

# Panduit Overhead Power Distribution Installation Manual IM057

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## Safety Information

Follow safe electrical work practices:

- Read, understand, and follow the instructions before installing this product.
- Disconnect and lock-out all power supplying equipment before working on or installing Panduit Overhead Power Distribution components. Use a properly rated voltage-sensing device to confirm that power is OFF.
- Install the Panduit Overhead Power Distribution (OPD) system in an appropriate electrical environment per local regulations.

Electrical equipment should be installed, operated, serviced, and maintained only by competent or skilled personnel and in accordance with all local safety codes. Panduit assumes no responsibility for any consequences arising out of the use of this manual. This document should not be viewed as sufficient by otherwise non-qualified personnel to operate, service, or maintain the equipment discussed.

## Part Numbers

This document pertains to the following Panduit product part numbers:

<b>Panduit Part Number</b>	<b>Product Description</b>
208D3-11LHH1B	Overhead Power Distribution - 208V Delta, 30A, (4) 600mm cab width, Left to Right PFM, Hot Aisle PFM and Hot Aisle CB, NEMA L15-30, Black
208D3-21LHH1B	Overhead Power Distribution - 208V Delta, 30A, (8) 600mm cab width, Left to Right PFM, Hot Aisle PFM and Hot Aisle CB, NEMA L15-30, Black
208Y3-11LHH2B	Overhead Power Distribution - 208V Wye, 30A, (4) 600mm cab width, Left to Right PFM, Hot Aisle PFM and Hot Aisle CB, NEMA L21-30, Black
208Y3-21LHH2B	Overhead Power Distribution - 208V Wye, 30A, (8) 600mm cab width, Left to Right PFM, Hot Aisle PFM and Hot Aisle CB, NEMA L21-30, Black
415Y3-11LHH3B	Overhead Power Distribution - 415V Wye, 30A, (4) 600mm cab width, Left to Right PFM, Hot Aisle PFM and Hot Aisle CB, IEC309 IP44, Black
415Y3-21LHH3B	Overhead Power Distribution - 415V Wye, 30A, (8) 600mm cab width, Left to Right PFM, Hot Aisle PFM and Hot Aisle CB, IEC309 IP44, Black

## Related Documents and Standards

### Documents

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

The Panduit Overhead Power Distribution system is manufactured to the following standards:

- Underwriters Laboratory Standard, UL 857 / cUL 857

## Site Evaluation and Pre-Installation

To plan a Panduit Overhead Power Distribution (OPD) system installation, determine the electrical requirements of a contiguous group of racks or cabinets, and translate these into physical power distribution layouts with parts selections from the OPD system.

### Planning Electrical Requirements

Determine the electrical requirements of a contiguous rack or cabinet group by designing the physical layout.

#### Source Voltage and Frequency

Source voltage at the Power Feed Module: the OPD system allows 208V Delta, 208V Wye, and 415V Wye. Voltage is uniform throughout the system. The source voltage and frequency are necessary parameters for the selection of connectivity at the Outlet Housings.

#### Neutral Size

Neutral is rated at the amperage of the system (Wye systems only).

#### Current Loads

Server rack current load translates to load for all components of the Panduit Overhead Power Distribution system. Built-in circuit breakers must exceed expected load.

The cumulative current load of the Outlet Housings connected to the system should not exceed its rated capacity.

#### Upstream Circuit Breakers

Panduit recommends rating upstream circuit breakers at 100% of the bus run amperage rating to avoid stranded capacity.

For a redundant power delivery system, upstream circuit breakers should also be rated at 100% of a single bus run, or the dual run will not be suitable as a fully redundant system.

#### Redundant Feeds

Determine whether you will use single or redundant power feeds to the rack.

Most servers are dual-corded, allowing redundant power sources.

Each Power Feed Module in a redundant layout should be powered from a separate independent power source.

Both OPD systems should be balanced at  $\leq 50\%$  total load of the redundant power run, and the total load on both systems must not exceed the amperage rating of either system.

### **Grounding**

The customer must provide a single-point ground connection to the ground lug in each Power Feed Module. The installer will connect a #4 wire to the ground lug inside the power feed module.

## **Physical Layout and Component Selection**

You should have a Visio drawing, CAD, or other DCIM layout of your server room. Overhead obstructions such as posts, CRAC units, fire detection, and suppression equipment should be noted prior to deployment.

Make maximum use of floor space and long continuous runs.

### **Overhead Support Structure**

The OPD system is hung from an overhead support structure, such as a Unistrut or grid structure. It is the customer's responsibility to evaluate, select, and install the overhead support structure and to provide the connecting hardware, such as bolts or all-thread, to connect the system hangers to the selected structure.

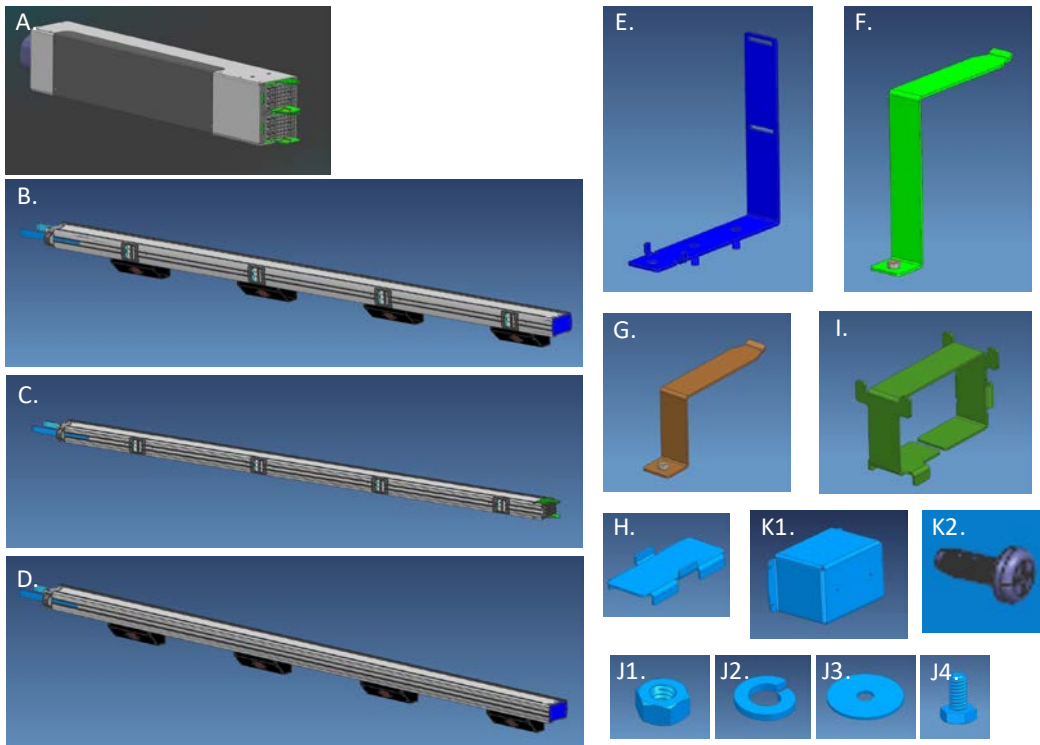
All seismic calculations must be done by a civil engineer prior to hanging the bus run.

