

# **Hyperlink WaveLAN**

## **Extended Range Wireless LAN Kit**

Featuring Lucent Technologies WaveLAN Technology

### **Installation Manual**

**NOTE:** The antenna system shall be installed **ONLY** by experienced antenna installers who are familiar with local building and safety codes, and wherever necessary have been licensed by appropriate government regulatory bodies. Failure to do so may void the Product Warranty, as well as expose the end-user to legal and/or financial liabilities. Hyperlink Technologies, its agents, resellers or distributors, are not liable for injury, damage, or violation of government regulations that may arise from failing to comply with the guidelines described in this document.

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Disclaimer: The diagrams used in this manual are for illustrative purposes only. They should not be confused with the PC card operating in standalone mode. When these diagrams are used the PC card transceiver will be installed in conjunction with the specific DC Injector/Lightning Protector, Amplifier, cables and antennas listed in this manual.

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## Contents

|                                                 |            |
|-------------------------------------------------|------------|
| FCC Radio Interference Statement                | 4          |
| Radiation and EIRP Information                  | 5          |
| Introduction                                    | 6          |
| System Features                                 | 6          |
| Types of Installations                          | 7          |
| <br>                                            |            |
| System Requirements                             | 8          |
| Kit Contents                                    | 8          |
| Tools Required                                  | 8          |
| WaveLAN Card Features                           | 8          |
| Overall System Configuration                    | 9          |
| <br>                                            |            |
| Antenna System Connection                       | 10         |
| Surveying the Antenna Site                      | 10         |
| Preparing for System Installation               | 11         |
| Connections & Features of the Amplifier         | 12         |
| The DC Power Injector/Lightning Protector       | 13         |
| Mounting & Cabling the Amplified Antenna System | 14         |
| <br>                                            |            |
| Installing the WaveLAN PC Card                  | 16         |
| Channel Settings                                | 16         |
| Basic System Checks                             | 17         |
| WaveLAN Antenna Alignment Diagnostics           | 17         |
| <br>                                            |            |
| System Specifications                           | 18         |
| <br>                                            |            |
| APPENDICES                                      |            |
| Antenna Mounting Instructions                   | Appendix A |

## **USA- Federal Communications Commission (FCC)**

### **Interference Statement**

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.

### **Information to the user**

NOTE: 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. If not installed and used in accordance with the instructions, it 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 and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications of equipment not expressly approved by the manufacturer could void the user's authority to operate the equipment and the company's warranty.

**NOTE: The antenna system shall be installed ONLY by experienced antenna installers who are familiar with local building and safety codes, and wherever necessary have been licensed by appropriate government regulatory bodies. Failure to do so may void the Product Warranty, as well as expose the end-user to legal and/or financial liabilities. Hyperlink Technologies, its agents, resellers or distributors, are not liable for injury, damage, or violation of government regulations that may arise from failing to comply with the guidelines described in this document.**

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**Caution: Exposure to Radio Frequency Radiation.**

The radiated output power of this product is below the FCC radio exposure limits. Nevertheless, this product shall be used in such a manner that the potential for human contact during normal operation is minimized.

**Antenna shall be mounted in such a manner as to minimize the potential for human contact during normal operation. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20 cm (8 inches) during normal operation.**

Hyperlink Technologies is not responsible for any radio or television interference caused by unauthorized modification of this device or the substitution or attachment of connecting cables and equipment other than specified by Hyperlink Technologies. The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.

