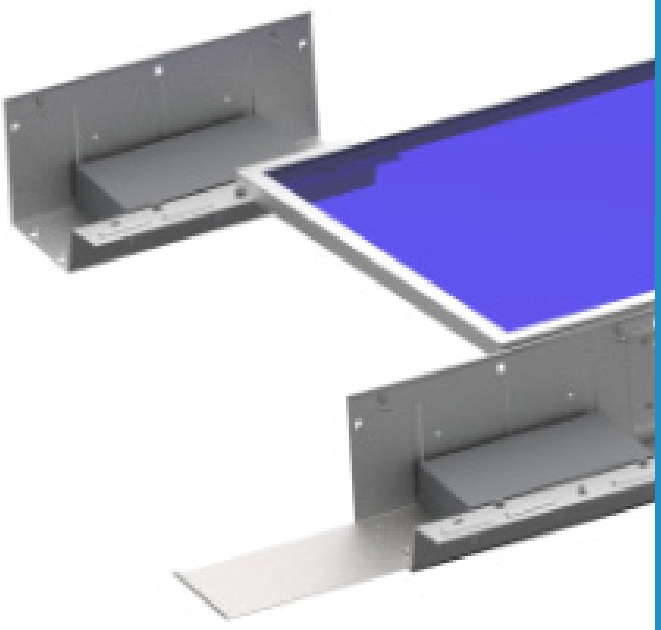
PRB

Flush Mount Racking System



Installation Manual

Released 5th April 2015

POLAR RACKING

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1. INTRODUCTION

1.1 PRODUCT OVERVIEW

As the most economical, functional, and easy to install system for flat roofs, the PRB Ballasted Flat Roof Solution has been designed for flat roof applications. This robust, versatile, long-life, and weather resistant mounting system accommodates both 60 and 72 cell modules with integrated bonding.

SIMPLE INSTALLATION

All sub-components (2) are sized and preassembled for the particular module type and tilt angle to be installed. Racking assembly and module installation have been carefully designed such that only one type of tool and one type of fastener is required, with all connections being visually and mechanically accessible.

SERVICE LIFE WARRANTY

Polar Racking provides a limited product warranty of 10 years for the service life of all PRB racking materials.

DURABILITY

The PRB system provides unmatched longevity and structural/material integrity and is fully comprised of aluminum and stainless-steel components. All components are corrosion-resistant and completely recyclable.

SAFETY

If a building permit is required, Polar Racking will design the PRB system according to an auditable assessment of the statics on request.

1.2 ABOUT THIS MANUAL

SUBJECT

This manual details the installation and assembly of the PRB ballasted rooftop PV mounting system.

TARGET AUDIENCE

This manual is intended for qualified personnel with a working knowledge of mechanics, hand tools and one who possesses mechanical skills.

1.3 PRODUCT LIABILITY

The technical documentation is part of the product. Polar Racking is not liable for damages resulting from failing to comply with the installation instructions, particularly the safety instructions, the ballast layouts, sealed by licensed professional engineer, as well as any and all misuse of the product.

1.4 STANDARDS COMPLIANCE

The PRB Ballasted flat Roof Solution is 100% OPA Compliant and is tested in accordance with the Ontario Building Code, the ASCE 7-05 [ASCE 7-10].

1.5 PRODUCT CARE AND MAINTENANCE

Maintenance Period

The maintenance work described below must be performed once every year from the date of installation.

Maintenance Requirement

- Inspect all fasteners and component connections once per year; i.e. excessive bend in racks and wind deflector deformation. If damage is observed on any PRB components, it must be replaced.
- Check specified torque on all M8 Hardware (Rack and Wind Deflector) and retighten if required while ensuring that the solar modules are seated correctly.
- Any other installed equipment/system not provided by Polar Racking, that interfaces with the PRB Racking System is the responsibility of others.

2. SAFETY CONSIDERATIONS

2.1 BASIC SAFETY CONSIDERATIONS

The following basic safety instructions and the warning notes are an essential part of this manual and are of fundamental importance for handling the product.

2.2 WARNINGS

Throughout this manual you will notice several warning notes which consist of:

- Warning Symbols
- Indicator Word to dictate the danger Level
- Information regarding the source and type of the danger
- Information about possible consequences if the hazard is not observed
- Measures for avoiding the hazard, and ways to prevent injuries or property damages

DANGER

Denotes a major risk. Failure to observe may lead to serious injury or death.

WARNING

Denotes a potentially dangerous situation. Failure to observe may lead to moderate to severe injury and/or property damage.

CAUTION

Denotes a potential hazard which may lead to physical injury and/or property damage.

2.3 RESPONSIBILITIES OF THE INSTALLER

It is the responsibility of the installer to ensure all applicable safety measures are strictly adhered to while installing this PV Racking system. Any modifications are to be performed only by authorized personnel and must be approved by Polar Racking prior to implementation. The installer must have adequate skill and knowledge with any materials and tools used to install this system. Furthermore, the installer must be able to recognize any possible dangers, whether they are stated in this manual or not. Every person installing this system must read, and fully understand, every section of this manual prior to working on the system.

IMPORTANT NOTE: Due to the inherent properties of mating stainless steel components, please ensure the limiting speed of cordless drivers (RPM) is set to the lowest setting (torque, vs. drill setting), for the fastening of all provided M8 Nuts. All fasteners provided by Polar Racking have been pre-treated to prevent material Galling (or cold welding), however, this is highly dependent upon the speed at which they are fastened.

2.4 RESPONSIBILITIES OF THE OPERATOR

It is the responsibility of the operator to ensure all scheduled maintenance is performed on time. He/She must ensure that the installation of the system is performed only by qualified personnel with adequate skill and knowledge who is able to meet the responsibilities listed in Chapter 2.3. The operator must ensure a copy of this manual is available to any installer and/or maintenance person as it is part of the system. Are placement manual may be obtained by contacting Polar Racking using the contact information provided on the back of this manual, and/or downloading and printing copy from the company website, at www.polarracking.com.

3. PREPARATION

3.1 ROOFING SYSTEMS

The PRB system is compatible with virtually all roofing systems and membranes. It is the responsibility of the developer, owner and/ or system installer to ensure that the holder of the roof warranty is aware of the solar installation using the specified PRB system, and will continue to honour its warranty. It is the responsibility of the developer, owner, and/or installer to verify that the rubber substrate that is ordered with the Polar Racking system is compatible with the host roofing system.

3.2 TOOLS AND MATERIALS

- The following tools and materials are required for installation :
- Chalk line
- Tape Measure
- PRB Installation Jig (supplied by Polar Racking)
- Cordless Driver with 13mm Deep Socket
- Torque Wrench (range of 2 ft.lbs - 25 ft. lbs.)
- Ballast Stones

3.3 SITE PREPARATION

- Prior to commencing installation of the PRB system ensure the following :
- All safety preparations have been made in compliance with local regulations,
- All required tools and materials are available for the installation,
- All loose debris and any potential safety hazards have been removed from the roof,
- All installers have copies of the construction drawings and this installation manual.

4. INSTALLATION INSTRUCTIONS

4.1 OVERVIEW OF SYSTEM COMPONENTS

1. Panel
2. Front Rack
3. Ballast Stone
4. Front Rack Substrate
5. PRB Rack Assembly
6. PRB Assembly Substrate
7. Wind Deflector
8. Ballast Extension Tray
9. PRB Clip
10. Fastener

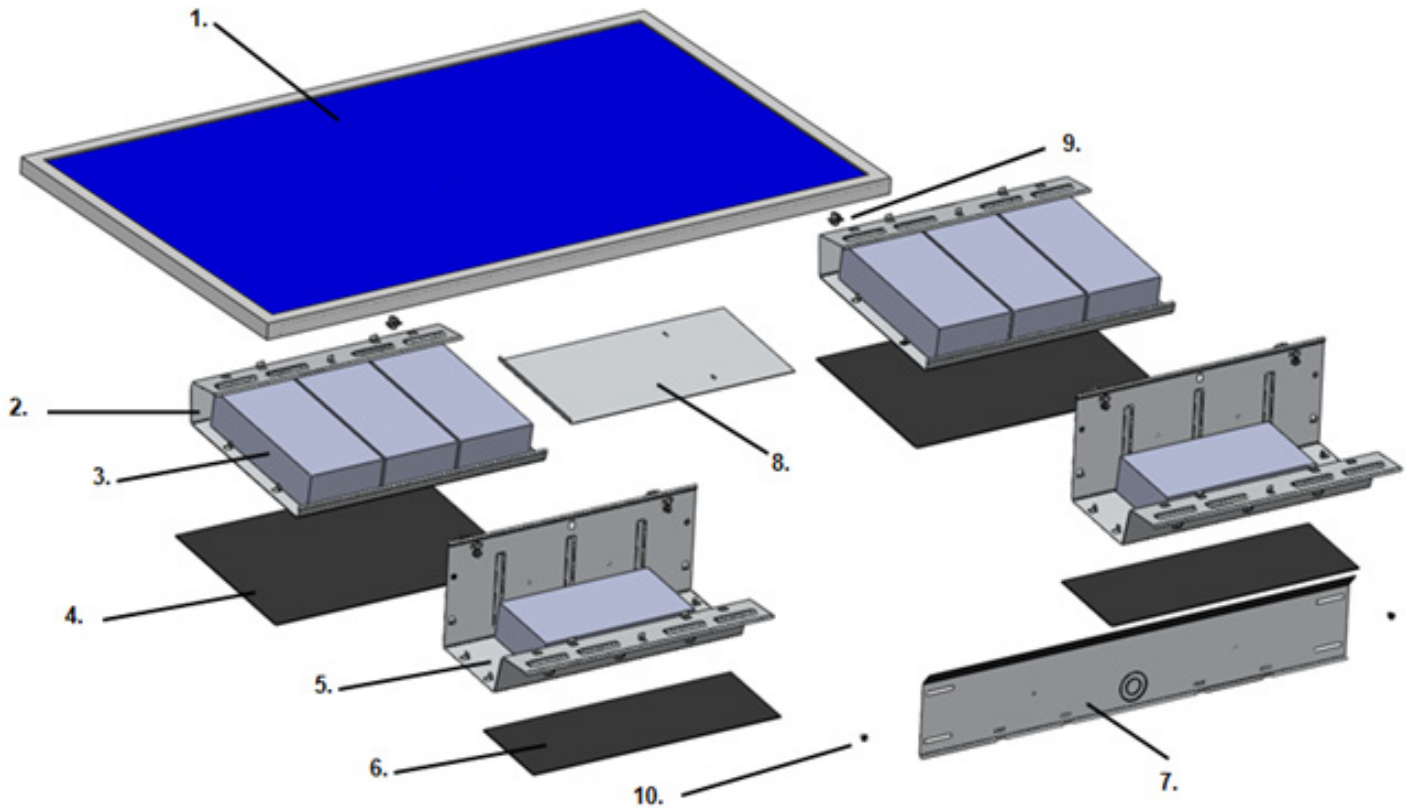


Figure 1

4. INSTALLATION INSTRUCTIONS continued

4.2 METHOD OF INSTALLATION

STEP#1

Prepare the installation jig. Set the distance (shown on the layout) between two ends for row installation on one jig and column installation on second jig. Make sure two bolts on jig are fixed tight to avoid any flexible during installation.

STEP #2

Utilize the panel layout provided by Polar Racking to locate your starting points for the array. Dimensions are given in two axes from the interior face of the building parapet to allow you to pinpoint the starting positions for the array perimeter. Using a measuring tape and chalk, snap lines between the arrays starting points to create a perimeter with which you will then be able to align the first row of the array. Verify the chalk lines using compass and/or other measuring equipment, as per the approved and stamped panel layout.

