

# ***Static Ground Mount-Portrait Installation Guide***



*KBFGMXXP-GA July 2022 Revision*

## ***Product Certifications***

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***SBWK-312***

***WEEB-M-KR***

***CL501TN***

The above products are tested to UL 467, CAN/CSA-C22.2 No.41 US/Can safety standards for safety grounding and bonding equipment.

Rails, Mid Clamps, and Kinetic Ground Lugs have been certified to meet the bonding requirements of UL 2703 and LTR AE-001-2012 please contact us for more details

## ***Disclaimer***

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Kinetic Solar Racking and Mounting Inc. (Kinetic Solar) does not install any components of its Racking and Mounting systems. Kinetic Solar does not have any duty or responsibility for the safe and proper installation and/or maintenance of its Racking and Mounting systems, including job site safety standards and procedures.

All installation work must comply with the applicable regional and local regulations or other national or international electrical standards and are the sole responsibility of the purchaser, installer, contractor, and/or developer.

Kinetic Solar shall not be held responsible for damages of any kind, including but not limited to bodily harm, damage to property, or injury. Kinetic Solar shall not be held responsible for the proper compliance or non-compliance with the instructions detailed in this manual including handling solar modules, solar racking, or system installation.

Before attempting to install, operate or service a Kinetic Solar system, all instructions should be read and understood. Failure to follow these instructions / guidelines may result in death, injury, or property damage.

In addition to the instructions provided in this guide, the module manufacturer's mounting guidelines must also be adhered to. It is the sole responsibility of the purchaser, installer, contractor, and/or developer to ensure that a compatible module is used.

Please retain this manual for future reference. Kinetic Solar reserves the right to make additions, deletions, and modifications to the content of this document without prior notice.

This manual is only valid for the following Kinetic Solar Systems: Static Ground Mount Models Starting with SKU KBFGMXXP-GA.

The instructions contained in this manual are exclusive to the products referenced. Use of any other products in conjunction with the listed products is done at one's own risk. Failing to comply with the above may result in the warranty being voided.

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## ***General Notes***

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- **The hot-dip galvanizing process may sometimes cause zinc accumulation inside holes or along edges. Bolts/hardware can be lightly tapped through the holes to clear the buildup. Alternatively, they can be cleaned up with a drill so long as the Zinc is not completely stripped**
  - **In case the laser cutting is not clean and clear, use a hammer and bolt to clear the hole.**
  - Drawings in this installation manual are examples and are NOT specific to your order.
  - When installing components do not fully tighten components until specified.
  - Prior to installation, ensure that you are in possession of the required components for installation.
-

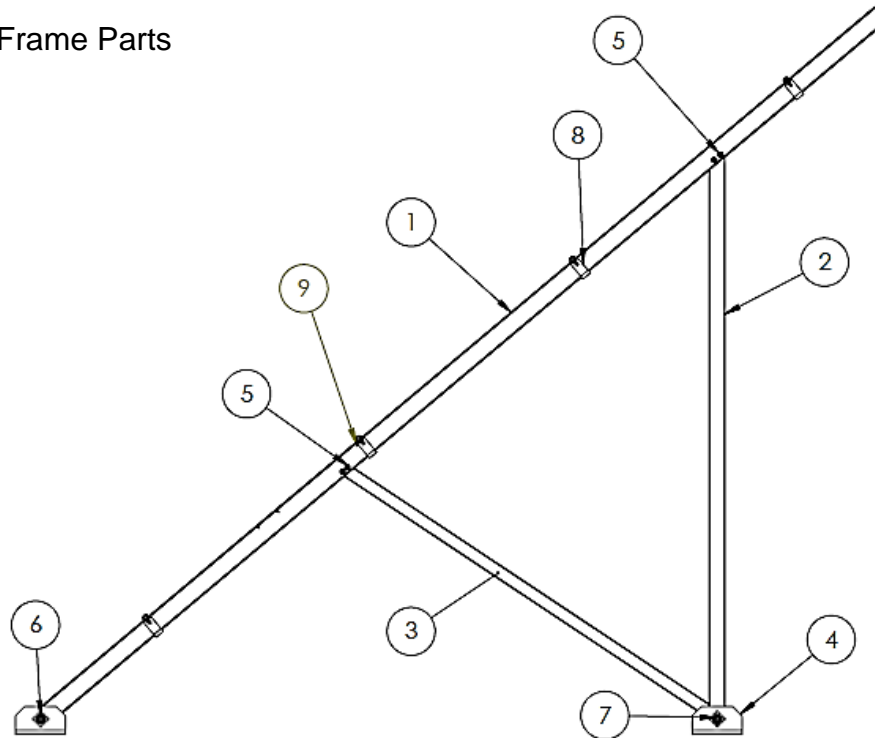
<b><i>Tools required</i></b>	<b><i>Main components</i></b>
Measuring Tape Chalk /String Line Impact Wrench / Drill 3/8" Socket 1/2" Wrench 1/2" Socket 9/16" Long Socket 9/16" Wrench 3/4" Wrench 3/4" Socket 6" Drive Extension Bar Torque Wrench Hammer Drill Bits (0.55" & 0.44") Ladder	A-Frame (Main Diagonal, Mid Brace & Rear Column) L-Foot Rail Cross Brace Bifacial U-Bracket Kit End Clamp Mid Clamp A-Frame Hardware Kit Cross-Brace Hardware Kit Rail Joiner Kit (for systems with 12 or more modules)

## Assembly Procedure

### Step 1: Pre-Assemble A-Frames

a. Each A-Frame consists of the following:

Figure 1: A-Frame Parts



ITEM NO.	DESCRIPTION	QTY.
1	Main Diagonal	1
2	Rear Column	1
3	Mid Brace	1
4	L-Foot	4
5	3/8" HARDWARE SET (3/8" x 4" Hex Head Bolt, 3/8" Hex Nut, 2x 3/8" Neoprene Bonded Washer, 3/8" Lock Washer)	4
6	1/2" Hardware Set(1/2" x 4.5" Hex Head Bolt, 1/2" Hex Nut, 2x 1/2" Neoprene Bonded Washer,1/2" Lock Washer )	1
7	1/2" Hardware Set(1/2" x 4" Hex Head Bolt, 1/2" Hex Nut, 2x 1/2" Neoprene Bonded Washer,1/2" Lock Washer )	1
8	Bifacial U-Bracket Kit	4
9	Slotted Spring Pin 5/16" Diameter, 1" Long	1

- b. Pre-Assemble the A-Frame by placing all 3 members (Main Diagonal, Rear Column and Mid Brace) on a horizontal plane.

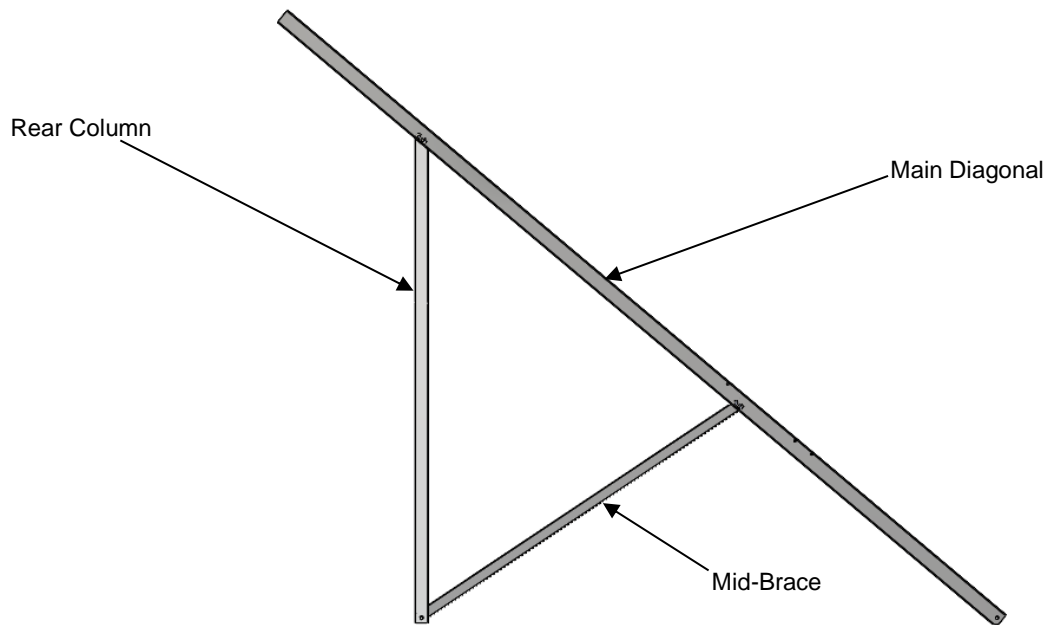


Figure 2: A-Frame Members

- c. Hand tighten the 4 sets of 3/8" hardware (see Figure 1 for locations) with the lock washer positioned between the neoprene bonded washer and the hex nut (see Figure 3 for hardware set arrangement).

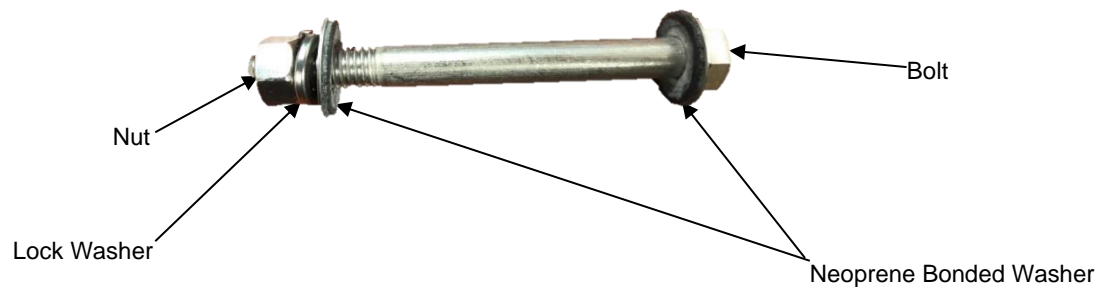


Figure 3: Hardware Set Arrangement



- d. Establish the highest point (on the ballast or ground screw) where an A-Frame foot will be located. This could be either the location of the front or back foot. This will be known as the datum foot. Take measurements of the height differences on all foot locations.
- e. Here is an example demonstrating this step. Say, it is a 4-ballast system, and the height differences are as follows (Figure 4).

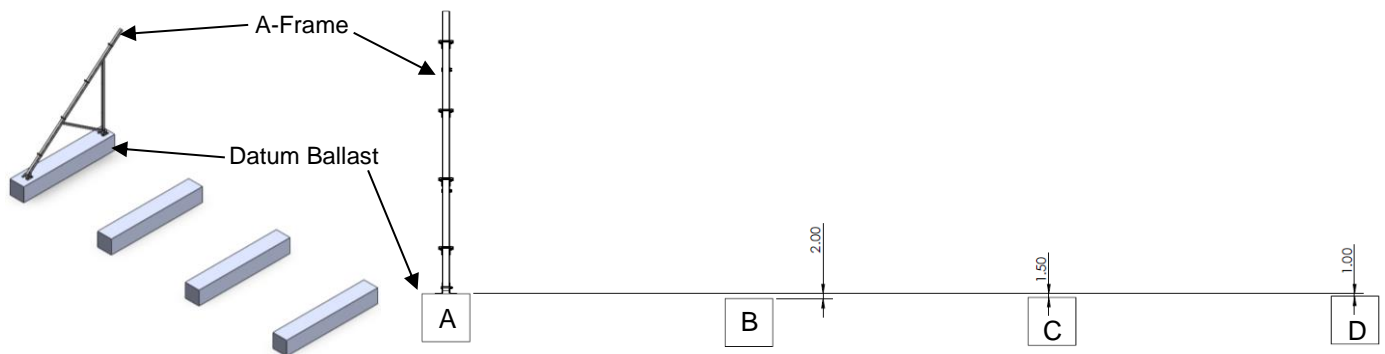


Figure 4: Example Ballast Vertical Misalignment (Left: Isometric View, Right: Side

In this example, the Ballast A will be the highest point. The datum foot will be installed here.

- f. The L-feet allow vertical 0.5" incremental adjustments (2.0" max). **The lowermost hole location must be used for the first A-frame that is on the datum foot (see Figure 5).** The 4.5" bolt will go on the front foot (bottom end of the Main Diagonal) and the 4" bolt will go on the back foot (bottom end of the back vertical column).

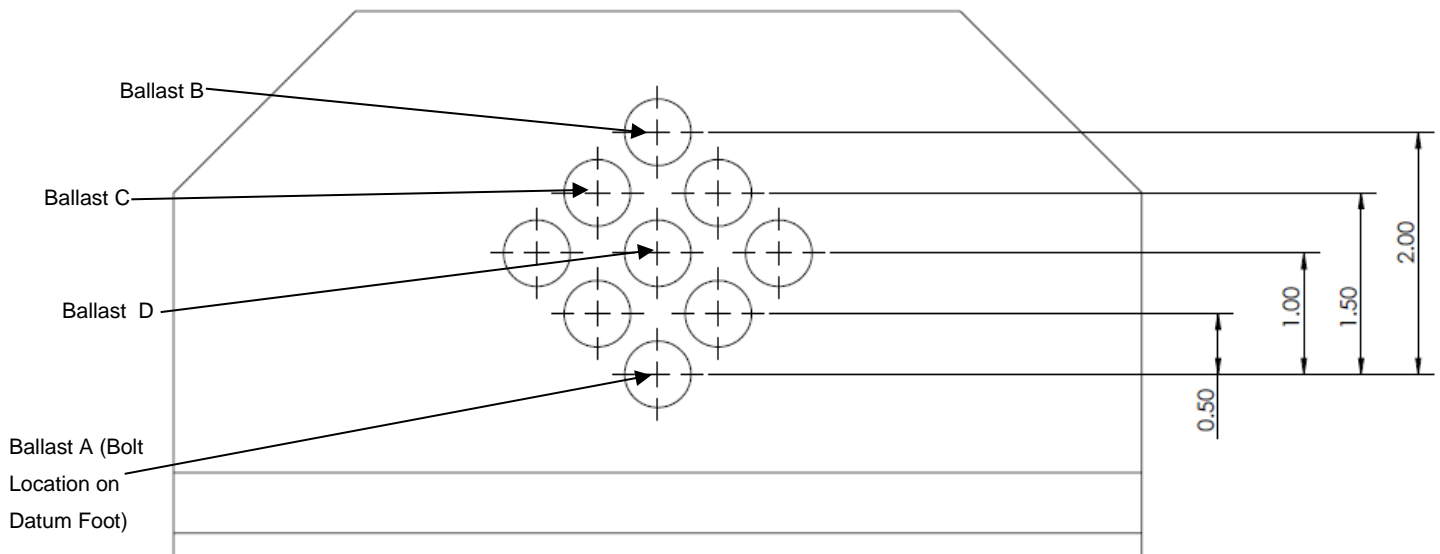


Figure 5: Example L-Foot Bolt Locations

In the example in step 'd' (Figure 4), ballast A (datum) will have the bolt in the lowest hole. Ballast B has a height difference of 2 inches from the datum ballast therefore the top hole will be used. Ballast C will use the second row of holes from the top and ballast D will use the third row from the top of holes. This is assuming that the front and the back foot are at the same height. The same procedure will be followed to align the front and the back feet.

