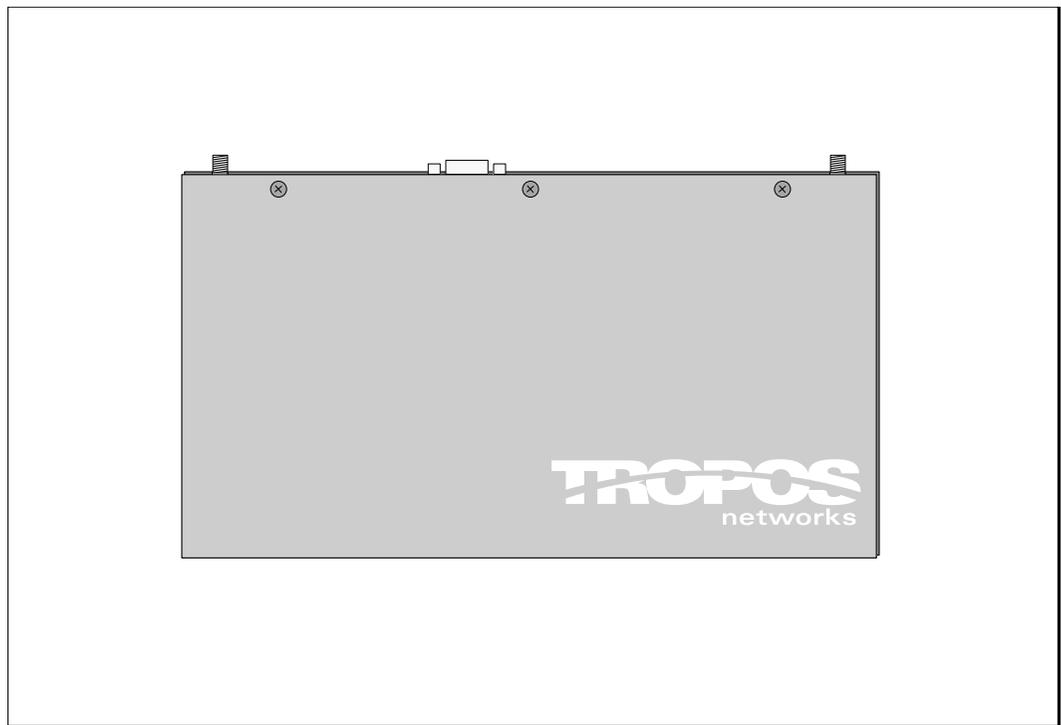


Tropos 3210 Professional Hardware Installation Guide



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Contents

1	Introduction	1
	Notice to Users	1
	FCC Notice to Users and Operators	1
	Taiwan DGT Telecommunications Act Notice to Users and Operators	2
	Antenna Options	3
	FCC Approved Antennas for US and Canada	3
	DGT Approved Antennas for Taiwan	3
	Tropos Wireless Networking	3
2	Pre-Installation Guidelines	6
	Selecting Locations	6
	Basic Guidelines	6
	Installation in Air-Handling Environments	7
	Antenna Options	7
	Site Surveys	7
	Wireless Coverage and Range	7
	RF Planning Guidelines	8
	Preparing for Installation	8
	Unpacking	8
	Items Included with Tropos 3210 Wi-Fi Cell	9
	Required Tools and Supplies for Installation	9
3	Installing the Tropos 3210 Wi-Fi Cell	11
	Wall Mounting Instructions	11
	Connecting Power and LAN	15
4	Operating the Tropos 3210 Wi-Fi Cell	18
	Operational Lights on the Tropos 3210 Wi-Fi Cell	18
	Operating the Wi-Fi Cell	19
	Preparing the Configuration Utility	20

Accessing the Configuration Utility	21
Safety Information for the Tropos 3210 Wi-Fi Cell	22
Guidelines to insure safe operation of the Tropos 3210 Wi-Fi cell.....	22
Use in specific environments	23
Antenna use guidelines	23
Service Instructions	23

1 Introduction

The instructions contained in this guide are intended for a trained technical professional audience. Operational and network configuration information for the Tropos 3210 Wi-Fi cell can be found in the *Tropos Networks Configuration Guide*.

This chapter contains important information about using Tropos equipment, antenna options, and background regarding Tropos wireless networking.

Notice to Users

FCC Notice to Users and Operators

The Tropos 3210 Wi-Fi cell complies with Part 15 of the FCC rules. Operation of the Tropos 3210 Wi-Fi cell 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 of 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 an office environment. This equipment generates, uses and radiates radio frequency energy, and if not installed and used in accordance with the instructions, the device may cause harmful interference. However, there is no guarantee that interference will not occur. 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.

**Caution**

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.

Taiwan DGT Telecommunications Act Notice to Users and Operators

低功率電波輻射性電機管理辦法

第十四條經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十七條低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信規定作業之無線電信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

**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 indoor use only 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.

**Note**

This device must be installed by trained professional, value added reseller or systems integrator who is familiar with RF cell planning issues and the regulatory limits defined by the Taiwan government “Telecommunications Act” for RF exposure, specifically those limits outlined in Telecom Technical Regulations RTTE01 and LP002.

Antenna Options

FCC Approved Antennas for US and Canada

The cell can be configured with one of the following antenna options. (Antennas are ordered separately.)

- AN025004 — Indoor 2.5 dBi omni directional antenna cable attached; SMA (male) connector
- AN040004 — Indoor 4.0 dBi directional patch antenna cable attached; SMA (male) connector

**Note**

The Tropos 3210 Wi-Fi cell must be installed by a trained professional, value added reseller, or systems integrator who is familiar with RF cell planning issues and the regulatory limits defined by the FCC for RF exposure; specifically those limits outlined in sections 1.1307.

