# Application Guide

# Panduit Power over Ethernet Extenders Application Guide

## Introduction

The Panduit Power over Ethernet (PoE) extenders provide the most cost-effective and reliable method to extend data and power at lengths up to 2,000 feet using standard off-the-shelf 4-pair copper cabling. The goal of this document is to provide application instructions for these PoE extenders. This includes:

- Overview of the offering
- Length and power guidelines
- Physical deployment recommendations
- Frequently asked questions
- Part Selection Guide

## PoE Extender Product Overview

### System Overview

The PoE Extenders can operate at either 10 Mb/s or 100 Mb/s. Both the switch and end device must be capable at operating at these speeds and both must operate at the same 10 Mb/s or 100 Mb/s speed.

To extend power and data beyond 100 meters, each link will require (1) transmitter and (1) receiver. There is only one type of transmitter, but two types of receivers: a 1-port and 4-port. An exemplary deployment is shown in Figure 1.

The system does require power, either through a Power over Ethernet enabled switch or at least one external power supply. The amount of power needed is dependent on the amount of power needed by the end device attached to the receiver. This is detailed in the next section.

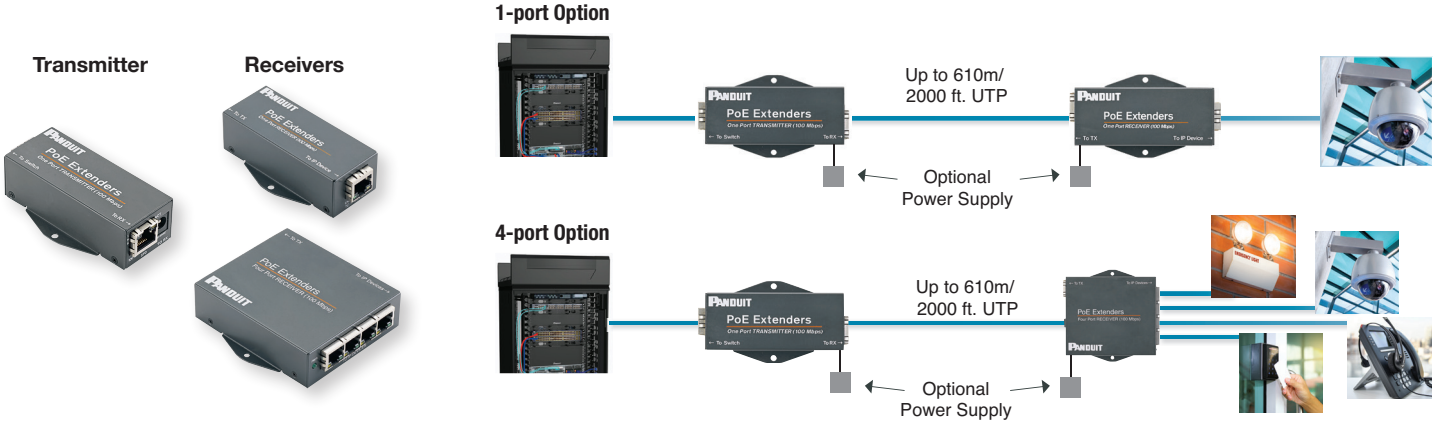



**Figure 1:** Panduit PoE Transmitter and Receivers, as well as an exemplary deployment example for both the 1-port and 4-port receivers.

## PoE Extenders, 1-port Transmitter Box (POEXTX1)

The Panduit PoE extender 1-port transmitter are shown in Figure 2. Panduit recommends placing this device within 50 feet (15 meters) of the switch it is connected to.


**Figure 2:** Panduit PoE Extender 1-port Transmitter (POEXTX1) with Speed Switch highlighted.

The transmitters come with a speed switch that allows a selection of ten or 100 Mb/s. It must be set to the speed it will operate at. The default setting is 100 Mb/s.

