SeeLevel™

Marine Tank Monitor

MODEL 759
MANUAL

IMPORTANT OPERATOR INFORMATION

DATE INSTALLED:_____

SERIAL NUMBER:_____

Tank #	Tank ID Name	Signal Level	Sender Height
1			
2			
3			
4			
5			
6			
7			

Printed in Canada

CANADA
Garnet Instruments
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SEELEVEL™

Marine Tank Monitor

MODEL 759

Table of Contents

SAFETY SYMBOLS INFORMATION

"Notes", "Cautions", and "Warnings" have been used throughout this manual to bring special matters to the immediate attention of the reader.

⚠ **NOTE:** expands on information for any procedures.

⚠ **CAUTION:** explains safety information that could cause damage to the product, including data loss.

⚠ **WARNING:** explains dangers that might result in personal injury or death.

CHAPTER 1 - OVERVIEW

The ***SeeLevel*** ™ Marine Tank Monitor represents a massive leap forward in level measurement technology for the marine vessel industry. The SeeLevel™ has a combination of features, accuracy, reliability, and diagnostic capability that have never been available before.

Model 759 will monitor the battery voltage, and up to 7 water and sewer holding tanks. The 759 has *Bluetooth*® wireless technology capability so that tank levels and battery voltage can be shown on a smartphone or tablet with the free downloaded app. (see page 9 for system requirements information).

Tank information is also displayed on your 3-digit alpha-numeric LED display. There are two programmable alarm outputs available which can be used to signal a high or low water or sewer level as required. In addition, the system can display the operating characteristics of each of the tank sending units, giving it unsurpassed diagnostic capability.

⚠ **WARNING:** All power circuits must be fused. If a fuse is not provided with the system then it is the installer's responsibility to install a fuse with a maximum rating of 7.5 amps.

For more detailed information please refer to Chapter 7 **"TROUBLESHOOTING GUIDE"** and section **"How to avoid damaging the display or pump switch due to excessive current"**.

⚠ **NOTE:** The tank senders can only be used on plastic storage tanks, they will NOT work on metal tanks. The plastic tanks must have a side that is accessible to mount the senders.

⚠ **NOTE:** The tank senders will only detect water based liquids. They will NOT work on fuels or oils.

CHAPTER 2 - SYSTEM DESCRIPTION

The SeeLevel consists of a wall or panel mount display unit, and sender strips that stick to the side of the holding tank. A single 2 conductor wire is used to connect all the sender strips to the display.

The Sender: Each sender strip is a flexible self-adhesive printed circuit board which is adhered to the side of the holding tank. The sender strip can be cut to length to match the height of the tank, and it auto calibrates itself so that it can read from Empty to Full regardless of the height of the tank. The sender scans the water level through the tank wall using advanced digital techniques programmed into the sender microprocessor. When the sender transmits the water or sewer level information to the display, it sends a digital code that has built in error detection, making it highly unlikely for the display to read an incorrect level, even if the wiring is marginal. In addition to the level, the sender also transmits diagnostic information about its operation. This information can be used to determine if there is buildup of sludge on the inside of the tank, or to determine if the sender is damaged or delaminating from the side of the tank. If sludge buildup in the tank becomes extreme the gauge will cease to operate properly, so by monitoring the signal power the tank can be cleaned before the buildup gets excessive. The ability to double stack the senders provide accurate level measurement for tank heights ranging from 5″ to 25″.

The Display: The display receives the information from all of the sender strips via a single 2 conductor wire, and displays the level information in percent of full on a 3-digit LED display. When the **LEVEL,** ← or → button is pressed, the display shows the level for the appropriate tank. The display will show the level for about 5 seconds and then shut down automatically. If the ← or → button is pressed before the display shuts down, then a new level will immediately be shown. If the **LEVEL** button is pressed twice, the display will hold on that tank and continue to show updated levels for 5 minutes before shutting off. This allows the user to monitor the filling or draining of a tank. By pressing two buttons at once, the diagnostic functions can be accessed; these are described in detail in the troubleshooting chapter.

If a sender is operating properly and connected to the display with good wiring, then the display will show the level normally. If the wiring is disconnected, shorted, or cut, or if the sender panel is defective, then the display will indicate an error code. The various error codes are shown in the troubleshooting chapter.

With these diagnostic features and the digital nature of the tank level sensing technology, it is almost impossible for the system to indicate an incorrect water level, and in the very unlikely event it does occur, servicing is greatly aided with the diagnostic information.

The system also shows the battery voltage by measuring the voltage which powers the display. The voltage is shown with a resolution of 0.1 volt.

In order to keep the tank level and alarm information current, the display regularly scans the senders every 10-15 seconds. When a tank button is pressed, the information displayed is recalled from the most recent scan. A tank on hold is scanned more frequently. Systems with two displays are configured so that the primary display initiates the scanning and the secondary display passively listens to the sender information, this way both displays stay updated without interfering with each other.

Two common alarm outputs can be programmed to indicate a high or low sewage level, or a high or low water level. More than one alarm can be assigned to an alarm output. The output can be connected to an indicator light or sounder and used to show a high sewer level and/or a low water level, alerting the user that attention is required. Another example is the alarm could be used on the black tank to prevent toilet use when the tank is full.

CHAPTER 3 - OPERATING INSTRUCTIONS

The display is the only system component that is accessed by the user. All user input to the display is done using the five buttons along the bottom of the display. Operation of the display is as follows:

To read a water or sewer tank level:

1. To view the level of the most recently viewed tank, press the **LEVEL** button. While the button is held down, it will show the tank identification, for example, "tn 1". When the **LEVEL** button is released, it will show the tank level in percent of full. If no other button is pressed, then the display will shut off after about 5 seconds.
2. To view the level of a different tank, press either the ← or → button to select either the next tank down or up, respectively. While the button is held down, it will show the tank identification, for example, "tn2". When the button is released, it will show the tank level in percent of full. If no other button is pressed, then the display will shut off after about 5 seconds.
3. Repeatedly pressing either the ← or → button will cycle through all of the tanks in the system. After the last tank is reached, the system will loop around to the first tank. For example, if the system is programmed for 5 tanks, and tank 2 was the most recently viewed tank, then pressing the → button will show tank 3. Pressing it again will show tank 4, then tank 5, then loop back to tank 1, then tank 2, etc. Pressing the ← button from tank 2 will show tank 1, then tank 5, tank 4, tank 3, and so on. The 5 second timer is reset every time a button is pressed.
4. To continuously display the level of the most recently viewed tank, press the **LEVEL** button while the display is showing the level (before the display shuts off). When the button is released, the display will be in hold mode, which is indicated by the decimal point on the right hand side turning on. While the display is in the hold mode it will recheck the held level every 2 - 3 seconds so the user can watch the level change while the tank is being filled or drained. The other tanks will continue to be scanned every 10 - 15 seconds. The display will automatically shut off after about 5 minutes in hold mode. To end the hold mode before the 5 minutes is up, press the **LEVEL** button to shut off the display immediately. Alternatively, press the **BATT**, ← or → buttons, the display will switch to the new reading and then shut off after 5 seconds.

5. The system will remember the most recently viewed tank even if the power to the system is shut off.

To read the battery voltage:

1. Press the **BATT** button and release it, the display will show the battery voltage on the LED display.
2. If no other button is pressed, then the display will shut down after about 5 seconds. If the **BATT** button is held down, the display will continuously recheck the voltage twice per second and show the updated value. The reading may flicker back and forth between two values, for example, 12.6 and 12.7 volts. This is normal behavior for a digital voltage display.
3. If another button is pressed before the 5 second time is up for the **BATT** button, the display will immediately switch to showing the value for the new button. The 5 second timeout is restarted every time a button is pressed.
4. There is no hold mode for the battery voltage

To show the sender diagnostic information:

1. Press either the ←, LEVEL, or → button to select the desired tank. While the button is still held down, press the **BATT** button, the display will show "d iR". Release both buttons, the display will show the tank number followed by "d" for a moment. For example, if you are on tank 4, it will show "t4d".
2. After a couple of seconds, the display will show the sender receive power level as "P23" for example. The power level can range from 0 to 99%, with 20% being the minimum for reliable operation. The power level will be shown for a few seconds. See the troubleshooting section for more details on this.
3. After the power level, the display will show the sender height as "h 7" for example. The height is the number of segments remaining on the sender after it has been cut to length to match the tank. This number can range from 3 to 8. See the troubleshooting section for more details on this.
4. After a few seconds of showing the sender height, the display will shut off.

To operate the alarms:

1. The alarms are normally programmed so that if a fresh water level gets too low (indicating that you are about to run out of water) or a sewer level gets too high (indicating that your sewer tank is almost full) then the alarm will go active. This would be indicated by a light or sounder turning on.
2. If an alarm is active, pressing the **ALARM** button will turn off (acknowledge) the alarm. The display will show "OFF" indicating that the alarm has been turned off.
3. Pressing the **ALARM** button when no alarm is active has no effect. If the display shows "OFF" when the **ALARM** button is pressed then this means that there is an alarm that has been turned off and the acknowledge has not been reset. If the display just shows "PrA" then there is no alarm that has been turned off.
4. The alarm acknowledge will reset when the water or sewer level goes past the programmed reset level. This would typically be near the bottom of a sewer tank or near the top of a water tank. This way the reset occurs when the water tank is filled or the sewer tank is emptied. When the alarm acknowledge is reset the alarm will be able to activate again once the level goes past the alarm trip point.
5. This alarm operation means that once an alarm is turned off, normal rocking of the boat will not turn the alarm back on. Then once the tank has been filled or emptied, the user does not need to remember to turn the alarm back on, it does this automatically.
6. Each tank has its own alarm acknowledge. This way if one tank goes into alarm and is acknowledged, and then another tank goes into alarm, the alarm will be turned on again. The second tank can then be acknowledged to turn off the alarm. Then if a third tank goes into alarm the alarm will sound again and so on. Each tank's alarm acknowledge can only be reset when the level in that tank goes past the reset point.
7. A sender failure can cause an alarm (depending on how it is programmed) and this alarm can be acknowledged as well. The only way to reset this acknowledge is to correct the sender failure and have the tank level past the reset point. Simply fixing the sender with the tank level not past the reset point will NOT reset the acknowledge, so a legitimate alarm could be missed in this case.

CHAPTER 4 - GARNET MARINE APP INSTRUCTIONS

The Garnet Marine *Bluetooth*® App:

- The free Garnet Marine App is available for any compatible Android and Apple iOS device.
- Wireless technology enables your tank monitor to send tank levels and battery voltage to any compatible Android or Apple iOS device.
- One display can send data to several phones or tablets, the phone or tablet does not need to be paired to your display unit.
- *Bluetooth*® has a limited range of up to 16 meters (50') but should function inside the marine vessel and immediate surrounding area.
- The following section will instruct you on installation and operation of the Garnet Marine App.

