees (0°). This ensures that the sensor will correctly measure the full angle range of the boom.

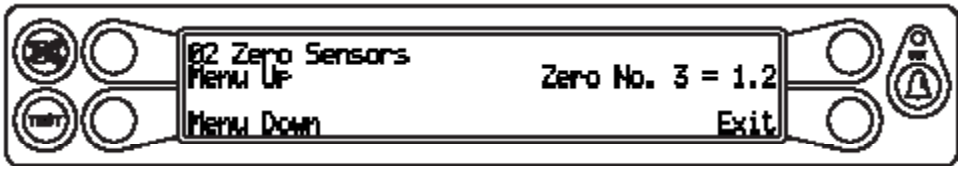
1. Verify the reading on the digital level is zero degrees (0°).
2. Loosen the two securing screws on either side of the sensor potentiometer just enough to allow the sensor potentiometer to be turned by hand. Do not remove the screws and do not put pressure on the terminals exiting the sensor.



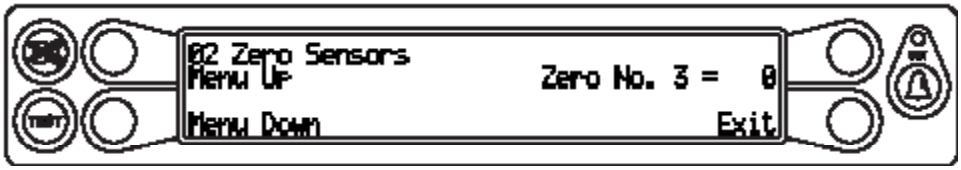
3. Measuring the voltage between TB1-2 and TB1-1, carefully rotate the potentiometer until the voltage measures 0.4 volts. Rotating the sensor counterclockwise will increase the voltage. Rotating clockwise will reduce the voltage. Only fine adjustments are required. Do not touch the pendulum hanging behind the sensor assembly, as this will affect the reading.
4. Tighten the securing screws and check that the voltage remains at 0.4 volts.

Zero Calibration

1. Press the key adjacent to "Menu Up" to zero the angle sensor (No. 3).



2. Press the key adjacent to "Zero No. 3 = 0".

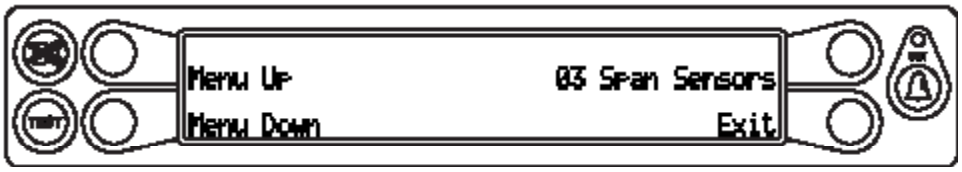


3. Press the key adjacent to "YES! Calibrate!" to set the angle sensor to zero.

When you have finished, press the key adjacent to "Exit" to return to the main menu.

Spanning the Extension and Angle Sensors

Press the key adjacent to either "Menu Up" or "Menu Down" until "03 Span Sensors" appears in the information window at the right.

