TERABEAM ™ *WIRELESS*

Marquee Point-to-MultiPoint Series
User Guide

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<u>LIMITED WARRANTY</u>

Terabeam Wireless (Terabeam) warrants that your device is free of defects in material and workmanship for a period of one year after initial purchase. Terabeam will, in this period of time, repair or replace, any Terabeam product returned to the factory, freight prepaid.

The Terabeam warranty covers repairs or replacement (at Terabeam's option) of the product only. Terabeam is not responsible for the cost of removal, reinstallation, or shipping to the place of repair. Terabeam does not extend or modify its warranty period as a result of repair or replacement.

Terabeam reserves the right to void a warranty and/or make reasonable charges for repair of a unit if the warranty seal is broken or the unit displays evidence of misuse, abuse, or tampering.

Terabeam is not responsible for damage to any other equipment or property, or any other consequential or incidental damages of any kind, whether based on contract, negligence, or strict liability. Maximum liability shall not in any case exceed the purchase price of the unit.

Warranties give you (the buyer) specific legal rights. You may also have other rights that vary from state to state. This warranty is only extended to purchases made in the United States of America or its possessions.

<u>SPECIAL WARRANTY NOTICE</u>

The warranty is null and void if any of the following occurs:

1. The product enclosure is opened.
2. The connections are not properly waterproofed.
3. The device is installed improperly or with incorrect connectors.
4. The round connector of the outdoor Ethernet cable (if provided) is improperly plugged into the rear jack of the enclosure.
5. The device or DC Power Injector (if provided) are physically damaged.
6. The device is operated outside the recommended DC power specifications.
7. The device is damaged by extreme forces of nature, lightning, or 'Acts of God.'

<u>FCC NOTICE</u>

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.*

* Note: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

These products are labeled with one of the following FCC ID numbers:

> ***FCC ID: NM5-MB-HP, NM5-MB-49, NM5-MB-49-HP***

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PROFESSIONAL INSTALLATION REQUIRED

The Marquee P-P must be installed as a system by experienced antenna installation professionals who are familiar with Radio Frequency (RF) issues such as gains and losses, as well as local building and safety codes. Failure to do so will void the product warranty and may expose the end user to excessive RF hazard.

Regulations regarding maximum antenna gains, power output and maximum permissible exposure vary from country to country. It is the responsibility of the end user to operate within the limits of these regulations and to ensure that the professional installers who install this device are aware of these regulations. All antennas are intended to be installed outdoors.

Section 1
Overview

1.1   Description

The Marquee™ Point-to-MultiPoint (P-MP) Series is a powerful answer for customers seeking a reliable high-speed wireless connectivity solution. It provides the best features and wireless reach in the field by combining industry leading outdoor Point-to-MultiPoint optimized software with its patented amplifier technology. Unlike other single band products, Marquee gives you the choice of installing a license-free 5.8 GHz, or a licensed 4.9 GHz network. If your needs change in the future, Marquee can change with you.

The Marquee P-MP Series features the award-winning industry standard TurboCell® software, a protocol which significantly enhances the performance of outdoor 802.11 systems through the use of adaptive dynamic polling, bandwidth allocation at the client, and packet aggregation. TurboCell® solves the "hidden node" problem inherent in adding nodes to traditional 802.11 outdoor networks.[1]

Marquee P-MP Series is comprised of Marquee Base units and Marquee Client / Customer Premise Equipment (CPE) units, also called Remote or Satellite units. The Marquee Base and Satellites are available in two types of enclosures: a flat panel (FP) and a ruggedized (EX) enclosure (see Figures 1.1a and b). The FP enclosure features an integrated antenna. The EX enclosure comes either with a flat panel antenna attached to the top of the unit, or it has an N-type connector on the rear to plug an external antenna.

Refer to Appendix A for Marquee P-MP technical specifications.

1.2   Marquee P-MP Kit Contents

Each Marquee P-MP kit includes the following (refer to Figures 1.1a and b):

- Outdoor radio with mounting hardware
- Surge protected Cat 5 DC Power Injector
- 110/240 VAC to 48 VDC power supply
- CD-ROM with Windows-based Configurator software
- User's Manual

A Terabeam outdoor Ethernet cable must be ordered separately per unit. Available lengths are 50, 100, 200, or 300 feet. Models with external antennas include one 6 ft LMR-600 coax cable per unit.

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1 Marquee 1.0 P-MP units operating with TurboCell® do not support traditional 802.11 Base station or Client access.

Figure 1.1a – Components of Marquee P-MP FP Enclosure

Figure 1.1b – Components of Marquee P-MP EX Enclosure

Section 2
Installation

<table>
<tr><td colspan="2" align="center"><u>Safety Warning</u></td></tr>
<tr><td align="center">⚠️
<strong style="color:red">CAUTION</td><td>This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment when installed as directed. The equipment should be installed and operated outdoors with fix-mounted antennas such that there will be a minimum of 2 meters of separation distance between the antenna and all persons during normal operation. This includes integrated, attached and external antenna versions of equipment.</td></tr>
</table>

2.1   Introduction

The Marquee P-MP is intended <u>for professional installation only</u>. Please review the entire manual before powering up or deploying these units.

NOTE: It is strongly recommended that you configure and test the units prior to deploying them in the field. Set up a "mini-network" that resembles your actual configuration as close as possible. By using such a mock-up, troubleshooting potential problems will be much easier than if you already installed the equipment in the field. Read through this entire Section 2 to understand how to install the hardware. To configure the Marquee P-MP, read Section 3.

2.2   DC Power Injector

The Cat 5 DC Power Injector is not in a waterproof enclosure and must be protected from the weather. It can be permanently mounted to a surface using the double stick tape found on the back of it.

2.3   Power Supply

The Marquee P-MP kit comes with a 110/220 VAC to 48 VDC power supply that has a standard barrel plug [center pin positive (+) tip and outer ring negative (-)].

2.4   LEDs

Three LEDs are present on the back of the Marquee (see Figures 2.1a and b):
- The green Power LED stays on when the unit is plugged and operating correctly
- The green Wireless Link LED flashes when there is traffic over the wireless medium
- The green Ethernet Link LED flashes when there is traffic over the Ethernet port

Figure 2.1 – Marquee P-MP LEDs

(a) Flat Panel (FP) Version   *(b) Ruggedized (EX) Version*
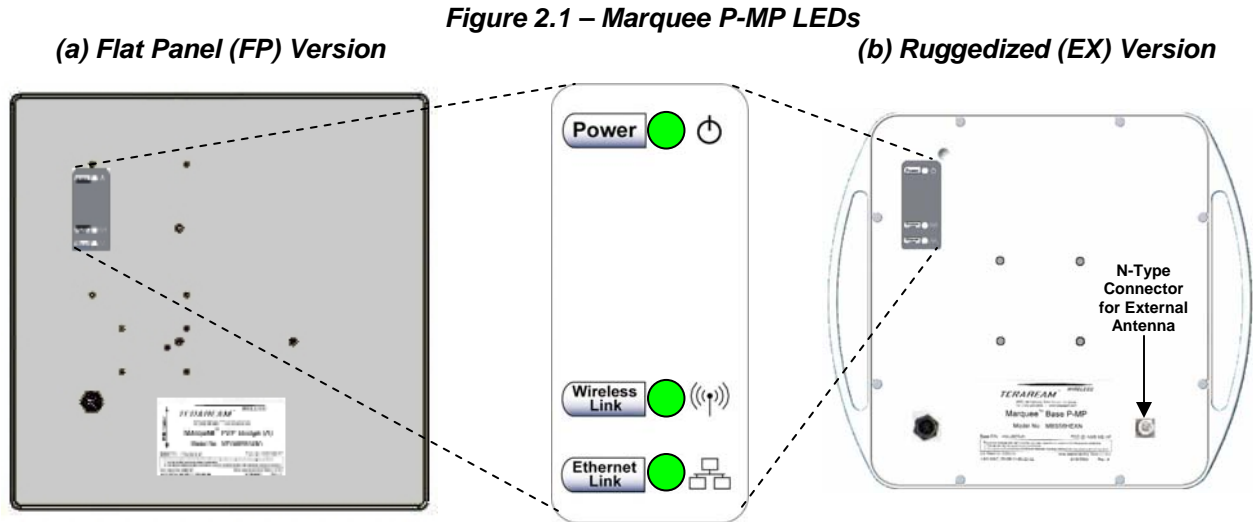
2.5   Hardware Installation – FP Enclosure

NOTE: All connectors must be properly water-proofed with all-weather electrical tape, Permagum, or equivalent. Do not use Silicon glue.

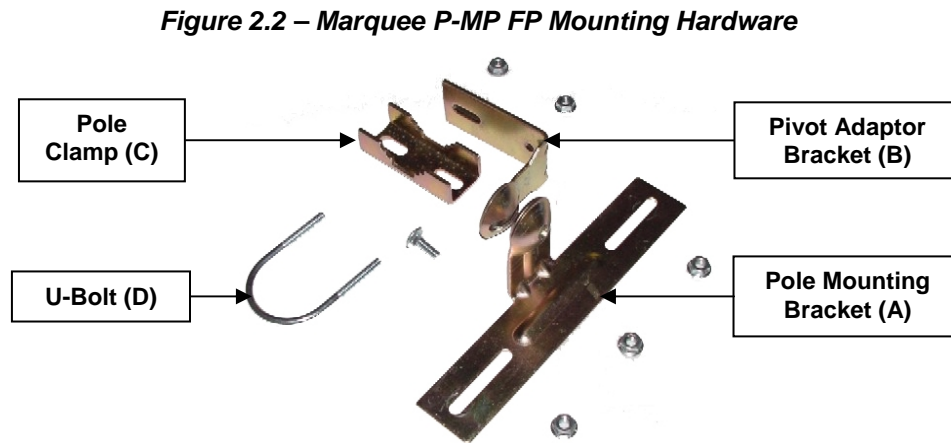The Marquee P-MP FP unit is installed by using a pole mounting bracket (A) that is secured to the pole with a pivot adaptor bracket (B), a pole clamp (C), and a U-bolt (D). Figure 2.2 shows the hardware provided to mount the Marquee P-MP FP unit.

Figure 2.2 – Marquee P-MP FP Mounting Hardware

The integrated antenna can be mounted either vertically or horizontally polarized. The label located on the back of the unit contains an arrow indicating the antenna's polarization (see Figures 2.3a and b). Please note that both ends of the link must use the same polarization. Be aware that most omni antennas are vertically polarized and if the Marquee P-MP FP is aimed at one, it must be installed vertically polarized, i.e., with the polarization arrow up and down.