### **Outlet Housing Locations**

The location of the Outlet Housings is optimized to drop power directly above servers to make the shortest run for power cords. Locating the outlet housing directly above its server rack also makes it easier for operators to associate it with its servers.



# Inventory



## 8 cabinet system inventory:

- A. Qty 1 - Power feed module (PFM)
- B. Qty 1 – Power distribution module w/ breakers (PDM-B)
- C. Qty 1 – Power extension module (PEM)
- D. Qty 1 – Power distribution module w/o breakers (PDM-NB)
- E. Qty 6 – Base brackets
- F. Qty 6 – Top brackets
- H. Qty 4 – Top spacers
- I. Qty 2 – Mid spacers
- J. Qty 1 Hardware kit – Includes:
  - J1. Qty 12 – Nuts
  - J2. Qty 18 – Locking washers
  - J3. Qty 18 – Washers
  - J4. Qty 6 – Bolts

## Suggested items (not included):

- Qty 12 – 1/2-13 inch threaded rod (length depends on installation)
- Qty 24 – 1/2-13 inch nuts
- Qty 24 – 1/2 inch washers
- Qty 6 – 1 5/8 x 1 5/8 12 ga. slotted strut channel support (length depends by installation)
- 2.5" EMT conduit and fittings

## Required Tools

- 7/16" Nut driver or socket wrench
- 2-29/32" hole punch
- Torque wrench covering 50 to 100 in-lbs

## 4 cabinet system inventory:

- A. Qty 1 - PFM
- B. Qty 1 – PDM-B
- E. Qty 4 – Base brackets
- F. Qty 2 – Top brackets
- G. Qty 2 – Top low brackets
- J. Qty 1 - Hardware kit – Includes:
  - J1. Qty 8 – Nuts
  - J2. Qty 12 – Locking washers
  - J3. Qty 12 – Washers
  - J4. Qty 4 – Bolts
- K. Qty 1- Module blanking cap kit
  - K1. Qty 1 – Blanking cap
  - K2. Qty 4 – M3 Phillips head screws

## Suggested Items (not included):

- Qty 8 – 1/2-13 inch threaded rod
- Qty 16 – 1/2-13 inch nuts
- Qty 16 – 1/2 inch washers
- Qty 4 – 1 5/8 x 1 5/8 12 ga. channel support
- 2.5" EMT conduit and fittings

## Required Tools

- 7/16" Nut driver or socket wrench
- Phillips Screwdriver
- 2-29/32" hole punch
- Torque wrench covering 50 to 100 in-lbs

# Installation Instructions

## Section 1 - Preparation and Planning

The OPD system utilizes a cantilevered strut support design (not included) requiring a minimum of 5" (127 mm) of cantilevered strut channel. Panduit recommends the following vertical clearance (free space):

- Above the OPD system, leave 6" (152 mm) of clearance.
- For NEMA L15-30 and NEMA L21-30 connections, plan 6" (152 mm) of clearance below the outlet housings.
- For IEC 60309 connections, plan 10" (254 mm) of clearance below the outlet housings.

1. Measure space above cabinets to determine vertical height and placement.

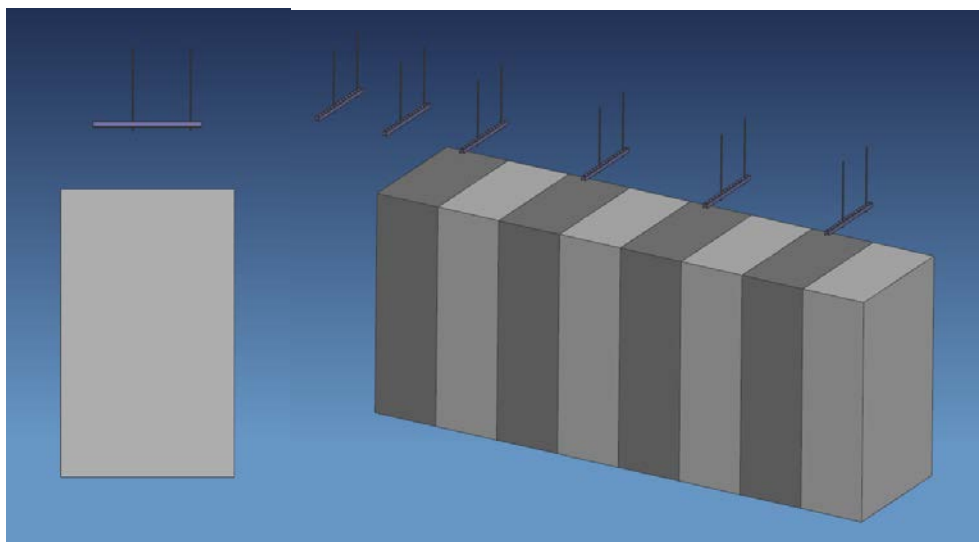


Figure 1 – Side view of cabinet and strut support and iso view of 8 cabinets with supports.

2. Determine if distribution system will face front or rear of cabinet.
3. Use the Support Interval Diagram (Figure 1 and Figure 2) to validate that threaded rod mounting locations on ceiling are clear for installation.

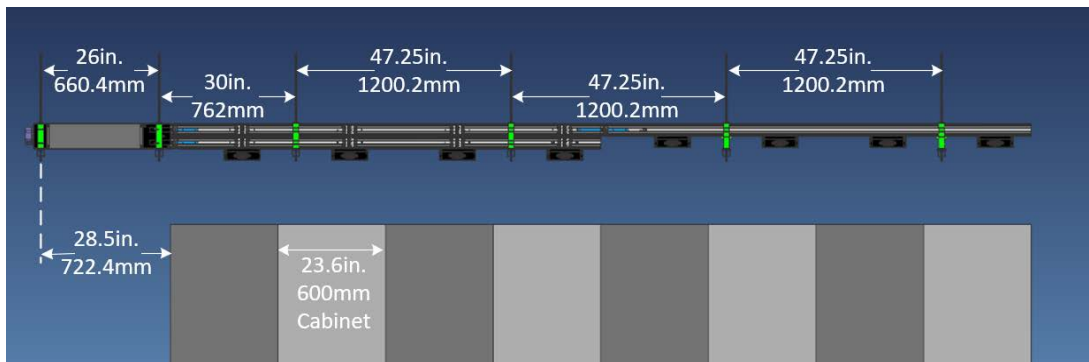


Figure 2 – Support Interval Diagram for 8 cabinet system

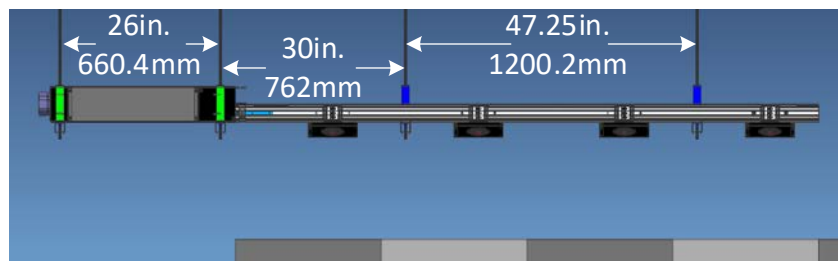


Figure 3 – Support Interval Diagram for 4 cabinet system

## Section 2 - Install the Suspension System

**NOTE:** Location of supports and intervals spacings are important to provide clearance for ease of assembly.

1. Attach threaded rods to the building infrastructure according to the Support Interval Diagram (see Figure 1 and Figure 2).
2. Attach supports to threaded rods using nuts and washers on both the top and bottom of support.

