

Panduit Fault Managed Power System (FMPS)

Hardware Installation Guide

Version 3.0.0

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Safety Information

- Always follow safety and lockout/tagout procedures when working on or near electrical systems and equipment.
- Do not use this product outside of the specified performance and environmental limits. See the Panduit FMPS Product Specifications for details.
- This product must be installed by a skilled person that is trained or experienced in the equipment technology and particularly knowledgeable about various energies and energy magnitudes used by the equipment.
- Panduit FMPS Transmitter Chassis and Receivers must be installed correctly and grounded as described in this Installation Manual for safe transmission of power. Correct functioning of the devices must be verified after installation.
- Fault conditions preventing system initiation and operation must be addressed. Check the LEDs on components or consult the web user interface error log to determine fault(s). Faults can typically be resolved by disabling the Transmitter Module(s), inspect lines and condition of equipment, and reenabling the Transmitter. See the [Troubleshooting](#) section for more detailed information.
- Always comply with local installation codes and standards.
- Please note that the product contains a lithium battery, which poses a risk of fire, explosion and or severe burns. To ensure safety, do not crush, recharge, disassemble, or heat the battery above 85 °C. Additionally, do not incinerate or expose the battery content to water.
- Only use approved UL Listed Class 4 Cable. Follow permissible AWG size range to avoid overheating of cables (see [Appendix A](#)).
- For all deployments that are outdoor, aerial, or underground, Over Voltage Protection (OVP) is required at the originating end and terminating end of each cable pair.
- Under certain conditions, Direct Current can cause corrosion. Concerned industries should practice accurate assessment and recording of direct stray currents to gauge and control any adverse effects.
- System cable, Power Supply Modules, Transmitter Modules, Receivers, and Network Management Cards can be replaced. Network Management Cards and Receivers must be installed or removed with the power off; however, Power Supply Modules and Transmitter Modules can be hot swapped. No other part of the product is serviceable. Do not attempt to open the Transmitter Chassis, any of the modules, or the Receivers for repair or modification. When servicing this product, only use specified replacement parts.

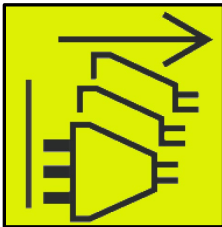
- The cable between the Transmitter and Receiver is touch-safe: positive to negative in the same cable and also between different cables of the same chassis.
- The system safeguards against transfer of energy capable of causing injury by interrupting/temporarily disconnecting the energy source on any channel pair.
- The voltage rating of the transmission wiring between Panduit FMPS Transmitter Chassis and Receiver(s) must be a minimum of 450 Vrms @ 75°C. For a Class 4 deployment, Class 4 cable must be used.
- The allowable line capacitance specified by IEC 60950-21 is 3 μ F. The Design Authority of the deployment must confirm that the line capacitance listed in the cable specifications for a single pair does not exceed 2.97 μ F over the total distance between the Transmitter Chassis and Receiver units.
- Panduit FMPS takes advantage of the Heart Current Factor for Line-to-Line faults, and the conductors are contained within a cable and are spaced by less than 8 inches.
- Splice connections in the Class 4 circuit premise wiring are to be made within a listed junction box (Panduit P/N CPB12BL or Panduit P/N CPB6BL) if installed within concealed spaces or where the splice may come in contact with a flammable material.
- Restricted Access Area: “Equipment is intended for installation in Restricted Access Area” (Instruction)
- Marking of Hot Parts: “WARNING: HOT SURFACE. DO NOT TOUCH.

- Multiple Power Sources: A prominent instruction is provided at each disconnect device giving adequate instructions for the removal of all power from the unit. The elements of the instruction is as follows:

- Element 1:



IEC 60417-60 42 (2010-11); and



IEC 60417-6172 (2012-09);

- Element 2: “Caution” or equivalent word or text, and “Shock hazard” or equivalent text;
- Element 3: Optional;
- Element 4: “Disconnect all power sources” or equivalent text

Product Overview

Panduit Fault Managed Power System (FMPS) is a novel, remote power delivery system that allows users to deliver power safely and easily to remote loads. Panduit FMPS is the first Class 4 system that complies with UL 1400-1 for a safer, more reliable power alternative for wireless systems that is easier to install. It eliminates many complicated requirements for traditional power and delivers significant power over longer distances using standard multi-conductor cables without the need for conduit, junction boxes, or breaker panels. Panduit FMPS simplifies installation and increases deployment speed while reducing deployment costs.

Panduit FMPS offers remote monitoring and control capabilities that provide total visibility into power usage to manage and troubleshoot remotely. The plug-and-play configuration is flexible and scalable allowing for growth with increasing wireless demands while a hot-swappable configuration minimizes equipment downtime and business interruptions.

Panduit FMPS is a safe, efficient, reliable, and practical remote power delivery system that will go the distance.

Features and Benefits

Safe High-Voltage Power

A fault management system that detects and instantly stops power transmission when a fault occurs, making it a safe power delivery system **that expands on** the safety benefits of Class 2 power systems.

Significant Power Over Long Distance

Up to 30x the power and up to 30x the distance of a Class 2 power system using fewer copper pairs and thinner wire gauge, saving up to 60% on cable costs.

Simple & Efficient Installation

No conduit, junction boxes, circuit breakers, or permits are required as with traditional power. Technicians may install copper and fiber cabling simultaneously for greater cost and time savings over traditional power: saving up to 40% on material and installation costs. The centralized design of the Panduit FMPS makes it easy to back up and provides ultimate flexibility for larger venues, unique locations, and places where

conduit is challenging to install. Easy-to-install connectors for secure and reliable connectivity accompanied with cable management solutions provide savings on rack space.

Latest Industry Standard Compliance

Safe and compliant with the latest industry standards for peace of mind when hiring technicians. Gain faster approval from local Authorities Having Jurisdiction (AHJ) and expedite installation.

Remote Monitoring & Control

Monitor, troubleshoot, and control your system remotely through web-based access or SNMP interface. Increase operational efficiency with full visibility into your power usage and the ability to remotely shut down individual components helping avoid costly site visits.

Hot-Swappable Components

Easy to move/add/change for a flexible and scalable power delivery system to grow with rising wireless demands. Minimizes equipment downtime and reduces business interruptions. Intelligent LED indicators on all system components for easier installation, onsite maintenance, and troubleshooting.

Project Package

The Project Package will include a list of all the purchased Panduit FMPS components, cable provisions, and requirements for a proper installation. Below is an example of a Project Package.

Project Name

Panduit FMPS Components

Component	Quantity	Notes
Panduit FMPS Transmitter Chassis	10	
Power Supply Module	20	
Transmitter Module	40	
Panduit FMPS Receiver Module	25	
Patch Panel	5	Recommended
Mini-com Adapter	40	Recommended

Requirements and Recommendations for Proper Installation

Requirements/Recommendation	Quantity	Notes
Minimum Rack Space Required	10 RU	1 per Chassis
Recommended Rack Space with Patching	15 RU	1 per Chassis and Patch Panel
Minimum PDU C19 outlets (or AC circuit breakers)	20	1 per Power Supply Module
Recommended PDU C19 outlets (or AC circuit breakers)	30	3 per Chassis, to allow for future growth
Network cable (minimum CAT5e 4-pair Ethernet)	10	1 per Chassis
Engineered Total Power Supplied to end devices	16,000 W	Based on Design
Head End Cooling Load Required	1,000 W	Based on Engineered Power Supply

Site Evaluation and Pre-Installation

Head End Location

- Make sure the site-specific Project Package is available. The package includes details of Transmitter Chassis and Receiver allocations, along with cabling specifications.
- Verify that the quantities of all part numbers specified in the Project Package are available on-site.
- Check for adequate Rack Unit (RU) space available to mount the Panduit FMPS Transmitter Chassis. See the Project Package for RU space required for Panduit FMPS equipment.
- Make sure the racks are properly bonded to grounding busbars, clamps, or Earth-ground conductors. The Panduit FMPS Transmitter Chassis connects to Earth-ground through the grounding system of the rack(s).

- Per the Project Package, make sure that the proper Class 4 Cable type and size (conductor counts and gauge) has been pulled between the head end and the various Receiver locations.
- Make sure the Panduit FMPS Transmitter Chassis or rack Power Distribution Unit (PDU) are closer than 50 feet from properly sized AC mains connections and/or breaker panels. For further details, check the Power Source Input Wiring Section below.

Power Source Input Wiring

The Power Source input power can be sourced from a PDU or directly from an AC breaker panel.

Relevant for PDU (Recommended)

- Check for adequate number and type of PDU outlets. See the Project Package for details.
- Verify PDU outlet compatibility with the power cords supplied with the Panduit FMPS system. Each Power Supply Module comes shipped with a C-19 to C-20 power cord. The C-19 connector inserts into the Power Supply Module and the C-20 plug inserts into the PDU.
- Ensure the PDU outlets have correctly sized circuit breakers. For a single phase 208 VAC power source (recommended), the PDU outlet should have a single phase two pole 10 Amp circuit breaker. If two power supplies will be on the same phase of the PDU, the circuit breaker should be at least 20 Amps. For more details, refer to the [Power Supply Installation](#) section.

Note: Because each Transmitter Chassis can hold up to three Power Supplies, Panduit recommends provisioning three PDU outlets per Panduit FMPS Transmitter Chassis for future-proofing.

Relevant for Direct AC Breaker Panel:

- Check that the adequate number of AC circuit breakers are installed in the AC breaker panel. See the Project Package for details.
- Ensure the circuit breakers are correctly sized. For a single phase 208 VAC power source (recommended), use a single-pole 10 Amp circuit breaker. For more details, refer to the [Power Supply Installation](#) section.
- Ensure all installed circuit breakers are in the “OFF” position until the complete system is ready to be powered.
- Verify breaker panel wires are properly grounded and have the appropriate plug to connect to the Power Supply Modules.

- Breaker panel wiring must be no more than 50 ft. of 12 AWG wire when terminating to an IEC 60320-19 plug to a circuit breaker.

Note: The gauge size for the breaker panel wiring is dependent on the distance between the panel and the Panduit FMPS Transmitter Chassis. If the distance will exceed 50 ft., follow all local and national electrical code requirements concerning voltage drop requirements and size the wire accordingly.

Panduit FMPS Receiver Location

- Per the Project Package, make sure that the proper Class 4 cable type and size (conductor counts and gauge) has been pulled between the head end and the various Receiver locations.
- Ensure proper bonded access to Earth-ground is available. All Receivers require an Earth-ground connection for functionality and electrical protection. Secure the appropriate gauge size wire to connect the Receivers to Earth-ground.
- Follow national and electrical code requirements for proper wiring methods and distances from Receivers to Earth-ground.
- Ensure Receiver mounting location is within 10 ft. of powered devices to maximize output power from the Receiver.
- Make sure the Receivers are not installed above a heat source or in direct sunlight.
- If mounting multiple Receivers in the same location, do not mount Receivers above each other. Mount Receivers next to each other with a minimum 4 in. separation for proper cooling.
- Make sure that the total power expected of the powered devices does not exceed the Receiver power capacity.

Note: As a general rule, each Receiver **channel** can provide approximately 500 W of output power. This depends on the distance and cable size used from the Transmitter.

Tools and Materials Required

All Panduit FMPS equipment is shipped with the hardware needed for proper installation of the system except for site specific requirements which include but are not limited to:

- Field wiring (not included)
- Copper patch wire (not included)

- Receiver grounding wire – 6 AWG (not included)

Below is a list of tools and materials recommended for proper installation of the Panduit FMPS system:

- Screwdrivers – #2 Phillips, #3 Phillips, & Slotted
- Wire stripper
- Wrenches and/or pliers
- Wire cutters
- Compression crimp tools
- Multimeter
- Cable management materials (Recommended: Pan-Ty cable ties or similar, Panduit P/N WMPFSE 1RU cable manager or similar, Panduit P/N SRB19MDBL multi-depth strain relief bar or similar, and Panduit P/N PR2VFD06 vertical cable manager or similar. Panduit Ferrules to be terminated on both ends of each class 4 cable pair. (Recommended Panduit 16AWG Ferrule P/N FSD78-6-D Single Wire Ferrule for 16AWG Wire, Panduit 18AWG Ferrule P/N FSD76-6-D Gray Single Wire Ferrule for 18AWG Wire.
- Suitable labeling means (Recommended: Panduit MP300 label maker or similar)

Labeling Recommendations

- Label the Transmitter Chassis with a unique identifier. If multiple Transmitter Chassis are mounted in the rack, label each from top to bottom.
- Label each Receiver with a unique identifier.
- Label each field cable on both ends with Transmitter Chassis identifier and its slot number and Receiver identifier.
- Label each patch cable on both ends with Transmitter Chassis identifier and its slot number.
- Label each patch panel with Receiver identifier.