- g. Attaching the Datum Foot to the A-Frame: The hardware arrangement will be the same as Figure 3. Lift the A-Frame assembly to install the L-Feet on the front or rear (as per Figure 6) of the datum foot. Tighten the bolt to the point where the lock washer is just under tension. Assemble the other foot using the appropriate bolt position from your measured vertical difference as in step 'e'. Tighten the bolt to the point where the lock washer is just under tension.

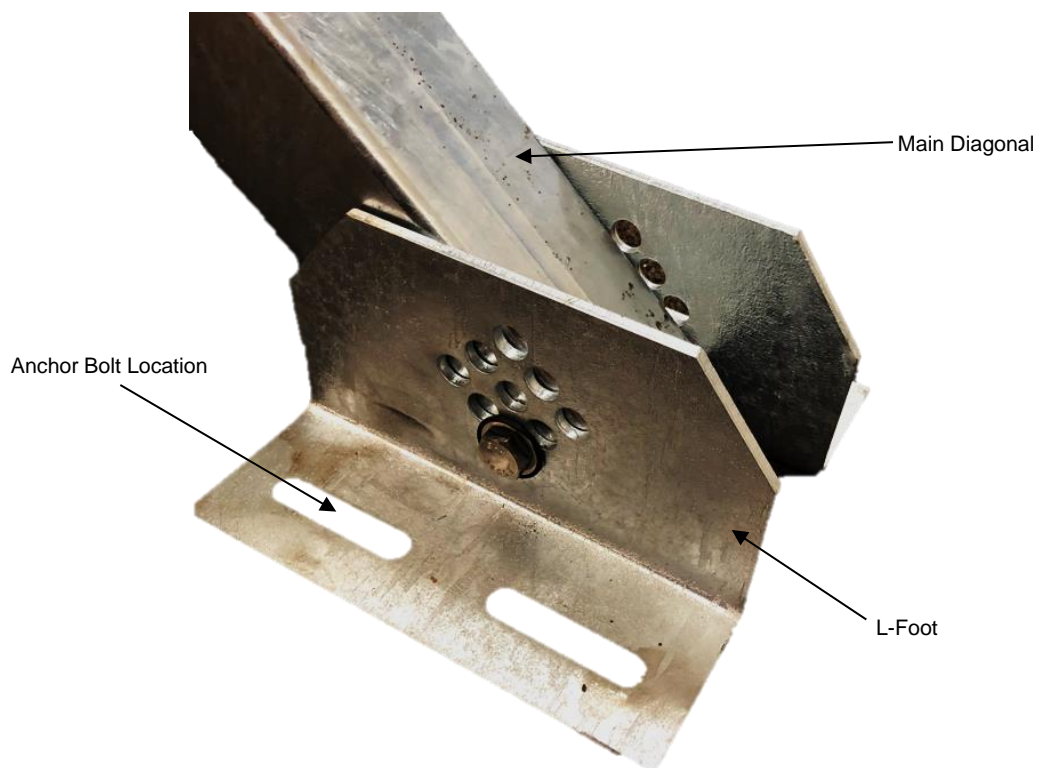


Figure 6: A-Frame Foot (Front Foot Shown)

The front and the rear foundation bolts will always be spaced at 108" as shown in Figure 7.

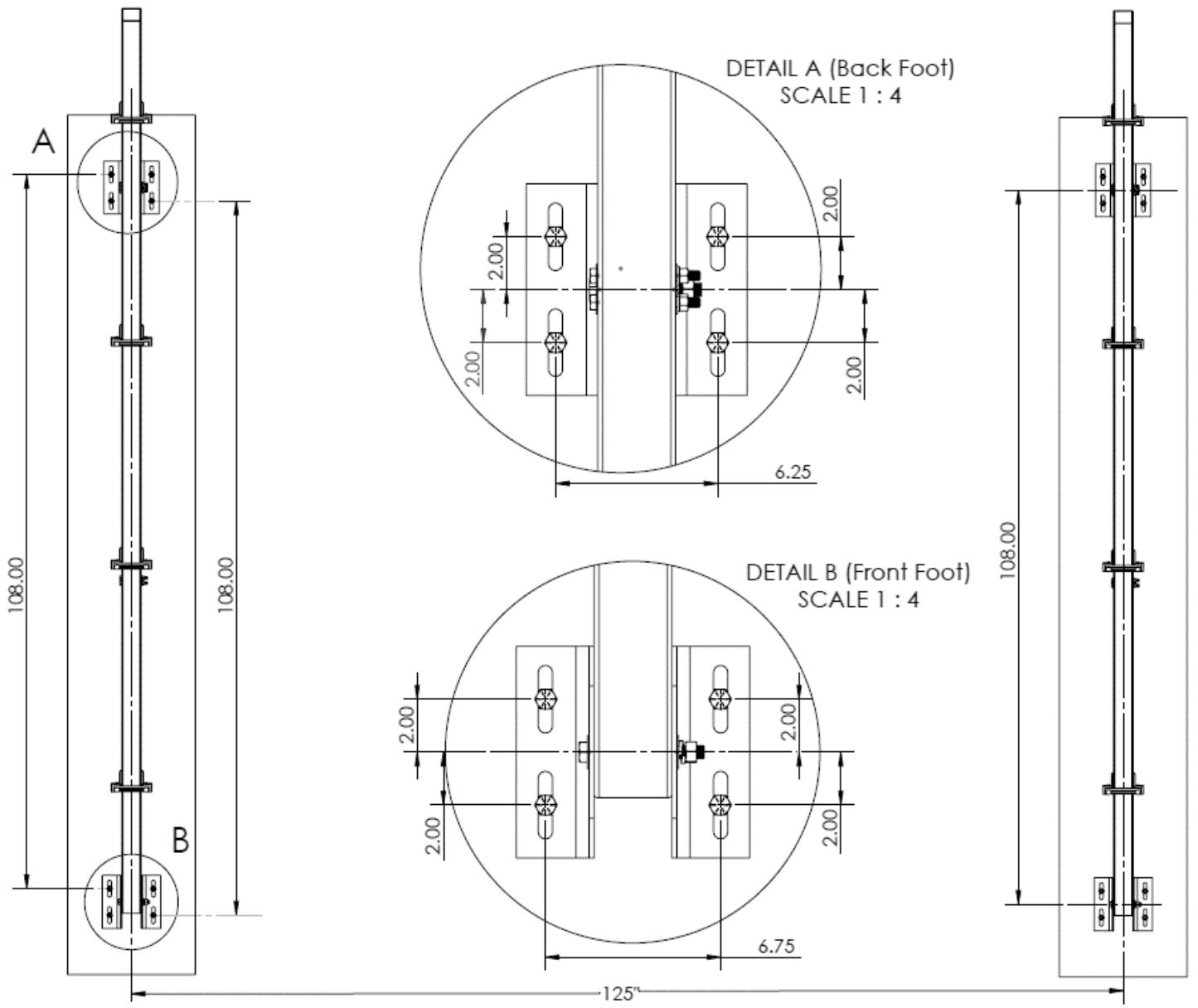


Figure 7: Foundation Bolt Locations

- h. Repeat same steps 'b', 'c', 'e' & 'f' for all additional A-Frames. The location of the hole in the L-Foot will be chosen based on the height difference in Step 'd' and 'e'.

### ***Step 2: Place A-Frames on Foundation***

Position A-Frames on foundation in the upright position – See Appendix 2 Spacing Guidelines.

- a. The spacing between A-Frames is 125”.
- b. The anchor bolts will be consistently spaced at 108” apart.

### ***Step 3: Attach Cross-Bracing***

- a. Mount Cross-Bracing to A-frames using the Cross-Brace hardware using the hardware arrangement in Figure 3.
- b. If the A-frame is in the middle of the array, the bolt (5/16” x 3 ½”) goes through the rear column and both pieces of cross bracing. The cross bracing is designed to be installed on opposite sides of the A-Frame.
- c. Fully tighten and torque the cross bracing to 12 ft lbs (see torque chart on Appendix 3).

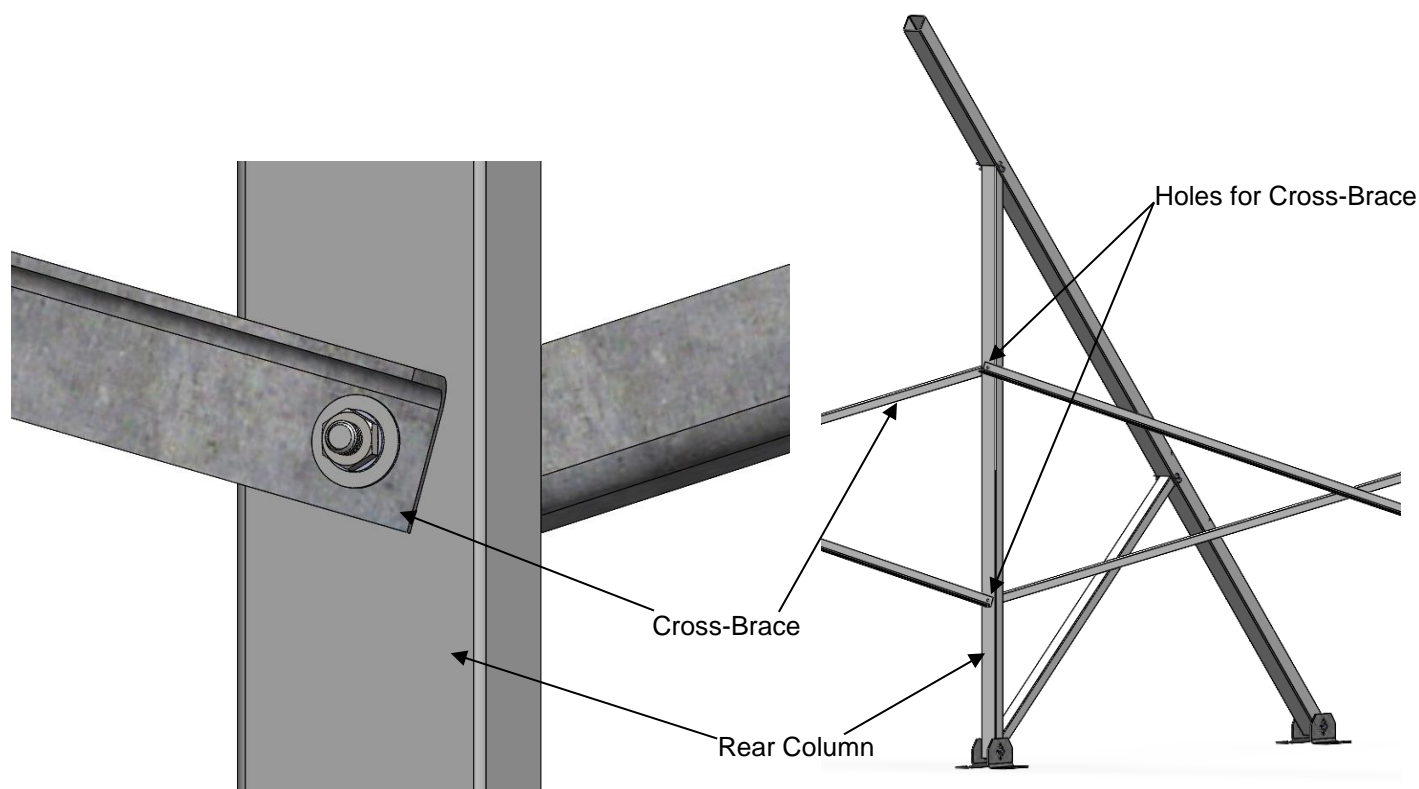


Figure 8: Cross Brace Location

#### **Step 4: Secure Structure**

- Torque the feet making sure that the feet are horizontal. Torque the rest of the hardware on the A-Frame using the torque table in Appendix 3.
- Check the positional squareness of the structure (ensure the center distances of front and back feet are 108" and the A-Frame to A-Frame is 125"). See Appendix 2 for diagonal distances.
- Once the structure is satisfactorily positioned on the foundation, affix the feet to the foundation.

### **Step 5: Mount Bifacial Rails**

- a. Install the datum pin half of the length of the pin in the square hole on the outer side of the Main Diagonal (Figure 9).