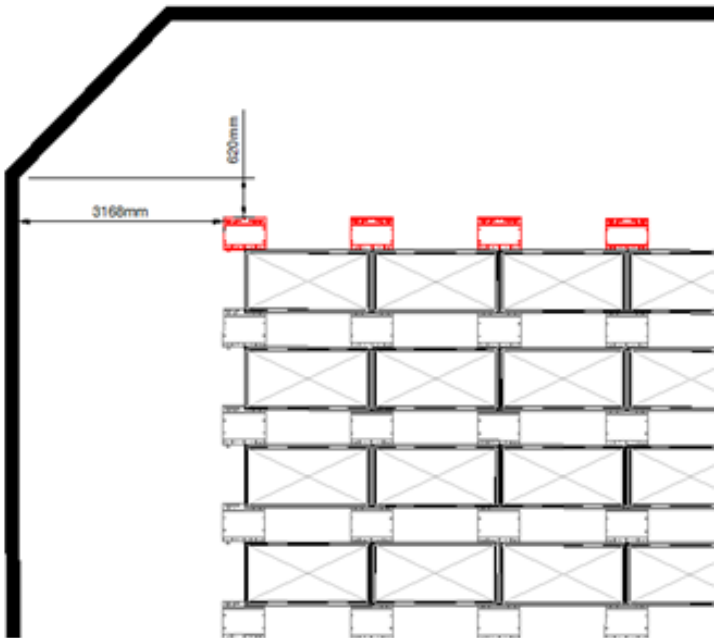


Figure 2

4. INSTALLATION INSTRUCTIONS continued

STEP#3

Starting at a corner indicated on the layout, lay down the first Rack assembly including substrate at the bottom while ensuring that the J-Clamps are oriented correctly based on the layout. The rack should be positioned in corner based on the layout prepared in Step #2. Add the required ballast to the racking assembly (Please refer to the Ballast Assembly diagram at the end of this manual).

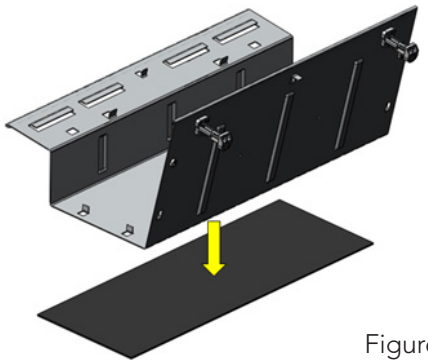


Figure 3

STEP #4

Once the first rack assembly is ballasted and putted in place, use the installation jig to create another corner to add the second rack assembly. Place the installation jig against the back of the first rack assembly and square it against two sides as Figure 4 shown while the jig is resting on roof. Once jig is aligned, repeat STEP #3 and place rack assembly.

Figure 4

4. INSTALLATION INSTRUCTIONS continued

STEP#5

Repeat STEP #4 to finish this row.

Figure 5

STEP #6

Upon securing the alignment of the first row, adjust installation jig to the proper column spacing value. Place the installation jig against the sides of the second rack assembly and square it against the two sides as Figure 6 shown.

Once jig is aligned, repeat STEP #3 to place PRB rack assembly.

Figure 6

4. INSTALLATION INSTRUCTIONS continued

STEP #7

Repeat STEP #6 to finish this column.

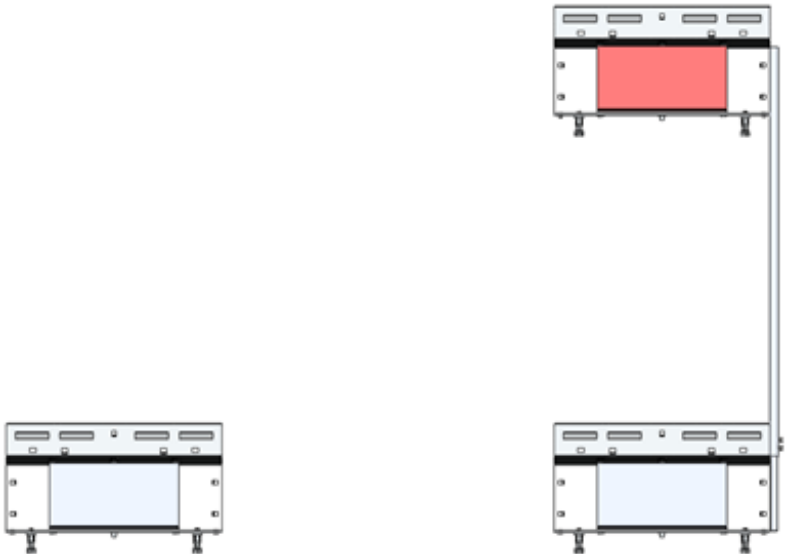


Figure 7

STEP #8

Upon securing the alignment of all rack assemblies ballasted and fixed in place, use the installation jig, that is adjusted to the shorter distance, to position the final rack assembly of the first solar panel in position. Place the installation jig on the sides of second rack assembly of the first row and square it against the two sides as Figure 8 shown. Once jig is aligned, repeat STEP #3 and place rack.

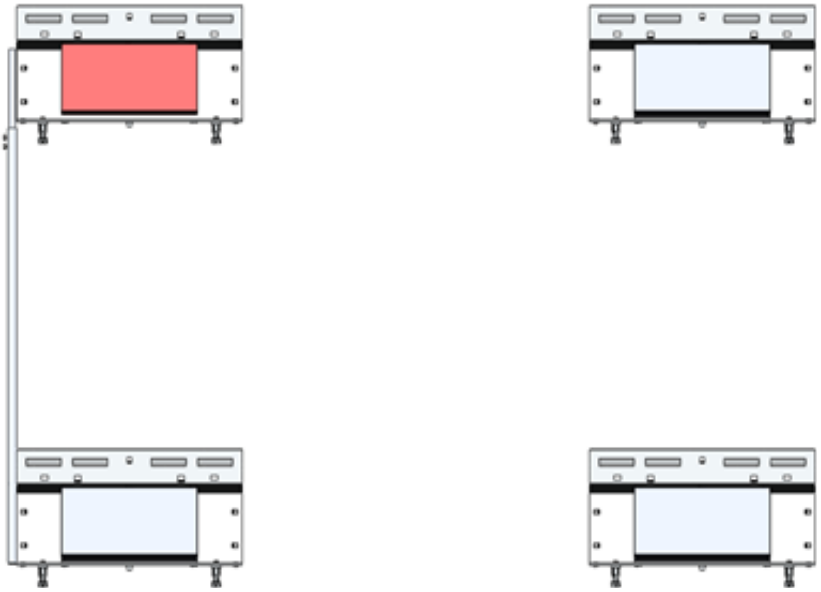


Figure 8

4. INSTALLATION INSTRUCTIONS continued

STEP #9

Ensure that J-clamps are loosened for preparation for placement of panel.

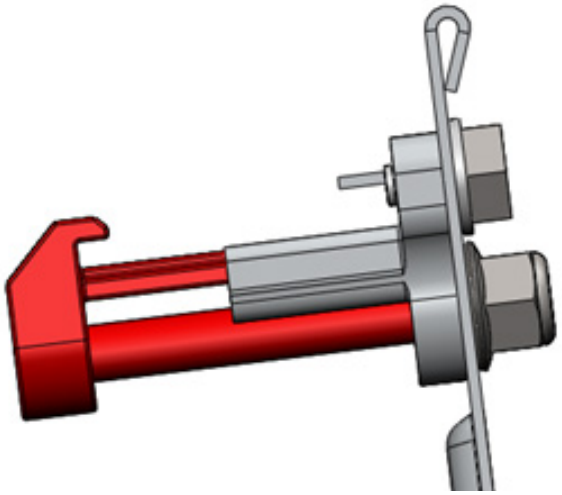


Figure 9

STEP #10

To install the panel, place front end of the panel on the rack assemblies in the second row and flush against the tabs.

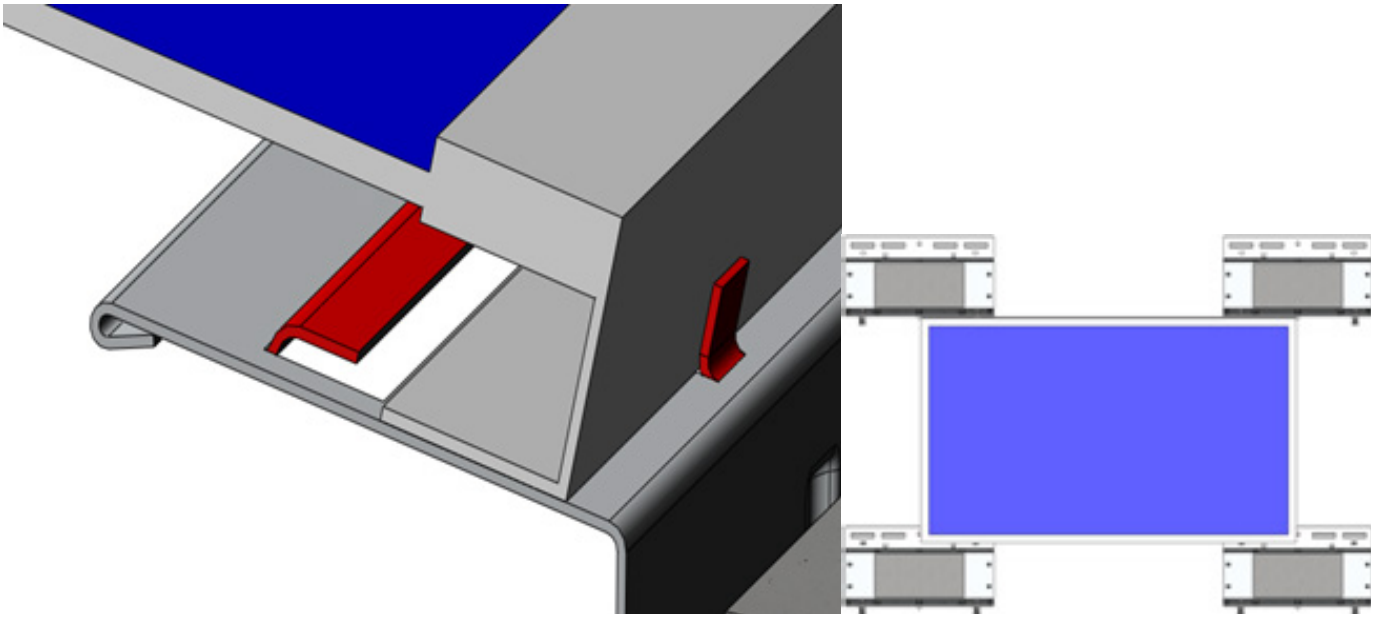


Figure 10: Detail view to describe the STEP with overview of the panel installation at right.

4. INSTALLATION INSTRUCTIONS continued

STEP #11

Once the panel is flush, rotate the panel and place the rear end on the J-clamps of the rack assemblies in the first row.

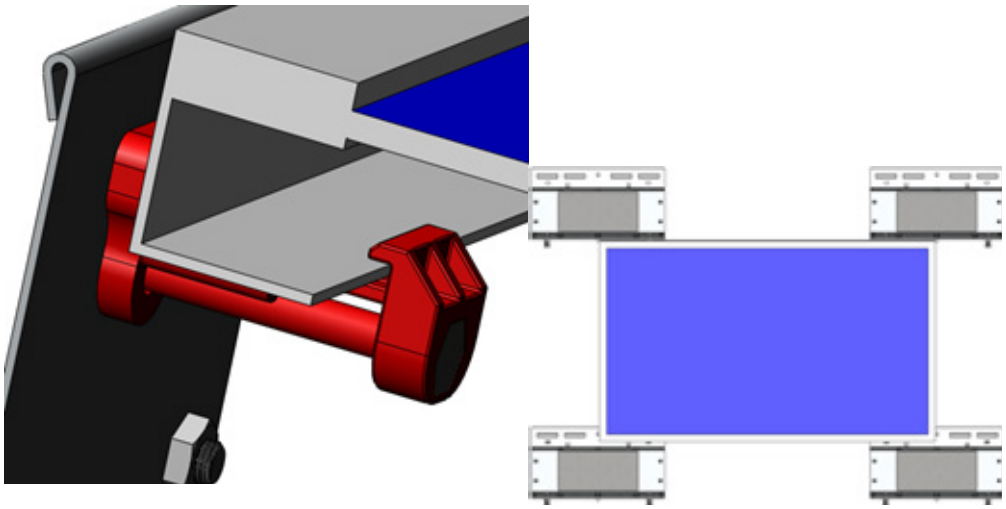


Figure 11: Detail view to describe the STEP with overview of the panel installation at right.

