TRAPEZE NETWORKS

A BELDEN BRAND

MP-622 Installation Guide

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About This Guide

This guide details how to install a Trapeze Networks™ Mobility Point™ (MP™) access point, model MP-622, in a Trapeze Networks Mobility System™ wireless LAN (WLAN). The MP-622 is suitable for installation outdoors.

This guide is intended for network administrators or others involved in installing MP access points in a network

Trapeze Networks Mobility System

The Trapeze Networks Mobility System is an enterprise WLAN solution that seamlessly integrates with an existing wired enterprise network. The Trapeze system provides secure connectivity to both wireless and wired users in large environments such as office buildings, hospitals, and university campuses.

The Trapeze Mobility System fulfills the three fundamental requirements of an enterprise WLAN: it eliminates the distinction between wired and wireless networks, allows users to work safely from anywhere (*secure mobility*), and provides a comprehensive suite of intuitive tools for planning and managing the network before and after deployment, greatly easing the operational burden on IT resources.

The Trapeze Networks Mobility System consists of the following components:

RingMaster tool suite—A full-featured graphical user interface (GUI) application used to plan, configure, deploy, and manage a WLAN and its users

One or more Mobility Exchange™ (MX™) switches—Distributed, intelligent machines for managing user connectivity, connecting and powering Mobility Point (MP) access points, and connecting the WLAN to the wired network backbone

Multiple Mobility Point™ (MP™) access points—Wireless access points (APs) that transmit and receive radio frequency (RF) signals to and from wireless users and connect them to an MX switch

Mobility System Software™ (MSS™)—The operating system that runs all MX switches and MP access points in a WLAN, and is accessible through a command-line interface (CLI), the Web View interface, or the RingMaster GUI

Documentation

The following documents provide information on how to plan, install, configure, and manage a Trapeze Networks Mobility System.

Planning, Configuration, and Deployment

RingMaster Configuration Guide — Instructions for configuring wireless services as well as MX appliances and MPs on a WLAN. Read this guide to learn how to configure a WLAN network.

RingMaster Management Guide — Instructions on how to manage and optimize the entire WLAN with the RingMaster tool suite.

Installation

Mobility Exchange Hardware Installation Guide — Instructions and specifications for installing an MX switch

Mobility System Software Quick Start Guide — Instructions for performing basic setup of secure (802.1X) and guest (WebAAA™) access, and for configuring a Mobility Domain for roaming

Indoor Mobility Point Installation Guide — Instructions and specifications for installing an MP access point and connecting it to an MX.

Mobility Point MP-622 Installation Guide (this document) — Instructions and specifications for installing the MP-622 access point and connecting it to an MX.

Regulatory Information— Important safety instructions and compliance information that you must read before installing Trapeze Networks products.

Configuration and Management

RingMaster Publication Suite — Instructions for planning, configuring, deploying, and managing the entire WLAN with the RingMaster tool suite

Mobility System Software Configuration Guide — Instructions for configuring and managing the system through the MSS CLI.

Mobility System Software Command Reference — Functional and alphabetic reference to all MSS commands supported on MX appliances and MPs.

Trapeze Documentation Conventions

Safety and Advisory Notices

The following types of safety and advisory notices appear in this guide.

This situation or condition can lead to data loss or damage to the product or other property.

This information is of special interest.

Hypertext Links

Hypertext links appear in Blue.

As an example, this is a link to **Contacting the Technical Assistance Center**.

Text and Syntax Conventions

Trapeze guides use the following text and syntax conventions:

Convention	Use
Monospace text	Sets off command syntax or sample commands and system responses.
Bold text	Highlights commands that you enter or items you select.
Italic text	Designates command variables that you replace with appropriate values or highlights publication titles or words requiring special emphasis.
Bold italic text font	***Bold italic text font*** in narrative, capitalized or not, indicates a program name, function name, or string.
Menu Name > Command	Indicates a menu item. For example, **File > Exit** indicates that you select **Exit** from the **File** menu.
[ ] (square brackets)	Enclose optional parameters in command syntax.
{ } (curly brackets)	Enclose mandatory parameters in command syntax.
| (vertical bar)	Separates mutually exclusive options in command syntax.

For information about Trapeze support services, visit http://www.trapezenetworks.com/supportportal/, or call 1-866-877-9822 (in the US or Canada) or +1 925-474-2400.

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Within the US and Canada, call 1-866-TRPZTAC (1-866-877-9822).

Within Europe, call +31 35 64 78 193.

From locations outside the US and Canada, call +1 925-474-2400.

In non-emergencies, send e-mail to support@trapezenetworks.com

If you have a service contract or are a Trapeze Authorized Partner, log in to http://www.trapezenetworks.com/supportportal/ to create a ticket online.

TAC Response Time

TAC responds to service requests as follows:

Contact method	Priority	Response time
Telephone	Emergency	One hour
	Non-emergency	Next business day
E-mail	Non-emergency	Next business day

Information Required When Requesting Service

To expedite your service request, please have the following information available when you call or write to TAC for technical assistance:

Your company name and address

Your name, phone number, cell phone or pager number, and e-mail address

Name, model, and serial number of the product(s) requiring service

Software version(s) and release number(s)

Output of the ***show tech-support*** command

Wireless client information

License levels for RingMaster™ and Mobility Exchange™ (MX™) products

Description of any problems and status of any troubleshooting effort

Warranty and Software Licenses

Current Trapeze Networks warranty and software licenses are available at http://www.trapezenetworks.com/support/warranty.

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MP-622 Overview

A Trapeze Networks Mobility Point (MP) model MP-622 provides IEEE 802.11 wireless access to the network. MP access points are designed for use with a Trapeze Networks Mobility Exchange (MX). MPs require hardware installation only. All configuration for an MP is performed on the MX.

Installation must be performed by qualified service personnel only. Read and follow all warning notices and instructions marked on the product or included in the documentation.

Before installing the product, read the *Regulatory Information* document. The Trapeze Regulatory Information document is located at: **http://www.trapezenetworks.com/support/contact_support/** and can be downloaded in PDF format.

The MP radios are disabled by default and can be enabled only by a system administrator using the MX.

Hardware Overview

The MP-622 provides only external antenna options and is designed to operate as the “root bridge” in point-to-multipoint configurations, supporting wireless bridge connections to as many as six units. The MP is housed in a weatherproof enclosure for mounting outdoors and includes brackets for attaching to a wall, pole, radio mast, or tower structure. The unit is powered through an Ethernet cable connection from a power injector module installed indoors.

A wireless bridge system offers a solution for connectivity between remote Ethernet wired LANs, or to provide Internet access to an isolated site where a wired link may be difficult or expensive to deploy. The wireless bridge connection provides data rates of up to 54 Mbps.

Radio Characteristics

The IEEE 802.11a and 802.11g standards use a radio modulation technique known as Orthogonal Frequency Division Multiplexing (OFDM), and a shared collision domain (CSMA/CA). The 802.11a standard operates in the 5 GHz Unlicensed National Information Infrastructure (UNII) band, and the 802.11g standard in the 2.4 GHz band.

IEEE 802.11g includes backward compatibility with the IEEE 802.11b standard. IEEE 802.11b also operates at 2.4 GHz, but uses Direct Sequence Spread Spectrum (DSSS) and Complementary Code Keying (CCK) modulation technology to achieve a communication rate of up to 11 Mbps.

The MP-622 provides a 54 Mbps half-duplex connection for each active channel.

Package Checklist

The MP-622 package includes:

One MP-622 Mobility Point (MP)

XPS-6201-OUT or XPS-6202-OUT

Optional: Lightning protector for outdoor antenna

Contact Trapeze Networks if there are any incorrect, missing or damaged parts. If possible, retain the carton, including the original packing materials. Use them again to repack the product in case there is a need to return it.

External Hardware Features

Figure 1–1. MP Access Point Model MP-622—Bottom View

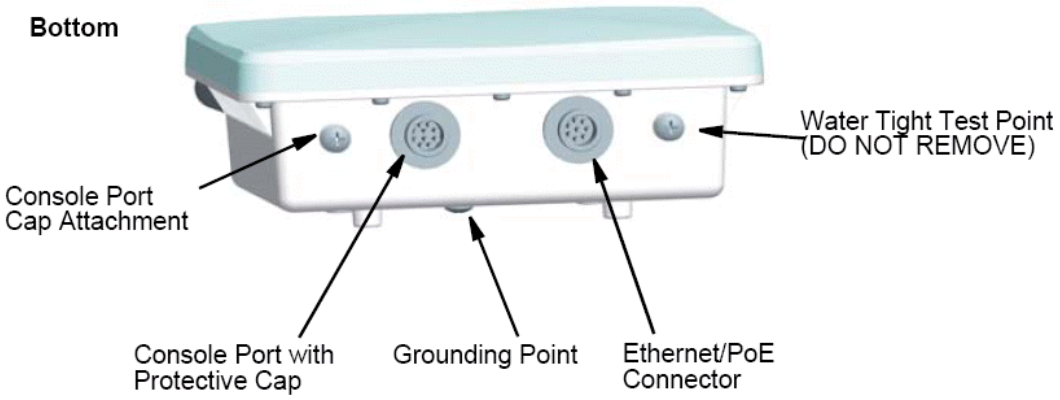
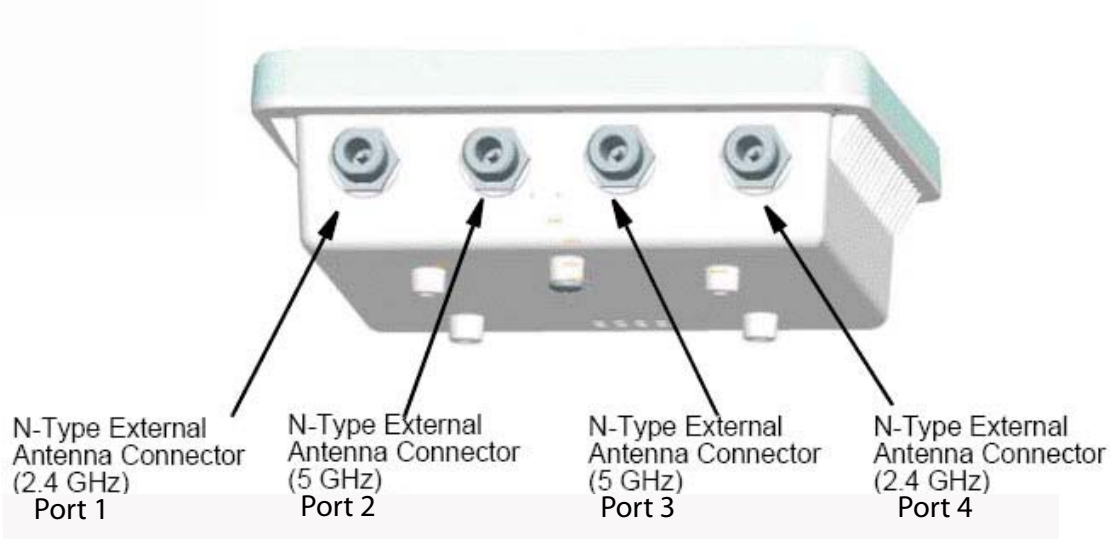
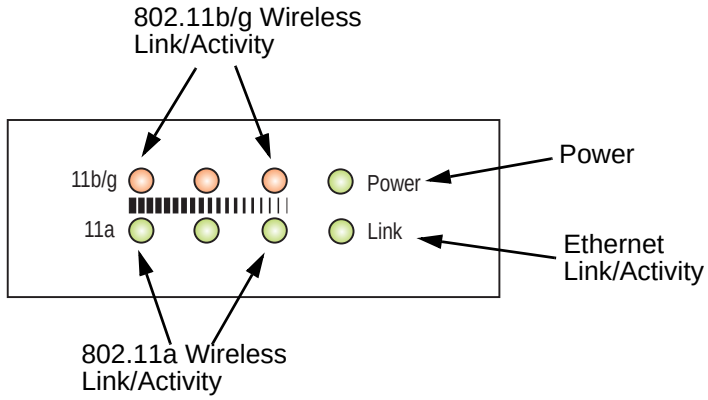


Figure 1–2. Access Point Model MP-622—Top View. Antenna ports are numbered from the left 1 to 4.



LED Indicators

The LEDs are used for RSSI signal strength measurements to aim directional antennas and to indicate the state of the AP. The access point includes eight status LED indicators, as shown below. The LEDs are viewed right to left as you look at the back of the MP.



The table below describes the system status LEDs.

LED	Status	Description
Power	Green	Indicates that the system is working normally.
	Amber	Indicates a system reset.
	Off	The bridge is not receiving power or there is a fault with the power supply.
Link	Green	Indicates a valid 10/100 Mbps Ethernet cable link with no activity.
	Flashing Green	Indicates that the access point is transmitting or receiving data on a 10/100 Mbps Ethernet LAN. Flashing rate is proportional to network activity.
	Off	No link is present or the Ethernet LAN port is disabled.

The 11a and 11b/g LEDs operate in two display modes, which are configurable through the management interface. The RSSI mode is for aligning antennas in a bridge link. The AP mode is for indicating data traffic rates.

The table below describes the wireless status LEDs in AP mode.

LED	Status	Description
11a (three LEDs)	Slow Flashing Green	The 802.11a radio is enabled with a low level of network activity.
	Fast Flashing Green	Indicates a medium level of network activity.
	Green	Indicates a high level of network activity.
	Off	No signal detected or the 802.11a radio is disabled.
11b/g (three LEDs)	Slow Flashing Amber	The 802.11b/g radio is enabled with a low level of network activity.
	Fast Flashing Amber	Indicates a medium level of network activity.
	Off	No signal detected or the 802.11b/g radio is disabled.

The table below describes the wireless status LEDs in RSSI mode.

LED	Status	Description
11a (three LEDs)	Off	No signal detected or the 802.11a radio is disabled.
	Slow Flashing Green	The 802.11a radio is enabled with a low level signal.
	Fast Flashing Green	Indicates a medium level signal.
	On Green	Indicates a high level signal.
11b/g (three LEDs)	Off	No signal detected or the 802.11b/g radio is disabled.
	Slow Flashing Green	The 802.11b/g radio is enabled with a low level signal.
	Fast Flashing Green	Indicates a medium level signal.

External Antenna Options

The AP bridge provides various external antenna options for both 5 GHz and 2.4 GHz operation. In a point-to-multipoint configuration, an external high-gain omnidirectional, sector, or high-gain panel antenna can be attached to communicate with bridges spread over a wide area. The MP-622 unit requires an omnidirectional or sector external antenna for 2.4 GHz operation.

The MP-622 supports one or two antennas per radio. If there are two antennas connected to the radio then antenna diversity is used to send all traffic types. If there is one antenna then proper operations of antenna diversity may be affected.

By default there is one external antenna so there will be no use of antenna diversity for MPs with external antennas defined.

set ap num radio num external-antennas num

This is a new command, and it is only supported in MSS 7.1 or higher.

The MP-622 supports one or two antennas per radio. If there are two antennas they must be the same antenna model. A single antenna will always be connected to the connector 1 for 2.4 GHz and connector 3 for 5Ghz.

