FlightTransport™ Systems

FlightLite™ 622

FlightLite™ G

Installation and Maintenance

LIGHTPOINTE™

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Safety

Free-Space Optical (FSO) systems incorporate semiconductor lasers as transmission sources. You must be aware of corresponding laser safety regulations and take the necessary precautions to avoid close direct exposure to the laser beam(s). The infrared laser beam is invisible and has the potential to penetrate to the retina and cause thermal damage.

This optical system uses a Class 1M laser in accordance with the international laser safety standard IEC/EN 60825-1 A2:2001.

Familiarize yourself with laser safety regulations and strictly enforce all necessary precautions.

Warning: Do not look directly into the laser aperture from a short distance. Never use any optical instruments to view the laser beam.

When using the built-in telescope, you must be aware of the appropriate safety distance (refer to the following table). For distances below the safety distance the operator must wear appropriate eye-protective laser safety glasses. These distances assume an exposure of more than ten seconds.

Safe Distances for Telescope Operation

Link head	Naked Eye safety distance	Telescope safety distance
FlightLite™ 622	0 m	0 meters
FlightLite™ G	0 m	0 meters

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Caution: This is a Class 1M Free-Space Optical Communication System (FSOCS) transmitter and may be installed in *unrestricted, restricted* or *controlled* locations. For additional details, please refer to IEC 60825: SAFETY OF LASER PRODUCTS Part 12: Safety of free space optical communication systems used for transmission of information.

Unrestricted locations are those areas that are normally accessible to the public (e.g., unrestricted areas of rooftops, public areas at ground level, open areas of offices and industrial premises, etc.). To install a LightPointe FSO system in an unrestricted location, the link head must be installed 3 meters high or higher above the surface of the unrestricted area or must be 1 meter or closer to the edge of the unrestricted area. If a LightPointe FSO system is installed in an unrestricted area, a warning sign must be posted that states "Do not use binoculars, telescopes or other optical aids to view the FSO link heads."

Restricted locations are those areas that are normally inaccessible by the general public (including workers, visitors, and residents in the immediate vicinity) by means of any administrative or engineering control measure but that is accessible to authorized personnel (e.g. maintenance or service personnel including window cleaners in exterior locations) that may not have laser safety training. There are no special requirements for a LightPointe FSO system installed in a restricted area.

Controlled locations are those locations where any kind of engineering or administrative control measure is introduced to make it inaccessible except to authorized personnel with appropriate laser safety training (e.g., tower-mounted terminals, fenced/secure areas of rooftops, locked rooms with strictly-controlled access, etc.). There are no special requirements for a LightPointe FSO system installed in a controlled area.

The laser system shall be installed in accordance with ANSI Z136.1 control measures (engineering, administrative, and procedural controls).

Laser Safety Labels

All relevant labels are affixed to the link heads as required by the agencies responsible for the oversight of Free Space Optics products. These identification and warning labels are affixed to the outer shell of the link head:

- Product label with details on company name, product information and specific compliance data, normally affixed to the side of the link head
- Laser classification product label with caution comments, normally affixed to the side of the link head
- Aperture label indicating that invisible laser radiation is being emitted, normally affixed near the transmission point of the link head

Caution: Do not modify this certified laser product.

Laser Safety Contact Information

Laser Safety in the United States is regulated by the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH). The FDA enforces laser performance standards within the US. The FDA may be contacted at:

U.S Department of Health and Human Services
Food and Drug Administration
Center for Devices and Radiological Health
2094 Gaither Road
Rockville, MD 20850
http://www.fda.gov/cdrh

Service

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

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 visit http://www.lightpointe.com/downloads/support/LIGHTPOINTE_StandardWarranty_v11.pdf for specifics on our Warranty. The warranty registration form was included with your system.

Contacting LightPointe

Corporate Office

10140 Barnes Canyon Road, San Diego, CA 92121
Phone: +1 (858) 643-5200, Fax: +1 (858) 643-5201

Technical Support

Corporate Office +1 (858) 643-5299
Website: www.lightpointe.com Click on
http://lightpointe.custhelp.com

Email: techsupport@lightpointe.com

Using This Manual

This manual describes how to install and maintain the FlightLite™ 622 and FlightLite™ G systems.

Step-by-step procedures describe:

- Performing a site review
- Preparing an installation site
- Performing a physical installation
- Performing system connection and alignment
- Checking the system for proper operation
- Performing troubleshooting procedures

Section	Contents
1. System Overview	System functional and physical overview
2. System Installation and Alignment	Detailed step-by-step installation and alignment procedures
3. FlightManagerPC Optical Management Interface	Reference to FlightManagerPC manual and general information about product capability
4. Maintenance	Minimal activities to maintain the system
5. Troubleshooting and Diagnostics	Resolving operational problems
6. Specifications	Physical and electrical specifications
7. Index	Keyword index

Additional Resources

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

Document Number	Title
505-002014-00000	FlightManager LDX AIC SNMP Proxy Agent Installation, Operation and Maintenance Manual
505-002532-00000	FlightManager HDX SNMP Proxy Agent Installation, Operation and Maintenance Manual
505-003098-00000	FlightManagerPC Software User's Guide
Not numbered	Field Engineering and Planning Guide

1. System Overview

This chapter covers the following main topics:

- System introduction
- Link head operating parameters
- Link head components

1.1. System Introduction

1.1.1. Free-Space Optical Transmission

LightPointe wireless optical systems communicate using single or multi-beam infrared light (invisible to the human eye). The link systems require true line-of-sight between locations or relay locations (hopping points) and operate in high and ultra-high bandwidths.