STEP #12

Align the side of the panel so it is flush with the built-in tab on the rack as Figure 12 shown. Adjust the rack assembly at the other side to make sure the panel is in contact with the build-in tab as described below.

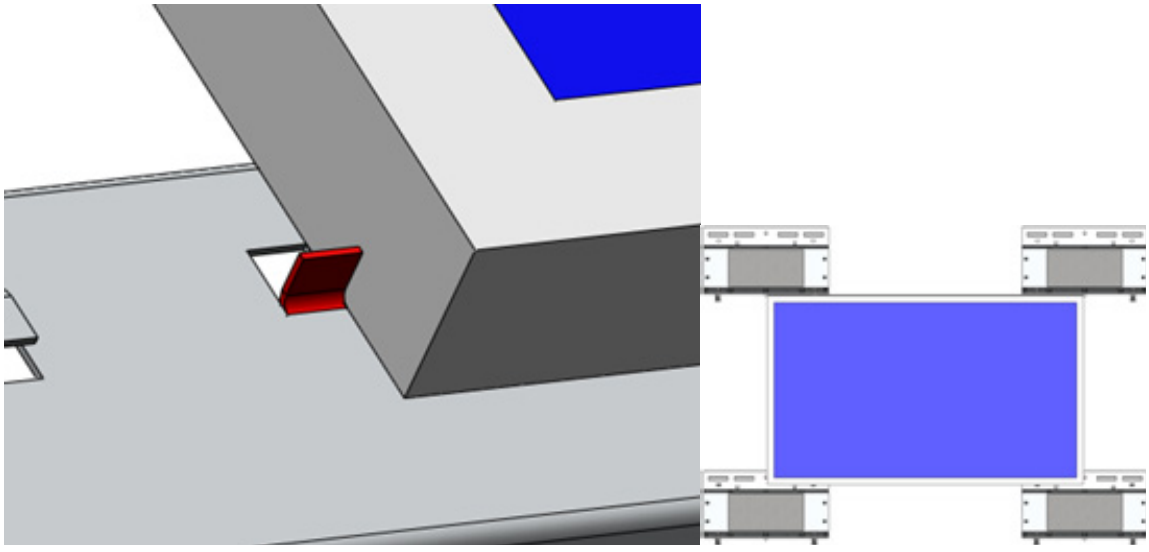


Figure 12 : Detail view to describe the STEP with overview of the panel installation at right.

4. INSTALLATION INSTRUCTIONS continued

STEP #13

Once the panel is flush with the rack, slide the return into hem.

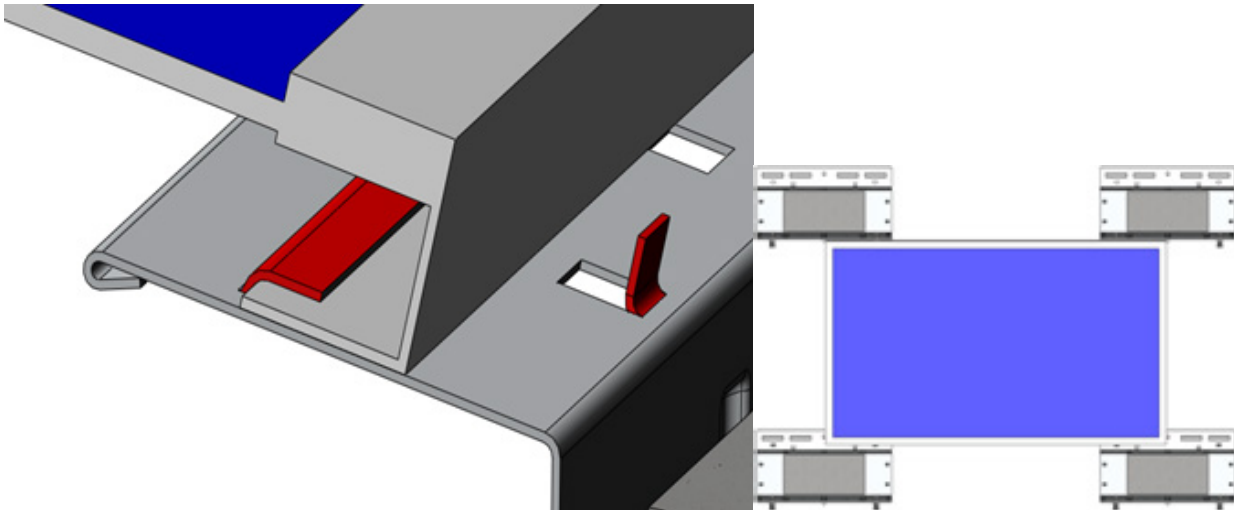
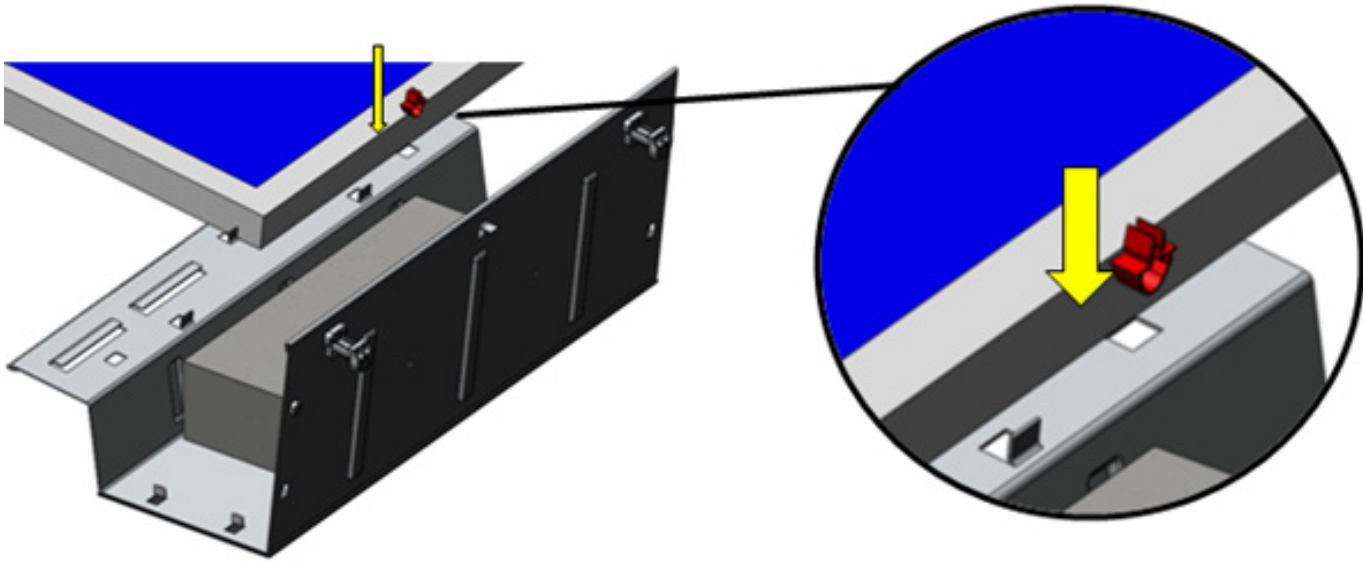


Figure 13 : Detail view to describe the STEP with overview of the panel installation at right.

STEP #14

Rotate and insert PRB clip into tabs at bottom panels as Figure 14 shown. Repeat on opposite side.



4. INSTALLATION INSTRUCTIONS continued

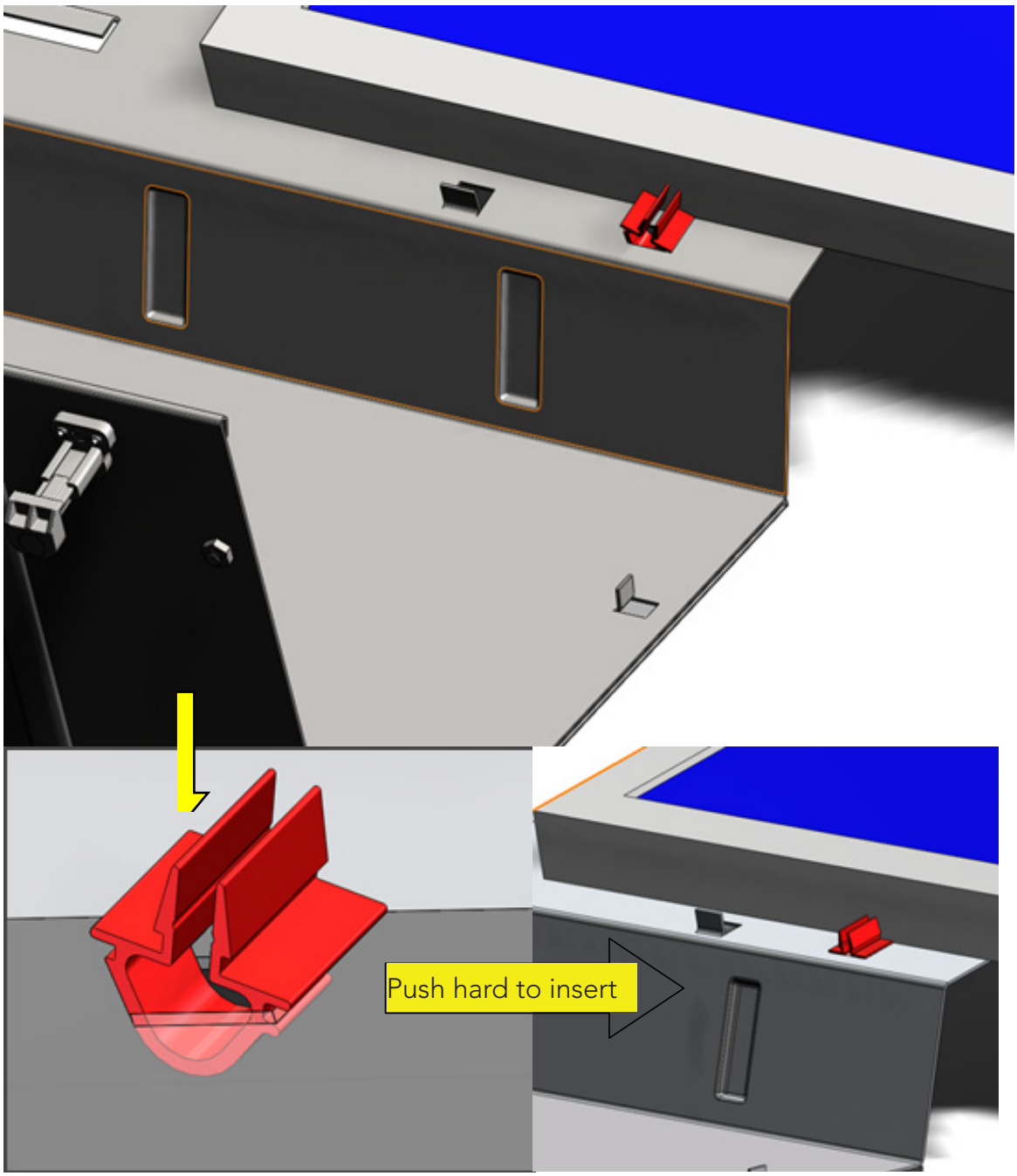


Figure 14

4. INSTALLATION INSTRUCTIONS continued

STEP #15

Inspect the connection to make sure that the rear end of the panel is flush with the built-in tabs at the J-clamp side of rack assemblies as Figure 15 shown.

