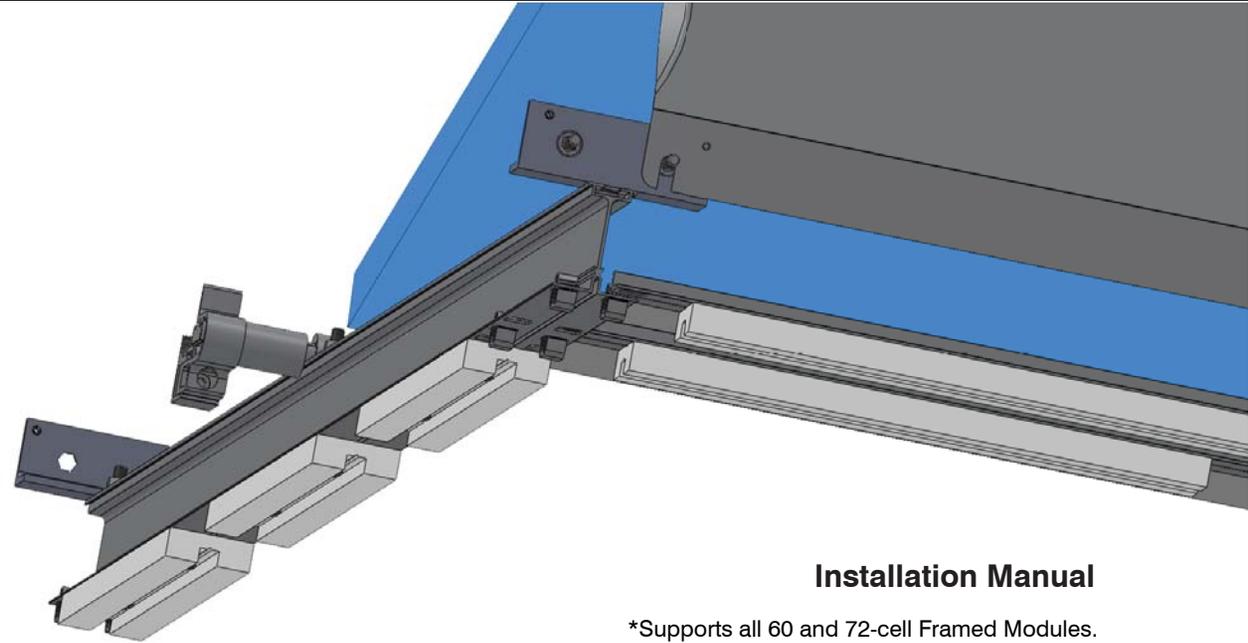


Modular.
Lighter.
Quicker.



PR-1 2.0 Ballasted Rooftop Mounting System



Installation Manual

*Supports all 60 and 72-cell Framed Modules.

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1. Introduction

1.1 Product Overview

The PR-1 2.0 Ballasted Mounting System has been designed as a versatile, economical, fixed tilt mounting system for rooftop PV power plants of all sizes. PR-1 2.0 now features integrated grounding and wire management for easier installation, also benefiting long term operation and maintenance.

Simple Installation

All sub-components(3) 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 tool and ONE fastener is required, with all connections being visually and mechanically accessible.

Service life Warranty

Polar Racking provides a warranty of 10 years for the service life of all materials used.

Durability

Fully comprised of aluminum and stainless-steel componentry, this robust system provides unmatched longevity and structural/material integrity. All components are corrosion-resistant, completely recyclable, with optional substrates made from recycled material.

Safety

If a building permit is required, Polar Racking will design the mounting 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 PR-1 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.

Signposts

The following will assist you in finding your way around in this manual:

Headers

The headers display the heading of the current chapter.

Footers

The footers display the product name, the name of the document, and the page number.

Text markups

Labels in the text are printed in bold, brand and company names in italics, item numbers from the illustrations are depicted in a text box as (1), (2), etc.

