

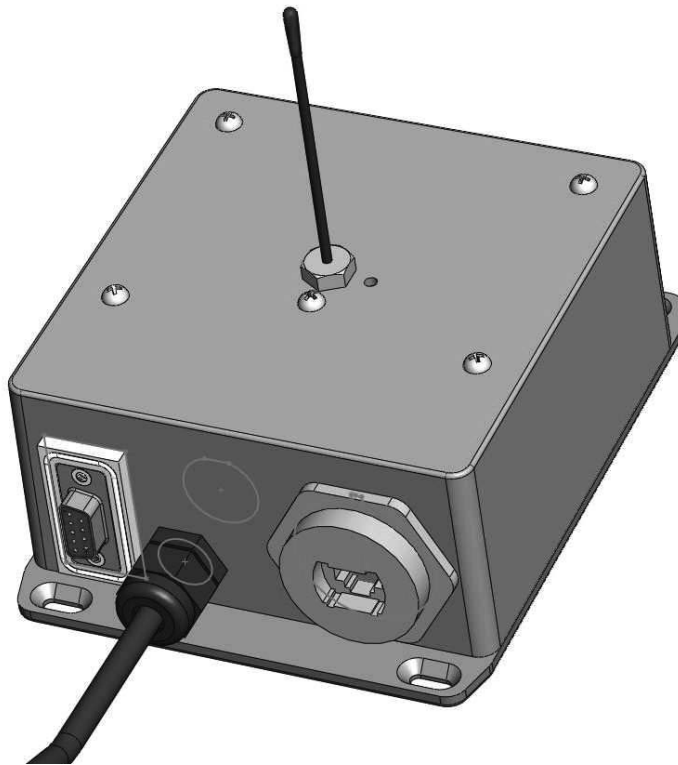
# LSI

Load Systems International

Manufacturers of Wireless  
Weighing Systems

## **GS22X Series & GS Series Sensors**

### **INSTALLER AND USER'S MANUAL**



**⚠ WARNING!** The GS22X series system is designed as an operator aid and is in no way a substitute for safe operating practice.


**⚠ WARNING!** Carefully read and understand this manual before proceeding.



## BEFORE PROCEEDING

### ***Read and understand the following:***

For your safety and that of the people that come into contact with **LSI** products, understand the significance of the instructions included in this guide, respect all laws and regulations and comply with applicable standards.

Pay particular attention to items bearing the alert symbol  and the following words:



### **WARNING!**

**Warning:** this denotes an instruction that if not complied with may lead to serious injury or death.



### **CAUTION!**

**Caution:** this denotes an instruction that if not complied with may lead to product failure or property damage.



### **IMPORTANT!**

**Important:** this denotes an instruction that if not complied with may lead to product performance issues.



**WARNING!** Installation must be made in compliance with **LSI** instructions and using **LSI** supplied components only. Failure to install all parts, or replacing parts or components with parts or components not supplied by **LSI**, may lead to system failure, serious injury or death.

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# 1. INTRODUCTION

## 1.1 Overview

The GS22X series of products are in many ways similar to a display in that they act as a base station for LSI's GS series line of wireless sensors. However they are not limited to crane applications but can also be used in a wide range of industrial process monitoring situations. There is no integrated display; the system is intended for bridging LSI's wireless sensors onto an existing automotive or industrial automation network. Depending on the derivative, the GS22X bridges onto a CAN bus or a RS232. The primary way of configuring sensors into the system is via a USB cable and end user PC software.



**WARNING!** The GS22X series system is designed as an operator aid and is in no way a substitute for safe operating practice.

## 1.2 Start-Up

The GS22X series products have been programmed for the sensors supplied in the shipping box. The GS22X powers up with its green lights flashing, this indicates that the receiver is waking up programmed sensors and creating a radio communication link with each. Once a reliable radio communication network is established, the green light will turn off and flash only when communicating with sensors. This process may take up to 60 seconds.

## 1.3 Product description

### **GS220 (Wireless to PC bridge)**

- Powered by USB (serial bus emulation), may have a 2 wire auxillary power cable or connector.
- USB connector for associating and configuring sensors as well as setting various system options using a PC. USB connector also serves for monitoring wireless sensors from the PC where it is installed.

### **GS221 (Wireless to CANBUS bridge)**

- 2 Wire Power Cable (some optional lockout wires may be added on the same cable).
- Standard 3 Pin Deutsch J1939 CANBUS Connector for interfacing configured sensors to crane, automotive or industrial computer network.
- USB connector for associating and configuring sensors as well as setting various system options using a PC or updating firmware with a key.

### **GS222 (Wireless to RS-232 bridge)**

- 2 Wire Power Cable (some optional lockout wires may be added).
- Standard DB9 serial port connector for interfacing configured sensors to crane, automotive or industrial computer network.
- USB connector for associating and configuring sensors as well as setting various system options using a PC.

## 2. CONFIGURATION

The GS22X first configuration should ideally be carried out before physical installation as it requires a PC with a USB port. If the GS22X remains fairly accessible, it can be configured on the spot with a laptop computer. Refer to **Installation** section as required.

*Note: The WRCM software and driver are only supported by Windows XP.*

### 2.1 WRCM PC User Interface and Driver Installation

1. Install the LSI software “WRCM PC User Interface V<version> Setup.exe” on a computer using the cd (or USB key) provided by LSI.
2. Connect the GS22X to the computer using a USB port;
  - a. When connected for the first time or connected to a new port, Windows will ask to install the driver. Follow the steps from the hardware wizard and install the “lsi-cdcserial\_v1.inf” (default location: C:\Program Files\Load Systems International\WRCM PC User Interface).
  - b. In the Connection window, select the WRCM to connect to and click **Ok**. If the WRCM connected is not in the list, click **Refresh**.

### 2.2 Application overview

Access the menus from the treeview (in the upper-left) by double-clicking on it. The appropriated details will be displayed in the right section of the application.

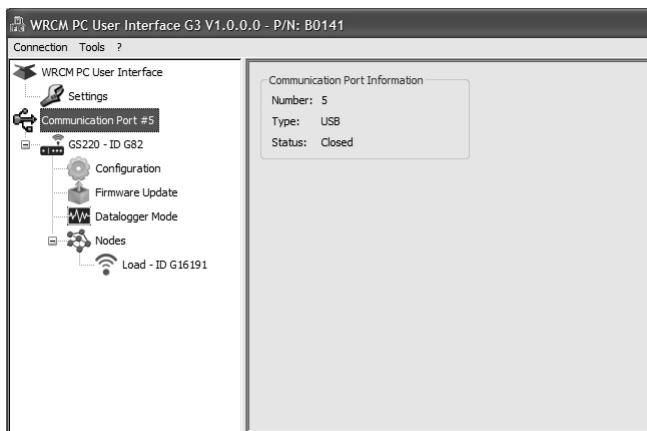


Figure: Application overview.

### 2.2a Settings

The data from the datalogger mode can be saved on the computer disk.

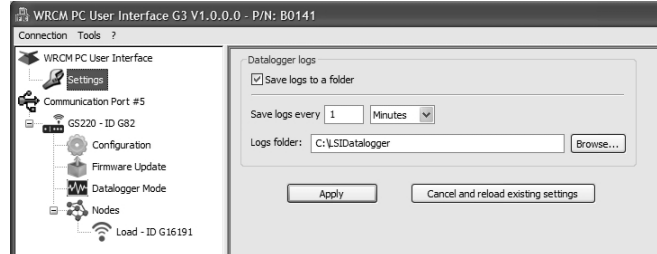


Figure: Settings

1. Define the time interval and location folder of the logs.
2. Press **Apply** to save changes or **Cancel to reload existing setting**.

### 2.2b Communication Port

Displays the communication port in use, the port type and status. The Open status indicates that one of the communication port menus is activated.

### 2.2c Configuration

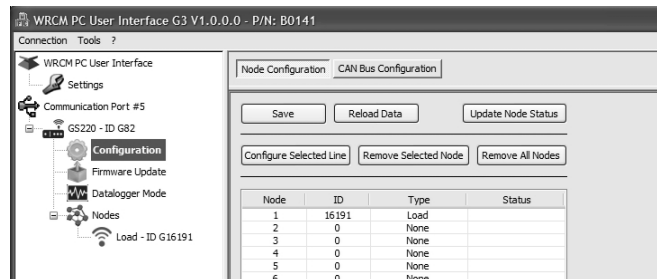


Figure: Node Configuration.

### Node Configuration:

All sensors in the GS22X system are programmed in the **Configuration** list. The information displayed under **Nodes** in the treeview section are defined in **Configuration** menu. Refer to section **2.4 Node Configuration** to add, remove or modify sensors information.

### 2.2d Firmware Update

Displays the current firmware information and allows to update the firmware. See **2.5 Firmware Update** section.

## 2.2e Datalogger Mode

In this mode, live information sent by the wireless nodes is displayed. The data can be logged to files; see the **Settings** section to configure this feature.

## 2.2f Nodes; sensor type

When a sensor is selected under Nodes, the following information is communicated to the WRCM;

- **Base Station ID:** Number engraved on the sensor.
- **Heart Beat:** When no change is detected in sensor value, the sensor status will be communicated to the GS22X in the interval (in seconds) indicated.
- **Communication timeout before sleep mode:** When the base station stops communicating information to the sensors, the sensors become inactive (sleep mode). The value indicated is the time (in seconds) before the sensors switch to the sleep mode.
- **Calibration Offset:** Allows to offset the value configured from the firmware.
- **Calibration Scale:** Allows to scale the value configured from the firmware.
- **Tx Sensivity:** Adjust sensors sensivity to value change.

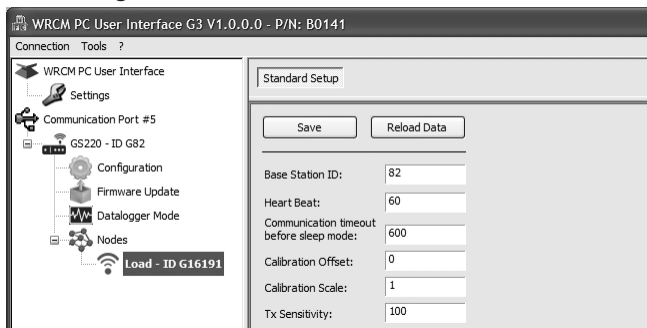


Figure: Nodes standard setup.