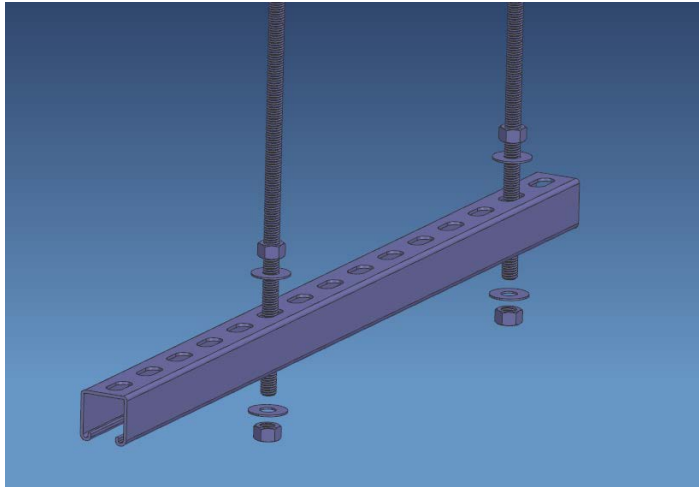


Figure 4 – Strut support nut and washer installation (not included)

3. Level and align supports to each other, then tighten bolts to secure.

### Section 3 - Install the Power Feed Module (PFM)

1. Locate conduit entry point on PFM. Punch source feed entry hole in PFM using a 2-29/32" hole punch and attach a 2.5" EMT fitting.
2. Install base bracket to strut supports using nuts, washers, and lock washers to secure base bracket (Figure 5).

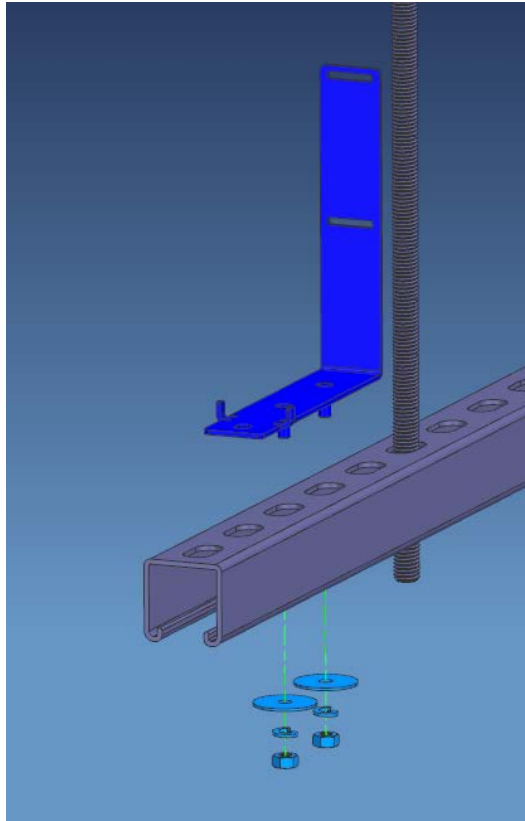


Figure 5 – Base bracket installation (Strut and threaded rod not included)

