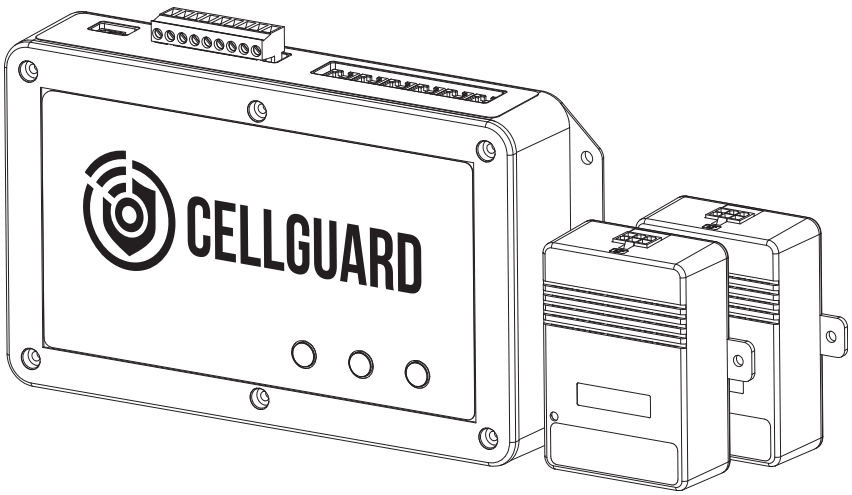
Franklin Electric
GRID SOLUTIONS

CELLGUARD™ WIRED BATTERY MONITORING SYSTEM FEATURING CONVERGE™ SOFTWARE

INSTALL GUIDE

10000014755 r1

WIRED BMS SYSTEM
CGBC-350-HWD



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10000014755 r1

CONVENTIONS USED IN THIS MANUAL

This manual includes safety precautions and other important information presented in the following format:

NOTE: This provides helpful supplementary information.

IMPORTANT: This provides important supplementary information and instructions to avoid damaging hardware or a potential hazard.

⚠ **CAUTION**: This indicates a potentially hazardous situation that could result in minor or moderate injury if not avoided. This may also be used to alert against unsafe practices.

⚠ **WARNING**: This indicates a potentially hazardous situation that could result in severe injury or death if not avoided.

⚠ **DANGER**: This indicates an imminently hazardous situation that will result in death if not avoided.

OPERATING PRECAUTIONS

⚠ **WARNING**: Important safety instructions. Before installing any Franklin Electric equipment, read this document 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.

⚠ **WARNING**: To reduce risk of battery explosion, follow these safety instructions and those published by the battery manufacturer and the manufacturer of any equipment to be used 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.

⚠ **WARNING**: Do not disassemble any equipment; contact Franklin Electric when a repair is required. Incorrect reassembly may result in a risk of electric shock, fire or other hazardous situation.

⚠ **WARNING**: Use Franklin Electric equipment in dry, well-ventilated area(s).

⚠ **WARNING**: Do not expose Franklin Electric equipment to rain, snow, or other moisture.

⚠ **WARNING**: To avoid electric shock when testing jars, abide by your company's safety practices and the following guidelines:

⚠ **WARNING**: Service work may only be performed by authorized personnel for procedures which they have satisfactorily been trained to execute.

⚠ **WARNING**: Refer to NFPA 70E for electrical safety requirements.

⚠ **WARNING**: Use of Personal Protection Equipment (PPE) and Protective Clothing per NFPA 70E guidelines is required. 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 re-extinguishers instead of water around battery systems.

⚠ **WARNING**: Always have someone within vocal range, or close enough to come to aid, when working around lead acid batteries.

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

⚠ **WARNING**: 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.

⚠ **WARNING**: Never smoke or allow a spark or flame in the vicinity of a battery or engine.

⚠ **WARNING**: Be extra cautious to reduce the risk of dropping a metal tool onto the battery or other component, potentially causing a spark, short circuit or other electrical part to possibly explode.

⚠ **WARNING**: 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.

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

⚠ **WARNING**: Do not disconnect the battery cables from power systems during the test without authorization.

⚠ **WARNING**: Do not place yourself in an electrical circuit.

⚠ **WARNING**: Avoid simultaneous contact with the jar and with the battery cabinet, racks, or hardware that may be grounded.

⚠ **WARNING**: 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.

⚠ **WARNING**: Protective features of this system may be compromised if not used in accordance with these instructions.

Contents

1 Introduction

The CELLGUARD™ Wired Battery Monitoring System (BMS) delivers economical, yet highly accurate and reliable remote health analysis of stationary batteries in applications with high electromagnetic noise.

1.1 Documentation

- This document is intended for qualified and certified installation persons.
- Instructions of this document are in English. All other language versions are translations of this original document.
- Illustrations in this document show a typical setup and are for instruction and description purposes only.
- The information given in this document is given as a guide only. It is the installer's responsibility to ensure that correct and safe procedures are followed.

1.1.1 Symbol Legend


Wear Protective Headwear


Wear Eye Protection


Wear Protective Clothing


Wear High-Visibility Clothing


Wear Protective Gloves


Wear Safety Footwear


Refer to instruction guide


Connect an earth terminal to the ground


Lockout/Tagout Electrical Equipment


Disconnect main plug from electrical outlet


Disconnect before carrying out maintenance or repair.


Warning: Electricity


General Warning


Warning: Flammable Material


No open flame; Fire, open ignition source and smoking prohibited

2 Safety/Security

2.1 General Safety Information

- Only perform procedures in this document that you are qualified and certified to perform.
- Personnel working on or with energized equipment must be authorized by relevant regulatory bodies to carry out such work and must have the appropriate training. Check with your employer and relevant regulatory body's rules for working with energized equipment.
- Obey all local laws, rules, regulations, and instructions in this document. In case of inconsistency or contradiction between information contained in this document and any laws, rules and regulations, obey the stricter of the two.
- Keep unqualified personnel at a safe distance during installation.
- Always wear all required PPE on-site and during installation.
- If it is necessary to remove safety/security devices, immediately reinstall the safety/security devices after completing the work.

2.2 Hazard Assessment

Prior to beginning work and prior to recommencing work after leaving and returning to the worksite, a worksite, *pre-job hazard assessment* must be performed to identify safety and environmental needs. At a minimum, this hazard assessment should:

- Identify possible hazards and risks.
- Identify the safety needs of the job.
- Identify the correct procedures, practices and equipment.
- Eliminate unsafe conditions and actions from the worksite.
- Identify the need for personal protective equipment.
- Inspect equipment before use.
- Confirm sheaths of all cables are secured and undamaged.
- Confirm plugs and connectors are properly connected and serviceable.
- Perform ongoing risk assessment during the project.

2.3 Required Personal Protective Equipment (PPEs)

These PPEs are required during all phases of installation.


Wear Protective Clothing


Wear Eye Protection


Wear High-Visibility Clothing


Wear Protective Gloves


Wear Protective Headwear


Wear Safety Footwear

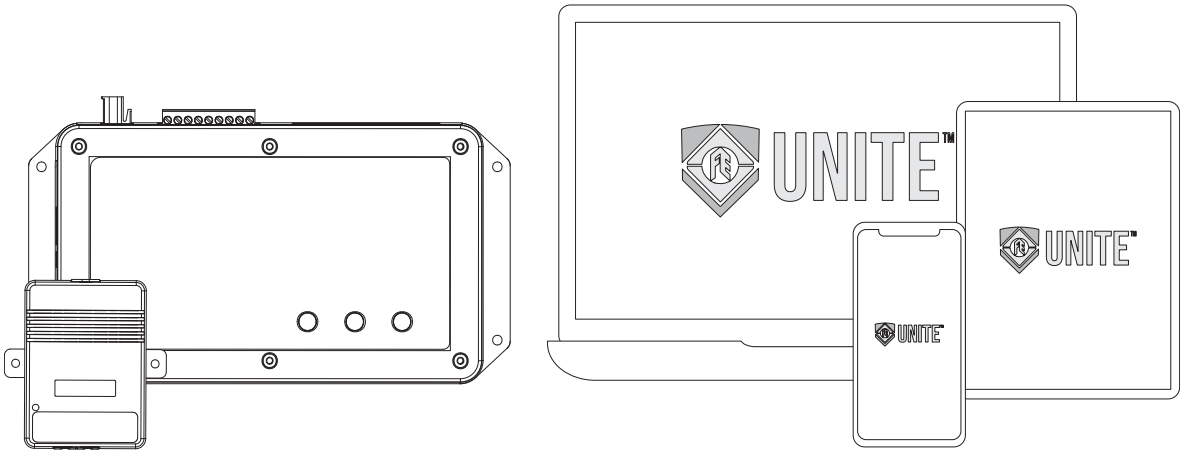
2.4 Cyber Security

This product is designed to be connected to and to communicate information and data via a network interface. It is solely the owner's responsibility to provide and continuously ensure a secure connection between the product and Owner's network or any other network (as the case may be).

The Owner shall establish and maintain appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

The manufacturer. Franklin Electric, and its affiliates are not liable for damages and/or losses related to such security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

3 Technical Overview



The Franklin Electric Wired Battery Monitoring System (BMS) consists of three primary components:

- *Battery Sensor* – which measures voltage, temperature, and internal resistance of batteries.
- *String Sensor* – which detects discharge events, measures battery string current, and ambient temperature.
- *Base Coordinator Unit (BCU)* – which receives battery and string sensor report data, communicating the information to UNITE™.

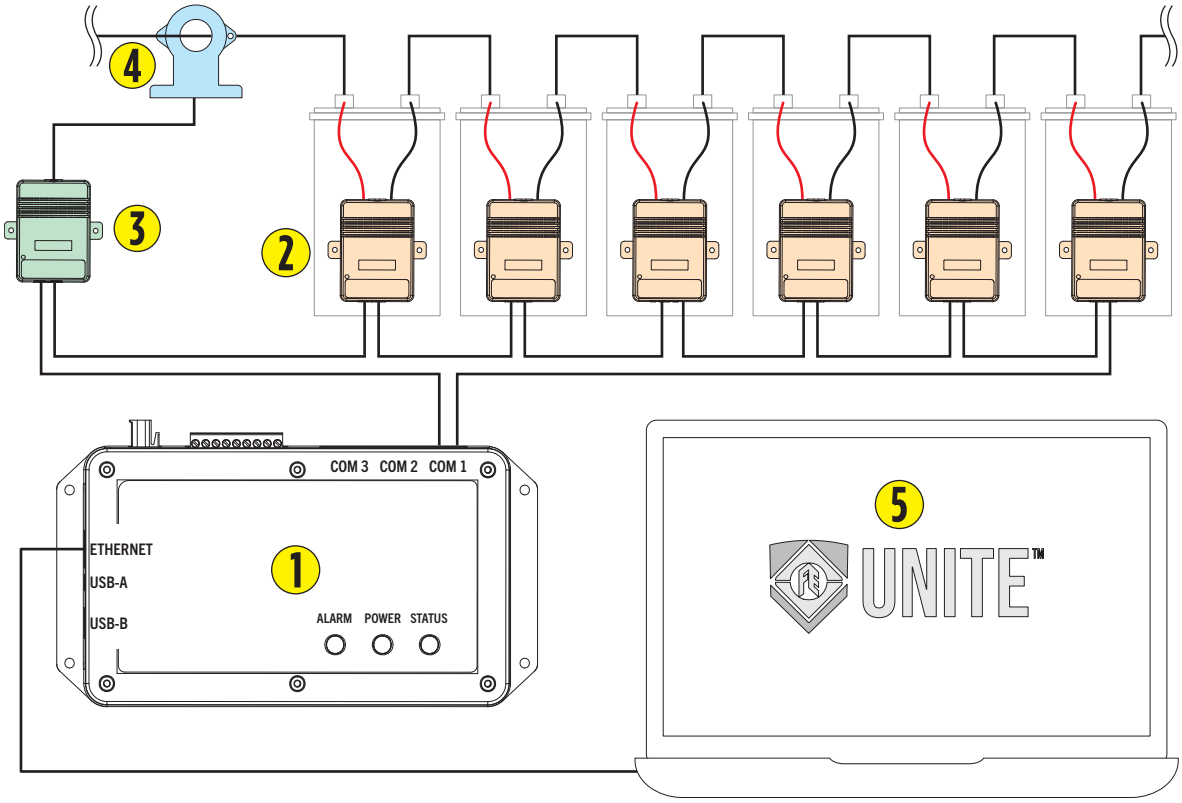
By design, these three components make up a simple, reliable system that seamlessly works with UNITE™.

UNITE™ is Franklin Electric's sophisticated IoT asset management database that features advanced data visualization tools for Franklin Electric handheld battery testers and battery monitoring systems. UNITE™ provides centralized data storage for an entire network of battery plants, enabling remote analysis and reporting from a centralized location via the CONVERGE™ web interface.

Base Coordinator Unit (BCU)

- Communicates with UNITE™ through Ethernet (RJ-45).
- User can view or monitor data via Web browser.
- System can be configured via a Web browser.

3.1 System Components



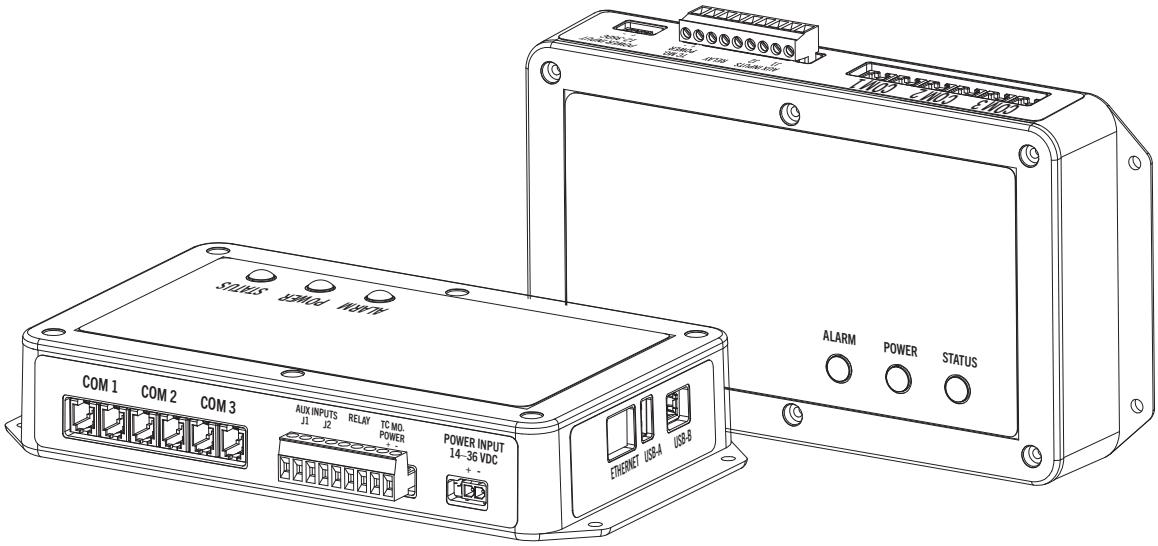
Component List

1. Base Coordinator Unit (BCU)
2. Battery Sensor
3. String Sensor
4. Current Transducer (CT)
5. UNITE™ Asset Management Database

Standard Configuration

- Allows online monitoring of:
  - Battery Voltage
  - Battery Internal Resistance
  - Battery Temperature
  - String Voltage
  - Charge/Discharge Current
  - Ambient Temperature
- Provides Automatic Outside Threshold Warnings and Alarms
- Provides data storage functions and can upload data though Ethernet (RJ-45) network connections
- Two dry-contact inputs
- One Form C alarm Relay Output

3.1.1 Base Coordinator Unit (BCU)



General Functions

- Connects through either an Ethernet (RJ-45) providing centralized management and the ability to view the health of battery string.
- Read monitored values one-by-one providing analysis and processing of data received from sensors.
- Maximum of six battery strings for each BCU connecting two strings per COM port.
- Sensors are connected through a UART bus, back to the BCU.

