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# Chapter 1: Introduction

## Overview

sunMAX™ by Ubiquiti Networks is a grid-tie solar solution that utilizes photovoltaic (PV) cells, or solar panels, to convert solar energy into alternating current electricity. Using a watertight residential mounting system, sunMAX offers both portrait and landscape array configurations with easy-to-use software to help you design and implement a fully customizable solar solution.

The sunMAX solar solution should be installed by someone trained and familiar with the safety and operational procedures of the sunMAX system and all of its components.

The *AC Modules* and solar system are UL listed to standard 2703. Please adhere to all applicable codes, required permits, and regulations concerning the installation and inspection requirements as they pertain to your location.

## Safety

The following instructions and safety precautions are in place to ensure proper deployment and operation of your solar equipment:

- Use only the materials and tools specified in this guide.
- Do not break or modify any of the solar components or use them outside of their intended use.
- Do not sit or stand on the surface of the *AC Modules*.
- Install components securely to avoid parts from becoming loose or falling off during the installation.
- Only work in dry conditions with dry tools.
- Prevent rafters and sheathing from becoming wet.
- Install each *AC Module* securely to ensure proper operation and grounding of the array.
- *AC Modules* are installed on rooftops where there is danger of slipping or falling. Ladders and scaffolding should be used when climbing onto roofs.
- Do not use chemicals on solar modules when cleaning.
- Do not wear metallic jewelry or any conductive material.
- Do not touch electrical contacts, cables, or wires.

## Recommendations

Note: Become familiar with the installation site and its surroundings by visiting the location prior to the actual install date.

Note: It is recommended that you work with at least one other person. Never work alone.

Take the following precautions before starting work:

- Plan the job and visit the site before doing any work.
- Always work with at least one other person on site.
- Inspect power tools before using them.

When conditions make it necessary, tell workers to stop working.

- Do not perform installation in poor weather conditions such as rain, snow, ice, or high winds.

Wear appropriate work clothes and protective equipment.

- Wear gloves when handling flashing. Flashing has sharp edges and may also become hot in warm temperatures.
- Work clothes for both the upper and lower body should fit well and allow you to move freely.
- Always wear protective equipment such as harnesses and lifelines.
- Wear non-slip shoes. Shoes get dirty when worn on a roof, so keep the soles clean.

Observe safety regulations for ascending and descending ladders and stepladders.

- Ladders from a first-story roof to a second-story roof are very dangerous. Do not set up a ladder on a roof.
- When there is no other choice, straddle the ridge and lay down a rubber anchor mat, and secure the ladder to the mat. Always have one person hold the ladder firmly.
- When you use a two-stage ladder, secure it with ropes or stays to prevent it from sliding sideways, and have two people hold the ladder steady.
- Use ladders with steps broad enough to permit safe work.

When working in high places, wear harnesses and use scaffolding.

- When working at heights of 6' or more, use scaffolds or other equipment to ensure a stable work platform.
- Scaffolds should be designed and erected by a qualified person.
- When it is difficult to erect a stable work platform, install safety nets, wear harnesses, and take other measures to prevent falls.
- Regulations mandate the use of harnesses. Fasten harnesses securely, and check that the length of lifelines is 6' or less.
- Attach the primary support line securely to a metal fixture installed for that purpose on a ridge or beam.

Install enclosures and covers.

- Install enclosures, guardrails, or covers at the end of work decks that are 10' or more above ground, at openings, and at other dangerous locations.
- When it is extremely difficult to install enclosures, guardrails, or covers, or when they must be removed to work in that location, install a safety net, wear harnesses, and take other measures to prevent falls.

WARNING: Wiring work should be performed according to the provisions of the National Electrical Code. Grounding work and wiring connections to the inverter should be performed by a qualified electrician.

Adhere to the National Electrical Code (NEC). Pay special attention to Article 110, Chapter 2 Article 250, Chapter 3, Articles 300 & 310, 480 & 690.

WARNING: The solar array generates electricity whenever it is exposed to sunlight. Be careful when handling it. There is a danger of shock if you touch the connectors or wires of the electric cables.

## Points to Check Before Wiring

- The solar modules generate electricity when exposed to light. You will need to wear insulating gloves.
- You will need a multimeter for volts, amps, resistance, and continuity capable of measuring DC and AC up to 600V and 40A.
- Make sure your tools are insulated.

## Wiring Solar Panels

- Never step or sit on the glass surface of the solar modules. The glass may break.
- When you install the solar modules on the mount, never allow an output cable to become caught between the mount and a module frame.
- Ensure that the module connectors are fully inserted. There is a risk of malfunction if they are not pushed all the way in.
- Support output cables to eliminate slack. High winds can blow slack cable against the mount, damaging the cables.

## Wiring Solar Arrays to the Inverter

- For wiring through walls, protect the cables with metal conduits, flexible metal conduits, or other protection. Failure to do so can result in shock and short circuits. Always use conduit to protect sections of array output cables that are exposed to sunlight.
- For wiring outdoors, protect cables with PVC conduits, metal conduits, or flexible conduits.
- Prevent water from entering or building up in conduit by using waterproof fittings or duct seal.
- To prevent shock, tape and label the cut ends of array output extension cables (the side opposite to the connector side) before connecting to solar module output cables. Furthermore, tape them again after measuring the voltage of each array.
- To prevent shock when you connect the array output cables to the inverter, remove the tape one cable at a time as you connect the cables.

## Measuring Array Output Voltage

- Ensure that all solar modules are exposed to sunlight. (Remove lightproof sheets, if present.)
- Set the volt meter measurement range to a DC voltage, greater than the expected measurement.
- Keep the plus (+) solar array output cables away from the ends of the minus (-) cables, as dangerous arcs can occur. The array output voltage under normal conditions (clear skies) can be very high.

## Grounding the Mount

- Use a minimum #10 AWG ground wire. Run a continuous bond wire to each module and rail in the array. Refer to section on grounding in this user guide.
- Follow NEC 690 grounding provisions.

## Installation Requirements

- No. 2 Phillips screwdriver
- Leveling string
- Tape measure
- Electric drill
- 3/16" (4.8 mm) long drill bit
- Chalk line
- Chalk stick (for marking cutting shingle)
- Tin snips or utility knife (for cutting shingle)
- 13 mm wrench  (preferably an impact driver)
- Caulking gun
- EPDM compatible roof caulking
- Shingle ripper or other prybar to remove existing nails

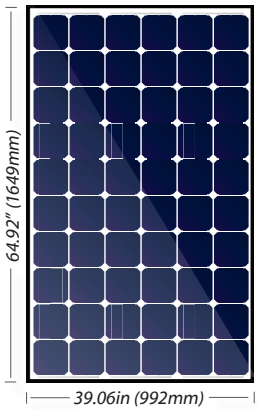
## Additional Tile Roof Mount Requirements

- 2" masonry hole saw or an angle grinder/saw with a masonry blade
- Roofing paper and roofing cement

# Chapter 2: Components

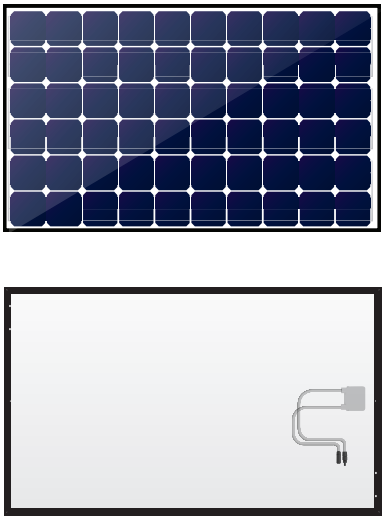
## Solar Panel

The *Solar Panel* (SM-SP-260-DC) can be installed in portrait orientation, landscape orientation, or a combination of both. Each panel in the array is installed downroof in the lower-edge position, side by side until a row is complete. Prior to transferring the *Solar Panels* to the roof for installation, each will be assembled with cabling and a Microinverter, at which point, the assembled parts will be referred to as an *AC Module*.



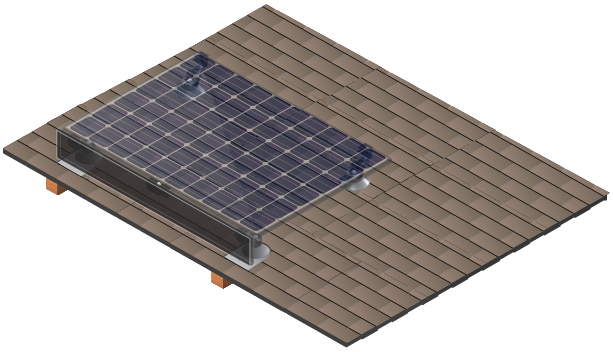

*Topside View of Solar Panel (Portrait Orientation)*

*Underside View of Solar Panel (Portrait Orientation)*

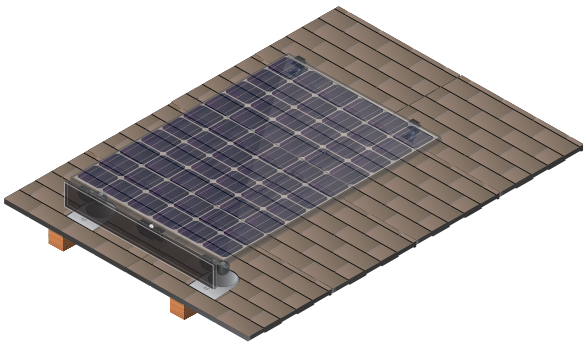


*(Landscape Orientation)*

When installing a single *Solar Panel*, you must have a minimum of four *Mounting Assemblies*. The overhang distance past each mount (on both sides) and the spacing between *Mounting Assemblies* must still adhere to the same specifications as a multi-panel array. For grounding purposes, a *Panel Connector,* along with a grounding wire, is installed between the *Trim Cover* and the lower edge of the array.



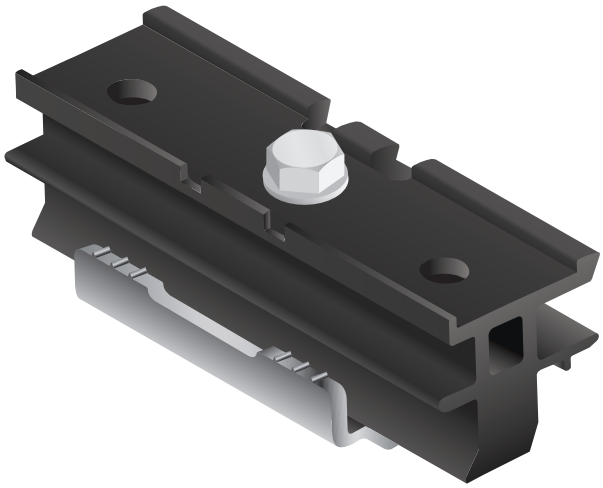
*Landscape Orientation*



*Portrait Orientation*

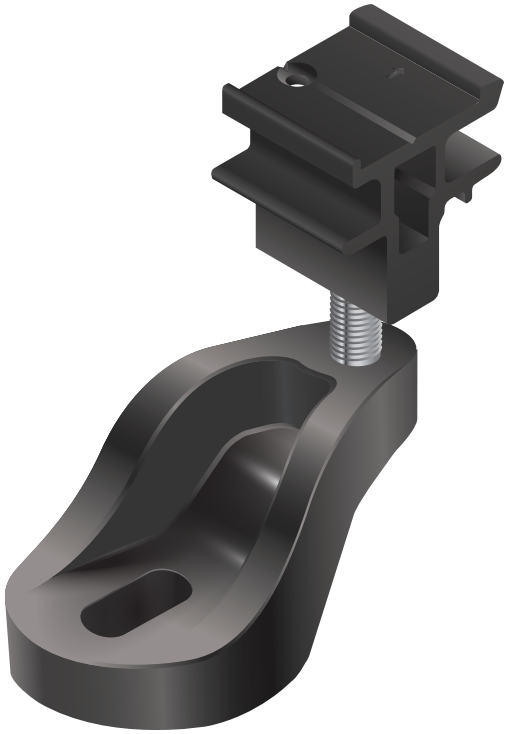
## Panel Connector

*Panel Connectors* (SM-PC) join solar panels together structurally between adjacent corners and along the outside edges of the *Solar Panels* and bond them together electrically.



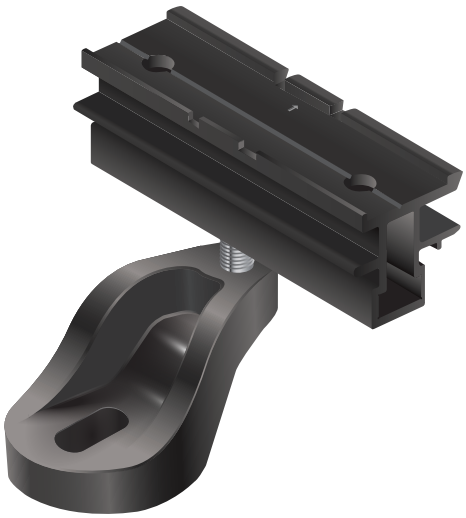
## Mounting Assembly

*Mounting Assemblies* (SM-MA) provide structural support and 360° adjustment swivel between the *Roof Mount* and outer edges of the *Solar Panel*. The arrow located on the top surface of each *Mounting Assembly* should always point downward towards the *Trim Cover*.



## Connector Mount

*Connector Mounts* (SM-CM) provide structural support and 360º adjustment swivel between the *Roof Mount* and outer edges of the *Solar Panel* where M*ount Assemblies* would coincide with a *Panel Connector* location. Each *Connector Mount* has an arrow on the top surface of the 360° swivel that should always face forward toward the trim cover.



## Trim Cover Kit

The *Trim Cover Kit* is used to enhance the visual appearance and aesthetics along the entire front edge of the array and help ease installation of the panels. There are three versions of the *Trim Cover Kit*: 1-panel portrait (SM-TC-1P), 2-panel portrait (SM-TC-2P), and landscape (SM-TC-L).

## Jumper Cable

*Jumper Cables* (SM-JC) connect and extend the Y-cables in adjacent rows together underneath the solar array. Includes cable support clips for attaching to the inside edge of the array.

## Solar Gateway

The *Solar Gateway* (SM-SG) communicates with and gathers data from all *Microinverters* in the solar array and sends information to Ubiquiti's sunMAX cloud management system via the home network.

## Roof Mount Kit

Provides a structural mount between the roof surface and *Mounting Assembly* to support the array. The kit includes the roof mount and mounting hardware, roof flashing and counter flashing to ensure watertight installation. (Note: *Flashing* has sharp edges and tends to get hot when exposed to full sunlight.)