The MP-622 supports four antenna ports, two for the 11a radio and two for the 11bg radio. The supported antennas models are:

802.11bg Radio

- ANT-1120-OUT
- ANT-1360-OUT

802.11a Radio

- ANT-5120-OUT
- ANT-5360-OUT
- ANT-5PNL-OUT (for single antenna only for use on port 3)

External antennas connect to the N-type RF connectors on the wireless bridge either directly or using coaxial cables.

Ethernet Port

The wireless bridge has one 10BASE-T/100BASE-TX 8-pin DIN port that connects to the power injector module using the included Ethernet cable. The Ethernet port connection provides power to the wireless bridge as well as a data link to the local network.

The wireless bridge appears as an Ethernet node and performs a bridging function by moving packets from the wired LAN to the remote end of the wireless bridge link.

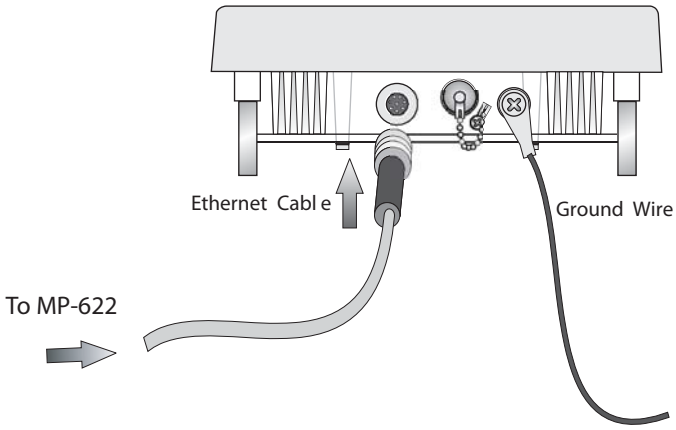
The power injector module does not support Power over Ethernet (PoE) based on the IEEE 802.3af standard. The wireless bridge unit must always be powered on by being connected to the power injector module.

Power Injector Module

The MP-622 receives power through the network cable connection using Power-over-Ethernet (PoE) technology. An outdoor power injector module is available seperately and provides two RJ-45 Ethernet ports, one for connecting to the MP-622 (PoE Output), and the other for connecting to an MX or a local LAN switch Data (Input).

The Input port uses an MDI (i.e., internal straight-through) pin configuration. You can therefore use straight-through twisted-pair cable to connect this port to most network interconnection devices such as a switch or router that provide MDI-X ports. However, when connecting the access point to a workstation or other device without MDI-X ports, you must use crossover twisted-pair cable.

Figure 1–3. Power Injector Module



The MP-622 does not have a power switch. It is powered on when the Ethernet port is connected to the power injector module, and the power injector module is connected to an AC power source.

The power injector module automatically adjusts to any AC voltage between 100-240 volts at 50 or 60 Hz. No voltage range settings are required.

The power injector module is designed for indoor or outdoor use.

Grounding Point

In order for the MP-622 includes a built-in lightning protector to work properly, the unit must be properly connected to ground. A grounding screw is provided for attaching a ground wire to the unit.

Water Tight Test Point

Do not remove or loosen this screw. If you do, you can damage the unit.

Wall- and Pole-Mounting Bracket Kits

The MP-622 includes bracket kits that can be used to mount the unit to a wall, pole, radio mast, or part of a tower structure.

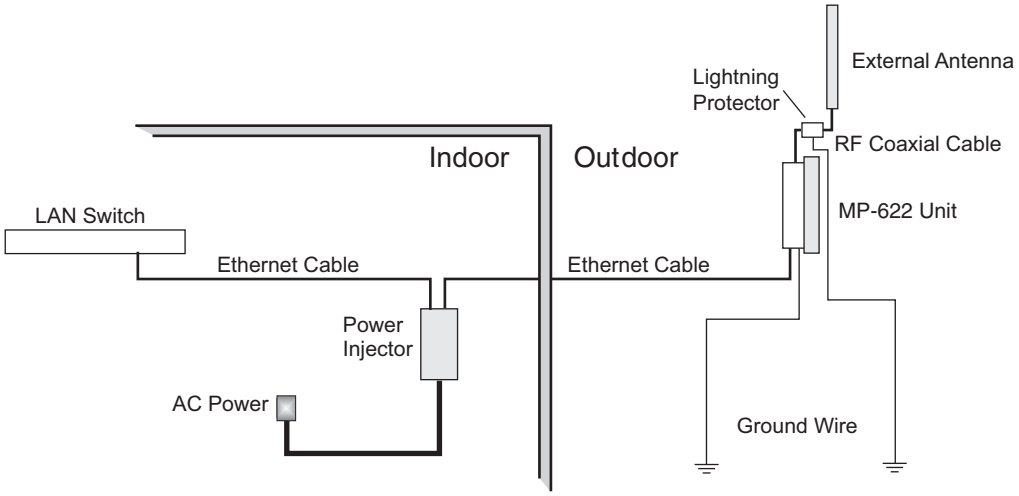
Lightning Protector for Outdoor Antenna

If you are using the MP-622 with an outdoor antenna, Trapeze Networks strongly recommends installing an external lightning protector for the antenna. An external lightning protector may be obtained from Trapeze Networks.

System Configuration

At each location where an MP-622 unit is installed, it must be connected to the local network using the power injector module. The following figure illustrates the system component connections.

Figure 1–4. System Component Connections



Features and Benefits

The MP-622 provides the following features and benefits:

- The MP-622 supports access point services for the 5 GHz and 2.4 GHz radios using various external antenna options
- MP-622 units support 5 GHz point-to-multipoint links using various external antenna options
- Maximum data rate up to 54 Mbps on the 802.11a (5 GHz) radio
- Outdoor weatherproof design
- IEEE 802.11a and 802.11b/g compliant
- Local network connection via 10/100 Mbps Ethernet port
- Powered through its Ethernet cable connection to the power injector module
- Includes wall- and pole-mount brackets

Security through 64/128/152-bit Wired Equivalent Protection (WEP) or 128-bit Advanced Encryption Standard (AES) encryption

Scans all available channels and selects the best channel and data rate based on the signal-to-noise ratio.

Manageable through an easy-to-use web-browser interface, command line (via Telnet), or SNMP network management tool.

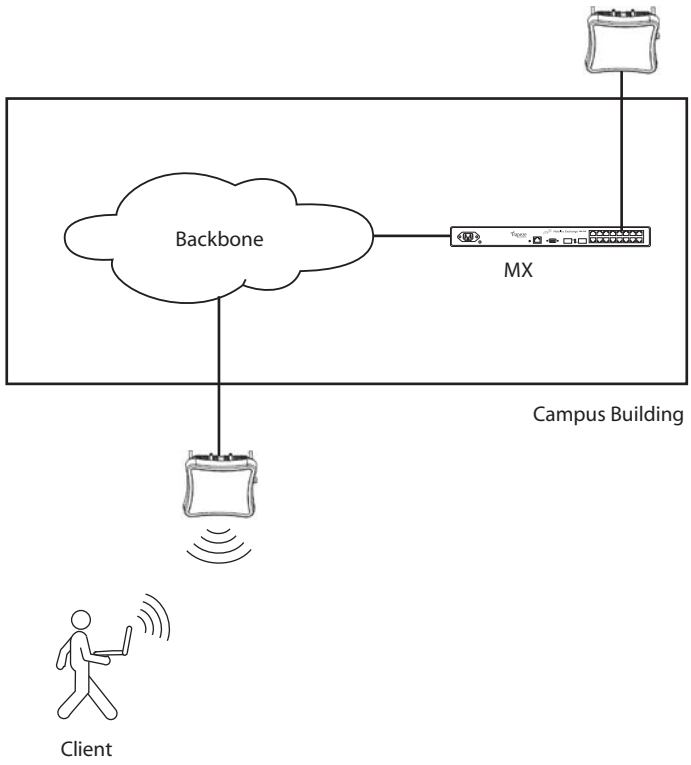
MP-622 Network Configurations

This chapter illustrates network configurations supported for the MP-622.

Infrastructure Configuration

In an infrastructure topology, the MP-622 provides access to a wired LAN for 802.11a/b/g wireless workstations. Since the MP-622 has a weatherproof casing, it can be installed outdoors (for example, on a pole) to provide network access to clients located outside.

Figure 2–1. Infrastructure Topology with Outdoor AP



The MP-622 can be connected directly to an MX or indirectly over the network.

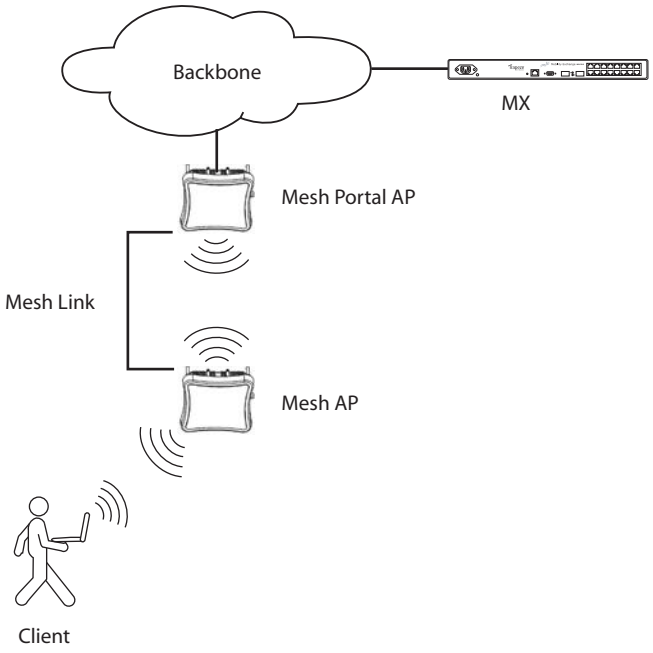
WLAN Mesh Configuration

WLAN mesh services allow an MP to provide wireless services to clients without a wired interface for the MP. Instead of a wired interface, the MP has a radio link to another MP with a wired interface.

WLAN mesh services can be used at sites where running Ethernet cable to a location is inconvenient, expensive or impossible. Note that power must be available at the location where the Mesh AP is installed.

The following illustration shows how a client can connect to a network using WLAN mesh services.

Figure 2–2. WLAN Mesh Topology



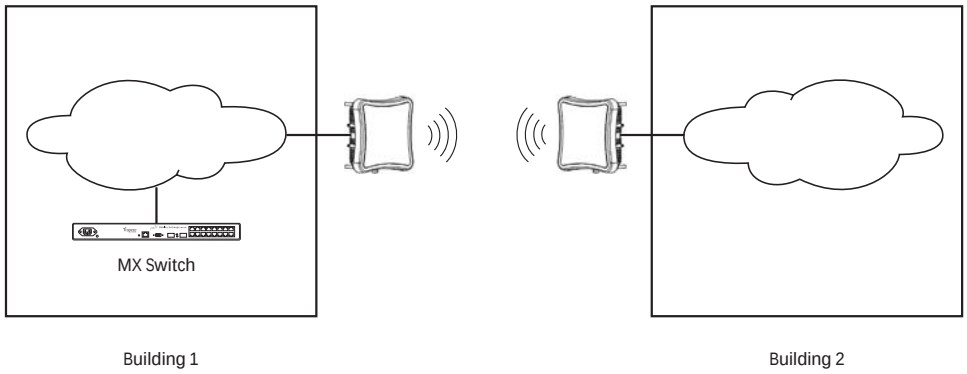
In the illustration, a client is associated with a *Mesh AP*, which is an MP without a wired interface to the network. The Mesh AP is configured to communicate with a *Mesh Portal AP*, an MP with wired connectivity to an MX. Communication between the Mesh AP and the Mesh Portal AP takes place over a secure radio link (a *Mesh Link*). When associated with the Mesh AP, the client has the same connectivity to the network as if the Mesh AP is using a wired link.

The Mesh AP and Mesh Portal AP make use of both radios. One radio (for example, the 802.11a radio) can be used for Mesh Link communications, using an SSID reserved for this purpose, while the Mesh AP can use its other radio for client associations in the same way a non-Mesh AP can.

Wireless Bridge Configuration

You can use WLAN mesh services in a wireless bridge configuration, with MP-622 units serving as bridge endpoints in a transparent Layer 2 bridge. A typical application of wireless bridging is to provide network connectivity between two buildings using a wireless link, as shown in the following illustration.

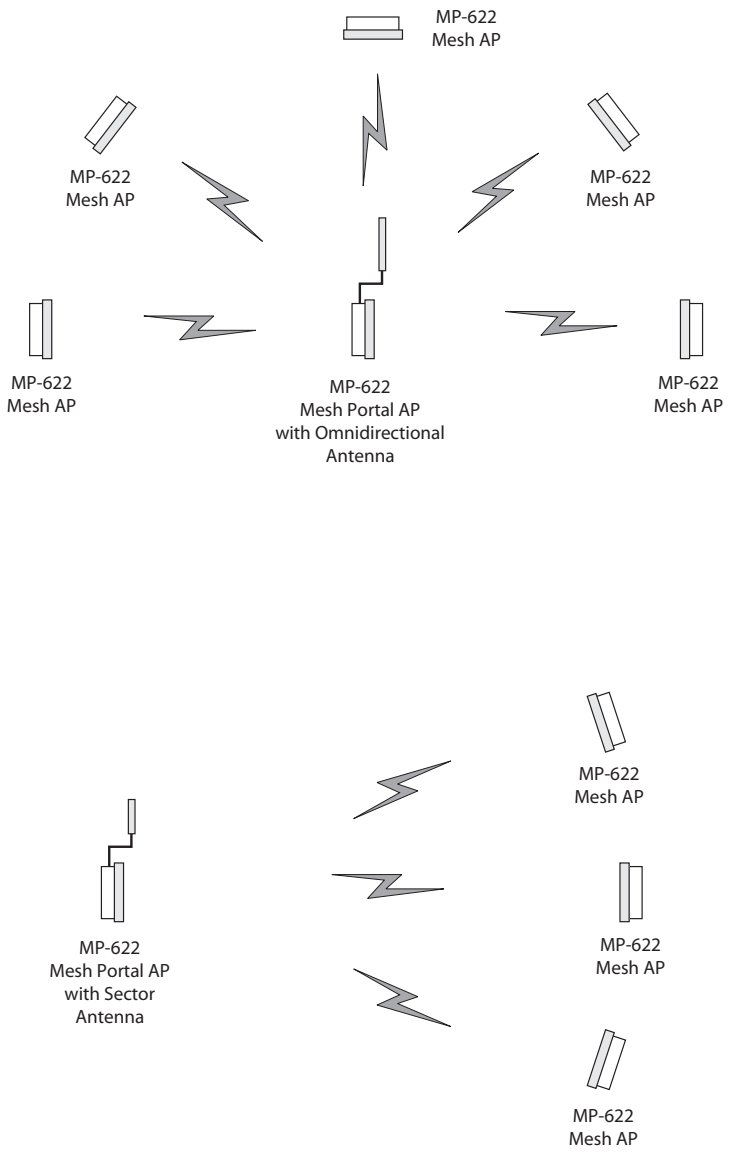
Figure 2–3. Point-to-Point Wireless Bridge Topology



The wireless bridge is established between a Mesh Portal AP and a Mesh AP to which it is associated. The bridged data packets are those present on the Ethernet interfaces of the two MPs. A Mesh AP serving as a bridge endpoint picks up packets from a wired port and transfers them to the other bridge endpoint. A simple source/destination learning mechanism is used to avoid forwarding packets across the bridge unnecessarily.