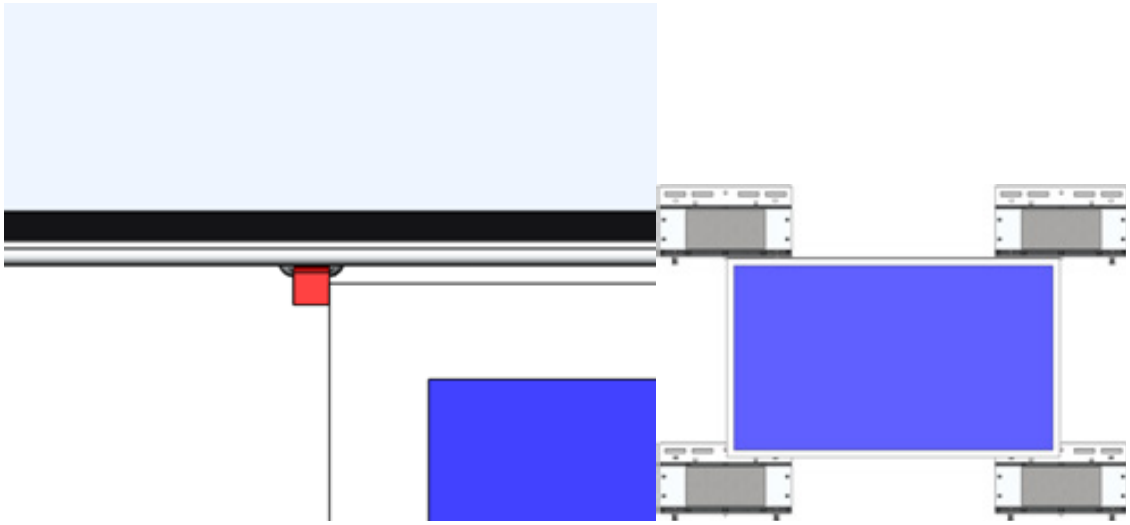


Figure 15 : Detail view to describe the STEP with overview of the panel installation at right.

STEP #16

Tighten J-clamps until they lock the return (torque to 12-lb-ft or 120 in-lb).

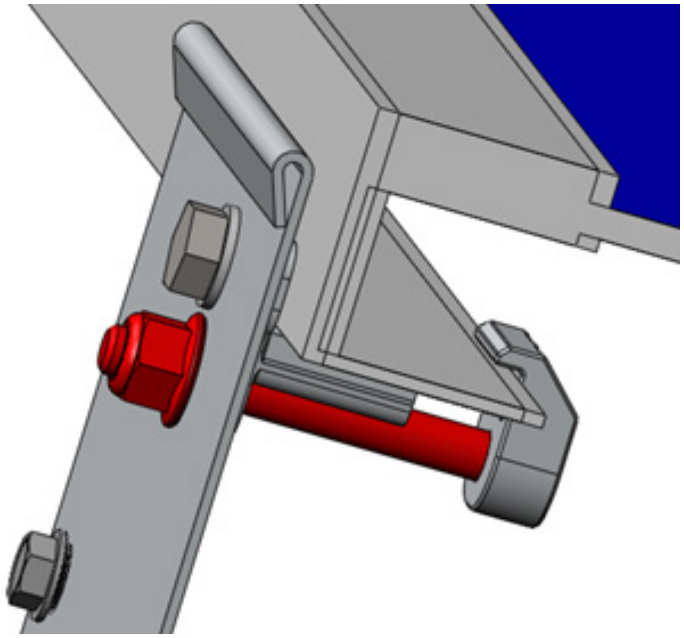


Figure 16

4. INSTALLATION INSTRUCTIONS continued

STEP #17

Hang the wind deflector on bottom tabs as Figure 17 shown. Repeat on opposite side.

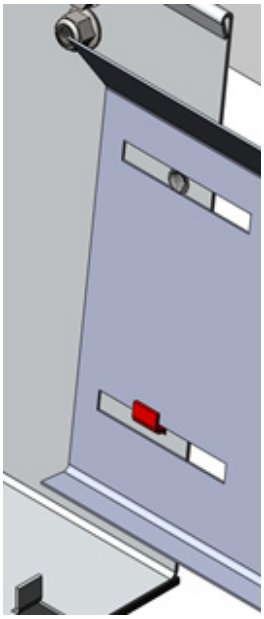


Figure 17

STEP #18

Fasten M8x1.25 screws and tighten them on the slot above the tab to secure the wind deflector. Repeat this step on the opposite side.

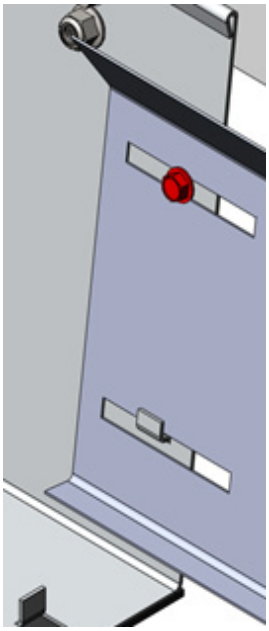


Figure 18

4. INSTALLATION INSTRUCTIONS continued

STEP #19

Repeat above steps and complete installation of all rows one by one, except the final row(Front row).Complete installation of wind deflectors for all PRB racking units except for PRB front row units.

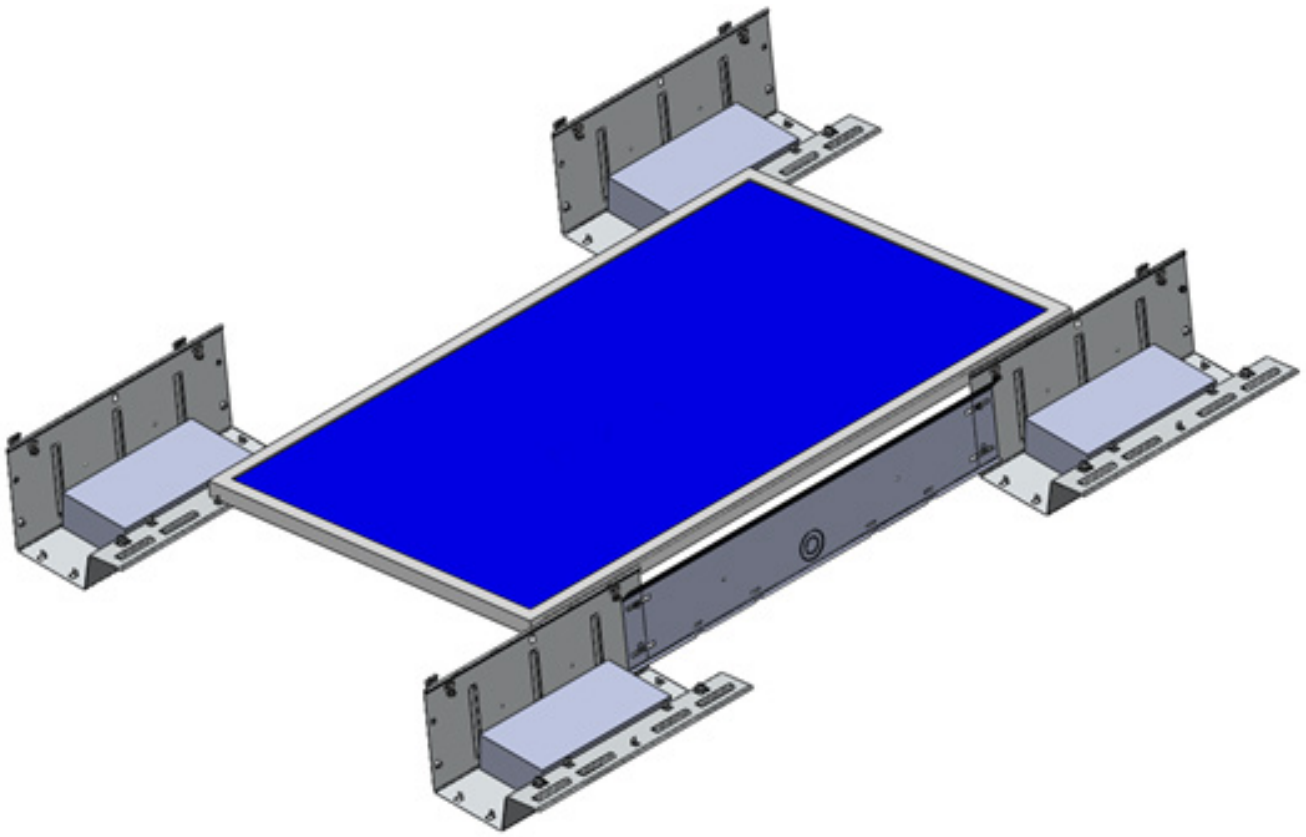


Figure 19

4. INSTALLATION INSTRUCTIONS continued

4.3 Other Components

Front Rack Installation (Front Row Only)

STEP #1

For the final row of the whole system according to the panel layout provided by Polar Racking, place the substrate and PRB rack assembly as Figure 20 shown.

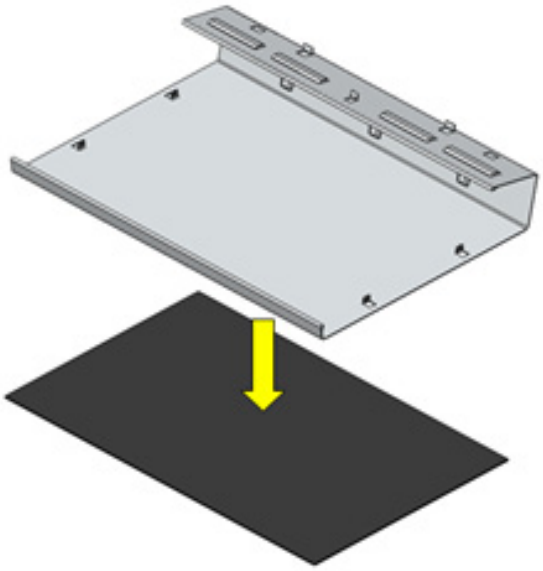


Figure 20

STEP #2

Insert ballast stones. (Number of stones vary by project. Please refer to the Ballast Assembly diagram at the end of this manual)

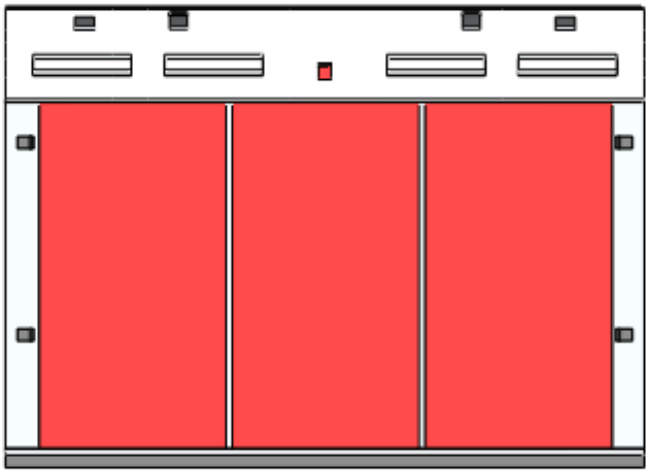


Figure 21

4. INSTALLATION INSTRUCTIONS continued

STEP #3

Place stones approximately half an inch away from the indicated corner below.

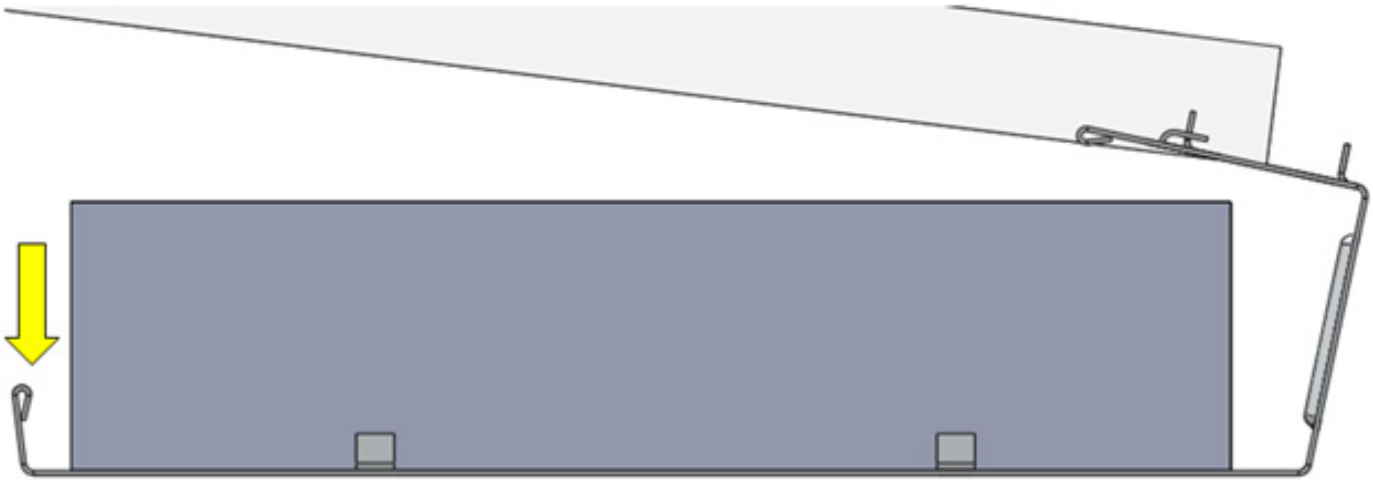


Figure 22

STEP #4

Use the installation jig to align the second rack assembly of this row. The length of the installation jig will be the same distance used to align the standard row rack assemblies.