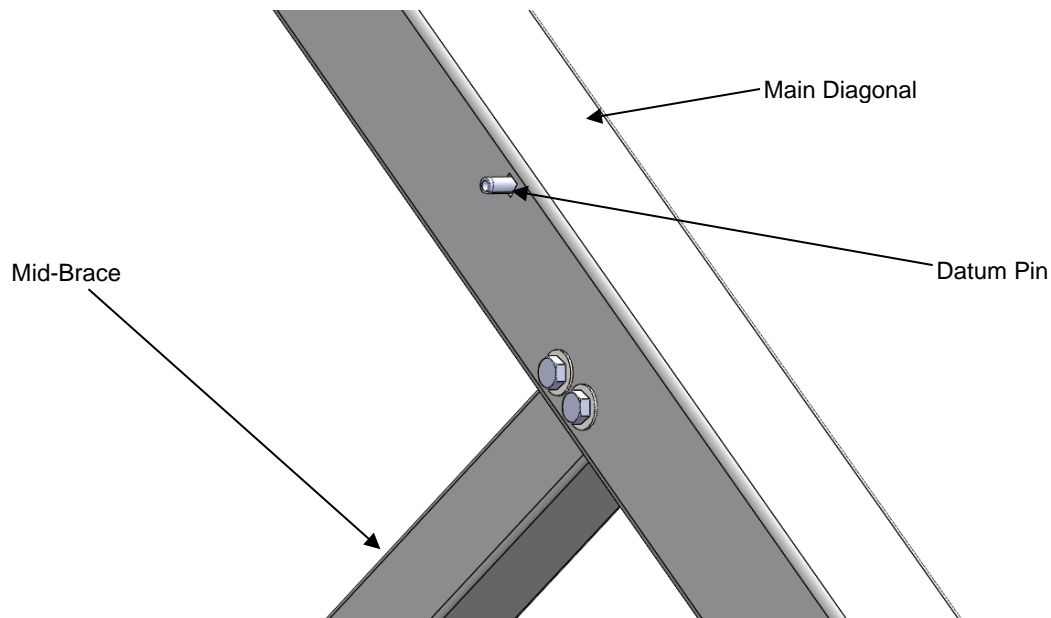


Figure 9: Datum Pin Location

- b. Lay the bifacial rail upside down on a horizontal surface and place one channel nut on either end of the rail into the shallower groove of the rail as shown in Figure 10.

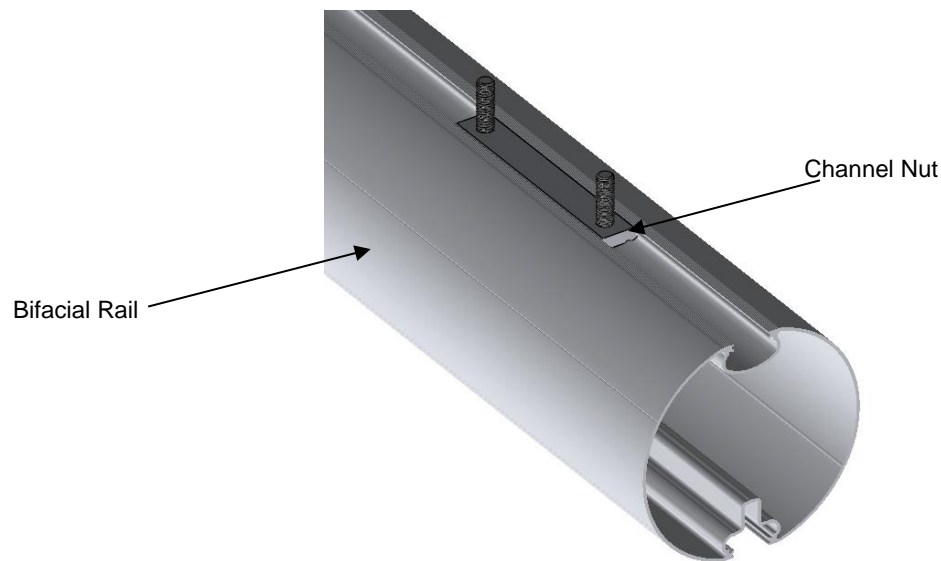


Figure 10: Channel Nut Placement (one end shown)

- c. Pick the bifacial rail up, rotate the rail & place the studs on either side of the A-Frame so that they are 90 degrees to the A-Frame Main Diagonal. Place the U-Bracket under the A-Frame Main Diagonal and on to the channel nut studs (Figure 11).

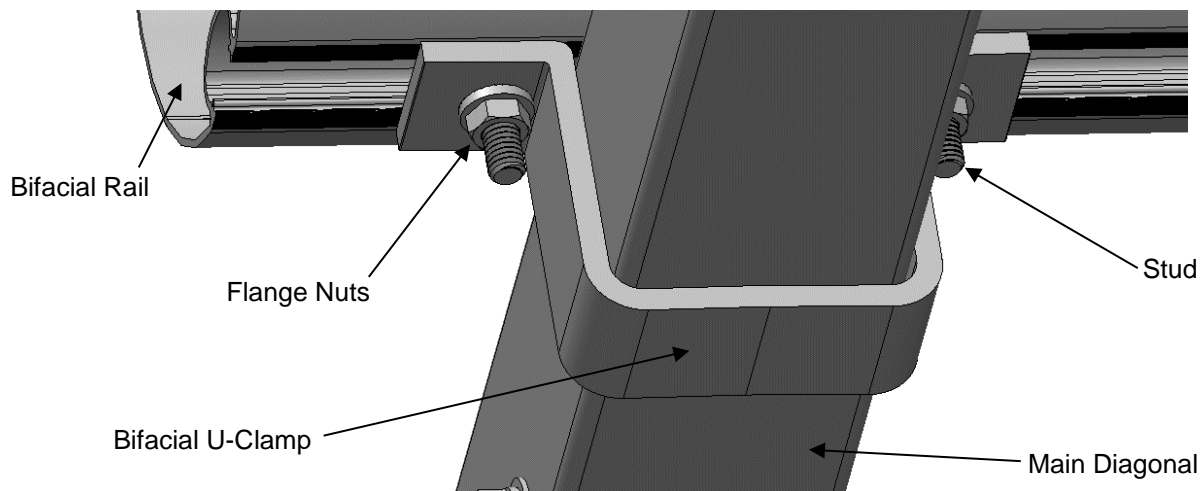


Figure 11: Bifacial U-Bracket & Rail Assembly



- d. Ensure that the rail and U-Bracket are above the datum pin as shown in Figure 12.

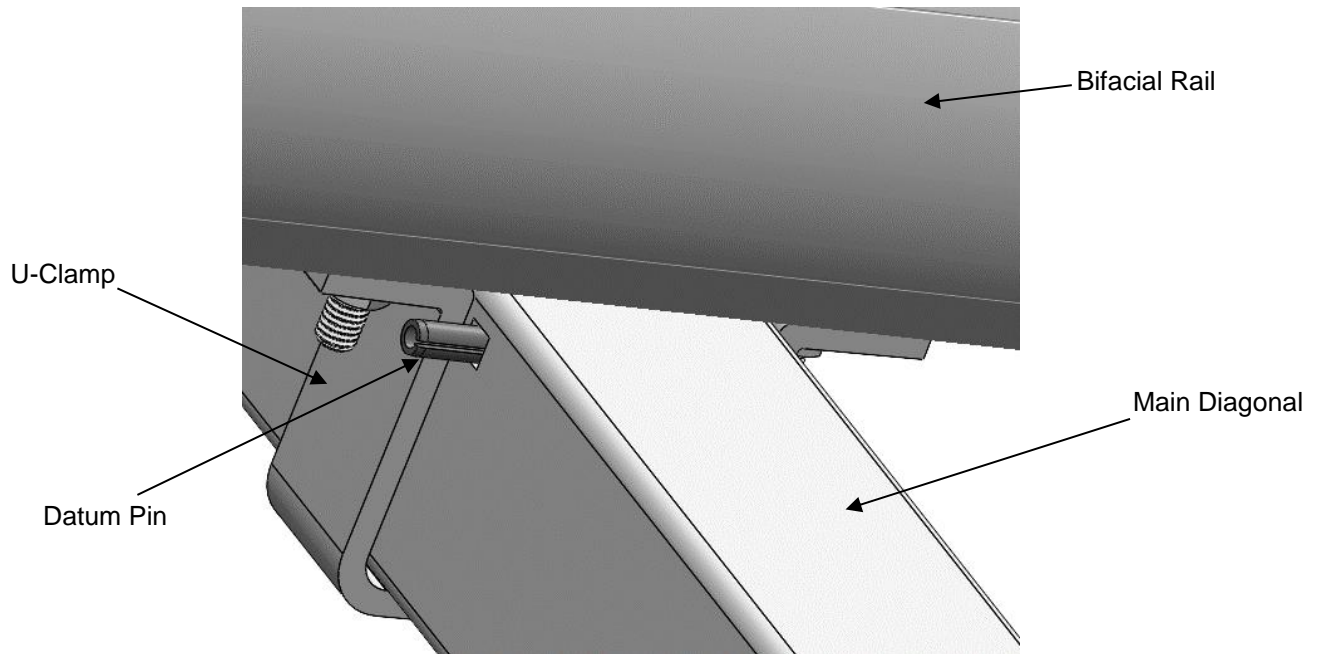


Figure 12: U-Bracket Placement

- e. For arrays with 6, 8 and 10 modules, center the rails on the two A-Frames. For all other configurations the outboard rails will end on the center of the second A-Frame in from the end of the array. See Appendix 6.
- f. Hand-tighten the flange nuts onto the studs while making sure that the channel nut is in position (Figure 13).

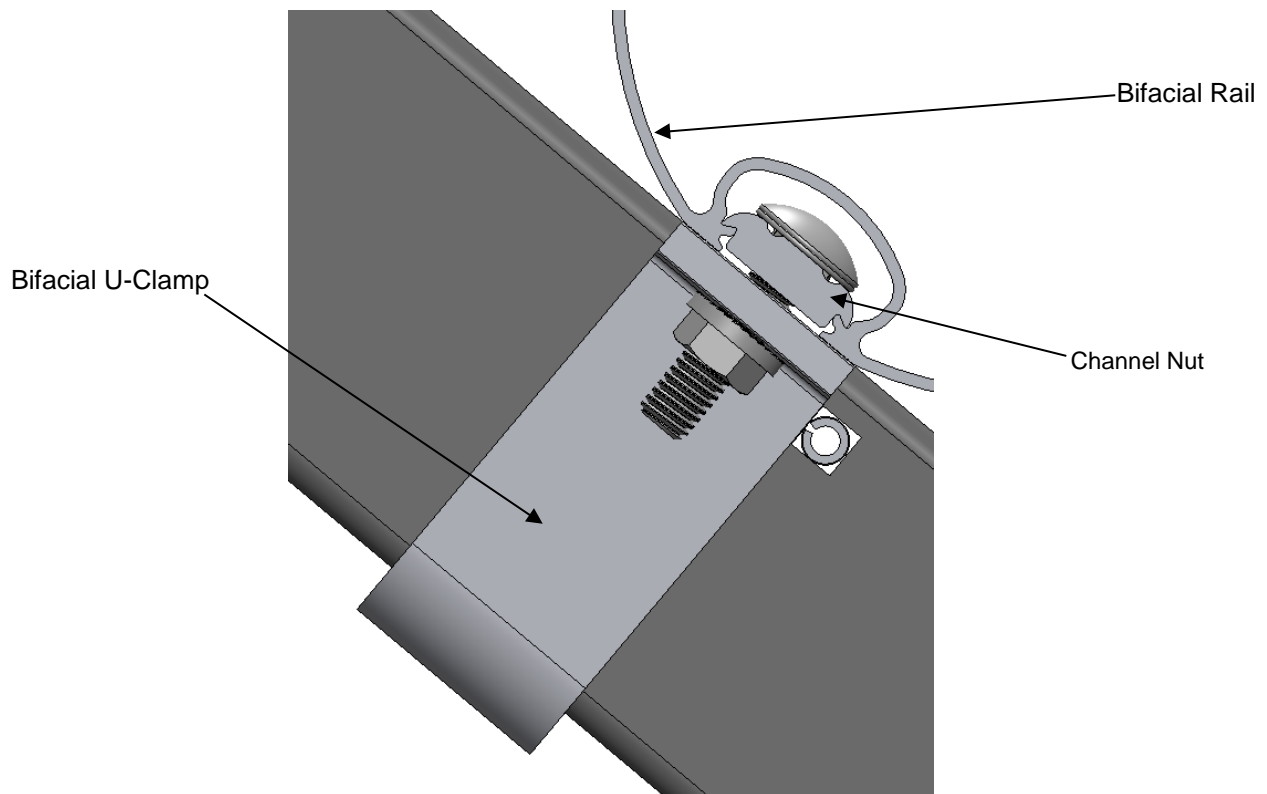


Figure 13: Nut-Clamp-Rail Assembly

- g. For systems with 10 or less modules a joiner is not required. **Proceed to step 'j'.**
- h. For 12 or more module systems, a Joiner will be required. The Joiner will always fall on the centre of the A-Frame. The Joiner may not be fall on every A-Frame. See Appendix 6.
- i. Insert half of the length of the Joiner into the end of second rail of the run. Fasten the Joiner to the rail using two ¼" Self-Drilling Screws. The screws must be in the drill guide, on the same side of the rail and 3" from the end of the rail (Figure 14).

