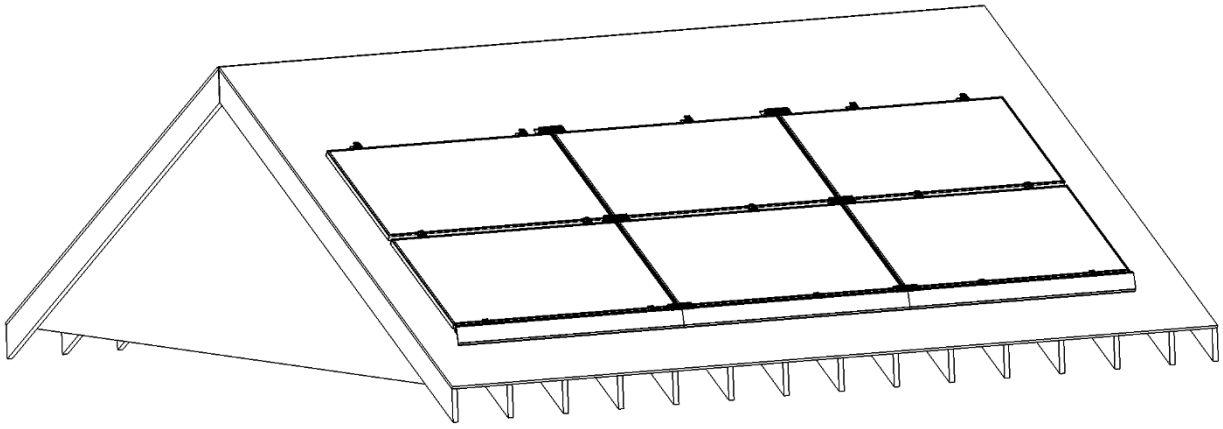
EcoX

Installation, Assembly, and Maintenance Instructions

Rev 3.5



340 W State St, Unit 22, Athens, OH 45701 740-249-1877 www.ecolibriumsolar.com

Ecolibrium Solar

Revisions

Rev 3.1 Initial Release	September 2014
Rev 3.2 Updated for UL2703/1703 fire testing	November 2014
Rev 3.3 Updated maximum allowable roof slope	December 2014
Rev 3.4 Added Tile, Extension, and Flat Roof Addendums Added note to allow rotation of lower support	January 2015
Rev 3.5 Updated UL 2703 Module Compatibility	January 2015

Introduction:

EcoX is an innovative, simple, and easy to install pitched roof racking system. By eliminating the mounting rail, EcoX streamlines ordering, shipping, and installations. EcoX utilizes aluminum components and stainless steel hardware ensuring the system will withstand even the harshest installation environments. With low part counts and a simple installation process, EcoX helps ensure projects are installed on time.

Installer Responsibility

The installer is solely responsible to:

- Comply with all applicable building and electrical codes
- Meet municipal, utility and inspector requirements
- Ensure installation methods and procedures meet all applicable OSHA safety standards
- Confirm all building structural members and related connections can withstand all forces resulting from the EcoX installation
- Maintain waterproof integrity of all existing roofing materials
- Verify all design criteria are correct and appropriate for the application and specific site
- Follow all manufacturer's specifications, recommendations and manuals
- Check that only Ecolibrium Solar approved materials are utilized during EcoX installation
- Guarantee array installation is completed by qualified and competent personnel
- Verify all equipment and materials are appropriate for application and site conditions
- Establish that anchoring devices, including lag screws, have adequate pullout strength and shear capacities as installed
- Determine that PV module is approved for use with EcoX and is capable of withstanding the project specific conditions.

Warnings & Safety

Both electrical and roofing knowledge is required to correctly and safely install a solar photovoltaic system. Only qualified and certified installation professionals should install EcoX. Failure to follow the methods and procedures outlined in this guide may result in injury and/or damage to property. Carefully read this guide before starting any work. Store a copy of this guide on the job site at all times and contact Ecolibrium Solar with any installation questions related to EcoX.

Please note the following warnings when installing EcoX:

- EcoX components may be sharp and may cause skin lacerations
- EcoX components fit together tightly and could cause pinch injuries
- EcoX components may be hot to the touch if left in the sun.

Please follow the safety requirements below when installing EcoX:

- Always keep children and unauthorized people away from work areas
- Always wear required OSHA approved Personal Protective Equipment (PPE)
- Always use insulated tools when working with or near electrical systems
- Always provide OSHA approved fall protection for all installation personnel
- Never wear jewelry during mechanical and electrical installation work
- Never work in rain, snow or extremely windy conditions
- Never leave a module unsupported or unsecured on the roof
- Never install broken photovoltaic modules
- Never use photovoltaic modules as a work surface

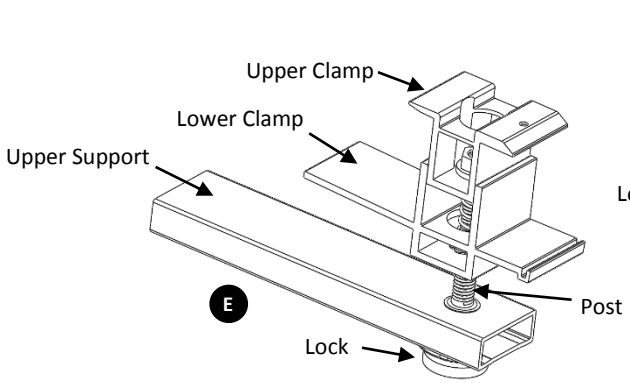
Ratings and Certifications:

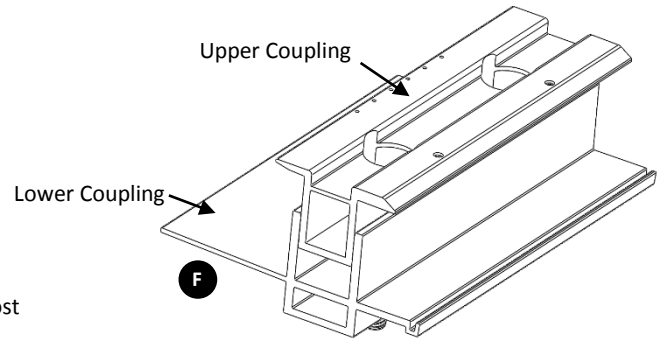
Ecolibrium Solar is committed to providing well validated, thoroughly tested products.

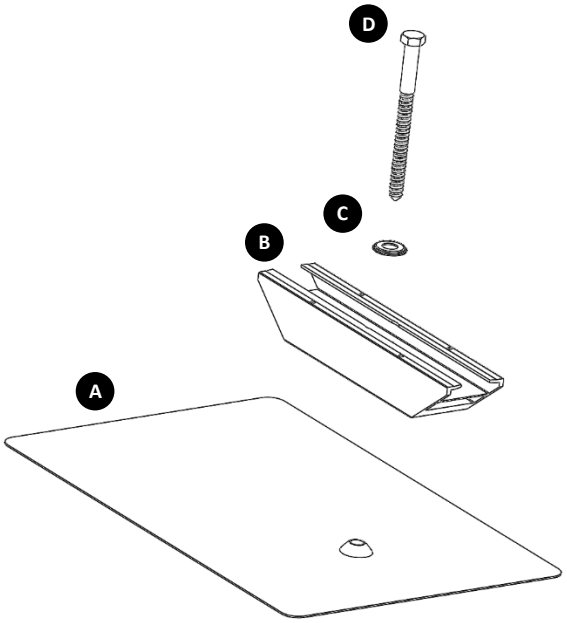
- EcoX is certified to UL2703. Please see Addendum G: UL2703 Approved Module List for more information.
- EcoX is rated to be installed with 60 cell modules according to the approval list in the Module Compatibility Addendum
- EcoX is certified to UL2703/UL1703 Fire Testing. EcoX is rated to Class A with Type I and 2 modules

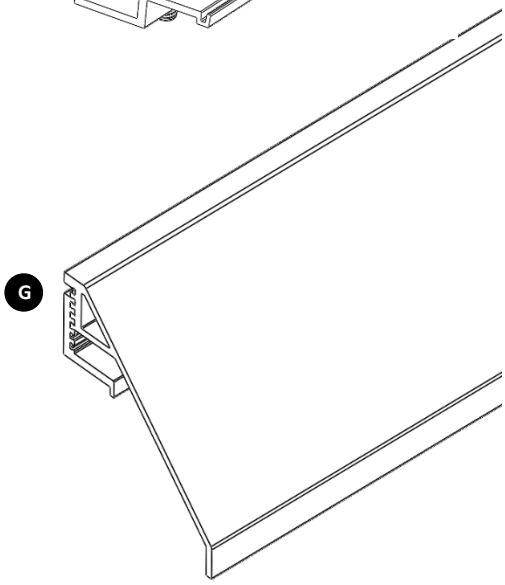
Components

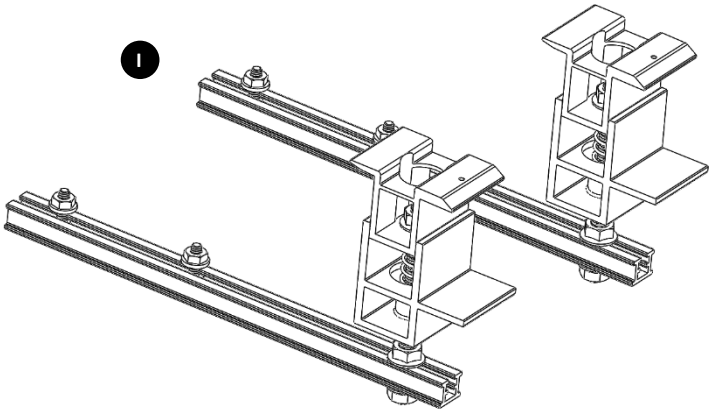
EcoX's low part count increases efficiencies, on and off the roof. EcoX includes the following components:

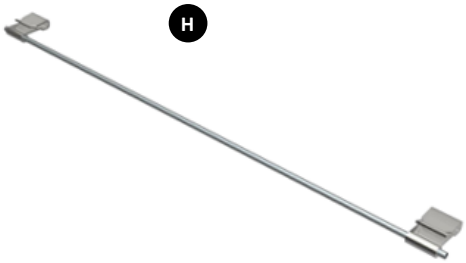












Composition Attachment Kit

The Composition Attachment Kit installs with ease and provides a redundant waterproofing solution. The kit includes Flashing, Lower Support, Washer and Lag Screw.

A Flashing

The Flashing is made of Kynar painted aluminum and includes an EPDM grommet for superior waterproofing.

B Lower Support

The Lower Support is made of aluminum. The Lower Support provides north-south mounting flexibility.