## 2.3 Base Station Configuration

There is no allowance to set device ID, manufacturing step, etc., which is not available. Contact your **LSI** representative or **LSI** technical support representative as required.

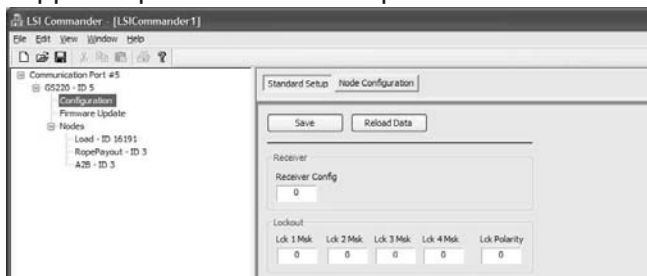


Figure: GS22X base station configuration.

## 2.4 Node Configuration

1. In the **Configuration** menu, select **Node Configuration**.
2. **Adding nodes:** To add sensors in the node list; Right-click on **Nodes** in the treeview section to add a sensor to the list using the scroll-box or; *In the **Configuration** menu, select a line and click on **Configure selected line** or double-click on the line to modify.*  
Enter the sensor ID and the node RF type.
3. **Removing nodes:** *To remove any sensor from the list;*  
*Right-click on the sensor under **Nodes** in the treeview section and select **Delete** or;*  
*In the **Configuration** menu, select the sensor line to remove and click on **Remove selected node**.*
4. **Reload Data:** Reload data from the WRCM and display data without saving any changes.
5. **Save:** Save changes in the WRCM memory. **Save** is automatically followed by **Update node status**.

## 2.5 Firmware Update (Base station only)

1. Select **Firmware Update** in the treeview section.
2. In the right section, click on **Browse** to select the update file (extension .220) and then hit **Update Firmware Now**.

**IMPORTANT!** The updated firmware will overwrite the current configuration settings.

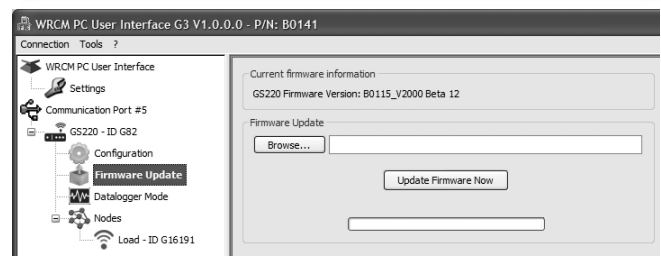


Figure: Firmware update.

### 3. INSTALLATION

**WARNING!** Installation must be made in compliance with *LSI* instructions and using *LSI* supplied components only. Failure to install all parts, or replacing parts or components with parts or components not supplied by *LSI*, may lead to system failure, serious injury or death.

**IMPORTANT!** Do not power wash the **GS22X**. The GS22X is not designed to withstand high-pressure washing devices that can erode the membrane fascia seal or create fissures in the membrane fascia. Power washing the display voids warranty coverage.

#### 3.1b Power Supply and Lockout Connection

#### 3.1c Wiring

Table: Wire description

Wire Color	Description
Red	Power supply, 9 to 36 volts
Black	Ground
Blue	CAN bus ground
	(not required on most CAN bus)
Green	CAN-H
White	CAN-L

### 3.1 GS22X Installation

It is recommended to install the receiver on the right side or left side of the cab, usually on the same side as the wind speed sensor. The best positioning would ensure line of sight in most boom position. If line of sight is not always possible, position optimisation could help improve the radio link, which improves battery life. If possible, do not hide the receiver behind metal structure.

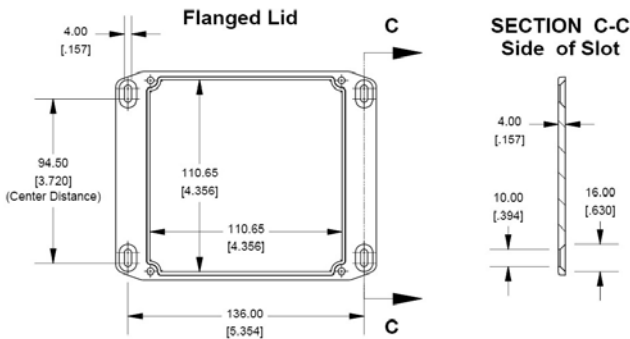


Figure: GS22X dimensions. Not to scale.

#### 3.1a Antenna Position

For optimal performance the antenna should be positioned on its side such that it is parallel to the sensor antennas (but not pointing directly to or directly away from them).

1. Adjust the antenna position with the articulating base.
2. The antenna should have 5 inches of clear space all around it.
3. The antenna should have an unobstructed line of sight to all sensor antennas at all boom angles.



## 3.2 Load Cell

**WARNING!** Capacity and safety factor for load cells and adapter plate assemblies are calculated for loads along the intended axis of load (vertical with the assembly hanging free); side loading may cause load cell and adapter plate assembly to fail, causing load to drop. Lifts must be rigged such that the load cell and adapter plate assembly hang free and not be subjected to side loading.

**CAUTION!** The load cell must be centered on the pins to avoid uneven loading on the plate kit assembly.

**IMPORTANT!** The load cell antenna should not be in contact with metal.

**IMPORTANT!** For optimal performance and signal reception, the load cell antenna should have a clear line of sight to the GS22X base station.

**IMPORTANT!** The load cell antenna should point to the left or to the right of the boom; it should not point directly to, or away from, the GS22X base station.

1. Install load cell bushings as supplied by *LSI*. Assembly of the load cell and adapter plates must be configured to the pin size required by the specific dead end or hook to which it is to be attached. In all cases, the bushings supplied by *LSI* must be used where possible to adapt the holes in the load cell to the pins. Bushings must be secured with the two allen screws provided, one on each side of the load cell.
2. As required, place a washer between adapter plate and pin head or nut on each end of the pin that links the adapter plates to the load cell. Additional washers should be added equally to each end of the pin as required to inhibit excessive lateral movement of load cell (maximum 1/8" total movement) and adapter plates along the pin.
3. If the dead end or hook to be connected to the adapter plates requires a larger opening, washers may be placed between the load cell and the adapter plates equally on both sides of the load cell.

4. In all cases the washers must be placed symmetrically such that the load cell is centered on the pins to avoid uneven loading.
5. Secure the pins with the nuts and cotter pins provided.
6. A qualified (lift supervisor or crane inspector) person must verify every lift assembly before first use and periodically thereafter (one to twelve months), including before any new, difficult or otherwise different lift.

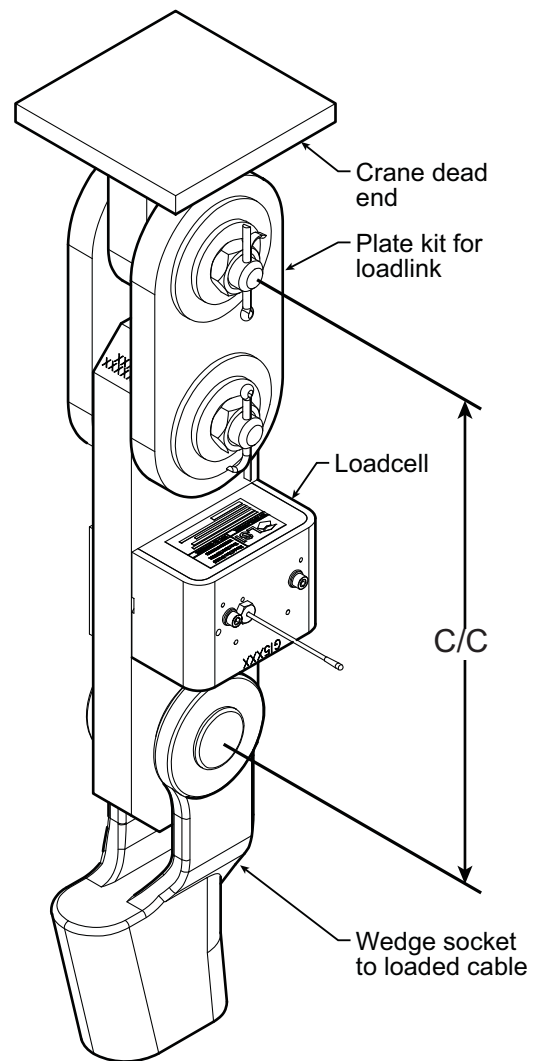


Figure: Typical load cell and adapter plate assembly installed.

### 3.3 Angle Sensors for the Boom or Jib

**IMPORTANT!** Keep the angle sensor away from the boom and any connecting metal structures when welding the metal lugs to the boom. Proximity to welding may cause permanent damage to the angle sensor and prevent accurate angle indication.

#### 3.3a Mounting Procedure

The GS010 series angle sensors can be turned on by starting up the GS22X base station to which they are programmed. The angle sensor can then assist in levelling itself with the red and green LED.

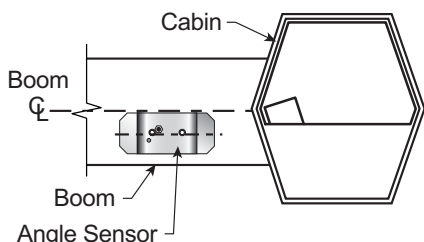


Figure: Angle sensor level with the boom (typical installation) - Side View

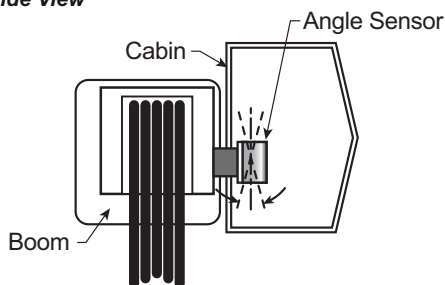


Figure: Angle sensor top/bottom axis within 15° of vertical (typical installation) - Front View

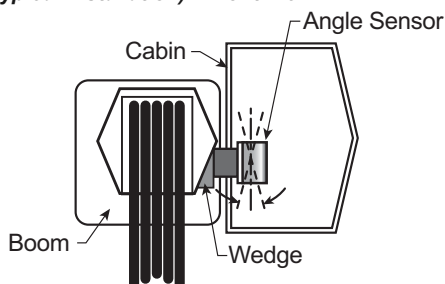


Figure: Wedge used to mount the angle sensor with its top/bottom axis within 15° of vertical (typical installation) - Front View

1. Determine the angle sensor position.

**WARNING!** The angle reading may be affected by vibration and may fluctuate; the angle sensor should not be installed in close proximity to a high RPM electric motor or other source of high frequency vibration.