Figure 2.3 – Marquee P-MP FP Orientation
(a) For Vertical Polarization   (b) For Horizontal Polarization

1. Fit the pole mounting bracket (A) to the two studs protruding from the back of the Marquee P-MP FP unit according to the desired polarization, as shown in Figures 2.3a and b. Position the bracket so that the side that has the circular tab is pointing towards the center of the unit. Secure to the unit by threading two nuts and tighten them firmly with an appropriate wrench.

2. Attach the pivot adaptor bracket (B) to the pole mounting bracket (A) by using bolt and nut, as shown in Fig 2.4. Tighten hardware (one place). **IMPORTANT:** Ensure that convex edge of the pivot adaptor bracket (B) is facing concave edge of the pole mounting bracket (A).

Figure 2.4 –Assembly of Pivot Adaptor Bracket (B) to Pole Mounting Bracket (A)

3. Turn the pivot adaptor bracket (B) so that the rectangular part is parallel with the surface of the Marquee P-MP FP. Fasten the Marquee P-MP unit to the pole using pole clamp (C), U-bolt (D), and two nuts, as shown in Fig 2.5. Tighten hardware (two places). The pole clamp (C) and U-bolt (D) will accept pole diameters between 0.75" to 1.5" OD.

Figure 2.5 – Attaching the Marquee P-MP FP Unit to the Pole
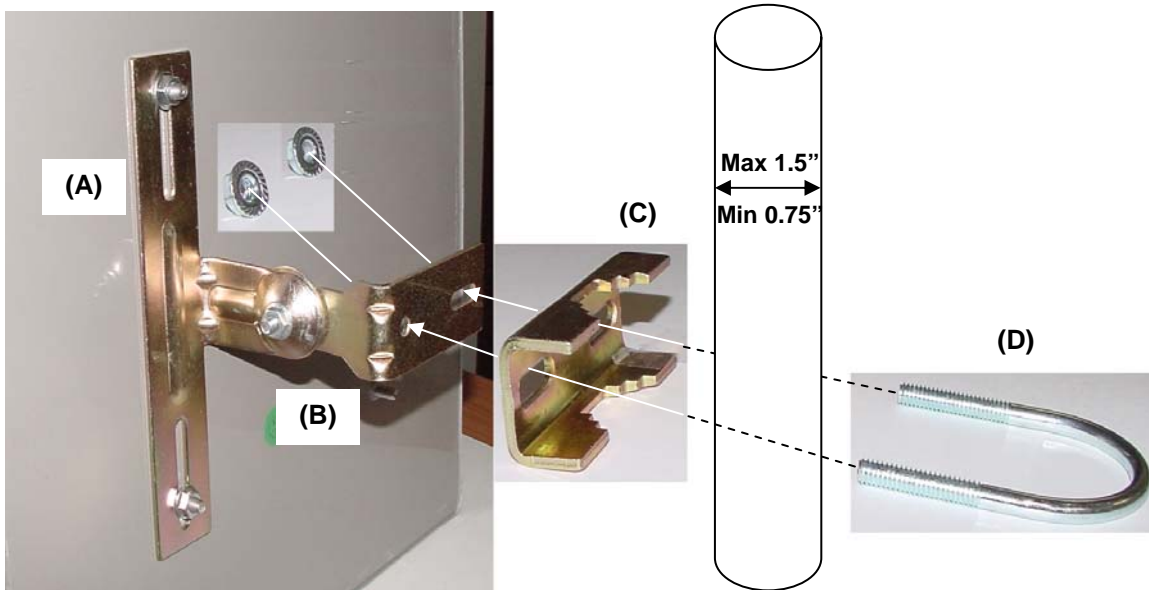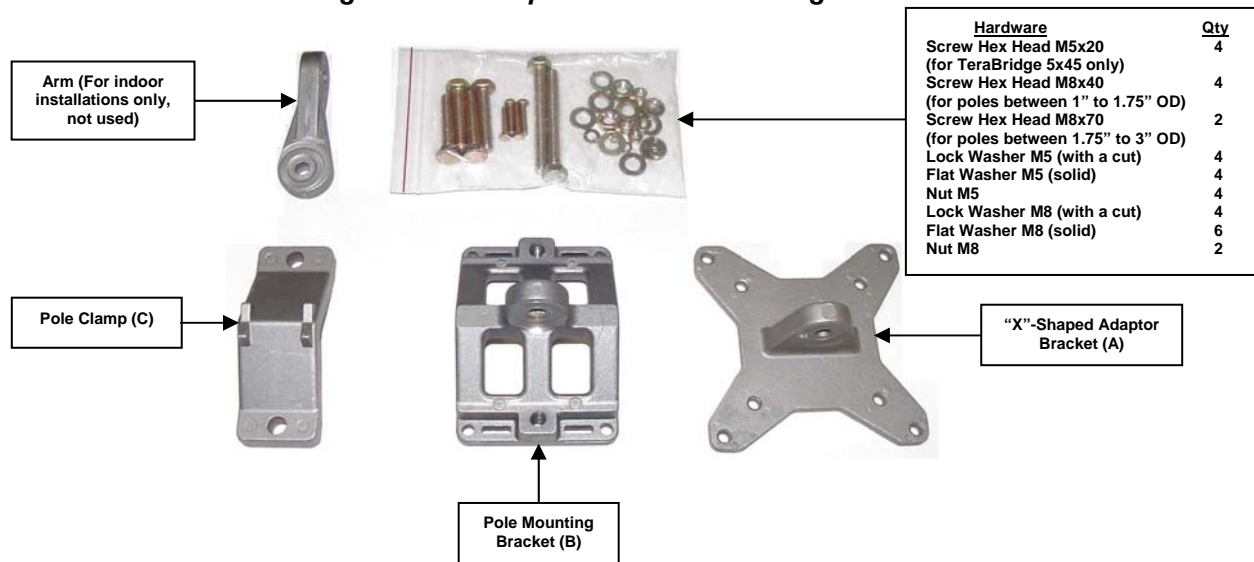

Proceed to Section 2.7 – Cabling the Marquee P-MP (All Enclosures).

2.6 Hardware Installation – EX Enclosure

NOTE: All connectors must be properly water-proofed with all-weather electrical tape, Permagum, or equivalent. **Do not use Silicon glue**.

The Marquee P-MP EX unit is installed by using an "X"-shaped adaptor bracket (A) that is secured to the pole with a pole mounting bracket (B), and a pole clamp (C). Figure 2.6 shows the hardware provided to mount the Marquee P-MP EX unit.

Figure 2.6 – Marquee P-MP EX Mounting Hardware

Hardware	Qty
Screw Hex Head M5x20 (for TeraBridge 5x45 only)	4
Screw Hex Head M8x40 (for poles between 1" to 1.75" OD)	4
Screw Hex Head M8x70 (for poles between 1.75" to 3" OD)	2
Lock Washer M5 (with a cut)	4
Flat Washer M5 (solid)	4
Nut M5	4
Lock Washer M8 (with a cut)	4
Flat Washer M8 (solid)	6
Nut M8	2

The antenna can be mounted either vertically or horizontally polarized. If you are using a Marquee P-MP with an attached antenna, the label located on the back of the unit shows an arrow indicating the antenna's polarization (see Figures 2.7a and b). Please note that both ends of the link must use the same polarization. Be aware that most omni antennas are vertically polarized and if the Marquee P-MP EX is aimed at one, it must be installed vertically polarized, i.e., with the polarization arrow up and down. If you are using a Marquee P-MP with an external antenna, there is no arrow on the label located on the back of the unit and an additional N-type female jack is present to connect a short coax cable to the antenna (see Figure 2.1b). All previous considerations regarding polarization are applicable to the external antenna.

⚠️ **WARNING**	*If you are using a Marquee P-MP with an external antenna, the unit must be operated with a proper antenna, microwave load or terminator plugged into the N-type female jack on the back of the unit. Operating the Marquee P-MP with nothing connected to the jack may result in damage to the TX section of the unit which will not be covered by the factory warranty and will be a billable repair.*

Figure 2.7 – Marquee P-MP EX With Attached Antenna Orientation
**(a) For Vertical Polarization** **(b) For Horizontal Polarization**


Polarization
Arrow

Polarization
Arrow
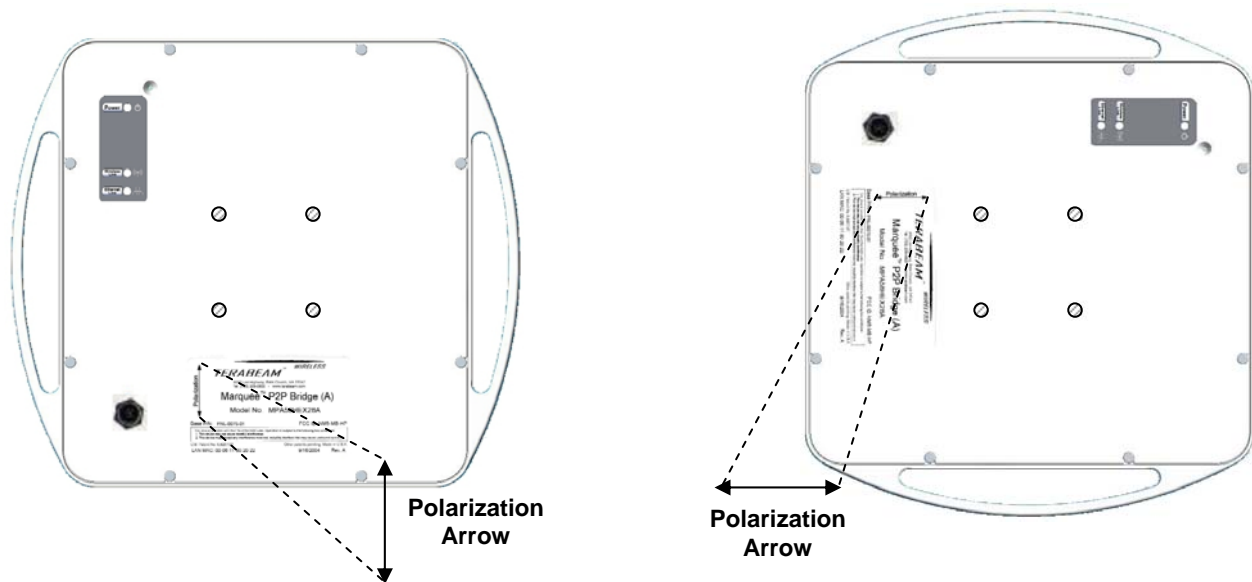
1. Fit the adaptor bracket (A) to the four studs protruding from the back of the Marquee P-MP EX unit, by aligning the four <u>inner</u> holes with the mounting studs on the back of the unit and securing to the unit using four nuts, lock washers, and flat washers, as shown in Figure 2.8. Tighten hardware (four places). **IMPORTANT:** Note the position of the serrated edge of bracket (A).

