



# INSTALLATION and OPERATION USER MANUAL

## UBIQUITI SM-MI-250 MICROINVERTER



PVP-0001 Ver1.2

## Contact Information

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San Jose, CA 95131

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PVSupport@ubnt.com

## FCC Compliance

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.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user authority to operate the equipment.

## Other Information

Product information is subject to change without notice. All trademarks are recognized as the property of their respective owners.

To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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## IMPORTANT SAFETY INFORMATION

### READ THIS FIRST & SAVE THESE INSTRUCTIONS.

This manual contains important instructions for the installation and maintenance of UBIQUITI SM-MI-250 micro inverters. Before installing, please read these safety instructions specifically. Take special care to follow the warnings indicated on the unit itself as well as the safety instructions listed below.

### Safety Symbols

To reduce the risk of injury and to ensure the continued safe operation of this product, the following safety instructions and warnings are marked in this manual.



#### **DANGER!**

This indicates the risk of electric shock. The presence of high voltage levels may constitute to injury or death to users and/or installers.



#### **WARNING!**

This indicates important information where failure to comply may result in safety hazards or cause damage to this product.

### Safety Instructions

Read all instructions and cautionary marks in the manual carefully before starting the installation.



#### **DANGER!**

Do not tamper or open this product. Opening this product may result in electric shock and void product warranty.



#### **DANGER!**

Do not attempt to repair this product; it does not contain user-serviceable parts. Repairs and internal servicing should only be performed by UBIQUITI authorized service personnel.



#### **DANGER!**

Perform all electrical installations in accordance with all applicable local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70.



#### **WARNING!**

Only qualified electrical personnel should perform the electrical installation and wiring of this product.



#### **WARNING!**

Be aware that even without an external voltage source connected, the SM-MI-250 micro inverter may contain high voltages and there is a risk of electrical shock.



#### **WARNING!**

Connect the UBIQUITI micro inverter to the utility grid only after receiving prior approval from the electrical utility company.



#### **WARNING!**

The temperature of heat sinks outside of the device can reach over 85°C in normal operation. To avoid human body burns, use caution while servicing micro inverters.

#### **DANGER!**



Do not disconnect the DC power source from the UBIQUITI micro inverter without first disconnecting the AC power source. Both AC and DC power sources must be disconnected before servicing. Be aware that DC power/voltage is generated when the photovoltaic array is exposed to light.



**WARNING!**

Switch off the circuit breakers before installation and wirings.



**DANGER!**

For safety remove all conductive jewelry or equipment during the installation or service of the device parts, connector and/or wiring.



**WARNING!**

Do not stand on a wet location while doing installation and wirings.



**WARNING!**

Enclose the outer covering well before switching on the circuit breakers.



**WARNING!**

SM-MI-250 inverters should be installed as instructed in this manual. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacturing, and intended use of the device. The manufacturer holds no liability for customer's failure to comply with these precautions.



**WARNING!**

When a GFDI (Ground fault) fault occurs, the LED will blink orange and red light alternately. Please refer to page 15 for more introductions.



This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.



*Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

# ABOUT UBIQUITI MICRO INVERTERS

## General Overview

Thank you for choosing UBIQUITI's SM-MI-250 micro inverters as a key component in your solar power system. SM-MI-250 converts DC power (generated by the solar module) to AC power (powers your home appliances). The UBIQUITI micro inverter is installed on the back of each solar module; and connects directly to the electric utility grid without the need for a string or central inverter. The AC output from SM-MI-250 micro inverter is synchronized and in-phase with the frequency range and voltage of the electric utility grid.

## Advantages of UBIQUITI Micro Inverters

**Optimal Energy Harvest** – UBIQUITI's micro inverters maximize the power produced from your Photovoltaic (PV) array. Every PV module in solar system having its own inverter means having its own separate MPPT. Maximum Power Point Tracking (MPPT), which monitors performance and maximizes the power harvested from each solar module under varying environmental conditions. Sometimes performance of an individual PV module may be affected by module mismatch, shading caused by trees or chimneys, or obstructions from leaves and other debris, with separate MPPT of each module, if the performance of an individual PV module is reduced due to shading, the overall production from the entire array is not affected, only the production of the individual PV module that is being shaded will get affected. This typically results in improved power harvest of up to 20% from the solar PV systems operated by string inverters, which represents significant cost/performance advantages.

