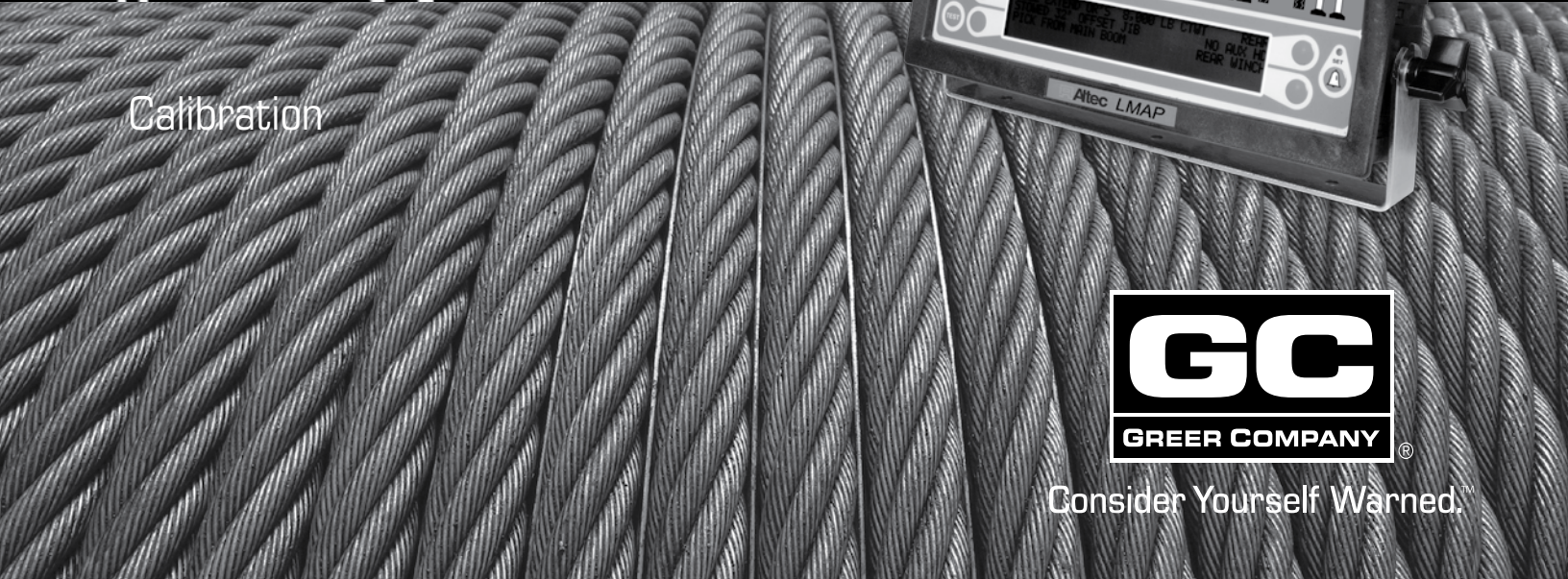


MicroGuard[®] 510 Retrofit

Rated Capacity Indicator System



Calibration



Consider Yourself Warned.[™]

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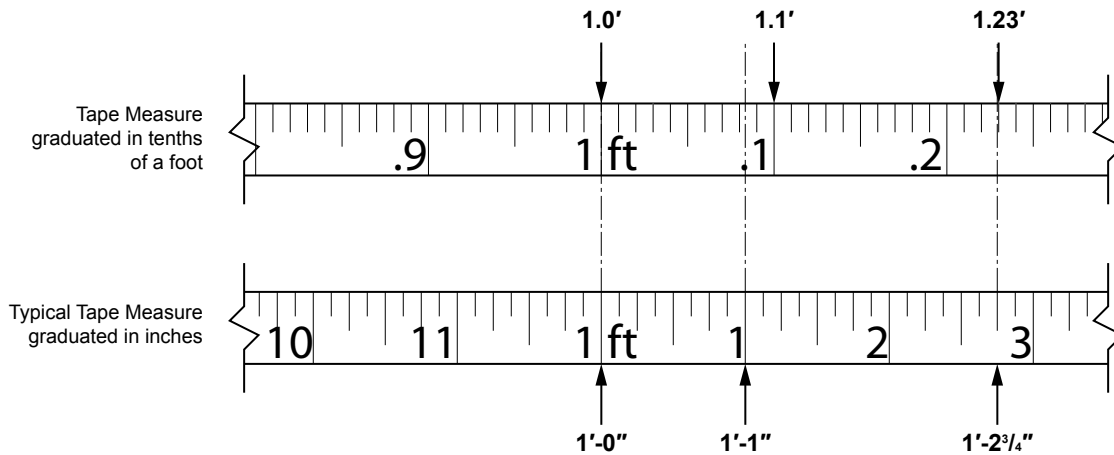
Introduction

Congratulations on choosing the new MicroGuard® 510 Retrofit Rated Capacity Indicator System.

This manual describes the calibration process for the MicroGuard® Retrofit Rated Capacity Indicator System (hereinafter referred to as “the system”) in an on-site environment and assumes that there is no prior knowledge of the geometry of the crane other than data provided by the manufacturer. This document also assists personnel in obtaining necessary measurements for calibration and in maintaining a record of the measurements and test results for review and/or comparison when changes are made. Recording measurements and test results during the calibration process will ensure an organized and easy to follow calibration.

Required Tools

- 1/4" nut driver or T15 Torx driver
- Digital or bubble level calibrated and accurate to 0.1° at level
- 100 foot measuring tape: fiber type graduated in tenths of feet



Note: The computer calculates measurements in feet and tenths of a foot, so having the correct measure will facilitate entering measurements.

- Digital volt/Ohm Meter capable of measurements to three decimal places

Number Conversion

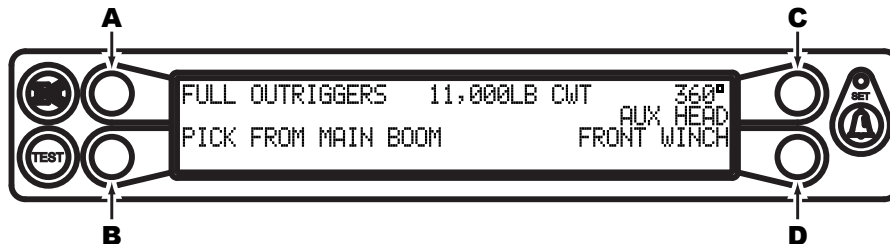
If you are using a standard tape measure, the measurement must be converted into feet and tenths of a foot. For example: a distance of 35'-6" would be entered into the system as 35.5 feet. Whole inches can be easily converted by dividing by 12 ($6/12=.5$). Fractions of an inch are converted by dividing the numerator by the denominator. For example: 1/4 inches would be entered as .25 ($1/4=.25$). Conversion of whole inches and fractions of an inch (for example 6-1/4") are converted by first converting the fraction to a decimal and then dividing by 12. In this case 6-1/4" is converted to 6.25 and then divided by 12 which equals 0.520. Refer to the Fraction to Decimal Conversion Chart on page A-5.

When entering weights, the number must be converted by moving the decimal three places to the left. For example: a weight of 1,400 pounds would be entered as 1.4, and a weight of 300 pounds would be entered as .300.

The MicroGuard® 510 Display

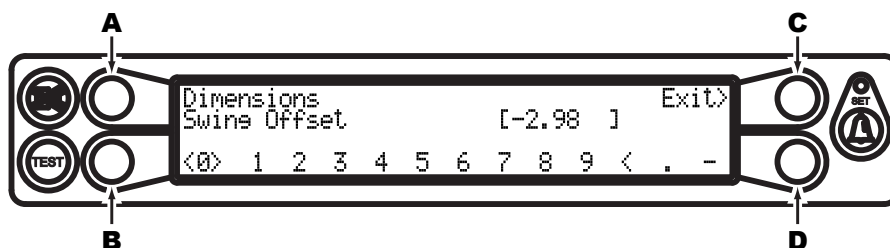
Command Entry

The keys 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 keys. Follow directions for each routine carefully.



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.

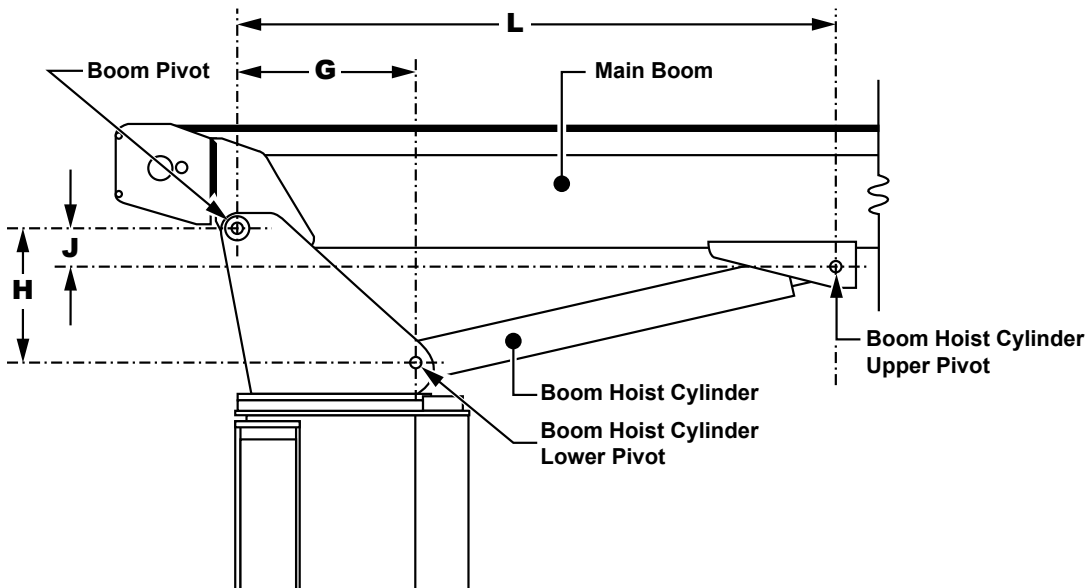
Example: To enter the value “-2.98”, do the following:

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.

Preliminary Checks and Measurements

The following pages provide a list of measurements that must be recorded and double-checked for accuracy. If measurements exist in the system from a previous application, or if no measurements exist, they must be entered into the system. Any data supplied by the crane manufacturer in the crane application data sheet stored in the system must be validated before calibration begins. All dimensions entered into the computer must be in feet and tenths of a foot.

Boom Pivot Dimensions



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

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

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

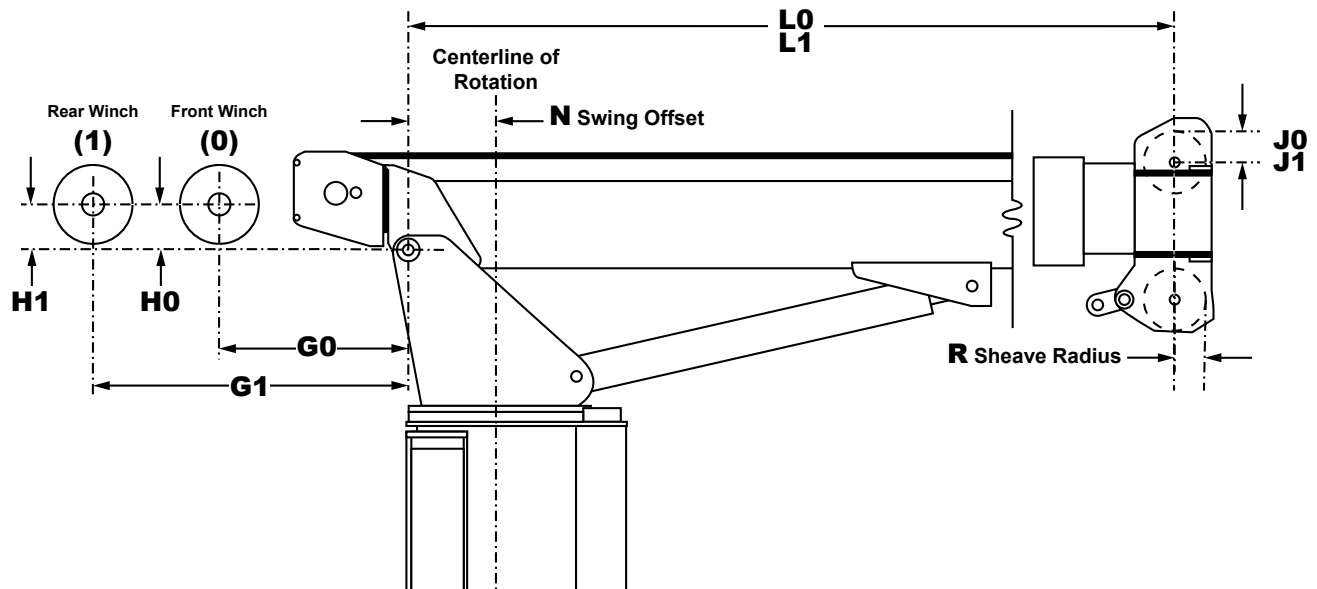
Note: If the Boom Pivot is above the boom hoist cylinder upper pivot the dimension is or negative.

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 center of the boom hoist cylinder lower pivot.