Overview

An overview with legend serves as an orientation aid for the installation and is located at the end of this installation manual.

Additional Information



Identifies background and additional information for processes

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(s) of the product.

1.4 Standards Compliance

The PR-1 2.0 Ballasted Rooftop PV mounting System is 100% OPA Compliant and is tested in accordance with the Ontario Building Code and the ASCE 7-05

TUV certified #U8V 13 10 78071 003, in accordance with:
CSA C22.2 No.41-07 (5th Edition)
UL 467:2007 (9th Edition)

1. Introduction

1.5 Product Care and Maintenance

Maintenance periods

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

Maintenance requirements

| Inspect all component connections (made during site installation), once a year for deformation; ie. tears at the wind deflector, cross member, or runner assembly connection points. If damage is observed, the corresponding components must be replaced.

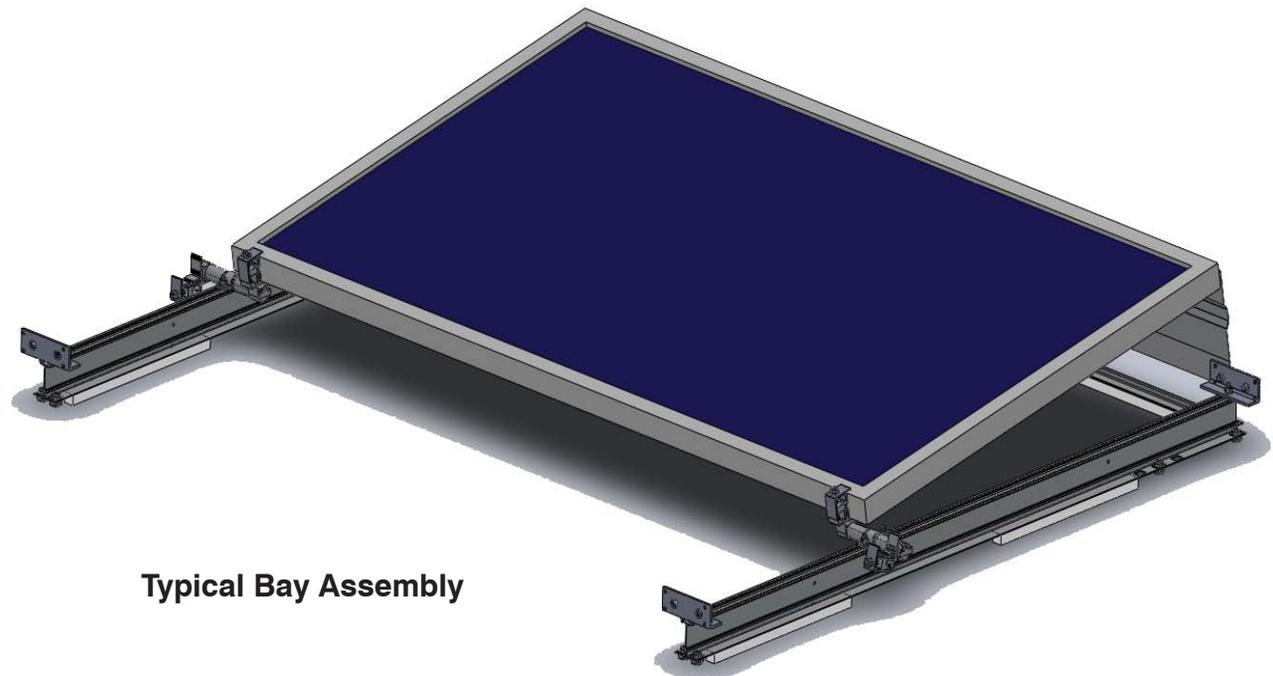
| Check specified torque on all M8 Nuts (front clamps, and wind deflector assembly) and retighten if required (ensuring that solar modules are seated correctly).

| Ensure that Structural plates (if used) are tightened and torqued as per the original permit drawings.

| Ensure that Cross member clips are seated correctly and still engaging both the Cross Member & the Runner.

| Check that any installed wire caps (optional), are seated correctly within the runner assembly.

| Any other installed equipment/systems not provided by Polar Racking, for use with the PR-1 2.0 racking system, is the responsibility of others.



