



# Ampt Communication Unit Installation Manual

57070008-1 F





Copyright 2016-2020 Ampt LLC. All rights reserved. No part of this document may be reproduced, retransmitted, or copied in any form without the expressed and written permission of Ampt.

This document contains information needed to install and commission an Ampt optimizer (including Smart String Technology™ optimizers, String Stretch® optimizers, Ampt Mode® optimizers, StringView® optimizers, V-match™ optimizers, I-match™ optimizers, Direct-to-Battery™ optimizers, and Direct-to-Converter™ optimizers) within a 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.

## Disclaimer of Liability

Ampt makes no representations, expressed or implied, that with respect to this documentation or any of the equipment and/or software it may describe, including (with no limitation) any implied warranties of utility, merchantability, or fitness for any particular purpose. All such warranties are expressly disclaimed. Ampt shall not be liable for any indirect, incidental, or consequential damages under any circumstances. (The exclusion of implied warranties may not apply in all cases under some statutes, and thus the above exclusion may not apply.)

The following information is subject to change without notice, even though every attempt has been made to make this document complete, accurate and up-to-date. Readers are cautioned, however, that Ampt reserves the right to make changes without notice and shall not be responsible for any damages, including indirect, incidental or consequential damages, caused by reliance on the material presented, including, but not limited to, omissions, typographical errors, arithmetical errors or listing errors in the content material.



### **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.

# Table of Contents

General Safety .....	3
Safety Message Types .....	4
Disclaimer of Liability .....	4
<b>Chapter 1: Product Overview .....</b>	<b>7</b>
<b>General Description .....</b>	<b>7</b>
<b>Dimensional Drawings .....</b>	<b>8</b>
<b>Physical Overview .....</b>	<b>9</b>
Bottom View .....	9
Labels .....	9
Internal.....	10
<b>Understanding the Status LEDs.....</b>	<b>11</b>
<b>Specifications.....</b>	<b>12</b>
<b>Modbus Register Map.....</b>	<b>13</b>
<b>Chapter 2: Installing the Ampt CU .....</b>	<b>15</b>
<b>Overview .....</b>	<b>15</b>
<b>Mounting Considerations .....</b>	<b>15</b>
Ampt CU Radio Wave Ranges .....	15
Antenna Locations .....	16
<b>Mounting Example.....</b>	<b>17</b>
<b>Connecting Ethernet .....</b>	<b>18</b>
<b>Connecting Power over Ethernet .....</b>	<b>18</b>
<b>Configuring the Ampt CU Network Settings .....</b>	<b>19</b>
<b>Restoring Factory Defaults .....</b>	<b>20</b>
<b>Appendix .....</b>	<b>21</b>
<b>Compliance.....</b>	<b>21</b>
FCC Compliance .....	21
<b>Contacts .....</b>	<b>23</b>



# Chapter 1: Product Overview

## General Description

The Ampt Communication Unit (Ampt CU) provides wireless two-way communication with Ampt String Optimizers.

