Tropos® Networks MetroMesh™ Router Outdoor Installation Guide

Models 6310 and 6320
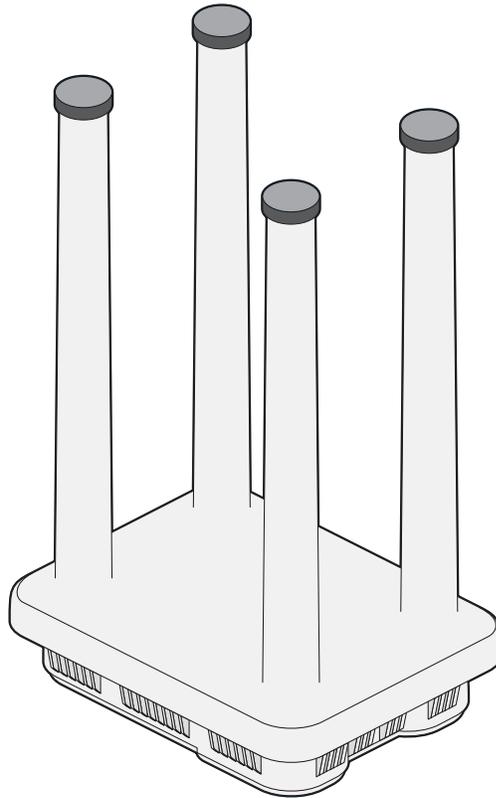
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TROPOS networks

Tropos Networks, Inc.
555 Del Rey Ave.
Sunnyvale, CA 94085 USA
www.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 6320 6310 overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF
Dutch	Hierbij verklaart *Tropos Networks, Inc.* dat het toestel 6320 6310 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 6320 6310 voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.
English	Hereby, *Tropos Networks, Inc.* declares that this 6320 6310 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Finnish	*Tropos Networks, Inc.* vakuuttaa täten että 6320 6310 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 6320 6310 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 6320 6310 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* 6320 6310 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 6320 6310 mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG. (Wien)
Greek	*ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Tropos Networks, Inc. ΔΗΛΩΝΕΙ ΟΤΙ ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ* 6320 6310
Italian	Con la presente *Tropos Networks, Inc.* dichiara che questo 6320 6310 è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Portuguese	*Tropos Networks, Inc.* declara que este 6320 6310 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 6320 6310 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 6320 6310 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 6310 and 6320 routers are installed in wet, outdoor locations. Make sure closure caps are installed and all cable connections are securely fastened and waterproofed.

Surfaces may become hot. Use caution when accessing the Tropos 6310 and 6320 routers.

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1   Installing the Router

This guide explains how to install the Tropos® 6310 and 6320 MetroMesh™ routers safely and is intended for trained technical professionals. This chapter covers the following topics:

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- "Preparing for Installation" on page 3
- "Mounting Strategies" on page 6
- "Proper Use of Clamps" on page 8
- "Pole, Tower, and Streetlight Mounting Instructions" on page 9
- "Connecting Data Cables" on page 18
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Product Summary

This document contains installation instructions for the following products:

■ Tropos 6310 Router
■ Tropos 6320 Router

Tropos 6310 Router

The Tropos 6310 router has the following characteristics:

■ 802.11b/g/n band, 2400-2483 MHz
■ Support for 802.11b/g/n clients
■ PoE power input 20-60 Vdc; 100-277 VAC with external accessory
■ LAN and Management 10/100BaseT Ethernet ports, auto-sensing

Table 1 lists the Tropos 6310 router models.

Table 1 Tropos 6310 Router Models

Model	Description
63103030	6310: 2.4 GHz, PoE power (FCC)
63102530	6310: 2.4 GHz, PoE power (ETSI)

Tropos 6320 Router

The Tropos 6320 router has the following characteristics:

■ 802.11a/b/g/n dual band, 2400-2500 MHz/5470-5825 MHz
■ Support for 802.11a/b/g/n clients
■ PoE power input 20-60 Vdc; 100-277 VAC with external accessory
■ LAN and Management 10/100BaseT Ethernet ports, auto-sensing

Table 1 lists the Tropos 6320 router models.

Table 2 Tropos 6320 Router Models

Model	Description
63203030	6320: 2.4 and 5.8 GHz, PoE power (FCC)
63202530	6320: 2.4 and 5.4 GHz, PoE power (ETSI)

Preparing for Installation

The Tropos 6310 and 6320 routers 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 explains how to prepare the installation site.
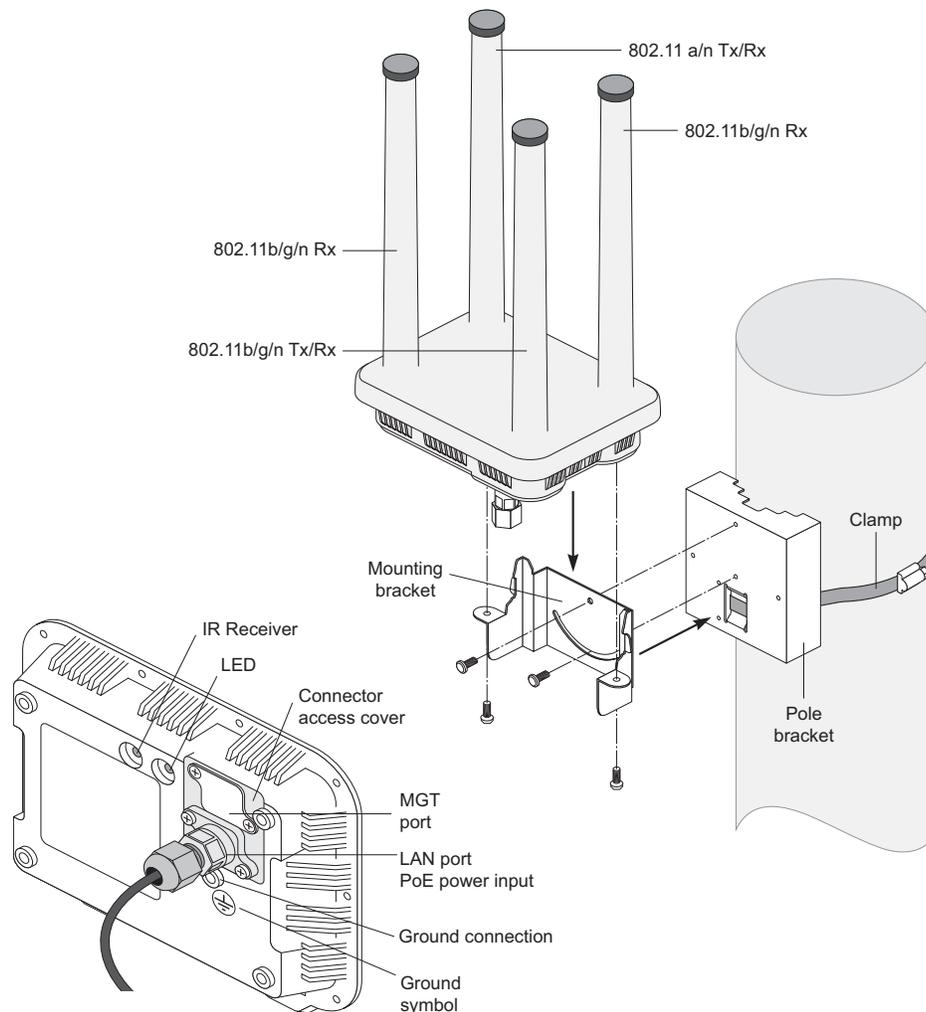
An exploded view of the router assembly is shown in Figure 1.