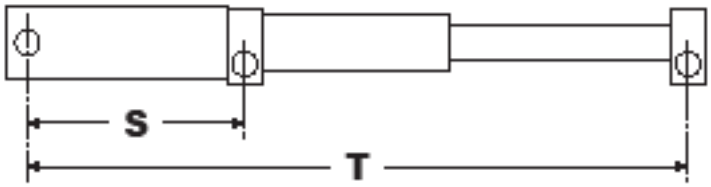


WARNING

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

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

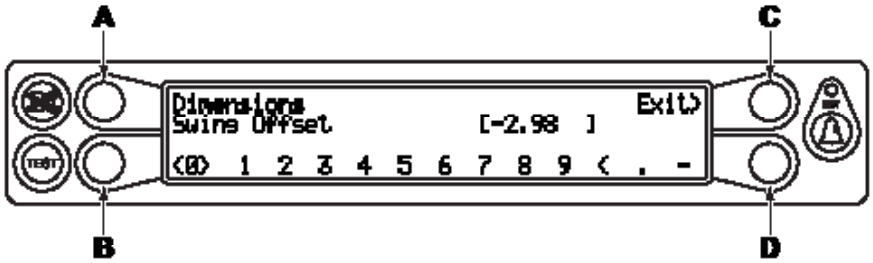
Dimension "T" - This is the dimension between the center of the boom pivot and the center of the sheave with the boom fully extended.



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

Number Entry

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



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

As each number is selected, press key A to enter it into the system. The number will then appear in the [ ] brackets. Up to five numbers may be entered. When entering a negative value, enter the numbers and decimal first, then enter the minus sign. If you enter a number incorrectly, select the < backspace and press key A. When all digits look correct, press key C to calibrate the complete number.

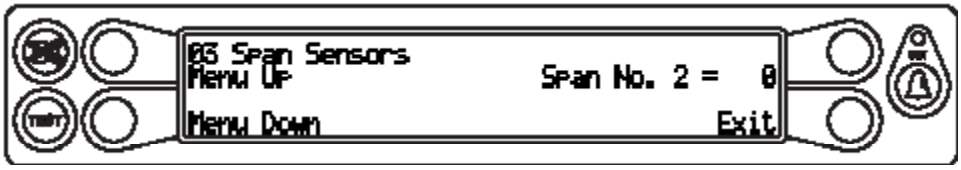
Example: To enter the value "-2.98", do the following:

1. Press key B or D until the number "2" is selected (indicated by flashing < > brackets) and then press key A to enter the number
2. Select the decimal "." then press key A.
3. Repeat the previous steps to enter the number "9" and "8".
4. After the numbers are entered, press key B or D until the minus sign "-" is selected and then press key A.
5. If the value is correct, press key C to exit.

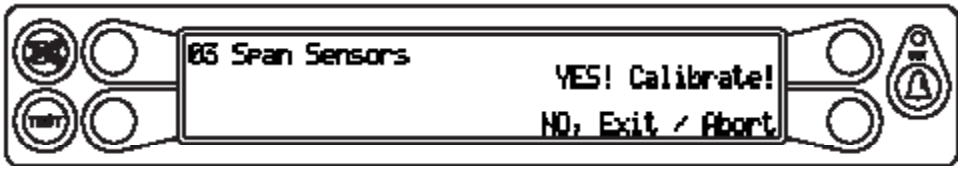
Entering the Span

Once the span has been determined:

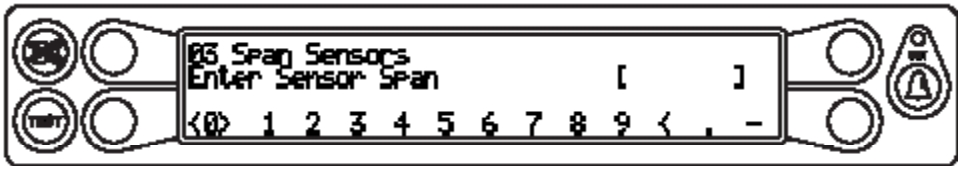
1. Press the key adjacent to "Span No. 2 = X.X".



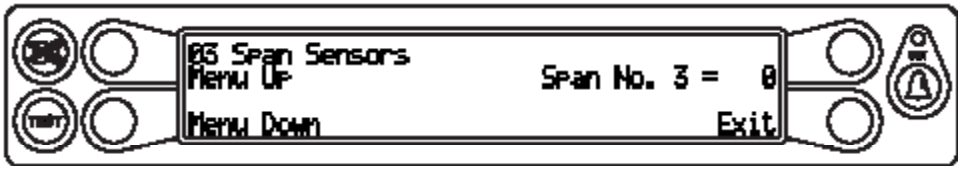
2. Press the key adjacent to "YES! Calibrate!" to enter the span.