Typical Bay Assembly

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 2.2. 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. A replacement 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 PR-1 2.0 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 PR-1 2.0 system, and will continue to honor its warranty.

Polar Racking provides a number of substrate options at the request of its clients. It is the responsibility of the developer, owner, and/or installer to verify that the selected 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
- Cordless Driver with 13mm Deep Socket
- Torque Wrench (range of 2 ft.lbs - 25 ft. lbs.)

3.3 Site Preparation

Prior to beginning installation of the PR-1 2.0 racking system ensure the following:

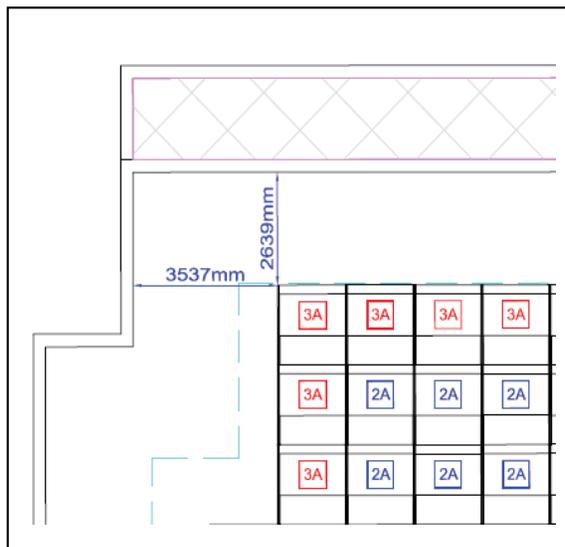
| all safety preparations have been made in compliance with local regulations

| 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.

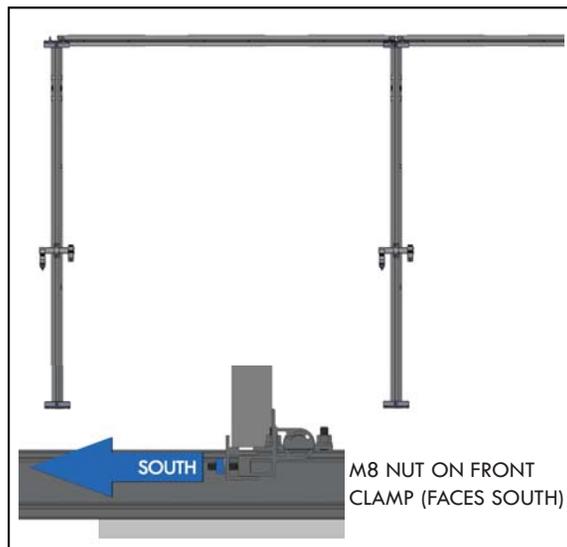
4. Installation Instructions



4.1 Step 1

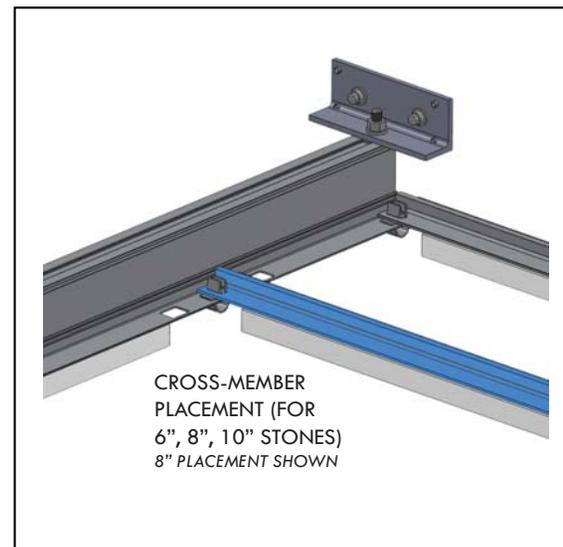
Utilize the panel layout provided by Polar Racking to locate your starting points for the array. Dimensions are given in two axes from the interior face of the building parapet to allow you to pinpoint the starting positions for the array perimeter.