Product Part Numbers

Product	Panduit Part Number*
Transmitter Chassis	PXTC1ARA
Power Supply Module	PXU1AJANNXX
Transmitter Module	PXTM1AF
Receiver	PXR1AJD

Supplementary Equipment	Panduit Part Number
Mini-Com Patch Panel	CFAPPBL1
Patch Panel Extension Brackets	RSB1B
Mini-Com Module Connector	PXM1ARGRBL
Rack Horizontal PDU	P06B03M or P24B14M
Vertical Cable Manager	PR2VFD06 or PR2VFD06WH
Strain Relief Bar	(5 in) CMBRC5; (7 in) SRB19D7BL
Rack-Mounted Shelf	SRM19FM1

*Contact [Panduit](#) for availability.

Panduit FMPS Equipment

The following sections cover the equipment provided in the Panduit FMPS Package.

Panduit FMPS Transmitter Chassis (PXTC1ARA)



Panduit FMPS Transmitter Chassis

Note: Transmitter Modules and Power Supply Modules must be purchased separately.

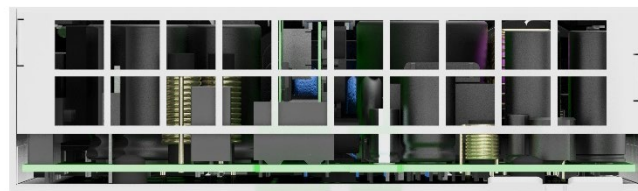
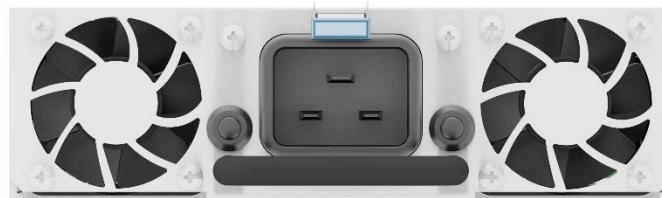
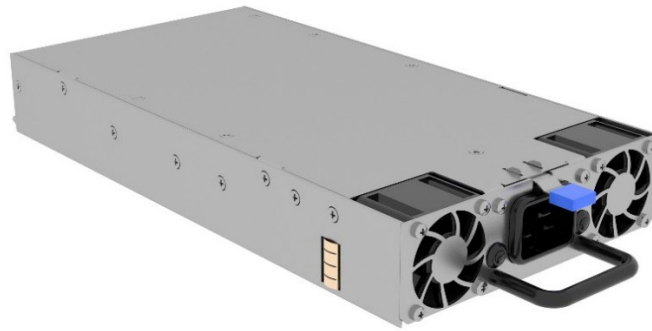
Each Panduit FMPS Transmitter Chassis includes:

- (1) Network Management Card (Panduit P/N PXG1A)
- (1) C-19 to C-20 power cord
- (2) L-brackets for cabinet or rack mounting
- (1) locking screw (M3x8mm)
- (1) Grounding screw (Panduit P/N RGTBSG-C)
- (8) Transmitter Module blanking panels
- (2) Power Supply blanking panels

- (3) rack mounting screws (#12-24) (Panduit P/N S1224-C)

Note: If mounting to a cabinet, use alternative mounting screws (not included).

Power Supply Module (PXU1AJANNXX)

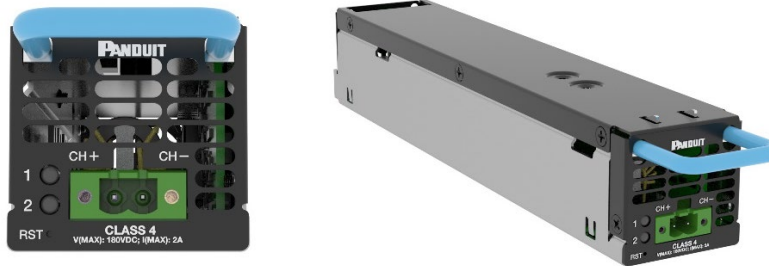


Power Supply Module Top, Front, and Back

Each Power Supply Module includes:

- (1) C-19 to C-20 power cord

Transmitter Module (PXTM1AF)

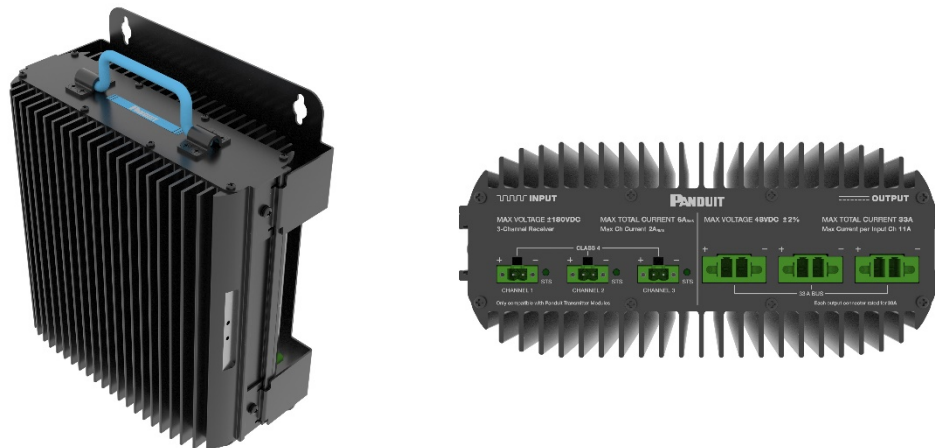


Transmitter Module

Each Transmitter Module includes:

- (1) screwed-in Euro-style connector

Panduit FMPS Receiver (PXR1AJD)



Panduit FMPS Receiver

Each Panduit FMPS Receiver includes:

- (1) Receiver mounting bracket

- (4) M5x8mm screws
- (4) #10 wood screws
- (2) grounding lugs (Panduit P/N LCC6-14JAW-L)
- (3) Euro-style connectors for input (Amphenol P/N 20020002-G021B01LF).
- (3) Euro-style connectors for output (Phoenix Contact P/N 1777833).
- (4) M5 grounding screws

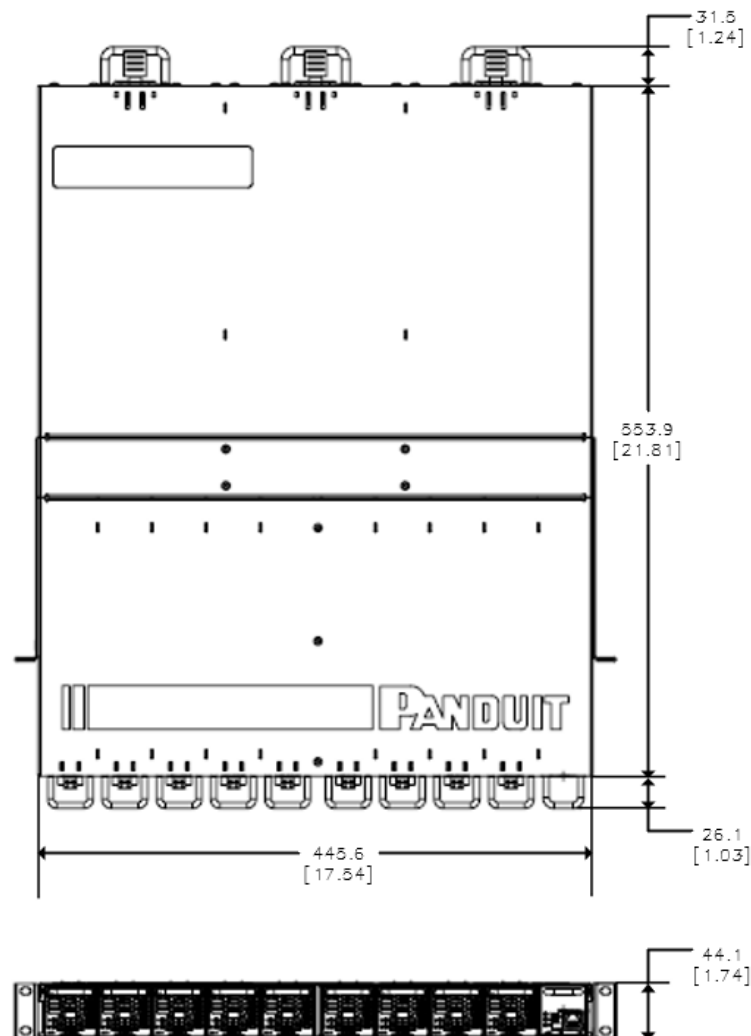
Recommended Equipment (Not included)

- Patch Panel (Panduit P/N CFAPPBL1)
- Mini-com Euro-style adapter (Panduit P/N PXM1ARGRBL)
- PDUs (Panduit P/N P06B03M or P24B14M)
- Cable
- Cable for patching

Installation Instructions

Panduit FMPS Transmitter Chassis Installation

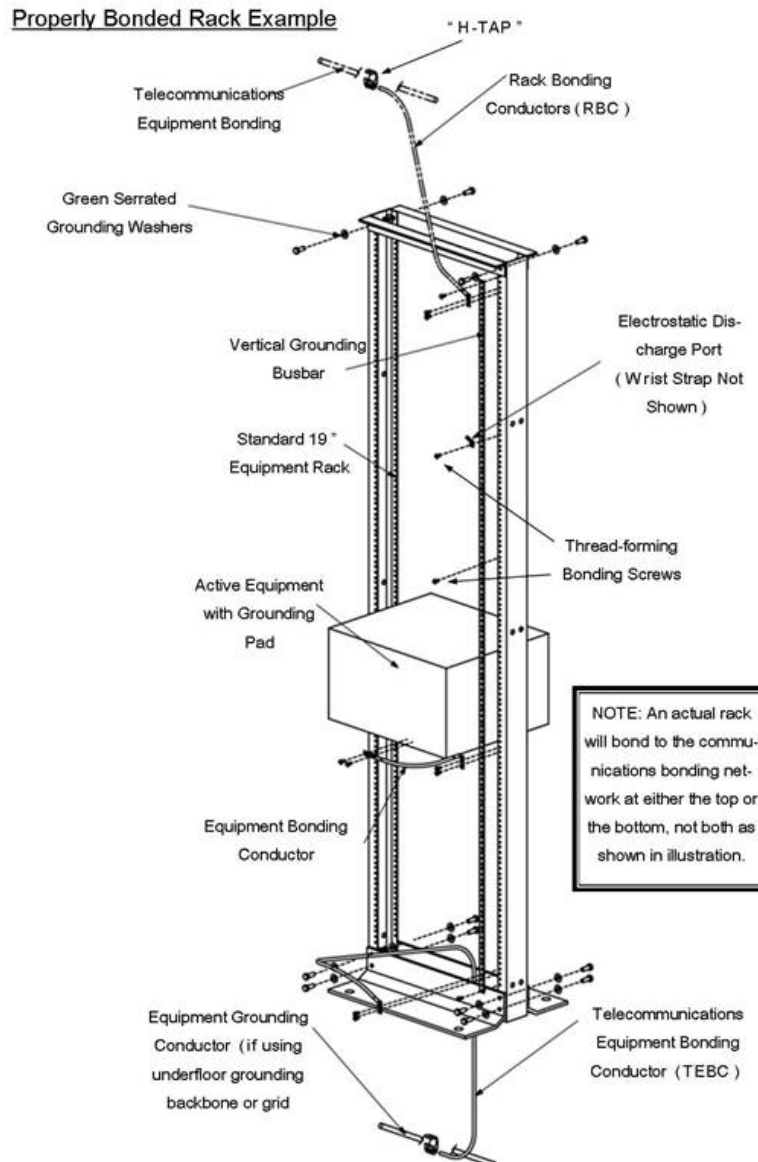
The Panduit FMPS Transmitter Chassis is a component of the Panduit FMPS™ Solution. It delivers pulse current which is received by the Panduit FMPS Receiver. The Panduit FMPS Receiver (Panduit P/N PXR1AJD) is the only receiver compatible with the Panduit FMPS Transmitter Chassis (Panduit P/N PXTC1ARA). The Panduit FMPS Transmitter Chassis comes in a 1RU form factor. It can be installed in any 1RU location of a rack, cabinet, or enclosure and can be mounted horizontally (Transmitter connections facing down). This section covers the recommended installation methods.