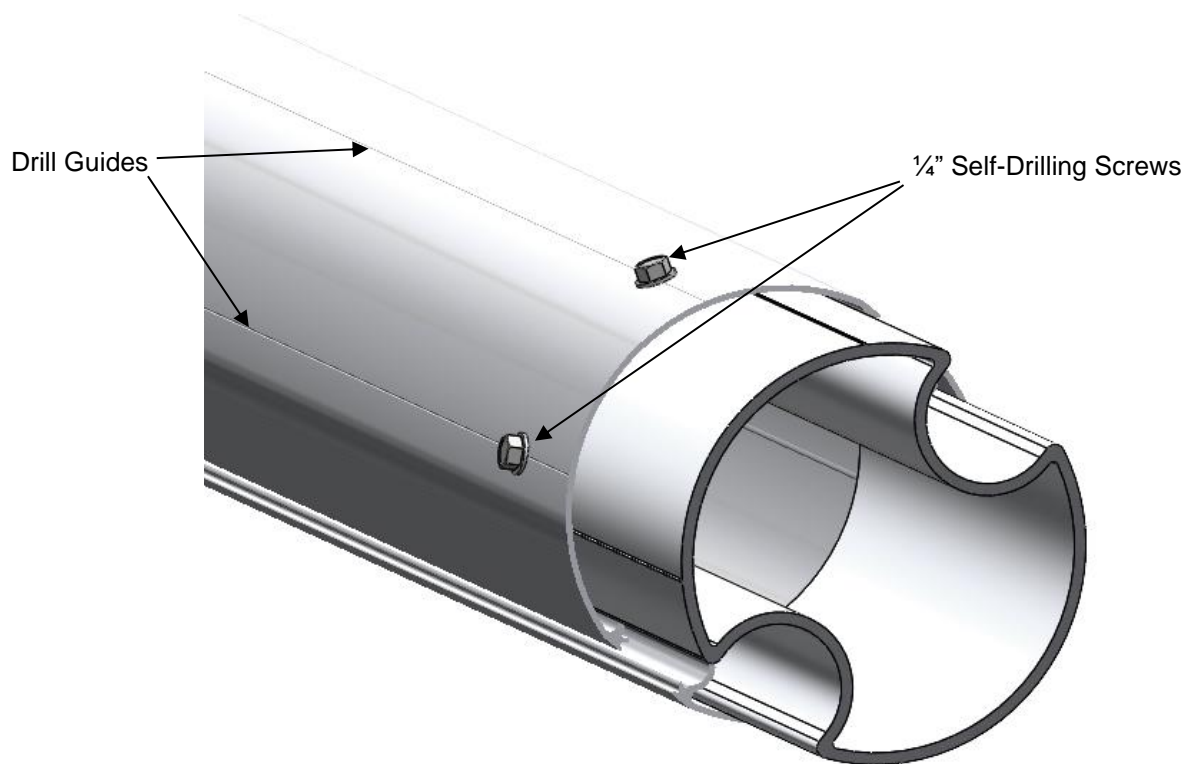


Figure 14: Two self drilling screws locations on the Rail Joiner

Slide the rail-joiner assembly into the first rail of the run and handtighten the flange nuts on the U-Bracket assembly on the second rail (Figure 15). On the opposite end of the second rail, insert the Channel nut as in step 'b' and handtighten the flange nuts on the U-Bracket assembly.

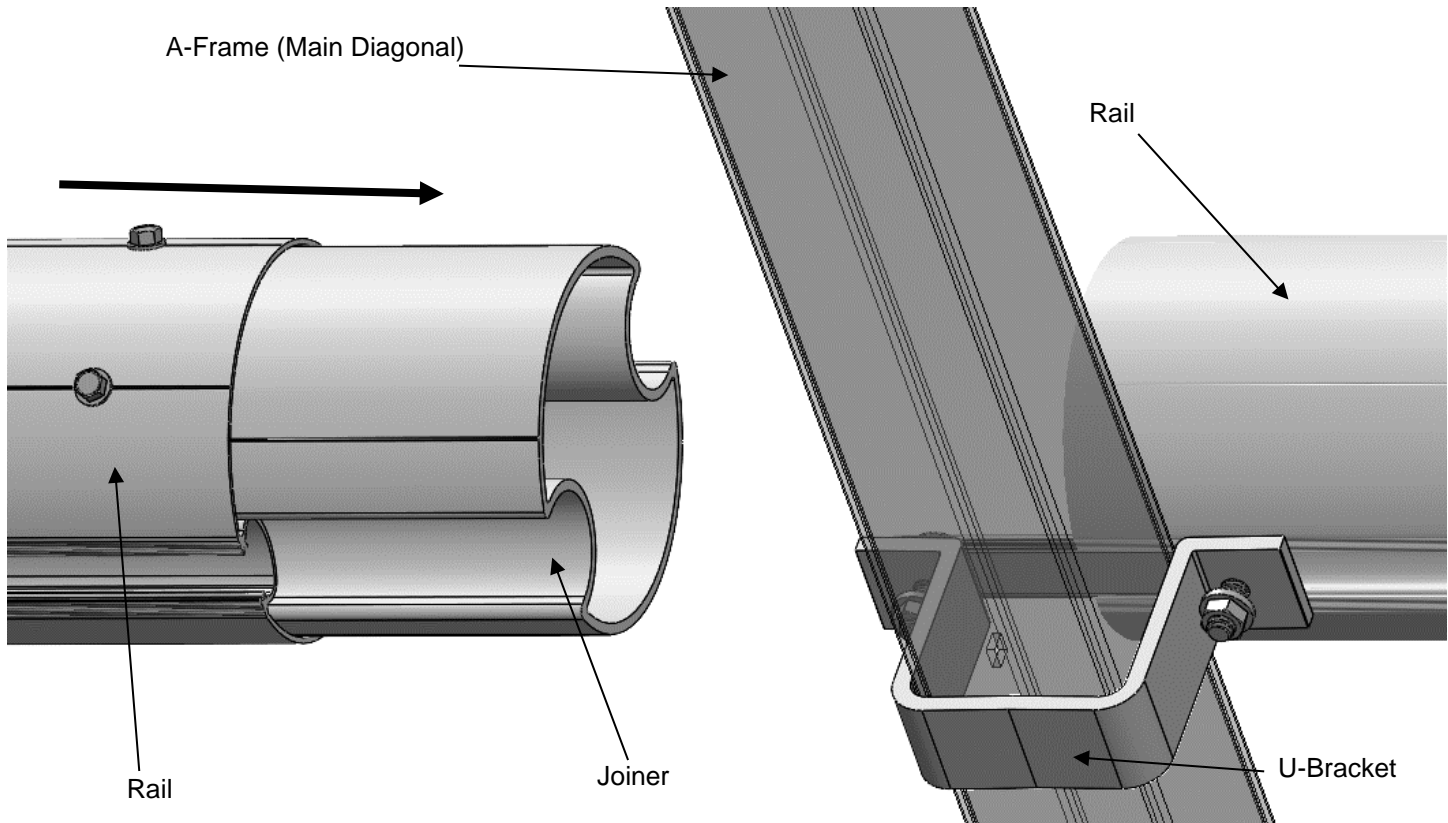


Figure 15: Rail/Joiner and Rail Assembly

Ensuring the U-Brackets-rail assemblies are resting against the datum pins, torque all the 3/8" flange nuts of the U-Bracket assemblies to 20 ft lbs (See Appendix 3).

Install two more 1/4" Self-Drilling Screws in the first rail on the same side as the second rail in the same way as in step 'i' (Figure 16). Install the 2 remaining 1/4" Self-Drilling Screws on each of the rails (4 screws in total) on the opposite side. Do not overtighten the final 4 screws, as this might deform the rail. Tighten it to the point where the screw head just makes contact with the rail. If the rail gets deformed accidentally loosen screw to the point where the underside of the screwhead just makes contact with the rail. Repeat step 'i' if there are more rails in the run.



Figure 16: Cross-Section of the Rail and Joiner Assembly

- j. Repeat the steps 'b', 'c', 'e', and 'f'-i' for the other three rails runs (1 rail run below the datum rail run and 2 rail runs above the datum rail run). The second rail run (datum rail run) can be used as a support the upper rail runs during assembly (Figure 17).

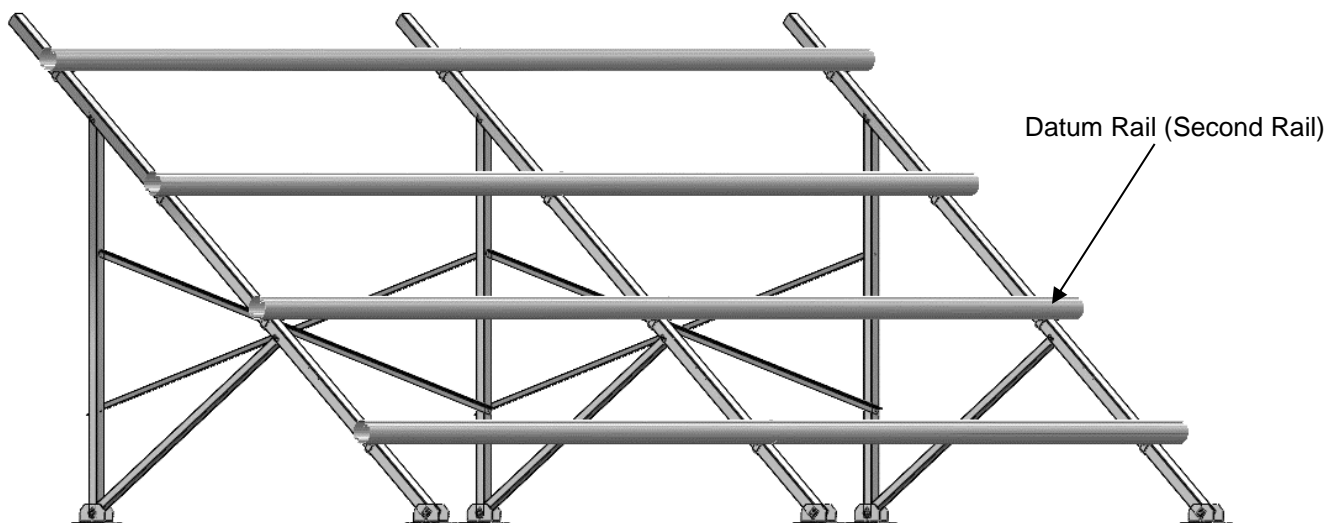


Figure 17: Rail Runs

The distances between rails will be governed by the module manufacturer's guidelines. Approximately, the vertical distance between rails is 50% of the module length. There is a 0.5" gap between the upper and the lower module. Ensure that the measurements are taken from the same point on every rail as shown in Figure 18.

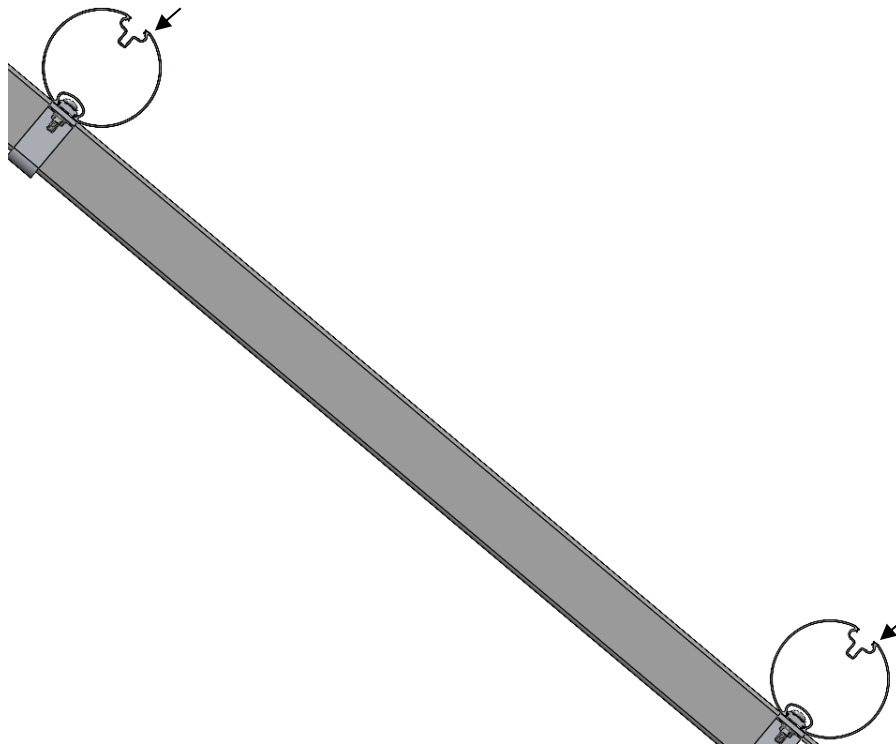


Figure 18: Measuring Distances between Rails

### ***Step 5: Mount Modules***

- a. Start on one end of the rail while mounting modules. The rail length can be calculated by the following formula:

Rail length for each run = Total Width of Modules + Mid-Clamp

Rail length for each run = Width of the panel + 0.5" x (Number of Panels-1)

The modules need to be centered by comparing the calculated length and the physical length of the rails. Refer to Appendix 4 for an example. Position the module on the rails and ensure that it is square before continuing, as this will affect the squareness of the array.

- b. Insert the K-Nut of the End-Clamp assembly into the top channel of the rail using steps i-vi.

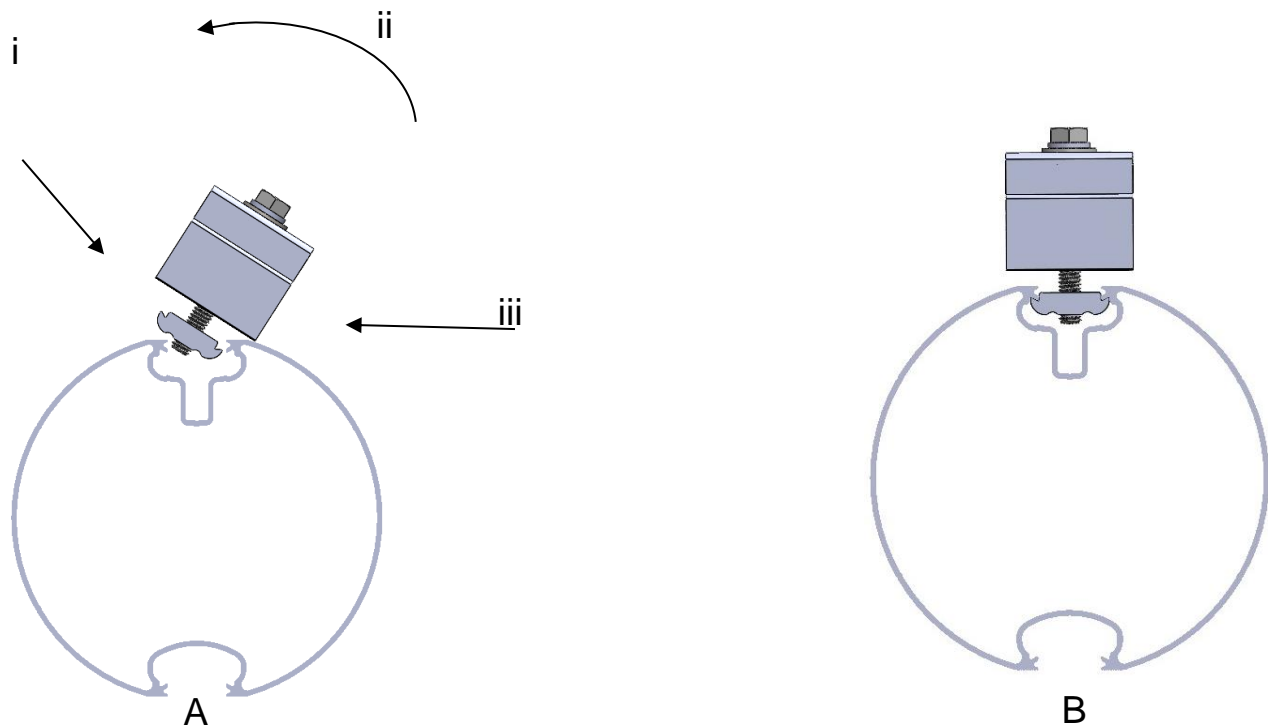


Figure 19: Inserting K-Nut into Bifacial Rail (End Clamp Shown)

- i. At a 30° angle insert the end-clamp assembly with the end-clamp held at the top of the bolt. Ensure that the K-Nut is positioned at the lowest point on the bolt so that there is clearance to pivot the clamp into an upright position.