C Washer

The Washer is made of stainless steel with an EPDM sealing ring. The Washer adds redundancy to the waterproofing.

D Lag Screw

The Lag Screw is made of stainless steel. The Lag Screw attaches through the Washer, Lower Support and Flashing connecting the kit to the roof structural member.

E Clamp

The Clamp locks into place without a tool by rotating the Upper Support. The Clamp includes the aluminum Upper Support, stainless steel Post, aluminum Lower Clamp and Upper Clamp. The Clamp's leveling capability and north-south adjustability provides unparalleled installation flexibility. The Upper Clamp is available in dark bronze or clear anodized aluminum.

F Coupling

The Coupling connects the corners of adjacent solar modules together. The Coupling consist of aluminum Upper Coupling and Lower Coupling. The Upper Coupling is available in dark bronze or clear anodized aluminum.

G Skirt

The Skirt covers the exposed downhill edge of the array and provides a superior aesthetic to the system. The Skirt has adjustable height in 5mm increments, making it compatible with PV module thicknesses of 35mm, 40mm, and 45mm. Contact Ecolibrium Solar to check compatibility with other size modules. The Skirt is available in dark bronze or clear anodized aluminum.

H Bonding Jumper

The Bonding Jumper creates a continuous bonding path between two adjacent rows of PV modules, and between skirt and the first row of modules.

I Electrical Kit (optional)

The Electrical Kit mounts a junction box directly to a PV module. The visual component is available in dark bronze or clear anodized aluminum.

Tools and Materials

The following tools and materials are required to install EcoX:

- Cordless Drill and Impact Driver
- 3/16 Pilot Drill Bit
- 1/2” Deep Hex Driver
- Hammer
- Torque Wrench
- String Line
- Chalk Line
- Flat Bar

Note: unless otherwise noted, torque all fasteners to 14 ft-lbs

Planning

EcoX is designed to flush-mount photovoltaic modules on pitched roofs as described below. Visit the EcoX Estimator at **www.Ecolibriumsolar.com/ecox/estimator** to layout your array and instantly obtain attachment spacing, bill of materials, and engineering analysis.

Roof Type

EcoX is designed to mount photovoltaic modules to a range of roof surfaces, including:

- Asphalt or composite shingles
- Concrete or clay tiles (see Addendum E)
- Wood shake shingle
- Flat roofs (see Addendum F)

Please contact Ecolibrium Solar if your project’s roof surface type is not listed.

Wind Zone

EcoX is designed to mount photovoltaic modules on pitched roof surfaces in areas with extreme wind conditions. Please contact Ecolibrium Solar if your project’s wind speed exceeds the zone allowable in the EcoX Estimator.

Roof Height

EcoX is designed to mount photovoltaic modules on pitched roof surfaces with a mean roof height of 60 feet. Please contact Ecolibrium Solar if your project’s mean roof height exceeds 60 feet.

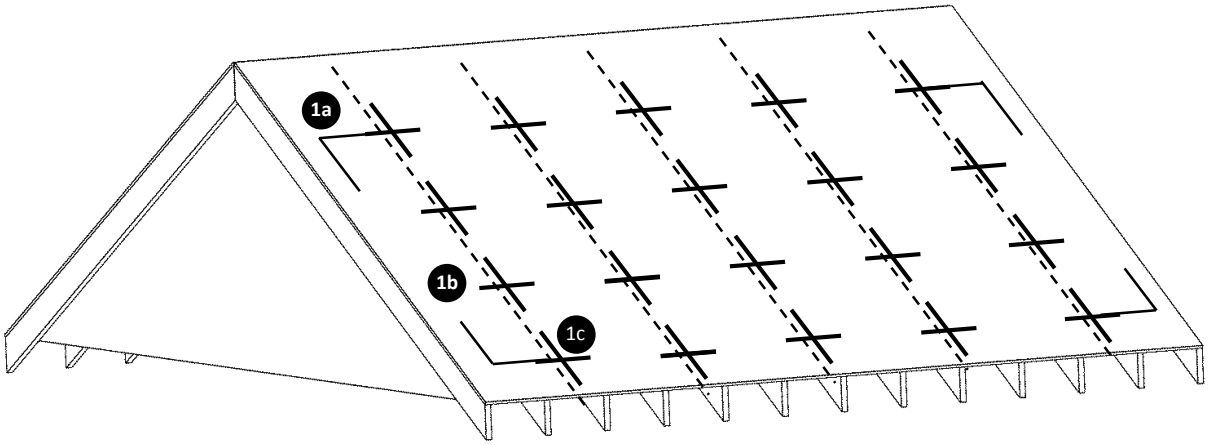
Roof Pitch

EcoX is designed to mount photovoltaic modules on pitched roof surfaces between 0 and 90 degrees from horizontal with a mean roof height less than or equal to 60 ft. The UL 2703/1703 fire certification is applicable only to “steep-sloped” systems with a roof slope greater than or equal to 2 in/ft (9.46 degrees).

Roof Zones

EcoX is designed to mount photovoltaic modules on pitched roof surfaces in all roof zones with variable attachment spacing as prescribed in the EcoX Estimator.

1 Layout Array



1a) Locate Array

Mark the array footprint of the array on the roof. Account for 1 ¼" gap between modules North/South and ½" (recommended) East/West gap. Check that no obstructions on the roof will interfere with the installation of the array. If the total east/west dimension of PV array exceeds 35 ft, the array must be broken into multiple sub-arrays per the appendix below to allow for thermal expansion and contraction.

Tip: Allow for ½" gap between modules East/West to increase air circulation and improve aesthetics

1b) Mark E/W Line

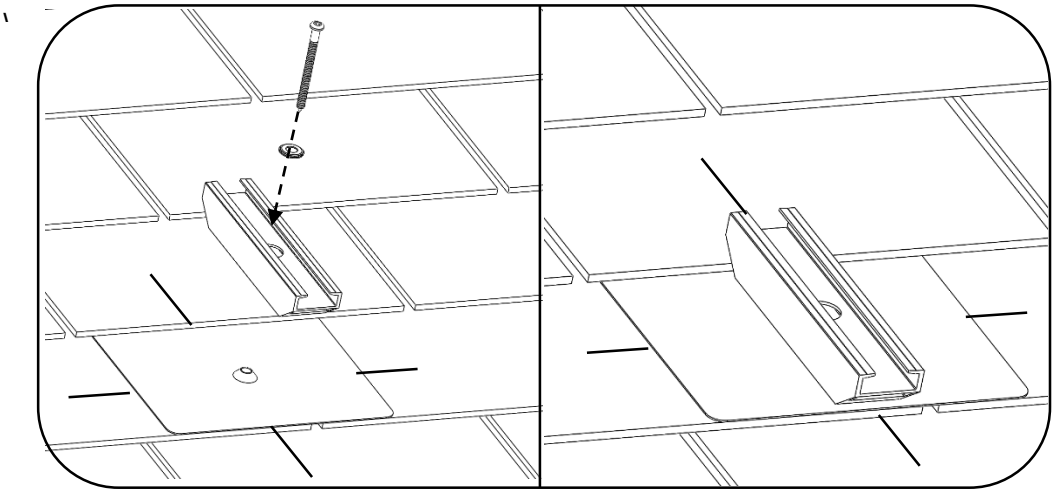
Find the shingle course for south edge of array. Mark vertical center of shingle. Mark each subsequent attachment location up the roof using a spacing of panel width plus 1 ¼".

1c) Mark attachment locations

Select and mark structural members to be used for attachments according to project engineering span and overhang values. All attachments should be located on rafters. Ensure PV module cantilever is within allowable cantilever prescribed by the EcoX Estimator.

Tip: Stagger attachments to reduce rafter loading if required by PE analysis of building

❷ Install Attachments



Note: The following describes a typical Composition Shingle Installation. Please see the Addendum section for alternate attachment options.

2a) Predrill Lag Screw Holes

Find intersection of each selected rafter and marked row. Predrill 3/16" hole through shingle and roof sheathing into the roof structural member.

2b) Install Attachment Kits

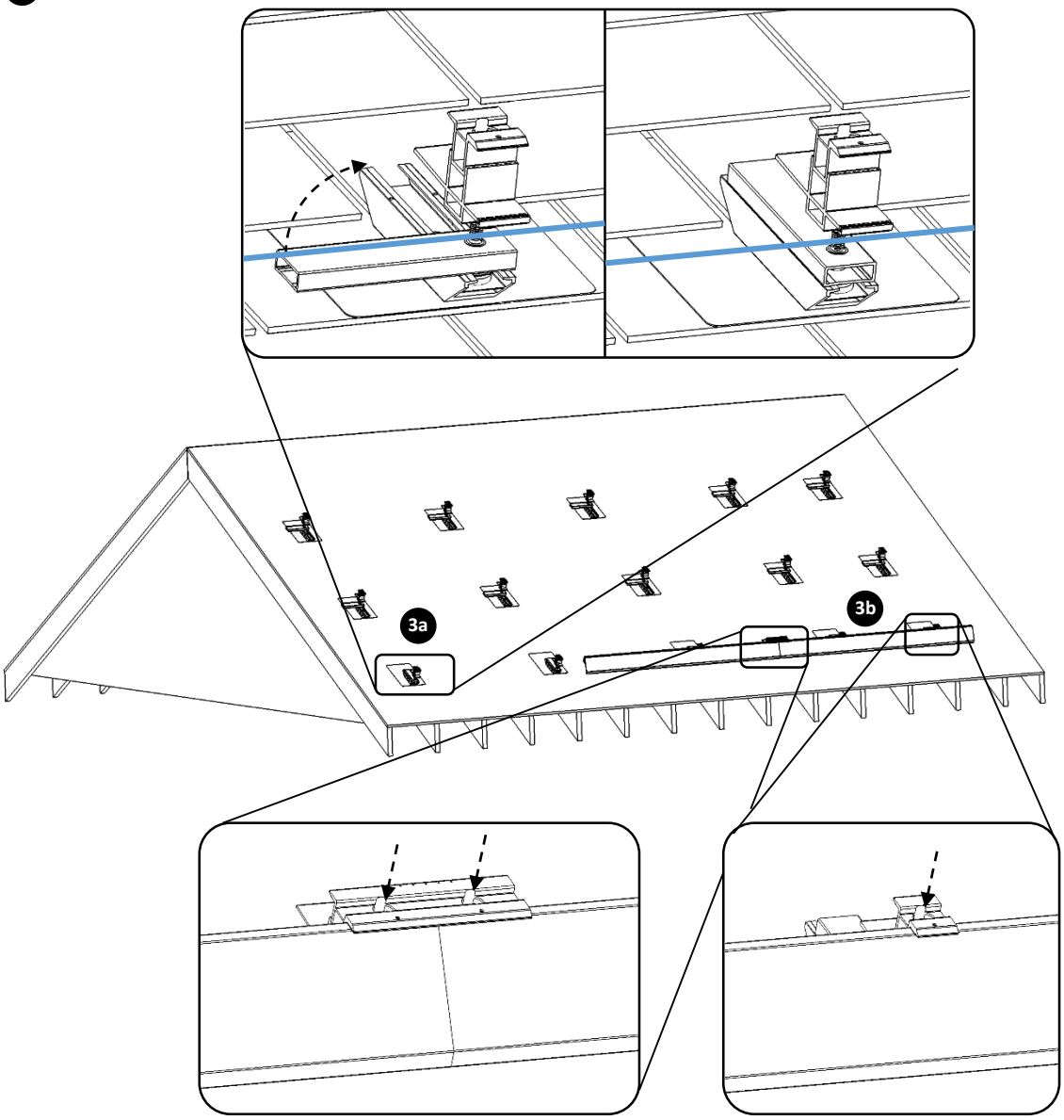
Find predrilled holes from previous step. Slip flashing underneath the shingle course above the intersection. Ensure southern edge of Flashing (A) does not hang below the southern edge of shingle it rests on. Cut shingle away as needed to ensure that the Lower Support (B) rests on only one shingle. Using ½" Hex Driver, drive Lag Screw (D) through the Washer (C), Lower Support (B) and Flashing (A) into the predrilled hole in the roof structural member.

