

DualPath™ Kit



Installation and Maintenance



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Safety

Electrical Guidelines

Observe the following electrical guidelines when working on the DualPath™ product:

- ❑ Do not work on the system or disconnect cables during thunderstorms, when power is applied, or while wearing wool clothing.
- ❑ Do not touch the power supply when the power cord is connected. Because the product doesn't have a power switch, line voltages are present within the power supply when the power cord is connected to the product.
- ❑ The product relies on the building's installation of short-circuit (overcurrent) protection. Make sure that a fuse or circuit breaker not larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on all current-carrying conductors.
- ❑ Before working on the unit, unplug the power cord from the AC outlet or disconnect the fuse or circuit breaker.
- ❑ Locate the emergency power-off switch for the AC source connected to the product. If an electrical accident occurs, use this switch to turn off power to the product.
- ❑ Identify possible hazards in your work area, such as moist floors, ungrounded power extension cables, and missing safety grounds. Do not work alone if potentially hazardous conditions exist.
- ❑ Ungrounded or improperly grounded antennas constitute a hazard to personnel and equipment. A lightning strike on a near an improperly grounded antenna can cause severe injury or death as well as equipment destruction.

General Safety Guidelines

Observe the following general guidelines to ensure safety:

- ❑ Keep tools away from walk areas where personnel could trip over them.
- ❑ Do not wear loose clothing that could get caught in the chassis mounting hardware. Fasten your tie or scarf and roll up your sleeves.
- ❑ Wear safety glasses when working under any conditions that might be hazardous to your eyes.
- ❑ Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- ❑ Antenna cables should be listed for outdoor installation in accordance with the National Electric Code, or acceptable to the local Authority Having Jurisdiction.

RF Regulatory Information

This RF product operates in the 5.4-5.8 GHz band (modified 802.11a), complies with the IEEE 802. ID MAC bridging standard and supports SNMP monitoring if IP routing is enabled.

FCC Radio Frequency Interference Statement

FCC ID: KA324WAN6

The RF product is certified to comply with Part 15 of Federal Communications Commission (FCC) Rules.

Operation is subject to the following two conditions:

1. It may not cause harmful interference.
2. It must accept any interference that may cause undesired operation.

Industrie Canada Radio Frequency Interference Statement

CANADA 2499391192A

The RF product is certified to comply with Industrie Canada (IC) RSS/CNR 139.

Operation is subject to the following two conditions:

1. It may not cause harmful interference.
2. It must accept any interference that may cause undesired operation.

Other Countries

Although the product uses a modified 802.11a radio operating in the 5.4-5.8 GHz frequency, it may not be considered an unlicensed radio in your country. Please check with your local government or municipality to ensure safe and legal operation of the system.

Radio Transmission Notice

The RF product is a low power (less than 1 Watt) direct-sequenced, spread-spectrum radio system pre-set to transmit and receive signals in the 5.4 – 5.8 GHz frequency band. The RF product has been certified by the U.S. Federal Communications Commission for use in the United States of America in that band. The manufacturer makes no representation as to the availability of the above-mentioned frequency band for such use in other countries.

Any prospective user of this product outside the United States of America should, prior to such use contact the government department responsible for assigning radio frequencies in the country in which use is proposed to determine whether such department or agency has any objection to the operation of the RF product in the 5.4 to 5.8 GHz bandwidth, and whether there are any other local devices generating signals in the band which might be expected to interfere with the operation of this product.

LightPointe shall not be responsible for any operation of the RF product which is in violation of local law, creates interference harmful to other local devices, or results in a malfunction of this product caused by outside interference.

In order to comply with FCC RF exposure requirements, a minimum separation distance of 27 inches must be maintained between the antenna and any persons. When installing the antenna, ensure that this clearance is maintained while the product is in operation.

This product must be installed and used in strict accordance with the manufacturer's instructions. However, there is no guarantee that interference to radio communications will not occur in a particular commercial installation. In case the product does cause harmful interference with an authorized radio service, the user/operator shall promptly stop operating the device until harmful interference has been limited. LightPointe 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 LightPointe. The correction of interference caused by such unauthorized modification, substitution, or attachment will be the responsibility of the user.

Declaration of Conformity

LightPointe declares that the RF product, manufactured 2001-2005, conforms to the following product specifications:
EMC-CISPR22 Class A, IEC 60417, UL 94, CFR47 Part 15, UL 1950, CSA22.2 No. 950-M95, RSS 210, Low Voltage Directive including amendments by CE Marking Directive.

Service

There are no serviceable parts within the units and the linkheads and radios should not be opened in the field. Only factory trained personnel can provide service on any internal components of the linkheads or radios.

Warranty

LightPointe warrants this product against faulty materials or workmanship under the terms of our current Standard Warranty And Support Agreement provided that the product was purchased directly from us or from one of our authorized resellers. Please contact LightPointe Customer Service for additional information or to obtain a copy of the Warranty Agreement.

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Using This Manual

This manual describes how to install and maintain the DualPath kit with LightPointe Optical Wireless systems.

Step-by-step procedures describe:

- ❑ Performing hardware configuration using both a Command Line Interface and Web Browser method
- ❑ Checking the system for proper operation
- ❑ Performing troubleshooting procedures

Section	Contents
1. System Overview	System functional and physical overview
2. System Installation	Detailed step-by-step installation, configuration, and alignment procedures
3. Maintenance	Activities required to maintain the system
4. Troubleshooting and Diagnostics	Resolving operational problems
5. Specifications	Physical and electrical specifications

Additional Resources

Refer to the following documents for additional information about the LightPointe system.

Document Number	Title
505-015902-00000	Field Engineering and Planning Guide
505-004148-00000	FlightLite 155/155E Installation and Maintenance
505-016300-00000	FlightLite 100/100E Installation and Maintenance
505-015408-00000	FlightLite G Installation and Maintenance
505-004148-00000	FlightStrata Installation and Maintenance
505-015494-00000	FlightStrata G Installation and Maintenance



1. System Overview

This chapter covers the following main topics:

- ❑ System Introduction
- ❑ System Components
- ❑ System Management
- ❑ System Operating and Control Parameters

1.1. System Introduction

1.1.1. DualPath™ Architecture

The LightPointe DualPath Kit provides LightPointe Optical Wireless products with a high availability upgrade option by combining a robust RF backup, sub-second intelligent switching and key network management features. The end result is unprecedented 99.999% network availability at distances up to 5 km – even in the most extreme weather conditions, including fog.

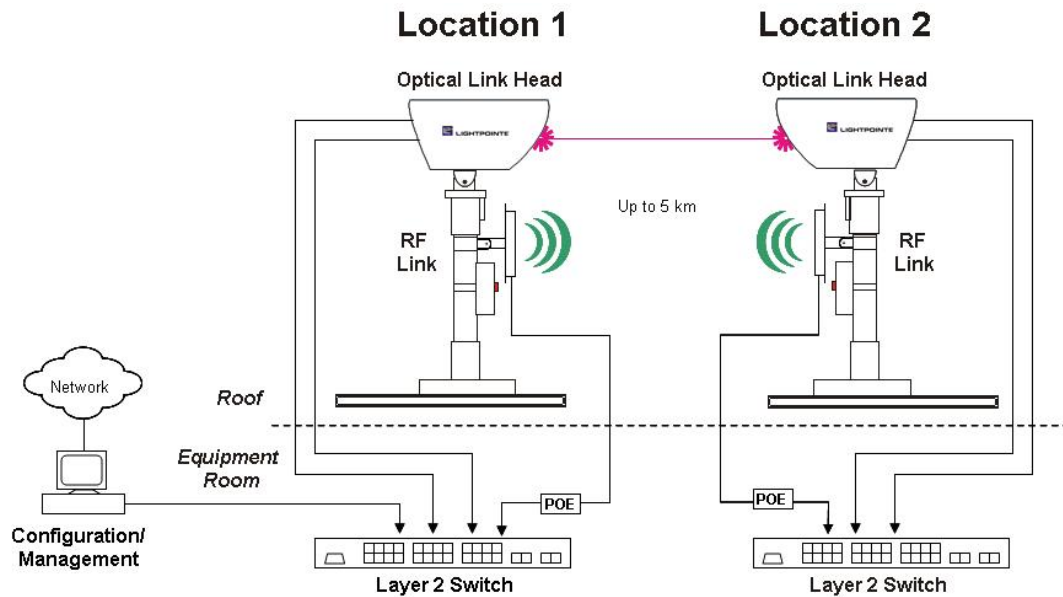


Figure 1-1: Dual Path Architecture

Free-Space Optical Wireless Transmission (Primary Link)

In all DualPath configurations, a LightPointe Optical Wireless linkhead will be the primary means of communications. The link systems require “true” line-of-sight between locations or relay locations (hopping points) and operate in high and ultra-high bandwidths.

The linkhead on the transmission side transmits a narrow infrared light beam carrying the data received from the network interface. The linkhead on the opposite side receives the beam, filters the optical signal, and transfers it to the network fiber interface on the receiving side. The system is capable of operating in a full-duplex mode, transmitting and receiving data simultaneously.

Radio Frequency (Secondary Link)

In the event of primary link failure, the DualPath kit's 5.4-5.8 GHz radios and antennas act as a backup wireless link. Unlike Optical Wireless transmission, these wireless LAN radios are specifically designed to provide communications in "near-line-of-site" environments, but obstacles such as trees, buildings or other potential sources of interference must be considered.

As with traditional Ethernet LANs, wireless LANs are based on a Carrier Sense Multiple Access network protocol. But unlike Ethernet which implements a Collision Detection scheme (where data is retransmitted if a collision is detected), wireless LANs implement a Collision Avoidance scheme (where data is only sent when the air is free). This CSMA/CA protocol, as defined, does not allow for simultaneous, two-way traffic. Thus, while Optical Wireless solutions are full-duplex, RF solutions are, by their very nature, half-duplex.

The RF backup uses power-over-Ethernet to simplify installations.

Switching

The intelligence behind the DualPath Architecture lies in its switching capabilities. In the event of a primary optical link failure, a Layer 2 hardware appliance seamlessly switches the data transmission to the secondary RF link, thereby maintaining connectivity. When the optical link is restored, the data transmission is switched back to the primary link.

A patented switching algorithm helps resolve a common switching issue known as "flapping". In unstable environments (such as fog) where optical signals can continuously fluctuate, the connection may be lost several times in the matter of a few seconds. Instead of switching back and forth between the primary and secondary links in this short amount of time, a "hold-off time" is implemented. Only when the optical link is stable for a specified time period will the transfer from secondary link back to primary link take place. Furthermore, the optical link must be lost for a designated time period before transfer to the secondary RF link, thereby avoiding instances where a bird, for example, temporarily breaks the optical path.

Configuration and Management

Configuration of a DualPath installation is done through the switch to each of the DualPath components. Network management features such as SNMP traps/alarms, Quality of Service (QoS), and traffic prioritization are also available.

1.1.2. Typical Applications

The DualPath Kit is ideal for bandwidth-intensive, mission-critical applications such as:

- ❑ Enterprise/LAN solutions (Point-to-point connectivity between buildings, campuses, remote locations)
- ❑ Wireless backhaul
- ❑ Metro network extension
- ❑ Voice-Over-IP
- ❑ Medical imaging
- ❑ CAD/Graphics design and video.

1.1.3. Network Interface Connectivity

The DualPath Kit and radios are equipped with RJ-45 ports while the switch includes 24 10/100/1000BaseT ports and 4 Combo SFP/Mini-GBIC ports for easy connectivity to an existing customer network.

1.2. DualPath Kit System Components

1.2.1. RF Components



Figure 1-2: RF Unit

The DualPath Kit RF secondary link consists of the following main components:

- ❑ Radio and flat panel antenna integrated into ruggedized 12 in x 12 in x 3 in waterproof chassis
- ❑ Mounting bracket
- ❑ 3-inch extension arm
- ❑ Power-over-Ethernet injector with power supply and power cords

1.2.2. Switch Components



Figure 1-3: DualPath Switch

The DualPath Switch consists of the following main components:

- ❑ 24-port auto-sensing Layer 2 switch
- ❑ Console cable (RS232)
- ❑ Power cord

NOTE: SFP/Mini GBICs and media converters for connecting to existing LightPointe Gigabit Ethernet or fiber-based linkheads are NOT included. Please contact LightPointe for recommended suppliers.

1.3. System Operating and Control Parameters

Refer to the following table for information about the DualPath Kit Radio and Switch operating and control parameters.

Table 1-1: System Operating and Control Parameters

Parameters	DualPath Radio	DualPath Switch
Receivers/Transmitters	Integrated Radio Panel Antenna	
Connectivity	Ethernet 10BaseT, 100BaseT	Ethernet 10BaseT, 100BaseT, 1000BaseT, 100BaseFX
Interface	RJ-45 Copper Interface	RJ-45 Copper Interface; SFP/Mini-GBIC
Data Rate	72 Mbps (Half Duplex)	8.8 Gbps Switch Fabric
Operational Range	Up to 5 km (Line-of-Sight)	
Operating Power	100mW (20 dBm)	
Operating Voltage	Power-Over-Ethernet, Indoor DC Injector (24V, 1.5A)	100 to 240V (50/60 Hz)
Configuration and Management	HTTP	HTTP, CLI/Console, SNMP v1, QoS, Load Balancing



2. System Installation

This chapter covers the following main topics

- ❑ Site review and preparation
- ❑ Recommended survey and installation tools and test equipment
- ❑ Site preparation
- ❑ Installation staffing
- ❑ System configuration
- ❑ DualPath Kit installation components
- ❑ Assemble and Mount system equipment
- ❑ System alignment
- ❑ Verify system operation

2.1. Site Review and Preparation

Please refer to the LightPointe Field Engineering & Planning Guide for detailed site survey instructions on Optical Wireless linkheads. For RF site preparation, use this guide.

2.1.1. Site Review

Step 1 Determine the appropriate system to meet the needs of each specific location:

- ❑ Data rate protocol
- ❑ Measure point-to-point distance using a laser range finder or GPS
- ❑ Is the physical distance of the antennas and the maximum transmission distance at the maximum?

Step 2 Check RF line-of-sight and evaluate potential RF interference.