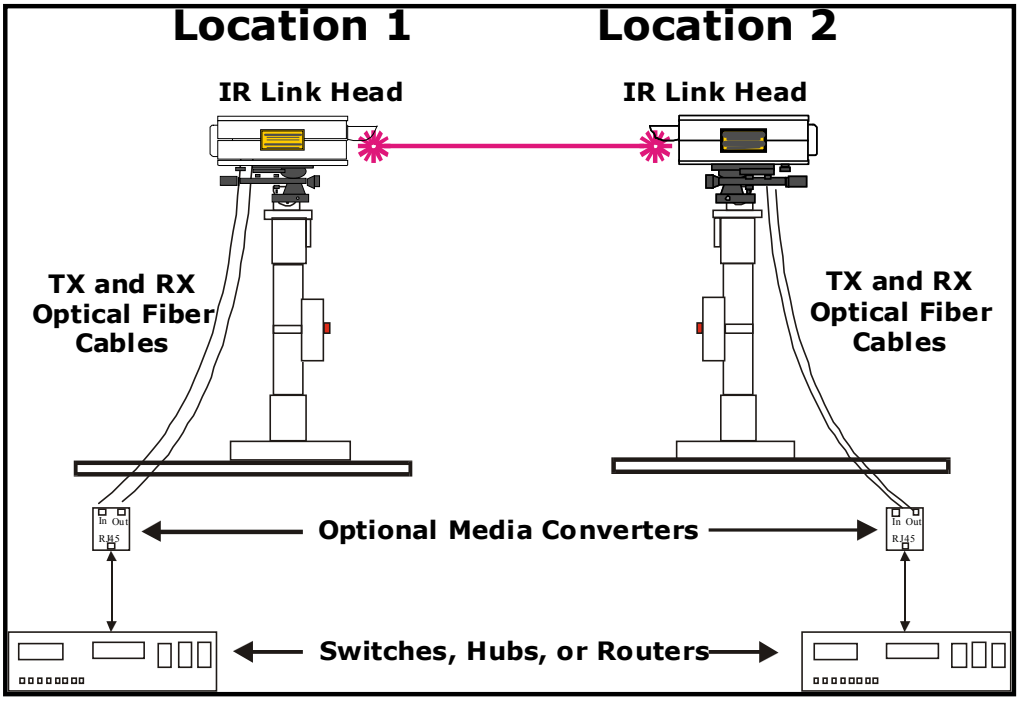


Figure 1-1: Typical Wireless LAN Connection

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

1.1.2. Typical Applications

Typical system applications include the following:

- Wireless backhaul
- Metro network extension
- Enterprise/LAN solutions

1.1.3. Network Interface Connectivity

The LightPointe FlightLite™ 622 and FlightLite™ G are bandwidth specific but protocol transparent and can support any current network architecture. The only requirement is a digital signal supplied to the link head via single mode or multimode fiber.

Local Area Network (LAN) options

- Gigabit Ethernet (FlightLite™ 622 only)
- Token Ring
- FDDI

ATM/ SONET Network options

- OC-12 (FlightLite™ 622 only)

1.1.4. Transmission Method

The FlightLite™ 622 and FlightLite™ G systems use a single transmission beam through free space.

Optical Components

The transmission and receive optics are positioned to make optimum use of the entire front surface of the link head. The sub-assemblies that perform electro-optic conversion are arranged around the optical portion of the system.

Transmission Components

Photo diodes convert the optical signals from the network interface into an electrical signal. The electrical signal is used to modulate a high power laser source that transmits an infrared beam into free-space.

Receiver Components

The receive amplifier converts the infrared signal(s) coming from the free-space path into an electrical signal by using a highly sensitive photo diode. This amplified receive signal drives an optical source that sends the receive signal back to the fiber optic network interface.

1.2. Link Head Operating Parameters

The system naming convention used by LightPointe also describe operational parameters. For example, the number or letter following the name of a linkhead describes the maximum data transmission rate of the linkhead.

- Up to 622 Mbps for the FlightLite™ 622 system
- Up to 1.25 Gbps for the FlightLite™ G system

The following tables list operational performance parameters for the FlightLite™ 622 and FlightLite™ G systems.

Table 1-1: FlightLite™ 622 and FlightLite™ G System Operating Parameters

Weather Condition/Precipitation	***Light Haze***	Haze	***Thin Fog***	Light Fog	***Moderate Fog***
	Light Rain *13mm/hour*	Medium Rain *25 mm/hour*	Heavy Rain *50 mm/hour*	Cloudburst *100 mm/hour*	Monsoon
Visibility (in meters)	***4000***	***2470***	***1900***	***770***	***500***
Loss in dB/1000 meters	***-3***	***-5***	***-10***	***-17***	***-30***
FlightLite	*Calculated Link Distance in meters with 5 dB Fade Margin remaining*				
FL 622	TBS	TBS	TBS	TBS	TBS
FL G	1300	1100	800	600	400

1.3. Link Head Components

The FlightLite™ 622 and FlightLite™ G link heads utilize a single beam transmitter and a single receiver.

