GS222-05 System & GS Series Sensors

Install & Operation Manual
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1: GENERAL

1.1 Overview
The GS222-05 Wireless Gateway acts as a base station for GS series wireless sensors. Not limited to crane applications, the Gateway can be used in a wide range of industrial process monitoring situations. The WRCM doesn’t have an integrated display; it provides a bridge from GS wireless sensors to an existing RS232 automotive or industrial automation network. The system is primarily configured via a USB cable using the PC software tool WM Configurator.

1.2 About This Manual
This installation and operation manual describes how to install, operate and maintain the GS222-05. For your safety and that of the people that come into contact with Trimble products, understand the significance of the instructions included in this guide, respect all laws and regulations and comply with applicable standards.

1.2a Notifications Included in Document
The following notations may be used in this manual:

**NOTE**
INDICATES PRACTICES NOT RELATED TO PERSONAL INJURY.

**CAUTION**
INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN MINOR OR MODERATE INJURY.

**WARNING**
INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.

**DANGER**
INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

1.2b How To Provide Feedback To Trimble Lifting Solutions
Trimble Lifting Solutions welcomes your feedback on the accuracy and effectiveness of this document. Please send feedback to TLS_doc@trimble.com. Please include the title of the manual and version (this information is located in the Document’s Revision History on page 24) with your feedback.

1.2c How This Manual Is Updated
Trimble Lifting Solutions will issue new releases of this manual as new material becomes available. Refer to the Document Revision History on page 24 of the manual for more information.

1.2d How to Contact Trimble Lifting Solutions
Please contact Trimble Lifting Solutions if you encounter problems or require advice. Contact details are located on the back cover.

1.3 Start-Up
The Gateway has been pre-configured for the system with which it shipped. It starts up with its green light flashing as it wakes up the system sensors and creates a radio communication link with each. Once a reliable communication network is established, the green light stops flashing. This process may take up to 60 seconds. Thereafter the green light flashes only when the Gateway communicates with sensors.

THE GS222-05 SYSTEM IS DESIGNED AS AN OPERATOR AID AND IS IN NO WAY A SUBSTITUTE FOR SAFE OPERATING PRACTICE.
2: OPERATION

2.1 Normal Operation

Radio communication between sensors and the Gateway is made in packets. Radio packets include both the source and destination ID numbers. This allows the Gateway to send acknowledgements back to the transmitter.

On start-up the Gateway sends a radio packet to each of the system sensors. This communication wakes the sensor and identifies the Gateway as the network controller. The sensor then sends future communications to the Gateway.

Sensors transmit once every 60 seconds and whenever their measurement changes by more than a default threshold. Example: A wind speed sensor transmits when wind speed varies by 2 mph or more.

The Gateway sends a packet on the RS232 network every time a sensor communication is received.
CHAPTER 3: CONFIGURATION

Configuration of the GS222-05 Wireless Gateway requires access to a PC with a USB port; initial configuration may be easier prior to physical installation of the Gateway. Refer to the Installation section as required.

3.1 PC Installation

3.1a System Requirements

Windows 2000, XP, Vista (32/64bit), Windows 7 (32/64bit), Windows 8 (32/64bit) or Windows 10 (32/64bit).

3.1b WM Configurator and USB Driver Installation

BEFORE STARTING INSTALLATION, MAKE SURE THAT NO GATEWAYS ARE CONNECTED TO THE COMPUTER.

1. Download the installation file from www.loadsystems.com/wmconfigurator
2. Install the file and follow the steps from the installation wizard.
3. When transferring the files, the installation wizard will automatically execute the USB driver installation; a Windows warning will recommend to stop the installation, ignore this warning and select Continue Anyway (Windows XP) or Install this driver anyway (Windows Vista, Windows 7).

3.1c Gateway Connection

Windows Vista / Windows 7/8/10:
1. Connect the Gateway to the computer; the device will automatically be installed.

Windows XP:
1. Connect the Gateway to the computer; Found New Hardware Wizard will appear.
2. If Windows asks to connect to Windows Update to search for software, select No, not this time and then click Next.
3. Select Install the software automatically, then click Next to continue.
4. A Windows warning indicating that the driver has not been tested will recommend to stop the installation, ignore this warning and select Continue Anyway.

