



# Ampt Communications Unit Installation Manual

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This document contains information needed to install and commission an Ampt optimizer (including Smart String Technology™ optimizers, String Stretch® optimizers, Ampt Mode® optimizers, and String View® optimizers) within a grid-tied photovoltaic (PV) installation. The result? Energy realized®.

## General Safety

Installation and maintenance should be performed only by qualified persons. Installers and maintenance personnel assume the risk of all injury that might occur during installation or maintenance including, without limitation, the risk of electric shock. Follow your safety procedures and protocols.

All electrical installations must be done in accordance with the local and National Electrical Code ANSI/NFPA 70, or the applicable standards, codes, and regulations for your region.

The Ampt product contains no user-serviceable parts. All repairs and maintenance should be handled in accordance with the instructions and terms contained in the product warranty.

The Ampt communication unit is used with Ampt optimizers. Before installing or using an Ampt optimizer, read all the instructions and safety messages on the optimizer and in the optimizer installation manual. Follow the safety precautions for this product as well as the other components in the PV system.

Keep this manual.

## Safety Message Types

The following messaging is used to identify a hazard to equipment or personnel:



### **DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



### **WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



### **CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

### ***NOTICE***

Indicates information considered important but not hazard, or personal injury, related - for example, property damage.

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### **WARNING**

Any use of this product that is not expressly authorized in this manual or associated documentation is expressly prohibited by Ampt. Ampt disclaims any responsibility or liability for such prohibited use.

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# Chapter 1: Product Overview

## General Description

The Ampt communications unit (Ampt CU) provides wireless two-way communication with Ampt String Optimizers.

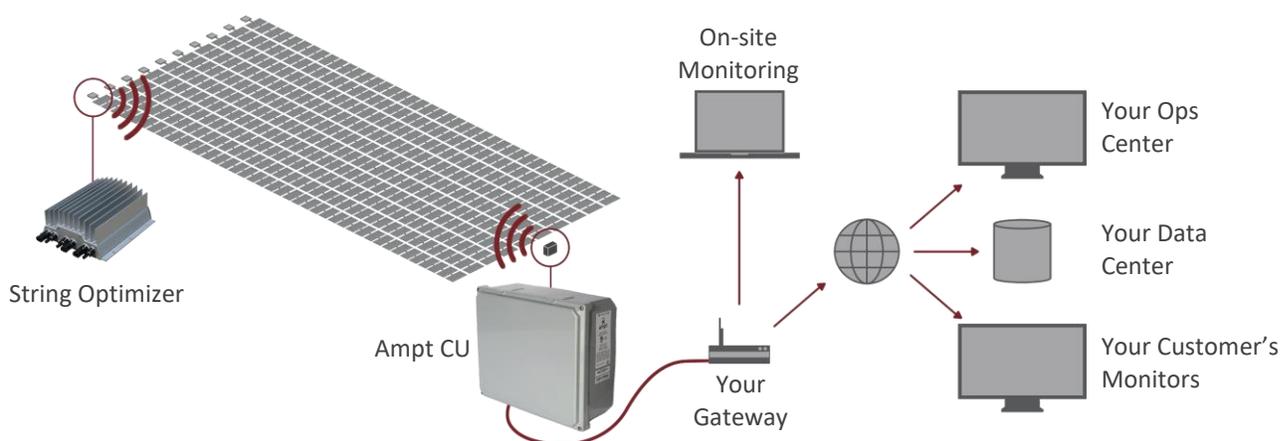


Figure 1: String-level data is transmitted from the String Optimizers to the Ampt CU and then to your SCADA system

Ampt String Optimizers are used to lower the total cost of PV systems by eliminating half of the electrical balance of system components and enabling lower cost per watt inverters. String Optimizers also put dual MPP trackers on each string to improve the lifetime performance of PV systems. These benefits are realized without communications. For more details, see the installation manual for the Ampt String Optimizer.

