Preliminary

EtherLeap ™

24 GHz Pt-Pt Bridge

User's Manual

Version 1.0   May 2003

LIMITED WARRANTY

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

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

YDI 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.

YDI 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.

SPECIAL WARRANTY NOTICE

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 provided is improperly plugged into the rear jack of the enclosure.
5. The device or DC Power Injector 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.'

FCC NOTICE

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-EL24A-11

TABLE OF CONTENTS

Section 1
Overview

1.1   Description

The EtherLeap^{TM} is a Point-to-Point Wireless Bridge that operates on the uncrowded license-free 24 GHz band. It was specifically created for RF hostile environments where the 2.4 and 5.8 GHZ bands have too much congestion or interference. It is designed to extend the reach of 10/100Base-T Ethernet networks through wireless connections where installation barriers and high cost make installing additional copper connections less desirable. It provides flexibility by being deployable in a large variety of network architectures. EtherLeap comes pre-configured and is capable to interface seamlessly with Ethernet networks.

EtherLeap is a Time Division Duplex (TDD) device with an over-the-air data rate of 11 Mbps. It uses Direct Sequence Spread Spectrum (DSSS) and an adaptive data rate technology to ensure the integrity of the link under adverse conditions. This allows for smooth changes in the data rate instead of an abrupt loss of link.

The product can be used in a wide range of applications. It can bridge Hot Spots by providing connectivity outside the 2.4 GHz and 5.8 GHz bands. It can also bridge Ethernet networks and connect remote servers to LANs, managing virtually an unlimited number of client MAC addresses on each side of the link. The unit features 128-bit WEP-Plus encryption.

The EtherLeap comes with an integrated one-foot dish antenna. Because the radio is located at the antenna, extending the Ethernet cable will not affect the operating range.

Since EtherLeap is based on 802.11 MAC layer, it provides transparent point-to-point connectivity. It requires only 25 watts to operate and it plugs into any layer-2 switch. These attributes make EtherLeap ideal for disaster recovery and emergency network restoration applications.

A Windows-based Manager provides configuration and diagnostic utilities that allow you to see vital information regarding the link between the two units. Information such as signal-to-noise ratio, signal strength, and noise level all in dB, provides for efficient installation and aiming of the units, as well as troubleshooting link problems.

The EtherLeap operates with a 48 VDC Adapter. All devices located inside the box get their power from a DC Power Injector which puts DC power onto the outdoor rated Ethernet cable (Power Over Ethernet, or POE). **Ethernet cables must be ordered separately**.

1.2   EtherLeap Features

Key Features

- Operates on the clear 24 GHz license-free band
- Provides connectivity even when the 2.4 and 5.8 GHz bands have congestion or interference
- Easy to install and configure
- Antenna integrated into single outdoor unit
- 13 user selectable radio channels available
- Bridges two LANs together transparently
- Plugs directly into an Ethernet Switch or Router
- Uses Power Over Ethernet (POE)
- Over 2 Watts EIRP transmit power with integrated antenna
- Line of sight range up to 5 miles or more possible with integrated antenna
- Up to 4.5 Mbps actual throughput
- FCC Part 15 Certified for license-free operation on the US 24GHz band

- Can be configured and monitored remotely from anywhere in the network
- Operating temperature range: -20°C to +60°C (excluding solar loading)

1.3   EtherLeap Kit

Each EtherLeap kit includes the following (refer to Figure 1.1):

- Two outdoor radios with integrated antennas and mounting hardware
- Two Cat 5 DC Power Injectors
- Two 110/240 VAC to 48 VDC power supplies (unit operates from 20 to 60 VDC)
- CD-ROM with Manager software
- User's Manual

Two YDI outdoor Ethernet cables must be ordered separately. Available lengths are 50, 100, 200, or 300 foot.

The latest software and User's Manuals can also be found at:

http://www.ydi.com/support/downloads.php, and

http://www.ydi.com/support/documents.php.

Figure 1.1 – Components of an EtherLeap Link

Section 2
Installation

2.1   Introduction

Please review the entire manual before powering up or deploying any EtherLeap.

The EtherLeap comes pre-configured from factory for point-to-point layer-2 bridging operation.