DGT Approved Antennas for Taiwan

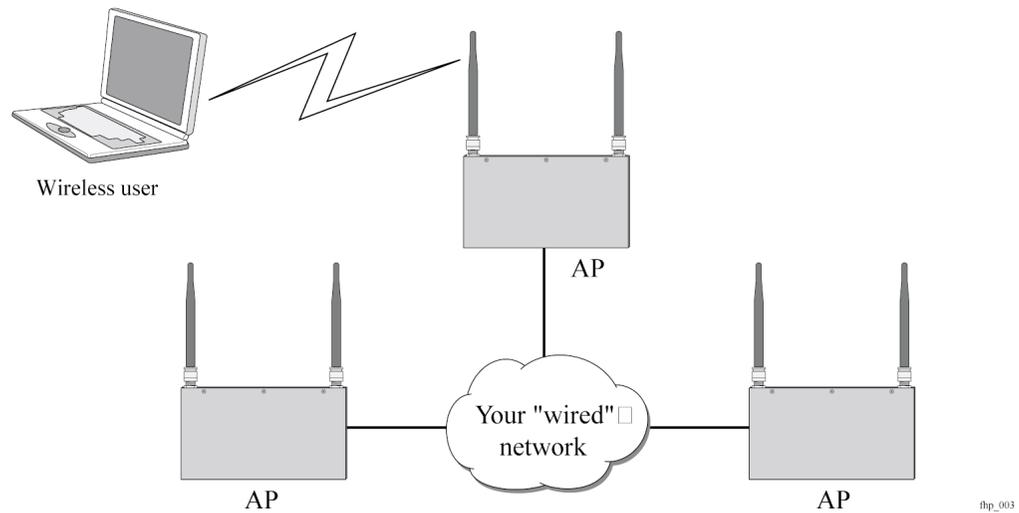
The cell can be configured with one of the following antenna options. (Antennas are ordered separately.)

- AN025004 — Indoor 2.5 dBi omni directional antenna cable attached; SMA (male) connector
- AN040004 — Indoor 4.0 dBi directional patch antenna cable attached; SMA (male) connector

Tropos Wireless Networking

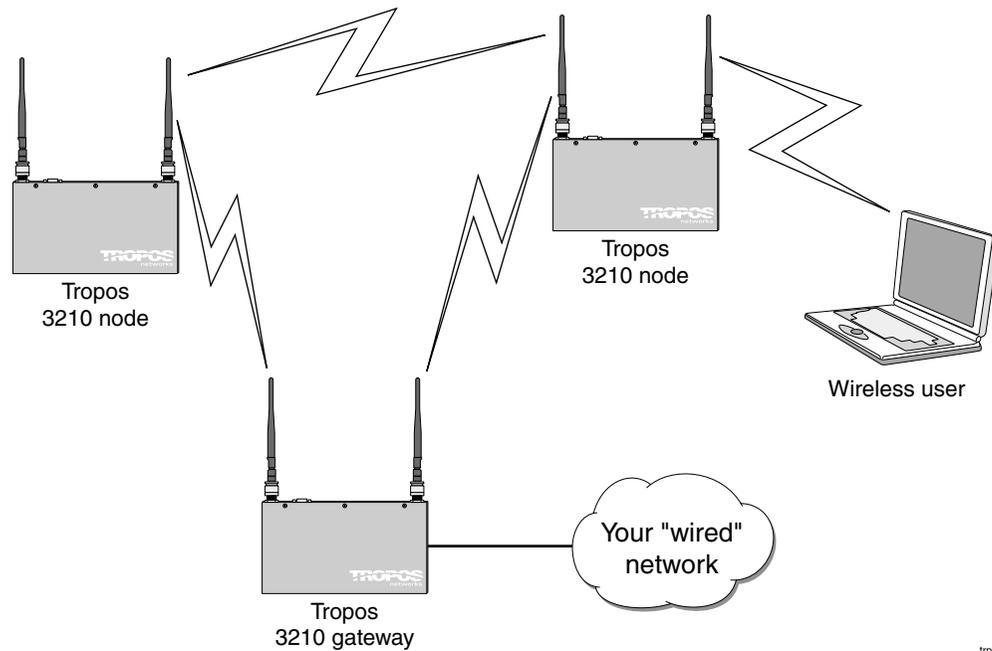
To better understand how a Tropos wireless networking system works, it is helpful to compare it typical 802.11g systems. Typical 802.11g access points must be “hardwired” to your internal network. To install a typical access point, you connect the Ethernet port on the access point to a hub or switch port on your internal network. Each access point acts as an extension to your wired

network by serving as a bridge, connecting clients to your internal network. An sample network is shown in the next figure.



Tropos networks are designed to significantly reduce the wired connectivity requirements of typical 802.11 networks. Only a small number of Tropos Wi-Fi cells, configured as gateways, must be hardwired to your internal network. In fact, for some wireless networks, only one Tropos Wi-Fi gateway may be needed. Additional gateways may be desired provide redundancy and additional bandwidth for larger wireless networks.

Non-wired Tropos Wi-Fi cells (Tropos Wi-Fi nodes) function independently to form large, routed wireless networks. You can expand the wireless network simply by installing and providing power to the Tropos Wi-Fi nodes. Freed from the need to connect every cell to the wired network, you can build large, routed wireless networks covering areas that are traditionally hard to reach. As shown in the next figure, the wireless Tropos Wi-Fi nodes provide service to clients while connecting wirelessly to the Tropos Wi-Fi gateway and on to the wired network.



trp_B004

Tropos Wi-Fi nodes automatically configure themselves to form clusters around each wired gateway. No user intervention is required and no knowledge of routing protocols is necessary to configure your network. Each device needs some basic configuration information (ESSID, WEP Key), but other than that, your wireless network configures itself and performs all routing functions in the background. Even the IP addresses on the wireless network are automatically configured and preset at the factory, enabling true “plug-and-play” network configurations.

