2.6f Radius Parameters for a Lattice Crane with Mast

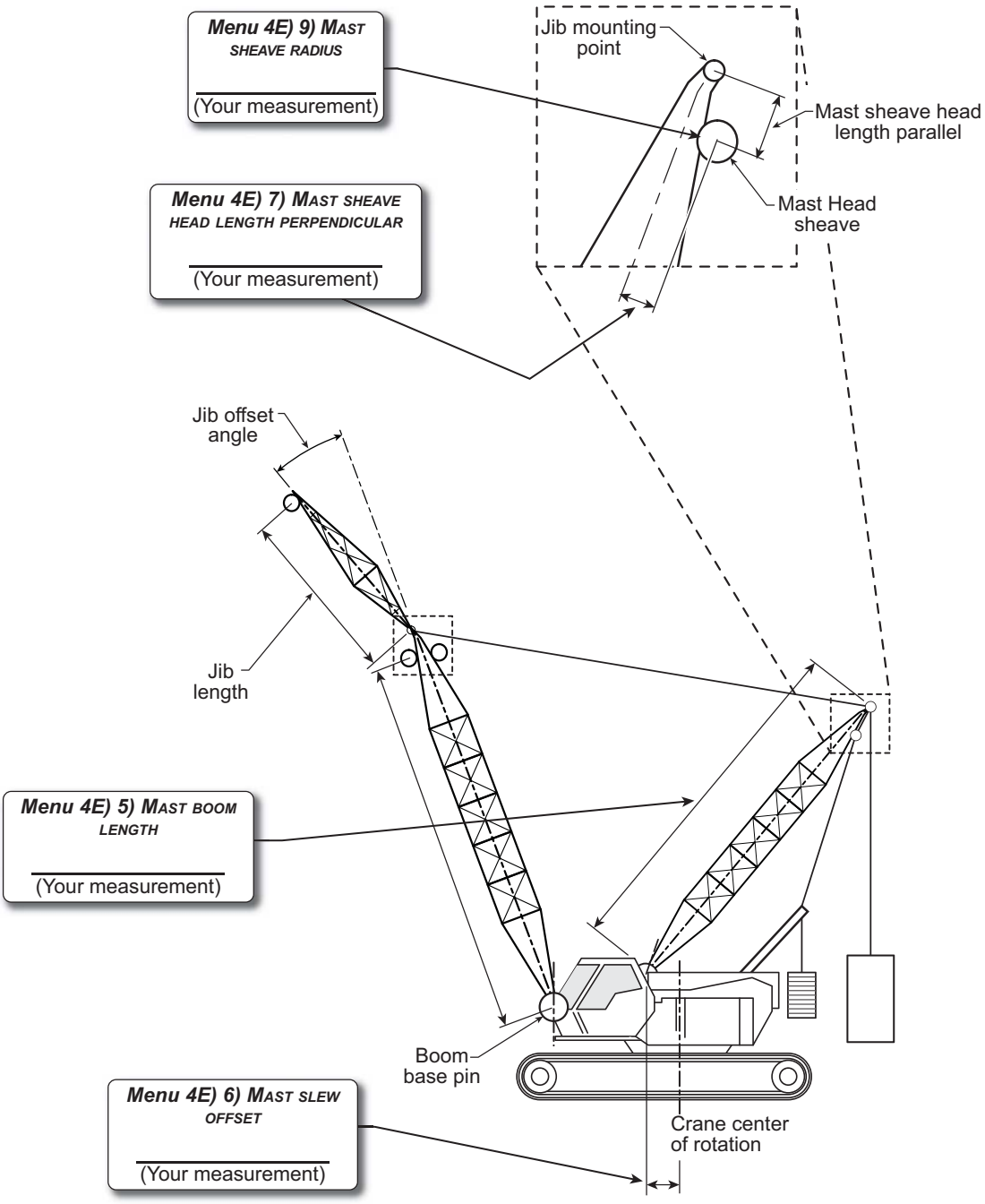


Figure: Advanced radius parameters - Lattice crane with Mast. Typical installation. Not to scale.

2.7 Wireless Wind Speed Sensor GS020

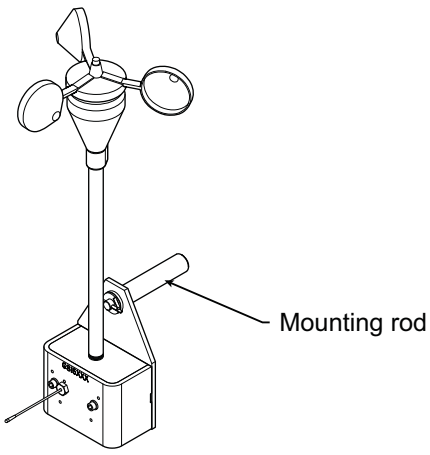


Figure: GS020 wireless wind speed sensor

1. Remove the mounting rod from the wind speed sensor.

> ***IMPORTANT!*** **Do not weld in proximity to *LSI* sensor/transmitters.**

2. Determine the mounting rod position.
   a. Install the mounting rod on the same side of the boom as the cabin mounted display, perpendicular to the boom, and at the highest point possible.
   b. The wind speed sensor must pivot freely on the mounting rod at all boom angles.

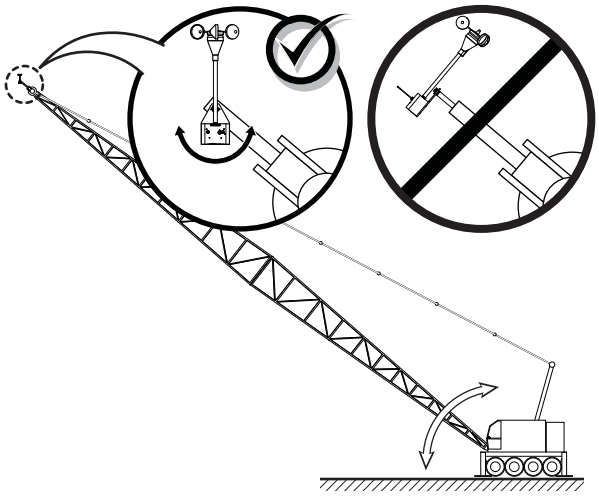


Figure: Swivel orientation

   c. The wind cups must be fully exposed to the wind and spin freely at all boom angles.

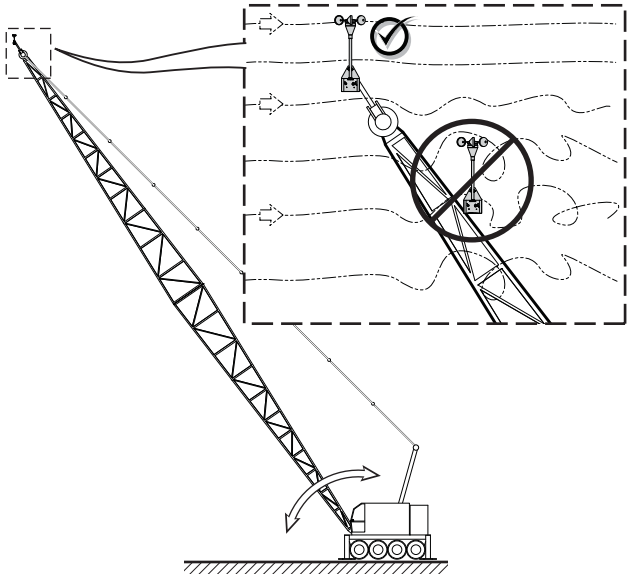


Figure: Wind clearance

   d. There should be a clear and unobstructed line of sight between the wind speed sensor antenna and the cabin mounted display unit.

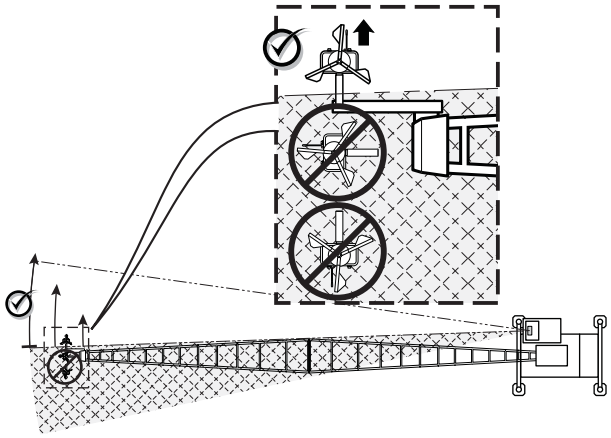


Figure: Radio line of sight - Crane top view

   e. The transmitter antenna should not contact any metal object.

Note: Angle iron can be used to extend the mounting position to be clear of the boom top.

3. Weld or screw the mounting rod to the boom at the selected position.
4. Re-position the wind speed sensor on the mounting rod, add the washer and secure with the cotter pin.

2.8 Wireless Load Pins

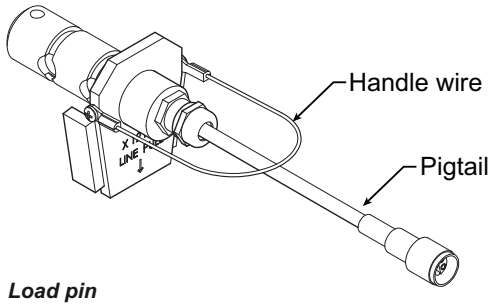


Figure: Load pin

IMPORTANT! **Do not pull on a load pin by the pigtail, pull on the handle wire.**

2.8a LP011, LP015, and LP026

1. Mount the load pin to the boom tip or block by replacing the pin of the wedge socket. The load pin is directional and must be oriented correctly to indicate load accurately. Install the pin so that the bracket embraces the wedge socket and prevents pin rotation.