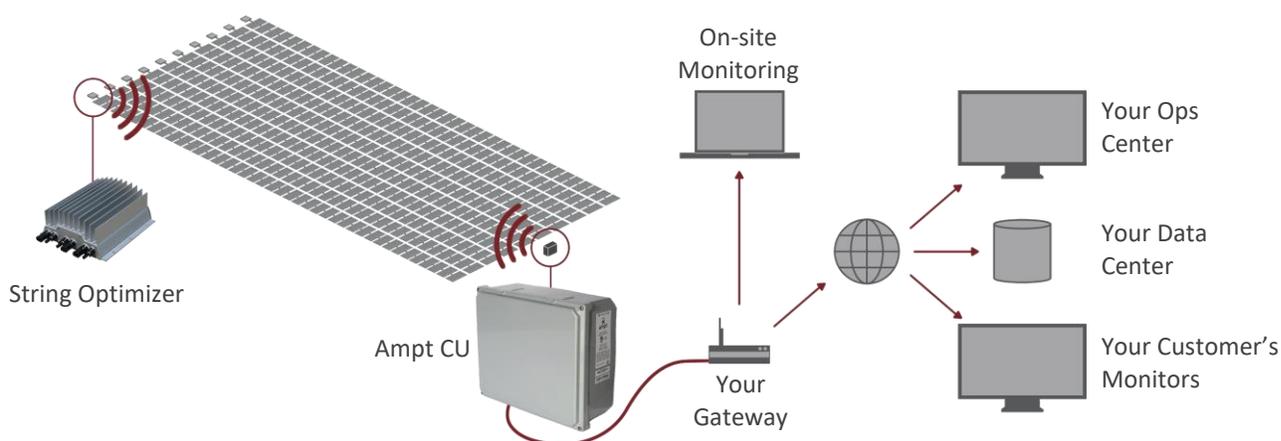


Figure 1: String-level data is transmitted from the String Optimizers to the Ampt CU and then to your SCADA system

Ampt String Optimizers are DC/DC converters that are used to lower the cost and improve performance of new PV systems, repower existing systems to produce more energy, and enable lower cost DC-coupled storage systems. Ampt String Optimizers perform maximum power point tracking on each string while eliminating half of the electrical balance of system components and enabling lower cost per watt inverters and battery-related power components. Learn more at [www.ampt.com](http://www.ampt.com).

The Ampt Communication Unit (Ampt CU) is paired with Ampt String Optimizers to provide optional string-level data for enhanced commissioning and O&M capabilities. Ampt optimizers transmit this StringView® optimizer data via two-way wireless communications to an Ampt CU. The Ampt CU uses Modbus/TCP to pass records to SCADA or data monitoring systems – 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.