StringView<sup>®</sup> is an optional feature that provides string-level data for enhanced commissioning and O&M capabilities. String Optimizers transmit string output current and daily integrated energy data via two-way wireless communications to an Ampt CU. The Ampt CU uses Modbus/TCP to pass records to your SCADA or data monitoring system – making the information available in the field, at your remote operations center, or through a third-party monitoring service.

## Dimensional Drawings

The dimensions for the Ampt CU are shown below.

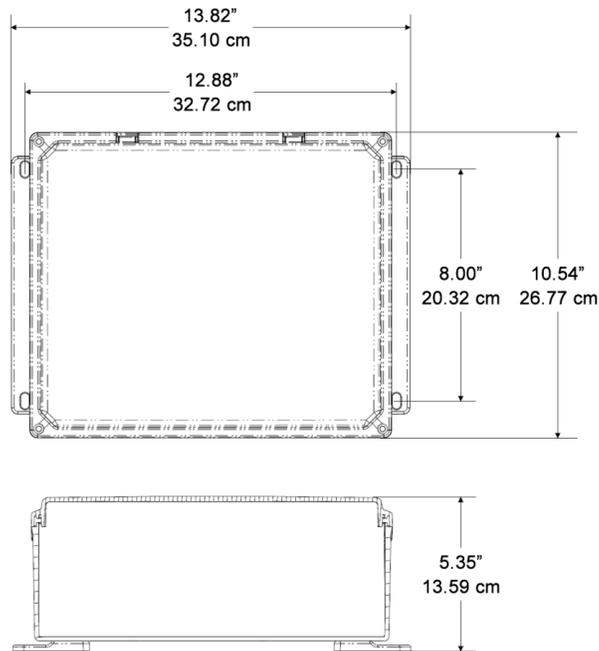


Figure 2: Dimensional drawings

## Physical Overview

### Labels



Figure 3: Serial number, model number, and MAC address labels

## Internal



Figure 4: Interface panel

Component	Description
Ethernet port	RJ-45 connector for Power over Ethernet (PoE) and Ethernet communication.
RS-485 port	Reserved for engineering use
Termination switch	Reserved for engineering use.
Reset button	Pressing this button forces the Ampt CU to reboot.
Restore button	This button restores the network settings and password back to their factory default values. See <i>Restoring Factory Defaults</i> on page 18 for more detail.
Power LED	This green LED is on continuously when the input voltage is above the minimum threshold.
Com LED	This LED displays boot status.
Fault LED	This red LED communicates fault conditions.
Cable locks	Route the input power and communication cables through these guides.

## Understanding the Status LEDs

The Ampt CU has three status LEDs. When input power is first applied to the Ampt CU, all LEDs are on continuously for several seconds. Then the Com LED flashes amber while software is booting. Once boot up is complete and the Ampt CU is operating normally, both the Power and Com LEDs are on solid green.

Name	State	Description
Power	Continuous Green	Input power supply voltage exceeds the minimum threshold.
Com	Flashing Amber	Software is booting up.
	Continuous Green	Boot process is complete.
Fault	Continuous Red	When this LED is on solid red after the boot up process, a fault condition has been detected. Cycle the input power. If this LED is still on after the Com LED finishes flashing (during the boot process), then contact Ampt support.

## Specifications

<b>Data Communications</b>	
Interface with Ampt optimizers	Two-way wireless
Number of Communication Units per MW	1 - 2
Interface with data monitoring system	Modbus/TCP
Connection with data monitoring	Ethernet 10/100 Base T
Measurement accuracy	±0.25%
Data interval	1 minute
Local data storage	45 day rolling buffer
<b>Electrical</b>	
Power supply	Power over Ethernet (PoE) power consumption < 4.5W
Power over Ethernet (PoE)	Class 0, 802.3af Modes A and B, 802.3at Type 1 (RJ-45 connector)
<b>Mechanical</b>	
Enclosure	IP66
Dimensions	13.82" x 10.54" x 5.35" (35.10 cm x 26.77 cm x 13.59 cm)
Weight	5.6 lbs (2.5 kg)
Ambient temperature, operating	-40 °F to +185 °F (-40 °C to +85 °C)
<b>General</b>	
Compliance	FCC Part 15, class B ETL to UL 60950-1, 60950-22, CSA-C22.2 Nos. 60950-1, 60950-22

## Modbus Register Map

Ampt StringView® records use the SunSpec protocol for device ID and variable record length to enable site-specific operation.