Note: When installed at the boom tip the lot number can be read right side up and the "line pull" arrow points down towards the block. When installed at the hook ball or block, the lot number can be read upside down and the "line pull" arrow points up towards the boom tip.

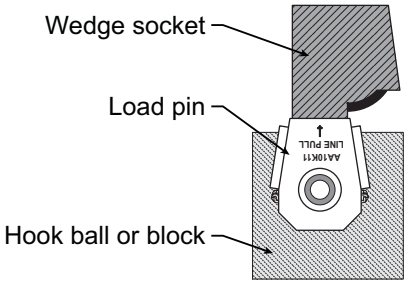


Figure: Load pin LP011, LP015 or LP026 - Installation on a single part block

2. Secure the load pin in place with a cotter pin or other suitable keeper device.

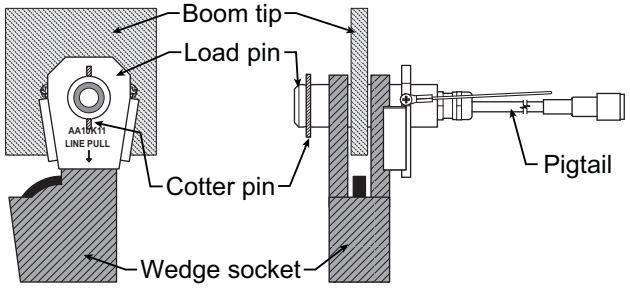


Figure: Load pin LP011, LP015 or LP026 - Installation at boom tip

2.8b Load Pin Transmitter GS001

1. Determine the transmitter mounting position.
   a. The load pin and transmitter pigtails must connect easily without stretching or kinking at all boom angles and working conditions. The jumper cable may be used between the load pin and transmitter to increase transmitter placement options.
   b. There must be direct unobstructed line of sight from the transmitter to the display; this may not be required on cranes with a maximum boom length less than 100 feet (33 metres).
   c. The transmitter antenna must not be in contact with any metal object.
2. Weld the mounting blocks where required.

IMPORTANT! **Do not weld in proximity to *LSI* sensor/transmitters.**

3. Mount the load pin transmitter on the mounting blocks.

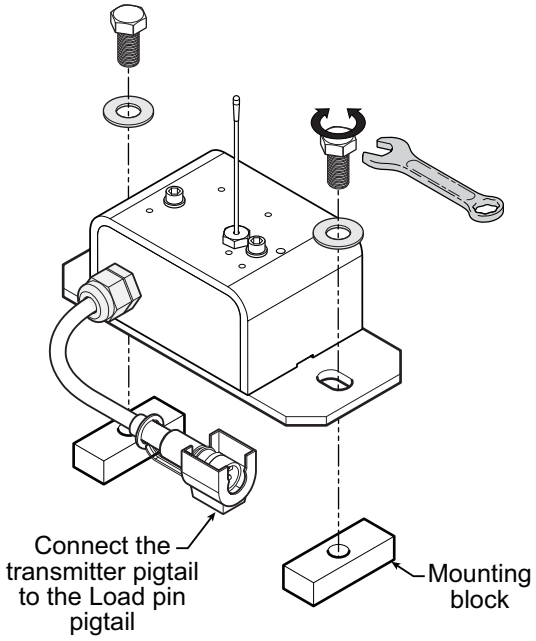


Figure: Install the load pin transmitter GS001

2.9 Line Riding Tensiometer

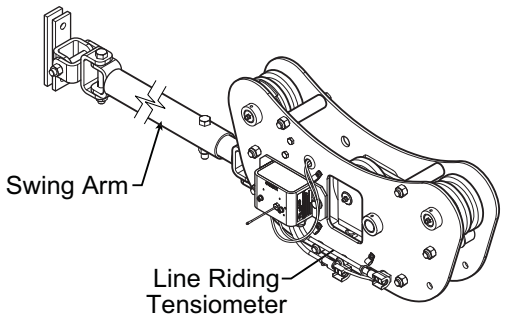


Figure: Line riding tensiometer

2.9a Line Riding Tensiometer Installation

CAUTION!

The Line Riding tensiometer must be held by the swing arm and the tension of the wire rope; do not fix the line riding tensiometer to the boom.

The Ratio of the distance between the line riding tensiometer and the hoist drum must be 18:1 as minimum to allow a normal winding on the drum.

The angle between the swing arm and the measured rope shouldn't exceed 30 degrees.

Two Landing Pads (Wooden cushion) must be added to allow line riding tensiometer sitting when the boom is down.

Nothing should limit free displacement of the swing arm & line riding tensiometer assembly at any boom angle or configuration.

Swing arm mounted

Application:

Most applications, mounted as far up the boom base as practical with the swing arm base attached near the tip of the butt section. This mounting allows the line riding tensiometer to follow the movement of the wire rope path.

Commentary:

Make sure that the swing arm is long enough to allow free movement at any boom angle.

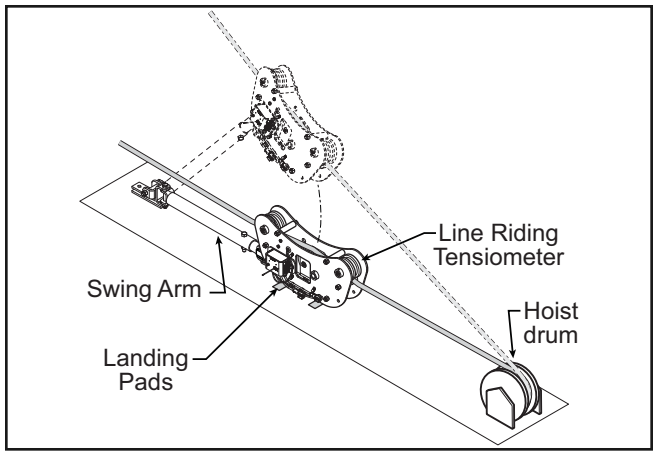


Figure: Typical installation (not to scale)

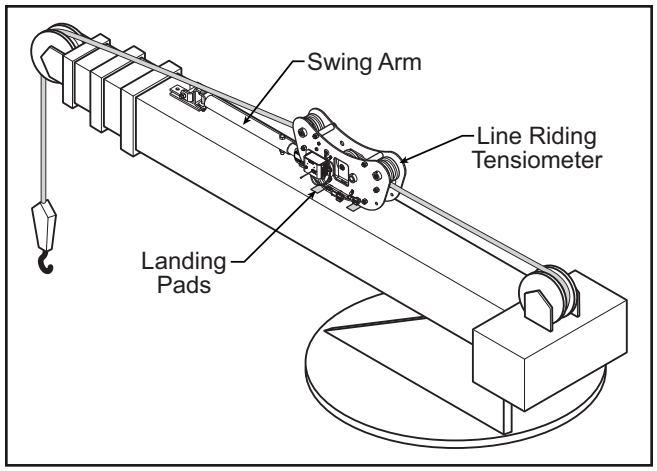


Figure: Example of a typical installation on a telescopic boom crane (not to scale)

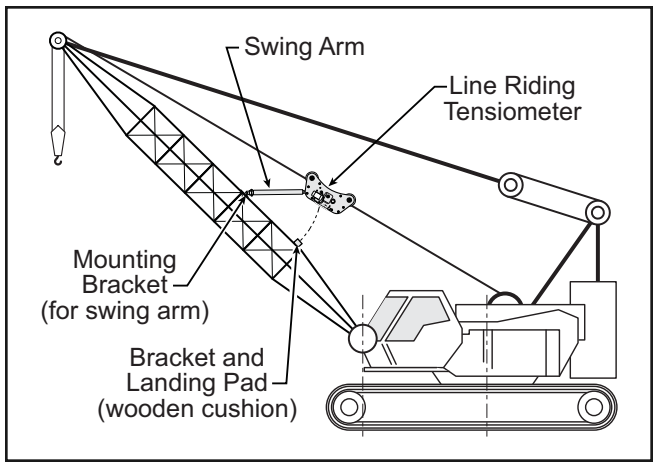


Figure: Example of a typical installation on a lattice boom crane, allows for lower clearance (not to scale)

2.9b Line riding tensiometer installation on a swing arm

1. Verify that the line riding tensiometer size fits with the wire rope diameter.

Table: Line riding tensiometer part number and rope diamater.

