Safety Instrumentation

W3100
Rated Capacity Indicator
Calibration Manual

For
Telescopic cranes with hoist rope load sensors

(frame S1TDS onward)

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1.0 INTRODUCTION

1.1 System

The Wylie W3100 Rated Capacity Indicator is a Load, Angle, Radius, Lifting capacity and Anti-Two-Block Indicator. A display near the operator gives information to remove the need for guesswork when using the crane. The system can also be set with limits by the operator to warn of an accidental manoeuvre into an unwanted area.

1.2 System Intelligence

The system is “microprocessor based”, meaning that there is a computer inside the box together with operating software. The software is divided into two parts, each having a distinct mode, the normal operating mode and the calibration mode.

The normal mode is the normal operating status of the unit when turned on. It is the only mode that the crane operator needs to know. In this mode the operator is able to read the hook load, safe working load, radius, angle and current duty selected. The operator is also able to set the limits, select the hoist, parts of line and boom configuration.

The calibration mode, which allows calibration of the sensors, the radius and other variables are accessed by pressing a group of keys on the keypad. A password is required to be entered before to get the calibration mode for the first time. No other equipment is necessary to calibrate the system.

1.3 Adaptability

The system is designed to be fitted on any crane, lattice or telescopic boom, and with 1 or 2 hoists. Thus its components can vary substantially from one machine to another.

The software in this system is designed to work on telescopic cranes with hoist rope tension sensors; other software versions are available.

The heart of the W3100 is the display unit. This box contains all the electronic components required to convert sensor signals into the meaningful information for the operator.

The other components are the Load Sensors, Angle Sensor, Extension drum and the Anti-Two-Block switches. All the above are connected to the display unit to provide basic data. Junction boxes are also sometimes used to reduce the amount of wiring going to the display box.

2.0 HOW THE INDICATOR WORKS

2.1 Load Sensor(s)

The load sensors can vary from a wide range of strain-gauged load cells fitted either in the dead end of the hoist rope or built into a deflector sheave assembly or multi sheave dynamometer. In all cases the electrical output from the load cell is proportional to the tension in the load rope of the crane. Separate load sensors are fitted to the main and auxiliary hoists on the crane as appropriate.

2.2 Amplifier

An amplifier is used when the distance between the load cell and the control unit is too high, generally more than 15m. Beyond this distance, radio waves and internal resistance of the cable may noticeably affect performance. An amplifier is also used when signal wires of other devices like angle and length sensors pass through slip rings.

The amplifier not only amplifies the sensor signal, but also converts it from a voltage to a current that is then no longer susceptible to external interference.

It is important that the following instructions are adhered and thus failure to do so may result in incorrect calibration of the system

2.3 Angle sensor

The angle sensor is a pendulum driven, high precision potentiometer that constantly monitors the boom angle relative to true horizon.

2.4 Anti-two-block switch

The Anti-Two-Block switch is a spring-loaded switch. It is attached to the boom tip on one end and to a chain leading to a weight assembled around the hoist line at the other end. When the hook block lifts the weight, the switch becomes disengaged and the signal is cut.

2.5 Length Sensor

The length sensor is a potentiometer, which is located inside the extension drum fitted on telescopic cranes. As the boom extends, the drum unwinds and the potentiometer is driven via a gear train. The output is proportional to the boom extension.

2.6 Display box

The display includes both the operator display panel and the processing unit where the sensor signals are read and computed to determine the load. The results are then displayed to the operator using a liquid crystal display screen and indicator lights. The display is composed of two sections: the I/O board and the CPU board.

2.6.1 The W3100 input/output board (I/O Board)

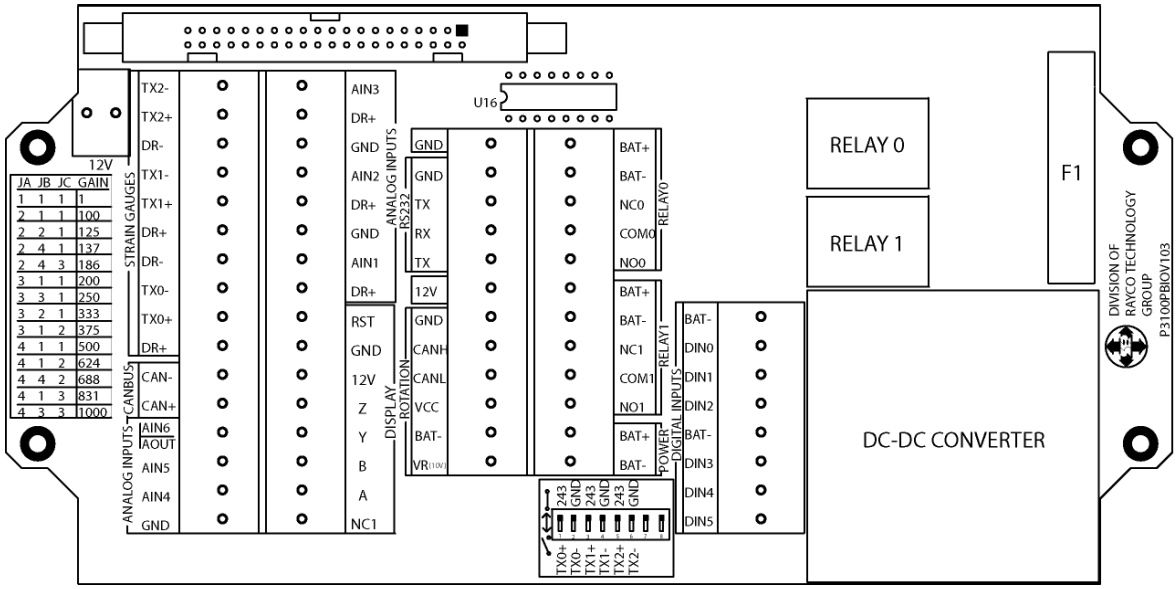
The input/output (I/O board) board includes all of the wire connections. On this board, signals are conditioned to be legible for the processor, and the power supply voltage is conditioned from an input range of 11 to 28 VDC to 5 VDC to supply both the processor and the sensors.