Using a measuring tape and chalk line, snap lines between the array's starting points to create a perimeter with which you will then be able to align the first (Northern Most) row of the array. Verify the chalk lines using a compass and/or other measuring equipment, as per the approved and stamped panel layout.



4.2 Step 2

Starting in either the Northeast or Northwest corner, lay down two Runner assemblies while ensuring that the front clamps are oriented correctly (M8 Nut on the front clamp - faces South). The first Runner will lay along the outside perimeter running in the North-South direction. The second Runner will be laid in parallel to the first Runner, with one Cross-Member of spacing in between

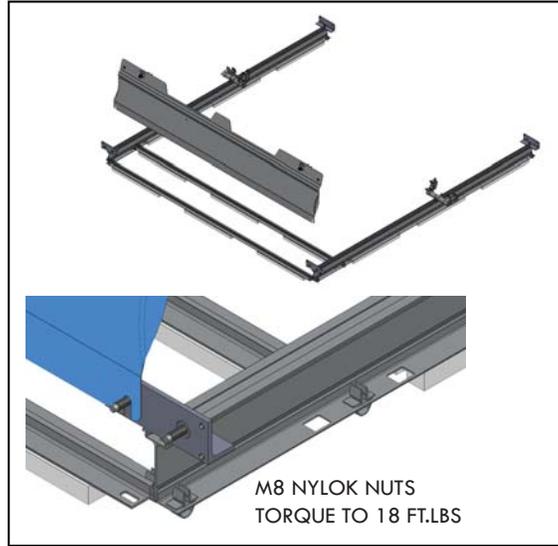
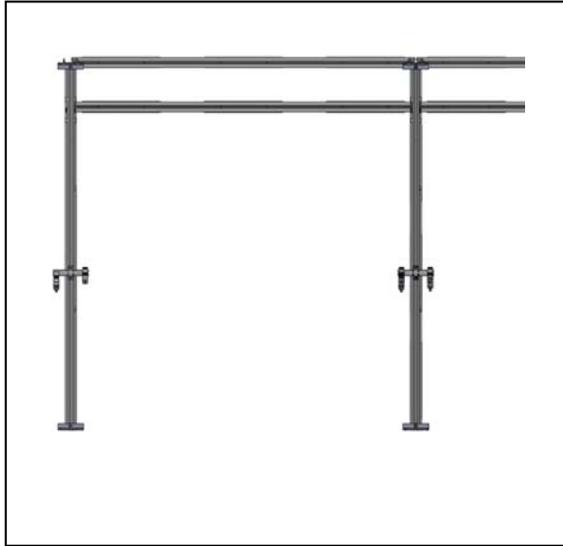


4.3 Step 3

Check Engineering drawing, to determine if one or two Cross Members are required in this Rack/Section of the Array. When the first Cross Member is snapped in place, it should extend outwards past the end of the Runner (as shown above), as the other side will snap into the South ends of Runners, where applicable.

Where ballast is required, ensure that the second Cross Member is installed to the correct width - to properly support the engineered ballast stone width.

4. Installation Instructions



4.4 Step 4

Continue building the Northern most row of the array by adding one additional Runner and one or two Cross Members (as required), from the sealed engineering drawing(s).

4.5 Step 5

Position the assembled Wind Deflector vertically, and rest it over top of the RivStud bolt as shown. Place M8 Nylok Nut on the end of the RivStud as shown, and tighten with 13mm deep socket. Once the array is fully installed, torque these M8 Nylok Nuts to 18 ft.-lbs.