A Mesh Portal AP serving as a bridge endpoint can support up to five Mesh APs serving as bridge endpoints in a point-to-multipoint configuration.

Figure 2–4. Point-to-Multipoint Wireless Bridge Topology



Installing and Connecting an MP-622

Before installing an MP, you might need to generate a network plan and an MP work order with RingMaster. (See *RingMaster Network Plan and Work Orders* below.)

Installation Requirements and Recommendations

For best results, follow these requirements and recommendations before installing an MP-622.

RingMaster Network Plan and Work Orders

If you are using RingMaster to plan your Trapeze Networks Mobility System installation, you might want to create and verify a network plan for the entire Trapeze network installation and generate an MP work order, before installing MP access points. A network plan and the MP work orders generated from it provide the following information about MP access point installation and configuration:

Number of MP access points required for adequate WLAN capacity in each coverage area

Detailed installation location for each MP access point

Settings for all MP access points in the WLAN

MX Appliance Recommendation

Trapeze Networks recommends that you install and configure the MX before installing an MP. If the MX is already installed and configured for the MPs, you can immediately verify the cable connection(s) when you plug the cable(s) into the MP.

MP model MP-622 is designed to receive power only from a Trapeze-approved power injector. Connecting an MP access point to a Power over Ethernet (PoE) device that is not approved by Trapeze Networks can damage the equipment.

Weather Conditions

When planning an MP-622 installation, you must take into account any extreme weather conditions that are known to affect your location. Consider these factors:

Temperature — The MP-622 is tested for normal operation in temperatures from -30 to 55 °C (-22 to 131 °F). Operating in temperatures outside of this range may cause the unit to fail.

Wind Velocity — The MP-622 can operate in winds up to 90 MPH and survive higher wind speeds up to 125 MPH. You must consider the known maximum wind velocity and direction at the site and be sure that any supporting structure, such as a pole, mast, or tower, is built to withstand this force.

Lightning — The MP-622 includes built-in lightning protection, except anntenna ports. However, you should make sure that the unit, any supporting structure, and cables are all properly grounded. Additional protection using lightning rods, lightning arrestors, or surge suppressors may also be employed.

Rain — The MP-622 is weatherproofed against rain. Also, prolonged heavy rain has no significant effect on the radio signal. However, it is recommended to apply weatherproof sealing tape around the Ethernet port and antenna connectors for extra protection. If moisture enters a connector, it may cause a degradation in performance.

Snow and Ice — Falling snow, like rain, has no significant effect on the radio signal. However, a build up of snow or ice on antennas may cause a degradation in performance. In this case, the snow or ice has to be cleared from the antennas to restore proper operation of the unit.

Ethernet Cabling

When you have determined a suitable location for the MP-622, you must plan a cable route from the MP-622 outdoors to the power injector module indoors. Consider these points:

The Ethernet cable length should never be longer than 328 ft (100 m).

Determine a building entry point for the cable.

Determine if conduits, bracing, or other structures are required for safety or protection of the cable.

For lightning protection at the power injector end of the cable, consider using a lightning arrestor immediately before the cable enters the building.

See the *Outdoor Power Supply Installation Guide* for details on installing the power supply for the MP-622.

Grounding

It is important that the MP-622 unit, cables, lightning arrestors, and any supporting structures are properly grounded. The MP-622 unit includes a grounding screw for attaching a ground wire. Be sure that grounding is available and that it meets local and national electrical codes.

MP Radio Safety Advisories

When you enable the MP radio(s) as part of MX configuration, the radios are able to receive and transmit radio frequency energy as soon as you connect the MP to the MX, either directly or through the network.

Radio Frequency Exposure

Federal Communications Commission (FCC) Docket 96-8 for Spread Spectrum Transmitters specifies a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC-certified equipment. When used with the proper antennas (shipped in the product), Trapeze Networks MP access point products meet the uncontrolled environmental limits found in OET-65 and ANSI C95.1-1991. Proper installation of the MP access point according to the instructions in this manual will result in user exposure that is below the FCC recommended limits.

Additional Radio Safety Advisories

For additional radio safety warnings, the *Regulatory Information* document.

Installing an MP-622

The MP-622 includes a bracket kit for mounting the unit to a 1.5 to 2 inch diameter steel pole or tube. The pole-mounting bracket allows the unit to be mounted to part of a radio mast or tower structure. The unit also has a wall-mounting bracket kit that enables it to be installed on a building wall or roof when using external antennas.

Hardware installation of the MP-622 involves these steps:

1. Mount the unit on a wall, pole, mast, or tower using the mounting bracket.
2. Mount external antennas on the same supporting structure as the MP-622 and connect them to the unit.
3. Connect the Ethernet cable and a grounding wire to the unit.
4. Connect the power injector to the Ethernet cable, a local LAN switch, and an AC power source.
5. For wireless bridge or Mesh Services installations, align antennas at the bridge or mesh link endpoints.

Mounting the Unit

You can mount the MP-622 using either the pole-mounting bracket or the wall-mounting bracket. Use one of the following procedures.

If you are installing the MP-622 as a Mesh AP in a WLAN Mesh or wireless bridge configuration, the MP does not have a wired link to an MX. You must configure the MP connection using a wired link to an MX before deploying the MP-622 in a final location.

See the *Mobility System Software Configuration Guide* for information about configuring WLAN Mesh Services and wireless bridging.

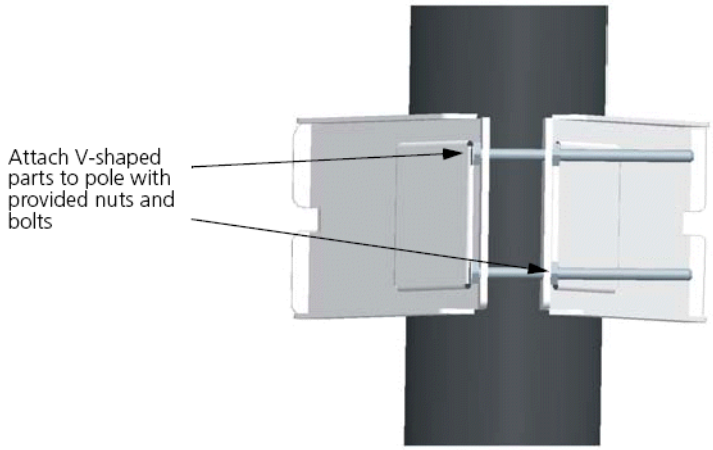
Using the Pole-Mounting Bracket

Perform the following steps to mount the unit to a 1.5 to 2 inch diameter steel pole or tube using the mounting bracket:

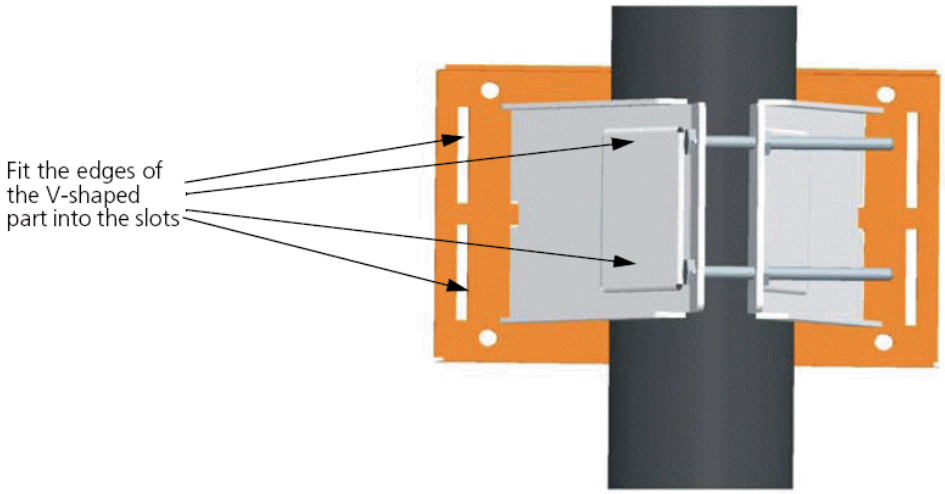
Always attach the bracket to a pole with the open end of the mounting grooves facing up.

1. Place the V-shaped part of the bracket around the pole and tighten the securing nuts just enough to hold the bracket to the pole. (The bracket may need to be rotated around the pole during the alignment process.)

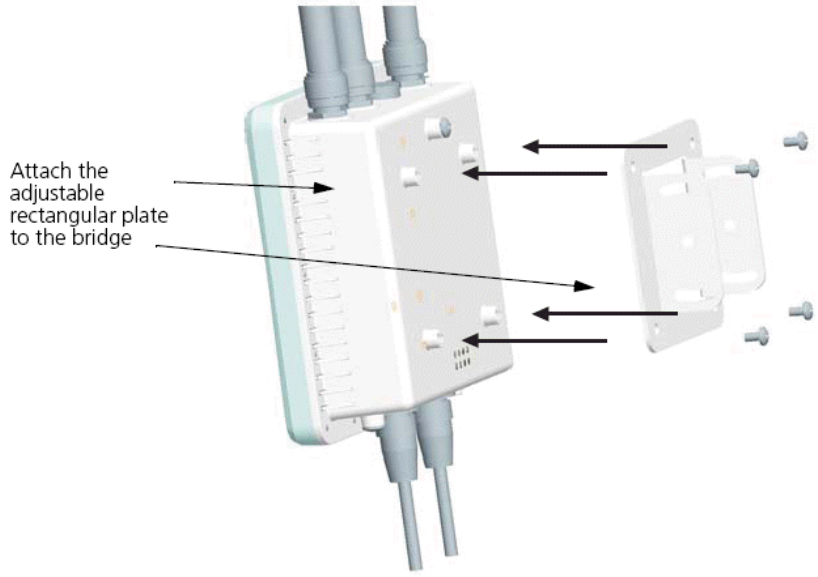
Figure 3–1. Attaching the Bracket to the Pole



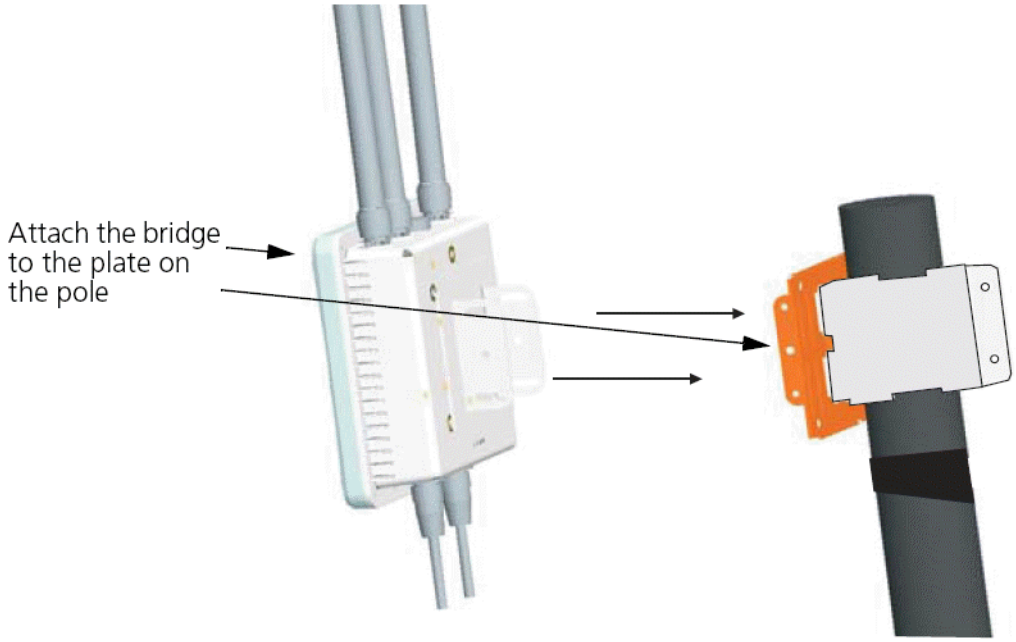
2. Fit the edges of the V-shaped part into the slots in the rectangular plate, and use the included nuts to tightly secure the MP-622 to the bracket.



3. Attach the adjustable rectangular plate to the bridge with supplied screws.



4. Attach the bridge with bracket to the plate already fixed to the pole.

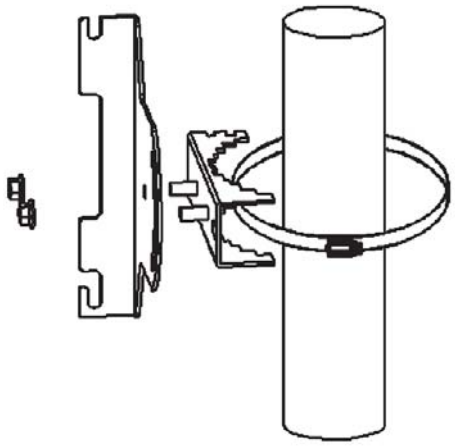


5. Use the included nuts to secure the wireless bridge to the pole bracket. Note that the wireless bridge tilt angle may need to be adjusted during the antenna alignment process. Be sure to take account of the antenna polarization direction. All antennas in a link must be mounted with the same polarization.

Mounting on Larger Diameter Poles

There is also a method for attaching the pole-mounting bracket to a pole that is 2 to 5 inches in diameter using an adjustable steel band clamp (not included in the kit). A steel band clamp up to 0.5 inch (1.27 cm) wide can be threaded through the main part of the bracket to secure it to a larger diameter pole without using the U-shaped part of the bracket. This method is illustrated in the following figure.

Figure 3–2. Attaching the Bracket Using a Steel Band Clamp



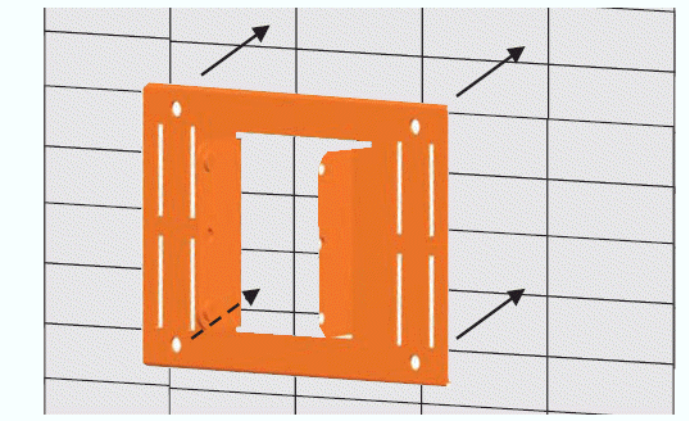
Using the Wall-Mounting Bracket

Perform the following steps to mount the unit to a wall using the wall-mounting bracket.

The wall-mounting bracket does not allow the integrated antenna of the wireless bridge to be aligned. It is intended for use with the unit using an external antenna.