(i) **Note**

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.

Figure 1 Tropos 6310/ 6320 Router Exploded View

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Installation Hardware and Tools

The following installation accessories are included in the shipping package:

- One pole bracket
- One 4-inch diameter clamp
- One 6-inch diameter clamp
- Five 5/16-inch #10-32 stainless steel hex head machine screws

You must supply the following tools:

- Level
- 5/16-inch nut driver
- 1/4-inch flat blade screwdriver
- Tower mounting only: 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: one 1/4-inch diameter, 3 1/2-inch long lag bolt

Site Planning

To ensure safe and durable wiring, router installation 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 routers:

- 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

Tropos routers are radio devices 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, 4.9 GHZ, or 5.8 GHz frequency range.

- Install the unit away from other possible sources of 802.11a/b/g/n 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.

Site Surveys

Due to variations in component configuration, placement, and physical environment, each installation is unique. Before installing routers, 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 orientation—Proper antenna orientation 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.

Power Source

The Tropos 6310 and 6320 routers are powered by power over Ethernet (PoE) input:

- PoE (20-60Vdc)
- 100-277 VAC with external accessory

⚠ **Caution**
Tropos 6310 and 6320 routers use proprietary PoE. The routers are not 802.3af compliant.

Safety

Installing the routers 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 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 Router" on page 21 and "Connecting Data Cables" on page 18 to determine the best strategy for the selected location.


ⓘ **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

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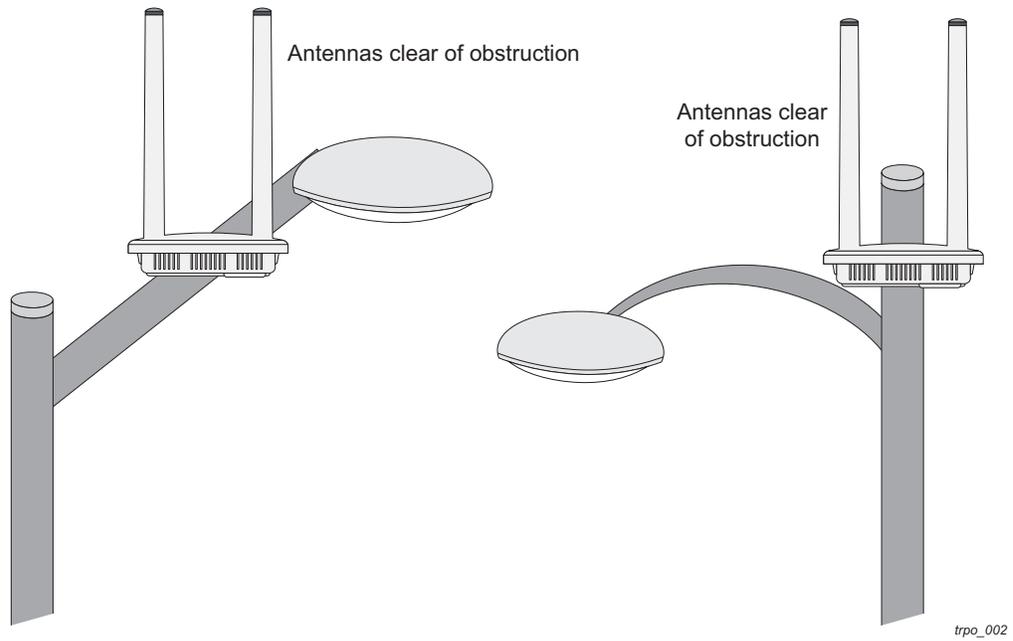
Proper Use of Clamps

The mounting assembly contains a clamp to secure the router to the mounting structure. Figure 3 illustrates the proper use of the clamp. The clamp must be routed through a slot in the pole bracket as shown in the figure, and then attached to the pole and tightened.

The pole bracket should be leveled before it is secured to the pole.

Figure 3 Proper Use of the Clamp
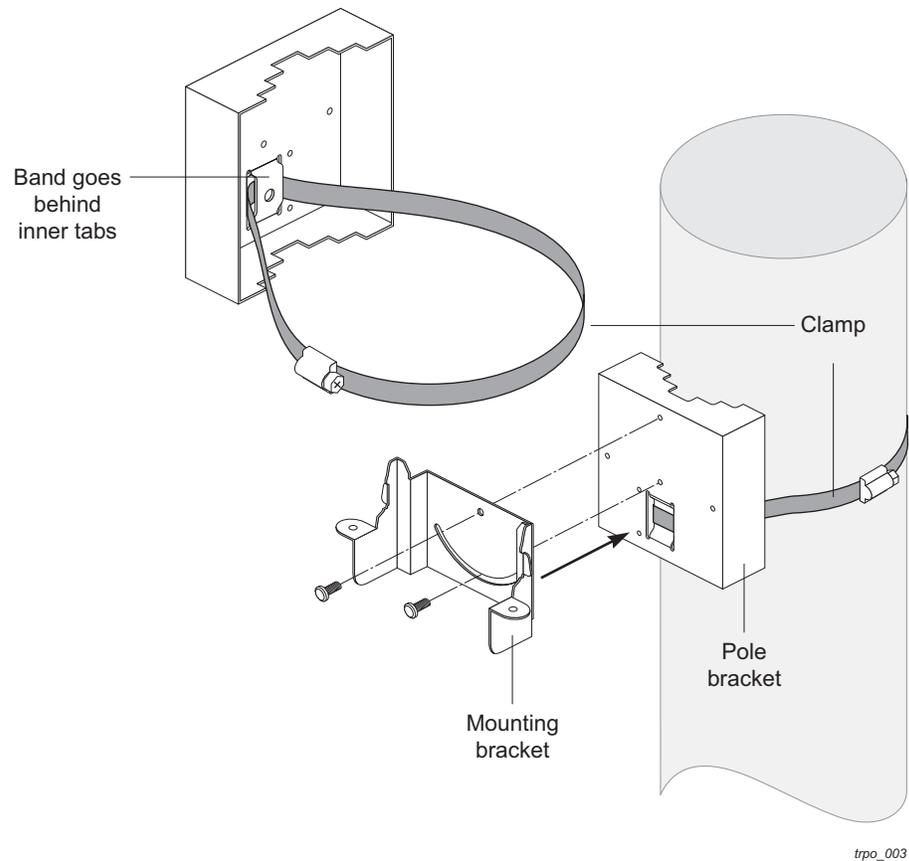
Pole, Tower, and Streetlight Mounting Instructions