**Note**

Refer to the *Tropos Networks Configuration Guide* for complete software configuration information.

Proceed to [Chapter 3, “Installing the Tropos 3210 Wi-Fi Cell,”](#) for complete installation instructions.

2 Pre-Installation Guidelines

This chapter presents guidelines for installing the Tropos 3210 Wi-Fi cell. It includes the following information:

- [Selecting Locations](#)
- [Basic Guidelines](#)
- [Preparing for Installation](#)

Selecting Locations

When installing your Tropos 3210 Wi-Fi cell, keep in mind that 10/100 Base-T Ethernet using category 5 network cabling has a 300 meter distance limitation. The Tropos 3210 Wi-Fi cell Ethernet duplex settings may be configured to operate at 10 Base-T, which has a distance limitation of 370 meters.

Basic Guidelines

Tropos 3210 Wi-Fi cells are radio devices, and as such, they are susceptible to common causes of interference that can reduce throughput and range. To ensure the best possible performance, follow these basic guidelines:

- Install the antennas in an area where trees, buildings, and large steel structures such as shelving units, bookcases, and filing cabinets do not obstruct radio signals to and from the antenna. Locating the antennas for direct line-of-sight operation is best.
- Install the cells away from microwave ovens or other devices operating in the 2.4 GHz frequency range. Microwave ovens operate on the same frequency as the cell and can cause signal interference.
- Install the cells away from other possible sources of 2.4 GHz WLAN interference, such as cordless phones, home spy cameras, frequency hopping (FHSS) and DSSS LAN transceivers (non-802.11g), 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).

Installation in Air-Handling Environments

Tropos 3210 Wi-Fi cells are UL2043 certified which means that they are suitable for use in air-handling spaces.

Antenna Options

Tropos 3210 Wi-Fi cells support external antennas with omni-directional or directional capabilities. Omni-directional antennas are best for systems requiring a signal distribution in more than one direction. High-gain directional antennas are best suited for covering longer distances in a fixed direction.



Note

Only use antennas supplied by Tropos. Operating a cell with a non-qualified antenna may be in violation of FCC Rules Part 15.203(c), Code of Federal Regulations, Title 47.

Site Surveys

Because of differences in component configuration, placement, and physical environment, every network application is a unique installation. Before installing multiple Tropos 3210 Wi-Fi cells, perform a site survey to determine the optimal use of networking components and to maximize range, coverage, and network performance. Consider the following operating and environmental conditions 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 the radio data increases.
- **Antenna type and placement**—Proper antenna configuration is a critical factor in maximizing radio range. As a general rule, range increases in proportion to antenna height and gain.
- **Physical environment**—Clear or open areas provide better radio range than closed or filled areas. Also, 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 between Tropos 3210 Wi-Fi cells. Avoid locating the antennas in a location where there is an obstruction between the sending and receiving antennas.
- **Building materials**—Radio penetration is greatly influenced by the building material used in construction. For example, drywall construction allows greater range than concrete blocks. Metal or steel construction is a barrier to radio signals.

For additional planning information, refer to the *Tropos Networks System Design Guidelines*.

Wireless Coverage and Range

Tropos wireless network operation depends upon multi-hop data transfers across nodes to provide connectivity to a Tropos Wi-Fi gateway. These gateways need to be placed close

enough to each other so that one device can communicate with other Tropos 3210 Wi-Fi cells over the RF wireless interface. However, clustering too many cells together within a small geographic area may create a situation in which the cells are subject to excessive interference. This can adversely affect network performance and throughput.

Each Tropos 3210 Wi-Fi cell should have a partial overlapping coverage area with at least one other cell. As a general rule, placing a Tropos 3210 Wi-Fi cell so that it has partial overlapping coverage area with two other cells provides adequate network redundancy while also mitigating interference.

RF Planning Guidelines

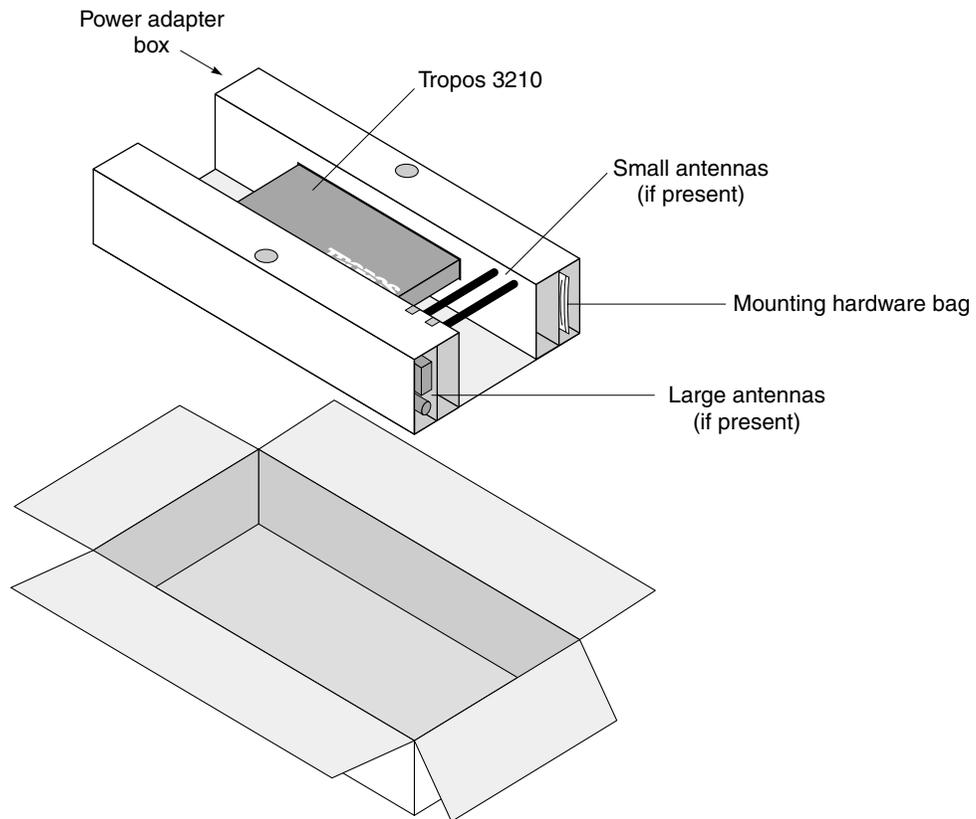
Tropos wireless routing technology is embedded in each Tropos Wi-Fi cell, allowing each cell to work in almost any environment and with a wide range of network topologies. To maximize coverage range, locate the cell in wireless-friendly areas. Try not to place them in areas that can block or interfere with transmission. 802.11g devices transmit in the 2.4 GHz frequency spectrum. This spectrum is shared by devices such as microwave ovens, portable phones, intercom systems and wireless alarm systems. Place each cell in a location at least 15 to 20 feet from any other transmitter to prevent the possibility of interference.

