


clawOS HelioScope Design Flow

This technical brief explains how to use Aurora’s HelioScope solar design software with PanelClaw’s clawOS platform to create structural design drawings based on PanelClaw’s clawFRplus commercial flat roof mounting system. Array layouts can be generated and simulated in HelioScope and then imported into clawOS to produce a complete structural permit package. This design flow combines two best-in-class solar design automation tools to provide a powerful bid preparation suite. For small to medium scale projects, this tool flow can produce final engineering level packages for the structural subsystem.

The following sections summarize key HelioScope design steps for commercial flat roof PV array layout creation and import into clawOS. Refer to HelioScope’s online documentation and the clawOS User Guide for more information on HelioScope and clawOS usage.

HelioScope has a way to pre-define system parameters using profiles. This approach speeds up the design process and ensures accurate module - racking geometry. Use the mechanical profile settings for **clawFRplus** racking shown on the subsequent pages. Unlike clawFR, clawFRplus does not need module adaptors for compatibility with some module families. In particular, the Cam Seat Spacers required with clawFR for modules with relatively thin flanges are no longer necessary thanks to clawFRplus’ improved low-side connection. This accessory subtlety affects footprint geometry and could result in failed layout imports when the appropriate adjustments were not made in Helioscope. clawFRplus eliminates this concern.

All clawFRplus Configurations

- Default Orientation: Landscape (Horizontal)
- Module Spacing: 0.059 ft (0.018 m)
- Frame Spacing: 0 ft (0 m)
- Setback (min): 4.5 ft (1.372 m)
- Alignment: 

clawFRplus 10 Degree

- Racking: Fixed Tilt Racking
- Tilt (Θ): 8.99° (PW = 1134mm, Excel formula for other widths:
 $\text{DEGREES}(\text{ASIN}(177.12/\text{PW}))$)
- Frame Size: 1 up, 1 wide
- Row Spacing ('D' dimension on PanelClaw construction drawing):
 - 29 cm (11 in): 0.913 ft (0.278 m) (PW = 1134 mm, formula for other widths:
 $(\text{PW} * (0.985 - \text{COS}(\text{RADIANS}(\Theta))) + 281.35) * 0.00328$ ft
 - 35 cm (14 in): 1.129 ft (0.344 m) (PW = 1134 mm, formula for other widths:
 $(\text{PW} * (0.985 - \text{COS}(\text{RADIANS}(\Theta))) + 347.15) * 0.00328$ ft
 - 44 cm (17 in): 1.419 ft (0.433 m) (PW = 1134 mm, formula for other widths:
 $(\text{PW} * (0.985 - \text{COS}(\text{RADIANS}(\Theta))) + 435.75) * 0.00328$ ft

clawFRplus 5 Degree

- Racking: Fixed Tilt Racking
- Tilt (Θ): 5.11° (PW = 1134 mm, Excel formula for other widths:
 $\text{DEGREES}(\text{ASIN}(100.92/\text{PW}))$)
- Frame Size: 1 up, 1 wide
- Row Spacing ('D' dimension on PanelClaw construction drawing):
 - 18 cm (7 in): 0.554 ft (0.169 m) (PW = 1134 mm, formula for other widths:
 $(\text{PW} * (1 - \text{COS}(\text{RADIANS}(\Theta))) + 164.3) * 0.00328$ ft
 - 26 cm (10 in): 0.866 ft (0.257 m) (PW = 1134 mm, formula for other widths:
 $(\text{PW} * (1 - \text{COS}(\text{RADIANS}(\Theta))) + 252.9) * 0.00328$ ft

clawFRplus Dual Tilt [22 cm (9 in)]