- ii. Rotate into position so that the entirety of the K-Nut is inside the top channel of the rail.
- iii. Drop into place. The inserted component should easily slide back and forth in the channel see Figure 19 B and Figure 20.

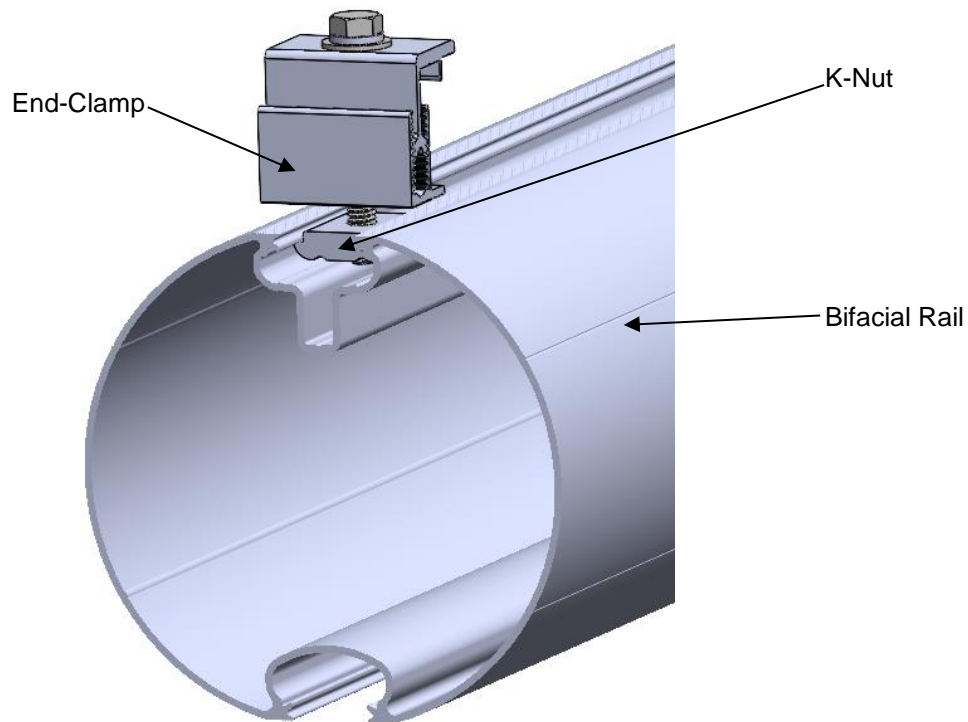


Figure 20: End-Clamp and Bifacial Rail

- iv. Make sure that the end clamp is set to the correct size for the module you are using.
- v. The end clamp should touch both the rail and the top of the module at the same time.
- vi. If it is the correct height hand-tighten the bolt if not, then disassemble, readjust to appropriate height and reassemble.



Repeat steps i-vi for all end-clamps and steps i-iii for all mid-clamps. See Figure 21 for End Clamp and Mid Clamp locations.

- c. Tighten Mid and End-Clamps to hold the module in place - do not fully torque
- d. Repeat steps a-c as required for the remaining modules.
- e. Torque all mid-clamps and end-clamps to 12 ft-lbs (16.3 N-m).

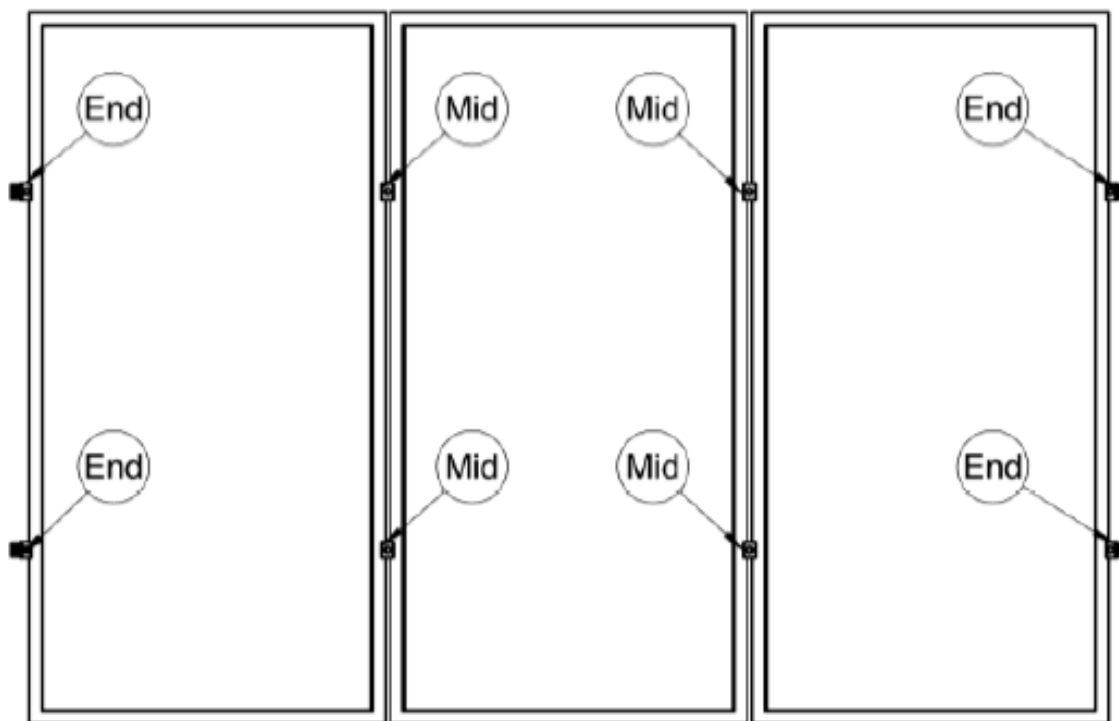


Figure 21: End-Clamp and Mid-Clamp Locations

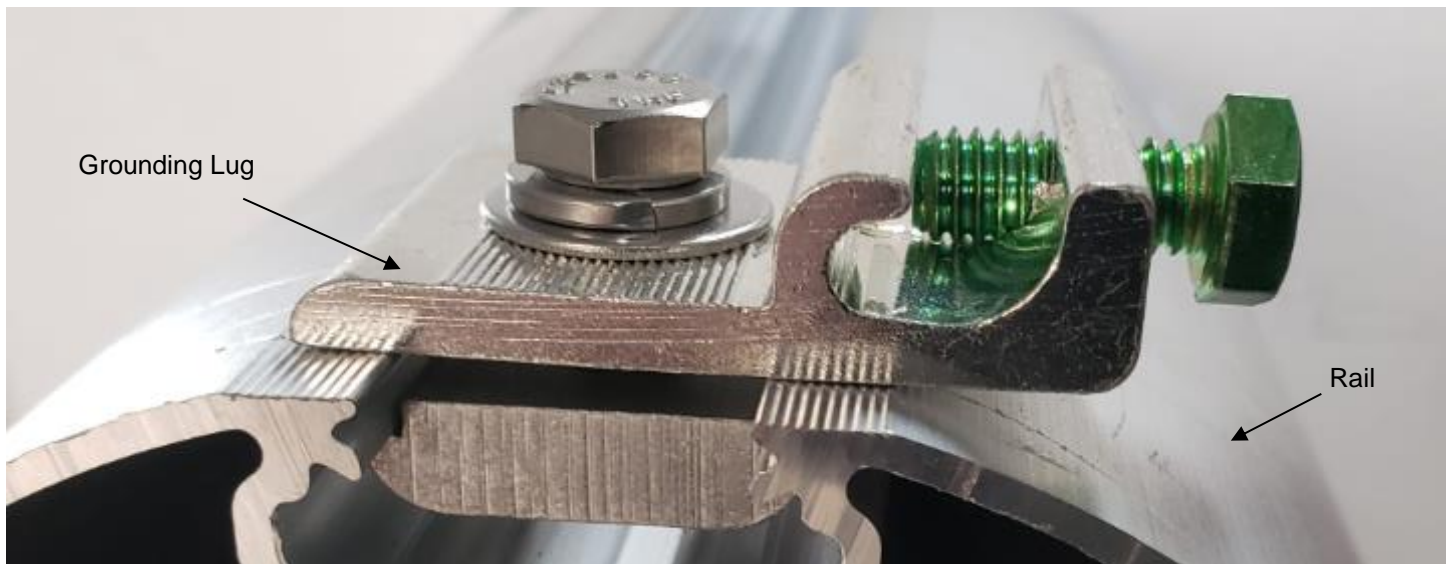
## ***Required Maintenance***

At 6 months and 12 months after installation and at least once yearly afterward, check to ensure that all bolts remain at the proper torque setting.

## ***Appendix 1 – Grounding Guidelines***

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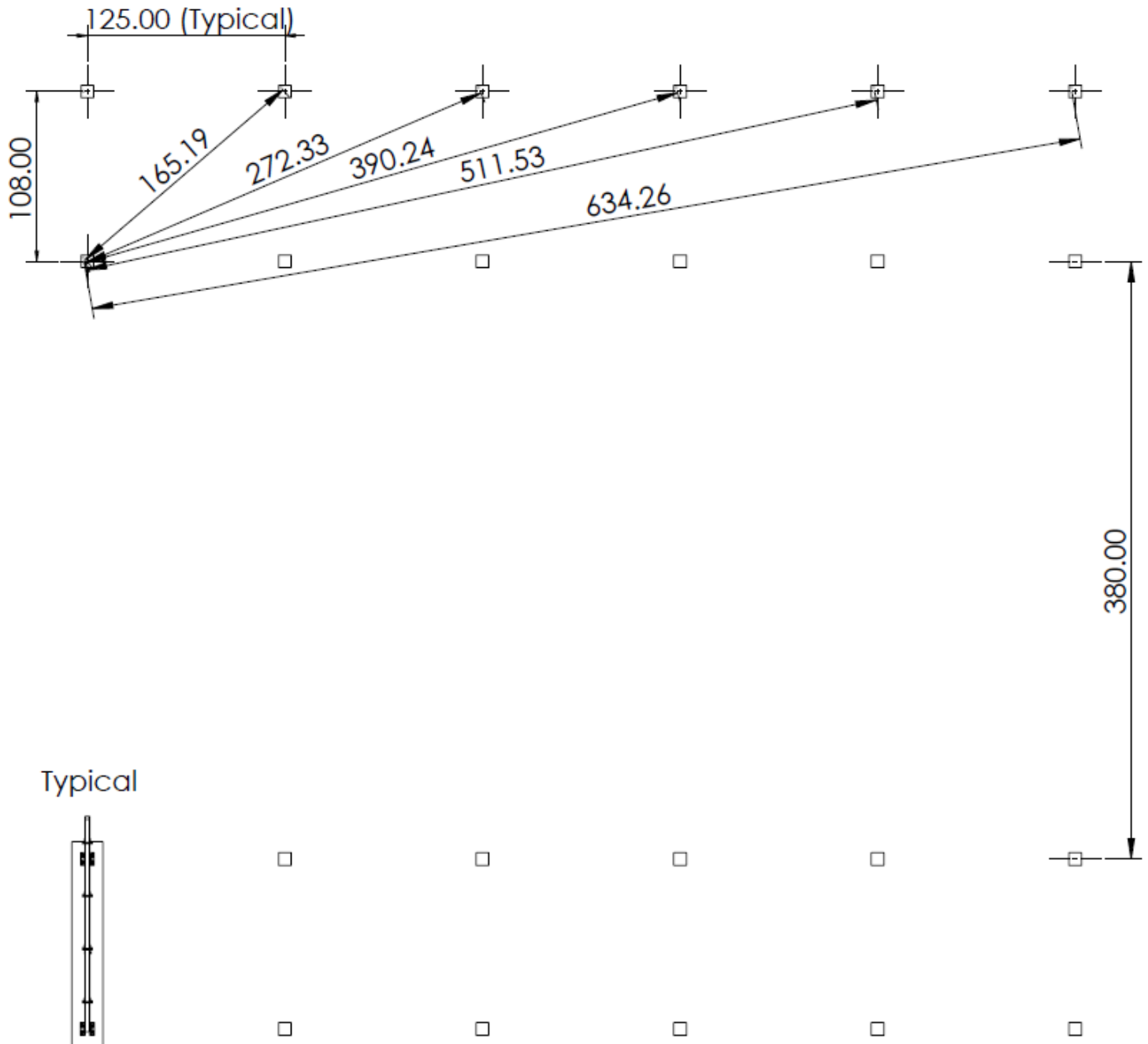
The Kinetic Grounding Lug comes with grounding lug, Kinetic-nut, 5/16" Hex bolt, flat-washer, lock washer and one green grounding hex bolt. Grounding can be achieved using a Kinetic Grounding Lug attached to a Bifacial Rail. One grounding lug is required per array.