The reduced voltages and the processed signals from the sensors are transmitted to the CPU board via a flat ribbon connector. This connector can be unplugged when the power is OFF by pulling open the side clamps of the connector on the board.

Also on this board is one fuse, F1, which protects the supply voltage to the unit. A 2 amps 3AG fuse is needed to replace it. There are dry contact relays for lockout and external alarm. They have a 2 amp 24 VDC rating and may be used to control a slave relay. The terminals available are common (COM), normally open (NO) and normally closed (NC).

There is a serial communication port RS 232 on the terminal identified as RS232. This port is for future use.

View of W3100 i/o Board



Connections description of W3100 i/o Board

Signal	**Description**	**Signal**	**Description**
BATT+	Power Supply (+) (Power)	DIN0	Digital Input 0 (ATB)
BATT-	Power Supply (-) (Power)	DIN1	Digital Input 1
TX0+	Positive Signal of load #1 sensor	DIN2	Digital Input 2
TX0-	Negative Signal of load #1 sensor.	DIN3	Digital Input 3
TX1+	Positive Signal of load #2 sensor	DIN4	Digital Input 4
TX1-	Negative Signal of load #2 sensor	DIN5	Digital Input 5
TX2+	Positive Signal of load #2 sensor	NC0	Normally closed contact of relay 0
TX2-	Negative Signal of load #2 sensor	NO0	Normally open contact of relay 0
DR+	Supply (+) for sensor	COM0	Common contact of relay 0
DR-	Supply (-) for load Sensor	NC1	Normally closed contact of relay 1
AIN1	Signal from Boom Angle Sensor	NO1	Normally open contact of relay 1
AIN2	Signal from extension sensor	COM1	Common contact of relay 1
AIN3	Analog input 3 (Not used)	CANH	Canbus (Not used)
AIN4	Analog input 4 (Not used)	CANL	Canbus (Not used)
AIN5	Analog input 5 (Not used)	VCC	Canbus (Not used)
AIN6	Analog input 6 (Not used)	VR+	Canbus (Not used)
GND	Supply (-) for angle & Ext. Sensor	AOUT	Analog Output (Not used)
TX	RS-232 (Not used)		
RX	RS-232 (Not used)		
12V	RS-232 (Not used)		

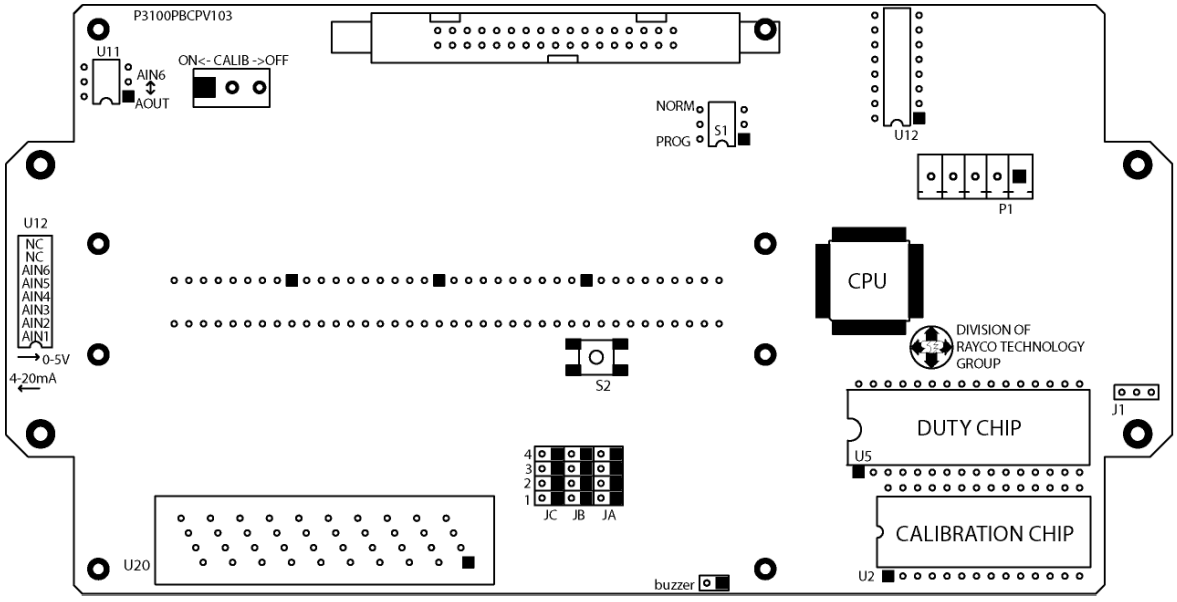
2.6.2 The W3100 CPU board

The Central Processing Unit board reads all the sensor signals delivered from the I/O board. In the centre of the board is located a multiplexed amplifier which conditions load cell input. This board can multiplex 3 load sensor signals.