## Tile Roof Accessory Kit

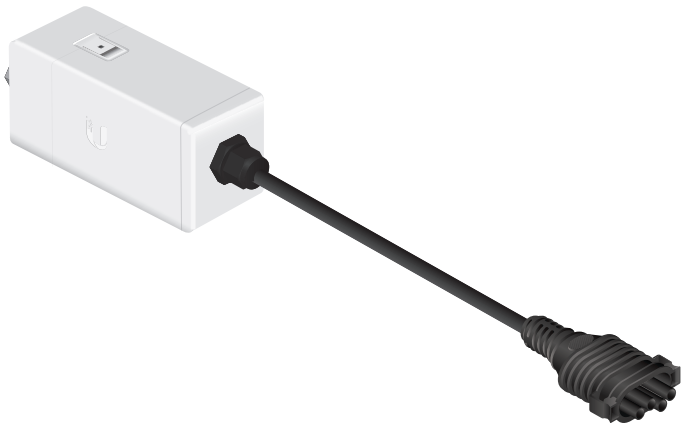
Provides structural mount between the roof surface and the array. Includes additional tile roof flashing with extension post and counter flashing for watertight installation. (Note: *Flashing* has sharp edges and tends to get hot when exposed to full sunlight.)

## End Run Kit

The *End Run* (SM-EC-NA for North America and SM-EC-EU for Europe) provides easy adaptation of cabling from the array to the electrical panel feeding the grid. It connects to the open-ended Y-cable in your solar array to the house-side wiring that feeds into the electrical panel on the outside of your home.

Typically you want to install the *Solar Panels* in a manner where the *End Run* will wind up closest to your breaker box or the location where the power cabling will penetrate the roof.

The End Run Kit also includes a cabling end cap and grounding kit (nut and bolt).



## Y-Cables

### Model: SM-YC-P4

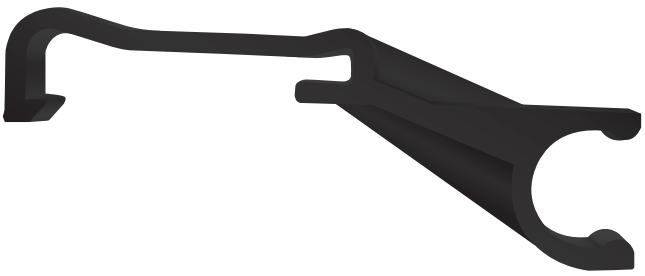
The sunMAX *Y-Cable* (Portrait) is used to connect panels and devices such as the Solar Gateway or a microinverter in a portrait panel configuration.

### Model: SM-YC-L4

The sunMAX *Y-Cable* (Landscape) is used to connect panels and devices such as the Solar Gateway or a microinverter in a landscape panel configuration.

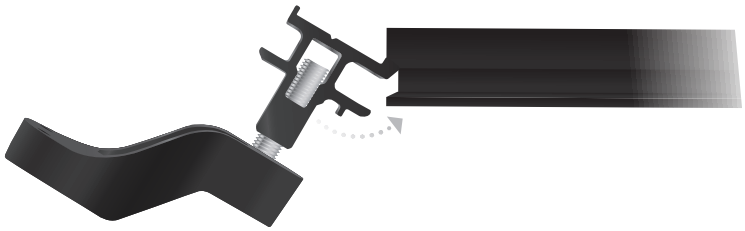
## Cabling Clip

*Cable Clips* hook and snap onto the solar panel from underneath to support and secure *Jumper Cables* and *Y-Cables* to the frame's edge.



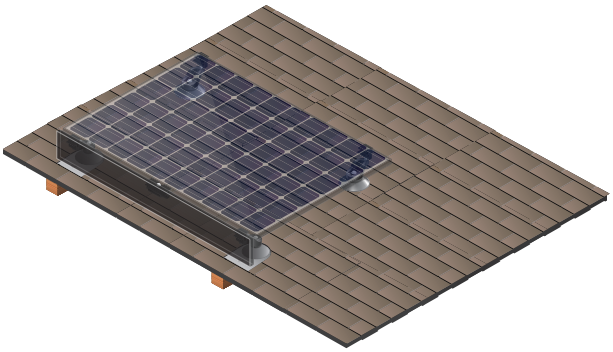
# Chapter 3: Component Usage

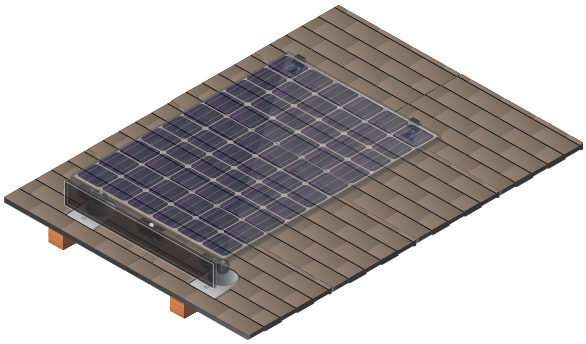
All sunMAX mounting components are installed into the *Solar Panel* frame using the same motion. Components hook underneath the outer edge of the panel's frame and then pivot down. Never force a component into place as it can damage the *Solar Panel's* frame.



## Solar Panel

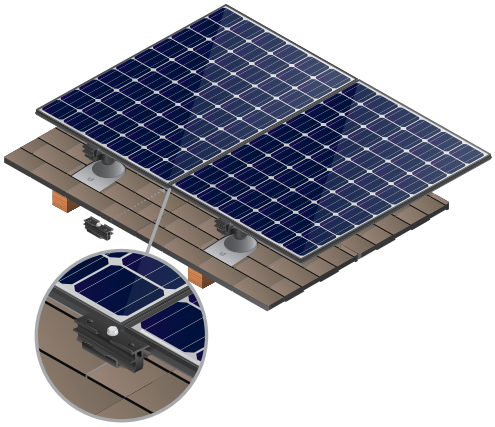
When installing a single *Solar Panel*, either portrait or landscape, it must have a minimum of four *Mounting Assemblies*. The overhang distance past each mount (on both sides) and the spacing between *Mounting Assemblies* must still adhere to the same specifications as a multi-panel array. For grounding purposes, a *Panel Connector, along* with grounding wire, is installed between the *Trim Cover* and the lower edge of the solar array.

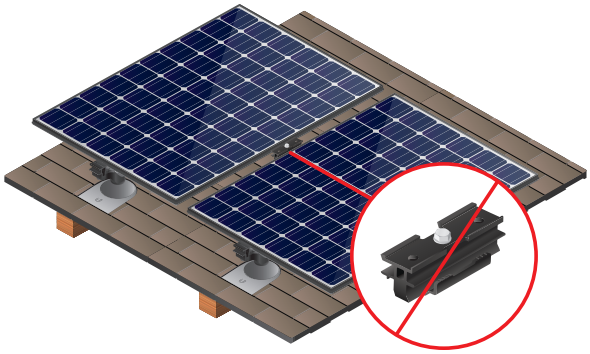




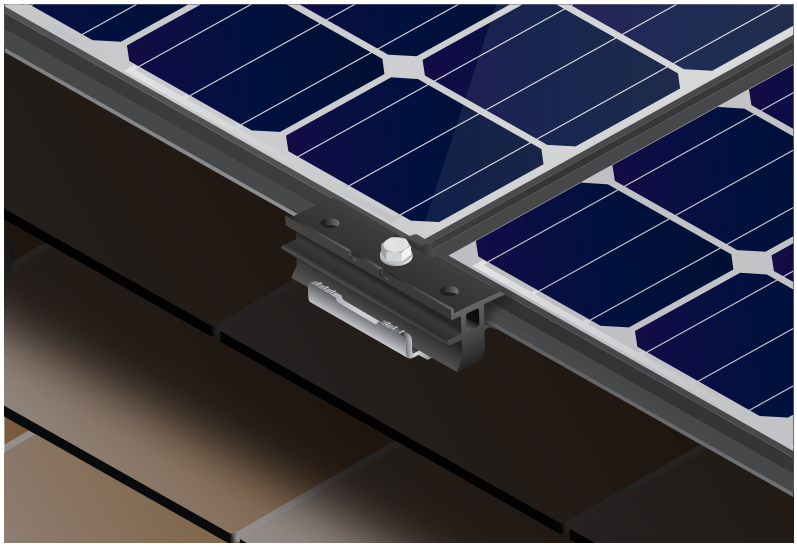
## Panel Connector

Panel Connectors are installed horizontally only, regardless of orientation of the solar array. Do not install vertically between the panels in your array.

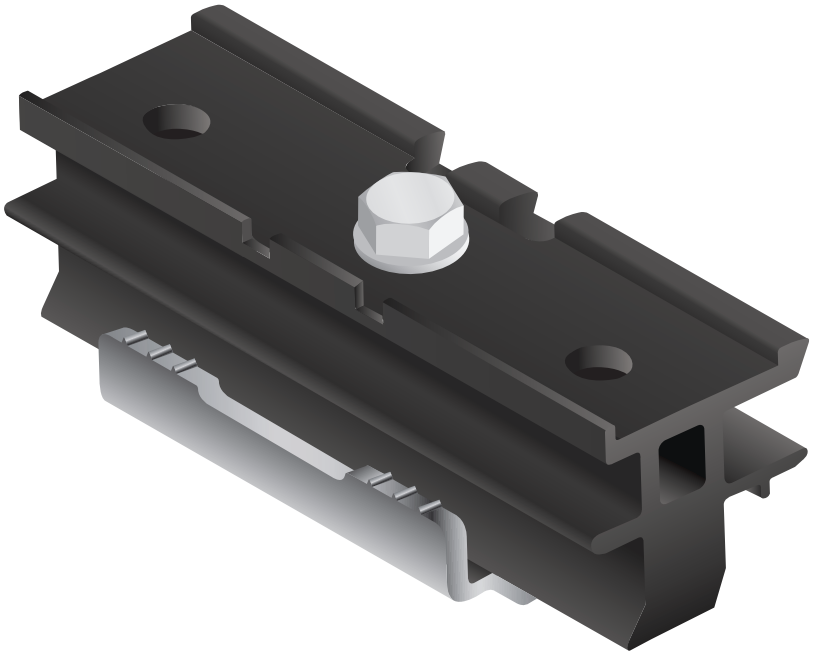




When you have multiple mounts on a *Solar Panel* or one right next to a connector, do not install the mount closest to the connector. Leave it loose temporarily, allowing the *Solar Panel* to drop quite a bit where they come together and make it easier to level the array panels.

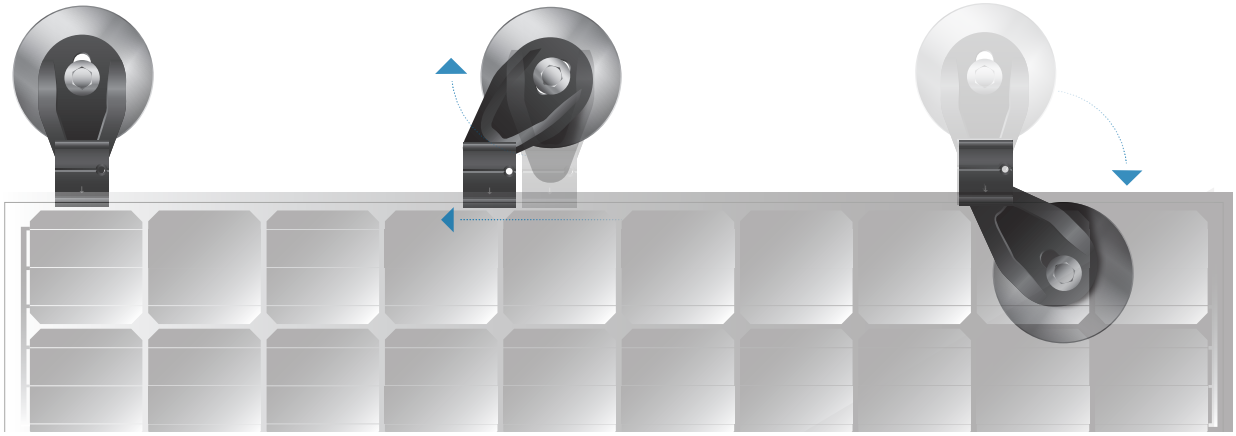


The *Panel Connectors* have preset gaps on them where the *Solar Panels* will sit as they come together. Align the gaps with the frame edges, hook them underneath, and pivot down.



## Mounting Assembly

*Mounting Assemblies* provides structural support and 360º adjustment between the *Roof Mount* and the outer edges of the *Solar Panel*. The *Mounting Assembly* base also slides forward and backward to allow adjustment of the swivel mount position supporting the *Solar Panel*. The arrow located on the top surface of each *Mounting Assembly* should always point downward towards the *Trim Cover*.



The same function and installation rules apply to the *Connector Mounts* as well. *Connector Mounts* (SM-CM) provide structural support and 360° adjustment swivel between the *Roof Mount* and outer edges of the array where *Mounting Assemblies* would coincide with a *Panel Connector* location.

## Trim Cover Kit

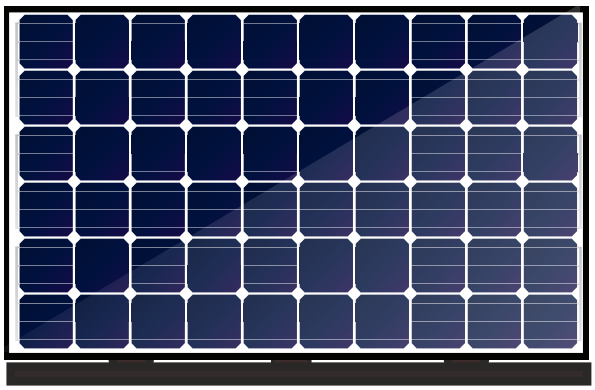
Trim covers serve the following purposes:

- Provide a cleaner appearance.
- Serve as an assembly aid by structurally stabilizing the array.

There are three different Trim Covers based on the layout of your solar array:

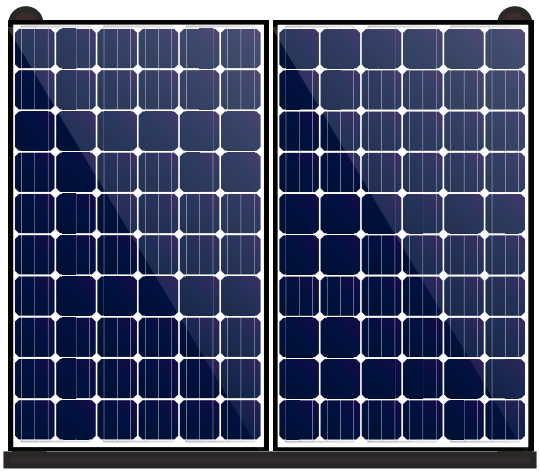
### Landscape

Standard width of one *Solar Panel* in landscape orientation. In a landscape layout, there will be one *Trim Cover* per column along the front edge where the first *Solar Panel* will be installed.