A 4" lag screw is supplied. It is the installer's responsibility to ensure proper embedment in the rafter.

Tip: To provide an additional layer of waterproofing, place a horseshoe shape of exterior roofing caulk underneath the flashing with the horseshoe opening downhill

Tip: Up to 1/3 of the Lower Supports (B) in each sub-array can be rotated to avoid interferences. Do not exceed a rotation of more than 45° from uphill/downhill axis.

3 Install Skirts



3a) Install South Row Clamps

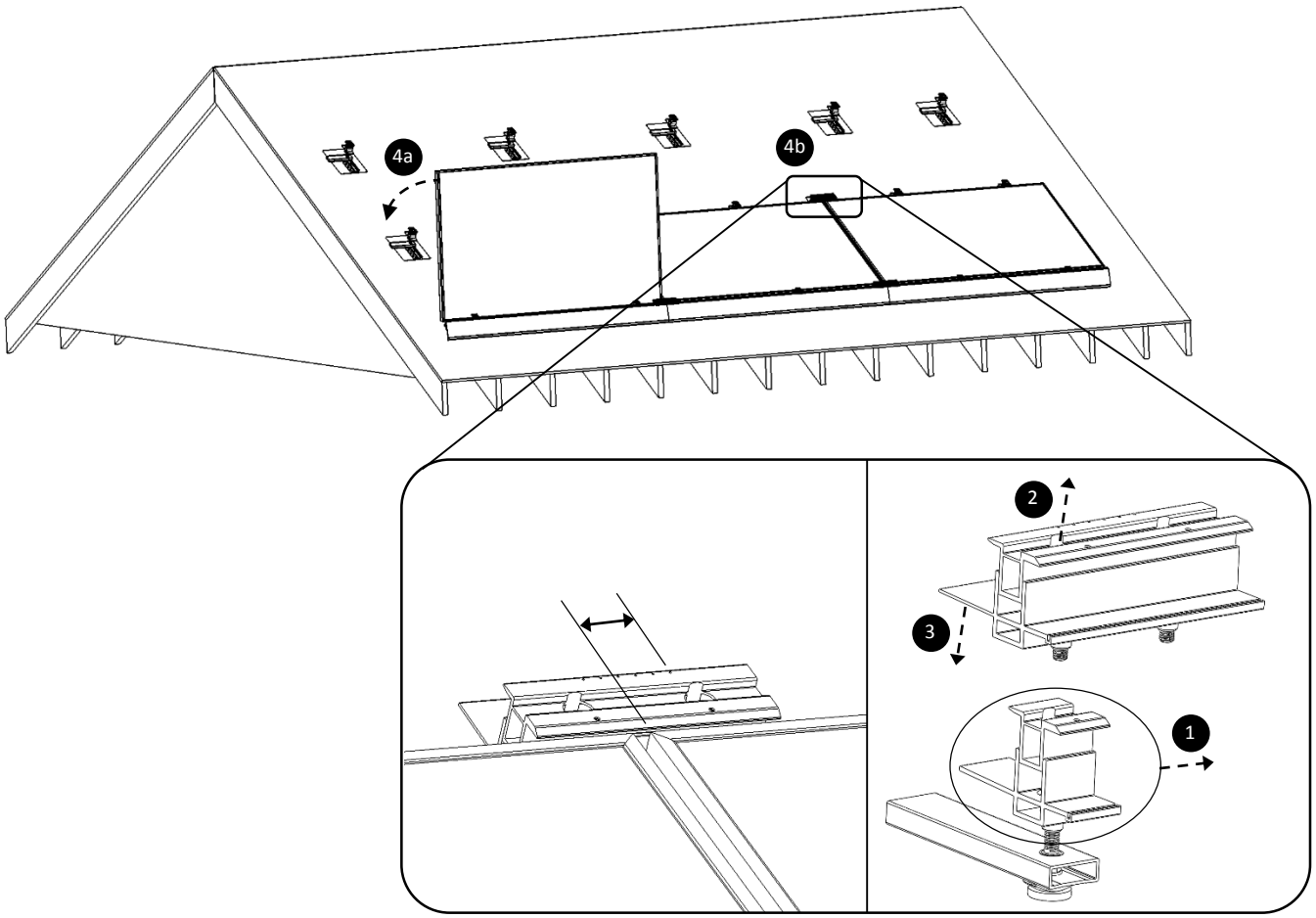
Insert south corner Clamps (E) with Upper Support in the 9 o'clock position. Align Clamp (E) so that the Upper Clamp centerline is in the lower half of the Lower Support (B) to avoid skirt interference. Tighten the south corner Clamps (E) by rotating the Upper Support clockwise 90 degrees. Hang a string line between the two south row corner Posts. Align remaining south row Posts with the string line. Insert Upper Support at the 9 o'clock position. Lock by rotating Upper Support clockwise 90 degrees.

Tip: Always ensure the longer flange of the Lower Clamp and Coupling is extending uphill.

3b) Install Skirts

Assemble the Skirt (G) so that the Skirt thickness matches the PV module thickness. Hook the Skirts (G) on the downhill notch on the Lower Clamp. Torque the Coupling (F) to 14 ft-lbs. Torque Clamp (E) to 14 ft-lbs.

4 Place Modules



4a) Install Row of Modules

Rest each module on the downhill Clamp (E) and Coupling (F) flanges. Pivot module down so it is parallel to roof surface.

4b) Secure Row of Clamps and Couplings

Slide the uphill Clamps (E) to they are flush with the module. Place Coupling (F) between modules so that the module edge is within the alignment marks on the Upper Coupling flange. Check alignment and elevation of the row of modules. To level, remove the clamp, spin the clamp up or down by hand, and re-position the clamp against the module. When the system is level, tighten Clamp (E) onto Lower Support (B) as described in 3a.
Torque uphill Clamps (E) and Couplings (F) to 14 ft-lbs.

Tip: If needed for alignment, the module may be shifted up to 0.080" (2mm) away from the vertical wall of the Clamp (E) and Coupling (F).
Tip: Space modules ½" apart East/West using the marks on the top of the Coupling.
Tip: Level the north edge of each row before installing the next row of modules.

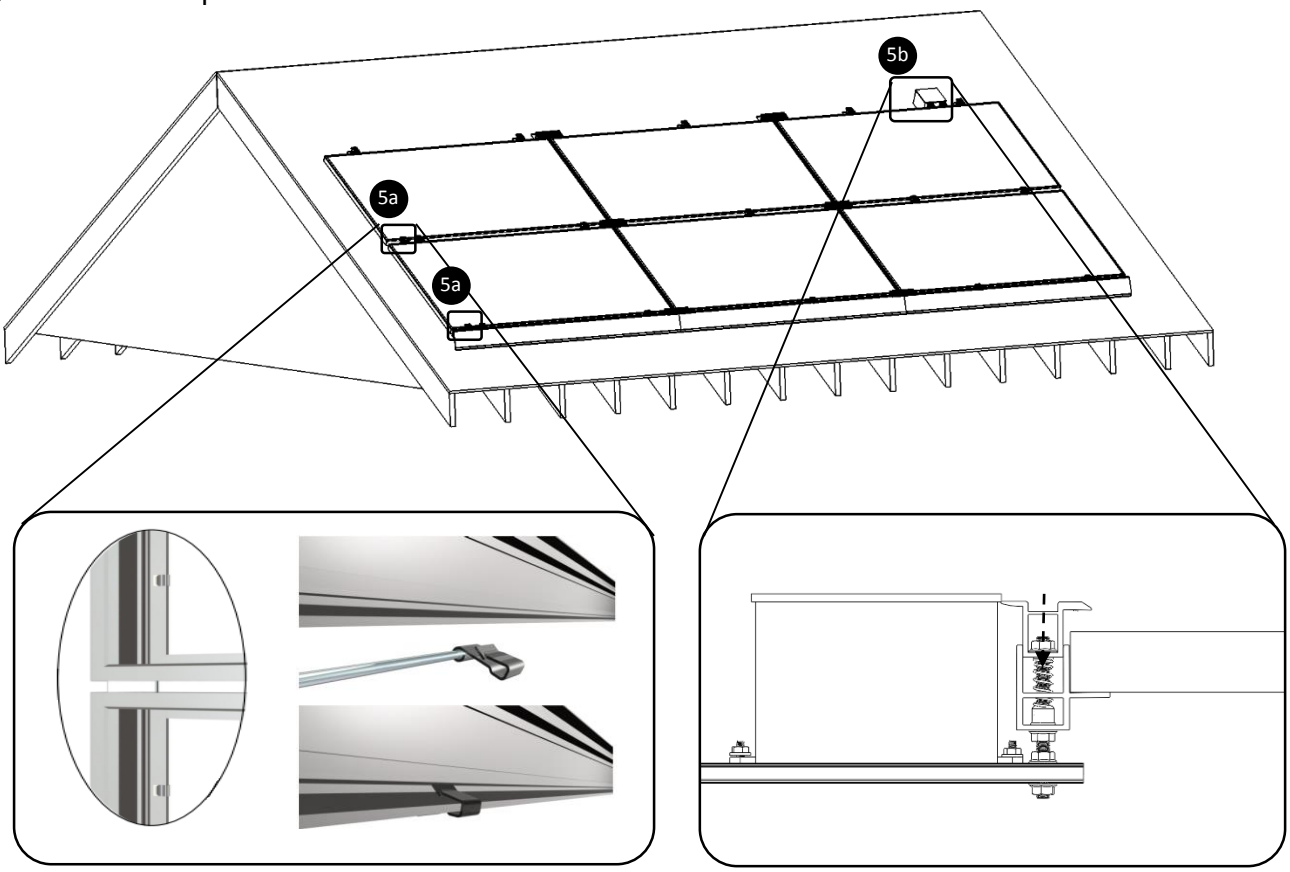
4c) Option: Combine Coupling and Clamp

If Coupling (F) interferes with Clamp (E) then combine the Clamp (E) with the Coupling (F) by 1) removing the Clamp (E) from the Post, 2) removing the Coupling (F) bolt, and 3) turning the Coupling (F) onto the Post.