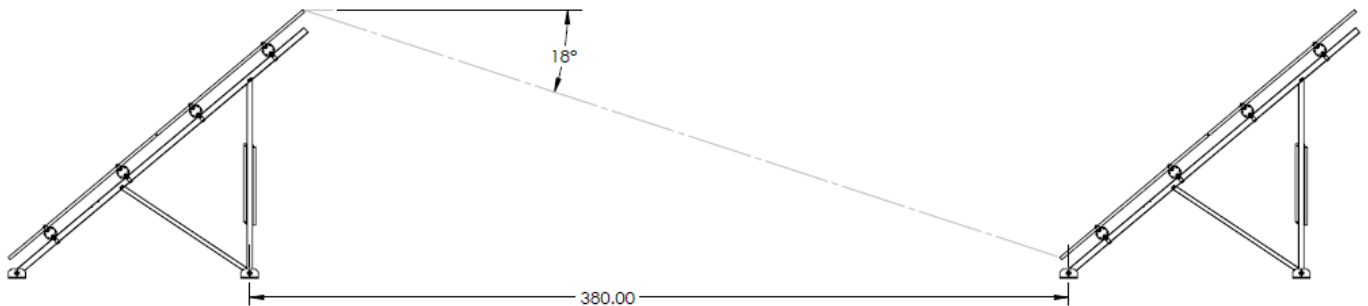
## Appendix 2 – Spacing Guidelines

All Dimensions are in inches. Not to Scale.

The squares represent foot locations.



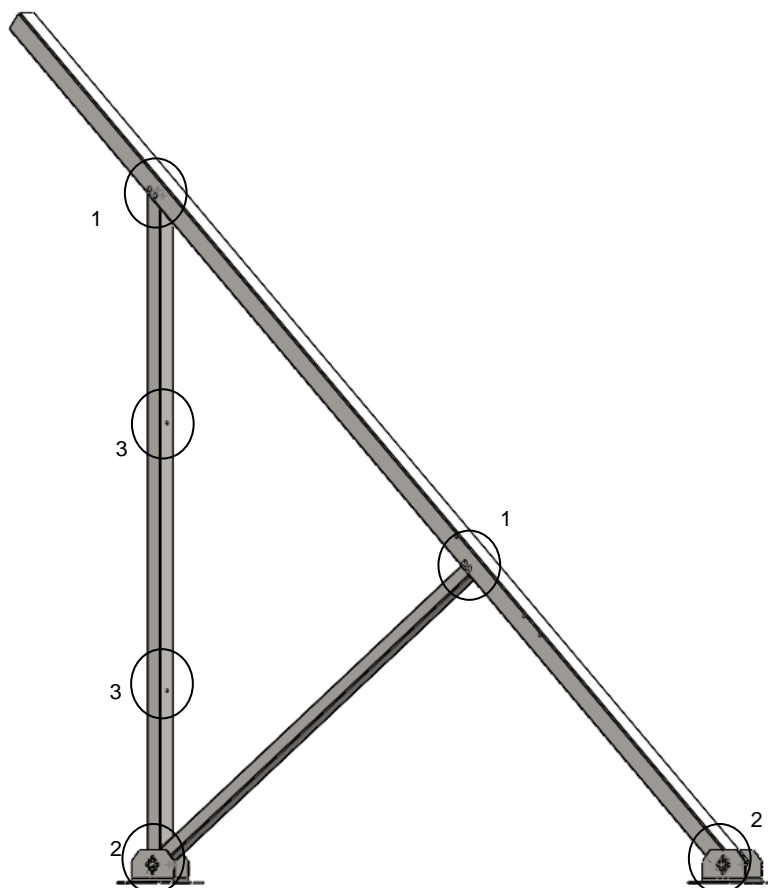
Based on an  $18^\circ$  back angle, the interrow spacing is a minimum of 380". The optimal spacing will vary from site to site.



Not to Scale.

All Dimensions are in inches.

## Appendix 3 – Torque Chart



Location	Bolt Size	Torque
#1	3/8"	20 ft-lbs
#2	1/2"	50 ft-lbs
#3	5/16"	12 ft-lbs

## Appendix 4: Module Placement

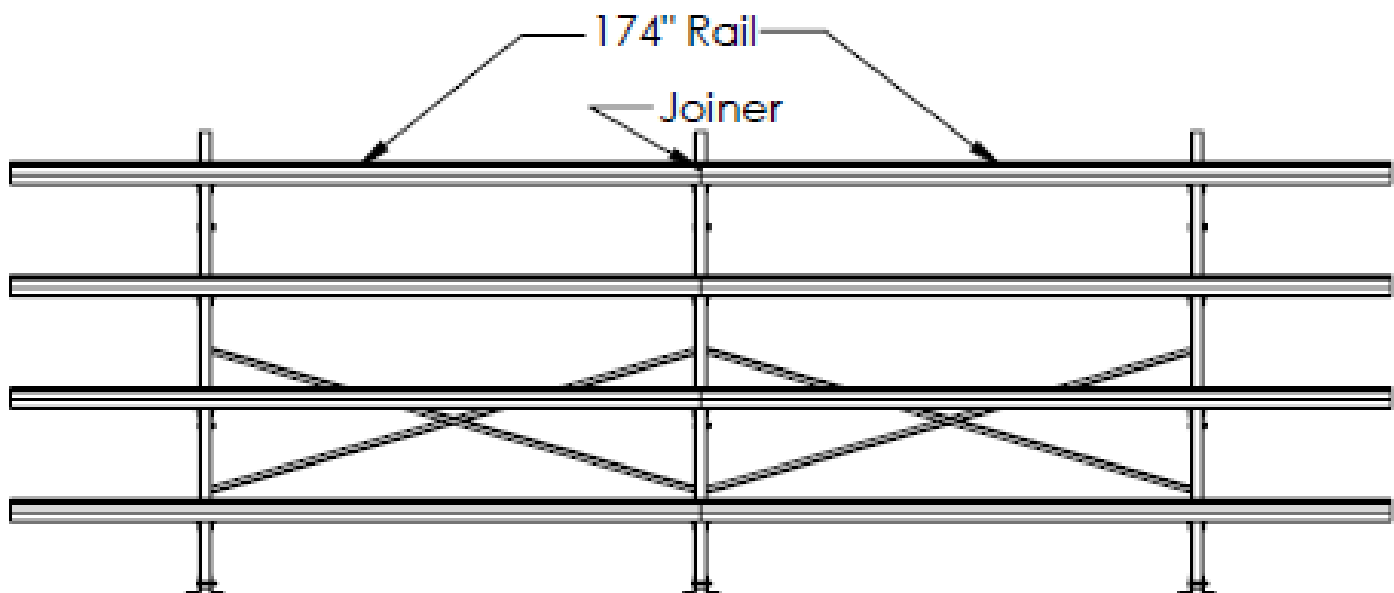
Rail length for each run = Total Width of Modules + Mid-Clamp

$$= \text{Total Width of Modules} + 0.5'' \times (\text{Number of Panels}-1)$$

In mm,

$$\text{Rail length for each run} = \text{Total Width of Modules} + 12.7 \text{ mm} \times (\text{Number of Panels}-1)$$

Example: 16 Module System (8 wide and 2 high).



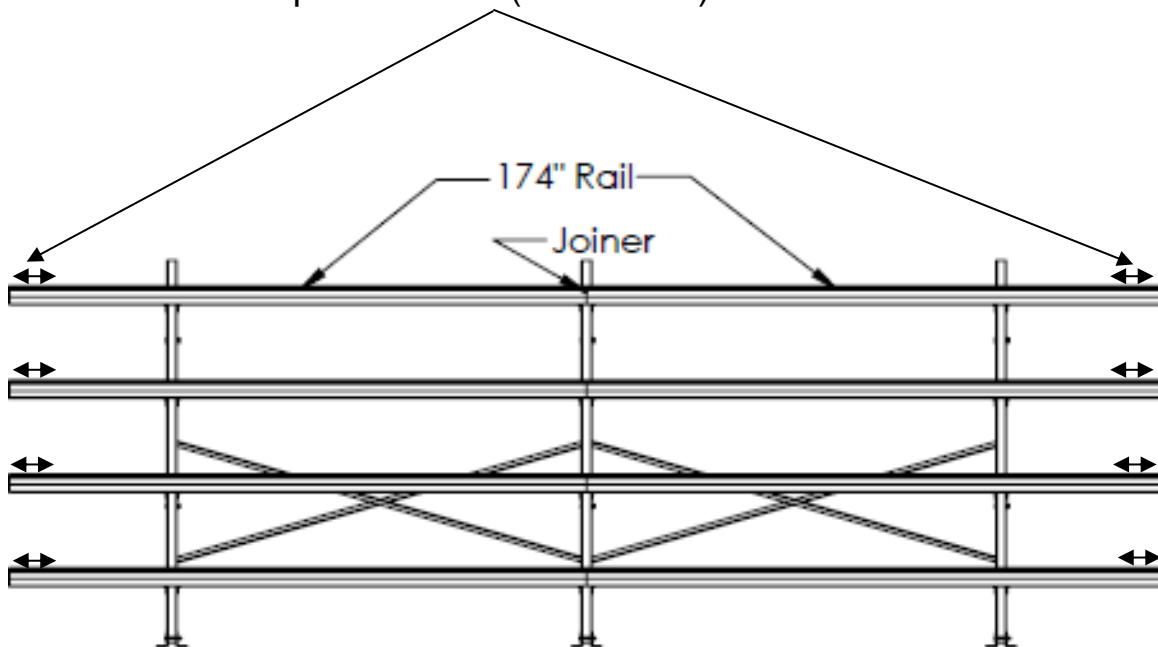
Example Module: 2300mm (90.55") x 1032mm (40.63")

Rail length for each run =  $40.63" \times 8 + 0.5" \times 7 = 328.54"$  (8344.92 mm)

Actual Rail Length for each Run =  $174" \times 2 = 348"$  (8839.2 mm)

Offset from ends =  $(348" - 328.54") / 2 = 9.73"$  (247.14mm)

The modules need to be placed 9.73" (247.14mm) from the end of the rails.



## Calculations:

Rail length for each run = Total Width of Modules + 0.5" x (Number of Panels-1)

Rail length for each run =      x      + 0.5x (      -1) =

Actual Rail Length for each Run = (      x      ) + (      x      ) + (      x      )      =

Offset from ends = (Actual Rail Length for each Run - Rail length for each run)/2

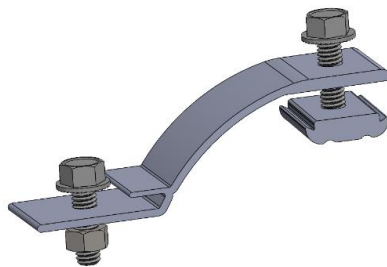
Offset from ends = (      -      )/2 =



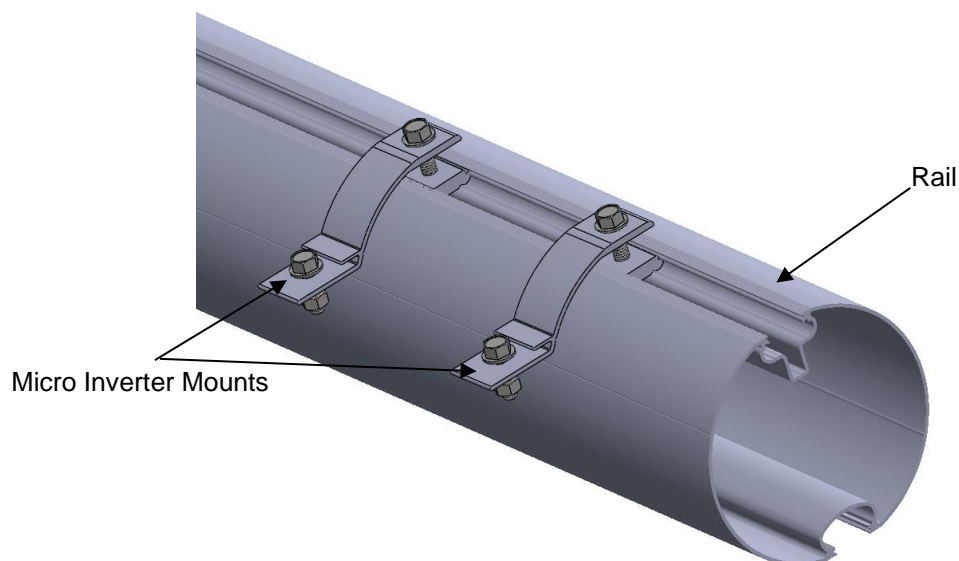
## Appendix 5: Installing Optional Accessories

### Micro-Inverter Mount for Bifacial Rail

The micro-inverter mount assembly consists of the aluminum extrusion, two 5/16" flanged bolts, a K-Nut and a 5/16" Hex Nut. A pictorial representation of the assembly is shown below.