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

Winch Dimensions



Dimension “G0” and “G1” – The horizontal distance between the center of the front and rear winch (respectively) and the center of the boom pivot.

Dimension “H0” and H1” – The vertical distance between the center of the front and rear winch (respectively) and the center of the boom pivot.

Dimension “JO” 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. Make sure to indicate a positive (+) or negative (-) value when noting the measurement.

Dimension “LO” 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).

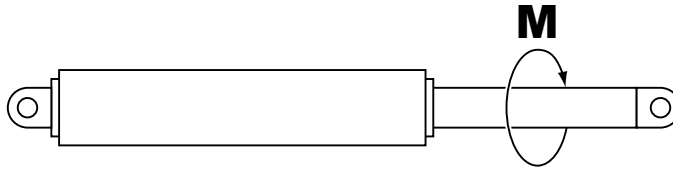
Dimension “N” Swing Offset – The horizontal distance between the center of the boom pivot and the centerline of rotation.

Note: If the centerline of rotation is ahead of the boom pivot as shown in the illustration, the dimension will be negative. Make sure to indicate a positive (+) or negative (-) value when noting the measurement.

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

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

Boom Cylinder Dimensions



Dimension "M" - This is the distance measured around the outside of the cylinder rod, divided by 12.

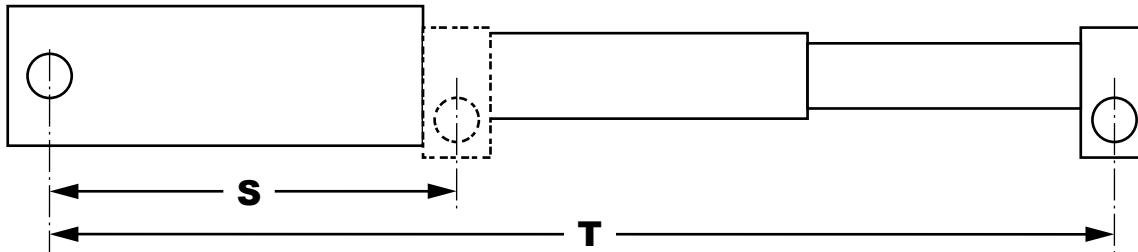
USE THE SPACE PROVIDED IN APPENDIX A TO RECORD THE MEASUREMENTS.

Span Dimensions

⚠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.

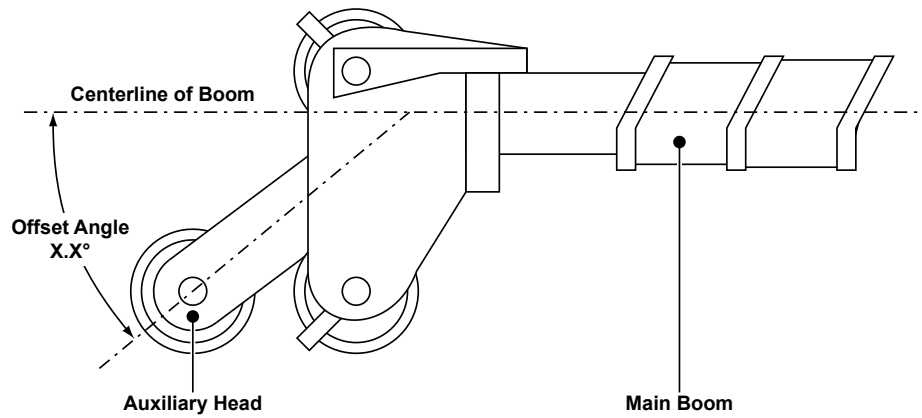


Dimension "T" - This is the dimension between the center of the boom pivot and the center of the sheave with the boom fully extended.

The span of the boom is calculated by subtracting Dimension "S" from Dimension "T" ($T - S = \text{span}$).

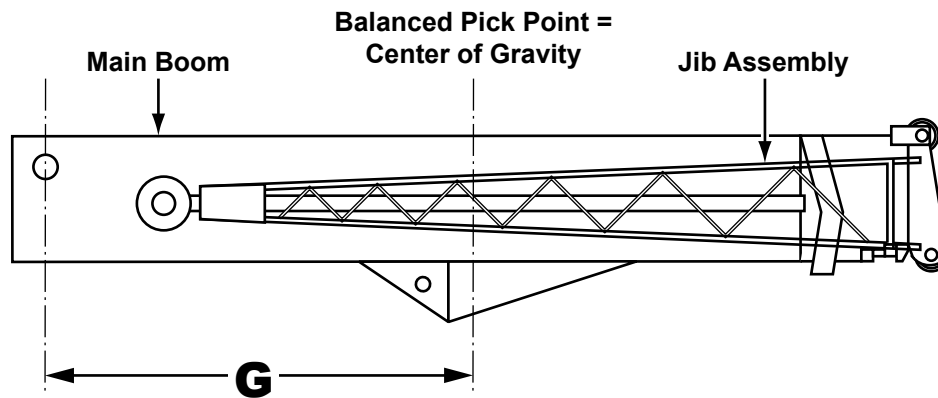
USE THE SPACE PROVIDED IN APPENDIX A TO RECORD THE MEASUREMENTS.

Auxiliary Head Dimensions



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

Stowed Jib Dimensions



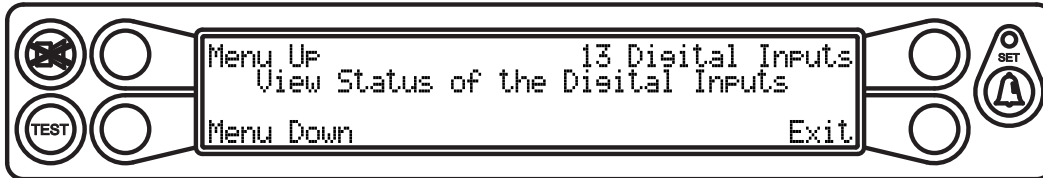
Dimension "G" - This is the distance between the center of the boom pivot and the center of gravity of the stowed jib.

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

Installation Checks

Check wiring and EPROM installations (see Installation Manual for wiring schematic).

Check 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 on Pages 6 and 7 in the installation guide.



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

Check the extension reel to ensure that the extension sensor clutch is properly set for “0”, and the 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 extension reel clockwise until you hear a “click”, indicating that the power spring clutch is engaged.
3. Turn the extension reel 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, leaving enough extra cable to reach the two-block hardware, and relieve the strain on the cable.
5. Pull the extension potentiometer downward against the tension spring enough to rotate the gear clockwise until the potentiometer reaches the end of the travel and the clutch drags.
6. Pre-tensioning of the reeling drum is complete, and the sensor clutch is properly set for calibration.

Entering Calibration Data

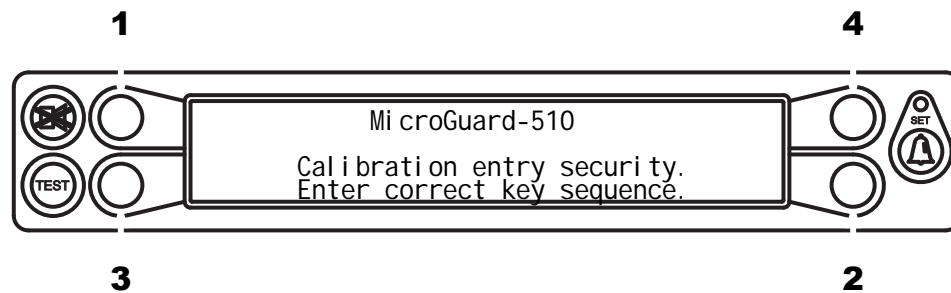
⚠WARNING

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

To enter calibration 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 system is now in calibration mode and ready to receive calibration data. Use the keys adjacent to the titles “Menu Up” and “Menu Down” to scroll through the following menus:

00 Error codes – Displays system information and error codes.

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

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

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.

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

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

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

09 Compensation – Sets rod side pressure compensation when booming down.

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

11 Auxiliary Head – Used to enter the dimensions of the auxiliary head.

12 Stowed Attachments – Used to enable or disable stowed attachments.

13 Digital Inputs – Used to view the status of digital inputs.

14 Enable Attachments – Used to enable or disable attachments in the system.

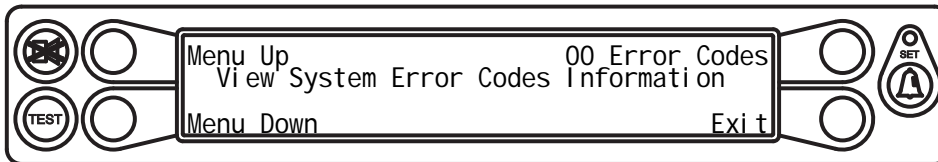
15 Enable Winches – Used to enable or disable winches in the system

16 Data Retrieval – Used to view radius moment, attachments, and pressure data as needed.

17 Language – Used to set the language for main display.

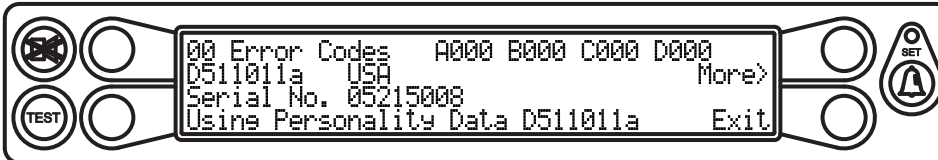
With the desired menu displayed, press the key adjacent to the menu name to select.

Menu 00 – Error Codes



This menu displays error code and system information.

Press the key adjacent to either “Menu Up” or “Menu Down” until “00 Error Codes” appears in the information window at the right.

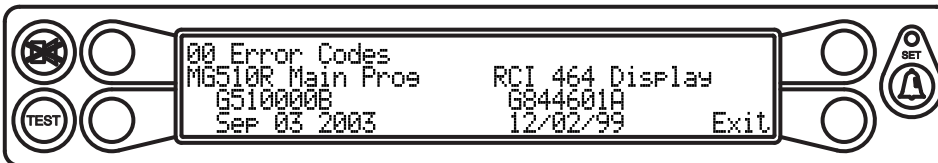


Press the key adjacent to “00 Error Codes” to enter the routine.

The following information is displayed:

1. System error codes
2. Computer serial number (should match the number on the label on the enclosure)

Press the key adjacent to “Exit” to leave the routine or, press the key adjacent to “More” to view additional system information. The following information is displayed:

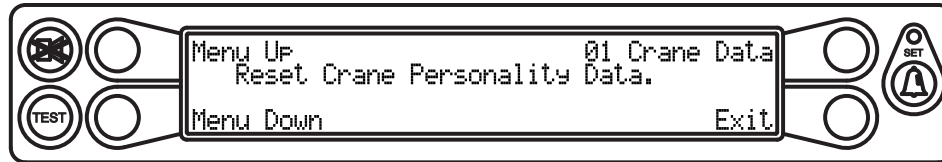


3. Crane specific file codes

When you have finished, press the key adjacent to “Exit” to leave the routine.

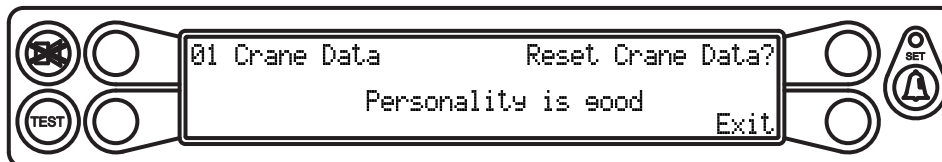
Menu 01 – Crane Data

This menu displays the status of the personality.



Press the key adjacent to either “Menu Up” or “Menu Down” until “01 Crane Data” appears in the information window at the right.

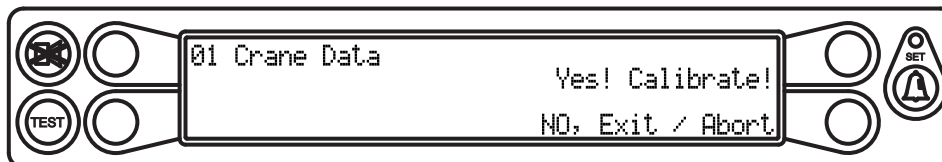
Press the key adjacent to “01 Crane Data” to enter the routine.



If the system has been reset and is functioning correctly the display will read “Personality is Good”. If there is no crane data present, or if the system has become corrupt, the display will read “Personality not in use”.

To reset the entire system, the crane data reset key must be pressed. This function will erase the personality memory which stores crane specific information and dimensions. It will also copy any known data from the system chip (ROM) applications file to the working personality memory for use by the system.

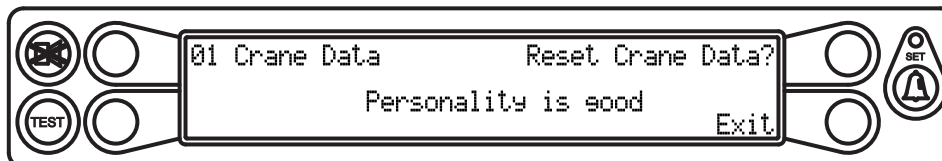
To reset crane data, press the key adjacent to “Reset Crane Pers. Data?”