- Racking: East-West Racking
 - Tilt (Θ): Fixed 8.99° (PW = 1134 mm, Excel formula for other widths:
 $\text{DEGREES}(\text{ASIN}(177.12/\text{PW}))$)
 - Frame Size: 1 up, 1 wide
 - Row Spacing* ('I' dimension on PC drawing):
 - 0.180 ft (0.055 m) (PW = 1134 mm, PT = 35 mm), formula:
 $(65.9 - 2 * \text{PT} * \text{SIN}(\text{RADIANS}(\Theta))) * 0.00328 \text{ ft}$
 - Peak Spacing** ('D' dimension on PC drawing):
 - 0.632 ft (0.193 m) (PW = 1134 mm, PT = 35 mm), formula:
 $(\text{PW} * (1.97 - 2 * \text{COS}(\text{RADIANS}(\Theta))) + 2 * \text{PT} * \text{SIN}(\text{RADIANS}(\Theta)) + 187.8) * 0.00328 \text{ ft}$
- * clawFRplus Dual Tilt valley spacing is called 'row spacing' in Helioscope
** Not in Helioscope profile, specify when creating field segment

KEY: PW = module width, PT = module height (thickness)

Array layouts are defined using field segments in HelioScope. Many field segment parameters are pre-set by selecting the appropriate profile including module selection. If the module for a given project is different than specified in the profile, choose another module when creating the field segment. HelioScope's solar module database is more expansive than the module database in clawOS. When importing layouts from HelioScope, clawOS tries to match the specified module with a module in its database. A match means the module is fully compatible with clawFRplus and clawOS will verify the design loads fall within the limits for that module when used in a project. If a matching module is not found, clawOS asks the user to provide missing module parameters such as module wattage, fire type and a datasheet. In this case, clawOS cannot verify the module loads and the user should request support from PanelClaw before finalizing the project design. In some cases, a matching module may exist in the HelioScope and clawOS solar

module databases, but the software does not automatically detect it due to different model number naming conventions.

HelioScope designs may consist of more than one field segment and each field segment can use a different module and different racking parameters. However, as of this writing, clawOS supports the importing of a single field segment and a single module model for a project.

Since there is no way to explicitly define roof outlines in HelioScope, field segments must be used for this purpose. Specifically, the field segment must be drawn directly on top of the building roof edge. This approach enables accurate wind load analysis by clawOS.


Make sure to follow clawFRplus array layout rules and guidelines when designing in HelioScope. Otherwise, validation errors will occur when creating a project in clawOS. Advanced clawOS users may be able to disable validation checks to successfully import a layout. Note this approach may result in geometry discrepancies between the Helioscope design and the design in clawOS.

<https://www.panelclaw.com/array-layout-guidelines>

HelioScope to clawOS Design Flow Summary

1. Create project in HelioScope


Design 1 cOS TEST 1, 1600 osgood street north andover

 System Designer

Design
✎ Rename

| | |
|---------------|----------------------------|
| Design | Design 1 |
| DC Nameplate | 89.9 kW |
| AC Nameplate | 72.2 kW (1.25 DC/AC) |
| Last Modified | PanelClaw API (06/05/2020) |

📍 Project Location



🗄️ Components

| Component | Name | Count |
|-----------|---------------------------------|---------------|
| Inverters | Sunny Tripower 24000TL-US (SMA) | 3 (72.2 kW) |
| Strings | 10 AWG (Copper) | 15 (894.3 ft) |
| Module | Jinkosolar, JKM 370M-72 (370W) | 243 (89.9 kW) |

🏗️ Field Segments


| Description | Racking | Orientation | Tilt | Azimuth | Intrarow Spacing | Frame Size | Frames | Modules | Power |
|-----------------|------------|------------------------|--------|---------|------------------|------------|--------|---------|---------|
| Field Segment 1 | Fixed Tilt | Landscape (Horizontal) | 10.14° | 167.02° | 1.2 ft | 1x1 | 243 | 243 | 89.9 kW |

🔌 Wiring Zones

| Description | Combiner Poles | String Size | Stringing Strategy |
|-------------|----------------|-------------|--------------------|
| Wiring Zone | 12 | 4-18 | Along Racking |