2. Attach the pole mounting bracket (B) to adaptor bracket (A) by using one M8x40 bolt and flat washer on one side, and nut, lock washer and flat washer on the other, as shown in Fig 2.8. Tighten hardware (one place). **IMPORTANT:** Ensure that the serrated edges on both brackets are facing each other.

3. Fasten the unit to the pole using pole clamp (C) and two M8x70 bolts, lock washers, and flat washers, as shown in Fig 2.9. Tighten hardware (two places). The pole mounting bracket (B) will accept pole diameters between 1.75" to 3" OD. You may attach the Marquee P-MP unit to smaller diameter poles, between 1" to 1.75" OD, by flipping over the pole clamp (C) so the convex part faces the pole and using two M8x40 bolts. The Marquee P-MP unit can also be mounted to larger pole diameters by

discarding pole clamp (C) and replacing it with metal straps (not included) fastened through slots located on the pole mounting bracket (B).

Figure 2.8 – Detail Showing Assembly of Pole Mounting Bracket to Marquee P-MP EX

B

A

Serrated Edges
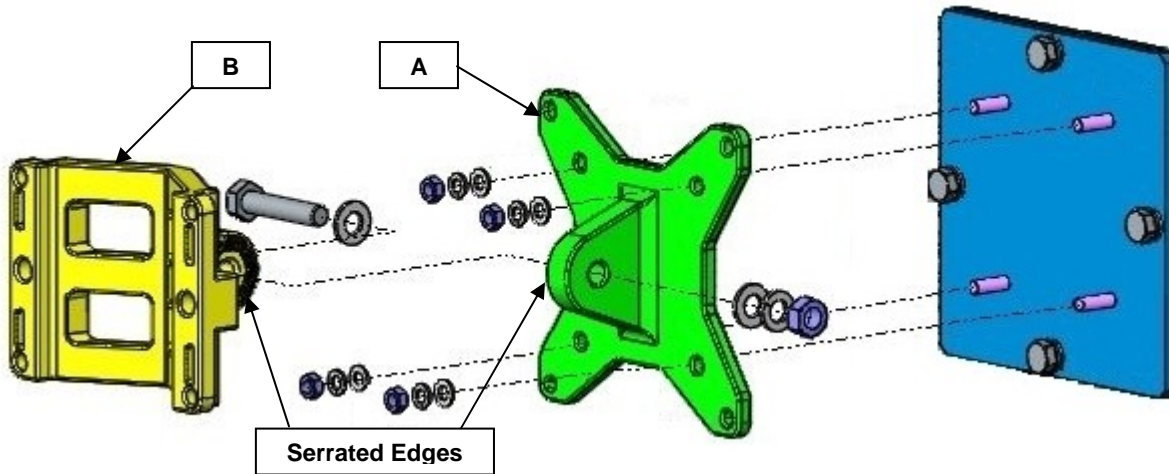
Figure 2.9 – Attaching the Marquee P-MP EX Unit to the Pole

Slots for optional metal straps

C

Max 3.0"

Min 1.0"
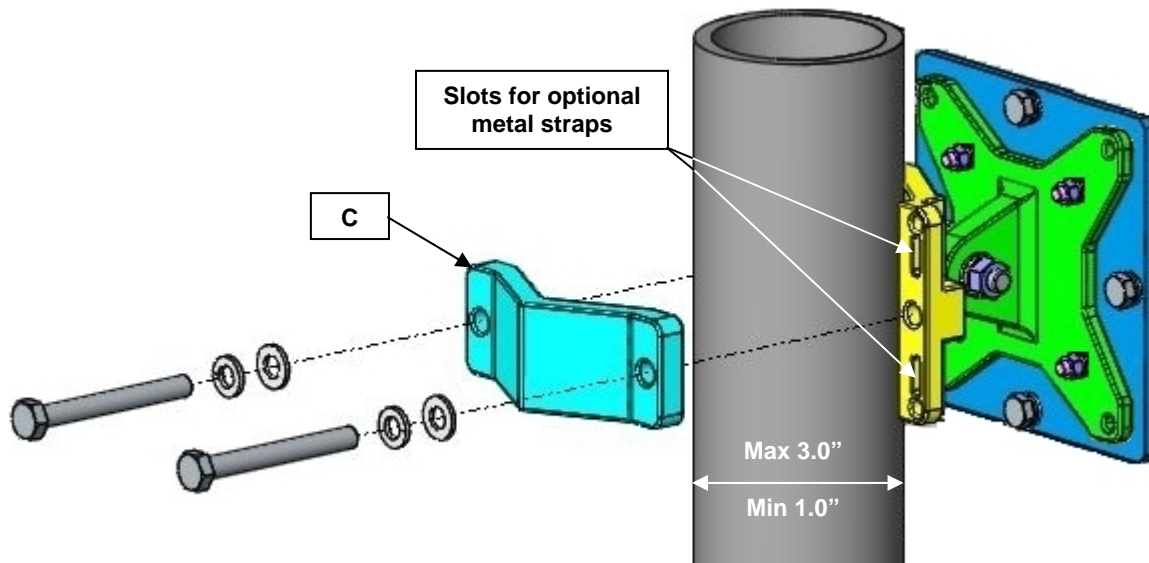
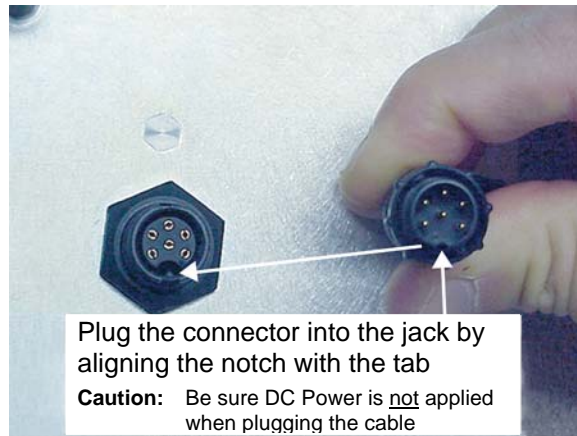Proceed to Section 2.7 – Cabling the Marquee P-MP (All Enclosures).

2.7   Cabling the Marquee P-MP (All Enclosures)

1. Ensuring that there is no DC power applied to the cable, plug the 6-pin N-male round connector of the outdoor Ethernet cable (ordered separately) into the rear jack of the unit, making sure the notch on the connector is correctly aligned with the tab on the jack as shown on Figure 2.10. Turn the round locking nut clockwise as you push in until it securely fastens onto the jack. **Please verify that the round connector is properly plugged into the rear jack of the antenna prior to connecting DC power** because it is possible to push it in the wrong way if enough force is used. If DC power is applied and the connector is not properly plugged, damage to the electronics of the unit or the connector itself may occur which will not be covered by the factory warranty.
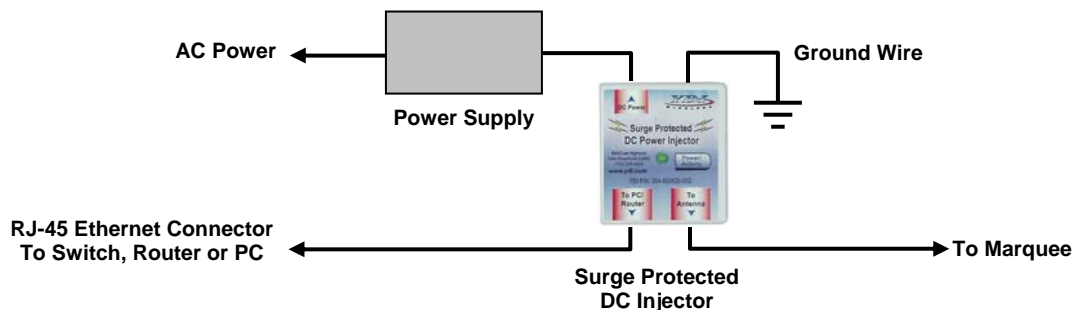
<table>
<tr>
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⚠️

WARNING

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If DC Power is applied while you are attempting to insert the round connector into the jack, it is possible that, as you rotate the plug in an effort to find the key, DC power pins will momentarily touch the Ethernet pins. **If this happens the Ethernet circuitry on the board will be damaged**. *Also, do not apply excessive pressure when you insert the round connector or the pins will pop out. Any damage caused by this action will <u>not</u> be covered by the factory warranty and will be a billable repair.*

</td>
</tr>
</table>

Figure 2.10 – Plugging the Outdoor Ethernet Cable

Plug the connector into the jack by aligning the notch with the tab

Caution: Be sure DC Power is <u>not</u> applied when plugging the cable

2. Attach the other end of the outdoor Ethernet cable to the Cat 5 DC Power Injector at port RJ-45 labeled "To Antenna."

3. Connect the Ethernet cable labeled "To PC/Router" from the Cat 5 DC Power Injector into a regular port on your router, switch or hub. If you connect to a laptop or PC, use a cross-over cable or adapter.

4. Perform an Earth ground connection to any of the rear bolts of the unit, the mounting brackets, or the mast (if metallic). For maximum protection, also connect the metal wire of the surge protected DC Injector to ground as shown on Figure 2.11.

Figure 2.11 – Installation of the Terabeam Surge Protected DC Injector for Maximum Grounding Protection

AC Power

Power Supply

Ground Wire

RJ-45 Ethernet Connector
To Switch, Router or PC

To Marquee

Surge Protected
DC Injector

5. If you are using a Marquee P-MP unit with an external antenna, connect the antenna to the N-type female jack on the back of the unit.

6. Connect the barrel plug of the power supply to the "DC Power" jack on the Cat 5 DC Power Injector, then plug the Power Supply into an AC outlet. Check that the green Power LED on the Marquee

P-MP turns on. If there is traffic over the wireless medium the green Wireless Link LED should be flashing. If the Ethernet port is active the green Ethernet Link LED should be flashing.

7. Install the Configurator program on a laptop or PC and configure your system (see Section 3). You are going to use the antenna alignment and link monitoring screen of the program to align the antennas.