Then, press the key adjacent to “Yes! Calibrate!”, or to exit without resetting, press the key adjacent to “No, Exit/Abort”.

The system will prompt you to “Enter Cal Seq...”, this is the same key combination used to enter calibration mode. The system will show that it is “Calibrating...”.

When it has finished, it will return to the main routine menu. The display will read “Personality is good”, indicating a successful transfer of data.



The system also contains a backup function that allows the installer/calibrator to retain a copy of the personality information after the unit is calibrated. This system consists of the following components:

1. System Program Chip (ROM)
2. Battery Backed RAM
3. Personality Chip

To back up the personality data, press the key adjacent to "Backup Personality to RAM Module".

Then, press the key adjacent to "Yes! Calibrate!", or to exit without resetting, press the key adjacent to "No, Exit/Abort".

The system will prompt you to "Enter Cal Seq...", this is the same key combination used to enter calibration mode. The system will show that it is "Calibrating...".

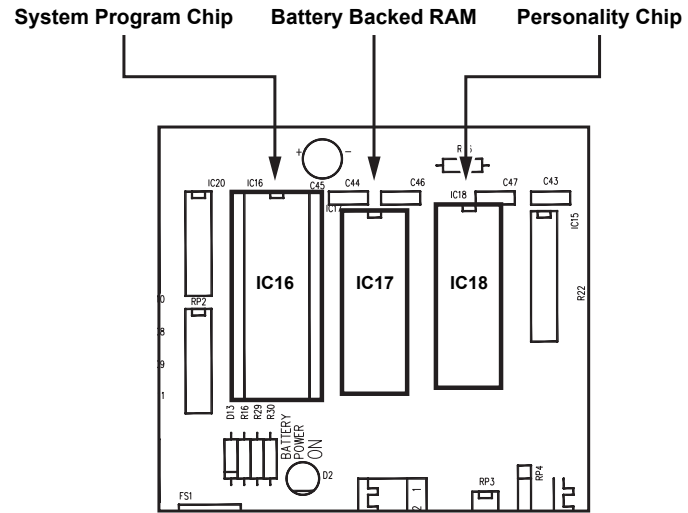
Pressing the button again after calibrating the backup will take you to the "Backup Personality from Ram mode" where you select the option and calibrate the back up.

To copy the backup file to a blank personality chip:

1. Turn the system off and remove the existing personality chip.
2. Install the blank personality chip.
3. Turn the system on.
4. Press the select button and enter the security code.

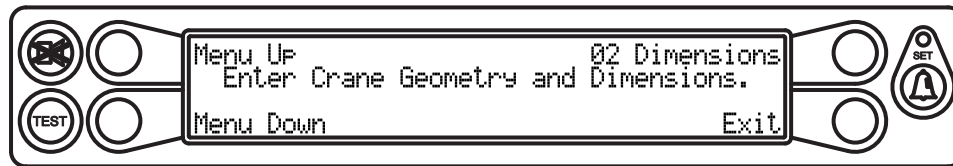
The personality data will be copied from RAM to the new chip.

Note: The backup procedure is used at the end of all calibration steps or anytime a the current personality is desirable. A copy of the personality data should be retained in case of computer failure.



Menu 02 - Dimensions

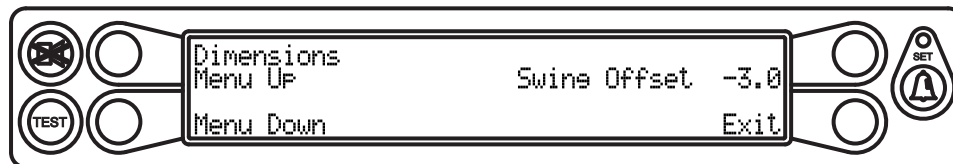
This menu is used to enter the physical dimensions of the crane that were previously recorded in Appendix A.



Press the key adjacent to either “Menu Up” or “Menu Down” until “02 Dimensions” appears in the information window at the right.

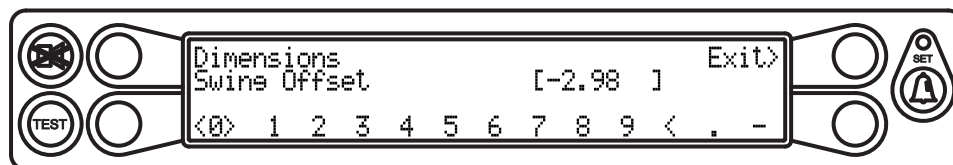
Press the key adjacent to “02 Dimensions” to enter the routine.

Press the key adjacent to “Swing Offset X.X”.



Enter the value for the swing offset. The only time this measurement will be positive, is if the boom pivot pin is in front of the center of rotation. Use the keys adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the key adjacent to “Swing Offset” to enter the number. When complete, the menu will automatically change to enter the next value. To skip to the next value, press the key adjacent to “Exit”.

Note: Numbers must be entered in feet and tenths [xx.xx]. Make sure to enter a negative value where appropriate.

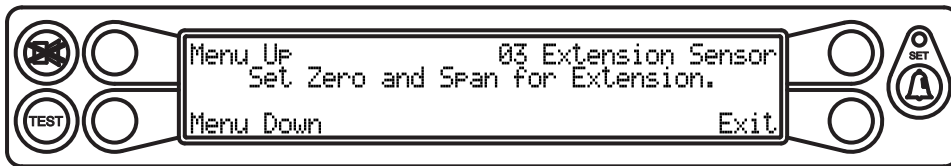


Continue entering the remaining values. After each value is entered, the menu will automatically change to enter the next value. When all values have been entered, the main menu will be displayed.

When you are finished, press the key adjacent to “Exit” to continue, otherwise, press the key adjacent to “Edit” to correct any of the values entered.

Menu 03 - Extension Sensor

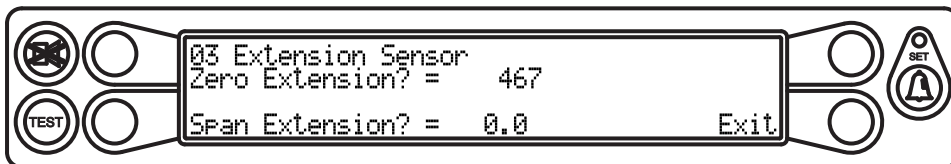
This menu allows for entering the zero point and span of the extension sensor that were previously recorded in Appendix A.



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

Press the key adjacent to "03 Extension Sensor" to enter the routine.

Press the key adjacent to "Zero Extension? = XXX".



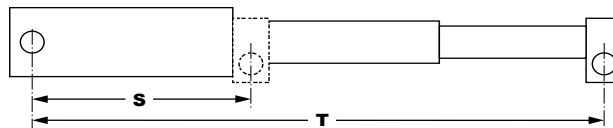
The extension sensor is now zeroed.

⚠WARNING

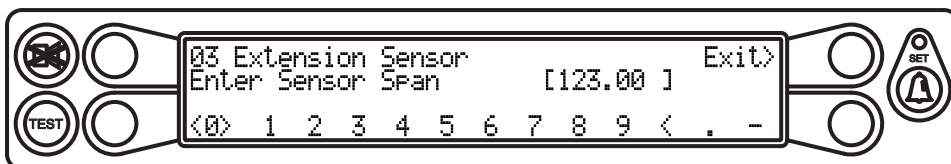
BEFORE EXTENDING THE BOOM, MAKE SURE THE AREA AROUND THE CRANE IS SAFE. MANY CRANES WILL TIP OVER IF THE BOOM IS EXTENDED HORIZONTALLY!!

Press the key adjacent to "Span Extension? X.X".

Full extend the boom and then enter the value for the span. Use the keys adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the key adjacent to "Enter Sensor Span" to enter the number. When complete, the menu will automatically change to the previous menu. To exit the routine without changes, press the key adjacent to "Exit".



Note: Measurements must be entered in feet and tenths [xx.xx]. If necessary, recorded measurements must be converted before starting.



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

Menu 04 - Angle Sensor

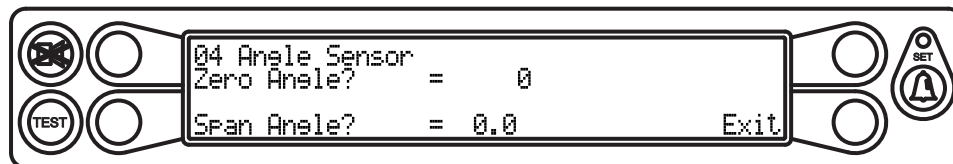
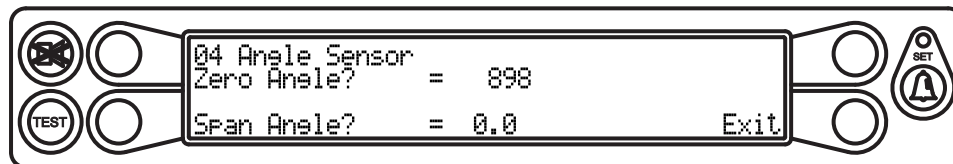
This menu is used to enter the zero point and span for the angle sensor. This is done using the digital level.



Press the key adjacent to either "Menu Up" or "Menu Down" until "04 Angle Sensor" appears in the information window at the right.

Press the key adjacent to "04 Angle Sensor" to enter the routine.

With the boom in a horizontal position, press the key adjacent to "Zero Angle? = XXX".



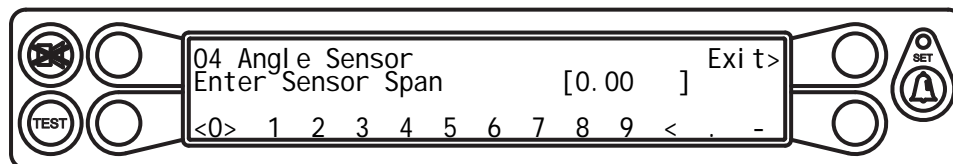
The extension sensor is now zeroed.

Press the key adjacent to "Span Angle? X.X".

Raise the boom until the inclinometer reads 60° or slightly higher.

Enter the value for the angle from the inclinometer. Use the keys adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the key adjacent to "Enter Sensor Span" to enter the number. When complete, the menu will automatically change to the previous menu. To exit the routine without changes, press the key adjacent to "Exit".

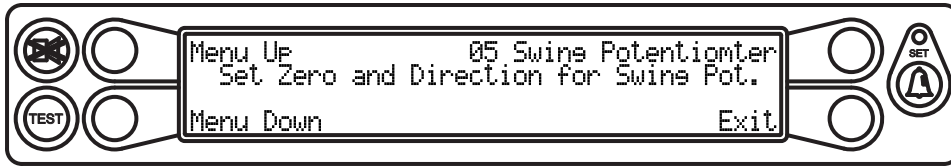
Note: Measurements must be entered in degrees and tenths [xx.xx]. If necessary, recorded measurements must be converted before starting.



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

Menu 05 - Swing Potentiometer (if equipped)

This menu is used to enter the zero point and the swing of the swing potentiometer (if equipped).

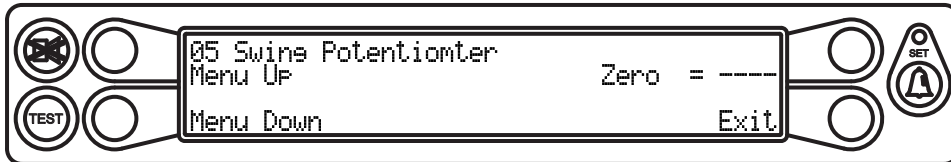


Press the key adjacent to either “Menu Up” or “Menu Down” until “05 Swing Potentiometer” appears in the information window at the right.

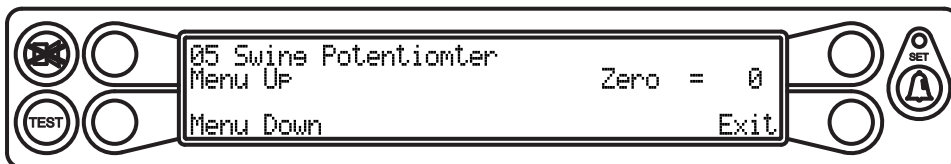
Press the key adjacent to “05 Swing Potentiometer” to enter the routine.

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.

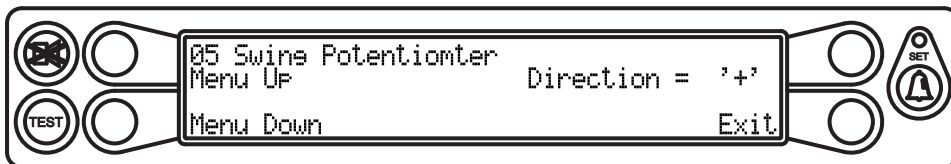
Stow the boom in “road travel” mode. Press the key adjacent to “Zero = —”.



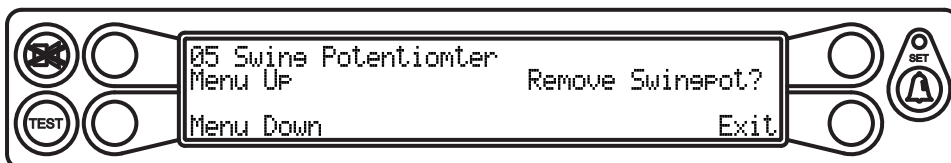
The swing is now zeroed.