System Requirements

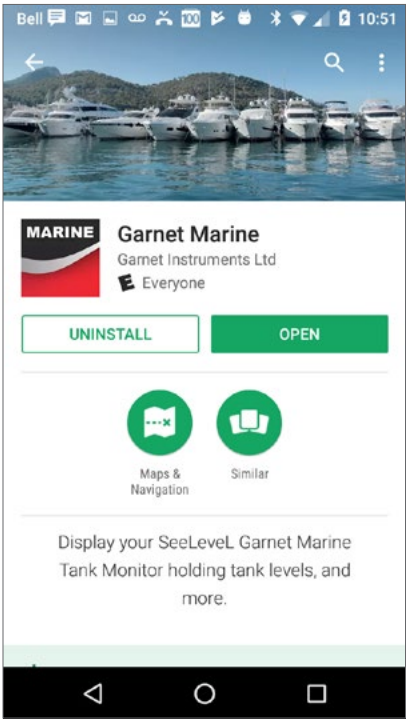
Android
An Android phone or tablet with *Bluetooth*® 4.1 running Android version 5.0 (Lollipop) or newer. **(see note below)**

Apple iOS
An Apple iPhone, iPad or iPod touch running iOS version 9.3 or later.

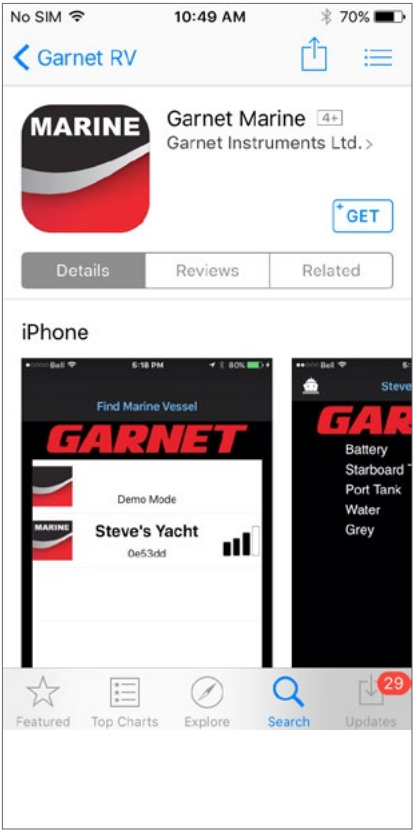
⚠ **NOTE:** The 759 SeeLevel Marine Gauge's *Bluetooth* functionality is good in iOS but has been affected when using Android devices and when the monitor is placed in aluminum utility cabinets that block the *Bluetooth* signal. It is highly recommended that the *Bluetooth* only be used on an iOS device and where signal can be successfully achieved.

Download the app:

For **Android** devices go to the Google Play store to download and install the app.



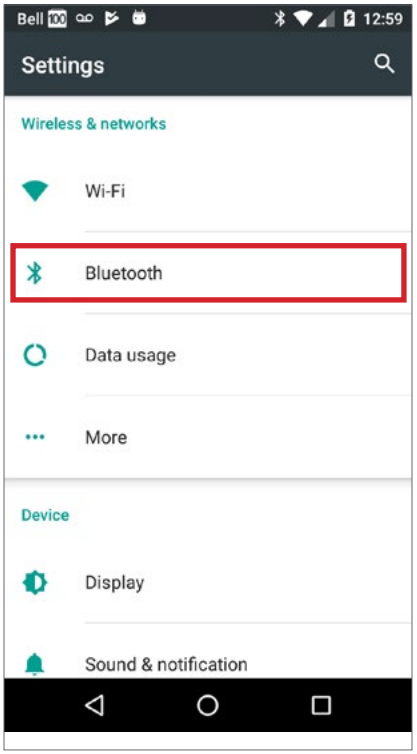
For **Apple iOS** devices go to the Apple app store to download and install the app.



Turn Bluetooth on:

Android

This is found in the settings app.



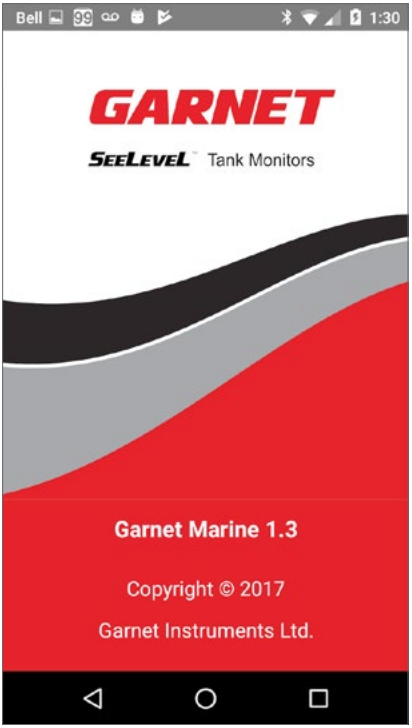
Apple iOS

This is found in the settings app.

Start the app:

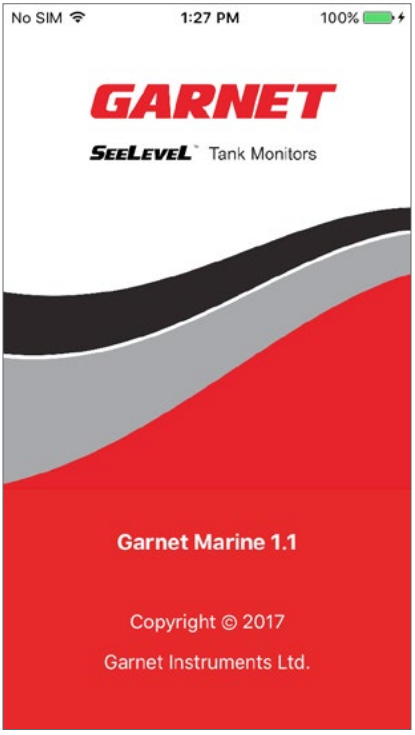
Android

The initial screen will load showing the version number of the app. Actual version numbers will change as future updates are provided.



Apple iOS

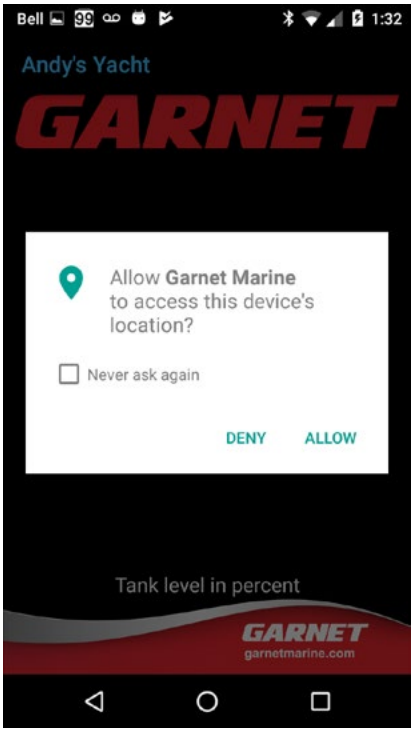
The initial screen will load showing the version number of the app. Actual version numbers will change as future updates are provided.



Device Location:

Android

If prompted, allow the app to access the device's location. This is needed for the app to locate the device using Bluetooth.

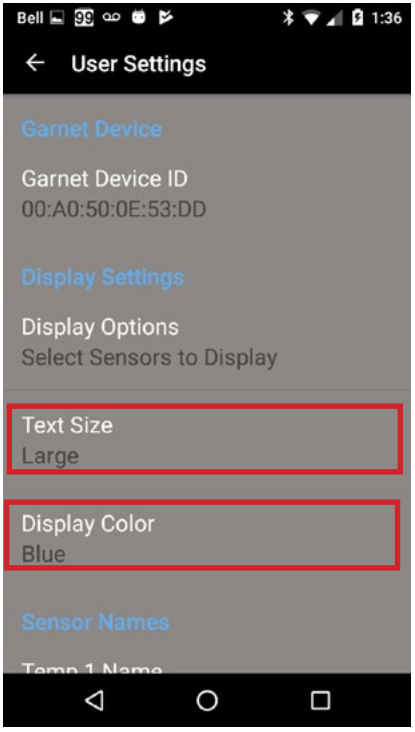


Configure the app:

Android

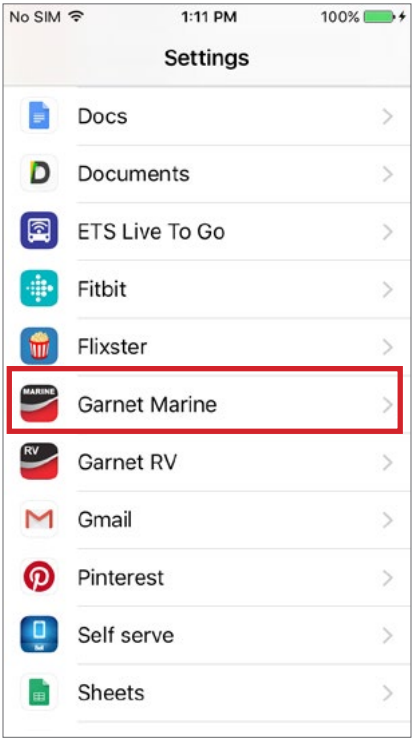
The user settings can be configured by selecting the configuration icon on the main display of the Garnet Marine app.

You can also change your text size and text display color here.



Apple iOS

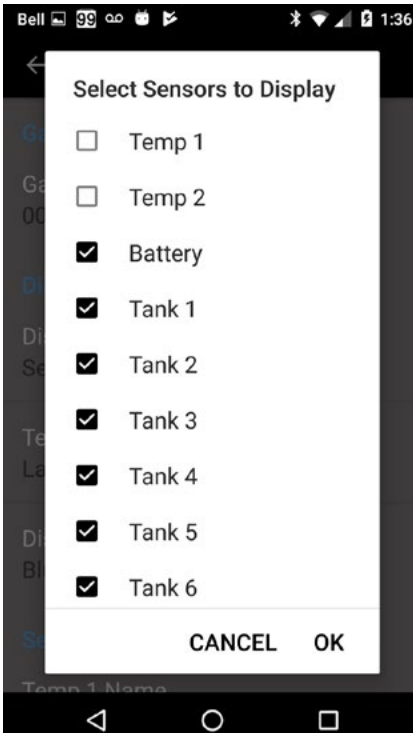
The user settings can be configured by selecting the settings app on the Apple device. Scroll through the available settings and select the Garnet Marine app icon.



Select sensors to display:

Android

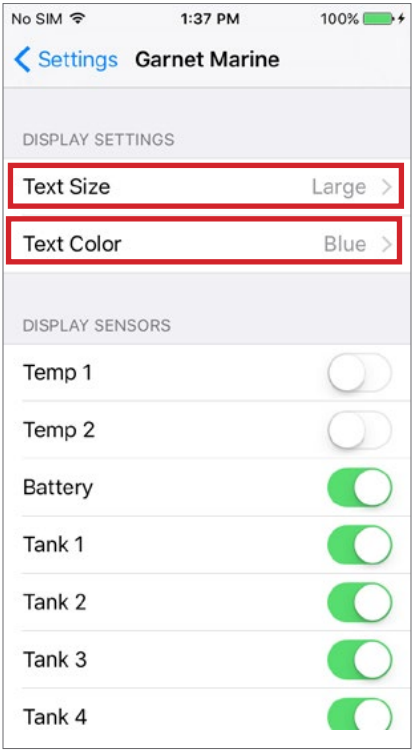
Select the sensors that have been installed in your Marine Vessel.