Figure 1-2: FlightLite™ 622and FlightLite™ G Link Head

The FlightLite™ 622 and FlightLite™ G products include the following main components:

- Front protective window with heater/lens defroster
- Single beam optical assembly with optical fiber connections
- Telescope for coarse alignment of the system
- Receive amplifier with avalanche photo diode (APD)
- Transmitter amplifier with Vertical Cavity Surface Emitting Laser (VCSEL)
- FlightManager Optical Management Interface card (OMI)
- Power supply with external connectors
- Back panel with system status display and optical level meter

2. System Installation and Alignment

This chapter covers the following main topics

- Site review
- Recommended installation tools and test equipment
- Site preparation
- Installation staffing
- Major system installation components
- Assemble and Mount the System Hardware
- Link Head Alignment
- Optical Cable Connection
- Verify System Operation

2.1. Site Review

For customer supplied preliminary installation assessment data and detailed site review instructions refer to the LightPointe Field Engineering & Planning Guide. Use this guide to check the proposed installation against actual LightPointe installation standards.

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
- Are both the physical distance of the link heads and the maximum transmission distance at the maximum?
- Is a single mode or multimode interface required?
- Wavelength of optical interface

Step 2 Ensure true, free line-of-sight.

- Can emissions, trees, or other obstacles in the line of sight interrupt the connection?
- Is there a possibility of work activity that could interfere with the transmission of data?
- No vents, big flat roofs, or smoke stacks

Step 3 Ensure transmission security.

- ❑ The transmission beam is narrow and invisible, making it very difficult to tap into without interrupting the beam path.
- ❑ Ensure that equipment mounted behind the link heads to intercept the transmission beam would be difficult to hide.

Step 4 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
- ❑ Use non-penetrating roof mounting hardware if possible

Step 5 Evaluate mounting locations for system access.

- ❑ Easy access to link heads
- ❑ Stable location/platform for mounting
- ❑ Safety considerations for installers and maintainers of the system

Step 6 Evaluate mounting locations for operational integrity (refer to Section 2.1.1 to see different types of mounts).

- ❑ Near roof edge to avoid interruptions of transmission
- ❑ Near roof edge to minimize heat (shimmer) effects
- ❑ Weather protected location if possible
- ❑ Personnel laser protection considerations

Step 7 Consider the mount foundation (refer to Section 2.1.1).

- ❑ Penetrating
- ❑ Roof surface
- ❑ Wall
- ❑ Interior floor behind window

Step 8 Consider mount type (refer to Section 2.1.1).

- ❑ Universal mount (floor or wall)
- ❑ Other specialized mount

2.1.1. Typical Mounting Locations and Platforms

Refer to the following table for examples of different mounting location and details regarding use.

Table 2-1: Link Head Mounting Locations

Mount Style	Typical Use
	**Universal Mount** Use this mount on normal upright installations where the surface is a solid material that can be penetrated with mounting bolts.
	**Office Floor Mount** Use this mount in a laboratory or office environment or when a stable indoor mount is needed for a short period of time.
	**Mast Side Mount** Use this mount when there is an existing pole that allows the standard mount to be easily affixed (with U-bolts, brackets, etc.). Make sure that there is no wind influence to the mounting from the other antennas.
	**Special Custom Mount** Use this mount based on unique customer needs or requirements.

Mount Style	Typical Use
	**Wall Mount** Use this mount when normal horizontal installation into a wall surface can be made with penetrating bolts. The wall material must be solid and deep enough to accommodate the bolts. Mount Power Box with cables at the bottom.
	**Parapet Custom Mount** Use this mount when the parapet is of sufficient height and made of solid material. This application does not allow foot traffic in front of the system.
	**Guy Wire Custom Mount** Use this mount for taller mast heights and/or where there are sustained high wind loads.
	**Tower Mount** Use this mount when significant heights are required for true line of sight.
	**Multiple Link heads** Use this mount when multiple link heads are installed at the same location.

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 Surveys:

- Thomas Guide or equivalent map 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 fiber, power runs, etc.
- Camera (digital recommended) to photograph installation sites to reduce need for return visits to sites (optional)

Installations:

- Standard electro-mechanical tool kit with pliers, screwdrivers, wire cutters, wire strippers, etc.
- Two-way radio or cell phones to communicate when aligning link heads
- Optical fiber connector cleaner kit to clean connectors before plugging them into the system
- Plastic tie wraps to secure flexible conduits, etc.
- Two each 6mm hex (Allen) wrenches to supplement wrenches shipped with the equipment
- 13mm socket or open end wrench for mounting bolts
- Electrical tape for securing and fastening
- Measuring level to evaluate flatness of mounting surfaces
- Optical light source and fiber power meter to ensure fiber performance from/to link head
- 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 link head 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)Major System Components

2.3. Site Preparation

Please refer to the LightPointe Field Engineering & Planning Guide for detailed site survey instructions.

Step 1 Check space requirements.

- Multiple link heads can be co-located at the same site. Multiple link heads should be spaced at least 3 meters (9 feet) apart if they are pointed in the same direction. There are no restrictions for link heads pointed in different directions.

Step 2 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 or broken
- Check the surface to ensure that it is rigid.

Step 3 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 4 Check the network interface connections.

The number of connections varies depending on system type and redundancy requirements. *Always pull double the amount of required cables.*

- ❑ Determine the fiber type (single mode or multimode)
- ❑ Pull at least 4 strands for the FlightLite™ 622 and FlightLite™ G systems if data transmission redundancy is desired, and 6 strands if data and OMI redundancy is desired.
- ❑ OMI is *presently always* multimode

Step 5 Check Fiber optic cable routing.

The system uses either 9 µm single mode or 50/62.5 µm multimode fiber for data and 50/62.5 µm multimode fiber for the OMI.

- ❑ Make sure the correct fiber is used
- ❑ Termination at link head side: SC-connectors
- ❑ Label all link head connectors (Data IN, Data OUT, and OMI)

Step 6 Use a fiber optic cable tester to check the attenuation of all fiber optic cables from the network and OMI interfaces.