Frame Sheave Size	P/N	GS series line-rider with swign-arm and transmitter P/N	Cable size Inches (mm)
Small (4.25")	LD006	GD004-0375	3/8"
Small (4.25")	LD006	GD004-0500	1/2"
Small (4.25")	LD009	GD004-0563	9/16"
Small (4.25")	LD010	GD004-0625	5/8"
Small (4.25")	LD012	GD004-0750	3/4"
Medium (6")	LD015	GD006-0875	7/8"
Medium (6")	LD017	GD006-0945	(24mm)
Medium (6")	LD016	GD006-1000	1"
Medium (6")	LD018	GD006-1125	1 1/8"
Medium (6")	LD020	GD006-1250	1 1/4" (32mm)
Large (8")	LD022	GD008-1375	1 3/8" (36mm)
Large (8")	LD024	GD008-1500	1 1/2"
Large (8")	LD026	GD008-1625	1 5/8"
X-Large (10")	LD028	GD010-1750	1 3/4"
X-Large (10")	LD031	GD010-1890	(48mm)
X-Large (10")	LD032	GD010-2000	2"
X-Large (10")	LD036	GD010-2250	2 1/4"

2. Identify the hoist rope and choose a proper place, normally as far up the butt section as practical, to install the swing arm.
3. Install the swing arm by welding, bolting or strapping it to the boom. It should be located to be as centered as possible with the boom end sheave and positioned such that neither the swing arm nor the line riding tensiometer interfere with the hoist rope or other objects.
4. Remove top sheaves and top bolts & spacers from the line riding tensiometer*. Place the line riding tensiometer on the unloaded hoist rope, oriented such that the transmitter antenna is on the cab side and the swing arm holes are directed to the boom top. Re-install bolts and sheaves.
5. Attach the swing arm end to the line riding tensiometer.
6. Verify that the angle the swing arm forms with the boom is not too large and that nothing limits free displacement of the swing arm and line riding tensiometer assembly at any boom angle or configuration. Extend the swing arm as needed.
7. If the line riding tensiometer has been supplied with rope payout, ensure that both proximity switches (led) operate as the appropriate sheave turns.
8. Verify that the sensor antenna is not curved.
9. Verify that all bolts are tight.
10. Operate the hoist to verify correct line riding tensiometer function.
11. Proceed to load pin / Line riding tensiometer calibration of the display/receiver (see ***Line Riding tensiometer Calibration*** section).

*** The hoist rope can also be installed by passing the wire rope around the pulleys when the hook does not interfere.**

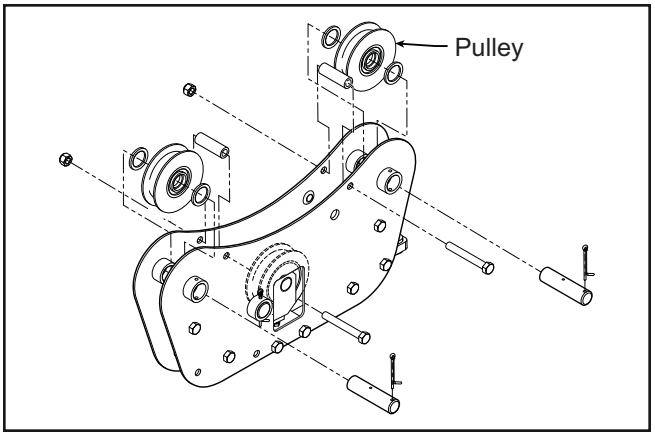


Figure: Removing top sheaves, bolts and spacers on Line Riding tensiometer type 1 (LD008 shown).

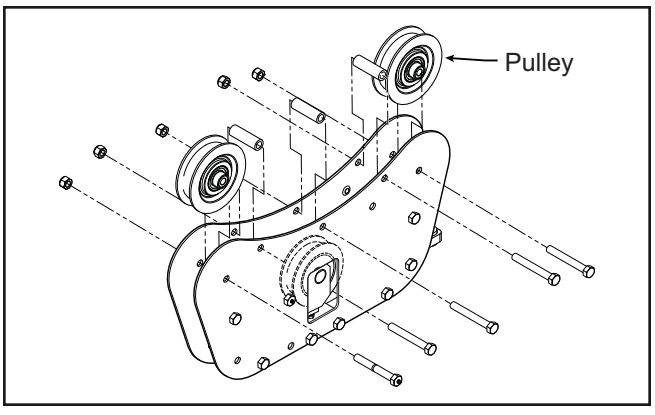


Figure: Removing top sheaves, bolts and spacers on Line Riding tensiometer type 2 (LD024 shown).

2.10 Load Pins, line riding tensiometers and Compression Cells: Calibration

Load pins, line riding tensiometers and compression cells must be calibrated at installation and every time thereafter the installation, the load sensor or the load transmitter is changed.

This procedure requires two known weights. The first (light) weight should be about 10% of load sensor capacity and not less than 5%. The second (heavy) weight should be over 50% of capacity, and absolutely not less than 25%.

1. Go to menu ***4) INSTALLATION*** and select ***4B) SENSOR CALIBRATION***.
2. Enter the user password, press ***Enter*** and select ***4B1) AUTOMATIC CALIBRATION WIZARD***.
3. Use ***Up*** and ***Down*** to select the load sensor, and then press ***Enter*** to confirm communication with the sensor is possible and to start the wizard.
4. Use ***Up*** and ***Down*** to adjust the actual parts of line on the load sensor, and then press ***Enter*** to confirm.

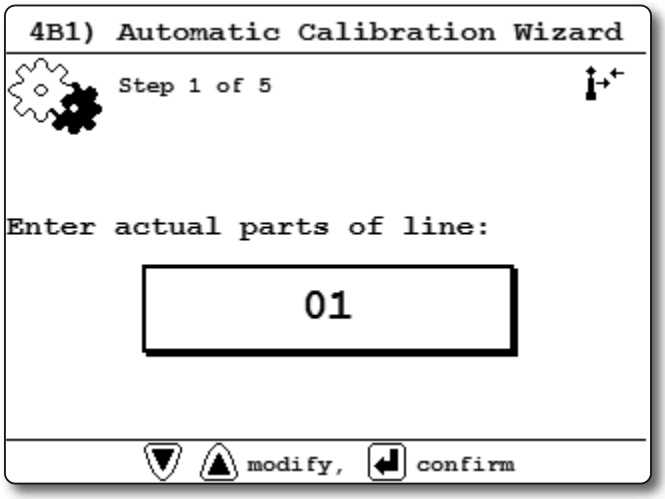


Figure: The automatic load calibration wizard, adjust the actual parts of line

5. Note the units that will be used during the calibration wizard, and then press ***Enter***.
6. Lift the first (lighter) known load, use ***Up*** and ***Down*** to adjust the load value displayed to equal the actual known load lifted, and then press ***Enter***.
7. Lower the first load, lift the second (heavier) known load, use ***Up*** and ***Down*** to adjust the load value displayed to equal the actual known load lifted, and then press ***Enter***.

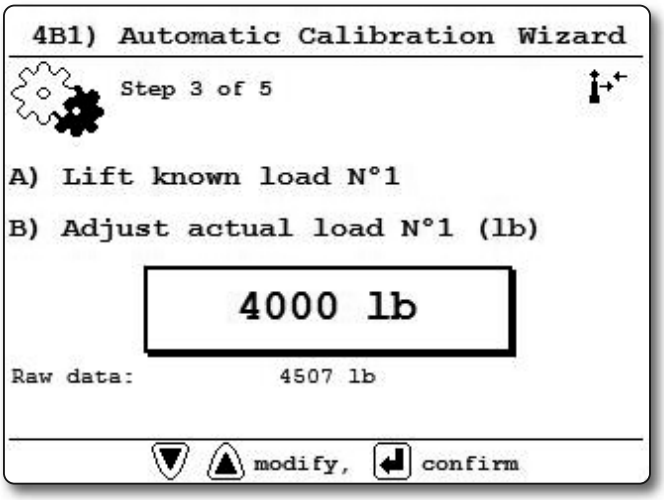


Figure: The automatic load calibration wizard, adjust the load

8. Note the new trim and scale values.

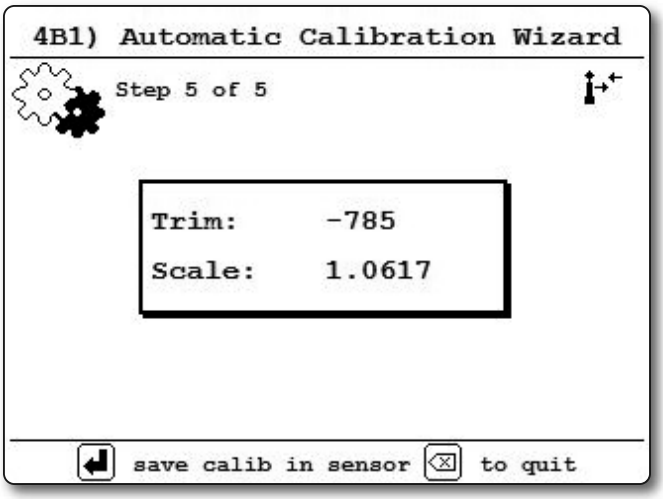


Figure: The automatic load calibration wizard, trim and scale values

9. Press ***Enter*** to send the new calibration to the load sensor.
10. Press ***Exit*** to return to the operation display.

2.11 Four Point Lift

The following functions are available for applications such as container cranes and gantry cranes that require load indication from four load sensors simultaneously.

- Sum load indication
- Imbalance
- Slack Rope

These functions can be used to generate an alarm condition on the lockout wires of the GS820.

2.11a Sum Load Indication

When sum load indication is programmed the sum of the loads on the pre-determined load sensors is indicated by the operation display. To activate sum load indication program a “Sum load sensor” in the sensor list. The “ID number” is used to identify the load sensors to be summed.

Sum maximum limit. The maximum limit for the sum load can be adjusted in the limit menu; the default maximum limit for sum load indication is 10000 (lb or kg depending on load display units).