Apple iOS

Select the sensors that have been installed in your Marine Vessel.

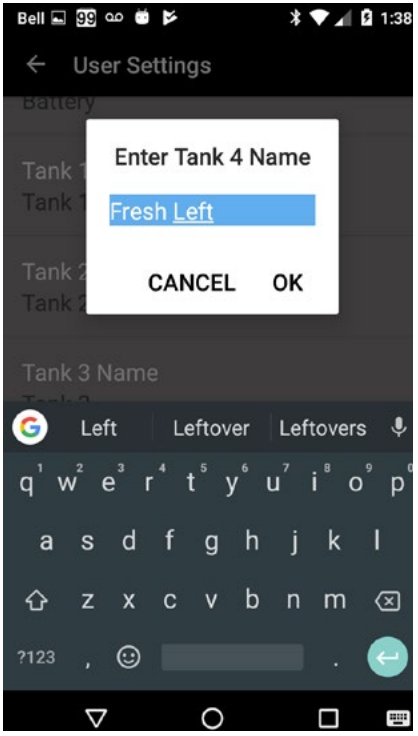
You can also change your text size and text display color here.



Name Sensors:

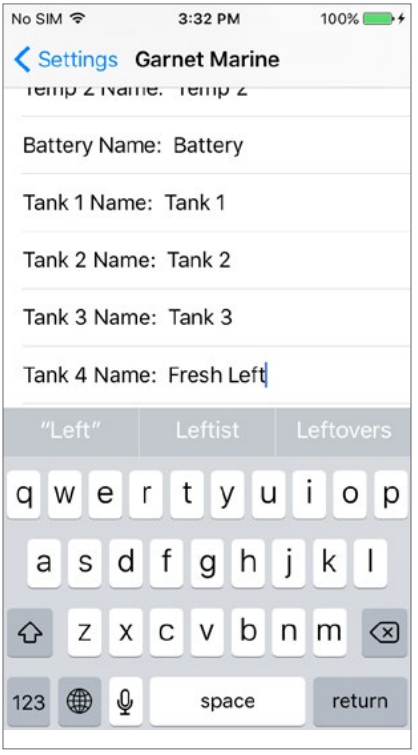
Android

Name the sensors that have been installed in your Marine Vessel.



Apple iOS

Name the sensors that have been installed in your Marine Vessel.



Find Marine Vessel:

Android

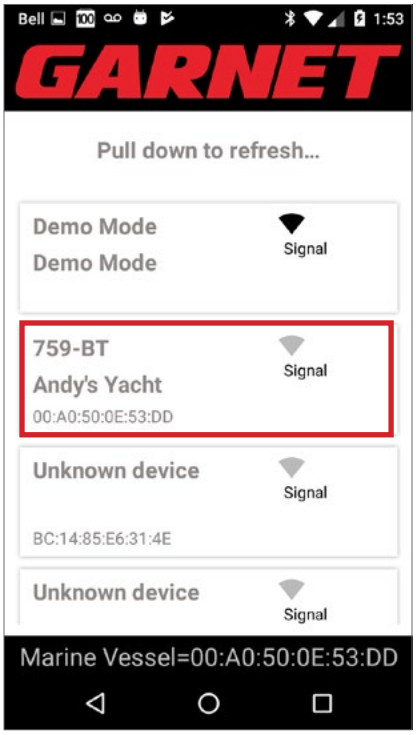
Select the device named "759".

This device selection will be saved for future use and will automatically be selected the next time you run the app.

The name shown is the user entered name for the marine vessel. See "Name Marine Vessel".

The identification string shown under the "759" device is a unique identifier for the Garnet hardware installed in your marine vessel.

Note: Ensure you select your device if you are in an area with other SEELEVEL tank monitoring systems.



Apple iOS

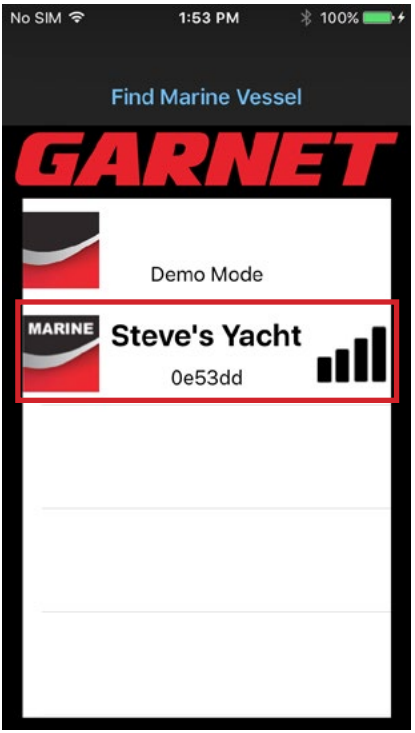
Select the device with the "Marine" icon displayed.

This device selection will be saved for future use and will automatically be selected the next time you run the app.

The name shown is the user entered name for the marine vessel See "Name Marine Vessel".

The identification number shown is a unique identifier for the Garnet hardware installed in your marine vessel.

Note: Ensure you select your device if you are in an area with other SEELEVEL tank monitoring systems.



Main display:

Android

This screen displays the values for the selected sensors.

The "Marine Vessel" icon lets you select a different marine vessel.

The "Edit" icon allows you to name your marine vessel.

The "Configuration" icon is used to change the configuration options for the app.

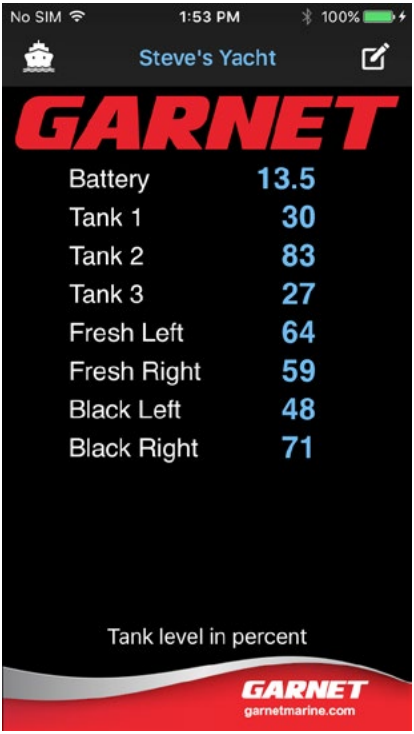
Apple iOS

This screen displays the values for the selected sensors.

The "Marine Vessel" icon lets you select a different marine vessel.

The "Edit" icon allows you to name your marine vessel.

Exit the app and use the Settings app to change the configuration for the app.

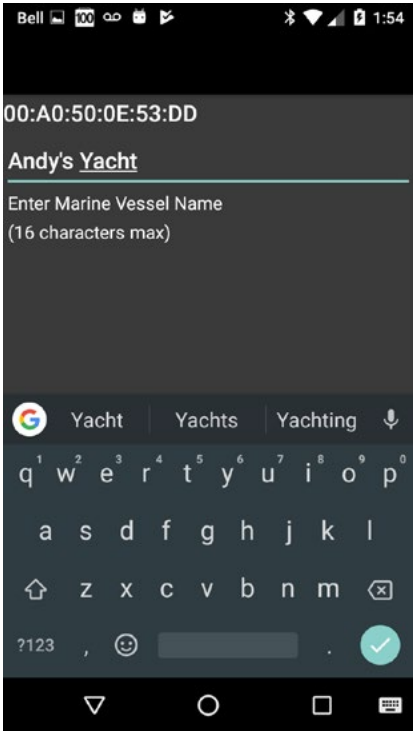


Name Marine Vessel:

Android

This screen is accessed from the "Edit" button on the "Main Display", and allows you to enter a name for the marine vessel.

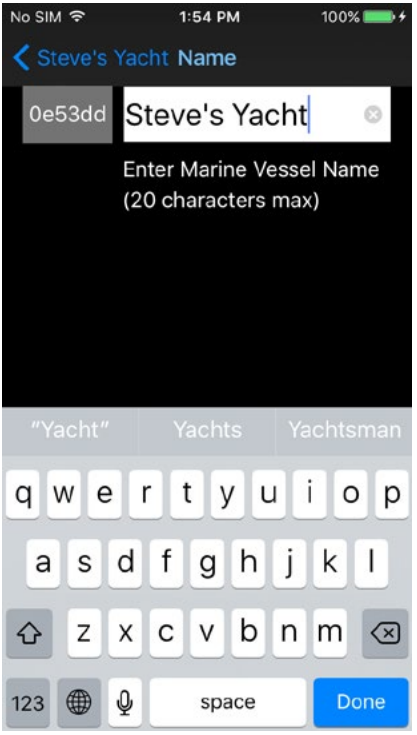
This name is stored on the Android device, and is displayed on the "Main Display" and "Find Marine Vessel" screens.



Apple iOS

This screen is accessed from the "Edit" button on the "Main Display", and allows you to enter a name for the marine vessel.

This name is stored on the iOS device, and is displayed on the "Main Display" and "Find Marine Vessel" screens instead of the ID.



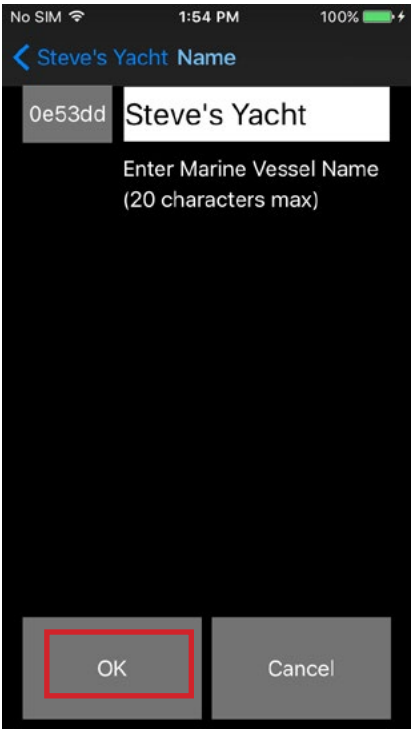
Name Marine Vessel (cont'd):

Android

Press "OK" to save the name, or "Cancel" to exit without saving. The maximum length of the name is 16 characters.

Apple iOS

Press "OK" to save the name, or "Cancel" to exit without saving. The maximum length of the name is 20 characters.