2.8   Antenna Alignment

There are three possible antennas that you can use with the Marquee P-MP unit:

- An FP enclosure
- An EX enclosure with an attached antenna
- An external antenna

The purpose of the following steps is to adjust the Line-of-Sight (LOS) of the antennas in order to maximize the main lobe Signal-to-Noise Ratio (SNR) level. Regardless of the type of antenna that you are using, the procedure involves making an azimuth (horizontal) alignment and an elevation (vertical) alignment. The steps below pertain to integrated and attached antennas, but they are also applicable to external antennas as long as you follow the specific alignment instructions of the corresponding manufacturer. For a P-MP configuration there are two possible cases:

- If you are installing a P-MP configuration for the first time, you are going to align both the antenna at the Base site and the antenna at the CPE site.
- If you are installing a new Client in an existing P-MP configuration, you are going to align only the antenna at the new CPE site.

IMPORTANT: During this process, all Marquee P-MP units must be at the same stage of the installation procedure and powered ON. It is assumed that you have configured your units (see Section 3) and that there is communication between the Configurator program and your Marquee P-MP units. Unless specifically noted, the term "antenna" is used to describe either of the three types.

1. Perform a coarse alignment of the antenna by using a compass heading so it is roughly "looking" at its remote partner.

2. Connect the near end Marquee P-MP unit to the laptop or PC where the Configurator program is installed by using a crossover Ethernet cable. Run the Configurator. Verify that the unit where you are locally connected to as well as its remote partner are both displayed on the Main Screen (Fig. 2.12).

   Note: If you cannot see the partner Marquee P-MP unit on the Main Screen, that probably means that your antenna is so misaligned that it cannot link to its partner. If you are setting a *new* P-MP configuration, perform a coarse alignment of both antennas by using a compass heading so they are "looking" at each other. Place the cursor anywhere in the **List of Scanned Devices** box and right-click the mouse. A **Re-scan local network** button will appear. Click on the button. If the partner Marquee P-MP still does not appear, repeat these steps until it is displayed. If you are installing a new client on an *existing* P-MP configuration, only align the Client antenna. The Base station antenna should **not** be touched.

3. Click the **Analyze** tab, then click the **Wireless Link Test** button. The **Enter IP Address** window appears (Fig. 2.13). Enter the IP address of the local unit (in this case 198.17.74.253) and a password of *public* (unless you have previously changed it, then enter the one you defined). Click **OK**.

*Figure 2.12 – Configurator Main Screen*
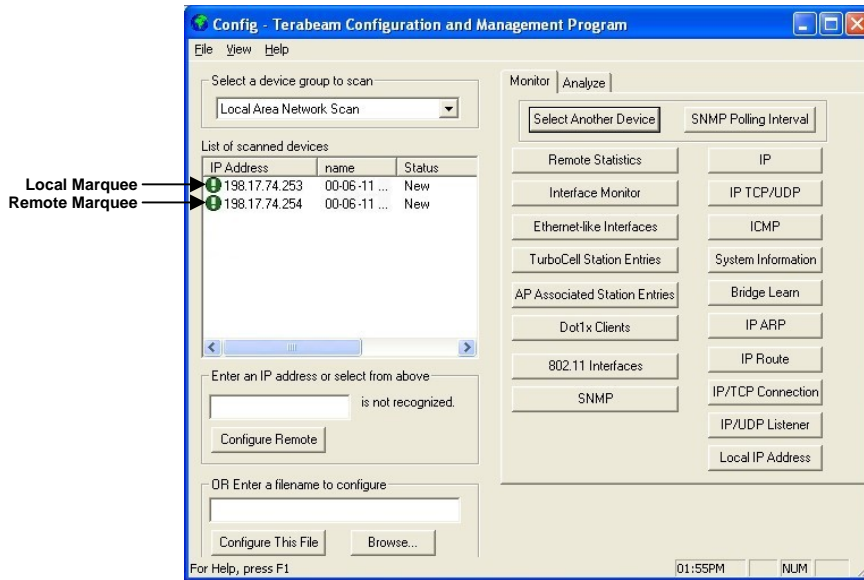
*Figure 2.13 –Enter IP Address Screen*
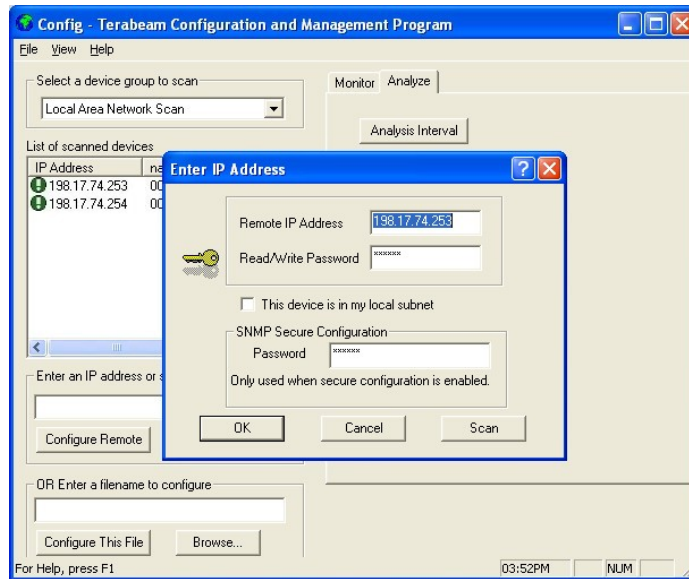
4. The **Select a Remote Link Partner** window appears (Figure 2.14). Verify that you have the partner Marquee P-MP unit displayed in the box, click on it and then click the **Link Test** button (or double-click the partner unit). The **Remote Test Link** window is shown (Figure 2.15). The main goal now is to peak the SNR levels at both ends of the link.

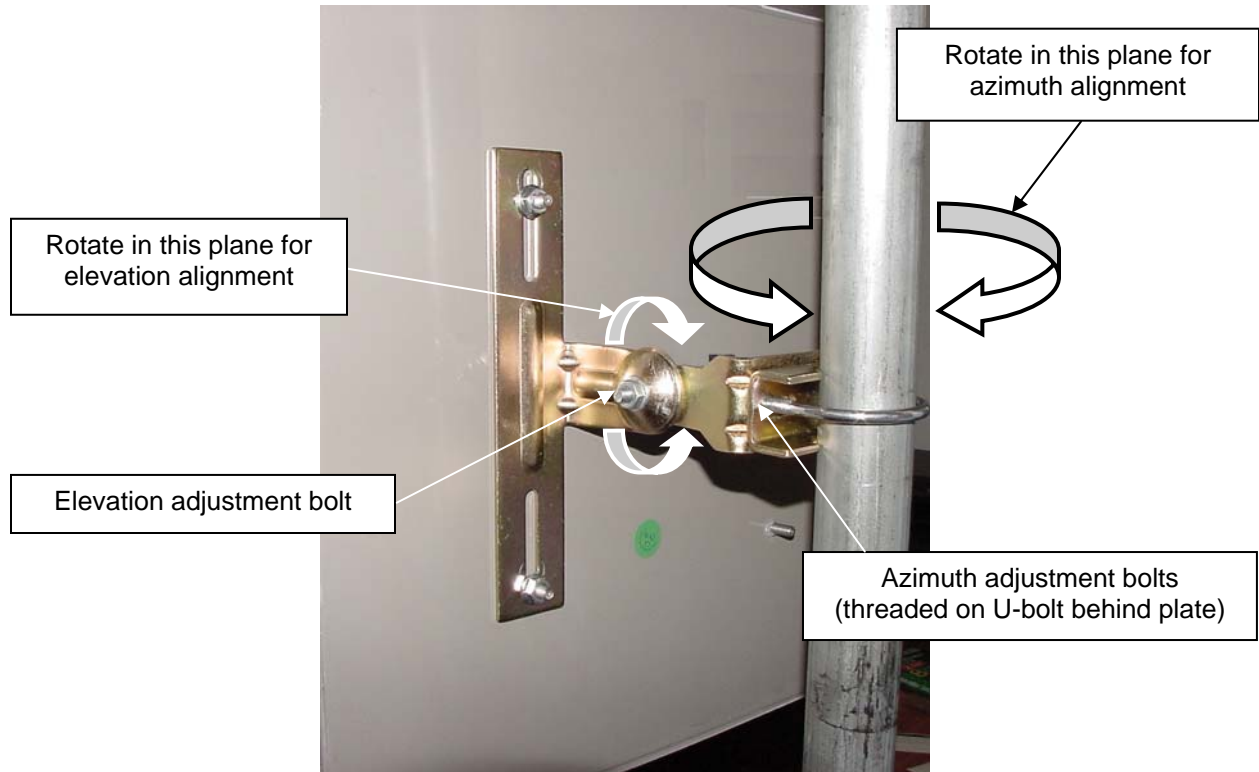*Figure 2.14 – Select a Remote Link Partner Screen*
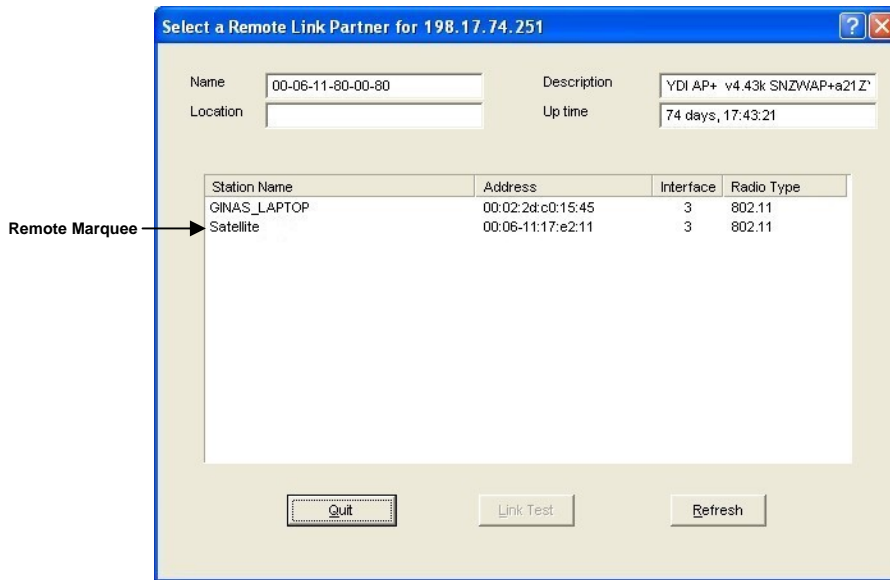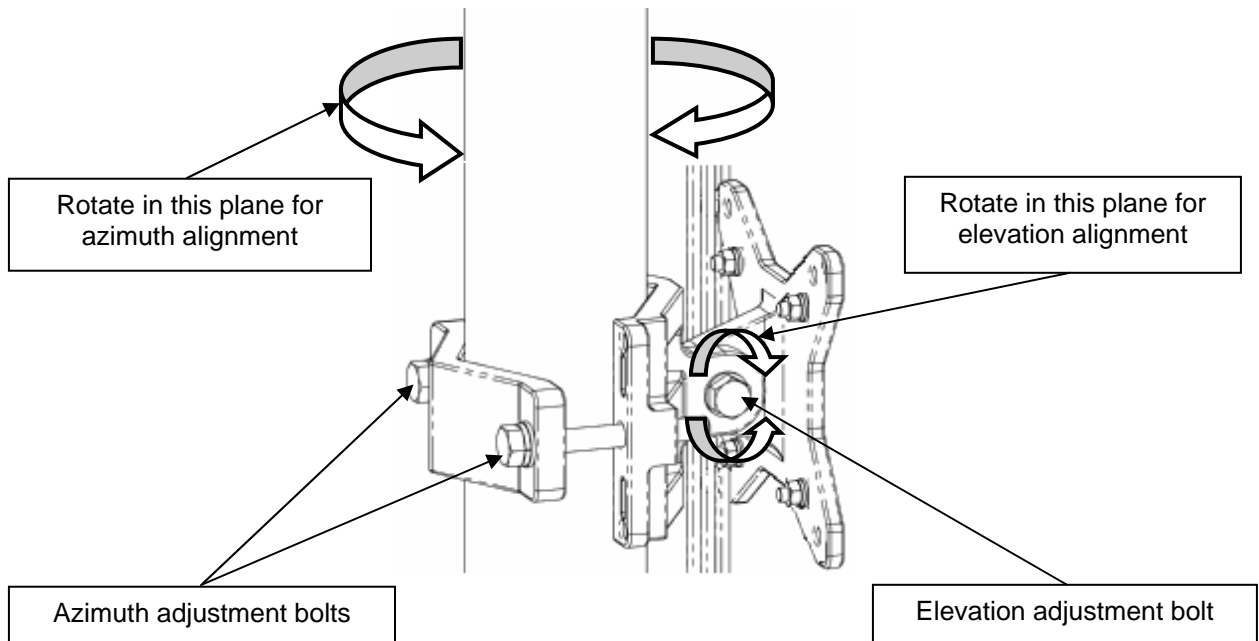