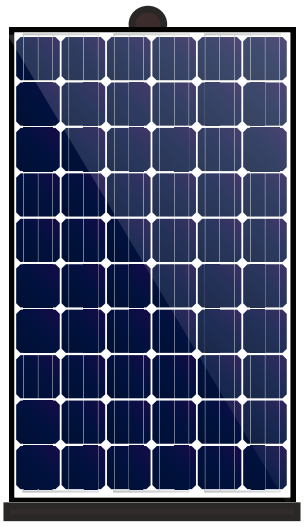
### 2-Portrait

Standard width of two *Solar Panels* in portrait orientation. For every 2 columns of *Solar Panels* in portrait layout, there will be one *Trim Cover* that extends along the front row of both *AC Modules*. For instance in an eight-column array of portrait *Solar Panels*, use four of the SM-TC-2P *Trim Covers*.



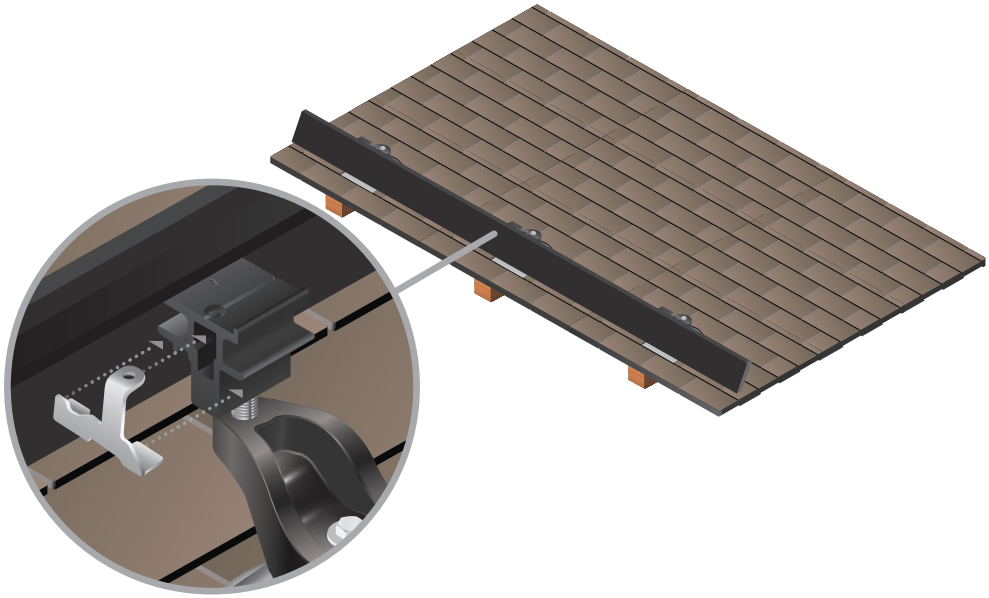
### 1-Portrait

Standard width of a single *Solar Panel* in portrait orientation. The single portrait Trim Cover is used in a solar array where there is an odd number or portrait columns. For instance in an array or three portrait columns, use one SM-TC-2P portrait *Trim Cover* and one SM-TC-1P portrait *Trim Cover*.



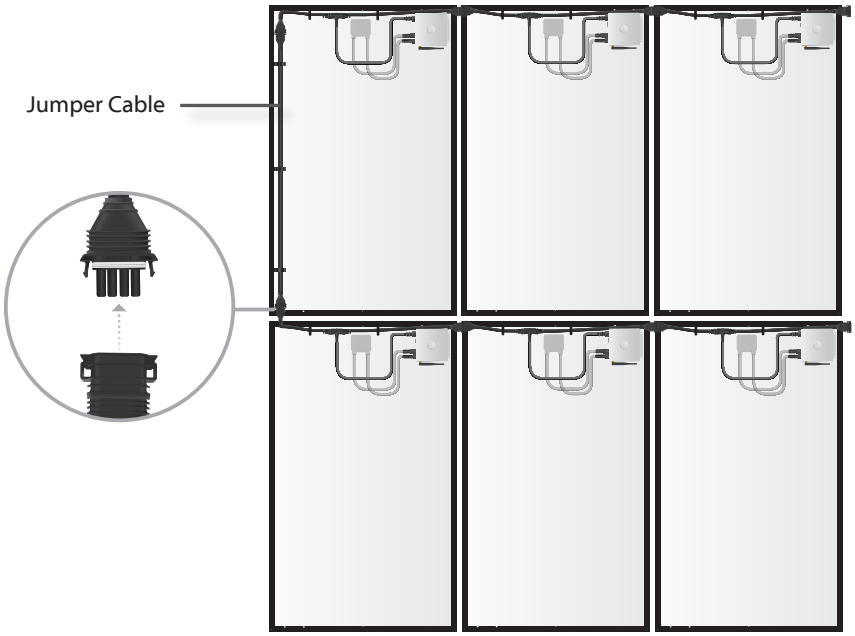
The *Trim Covers* also come with two end plates, or endcaps. Depending on the layout of your solar array, if columns go beyond a single landscape, portrait, or 2P design, multiple *Trim Covers* may be used and installed side-by-side across the front edge of your array. Once the front edge of your solar array is complete, install an end plate on both of the open ends of the *Trim Covers* using the included mounting screws.

Each *Trim Cover* also comes with a set of trim locks to secure it in place at all *Mounting Assembly* locations along the front edge of the array.



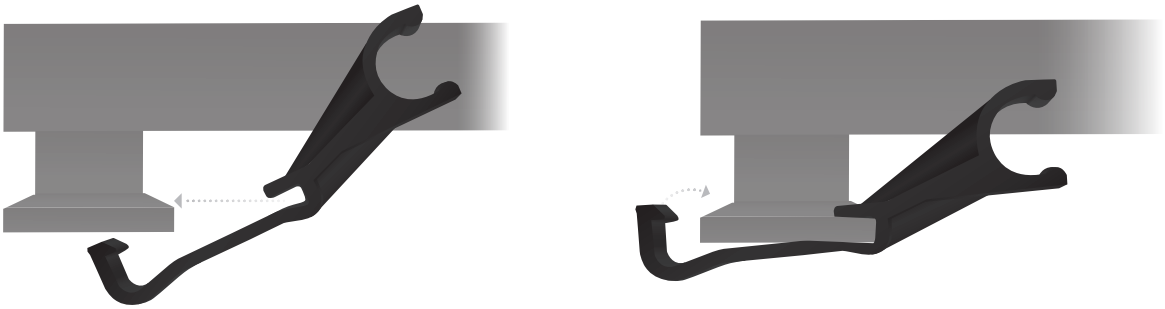
## Jumper Cable

*Jumper Cables* are used to connect power cables in adjacent rows or small gaps between modules. The same *Jumper Cable* can be used in either portrait or landscape installations.




## Cable Clip

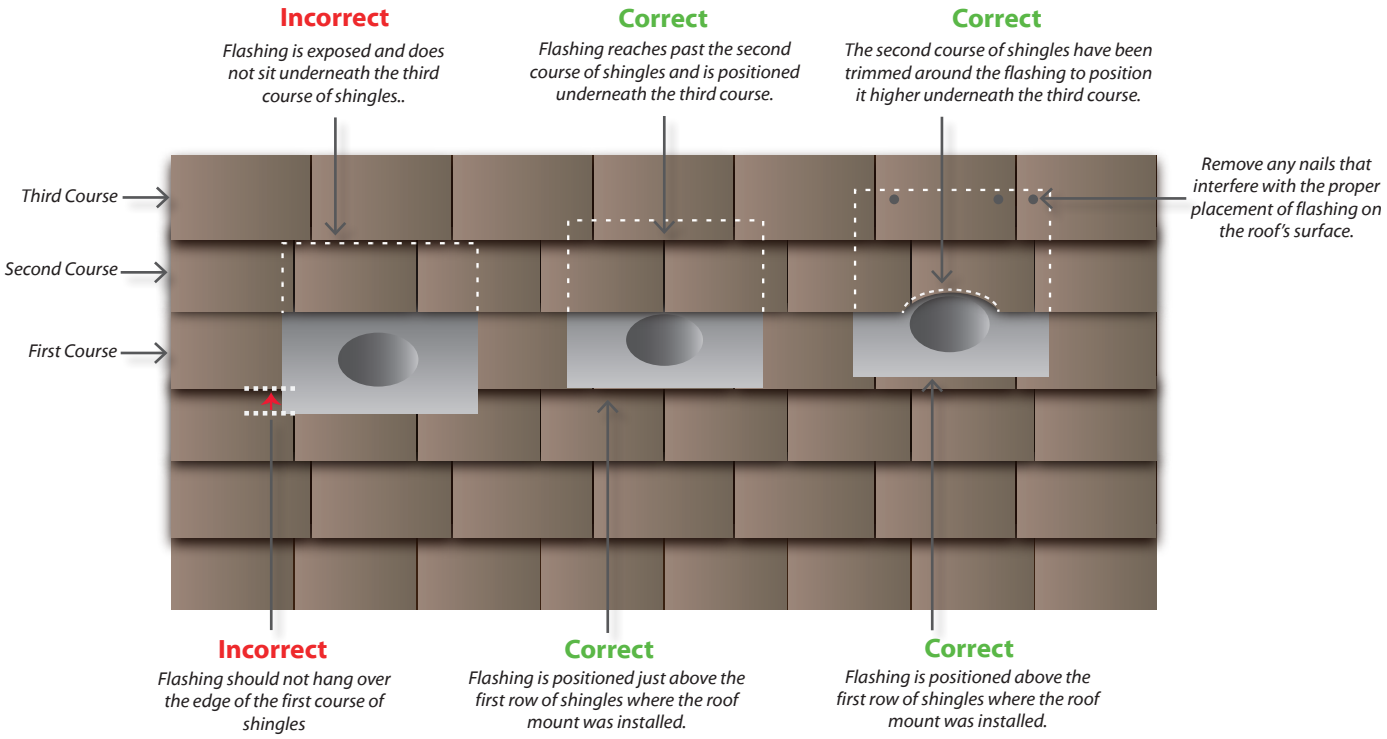
*Cable Clips* hook onto the panel's edge to support and secure *Jumper Cables* and *Y-Cables* to the *AC Module*.



Cables then snap into the *Cable Clip* underneath the *AC Module*, holding them in place along the inside edge of the *AC Module's* frame.

## Flashing

*Flashing* is placed over each roof mount and helps ensure watertight installation when positioned properly. The upper edge of the *Flashing* should always be covered by the third course of shingles to prevent water from entering underneath the *Flashing*. The upper edge of the *Flashing* should be covered by at least 1/4" of the third course of shingles. The lower edge of the flashing should not extend beyond the edge line of the first course of shingles.



# Chapter 4: Analysis

To determine the maximum amount of spacing to use when installing your solar system, several factors need to be taken into consideration based on the location of your install. Refer to the span tables in **"Appendix A: Span Tables" on page 48** to determine the measurements for your particular location.

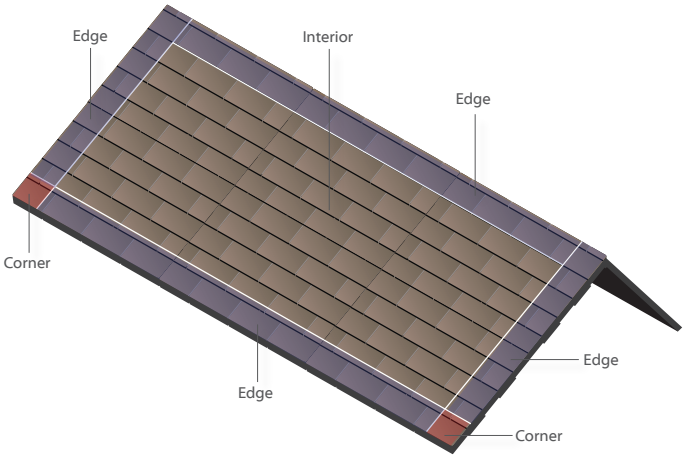
## Basic Wind Speed

Determine the wind speed at your installation site. In certain regions where wind may be stronger, consult your local building and safety department for guidelines.

## Roof Zones

Locate the area on the roof where you will be installing the solar array. The roof is actually divided into three zones: the interior, edges, and corners.

- **Interior** The inner-most area surrounded by the edges, also referred to as the field.
- **Edges** The edges are defined as 10% of the least horizontal dimension or a minimum of 3' (.9m) from the roof's edge and represent areas of higher wind load.
- **Corners** The corners are defined as the intersection of the two edge zones in the leading edge of the roof. Wind loads are highest in the corner zones and lowest in the interior zone. AC Modules are not to be mounted in the corner zones.




## Snow Loading

To determine the ground snow load at the installation site, consult with your local building and safety department for the specific requirements for your location. AC Modules should not be installed in snow drift areas of the roof.

## Exposure Category

Determine the exposure category of the installation site by using the following guidelines:

- **Category B** Urban, suburban, wooded areas or other terrain with numerous obstructions or closely-placed objects having the size of single-family dwellings or larger.
- **Category C** Open terrain with scattered obstructions such as flat open country, grasslands, or shorelines in hurricane-prone regions.
- **Category D** Flat, unobstructed areas within 1500' (460m) of shoreline or areas exposed to wind flowing over open water (excluding shorelines of hurricane-prone regions) for a distance of at least one mile (1.61km).

## Grounding

The sunMAX mounting system provides a built-in integrated grounding system to bond the array together. When panel connectors are installed they provide up to a 4 way bond with adjacent modules and/or trim skirts. By bonding modules into one continuous system only a single wire equipment grounding conductor (EGC) is required for up to 16 contiguous modules. The grounding wire is connected to any of the panel connectors in the system with the addition of the grounding kit (SM-GK).

## Special Mounting Considerations

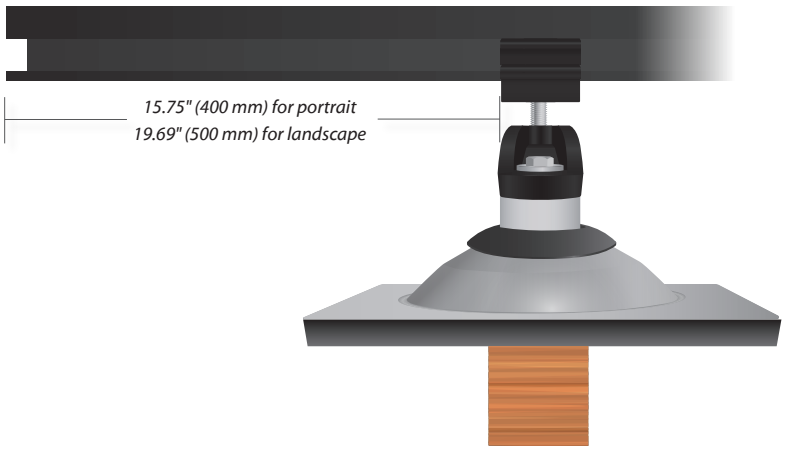
The mount spans in make the following assumptions:

- The building is not a special occupancy structure that represents a substantial hazard to human life or essential facility such as a public school or hospital.
- The building is not located on a bluff or near the top of a hill where topographic effects change.