4d) Complete Wire Management

Secure conductors on the uphill edge of the last row of modules placed. Repeat steps 4a through 4c for remaining rows.

5 Electrical Components



5a) Install Bonding Jumper

EcoX electrically bonds each connected row of modules. The grounding point on the south edge of each clamp and coupling creates a secure bond between the module and racking system. The two bonding points on the coupling maintain the bond path through each row. To maintain the bond path between rows, install the bonding jumper between each connected row of modules and between the skirt and south row of modules as shown.

5b) Ground the Array

Connect an outdoor rated ground lug (by others) to the module closest to the junction box. Bring the EGC to this lug to ground the array. Ensure the ground connection complies with NFPA 70, NEC 250L Grounding and Bonding, NEC690: Solar Photovoltaic Systems, CSA C22.2: Safety Standards for Electrical Installations and any local electrical codes.

5c) Install Electrical Assembly

Mount the Junction Box (not included) to the Electrical Assembly Kit as shown. Clamp the Electrical Assembly to the module and torque to 14 ft-lbs.

THE FOLLOWING PAGES CONTAIN ADDENDUMS TO THIS MANUAL

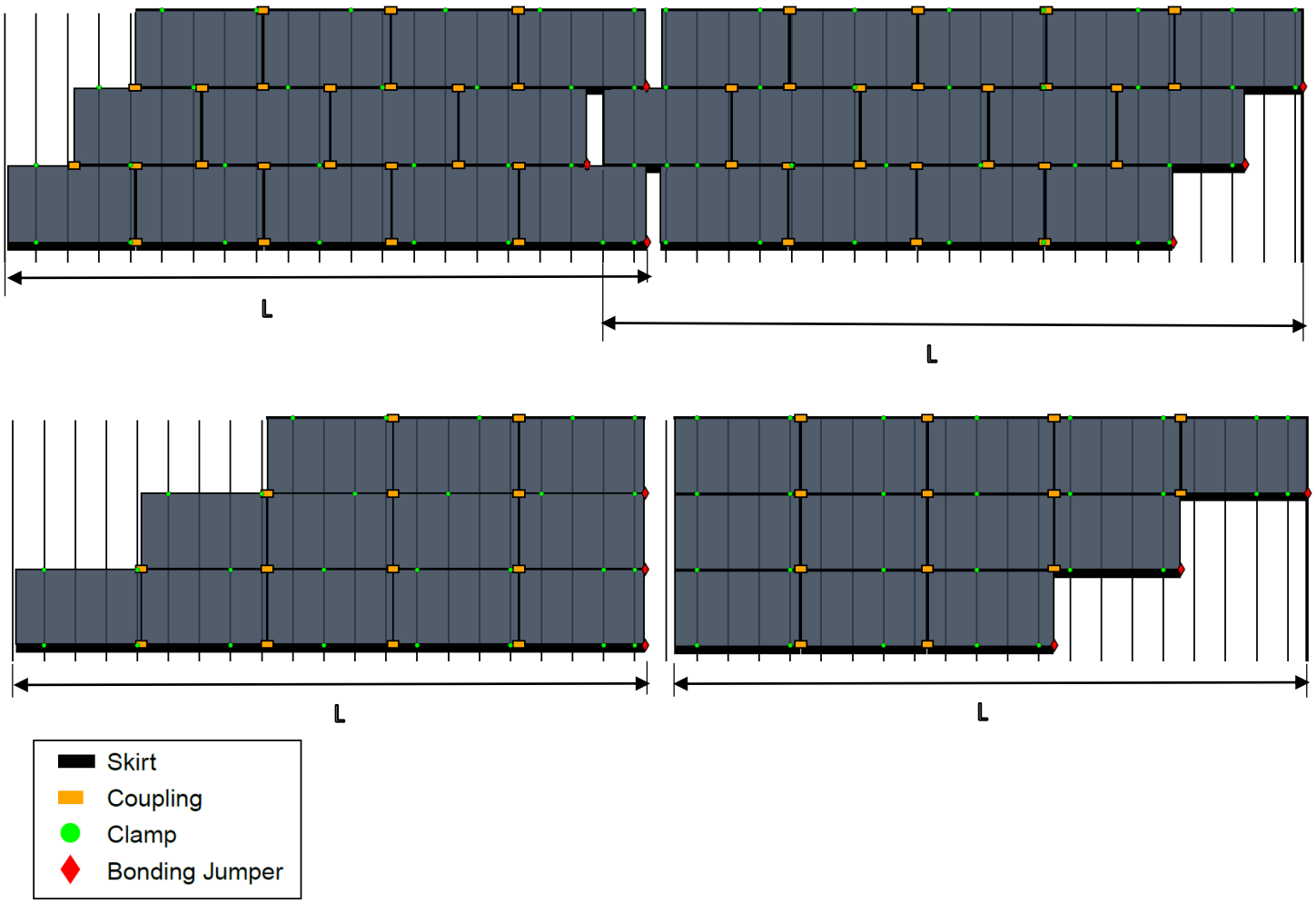
Addendum A:	Thermal Expansion
Addendum B:	Module Removal
Addendum C:	Supporting Conduit with EcoX
Addendum D:	North Row Extension Kit
Addendum E:	Tile Roof Attachments
Addendum F:	Flat Roof Attachments
Addendum G:	UL2703 Approved Module List

ADDENDUM A: Thermal Expansion Planning

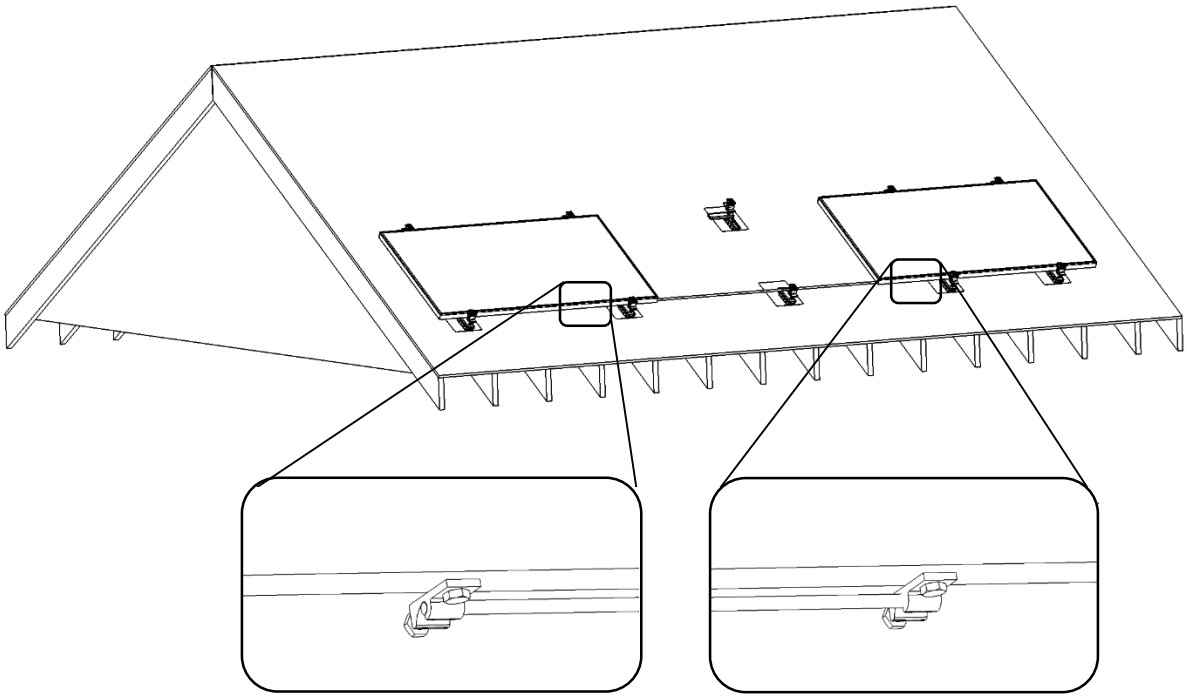
With natural ambient temperature fluctuations, thermal expansion and contraction can impact large arrays. To prevent excessive thermal movement in an array, thermal breaks should be installed for arrays longer than 35 ft.

If the total east/west dimension of an array exceeds 35 ft, break array as shown to accommodate thermal expansion and contraction. Ensure each sub-array's east/west length "L" do not exceed 35 ft. Add Clamps as necessary to support PV modules on each side of the thermal break without exceeding the allowable cantilever specified in the project specific engineering calculations. The east/west gap between sub-arrays should be set to a minimum of ½". Note that the gap shown below is much greater than ½" for demonstration purposes.

Use a bonding jumper to bond the two sub-arrays together. Alternatively, connect a separate EGC to a single point on each sub-array.



ADDENDUM B: Module Removal – Maintaining Bond Path



Bonding Option 1: Single Row Array:

A) **Install ground lug on adjacent modules**
Install a WEEB Lug 6.7 or other outdoor rated ground lug (by others) on both of the modules adjacent to the module to be removed. Utilize the grounding hole on the frame of the module.

B) **Connect Bonding Jumper**
Lay a bare #6 CU conductor (by others) into the two lay in lugs connected to the adjacent modules. Tighten lay-in lug terminal screw onto the conductor and torque to 7 ft-lbs.

Bonding Option 2: Multiple Row Array:

A) **Install a Bonding Jumper on either end of the row.**
See installation step 5a for reference.

Module Removal:

A) Remove the upper clamp on the north side of the module to be removed.

B) Loosen Couplings connected to the module. Slide the coupling over onto the adjacent module. Do not disassemble the coupling completely.