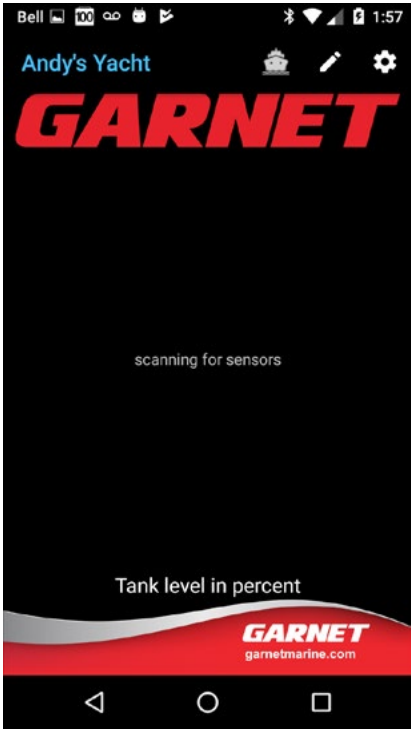
Troubleshooting - No Devices:

Android

If no Garnet Marine devices appear, ensure that you are within 16m (50ft) of the marine vessel, and use the "Refresh" icon or "Find Marine Vessel" icon to scan again for the marine vessel.

Verify that *Bluetooth* is ON.

Ensure that the Garnet Marine hardware is powered ON.



Apple iOS

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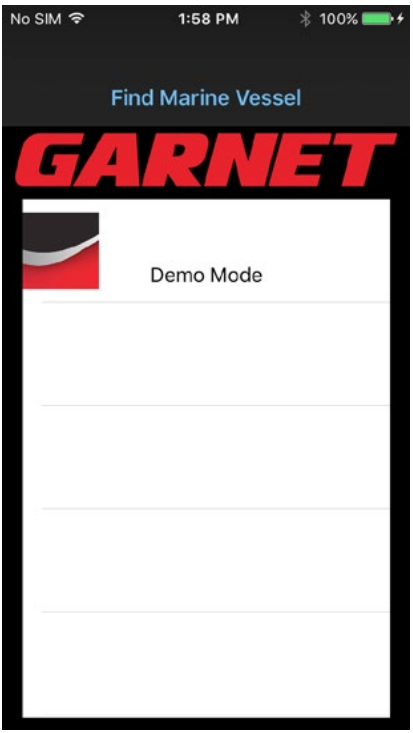
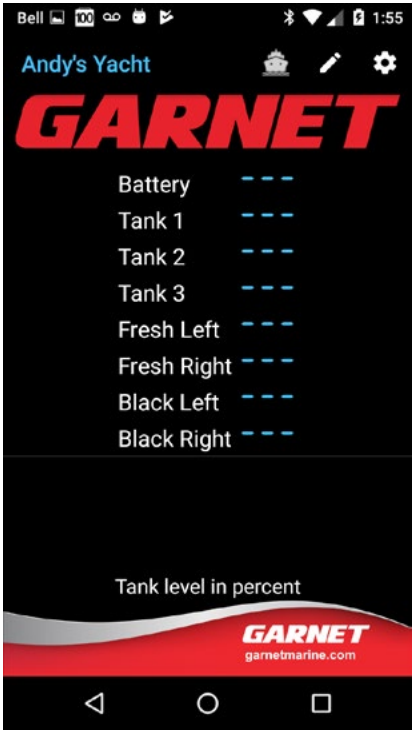


Troubleshooting - No Data/Stale Data:

Android

When the Main Display shows a value of "---" this is an indication that no data is available for the sensor. This is normal operation when the app is first started until data values appear.

It can also be an indication that you are more than 16m (50ft) away from your marine vessel and unable to establish communication with the sensors.



Apple iOS

When the Main Display shows a value of "---" this is an indication that no data is available for the sensor. This is normal operation when the app is first started until data values appear.

It can also be an indication that you are more than 16m (50ft) away from your marine vessel and unable to establish communication with the sensors.

Troubleshooting:

Android

A "Demo Mode" is available to show potential customers the provided functionality of the app without the need for actual Garnet Marine hardware to be installed.

The sensor data values are simulated, and do not correspond to actual sensor readings.

Ensure that you are not using this mode if you have installed a Garnet Marine system in your marine vessel.

Apple iOS

A "Demo Mode" is available to show potential customers the provided functionality of the app without the need for actual Garnet Marine hardware to be installed.

The sensor data values are simulated, and do not correspond to actual sensor readings.

Ensure that you are not using this mode if you have installed a Garnet Marine system in your marine vessel.

To program the display LED brightness:

1. The LED display brightness can be adjusted to suit the environment where the display is located.
2. To program the LED brightness, the display needs to enter the brightness programming mode. To do this, press and hold down the **BATT** button, the display will show the battery voltage.
3. While continuing to hold down the **BATT** button, press and hold down the **LEVEL** button. Continue to hold down both buttons for about 5 seconds until the display shows "br ı" to indicate the brightness programming mode. When this occurs release both buttons.
4. The display will now indicate the brightness that is currently programmed by showing "b- 1", "b-2", "b-3", or "b-4", where "b- 1" is the minimum brightness and "b-4" is the maximum brightness.
5. Press the ← button to increase brightness, or the → button to decrease brightness. The new brightness value is saved every time one of these buttons is pressed.
6. When the display shows the correct brightness, press the
7. **BATT** button to exit the brightness programming mode.

To program the sender configuration for each tank:

1. During installation, each tank needs to be programmed to tell it whether it is present, whether there are one or two senders, and how the tank is to be displayed. For example, if the application has 4 tanks, then tanks 5, 6, and 7 need to be turned off. Depending on the height of the tank, either one sender is used or two senders are stacked to reach the full height of the tank. Finally, the user can pick from several descriptions of the tank to suit their own preference.
2. If the display programming does not match the senders on the tanks, errors or improper operation will result.
3. To do this programming, the display needs to enter the sender programming mode. To enter this programing mode, press and hold the **ALARM/PROG** button and then the **BATT/SAVE** button, the display will show "PrS" for about 5 seconds, then "En 1". When this occurs, release both buttons.

4. The first menu level is the tank number. Pressing the **TANK** button cycles through the 7 possible tanks. The menu will loop back to tank 1 after tank 7. While the **TANK** button is held down the display shows "tn 1" through "tn7" indicating tank number 1 to 7. Each tank number needs to be programmed with three parameters-the number of senders (none, one, or two), the displayed tank description, and the displayed tank number (for example, Fr3 meaning fresh tank number 3).
5. The second menu level contains the three parameters to be programmed for each tank number. Pressing the **MENU** button cycles through these three parameters, after the final parameter the menu loops back to the first parameter.
6. The third and final menu level is the options within each of the three parameters. Pressing the **ADJUST** button cycles through these options, with the options looping back to the first one after the final option.
7. Whenever an option is changed, press the **SAVE** button to save that option. If the **SAVE** button is not pressed for each new option selected, that selection is not saved and the original option will still be used. This allows the user to scroll through and check which options are selected without unintentionally changing an option.
8. Begin by programming tank 1. Note that the tanks must all be sequential, so if there are 4 tanks for example, then tanks 1 to 4 must be programmed with one or two senders and tanks 5 to 7 must be programmed with the senders off. You cannot "skip" a tank, or the tanks above the skipped one will be ignored.
9. The first menu item for any tank will be the number of senders, either one single sender "SS 1", two double stacked senders "SdS", or off indicating no sender "SoF". Use the **ADJUST** button to select the correct sender configuration, then press the **SAVE** button to store that value, the display will show "Sto" while the **SAVE** button is held down.
10. Press the **MENU** button to go to the second menu item, which is how you want the tank description to be displayed. The display will show the options as "dtn", "dFr", "dGr", or "dbL, meaning display it as tank, fresh, grey, or black. Use the **ADJUST** button to select the correct display option, then press the **SAVE** button to store that value, the display will show "Sto" while the **SAVE** button is held down.
11. Press the **MENU** button to go to the third menu item, which is how you want the tank number to be displayed. The display will show the options as "d " (no number displayed), "d 1",

"d 2", "d 3, "d 4", "d 5", "d 6", "d 7" (number 1 through 7), "d L", "d r" (left or right), "d P", "d S" (port or starboard), "d F", or "d A" (fore or aft). Use the **ADJUST** button to select the correct display option, then press the **SAVE** button to store that value, the display will show "Sto" while the **SAVE** button is held down. By holding the **ADJUST** button down and then pressing the **BATT/SAVE** button, you can scroll backwards through the values.

12. If you want to review your selections, use the **MENU** button to cycle through them. Otherwise, press the **TANK** button to go to the next tank. When you have done all the tanks that are being used, program all the rest of the tanks as having the sender off. For the unused tanks, you don't have to program the display options, they will never appear.
13. Review you selections to make sure they are correct. When the sender configuration programming is complete, press the **ALARM/PROG** button to exit the menu. The menu can be exited at any time without saving by pressing the **ALARM/PROG** button.
14. As soon as this menu is exited, the display will show how many tanks the display is programmed for. For example, if the display is programmed for 4 tanks, the display will show "4tn". If the **ALARM/PROG** button is held down for a few seconds, then the display will show "dun" (done) after showing the number of programmed tanks. When the button is released the display will turn off.

Sender Configuration Quick Menu Description:

1. **ALARM/PROG** then **BATT** enters menu after 5 seconds, shown by "PrS" then "tn 1".
2. Each tank programmed for:
   - menu 1 is sender configuration: Single "SS 1", double stacked "SdS", or off "SoF".
   - menu 2 is displayed appearance designation: Tank "dtn", Fresh "dFr", Grey "dGr" or Black "dbL".
   - menu 3 is displayed appearance number: 1-7 "d 1", Left "d L", Right "d r", Port "d P", Starboard "d S", Fore "d F", Aft "d A", or blank "d ".
3. **TANK** goes to the next tank, wraps from tank 7 to tank 1, shows tank number while held down.
4. **MENU** goes to the next menu, wraps from menu 3 to menu 1.

5. **ADJUST** changes the value, wraps from last value to first value. When on menu 3, press **BATT** while **ADJUST** is held down to decrease.
6. **SAVE** saves the value shown, shows "SEd" while held down.
7. **PROG** exits the menu, shows number of tanks programmed as "4En" for example. Does not save.

To program the alarms for each tank:

1. Each tank has an alarm which can be programmed for a variety of options. Even if the alarm for one of the tanks is not going to be used, it should be programmed to "tOF" and "HLA" to prevent false or nuisance alarms. The options are:

   a) The alarm can be tested by forcing the apparent tank level to either full or empty, this will activate any lights or sounders connected to the common alarm outputs. This is useful to verify that part of the programming is correct and that the light or sounder is properly connected.

   b) The trip point, this is the tank level that will cause the alarm to be activated.

   c) The acknowledgement reset point, this is the level at which the alarm turn off feature is reset so that at the next alarm event it will go active again. Normally the reset point is set near the bottom of the tank for a high level alarm and near the top of the tank for a low level alarm.

   d) Whether the alarm is a high level alarm (for example, to warn of a full sewer tank) or a low level alarm (for example, to warn of an empty fresh water tank).

   e) Whether the alarm is included in the alarm 1 or 2 common outputs. If the alarm is included, then it will activate that output when it is active. The alarm can be included in no outputs, output 1 only, output 2 only, or both outputs. These common outputs are normally connected to a light or sounder to indicate the alarm.

   f) Whether or not the alarm will go active to indicate a failed sender.

2. To do the alarm programming, the display needs to enter the alarm programming mode. To do this, press and hold the **ALARM/PROG** button, the display will show "PrA" for about 5 seconds, then "tn 1" (the display may show "OFF" first). When "tn 1" is shown, release the button.