If your installation site differs from any of the fore mentioned factors in this section, please consult with Ubiquiti Networks about your solar installation project.

## Mounting

The other important factor when mounting modules is the maximum cantilever distance that a module can overhang past the outside mounting assemblies. For a portrait installed module this distance is 15.75" (400 mm) and for a landscape installed module this is 19.69" (500 mm). To reduce this the module or mount location needs to be shifted to reduce the cantilever distance. For configurations with staggered rows of modules the cantilever distance should be checked on each row.

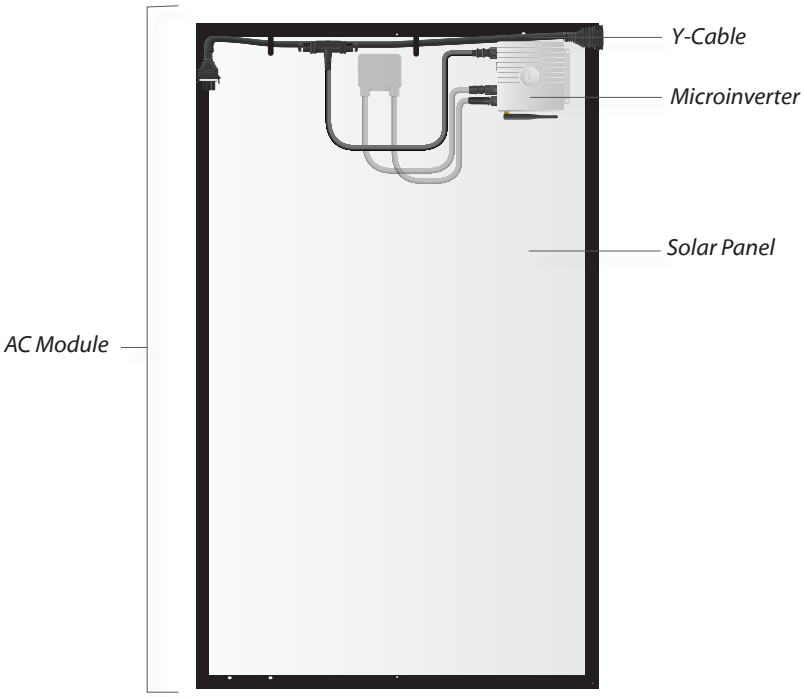



## Thermal Expansion

Arrays more than 33' (10 m) in any direction should be separated by a minimum of 1" (25 mm) gap to allow for thermal expansion. This will help prevent damage to the module. Gaps should be located near the center of the array and each array should be grounded individually.

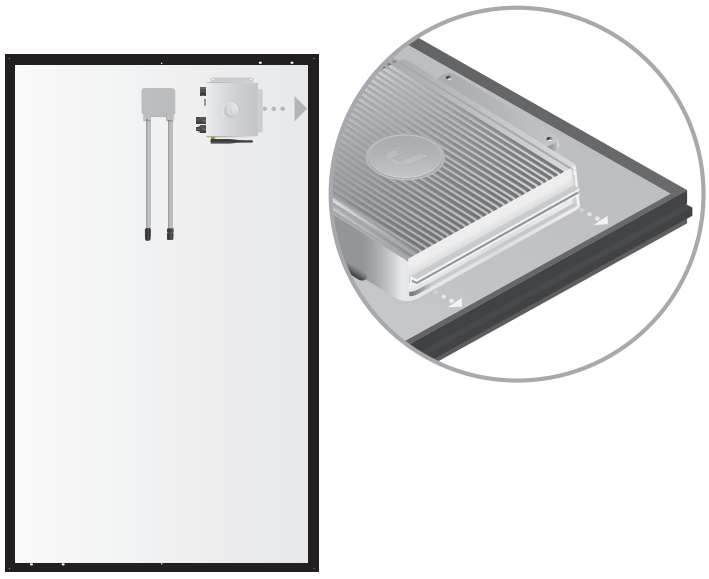
# Chapter 5: AC Module Assembly

The *AC Module* is a *Solar Panel* with a *Microinverter* installed. We recommend that you assemble the *AC Module* and attach the required cabling and cabling clips prior to transferring the *AC Module* to the roof.

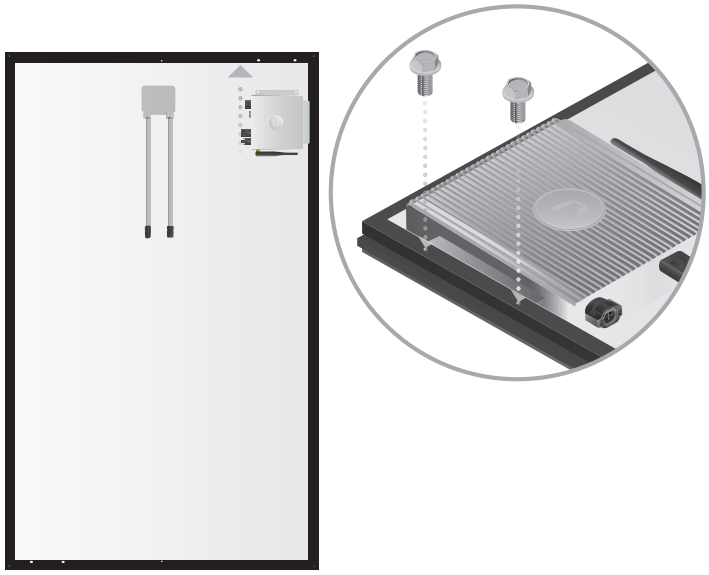



To assemble the *AC Module*, follow these steps:

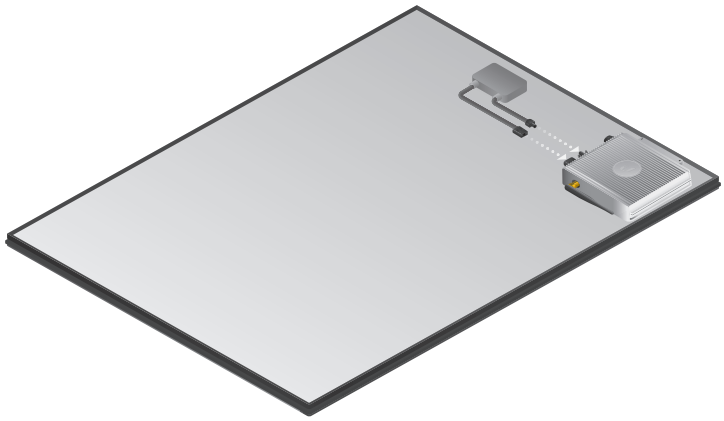
1. Stand the *Solar Panel* up against a sturdy wall or lay it on a flat surface that will not scratch the top side of the panel. The pre-installed junction box should be facing you on the upper-half of the *Solar Panel*. (Note: Do not sit or place heavy objects anywhere on the *Solar Panel*.)
2. Ensure that the two holes in the *Microinverter* align underneath the two pre-drilled holes along the upper-right edge of the *Solar Panel*. Ensure the neighboring side of the frame edge sits in the slotted edge of the *Microinverter,* which secures it to the frame edge.



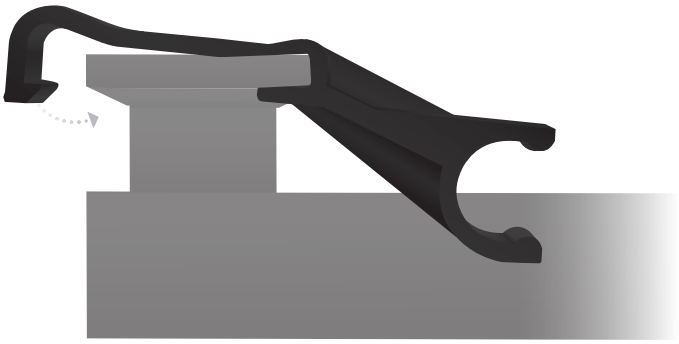
3. Secure the *Microinverter* to the inside edge of the *Solar Panel* using the two included mounting bolts. Ensure that the neighboring edge of the *Microinverter* is still attached to the corner frame edge before inserting the mounting bolts.



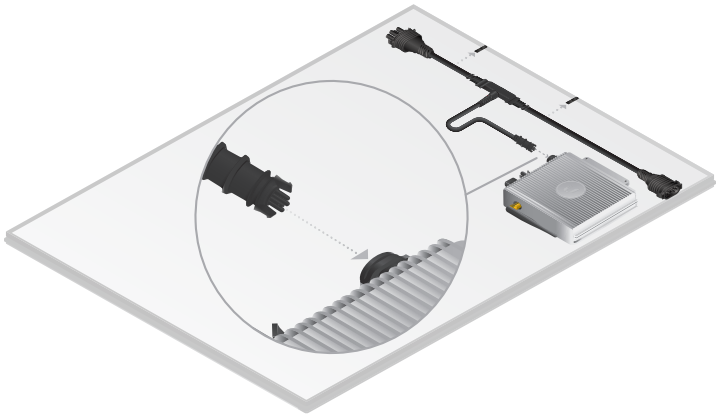
4. Connect both cables on the junction box to the DC ports on the *Microinverter*. Each cable only fits one way into its respective port on the *Microinverter*.



5. Attach *Cable Clips* to the top edge of the frame by hooking the *Cable Clip* onto the inside edge of the frame and pivot down over the top until it snaps onto the front edge of the *AC Module*.



6. Attach the *Y-Cable* to the *Cable Clips*, securing it to the *AC Module*, and plug the power connector into the AC port on the *Microinverter*.



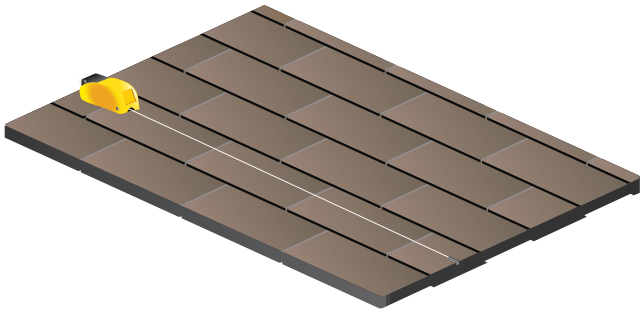
The *AC Module* is now complete and ready for installation.

# Chapter 6: Installation

## Roof Mount and Flashing Installation

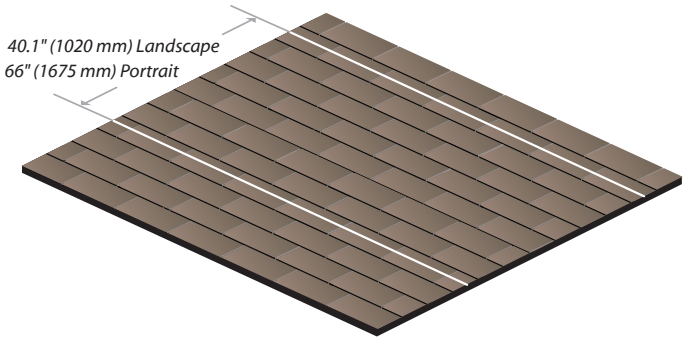
Locate on the roof where the solar array will be installed. Be sure to adhere to all local rules and regulations that correspond to your location in regards to measurements and spacing from roof eaves and ridges.

1. Mark the location of the first row of roof mounts by placing a chalk line horizontally across the roof. This chalk line should be 1.5" (38 mm) up from where the lower edge of the solar array will sit.



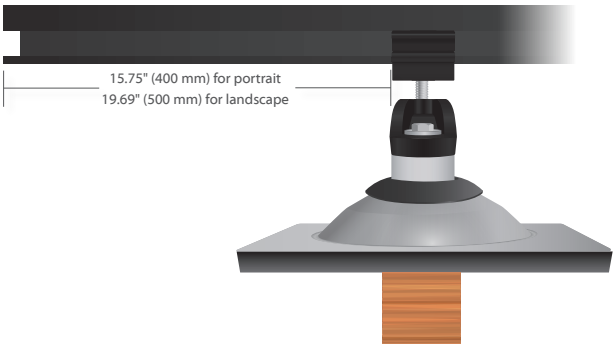
2. Mark the location of the second row of roof mounts by placing a parallel chalk line above the first, using the following guidelines:
   - For portrait configurations, mark 66" (1675 mm) up from the previous chalk line.
   - For landscape configurations, mark 40-1/8" (1020 mm) up from the previous chalk line.

   For additional rows, repeat this step as needed.

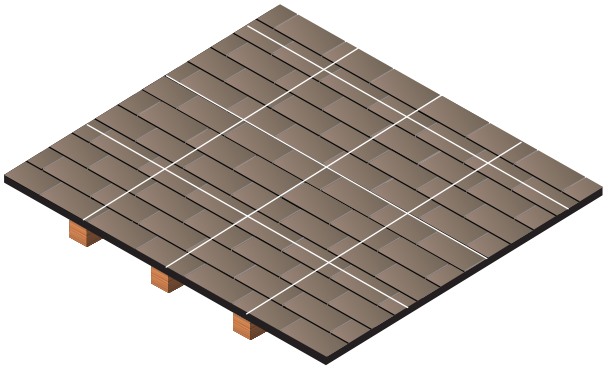



3. Mark the center line of each rafter along each of the horizontal chalk lines. These marks should be within an 1/8" of the rafter center line.

4. Identify the first mount location by locating the closest rafter underneath the outside edge of the first *AC Module* in your array. Mark the center of the first rafter that will support the lower-edge corner of the first *AC Module* in your array. Ensure the location does not exceed the maximum cantilever distance of 15.75" (400 mm) for portrait configuration or 19.69" (500 mm) for landscape configuration. If a rafter does not fall within the maximum cantilever distance based on the current chalk line position, the *AC Module* location will need to be shifted in order to reduce the cantilever distance.

