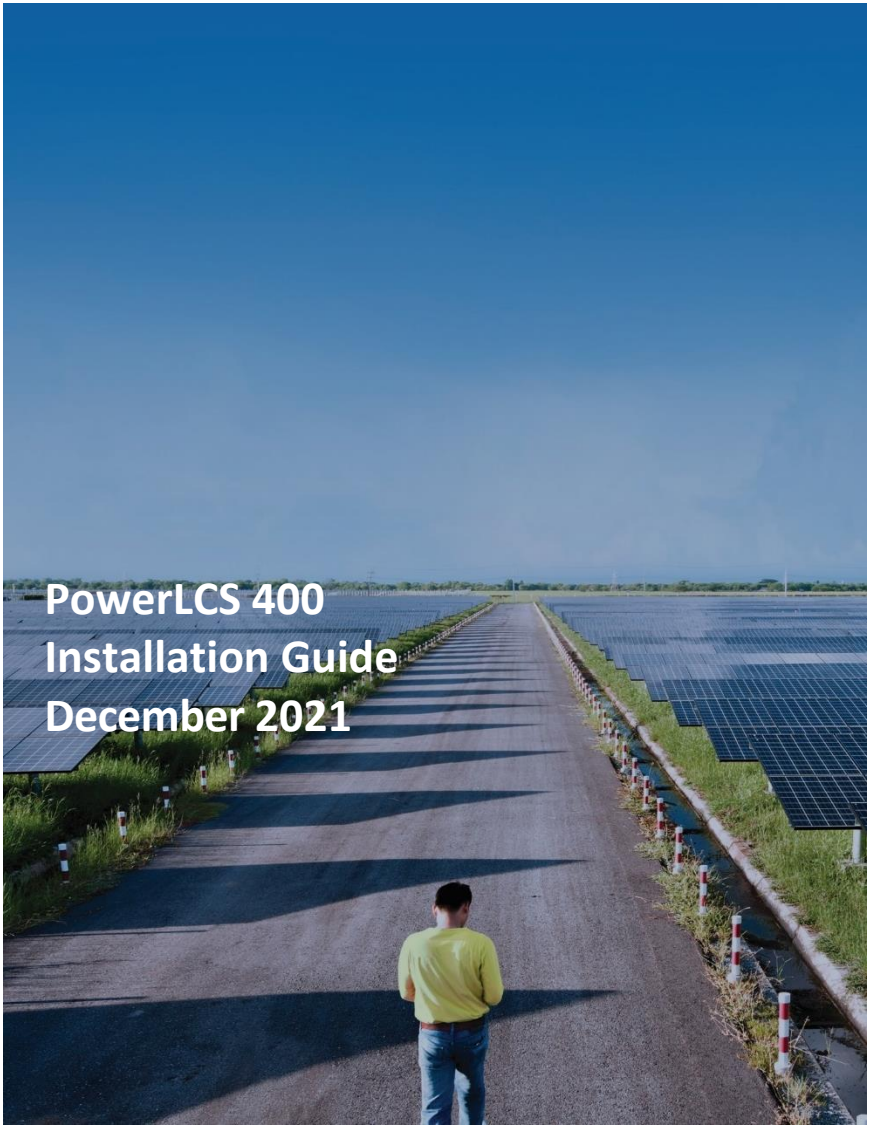
AlsoEnergy



PowerLCS 400
Installation Guide
December 2021

Revision History

Revision	Date	Author	Comments
1	September 2019	Engineering	Original Release
2	December 2021	Engineering	Hardware Update

Limitation of Liability

AlsoEnergy™ Inc. ("AE") reserves the right to make changes to its products and/or their specifications without notice. Obtain the latest version of the device specifications to assure the most current information is available to the customer.

AE assumes no liability for applications assistance, customer's system design, or infringement of patents or copyrights of third parties by/or arising from the use of AE's devices.

AE SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES SUSTAINED IN CONNECTION WITH AE PRODUCTS, EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW. FURTHERMORE, AE NEITHER ALLOWS NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY SUCH OBLIGATION OR LIABILITY.

Although the information contained in this document is believed to be accurate, AE assumes no responsibility for any errors which may exist in this publication.

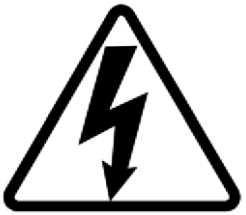
Installation Personnel

Installation and maintenance of the communications enclosure should only be performed by qualified, competent personnel who have appropriate training and experience with high voltage and current devices. The communications enclosure must be installed in accordance with all Local and National Electrical Safety Codes.

WARNING

Failure to observe the following may result in severe injury or death:

- Keep these instructions.
- There are no user-serviceable parts inside. Refer service to an authorized service person.
- During normal operation of this device, hazardous voltages are present on the input terminals of the devices and throughout the connected power lines. With their primary circuit energized, current transformers (CTs) may generate a high voltage when their secondary windings are open. Follow standard safety precautions while performing any installation or service work (i.e., remove line/ PT fuses, short CT secondaries, disconnect power whenever adjusting terminations).
- This product must be used in accordance with the instructions in this manual. Otherwise, the product may not perform as expected and can cause hazards to the user.