### NOTICE

The SunSpec Common Model precedes the map below.

Start offset	Size	Name	Type	R/W	Description
1	1	ID	Uint16	R	Ampt SunSpec Vendor Code 64050
2	1	L	Uint16	R	Variable number of 16 bit registers to follow: 12+N*16
3	1	DCA_SF	Int16	R	Current scale factor
4	2	<i>Reserved</i>	-	-	
6	1	DBWh_SF	Int16	R	Energy scale factor
7	1	<i>Reserved</i>	-	-	
8	1	N	Uint16	R	Number of strings
9	6	<i>Reserved</i>	-	-	
<i>Register blocks for string data follow. Repeat block for each string. Two strings are shown as an example.</i>					
15	1	String ID	Int16	R	The string number.
16	2	<i>Reserved</i>	-	-	
18	2	String data timestamp	Uint32	R	The UTC timestamp of the measurements.
20	1	OutDCA	Int16	R	String output current in mA
21	6	<i>Reserved</i>	-	-	
27	2	DCWh	Uint32	R	Daily integrated string output energy
29	2	<i>Reserved</i>	-	-	
31	1	String ID	Int16	R	The string number.
32	2	<i>Reserved</i>	-	-	
34	2	String data timestamp	Uint32	R	The UTC timestamp of the measurements.
36	1	OutDCA	Int16	R	String output current in mA
37	6	<i>Reserved</i>	-	-	
43	2	DCWh	Uint32	R	Daily integrated string output energy
45	2	<i>Reserved</i>	-	-	
<i>Repeat block for additional strings</i>					

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# Chapter 2:

## Installing the Ampt CU

### Overview

This chapter explains how to mount the enclosure, provide power over Ethernet, and configure the network settings.

### Installing the Ethernet Cable Feed-through

A liquid-tight wire grip is recommended for the Ethernet cable feed-through. The markings on the bottom of the unit show where to make a hole for the wire grip.



*Figure 5: Bottom view of the communication unit*

1. Make sure the communication unit is not powered up.
2. Use a drill or punch to create a hole for the wire grip within the marked area.

**NOTICE**

Drilling outside of the designated area may damage internal electronic components.



Figure 6: Drill hole for the wire grip within the marked area

3. Install your wire grip. An example is shown below.



Figure 7: Example of an installed liquid-tight wire grip

## Mounting the Enclosure

Connect the hardware as shown in the figure below, or using a similar method, to mount the Ampt CU enclosure.

