

Tropos Networks Outdoor Installation Guide



Tropos Networks, Inc.
1710 South Amphlett Boulevard
Suite 304
San Mateo, CA 94402
USA

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FCC Notice to Users and Operators

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by using one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician.

This Part 15 radio device operates on a non-interference basis with other devices operating at this frequency. Any changes or modification to said product not expressly approved by Tropos Networks could void the user's authority to operate this device.

Warning



You can be killed installing this device!

You can be killed if the 5110 antennas come near electric power lines. Carefully read and follow all instructions in this manual.

By nature of the installation, you may be exposed to hazardous environments, and high voltage. Use caution when installing the outdoor system.

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Installing the Tropos 5110 Wi-Fi Cell

This guide explains how to install the Tropos 5110 a Wi-Fi cell safely and is intended for a trained technical professionals. It covers the following topics:

- [Preparing for Installation](#)
- [Mounting Instructions](#)
- [Connecting Antennas](#)
- [Grounding the Tropos 5110 Wi-Fi Cell](#)
- [Connecting Power](#)
- [Connecting a Data Port](#)
- [Connecting Peripherals](#)

Preparing for Installation

The Tropos 5110 Wi-Fi Cell must be installed by a trained professional, value added reseller, or systems integrator who is familiar with RF cell planning issues and regulatory limits defined by the FCC for RF exposure (sections 1.1307). This section lists the required equipment and model numbers and explains how to identify and prepare the installation site.

Model Numbers

[Table 1](#) lists the model numbers and ranges for the units discussed in this guide. [Figure 1](#) on page 2 shows an exploded view of the Tropos 5110 Wi-Fi Cell.

Table 1 Tropos 5110 Wi-Fi Cell Model Numbers

Model	Model Number
Tropos 5110 Wi-Fi Cell; -30 deg to 55 deg C; N connectors (requires external antenna)	51102100
Tropos 5110 Wi-Fi Cell; -30 deg to 55 deg C; 7.4 dBi; Antennas, bracketry	51103000



Note

The antenna(s) used for this transmitter must be omni directional antennas with a gain of 7.4dBi or less. Antenna(s) must be installed by a trained professional. Operating the unit with non-qualified antennas is a violation of FCC Rules Part 15.203(c), Code of Federal Regulations, Title 47.

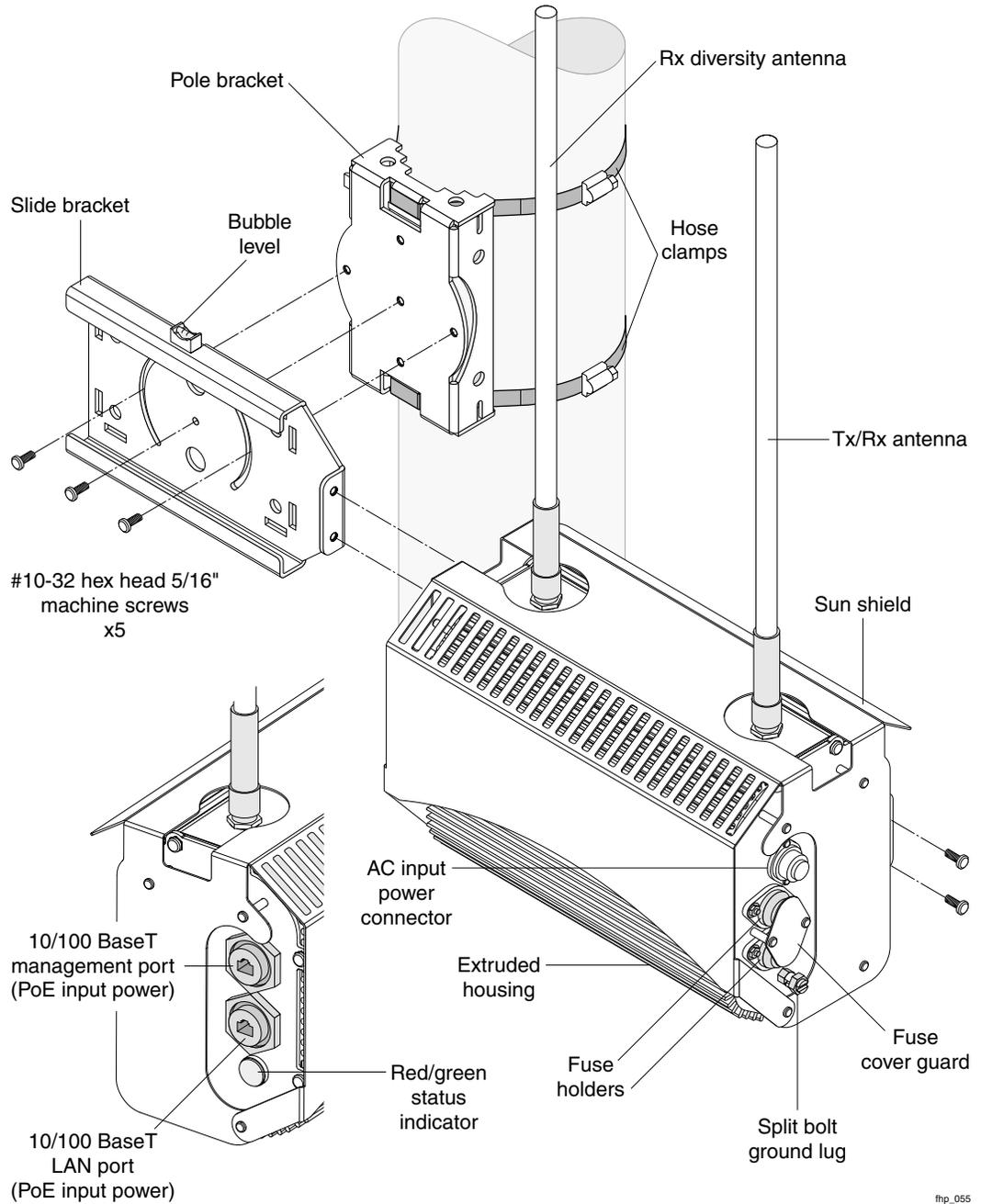


Figure 1 Tropos 5110 Wi-Fi Cell exploded view

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Installation Hardware and Tools

Tropos Networks provides the following accessories to install the Tropos 5110 Wi-Fi Cell:

- One mounting bracket
- Two 4-inch diameter hose clamps
- Four 6-inch diameter hose clamps
- Five 5/16-inch #10-32 stainless steel hex head machine screws

You must supply the following tools:

- 5/16 inch nut driver
- 1/4-inch flat blade screwdriver
- Tower mounting only: supply stainless or galvanized steel channel stock and 1/2-inch or 5/8-inch nuts, bolts, and washers to connect to the tower arm.
- Wood pole mounting only: two 5/8-inch diameter, 3-inch long lag bolts

Site Planning

To ensure safe and durable wiring, installation of the Tropos 5110 Wi-Fi Cell must follow appropriate electrical and building codes. Follow the National Electrical Code (NEC) requirements, unless local codes in your area take precedence over the NEC code.

The following distance limits apply to installations that have 10/100 Base-T Category 5 network cables attached to the Tropos 5110 Wi-Fi Cell:

- 100 meters between devices for 100BaseT operation
- 366 meters for 10BaseT operation.

The Ethernet duplex and speed setting is configurable.

Location Guidelines

The Tropos 5110 Wi-Fi Cell is a radio device and therefore susceptible to interference that can reduce throughput and range. Follow these guidelines to ensure the best performance:

- Install the unit in an area where trees, buildings, and large steel structures do not obstruct radio signals to and from the antenna. Direct line-of-sight operation is best.
- Install the unit away from microwave ovens or other devices operating in the 2.4 GHz frequency range.
- Install the units away from other possible sources of 2.4 GHz WLAN interference, such as cordless phones, home spy cameras, frequency hopping (FHSS) and DSSS LAN transceivers (non-802.11b), electronic news gathering video links, radars, amateur radios, land mobile radio services, local government sites (such as law enforcement), fixed microwave services, local TV transmission and private fixed point transmitters.

Antenna Options

You can purchase the Tropos 5110 Wi-Fi Cell with an integrated omni-directional antenna (Model 51103000) or use your own external antenna (Model 51102100). Omni-directional antennas are best for systems requiring a signal distribution in more than one direction. To comply with FCC RF exposure limits, locate antennas at a minimum distance of 7.9 inches (20cm) from people.

**Note**

The antenna(s) used for this transmitter must be omni directional antennas with a gain of 7.4dBi or less. Antenna(s) must be installed by a trained professional. Operating the unit with non-qualified antennas is a violation of FCC Rules Part 15.203(c), Code of Federal Regulations, Title 47.

Site Surveys

Due to; variations in component configuration, placement, and physical environment, each installation is unique. Before installing the Tropos 5110 Wi-Fi Cell, perform a site survey to determine the optimum placement of units for maximum range, coverage, and network performance. Consider the following factors when performing a site survey:

- Data rates—Sensitivity and range are inversely proportional to data bit rates. The maximum radio range is achieved at the lowest workable data rate. A decrease in receiver threshold sensitivity occurs as radio data increases.
- Antenna type and placement—Proper antenna configuration is a critical factor in maximizing radio range. As a general rule, range increases in proportion to antenna height and gain.
- Physical environment—Clear or open areas provide better radio range than closed or filled areas. The less cluttered the operating environment, the greater the range.
- Obstructions—A physical obstruction, such as a building or tree, can block or hinder communication. Avoid locating antennas in a location where there is an obstruction between sending and receiving antennas.
- Building materials—Radio penetration is influenced by the building material used in construction. For example, drywall construction permits greater range than concrete blocks. Metal or steel construction is a barrier to radio signals.
- Diversity—The Tropos 5110 Wi-Fi Cell supports RX diversity, which requires two antennas.

Power Source

The Tropos 5110 Wi-Fi Cell supports 4 options for connecting to a power source:

- DC power source (power over Ethernet) — input voltage 24 to 48 VDC
- AC power source (3-wire service) — 120/208 VAC

- NEMA plug, for streetlight photoelectric control power tap (2-wire service) — 120/208 VAC



Warning

Connect the AC powered outdoor system only to 120/208V AC power sources. Do not connect it to a power source of higher voltage.

Safety

Installing the Tropos 5110 Wi-Fi Cell can pose a serious hazard. Be sure to take precautions to avoid the following:

- Exposure to high voltage lines during installation
- Falls when working at heights or with ladders
- Injuries from dropping tools
- Contact with AC wiring

Mounting Instructions

This section explains how to mount the Tropos 5110 Wi-Fi Cell on a pole, tower, or streetlight.



Note

The sun shield for the Tropos 5110 Wi-Fi Cell is designed to accommodate antennas facing upward. If conditions at the installation site require that the antennas face downward, you must remove the sun shield and reattach it upside down. See [“Mounting for Downward Facing Antennas”](#) on page 12.

