# SeeLevel I™
## Tank Monitor


# MODEL 705CE MANUAL

## IMPORTANT OPERATOR INFORMATION

DATE INSTALLED:_____

SERIAL NUMBER:_____

Printed in Canada

GARNET INSTRUMENTS LTD.

GARNET

SEELEVEL I ™

Tank Monitor

**MODEL 705-CE**

# Table of Contents

## CHAPTER 1 - OVERVIEW

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

The ***SeeLeveL I*** ™ will monitor the sewer holding tank. The information is displayed on a 5 segment color coded LED bar graph.

## CHAPTER 2 - SYSTEM DESCRIPTION

The SeeLeveL consists of a display unit that mounts inside the RV, and a sender panel that sticks to the side of the holding tank. A two conductor wire is used to connect the sender panel to the display.

***The Sender:*** The sender panel is a flexible self adhesive printed circuit board which is stuck to the side of the holding tank. The sender panel can be cut to length to match the height of the tank (from 4 to 12 inches), 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 patented digital techniques programmed into the sender microprocessor. When the sender transmits the water level information to the display, it sends a digital code that has built in error detection, making it impossible for the display to read an incorrect level, even if the wiring is bad. In addition to the level, the sender also transmits diagnostic information about its operation. This information is used to calibrate the sender output so if there is a buildup of sludge on the inside of the tank or if the sender is delaminating from the side of the tank, the system will compensate until the degradation is excessive. If the occurs the tank level will always read empty.

***The Display:*** The display receives the information from the sender panel via a two conductor wire, and displays the level information in percent of full on a five segment LED bar graph. When the front panel button is pressed, the display powers up and displays the tank level. If the button is pressed and released, the display will show the level for about 5 seconds and then shut down automatically. If the button is pressed twice, the display will hold 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.

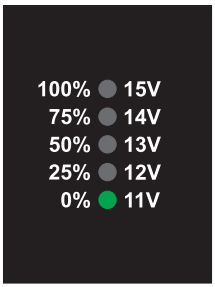
If the sender is operating properly and connected to the display with good wiring, then the display will show the level normally. If the wiring is disconnected, shorted, or cut, or if the sender panel is defective, then the display will indicate an error code. The various error codes are shown in the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

## CHAPTER 3 - OPERATING INSTRUCTIONS

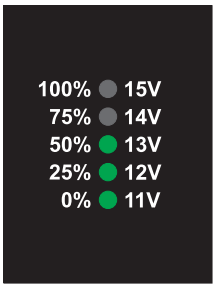
The display is the only system component that is accessed by the user. All user input to the display is done using the button on the display. Operation of the display is as follows:

To read the sewer tank level:

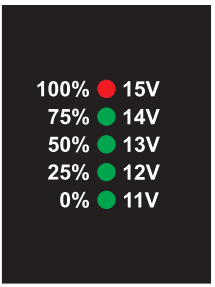
1. Press the button and release it, the display will show the level in percent on the LED bar graph. If the button is not pressed again, then the display will shut off after about 5 seconds. The following diagrams show examples of the color coded bar graph.




Empty




½ Full




Full

2. To continuously display a reading, press and release the button, and then press the button a second time. When the button is released, the display will be in hold mode, which is indicated by the bar graph flashing on and off. While the display is in the hold mode it will recheck the level once per second so the user can watch the level change while the tank is being filled or drained. The display will automatically shut off after 5 minutes in hold mode. To end the hold mode before the 5 minutes is up, press the button again, and the display will shut off.

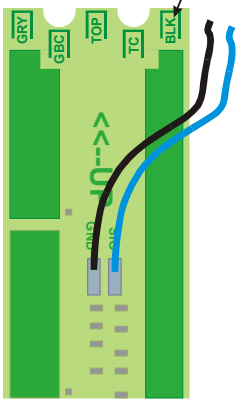
## LONG STACKABLE SENDERS

These senders are 12 inches long. They are identified by the "**TOP**" on the middle tab.

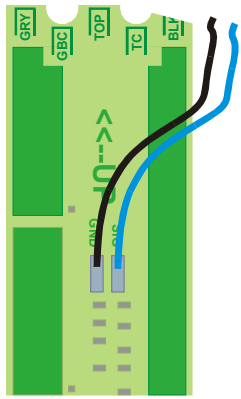
***To program the sender for the correct tank:***

1. For other applications, the senders are all connected in parallel to save wiring and to simplify installation, so the senders must be programmed so they know which tank they are on. The senders can be programmed for either the fresh, gray, or black tank for three tank models, or for fresh, gray, galley, or black for four tank models. This is done with the tabs on the top of the sender. See the following diagram. For this application, program the sender for black single operation.
2. The senders default to fresh tank operation if the programming is not altered. Consequently, for this application, the sender needs to be programmed to operate properly.
3. The sender is for the black tank, so remove the tab that says "**BLK**" next to it.
4. This is all that is required to program the senders for the correct tank. However, if you make an error, you have one chance to correct it, as described below.
5. If the "**GRY**" tab has been removed and it should be a black tank sender, or if the "**BLK**" tab has been removed and it should be a gray tank sender, then cut out the recessed gray-black correction tab that says "**GBC**" next to it. This reverses the effect of the gray and black tabs.
6. If both the "**GRY**" and "**BLK**" tabs are removed, it is equivalent to neither of them being removed.

