PATENT

For specific patent information, contact Franklin Electric at +1.844.344.5025

LIMITED WARRANTY

Franklin Electric products are warranted to be free of defects in materials and workmanship for a period of one (1) year from date of purchase. Franklin Electric will, at our option, repair or replace the unit with a re-manufactured unit. This limited warranty applies only to Franklin Electric products, and does not cover any other equipment, static damage, water damage, overvoltage damage, dropping the unit, or damage resulting from extraneous causes including owner misuse. Franklin Electric is not liable for any incidental or consequential damages for breach of this warranty. The warranty is void if owner attempts to disassemble the unit or to modify the cable assembly.

SERVICE

To obtain service, contact Franklin Electric at +1.844.344.5025. Have your model and serial numbers ready. This first step is critical as we will trouble-shoot the problem(s) over the phone, and many perceived problems are in fact resolved during this step. If the problem cannot be resolved, then the CS Agent will issue you a Return Material Authorization or RMA. This number becomes your tracking number. The final step is to return the unit to Franklin Electric freight prepaid (you pay), to the attention of the RMA number obtained.

Franklin Electric will service the unit and reship the next scheduled business day following receipt (in most cases), using the same type carrier and service as received. If Franklin Electric determines that the failure was caused by misuse, alteration, accident, or abnormal condition of operation or handling, purchaser will be billed for the repaired product and it will be returned freight prepaid with shipping & handling charges added to the invoice.
Franklin Electric products beyond the warranty period are subject to the repair charges in place at that time.
Optional re-manufacturing service is available to return our products to like-new condition.
Out-of-warranty repairs carry a 3-month warranty. Re-manufactured units purchased from Franklin Electric are covered by a 6-month warranty.

Franklin Electric

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CELLGUARD ELS+

ELECTROLYTE LEVEL MONITORING SYSTEM

USER GUIDE

Franklin Electric

NOTES

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WWW.FRANKLINGRID.COM

TABLE OF CONTENTS

1 SAFETY GUIDELINES

General Safety Precautions

1. IMPORTANT SAFETY INSTRUCTIONS. ***BEFORE INSTALLING THE ELS+ SYSTEM, READ THE USER GUIDE AND FOLLOW SAFETY AND OPERATING INSTRUCTIONS.*** SAVE THESE INSTRUCTIONS.

⚠ WARNING

Risk of explosive gases

Batteries generate explosive gases during normal operation, and when discharged or charged.

1.1 To reduce risk of battery explosion, follow these safety instructions and those published by the battery manufacturer and the manufacturer of any equipment you intend to use in the vicinity of a battery. Review cautionary marking on these products and on the battery cabinets, battery racks, battery rooms, and on equipment containing the battery.

1.3 Do not disassemble and CG-ELS+ Sensor or CG-ELS Hub; contact Midtronics customer service when a repair is required. Incorrect reassembly may result in a risk of electric shock or fire.

1.4 Use the CG-ELS+ System in a dry, well-ventilated area.

1.5 Do not expose the CG-ELS+ System to rain or snow.

Safety Precautions

IMPORTANT:
Read this instruction guide before using the ELS+ system.

⚠ WARNING

To avoid electric shock when testing jars, follow your company's safety practices and these guidelines:

2.1 Perform service work only for which you have been trained.

2.2 Refer to NFPA 70E for electrical safety requirements.

2.3 Use of Personal Protection Equipment (PPE) and Protective Clothing per NFPA 70E guidelines. Some examples of these, but not limited to, are:

- Electrical-insulating, acid-resistant, and protective gloves and sleeves per ASTM D 120, OSHA 29 CFR 1910.137, and NFPA 70E requirements
- Protective footwear
- Aprons (acid-resistant)
- Insulating blankets
- On-site spill kits
- Protective clothing for voltage levels, level of corrosive protection, and the amount of arc-flash protection provided
- Insulated rescue hooks or other means for pulling personnel from live circuits
- Eyewash stations or portable eyewash bottles
- Class "C" dry chemical fire extinguishers instead of water around battery systems

2.5 Always have someone within range of your voice, or close enough to come to your aid, when working around lead acid batteries.

2.6 Have plenty of fresh water and baking soda nearby in case battery acid contacts skin, clothing or eyes.

2.7 If battery acid contacts skin or clothing, wash immediately with baking soda and water. If acid enters the eye, immediately flush with cold running water for at least 10 – 15 minutes, and seek medical attention.

2.9 Never smoke or allow a spark or flame in the vicinity of a battery or engine.

2.10 Be extra cautious to reduce risk of dropping a metal tool onto the battery. It might spark or short circuit the battery or other electrical part that may cause an explosion.

2.11 Before working with a lead-acid battery, remove personal metal items such as rings, bracelets, necklaces, watches, etc. A lead-acid battery can produce a short circuit current high enough to weld such items causing a severe burn.