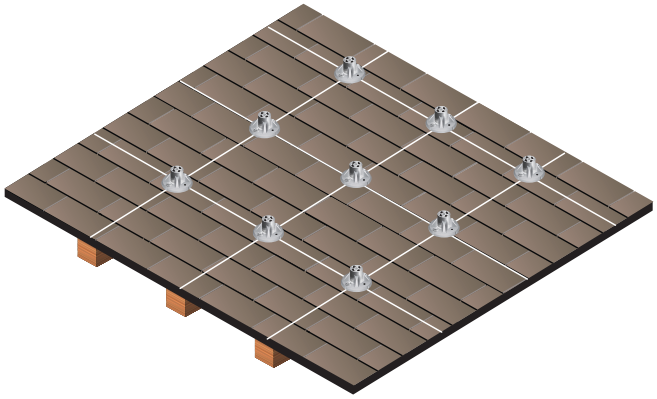



5. Once the first roof mount location is marked, continue to mark additional roof mount locations along each horizontal chalk line observing the maximum mount spacing for your location until the desired array layout is complete. Check the opposite end of the array to ensure the cantilever distance has not been exceeded at any other locations in your array.

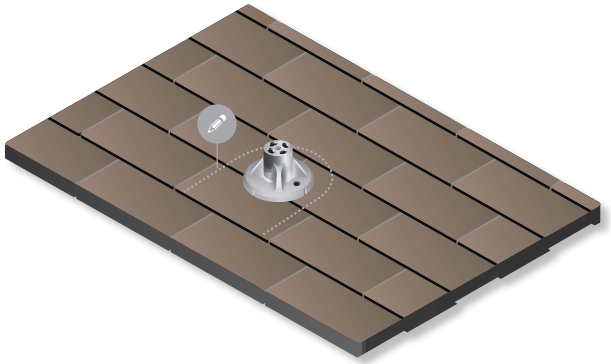


Refer to the span tables in **"Appendix A: Span Tables" on page 48** to determine the mount spacing for your particular location. This will provide you with the maximum spacing for your roof mounts.

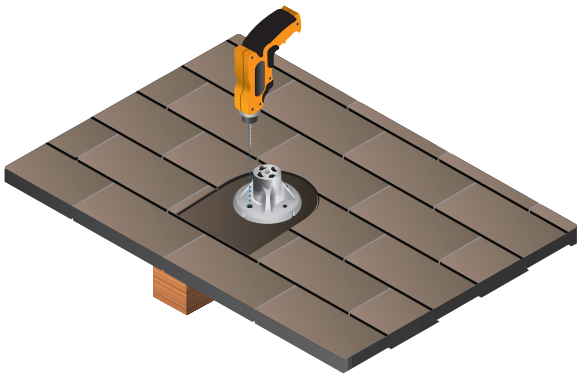
6. Once proper spacing has been determined, place each roof mount in position over the chalk lines to use as a guide when marking the shingles to cut for the roof mount.



7. The roof shingles need to be cut to allow proper installation of the roof mounts and flashing. Use a chalk stick to mark a 2" (50 mm) area around the roof mount (to use as a guide) and trim the second course of shingles.

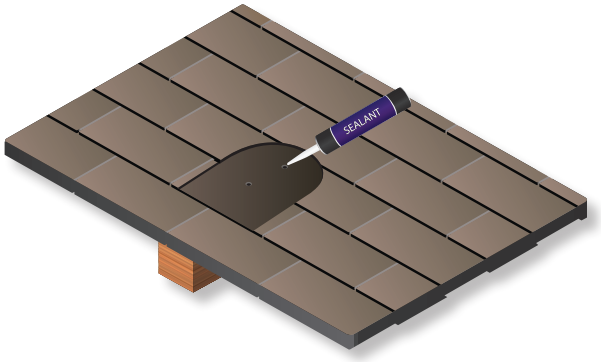


8. Once the shingles have been trimmed, position the roof mount over the rafter center and start predrilling the two holes that will be used to secure the roof mount to the rafter. Use the shingle cutout and the two smaller holes on the roof mount as a guide for positioning. (Note: To avoid damaging the roof mount, do not drill the holes completely through with the roof mount in place.)

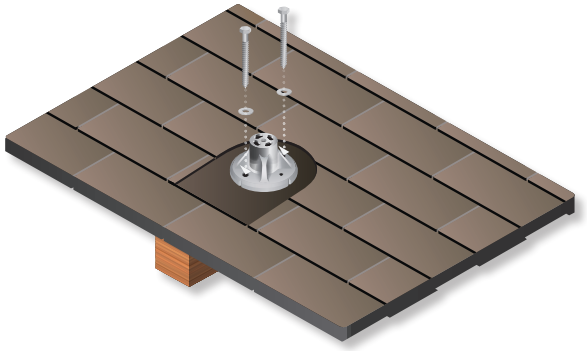


9. Remove the roof mount temporarily and finish predrilling two 3/16" (4.8 mm) holes approximately 2" (50 mm) deep.

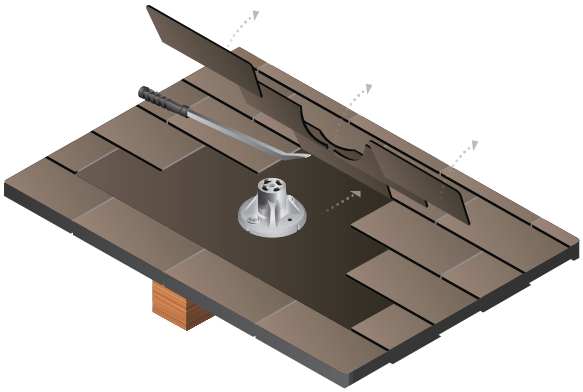
10. Cover both hole openings with roofing sealant. This will ensure watertight installation once the lag screws have secured the roof mount to the rafter.




11. Position the roof mount back into place and secure it to the roof structure using the provided lag screws until it is fully seated.

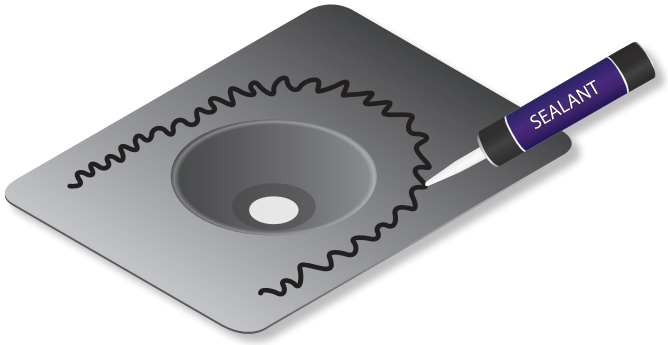


12. Slide a prybar under the roof shingles where the flashing is to be installed to break the bond between the roof courses. Remove any nails from shingles that will interfere with the flashing installation and lift up the shingles.

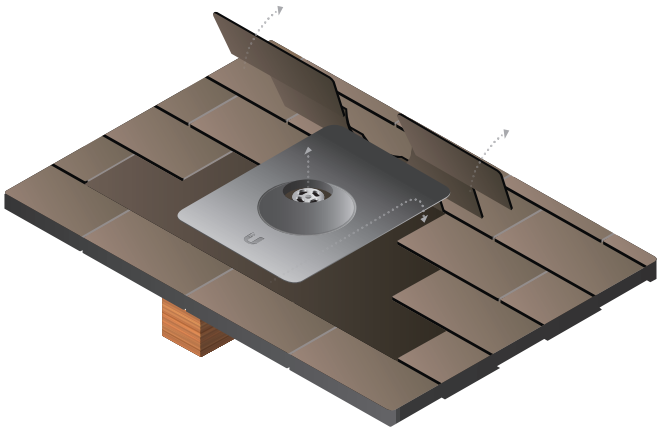


13. Apply roof sealant to the underside of the *Flashing* and spread evenly across the bottom surface.

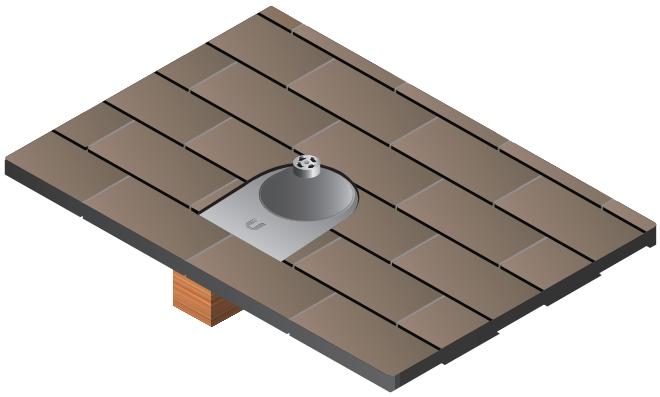
Wearing gloves is recommended as *Flashing* has sharp edges and also may become hot when exposed to warm temperatures.



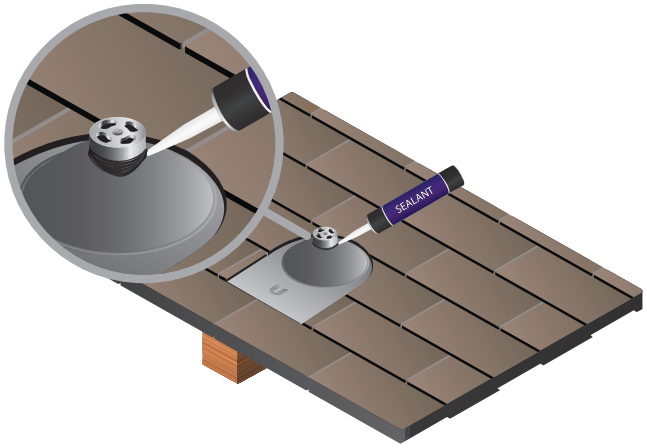

14. Slip the *Flashing* into place underneath the upper course of shingles and lower it in to place over the roof mount. The flashing should be installed with the Ubiquiti logo towards the front.



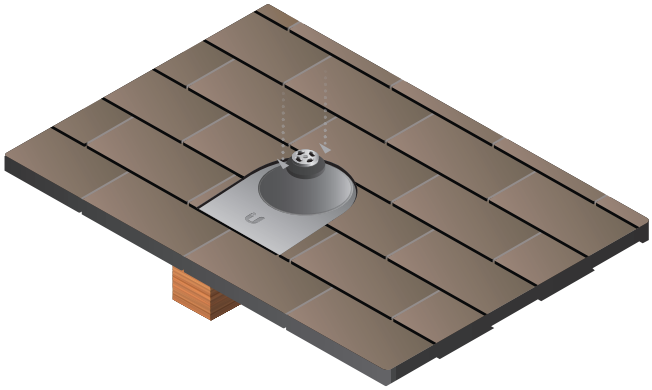
15. Replace the shingles to cover the roof flashing. *Flashing* should be positioned so that the lower edge does not extend beyond the edge of the first course of shingles and the upper edge is located underneath the third course.



16. Apply a minimum of 1/4" (6 mm) continuous roof caulking around the gap between the flashing and roof mount.

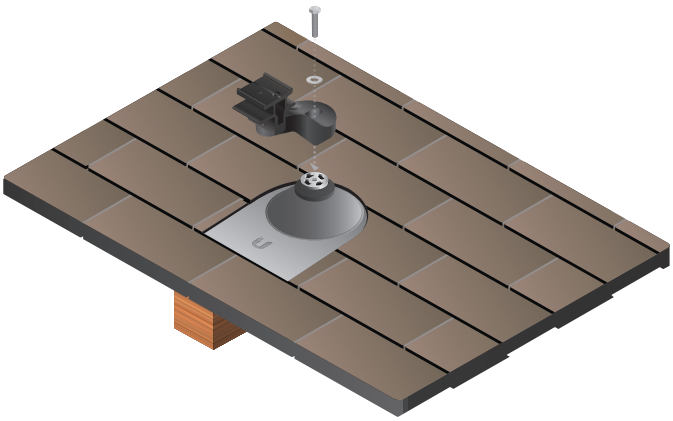



17. Install the rubber counter flashing over the neck of the roof mount until it is fully seated onto the flashing.

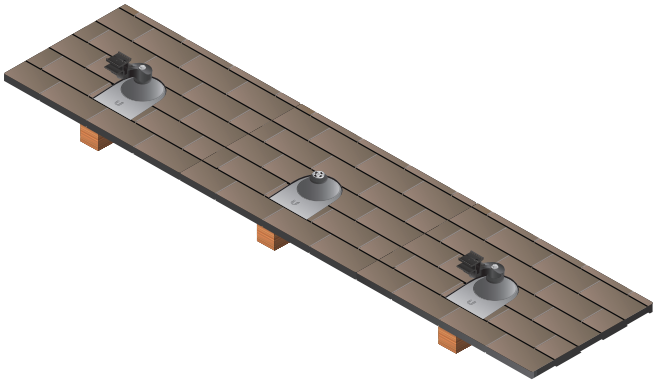


## Mounting Assembly Installation

1. Using the mounting hardware, use the mounting bolts to attach mounting assemblies to both outer-location roof mounts installed in the front row of your solar array. Each Mounting Assembly has an arrow on the top surface of the 360° swivel that should always face forward toward the trim cover.

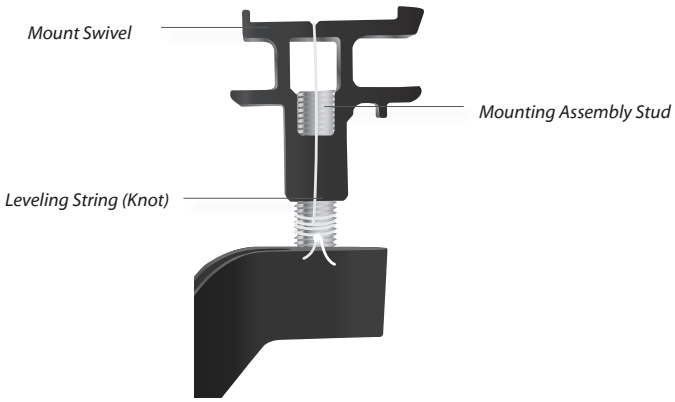


2. The mounting base and swivel portion for each mounting assembly should be facing towards the front as shown. (Note: You may need to adjust the position of the mounting assemblies as you proceed, so you can leave the mounting bolts slightly loose for the time being.)

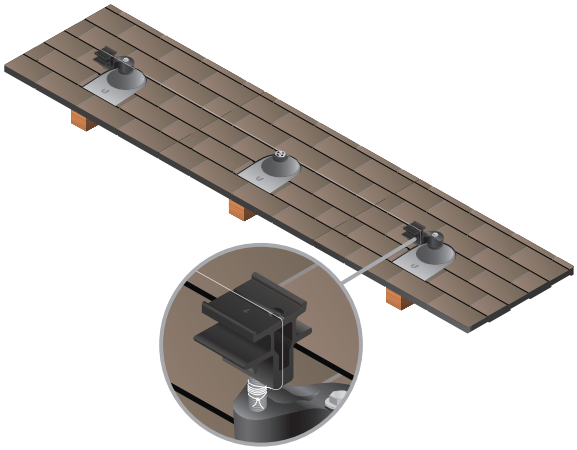


## Leveling the Mounting Assemblies

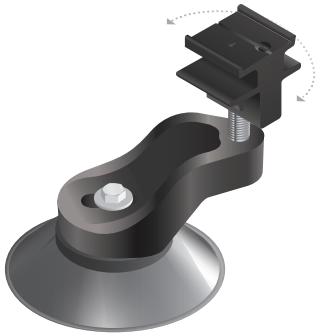
Using leveling string, tie a knot around the first mounting assembly stud, just below the swivel portion of the mounting assembly. Ensure that the top portion of the stud can be seen through the opening of the mount swivel. As a starting point, it's a good idea to adjust the mounting assembly to mid-height where the top of the mounting stud is level with the lower lip of the mount swivel.



