



Ampt String Optimizer V1500-30 Series

Installation Manual

57070016-1 v20201023

(PRELIMINARY)



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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, String View[®] optimizers, V-match[®] optimizers, and Direct-to-Battery[®] optimizers) within a photovoltaic (PV) installation. The result? Energy realized[®].

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U.S. and international patents apply to this product. For details visit: www.ampt.com/patents.

Read This First

To help avoid problems during the system installation, familiarize yourself in advance with the installation process by reading this entire document before starting the installation.



Risk of electric shock, do not remove covers. No user serviceable parts inside. Refer servicing to qualified service personnel. When the photovoltaic array is exposed to light, it supplies a dc voltage to this equipment.



Le risqué de décharge électirque n'enlèvent pas la couverture. Aucunes pieces utiles d'utilisateur à l'intérieur. Référez-vous l'entretien au personnel de service qualifiè. Quand la range photovoltaïque est exposée à la lumière. Il fournit une tension CC à cet équipement.



Hot surfaces – to reduce the risk of burns – do not touch.



Les surfaces chaudes - pour réduire le risque de brûlures - ne se touchent pas.

IMPORTANT SAFETY INSTRUCTIONS

This manual contains important instructions for Ampt optimizers that shall be followed during installation and maintenance. The optimizer has been designed and tested according to international safety requirements, but requires certain precautions are observed when installing and/or operating the optimizer. To reduce the risk of personal injury and to ensure the safe installation and operation of the optimizer, please be sure you carefully read and follow all instructions and safety messages in this manual.

SAVE THESE INSTRUCTIONS

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.

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; Canadian Electrical Code, Part I; or the applicable standards, codes, and regulations for your region.

Failure to follow this manual will void warranty.

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.

Before installing or using the Ampt optimizer, read all instructions and safety messages on the optimizer and in this manual. Follow the safety precautions for this product as well as the other components in the PV system.

PV modules produce electrical energy when exposed to light and thus can create an electrical shock hazard. Wiring of the PV modules should only be performed by qualified personnel.

NOTICE

Opening the optimizers, performing any other service to the optimizers, or using the optimizers in a way that is not specified by the manufacturer voids warranty.

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 the Ampt String Optimizer 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

Ampt String Optimizers are DC/DC converters with multiple features that lower the cost and improve the performance of new and existing PV systems.

- **Dual MPPT per optimizer** - Ampt String Optimizers put maximum power point tracking on each of its two input strings of PV modules. This mitigates or eliminates mismatch losses to deliver more energy under changing environmental and system conditions over the lifetime of the power plant.
- **High Fixed-Voltage Bus (HFVB)** – Ampt’s advanced DC power management technology allows for HFVB system designs which turn the variable voltage of the PV array into a fixed and predictable DC bus voltage to achieve system-level economic advantages. HFVB designs lower the cost per watt of inverters, battery converters, and trackers while reducing ampacity requirements and the number of home runs. Ampt’s HFVB technology can also restore lost revenue from underperforming systems suffering from “voltage sag.”
- **Ampt Mode®** – Inverters with Ampt Mode® operate in a fixed or narrow input voltage range that is closer to the maximum system voltage. This allows the inverter to deliver a higher AC output voltage at the same current which raises the rated output power of the inverter to lower the inverter's cost per watt.
- **Direct-to-Converter** – For DC-coupled energy storage systems, Ampt String Optimizers include Direct-to-Converter technology which allows the DC bus to operate at a higher fixed voltage so the converter only needs to buck when charging and boost when discharging. This simplified operation reduces battery converter costs by up to 50% with less circuitry and a higher power density.
- **High DC/AC** – Ampt’s unique combination of output current limits and a higher DC bus voltage allows PV system designers to achieve optimal DC/AC ratios (up to 3:1). With Ampt, system owners can expand the DC power on existing systems without replacing inverters, combiners, or cables; optimize inverter utilization on new systems to lower the cost per watt; and lower capex while increasing storage durations on systems with DC-coupled energy storage.
- **V-match®** – Ampt’s patented V-match® technology allows the output of our optimizers to match the DC bus voltage set by the inverter or battery while delivering full available power from the PV modules. This uniquely allows PV arrays with Ampt to automatically adapt to legacy or future power equipment to repower existing systems, upgrade inverters, mix new and legacy PV modules, deploy optimized DC-coupled storage systems, and other applications.
- **Wireless Communication** – Ampt String Optimizers incorporate optional wireless communication to provide string-level data that is highly accurate, synchronous, and scalable to improve O&M, as well as enhanced controls for storage applications.

For more information on Ampt’s product features and applications, visit www.ampt.com.

Dimensional Drawings

The dimensions for the String Optimizer shown below are in millimeters and inches.

