POWER-FAB CRS-G2
ASSEMBLY INSTRUCTIONS
step-by-step assembly and installation

Part Number: 5802110, Rev D
The POWER-FAB CRS-G2 (Commercial Racking System) is a non-penetrating structure, i.e., the structure does not get screwed, bolted or otherwise fastened to the roof substrate. Instead, it is weighted/held in place to the roof substrate using concrete-cap blocks as ballast.

**Important Installation Considerations**

- Minimum setback of 3 feet
- Roof slope cannot exceed 5°
- Exposure B and C only, Exposure D racks on a case by case scenario.
- Consulting with a local building department and/or professional engineer is recommended.

**Grounding Considerations**

When used in conjunction with the listed minimum torque values and installation methods within these assembly instructions, the components listed below have been tested to be utilized as a grounding/bonding device equivalent to 6 AWG aluminum or copper wire and has been ETL tested to meet or exceed the requirements of UL 467-9th Edition.

- End Clamp (module clamp)
- Grounding Disk
- Kep Nuts

**About these Assembly Instructions**

- These instructions are intended to be used by individuals with sufficient technical skills for the task. Knowledge and use of hand tools, measuring devices and torque values is also required.

- These instructions include various precautions in the forms of Notes, Cautions, and Warnings to assist in the assembly process and/or to draw attention to the fact that certain assembly steps may be dangerous and could cause serious personal injury and/or damage to components. Following the step-by-step procedures and these precautions should minimize the risk of personal injury or damage to components while making the installation not only safe but an efficient process.

For questions on a specific installation please contact us at:

Phone: 800-260-3792   Email: info@power-fab.com

**WARNING**

1. DPW Solar is not liable for, and makes no warranty on, expressed or implied, the suitability of roofing, in situ weatherproofing materials, effect of adjacent buildings and/or equipment geometry, and other installation issues which are outside of DPW's scope. DPW Solar's sole liability is if its product is defective. Please contact the roofer or warranty holder of the roof or building envelope system prior to the installation of a solar structural array, to confirm acceptance and compatibility of the penetration, attachment, and roof contact methods provided and/or proposed in this manual.

2. DPW Solar offers no liability/warranty on any racks not installed to approved layout by DPW Solar. Furthermore, DPW Solar has no obligation to evaluate adjacent building or equipment geometry that may affect the wind dynamics and pressures exerted on the solar array and disclaims any liability related thereto.

3. The POWER-FAB CRS system is to be installed over adhered or fixed roof surfaces only. If additional roof protection materials are added under the CRS structure, including slip sheets, drain mats or sacrificial layers, those materials must either be adhered to the main roofing material or trimmed to fit only under the CRS rails and ballast trays.

4. Stainless Steel hardware can gall when tightened too quickly. Installer should use a Silver Grade anti-seize compound prior to assembling any stainless steel hardware. Do not use an impact driver. All other driver types should be set to low speed settings.
**Before You Start**
There are six main components used in an array (Splice Pans only when needed)

- **N-S Channel**: Captive studs, symmetrical for ease of assembly. Includes mounting holes for wire management.
- **N-S Bars**: Symmetrical for ease of assembly.
- **E-W Spacer**: Used on southern row only.
- **Foot**: No module clamps required.
- **Pan**: Module clamping feature with integrated grounding.
- **Splice Plate**: Captive studs for ease of assembly.

**Small Components and Hardware**
A minimal number of small components and hardware.

**Required Tools:**
- 7/16" Wrench or Socket for 1/4" module clamp hardware
- Torque Wrench
- Ratchet Wrench
- Ratchet Extension Bar
- Felt Tip Marker

- **End Clamp**: Two per Module, self grounding. Grounding component can be reused.
- **J-Bolt**: Two per Module, hooks into Pan, used to secure End Clamps.
- **Kep Nut**: Ten per Module, one type for entire system.
- **Grounding Disk**: Two per Module between N-S Bars and Channels, used only in conjunction with the Pans. One time use only, must be replaced if torqued and disassembled.
- **Hex Bolt**: Used on southernmost Feet and on northern columns that end with a N-S Bar.