Using the stored calibration data, the CPU converts the signals into information for hook load. The CPU then compares the information with the set limits entered by the operator, and the current duty. The CPU will finally trigger the alarms if a limit is reached or lockout output if overload or Two-Block situation is sensed.

This board is the operator interface. It carries two alpha-numerical Liquid Crystal Display (LCD) which provides information such as hook load, boom angle, preset limits, failure messages, hoist used and parts of lines, and also the processing circuitry for the 8 button keypad.
The Gain setting is located on this board and is denoted JA, JB, and JC. Three small jumpers are used to configure it. The default value is 333. The gain table is noted on the i/o Board and given in section 3.3.1.

View of the W3100 CPU Board



3. INSTALLATION OF THE W3100

3.1 Load Sensor

Install the load sensor/dynamometer in accordance with any drawings provided separately paying particular attention to the effects of changing boom angle.

3.2 Anti-Two-Block switch

If two switches are to be used at the same time, make sure the proper switch or junction box is used at the boom tip.
If only one switch will be used and has to be moved from the main tip to the jib tip, it can be done using an extension wire
No extra wiring is needed, since a standard connector is supplied for the switch. If a junction box is used, wire according to the supplied drawing.

3.3 Display

The display should be located at the front of the cab, where it is readily visible from the operator's control position. Take care not to obscure any displays, control levers, switches or the operator view of the load. Leave sufficient room for the sensor wires to be fed to the bottom of the display.

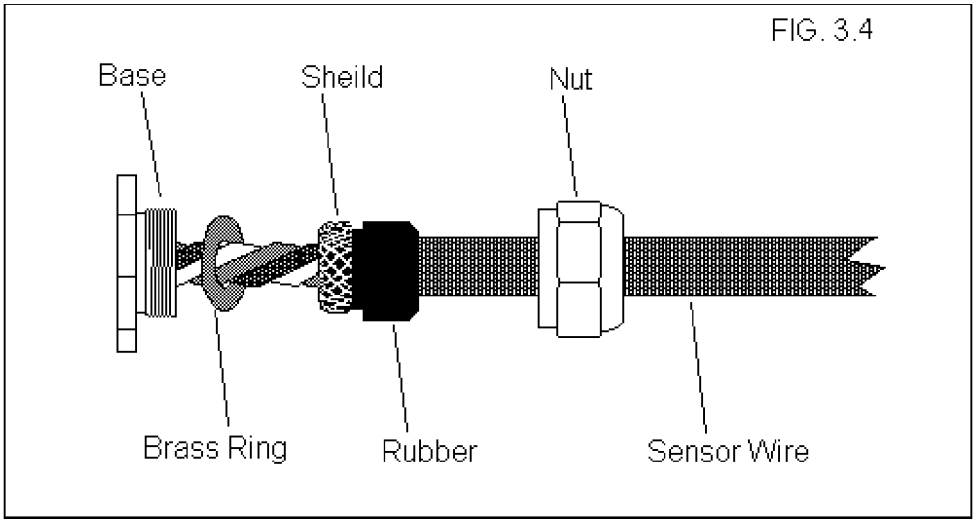
If the unit is pre-wired with connectors, simply plug in the connectors. If the unit is not pre-wired, use the following instructions.

Loosen the four top screws and flip the cover over the box. Proceed gently in order not to damage the wires or the keypad.

Wire according to the supplied drawing. Make sure all connections are made properly and completed before powering the system. When stripping wires, do not drop any wire ends or debris into the box.

All cable screens should be grounded to the glands of the display box only. Fold the screen over the rubber sleeve as shown in the diagram below. Use the brass ring.

FIG. 3.4



Power supply must be from 11 to 28 Volts DC only. If not available, an external power supply to convert to 12 Volts DC is required. The power lead must be able to sustain a minimum of 11 Volts with a current of 5 amps if the unit is connected to a lockout device.

Lockout wires should not load more than 2 amps on the internal relay.
No wires should pass near a radio antenna. All wires must be shielded.
All wires must be fed away from mechanical parts, keep a minimum bending radii of two inches when static and 4 inches when moving.

The lockout connection is according to your lockout configuration. Safe operation (without alarm) gives a relay status of COM-NO. When an ATB (related to Input DIN0) or Overload condition is detected, the relay status will change to COM-NC.

The ATB signal is a Pull-Up signal during normal operation the signal must be grounded. When an ATB condition occurs, the ground on ATB Signal must be released. If the ATB is not used, a jumper must be installed between ATB and BAT-.