**Improved Safety** – UBIQUITI micro inverters convert DC power to AC at module level; thus, eliminating the need for high voltage DC wiring and making the solar system intrinsically safer. By eliminating DC wiring, specialized DC practices and equipment are not required for installation. And arcing problems which are associated with string/traditional inverters are not involved.

**Increased Lifetime and Reliability** – UBIQUITI micro inverters are more reliable and have a longer life cycle than the traditional string or central inverters. Typically, string/central inverters will need to be replaced at least once over the lifetime of the solar module adding significantly to the overall cost of the solar PV system. UBIQUITI's solar micro inverters are designed to operate in real world conditions and achieve a peak efficiency of 95.7% at temperature ranging from -40°C (45°F) and 65°C (150°F) without degradation of performance. The micro inverter fully potted housing is designed for outdoor installation and complies with the NEMA 6 environmental enclosure rating standards.

**Enhanced Monitoring System** – UBIQUITI's enhanced monitoring system can view the performance of each module in the PV array, a capability not available with string inverters. This provides users/installers with detailed real-time information that can be used to pinpoint the location for performance issues and provide guidance for maintenance, ensuring the solar system's performance is optimized over the lifetime of the installation.

**Simplified PV Array Design and Installation** – With UBIQUITI micro inverters, the PV array design and installation can be simplified because solar modules can be installed at any available space on rooftops. With conventional inverters, the PV array design and installation are generally more complicated due to the effects shading has on the overall performance of the PV array. When using UBIQUITI micro inverters, installers do not need to match the performance levels of adjacent solar modules to optimize the performance of the entire array. Integrated grounding also makes UBIQUITI solar installations easier, faster and cheaper to implement.

**TECHNICAL SPECIFICATIONS**

<b>INPUT DATA (DC)</b>	
Recommended input power (STC)	210 - 300 W
Maximum input DC voltage	45V
Peak power tracking voltage	22 - 36 V
Operating range	16 V - 45 V
Min/Max start voltage	22 V / 45 V
Max DC short circuit current	15 A
Max input current	9A
PV backfeed current	0A
Input	DC 36V
Input/ Output:	AC 240V/ 60Hz
<b>OUTPUT DATA (AC)</b>	
Rated output power	250W
Nominal output current	1.05A
Nominal voltage/range	240/211-264V
Nominal frequency/range	60/59.3 - 60.5 Hz
Power factor	>0.95
Input/ Output:	AC 240V/ 60Hz
<b>EFFICIENCY</b>	
Peak inverter efficiency	95.50%
CEC efficiency	95%
Night-time Power Consumption	200mW
<b>MECHANICAL DATA</b>	
Operation Temperature	-40°C to +65°C
Storage Temperature	-40°C to +85°C
Dimensions(WxHxD)	198 x 231 x 43.1 228 x 243 x 43.1(Antenna)
Weight	1.5 kg
Enclosure Rating	NEMA 3R
Connector type	TBD
Cooling	Natural Convection
<b>FEATURES</b>	
Module Compatibility	60-cell modules
Communication	Blue Tooth
Compliance	UL1741/IEEE1547, FCC Part 15 Class B, CAN/CSA-C22.2 NO. 0-M91, 0.4-04, and 107.1-01

## BEFORE INSTALLATION

Review and follow the instructions in this section before installing UBIQUITI SM-MI-250 micro inverters.

### Layout PV System

The optimal PV array layout will need to be planned before installation. The layout/plan will affect the wiring and cabling schemes and will need to be adjusted accordingly. The layout will also need to account for the constraints of the distance between each PV module due to the cable length. Please complete reading this user manual before installing the system.