2.12 Always wear safety glasses with side shields in the vicinity of battery work per 29CFR1910.133 (OSHA).

2.13 Do not disconnect the battery cables from power systems during the test without authorization.

2.14 Do not place yourself in an electrical circuit.

2.15 Avoid simultaneous contact with the jar and with the battery cabinet, racks, or hardware that may be grounded.

2.16 Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to cause cancer and birth defects or other reproductive harm. ***Wash hands after handling.***

6 CG-ELS+ SENSOR LED LIGHT CODES

LED COLOR & ACTIVITY	MEANING	SOLUTION
Blinking Green	Normal Mode (No Alarm)	Not Applicable
Blinking Red	Alarm Mode	Not Applicable
Blinking Orange	Sensor is not calibrated	Follow sections 3.5 and 3.6, instructions for calibrabting and closing the alarm loop
Solid Red	Internal Error	Power cycle the sensor. If the sensor is still solid red, replace the sensor
Alternating Green & Orange	Alarm loop closed incorrectly	1) Power Cycle Hub 2) After startup, follow step 3.6, closing the alarm loop
Other	Invalid	Power cycle the sensor. If the sensor is still invalid, replace the sensor

7 TROUBLESHOOTING SENSOR

FAILURE TO CALIBRATE

If the sensor blinks red 6 times in rapid succession after calibration, the calibration process failed. First, retry the calibration process. If calibration fails again, the sensor should be replaced; it may have been damaged or has become defective.

FAILURE TO RESET ALARM WHEN INSTALLING FINAL SENSOR IN CHAIN

If after the button is held for 10 seconds to set the final sensor in the string, and the sensor blinks red 8 times in 4 seconds, the sensor has failed to set itself as the final sensor in the string. Ensure there is one empty connector location (the sensor truly is the last one in the string). Replace the sensor, it has malfunctioned.

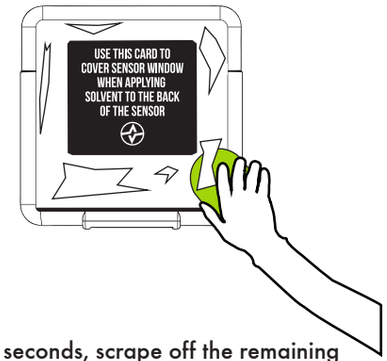
SENSOR BLINKS RED WHEN BATTERY ELECTROLYTE LEVEL IS HIGH

Ensure green level line on sensor is below the electrolyte level on battery. Ensure sensor is level on battery. If it is not obvious, use the alignment bracket. Ensure sensor is not mounted over text or other markings that would prevent the sensor from seeing through the clear case. Ensure the sensor is not mounted over large obvious scratches in the case. Ensure the battery case is transparent (clear). If the sensor is not calibrated, follow the calibration procedure found in section 3.5.

8 TROUBLESHOOTING HUB

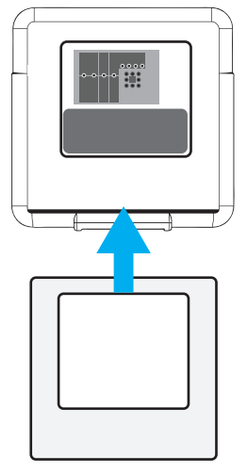
CONNECT LED DOES NOT ILLUMINTATE WHEN SENSOR IS PLUGGED IN

Ensure the hub itself has power. Try to replace the current sensor and cable to see if the connect LED turns on. If there is still no green CONNECT LED, the hub has malfunctioned and should be replaced.



7) After 60 seconds, scrape off the remaining adhesive foam from the back of the sensor.

8) Use a soft cloth to wipe away any left over adhesive remover.



9) Line Up and place new the new foam adhesive pad to the back of the sensor.