4.0: BEGINNING CALIBRATION OF W3100

The calibration section of this manual will guide the technician and explain the procedures to follow in order to rapidly and efficiently calibrate the crane and the system.

The calibration mode is a separate entity of the W3100 system. It is totally independent of the regular operating mode (normal mode) as if it were a different system. The purpose of the calibration mode is to adjust the angle sensor, the length sensor, the pressure sensors, the radius and numerous other factors or set points. Calibration mode can be accessed by pressing the MODE button and is protected by a 5-digit password.

4.1 Sensors check before calibration

Before beginning calibration, it is important to verify that all the sensors are connected properly, that the control unit receives a signal from each sensor, that the signal received from each sensor is within the receiving limits from the minimum to the maximum of the sensor's working range and that each sensor's signal is optimized to provide best resolution and accuracy.

Access the diagnostic menu by pressing the "Display" (#3) button and then choose diagnostic (showing on the upper LCD display) using the arrow keys (button #3 for scrolling up and button #6 for scrolling down). When the correct mode is highlighted, press the "Select" Key (#8) to access it.

AIN1 is the voltage received from the angle sensor. At zero degrees, the voltage should be approximately 1.7 volts and at 70 degrees, the voltage should be approximately 3.0 volts. Refer to the installation drawings and instructions. The overall change in voltage from zero degrees to 70 degrees should be at least 1.0 volt.

AIN2 is the voltage received from the length sensor. Fully retracted, the voltage should be around 0.5 volts and fully extended the voltage should be approximately 1 volt per 34ft + the initial 0.5 volts. Refer to the installation drawings and instructions.

DR+ is the supply voltage for the angle and length sensors. This value should be very close to 5 volts at all times.

Scroll down with button #6 until "MAIN" or "AUX" are on the screen. "Main" is the signal seen by the TX0 input, which is the main hoist sensor. "AUX" is the signal seen by the TX1 input, which is the auxiliary hoist sensor. The display reading is in bits. The maximum number that can be reached is1023 bits. The sensor with no load applied should range from 15 to 100 bits. With full load the reading should range between 750 and 950 bits.

IF "MAIN" (TX0) IS LOWER THAN 750 BITS OR HIGHER THAN 950 BITS, THE AMPLIFIER GAIN NEEDS TO BE ADJUSTED. TO ADJUST THE INTERNAL AMPLIFIER GAIN REFER TO 4.1.1 OF THIS MANUAL.

4.1.1 Internal amplifier setting

4.1.1.1
Set the display to the relevant hoist and correct number of parts. Enter the Diagnostic menu and select load sensor output (in bits). Refer to the Operator Manual for further details of diagnostics.

4.1.1.2
The display will show:

Main: aaa bb hoiststop

Where «aaa» represents the signal in terms of bits measured at the load input, «bb» represents the load calculated by the system. With no load suspended on the hook, the signal should be between 50 and 300 Bits. When lifting a load that generates maximum line pull, the signal should never exceed 950. If the voltage is lower than 750 bits, the gain factor must be increased. If the value exceeds 950 bits, the gain factor must be decreased. Refer to the following table for the internal amplifier's jumper settings and their resulting gain factors.

If the displayed value is outside the required range, then adjust the gain settings on the CPU board according to the table below.

JA	JB	JC	GAIN
1	1	1	1
2	1	1	100
2	2	1	125
2	4	1	137
2	4	3	188
3	1	1	200
3	3	1	250
3	2	1	333
3	1	2	375
4	1	1	500
4	1	2	624
4	4	2	688
4	1	3	831
4	3	3	1000

If the amplifier gain required changing, recalculate the Vmax value to verify that the new settings are correct.

Repeat the gain calculations for each winch's load sensor, by returning to the normal operation's menu, selecting the proper winch and then repeating the above procedure for that winch.

All load sensor inputs use the same internal amplifier/gain setting, so the final jumper setting must be made so that none of the winches' load sensor inputs exceed 875 bits. This means it may be necessary to have one or more of the load sensor inputs with a lower gain then it is calculated to prevent another load sensor input from exceeding 875 bits.

4.2 Memory protection

The W3100 system has both a hardware and software key to protect the data calibration. The hardware key protection is implemented by the calibration switch located on the CPU board. When you slide the calibration switch to the ON position, the hardware protection is disabled and you are allowed to enter calibration data in the memory bank.

MAKE SURE THAT THE CALIBRATION SWITCH IS SET TO THE ON POSITION BEFORE STARTING CALIBRATION OF THE SYSTEM. WHEN THE CALIBRATION IS OVER SET THE CALIBRATION SWITCH TO OFF POSITION TO PREVENT YOUR CALIBRATION DATA FROM BEING CORRUPTED.

4.3 Enter calibration mode

To enter into the calibration mode, first make sure you are in the normal mode. If you see the boom configuration on the upper LCD display, you are in the normal mode. If you are not in the normal mode, press ESC (#7) as many times as necessary to reach it. Once in the normal mode, press "Display" button (#3) and select "CALIBRATION" on the upper LCD display using the SCROLL UP (#3) button. When calibration is highlighted, press SELECT (#8) button to open this mode.