Transmitter Chassis Dimensions

Grounding the Panduit FMPS Transmitter Chassis

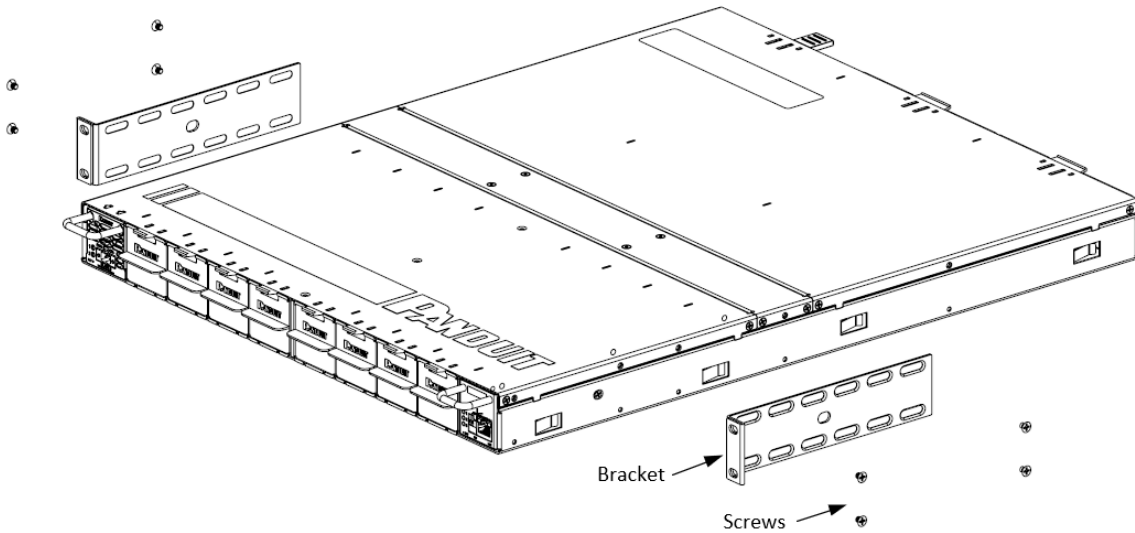
Verify that the rack has appropriate grounding to earth ground before proceeding – proper grounding is critical for FMPS operation. The grounding screw provided with the Panduit FMPS Transmitter Chassis will properly ground the chassis to the rack. The image below shows an example of a properly grounded rack.



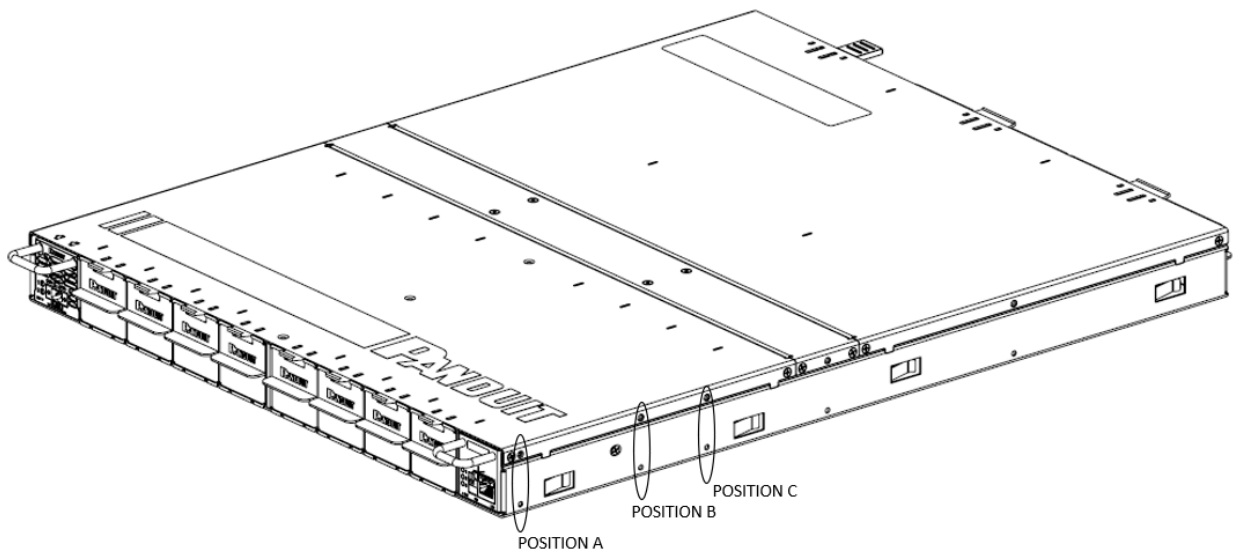
Example of properly bonded rack.

Mounting the Panduit FMPS Transmitter Chassis

The Panduit FMPS Transmitter Chassis comes with 2 brackets and 4 screws per bracket to allow for mounting. The unit can be mounted in either a flush or extended front mounting position.



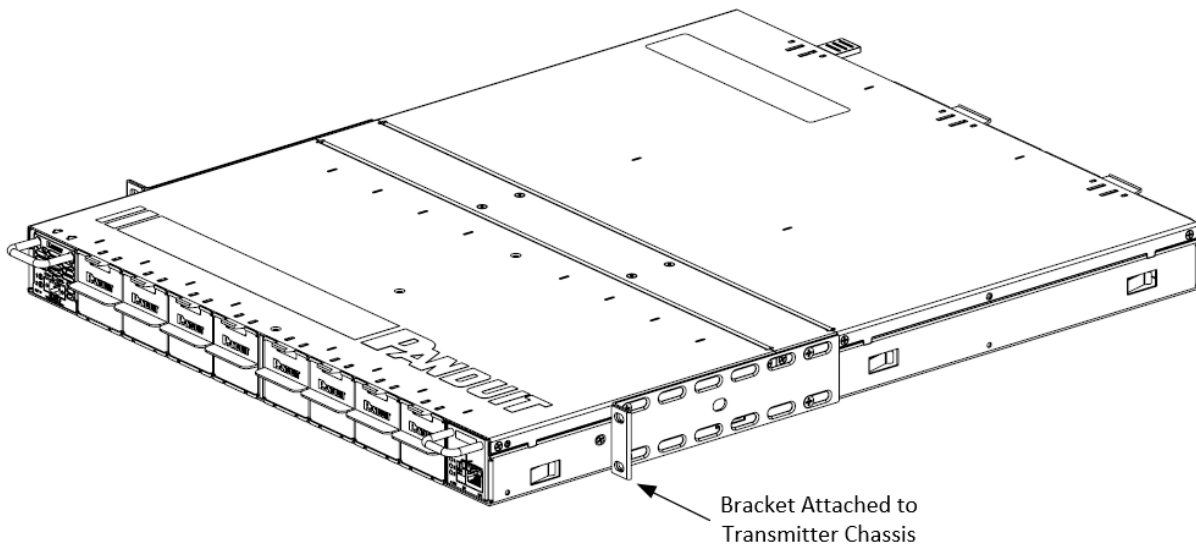
Use the image below and the instructions that follow for the recommended positioning of the side brackets (circled below).



Transmitter Chassis Mounting Locations

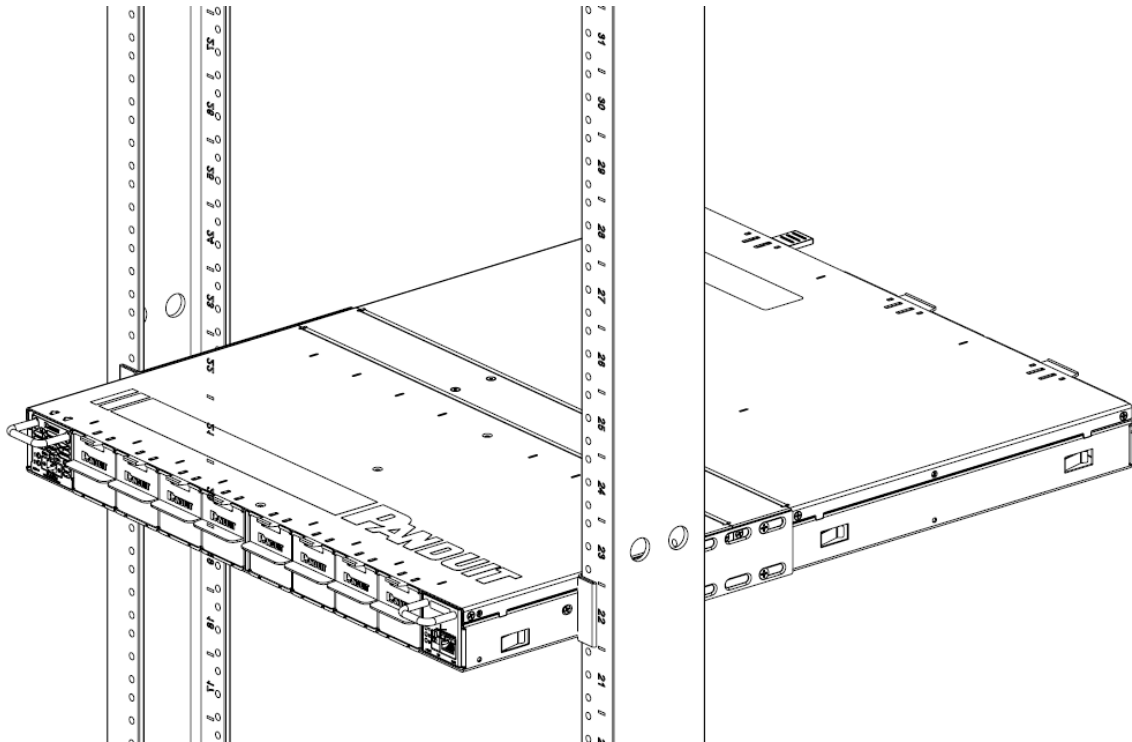
1. Mounting to a 2-post rack:

- a. If mounting to a 2-post rack, install the side brackets at position B (recommended) or position C ensuring that the bracket is pushed all the way in for as far back as possible.



- b. Mount the Transmitter Chassis to the rack using the three rack mounting screws (Panduit P/N S1224-C) and one grounding screw (Panduit P/N RGTBSG-C) provided.

Note: For Grounding details, follow the instructions in the [Grounding the Panduit FMPS Transmitter Chassis](#) section.



Panduit FMPS Transmitter Chassis Mounted in 2-Post Rack

2. Mounting to a 4-post rack or cabinet:

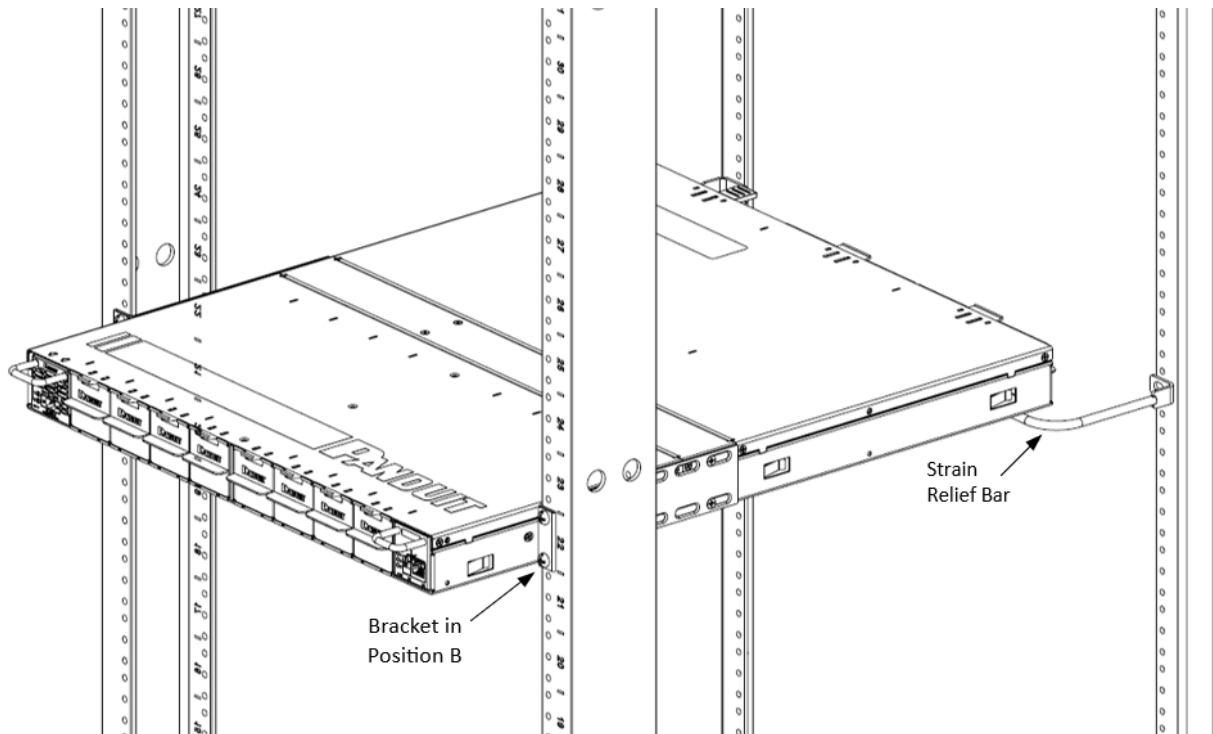
Note: For an extended front mounting position, you can follow the same instructions in 2-post rack mounting section above.