Danger

Line voltages up to 600 VRMS are present on the input terminals of the device and throughout the connected line circuits during normal operation. These voltages may cause severe injury or death. Installation and servicing should be performed only by qualified, properly trained personnel.

CSA - C22 Statement

This product meets the requirements of Can/CSA-C22.2 no. 61010-1, second edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.

FCC Statement

This device is classified as a Class A digital device.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operations.

Contents

Figures

1.0 General

Product Overview

The AlsoEnergy PowerLCS 400 comes preconfigured and prewired in a NEMA 4 enclosure for easy installation. The AlsoEnergy PowerLCS interfaces up to 16 inverters via Modbus RTU or Modbus TCP with the AlsoEnergy database via an Internet-accessible Ethernet connection. Data is compressed and uploaded every 2 hours, at 5-minute granularity. The AlsoEnergy PowerLCS enclosure includes a Weather Station signal conditioner, an Ethernet switch, a Revenue Grade Meter and an optional Cell Modem. No additional configuration options are available for this enclosure, and remote access is not supported or possible. PowerLCS comes with solid core 400A CTs, and the enclosure is rated to handle up to 325kW AC capacity at 480 VAC.

The following pages provide an overview of the hardware solution. Please contact customer support if additional technical or installation information is needed.

The datalogger and cell modem transmit all operating information for the communications enclosure to AlsoEnergy PowerTrack via Ethernet. No preventive maintenance or inspection is required.

Documentation

This document guides a licensed electrician to plan, install, and commission an AlsoEnergy™ PV Monitoring System. Separately, AlsoEnergy™ has included installation documents for the inverters and a one-line drawing showing the interconnection between the PowerLCS and the inverter(s), metering, and weather station sensor installation.

Electrical Wiring

BECAUSE OF POSSIBLE ELECTRICAL SHOCK OR FIRE HAZARDS, ONLY QUALIFIED PERSONNEL SHOULD CONNECT THIS EQUIPMENT IN COMPLIANCE WITH ALL LOCAL APPLICABLE ELECTRICAL CODES AND STANDARDS.

Warranty

The AlsoEnergy communications enclosure is warranted to the original purchaser against defective material and workmanship. During the warranty period, AlsoEnergy will repair or replace, at its option, all defective equipment that is returned freight prepaid. There will be no charge for repair provided if there is no evidence that the equipment has been mishandled or abused. If the equipment is found to be in proper working order, AlsoEnergy will charge a service fee. The complete terms and conditions of the warranty are located at www.AlsoEnergy.com.

2.0 Installation Overview

Installation is straightforward with proper planning. First, familiarize yourself with the hardware, then follow these three tasks:

1) Installing the system
    a) Location and Mounting of the Enclosure
        i) Mount to a Secure Indoor or Outdoor location.
        ii) Within 65 feet of the pyranometer mounting location.
        iii) Within 20 feet of the CT location.
        iv) Allow space beneath the enclosure for conduit runs.
        v) Allow space for the front door to open fully.

vi) With access to 100 – 277 VAC for power.

vii) Within 6 feet of earth ground.

b) Set Up Internet Connection

i) With No Cell Modem - Locate the on-site internet connection point.

ii) With Cell Modem Option – Mount Antennas.

c) Connect Inverter(s) and Set Communication Configuration

2) Modbus RTU / rs-485

a) Daisy chain rs-485 inverter connections using Belden 3106A or equivalent shielded, twisted pair rs-485 wire.

b) Set inverter Modbus addresses.

3) Modbus TCP

a) Connect Modbus TCP inverters using Belden 7919A or equivalent shielded cat5e cable for all ethernet connections.

b) Set inverter static IP addresses.

4) Connect Weather Station Sensors

a) Pyranometer

i) Plan Pyranometer location within 65 feet cable run of the enclosure.

ii) Install Pyranometer mounting bracket to be parallel to the plane of the array.

iii) Wire Pyranometer to the enclosure

b) Module Temperature Sensor.

i) Plan Module Temperature sensor location within 500 feet cable run of the enclosure.

ii) Mount the sensor near the center of the back of a module near the center of the array.

iii) Mount the Module temperature sensor conditioner (small plastic box) to the panel rack.

iv) Wire Module Temperature Sensor to the sensor digitizer inside the enclosure.

5) Connect the Revenue Grade Meter
   a) ENSURE ALL SYSTEM AC AND DC POWER TURNED OFF.
      i) Tap the voltage lines in the three-phase system.
      ii) Installing solid core Current Transformers, CTs, around each of the phases in the three-phase system.
      iii) Locate CTs within 20 feet wire run from the enclosure.
      iv) Connect CT and Voltage Taps to the Enclosure.
6) Powering-On the System
   a) Powering the Communication Box.
      i) Energize Enclosure Power and Turn Enclosure Breaker ON
   b) Power-On Inverters
      i) Follow Inverter User Installation Guide
7) Verify Installation
   a) Internet Access
      i) Look at Data logger screen
   b) Weather Sensors
      i) Check DC voltages at Weather Station Digitizer with Voltmeter
   c) Inverter Communications
      i) Verify data on PowerTrack or LocusNOC
   d) Meter Operation
      i) Look at meter front panel
   e) PowerTrack Operation
      i) Use mobile application