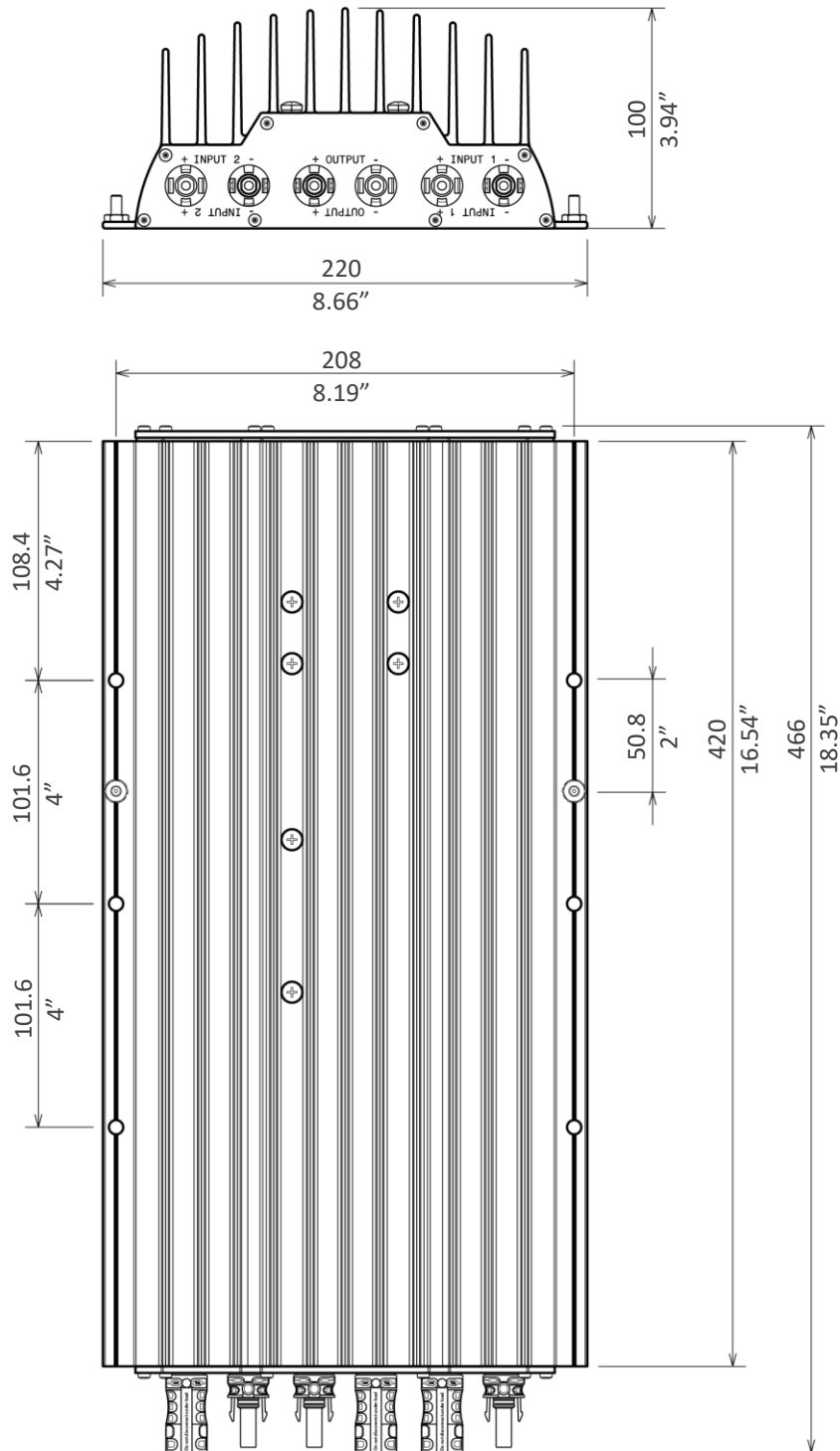


Figure 1: Dimensional drawings

Physical Overview

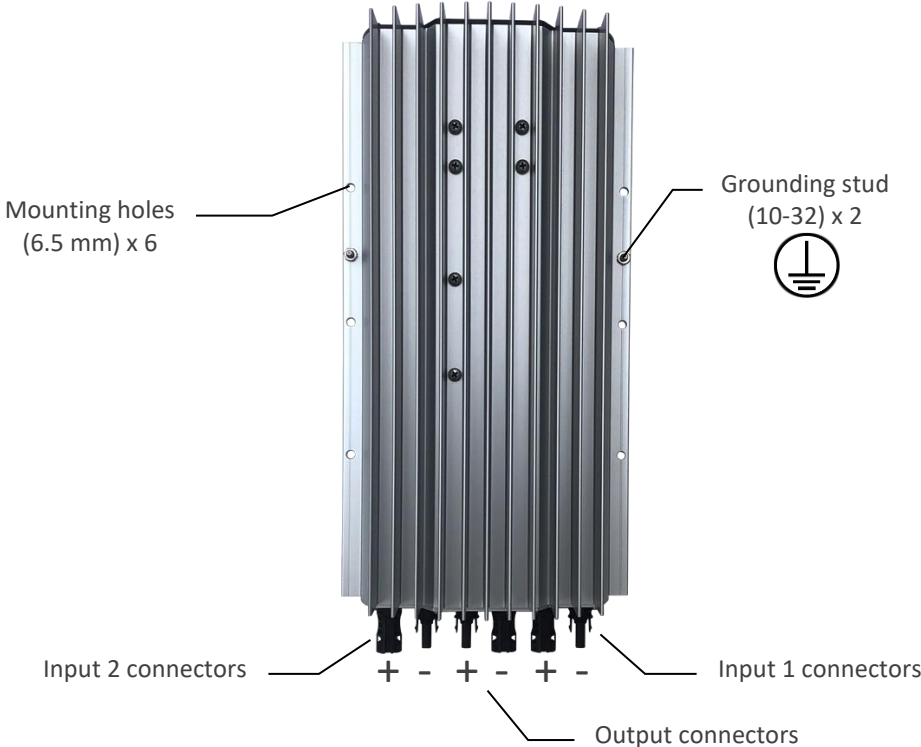


Figure 2: Physical overview of the string optimizer

Bar Code Label

The image below shows the bar code label with model and serial numbers.