If it is the first time since the last power up or reset of the system that the calibration mode is accessed, a screen will appear asking you to enter your password. The calibration menu is protected to prevent your data from being modified by the crane operator. Enter your five-digit password to go directly to the first screen of the calibration menu.

By default the password is : **1-2-3-4-5** unless asked for a specific password.

Note: When you do calibration for the very first time it is recommended to initialize memory Bank A as instructed in section «7 - Memory management».

4.4 Calibration mode presentation

The calibration mode is organized in a linear sequence. A series of 18 menus or sections will appear. The SCROLL UP (#3) or SCROLL DOWN (#6) buttons will allow you to scroll through these menus. Once in the calibration mode it is possible to scroll and access any stage of the calibration.

4.5 Disable unused inputs

One of the first things you may want to do is to turn off some of the system's inputs not used for your specific installation.

To disable an input or output proceed as follows:

1-Scroll UP or DOWN to highlight «18-enable/disable i/o» and push the SELECT (#8) button to enter the menu.
2-Scroll UP or DOWN to highlight the desired input or output.
3-Push the SELECT button to toggle the input or output to enable or disable.
4-Repeat for all unused inputs or outputs.
5-Push the ESCAPE (#7) button once to return to the main calibration menu.

4.6 System configuration

Before beginning the system calibration, it is important to enter basic information that the calibration function needs to use. This is done using specific menus:

«14 - Calibration data»
«15 - Limit setting»
«16 - Interpolation»
«17 - Calib. Unit»

These menus have been placed at the end because they are only used at the beginning of the calibration process and the data are normally set once.

4.6.1 Calibration Unit

This is the very first thing to set after having disabled your unused inputs. You have the choice of «imperial» which is expressed in feet and 1000 lbs or «metric» which is expressed in meters and tons.

Be careful, when you have calibrated or entered a dimension, it will be impossible to change the calibration unit unless you do a complete initialization (init all). To change the calibration unit, just push the SELECT (#8) button once the «17-Calib. unit» is highlighted. Watch the state display showing the actual unit of calibration.

4.6.2 Interpolation

Used to interpolate the safe working load between operating radiuses. To change the status of the interpolation (On/OFF), just push the SELECT (#8) button once the «16- Interpolation» is highlighted. Watch the state on the upper LCD display showing the actual status of the interpolation.

4.6.3 Limit setting

Used to set the approach limit for: Angle, Length, radius or height. To change the value

4.6.3 Calibration Data

The calibration data menu is a sub-menu used to access 17 different variables used in various system operations.

These variables are :

-Slew offset: The distance between the centre of rotation of the crane and the boom base pin in units and tenths of units. The value is negative if the boom base pin is behind the centre of rotation. Use the set button #6 until the value becomes negative. E.G: 2 feet, 4 inches on a telescopic crane becomes minus 2.3ft
(-2.3)

-Sheave radius: The radius of the boom head sheave. It is used to compensate radius when lifting with one part of line (fall).

-Height offset: The height offset is the distance between the ground and the boom head highest point. Level the boom (0°) to mea sure this parameter.

-Rope limit main: (Single line pull) This is the maximum line pull permitted per part of line on the main hoist according to the chart. This value multiplied by the parts of line is used as the load limitation if lower than the rated capacity obtained from the load chart for the current crane configuration and radius or angle.

-Rope limit aux: (Single line pull) This is the maximum line pull permitted per part of line on the auxiliary hoist. This value will be used as the capacity if it is lower than the radius capacity.

-Rope limit whip1: (Single line pull) This is the maximum line pull permitted per part of line on the first whip hoist. This value will be used as the capacity if it is lower than the radius capacity.

-Max parts of line: (Max number of falls) Set the maximum number of parts of lines. This will apply to all hoists when pressing the PARTS button, the number of parts will increase up to the set number and return to one.

-Percent per part: This value allows for departure of the hoist line capacity when reeving with more than one part. The total rope capacity will derate by the percent set multiplied by the number of parts of lines minus one (-1).

-Gap for extension: The zero extension is calculated by the W3100 for each boom configuration. If you see this message when doing P1/P2: «not fully retracted», you may want to increase this variable to enlarge the correct zone for zero extension.

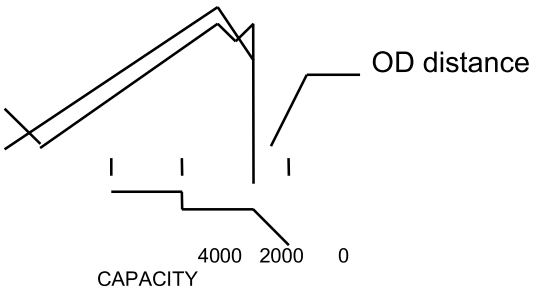
-Rig angle: This sets the angle at which the rigging is permit

-Alarm 1: This sets the approach alarm warning.

-Alarm 2: This sets the maximum load limit (over alarm warning).

-Alarm 3: This sets the lock-out activation limit (cut-off alarm warning).