- a. The GS010-01 boom angle sensor can be mounted on either side of the boom.
- b. The GS010-02 360° angle sensor must be mounted on the port side of the jib.
- c. The angle sensor must be level with the boom or jib centerline.
- d. The top / bottom axis of the angle sensor must be within 15 degrees of vertical
- e. The angle sensor should have a clear line of sight to the cabin mounted display.
- f. The angle sensor antenna should not contact a metal object.

2. Install the welding pads; keep the angle sensor at least three feet 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 the angle indication; **the GS22X must be connected to a computer.**
5. If the angle displayed by a GS010-01 boom angle sensor is a high negative value, then tilt the angle sensor up over 45 degrees, and then tilt back down to horizontal. The GS010-01 boom angle sensor will automatically detect on which side of the boom it is installed and correct angle indication accordingly.

#### 3.3b Angle Calibration Procedure № 1: Mechanical Set-Up

**The GS22X must be connected to a computer to proceed with calibration procedure.**

1. Level the boom such that it is perfectly horizontal; use a high quality bubble or digital angle sensor. If the GS22X base station indicates 0.0 degrees then angle calibration is complete; if not then continue to step 2.

**WARNING!** Failure to ensure the boom is levelled will result in false reading of the crane's radius hence the risk of structural failure of the crane or crane tipping over.

Note: Press **Update Node Status** in the WRCM PC user interface to display the current angle value.

2. For GS011 angle/length sensors only: Carefully remove the cover of the GS101 cable reel.
3. Loosen the mounting screw in the slotted hole of the angle sensor mounting plate.

- Pivot the angle sensor slightly until angle indication is correct. Repeat the angle validation (step 1) as required.

### 3.3c Angle Calibration Procedure № 2: Correct with the GS22X

*The GS22X must be connected to a computer to proceed with calibration procedure.*

Calibrate angle indication by adjusting the trim (offset) value in the WRCM PC user interface; the GS22X will then communicate the updated trim value to the sensor.

- Position the boom at a precisely known angle.
- Adjust the trim value in the WRCM.  
**Example:** If angle indicated is 0.3° over the actual angle, adjust the trim value to -0.3.  
**Example:** If angle indicated is 0.9° below the actual angle, adjust the trim value to 0.9.
- Verify accurate angle indication at both very high and very low angles.

## 3.4 Anti-Two-Block Switch

**WARNING!** Keep the anti-two-block switch away from the boom and any connecting metal structures when welding mounting brackets to the boom. Proximity to welding may cause permanent damage to the anti-two-block switch and render the anti-two-block system unsafe.

**IMPORTANT!** To ensure reliable radio communication between the anti-two-block switch and the GS22X base station the following conditions must be respected:

- The antenna of the anti-two-block switch should not be in contact with metal.
- The anti-two-block switch antenna should point to the left or to the right of the boom; it should not point directly to, or away from, the GS22X base station.
- The anti-two-block switch antenna should have a clear line of sight to the GS22X base station; in most cases this means mounting the sensor on the same side of the boom as the operator's cab.

Verify the anti-two-block switch is programmed to the GS22X base station. Switches shipped with GS22X are pre-programmed in the factory. *Test:* if the switch has been programmed to the display then the display will go in to two-block alarm when the wire rope of the switch is released. If the switch has not been programmed to the GS22X, this should be done before proceeding with installation. See the section **2.4 Nodes Configuration**.

### 3.4a GS050 Installation

- Position the sensor mounting bracket. To ensure that the sensor can pivot securely on the mounting bracket throughout the full range of boom angle, the mounting bracket must be positioned at a 30° from horizontal with the boom parallel to the ground and such that the locking pin of the mounting bracket points up. **Bolt or weld securely.**

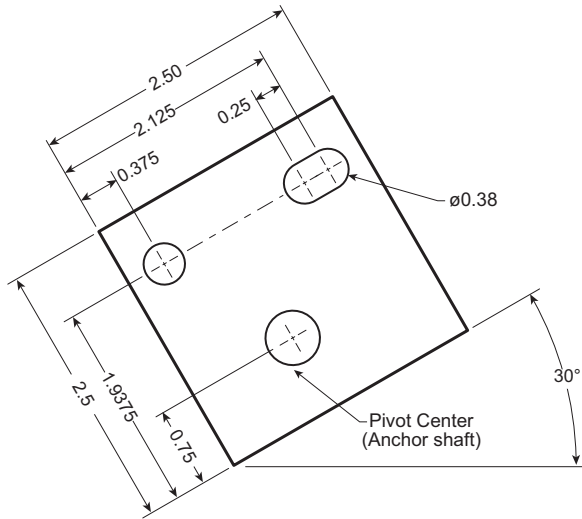


Figure: Bracket footprint and orientation, All dimensions are in inches. Not to scale.

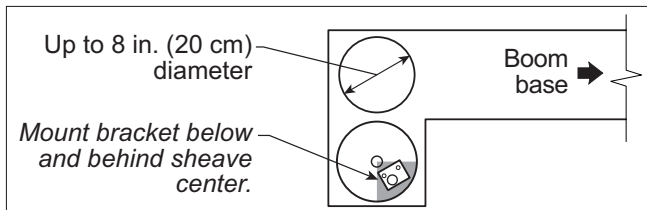


Figure: Anti-two-block switch placement on a telescopic boom

If the head sheave diameter is between 8 and 16 inches (20-41 centimetres) then two mounting brackets will be required to permit both live and dead end mounting.

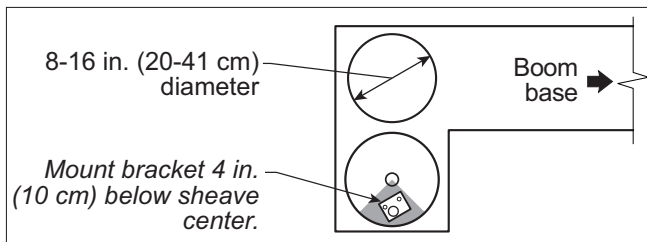


Figure: Anti-two-block switch placement for live end mounting on a lattice boom

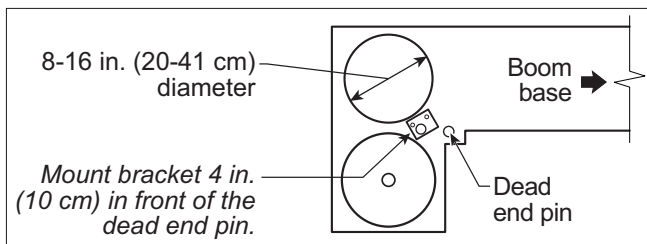


Figure: Anti-two-block switch placement for dead end mounting on a lattice boom

For live end mounting on multiple sheave blocks with sheaves greater than 16 inches (41 centimetres) in diameter consult your service representative.

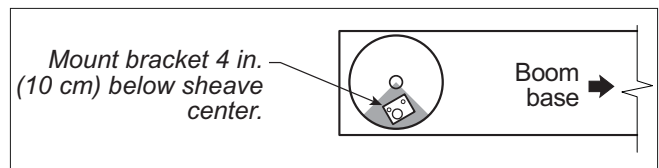


Figure: Jib, rooster or other extension; anti-two-block switch placement for single part of line operation only

For fast line weight installation place the anti-two-block switch mounting bracket directly below the sheave center as low and as close to the edge of the sheave as possible. Place the fast line weight mounting bracket on the opposite side of the sheave with the chain hole pointing down and lined up opposite the pivot of the anti-two-block switch mounting bracket.

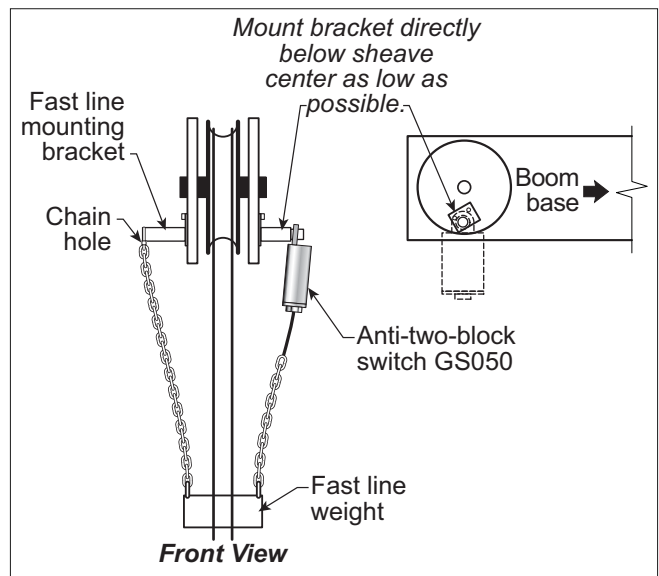


Figure: Fast line weight installation

2. Mount the GS050 on the bracket and verify that the GS050 can rotate freely through all possible boom movements without being able to come off the bracket.
3. Install the weight and chain assembly around the cable and attach the other end of the chain to the GS050. Tighten all the chain links of the chain assembly.
4. Adjust chain length as required, see sub-section **Chain length adjustment**.
5. Test system function.

### 3.4b GS075 Installation

1. **Optional Bracket:** Position the optional mounting bracket on the boom. **Bolt or weld securely.**
2. Attach one end of the chain assembly to the optional bracket or to the boom and the other end to the eye bolt of the GS075. Tighten all the chain links of the chain assembly.
3. Remove the hair pin and the clevis pin and open the back end of the GS075. Install the GS075 around the cable and then put the clevis pin back in.