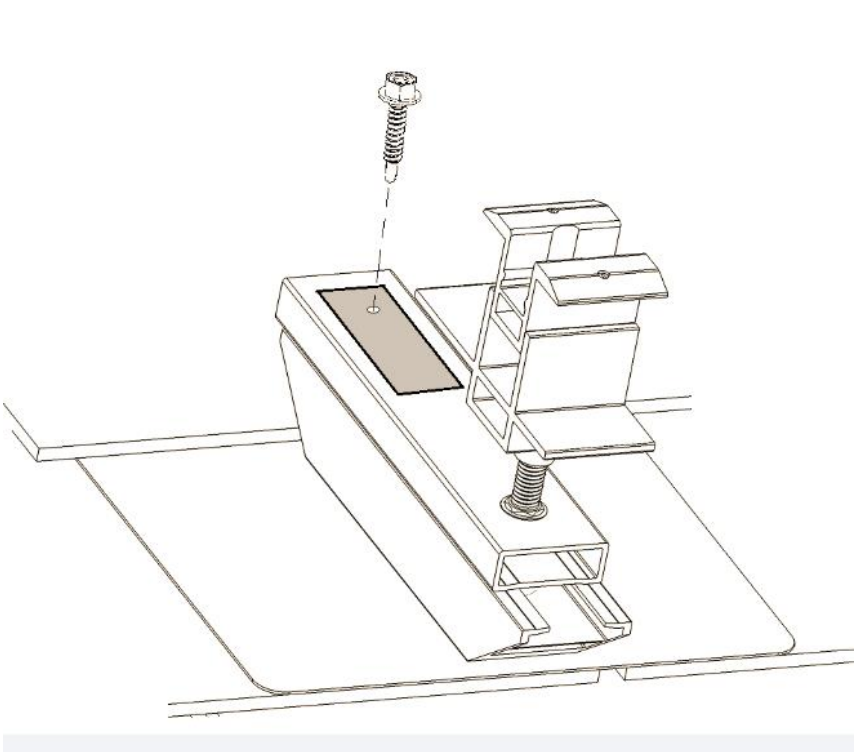
C) Remove module, taking care not to damage the surrounding modules and racking components.

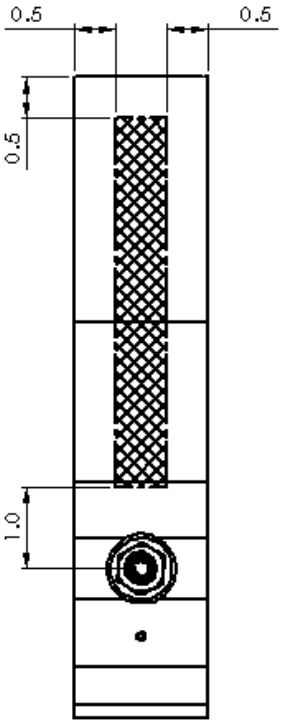
ADDENDUM C: Supporting Conduit with EcoX

It is acceptable to support conduit using the EcoX upper support, as long as general mounting and attachment guidelines are followed. In general, commonly available conduit clamps or straps can be used, and can be connected to the upper support using self-drilling screws. To ensure the attachment method does not affect the integrity of the EcoX components, the following recommendations should be followed:

- Use #10 or #12 self-drilling screws
- Screws should be 1" maximum length
- Screws should be placed ½" from any edge of the support, and 1" from the post in the clamp assembly. The allowable location for the screws are highlighted in the illustrations below.
- Load added to each support should not exceed 20 lbs.
- This recommendation applies to the use of EcoX as a support only. It is the installer's responsibility to ensure the application meet all applicable code requirements.

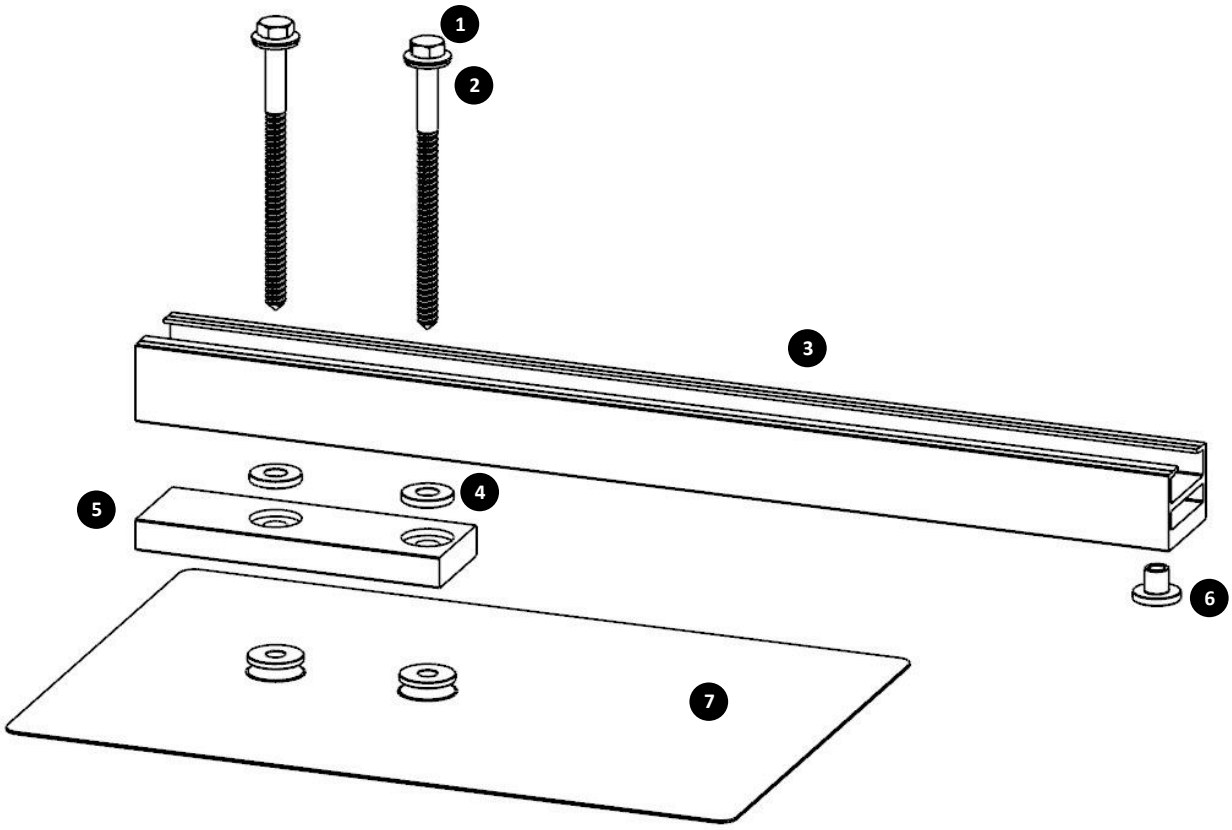
Acceptable Screw Installation Location:





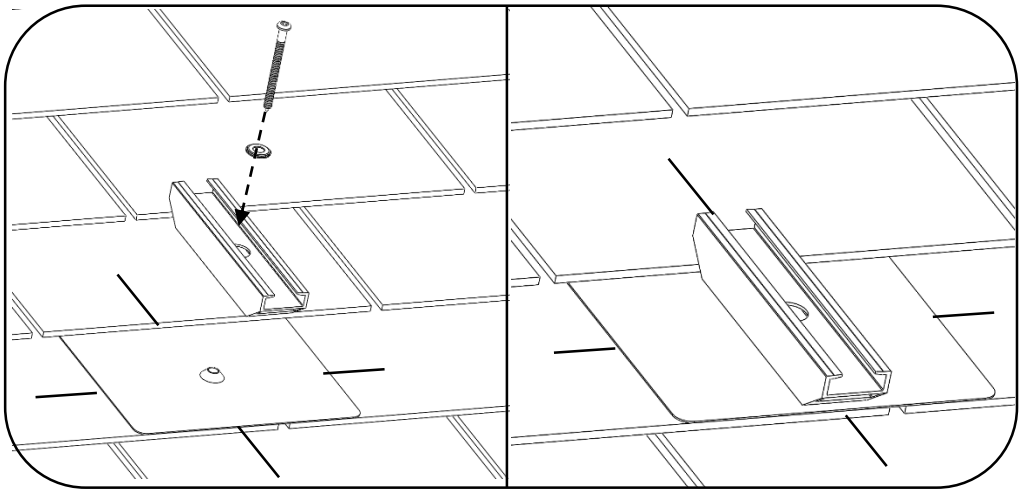
ADDENDUM D: North Row Extension Kit

For installations requiring the placement of a module within 18” of the roof peak, the north row extension attachment kit must be used.



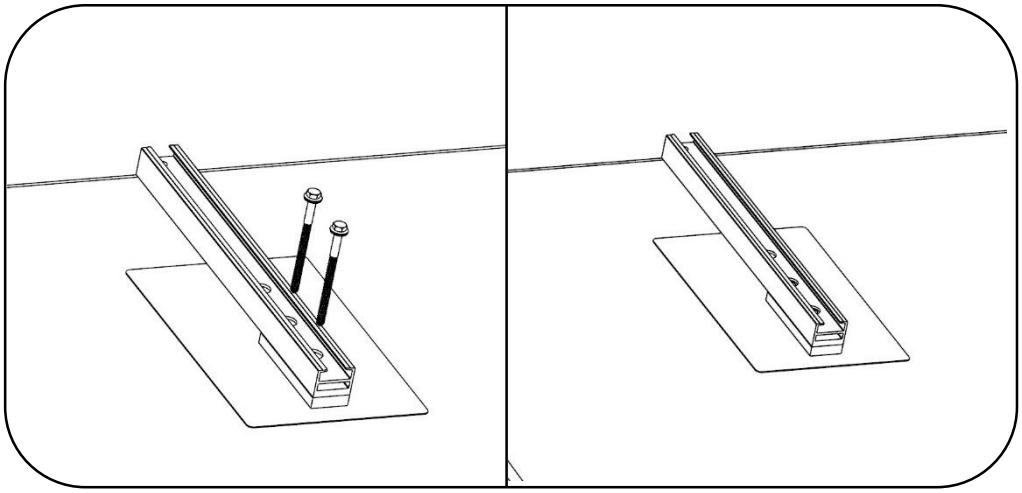
Item No.	Description	QTY
1	Lag Screw 5/16"X 5" 18-8 SS	2
2	5/16” ID EPDM Bonded Washer 18-8 SS	2
3	Lower Support	1
4	EPDM Washers	2
5	Riser	1
6	Bumper	1
7	EcoFasten Solar GF2 Flashing	1

❷ Install Attachments



2a) Install Attachment Kits

Install all standard attachments as previously specified in instruction manual.