- ❑ Measure fiber losses to ensure acceptable performance

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.

2.5. Major System Installation Components

2.5.1. Universal Mount Hardware

The universal mount is used for pedestal or wall mounting the link head.

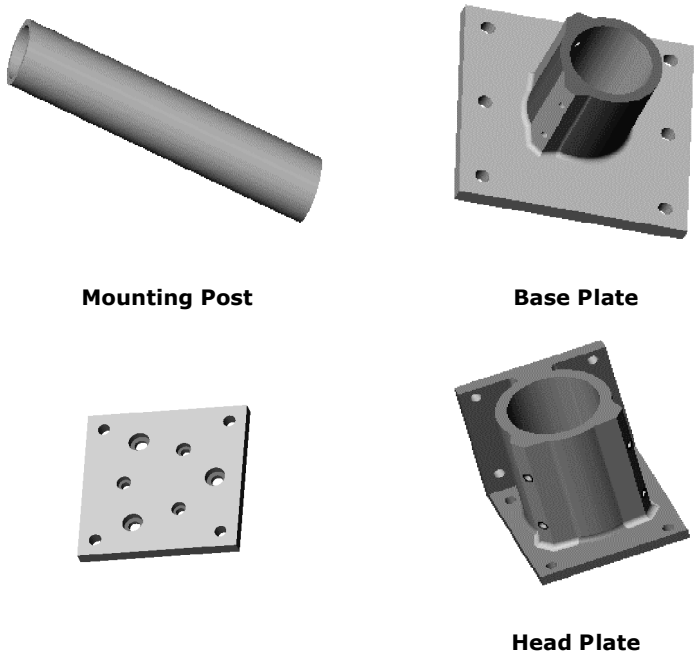


Figure 2-1: Universal Mount Hardware

2.5.2. Pan and Tilt Hardware

The pan and tilt hardware is used for coarse alignment of the link head.

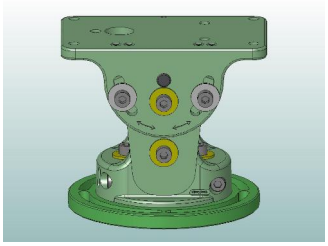


Figure 2-2: Pan and Tilt Hardware

2.5.3. Power Supply Assembly

The weatherproof power supply assembly mounts near the link head.

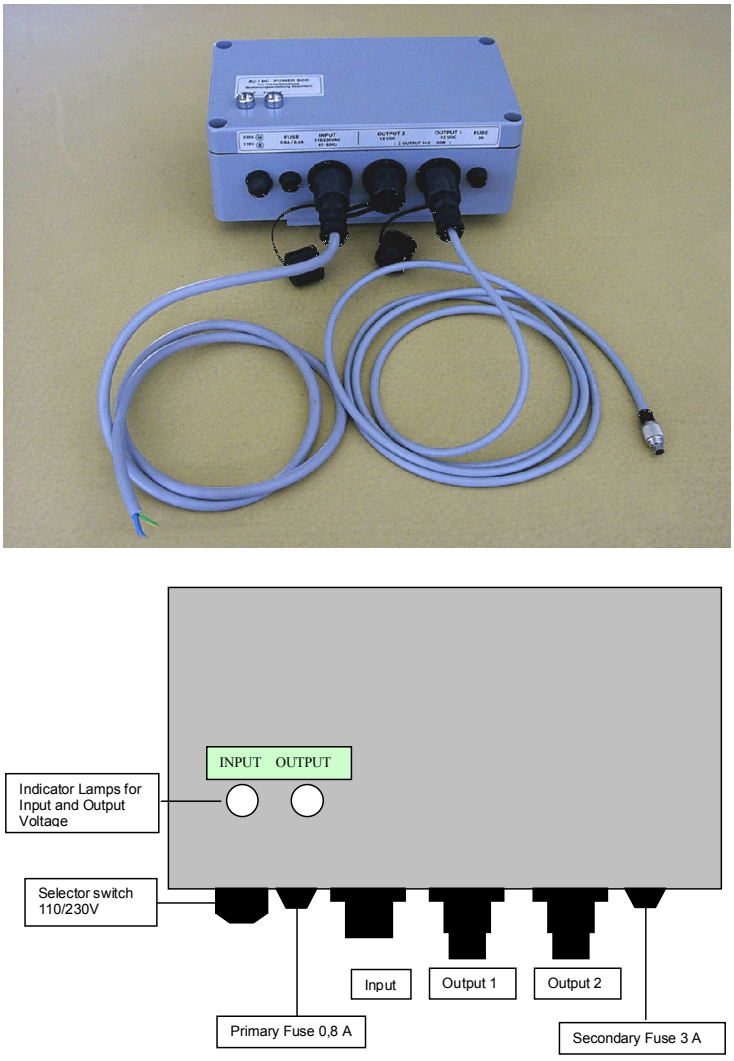


Figure 2-3: Power Supply Assembly

This assembly provides:

- 115 or 230 VAC power input (requires correct switch setting on power supply)
- Dual 12 VDC power outputs
- Ability to power one or two link heads with a single power supply
- Input and output power LED indicators

FlightPower Options

The following power supplies are available for the link heads.

Table 2-2: FlightPower Power Supply Options

Power Supply	Description
LPS-A12	Standard (hardened) Power Supply
LPS-D12	Power Supply for Link Heads Hardened –48 VDC to 12 VDC

2.5.4. Link Head Assembly

The link head and pan and tilt hardware are mounted on the head plate assembly.