- a. For a flush mount, install the side brackets in position A. It is required to use a strain relief bar such as Panduit P/N SRB19D7BL or SRB19D5BL or a shelf such as Panduit P/N SRM19FM2 in the back of the rack or cabinet to support the back of the chassis.

Note: The 4-post rack or cabinet must be less than 26" deep.

- b. Install the strain relief bar or shelf in the back posts of the rack/cabinet.
- c. Mount the chassis to the 4-post rack using the provided rack screws and the grounding screw (same as 2-post rack instructions above).

Note: For Grounding details, follow the instructions in the [Grounding the Panduit FMPS Transmitter Chassis](#) section.



Panduit FMPS Transmitter Chassis Mounted in 4-Post Rack

Power Supply Installation

Install Power Supply

1. Insert the Power Supply Module in the empty slot in the back of the Panduit FMPS Transmitter Chassis and slide forward until it clicks. Verify engagement of latches with a gentle pull of the handle.
2. To install additional Power Supply Modules, remove the Power Supply blanking panel first and follow repeat Step 1 above.

NOTE: Make sure that installed Power Supply Modules do not have any blockages in front of the dual fans to allow for proper air flow through the fans.

3. To undock the Power Supply Module, first remove the power cord from the module (if applicable), then unlatch and pull the Power Supply Module using the handle. Re-install the Power Supply blanking panel to ensure proper airflow through the system and to keep debris out.



Power Supply in Chassis

Input Power Connections

NOTE: For the next few sections, ensure PDU outputs and/or power cords will **not** be supplying power. **Power will be supplied at the end of the hardware installation.**

There are a variety of ways to supply power to the Power Supply Module. Preferred methods are as follows:

1. Connection to an existing wiring device (outlet). The Power Supply Module can be powered directly utilizing a power cord with an IEC 60230 C-19 connector on one end with either a NEMA 5-15P, NEMA 5-20P or several other possible male plugs on the other end. Follow the recommended power requirements stated in the [“Power Source Input Wiring”](#) section to ensure the power from the wiring device is adequate for the Power Supply Module.
2. Connecting the Power Supply Module to a PDU. The Power Supply Module can be connected to a PDU that provides IEC 60320 C19 outlets. Every Power Supply Module is shipped with a C-19 to C-20 power cord. This cord can be used to connect the Power Supply Module to the PDU. Plug the rectangular IEC 60320 C-19 end into the Power Supply Module in your system. Connect the other end of the power cord to a properly sized PDU for your installation. Power requirements for the PDU are summarized below.

Properly Sizing the PDU

1. The Power Supply Module can operate from 115 to 230 VAC with a frequency of

50-60 Hz, single phase. For optimal performance, 208 VAC single phase is recommended.

- Please refer to the table below to properly size the circuit breakers.

Input Voltage	PDU outlet breaker size
208 VAC single phase	Double pole 10 Amp breaker
120 VAC single phase	Single pole 20 Amp breaker

NOTE: If multiple PDU outlets share one circuit breaker, make sure it is correctly sized. For example: For two PDU outlets sharing one breaker and operating at 208 VAC single phase, use a double pole 20 Amp circuit breaker.

- Make sure your PDU is sized correctly for the number of Transmitter Chassis and Power Supply Modules that will be installed.
- Each fully populated Transmitter Chassis operating at 208 VAC requires a total of 30 Amps. This can be accomplished by having three single-phase 10 Amp circuits on the same phase for a total 30 Amps or by using a three-phase 208 VAC supply with each phase capable of 10 Amps (one phase being used for each of the chassis' three Power Supply Modules.)

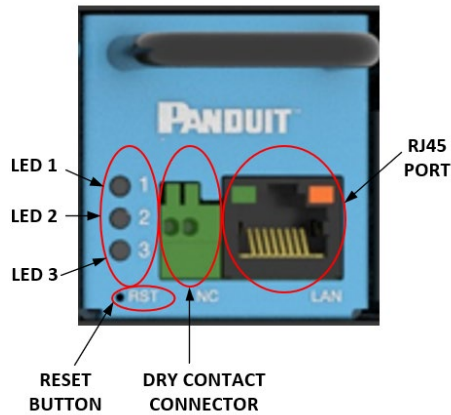
NOTE: Two fully loaded Transmitter Chassis' will require 60 Amps of 208 VAC power. This can be done in two ways: 1) By having six 10 Amp single-phase circuits on the same phase for a total of 60 Amps. 2) By using a three-phase 208 V supply with each phase capable of supplying 20 Amps for each phase which will power two 10 Amp Power Supply Modules.

Follow the instructions above for a direct feed into an AC breaker panel also.

Network Management Card Wiring

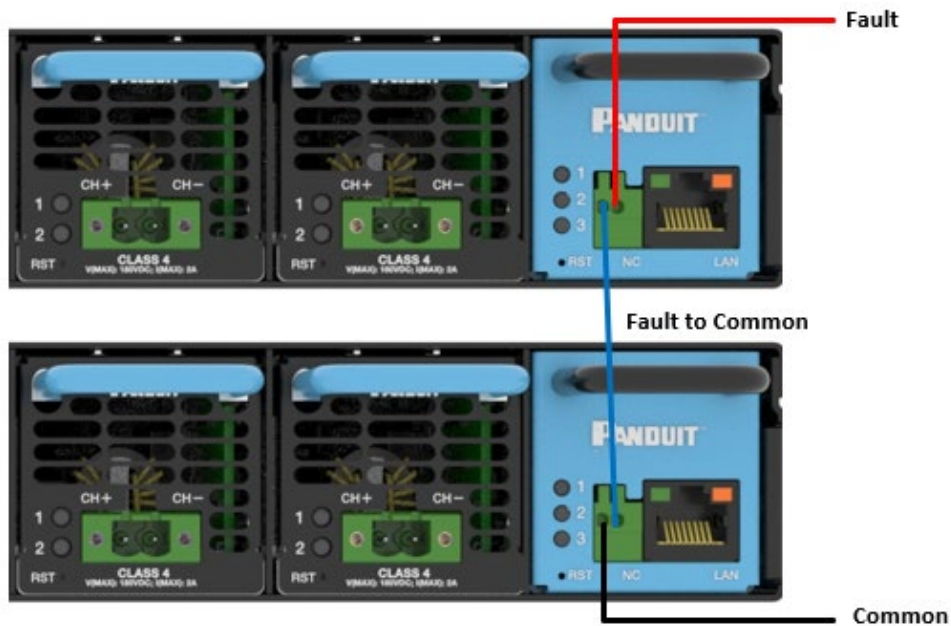
The Panduit FMPS Transmitter Chassis is shipped with a pre-installed Network Management Card. The Network Management Card has two connections:

- RJ45 connection to IP Management Network (10/100Base-T Ethernet)
- Dry contact to connect with the remote alarm system (normally closed). The dry contact connector accepts wire no larger than 18AWG (1mm²).



1. Connect a standard network category cable into the Network Management Card, which connects to the local network.
2. The dry contact connector is spring loaded. Remove 1/3 inch (8 mm) of insulation from the end of the alarm wires.
3. Press the spring release levers and insert the bare alarm wires into the dry contact connector.

For installations with multiple Power Sources, the dry contacts on the Network Management Card can be wired in series with the dry contact wires from other Power Sources. Below is an illustration of proper series wiring for the dry contact alarm.



Network Management Card – Series Wiring for Dry Contact Alarm

Transmitter Module Installation

Slide-In Transmitter Module

1. Transmitter Modules slide into the slots in the front of the Transmitter Chassis. It is recommended to populate Transmitter Modules from left to right. Slide in the first Transmitter Module in the leftmost slot of the Transmitter Chassis without output connection cables plugged in.



Transmitter Module Sliding into an Empty Slot

2. When the Transmitter Module is properly seated in the chassis, the latching mechanism will engage. Verify the latch by gently pulling on the Transmitter handle.
3. To add additional Transmitter Modules to the system, remove the Transmitter Module blanking panels and slide in the Transmitter Modules one at a time without output connection cables plugged in.

NOTE: For optimal performance, make sure Transmitter Modules installed in the front align with a Power Supply Module in the back. The Power Supply Module fans provide cooling to both the Power Supply Module and the Transmitter Modules aligned with it in the front.

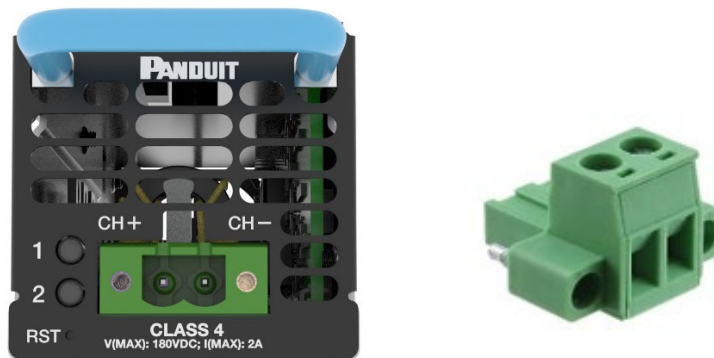
Replace any blanking panels into unused slots.

Head End Power Source Wiring

As mentioned in the [Site Evaluation and Pre-Installation](#) section, make sure that the proper cable type and size has been pulled between the head end and the various Receiver locations. Panduit recommends using a patch panel solution in the head end to make a convenient demarcation point for future service and maintenance.

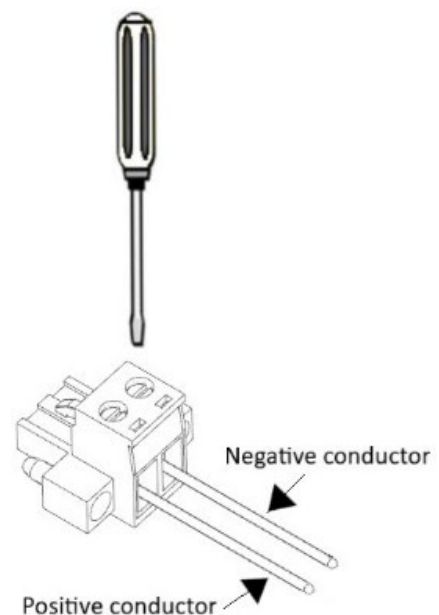
Transmitter Module Wiring

1. Each Transmitter Module is shipped with one Euro-style plug connector with side mounting screws. Below shows a picture of the front of the Transmitter and the plug (Amphenol P/N 20020002-G021B01LF).



Transmitter Module with Euro-Style Plug Connector

2. If field wiring terminates at the Transmitter Module directly (not recommended), remove approximately 1/3 inch (8 mm) of insulation from the cable ends and trim them to approximately equal lengths.
3. Fully insert the positive conductor into the left pin of the Euro-style plug with no exposed metal protruding and tighten the wire-clamping screw at the top of the plug.
4. Fully insert the negative conductor into the right pin of the Euro-style plug with no exposed metal protruding and tighten the wire-clamping screw at the top of the plug.



Note: For use with copper conductors only. Do not exceed a torque of 5 lb-in (0.5 Nm).

Note: Polarity integrity must be maintained between the Transmitter and the Receiver. Left is always positive throughout the system.