- ❑ Can trees or other obstacles in the line of sight interrupt the connection or encroach into the Fresnel zone? Is it possible to have visual line-of-site without achieving RF line-of-sight? Also, keep in mind the time of year for foliage.
- ❑ Are there any other in-band 5.4-5.8 GHz RF products installed nearby that can potentially impact wireless spectrum usage?
- ❑ Are cellular devices, low frequency devices (TV, radio) or power lines nearby? These may cause interference.
- ❑ If necessary, use a spectrum analyzer or RF signal tester to check the RF environment and minimize interference risk

Note: The RF antenna and optical linkheads may be located at different locations on the roof to achieve line-of-sight.

- Step 3** Evaluate environmental mounting conditions.
- Stable and vibration-free mounting platform
 - Foundation at the mounting location not susceptible to change due to humidity or temperature
 - Evaluate the need for a lightning protection system (the RF antenna includes a built-in surge arrestor, but additional equipment may be required to protect other network components from lightning and other surges).
 - Use non-penetrating roof mounting hardware if possible
- Step 4** Evaluate mounting locations for system access.
- Easy access to linkheads and antennas
 - Stable location/platform for mounting
 - Safety considerations for installers and maintainers of the system
- Step 5** Evaluate mounting locations for operational integrity (refer to Section 2.1.2 to see different types of mounts).
- Near roof edge to avoid interruptions of transmission and minimize heat (shimmer) effects
 - Leave enough room on the mounting pole to mount the RF antenna below the linkhead
 - Weather protected location if possible
 - Personnel laser protection considerations
- Step 6** Consider the mount foundation (refer to Section 2.1.2).
- Penetrating
 - Roof surface
 - Wall
 - Interior floor behind window
- Step 7** Consider mount type (refer to Section 2.1.2).
- Joint mount
 - Other specialized mount

2.1.2. Typical Mount Installation

The RF antenna is normally mounted directly below the linkhead on the same mounting post. If a different linkhead mount is used, the RF antenna may be mounted differently than shown below.



Figure 2-1: Typical DualPath Optical Wireless + RF Mount Installation

2.2. Recommended Survey and Installation Tools and Test Equipment

The following tools and supplies may be needed for survey, installation, testing, and maintenance of the LightPointe system hardware.

Site Survey Tools:

- ❑ Thomas Guide or equivalent mapping tool for locating sites and doing rough distance calculations
- ❑ Laser range finder or GPS for accurate distance measurement
- ❑ Binoculars to assist in locating the planned opposite end installation location
- ❑ Sketch pad to make rough drawings and notes (recommend using LightPointe Field Engineering Guide)
- ❑ Tape measure to determine approximate short distance cabling, power runs, etc.
- ❑ Latitude and Longitude mapping software.
- ❑ Terrain mapping software (Micropath)
- ❑ Spectrum analyzer (Antitsu)
- ❑ Camera (digital recommended) to photograph installation sites to reduce need for return visits to sites (optional)

Installation Tools:

- ❑ Standard electro-mechanical tool kit with pliers, screwdrivers, wire cutters, wire strippers, etc.
- ❑ Two-way radio or cell phones to communicate when aligning linkheads
- ❑ CAT-5 crimp tool and connectors

- ❑ Plastic tie wraps to secure flexible conduits, etc.
- ❑ Wrenches to tighten bolts
- ❑ Electrical tape for securing and fastening
- ❑ Measuring level to evaluate flatness of mounting surfaces
- ❑ The tape measure and camera from the site survey can also be helpful in completing and documenting site installations

The following items may also be needed for installation and/or service, depending on the location and type of installation:

- ❑ Digital volt meter to check electrical systems
- ❑ Power drill or power hammer with appropriate bits to securely install the mounting platforms
- ❑ Step or extension ladder for access to elevated locations
- ❑ High quality rope to use for hoisting materials and/or to be used in conjunction with a safety harness to ensure installer safety when appropriate
- ❑ Exterior rated extension cord (50' or longer recommended)

2.3. Site Preparation

Please refer to the LightPointe Field Engineering & Planning Guide for detailed site preparation instructions on Optical Wireless linkheads. For RF site preparation, use this guide.

Step 1 Prepare the surface for mounting.

- Inspect the surface to ensure that it is a solid material that can be penetrated by bolts.
- Make sure the surface is not cracked, broken, or spongy.
- Check the surface to ensure that it is rigid

Step 2 Check the available power.

- Ensure that the power cable is long enough
- Use cable of correct diameter and rating
- Be aware of local building code requirement

Step 3 Check the network interface connections.

- For each location, a CAT-5 cable run is required from the switch to the antenna.

Step 4 Check CAT-5 cable routing.

- Make sure the correct cabling is used (outdoor rated recommended)
- Termination at antenna side: CAT-5, RJ45
- Label all cables at both the roof location and switch location to distinguish between cable runs. If you accidentally plug the POE into the wrong port you may damage something.

2.4. Installation Staffing

A single person can perform all required installation and alignment procedures at most locations. However, installation can be completed more efficiently and safely if two people are used (one person at each linkhead).

2.5. System Configuration

2.5.1. Introduction

The DualPath Kit is factory configured before delivery. The only configuration parameters that may require change are the hardware IP Addresses. When it becomes necessary to reconfigure the DualPath Kit components system, you have the following two options for configuration procedures:

- ❑ To configure and bench test the system before installation, refer to Section 2.5.2. This approach uses the Switch Command Line Interface, and a Web GUI for radios.
- ❑ To install the system and then configure the hardware, refer to Section 2.5.3. This approach uses a Web GUI to configure the switches and radios.

Note: The PC management console IP Addresses must be set to the addresses shown in Table 2-1.

Configuration Data

The following table identifies the required components and network addresses (factory defaults) required to configure the DualPath Kit components.

IMPORTANT NOTE

The DualPath Kit components (switches and radios) have been customized and preconfigured to ensure optimal performance in LightPointe-specific Optical Wireless installations. Any changes to default settings, port assignments, use of advanced switch features or use of non-LightPointe linkheads or radios may impact system operation and will not be supported by LightPointe.

Table 2-1: Bench Test Components and Required Network Information

Components	Number Required	IP Address	Description
Laptop Management Console	1 Minimum	(Customer Assigned = XXX) Root: 192.168.1.XXX Peer: 192.168.1.XXX	Pentium 4 or equivalent
DualPath Kit Switch	2	(Factory Configured) Root: 192.168.1.102/24 Peer: 192.168.1.202/24	Layer 2 switch
DualPath Kit Radio and Flat Panel Antenna	2	(Factory Configured) Root: 192.168.1.101 Peer: 192.168.1.201	Secondary communications link

Customer Assigned IP Address Information

Please record customer assigned IP address information in this section before beginning equipment configuration and installation. Information can also be written on the diagram in Figures 2-2 to 2-4 for easy reference.

Table 2-2: Customer Assigned IP Addresses

Customer Configurable Component	Customer Assigned IP Address
Root Laptop Management Console:	_____
Peer Laptop Management Console (Optional):	_____
Root DualPath Switch:	_____
Peer DualPath Switch:	_____
Root DualPath Radio:	_____
Peer DualPath Radio:	_____
Root Linkhead Management Port:	_____
Peer Linkhead Management Port:	_____
(Optional) SNMP Server:	_____

2.5.2. Hardware Configuration and Bench Testing before Installation

If you want to reconfigure parameters and verify the operation of your system before installation, use the procedures in this section.

IMPORTANT NOTE

The DualPath Kit components (switches and radios) have been customized and preconfigured to ensure optimal performance in LightPointe-specific Optical Wireless installations. Any changes to default settings, port assignments, use of additional ports, use of advanced switch features or non-LightPointe linkheads or radios may impact system operation and will not be supported by LightPointe.

Bench Test Set Up - Equipment and Interconnection

The following figures illustrate how to set up the DualPath Kit components with various LightPointe Optical Wireless Linkheads for bench testing and component pre-configuration.

IMPORTANT NOTES

- * For configurations requiring Optical-to-Ethernet Media Converter (FL155, FL155E and others), the media converter must have link pass-through capabilities and must match the fiber type, bandwidth, optical power and wavelength of the linkhead. Media converters are NOT included with the DualPath Kit (sample vendors: Canary, Omnitron, Transition)**
- * The switch is rate-limited for optimal use in combination data and voice environments. If data-only traffic is being transmitted, turning the switch QoS features off will result in higher throughput. Furthermore, all ports should be in Auto Negotiation mode to ensure highest throughput.**
- * The SFP/Mini-GBIC for interface between fiber and switch port (must match fiber type) is NOT supplied with the DualPath Kit. LightPointe recommends D-Link SFP-Mini GBIC DEM-311GT for Multimode or SFP-Mini GBIC DEM-310GT for Singlemode and/or Multimode.**