### Compatibility and Capacity

UBIQUITI SM-MI-250 micro inverters are electrically compatible with PV modules that have a voltage range of 22 ~ 36V and a maximum input power of 300W. For more information, refer to the Technical Specifications section on page 16.

For a list of electrically-compatible PV modules and racking systems, refer to the UBIQUITI website at [www.UBIQUITIsolar.com](http://www.UBIQUITIsolar.com). Before ordering the PV module connector, make sure the connector type is compatible with both the micro inverter and PV module.

#### Electrical Compatibility

Model	PV MPPT Voltage Range	PV Module Connector Type
SM-MI-250	22V ~ 36V	MC-4 Locking

#### Voltage and Capacity

Maximum number of SM-MI-250s per AC Branch Circuit	Over current Protection
240V with 12AWG AC Trunk Cable	12 20Amp Breaker



#### WARNING!

DO NOT exceed the maximum number of micro inverters in an AC branch circuit as listed above.



#### WARNING!

Each AC branch circuit must be protected by a dedicated circuit breaker of 30A or less if using 10 AWG trunk cable, or 20A or less if using 12 AWG trunk cable.

### Utility Service Requirements

The M215 Microinverter works with split phase 240 VAC service only. Measure AC line voltage at the electrical utility connection to confirm that it is within the ranges of 211 ~ 264V.

### Lightning Surge Suppression

Lightning does not actually need to strike the equipment or building where the PV system is installed to cause damage. Often, a nearby strike will induce voltage spikes in the electrical grid that can damage equipment. UBIQUITI's micro inverters (SM-MI-250) have built-in integral surge protection, which is much higher than traditional inverters. However, if the surge has sufficient energy, which exceed built-in protection limits then the device could potentially be damaged. As UBIQUITI's limited Warranty does not cover "extraordinary and unexpected manifestation of the forces of nature," such as lightning strikes, it is recommended to install surge protection as part of any solar installation. We recommend the following protection devices, which have been tested to ensure that they do not interfere with power line communications. Please install as per manufacturer's instructions:



**Residential:**

Vendor: Citel, Part Number DS72RS-120 or DS73RS-120

Application: DS72RS-120 is applied when N-G is bound together, or DS73RS-120 were N-G is unbound.

**Commercial:**

Vendor: Citel, Part Number SP-120

Application: Branch panel protection

See the vendor datasheet for DS70R, (which includes the DS72RS-120) or for SP-120 at [www.citelprotection.com/english/citel\\_data\\_sheets/ac\\_protection/](http://www.citelprotection.com/english/citel_data_sheets/ac_protection/)

**Integrated Grounding**

UBIQUITI MI-XXX offers Integrated Grounding, which eliminates the need to install a Grounding Electrode Conductor (GEC) to each micro inverter by completely isolating the internal DC circuit from the AC circuit and ground. DC ground faults are detected on either the positive and/or negative conductors of the DC circuit by a Ground Fault Detection Interrupter Insulation Monitor (GFDI IM). If the GFDI IM detects a ground fault has occurred to the PV input, the micro inverter will automatically disconnect all conductors and cease supplying output power. In accordance with NEC 690.35, Installers can build ungrounded arrays where only an Equipment Grounding Conductor (EGC) is required to connect or bond non-current carrying metal equipment together. The EGC grounding process is completed via the grounding connection of MI-XXX 4-wire AC cable to the AC trunk cable. Despite the fact that UBIQUITI has made it easier for the MI-XXX to install, by integrating the ground to the AC trunk cable, the PV module will still need to be grounded according to the PV manufacturer's recommended grounding methods.

**AC Cable terminal connector**

The connector as below picture is for cable terminal connection. Installer could connect it with general electrical power cable, and please follow the color for identifying of phase, neutral and ground connection.