3. Position PFM on top of base brackets (Figure 6).

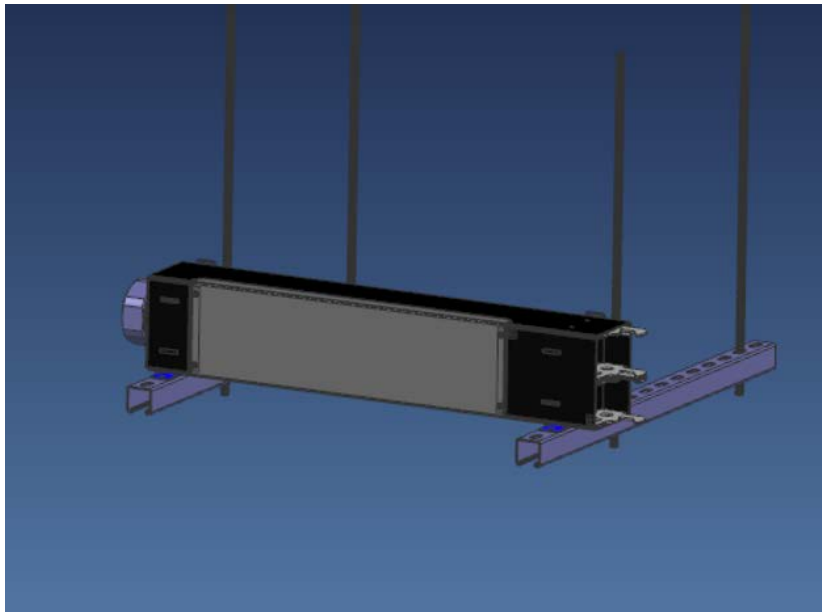


Figure 6 – Locate PFM on base brackets

4. Install Top brackets and secure with included bolts and hardware (Figure 7).

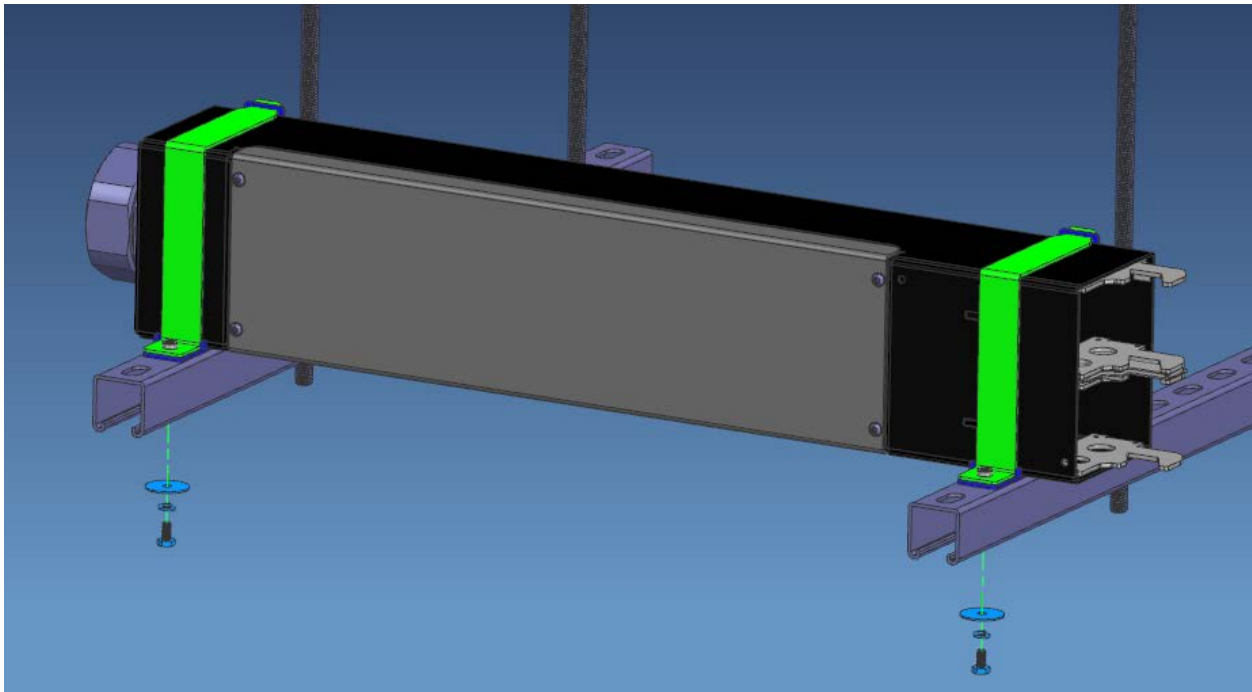


Figure 7 – Top bracket installation

## Section 4 - Connecting PFM to Power

**DANGER!** Make sure all source feed breakers are off until entire system is installed. Severe or fatal injury can result from installing with power on. Ensure that the source power remains off until the system is fully assembled.

1. Connect the conduit to the PFM enclosure.
2. Connect wires to busbars using the provided lugs (3 Phases, Neutral, and Ground) inside the PFM (Figure 8).

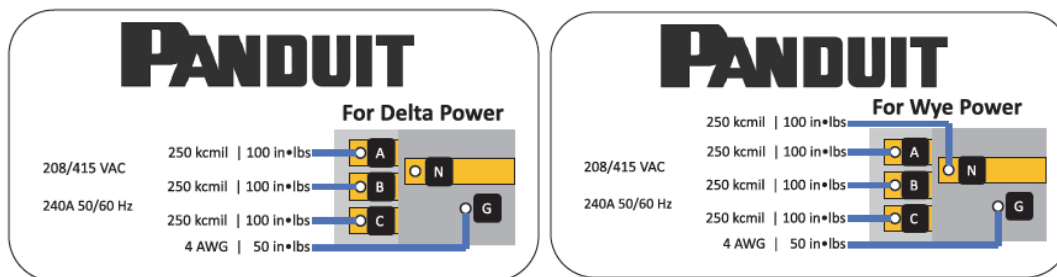


Figure 8 – Connect source feed to busbars

## (Optional) Section 5 - Reverse the Outlet Housings

**Note:** Rotating outlet housings is an optional step. Skip to Section 6 - Install the Power Distribution Module with Breakers (PDM-B) on page 15 if rotating outlets is not needed.

A Torx T25 driver is required for removing outlet housings.

1. Remove screws securing outlet housing to power distribution module (Figure 9).

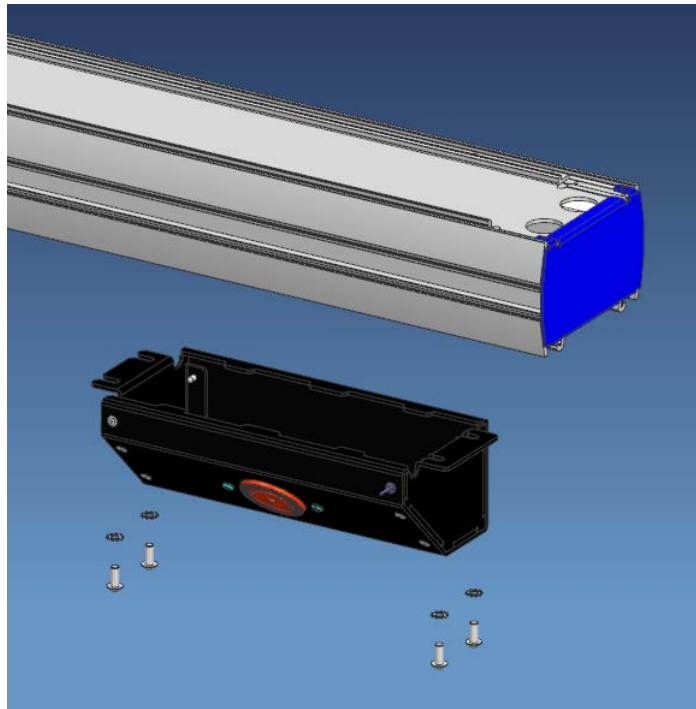


Figure 9 – Outlet housing disassembly

2. Rotate outlet housing 180 degrees.
3. Re-assemble outlet housing.

## Section 6 - Install the Power Distribution Module with Breakers (PDM-B)

1. Set PDM-B on suspension bracket so that the male end of the PDM-B is 1" to 2" from the PFM's bottom receptacle (Figure 10).

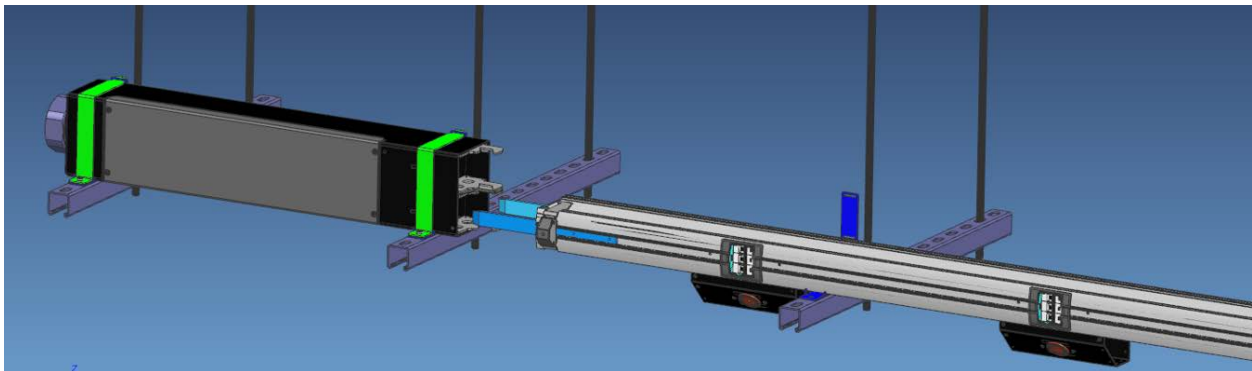


Figure 10 – Set PDM1-B module on base brackets

2. Ensure OPD module breakers are in the OFF position. The module's breaker window will show green when the breaker's connection is open and in the OFF



position. The module's breaker window will show red when the connection is closed and in the ON position (Figure 11).

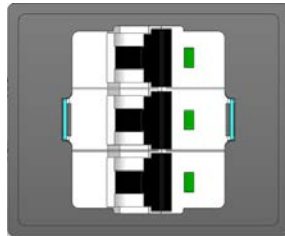


Figure 11 – Breakers in OFF position (Green)

## Section 7 - Module Connecting Process

1. Loosen engagement nut (rotate counterclockwise) to the Initial Engagement position (Figure 14) to prepare for installation (Figure 12).