FLIGHTLITE 100/100E CONFIGURATION

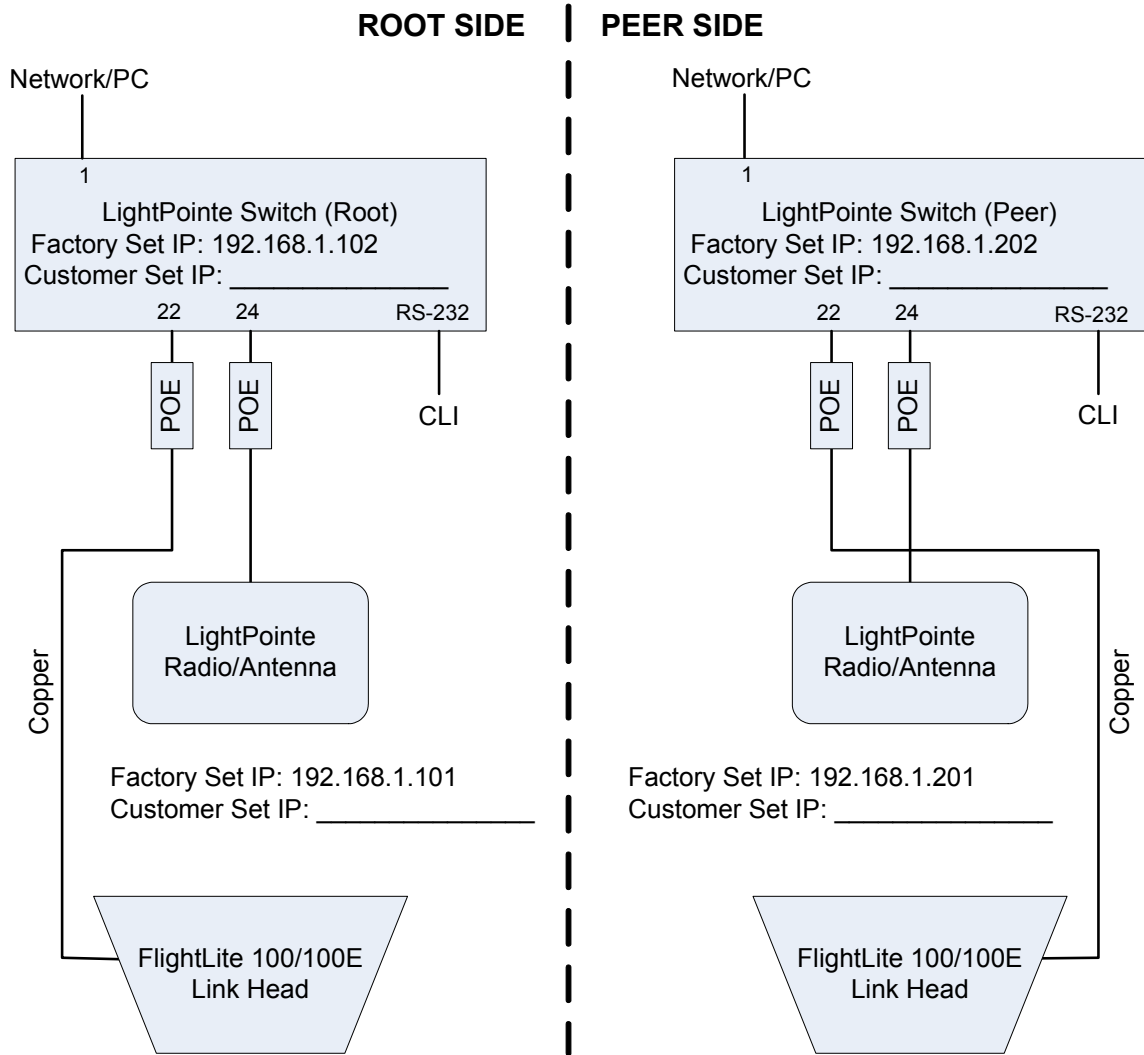


Figure 2-2: DualPath Kit Interconnect Diagram for FL100/100E

FLIGHTLITE 155/FLIGHTSTRATA 155 CONFIGURATION

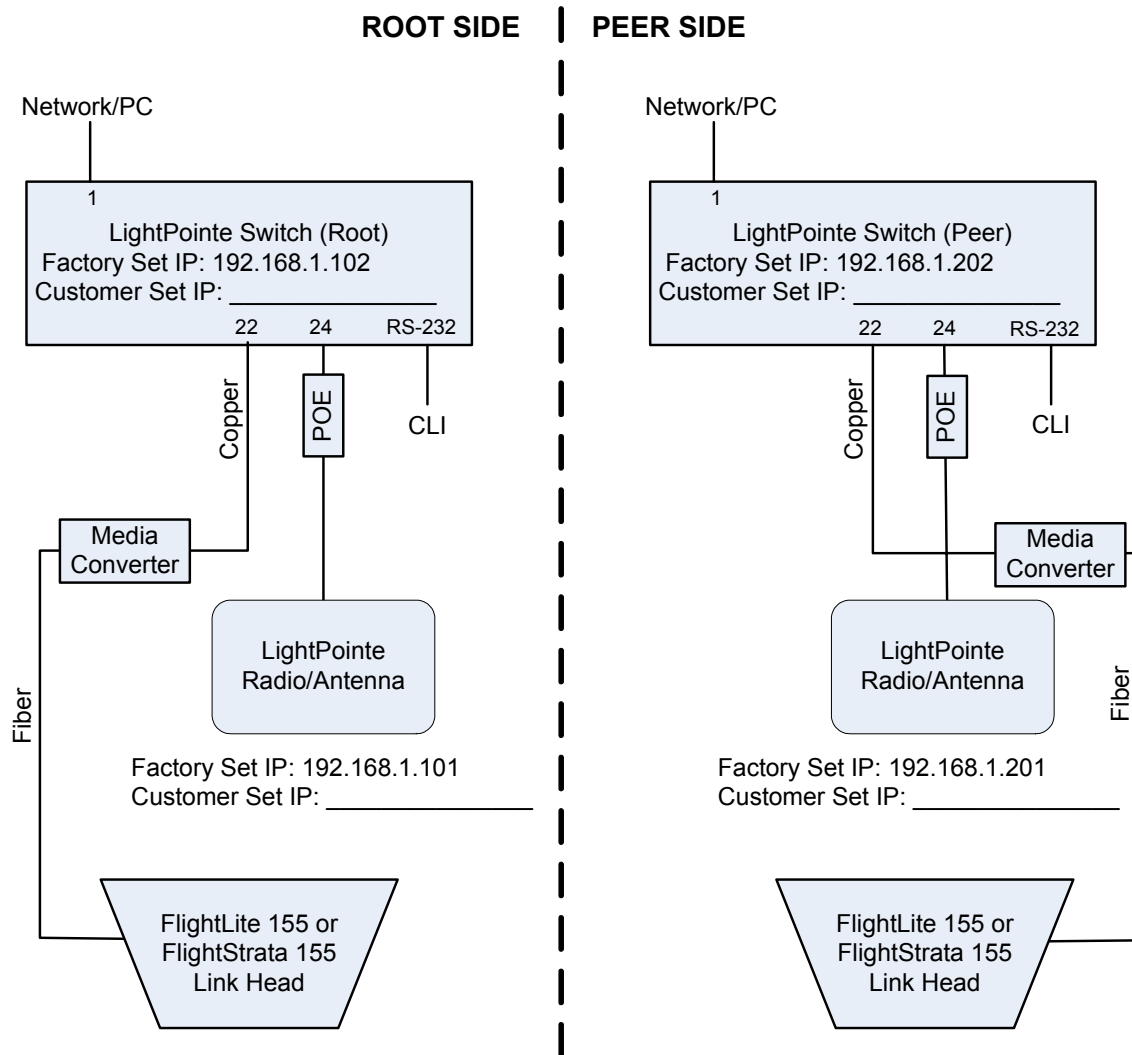


Figure 2-3: DualPath Kit Interconnect Diagram for FL 155/FSA 155

IMPORTANT NOTE

Media Converters and SFP Mini-GBICs are NOT included with the FlightSwitch product. To obtain a list of recommended Media Converters or SFP Mini-GBICs, please contact your local LightPointe sales representative or partner.

FLIGHTLITE G/FLIGHTSTRATA G CONFIGURATION

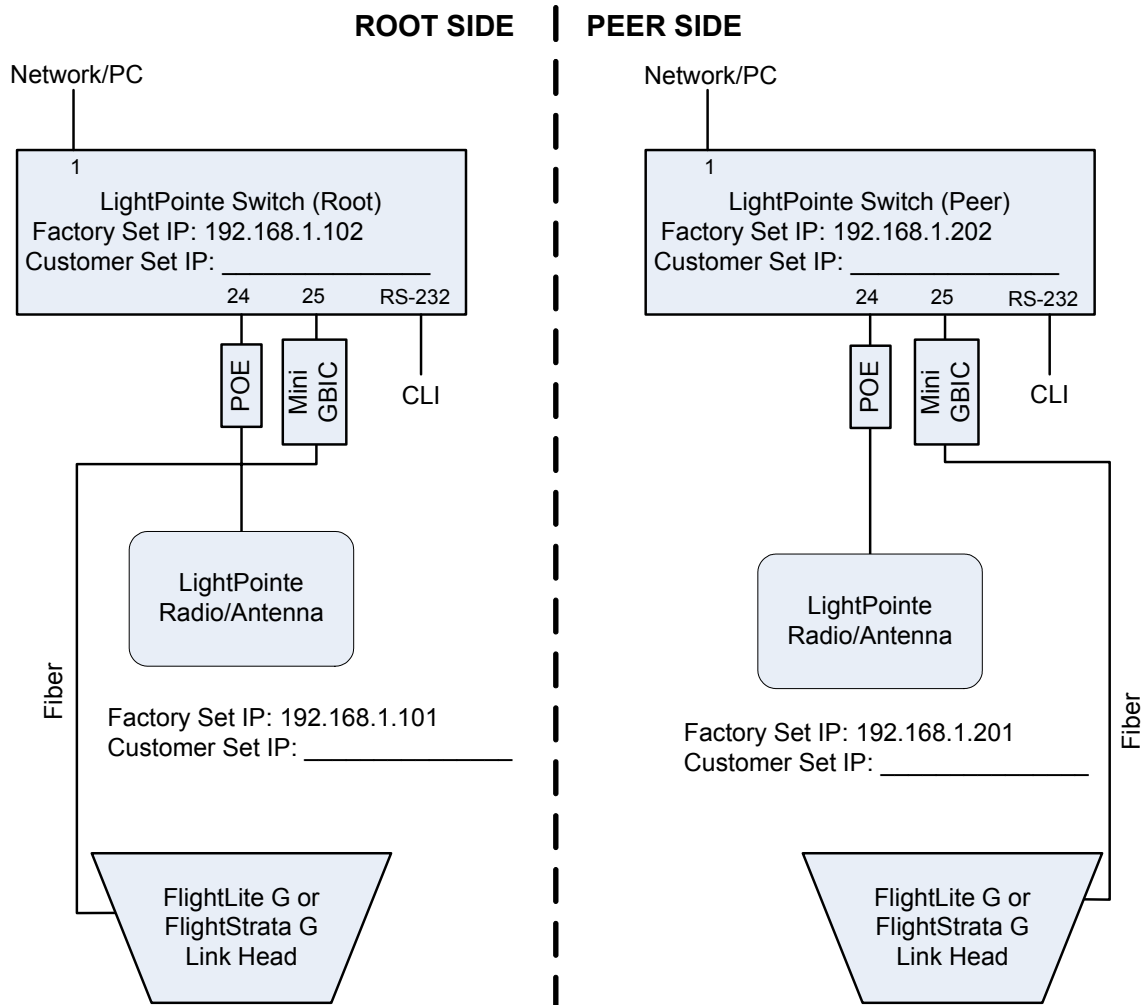


Figure 2-4: DualPath Kit Interconnect Diagram for FL G, FSA G

IMPORTANT NOTE

Media Converters and SFP Mini-GBICs are NOT included with the FlightSwitch product. To obtain a list of recommended Media Converters or SFP Mini-GBICs, please contact your local LightPointe sales representative or partner.

Switch Configuration using the RS-232 Command Line Interface

LightPointe uses the LFSW-3226L switch to support its dual path solution. The LightPointe switch can be configured by using either a Command Line Interface (CLI) or a Web based browser interface. Configuring the switch includes the following tasks:

- ❑ Set Network IP Address
- ❑ Set Per Port data rate limitation
- ❑ Enable and disable selected ports
- ❑ RSTP Setup
- ❑ VLAN QoS setup
- ❑ SNMP (Simple Network Management Protocol) setup

You can connect to the switch's management agent via the CLI serial port on the switch and a terminal or through a computer running a terminal emulation program.

IMPORTANT NOTE

When you use HyperTerminal with the Microsoft® Windows® 2000 operating system, ensure that you have Windows 2000 Service Pack 2 or later installed. Windows 2000 Service Pack 2 allows you to use arrow keys in HyperTerminal's VT100 emulation.

RSTP Set up

To set up the switch to utilize Rapid Spanning Tree Protocol, perform the following steps on both the peer and root switches. All CLI comments are preceded by two forward slashes (i.e. // comment).

Step 1 Ensure the bench test system is interconnected as shown in Figures 2-2 to 2-4. Double check switch port usage:

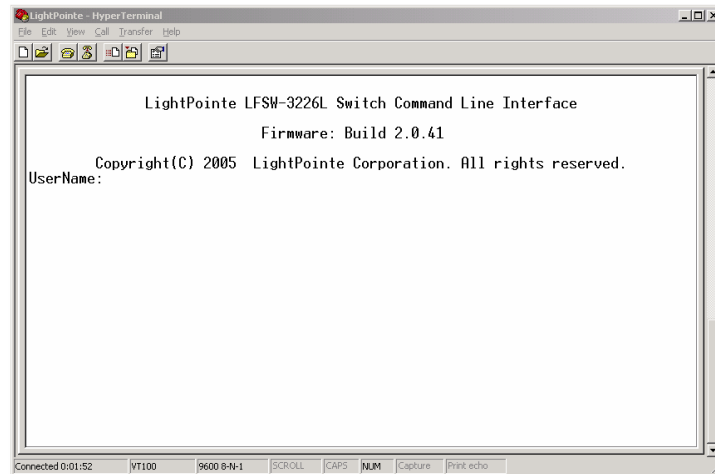
- ❑ Port #1 – Connected to a Network/PC
- ❑ Port #24 – RF Unit (STP Enabled)
- ❑ **FlightLite 100/100E/155 and FlightStrata 155**
Port #22 – Linkhead Data (STP enabled)
or
FlightLite/FlightStrata G
Port #25 for "G" Linkheads (STP enabled)

Step 2 Connect a 9-pin RS-232 serial port between the PC serial port and the CLI serial port on the front panel of each switch.

Step 3 Ensure the PC serial port is configured as follows:

- 9600 baud
- no parity
- 8 data bits
- 1 stop bit
- Flowcontrol none

Step 4 Start up a HyperTerminal on the PC. With the serial port and computer properly connected, the following screen should appear.



Step 5 Press the Enter key twice. The CLI cursor **LFSW-3226L:4#** is displayed. This is the command line from which all of the following CLI commands are input.

Step 6 The following CLI commands can be used to display the status of the switch:

- Display information about the switch
LFSW-3226L:4#show switch
- Display the IP address
LFSW-3226L:4# show ipif
- Display the port status
LFSW-3226L:4# show ports
- Display STP settings
LFSW-3226L:4# show stp
- Display STP port settings
LFSW-3226L:4# show stp ports

Step 7 Configure the IP Addresses of the Near and Peer Switches. You must use the customer IP addresses. The addresses shown below are the factory default settings.

- Root:
**LFSW-3226L:4#config ipif system ipaddress
192.168.1.102/24**
- Peer:
**LFSW-3226L:4#config ipif system ipaddress
192.168.1.202/24**

Step 8 Enable Fast Ethernet ports and disable ports not used.

- FlightLite 100/100E/155 and FlightStrata 155**
LFSW-3226L:4#config ports 22 speed 100_full
or
FlightLite/FlightStrata G
LFSW-3226L:4#config ports 25 speed 100_full
- FlightLite 100/100E/155**
LFSW-3226L:4#config ports 2-21, 23 state disable
or
FlightLite/FlightStrata G
LFSW-3226L:4#config ports 2-23 state disable

Step 9 Configure the switch Spanning Tree Protocol settings for both switches.

- LFSW-3226L:4#enable stp**
- Globally enable STP on switch for rapid spanning tree protocol.
LFSW-3226L:4#config stp version rstp
- Set the maximum amount of time (in seconds) that the switch will wait to receive a BPDU packet before reconfiguring STP.
LFSW-3226L:4#config stp maxage 6
- Set the maximum amount of time (in seconds) that the root device will wait before changing states.
LFSW-3226L:4#config stp forwarddelay 4
- The time interval between transmission of configuration messages by the root device.
LFSW-3226L:4#config stp hellotime 1

-
- Step 10**
- ❑ Set the maximum number of Hello packets transmitted per interval. The count can be set from 1 to 10.
LFSW-3226L:4#config stp txholdcount 10
 - ❑ Allow the forwarding of STP BPDU packets from other network devices when STP is disabled on the switch.
LFSW-3226L:4#config stp fbpdu disable
 - ❑ Root side - A numerical value between 0 and 61,440 that is used in determining the root device, root port, and designated port. The device with the highest priority becomes the root device. The lower the numerical value, the higher the priority.
LFSW-3226L:4#config stp priority 4096
 - ❑ Peer side
LFSW-3226L:4#config stp priority 8192
 - ❑ **FlightLite 100/100E/155 and FlightStrata 155**
LFSW-3226L:4#config stp ports 22 priority 16
or
FlightLite/FlightStrata G
LFSW-3226L:4#config stp ports 25 priority 16
 - ❑ **FlightLite 100/100E/155 and FlightStrata 155**
LFSW-3226L:4#config stp ports 1-21, 23 state disable
or
FlightLite/FlightStrata G
LFSW-3226L:4#config stp ports 1-23 state disable
 - ❑ **FlightLite 100/100E/155 and FlightStrata 155**
LFSW-3226L:4#config stp ports 22, 24 state enable
or
FlightLite/FlightStrata G
LFSW-3226L:4#config stp ports 24-25 state enable
 - ❑ Set the transmit bandwidth of port 24 to 15 Mbps.
LFSW-3226L:4#config bandwidth_control 24 tx_rate 192
- Step 11**
- ❑ Save all settings.
LFSW-3226L:4#save

Optional QoS Set up (Priority Queuing of Frame Packet Data)

Ports 23 -26 are by default set as VLAN ports. The QoS (Quality of Service) CLI commands are used to set up the switch to utilize 802.1p priority queuing. Perform the following steps to implement priority queuing on both the far and local switches.

- Step 1** The switch default state is QoS On. The following settings are examples only. The actual settings are all customer network specific.
- Create vlan on the switch named "voip" with ID of "2".
LFSW-3226L:4#create vlan voip tag 2
 - Create vlan on the switch named "data" with ID of "3".
LFSW-3226L:4#create vlan data tag 3
- Step 2**
- FlightLite 100/100E/155 and FlightStrata 155**
Add ports to the port list of a previously configured vlan "default".
LFSW-3226L:4#config vlan default add tag 1, 22, 24

Add ports to the port list of a previously configured vlan "voip".
LFSW-3226L:4#config vlan voip add tag 1, 22, 24

Add ports to the port list of a previously configured vlan "data".
LFSW-3226L:4#config vlan data add tag 1, 22, 24
or
FlightLite/FlightStrata G
Add ports to the port list of a previously configured vlan "default".
LFSW-3226L:4#config vlan default add tag 1, 24-25

Add ports to the port list of a previously configured vlan "voip".
LFSW-3226L:4#config vlan voip add tag 1, 24-25

Add ports to the port list of a previously configured vlan "data".
LFSW-3226L:4#config vlan data add tag 1, 24-25
- Step 3**
- Save all settings.
LFSW-3226L:4#save

Optional SNMP Set up (Version 1 or 2c)

The LFSW-3226L switch supports the Simple Network Management Protocol (SNMP) versions 1, 2c, and 3. You can specify which version of the SNMP you want to use to monitor and control the switch. Perform the following steps on both the Local and Peer switches.