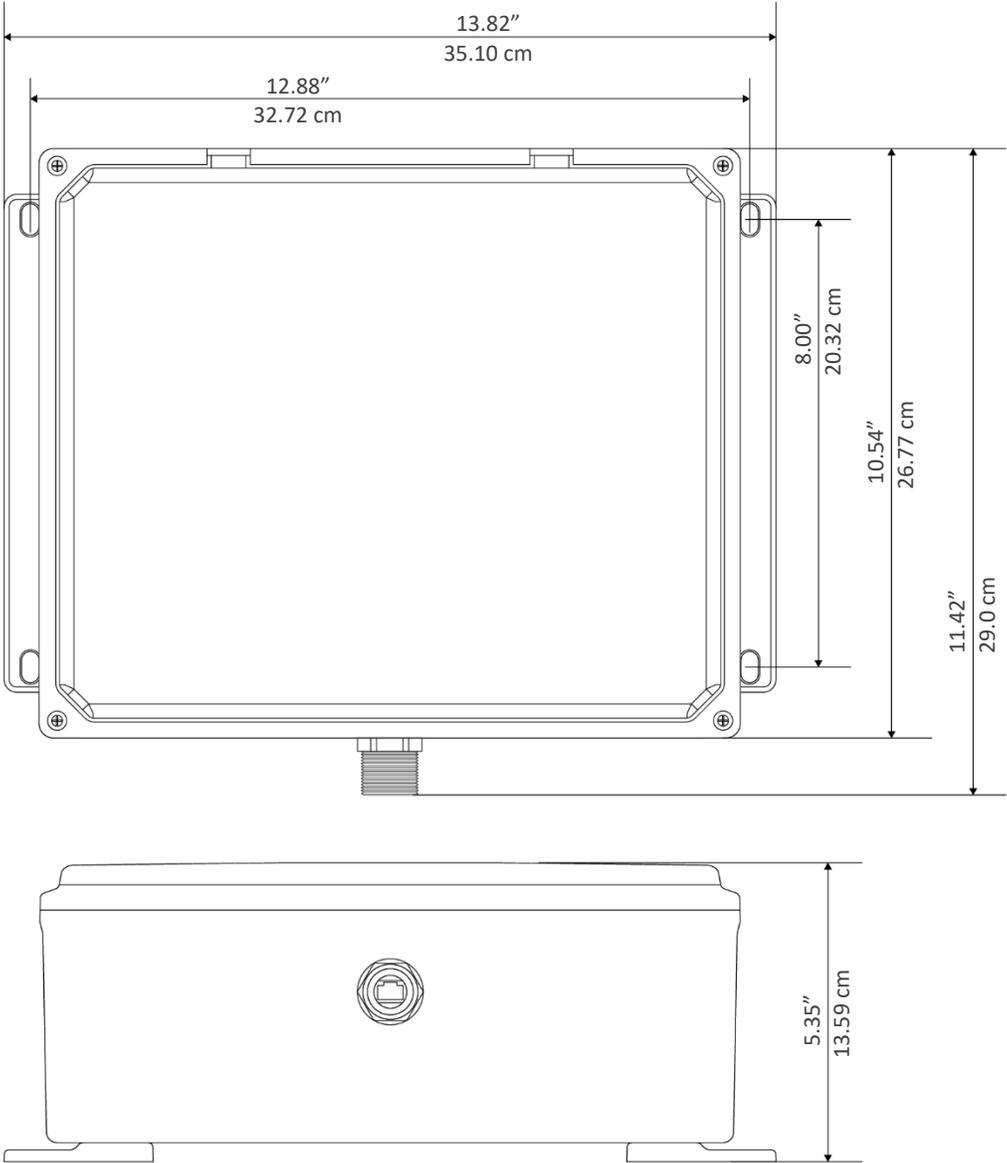


Figure 2: Dimensional drawings

# Physical Overview

## Bottom View

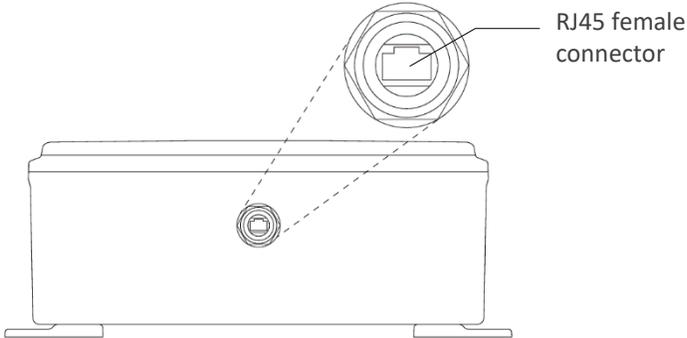


Figure 3: Bottom view with RJ45 connector

## Labels

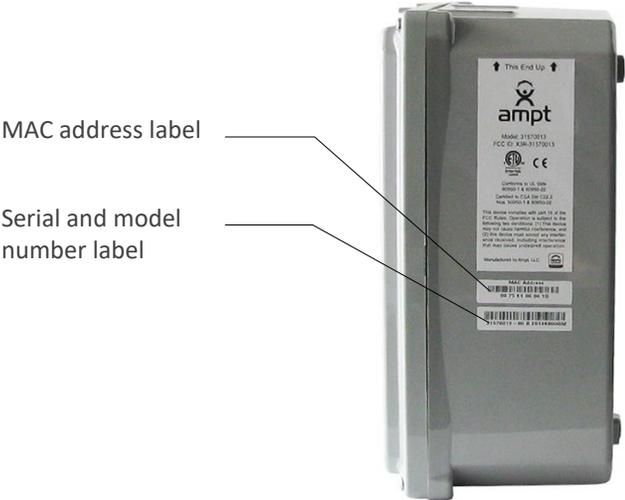


Figure 4: Serial number, model number, and MAC address labels

## Internal

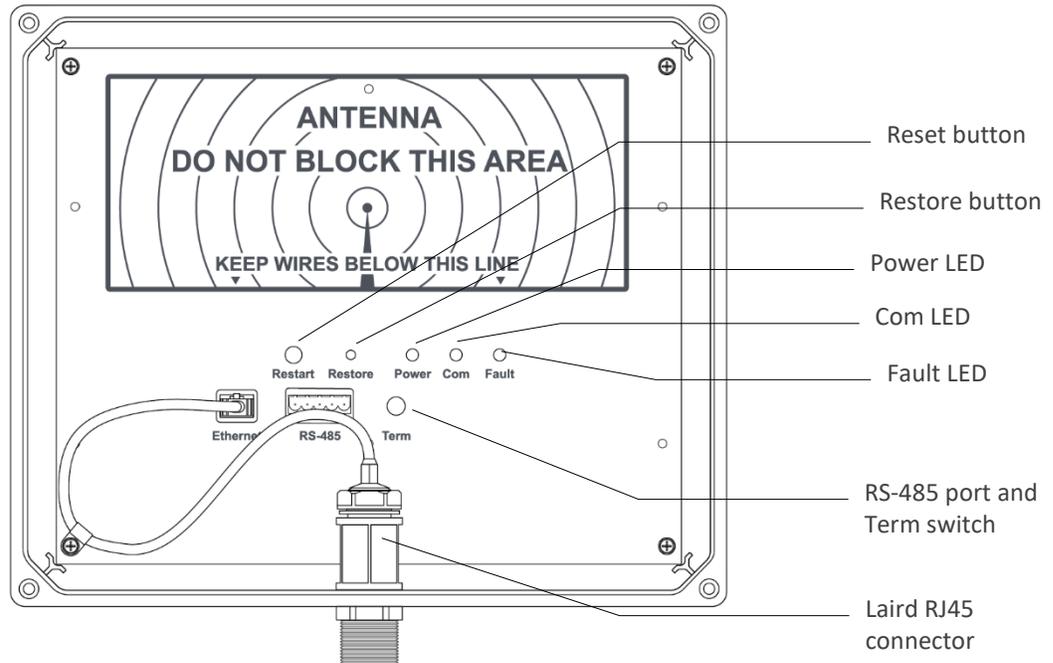


Figure 5: Interface panel

Component	Description
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 20 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.
RS-485 port	Reserved for engineering use
Termination switch	Reserved for engineering use.
Laird RJ45 connector	Allows connecting Ethernet cable without removing the Ampt CU cover.

## 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 11.42" x 5.35" (35.10 cm x 29.0 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's StringView® optimizer records use the SunSpec protocol for device ID and variable record length to enable site-specific operation.

Start offset	Size	Name	Type	R/W	Description
1	2	SID	uint32	R	A well-known value 0x53756e53, uniquely identifies this as a SunSpec Modbus Map
3	1	ID	uint16	R	A well-known value 1, uniquely identifies this as a SunSpec Common Model
4	1	L	uint16	R	Well-known # of 16-bit registers to follow: 66
5	16	Manufacturer	string	R	A well-known value registered with SunSpec for compliance: "Ampt"
21	16	Model	string	R	Manufacturer specific value "Communication Unit"