Required Tools

- Drill and Bit Set
- Knockout Set
- Wire Stripper/Cutter
- Small Flathead Screwdriver
- Large Flathead Screwdriver
- AC/DC voltmeter
- RJ45 Termination Tool
- Network cable tester
- Mounting hardware to mount enclosures, sensors
- Outdoor-rated shielded STP Cat5 cable
- Conduit and rain-tight connectors

Wiring Sequence

The following sections provide detailed wiring instruction and diagrams. For the devices that apply, the recommended order of wiring is:

1. Power for the communications enclosure: Ground, AC Power
2. Internet Connection (wired, cell modem)
3. Inverter Communication
4. Weather station sensors for the internal weather station
5. Voltage and CTs for the revenue-grade energy production meter

3.0 Hardware Overview

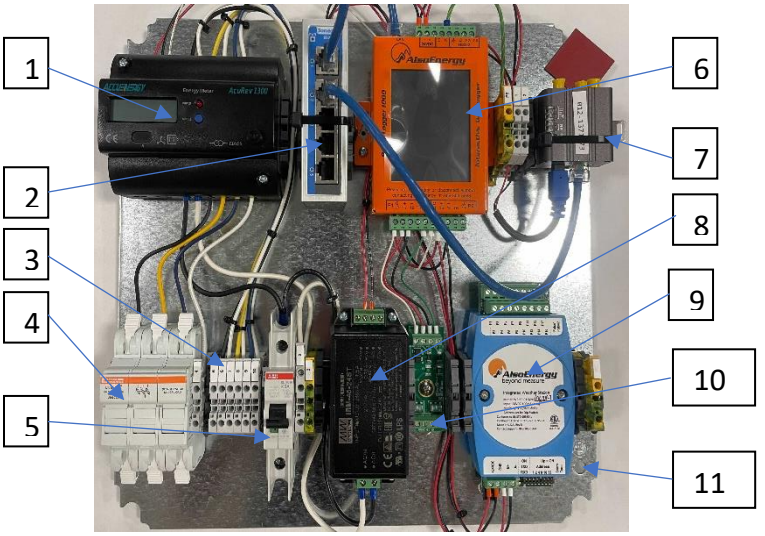


Figure 1 - PowerLCS 400 Enclosure Assembly

1	Revenue Grade Meter
2	Ethernet Switch
3	Current Transformer Terminal Blocks
4	Voltage Reference Fused Disconnect
5	Control Power Input Terminals and Breaker
6	Datalogger
7	Cellular Modem (Optional)
8	DC Power Supply
9	Weather Station Digitizer
10	RS-485 Terminals for Inverter Direct Monitoring
11	Grounding Stud

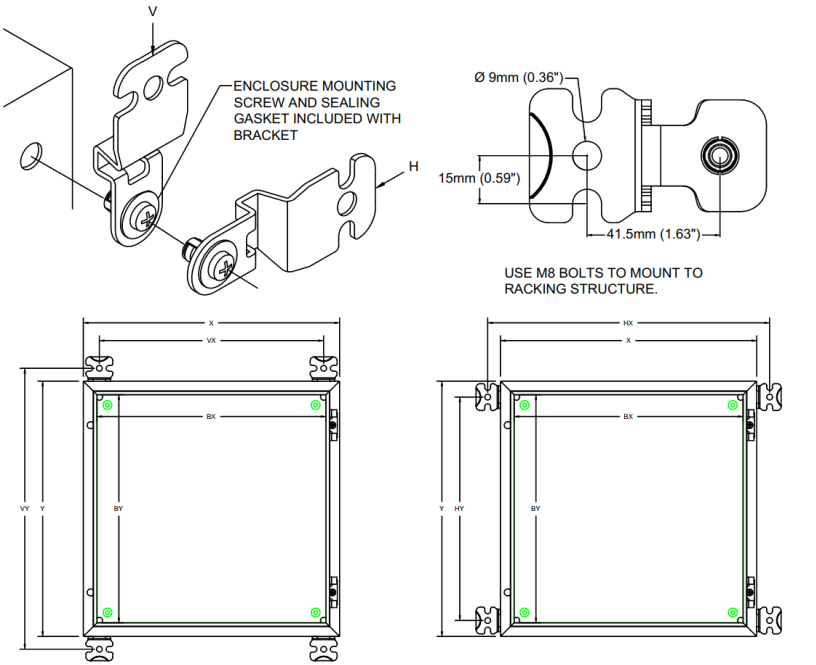
The Also Energy PowerLCS is a fully integrated monitoring system with Modbus RTU / TCP inverter communications, a revenue-grade meter, irradiance sensor, and module temperature sensor. It is available with an optional cell modem if no internet connection is available.

4.0 Mount the PowerLCS

Location

1. The unit should be placed in a secure location, away from any potential tampering
2. Allow space beneath the enclosure for conduit runs for all input and output wires
3. Within 65 feet of the pyranometer mounting location
4. Within 20 feet of the CT location
5. Allow space in front of the unit to allow the front door to open fully
6. Mount to an indoor or outdoor wall using four M8 or 5/16” bolts through the holes in the mounting flanges

See enclosure dimensions with mounting options below.