- Step 1** The following settings are examples only. The SNMP server in the following example has an IP address of 192.168.1.106. The actual SNMP server IP address is customer network specific.
- Enable SNMP traps.
LFSW-3226L:4#enable snmp traps
 - Optional - Create a recipient of SNMP traps generated by the switch's SNMP, set the SNMP version to v2c, and specify packet authorization and encryption.
LFSW-3226L:4#create snmp host 192.168.1.106 v2c private
 - Optional - Same as above command except SNMP version v1 is used.
LFSW-3226L:4# create snmp host 192.168.1.106 v1 private
- Step 2**
- Save all settings.
LFSW-3226L:4#save

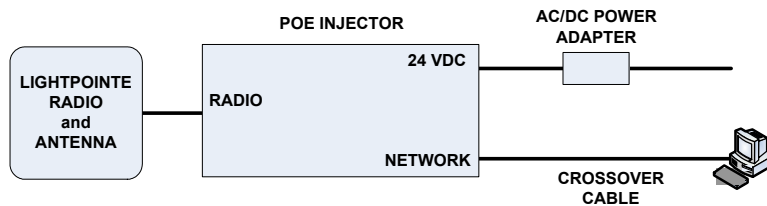
Radio Configuration using a Crossover Cable

As required by the installation, the factory default radio configuration settings can be changed using the following procedure.

IMPORTANT NOTE

DualPath Kit components (switches and radios) have been customized and preconfigured to ensure optimal performance in LightPointe-specific Optical Wireless installations. Any changes to default settings, port assignments, use of additional ports, use of advanced switch features or non-LightPointe linkheads or radios may impact system operation and will not be supported by LightPointe.

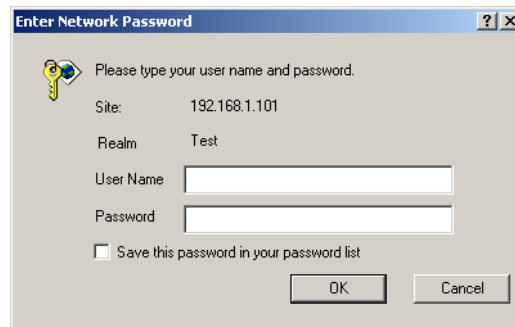
- Step 1** Connect a crossover Ethernet cable between each radio Ethernet port and the Ethernet port on a PC.



Note: The PC management console IP Addresses must be set to the addresses shown in Table 2-1.

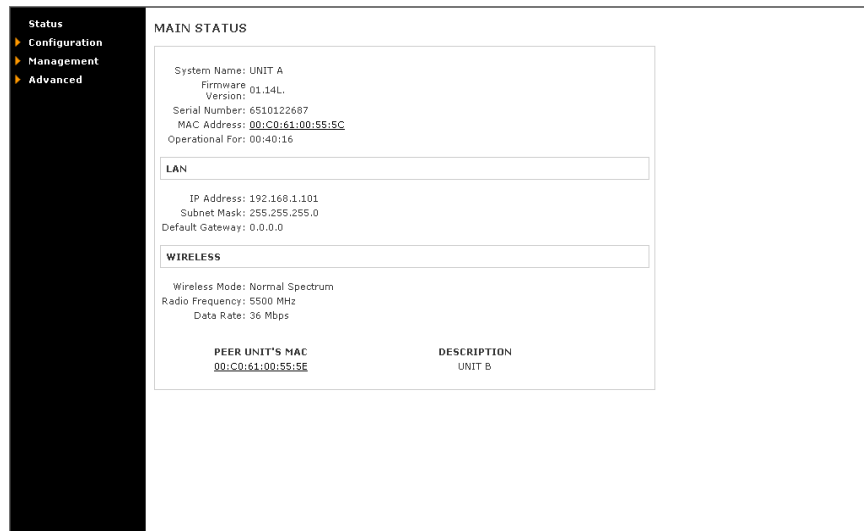
- Step 2** Start up a Browser on the PC.
- ❑ The radios can be configured using a web browser such as Netscape® Navigator (version 6.2 and higher) or Microsoft® Internet Explorer (version 5.0 and higher)

- Step 3** To access the radio, at the browser URL address line enter the appropriate radio default IP address. From the Welcome screen click on **Login**, the Password window is displayed.



Step 4 Enter **User Name** and **Password** and click the **OK** button. The Root radio Main Status window is displayed.

- The default user name is admin and the default password is default.

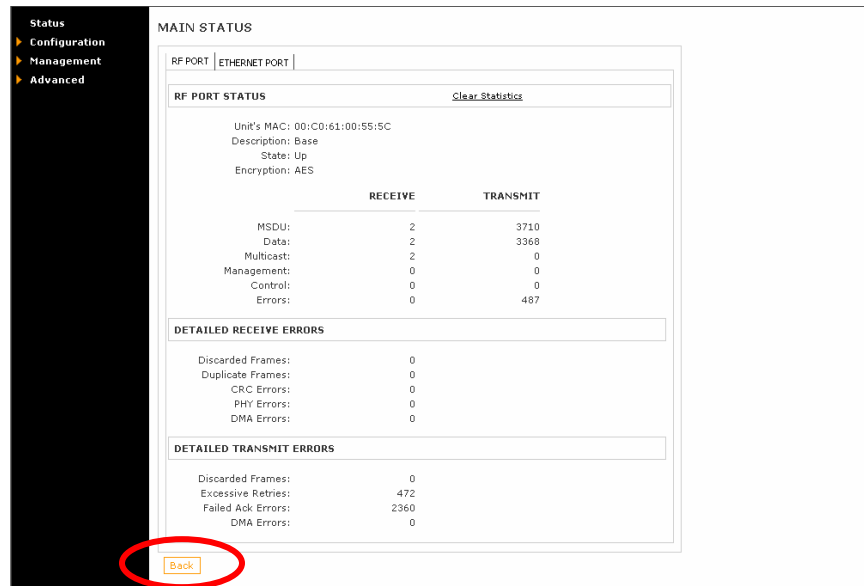


Locate the following Root radio status information:

- Name, firmware version, serial number, MAC address
- LAN address data and wireless mode of operation

Step 5 To check the Root radio receive and transmit data status, click on the upper MAC address. The Root Radio Status window is displayed.

- Click the Back button to return to the Main Status window.



- Step 6** To check the peer radio port and receive and transmit data status, click on the lower MAC address. The Peer Radio Status window is displayed.

The screenshot shows the 'Peer Radio Status' window with a sidebar on the left containing 'Status', 'Configuration', 'Management', and 'Advanced'. The main content area is titled 'MAIN STATUS' and contains two sections for 'PEER'S RF PORT STATUS'. Each section includes a 'Clear Statistics' link and a signal level bar. Below each section is a table of statistics:

	RECEIVE	TRANSMIT
MSDU:	2	3992
Data:	2	4113
Multicast:	2	0
Management:	0	0
Control:	0	0

Below the tables are sections for 'DETAILED RECEIVE ERRORS' and 'DETAILED TRANSMIT ERRORS' with the following data:

Category	Value
Discarded Frames	0
Duplicate Frames	0
Discarded Frames	0
Excessive Retries	472
DMA Errors	0

A red circle highlights the 'Back' button at the bottom left of the window.

- ❑ Click the Back button to return to the Main Status window.

- Step 7** In the left window pane, click the **Configuration** menu **Basic** option. The Basic Configuration window is displayed.

The screenshot shows the 'Basic Configuration' window with a sidebar on the left containing 'Status', 'Configuration', 'Management', and 'Advanced'. The main content area is titled 'BASIC CONFIGURATION' and contains the following settings:

- System Name: UNIT A
- LAN section:
 - IP Address: 192.168.1.101
 - Subnet Mask: 255.255.255.0
 - Default Gateway: 0.0.0.0
- WIRELESS section:
 - Radio Spectrum Bandwidth: Normal
 - Radio Frequency (MHz): 5500
 - Data Rate (Mbps): 36

Buttons for 'Update', 'Reset', and 'Select' are visible at the bottom of the configuration area.

The maximum radio data rates listed below:

- ❑ United States – 72 Mbps
- ❑ European – 36 Mbps

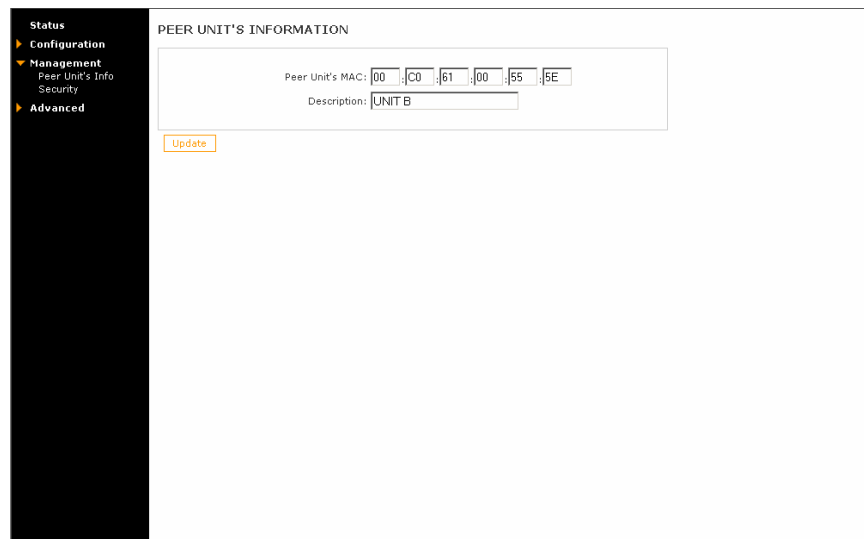
Step 8 As required by the customer, change the following settings on both the root and peer radios.

- System Name
- IP Address and Subnet Mask (Default Gateway not required)
- Radio Frequency (May differ depending on the country of operation)

If you change any settings, click the **Update** button and reboot the system.

Note: After changing the IP address of the radio, it takes a moment for the RF unit to get settled.

Step 9 Click the **Management** menu **Peer Unit's Info** option. The Peer Unit's Information window is displayed.



Step 10 Each Root radio is programmed with the MAC address of its peer radio.

- Step 11** To set the encryption option, click the **Management** menu **Security** option. The Security Manager window is displayed.

The screenshot shows the SECURITY MANAGER interface. On the left is a navigation menu with 'Status', 'Configuration', 'Management', 'Peer Unit's Info', 'Security', and 'Advanced'. The 'Security' option is selected. The main area is titled 'SECURITY MANAGER' and contains an 'ENCRYPTION' section. It has three radio buttons: 'WEP', 'AES', and 'Clear'. The 'AES' radio button is selected. Next to 'WEP' is a dropdown for 'WEP Key Length' set to '64 bit/10 hex Digits' and a text field for 'WEP Key Value'. Next to 'AES' is a dropdown for 'AES Key Length' set to '152 bit/32 hex Digits' and a text field for 'AES Key Value' containing 32 'a' characters. At the bottom are 'Submit' and 'Reset' buttons.

- Step 12** Click on the AES button to enable AES encryption.

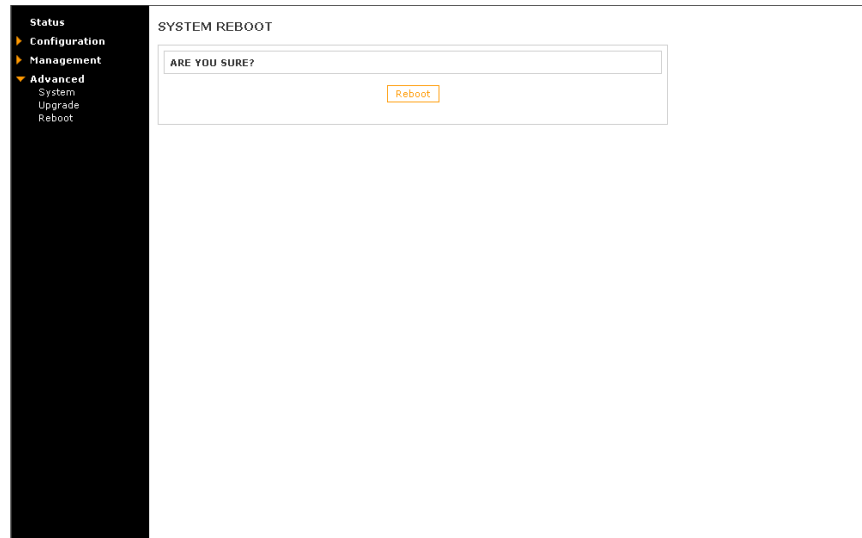
Note: If the AES radio button is selected, the AES Key Value field must be populated with something. In the above example the field has been populated with a's.

- Step 13** To configure the radios to use SNMP (Simple Network Management Protocol), click the **Configuration** menu **SNMP** option. The SNMP Configuration window is displayed.

The screenshot shows the SNMP CONFIGURATION interface. On the left is a navigation menu with 'Status', 'Configuration', 'Basic', 'SNMP', 'Management', and 'Advanced'. The 'SNMP' option is selected. The main area is titled 'SNMP CONFIGURATION' and contains four text input fields: 'Get Community Name' (public), 'Set Community Name' (private), 'Trap Community Name' (default), and 'Trap Manager IP Address' (0.0.0.0). At the bottom are 'Update' and 'Reset' buttons.

- Step 14** Enter the customer supplied Community Names and Trap Manager IP Address information. Click the **Update** button to activate changes.

- Step 15** Reboot the radios to save changes. Click the **Advanced** menu **Reboot** option. The System Reboot window is displayed.