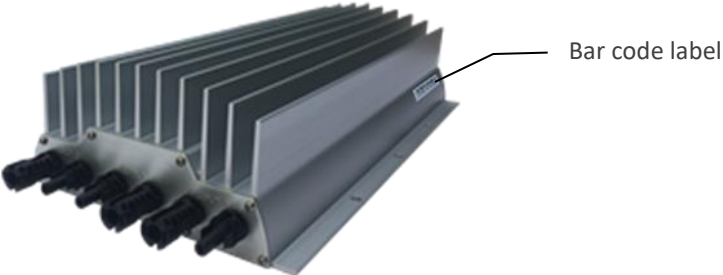


Figure 3: Bar code tag with the model and serial numbers

Specifications

V1500-30 Series

		V1250-30	V1275-30	V1300-30	V1325-30	V1350-30	V1375-30	V1400-30	V1415-30
Electrical									
Input									
Maximum voltage per input ¹	V	1350	1350	1350	1350	1350	1350	1350	1350
Maximum current per input ²	A	24	24	24	24	24	24	24	24
Maximum Isc per input ³	A	26	26	26	26	26	26	26	26
MPP tracking voltage range	V	300-1200	300-1225	300-1250	300-1275	300-1300	300-1325	300-1350	300-1300
Startup voltage per input	V	390	390	390	390	390	390	390	390
Number of inputs		2	2	2	2	2	2	2	2
Output									
Output voltage range	V	0-1250	0-1275	0-1300	0-1325	0-1350	0-1375	0-1400	0-1415
Maximum output current ⁴	A	30	30	30	30	30	30	30	30
Max continuous output power	kWdc	35.2	35.9	36.6	37.3	38.2	38.9	39.7	40.1
Efficiency (max, CEC, Euro)	%	99.6 / 99.5 / 99.4							
Mechanical									
Input & output connector		MC4-Evo 2							
Dimensions		18.35" x 8.66" x 3.94" (466.1 mm x 220 mm x 100 mm)							
Weight		17.8 lbs. (8.1 kg)							
Ambient temperature operating range		-40 °F to +122 °F (-40 °C to +50 °C)							
Cooling		Convection							
Environment									
Environment category		Outdoor							
Pollution degree		2							
Maximum operating altitude ⁵		9843 ft (3000 m)							
Overvoltage category		OVII							
Ingress protection		IP66 / 4X							
General									
Maximum system voltage		1500 V							
Compliance		ETL to UL 1741; IEC 61000-6-1, 61000-6-3, 62109; CE; Giteki 2-1-19; FCC Part 15, class A							

Place holder only. See separate datasheet file

1. Voc at coldest design temp. Follow Ampt's design guidelines to determine the number of modules per input and max. system voltage.
2. Maximum Imp of modules on the input at standard test condition (STC) - irradiation level of 1000 W/m2 at 25°C.
3. Maximum short-circuit current (Isc) of modules on input.
4. For system designs where the DC bus voltage is always greater than optimizer input voltage. See manual for details.
5. Optimizer derates above this altitude.

Chapter 2: Planning Installation

Overview

This chapter explains the installation requirements that ensure proper operation of the String Optimizer.

NOTICE

The inputs of the optimizer are not intended for connection to a battery or any other type of DC source except PV modules.

PV System Configurations

String Optimizers can be installed in ungrounded and resistively grounded PV systems. Notice that input configurations can vary. See *Acceptable Input Configurations* section for details.

Ungrounded PV Systems

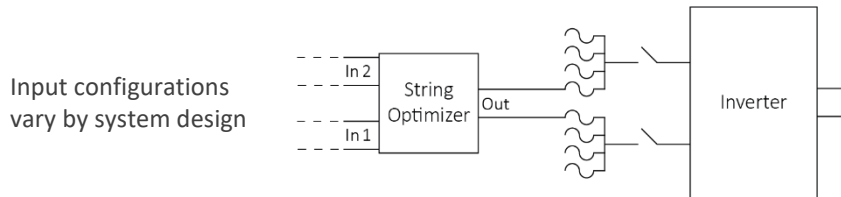


Figure 4: Electrical connections for an ungrounded PV system

Resistively Grounded PV Systems (positive or negative)

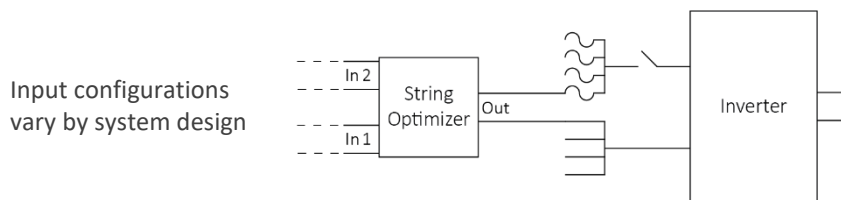


Figure 5: Electrical connections for a grounded PV system

Acceptable Input Configurations

Each input of the optimizer can have multiple PV strings of the same length in parallel. Each PV string in parallel, on a given input, should have the same open-circuit voltage ($V_{oc-cold}$).

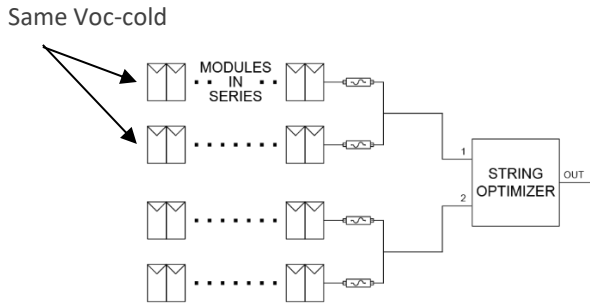


Figure 6: Example - Two strings in parallel on each input

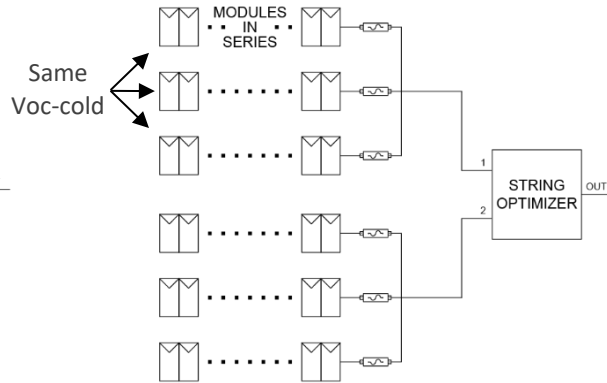


Figure 7: Example - Three strings in parallel on each input

When the number of modules on each input is not the same, the input with the highest power should be connected to input 1.