Pin	Pin Color	Wire Usage
1	Black	L1
2	White	Neutral
3	Black	L2
4	Green	Ground

## UBIQUITI SM-MI-250 INSTALLATION PROCEDURE

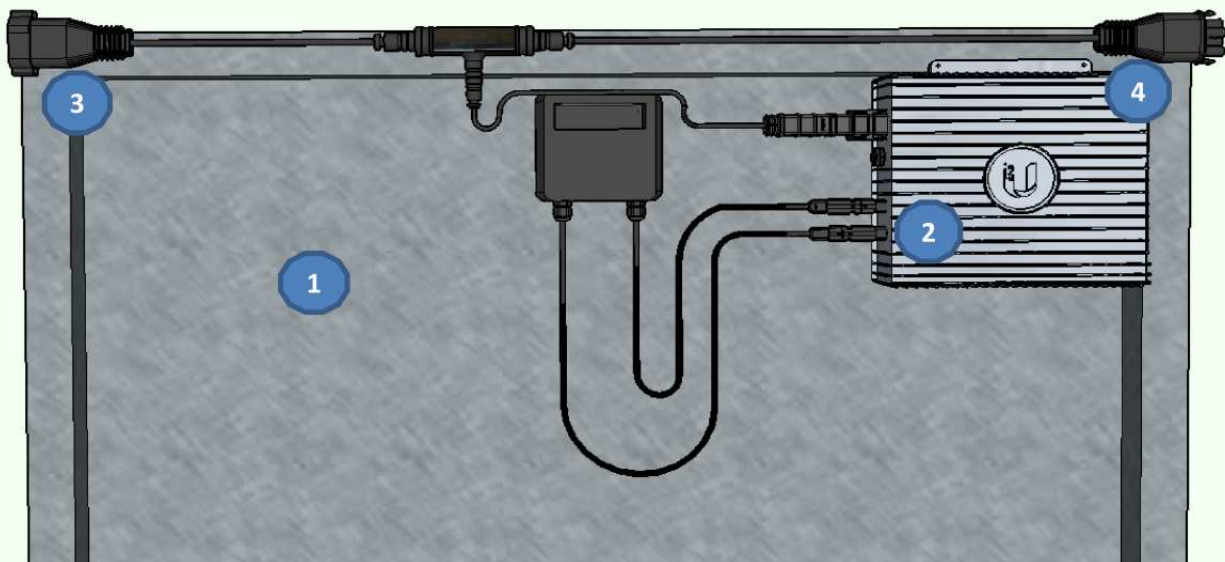
The following section list steps on how to install the UBIQUITI SM-MI-250 micro inverter onto PV module. Before installing, review and follow all important safety instructions listed in this section:

Step 0: Please ensure you have all the components mentioned as below.

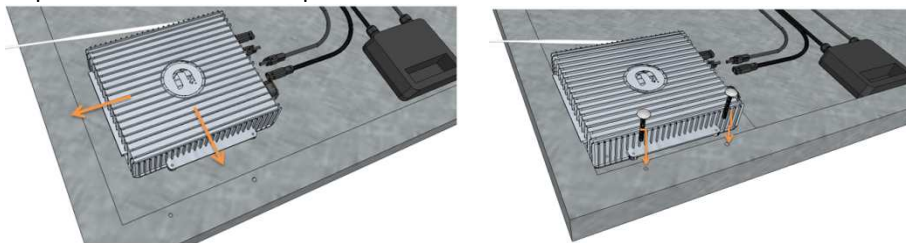
Step 1: Measure AC voltage on each phase at the Site  
Measure grid voltage at the point where trunk cables intend to be connected. Please make sure that the AC voltages at the electrical utility connection and at the junction box for each AC branch circuit are within the mentioned range.