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



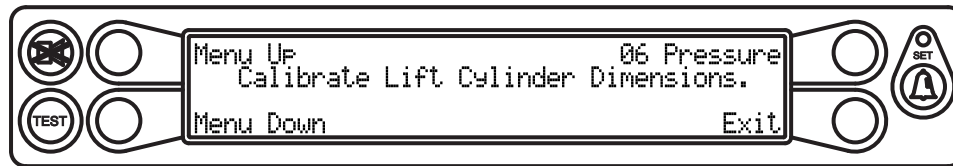
Press the key adjacent to “Menu Up” to view the Remove Swing pot command. This command can be used in the event you want to remove the swing pot from the system. This is usually only used as a troubleshooting tool and is not part of the calibration routine.



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

Menu 06 - Pressure

This menu is used to determine the pressure of the boom hoist cylinder. A calibrated load is needed to calculate the diameter of the boom hoist cylinder. It is a good idea for this load to be approximately 80% of the single part load rating. If a smaller weight is all that is available, the boom should be extended and/or lowered to about 55° to induce higher pressure in the base of the cylinder.

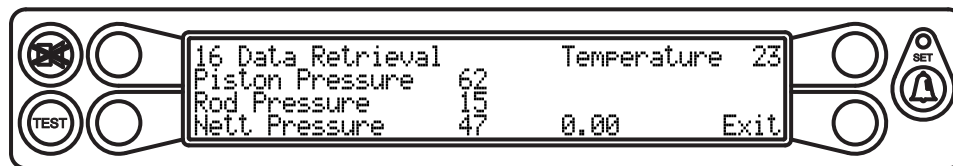


Press the key adjacent to either “Menu Up” or “Menu Down” until “06 Pressure” appears in the information window at the right.

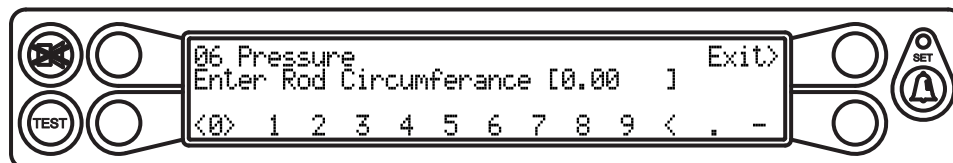
Press the key adjacent to “06 Pressure” to enter the routine.

You must first enter the circumference of the cylinder rod (previously recorded). If the dimension of the cylinder is already known, or easily measured, you may skip this routine by selecting “No” at the beginning of the routine and, you will be given an opportunity at the end of the routine to manually enter the cylinder bore size. This dimension is critical and must be measured within 1/10”. Pressure can not be calibrated until the L, J, G, and H dimensions have been calculated and entered into the system. An error message will flash on the screen if this is not done.

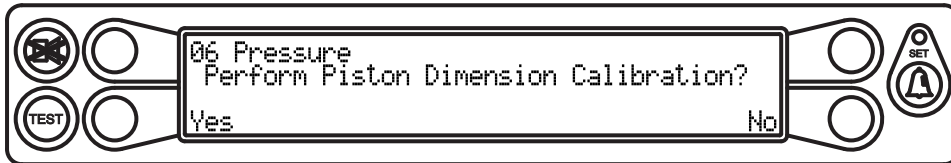
1. With the boom slightly raised, examine the rod and piston side pressures before entering the routine. This can be monitored using Menu 16 - Data Retrieval. The readings should show positive numbers of approximately 20-300 psi.



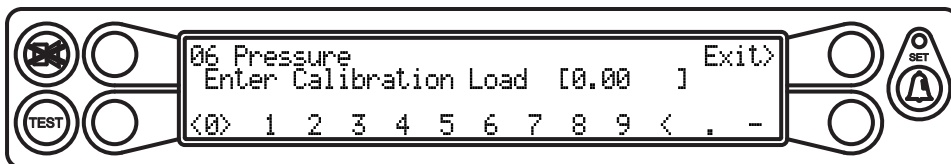
2. Raise the boom and monitor the readings. The value of the piston side should increase while the rod side value should remain constant. If this is not the case, the hoses must be switched. The value of the piston side should increase when booming up, and the rod side pressure should increase when booming down. If not, it is possible that the transducer hoses are routed wrong and will have to be fixed.
3. Enter the circumference of the cylinder rod in feet and tenths of a foot as previously recorded in Appendix A.



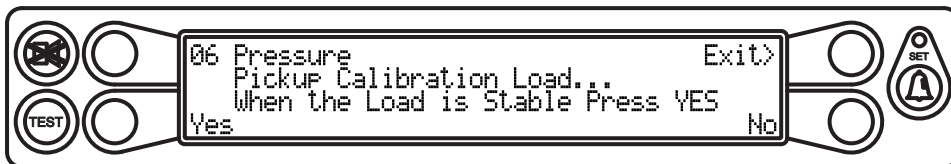
- The question, "Perform Piston Dimension Calibration?" Will appear on the screen. If "NO" is selected the system will ask for a manual entry of the piston diameter and then exit the calibration routine. If you do not know the piston diameter, press the key adjacent to "Yes" to calculate.



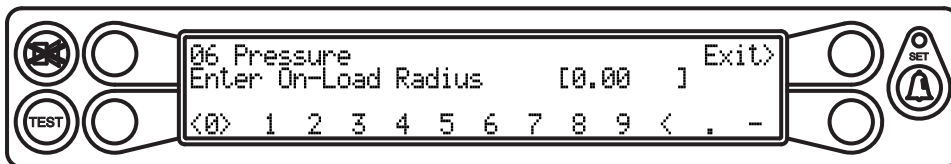
- Enter the weight of the calibration load including all shackles and hook weights. Load must be entered in thousandths of pounds (i.e. 1,400 lbs is entered as 1.4). The calibration load should be as large a mass that is safe for the crane to pick at a boom angle of around 60°. If smaller loads are used, the boom may be partially extended, and the angle may also be lowered to 50 or 55°. This will cause more induced pressure in the cylinder and help make the load calibration as close as possible.



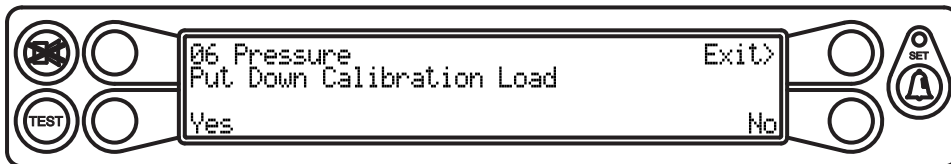
- Pick up the calibration load and hold it steady to settle any fluctuations or movement. Confirm the calibration.



- Measure the radius of the suspended load and enter the measurement into the calibration routine.



- Set down the calibration load, hook block, and load handling equipment and allow it to settle and then confirm the calibration. The calibration routine will exit automatically.



9. Pick up the calibration load again and check that the display shows the correct amount. Allow the load to adjust for a few seconds if necessary.



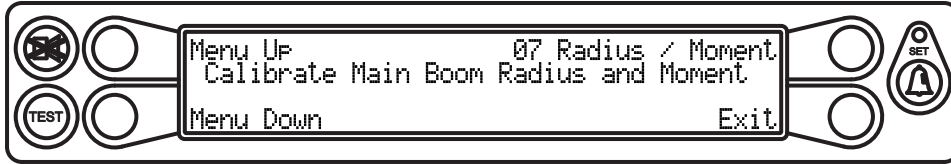
Remember that the load will actually show the boom moment plus the load, because the system has not yet been calibrated for boom moment. A good way to check this is to read the load when the load is set down, and then take another reading when the boom is raised. Subtract the 1st unloaded number from the loaded number, and the result should be very close to the exact weight.

In cases where the proper result is not being achieved and the geometry dimensions are correct, by re-entering the pressure calibration routine and selecting "No" when asked to perform piston calibration, the cylinder bore size may be adjusted to achieve the proper weight. Be aware that any changes made will have a dramatic effect on the displayed load.



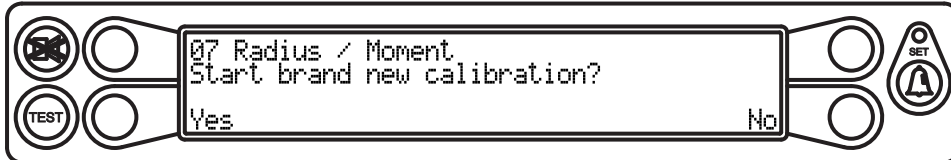
Menu 07 - Radius/Moment

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



Press the key adjacent to either “Menu Up” or “Menu Down” until “07 Radius/Moment” appears in the information window at the right.

Press the key adjacent to “07 Radius/Moment” to enter the routine.



⚠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!

DO NOT HAVE ANY ATTACHMENTS ON THE SIDE OR TIP OF THE BOOM DURING THESE TESTS. THIS CAN CAUSE INACCURACY IN THE MAIN BOOM MOMENT IF THE SETUP OR STORED INFORMATION IS INCORRECT.

Up to seven points may be stored and must include: 1) boom fully retracted and, 2) boom fully extended. 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. This may be 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 still be affected. Therefore it is essential to add an extra calibration point at 90% of the boom extension.

For each extension calibration, the system requires a stable measurement of the moment (taken from its own pressure sensors) and radius (taken from manual measurements) at both high and low boom angles. Select angles of between 60° and 70° for high boom angles, and as close to zero degrees as possible for low boom angles. Take care to accurately measure the radius at each calibration point. Using a single part of line will aid in this.

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

Determine if this will be a brand new calibration or an existing calibration with changes.

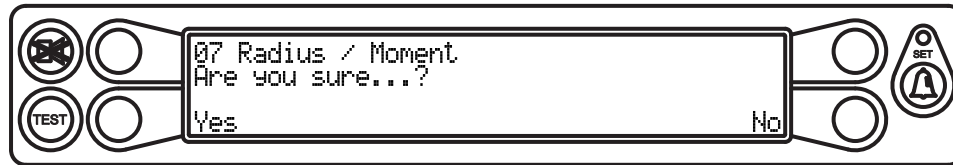
To start a new calibration, press the key adjacent to “Yes”, otherwise press the key adjacent to “No”.

IMPORTANT!

SELECTING “YES” WILL START A NEW RADIUS MOMENT CALIBRATION AND ALL EXISTING DATA WILL BE ERASED.

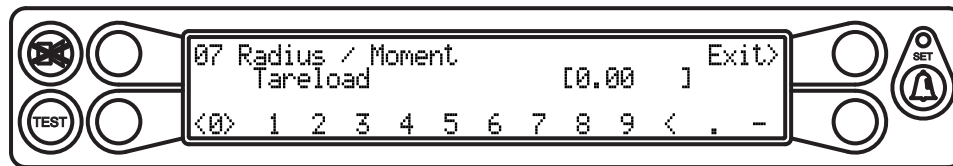
If you are checking an existing calibration, select “No”. You will be prompted to extend the boom to the necessary length to calibrate, or recalibrate a different length configuration.

If “Yes” is pressed, you will be asked to confirm your request. Press the key adjacent to “Yes”.



Note: A new calibration will erase any and all radius moment data previously entered.

Enter the tare load (the only weight should be that of the hook block; if there is a block hanging, add this to the tare). Also, the unit must be configured with a single part line. When entering the tare load in the calibration routine, adding 100 pounds (0.1) to the actual weight will help guarantee a slightly positive load reading in all operating configurations.

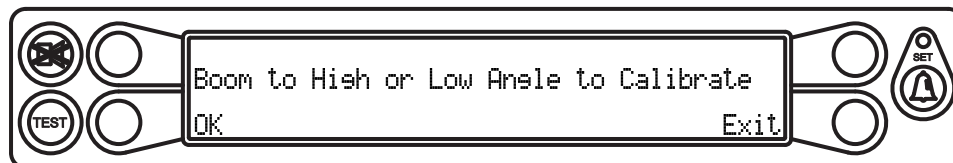


Begin with the boom fully retracted and enter the length.

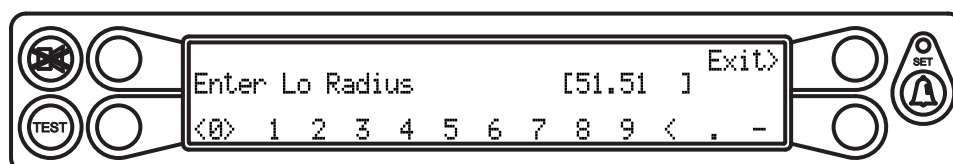
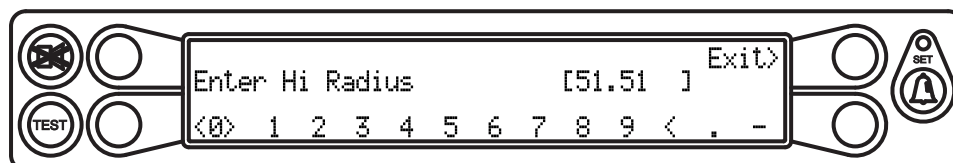
IMPORTANT!