If a Power over Ethernet port is used at the switch, a switch port providing 30 W or 50 W will function in providing data and power to the receiver and end device. More power will be available with a 50 W power. If only data transmission is needed, a PoE compatible 802.3af class 2-port (providing up to 6.49 W) is required.

If an external power supply is used, Panduit recommends the 60 W power supply (POWER-60W, sold separately) for use with this device.

In the case where multiple transmitters are located in close proximity, such as on the POEXPANEL-BL and POEXPANEL-WH, Panduit recommends the 190 W power supply (POWER-190W). This is a single power supply that can power up to four transmitters.

## PoE Extenders, 1-port Receiver Box (POEXRX1)

The Panduit PoE extender 1-port receiver box is shown in Figure 3. Panduit recommends placing this device within 50 feet (15 meters) of the device it is connected to.

The transmitter is capable of supplying power to the PoE extender 1-port receiver If the guidelines for supplying power to the transmitter are followed as noted above, the receiver will function.

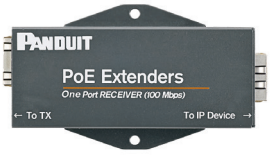



**Figure 3:** Panduit PoE Extender 1-port Receiver (POEXRX1)

If an external power supply is used, Panduit recommends the 60 W power supply (POWER-60W, sold separately or as part of the POEXKIT1 and POEXKIT1-NP) for use with this device. This should be done in cases where the transmitter was unable to provide sufficient power to the receiver for use by the end device.

Note: The receiver is not capable of supplying power to the transmitter. The transmitter must always have its own power source from either a PoE switch or external power supply.

## PoE Extenders, 4-port Receiver Box (POEXRX4)

The Panduit PoE extender 4-port receiver box is shown in Figure 4. Panduit recommends placing this device within 50 feet (15 meters) of the devices it is connected to.

The Panduit PoE extender 1-port transmitter is capable of supplying power to the PoE extender 4-port receiver. If the guidelines for supplying power to the transmitter are followed as noted above, the receiver will function. However, note that now because the power is split among four ports it may be less than needed.

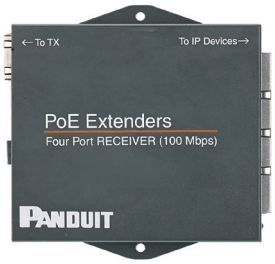



**Figure 4:** Panduit PoE Extender 4-port Receiver (POEXRX4)

### PoE Extenders, 4-port Receiver Box (POEXRX4) continued

If an external power supply is used, Panduit recommends the 110 W power supply (POWER-110W, sold separately or as part of the POEXKIT4 and POEXKIT4-NP) for use with this device. This should be done in cases where the transmitter was unable to provide sufficient power to the receiver for use by the end devices.

Each device connected to each of the 4-port receiver ports will be assigned a unique IP address. The 4-port receiver is equipped with intelligence that "switches" Ethernet traffic to the appropriate IP device port/endpoint when it comes from the head-end switch. It aggregates traffic from all four ports/endpoints in the other direction and sends it upstream to the switch.

Note: The receiver is not capable of supplying power to the transmitter. The transmitter must always have its own power source from either a PoE switch or external power supply.

## Length and Power Guidelines

### Data Transmission Only

Data transmission will always be up to 2,000 feet. If using the PoE extenders for only data transmission, Panduit recommends only providing power to the transmitter. The transmitter can receive sufficient power from essentially all PoE switches or the 60 W power supply (such as POWER-60W) to also power the receiver. Powering the receiver would not power the transmitter.

### Using PoE-Enabled Switch

If using a PoE-enabled switch to power the transmitter, only a 802.3af class 2 compatible switch port is needed (providing up to 6.49 W to powered devices). This will power both the transmitter and receiver, and ensure that you can have a 2,000-foot reach between them.

### Using External Power Supply at Transmitter Only

If using an external power supply, Panduit recommends a 60 W power supply plugged in at the transmitter side. Panduit sells the POWER-60W power supply either separately or as part of the POEXKIT1 and POEXKIT1-NP kits. This will power both the transmitter and receiver, and ensure that you can have a 2,000-foot reach between them.