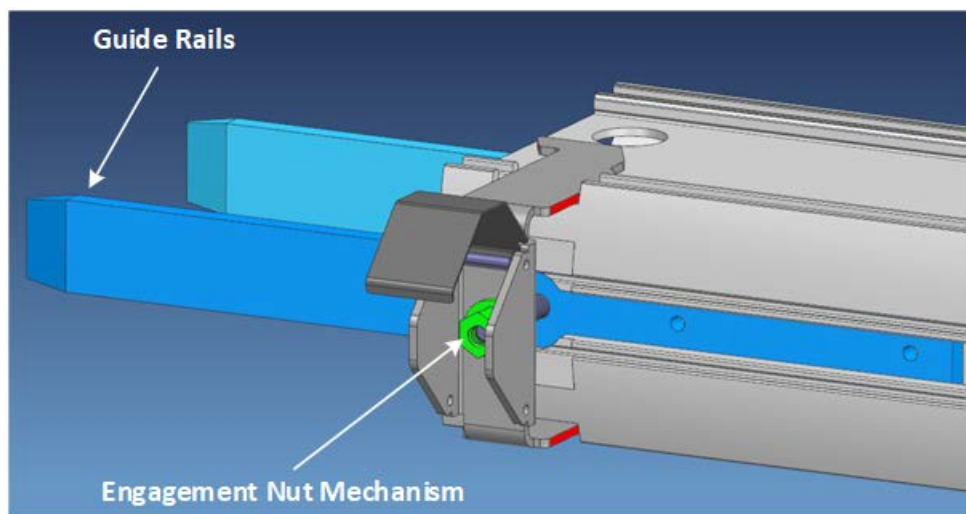


Figure 12 – Engagement nut in Initial Engagement position

2. Align the guide rails of the PDM-B to the receiving rails in the bottom receptacle of the PFM. Gently slide the PDM-B into the PFM until it has reached initial engagement. This should leave a gap between the PFM and the PDM-B of approximately 5/16" or 10mm (Figure 13).

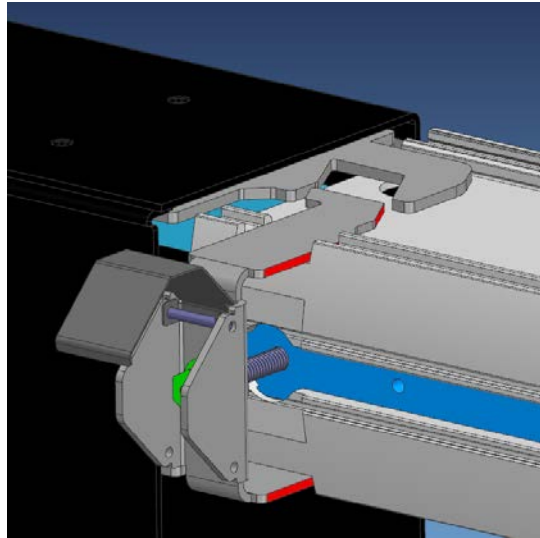


Figure 13 – Engagement mechanism in initial engagement position (open position).

- Use an insulated 7/16" nut driver to engage the mechanism (rotate nut clockwise to tighten) and insert PDM-B to PFM. When the PDM module is pulled tight to the PFM with no gap, the PDM-B is fully engaged (Figure 14).

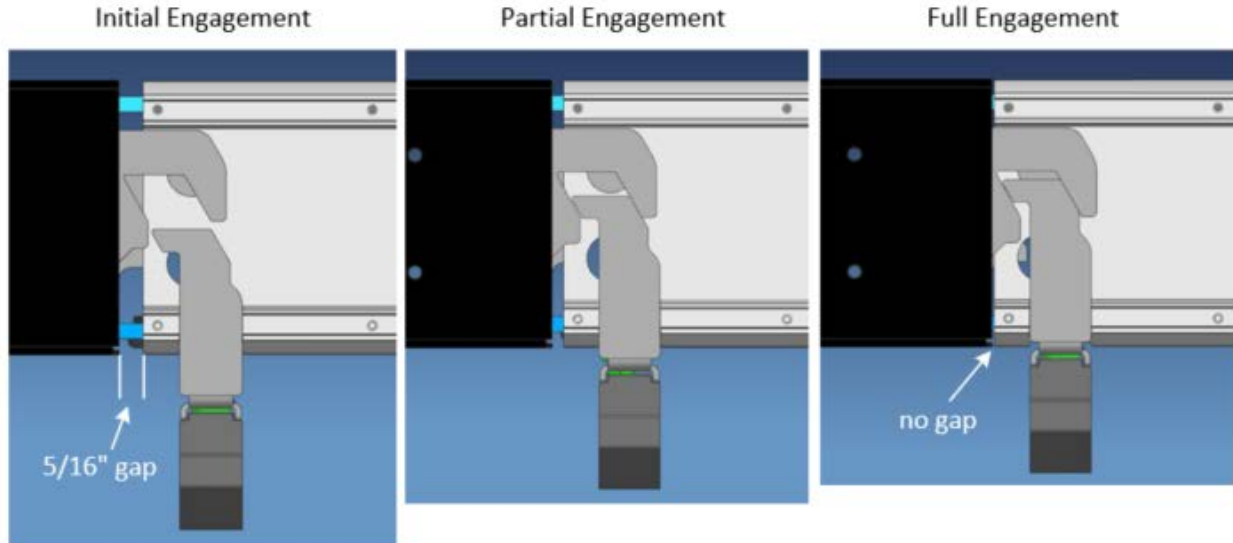


Figure 14 – Top view of Initial, Partial, and Full Engagement positions

**Note:** The mechanism should easily turn until PDM-B is flush with PFM. If mechanism binds before modules are flush, back out mechanism, re-align modules, ensure PDM-B is inserted into PFM as far as possible, then re-engage mechanism.

### End of Module Connecting Process

At this point, the PDM-B should be installed in the bottom receptacle of the PFM (Figure 15).