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 EtherLeap , 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.
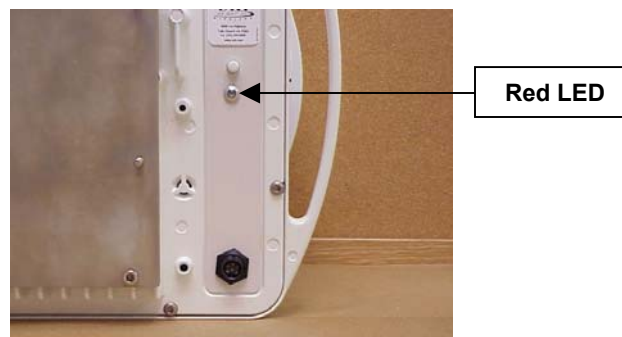
2.3   Power Supply

The Ether Leap 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   LED

One red LED is present on the back of the EtherLeap (see Figure 2.1):
- The red LED stays on when the unit is operating correctly
- The red LED flashes when there is a fault

*Figure 2.1 – EtherLeap LED*

Red LED

2.5   Hardware Installation

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

The EtherLeap unit is installed by using an "X"-shaped adaptor bracket that is secured to the pole with a pole mounting bracket and a pole clamp. Figure 2.2 shows the components provided to mount the EtherLeap unit.

*Figure 2.2 – EtherLeap Mounting Components*
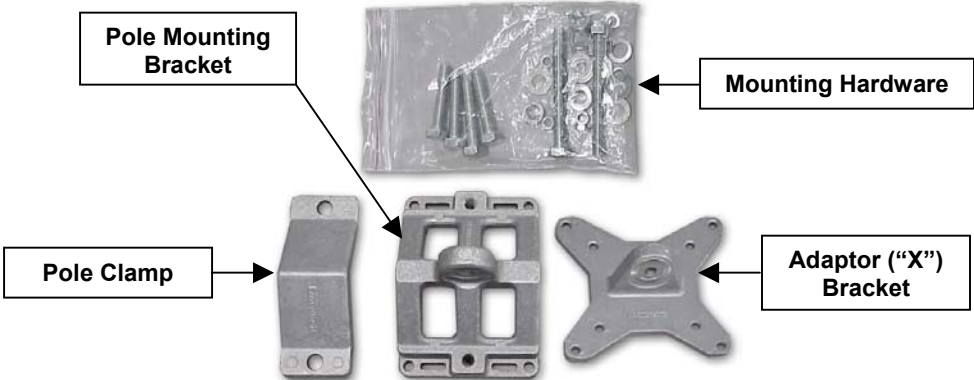
1.   Fit the adaptor bracket (A) to the four M5 studs protruding from the back of the EtherLeap unit, by aligning the four mounting studs on the back of the unit with the adaptor bracket holes and securing to the unit using four M5 nuts, flat washers, and lock washers, as shown in Figure 2.3. Tighten hardware (four places). Torque to 5.7 N-m (4.2 lb-ft). Note the position of the serrated edge of bracket (A).

2.   Attach the pole mounting bracket (B) to adaptor bracket (A) by using one M8 x 40L bolt, flat washers, lock washer, and nut, as shown in Fig 2.3. Tighten hardware (one place). Torque to 24 N-m (17.7 lb-ft). **IMPORTANT:** Ensure that the serrated edges on both brackets are facing each other.