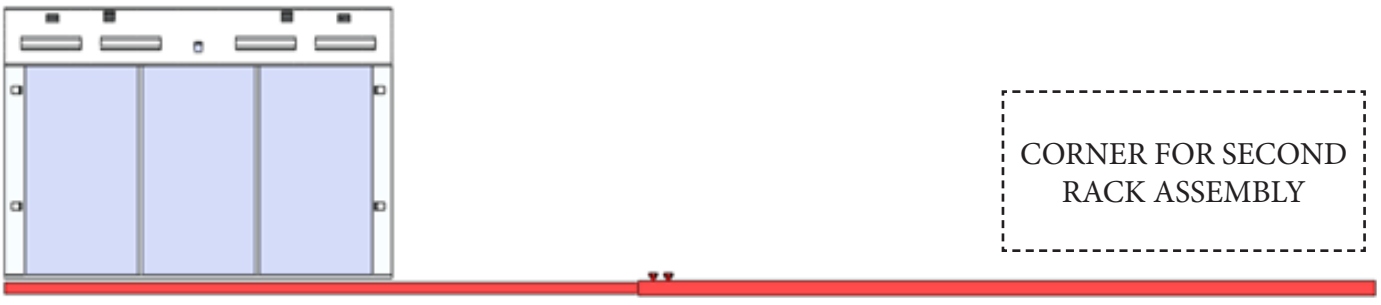


Figure 23

4. INSTALLATION INSTRUCTIONS continued

STEP #5

Repeat STEP #1 of this section. Insert ballast stones as shown in picture and make sure it is placed approximately half an inch away from the indicated corner as STEP #3 of this section.

Figure 24

STEP #6

Upon finishing placement of all four rack assemblies, place the panel on the PRB racking units and adjust the solar panel as noted in STEP #9 through STEP #17in section 4.2.

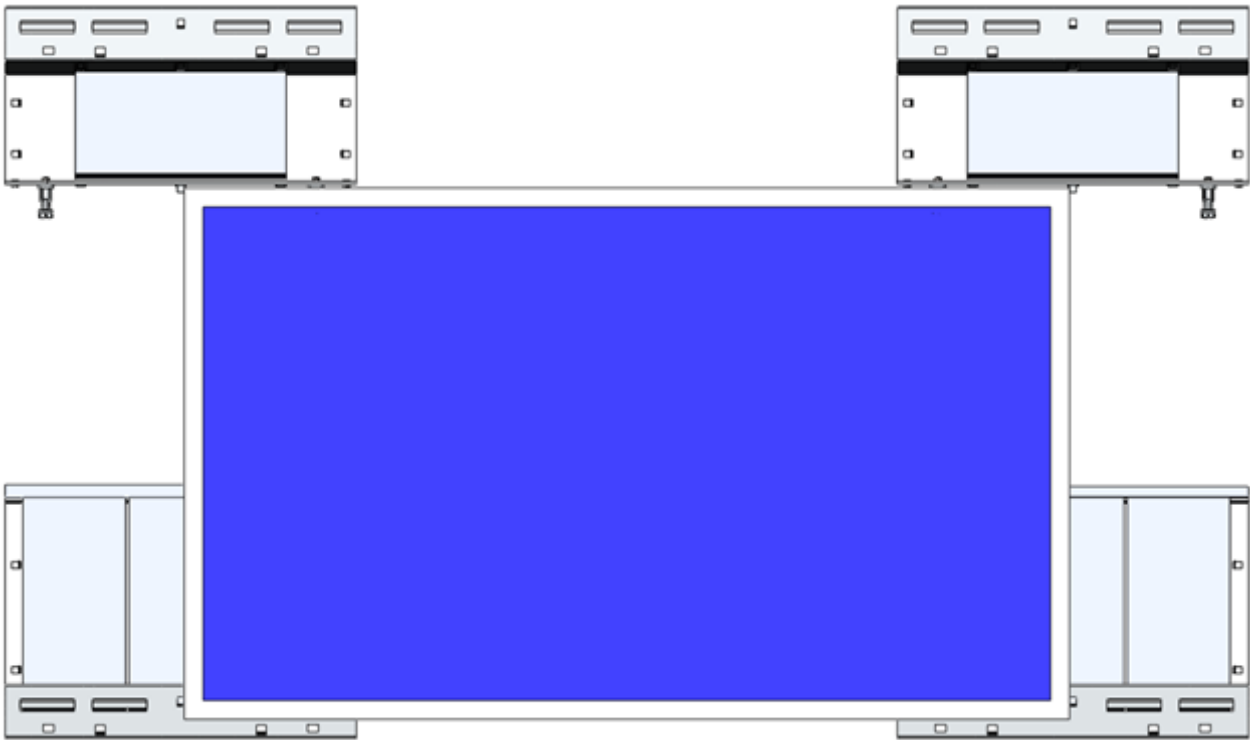


Figure 25

4. INSTALLATION INSTRUCTIONS continued

STEP #7

Rotate and insert PRB clip into tabs located in the front rack as Figure 26 shown in following STEP #14 in 4.2 section. Repeat on opposite side.

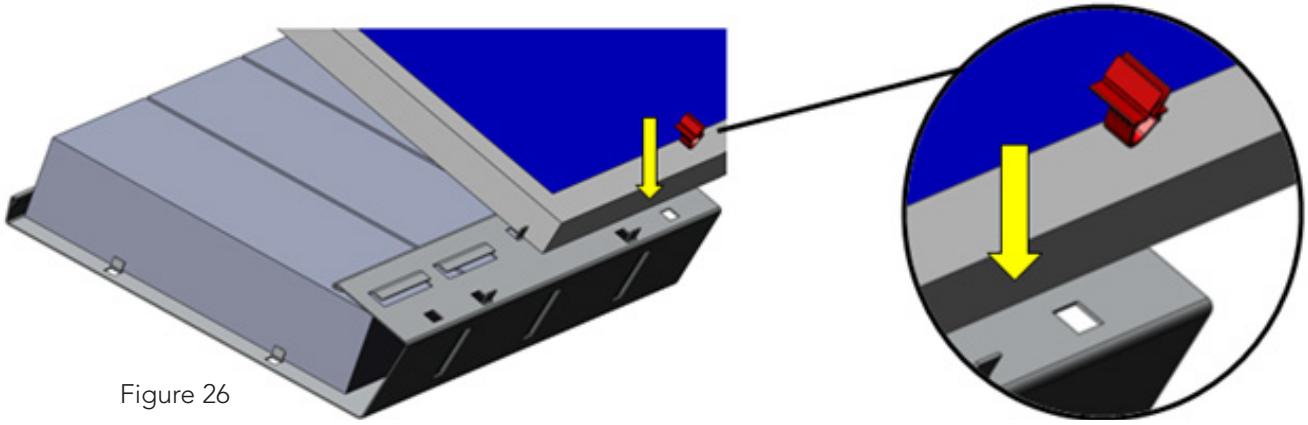


Figure 26

STEP #8

Repeat above steps to complete the installation of final row(Front row).

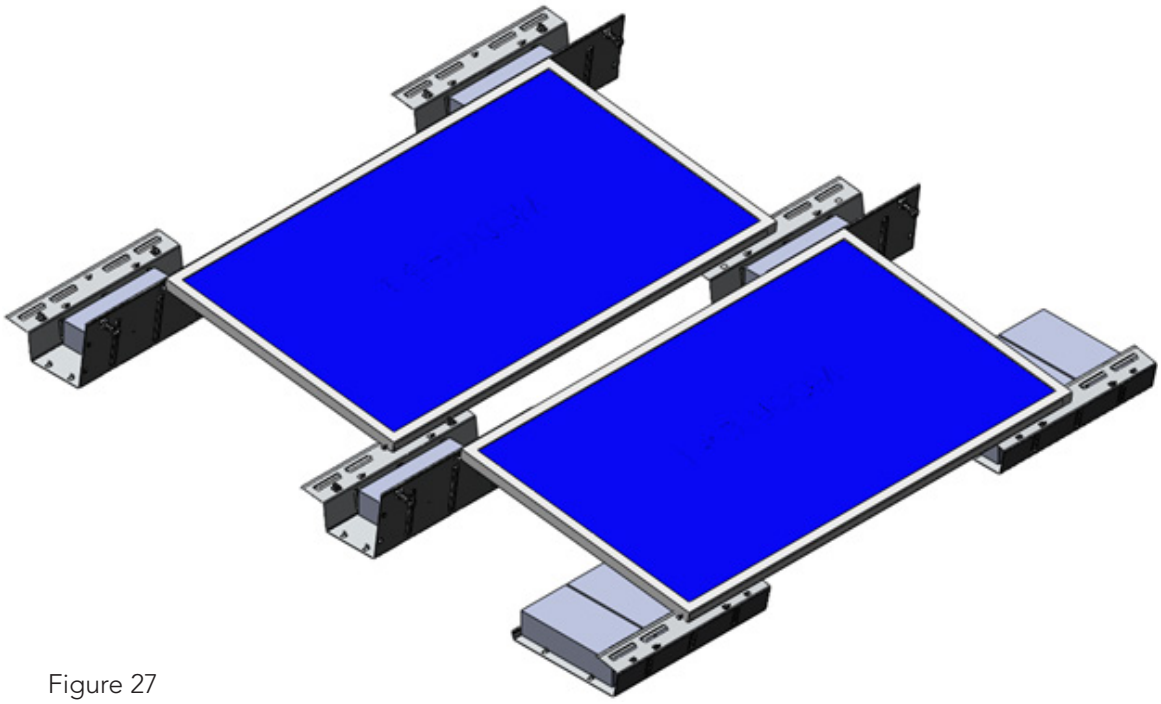


Figure 27

4. INSTALLATION INSTRUCTIONS continued

Ballast Extensions Installation (Optional)

STEP #1

The location of the tabs on the rack assembly is shown in red in the picture below. Upon locating the tabs, place the ballast tray substrate and the extensions as shown in the Figure 28.