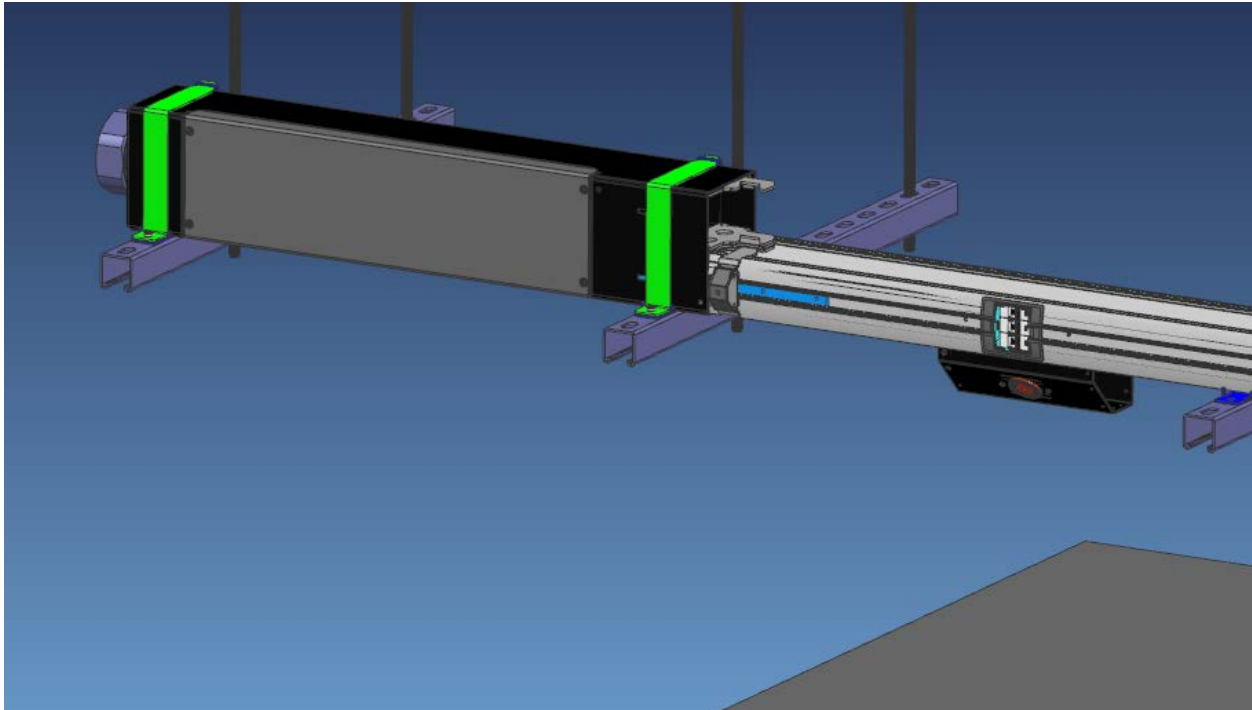


Figure 15 – PDM-B fully engaged in PFM

**Note:** The following two sections, 8 and 9, are to complete an 8 cabinet installation.

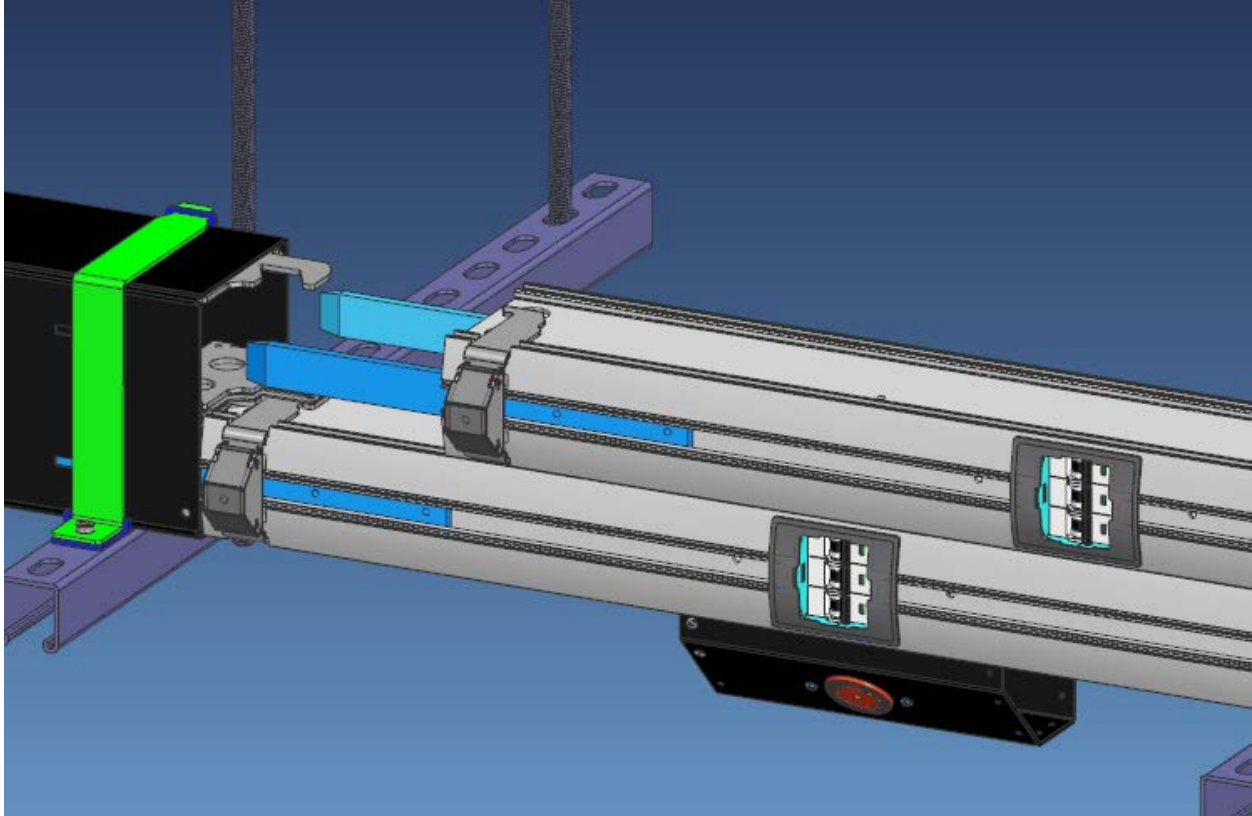
To finish an **8 cabinet installation**, continue with **Section 8 - Attach the Power Extension Module (PEM) with Breakers to the PFM (8 cabinet system)** and Section 9 - Install the Power Distribution Module without Breakers (PDM-NB) (8 cabinet system).

To finish a **4 cabinet installation**, skip to Section 10 - Installation for 4 cabinet system. on page 24.

## Section 8 - Attach the Power Extension Module (PEM) with Breakers to the PFM (8 cabinet system)

1. Set the PEM on top of the already installed PDM-B so that the male end of the PEM is 1" to 2" from the PFM receptacle (Figure 16).

Figure 16 – Installing the PEM into PFM's top module



2. Follow Section 7 - Module Connecting Process on page 16 to engage the PEM into PFM's top module.
3. Once PEM module is fully engaged with PFM, align the top spacers with the base brackets and place on top of the PEM (Figure 17).

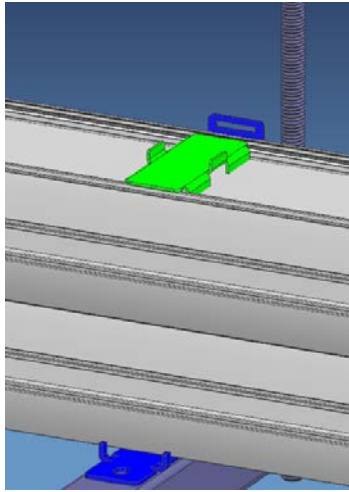


Figure 17 – Place top spacers

4. Insert top bracket into base bracket slot and secure with provided hardware (Figure 18).

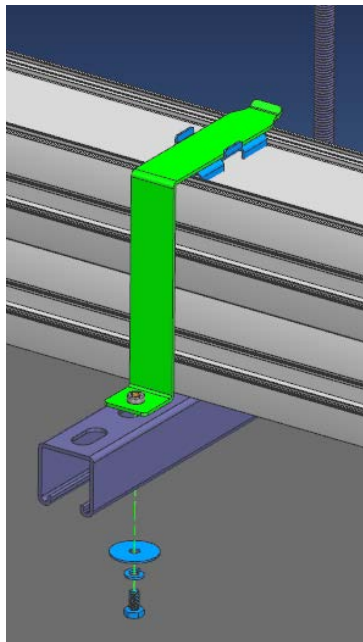


Figure 18 – Install top bracket and secure.