240 Volt AC Single Phase	
L1 to L2	211 to 264 VAC
L1, L2 to neutral	106 to 132 VAC

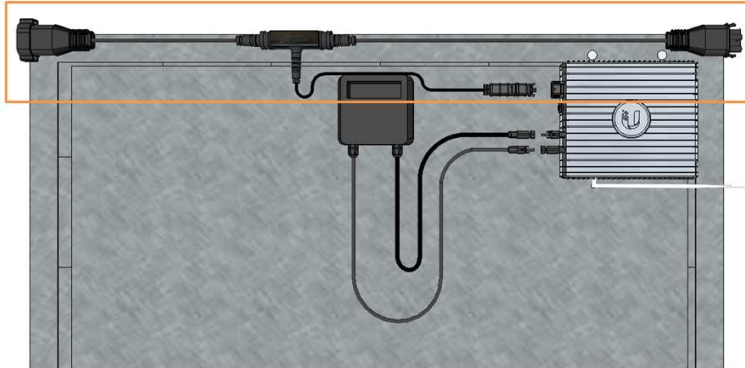
1. UBIQUITI PV Module
2. Micro Inverter
3. AC Cable Female Connector
4. AC Cable Male Connector



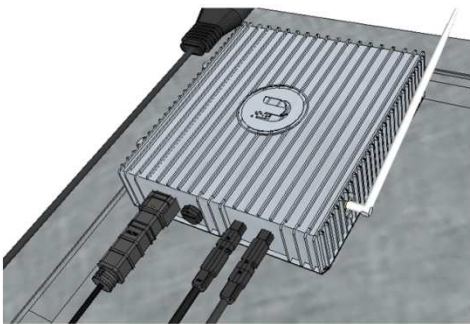
Step 2: Combine MI and PV panel.



Step 3: Arrange and fasten the cable.

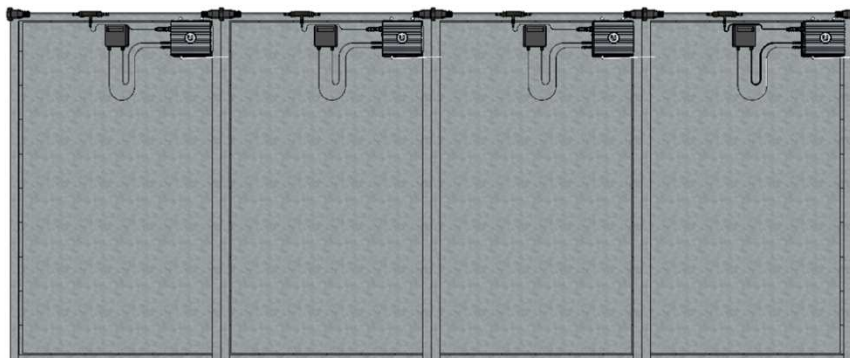
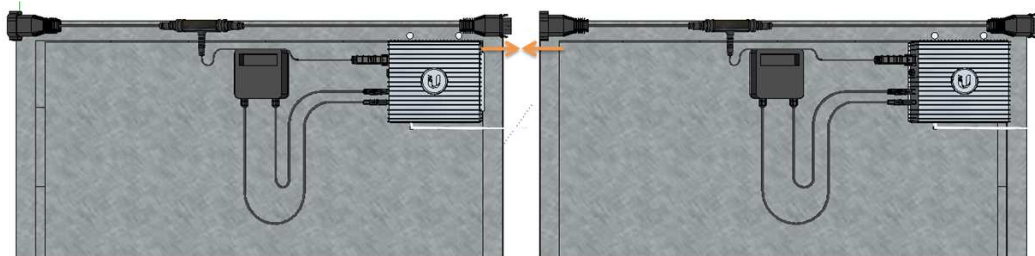


Step 4: Plug DC connector into MI.



Step 5: Complete all modules following by step 0 to Step 4 before roof installation.

Step 6: Combine Male and Female connector between AC modules.