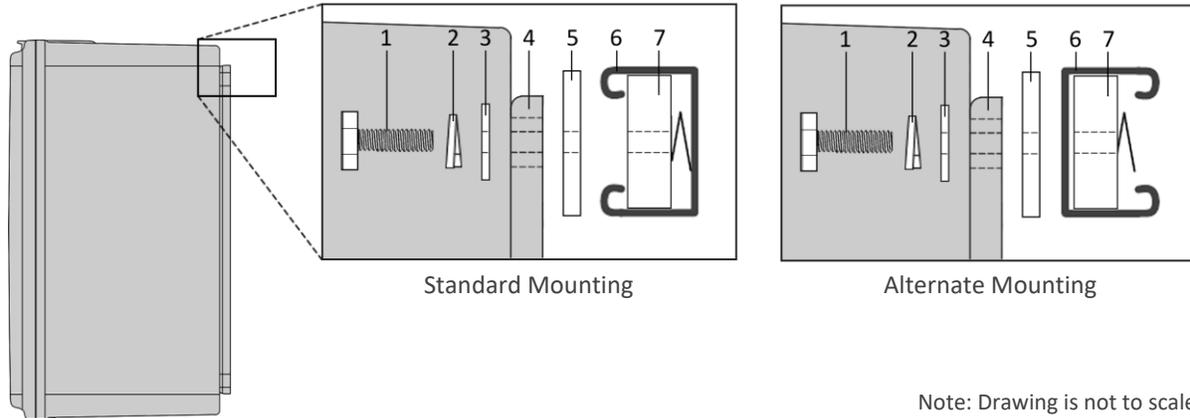


Figure 8: Mounting hardware for Ampt CU

### NOTICE

The 1-5/8" washer (number 5 above) is recommended for strut and uneven mounting surfaces.

### NOTICE

If a vertical pole is used behind the Unistrut, it should be placed near the horizontal center of the Ampt CU.

ID	Description
1	4 each ¼-20 x 1.25" 18-8 SS Hex Head Cap Screw (McMaster Carr 92240A544 or equivalent)
2	4 each ¼ STD split lock washer 18-8 SS (Grainger 1NY97 or equivalent)
3	4 each ¼ STD flat washer 18-8 SS (Grainger 1NU48 or equivalent)
4	1 each Ampt-CU
5	4 each 1 hole washer, flat plate fitting (1-5/8" series) Unistrut P1062 EG or equivalent (McMaster Carr 3133T11 or equivalent)
6	2 each Unistrut or Kindorf 1-5/8" x 13/16" x 16" galvanized slotted channel
7	4 each ¼-20 strut spring nut, galvanized (McMaster Carr 3259T17 or equivalent)

## Connecting Power over Ethernet

You will need to use a Power over Ethernet (PoE) injector that meets the requirements in the *Specifications* section. The diagram below illustrates the basic installation of a PoE injector; however, be sure to follow the installation instructions that comes with your PoE device.

**⚠ CAUTION**  
Live voltages may be present on the PoE cables.

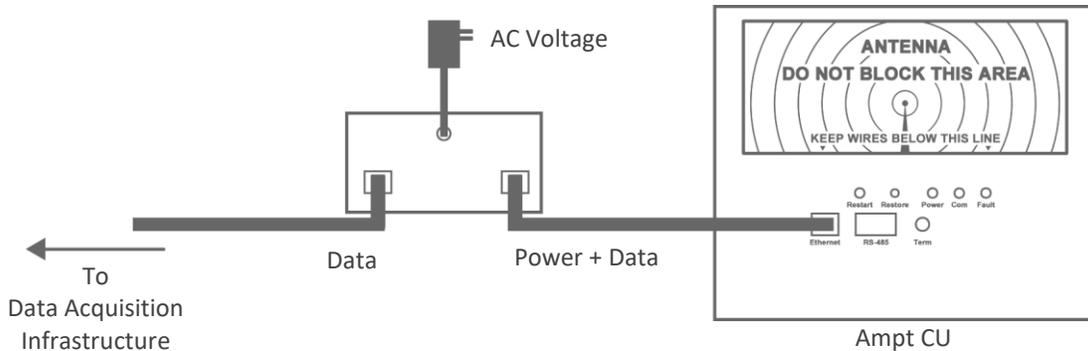


Figure 9: Generic Power over Ethernet (PoE) connection diagram – follow the instructions for your device

1. Route the Ethernet cable through the feed-through and cable locks. An example is shown below.



Figure 10: Ethernet cable routing and connection

2. Connect the cable to the Ethernet port.
3. Twist the ends of the cable locks together to hold the cable in place.

### NOTICE

Keep wires out of the antenna area as noted on the panel.

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## Configuring the Ampt CU Network Settings

You will need a laptop with an Ethernet port and administrator privileges to configure the Ampt CU.

### **NOTICE**

Completing the tasks in this section should be completed by a Network Administrator.