37	8	<i>Reserved</i>	-	-	
45	8	Version	string	R	Software Version
53	16	Serial Number	string	R	Manufacturer specific value
69	1	Device Address	int16	R/W	Modbus Device ID
71	1	ID	uint16	R	Ampt SunSpec Vendor Code 64050
72	1	L	uint16	R	Variable number of 16-bit registers to follow: 12 + N*16
73	1	DCA_SF	int16	R	Current scale factor
74	1	DCV_SF	int16	R	Voltage scale factor
75	1	<i>Reserved</i>	-	-	
76	1	DckWh_SF	int16	R	Energy Scale Factor
77	1	<i>Reserved</i>	-	-	
78	1	N	uint16	R	Number of strings
79	6	<i>Reserved</i>	-	-	
<i>Register blocks for string data follow. Repeat block for each string.</i>					
85	1	String ID	int16	R	String number
86	2	<i>Reserved</i>	-	-	
88	2	String data timestamp	uint32	R	UTC timestamp of the measurements
90	1	OutDCA	int16	R	String output current in mA
91	2	OutDCV	uint32	R	String output voltage in mV
93	2	In1DCV	uint32	R	String input 1 voltage in mV
95	2	In2DCV	uint32	R	String input 2 voltage in mV
97	2	DCWh	uint32	R	Daily integrated string output energy in Wh
99	1	In1DCA	int16	R	String input 1 current in mA
100	1	In2DCA	int16	R	String input 2 current in mA
<i>Repeat block for additional strings</i>					



---

# Chapter 2:

## Installing the Ampt CU

### Overview

This chapter addresses the following: Mounting Considerations, Mounting Example, Connecting Power over Ethernet, Configuring the Ampt CU Network Settings, and Restoring Factory Defaults.