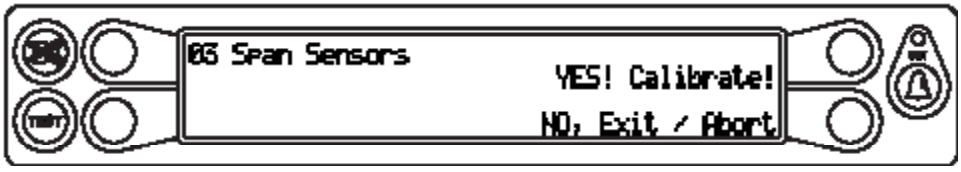
3. Use the number entry procedure on page 6 to enter the span.



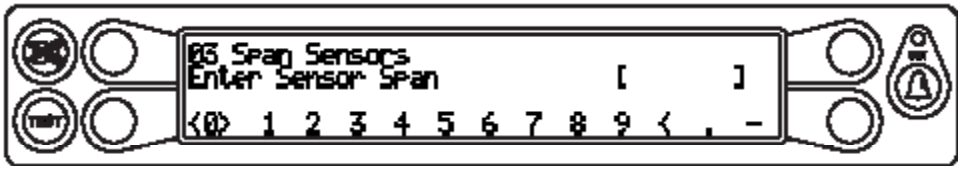
4. With the digital level still attached to the boom, raise the boom to an angle of about 65°.
5. Press the key adjacent to "Span No. 3 = X.X".



6. Press the key adjacent to "YES! Calibrate!" to enter the angle.



7. Use the number entry procedure on page 6 to enter the number exactly as shown on the digital level.

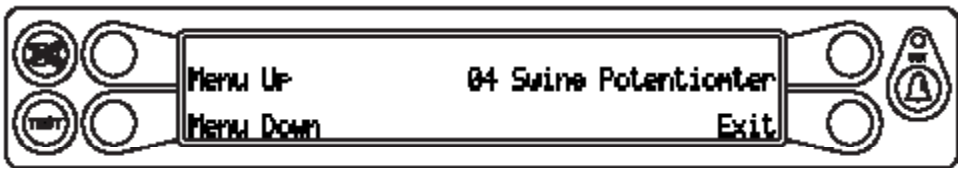


When you have finished, press the key adjacent to "Exit" to return to the main menu.

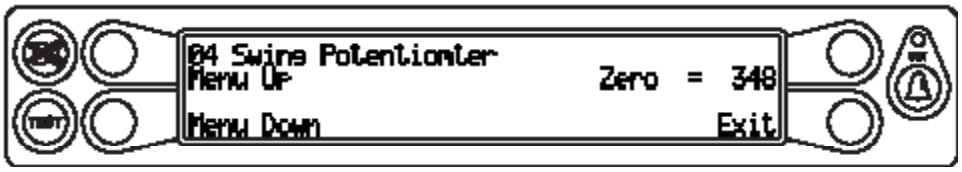
Zeroing the Swing Potentiometer

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.

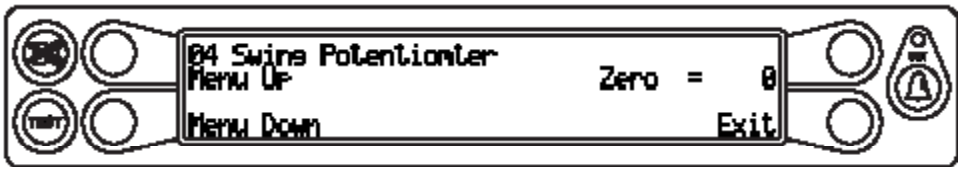
1. Enter calibration mode (see page 2).
2. Press the key adjacent to either "Menu Up" or "Menu Down" until menu "04 Swing Potentiometer" appears in the information window at the right.