This section explains how to mount the 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 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 mounting bracket, as explained in this section. Before mounting the router, review the wiring instructions in "Grounding the Router" on page 21 and "Connecting Data Cables" on page 18 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.
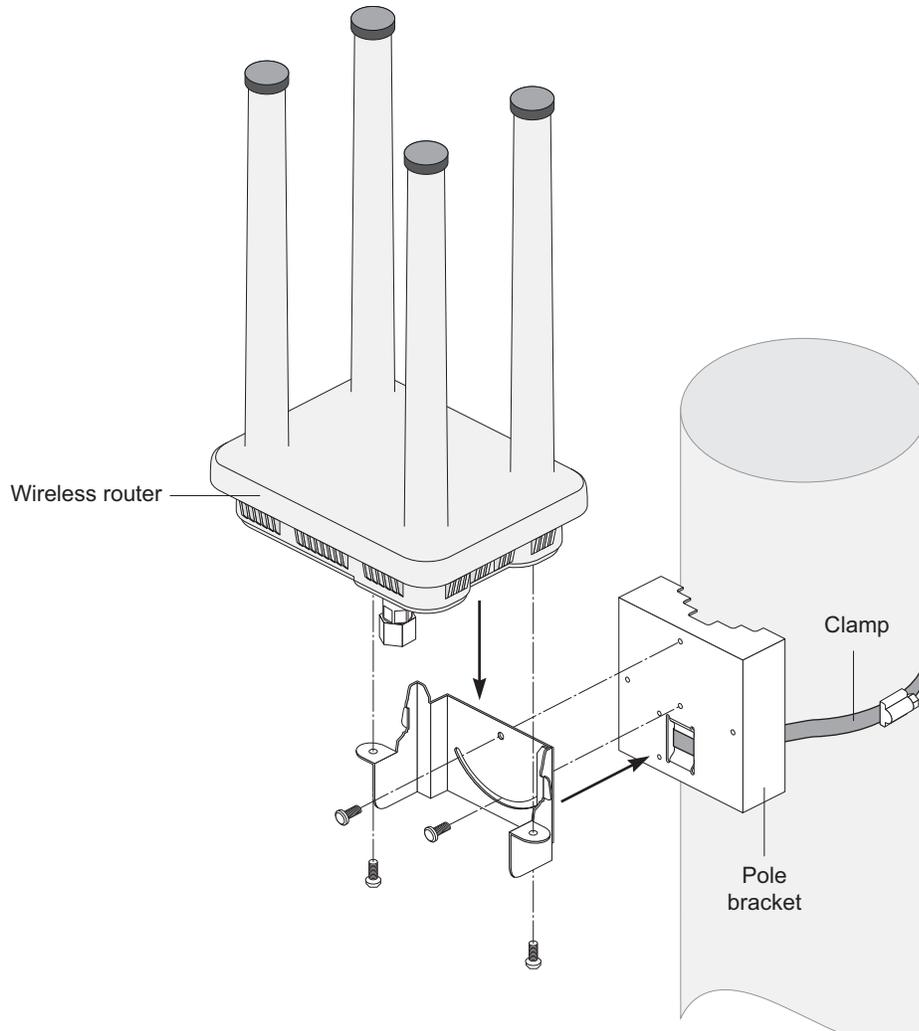
Metal Pole Mounting

Figure 4 illustrates proper mounting for an outdoor metal pole.

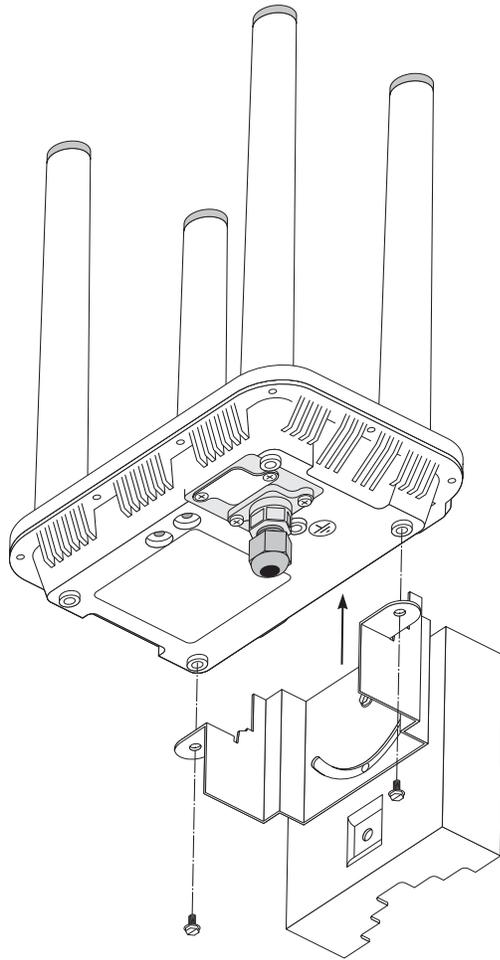---

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

Figure 4 Metal Pole Mounting

Mount the 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 clamp under the inner slot of the pole bracket.

3. Use the clamp to attach the pole bracket to the pole, making sure that it is level. 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 mounting bracket of the router to the pole bracket with two 5/16-inch machine screws (refer to Figure 4 for the correct orientation):

   ■ Insert one screw through the hole at the top of the mounting bracket to the hole at the top of the pole bracket.

   ■ Insert the other screw through the curved slot track in the mounting bracket to the hole in the middle of the pole bracket just above the clamp slot.

5. Level the mounting bracket by rotating the unit along the curved slot tracks. Tighten the screws.

6. Place the upright router onto the top of the mounting bracket, as shown in Figure 5. Secure the mounting bracket to the router by attaching two 5/16-inch machine screws through the holes in the mounting bracket tabs to corresponding holes on the bottom of the router.

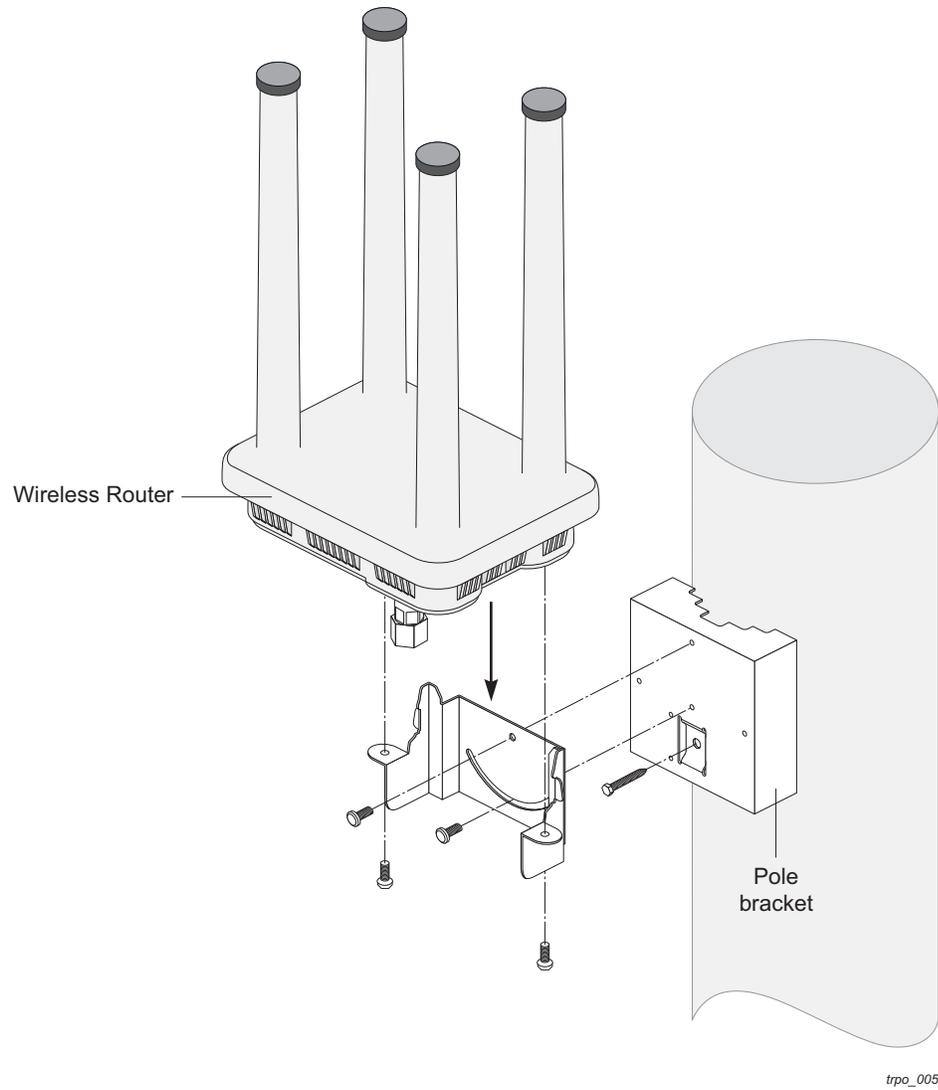**Figure 5 Placing the Router on the Mounting Assembly**