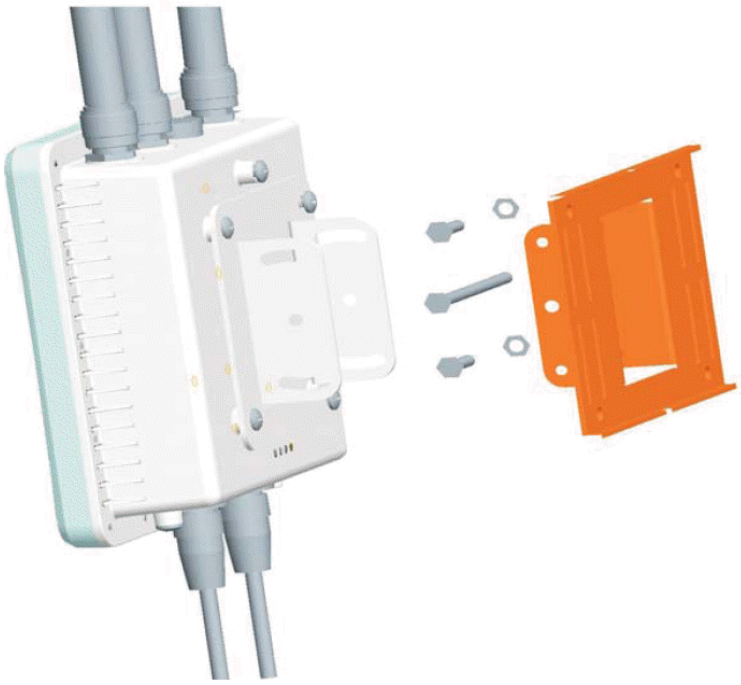
1. Always attach the bracket to a wall with the flat side flush against the wall (see following figure).

Figure 3–3. Wall-Mounting Bracket



2. Position the bracket in the intended location and mark the position of the four mounting screw holes.

3. Drill four holes in the wall that match the screws and wall plugs included in the bracket kit, then secure the bracket to the wall.
4. Use the included nuts to tightly secure the MP-622 to the bracket.



Connecting External Antennas

For some applications, when deploying an MP-622, you must mount external antennas and connect them to the unit. Typically, access point operation requires a 2.4 GHz antenna, and bridge link operation requires a 5.0 GHz antenna.

The primary port for 802.11bg (2.4Ghz) is port 1 and the primary port for 802.11a is Port 3. The MP-622 supports one or two antennas connected to each band. If you install one antenna it must be installed in the primary port. If you install two antennas they must be the same antenna model. There are no additional configuration requirements for adding the second antenna. If antenna diversity between the two antennas is a desired option it must be configured.

The default for the 802.11bg radio is ANT-1360-OUT.

```
set ap apnum radio num antennatype {ANT-1120-OUT | ANT-1360-OUT |
        ANT-5360-OUT  | ANT-5120-OUT | ANT-5PNL-OUT}
```

The antenna-location must be either indoors or outdoors. Placing and configuring one antenna indoors and the other outdoors is not allowed.

```
set ap apnum antenna-location {indoors | outdoors}
```

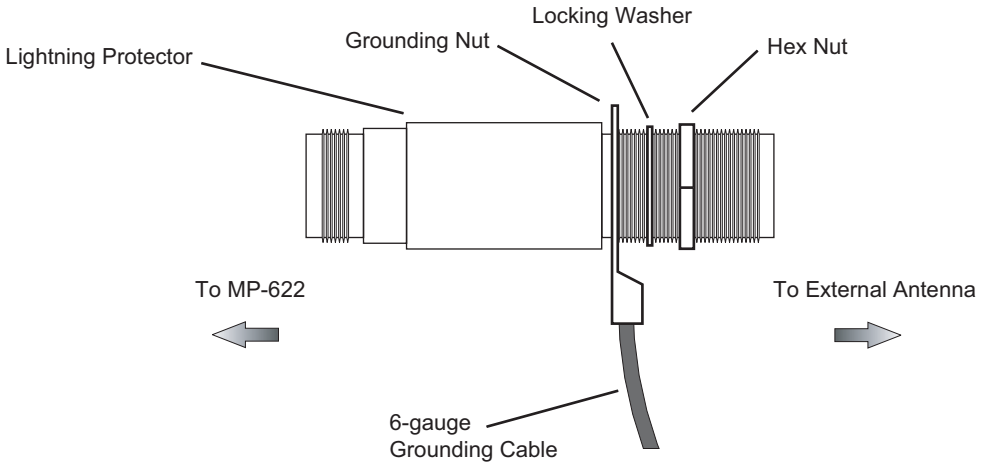
To connect external antennas follow these steps:

1. Mount the external antenna to the same supporting structure as the MP-622, within 10 ft (3 m) distance, using the bracket supplied in the antenna package.
2. If you are installing the optional lightning arrestor for an outdoor antenna, perform the following steps. Otherwise, skip to step 3.
   a. Solder the ground wire to the ground-wire terminal lug supplied with the lightning arrestor. Trapeze Networks recommends that you use 6-gauge cable for the ground wire. The ground wire must be properly earthed in order to provide adequate protection.

b. Attach the ground-wire terminal lug, lock washer, and hex nut to the lightning arrestor, in the order shown in Figure 3–4 below.

To meet regulatory requirements, you must ensure that the external antenna specified with the **set ap radio antennatype** command exactly matches the external antenna attached to the MP-622 external antenna port.

Figure 3–4. Attaching the Ground-Wire Terminal Lug, Lock Washer, and Hex Nut to the Lightning Arrestor

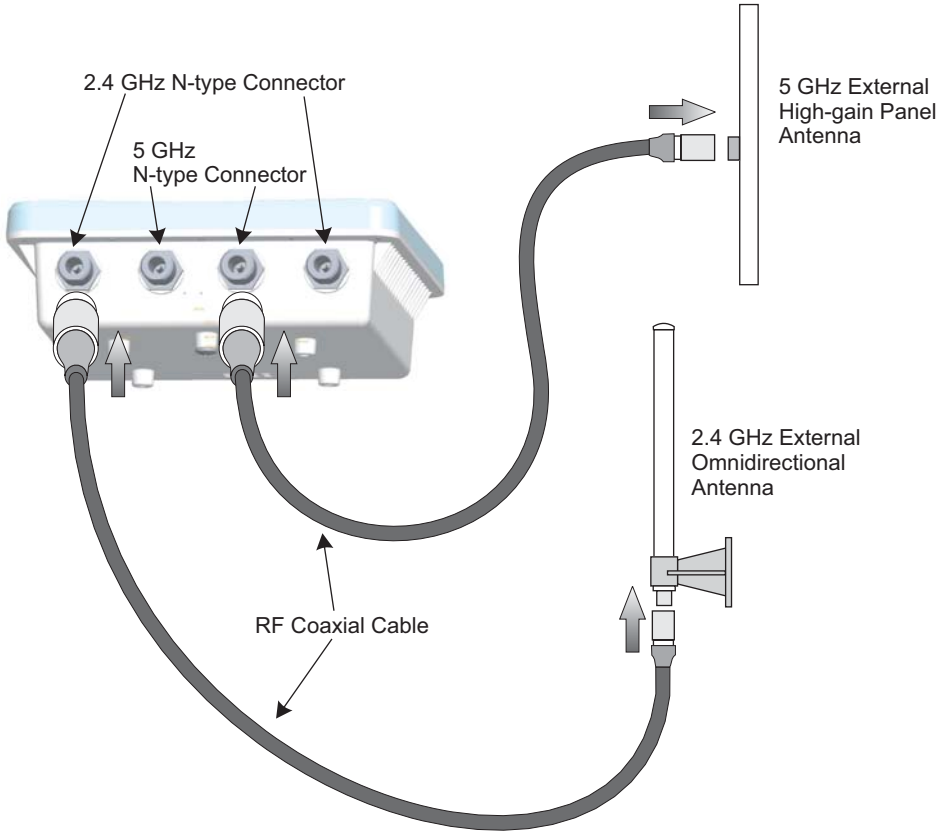


c. Connect one end of the short RF coaxial cable to the MP-622 N-type connector, and connect the other end to the lightning arrestor.

d. Connect one end of the 3m RF coaxial cable to the lightning arrestor, and connect the other end to the outdoor antenna. Continue with step 4.

3. Connect the antenna to the MP-622 N-type connector using the RF coaxial cable provided in the antenna package.
4. Apply weatherproofing tape to the antenna connectors to help prevent water entering the connectors.

Figure 3–5. Connecting External Antennas to the MP-622

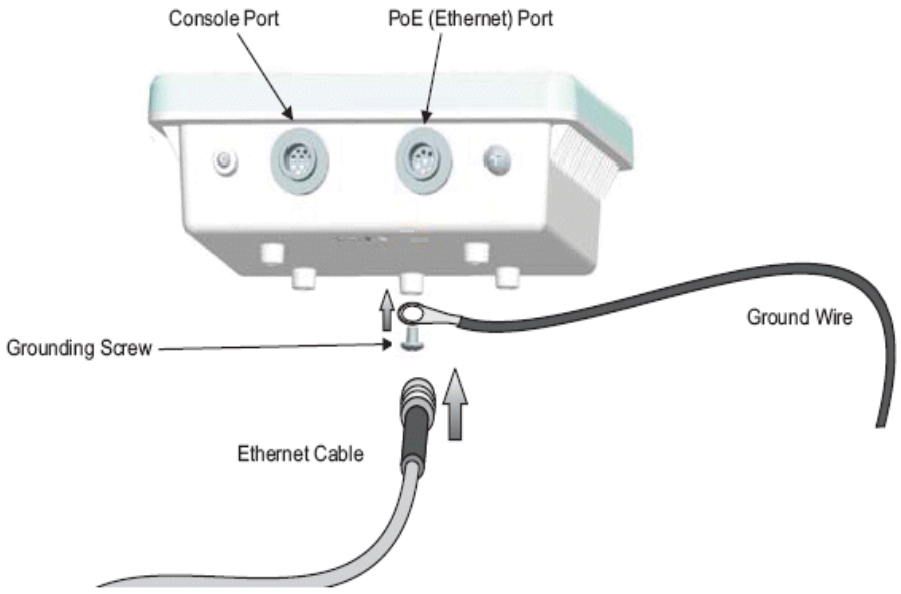


Connecting Cables to the Unit

1. Attach the Ethernet cable to the Ethernet port on the MP-622.
2. For extra protection against rain or moisture, apply weatherproofing tape (not included) around the Ethernet connector.
3. Be sure to ground the unit with an appropriate grounding wire (not included) by attaching it to the grounding screw on the unit.
4. Be sure to install a lightning arrestor on the Ethernet cable between the bridge and power injector. The lightning arrestor should be placed outdoors, immediately before the Ethernet cable enters the building.

Be sure that grounding is available and that it meets local and national electrical codes. For additional lightning protection, use lightning rods, lightning arrestors, or surge suppressors.

Figure 3–6. Attaching an Ethernet Cable to the MP-622



Connecting the Outdoor Power Supply

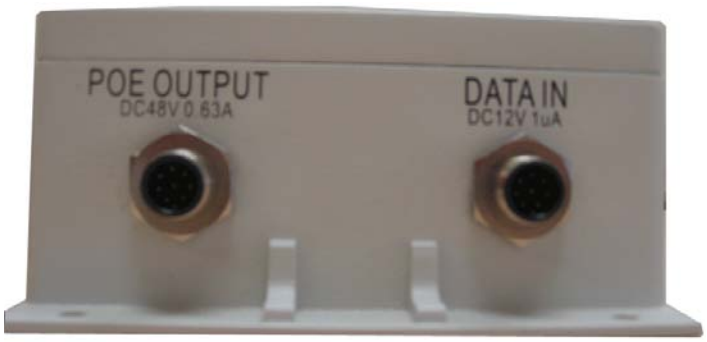
For instructions on connecting the outdoor power supply to the MP-622, refer to *Installing an Outdoor Power Supply (Model XPS-620x-OUT)*. Be sure to contact a fully qualified electrician to perform the installation.

Connecting the Power Injector

To connect the wireless bridge to a power source:

The Ethernet port on the wireless bridge does not support Power over Ethernet (PoE) based on the IEEE 802.3af standard. Do not try to power the unit by connecting it directly to a network switch that provides IEEE 802.3af PoE. Always connect the unit to the included power injector module.

1. Connect the Ethernet cable from the wireless bridge to the RJ-45 port labeled “Output” on the power injector.
2. Connect a straight-through unshielded twisted-pair (UTP) cable from a local LAN switch to the RJ-45 port labeled “Input” on the power injector. Use Category 5e or better UTP cable for 10/100BASE-TX connections.



You must align the UTP cable with the pins in the RJ-45 “Input” port. If you force the cable into the port, you will damage the unit and can bend the power injector pins. The picture below shows an example of a port with two bent bottom pins.

3. Insert the power cable plug directly into the standard AC receptacle on the power injector.
4. Plug the other end of the power cable into a grounded, 3-pin socket, AC power source.

For International use, you may need to change the AC line cord. You must use a line cord set that has been approved for the receptacle type in your country.

Checking the LED Indicators

The 11a and 11b/g LEDs on the MP-622 operate in two display modes, which are configurable through the software. The default AP mode indicates data traffic rates. The RSSI mode indicates the received signal power and is used when aligning antennas in a bridge link.

When the bridge is connectedd to power, the LEDs indicate as follows:

LED	Color	Indicates
Power	Green	The bridge is powered up and operating normally.
	Off	The bridge is not receiving power or there is a fault with the power supply.
	Amber	The system is under cold reset status.
Link	Green	The bridge has a 10/100 Mbps Fast Ethernet connection, but there is no activity.
	Flashing	Indicates that the bridge is transmitting or receiving data on a 10/100 Mbps Ethernet LAN. Flashing rate is proportional to network activity.
	Off	No link is present or the Ethernet LAN port is disabled.
11a (Three LEDs)	Green and Flashing	The 802.11a 5.3 GHz radio is enabled. RSSI Mode: One fully lit LED indicates a low RSSI output level, two LEDs.a medium level, and three LEDs the maximum level. A flashing LED indicates an intermediate RSSI output level AP Mode: One fully lit LED indicates a low traffic rate, two LEDs.a medium rate, and three LEDs the maximum rate. A flashing LED indicates an intermediate traffic rate level
	Off	No link is present or the 802.11a radio is disabled.
11g (Three LEDs)	Amber and Flashing	The 802.11g 2.4 GHz radio is enabled. RSSI Mode: One fully lit LED indicates a low RSSI output level, two LEDs.a medium level, and three LEDs the maximum level. A flashing LED indicates an intermediate RSSI output level AP Mode: One fully lit LED indicates a low traffic rate, two LEDs.a medium rate, and three LEDs the maximum rate. A flashing LED indicates an intermediate traffic rate level
	Off	No link is present or the 802.11g radio is disabled.