**Assembly Instructions, POWER-FAB CRS-G2 (Part Number: Rev D) 5802110**
Before You Start
Distribute one bag per Module, along with two J-Bolts and two End Clamps

Pre-Packaged Hardware

- **Kep Nuts**
  - Qty of 10

- **Grounding Discs**
  - Qty of 2

Assembly Jigs
Use these jigs as intended for proper fit and alignment of components

- **Module Marking Jig**
  - Use with felt tip marker to mark alignment marks on modules prior to installation.
  - (see page 8)

- **E-W Spacing Jig**
  - Sets E-W span between columns. Jig is placed on top edge of adjacent Pans.
  - (see page 14)
Before You Start

There is a repetitive order to the assembly. Repetition makes assembly straightforward and uncomplicated.

Know the difference between **N-S Bars** and **N-S Channels** and how they interlock via the pressed-in studs of the **N-S Channels**. Familiarize yourself with the **Foot**, the **Pan**, and their orientation to the **N-S Bars** and **N-S Channels**.

---

**N-S Channel**
- Kep Nuts
- Grounding Disk
- PV Module (shown transparent for clarity)
- Foot
- Pan

**N-S Bar**

**1/4" x 3/4" Hex Bolt**

---

**Grounding Disk**

---

---

---
Before You Start

Southern end of columns always start with N-S Bars
Never start the southern end with N-S Channels.

Note: To visibly demonstrate system components, PV Modules are illustrated in transparent form.

Staggered south ends also start with N-S Bars
Every southern end starts with N-S Channels.
Before You Start

North end of columns may end with a N-S Bar or N-S Channel. Each requires distinct hardware for the Pan connection as shown below.

In this example, the northern end of the column ends with a N-S Bar. The N-S Bar is attached to the Pan using a hex bolt and Kep nut.

In this example, the northern end of the column ends with a N-S Channel. The N-S Channel is attached to the Pan via its pressed-in studs and a Kep nut.
Before You Start

Understanding the job specific ballast requirements
The job layout indicates the required ballast via the symbols in the legend.

Here’s an example of a ballast legend and job layout to demonstrate the use of colored symbols which indicate ballast requirements across the array.

Matching the symbol from the layout to the legend defines the specific ballast requirements for any location of the array. The illustration next to the legend further defines how the ballast blocks are positioned and counted.

**WARNING:**

Without exception, ballast must be installed/applied per the job layout. Be absolutely certain that the concrete blocks meet the specified weights and dimensions. Failure to do so could lead to a catastrophic structural failure and severe personal injury or death.

---

**BALLAST BLOCK QTY. PER MODULE PAN**

- ▲ 1 BLOCK
- ◼ 2 BLOCKS
- ◼ 3 BLOCKS
- ◇ 4 BLOCKS
- ◼ 4 BLOCKS + 1 BLOCK BETWEEN MODULES IN SPLICE PAN
- ◼ 4 BLOCKS + 2 BLOCKS BETWEEN MODULES IN SPLICE PAN

*ONLY REQUIRED WHEN INDICATED BY LAYOUT*
Before You Start

Mark the Modules with Marking Jig

Marking the Modules while they are stacked saves time.

Be precise during the marking process. These marks are used to align the Modules to the Pans and Feet which, in-turn, square the rack as the Modules are installed.

Place the Marking Jig as shown and strike marks with a felt tip marker by either sliding the Marking Jig down the stack of modules and marking each module or simply mark the top and bottom modules and use a straight edge to draw a line down the entire stack of modules.

It's also possible to Mark a Stack of Modules

Be sure to remove corner protectors and carefully align stack

Marking the Modules while they are stacked saves time.

Mark the Modules with Marking Jig

Marking the Modules while they are stacked saves time.
Step 1
Establish perpendicular Chalk Lines on Rooftop
These lines represent the southwest corner of the array.