| Antenna Type | Specified Antenna Gain (dBi) | Maximum Output Power at Antenna Terminal (dBm) | Total EIRP (dBm) | Minimum RF Exposure Separation Distance (cm) |
|--------------|------------------------------|------------------------------------------------|------------------|----------------------------------------------|
| HG2408P      | 7.5                          | 24                                             | 31.5             | 10.6                                         |
| HG2408U      | 8.0                          | 24                                             | 32.0             | 11.2                                         |
| HG2412P      | 12.0                         | 20                                             | 32.2             | 11.5                                         |
| HG2415Y      | 14.5                         | 20                                             | 34.7             | 15.3                                         |
| HG2415U      | 15.0                         | 20                                             | 35.2             | 16.2                                         |
| HG2415G      | 15.0                         | 20                                             | 35.2             | 16.2                                         |
| HG2419G      | 19.0                         | 17                                             | 36.0             | 17.8                                         |
| HG2424G      | 23.5                         | 11                                             | 35.1             | 16.0                                         |

**WARNING:** It is the responsibility of the professional installer to ensure that when using the outdoor antenna kits in the United States (or where the FCC rules apply), only these antenna configurations shown in the table above and which are described in this document are used. The use of any other than those listed is expressly forbidden in accordance to FCC rules CFR47 part 15.204.

## **Introduction**

The Hyperlink Extended Range Wireless LAN Kit is a direct sequence spread spectrum wireless transceiver providing 11 Mbit/sec data rate to support wireless connections in an IEEE 802.3 LAN. Equipped with a Hyperlink Extended Range Amplified Antenna System, this product offers a high-performance long-range building-to-building wireless networking solution.

This kit incorporates Lucent Technologies WaveLAN technology. WaveLAN uses a state-of-the-art direct sequence spread spectrum technology to implement robust 11 Mbps transmission, and offers true "Plug and Play" installation.

## **System Features:**

This system has the following features:

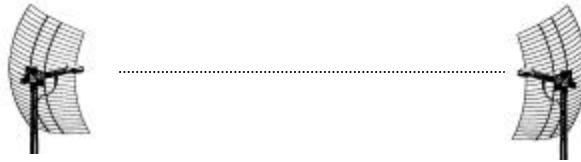
- IEEE 802.11 Compatibility.
- Wireless 11 Mbps data rate.
- State-of-the-art spread spectrum technology provides reliable, secure, long range, radio link operation.
- True "Plug and Play" installation for compatibility with all 802.3 and Ethernet II LAN devices, all operating systems and all protocol stacks.
- PCMCIA Form Factor
- User-selectable channels of operation.
- Remote mounted bi-directional amplifier to optimize transmit power and eliminate the effects of system cable losses.
- Limited 2 year Warranty.

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## Types of Installations

The type of application will determine which type of kit to install:

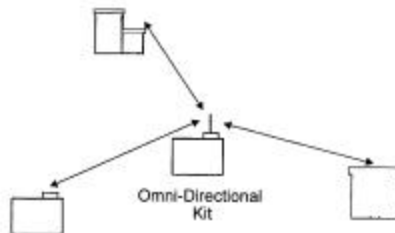
**1. Fixed Point-to-Point (Building-to-Building or Tower-to-Tower):** Typically these installations will typically require directional Yagi, Panel or Grid Antenna kits.



These devices are authorized for operation in fixed, point-to-point configurations only. The professional installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations.

| ANTENNA MODEL | ANTENNA GAIN | TYPE              |
|---------------|--------------|-------------------|
| HG2408P       | 8 dBi        | DIRECTIONAL PATCH |
| HG2412P       | 12 dBi       | DIRECTIONAL PANEL |
| HG2415G       | 15 dBi       | DIRECTIONAL GRID  |
| HG2415Y       | 14.5 dBi     | DIRECTIONAL YAGI  |
| HG2419G       | 19 dBi       | DIRECTIONAL GRID  |
| HG2424G       | 23.5 dBi     | DIRECTIONAL GRID  |

**2. Central Node in a Multipoint Network or Mobile Network:** This type of installation typically requires an Omni Directional Kit at the central node for 360 degree coverage.



| ANTENNA MODEL | ANTENNA GAIN | TYPE            |
|---------------|--------------|-----------------|
| HG2408U       | 8 dBi        | OMNIDIRECTIONAL |
| HG2415U       | 15 dBi       | OMNIDIRECTIONAL |