Connecting an MP to an MX

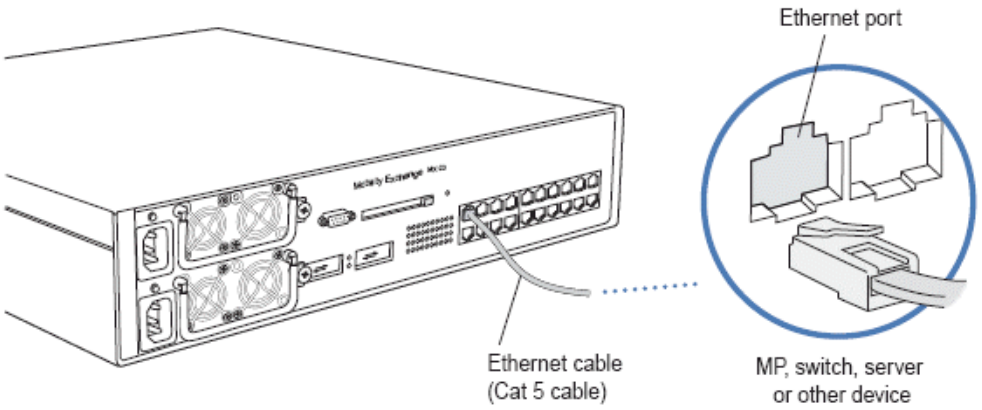
For lightning protection at the power injector end of the cable, consider using a lightning arrestor immediately before the cable enters the building.

You can connect an MP directly to an MX or indirectly to the MX through an intermediate Layer 2 or Layer 3 network. If you are connecting the MP directly to an MX, use the following procedure to insert the cable into the MX and verify the link.

You can use the CLI or RingMaster to configure an MP connection. If you are installing the MP-622 as a Mesh AP in a WLAN Mesh or wireless bridge configuration, you must configure the MP connection before deploying the MP-622 in its final location. (See the *Mobility System Software Configuration Guide.)*

Figure 3–7 shows how to insert a Cat 5 cable into 10/100 Ethernet port on an MX. Refer to this figure as you perform the procedure.

Figure 3–7. 10/100 Cat 5 Cable Installation



1. Insert a Cat 5 cable with a standard RJ-45 connector as shown in Figure 3–7. For connection to an MP, use a straight-through cable.
2. When the link is activated, observe the MP LED for the port on the MX:

MX Port LEDs for MP Connections	Meaning
Solid green	For an MP access point active link, all the following are true: MP has booted. MP has received a valid configuration from the MX switch. Management link with an MP is operational. At least one radio is enabled or is in sentry mode. For an MP secondary link, the link is present.
Alternating green and amber	MP is booting with an image received from the MX switch. After the access point boots and receives its configuration, this LED appearance persists until a radio is enabled or is placed in sentry mode.
Solid amber	PoE is on.
Blinking amber	MP is unresponsive or there is a PoE problem.
Unlit	PoE is off.

The MX 10/100 Ethernet ports are configured as wired network ports by default. You must change the port type for an MX port directly connected to an MP to activate the link. (See the *Mobility Exchange Installation and Basic Configuration Guide.)*

Aligning Antennas for Bridge or Mesh Links

If you are installing MP-622 units for wireless bridge or Mesh Services operation, after the units have been mounted, connected, and the radios are operating, the antennas must be accurately aligned to ensure optimum performance on the bridge or mesh links.

This alignment process is particularly important for long-range point-to-point links. In a point-to-multipoint configuration, the Mesh Portal AP uses an omnidirectional or sector antenna, which does not require alignment, but Mesh APs still need to be correctly aligned with the Mesh Portal antenna.

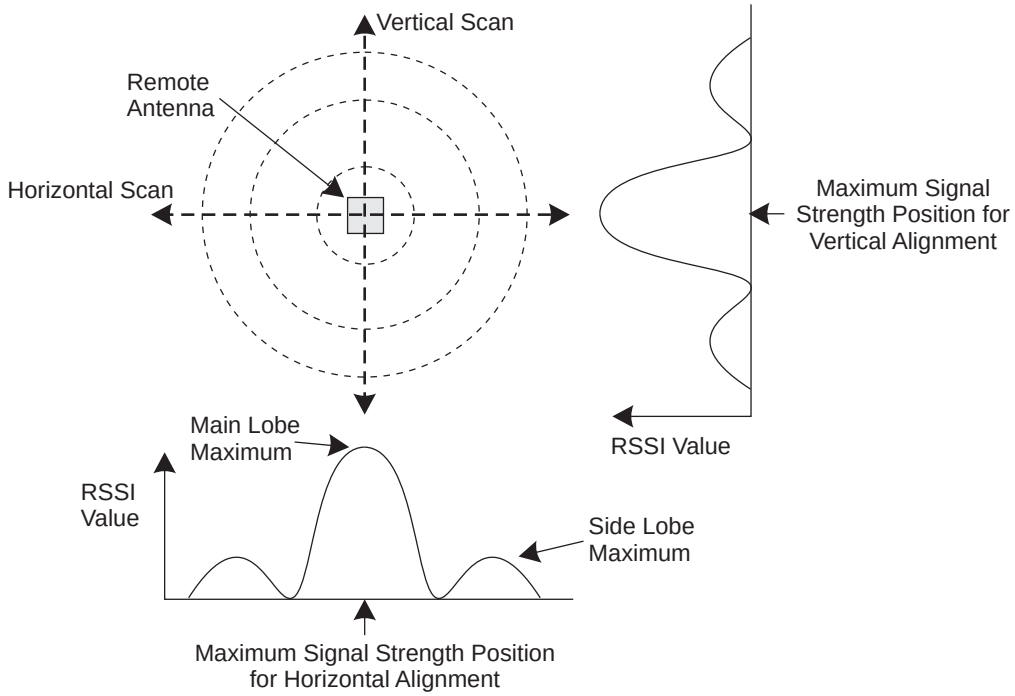
Point-to-Point Configurations – In a point-to-point configuration, the alignment process requires two people at each end of the link. The use of cell phones or two-way radio communication may help with coordination. To start, you can just point the antennas at each other, using binoculars or a compass to set the general direction. For accurate alignment, monitor the RSSI's LED indicator as you move the antenna horizontally and vertically.

Point-to-Multipoint Configurations – In a point-to-multipoint configuration all Mesh APs must be aligned with the Mesh Portal antenna. The alignment process is the same as for point-to-point links, but only the Mesh AP end of the link requires the alignment.

The LEDs are viewed right to left as you look at the back of the MP. The range from 1 to 12 will cover the signal range to accurately align the antenna. The signal strength LEDs indicate the received radio signal strength for a particular bridge link. The more LEDs that turn on, the stronger the signal. (RSSI level 1 should equate to the lowest useful signal). Alternatively, you can monitor the Receive Signal Strength Indicator (RSSI) value directly from the management interface. The higher the RSSI value, the stronger the signal.

When you move the antenna during alignment, the radio signal from the remote antenna can be seen to have a strong central main lobe and smaller side lobes. The object of the alignment process is to set the antenna so that it is receiving the strongest signal from the central main lobe.

Figure 3–8. Aligning the MP-622 Antenna According to Signal Strength



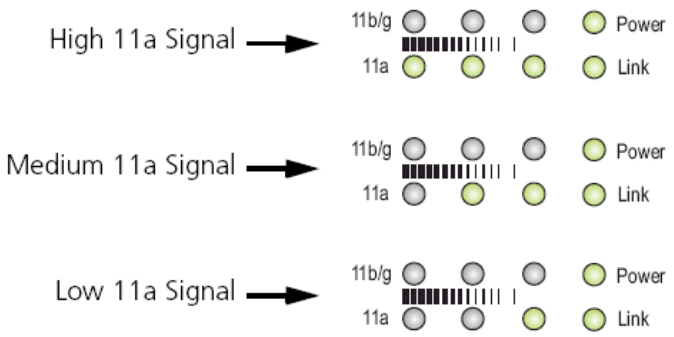
When aligning the antennas the MP with the antenna that is being aligned to must be set to send link-calibration packets. Use the following command to setup the MP that the MP-622 is being aligned with.

```
set ap num radio num link-calibration mode {enable | disable}
```

Link-calibration should be disabled under normal operation of the MP.

If the MP-622 is installed with two directional antennas, connect the first antenna to the primary antenna port with antenna diversity off and align it. Then disconnect the first antenna and connect the second antenna to the primary antenna port. If the second antenna is being aligned with a different MP, disable link-calibration on the original MP and enable it on the new MP. Once both antennas are properly aligned, connect them to their desired ports.

To align the antennas in the link using the output LEDs, start with one antenna fixed and then perform the following procedure to align the other antenna:



1. Pan the antenna horizontally back and forth while checking the RSSI LEDs. If using the pole-mounting bracket with the MP-622, you must rotate the mounting bracket around the pole. Other external antenna brackets may require a different horizontal adjustment.
2. Find the point where the signal is strongest (all LEDs on) and secure the horizontal adjustment in that position.

Sometimes there may not be a central lobe peak in the RSSI LED indicators because vertical alignment is too far off and only two similar peaks for the side lobes are detected. In this case, fix the antenna so that it is halfway between the two peaks.

3. Loosen the vertical adjustment on the mounting bracket and tilt the antenna slowly up and down while checking the LEDs.
4. Find the point where the signal is strongest and secure the vertical adjustment in that position.

MP-622 Technical Specifications

This chapter lists the technical specifications for the Trapeze Networks MP-622.

For detailed compliance information, see the *Regulatory Information* document.

The Trapeze Regulatory Information document is located at: **http://www.trapezenetworks.com/support/contact_support/** and can be downloaded in PDF format.

Table 4– 1 lists the mechanical and compliance specifications. Table 4– 2 lists the MAC address allocation scheme. The remaining tables list the specifications and link budgets for the external antennas.

(For specifications for the MX, see the *Mobility Exchange Installation and Basic Configuration Guide.)*

This Listed Accessory is designed and approved to be used only with Trapeze Networks Mobility Exchange (MX) models MX-20, MX-8, MX-216, and MXR-2. (The MX-200, MX-2800 and MX-400 switches do not directly connect to the MP.)

The MP radios are disabled by default and can be enabled only by the system administrator using the RingMaster management application or the MX switch's command-line interface (CLI).

The radio frequency band, operating channels, and transmit power depend on the country of operation specified by the system administrator using RingMaster or the MX switch's CLI.

MP-622 Mechanical and Compliance Specifications

Table 4– 1 lists the mechanical and compliance specifications for the MP-622.

Table 4– 1. MP-622 Mechanical and Compliance Specifications

Specification	Description
Maximum Channels (Outdoor)	Based on the country of operation specified by the system administrator
Data Rates	802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps per channel 802.11g: 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps per channel 802.11b: 1, 2, 5.5, 11 Mbps per channel

Table 4– 1. MP-622 Mechanical and Compliance Specifications (continued)

Specification	Description
Maximum Clients	64 for the radio interface set to access point mode
Modulation Types	802.11a: BPSK, QPSK, 16-QAM, 64-QAM 802.11g: CCK, BPSK, QPSK, OFDM 802.11b: CCK, BPSK, QPSK
Network Configuration	Access Point Mode: Infrastructure Bridge Mode: Point-to-point and point-to-multipoint
Operating Frequency	802.11a: 5.15 GHz to 5.825 GHz based on country regulations 802.11b/g: 2.4 GHz to 2.4835 GHz based on country regulations
Power Injector	Input: 90-240 VAC; 50/60 Hz Output: 48 Vdc/0.63A, 12Vdc/1A
Physical Size	7.68 x 7.48 x 2.91 in (19.5 x 19 x 7.4 cm)
Weight	3.4 lbs (1.54 kg)
Temperature	Operating: -22 to 131 °F (-30 to 55 °C) Storage: -40 to 176 °F (-40 to 80 °C)
Humidity	5% to 95% (non-condensing)
EMC Compliance (Class B)	FCC Class B (US) RTTED 1999/5/EC DGT (Taiwan)
Radio Signal Certification	FCC Part 15.247 (2.4 GHz) IC RSS-210 EN 300.328, EN 302.893 EN 300 826, EN 301.489-1, EN 301.489-17 ETSI 300.328; ETS 300 826 (802.11b)
Safety	UL/cUL60950-1, IEC60950-1 (CB) and IEC60529 IP68 (NEMA250 6P)
Standards	IEEE 802.3 10BASE-T, IEEE 802.3u 100BASE-TX, IEEE 802.11a, b, g

Federal Communication Commission Interference Statement

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 in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipme

IMPORTANT NOTE

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

IEEE 802.11b or 802.11g operation of this product in the U.S.A. is firmware-limited to channels 1 through 11.

Industry Canada Stateme

This Class B digital apparatus complies with Canadian ICES-003

Cet appareil numerique de la classe B conforme a la norme NMB-003 du Canada.

Operation is subject to the following two conditions:

1. this device may not cause interference and
2. this device must accept any interference, including interference that may cause undesired operation of the device

This device has been designed to operate with an antenna having a maximum gain of 18 dBi.

Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. 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 EIRP is not more than required for successful communication.
The maximum antenna gain permitted (for devices in the band 5725-5825 MHz) to comply with

the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate, as stated

in section A9.2(3).

IMPORTANT NOTE:

IC Radiation Exposure Statement:

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

MAC Addresses

Each MP-622 is assigned a unique block of 64 MAC addresses. Each radio has 32 MAC addresses and can therefore support up to 32 SSIDs, with one MAC address assigned to each SSID as its BSSID.

The MAC address block is listed on a label on the back of the MP. If the MP is already deployed and running on the network, you can display the MAC address assignments by using the **show {ap | dap} status** command.

All MAC addresses on an MP are assigned based on the MP base MAC address, as described in Table 4– 2.

Table 4– 2. MAC Address Allocations on MP-622

MP base MAC Address	The MP has a base MAC address. All the other addresses are assigned based on this address.
Ethernet Port MAC Addresses	The Ethernet port equals the MP base MAC address.
802.11a Radio and SSID MAC Addresses	The 802.11a radio equals the MP base MAC address + 1. The BSSIDs for the SSIDs configured on the 802.11a radio end in odd numbers. The first BSSID is equal to the MP's base MAC address + 1. The next BSSID is equal to the MP's base MAC address + 3, and so on.
802.11b/g Radio and SSID MAC Addresses	The 802.11b/g radio equals the MP base MAC address. The BSSIDs for the SSIDs configured on the 802.11b/g radio end in even numbers. The first BSSID is equal to the MP's base MAC address. The next BSSID is equal to the MP's base MAC address + 2, and so on.