DO NOT MOVE THE BOOM EXTENSION AGAIN DURING THIS PROCESS. THE BOOM EXTENSION MUST REMAIN AT THE SAME LENGTH DURING BOTH THE HIGH AND LOW RADIUS CHECKS.

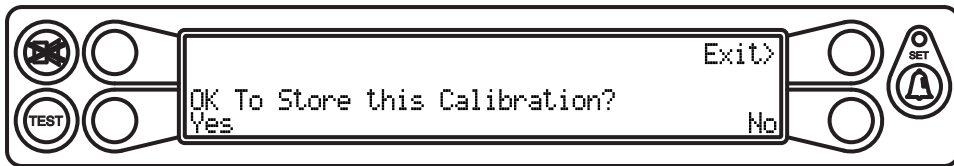
Press the key adjacent to “OK” key when ready. Enter the radius at these points of calibration.



Enter the value for the high radius. Use the keys adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the key adjacent to “Enter Hi Radius” to enter the number. When complete, the menu will automatically change to the previous menu. To exit the routine without changes, press the key adjacent to “Exit”. Repeat the procedure to enter the low radius.



When you have finished, press the key adjacent to “Yes” to store the data.



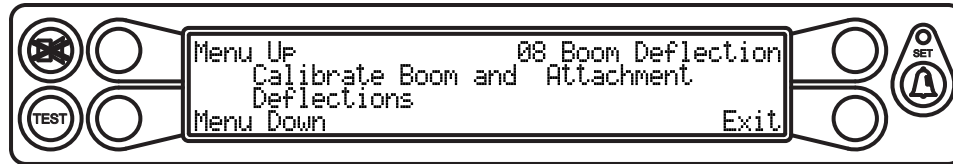
TIP

After saving this calibration point, the system will be showing the proper hook weight and working with the corrected radius. You can boom up to 45° and recheck the radius (45° is probably the worst case angle, so if the radius still checks good here you can move on to the next point with confidence).

Continue until all boom length points have been entered. When finished, press the key adjacent to “Exit”. After calibrating the radius moment, reenter the radius moment routine, and press the key adjacent to “No” when prompted to start a new calibration. This will take you to an edit screen and will enable you to view the data for each boom length calibrated. Writing these numbers down will save time should the calibration data be lost for any reason (refer to Appendix A to record values).

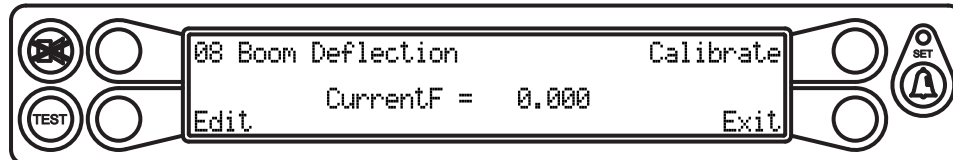
Menu 08 - Boom Deflection

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



Press the key adjacent to either "Menu Up" or "Menu Down" until "08 Boom Deflection" appears in the information window at the right.

Press the key adjacent to "08 Boom Deflection" to enter the routine.



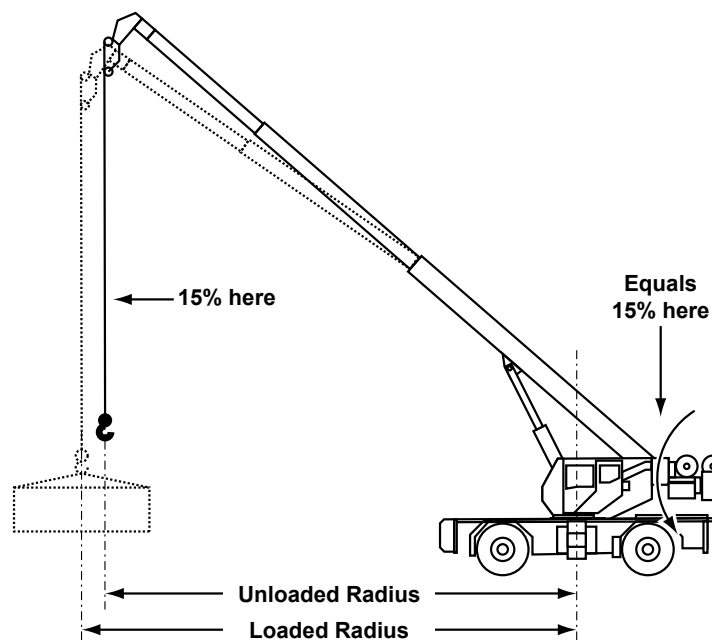
⚠WARNING

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

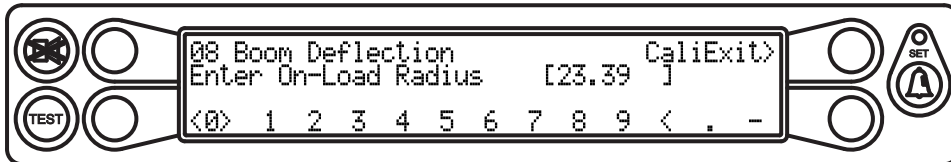
Boom deflection is a natural occurrence and can have a significant affect on the boom radius under load (see figure).

It is important to run this test with the boom fully extended using a weight of 85-100% of rated capacity at an angle greater than 60°. Measure the resulting radius and enter the corrected radius into the calibration routine and the system will enter the "F" Factor into the system (this will usually be a negative number).

Ensure that the crane is configured to pick from the main boom, all stowed attachments are set correctly, and there are no erected or unused attachments (see page 26 for attachment calibrations).



1. Fully extend the boom at an angle greater than 60°.
2. Lift a suitable calibration load. The load should induce significant deflection in the boom.
3. Begin the calibration by pressing the key adjacent to "Edit" .
4. Measure the loaded main boom radius and enter the value. Use the keys adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the key adjacent to "Enter On-Load Radius" to enter the number. When complete, the menu will automatically change to the previous menu. It is useful to add .1 ft. to the radius when entering the radius for boom deflection. This will create a slightly positive radius for most boom operating conditions.

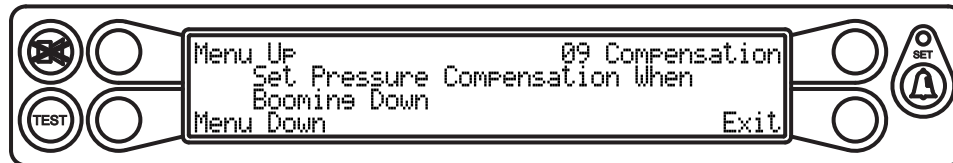


5. Assure that the new displayed radius matches or slightly exceeds the actual measured radius.

Menu 09 - Compensation

This menu is used to enter data to compensate for fluctuating loads.

Loads can change dramatically when booming down because of fluctuating pressures in the base side of the boom hoist cylinder. The rod side pressure transducer constantly monitors these pressure changes on the base and rod side of the boom hoist cylinder and sends its signals to the computer for processing. This signal calculates a correction for the fluctuations that are caused in the base side pressure of the boom hoist cylinder being used to measure the load. This routine will allow for adjustment of these pressure fluctuations.



Press the key adjacent to either "Menu Up" or "Menu Down" until "09 Compensation" appears in the information window at the right.

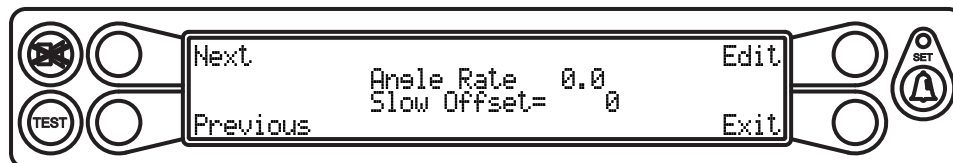
Press the key adjacent to "09 Compensation" to enter the routine.

To accomplish this testing, the boom should be half extended with a medium hook load of 2000 or 3000 lbs.

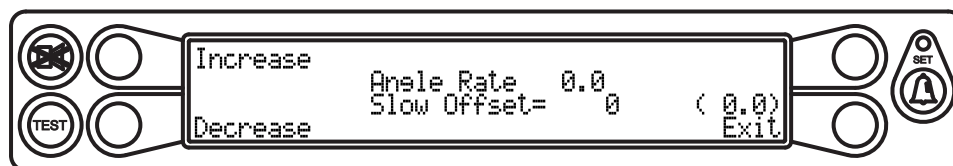
1. Set the boom angle above 60° and raise the load.
2. Boom down at normal speed. Note the hook load during decent. If the load goes to "0" or drops and stays down, adjusting the compensation should bring it back up to the proper reading during the boom down process.

Two compensation modes are allowed; "Slow Rate" and "Fast Rate". The actual rate of the boom is displayed while in this routine.

3. Press the key adjacent to "Edit" to enter the routine. Use the keys adjacent to "Next" and "Previous" to select desired compensations.



4. Select the rate by pressing the key adjacent to "Edit" and adjust the offset value by pressing the key adjacent to "Increase" and "Decrease". To see the effect, lower the boom. If the effect is too small, increase the compensation.



Note: It is customary to leave the slow rate compensation as "0", or a very small number and adjust the fast rate compensation to counter the booming down effect.

When you have finished, press the key adjacent to "Exit". Press the key adjacent to "Next" or "Previous" to adjust the fast rate compensation value. Repeat steps 1 and 2.

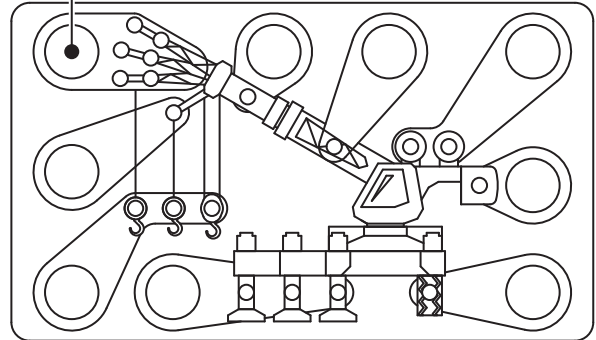
Note: Compensation is activated only when booming down.

Menu 10 - Erected Attachments

This menu is used to calibrate attachment radii, moments, and dimensions. For systems without pre-calibrated flies, perform a calibration routine on each jib configuration.

Before starting this procedure you must configure the jib or attachment while in normal operation mode. You can not adjust or erect a jib while in calibration mode.

Select proper fly/jib configuration



Press the key adjacent to either “Menu Up” or “Menu Down” until “10 Erected Attachments” appears in the information window at the right.

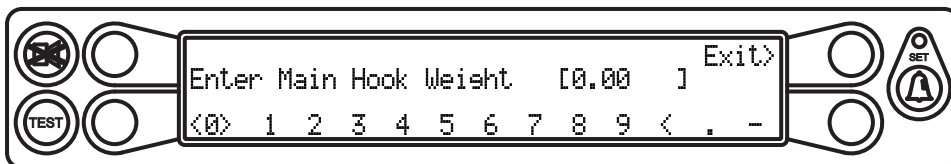


Press the key adjacent to “10 Erected Attachments” to enter the routine.

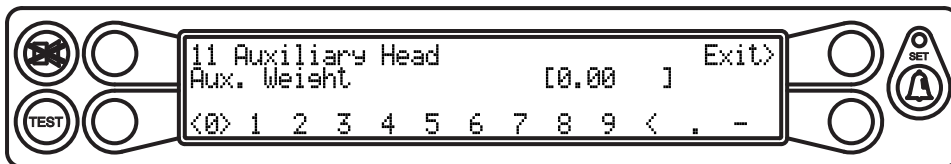
Upon starting the procedure the editor can be used to enter supplied calibration data manually to avoid performing the entire calibration routine. It can also be used to trim calibrations that are less than perfect.

For each fly/jib combination, the system must gather data about the jib moment (taken from the pressure sensors) and the jib radius (taken from manual measurements, use the measurements recorded in Appendix A). Data must be gathered with the boom fully extended at high and low boom angles, and fully retracted at high and low boom angles.

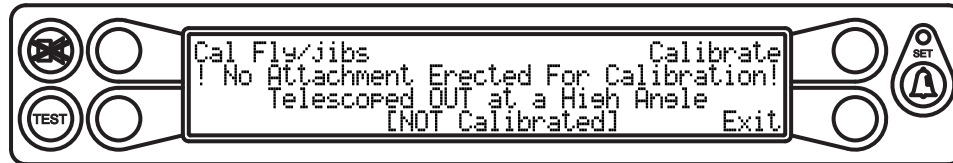
1. Enter the main hook weight. If there is an unused hook block present on the main boom; otherwise enter 0.0 .



2. Enter the weight of the fly hook and any other shackles or rope weights suspended from the fly pick point.



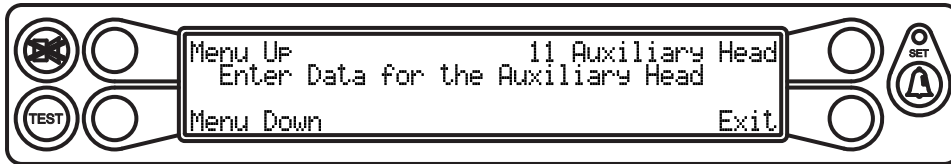
3. Set the boom to the fully extended and fully retracted high low angle positions. The system should display the correct configuration (i.e. fully extended at low angle; indicating it is gathering data with a fully extended boom at a low angle). If the reading is incorrect, press the key adjacent to the appropriate menu to correct the configuration.