Figure 2.3 – Detail Showing Assembly of Pole Mounting Bracket to Unit
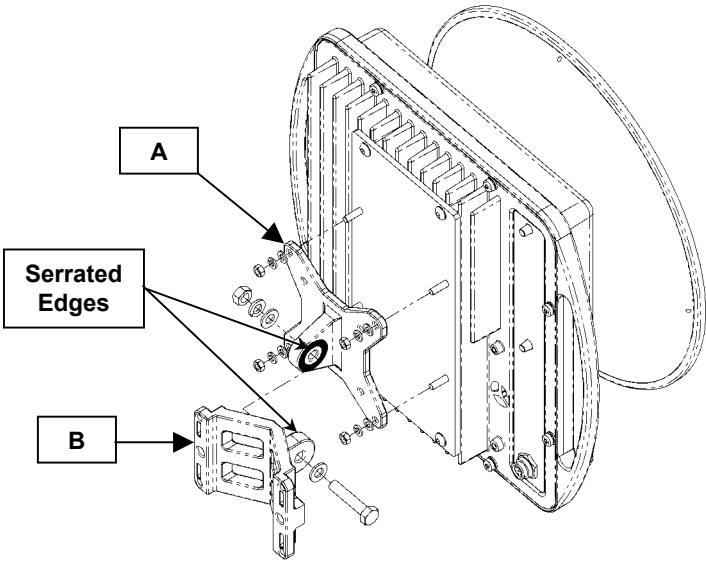
3. Fasten the EtherLeap unit to the pole using pole clamp (C) and two M8 x 70L bolts, lock washer, and flat washer, as shown in Fig 2.4 (you may need to use two M8 x 40L bolts if you are fastening the EtherLeap to a 1.75" diameter pole). Tighten hardware (two places). Torque to 24 N-m (17.7 lb-ft). The pole mounting bracket (B) will accept pole diameters between 1.75" to 3" OD. The EtherLeap unit can 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).

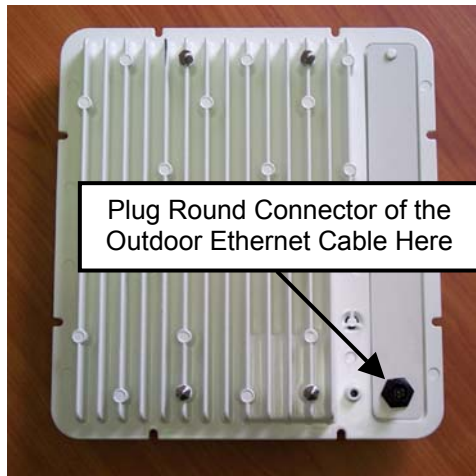*Figure 2.4 – Attaching the EtherLeap Unit to the Pole*
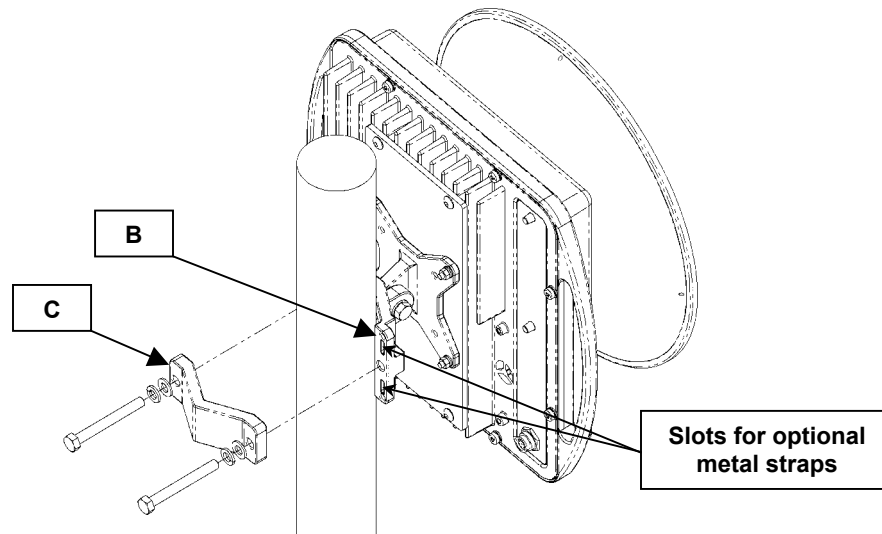
4. Ensuring that there is no DC power applied to the DC Power Injector, plug the round connector of the outdoor Ethernet cable (ordered separately) into the rear jack, making sure the notch is correctly aligned with the tab on the jack as shown in Figures 2.5 and 2.6. Then turn the round locking nut 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 EtherLeap unit 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.
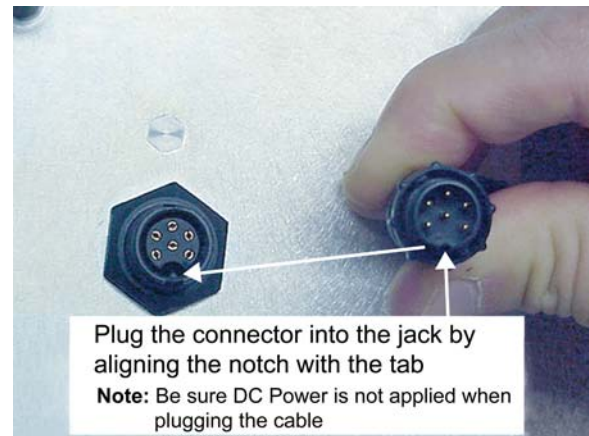
⚠️ **WARNING**	*If DC Power is applied while you are attempting to insert the round connector into the jack, it is possible that, as you rotate the plug in an effort to find the key, DC power pins will momentarily touch the Ethernet pins. **If this happens the Ethernet circuitry on the board will blow**. Any damage caused by this action will <u>not</u> be covered by the factory warranty and will be a billable repair.*