5. When the installation wizard has finished installing the software, click Finish to close the wizard.

When the installation is completed, the Device Manager will appear as shown below:

Figure: Device Manager, Windows Vista / Windows 7

Figure: Device Manager, Windows XP

THE SYSTEM MUST BE INSTALLED IN COMPLIANCE WITH TRIMBLE INSTRUCTIONS AND USING TRIMBLE SUPPLIED COMPONENTS ONLY. FAILURE TO INSTALL ALL PARTS, OR REPLACING PARTS OR COMPONENTS WITH PARTS OR COMPONENTS NOT SUPPLIED BY TRIMBLE, MAY LEAD TO SYSTEM FAILURE, SERIOUS INJURY OR DEATH.
3.2 Application Overview

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

3.2a Settings

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

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

3.2b Communication Port

This section displays the communication port in use, the port type and status. The Open status indicates that the communication port is in use and that the Gateway is communicating information.

3.2c Configuration

Sensor List:

All sensors in the GS222-05 system are defined in the Configuration menu and are also displayed under Sensor Settings in the treeview section. Refer to section 3.3 Sensor List to add, remove or modify sensor information.
3.2d Firmware Update
This section displays current Gateway firmware information and is used to update the firmware. Refer to section 3.4 Firmware Update.

3.2e Datalogger Mode
In this mode, live information sent by the wireless sensors is displayed. The data can be logged to files; see the 3.2a Settings section to configure this feature.

3.2f Sensor Settings
When a sensor is selected under Sensor Settings, the following information is communicated to the Gateway;

- **Base Station ID:** The radio id number of the Gateway that has the sensor programmed in its sensor list.
- **Heart Beat:** When no change is detected in sensor value, the sensor status will be communicated to the GS222-05 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:** Sensor calibration.
- **Calibration Scale:** Sensor calibration.
- **Tx Sensitivity:** The minimum change in sensor value required to trigger communication.

3.3 Sensor List

1. In the Configuration menu, select Sensor List.

2. To **add** sensors to the sensor list, select a line and click on Configure Selected Line or double-click on the line.

3. Enter the sensor ID, the sensor type, units, parts of line and tare value.

   **NOTE**
   **DOUBLE-CLICKING IN THE “ID” COLUMN WILL OPEN A SERIES OF POP-UP WINDOWS THAT WILL ALLOW YOU TO CONFIGURE ALL SENSOR PARAMETERS. DOUBLE-CLICKING DIRECTLY ON OTHER COLUMNS AT THE LEFT ALLOW THE USER TO MODIFY FURTHER ONE PARAMETER DIRECTLY.**

   **NOTE**
   **PARTS OF LINE MAY BE USED FOR LOAD SENSOR ONLY.**

   **NOTE**
   **IT IS POSSIBLE TO ASSIGN A TARE VALUE TO MULTIPLE SENSOR TYPES, BUT BE AWARE THAT IT MAY BE A SOURCE OF POTENTIAL PROBLEMS WITH SOME SENSOR TYPES. FOR EXAMPLE, ASSIGNING A TARE VALUE TO A SLEW SENSOR MAY LEAD TO UNEXPECTED RESULTS.**

4. To **remove** any sensor from the sensor list, select the sensor line to remove and click on Remove Selected Sensor.

5. Reload data from the Gateway and display data without saving any changes (the unsaved data in the Gateway will be replaced).

6. Save changes in the Gateway memory. Save to Gateway is automatically followed by Update Sensor Status.
3.4 Custom RS232

The format of the data sent from the RS232 port can be configured in the Custom RS232 section.

1. Use the RS232 Configuration section to set basic RS232 parameters.

2. For other section, please refer to Figure: RS232 Configuration.
   a. RS232 Communication is used to setup the interval that the data from a sensor is sent to the RS232:
      • Disabled: data of the selected sensor won’t be forwarded on RS232 port
      • Live: data from the selected sensor is forwarded when it is received by the Gateway
      • Custom (milliseconds): data from the selected sensor is forwarded at the defined interval, even if the data did not change
   b. RS232 Packet Definition is used to configure the format of the data that will be sent on RS232 port for each sensor configured.
   c. RS232 Packet Definition (nearby sensors) is used to configure the data format of received sensors that are not configured in the sensor list.