In the case where multiple transmitters are located in close proximity, such as on the POEXPANEL-BL and POEXPANEL-WH, Panduit recommends the 190 W power supply (POWER-190W). This is a single power supply that can power up to four transmitters.

## Data and Power Transmission

While data transmission is always at 2,000 feet, the amount of power available is dependent on:

- The total distance of the link
- The type of cable used (23 versus 24 AWG)
- The powering method

This section will discuss the different powering methods and then provide information on how much power can be available based on the type of cable used and the distance of the link.

Note: The system minimally requires power to be provided to the transmitter. If the transmitter has power, it can provide power to both the receiver and the device attached to the receiver. If the receiver is powered, it cannot provide power to the transmitter.

## Using PoE-Enabled Switch

This section looks at the scenario of only a PoE switch capable of supplying either 30 or 50 W to be connected to the transmitter. No other power is provided to the receiver.

Note: it is possible to provide power to the receiver through another separate power supply. This can be done in cases where additional power is needed at the receiver in order to power the end device. Powering the receiver will not provide power to the transmitter. See the "Using External Power Supply at Receiver Only" section for more information on this use case.

Table 1 provides guidance as to how long the distance between the transmitter and receiver when the system is only powered by a 30 W PoE Switch.

Table 2 provides guidance as to how long the distance between the transmitter and receiver when the system is only powered by a 50 W PoE Switch.

- The "Max Wattage at PD" refers to how much power is available at the Powered Device (PD)
- The amount of power needed is dependent on the requirements of the Powered Device (such as a security camera)
- The "TX1 – RX1 Cable Distance ft. (m)" refers to how far the transmitter and receiver can be separated from each other with either 23 AWG cable or 24 AWG cable
- Panduit recommends 23 AWG cable as it provides further distance
- In all cases, we recommend no more than 50 feet (15 meters) from the transmitter and receiver and the corresponding devices they are connected to
- In the case where a 4-port receiver (POEXRX4) is connected to the transmitter, the "Max Wattage at PD" must be split amongst the four ports, offering a lower total power available per port

As can be seen from the tables, for example, with a 30 W PoE Switch, Panduit can supply up to 12.95 W at 2000 feet with 23 AWG or 24 AWG cables. With a 50 W PoE Switch, Panduit can only supply up to 25.5 W at 1257 feet (383 meters) with 23 AWG cable.

| PoE Class | Standard | Max Wattage at PD | Under Voltage Lockout at PD | PSE – TX1 | TX1 – RX1 Cable Distance ft. (m) | | RX1 – PD |
|---|---|---|---|---|---|---|---|
| | | | | | 23 AWG (1.04Ω/100 ft.) | 24 AWG (1.43Ω/100 ft.) | |
| 1 | 802.3af | 3.84 | 37 | 50 ft. (15 m) | 2000 (610) | 2000 (610) | 50 ft. (15 m) |
| 2 | 802.3af | 6.49 | 37 | | 2000 (610) | 2000 (610) | |
| 3 | 802.3af | 12.95 | 37 | | 2000 (610) | 2000 (610) | |
| 4 | 802.3at | 25.5 | 42 | | 200 (61) | 85 (26) | |
| 5 | 802.3bt | N/A | N/A | N/A | N/A | N/A | N/A |
| 6 | 802.3bt | N/A | N/A | N/A | N/A | N/A | N/A |

**Table 1:** 1-port (POEXTX1) Transmitter powered by 30 W Power Sourcing Switch at the Transmitter (assuming 55 VDC output). No Additional External Power Source for the Receiver.