*Figure 2.5 – Connecting the Outdoor
Ethernet Cable to an EtherLeap*

*Figure 2.6 – Plugging the Outdoor
Ethernet Cable*

Plug Round Connector of the
Outdoor Ethernet Cable Here

Plug the connector into the jack by
aligning the notch with the tab
Note: Be sure DC Power is not applied when
plugging the cable

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

6. Connect the Ethernet cable labeled "To PC or ROUTER" from the Cat 5 DC Power Injector to your computer or PC. If you connect to a router, switch or hub, make sure you plug the cable into the Uplink/WAN port, otherwise a cross-over cable or adapter will be needed.

7. Install a #6 AWG insulated ground cable (not provided) to the ground connector on the back of the radio as shown in Figure 2.7. Use an M5 x 12L thread-forming screw, and an M5 flat washer and lock washer to fasten the earth lug. Torque to 5.7 N-m (4.2 lb-ft). This provides maximum protection against lightning.

8. Plug the AC Adapter into an AC outlet and connect it to the "DC Power" jack on the Cat 5 DC Power Injector.

9. Perform antenna alignment procedures at both sites. Proper antenna alignment is crucial for the correct operation of the EtherLeap system and should only be accomplished by experienced professionals. After that your installation is complete.

*Figure 2.7 – Detail Showing Ground Cable Connection
(this provides maximum lightning protection)*

Ground Cable
(not provided)

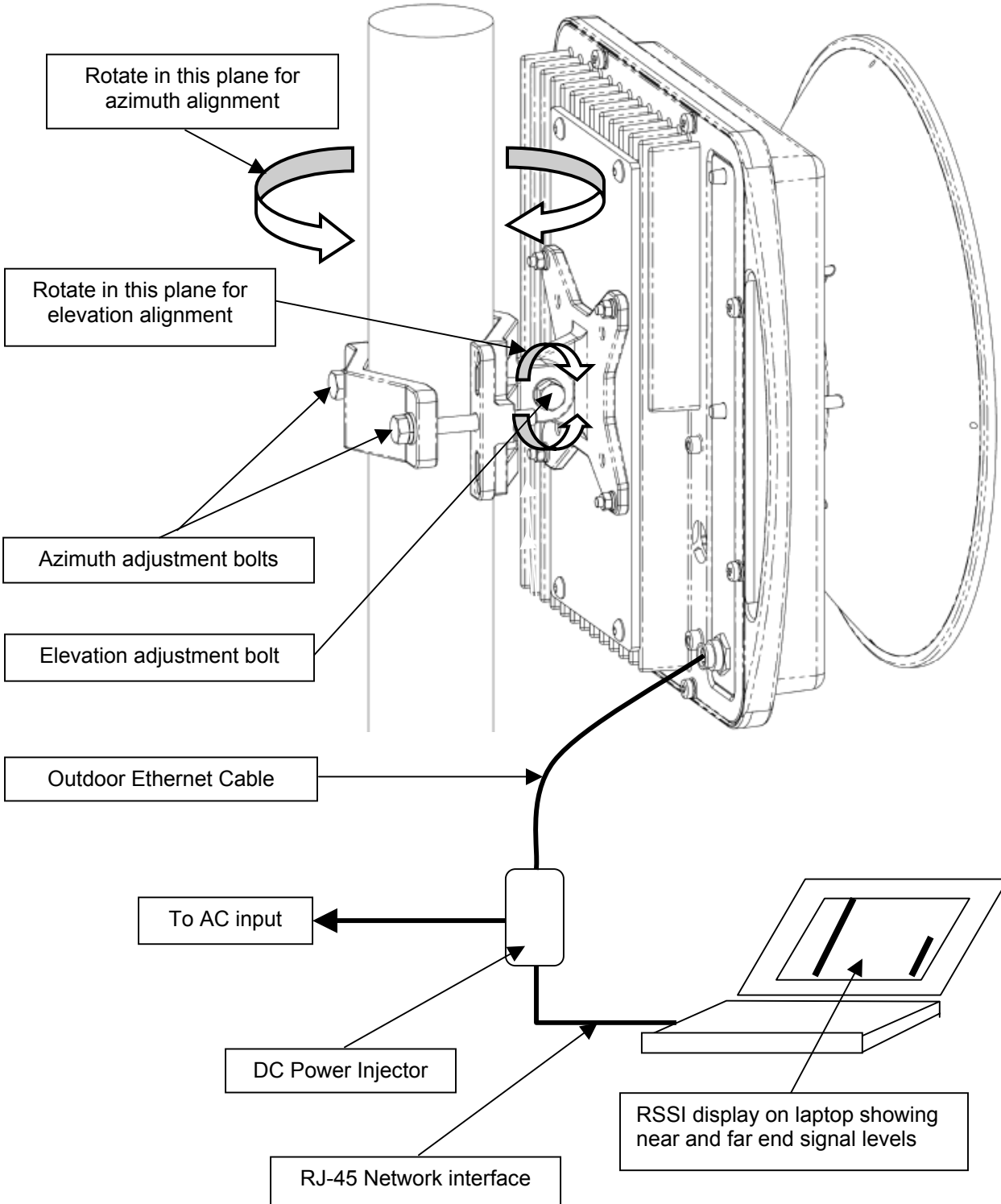## 2.6   Making Final Adjustment to Maximize Received Signal

