

Remote Tank Monitoring System Installation Guide



Installation Quick Reference

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1.0 Getting Started

1.1 Safety Precautions

Sentinel™ uses Radio Frequency (RF) waves for communication to the nearest cellular tower and can transmit at several times the power of a hand-held cellular phone. In general, if you can place a cellular telephone call in the location where you wish to install the unit, then Sentinel should be able to communicate properly. However, because of the inherent characteristics of RF communications, there are certain guidelines that should be followed when positioning the unit.

WARNING!



- Do not install Sentinel on a non-vented tank.
- Do not install Sentinel where hazardous vapors are present.
- Do not use Sentinel where blasting is in progress.
- Electrostatic discharge can damage sensitive electronic components. Be sure to discharge yourself by touching a grounded metal object before opening the unit.
- The unit should be installed in an area free from overhanging metal structures, large obstructions, or equipment which could generate RF or electrical interference.
- Do not install the unit below ground level unless provisions are made for an external antenna.
- Service may be limited in areas that do not have GSM cellular coverage and support SMS (short message service).
- If the unit is installed in an area with poor signal strength, an external antenna may be required for reliable performance. If you have doubt about the suitability of a particular location for Sentinel, or are having difficulty transmitting, please see sections 4.2 and 4.3. If an external antenna is required, several optional antennas are available. Please contact Camgian Customer Service to determine your exact needs.

NOTE: Use of Sentinel for the monitoring of refined crude oil petroleum products such as diesel fuel, gasoline, and jet fuel is prohibited.

1.2 Initial Inspection

When you receive the Sentinel unit, thoroughly inspect it for any damage which may have occurred during shipping. If there is any damage to Sentinel, contact the shipping company as soon as possible. Locate the packing checklist in the shipping container. Check for any missing items before you begin installation of Sentinel.

1.3 Sentinel Diagram

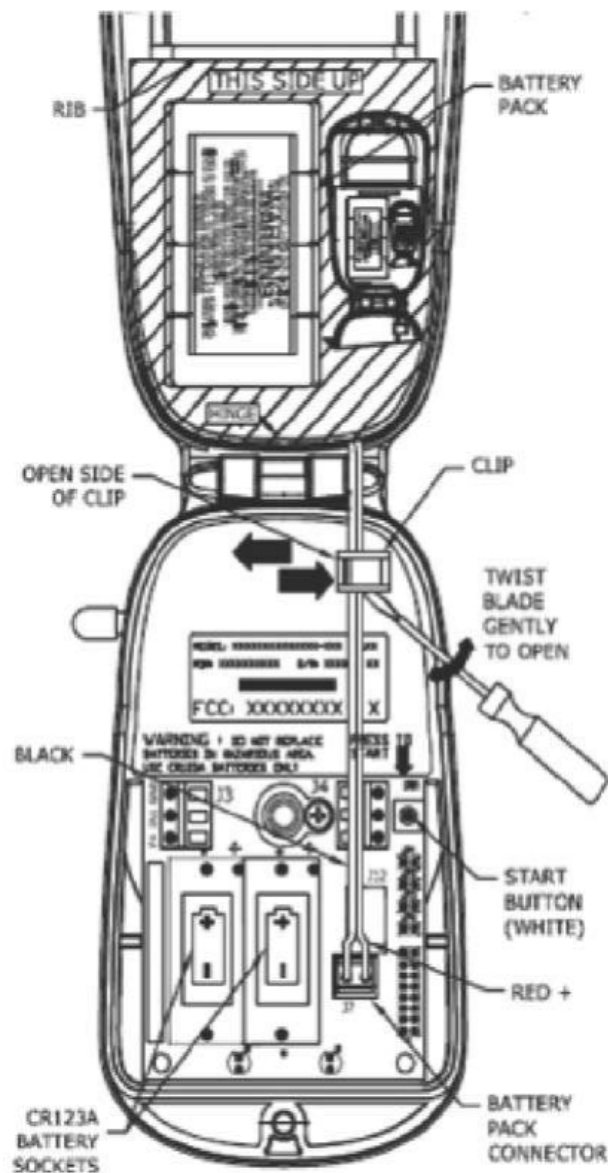


Figure 1. Sentinel Diagram

1.4 Mounting a Differential Pressure Unit

Differential pressure units operate by measuring the pressure (weight) of the liquid the sensor is submerged into. This pressure is proportional to the density of the liquid.