NOTE

DO NOT FORGET TO CHECK THE CHECKBOX SEND PACKETS OF ALL NEARBY NODES TO RS232 TO ENABLE THAT FEATURE.
When the selected Units of a configured sensor is displayed as floating point format, it is the task of the user to configure the size of the data as “Floating point” or else the data shown on the RS232 output may be wrongly interpreted.

For example, a load value of “1.23” Ton may be displayed as “123” if not properly configured with the floating point format.

The Units that require floating point format are (suggested number of decimal points in parentheses):

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Requires Floating Point Format</th>
<th>DOES NOT Require Floating Point Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind/Gust Knot (1), m/s (1), Ft/s (1)</td>
<td>mph, km/h</td>
<td></td>
</tr>
<tr>
<td>Load kip (2), kN (1), Long ton (3), Short ton (3), Metric ton (3)</td>
<td>kg, pounds</td>
<td></td>
</tr>
<tr>
<td>Slew Degree (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure bar (1)</td>
<td></td>
<td>psi</td>
</tr>
<tr>
<td>Angle, List, Trim Degree (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length, Rope Payout ft (1), m (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rope Speed knot (1), m/s (1), ft/s (1)</td>
<td>mph, km/h</td>
<td></td>
</tr>
</tbody>
</table>

### 3.5 Firmware Update (Gateway 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 click Update Firmware Now.

**NOTE**

A FIRMWARE UPDATE WILL RESET THE GATEWAY TO THE FACTORY DEFAULT CONFIGURATION.

### 3.6 Import/Export Gateway Configuration

It is possible to export and import the global configuration of a Gateway.

This will save the configuration of all 3 configuration sections: Sensor List, LSI Gateway Internal Ports and Custom RS232.

**NOTE**

WHEN IMPORTING A CONFIGURATION FILE, THE FILE MUST HAVE BEEN CREATED WITH THE SAME HARDWARE TYPE. EX: THE CONFIGURATION FILE OF A GS221-XX CANNOT BE IMPORTED TO A GS222-05.
3.7 Packet Format

The ASCII module will receive data as shown in the example below.

<table>
<thead>
<tr>
<th>Delim</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>Delim</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘X’</td>
<td>‘A’</td>
<td>‘0’</td>
<td>‘1’</td>
<td>‘2’</td>
<td>‘3’</td>
<td>‘4’</td>
<td>‘5’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘C’</td>
<td>+</td>
<td>‘0’</td>
<td>‘4’</td>
<td>‘5’</td>
<td>‘-’</td>
<td>‘2’</td>
</tr>
</tbody>
</table>

Delimiters:
Letter ‘X’, ASCII 88, is the RS232 start delimiters
Letters ‘A’ to ‘Z’ are individual sensor delimiters
Symbols LF and CR are RS232 stop delimiters
Packets always have the same length of 23 bytes

RS232 Protocol:
Baud rate: 115200
Format: 8n1 (8 bits, no parity, 1 stop bit)
Handshaking (or protocol): none

3.7a Low Battery Signal
A sensor low battery is indicated by a lower case sensor start delimiter
Example: if the second load cell has a low battery
the second sensor delimiter will be a lower case “b”:

<table>
<thead>
<tr>
<th>Delim</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>Delim</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘X’</td>
<td>‘A’</td>
<td>‘0’</td>
<td>‘1’</td>
<td>‘2’</td>
<td>‘3’</td>
<td>‘5’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘B’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘1’</td>
<td>‘6’</td>
<td>‘5’</td>
<td>‘0’</td>
<td>‘C’</td>
<td>+</td>
<td>‘0’</td>
<td>‘4’</td>
<td>‘5’</td>
<td>‘-’</td>
<td>‘2’</td>
</tr>
</tbody>
</table>

3.7b Missing Sensor
A sensor that is out of range, has a dead battery, or that is damaged is indicated by dashes
Radio range is about 3000 ft with a direct line of sight
Example: the second load cell is out of range:

<table>
<thead>
<tr>
<th>Delim</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>Delim</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘X’</td>
<td>‘A’</td>
<td>‘0’</td>
<td>‘1’</td>
<td>‘2’</td>
<td>‘5’</td>
<td>‘0’</td>
<td>‘0’</td>
<td>‘B’</td>
<td>‘-’</td>
<td>‘-’</td>
<td>‘-’</td>
<td>‘-’</td>
<td>‘-’</td>
<td>‘-’</td>
<td>‘-’</td>
<td>‘C’</td>
<td>+</td>
<td>‘0’</td>
<td>‘4’</td>
<td>‘5’</td>
<td>‘-’</td>
<td>‘2’</td>
</tr>
</tbody>
</table>
3.8 Changing Sensors

If a sensor needs to be changed, the Gateway must learn to recognize the replacement sensor. Two mechanisms are available to change an ID in the sensor list of the Gateway.

1. Automatic ID change
2. Manual ID change

3.8a Automatic Sensor Settings

Trimble will supply a replacement sensor programmed to replace the original one. When the replacement sensor is detected by the Gateway it causes the Gateway to automatically update the sensor list, replacing the ID of the old sensor with the ID of the new sensor; the process may take up to two minutes to complete.

3.8b Manual Sensor Setting

See Configuration 3.1 to 3.4.
## 4: INSTALLATION

### WARNING

INSTALLATION MUST BE MADE IN COMPLIANCE WITH TRIMBLE INSTRUCTIONS AND USING TRIMBLE SUPPLIED COMPONENTS ONLY. FAILURE TO INSTALL ALL PARTS, OR REPLACING PARTS OR COMPONENTS WITH PARTS OR COMPONENTS NOT SUPPLIED BY TRIMBLE, MAY LEAD TO SYSTEM FAILURE, SERIOUS INJURY OR DEATH.

### NOTE

DO NOT POWER WASH THE GS222-05 GATEWAY. POWER WASHING THE GATEWAY VOIDS WARRANTY COVERAGE.

### 4.1 GS222-05 Gateway

The GS222-05 Wireless Gateway should be installed on the same side of the cab as the sensors with a direct clear line of sight to the sensors at all boom angles. Avoid hiding the Gateway behind a metal structure if at all possible. Optimizing position to improve the radio link will increase sensor battery life.

#### 4.1a 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. Optimally, the antenna should have 5 inches of clear space all around it.
2. The antenna should have an unobstructed line of sight to all sensor antennas at all boom angles.

#### 4.1b Power Supply Connection

1. Connect the black wire (ground) to the negative terminal of the battery or the panel connection; alternatively bolt the black wire to the body of the machine with a 1/4 inch or 5/16 inch bolt. The ground connection must be strong enough to sustain 1 ampere.
2. Connect the red wire to a fused accessory source, rated at least 1 ampere, that supplies +12 or +24 volts when the machine is in use. The GS222-05 will automatically detect the voltage level and adjust itself.

#### 4.1c Wiring

<table>
<thead>
<tr>
<th>Wire Color – Power Cable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Power Supply, 10 to 30 Volts</td>
</tr>
<tr>
<td>Black</td>
<td>Ground</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wire Color – RS232 Cable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>GS222-05 - TX</td>
</tr>
<tr>
<td>Brown</td>
<td>GS222-05 - RX</td>
</tr>
<tr>
<td>Black</td>
<td>RS232 Ground</td>
</tr>
</tbody>
</table>

Figure: GS222-05 Gateway Dimensions, Not to Scale. (Dimensions are in Inches)

Table: Wire Description
4.2 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.

**NOTE**
FOR OPTIMAL PERFORMANCE AND SIGNAL RECEPTION, THE LOAD CELL ANTENNA SHOULD HAVE A CLEAR LINE OF SIGHT TO THE GS222-05 GATEWAY.

**NOTE**
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 GS222-05 GATEWAY.

1. Install load cell bushings as supplied by Trimble. 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 Trimble 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**
4.3 Angle Sensors for the Boom or Jib

NOTE

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.

4.3a Mounting Procedure

The GS010 series angle sensors can be turned on by starting up the GS222-05 base station to which they are programmed or by clicking on Update Sensor Status in WM Configurator. The angle sensor can then assist in levelling itself with the red and green LED.