### Mounting Considerations

#### Ampt CU Radio Wave Ranges

Use the image below as a guideline for radio wave ranges. The actual ranges depend on the mounting position of the String Optimizer relative to the Ampt CU, obstructions between the String Optimizer and the Ampt CU, and other variables common with wireless communications. To maximize radio wave range, avoid mounting the Ampt CU near large metal objects like inverters, combiner boxes, tracker arms, etc.

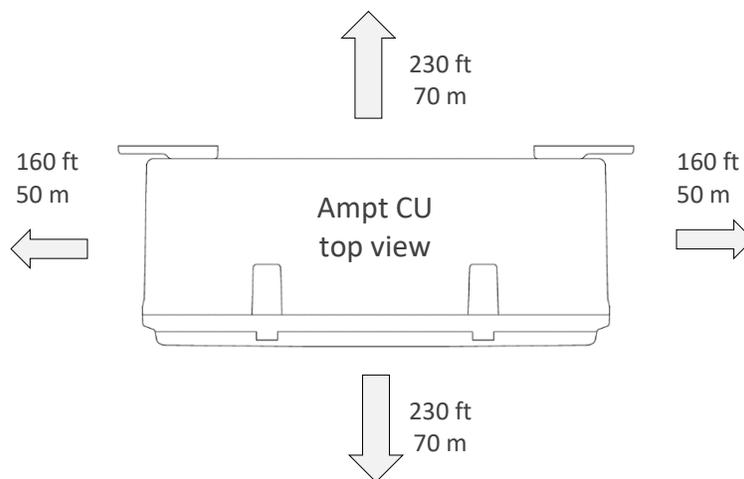


Figure 6: Top view of the Ampt CU with radio wave ranges

## Antenna Locations

The Ampt CU has antennas located in the region denoted below. Minimize obstructions to this region on the front, back, and sides of the Ampt CU for the best signal strength.

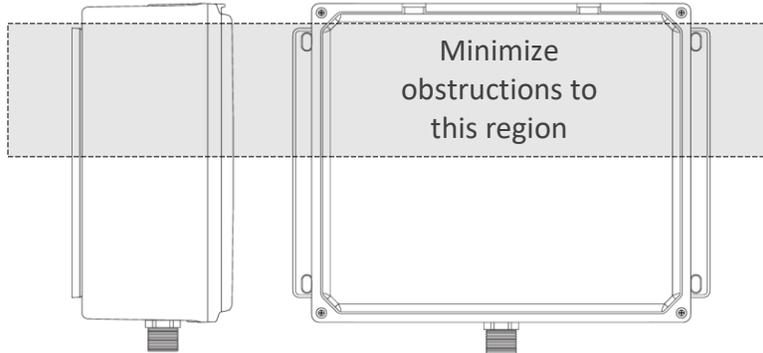


Figure 7: Minimize obstructions to this region on the front, back, and sides of the Ampt CU for the best signal strength

Ampt String Optimizers have an antenna on the opposite side of the connectors. Keep the plastic cover clear from obstructions - including cables, mounting hardware, and PV modules, to allow radio waves from the Ampt CU.

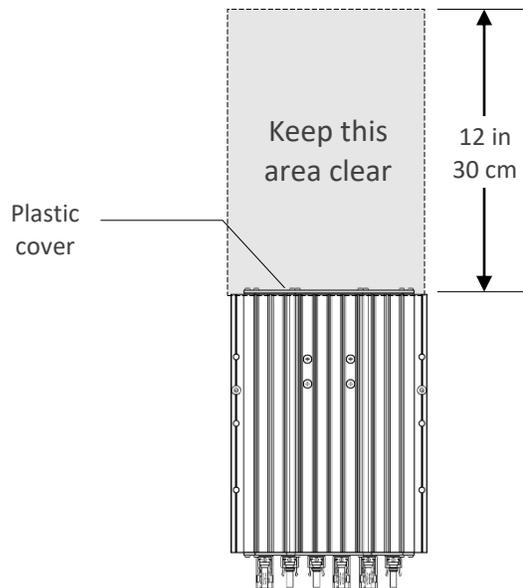


Figure 8: Keep this area of the String Optimizer clear to allow radio waves from the Ampt CU