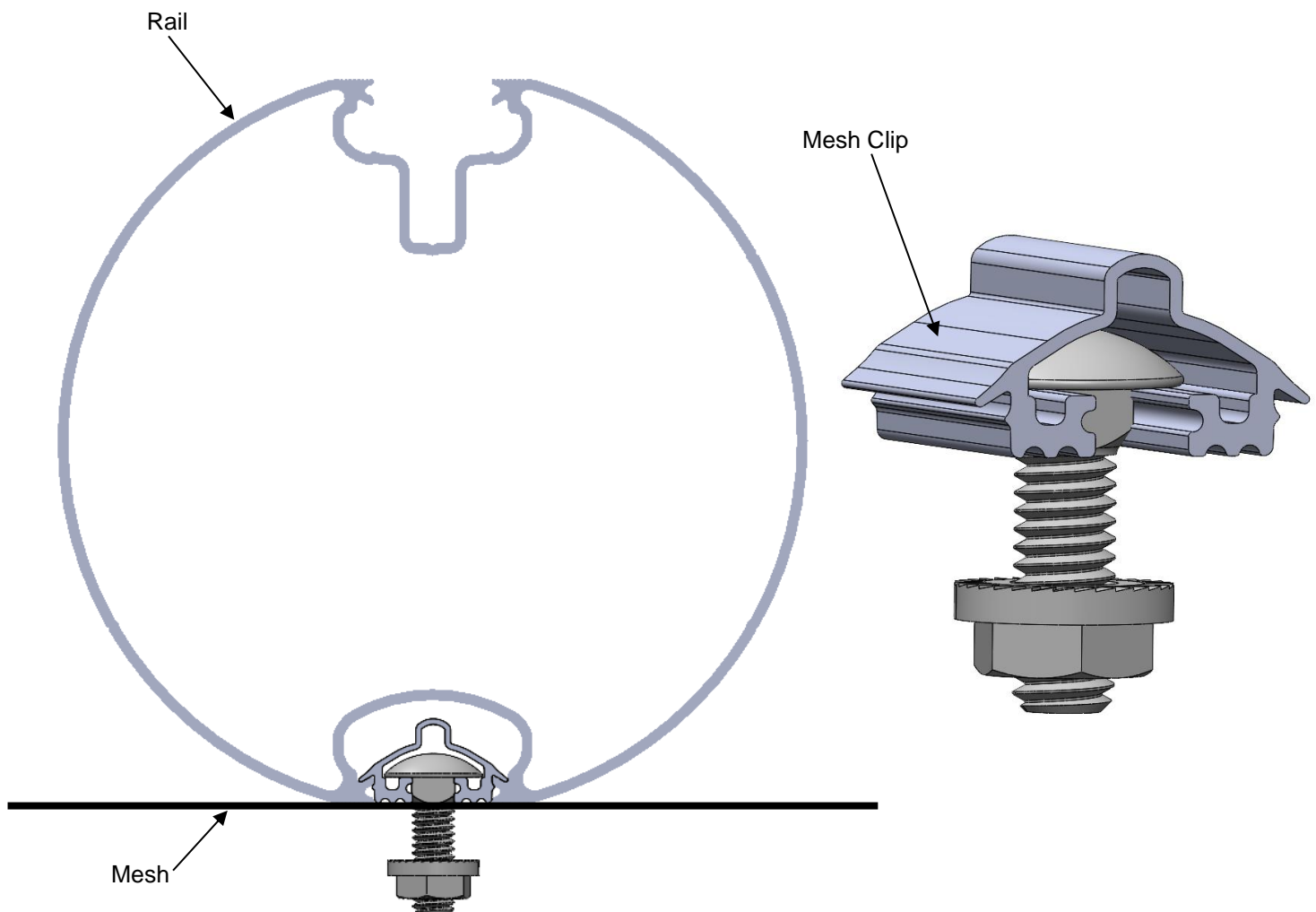


Insert the K-Nut into the rail. Attach the micro-inverter/optimizer with the 5/16" flanged bolts and nuts. One or two mounts may be required depending on the type of micro-inverter/optimizer being used.



## Mesh Clip for Bifacial Rail

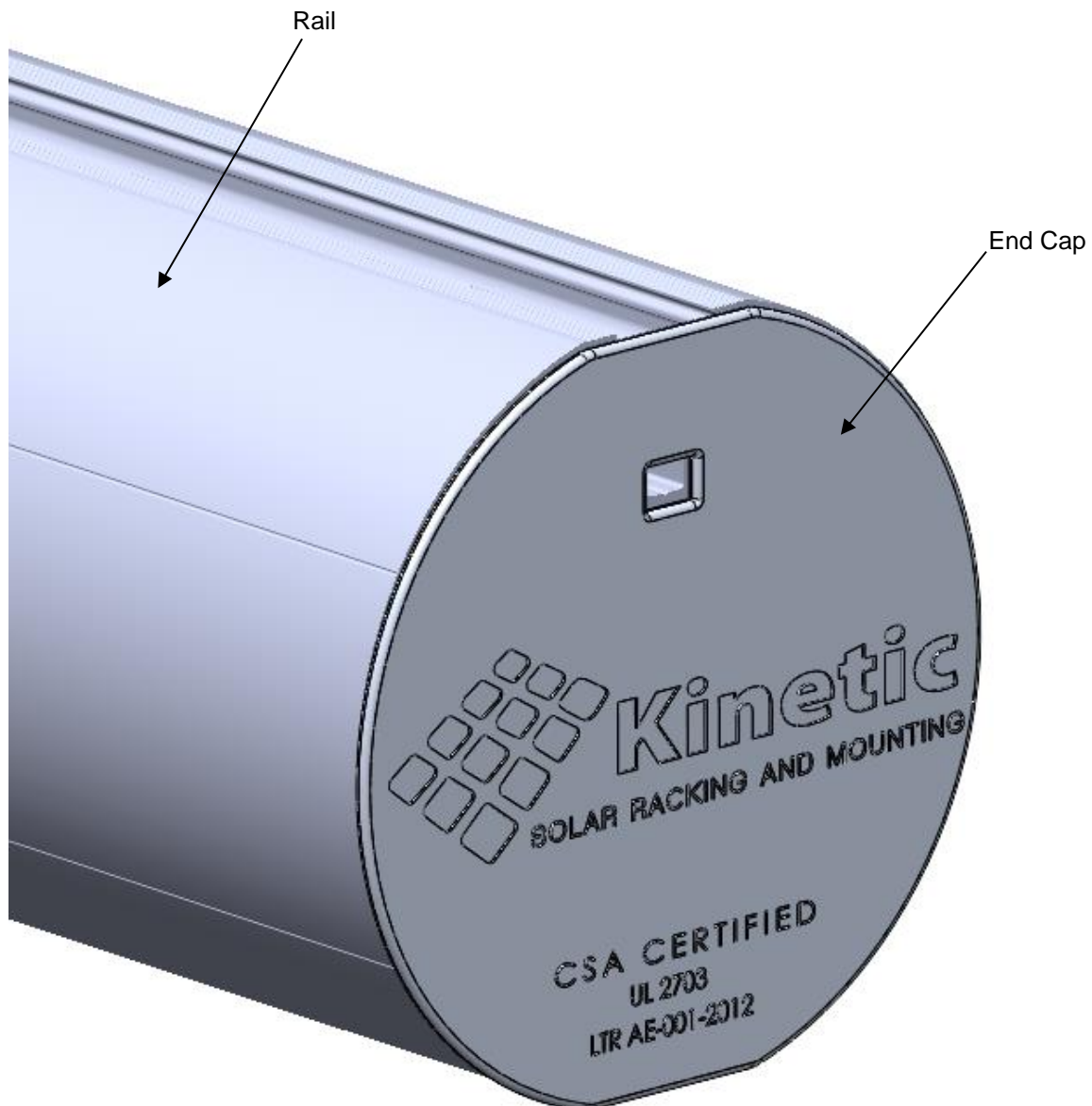
The Mesh Clip consists of the aluminum extrusion, 5/16" carriage bolt and a serrated nut. It is used to attach rodent guard mesh to the underside of bifacial rails.

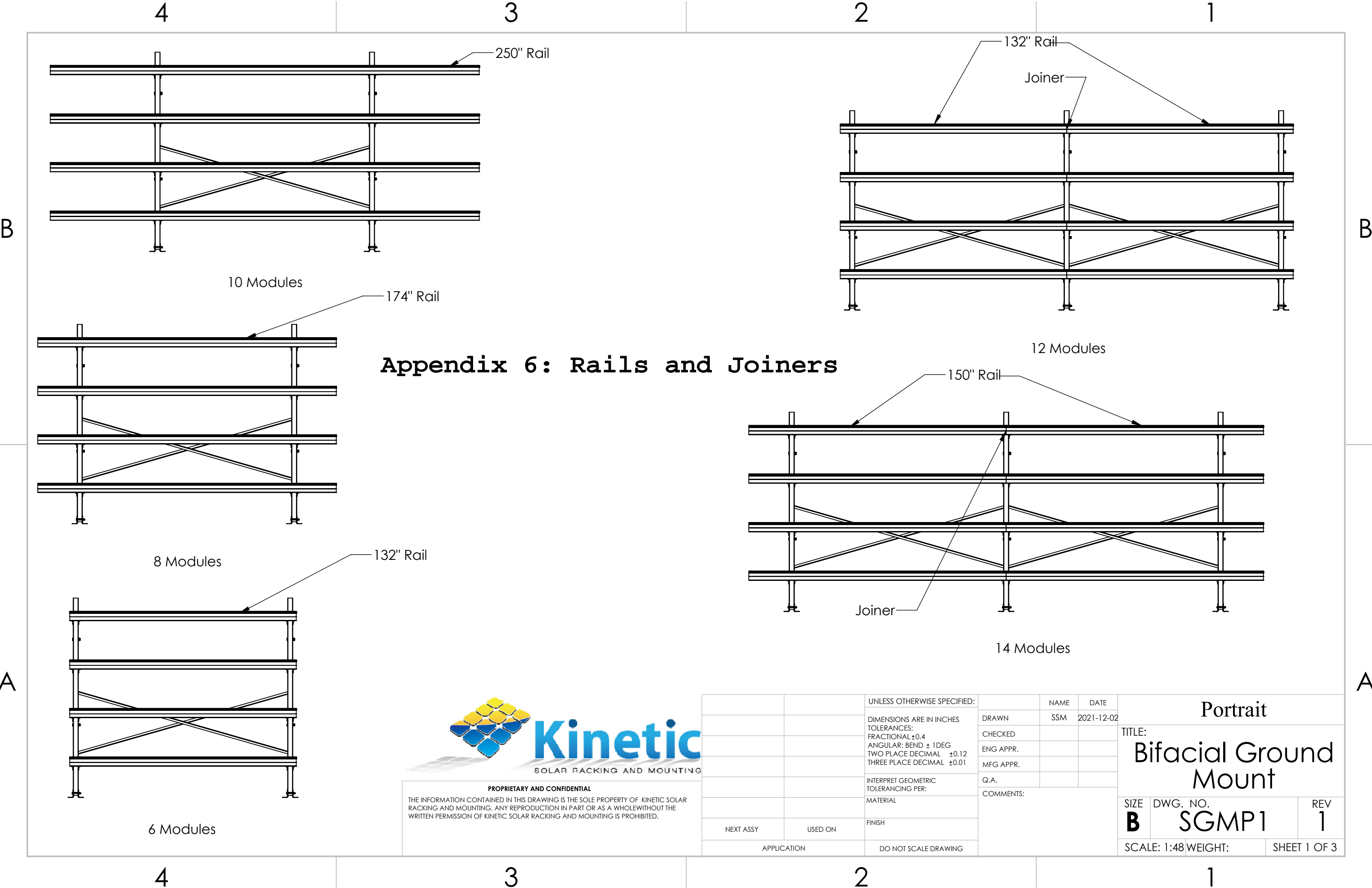


Insert the clip into the channel of the rail. To attach the rodent mesh, simply remove the serrated nut from the carriage bolt, lay the mesh on the underside of rail, ensure that the carriage bolt protrudes through the appropriate square and then tighten the nut.

## End Cap for Bifacial Rail

The End Cap provides a clean finish look and helps prevent rodents from nesting inside the rail. The cap locks on to the end of the bifacial rail.





**PROPRIETARY AND CONFIDENTIAL**

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF KINETIC SOLAR RACKING AND MOUNTING. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF KINETIC SOLAR RACKING AND MOUNTING IS PROHIBITED.

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	Portrait		
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ±0.4 ANGULAR: BEND ± 1DEG TWO PLACE DECIMAL ±0.12 THREE PLACE DECIMAL ±0.01	DRAWN	SSM	2021-12-02	TITLE:  Bifacial Ground Mount		
			CHECKED					
			ENG APPR.					
			MFG APPR.					
			Q.A.					
		INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:			SIZE DWG. NO. REV  B SGMP1 1		
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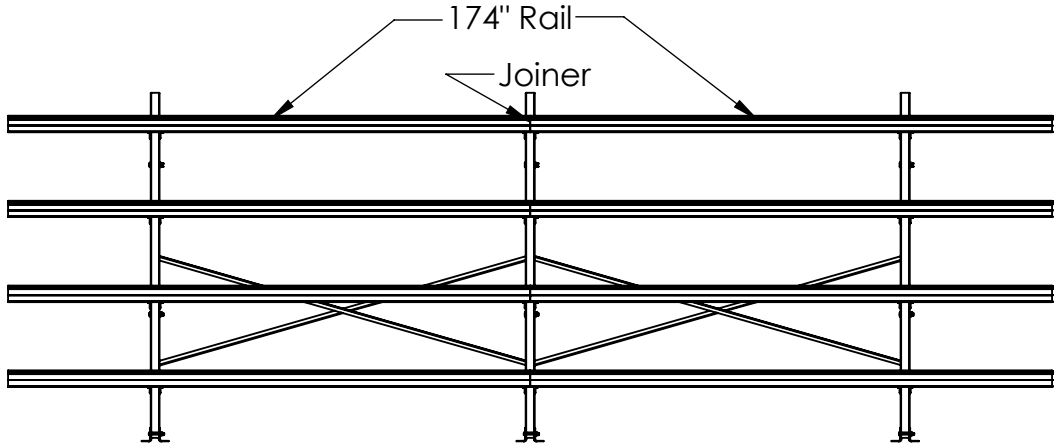
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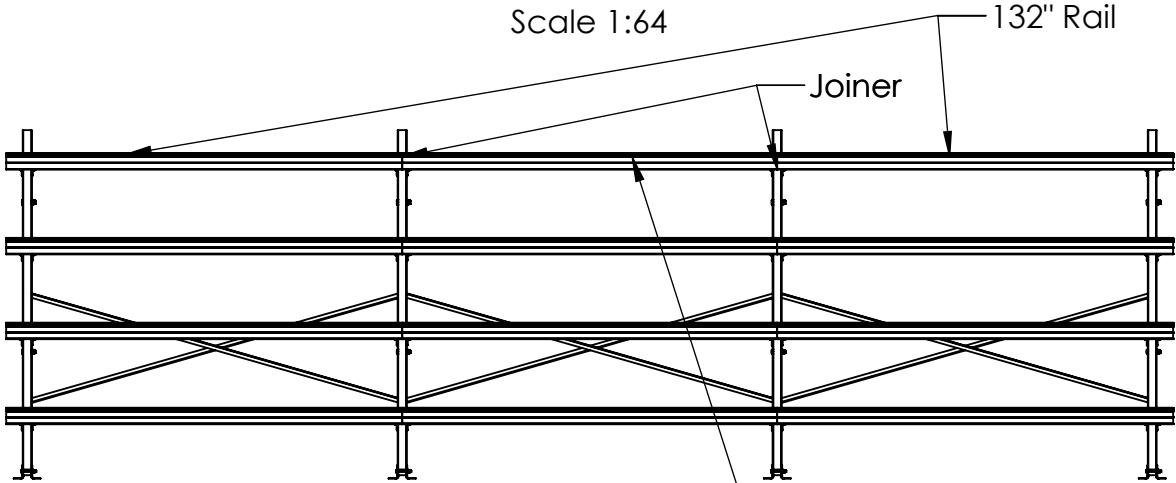
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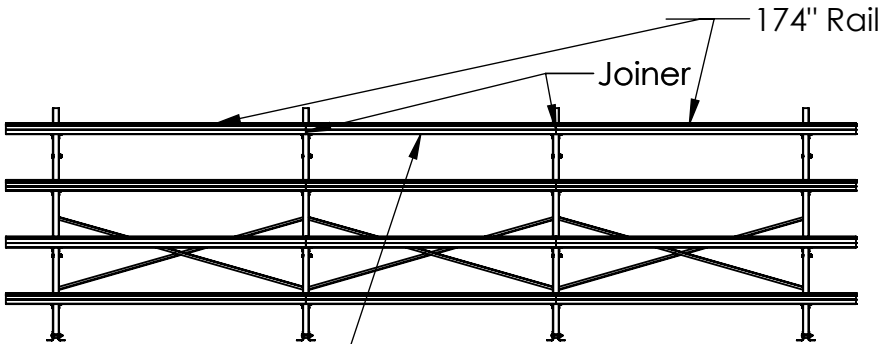
B