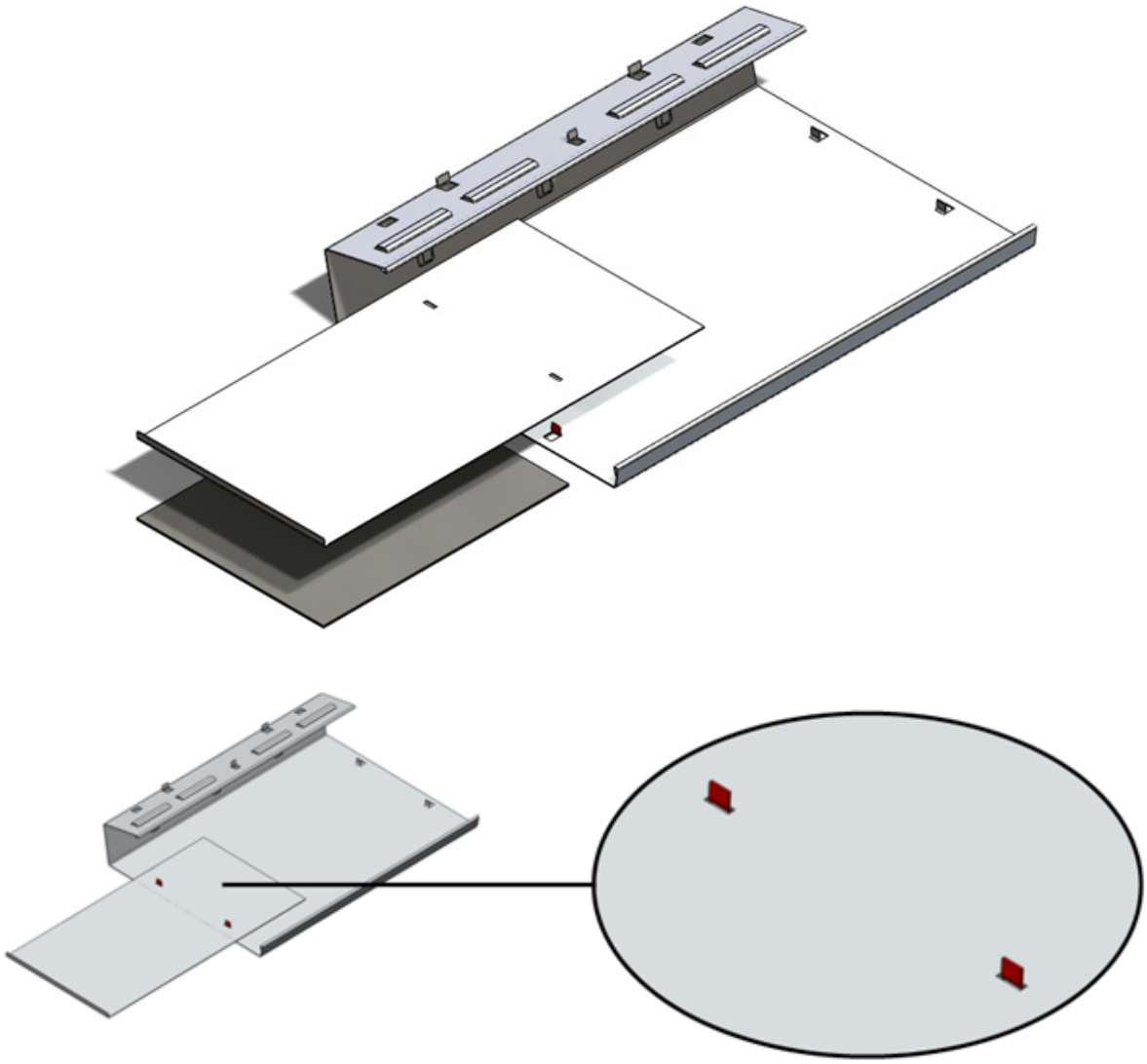


Figure 28 : Ballast tray substrate under extension

4. INSTALLATION INSTRUCTIONS continued

STEP #2

Once extensions are inserted, place ballast stones as Figure 29 shown. (Please refer to the Ballast Assembly diagram at the end of this manual.)

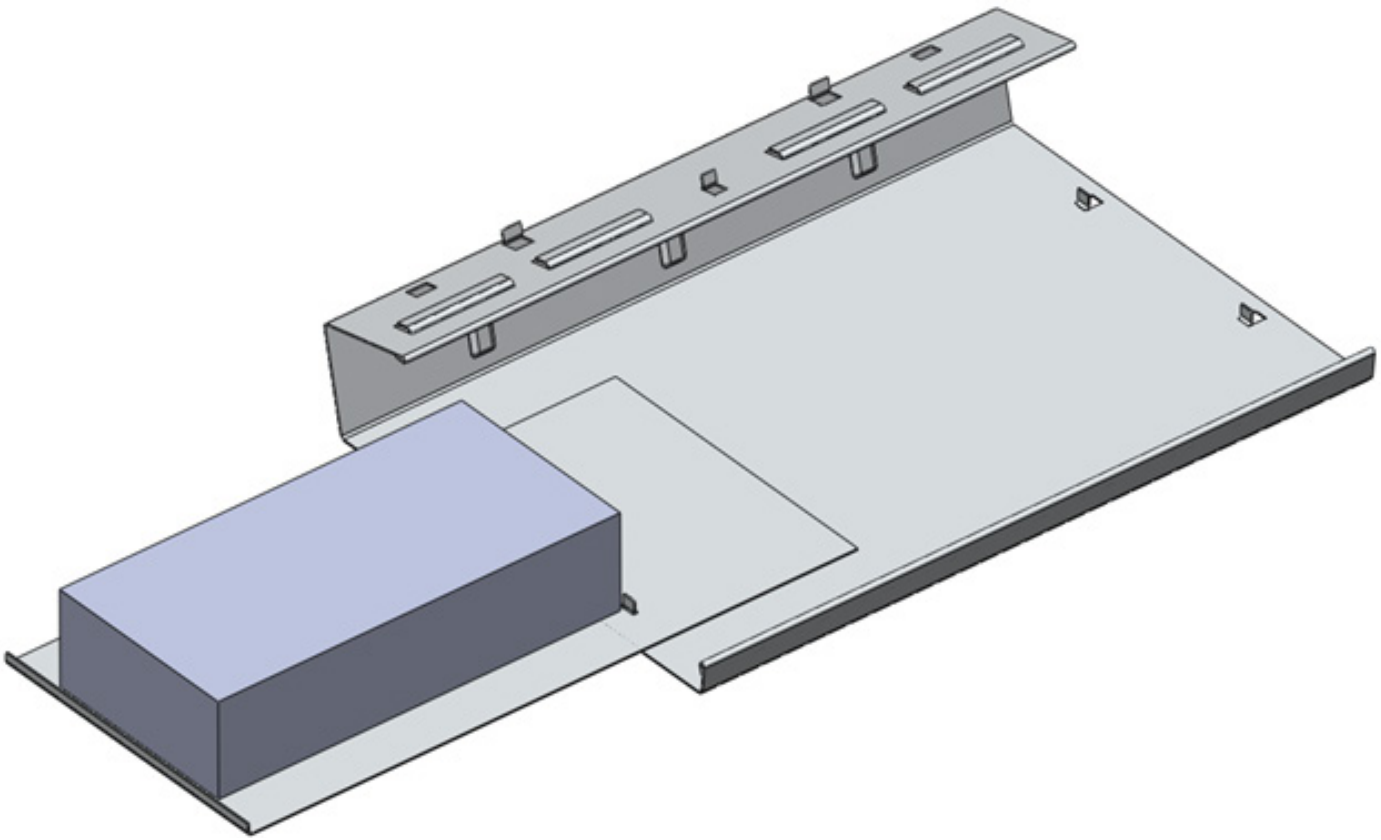
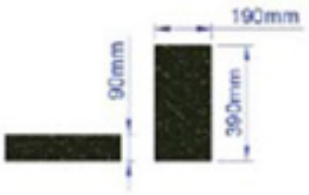
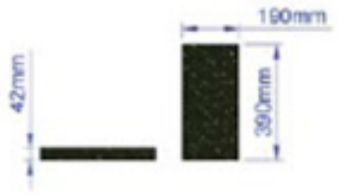


Figure 29

Note: This procedure must be done before the placement of the ballast stones on the rack assembly.

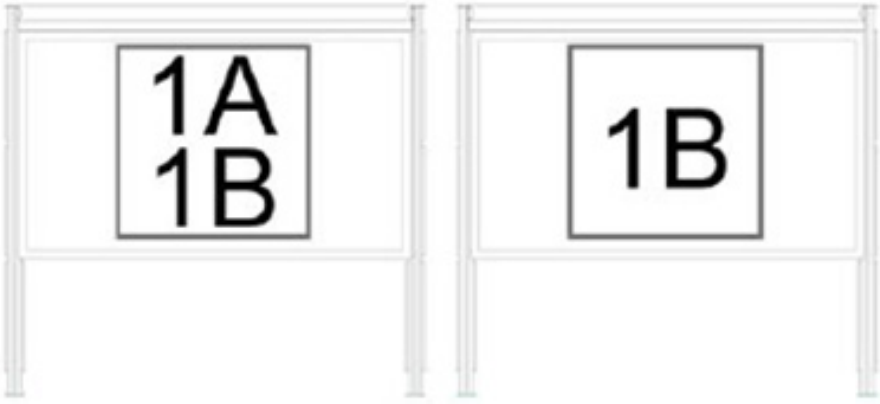
5. APPENDICES

5.1 Appendix – A: Ballast Stones, Specifications & Sizing

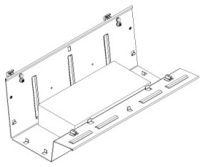
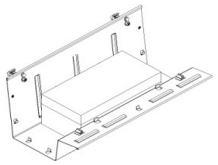
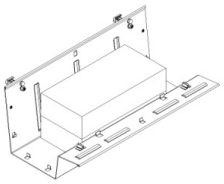
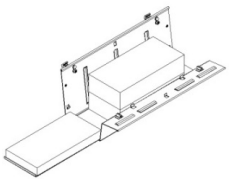
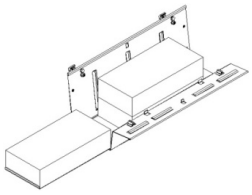
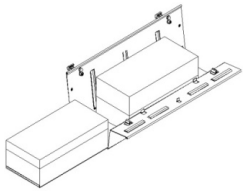
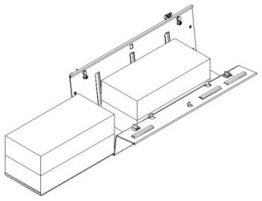
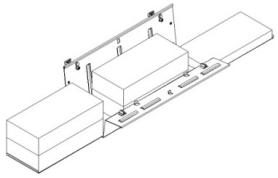
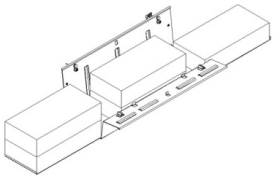
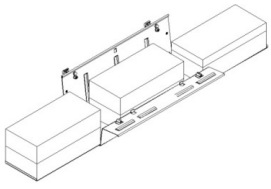
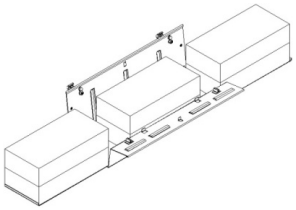
BALLAST STONE TYPE	A	B
DETAILS	90mm SOLID ASHLER PAVER STONE 	42mm SOLID ASHLER PAVER STONE 
WEIGHT PER STONE	15.0Kg (33lbs)	6.6Kg (14.6lbs)
TOTAL IN ARRAY	XX	XX
TOTAL WEIGHT	XX	XX

1 - DENOTES NUMBER OF STONES

A / B - DENOTES STONE TYPE



5. APPENDICES CONTINUED

BEST PRACTICE BALLAST INSTALLATION (7°)			
1A		1A/1B	
2A		2A/1B	
3A		3A/1B	
4A		4A/AB	
5A		5A/1B	
6A			

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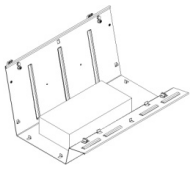
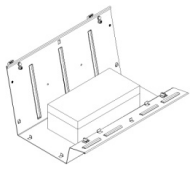
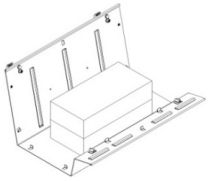
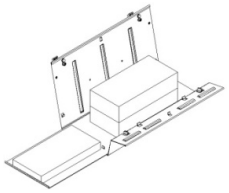
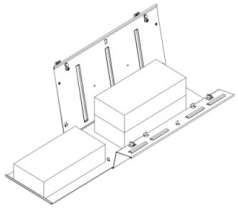
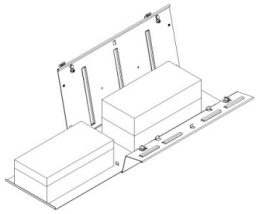
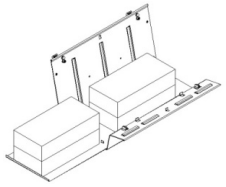
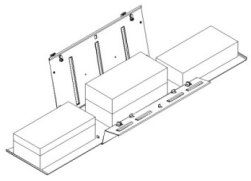
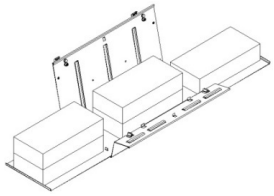
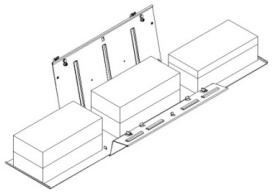
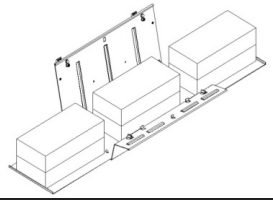
1A		1A/1B	
2A		2A/1B	
3A		3A/1B	
4A		4A/AB	
5A		5A/1B	
6A			