Antenna Specifications

8 dBi Omnidirectional (2.4 GHz)

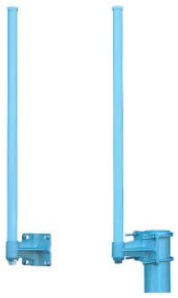


Table 4– 3. 8 dBi Omnidirectional (2.4 GHz) Antenna Specifications

Specification	Description
Model Number	ANT-1360-OUT
Frequency Range	2.400 - 2.500 GHz
Gain	8 dBi
VSWR	2.0 : 1 max
Polarization	Linear, vertical
HPBW	Horizontal: 360°
Downtilt	0°
Power Handling	10 W (cw)

Table 4– 3. 8 dBi Omnidirectional (2.4 GHz) Antenna Specifications (continued)

Specification	Description
Impedance	50 Ohms
Connector	N type, male
Radome	Material: Fiber glass Color: Gray-white
Environmental	Survival Wind Speed: 134.22 mph (216 km/hr) Temperature: -40 °F to 176 °F (-40 °C to 80 °C) Humidity: 95% @ 131 °F (55 °C)
Mechanical	Dimensions: 22.8 x 0.82 in (diameter) (58 x 2.1 cm) Weight: 0.44 lbs (200 g)

8 dBi Omnidirectional (5 GHz)

Table 4– 4. 8 dBi Omnidirectional (5 GHz) Antenna Specifications

Specification	Description
Model Number	ANT-5360-OUT
Frequency Range	5.725 - 5.875 GHz
Gain	8 dBi
VSWR	2.0 : 1 max
Polarization	Linear, vertical
HPBW	Horizontal: 360° Vertical: 12°
Downtilt	0°
Power Handling	5 W (cw)
Impedance	50 Ohms
Connector	N type, female
Radome	Material: Fiber glass Color: Gray-white
Environmental	Survival Wind Speed: 134.22 mph (216 km/hr) Temperature: -40 °F to 176 °F (-40 °C to 80 °C) Humidity: 95% @ 131 °F (55 °C)
Mechanical	Dimensions: 12.8 x 8.6 in diameter (32.5 x 2.2 cm) Weight: 2.4 lbs (1100 g)

13.5 dBi 120-Degree Sector

Table 4– 5. 13.5 dBi 120-Degree Sector Antenna Specifications

Specification	Description
Model Number	ANT-5120-OUT
Frequency Range	5.150 - 5.875 GHz
Gain	13.5 dBi
VSWR	2.0 : 1 max
Polarization	Linear, vertical
HPBW	Horizontal: 120° Vertical: 6°
Downtilt	0°
Power Handling	5 W (cw)
Impedance	50 Ohms
Connector	N type, female
Radome	Material: ABS Color: Gray, white
Environmental	Survival Wind Speed: 134.22 mph (216 km/hr) Temperature: 40 °F to 176 °F (-40 °C to 80 °C) Humidity: 95% @ 131 °F (55 °C)
Mechanical	Dimensions: 24.4 x 3.46 x 2.76 in (62 x 8.8 x 7 cm) Weight: 1.3 lbs (590 g)

10 dBi 120-Degree Sector

Table 4– 6. 10 dBi 120-Degree Sector Antenna Specifications

Specification	Description
Model Number	ANT-1120-OUT
Frequency Range	2.4 - 2.5 GHz
Gain	10 dBi
VSWR	1.5 : 1 max
Polarization	Linear, vertical
HPBW	Horizontal: 120° Vertical: 15°
Downtilt	0°
Power Handling	10 W (cw)
Impedance	50 Ohms
Connector	N type, female
Radome	Material: ABS Color: Gray, white
Environmental	Survival Wind Speed: 134.22 mph (216 km/hr) Temperature: 40 °F to 176 °F (-40 °C to 80 °C) Humidity: 95% @ 131 °F (55 °C)
Mechanical	Dimensions: 29.5 x 3.46 x 2.76 in (75 x 8.8 x 7 cm) Weight: 1.5 lbs (700 g)

18 dBi 18-Degree Panel

Table 4– 7. 18 dBi 18-Degree Panel Antenna Specifications

Specification	Description
Model Number	ANT-5PNL-OUT
Frequency Range	4.9 - 5.875 GHz
Gain	18 dBi
VSWR	2.0 : 1 max
Polarization	Linear, vertical
HPBW	Horizontal: 18° Vertical: 18°
Downtilt	0°
Power Handling	5 W (cw)
Impedance	50 Ohms
Connector	N type, female
Radome	Material: ABS Color: Gray, white
Environmental	Survival Wind Speed: 134.22 mph (216 km/hr) Temperature: 40 °F to 176 °F (-40 °C to 80 °C) Humidity: 95% @ 131 °F (55 °C)
Mechanical	Dimensions: 28.46 x 7.87 x 1.97 in (1.5 x 20 x 5 cm) Weight: 1.82 lbs (825 g)

Signal Loss from Lightning Protector and Coaxial Cable

Frequency	Loss from Lightning Protector	Loss from 3m cable	Loss from 1.8m cable	Loss from 0.3m cable
2.4 GHz	0.08 dB	0.75 dB	0.59 dB	0.24 dB
5.5 GHz	0.25 dB	1.17 dB	0.89 dB	0.37 dB

Safety Compliance

Power Cord Safety

Please read the following safety information carefully before installing the device:

Installation and removal of the unit must be carried out by qualified personnel only

The unit must be connected to an earthed (grounded) outlet to comply with international safety standards.

Do not connect the unit to an A.C. outlet (power supply) without an earth (ground) connection.

The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN 60320/IEC 320 appliance inlet.

The socket outlet must be near to the unit and easily accessible. You can only remove power from the unit by disconnecting the power cord from the outlet.

This unit operates under SELV (Safety Extra Low Voltage) conditions according to IEC 60950. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.

Foreign Regulatory Requirements

France and Peru only

This unit cannot be powered from IT supplies. If your supplies are of IT type, this unit must be powered by 230 V (2P+T) via an isolation transformer ratio 1:1, with the secondary connection point labelled Neutral, connected directly to earth (ground).

Impédance à la terre

Important! Before making connections, make sure you have the correct cord set. Check it (read the label on the cable) against the following:

Power Cord Set	
USA and Canada	The cord set must be UL-approved and CSA certified.
	The minimum specifications for the flexible cord are: No. 18 AWG - not longer than 2 meters, or 16AWG Type SV or SJ 3-conductor
	The cord set must have a rated current capacity of at least 10A
	The attachment plug must be an earth-grounding type with NEMA 5-15P (15 A, 125 V) configuration.
Denmark	The supply plug must comply with Section 107-2-D1, Standard DK2-1a or DK2-5a
Switzerland	The supply plug must comply with SEV/ASE 1011.
UK	The supply plug must comply with BS1363 (3-pin 13 A) and be fitted with a 5 A fused which complies with BS1362.
	The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).

Power Cord Set	
Europe	The supply plug must comply with CEE7/7 (“SCHUKO”)
	The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75)minimum).
	IEC-320 receptacle

Veuillez lire à fond l'information de la sécurité suivante avant d'installer l’appareil:

AVERTISSEMENT: L’installation et la dépose de ce groupe doivent être confiés à un personnel qualifié.

Ne branchez pas votre appareil sur une prise secteur (alimentation électrique) lorsqu'il n'y a pas de connexion de mise à la terre (mise à la masse).

Vous devez raccorder ce groupe à une sortie mise à la terre (mise à la masse) afin de respecter les normes internationales de sécurité.

Le coupleur d’appareil (le connecteur du groupe et non pas la prise murale) doit respecter une configuration qui permet un branchement sur une entrée d’appareil EN 60320/IEC 320.

La prise secteur doit se trouver à proximité de l’appareil et son accès doit être facile. Vous ne pouvez mettre l’appareil hors circuit qu’en débranchant son cordon électrique au niveau de cette prise.

L’appareil fonctionne à une tension extrêmement basse de sécurité qui est conforme à la norme IEC 60950. Ces conditions ne sont maintenues que si l’équipement auquel il est raccordé fonctionne dans les mêmes conditions.

France et Pérou uniquement:

Ce groupe ne peut pas être alimenté par un dispositif à impédance à la terre. Si vos alimentations sont du type impédance à la terre, ce groupe doit être alimenté par une tension de 230 V (2 P+T) par le biais d’un transformateur d’isolement à rapport 1:1, avec un point secondaire de connexion portant l’appellation Neutre et avec raccordement direct à la terre (masse).

Cordon électrique - Il doit être agréé dans le pays d’utilisation	
Etats-Unis et Canada	Le cordon doit avoir reçu l’homologation des UL et un certificat de la CSA.
	Les spécifications minimales pour un cable flexible sont AWG No. 18, ouAWG No. 16 pour un cable de longueur inférieure à 2 mètres. type SV ou SJ 3 conducteurs
	Le cordon doit être en mesure d’acheminer un courant nominal d’au moins 10 A.
	La prise femelle de branchement doit être du type à mise à la terre (mise à la masse) et respecter la configuration NEMA 5-15P (15 A, 125 V) ou NEMA 6-15P (15 A, 250 V).
Danemark	La prise mâle d’alimentation doit respecter la section 107-2 D1 de la norme DK2 1a ou DK2 5a.
Suisse	La prise mâle d’alimentation doit respecter la norme SEV/ASE 1011.
Europe	La prise secteur doit être conforme aux normes CEE 7/7 (“SCHUKO”)
	LE cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).

Germany

Bitte unbedingt vor dem Einbauen des Geräts die folgenden Sicherheitsanweisungen durchlesen (Germany):

WARNUNG: Die Installation und der Ausbau des Geräts darf nur durch Fachpersonal erfolgen.

Das Gerät sollte nicht an eine ungeerdete Wechselstromsteckdose angeschlossen werden. Das Gerät muß an eine geerdete Steckdose angeschlossen werden, welche die internationalen Sicherheitsnormen erfüllt.

Der Gerätestecker (der Anschluß an das Gerät, nicht der Wandsteckdosenstecker) muß einen gemäß EN 60320/IEC 320 konfigurierten Geräteeingang haben.

Die Netzsteckdose muß in der Nähe des Geräts und leicht zugänglich sein. Die Stromversorgung des Geräts kann nur durch Herausziehen des Gerätenetzkabels aus der Netzsteckdose unterbrochen werden.

Der Betrieb dieses Geräts erfolgt unter den SELV-Bedingungen (Sicherheitskleinstspannung) gemäß IEC 60950. Diese Bedingungen sind nur gegeben, wenn auch die an das Gerät angeschlossenen Geräte unter SELV-Bedingungen betrieben werden.

Stromkabel. Dies muss von dem Land, in dem es benutzt wird geprüft werden:	
U.S.A und Canada	Der Cord muß das UL gepruft und war das CSA beglaubigt.
	Das Minimum spezifikation fur der Cord sind: Nu. 18 AWG - nicht mehr als 2 meter, oder 16 AWG. Der typ SV oder SJ 3-Leiter
	Der Cord muß haben eine strombelastbarkeit aus wenigstens 10 A
	Dieser Stromstecker muß hat einer erdschluss mit der typ NEMA 5-15P (15A, 125V) oder NEMA 6-15P (15A, 250V) konfiguration.
Danemark	Dieser Stromstecker muß die ebene 107-2-D1, der standard DK2-1a oder DK2-5a Bestimmungen einhalten.
Schweiz	Dieser Stromstecker muß die SEV/ASE 1011Bestimmungen einhalten.
Europe	Das Netzkabel muß vom Typ HO3VVF3GO.75 (Mindestanforderung) sein und die Aufschrift <HAR> oder <BASEC> tragen.
	Der Netzstecker muß die Norm CEE 7/7 erfüllen (”SCHUKO”).

Montieren der Bridge

Die Bridge kann auf folgenden Oberflächentypen montiert werden:

Mast Wand oder elektrischer Kasten (NEMA Enclosure)

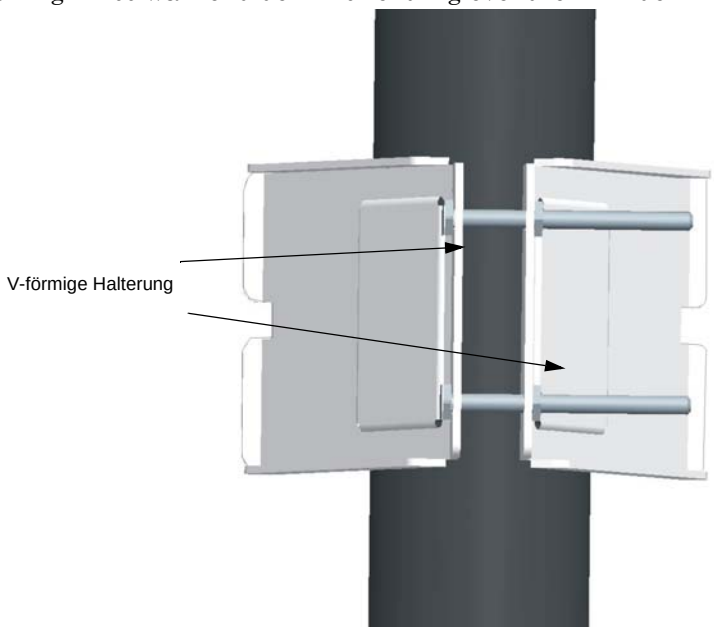
Achtun: Die Bridge darf nur im Freien verwendet werden. Installieren Sie die Bridge nicht in Innenräumen.

Verwenden der Halterung für Mastmontage

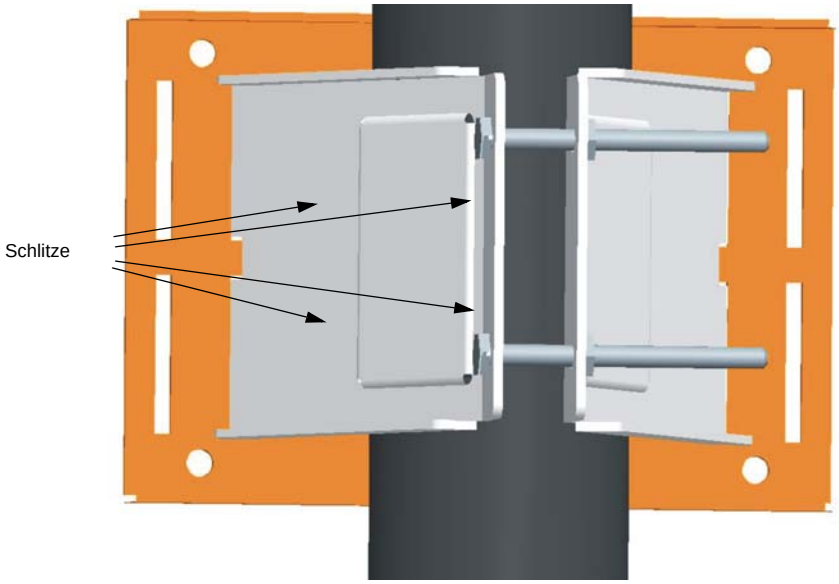
Montieren Sie das Gerät anhand folgender Schritte mit der Montagehalterung an einen Stahlmast oder eine Stahlröhre mit einem Durchmesser von 1,5 bis 2 Zoll:

1. Befestigen Sie die Halterung immer so an einen Mast, dass das offene Ende der Montagerillen nach oben weist.

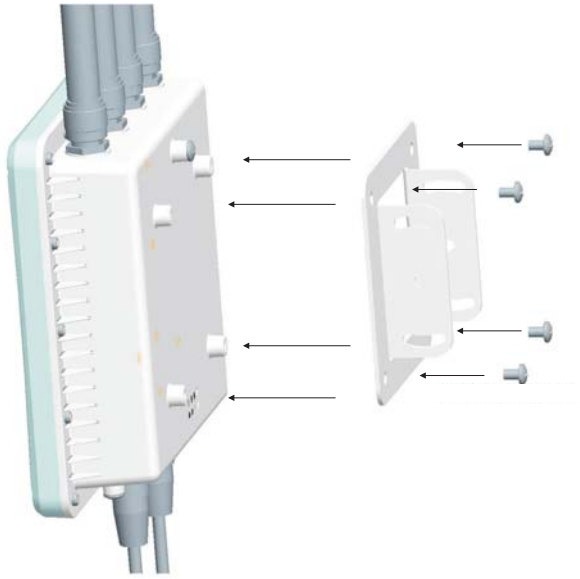
2. Legen Sie den V-förmigen Teil der Halterung um den Mast und ziehen Sie die Befestigungsmuttern gerade so fest an, dass sie die Halterung am Mast festhalten. (Die Halterung muss während der Ausrichtung eventuell um den Mast herumgezogen werden.)