The purpose of these steps is to adjust the Line-of-Sight of the EtherLeap unit to maximize the main lobe signal level. During this process, the second EtherLeap unit at the far end of the link must also be at the same stage of the installation procedure and powered ON.

1. Connect the near end EtherLeap unit to a laptop computer with a network card installed and then run the signal strength screens off an appropriate Manager program. The Manager program will display two Received Signal Strength Indicator (RSSI) bar graphs, one for the near end unit and one for the far end unit. The main goal now is to peak the RSSI signals at both ends of the link.

2. Using the Azimuth adjustment bolts (see Figure 2.8), adjust the azimuth until the RSSI readings for both ends of the link peak. Start with azimuth adjustment on the far end of the link first. It is recommended that, in order to ensure the true maximum, you should adjust through the maximum RSSI 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.

3. Using the Elevation adjustment bolt (see Figure 2.8), adjust the elevation until the RSSI readings for both ends of the link peak. Start with elevation adjustment on the far end of the link first. It is recommended that, in order to ensure the true maximum, you should adjust through the maximum RSSI 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.

4. Repeat steps 2 and 3 above to guarantee optimum alignment for maximum signal strength.

CAUTION: It is possible to obtain a false peak RSSI 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 RSSI readings so to zero in on the true peak alignment reading due to the main antenna beam.

5. Tighten the two Azimuth adjustment bolts while observing the RSSI reading to ensure the azimuth alignment does not change while tightening. Torque the two M8 galvanized hex bolts to 24 N-m (17.7 lb-ft).

6. Tighten the Elevation adjustment bolt while observing the RSSI reading to ensure the elevation alignment does not change while tightening. Torque the M8 galvanized hex bolt to 24 N-m (17.7 lb-ft).

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

Figure 2.8 – Final Line-of-Sight Adjustment and Signal Optimization

Rotate in this plane for
azimuth alignment

Rotate in this plane for
elevation alignment

Azimuth adjustment bolts

Elevation adjustment bolt

Outdoor Ethernet Cable

To AC input

DC Power Injector

RSSI display on laptop showing
near and far end signal levels

RJ-45 Network interface

UNI-POP **EX-1** **Amps & Antennas** **WIPOP-In-A-Box**

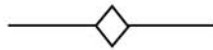**Bandwidth Control Unit** **EtherAnt II, EtherAnt II-LR** **Diamond Card** **Lightning Protectors**

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