Specific Functions

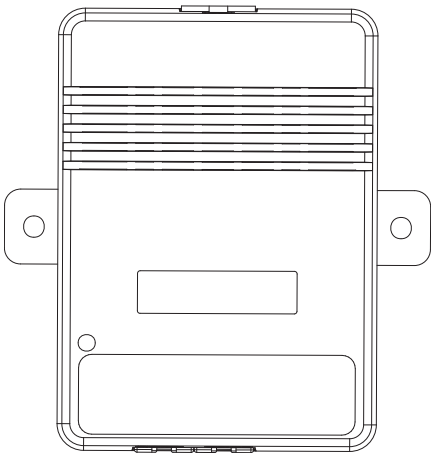
- Reads each sensor in series to the end strings or strings including string sensors.
- Parameters for string(s) set up in the web interface, including upper and lower alarm limits.
- Automatic alarm function (when an alarm occurs, the Alarm LED flashes red).
- COM ports are RJ-22 RS-485 Serial.
- Power Option (BCU):
  - **CGBC-DC-72-WD** => 18–72 VDC
  - **CGBC-AC-264-WD** => 85–264 VAC & 120–370 VDC
  - **CGBC-DC-1500-WD** => 200–1500 VDC

CGBC-DC-72-WD

CGBC-AC-264-WD

CGBC-DC-1500-WD

3.1.2 Battery Sensors

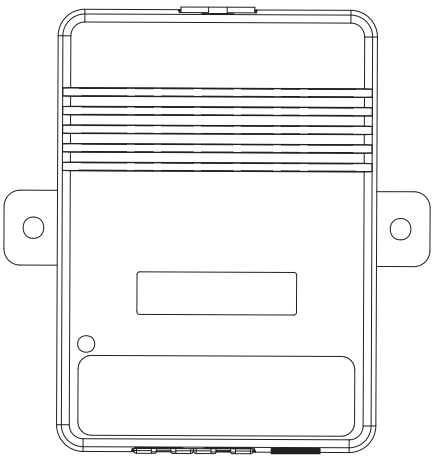


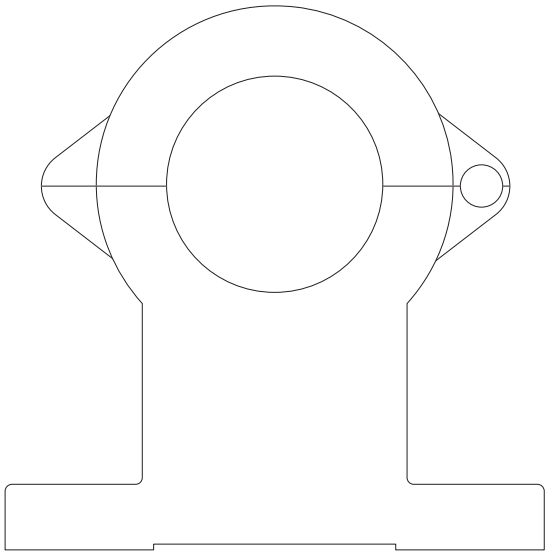
- Monitor voltage, internal resistance and temperature of each battery, uploading the data through a COM port.
- Are powered by the monitored battery.
  - 2 V Sensor, 2 V @ 13 mA
  - 6 V Sensor, 6 V @ 7 mA
  - 12 V Sensor, 12 V @ 7 mA

  IMPORTANT: Must be installed on a battery with the appropriate voltage for the sensor or the unit can be damaged:
  - 2 V lead-acid battery
  - 6 V lead-acid battery
  - 12 V lead-acid battery
- Measuring circuits without a “measuring catagory”

3.1.3 String Sensors

- Monitor ambient temperature and the charge/discharge current for one battery string.
- Require separate string sensors for each battery string.
- Communicate with the BCU through serial ports.
- The discharge current threshold is -10 A with a sample rate every second.

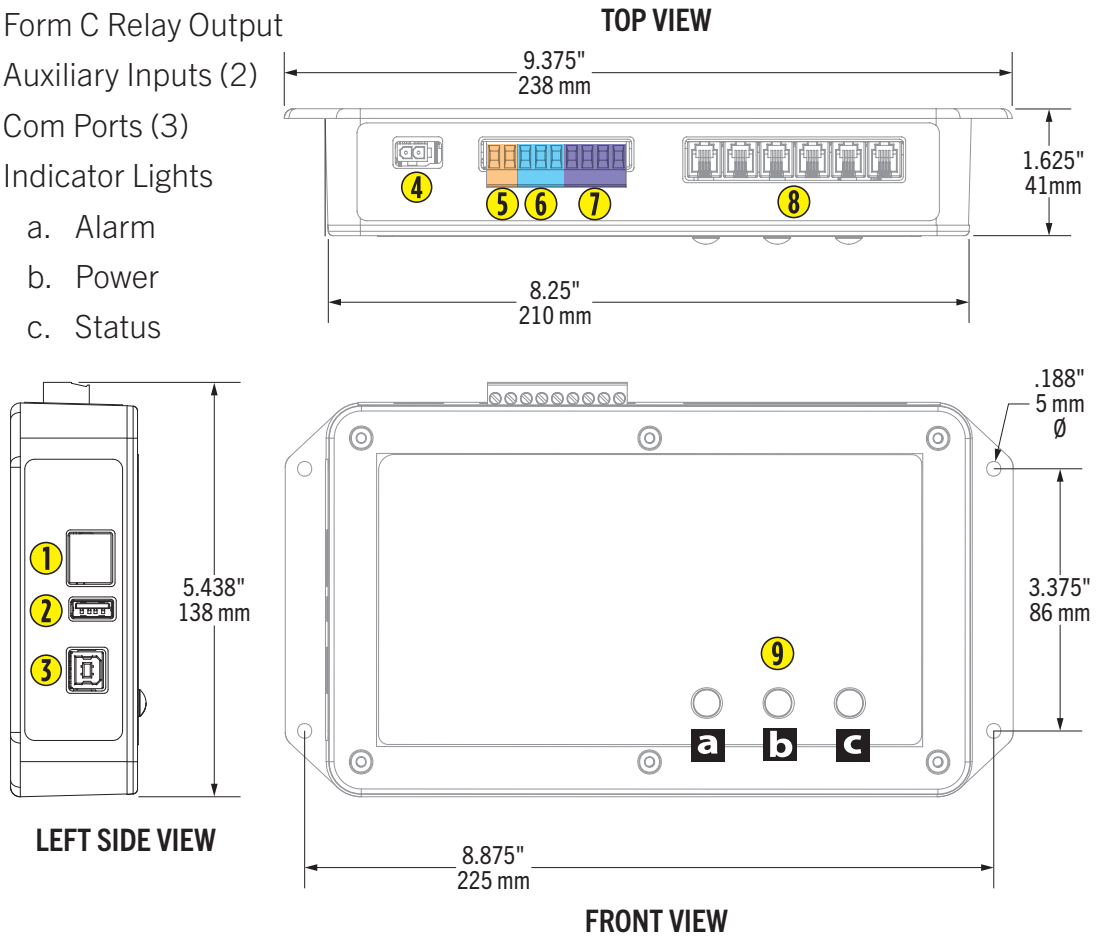




3.2 Dimensions & Identification

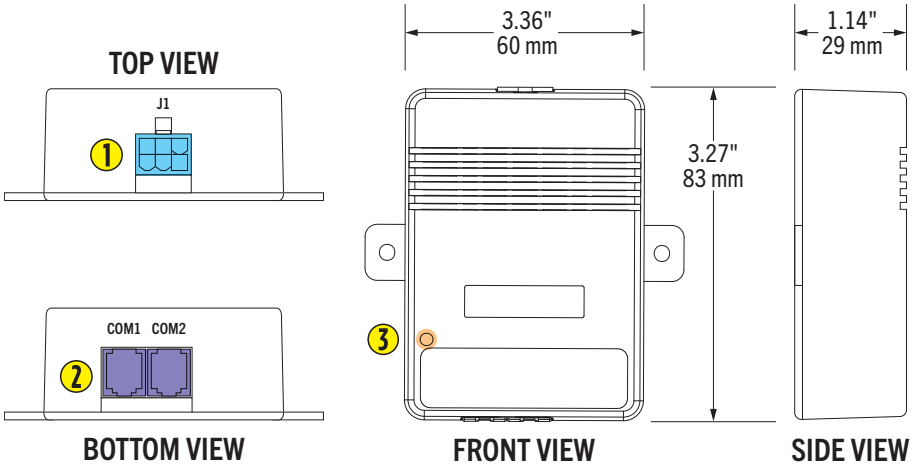
3.2.1 Base Coordinator Unit (BCU)

1. Ethernet Port
2. USB-A Port
3. USB-B Port
4. Power Input
5. TC String Sensor Power
6. Form C Relay Output
7. Auxiliary Inputs (2)
8. Com Ports (3)
9. Indicator Lights
    a. Alarm
    b. Power
    c. Status



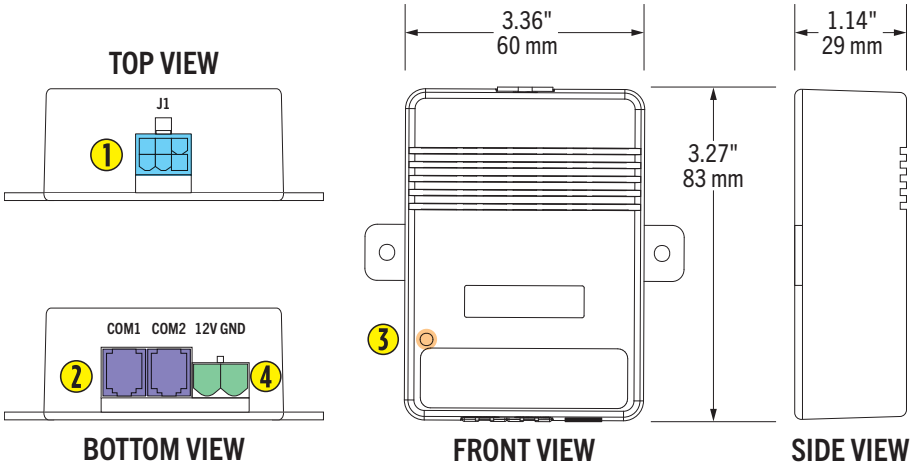
3.2.2 Battery Sensor

1. Battery cable harness connector
2. COM1/COM2 Ports
3. Indicator Light



3.2.3 String Sensor

1. CT cable harness connector Module Port
2. COM1/COM2 Ports
3. Indicator Light
4. Power Input



3.3 Specifications

Environment

Feature	Description
Location	Indoor Use Only
Temperature Range	14° F – 122° F (-10° C – 50° C)
Relative Humidity	5–95% RH
Altitude	Up to 6562' (2000 M)
Pollution Degree	2

Monitoring Capability

Feature	Description
Maximum Batteries Per String	180
BCU String Maximum	6
BCU Battery Maximum	360

General Weight & Capacity

Feature	Description
Battery Types	2 V, 6 V, 12 V (capacity less than 3000 AH)
Insulation	2000 VAC
Weight (Coordinator)	0.3 Kg
Weight (Battery Sensor)	75 g
Weight (String Sensor)	80 g

Controller Communication

Feature	Description
Serial Port	RS-485 Modbus/RTU
RJ-45 Port	SNMP, Modbus/TCP
RJ-22 Port	3 sensor COM ports

Power Requirements

Feature	Description
BCU	14–36 VDC 40 W, external power supplies available
Battery Sensor	<13 mA (2 V) or 7 mA (6 V, 12 V) from battery
String Sensor	10.8–13.8 VDC, 2 W, power from control module

Measurement & Accuracy

Component	Range	Accuracy
String Voltage	20–800 V	±0.5%
Battery Voltage	2 V, 6 V, 12 V	±0.1%
Battery Resistance	50–65535 uΩ	±2%, uΩ
Battery Temperature	-5° C–99.9° C	±1° C
String Current	0–1000 A	±2%
Ambient Temperature	-5° C–99.9° C	±1° C

Approvals & Certifications

Agency	Type/Document
EMC Certification	» CISPR 11 » IEC 61000-4-2 » IEC 61000-4-3 » IEC 61000-4-4 » IEC 61000-4-5 » IEC 61000-4-6 » IEC 61000-4-11
CE & FCC	» Compliance

3.4 Accessories

TABLE 3.2

Accessory	Description	Product Image
Battery Terminal Tabs	Installed on battery terminal posts. » 8-packs of battery tabs are included with CELLGUARD™ Wired Battery Monitoring systems at no cost, however, quantities must be specified upon ordering.	
Sensor Module Address Modifier (CGS3-AMM-WD)	Used to address string and battery sensors. » 3 AA Batteries *required*. » *Batteries are not included.*	
String Sensor Cable	*Included* with string sensors.	
Interconnect Cable	Used to connect string and battery sensors to the BCU. » *Required for the system.* » *Included with string sensors.* » *NOT INCLUDED with battery sensors.* » 13" and TC-8 m (25")	
Battery Sensor Cable	» *Required* for the system. » *NOT INCLUDED* with the sensors.	

4 Installation

NOTE: When the installation is complete, leave this guide for the owner or operator.