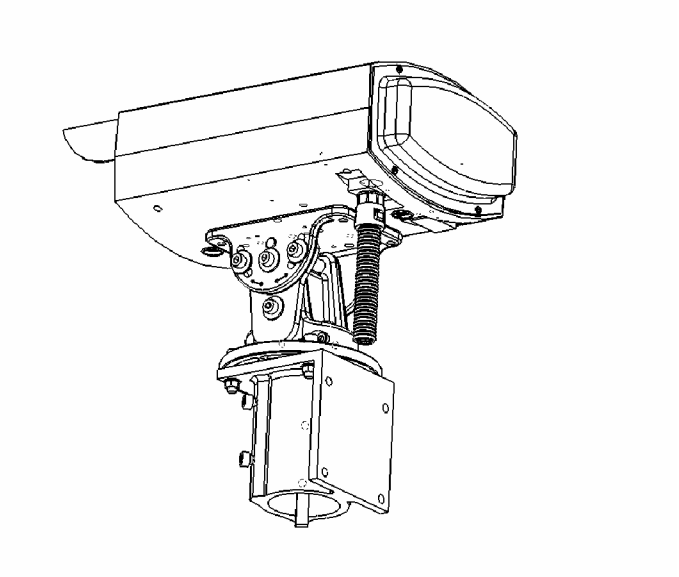


Figure 2-4: Link Head and Pan and Tilt Assemblies

The link head assembly consists of:

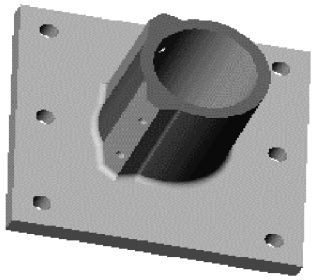
- A link head cover
- Optics, transmission, and receiver assembly
- An alignment telescope
- Interface back panel

2.6. Assemble and Mount the System Hardware

Caution: For indoor installations where people may be present, the link head(s) should be installed close enough to the window to prohibit looking into the transmitter beams. Avoid link head angles of 50 degrees or less measured from the window glass.

Step 1 Install the mounting base plate to a solid platform using 12 mm (1/2") screws.

- Anchor the mount in wall or concrete (recommend M12-screws)
- Use bolts of hardness class not less than 6.6

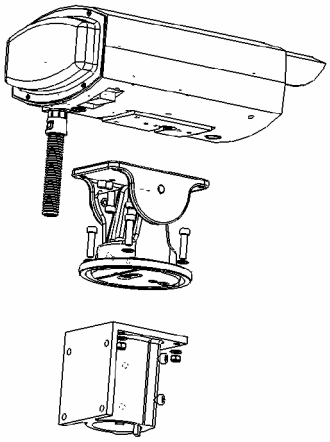


- Use the mounting plate hole template provided for aligning any penetration holes

Step 2 To ensure stability, keep the mounting post as short as possible.

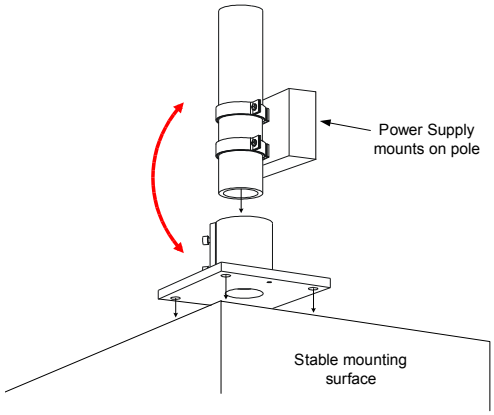
Note: The maximum allowable mounting pole length is 110 cm (43.3").

Step 3 Attach the adapter plate and pan and tilt assembly to the link head.