2b) Install North Row Extension Attachment Kits

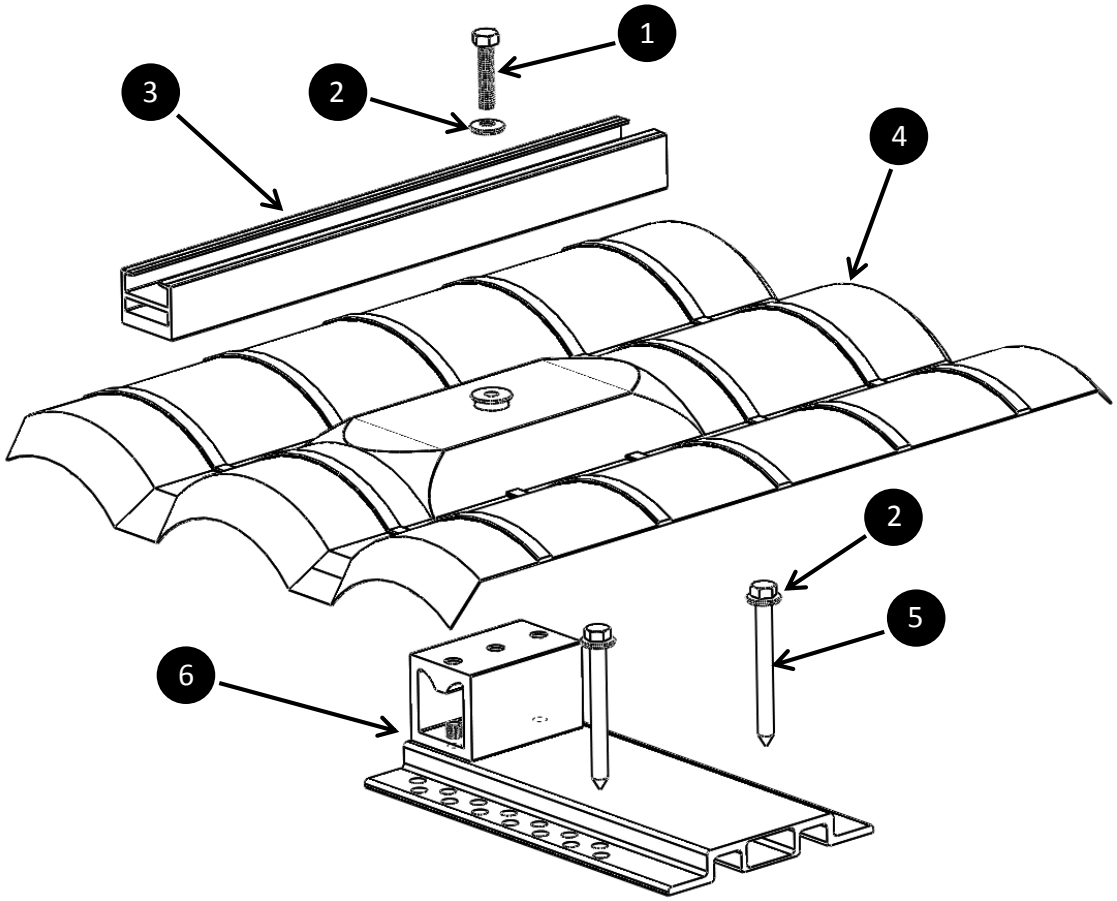
Find intersection of each selected rafter and marked row. Slip flashing underneath the last full shingle course at the peak of the roof. Mark the hole locations and remove the flashing. Predrill two (2) 3/16” holes through shingle, the roof sheathing and into the roof structural member.

2c) Install Attachment Kits

Find predrilled holes from previous step. Slip flashing underneath the shingle course above the intersection. Ensure southern edge of Flashing does not hang below the southern edge of shingle it rests on. Cut shingle away as needed to ensure that the Riser rests on only one shingle. Using ½” Hex Driver, drive two (2) Lag Screws through the Washer, the Lower Support, the EPDM Washer, the Riser, and the Flashing into the predrilled holes in the roof structural member.

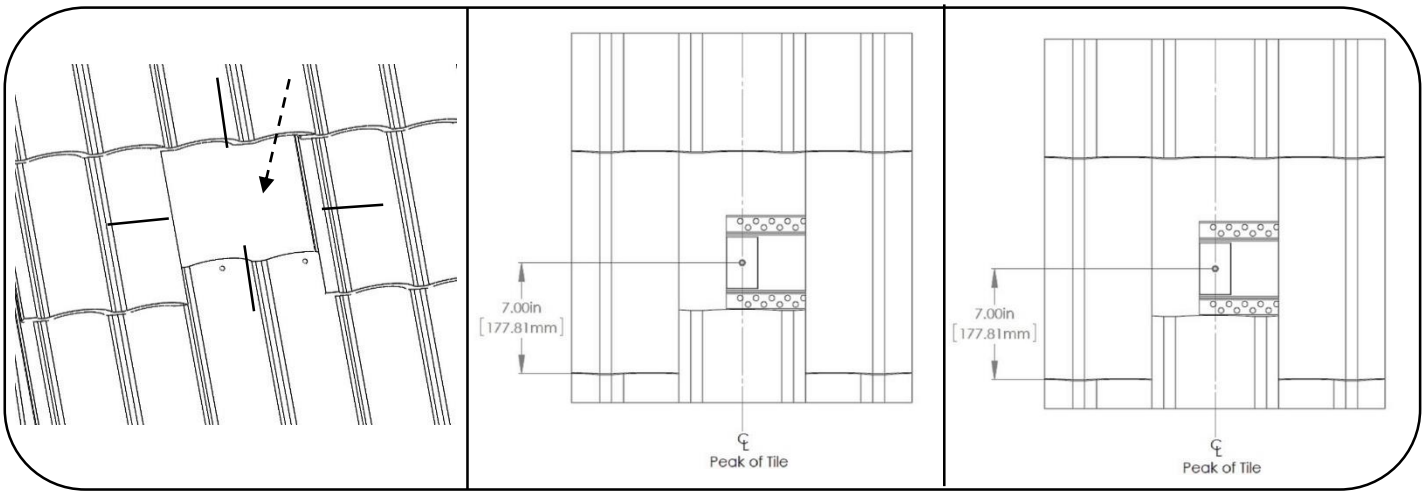
Continue with step 3 in the general instructions.

ADDENDUM E: Tile Roof Attachments



Item No.	Description	QTY
1	5/16”-18 X 1.5” Fully Threaded Hex Head Cap Screw 18-8 SS	1
2	5/16” ID EPDM Bonded Washer 18-8 SS	3
3	Lower Support	1
4	EcoFasten Solar Tile Flashing (W, S, or Flat)	1
5	5/16” X 4” Hex Head Lag Screw 18-8 SS	2
6	EcoFasten Solar Tile Base	1

2 Install Attachments



2a) Remove Tile

Remove the tile at rafter location nearest to desired mounting location. Locate the rafter and place the tile base on the roof deck.

Note: Depending on rafter location relative to desired mounting point, east west orientation of tile base may need to be adjusted.

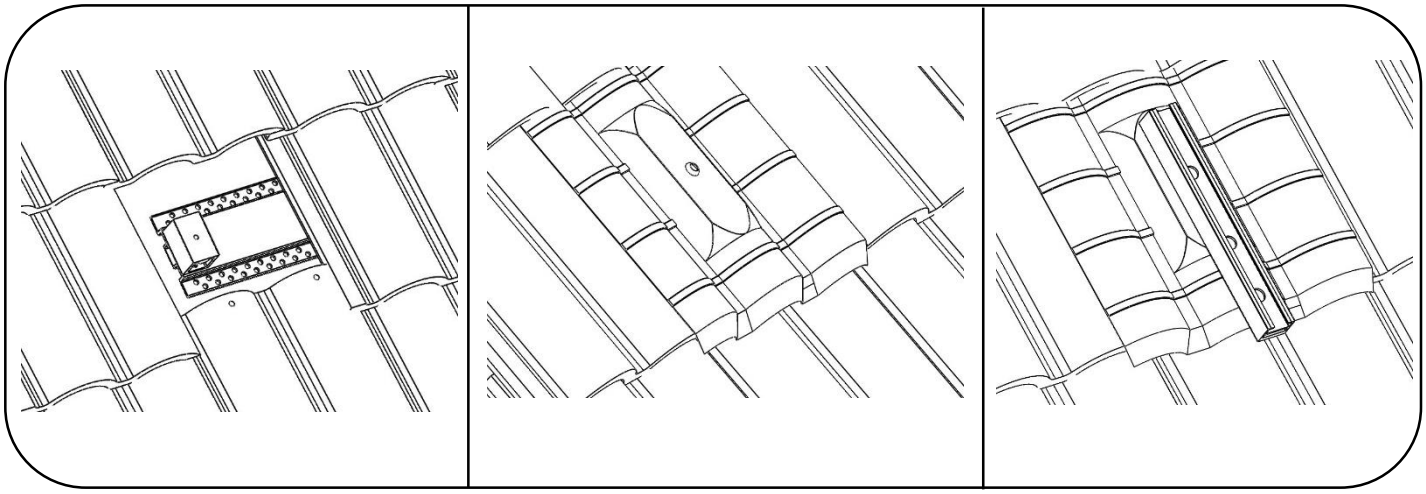
2b) Predrill Lag Screw Holes

Find intersection of each selected rafter and marked row. Predrill 3/16" hole through the roof sheathing and into the roof structural member.

2c) Install Tile Base

Find predrilled holes from previous step. Locate the Tile Base by sliding it underneath the adjacent tile. Using ½" Hex Driver, drive Lag Screws through the Washers and the tile base and into the predrilled hole in the roof structural member.

Tip: To provide an additional layer of waterproofing, fill the predrilled holes with caulk.



2d) Install Tile Flashing

With the tile base installed, tilt the tile flashing into place. To do this, it may be helpful to push the tile in the next course up slightly to allow the tile flashing to easily align with the base. Re-align adjacent tiles as necessary to create a watertight roof connection.