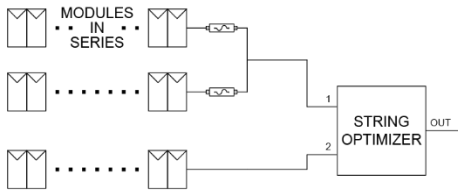


Figure 8: Strings with the highest power should be connected to Input 1

Note:

For inputs with a single string, like Input 2 shown here, a fuse may or may not be needed to protect the modules in case of an array fault. See *Fuses* section for more information.

Optimizer Input Requirements

Inputs 1 and 2 of the String Optimizer have the following requirements for the optimizer to operate at maximum power point (MPP):

- $V_{oc-cold-in1} \leq \text{Optimizer's Maximum voltage per input}$
 - $V_{oc-cold-in1} \leq \text{Inverter maximum input voltage}$
 - $V_{mp-hot-in1} > (V_{out} \div 2)$
 - $V_{mp-hot-in2} > (V_{out} \div 2)$
 - $V_{mp-cold-in1} < V_{out}$
 - $V_{mp-cold-in2} < V_{out}$
 - $V_{oc-cold-in1} \geq V_{oc-cold-in2}$
 - $(P_{in1} \div 2) < P_{in2} \leq P_{in1}$
- V_{out}* = voltage at the output of the optimizer, which includes the voltage set by the inverter (or battery converter) plus line losses

The input configurations of different optimizers within the same PV array can vary so long as they meet the defined criteria.

Fuses

CAUTION

Over-current protection devices and conductors shall be sized in accordance with the National Electrical Code (ANSI/NFPA 70); Canadian Electrical Code, Part I; or the applicable standards, codes, and regulations for your region.

Understanding Maximum Output Current and Fuse Sizing

The recommended PV system design ensures that the DC bus voltage, which is set by the inverter, is always greater than the optimizer input voltages. For these systems, the maximum output current will be the *Maximum output current* listed on the optimizer’s datasheet.

This design allows the output current limit of the Ampt String Optimizer to eliminate the need for the 1.25 multiplication factor for over-sun conditions when calculating ampacity. The 1.25 multiplier for continuous use is still required.

Optimizer Max Output Current (A)	Minimum Fuse Size (A)
12	15
16	20
20	25
24	30
30	37.5 (40 A standard)

For other system designs where the DC bus voltage can be less than the voltage on either optimizer input, the potential maximum output current will either be the *Maximum output current* listed on the optimizer’s datasheet or the maximum input current – whichever is greater. If the maximum output current is the one listed on the optimizer datasheet, use the table above. Otherwise, use your standard fuse sizing method including margins for both over-sun and continuous use.

Input Fuses

For single PV strings on an optimizer input, an input fuse may be required to protect the modules in the event of an array fault when the maximum series fuse rating for the PV modules is less than the output fuse rating. For parallel PV strings on an optimizer input, always use fuses to protect the PV modules.

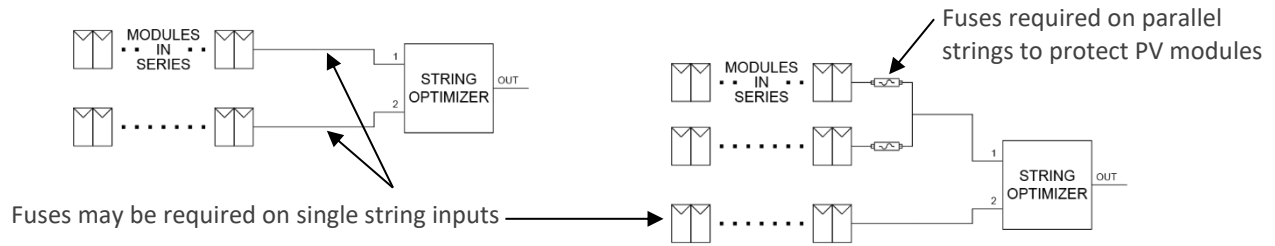


Figure 9: Single PV strings may, and parallel PV strings must, have input fuses to protect the PV modules.

When input fuses are needed, use the appropriate calculations for your jurisdiction to size fuses to ensure that your module strings are protected according to the maximum series fuse rating on the datasheet for the PV modules.

Two-in-Portrait Wiring

To maximize bi-facial gains or to mitigate shading between fixed-tilt racking or trackers, keep all PV modules connected to a given optimizer input within the same row.

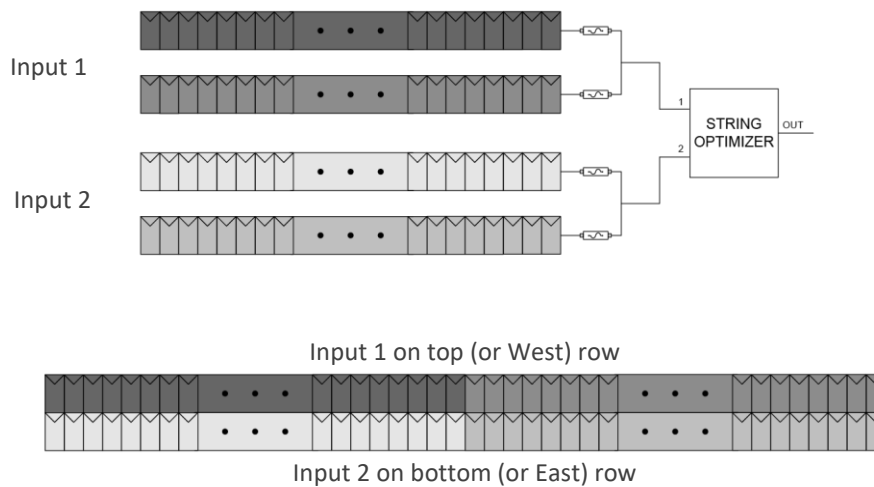


Figure 10: Keep all modules on a given optimizer input within the same row to maximize production