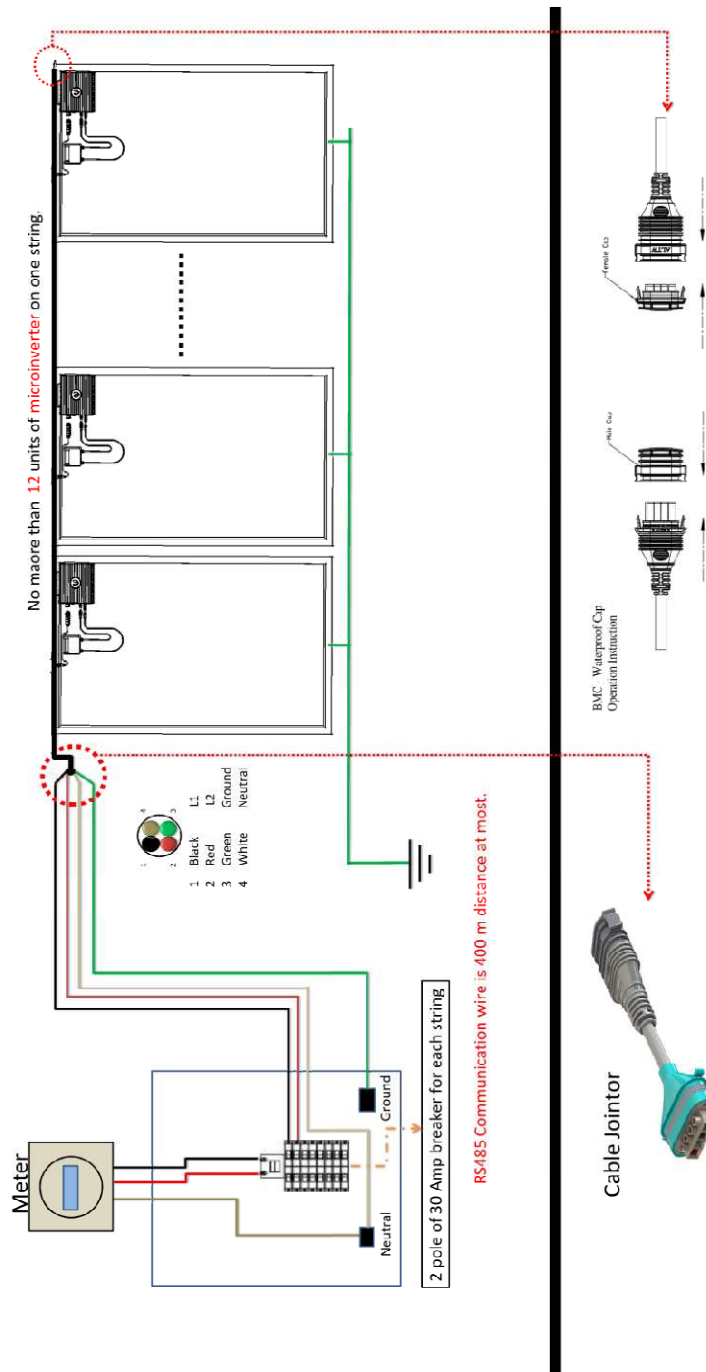
Step 7: Review the layout and check the voltage range again.

Voltage between red wire and black wire should be closed to 240V. Please check and adjust layout before operating system. The wires in the AC cable are identified by color: L1 is sheathed in Red, L2 is sheathed in Black, Neutral is sheathed in White and Ground is sheathed in Green.













We put the SM-SP-250W module on the structure/racking, and connect the AC cable before fixing the SM-SP-250W module on the racking.

The total number of MI/PV module should not exceed 12 units on single string.

End CAP have to be applied for cable water-proof.



There are some optional materials/accessories for different installation requirements, users could evaluate and count the quantities by below sheet.