Figure 2.15 – Remote Link Test Screen
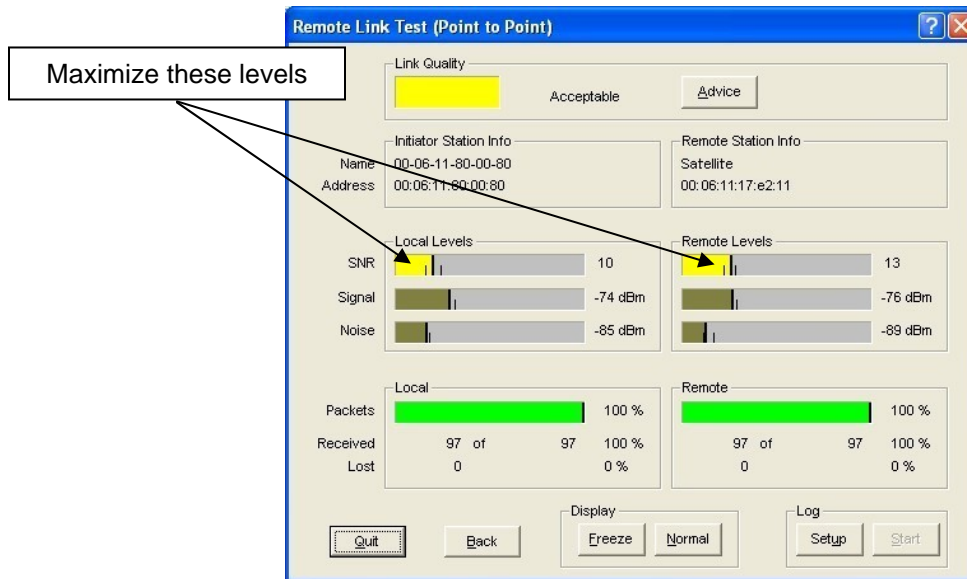
5. Using the Azimuth adjustment bolts (see Figure 2.16a or b), adjust the azimuth until the SNR readings for both ends of the link peak. Start with azimuth adjustment on the far end of the link first (if applicable). It is recommended that, in order to ensure the true maximum, you should adjust through the maximum SNR reading until the reading clearly drops and continues to drop to lower level side-lobes. Adjust back until the maximum is attained again. Then repeat for the near end of the link.

6. Using the Elevation adjustment bolt (see Figure 2.16a or b), adjust the elevation until the SNR readings for both ends of the link peak. Start with elevation adjustment on the far end of the link first (if applicable). It is recommended that, in order to ensure the true maximum, you should adjust through the maximum SNR reading until the reading clearly drops and continues to drop to lower level side-lobes. Adjust back until the maximum is again attained. Then repeat for the near end of the link.

Figure 2.16a – Final Line-of-Sight Adjustment for Signal Optimization (FP Enclosure)

Rotate in this plane for azimuth alignment

Rotate in this plane for elevation alignment

Elevation adjustment bolt

Azimuth adjustment bolts (threaded on U-bolt behind plate)

Figure 2.16b – Final Line-of-Sight Adjustment for Signal Optimization (EX Enclosure)

Rotate in this plane for azimuth alignment

Rotate in this plane for elevation alignment

Azimuth adjustment bolts

Elevation adjustment bolt

7. Repeat steps 7 and 8 above to guarantee optimum alignment for maximum signal strength.

CAUTION: It is possible to obtain a false peak SNR reading from the signal of a side-lobe. Up to three different side-lobes on either side of the main lobe may give false peak alignment readings. For this reason, it is important that a wide sweep in both azimuth and elevation is made in order to identify these false peak SNR readings so to zero in on the true peak alignment reading due to the main antenna beam.

8. Tighten the two Azimuth adjustment bolts while observing the SNR reading to ensure the azimuth alignment does not change while tightening.

9. Tighten the Elevation adjustment bolt while observing the SNR reading to ensure the elevation alignment does not change while tightening.

10. **Test the Link**. Prior to placing the link in service for network traffic, the link should be tested using standard network procedures.

Section 3
Configuration

3.1   Installing the Configurator

The Terabeam Wireless Network Configurator is a Windows-based program that can be installed on a laptop or PC running Windows 98, ME, 2000, NT, or XP. The program allows you to locally or remotely perform the following procedures:

- Display a list of units running on the network
- Display and edit the current configuration of the units
- Load and save configurations
- Update the firmware of the units

To install the Network Configurator, perform the following steps:

1. Insert the Terabeam Wireless Software and Documentation CD-ROM included with your product into the appropriate drive of your computer.

2. Using your Windows Explorer open the contents of the CD-ROM drive and select the following directory: **\Management Software\Configurator**. Run the installation (.exe) program.

3. An **InstallShield Wizard** screen will appear first. Choose **Next** to continue the installation or **Cancel** to terminate.

4. The **Choose Destination** screen will appear next. You can use the default location, **\Program Files\Terabeam\Terabeam Configurator**, or press the **Browse** button to specify a different install location. Choose **Next** to continue the installation or **Cancel** to terminate.

5. The **InstallShield Wizard Completed** screen will appear to indicate successful installation of the Configurator. Click **Finish** to complete the installation.

3.2   Basic Configuration of a Marquee P-MP

After completing the Configurator installation, you are ready to configure your Marquee P-MP system. The following steps provide a quick procedure to get you started. For more in-depth information about the Configurator and its commands, menus and options, please refer to the **Network Configurator User Guide**, available as a pdf file on your CD ROM. Also, you may access the online help documentation of the Configurator by clicking **Help -> Index** on the Menu Bar or by pressing the **F1** function key on your keyboard.

IMPORTANT: Your Marquee P-MP units must be on the same subnet as the computer where the Configurator program is installed, or have a routable IP address, in order to access them. If not, you will get a status of **Offline** for the units (see the **Status** column in Figure 3.1) even if the LEDs show activity. In order to be able to configure the units, change the IP address of your computer to a 198.17.74.x sub-net (the Marquee P-MP's default sub-net configured from factory). Once you have access to the units, you can assign a new IP address to them later by clicking on the **Setup** tab and **IP Host** button.

The Marquee P-MP is shipped from factory pre-configured for operation and with the proper transmit power settings. The units are set with the following default IP addresses:

Marquee P-MP Base: 198.17.74.253   **Marquee P-MP CPE:**   198.17.74.254
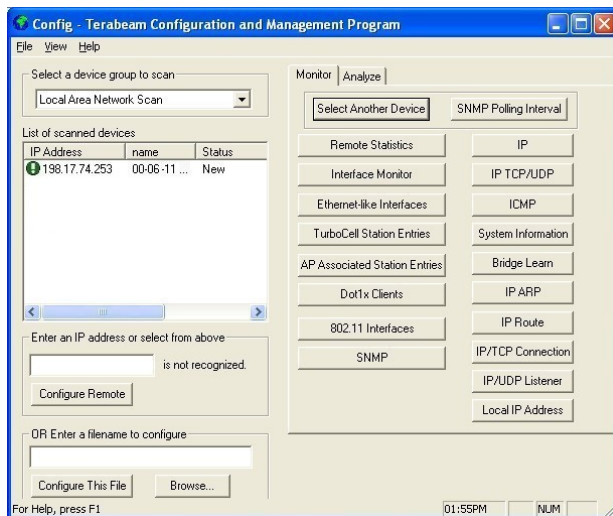
The default read/write password is *public*.

The basic parameters that you need to set up are the following:

- Read/Write password
- Interface settings
- IP addresses
- System access pass phrase

1. Connect a crossover Ethernet cable from the Cat 5 DC Power Injector to your laptop or PC.

2. Double-click the Configurator shortcut on your desktop. You may also open the directory where the Configurator program has been installed (the default is **\Program Files\Terabeam\Terabeam Configurator**) and run the program **config.exe**.

3. The Main Screen shown in Figure 3.1 appears. To scan for devices on the network, place the cursor anywhere in the **List of Scanned Devices** box and right-click the mouse. A **Re-scan local network** button will appear. Click on this button. A list of devices will appear.

4. Click on the device you wish to configure. The selected device IP address will appear in the text box above the **Configure Remote** button (alternatively, you can manually enter here the IP address of the unit). Click this button. If the device you want to configure has a status of **New** (identified by a green exclamation point next to its IP address on the screen), the Configurator will ask you to change the IP address. Select any IP address within the subnet that is not shown on the screen (in this case 198.17.74.251 was selected). Click **OK**.