3. The first menu level is the tank number. Pressing the **TANK** button cycles through all of the tanks. Only the number of tanks programmed with senders will appear in the menu, so for example if the system is programmed for 4 tanks then the alarm menu will only go up to tank 4. After this the menu will loop back to tank 1. While the **TANK** button is held down the display shows the tank number, for example "tn 1" indicates tank number 1. Each tank needs to have its alarms programmed separately.
4. The second menu level contains the one test mode and the five parameters to be programmed for each tank. Pressing the **MENU** button cycles through these six items, after the final items the menu loops back to the first item.
5. The third and final menu level is the options within each of the six items. Pressing the **ADJUST** button cycles through these options, with the options looping back to the first one after the final option.
6. Whenever an option is changed, press the **SAVE** button to save that option. If the **SAVE** button is not pressed for each new option selected, that selection is not saved and the original option will still be used. This allows the user to scroll through and check which options are selected without unintentionally changing an option.
7. Begin by programming tank 1. The first menu item for any tank will be the alarm test, this simulates either a high tank level "HiL" or a low tank level "LoL" for the purpose of testing the alarm outputs. Use the **ADJUST** button to select between the two tank levels to verify alarm operation. If may seem counter-intuitive that this menu occurs first, since the alarms have not yet been programmed. The reason for this is so that the alarms can be quickly checked after all programming is done.
8. Press the **MENU** button to go to the second menu item, which is the alarm trip point. The display will show the value as "t80" for example, meaning that the alarm will trip when the level is at 80%. Use the **ADJUST** button to increase the value, or by holding the **ADJUST** button down and then pressing the **BATT/SAVE** button, you can decrease the value. Hold the button (or buttons) down for more than one second to quickly change the value. Note that 100% is shown as "t00". If you go above 100%, the display will show "tOF" indicating that a high level alarm is permanently turned off for this tank. In this case be sure to set the alarm as a high level alarm "HLA" as well. The value will NOT wrap around, so if you hit 0 or OFF, the value will not change any more unless you go back the other way. Press the **SAVE** button to store that value, the display will show "Sto" while the **SAVE** button is held down.

9. Press the **MENU** button to go to the third menu item, which is the acknowledge reset point. The display will show the value as "r 10" for example, meaning that the alarm turn off will be reset when the level is at 10%. Use the **ADJUST** button to increase the value, or by holding the **ADJUST** button down and then pressing the **BATT/SAVE** button, you can decrease the value. Hold the button (or buttons) down for more than one second to quickly change the value. Note that 100% is shown as "r00". The value will NOT wrap around, so if you hit 0 or 100, the value will not change any more unless you go back the other way. Press the **SAVE** button to store that value, the display will show "Sto" while the **SAVE** button is held down.
10. Press the **MENU** button to go to the fourth menu item, which is whether the alarm is a high level alarm "HLA" or low level alarm "LLA". Use the **ADJUST** button to toggle between the two options, then press the **SAVE** button to store that option. The display will show "Sto" while the **SAVE** button is held down.
11. Press the **MENU** button to go to the fifth menu item, which is whether the alarm is included in the alarm 1 or 2 common outputs. The display will show " c 1" to indicate that the alarm is included in common output 1, " c2" to indicate inclusion in alarm output 2, " cb" to indicate inclusion in both outputs, or " cn" to indicate inclusion in neither output. The neither option is used when an alarm is only to be reported through a remote output (such as *Bluetooth*® or NMEA2000®). Use the **ADJUST** button to select between the four options, then press the **SAVE** button to store that value. The display will show "Sto" while the **SAVE** button is held down.
12. Press the **MENU** button to go to the sixth menu item, which is what happens to the alarm in the event of a failed sender. The display will show an error message and the alarm can be programmed to turn on or off. This is shown as fail to full (the alarm will behave as though the tank were full) "FtF" or fail to empty (the alarm will behave as though the tank were empty) "FtE". Use the **ADJUST** button to toggle between these two options, then press the **SAVE** button to store that option. The display will show "Sto" while the **SAVE** button is held down.
13. If you want to review your selections, use the **MENU** button to cycle through them. Otherwise, press the **TANK** button to go to the next tank. While the **TANK** button is held down the display shows the tank number, for example "tn2" indicates tank number 2. The system will only show the tanks that have been programmed with senders, if the sender is programmed as off then the tank number will not appear in the alarm menu.

14. All of the alarm programming can be reviewed by using the **TANK** button to select the tank and the **MENU** button to select the parameters for each tank. When the alarm programming is complete, press the **ALARM/PROG** button to exit the menu, the display will show "dun" while the button is held down. The menu can also be exited at any time without saving by pressing the **ALARM/PROG** button.

Alarm Programming Quick Menu Description:

1. **ALARM/PROG** enters menu after 5 seconds, shown by "PrA" then "tn 1".
2. Each tank programmed for:
   - menu 1 is alarm test-simulates a high "H iL" or low tank level "LoL"
   - menu 2 is alarm trip point "t80".
   - menu 3 is acknowledge reset point "r 10".
   - menu 4 is high level "HLA" or low level "LLA" alarm select.
   - menu 5 is include in common output 1 " ic 1", output 2 " ic2", both outputs " icb" or neither output " icn".
   - menu 6 is failure polarity-fail to full tank "FtF" or fail to empty tank "FtE".
3. **TANK** goes to the next tank, wraps from the last tank to tank 1, shows tank number while held down.
4. **MENU** goes to the next menu, wraps from menu 6 to menu 1.
5. **ADJUST** changes the value, wraps from last value to first value. When on menus 2 & 3, press **BATT** while **ADJUST** is held down to decrease the number.
6. **SAVE** saves the value shown, shows "Sto" while held down.
7. **PROG** exits the menu, shows "dun". Does not save.

To program the display as primary or secondary:

An optional second display can be added to the system so that the tank levels can be read from two separate locations. To avoid reading errors when using dual displays, one display needs to be set to secondary mode. A display in secondary mode monitors the primary displays sender requests and will only scan the tank levels at a much slower rate if the primary display is disconnected. The alarms are inactive on the secondary display.

1. Press and hold the **BATT** and the ← button while powering up the display.
2. The display will show "Scn" for 5 seconds, then change to "SEC" or "Pr 1" depending on current programming.
3. The ← button sets the mode to PRIMARY, the **LEVEL** button to SECONDARY and the **BATT** button saves and exits.

To check the primary/secondary mode:

1. Press and hold down the **BATT** button, the display will show the battery voltage. While continuing to hold down the **BATT** button, press and hold down the → button. Continue to hold down both buttons for about 5 seconds until the display shows "Pr 1" for primary mode or "SEC" for secondary mode. When viewing is complete, release both buttons to return to normal operation.

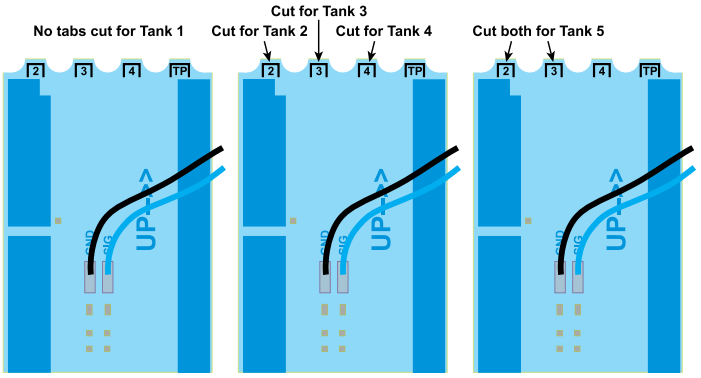
To check the hardware and software revision:

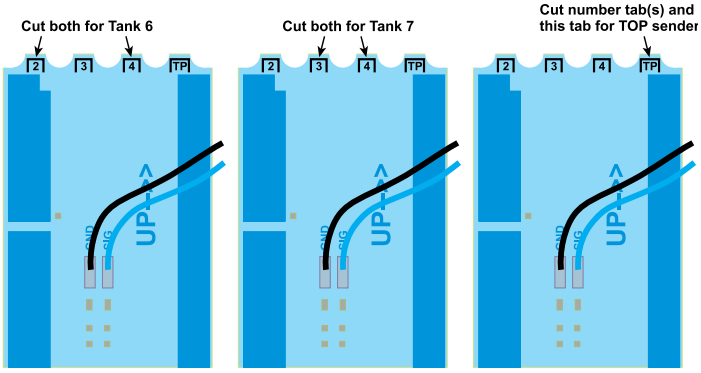
1. Hardware and software updates may be periodically released to add features. To check the hardware and software version of the display, use the following procedure.
2. Press and hold down the **BATT** button, the display will show the battery voltage. While continuing to hold down the **BATT** button, press and hold down the ← button. Continue to hold down both buttons for about 5 seconds until the display shows a number such as "3.14", the first number is the hardware version and the last two numbers are the software version. When viewing is complete, release both buttons to return to normal operation

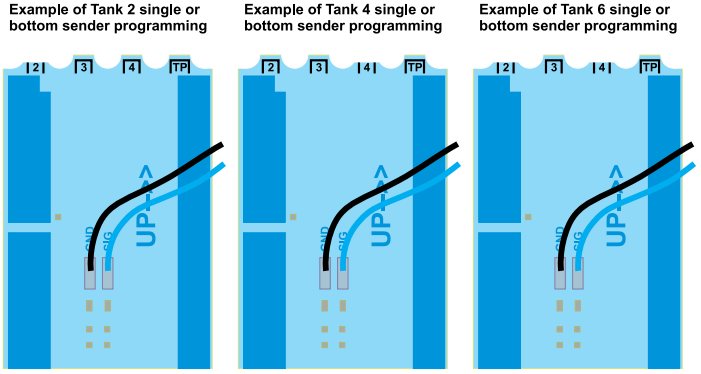
> ⚠ **NOTE:** The battery voltage is calibrated at the factory; this should never need to be changed.

To program the 760ES sender for the correct tank:

1. Since the senders are all connected in parallel to save wiring and to simplify installation, the senders must be programmed so they know which tank they are on. The senders can be programmed from tank #1 to tank #7. This is done with the tabs on the top of the sender. See the following diagrams.
2. The senders must be programmed sequentially. Start at 1 and do not skip any numbers. For example, if there are 4 tanks, then the senders must be programmed as 1, 2, 3, and 4.
3. The senders default to #1 operation if the programming is not altered. Consequently, if the sender is for the # 1 tank, nothing further needs to be done to it.
4. If the sender is for the #2 tank, remove the tab that says "**2**" next on it, and so on.
5. For tanks numbers greater than 4, use the sum of 2 tabs.
6. If the sender is single, no further programming is required.
7. If double stacked senders are used, the top sender must have additional programming to function correctly. The bottom sender requires no additional programming.
8. For a top sender, remove the tab that says "**TP**" next to it.
9. Verify that both the top and bottom senders have been programmed for the correct tank.