| PoE Class | Standard | Max Wattage at PD | Under Voltage Lockout at PD | PSE – TX1 | TX1 – RX1 Cable Distance ft. (m) | | RX1 – PD |
|---|---|---|---|---|---|---|---|
| | | | | | 23 AWG (1.04Ω/100 ft.) | 24 AWG (1.43Ω/100 ft.) | |
| 1 | 802.3af | 3.84 | 37 | 50 ft. (15 m) | 2000 (610) | 2000 (610) | 50 ft. (15 m) |
| 2 | 802.3af | 6.49 | 37 | | 2000 (610) | 2000 (610) | |
| 3 | 802.3af | 12.95 | 37 | | 2000 (610) | 2000 (610) | |
| 4 | 802.3at | 25.5 | 42 | | 200 (61) | 85 (26) | |
| 5 | 802.3bt | N/A | N/A | N/A | N/A | N/A | N/A |
| 6 | 802.3bt | N/A | N/A | N/A | N/A | N/A | N/A |

**Table 2:** 1-port (POEXTX1) Transmitter powered by 50 W Power Sourcing Switch at the Transmitter (assuming 55 VDC output). No Additional External Power Source for the Receiver.

## Using External Power Supply at Transmitter Only

This section looks at the scenario where only a 60 W external power supply (such as the POWER-60W power supply) is connected to the transmitter. No other power is provided to the receiver.

Note: it is possible to provide power to the receiver through another separate power supply. This can be done in cases where additional power is needed at the receiver in order to power the end device. Powering the receiver will not provide power to the transmitter. See the "Using External Power Supply at Receiver Only" section for more information on this use case.

Table 3 provides guidance as to the maximum distance between the transmitter and receiver when only the transmitter is powered by a 60 W external power supply.

- The "Max Wattage at PD" refers to how much power is available at the Powered Device (PD)
- The amount of power needed is dependent on the requirements of the Powered Device (such as a security camera)
- The "TX1 – RX1 Cable Distance ft. (m)" refers to how far the transmitter and receiver can be separated from each other with either 23 AWG cable or 24 AWG cable
- Panduit recommends 23 AWG cable as it provides further distance
- In all cases, we recommend no more than 50 feet (15 meters) from the transmitter and receiver and the corresponding devices they are connected to
- In the case where a 4-port receiver (POEXRX4) is connected to the transmitter, the "Max Wattage at PD" must be split amongst the four ports, offering a lower total power available per port

As can be seen from the table, for example, Panduit can only supply up to 25.5 W at 1,263 feet with 23 AWG cable.

| PoE Class | Standard | Max Wattage at PD | Under Voltage Lockout at PD | PSE – TX1 | TX1 – RX1 Cable Distance ft. (m) | | RX1 – PD |
|---|---|---|---|---|---|---|---|
| | | | | | 23 AWG (1.04Ω/100 ft.) | 24 AWG (1.43Ω/100 ft.) | |
| 1 | 802.3af | 3.84 | 37 | 50 ft. (15 m) | 2000 (610) | 2000 (610) | 50 ft. (15 m) |
| 2 | 802.3af | 6.49 | 37 | | 2000 (610) | 2000 (610) | |
| 3 | 802.3af | 12.95 | 37 | | 1798 (548) | 1303 (397) | |
| 4 | 802.3at | 25.5 | 42 | | 1263 (385) | 914 (279) | |
| 5 | 802.3bt | N/A | N/A | N/A | N/A | N/A | N/A |
| 6 | 802.3bt | N/A | N/A | N/A | N/A | N/A | N/A |

**Table 3:** 1-port (POEXTX1) Transmitter powered by a 60 W External Power Supply (such as POWER-60W) plugged into the Transmitter (assuming 55 VDC output).
No Additional External Power Source for the Receiver.

## Using External Power Supply at Receiver Only

This section looks at the scenario where an external power supply (such as the POWER-60W or POWER-110W power supply) is connected to the receiver.

Note: In this case, the transmitter must be powered separately as the receiver cannot power the transmitter. This can be through either a PoE-enabled switch of at least a 802.3af class 2 compatible port (providing up to 6.49W) or the POWER-60W external power supply.