![Diagram of angle sensor level with the boom](Typical Installation) - Side View

![Diagram of angle sensor top/bottom axis within 15° of vertical](Typical Installation) - Front View

![Diagram of 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.
   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 GS222-05 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.
4.3b Angle Calibration Procedure No. 1: Mechanical Set-Up

1. Level the boom such that it is perfectly horizontal; use a high quality bubble or digital angle sensor. If the WM 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 SENSOR STATUS IN WM CONFIGURATOR TO DISPLAY THE CURRENT ANGLE VALUE.

1. **THE GS222-05 MUST BE CONNECTED TO A COMPUTER TO PROCEED WITH CALIBRATION PROCEDURE.**

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.

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

4.3c Angle Calibration Procedure No. 2: Correct with the GS222-05

1. Position the boom at a precisely known angle.

2. Adjust the trim value in WM Configurator.

3. Example: If angle indicated is 0.3° over the actual angle, adjust the trim value to -0.3.

4. Example: If angle indicated is 0.9° below the actual angle, adjust the trim value to 0.9.

5. Verify accurate angle indication at both very high and very low angles.

Calibrate angle indication by adjusting the trim (offset) value in WM Configurator; the GS222-05 will then communicate the updated trim value to the sensor.
CHAPTER 5: MAINTENANCE

5.1 Replacing Sensor Battery

Gasket Kit P/N: TB027-XX

5.1a Tools Required

- Alcohol/Cleaning Solvent
- 1/8" Allen Wrench
- 5/32" Allen Wrench
- Wire Brush
- Utility Razor Knife
- Flat Blade Screwdriver
- G Clamp

5.1b Procedure

Step 1: Opening Sensor
1. Unscrew the two allen screws with the 5/32" allen wrench and pull them free of transmitter case. Discard old screws.
2. Remove any excess RTV from around the transmitter base, especially from the battery cover notch.
3. Clamp the transmitter case to a rigid structure (e.g., work bench).
4. Place the large screwdriver into the battery cover notch (ensure screwdriver tip fits snugly into battery cover notch) and use the 1/8" allen wrench as a fulcrum.
5. Push the screwdriver down until the transmitter case/housing lifts free of the base.

Step 2: Remove Battery and Clean
1. Remove existing battery and dispose of properly.
2. Using the utility razor knife, remove ALL existing RTV on the outside and inside of the transmitter and ALL edges on the back plate.
3. Using a wire brush and alcohol/cleaning solvent, clean all areas that once had RTV. Any leftover residue may cause leaks once new gasket is fitted.
CHAPTER 5: MAINTENANCE

GS222-05 SYSTEM & GS SERIES SENSORS

Step 3: Install
1. Install new gasket (QR040) around back plate with grooved side down / flat side up.

   ![Image](This Side Down (Grooved) This Side Up (Flat)

   Figure: New Gasket

2. Install two new retaining screws (QV338) into transmitter case.
3. Install new 3.6 Vdc lithium battery.

Step 4: Reassemble
1. Place transmitter onto gasket/back plate.
2. Use the 1/8” allen wrench to tighten screws to 12 inch/lbs (1.35 Nm) of torque.
   If a proper torque driver is not available, apply half of one revolution to the screws once the thread of the screws is correctly engaged to ensure proper tightening.

5.2 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).

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.

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.

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.

NOTE

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 so 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.
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.

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.

### 5.3 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.**

#### 5.3a Reading Accuracy

Trimble 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. Trimble flat bar load links are calibrated to indicate between 100% and 104% of their Working Load Limit (WLL).

**Trimble 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.

#### 5.3b Load Testing

Trimble 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 working load limit; a good test weight is greater than 50% of the WLL. For example, a 30,000 lb load cell on four parts of line has a WLL 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.

#### 5.3c 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.

* Dow Corning dielectric grease No. 4
**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 Trimble Lifting Solutions 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 or with the gasket kit and sealing screws.

**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 Trimble Lifting Solutions for replacement bolts.
CHAPTER 6: CERTIFICATION NOTES

6.1 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.

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.