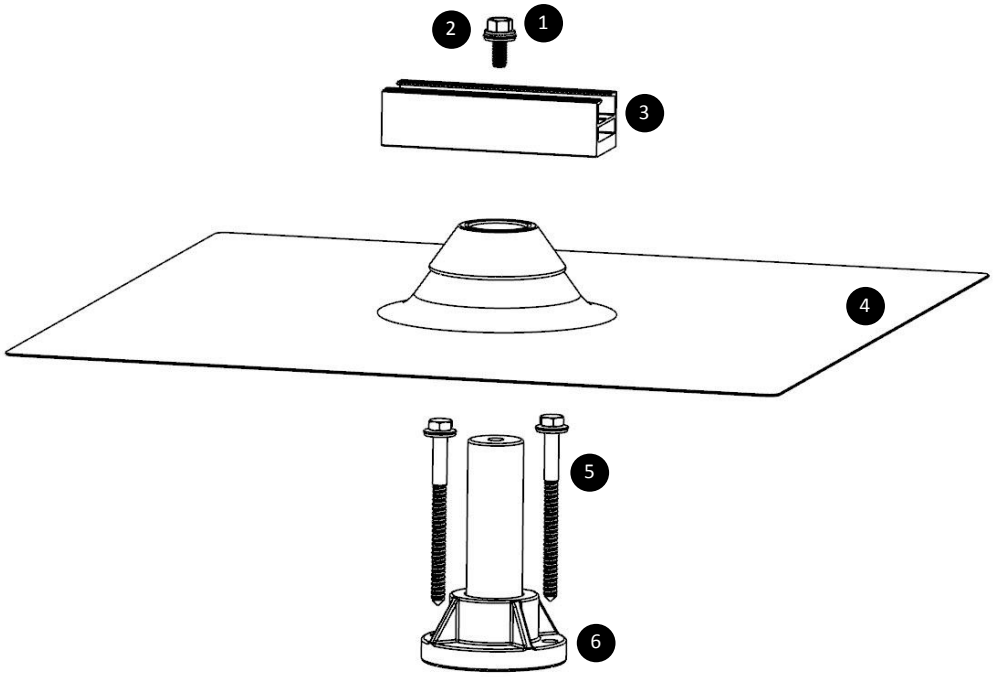
Note: Please reference manufactures install guide for complete waterproofing instructions.

2e) Install Attachment Kits

Using the provided 5/16” – 18 hex head cap screw to attach the lower support to the tile base.

Continue with step 3 in the general instructions.

ADDENDUM F: Flat Roof Attachments

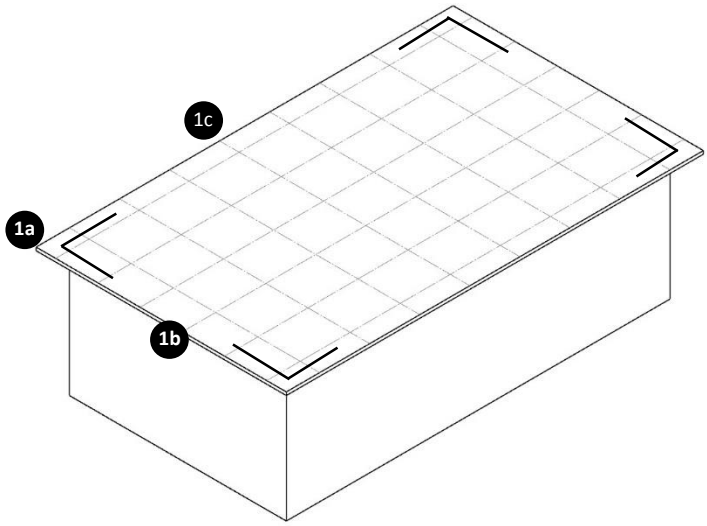


Item No.	Description	QTY
1	5/16”-18 X 1.5” Fully Threaded Hex Head Cap Screw 18-8 SS	1
2	5/16” ID EPDM Bonded Washer 18-8 SS	3
3	Lower Support	1
4	Flat Roof Flashing	1
5	5/16” X 5” Hex Head Lag Screw 18-8 SS	2
6	Flat Roof Standoff	1

Flat Roof Standoff Requirements:

Standoff not provided by Ecolibrium Solar; Standoff is by others.
Standoff must not exceed 6” in height
Standoff must post must be a minimum of 1.25” in diameter

1 Layout Array



1a) Locate Array

Mark the array footprint of the array on the roof. Account for 1 ¼" gap between modules North/South and ½" (recommended) East/West gap. Check that no obstructions on the roof will interfere with the installation of the array. If the total east/west dimension of PV array exceeds 35 ft, the array must be broken into multiple sub-arrays per the appendix below to allow for thermal expansion and contraction.

Tip: Allow for ½" gap between modules East/West to increase air circulation and improve aesthetics

1b) Mark E/W Line

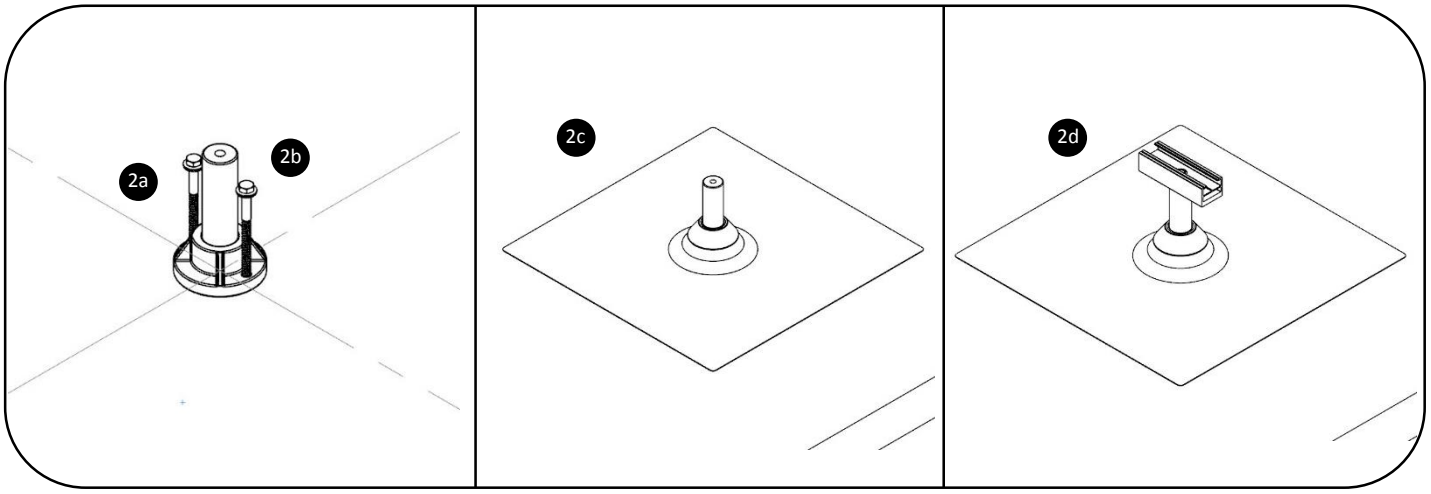
Find the shingle course for south edge of array. Mark vertical center of shingle. Mark each subsequent attachment location up the roof using a spacing of panel width plus 1 ¼".

1c) Mark attachment locations

Select and mark structural members to be used for attachments according to project engineering span and overhang values. All attachments should be located on rafters. Ensure PV module cantilever is within allowable cantilever prescribed by the EcoX Estimator.

Tip: Stagger attachments to reduce rafter loading if required by PE analysis of building

2 Install Attachments



2a) Predrill Lag Screw Holes

Find intersection of each selected rafter and marked row. Predrill 3/16" hole through roofing, roof sheathing, and into the roof structural member.

2b) Install Standoff

Find predrilled holes from previous step. Using ½" Hex Driver, drive Lag Screw (C) through the Washer, (B) through the Standoff Base, (A) and into the predrilled hole in the roof structural member.

Tip: To provide an additional layer of waterproofing, fill the predrilled holes with caulk, and place a large bead of caulk underneath the pad of the standoff.

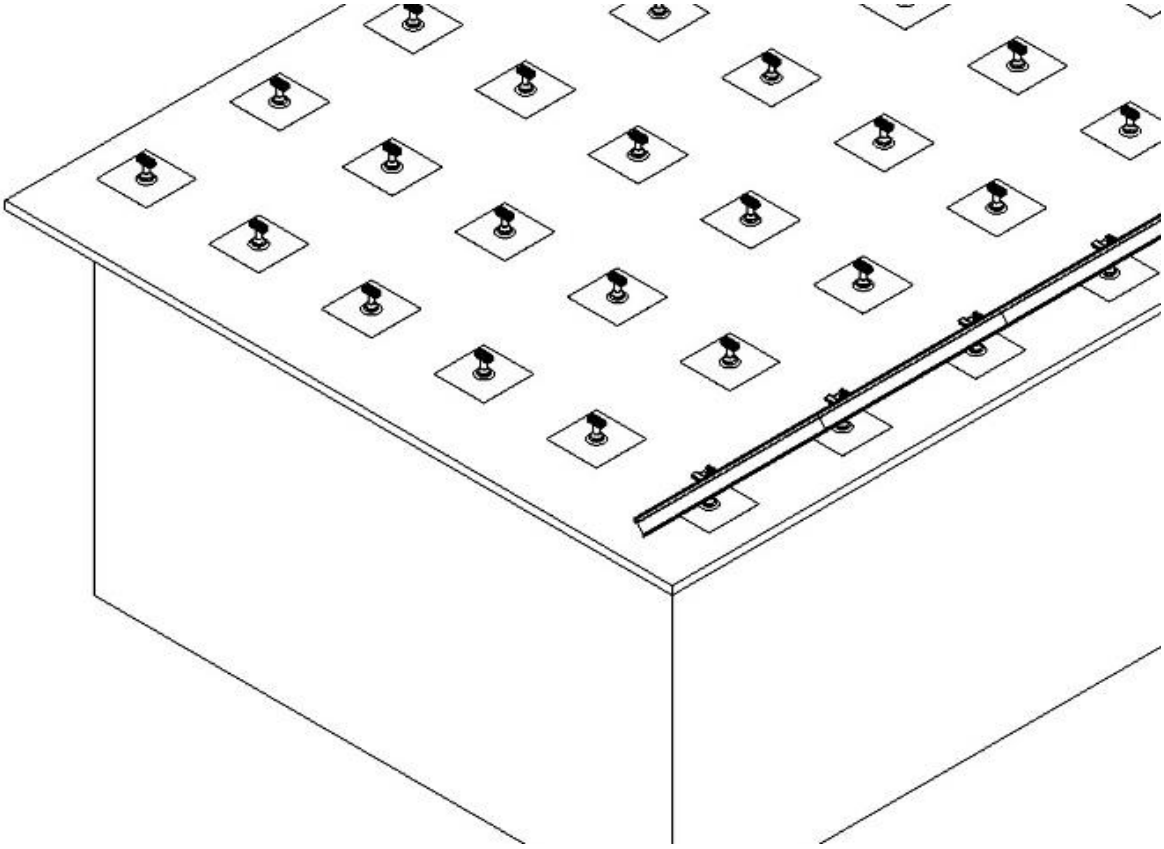
2c) Install Flashing

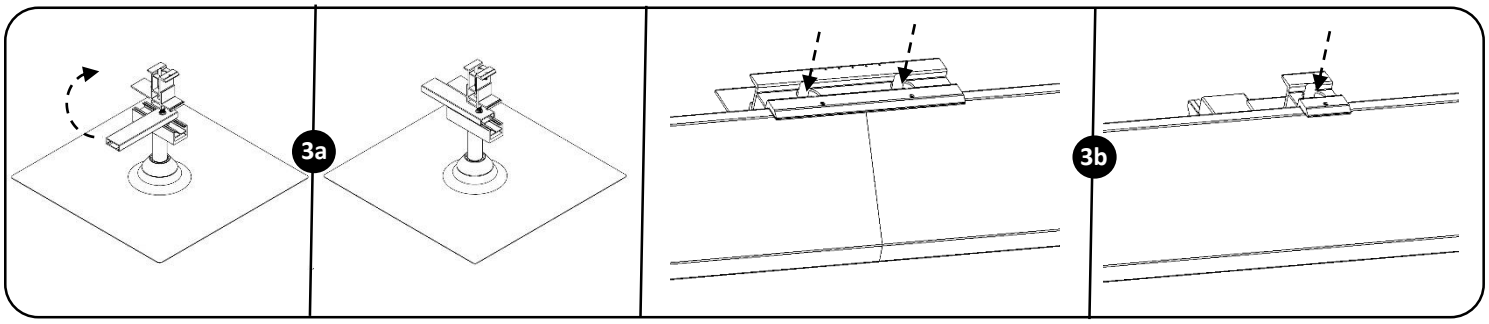
Slip flashing over the standoff post and secure according to manufactures specifications.