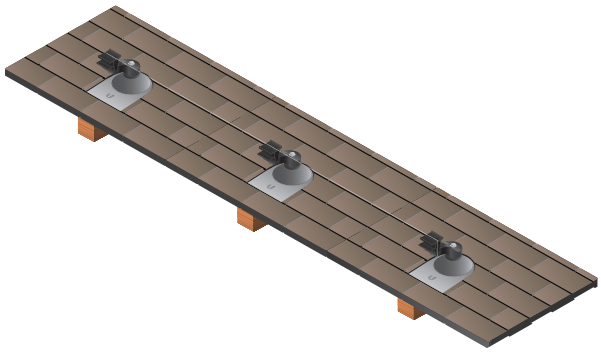

3. Pull the leveling string up and over the top of the mount swivel, extending it all the way to the last mounting assembly in the row.



4. Once you've reached the mounting assembly at the other end of the row, pull the leveling string over the top surface of the mount swivel and tie another knot around the mounting assembly stud as performed in step one. (Note: Apply some tension to the string to create a leveling guide between the first and last mounting assemblies.)
5. At both ends of the leveling guide, measure the height between the string and the surface of the roof structure. If the height is not the same at both ends, turn the mounting swivel to adjust the height so they are the same. To raise the height, turn the mounting swivel counterclockwise. To lower the height, turn the mounting swivel clockwise.



6. Once the first and last mounting assemblies in that row are the same height, adjust the remaining mount assemblies by turning the mount swivels (clockwise or counterclockwise) until they are the same height and position as the leveling string.

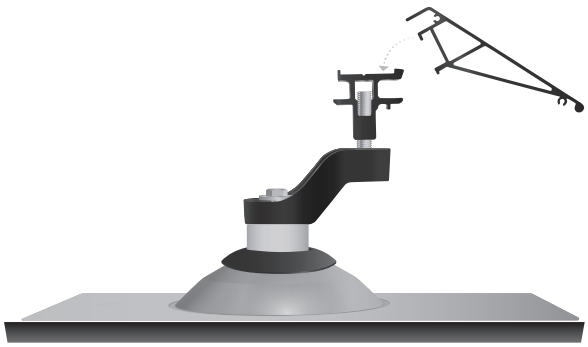


7. Secure and tighten each mounting assembly bolt (19 N-m torque) and remove the leveling string before installing the trim cover.

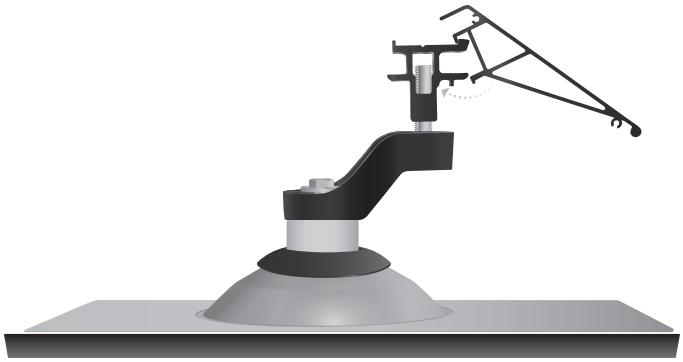
## Trim Cover Installation

With all of the mounting assemblies now at the same height, install the trim cover by following these steps:

1. Hook the trim cover over the top lip of the mounting assemblies by placing it horizontally across the mount swivels in row one and rotating it down until it comes to a stop.



2. The trim covers are sized to fit the *AC Module* edges and should be positioned to support each location the *AC Modules* will be installed. Make sure each trim cover is fully seated on the mounting assemblies in that row. If more than one trim cover will be installed, position each additional one side-by-side until the front row is complete.

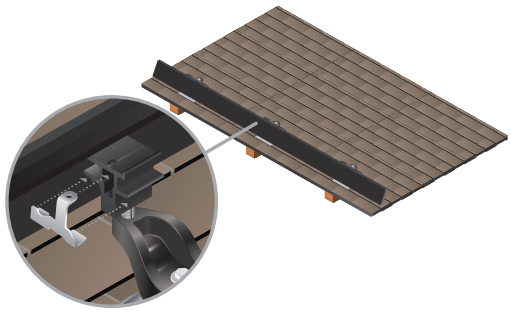


3. Using the accompanying hardware, attach the endcap plates to both ends of the *Trim Cover* that are exposed. Align the holes in the endcap with the pre-drilled holes on the ends of the Trim Cover and secure it to each of the sides.

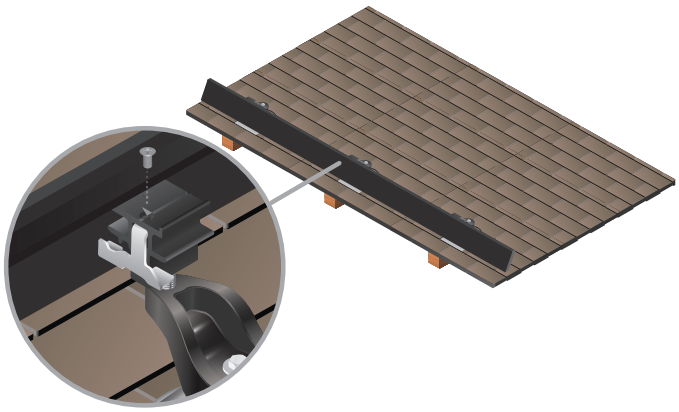
## Trim Lock Installation

Once the solar trim covers are installed, secure each to the mounting assemblies by installing a trim lock on each mounting swivel.

4. Place and hold the trim lock up against the side of the mounting assembly and align it underneath the hole located in the mounting swivel.



5. Holding the trim lock in place, insert the trim lock screw through the top of the mounting assembly and secure the trim lock to the mount swivel. The trim lock will also will also secure the trim cover to the mounting assemblies in row one.

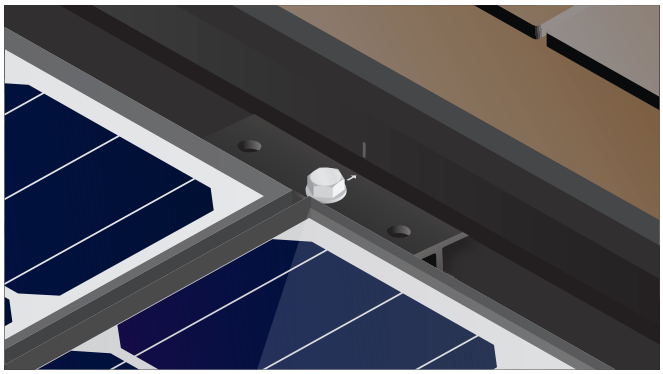


## Panel Connector Installation for Trim Cover

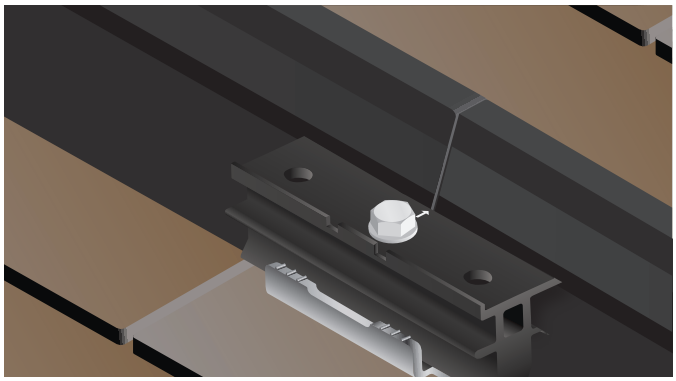
Prior to installing the first row of *AC Modules*, panel connectors need to be inserted along the trim cover at all locations where *AC Modules* will be installed. If the first row in your solar array will consist of more than one trim cover, you will also use a panel connector to join together the ends of side-by-side trim covers.

Each panel connector has an arrow on its top surface, marking the center point that should be aligned with each of the following:

- The alignment mark on all 2-panel portrait trim covers.



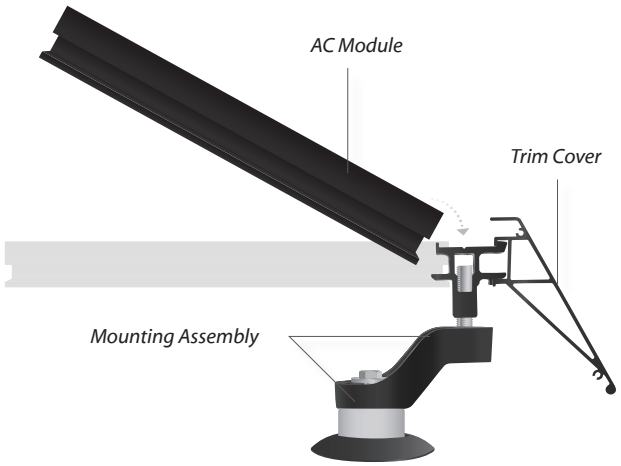
- The vertical gap created by the installation of two trim covers installed side-by-side.



## AC Module Installation

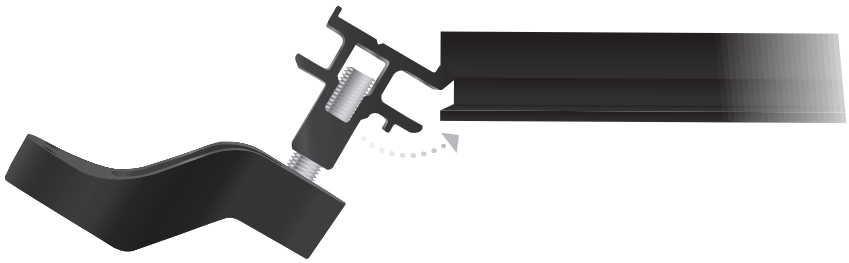
With the *Trim Covers* installed properly, follow these steps to install the *AC Modules*:

1. Hook the *AC Module* onto the top lip of the *Mounting Assemblies* (in row one) and lower it approximately 45 degrees while pulling back slightly on the *AC Module*. (Note: The remaining roof mount locations should not have mounting assemblies installed yet.)

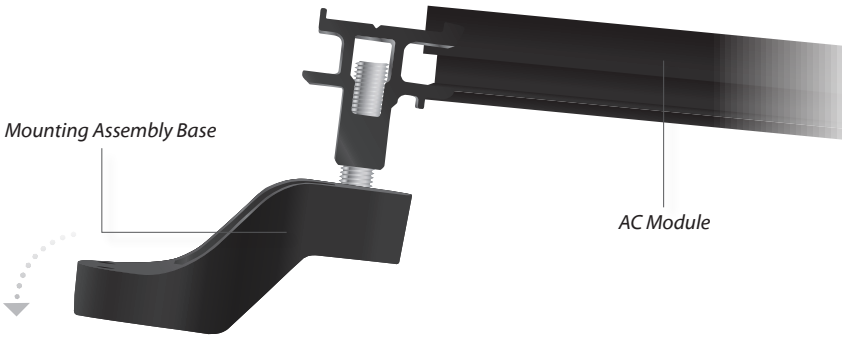



2. Holding the *AC Module* in position, insert the mounting assembly hardware into the top edge of the panel (with the arrows facing forward) and line it up over the roof mounts in the next row.

(Note: If the *AC Module* will sit on more than one mounting assembly or connector mount, ensure that each component is inserted into the top edge of the *AC Module* before securing it to the roof mounts.)



3. While lowering the *AC Module* into place, continue to pull the top edge of the solar panel slightly towards you to ensure it remains hooked onto the swivel mounts in the previous row. Secure the *AC Module* to the *Roof Mounts* using the mounting hardware. If the *AC Module* is not seated properly or sitting evenly with the mounting hardware in row one, make the necessary adjustments.

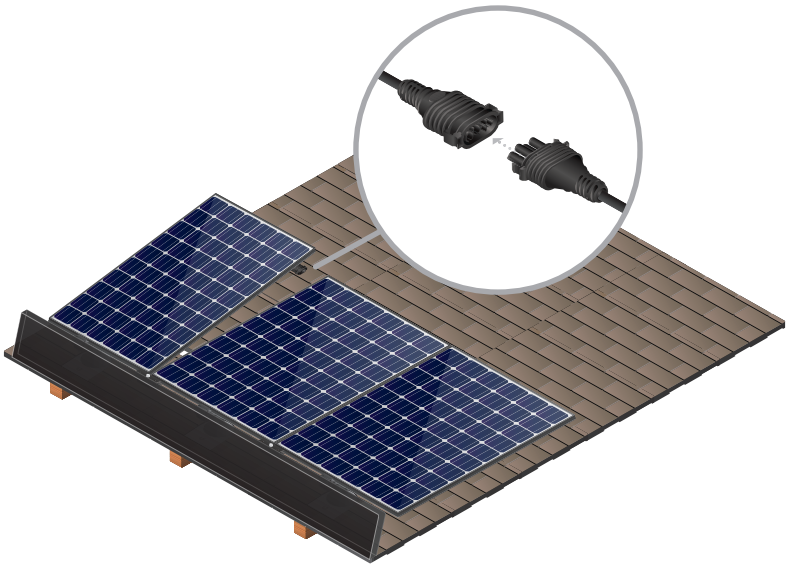


If adjustments need to be made to one or both of the mounting assemblies in row two, turn the *Mounting Assembly Base* in either direction to adjust its height. To raise the height, turn the base clockwise. To lower the height, turn the base counterclockwise.