Program sum load indication

1. Go to menu ***4) INSTALLATION*** and select ***4A1) SENSOR LIST***.
2. Enter the user password and press ***Enter***.
3. Use ***Up*** and ***Down*** to advance to the next available sensor position, usually following the four load sensors and press ***Enter*** to modify.
4. Determine the sum load cell “ID number”. For example: *ID 1234* to indicate the sum of load sensors № 1, № 2, № 3, and № 4, or *ID 34* to indicate the sum of load sensors № 3 and № 4.
5. Use ***Up*** and ***Down*** to select the sensor type “*Sum load cell*” and press ***Enter*** to confirm.
6. Use ***Up*** and ***Down*** to adjust the ID number and press ***Enter***.
7. Press ***Enter***.
8. Use ***Up*** and ***Down*** to advance to the next available sensor position to program the imbalance sensor or press ***Exit*** to return to the operation display.
9. Adjust the sum maximum limit in menu ***6) SYSTEM LIMITS***.

2.11b Imbalance

Systems programmed for four load sensors and four load sum indication can be programmed with an imbalance sensor to warn against uneven load distribution or against unwanted rope payout if one corner of the load touches down before the others.

Imbalance factor limit. The imbalance factor is the percent difference between the load on one load sensor and the average load on the other three. The imbalance factor is calculated for each of the four load sensors and then compared to an adjustable limit. The default imbalance factor limit is 15%.

Imbalance minimum limit. Imbalance is not calculated when the four load sum is below the imbalance minimum limit. Adjust this limit to avoid generating an imbalance alarm under minimum load conditions (for example: with an empty container or with rigging only). The default imbalance minimum limit is 1000 (pounds or kilograms depending on load display units).

Examples:

Imbalance factor calculation for load sensor № 1

$$\text{Load № 1 (A) Imbalance Factor} = 100 \times \frac{(\text{Average } B,C,D) - A}{(\text{Average } B,C,D)}$$

A = Load № 1 *B = Load № 2*
C = Load № 3 *D = Load № 4*

If the imbalance factor limit is 15%, then the system is safe.

$$\text{Load № 1 (A) Imbalance Factor} = 100 \times \frac{8100 - 7500}{8100} = 7.5\ \%$$

A = 7500 *B = 8100*
C = 8000 *D = 8200*

If the imbalance factor limit is 15%, then an imbalance alarm is generated.

$$\text{Load № 1 (A) Imbalance Factor} = 100 \times \frac{8100 - 6800}{8100} = \mathbf{16\ \%}$$

A = 6800 *B = 8100*
C = 8000 *D = 8200*

Program the imbalance sensor

1. Go to menu ***4) INSTALLATION*** and select ***4A1) SENSOR LIST***.
2. Enter the user password and press ***Enter***.
3. Use ***Up*** and ***Down*** to advance to the next available sensor position, usually following the

four load sensors and press ***Enter*** to modify.

4. Use ***Up*** and ***Down*** to select the sensor type "*Imbalance sensor*" and press ***Enter***. Only one imbalance sensor is required to calculate imbalance for all four load sensors.
5. The ID can be left at 0, press ***Enter***.
6. Press ***Enter*** to save any changes.
7. Press ***Exit*** to return to the operation display.
8. Confirm the imbalance factor limit and the imbalance minimum limit in menu ***6) SYSTEM LIMITS***.

2.11c Slack Rope

Systems programmed for four load sensors and four load sum indication can be programmed with a slack rope sensor to warn against unwanted rope payout when the load touches down.

Slack rope minimum limit. The slack rope sensor compares the sum load to an adjustable slack rope minimum limit. When the sum load goes below the slack rope limit a slack rope alarm is generated. The slack rope limit is usually adjusted to less than the weight of all rigging below the load sensors. The default slack rope minimum limit for is 1000 (pounds or kilograms depending on load display units).

Program the slack rope sensor.

1. Go to menu ***4) INSTALLATION*** and select ***4A1) SENSOR LIST***.
2. Enter the user password and press ***Enter***.
3. Use ***Up*** and ***Down*** to advance to the next available sensor position, usually following the four load sensors, the sum load sensor and the imbalance sensor. Press ***Enter*** to modify.
4. Use ***Up*** and ***Down*** to select the sensor type "*Slack rope sensor*". Only one slack rope sensor is required to calculate slack rope for all four load sensors.
5. The ID can be left at 0, press ***Enter***.
6. Press ***Exit*** to return to the operation display.
7. Adjust the slack rope minimum limit in menu ***6) SYSTEM LIMITS***.

2.12 List and Trim Angle Sensor

The GS010-03 is a two axis angle sensor designed to detect both list and trim angle. Minimum and maximum limits for list and trim angle are adjustable in the display. The display will generate an alarm if the limits are exceeded and can be programmed to generate lockout. Furthermore list and trim angle can be used to control rated capacity chart selection where required (example: barge cranes).

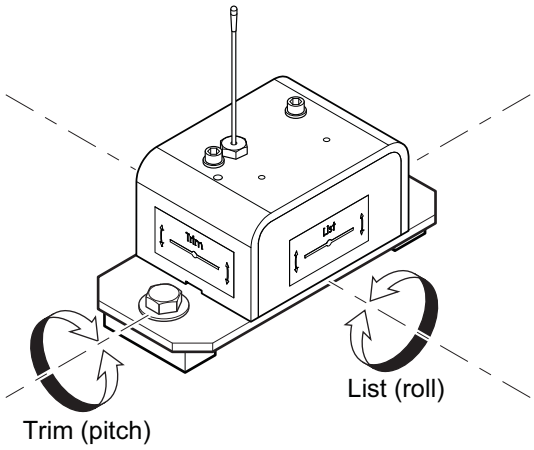


Figure: List and Trim axes

2.12a Programming the GS820 for List and Trim Indication

For list indication, add the GS010-03 ID number to the sensor list (menu ***4A)***) and select the sensor type "*List sensor*".

For trim indication, add the GS010-03 ID number to the sensor list (menu ***4A)***) and select the sensor type "*Trim sensor*".

The maximum and minimum angles for list and trim indication can be adjusted in the limit menu. The default limits are 10.0° maximum and -10.0° minimum.

2.12b Mounting Instructions

IMPORTANT! **Remove the angle sensor from any connecting metal structures or surfaces when welding the metal lugs to the mounting surface. Proximity to welding may cause permanent damage to the angle sensor and prevent accurate angle indication.**

1. Determine the angle sensor position.
   a. The mounting surface should be flat and known to be level (0°) in both the list and trim axes.
   b. The angle sensor should have a clear line of sight to the cabin mounted display.
   c. The angle sensor should be installed horizontally, with the antenna pointing up.
   d. The list and trim axes are indicated on the angle sensor, follow these indications to orient the sensor correctly for accurate list and trim indication.
   e. The angle sensor antenna should not contact a metal object.
2. Install the welding pads; keep the angle sensor well removed from the weld site and any connecting metal objects while welding.
3. Mount the angle sensor to the weld pads with the screws and washers provided.
4. Verify list and trim angle indication in the operation display.

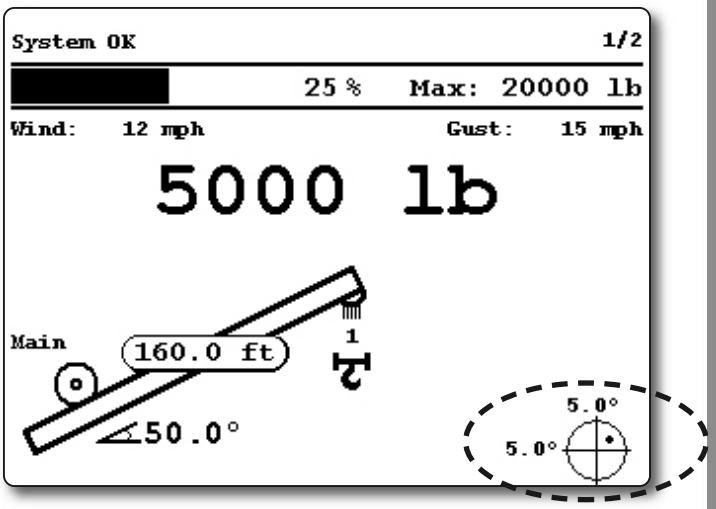


Figure: Trim and list angle indication

2.12c List and Trim Angle Calibration Procedure

Calibrate angle indication by adjusting the offset values for list and trim in the GS820 display; the GS820 will then communicate the updated offset values to the sensor.

1. **Install the sensor at a precisely known list and trim angle.**
2. Go to menu ***4) INSTALLATION*** and select ***4B) SENSOR CALIBRATION***.
3. Enter the user password and press ***Enter***.
4. Select ***4B1) AUTOMATIC CALIBRATION WIZARD***.
5. Use ***Up*** and ***Down*** to select the trim (or list) sensor.
6. Press ***Enter*** to go to the first step of the calibration wizard; note the uncorrected angle indicated.
7. Use ***Up*** and ***Down*** to adjust the angle value indicated until it is equal to the known angle.