The opening on the end of the sensor contains an exposed diaphragm which responds to changes in liquid pressure as the tank is filled or emptied with product. This measured pressure is compared against atmospheric pressure and is converted to a readable signal by a microprocessor in Sentinel.

Please note that the sensor and sensor cable must be clean when installed to avoid contamination of the contents of the tank.

Care must be taken before and during installation to not strike the sensor against any stationary surface. This can frequently occur during installation of the probe into the tank. Shock may damage the probe causing it to fail prematurely.

CAUTION

- Do not install the Levelpro sensor in a liquid that is susceptible to freezing or at the bottom of a tank with water in it that may freeze. If the liquid freezes, it will damage the probe which will not be covered under warranty.
- Do not drop or strike the Levelpro sensor against a solid object. This may damage the sensor or cause a shift in the output of the probe.
- Do not kink the probe cable. This could restrict the breather tube in the cable and cause fluctuating readings.
- Do not install the Levelpro sensor where sludge or sediment can clog the probe opening. If necessary, suspend the sensor above the maximum level of the sediment.
- Do not cut the sensor cable. The length is not user-adjustable and this will void the warranty.
- Do not use Sentinel housing to screw the unit into the tank. Use only the wrench flats on the bottom fitting.



1.5 Installation in Tank with Mechanical Agitation Device

Typically there will be more cable than what is required for the sensor to reach the bottom of the tank. This will not cause a problem with the sensor or readings. If the “slack” cable could cause a problem, such as in a tank with a mechanical agitation device, it should be looped and secured using plastic or non-metallic ties so the loop will not come apart. A correct installation will result in the sensor hanging just slightly above the agitation device with all excess slack secured in the loop. Refer to Figure 2 below.