## Section 9 - Install the Power Distribution Module without Breakers (PDM-NB) (8 cabinet system)

1. Slide mid spacers down onto base brackets, ensuring base brackets are inserted into mid spacer rear tabs (Figure 19).

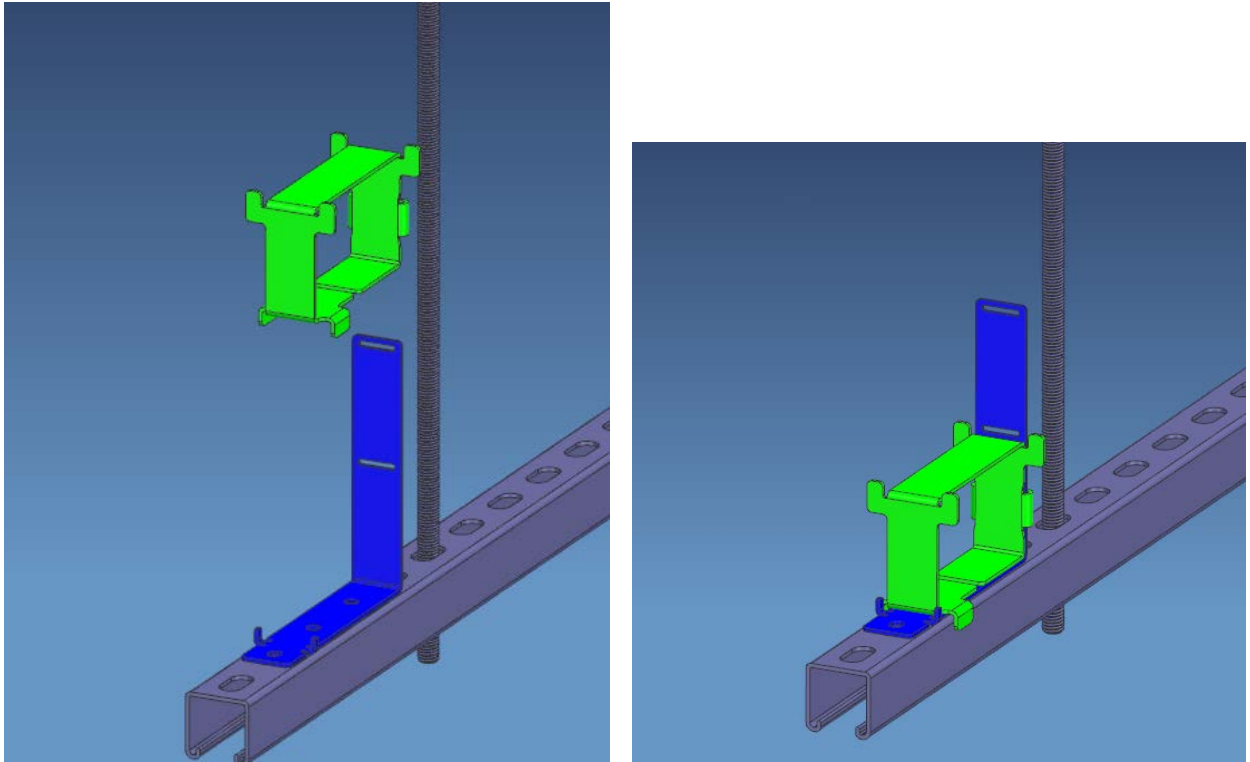


Figure 19 – Slide mid spacers onto top brackets

2. Set the PDM-NB on top of mid spacer and base bracket so the male end of the PDM-NB is 1" to 2" from the PEM receptacle (Figure 20).

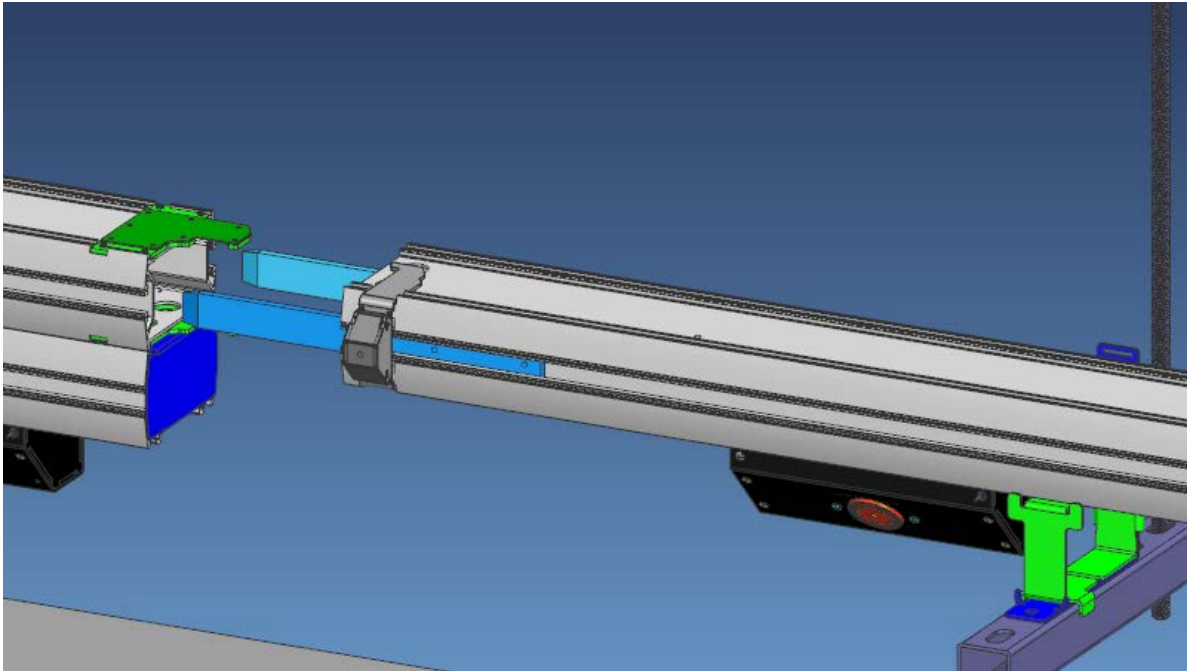


Figure 20 – Locate PDM-NB on mid spacer

3. Follow Section 7 - Module Connecting Process on page 16 to engage PDM-NB into PEM module.
4. Once PDM-NB module is fully engaged with PEM, align top spacers with base bracket/mid spacer assembly and place on top of PDM-NB (Figure 21).