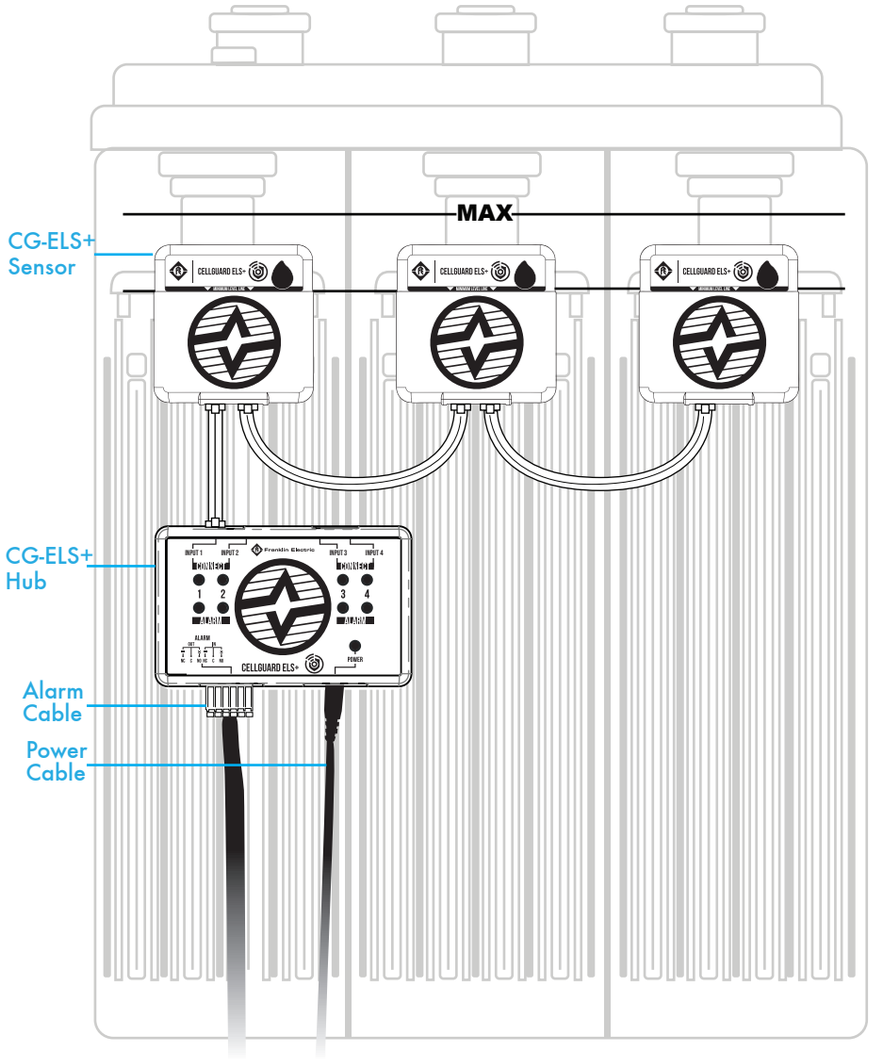
2 SYSTEM OVERVIEW

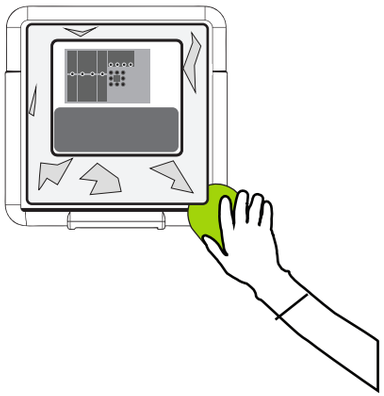
The ***CELLGUARD SYSTEM – ELS+ Electrolyte Monitoring System*** provides 24/7 monitoring of Vented Lead Acid batteries.

Using double-sided tape, CG-ELS+ sensors are adhered to the side of VLA batteries and sense the electrolyte level. The sensors are daisy-chained together with modular quick connect cables. Each chain is powered from a CG-ELS+ Hub unit. The Hub has four inputs so one hub can power four strings of sensors. Sensors alarm when the electrolyte level falls below the minimum fill line on the battery case.

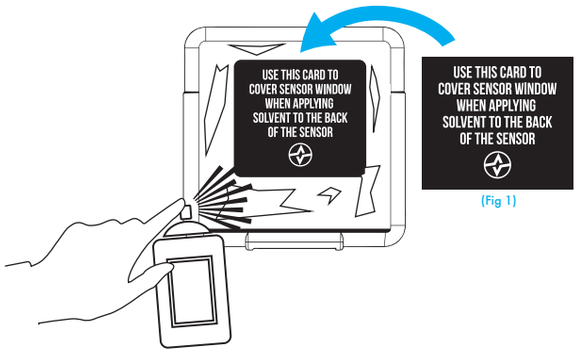
CG-ELS+ Sensors also measure the case temperature and alarm when the temperature is out of range of a lower and upper limit. The sensors have a droplet light in the upper right corner. In normal mode, the droplet button flashes green. During an alarm, the droplet flashes red. In addition, the Hub unit has LEDs identifying which of the four chains of sensors the alarm can be found on. The CG-ELS+ Hub has an alarm output via two form C dry contacts. The hub output can be used to integrate the CG-ELS+ Electrolyte Monitoring System into most commercially available battery or Building Management Systems including a SCADA system.

2.1 SINGLE STRING EXAMPLE





4) Scrape off the remaining large piece of adhesive foam from the back of the sensor.

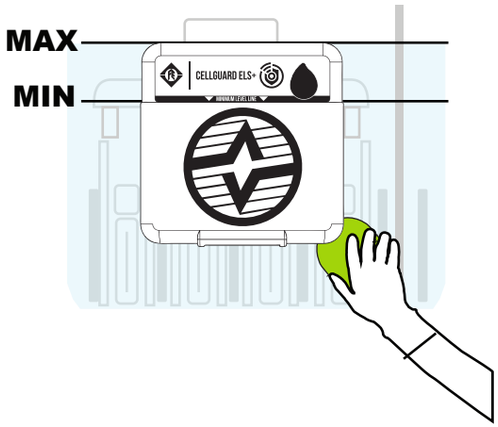


(Fig 1)

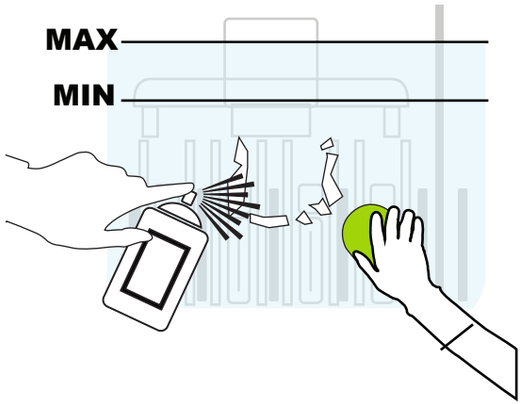
5) **IMPORTANT** Cover the clear window on the back of the sensor with the provided window card. (Fig 1)

6) Spray the 3M citrus based adhesive remover on the remaining adhesive.