4. The information window will display "NOT Calibrated" or "Calibrated" for each setting.
5. For each of the four positions, measure the radius and enter the measurement when prompted. The corrected radii will not be entered or shown until all steps of the routine are complete. Then the radius must be checked and verified before moving on.
6. When finished, press the key adjacent to "Calibrate" to store the calibration.

Menu 11 - Auxiliary Head

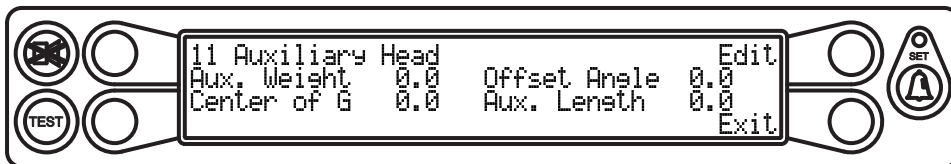
This menu is for entering the dimensions of the auxiliary head.



Press the key adjacent to either "Menu Up" or "Menu Down" until "11 Auxiliary Head" appears in the information window at the right.

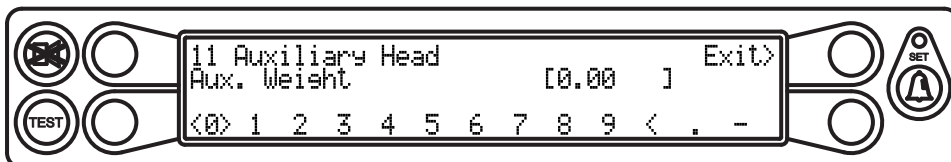
Press the key adjacent to "11 Auxiliary Head" to enter the routine.

Press the key adjacent to "Edit".

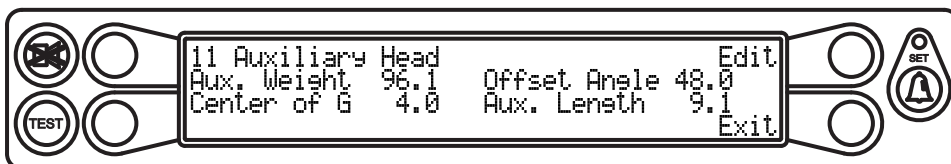


Enter the value for the auxiliary head weight. Use the keys adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the key adjacent to "Aux. Weight" to enter the number. When complete, the menu will automatically change to enter the next value. To skip to the next value, press the key adjacent to "Exit".

Note: Numbers must be entered in thousandths of pounds (i.e. 1,000 pounds will be entered as 1.0, and 900 pounds will be entered as 0.9).



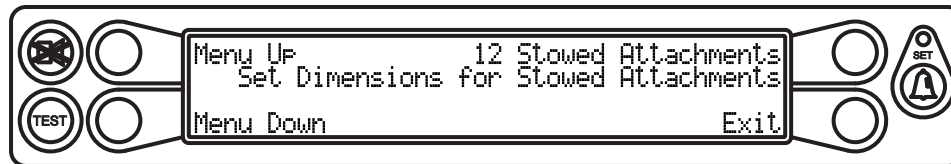
Continue entering the remaining values. After each value is entered, the menu will automatically change to enter the next value. When all values have been entered, the main menu will be displayed.



When you are finished, press the key adjacent to "Exit" to continue, otherwise, press the key adjacent to "Edit" to correct any of the values entered.

Menu 12 - Stowed Attachments

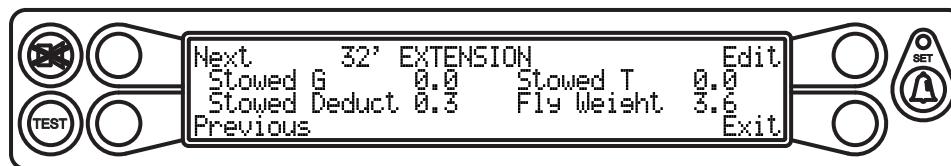
This menu is used to enter data for stowed attachments.



Press the key adjacent to either “Menu Up” or “Menu Down” until “12 Stowed Attachments” appears in the information window at the right.

Press the key adjacent to “12 Stowed Attachments” to enter the routine.

Press the key adjacent to “Edit”.

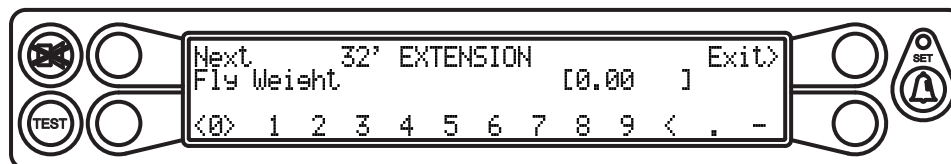


When prompted, enter the measurements for jibs, weights of jibs, etc. Use the keys adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the key adjacent to the value name to enter the number. When complete, the menu will automatically change to enter the next value. To skip to the next value, press the key adjacent to “Exit”.

Note: Numbers must be entered in feet and tenths.

Adjust the center of gravity of the jib for proper hook weight when unit is stowed. The required jib data can be gathered as follows:

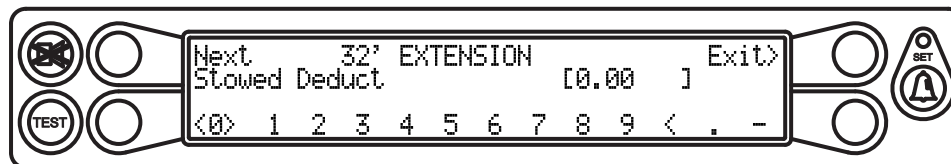
Fly Weight - Weigh it!! Use the weight gathered during the erected attachment calibration. Refer to the Data Retrieval Menu #16.



Stowed G - Balance Jib on hook to find the center point. Compute the distance from the boom pivot pin to this point when the jib is stowed. See Figure.



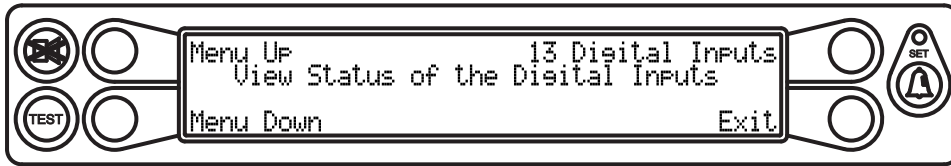
Note: Stowed deduction will be noted on the load chart or cab plate.



Note: This information should be entered before performing a main boom radius/moment calibration, if it is to be calibrated with an attachment stowed. **(NOT RECOMMENDED)**.

Menu 13 - Digital Inputs

This menu is used to view the status of the digital inputs. For inputs from swing switches, see page 16.



Press the key adjacent to either "Menu Up" or "Menu Down" until "13 Digital Inputs" appears in the information window at the right.

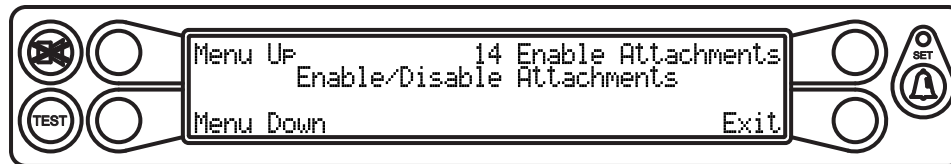
Press the key adjacent to "13 Digital Inputs" to enter the routine.



When you have finished viewing, press the key adjacent to "Exit".

Menu 14 - Enable Attachments

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



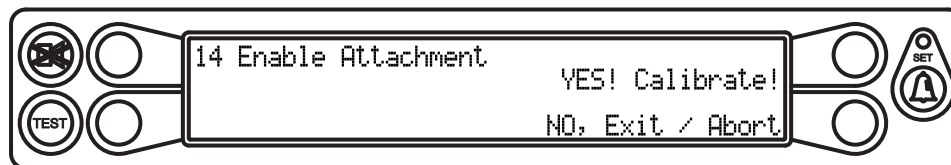
Press the key adjacent to either "Menu Up" or "Menu Down" until "14 Enable Attachments" appears in the information window at the right.

Press the key adjacent to "14 Enable Attachments" to enter the routine.



Press the key adjacent to the attachment number and name (Fly# 1 as shown in figure) to enable or disable the attachment.

Press the key adjacent to "YES! Calibrate!" to toggle enabled or disabled. To exit without changing the selection, press the key adjacent to "Exit".

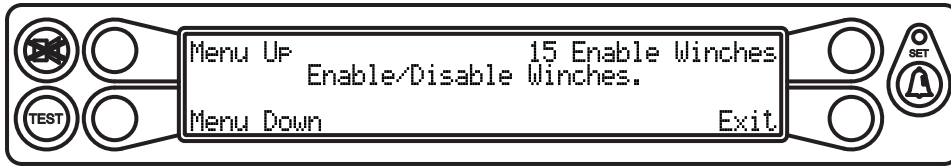


Press the key to either "Next FLY Up" or "Next FLY Down" to select the next attachment. Continue with each attachment as described previously to enable or disable each attachment.



Menu 15 - Enable Winches

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



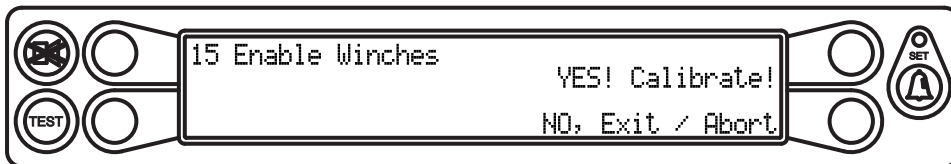
Press the key adjacent to either “Menu Up” or “Menu Down” until “15 Enable Winches” appears in the information window at the right.

Press the key adjacent to “15 Enable Winches” to enter the routine.

Press the key adjacent to “Winch Enabled” .



Press the key adjacent to “YES! Calibrate!” to disable the winch.



The selected winch is now disabled.



Note: There must be at least one winch enabled on the crane, the system will not allow you to disable all winches on the crane.

Press the key adjacent to “Change Winch” to select the next available winch on the crane. Continue with each winch as described previously to enable or disable each winch.

Menu 16 - Data Retrieval

This menu is used to view radius/Moment, attachment data, and pressure data.

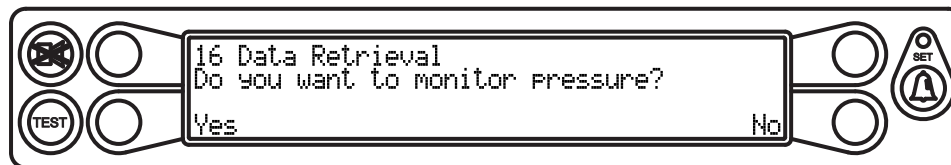
IMPORTANT!

DATA CAN BE EDITED WHILE IN THIS ROUTINE. USE CAUTION WHEN VIEWING THIS INFORMATION SO AS NOT TO EDIT ANY DATA.

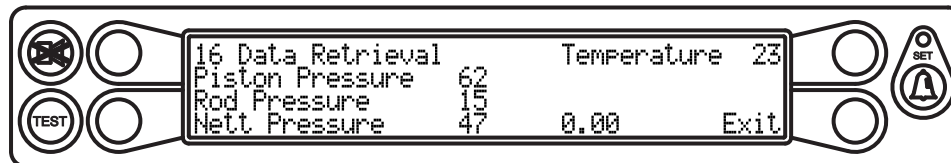


Press the key adjacent to either "Menu Up" or "Menu Down" until "16 Data Retrieval" appears in the information window at the right.

Press the key adjacent to "16 Data Retrieval" to enter the routine.



The system will ask "Do you want to monitor pressure?". Select the key adjacent to "Yes".

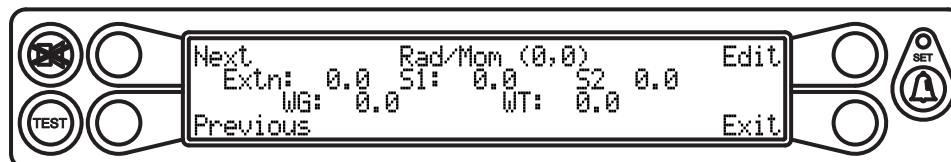


The information for the boom piston pressure is displayed. When finished, press the key adjacent to "Exit".

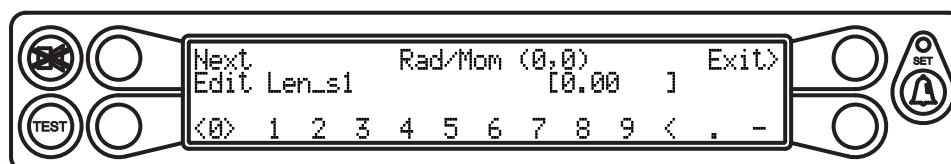
The system will ask "Do you want to edit Radius/Moment Data?" Select the key adjacent to "Yes".



The system will display the current data. Press the key adjacent to "Edit".