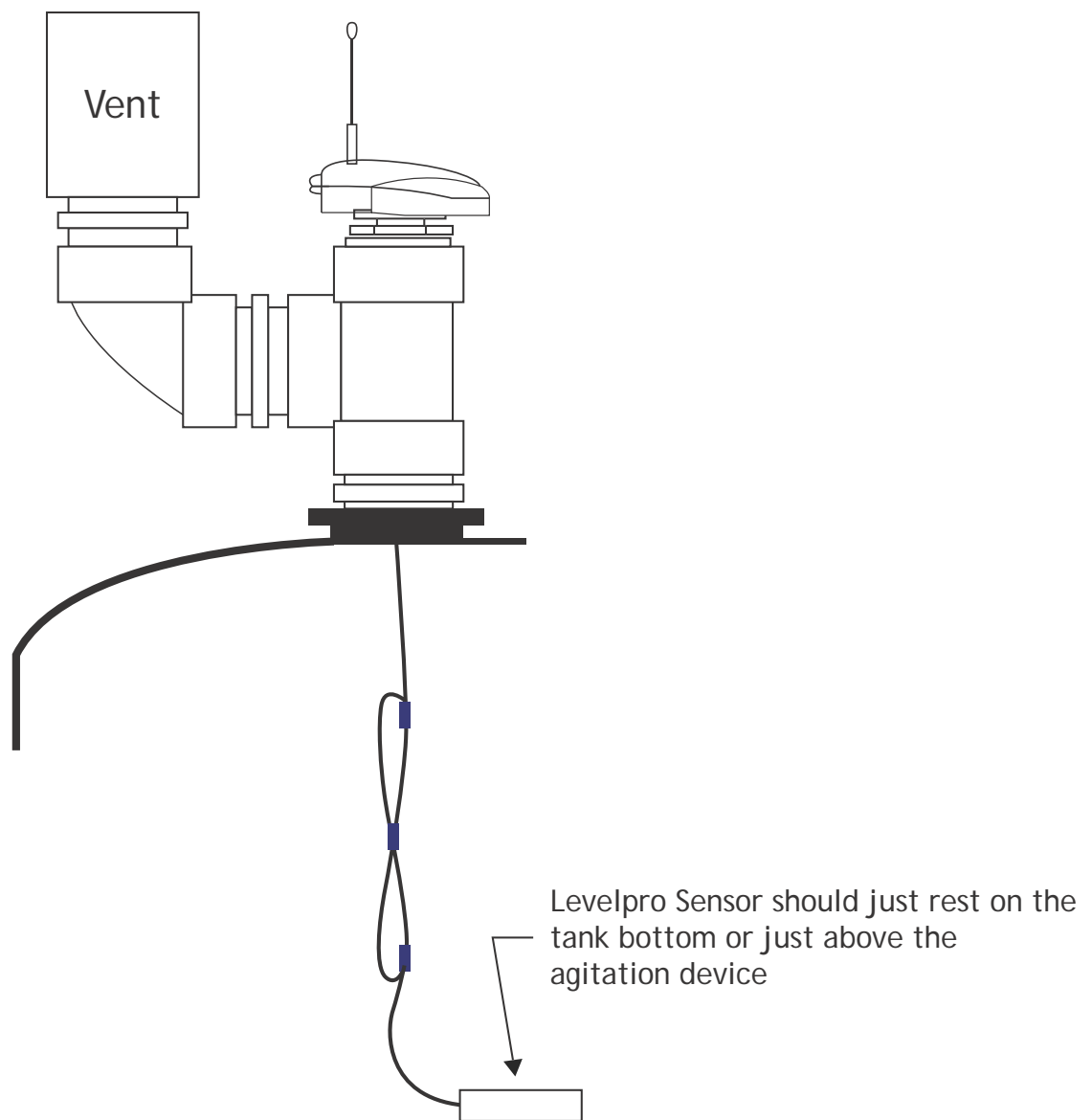
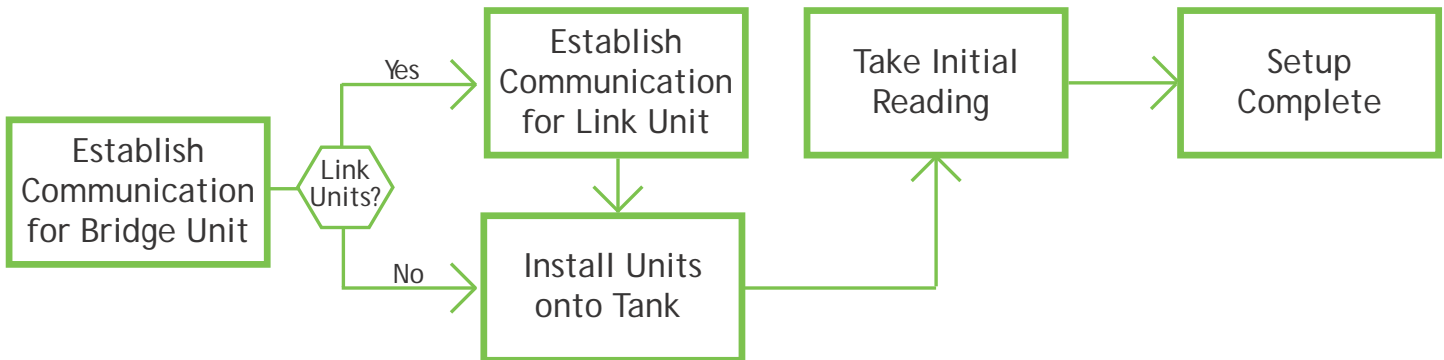


Figure 2. Levelpro Level Sensor

2.0 Installation Process



NOTE: Sentinel is shipped with the antenna disconnected. It is located in a separate area within the shipping carton. Verify that the antenna is present before proceeding.