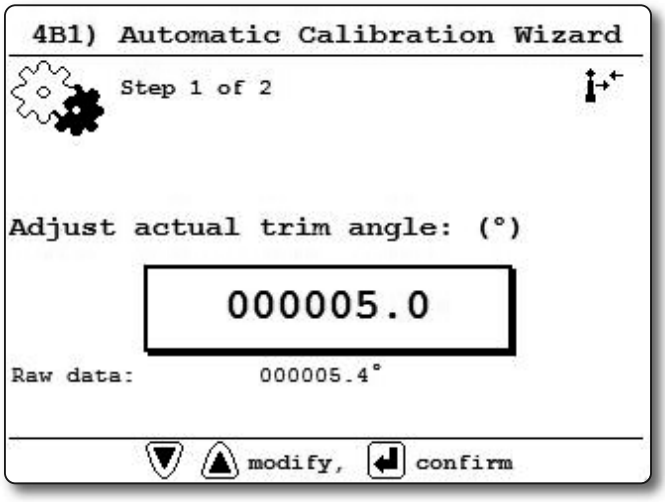


Figure: Trim Angle calibration, adjust the angle

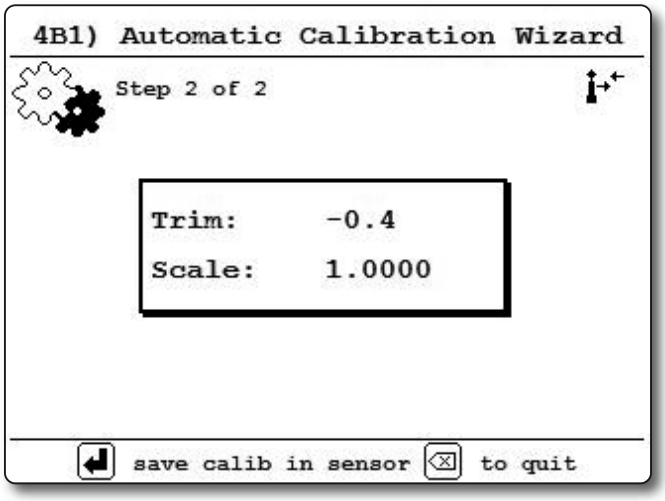


Figure: Trim Angle calibration, trim and scale values

7. Note the trim and scale values.
8. Press ***Enter*** to save and communicate changes to the sensor.
9. Repeat steps 4 through 8 for the list angle.
10. Press ***Exit*** to return to the operation display.
12. Verify accurate list and trim angle indication.

2.13 Rope payout

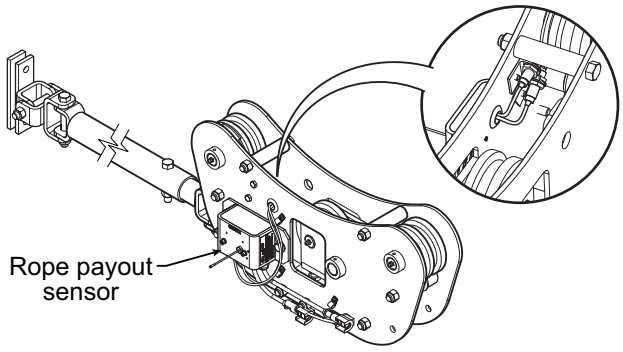


Figure: Rope payout on a line riding tensiometer

Typically the rope payout sensor is factory installed on the line riding tensiometer load sensor (figure above). Alternatively the rope payout sensor may be installed on an appropriate sheave (figure below). Power supply must be provided to the rope payout sensor. A GS820 display can then be programmed to communicate with the sensor and to indicate rope payout (length) and rope speed.

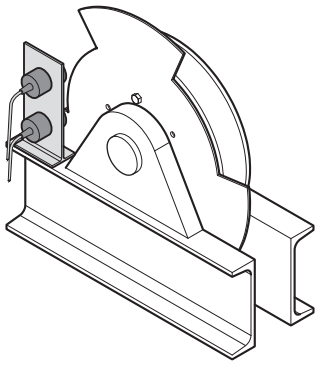


Figure: Alternative installation of a rope payout

Zero the rope payout using the Tare menu before calibration.

2.13a Rope Payout Calibration Procedure № 1: Mechanical Set-Up

1. Hoist up to reel in the wire rope fully.
2. Install the rope payout system.
3. Zero the rope payout length in the Tare menu
4. Hoist down to pay out a known length of wire rope (for example: 20 feet).
5. Verify the rope payout indicated matches the actual length of wire rope paid out. If not then follow *Rope Payout Calibration Procedure № 2*.

2.13b Rope Payout Calibration Procedure № 2: Correct with the GS820

If rope payout indicated does not match actual rope payout, and if it is not possible to easily correct by following *Rope Payout Calibration Procedure № 1*, then follow this procedure. This procedure requires hoisting up to fully reel in the wire rope, and then hoisting down to pay out a known length of wire rope. For accurate calibration the “known length” paid out must be accurately measured.

1. Go to menu ***4) INSTALLATION*** and select ***4B) SENSOR CALIBRATION***.
2. Enter the user password and press ***Enter***.
3. Select ***4B1) AUTOMATIC CALIBRATION WIZARD***.
4. Use ***Up*** and ***Down*** to select the rope payout sensor, and then press ***Enter*** to confirm communication with the sensor is established.
5. Note the units that will be used during the calibration wizard, and then press ***Enter***.
6. Hoist up (pay in) the wire rope, use ***Up*** and ***Down*** to adjust the actual wire rope payout length and then press ***Enter***.

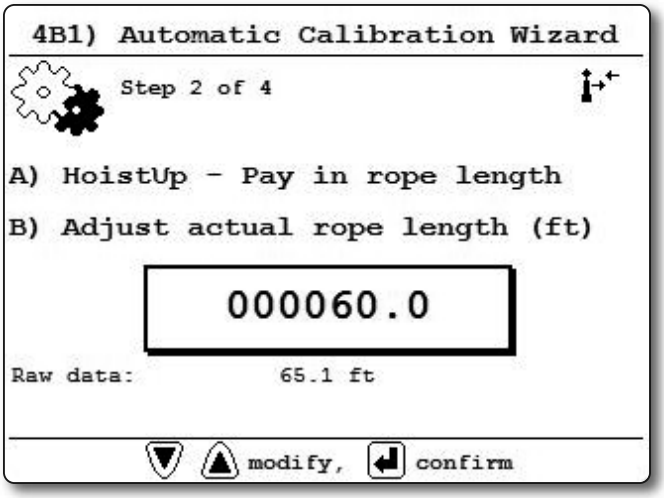


Figure: Rope payout calibration, adjust the actual rope length

7. Hoist down (payout) the wire rope, use ***Up*** and ***Down*** to adjust the actual wire rope payout length and then press ***Enter***.

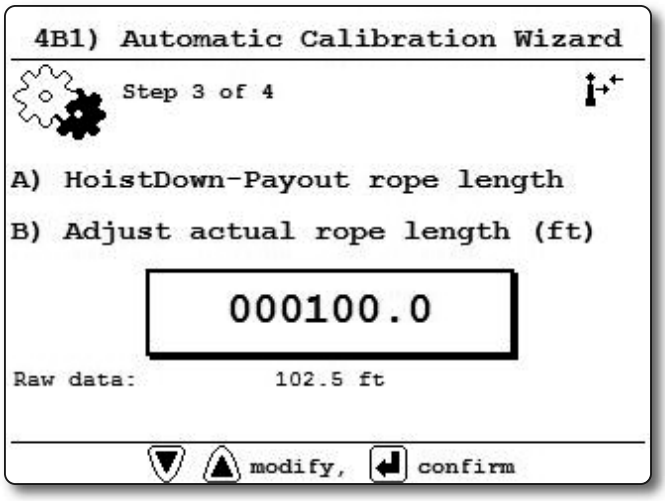


Figure: Rope payout calibration, adjust the actual rope length

8. Note the new trim and scale values.

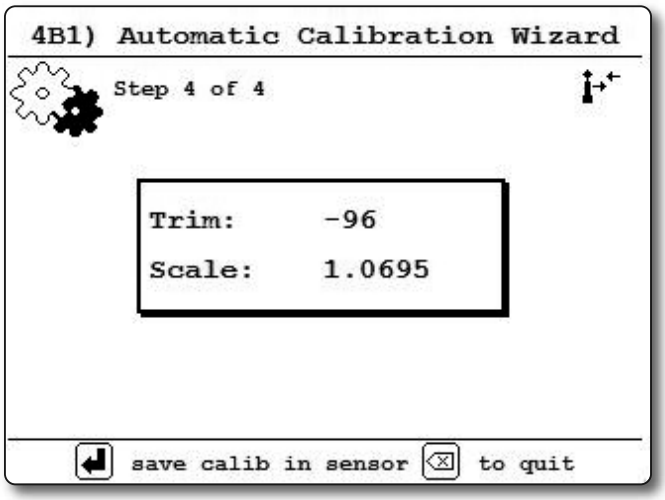


Figure: Rope payout calibration, trim and scale values

9. Press ***Enter*** to save and send the new calibration to the rope payout sensor.
10. Press ***Exit*** to return to the operation display.

2.13c Rope Payout Limits

The minimum and maximum rope payout (length) limits and the maximum rope speed limit can be adjusted in the display in the limit menu. The maximum rope payout limit can be programmed to trigger lockout when exceeded, see menu ***4G) Lockout Settings***. The minimum rope payout limit and the maximum rope speed limit will trigger an alarm when exceeded. The default limit for maximum rope payout is 300 feet; the default minimum limit is -300 feet. The default limit for maximum rope speed is 15.0 feet per second.