2d) Install Lower Support

Using the provided 5/16" – 18 hex head cap screw, attach the lower support to the standoff.

3 Install Skirts





3a) Install South Row Clamps

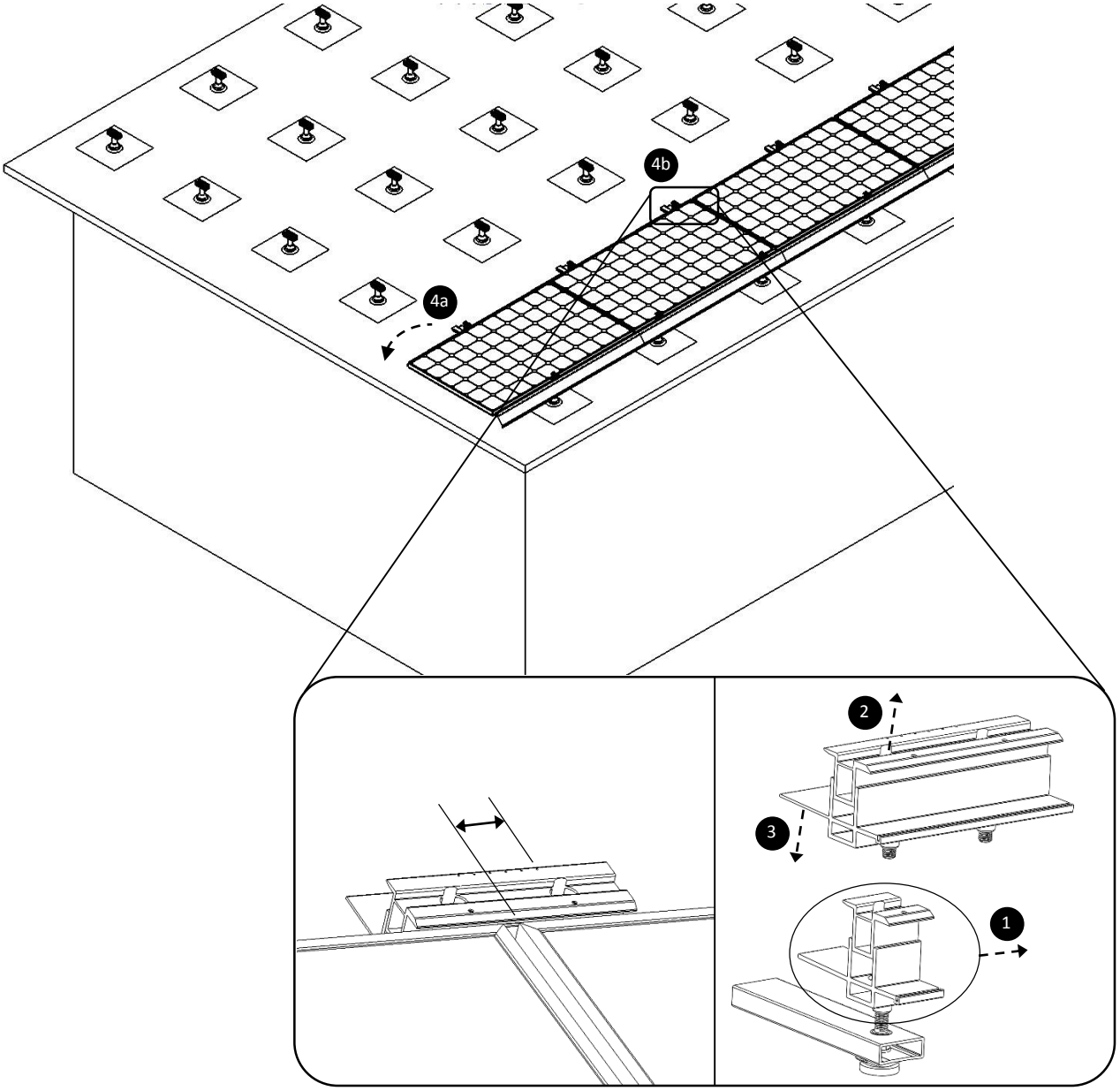
Insert south corner Clamps with Upper Support in the 9 o'clock position. Align Clamp (E) so that the Upper Clamp centerline is in the lower half of the Lower Support (B) to avoid skirt interference. Tighten the south corner Clamps (E) by rotating the Upper Support 90 degrees. Hang a string line between the two south row corner Posts. Align remaining south row Posts with the string line. Insert Upper Support at the 9 o'clock position. Lock by rotating Upper Support clockwise 90 degrees.

Tip: Always ensure the longer flange of the Lower Clamp and Coupling is extending uphill.

3b) Install Skirts

Assemble the Skirt (G) so that the Skirt thickness matches the PV module thickness. Hook the Skirts (G) on the notch on the south side of the Lower Clamp. Torque the Clamps (E) and Coupling (F) to 14 ft-lbs.

4 Place Modules



4a) Install Row of Modules

Rest each module on the north side of the Clamp (E) and Coupling (F) flanges. Pivot module down so it is parallel to roof surface. Slide the next row of Clamps (E) into final position and tighten Clamp (E) onto Lower Support (B) by turning Clamp (E) clockwise 90 degrees. Ensure modules are flush against the Clamp (E) and Coupling (F). If needed for alignment, the module may be shifted up to 0.080" (2mm) away from the vertical wall of the Clamp (E) and Coupling (F).

Tip: Space modules ½" apart East/West using the marks on the top of the Coupling

4b) Secure Row of Clamps and Couplings

Place Coupling (F) between modules so that the module edge is within the alignment marks on the Upper Coupling flange. If Coupling (F) interferes with Clamp (E) then combine the Clamp (E) with the Coupling (F) by 1) removing the Clamp (E) from the Post, 2) removing the Coupling (F) bolt, and 3) turning the Coupling (F) onto the Post. Torque uphill Clamps (E) and Couplings (F) to 14 ft-lbs.

ADDENDUM G: UL 2703 Approved Module List

The following table lists modules that have been certified and approved to UL Subject 2703. Modules may be used in either the landscape or portrait orientation.

Table 1: Modules certified to UL2703 Bonding and Mechanical Loading

Manufacturer	Product Series	Wattage (STC)	Voltage (Vsys)
Canadian Solar	CS6P Monocrystalline (CS6P-2XXM)	255; 260	1000
Canadian Solar	CS6P Polycrystalline (CS6P-2XXP)	250; 255	1000
Jinko Solar	JKM260P-60	245; 250; 255; 260; 265	1000
Jinko Solar	JKM260M-60	250; 255; 260; 265; 270	1000
LG Solar	MonoX-Neon (LGXXXN1C-A3)	285; 290; 295; 300	1000
LG Solar	MonoX-Neon (LGXXXN1C-G3)	280; 285; 290; 295; 300	1000
LG Solar	MonoX (LGXXXS1C-A3)	260; 265; 270	1000
LG Solar	MonoX-Black (LGXXXS1K-A3)	255; 260; 265	1000
SolarWorld	SW Poly Pro (SW 2XX)	245; 250; 255	1000
SolarWorld	SW Poly 2.5 (SW2XX)	220; 225; 230; 235; 240; 245	600
SolarWorld	Sunmodules Plus SW Mono (SW 2XX mono)	250; 255; 260; 265; 270; 275	600
SolarWorld	Sunmodule Protect SW Mono (SW 2XX)	265; 270; 275	600
SunEdison	F-Series (F2XXXXX-XX)	255; 260; 265; 270; 275	1000
Trina Solar	TSM-PA05.08 (TSM-2XX PA05.08)	240; 245; 250; 255; 260	600
Yingli Solar	YGE 60 (YL2XXP-29B)	230; 235; 240; 245; 250; 255; 260	1000
Yingli Solar	Panda 60 (YL2XXC-30b)	250; 255; 260; 265; 270	1000

Table 2: Modules certified to UL2703 Bonding

Manufacturer	Product Series	Wattage (STC)	Voltage (Vsys)
Hyundai Solar	MG-Series (HiS-XXXXMG)	245; 248; 250; 255; 260; 265	1000
Hyundai Solar	RG-Series (HiS-XXXXRG)	260; 265; 270	1000
Hyundai Solar	RW-Series (HiS-XXXXRW)	255; 260; 265	1000
JA Solar	JAP6 60-2XX	245; 250; 255; 260; 265	1000
JA Solar	JAP6(BK) 60-2XX	245; 250; 255; 260; 265	1000
REC Group	REC2XXPE	240; 245; 250; 255; 260; 265	600
REC Group	REC2XXPE BLK	240; 245; 250; 255; 260; 265	600
REC Group	REC2XXPE ECO	240; 245; 250; 255; 260; 265	600
Suniva	OPT XXX-60-4-100	260; 265; 270	1000
Suniva	OPT XXX-60-4-1B0	255; 260; 265; 270	1000
Suniva	MVX XXX-60-5-XX1	240; 245; 250; 255	600
Upsolar	UP-MXXXM	250; 255; 260; 265; 270	1000
Upsolar	UP-MXXXM-B	245; 250; 255; 260; 265	1000
Upsolar	UP-MXXXP	240; 245; 250; 255; 260	1000
Upsolar	UPMXXXP-B	235; 240; 245; 250; 255	1000