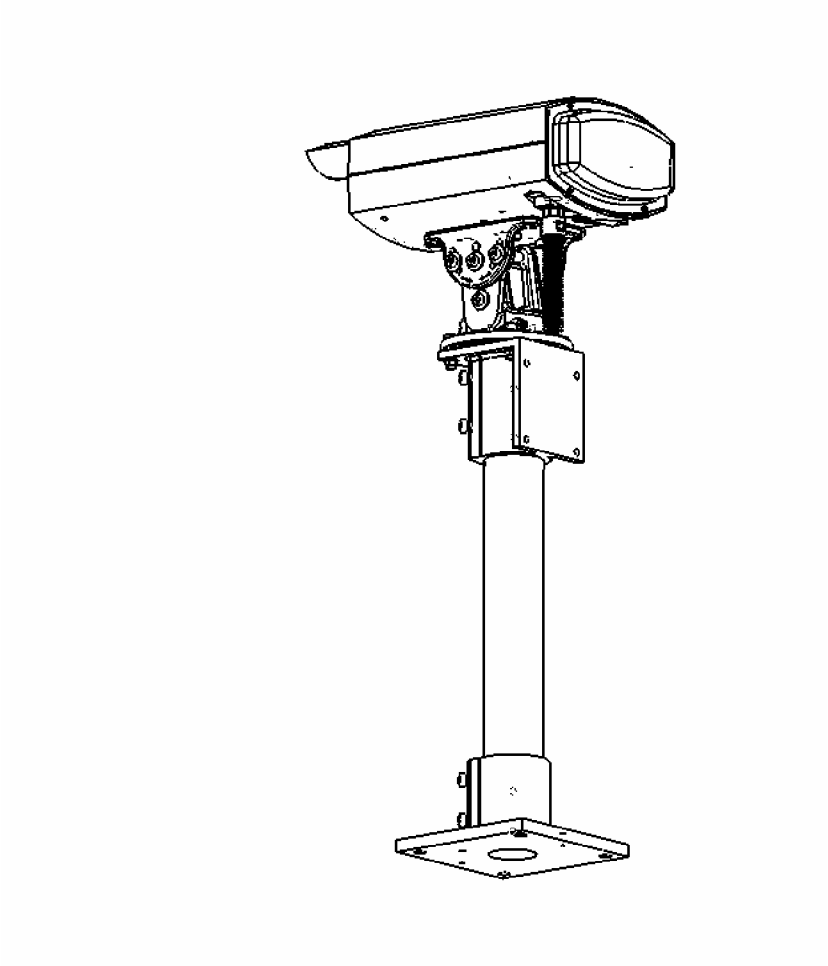


Step 4 Fasten the head plate to the link head using the supplied fasteners.

Step 5 Attach and fasten the mounting post assembly to the base plate using the supplied fastening screws. Do not over tighten the mounting screws.



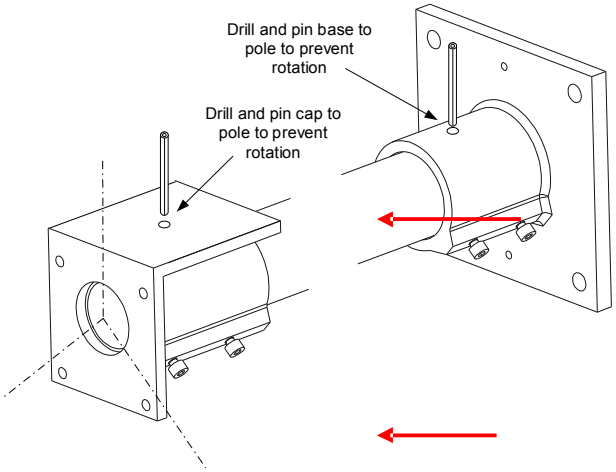
Step 6 Fasten the head plate to the mounting post using the supplied fastening screws.



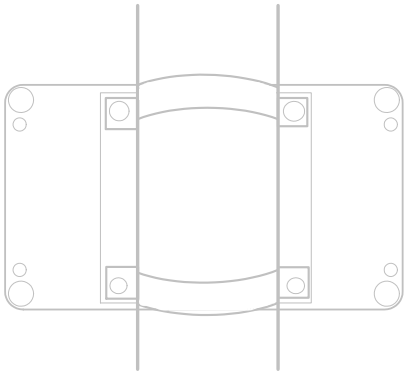
Caution: The base plate and head plate must be pinned to the mounting post when the base plate is wall mounted.

To pin the base plate and head plate to the mounting post:

- ❑ Drill an 8 mm hole through the cylinder wall of the base plate and the mounting post and pin the assemblies together using 8 mm grooved pins or 3/8 x 1 inch screws.
- ❑ Drill an 8 mm hole through the cylinder wall of the head plate and the mounting post and pin the assemblies together using 8 mm grooved pins or 3/8 x 1 inch screws.

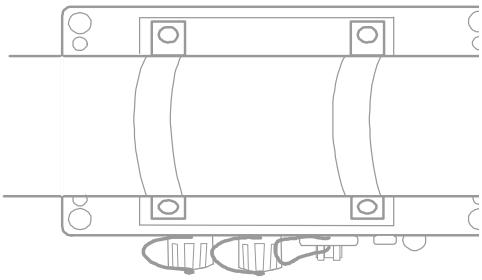


Step 7 If the power supply will be used with the standard LightPointe universal mount, use the two round, insulated clamps provided with the power supply to attach the unit to the pole.



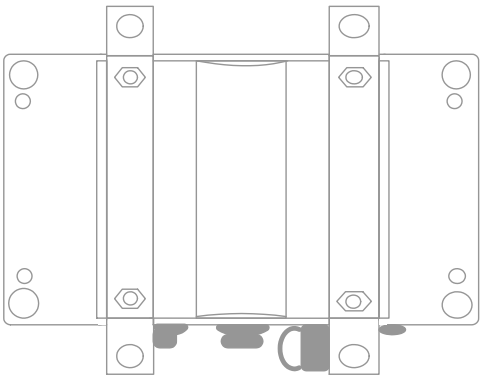
If the power supply will be mounted with the pole in a horizontal position:

- Remove the four back plate nuts
- Rotate the plate 90 degrees and then re-securing the back plate



If the power supply is to be mounted to a surface other than the standard LightPointe pole, the power supply may be secured using the two metal strips provided with the system.

- The metal strips should be secured to the power supply as indicated in the following picture
- The system should then be attached to a solid surface with the appropriate type of mounting screws

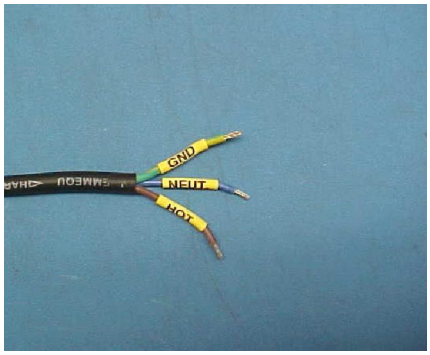


Note: The maximum recommended distance between the power supply box and the link head is 3 meters.

Step 8 Connect the power cable.