5. After connecting to the unit, a **Read/Write Password** login box will appear (see Figure 3.2). The default password is *public*. Click the **OK** button. It is suggested that you change the password later, write it down and keep it in a safe place.
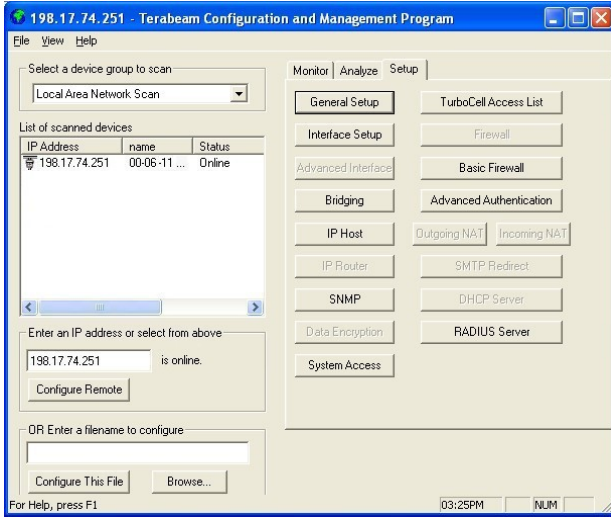
| Figure 3.1 – Configurator Main Screen	Figure 3.2 – Login Screen
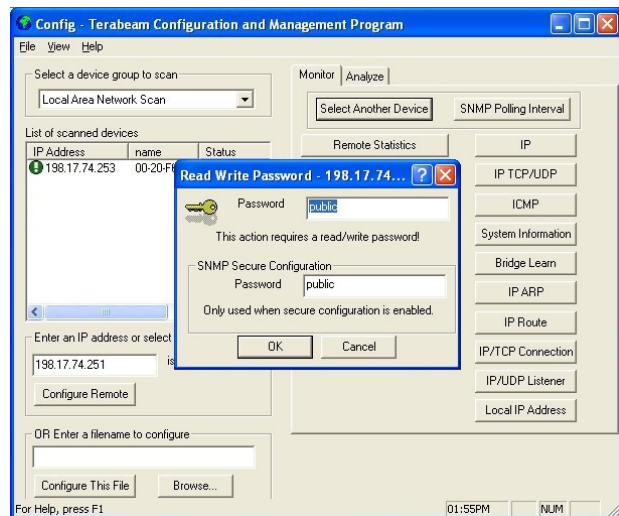
6. Once you have logged in successfully, the **Setup** tab and screen appear (see Figure 3.3). Notice that the status of the unit has changed to **Online** (you may need to re-scan the local network to refresh the screen).

7. Click on the **Interface Setup** button. The **Interface Setup** screen appears (see Figure 3.4).
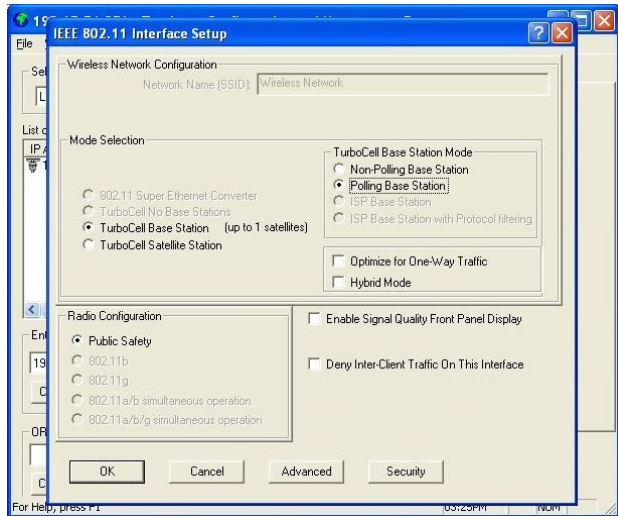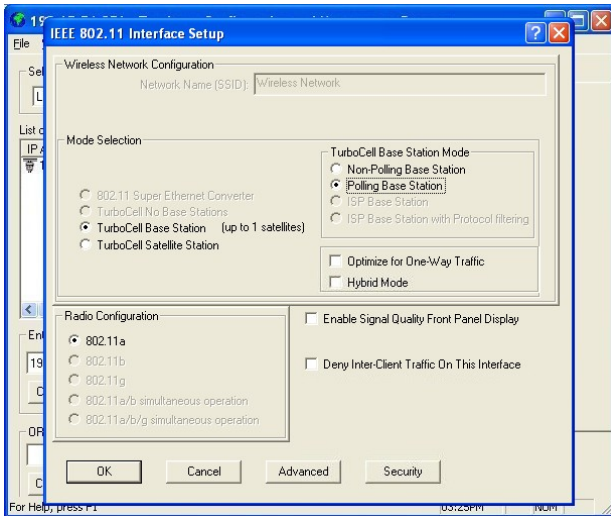
Figure 3.3 – Setup Screen   *Figure 3.4 – Interface Setup Screen*
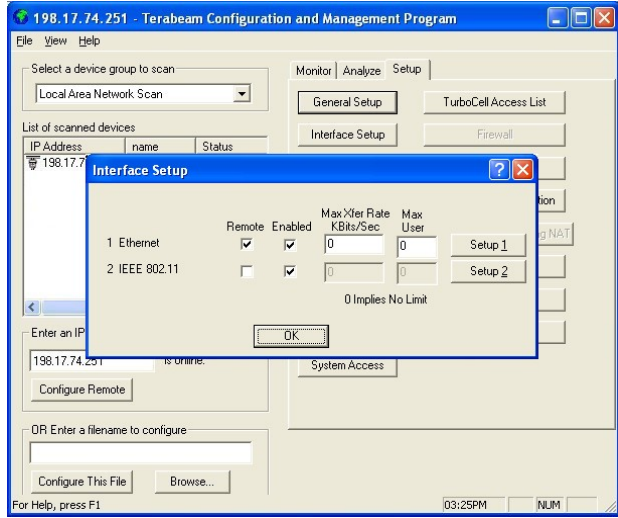
8. Click on the setup button corresponding to the active wireless card (in this case **Setup 2**). The **IEEE 802.11 Setup** screen appears. Notice that this screen is slightly different depending on whether you are configuring a 5.8 GHz radio (Figure 3.5a) or a 4.9 GHz radio (Figure 3.5b).

Figure 3.5a – IEEE 802.11 Interface Setup Screen *Figure 3.5b – IEEE 802.11 Interface Setup Screen*
for 5.8 GHz Radios   *for 4.9 GHz Radios*

Mode Selection – In a P-MP configuration one unit must be Base and all the others must be Satellite.

TurboCell Base Station Mode – For the unit that is set up as Base, select **Polling Base Station**. This mode is ideal for any TurboCell application, P-P or P-MP. For the unit that is set up as Satellite, these buttons are grayed out.

Radio Configuration – Select **802.11a** for a 5.8 GHz radio. Select **Public Safety** for a 4.9 GHz radio.

Hybrid Mode – This button is exclusively used for Atheros-based units. If you use this mode, this setting <u>must</u> be enabled for <u>all</u> Atheros-based units within the same cell.

Leave the rest of the buttons unchanged.

9. Click the **Advanced** button. The **TurboCell Advanced Setup** screen appears. Notice that this screen is slightly different depending on whether you are configuring a 5.8 GHz radio (Figure 3.6a) or a 4.9 GHz radio (Figure 3.6b)

Figure 3.6a – TurboCell Advanced Setup Screen for 5.8 GHz Radios *Figure 3.6b – TurboCell Advanced Setup Screen for 4.9 GHz Radios*
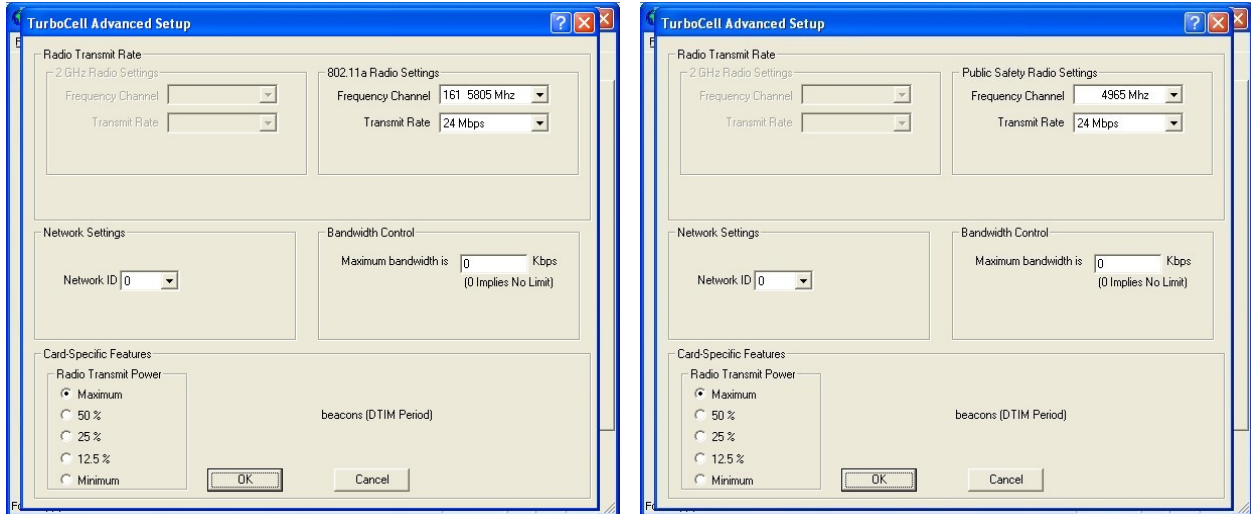
10. Select a Frequency Channel from the pull down menu box. Both units in a link must be configured with the same frequency value. Figure 3.7 shows the screen for a 5.8 GHz radio. There is only one possible frequency for 4.9 GHz radios (4.965 GHz).