5 REMOVING THE CG-ELS+ SENSOR



1) Using a plastic scraper, peel the sensor off of the battery case.

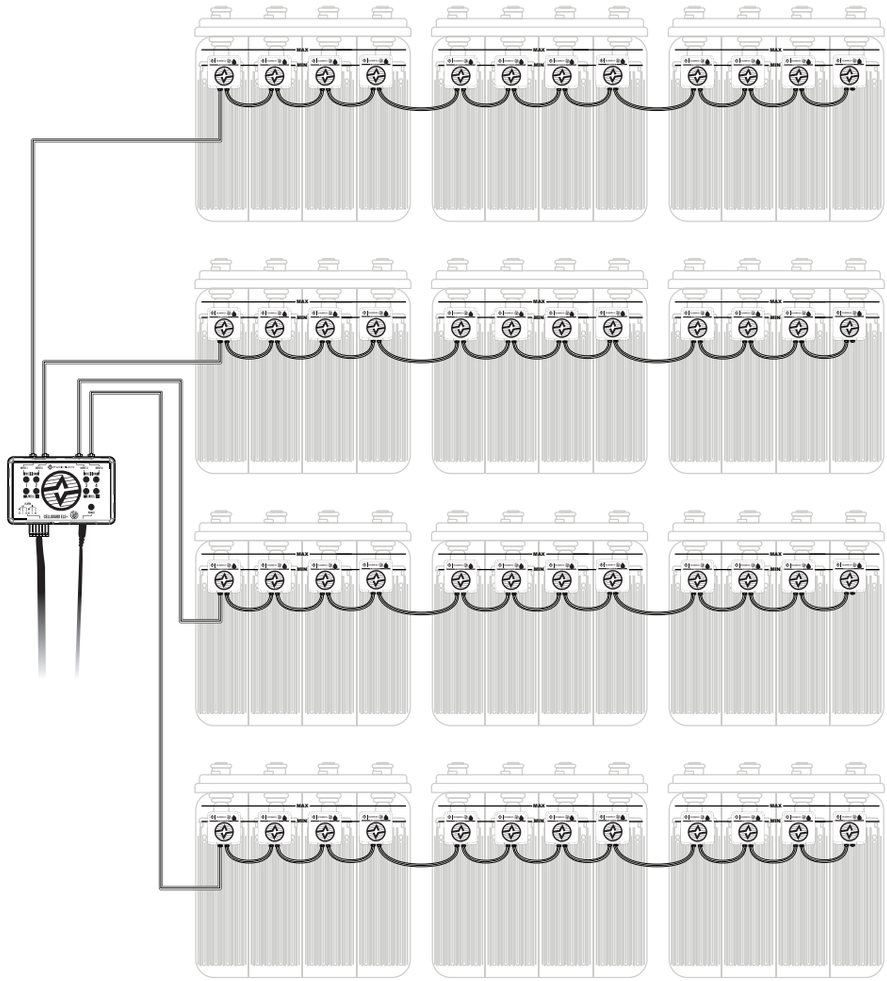


2) Spray the 3M citrus based adhesive remover on the remaining adhesive.

3) After 60 seconds, scrape off of the battery case.

2.2 MULTIPLE STRING EXAMPLE

NOTE: The hub contains 4 inputs. Each input can power up to 150 sensors



2.3 SPECIFICATIONS

CG-ELS+SENSOR

Part Number:

CG-ELS+ SENSOR

Battery Types:

Vented Lead-Acid (VLA) battery types

Alarm Leads:

Active Open, via RJ25 jack connection

Alarm Activation (Temperature):

Activation when battery case temperature is greater than 35° C ± 2°C or less than 0°C ± 2°C, with field adjustable alarm limits

Alarm Activation (Electrolyte Level):

Activation when level is below ± 2 mm of calibrated reference

LED Status Indicator:

Flashing Green (normal state),
Flashing Red (alarm state),
Orange (non-calibrated)

Power Input:

12V dc ± 2V dc at 2.5 mA Average, via RJ25 jack Hub connection

Operating Temperature Range:

-10 to 60° C

Storage Temperature Range:

-20 to 70° C

Dimensions:

2.60" W X 2.60" D x 1.00" H
(66.04 mm W x 66.04 mm D x 25.4 mm H)

Enclosure:

94V-0 ABS Plastic Housing

Mounting:

3M Adhesive Tape

Maximum Case Thickness for Level Sensor:

1/2" (non-opaque)

CG-ELS+ HUB

Part Number:

CG-ELS+ HUB

Battery Strings:

Up to 4 Sensor strings containing 2, 4, 6, and 8 Volt batteries

Input Configurations:

Flexible configuration, typically 24, 48, 110/120, 220/240 and 480 Volt systems

ELS+ Sensor Arrangement:

600 Sensors per Hub with 150 maximum Sensors for each of the 4 Hub inputs

Multiple Hub inputs can be used on a single battery string to monitor all the cells within the battery string

Alarm output:

2 Form C Dry Contacts, 1A

Duplicate connector pins for alarm aggregation from multiple Hub units

LED Status Indicator:

Green (normal state), Red (alarm state)

Power Input:

120V/240V AC 50/60 Hz AC Wall Adapter to 12 Vdc at 2 Amps max.