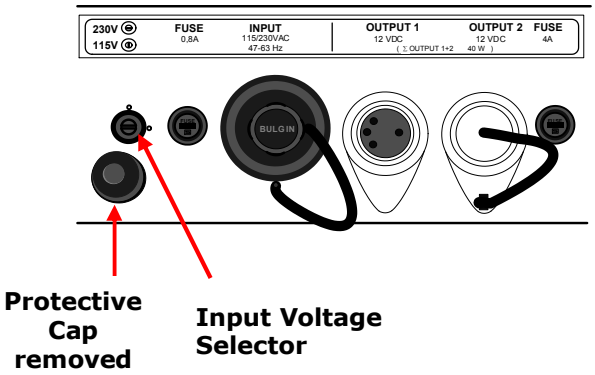
There is a 3-meter power cord provided with the standard AC power supply. The connector side is pre-wired, and the cord tail has three labeled wires (Hot, Neutral and Ground).

- The cord tail must be properly terminated (junction box, electrical plug, etc.) for connection to an electrical power source
- If possible, hardwire the power cord into a dedicated circuit

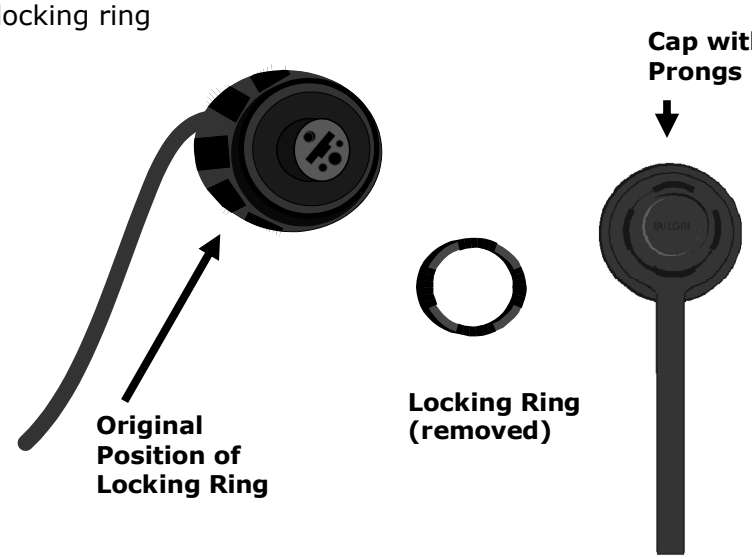


Caution: Disconnect main power before connecting electrical cables.

Step 9 Once the power cord tail has been connected to an electrical source, secure the power cord connector to the AC Input connector on the power supply.



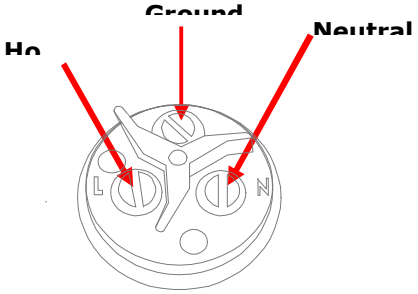
If you need to change the power cord, first open the power connector by removing the locking ring from the connector. The prongs on the caps of the protective cover of the cord and the AC input connector can be used to remove the locking ring



Loosen the strain relief on the connector to release the power cord and detach the power cord wires from the connector.

Place the strain relief over the new power cord, thread the power cord through the connector and connect the wires of the power cable to the correct pins of the terminal connector as indicated on the connector and in the following picture.

- The power cord cable outer sheath diameter must be between 5 and 10.25 mm (.19 to .38 inches) in diameter, and the individual wire connections at the connector plug must be between .75 mm and 3.31 mm (18 AWG to 12 AWG).



Once the wires have been connected, reassemble the input power connector. Ensure that the key slot on the terminal block is properly aligned with the key tab on the connector. Replace and tighten the locking ring, then connect the power cord to the AC Input connector

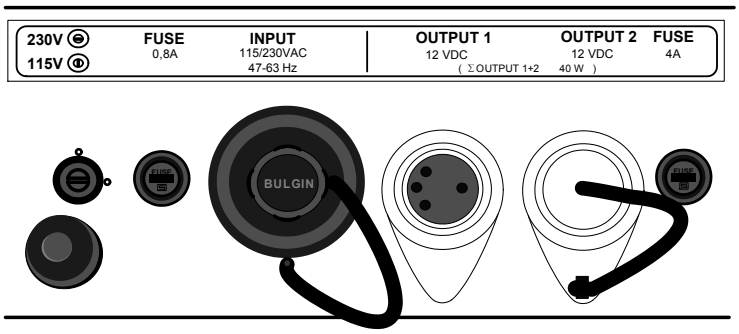
Warning: Ensure that the correct power cable is used.

Exercise extreme caution when affixing the wires to the connector. Incorrect wiring at the connector can pose personnel hazards and may cause damage to the equipment that is NOT covered under warranty.

Step 10 Set the power supply input selector switch to the correct position.

- The power supply is preset at the factory to an input voltage of 230 VAC

To reset the input voltage to 115 VAC:



- Remove the input selector switch cover protective cap
- Turn the selector switch to the vertical position using a flat head screw driver
- Replace the protective cover

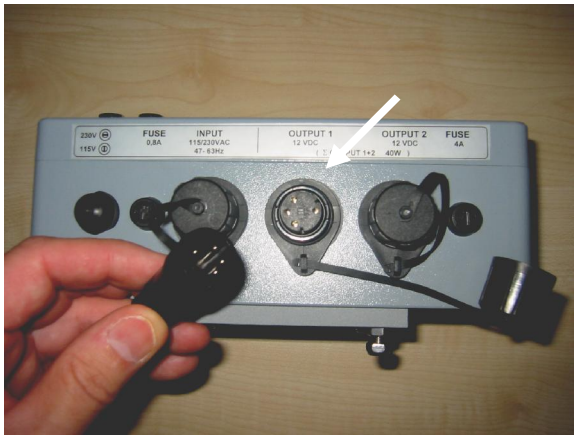
Caution: Ensure that the correct power input voltage is selected BEFORE applying power to the power supply.