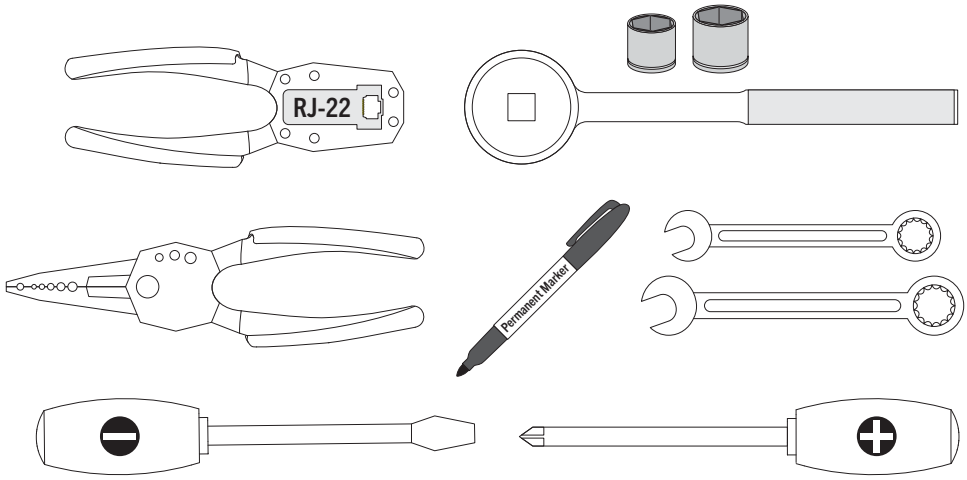
4.1 Pre-Installation Inspection

Upon Receipt of Item(s)

- Verify all items are in accordance with the order.
- Check all items for damage.
- If any item shows damage or is not in accordance with the order, inform Franklin Electric *immediately*.
- Remove the packaging material.
    - Follow all local laws, rules and regulations regarding disposal of discarded parts, packaging material or items and any subsequent components.

4.2 Required Tools

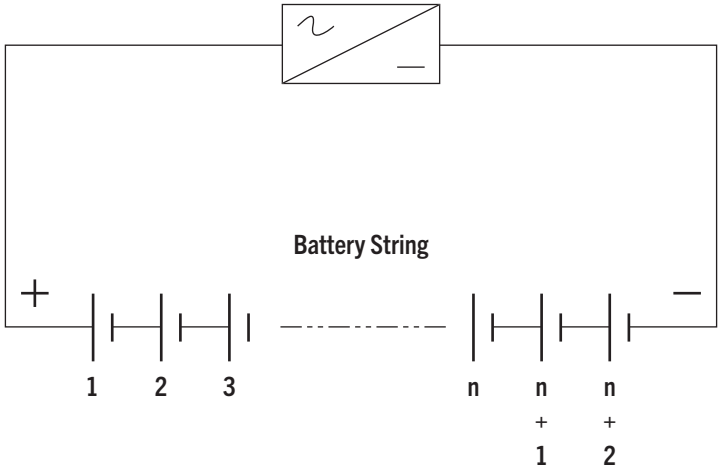
⚠ **WARNING**: Ensure that all tools used are properly insulated and rated for the task being performed to prevent the risk of electrical damage or harm.



4.3 Install Instructions

4.3.1 Numbering Batteries

Before connecting the battery sensors to the batteries, label and number both the battery sensors and batteries clearly.

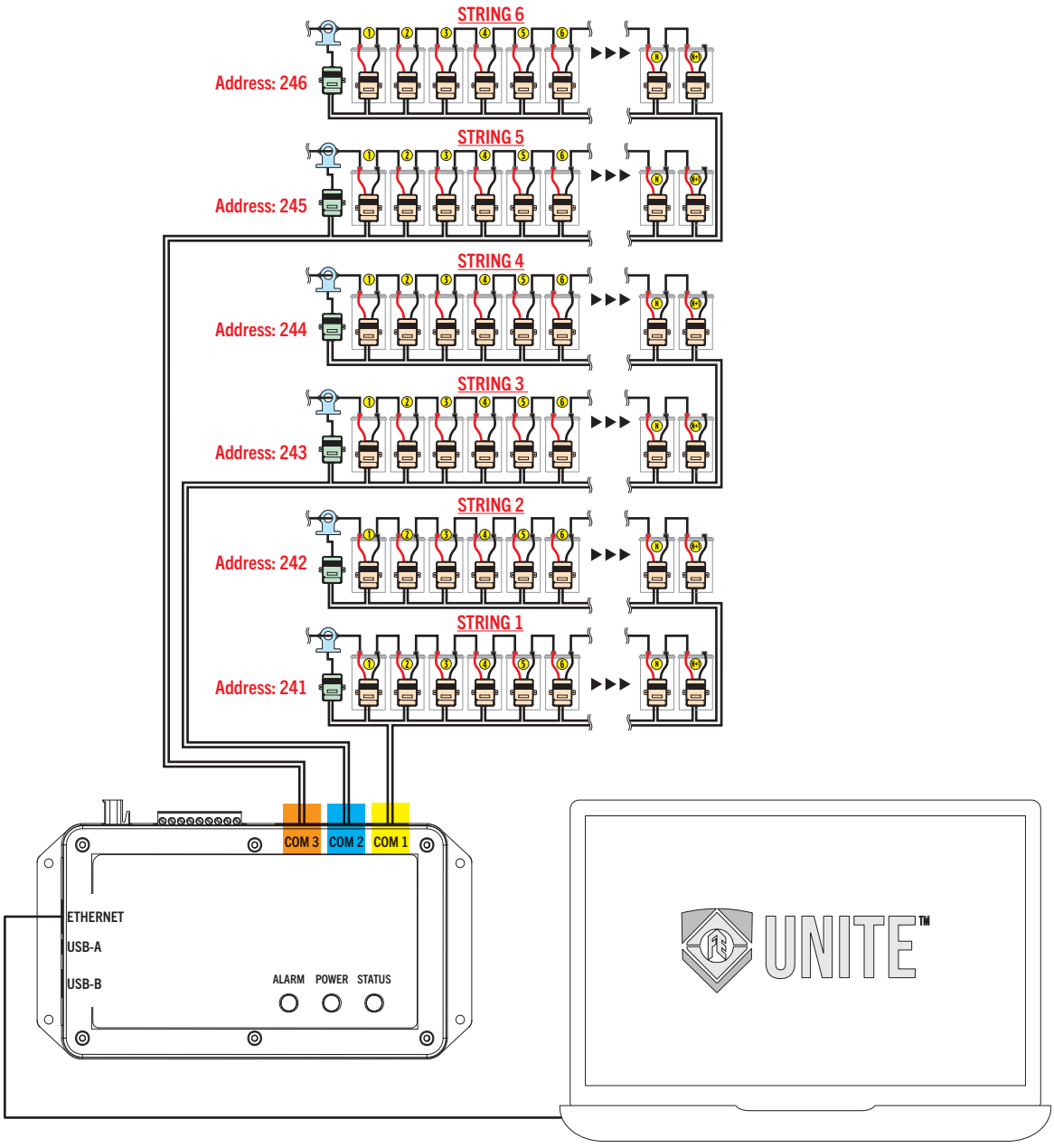


- The first battery, or battery NO.1, must be the first one on the string's positive terminal, the NO.2 is the battery following the NO.1 battery, and so on:
  - Multiple strings with separate ports and sensors in parallel:
    - Each string starts with 1 and continues to the last battery in the string.
    - Each string requires a string sensor.
    - Example: 120 Batteries consisting of two strings of 60:
      - String 1: 1–60 (addressing).
      - String 2: 1–60 (addressing).

  NOTE: All string sensors must have different addresses (starting at 241 and incrementally increasing in order in configuration up to address 246).

  - Multiple strings that use the same port (maximum two strings) with sensors in series:
    - String 1: 1–30 (addressing).
    - String 2: 31–60 (addressing).
    - Second string sensor (has an address different from the first).
- The last battery is the one attached closest to the string negative terminal. Number the batteries according to this practice.

NOTE: The BMS is a multiple string system. COM ports 1–3 on the BCU are capable of supporting two strings (six strings maximum) for each COM port.

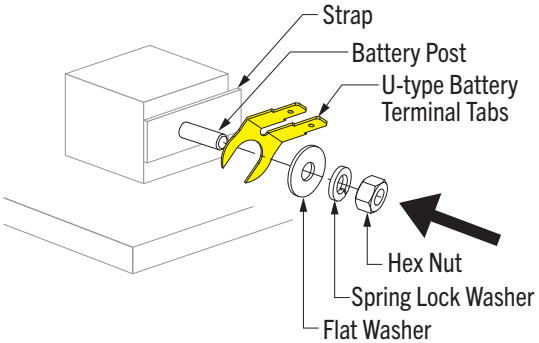


4.3.2 Battery Terminal Tabs

Install the U-type battery terminal tabs (sold separately) on each post on top of the batteries to be monitored. Install the terminals in the following order:

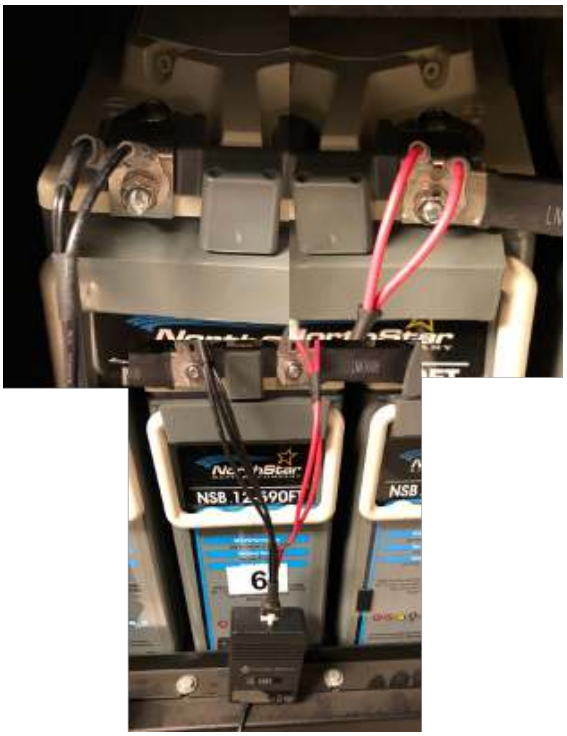
- U-type battery terminal tabs > Flat washer > Spring washer > Nut (or bolt).

NOTE: Use torque specs supplied by battery manufacturer when installing terminal tabs.



4.3.2.1 Installing Battery Sensor Cables

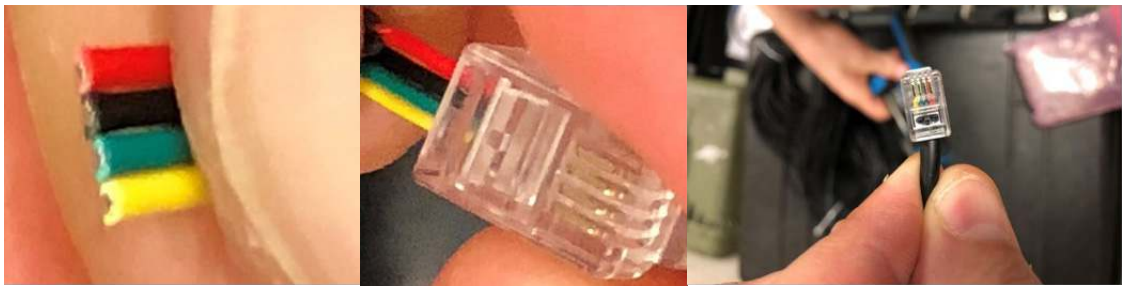
1. Attach the appropriate end of the battery sensor cable to the tabs on the U-type battery terminal tabs.
2. Plug the battery sensor cable into the battery sensor connector.

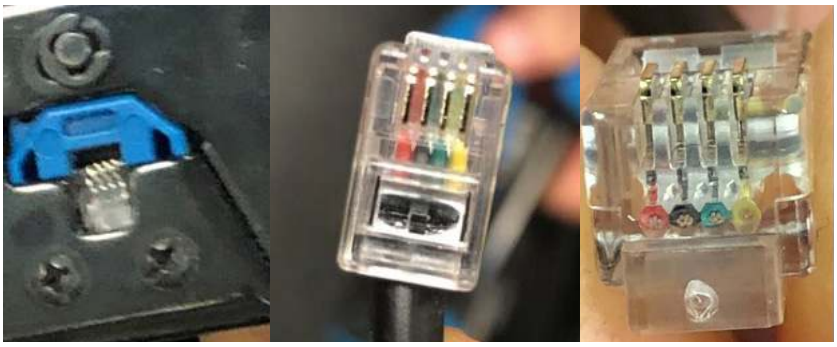


4.3.2.2 Creating Custom Length Sensor Cables

IMPORTANT: You must use an RJ-22 crimping tool.

1. Cut CGS3-800CBL-WD cable to the length required.
2. Crimp the cable ends with RJ-22 connectors.





4.3.2.3 Addressing Battery Sensors

1. Make sure the sensors are secured on the batteries, and confirm the power light in the lower left corner is green.
2. To use the Address Modifier (provided):
   - Connect the connector wire to the Address Modifier and COM1 of the sensor.
   - Press the up or down arrow at the bottom of the Address Modifier until the desired address number appears on the Address Modifier display (1–240).
   - Press Enter (the Active light flashes green).
   - After the address is changed, the Address Modifier changes to the next address automatically.
   - Connect the Address Modifier to the next sensor, and press Enter until the entire string is addressed.

IMPORTANT: Sensors will not address if the cable is connected to COM2. Make sure only the Address Modifier is connected to the sensor when you attempt to the address the sensor.

4.3.2.4 Addressing String Sensors

The default string sensor address is 241, but you can choose an address from 241–246. If you are monitoring only one battery string, the address can remain the default.

To change the address:

1. Connect the Address Modifier to COM1 on the string sensor.
2. Turn on the Address Modifier power switch.
3. Press the ESC button.
4. Use the arrow buttons to change the address.
5. Press Enter to select the next digit. After you set the last digit, press Enter.
6. Press the arrow to select H-C, and then press Enter.
7. When “96” appears in the address modifier display, press Enter. The address will appear in the display.*
8. Press Enter. When the ACTIVE light turns green, the change is complete.

NOTE: *Step 7 is necessary on older addressing modules

4.3.3 Connecting BCU & String / Battery Sensor COM Ports

BCU

a. COM1 Ports on the BCU:
   - Facing BCU COM Ports. COM1 left port to either String Sensor Port.
   - Facing BCU COM Ports. COM1 right port to COM 2 port of the last battery sensor in String 1 (or String 2 if configuring two strings).
   - Repeat for BCU COM 2 and COM 3 ports if configuring additional strings.