## System Requirements

*The WaveLAN/HyperGain™ Amplified Extended Range Bridge Kit provides a complete plug-and-play solution for linking buildings in an outdoor environment. The PC card included can be installed in any one of the following devices:*

*Lucent Orinoco Central or Remote Office Router Processor*

*KarlNet Central or Satellite Router Processor*

*Other compatible PC, Router, or Bridge Processor equipped with a PC Card slot*

*Besides one of the host processors above, all you need to add is suitable masts or towers and some basic site planning. Please read this manual in its entirety before beginning the installation.*

## Kit Contents:

Each Kit contains the following items:

- WaveLAN/Orinoco Turbo 11 Mbit IEEE 802.11 PC Card
- HyperAmp Remote Mounted Amplifier
- HyperGain Antenna (Omni, Yagi, Panel or Grid)
- HyperGain DC Power Injector/Lightning Protector
- 50 ft. Antenna Cable
- 0.5 meter Jumper Cable
- Mounting Hardware
- Manual

## Tools Required:

- Assorted open-end or adjustable wrenches
- #12-10 AWG or similar wire (for grounding)
- Wire cutter / stripper
- Pliers

## Other Required Equipment:

- Suitable mast or tower hardware

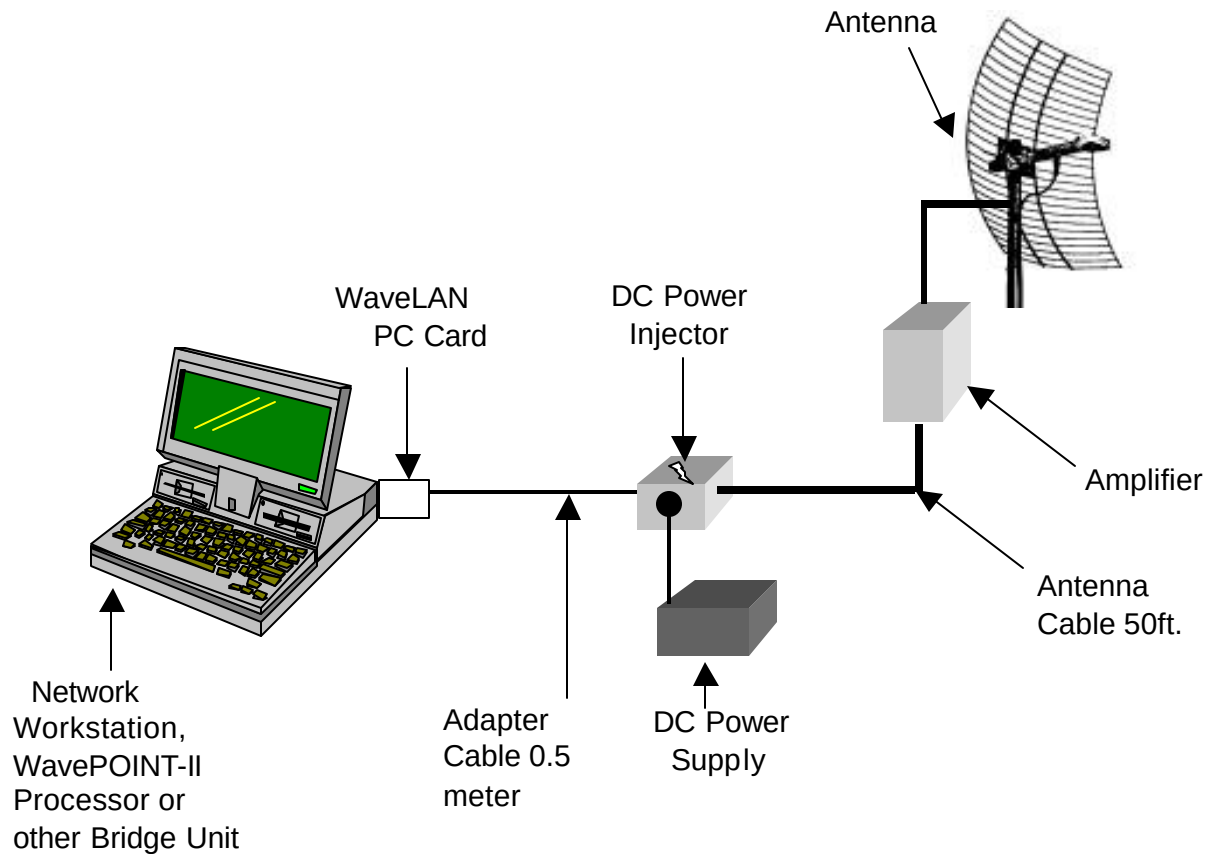
## Other Helpful Equipment and Tools:

- Cellular telephones or Walkie-talkies
- Binoculars
- Compass
- Handheld GPS

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## Overall System Configuration

The overall system configuration is shown below. Refer to this diagram while reading the section which follows, and during system installation.



## ANTENNA SYSTEM CONNECTION

**NOTE: THE ANTENNA SYSTEM SHALL BE INSTALLED ONLY BY EXPERIENCED ANTENNA INSTALLERS WHO ARE FAMILIAR WITH LOCAL BUILDING AND SAFETY CODES, AND WHEREVER NECESSARY HAVE BEEN LICENSED BY APPROPRIATE GOVERNMENT REGULATORY BODIES. FAILURE TO DO SO MAY VOID THE PRODUCT WARRANTY, AS WELL AS EXPOSE THE END-USER TO LEGAL AND/OR FINANCIAL LIABILITIES. HYPERLINK TECHNOLOGIES, ITS AGENTS, RESELLERS OR DISTRIBUTORS, ARE NOT LIABLE FOR INJURY, DAMAGE, OR VIOLATION OF GOVERNMENT REGULATIONS THAT MAY ARISE FROM FAILING TO COMPLY WITH THE GUIDELINES DESCRIBED IN THIS DOCUMENT.**

### Surveying the Antenna Site

Before beginning system installation, emphasis should be placed on system planning. It is important that no large obstructions exist near the antenna, such as retaining walls, chimneys, air-conditioning units or other antenna masts. These types of objects can have an impact on the antenna system performance.

Plan to mount the antenna as high as possible. You will need enough mast to elevate the antenna approximately 10-15 feet above the roof or above any obstruction that might be in the antenna's signal path.

You will need to identify the location where the antenna cable will be routed. If you run the antenna cable through the roof, a water-proof fitting will be required. Consult a building contractor or licensed electrician to help you with the routing if necessary. Take note of the length of the mast you will need and the type of mounting hardware required. The amplified antenna kit is shipped with U-Bolt mounting hardware which should be ideal for mounting the antenna and amplifier to most types of mast. Also, make plans on how you are going to talk to the person at the remote antenna while you are going through the antenna alignment procedure. For example, cellular phones or walkie-talkies can be used.

## Preparing for System Installation

**Warning:** These antennas are designed to be mounted in open areas such as rooftops or building exterior walls. They are designed to be installed at least 6 feet away from areas occupied by people. During system operation, always keep the antenna at least 1 foot away from your head.

**Warning:** Before performing the following steps make certain that there are not any power lines within 50 ft. If the mast should fall, either while installing or during operation, contact with any power lines will be fatal or result in a fire.

*The Antennas are designed to be mounted on an aluminum or steel mast with a diameter from 1-1/4 inches to 3 inches. A larger diameter mast would be suggested for a more durable installation. This system includes a 50 foot antenna cable.*

In addition to the kit contents, you will need a ground wire and wire ties.