2.13d Electrical connections

Voltage: 9 to 30 Volts DC, about 0.3 Amp

Red wire: positive voltage

Blue wire: negative or ground

Two types of connections are recommended;

1) Always powered up
2) Powered-up at the same source as the GS820 display unit

2.14 Data Logger

The GS820 includes a data logger that records all significant events including actual sensor values and a date and time stamp. The data logger memory can hold over 32 000 records, this is equivalent to several days or several years of operation depending on the recording mode selected and machine use. The data can be extracted using a USB mass storage device (USB key) and then transferred to a personal computer for analysis.

2.14a Recording Modes

Adjust the data logger recording mode as required:

1. Go to menu ***4)*** and select ***4F) DATA LOGGER***.
2. Enter the user password and press ***Enter***.
3. Use ***Up*** and ***Down*** to select the data logger recording mode and press ***Enter***.

   Automatic modes only: select the record added below the recording mode (interval, variation or threshold), press ***Enter*** and adjust the value using ***Up*** and ***Down***, then press ***Enter***.
4. Press ***Enter*** to save any changes.
5. Press ***Exit*** to return to the operation display or press ***Down*** to adjust the data logger date and time (see *Date and Time* sub-section).

Note: all alerts are recorded by the data logger regardless of the mode selected.

Recording Modes description:

Alarm only. Record alarms only. All the other data logger modes also record alarms.

Automatic recording. A record is added at a specified interval. When the automatic recording data logger mode is selected on menu ***4F) 1)*** (see step 3 above) select ***1A) MINUTES***, press ***Enter*** and then use ***Up*** and ***Down*** to adjust the record interval in minutes.

IMPORTANT! **Wind speed: the data logger recording mode must be set to automatic recording to log the data required by the wind speed report feature of the Data Logger Viewer software.**

Automatic variation. A record is added when load increases by more than the operator adjusted percentage. When the automatic variation data logger mode is selected on menu ***4F) 1)*** (see step 3 above) select ***1A) VARIATION (%)***, press ***Enter*** and then use ***Up*** and ***Down*** to adjust the variation threshold.

Automatic peak. In the automatic peak mode the data logger analyzes the measured weight and records the peak value only. One threshold per load cell must be adjusted. When the weight drops by more than the peak threshold the peak weight is recorded. Only one event is recorded for each pick when the threshold is adjusted correctly. When the automatic peak data logger mode is selected on menu ***4F) 1)*** (see step 3 above) select ***1A) THRESHOLD №1***, press ***Enter*** and then use ***Up*** and ***Down*** to adjust the peak threshold for the first load cell. Press ***Down*** to repeat for the second load cell etc. Up to four load cells can be programmed for automatic peak data logging.

User input. The status of all sensors is recorded on demand. A normally open push button must be installed on a digital input to the GS820 through a pre-determined wire of the power supply and lockout cable.

All data. All communications between a display and its sensors are recorded.

2.14b Date and Time

Adjust the data logger date and time as required:

1. Go to menu ***4)*** and select ***4F) DATA LOGGER***.
2. Enter the user password and press ***Enter***.
3. Select ***2) DATE*** and press ***Enter***.
4. The digits of the year should be flashing: use ***Up*** and ***Down*** to adjust the year and press ***Next***.
5. Use ***Up*** and ***Down*** to adjust the month and press ***Next***.
6. Use ***Up*** and ***Down*** to adjust the day and press ***Enter*** to confirm.
7. Select ***3) TIME*** and press ***Enter*** to adjust the time.
8. The hour should be flashing: use ***Up*** and ***Down*** to adjust the hour from 00 (midnight) to 23 (11 pm).
9. Press ***Next*** to adjust the minute.
10. Use ***Up*** and ***Down*** to adjust the minute and press ***Next***.
11. Use ***Up*** and ***Down*** to adjust the second and press ***Enter*** to save any changes.
12. Press ***Exit*** to return to the operation display.

2.15 Sensor List

All sensors in the GS820 system are programmed in the sensor list. The GS820 uses information from all sensors in the sensor list. Conversely the GS820 will not use or display information from sensors that are not programmed to the sensor list. If a sensor is removed from the crane then it must be removed from the sensor list. If a sensor is replaced the sensor list must be updated with the new ID number.

IMPORTANT! **Information displayed from load, angle and boom length sensors that are not correctly installed will not be accurate.**

IMPORTANT! **Rated capacity, radius, and tip height based on information from angle and boom length sensors that are not correctly installed will not be accurate.**

Note: To ensure communication, sensors must be at least six feet from the GS820 display.

2.15a How to Add a Sensor to the GS820

1. Determine the radio identification number (ID) of the sensor to be added. This number between 10000 and 99999 is engraved on the sensor.
2. Go to menu ***4A)***.
3. Enter the user password and press ***Enter***.
4. Advance to the next empty sensor position in the sensor list "***No sensor***". Up to 32 sensors may be added to the sensor list. Press ***Enter***.
5. Use ***Up*** and ***Down*** to select the sensor type and press ***Enter***.
6. Use ***Up*** and ***Down*** to program the sensor ID and press ***Enter***.
7. Press ***Enter*** to save any changes made to the sensor list.
8. Press ***Exit*** to return to the operation display.

2.15b How to Remove a Sensor from the GS820

1. Determine the sensor to be removed. If more than one sensor of the same type has been added to the sensor list then determine the radio identification number (ID) of the sensor to be removed before proceeding. This number between 10000 and 99999 is engraved on the sensor.
2. Go to menu ***4A)***.
3. Enter the user password and press ***Enter***.
4. Select the sensor to be removed and press ***Enter*** to modify.
5. Use Up and Down to select "No sensor". This will remove the sensor from the sensor list but retain the sensor ID.
6. Press ***Enter*** to save any changes made to the sensor list.
7. Press ***Exit*** to return to the operation display.

Note: Press ***Next*** *and* ***Back*** *simultaneously to remove the sensor from the sensor list. The ID number will revert to 0, and the sensor type will revert to "****No Sensor****".*

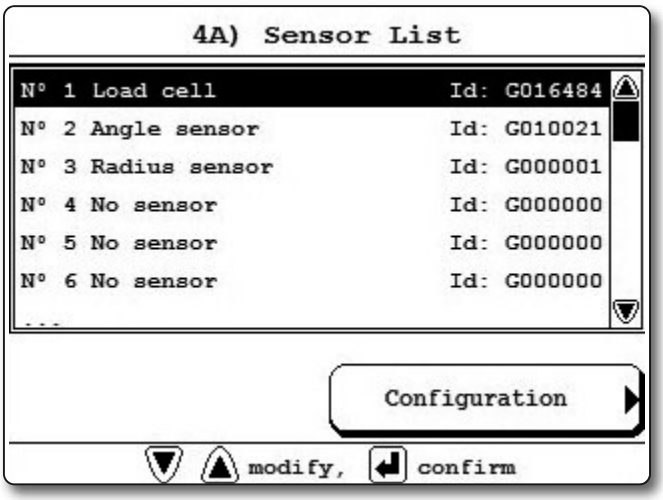


Figure: Menu 4A) - the sensor list

2.16 Network Options

2.16a Listen to sensor only

When the GS820 is started it normally wakes up the sensors in the sensor list and takes control of them. The last display powered on that is programmed for a sensor becomes that sensor's network controller. This means that if a second display is programmed for a sensor, it will take control of it; the sensor will no longer acknowledge communication from the first display. Occasionally it may be useful to monitor an installed system from a remote display without disrupting the existing network. The GS820 can be programmed to operate in "listening mode". In this mode the GS820 will display information from programmed sensors without becoming the network controller.

IMPORTANT! **Sensors can only have one network controller at a time. To receive communication from a sensor without taking control of that sensor a display must first be programmed in "listening mode".**

Program the listen only mode

1. Go to menu ***4)*** and select ***4l) NETWORK OPTIONS***.
2. Enter the user password and press ***Enter***.
3. Select ***4l1) NETWORK CONTROL)***.
4. Press ***Enter*** to modify "***DISPLAY MODE***" and use ***Up*** and ***Down*** to switch between "***NETWORK CONTROLLER***" and "***LISTEN ONLY***" modes.
5. Press ***Enter*** to save any change.
6. Press ***Exit*** to return to the operation display.

   When a display is adjusted to "listen only mode" the following message flashes three times during the start-up routine: "***THE DISPLAY IS IN LISTEN ONLY MODE***".

*Note: To regain network control of programmed sensors adjust the GS820 to "**NETWORK CONTROLLER**", shut the display off, and then start it again.*

2.16b Remote monitoring

The remote-monitor mode enables one GS820 (the supervisor display) to monitor another GS820 (the operator display) from a remote location.

The supervisor display is synchronized with the operator display configuration and listens directly to the sensors in the sensor list. Furthermore, with the option "sync operating page" the supervisor display can be synchronized to the exact page shown by the operator display when not in menu mode.

IMPORTANT! **Do not set a dedicated system display to remote monitoring mode. The entire system configuration will be lost including the sensor list and radius parameters.**

Set-up

1. Set the display mode to "***remote monitor***" on line 1 of menu ***4l1) NETWORK CONTROL***.
2. Set the ID of the operator display to be monitored on line 2.
3. Set the sync operating page option as required on line 3.

   When communication has been established and the supervisor display configuration has been synchronized the message "***Remote monitor of id Gxxxxx***" appears on the top line of the supervisor display.

Operation

The supervisor display is not synchronized when the operator display is in the menu mode. When the operator display is returned from menu to operating mode it synchronizes the supervisor display with any changes that have been made to the system configuration.