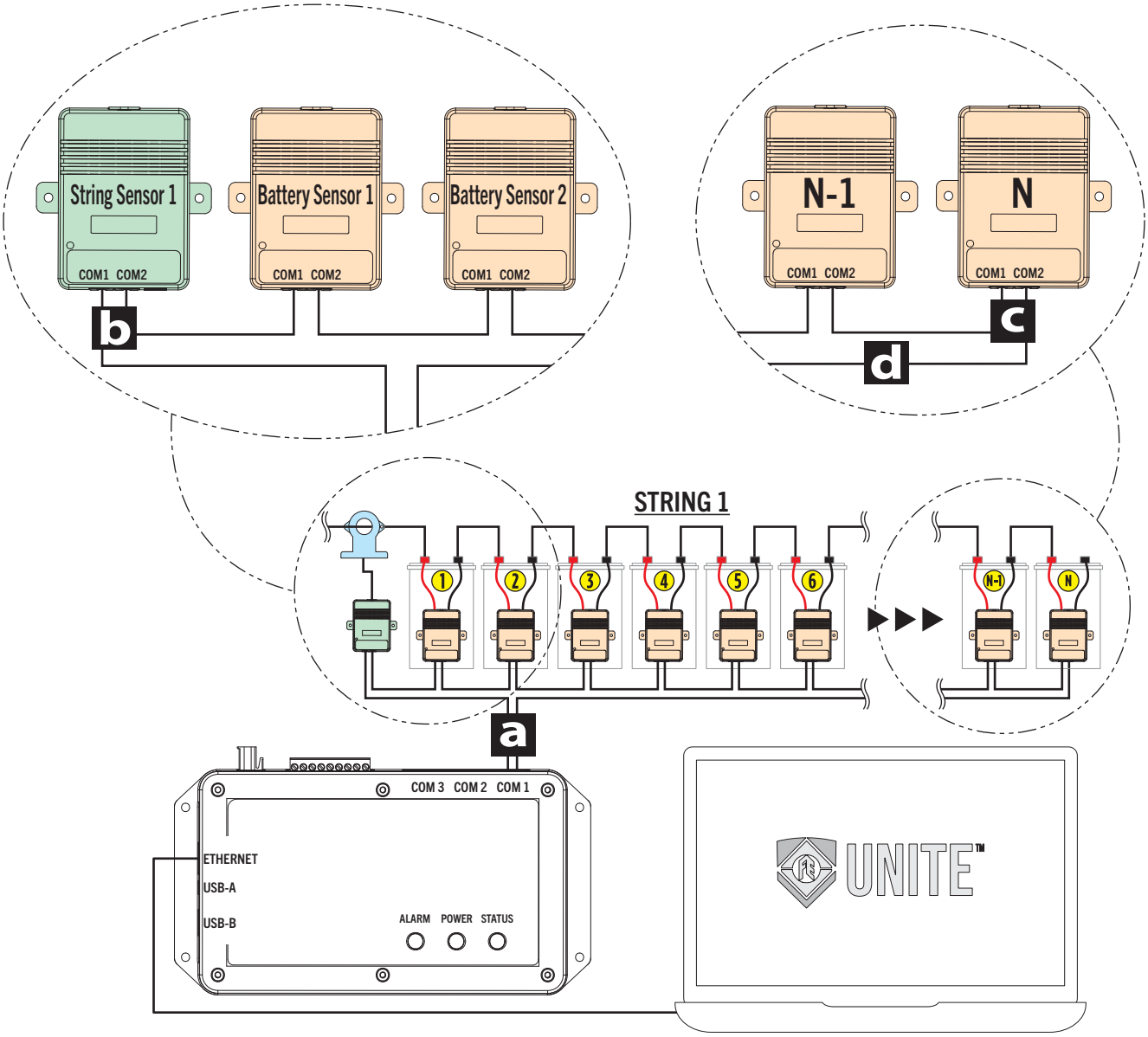
String Sensor

b. COM1 and COM2 operate identically once the string sensor is addressed.

Battery Sensor 1

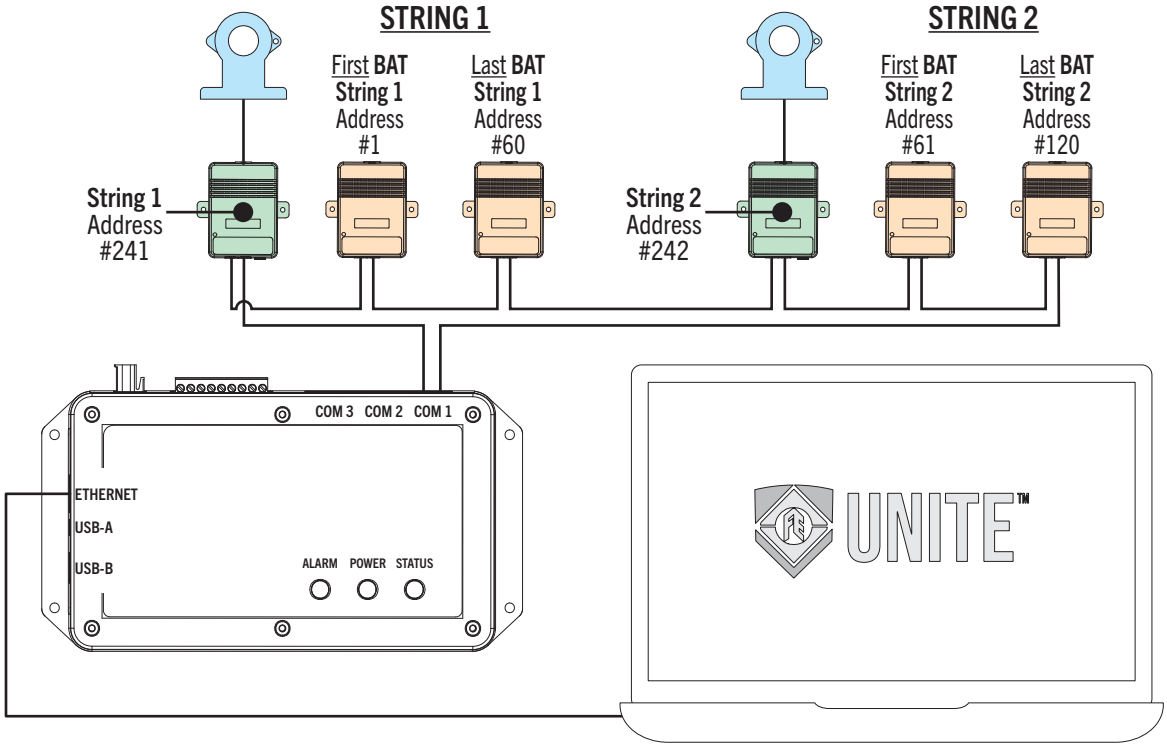
c. COM1 and COM2 operate identically once the battery sensor is addressed.

d. The last battery sensor in the string (COM2–battery sensor), *must run back to the right port on COM1 of the BCU.*



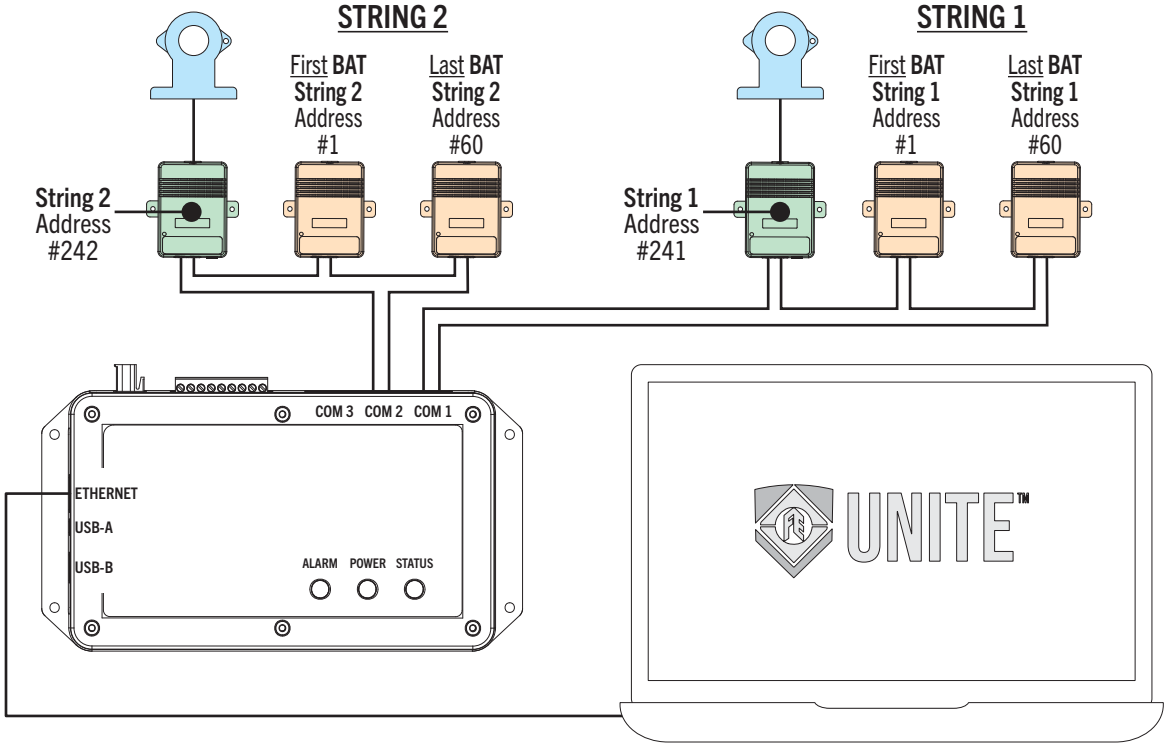
4.3.3.1 Connecting String Sensor COM Ports (Series)

NOTE: This wiring method uses the same COM port where in String 2, battery sensors must continue numeric sequence.



4.3.3.2 Connecting String Sensor COM Ports (Parallel)

NOTE: This wiring method uses multiple COM ports where String 2, battery sensors restarts numeric sequence.



4.3.4 Connecting BCU & String Sensor Power

BCU

IMPORTANT: These terminals are at the far end of the terminal strip, to the left of J1.

- RED (+) on left.
- BLACK (–) on right.

String Sensor

- String (12–13 VDC - @ 1 W - from the BCU):
  - Wire (18–22 AWG).
  - RED (+) on left.
  - BLACK (–) on right.

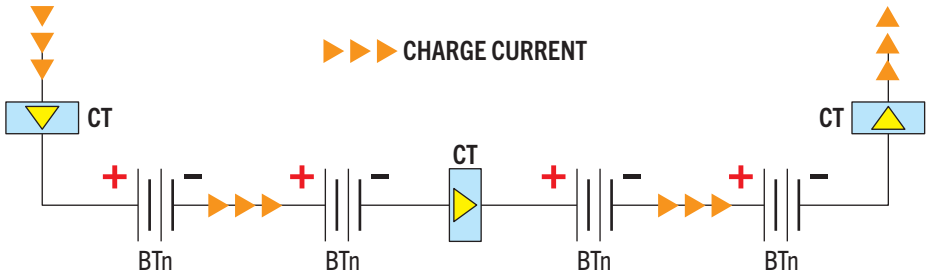
Multiple String Sensors

Power is daisy chained from one string sensor to another.

4.3.5 Connecting A CT Sensor

- Use the provided string sensor cable harness to connect to the string sensor:
  - A 4-pin terminal connects to the CT sensor.
  - A WHITE, six-section plug connects to the top of string sensor.
  - The direction indicated on the CT sensor should be the same direction as battery charging current.
  - The current transducer can be placed in any location of the battery string as long as the arrow points to a positive battery terminal and/or away from a negative battery terminal.

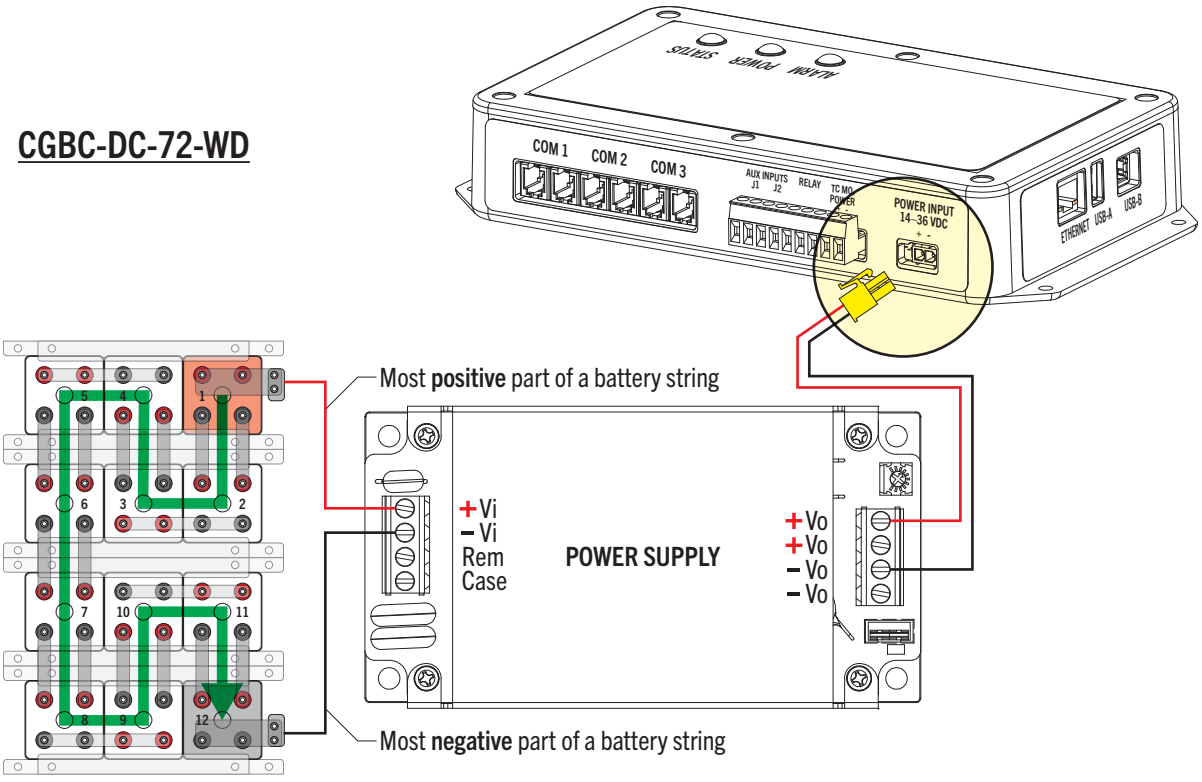
1. Separate the CT by unfastening the retaining screw.
2. Mount the CT on the string cable in front of the positive post of a battery in the string.
3. Refasten the retaining screw and secure with a cable tie.