5. Insert the Euro-style plug into the Transmitter Module receptacle. Tighten the mounting screws on both sides of the plug into the Transmitter.

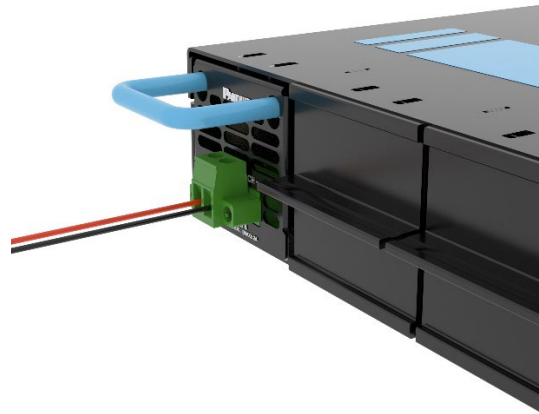


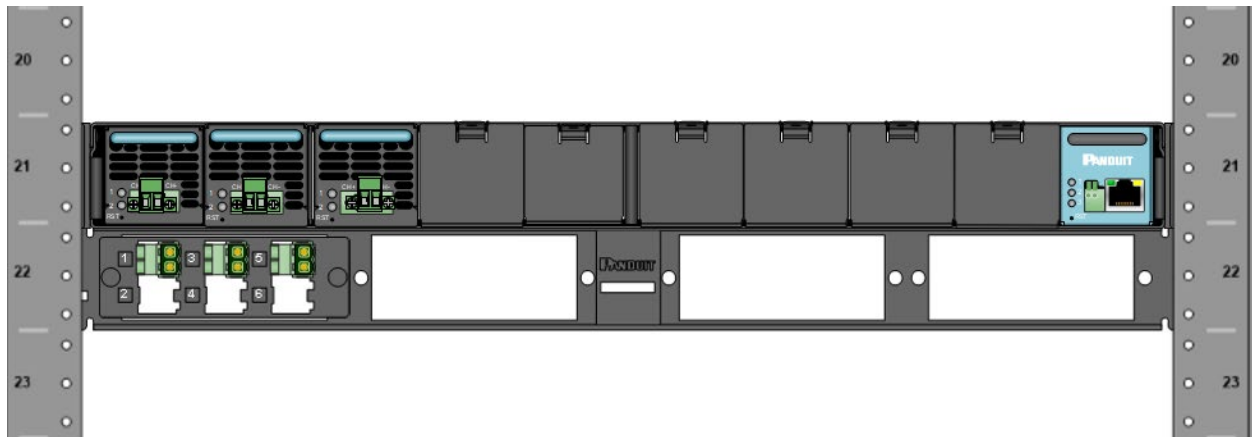
Image of Transmitter with Plug and Wire Connected

Patch Panel Mounting

Panduit recommends using a patch panel solution in the head-end to make a convenient demarcation point for future service and maintenance.

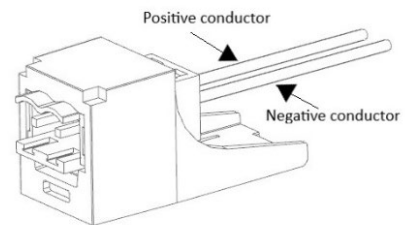
1. Panduit recommends designating 1 RU above or below the Transmitter Chassis to mount a patch panel.

Note: One patch panel (Panduit P/N CFAPPBL1) can provide patching for two fully loaded Panduit FMPS Transmitter Chassis and extra room for other uses (such as patching Ethernet cable from Network Management Card). Below is an example of recommended stacking.



Panduit FMPS Rack Configuration

- Each slot on the patch panel will accept one Panduit FMPS mini-com module & connector (Panduit P/N PXM1AGRBL). Each mini-com module is shipped with its complementary Euro-style connector. See PXM1AGRBL instructions for additional installation details.
- Bring field wiring through the opening where the patch panel will be installed. Pull enough cable for ease of installation, servicing and dressing the system.
- Remove 1/3 inch (8 mm) of insulation from the end of the field wires.
- Fully insert the negative conductor into the right pin of the mini-com connector (when plugged into patch panel and viewed from the front) with no exposed metal protruding and tighten the wire-clamping screw at the top of the connector.
- Fully insert the positive conductor into the left pin of the mini-com connector (when plugged into patch panel and viewed from the front) with no exposed metal protruding and tighten the wire-clamping screw at the top of the connector.



Note: The Panduit FMPS mini-com module and connector are used with copper conductors only. Do not exceed a torque of 5 lb-in (0.5 Nm).

Note: Polarity integrity must be maintained between the Transmitter and the Receiver. Left terminals are always positive throughout the system.

7. Repeat the process for all field wiring connections that will be attached to the same patch panel.
8. Snap the mini-com adapters into the patch panel.
9. Label the patch panel as needed for ease of installation and future maintenance.
10. Once all the mini-com adapters are in place, mount the patch panel into the designated RU location in the rack using the provided screws.

Note: If the Transmitter Chassis is in an extended front mounting position, Panduit recommends using the stand-off bracket (Panduit P/N RSB1B) before mounting the patch panel. Also consider the use of a standard horizontal cable manager such as Panduit P/N NM1. This is an option, not a requirement.

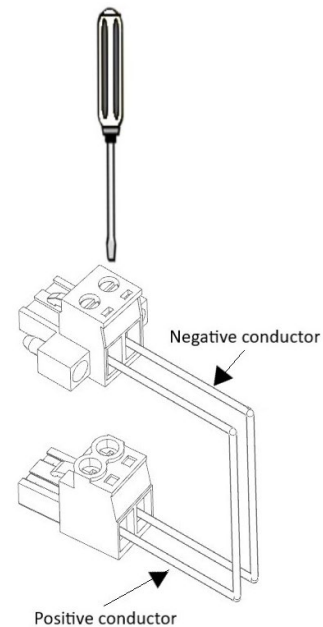
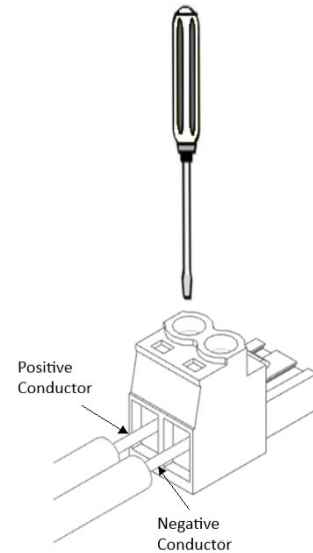
For a 4-post design, the PDU can be mounted on the rear rail in the same RU position as the patch panel or horizontal manager that has the Transmitter Module connections. The incoming cable can be routed up the back side of a front vertical cable manager such as Panduit P/N CMBRC5.

Custom Patch Cables from the Transmitter Modules to the Patch Panel

Now that the Transmitter Chassis and the patch panel are mounted, patch cables can be constructed by measuring the required length from the Transmitter Module to the designated patch panel slot. Cut the patch cables to the desired lengths.

Note: Custom patch cables can be constructed using wires no smaller than 20 AWG. The wire may be solid or stranded and rated for 450 Vrms minimum at 75°C. The patch cable should not exceed 10 feet (3 m) in length.

1. Remove 1/3 inch (8 mm) of insulation from one end of the patch cable.
2. Use the Euro-style connector plug provided with the Mini-com Module.
3. Fully insert the negative conductor into the right pin of the Euro-style connector with no exposed metal protruding and tighten the wire-clamping screw at the top of the connector.
4. Fully insert the positive conductor into the left pin of the Euro-style connector with no metal protruding and tighten the wire-clamping screw at the top of the connector.
5. Tighten the wire-clamping screws at the top of the plug. Make sure not to exceed a torque of 5 lb-in (0.5 Nm).
6. Use the Euro-style connector provided with the Transmitter Module.
7. Remove 1/3 inch (8 mm) of insulation from the other end of the patch cable.
8. Fully insert the negative conductor into the right pin of the Euro-style connector with no exposed metal protruding and tighten the wire-clamping screw at the top of the connector.
9. Fully insert the positive conductor into the left pin of the Euro-style connector with no exposed metal protruding and tighten the wire-clamping screw at the top of the connector.
10. Plug the patch cable into the patch panel.
11. Plug the other end of the patch cable into the Transmitter Module. Tighten the mounting screws on both sides of the plug into the Transmitter Module.





Connector Assembly in Patch Panel

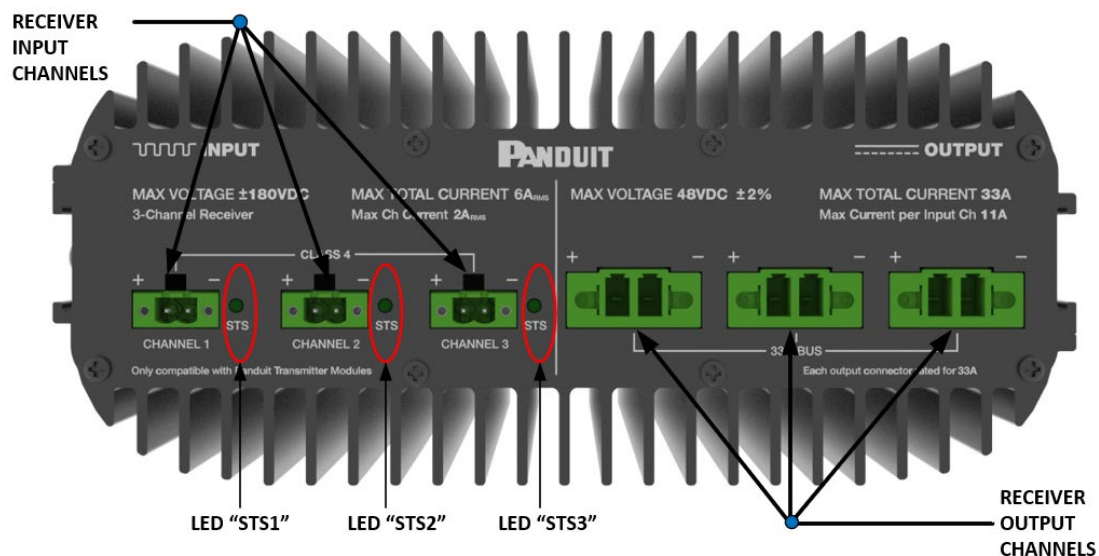
Receiver Installation

The Panduit FMPS Receiver is a component of the Panduit FMPS Solution. It receives pulse current from the Panduit FMPS Transmitter Chassis (typically resides in the head-end) through multiple multi-conductor cables. It converts the pulse current into 48 VDC $\pm 2\%$ to power end-devices. It provides up to 1600 W for nominal 48 V devices.

The Receiver has three input channels that can be connected to three corresponding Transmitter Modules from the Transmitter Chassis. The Panduit Transmitter (Panduit P/N PXTM1AF) is the only compatible transmitter for the Panduit FMPS Receiver (Panduit P/N PXR1AJD). The Receiver has three output channels and can provide up to 1600 W to power an unlimited number of devices

Note: The true output power capacity of the Receiver will be dependent on the distance and the wire gauge used between the Transmitter Module and the Receiver.

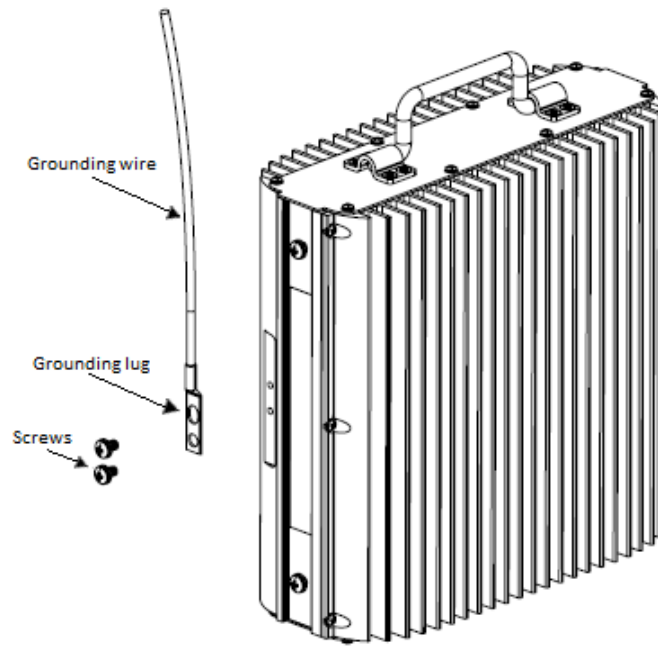
This section covers the recommended installation for the Panduit FMPS Receiver.