# Mounting Example

The mounting example below minimizes obstructions to the antenna region. To maximize radio wave range, avoid mounting the Ampt CU near large metal objects like inverters, combiner boxes, tracker arms, etc.

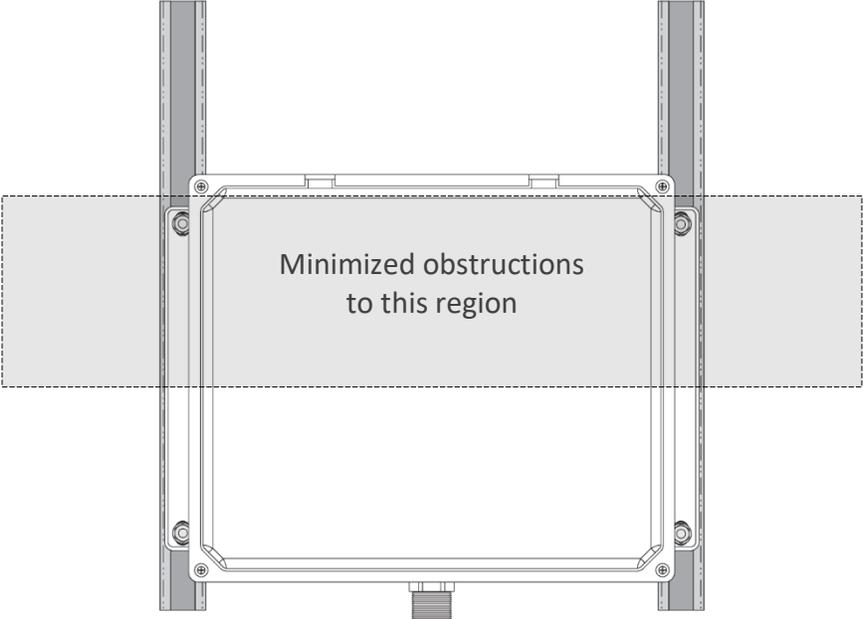
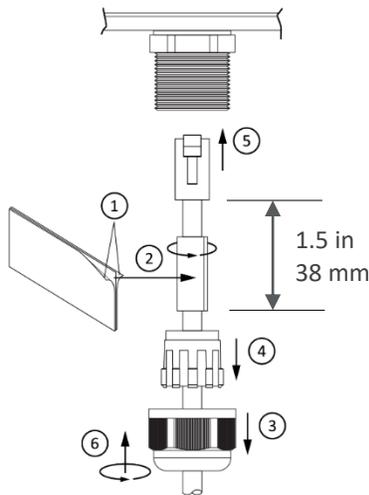


Figure 9: Mounting example that minimizes obstructions

## Connecting Ethernet

Follow the diagram to connect Ethernet to the Ampt CU. The front cover does not need to be removed since an internal connection is already made to the Ethernet port of the Ampt CU circuit board. See Figure 5. The sealant, cinch nut, and fitting are included with the Ampt CU.



1. Remove plastic on both sides of sealant.
2. Apply the sealant as shown and mold around the cable.
3. Slide the cinch nut over the cable.
4. Slide the fitting over the cable with the orientation shown.
5. Plug the Ethernet cable into the connector.
6. Tighten the cinch nut.

Figure 10: Connecting the Ethernet cable

## Connecting Power over Ethernet

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.

Do not connect or disconnect the RJ45 connector if the PoE is powered on.