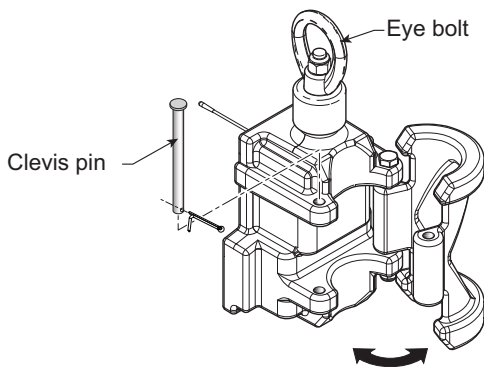


Figure: Install the GS075 around the cable

4. Adjust chain length as required, see sub-section **Chain length adjustment.**
5. Test system function.

### 3.4c Chain length adjustment

1. Chain length adjustment № 1 – minimum boom angle
  - a. At minimum boom angle, with no additional weight on the hook block and one part of line only, lift the boom just enough to have the hook block suspend and clear the sensor chain and weight.

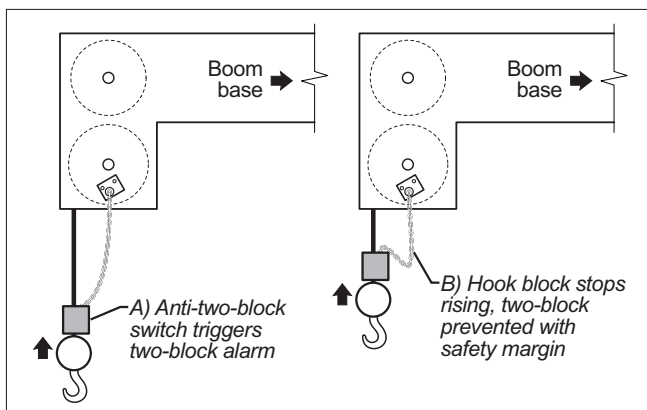


Figure: Chain length test at minimum angle

- b. Hoist slowly until the buzzer sounds. Note the hoisting distance remaining; this distance must be great enough to allow the operator and the lockout system, if installed, to prevent a two-block event. If necessary, add chain between the sensor and weight to increase warning distance. If still insufficient, contact your service representative.

2. Chain length adjustment № 2 – maximum boom angle
  - a. Raise the boom to the maximum angle.
  - b. Hoist slowly as described in **Step 1.b.** Verify that the warning distance is equal to or greater than that determined at the minimum boom angle.

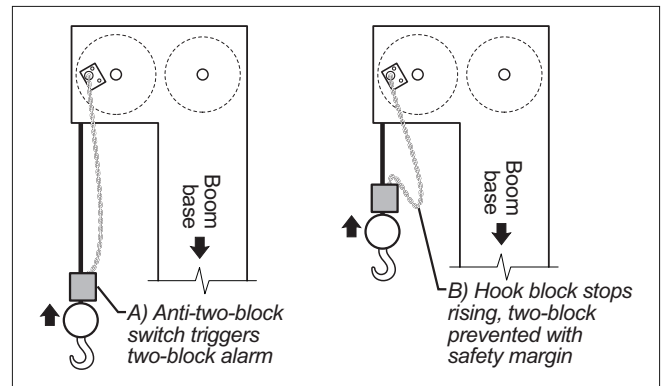


Figure: Chain length test at maximum angle

3. Chain length adjustment № 3 – speed test: Lower the boom until the weight height becomes visually clear to the operator. Repeatedly create two-block, progressively hoisting faster, to ensure that the warning and lockout work within acceptable amount of time and distance. Increase the length of the chain if needed.

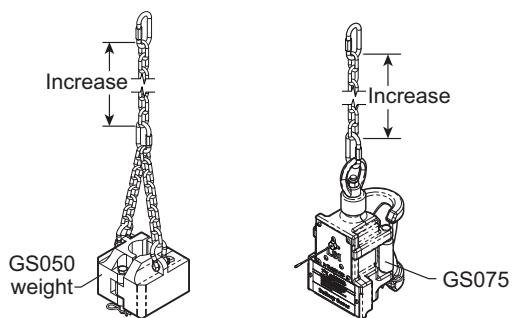


Figure: Chain length adjustment

**IMPORTANT!**  
 GS050: to increase chain length, only use lightweight chain.

### 3.5 Length Sensor Cable Reel

**WARNING!** Arc welding may damage LSI sensors, causing immediate failure or greatly reducing functional life. Arc welding on or near LSI equipment will void warranty. Keep LSI equipment well clear of any arc welding.

The GS101 includes the LS101 cable reel and the GS011 angle/length sensor. The GS011 is concealed under the cover of the LS101, though the antenna is visible. Following cable reel installation and boom length indication calibration, boom angle indication will have to be verified and possibly calibrated. Refer to **Angle Calibration Procedure № 1: Mechanical Set-Up** and **Angle Calibration Procedure № 2: Correct with the GS22X**, sections of this manual.

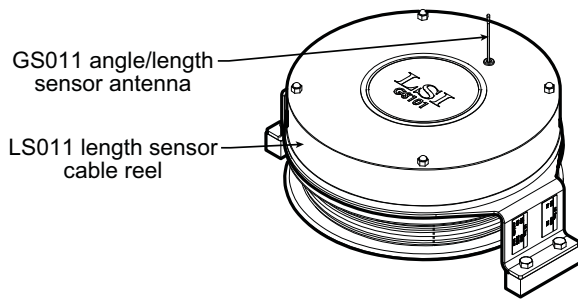


Figure: GS101 angle & length sensor

#### 3.5a Maximum Boom Extension

Confirm the maximum extension of the LS101 cable reel is compatible with the maximum boom length.

Step 1. Note the cable reel maximum extension: 100 feet (30.5 metres) unless specified otherwise.

$$T = \underline{\hspace{2cm}}$$

Step 2. Note the retracted boom length.

$$A = \underline{\hspace{2cm}}$$

Step 3. Note the maximum extended boom length, not including jib.

$$B = \underline{\hspace{2cm}}$$

Step 4. Calculate maximum boom extension.

$$C = B - A = \underline{\hspace{2cm}}$$

Step 5. Compare cable reel maximum extension (T) to maximum boom extension (C).

$$D = T - C = \underline{\hspace{2cm}}$$

**Maximum cable reel extension must be greater than maximum boom extension.**

#### 3.5b Mounting the Cable Reel

1. Determine placement. Find a clear mounting position on the left side of the first (main) section of the boom. The mounting position should be close to the base of the boom; at least ten feet (three metres) from the tip of the first section and where the cable reel won't obstruct free boom movement at all boom angles and slew positions. Furthermore, the reel must be placed such that the cable has a clear straight line to the end of the last section at all boom lengths.

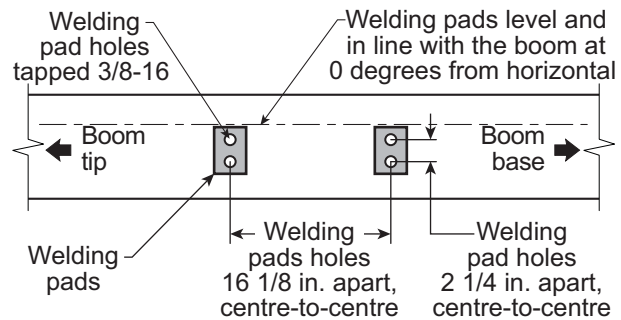


Figure: Cable reel mounting position

2. Mount the welding tabs. They must be placed parallel to each other, with 16 1/8" inches between the holes' centres. Install the tabs such that they create a level mounting position in line with the boom at 0 degrees.

*Note: When factory installed, the GS011 angle/length sensor transmitter is integrated to the LS101 cable reel with the angle sensor zeroed. If the cable reel is installed perfectly level on the boom at 0 degrees, the angle sensor of the GS011 will also be zeroed. Minor adjustments to the angle sensor (within plus or minus two degrees) are possible after cable reel installation.*

3. Attach the reel to the welding tabs with the bolts provided.
4. Install the first cable guide (PA111) about 10 feet (3 metres) from the cable reel. Correct alignment of the first guide is critical to ensure orderly winding of the cable on the reel. Install the other guides at the end of each of the intermediate sections and the anchor (PA113) at the end of the last section. All guides must be aligned so as to permit unobstructed movement of the cable.
5. Pull out at least 5 feet (1-1/2 metres) of cable, but not more than half the excess extension of

measurement D. Feed through the cable guides and attach to the cable anchor on the tip of the last boom section. If additional cable length is required to reach the cable anchor point remove winds from the reel without putting additional tension on the cable reel spring. There should be minimal tension on the cable reel spring when the boom is fully retracted.

**The GS22X must be connected to a computer to proceed with the following.**

6. Verify the boom length indicated by the WRCM PC user interface. Boom length indicated should equal the actual total boom length. The actual boom length is the distance from the boom base pin to the head sheave centre as measured along the boom centreline. Depending on the exact placement of the cable reel and the cable anchor the displayed length may differ from the actual length.

### 3.5c Boom Length Calibration Procedure № 1: Mechanical Set-Up



**CAUTION!** Visually monitor remaining length on the cable reel as the boom is extended for the first time following installation. This generally requires a second person (in addition to the operator).

**The GS22X must be connected to a computer to proceed with calibration procedure.**

1. Fully retract the boom
2. Adjust the loose wire rope at the boom tip so that the displayed boom length matches the actual boom length.
3. Fully extend the boom

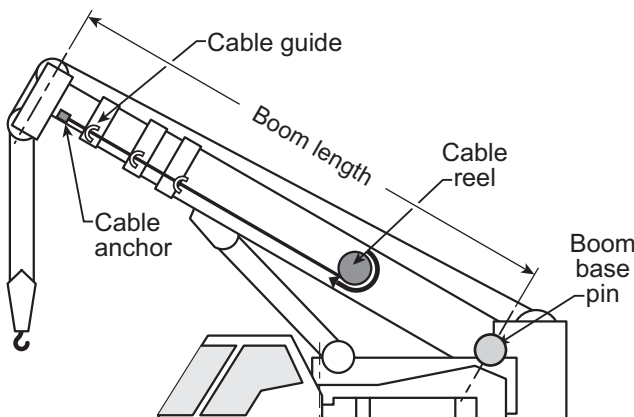


Figure: The actual boom length. typical installation.