Snap perpendicular chalk lines using the 3-4-5 triangulation method. In this example, a factor of 5 feet has been used. On larger systems, use a factor of 10 feet. The chalk lines represent the E-W and N-S coordinates of the array.

CAUTION:
Do not rely on the roof edges or parapets when snapping chalk lines, as they are not always square.

Tip!
Assemble by Zones
This simple approach leads to a square, aligned array.

Assemble by Zones and in sequence.

Zone 1
Assemble the southernmost row, including PV Modules and Ballast.

Zone 2
Assemble the westmost column, including PV Modules and Ballast.

Zone 3
Assemble the rest of the rack components including ballast, and Modules.

WARNING:
To prevent damage to PV Modules, always install required ballast blocks prior to installing PV Modules.
**Step 2**  
**Attach Foot and E-W Spacer to Inner Bars**  
Start at the southwest corner of the array and work to east.

**Note:**  
The southernmost Foot is the only one that uses the 1/4" x 3/4" Hex Bolt; all other Feet are attached via the Pressed-in Studs of the N-S Channels.

**Step 3**  
**Attach Next In-line N-S Bar and Foot**  
Continue this process eastward, completing the southern row.
Tip!
Where to Install E-W Spacers?
Between columns, at southern ends, and where instances of N-S Bar to N-S Bar occur.

E-W Spacers are required only where a combination of N-S Bar to N-S Bar occur between columns at the southernmost end of columns. E-W Spacers are used to connect one column to the next.

E-W Spacers should never be attached to N-S Channels, not under any circumstances.

NOTE:
E-W Spacers are used as an aide during assembly as such:
• They are not essential to the final assembly.
• They do not need to be removed after assembly is complete.
• The structural integrity of the final assembly is not affected if the E-W Spacers are not used in all prescribed locations.

Where to Install E-W Spacers?
Between columns, at southern ends, and where instances of N-S Bar to N-S Bar occur.

Tip!
E-W Spacer
✓ = N-S Bar to N-S Bar
E-W Spacer required
❌ = N-S Bar to N-S Channel
E-W Spacer not used

NOTE:
1/4" x 3/4" Hex Bolt
Kep Nut
Torque to 8 ft-lbs.
Understand Grounding Disks & Locations
Two per Pan connection, between N-S Bars and the N-S Channels

Grounding Disks are installed as shown in the two examples to the right and are similarly installed on the opposite sides of the Pan(s).
In all cases, the Grounding Disk goes between the N-S Channel and N-S Bar.

CAUTION:
Grounding Disks are designed for one time use only. After torque pressures have been applied, they cannot be removed and re-used. If removed, it must be discarded and replaced with a new Grounding Disk.

WARNING:
Electrical hazard will exist if Grounding Disks are not installed per these instructions. Failure to do so could lead to severe personal injury or death.

Installing Grounding Disk at Northern end of N-S Channel

Installing Grounding Disk at Southern end of N-S Channel
Distribute one pre-packaged bag of hardware per PV Module. Placing one bag in each Pan is the recommended approach.

**WARNING:**
To effectively ground the array, Grounding Disk(s) must be installed as shown in these instructions. See "Installing Grounding Disks" on page 8 for more information on the use and required locations of Grounding Disks.

**TIP:**
If the studs on a set of N-S Channels appear too short to pass through the N-S Bar and Foot or Pan perform the following tasks. Loosely hand-start the Kep Nuts first onto all eight studs on the set of N-S Channels. After all eight are hand started, they can then be tool tightened and secured.

The rack should now look like this.
**Step 5a**

**Using the E-W Spacing Jig**

Accurately spaced rows are critical to properly fitting PV Modules

**E-W Spacing Jig**

Establishes space between columns. Place on top edge of adjacent Pans, then push columns outward until the Pans are firmly against Jig.

Once spacing is set, lock in place by tightening the four Kep Nuts securing the Splice Plate to the adjacent Pans.