Table 4 provides guidance as to the maximum distance between the transmitter and receiver when the 1-port receiver (POEXRX1) is powered by a 60 W external power supply (such as POWER-60W) or the 4-port receiver (POEXRX4) is powered by a 110 W external power supply (such as POWER-110W).

- Note that in this case, the 1-port receiver is using a 60 W supply and the 4-port receiver is using a 110 W supply and they both have the same available power per port
- The “Max Wattage at PD” refers to how much power is available at the Powered Device (PD), per port of the receiver
- The amount of power needed is dependent on the requirements of the Powered Device (such as a security camera)
- The “TX1 – RX1 Cable Distance ft.” refers to how far the transmitter and receiver can be separated from each other with either 23 AWG cable or 24 AWG cable; as the receiver has its own power, in all cases this is 2,000 feet (610 meters)
- Panduit recommends 23 AWG cable as it provides greater distance
- In all cases, we recommend no more than 50 feet (15 meters) from the transmitter and receiver and the corresponding devices they are connected to

As can be seen from the table, in all cases since the receiver has its own power supply, the distance between the transmitter and receiver is 2,000 feet.

| PoE Class | Standard | Max Wattage at PD | Under Voltage Lockout at PD | PSE – TX1 | TX1 – RX1 Cable Distance ft. (m) | | RX1 – PD |
|---|---|---|---|---|---|---|---|
| | | | | | 23 AWG (1.04Ω/100 ft.) | 24 AWG (1.43Ω/100 ft.) | |
| 1 | 802.3af | 3.84 | 37 | 50 ft. (15 m) | 2000 (610) | 2000 (610) | 50 ft. (15 m) |
| 2 | 802.3af | 6.49 | 37 | | 2000 (610) | 2000 (610) | |
| 3 | 802.3af | 12.95 | 37 | | 2000 (610) | 2000 (610) | |
| 4 | 802.3at | 25.5 | 42 | | 2000 (610) | 2000 (610) | |
| 5 | 802.3bt | 40 | 42 | | 2000 (610) | 2000 (610) | |
| 6 | 802.3bt | N/A | N/A | N/A | N/A | N/A | N/A |

**Table 4:** 1-port (POEXRX1) Receiver Box powered by a 60 W External Power Supply (such as POWER-60W) (assuming 55VDC output) or a 4-port (POEXRX4) Receiver Box powered by a 110 W External Power Supply (such as POWER-110W). A PoE Switch or additional external power supply (such as POWER-60W) is attached to the Transmitter Box (POEXTX1).

# Recommended Deployment

## Key Questions to Answer on Deployment

Panduit recommends understanding the following elements when determining how to deploy the PoE extenders.

### Can the switch and powered devices both run at the same speed, either 10 Mb/s or 100 Mb/s?

Refer to the instructions or specifications for both the switch and the powered device for the data rate at which they can operate. Both must be capable of operating at the same speed, either 10 Mb/s or 100 Mb/s. The typical and default setting for the Panduit PoE Extenders is 100 Mb/s.

100 Mb/s is a common rate and is sufficient for most applications like IP phones and high definition cameras.

### What amount of power is required for the powered devices?

Refer to the instructions or specifications for the powered device to understand the specific power needs.

If no power is needed as the connection is going to supply data only, ensure that a PoE-enabled switch of at least a 802.3af class 2 compatible port (providing up to 6) or the POWER-60W external power supply is connected to the transmitter to provide power for both the transmitter and receiver.

### How will power be provided to the Panduit PoE Extenders?

One must decide among the three options for providing power. Factors to consider are if a 50 W PoE switch is available, the ability to place the power supplies in a safe location, and how much power is needed at the receiver. The three powering options are:

1. 30 W or 50 W PoE switch providing power to the transmitter
2. External power supply of at least 60 W at the transmitter
3. External power supply of at least 60 W or 110 W at the receiver, depending on if the 1-port or 4-port receiver is used (Note that in this case, the transmitter will need to be powered via a PoE-enabled switch of at least a 802.3af class 2 compatible port [providing up to 6.49 W] or with the POWER-60W power supply)

## Deployment

Once these factors are known, then refer to Table 2, Table 3, or Table 4 to understand how far apart the transmitter and receivers can be placed (“TX1–RX1 Cable Distance ft. [m]”) and powered for the required power (“Max Power at PD”).