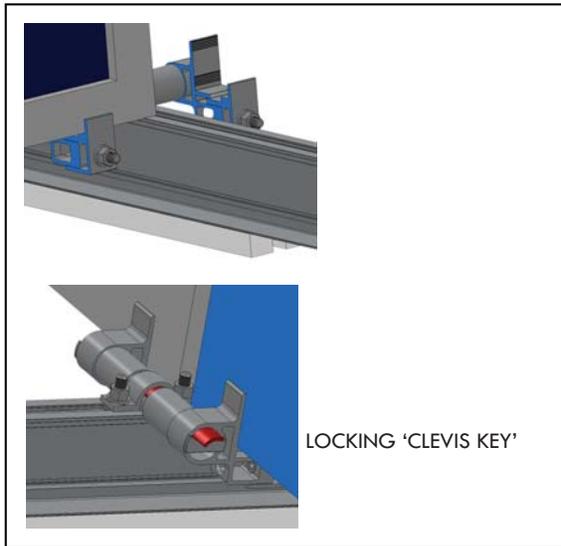


Note that each Runner End Plate contains two RivStuds on the North Side. The PR-1 2.0 system minimizes components by sharing runners between adjacent panels.

4.6 Step 6

Insert Ballast Weight (as specified in the Sealed Engineering drawing), into the supplied racks with two Cross Members. If more than four stones are required, place the first row (4 stones max.) in between the two Cross Members as shown, and then add additional stones on top.

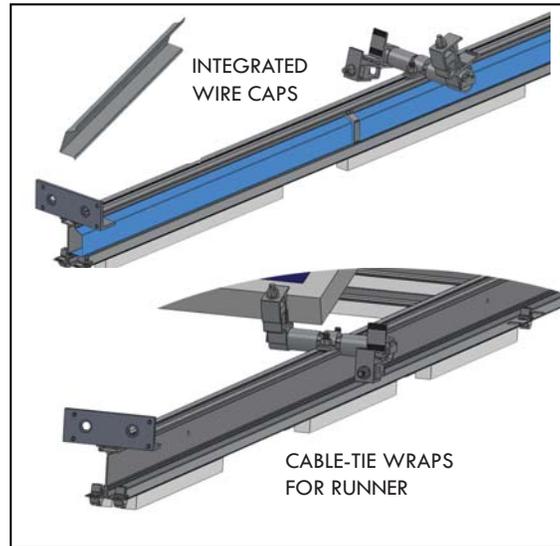
4. Installation Instructions



4.7 Step 7

Insert the Solar Modules into the front clamps. Ensure that the Solar Module rests flush inside the clamp, and that the clamps remain square as tightened. Tighten and torque the M8 Nylok nut, on each of the two front clamps, to 2 ft.-lbs.

During the electrical/wiring process, insert the locking Clevis Key into the front clamp as shown above. This will prevent the Solar Module from falling Northwards in high wind conditions. Once the electrical is complete, remove the Clevis Key and rotate Solar Module into the rear J-Clamps.



4.8 Step 8

North-South Wire management options (pending Customer's order requirements and specification).

In the North-South direction, options consist of 1) the Integrated "Wire Cap" (spring and snap into the Runner profile, position to suit), or 2) "Cable Tie Wraps" which are snapped into the 6mm holes (provided in the Runner, where applicable).