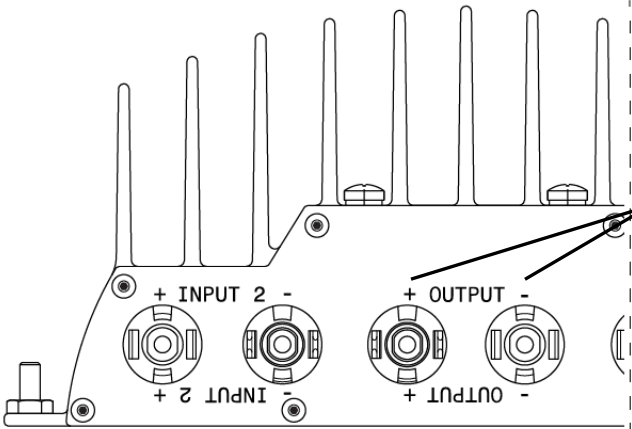
DC-coupled Storage

When used in DC-coupled storage applications, the optimizer does not function as a blocking diode.

Connector Polarity

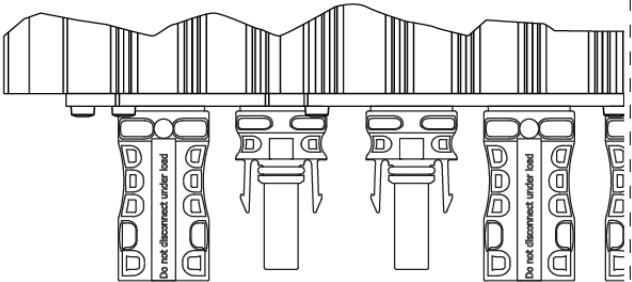
Always use the polarity markings on the faceplate instead of any polarity markings on the connectors.

Optimizer
Front View



! Use the polarity markings on the faceplate to avoid damaging the device.

Optimizer
Top View



Output Mating
Connectors
Top View

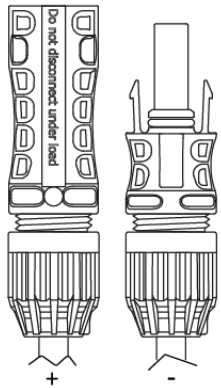


Figure 11: Output connector polarity

Chapter 3:

Installing the Ampt String Optimizer

Getting Started

This chapter addresses the proper mounting and installation of the Ampt String Optimizer. Read the entire chapter before starting the procedures and then conduct each task in the order given.

Parts and Tools Needed

- The mounting hardware varies by the type of PV module mounting rail
- Appropriately rated voltmeter and DC current clamp
- Stäubli crimping tool and disconnect tool
- MC4-Evo 2 sealing caps (male and female)

Mounting and Grounding the String Optimizer

WARNING

Read the warning statements below:

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; Canadian Electrical Code, Part I; or the applicable standards, codes, and regulations for your region.

The Ampt optimizer is to be installed so that it is not expected to be contacted by persons.

CAUTION

Keep connectors dry and clean. Do not install Ampt String Optimizers in a location where they might be immersed in water.

Steps

1. Mount the String Optimizer to the rack
 - a. See *Dimensional Drawings* on page 10
 - b. The recommended practice is to mount the unit parallel to the PV modules with the connectors facing downward.
 - c. Ensure sufficient spacing such that the safety icons as well as the serial and model numbers on the bar code label can be read by maintenance personnel.
2. Ground the String Optimizer as required by your local codes using one of the grounding studs provided, or with a listed bonding washer.

Making Electrical Connections

WARNING

Read the warning statements below:

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.

Do not make or break connections under load.

Ensure that there are no parallel connections to the string while series connections are being made.

Voltage may be present on the output terminals when an input terminal is connected.

Voltage builds as modules are connected in series.

CAUTION

Read the caution statements below:

To reduce the risk of fire, connect the outputs of the Ampt equipment only to conductors with sufficient ampacity based on the maximum output fault current (maximum optimizer output current) for the chosen optimizer. Over-current protection devices and conductors shall be sized in accordance with the National Electrical Code (ANSI/NFPA 70); Canadian Electrical Code, Part I; or the applicable standards, codes, and regulations for your region.

Over current protection is required for the DC output circuit in the installation.

Ampt recommends that a disconnect switch be included in the installation for the DC output.

Do not put stress on the optimizer connectors at any time. The cable management method must prevent tension on each connector and movement of the connecting wires at all times. Tracker installations must avoid tension on the connectors throughout its rotation.

NOTICE

Read the notice statements below:

Failure to follow these instructions will void warranty.

Failure to follow the prescribed connection and disconnection order can result in damage to the device.

Follow these instructions to avoid damaging the device. Follow polarity markings on the optimizer faceplate. Do not cross-wire inputs or output.

Use only MC4-Evo 2 mating connectors or connectors manufactured by Stäubli that are recognized as being part of the MC connector family with the appropriate rating.

Per Canadian Electrical Code, the installer is required to mark the device with the following wording or equivalent, located on or adjacent to each wiring compartment giving access to high voltage circuits, only if actually connected to high voltage in the installation:

DANGER — HIGH VOLTAGE
or
DANGER XXXX V
where XXXX is replaced by the rated voltage.

Connection/Disconnection Order Matters

The following label on the optimizer faceplate serves as a field reference to ensure proper connection/disconnection order to avoid damaging the device. It is not meant to replace the instructions that follow.