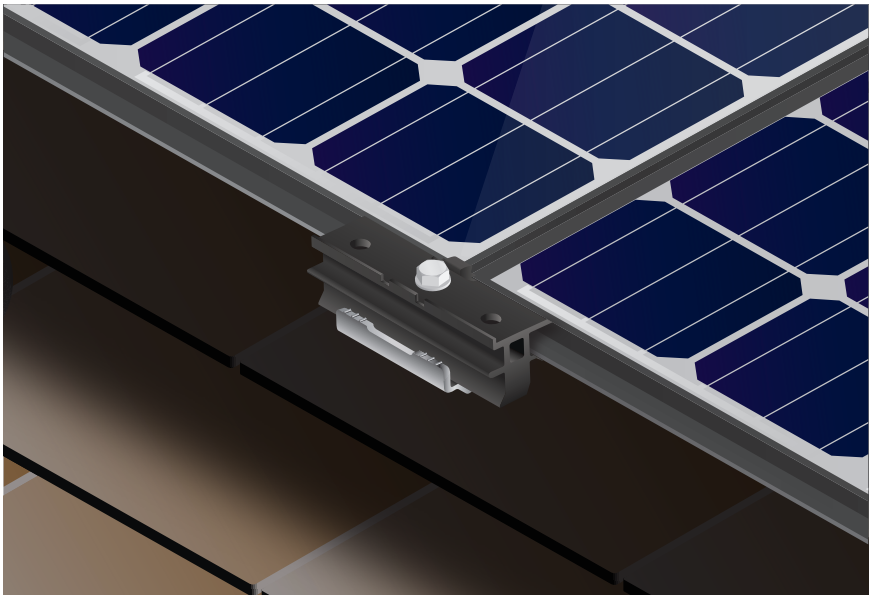
4. Once the mounting assemblies are all the same height, secure the *AC Module* to the roof mounts.
5. Install the second *AC Module,* like the first, and join them together with a panel connector along the frame corners.

For each additional *AC Module* in the array, connect the AC trunk cables underneath before securing the next *AC Module* to the roof mount(s). This ensures easier accessibility to the assembly components underneath.

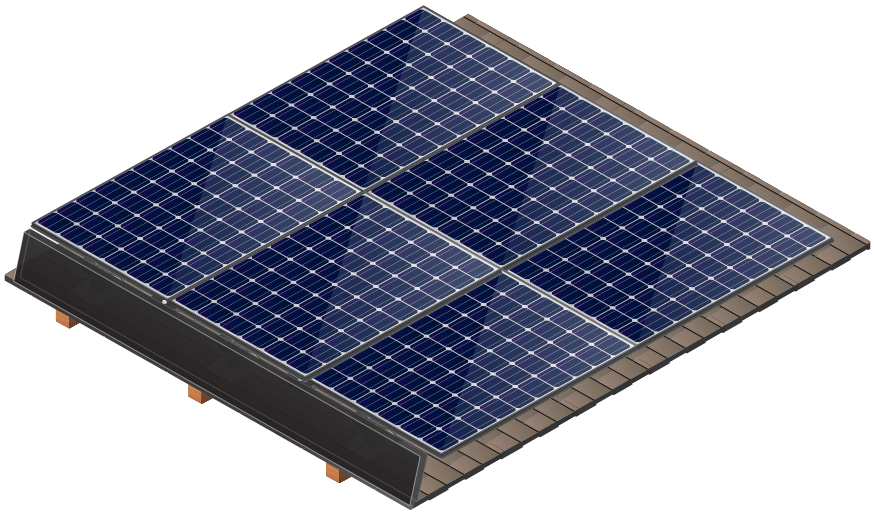
Once the trunk cables are connected, lower and secure the *AC Module* into position.



If the corner edges of the *AC Modules* do not rest on a connector mount, use a panel connector to join the *AC Modules* together. Panel connectors connect *AC Modules* together structurally (along the frame edges and corners) and bond them together electrically.

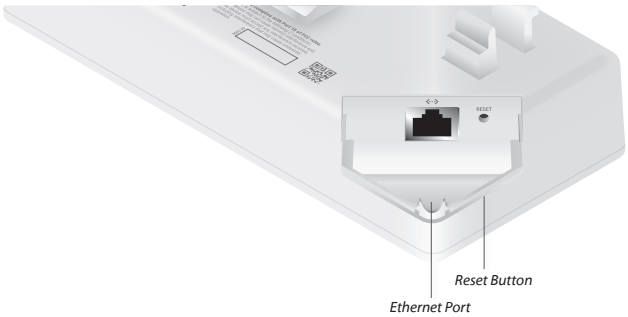


Continue installing *AC Modules*, working from side-to-side, until the layout of your solar array is complete. In a multi-row system, *Jumper Cables* are required to connect the second row of *AC Modules* to the first.



## Solar Gateway

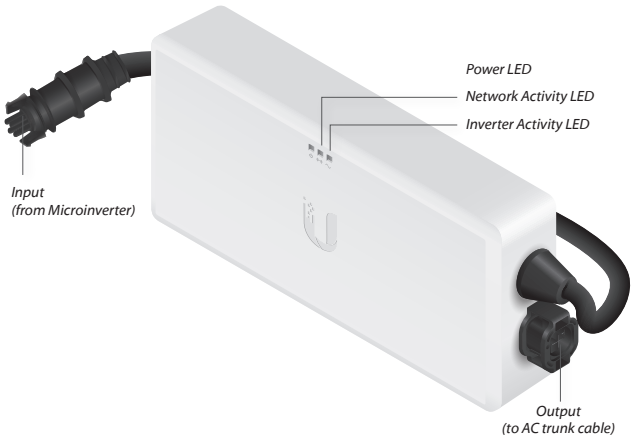
### Ports




**Ethernet Port** This Ethernet port is used to connect the Solar Gateway to your network router or DHCP server.

**Reset Button** This button resets the Solar Gateway back to factory defaults. Press and hold the *Reset* button for more than 10 seconds while the Solar Gateway is powered on.

### LEDs and Connectors




#### LEDs

**Power** The *Power* LED will light steady green when the device is connected to a power source. The LED may flash during general system activity.

**Network Activity** The *Network Activity* LED will light steady green when the network and cloud are connected. It will light red if a network connection cannot be established.

**Inverter Activity** The *Inverter Activity* LED will light steady green if all Microinverters are detected. It will light yellow if one or more of the Microinverters are missing and light red if errors are detected on any of the Microinverters.

#### Connectors

The Solar Gateway has two external connectors.

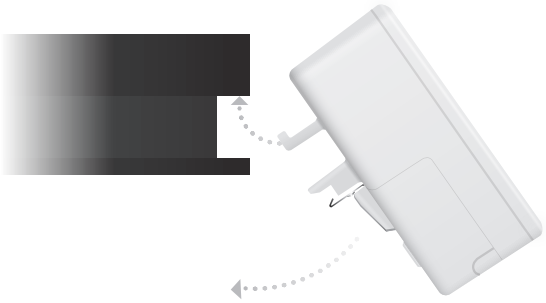
**Input** Connects the Solar Gateway to the Microinverter.

**Output** Connects the AC trunk cable to the Solar Gateway.

## Installation

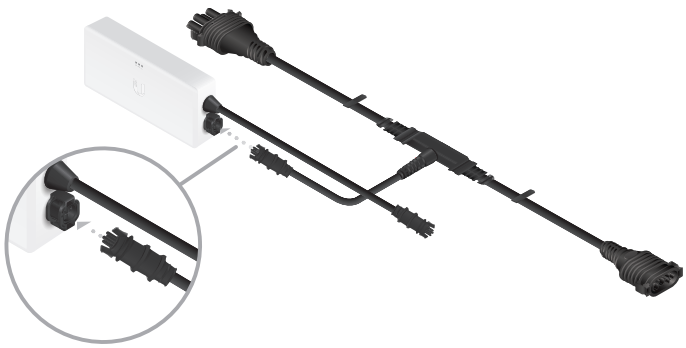
WARNING: Before installing this product, disconnect the solar system from the grid or any source of power to prevent shock or damage.

1. Tilt the Solar Gateway forward and hook it underneath the upper edge of the solar module railing. Rotate it down until it stops and rests along the side of the solar module.

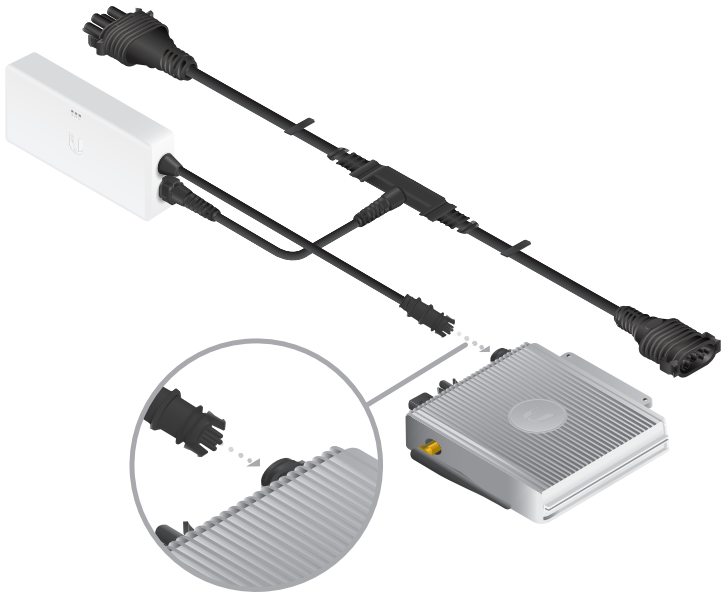


2. Use the *AC Disconnect Tool* to disconnect the AC trunk cable from the Microinverter.

3. Connect the AC trunk cable (that was previously connected to the Microinverter) to the *Output* connector on the Solar Gateway.



4. Connect the *Input* cable on the Solar Gateway to the four-prong connector on the Microinverter.



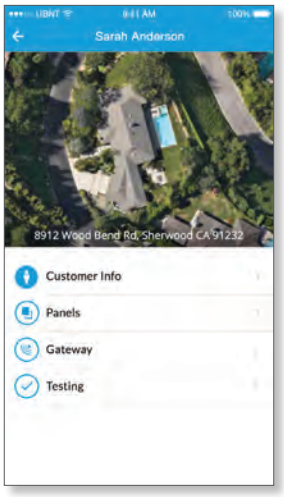
## Setup

The *sunMAX Install* app allows you to set up the Solar Gateway on your network to communicate with Ubiquiti's cloud management software. Download the *sunMAX Install* app on your mobile device from the App Store (iOS) or Google Play™ (Android).

1. Launch the app once your download is complete.
2. Type your username and password into their corresponding fields. (Note: The username and password are created when you register at **https://account.ubnt.com/login**.)
3. Tap **Sign In** to sign into the app and proceed.

4. Tap **Install** to select a customer site to view or install.

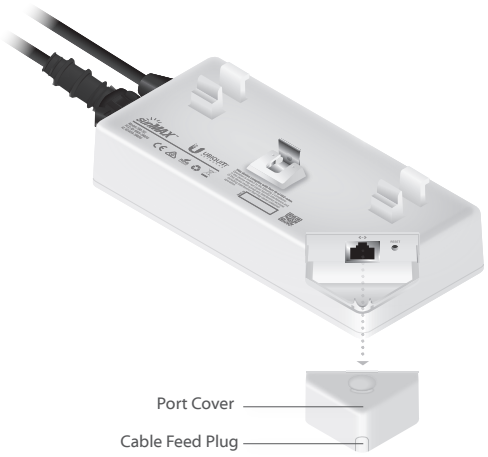

5. Tap **Gateway** from the *Site Dashboard* screen.



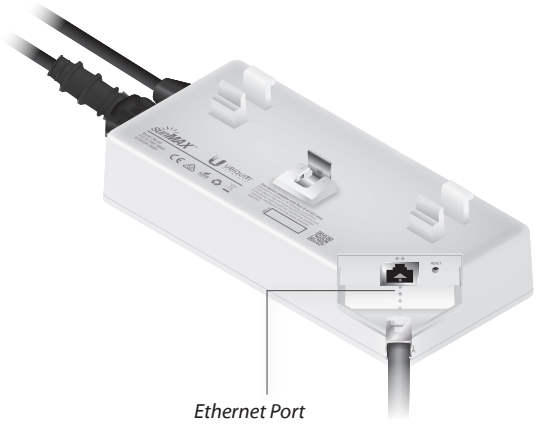

6. When prompted for a connection type to your local network, tape **Ethernet**.

7. Connect an Ethernet cable to your Solar Gateway by performing steps a-c and tap **Next** when finished.


a. Remove the *Port Cover* from the Solar Gateway and remove the *Cable Feed Plug* from the *Port Cover*.




b. Connect an Ethernet cable from your home network to the *Ethernet Port* on the Solar Gateway.



c. Replace the *Port Cover*.

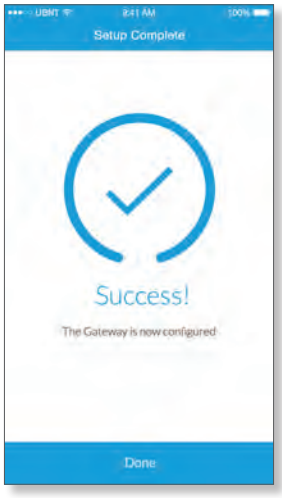
8. Tap **Scan QR** to pair the Solar Gateway with the current customer site information.


9. Scan the QR code to complete the pairing process.

10. The MAC address and serial number should appear. Tap **Next** to continue or *Redo Scan* if necessary.


11. The following screen appears while the Gateway is connecting to your network and being configured.


12. Tap **Done** to complete the installation.



## End Run Installation

### Safety

Prior to the installation of the *End Run*, ensure the main breaker and any alternate power sources are turned off so the main panel is not energized.

Make sure not to cut or damage insulation of any wires.

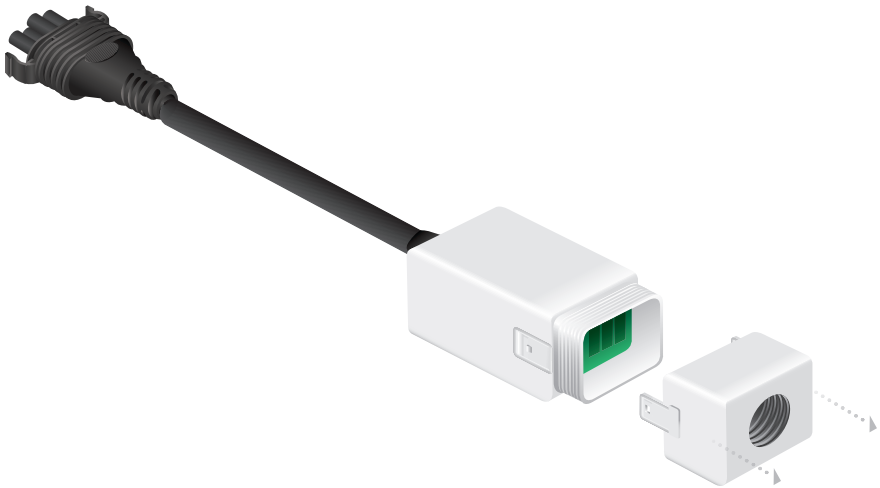
Adhere to local guidelines for all wire gauges and installation requirements.