- Step 16** Click on the **Reboot** button to reboot the radios.

Note: It takes much longer than 30 seconds for the radios to reboot.

- Step 17** Disconnect the crossover cable and reconnect the unit as shown in Figures 2-2 to 2-4.

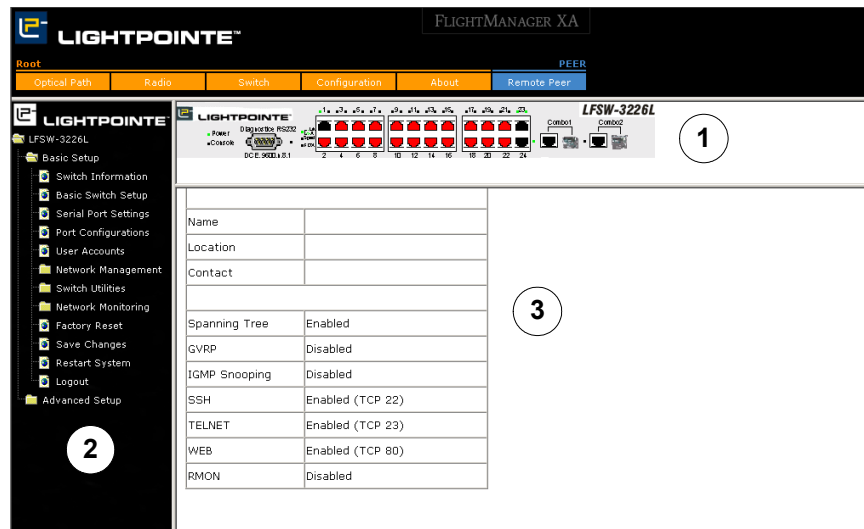
2.5.3. Switch Configuration using a Web Browser

The Web-based management module and the RS-232 CLI Console program are different ways to access the same internal switching software and configure it. All settings encountered in web-based configuration are the same as those found in the CLI console program (see section 2.5.2).

IMPORTANT NOTE

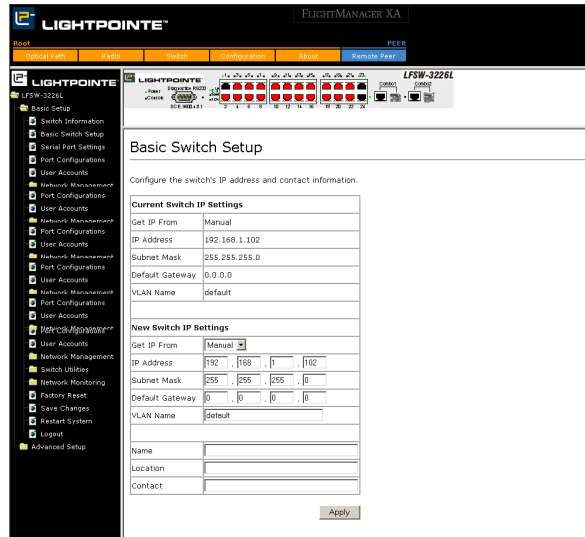
The DualPath components (switches and radios) have been customized and preconfigured to ensure optimal performance in LightPointe-specific Optical Wireless installations. Any changes to default settings, port assignments, use of additional ports, use of advanced switch features or non-LightPointe linkheads or radios may impact system operation and will not be supported by LightPointe.

- Step 1** Start up a Browser on the PC.
- ❑ The switch can be configured using a web browser such as Netscape® Navigator (version 6.2 and higher) or Microsoft® Internet Explorer (version 5.0 and higher)
- Step 2** Type in the IP address of the switch. The switch Information screen displays the Switch's MAC Address (assigned by the factory and unchangeable), IP configuration, important settings and status information.



- ❑ Pane 1 presents a graphical image of the front panel of the Switch.
- ❑ Pane 2 is used to select the window to be displayed.
- ❑ Pane 3 Displays switch information based on your selection in Area 2.

- Step 3** Click the **Basic Setup** option in the menu window pane on the left side. The Basic Switch Setup information is displayed.

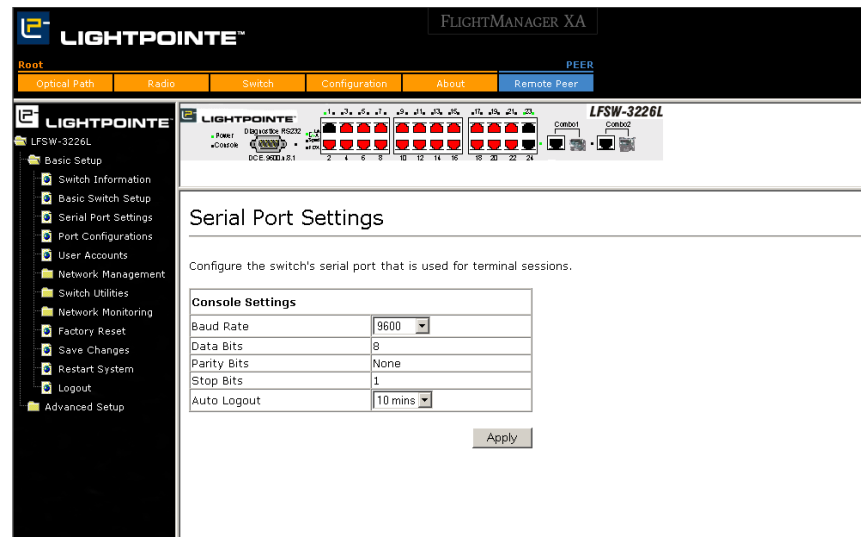


- In the **Get IP From** drop-down menu, select **Manual**.
- Enter the appropriate IP address and subnet mask

Note: You must use the procedures in Section 2.5.2 if you decide to change the IP Addresses to a new Subnet.

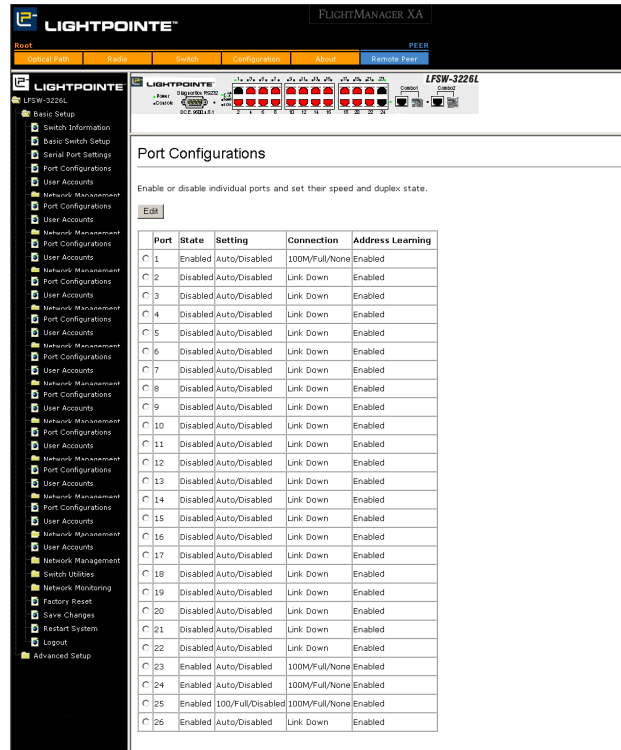
- Click on the **Apply** button to save changes.

- Step 4** Click the **Serial Port Settings** option. The Serial Port Settings window is displayed.



- Use factory default settings shown above

- Step 5** Click the **Port Configuration** option. The Port Configuration window is displayed.



Use the factory default settings.

- FlightLite 100/100E/155 and FlightStrata 155**
LFSW-3226L:4#config ports 22 speed 100_full
or
FlightLite/FlightStrata G
LFSW-3226L:4#config ports 25 speed 100_full
- FlightLite 100/100E/155**
LFSW-3226L:4#config ports 2-21, 23 state disable
or
FlightLite/FlightStrata G
LFSW-3226L:4#config ports 2-23 state disable

Step 6 Click on **Advanced Setup, Spanning Tree**, select the **STP Switch Settings** option. The STP Switch Settings window is displayed.

The screenshot shows the 'STP Switch Settings' configuration window. The left sidebar contains a tree view with 'Spanning Tree' expanded to 'STP Switch Settings'. The main area has a title 'STP Switch Settings' and a description: 'Configure the switch's global STP settings. STP must be enabled on the switch before it can be enabled on a particular port.' Below this are two tables of settings:

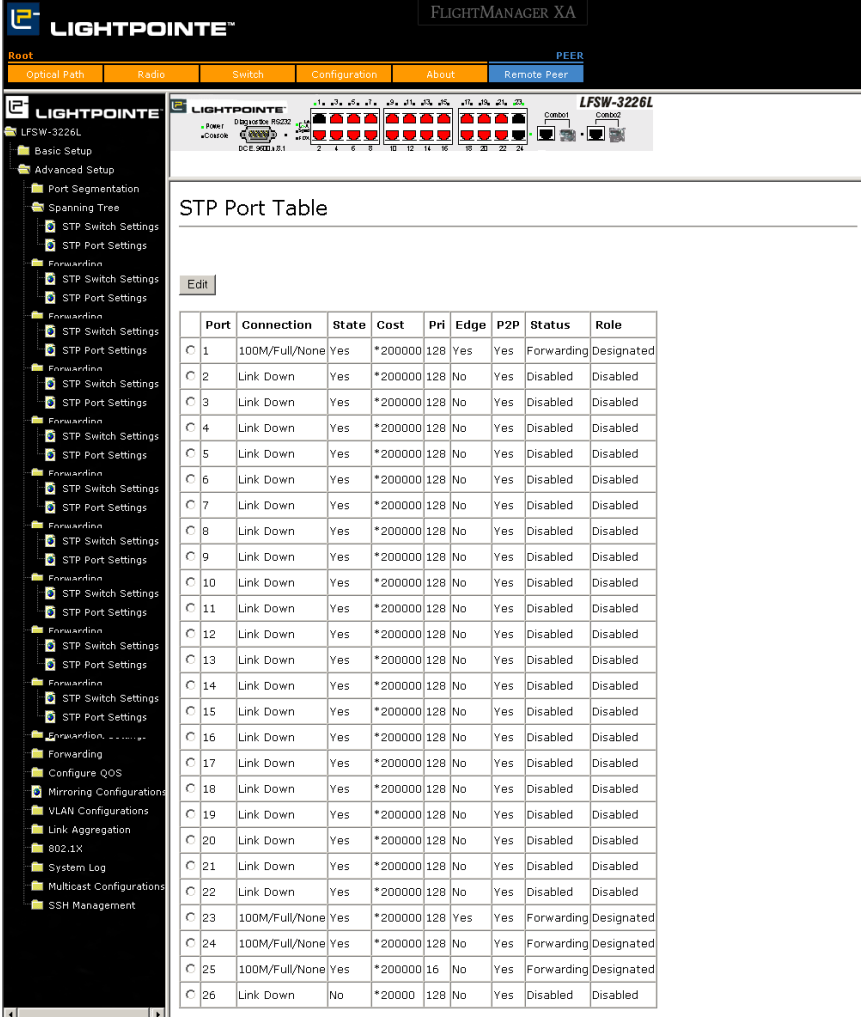
Status	Enabled	Designated Root Bridge	00-0F-3D-EB-4B-C2
Max Age (6 - 40 sec)	6	Root Priority	4096
Hello Time (1 - 10 sec)	1	Cost to Root	0
Forward Delay (4 - 30 sec)	4	Root Port	None
Priority (0 - 61440)	4096	Last Topology Change	2103 secs.
Default Path Cost	802.1T	Topology Changes Count	7
STP Version	RSTP	Protocol Specification	3
TX Hold Count (1-10)	10	Max Age	6
Forwarding BPDU	Disable	Hello Time	1
		Forward Delay	4
		Hold Time	10

Below the tables is an 'Apply' button and a note: 'The above values must conform to this formula: 2*(Hello Time+1) <= Max Age <= 2*(Forward Delay-1)'

Use the factory default settings shown above.

- Root Priority set to 4096
- Peer Priority set to 8192

Step 7 Click the **STP Port Table** option. The STP Port Table window is displayed.



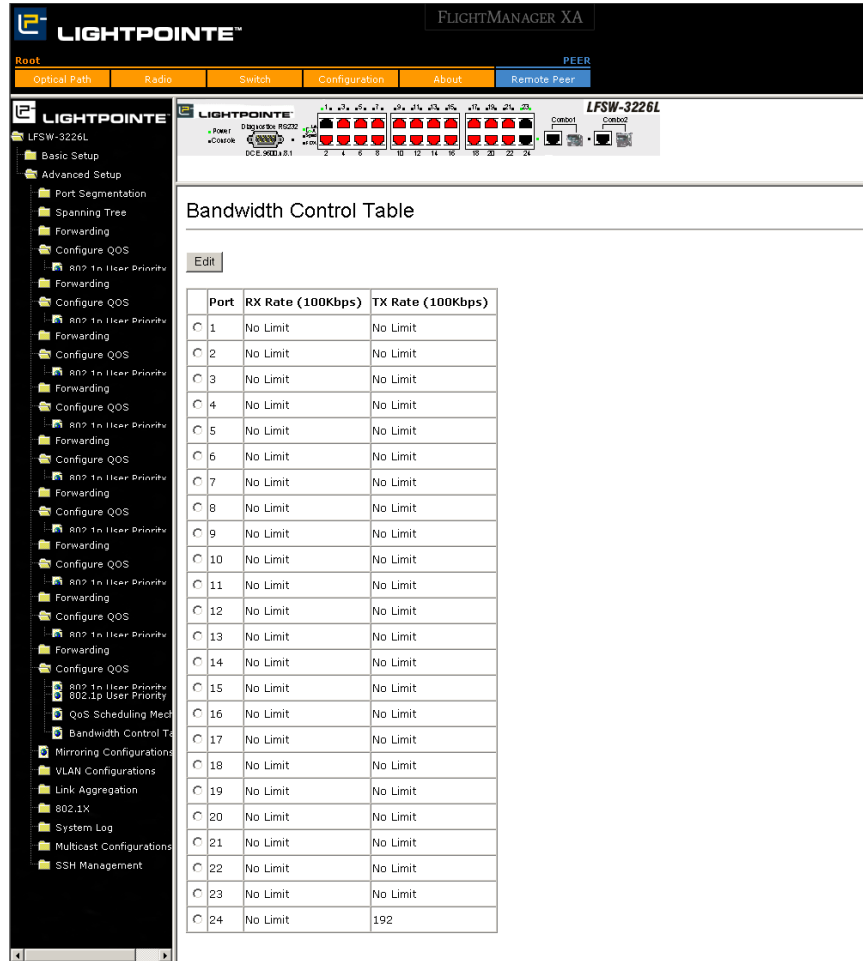
The screenshot shows the LIGHTPOINTE FLIGHTMANAGER XA interface. The left sidebar contains a navigation tree with 'STP Port Settings' selected. The main window displays the 'STP Port Table' configuration page. The table below shows the factory default settings for 26 ports.