5. APPENDICES CONTINUED

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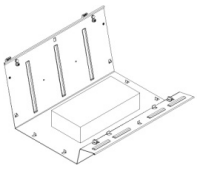
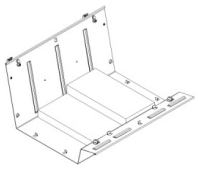
1A		1A/1B	
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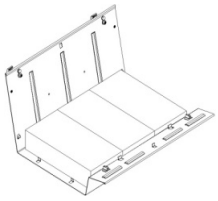
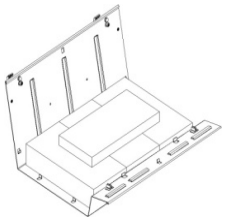
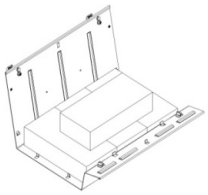
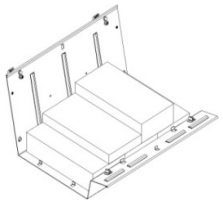
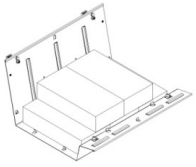
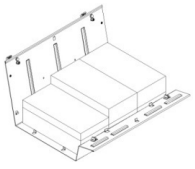
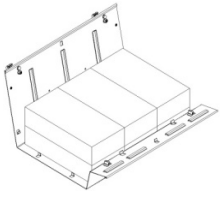
3A		3A/1B	
4A		4A/AB	
5A		5A/1B	
6A			

5. APPENDICES CONTINUED

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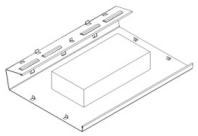
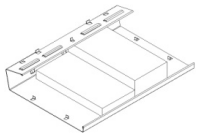
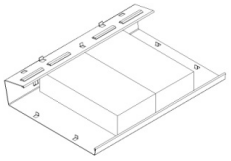
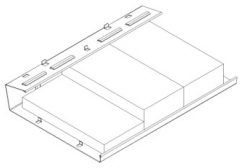
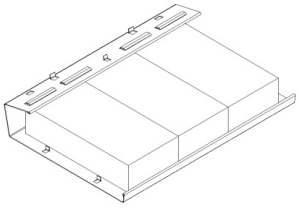
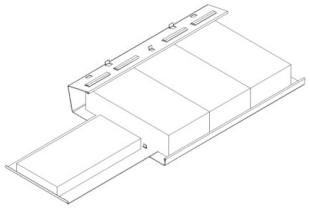
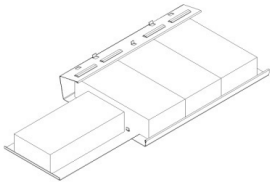
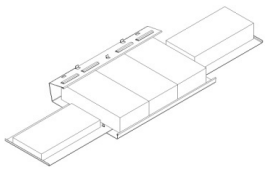
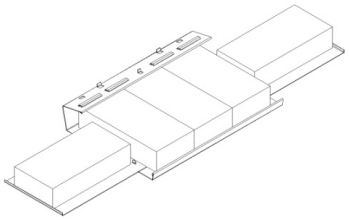
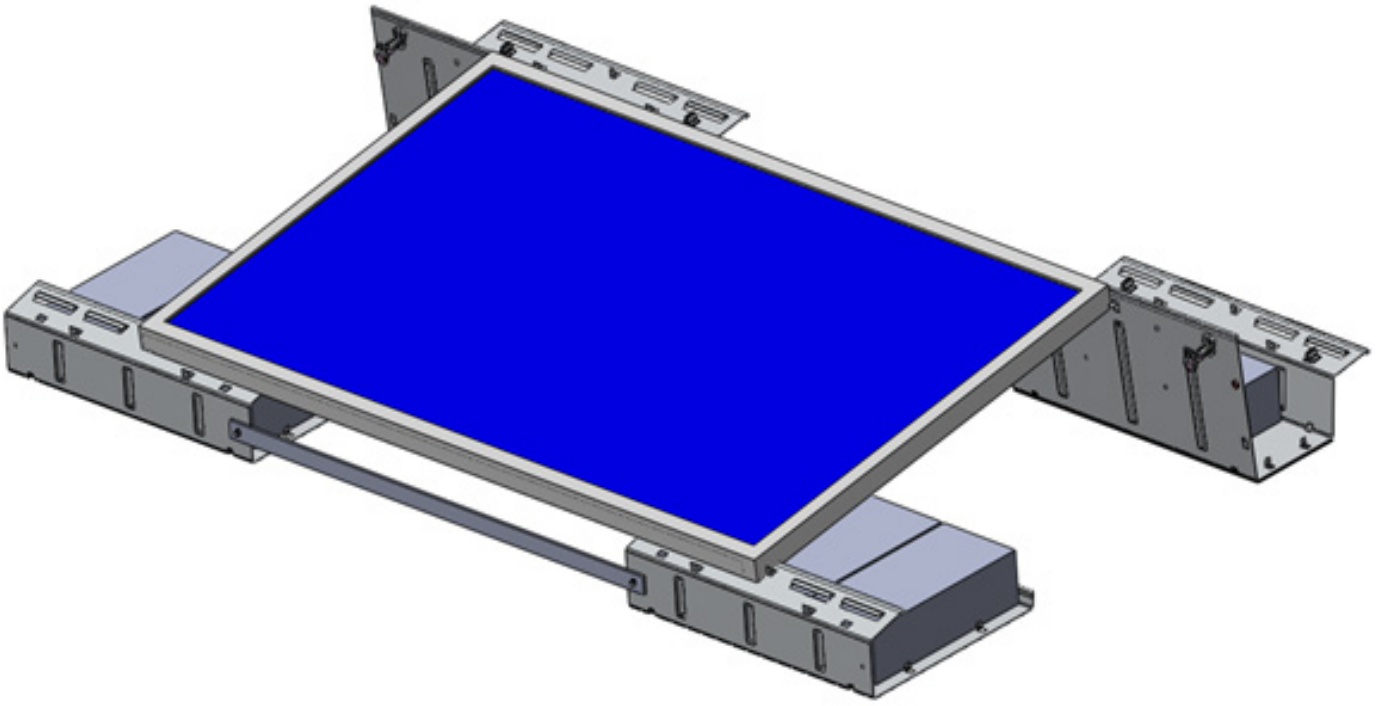
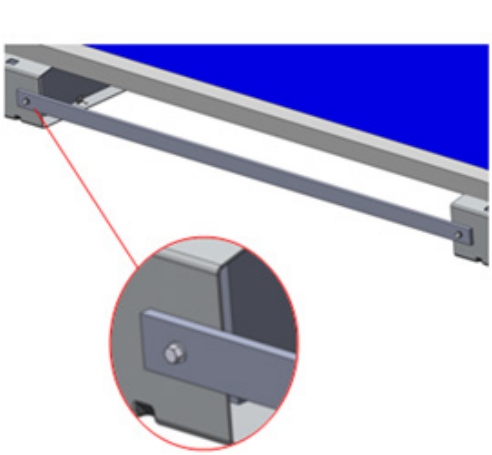
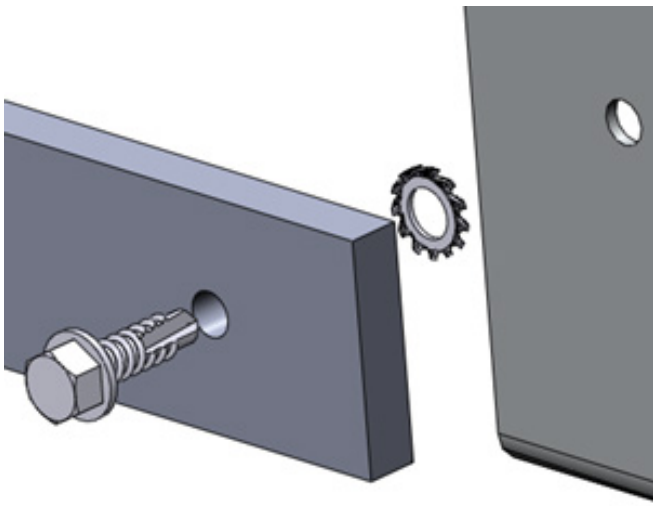
1A		1A/1B	
2A		2A/1B	
3A		3A/1B	
4A		4A/AB	
5A			

5. APPENDICES CONTINUED

5.2 Appendix 'B': Front Rack Bonding







Bonding is achieved through a stainless steel star washer to an aluminum bar connection held in place by self-tapping screws.

5. APPENDICES CONTINUED

5.3 Appendix 'C': Full Rack Bonding

Figure 1

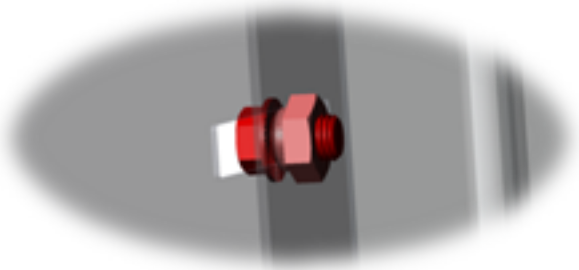
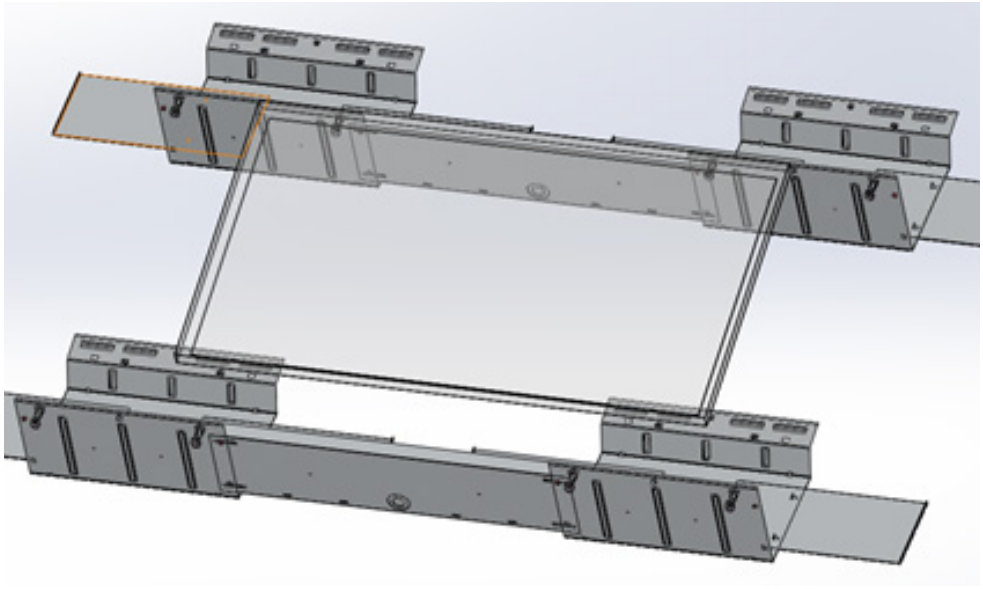