2. Enter HelioScope credentials in clawOS user profile

User Profile



First Name *

Last Name *

Helioscope Email Address

Phone Number *

Email Address *

Helioscope password^(show)

Test login

Company Name *

Company Street Address *

Company Street Address *

Company State/Province *

Company Zip Code *

Company Country *

Unit of measure

Receive Email notifications

Default Subarray FS

Default Module/Dome FS

Turn Debug Mode ON

Update

3. Create clawOS project with HelioScope layout

Create New Project **CREATE PROJECT**

Disable validation

| | |
|---|--|
| Project Details | Project Location |
| Name * | Site Address * |
| <input type="text" value="cOS HSCOPE TEST 1"/> | <input type="text" value="1600 Osgood Street, North Andover, MA, USA"/> |
| Unit of Measure * | Latitude * |
| <input type="text" value="Imperial"/> | <input type="text" value="42.731522"/> |
| Revision Description* | Longitude * |
| <input type="text" value="HelioScope to clawOS design flow test"/> | <input type="text" value="-71.114608"/> |
| Project Owner* | <input checked="" type="checkbox"/> Include aerial image in construction drawing |
| <input type="text" value="PanelClaw"/> | Product Selection |
| Prepared By* | Manufacturer * |
| <input type="text" value="JD"/> | <input type="text" value="Select..."/> |
| Opportunity | Module * |
| <input type="text"/> | <input type="text" value="Select..."/> |
| <input type="radio"/> AutoCAD <input checked="" type="radio"/> Helioscope | Module Spec Sheet * |
| Project Assets | <input type="text" value="Select..."/> <input type="button" value="Download"/> |
| <input type="button" value="IMPORT FROM HELIOSCOPE"/> | Module not listed here? Add |
| | Mounting System * |
| | <input type="text" value="Select..."/> |
| | Row Spacing* |
| | <input type="text" value="Select..."/> |

Helioscope Project Import

| | |
|----------------------|--|
| Select Project | <input type="text" value="cOS TEST 1"/> |
| Select Design | <input type="text" value="Design 1"/> |
| Select Field Segment | <input type="text" value="Field Segment 1"/> |

FAQ

- clawFRplus design rules call for 6" (0.5') minimum keepout setbacks and 4' minimum roof edge setbacks.
 - Keepout and roof edge setbacks may need to be increased in Helioscope by approximately 1/8" to compensate for a slight reduction in these dimensions during the import process.
 - HelioScope is not aware of racking stickout therefore setbacks must be increased by 6" to account for the worst case clawFRplus stickout on north and south array edges (east and west for clawFRplus Dual Tilt).
 - Use 4.5' min. for roof edge setbacks and 1' min. for keepout setbacks. Since clawFRplus has zero stickout at row ends, clearances along eastern and western array edges of south facing systems and northern and southern edges of dual-tilt systems may be decreased by 6". The only exception is south facing system single module peninsulas where the Deflector may extend beyond the module edges.
- Keepouts change order during the import process from Helioscope to clawOS. The last keep out numbers in Helioscope come first in clawOS.
- Keepouts in all field segments show up in clawOS even though only one field segment is imported.
- When creating a Helioscope project in clawOS, ensure the correct Mounting System and Row Spacing options are selected. clawOS should detect the Mounting System but not the row spacing.
- If the roof height is not entered in HelioScope (default is 0'), clawOS will generate an error during design processing.
- When editing a project in clawOS, the Helioscope layout may be re-imported, for example if the layout was revised. Before pressing 'Update Project' on the project edit page, make sure all racking inputs are selected and the correct values are specified.

For questions contact us at +1 (978) 688-4900 and ask for technical services or contact your PanelClaw sales representative directly.

About PanelClaw:

PanelClaw is a global expert focusing exclusively on flat roof PV structures. The company is headquartered in North Andover, Massachusetts and has gigawatts of experience designing and engineering flat roof structures in over 35 countries around the world. For more information, contact sales@panelclaw.com