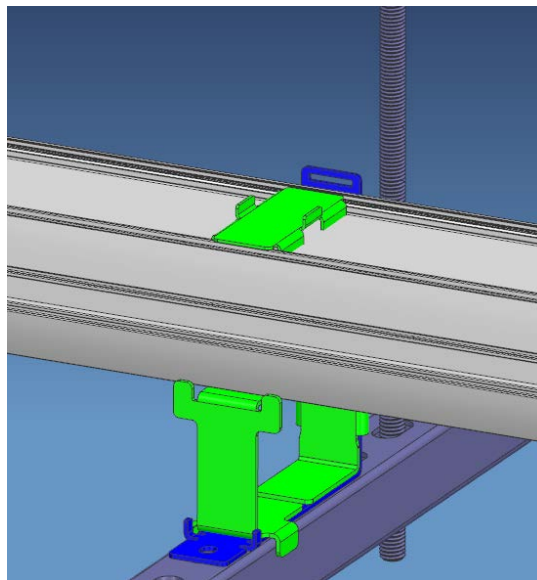


Figure 21 – Place top spacer on PDM2-NB

5. Insert top brackets into base bracket slots and secure with provided hardware (Figure 22).

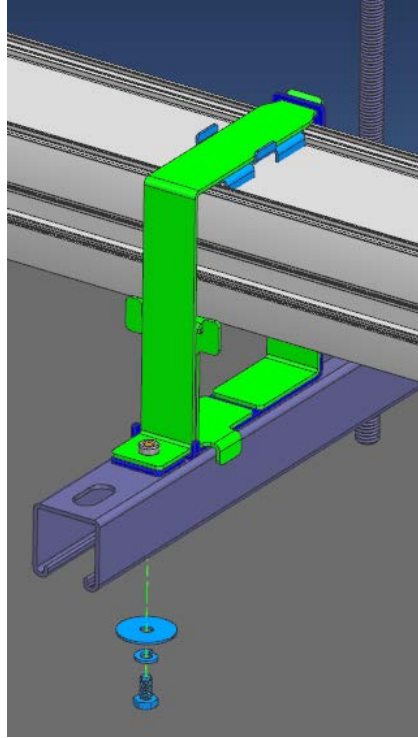


Figure 22 – Install top bracket and secure

The Panduit OPD 8 cabinet system is now installed and ready for commissioning.



## Section 10 - Installation for 4 cabinet system.

1. Insert top low brackets into base bracket middle slots and secure with provided hardware (Figure 23).

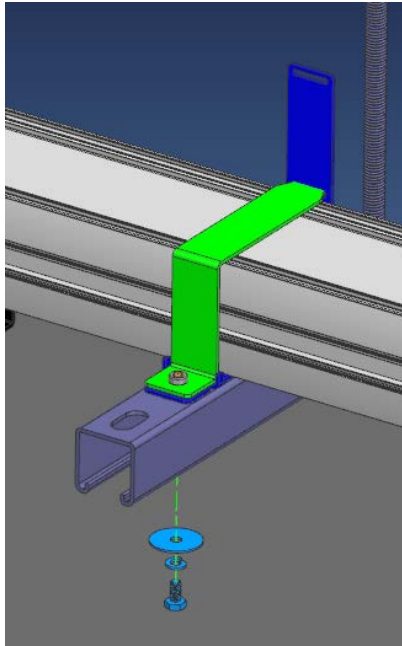


Figure 23 – Install top low bracket and secure

2. Install protective cap in top module of PFM and secure into place with included M3 screws (Figure 24).

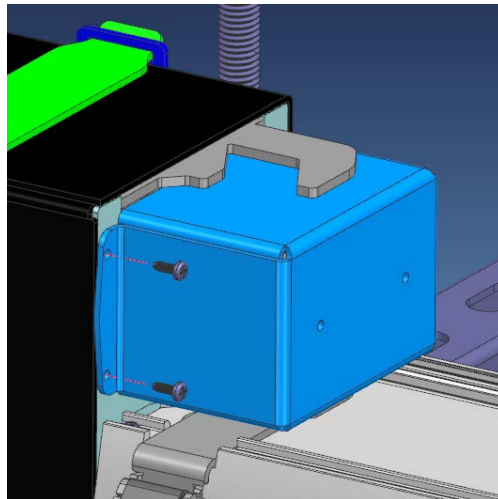


Figure 24 – Install protective cap and secure

The Panduit OPD 4 cabinet system is now installed and ready for commissioning.

# Maintenance

**DANGER!** This product must be installed and inspected by licensed electricians or by authorized technicians. This document should not be viewed as sufficient by otherwise non-qualified personnel to operate, service, or maintain this equipment. Severe or fatal injury can result from electrical shock during contact with high voltage conductors, monitoring PCBs, or similar equipment!

Wear suitable personal protective clothing and use protective equipment for performing mechanical and electrical installations.

Use the same safety precautions as for startup. Power and circuit breakers must be OFF and locked out to perform the following tests.

The OPD system requires only nominal maintenance. Inspect the system annually or after any short circuit or ground fault.

## Annual Inspection

Visually inspect the entire OPD System.

*(Recommended)* Use a thermal scanning device to record the temperature rise for each termination in the end feed. Record this information for year-over-year comparison.

## Procedure After Circuit Breaker Trip

1. Carefully inspect the entire busway.
2. Check to make sure connected loads are operating properly and drawing expected power specified.
3. Check power feed terminations, modules, and Outlet Housing contacts for discoloration, corrosion, or pitting. Replace affected components with new components.
4. Check that all mechanisms and mechanical interlocks are in satisfactory operating condition.
5. Check the torque on all power connections using a torque wrench. The tightening torque for the 3 phases and neutral is 100 in-lbs. and for ground is 50 in-lbs.
6. *(Recommended)* After the busway is re-energized and has reached a stable operating temperature, perform an infrared temperature test on all electrical connections.

## IR Thermal Scanning

Connections in the Power Feed Module can be infrared thermal scanned by qualified personnel wearing appropriate PPE. Circuits in the Outlet Housing can be scanned directly through the front. Scan circuit connections just under the circuit breakers.

# Troubleshooting

## Common Issues and Possible Remedies

### **PDM module will not insert to initial engagement position.**

- Validate that engagement mechanism is in the initial engagement position (Figure 14). Mechanism may prevent insertion if left in full engagement position.
- Check that guide rail system is aligned properly and clear of obstructions.

### **Strut supports are in the way of outlet housings, preventing assembly of modules.**

- Use the support interval diagram to locate supports (Figure 2 and 3)

### **Engagement mechanism binding before full engagement**

- If mechanism binds before modules are flush, back out mechanism, re-align modules, ensure module is inserted into PFM as far as possible, then re-engage mechanism.

### **No power at outlet.**

- Check breakers on modules and utility feed to ensure power is on.
- Contact a certified electrician to verify your electrical feed is correct.

## Revisions

Revision	Date	Changes
REV 01	12/12/22	Initial release
REV 02	3/2/23	Added Part Numbers. Removed reference to Blue / Red for primary / secondary feeds. Added recommended clearance above / below. Clarified “Initial Engagement” position. Updated torque values in “Maintenance” section. Added torque wrench to “Required Tools” list.
REV 03	2/9/24	Added cUL 857 (Canada). Updated brand information.