Locating your Tropos 3210 Wi-Fi cells high on a wall or hanging from a ceiling is a good start. This allows transmission over the entire environment or office space with minimal blocking objects. If you are trying to cover an outdoor area from inside a building, place cells in front of non-metallic coated windows, or close to the outside walls of the building.

Preparing for Installation

Unpacking

Carefully unpack the Tropos 3210 Wi-Fi cell shipping box. The power adapter box and the mounting hardware bag are contained in the cardboard holder for the unit, as shown in the next figure. Do not discard the bag or box.



fhp_002

Items Included with Tropos 3210 Wi-Fi Cell

Each Tropos 3210 Wi-Fi cell is shipped with the following items:

- Four 1-inch drywall screws
- Four 1-inch drywall anchors
- Two right angle mounting brackets
- One Tropos 3210 Wi-Fi cell
- One AC/DC power converter, for use at 100 to 240 VAC
- Two antennas (optional)
- One 0.5 ml capsule of Loctite® Threadlocker 242 (used to bond antenna connectors to unit)
- Four #6–32 screws - phillips head
- Four #6–32 screws - tamper-resistant TORX® T10-H

Required Tools and Supplies for Installation

You need the following tools and supplies to complete the Wi-Fi cell installation:

- Phillips-head screwdriver

- Drill with 3/16 inch diameter drill bit
- Stud finder
- Tamper-resistant TORX key driver T10-H (if tamper-resistant TORX screws are used)
- A non-switched, 100 to 240 Volt 15 Amp duplex power outlet within five feet of the Tropos 3210 Wi-Fi cell mounting location
- A wood or plasterboard wall with adequate clearance to mount the Tropos 3210 Wi-Fi cell.



Note

To comply with FCC RF exposure limits, Tropos 3210 Wi-Fi cell dipole antennas should be located at a minimum distance of 7.9 inches (20cm) or more from people.

3 Installing the Tropos 3210 Wi-Fi Cell

This chapter describes how to install the Tropos 3210 Wi-Fi cell, and includes the following information:

- [Wall Mounting Instructions](#)
- [Connecting Power and LAN](#)



Caution

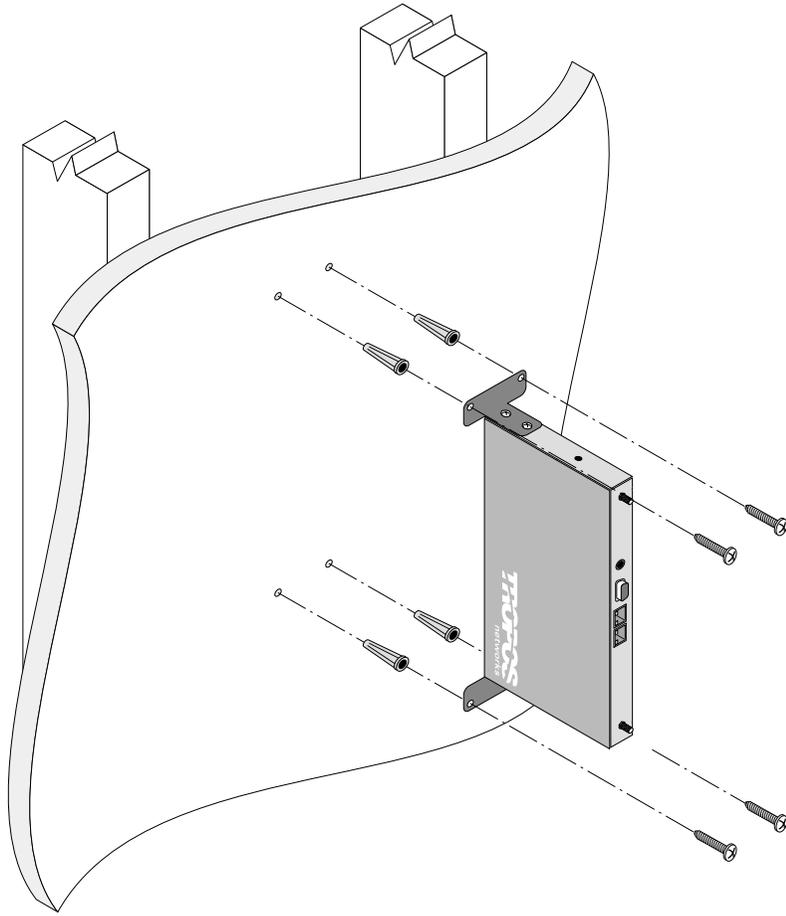
Tropos 3210 Wi-Fi cell dipole antennas should be located at a minimum distance of 7.9 inches (20cm) or more from people. This is the safe distance specified by the FCC for RF exposure limits.