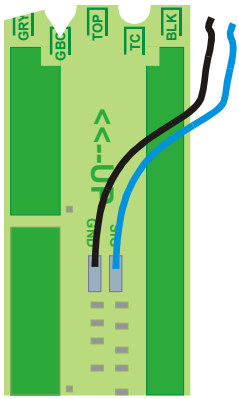
Cut for BLACK tank




Example of BLACK sender programming




Example of corrected BLACK sender programming (GRY cut by mistake)

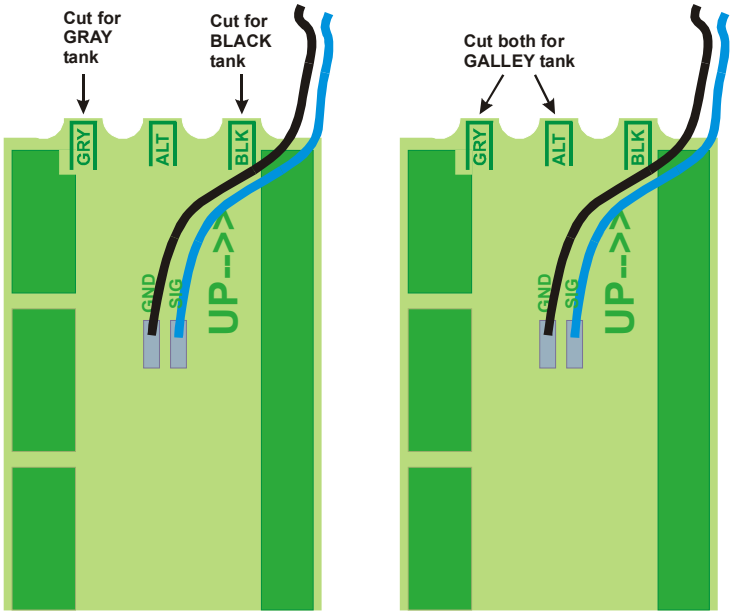


## SHORT SINGLE SENDERS

These senders are 6 inches long. They are identified by the "**ALT**" on the middle tab.

***To program the sender for the correct tank:***

1. For other applications, the senders are all connected in parallel to save wiring and to simplify installation, so the senders must be programmed so they know which tank they are on. The senders can be programmed for either the fresh, gray, or black tank for three tank models, or for fresh, gray, galley, or black for four tank models. This is done with the tabs on the top of the sender. See the following diagram. For this application, program the sender for black single operation.
2. The senders default to fresh tank operation if the programming is not altered. Consequently, for this application, the sender needs to be programmed to operate properly.
3. The sender is for the black tank, so remove the tab that says "**BLK**" next to it.
4. This is all that is required to program the senders for the correct tank. There are no correction tabs on this sender. However, if either the "**GRY**" or "**BLK**" tabs have been removed and it should be for a fresh tank, then remove the other "**GRY**" or "**BLK**" tab. When both the "**GRY**" and "**BLK**" tabs are removed, it is equivalent to neither of them being removed.


Cut for
GRAY
tank
Cut for
BLACK
tank
GRY
ALT
BLK
GND
SIG
UP-->>
Cut both for
GALLEY tank
GRY
ALT
BLK
GND
SIG
UP-->>

## CHAPTER 5 - INSTALLATION GUIDE (NEW OEM INSTALLATIONS ONLY)

1. The installation consists of mounting the display inside the RV, cutting and fastening the sender to the side of the holding tank, and connecting wiring.
2. Mount the display by cutting a hole in the wall 3" wide by 1 7/8" high and bringing the wiring out through the hole to connect to the display panel connector.
3. 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 sender needs to be grounded to a single ground wire from the display.