Figure 2



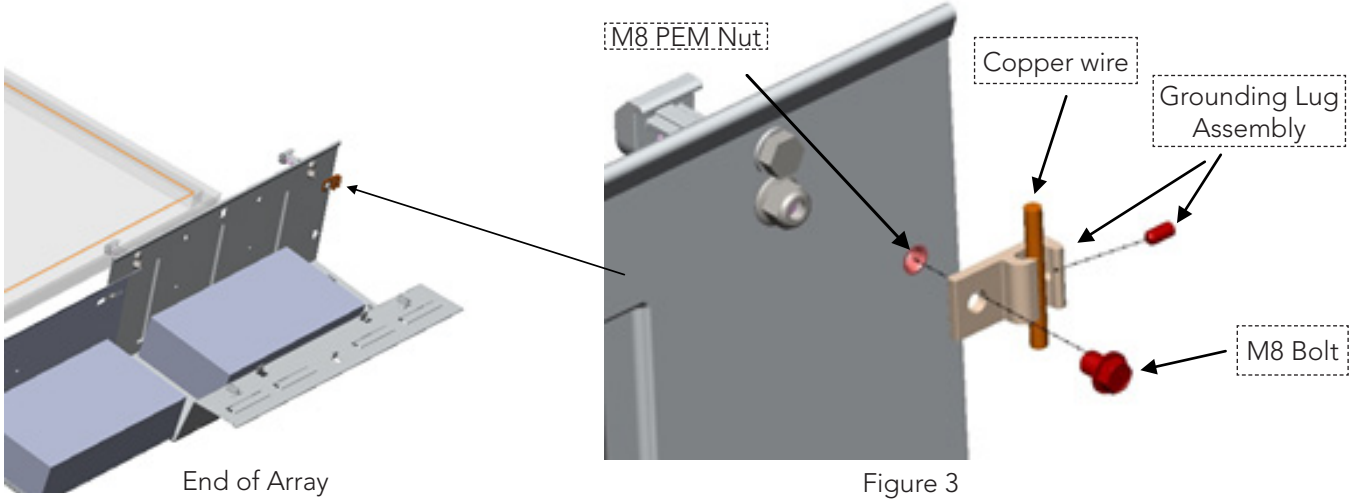


Figure 3

5. APPENDICES CONTINUED

Bonding is achieved through a stainless steel bonding pin. This bonding pin is integrated with the J-Clamp and can be seen in Figure 1 above.

The bonding pin pierces the anodization of the solar modules and racking system to allow the 2 entities to be electrically bonded tougher. The Flange bolt and pem nut shown in Figure 2 are used in combination to bond the PRB rack with the wind deflector. This ties the units tougher and allows the racks to be bonded laterally.

A grounding lug will be used at the end of the array in order to ground the racks tougher and have a single bonding cable per row of racks. See Figure 3

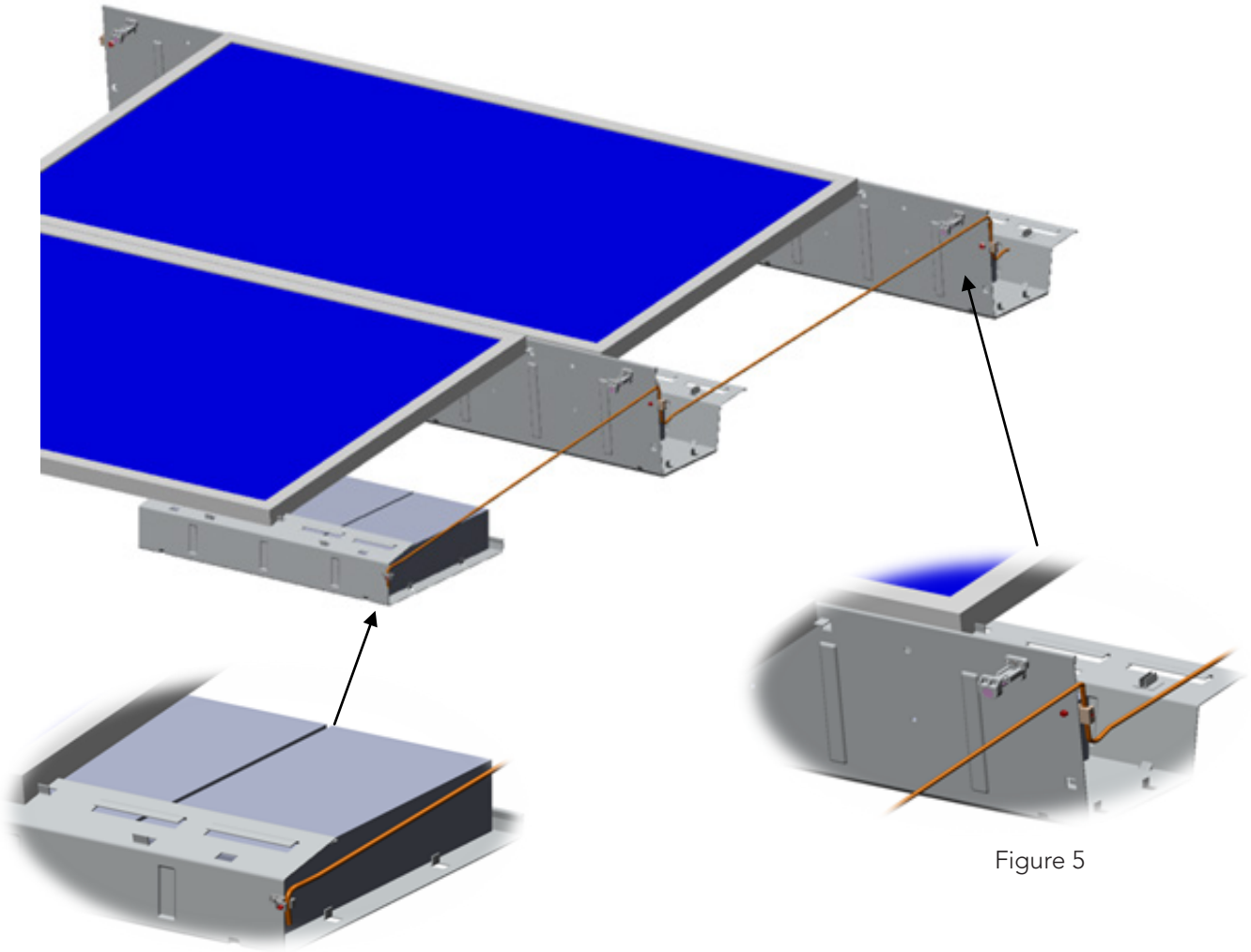


Figure 4

Figure 5

5. APPENDICES CONTINUED

Bonding on the Front Rack is achieved through a grounding lug with a star washer between the material and the Grounding Lug. This can be achieved through a self tapping screw to secure all 3 pieces tougher or can be achieved by drilling a #10x3/4" Stainless steel self tapping screw through all pieces. Alternatively a 5mm Hole can be drilled into the front rack and a bolt can be placed through with a star washer. Both options will create an electrical bond.

The full racks can be bonded with the same method as shown in Figure 5 using the flange bolt to create the electrical bond between the rack and the Grounding Lug.

6. WARRANTY

IMPORTANT WARNING

It is critical that the Polar Racking be properly and securely attached together and installed on a roof. Improper installation could result in injury or damage to people and pro erty including, but not limited to, the installer(s), building, roof, solar modules and other people and equipment. You are responsible for installing and securing the Polar Racks properly and checking the attachments prior to module installation.

Read and understand all of the instructions and cautions supplied with your Polar Racking Product prior to installation or use. If you do not understand all of the instructions and cautions, or if you do not have sufficient mechanical and electrical experience and are not thoroughly familiar with the installation procedures, you should have the Product installed by a professional installer.

Polar Racking Inc. ("Polar") , warrants to the original purchaser ("Purchaser") of its racking Product(s) ("Product") that the Product shall be free from defects in material and workmanship for a period of ten (10) years from the date or original purchase ("Racking Warranty"), save and except for the finish of said Product.

• What Does The Warranty Cover?

The Racking Warranty covers any defects in material and workmanship, but does not include on-site labour.

• How Long Does The Coverage Last?

The Racking Warranty lasts for a period of ten (10) years from the date of original purchase. The warranty, during its term, is transferable from the Purchaser to a new owner of the Product upon written notice of said change of ownership being given from original purchase to Polar within 60 days of said change of ownership.

• What Will Polar Do?

If within the specified Warranty periods the Product shall be reasonably proven to be defective, then Polar shall at its option, and subject to the limitations described herein, Polar will: (i) repair or replace any defective Product at no charge; (ii) refund the full purchase price of the Product; or (iii) issue credit in the amount of the purchase price to be used toward the purchase of new Product or accessories from Polar. Such repair or replacement shall completely satisfy and discharge all of Polar's liability with respect to this limited Warranty.

• What Does This Warranty Not Cover?

The following are not covered by these warranties: on-site labour in any form and any problem or damage that is caused by abuse; negligence; failure to follow professional engineer stamped drawings for the specific installation; normal wear and tear; defective roofing; modifications or repairs not performed or authorized by Polar; overloading; misuse, including but not limited to failure to assemble, mount, or use the Product in accordance with its written instructions or guidelines included with the Product or made available to the Purchaser; or an act of God (such as wind storms or similar events). Polar is not liable for or warranty material used on or fixed to the bottom of Product runner and/or ballast pan(s), which in all installations are chosen by the original purchaser/installer/user of the Product. All installations in corrosive atmospheric

conditions are excluded and void said Racking Warranty. This Racking Warranty shall be VOID if installation of the Product is not performed in accordance with any Professional Engineer stamped drawings created for the specific installation, or Polar's written installation instructions, or if the Product has been modified, repaired, or reworked in a manner not previously authorized in writing by Polar, or if the Product is installed in an environment or fashion for which it was not designed.

The Racking Warranty does not cover damage to the Product that occurs during its shipment, storage, or installation.

No warranty is given for Products purchased or used outside the United States, Canada, or Mexico. To the furthest extent permitted by law, (i) this warranty does not cover damage to property other than the Product itself; and (ii) the remedies provided for herein shall be exclusive.

POLAR LIMITS THE DURATION OF ALL IMPLIED WARRANTIES, INCLUDING BUTNOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR APARTICULAR PURPOSE TO THE SHORTEST PERIOD PERMITTED BY LAW, WHICH INANY EVENT SHALL NOT EXCEED THE DURATION OF THIS WARRANTY. Some provinces/states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. ALSO, CONSEQUENTIAL ANDINCIDENTAL DAMAGES ARE NOT RECOVERABLE UNDER THIS WARRANTY. Under no circumstances shall Polar be liable for special, indirect or consequential damages

arising out of or related to use by Purchaser of the Product. Manufacturers of related items, such as PV modules and flashings, may provide written warranties of their own. Polar's limited Warranty covers only its Product, and not any related items. Some provinces/states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Polar will not be held responsible for any modifications or alterations made to any approved design layout and/or specification provided by Polar. Any and all proposed changes must first be reviewed, and approved in writing by Polar's Engineering team. No warranty is provided or implied by Polar with regards to the longevity or leak-resistance of the roof, validity of any roof warranty, ballasting or anchoring of the Product, suitability of the roof to support the installation of such Product, or otherwise. By acceptance of this document, the Purchaser acknowledges that they understand and agree to/with the above statement and any and all limitations detailed in this warranty.

• How Do You Get Service?

In order to be eligible for service under this warranty you must immediately notify Polar, in writing, upon learning of any defect of its Products by either calling the phone number listed above or writing to the address listed above and explaining the nature of the defect. If appropriate, arrangements for service under this warranty will be made. You may be required to provide proof of purchase prior to obtaining service under this warranty. In addition, Polar may require you to return the Product to Polar at your sole cost and expense for service and/or a determination by Polar, in its sole discretion, as to whether the Product is defective. It is critical that the Polar Racking be properly and securely attached together and installed on a roof. Improper installation could result in injury or damage to people and property including, but not limited to, the installer(s), building, roof, solar modules and other people and equipment. You are responsible for installing and securing the Polar Racks properly and checking the attachments prior to module installation. Read and understand all of the instructions and cautions supplied with your Polar Racking Product prior to installation or use. If you do not understand all of the instructions and cautions, or if you do not have sufficient mechanical and electrical experience and are not thoroughly familiar with the installation procedures, you should have the Product installed by a professional installer.

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