4. Verify the boom length indicated at full boom extension matches the actual fully extended boom length. If not then follow **Boom Length Calibration Procedure № 2: Correct with the GS22X.**

### 3.5d Boom Length Calibration Procedure № 2: Correct with the GS22X

**The GS22X must be connected to a computer to proceed with calibration procedure.**

If the displayed boom length does not match the actual length of the boom retracted or extended and if it is not possible to easily correct by following 2.6c Boom Length Calibration Procedure № 1, then follow this procedure. This procedure is completed in the operators cab, it requires fully retracting, and then fully extending the boom, as prompted by the on screen instructions.

1. Select the length sensor in the **Nodes** list in the WRCM PC user interface.
2. Press **Next** to start the wizard.
6. Note the units that will be used during the calibration wizard, and then press **Next**.
7. Fully retract the boom, and then press **Next**.
8. Use **Up** and **Down** to adjust the length value displayed to equal the actual fully retracted boom length, and then press **Next**.
9. Fully extend the boom, and then press **Next**.
10. Use **Up** and **Down** to adjust the length value displayed to equal the actual fully extended boom length, and then press **Next**.
11. Note the new trim value, and then press **Next**.
12. Note the new scale value, and then press **Next**.
13. Press **Enter** to send the new calibration to the length sensor.
14. Press **Exit** three times to return to the operation display.

### 3.7 Wireless Wind Speed Sensor GS020

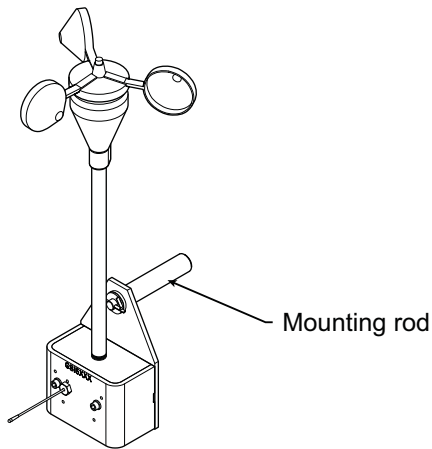


Figure: GS020 wireless wind speed sensor

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

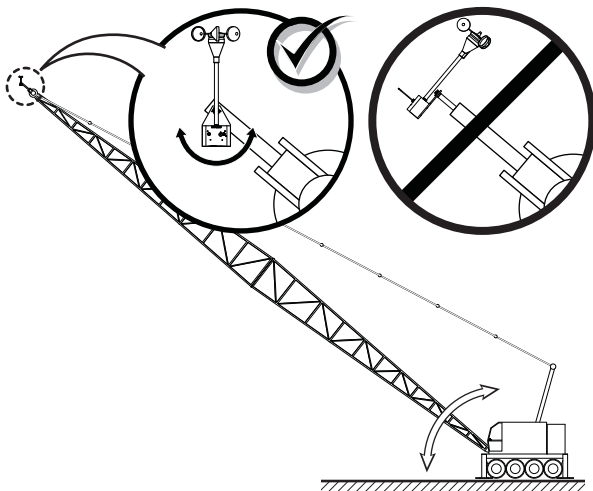


Figure: Swivel orientation

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

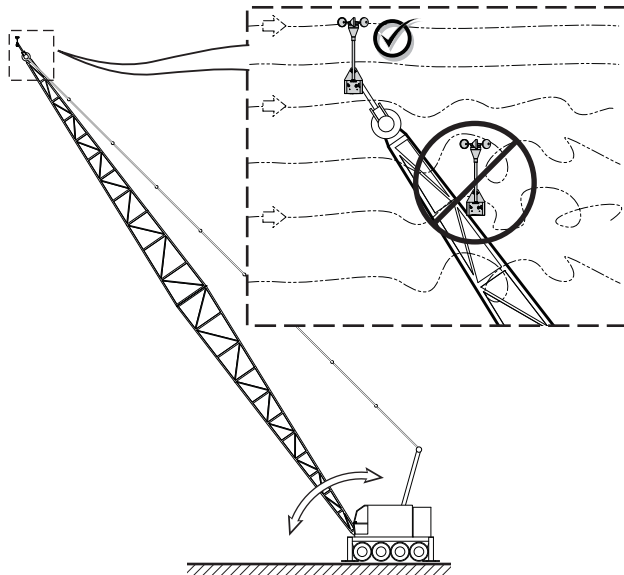


Figure: Wind clearance

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

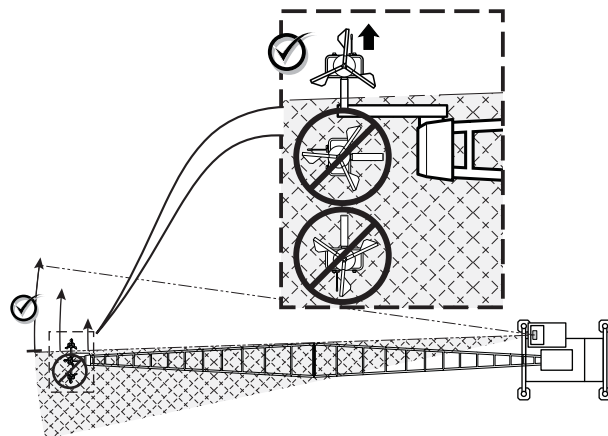


Figure: Radio line of sight - Crane top view

3. Weld or screw the mounting rod to the boom at the selected position.

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

4. Re-position the wind speed sensor on the mounting rod, add the washer and secure with the cotter pin.



### 3.8 Wireless Load Pins

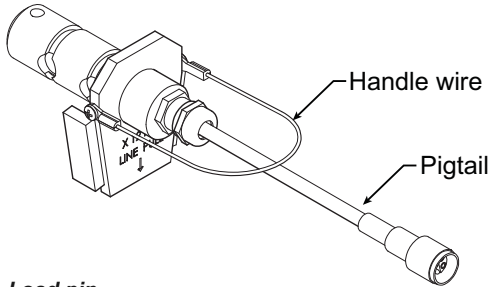


Figure: Load pin

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

#### 3.8a 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.*

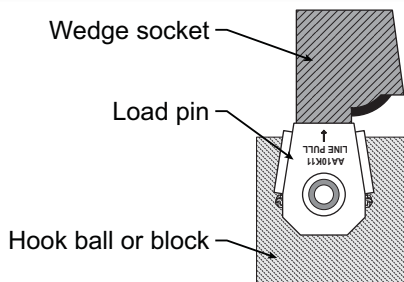


Figure: Load pin LP011, LP015 or LP026 - Installation on a single part block

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

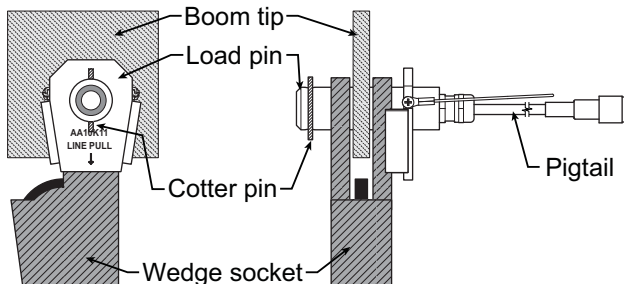


Figure: Load pin LP011, LP015 or LP026 - Installation at boom tip

#### 3.8b 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.

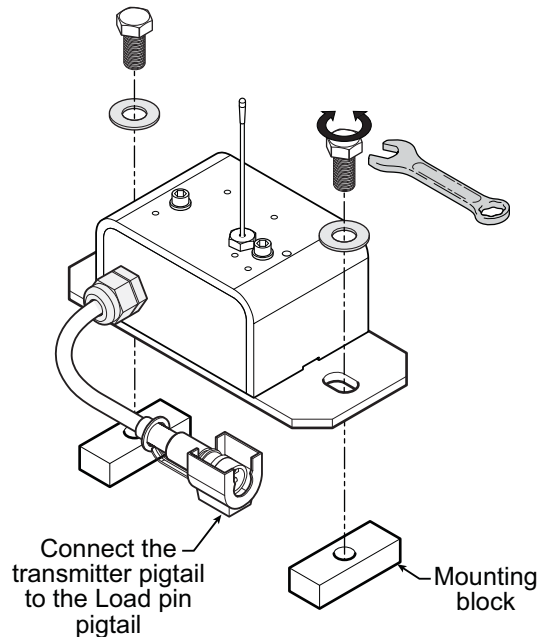


Figure: Install the load pin transmitter GS001

## 3.9 Line Riding Tensiometer

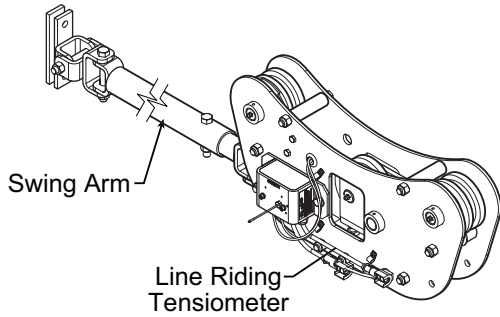


Figure: Line riding tensiometer

### 3.9a 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.

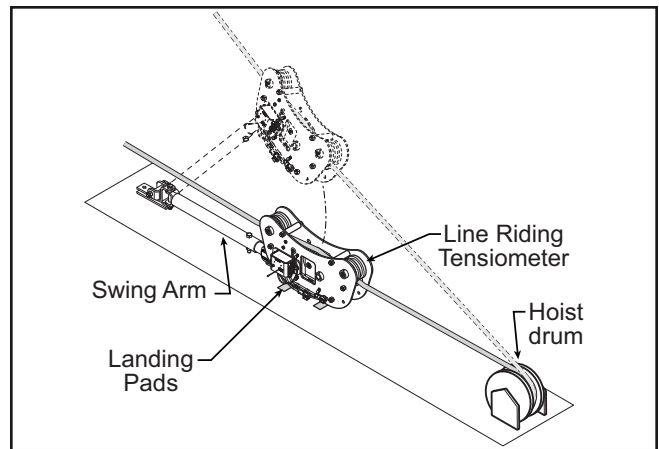


Figure: Typical installation (not to scale)