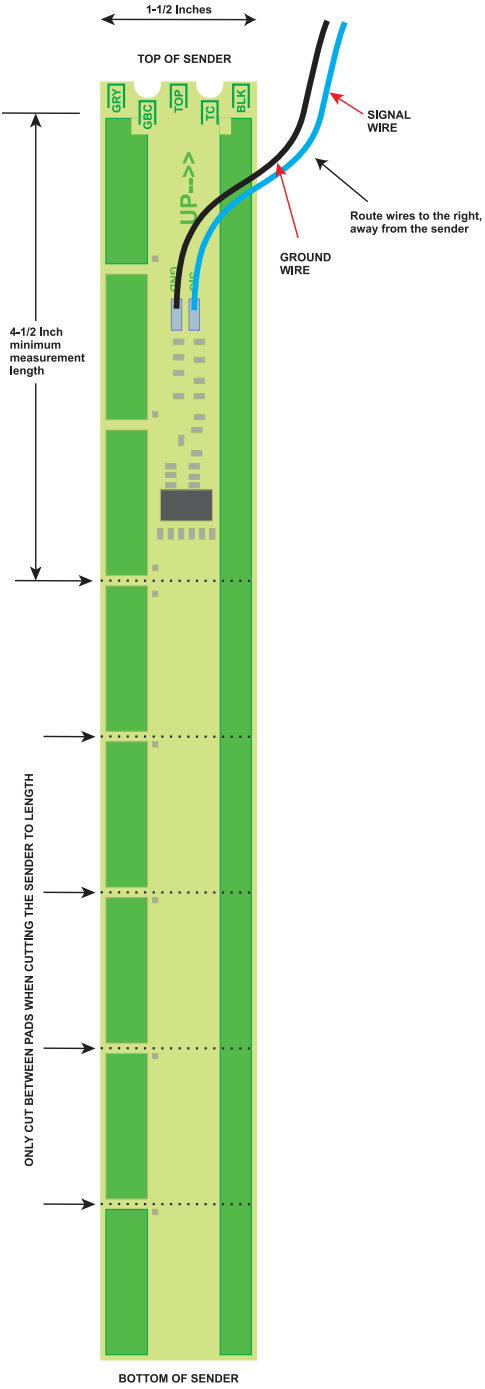
| Wire Color | Function |
|---|---|
| Red 18 gauge | +12V power input to monitor |
| Black 18 gauge | Ground |
| Blue 18 gauge | Tank sender |

4. Determine where to mount the sender on the tank. It 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 inch away from 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.
5. Measure the height of the tank to determine how long the sender should be. For tanks less than 7" tall, follow step 6. For tanks from 7" to 13" tall, follow step 7.
6. For tanks less than 7" tall, a short sender is used. The sender ends should be 1/4" to 3/4" 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 sender is calibrated to account for this distance from the bottom of the tank. The sender is cut to the nearest even 1 inch in length, for example, a system with a tank height of 5.75 inches, cut the sender to be 5 inches long, this allows 3/8" at each end when the sender is centered vertically on the tank. IMPORTANT: Do not cut the sender shorter than 4 inches! The sender will not work if it is cut less than 4 inches. Proceed to step 8.

7. For tanks less than 13" tall, a long sender is used. The sender ends should be 1/4" to 3/4" 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 sender is calibrated to account for this distance from the bottom of the tank. The sender is cut to the nearest even 1.5 inch in length, for example, a system with a tank height of 11.75 inches, cut the sender to be 10.5 inches long, this allows 5/8" at each end when the sender is centered vertically on the tank. IMPORTANT: Do not cut the sender shorter than 4-1/2 inches! The sender will not work if it is cut less than 4-1/2 inches. Proceed to step 8.
8. To make the sender the right length (assuming it is too long) it 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). DO NOT cut the sides, and DO NOT cut the sender shorter than 4-1/2 inches (long sender) or 4" (short sender). 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.
9. The sender needs to be programmed so it knows which tank it is on. This is done by selectively cutting off the tabs on the top of the sender. See the chapter entitled "SENDER PROGRAMMING" and the section "To program the sender for the correct tank" for details.
10. Once the sender is cut to length and programmed, 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. MAKE SURE THAT THE END WITH WIRES IS POINTING UP!! Position the bottom of the sender at least 1/4" above the bottom of the tank, and more 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. Connect the blue wire from the sender to the blue wire from the display. Connect the black wire from the sender to ground. Use Marrette or crimp connectors to fasten the wires together. Make sure that the wires from the sender are routed away from the sender, if they drape over the sender they could affect the reading. 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.

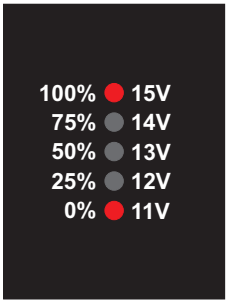
12. All that remains now is testing. The tank senders will self calibrate to whatever length they are cut, so they will always read from 0 to 100%. For the initial test, have the tank at least 1/4 full of water or sewage, and verify that the percent level reading looks correct (see the chapter entitled "OPERATING INSTRUCTIONS" and the section "To read the sewer tank level" for details). 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 1/4 full the system will be properly "taught" and should read correctly after that.