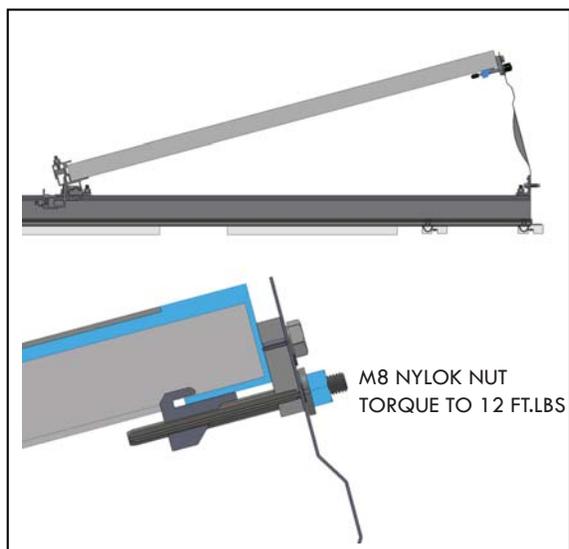


4.9 Step 9

East-West Wire management option (pending Customer's order requirements and specification).

In the East-West direction, for wire and cable routing, utilize the provided MC4 Wire Clips (two per Wind Deflector, shipped separately to the site, per Customer requirements). Wire Clips snap into the provided holes (2), in the Wind Deflector.

4. Installation Instructions

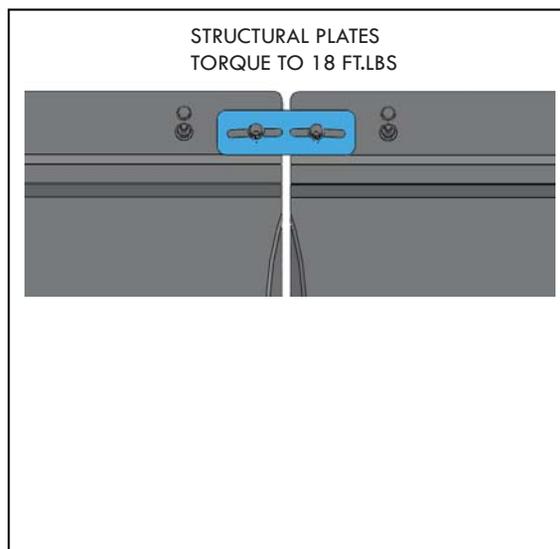


4.10 Step 10

When closing the Bay, ensure that the mounting surface of the PV module frame is resting on top of the lower portion of the J-Clamps.

As the M8 Nylok Nut is tightened (rear side of Wind Deflector), ensure that the lip of the PV module frame is engaged within the clamp.

Torque the M8 Nylok Nut to 12 ft.-lbs.

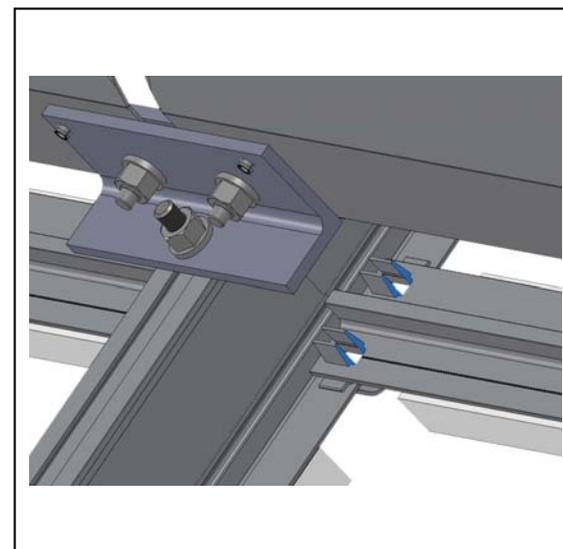


4.11 Step 11

Install the provided Structural Plates on the North side of the Wind Deflectors. Align the curved slots on the Plate, with the integrated M8 RivNuts on the Wind Deflector (the Structural Plate ties adjacent racks together). Insert and thread the M8x16mm Hex Bolt, tighten and torque to 18 ft.-lbs.



In order to maintain Polar Racking warranty, all PV modules must be properly installed into the racking system, at the time of racking installation. Wind deflectors are not to be left unsupported.