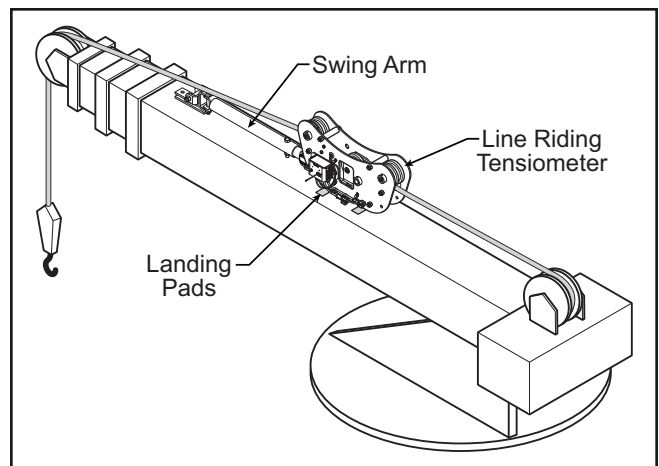


Figure: Example of a typical installation on a telescopic boom crane (not to scale)

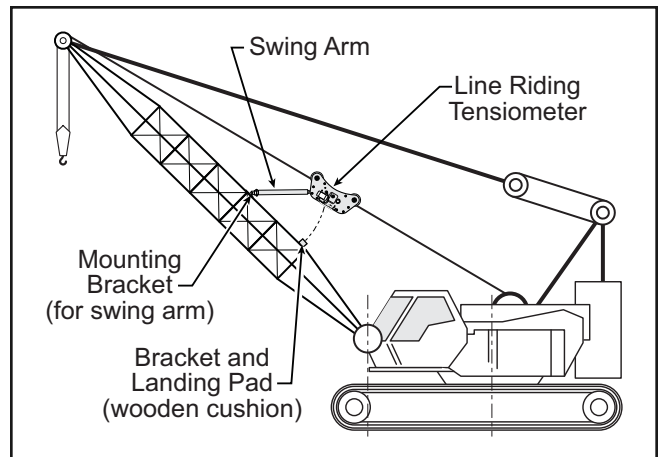


Figure: Example of a typical installation on a lattice boom crane, allows for lower clearance (not to scale)

### 3.9b 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 diameter.

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

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

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).

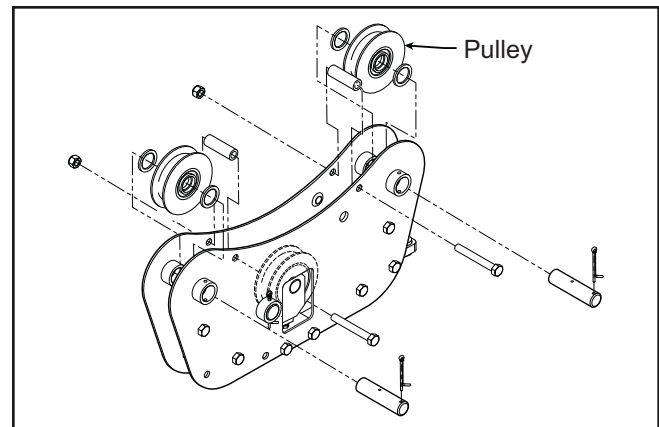


Figure: Removing top sheaves, bolts and spacers on Line Riding tensiometer type 1 (LD008 shown).

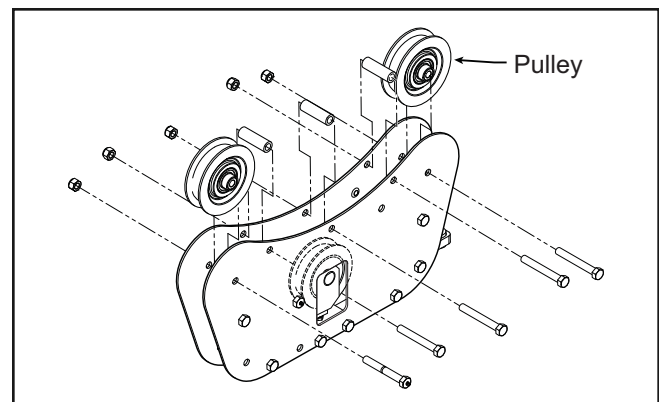


Figure: Removing top sheaves, bolts and spacers on Line Riding tensiometer type 2 (LD024 shown).

### 3.12 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).

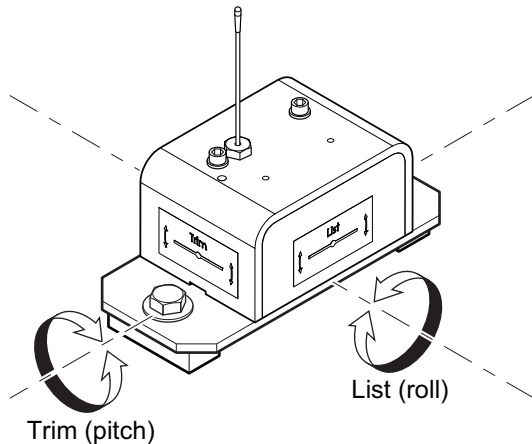


Figure: List and Trim axes

#### 3.12a Programming the GS22X for List and Trim Indication

**The GS22X must be connected to a computer to proceed with the following.**

For list indication, add the GS010-03 ID number to the sensor list and select the sensor type “List sensor”.

For trim indication, add the GS010-03 ID number to the sensor list 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.

#### 3.12b 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 WRCM.

#### 3.12c List and Trim Angle Calibration

**The GS22X must be connected to a computer to proceed with the following.**

Calibrate the angle indication by adjusting the **Offset** values for list and trim in the WRCM; the GS22X will then communicate the updated offset values to the sensor. Verify accurate list and trim angle indication.

### 3.13 Rope payout

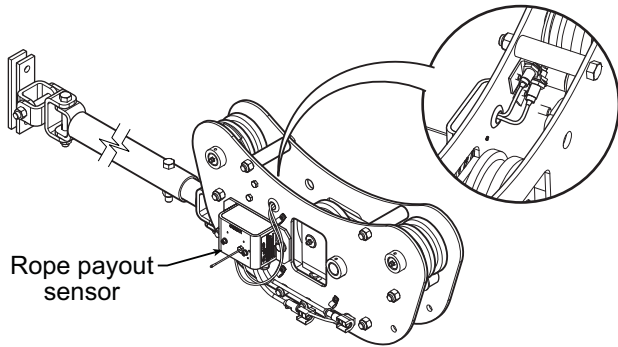


Figure: Rope payout on a line riding tensiometer

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. It indicates rope payout (length) and rope speed.

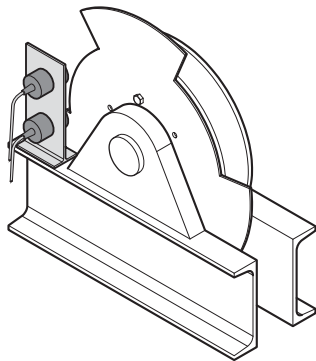


Figure: Alternative installation of a rope payout

Zero the rope payout using the Tare menu before calibration.

#### 3.13a Rope Payout Calibration Procedure № 1: Mechanical Set-Up

**The GS22X must be connected to a computer to proceed with the following.**

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 in the WRCM matches the actual length of wire rope paid out. If not then follow **Rope Payout Calibration Procedure № 2.**

#### 3.13b 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 GS22X base station unit

## 5. MAINTENANCE

### 5.1 Sensors

#### 5.1a Replacing Sensor Battery

**IMPORTANT!** Protect the interior of the sensor from dirt and humidity at all times.

**IMPORTANT!** Both lithium or alkaline batteries can be used, however lithium battery will last about 2.5 times longer.

1. Unscrew the two allen screws about a quarter of an inch.
2. Insert a flat bladed screwdriver in the battery cover notch to pry the box away from the mounting plate. The silicone seal may cause some resistance.

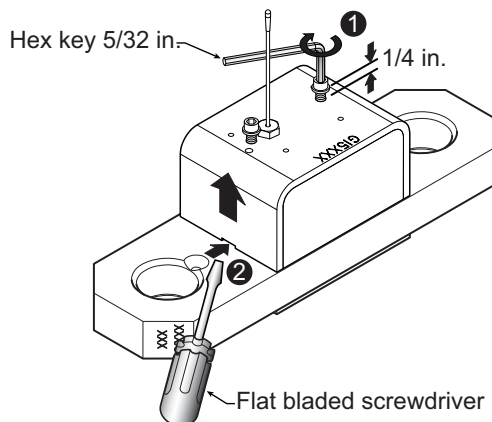


Figure: Remove the sensor box from the mounting plate

3. The data wires of a load cell may be disconnected to facilitate battery replacement.

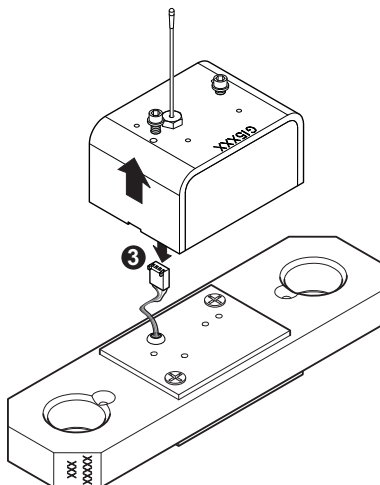


Figure: Disconnect the data wires

4. Remove the battery by hand.
5. Remove the remaining silicone from both the box and the mounting plate.
6. Install the new battery: insert the positive end and then push in the direction of the positive pole.
7. Reconnect the data wires if disconnected.

*Note: A 3.6 volt lithium "D" cell battery will provide about two years of battery life for a load cell, while an alkaline "D" cell battery will provide less than one year of battery life\*.*

New high quality "D" cell battery: 3.6 V lithium, or alkaline

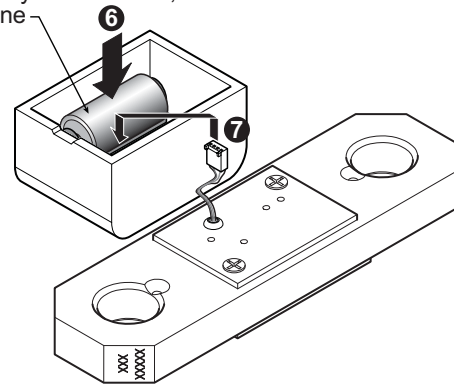


Figure: Install the new battery and reconnect the data wires

8. Apply a non-corrosive RTV silicone all around the edge of the mounting plate to create a new seal without bubbles or breaks.