1-1/2 Inches
TOP OF SENDER
GRY
GBC
TOP
TC
BLK
SIGNAL WIRE
Route wires to the right, away from the sender
GROUND WIRE
4-1/2 Inch minimum measurement length
ONLY CUT BETWEEN PADS WHEN CUTTING THE SENDER TO LENGTH
BOTTOM OF SENDER

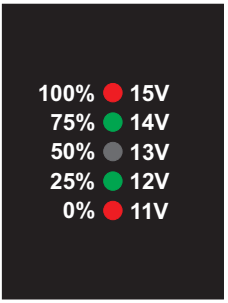
***Display trouble codes:***

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 the open circuit code. If a sender is shorted or there is an short in the wiring, the display will indicate the short circuit code.

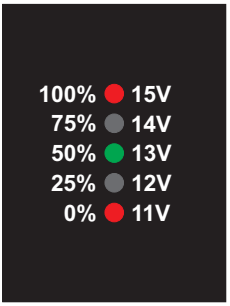



**Open Circuit**



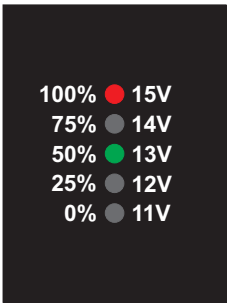

**Short Circuit**

2. If a sender is sending bad data, there is damaged wiring, or if there is electrical interference, the display will indicate the data error code. Check the sender to make sure it is programmed correctly. If it is, replace the sender.

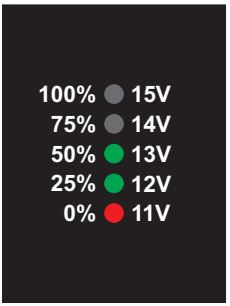



**Data Error**

3. The display has been programmed for a single sender, so if dual stacked senders have been connected, the display will show the stack error code. In this case, change the senders as required. If only a top sender has been connected, the display will show the no bottom error code, indicating that no bottom sender has been received. The tank should only have 1 sender, correct the programming on the sender, it should not be a top sender.

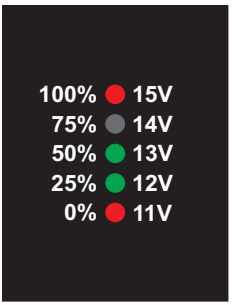



**Stack Error**




**No Bottom Error**

4. The display contains a permanent memory which is used to store the tank sender signal levels. These signal levels are used to help the system adapt to the tank, which increases sender accuracy at low tank levels. If this memory should fail, the memory error code will be flashed on the display, indicating a calibration failure. It will be necessary to replace the display if this occurs.




**Memory Error**

5. The diagnostics can be used to check the wiring and the senders:
    a. If a short circuit is showing, disconnect the sender at the sender location. If the short circuit indication goes away when a sender is removed, then that sender is bad. If the sender is 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.
    b. If an open circuit for the sender is showing, it may be a wiring open circuit or display failure, or a sender failure. 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 location. If no short circuit is shown, then the wiring is open. If the display does show a short circuit, then the sender must be bad.

# CHAPTER 7 - SERVICE AND WARRANTY INFORMATION

The warranty will apply only if the warranty card shipped with the equipment has been returned to Garnet Instruments Ltd.

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

**UNITED STATES**
Garnet Technologies Inc.
201 M&M Ranch Road
Granbury, TX 76049
USA
email: info@garnettechnologiesinc.com

## CHAPTER 8 - SPECIFICATIONS

| | |
|---|---|
| Resolution: | 1/4 inch (6 mm) (short sender) |
| | 3/8 inch (10 mm) (long sender) |
| Accuracy: | +/- 6% or better, limited by resolution and tank height and shape |
| Temperature range: | +32 to +140°F (0 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 to 6 inches (short sender), which will measure tank heights from 4-1/2" to 8". |
| | 4-1/2 to 12 inches (long sender), which will measure tank heights from 5" to 14" (single sender). |
| Display mounting panel: | Black panel, approximately 4"" wide by 2.8" high by 1" thick (102mm wide X 71mm high X 25mm deep). Panel screws to wall. |
| Power requirements: | Display requires 12 volts from the RV battery, the system will function from 11 volts to 16 volts. Current drain is less than 200mA. |
| Wiring: | A single two wire conductor required from the display to the sender. 12 V power and ground required for display. |

NOTES: