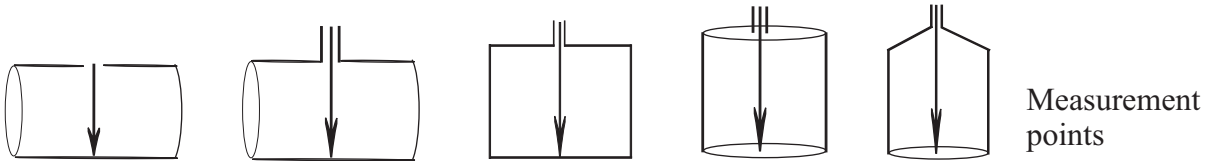


Sales Office
20675 N. Friends Road
P. O. Box 309
Greenleaf, ID 83626
USA


888-884-2843
888-884-4145 - Fax
Outside USA
208-453-1714
208-459-3365 - Fax

EFG-8000 User's Guide

- You ***MUST***:
- accurately measure the tank from the top of the 2" pipe nipple to the inside bottom of the tank. Refer to drawings below.
 - verify the ***actual*** tank capacity. Using the incorrect tank capacity will produce incorrect results. Refer to formulas on page 10 to compute tank capacities if needed.
 - ensure that the 2" NPT pipe nipple is vertically straight using a level. Adjust if needed.



DO NOT PROCEED WITHOUT UNDERSTANDING THE FOLLOWING:

1. The unit has been pre-programmed and put into a ***"SLEEP MODE"*** for storage and shipping to preserve power. Sleep mode will constantly display the Program Version, i.e. 80-E. To wake up the gauge: Use the pocket magnet to touch the PLANET symbol  on the front of the gauge. Hold only until the gauge display changes to the Firmware version, i.e. 11 - 00 or similar. Pull away the magnet and it will go to normal operating mode. See page 4 for other programming details.
2. The probe, transducer, and gauge are a matched set. If for any reason they are separated or used in an application other than that which they were intended, re-programming will be required.



This order # _____ Type of liquid _____ Actual Tank capacity _____

The probe for this tank was ordered and custom designed for use in a tank that measures total inches from the top of the 2" pipe nipple to the inside bottom of the primary tank. If the actual distance differs from this amount, you will need to compensate. The chain can be shortened by choking it up to the desired length, DO NOT CUT IT! Pass the extra beads through the connector and snap the correct bead closest to the right adjustment into the connector. See the assembly instructions on page 3. Make sure the measurements match up by changing the length of the pipe nipple, or connecting to another bead on the chain other than the end bead. The probe for this tank should be inches off the bottom of the tank.

THE PROBE MUST NEVER TOUCH THE BOTTOM OF THE TANK DURING NORMAL OPERATION or EXTEND ABOVE THE PRIMARY TANK HEIGHT. SEE ORDER INFORMATION SHEET FOR PLACEMENT.

REFER TO PAGE 11 FOR TROUBLESHOOTING AND TECHNICAL ASSISTANCE.

EFG-8000

USER'S GUIDE

THIS INFORMATION PACKET INCLUDES THE FOLLOWING INFORMATION.

Assembly/Installation.....	page 3	Determining Total Gallons.....	page 11
Programming Details.....	page 4	Specifications.....	page 12
Using Calibration Weights.....	page 5-10	Repair and Return Policies.....	page 12
Other Calibration Issues.....	page 10	Manufacturer Suggested Annual	
Troubleshooting.....	page 11	Maintenance Protocols.....	page 13-16
Information needed for a tech call.....	page 11	Warranty.....	page 17

GENERAL PRODUCT INFORMATION

OPERATION:

The probe that is used with this gauge has been custom designed according to your specifications on the Order Form. These include: Tank shape. Box 1 = Nipple Height. Box 2 = Primary tank height. Box 3 = Total height of nipple and tank. An accurate measurement from the top of the pipe nipple that the gauge is to be installed on, to the inside bottom of the tank. Use of this probe on a tank other than the one it was custom designed for, or in a liquid product other than the one it was designed for, may provide inaccurate results. The probe must never contact the bottom of the tank, rest against the side of the drop tube (if used), or be allowed to touch any internal structures. Please refer to the QUICK START GUIDE included with the gauge.

POWER:

The EFG-8000 in most installations is powered by the solar cell that is backed up by a rechargeable battery assembly (left side) and a lithium 9v battery (right side). The solar cell model is intended for outdoor use. If you have an indoor location where you wish to use the gauge, or an outdoor location with inadequate light, please contact your distributor or Greenleaf Gauge today about our model which operates by the power of two (2) non-rechargeable 9 volt batteries or possibly an external power supply.

MEASUREMENTS:

The EFG-8000 will display up to five digits to show measurable units in gallons, liters, pounds, inches or % full. The same five digit display is used during setup, calibration, and to display operation or error messages. Depending on your site requirements, these gauges are used on tanks as small as 100 gallons and tanks as large as several million gallons.

INSTALLATION:

The EFG-8000 must be installed in accordance with your local regulations and manufacturer's specifications. Failure to do so may affect the long term service of the gauge and may void the warranty. Any regulatory issues should be directed to your local entity having jurisdiction over the issues involved. ***Manufacturer's specifications require any wire connections to the transducer, gauge, and their connectors, to be protected from the elements and other possible physical damages, by the use of appropriate electrical items such as conduit and junction boxes. The manufacturer will not be responsible for problems arising from improper equipment installation which may also void the warranty. Please refer to assembly instructions, page 3.***

IMPORTANT NOTICE: When this gauge and alarm are utilized as the High-level warning, the test/reset button should ALWAYS be tested by the operator by pressing and holding the button before filling the tank. If it does not respond correctly **DO NOT FILL**. The operator must monitor the tank filling process and the status of the gauge and alarm to prevent overfills.

HELP: For technical help please contact us between 9-5 M-F MST : Local 208-453-1714, or toll free 888-88-GAUGE (888-884-2843). Our fax numbers are 208 459-3365, or 888-884-4145, or visit us online at www.solargauge.com.

ASSEMBLY / INSTALLATION INSTRUCTIONS

NOTICE TO INSTALLER: Tank dimensions, Type of liquid, and True total gallons must match the tank that you are working on. Any compromise will result in inaccurate readings from the gauge.

Please remember that even though the probe is well made, the material is very thin walled and needs to be handled with care at all times!

NOTICE TO TANK MANUFACTURERS AND DISTRIBUTORS!

We recommend the gauge and probe be installed in the tank at the final destination. If it is necessary to install the gauge and probe in the tank before shipping to the final destination, the probe may be allowed to swing freely in the tank but precautions must be taken to eliminate it from “hanging up” on any internal tank structures. The probe must not be allowed to rub on anything in the tank during normal operation or it will severely reduce the accuracy of the gauge.

TO ASSEMBLE “ONE SECTION” PROBE

1. Remove the probe, gauge, and transducer from the shipping boxes. Take care to remove all packing materials (bubble wrap, tape, etc.) from the units. You may use a clamp near the top of the probe during installation to keep the probe from falling into the tank during assembly.

2. Apply a good quality pipe thread sealant to the 2" pipe threads. Insert the probe (See **Figure 1**) down into the 2" pipe nipple. Connect the probe to the transducer assembly. **For multi-section probes see instructions below.**

3. To connect the probe to the transducer, simply snap the free end of the bead chain on the top of the probe into the end coupling connected to the split ring located at the bottom of the transducer. (See **Figure 2**) The bead **MUST** snap in place or it is not seated correctly. Screw the transducer assembly onto the tank's 2" pipe nipple. **The probe should never touch the bottom of the tank. Refer to the QUICK START GUIDE included with the gauge before installation to know the correct measurements you need.**

4. Mount the gauge (See **Figure 3**) to the tank at the location of your choice. Connect the transducer assembly to the gauge by use of the wire and wire nuts provided. **CONNECT LIKE COLORED WIRES TOGETHER.** Remove right cover plate from gauge console. Carefully unplug the alarm plate wires from the connector board inside. Set cover and screws aside while wiring the console. Attach necessary conduit fittings to the gauge to weatherproof the console before inserting wire from the transducer through the conduit into the gauge console. Connect wires to wire terminal according to wiring label inside the gauge console. Plug alarm plate wires back into the connector board. Carefully position the cover plate back onto the gauge console to ensure weather proof seal and replace **ALL** screws. **DO NOT OVER TIGHTEN COVER SCREWS!** To comply with manufacturer's specifications, wire and wire connectors must be installed using appropriate junction boxes and conduit to protect it from the weather or other damages.

NOTE: Water destroys live electronics. **Do not power wash!** Precautions must be taken to eliminate water from getting into the gauge console. Manufacturer's recommendation is to install a conduit junction with a drain at a lower elevation than the gauge and / or conduit seal at the gauge to eliminate moisture from entering the console. **We recommend using a sealant to plug the hole that the wires pass through to enter the gauge.** (See **Figure 4**) Failure to do so may void the warranty.

This gauge has been calibrated at the manufacturer to your specifications. Please refer to the Quick Start Guide for details. If your gauge or the probe specifications do not match your tank dimensions and requirements, you will need to purchase a different probe. **If you need to re-calibrate the gauge,** this can be easily accomplished by following the instructions page titled Why we use calibration weights.

TO ASSEMBLE “MULTI-SECTION” PROBES

Remove the probe sections from the shipping container and the packing materials. Please use only the cotter pins provided to connect the sections of the multi-section probe, as all components are carefully weighed. (See **Figure 5**) Lower the probe into the tank beginning with the bottom section. Carefully slide the sections together over the joining plug and align the matching colored arrows then insert and set cotter pins. Repeat procedure until all sections are connected and lowered into the tank. Connect the fully assembled probe to the transducer making sure the bead snaps into place. Continue installation with steps 3 and 4 in “TO ASSEMBLE ONE SECTION PROBE” instructions.

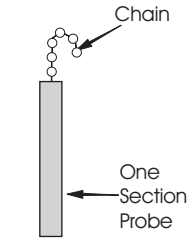


Figure 1

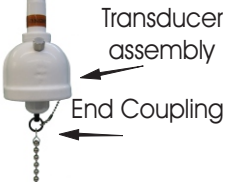


Figure 2

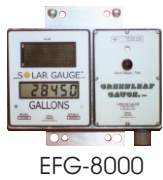
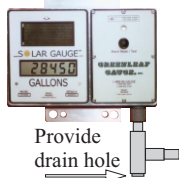


Figure 3

Preferred Entry



Alternate entry

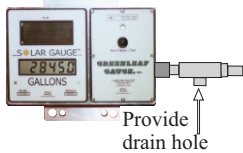


Figure 4

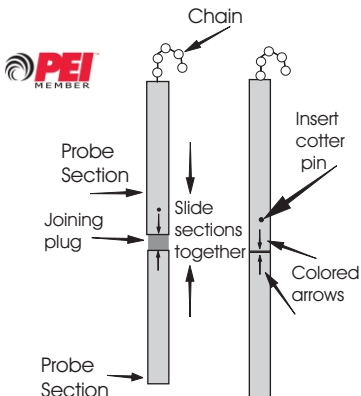


Figure 5

PROGRAMMING DETAILS

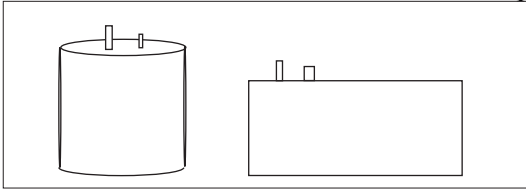
Normally new gauges are already programmed. The steps below would not be needed.

Included with the **SOLAR GAUGE™** is a pocket magnet. This is the tool used in the re-programming of the gauge. On the face of the gauge, you will find three symbols which are also important to the calibration process. These three symbols are:



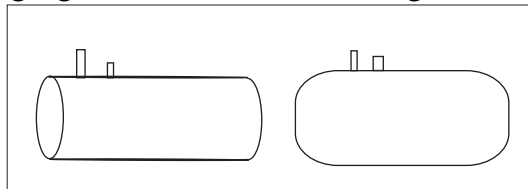
PLEASE READ ALL INSTRUCTIONS BEFORE PROGRAMMING THE GAUGE.

Prior to calibration, determine what shape of tank the gauge will be used on. See diagrams below:



STRAIGHT TANKS

OR



ROUND TANKS, & CUSTOM SHAPE

SYMBOLS USED DURING PROGRAMMING:

Displayed during setup and programming.

- | | | | | |
|---------------|------------------------------|----|---------------|---|
| ≡ - - - | Tank select mode | | - <i>HP</i> - | High calibration point number |
| - <i>00</i> - | Round tank program | or | - <i>AL</i> - | Alarm - low level % full |
| - <i>11</i> - | Straight tank program | | - <i>AH</i> - | Alarm - high level % full |
| - <i>PP</i> - | Program tank capacity number | | - <i>05</i> - | Off set value (optional) Normally Zeros |
| - <i>LP</i> - | Low calibration point number | | <i>End</i> - | Programming complete |

SYMBOLS USED DURING OPERATING MODE:

HELP Gauge display will alternate the *HELP* error message code with one of the following error codes to help identify the problem area to correct. **DO NOT FILL TANK** until problem has been corrected and the gauge is operating properly.

- | | | | |
|-------------|---|---------------|--|
| -*** | Negative number- the gauge has gone below the determined zero level. | <i>0--0</i> | Connection failure between the transducer and gauge. |
| <i>EEEE</i> | Measurement has exceeded the set capacity of the tank, or probe is resting on bottom of the tank. | - <i>EE</i> - | Reading has gone below extended range. |
| | | <i>ISLR</i> | Interstitial leak alarm (optional model) |
| | | <i>L0BR</i> | Low battery. Contact distributor for replacement. |
- (*) Represents any numerical value, 0 through 9

BATTERY

The EFG-8000 is equipped with a replaceable backup battery. Should the error code, *L0BR*, appear for low battery, contact your distributor or Greenleaf Gauge for an authorized battery replacement. Use of an improper battery may damage the gauge or effect the operation of the gauge and alarm. **NEVER REPLACE** the Accumulator with a standard battery.

HIGH / LOW ALARM

The EFG-8000 model with Alarm features a **High Level Alarm** which can be set from 95% to the Low Level Alarm % of tank capacity (as per instructions in calibration section of this user's guide). The High Level Alarm can not be disabled. The alarm will enunciate every 0:03 sec for 0:90 sec, after which it will enunciate every 0:06 sec until the operator presses and holds the reset button for 0:30 sec. To conserve the power supply, we highly recommend that the operator turn off the alarm as soon as it sounds a high level warning. The **Low Level Alarm** can be set at any % of tank capacity up to the high level setting and will enunciate with a less frequent (every 0:20 or 0:90 sec) series of three "beeps" until liquid is added to the tank. To disarm the low level warning alarm the operator can set the values to *00* (as per programming instructions). **WARNING: The individual filling the tank should always test the alarm prior to filling the tank. Press and hold the "Test / Reset" button until three short beeps are heard, indicating that the gauge and the alarm are working properly. This does not, however, insure that the tank and alarm settings were properly entered. This has to be verified in the programming mode above at the time of installation.**

Why we use Calibration Weights and the Calibration Procedure

The Calibration Weights procedure should only be performed “as Needed” and is normally not required.

Brief background: The GREENLEAF GAUGE is a positive displacement device. By simply knowing the weight of a fluid and displacing a known amount of fluid, in this case with a sealed, weighted, specific length probe hung at precisely the correct place in the tank, one can then measure the amount of liquid in the tank. The GREENLEAF GAUGE uses several different weight referenced transducers to meet the design issues of different liquids, tank heights and shapes. Tanks ranging in size from a few inches high to over 50 feet tall can be gauged. Each Transducer produces a unique electronic/numeric output based on standard reference weights. The calibration weight standard must be within less than 1/100 of a gram of the target test weight. Depending on your specific transducer, you will need a combination of two different weights to derive the two correct calibration numbers. **WHY IS THIS IMPORTANT?** These two unique calibration numbers **MUST** then be used in the transducer section of the gauge program that this transducer is connected to. Failure to do so will result in the gauge being unable to track the liquid volume correctly. In other words it will display gallons, but the readings may be way off from what is actually in the tank at that time.

Transducer's Serial Numbers, Sizes, and The HC and LC Numbers

Current production transducers sizes are: A, B, C, D, E, and H. You can determine your transducer(s)' size from the unique serial number labeled on the ½” pipe portion at the top part of the transducer. Current transducer styles have a test port and the letter P in the serial number, i.e. TRB123PC. Older transducer serial numbers are 3 letters and 3 numbers and a letter, i.e. TRC124B. The large printed serial number is followed by two smaller printed numbers the LC and the HC. The top number starts with 4 digits and LC, i.e. 2106 LC. The bottom number starts with 3 to 4 digits and HC, i.e. 1019 HC. The LC number **MUST** always be a larger value than the HC number.

NOTE: IF INSTALLING A NEW TRANSDUCER, CALIBRATION IS NOT REQUIRED.

Installing a newly purchased transducer does NOT require performing any part of finding the calibration numbers by using the weights in the calibration procedure. Be sure you are installing the same size, i.e. an A for an A. Changing the size of transducer **will** require changing the probe also. They both must be in the same weight range. New Transducers are labeled with the -LC- and the -HC- numbers. You **MUST** enter in the new transducer calibration numbers into the gauge transducer calibration section at the time of installation. **FAILURE TO ENTER THE NEW LC & HC NUMBERS INTO THE PROGRAMMING WILL RESULT IN FALSE READINGS.** The previous calibration numbers are no longer relevant and if not changed the gauge will not read the volume correctly.

The Tool list for calibrating/recalibrating a gauge:

2 calibration magnets*

1 set of calibration weights

Standard tools for the conduit and wiring for disconnecting from the top of the transducer

Standard tools required when dealing with a 2” pipe nipple.

*You will need two pocket magnets like the one supplied by GREENLEAF GAUGE (they both must be used at the same time). We can supply them or you can substitute a pickup magnet sold at tool/parts houses that easily picks up a 5/16 nut. Magnets that pick up more than 2 ounces maybe too strong making stepping through the program difficult.

PREPARATION STEPS FOR CALIBRATION

- Disconnect the transducer and remove the conduit from the top of your transducer.
- As you start pulling the un-screwed transducer up off the tank be prepared to disconnect the stainless steel bead chain from the probe at the coupler on the bottom of the transducer rod's slit ring. It will un-snap in only one direction.
- On short tanks just pull out the probe. On tall tanks; have a clamp or tools ready to hold onto the probe still hanging in the tank until you are ready for reassembly. Letting a probe fall back down into the tank would = A BAD DAY
- With the tank open, take a "stick reading" of the height of the liquid in the tank and record it.
- Take the transducer down to the gauge and temporarily connect it directly to the gauge wire screw terminals. (Temporarily remove any of the existing transducer wires at the gauge during this brief time)
- Have the transducer held rigidly in a straight up and down position (NOTE: Tank nipples and bungs that are not straight up and down will cause poor performance. There are special transducers available that can adjust to different angles.)

Extremely Important

- Have free access to the bottom of the transducer so the weights can easily be changed.
- Be out of any wind so the weights can hang down off the transducer without being disturbed, i.e. no wind & no vibrations. Wait until any swinging movement has stopped before taking a reading.
- Have direct access to the face of the gauge to activate the proper switches with your Magnets.
- Be able to clearly view the display and record the readings for later use.

How to Select the Correct Calibration weights

All transducer sizes, except the H, require a set of reference weights consisting of the sizes 0.5, 1.0, 2.0 pound weights made to a standard of +/- 0.01 gram of the target weight. The size H requires one additional 1.0 pound weight to be added to the set. GREENLEAF GAUGE sells these weights in a kit, but if you choose to produce your own make very sure you are within the tolerance standard. Below is a quick reference for which weights will be needed. Use which ever combination of the weights to produce the correct weight needed.

Transducer Size	Weight to use for the LC#	Weight to use for the HC#
A	1.0#	0.5#
B	2.0#	1.0#
C	2.5#	1.0#
D	3.0#	1.0#
E	3.5#	1.0#
H	4.0#	1.0#

It is important to note that the heavier weight (LC) must always be used first even if you only want to check on the lighter weight (HC)

Site considerations: Up or down?

Normally it is easier to take the transducer off of the top of the tank and bring it down to the face of the gauge. However, calibration can be done using the weights with the transducer from the top of the tank if you have additional help. It is a judgment call that has to be made at each site. Either way the calibration procedure will need to be followed

Calibration Procedure

-also see flow chart-

Finding the -LC- number. Hang the heavy weight for your size of transducer (chosen from the chart) on the transducer split ring. At the same time, place one magnet on the Star symbol and one magnet on the Moon symbol. Hold them there until the numeric display changes to 2 numbers, a dash, and a single letter or a number: i.e. 40-4 or 80-E depending on the age and model of the gauge your working on. Once the display reads this pattern remove both magnets. Using one magnet, place and hold it against the Star symbol on the left hand side of the gauge. Hold the magnet there until the display shows a 3 or 4 digit number and do not lift the magnet. Lightly tap on the body of the transducer a few times to settle the weight. Do this until the reading always goes back to the same number. With no movement from the hanging weight, record the four-digit number. Having recorded the number and having a still steady display remove the magnet. (This is the LC number). Remove the heavy weight and replace it with the light weight.

Finding the LC number must always precede finding the HC number. If the -LC- number process is skipped and you just try getting the -HC- number only, the gauge will NOT perform correctly.

Finding the -HC- number. Hang the light weight for your size of transducer (chosen from the chart) on the transducer split ring. Using one magnet, place and hold it against the Moon symbol on the right hand side of the gauge. Hold the magnet there until the display shows a 3 or 4 digit number and do not lift the magnet. Lightly tap on the body of the transducer a few times to settle the weight. Do this until the reading always goes back to the same number. With no movement from the hanging weight, record the four-digit number. Having recorded the number and having a still steady display remove the magnet. (This is the HC number).

Remove the light weight from the base of the transducer; we are done using the calibration weights. You now have both of the current calibration numbers to compare and enter into the transducer section of the gauge program. Before re-assembling the gauge system, measure the liquid level in the tank again if there is any possibility that it might have changed. Use the same port as the transducer and probe. Reassemble the gauge system. Determine if the liquid level can stay undisturbed for a few minutes so a comparison can be made to the readout of the gauge. Verify that the liquid level readout displayed on the gauge is within the working +/- tolerance as the liquid level of the tank chart. (Normal +/- tolerance is +/- 1% of the true total capacity of the tank) Make sure it is the correct tank chart for the tank you are working on. **Don't ass-u-me it is correct! Verify it is the right Tank Chart!**

The first part of the gauge program is listed in detail in the Online User's Guide. Note the web address is printed on the face of the gauge directly below the solar cell.

The gauge may still be in the mode showing the two numbers a dash and one number or letter. Place the magnet on the Planet symbol and hold it there until the display changes, then pull the magnet away. It will either display a number or an error code depending if everything has been put back together correctly.

Now we need to go through the gauge setups dealing with the tank information in the program and write them down. Proceed into the transducer section of the program (See below “Entering the LC and HC into the Gauge”) and adjust the transducer calibration numbers. You may want to refer to the block flow diagram that is provided with these directions. (Some of these labels differ in order and may be different depending on the products and the programs, call in for assistance if help is needed.)

Hold the magnet on the Planet symbol until the readout goes to dashes across the display. Pull it away. What you should see in the display is typically -00- for a horizontal cylindrical tank or -ll- for a straight sided tank. Verify that the tank shape matches your tank. (Again please call us for assistance if something just doesn't make sense.)

Perform the next several steps by holding the magnet on the Planet symbol until the readout changes. Pull the magnet away and record the numbers shown in the display.

-PP- : total tank capacity

-LP- : lowest number that the gauge will measure at the bottom of the tank (amount of liquid in the tank below the bottom of the probe).

-HP- : value computed for the liquid type *around* 75% full. **Never change this number!** If you believe this number needs to be changed call for technical assistance.

-AL- : low-level alarm trip point in % of total full

-AH- : high-level alarm trip point in % of total full, normally 90%

-OS- : any off set number either + or - but **never greater than 2% of the actual total tank capacity**, normally it is just zero's. Make note of this number then adjust it to zero's for now.

End- Hold on planet until display changes to LC. Lifting magnet will result in starting at the beginning.

Entering the LC and HC into the gauge. When you place the magnet to the Planet symbol after the OS numbers appear do not lift the magnet but hold it there (maybe up to 26 seconds) until the display shows -end (depending on the model) then CHANGES to -LC- in the display (again depending of which model). NOW you can pull the magnet away. If you pull it away before the -LC- shows you will have to go clear back through the above program steps again to get back to this step in the programming.

The number that shows after you had the -LC- in the display should first be recorded and then needs to be changed so it matches the number you recorded during the calibration weight procedure. It is easy to change the number: to decrease the number place the magnet on the Star, to increase the number place the magnet on the Moon. Once you have set the number in the display to match the -LC- number from the weights procedure you need to do the same thing for the -HC- number.

Place one magnet to the Planet symbol again and hold it there until the display changes and shows -HC- (depending on the model) in the display. Remove the magnet. The number that now shows after you had the -HC- in the display should first be recorded and then needs to be changed so it matches the number you recorded during the calibration weight procedure. It is easy to change the number, to decrease the number place the magnet on the Star, to increase the number place the magnet on the Moon. Once you have set the number in the display to match the -HC- number you are done changing calibration settings.

Take the magnet to the top and hold it against the planet symbol. The display will change to -endC (depending on which model) pull the magnet away. The display should now read out the quantity in your tank within the +/- tolerance. Any time you wait longer than about 30 seconds in the setup portion of the gauge program, you will fall out of the set up program and will have to start over again. The numeric values are in a secure area of the device and should always be there unless the above process changes them. If the set up numbers ever change without human intervention, the gauge is failing and will need to be replaced.

Differences in your recorded -LC- and -HC- numbers and number's stored previously in the set up values in the gauge program.

The four common reasons for a difference in your new numbers compared to the old numbers:

- 1 The most common reason for a difference in the old and new numbers is that someone has replaced the old transducer and installed a new transducer connected to this gauge but did not finish the installation. Installation of a new transducer must include the entering in of the new calibration numbers. The -LC- and the -HC- numbers are labeled on the new transducer.
- 2 The transducer has aged and over time the numbers have shifted.
- 3 Water damage at the top of the transducer where the three wires come out has, over the years, slowly entered the electronic components and is changing their performance. This type of damage will eventually make the transducer stop working.
- 4 Lightning events may have affected the electronics and changed their performance.

-This is the rule: -LC- numbers may not change more than 5 counts and still be serviceable. IF the number difference is greater than 5 counts replace the transducer UNLESS it is a different transducer than what the gauge was programmed for.

Call us if you need help to determine this, we track all of the serial numbers we sell.

-This is the rule: -HC- number cannot differ more than 2 counts. If it is a greater difference than the 2 counts the transducer needs to be replaced. UNLESS it is a different transducer than what the gauge was programmed for. You can always check on the serial number area on the transducer and see if your numbers are very close to what you have found. If they are both different numbers then probably the transducer has been changed out and not programmed into the gauge. Again call us if you need assistance to determine that.

Please have the serial numbers of the parts you'll be asking about.

Other Calibration Issues

The -LC- and the -HC- numbers are not the only numbers in the gauge program that will affect the accuracy of the gauge. The first section of the gauge program deals with numbers based off the tank information, the second section deals with the transducer's unique calibration values. It takes correct information entered in both sections for the gauge program to accurately track the tank liquid. If you have unanswered questions please call us with the serial number and we can provide you documentation on file. Normally matching the order data to the actual on site measurements will show where any problem lies and we can address what changes need to be made so that the gauge can track the tank contents accurately.

NOTE: We have a wide variety of products and to list every programming option would not be helpful in this type of document. Please feel free to call in for assistance, we service what we sell and have replacement parts in stock to get your system going.

Contact Us:

E-mail: support@solargauge.com Outside the USA use Country code first:

Phone: Voice: 208-453-1714 Voice: 1-888-884-2843

Fax: 208-459-3365 Fax: 1-888-884-4145

Web site: www.solargauge.com

TROUBLESHOOTING

Possible error messages that may be displayed on EFG-8000 model Solar Gauge.

HELP	Gauge will alternate the <i>HELP</i> error message code with one of the following error messages to help identify the problem area to correct. DO NOT FILL TANK until the problem has been corrected and the gauge is operating properly.
-***	Indicates a negative number. It may continue into the extended range until the gauge displays -EE-. For accuracy, the gauge should be re-calibrated. (*) Represents any numerical value, 0 through 9.
-EE-	Reading has gone below the extended range. Re-calibrate gauge to correct error.
EEEE	Measurement has exceeded the set capacity of the tank. This could be due to an overfill, or the probe is resting on the bottom of the tank from improper installation. Check measurements and/or re-calibrate.
0--0	Indicates a problem with the electrical connection between the transducer on top of the tank and the gauge. Check all wires and connections.
LOBA	Low battery. Battery needs replaced. Contact distributor or Greenleaf Gauge for authorized replacement.
ISLA	Interstitial leak. (Optional model)
'SPF9	Loss of connection of the black wire between the gauge and the transducer

PRIOR TO CONTACTING GREENLEAF GAUGE FOR TECHNICAL SUPPORT, PLEASE VERIFY ORDER INFORMATION, GAUGE SETTINGS, AND COMPLETE THE FOLLOWING INFORMATION.

1. Gauge Serial # _____
2. Order # (if known) _____
3. **Accurate** measurement from bottom of tank to top of pipe nipple _____
4. **Actual** capacity of tank. Refer to formulas below. _____
5. Type of liquid in the tank _____
6. Current liquid level (inches or gallons) Please be accurate _____
8. Error messages displayed on gauge console _____
7. Changes or adjustments to original equipment _____
9. Other information _____

TO DETERMINE GALLONS PER TANK

Cylindrical tanks- measure in inches:

$$\text{Length} \times \text{Diameter} \times \text{Diameter} \times .0034 = \text{Gallons}$$

(Diameter = Circumference divided by 3.14)

Rectangular tanks- measure in inches:

$$\text{Length} \times \text{Width} \times \text{Depth} \times .004329 = \text{Gallons}$$

TECHNICAL ASSISTANCE

Greenleaf Gauge, Inc.

P. O. Box 309

Greenleaf, ID 83626

888-884-2843

208-453-1714

Fax 208-459-3365

E-mail: support@solargauge.com

Web site: www.solargauge.com

SPECIFICATIONS MODEL EFG-8000

Supply Source.....	Solar Cell - 5Volt
Backup power.....	Accumulator custom assembly = Nickel Metal-Hydride Solar rechargeable battery - 9 Volt and a 9V lithium backup
Accuracy.....	+ / - 1.0% optimal + / - 2.0% typical
Housing.....	Plastic / Aluminum mounting holes provided 6.0" H (9.0" W/ mounting for 3" & 4" U-bolts. Brackets) x 9.5"W x 1.5" D Holes: 5/16" & 7/16"
Indicators.....	6 digit LCD digital
Operating Temperature.....	-30° F to +140° F
Warranty.....	1 year

IMPORTANT NOTICE: When gauge and alarm are utilized as the High-level warning, the test/reset button should **ALWAYS** be tested by the operator by pressing and holding the button before filling the tank. If it does not respond correctly **DO NOT FILL**. The operator must monitor the tank filling process and the status of the gauge and alarm to prevent overfills.

REPAIR AND RETURN POLICIES

All repairs or returns must be assigned a RMA (Return Materials Authorization) number. Call before returning.

REPAIRS

Your **SOLAR GAUGE™** display module (left side of console) has been hermetically sealed at the factory. Once the gauge has been installed on the tank with the probe it was designed to work with, and calibrated properly, it should give years of flawless service. In the event you have a problem with this product, it needs to be returned to Greenleaf Gauge for repairs. Contact Greenleaf Gauge for warranty status and detailed instructions before returning the product. Gauges covered by warranty will be repaired/replaced at the option of Greenleaf Gauge. Please refer to the Terms and Conditions of warranty. If the gauge is past the warranty period, it may be returned for a core credit toward the purchase of a new gauge providing there are no signs of misuse, abuse, damage, or attempted repair.

RETURNS

To return your gauge for repairs contact Greenleaf Gauge for complete details concerning warranty issues as well as shipping requirements. Local: 208-453-1714, or Toll free: 888-88-GAUGE (888-884-2843).

Fax: 208 459-3365, or Toll free: 888-884-4145

Visit us online at www.solargauge.com.

Shipping

Greenleaf Gauge
20675 N. Friends Rd.
Greenleaf, Idaho 83626

Mailing

Greenleaf Gauge
P. O. Box 309
Greenleaf, Idaho 83626-0309

Sales Office
20675 N. Friends Road
P. O. Box 309
Greenleaf, ID 83626
USA



www.  **SOLAR GAUGE™**.com

by
**GREENLEAF
GAUGE**



A Division of I.T.M. Electronics, Inc.



888-884-2843
888-884-4145 - Fax
Outside USA
208-453-1714
208-459-3365 - Fax

Manufacturer's Suggested Annual Maintenance Protocol

SOLAR GAUGE™

by Greenleaf Gauge
(Without test port)

The EFG-8000 series of liquid level gauges operate as a very simple gauging device with level alarm options that require almost no maintenance. Measuring the current liquid level in the tank and comparing the gauge reading to the charted amount can confirm normal gauge accuracy. The comparison between the gauge readout and the charted amount should differ no more than 2%, and typically operates with less than 1 % error.

The High and Low liquid level alarms are user set points in the gauge programming as a percent of the total tank capacity. Access to these alarm values may be reviewed by stepping through the setup program as detailed in the User's Guide*. The Low-level alarm may be set to "off" at a zero value or any value 5% under the High-level alarm value. The High-level alarm cannot be turned off and may not exceed 95% of tank capacity. We strongly recommend against setting the High-level alarm any higher than 90% in normal conditions.

Although this is not the preferred method, High Level alarms may be observed during filling as the liquid level reaches the set percentage of fill. The preferred method of a High level alarm activation, provided the tank level is above 50%, is to go into the setup program and adjust the High level alarm to just below the actual displayed level. This will trigger a High-level alarm. The last option is to temporarily unscrew the transducer** just up off the mounting nipple on top of the tank and very gently and slowly pull up on the beaded chain. This will simulate an actual High-level tank condition and activate the High-level alarm. Return the Transducer to the original position and secure all wire fittings.

*User's Guides are always available on the web at www.solargauge.com

**A EFG-TXD2- # (# is the size, i.e. A) transducer is available that provides a test port to pull on the probe without removing the transducer body from the tank nipple.

Sales Office
20675 N. Friends Road
P. O. Box 309
Greenleaf, ID 83626
USA



www.SOLAR GAUGE™.com
by

GREENLEAF
GAUGE



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Manufacturer's Suggested Annual Maintenance Protocol The Interstitial Float Switch Assembly

The EFG-8000 series of liquid level gauges operates as a very simple gauging device with level alarm options, and an interstitial alarm option that requires almost no maintenance. This document is specifically about the interstitial float assembly operation and testing procedures.

The interstitial float device operates as a normally closed circuit device. An interstitial alarm will visually alternate in the LCD display by showing the letters "ISLA" and the gallons in the tank. This visual indicator will continue until the open circuit condition is cleared (the float returns to the bottom position). The Solar Gauge typically operates in a low power mode until it has sensed a greater than 2% tank volume change. When the gauge detects no liquid level change in the tank it goes into a power saving mode reducing the refresh timing of the display and alarm soundings. This is important to understand during testing of the interstitial float assembly and listening for the enunciation. Although the display will show the alarm in seconds, the enunciator may take up to approximately 90 seconds to enunciate the audible alarm - three short beeps. Once the alarm has sounded it will continue to enunciate approximately every 90 seconds until cleared.

Operational inspections must be done at least once a year depending on local inspector authority requirements. The preferred method of testing the assembly is removal from the interstitial cavity. (Note: pipe fittings must be provided above the interstitial cavity that allow for the inspection and removal of the interstitial assembly without disconnecting the communication wires.) Hold the assembly in your hand and inspect for liquid contamination past or present and document the findings. The preferred method of activation is by turning the assembly upside down. The float must fall freely and move to both extends when carefully shaken up and down. If the float does not move freely the assembly needs replaced. Next, holding the assembly upside down (wires coming out of assembly will be facing down), watch for the alarm message in the LCD display. You must hold this position until the three short beeps are heard. Another option is to temporarily place the assembly into a container of clean water, unleaded gas, or Av-Gas at least two inches deep (with the wires in an upright position). Test for the alarm under the timing conditions outlined above. **Diesel is not a recommended liquid to test in because it might show false contamination over years of testing.** With either method of testing, the float assembly should cause an interstitial alarm, which confirms correct operation of this device. When testing has correctly caused an alarm, carefully return the interstitial alarm assembly down into the bottom of the cavity and make sure all the pipe fittings are sealed against moisture.

If you have questions on your results please contact customer assistance*.
888-884-2843 between 9-5 M-F, MST.

*User's Guides are always available on the web at www.solargauge.com

Manufacturer's Suggested Annual Maintenance Protocol

High Level Alarm testing using transducers with the test port* *(Manual activation of the high level alarm by direct simulation of a high liquid level)*

Back Ground: The EFG-8000 series of liquid level gauges operate as a very simple gauging device with level alarm options that require almost no maintenance. Measuring the current liquid level in the tank and comparing the gauge reading to the charted amount can confirm normal gauge accuracy. The comparison between the gauge readout and the charted amount should differ no more than 2%, and typically operates with less than 1 % error.

The High and Low liquid level alarms are user set points in the gauge programming as a percent of the total tank capacity. Access to these alarm values may be reviewed by stepping through the setup program as detailed in the User's Guide*. The Low-level alarm may be set to "off" at a zero value or any value 5% under the High-level alarm value. The High-level alarm cannot be turned off and may not exceed 95% of tank capacity. We strongly recommend against setting the High-level alarm any higher than 90% in normal conditions.