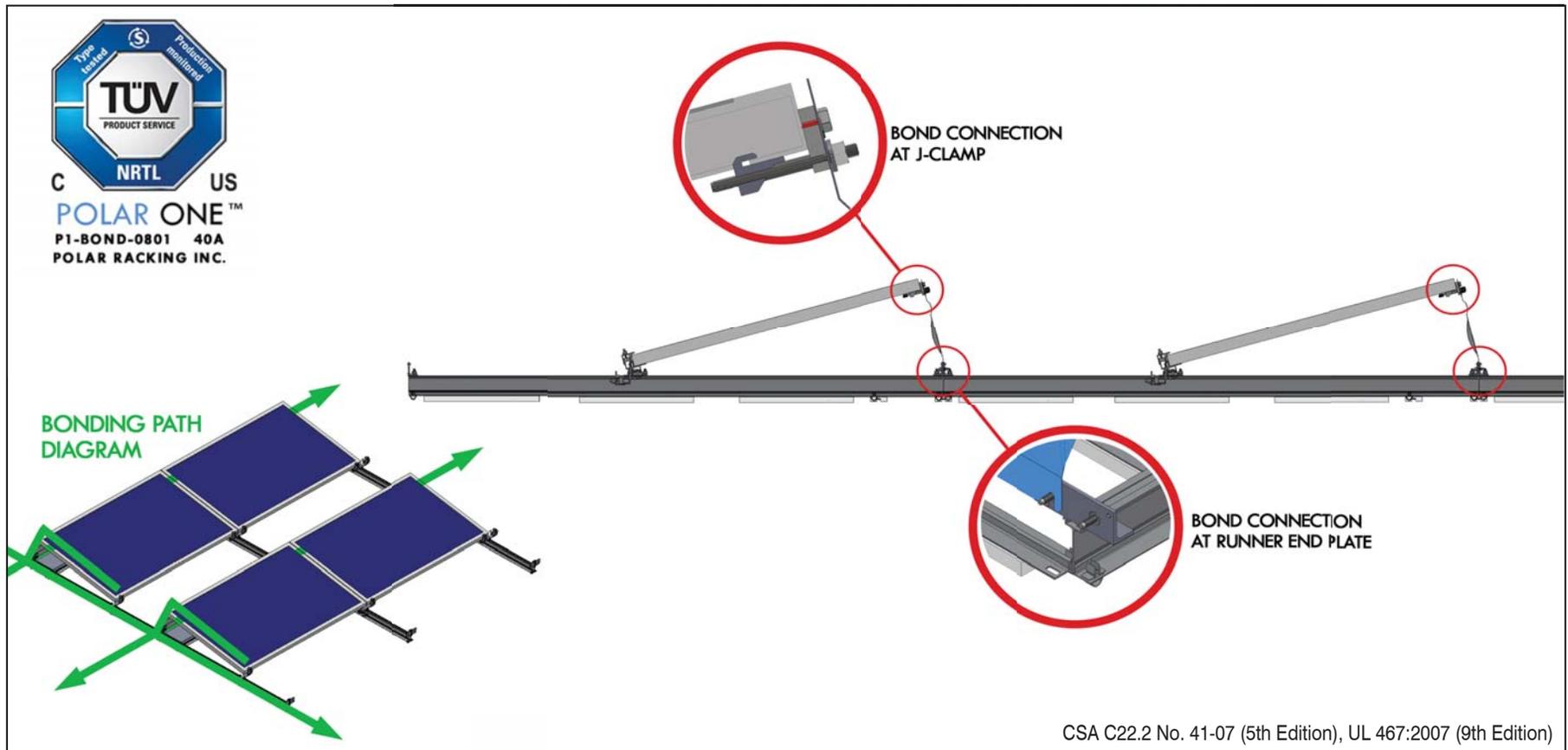
4.12 Step 12

To build additional rows of racking (towards the South), simply follow the same process as Steps 4 – 11.