**Step 5b**

**Attach Splice Plates to the Pans**

Use E-W Spacer Jig to set span between columns

**NOTE:**

Although they are not required on all systems, some systems will require the use of "Splice Pans" to further increase ballast.

Splice Pans replace Splice Plates in key locations of the array where it has been determined additional ballast is needed. If used, Splice Pans will be shown on the project/site specific layout.

If your project calls for "Splice Pans" see Step 5c on the next page for their installation.

---

Assembly Instructions, POWER-FAB CRS-G2 (Part Number: 5802110 Rev D)
**Step 5c** Installing Splice Pans between PV Modules

Not required on all systems. See project/site specific layout. (replaces Splice Plate)

**Zone**

Splice Pans are used only when the site conditions call for additional ballast. They replace the standard Splice Plate in pre-defined locations.

**NOTE:**

See Step 5a for use of the E-W Spacing Jig. Use the same E-W Spacing Jig for Splice Pans or Splice Plates.

**Review**

The rack should now look like this.

**WARNING:**

Electrical hazard will exist if Grounding Disks are not installed per these instructions. Failure to do so could lead to severe personal injury or death.

Before proceeding, take the time to review the proper placement of Grounding Disks with the installation team.
Step 6  Pre-load N-S Bars on N-S Channels
Include Grounding Disks as shown.

Now assemble the westernmost row. Working in the northern direction, complete the row then stop and square-up the rack.

**WARNING:** Improper installation of Grounding Disks could lead to severe personal injury or death if system is not grounded. See "Understand Grounding Disks and Locations" on page 12 for more information.

Step 7  Install next in-line Pans and Feet
Complete the westernmost column, and then square the rack.

**NOTE:** If the north end of the column ends with N-S Bars instead of N-S Channels, the Pan is attached to the N-S Bars using the same 1/4" x 3/4" Hex Bolts and Kep Nuts as used on the southern end of the column. See examples of these two possible scenarios on page 6.
NOTE:
Refer to job specific layout and ballast requirements as well as page 7 before installing ballast blocks.

CAUTION:
To help prevent any accidental damage to PV Modules, always install ballast blocks before installing the PV Modules.

Step 8
Start adding Ballast to pans
This will stabilize the system during alignment and squaring of the rack.

Tip!
Stop assembly of the rack components
Add ballast to the pans and then attach PV Modules to Zones 1 & 2.

Align and square the rack by installing the ballast and PV Modules in Zones 1 & 2.

Install the ballast before the Modules to prevent accidental damage to the Modules. (See Step 8)

As ballast is added, be certain to maintain the rack alignment to the chalk lines. The rack will become more fixed and less flexible as ballast is added making it more difficult to reposition.

As the Modules are secured, the rack becomes increasingly rigid and less likely to shift out of alignment as assembly continues.
First install PV Modules along the entire southern row and western column. This will square-up the rack and make the remainder of the array easy to assemble and trouble free.

**Step 9a**  
Install and Align PV Modules  
Rest module on Pocket flange, slide into Pocket and set on Pan flange.

**Step 9b**  
Align Marks on Modules to Feet & Pans  
Careful Module alignment on the Feet and Pans square the rack.

**NOTE:**  
It’s very important to carefully align each Module to the Pan and Foot by utilizing the previously made marks on the PV Modules. This will ensure proper spacing between Modules and square the rack.
After these initial Modules are installed, the rack will be square, stable and ready to complete assembly.

**NOTE:**
As assembly continues, be sure to use the E-W Spacer Jig when installing Splice Plates.

**CAUTION:**
To help prevent any accidental damage to PV Modules, always install ballast blocks before installing the PV Modules.

The rack should now look like this.
Step 11  In Zone 3, complete the rack assembly
Install N-S Bars, Channels, Feet, Pans, Ballast and Modules.

Refer to the previous steps to complete the rack assembly within Zone 3.
Once the rack is completed and ballast is in place, refer to Step 9 and install the remaining Modules.

Chalk Lines