Metal Pole Mounting

Figure 2 shows a typical installation with the Tropos 5110 Wi-Fi Cell mounted on an outdoor metal pole.

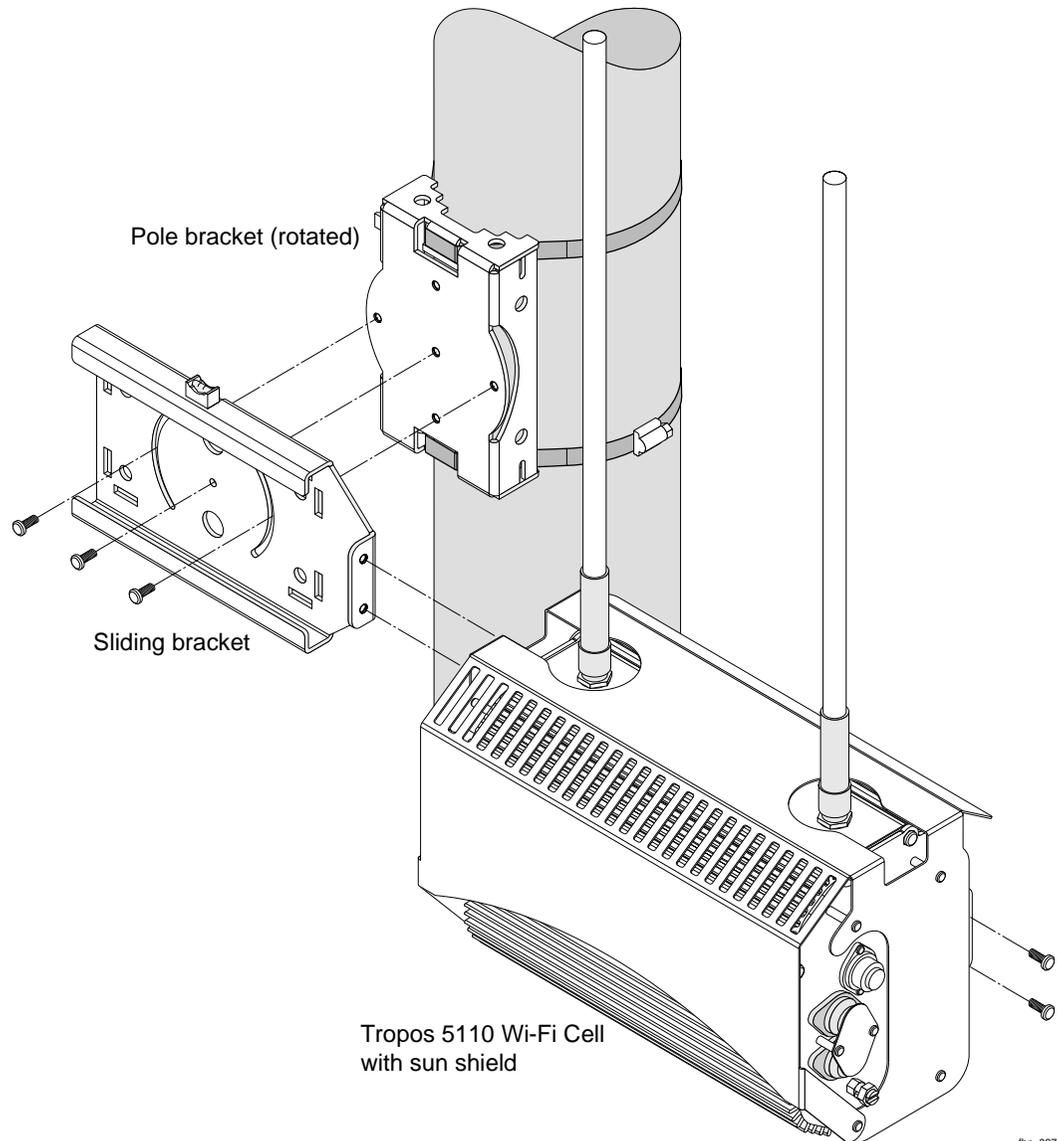


Figure 2 Metal Pole Mounting

To mount the Tropos 5110 Wi-Fi Cell on a metal pole:

1. Select a mounting location. You can attach the Tropos 5110 Wi-Fi Cell to any pipe or pole with diameter 1.75" to 10".
2. If the pole is vertical, use a 5/16-inch nut driver to remove the 3 bolts that attach the pole bracket to the sliding bracket. Rotate the pole bracket 90 degrees and reattach it to the

sliding bracket. Tighten the center bolt, but keep the bolts in the curved grooves slightly loose to permit rotation.

3. Slip the flat portion of the hose clamps under the inside lips of the pole bracket.
4. Use the hose clamps to attach the pole bracket to the pole. Depending upon the diameter of the pole, you may need to use a single small clamp, single large clamp, or pair of large clamps joined together.
5. Level the pole bracket by adjusting the hose clamp and rotating the bracket along the curved grooves. Use the internal bubble levels for reference.
6. Tighten all the mounting bolts.
7. Slide the Tropos 5110 Wi-Fi Cell into place and secure it at the end with two #10-32 hex head machine screws.

To continue installing the outdoor system, see [“Connecting Antennas”](#) on page 13.

Wood Pole Mounting

Figure 3 shows a typical installation with the Tropos 5110 Wi-Fi Cell mounted on an outdoor wood pole.

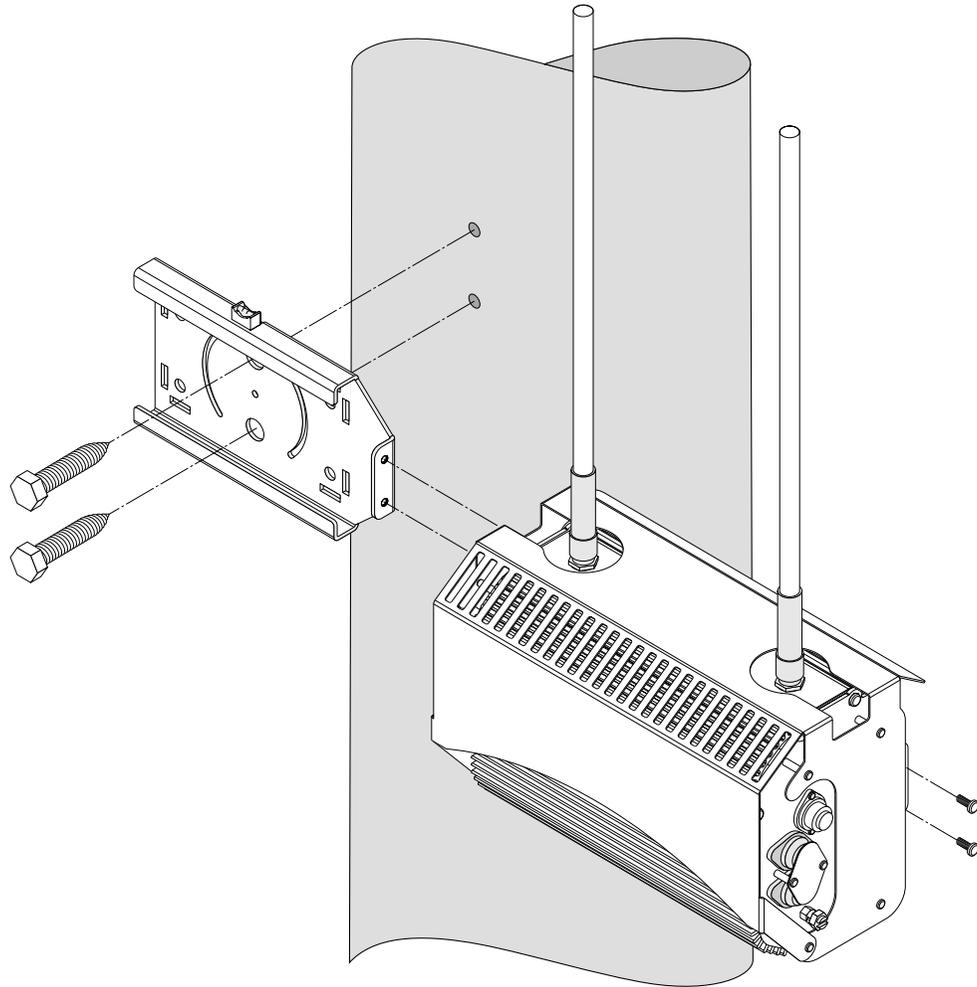


Figure 3 Wood Pole Mounting

To mount the Tropos 5110 Wi-Fi Cell on a wood pole:

1. Select a mounting location. You can attach the Tropos 5110 Wi-Fi Cell to any outdoor wood pole of diameter at least 1.75 inches.
2. Remove the pole bracket from the sliding bracket.
3. Level the sliding bracket against the pole.
4. Use two 5/8-inch lag bolts to attach the sliding bracket to the pole.

- Slide the Tropos 5110 Wi-Fi Cell into place and secure it at the end with two #10-32 hex head machine screws.

To continue installing the outdoor system, see [“Connecting Antennas”](#) on page 13.

Tower Mounting

You can mount the outdoor system to an outdoor tower.



Note

At the antenna level, the Tropos 5110 Wi-Fi Cell must be free from metal obstruction within a 4-foot radius ([Figure 4](#) on page 9).

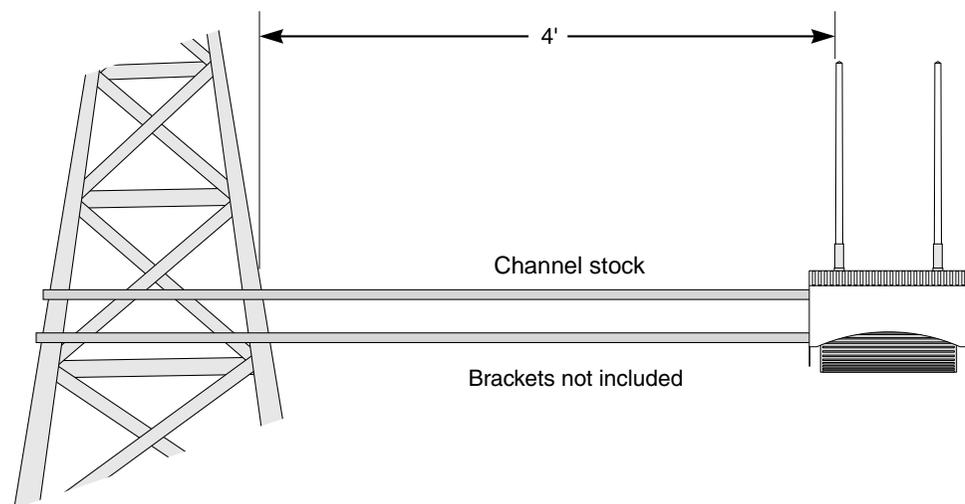


Figure 4 Tower Mounting

To mount the Tropos 5110 Wi-Fi Cell on a tower:

- Remove the pole bracket from the sliding bracket.
- Make a tower bracket by attaching the sliding bracket directly to any stainless steel or galvanized steel channel stock.
- Attach the bracket assembly to the tower arm so that the slides are horizontal.
- Level the bracket assembly by rotating the sliding bracket along the curved grooves.
- Tighten the mounting bolts.
- Slide the Tropos 5110 Wi-Fi Cell into place and secure it at the end with two #10-32 hex head machine screws.