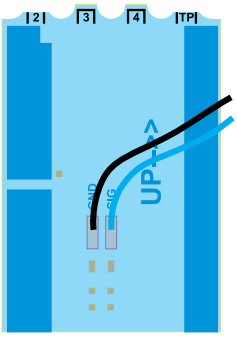




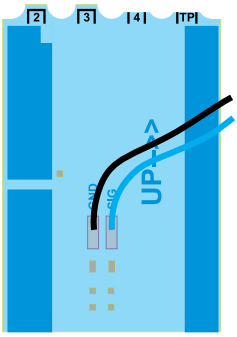


760ES SENDER PROGRAMMING

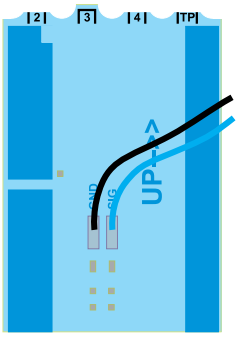
Example of Tank 2 top sender programming



Example of Tank 4 top sender programming



Example of Tank 6 top sender programming



760ES TOP SENDER PROGRAMMING

1. Please refer to the "**Troubleshooting and Installation Tips**" section in Chapter 8 for details on avoiding installation issues.
2. The installation consists of mounting the display, cutting and fastening the senders to the sides of the holding tanks, connecting wiring, and programming the display. When wiring DO NOT use spade connectors to join wires, only use crimp on butt connectors or solder the wires together.
3. Mount the display by cutting a hole in the panel or wall 3" wide by 1 ⅞" high and bringing the wiring out through the hole to connect to the display panel connector.
4. Connect the wiring according to the following table. It is easier to connect the wiring to the display connector first, and then plug the connector into the display panel. The senders need to be grounded to a single ground wire from the display. Make sure that the system ground is connected to the breaker panel ground.

Wire Colours on Connector

Wire Color	Function
Red	+12V
Black	Ground
Blue	Tank Senders
Purple	Common Alarm Output 1
Yellow	Common Alarm Output 2

5. Determine where to mount the senders on the tanks. They will need to have a flat area on the side of the tank large enough so the whole width of the sender is in contact with the side of the tank, all the way from the top to the bottom of the tank. Make sure that any metal is at least an 1" away from either side or the top and bottom of the sender, and at least 2" away from the face of the sender. Clean the area well so that there is no dust, grease, oil, water, etc., that would prevent the adhesive on the sender from sticking.
6. Measure the height of the tank to determine which sender configuration to use and how long the senders should be. If the tank is taller than 13", stack two senders which will cover tank heights up to 25".

For single sender applications:

The sender ends should be ¼" to ¾" away from the top and bottom of the tank, to allow for the thickness of the tank top and bottom and any bows in them (see the diagrams). The senders are calibrated to account for this distance from the bottom of the tank. The 760ES sender is cut to the nearest even 1.5" in length, for example, for a system with a tank height of 11.75", cut the sender to be 10.5" long, this allows ⅝" at each end when the sender is centered vertically on the tank.

> ⚠ **CAUTION:** DO NOT cut the 760ES sender shorter than 4½". This sender will not work if it is cut less than 4½".

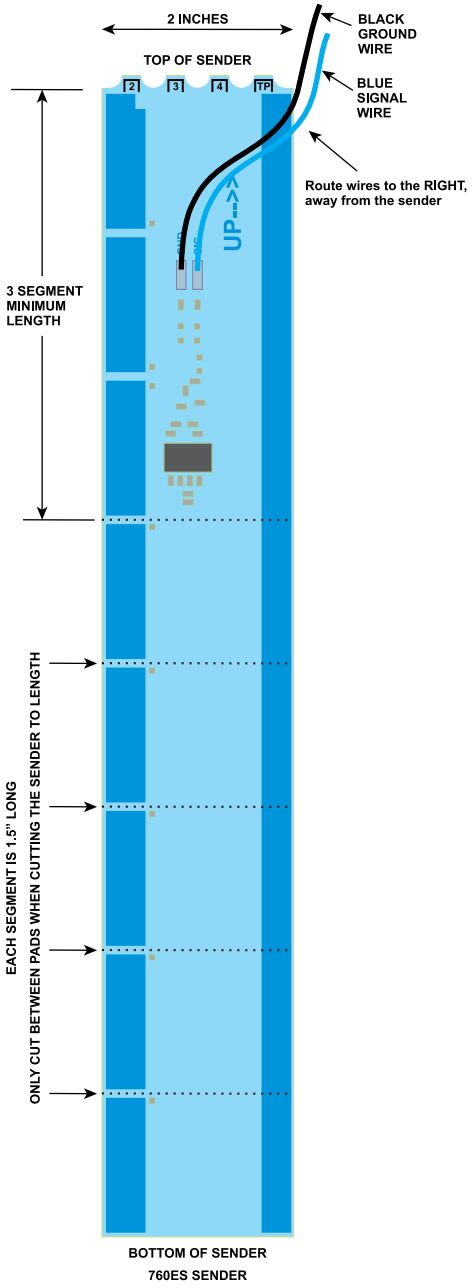
For double stacked sender applications:

For tall tanks, two stacked 760ES senders are used. The sender ends should be ¼" to ¾" away from the top and bottom of the tank, to allow for the thickness of the tank top and bottom and any bows in them (see the diagrams). The senders are calibrated to account for this distance from the bottom of the tank. In addition, there needs to be a gap of 1⁄16" to ⅛" in between the two senders. Therefore the total length of both senders will be: tank height -¼"-¼"-⅛", then rounded down to the nearest 1.5". The top and bottom senders should be approximately the same length for best results. For example, if the tank height is 22", then 22"-¼"-¼"-⅛"= 21 ⅜", so the total length of both 760ES senders will be 21". Make both senders 10.5" long.

7. To make the senders the right length (assuming they are too long) they will need to cut off with a pair of scissors. The end to be cut is the bottom end, which is the opposite end from the top where the wires come out (see the diagrams). The senders need to be programmed so they know which tank they are on. This is done by selectively cutting off the tabs on the top of the sender. See the chapter entitled **"SENDER PROGRAMMING"** for details.

   > ⚠ **CAUTION:** DO NOT cut the sides, and DO NOT cut the 760ES sender shorter than 4 ½". The cut must be in between the sensor pads, and the cut must be made parallel to the existing bottom end. Double check your measurements, if the sender is cut too short, it cannot be lengthened.

8. The senders need to be programmed so they know which tank they are on. This is done by selectively cutting off the tabs on the top of the sender. See the chapter entitled **"SENDER PROGRAMMING"** for details.



760ES SENDER

9. For double stacked sender systems, the senders also need to be programmed so they know whether they are being used as top or bottom senders. See the chapter entitled **"SENDER PROGRAMMING"** for details.
10. Once the sender is cut to length and programmed, do a test by taping the sender to the tank wall. Make sure there are no air gaps between the sender and the tank. Verify operation before permanently sticking the sender to the tank wall. Once proper operation has been confirmed, carefully peel the backing paper off the adhesive. Do this slowly to prevent the adhesive from being ripped off the sender, and to prevent the backing paper from ripping. Be careful not to bend the sender sharply in the process. Position the sender over the side of the tank and carefully stick it down.

    ⚠ **CAUTION:** Make sure that the end with wires is pointing up!!

    Position the bottom of the sender at least ¼" above the bottom of the tank, or slightly higher if required to equalize the space at the top and bottom of the tank. Make sure that the sender is square with the tank. You only have one shot at this, if you try to peel it off the tank once it is stuck the sender may be damaged by the sharp bending. Carefully press the sender down to the tank so that all of the adhesive is contacting the tank wall.
11. Do steps 5 to 10 for the other two holding tanks.
12. Connect all the blue wires from the senders together, and to the blue wire from the display. Connect the black wire from each sender to ground at the display. It is very important that the display and the senders have the same ground. Use crimp on butt connectors to fasten the wires together.

    ⚠ **CAUTION:** Make sure that the wires from the sender are routed to the RIGHT side of the sender, away from the sender. NEVER route the wires to the left of the sender. If they drape over the sender they could affect the reading.
13. Secure the wires with tie wraps or something similar so that the wires do not rattle or press against the sender, this may result in sender damage or wires breaking over time. Refer to the following wiring diagram.

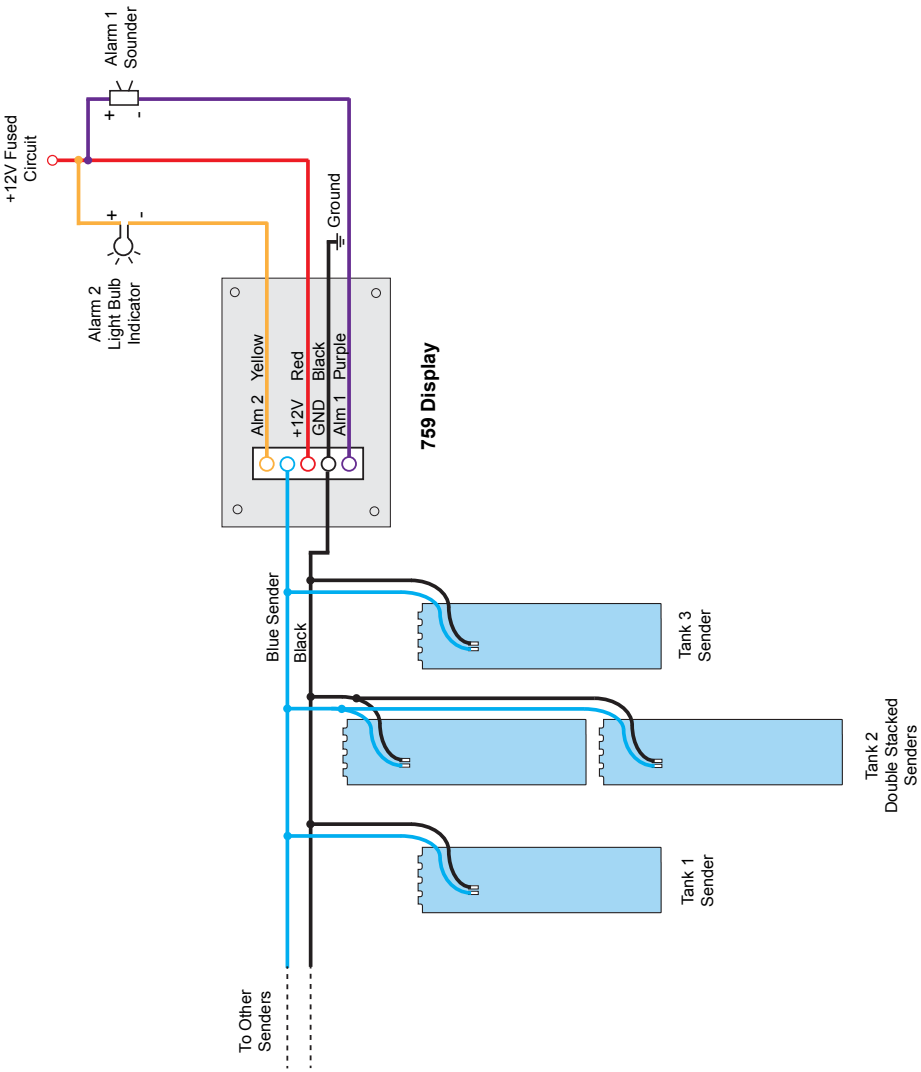
14. All that remains now is calibration and testing. The tank senders will self calibrate to whatever length they are cut, so they will always read from 0% to 100%. The display needs to be programmed for the correct sender configuration. See the chapter entitled **"DISPLAY CALIBRATION"** and the section **"To program the sender configuration for each tank"** for details. Make sure you do it for each tank.