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To continue installing the router, see "Connecting Data Cables" on page 18.

Wood Pole Mounting

Figure 6 illustrates proper mounting for an outdoor wood pole.

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

Figure 6 Wood Pole Mounting

Wireless Router

Pole bracket

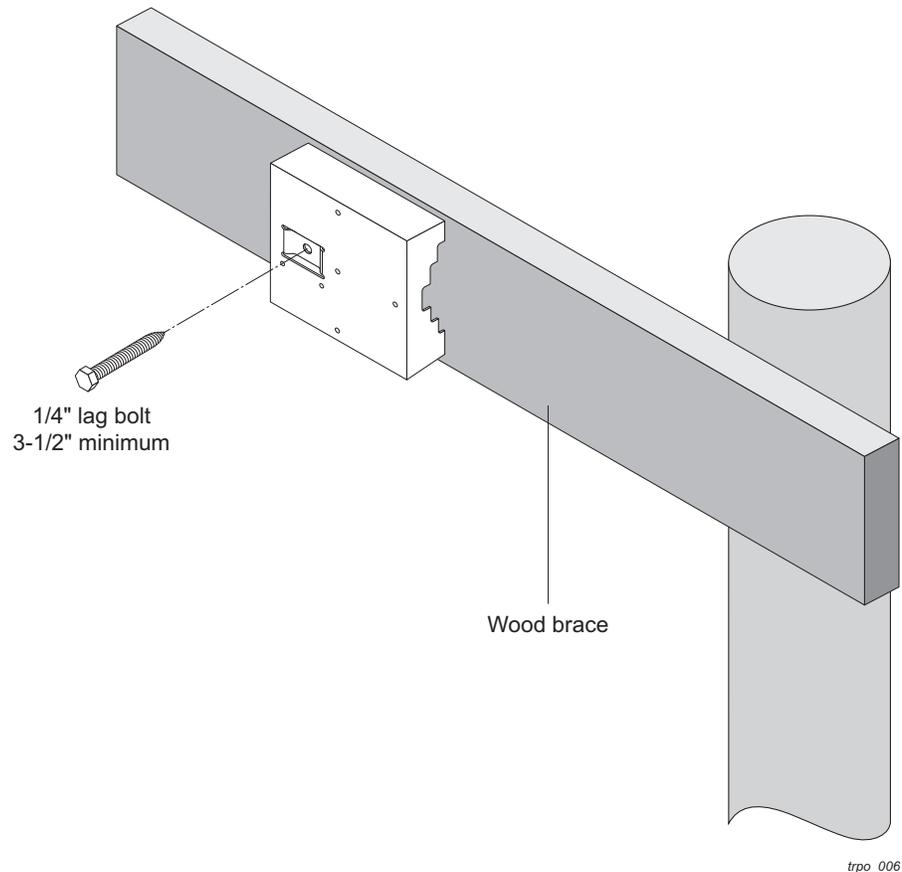*trpo_005*

Mount the 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 pole bracket to the pole by threading a 1/4-inch bolt through the hole in the clamp slot to the pole. The bolt should be at least 3 1/2 inches in length. Make sure that the bracket is level.

3. Attach the mounting bracket of the router to the pole bracket with two 5/16-inch machine screws (refer to Figure 4 for the correct orientation):

   - Insert one screw through the hole at the top of the mounting bracket to the hole at the top of the pole bracket.
   - Insert the other screw through the curved slot track in the mounting bracket to the hole in the middle of the pole bracket just above the clamp slot.

4. Level the mounting bracket by rotating the unit along the curved slot tracks. Tighten the screws.

5. Place the upright router onto the top of the mounting bracket, as shown in Figure 5 on page 12. Secure the mounting bracket to the router by attaching two 5/16-inch machine screws through the holes in the mounting bracket tabs to corresponding holes on the bottom of the router.

To continue installing the router, see "Connecting Data Cables" on page 18.

Wood Brace Mounting

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

Figure 7 Wood Brace Mounting Option

1/4" lag bolt
3-1/2" minimum

Wood brace

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Mount the 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 mounting bracket of the router to the pole bracket with two 5/16-inch machine screws (refer to Figure 4 for the correct orientation):

   ■ Insert one screw through the hole at the top of the mounting bracket to the hole at the top of the pole bracket.

   ■ Insert the other screw through the curved slot track in the mounting bracket to the hole in the middle of the pole bracket just above the clamp slot.

4. Level the mounting bracket by rotating the unit along the curved slot tracks. Tighten the screws.

5. Place the upright router onto the top of the mounting bracket, as shown in Figure 5 on page 12. Secure the mounting bracket to the router by attaching two 5/16-inch machine screws through the holes in the mounting bracket tabs to corresponding holes on the bottom of the router.

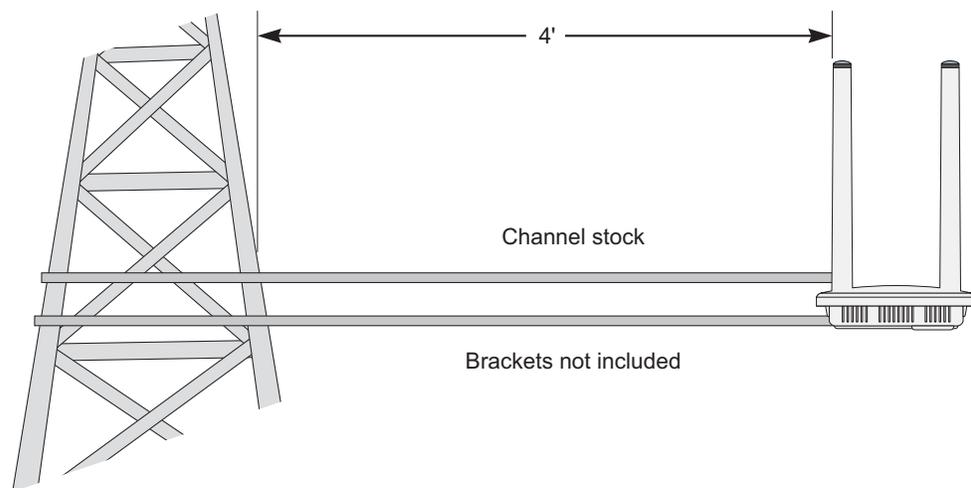To continue installing the router, see "Connecting Data Cables" on page 18.