-Outside duty radius: This variable represents a transition distance between the last radius rating and zero capacity. If the operator is lifting a load at the outermost radius on the chart, the alarm may sound even if there is no overload if the displayed radius exceeds the chart radius even by one inch. The OD (OUT of DUTY on RADIUS) will allow a straight line capacity from the chart value to zero and stretched over the distance set by this variable.



-Outside duty angle: The outside duty angle variable applies to angle based charts and allow for a smooth transition from the lowest degree capacity on the chart to zero capacity. This variable is set in degrees.

-Outside duty length: The OD length variable represent the permitted zone where the specific boom length based capacity chart is still accepted. This is a very important factor when the displayed boom length exceeds the maximum boom length on the chart. The distance entered for this variable extends the acceptable boom length for the maximum boom length on the chart.

-Inside duty length: This variable fulfills the same tasks as the outside duty length variable but applies to the minimum retracted boom length acceptable within the retracted boom length chart.

To modify one of these variables in the calibration data menu proceed as follows:

1. Scroll UP or DOWN to highlight the «14-calib. data» line and push the SELECT (#8) key to enter the menu.
2. Scroll up or down to highlight the desired variable.
3. Push the SELECT button to edit the variable.
4. Use the UP or DOWN button to change the value.
5. Push the SELECT button to record the change.
6. Repeat 1 to 5 for all desired variables.
7. Push the ESCAPE button to return to the main calibration menu.

5.0: SENSOR CALIBRATION

enter calibration mode

5.1 Angle calibration

5.1.1 Zero angle

1- Scroll UP or DOWN to highlight the «1- select sensor» line and press the SELECT (#8) button.
2- Scroll UP or DOWN to choose the angle sensor and press the SELECT button, wait for system confirmation.
3- Scroll UP or DOWN to highlight the «2- Zero sensor» line and press the SELECT (#8) button.
4- Boom down to zero degrees (main boom parallel to ground). The angle is in degree and the sensor's value is in bits. This sensor's value must be above 100.
5- Press the SELECT button to edit the zero angle value using Scroll UP or DOWN buttons.
6- Press SELECT again to confirm the zero and wait for system confirmation.
7- Push the ESC (#7) button to go back in the main calibration menu.

5.1.2 Span angle

1- Scroll UP or DOWN to highlight the «2-span sensor» line and press the SELECT (#8) button.
2- Boom up to 70 degrees or higher. The sensor's value should be approximately 600 bits at 70°.
3- Press the SELECT button to edit the span value.
4- Use the UP or DOWN button to change the span value. Enter the present boom angle measured with an inclinometer.
5- Press the SELECT button to confirm the value.
6- Press the ESC (#7) button to return to the main calibration menu.

Hint:
An important aspect of the display in bits is to verify if the signal is variable throughout the entire working area of the boom angle and that the resolution is above 3 bits per degree.

5.2 Extension calibration

5.2.1 Zero extension

1- Scroll UP or DOWN to highlight the «1- select sensor» line and press the SELECT (#8) button.
2- Scroll UP or DOWN to choose the Length sensor, press the SELECT (#8) button and wait for system confirmation.
3- When the change is approved Scroll UP or DOWN to highlight the «2- Zero sensor» line and press the SELECT (#8) button.
4- Retract the boom completely. The sensor's value must be approximately 100 (0,50 volts; adjust the potentiometer inside the cable reel if necessary).
5- Press the SELECT button to edit the zero value (when the boom is completely retracted the value must be set to zero).
6- Push the SELECT button again to confirm the value.
7- Press the ESC button to return to the main calibration menu.

5.2.2 Span extension

1- Scroll UP or DOWN to highlight the «3-span sensor» line and press the SELECT button.
2- Extend the boom completely. The sensor's value should be 150 bits above the zero value. Refer to the crane's main boom chart. Enter the difference between the fully extended main boom and the fully retracted main boom. Example: A fully extended boom of 81 feet minus a fully retracted boom of 34 feet = 47 feet. You enter 47.0 at span extension.
3- Push the SELECT button to edit the span value.
4- Use the up or down button to change the span value.
5- Press the SELECT button to confirm the value.
6- Press the ESC button to return to the main calibration menu.

5.3 Load hoist calibration

It is recommended to always hoist and stop the load smoothly when calibrating load on the W3100 system. This is to eliminate any errors in the load reading due to frictional effects. The frictional effect can be observed on dynamometer (line rider) systems, the displayed load will decrease when lowering the load and increase when hoisting the load. On dead-end load cell systems, the displayed load increases when lowering. These friction effects can be minimised by ensuring boom head sheaves and hook block are properly greased.

The system does not write the ZERO LOAD into the permanent memory until the SPAN LOAD calibration has been completed. Is a ZERO LOAD calibration is done, then a SPAN LOAD calibration must also be done.

5.3.1 Preparation for load calibration

Select hoist to be calibrated.

1. Scroll UP or DOWN to highlight the «4- select hoist» line and press the SELECT (#8) button.

2. Scroll UP or DOWN to choose the hoist sensor (Main, Aux or Whip) that you want to calibrate, press the SELECT button and wait for system confirmation. If it is not possible to change to the correct hoist, the system may not be set-up for multiple hoist sensors, refer to section 4.5 to configure the system for the proper number of hoist.