The supervisor display records all normal data logger events in parallel with the operator display, except during synchronization or when it is turned off.

When remote monitoring is turned off, the entire system configuration is cleared from the supervisor display and all parameters revert to their default values.

Restrictions

Both the supervisor and operator displays must have exactly the same firmware and capacity chart (if applicable). Remote monitoring uses the standard ***LSI*** radio protocol; it is subject to the same limitations. A clear and direct line of sight may be required between the remote monitor and both the operator display and the system sensors.

Supervisor display system parameters cannot be adjusted when in remote monitor mode.

An operator display can only be monitored by one supervisor display at a time.

2.16c Repeater

Communication between a GS820 and a programmed sensor can be routed through a different programmed sensor (repeater). This can be done either to extend the range of the network or to assist communication around a large radio obstacle. The battery life of the sensor repeated (source) will be reduced by about a year*. The battery life of the sensor repeater will be reduced to 35 days**. This function should not be used where it is not required.

*** Repeated (source) battery life estimated for standard product, using new factory specified batteries correctly installed, operating 32 hours per week. Individual results may vary with intensity of use, environmental conditions and other factors.**

**** Repeater battery life estimated for standard product, using new factory specified batteries correctly installed. Individual results will not vary with of intensity of use; individual results may vary with environmental conditions and other factors.**

Program a sensor repeater

1. In menu ***4I)***, select ***4I3) SET UP SENSOR REPEATOR***.
2. Select ***1) SELECT REPEATER***, press ***Enter*** to modify and use ***Up*** and ***Down*** to program the radio ID number of the sensor that will be the repeater and press ***Enter*** to confirm.
3. Select ***2) SELECT SOURCE***, press ***Enter*** and program the radio ID number of the sensor that will be the source and press ***Enter***.
4. Press "***SET UP REPEATER***" to save the new network path. The following messages will be displayed briefly:

   "***PARAMETERS SAVED CORRECTLY***"

   "***COMMUNICATING WITH REMOTE SENSOR…***"

   "***CONFIGURATION SAVED SUCCESSFULLY***"
5. Press ***Exit*** to return to the operation display.

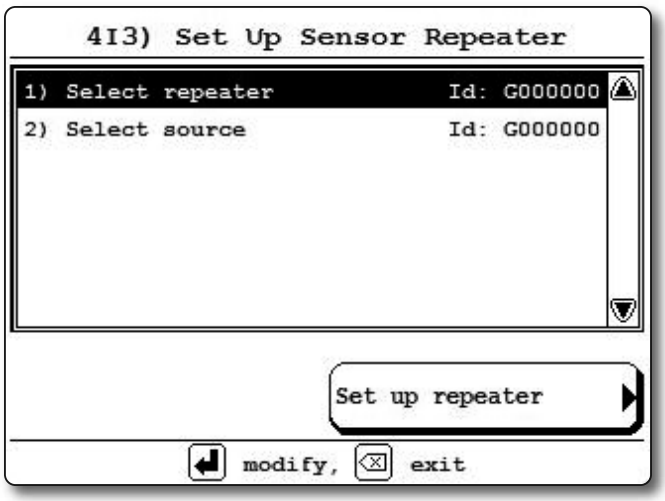


Figure: Program a sensor repeater

Clear a sensor repeater

1. In menu ***4I)***, select ***4I2) REPEATOR LIST***. Menu ***4I2*** details the last repeater programmed. When no repeater has been programmed, "***NO REPEATER SET UP***" message is displayed.
2. Select a repeater in the list and press "***REMOVE REPEATER***" to shut down the repeater programmed. The following messages will be displayed briefly:

   "***REMOVING NETWORK PATH…***"

   "***INITIALIZING NETWORK…***"
3. To shut down additional repeaters repeat step 1 and 2.

CAUTION! **Test all system functions after setting up or removing a repeater. Shut off and then restart the GS820.**

4. Press ***Exit*** to return to the operation display.

2.16d Wireless Sensor Update

It is possible to send a firmware update to a sensor using the GS820 (menu ***4I4) INSTALL SENSOR UPDATE***). For more information on installing a sensor update please contact ***LSI***.

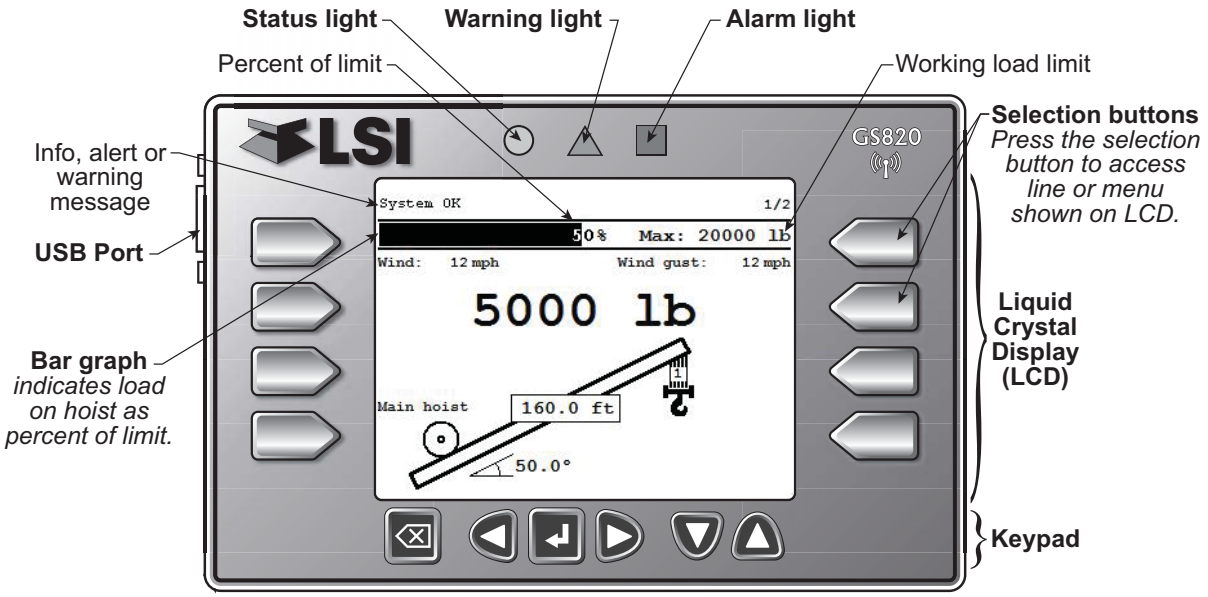
3. OPERATION

3.1 Display GS820

The GS820 displays detailed information on the liquid crystal display (LCD); warnings, alarms, and radio status is also communicated by the display buzzer.

3.2 USB Port

The USB port is used to download data from the data logger or to upload capacity charts using a USB mass storage device (USB key).



3.3 Keypad

The main keypad consists of six buttons used to control, consult, program, and troubleshoot the GS820 display and system. The keypad also includes the selection buttons that allows the user to quickly access the menus and informations displayed on the LCD.

Bypass / Exit
Override lockout for emergency purposes*. The alarm will remain silent until the next alarm; lockout will re-engage as soon as the button is released. / Exit menu.

Back
Move to the previous page/digit.

Menu / Enter
Access the system menus, refer to Menu System section. / Enter menu, confirm changes to system settings.

Next
Move to next page/digit.

Down
Modify numeric values and move down through a list of choices.

Up
Modify numeric values and move up through a list of choices.

*** This applies only if the GS820 has been correctly installed to control crane lockout function.**

3.4 Display lights

Status light (green)

The status light stays on when the GS820 has a reliable radio communication link to all programmed sensors.

Warning light (yellow)

The warning light flashes when;

1. the communication with a sensor is not established ("***NoRx***" apears on LCD);
2. a warning threshold has been reached (typically 90% of the maximum limit);
3. an alarm is bypassed;
4. the sensor battery life drops below 10%. Normally several weeks of battery life remains from the moment the low battery message first appears.

A warning message is also generated on the LCD.

Alarm light (red)

The alarm light flashes when a sensor limit is reached (100% and more). An alarm message is also generated on the LCD.

3.5 Menu System

WARNING! System limits are not monitored when the display is in menu mode. DO NOT operate the crane in menu mode. DO NOT navigate system menus when operating the crane.

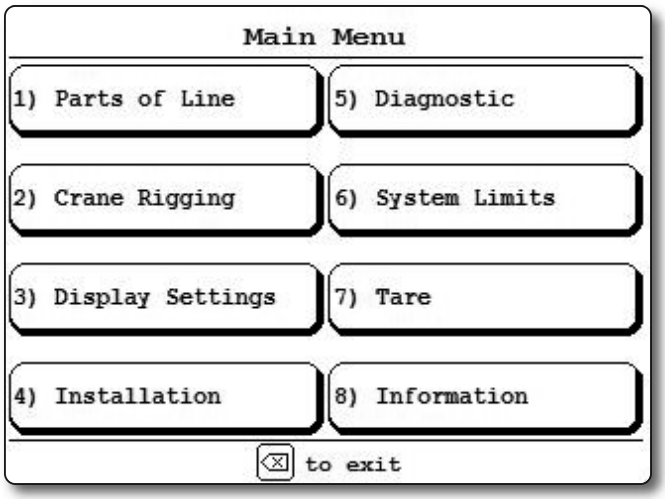


Figure: Basic menus (level one)

There are eight basic menus (level one) used to program, consult and control the GS820 system; ***1) Parts of Lines; 2) Crane Rigging; 3) Display Settings; 4) Installation; 5) System Diagnostic; 6) System limits; 7) Tare; 8) Information***.