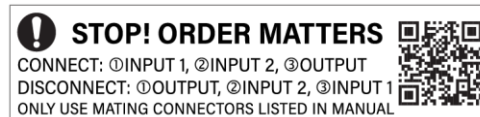


Figure 12: Connection order label on the optimizer faceplate

Connecting the Inputs

1. Read the warning, caution, and notice statements starting on page 20.
2. Make sure that the unit is properly mounted and grounded.
3. Make sure the strings of PV modules that will be connected to the inputs of the optimizer meet the acceptable input criteria, fusing, and other requirements outlined in Chapter 2.
4. For optimizer inputs with strings in parallel
 - a. Follow your safety procedures and protocols to prepare each set of PV strings for each optimizer input.
 - i. Connect the PV modules in series for each string.
 - ii. Use an appropriately rated multimeter to verify the voltage and polarity of each PV string before connecting in parallel.

5. Follow your safety procedures and protocols and use an appropriately rated multimeter to measure the voltage and verify the polarity for the string(s) of modules being connected to Input 1.

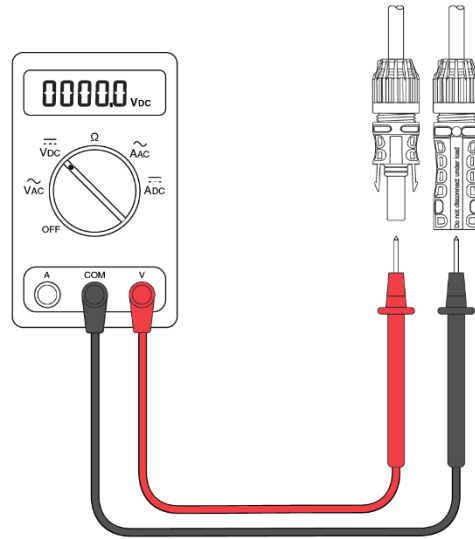


Figure 13: Check the polarity and gender for PV string

6. Connect the set of PV strings for Input 1 to the INPUT 1 connectors of the String Optimizer. Ensure that the locking mechanisms on the connectors are fully engaged.

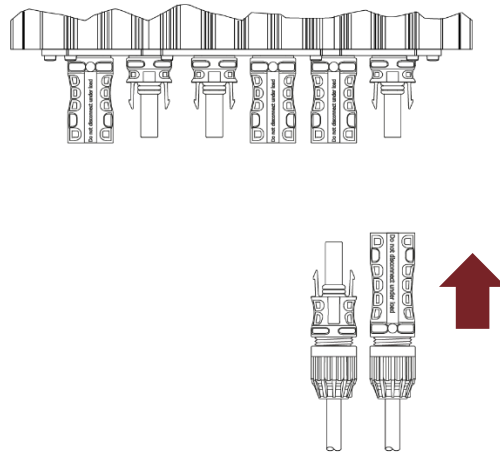


Figure 14: Connecting Input 1

7. Follow your safety procedures and protocols and use an appropriately rated multimeter to measure the voltage and verify the polarity for the string(s) of modules being connected to Input 2. See Figure 13.

- Connect the set of PV strings for Input 2 to the INPUT 2 connectors of the String Optimizer. Ensure that the locking mechanisms on the connectors are fully engaged.

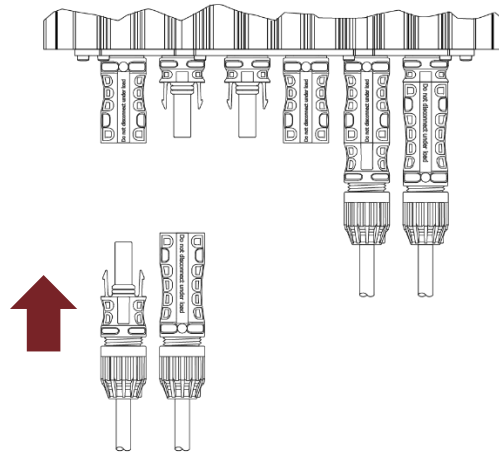


Figure 15: Connecting Input 2

- Follow your safety procedures and protocols to measure the output voltage of the String Optimizer. It should be equal to the maximum value of the Output Voltage Range on the product label (+/- 1.5%). If it is not, contact Ampt.

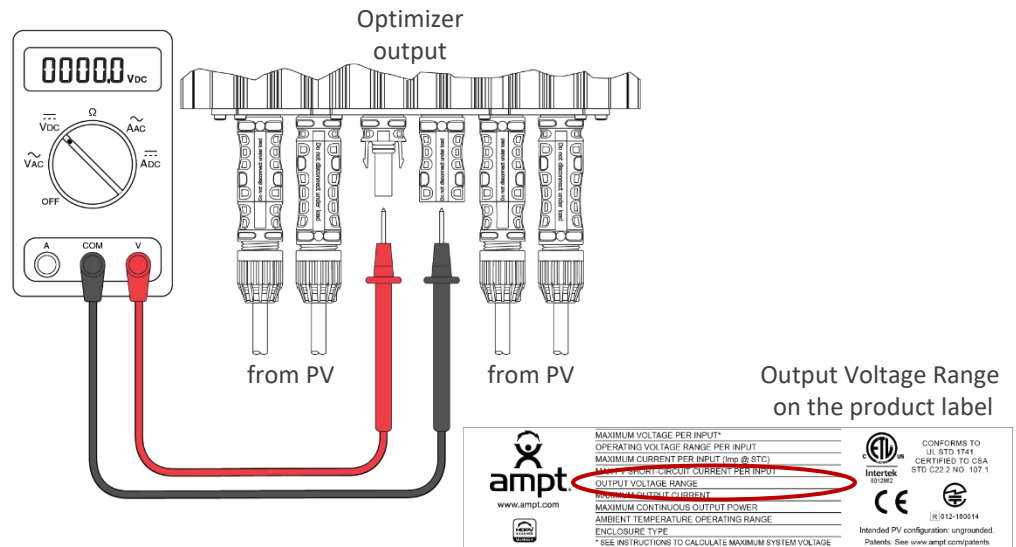
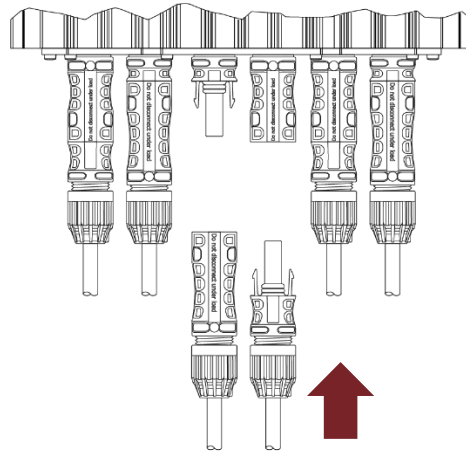