3. Press the key adjacent to "04 Swing Potentiometer" to enter the routine.

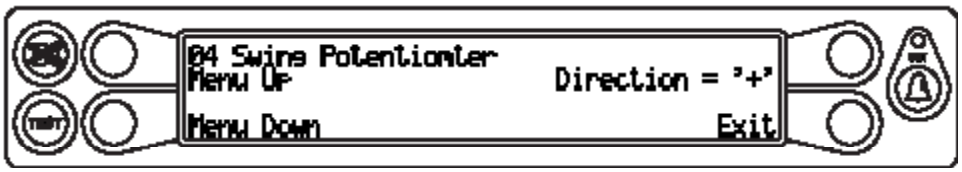


4. Press the key adjacent to "Zero = ----".



The swing is now zeroed.

5. Raise the boom and swing it clockwise (right). The "Zero = XXX" should increase. If the number decreases, change the direction in the menu.
6. Press the key adjacent to "Menu Up".
7. Press the key adjacent to "Direction '+'". This will reverse the swing direction in the computer.



8. Press the key adjacent to "Menu Down" to return to the "Zero = XXX" sub-menu. Raise the boom and swing it clockwise (right). The "Zero = XXX" should increase.

Disabling the Swing Potentiometer

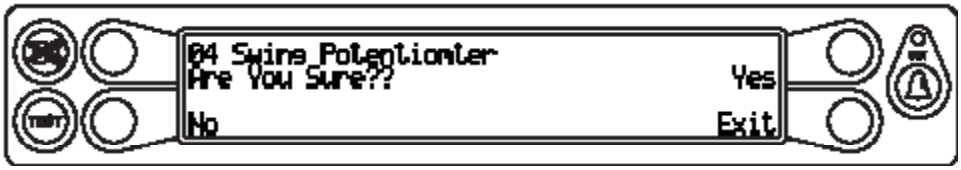
In some cases, it may be necessary to disable the swing potentiometer. For example, if the swing potentiometer is malfunctioning, it can be disabled or "removed" from the system, esentially disconnected so that the computer does not receive false readings.

WARNING

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

1. While in menu "04 Swing Potentiometer", press the key adjacent to either "Menu Up" or "Menu Down" until "Remove Swingpot?" appears in the information window at the right.
2. Press the key adjacent to "Remove Swingpot?".

3. The computer will ask you to confirm the choice. Press the key adjacent to "yes" to proceed, or press the key adjacent to "No" to cnacel. Press the key adjacent to "Exit" to return to the sub-menu.

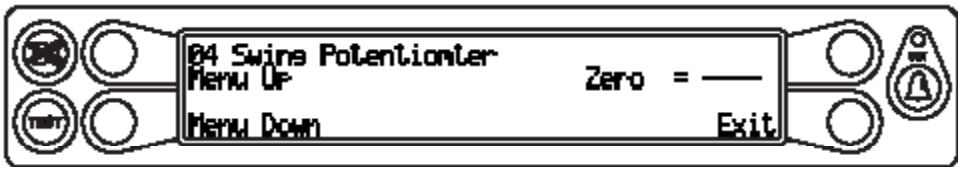


4. The information window will show "Swing Pot Removed" at the right.

When you have finished, press the key adjacent to "Exit" to return to the main menu.

Enabling the Swing Potentiometer

1. While in menu "04 Swing Potentiometer", press the key adjacent to either "Menu Up" or "Menu Down" until "Zero = ----" appears in the information window at the right.
2. Press the key adjacent to "Zero = ----".



3. The swing potentiometer is now enabled, refer to "Zeroing the Swing Potentiometer" on page 8 to set the proper zero point for the boom.

When you have finished, press the key adjacent to "Exit" to return to the main menu.

Consider Yourself Warned. ™

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As a leader in product innovation, Greer Company is committed to the ongoing improvement of its equipment.

We reserve the right to make changes to our products without notice.