Please note the following:

- Default IP address of the Ampt CU is 192.168.1.249
- Web interface to configure the Ampt CU is accessed via port 8080
- Modbus data is accessed via port 502

To configure the Ampt CU network settings:

1. Configure the TCP/IP settings of your *laptop* to:
  - a. IP Address - 192.168.1.248
  - b. Netmask - 255.255.255.0
2. Ensure the Ampt CU is powered up. The Power LED should be on and solid green.
3. Connect your laptop to the field computer using the Ethernet ports of each device. If using PoE, the PoE injector must be connected between the laptop and the Ampt CU.
4. Open your web browser and enter the default IP address (<http://192.168.1.249:8080/>) in the address bar.
5. Complete the fields on the login page
  - a. Login: admin, Password: password
6. Once logged in, use the menu on the left to:
  - a. View Ampt-CU information on the Home page
  - b. Monitor optimizer data and manage the site layout on the Site Overview page.
    - i. At initial startup, follow the on-screen instructions to establish communications with the optimizers.
  - c. Change your password
  - d. Configure network settings
  - e. Set time zone and network time servers
  - f. Reference the Modbus map
  - g. Download string data in CSV format - new hardware will not have any data available until it has been online at least a day with a live system.
  - h. Perform a system self-test
  - i. Enable Ampt support access
  - j. Reboot the system

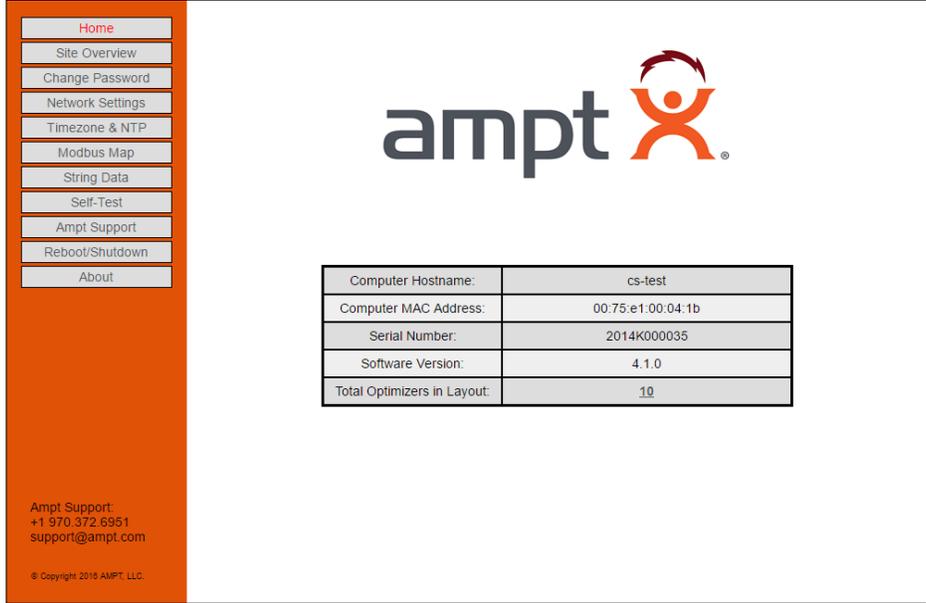


Figure 11: Ampt-CU Home Screen

7. Follow the onscreen directions for each task.

## Restoring Factory Defaults

The network settings and password can be restored to factory default values by pressing and holding the *Restore* button during the boot process. If you are using this feature to restore the password, be sure to record your network settings first. See *Configuring the Ampt CU Network Settings* on page 17 for more details.

To restore the network settings and password:

1. Press the *Restart* button
2. The LEDs will be on continuously for several seconds.
3. When the *Com* LED flashes, press and hold the *Restore* button until the *Com* and *Fault* LEDs alternate flashing.
4. The network settings and password are restored and the unit automatically reboots.

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# Appendix

## Compliance

### FCC Compliance

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 operation.

This equipment complies with radiation exposure limits set forth for uncontrolled environment. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons.

**IMPORTANT!** Changes or modifications not expressly approved by Ampt, LLC could void the user's authority to operate the equipment.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC ID # X3R-31570013  
Model Number: 31570013



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