Tower Mounting

You can mount the router on an outdoor tower.

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

Figure 8 Tower Mounting

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Mount the Tropos router on a tower

1. Remove the pole bracket from the mounting bracket, if they are attached.

2. Make a tower bracket by attaching the mounting bracket directly to any stainless steel or galvanized steel channel stock.

3. Attach the mounting bracket to the tower arm so that the top of the shield is horizontal and level.

4. Tighten the mounting bolts.

5. Place the upright router onto the top of the mounting bracket, as shown in Figure 5 on page 12. Secure the mounting bracket to the router by attaching two 5/16-inch machine screws through the holes in the mounting bracket tabs to corresponding holes on the bottom of the router.

To continue installing the router, see "Connecting Data Cables" on page 18.

Streetlight Mounting

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

Figure 9 Streetlight Mounting

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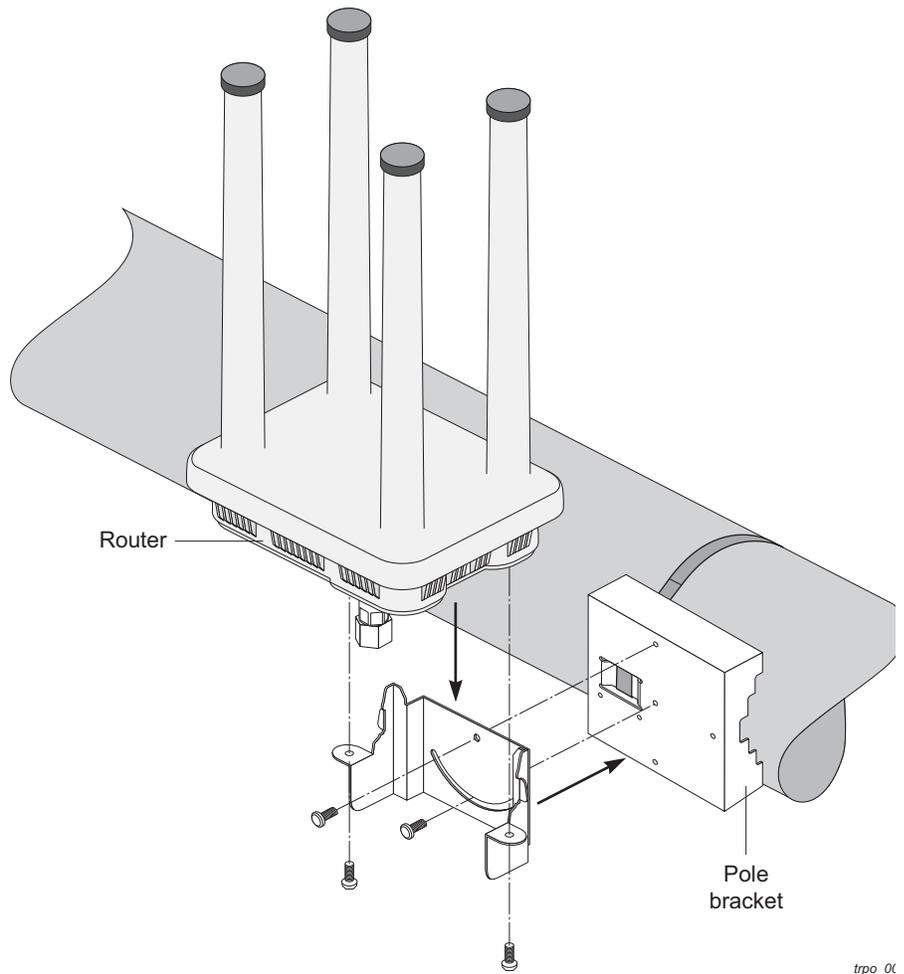
Mount the router on a streetlight

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 clamp under the inner slot of the pole bracket.
3. Use the clamp to attach the pole bracket to the arm, making sure that it is level. Depending upon the diameter of the arm, you may need to use a single small clamp, single large clamp, or pair of large clamps joined together.

4. Attach the mounting bracket of the router to the pole bracket with two 5/16-inch machine screws (refer to Figure 4 for the correct orientation):

   ■ Insert one screw through the hole at the top of the mounting bracket to the hole at the top of the pole bracket.

   ■ Insert the other screw through the curved slot track in the mounting bracket to the hole in the middle of the pole bracket just above the clamp slot.

5. Level the mounting bracket by rotating the unit along the curved slot tracks. Tighten the screws.

6. Place the upright router onto the top of the mounting bracket, as shown in Figure 5 on page 12. Secure the mounting bracket to the router by attaching two 5/16-inch machine screws through the holes in the mounting bracket tabs to corresponding holes on the bottom of the router.

To continue installing the router, see the next section, "Connecting Data Cables."

Connecting Data Cables

The router is equipped with two Ethernet ports that support RJ45 connectors. To provide power to the router as well as wired network connectivity, you must connect an Ethernet cable to the LAN port. Cable connection to the MGT port is used for router configuration.

This section describes how to connect the Ethernet cables.

(i) **Note**

The 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 (-).

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

Connecting the Ethernet cable

1. Have the Ethernet data cable, nut, rubber boots, and cable gland available.

2. Remove the cable gland from the bottom of the router. For power and wired network connectivity, use the LAN port, which is farther from the edge of the router than the MGT port (see Figure 11).

3. Press the tab on the RJ45 connector down as you push the cable through the nut. Make sure that the orientation is consistent with Figure 10.

4. Separate the rubber boot as needed and slide the connector through the boot. Use the boot with the smaller diameter opening, unless the cable is too wide to permit the boot to close completely.

5. Slide the cable through the cable gland, as shown in Figure 10.

Figure 10 Routing the Data/Power Cable to the Router
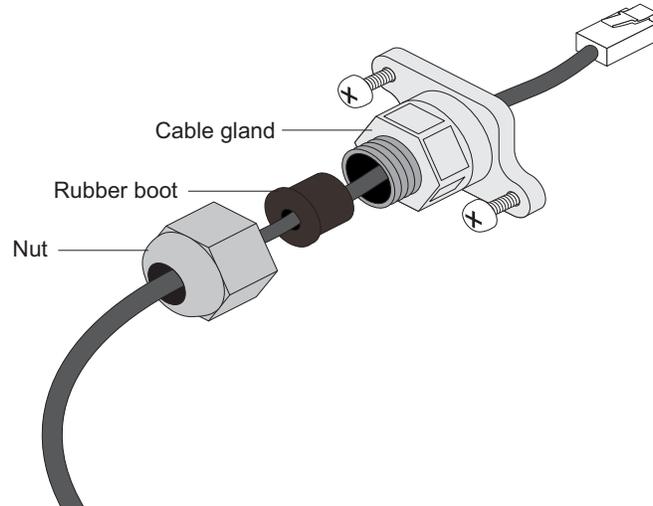
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6. Plug the cable into the appropriate port on the router. For power and wired network connectivity, plug the cable into the LAN port, which is farther from the edge of the router than the MGT port (see Figure 11).