16 Modules  
Scale 1:64



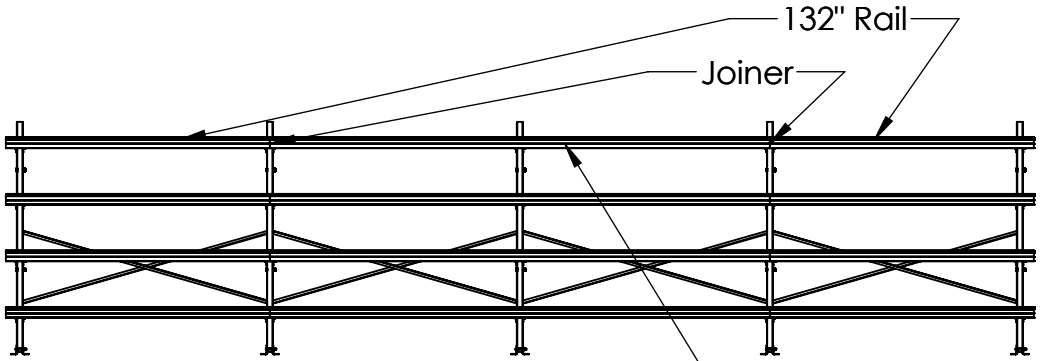
18 Modules  
Scale 1:64



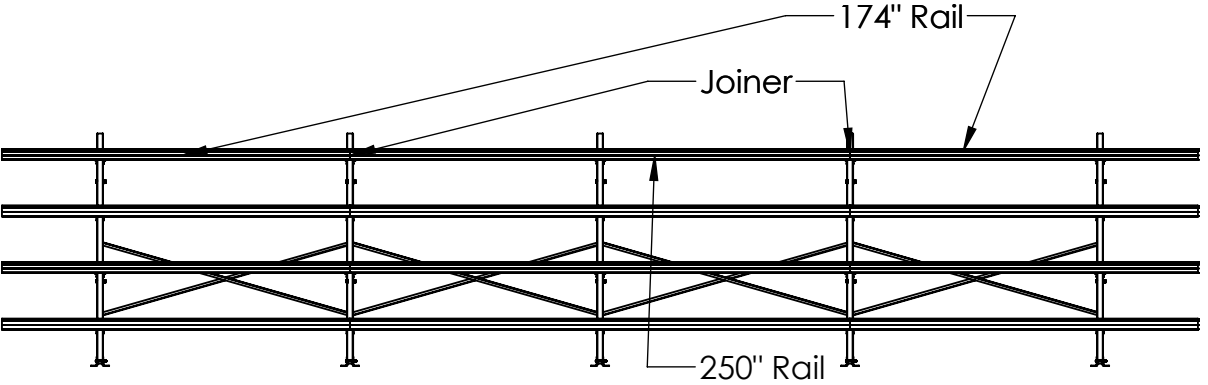
22 Modules  
Scale 1:96

A

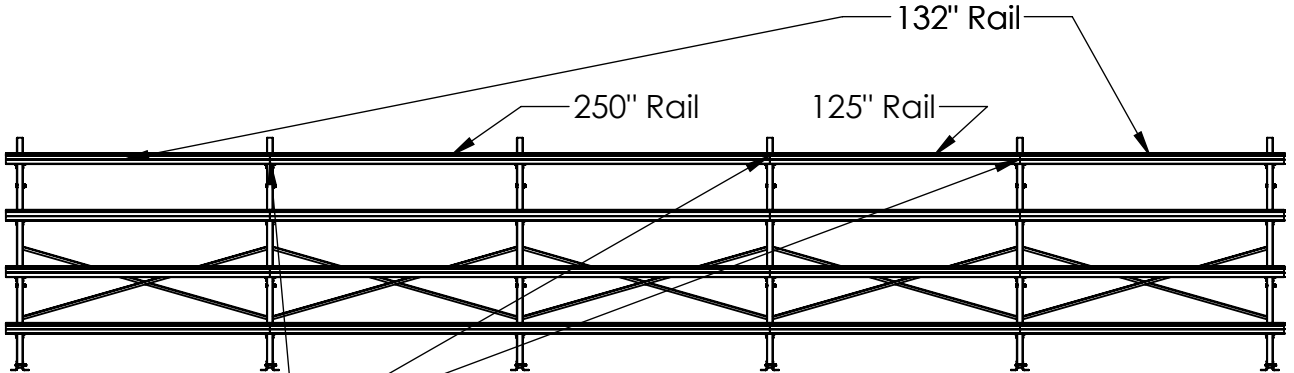
A



24 Modules  
Scale 1:96



28 Modules  
Scale 1:96



30 Modules  
Scale 1:96



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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE	Portrait			
		DIMENSIONS ARE IN INCHES	DRAWN	SSM				2021-12-02
		TOLERANCES:	CHECKED					
		FRACTIONAL ±0.4	ENG APPR.					
		ANGULAR: BEND ± 1DEG	MFG APPR.			TITLE: Bifacial Ground Mount		
		TWO PLACE DECIMAL ±0.12	Q.A.					
		THREE PLACE DECIMAL ±0.01	COMMENTS:					
		INTERPRET GEOMETRIC TOLERANCING PER:						
		MATERIAL				SIZE	DWG. NO.	REV
NEXT ASSY	USED ON	FINISH				B	SGMP2	1
APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:64, 1:96		
						WEIGHT:		SHEET 2 OF 3

4

3

2

1

4

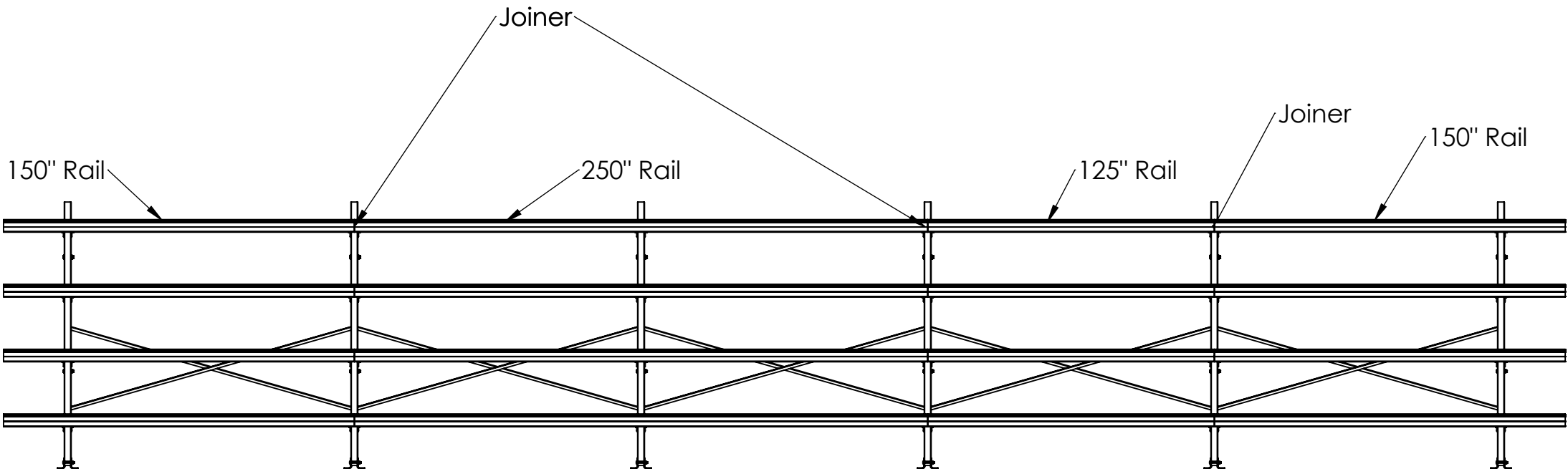
3

2

1

B

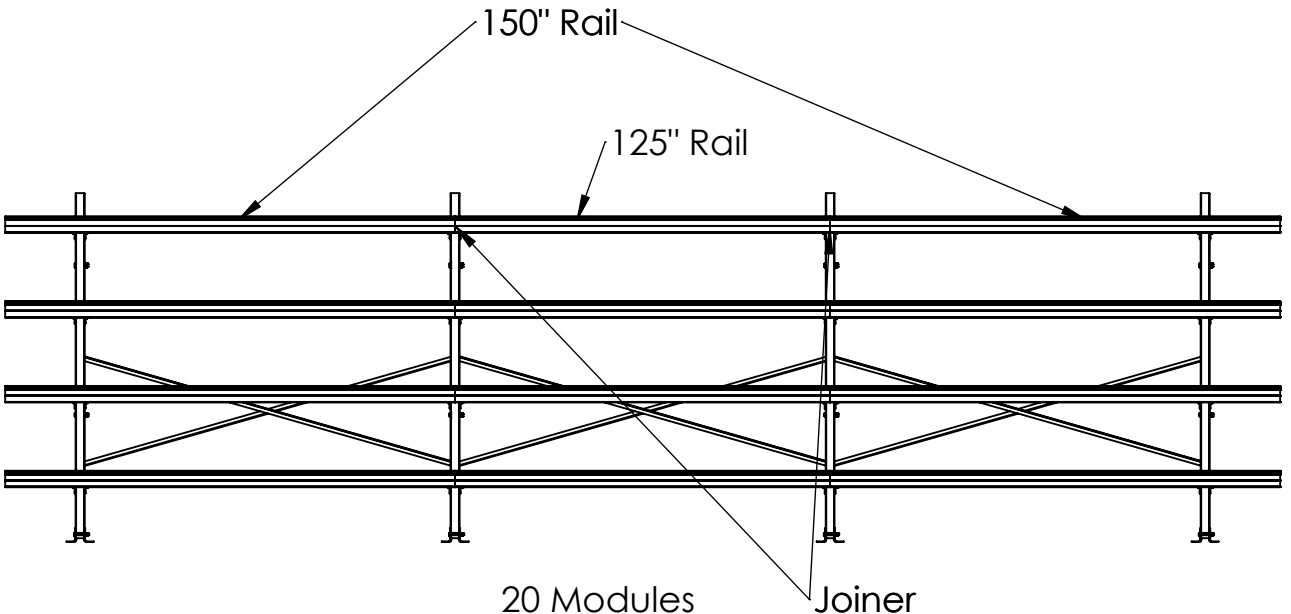
B



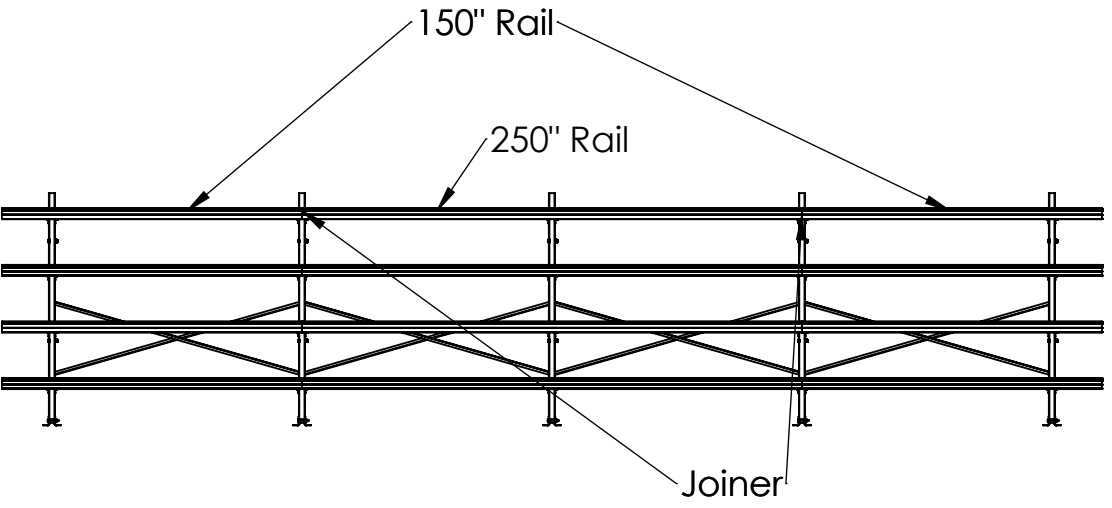
32 Modules

A


A



20 Modules



26 Modules



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		UNLESS OTHERWISE SPECIFIED:  DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 0.4$ ANGULAR: BEND $\pm 1$ DEG TWO PLACE DECIMAL $\pm 0.12$ THREE PLACE DECIMAL $\pm 0.01$  INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL  FINISH		NAME	DATE	Portrait	
			DRAWN	SSM	2022-04-27	TITLE: Bifacial Ground Mount	
			CHECKED				
			ENG APPR.				
			MFG APPR.				
			Q.A.			COMMENTS:	
NEXT ASSY	USED ON						
APPLICATION		DO NOT SCALE DRAWING				SIZE <b>B</b>	DWG. NO. SGMP3
						1:60	WEIGHT:
						SHEET 3 OF 3	

4

3

2

1