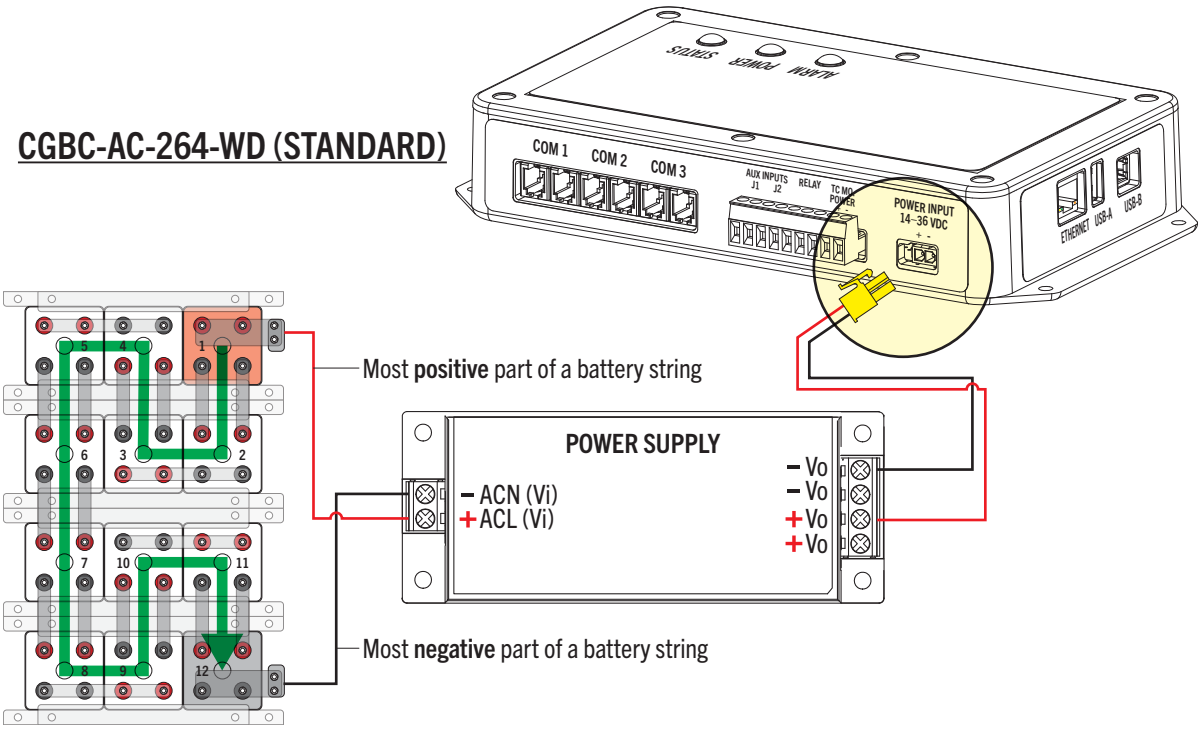
4.3.6 Connecting BCU To Power Supply

1. Wire the input power cables to the input ports of the power supply.
2. Wire the cables of the 2-pin connector to the output of the power supply.
3. Wire the input power to the necessary input power.
4. Plug the 2 Pin connector into the BCU Port.

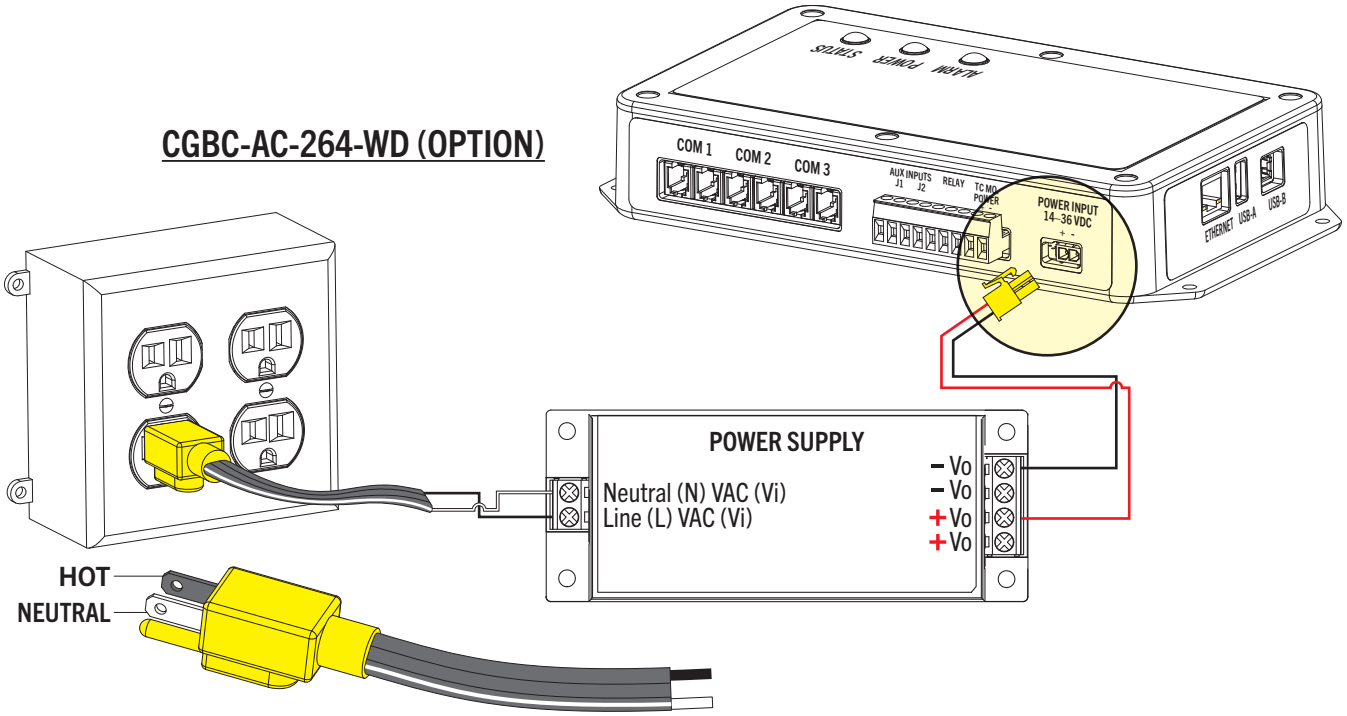
CGBC-DC-72-WD



CGBC-AC-264-WD (STANDARD)

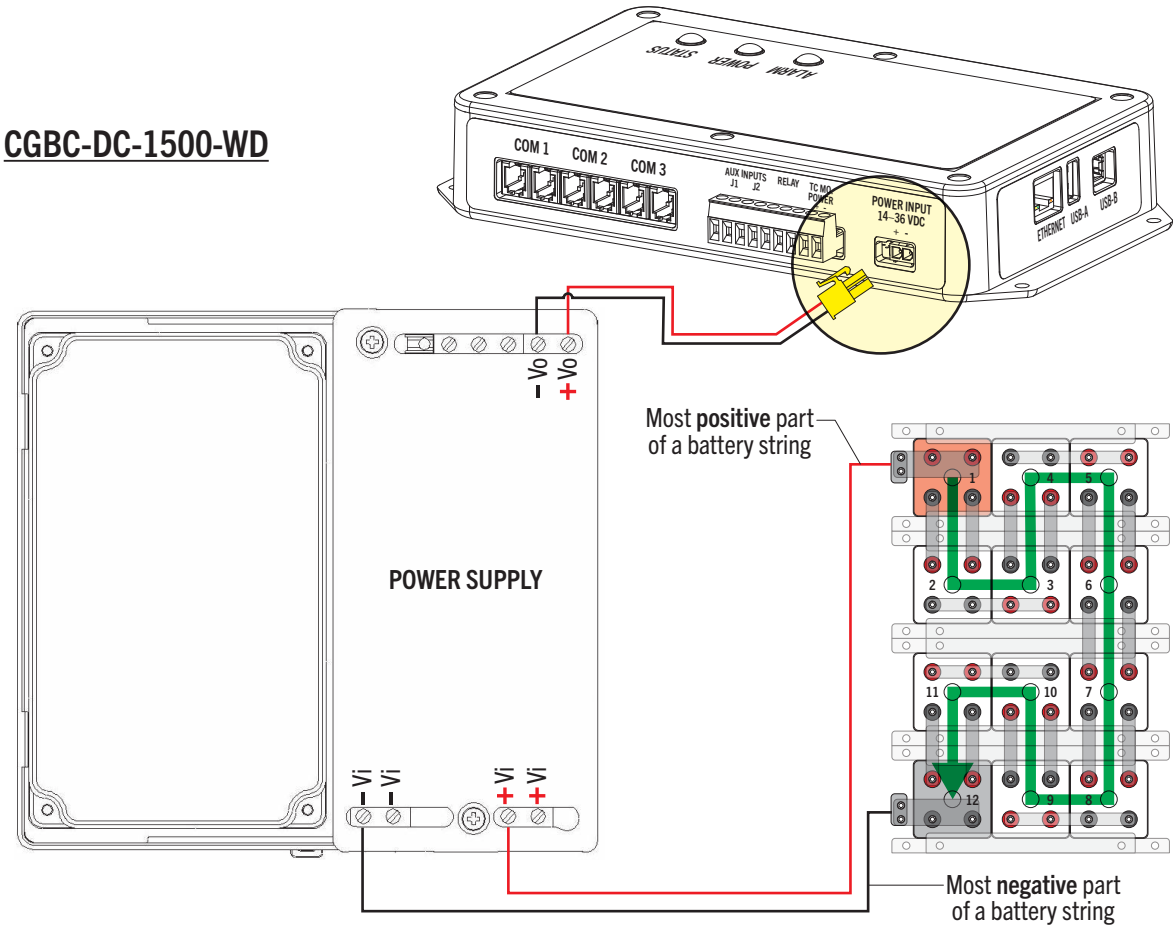


CGBC-AC-264-WD (OPTION)



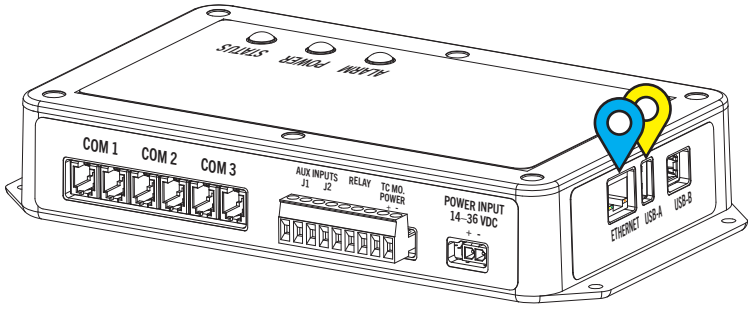
NOTE: EU colors are – Neutral (BLUE) and Line (BROWN).

CGBC-DC-1500-WD



5 Commissioning

NOTE: If BCU is already networked, you can access the BCU by directly connecting over the same network as the BCU using Chrome®, Firefox™, or Safari®.



5.1 Connecting A PC To The BCU

The Web Browser Interface of the BCU is accessible through PC via a network connection. This connection can be established by either the USB Type B port or the Ethernet port.

NOTE: The USB Type B port is the ***recommended*** and simplest way to directly connect to the BCU console as it doesn't require any network configuration changes to be made.

5.1.1 Connecting Via USB Type A/B Cable (Recommended)

5.1.1.1 Connecting The USB Type B Cable

1. Plug the USB Type A/B connector into the USB Type B port of the BCU ( ).
2. Connect the other end of the cable Type A, to the PC.
3. Turn on and login to the PC.

5.1.1.2 Accessing The Web Browser Interface

1. Open a web browsing application.
2. In the address bar of the web browsing application, enter "https://<USB IP address of the BCU>". For example, to access the Web Browser Interface using the default USB IP address of the BCU enter, "https://192.168.171.171".

NOTE:

- If there is a problem connecting, ensure the correct driver was loaded when connected by checking the Device Manager of the PC. The device type for this connection is a Network adapter labeled "USB Ethernet/RNDIS Gadget".
    - Go to the configuration page to set up the Ethernet Cable Connection with IP Address, Netmask, and Gateway.

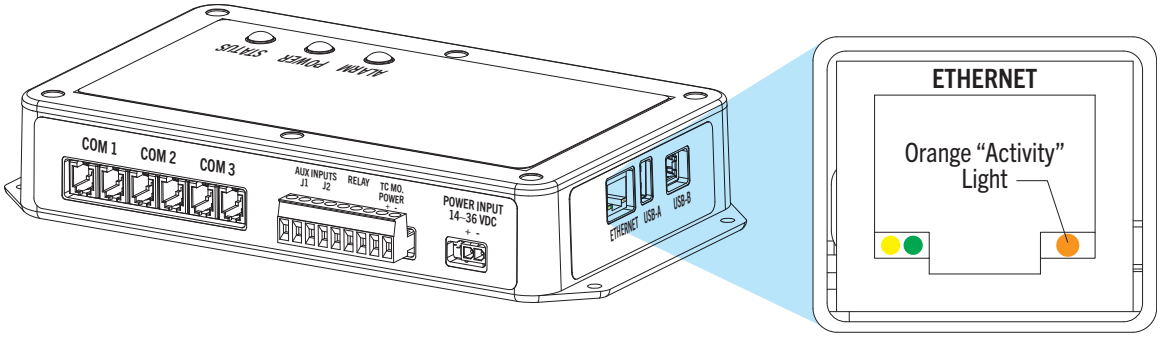
5.1.2 Connecting Via Ethernet Cable

5.1.2.1 Connecting The Ethernet Cable

1. Plug one RJ-45 connector into the Ethernet port of the BCU ( ).
2. Connect the other RJ-45 connector to the PC.
3. Turn on and login to the PC.

5.1.2.2 Checking Ethernet Communication

1. Locate the Ethernet port on the BCU.
2. Verify the orange RX light (right side of the Ethernet port relative to the connector clasp in the down position) is flashing to confirm data is being received.
3. Verify the green link light on the right-hand side of the Ethernet port is lit to confirm the connection is stable.



5.1.2.3 Checking Network Connection

1. Select "Start" button of the PC.
2. Search for and select "View network connections".
3. Ensure the applicable Ethernet connection is enabled. If the connection status is disabled, enable it by right-clicking on the applicable Ethernet connection and selecting "Enable".