7. Screw the cable gland onto the bottom of the router, and then slide the nut over the rubber boot and screw both tightly to the cable gland. Tighten the nut to ensure a positive water seal. Figure 11 shows how the cable assembly is attached to the bottom of the router.

Figure 11 Data Port Connection
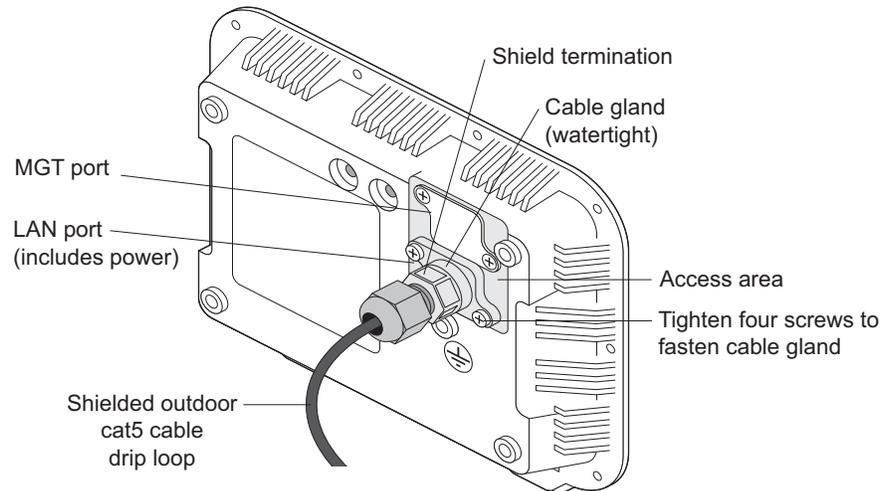

trpo_012

Grounding the Router

⚠ **Caution**
You must install an external grounding wire if the 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 router is shown in Figure 12.

Figure 12 Grounding Arrangement
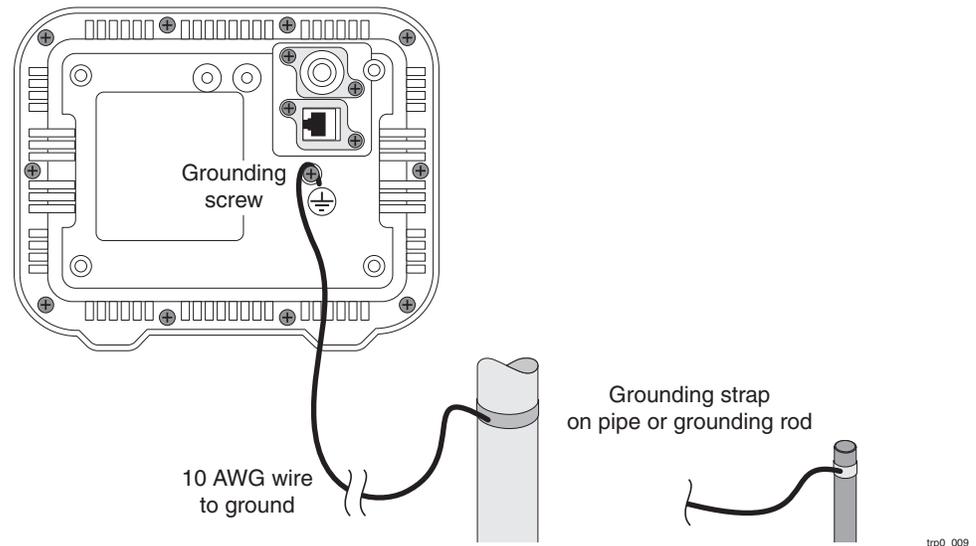
Ground the router

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
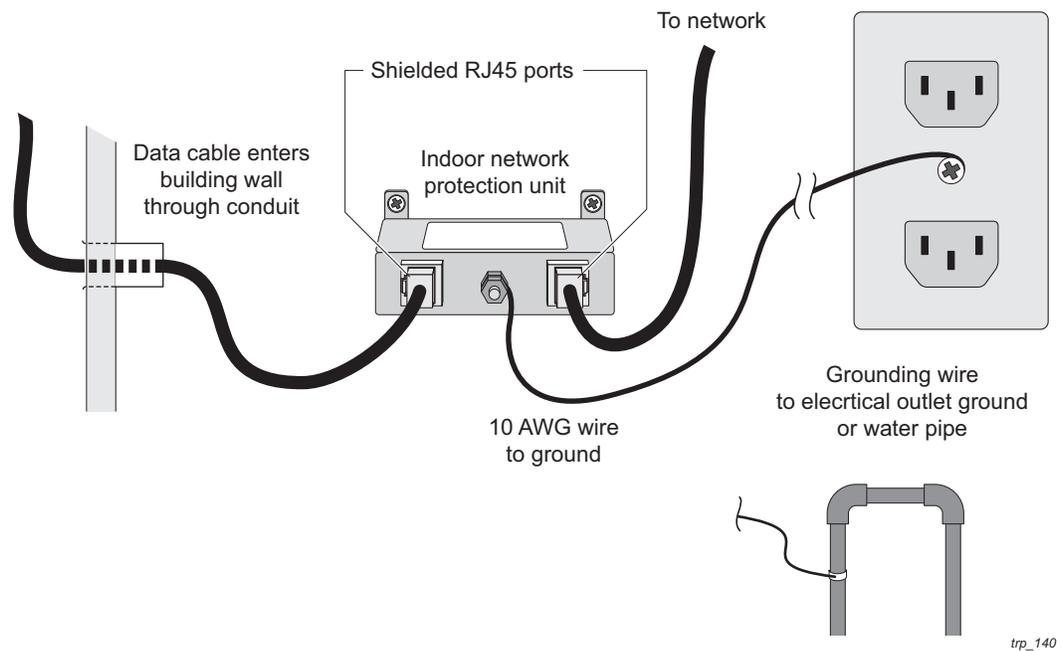
Safety and Servicing Information

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 6310 and 6320 routers meet the uncontrolled environmental limits found in OET-65 and ANSI C95.1, 1991. Proper operation of this device according to the instructions found in this manual and the hardware and software guides on the router results in user exposure that is substantially below the FCC recommended limits.