Port	Connection	State	Cost	Pri	Edge	P2P	Status	Role
C 1	100M/Full/None	Yes	*200000	128	Yes	Yes	Forwarding	Designated
C 2	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 3	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 4	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 5	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 6	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 7	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 8	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 9	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 10	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 11	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 12	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 13	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 14	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 15	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 16	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 17	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 18	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 19	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 20	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 21	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 22	Link Down	Yes	*200000	128	No	Yes	Disabled	Disabled
C 23	100M/Full/None	Yes	*200000	128	Yes	Yes	Forwarding	Designated
C 24	100M/Full/None	Yes	*200000	128	No	Yes	Forwarding	Designated
C 25	100M/Full/None	Yes	*200000	16	No	Yes	Forwarding	Designated
C 26	Link Down	No	*20000	128	No	Yes	Disabled	Disabled

Use the factory default settings shown above.

- Port 25 priority set to 16
- Port 26 state disabled

Step 8 Click on **Advanced Setup, Configure QOS**, select the **Bandwidth Control Table** option. The Bandwidth Control Table window is displayed.



Use the factory default settings shown above.

- Port 24 TX Rate set to 192

Note: Any changes made to the Switch configuration during the current session must be saved in the **Save Changes** window.

2.6. RF Installation Components

2.6.1. RF Components

RF Mounting Kit Assembly

The two-way mounting kit is used for connecting the RF antenna to a mounting post (typically, the same post as the linkhead). There are three possible mount configurations to accommodate small, medium and large mast diameters.



Figure 2-5: RF Mounting Clamps

Ethernet Cables

An outdoor rated CAT-5 Ethernet cable is needed to connect the RF antenna to the indoor POE injector. An additional straight CAT-5 cable is required to connect from the POE injector to the switch. The combined length of the two CAT-5 cables must not exceed 200 feet.

To ensure all-weather operation, a weatherproofing cable gland must be built into the Ethernet cable. The seal can be slipped onto the CAT-5 cable before attaching the RJ45 connectors at the ends.



Figure 2-6: Waterproof Cabling Gland

Power-Over-Ethernet (POE) Injector

An indoor POE injector provides power to the antenna/radio via a CAT-5 Ethernet cable.



Figure 2-7: Power-Over-Ethernet (POE) Injector

Antenna and Radio

The RF panel antenna and radio are fully integrated into a weatherproof chassis for simple operation.



Figure 2-8: Antenna and Radio

2.7. Assemble and Mount System Equipment

2.7.1. Network Switch Setup

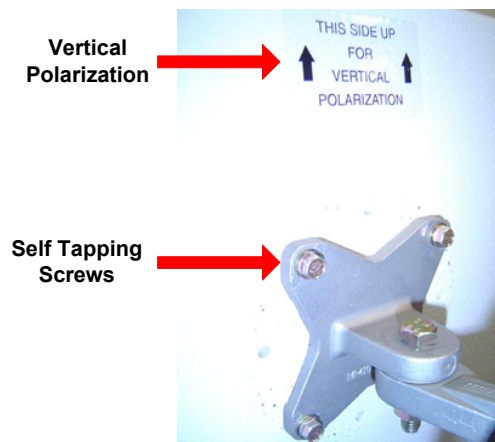
The following steps must be followed to setup the network switch.

- Step 1** If switch is to be rack mounted, attach switch mounting hardware using screws provided.
- Step 2** Connect power cord to back of switch and plug cord into a power outlet.

2.7.2. RF Equipment Setup

The following steps must be followed to setup the radio and antenna equipment.

- Step 1** Attach mounting kit to antenna housing.



- Pre-assemble the antenna mounting kit using hardware provided.
- Make sure antenna polarity is correct before attaching the mounting kit.
- Attach mounting kit to back of RF antenna using self-tapping screws provided.

- Step 2** Attach antenna to mounting post.



- Place antenna on mounting post below the linkhead.
- Tighten corresponding bolts to secure (depending on post diameter).

Step 3 Connect Ethernet cable.

- ❑ To ensure a weatherproof seal, place the CAT-5 cable wiring through the weatherproof gland before crimping connectors.
- ❑ Crimp on RJ45 connectors.
- ❑ Plug RJ-45 connector into the antenna bottom.



- ❑ Tighten gland onto antenna bottom.

Note: The combined length of the two CAT-5 cables must not exceed 200 feet.

Step 4 Connect Power-Over-Ethernet Injector



- ❑ At indoor location, connect CAT-5 cable from antenna to POE injector.
- ❑ Use another straight CAT-5 cable to connect from the POE injector to the switch.
- ❑ Plug a power adapter into the POE injector and plug power cord into a power outlet.

2.8. System Alignment

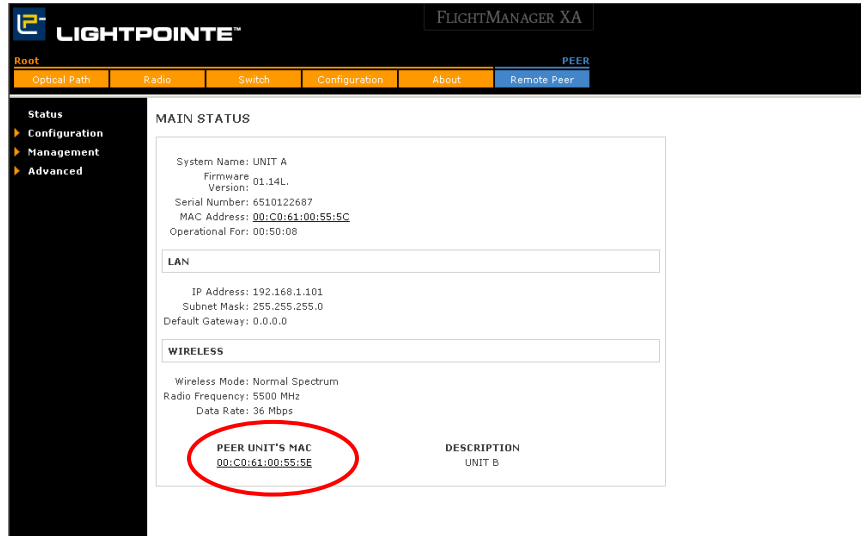
2.8.1. RF Antenna Alignment

The following steps must be followed to properly align the RF system. A single person can perform antenna alignment. However, it is easier to perform the procedure with two people.

Perform the following steps at both antennas:

- Step 1** Ensure the radios have been properly pre-configured (Section 2.5.2).
- Step 2** Ensure the system is interconnected as shown in Figures 2-2 to 2-4. Double check switch port usage:
- Port #24 – RF Unit (STP Enabled)
 - Port #22 – Linkhead Data (STP enabled)
 - Port #26 – Switches must be disconnected from the network while performing configuration procedures
- Step 3** Connect an Ethernet cable between port 1 and the Ethernet port on a PC.
- Step 4** Start up a Browser program on the PC.
- The radio can be configured using a web browser such as Netscape® Navigator (version 6.2 and higher) or Microsoft® Internet Explorer (version 5.0 and higher)

- Step 5** To check the peer radio port and receive and transmit data status, click on the lower MAC address. The Peer Radio Status window is displayed.



The screenshot shows the LIGHTPOINTE FLIGHTMANAGER XA interface. The navigation menu on the left includes Status, Configuration, Management, and Advanced. The main status area displays the following information:

MAIN STATUS

System Name: UNIT A
Firmware Version: 01.14L
Serial Number: 6510122687
MAC Address: 00:C0:61:00:55:5C
Operational For: 00:50:08

LAN

IP Address: 192.168.1.101
Subnet Mask: 255.255.255.0
Default Gateway: 0.0.0.0

WIRELESS

Wireless Mode: Normal Spectrum
Radio Frequency: 5500 MHz
Data Rate: 36 Mbps

PEER UNIT'S MAC
00:C0:61:00:55:5E

DESCRIPTION
UNIT B

The radio configuration procedures performed at this point are identical to the procedures found on page 2-20, starting at Step 5.

Note: You must use the procedures in Section 2.5.2 if you decide to change the IP Addresses to a new Subnet.

- Click the Back button to return to the Main Status window.

- Step 6** Check the Receiver Signal Strength Indicator (RSSI) screen on each unit via a browser interface.

MAIN STATUS

PEER'S RF PORT STATUS [Clear Statistics](#)

Peer Unit's MAC: 00:C0:61:00:55:5E
 Description: UNIT B
 State: Joined
 Encryption: AES
 Data Rate (Mbps): 36
 RSSI: 35
 Signal Level:

	RECEIVE	TRANSMIT
MSDU:	2	3992
Data:	2	4113
Multicast:	2	0
Management:	0	0
Control:	0	0

State: Joined
 Encryption: AES
 Data Rate (Mbps): 36
 RSSI: 39
 Signal Level:

	RECEIVE	TRANSMIT
MSDU:	2	4018
Data:	2	4140
Multicast:	2	0
Errors:	0	487

DETAILED RECEIVE ERRORS

Discarded Frames:	0
Duplicate Frames:	0

DETAILED TRANSMIT ERRORS

Discarded Frames:	0
Excessive Retries:	472
DMA Errors:	0

[Back](#)

- RSSI is the receive signal strength from the other radio
- A level above 20 RSSI is desired
- A RSSI level over 40 may saturate the receive

Step 7 Align the antenna.

- Adjust antenna to optimize RSSI value
- When making physical adjustments, it's always easier to move one radio at a time in small increments
- Click the Back button to return to the Main Status window.

2.9. Verify System Operation

2.9.1. Verify System Operation using RF

- Step 1** Ensure the system components are properly connected and have power applied.
- Step 2** From a computer on the network, use Microsoft Internet Explorer to access the follow address: <http://192.168.1.101>. The Radio Welcome window is displayed.
- Step 3** From the Root radio Main Status window, click on the lower MAC address. Observe the peer radio RSSI (Receiver Signal Strength Indicator) value.

The screenshot shows the 'MAIN STATUS' window with a sidebar on the left containing 'Status', 'Configuration', 'Management', and 'Advanced'. The main content area is titled 'PEER'S RF PORT STATUS' and includes a 'Clear Statistics' link. It displays the following information:

- Peer Unit's MAC: 00:C0:61:00:55:5E
- Description: UNIT B
- State: Joined
- Encryption: AES
- Data Rate: 36Mbps
- RSSI: 35
- Signal Level: (represented by a blue progress bar)

Below this, there are two tables of statistics:

	RECEIVE	TRANSMIT
MSDU:	2	3992
Data:	2	4113
Multicast:	2	0
Management:	0	0
Control:	0	0

State: Joined
Encryption: AES
Data Rate (Mbps): 36
RSSI: 35
Signal Level:

	RECEIVE	TRANSMIT
MSDU:	2	4018
Data:	2	4140
Multicast:	2	0
Errors:	0	487

Below these tables are sections for 'DETAILED RECEIVE ERRORS' and 'DETAILED TRANSMIT ERRORS':

DETAILED RECEIVE ERRORS

Discarded Frames:	0
Duplicate Frames:	0

DETAILED TRANSMIT ERRORS

Discarded Frames:	0
Excessive Retries:	472
DMA Errors:	0

A 'Back' button is located at the bottom left of the main content area.

- RSSI is the receive signal strength from the other radio
- An level above 20 RSSI is desired
- An RSSI level over 40 may saturate the receiver

Step 4 Align the antenna.

- Adjust antenna to optimize RSSI value
- When making physical adjustments, it's always easier to move one radio at a time in small increments

3. Maintenance

3.1. Scheduled Maintenance

As with all outdoor wireless installations, alignment should be checked from time to time. Compare the signal strength with the original values if you are not sure that the system needs to be re-aligned.

Furthermore, make every effort to keep antennas, linkheads and other devices clean to optimize transmission.

Do not attempt to open the linkhead or radio housings, as there are no user-serviceable parts inside.

3.1.1. Field of View

Periodically check the linkhead and radio field of view for obstructions.



4. Troubleshooting and Diagnostics

Please refer to the corresponding linkhead user manual for detailed information on how to troubleshoot and diagnose Optical Wireless-specific issues. This chapter covers the following main topics pertaining specifically to RF and switch troubleshooting:

- ❑ Failure types
- ❑ Fault isolation and troubleshooting
- ❑ Additional troubleshooting methods
- ❑ Network monitoring
- ❑ Technical support
- ❑ Return material authorization (RMA) procedures

4.1. Failure Types

Three different kinds of failures can affect system performance:

- ❑ Failures caused by attached network components
- ❑ Failures caused by the environment
- ❑ DualPath system failures

The troubleshooting flow chart (Section 4.1.3) should be used in the event of a LightPointe system failure. If a system failure occurs during initial installation, contact LightPointe Technical Support.

The most important error detection functions can be performed from the PC using the Management Port that allows you to pinpoint the failure precisely.



Caution: If a failure is found in the power supply unit, please remember that only authorized technical personnel may conduct checks of the power supply. In all cases, the system must be disconnected from the AC or DC power supply in advance of a service call.

4.1.1. Network Component Problems

There are a number of network-related problems that can cause the DualPath system to malfunction.

Table 4-1: Networking Equipment Problems

Network Problem	Effect on the DualPath System
Bad network input signal	System failure, high BER, or low RSSI
Ethernet cable or connector damaged	High number of errors
Cable length violation	Low signal strength at the radio The maximum length of a CAT-5 UTP cable in an Ethernet segment must not exceed 100 meters (328 feet)
RF signal weak	Link failure
Wrong switch port used	No communications, no fail over

4.1.2. Environmental Problems

There are a number of environmental problems that can cause the DualPath system to malfunction.