Tools Required for Installation :

- 3/16" flat-head screwdriver
- Large adjustable wrench

2.1 Establishing Communication

Note: During installation, you can determine your GSM signal suitability by operating a GSM cellular phone and confirming its operation capability by placing a call.

2.1.1 Establishing Communication for Bridge Unit

- 1) Open the top cover of Sentinel by loosening the screw at the front of the lid using a 3/16" flat-head screwdriver. Insert the two batteries into the battery holders and connect the extended life battery pack. Refer to Figure 1 on page 3.
- 2) Install antenna and verify it is pointing straight up.
- 3) Press the white start button on the inside of the unit. A green LED will light up on the circuit board.
- 4) The green LED will flash fast (half second ON, half second OFF).
- 5) Once communication is established, the green LED will flash slow (one second ON, one second OFF).
- 6) The green LED will go to solid ON for about 60 seconds while the unit is transmitting data.

- 7) After a successful transmission, the green LED will flash and then go out. Sentinel is now in sleep mode, and will remain in sleep mode until the next scheduled transmission time or until the white button is pressed again.
- 8) If the data transmission was not successful, a red LED will light and the green LED will flash an error code. Count the number of blinks and refer to section 4.4 of this manual for information on the error codes.
- 9) Close lid of monitor but do not tighten. You will need to access the interior area of the unit for installation.
- 10) If also installing Link units, continue with section 2.1.2.

If no Link units are being used continue to

- Section 2.2 for stainless steel tank preparation and installation.
- Section 2.3 for installing into a vent line.
- Section 2.4 for poly tank/tote preparation and installation.

2.1.2 Establishing Communication for Link Unit(s)

Once you have successfully established communication for your Bridge unit, it is time to connect your link units. If you do not have any Link units, please proceed with installation of your Bridge. It is important to establish communication for the Bridge prior to the Link. Additionally, you must wait 3 minutes between Bridge setup and Link setup. The Bridge will continue downloading data even after the LED goes off so it will not be available to communicate with the Link for 3 minutes.



Figure 3. Orientation of Bridge and Link

- 1) Open the top cover of the Link by loosening the screw at the front of the lid using a 3/16" flat-head screwdriver. Insert the two batteries into the battery holders and connect the extended life battery pack. Refer to Figure 1 on page 3
- 2) Ensure that the front of the Link unit is pointed towards the Bridge unit as shown in Figure 3 above.

- 3) Press the white start button on the inside of the unit. A green LED will light up on the circuit board.
- 4) The green LED will flash fast (half second ON, half second OFF).
- 5) Once communication is established, the green LED will flash slow (one second ON, one second OFF).
- 6) After a successful transmission, the green LED will flash and then go out. Sentinel is now in sleep mode, and will remain in sleep mode until the next scheduled transmission time or until the white button is pressed again.
- 7) If the data transmission was not successful, a red LED will light and the green LED will flash an error code. Count the number of blinks and refer to section 4.4 of this manual for information on the error codes.
- 8) Close lid of monitor but do not tighten. You will need to access the interior area of the unit for installation.
- 9) Continue this process for each additional Link.

2.2 Stainless Steel Tank Preparation and Installation

Please check the following before installation of Sentinel:

- A 2-inch diameter threaded opening is required for the installation of Sentinel. Stainless steel tanks are typically built with one or more 2-inch threaded “bung” opening. The tank’s vent line can be modified to provide both tank venting and access for Sentinel, if the vent is the only 2-inch threaded opening available. Refer to procedure 2.3 for the installation into a vent line.
 - Verify that there is no mechanical agitation device within the tank which could damage the sensor. If a mechanical agitation device is present, refer to the instructions in procedure 1.5.
- 1) Install the Sentinel unit by slowly lowering the sensor into 2” tank opening.
 - 2) Using channel locks, grasp the hexagonal nut above threads and gently screw into tank fitting.
Note: Do not over tighten the unit. Do not use the Sentinel unit housing to screw the unit into the tank.
 - 3) After installing the unit, open the blue housing and ensure that the batteries and extended battery packs are still correctly installed.
 - 4) Press the white button to obtain initial reading.