### Requirements

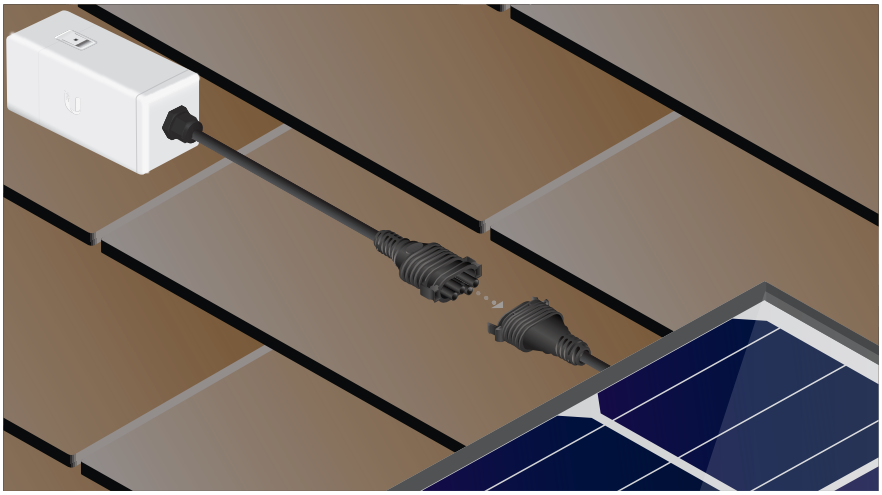
- Small flat blade screwdriver
- Wire stripper
- #2 Phillips screwdriver
- 13mm wrench
- ½" NPT for SM-EC-NA and M20x1.5 for SM-EC-EU
- ½" Liquid tight flexible metal conduit (LFMC) or EMT tubing
- 10-12 AWG (3.3-5.3mm$^2$) THWN-2 differently colored wire
- Copper grounding wire

### Hardware Installation

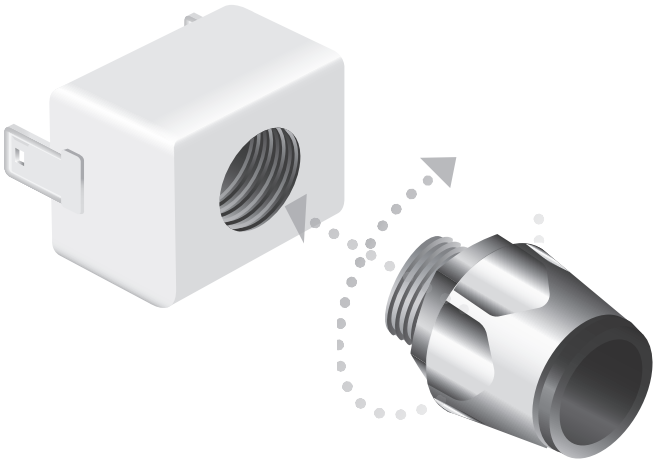
1. Using a flat blade screwdriver, remove the *End Run* cover by gently prying the locking tabs outward and sliding the cover off.



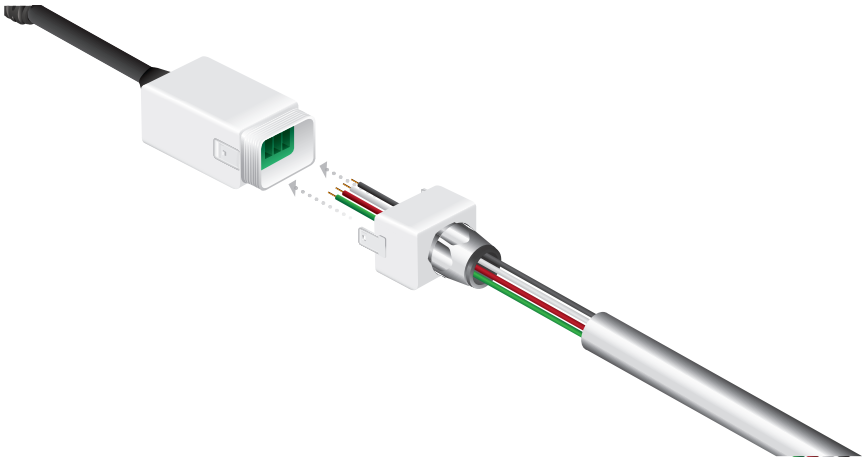
2. Locate the open connector at the end of your array of AC Modules and connect the end run cable to the Y-Cable until it is firmly seated. (Note: One End Run Assembly can support up to 16 continuous AC Modules in an array. Solar arrays larger than 16 AC Modules will require additional End Run assemblies.)



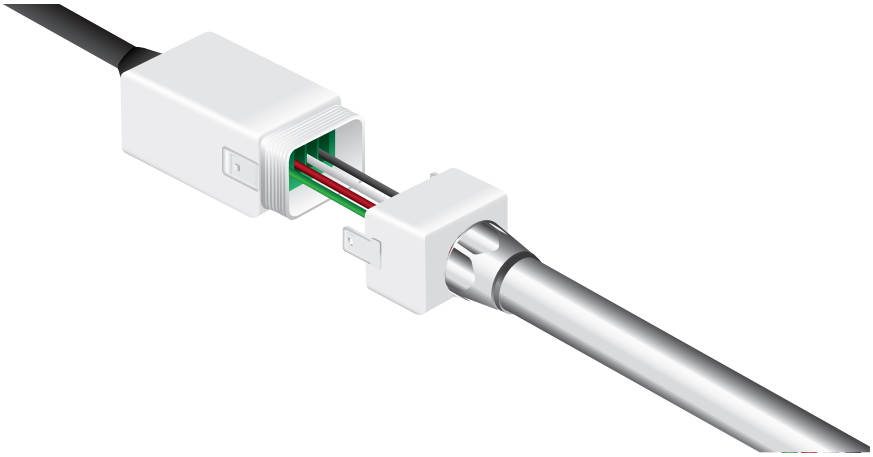
3. Thread the conduit connector into the End Run cover.



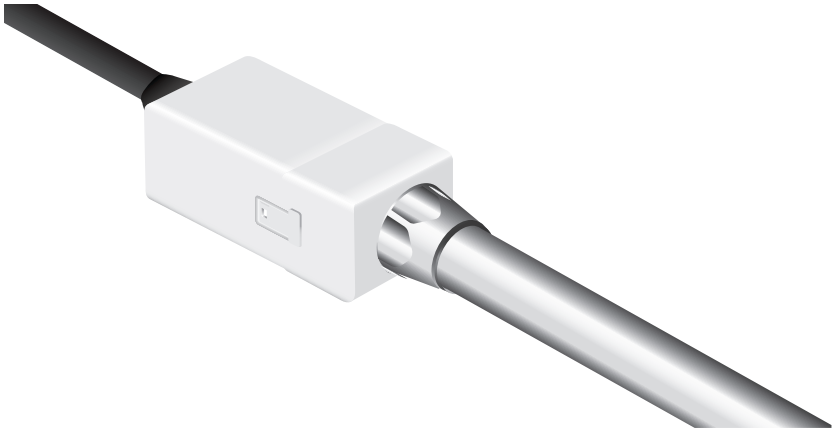
4. Feed the house-side wiring through the conduit and the cover of the End Run assembly.



5. Secure the conduit to the NPT connector and install the appropriate wires into their respective terminal block locations (L1-N-L2-GND for the SM-EC-NA and L-N-GND for the SM-EC-EU) inside the End Run housing.



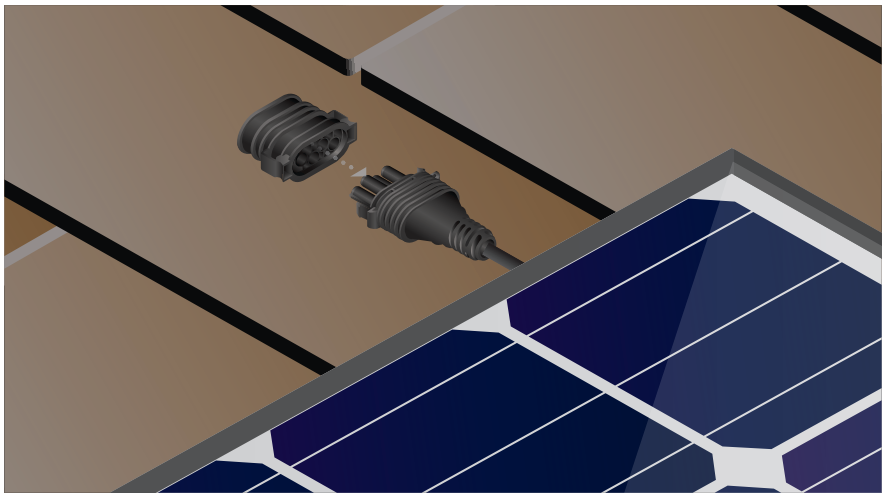
6. Slide the End Run housing into the cover until it snaps securely in place.



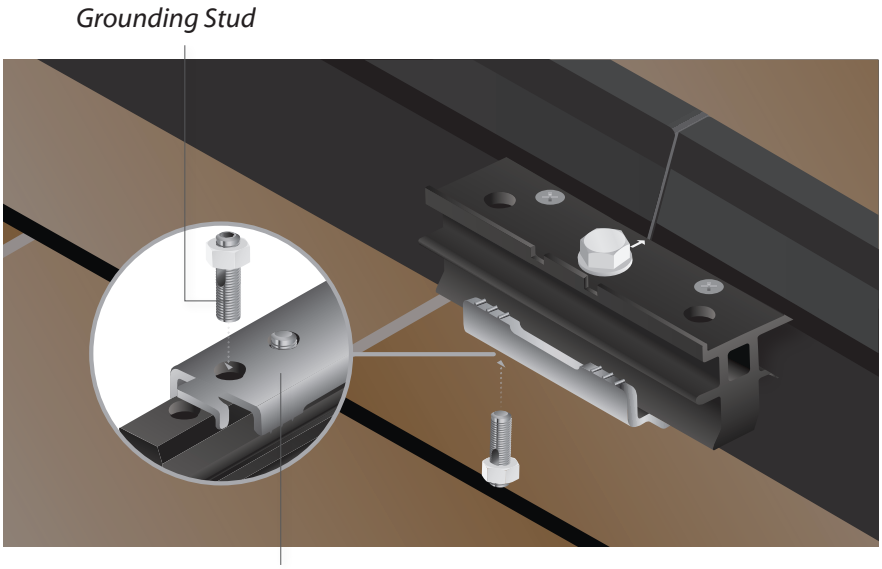
7. Position the end run assembly underneath and inline with the outside edge of the AC module preferably with the conduit side connection facing downhill.

8. Spread the conduit support clamps open and fit them over the conduit with the non threaded screw hole facing out. Preinstall the screw into the clamp until the screw thread is visible and protruding from the opposite side.
9. Hook the conduit clamp on the inside lip of the AC module and then over the outer lip. Tighten the screw on each conduit clamp to support the conduit on the AC module.

10. On the opposite end of the string of *AC Modules*, terminate the open Y-Cable connector using the cable end cap.



11. Install the *Grounding Stud* into the pre-threaded hole located underneath any *Panel Connector* in the array. (Note: A *Grounding Stud* can ground up to 60 *AC Modules* if they are connected together using *Panel Connectors*.)




12. Complete the house side wiring according to local rules and regulations. (Note: A maximum of 20A circuit breaker should be installed at the fuse panel between the solar array and the grid side power source.)

# Appendix A: Span Tables

## Exposure Category B

### Interior Zone

| Roof Zone | Roof Slope | Ground Snow Load (psf) | Wind Speed (mph) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 85 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
| Interior | 0-7° <2:12 | 0 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | >7-27° 2:12 - 6:12 | 0 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | >27-45° 7:12 - 12:12 | 0 | 48" | 48" | 48" | 48" | 48" | 48" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 48" | 48" | 48" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 48" | 48" | 48" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 48" | 48" | 48" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 48" | 48" | 48" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 48" | 48" | 48" | 24" | 24" |
| | | 60 | 48" | 48" | 48" | 48" | 48" | 48" | 24" | 24" |
| | | 70 | 48" | 48" | 48" | 48" | 48" | 48" | 24" | 24" |
| | | 75 | 48" | 48" | 48" | 48" | 48" | 48" | 24" | 24" |

## Edge Zone

| Roof Zone | Roof Slope | Ground Snow Load (psf) | Wind Speed (mph) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 85 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
| Edge | 0-7° <2:12 | 0 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | >7-27° 2:12 - 6:12 | 0 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | >27-45° 7:12 - 12:12 | 0 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 60 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 70 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 75 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |

## Exposure Category C

### Interior Zone

| Roof Zone | Roof Slope | Ground Snow Load (psf) | Wind Speed (mph) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 85 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
| Interior | 0-7° <2:12 | 0 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | >7-27° 2:12 - 6:12 | 0 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | >27-45° 7:12 - 12:12 | 0 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 60 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 70 | 48" | 48" | 48" | 48" | 48" | 24" | 24" | 24" |
| | | 75 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |

## Edge Zone

| Roof Zone | Roof Slope | Ground Snow Load (psf) | Wind Speed (mph) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 85 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
| Edge | 0-7° <2:12 | 0 | 48" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 10 | 48" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 20 | 48" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 30 | 48" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 40 | 48" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 50 | 48" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | >7-27° 2:12 - 6:12 | 0 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 10 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 20 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 30 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 40 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 50 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 60 | 48" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 70 | 48" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | | 75 | 48" | 24" | 24" | 24" | 24" | 24" | 24" | N/A |
| | >27-45° 7:12 - 12:12 | 0 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 60 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 70 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |
| | | 75 | 48" | 48" | 48" | 48" | 24" | 24" | 24" | 24" |

## Exposure Category D

### Interior Zone

| Roof Zone | Roof Slope | Ground Snow Load (psf) | Wind Speed (mph) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 85 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
| Interior | 0-7° <2:12 | 0 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 60 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | >7-27° 2:12 - 6:12 | 0 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | 24" | 24" |
| | >27-45° 7:12 - 12:12 | 0 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 60 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |

## Edge Zone

| Roof Zone | Roof Slope | Ground Snow Load (psf) | Wind Speed (mph) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 85 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
| Edge | 0-7° <2:12 | 0 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 10 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 20 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 30 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 40 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 50 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | >7-27° 2:12 - 6:12 | 0 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 10 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 20 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 30 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 40 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 50 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 60 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 70 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | | 75 | 24" | 24" | 24" | 24" | 24" | 24" | N/A | N/A |
| | >27-45° 7:12 - 12:12 | 0 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 10 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 20 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 30 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 40 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 50 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 60 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 70 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |
| | | 75 | 48" | 48" | 48" | 24" | 24" | 24" | 24" | 24" |