The basic menus include nested sub-menus (level two and three) designed to address specific tasks including adjusting values, choosing from lists and following "wizards" through step by step processes.

3.5a Menu Numbers

The basic menus (level one) are numbered one through eight. Level two menus are lettered alphabetically. Level three menus are numbered. Menus can also include numbered lists.

3.5b Menu Navigation

From the operation display press ***Menu/Enter*** to see the eight basic menus (level one). Use the selection button to select a menu. Press ***Exit*** to leave a menu and return up one level. Press ***Next*** to move to the next page within a menu; press ***Back*** to move to the previous page within a menu. Use ***Up*** and ***Down*** to modify numeric values and to move through a list of choices.

3.5c Password Protection

The submenus of menu ***4) Installation*** are protected by a password by default. Password settings can be adjusted in menu ***4H) Password Settings***. If the user password is forgotten, it can be changed as long as the administrator password is known.

*Forgotten password? Call **LSI** technical support (Houston, TX) at 888 819 4355.*

3.5d Menu Layout

The menus accessible to the operator without password protection under the default factory settings are listed below.

- ***1) Parts of Line***
- ***2) Crane Rigging***
- ***3) Display Settings***
- ***4) Installation***
- ***5) System Diagnostic***
  - ***5A) System Sensors Diagnostic***
  - ***5B) Radio Network Diagnostic***
    - *5B1) Radio network*
    - *5B2) Last sensors received*
    - *5B3) Search for sensors*
    - *5B4) Bit Error Rate Test*
  - ***5C) Lockout Diagnostic***
  - ***5D) Display Diagnostic***
  - ***5E) Digital Input Diagnostic***
- ***6) System Limits***
- ***7) Tare***
- ***8) Information***

3.5e Parts of Line

The load sensor often shares the weight with multiple parts of line. For accurate load indication the GS820 must be programmed for the number of parts of line.

1. Go to menu ***1) PARTS OF LINE***.
2. Use ***Up*** and ***Down*** to select the load sensor; typically sensor number one is associated with sheave one (the main hoist) and sensor number two is associated with sheave two (the auxiliary hoist) etc. Press ***Enter*** to modify.
3. Use ***Up*** and ***Down*** to adjust the number of parts of line.
4. Press ***Enter*** to save any changes and then press ***Exit*** to return to the operation display.

3.6 Rated Capacity Indicators

The GS820 can be programmed to assist the operator by indicating the working load limit (WLL) from the crane specific rated capacity charts according to the angle and radius information received from the boom mounted sensors.

3.6a Display Programming

In order to indicate WLL the GS820 must be programmed with a valid rated capacity chart specific to the crane. The capacity chart programmed can be verified in the Information menu: press ***Menu*** and select "***8) INFORMATION***" (press ***Exit*** to return to the operation display).

IMPORTANT! **If the chart number information screen says "*CHART NOT AVAILABLE*", no chart is loaded in the GS820 and *"CHART NOT USED"*, the GS820 has not been programmed to function as a rated capacity indicator.** If rated capacity indication is required contact the person responsible for the GS820 system installation and maintenance. If in doubt, contact *LSI*.

3.6b Crane Rigging

Under no circumstances is the GS820 a substitute for safe operating practices. The operator must fully understand the crane rigging and the crane rated capacity chart to be able to correctly set the GS820 for rated capacity indication. The GS820 will not take into account critical variables such as weather, ground and crane conditions that will reduce the safe working capacity of the crane.

3.6c Chart Wizard

Rated capacity indication is based on interpretation of a selected capacity chart using boom angle and load radius. The chart must be selected by "rigging" the working hoist in the GS820; this is done by following the chart wizard in menu ***2) CRANE RIGGING***.

IMPORTANT! **It is possible to leave the chart wizard at any time by pressing *BYPASS/EXIT*;** the GS820 will display the message "*RIGGING ABORTED*". Current capacity chart selection may have changed, possibly changing the rated capacity indicated by the GS820. **Always complete the chart wizard all the way to the "Rigging ok" message before operating the crane.**

1. Go to menu ***2) CRANE RIGGING*** and press ***Enter*** to start the chart wizard.
2. The first page of the chart wizard is "select hoist". Use ***Up*** and ***Down*** to select the hoist and press ***Enter***. If there is only one load sensor in the system select "***MAIN***". With two or more load sensors in the system the main hoist is associated with the first load sensor in the sensor list; the auxiliary hoist is associated with the second sensor in the sensor list etc.

Figure: Select hoist menu

3. The steps that follow will depend on the size and complexity of the rated capacity chart itself. Typical steps include chart selection, outrigger / on rubber selection and boom length selection (lattice cranes only). Use ***Up*** and ***Down*** to select from the list of choices and then press ***Enter*** to advance to the next step. For accurate rated capacity indication the rigging configuration selected in the chart wizard must reflect the actual rigging of the working sheave.

4. After the last step has been completed, the GS820 displays "***RIGGING OK***" and then returns to menu ***2)***. Press ***Exit*** to return to the operation display or press ***Enter*** to rig another hoist. If a sensor required by the selected capacity chart is not a part of the system or has not established communication with the GS820, then the GS820 will display "***SENSOR INVALID***".

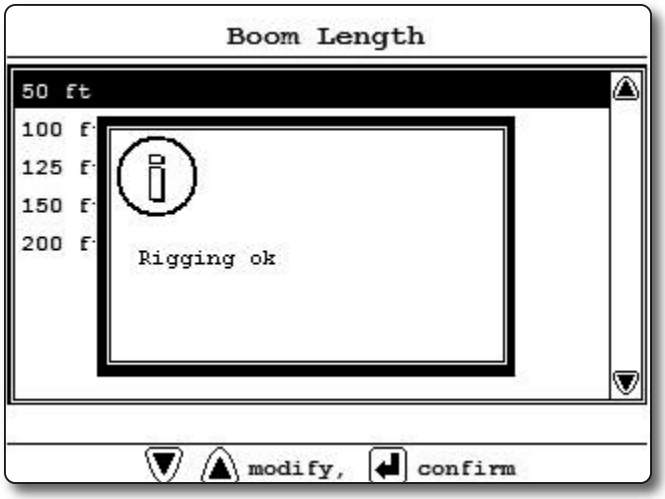


Figure: the GS820 displays "rigging ok"

3.7 Display Settings

Program the display for operator preferences in menu ***3) DISPLAY SETTINGS***.

1. Go to Menu ***3) DISPLAY SETTINGS***.
2. Use ***Up*** and ***Down*** to select the setting to modify and press ***Enter***.
3. Use ***Up*** and ***Down*** to modify the setting.
4. Press ***Enter*** to confirm.
5. Press ***Exit*** to return to the operation display.

3.7a Units

The weight units for load display may be selected according to operator preference. Length units are associated with weight units by default; see the table below.

Table: Weight Units

Unit	Equivalent	Weight	Length Unit
Notes			
Pound (lb)	1 lb	0.4536 kg	Foot (ft.)
Kilogram (kg)	2.205 lb	1 kg	Metre (m)
Short ton (T) *United States*	2000 lb	907.2 kg	Foot (ft.)
Long ton (T) *United Kingdom*	2240 lb	1016 kg	Foot (ft.)
Metric tonne (t) *International System (SI)*	2205 lb	1000 kg	Metre (m)

3.7b Backlight Mode

Adjust the LCD backlight control mode to conform to viewing and power supply conditions. The LCD backlight can be "*always on*", "*always off*" or on a "*four second timer*". In the "*four second timer*" mode the backlight will come on for four seconds when any button is pressed.

3.7c Wind speed units

The wind speed units can be set to "km/h", "mph", "m/s" or "knot".

3.8 System Diagnostic

Diagnose system issues with the sub menus of menu ***5) DIAGNOSTIC***.

3.8a System Sensors Diagnostic

1. Go to menu ***5A) SYSTEM SENSORS DIAGNOSTIC.***
2. Select the sensor and press ***Enter*** to see the sensor data in menu ***5A1) SENSOR INFORMATION***.
3. Press ***Exit*** to return to menu ***5A)*** and select an other sensor or press ***Exit*** again to return to the operation display.

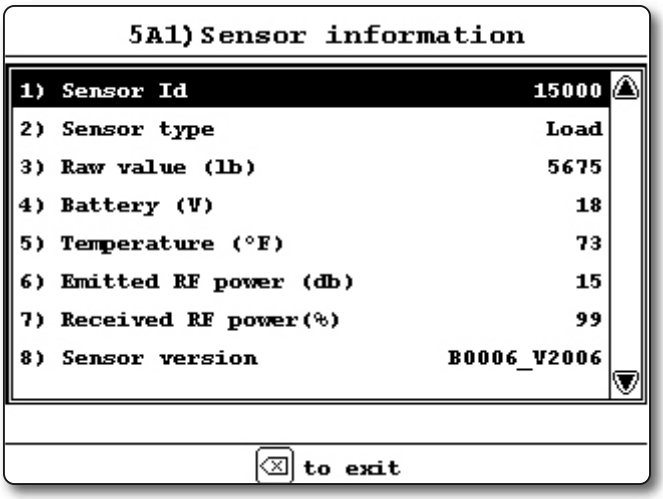


Figure: Sensor information menu