Power Status LED:

Green when module power is on

Operating Temperature Range:

-10 to 65° C

Storage Temperature Range:

-20 to 70° C

Dimensions:

3.972" W x 2.023" D x 0.876" H
(100.9 mm W x 51.40 mm D x 22.25 mm H)

Enclosure:

94V-0 ABS Plastic Housing

Mounting:

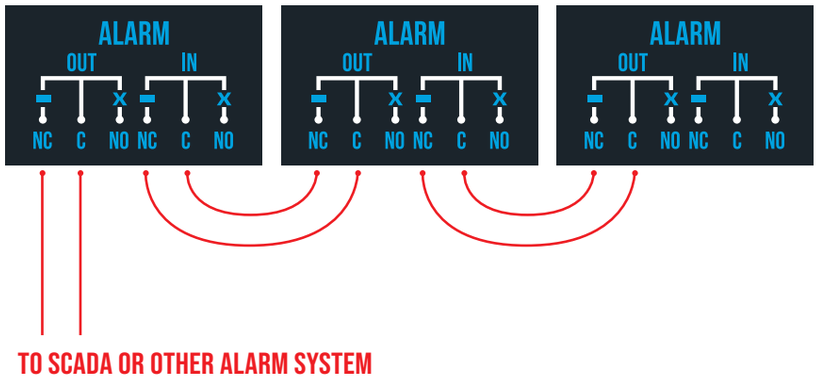
Cable Tie Brackets or Free Standing

If more than one Hub is used, each alarm output can be combined into a single dry contact alarm output. The alarm outputs of a total of 20 Hubs maximum can be wired together into a single output. There are two methods to wire the alarm outputs.

METHOD 1: ALARM EQUALS CLOSED CONTACTS

The Hub alarm outputs can be wired in parallel. According to the diagram, the NC and C of the alarm relay labeled OUT is wired to the NC and C of the alarm relay on the next Hub labeled IN. Since the hubs are wired in parallel, if any of the relays connect the NC with the C pin, the closure will be seen on the wires leading to the customers BMS or SCADA system.

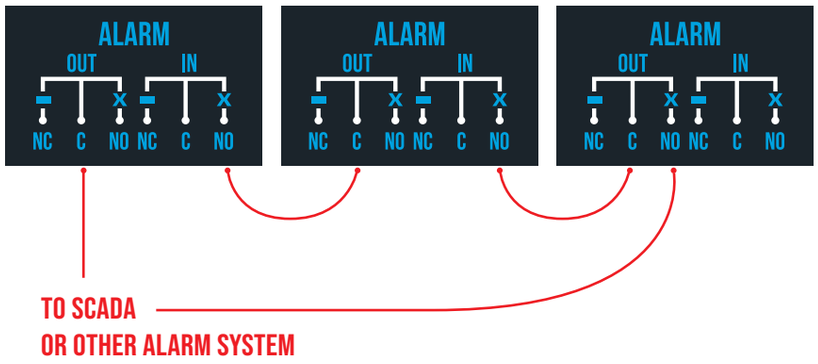
HUBS IN PARALLEL



METHOD 2: ALARM EQUALS OPEN CONTACTS

The Hub alarm outputs can be wired in series According to the diagram, the C of the alarm relay labeled OUT is wired to the NO and C of the alarm relay labeled IN. Since the hubs are wired in series, if any of the relays open the connection between the NO with the C pin, the open circuit will be seen on the wires leading to the customers BMS or SCADA system.

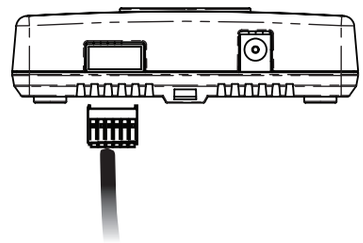
HUBS IN SERIES



4 CG-ELS+ HUB ALARM OUTPUT

Review this section if you are connecting the ELS+ Hub to an alarm system.

Connect wires from any alarm collection system to the green terminal block male connector on the normally open and/or normally closed CG-ELS+ Hub alarm output.



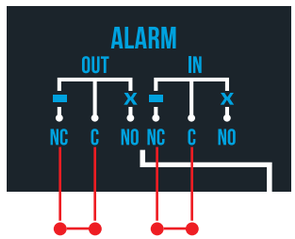
1) Connect the male green terminal block connector to the hub ALARM connector

.

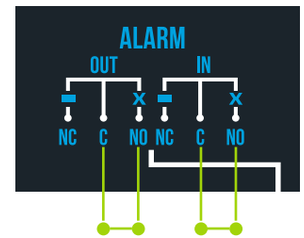
2) Hub alarm relay will switch to an ALARM state when the first sensor is connected.