Wall Mounting Instructions

The Tropos 3210 Wi-Fi cell can be wall-mounted in the following three ways:

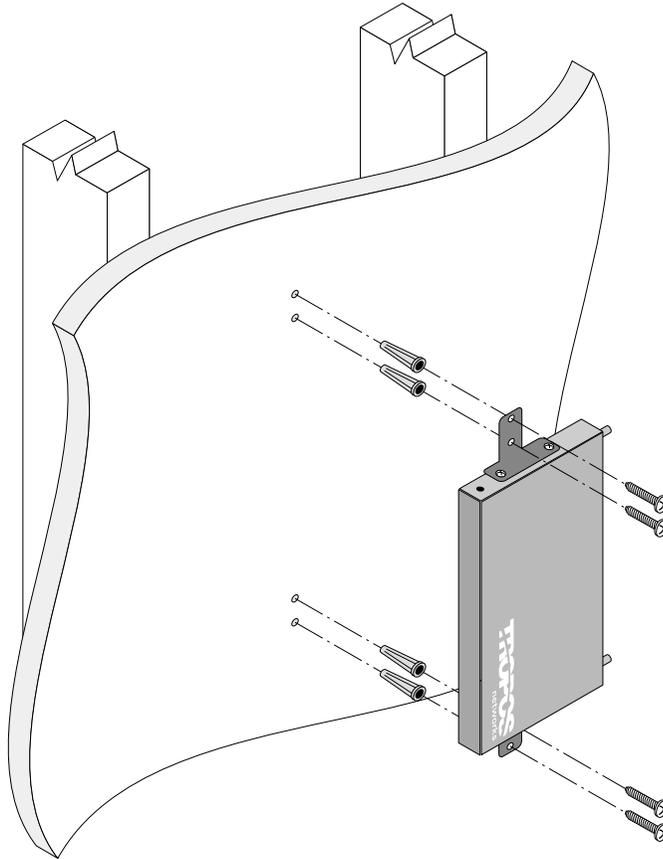
- Edge mounted, as shown in the figure on page 12
- Flat mounted, as shown in the figure on page 13
- Secure mounted, as shown in the figure on page 14

Edge Mounting



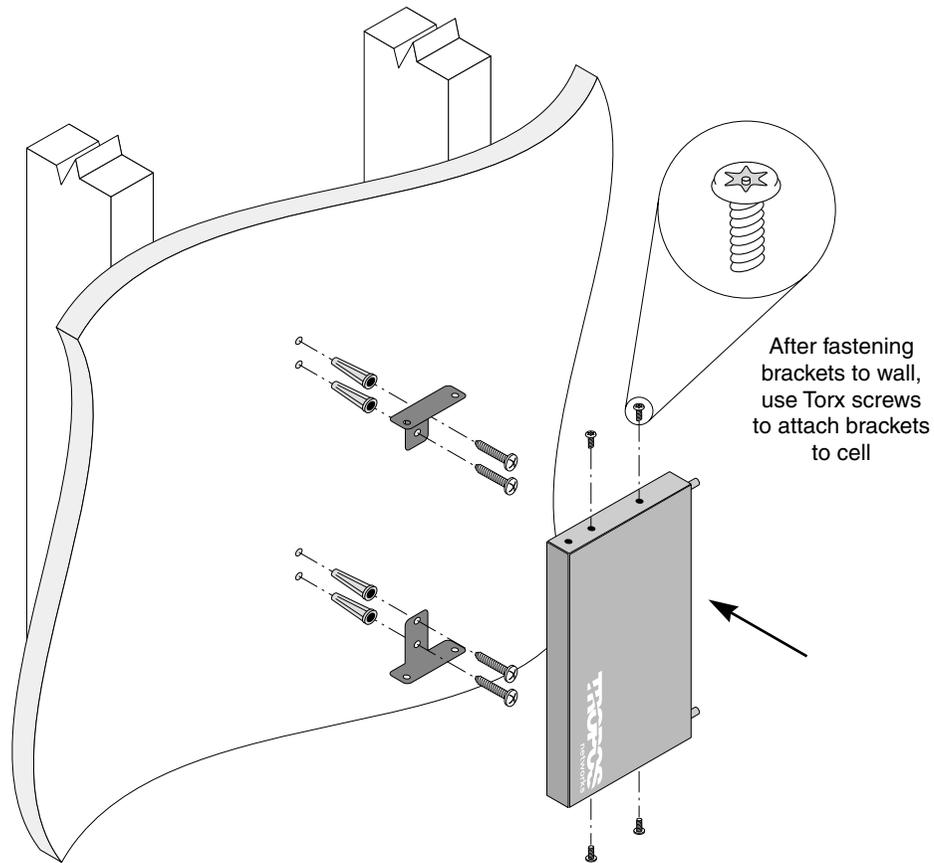
trp_005

Flat Mounting



trp_006

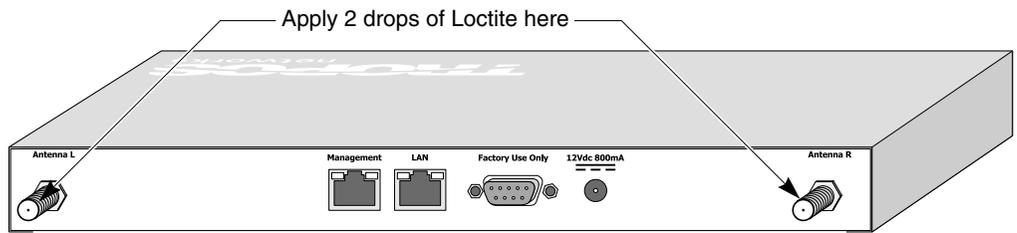
Secure Mounting



To mount Tropos 3210 Wi-Fi cell on a wall

1. Select a mounting orientation for the cell.
2. Locate two studs on the wall using the stud finder. The cell should be mounted midway between the two studs.
3. Drill four holes in the wall to accommodate the mounting brackets.
4. Push the four wall anchors into the four holes.
5. Screw the mounting brackets to the wall.
6. Screw the cell to the mounting brackets.
7. Perform a trial installation of the antennas or antenna cables, depending on your installation.

