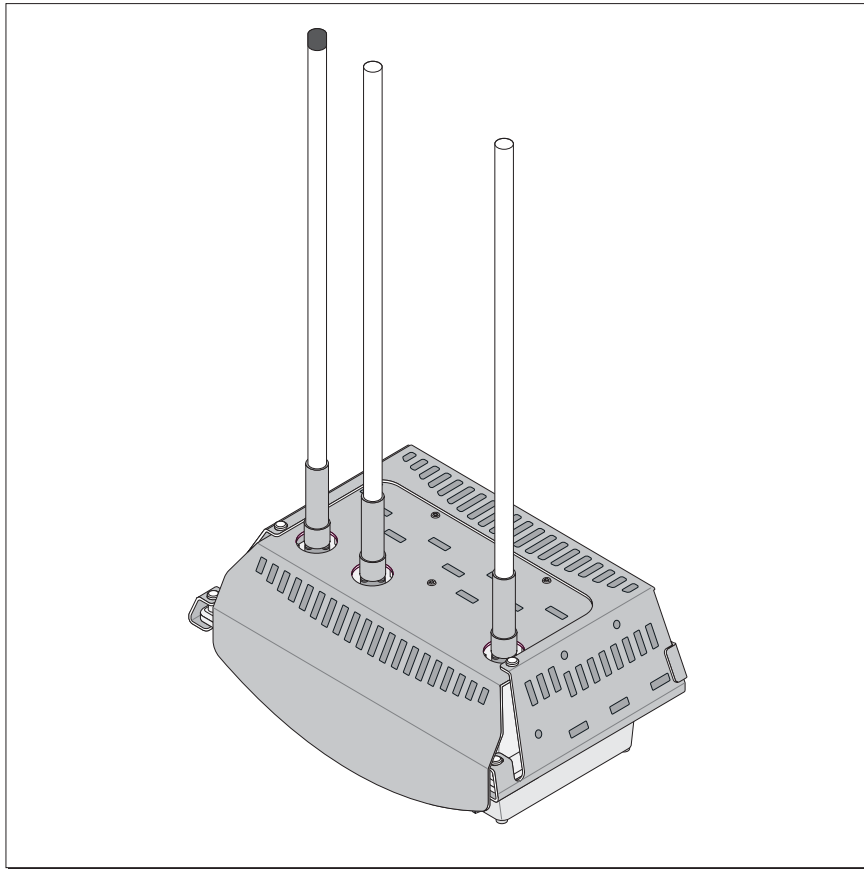# Tropos Networks MetroMesh Router

Outdoor Installation Guide

Models 5320/9532

Tropos Networks, Inc.
555 Del Rey Ave.
Sunnyvale, CA 94085
USAwww.troposnetworks.com
408-331-6800

Copyright Notice

FCC Notice to Users and Operators

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B 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.

Industry Canada

Notice to users and operators:

This Class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe B répond à toutes les exigences de l'interférence canadienne causant des réglements d'équipement. L'opération est sujette aux deux conditions suivantes : (1) cet dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

⚠ **Warning**

It is illegal to modify the construction of this product. Modifying the operating frequency or enhancing the transmit output power through the use of external amplifiers or other equipment is specifically disallowed by the "Telecommunications Act."

⚠ **Warning**

This device is for outdoor or indoor use with conditions that no harmful interference to authorized radio stations results from the operation of this device. This device shall not influence aircraft security and/or interfere with legal communications as defined in the "Telecommunications Act." If this device is found to cause interference, the operator of this equipment shall cease operating this device immediately until no interference is achieved.

European Union WEEE Notice

For EU member countries, this symbol means: Do not dispose of this equipment as unsorted municipal waste. This equipment must be collected separately.

The return and collection of this product has not been defined at this time, please contact Tropos Networks for return and/or collection.

It is important for users of this equipment to participate in reuse, recycling, and other forms of recovery. The potential effects on the environment and human health as a result of the presence of hazardous substances in electrical and electronic equipment are a waste of natural resources and cause pollution.

European Community Language Versions of Informal Statement for Inclusion in User Information

The following statements are in accordance with Article 6.3 of Directive 1999/5/EC.

Danish	Undertegnede *Tropos Networks, Inc.* erklærer herved, at følgende udstyr *5320* overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF
Dutch	Hierbij verklaart *Tropos Networks, Inc.* dat het toestel *5320* in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG
	Bij deze verklaart *Tropos Networks, Inc.* dat deze *5320* voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.
English	Hereby, *Tropos Networks, Inc.*, declares that this *5320* is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Finnish	*Tropos Networks, Inc.* vakuuttaa täten että *5320* tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
French	Par la présente *Tropos Networks, Inc.* déclare que l'appareil *5320* est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE
	Par la présente, *Tropos Networks, Inc.* déclare que ce *5320* est conforme aux exigences essentielles et aux autres dispositions de la directive 1999/5/CE qui lui sont applicables
German	Hiermit erklärt *Tropos Networks, Inc.*, dass sich *dieser/diese/dieses 5320* in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet". (BMWi)
	Hiermit erklärt *Tropos Networks, Inc.* die Übereinstimmung des Gerätes *5320* mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG. (Wien)
Greek	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ *Tropos Networks, Inc.* ΔΗΛΩΝΕΙ ΟΤΙ *5320* ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ
Italian	Con la presente *Tropos Networks, Inc.* dichiara che questo *5320* è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Portuguese	*Tropos Networks, Inc.* declara que este *5320* está conforme com os requisitos essenciais e outras provisões da Directiva 1999/5/CE.
Spanish	Por medio de la presente *Tropos Networks, Inc.* declara que el *5320* cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE
Swedish	Härmed intygar *Tropos Networks, Inc.* att denna *5320* står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

STOP!! STOP!! STOP!! STOP!!

READ THIS FIRST!

Important Safety Instructions

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

The lightning flash with an arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

Caution

Read these instructions.

Keep these instructions.

Heed all warnings.

Follow all instructions.

Do not defeat the safety purpose of the grounding.

Only use attachments/accessories specified by the manufacturer.

Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damage in any way, such as power-supply cord or plug is damaged, liquid has been spilled on objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

Warning

Risk of personal injury or death when installing this device!

There is a risk of personal injury or death if the router 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.

This apparatus must be connected to earth ground.

Do not open the unit — risk of electric shock inside.

Risque d'électrocution. Ne pas ouvrir l'unité.

Caution

You are cautioned that any change or modification not expressly approved in this manual could void your authority to operate this equipment.

Les changements et modifications, non expressément approuvés dans le présent manuel, peuvent entraîner une interdiction d'utiliser cet appareil pour l'utilisateur.

Service

There are no user-serviceable parts inside. All service must be performed by qualified personnel.

Vous ne devez pas réparer les pièces se trouvant à l'intérieur de l'appareil. Les réparations doivent être effectuées uniquement par du personnel qualifié.

The Tropos 5320 MetroMesh Router may contain a lithium-ion battery. To avoid the possibility of an explosion, the Tropos 5320 MetroMesh Router should **NOT** be exposed to any temperatures higher than 85 degrees C.

The RJ45 connectors of your Tropos 5320 MetroMesh Router may source DC power on pins 4,5 and 7,8. The IEEE 802.3 standards allow for pins 4,5 and 7,8 to be used for Power Over Ethernet. Some products may be incompatible with the Tropos Power Over Ethernet capability. If such problems occur, make sure that the unit is configured with the Power Over Ethernet capability set to Off (default setting). If problems persist, use Ethernet cables that have no connections to the unused pins 4,5 and 7,8.

The Tropos 5320 MetroMesh Router is installed in wet, outdoor locations. Make sure closure caps are installed and all cable connections are securely fastened and waterproofed.

The Tropos 5320 MetroMesh Router can only be used with approved antennas. See Appendix C, "Approved Antenna Configurations and Attenuation Settings" for further information.

Surfaces may become hot. Use caution when accessing the Tropos 5320 MetroMesh router.

Contents

List of Figures

List of Tables

1   Installing the Tropos MetroMesh Router

This guide explains how to install the Tropos 5320 MetroMesh router safely and is intended for trained technical professionals. This chapter covers the following topics:

Preparing for Installation

The Tropos 5320 MetroMesh router must be installed by a trained professional, value added reseller, or systems integrator who is familiar with RF planning issues and regulatory limits defined by the governing body of the country in which the unit will be installed. This section lists the required equipment and model numbers and explains how to prepare the installation site.

Model Numbers

An exploded view of the Tropos 5320 MetroMesh router assembly is shown in Figure 1.

(i) **Note**
Antenna(s) must be installed by a trained professional. Operating the unit with non-qualified antennas is a violation of U.S. FCC Rules Part 15.203(c), Code of Federal Regulations, Title 47. See "Approved Antenna Configurations and Attenuation Settings" on page 48 for a listing of antenna options.

Figure 1 Tropos MetroMesh Router Exploded View

802.11a
Tx/Rx
antenna

802.11b/g
Aux
Tx/Rx antenna

802.11b/g
Main
Tx/Rx antenna

Pole bracket

Sun shield

#10-32
hex head 5/16"
machine screws
x 7

Hose
clamps

Router

LED

AC input
power connector

Connector
access cover

Cable gland

Quick tie
anchors

10/100 BaseT
LAN cable

10/100 BaseT
Management cable

Shielded outdoor
cat5 cable

Ground
bolt

Connector
access cover
without
cable glands

Bottom view of Router

trp_150

Tropos 5320 MetroMesh Router Installation Guide   **3**

Installation Hardware and Tools

Tropos Networks provides the following accessories to install the Tropos 5320 MetroMesh router:

- One pole bracket
- One sun shield
- Two 4-inch diameter hose clamps
- Four 6-inch diameter hose clamps
- Seven 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 1/4-inch diameter, 3 1/2-inch long lag bolts

Site Planning

To ensure safe and durable wiring, installation of the Tropos 5320 MetroMesh router 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 5320 MetroMesh router:

- 300 feet maximum between devices for 100BaseT operation
- 500 feet maximum for 10BaseT operation.

The Ethernet duplex and speed setting is configurable.

(i) Note
National Electrical Codes (NEC) Article 800 requires the use of Agency Listed (UL/CSA/TUV) Building Entrance Protector for all power and data 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.

(i) Note
Ethernet data cable installations having lengths greater than 140 feet in the outdoor environment must use a UL497 approved (UL/CSA/TUV Listed) primary protection device at the building entrance. Ethernet data cable installations having lengths less than 140 feet in the outdoor environment may use

a UL497A (UL/CSA/TUV Listed) secondary protection device at the building entrance. Tropos Data Protection Device and Network Protection Units are UL497A secondary protection devices.

Location Guidelines

The Tropos 5320 MetroMesh router 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 or 5 GHz frequency range.
- Install the unit away from other possible sources of 802.11a or 802.11b/g interference, such as cordless phones, home spy cameras, frequency hopping (FHSS) and DSSS LAN transceivers (non-802.11), 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 5320 MetroMesh router with an omni-directional antenna, or use an approved external antenna. Omni-directional antennas are best for systems requiring a signal distribution in more than one direction. To comply with regulatory RF exposure limits, locate antennas a minimum distance of 7.9 inches (20cm) from people. For antenna model numbers, refer to "Approved Antenna Configurations and Attenuation Settings" on page 48.

> (i) **Note**
> Antenna(s) must be installed by a trained professional. Operating the unit with non-qualified antennas is a violation of U.S. FCC Rules Part 15.203(c), Code of Federal Regulations, Title 47. See "Approved Antenna Configurations and Attenuation Settings" on page 48 for a listing of antenna options.

Site Surveys

Due to variations in component configuration, placement, and physical environment, each installation is unique. Before installing the Tropos 5320 MetroMesh router, 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 rate 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 gain and antenna height measured from the ground.
- 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 devices.
- Building materials—Radio penetration is influenced by the building material used in construction. For example, drywall construction permits greater range than concrete blocks.
- Diversity—The Tropos 5320 MetroMesh router supports transmit and receive diversity for 802.11b/g. Diversity requires two antennas.

Power Source

The Tropos 5320 MetroMesh router supports the following options for connecting to a power source:

- AC power source (3-wire service) — 3W(P+N+PE) or 3W(2P+PE); 100-480 VAC, 50/60 Hz
- NEMA plug, for streetlight photoelectric control power tap (2-wire service) —2W(2P) or 2W(P+N); 100-480 VAC 50/60 Hz
- In Europe, a suitably-rated plug provided by the installer

Warning
Connect the AC powered outdoor system only to a suitably-rated power source. Do not connect to a power source of other voltage.

Caution
You must install an external grounding wire if the Tropos 5320 MetroMesh router is installed on a non-metal pole or if the metal installation structure 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 to the Tropos 5320 MetroMesh router.

Safety

Installing the Tropos 5320 MetroMesh router 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 and equipment

■ Contact with AC wiring

Mounting Strategies

When choosing mounting locations, consider the available mounting structures and antenna clearance. The Tropos 5320 MetroMesh router should always be mounted with the top of the unit horizontal and level and with the antennas facing upward.

It is usually best to attach ground and data cables to the router prior to mounting. Before mounting the router, review the wiring instructions in "Grounding the Tropos 5320 Router" on page 21 and "Connecting a Data Port" on page 30 to determine the best strategy for the selected location.

(i) **Note**

To eliminate potential interference from the mounting structure, the router should be mounted with at least 4 feet of clearance around the antennas.

Acceptable options for mounting on a streetlight are shown in Figure 2. In each case the router is mounted to assure clearance for the antennas above the height of the streetlight.

Figure 2 Example Mounting Location - Antennas Facing Upward

Antennas clear of obstruction

Antennas clear of obstruction

trp_151
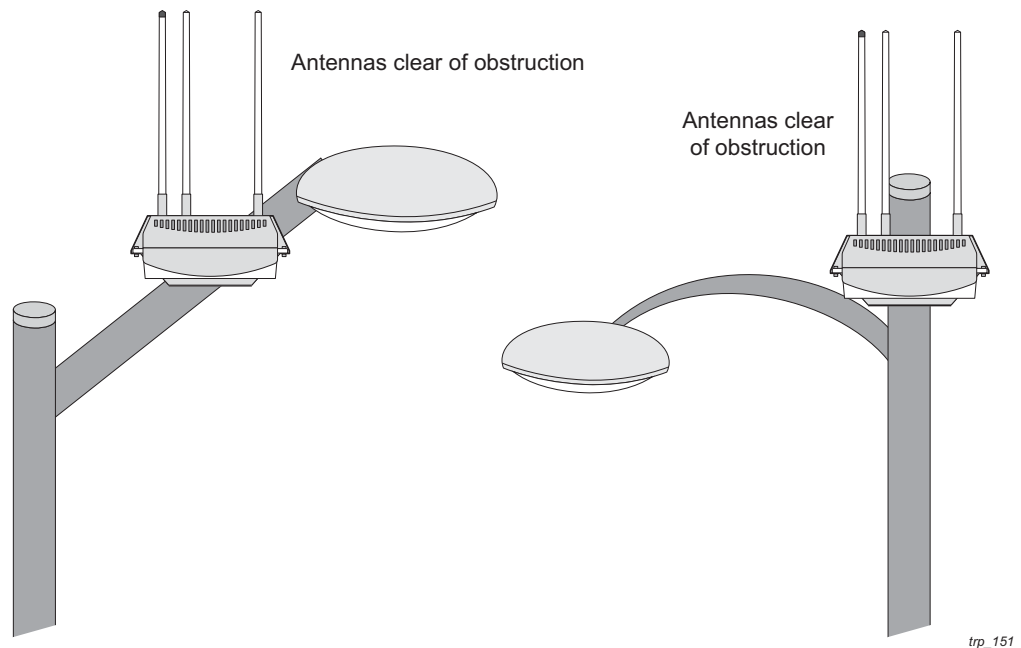
Proper Use of Hose Clamps

The mounting assembly for the Tropos 5320 MetroMesh router contains hose clamps to secure the router to the mounting structure. Figure 3 illustrates the proper use of the hose clamps. The clamps must be routed through slots in the pole bracket as shown in the figure, and then attached to the pole and tightened.

Figure 3 Proper Use of Hose Clamps

Hose clamp band

Band goes behind inner tabs

Sun shield

trp_152
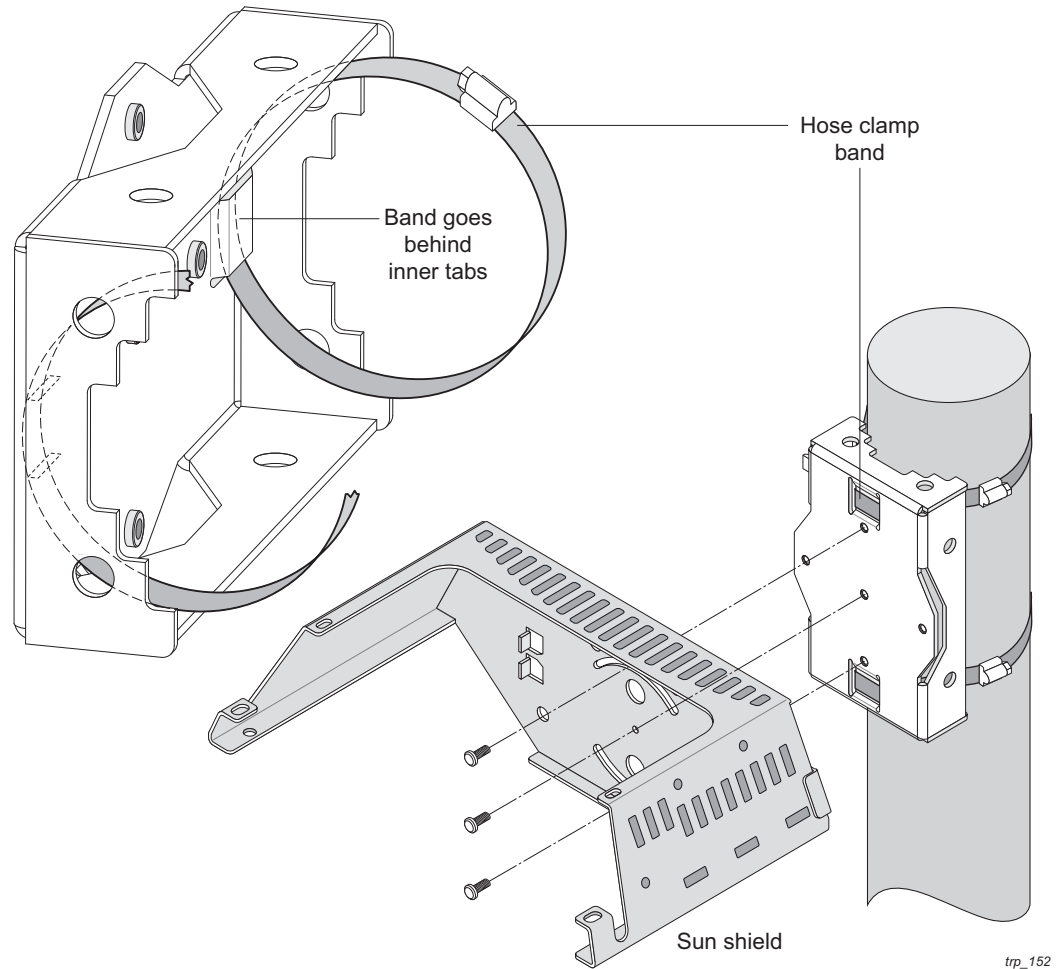
Pole, Tower, and Streetlight Mounting Instructions

This section explains how to mount the Tropos 5320 MetroMesh router on a pole, tower, or streetlight. It is best to mount the router to aluminum or galvanized steel structures. The mounting brackets are designed to pierce any oxidation layers that are on the outside of the pole, thereby assuring good quality connection to the grounded structure.

Due to potential antenna obstruction issues, the router is not designed to be directly mounted on a building wall. If it is necessary to mount the router on a wall, follow the instructions for mounting on a wooden pole ("Wood Pole Mounting" on page 13), and attempt to mount the router with maximum possible clearance around the antennas.

(i) **Note**
The Tropos 5320 MetroMesh router should always be mounted with the top of the router horizontal and level and with the antennas facing upward.

(i) **Note**
It is best to attach ground and data cables to the router before sliding the router into the mounted sun shield, as explained in this section. Before mounting the router, review the wiring instructions in "Grounding the Tropos 5320 Router" on page 21 and "Connecting a Data Port" on page 30 to determine the best strategy for the selected location.

(i) **Note**
Mounting to wood, concrete, or painted poles may require primary grounding for the unit. Check the national electrical codes in your area for specific rules.

Metal Pole Mounting

Figure 4 illustrates the proper method of mounting the Tropos 5320 MetroMesh router on an outdoor metal pole.

(i) **Note**
Antennas must be clear of obstruction.

Figure 4 Metal Pole Mounting

Pole bracket
(rotated)

Sun shield
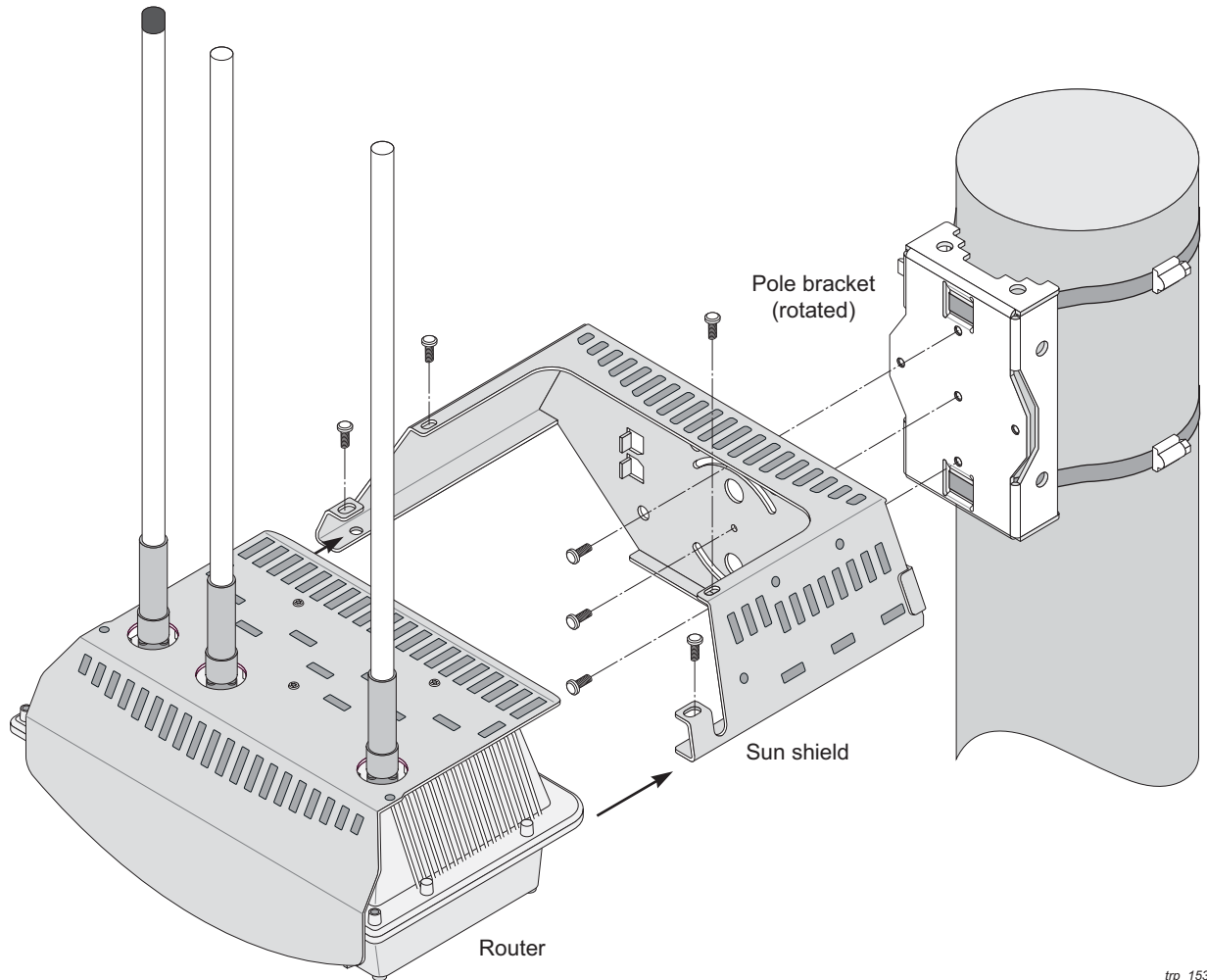
Router

trp_153

Mount the Tropos 5320 MetroMesh router on a metal pole

1. Select a mounting location. You can attach the router to any pipe or pole with diameter between 1 inch and 10 inches.

2. Slip the flat portion of the hose clamps under the inner tabs or slots of the pole bracket.

3. 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 to reach around the pole.

4. Attach the sun shield of the router to the pole bracket with three 5/16-inch machine screws. Insert one screw through the hole in the center back of the sun shield and the other two screws through the curved slot tracks. Figure 5 shows the proper screw locations on the back of the sun shield.

ⓘ **Note**
Use anti-seize lubricant, such as Loctite 37230, when screwing the router into the sun shield.

---

5. Level the sun shield by rotating the unit along the curved slot tracks. A built-in level is located on the left side of the shield. Tighten the screws.

6. Slide the router into place with the antennas on top and secure it at the end with four #10-32 hex head machine screws.

To continue installing the router, see "Connecting Cable Attached Antennas" on page 18.

Figure 5 Sun Shield Connections

Screws to attach 5210 cell to sun shield

Bubble level

Use machine screws to attach sun shield to pole bracket
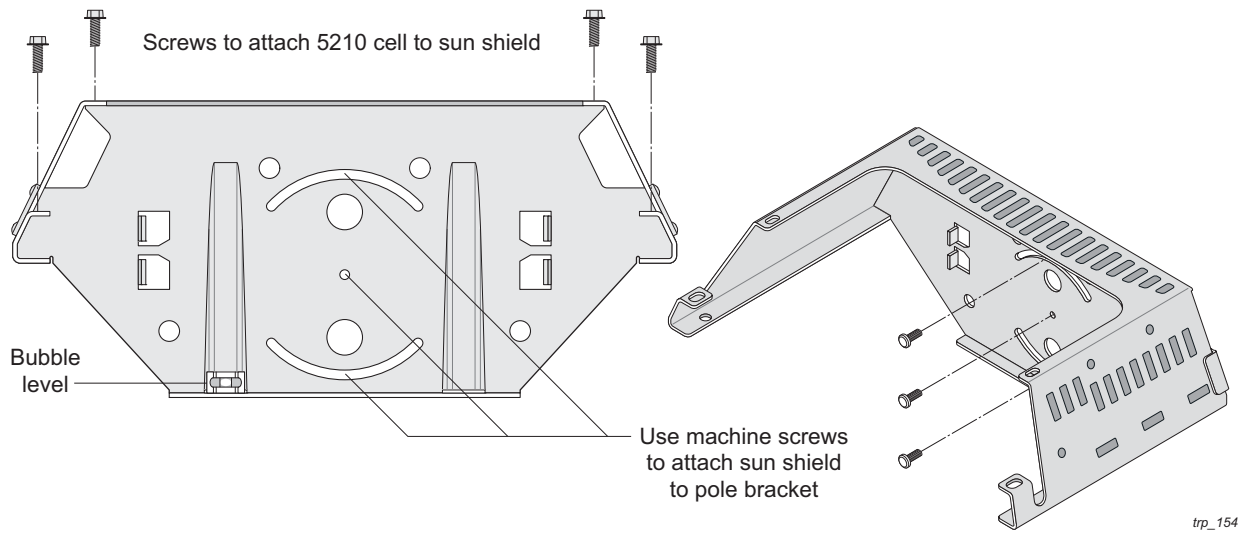
trp_154

Wood Pole Mounting

Figure 6 shows a typical installation with the Tropos 5320 MetroMesh router mounted on an outdoor wood pole.

(i) **Note**

Antennas must be clear of obstruction.

Figure 6 Wood Pole Mounting
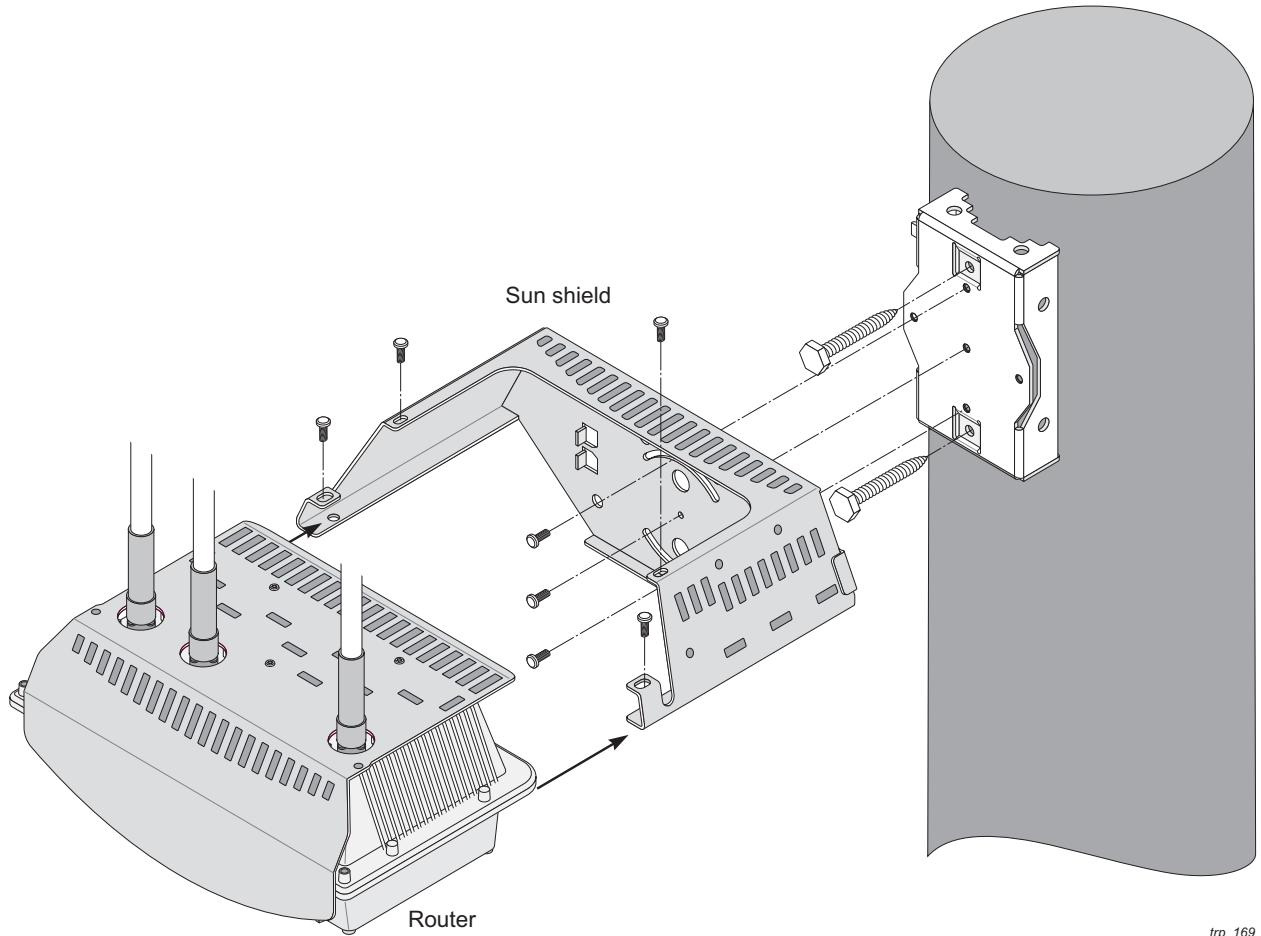
Mount the Tropos 5320 MetroMesh router on a wood pole

1. Select a mounting location. You can attach the router to any outdoor wood pole of diameter at least 1 inch.

2. Attach the sun shield of the router to the pole with two 1/4-inch bolts, making sure that the shield is level. Figure 5 on page 12 shows the proper bolt locations on the back of the sun shield. The bolts should be at least 3 1/2 inches in length.

3. Slide the router into place and secure it at the end with four #10-32 hex head machine screws.

To continue installing the router, see "Connecting Cable Attached Antennas" on page 18.

Wood Brace Mounting

You can mount the pole bracket directly on a wood brace without using pole hose clamps, as shown in Figure 7.

Figure 7 Wood Brace Mounting Option
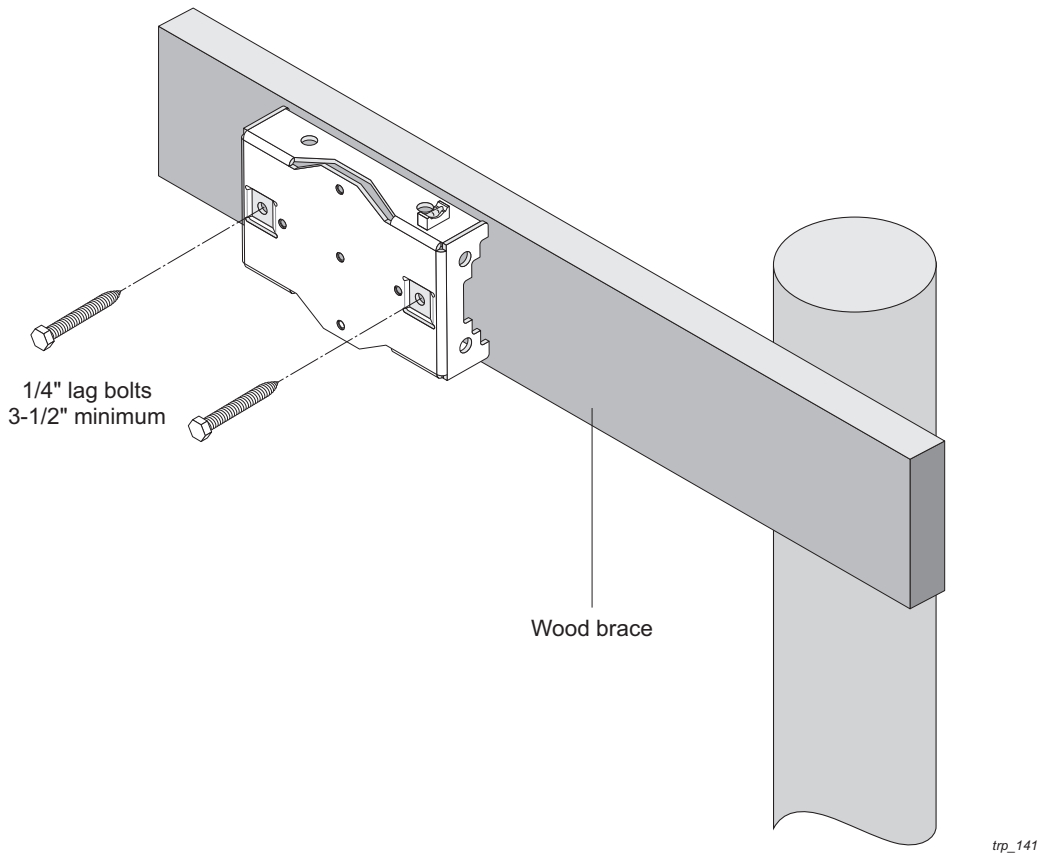
1/4" lag bolts
3-1/2" minimum

Wood brace

trp_141

Mount the Tropos 5320 MetroMesh router on a wood pole

1. Select a mounting location. You can attach the router to any wood brace.

2. Attach the pole bracket to the wood brace with two 1/4-inch lag bolts that are at least 3 1/2 inches in length, making sure that the wood brace is level.

3. Attach the sun shield of the router to the pole bracket with three 5/16-inch machine screws. Insert one screw through the hole in the center back of the sun shield and the other two screws through the curved slot tracks. Figure 5 on page 12 shows the proper screw locations on the back of the sun shield.

4. Level the sun shield by rotating the unit along the curved slot tracks. A built-in level is located on the left side of the shield. Tighten the screws.

5. Slide the router into place with the antennas on top and secure it at the end with four #10-32 hex head machine screws.

To continue installing the router, see "Connecting Cable Attached Antennas" on page 18.

Tower Mounting

You can mount the Tropos 5320 MetroMesh router to an outdoor tower.

> (i) **Note**
> At the antenna level, the Tropos 5320 MetroMesh router must be free from metal obstruction within a
> 4-foot radius (Figure 8).

Figure 8 Tower Mounting

4'

Channel stock

Brackets not included

trp_156

Mount the Tropos 5320 MetroMesh router on a tower

1. Remove the pole bracket from the sun shield.
2. Make a tower bracket by attaching the sun shield directly to any stainless steel or galvanized steel channel stock.
3. Attach the sun shield to the tower arm so that the top of the shield is horizontal and level.
4. Tighten the mounting bolts.
5. Slide the router into place and secure it at the end with four #10-32 hex head machine screws.

To continue installing the router, see "Connecting Cable Attached Antennas" on page 18.

Streetlight Mounting

You can mount the Tropos 5320 MetroMesh router on the horizontal or angled arm of a streetlight. Figure 9 shows a typical streetlight mounting installation.

Figure 9 Streetlight Mounting

Pole bracket

Sun shield
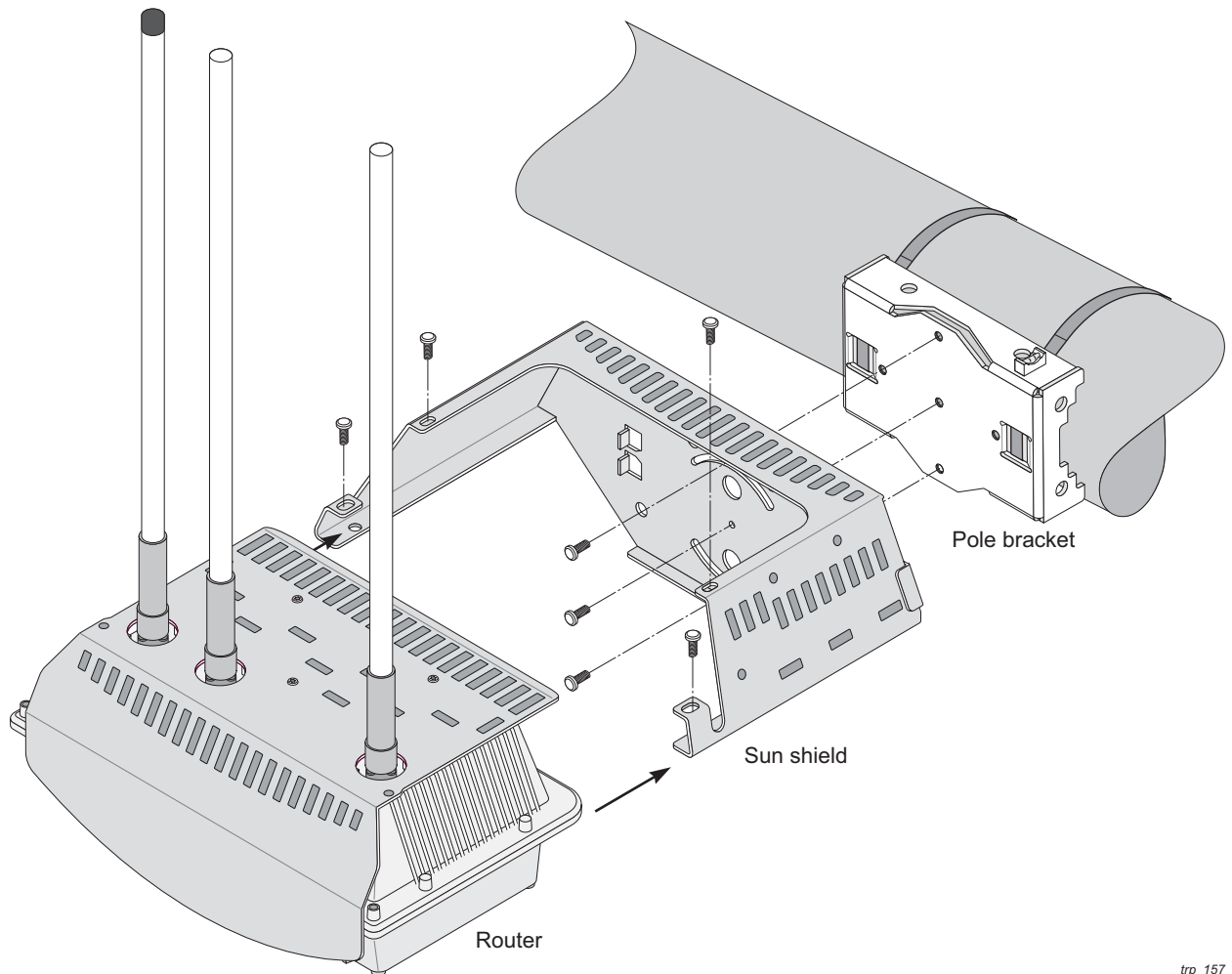
Router

trp_157

Mount the Tropos 5320 MetroMesh router on a streetlight

1. Select a mounting location. You can attach the router to any streetlight arm with diameter 1" to 10".

2. Slip the flat portion of the hose clamp under the inside lip of the pole bracket.

3. Use the hose clamps to attach the pole bracket to the streetlight. Depending upon the diameter of the pole, you may need to use 2 small clamps, 2 large clamps, or 2 pairs of large clamps joined together to reach around the pole.

4. Attach the sun shield of the router to the structure with three 5/16-inch machine screws. Insert one screw through the hole in the center back of the sun shield and the other two screws through the curved slot tracks.

5. To level the assembly, slide the router loosely into the sun shield, but do not secure it. Level the sun shield by rotating the unit along the curved slot tracks. A built-in level is located on the left side of the shield. Maintain the level orientation while you slide the router out of the sun shield. Tighten the sun shield screws.

6. Slide the router into place and secure it at the end with four #10-32 hex head machine screws.

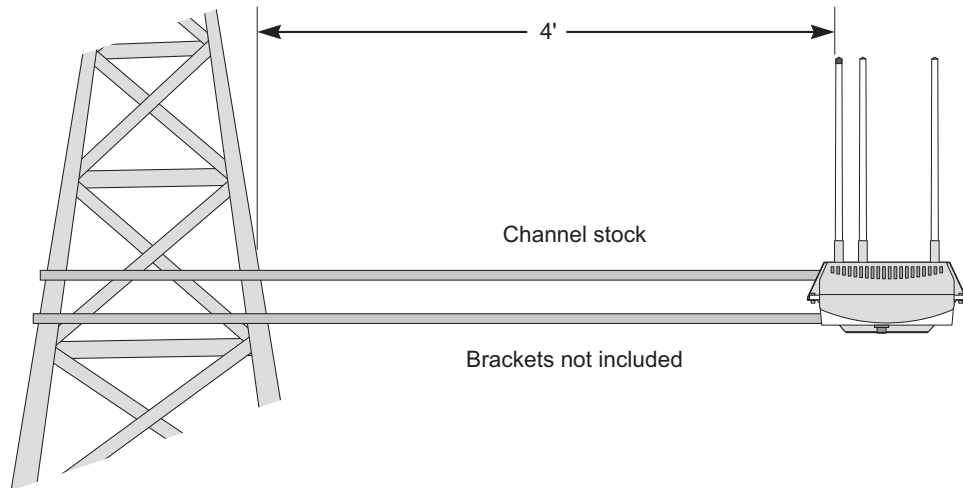To continue installing the router, see "Connecting Cable Attached Antennas" on page 18.

Connecting Cable Attached Antennas

This section applies to external antennas used with the Tropos 5320 router. You can mount the antenna on a structure and then use cables to attach it to the router. After mounting, secure the antennas with ThreadLocker Loctite 242 and waterproof them using self-fusing EPR tape. (See "Installation Accessories" on page 65 for the correct part number.) Figure 10 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).

Figure 10 Connecting External Antennas

Cables
from antennas
to unit

802.11a
antenna

802.11b/g Main
antenna

802.11b/g Aux
antenna

trp_158
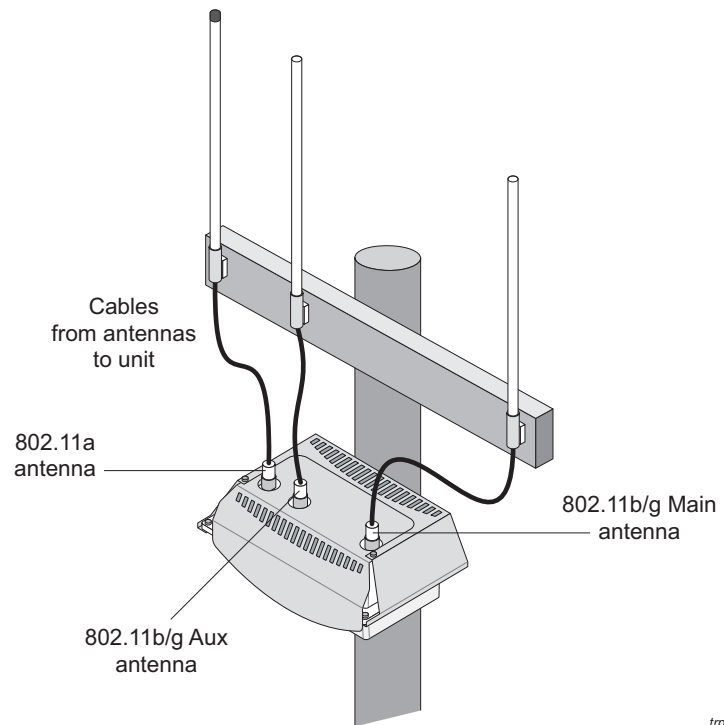
Connect antenna cables

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 5320 MetroMesh router and apply two drops of ThreadLocker Loctite 242 to the antenna connector thread (Figure 11).

4. Install the antenna cables. Be sure to provide a drip loop to divert water away from the connector.

(i) 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.

(i) Note
Antenna(s) must be installed by a trained professional. Operating the unit with non-qualified antennas is a violation of U.S. FCC Rules Part 15.203(c), Code of Federal Regulations, Title 47. See "Approved Antenna Configurations and Attenuation Settings" on page 48 for a listing of antenna options.

Waterproofing Antenna Connections

Figure 11 illustrates how to waterproof the antenna connections after they are installed. Make sure that you waterproof the connections at both ends (cable-to-antenna and cable-to-router).

Waterproof the antenna connections

1. Locate the self-fusing EPR waterproofing tape included in the antenna installation kit.

2. Separate the liner from the tape.

3. Pre-stretch the tape and wrap it tightly around the connector.

Figure 11 Waterproofing Antenna Connections

Apply 2 drops of Loctite to threads

Apply tape around RF cable joints

trp_159
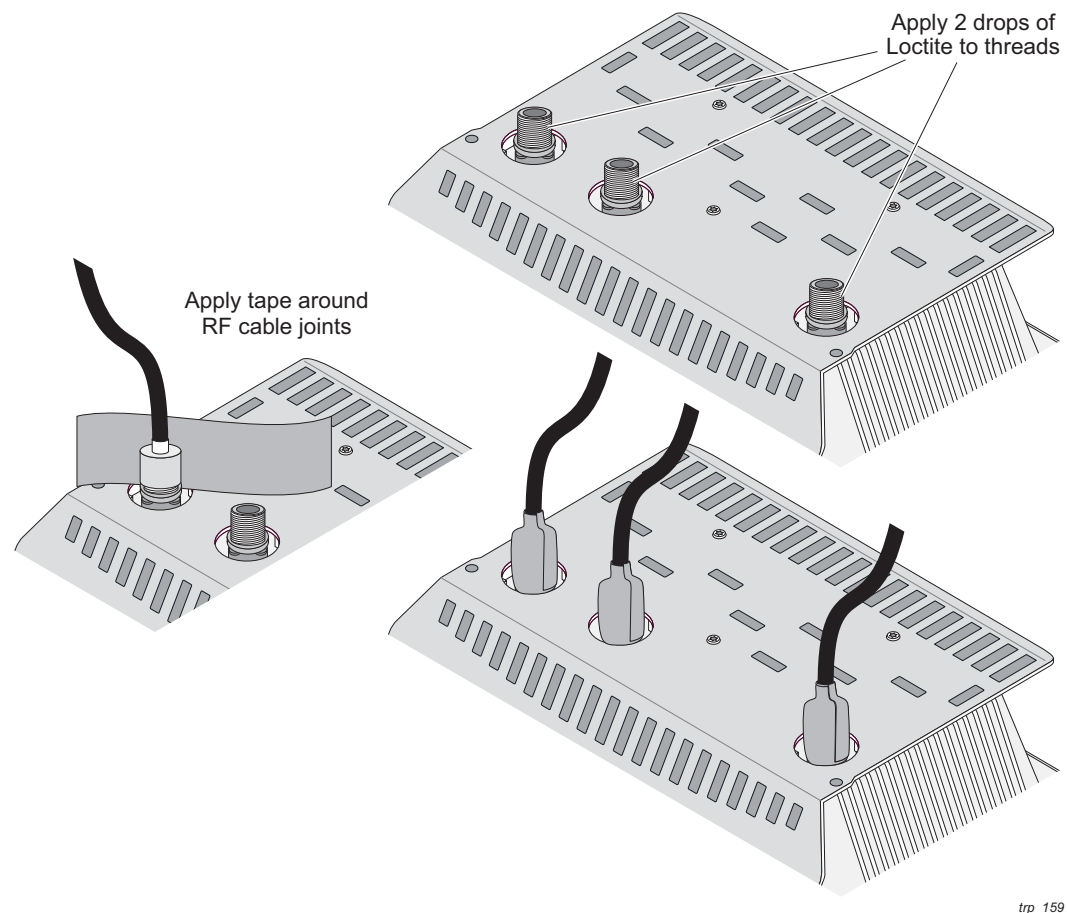
Installing Attached Antennas

The following steps explain how to install antennas that are attached directly to the Tropos 5320 MetroMesh router.

Replace the Tropos 5320 MetroMesh router antennas

1. Turn power off to the router.

2. Remove the screws that secure the router to the sun shield, and slide the router out from the sun shield.

3. Apply two drops of Loctite Threadlocker 242 to the antenna connector thread.

4. Screw the antennas onto the router, making the connection hand-tight.

5. Locate the self-fusing EPR waterproofing tape included in the antenna installation kit.

6. Separate the liner from the tape.

7. Pre-stretch the tape and wrap it tightly around the connector.

8. Slide the router back into the sun shield and secure it with screws.

Grounding the Tropos 5320 Router

⚠ **Caution**
You must install an external grounding wire if the Tropos 5320 MetroMesh router is installed on a non-metal pole or if the metal installation structure 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 to the router.

The grounding arrangement for the Tropos 5320 router is shown in Figure 12.

Figure 12 Grounding Arrangement

Grounding
screw

Grounding strap
on pipe or grounding rod

10 AWG wire
to ground

trp_104
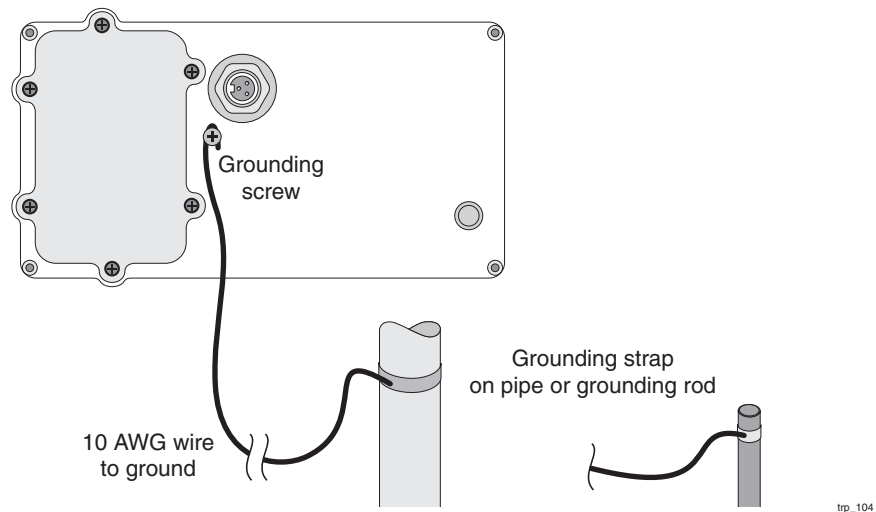
Ground the Tropos 5320 MetroMesh router

1. Insert the grounding screw into the grounding screw hole on the bottom of the router.

2. Connect a length of #10 AWG bare copper wire to the grounding screw and tighten.

3. Connect the other end of the grounding wire to a grounding strap that is attached to a grounded surface or other earth ground, such as a grounding rod.

Grounding the Data Protection Device

The grounding arrangement for an indoor data protection device is shown in Figure 13.

Ground an indoor data protection device

1. Place the protection device as close to the building entrance as possible.

2. Connect a length of #10 AWG bare copper wire to the ground post on the data protection device.

3. Connect the other end of the grounding wire to the ground connection of an electrical outlet or a grounded water pipe.

Figure 13 Grounding the Indoor Network Protection Unit
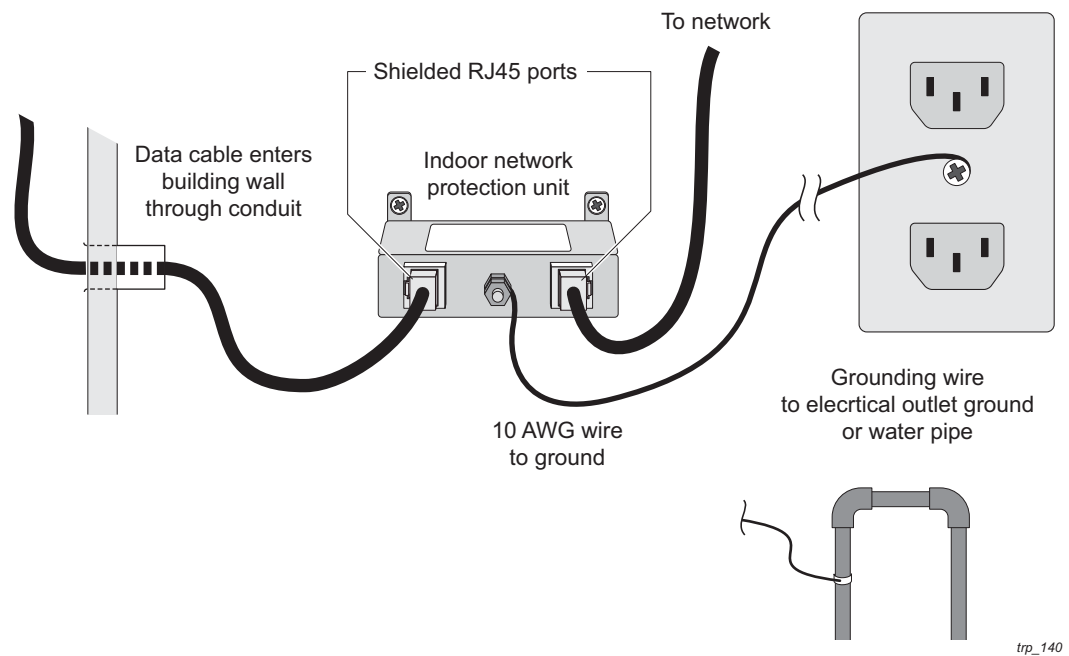
Connecting Power

This section explains the different categories of electrical power and provides procedures for connecting the outdoor system to power. There are two options for connecting the Tropos 5320 MetroMesh router to a power source:

- AC power source (3-wire service) — 3W(P+N+PE) or 3W(2P+PE); 100-480 VAC, 50/60 Hz
- NEMA plug, for streetlight photoelectric control power tap (2-wire service) —2W(2P) or 2W(P+N); 100-480 VAC 50/60 Hz

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.

Caution
You must install an external grounding wire if the Tropos 5320 MetroMesh router is installed on a non-metal pole or if the metal installation structure 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 to the router.

Note
Tropos power cords are intended for use only on Tropos routers.

Categories of Power

The IEEE/ANSI C62.41 standards (equivalent to the IEC Category IV 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 1 lists power types and Figure 14 shows hook-ups for the IEEE/ANSI C62.41 Power Categories power categories.

Table 1 IEEE/ANSI C62.41 Power Categories

Category	Summary	Examples
CAT C	Outside and service entrance	• 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	• 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	• 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

Figure 14 IEEE/ANSI C62.41 Power Categories

Outdoor units powered from distribution panel are in Overvoltage Installation Category B

Category C

Category A

Category B

Outdoor units powered from electrical meter are in Overvoltage Installation Category C

Category C

trp_164
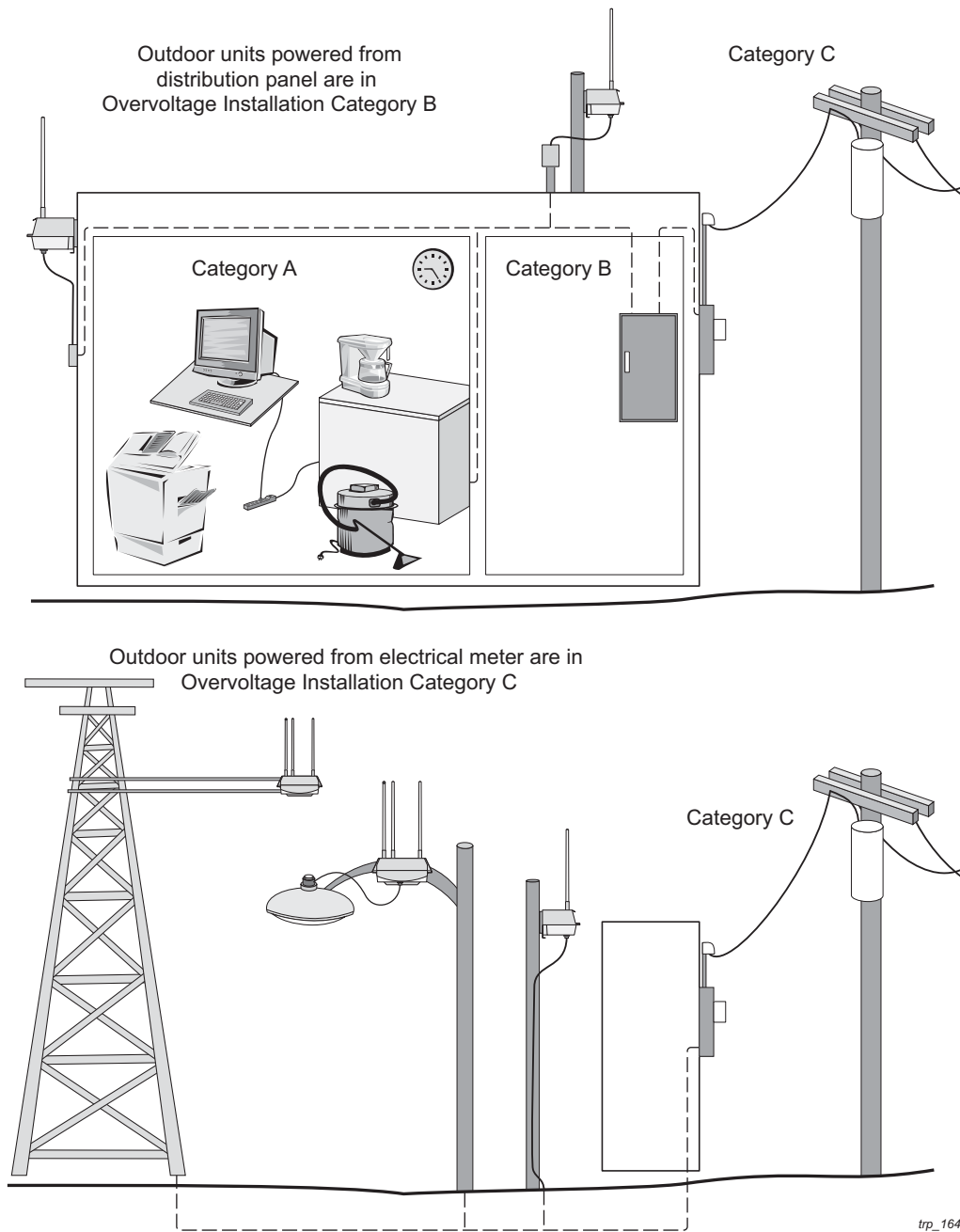
Connecting to AC Power (Category C)

The AC power connections for a Category C AC power source are shown in Figure 15.

Figure 15 Connecting Category C AC Power
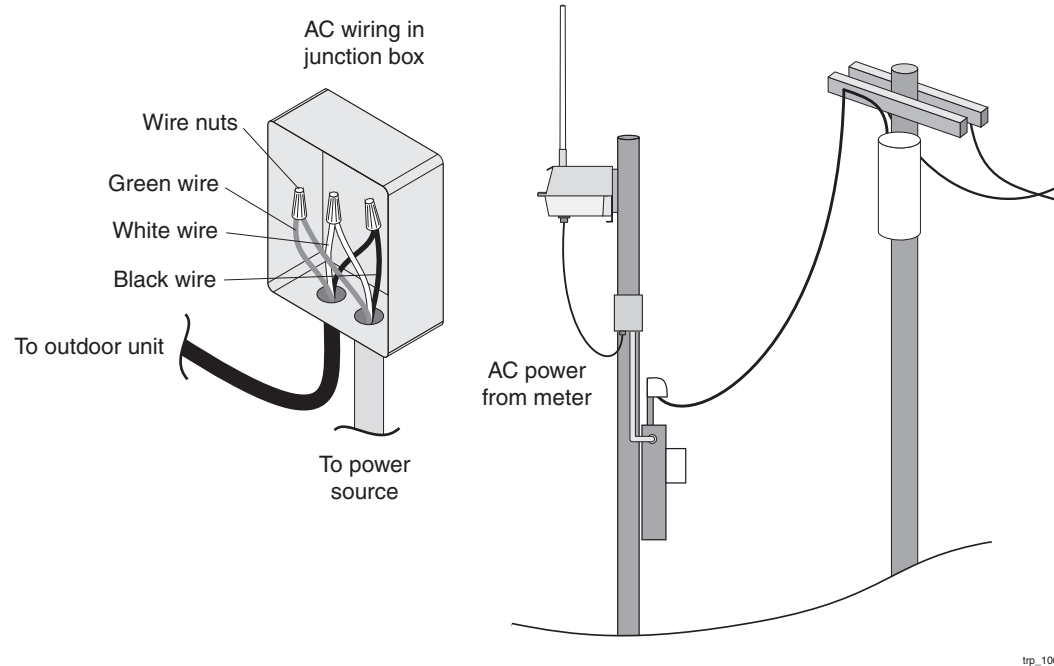
Connect an AC power source

1. Verify that the service voltage is 100-480 VAC 50/60 Hz.

2. Verify that power is turned off on the designated circuits.

3. Install 1/2-inch liquid-tight conduit from the building entrance point to within 3 feet of the outdoor system.

4. Run 3-wire AC service through the conduit.

5. Connect the conduit to a junction box. The conduit and junction box must be IEEE/ANSI compliant and suitable for outdoor use.

(i) **Note**

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

---

6. Connect the AC cable to the router and tighten the nut hand-tight. See Figure 16.

7. Connect the Tropos 5320 MetroMesh router to a 100-480 VAC 50/60 Hz CAT C power source.

8. Reenergize the circuit and confirm that power to the router comes on.

(i) **Note**

The Tropos 5320 MetroMesh router 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.

Figure 16 Connecting the AC Power Cable

Tighten nut to secure power connection

trp_107

Connecting to Streetlight Power (Category C)

The power connections for Category C streetlight power are shown in Figure 17. 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 100-480 VAC 50/60 Hz.

⚠ **Warning**

Be extremely careful when connecting to Category C streetlight power.

Figure 17 Connecting Streetlight Power

AC power from power adapter on photosensor

AC power from power adapter on photosensor
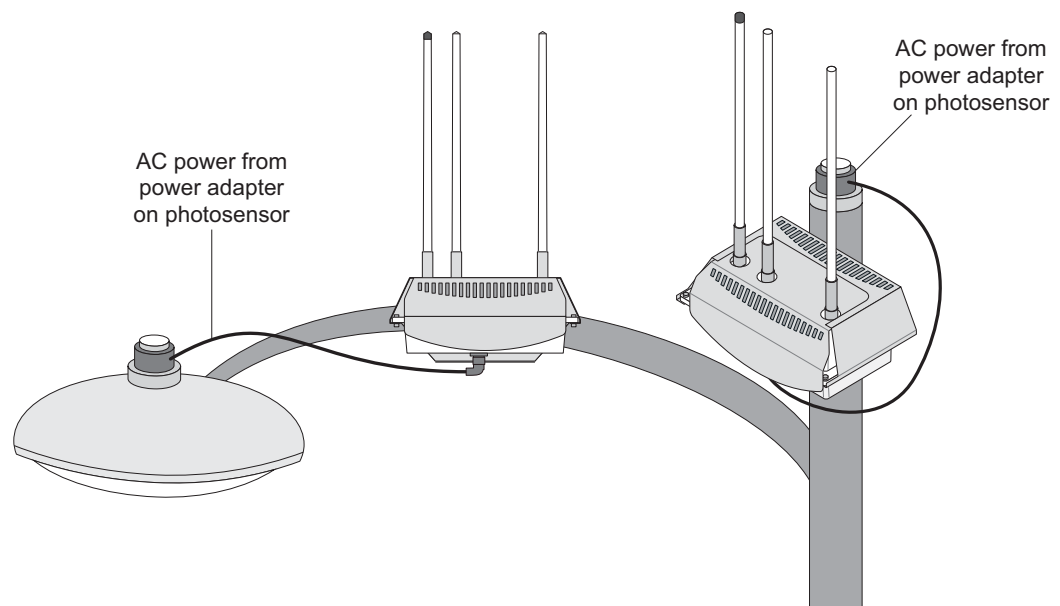
⚠ **Warning**

Connect the outdoor system only to a twist-lock style outdoor lighting control powered by 100-480 VAC 50/60 Hz. Do not connect it to twist-lock style outdoor lighting controls powered by higher voltage.
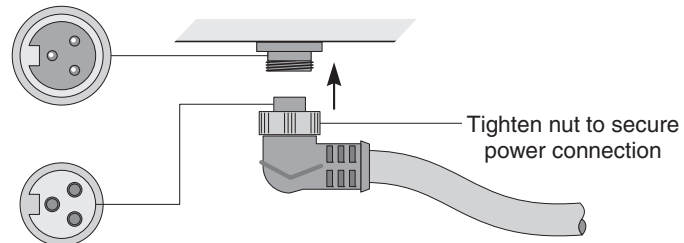
Connect a streetlight power source

1. Verify that the service voltage is 100-480 VAC 50/60 Hz.

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 5320 MetroMesh router to the photosensor connector on the street light.

ⓘ **Note**

Make sure that you include a service loop on both ends when installing the power cord. The service loop at the street light end should be long enough to allow full 360 degree rotation of the power adapter on the photosensor socket.

5. Connect the photosensor to the top of the NEMA 3 prong plug.

6. Connect the AC plug to the router and tighten hand-tight.

7. Reenergize the circuit and confirm that power to the router comes on.

ⓘ **Note**

The Tropos 5320 MetroMesh router 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 5320 MetroMesh router is equipped with two Ethernet ports that support RJ45 connectors.

> (i) **Note**
> The Tropos 5320 MetroMesh router is shipped pre-configured. For post-installation changes in configuration, you can communicate with the router by way of its wireless connection. For more information, see the *Tropos Networks Configuration Guide.*

> (i) **Note**
> Only use shielded 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.

> (i) **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.

> ⚠ **Warning**
> DC voltage may be present on RJ-45 pins 4,5 (+) and 7,8 (-)

> ⚠ **Attention**
> Une tension continue peut être présente sur les broches RJ-45 4, 5 (+) et 7, 8 (-).

> (i) **Note**
> This is not a mid-span powered device. Never attempt to daisy-chain Power Over Ethernet devices.

Figure 18 illustrates the method for routing cables to the Tropos 5320 MetroMesh router. Use the RJ45 jacks for port connection.

Figure 18 Options for Connecting a Data Port

Watertight access cover cable glands

Shield termination

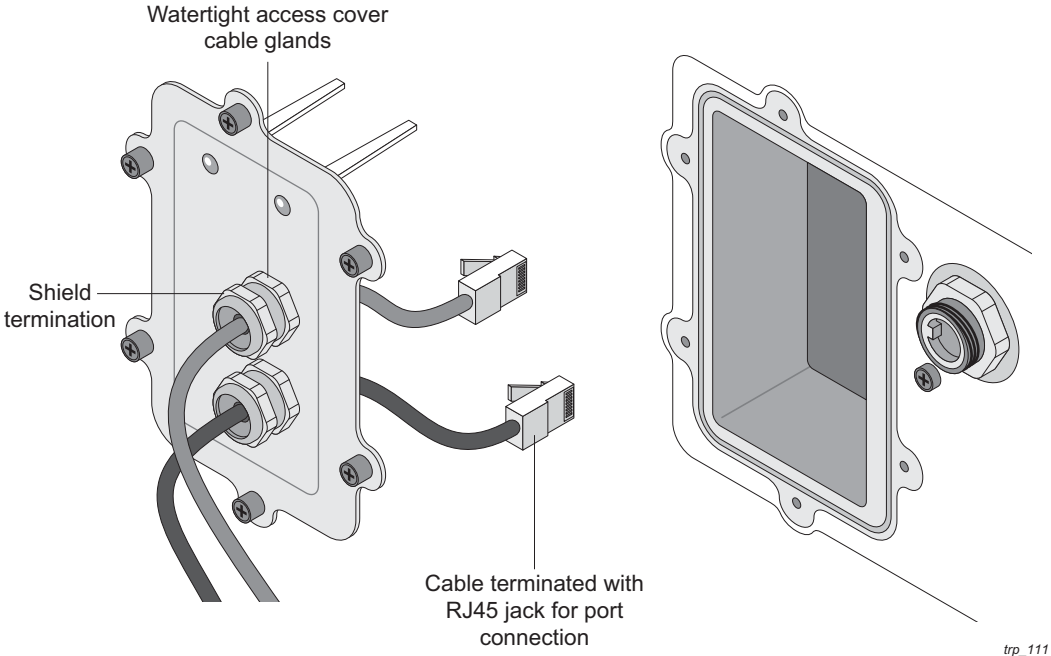Cable terminated with RJ45 jack for port connection

trp_111

Figure 19 shows the layered shield and jacket for the data cable, which must be removed to expose the inner cable and twisted pairs.

Figure 19 Data Cable Detail
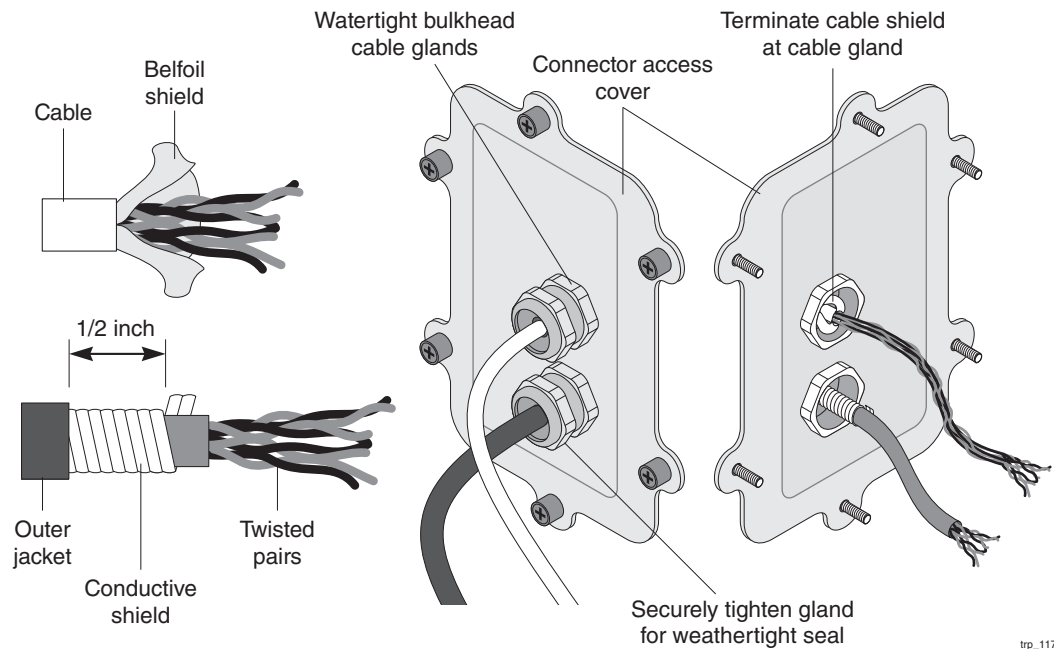
> **(i) Note**
> Attach ground and data cables to the router before sliding it into the sun shield.

Connect to the data port

1. Verify that power is turned off on the designated circuits.

2. Run shielded Category 5 Ethernet cable appropriate for outdoor use from a data protection unit to the Tropos 5320 MetroMesh router.

3. Connect one end of the Category 5 cable to the protection unit.

4. Remove the connector access cover on the bottom of the router.

5. Run raw cables for the Management or LAN port, or both, through the bulk head openings, allowing sufficient length to terminate the cables without causing crowding in the connection area. See Figure 20.

Figure 20 Data Port Connection

Connector access cover

AC power connector

Grounding bolt

Cable guides

O-ring

Tighten six screws to fasten access cover

trp_112
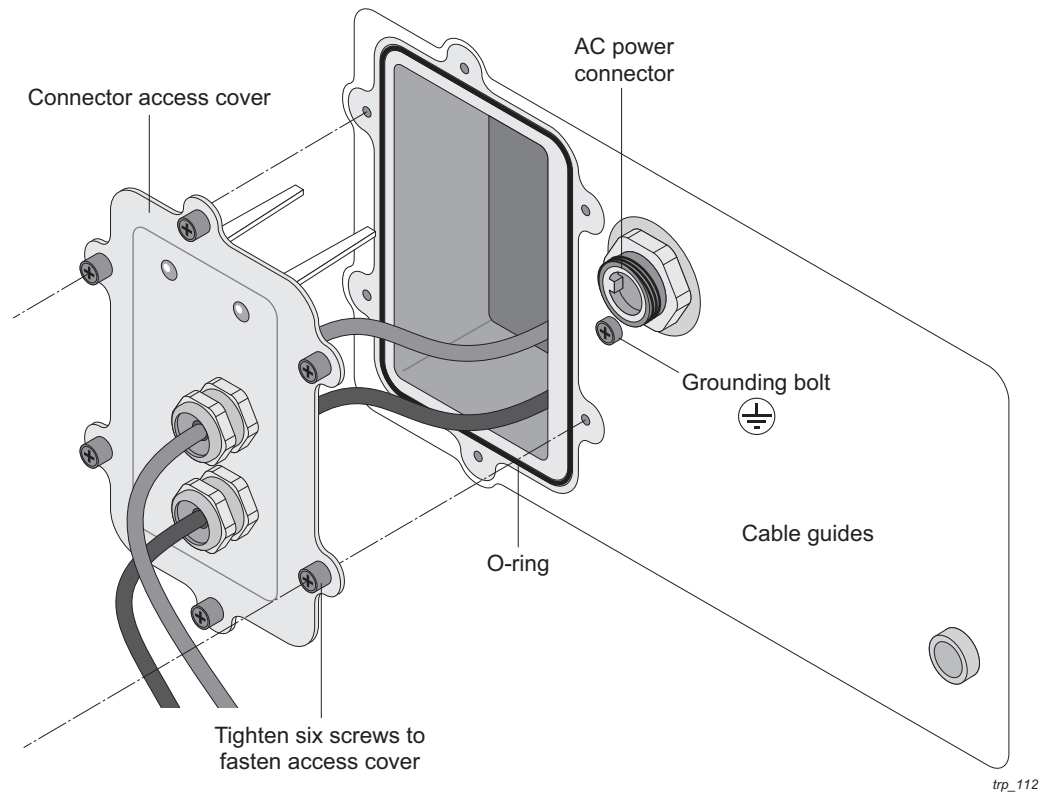
6. Connect the cable ends that were routed through the connector access cover to the LAN and Management ports on the router. Use an appropriate RJ45 8-pin modular plug to terminate the cables at the desired lengths. The outer jacket and conductive shield must be stripped to expose the twisted pairs for attachment, as shown in Figure 19. The proper location of the connections on the circuit board is shown in Figure 21.

7. Verify that the protection unit is properly grounded.

Figure 21 Circuit Board Connection Locations

O-ring gasket

Screw holes
for access cover

LED

Reset

Management
port

LAN
port

Threaded hole for
grounding bolt

AC power
connector
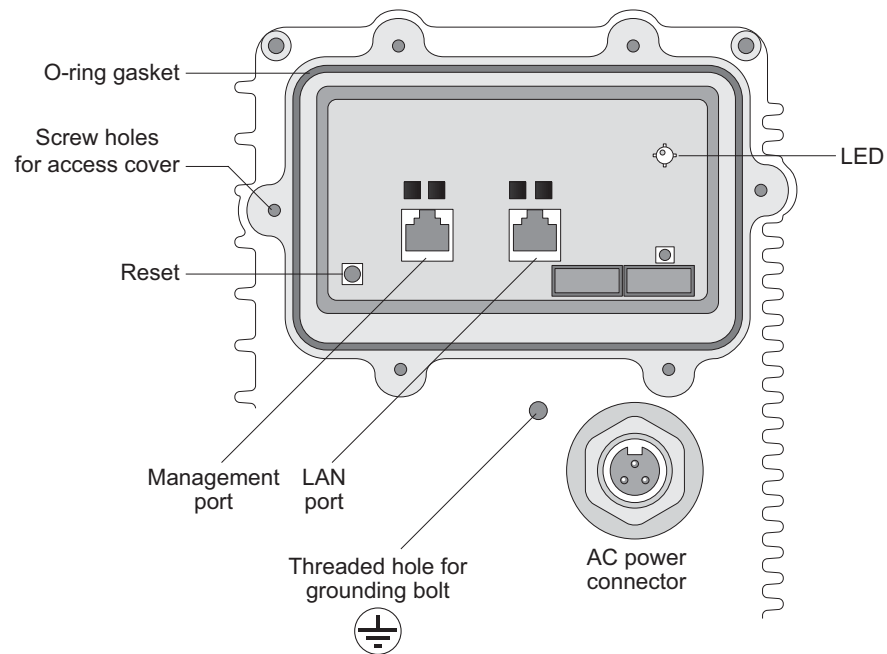
trp_110

Resetting the Router

You can use the Reset button on the circuit board to reset the hardware and software and to turn the router off if it is operating on battery power.

Perform a hardware reset

1. Remove the connector access cover on the bottom of the router.

2. Press the Reset button for one second.

Turn the battery-powered router off

Follow these steps if AC power is off and the router is running on battery power:

1. Remove the connector access cover on the bottom of the router.

2. Press and hold the Reset button for 3-5 seconds.

Connecting Peripherals

The Tropos 5320 MetroMesh router can be configured to source DC power on the Ethernet connector pins 4,5 and 7,8, This capability allows the router to power remote peripherals such as backhaul point-to-point radios, video cameras, or fiber optic transceivers. The Tropos Power over Ethernet (PoE) power sourcing capability is a fully isolated supply and can be used to power either positive or negative polarity peripherals.

The Tropos PoE power sourcing capability differs from the IEEE 802.3af standard in the following ways:

- Tropos PoE includes support for multiple voltages; the 802.3af standard supports only 48V operation.
- Tropos PoE does not include support for auto-discovery.

Many IEEE 802.3af-compliant power devices (PDs) will operate using the Tropos power sourcing equipment capabilities.

The Tropos 5320 MetroMesh router can supply up to a total of 30W of DC power distributed to the LAN port, Management port, or both. Each port must be configured for the same voltage. To configure the voltage, use the Tropos Configuration Utility (see the *Tropos Networks User Guide)* or an element management system such as Tropos Control (see the *Tropos Control EMS Installation and User Guide*). The DC output voltage can be configured to 12Vdc, 24Vdc, 48Vdc, or to the Off state (0Vdc). Table 2 lists the maximum power output as a function of voltage.

Table 2 PoE Power Sourcing Power Output

Voltage	Max PoE Power Output
12Vdc	30W
24Vdc	30W
48Vdc	30W

In the event of an over-current or short-circuit fault event, the Tropos 5320 MetroMesh router will remove PoE output for three to five seconds before attempting to resume sourcing power to the peripheral device.
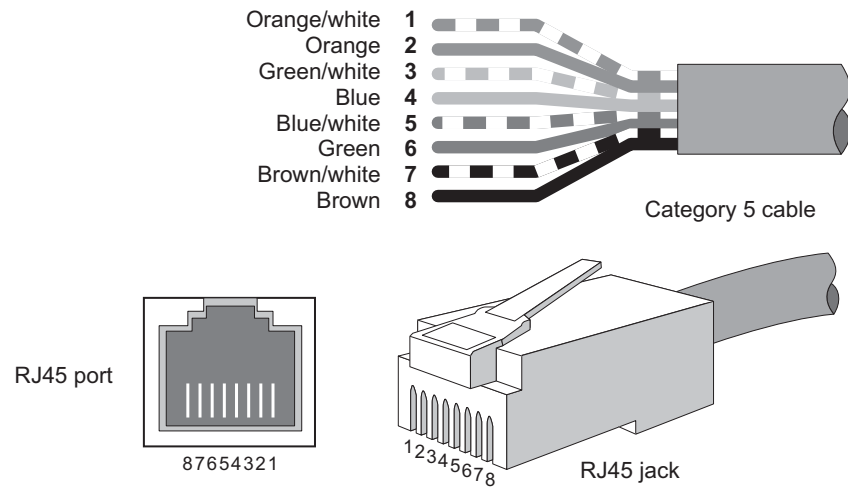
(i) **Note**
When the software restarts following a software upgrade, the PoE output will experience a disruption for the period of the restart.

If the battery backup capability is installed, PoE output power is unaffected by the temporary loss of AC power. The power sourcing feature continues to function during battery backup operation (see "Battery Backup Operation" on page 37).

Figure 22 shows the pin locations for the RJ45 connector, and Table 3 shows the associated pin descriptions.

Figure 22 RJ45 Pin Locations

Orange/white	**1**
Orange	**2**
Green/white	**3**
Blue	**4**
Blue/white	**5**
Green	**6**
Brown/white	**7**
Brown	**8**

Category 5 cable

RJ45 port

87654321

12345678

RJ45 jack

trp_109

Table 3 RJ45 Pin Descriptions for Data Connection

Pin	T/R	Signal	Color	Description
1	T	TXD+	Orange-White	TX Data 10/100BaseT
2	R	TXD-	Orange	TX Data 10/100BaseT
3	T	RXD+	Green-White	RX Data 10/100BaseT
4	R	PoE+	Blue	Power output, 0, 12, 24, 48 Vdc (+)
5	T	PoE+	Blue-White	Power output, 0, 12, 24, 48 Vdc (+)
6	R	RXD-	Green	RX Data 10/100BaseT
7	T	PoE-	Brown-White	Power output, 0, 12, 24, 48 Vdc (-)
8	R	PoE-	Brown	Power output, 0, 12, 24, 48 Vdc (-)

(i) **Note**
Only use shielded 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.

Battery Backup Operation

The Tropos 5320 MetroMesh router may contain an automatically recharging battery, which provides an integrated uninterruptible power supply (UPS). The available backup time depends upon the level of network traffic serviced by the router and the ambient temperature. Figure 23 shows the relationship between average throughput and battery uptime. The Tropos 5320 router will typically recharge the UPS in approximately 10 hours.

(i) **Note**

The internal battery is not field replaceable.

Figure 23 Average Battery Backup Time
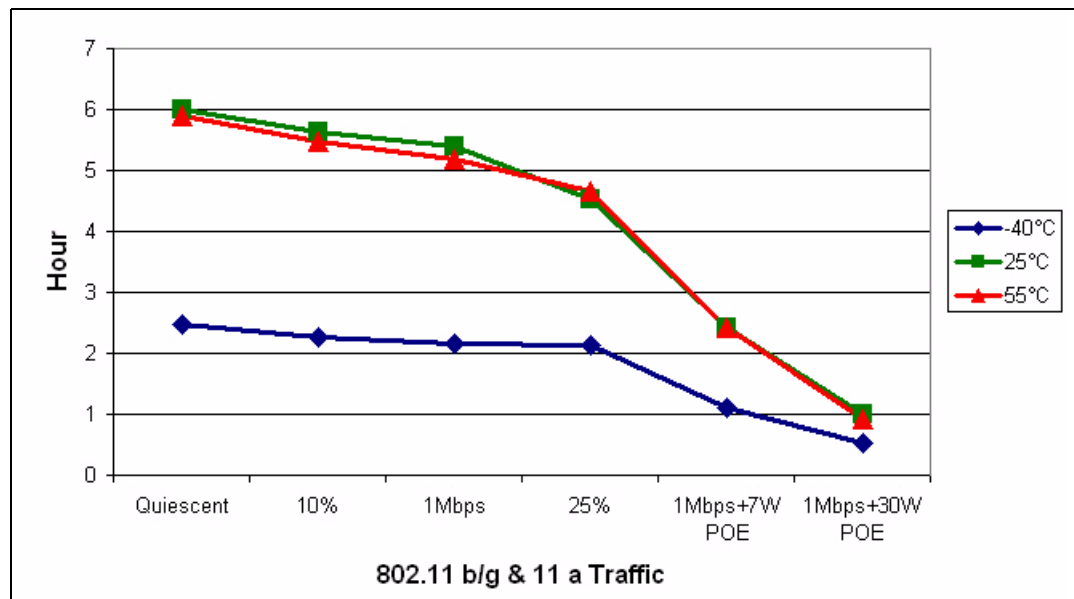
The battery is equipped with a small internal heater that enhances battery life in very cold operating conditions. When the ambient temperature of the unit approaches -12 degrees C, the internal heater is activated. An active internal battery heater consumes power; therefore, the average power consumption of the Tropos 5320 MetroMesh router increases slightly in extremely cold weather conditions.

Safety Information for the Tropos MetroMesh Router

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 5320 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 5320 MetroMesh routers result in user exposure that is substantially below the FCC recommended limits.

Follow these guidelines to ensure safe operation of the Tropos 5320 MetroMesh routers:

- 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 5320 MetroMesh routers must be used only with Tropos-approved components and antennas. See "Approved Antenna Configurations and Attenuation Settings" on page 48 for details.
  - In order to comply with FCC RF exposure limits, dipole antennas should be located at a minimum distance of 21.77 inches (55.3cm) 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.
- Battery backup:
  - The Tropos 5320 MetroMesh router may contain a lithium-ion battery. To avoid the possibility of an explosion, the Tropos 5320 MetroMesh router should **not** be exposed to any temperatures higher than 85 degrees C.

2 Power Consumption

Several factors influence the power consumption at any given time, including the level of network traffic and whether a powered peripheral device is connected to the LAN or Management port of the Tropos 5320 MetroMesh router. Temperature may also influence the power consumption for units configured with battery backup, due to the internal freeze protection capability associated with the internal battery module. Figure 24 shows the basic relationship between throughput and AC power consumption at normal temperatures.

Figure 24 5320 AC Power Consumption at 25°C (No POE, No Battery Backup)
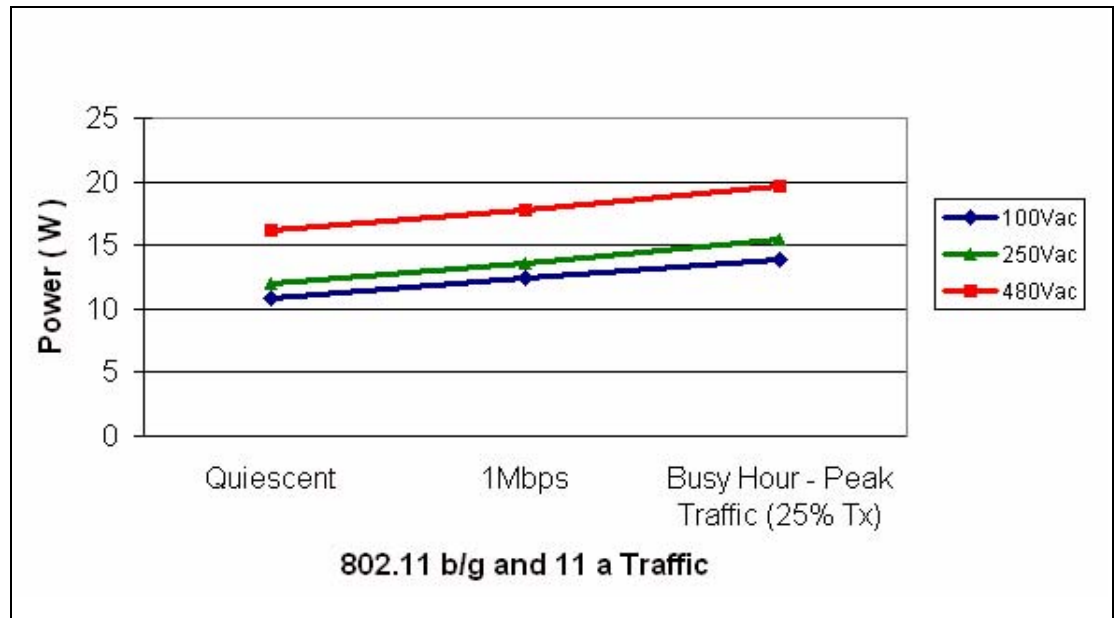
When a Tropos 5320 MetroMesh Router is equipped with a battery and the router is exposed to cold temperatures (below -12 degrees C), the internal heater associated with the battery is activated. This causes the router to draw additional AC power, as shown in Figure 25.

Figure 25 5320 AC Power Consumption at -40°C with Battery Backup (No POE)

3 Product Specifications

The tables in this chapter contain specifications for the Tropos 5320 MetroMesh routers:

- **"Physical Specifications - Tropos 5210 Series Routers"** on page 41
- **"Interfaces"** on page 43
- **"Power Options / Consumption"** on page 46
- **"Power Over Ethernet - Power Sourcing"** on page 46
- **"Certifications, Other"** on page 47

Table 4 Physical Specifications - Tropos 5210 Series Routers

Specification	Value
Physical Dimensions	
Inches	Height: 5.3 Width: 13.2 Depth: 7.9
Centimeters	Height: 13.5 Width: 33.5 Depth: 20.1
Weight	
lbs - maximum Kg - maximum	16 7.2 Includes all brackets and sun shields
Mounting	
Mounting Pole Diameter	1" to 10"
Temperature	
Operating Range	Min: -40° C Max: 55° C
Storage Range	Min: -45° C Max: 85° C

Table 4 Physical Specifications - Tropos 5210 Series Routers (*continued*)

Specification	Value
Weather	
Weather Rating	UL579/IEC 60529 IP67
Wind Survivability	> 165 mph
Wind Loading (165 mph)	< 300 newtons
Projected Area	0.8 sq. ft. (115 sq. in.)
Corrosion Resistance	ASTM B117 Salt Fog
Color	
Color	Gloss white
Shock and Vibration	
Operational:	ETSI 300-19-2-4 Specification T41.E, class 4M3
Transportation:	ISTA 2A Random Bounce Random Vibration 6 Corner Drop Test
Reliability	
Reliability (MTBF)	505,787 hours demonstrated Field failure rate 1.73%

Table 5 Interfaces

Specification	Value
Data Interface	

IEEE 802.3 10/100BaseT	• Maximum Distance (ft):
	  600 (10BaseT Duplex Setting)
	  300 (100BaseT Duplex Setting)
	• RJ45 connector

Management Interface	

IEEE 802.3 10/100Base T	• Maximum Distance (ft):
	  600 (10BaseT Duplex Setting)
	  300 (100BaseT Duplex Setting)
	• RJ45 connector

802.11b/g Wireless Interface	
Standard	IEEE 802.11b/g Wi-Fi
Frequency Range	2400 to 2485 MHz ISM Band
Modulation	DSSS; DBPSK @ 1 Mbps, DQPSK @ 2 Mbps, CCK @ 5.5 and 11 Mbps OFDM @ 54, 48, 36, 24, 18, 12, 6
Rx Sensitivity	-100dBm (1 Mbps) -95dBm (2 Mbps) -93dBm (5.5 Mbps) -91dBm (11 Mbps) -94dBm (6 Mbps) -93dBm (9 Mbps) -92dBm (12 Mbps) -89dBm (18 Mbps) -86dBm (24 Mbps) -83dBm (36 Mbps) -78dBm (48 Mbps) -76dBm (54 Mbps)

Table 5 Interfaces (*continued*)

Specification	Value
Rx Saturation Maximum Power at Antenna Port	-5dBm (1 Mbps) -5dBm (2 Mbps) -5dBm (5.5 Mbps) -5dBm (11 Mbps) -5dBm (6 Mbps) -5dBm (9 Mbps) -5dBm (12 Mbps) -10dBm (18 Mbps) -30dBm (24 Mbps) -35dBm (36 Mbps) -35dBm (48 Mbps) -35dBm (54 Mbps)
802.11a Wireless Interface	
Standard	IEEE 802.11a Wi-Fi
Frequency Range	Model 5320-0000: 5470 - 5725 MHz ISM band (EU) Model 5320-1000: 5725 - 5850 MHz ISM band (FCC)
Modulation	OFDM @ 54, 48, 36, 24, 18, 12, 6
Rx Sensitivity	-94dBm (6 Mbps) -93dBm (9 Mbps) -92dBm (12 Mbps) -89dBm (18 Mbps) -86dBm (24 Mbps) -83dBm (36 Mbps) -78dBm (48 Mbps) -76dBm (54 Mbps)
Rx Saturation Maximum Power at Antenna Port	-30dBm (6 Mbps) -30dBm (9 Mbps) -30dBm (12 Mbps) -30dBm (18 Mbps) -30dBm (24 Mbps) -35dBm (36 Mbps) -35dBm (48 Mbps) -35dBm (54 Mbps)

Table 5 Interfaces (*continued*)

Specification	Value
Antennas	
Antennas	External
Antenna Diversity	802.11b/g: Transmit/Receive 802.11a: No diversity
Impedance	50 ohms
VSWR	1.5 : 1
Connectors (two)	N (female)
Indicator - Status Lamp	Red/Green

Table 6 Power Options / Consumption

Specification	Value
Antenna protection	<= 0.5μJ for 3kA @ 8/20μS Waveform EN61000-4-2 Level 4 ESD Immunity EN61000-4-5 Level 4 Surge Immunity
Data Port Protection	EN61000-4-2 Level 4 ESD Immunity EN61000-4-5 Level 4 Surge Immunity
AC Power	
Single Phase VAC	100-480 VAC 50/60 Hz; 23W/60W IEEE/ANSI C62.41 CAT C Power Source IEC Category IV Power Source
AC Input Protection	EEE/ANSI C62.41 Category C 10kA @8/20uS Waveform; 36kA per phase L-L, L-N, L-PE EN61000-4-2 Level 4 ESD Immunity EN61000-4-5 Level 4 Surge Immunity EN61000-4-4 Level 4 EFT Immunity Integrated Branch Circuit Protection Class CC-Fuse: Littlefuse KLDR Time- Delay 20A
Integrated Branch Circuit Protection	Class CC-Fuse: Littlefuse KLDR Time-Delay 20A

Table 7 Power Over Ethernet - Power Sourcing

Specification	Value
LAN and/or Management Port	+ on pins 4,5; - on pins 7,8
DC Output Voltages	0 (Off), 12, 24, 48 Vdc
Output Power	Total power on LAN and/or Management ports: **Voltage** **Maximum Power Output** 12Vdc 30W 24Vdc 30W 48Vdc 30W
Over-Current Protection	Hi Cup mode
Over-Voltage Protection	90Vdc surge
Output Isolation	1500Vdc

Table 8 Certifications, Other

Regulatory Domain	Specification
U.S.	CFR 47 FCC Part 15.C; Class B UL579/IEC 60529 IP67 Rated for Outdoor Use ISTA 2A
Europe	EN60950 cTUVus Listed I.T.E. IEEE/ANSI C62.41 Category C AC Surge Immunity 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 ETSI EN 301 489-17 ETSI EN 300 328 EN 60950-1, IEC 60950-1 CISPR 22 Class B CE ①
Canada	Industry Canada RSS210

4 Approved Antenna Configurations and Attenuation Settings

This chapter lists approved antenna configurations and ordering information and attenuation settings:

- *"High Power Product Antennas"* on page 49
- *"Standard Power Product Antennas"* on page 51
- *"Public Safety Product Antennas"* on page 53

High Power Product Antennas

U.S. and Canada

The information in this section applies to the following Tropos router models:

- 53201000—Dual mode outdoor Tropos router for FCC markets (802.11b/g and 802.11a, 5.8 GHz)
- 53201100—Dual mode outdoor Tropos router for FCC markets (802.11b/g and 802.11a, 5.8 GHz), with battery backup

Table 9 lists antenna configurations for the 802.11b/g antennas, and Table 10 lists antenna configurations for the 802.11a antennas.

(i) **Note**

CANADA ONLY: This device has been designed to operate with the antennas listed in Table 9, and having a maximum gain of 12dBi. Antennas not included in this list or having a gain greater than 12dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the Effective Isotropic Radiated Power (EIRP) is not more than that permitted for successful communication.

Table 9 802.11b/g Antenna Configurations

Antenna	Ordering Number	Mode (b or g)	Measured Cond. Avg. Power (dBm)	Tx Attenuation Software Setting (dB)	Approximate EIRP (dBm)
7.4dBi omni, unit mounted	AN074077	b	28.6	0	36.0
7.4dBi omni, unit mounted	AN074077	g	28.6	0	36.0
10.0dBi omni, unit mounted	AN100022	b	26.0	3	36.0
10.0dBi omni, external bracket mounted[a]	AN100022	g	26.0	3	36.0
12.0dBi sector, external bracket mounted	AN120044	b	24.0	5	36.0
12.0dBi sector, external bracket mounted	AN120044	g	24.0	5	36.0

a. All external antennas include pole mounting bracketry and sealing materials. RF cables are not included.

Table 10 802.11a Radio (5.725-5.850 GHz) - Antenna Configurations

Description	Part Number	Measured Cond. Avg. Power (dBm)	Tx Attenuation Software Setting (dB)	Approximate EIRP (dBm)
9.1dBi omni, unit mounted, point-to-multipoint operation	AN091058	24	0	33
17dBi 90° sector, external bracket mounted, point-to-point operation[a]	AN170058	24	0	41
17dBi 90° sector, external bracket mounted, point-to-multipoint operation[a]	AN170058	19	5	36
19dBi patch antenna, external bracket mounted, point-to-point operation[a]	AN190058	24	0	43

a. All external antennas include pole mounting bracketry and sealing materials. RF cables are not included.

Attenuation with Antennas

If external antennas are used, it is necessary to adjust the transmit power attenuation to provide the correct power level for the router. Use the following formulas to compute the required attenuation levels:

802.11b/g:

```
Attenuation setting = Antenna gain (dBi) - 7.4 dBi - Cable loss
```

802.11a:

```
Attenuation setting point-to-multipoint links = Antenna gain (dBi)
- 9.1 dBi - Cable loss
```

The attenuation setting cannot be negative; therefore, a positive attenuation setting is only required if the antenna gain is greater than 7.4dBi. Table 9 and Table 10 show the proper attenuation settings, assuming that low-loss cable is used (1dB). The attenuation should be rounded to the nearest half-integer value.

When using a directional antenna in a point-to-multipoint application, the maximum allowed EIRP is 36.0dBm. The conducted power should be reduced accordingly.

Standard Power Product Antennas

Europe

The approved European countries are Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

The information in this section applies to the following Tropos router models:

- 53200000—Dual mode outdoor Tropos router for ETSI markets (802.11b/g and 802.11a, 5.4 GHz)
- 53200100—Dual mode outdoor Tropos router for ETSI markets (802.11b/g and 802.11a, 5.4 GHz), with battery backup

Table 11 lists antenna configurations for the 802.11b/g antennas, and Table 12 lists antenna configurations for the 802.11a antennas.

Table 11 802.11b/g Antenna Configurations

Antenna	Ordering Number	Mode (b or g)	Measured Cond. Avg. Power (dBm)	Tx Attenuation Software Setting (dB)	Approximate EIRP
6.0dBi omni, unit mounted	AN060077	b	13.6	4	19.6
6.0dBi omni, unit mounted	AN060077	g	13.0	4	19.0
7.4dBi omni, unit mounted	AN074077	b	11.4	6	18.8
7.4dBi omni, unit mounted	AN074077	g	11.6	5	19.0
10.0dBi omni, unit mounted	AN100022	b	9.2	8	19.2
10.0dBi omni, external bracket mounted[a]	AN100022	g	9.1	8	19.1
12.0dBi sector, external bracket mounted	AN120044	b	7.3	10	19.3
12.0dBi sector, external bracket mounted	AN120044	g	7.2	9	19.2

a. All external antennas include pole mounting bracketry and sealing materials. RF cables are not included.

Table 12 802.11a Radio (5.470-5.725 GHz) - Antenna Configurations

Description	Part Number	Measured Cond. Avg. Power (dBm)	Tx Attenuation Software Setting (dB)	Approximate EIRP
9dBi omni, unit mounted	AN091058	19.3	2	28.4
17dBi 90° sector, external bracket mounted[a]	AN170054	12.0	10	29.0
19dBi patch antenna, external bracket mounted	AN190054	9.8	12	28.8

a. All external antennas include pole mounting bracketry and sealing materials. RF cables are not included.

> **ⓘ Note**
> Luxembourg does not permit point-to-point installations in the 802.11a band (5.470-5.725 GHz).

Public Safety Product Antennas

U.S. and Canada

The information in this section applies to the following Tropos router models:

- 95321000-Dual mode outdoor Tropos router for FCC public safety markets (802.11b/g and 802.11a, 4.9 GHz)
- 95321100-Dual mode outdoor Tropos router for FCC public safety markets (802.11b/g and 802.11a, 4.9 GHz), with battery backup

Certifications:

- USA: PJ9-BF4P9
- Canada: 4751A-BF4P9

(i) **Note**

Operation in the 4.9 GHz band requires an FCC license. The following eligibility rules are specified in Part 90.1203 of the FCC rules:

- Entities providing public safety services as defined under section 90.523 are eligible to hold an FCC license for systems operating in the 4940-4990 MHz band. All of the requirements and conditions set forth in that section also govern authorizations in the 4940-4990 MHz band.
- 4.9 GHz band licensees may enter into sharing agreements or other arrangements for use of the spectrum with entities that do not meet these eligibility requirements. However, all applications in the band are limited to operations in support of public safety

---

Table 13 lists antenna configurations for the 802.11b/g antennas, and Table 14 lists antenna configurations for the 802.11a antennas.

(i) **Note**

CANADA ONLY: This device has been designed to operate with the antennas listed in Table 13, and having a maximum gain of 12dBi. Antennas not included in this list or having a gain greater than 12dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the Effective Isotropic Radiated Power (EIRP) is not more than that permitted for successful communication.

Table 13 802.11b/g Antenna Configurations for Public Safety Applications

Antenna	Ordering Number	Mode (b or g)	Measured Conducted. Power (dBm)	Tx Attenuation Software Setting (dB)	Approximate EIRP (dBm)
7.4dBi omni, unit mounted	AN074077	b	28.6	0	36.0
7.4dBi omni, unit mounted	AN074077	g	28.6	0	36.0
10.0dBi omni, unit mounted	AN100022	b	26.0	3	36.0
10.0dBi omni, external bracket mounted[a]	AN100022	g	26.0	3	36.0
12.0dBi sector, external bracket mounted	AN120044	b	24.0	5	36.0
12.0dBi sector, external bracket mounted	AN120044	g	24.0	5	36.0

a.All external antennas include pole mounting bracketry and sealing materials. RF cables are not included.

Table 14 802.11a Antenna Configurations for Public Safety Applications

Antenna	Ordering Number	Channel Bandwidth / Operating Frequency (MHz)	Measured Conducted Power (dBm)	Tx Attenuation Software Setting (dB)	Approximate EIRP (dBm)
9.0dBi omni, unit mounted	AN090049	20 4950 - 4980	20.0	0	29.0
9.0dBi omni, unit mounted	AN090049	10 4945 - 4985	17.0	3	26.0
9.0dBi omni, unit mounted	AN090049	5 4945 - 4985	14.0	6	23.0

Attenuation with Antennas

If external antennas are used, it is necessary to adjust the transmit power attenuation to provide the correct power level for the router. Use the following formulas to compute the required attenuation levels:

802.11b/g, 2.4 GHz:

```
Attenuation setting = Antenna gain (dBi) - 7.4 dBi - Cable loss
```

802.11a, 4.9 GHz:

```
Attenuation setting = Antenna gain (dBi) - 9.0 dBi -Cable loss
```

5 Antenna Specifications and Patterns

Table 15 provides antenna specifications and patterns for the Tropos-supplied antennas.

Table 15 Antenna Specifications and Patterns
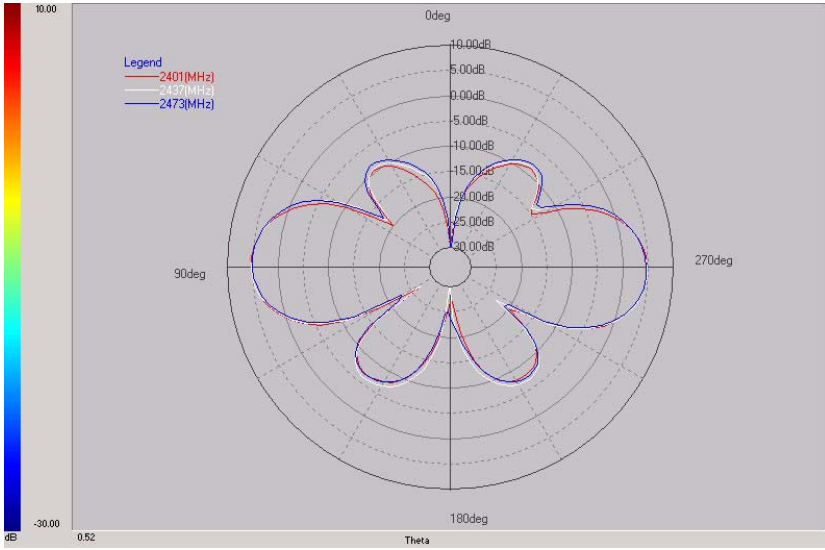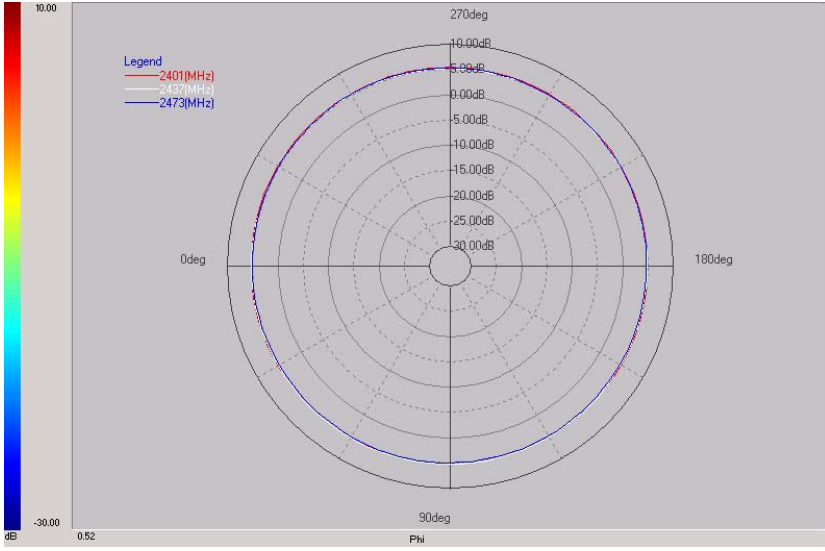
Part Number	Specifications	Pattern
AN060077	One outdoor 6.0dBi omni unit-mounted antenna; N connector • 2400-2485 MHz • Length: 11.9 in (30.3 cm) • Weight: 4.4 oz (.125 kg) • Color: White • Measured peak gain: 5.3dBi • Connector type: N male	**Elevation** **Azimuth**

Table 15 Antenna Specifications and Patterns (*continued*)

|		
AN074077	One outdoor 7.4dBi omni unit-mounted antenna; N connector • 2400-2485 MHz • Length: 19 in (48.3 cm) • Weight: 4.7 oz (.133 kg) • Color: White • Measured peak gain: 7.1dBi • Connector type: N male	**Elevation**
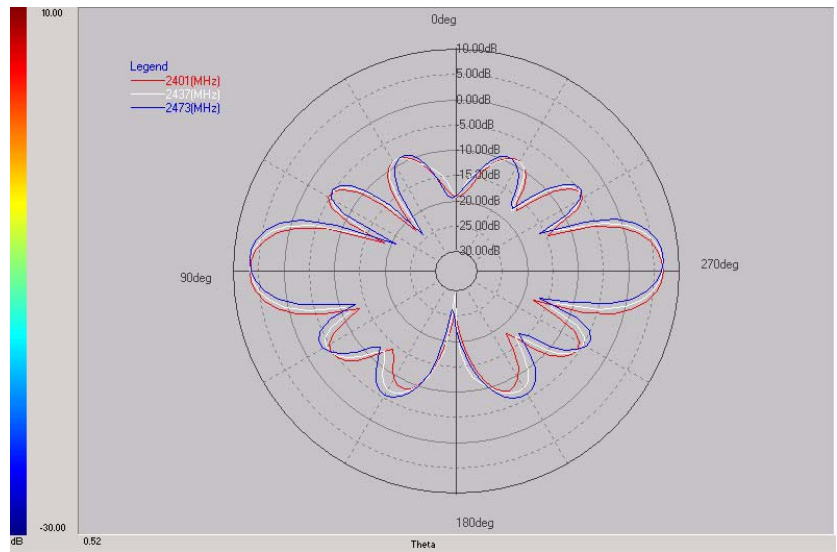
Azimuth
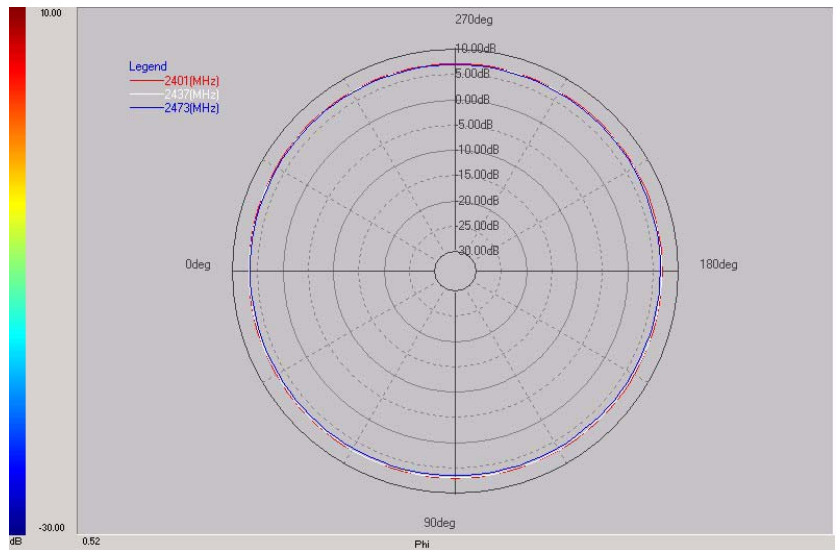
Table 15 Antenna Specifications and Patterns (*continued*)

AN100022   One outdoor 9.9dBi omni
             mast-mounted antenna;

             N connector; bracketry
             - 2400-2485 MHz
             - Length: 45 in (114.3 cm)
             - Weight: 20 oz (.57 kg)
             - Color: White
             - Measure peak gain: 9.9dBi
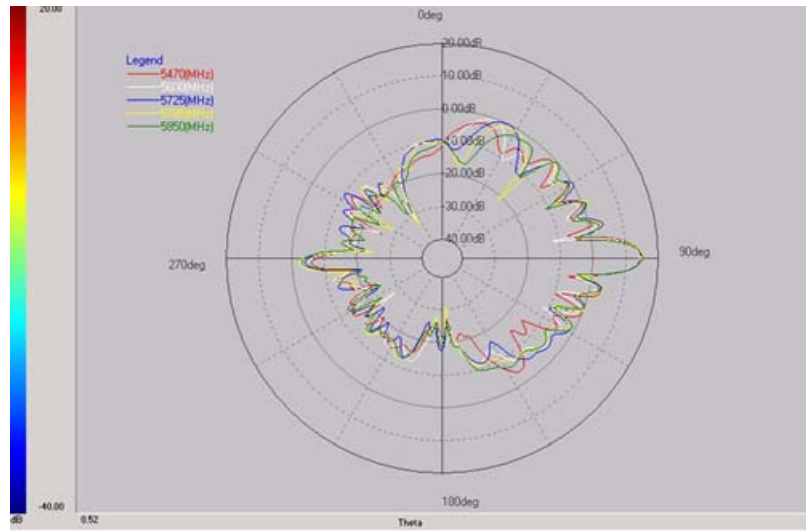   - Connector type: N female

Elevation
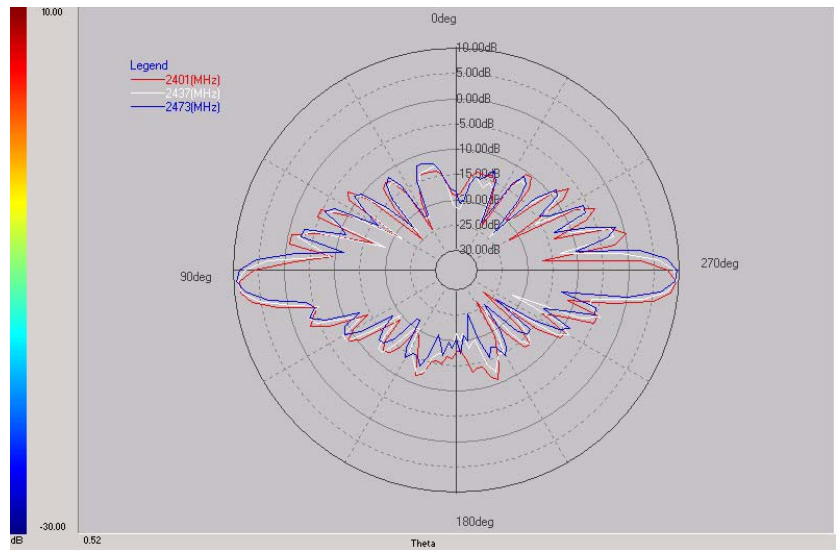
Azimuth
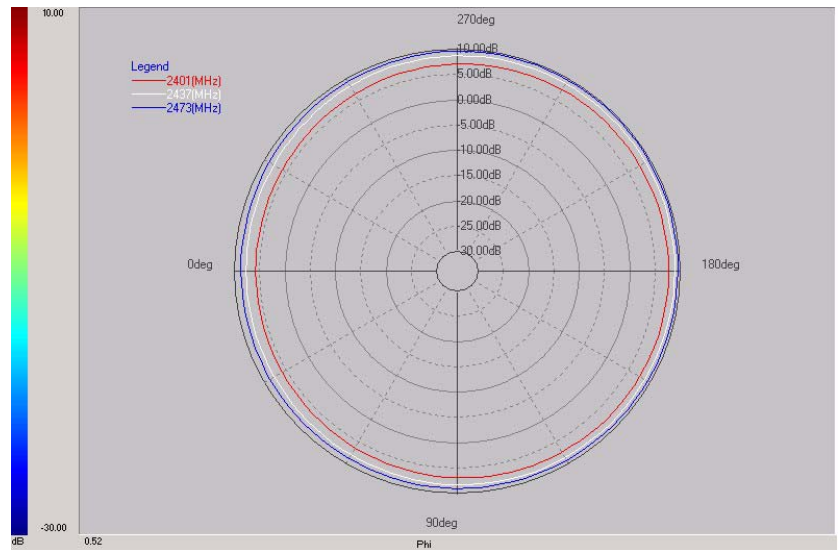
Table 15 Antenna Specifications and Patterns (*continued*)

AN120022   One outdoor 12.0dBi 90°
            sector antenna;

            N connector; bracketry
            • 2400-2485 MHz
            • Length: 34 in (86.4 cm)
            • Width: 3 in (7.6 cm)
            • Depth: 1.2 in (3.0cm)
            • Weight: 25.6 oz (.73 kg)
            • Color: Gray
            • Measured peak gain:
              12.0dBi
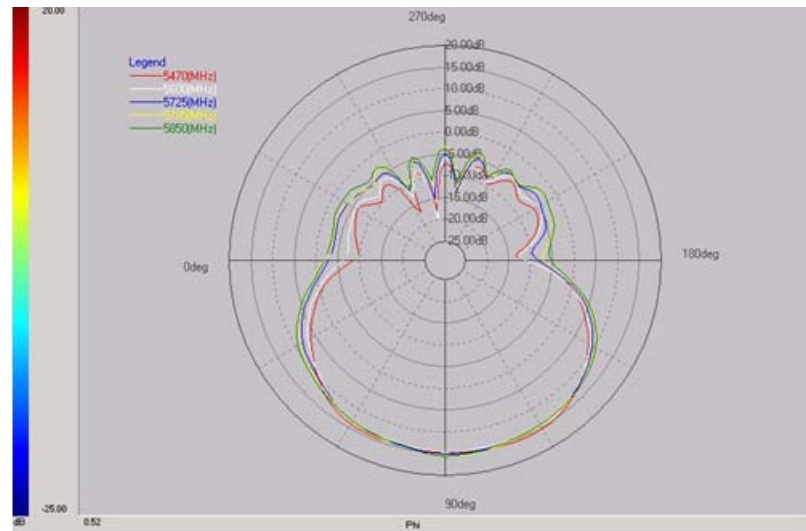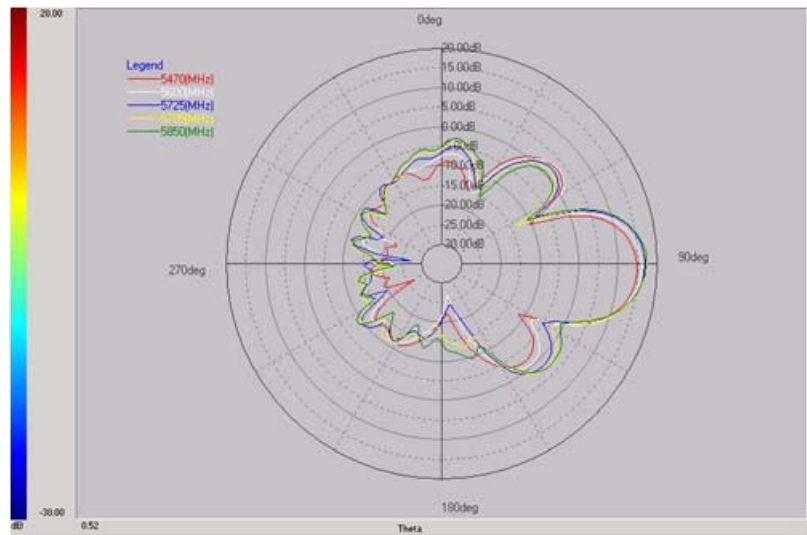   • Connector type: N female
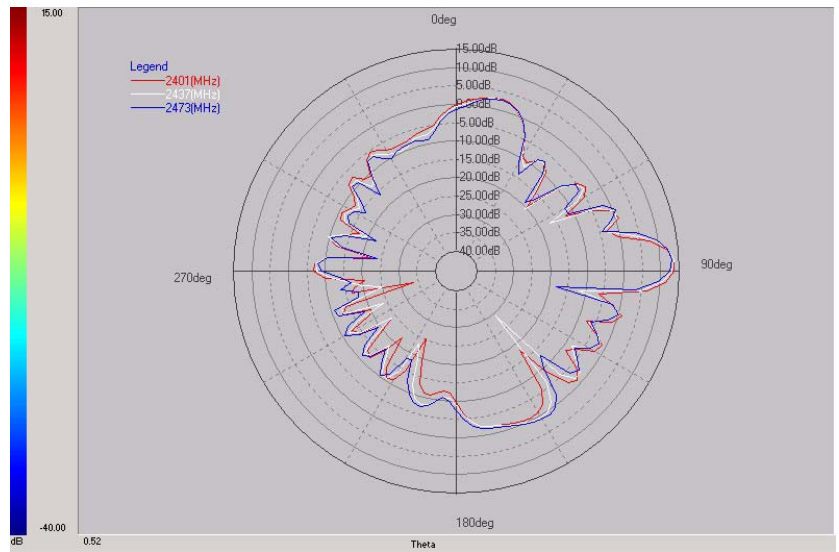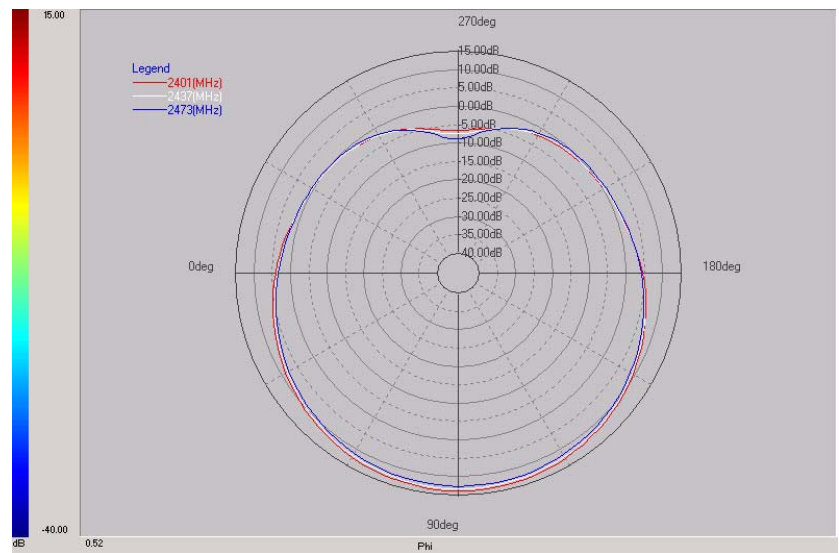
Elevation

Azimuth

Table 15 Antenna Specifications and Patterns (*continued*)

AN091058   Outdoor 9.1dBi omni antenna;

N connector
- 5725-5850 MHz
- Length: 17.5 in (43.2 cm)
- Weight: 4.7 oz (.133 kg)
- Color: White
- Measured peak gain: 6.7 dBi
- Connector Type: N Male

Elevation
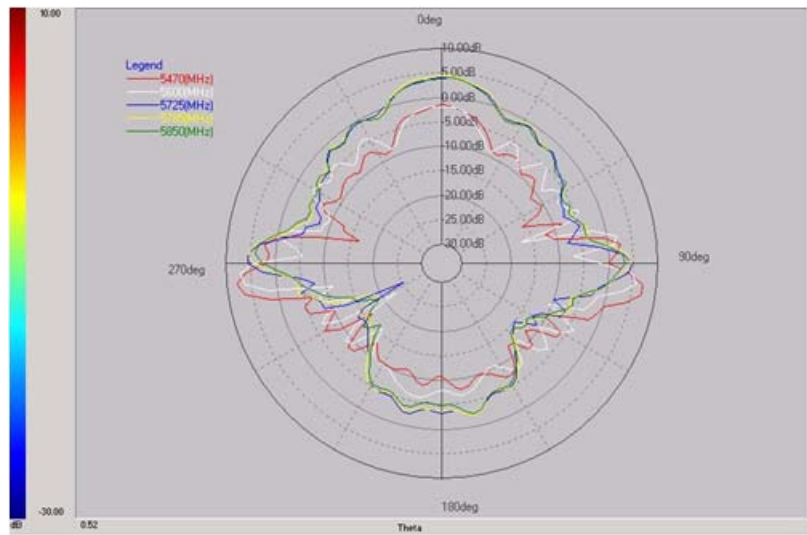
Azimuth
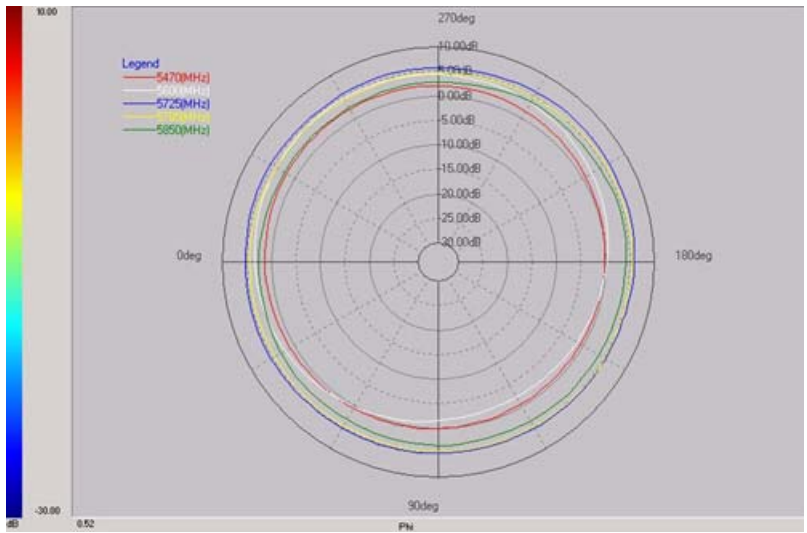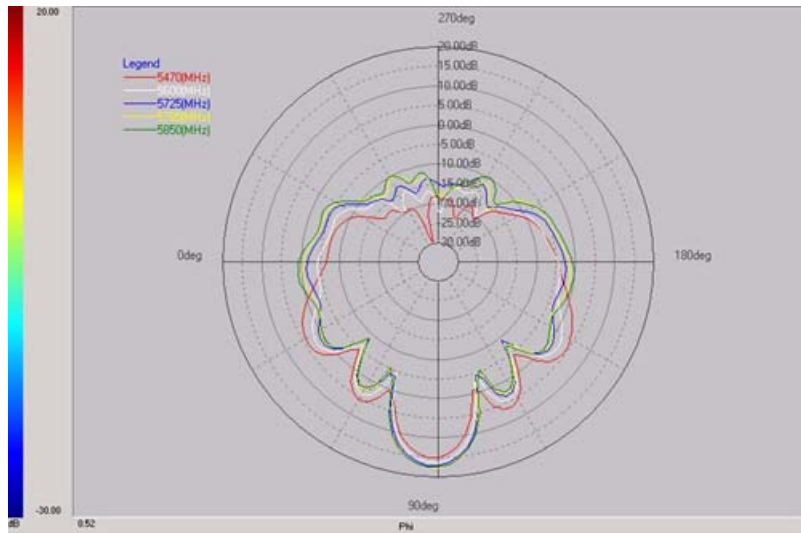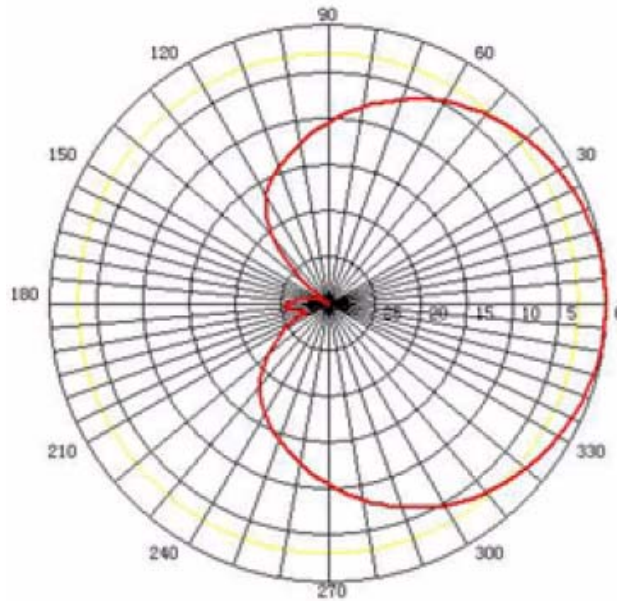
Table 15 Antenna Specifications and Patterns (*continued*)

AN170058   Outdoor 17.0dBi 90° sector
            antenna;

            N connector, bracketry
            - 5725-5850 MHz
            - Length: 14.5 in (370 cm)
            - Width: 6.7 in (170 cm)
            - Depth: 2.5 in (65 cm)
            - Weight: 2.2 lbs (1 kg)
            - Color: gray
            - Measured peak gain: 15.3
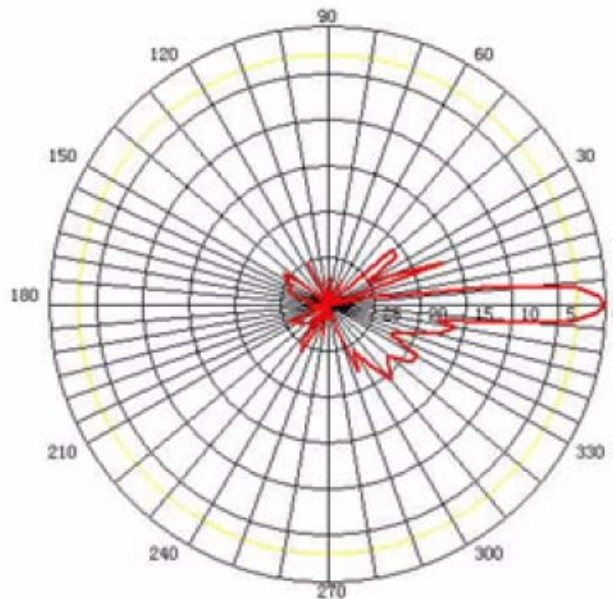   dBi
            - Connector Type: N Female

Elevation

Azimuth

Table 15 Antenna Specifications and Patterns (*continued*)

AN190058	Outdoor 19.0dBi 16° patch antenna; N connector, bracketry • 5725-5850 MHz • Length: 7.45 in (189 cm) • Width: 7.45 in (189 cm) • Depth: 1.37 in (35 cm) • Weight: 1.6 lbs (0.72 kg) • Color: gray • Measured peak gain: 17.3 dBi • Connector Type: N Female	**Elevation**

Azimuth

Table 15 Antenna Specifications and Patterns (*continued*)

AN170054   One outdoor 17.0dBi 90°
            sector antenna;
            N connector; bracketry
            • 5470-5725 MHz
            • Length: 14.5 in (370 cm)
            • Width: 6.7 in (170 cm)
            • Depth: 2.5 in (65 cm)
            • Weight: 2.2 lbs (1 kg)
            • Color: gray
            • Measured peak gain:
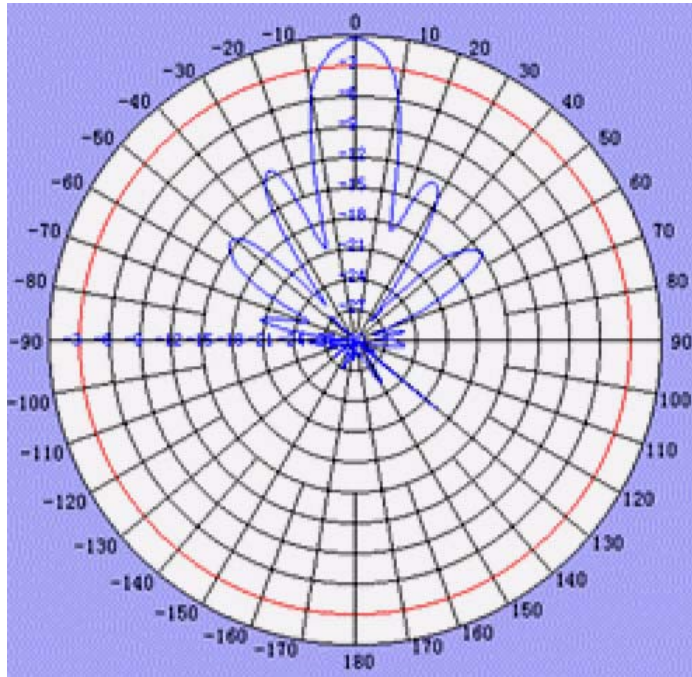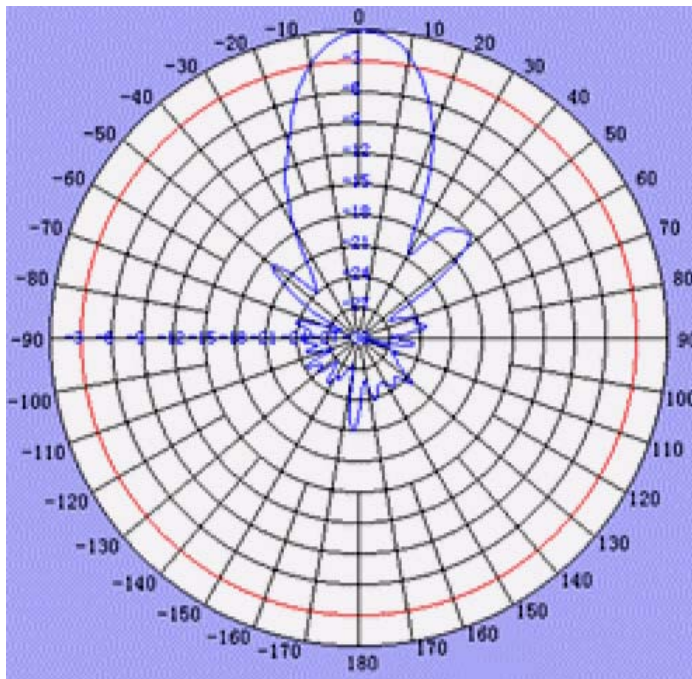   • Connector Type: N Female

Horizontal

Vertical

Table 15 Antenna Specifications and Patterns (*continued*)

AN190054   One outdoor 19.0dBi 16°
patch antenna;
 N connector; bracketry
- 5470-5725 MHz
- Length: 7.45 in (189 cm)
- Width: 7.45 in (189 cm)
- Depth: 1.37 in (35 cm)
- Weight: 1.6 lbs (0.72 kg)
- Color: gray
- Measured peak gain:
- Connector Type: N Female

Horizontal

Vertical

6 Installation Accessories

This chapter contains accessory ordering information:

- *"Installation Accessories" on page 65*
- *"Tropos Antennas, Cables, and Related Ordering Numbers" on page 66*

Table 16 Installation Accessories

Description	Manufacturer	Part Number	Distributor	Contact Information	Order Number
Outdoor CAT5 4-Pair Data Cable	Belden Belden	7929A 7921A	Anixter Anixter	www.anixter.com www.anixter.com	
	Superior Essex	BBDG	Anixter	www.anixter.com	
Cable, CAT5, 8 Conductor, Harsh Environment	Madison Cable	08KFK00013 (recommended)	Tyco	www.xgsgroup.com	
Self-Fusing EPR Tape	3M	Scotch 23 Rubber Splicing Tape	McMaster Carr Alameda Electric Distributors	www.mcmaster.com www.alamedaelectric.com	7682A65
ThreadLocker LocTite 242 0.5 ml (0.017oz)	LocTite	242	McMaster Carr	www.mcmaster.com	91458A24
3 pin AC Male Plug (cord end) - 115 VAC 15A	Leviton	14W47-B	Alameda Electric Distributors	www.alamedaelectric.com	
3 pin AC Female Receptacle 115 VAC 15A	Leviton	15W47	Alameda Electric Distributors	www.alamedaelectric.com	
3 pin AC Plug Female (cord end) - Tropos 5320 router	Remke	50982	DSC Technical Sales	www.dsctechnicalsales.com	
Data Protection Device	Polyphase	IX-2H1DC48/W	Electro-Comm	www.electro-comm.com	
	Hyperlink	HGLN-CAT5-1		www.hyperlinktech.com	
Yellow 3-Pin Mini-Link AC Plug Female Pig Tail Unterminated 12 ft.	McMaster-Carr	321K16		www.mcmastercarr.com	

Table 16 Installation Accessories

Description	Manufacturer	Part Number	Distributor	Contact Information	Order Number
Anti-seize lubricant	Loctite	37230	McMaster Carr	www.mcmaster.com	
Universal remote control	Universal Remote	MX-500		www.universalremote.com	

Table 17 Tropos Antennas, Cables, and Related Ordering Numbers

Part Number	Description
AN060077	One outdoor 6.0dBi omni unit-mounted antenna; N connector
AN074077	One outdoor 7.4dBi omni unit-mounted antenna; N connector
AN074088	One outdoor 7.4dBi omni mast-mounted antenna; N connector; bracketry
AN100022	One outdoor 9.9dBi omni mast-mounted antenna; N connector; mounting bracketry, sealing materials
AN120022	One outdoor 12.0dBi 90° sector antenna; N connector with pole-mount bracketry, sealing materials (RF cable not included)
AN091058	One outdoor 9dBi omni unit-mounted antenna; N connector. For standard and high power products
AN170054	One outdoor 17dBi 90° sector antenna, 5470-5725 MHz; N connector with pole mounting bracketry, sealing materials. RF cable not included. For standard power products
AN170058	One outdoor 17dBi 90° sector antenna, 5725-5850 MHz; N connector with pole mounting bracketry, sealing materials. RF cable not included. For high power products
AN190054	19dBi patch antenna, 5470-5725 MHz, external bracket mounted. For standard power products
AN190058	19dBi patch antenna, 5725-5850 MHz, external bracket mounted. For high power products
RC003400	3' N (male) to N (male) cable - LMR 400 DB
RC006400	6' N (male) to N (male) cable - LMR 400 DB
RC005000	50 ohm terminator - N (male); Sealing Materials
RC008000	Sealing Kit - Loctite242, EPR Rubber Splicing Tape
RC008100	N connector cover/cap, outdoor, water tight
RC009000	N adapter for 7.4dBi Mast-mounted antenna to N (male) cable
SA006801	Indoor Cat 5 data cable surge protector
SA006802	Indoor Cat5 data cable surge protector for shielded cable

Table 17 Tropos Antennas, Cables, and Related Ordering Numbers

Part Number	Description
PT021004	Tropos 5320 input power cable - photo-electric cell adaptor; 2-wire; 4 ft.
PT021020	Tropos 5320 input power cable - photo-electric cell adaptor; 2-wire; 20 ft.
PT031006	Tropos 5320 input power cable - watertight plug; 3-wire; 6 ft.
PT031030	Tropos 5320 input power cable - watertight plug; 3-wire; 30 ft.
PT032030	Tropos 5320 input power cable - pigtail, 3-wire, 30 ft., for EU markets
EC003500	Tropos 5320 weathertight gateway connector kit
EC003600	Tropos 5320 weathertight field-installable cable gland
EC003704	Tropos 5320 weathertight RJ45 data cable, crossover, 4 ft (requires EC003500 gateway connector kit)
EC003708	Tropos 5320 weathertight RJ45 data cable, crossover, 8 ft (requires EC003500 gateway connector kit)
EC003811	Alvarion to Tropos Gateway Adapter Kit
MB004300	Tropos 5320 unit-attached mounting pole for Canopy SM; bracket and cable
MB006201	Tropos 5320 Paintable Bottom Shell Kit
MB005300	Tropos 5320 Downward Facing Antenna Bracket

7   AC Wiring Diagrams

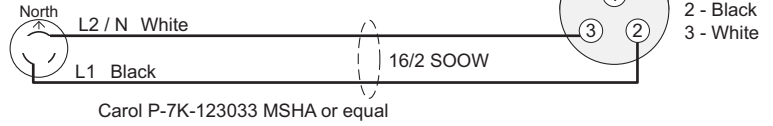This chapter contains wiring diagrams for AC power:

-
-

Figure 26 AC Wiring — Photoelectric Power Tap

PT021004 (4') or PT021020 (20')
Photoelectric Power-Tap
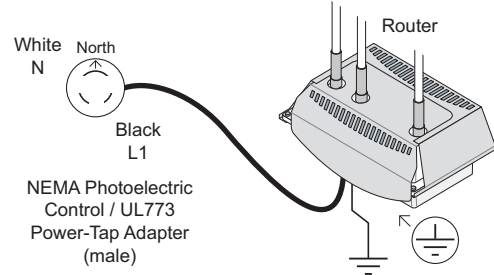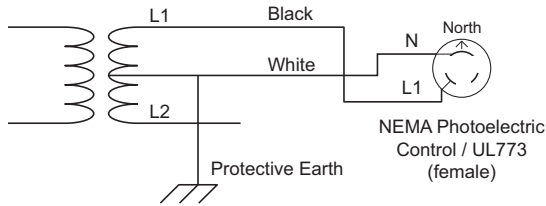Power Input Cable
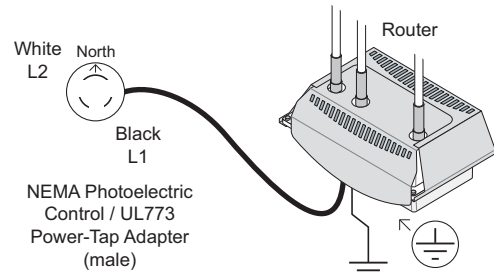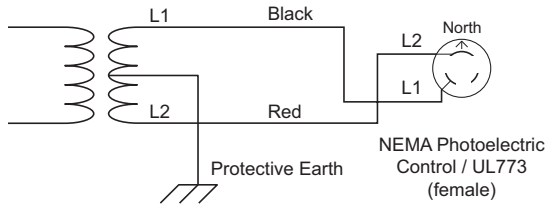2Wire - 90-480Vac
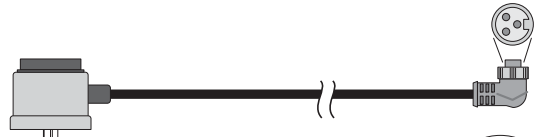
Length: 4' or 20'

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

North

L2 / N   White

L1   Black
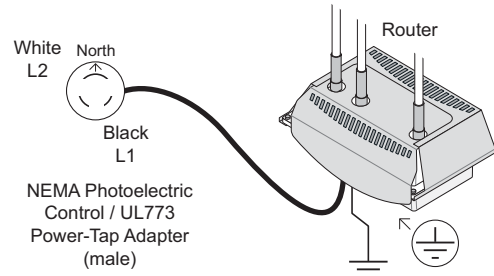
16/2 SOOW

Carol P-7K-123033 MSHA or equal

1 - Green
2 - Black
3 - White

Power-Tap single phase; two wire service

White
N

North

Router

L1   Black

White

N

North

L1

NEMA Photoelectric
Control / UL773
(female)

L2

Protective Earth

Black
L1

NEMA Photoelectric
Control / UL773
Power-Tap Adapter
(male)

Power-Tap single phase; two wire service

White
L2

North

Router

L1   Black

L2   North

L1

Red

L2

Protective Earth

NEMA Photoelectric
Control / UL773
(female)

Black
L1

NEMA Photoelectric
Control / UL773
Power-Tap Adapter
(male)

Three phase; two wire service (Delta)

White
L2

North

Router

L1

Black

L2   North

White

L1

L2

Protective Earth

NEMA Photoelectric
Control / UL773
(female)

Black
L1

NEMA Photoelectric
Control / UL773
Power-Tap Adapter
(male)
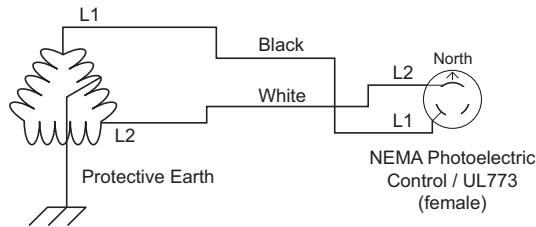
208Vac three phase; two wire service (grounded-Wye)

White
L2

North

Router

L1

Black

L2   North

480Vac

L1

Red

L2

N

Protective Earth

277Vac

L3

NEMA Photoelectric
Control / UL773
(female)

Black
L1

NEMA Photoelectric
Control / UL773
Power-Tap Adapter
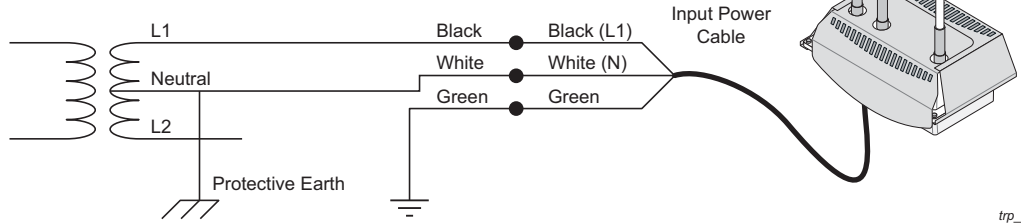(male)
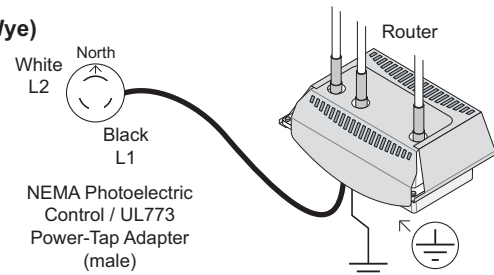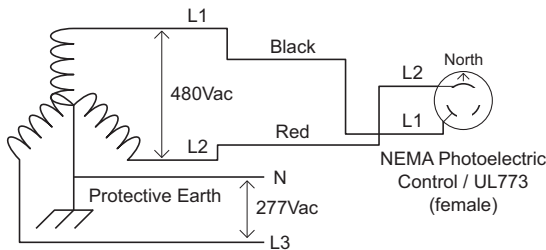
trp_161

Figure 27 AC Wiring Power Cable 120VAC, 15A Plug

PT031006 (6') or PT031030 (30')
Overvoltage Category 2 or
IEEE/ANSI C62.41 Category B
Power Electrical Service Cable
3Wire - 120Vac

Black   White

Green

Length: 3' to 30'

White   L2/N

Green or Green/Yellow

White

1 - Green
2 - Black
3 - White

Protective Earth
Green or Green/Yellow

16/3 SOOW

L1 Black

Black
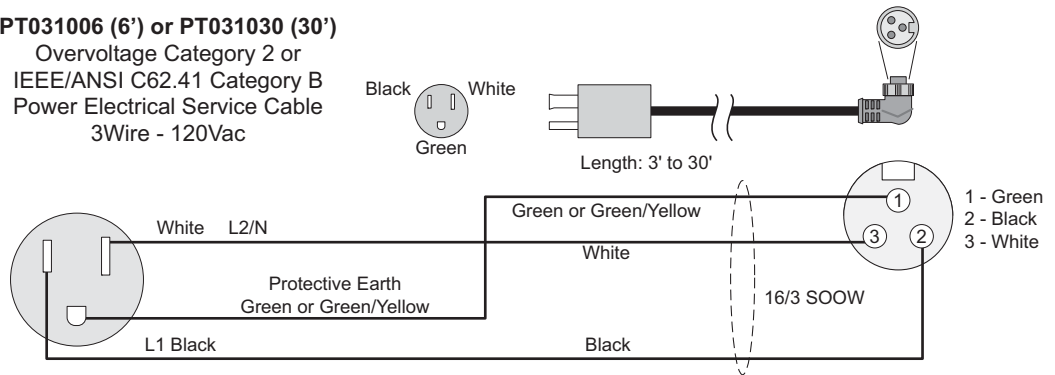
120Vac single phase; three wire service

Router

L1

Black

Black (L1)

Input Power
Cable

Neutral

White

White (N)

Green

Green

L2

Protective Earth

trp_162

8 Wind Loading Considerations

The American Association of State Highway and Transportation Officials (AASHTO) standards manual, "Standard Specifications for Structural Supports for Signs, Luminaires and Traffic Signals," governs most structural support issues related to traffic lighting and controls. Many state and city public works departments site the AASHTO standard as the guide for their requirements. Local municipalities in coastal states, which experience frequent hurricanes, etc., may have exceptions to the AASHTO standard that require higher design limits for wind velocity or dead load.

Numerous pole and mast arm assemblies are used for traffic controls and traffic lighting. Each assembly and installation is unique and worthy of an evaluation of the static and dynamic load bearing capabilities; however, in most cases, the assembly will include a pole with a single 6', 9' or 12' mast arm holding a single luminaire. Many of these mast arms are typically designed to hold hundreds of pounds of static load and to carry several square meters of sail area in 80mph winds. The typical mast arm is capable of supporting a single traffic control (typically weighing around 160 lbs) and a single traffic sign (typically presenting a few square meters of sail area). A single luminaire typically weighs about 60 lbs and presents about 3 square feet of sail area.

> ⓘ **Note**
> Each assembly and installation is unique and worthy of an evaluation of the static and dynamic load bearing capabilities. It is your responsibility to evaluate the load bearing capabilities of the structure.

The Tropos 5320 MetroMesh Router weighs approximately 16 lbs, including all mounting hardware. The Tropos 5320 MetroMesh Router may be mounted to either the pole portion of the streetlight or to the mast arm portion.

When the Tropos 5320 MetroMesh Router is mounted to the pole or mast arm, most of the unit is hidden by the pole or mast arm and therefore presents minimal additional sail area to the structure. When the Tropos 5320 MetroMesh Router is mounted to the pole portion of the structure, the sail area of the router is approximately 1 square foot. Pole manufacturers have advised Tropos Networks that small communications devices such as the Tropos 5320 MetroMesh Router do not present any significant static or dynamic load to these structures.

9   Canopy Installation Instructions

The Tropos 5320 Canopy Subscriber Module and Bracket kit allows you to attach a third-party radio, the Motorola Canopy Subscriber Module, to the Tropos 5320 MetroMesh Router.
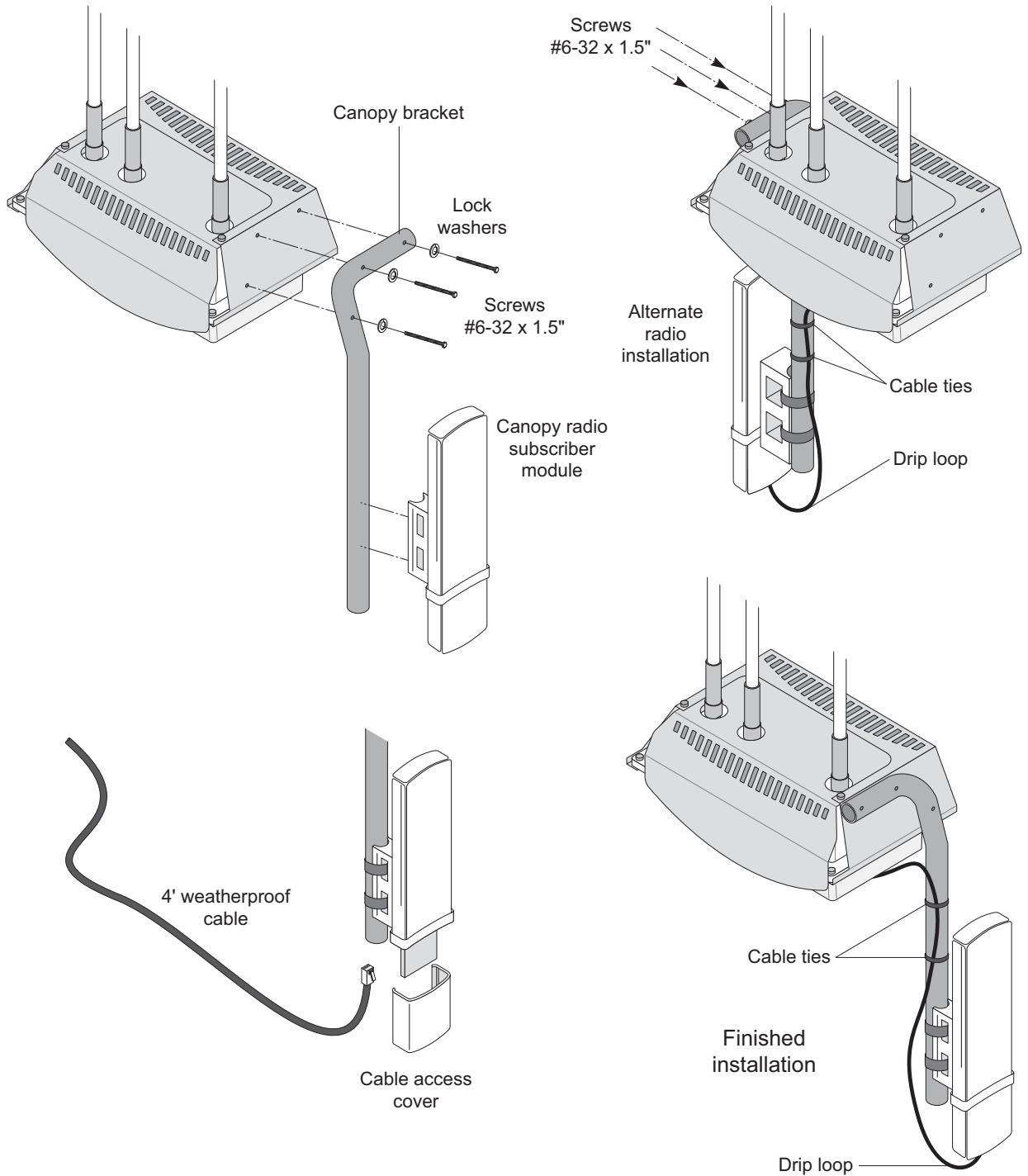
The kit includes the following items:

- Outdoor CAT5 weatherproof cable
- Bracket (metal pole)
- Screws #6-32 x 1.5"
- Lockwashers
- Cable ties

Follow these steps to install the canopy (refer to Figure 28):

1. Align the bracket and attach it using the three screws included in the kit.

2. Attach your radio subscriber module to the end of the bracket. Direct the Canopy Subscriber Module toward the canopy base station.

3. Remove the cable access cover on the Canopy Subscriber Module so that you can attach the RJ45 end of the data cable to the module. (The cover slides off.) Put the cable access cover back in place.

Figure 28 Canopy Assembly

Canopy bracket

Lock washers

Screws #6-32 x 1.5"

Canopy radio subscriber module

Screws #6-32 x 1.5"

Alternate radio installation

Cable ties

Drip loop

4' weatherproof cable

Cable access cover

Cable ties

Finished installation

Drip loop

trp_163

4. Unscrew the 6 screws around the Tropos 5320 access cover (Figure 29). Replace the access cover of the Tropos 5320 unit with the access cover provided with the Canopy Subscriber Module cable.

5. Connect cable to the LAN port inside the Tropos 5320 unit.

Figure 29 Cable Connections

Watertight access cover
cable glands

Connector
access cover

Shield
termination

Tighten six screws to
fasten access cover

Cable from radio

Cable terminated
with RJ45 jack
for port connection

LAN
port

Management
port

Cable ties

Screw holes
for access cover

Drip loop
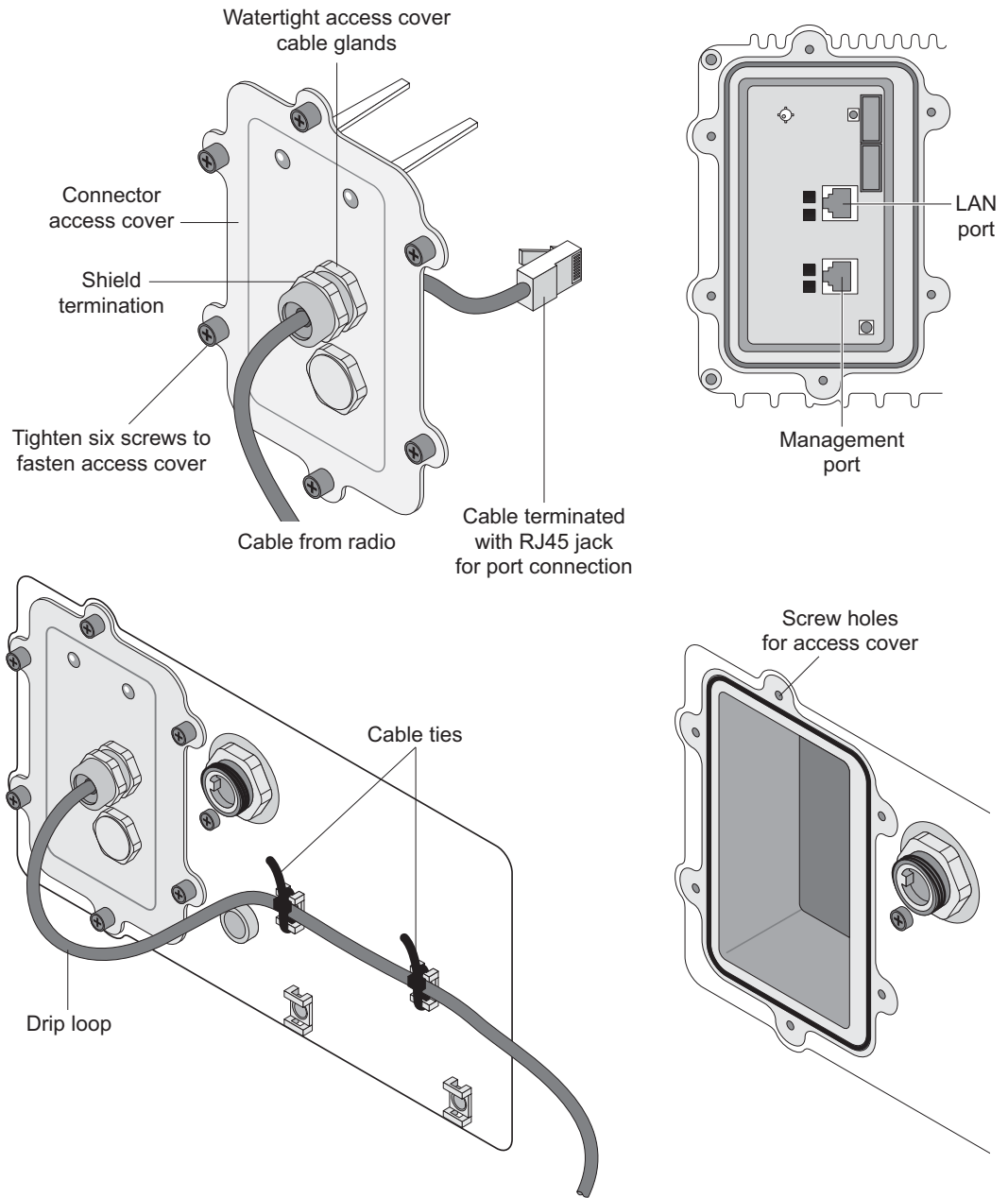
trp_122a

6. Attach the access cover by tightening the 6 screws. Check that the cable gland is securely tightened.

7. Secure the weatherproof cable to the canopy bracket with two cable ties (Figure 28). Use two additional cable ties to anchor the cable to the bottom of the Tropos 5320 unit (Figure 29). Refer to Table 18 for canopy cable wiring information.

Table 18 Canopy Cable Wiring

Canopy SM (RJ45)	Color	Tropos 5320 MetroMesh Router	Signal
3	Orange	1	TXD+
6	Orange-White	2	TXD-
1	Blue	3	RXD+
7	Green	4	24Vdc+
8	Green-White	5	24Vdc+
2	Blue-White	6	RXD-
4	Brown	7	24Vdc_RTN
5	Brown-White	8	24Vdc_RTN
Shield	Drain wire	Shield	Shield

10 Cable Termination Instructions

Follow these steps to prepare and terminate cables connected to the Tropos 5320 unit:

1. Strip off the outer sheath of cable to expose 6 inches of the inner cable or twisted pairs. The shield may be armored, braided or foil type depending upon cable type (see Table 30).

2. For armored or braided cable, remove all but 1/2 inch of the armor or braid.

   - Remove waxy residues on the shields of "flooded" type cables.
   - For foil shielded cable, remove all but 1/2 inch of the foil, and fold the foil part back onto the outer sheath. Most foil shields are conductive on the inner side, as the outer side typically has a plastic coating.
   - The exposed conductive surfaces will ground to the conductive contacts inside the cable gland.

Figure 30 Cable Components
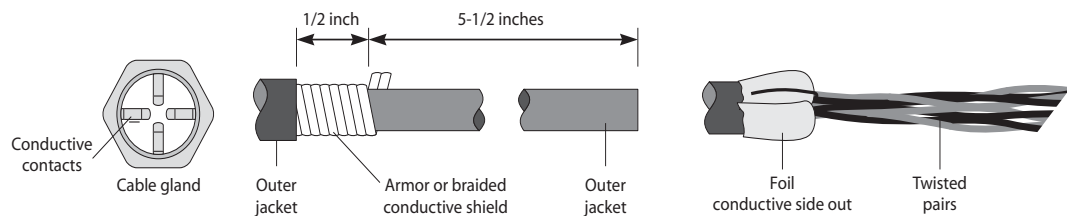
3. Run the stripped part of the cable through the cable gland (Figure 31). Make sure that the braided conductive shield of the cable makes contact with the conductive contacts of the cable gland (Figure 31).

4. Attach the cable gland by first tightening the gland base into the access cover. Then tighten the gland cover to constrict the weather-tight grommet around the outer jacket of the cable, thereby creating a weather-tight fitting.

Figure 31 Cable Gland Assembly

Cable gland base tightened first to cover

Gland cover then tightened over cable

Weather-tight grommet

Accessory connector access cover

Finished installation
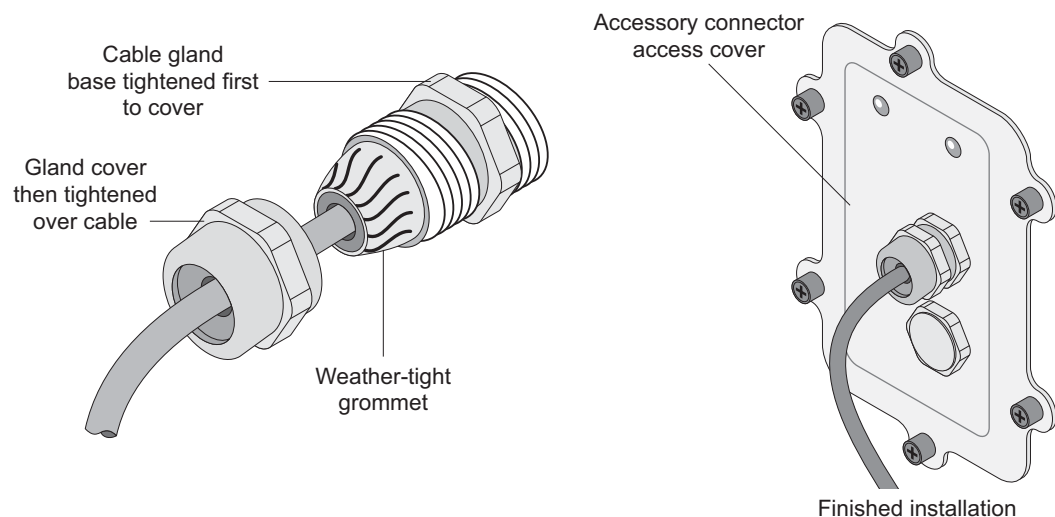
trp_123a

5. Apply a RJ45 modular jack and connect to the LAN or Management port. Figure 31 shows the termination options, and Table 19 provides pin descriptions.

Figure 32 Cable Preparation and Termination

Orange/white **1**
Orange **2**
Green/white **3**
Blue **4**
Blue/white **5**
Green **6**
Brown/white **7**
Brown **8**

Category 5 cable

RJ45 port

87654321

12345678

RJ45 jack
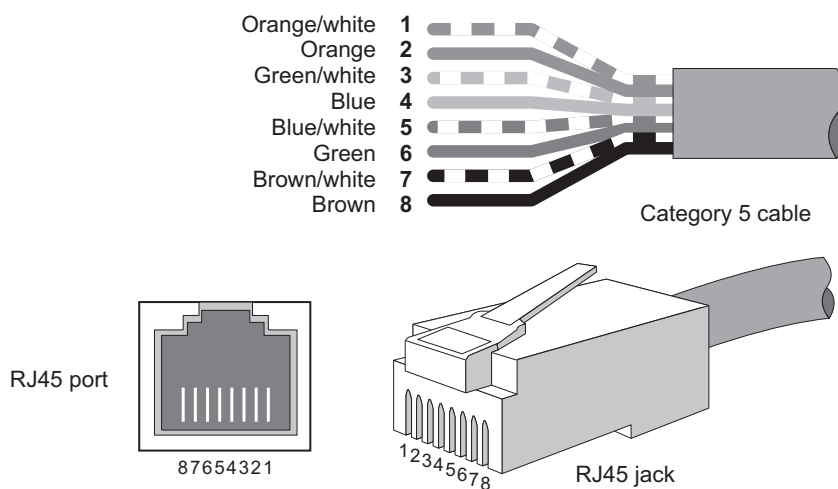
trp_109

Table 19 TIA/EIA 5688 Wiring - RJ-45 Pin Descriptions for Data Connection

Pin	T/R	Signal	Color	Description
1	T	TXD+	Orange-White	TX Data 10/100BaseT
2	R	TXD-	Orange	TX Data 10/100BaseT
3	T	RXD+	Green-White	RX Data 10/100BaseT
4	R	PoE+	Blue	Power output, 0, 12, 24, 48 Vdc (+)
5	T	PoE+	Blue-White	Power output, 0, 12, 24, 48 Vdc (+)
6	R	RXD-	Green	RX Data 10/100BaseT
7	T	PoE-	Brown-White	Power output, 0, 12, 24, 48 Vdc (-)
8	R	PoE-	Brown	Power output, 0, 12, 24, 48 Vdc (-)

Abbreviations

The following acronyms are used in this document.

Table 20 Abbreviations

2P	Two-Phase or Split Phase
2W	Two-Wire
3W	Three-Wire
AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current
ANSI	American National Standards Institute
AWG	American Wire Gauge
C	Celsius
CAT	Category
CCK	Complementary Code Keying
CE	Conformite Europeene
CFR	Code of Federal Regulations
CISPR	International Special Committee on Radio Interference
CSA	Canadian Standard Association
dB	Decibels
dBi	Decibels Relative to an Isotropic Radiator
dBm	Decibels Referred to 1 Milliwatt
DBPSK	Differential-Binary Phase-Shift Keying
DC	Direct Current

Table 20 Abbreviations (*continued*)

DGT	Directorate General of Telecommunications (Taiwan)
DQPSK	Differential-Quadrature Phase-Shift Keying
DSSS	Direct-Sequence Spread Spectrum
EFT	Electrically Fast Transients
EIRP	Effective Isotropic Radiated Power
EMC	Electromagnetic Compatibility
EN	IEC standard
ESD	Electrostatic Discharge
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
FHSS	Frequency Hopping Spread Spectrum
HFC	Hybrid Fiber Coax
Hz	Hertz
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP67	Ingress Protection Standard
ISM	Instrumentation, Scientific, and Medical band
ISTA	International Safe Transit Association
LAN	Local Area Network
Mbps	Megabits Per Second
MHz	Megahertz
MIL-STD	Military Standard
MPHPT	Ministry of Public Management, Home Affairs, Posts and Telecommunications (Japan)
MSO	Multiple Service Operator
MTBF	Mean Time Between Failure
N	Neutral
NEC	National Electrical Codes

Table 20 Abbreviations (*continued*)

NEMA	National Electrical Manufacturers Association
OFDM	Orthogonal Frequency Division Multiplexing
P	Phase
PE	Protective Earth
PoE	Power over Ethernet
RJ45	Registered Jack 45
RSS	Received Signal Strength
Rx	Receive
RXD	Receive Data
TUV	Technical Inspection Association
Tx	Transmit
TXD	Transmit Data
UL	Underwriters Laboratories
UPS	Uninterruptible Power Supply
VAC	Voltage (Alternating Current)
VCCI	Voluntary Control Council for Interference (Japan)
VDC	Voltage (Direct Current)
VSWR	Voltage Standing Wave Ratio
W	Watts

Index