EXTERNAL DIMENSIONS			BACKPLATE		VERTICAL BRACKET ORIENTATION SPACING		HORIZONTAL BRACKET ORIENTATION SPACING		APPROXIMATE WEIGHT
X	Y	Z	BX	BY	VX	VY	HX	HY	-
400mm (15.75")	400mm (15.75")	200mm (7.9")	350mm (13.8")	350mm (13.8")	357mm (14.1")	440mm (17.3")	440mm (17.3")	357mm (14.1")	11-16kg (25-35lb)

Figure 2 - Enclosure Mounting Dimensions

Electrical

1. Supply between 100 and 277VAC at 0.4A – 0.2A, 50 -60 Hz
2. Protect by a branch circuit breaker rated up to 20 amps
3. No further than six feet from earth ground

Distance Limitations

1. Without an internal cell modem, 300 feet or less from an internet-connected network port
2. 300 feet or less from the first Inverter if using ethernet for inverter communications
3. RS-485 for inverter communications

    - Max 1,000 feet between any two RS-485 devices, including PowerLCS enclosure

    - Max 4,000 feet from PowerLCS to the last RS-485 inverter

Enclosure Penetrations

1. Do not penetrate the top or sides of the enclosure
2. WARRANTY IS VOID IF THERE ARE ENTRY POINTS ON THE TOP OR SIDES OF THE ENCLOSURE
3. All penetrations must be liquid-tight, for outdoor installations
4. Place the AlsoEnergy provided desiccant packet within the enclosure after final verification to reduce the internal humidity of the enclosure

5. Replace the desiccant packet when the humidity indicator card shows 40% relative humidity or higher during scheduled maintenance
6. DO NOT RUN RS-485, CAT5e or WEATHER SENSOR WIRE IN THE SAME CONDUIT AS AC POWER, VOLTAGE TAPS OR CT WIRES
7. Penetrate the enclosure for separate conduits, as shown below:

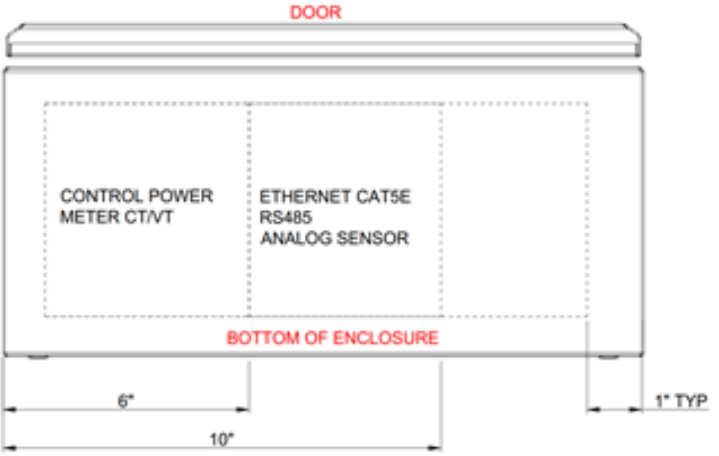


Figure 3 - Enclosure Penetrations

5.0 Set up Internet Connection

Using Site Internet – No Modem

Connect to a third-party network by connecting a CAT5e from the router to the PowerLCS network switch. If inverters communicate with Modbus TCP protocol, it is necessary to receive a static IP from the network administrator for each device. The address information must be entered in PowerTrack or LocusNOC for PowerLCS to establish communication with the device(s), contact support@alsoenergy.com to update network settings if necessary.

Not Using Site Internet – Cell Modem Setup

The PowerLCS may include the optional cellular modem for internet access. These steps need to be taken to install the cell modem antenna. Release the modem from the backplate by pressing down on the clip release. Reinstall the modem after all connections are complete.

1. Connect the antenna to the coaxial terminals on the top of the modem
2. Route the antenna wires through a penetration on the bottom of the enclosure and mount the antenna
3. For best signal strength mount the antenna as high as possible and away from large magnetic fields
4. Connect the modem to the ethernet switch in the enclosure with a short CAT5e patch cable
5. Connect the power cable and ensure that it clicks into place

6.0 Installation Connections

Follow the sections below to connect the PowerLCS to the field devices and power source.

Power

The power supply in the AlsoEnergy PowerLCS requires 100-277VAC at 0.2A-0.4A, 50-60 Hz, and is auto-ranging. DO NOT USE two “hot” phases to power the enclosure, a neutral wire is required for power.

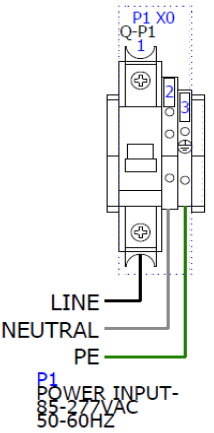
Use a branch circuit breaker rated up to 20 Amps to protect the monitoring system.

It is best to use a dedicated circuit to power the enclosure. Providing power from the line side of the voltage reference is not permitted in all areas. Consult NEC and local regulations if not powering the enclosure from a dedicated breaker.

Check that power is off at the main breaker and that the breaker inside the PowerLCS is off before starting any work. Complete all other enclosure connections before energizing the enclosure.

All AC input power connections are made with 12-14AWG as follows:

(1) Circuit Breaker - AC line 100-277VAC
(2) Terminal Block – AC neutral
(3) Green/Yellow Terminal Block - EGC



Connect the Inverters

Daisy chain the inverters to the PowerLCS. The PowerLCS supports both RS-485 and ethernet connected inverters. Inverters need to have their addresses programmed by the installer.