Figure 3.7 – TurboCell Advanced Setup Screen for 5.8 GHz Radios – Frequency *Figure 3.8 – TurboCell Advanced Setup Screen for 5.8 GHz Radios – Network ID*
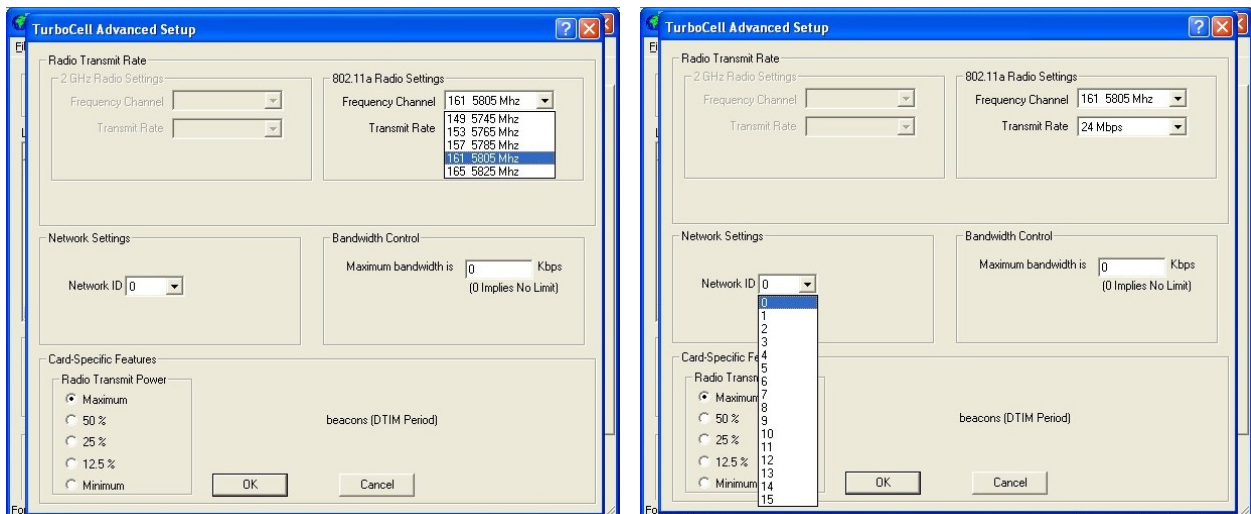

11. The Marquee P-MP is optimized for a transmit rate of 24 Mbps and the transmit power is preset from factory with the proper value.

IMPORTANT: Make sure the transmit power is set to 50% when using an antenna with a gain greater than 13 dBi (see Table A.4). For all other antennas, leave the power set to Maximum. Setting the transmit power to less than 50% may cause connections to be lost.

12. Click the **Network ID** button. The corresponding screen appears (see Figure 3.8). Select a number from 0 through 15 to identify your network. Both units in a link must be configured with the same Network ID value.

13. Click **OK** three times to return to the **Setup** Screen.

14. Click the **IP Host** button. The **IP Setup** screen appears (see Figure 3.9). Enter the IP Address, Subnet Mask, and Default Router IP Address (if applicable) of your unit for your specific network. Leave the rest of the options unchanged. Click **OK**.

15. Click the **System Access** button. The corresponding screen appears (see Figure 3.10). Enter a Pass Phrase to identify the wireless network. All Satellite units must be configured with the same Pass Phrase value as their Base unit. Click **OK**.

Figure 3.9 – IP Setup Screen
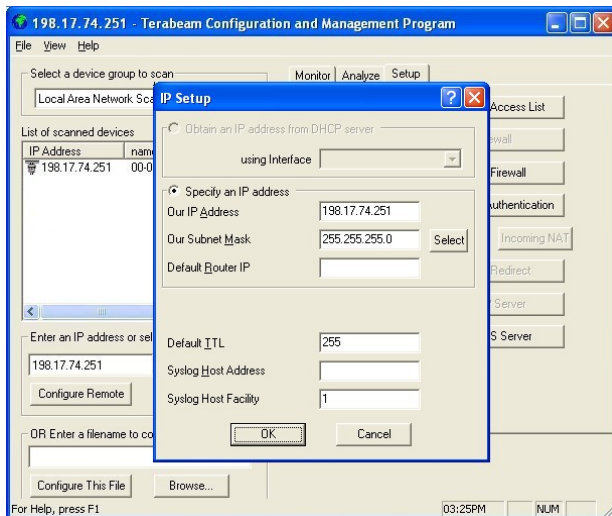
Figure 3.10 – System Access Setup
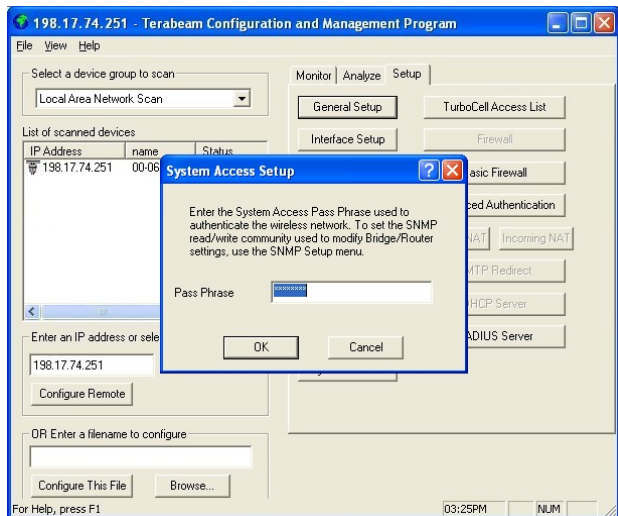
Figure 3.11 – Save Configuration

16. Go to **File** and click **Save Config** (see Figure 3.11): this will save the new settings to the unit and reboot it.

17. After the Marquee P-MP has finished saving its configuration, exit the Configurator program. Now you have to repeat these steps for all the other units. **Important:** Make sure that you define a different IP address for the remote units and follow all the instructions regarding complementary settings such as Base-Satellite, frequency, network ID, Pass Phrase, etc. Refer to the **Network Configurator User Guide**, available as a pdf file on your CD ROM, or the online help of the Configurator for complete instructions on setting up additional features for the units.
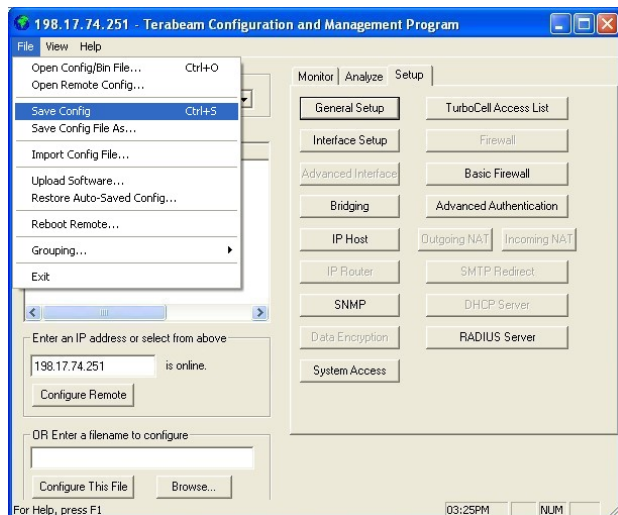
Section 4
Troubleshooting

4.1   Introduction

If you followed the advice highlighted in Section 2.1 and configured and tested your units in a "mini-network" setup before of actually deploying them in the field, the majority of the potential problems that you may face will be dealt with well in advance.

Once deployed, there are a number of issues that can cause a Marquee link not to work. Listed below are some of the most common:

1. Cabling or installation (e.g., line of site, multipath, interference, or antenna alignment).
2. Configuration.
3. Actual equipment failure.

4.2   Cabling or Installation Issues

Slow speeds are generally signal related. Poor signal or bad signal fluctuations can be caused by a faulty jumper connection (the cable that goes from the unit to the antenna), line of site and multipath issues, interference, and/or antenna alignment.

Check that all your cables are properly and firmly connected. If necessary, swap suspecting cables with known good cables to eliminate points of failure.

Once the cables are cleared, check possible installation issues. One of the most useful tools to isolate these kind of problems is the Wireless Link test located under the **Analyze** tab of the Configurator. In here you input the address of the unit you want to run the test from and it will list all the possible partners you can test it with (see Section 2.8 and Figures 2.12 to 2.16).

One little known fact is that although there are several configuration items that need to match between the Base and Satellites, only <u>one</u> thing needs to match in order to run a link test, and that is the channel being used. As long as the units are in range and on the same channel you should be able to run a link test.

At different transmit rates you will have a different SNR "knee": this is where the SNR is low enough that the performance drops. At 36 Mbps the knee is 17 SNR. At 24 Mbps the knee is 14 SNR. At 6 Mbps the knee is 4 SNR.

You can check your current SNR through the Wireless Link test option under the **Analyze** tab. Select it, and enter the IP address and password of the unit you want to run the test FROM (Fig. 2.14). It will give you a list of possible test partners (Fig. 2.15). Select the one you want and click the Link Test button (or double-click the partner unit). You will get the SNR on both sides (Fig. 2.16). Recommended SNR at all times is 25 or greater. Lots of signal fluctuations can indicate cable problems (which you already have checked), interference, or moving obstructions in your path. Try different frequencies to avoid any interference that may be in the area. Double check your path for any obstructions.

If the problem persists, then either the units are out of range or alignment, there are too many obstructions, a cable is loose, an internal software problem has happened, there is a power issue, or an actual equipment failure has occurred. In any of these cases the best thing to do would be to get all units in your lab for testing. This will eliminate interference, Line of Site, range, or multipath issues. Then you must check the configuration.

4.3 Configuration Issues

If connection problems persist but you can run a Wireless Link test between units with good results then the problem is most likely configuration related. For more information you may also refer to Section 3 – Configuration, the **Network Configurator User Guide**, available as a pdf file on your CD ROM, or the online help of the Configurator.

The following steps assume that:

1. You are locally connected with your laptop or PC to one of the units using a cross-over Ethernet cable and that you have connectivity to the unit.

2. You are using the latest version of the Configurator, available from your CD ROM or downloadable from our Web site, http://www.terabeam.com/support/downloads.php. Since your CD ROM may have become obsolete since the time you purchased the equipment, it is recommended that you always check our Web site for the latest version.

4.3.1 Basic Configuration Checks

1. Click the **Setup** tab and then the **General Setup** button. The corresponding screen appears. Make sure that **Enable Bridging** and **Enable Watchdog Reboot Timer** are checked.

2. Click the **Setup** tab and then the **Interface Setup** button. The **Interface Setup** screen appears (see Figure 3.4). Click on the setup button corresponding to the active Ethernet interface (in this case **Setup 1**). The **Ethernet Setup** screen appears. Make sure the speed and duplex of the unit's Ethernet interface match the speed and duplex of the device that it is connected to.

3. From the **Interface Setup** screen, click on the setup button corresponding to the active wireless card (in this case **Setup 2**). The **IEEE 802.11 Setup** screen appears (see Figures 3.5a and b). Make sure:
   - If you selected Base, that **Polling Base Station** is checked. Polling is the recommended setting even for a single P-P connection.
   - That **Optimize to One Way Traffic** is not checked.
   - That **Hybrid Mode** is checked only if the unit is Atheros-based (if you use this mode, this setting must be enabled for all Atheros-based units within the same cell).