## Location of Devices

### Transmitters (POEXTX1)

Panduit recommends placing the transmitters (POEXTX1) near the switch. The ideal deployment would be to place the transmitters in the panels (POEXPANEL-BL and POEXPANEL-WH) which are designed to mount in the rack. These can then be patched using a short patch cord as shown in Figure 5.

Note that when using the POEXPANEL products, Panduit recommends using the POWER-190W power supply which can be mounted to the panel and power up to four POEXTX1 devices.

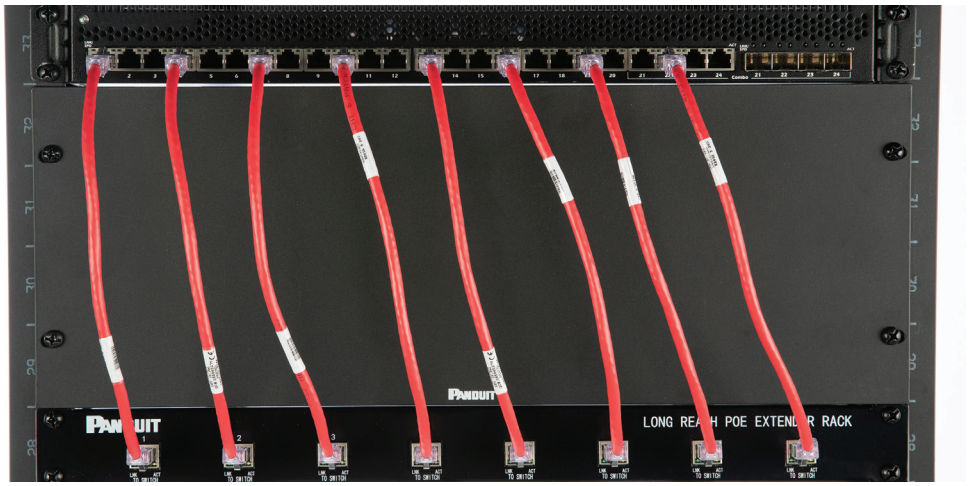



**Figure 5:** Multiple POEXTX1 mounted in the POEXPANEL near the Switch.

### Receivers (POEXRX1 and POEXRX4)

Panduit recommends placing the receivers (POEXRX1 and POEXRX4) within 50 feet of the powered device. If these are required to be located outdoors, they must then be placed in a NEMA-rated enclosure. If external power is needed, ensure the enclosure or location can accommodate either the POWER-60W or POWER-110W power supply.

## Frequently Asked Questions

### Question: How do I provide lightning protection with this device?

**Answer:** To prevent damaging networking equipment, Panduit recommends using the guidance of Article 800 of the NEC. The article recommends using a UL 497 Listed primary protector for all conductive communications paths entering or leaving a building as close as possible to the cable's point of entrance.

Panduit recommends purchasing an additional Ethernet UL 497 approved lightning protection device (such as DTK-MRJEXTS) if lightning protection is required.

### Question: If I do not need power delivery, are these a good option?

**Answer:** Absolutely, these can extend data up to 2,000 feet and are a great option for doing so.

### Question: If power is only at the transmitter or receiver, will it power both devices?

**Answer:** Power at the transmitter can provide power to the receiver and end device. However, power at the receiver will NOT power the transmitter. An additional power supply would be needed.

### Question: Does the 4-port receiver behave like a switch?

**Answer:** Yes. The RX4 has some intelligence in that "switches" Ethernet traffic to the appropriate IP device port/endpoint when it comes from the head-end switch. It aggregates traffic from all four ports/endpoints in the other direction and sends it upstream to the switch.