Modbus RTU / RS-485 Communication Wiring

1. The PowerLCS supports a maximum of 16 inverters
2. SET UNIQUE INVERTER MODBUS ADDRESSES AS 51, 52, 53, ETC. IF TWO DEVICES ON THE BUS HAVE THE SAME ADDRESS, THE SYSTEM WILL NOT COLLECT DATA FROM EITHER DEVICE.
3. Use Belden 3106A or equivalent shielded, twisted pair RS-485 wire
4. RS-485 connections could show as 'A' or 'B' or "A+" or "B-" but the convention is not standardized. The polarity of the inverter daisy chain must match the datalogger, wire according to data+ and data- as opposed to A and B. Refer to inverter manufacturer documentation if the polarity of the RS-485 terminations is not clear.
5. Use a single "daisy chain" configuration for RS-485 devices. Do not use an RS-485 star-configuration; there should be no more than two wires on any RS-485 terminal
6. The total RS-485 daisy chain should not exceed 4000 feet in wire length
7. Do not exceed 1000 feet between devices

8. Land the RS-485 shield ONLY at the PowerLCS enclosure
9. NEVER GROUND THE RS-485 SHIELD IN MORE THAN ONE LOCATION
10. If a termination resistor is used, it must be only on the last device in the chain

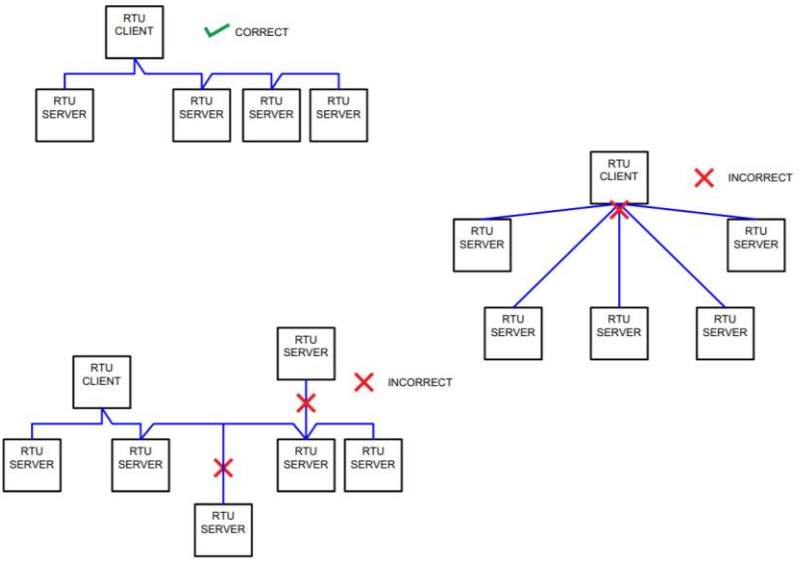


Figure 4 - RS-485 Daisy Chain Configuration

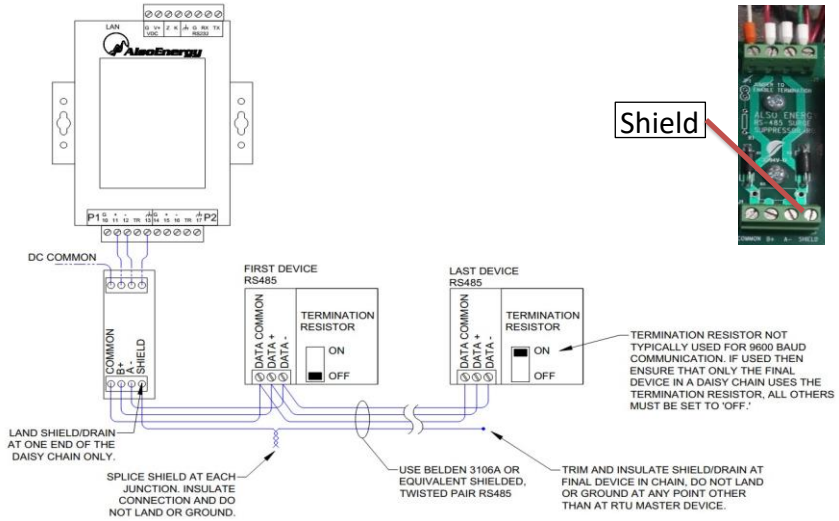


Figure 5 - RS-485 Daisy Chain Wiring

Modbus TCP / CAT5e Ethernet Communication Wiring

1. Connect Inverter Communication Module(s) to any open PowerLCS ethernet RJ45 switch port(s).
2. Use belden 7919A or equivalent shielded cat5e cable for all ethernet connections.
3. Each device must be assigned a static IP address on the network. If the PowerLCS was purchased with a cell modem address the inverters with the following.

Default Gateway	**192.168.13.1**
Subnet Mask	**255.255.255.0**
Inverter 1	192.168.13.51
Inverter 2	192.168.13.52
…	
Inverter 16	192.168.13.66

If using an existing network, you must obtain a static IP address for each Modbus TCP connected device from the network administrator.