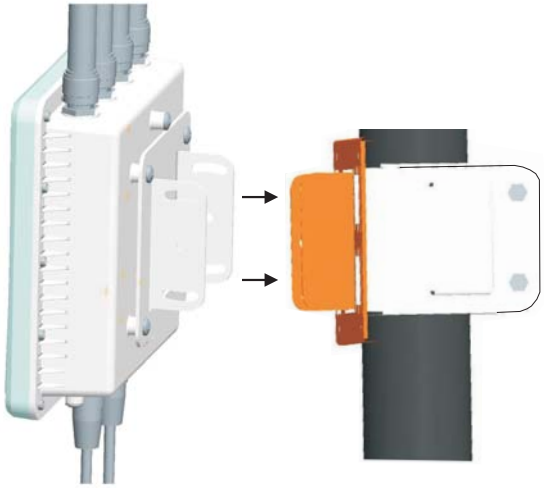
3. Stecken Sie die Ränder der V-förmigen Halterung in die Aussparungen in der rechteckigen Platte und ziehen Sie die Muttern fest an.



4. Befestigen Sie die verstellbare, rechteckige Platte mit den beigefügten Schrauben an der Bridge.



5. Befestigen Sie die Bridge mit Halter an der am Mast angebrachten Platte.



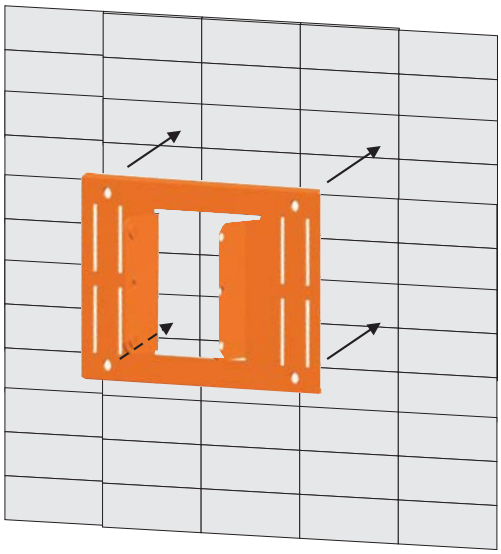
Befestigen Sie die drahtlose Bridge mit den beigefügten Muttern an der Halterung. Berücksichtigen Sie dabei die Ausrichtung der Antennenpolarisierung; alle Antennen in einem Link müssen mit derselben Polarisierung montiert werden.

Verwenden der Halterung für Wandmontage

Montieren Sie das Gerät anhand folgender Schritte mit der Halterung für Wandmontage an eine Wand:

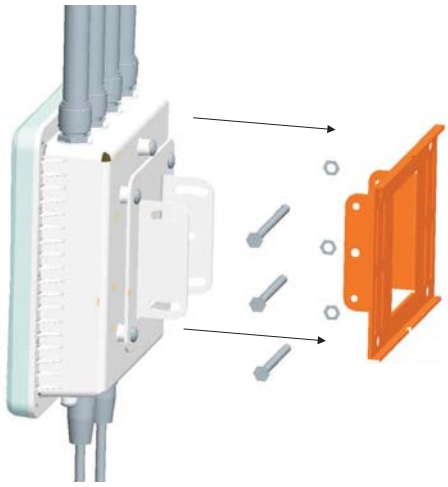
Achtung: Die Halterung für Wandmontage ist nicht dafür vorgesehen, dass die integrierte Antenne der drahtlosen Bridge ausgerichtet werden kann. Sie ist für die Geräteverwendung mit einer externen Antenne gedacht.

1. Befestigen Sie die Halterung immer so an eine Wand, dass die flache Seite glatt an der Wand anliegt (siehe folgende Abbildung).



2. Halten Sie die Halterung an der gewünschten Stelle an und markieren Sie die Positionen der drei Löcher für die Montageschrauben.
3. Bohren Sie drei Löcher in die Wand, passend zu den Schrauben und den Dübeln, die der Halterung beigelegt sind, und befestigen Sie die Halterung an der Wand.

4. Befestigen Sie die drahtlose Bridge mit den beigefügten Muttern an der Halterung.



5. Verbinden Sie das Ethernet-Kabel (und das Netzkabel, falls erforderlich) mit den Anschlüssen auf der Vorderseite der Bridge.

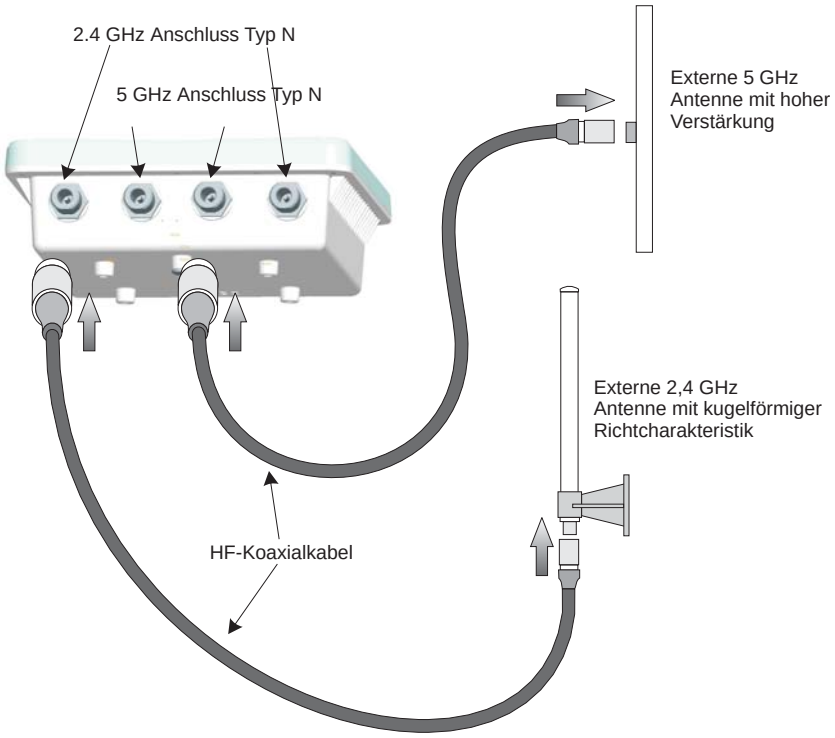
Anschließen der externen Antennen

Die in der Bridge eingebaute Antenne ist ihre Hauptantenne. Für einige Anwendungen, z.B. Einsatz eines WA6202A/AM-Geräts als Bridge-Link oder Zugriffspunkt, müssen Sie externe Antennen anbringen und sie an die Brücke anschließen. Typischerweise benötigt ein Bridge-Link eine 5,0 GHz Antenne und ein Zugriffspunkt eine 2,4 GHz Antenne. WA6202A/AM-Geräte, die als verwaltete Zugriffspunkte fungieren, benötigen auch eine externe Antenne für 2,4 GHz Betrieb.

Führen Sie folgende Schritte aus:

1. Montieren Sie die externe Antenne innerhalb eines Abstands von 3 m (10 Fuß) mit der Halterung, die der Antenne mitgeliefert ist, an derselben Stützstruktur wie die Bridge.
2. Verbinden Sie die Antenne mit dem HF-Koaxialkabel, welches der Antenne mitgeliefert ist, an den Bridge-Anschluss Typ N.

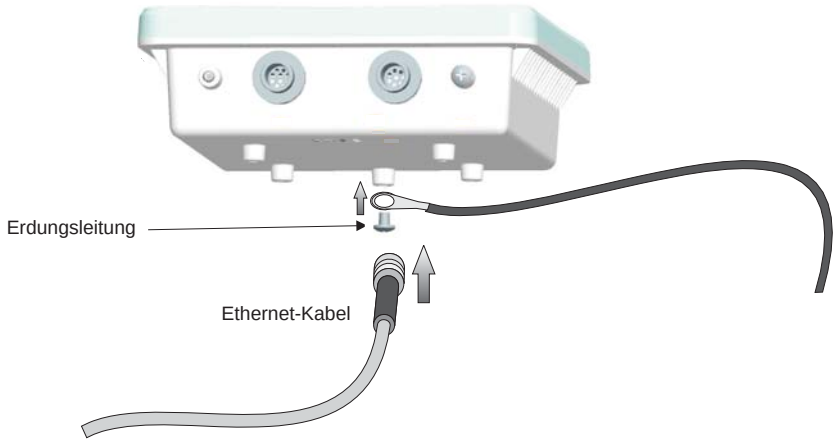
3. Versiegeln Sie die Antennenanschlüsse mit wasserdichtem Klebeband, um zu verhindern, dass Wasser in die Anschlüsse eindringt.



Anschließen der Kabel an das Gerät

1. Verbinden Sie das Ethernet-Kabel mit dem Ethernet-Port der drahtlosen Bridge.
2. Umwickeln Sie als zusätzlichen Schutz gegen Regen oder Feuchtigkeit den Ethernet-Anschluss mit wasserdichtem Klebeband (nicht mitgeliefert).
3. Achten Sie darauf, das Gerät mit einer passenden Erdungsleitung (nicht mitgeliefert) zu erden, indem Sie die Leitung an der Erdungsschraube am Gerät anbringen.

Achtung: Vergewissern Sie sich, dass ein Schutzleiter verfügbar ist und dass er den örtlichen und staatlichen Vorschriften für elektrische Anlagen (z.B. VDE) entspricht. Als Zusatzschutz gegen Blitzeinschlag sollten Sie Blitzableiter, Überspannungsableiter oder Spannungsstoß-Entstörer einsetzen.



Anschließen des PoE Injectors

So schließen Sie die drahtlose Bridge an eine Stromquelle an:

Achtung: Installieren Sie den PoE Injector nicht im Freien. Das Gerät darf nur in Innenräumen installiert werden.

Hinweis: Der Ethernet-Port der drahtlosen Bridge unterstützt kein PoE (Power over Ethernet) auf Basis des IEEE 802.3af-Standards. Versuchen Sie nicht, das Gerät dadurch mit Strom zu versorgen, indem Sie es direkt an einen Netzwerk-Switch anschließen, der über IEEE 802.3af PoE verfügt. Schließen Sie das Gerät immer an das mitgelieferte Injector-Modul für Stromversorgung an.

1. Verbinden Sie das Ethernet-Kabel von der drahtlosen Bridge mit dem RJ-45-Anschluss am Injector-Modul, der mit "Output" (Ausgang) gekennzeichnet ist.
2. Verbinden Sie ein durchgehendes, nicht abgeschirmtes UTP-Kabel von einem lokalen LAN-Switch mit dem RJ-45-Anschluss am Injector-Modul, der mit "Input" (Eingang) gekennzeichnet ist. Verwenden Sie für die 10/100BASE-TX-Verbindungen ein Kabel der Kategorie 5e oder bevorzugterweise ein UTP-Kabel.

Hinweis: Der RJ-45-Anschluss am njector-Modul ist ein MDI-Port. Verwenden Sie ein Crossover-Kabel für eine Direktverbindung mit einem Computer, um den Link zu testen.

3. Stecken Sie den Netzleitungsstecker direkt in den standardmäßigen Netzanschluss des Injector-Moduls.
4. Verbinden Sie das andere Ende der Netzleitung mit einer geerdeten, 3-poligen Netzstromquelle.

Hinweis: Bei internationaler Verwendung müssen Sie eventuell die Netzleitung austauschen. Sie müssen eine Netzleitung verwenden, die für den Steckdosentyp in Ihrem Land geprüft und abgenommen ist.

5. Prüfen Sie die LED oben auf dem Injector-Modul, um sich zu vergewissern, dass die drahtlose Bridge über die Ethernet-Verbindung mit Strom versorgt wird.

Cables and Pinouts

This chapter describes the wiring and pin assignments for the cables and connectors that can be used with the MP-622.

Twisted-Pair Cable Assignments

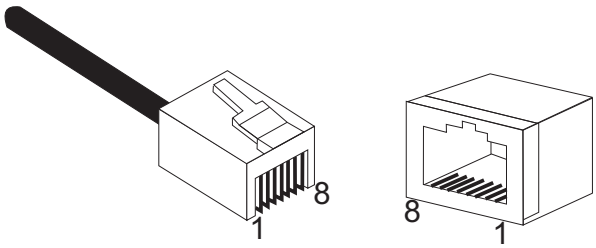
For 10/100BASE-TX connections, a twisted-pair cable must have two pairs of wires. Each wire pair is identified by two different colors. For example, one wire might be green and the other, green with white stripes. Also, an RJ-45 connector must be attached to both ends of the cable.

Each wire pair must be attached to the RJ-45 connectors in a specific orientation.

Never plug a phone jack connector into a power injector RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform with FCC standards.

The following figure illustrates how the pins on the RJ-45 connector are numbered. Be sure to hold the connectors in the same orientation when attaching the wires to the pins.

Figure 5–1. Pin Numbering on RJ-45 Connector



10/100BASE-TX Pin Assignments

Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3 or better cable for 10 Mbps connections, or 100-ohm Category 5 or better cable for 100 Mbps connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

The RJ-45 Input port on the power injector is wired with MDI pinouts. This means that you must use crossover cables for connections to PCs or servers, and straight-through cable for connections to switches or hubs. However, when connecting to devices that support automatic MDI/MDI-X pinout configuration, you can use either straight-through or crossover cable.

Table 5– 1. 10/100BASE-TX MDI and MDI-X Port Pinouts

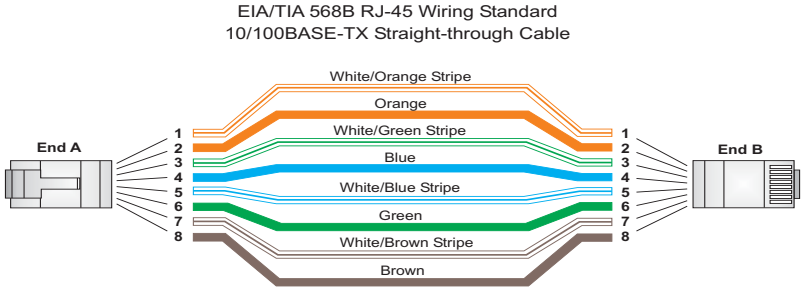
Pin	MDI-X Signal Name	MDI Signal Name
1	Receive Data plus (RD+)	Transmit Data plus (TD+)
2	Receive Data minus (RD-)	Transmit Data minus (TD-)
3	Transmit Data plus (TD+)	Receive Data plus (RD+)
6	Transmit Data minus (TD-)	Receive Data minus (RD-)
4,5,7,8	Not used	Not used

Note: The "+" and "-" signs represent the polarity of the wires that make up each wire pair.