5.3.2 Part of line selection

Scroll UP or DOWN to highlight the «5- Parts of line» line and press the SELECT (#8) button. The number of parts of line will flash. Scroll UP or DOWN buttons #3 and #6 to set the value to the number of parts of line reeved and press the SELECT (#8) button. Verify that the number of parts of lines is shown correctly. If it is not possible to change to the correct number of parts of line refer to section 4.6.3 to configure the system for the maximum number of parts of line for the crane.

At this point, the load sensor is ready for calibration. Get the crane ready to lift the calibration loads. The calibration loads should consist of at least two loads, a small load and a large load. The addition of a third load allows for checking the mid-range calibration of the system. The large calibration load should provide between 50-90% line pull on the hoist line, while using as many parts as is feasible. If a large enough load cannot be found, the crane can be reeved to fewer parts to increase the line pull for a given calibration load.

EXAMPLE:

A W3100 System is being calibrated on a crane that has a single-part line pull of 5,000 Kg and a maximum reeving of 12 parts. The available “known” test weight is 25,000 Kg. To achieve the best calibration, the crane should be reeved to 6 parts.

This will achieve 83% of maximum line pull when the calibration load is lifted. The crane could be reeved to as many as 10 parts and still be within the range of 50-90% of line pull. This would, however, not provide as good a calibration as would the 6 parts reeving.

The smaller load should be approximately 5-10% of the larger load. In the example above, the appropriate small load would weigh 1,000-2,500 Kg.

In the same example, a typical mid-range load would weigh 9,000 – 15,000 Kg.

NOTE: *The weight of the calibration loads and any device used for lifting the calibration loads, including the hook block weight, must be known accurately. The accuracy of the calibration is dependant upon the accuracy of the weights used during calibration*

5.3.3 Zero Load

1. Scroll UP or DOWN to highlight the «5- Zero load» line and press the SELECT (#8) button.
2. Hoist the small calibration load and stop. Press the SELECT (#8) button again and the number in the upper right corner of the lower LCD display will flash. Use the Scroll UP or DOWN buttons #3 and #6 to adjust the displayed weight to match the total load weight suspended (load, hook block, slings, hoist line below boom tip – if applicable, etc). Once correct, press the SELECT (#8) button to accept the value, and wait for system confirmation.
3. Press the ESC (#7) button to return to the main calibration menu.

5.3.4 Span Load

1. Scroll UP or DOWN to highlight the «5- Span load» line and press the SELECT (#8) button.
2. Lift the large calibration load smoothly and stop Press the SELECT (#8) button again and the number in the upper right corner of the lower LCD display will flash. Use the Scroll UP or DOWN buttons #3 and #6 to adjust the displayed weight to match the total load weight suspended (load, hook block, slings, hoist line below boom tip – if applicable, etc). Once correct, press the SELECT (#8) button to accept the value, and wait for system confirmation.
3. Press the ESC (#7) button to return to the main calibration menu.

5.3.5 Verify the load calibration

Return to SPAN LOAD and press the SELECT (#8) button. Verify the weight displayed against a minimum of 2 suspended calibration loads. Hoist and stop the load a minimum of 5 times at different heights, always hoist at a constant speed and stop as smoothly as possible. Once finished, press ESC (#7) to exit the menu selection without changing the calibration.

The weight displayed should be between 95% and 105% of the actual calibration load weight to meet the requirements of BS7262 but note other standards may require alternative calibrations.

If the large load reading is consistent but inaccurate, it is possible that a fluctuation or movement of the load during calibration has caused a load increase or decrease before the SELECT (#8) button was pressed. Repeat the procedure from 5.3.4 onward (Note: It is not necessary to leave the calibration mode to verify the weights being hoisted).

If the smaller calibration weight is incorrect, a bad value may have been entered at ZERO LOAD. If this happens, it is necessary to repeat the procedure from 5.3.3 onward.

6. RADIUS CALIBRATION

Each boom configuration must be passed through the following 5 steps in order to calibrate the radius. The main boom must be calibrated before any other boom configurations eg. manual, jib at 0 deg., jib at 10 deg, jib at 10 deg with manual, etc... The boom configuration is selected in Normal mode using «Duty» (#2) button.

All values should be set in metres or feet as defined on 4.6.1 Calibration Unit.

6.1 Preparation for radius calibration

6.1.1 Parts of line configuration

1. Scroll up or down to «5- Parts of line» line

2. Press the SELECT (#8) button, set the proper parts of line as reeved and press the SELECT (#8) button. This is to take account of the head sheave radius if only one fall is reeved since the ball is in front of the head sheave rather than under it.

6.1.2 Tare load configuration

1. Scroll up or down to «10- Tare Load » line and press the SELECT (#8) button.

2. Set the weight of the block as tare load. Press the SELECT (#8) button for editing. Use the Scroll UP or DOWN buttons #3 and #6 to adjust the displayed weight to match the Tare load. Once correct, press the SELECT (#8) button to accept the value, and wait for system confirmation.
3. Press the ESC (#7) button to return to the main calibration menu.