Preferred Method of Testing

1. Make note of the current gallons displayed. (Needed in step 5) The tank needs to be less than 75% full to perform repeatable tests, otherwise you may only get one alarm test until lower tank levels.
2. Go up on top of the tank to locate the transducer and unscrew the small Test Port hex nut. If your transducer does not have a test port a new transducer with a test port can be ordered to replace yours.
3. Carefully and slowly pull up (NEVER should more than 3 pounds of pulling force be applied) on the nut which is attached to a very small S.S. bead chain, which in-turn is connected to the probe down inside the tank. This action needs to trigger a High-level alarm as you pull up (about 1 ½") and before it reaches the full length of pull. If you have a person in front of the gauge reading the display you can determine the quantity at which it alarms. It will be the percent setting of the high-level in the gauge program. The alarm trip point is set as a corresponding percentage of total tank capacity. **IF THE HIGH LEVEL ALARM FAILS TO ACTIVATE PLEASE PROCEED TO THE FOLLOWING PAGE.** Otherwise, after successful tests proceed to step 4.
4. Feed the chain back down into the hole (checking placement and condition of the small O-ring, use a small amount of silicone grease if needed) and screw the Test Port hex nut carefully back into place. **ONLY** tighten it down enough to make firm contact against the o-ring to seal out the elements. If it is damaged or missing it **MUST** be replaced. If the o-ring has been damaged or it is missing, you must tape or keep in place a sealing cover over the transducer to keep the elements away from the nut until a replacement o-ring or replacement of the transducer can be made. Call Greenleaf Gauge for the protocol to replace this o-ring. It is serviceable in the field, but it is a delicate procedure. After considering all the conditions at your tank site, as an example; extreme cold, very tall tank, very remote location, it may be best to order a new transducer and change out the existing transducer.
5. The last step is to check the current reading on the gauge display to see if it reads within 2% on the reading taken for step one. See back page 16 for an example. If it does not read within the 2% you may try repeating steps two thru five to get the correct results or proceed to the last option.



Alternate Test Method: Although this is not the preferred method, High Level alarms may always be observed during filling as the liquid level reaches the set percentage of fill. This method is not preferred only because it is not always practical to observe this event. You also only have one alarm event to observe. The *preferred method* of a High level alarm activation is provided on top of the tank using a transducer with a test port.

Last Option: transducer removal

1. The last option starts with reading and making note of the current gauge display.
2. Next go up on top of the tank and temporarily unwire and unscrew the transducer just up off the 2" pipe nipple on top of the tank. Depending on the site wiring means, it may require a small additional length of wire to re-connected to the gauge.
3. After temporarily re-connecting the three transducer wires and losing the 0--0 error code, very gently and slowly pull up on the beaded chain or the top of the probe sticking down in the tank. To do this it usually requires the transducer to be above the tank nipple about 5 inches. Pulling up on the chain or probe will simulate an actual High-level liquid tank condition and will activate the High-level alarm. **DO NOT** handle the movable transducer rod which will normally only travel about 5/8 of an inch empty to full. The High-level alarm must activate before the rod stops moving into the topmost position while lifting up on the bead chain or top of the probe.

IF THE HIGH LEVEL ALARM FAILS TO ACTIVATE PLEASE PROCEED TO THE NEXT SECTION OF THIS PAGE.

4. Next you must test to make sure the transducer rod moves very freely in and out of the base. You can do this test by lifting up slowly on the bead chain or probe top and letting it back down slowly several times just before reassembly to the pipe nipple. If the transducer rod does not move freely and you can not clean it so that it does, the transducer **MUST** be replaced.
5. Just before returning the transducer to the original position on the tank nipple make sure the small bead chain is loose. After screwing the transducer back down onto the tank pipe nipple and connecting the wires, check the current reading on the gauge display to see if it reads within 2% of the total tank capacity compared to the first reading you noted before you started this procedure.

% of Error Example: Total tank capacity 10,000 gallons. $10,000 \times .02$ would equal 200 gallons. The difference would then need to be less than 200 gallons plus or minus of the first and current reading.

6. If you are within the percentage of error then finish securing all wire and wiring means. If it is not, repeat the steps above because the rod may have been twisted and needs to be moved back and forth to the extreme ends again and then the transducer can be re-mounted carefully back into place and checked again for the % of error.

IF THE HIGH LEVEL ALARM FAILS TO ACTIVATE

1. Determine if the annunciator operates on the gauge alarm plate, if not replace it. (Call for part #)
2. Determine if there is moisture present behind the alarm plate. Dry out the cavity. Seal off all the conduit openings and replace alarm connector board if needed. **DO NOT** use any alarm board with any corrosion on it. It **MUST** be replaced.
3. Determine if gauge displays the correct quantity in the tank, if not, check the program settings in the gauge. Call if you need assistance determining the setup values.
4. If steps 1 thru 3 are found correct then the gauge may need removed and replaced.

IF YOU CAN NOT DETERMINE THE PROBLEM AND THEN ACTIVATE THE HIGH LEVEL ALARM, PLACE A SIGN OF "NO HIGH LEVEL ALARM, OUT OF SERVICE" ON THE GAUGE FACE AND NOTIFY THE TANK OPERATOR. LEAVE THE SIGN ON THE GAUGE FACE UNTIL REPLACEMENT PARTS ARE AVAILABLE TO RETURN THE GAUGE TO NORMAL SERVICE. If you can determine that the gauge is reading the tank quantity correctly, but the High-level alarm is not sounding, make note of that to the tank operator.

*User's Guides are always available on the web at www.solargauge.com

*Pictures are available on the web site for clarification as to the different styles of transducers that have been produced.