8. Once you are satisfied with the trial placement of the antennas or antenna cables, remove the antenna connections from the cell and apply two drops of Loctite Threadlocker 242 to the antenna connector thread.



trp_007

9. Install the antenna or antenna cables.

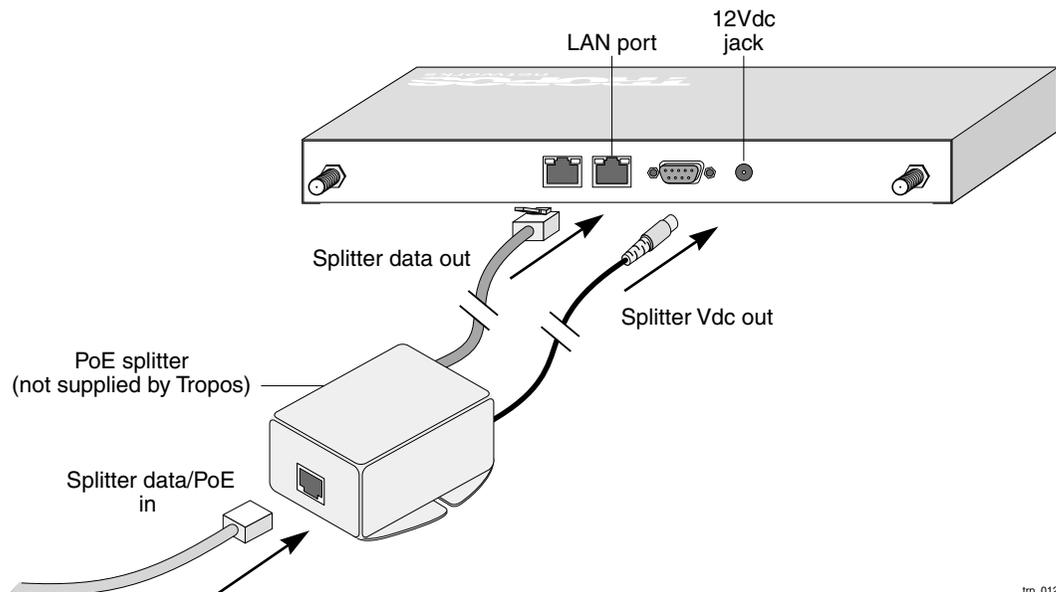
Connecting Power and LAN

The LAN port on your Tropos 3210 Wi-Fi cell is not compatible with the IEEE 802.3af standard. If you plan to use Power over Ethernet (PoE) to power the cell, an external PoE splitter device is required (see the next figure).



Note

When the Tropos 3210 Wi-Fi cell is installed in a plenum or air-handling space, the cables employed should be suitable under NEC article 800-50 and NFPA 262 and marked accordingly, for use in plenums and air-handling spaces with regard to smoke propagation, such as CL2-P, CL3-P, MPP or CMP.



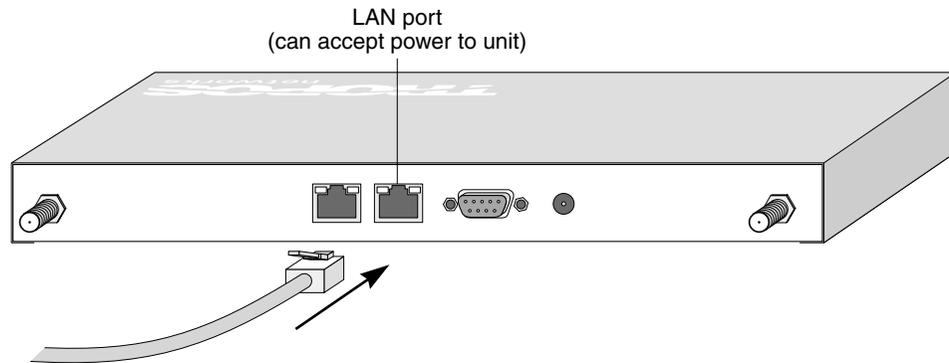
trp_012

**Note**

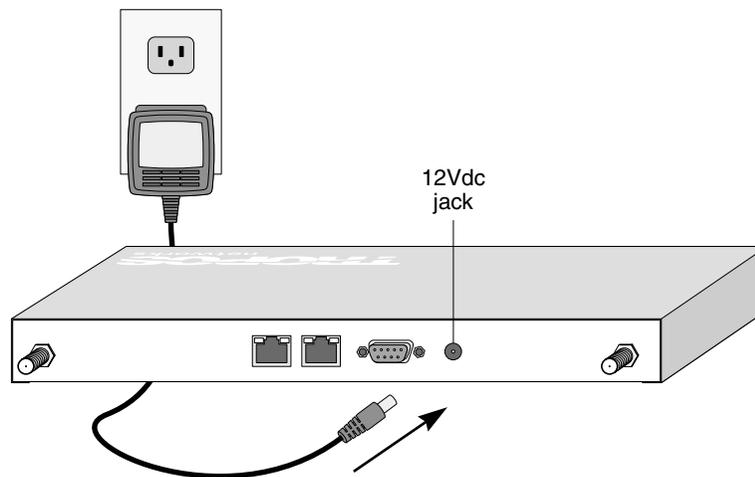
If you use the PoE option, make sure that the power sourcing device is IEEE 802.3 af-compliant.