2.3 Installing into a Vent Line (Fuming Applications)

The following items are required to complete this procedure:

- Two pipe wrenches
 - 2-inch vent kit consisting of either non-metallic or stainless steel material
 - One 2-inch tee
 - One 2-inch 90° elbow
 - Two 2-inch closed nipple
- 1) Using the two pipe wrenches, remove the existing vent assembly from the top of the tank.
 - 2) Assemble the vent kit items in the manner shown in Figure 4.

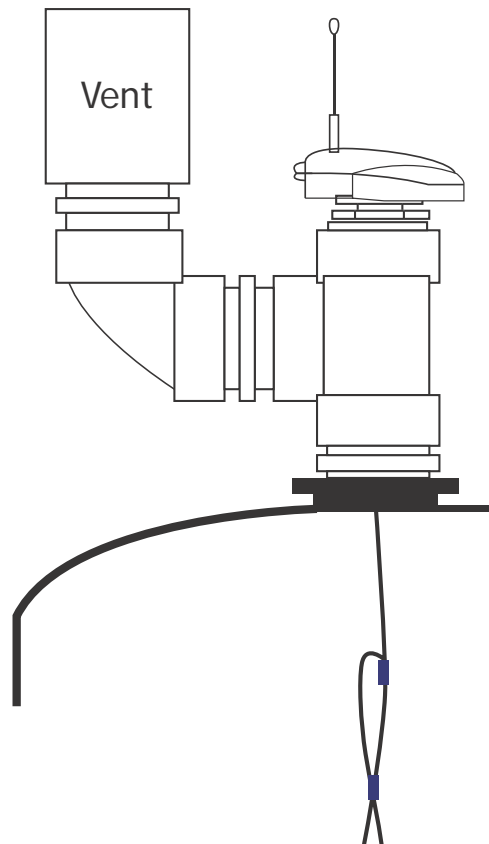


Figure 4. Vent Kit Installation

- 3) Install the existing vent assembly onto the 90° elbow as shown in Figure 4.
- 4) Install the Sentinel unit onto the top of the tee as shown in Figure 4 by slowly lowering the sensor into 2" tank opening.
- 5) Using channel locks, grasp the hexagonal nut above threads and gently screw into tank fitting.
Note: Do not over tighten the unit. Do not use the Sentinel unit housing to screw the unit into the tank.
- 6) After installing the unit, open the blue housing and ensure that the batteries and extended battery packs are still correctly installed.
- 7) Press the white button to obtain initial reading.

2.4 Poly Tank/Tote Preparation and Installation

Please check the following before installation of Sentinel :

- A 2-inch diameter threaded opening is required for the installation of Sentinel. If the tank/tote does not have a threaded opening available but has a 6-inch tote opening, follow the procedure in section 2.5.
 - If you wish to install a new opening on the tank/tote, request a plastic bung kit and follow the procedure outlined in section 2.6.
 - Verify that there is no mechanical agitation device within the tank which could damage the sensor. If a mechanical agitation device is present, refer to the instructions in procedure 1.5.
- 1) Install the Sentinel unit by slowly lowering the sensor into 2" tank opening.
 - 2) Using channel locks, grasp the hexagonal nut above threads and gently screw into tank fitting.
Note: Do not over tighten the unit. Do not use the Sentinel unit housing to screw the unit into the tank.
 - 3) After installing the unit, open the blue housing and ensure that the batteries and extended battery packs are still correctly installed.
 - 4) Press the white button to obtain initial reading.

2.5 Installing a Tote Lid

A 6-inch opening to dual 2-inch NPT opening lid for totes is required to complete this procedure.