**FCC ID:** QVBGS000 IC: 7076A-ICGS000
**FCC ID:** QVBGS001 IC: 7076A-ICGS001
**FCC ID:** QVBGS050 IC: 7076A-ICGS050
**FCC ID:** QVBGS075 IC: 7076A-ICGS075

**ANTENNA LIST**

<table>
<thead>
<tr>
<th>LSI-Robway P/N:</th>
<th>TA011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>1/4 wave monopole</td>
</tr>
<tr>
<td>Manufacturer:</td>
<td>Load Systems International</td>
</tr>
</tbody>
</table>

**NOTE**

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:**

Trimble Lifting Solutions sensors comply 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 8 in (20 cm) or more between the product and your body. This product may not be collocated or operated in conjunction with any other antenna or transmitter.
6.2 CE

6.2a Declaration of Conformity

Declaration of Conformity
According to EN 45014

Manufacturer's Name: Load Systems International Inc.

Manufacturer's Address:
Canada: 44GS Blvd. Wilfrid-Hamel, Suite 110
Québec, QC, Canada, G1P 2J7

United States of America: 9223 Solon, Suite A
Houston, TX 77064

United Arab Emirates: Q3-171 SAIF Zone, P.O. Box 7976
Sharjah - UAE

declare under our own responsibility that the products:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC005-CE, GC005-ATEX-CE</td>
<td>5 000 lb Capacity Load Cell</td>
</tr>
<tr>
<td>GC012-CE, GC012-ATEX-CE</td>
<td>12 000 lb Capacity Load Cell</td>
</tr>
<tr>
<td>GC018-CE, GC018-ATEX-CE</td>
<td>18 000 lb Capacity Load Cell</td>
</tr>
<tr>
<td>GC035-CE, GC035-ATEX-CE</td>
<td>35 000 lb Capacity Load Cell</td>
</tr>
<tr>
<td>GC060-CE, GC060-ATEX-CE</td>
<td>60 000 lb Capacity Load Cell</td>
</tr>
<tr>
<td>GC100-CE, GC100-ATEX-CE</td>
<td>100 000 lb Capacity Load Cell</td>
</tr>
<tr>
<td>GC170-CE, GC170-ATEX-CE</td>
<td>170 000 lb Capacity Load Cell</td>
</tr>
<tr>
<td>GS001-CE, GS001-ATEX-CE</td>
<td>Load Transmitter With Pigtail 6 in.</td>
</tr>
<tr>
<td>GS002-CE, GS002-ATEX-CE</td>
<td>Load Transmitter With Pigtail 6 in for balanced cell</td>
</tr>
<tr>
<td>GS005-CE, GS005-ATEX-CE</td>
<td>Anti-Two-Block Transmitter</td>
</tr>
<tr>
<td>GS010-XX-CE, GS010-XX-ATEX-CE</td>
<td>Angle Sensor</td>
</tr>
<tr>
<td>GS011-XX-CE, GS011-XX-ATEX-CE</td>
<td>Angle Sensor With Length Input</td>
</tr>
<tr>
<td>GS012-CE</td>
<td>Angle Length Sensor</td>
</tr>
<tr>
<td>GS020-CE, GS020-ATEX-CE</td>
<td>Wind Speed Sensor</td>
</tr>
<tr>
<td>GS035-CE</td>
<td>Pressure Transducer</td>
</tr>
<tr>
<td>GS050-CE, GS050-ATEX-CE</td>
<td>Anti-Two-Block Sensor</td>
</tr>
<tr>
<td>GS075-CE</td>
<td>All-In-One Anti-Two-Block Switch Weight</td>
</tr>
<tr>
<td>GS2XX-CE</td>
<td>LSI Wireless Gateway</td>
</tr>
<tr>
<td>GS320-CE</td>
<td>Stand Alone Wind Speed Display</td>
</tr>
<tr>
<td>GS375-CE</td>
<td>Stand Alone A2B Display</td>
</tr>
<tr>
<td>GS550-CE, GS550-ATEX-CE</td>
<td>Standard GS display</td>
</tr>
<tr>
<td>GS550-03-CE</td>
<td>Hand-Held GS display</td>
</tr>
<tr>
<td>GS550-XX-CE</td>
<td>OEM GS display</td>
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<tr>
<td>GS820-CE</td>
<td>Graphical GS display</td>
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</tbody>
</table>

to which this declaration refers conform to the relevant standards or other standardising documents:

Wireless: EN 300 220-3 V1.1.1 (2000-09)
EMC: EN 301 489-3 V1.4.1 (2002-09)

Québec, April 1st, 2010

Éric Beauleau
Technologies Manager
6.2b CE Safety

**WARNING**

*Burn hazard. Do not operate sensors when the ambient temperature is higher than 183°F (84°C) and do not operate the gateway when the ambient temperature is higher than 138°F (59°C).*

**WARNING**

*For the operator’s safety, take only the ambient temperature range into consideration. The device should be used within this range specified above.*

**WARNING**

*The protection will be impaired if the material and equipment are used in a manner not specified by the manufacturer.*

**NOTE**

*The IP of equipment corresponds to 65.*

6.3 Applicable to the Class 1 Division 2 Certified Gateway

Class 1, Division 1 certification (intrinsically safe) is available for most Trimble sensors. Class 1, Division 2 certification (non-incendive) is available for the Gateway.

The certificate CSA #1332949 on master contract 215780 is available on request.

Applicable requirements certified by CSA include:

- CSA Standard C22.2 No. 0.4-M2004: Bonding and grounding of electrical equipment (protective grounding).
- CSA Standard C22.2 No. 0-M1991: General requirements Canadian electrical code part II.
- UL Standard 913, seventh edition: Intrinsically safe apparatus and associated apparatus for use in Class 1, 2, 3, Division 1, hazardous (classified) locations.
- ANSI/ISA–12.12.01–2007 – Nonincendive Electrical Equipment for Use in Class 1 and 2, Division 2 and Class 3, Divisions 1 and 2 hazardous (classified) locations.
### 7: LIMITED WARRANTY

<table>
<thead>
<tr>
<th>WARRANTY LENGTH</th>
<th>PRODUCT FAMILY</th>
</tr>
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<tbody>
<tr>
<td>24 months</td>
<td>GC Series Load Cells, GD Series Line Riders, GP Series Load Pins GS001, GS002, GS003, GS004, GS005, GS007, GS010, GS011, GS012, GS020, GS030, GS031, GS035, GS050, GS075-B, GS101, GS106, GS110, GS112, GS220, GS221, GS222, GS224, GS550, GS820, LP Series Load Pins, LS051, LS055, PT00100</td>
</tr>
<tr>
<td>12 months</td>
<td>GS026, GS085, GS320, GS375, MBR100, MBR105</td>
</tr>
<tr>
<td>12 months*</td>
<td>All cabled products</td>
</tr>
<tr>
<td></td>
<td>“Warranty duration for these Products may start from date of commissioning, provided a commissioning and calibration report is provided to us within six months of Delivery.”</td>
</tr>
</tbody>
</table>

Please note that the Products are not intended for use in pile driving, wire rope activated clamshell or dragline applications, and any such use will be considered misuse of the Product and will exclude the Product from warranty coverage.

In connection with this limited warranty, we may require that we receive the data logging equipment used with the Products. You hereby authorize us to retrieve all information from such data logging equipment, which we may use, for example, in order to confirm compliance with written instructions and applicable standards, including design factors. If we do not receive such information as requested, we shall have no obligations under this limited warranty.

Costs associated with providing us with data logging equipment shall be borne by you.

If you request and we agree to provide attendance on site, you will pay our current applicable service rate for time on site, along with travel time from the nearest service center with the requisite capabilities, and fares and expenses.

In the event a Product is determined to be covered by this limited warranty, we will pay ground freight shipping fees of replacement or repaired parts or Products to the destination in the countries in which we maintain a service center for the applicable Products (currently Canada, continental United States of America, United Kingdom, Australia and the United Arab Emirates), but shipping fees for any other destination will be borne by you.

Detailed terms of the warranty are set forth at http://www.trimble.com/support/terms_of_sale.aspx, subject to the additional terms set forth above.
## REVISION HISTORY

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Summary of Change</th>
<th>Approved By</th>
</tr>
</thead>
<tbody>
<tr>
<td>20160129</td>
<td>Jan. 29, 2016</td>
<td>New template, 3.1a, 3.1c, 3.3, 3.4, 3.5, 3.6, text edits throughout</td>
<td>R. Wadewitz</td>
</tr>
</tbody>
</table>

Table: Revision History

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