Figure 16: Verify proper installation

- If you are connecting the output now, then proceed to the next section. Otherwise, use MC4-Evo 2 Sealing Caps to protect the connectors until the output is connected.

Connecting the Output

1. Read the warning, caution, and notice statements starting on page 20.
2. Make sure you have completed all the steps in the *Connecting the Inputs* section starting on page 21.
3. Follow your safety procedures and protocols to ensure the output cables are appropriately terminated and not under load.
4. Connect the output cables to the OUTPUT connectors of the String Optimizer.




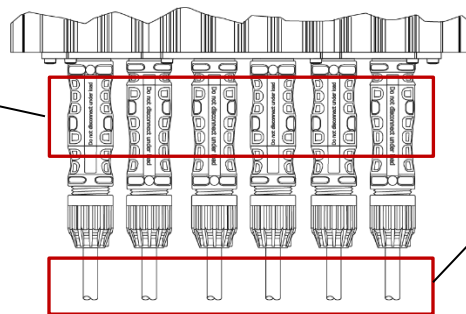
 Use the polarity markings on the optimizer faceplate to avoid damaging the unit.

Figure 17: Connecting the output connectors

5. Ensure that the locking mechanisms on all connectors are fully engaged.
6. Ensure that the cable management method prevents tension on each optimizer connector at all times.

Ensure locking mechanisms on all connectors are fully engaged



The cable management method must prevent tension on each connector and avoid movement of the connecting wires at all times.

Figure 18: Verify that the connectors are fully engaged and manage cables to prevent tension on the connectors

Uninstalling an Optimizer

WARNING

Read the warning statements below:

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.

Do not perform any servicing other than that specified in these instructions.

Do not make or break connections under load.

Voltage may be present on the output terminals when an input terminal is connected.

CAUTION

Read the caution statements below:

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 surface of the optimizer may be hot.

NOTICE

Read the notice statements below:

Failure to follow these instructions will void warranty.

Failure to follow the prescribed order can result in damage to the device.

Parts and Tools Needed

- MC4-Evo 2 connector unlocking tool
- Appropriately rated voltmeter and DC current clamp

Steps

1. Read the warning and caution statements above.
2. Follow your safety procedures and protocols to ensure the String Optimizer is not under load.

3. Follow your safety procedures and protocols to verify that there is zero current flowing through the optimizer circuit by using a current clamp to test each wire connected to Input 1, Input 2, and the output.
 - a. If current is detected on any of these cables, wait for zero irradiance and verify that there is zero current flowing through the optimizer circuit.
4. If no current is detected, then use the MC4-Evo 2 unlocking tool to disconnect connectors in the following order:
 - a. Output
 - b. Input 2
 - c. Input 1

Appendix

Compliance

The box is not meant to be user serviced or opened in any way.







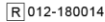
Model Numbering System

The model numbers for Ampt String Optimizers are in the following format:

- 315700xx-xxxx (30A models, ranging from 400 – 1500V)
- 315700xx-xxxx (24A models, ranging from 400 – 1500V)
- 315700xx-xxxx (20A models, ranging from 400 – 1500V)
- 315700xx-xxxx (16A models, ranging from 400 – 1500V)
- 315700xx-xxxx (12A models, ranging from 400 – 1500V)

...where xxxx equals voltage of the unit (e.g. -0750 is a V750; -1325 is V1325).

Markings

 www.ampt.com 	MAXIMUM VOLTAGE PER INPUT*	     Intended PV configuration: ungrounded. Patents: See www.ampt.com/patents
	OPERATING VOLTAGE RANGE PER INPUT	
	MAXIMUM CURRENT PER INPUT (Imp @ STC)	
	MAX PV SHORT-CIRCUIT CURRENT PER INPUT	
	OUTPUT VOLTAGE RANGE	
	MAXIMUM OUTPUT CURRENT	
	MAXIMUM CONTINUOUS OUTPUT POWER	
	AMBIENT TEMPERATURE OPERATING RANGE	
	ENCLOSURE TYPE	
	* SEE INSTRUCTIONS TO CALCULATE MAXIMUM SYSTEM VOLTAGE	

30 A Models

Ampt model number								
Maximum voltage per input (Vdc)								
Operating voltage range per input (Vdc)								
Maximum current per input (Imp@STC) (A dc)								
Max PV short-circuit current per input (A dc)								
Output voltage range (Vdc)								
Maximum output current (A dc)								
Maximum continuous output power (kWdc)								
Ambient temperature operating range								
Enclosure type								

24 A Models

[table here]

20 A Models

[table here]

16 A Models

[table here]

12 A Models

[table here]

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.