Optical Malfunctions

- ❑ Smoke emissions
- ❑ Fog, snow, or heavy rain
- ❑ Heat turbulence (shimmer)
- ❑ Tree (leaf) growth

RF Malfunctions

- ❑ Heavy rain emissions
- ❑ Tree (leaf) growth
- ❑ RF interference from nearby RF devices
- ❑ Fresnel zone violations

RF System Fresnel Zone

The flat panel antenna has a narrow beam width (9°) to optimize performance and minimize interference.

- ❑ Obstacles encroaching more than 40% into the Fresnel zone may attenuate the received signal
- ❑ To avoid transmission loss, there should be no obstacle within the first 6/10ths of the RF Fresnel zone (known as 0.6 F1 clearance)

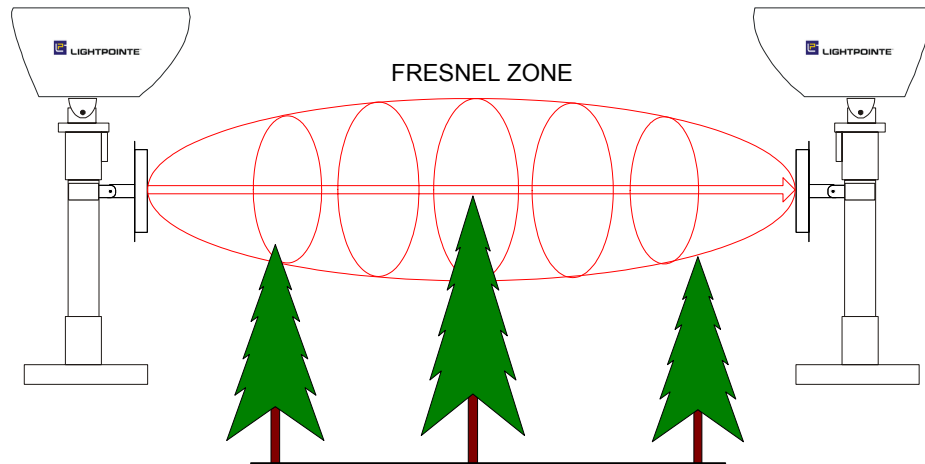


Figure 4-1: RF Fresnel Zone

The following formula is used to calculate the radius (in feet) of the Fresnel zone at a point in the path:

$$R = 7.21 \cdot \sqrt{\frac{d_1 d_2}{F(d_1 + d_2)}}$$

Where:

R = Radius (in feet)

d_1 = distance from TX antenna (in miles)

d_2 = distance from RX antenna (in miles)

F = Frequency (in GHz)

4.1.3. Fault Isolation and Troubleshooting

The following flowcharts can be used to troubleshoot the system. Tasks marked with a gray circle can be accomplished using OMI diagnostic loop back tests.

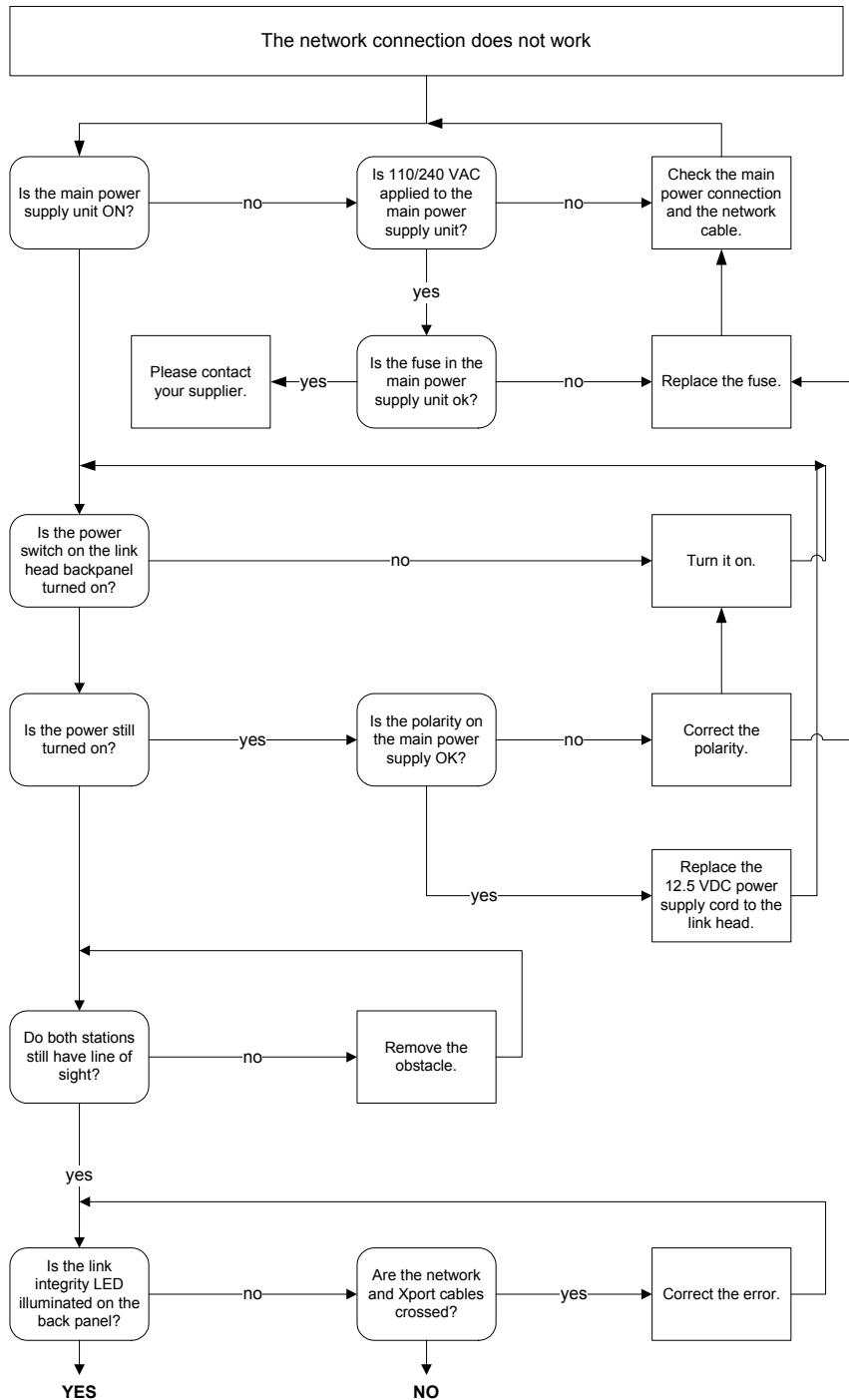


Figure 4-2: Troubleshooting Flowchart (Part 1)

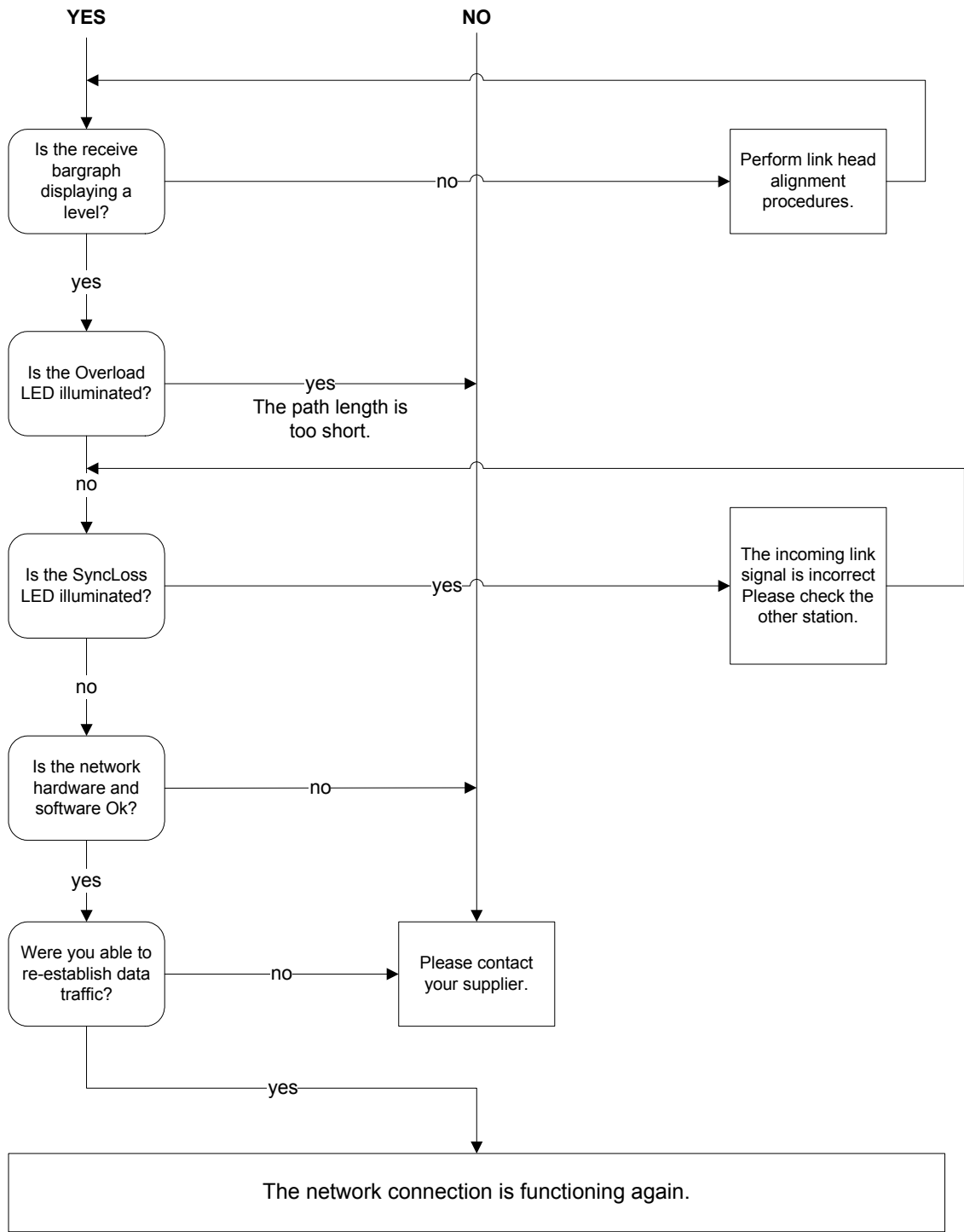


Figure 4-3: Troubleshooting Flowchart (Part 2)

4.2. Additional Troubleshooting Methods

4.2.1. Ping Test to Check Configuration

You can use a laptop with Ethernet card to perform a ping test on the DualPath Radios and Optical Wireless linkheads. Factory default LightPointe system component IP addresses are found in Table 2-1.

Customer requested IP addresses are found in Table 2-2. The following equipment is required to perform a ping test.

- Laptop with Ethernet card
- Ethernet cable with RJ45 connectors

The connections shown in Figures 2-2 to 2-4 are required to perform field diagnostic tests.

Step 1 Ensure the bench test system is connected as shown in Figures 2-2 to 2-4. Double check switch port usage:

- Port #24 – RF Unit (STP Enabled)
- Port #22 – Linkhead Data (STP enabled), FlightLite 100/100E/155 and FlightStrata 155
- Port #25 – Linkhead Data (STP Enabled), FlightLite G and FlightStrata G
- Port #1 – PC connection

Step 2 Power up all equipment.

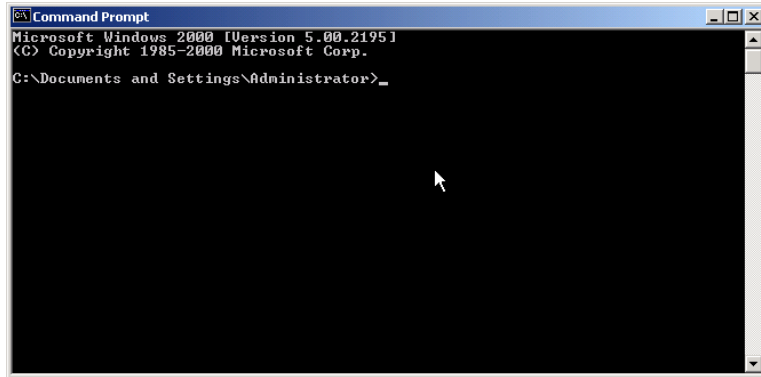
Step 3 Connect a PC to Port 1 of the Root or Peer switch.

Step 4 Configure the PC IP Address and Subnet Mask.

- Use any IP address that wont conflict with current addresses (192.168.1.XXX)
- Use subnet mask 255 255 255 0

Step 5 Click the **Start** button on the PC and select the **Programs** option.

- Step 6** Select the **MSDOS** prompt on the PC. The DOS window is displayed.



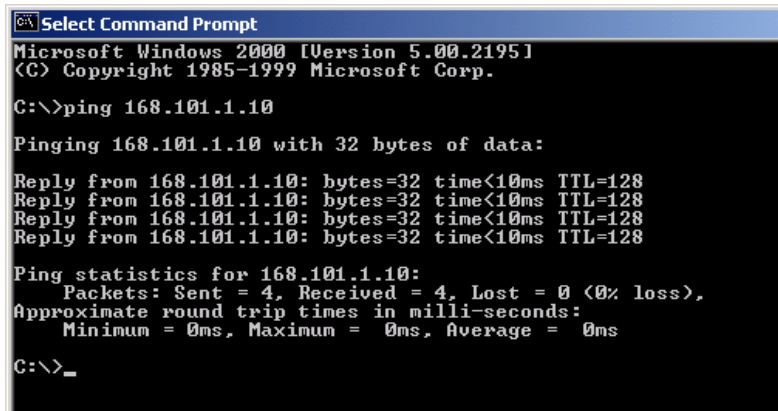
- Check the switch only if you are unable to communicate with the linkheads or RF units.

- Step 7** To ping from the Root laptop, type in the Peer IP address: **ping 192.168.1.XXX.**

To ping from the Peer laptop, type in the Root IP address: **ping 192.168.1.XXX.**

To stop the ping tests, type **<Ctrl> C** on each laptop.