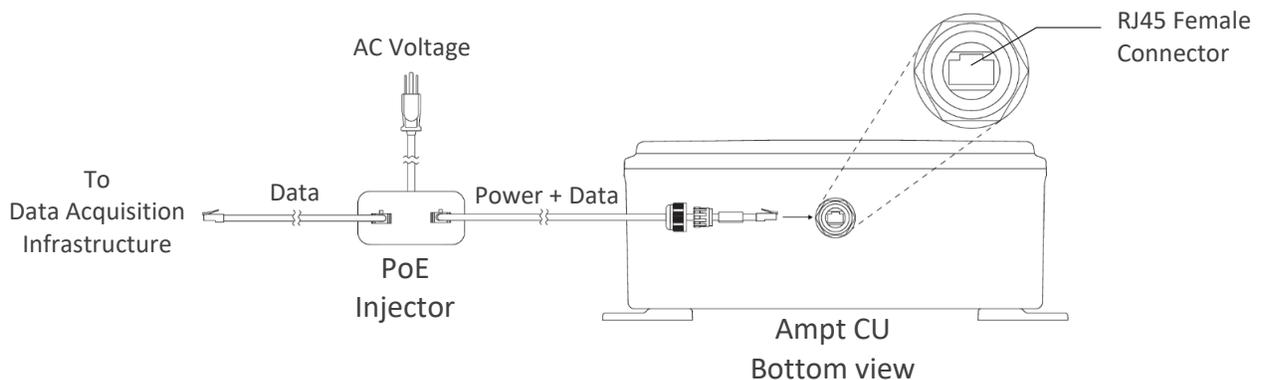


Figure 11: Generic Power over Ethernet (PoE) connection diagram – follow the instructions for your device

---

## 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

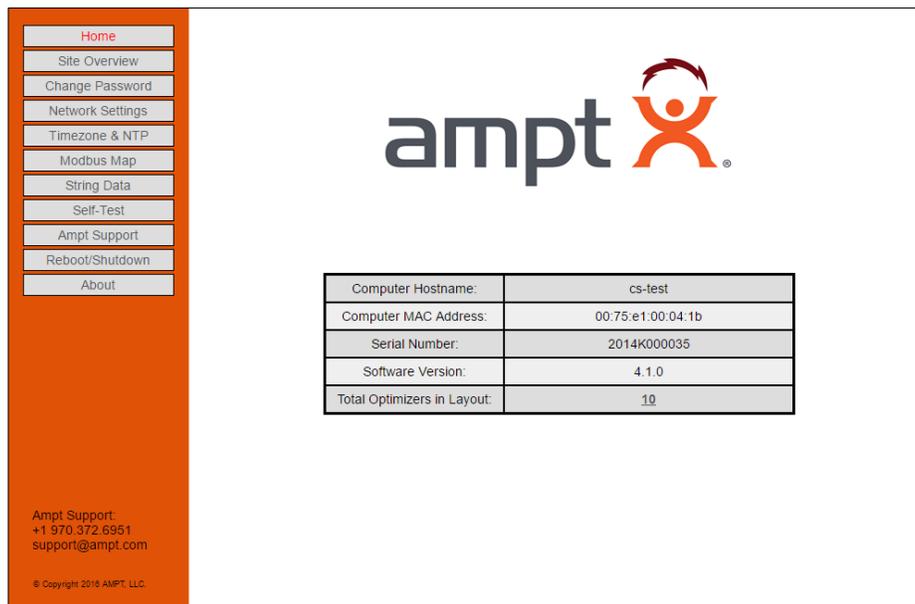


Figure 12: Ampt-CU Home Screen

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* section 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.

---

# 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



---

## Contacts

### Headquarters

Ampt, LLC  
4850 Innovation Drive  
Fort Collins, CO 80525  
970-372-6950

### Sales

Global:	sales@ampt.com
North America:	p: +1 970.372.6952 f: +1 970.225.0483
Europe:	p: +49 7456 20 88 42 f: +49 7456 20 88 43
Japan:	p: +81.80.3816.9618

### Support

Global:	support@ampt.com
North America:	p: +1 970.372.6951 f: +1 970.225.0483
Europe:	p: +49 7456 20 88 42 f: +49 7456 20 88 43
Japan:	p: +81.80.3816.9618