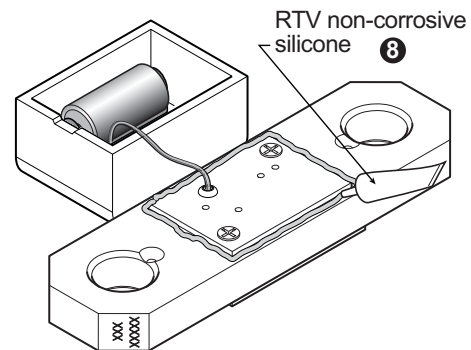


Figure: Apply non-corrosive RTV silicone

9. Reposition the box over the mounting plate and screw in the hex screws. **Do not overtighten.**

\* Actual battery life will vary greatly depending on the application, the frequency of use, the age and quality of the battery etc.

## 5.2 Anti-Two-Block switch

**IMPORTANT!** Replace all the batteries of the anti-two-block switch at the same time. Unchanged batteries will reverse polarity severely reducing battery life.

**IMPORTANT!** Protect the interior of the anti-two-block switch from dirt and humidity at all times.

**IMPORTANT!** Both lithium or alkaline batteries can be used, however lithium battery will last about 2.5 times longer.

### 5.2a Replacing the GS050 Batteries

**IMPORTANT!** Class I Div I sensors certified by CSA or ATEX should use alkaline batteries only.

**IMPORTANT!** Do not unscrew the white nylon hex bolt of the antenna.

**IMPORTANT!** Do not unscrew the small screw to the left of the antenna.

This procedure does not apply to the GS005 mechanical anti-two-block transmitter; please refer to the **Replacing Sensor Battery** section.

1. Remove the anti-two-block from the crane and clean off dust and grime.
2. Place the anti-two-block on the edge of flat surface. Use an adjustable wrench to unscrew the large white nylon hex bolt of the wire rope about one half-inch.
3. Carefully remove the plunger assembly without separating it from the cover, and place it on a clean and dry surface.

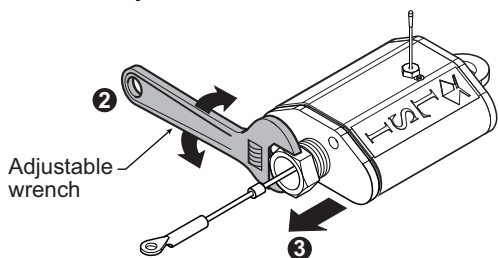


Figure: Remove the plunger assembly of the GS050

4. Slide out the four old batteries.
5. Insert the four new batteries following the positive - negative schematic printed on the

back of the sensor.

6. Replace the plunger assembly. Correctly align the bottom cover before screwing in the white nylon hex bolt of the wire rope. Tighten well.
7. Pull and release the wire rope, the light emitting diode (LED) on the bottom of the sensor should flash red.

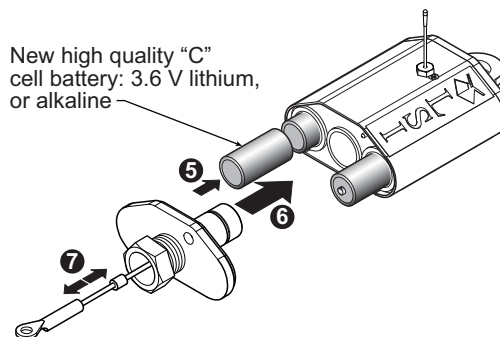


Figure: Install the new batteries and the plunger

8. Reinstall the anti-two-block switch.
9. Test the anti-two-block system for alarm and lockout before operating the machine.

### 5.2b Replacing the GS075 Battery

1. Remove the GS075 anti-two-block from the crane and clean off dust and grime.
2. Unscrew the two screws of the battery cover and remove the battery cover.
3. Remove the battery by hand.
4. Insert the new battery following the positive - negative schematic.
5. Reposition the battery cover and screw in both screws.

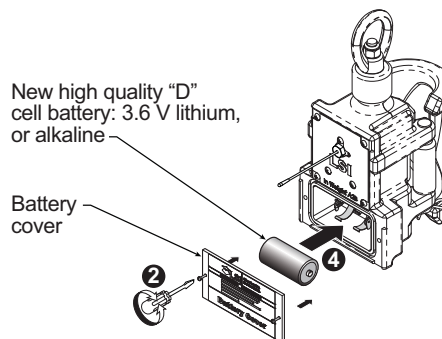


Figure: Replacing GS075 battery

6. Reinstall the anti-two-block switch.
7. Test the anti-two-block system for alarm and lockout before use.

## 5.3 Replacing a Sensor Antenna

Heavily damaged antennas (ripped out, sheared off, wire exposed and fraying etc.) should be replaced to ensure effective communication between the sensor and the cabin mounted display unit.

This procedure may be followed without removing the sensor from the crane if it is safe to do so. If removed, an angle sensor must be re-calibrated during reinstallation for correct angle display (see the angle sensor installation section of the user's manual).

**IMPORTANT!** The interior of the sensor must be protected from dust, grime and water at all times.

1. Place the crane, boom, jib or ball hook such that the sensor is safely accessible.
2. Clean dust, grime and water from the sensor.
3. Identify the short black whip antenna and the white hex bolt securing it.
4. Inspect the antenna for signs of obvious physical damage.
5. Carefully unscrew the white nylon hex bolt completely and slide it up the antenna.

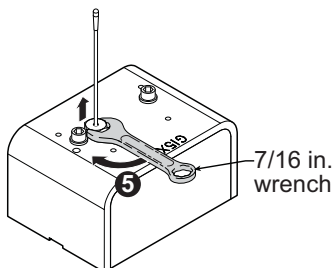


Figure: Unscrew the white nylon hex

6. Grip the antenna by the base of the black plastic sheathing and pull it straight out of the hole in which it is seated. Place the old antenna aside.

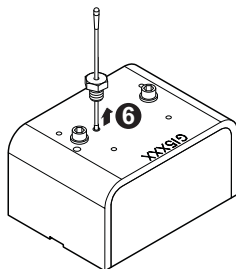


Figure: Pull out the antenna

7. Slide the white nylon hex bolt to the middle of the length of the new antenna.
8. Coat the exposed metal foot of the new antenna with an electrical insulating compound by carefully inserting it in the mouth of the compound tube.

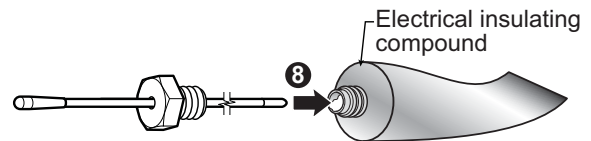


Figure: Coat the exposed metal foot of the antenna

9. Hold the new antenna by the black plastic sheathing and guide it through the hole in the sensor box. Carefully seat the antenna in its mating connector. When the antenna is correctly seated, pulling on it will be met with light resistance.

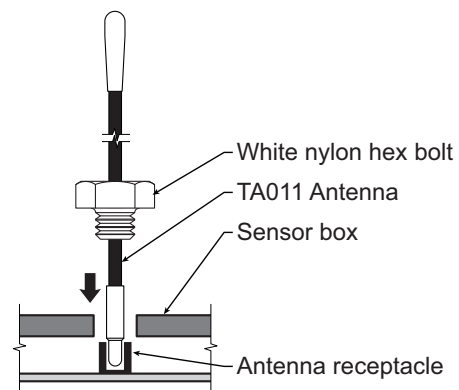


Figure: Install the new antenna

10. Carefully re-thread, screw-in and tighten the white nylon hex bolt to secure the antenna in place. **Do not overtighten.**
11. Reinstall the sensor if necessary (if removed from the boom or jib, an angle sensor will require re-calibration during the installation procedure, see the angle sensor installation section of the user's manual).
12. Verify that the sensor functions properly.



## 5.4 Load Cells

**WARNING!** Heavy shock may affect load indication accuracy. Inspect the load cell regularly for clearly visible dents or scratches. Test the load indication if collision damage is visible.

### 5.4a Reading Accuracy

*LSI* flat bar load links are pre-calibrated at the factory. No “zeroing” or other calibration is required on installation. Each link is heat treated to age the steel and ensure stable readings for many years; the load cells are individually temperature compensated to guarantee accuracy. *LSI* flat bar load links are calibrated to indicate between 100% and 104% of their Safe Working Load (SWL).

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

SAE J 159 4.2.1 recommends load indicating devices should show not less than 100% of the actual load and not more than 110% of the actual load.

### 5.4b Load Testing

*LSI* recommends testing the load cell every year for accuracy. The simplest way of testing a load cell is to lift at least two known weights. A test weight should be known with an accuracy of ±1%. If the load cell is installed at the boom tip dead end, all additional equipment such as blocks, slings, sensors, etc. should also be known to an accuracy of ±1%.

Determine the accuracy of the tested system with the following formula:

$$\frac{\text{Indicated Load}}{\text{Actual Load}} \times 100 = \% \text{ of Load}$$

(Reference: SAE-J-159 7.3)

The test loads must be significantly relative to the load cell capacity. The minimum test weight is about 20% of the safe working load; a good test weight is greater than 50% of the SWL. For example, a 30 000 lb load cell on four parts of line has a SWL of 120 000 lb; the minimum test load in this case would be 24 000 lb, a good test load would be 60 000 lb or more.

### 5.4c Care

**Battery.** Lithium batteries older than 18 months old (alkaline batteries over 6 months old) should be changed at the first available planned inspection even if there is not yet a low battery warning. This will avoid costly delays in the field.

**Corrosion.** Verify that no corrosion is visible on the battery holder inside the load cell transmitter. If some trace of corrosion is visible, rub it off gently and put a small amount of dielectric grease\* on each battery holder post to protect the contacts.

**Mechanical stresses.** Verify the load cell sides for dents or heavy scratches. The side of the load cell under the transmitter box is the most sensitive region. Engraving a number in this area will affect load cell accuracy and reliability. If the transmitter box has been hit and the box does not fit perfectly to the underlying link, please call *LSI* to have it repaired. Engraving on the transmitter box sides will not affect reading.

**Seal.** If the transmitter box has been removed it must be correctly resealed with RTV non-corrosive silicone.

**Antenna.** Small scratches on the antenna will not affect radio communications. A heavy bending of the antenna or bare sections on the wire may reduce the radio efficiency.