Follow these steps to connect a Tropos 3210 Wi-Fi cell to your network:

1. Attach a category 5 twisted pair patch cable to the Ethernet port labeled **LAN** on the cell.



2. Connect the other end directly into your PC or laptop or to your internal network. See “Selecting Locations” on page 6 for more information on where to connect the cell to your internal network.
3. If you are not using the PoE option, connect the supplied AC/DC adapter to the cell and plug the power adapter into a standard 100 to 240VAC power outlet, as shown in below. Wait 2 minutes for the cell to boot.





Note

The DB-9 connector marked **Factory Use Only** is a serial port used at the factory to configure settings and software for the Tropos 3210 Wi-Fi cell. It is not necessary to use this port for configuration.

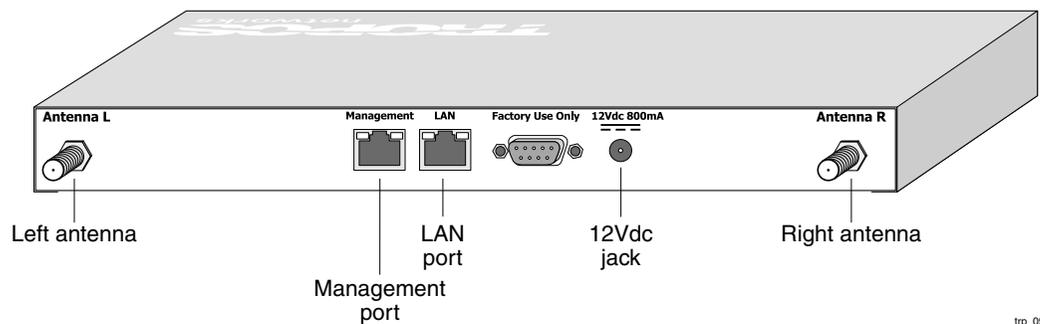
4 Operating the Tropos 3210 Wi-Fi Cell

This chapter contains instructions and information for operating the Tropos 3210 Wi-Fi cell. It contains the following information:

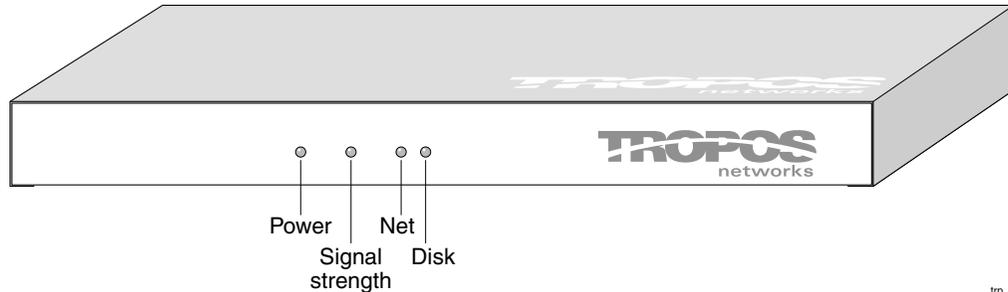
- [Operational Lights on the Tropos 3210 Wi-Fi Cell](#)
- [Operating the Wi-Fi Cell](#)
- [Safety Information for the Tropos 3210 Wi-Fi Cell](#)
- [Service Instructions](#)

Operational Lights on the Tropos 3210 Wi-Fi Cell

The next figure shows the names and locations of the connections found on the front panel of the Tropos 3210 Wi-Fi cell. The panel includes antenna connectors, Reset button, power connection, and Management and LAN ports. The LEDs for the management port and the LAN port show whether connectivity has been established over those ports.



The next figure shows the names and locations of the LEDs found on the rear panel of the Tropos 3210 Wi-Fi cell. The green Power LED is located towards the left, and remains on while the unit is powered. The red signal strength LED shows the strength of the network connection. The Net LED flashes to indicate network traffic, and the Disk LED flashes when the flash boot memory is accessed.



Booting sequence for the Tropos 3210 Wi-Fi cell

1. The green power LED turns on, the signal strength LED remains off.
2. When the Tropos 3210 Wi-Fi cell begins to obtain network settings, the signal strength LED turns solid red.
3. Once the Tropos 3210 Wi-Fi cell has obtained network settings and is fully operational, the red signal strength LED begins flashing, and continues to do so during normal operation.

If there is no connection, the LED is solid red. If there is a connection, the speed of the blinking red light indicates its strength, with faster blinking indicating a stronger connection.

Operating the Wi-Fi Cell

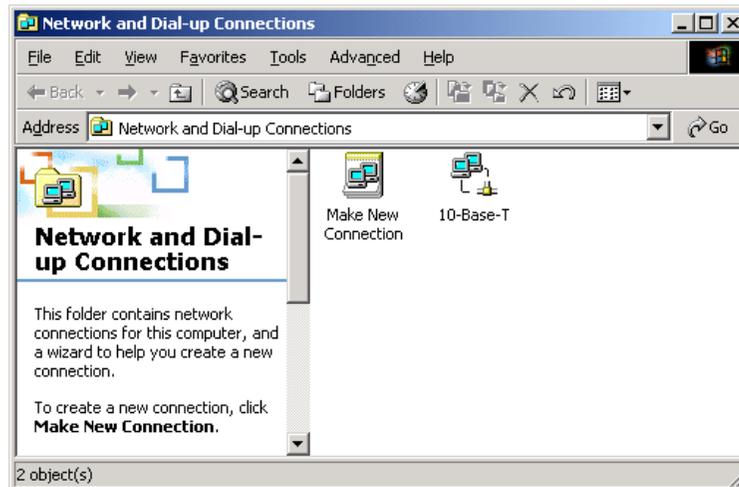
This section describes the steps required to properly configure your Tropos 3210 Wi-Fi cell for use. For complete configuration information, see the *Tropos Networks User Guide*.