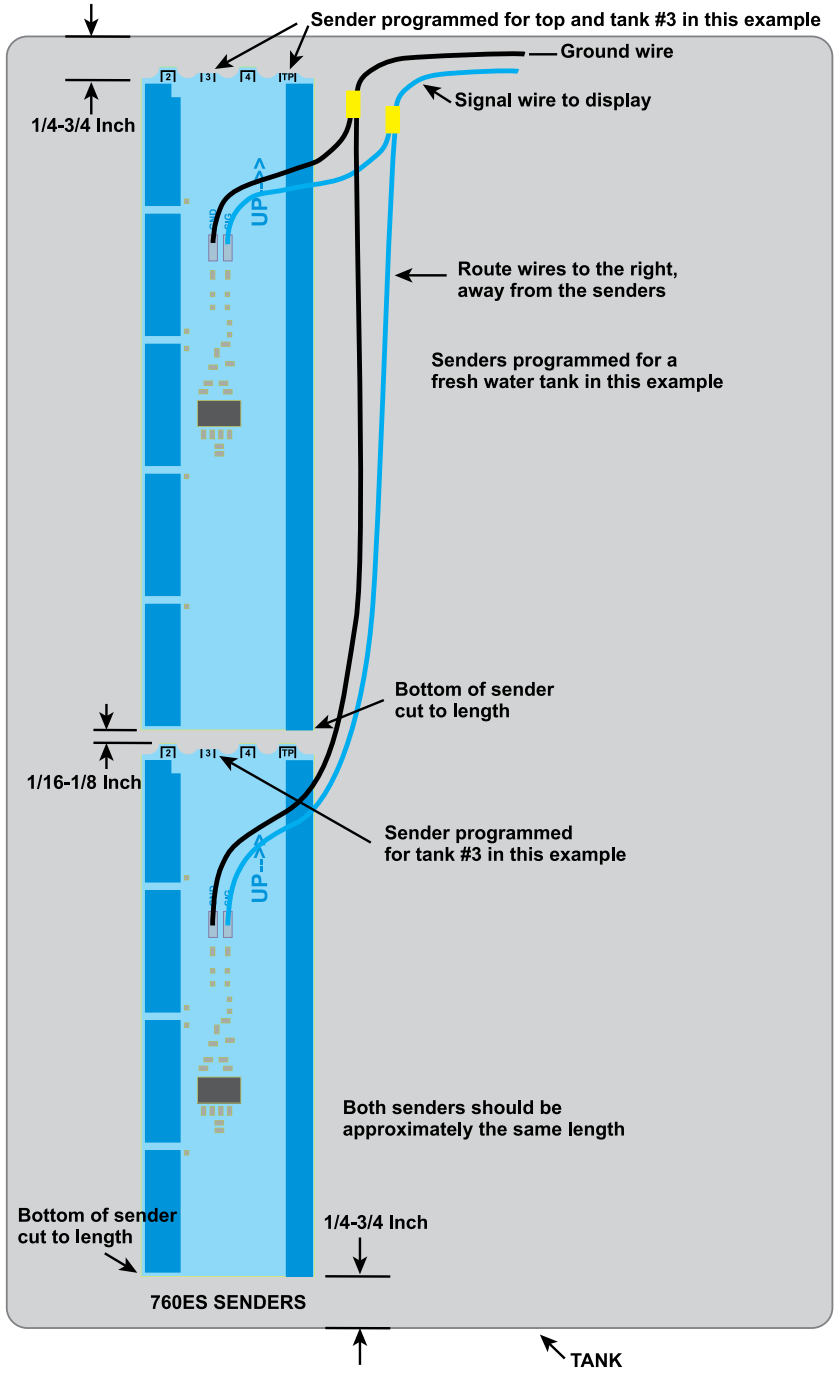
15. For the initial test, have the tank at least ¼ full of water or sewage, and verify that the percent level reading looks correct (see the chapter entitled **"OPERATING INSTRUCTIONS"** and the section **"To read a water or sewer tank level"** for details). Check to see that the signal power is at least 20% (see the chapter entitled **"OPERATING INSTRUCTIONS"** and the section **"To show the sender diagnostic information"** for details). If the signal power is too low, make sure that the sender(s) is well stuck to the side of the tank and that the tank is reasonably clean inside, as a large buildup will reduce signal strength. The gauge will work with maximum signal strengths as low as 20%, but it is good to have at least 50% to 60% at installation so that there is some margin available for buildup in the tank. Note that the system "learns" about the characteristics of the tank with use, so the readings may be inaccurate when the tank is empty or almost empty when the system is first tested. Once the tank has been filled at least ¼ full the system will be properly "taught" and should read correctly after that.

16. Verify that the battery voltage reads correctly. If it appears low, make sure you have good wiring for the 12 volt power and the ground.

17. The common alarm outputs provide a connection to ground when the alarm is active. The maximum current that can be put through the alarm output is 200 mA, be sure to use a relay if more current is required. Program and test the alarm output to ensure that it functions as desired.

759 Wiring Diagram





Typical Double Stacked 760 Sender Installation

Display trouble codes:

If a sender or its wiring is not operating properly, the following codes are shown on the display:

1. If a sender is unresponsive or there is an open circuit in the wiring so that the sender is not connected, the display will indicate an open circuit by showing "OPn" on the LED display.
2. If a sender is shorted or there is a short in the wiring, the display will indicate a short circuit by showing "SHt" on the LED display.
3. If a sender is sending bad data, there is damaged wiring, or if there is electrical interference, the display will indicate a data error by showing "Err" on the LED display. Also, if the senders have not been programmed correctly, they can interfere with one another and result in "Err" on the LED display. Check all the senders to make sure they are programmed correctly. If they are, replace the sender that is creating the error.
4. If the display has been programmed for a single sender, and double stacked senders have been connected, the display will show "StA". In this case, change the senders or reprogram the display as required. If only a top sender has been connected, the display will show "nbo", indicating that no bottom sender has been received. If the tank should only have a single sender, correct the programming on the sender, it should not be a top sender.
5. If the display has been programmed for double stacked senders for tall tanks, and only the bottom sender is working and the top one is not, then the display will show "ntP" indicating that no top sender is being received. If the top is working but no bottom sender is being received, then the display will show "nbo". If neither sender is working, then the display will show "OPn". Check the wiring and the programming of the senders. If all is OK with that, replace the bad sender.
6. The display contains a permanent memory which is used to store the programming for battery voltage calibration value and the tank sender signal levels. These signal levels are used to help the system adapt to the tanks, which increases sender accuracy at low tank levels. If this memory should fail, "CAL" will be flashed on the LED display, indicating a calibration failure. It will be necessary to replace the display if this occurs.
7. There are no display diagnostics for the battery voltage.

The display diagnostics can be used to check the wiring and the senders:

1. If a short circuit is showing, disconnect the senders one at a time at the sender location. If the short circuit indication goes away when a sender is removed, then that sender is bad. If all the senders are removed but a short circuit still shows, then the wiring may be shorted. Disconnect the sender wire at the display, the short indication should go away. If it doesn't, the display is bad.
2. If an open circuit for all the senders is showing, it is most likely a wiring open circuit or display failure, since it is unlikely that all three senders are bad. Try shorting the wiring together at the display, the display should indicate a short circuit. If it doesn't, the display is bad. If it does, then remove that connection and short the wires together at the sender locations. If no short circuit is shown, then the wiring is open. If the display does show a short circuit, then the senders must be bad.
3. If a single sender is showing an open, try shorting the wiring together right at that sender. If a short now shows, the sender is bad or not wired properly. If no short circuit shows on the display, the wiring to that sender is open.

To review the sender diagnostics:

1. The sender diagnostics can be reviewed periodically to check for any degradation of the tank senders. If a sender appears to be malfunctioning, reviewing the diagnostics should be the first step in the troubleshooting process.
2. There are two diagnostics for the senders: the signal power, and the sender height.

> ⚠ **NOTE:** The signal power is an indication of how much signal is being transmitted through the tank wall and picked up by the receive part of the sender. If the signal power is too low, it can indicate a sender which is detached from the tank, excessive buildup on the inside of the tank, bad wiring to the sender, low battery voltage, or a defective sender. Typical signal power should be 50% to 60%. The minimum signal power for proper operation is 20%.

> ⚠ **NOTE:** The sender height is the number of receive segments present in the sender. To determine the length of the sender, multiply the calibration by 1.5 to get the length in inches. The senders always auto calibrate to the length that they are cut, so this diagnostic allows the user to confirm the length and to make sure that the auto calibration is working properly.

3. Press either the ←, **LEVEL**, or → button to select the desired tank. While the button is still held down, press the **BATT** button, the display will show "d iR". Release both buttons, the display will show the tank number followed by "d" for a moment. For example, if you are on tank 4, it will show "t4d".
4. After a couple of seconds, the display will show the sender receive power level as "P23" for example. The power level can range from 0 to 99%. The power level will be shown for a few seconds.
5. After the power level, the display will show the sender height as "h 7" for example.
6. After a few seconds of showing the sender height, the display will shut off.

TROUBLESHOOTING AND INSTALLATION TIPS

What to do if the system freezes or is unresponsive:

1. If the display is unresponsive, it may be "hung" due to a static discharge or electrical noise. Try rebooting it by shutting off the 12V power to it for a few seconds, then turning it back on.

What to do if operation becomes erratic or stops completely:

1. Make sure all wiring connections are solid. Do not use spade connectors to join wiring as they will degrade over time. Use insulated crimp-on butt connectors or solder and insulate the wire connections.

> ⚠ **CAUTION:** This is very important; marine vessels can have several ground circuits with resistance between them. We have had instances where two consoles are installed with a different ground. If you see different levels from each console on the same tank, then the ground circuit is not common. Connect both consoles to the same ground back to the breaker panel ground point.

What to do in dual console systems if the two displays do not read the same:

1. For dual display console applications, if the consoles disagree the most likely reason is a bad console ground. Both console grounds, and the sender grounds, must be connected together with ground wiring. Do not depend on metal chassis components. See item 2 in the following section for further details.

What to do if readings jump or are inaccurate

1. We have had a few instances where 120 Vac interference has caused the readings to stall and create a gap; readings would skip from 50% to 70% and then begin to function again. The cause was wiring between consoles and senders being tied too close to entrance boxes for shore power or bundled with other high ac voltage lines or junction boxes.
2. Always ground the senders and the console to the same ground circuit.