3) The hub will be in ALARM state until the last sensor is installed and terminated.

4) During the alarm condition, the relay will connect the COMMON pin to the NORMALLY CLOSED pin. The alarm condition is considered the NORMALLY CLOSED condition, because if the hub loses power, the relay will revert to the alarm state.



Output Relay Connections in ALARM state



Output Relay Connections in NORMAL state

2.4 COMPONENTS

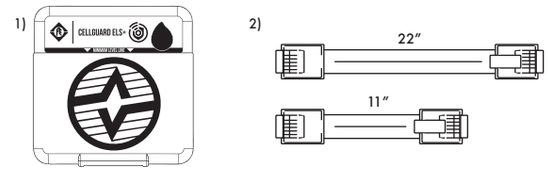
PLEASE NOTE:

Your CG-ELS+ System components will be in 3 packages.

PACKAGE 1

1. Sensor(s)
   (Part #: CG-ELS+ Sensor)

2. 22" Cables (Part #: 130-000526)
   11" Cables (Part #: 130-000525)



PACKAGE 2

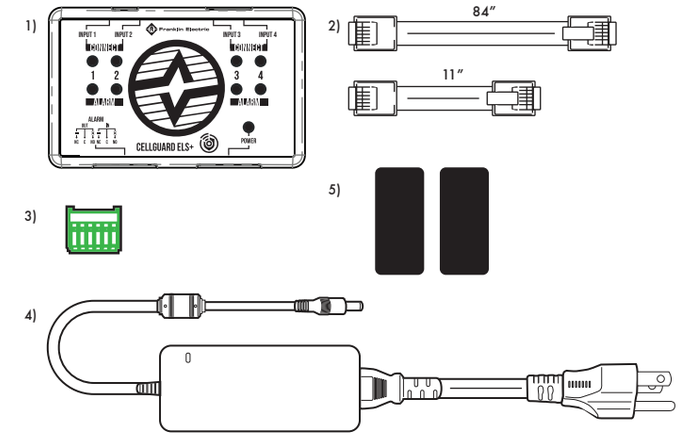
1. Hub
   (Part #: CG-ELS+ Hub)

2. 84" Cables (4)
   (Part #: 130-000527)
   11" Cable
   (Part #: 130-000525)

3. Green Terminal Alarm Block
   (Part #: 205-250021)

4. Power Supply
   (Part #: 157000042)

5. Dual Lock 3M Adhesive
   (Part #: 142-101A)



PACKAGE 3

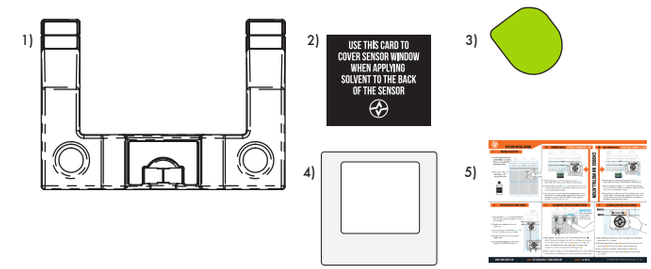
1. Alignment Bracket
   (Part #: 130-000749)

2. Proctective Window Cover
   (Part #: 130-000843)

3. Scraper Removal Tool
   (Part #: 130-000007)

4. Replacement Adhesive Pads (4)
   (Part #: 130-000080)

5. Quick Reference Guide
   (Part #: 167-000751)



RECOMMENDED

For easier removal when replacing a sensor on a battery it is recommended that you use:

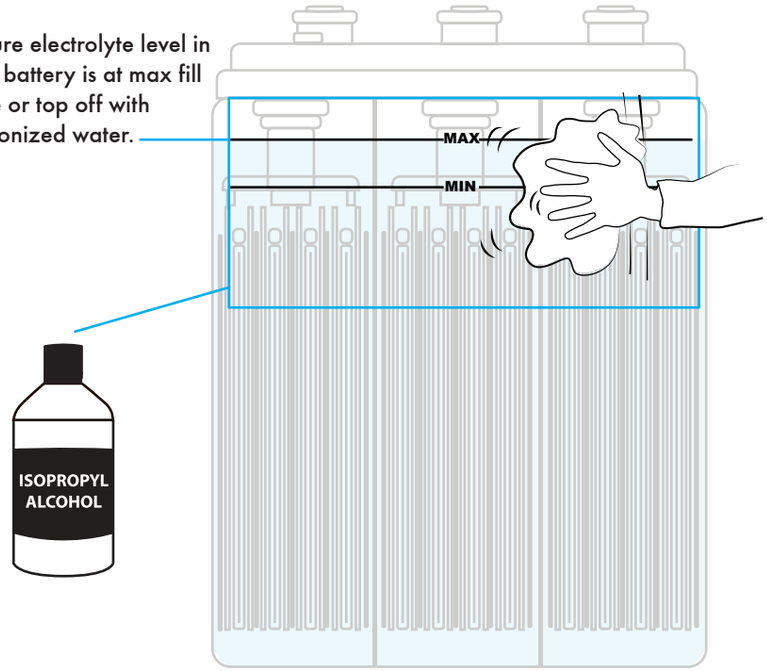
3M 6040 Citrus Based Adhesive Remover

Due to shipping restrictions, the adhesive remover is not included in the installation kit. It can be purchased from Allied Electronics or Amazon.com

3 INSTALLATION

3.1 PREPARE THE BATTERY

1) Ensure electrolyte level in the battery is at max fill line or top off with deionized water.