**Hex bolts.** The hex head bolts on the transmitter box are there to protect the antenna and to hold the transmitter box on the load cell link. If one or both hex nuts are scratched, it will not affect the load cell readings or operation. If the bolt head is bent or sheared verify that the transmitter box fits tightly to the load cell link before contacting *LSI* for replacement bolts.

\* Dow Corning dielectric grease №4

## 7. CERTIFICATION NOTES

### 7.1 FCC and IC – Instructions to the User

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception.

**IMPORTANT!** Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**FCC ID: QVBGS200      IC: 7076A-ICGS200**

#### RF Exposure Warning:

This product complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment. To comply with RF exposure requirements, the unit must be installed and operated with 20 cm (8 in.) or more between the product and your body. This product may not be collocated or operated in conjunction with any other antenna or transmitter.

This device has been designed to operate with the antennas listed below, and having a maximum gain of 3.0 dB. Antennas not included in this list or having a gain greater than 3.0 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

#### Antenna List

LSI P/N:	TA011
Description:	1/4 wave monopole
MFG	Load Systems International

**FCC ID: QVBGS000      IC: 7076A-ICGS000**

**FCC ID: QVBGS050      IC: 7076A-ICGS050**

**FCC ID: QVBGS075      IC: 7076A-ICGS075**

#### RF Exposure Warning:

This product complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment. To comply with RF exposure requirements, the unit must be installed and operated with 20 cm (8 in.) or more between the product and your body. This product may not be collocated or operated in conjunction with any other antenna or transmitter.

This device has been designed to operate with the antennas listed below, and having a maximum gain of 3.0 dB. Antennas not included in this list or having a gain greater than 3.0 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

#### Antenna List

LSI P/N:	TA011
Description:	1/4 wave monopole
MFG	Load Systems International

## 8. LSI PRODUCT LIMITED WARRANTY - 2009/02/16

### 8.1 Limited Warranty

**LOAD SYSTEMS INTERNATIONAL INC.** (hereafter "**LSI**") warrants its products (the "Products"), for a period of twenty four (24) consecutive months after delivery of such Products to the user (as evidenced on a **LSI** document) (the "Warranty Period"), when installed and used in accordance with specifications described in **LSI** Installer and User's Manual, as amended from time to time, **LSI** technical materials and any related writings published by **LSI** with respect with such Products and any industry standards, will be free from defects in materials and workmanship. During the Warranty Period, **LSI** or its designated service representative shall repair, or at its option, replace any Product that is confirmed to be defective by **LSI**, in its sole discretion, in accordance with the Limited Warranty Services Procedures described below.

### 8.2 Warranty Services Procedures

In order to benefit of this-mentioned Limited Warranty coverages and benefits, the purchaser must notify **LSI**'s customer service or **LSI**'s authorized distributor or representative originally responsible for the sale of the Products within 10 days of the occurrence of a suspected defect in materials or workmanship, prior to the expiry of the Limited Warranty Period in order to obtain a Return Authorization Number. A proof of purchase of the Product, such as an invoice or a receipt certifying the validity of the Warranty, must be presented in order to obtain Limited Warranty coverage. In any event, even if a Return Authorization Number is provided to purchaser, **LSI** reserves the right to inspect the damaged Product or part before the final decision of repairing or replacing the defective Product or part.

The Product or part shall be returned to **LSI** or its designated service representative, accompanied by the Return Authorization Number with prepaid shipping charges. The purchaser must insure the shipment or accept the risk of loss or damage during the shipment. Purchaser shall also pay any tariff or duty applicable to the return of defective part or Product. **LSI** will, at its option, repair or replace the Product or part returned to **LSI** or to its designated service representative. **LSI** owns all parts or Products replaced, repaired or removed from a repaired Product. If **LSI** repairs a Product, the Product

Warranty coverage Period is not extended and the Limited Warranty shall expire as if uninterrupted upon the occurrence of the 24th month from shipping from **LSI**. If **LSI** replaces a Product, the replaced Product is warranted for the remainder of the original term or sixty consecutive (60) days, whichever is longer.

**LSI** reserves the right to require from you the user or owner of the Products, prior to determining if the Limited Warranty coverage is applicable, that **LSI** receive the data logging equipment used with the Products and that **LSI** be authorized to retrieve all information from such data logging equipment in order to, among others, ensure that the written instructions and applicable standards, including safety margins, were respected and not exceeded during Product use. Failure by you the owner or user of the Product to supply such information shall be deemed a material default of the terms and conditions of this Limited Warranty and shall be irrevocably construed as evidence that the Product was misused or abused. Consequently **LSI** shall irrevocably be relieved of any obligations to compensate you the user or owner of the Product for any and all damages resulting from Product failures when data logging equipment, and access to its content, cannot be freely and readily provided, unhampered, to **LSI**.

**LSI will pay ground freight transportation costs of replacement or repaired parts or Products to the destination in Canada and the continental United States of America (the "Territory"). LSI will not pay any transportation costs of replacement or repaired parts to destination outside of the Territory. Shipping and handling costs to locations outside the Territory shall be the responsibility and borne by Purchaser or Owner of the Product prior to any shipment by LSI. (Contact LSI to get a Return Authorization Number and the address to ship parts).**

### 8.3 Exclusion of Other Warranties

THE ABOVE WARRANTY IS THE SOLE WARRANTY APPLICABLE AND THERE ARE NO EXPRESS, LEGAL OR IMPLIED WARRANTIES OR CONDITIONS IN RELATION TO ANY PRODUCTS INCLUDING ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, NON-INFRINGEMENT OR FITNESS FOR A PARTICULAR PURPOSE AND THOSE OTHERWISE ARISING BY STATUTE OR OTHERWISE IN LAW OR FROM A COURSE OF

DEALING OR USAGE OF TRADE, WHICH ARE EXPRESSLY DISCLAIMED. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY **LSI** OR ITS EMPLOYEES OR REPRESENTATIVES SHALL CREATE A WARRANTY OR CONDITION OR IN ANY WAY INCREASE THE SCOPE OF **LSI'S** OBLIGATION. **LSI** DOES NOT WARRANT THAT THE BUSINESS RESULTS OBTAINED FROM THE USE OF THE PRODUCTS WILL BE APPROPRIATE OR ADEQUATE FOR THE PURCHASER.

## 8.4 Exclusion

This Limited Warranty does not cover and shall not apply to:

- Any Product that is misused or abused, including being altered, modified or repaired not in accordance to **LSI** written instructions or authorizations and any use not in compliance with **LSI's** instructions and/or industry standards and practices;
- Any incidental costs or expense, such as shipping charges to **LSI** or an designated service representative as well as the technician out-of-pocket expenses including traveling, lodging and meal expenses, if any;
- The damages caused during the transport or the moving of the Products;
- Damages caused by accidents, abuse, misuse, a force majeure (described as events outside a **LSI's** or any Product user's control, including war, riot, strikes, embargoes) or external cause;
- Any cost, damage or expenses for field labor or any other expenses related to or arising from the replacement of defective parts.
- Products used for pile-driving, wire rope activated clamshell or dragline applications. If purchaser uses the Products for pile-driving, wire rope activated clamshell or dragline application, the limited warranty will be deemed to have been violated for abuse.
- Any costs associated with providing **LSI** with data logging equipment.

## 8.5 Limitation of Liability

To the maximum extent permitted by applicable law, in no event will **LSI** be liable to the purchaser or any third party for any indirect, special, consequential, incidental or exemplary damages whatsoever, including but not limited to loss or revenue or profit, lost or damaged data, business interruption or any other pecuniary loss whether based in contract, tort or

other causes of action, even if **LSI** has been advised of the possibility of such damages. In any event, the total liability of **LSI** arising from any cause of action or claim whatsoever, whether (1) in contract, (2) in tort (including negligence, whether sole, joint, contributory, concurrent or otherwise, but not including intentional, reckless or wanton tort), (3) under strict liability, (4) under any environmental or antipollution law or regulation, (5) connected with any toxic or hazardous substance or constituent, (6) arising out of any representation or instruction, or under any warranty, (7) or otherwise, arising out of, connected with, or resulting from the design, manufacture, sale, resale, delivery, repair, replacement or use of Products or the furnishing of any service shall in no event exceed the price allocable to and paid to **LSI** for the individual unit of Products or service or part thereof which gives rise to the cause of action or claim.

SOME STATES OR JURISDICTIONS DO NOT ALLOW THE LIMITATION OR EXCLUSION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

## 8.6 Recommended Practices

**LSI** recommends careful consideration of the following factors when specifying and installing the Products. Before installing a Product, the Installation, Operation, and Maintenance instructions provided with the unit must be read and understood and complied with.

## 8.7 Choice of law

This Limited Warranty shall be governed by and construed in accordance with the laws of : 1. For Products sold in Canada: the Province of Quebec or, For Products sold in the USA: the State of Florida, without giving effect to principles of conflicts of law. You agree that the exclusive venue for any disputes arising under this Agreement shall be the state and federal courts located in Orlando, Florida.

### 8.7a Entire Agreement

This document contains the entire agreement of the parties regarding the subject matter of the Product and supersedes all previous communications, representations, understandings and agreements, either oral or written, between you and **LSI**.



# LSI

Load Systems International

## ***LSI Contact Information***

### **Technical Support:**

***LSI Technical Support is available 24 hours a day, 7 days a week from our Houston and Dubai locations.***

**Please direct all technical support questions to either of these locations or contact us via email:**

**[techsupport@loadsystems.com](mailto:techsupport@loadsystems.com)**

#### **North America**

**Toll Free Phone: (888) 819 4355**

**Toll Free Fax: (888) 238 4099**

**International: +1 (281) 664 1330**

#### **Middle East & Africa**

**Phone: +971 6 557 8314**

**Fax: +971 6 557 8315**

#### **USA Corporate Office:**

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Houston, TX 77064**

**Direct Phone: 281.664.1330**

**Direct Fax: 281.664.1390**

**Email: [sales@loadsystems.com](mailto:sales@loadsystems.com)**

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Quebec QC G1P 2J7**

**Direct Phone: (418) 650 2330**

**Direct Fax: (418) 650 3340**

**Email: [sales@loadsystems.com](mailto:sales@loadsystems.com)**

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