Connect Weather Sensors

Pyranometer Mounting

1. The sensor is calibrated for the included cable and must not be altered.
2. For best accuracy, mount the pyranometer on top of the north side of the array at the same angle as the panels.
3. Ensure the pyranometer is not shaded at any time of the day.
4. Mount the pyranometer bracket to a pole or strut with the included U-bolt.
5. Attach the pyranometer to the leveling plate with the included screws, ensure that the cable points North.
6. Attach the leveling plate to the circular mounting bracket by threading the included gold screws three full turns, do not tighten down
7. Use the hex screws to level the pyranometer to the plane of the solar array then fully tighten the gold screws to secure in place
8. Route the pyranometer cable to the enclosure.
9. Remove the green protective cap.

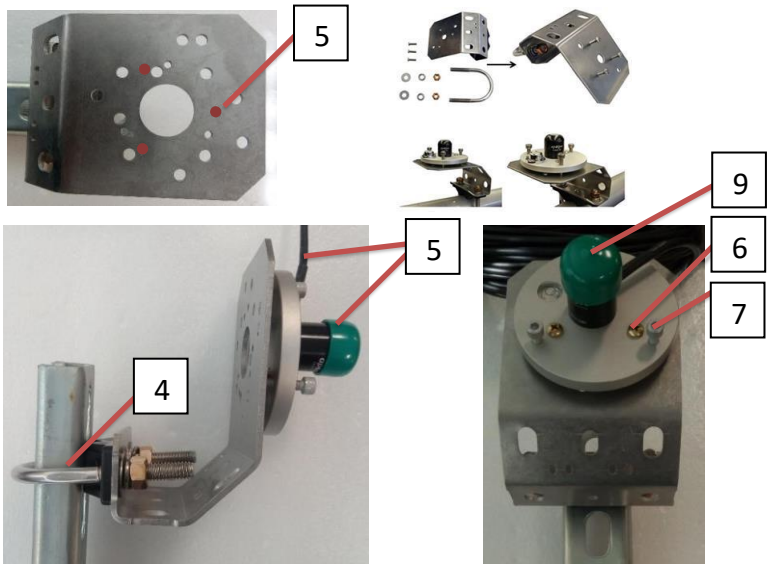


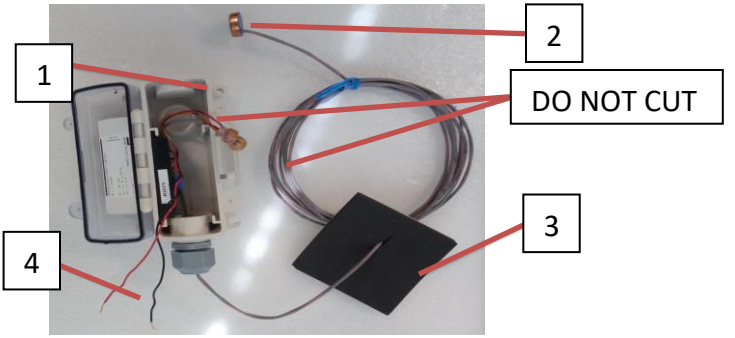
Figure 6 - Pyranometer Mounting

Module Temperature Sensor Mounting

THE SENSOR IS CALIBRATED FOR THE INCLUDED CABLE AND MUST NOT BE ALTERED. Mount the sensor box near the monitored module. Excess cable should be wrapped and secured to the rack structure with zip ties.

1. Choose a module near the center of the array and secure the plastic box nearby. Plug any holes in the enclosure and ensure that the box is weathertight.
2. Select an area near the center of the back of the module to place the sensor. If the module has distinct cells, be sure to place the probe in the center of a cell. Clean all dirt and oil from the area, peel the backing and firmly press the probe onto the module. Use Kapton tape to reinforce the sensor adhesive as needed.
3. Place the strain relief tab several inches from the probe and ensure that the cable between the tab and sensor probe is slack.
4. Use 22AWG wire to extend the red and black wires up to 500 feet to the PowerLCS

IMPORTANT - DO NOT CUT, SPLICE, OR SHORTEN THE SENSOR PROBE LEAD!



Weather Sensor Wiring

1. Remove the front cover of the weather station digitizer to access the field wiring terminals
2. Connect the weather sensor wires per the chart below and replace the cover
3. The clear pyranometer shield wire does not connect to the weather station digitizer and instead connects to the shield terminal on the RS-485 field terminal block

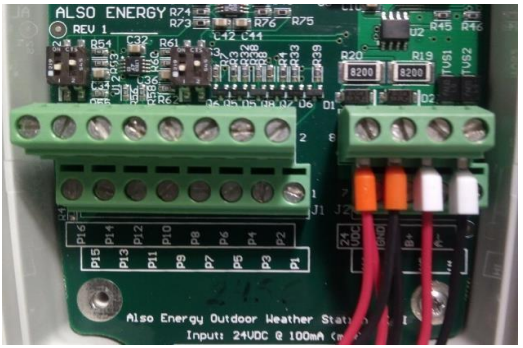
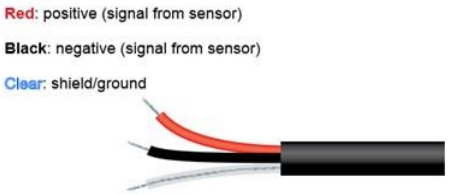