- 1) Remove the existing lid on the tote.
- 2) Secure the provided lid on the opening.
- 3) Install the 2-inch vent lid over one of the two NPT openings. The other opening will be for Sentinel. Refer to Figure 5 for proper assembly.
- 4) Install the Quantus unit by slowly lowering the sensor into 2" tank opening.
- 5) Using channel locks, grasp the hexagonal nut above threads and gently screw into tank fitting. Note: Do not over tighten the unit. Do not use the Sentinel unit housing to screw the unit into the tank.
- 6) After installing the unit, open the blue housing and ensure that the batteries and extended battery packs are still correctly installed.
- 7) Press the white button to obtain initial reading.



Figure 5. Tote Lid Installation

2.6 Installing a Plastic Bung Kit (New opening)

The following tools are required to complete this procedure :

- Plastic bag for catching debris
 - Duct tape
 - Drill with a 3-inch holesaw bit
 - 2-inch plastic bung kit
- 1) Open the lid at the top of the tank/tote.

- 2) Open the plastic bag and secure the opening to the approximate center where the hole will be drilled. The bag should be secured inside the tank/tote. The bag will catch any debris created by the hole saw while drilling the bung hole.
- 3) Using the drill with 3-inch holesaw bit, drill through the plastic tank/tote.
- 4) Once the hole is cut, remove the plastic bag. Use care in removing the bag and duct tape from the inside surface of the tank/tote.
- 5) The 2-inch plastic bung kit may now be installed. The bung need only be tightened by hand. Refer to Figure 6 for proper assembly.
- 6) Install the Sentinel unit by slowly lowering the sensor into 2" tank opening.
- 7) Using channel locks, grasp the hexagonal nut above threads and gently screw into tank fitting. Note: Do not over tighten the unit. Do not use the Sentinel unit housing to screw the unit into the tank.
- 8) After installing the unit, open the blue housing and ensure that the batteries and extended battery packs are still correctly installed.
- 9) Press the white button to obtain initial reading.

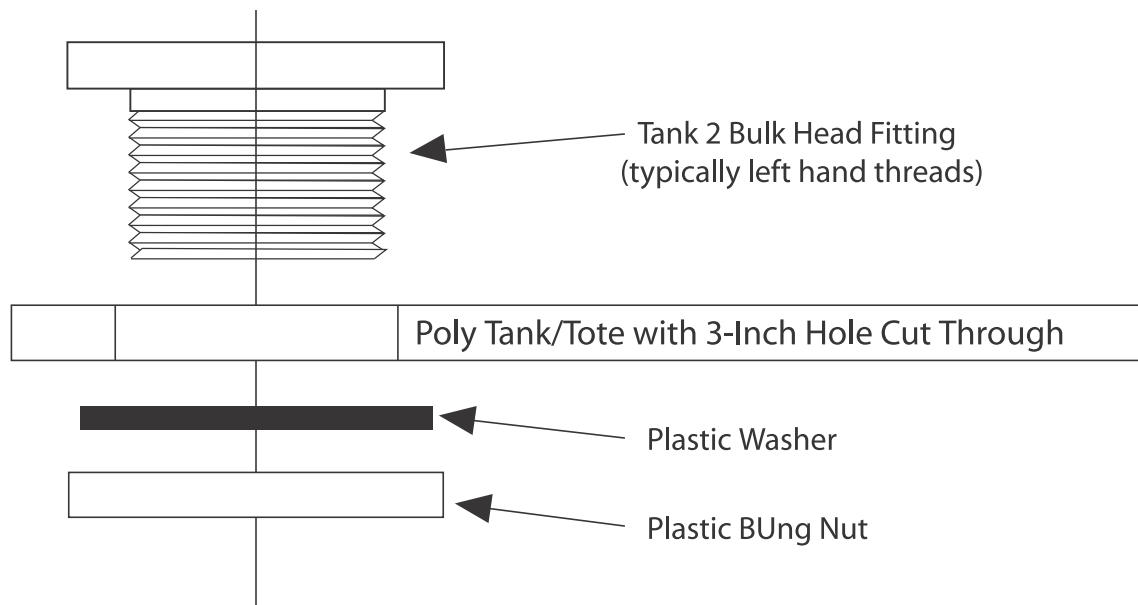


Figure 6. Plastic Bung Kit Installation

3.0 Normal Operation

After communication has been established and the tank information has been given to the Sentinel Back Office, Sentinel will continue to transmit data based upon the number of preset call outs per day.