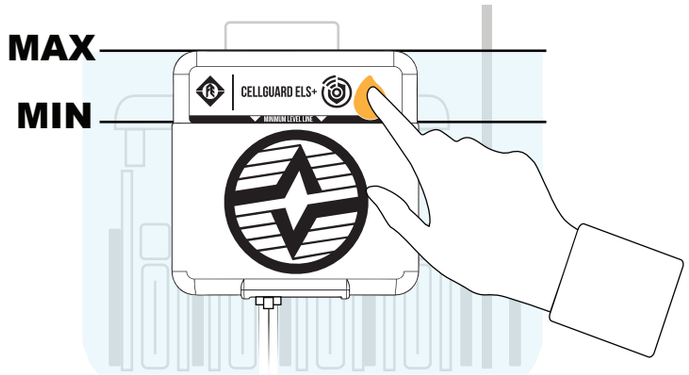


NOTE: Follow the battery manufacturer's recommended process for adding water to the battery.

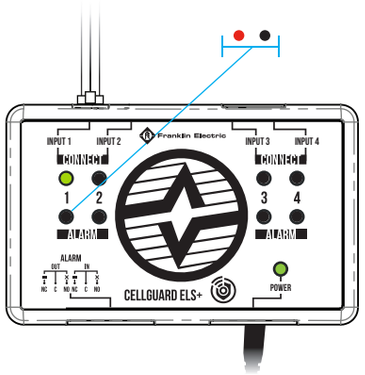
2) Clean the surface area of the battery, where the sensors will be installed, with isopropyl alcohol.

NOTE: The CG-ELS+ Sensor works with Non-Opaque battery cases that exhibit transparency to the electrolyte contained within.

3.6 CLOSING ALARM LOOP (FINAL SENSOR)



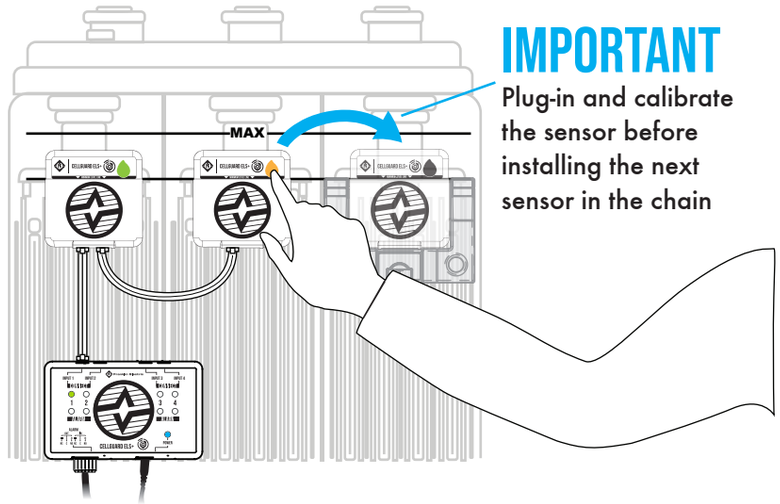
1) After calibrating the final sensor in the string, again press and hold the droplet button for 10 seconds.
2) When the droplet flashes orange release the button. The sensor will flash orange for 20 seconds while it closes the alarm loop.
3) When completed successfully, it will fast blink green 6 times.
4) After 6 fast blinks it will slow flash green and your string is setup and complete.



5) The ALARM LED on the hub will turn off when the setup is completed.

NOTE: For additional sensor chains, repeat steps 3.3 - 3.6.

3.5 CALIBRATION & CONNECTING MORE SENSORS



IMPORTANT

Plug-in and calibrate the sensor before installing the next sensor in the chain

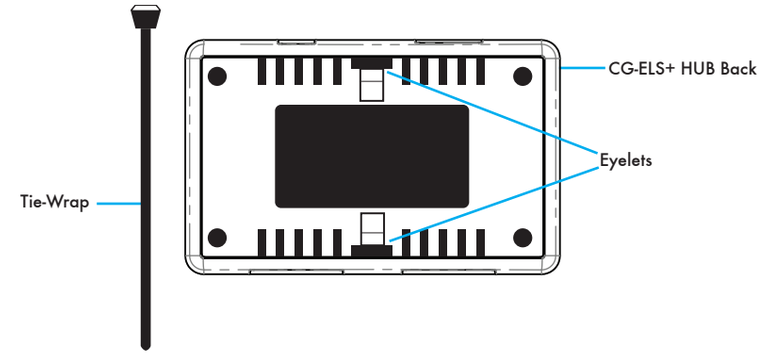
1) After plugging in the first Sensor, press and hold the droplet button. When first pressed, the droplet button will show solid green.