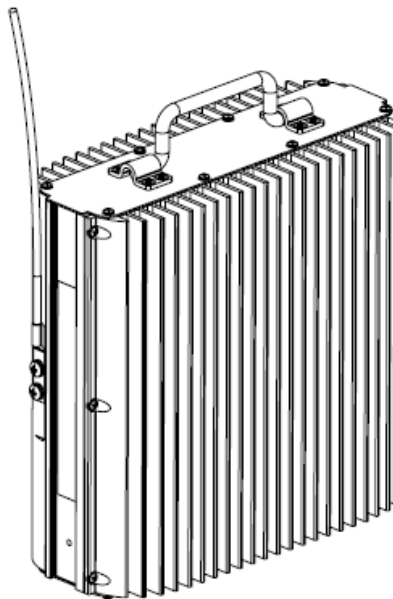
Grounding the Receiver

The Panduit FMPS Receiver must be grounded to earth ground for surge protection, electrical safety, and proper operation of the unit. To properly ground the Receiver, ensure there is proper bonded access to earth ground.

1. Use 6 AWG wire to connect the Receiver to earth ground.
2. Strip insulation from grounding wire.
3. Insert stripped wire into the provided grounding lug.
4. Crimp the grounding lug to the grounding wire.



5. Attach the wired grounding lug to the Receiver using the provided screws as shown below.

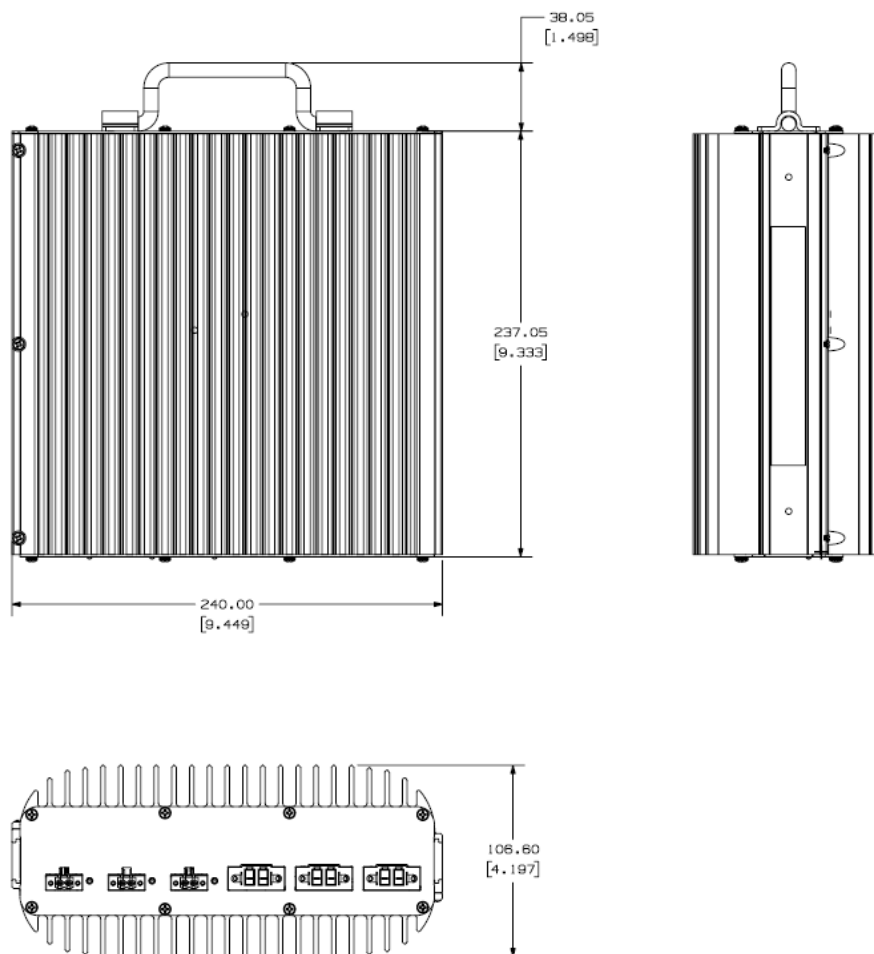


6. Connect the other side of the grounding wire to earth ground.

Mounting the Receiver:

The Receiver is shipped with a wall-mount bracket, four (4) M5x8mm screws and four (4) #10 wood screws. Mounting the Receiver requires a clear mounting surface that is 9.45" (240mm) wide by 9.84" (250mm) high. The image below shows detailed dimensions of the Receiver.

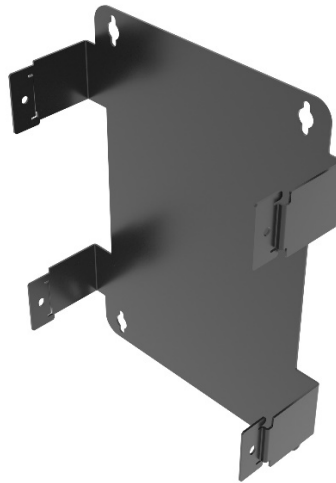
Note: The Receiver is shipped with wood mounting screws. The Receiver can be mounted to other surfaces (e.g. metal or concrete); however, make sure to use appropriate mounting hardware.



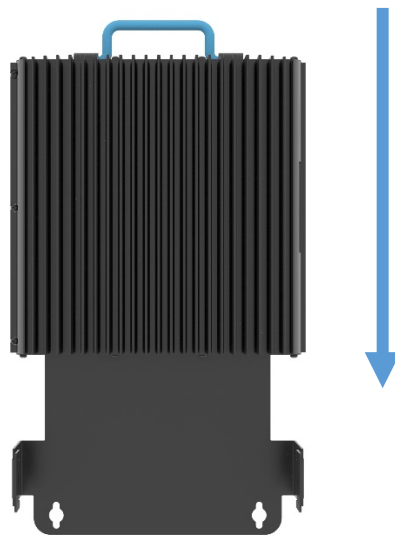
Receiver Dimensions

Note: Make sure to ground the Receiver before mounting. See previous section for details.

1. Ensure the Receiver has a minimum clearance of 4 inches on all sides. Do not place other FMPS Receivers above or below Receivers.
2. Attach wall-mount bracket to wall with appropriate hardware.



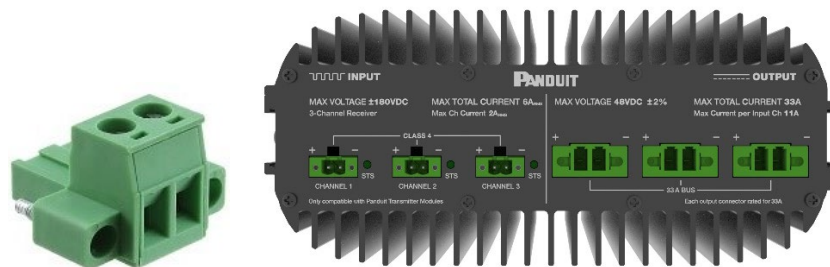
3. Slide the Receiver into the bracket from the top and attach with provided bracket screws.



Note: The input and output connections should be on the **bottom**.

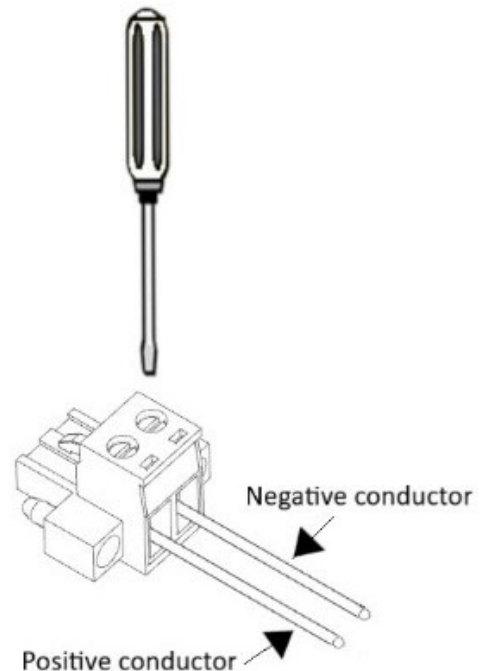
Receiver Input Wiring

Each Receiver is shipped with six (6) 2-pin Euro-style plug connectors (three for input and three for output) with side mounting screws. Below shows a picture of the **connector** side of the Receiver and the input plug connector.



Receiver Input Side and Euro-style Plug Connector for Input

1. It is expected that field input wiring (12-24 AWG) terminates at the Receiver directly. To terminate the field wires, remove approximately 1/3 inch (8 mm) of insulation from the cable ends and trim the pairs to approximately equal lengths.
2. Fully insert the negative conductor into the right pin of the Euro-style plug connector for input with no exposed metal protruding and tighten the wire-clamping screw at the top of the plug.
3. Fully insert the positive conductor into the left pin of the Euro-style plug connector for input with no exposed metal protruding and tighten the wire-clamping screw at the top of the plug.
4. Insert the Euro-style plug into the Receiver receptacle. Tighten the mounting screws on both sides of the plug into the Receiver.
5. Repeat the process for the remaining input connectors.

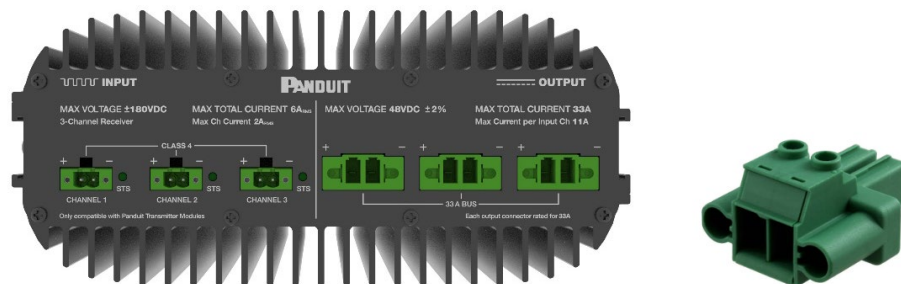


Note: For use with copper conductors only. Do not exceed a torque of 5 lb-in (0.5 Nm).

Polarity integrity must be maintained between the Transmitter and the Receiver. Left is always positive throughout the system.

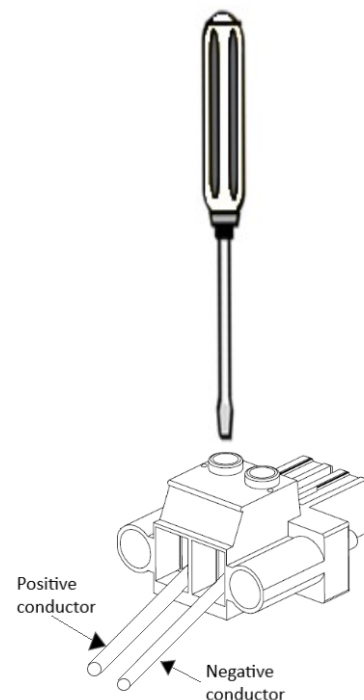
Receiver Output Wiring

Each Receiver is shipped with six (6) 2-pin Euro-style plug connectors (three for input and three for output) with side mounting screws. Below shows a picture of the output side of the Receiver and the output connector.



Receiver Output Side and Euro-style Connector for Output

1. It is expected that field output wiring (8-24 AWG) terminates at the Receiver directly. To terminate the field wires, remove approximately 1/3 inch (8 mm) of insulation from the cable ends and trim the pairs to approximately equal lengths.
2. Fully insert the negative conductor into the right pin of the Euro-style connector for output with no exposed metal protruding and tighten the wire-clamping screw at the top of the connector.
3. Fully insert the positive conductor into the left pin of the Euro-style connector for output with no exposed metal protruding and tighten the wire-clamping screw at the top of the connector.
4. Insert the Euro-style connector for output into the Receiver receptacle. Tighten the mounting screws on both sides of the connector into the Receiver.
5. Repeat the process for the remaining output connectors.



Note: For use with copper conductors only. Do not exceed a torque of 5 lb-in (0.5 Nm).

Polarity integrity must be maintained between the Transmitter and the Receiver. Left is always positive throughout the system.