5.1.2.4 Configuring PC Network Settings – Communication

1. Select the "Start" button of the PC.
2. Search for and select "View network status and tasks".
3. Select "Change adapter settings" located in the left column.
4. Right click on the applicable Ethernet connection and select "Properties".
5. In the Ethernet Properties dialog box, under "This connection uses the following items", ensure "Internet Protocol Version 4 (TCP/IPv4)" is marked as one of the items to use.
6. Double click on "Internet Protocol Version 4 (TCP/IPv4)".
7. Make detailed notes on the current configuration of the TCP/IP settings shown in the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box for use when programming is complete before moving forward in setting configuration.
8. Identify whether "Obtain an IP address automatically" or "Use the following IP address:" is selected in the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box.
9. Continue to Section:
   - 5.1.2.5 if "Obtain an IP address automatically" is selected.
     OR
   - 5.1.2.6 if "Use the following IP address:" is selected

5.1.2.5 Configuring TCP/IP Settings On The PC

5.1.2.5.1 If "Obtain An IP Address Automatically" Is Selected

If "Obtain an IP address automatically" is currently selected in the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box:

1. Select the "Alternate Configuration" tab.
2. Select "User configured".
3. In the "IP address" entry box, enter an available IP address in the same subnet as the BCU Ethernet IP address.

   NOTE: The default subnet mask of the BCU is 255.255.255.0 and the default Ethernet IP address of the BCU is 192.168.168.168. For simplicity, it is recommended to set the value of the last octet by an offset of one from the BCU Ethernet IP address. For example, if the Ethernet IP address of the BCU is 192.168.168.168, configure the TCP/IP settings to have an IP address of 192.168.168.167.
4. In the "Subnet mask" entry box, enter the Ethernet subnet mask of the BCU.
5. Ensure all remaining entry boxes are blank and click "OK".

5.1.2.5.2 If "Use The Following IP Address" Is Selected

If "Use the following IP address:" is currently selected in the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box:

1. In the "IP address" entry box, enter an available IP address in the same subnet as the BCU Ethernet IP address.

   NOTE: The default subnet mask of the BCU is 255.255.255.0 and the default Ethernet IP address of the BCU is 192.168.168.168. For simplicity, it is recommended to set the value of the last octet by an offset of one from the BCU Ethernet IP address. For example, if the Ethernet IP address of the BCU is 192.168.168.168, configure the TCP/IP settings to have an IP address of 192.168.168.167.
2. In the "Subnet mask" entry box, enter the Ethernet subnet mask of the BCU.
3. Ensure all remaining entry boxes are blank and click "OK".

5.1.2.6 Accessing The Web Browser Interface

1. Open a web browsing application.
2. In the address bar of the web browsing application, enter "https://<Ethernet IP address of the BCU USB>". For example, to access the Web Browser Interface using the default Ethernet IP address of the BCU enter, "https://192.168.168.168".

5.2 Initial Web Browser Interface Setup

Once the Web Browser Interface has been accessed per §5.1.1.2 or §5.1.2.7, a user will be able to perform initial Web Browser Interface setup.

5.2.1 Setting The Admin Password

When first accessing the Web Browser Interface, the initial web page will require a user to set a password for the administrator user.

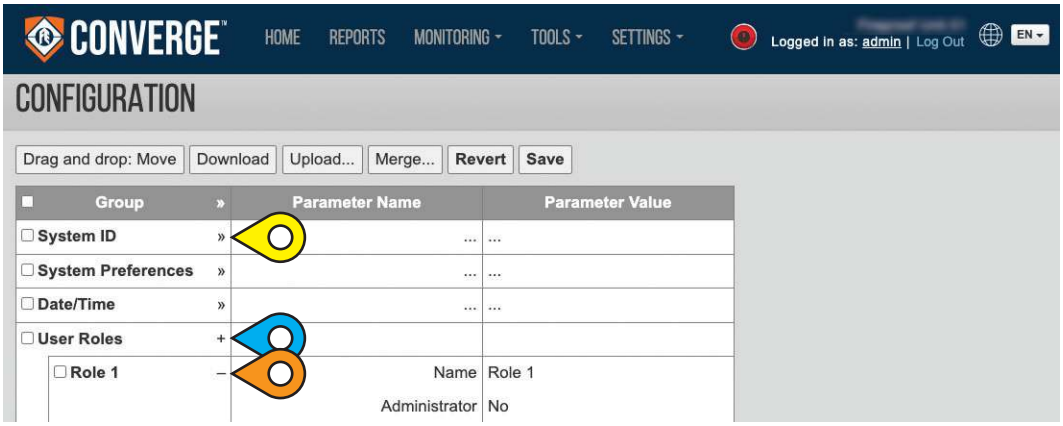
1. Enter a password into both "New Password and "Repeat Password" that meets the following requirement:
    - 12–36 characters including one each of the following alpha-numeric characters: A-Z, a-z, 0-9, -_! &@?*+.()
2. Select "Set new password" to apply.
3. Enter "admin" into the "User" entry box.
4. Enter the set password into the "Password" entry box.
5. Select "Submit".

IMPORTANT: It is recommended to document the set password and keep in a safe location. Once the password is set, if it is forgotten, the user will need to use a backup code or wait to login until Franklin Electric Technical Support is able to assist the user with resetting it. For further information on backup codes, see §4.9.3.

5.2.2 Initial Configuration Setup

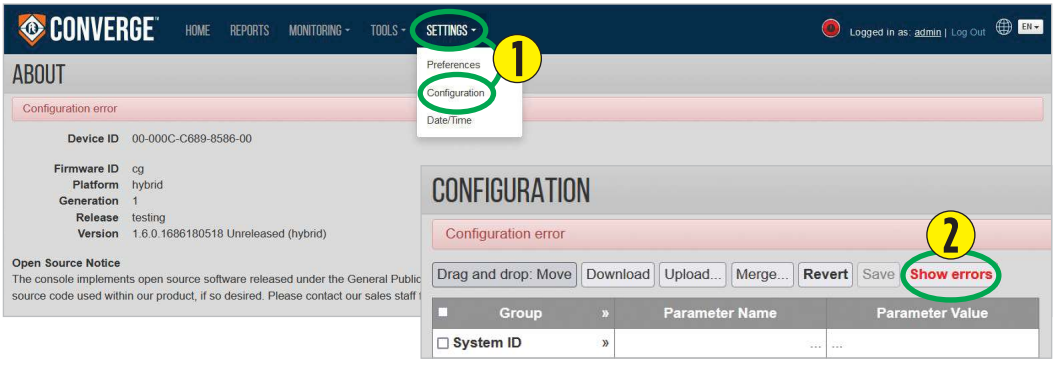
Once the system has been fully installed and the Web Browser Interface is accessible, the system may be configured. See §5.3.1 and §5.3.2 for configuration information.

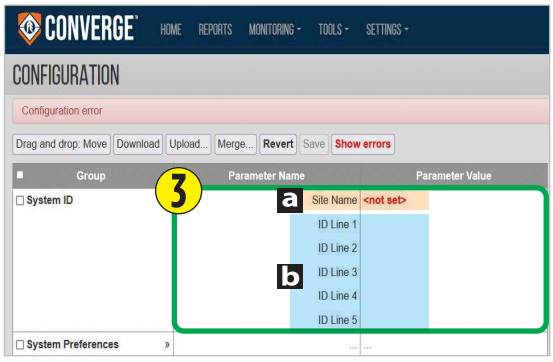
- Select ">>" (📍) to expand a group to see the full programming section.
- Select "+" (📍) to add a String Battery.
- Select "–" (📍) to delete a String, Battery.

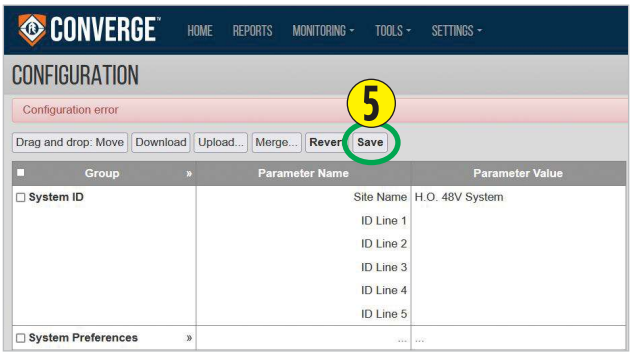


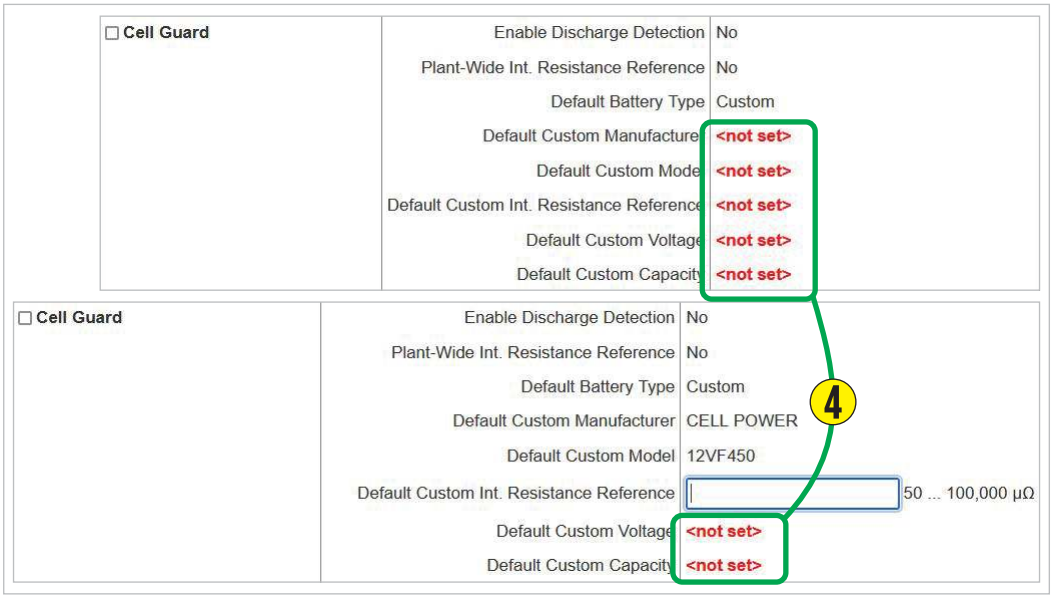
Setting Configuration Errors

1. Navigate to Settings > Configurations to view Configuration Errors.
2. Select **Show Errors** to view required system parameters.
3. Populate Site Name and Battery Data for system (Press the **ENTER** key to save parameters).
    a. **Site Name** – Physical name of site; typically, will have a Facility Name, Building Name or other unique identifier.
    b. **ID Line** – These lines will contain physical address of site. This information will appear as headers on reports and is used to identify the site.
4. Enter *necessary battery information* in the "<not set>" fields where applicable.
5. Select **Save** to clear configuration errors (Battery Data may be updated later).



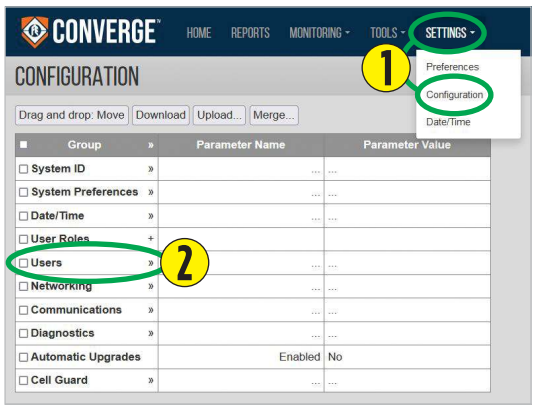


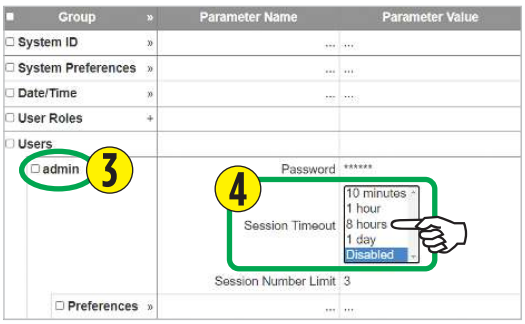




Setting Session Timeout

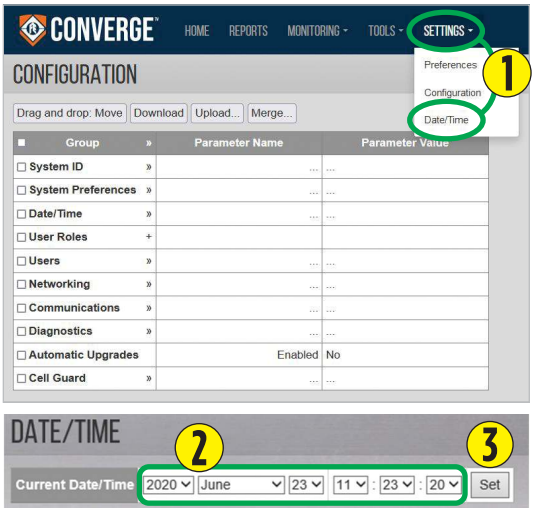
1. Navigate to Settings > Configuration.
2. Select **Users**.
3. Select **admin**.
4. Set time out to a desired duration.