No	Category	Item	Q'ty	Note															
1	Optional	<b>AC_CONNECTOR_TRANSITION_CABLE_UL_MALE</b>  INTERCONNECTING CABLE PLUG ON ONE END AND CABLE (12AWG) OF STRIPPED WIRES ON THE OTHER.																	
2	Optional	<b>AC CONNECTOR TRANSITION CABLE UL FEMALE</b>  INTERCONNECTING CABLE PLUG ON ONE END AND CABLE (12AWG) OF STRIPPED WIRES ON THE OTHER.																	
3	Optional	<b>AC_CABLE_4C10AWG_S50000</b>  UL TECR 4C 10AWG L=50M <table border="1" data-bbox="602 642 740 678"> <thead> <tr> <th colspan="5">AC CABLE DEFINITION</th> </tr> <tr> <th>WIRE DEFINITION</th> <th>L1</th> <th>L2</th> <th>N</th> <th>NEUTRAL</th> </tr> </thead> <tbody> <tr> <td>WIRE COLOR</td> <td>BLACK</td> <td>RED</td> <td>GREEN</td> <td>WHITE</td> </tr> </tbody> </table>	AC CABLE DEFINITION					WIRE DEFINITION	L1	L2	N	NEUTRAL	WIRE COLOR	BLACK	RED	GREEN	WHITE		
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7	Optional	<b>AC_CONNECTOR_UNLOCK_TOOL</b>  TOOLING FOR UNLOCKING MICRO INVERTER AC CONNECTOR & WATERPROOF CAP.																	
8	Optional	<b>AC_CABLE_JOINER</b> (12AWG&4mm <sup>2</sup> )  CABLE GLAND FOR AC_T-CABLE EXTENSION																	
9	Optional	<b>AC_CABLE_CHIP</b>  ACC-R2																	
10	Optional	<b>AC_CABLE_CHIP</b>  ACC-R4																	
11	Optional	<b>AC_DAISSY_CHAIN_WATERPROOF_CAP_MALE</b>  SEALING CAP FOR AC CABLE CONNECTOR																	
12	Optional	<b>AC_DAISSY_CHAIN_WATERPROOF_CAP_FEMALE</b>  SEALING CAP FOR AC CABLE CONNECTOR																	

Remove the temporary shipping cap from the AC cable. Ensure the connection is secure and locked into place. For unused connectors on the AC cable, replace the temporary shipping cap with a sealing cap (end cap). Make sure there is a click sound as the sealing cap is connected to ensure that it is securely locked.

Step 8: With this installation is complete, to enable the I-cloud function of data logger, please refer to next chapter “Communication System Enable “.

**WARNING**

Make sure the AC cable and terminator do not touch the roof, using cable clips or tie wraps secure AC trunk cable with structure/racking. Ensure that all cabling is securely located under the PV module and away from roof surface.

**WARNING**

Correct AC grounding and short circuit protection must be provided to ensure operational safety.

**WARNING**

Although the AC trunk cable includes an EGC, the continuous grounding conductor or grounding washers is still required.

## POST-INSTALLATION

**WARNING**

Service or Changes to your electrical system should be carried out only by qualified electricians.

**WARNING**

Do not attempt to repair this product; it does not contain user-serviceable parts. Repairs and internal servicing should only be performed by UBIQUITI authorized service personnel.

## Commissioning and Operating

Turn on the AC disconnect or the circuit breaker of each micro inverter string.

Turn on the main utility-grid AC circuit breaker. System will start producing power after five minutes.

(Optional Monitoring System) Depending on the strength of the signal, it can take up to 2 hours before the monitoring system detect all the micro inverters in the PV system. For more information on the monitoring system, refer to the [PV Monitoring System user’s manual](#).

## Important Notification

### GFDI fault

GFDI fault is defined as an unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the normally non-current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment or earth. When a Ground fault occurs, the GFDI will trigger the LED light to flash in alternating Orange and Red colour, and SM-MI-250 will automatically disconnect all the conductors as a safety precaution.

If GFDI has been detected, please contact with the installer and follow the *Operation Manual* to fix this situation. Or you can contact with UBIQUITI customer support at [support@UBIQUITI.com](mailto:support@UBIQUITI.com).

Make sure that any upstream AC disconnects, as well as the dedicated circuit breakers for each AC branch circuit, are functioning properly and are closed.