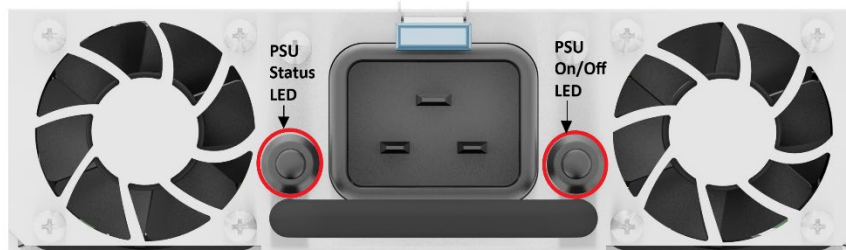
Note: The **output** connectors have the more negative voltage on the right (labeled “-”) and the more positive voltage on the left (labeled “+”). For -48 V equipment, “-” will be -48 V and “+” will be 0 V. For +48 V equipment, “-” will be 0 V and “+” will be +48 V.

Applying power

Turn on your AC power source to the PDU or plug into wall-power. The rest of the installation can proceed with the Power Supply Module ON.

Initial setup

1. Once AC power is supplied, the **right** LED indicator (PSU On/Off LED) on the Power Supply Module should be green. The **left** LED indicator (PSU Status LED) will be **blue** for standby or **green** for enabled. (Refer to [Panduit FMPS User Interface Operating Instructions](#) section).



Power Supply LEDs

2. If no LEDs are lit, check the power source.
3. If either LED is **red**, remove power.

NOTE: Refer to the [Troubleshooting](#) section for LED states.

4. For the Network Management Card, LED2 and LED3 will be **green**. If the Power Supply Module is faulted, LED2 will be **red**. LED1 will provide overall system status; see [Troubleshooting](#) section for details.

5. For the Transmitter, the top LED will be solid **yellow** for standby or **blue** for active. The bottom LED will be breathing **blue** (brightness increases to maximum gradually then decreases to off gradually then repeats the cycle). This indicates that each Transmitter Module is properly connected and **waiting to be connected to a Receiver**.
6. For the Receiver, the output Status LEDs will be **blue** for standby or **green** for supplying output power.
7. If all LEDs are glowing correctly, installation was successful. If any status LED is not correct, consult the [Troubleshooting](#) section for details.

Network Management Card Web Interface (GUI)

The Panduit FMPS Network Management Card (NMC) allows users to monitor the system and activation/deactivation of system components and features. The factory default setting of this NMC is to use DHCP to obtain an IP address and communicate with clients via HTTPS.

The supported Web browsers are Google Chrome (mobile and desktop), Mozilla Firefox, Microsoft Edge, and Apple Safari (mobile and desktop).

Connecting to the NMC via Ethernet

Option 1 – Local Network with DHCP Server

If there exists a network with a DHCP server that can assign IP addresses then simply connect the NMC to this network using a standard patch cord. A network admin will need to access the DHCP server and set up a reservation for the NMC. The NMC MAC address can be found on the front of the NMC under the handle. Document the assigned IP address for use in the following section.

Connect to the NMC with the assigned IP address from a supported browser (https://YOUR_ASSIGNED_IP_HERE)

Example: <https://192.168.0.1>

Option 2 – Direct Connect to Laptop

You can connect directly to the NMC from a laptop for initial setup. The IP address of the NMC is "169.254.254.1" and the NMC has an auto-configure function that will communicate with most modern laptops running Windows 10 or 11. To see if your computer supports this feature, directly connect your computer to the NMC via a standard patch cord. After a couple of minutes, check your computer's network settings for the ethernet port. If it has been configured to the "169.254.254.x" network where "x" is the computer's IP address, then you should be ready to connect to the NMC.

Connect to the NMC from a supported web browser (<HTTPS://169.254.254.1>).

Note: If the login screen does not show up, see [Appendix C](#) for more information on how to check your computers network settings.

Connecting to the Network Management Card

1. Network Management Card LED1, LED2, and LED3 should be illuminated solid **green**. This indicates successful connectivity to the network and normal system operation.
2. In a standard web browser, enter the Network Management Card IP address (“https://IP ADDRESS”) and proceed to configure the Network Management Card as shown in the Web Configuration section.

Logging into the NMC for the First Time

Login to the Panduit FMPS web user interface. The default username and password are **admin** and **admin**.



Changing Your Password

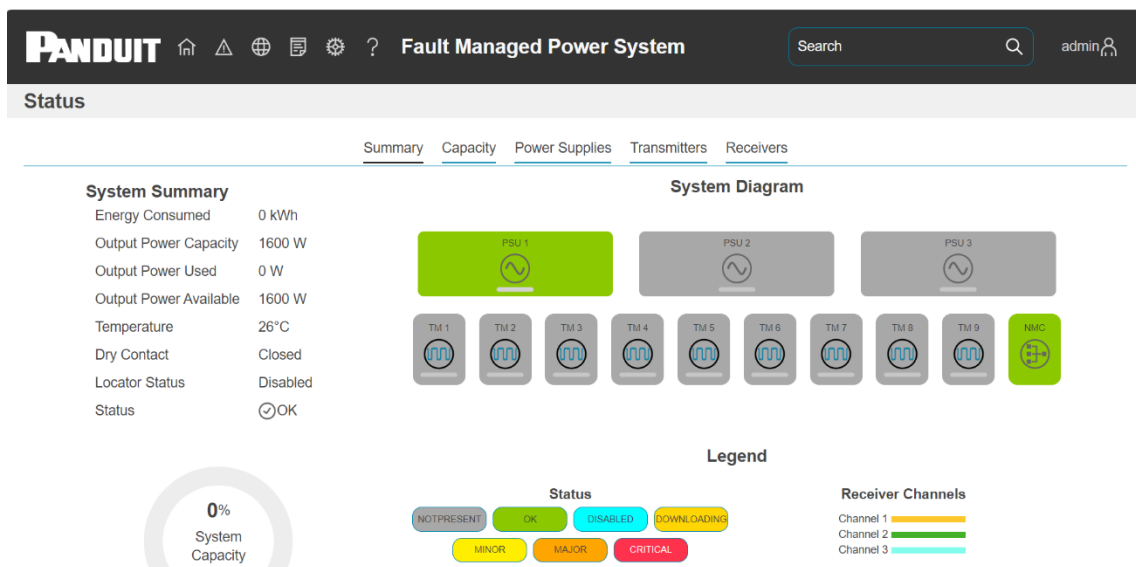
At initial login, you are required to change the default password:

1. Enter the username, current password, and new password twice to confirm. The passwords must be between 8 and 40 characters and follow three of the following four rules:
 - a. Contains at least one lowercase character.
 - b. Contains at least one uppercase character.
 - c. Contains at least one number.

- d. Contains at least one special character.



2. Click **Log In** to complete the password change. This should take you to the status page shown below.



3. Initial login and password setup is now complete.

Note: If you were not able to determine the IP address of the NMC or for difficulty logging in, please refer to [Appendix C](#) for more details.

Where to Go from Here

Verify that the system status is **green** and all installed components are detected and showing green. In the screenshot above, PSU 1 is **green** and the NMC is **green**. Any installed PSU should show up this way. Any Transmitter Modules installed should initially show up **green** (if connected to a Receiver and enabled).

Check the firmware version and update if needed. Latest firmware version can be found at <https://www.panduit.com/en/support/download-center/fault-managed-power-system-downloads.html>

Now that the NMC is available, you need to configure it for specific use cases. The FMPS NMC User Manual provides detailed instructions on how to perform various operations. The common items configured at this stage include:

- Complete/Update Network configuration
 - Date/Time (set NTP if used. Required for accurate logging info)
 - Syslog server setup
- Complete/Update system management information (documentation)
 - System information fields (asset details)
 - Rack Information (location data)
 - Power info
- SNMP and logging configuration (System Management)
- Create Additional Users and Roles as needed

The latest version of the FMPS NMC User Manual can be found at <https://www.panduit.com/en/support/download-center/fault-managed-power-system-downloads.html>

Troubleshooting

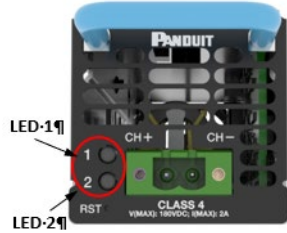
WARNING:

- Always de-energize power before accessing an electrical rack or cabinet.
- Always follow safety and lockout/tagout procedures when working on or near electrical systems and equipment.
- Use proper personal protective equipment (PPE) when working around sources of hazardous electrical energy.
- The Power Supply Module and Transmitter Module can be replaced. No other part of the product is serviceable. Do not attempt to open the Power Supply Module, Transmitter Module, Network Management Card, or Receiver for repair or modification. When servicing this product, only use specified replacement parts.

The Panduit FMPS Transmitter Chassis' Network Management Card checks for proper connection of the Power Supply Module, Transmitter Module, and Receiver and verifies that the Panduit FMPS is working correctly with a series of self-checks. If the FMPS fails any of these tests, it will indicate a failed test and communicate the reason for test failure by illuminating the designated indicator as detailed below.

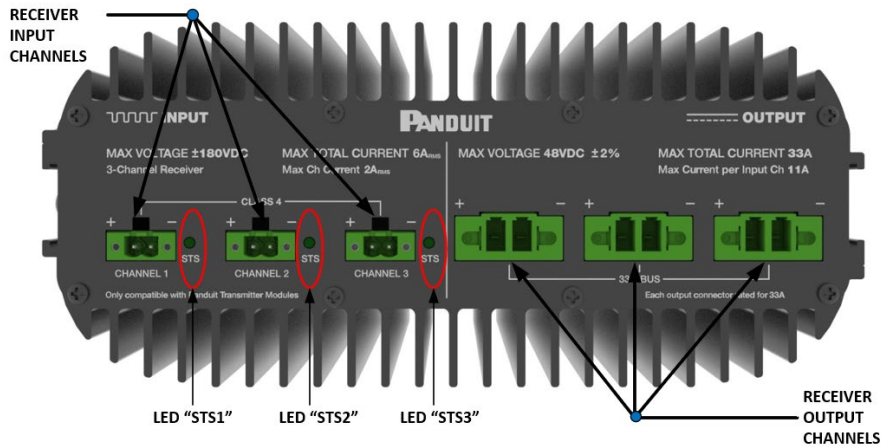
LED Statuses

Transmitter Module Indicators



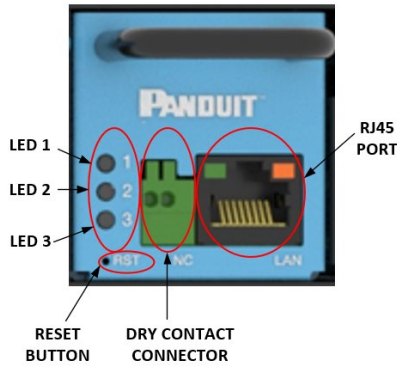
LED Label & Description	LED Color & Motion	Fault	Recommended Action
1 (Communication Status)	Green/solid	None (Normal conditions)	None
	Red/solid	Communication Error: Receiver is detected; Transmitter is enabled but cannot communicate after power is enabled with Receiver	Check wiring Check Transmitter connections Check Receiver connections Check cable length and type Check adjacent cables
	Yellow/solid	Receiver Not Detected: No Panduit FMPS Receiver detected by the Transmitter	Check wiring/polarity Check Transmitter connections Check Receiver connections
	Blue/solid	Normal Output Disabled: Transmitter detects the presence of Receiver; Output power is disabled	None
2 (Transmitter Status)	Green/solid	None (Normal conditions)	None
	Blue/breathe	Normal Output Disabled	None
	Red/solid	Pulsing Error: Pulse on time too long or pulse frequency is too fast	Check wiring Check Transmitter connections Check Receiver connections Check cable length and AWG
	Red/solid	Overload (input current to Transmitter due to load): Power drawn by load is over capacity	Check wiring Check Receiver Check loads Reduce loads if needed
	Red/solid	Internal Failure	Reset Transmitter Module Check software Replace Transmitter Module Contact Panduit
		Critical Temperature: Transmitter Module will shut down	Transmitter Module is bad
	Red/4Hz, 50%	Safety Fault: Short circuit detected	Web UI Report against both Transmitter Module and Receiver Check wiring shorts Check that channel pairs terminate at the same Receiver Check for human interactions
	Yellow/solid	Temperature: Transmitter Module over or under the recommended temperature range	Check ambient temperature Check airflow Check external heat sources Reduce loads if needed
Orange/solid	Output Voltage: Transmitter Module output voltage not in range	Check Power Supply Module	
	Input Voltage: Transmitter Module input voltage out of range	Check LED indicators on other Transmitter Modules. If they indicate the same status, this is a Power Supply problem. Check Power Supply Module	