To continue installing the outdoor system, see [“Connecting Antennas”](#) on page 13.

Streetlight Mounting

You can mount the Tropos 5110 Wi-Fi Cell on the horizontal or angled arm of a streetlight. [Figure 2](#) shows a typical streetlight mounting installation.

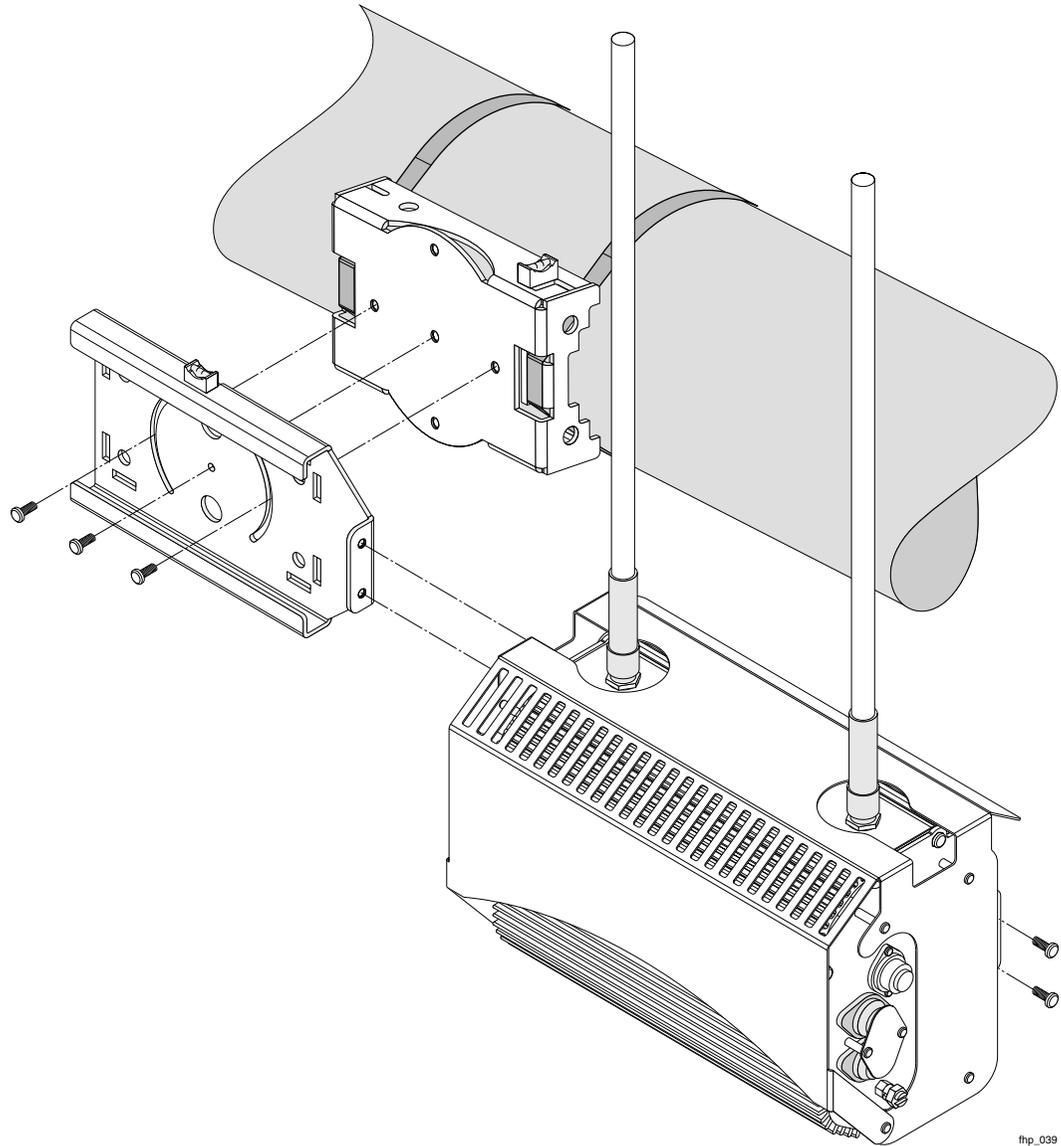


Figure 5 Streetlight Mounting

To mount the Tropos 5110 Wi-Fi Cell on a streetlight:

1. Select a mounting location. You can attach the Tropos 5110 Wi-Fi Cell to any streetlight arm with diameter 1.75" to 10".
2. If the angle of the streetlight arm has a vertical orientation, use a 5/16-inch nut driver to remove the 3 bolts that attach the pole bracket to the sliding bracket. Rotate the pole bracket

90 degrees and reattach it to the sliding bracket. Tighten the center bolt, but keep the bolts in the curved grooves slightly loose to permit rotation.

- 3.** Slip the flat portion of the hose clamp under the inside lip of the pole bracket.
- 4.** Use the hose clamps to attach the pole bracket to the streetlight. Depending upon the diameter of the pole, you may need to use a single small clamp, single large clamp, or pair of large clamps joined together.
- 5.** Level the pole bracket by adjusting the hose clamp and rotating the bracket along the curved grooves. Use the internal bubble levels for reference.
- 6.** Tighten all the mounting bolts.
- 7.** Slide the Tropos 5110 Wi-Fi Cell into place and secure it at the end with two #10-32 hex head machine screws.

To continue installing the outdoor system, see [“Connecting Antennas”](#) on page 13.

Mounting for Downward Facing Antennas

In areas with significant ice and snow, it may be desirable to mount the Tropos 5110 Wi-Fi Cell with the antenna facing downward. To do so, you must remove the Tropos 5110 Wi-Fi Cell from its sun shield and reattach it facing downward (Figure 6).

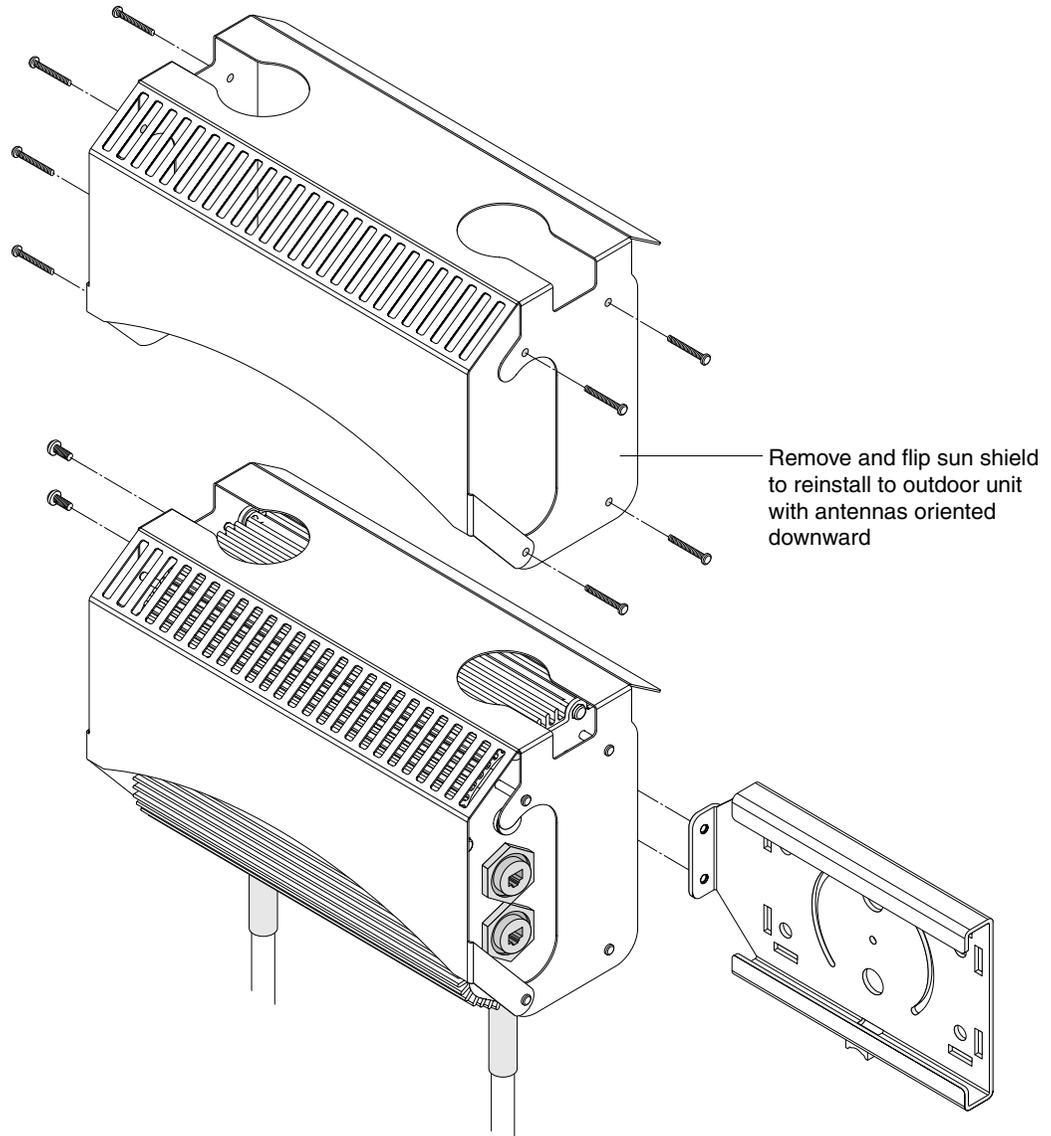


Figure 6 Reattaching sun shield for downward facing antennas

To prepare for downward facing antennas:

1. Remove the 8 screws that connect the Tropos 5110 Wi-Fi Cell to its sun shield.
2. Invert the sun shield so that the Tropos 5110 Wi-Fi Cell antennas face towards the bottom of the shield.
3. Reattach and tighten the 8 screws to secure the Tropos 5110 Wi-Fi Cell to the sun shield.

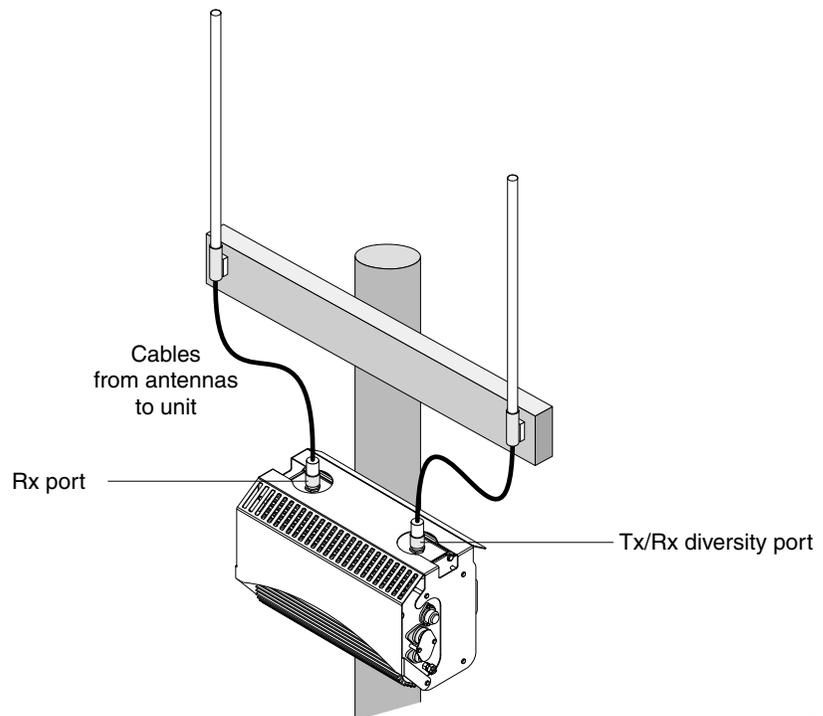
Connecting Antennas

This section applies to external antennas used with Model 51102100. You can mount the antenna on a pole and then use cables to attach it to the Tropos 5110 Wi-Fi Cell. After mounting, secure the antenna with Loctite and waterproof it. [Figure 7](#) shows an installation with external antenna cabling.



Warning

Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, as they can cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (e.g. U.S.:NFPA 70, National Electrical Code, Article 810, in Canada: Canadian Electrical Code, Section 54).



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Figure 7 Connecting External Antennas

To connect antenna cables:

1. Mount the antennas in a suitable location, following the instructions supplied with the antennas.
2. Perform a trial installation of the antenna cables.

3. When you are satisfied with the trial placement of the antenna cables, remove the antenna connections from the Tropos 5110 Wi-Fi Cell and apply two drops of Loctite Threadlocker 242 to the antenna connector thread (Figure 8 on page 15).
4. Install the antenna cables.



Note

To ensure good electrical contact with the antenna, do not get Loctite on the center conductor pin of the antenna cable or outdoor system connector.



Note

The antenna(s) used for this transmitter must be omni directional antennas with a gain of 7.4dBi or less. Antenna(s) must be installed by a trained professional. Operating the unit with non-qualified antennas is a violation of FCC Rules Part 15.203(c), Code of Federal Regulations, Title 47.

Waterproofing Antenna Connections

Figure 8 shows how to waterproof the antenna connections after they are installed.

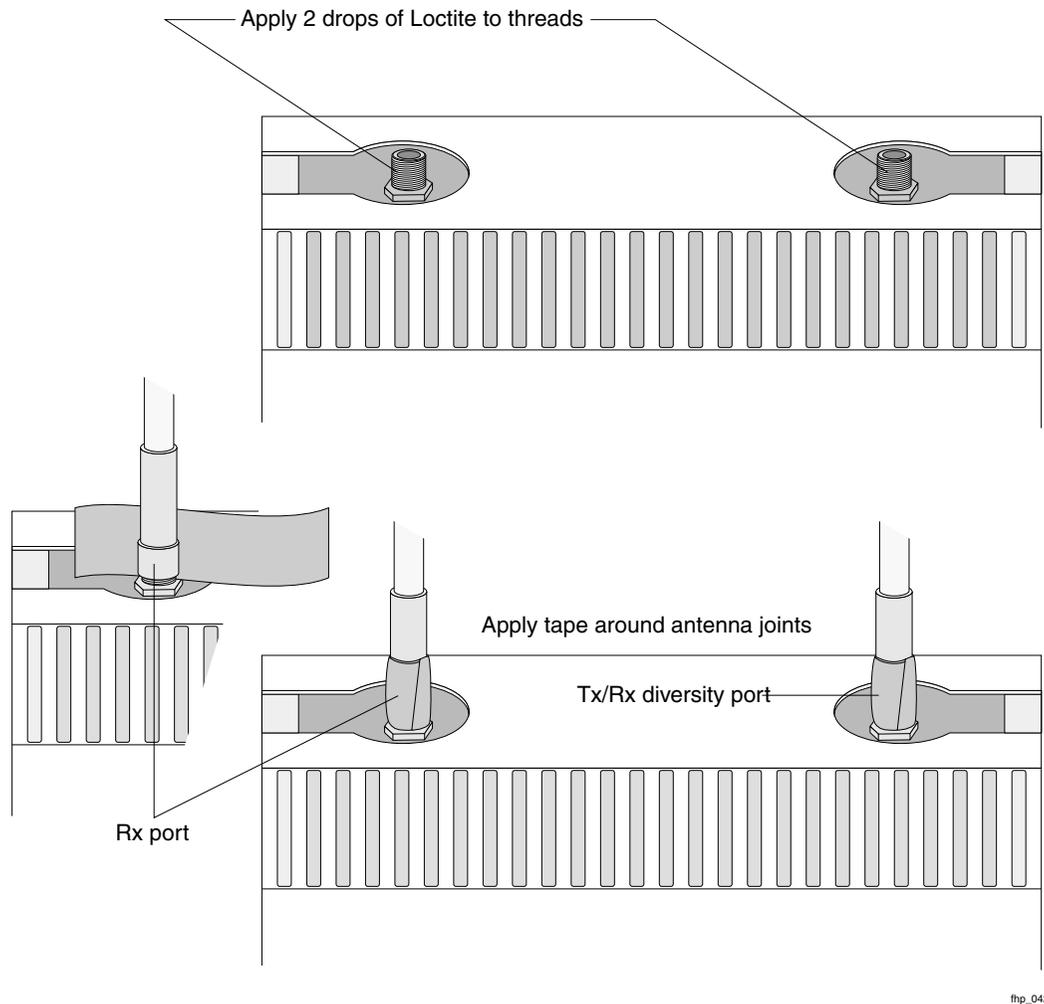


Figure 8 Waterproofing Antenna Connections

To waterproof the antenna connections:

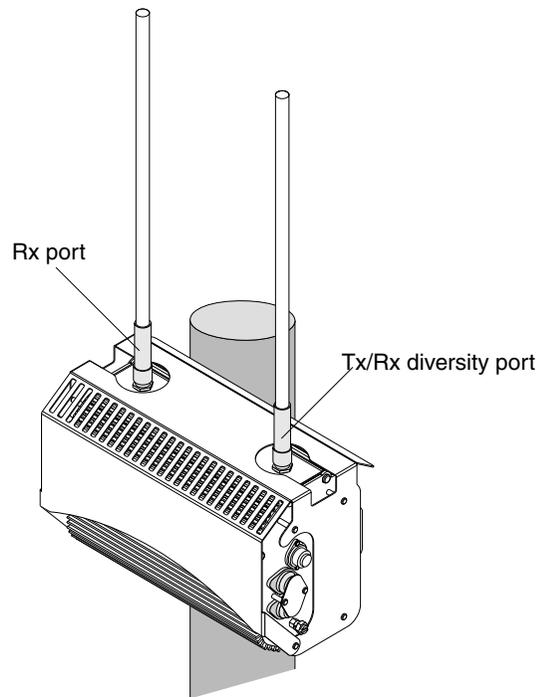
1. Locate the antenna waterproofing tape included in the antenna installation kit.
2. Wrap a piece of waterproofing tape tightly around each antenna or antenna cable connection. If you installed the antennas using antenna cables, be sure to waterproof those connections as well.

Replacing the Antenna

Figure 9 shows the location of the antennas installed with the Tropos 5110 Wi-Fi Cell.

To replace the Tropos 5110 Wi-Fi Cell antennas:

1. Turn power off to the Tropos 5110 Wi-Fi Cell.
2. Remove the waterproofing tape from the antenna connections.
3. Unscrew the antennas.
4. Replace the antennas and apply two drops of Loctite Threadlocker 242 to the antenna connector thread.
5. Waterproof the antenna connections ([“Waterproofing Antenna Connections”](#) on page 15).



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Figure 9 Replacing Tropos 5110 Wi-Fi Cell Antennas

Grounding the Tropos 5110 Wi-Fi Cell



Caution

You must install an external grounding wire if the Tropos 5110 Wi-Fi Cell is installed on a non-metal pole or if the metal installation pole is not properly grounded. You must also ground the outdoor data protection device to a bonded pipe or ground rod. Make sure that grounding is complete before you connect power.

Figure 10 shows the grounding arrangement for the Tropos 5110 Wi-Fi Cell

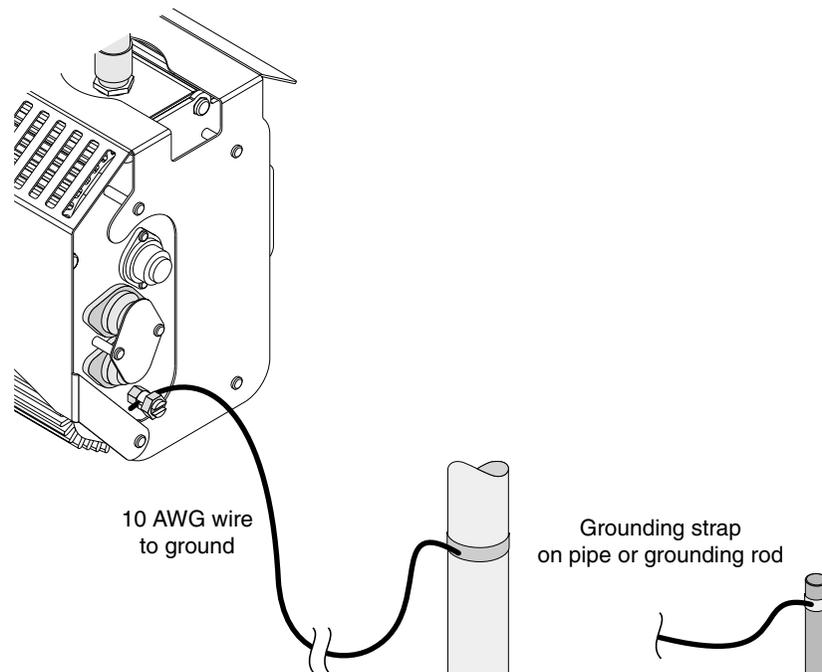


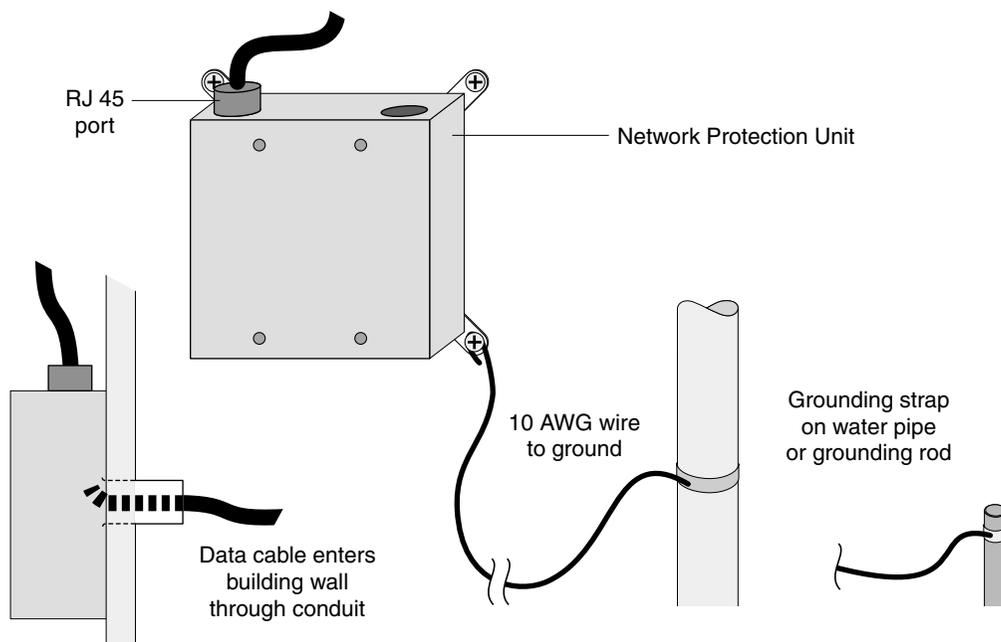
Figure 10 Ground Post Connection

To ground the Tropos 5110 Wi-Fi Cell:

1. Connect a length of #10 AWG bare copper wire to pin 4 of the electrical interface on the Tropos 5110 Wi-Fi Cell, or to the split bolt ground lug.
2. Connect the other end of the grounding wire to a grounding strap attached to a grounded surface or other earth ground such as a grounding rod.
3. Secure the #10 AWG bare copper wire into the split-bolt connectors by first tightening the nuts finger tight and then tightening further by applying a 1/4 turn with an open-end wrench. The split-bolt connector should be tightened to a torque of 20 ft-lbs.

Grounding the Data Protection Device

A data protection device, the Network Protection Unit (NPU), is an orderable accessory for the Tropos 5110 Wi-Fi Cell gateway. [Figure 11](#) shows the grounding arrangement.



fig_044

Figure 11 Grounding the Data Protection Device

To ground the data protection device:

1. Connect a length of #10 AWG bare copper wire to the ground post on the data protection device.
2. Connect the other end of the grounding wire to a grounded surface or other earth ground such as a metal pipe, as near as possible to the point where the cable enters the building.

Connecting Power

This section explains the different categories of electrical power and provides procedures for connecting the outdoor system to power. There are four options for connecting the Tropos 5110 Wi-Fi Cell to a power source:

- DC power source (power over Ethernet) — input voltage 24 to 48 VDC
- AC power source (3-wire service) — 120/208 VAC
- NEMA plug, for streetlight photoelectric control power tap (2-wire service) — 120/208 VAC

**Warning**

Before you work on an electrical circuit, make sure the power is off. Turn off the breaker to the circuit you plan to work on. Post a sign on the service panel so nobody tries to reconnect power while you are working on the circuits. Double-check the circuit with a circuit tester before you touch it to make sure the correct breaker has been disconnected.

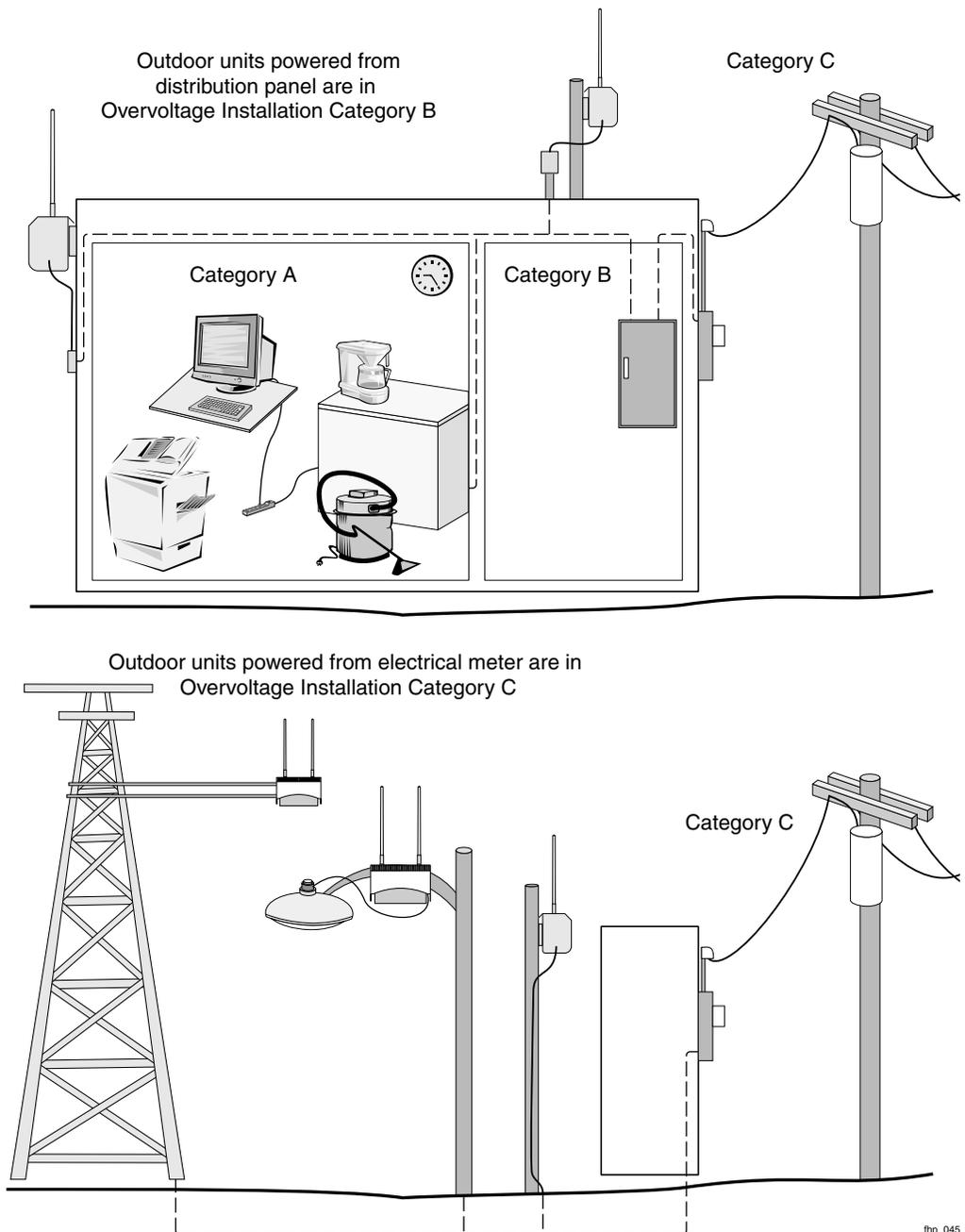
Categories of Power

The IEEE/ANSI C62.41 Category C standards (equivalent to the IEC Cat 3 standards) define Categories A-C. Equipment designed to a CAT C standard is resistant to much higher energy transients than one designed to CAT B or CAT A standards. Within a category, a higher voltage rating denotes a higher transient withstand rating.

[Table 2](#) lists power types and [Figure 13](#) shows hook-ups for the different power categories.

Table 2 IEEE/ANSI C62.41 Power Categories

Category	Summary	Examples
CAT C	Outside and service entrance	<ul style="list-style-type: none"> • Service drop from pole to building entrance • Run between meter and distribution panel • Overhead line to detached buildings • Underground lines to well pumps
CAT B	Major feeders and short branch circuits	<ul style="list-style-type: none"> • Distribution panel devices • Bus and feeder systems in industrial plants • Heavy appliance outlets with “short” connections to the service entrance • Lightning systems in commercial buildings
CAT A	Outlets and long branch circuits	<ul style="list-style-type: none"> • All outlets at more than 10 m (30 ft) from Category B with wires #14-10 • All outlets at more than 20 m (60 ft) from Category C with wires #14-10



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Figure 12 IEEE/ANSI C62.41 Power Categories

Connecting DC Power (Power over Ethernet)

Figure 13 shows the DC power connections for power over Ethernet, Figure 14 shows the pin locations for the RJ45 connector, and Table 3 on page 23 gives the pin definitions. Make sure that the Tropos 5110 Wi-Fi Cell is properly grounded before connecting power.

**Note**

Only use shield Cat5 cable rated for outdoor use. For protection against risk of fire, electrical hazard and to ensure the reliable operation of this equipment, the shields of the Cat5 cable must be properly terminated and bonded to the unit and to the protective earth (PE) at the building entrance.

**Note**

National Electrical Codes (NEC) Article 800 requires the use of Agency Listed (UL/CSA) Building Entrance Protector for all power and communications cables entering a building. The NEC intends by Article 800 to protect the building and occupants from fires caused by transient voltage and current surges.

**Note**

This unit may be powered by either an AC input or by a DC voltage supplied by Power Over Ethernet Power Sourcing Equipment (PSE). When the unit is powered by the AC input a 24Vdc voltage is present on RJ45 connector pins 4,5(+) and 7,8 (-). When the unit is powered by the DC Power Over Ethernet the DC input voltage is present on the RJ45 connector pins 4,5 and 7,8.

**Warning**

DC voltage on RJ-45 pins 4,5 (+) and 7,8 (-)

**Note**

This is not a mid-span powered device. Never attempt to daisy-chain Power Over Ethernet devices.

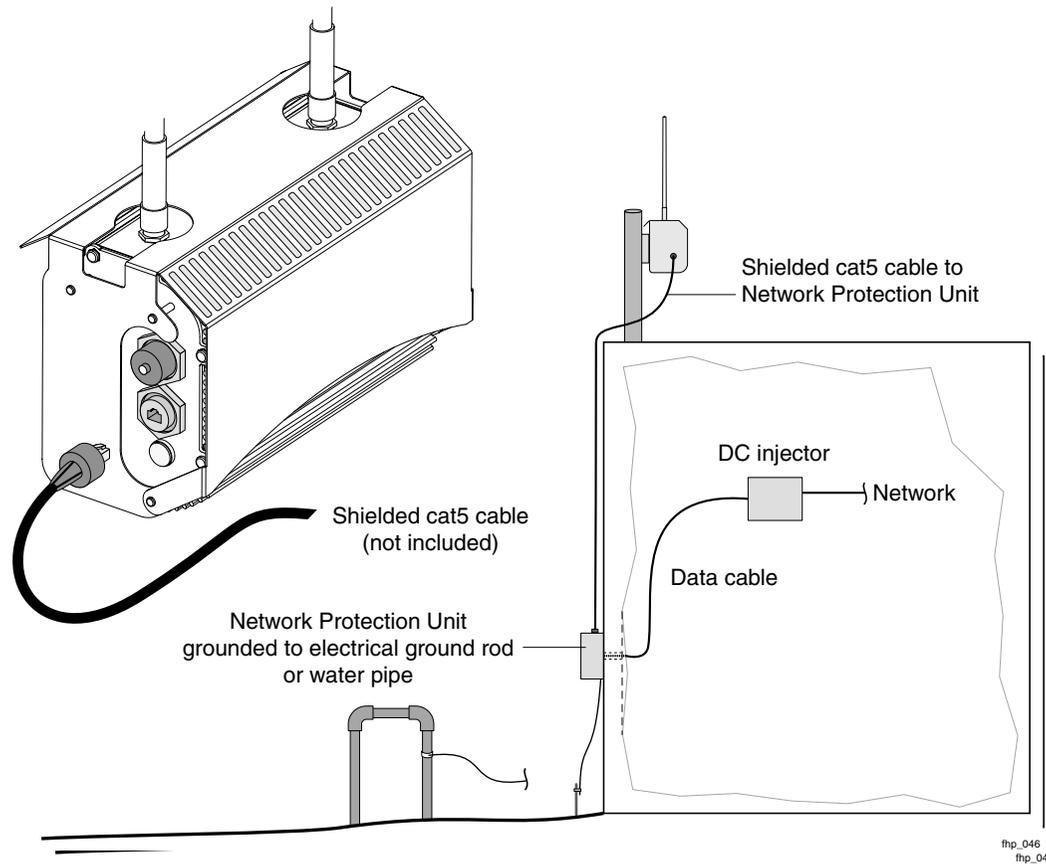


Figure 13 Connecting DC Power

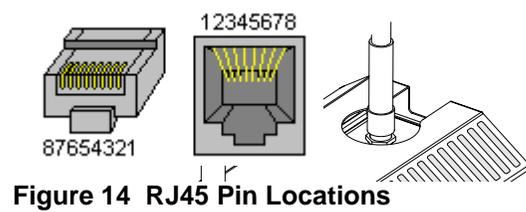


Table 3 RJ45 Pin Descriptions

Pin	Signal	Description
1	TXD+	TX Data 10/100BaseT
2	TXD-	TX Data 10/100BaseT
3	RXD+	RX Data 10/100BaseT
4	PoE+	Feeding power input 24 to 48 Vdc(+)
5	PoE+	Feeding power input 24 to 48 Vdc(+)
6	RXD-	RX Data 10/100BaseT
7	PoE-	Feeding power input 24 to 48 Vdc(-)
8	PoE-	Feeding power input 24 to 48 Vdc(-)

To connect a DC power source (power over Ethernet):

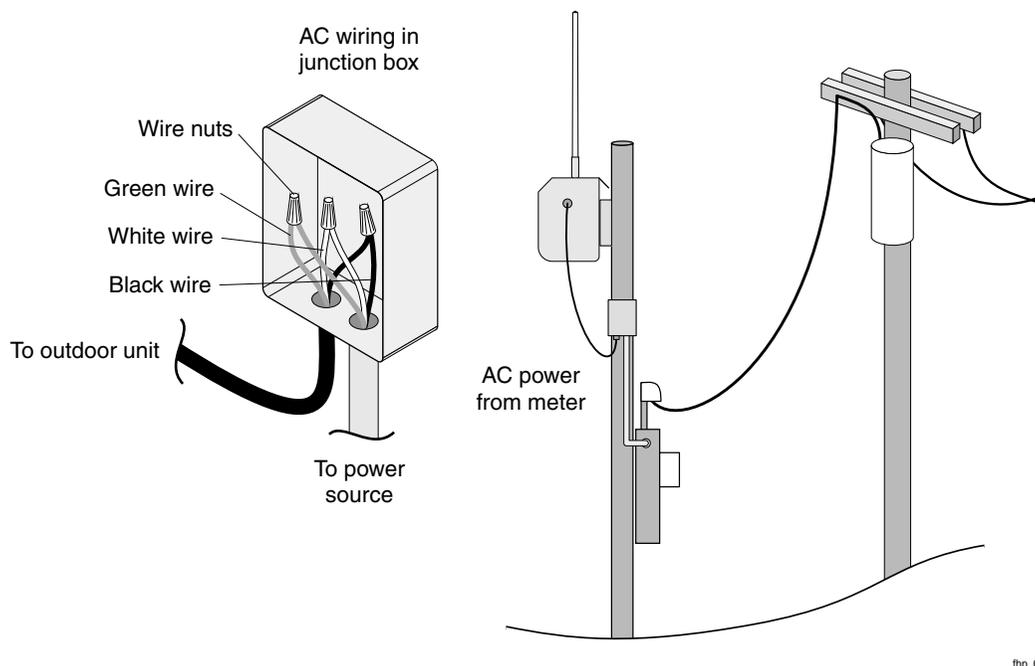
1. Verify that power is turned off on the designated circuits.
2. Run shielded Category 5 Ethernet cable appropriate for outdoor use from a network protection unit (NPU) to the Tropos 5110 Wi-Fi Cell.
3. Connect one end of the Category 5 cable to the NPU. The NPU is IEEE/ANSI compliant and suitable for outdoor use.
4. Connect the other end of the cable to the LAN or Management port on the Tropos 5110 Wi-Fi Cell. Use a Field Attachable Ethernet connection (Tropos Networks EC003300) to terminate the cable at the desired length.
5. Verify that the NPU is properly grounded.
6. Connect the NPU device to a DC power injector.
7. Reconnect the circuit and confirm that power to the Tropos 5110 Wi-Fi Cell comes on.

**Note**

This is not a mid-span powered device. Never attempt to daisy-chain Power Over Ethernet devices.

Connecting to AC Power (Category C)

Figure 15 shows the AC power connections for a Category C AC power source.



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Figure 15 Connecting Category C AC Power

To connect an AC power source:

1. Verify that the service voltage is 120/208 VAC.
1. Verify that power is turned off on the designated circuits.
2. Install 1/2 inch liquid-tight conduit from the building entrance point to within 3 feet of the outdoor system.
3. Run 3-wire AC service through the conduit.
4. Connect the conduit to a junction box. The conduit and junction box must be IEEE/ANSI compliant and suitable for outdoor use.



Note

Data and power must never be enclosed in the same conduit.

5. Connect the 3-wire AC cable to the wires on the Tropos 5110 Wi-Fi Cell using wire nuts.
6. Connect the Tropos 5110 Wi-Fi Cell to a 120 or 208 VAC CAT C power source.
7. Reenergize the circuit and confirm that power to the Tropos 5110 Wi-Fi Cell comes on.

**Note**

The Tropos 5110 Wi-Fi Cell is equipped with additional AC surge protection and dual fuse branch circuit protection. Additional ISA branch circuit protection is not required in the upstream power distribution.

Connecting to Streetlight Power (Category C)

Figure 16 shows the power connections for Category C streetlight power. Use the 3-prong NEMA twist-lock adapter with twist-lock style photoelectric controls for outdoor lighting commonly used by utilities. The NEMA twist-lock adapter can be used only with UL 773 listed outdoor lighting controls rated for and operated at 120/208 VAC.

**Warning**

Be extremely careful when connecting to Category C streetlight power.

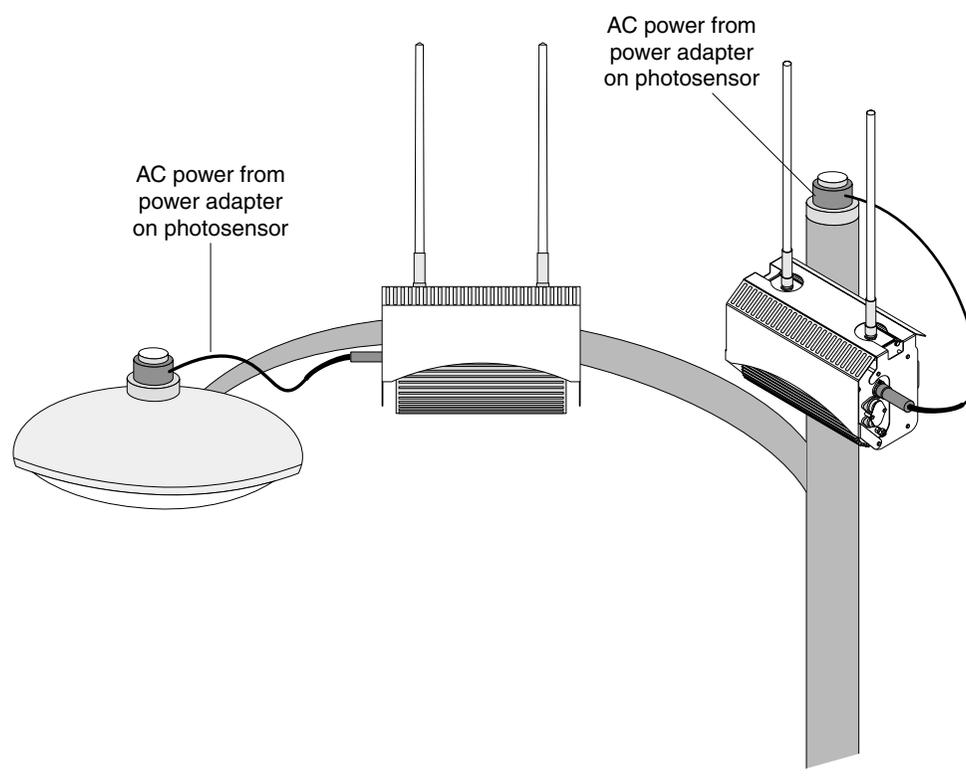


Figure 16 Connecting Streetlight Power

**Warning**

Connect the outdoor system only to a twist-lock style outdoor lighting control powered by 120/208 VAC. Do not connect it to twist-lock style outdoor lighting controls powered by higher voltage.

To connect a streetlight power source:

1. Verify that the service voltage is 120/208 VAC.
2. Verify that power is turned off on the designated circuits.
3. Remove the photosensor from the streetlight.
4. Connect the NEMA 3 prong plug from the Tropos 5110 Wi-Fi Cell to the photosensor connector on the street light.
5. Connect the photosensor to the top of the NEMA 3 prong plug.
6. Connect the AC plug to the Tropos 5110 Wi-Fi Cell.
7. Reenergize the circuit and confirm that power to the Tropos 5110 Wi-Fi Cell comes on.

**Note**

The Tropos 5110 Wi-Fi Cell is equipped with additional AC surge protection and dual fuse branch circuit protection. Additional ISA branch circuit protection is not required in the upstream power distribution.

**Note**

Do not leave connectors open to the environment. Connectors should be covered with closure caps when not in use. Closure caps should be tightened to be snug.

Connecting a Data Port

The Tropos 5110 Wi-Fi Cell is equipped with two RJ45 Ethernet ports. Use either port for the wired connection to the Tropos 5110 Wi-Fi Cell gateway and to run DC power over Ethernet (page 21). Use the Management port as the wired configuration interface. Use either port to attach wired peripherals such as a traffic camera or IP networking device.

**Note**

The Tropos 5110 Wi-Fi Cell node comes pre-configured. For post-installation changes in configuration, you can communicate with the node by way of its wireless connection. For more information, see the *Tropos Networks Configuration Guide*.

**Note**

Only use shield Cat5 cable rated for outdoor use. For protection against risk of fire, electrical hazard and to ensure the reliable operation of this equipment, the shields of the Cat5 cable must be properly terminated and bonded to the unit and to the protective earth (PE) at the building entrance.

**Note**

National Electrical Codes (NEC) Article 800 requires the use of Agency Listed (UL/CSA) Building Entrance Protector for all power and communications cables entering a building. The NEC intends by Article 800 to protect the building and occupants from fires caused by transient voltage and current surges.

**Note**

This unit may be powered by either an AC input or by a DC voltage supplied by Power Over Ethernet Power Sourcing Equipment (PSE). When the unit is powered by the AC input a 24Vdc voltage is present on RJ45 connector pins 4,5(+) and 7,8 (-). When the unit is powered by the DC Power Over Ethernet the DC input voltage is present on the RJ45 connector pins 4,5 and 7,8.

**Warning**

DC voltage on RJ-45 pins 4,5 (+) and 7,8 (-)

**Note**

This is not a mid-span powered device. Never attempt to daisy-chain Power Over Ethernet devices.

Figure 17 shows how to connect a data cable to the management and LAN ports.

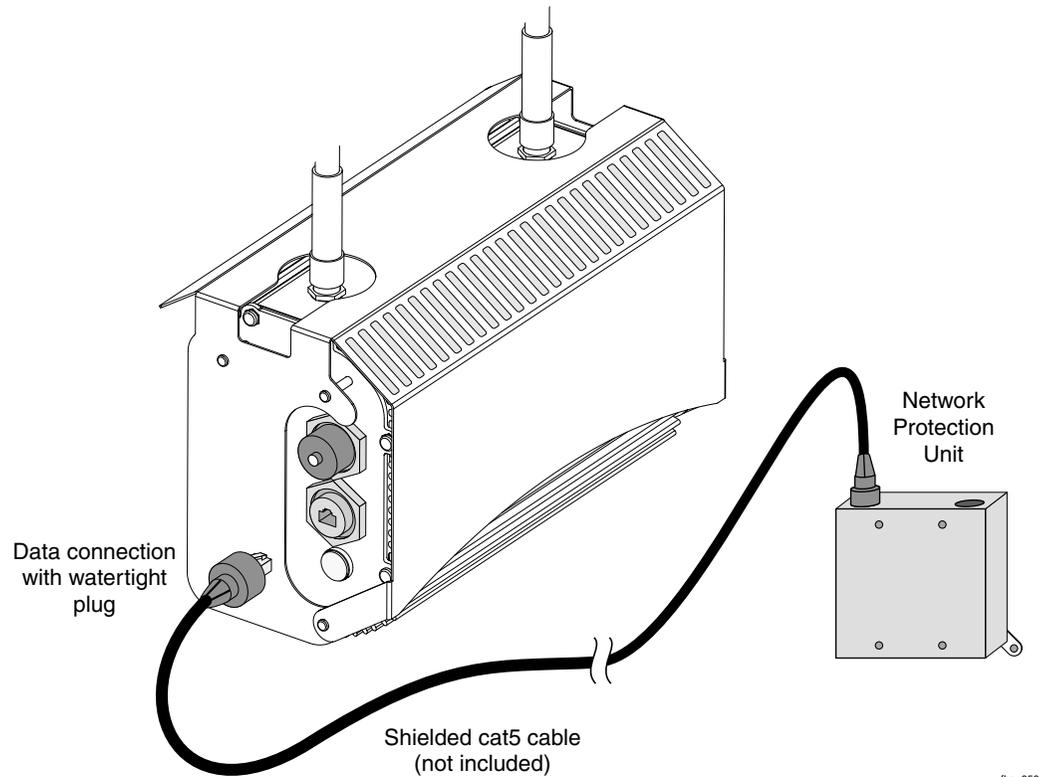


Figure 17 Connecting a Data Port

To connect a DC power source (power over Ethernet):

1. Verify that power is turned off on the designated circuits.
2. Run shielded Category 5 Ethernet cable appropriate for outdoor use from a network protection unit (NPU) to the Tropos 5110 Wi-Fi Cell.
3. Connect one end of the Category 5 cable to the NPU. The NPU is IEEE/ANSI compliant and suitable for outdoor use.
4. Connect the other end of the cable to the LAN or Management port on the Tropos 5110 Wi-Fi Cell. Use a Field Attachable Ethernet connection (Tropos Networks EC003300) to terminate the cable at the desired length.
5. Verify that the NPU is properly grounded.
6. Connect the NPU device to a IEEE DC power injector.
7. Reconnect the circuit and confirm that power to the Tropos 5110 Wi-Fi Cell comes on.

Connecting Peripherals

If your Tropos 5110 Wi-Fi Cell is AC-powered, you can connect a peripheral to either of its ports. 24V power is available on the unused electrical pair (rating 10 watts). [Figure 18](#) shows the pin locations for the RJ45 connector, and [Table 4](#) shows the associated pin descriptions.



Note

Since peripheral connections require AC power, this configuration is not compatible with power over Ethernet.

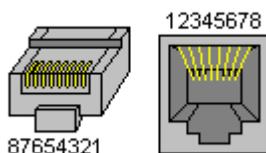


Figure 18 RJ45 Pin Locations

Table 4 RJ45 Pin Descriptions for Data Connection

Pin	Signal	Description
1	TXD+	TX Data 10/100BaseT
2	TXD-	TX Data 10/100BaseT
3	RXD+	RX Data 10/100BaseT
4	PoE+	Feeding power output, 24 Vdc (+)
5	PoE+	Feeding power output, 24 Vdc (+)
6	RXD-	RX Data 10/100BaseT
7	PoE-	Feeding power output, 24 Vdc (-)
8	PoE-	Feeding power output, 24 Vdc (-)



Note

Only use shield Cat5 cable rated for outdoor use. For protection against risk of fire, electrical hazard and to ensure the reliable operation of this equipment, the shields of the Cat5 cable must be properly terminated and bonded to the unit and to the protective earth (PE) at the building entrance.

A Safety Information

This chapter describes important safety and service information for the outdoor system and contains the following sections:

- [Safety Information for the Tropos 5110 Wi-Fi Cells](#)
- [Service Instructions](#)

Safety Information for the Tropos 5110 Wi-Fi Cells

The Federal Communications Commission (FCC) with its action in ET Docket 96-8 has adopted a safety standard for human exposure to RF electromagnetic energy emitted by FCC certified equipment. The Tropos 5110 products meet the uncontrolled environmental limits found in OET-65 and ANSI C95.1, 1991. Proper operation of this radio according to the instructions found in this manual and the hardware and software guides on the Tropos 5110 Wi-Fi Cells result in user exposure that is substantially below the FCC recommended limits.

The following are guidelines to insure safe operation of the Tropos 5110 Wi-Fi Cells:

- Do not touch or move the antenna(s) while the unit is transmitting or receiving.
- Do not hold any component containing a radio such that the antenna is very close to or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Do not operate the radio or attempt to transmit data unless the antenna is connected; otherwise, the radio may be damaged.
- Use in specific environments:
 - Do not operate a portable transmitter near unshielded blasting caps or in an explosive environment unless it is a type especially qualified for such use.
 - The use of wireless devices in hazardous locations is limited to the constraints posed by the safety directors of such environments.
 - The use of wireless devices on airplanes is governed by the Federal Aviation Administration (FAA).
 - The use of wireless devices in hospitals is restricted to the limits set forth by each hospital.
- Antenna use:
 - The Tropos 5110 Wi-Fi Cells must only be used with Tropos-approved components and antennas.

- In order to comply with FCC RF exposure limits, dipole antennas should be located at a minimum distance of 7.9 inches (20 cm) or more from the body of all persons.
- High-gain, wall-mount or mast-mount antennas are designed to be professionally installed and should be located at a minimum distance of 12 inches (30 cm) or more from the body of all persons. Please contact your professional installer, VAR, or antenna manufacturer for proper installation requirements.

Service Instructions

This section contains service information for the Tropos 5110 Wi-Fi Cells.



Note

The Tropos 5110 Wi-Fi Cells have no user serviceable parts inside. The following information is intended for trained service personnel only.

Clock Battery

The Tropos 5110 Wi-Fi Cells have a real-time clock which is powered by a small lithium rechargeable battery. If the real-time clock fails, return the unit to Tropos Networks for servicing.



Caution

There is a danger of explosion if the battery is incorrectly replaced. Replace the battery with only the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Fuses

The Tropos 5110 Wi-Fi cell uses two 20A, 250V, time delay type CC fuses.

To replace a fuse:

1. Turn off power to the Tropos 5110 Wi-Fi cell and remove the AC power plug.
2. Remove the screws that hold the metal fuse guard in place.
3. Unscrew the fuse cap, and replace the fuse.
4. Tightly fasten the screw cap.
5. Replace the power plug. Make sure that it is screwed in tightly.
6. Power on the Tropos 5110 Wi-Fi cell and confirm that the power light comes on.
7. Replace the metal fuse guard.



Caution

For continued protection against risk of fire, replace only with the same type and rating of fuse.



Caution

The Tropos 5110 Wi-Fi cell has dual fusing.



Warning

DC voltage on RJ-45 pins 4,5 (+) and 7,8 (-)

B Product Specifications

Table B-1 Physical Specifications

Physical Dimensions	Height	Width	Depth
Inches	8.5	13.0	7
Centimeters	21.59	33.02	17.78
Weight			
lbs - maximum	19		
Kg - maximum	7.1		
Mounting Pole Diameter	1.75" to 10"		
Temperature		Min	Max
Operating Range		-35C	55C
Storage Range		-40C	85C
Weather Rating	Rainproof per UL50		
Color	Gloss white		

Table B-2 Interfaces

Data Interface	Distance (km)	Connector
IEEE 802.3 10/100BaseT	0.37 (10BaseT Duplex Setting)	Weathertight RJ45
Management Interface	Distance (km)	Connector
IEEE 802.3 10/100Base T	0.37 (10BaseT Duplex Setting)	Weathertight RJ45
Wireless Interface		
Standard	IEEE 802.11b Wi-Fi	
Frequency Range	2400 to 2485 MHz ISM Band	
Modulation	DSSS; DBPSK @ 1 Mbps, DQPSK @ 2 Mbps, CCK @ 5.5 and 11 Mbps	
TX Power	28dBm	
EIRP	36 dBm (7.4dBi omni antennas)	
RX Sensitivity (1Mbps)	-94dBm	
Antennas	External	
Antenna Pattern	7.4 dBi omni	
Antenna Diversity	Receive	
Impedance	50 ohms	
VSWR	1.5 : 1	
Connector	N (female)	
Indicator - Status Lamp	Red/Green	

Table B-3 Power Options / Consumption

Power Over Ethernet (POE)	24 to 48 Vdc/1A maximum	14W/19W	typical/max
Single Phase VAC IEEE/ANSI C62.41 CAT C Power	120, 208 VAC	28W/238W	typical/max
Protection Circuits			
Antenna Protection	<= 0.5μJ for 3kA @ 8/20μS Waveform EN61000-4-5 Level 4 Surge Immunity		
VAC Surge Protection	IEEE/ANSI C62.41 Category C 10kA @ 8/20uS Waveform; 36kA per phase L-L, L-N, L-PE EN61000-4-5 Level 5 Surge Immunity UL1449 2nd Edition Recognized		
Integrated Branch Circuit Protection	Class CC-Fuse Protection: Littlefuse KLDR Time-Delay 20A		
Data Port Protection	EN61000-4-2 Level 4 ESD Immunity EN61000-4-5 Level 4 Surge Immunity		

Table B-4 Certifications, Other

Certifications	CFR 47 FCC Part 15.C; Class A UL 60950 Listed I.T.E. CAN/CSA-C22.2 60950-00 UL 50 IEC 60664-1 Rated for Outdoor Use CAN/CSA-C22.2 60950-00 UL 1449 IEC 60529 EN61000-4-5 Level 4 AC Surge Immunity EN61000-4-2 Level 4 ESD Immunity EN61000-4-4 Level 4 EFT Burst Immunity EN61000-4-3 EMC Field Immunity
Wind Survivability	> 160 mph
Wind Loading (160 mph)	< 1024 newtons

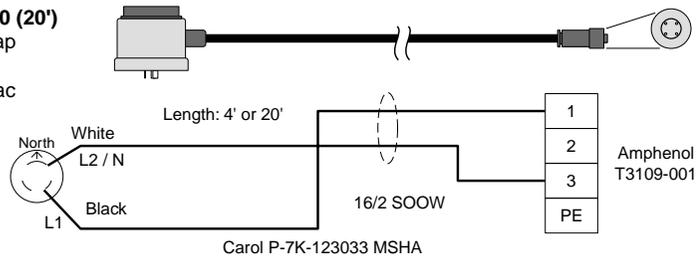
C AC Wiring Diagrams

This appendix contains wiring diagrams for AC power:

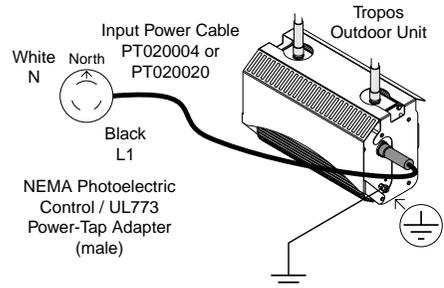
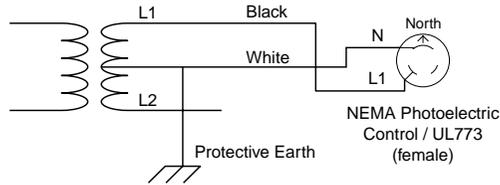
- [Table 19](#) — Photoelectric Power Tap
- [Table 20](#) — Category C

PT020004 (4') or PT020020 (20')
 Photoelectric Power-Tap
 Power Input Cable
 2Wire - 120/208/240Vac

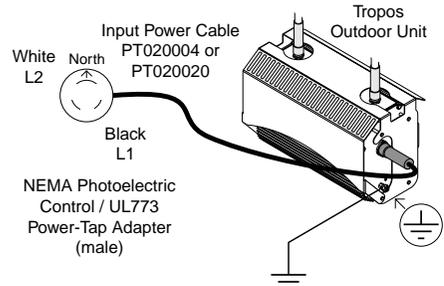
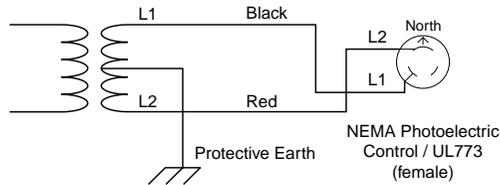
NEMA Plug - UL Standard 773
 Plug-in locking type for
 photocontrols in use with
 area lighting



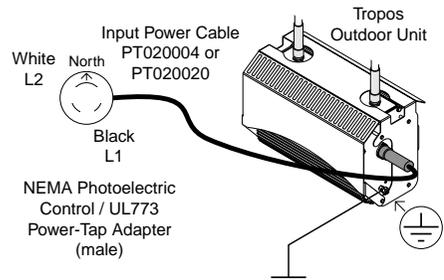
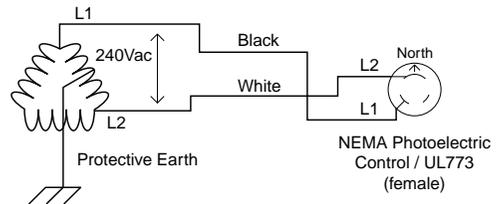
Power-Tap 120Vac single phase; two wire service



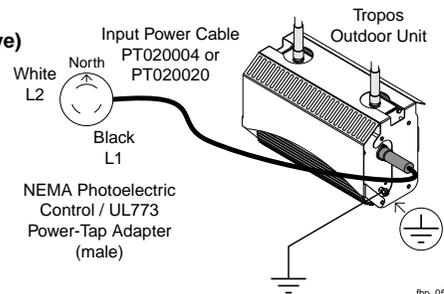
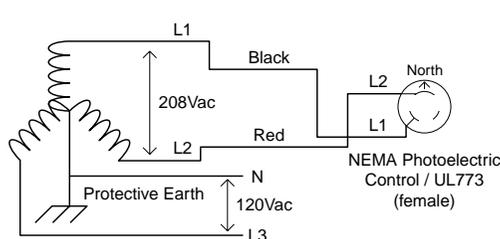
Power-Tap 240Vac single phase; two wire service



240Vac three phase; two wire service (Delta)



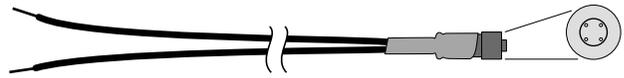
208Vac three phase; two wire service (grounded-Wye)



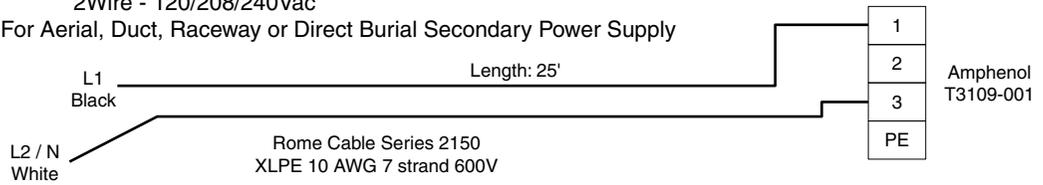
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Figure 19 AC Wiring — Photoelectric Power Tap

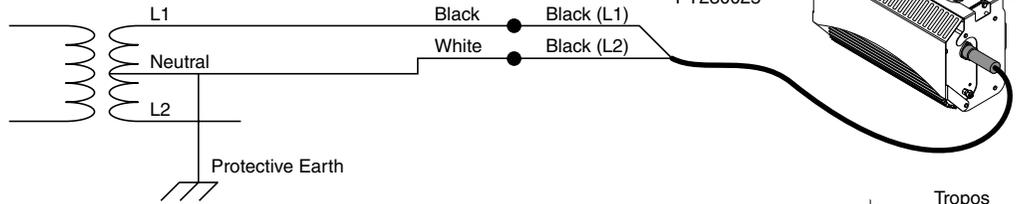
PT230025 Overvoltage Category 3 or IEEE/ANSI C62.41 Category C Power Electrical Service Cable
2Wire - 120/208/240Vac



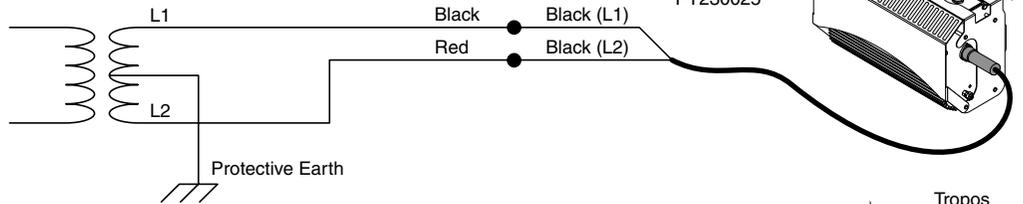
For Aerial, Duct, Raceway or Direct Burial Secondary Power Supply



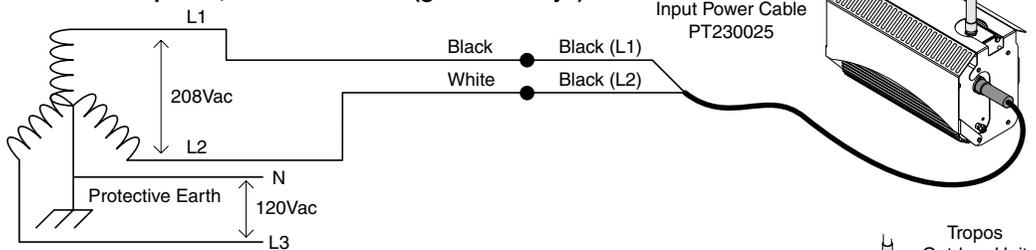
120Vac single phase; two wire service



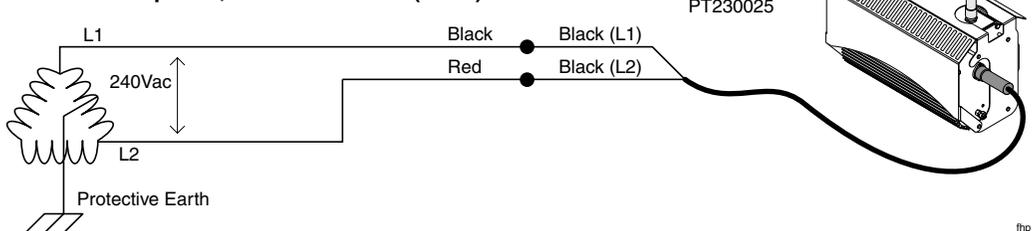
240Vac single phase; two wire service



208Vac three phase; two wire service (grounded-Wye)



240Vac three phase; two wire service (Delta)



thp_054

Figure 20 AC Wiring Category C

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