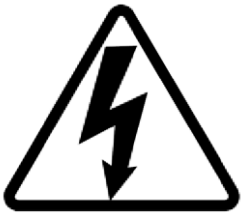
Figure 9 - Weather Station Digitizer Connections

Device	Wire	Terminal
Pyranometer	Black (Common)	P7
	Red (Signal)	P8
	Clear (Shield)	Shield
Module Temperature	Red (+24VDC)	P1
	Black (Signal)	P4



Connect the Revenue Grade Meter to Measure Production

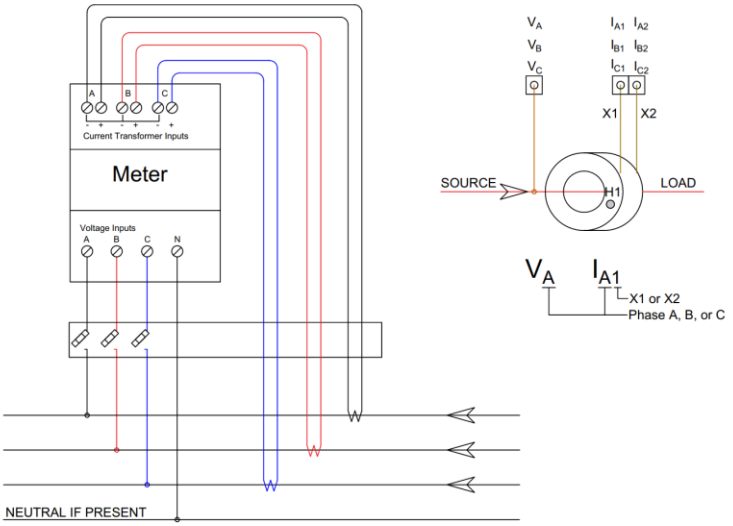
This step consists of tapping the voltage lines in the three-phase system and installing solid core Current Transformers, CTs, around each of the phases in the three-phase system. Install CTs and make all AC connections with all system AC and DC power turned **OFF**. CTs provide power readings from the production meter by scaling large primary currents to smaller currents or voltages. If you have any questions, please call AlsoEnergy technical support before energizing the system.



Danger

The meter is a Class III Measurement Device. Line voltages up to 600 VRMS are present on the input terminals of the device and throughout the connected line circuits during normal operation. These voltages may cause severe injury or death. Installation and servicing should be performed only by qualified, properly trained personnel.

Typical 3 phase Installation



Current Transformer and Voltage Reference Installation

1. Place CTs around each of the three phases of the solar generation output so that dot or "H1" mark faces the inverter and wire them back to the appropriate terminals in the PowerLCS

2. Place voltage taps on each of the three phases and wire them back to the appropriate terminals in the PowerLCS

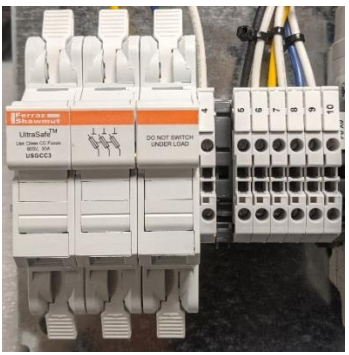
3. Install Voltage taps, and CTs in the same enclosure. Ensure there is not a transformer between the voltage taps and CTs.

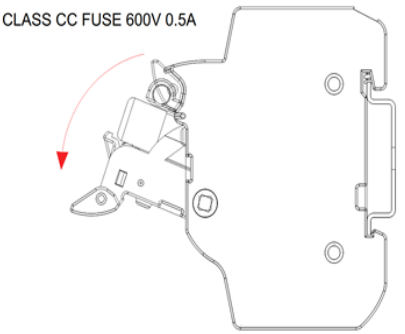
CTs and voltage taps are phase-specific. Align these per phases when connecting to the meter. The voltage tap "V_A" must connect to the same phase that is being measured by the CT connected to "I_{A1}" and "I_{A2}". Similarly, "V_B" is associated with "I_{B1}" and "I_{B2}" and "V_C" with "I_{C1}" and "I_{C2}".

1	Voltage Reference Phase A
2	Voltage Reference Phase B
3	Voltage Reference Phase C
4	Voltage Reference Neutral
5	CT Phase A X1
6	CT Phase A X2
7	CT Phase B X1
8	CT Phase B X2
9	CT Phase C X1
10	CT Phase C X2

4. Observe correct polarity of the CT leads. X1 and X2 are labeled or color-coded by the CT manufacturer.

- To replace fuses or de-energize the meter voltage reference pull down on the fuse holder. Replace fuses with 0.5A 600V Class CC fuses.





7.0 Power-On the Communication Box

Turn Circuit breaker, 5, ON. Wait ten seconds and the Power Supply, 2, to startup. Verify the "DC OK" green light illuminates on the Power Supply. Verify the Meter face shows data. Verify the Data Logger boots to the home page and shows the time and date in the upper left. If this does not occur, check these items:

Verify AC Power at Enclosure Circuit Breaker

1. Using a voltmeter, check if AC power is present. Refer to the supplied single-line drawing.
2. If AC power is not present, check the status of feeder fuses and circuit breakers.
3. Otherwise, refer this problem to a licensed electrician.