2) Continue to hold the droplet button until it turns orange (about 4 seconds). Then release.

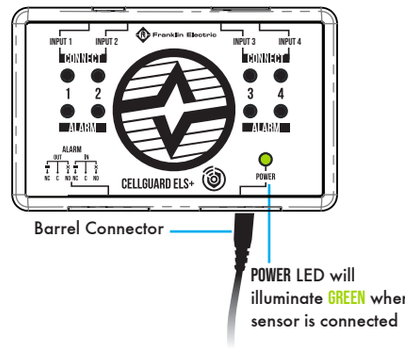
3) The droplet will stay solid orange for 10 seconds. When completed successfully, the droplet button flashes green.

4) When complete, install the next sensor utilizing Step 2 (A or B) and calibrate per Step 4 for each individual sensor until you reach the end of the string.

3.2 CG-ELS+ HUB MOUNTING AND WIRING

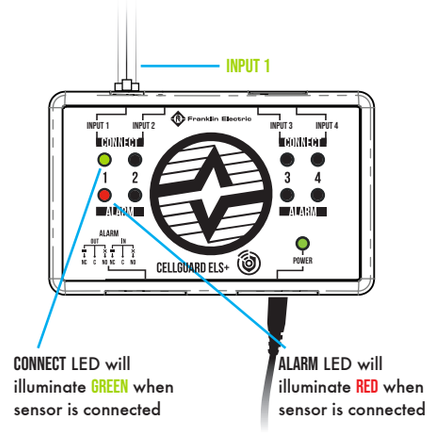


1) Mount hub on a surface top or rack, and secure enclosure with a tie-wrap inserted through the back side hub enclosure eyelets.



2) Connect the supplied 12V wall adapter power supply to local AC power.

3) Connect the wall power supply 12V barrel connector to the hub power input connector.



4) Connect RJ25 modular cable to one of the string inputs on the hub.

3.3 POWER UP THE CG-ELS+ SENSOR

1) Connect the other end of the RJ25 modular cable to the first CG-ELS+ Sensor connector

CG-ELS+ Sensor Left Side of Connector

1A) Place the RJ25 jack on the left side sensor connector if the battery numbering sequence is from left to right.

CG-ELS+ Sensor Right Side of Connector

1B) Otherwise, place the RJ jack on the right side sensor connector when the battery numbering sequence is from right to left.

1C) When first plugged in, the sensor droplet button will quickly first flash RED, then GREEN, then will turn off until startup has completed.

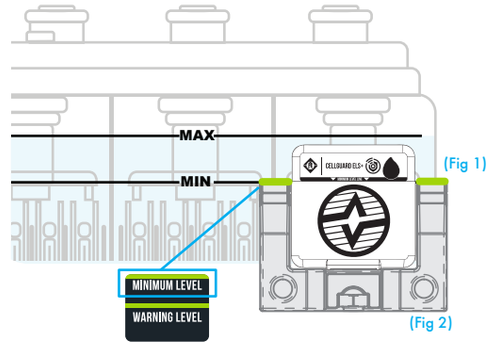
1D) If the sensor is new and uncalibrated, the sensor's droplet button flashes ORANGE.

If the sensor was previously calibrated, the sensor's droplet button flashes RED.

3.4 CHOOSE AN INSTALLATION METHOD

CHOOSE AN INSTALLATION

3.4 A STANDARD INSTALL - ALARMS AT MINIMUM FILL LINE

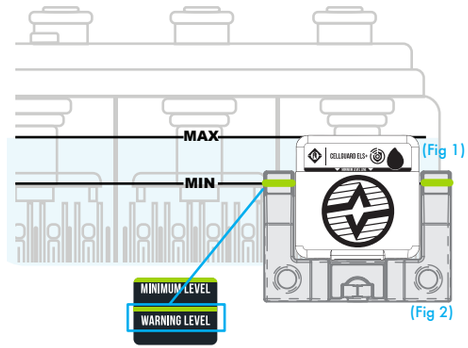


1) Peel the adhesive liner off of the back of the sensor (Fig 1), place aside within reach, bottom (adhesive side) facing up.

2) Using the Alignment bracket (Fig 2), place the Minimum Level Line over the Minimum Fill Line on the battery. Utilize the built-in level to be sure the bracket is straight.

3) Pick up the sensor with your free hand and lightly place it in the bracket. When confirmed straight, apply pressure to the sensor, hold for five seconds to allow the adhesive to stick cleanly to the battery casing. Repeat per sensor.

3.4 B EARLY WARNING INSTALL - ALARMS ABOVE MINIMUM FILL LINE



1) Peel the adhesive liner off of the back of the sensor (Fig 1), place aside within reach, bottom (adhesive side) facing up.

2) Using the Alignment bracket (Fig 2), place the Warning Level Line over the Minimum Fill Line on the battery. Utilize the built-in level to be sure the bracket is straight.

3) Pick up the sensor with your free hand and lightly place it in the bracket. When confirmed straight, apply pressure to the sensor, hold for five seconds to allow the adhesive to stick cleanly to the battery casing. Repeat per sensor.