Preparing the Configuration Utility

Before you can access the Tropos Configuration Utility, you must set the IP address and subnet mask on your computer, as described in the following steps:

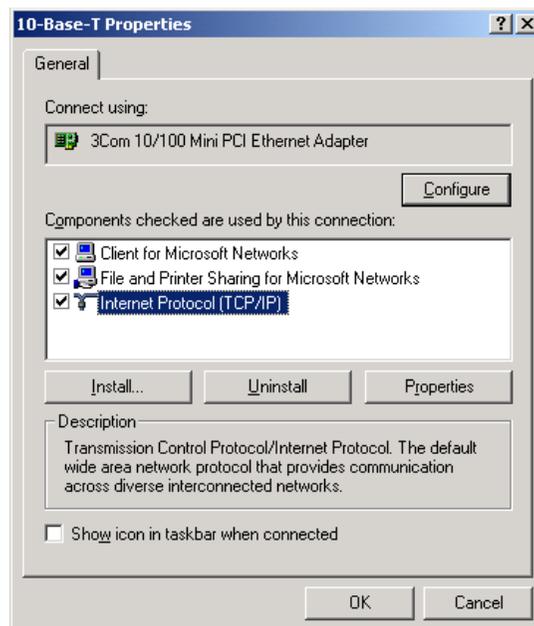
1. From the Start button, select **Setting > Network and Dial-Up Connections**.

The Network and Dial-up Connections folder opens.



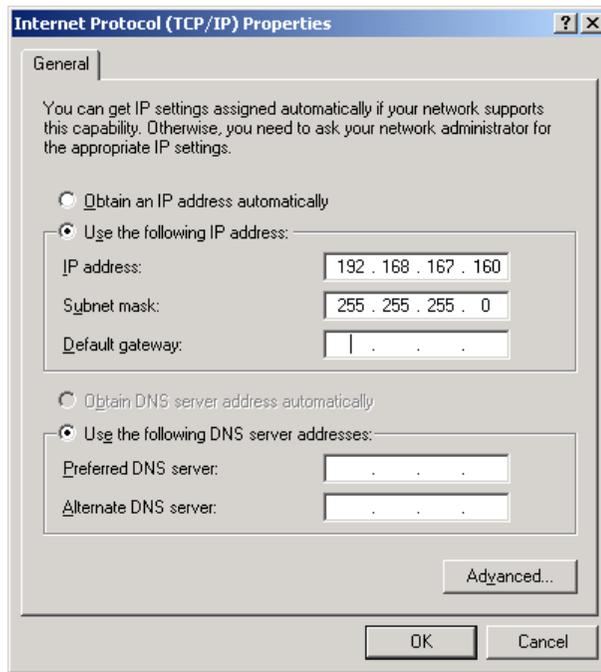
2. Right-click on the Ethernet interface for your PC (for example 10-Base-T).
3. Select **Properties**.

The Properties dialog box for your interface opens.



4. Select **Internet Protocol (TCP/IP)**, and click **Properties**.

The Internet Protocol (TCP/IP) Properties dialog box opens.

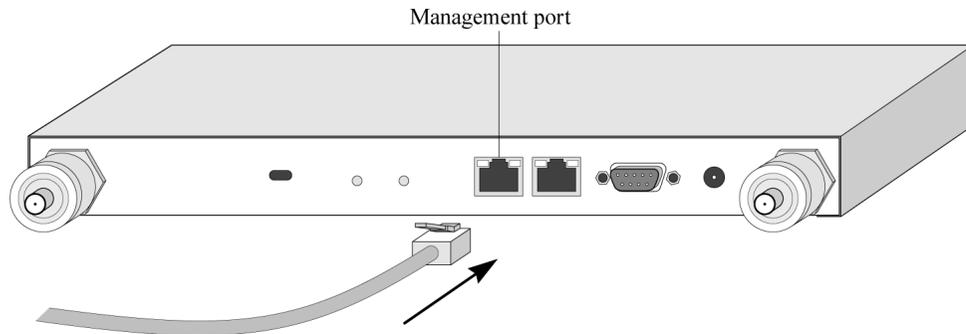


5. Select **Use the following IP address**.
6. In the IP address box, enter **192 . 168 . 167 . 160**
7. In the Subnet mask box, enter **255 . 255 . 255 . 0**
8. Click **OK**.
9. Restart your computer.

Accessing the Configuration Utility

Follow these steps to access the Configuration Utility:

1. Connect your computer to the port marked **Management** on the Tropos 3210 Wi-Fi cell using an IEEE 802.3 RJ-45 **crossover cable**.



fig_010

2. Start a Web browser (Explorer or Netscape) on your PC.
3. In the URL window of the browser, enter the management IP address of the Tropos 3210 Wi-Fi cell: **https://192.168.167.166**
4. When the Enter Network Password dialog box appears, enter the username **admin** and password **tropos**, then click **OK**.



5. Once properly logged in, the Tropos Wireless Configuration Center screen opens.



Note

The first time you log in, you will be prompted to change the wireless routing domain ID. All cells located within the same network must be assigned the same wireless routing domain ID to communicate.

You have now successfully installed your Tropos 3210 Wi-Fi cell. To configure your wireless gateway, refer to the *Tropos Networks Configuration Guide*.

Safety Information for the Tropos 3210 Wi-Fi Cell

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 3210 series 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 3210 Wi-Fi cell result in user exposure that is substantially below the FCC recommended limits.

Guidelines to insure safe operation of the Tropos 3210 Wi-Fi cell

- 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 guidelines

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

Service Instructions

This section contains service information for the Tropos 3210 Wi-Fi cell.



Note

The Tropos 3210 Wi-Fi cell is not configured with user serviceable parts. The following information is intended for trained service personnel only.

The Tropos 3210 Wi-Fi cells have a real-time clock which is powered by a small lithium rechargeable battery. If real-time clock should fail, return the unit to Tropos Networks for servicing.



Warning

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