When adding to existing rows, always **ensure that the Wind Deflector is positioned “in between” the Runner End plates** of each consecutive row. The Integrated Bonding within the racking system depends on this proper mechanical connection. Refer to the “Bond Path Illustration” on Page 12 illustrating the certified Bond Path connection.

5. Bond Path Illustration

5.1 Bond Path Illustration

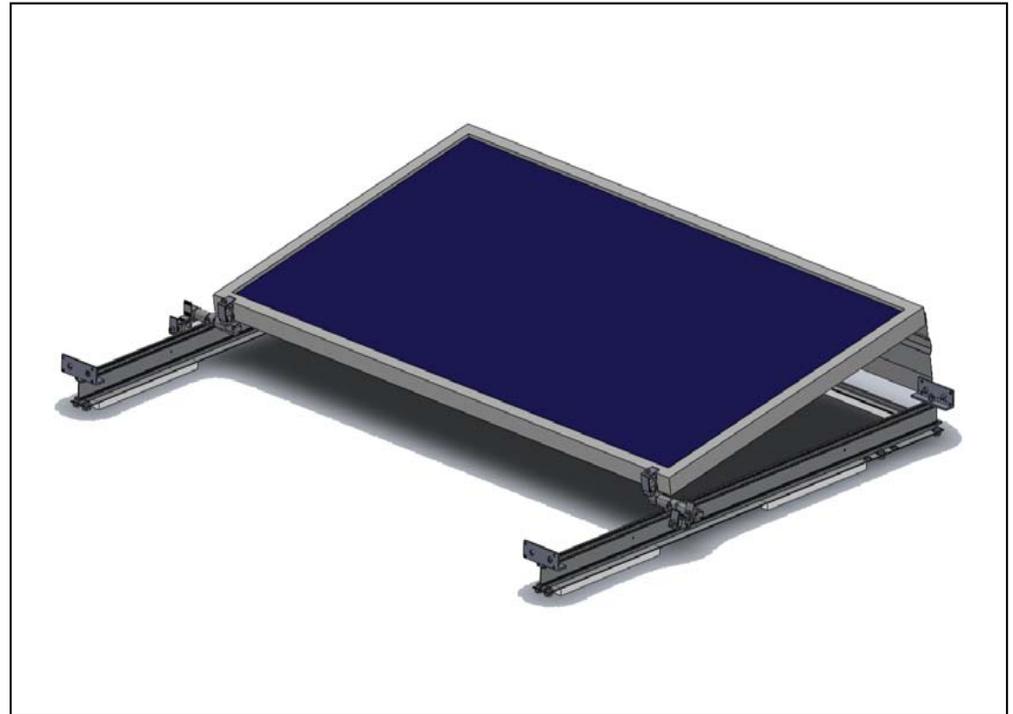


6. Appendix 'A'

6.1 Parts List (Per Module)

Item #	Description	Part #	Qty
1	Runner Assembly	P2-RUT-A-XX	1
2	Cross-Member Assembly	P2-CSM-A-XX	1
3	Wind Deflector Assembly	P2-WIN-A-XX	1
4	Structural Plate	P1-STR-R-XX	1
5	M8 Nylok Nut	P1-FAS-R-XX	2

6.2 Assembly Overview



"XX" denotes module specific Part #'s

6. Appendix 'A'

6.3 Ballast Stones, Specification & Sizing

BALLAST STONE TYPE	A	B
DETAILS	<p>90mm SOLID ASHLER PAVER STONE</p>	<p>42mm SOLID ASHLER PAVER STONE</p>
WEIGHT PER STONE	15.0Kg (33lbs)	6.6Kg (14.6lbs)
TOTAL IN ARRAY	XX	XX
TOTAL WEIGHT	XX	XX
<p>1 - DENOTES NUMBER OF STONES</p> <p>A / B - DENOTES STONE TYPE</p>		

7. 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 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.

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 of 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 BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE TO THE SHORTEST PERIOD PERMITTED BY LAW, WHICH IN

ANY 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 AND INCIDENTAL 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.



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