The real power behind the Sentinel Tank Monitoring System is the back office web site. On this web site, you may view the current level and status of your devices using a standard web browser (i.e. Microsoft Internet Explorer, Mozilla Firefox, Chrome, etc.), download your historical data to applications such as Microsoft Excel®, or set up alarm levels to automatically trigger events such as an e-mail, text, or page to a local service or sales representative. The web site is a secure web site that utilizes the latest in Internet encryption technology to ensure that your data stays confidential. It is constantly being upgraded and new features being added periodically. To access

4.0 Servicing and Troubleshooting

4.1 Battery Replacement

Sentinel tank monitor operates on two CR-123A disposable lithium batteries and an extended battery pack. Sentinel estimates the remaining battery life using a sophisticated algorithm based on the battery voltage and temperature, cellular signal strength and the number of transmissions and retries that the unit has made. This estimate is transmitted to the Camgian monitoring center and displayed on the Internet. The procedure below outlines the steps necessary to change dead batteries. Reference Figure 1 on page 3.

- 1) Carefully loosen the screw at the front of the housing using a 3/16" flat-head screwdriver, then lift the top cover to expose the electronics and batteries.
- 2) Remove ALL existing batteries: individual and extended life battery pack if equipped. Properly dispose of all expired batteries and pack. Never mix fresh batteries with partially or fully expired batteries.
- 3) Insert new batteries into the battery sockets located on the printed circuit card and

Note : Never mix new and used batteries. Sentinel will operate as intended with either the two individual batteries or the extended life battery pack or with both.

- 4) START Sentinel: Before closing and securing the lid, press the white START button and verify the green LED begins to flash.
- 5) Call your customer support representative to verify operation (662-320-1062).
- 6) Close the monitor lid. Ensure the gasket seal is secure and flush in the groove of the enclosure base. Failure to do so may allow moisture to enter the enclosure and damage the electronics. Tighten the locking screw using a flathead screw driver.

4.2 Amplifying a Weak Carrier Signal

If the signal strength is weak as indicated by error code 7 in section 4.4, or if data transmissions are intermittent, an external antenna can be used as a replacement to the small antenna supplied with Sentinel. The external antenna connects directly to a Sentinel unit with no adapter connector necessary, thereby improving the antenna's performance. Please contact Customer Service for a list of commonly available and supported external antenna options. The following outlines the most common external antenna installation steps.

- 1) Position the external antenna at a location within cable reach of Sentinel's installation and attach it to Sentinel replacing the small antenna.
- 2) Holding the external antenna at the same location where Sentinel is installed (typically the top of the tank).
- 3) Test unit by initiating a data transmission with the external antenna, and observing the error code output in section 4.4.
- 4) If the above test doesn't produce any error codes as defined in section 4.4, proceed to the next step. If the error code 4, error code 7, or error code 8 still appears, see if the external antenna can be moved to a different location, possibly outside the building or higher into the building's roof.
- 5) Secure the external antenna using either the magnetic base, or the clamp base supplied with the antenna.

4.3 Troubleshooting

Nothing happens when the start button is pressed.

Remove all of the batteries. Wait 30 seconds to initialize Sentinel memory and then reinsert the batteries. If the green LED does not come on when the switch is pressed, replace the batteries with new ones.

Unit cannot transmit to data center.

Check for interfering structures such as tanks, buildings, or large equipment.

Reposition the unit if possible.

Check that the antenna connection to the unit is tight.

Verify the serial number of the unit is correct on the Sentinel back office web site.