## Installing the Amplifier Bracket for mast-mounting:



Install the right angle bracket as shown above using two (2) #10-24 screws and split lockwashers as shown. Note the orientation of the label relative to the 90 degree bend in the bracket. Proper positioning will ensure better visibility of the indicator LEDs when installed on the mast.

## Connections and Features of the Amplifier

### Receive Indicator LED:

This LED illuminates green in receive mode.

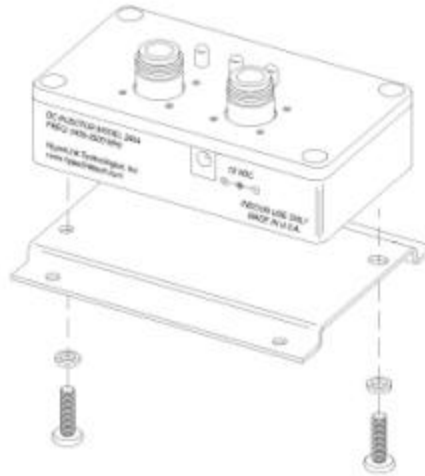
### Power Indicator LED:

This LED illuminates red in transmit mode.

### Radio Connection:

This connection attaches to the DC Power Injector via the antenna feed cable, and provides both signal and DC coupled power.

## Installing the DC Injector Mounting Bracket:



Install the bracket as shown above using two (2) #10-24 screws and split lockwashers as shown. For optimal lightning protection, it is recommended that one screw also be used for attachment of a suitable ground wire.

## Connections and Features of The DC Power Injector/ Lightning Protector

The DC Power Injector (also known as a "Bias-T") is an in-line device which couples DC power onto a coaxial cable, enabling the cable to carry both RF (radio frequency) signals and DC power. The amplifier is powered remotely through the coaxial antenna feed cable by the way of this device. The DC Power Injector included with the kit also provides integral lightning protection.

In addition to a POWER indicator LED, the DC Power Injector provides Remote Receive and Transmit Detect indicator LEDs. The Power LED indicates that the DC Power Supply is functioning. The Remote Receive and Transmit Detect indicator LED detect changes in the DC current traveling through the antenna feed cable supplying the amplifier. When the amplifier enters the receive mode the Receive indicator will illuminate. When the amplifier enters the transmit mode the Receive LED is extinguished and the Transmit LED will be illuminated. This provides positive indication that the amplifier is functioning properly.

## **Mounting and Cabling the Amplified Antenna System:**

Note: Different model antenna kits have different mounting requirements and procedures. Refer to Appendix A in this manual for antenna mounting details.

1. Attach the mast mounting hardware to a solid structure on your building (e.g., the roof itself, concrete bulkhead, vent pipe).
2. Using the included mounting hardware, secure the antenna to the top section of the mast (see Appendix A for details) and similarly, install the amplifier directly beneath the antenna using the included V-bolts.
3. Attach one end of the 50 ft. cable to the connector labeled "TO DC INJECTOR" on the amplifier. Then connect the antenna to the connector labeled "TO ANTENNA" on the amplifier.
4. Apply sealant tape around the joined connectors to prevent corrosion from the weather. Wrap the entire connection, overlapping each layer slightly to ensure a weather-tight seal.
5. Ground the antenna by connecting a suitable ground cable between the antenna mounting bracket and the building ground.
6. Very carefully raise the mast and loosely secure it with the mast mounting hardware. Use the plastic wire ties to tie the antenna cable to the mast every six to twelve inches.
7. Aim the directional antenna in the direction of the building you will be linked to. The omni-directional antennas should be mounted vertically and do not need to be aimed as they radiate in a 360 degree pattern.
8. Tighten the mast mounting screws. Do not do anything that would make it difficult to change the position of the antenna. It may be necessary to reposition the antennas while aiming them.
9. Route the antenna cable along the roof to the point where it enters the building. From the inside, pull the cable through the hole and take up any excess slack.