### Question: Do the individual receivers and transmitters have MAC and IP addresses?

**Answer:** Each individual part has a MAC address but no IP. Only the IP devices connected to the end points of the PoE Extender system are assigned IP addresses.

## Part Selection Guide

All deployments will require:

- (1) Transmitter
- (1) Receiver
- (1) Power supply if the switch cannot provide enough power to transmitter (we recommend at a minimum, a PoE switch that can provide 50 W of power for power transmission; any PoE switch will work if only data transmission is required)

There are a few notes about accessories and kits below.

- The kits include a power supply, so an additional power supply is not needed
- If the –NP option is ordered, the customer will need a power cord as well; ensure it is correct for the region
- Use POWER-60W for the 1-port transmitter or receiver
- Use POWER-110W for the 4-port receiver, if more power is needed than the 60 W can supply
- Use POWER-190W when using the POEXPANEL; this can power up to (4) 1-port transmitters or receivers and mounts to the panel

Refer to Table 5 for a list of the Panduit PoE Extender Parts and Kits and Table 6 for Panduit PoE Extender Accessories.

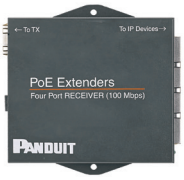
| Part Number | Image | Description |
|---|---|---|
| POEXTX1 |  | PoE extender transmitter. |
| POEXRX4 |  | PoE extender receiver, 4-port. |
| POEXRX1 |  | PoE extender receiver, 1-port. |
| POEXKIT1 |  | PoE extender kit (1) transmitter, (1) 1-port receiver, one power supply with power cord for North America. |
| POEXKIT4 |  | PoE extender kit (1) transmitter, (1) 4-port receiver, one power supply with power cord for North America. |
| POEXKIT1-NP |  | PoE extender kit (1) transmitter, (1) 1-port receiver, one power supply.<br>Power cord sold separately – for use outside of North America. |
| POEXKIT4-NP |  | PoE extender kit (1) transmitter, (1) 4-port receiver, one power supply.<br>Power cord sold separately – for use outside of North America. |

**Table 5:** Panduit PoE Extender Parts and Kits

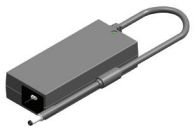
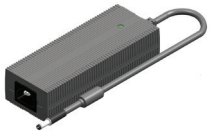
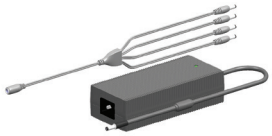
| Part Number | Image | Description |
|---|---|---|
| **POEXPANEL-BL** |  | PoE transmitter panel, Black, accepts up to eight transmitters and two POWER-190W, both sold separately. |
| **POEXPANEL-WH** |  | PoE transmitter panel, White, accepts up to eight transmitters and two POWER-190W, both sold separately. |
| **POWER-60W** |  | Power supply – 60 W. Use with 1-port transmitters or receivers when switch is not providing enough power. Power cord sold separately. See below. |
| **POWER-110W** |  | Power supply – 110 W. Use with 4-port receivers when transmitter is not providing enough power. Power cord sold separately. See below. |
| **POWER-190W** |  | Power supply – 190 W. Use with POEXPANEL. Supplies power to (4) 1-port transmitters or receivers. Power cord sold separately. See below. |
| **C13CORD-B** |  | Power cord, 3-pin, 10A, 2m, IEC320-C13 to GB2099 (Americas). |
| **C13CORD-F** |  | Power cord, 3-pin, 10A, 2m, IEC320-C13 to CEE 7/7 (EU). |
| **C13CORD-G** |  | Power cord, 3-pin, 10A, 2m, IEC320-C13 to BS1363A (UK). |
| **C13CORD-I** |  | Power cord, 3-pin, 10A, 2m, IEC320-C13 to GB2099 (China). |

**Table 6:** Panduit PoE Extender Accessories