You will be prompted to enter data that was previously recorded in Appendix A as follows: 1) Edit Extension; 2) Edit Len_s1; 3) Edit Len_s2; 4) Edit WG; 5) Edit WT. Use the keys adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the key adjacent to the value name to enter the number. When complete, the menu will automatically change to enter the next value. To skip to the next value, press the key adjacent to "Exit".



When you have finished, the system will display the previous menu. To edit the data further press the key adjacent to "Edit" and continue as previously described. To go to the next menu, press the key adjacent to "Exit".

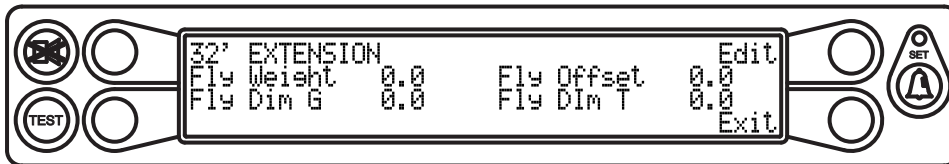
The system will ask "Do you want to edit Fly data?". Select the key adjacent to "Yes".



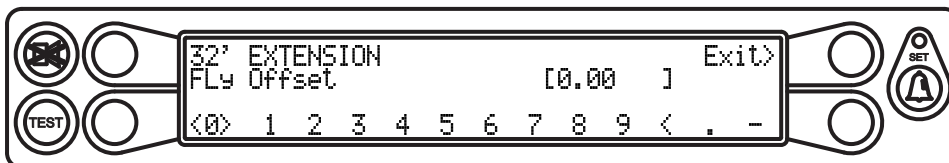
The current fly is displayed. Press the key adjacent to "View Data" to display the dimensions of the selected fly. If no data is present, the system will display "[NO DATA]" in the window.



The dimensions for the selected fly is displayed. To edit the data, press the key adjacent to "Edit". Otherwise, press the key adjacent to "Exit" to leave the routine.



You will be prompted to enter data as follows: 1) Fly Weight; 2) Fly Offset; 3) Fly Dim G; 4) Fly Dim T. Use the keys adjacent to the numerical values at the bottom of the window to scroll left or right and highlight each number. Use the key adjacent to the value name to enter the number. When complete, the menu will automatically change to enter the next value. To skip to the next value, press the key adjacent to "Exit".



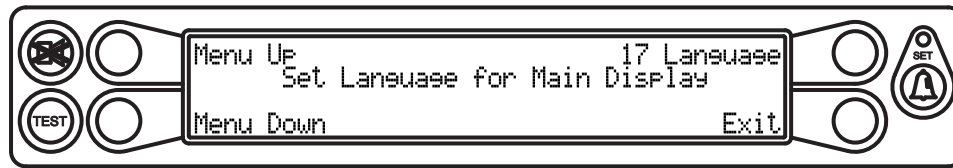
When all the values are entered, the system will return to the previous menu.

Press the key adjacent to "Exit" to return to the main menu.

To edit the information for additional flies, re-enter the routine. Press the key adjacent to either "Next" or "Previous" to view and/or edit the data for each selected fly.

Menu 17 - Language

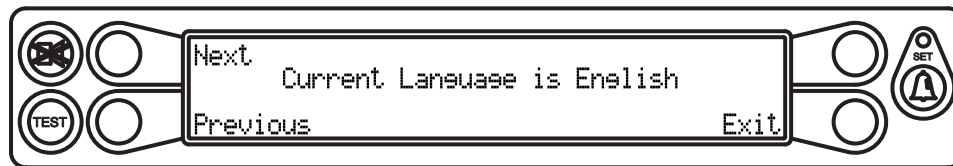
This menu is used to enter a different language for display (where appropriate and subject to availability).



Press the key adjacent to either “Menu Up” or “Menu Down” until “17 Language” appears in the information window at the right.

Press the key adjacent to “17 Language” to enter the routine.

The system will display the current language.



To select a different language (if available), press the key adjacent to either “Next” or “Previous” . Press the key adjacent to the desired language.

Appendix A - Measurement Record

Use the space provided below to enter the necessary dimensions. Dimensions must be entered into the system in feet and tenths of a foot. Please make sure to convert any measurements if necessary before recording them.

Callout	Description	Measurement
Boom Pivot Dimensions (see page 4)		
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 or 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 center of the boom hoist cylinder lower pivot.	
Winch Dimensions (see page 5)		
GO	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.	
HO	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.	
JO	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.	
LO	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.	

Callout	Description	Measurement
Boom Hoist Cylinder Dimensions (see page 6)		
M	This is the distance measured around the outside of the cylinder rod, divided by 12.	
	Number of cylinders.	
Span Dimensions (see page 6)		
T	This is the dimension between the center of the boom pivot and the center of the sheave with the boom fully extended.	
S	This is 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 (see page 7)		
	Auxiliary Head Weight	
	Auxiliary Head Offset Angle	
	Auxiliary Head Center of Gravity	
	Auxiliary Head Length	
Stowed Jib Dimensions (see page 7)		
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) (see page 20)

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

Load Verification

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

Fraction to Decimal Conversion Chart

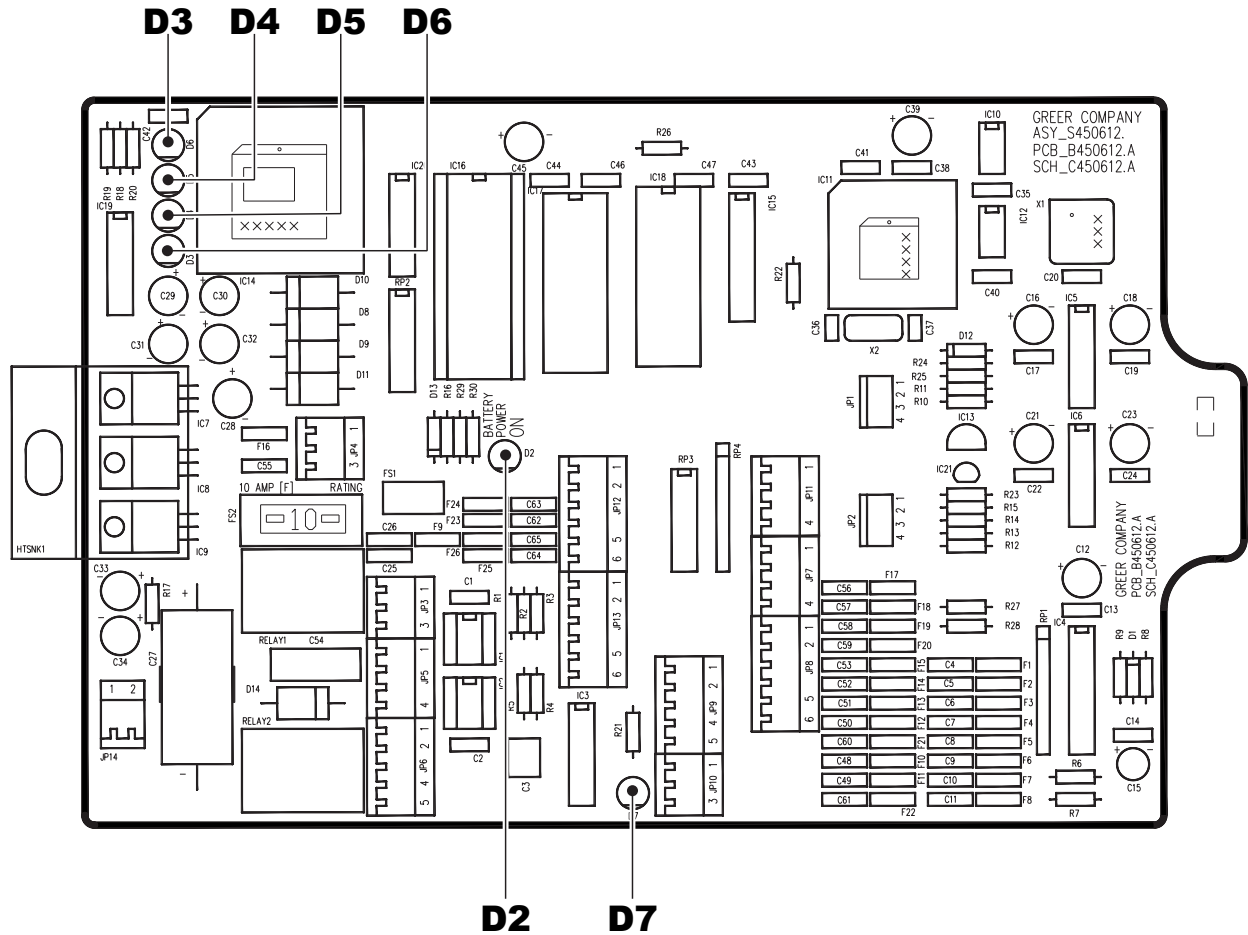
Fraction	Decimal	Fraction	Decimal
1/64	.015625	33/64	.515625
1/32	.03125	17/32	.53125
3/64	.046875	35/64	.546875
1/16	.0625	9/16	.5625
5/64	.078125	37/64	.578125
3/32	.09375	19/32	.59375
7/64	.109375	39/64	.609375
1/8	.125	5/8	.625
9/64	.140625	41/64	.640625
5/32	.15625	21/32	.65625
11/64	.171875	43/64	.671875
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

Appendix B - Computer Troubleshooting

Computer Internal Status Indicators

The computer unit contains six LED indicators that provide an aid to checking presence of power supply voltages and communications between the computer and display console. There are five power indicators (D2 through D6) and one communications indicator (D7), all Indicators are bright green light emitting diodes.

With the exception of the communications indicator, all indicators should be illuminated at the same brightness level with the system power on. A missing or dimly lit indicator indicates a power supply problem.



LED Indicator	Function
D2	Battery Power
D3	+5V Analog Poser
D4	+5V Digital Power
D5	+10V Relay Drive Power
D6	Protected Machine Power
D7	Communication Indicator

Power Indicator States and Actions

Power Indicator State	Corrective Action
All indicators OFF	Check power and ensure that PTO switch is properly engaged.
D2 ON but all other indicators OFF	Check display console cable and connection.
D5 OFF but all other indicators ON	Replace computer
D3, D4 and D7 OFF but all other indicators ON	Replace computer
D3 OFF but all other indicators ON	Check extension reel signal cable and internal voltages within extension reel.

Communication Indicator

The Communication Indicator provides an indication of the success or otherwise of communication with the display console, and of the running state of the computer program.

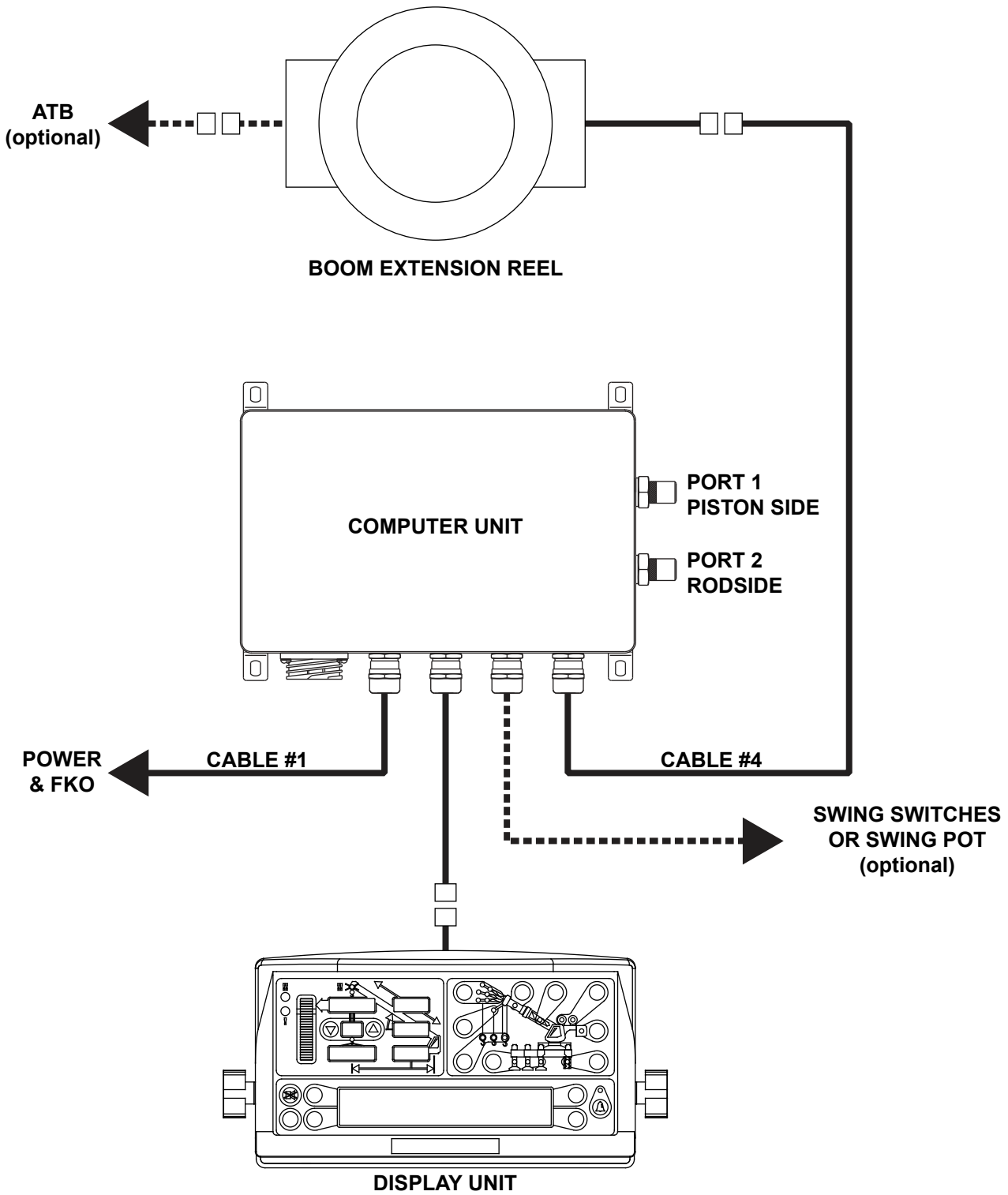
Carefully observe the Communication indicator and the display console at power on and through self-test, and then use the following chart to help decide the course of action.