10. The DC Power Injector and Power Supply must be installed indoors near the radio. The Injector unit can be wall-mounted using the included bracket if desired. Attach the end of the 50 ft. antenna cable to the "TO AMPLIFIER" connector on the DC Power Injector/Lightning Protector. Attach the 0.5 meter adapter cable between the DC Power Injector's "TO RADIO" connector and the WaveLAN card.
11. Attach a ground wire to the ground lug on the DC Power Injector/Lightning Protector and to a good building ground.
12. First, plug the 12 VDC power supply into the DC Power injector and then into the building's AC power. Never use a power supply other than the one shipped with the system as it may cause damage to the radio and/or amplifier. It is further recommended that the AC connections be made through a commercially available "surge" protector power strip.

## Installing the PC Card

The method for installing the WaveLAN PC card depends upon the type of host processor used. Follow the basic hardware installation instructions which came with the host processor for installing PC cards.

When the PC card basic hardware installation is complete the card can be configured using the WaveLAN PC card configuration utilities software.

## Channel Settings

The Hyperlink Extended Range WaveLAN System is approved for operation in seven (7) different operating frequency channels. These seven channels are a subset of the eleven standard IEEE 802.11 channels.

NOTE: This equipment is not authorized for and may not be operated on IEEE channels 1, 2, 10, and 11. If you wish to interoperate with other IEEE 802.11 WaveLAN-compatible equipment be sure to set that equipment to one of the seven channels (A-G) shown in the table below:

| Channel  | Corresponding<br>IEEE 802.11 Channel | Channel Center<br>Frequency |
|----------|--------------------------------------|-----------------------------|
| NOT USED | 1                                    | 2412                        |
| NOT USED | 2                                    | 2417                        |
| A        | 3                                    | 2422                        |
| B        | 4                                    | 2427                        |
| C        | 5                                    | 2432                        |
| D        | 6                                    | 2437                        |
| E        | 7                                    | 2442                        |
| F        | 8                                    | 2447                        |
| G        | 9                                    | 2452                        |
| NOT USED | 10                                   | 2457                        |
| NOT USED | 11                                   | 2462                        |

Once the channel selection has been made proceed with Basic System Checks and Antenna Alignment procedures which follow.

## Basic System Operational Checks

Using the system's diagnostic LEDs, some basic system checks can now be performed. When power is applied to the DC Injector the POWER and RECEIVE indicators should illuminate green. In addition, the POWER/RECEIVE indicator will illuminate green on the remote amplifier unit.

When the system is transmitting and receiving data the TRANSMIT to RECEIVE indicator LEDs flash on and off. The POWER LED remains constant.

Note that the LED indicators may be difficult to recognize in bright sunlight.

## WaveLAN Antenna Alignment Diagnostics

While many short-haul links can be installed simply by performing a visual antenna alignment, in order to ensure that optimal antenna alignment is achieved it is recommended that the installer run the WaveLAN link diagnostic software. This is part of the WaveManager Client software which is included on the drivers disk. If you are not already familiar with the diagnostic utilities please refer to the WaveManager Client instructions for details.

Once optimal alignment has been achieved be sure to secure all cables, connections and mounting hardware.

## Specifications

|                                         |                                            |
|-----------------------------------------|--------------------------------------------|
| Frequency Range:                        | 2400-2483.5 MHz ISM band                   |
| Operating Channel<br>Center Frequencies | 2422, 2427, 2432, 2437<br>2442, 2447, 2452 |
| Modulation Type:                        | Direct Sequence Spread Spectrum            |
| Communication Method:                   | Half Duplex                                |
| Channel Access Method:                  | CSMA/CA                                    |
| Type of Interface:                      | PCMCIA                                     |
| Operating Temperature:                  | 0 ~ +40 C                                  |
| Storage Temperature:                    | -20 ~ +60 C                                |
| Humidity:                               | 0% ~ 90%                                   |