Verify DC Power at Data Logger

1. Using a voltmeter, verify 24VDC is present on the data logger, and meters
2. Check DIN mounted power supply for green DC OK light
3. If DC power is not present
    a. check the breaker in the enclosure
    b. check for 100 – 277 VAC at the enclosure power input
4. If the breaker is good, disconnect AC power, disconnect all loads then Reconnect AC power
5. If DC power is still not present on the output of the power supply, Call AlsoEnergy

8.0 Power-On Inverters

Refer to the inverter manufacturer manuals.

9.0 Verify Installation

Datalogger Screen Calibration

If there are issues with the touchscreen interface, calibrate the screen by tapping the screen 3 times during startup.

Verify Internet Access

Check the Last Upload and Last Heartbeat on the main screen. The logger should heartbeat within 1-2 minutes after booting up, then once every 30 minutes after that. If not, there is likely a network configuration issue or cable issue.

1. Select Network – Quick Test – Start ○ Verify Network Up - True, and AE Reached - Yes ○ Stop and Close
2. Net Type should typically be DHCP. If set to static, ensure that the logger's IP address, subnet mask, and gateway match the LAN network settings.
3. Check that the cell modem or other Internet connection is online.
4. Check cable.

Verify Weather Sensors

Apogee Pyranometer

Measure the voltage between the terminals P7 and P8. Refer to Figure 9 - Weather Station Digitizer Connections for terminal markings. The voltage should be between 0.00V in total darkness and 0.200V DC in full sun, 1000 W/m². If it is not, disconnect the Apogee leads and measure it.

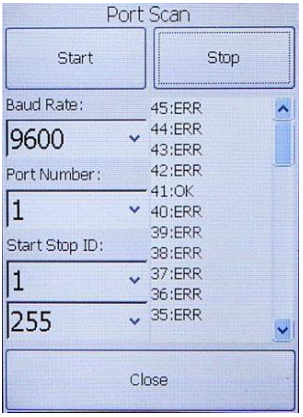
If the voltage does not lie between these values, the Apogee pyranometer is defective and should be replaced. Otherwise, replace the weather station digitizer.

Module Temperature

(4-20mA, -40°C to 85°C, -40°F to 185°F)

Measure the voltage between the terminals where the sensor is connected. Between P3 and P4 the voltage should be about 3.3V at 80° F. If the voltage is less than 2V, the sensor is not connected or needs to be replaced. If the voltage is higher than 5V, inspect the black card in the BAPI temperature housing for damage.

Verify Inverter RTU Communications



6. Navigate to Utilities -> Port Tools > Port Scan.
7. Select Baud Rate 9600, press Start. For any device addresses detected on the bus, the output shows “OK.” ALL CONNECTED MODBUS INVERTERS SHOULD SHOW OK. CHECK WIRING IF THEY DO NOT.
    a. Inverters that If “ERR” shows for a device that should be detectable, there is probably a physical layer issue, e.g., wiring. Check the RS-485 bus.
    b. If “OK” but no device in PowerTrack after 30 minutes, contact AlsoEnergy Support.

Verify Inverter TCP Communications

Verify device data appears in PowerTrack or LocusNOC. If a computer is available and connected to the LAN, use a command line “arp -a” command to confirm all inverter IPs appear in the node table. Otherwise, refer to the inverter manual to confirm inverter settings.

Verify System Power Output

With all inverters running and constant sun, read inverter production kW and calculate meter kW. Read meter kW on display and verify it is around to the calculated value. Remember system production changes by the second according to the sun intensity.

Verify PowerTrack Operation

1. If you do not have it already, download the Also Energy PowerTrack mobile application and request a login
2. Log in to the mobile application or browser version
3. Navigate to the site name
4. Verify all on-site devices are communicating and communicating the correct values
5. If these steps do not work, please call AlsoEnergy for support

Appendix B - Data Logger Networking Considerations

The data logger gathers data from devices and sends the data over the internet to a hosted database:

1. The Data Logger (DL) powers up
2. The DL gets its IP address via either DHCP or its static assigned network configuration. Contact AlsoEnergy™ for the correct documentation for configuring the DL environment.
3. The DL resolves www.AlsoEnergy.com via DNS services.
4. The DL periodically updates its real-time clock using network time services.
5. The DL contacts AE Web Services (AEWS) supplying its MAC address and current code version.
6. The AEWS responds as:
   - 6.1. The code is not correct. Update the program with the code that follows then reboot.
   - 6.2. The code is correct. Configuration data follows.
7. The DL uses the configuration data to query devices connected to it.
8. The DL packetizes the received device data and sends it to the AEWS via TCP.
9. The DL sleeps for the configured length of time.
10. The DL wakes up and repeats the process at step 3.

Ports

For security, install the Data Logger in a DHCP or static IP environment behind a firewall. It does not need an external internet IP address or ports forwarded. This table shows the unique ports opened:

	Inbound Ports	Outbound Ports
HTTP: Port 80 (TCP)		☒
HTTPS: Port (443) TCP		☒
SNTP: Port 123 (UDP)		☒
SMTP Port 25 (TCP)		☒
FTP: Port 20 & 21 (TCP)	Only if local diagnostic PC present	
Telnet: Port 23 (TCP)	Only if local diagnostic PC present	