4. From the **IEEE 802.11 Setup** screen, click on the **Advanced** button. The **TurboCell Advanced Setup** screen appears (see Figures 3.6 to 3.8). Make sure that each **Frequency Channel**, **Transmit Rate**, and **Network ID** value matches on both sides of the link. One way to tell whether there is a mismatch is by clicking the **Monitor** tab and then the **TurboCell Station Entries** button. If a Satellite shows up on the screen as Type = "Compatible", then that is the case.

5. Click the **Setup** tab and then the **System Access Setup** button. The corresponding screen appears (see Figure 3.10). The System Access Pass Phrase is an authentication token between the Base and its Satellites. This must be the same on both ends. There will already be something in this field, simply overwrite it with what you want to use.

6. Go to **File** and click **Save Config** (see Fig. 3.11): this will save the new settings to the unit and reboot it.

7. Repeat these steps for the other unit in the P-MP link.

4.3.2 Internal Software Issue

This can happen whenever a configuration is loaded into the unit but parts of it got garbled somehow or it just did not save it right. This can be caused by anything from a corrupted network card driver, to sending

the information through a firewall, to simply using an older version of the Configurator. To recover from this, you have several choices:

1. If you suspect the laptop or PC, use a different computer. Install the latest verrsion of the Configurator (see Section 4.3, bullet 2) on the new laptop or PC, open the configuration of the unit, then just save it back from the **File** menu.

2. If the power settings under the **TurboCell Advanced Setup s**creen (see Figures 3.7 and 3.8) have been altered at anytime, it may need recovery. In some cases this procedure may help even if those settings have never been altered. Go to that screen and set the **Radio Transmit Power** all the way down to **Minimum**. Save the configuration. Open the configuration again, go back to that screen, and set the power to **Maximum**. Save the configuration. This can also be used to reset a radio suspected of low output.

3. If you are using a Windows emulator such as virtual pc or vmware, it is possible that even though it appears that the Configurator is working fine in that environment some of the data may still have been corrupted. Locate and use a native Windows PC with the latest version of the Configurator installed on it and refer back to steps 1 and 2.

4.3.3   Reload Procedure

If all else fails a reload procedure of the unit may be needed. To do this you will need a binary file and a license key for each unit. You can get the binary file from our Web site at http://www.terabeam.com/support/downloads.php: click on the Marquee Series Firmware link to start the download. The license key however is individual and based upon the Ethernet MAC address of the unit. To obtain a license key, email the Ethernet MAC Address of each unit to techsupport@terabeam.com and indicate that you need a license key.

WARNING: This is a dangerous option, and should only be used if all other possibilities have been exhausted. You must have already read and saved the configuration of the unit with the Configurator prior to doing this. If not then the configuration will be lost completely and the unit must be returned to the factory for repair.

1. From the Configurator Main screen, click the **File** menu and select **Open Remote Config**. Enter the IP address and read/write password of the unit you want to reload. Click **OK**. You should get a **Configuration has been read from...** message. Click **OK** and the setup tab should appear. If not then repeat the process, do not go any further until the configuration has been read.

2. Click the **File** menu and select **Open Config/Bin file**. You will get a warning message about this. If the configuration had been read in the previous step then you may click **Yes** to continue.

3. Navigate to the directory where your bin file is stored. Open the drop down menu at the bottom and select **Kernel Files (*.bin)**. Highlight the correct bin file corresponding to the Marquee series (tbrgatce…) in the large window above, then click the **Open** button (or double-click the file). You may get a message about the MAC Address being unknown. In any instance, click **OK**.

4. In the new window click on the **Import License Key** button. Navigate to the directory where your license key file is stored. Open the drop down menu at the bottom and select **All License Key Files (*.LKF)**. In the large window above, look for a file named **YDRGATCE-V40-************.lkf** where the 12 *'s match the MAC Address of the unit. Highlight this file and click on the **Open** button (or double-click the file).

5. The license key information should now be automatically filled in. Verify once more that the **MAC Address** field contains the correct MAC Address, then click the **OK** button. You should get a popup window stating **Opened File:**… followed by the path to the file. Click **OK**.

6. Click the **Setup** tab and and then the **Interface Setup** button: all interfaces will say **Not Configured**. Highlight **Interface 1** and in the drop down menu to the right select **Ethernet**. Highlight **Interface 2** and in the dropdown menu to the right select **IEEE 802.11**. At this point, **Interface 1** must say **Ethernet** and **Interface 2** must say **IEEE 802.11**. Click **OK**.

7. Click the **File** menu and select **Upload Software**. You should get a window asking for an IP address, and password. Enter the IP Address of the unit to be upgraded (if you want, click the **Scan** button to verify you can see it). Enter the password for the unit and click **OK**.

8. You should get several warning windows. Simply click **Yes** to these. When the saving is finished the unit should reboot. If you get a confirmation window, just click **OK**.

9. After the unit has rebooted, click the **File** menu and select **Open Remote Config**. Click the **Scan** button: the unit should now show up with an IP address of 198.17.74.253 or 254. This is the default IP address. At this point, you can change your computer's IP to match it, (for example, change your computer's IP to 198.17.74.250, subnet mask 255.255.255.0), or highlight the unit on the scan windows and click the **Change IP** button. **NOTE:** if the Change IP option is used your computer must have an IP assigned within the same IP subnet as the one you are changing the device to.

10. Once this is done, click **OK** on both windows and you should get a message stating that the configuration has been read. Click **OK.** Now you can configure the device with the options in the **Setup** menu.

After all of this, if a connection can still not be established:

1. Make sure you have clear line of site.
2. Make sure your antennas are properly aligned. With their narrow beamwidth, it may take a bit of time. Only align one side at a time, using an extremely slow side to side and up to down motion.
3. Try setting the transmit rate to the lowest setting (6 Mbps).

4.4   When to Contact Technical Support

If at this point you continue to have problems and you have verified all cable connections for security or damage, confirmed Line of Site, checked multipath, interference and antenna alignment, and made sure you have a functional and working configuration, then there are no further troubleshooting steps that can be taken. You are either out of range or there is an actual equipment failure. Contact technical support for further assistance:

- Customer Support on the **East Coast** – please call **1-888-297-9090**
  (overseas customers please call **+1-703-205-0600** or email techsupport@terabeam.com)

- Customer Support on the **West Coast** – please call **1-800-664-7060**
  (overseas customers please call **+1-408-617-8150** or email techsupport@terabeam.com)

Appendix A – Marquee P-MP Technical Specifications

Table A.1 – Network Features

Network device type	Ethernet bridge, IP router
Media Access Control • Engineered for multipoint networks • Eliminates 802.11 hidden node • Adaptive Dynamic polling algorithm • SuperPacket Aggregation • Optimized for Internet traffic	TurboCell Polling Protocol • Yes • Yes • Yes • Yes • Yes
RADIUS Authentication	Yes
IP Routing	RIP II
Bridging	Yes, 100% transparent (protocol independent)
Bridge Filters	MAC address, Protocol ID
Spanning Tree	Yes
Automatic channel searching CPEs	Yes
Encryption	DES (56-bit) Blowfish (128 bit) AES (128 Bit) Note: Encryption option lowers throughput since it is done in software.
Watchdog Reboot Timer	Yes
DHCP Client & Server	Yes
Static and Dynamic IP address	Yes
NAT	Yes
Roaming in the subnet	Yes
Bandwidth Management: • Configurable for each remote location • Configurable for each interface	Yes • Yes • Yes
SNMP Management	Yes, GUI Management utility included
SNMP Support	MIB II and Private MIB
Extensive Online Help	Yes

Table A.2 – Physical & Environmental Features

Ethernet Interface (at POE injector)	RJ-45, 10/100 Base-T
Ethernet Cable Length	300 ft maximum
RF Interface (external antenna models)	N-Female
Operating Temperature Range	-30°C to 60°C (-22°F to 140°F)
Storage Temperature	-40°C to 75°C (-40°F to 167°F)
Operating Humidity	0% to 100% (non-immersion rain)
Altitude	1000 ft (300 meters)
Power Scheme	Power over Ethernet (POE) Cat 5 DC Injector
Power Supply	110/220 VAC, 50-60 Hz
Power Consumption	16 W Max
Current Draw	0.5 A Max
Input Voltage Required at Radio	48 VDC (supplied via POE)
Dimensions (H x W x D)	FP Enclosure: 15.3 x 15.3 x 1.13 in (389 x 389 x 29 mm) EX Enclosure: 12 x 14 x 3.25 in (305 x 356 x 83 mm)
Weight	FP Enclosure: 2.90 lbs (1.32 Kg) EX Enclosure: 9.65 lbs (4.38 Kg)
Enclosure	Outdoor, all-weather
LED status indicators	Power, Wireless Link, and Ethernet Link
Min – Max Diameter of Mounting Pole	For FP Enclosure: 0.75 – 1.5 in For EX Enclosure: 1.0 – 1.75 in or 1.75 – 3.0 in

Table A.3 – RF Features

	5.8 GHz Frequency Specs	**4.9 GHz Frequency Specs**
Operational Frequency Band	5725 – 5850 MHz	4940 – 4990 MHz
Channels (user selectable)	5 non-overlapping channels with a bandwidth of 20 MHz: 5745 MHz - Channel 149 5765 MHz - Channel 153 5785 MHz - Channel 157 5805 MHz - Channel 161 5825 MHz - Channel 165	Single channel: 4965 MHz with a bandwidth of 20 MHz
Over-The-Air Data Rate	User selectable up to 36 Mbps	User selectable up to 36 Mbps
Throughput[1]	24 Mbps[2]	24 Mbps for single channel operation
Modulation Scheme	OFDM-QPSK	OFDM-QPSK
Radio Operation	Time Division Duplex (TDD)	Time Division Duplex (TDD)
FCC Certified	Yes	Yes
Transmit Output Power	+14 dBm for standard version +23 dBm for amplified version	+10 dBm for standard version +23 dBm for amplified version
Receiver Sensitivity	-74 dBm @ 36 Mbps -83 dBm @ 6 Mbps	-77 dBm @ 24 Mbps -84 dBm @ 12 Mbps -86 dBm @ 6 Mbps
Maximum Receive Level	-30 dBm	-30 dBm

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1 This is a typical figure. Actual throughput varies according to the specifications of the antenna used and the conditions of the terrain.
2 Actual receiver sensitivity for individual products may vary based on manufacturing process and environmental variations.

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