Communication Indicator Indications At Power On	ACTION
From the moment the system power is applied, the COMM indicator does not illuminate. During and after the self-test period of eight seconds, the COMM indicator remains off.	The computer is not running. Check status indicators (D2 through D6). Try to reset the system by powering off and on again. Listen to the computer for the relays to click. If they do not click, replace the System Chip If not successful, replace the computer. If the relays do click, replace Communication chips IC1, 2.
From the moment the system power is applied, the COMM indicator does not illuminate. The display console, which never goes to normal, continually reads: "No Communication with MicroGuard."	Communication with the display has not been made. Is the display console connected? Check connector and cabling to the display console.
At the moment power is applied, the COMM indicator flashes briefly, then switches off. After a few seconds, the COMM indicator starts to flash at a fast rate and never stops.	This is the normal operation of the communication between the computer and display console.

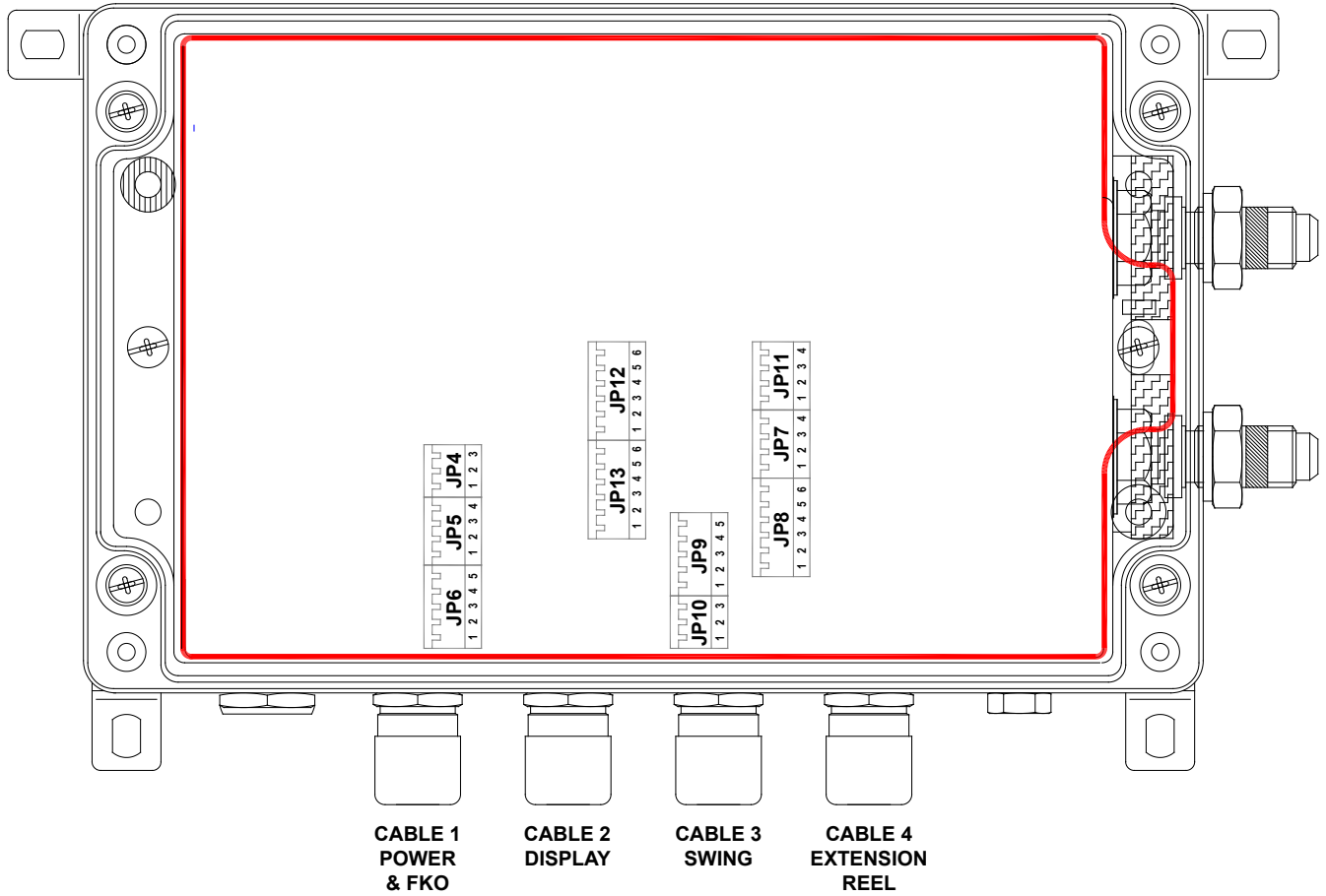
Start-up Problems

Condition	Corrective Action
Display unit lights and alarms are flashing; the computer unit sounds as if it is buzzing.	<ul style="list-style-type: none"> • Make sure the PTO is fully engaged.
During system setup, it is not possible to adjust the angle sensor. The display shows “---”.	<ul style="list-style-type: none"> • Make sure the extension reel is installed the correct way up. • Make sure the extension reel signal cable is correctly connected to the computer unit. • Check the extension reel voltages. Refer to “Extension Reel Voltage Checks” on page A-3.
A few seconds after power up, the display shows “No communications with MicroGuard®” in the load display window.	<ul style="list-style-type: none"> • Computer is possibly not running. • Check that the system program chip is correctly inserted. • Check that all LEDs within the computer are lit and that the communications LED (D6) is flashing; If not replace system chip. • Check the display cable for damage.

System Schematic



Terminal Block Positions and Functions



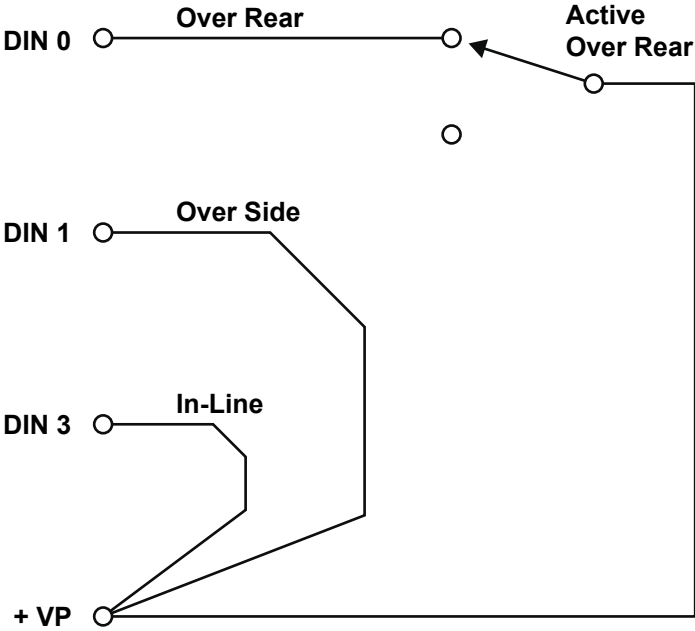
CABLE 1: Power and FKO Connections		
Color	Function	Connection
Black	System Ground	JP3-1 (Battery -VE)
Red	System Power	JP3-2 (Battery +VE)
Jumper	System Supply	JP3-3 (Battery +VE)
	Power Feed to FKO Relays	JP5-1 (FKO In)
Green	FKO Output to Mach. Solenoids	JP5-2 (FKO Out)
	Not Used	JP5-3 (RLY3 NO)
	Not Used	JP5-4 (RLY3 NC)

CABLE 2: Display Connections		
Color	Function	Connection
White	Communication A	JP12-1 (Display Data A)
Green	Communication B	JP12-2 (Display Data B)
Blue	Reset	JP12-3 (Reset)
Red/Yellow	+ Power	JP12-4 (DSPLY 1 PWR)
Black/Orange	- Power	JP12-5 (DSPLY 1 GND)
	Not Used	JP12-6 (DSPLY 1 GND)

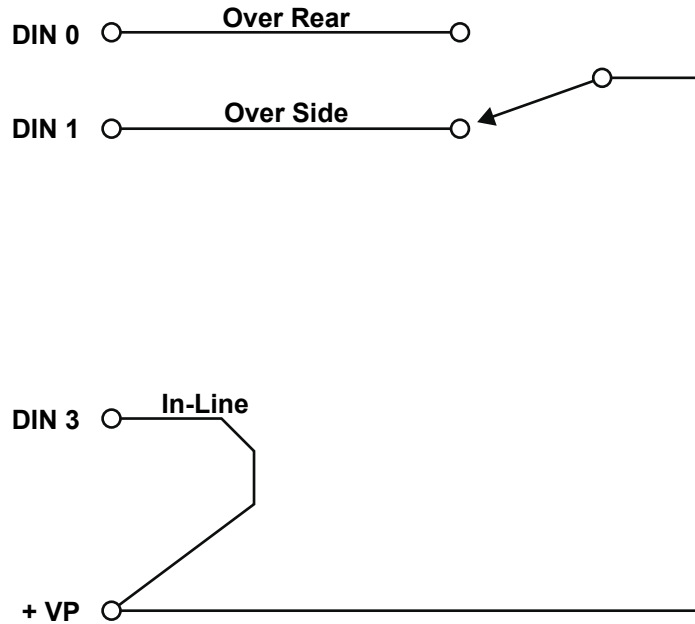
CABLE 3: Swing Connections		
Swing Switch Connections		
Color	Function	Connection
Green	Rear	JP9-1 (DIN0)
White	Side	JP9-2 (DIN1)
	Front	JP9-3 (DIN2)
Black	Bet. Tires in-Line Front/Rear	JP9-4 (DIN3)
Red	+VP	JP9-5 (SW PWR)
		JP10-1 (DIN4)
		JP10-2 (DIN5)
		JP10-3 (SW PWR)
Swing Pot Connections		
		JP11-1 (Positive Drive)
		JP11-2 (Negative Drive)
		JP11-3 (Swing Signal "A")
		JP11-4 (Swing Signal "B")

Suggested Swing Connections

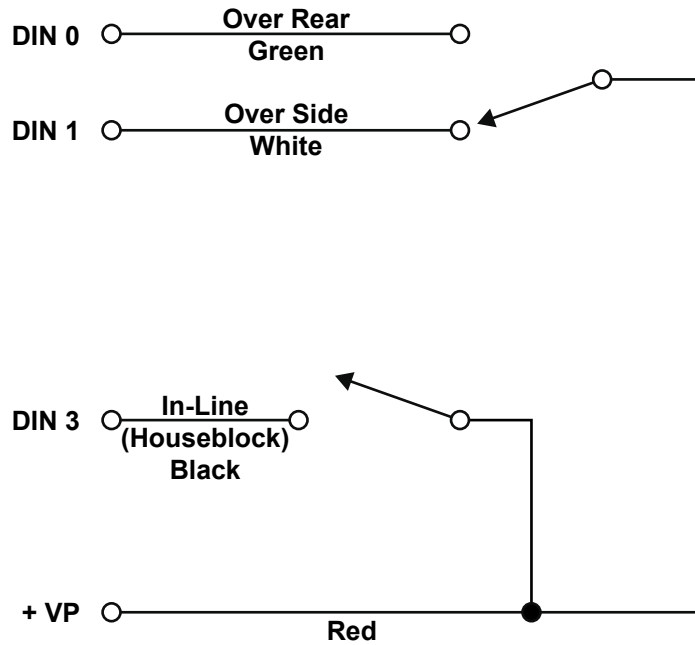
Over Rear Switch Only



Over Rear/Over Side Switch



Over Rear/Side & In-Line/Houselock



CABLE 4: Extension Reel Connections		
Color	Function	Connection
Black	ATB Switch Feed (2)	JP8-1 (ATB FD)
White	Extension Sensor Signal	JP8-2 (BM EXTN SIG)
Green	Angle Sensor Signal	JP8-3 (BM ANG SIG)
Brown	ATB Switch Signal (1)	JP8-4 (ATB SIG)
Red	+ Sensor Drive	JP8-5 (BM SNSR +DR)
Blue	- Sensor Drive	JP8-6 (BM SNSR -DR)



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