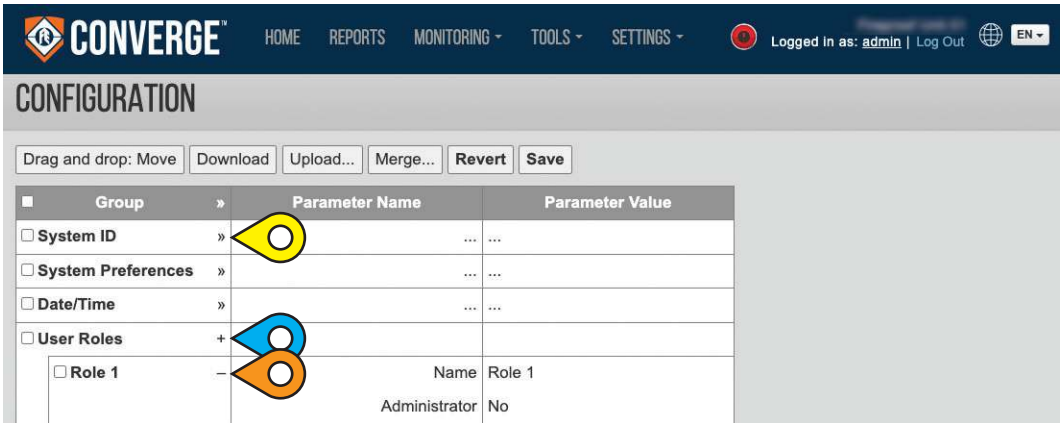
Setting Date / Time

1. Navigate to Settings > Date / Time.
2. Set Time / Date fields.
3. Select **Set** when done.



5.3 Configuration

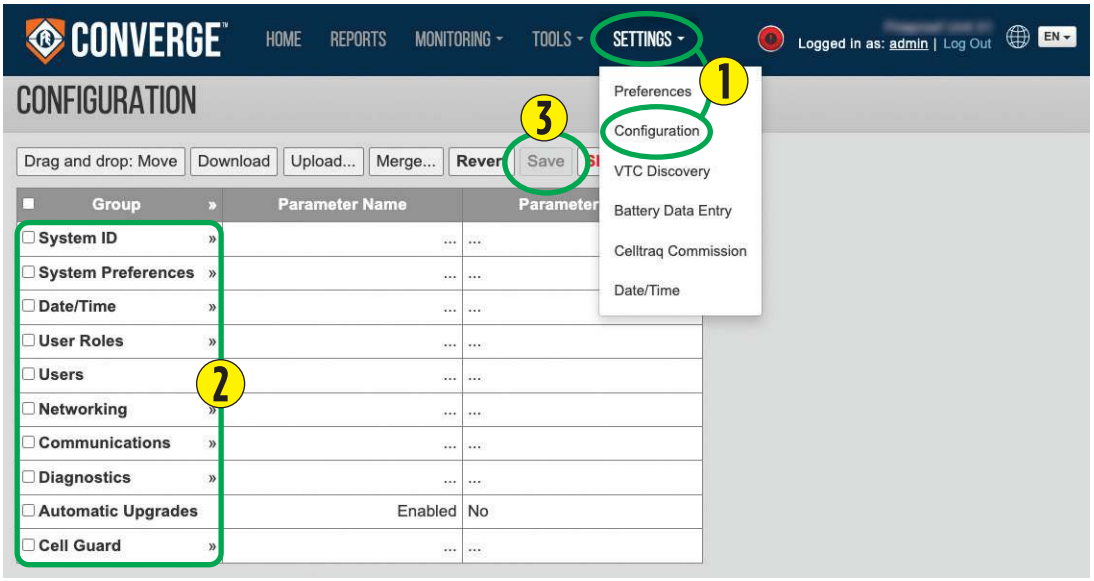
- Select ">>" (📍) to expand a group to see the full programming section.
- Select "+" (📍) to add a String Battery.
- Select "–" (📍) to delete a String, Battery.



5.3.1 Configuring BCU System Parameters

NOTE: You must have administrative access to make set up changes.

1. Navigate to Settings > Configuration.
2. Select a parameter to edit as needed (hit enter to save the change).
3. Select Save (when finished).



5.3.1.1 System Preferences

Group	Parameter Name	Parameter Value
☐ System Preferences	Language	Select a language for the Web Browser Interface.
	Regional Formats	Select the preferred system regional format.
☐ Units	Temperature	Select the preferred unit for the parameter to display.

5.3.1.2 User Roles

Group	Parameter Name	Parameter Value
☐ User Roles		
☐ Role #	Name	Enter the user's name.
	Administrator	» Select "Yes" to grant the user full access of the system. » Select "No" to allow for customization of the user's access. **NOTE**: "Yes" allows the user to deny or allow access to each of the following abilities.
	Firmware upgrade	Ability to upgrade system firmware versions.
	System reboot	Ability to perform system reboots.
	Erase all configuration and data	Ability to erase historical data and configuration settings.
	Erase data	Ability to erase historical data.
	Set Date/Time	Ability to set the current date and time.
	Change preferences	Ability to modify the user's preferences.
	Diagnostics	Ability to access diagnostic data.
	Generate Reports	Ability to generate reports.
	View events	Ability to view event history.
	Annotate events	Ability to enter information into the "Notes" section of individual event pages.
	Change configuration	Ability to make configuration changes.
	View CG Information	
	Control CG Behavior	
☐ User Roles		
☐ admin		
☐ user1	Name	user1
	Description	
	Password	<not set>
	Password Requirements	12–36 characters including one each of the following: A-Z, a-z, 0-9, -_! &@?*+.()
	Session Timeout	10 minutes
	Session Number Limit	3
	Role	Disabled

5.3.1.3 Date/ Time

NOTE:

- If using a URL, the DNS server must be properly configured in the network settings of the BCU.
- If NTP Servers are not programmed, navigate to Settings > Date/Time to set the date and time.
- Set Time Zone before setting Date/Time as changes to Time Zone afterward will impact set time.

☐ Group	Parameter Name	Parameter Value
☐ Date/Time	Time Zone	Set the relevant time zone.
	NTP Servers	If using NTP server, enter NTP server address.

5.3.2 CELLGUARD™

NOTE: If battery manufacturer and/or model is not selectable in drop down menu, *Custom* must be selected from battery type and battery information entered manually.

- Battery Internal Resistance reference: enter the Internal Resistance reference if known or the calculated Internal Resistance value based on the age of the batteries.

☐ Group	Parameter Name	Parameter Value
☐ Cellguard	Enable Discharge Detection	No
	Plant-Wide Conductance Reference	Yes
	Battery Type	Select a battery type.
	Custom Manufacturer	Select a battery manufacturer.
	Custom Model	Select a battery model
	Custom Internal Resistance Reference	Corresponding IR reference for the battery being monitored.
	Default Custom Voltage	Select the voltage for the battery being monitored.
	Default Custom Capacity	Select the capacity for the battery being monitored.
☐ Interval Tests		
☐ Strings		
☐ Temperature Zones		
☐ ELS Strands		
☐ External Alarm Devices		
☐ External Analog Devices		
☐ Logging		

5.3.2.1 Interval Tests

☐ Group	Parameter Name	Parameter Value
☐ Interval Tests	G Interval	Set the number of days between Internal Resistance tests.
	VT Interval	Set the number of hours between Voltage and Temperature tests.

5.3.2.2 Strings

- Click “+” to add string .
- Strings will list in order they are programed.
- Strings can be reorganized using drag and drop feature.
- String-Wide Int. Resistance Reference: Yes or NO
- Default manufacture: select battery Manufacture.
- Default model: Select battery model.
- Battery Internal Resistance reference: enter battery Internal Resistance reference.
- Battery voltage: select correct voltage for battery being monitored.
- Battery Sensor Type: select correct sensor installed on battery.
- Comm Port
- Number of batteries

☐ Group	Parameter Name	Parameter Value
☐ Strings		
☐ String1	Name	Name assigned to a string.
	Installation Date (YYYY-MM-DD)	
	Warranty Date (YYYY-MM-DD)	
	String-Wide Int. Resistance Reference	
	Battery Type Default Manufacturer Default Model Battery Int. Resistance Reference Battery Voltage	These values are auto-populated when §5.3.2 “CELLGUARD™” is completed.
	Battery Sensor Type	» Select sensor type installed on battery from the provided list: » 2 Volt » 6 Volt » 12 Volt
	Comm Port	» Select a port from the list to correspond with the strings used: » 1 » 2 » 3 **NOTE**: For example, Strings 1–2 route to “Comm Port 1” on the BCU, Strings 3–4 to “Comm Port 2” and Strings 5–6 to “Comm Port 3”
	Number of Batteries	Enter the number of batteries in a string.

☐	Group	Parameter Name	Parameter Value
	☐ Batteries		
	☐ Battery Thresholds		
	☐ String Thresholds		

5.3.2.2.1 Batteries

NOTE: This section will auto populate using battery Data entry screen.

- Updating data on all batteries in string.
  - Make updates to parameters at string level.
    - Manufacture
    - Model
    - Internal Reference
    - Voltage
    - Sensor type
- Change string-wide Internal Resistance reference to Yes.
- Change back to no and changes will now reflect in all batteries.

☐	Group	Parameter Name	Parameter Value
☐ Strings			
	☐ String1		
	☐ Batteries		
	☐ Battery1	Manufacturer	» Select a manufacturer of the battery from the provided list: » Manufacturer Example 1 » Manufacturer Example 2 » Etc.
		Model	» Select the model of the battery from the provided list: » Model Example 1 » Model Example 2 » Etc.
		Battery Int. Resistance Reference	
		Battery Voltage	
		Battery Serial Number	
		Manufacture Date (YYYY-MM-DD)	Enter the date of manufacture for the battery.
	☐ Battery 2		
	☐ Battery Thresholds		
	☐ String Thresholds		

5.3.2.2.2 Battery Thresholds

☐ Group	Parameter Name	Parameter Value
☐ Strings		
☐ String1		
☐ Batteries		
☐ Battery Thresholds		
☐ Conductance	Enable	» Threshold of *Internal Resistance* that will trigger alarms. » High Alarm » High Warning » Low Warning » Low Alarm
☐ Strap Resistance	Enable	» Threshold of *Strap Resistance* that will trigger alarms. » High Alarm » High Warning » Low Warning » Low Alarm
☐ Conductance %	Enable	» Threshold of *Internal Resistance %* that will trigger alarms. » High Alarm » High Warning » Low Warning » Low Alarm
☐ Temperature	Enable	» Threshold of *Temperature* that will trigger alarms. » High Alarm » High Warning » Low Warning » Low Alarm
☐ Voltage	Enable	» Threshold of ***Voltage*** that will trigger alarms. » High Alarm » High Warning » Low Warning » Low Alarm
☐ String Thresholds		

5.3.2.2.3 String Thresholds

☐ Group	Parameter Name	Parameter Value
☐ Strings		
☐ String1		
☐ Batteries		
☐ Battery Thresholds		
☐ String Thresholds		
☐ Voltage	Enable	» Threshold of ***Voltage*** that will trigger alarms. » High Alarm » High Warning » Low Warning » Low Alarm
☐ Current	Enable	» Threshold of ***Current*** that will trigger alarms. » High Alarm » High Warning » Low Warning » Low Alarm

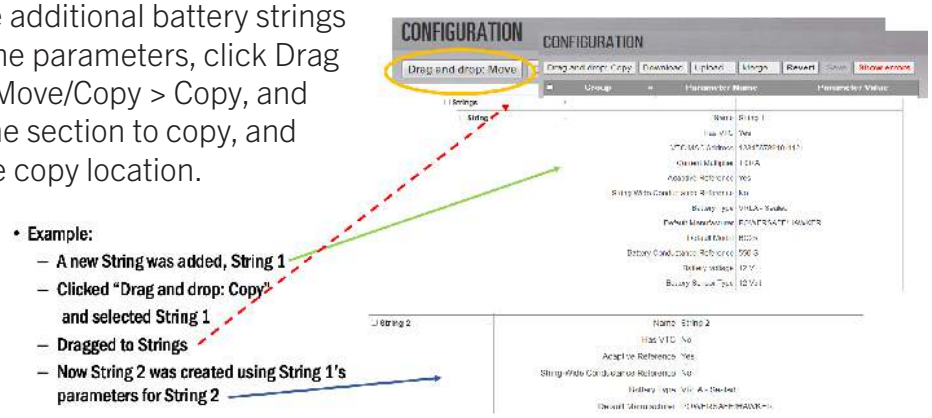
5.3.2.3 Temperature Zones

☐ Group	Parameter Name	Parameter Value
☐ Temperature Zones		
☐ Temperature Zone 1	Name	Name of the zone being measured.
	Connection Type	TC - String Sensor.
	TC	String Name pertaining to String Sensor - TC.
	High Alarm	Threshold to trigger high temperature alarm.
	Low Alarm	Threshold to trigger low temperature alarm.

5.3.2.4 ELS Strands

☐ Group	Parameter Name	Parameter Value
☐ ELS Strands		
☐ ELS Strand 1	Name	Name of the ELS strand.
	Digital Input #	1 or 2

- To configure additional battery strings with the same parameters, click Drag and drop > Move/Copy > Copy, and then click the section to copy, and drag it to the copy location.



5.3.2.5 External Alarm Devices

☐ Group	Parameter Name	Parameter Value
☐ External Alarm Devices		
☐ External Alarm Device 1	Name Digital Input @ Invert Input Severity	Name of *External Alarm Device.*
☐ External Alarm Device 2		

5.3.2.6 External Analog Devices

☐ Group	Parameter Name	Parameter Value
☐ External Analog Devices		
☐ External Analog Device 1	Name Analog Input @ Units Precision 10V Value 0V Value High Alarm High Warning Low Warning Low Alarm	Name of *External Analog Device*.

5.3.2.7 Logging

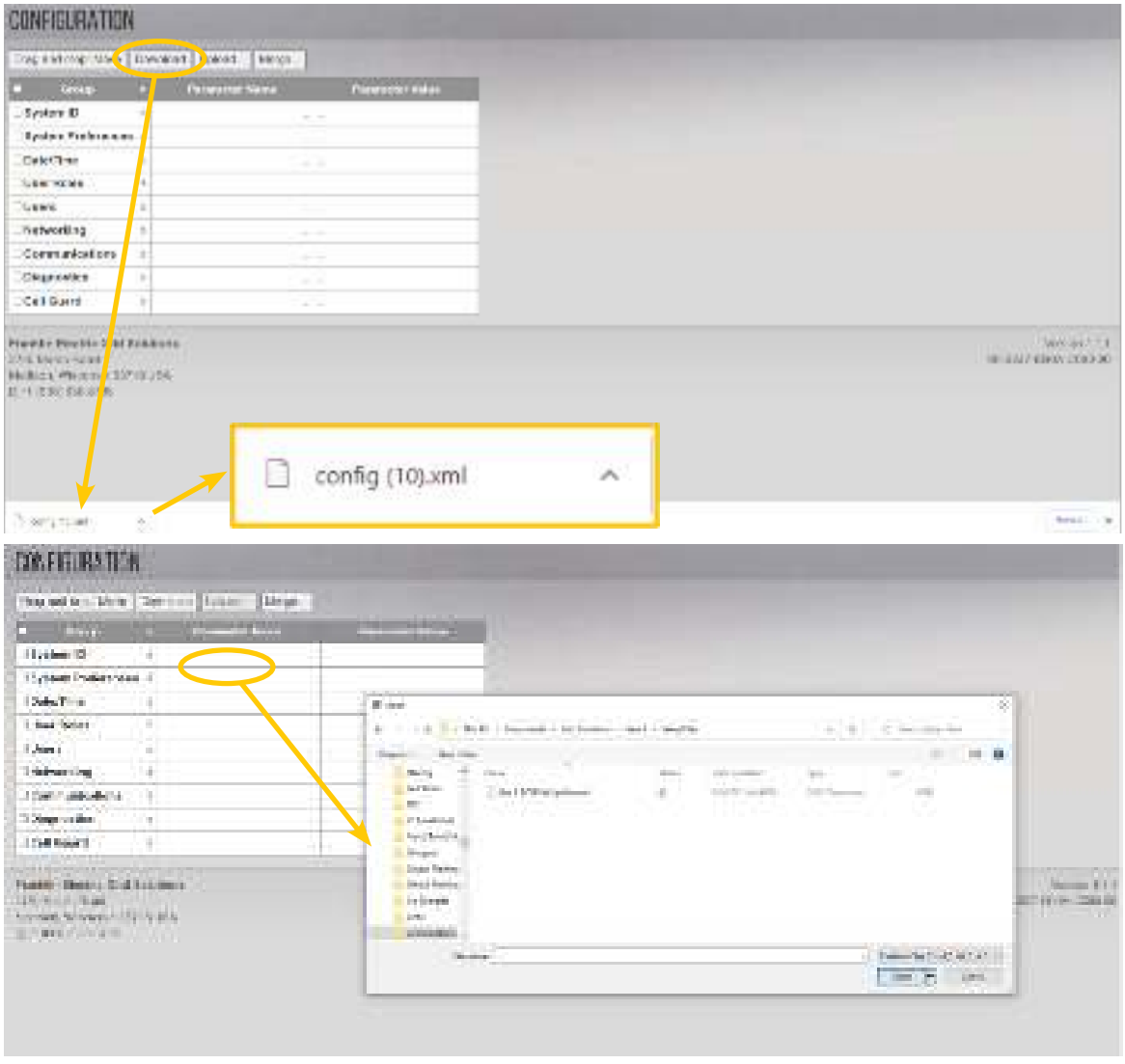
☐ Group	Parameter Name	Parameter Value
☐ Logging	HAL Application Logging Level HAL Zigbee Logging Level HAL String Logging Level HAL Battery Logging Level HAL Temperature Logging Level ***HAL Digital Input Logging Level*** ***HAL Analog Input Logging Level*** Monitor Application Logging Level Monitor Int. Resistance Logging Level Monitor Voltage/Temperature Logging Level Monitor Discharge Logging Level Monitor Temperature Logging Level Monitor ELS Logging Level	