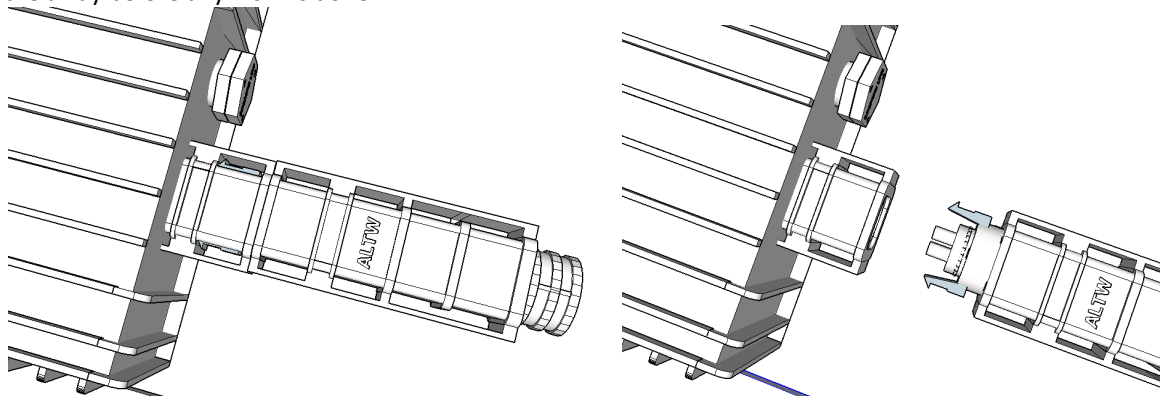
Verify the PV module DC voltage is within the allowable voltage and wattage range (refer Technical Specifications on page 25).

Make sure DC wires of PV module are connected correctly with DC connectors of micro inverter.

If the problem persists, contact UBIQUITI Technical Support at [support@UBIQUITI.com](mailto:support@UBIQUITI.com).

### Disconnecting a Micro Inverter

Ensure the micro inverter is **NOT** disconnected from the PV modules under load. Always disconnect all circuits to the array before any work is done.

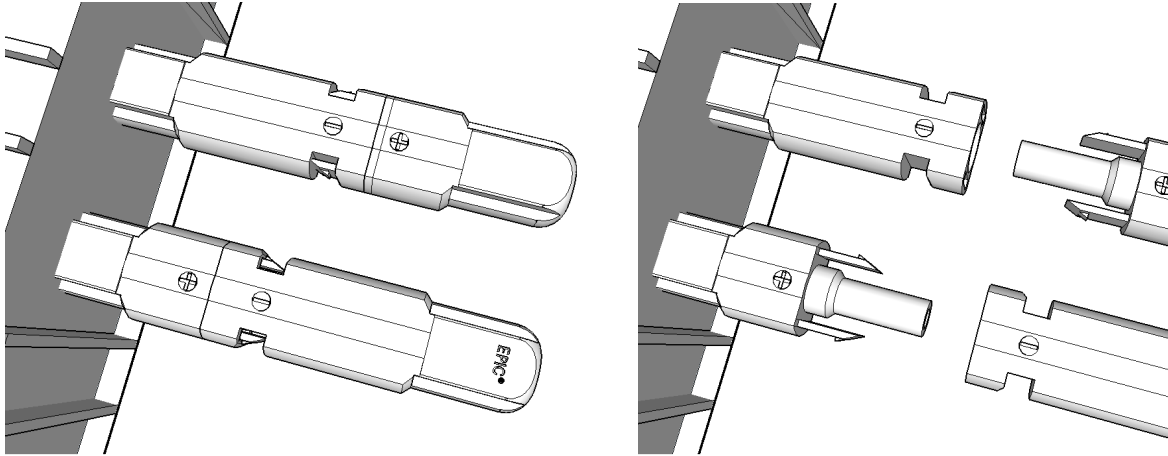


#### WARNING

Be aware that DC power/voltage is generated when the PV module is exposed to light.

Using a multi meter, verify that the DC conductors between the PV module and the micro inverter do not have any current.

Disconnect the PV module from the micro inverter. To disconnect the micro inverter's positive connector, squeeze the locking mechanism and pull the connectors apart. The micro inverter's negative connector is tool-removable only.



Disconnect the grounding wire or washer from the micro inverter.  
Remove the micro inverter from the PV racking.



**WARNING**

Do not leave the disconnected SM-SP-250W module and expolse connectors for an extended period of time. If the removed micro inverter will not be replaced with another micro inverter immediately, connect a sealing cap to the connector.





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