This is to account for the weight of the block as a load during unloaded boom deflection in menu «9- boom def. P3-4». Ignore the weight of the other block. If a jib is erected, ignore the weight of the jib. The jib will have to be either removed or left on the boom through to item 11 - LOAD BEND COR. Check the programmed configuration for details of whether or not unused equipment should be fitted for the calibration.

6.2 Main boom radius calibration

6.2.1 20° Retracted Boom

1. Scroll up or down to «8 – Boom Len p1-2 » line and press the SELECT (#8) button to get access. The lower LCD display will show the boom extension. If this is the main boom done for the first time, it will read 0.0. On the top right of the LCD, the boom angle is displayed.

2. As the menu instructs, boom down to between 15 and 20 degrees and fully retract the boom. If the angle or the boom length is incorrect, the display will indicate the expected values. If the message < not retracted > is displayed, the retracted boom length cannot satisfy the requirement. Try to retract the boom. If not, extend and retract it. If the displayed boom length is always above 0.2 feet, (60mm) press ESC (#7) and redo menu option «2 – zero sensor». Then return to «8 – Boom Len p1-2 » and verify menu Boom configuration for correct settings.

3. Once at the correct angle and extension, press the SELECT (#8) button. The radius will flash. Measure the actual radius and set the value on the display and press the SELECT (#8) button to request calibration. The system will scroll automatically to point P2: 60° Retracted Boom.

60º Retracted Boom

1. The displayed radius and boom length will be wrong, but don't worry. Boom up to between 60 and 65 degrees.

2. Press the SELECT (#8) button for editing. While the radius flashes, set the correct value. Press the SELECT (#8) button to request calibration. The system will scroll automatically to menu «9- boom def. P3-4».

60º 1/3rd Extension

1. Press the SELECT (#8) button to get access. Telescope out about 1/3 of the full extension of the main boom only.

2. Press the SELECT (#8) button for editing. The radius value displayed will flash. Measure the radius. It should be close to and greater or equal to the displayed radius. Enter the radius and press the SELECT (#8) button to request calibration. The system will scroll automatically to point 60º Full Ext. Note: If the length is improper, the system will indicate the acceptable length range. Continue to telescope until within the range and press the SELECT (#8) button.

High Full Extension

1. Extend fully the main boom only and measure the radius, It should be close to and greater or equal to the displayed radius.

2. Press the SELECT (#8) button for editing. The radius value displayed will flash. Enter the radius and press the SELECT (#8) button to request calibration. The system will scroll automatically to point P3 60º 1/3 Ext. Note: If the length is improper, the system will indicate the acceptable length range. Continue to telescope until within the range and press the SELECT (#8) button.

3. Press the ESC (#7) button to return to the main calibration menu

Loaded Boom Correction

1. Scroll to menu «11 – Load Bend Cor».
2. Press the SELECT (#8) button to get access.
3. Move the boom to the fully telescoped position and at an angle of between 60 and 70 degrees.
4. Lift a load between 50% and 90% of the SWL when fully telescoped and at the stated angle.
5. Measure the radius. It should be equal to or slightly greater than the displayed radius.
6. Press the SELECT (#8) button for editing, the radius value will flash. Increase the value to the new radius. Never decrease this value below the primary value calculated by the system.
7. Press the SELECT (#8) button to request calibration.

The radius is now calibrated for the main boom.

Repeat steps 6.2.1 to 6.2.5 for each jib duty. Using ESC (#7) button in the main calibration menu will return in normal mode for the selection of the boom configuration.

Note: When your calibration is finished Press ESC (#7) to return to the main menu and backup your calibration data using menu «12- BACKUP» and after set the calibration switch to OFF POSITION to prevent your calibration data from being corrupted.

7. SAVING CALIBRATION DATA

Scroll to menu «12- BACKUP». Press the SELECT (#8) button. The system will save the calibration in a spare bank called bank B. If in the next stages of calibration, an error is made, it will be possible with menu item 13 - MEMORY to discard the new changes and retrieve the previously saved calibration.

The use of this function is not necessary to store calibration. Calibration is saved when confirmed, and stored in the calibration bank A. This bank like bank B is a permanent EEPROM bank. Battery back up is not necessary.

7.1 Memory management

Scroll to menu «13 – MEMORY». Press the SELECT (#8) button to get access. The top display will indicate the status of both the memory banks A and B. A must read OK for the system to operate. By scrolling up and down, the bottom display will offer various options:

7.1.1 Copy memory A to B

By pressing the SELECT (#8) button, the contents of bank A will be copied into bank B.

7.1.2 Copy memory B to A

This option will copy the contents of bank B into bank A. All the data in bank A will be lost.

7.1.3 Swap Memory A and B

This option will place the contents of bank A into bank B and at the same time the contents of bank B in bank A. Both banks will be preserved but switched.

7.1.4 Init. Memory A

This option will obliterate all data from memory bank A. This should only be done when a system is installed for the first time or if an incompatible operating system is installed in the system. This must never be done during or after calibration.

7.1.5 Init. Memory C

This option will eliminate all configuration information (duty, number of fall, winch, etc) from memory bank C, and reset all variables to their default values. Initialisation must be done when a system is first installed, or if an incompatible operating system is installed in the display.