5.3.3 Downloading A Configuration File

To download a full site configuration:

1. Select “Download”.
2. Open the “Downloads” folder in file explorer and save the configuration file to the desired location.
3. Rename the file with a name that includes the site it represents and the date.

NOTE: The user may need to temporarily disable any pop-up blocker to download the configuration.

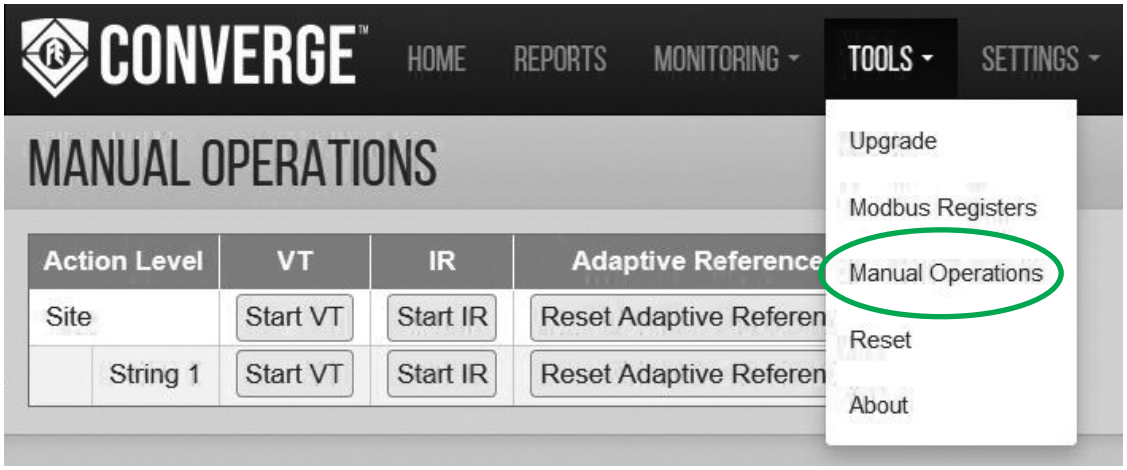


5.3.4 Verify Installation & Configuration

IMPORTANT: Use this tool to test communications between sensors and CONVERGE™ to ensure the system is set up correctly.

- Go to; Tools > Manual Operations
  - Manual Operations – used to test both individual sensors and entire strings.
  - VT - Voltage / Temperature Testing – Tests if a string is operating properly, and verifies the temperature stamp appears in CONVERGE™.
  - IR - Internal Resistance Testing – Tests if a string is operating properly, and verifies that each battery section is working.

NOTE: Once tests are initiated, navigate to Monitoring > Status to see new readings populate.



5.3.5 Setting BCU Output Communications

5.3.5.1 Networking > Ethernet >IPv4

Group	Parameter Name	Parameter Value
☐ Networking		
☐ Ethernet		
☐ IPv4	Method	» **Manual**: Enter IP address manually. » **DHCP**: Obtain a valid IP address.
	Address	IP address must either be address on network or static IP provide by service provider.
	Netmask	The mask must match that of the network the BCU is connected to.
	Gateway	Logical address to the nearest router port.
	DNS Servers	Domain Name Systems: Required if using email functionality of BCU.
	Search Domains	
	DHCP Server	» Enable/Disable » **Start**: 2–254 » **Limit**: 1–50 » **Lease Time**: 2–1440 (in minutes)

5.3.5.2 Communication > Protocols

5.3.5.2.1 CELLTRAQ™ IR

☐ Group	Parameter Name	Parameter Value
☐ Communication		
☐ Protocols		
☐ Celltraq IR	Enabled	» Yes or No » *Must* be set to Yes and at least one battery string *must* be created for "CELLTRAQ™ IR Commission" to appear in the Settings list.
	Site Serial	» Serial number of BCU. » Sites with multiple BCUs reporting to CELLTRAQ™ IR *require* programming same serial number in each BCU.
	Site Name	Site name for battery hierarchy.
	Plant Name	Plant name for battery hierarchy.
	Server	IP address of server where CELLTRAQ™ IR is located.
	Port	SMTP port number on server.
	Enable Debugging	» Yes or No.
☐ Modbus		
☐ SNMP		
☐ MQTT		

5.3.5.2.2 Modbus

☐ Group	Parameter Name	Parameter Value
☐ Communication		
☐ Protocols		
☐ Celltraq IR		
☐ Modbus	Enabled	» Yes or No.
	Port	Modbus port assignment.
☐ SNMP		
☐ MQTT		

5.3.5.2.3 SNMP v3

NOTE: Set the SNMP Configuration to match the protocol of the device the BCU will communicate to using SNMP.

Group	Parameter Name	Parameter Value
☐ Communication		
☐ Protocols		
☐ Celltraq IR		
☐ Modbus		
☐ SNMP	SNMP Version	SNMP v3
	SNMPv3 User Name	12345678910
	Authentication Protocol	MD5
	Authentication Pass Phrase	<not set>
	Privacy Protocol	AES
	Set Privacy Pass Phrase	Yes
	Privacy Pass Phrase	<not set>
☐ Notifications	Authentication Failure Traps	Enabled
☐	Host	<not set>
	Port	162
	Notification Type	SNMPv3 Trap
☐ MQTT		

5.3.5.2.4 MQTT

Configuring MQTT parameters is a two-stage setup process:

Initial Parameter Value Configuration

Group	Parameter Name	Parameter Value
☐ Communications		
☐ Protocols		
☐ Celltraq		
☐ Modbus		
☐ SNMP		
☐ MQTT		
☐ Connection 1	Name	Connection 1
	Service	*Change "**Diagnostic**" to "**Unite**".*
	Password	<not set>

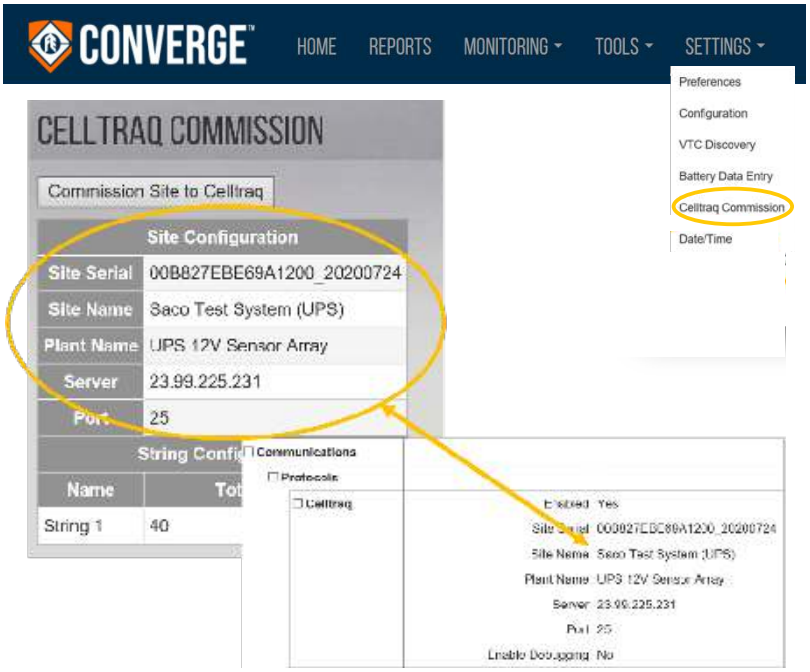
IMPORTANT: In order to advance to the final-stage MQTT Parameter Configuration, "Diagnostic" must be changed to "Unite" ( ).

Final Parameter Value Configuration

Group	Parameter Name	Parameter Value
☐ MQTT		
☐ Connection 1	Name	Connection 1
	Service	Unite
	Host	unite1.franklingrid.com
	Password	» Enter a MQTT password for use with UNITE™ meeting this criteria: » 12–36 characters including one each of the following alpha-numeric characters: A-Z, a-z, 0-9, -_! &@?*+.()
	Connection Retries	Unlimited
	Connection Retry Interval	1 minute
	Connection Alarm	Enabled

5.3.6 CELLTRAQ™ IR Commission

- Commission site to CELLTRAQ™ IR
  - Complete programming in CELLTRAQ™ IR section under configuration.
  - This should then populate in the CELLTRAQ™ IR commission screen.
  - Once all data is confirmed, click on Commission site to CELLTRAQ™ IR.
  - Verify in CELLTRAQ™ IR the site was created.

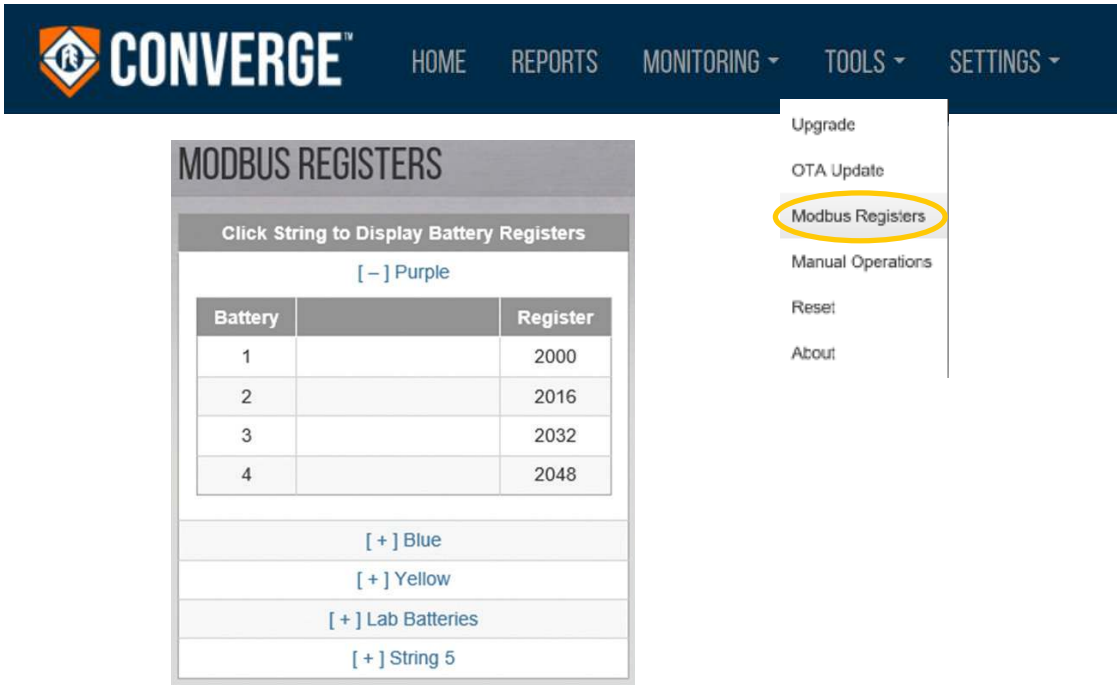


NOTE:

- CELLTRAQ™ IR must be enabled and at least one battery string must be created for "CELLTRAQ™ IR commission" to appear in the settings list.
- If CELLTRAQ™ IR was previously used, Site, Plant, and String names must match CELLTRAQ™ IR identically.
- Site Serial number must match exactly what is populated in CELLTRAQ™ IR.

5.3.7 Modbus Register

1. Click Tools>Modbus Registers.
2. Click the string to display the battery register.
3. The Modbus register map is provided upon request.



5.3.8 Diagnostics & Automatic Upgrades

☐ Group	Parameter Name	Parameter Value
☐ Diagnostics		
☐ Remote Syslog	Mode	Disabled / UDP / TCP/IP
☐ Secure Shell	Enabled	No
☐ Automatic Upgrades	Enabled	No

5.3.9 UNITE™

The Base Coordinator Unit (BCU) is the *controller* component of the CELLGUARD™ Battery Monitoring System (BMS) managing battery sensor test activities, collecting test data, and communicating with the CONVERGE™ web interface to save data in the UNITE™ database.

NOTE: Please see document p/n 10000011818, UNITE™ Asset Management Database (User Reference Guide), for information regarding database familiarization, setup, and operation for the CELLGUARD™ BMS. Suggested sections to reference include:

- Creating an Organization
- Managing BCU Organizations
    - Adding a BCU to an Organization
    - Editing a BCU Plant

6 Appendix

6.1 Related Documents

Documentation can be found online at www.franklingrid.com.

Related Documents

Part Number	Description
167-000801	Wired BMS Install Commissioning Checklist
10000011818	UNITE™ Asset Management Database (User Reference Guide)

6.2 Glossary

BCU.....Base Coordinator Unit

BMS .....Battery Monitoring System

10000014755 r1