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

Model: TKKR
FCC ID: X3R-TKKR
IC: 8399A-TKKR

RSS-GEN

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Avis IC

Cet appareil est conforme à la partie 15 des règles de la FCC. Son fonctionnement est soumis aux deux conditions suivantes: (1) Ce dispositif ne peut causer des interférences nuisibles, et (2) cet appareil doit accepter toute interférence reçue, y compris les interférences qui peuvent provoquer un fonctionnement indésirable.

IMPORTANT! Les changements ou modifications non expressément approuvés par Ampt LLC pourraient annuler l'autorité de l'utilisateur à utiliser l'équipement.

Model: TKKR
FCC ID: X3R-TKKR
IC: 8399A-TKKR

RSS-GEN

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage.
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Reference: Electrical Connection Order

After the installer has read the manual, this page can be used as a reference on the job site to ensure the electrical connection order and to avoid damage to the device.



These instructions are for reference only and do not replace the installation manual. See the manual for complete instructions and safety messages.



WARNING

Read the warning statements below:

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.

Do not make or break connections under load.

Ensure that there are no parallel connections to the string while series connections are being made.

Voltage may be present on the output terminals when an input terminal is connected.

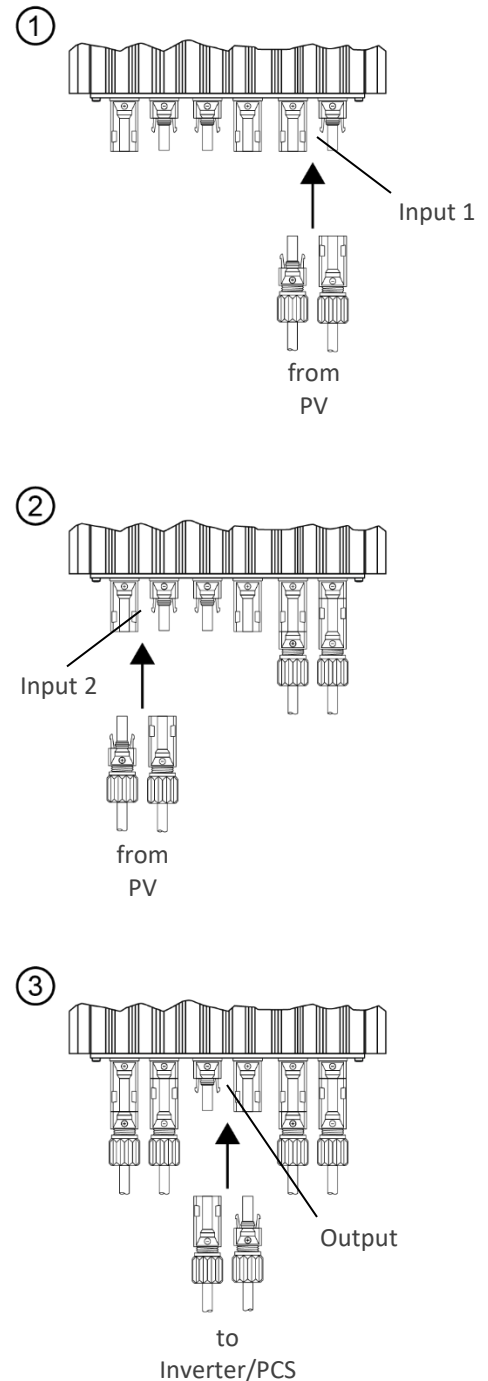
Voltage builds as modules are connected in series.

Do not put stress on the optimizer connectors at any time. The cable management method must prevent tension on each connector and movement of the connecting wires at all times. Tracker installations must avoid tension on the connectors throughout its rotation.

NOTICE

Failure to follow these instructions will void warranty.

Failure to follow the prescribed connection order can result in damage to the device.



Note: Disconnect in reverse order.
Output, Input 2, Input 1

Mechanical Installation Best Practices

- Store optimizers in a sheltered location that is protected from weather exposure. Optimizers damaged by water due to improper storage are not covered under warranty.
- Ground according to local codes using the grounding stud or a listed bonding washer.
- Ensure that optimizers are oriented with connectors facing down unless otherwise specified by Ampt.
- Keep optimizer in a covered location and free from pooling water.
- If possible, keep the top side of optimizer free from obstructions to maximize the radio signal.
- Leave connector caps in place until they are ready to be connected to protect the optimizer from water and debris ingress.
- Leave space between mounted optimizers to allow for air circulation and cooling.
- Make sure there is enough slack on the input and output wires to ensure that they do not cause strain on the optimizer bulkhead connectors.
- If installed on a tracker system, keep wires free from abrasion and leave enough slack in the wires to account for tracker movement.
- DO NOT
 - Store optimizers outdoors without protection from weather and water ingress.
 - Transport optimizers that are removed from packaging.
 - Mount optimizers with connectors facing upwards.
 - Mount optimizers directly to a solar module frame.
 - Drill into optimizer frame to expand mounting holes.

Electrical Commissioning Best Practices

- Be sure to only use Stäubli connectors on input and output wires that are connected to optimizer.
- Only use Stäubli crimping tool and disconnect tool on cabling and connectors.
- Ensure there are no ground faults on input strings.
- Test voltage and polarity of input strings and optimizer output.
- If an optimizer input will have two or more PV strings in parallel, make these connections before connecting the optimizer input.
- Connect in the following order: Input 1, Input 2, Output.
- Always use a current clamp to ensure there is no current present before disconnecting outputs/inputs.
- If disconnecting unit: disconnect Output first, then Input 2, then Input 1.
- Configure inverter settings appropriately according to the project design.
- DO NOT
 - Connect output of optimizer before connecting inputs.
 - Disconnect under load.
 - Disconnect optimizer connectors without checking for current first.
 - Disconnect optimizer inputs before output.
 - Operate optimizer with only one input.
 - Use improper disconnecting tools on the connectors.

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