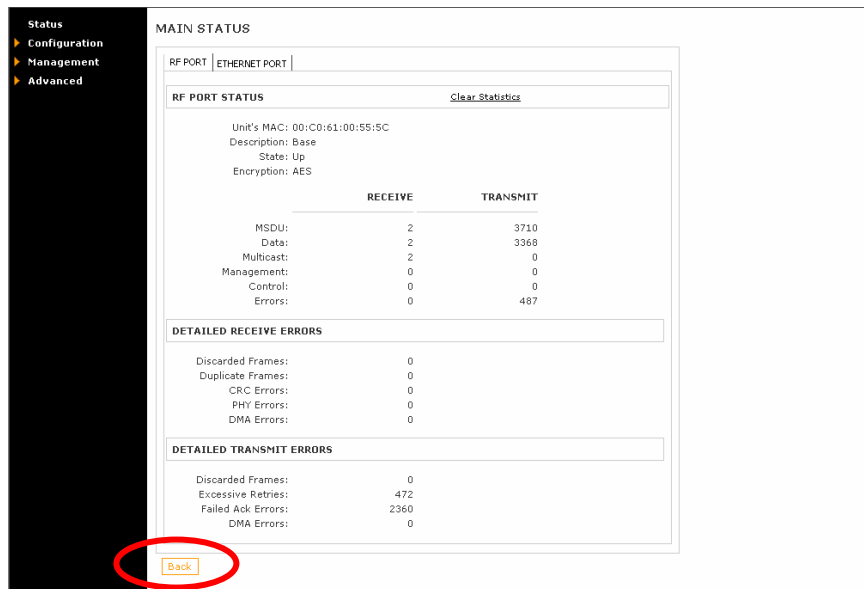
- Step 8** A successful ping will display the following information on the PC screen.



- Step 9** After completing ping tests, disconnect the PC cable from the switch and replace the network cable.

4.3. Network Monitoring

- Step 1** Connect a PC to Port 1. Ensure the system is connected as shown in Figures 2-2 to 2-4. Double check switch port usage:
- Port #24 – RF Unit (STP Enabled)
 - Port #22 – Linkhead Data (STP enabled), FlightLite 100/100E/155 and FlightStrata 155
 - Port #25 – Linkhead Data (STP Enabled), FlightLite G and FlightStrata G
 - Port #1 – Connected to a PC
- Step 2** Connect an Ethernet cable between port 1 and the Ethernet port on a PC.
- Step 3** Start up a Browser program on the PC.
- The system can be configured using a web browser such as Netscape® Navigator (version 6.2 and higher) or Microsoft® Internet Explorer (version 5.0 and higher)
- Step 4** Enter the IP address of the desired radio in the web browser address bar.
- Step 5** The Root Radio Status window is displayed.
- Click the Back button to return to the Main Status window.



Step 6 To check the peer radio port and receive and transmit data status, click on the lower MAC address. The Peer Radio Status window is displayed.

The screenshot shows the 'MAIN STATUS' window with a sidebar on the left containing 'Status', 'Configuration', 'Management', and 'Advanced'. The main content area is titled 'PEER'S RF PORT STATUS' and includes a 'Clear Statistics' link. It displays details for two peer units, including MAC addresses, descriptions, states, encryption, data rates, RSSI, and signal levels. Below these details are two tables of statistics:

	RECEIVE	TRANSMIT
MSDU:	2	3992
Data:	2	4113
Multicast:	2	0
Management:	0	0
Control:	0	0

	RECEIVE	TRANSMIT
MSDU:	2	4018
Data:	2	4140
Multicast:	2	0
Errors:	0	487

Below the tables are sections for 'DETAILED RECEIVE ERRORS' and 'DETAILED TRANSMIT ERRORS'. A red circle highlights a 'Back' button at the bottom left of the window.

❑ Click the Back button to return to the Main Status window.

Step 7 To verify Root switch operation, enter the switch IP address in the web browser address bar.

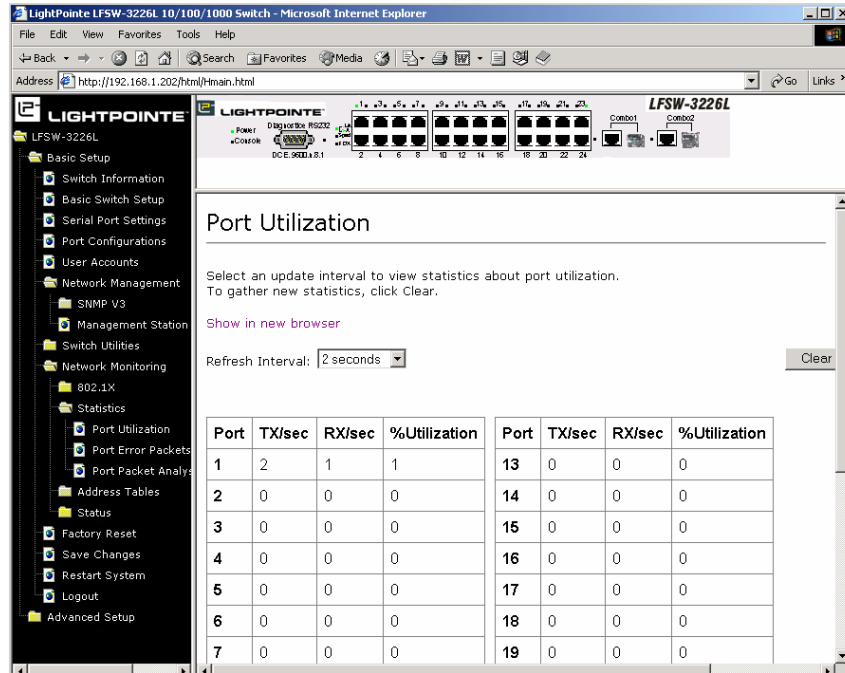
Step 8 To open the Logon window, click on the spinning logo. The Switch Information window is displayed.

The screenshot shows a Microsoft Internet Explorer browser window displaying the LightPointe website for the LFSW-3226L switch. The address bar shows 'http://192.168.1.202/'. The page features a navigation bar with a spinning logo circled in red and a red arrow pointing to it. The main content area includes the product name '10/100/1000 Mbps Layer 2 Switch', a 'Layer 2 Switch' button, and a 'Features' section with a list of technical specifications.

Step 9 Click on **Basic Setup, Network Monitoring, Status,** and **Switch History** options. The Switch History window is displayed.

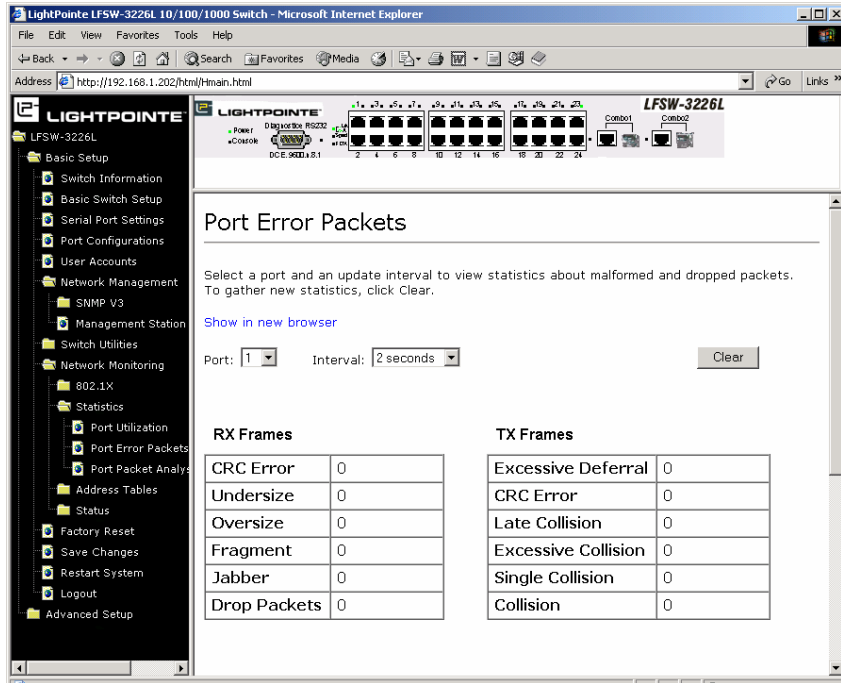
- ❑ View the Switch History window for any signs of errors.

Step 10 Click on **Basic Setup, Network Monitoring,** and **Statistics** options. The Port Utilization window is displayed.



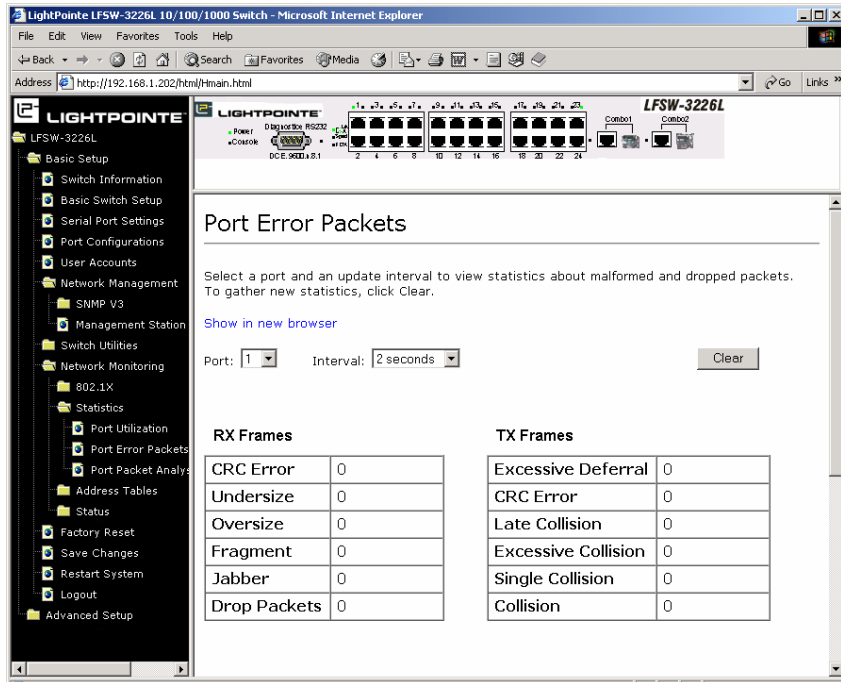
- ❑ View the Port Utilization window for any signs of errors.

Step 11 Click on **Port Error Packets** option. The Port Error Packets window is displayed.



☐ View the Port Error Packets window for any signs of errors.

Step 12 Click on **Port Packet Analysis** option. The Port Error Packets window is displayed.



☐ View statistics about Port Packet Analysis window for any signs of errors.

Step 13 To repeat the above steps on the Peer system.

- ❑ Exit the program and disconnect the PC from the system. Reconnect the system on the Peer side.

4.4. Technical Support

- Did you complete the steps in the Fault Isolation Troubleshooting Tree?

4.4.1. Checklist Before You Call Technical Support

- Be sure to fill out the following checklist before contacting LightPointe Technical Support.

General Information	Your Installation
<input type="checkbox"/> Application (Protocol)?	
<input type="checkbox"/> Distance?	
<input type="checkbox"/> How long has system been in operation?	
How does the error show up?	
<input type="checkbox"/> Temporary/permanent error?	
<input type="checkbox"/> Is error observed for the first time?	
How was the weather when error showed up?	
<input type="checkbox"/> What time of day?	
<input type="checkbox"/> Special weather conditions (fog, snowfall)	
<input type="checkbox"/> Outside temperature (moisture on entrance window)	
Status of Back Panel LEDs	
<input type="checkbox"/> Are all red LEDs off?	Yes/No
<input type="checkbox"/> How many bars does the bar graph indicator show?	
<input type="checkbox"/> Outside temperature (moisture on entrance window)	
Status of Back Panel Indicators	
<input type="checkbox"/> Connection to network	Yes/No
<input type="checkbox"/> Failure of endpoint equipment	Checked/Not Checked
What type of system is installed?	
<input type="checkbox"/> Model number	
<input type="checkbox"/> Serial number	
<input type="checkbox"/> Single mode or multimode	

Note: This form is available as a downloadable PDF file on our web site.

4.5. Return Material Authorization (RMA) Procedure

Please contact LightPointe before returning any system components for repair or replacement.

RMA products include:

- Linkhead
- Standard power supply
- Switch
- Radio

5. Specifications

Table 5-1: DualPath Kit System Specifications

Product Information	Radio	Switch
Description	Outdoor RF Bridge	Managed Layer 2 Switch
Receivers/Transmitters	Integrated Radio, High Gain Panel Antenna (22 dB), Lightning Protector	
Dimensions (WxHxL)	76.2 x 304.8 x 304.8 ((3 x 12 x 12 in)	441 x 66 x 388 mm (17.6 x 2.6 x 15.28 in)
Unit Weight	9.09 kg (20 lbs)	6.0 kg (13.23 lbs)
Operating Voltage	Power-Over-Ethernet, DC Injector, Indoor (24 V, 1.5A)	100 to 240 V (50/60 Hz)
Operating Temperature	-20° to 60°C (-4° to 140°F)	-0° to 40°C (32° to 1104°F)
Relative humidity	100% (IEC 529/IP67) Condensing	5% to 95% Non-Condensing
Power	100mW (20 dBm)	
Mount	Two-Axis Mast Mounting Kit (included)	19-in Rack Mount Width
Networking		
Connectivity	Ethernet 10BaseT, 100BaseT	Ethernet 10BaseT, 100BaseT, 1000BaseT, 100BaseFX
Interface	RJ-45 Copper Interface	RJ-45 Copper Interface, SFP/Mini-GBIC
Data Rate	72 Mbps (Half Duplex)	8.8 Gbps Switch Fabric
Operational Ranges	5 km (Near-Line-of-Sight)	
Configuration & Management	HTTP, SNMP v1	HTTP, CLI/Console, SNMP v1, QoS, Load Balancing

Note: All LightPointe Optical Wireless products are certified eye-safe in accordance with IEC/EN 60825-1 A2:2001 Class 1M standards.