Straight-Through Wiring

Because the 10/100 Mbps Input port on the power injector uses an MDI pin configuration, you must use "straight-through" cable for network connections to hubs or switches that only have MDI-X ports. However, if the device to which you are connecting supports automatic MDI/MDI-X operation, you can use either "straight-through" or "crossover" cable.

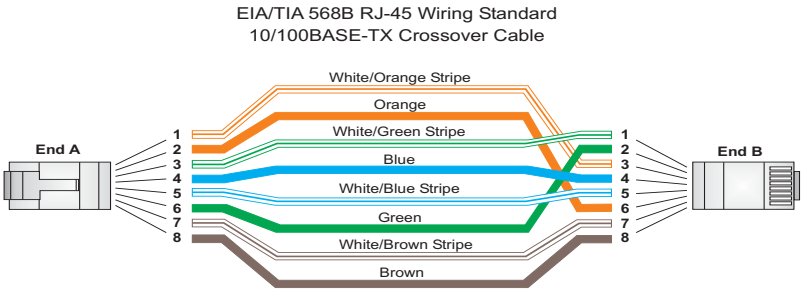
Figure 5–2. Straight-Through Cable Wiring



Crossover Wiring

Because the 10/100 Mbps port on the power injector uses an MDI pin configuration, you must use "crossover" cable for network connections to PCs, servers or other end nodes that only have MDI ports. However, if the device to which you are connecting supports automatic MDI/MDI-X operation, you can use either "straight-through" or "crossover" cable.

Figure 5–3. Crossover Cable Wiring



8-Pin DIN Connector Pinout

The Ethernet cable from the power injector connects to an 8-pin DIN connector on the MP-622. This connector is described in the following figure and table.

Figure 5–4. 8-Pin Ethernet DIN Connector

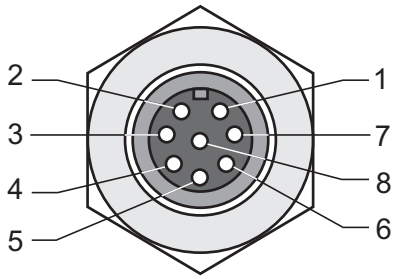


Table 5– 2. 8-Pin DIN Ethernet Port Pinout

Pin	Signal Name
1	Transmit Data plus (TD+)
2	Transmit Data minus (TD-)
3	Receive Data plus (RD+)
4	+48 VDC power
5	+48 VDC power
6	Receive Data minus (RD-)
7	Return power
8	Return power

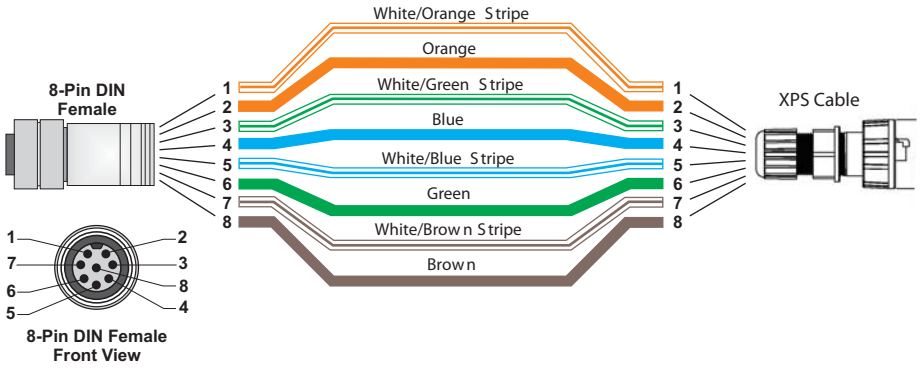
Note: The "+" and "-" signs represent the polarity of the wires that make up each wire pair.

8-Pin DIN to RJ-45 Cable Wiring

To construct an extended Ethernet cable to connect from the power injector's RJ-45 Output port to the MP-622's 8-pin DIN connector, follow the wiring diagram below. Use Category 5 or better UTP or STP cable, maximum length 100 m (328 ft), and be sure to connect all four wire pairs.

To construct a reliable Ethernet cable, always use the proper tools or ask a professional cable supplier to construct the cable.

Figure 5–5. 8-Pin DIN to RJ-45 Cable Wiring



Wireless Bridge Link Planning

The MP-622 supports fixed point-to-point or point-to-multipoint wireless links. A single link between two points can be used to connect a remote site to a larger core network. Multiple bridge links can provide a way to connect widespread Ethernet LANs.

For each link in a wireless bridge network to be reliable and provide optimum performance, some careful site planning is required. This chapter provides guidance and information for planning your wireless bridge links.

The planning and installation of a wireless bridge link requires professional personnel that are trained in the installation of radio transmitting equipment. The user is responsible for compliance with local regulations concerning items such as antenna power, use of lightning arrestors, grounding, and radio mast or tower construction. Therefore, it is recommended to consult a professional contractor knowledgeable in local radio regulations prior to equipment installation.

Data Rates

Using a 5 GHz integrated antenna, the MP-622 can operate over a range of up to 9.6 miles (15.4 km) or provide a high-speed connection of 54 Mbps. However, the maximum data rate for a link decreases as the operating range increases. A 9.6 mile link can only operate up to 6 Mbps, whereas a 54 Mbps connection is limited to a range of 0.81 mile (1.3 km).

When you are planning each wireless bridge link, take into account the maximum distance and data rates for the various antenna options. A summary for 5 GHz (802.11a) antennas is provided in the following table. For full specifications for each antenna, see **Antenna Specifications**.

Table 6– 1. Data Rates Achieved over Distances using MP-622 Antennas

Data Rate	17 dBi Integrated	8 dBi Omni	13.5 dBi 120-Degree Sector	16.5 dBi 60-Degree Sector	23 dBi Panel
6 Mbps	9.567 mi (15.4 km)	2.05 mi (3.3 km)	6.4 mi (10.3 km)	8.7 mi (14 km)	15.16 mi (24.4 km)
9 Mbps	9.13 mi (14.7 km)	1.8 mi (2.9 km)	5.72 mi (9.2 km)	8.32 mi (13.4 km)	14.48 mi (23.3 km)
12 Mbps	8.7 mi (14 km)	1.62 mi (2.6 km)	5.1 mi (8.2 km)	7.95 mi (12.8 km)	13.8 mi (22.2 km)
18 Mbps	7.95 mi (12.8 km)	1.3 mi (2.1 km)	4.04 mi (6.5 km)	7.27 mi (11.7 km)	12.61 mi (20.3 km)
24 Mbps	6.9 mi (11.1 km)	.932 mi (1.5 km)	2.86 mi (4.6 km)	5.72 mi (9.2 km)	10.9 mi (17.7 km)
36 Mbps	4.04 mi (6.5 km)	.5 mi (0.8 km)	1.62 mi (2.6 km)	3.23 mi (5.2 km)	8.7 mi (14 km)
48 Mbps	1.8 mi (2.9) km	.25 mi (0.4 km)	.75 mi (1.2 km)	1.42 mi (2.3 km)	5.72 mi (9.2 km)

Note: *Distances provided in this table are an estimate for a typical deployment and may be reduced by local regulatory limits. For accurate distances, you need to calculate the power link budget for your specific environment.*

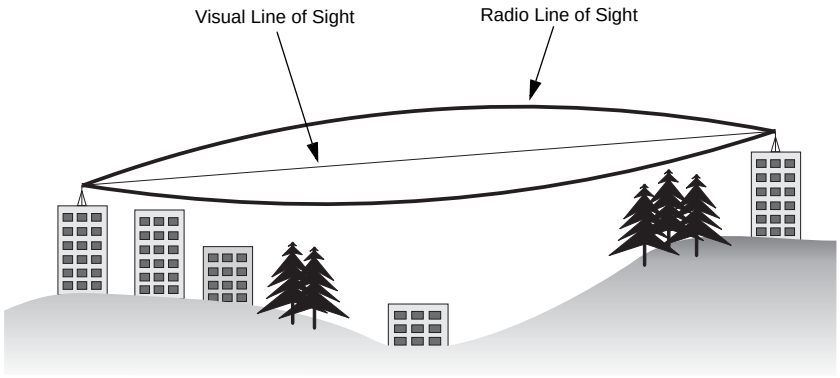
Radio Path Planning

Although the MP-622 uses IEEE 802.11a radio technology, which is capable of reducing the effect of multipath signals due to obstructions, the wireless bridge link requires a “radio line-of-sight” between the two antennas for optimum performance.

The concept of radio line-of-sight involves the area along a radio link path through which the bulk of the radio signal power travels. This area is known as the first Fresnel Zone of the radio link. For a radio link not to be affected by obstacles along its path, no object, including the ground, must intrude within 60% of the first Fresnel Zone.

The following figure illustrates the concept of a good radio line-of-sight.

Figure 6–1. Radio Line-of-Sight



If there are obstacles in the radio path, there may still be a radio link but the quality and strength of the signal will be affected. Calculating the maximum clearance from objects on a path is important as it directly affects the decision on antenna placement and height. It is especially critical for long-distance links, where the radio signal could easily be lost.

For wireless links less than 500 m, the IEEE 802.11a radio signal will tolerate some obstacles in the path and may not even require a visual line of sight between the antennas.

When planning the radio path for a wireless bridge link, consider these factors:

Avoid any partial line-of-sight between the antennas.

Be cautious of trees or other foliage that may be near the path, or may grow and obstruct the path.

Be sure there is enough clearance from buildings and that no building construction may eventually block the path.

Check the topology of the land between the antennas using topographical maps, aerial photos, or even satellite image data (software packages are available that may include this information for your area)

Avoid a path that may incur temporary blockage due to the movement of cars, trains, or aircraft.

Antenna Height

A reliable wireless link is usually best achieved by mounting the antennas at each end high enough for a clear radio line of sight between them. The minimum height required depends on the distance of the link, obstacles that may be in the path, topology of the terrain, and the curvature of the earth (for links over 3 miles).

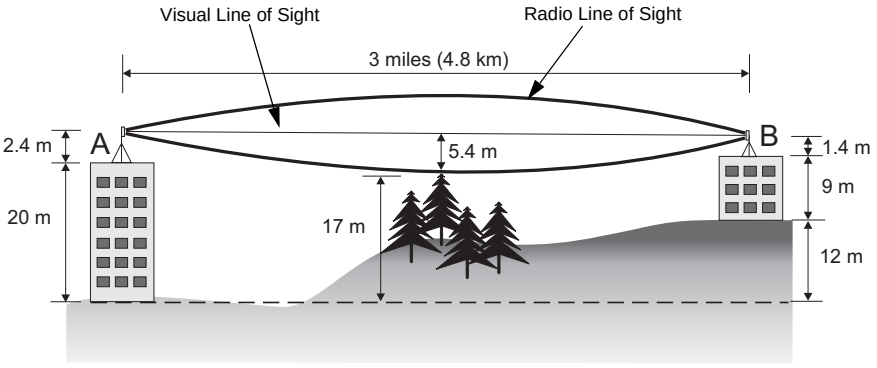
For long-distance links, a mast or pole may need to be constructed to attain the minimum required height. Use the following table to estimate the required minimum clearance above the ground or path obstruction (for 5 GHz bridge links).

Table 6– 2. Required Clearance Above Obstructions

Total Link Distance	Max Clearance for 60% of First Fresnel Zone at 5.8 GHz	Approximate Clearance for Earth Curvature	Total Clearance Required at Mid-point of Link
0.25 mile (402 m)	4.5 ft (1.4 m)	0	4.5 ft (1.4 m)
0.5 mile (805 m)	6.4 ft (1.95 m)	0	6.4 ft (1.95 m)
1 mile (1.6 km)	9 ft (2.7 m)	0	9 ft (2.7 m)
2 miles (3.2 km)	12.7 ft (3.9 m)	0	12.7 ft (3.9 m)
3 miles (4.8 km)	15.6 ft (4.8 m)	1.8 ft (0.5 m)	17.4 ft (5.3 m)
4 miles (6.4 km)	18 ft (5.5 m)	3.2 ft (1.0 m)	21.2 ft (6.5 m)
5 miles (8 km)	20 ft (6.1 m)	5 ft (1.5 m)	25 ft (7.6 m)
7 miles (11.3 km)	24 ft (7.3 m)	9.8 ft (3.0 m)	33.8 ft (10.3 m)
9 miles (14.5 km)	27 ft (8.2 m)	16 ft (4.9 m)	43 ft (13.1 m)
12 miles (19.3 km)	31 ft (9.5 m)	29 ft (8.8 m)	60 ft (18.3 m)
15 miles (24.1 km)	35 ft (10.7 m)	45 ft (13.7 m)	80 ft (24.4 m)
17 miles (27.4 km)	37 ft (11.3 m)	58 ft (17.7 m)	95 ft (29 m)

To avoid any obstruction along the path, the height of the object must be added to the minimum clearance required for a clear radio line-of-sight. Consider the following simple example, illustrated in the figure below.

Figure 6–2. Establishing a Clear Line-of-Sight



Example

A wireless bridge link is deployed to connect building A to a building B, which is located three miles (4.8 km) away. Midway between the two buildings is a small tree-covered hill. From the above table it can be seen that for a three-mile link, the object clearance required at the mid-point is 5.3 m (17.4 ft). The treetops on the hill are at an elevation of 17 m (56 ft), so the antennas at each end of the link need to be at least 22.3 m (73 ft) high. Building A is six stories high, or 20 m

(66 ft), so a 2.3 m (7.5 ft) mast or pole must be constructed on its roof to achieve the required antenna height. Building B is only three stories high, or 9 m (30 ft), but is located at an elevation that is 12 m (39 ft) higher than building A. To mount an antenna at the required height on building B, a mast or pole of only 1.3 m (4.3 ft) is needed.

Never construct a radio mast, pole, or tower near overhead power lines.

Local regulations may limit or prevent construction of a high radio mast or tower. If your wireless bridge link requires a high radio mast or tower, consult a professional contractor for advice.

Antenna Position and Orientation

Once the required antenna height has been determined, other factors affecting the precise position of the MP-622 must be considered:

- Be sure there are no other radio antennas within 2 m (6 ft) of the MP-622
- Place the MP-622 away from power and telephone lines
- Avoid placing the MP-622 too close to any metallic reflective surfaces, such as roof-installed air-conditioning equipment, tinted windows, wire fences, or water pipes
- The MP-622 antennas at both ends of the link must be positioned with the same polarization direction, either horizontal or vertical

Antenna Polarization — The MP-622's integrated antenna sends a radio signal that is polarized in a particular direction. The antenna's receive sensitivity is also higher for radio signals that have the same polarization. To maximize the performance of the wireless link, both antennas must be set to the same polarization direction. Ideally the antennas should be pointing upwards mounted on the top part of a pole.

Figure 6–3. Antenna Polarization Markings on the MP-622

Radio Interference

The avoidance of radio interference is an important part of wireless link planning. Interference is caused by other radio transmissions using the same or an adjacent channel frequency. You should first scan your proposed site using a spectrum analyzer to determine if there are any strong radio signals using the 802.11a channel frequencies. Always use a channel frequency that is furthest away from another signal.

If radio interference is still a problem with your wireless bridge link, changing the antenna polarization direction may improve the situation.