Use an external antenna.

The level reading is incorrect.

Normally, all of the sensor parameters are set up by your Camgian account representative when the tank is initially configured. On rare occasions, the information may not be correctly entered. Verify the tank information and if the tank level is still incorrect, call Customer Support at (905) 469-9283.

The level reading is correct but volume is off.

Call Customer Support at (905) 469-9283.

The unit has stopped calling.

Replace the batteries.

Ensure that the antenna is tight and vertical.

4.4 Error Codes

If the data transmission was not successful from Sentinel, a red LED will light and the green LED will flash an error code.

Number of Green Flashes Error Code Description

1. **Internal Hardware Error:** Sentinel could not initialize properly due to an internal hardware error. If this problem continues, contact Customer Service.
2. **Low Battery Voltage:** Sentinel could not transmit due to a low battery voltage. Replace the batteries and re-try a data transmission.

3. **Radio Error:** Sentinel's wireless transmitter did not power on properly. Re-try a data transmission. If this problem continues, contact Customer Service.
4. **Cellular Service Error:** The unit did not detect cellular service. Ensure that the antenna is tightly connected to the unit and is vertical. If still not successful, contact Customer Service for confirmation of data channel availability.
5. **Cellular Busy Error:** Sentinel could not transmit because the cellular network is busy. Re-try data transmission.
6. **Radio Respond Error:** Sentinel's wireless transmitter did not respond to the command to transmit data. Re-try a data transmission. If this problem continues, contact Customer Service.
7. **Low RSSI Error:** The data transmission failed due to low signal strength. Apply the technique indicated in section 4.2 to establish the best location for an external antenna to improve the signal strength.
8. **Failed Transmission Error:** The data transmission failed. Insert new batteries into the unit and re-try a data transmission. If this problem continues, contact Customer Service.
9. **Radio Error:** Sentinel's wireless transmitter did not initialize properly. Re-try the data transmission. If this problem continues, contact Customer Service.
10. **Memory Error:** Sentinel's memory has been corrupted. If this problem continues, contact Customer Service.

4.5 Obtaining Technical Support

If you still are having trouble, contact Customer Service at

Phone: 905-469-9283

Email: areid@iconprotech.com

You will need the following information:

- Sentinel serial number (label on the bottom or inside of the unit)
- Tank location (street address/city/state)
- Tank product

REMEMBER

For security reasons, no one from Sentinel will ever ask you for your username or password.

If it should be necessary to return this unit to Sentinel for service :

- 1) You must first obtain a return authorization number from Sentinel.
- 2) This number must be clearly marked on the outside of the shipping container.
- 3) Place the unit in the original container and ship it prepaid to Icon Process Controls

5.0 Quantus Specifications

Performance Specifications

Output Voltage	Nominally 24V ± 5%
Output Current	Rated from 0 – 24 mA
Load Regulation	0.5% from a 24 mA load
Ripple	50 mV Peak-to-Peak
Output Short Circuit Protection	Output is current limited to 24 mA
Accuracy	± 1% of Span

Performance Specifications

LevelPro Pressure Sensor	Bulkhead Fitting-
Housing	NEMA 4X; weatherproof; UL approved (UL94HB); grass-filled nylon
Area Classification	General purpose environment
Unit Gross Weight	With 7.5 psi range Submersible Differential Pressure Sensor: 2.1 lbs (0.95 kg) With 15 psi range Submersible Differential Pressure Sensor: 2.6 lbs (1.18 kg)
Battery Type	Two Replaceable Lithium-Ion Batteries (CR-123A)
Expected Battery Life	One call out per day – up to 3 years Three call outs per day – up to 1 year

Environment

Storage Temperature Range	-40°F to 185°F (-40°C to 85°C)
Operating Temperature Range	-22°C°F to 167°F (-30°C to 75°C)

Antenna Connector

Type	Standard SMA	
Frequency Bands	850 (824 – 894) MHz	1900 (1850 – 1990) MHz