Receiver Channel Indicators



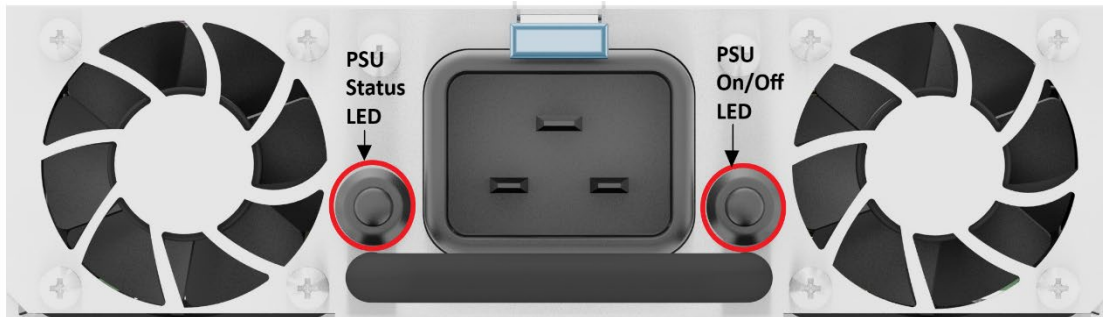
LED Label & Description	LED Color & Motion	Fault	Recommended Action		
STS1/STS2/STS3 (Receiver Channel Status)	Green/solid	None (Normal conditions)	None		
	Blue/solid	Normal Output Disabled	None		
	Yellow/solid	No Load: No load detected by the Receiver	Temperature: Receiver over or under the recommended temperature range	Check ambient temperature Check external heat sources Check loads compared to input Reduce loads if needed	
			Short circuit detected: output power short circuit detection; output power disabled	Check any wire short	
			Overload: Too much current drawn by load	Check loads Connect and enable more Transmitter Modules Reduce loads if needed	
	Red/solid	Critical Temperature: Receiver channel will shut down	Internal Failure: Receiver Module detects internal hardware fault (Power supply temperature sensors, etc.)	Reset Receiver Check software Replace Receiver Contact Panduit	
			Orange/solid	Input Voltage: Input voltage out of range	Check Receiver connections Check Transmitter Module Output Voltage Check cable length and type Check adjacent cables
				Output Voltage: Receiver output voltage not in range - Under voltage or Overvoltage	Replace Receiver Contact Panduit

Network Management Card Indicators



LED Label & Description	LED Color & Motion	Fault	Recommended Action
1 (System Status)	Green/solid	None (Normal conditions)	None
	Yellow/solid	Capacity Threshold: System is using more than 90% of the power intake	Consider adding a new Power Supply
	Red/solid	Capacity Overload: System exceeds power capacity	Check wiring/polarity
	Varies/solid	Transmitter Module Fault: If Transmitter Module alarm level is greater than system alarm level, then this indicates that fault level	Check Transmitter Module alarms
		Receiver Fault: If Receiver alarm level is greater than system alarm level, then this indicates that fault level	Check Receiver alarms
2 (Power Supply Status)	Green/solid	None (Normal conditions)	None
	Red/solid	No Communication: No communication between the Power Supply and Network Management Card (CAN bus error)	Plug the PSU into a different slot Contact Panduit
	Varies/solid	PSU Fault: Highest PSU alarm level	Check PSU Alarms
3 (Network Management Card Status)	Green/solid	None (Normal conditions)	None
	Red/solid	Powering Up: System is powering up	None
	Red/1Hz 50% cycle	Shutting Down: System is shutting down	None
	Red/2.5Hz 50% cycle	Factory Reset: System is performing a factory reset	None
	Yellow/solid	Temperature: Temperature is out of range	Check ambient temperature
	Orange/solid	SD Card: Missing/Damaged SD Card	Check SD Card

Power Supply Module Indicators

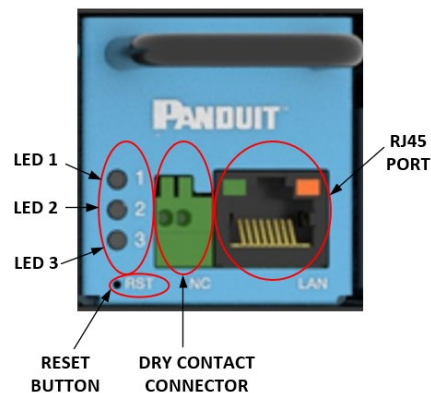


LED Label & Description	LED Color & Motion	Fault	Recommended Action
1 (PSU Status)	Green/solid	None (Normal conditions)	None
	Blue/solid	Normal Output Disabled	None
	Yellow/solid	PSU Over or Under the Recommended Temperature Range	Check ambient temperature Check airflow Check external heat sources Reduce loads if needed
	Orange/solid	PSU Output Voltage Not in Range	Check Power Supply Module
		PSU Input Voltage Out of Range	Check LED indicators on other Transmitter Modules. If they indicate the same status, this is a Power Supply problem. Check Power Supply Module
		PSU Input AC Frequency Is Out of Range	Check input power source
	Red/solid	Fan Speed Out of Range	Check ambient temperature Check for blockage around the fan
Fan Failure: One of the Fans Failed Overload: Power Drawn By Load Is Over Capacity		Check wiring Check Receiver Check loads Reduce loads if needed	
2 (PSU On/Off)	Green/solid	None (Normal conditions)	None
	None	PSU Off: PSU is not powered	Check input power source Check input power cord

System Reset or Password Recovery

Press and hold the Network Management Card Reset Button for 2 seconds to recover from a network management card communication failure. LED 3 (bottom) will flash **red** slowly indicating the Network Management Card will reset. This will cause a reset of the Network Management Card; however, all configuration(s) will be retained.

To reconfigure the network management card to **factory settings**, press and hold the Network Management Card Reset Button for at least 10 seconds. LED 3 (bottom) will flash **red** quickly indicating the Network Management Card will reset to the factory default. This will cause a reset of the Network Management Card, erasing all existing configurations, including username(s) and password(s).



Network Management Card

System Expansion

A single Transmitter Chassis can be expanded to hold three Power Supplies, nine Transmitters, and up to nine Receivers. If the system will be expanded, follow the steps below:

1. Add any Power Supplies needed. Existing Power Supplies can be left enabled/powered. If the system is currently powered from a PDU or wall power, new Power Supplies can be added and wired to power. Keep power removed from these new Power Supplies until all new equipment is added.
2. Add any Transmitters needed by following the Transmitter Module Installation section in this manual. Power does not need to be removed/disabled to add Transmitters to an existing system. Using the GUI, ensure the new Transmitters are **Disabled** from the Transmitter page.
3. Add any Receivers needed by following the Receiver Installation section in this manual.
4. Cable between the Transmitter(s) and Receiver(s) by following sections Receiver Input Wiring and/or Receiver Output Wiring in this manual.
5. Enable incoming power to the new Power Supplies from their PDU or plug in the wall power.
6. From the GUI, **Enable** the new Power Supplies, Transmitters, and Receivers.

Appendix A: Cable Recommendations

Cables to be used with the Panduit FMPS shall meet the following requirements:

- Only Class 4 copper cables shall be used with the Panduit FMPS.
- Cable gauge shall be 12-18 AWG. Consult with Panduit before installation of cable gauges outside of this range.
- Single-pair or multi-pair solid or stranded Ethernet cables may be used.
- Cables can be bundled; if cables are bundled, adherence to requirements defined in UL 1400-2, NEC Article 722, and NEC Article 726 must be maintained. The number of cables that can be bundled will be specific to the application.
- Contact Panduit for assistance with determining appropriate cables for intended application.

Appendix B: Technical Specifications

Standards

Safety	UL 1400-1
	IEC 61508 Functional Safety SIL 2
	Class 4 NEC
Emissions	EN55032 (CISPR32) Class A
	EN55032 (CISPR32) Class B
	EN61000-3-2
Immunity (EMC)	EN 55035
	EN61204-3

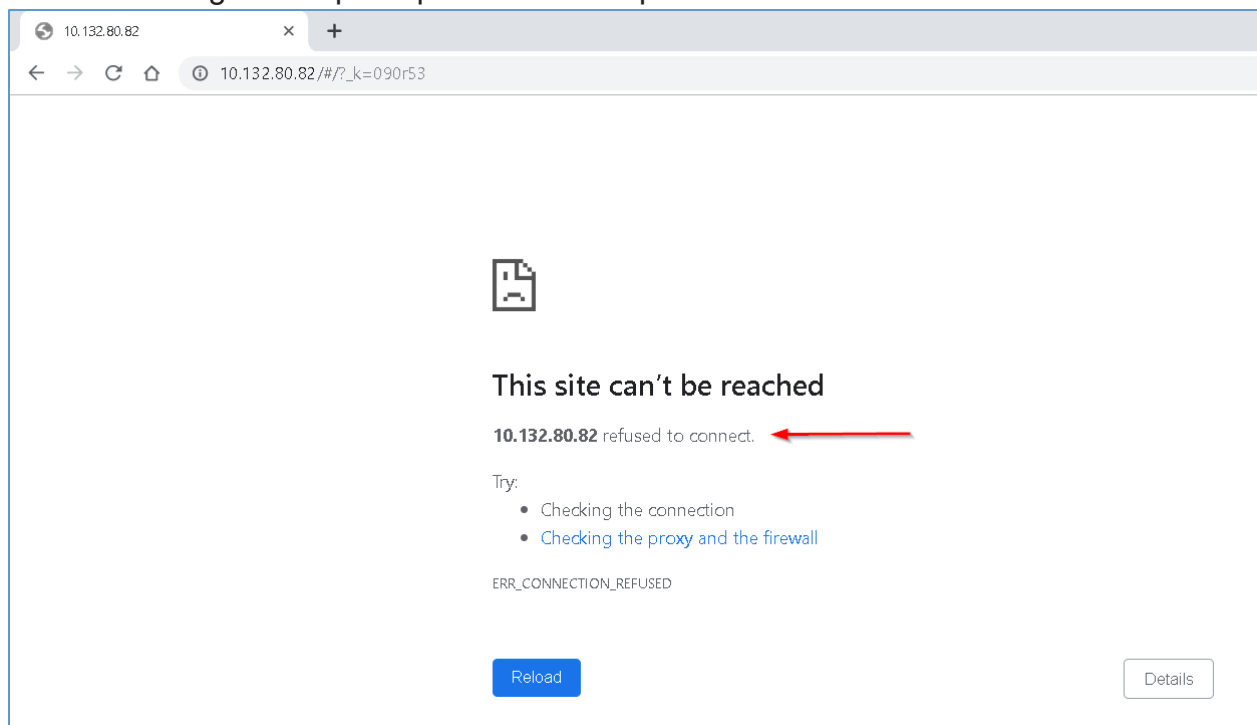
Environmental

Operating Temperature	-10° C to 60° C (14° F to 140° F)
Storage Temperature	-10° C to 60° C (14° F to 140° F)
Humidity	85% non-condensing relative humidity
ROHS	Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast)
Regulation (EC) No. 1907/2006	Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)
CE Mark	

Appendix C: NMC Common Log In Errors

Logging in to the Web Interface

- Open a supported web browser and enter the IP address of the Network Management Card (HTTPS)
- If browser displays “refused to connect” please *double check* that you are using the “https://” protocol not “http://”



Refused Connection Example

- If username and password have NOT been configured, use the default username: **admin** and password: **admin**. For security purposes, a change of password is required upon initial login.
- If admin credentials are lost, perform a factory reset on the Network Management Card.

Appendix D: Contact Information

Address

Panduit
18900 Panduit Drive
Tinley Park, IL 60487

North America

Customer Service

- Price & Availability
- Expedites
800-777-3300 or cs@panduit.com

Technical Support

- Competitor Cross References
 - Product Documentation
 - Technical Issues
- Email: techsupport@panduit.com

Europe/Middle East

Customer Service

- Price & Availability
- Expedites
+44(0)208-6017219 or cx-uki@panduit.com

Technical Support

- Competitor Cross References
 - Product Documentation
 - Technical Issues
- Email: techsupportemea@panduit.com

<https://www.panduit.com/en/support/contact-us.html>