Safety Guidelines

Follow these guidelines to ensure safe operation of the router:

- Do not touch or move the antennas 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.
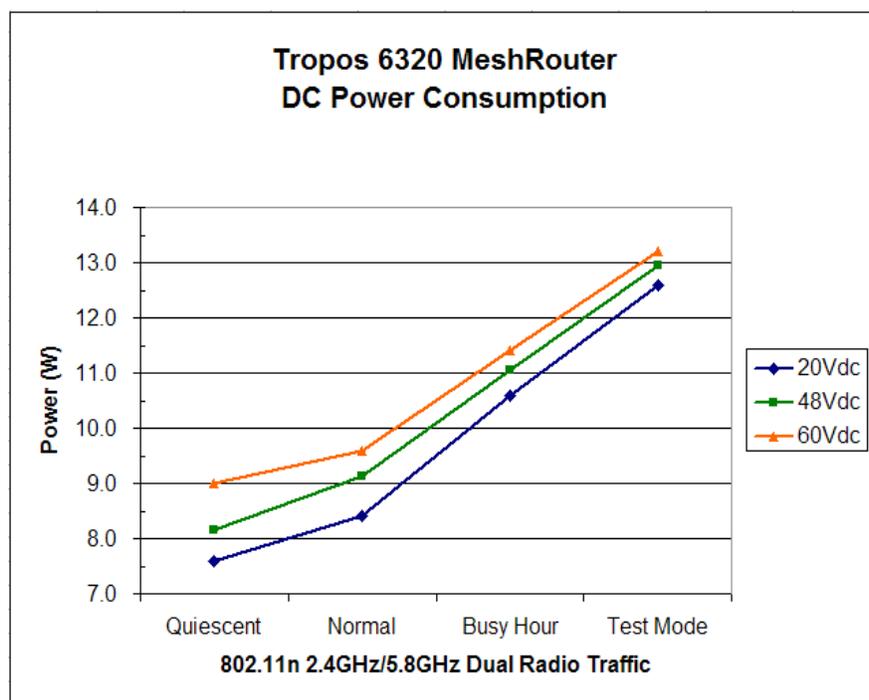
Servicing the Router

The router has no user serviceable parts inside. For any service-related issues, contact Tropos Customer Support (support@tropos.com).

2 Power Consumption

Figure 14 shows router power consumption as a function of traffic load.

Figure 14 6310/ 6320 Power Consumption

3 Product Specifications

The tables in this chapter contain specifications for the Tropos 6310 and 6320 routers:

- "Physical Specifications" on page 25
- "Interfaces" on page 27
- "Power Options / Consumption" on page 30
- "Certifications, Other" on page 30

Table 3 Physical Specifications

Specification	Value
Physical Dimensions	
Inches	Height: 2.5" (6.4cm) without antennas Height: 14.25" (36.2cm) with antennas Width: 8.75" (22.2cm) Depth: 7.25" (18.4cm)
Weight	
lbs - maximum Kg - maximum	4 lbs (1.8 kg) 5 lbs (2.3 kg) with mounting brackets
Mounting	
Mounting Pole Diameter	1" to 10"
Temperature	
Operating Range	Min: -40° C Max: 55° C
Storage Range	Min: -40° C Max: 85° C
Weather	
Weather Rating	IP67 weathertight
Wind Survivability	> 165 mph

Table 3 Physical Specifications (*continued*)

Specification	Value
Wind Loading (165 mph)	< 210 newtons
Projected Area	0.7 sq. ft. (100 sq. in.)
Corrosion Resistance	ASTM B117 Salt Fog rust resistance compliant
Color	
Color	Unpainted metal/White Radome
Shock and Vibration	
Operational:	ETSI 300-19-2-4 Specification T41.E, class 4M3
Transportation:	ISTA 2A
Reliability	
Reliability (MTBF)	505,787 hours demonstrated Field failure rate 1.73%
Status Lamp	
Indicators	Green/Red/Blue

Table 4 Interfaces

Specification	Value
LAN Interface	

IEEE 802.3 10/100BaseT	• Auto sensing
	• Maximum Distance (ft):
	   550 (10BaseT Duplex Setting)
	   300 (100BaseT Duplex Setting)
	• RJ45 connector

MGT Interface	

IEEE 802.3 10/100Base T	• Auto sensing
	• Maximum Distance (ft):
	   550 (10BaseT Duplex Setting)
	   300 (100BaseT Duplex Setting)
	• RJ45 connector

802.11b/g/n Wireless Interface	
Standard	IEEE 802.11b/g/n Wi-Fi

Frequency Range	• 2400 to 2483 MHz ISM Band (CH 1-11) FCC Part 15
	   Models: 63103030, 63203030
	• 2400 to 2500 MHz (CH 1-13) ETSI/EU
	   Models: 63102530, 63202530

Modulation	802.11g/n - OFDM (64-QAM, 16-QAM, QPSK, BPSK) 802.11b - DSSS (DBPSK, DQPSK, CCK)
Rx Sensitivity	-97dBm @ 1 Mbps -95dBm @ 18 Mbps -94dBm @ 5.5 Mbps -92dBm @ 24 Mbps -92dBm @ 11 Mbps -89dBm @ 36 Mbps -96dBm @ 6 Mbps -85dBm @ 48 Mbps -96dBm @ 12 Mbps -84dBm @ 54 Mbps
Tx Power	ETSI/EU 5dBm-20dBm (EIRP) set in 1dB units FCC/IC 19dBm-34dBm (EIRP) set in 1dB units

Table 4 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)
Antennas	Multi-antenna system: 1-TX x 3-RX 6dBi omnidirectional integrated antennas Support for 802.11n MRC
802.11a/n Wireless Interface	
Standard	IEEE 802.11a/n Wi-Fi
Frequency Range	5.725 - 5.850 GHz (FCC/IC) 5.470 - 5.725 GHz (ETSI/EU)
Modulation	OFDM (64-QAM, 16-QAM)
Rx Sensitivity	-92dBm @ 6 Mbps -84dBm @ 24 Mbps -91dBm @ 9 Mbps -81dBm @ 36 Mbps -90dBm @ 12 Mbps -77dBm @ 48 Mbps -87dBm @ 18 Mbps -75dBm @ 54 Mbps
Tx Power	ETSI/EU 15dBm-30dBm (EIRP) set in 1dB units FCC/IC 18dBm-33dBm (EIRP) set in 1dB units

Table 4 Interfaces (*continued*)

Specification	Value
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)
Antennas	Multi-antenna system: 1-TX x 1-RX 8dBi omnidirectional integrated antennas Support for 802.11n

Table 5 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
Power	
Power Input	Power input: PoE (20-60Vdc) 100-277 VAC with external accessory
Power Consumption	10 W typical

Table 6 Certifications, Other

Regulatory Domain	Specification
U.S.	CFR 47 FCC Part 90 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 ⓘ
Canada	Industry Canada RSS210

4   Antenna Information

This chapter provides information on the integrated Tropos antennas:

- *"2.4 GHz Antennas"* on page 32
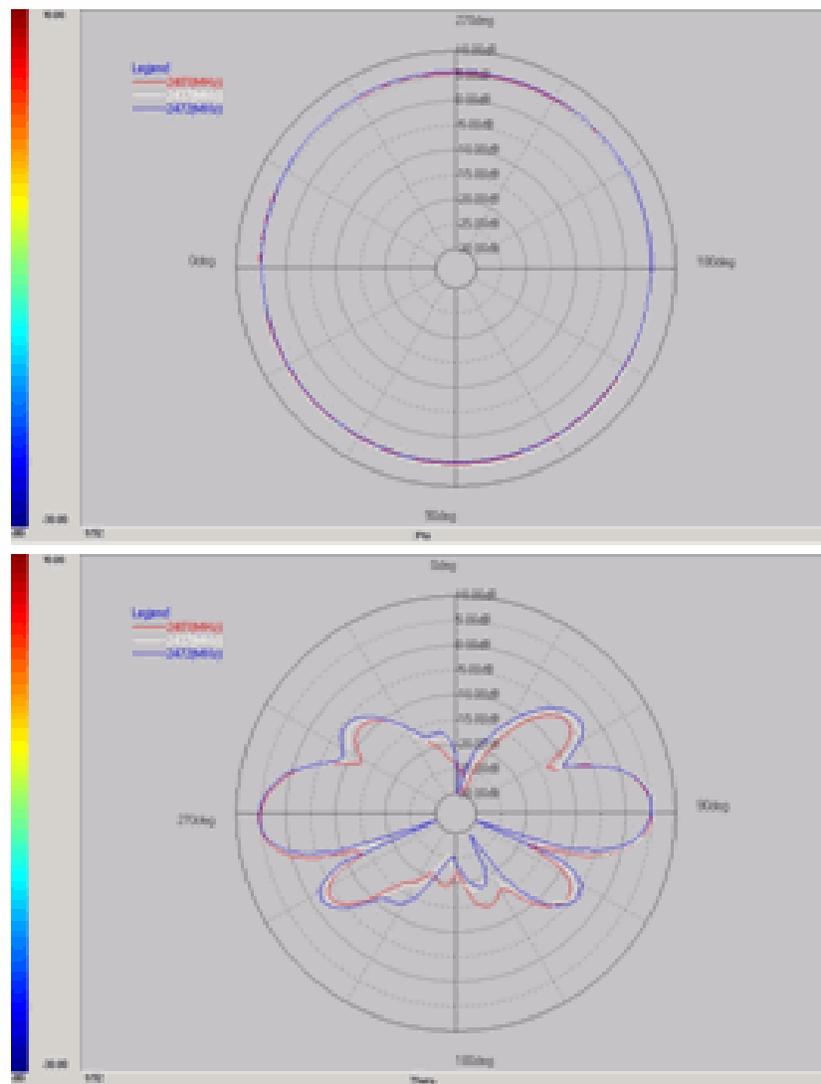- *"5 GHz Antenna"* on page 33

2.4 GHz Antennas

Specifications for the 2.4 GHz antennas:

- Integrated omni antenna
- Length: 11.5" (29.2 cm)
- Average gain azimuth: 5.2dBi
- Peak gain: 6.0 dBi
- Maximum efficiency: 73%

Antenna Patterns are shown in Figure 15.
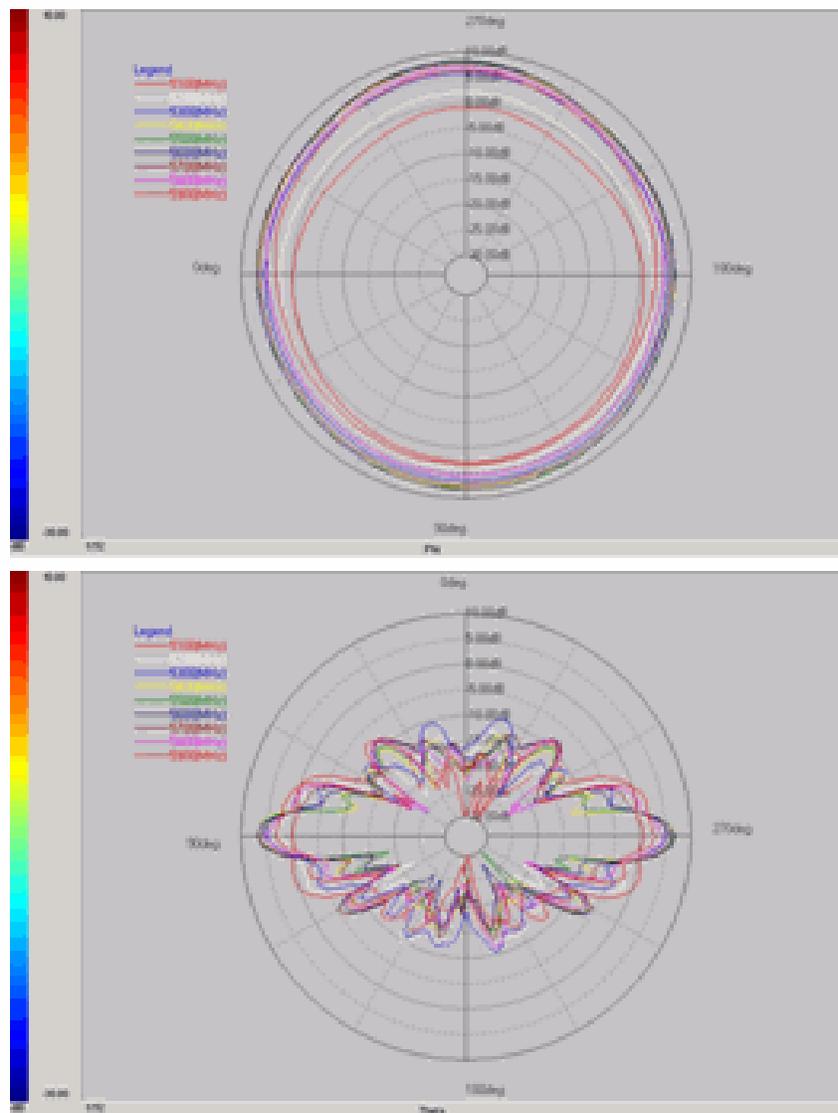
Figure 15 2.4 GHz Antenna Patterns

5 GHz Antenna

Specifications for the 5 GHz antenna:

- Integrated omni antenna
- Length: 10" (25.4 cm)
- Average gain azimuth: 7.0dBi
- Peak gain: 8.0 dBi
- Maximum efficiency: 68%

Antenna Patterns are shown in Figure 16.

Figure 16 5 GHz Antenna Patterns

5   Installation Accessories

This chapter contains accessory ordering information:

Table 7 Installation Accessories

Description	Manufacturer	Part Number	Distributor	Contact Information
Outdoor CAT5 4-Pair Data Cable	Belden	7929A	Anixter	www.anixter.com
	Belden	7921A (recommended)	Anixter	www.anixter.com
	Superior Essex	BBDG	Crossover Distribution	www.crossoverdistribution.com
Cable, CAT5, 8 Conductor, Harsh Environment	Madison Cable	08KFK00013	Tyco	www.madisoncable.com
Data Protection Device	Polyphaser	IX-2H1DC48/W	Polyphaser	www.polyphaser.com
	Hyperlink	HGLN-CAT5-1	Hyperlink	www.hyperlinktech.com
Data and PoE Protection Device	Polyphaser	POLNX4-60	Talley Communications, Inc.	www.talleycom.com
Universal remote control	Universal Remote	MX-500	Amazon	www.amazon.com
PoE PSE 90-264VAC PoE injector	Skynet	SNP-POET 48V SNP-POE9 24V	PowerGate	www.powergatellc.com/
	EnGenius	EBU-101-01	Netgate	www.netgate.com
Pole Power ANSI C136.10 PoE	SB Wireless	SB-POEAPT-2448	SB Wireless	www.sbwireless.com

6   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.

(i)   **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 router weighs approximately 5 lbs, including all mounting hardware. The router can be mounted to the pole portion of the streetlight or to the mast arm portion.

When the 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 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 Tropos routers do not present any significant static or dynamic load to these structures.

Abbreviations

The following acronyms are used in this document.

Table 8 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 8 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
EU	European Union
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

Table 8 Abbreviations (*continued*)

NEC	National Electrical Codes
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

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