What to do if the system indicates a residual or non-zero water level even though the tank is drained completely:

1. This can be due to a convex tank bottom or a sloped tank bottom. In the case of the convex bottom tank a ring of water may remain after draining. In the case of the sloped bottom

(to the drain valve side) a very small amount of water left in the tank will result in a non-zero level indication. In both of these cases, temporary installation of the sender using duct tape or masking tape will allow the installer to check the tank level before committing to a final sender position. After cutting the sender to length and connecting the wires, be sure to tape down both sides of the sender to eliminate air gaps between the sender and tank surface which can cause low signal strength and unpredictable performance. The ends of the sender must be at least ¼" to ½" away from the tank bottom and top to allow for wall thickness. The exterior bottom & top of the tank are not the same as the interior bottom & top; depending on the tank wall thickness the inside height is ½" to 1" shorter than the outside height. Knowing the wall thickness of your tank will allow you to find the optimal sender position; placing the sender where it can "see" the water will ensure proper level calculation and sender operation.

2. The signal strength should be in the 50% range for best performance. If the signal strength is in the 20% range it is indicative of a high resistance in a connector, a bad ground, or improper bonding of the sender to the tank (a possible air gap on one or both sides of the sender).

3. With the console installed you can check the level on each tank, if you get an indicated level of 10% to 20% and you know this is too high, reposition the sensor board as follows:

   In the case of a convex tank bottom, usually found on large flat tanks, raising the sender is the best solution to accomplish a zero reading when the tank is empty. This may result in having to shorten the sender by an additional segment.

   On sloped tanks, which are used to promote complete draining, one alternative is to measure the end of the tank opposite from the drain valve. It may be necessary to extend the wire harness to be able to measure on the optimal side. On the drain valve side, the best choice is to elevate the sender to avoid reading a puddle at the drain valve.

4. The close proximity of metal to the sender can be misinterpreted as water, since they have similar electrical characteristics. Any metal such as steel, aluminum, copper, or brass can affect the sender reading if it is closer than about 2" from the face of the sender. If there are metal frame pieces, brackets, straps, pipes, ducts, etc. close to the sender you may have to move the sender away from them. Again, trial positioning using tape is necessary until the problem disappears. Flexible pieces of metal can be held away from the sender with rubber

wedged between the sender and the metal. If the metal is off to the side of the sender, or just butting to the edge then it is usually not a problem, particularly on the right hand side of the sender.

5. Make sure that metal doors or covers are far enough away from the sender as well, once everything is closed up the positioning may change. The symptoms of exposure to large metal components are usually a non-zero reading when the tank is empty, or the level appearing to jump suddenly as the tank is drained or filled.
6. On fresh tanks there is sometimes a potential to not be able to use all the water in the tank, we suggest you elevate the fresh sender 1" off the tank bottom and position the top of the sender to allow for vent position (if the vent is on the side of the tank). This way you should see '0' before the pump starts to suck air. Some tanks have a sump style draw system, in this case there is no concern with unusable water, just allow for the wall thickness when positioning the sender board (usually ½" to 1" margin from the outer shell). If the sender is positioned above the vent then the maximum reading may be less than 100%.
7. There may be a buildup on the inside walls of black or grey tanks. We get calls occasionally about older systems that have not been in service for a few years in which the black tank will now indicate a level even though it is empty. The likely cause is that the tank has a significant build-up, probably exceeding ¼" to ½"thick! Redex is not an acceptable chemical to promote clean tank walls; it is far too slow to get the breakdown action started. Use an RV type of liquid chemical, we suggest Tissue Digester, Sensor Cleaner, or the latest we have used called Happy Campers Holding Tank Extreme Cleaner available at www.happycampersworld.com. The next time you take a trip, leave with a high concentration of the chemical in the tank and approximately 30% full of fresh water. Hopefully you can have 2-3 days allowing the tank levels to rise through normal use. We recommend that you exceed the level that you see the system report when the tank is empty. After the sloshing and the soaking hopefully the build-up will be flushed away when the tank is drained and flushed. If you still have symptoms the treatment may required a few more times. The waste did not build up on the tank wall in one day, so it may not dissolve in one treatment! The build-up looks like water to the system since it holds a significant volume of water in the build-up area. It takes much more than a film or piece of tissue to cause the error.

What to do if the system reads a zero water level at all times, or does not reach 100%:

1. This may be due to excessive tank wall thickness. We have tested the sender on an actual tank with ⅜" wall thickness to ensure proper operation. If you encounter an excessively thick tank wall the symptom will be a zero reading regardless of the actual tank level. The cross check would be to test the sender on another tank by taping it in place temporarily, if it now works the tank wall thickness is well over ⅜". You can also use a 1 gallon jug or a 5 gallon pail as a test tank to crosscheck operation of the sender.
2. A symptom we have seen is the sender will not indicate 100% when the tank is full. If the sender is positioned too high on the tank, then water cannot reach high enough on the sender for it to read 100%. The top of the sender must be at least ¼" to ½" away from the top of the tank to allow for wall thickness.
3. Another possibility is a tank wall thickness issue that may occur at the corners or edges of the tank. This has not been a common issue, and the only correction you can make is to move the board slightly lower, away from the thick area.

What to do if sender delamination occurs:

1. We have had reports of the senders literally falling off the tanks or showing serious delamination. This is likely caused by a lack of tank surface preparation. Surface prep is very simple, wipe the area to be adhered to with products like Pro Bond, alcohol, or acetone. Do not use thinners because they leave residues which attack the adhesive. Ambient temperatures of less than 60°F or 15°C prevent the bonding agents in the adhesive from working properly; use a heat gun to warm the tank surface if necessary. Also be sure the surface is dry, again a heat gun is the best way to dry the bonding area. Finally, the surface of the tank must be smooth. The adhesive works much better on smooth surfaces, if necessary use an orbital sander with fine grit paper (220 grit) to quickly accomplish the desired smoothness.
2. Another possibility is the wiring harness pulling on the sender. Make sure the wiring to the tank sender is well supported so that it does not put a load on the sender. Be sure to support all connecting harnesses; do not let the board support the harness, this will in time cause delamination of the board from the tank. One simple way to do this is to use Gorilla tape across the top of the sender at a 90 degree angle to the sender orientation, with the wiring held in place by the tape. The wires from the sender must be routed straight up or to the right for reliable operation.

How to protect the sender from water spray, condensation or debris:

1. On installations where the holding tank is exposed to water drops or debris we recommend the use of an auto body undercoat, which is easily purchased in auto parts stores. This tar based material clings well to the senders and protects from water and debris.
2. One material in particular is 3M Professional Grade Rubberized Undercoating, product code 03584. Another product that works well is a Dominion Sure Seal rubberized undercoating such as Gravel Guard Rocker Guard Coating.
3. After the system is completed and tested apply the undercoat over the complete board using two coats. Do not use lacquer, enamel paint, or plastic paint for auto bumpers as these contain chemicals that will dissolve the conformal coating on the board and cause malfunctions.

How to avoid damaging the display when mounting:

1. If mounting the display in a metal panel or wall there is a risk of permanent damage due to a jagged opening or too small of an opening. The metal panel can short circuit the display rendering it inoperable and requiring the installer to replace it. Ensure that the edges of the cutout are smooth and that no material is bent outward where it can dig into the display. Make sure that the cutout is large enough so that the display can be easily inserted without having to angle it. There is a ½" border all around the display to cover the edge of the hole, so if the hole is a bit larger than the minimum requirement it will still be covered by the display.
2. When fastening the display to the panel, make sure that it is centered in the hole and not resting on one edge.
3. Non-conductive mounting spacers are available to help prevent damaging the display. Contact Garnet for further details.

CHAPTER 9 - SPECIFICATIONS

Resolution	⅜" (10 mm)
Accuracy:	+/- 8% or better, limited by resolution and tank height and shape.
Temperature range:	+32 °F to +140 °F (0 °C to + 60 °C)
Sender materials:	0.008" thick glass epoxy circuit board with conformal coating for circuit protection. Laminated on the back with 3M 300LSE Bonding Adhesive.
Sender length range:	4 ½" to 12", which will measure tank heights from 5" to 13" (single sender) and up to 25" (dual senders).
Display mounting panel:	Panel size, approximately 4" wide by 2.8" high by 1" deep (102mm wide X 71mm high X 25mm deep). Panel screws to wall.
System power requirements:	Display requires 12 volts from the marine vessel battery, the system will function from 11 volts to 16 volts. Current drain is less than 200 mA.
Wiring:	A single two wire conductor required from the display to the senders. All the senders are wired in parallel. 12 V power and ground required for display.
Common Alarm Outputs:	Maximum voltage: 16 volts dc Maximum current: 200 mA dc Polarity: The output makes a connection to ground when the alarm is on.

CHAPTER 10 - SERVICE AND WARRANTY INFORMATION

The warranty will only apply if the warranty has been registered online from the Garnet Instruments registration web page.

Go online to seelevelsupport.com/ and select "Register Warranty".

DISCLAIMER OF WARRANTY ON HARDWARE

Garnet Instruments warrants equipment manufactured by Garnet to be free from defects in material and workmanship under normal use and service for a period of one year from the date of sale from Garnet or an Authorized Dealer. The warranty period will start from the date of purchase or installation as indicated on the warranty card. Under these warranties, Garnet shall be responsible only for actual loss or damage suffered and then only to the extent of Garnet's invoiced price of the product. Garnet shall not be liable in any case for labor charges for indirect, special, or consequential damages. Garnet shall not be liable in any case for the removal and/or reinstallation of defective Garnet equipment. These warranties shall not apply to any defects or other damages to any Garnet equipment that has been altered or tampered with by anyone other than Garnet factory representatives. In all cases, Garnet will warrant only Garnet products which are being used for applications acceptable to Garnet and within the technical specifications of the particular product. In addition, Garnet will warrant only those products which have been installed and maintained according to Garnet factory specifications.

LIMITATION ON WARRANTIES

These warranties are the only warranties, expressed or implied, upon which products are sold by Garnet and Garnet makes no warranty of merchantability or fitness for any particular purpose in respect to the products sold. Garnet products or parts thereof assumed to be defective by the purchaser within the stipulated warranty period should be returned to the seller, local distributor, or directly to Garnet for evaluation and service. Whenever direct factory evaluation, service or replacement is necessary, the customer must first, by either letter or phone, obtain a Returned Material Authorization (RMA) from Garnet Instruments directly. No material may be returned to Garnet without an RMA number assigned to it or without proper factory authorization. Any returns must be returned freight prepaid to: Garnet Instruments, 286 Kaska Road, Sherwood Park, Alberta, T8A 4G7. Returned warranted items will be repaired or replaced at the discretion of Garnet Instruments. Any Garnet items under the Garnet Warranty Policy that are deemed irreparable by Garnet Instruments will be replaced at no charge or a credit will be issued for that item subject to the customer's request.

If you do have a warranty claim or if the equipment needs to be serviced, contact the installation dealer. If you do need to contact Garnet, we can be reached as follows:

CANADA
Garnet Instruments
286 Kaska Road
Sherwood Park, AB T8A 4G7
CANADA
email: info@garnetinstruments.com

UNITED STATES
Garnet US Inc.
5360 Granbury Road
Granbury, TX 76049
USA
email: infous@garnetinstruments.com