The power supply input selector switch should NEVER be changed while power supply is connected to its primary power source.

Setting the power supply to 115 VAC and then applying 230 VAC will damage the power supply.

If the power supply is set to 230 VAC and then connected to 115 VAC, the output from the power supply will not be sufficient to operate the link head.

Step 11 Connect the 12 VDC cable (provided with the system) to the power supply by unscrewing the cap from the Output 1 port and securing the connector into the plug.



Note: The second power output port (Output 2) from the power supply can be used to connect to a second link head if desired.

If redundant power supplies are desired, a separate (backup) power supply and cable to interconnect two power supplies may be ordered from LightPointe.

If two power supplies are already available at the installation location, the power interconnect cable may be ordered separately.

Step 12 Connect the 12 VDC cable to the link head by first removing the cable duct seal at the bottom of the link head.

Run the connector of the 12 VDC cable through the cord grip connector located at the left bottom side of the link head.

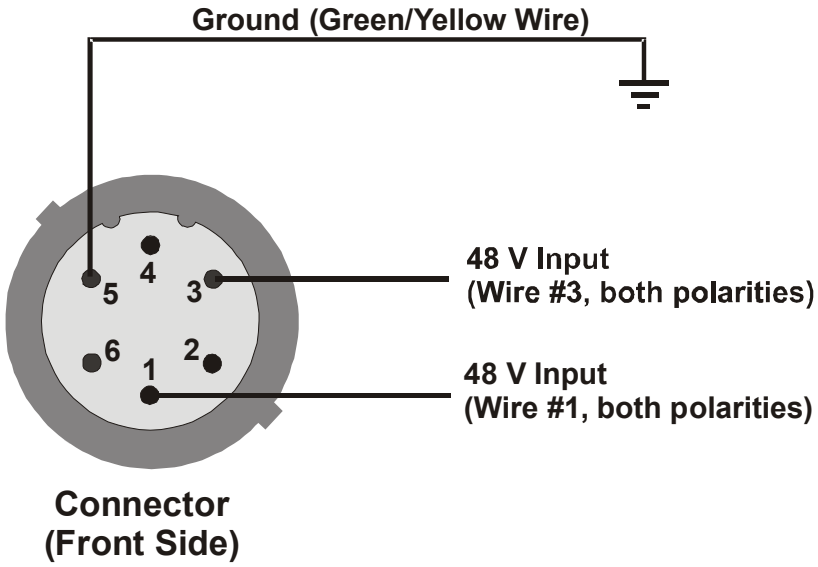
- Ensure that a sufficient amount of the 12 VDC cable has been fed through the cable duct to enable the connector to be attached to the socket in the back of the link head.
- Securely tighten the cable to the 12 VDC power connector on the back of the link head.

Tighten the connector screw to waterproof the assembly, ensuring that it is securely fastened.

Step 13 Repeat these steps at the second link head.

Optional –48 VDC DC Power Supply

The mechanical installation and connection to the link head for the -48 VDC power supply is identical to the steps described in this section. LightPointe provides a 3-meter (approximately 9 feet) -48 VDC input power cable. The -48 VDC input cable wiring is as follows:



2.7. Link Head Alignment

Following are the alignment procedures for the FlightLite™ 622 and FlightLite™ G systems.

2.7.1. Alignment Procedure

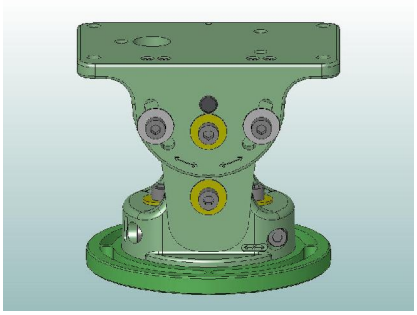
The following steps must be followed to properly align the system. A single person can perform link heads alignment, however it is easier with two people. The only tool required to perform coarse system alignment is the Allen wrench (metric #6) that is provided with the system (stored on the back of the link head).

Note: When you are finished aligning the system, always return the Allen wrench back to its holder.

Perform the following steps at both link heads:

Step 1 Remove the back cover protective plate from the link head and the lens covers from the link head telescope.

Step 2 Loosen the locking screws at the pan and tilt assembly.



Caution: Before aiming the telescopes, review the safety section of this manual and the following table of safe minimum telescope operating distances.

Link head	Built-in telescope safety distance
FlightLite™ 622	0 m
FlightLite™ G	0 m

Step 3 Center the telescope crosshairs on the opposite link head. The telescope is mounted externally.

Step 4 Lightly fasten the locking screws.

Step 6 Repeat steps 1-5 at the opposite link head.

Caution: Before applying power to the link heads, make sure the input power selector switch (115V or 230V) is in the correct position.

Step 7 Power up the link heads (after the initial telescope alignment) and check the receive power level bar graph. A few signal level bars should be illuminated and the "SyncLoss" will be illuminated, indicating the opposite link head is in the TX Idle (transmit test signal) mode.

- Move the link heads slightly in the vertical and horizontal directions to find the maximum signal strength level at both locations
- Carefully tighten all locking screws
- The number of bars that can be seen at the back panel signal strength meter should not be lower after the locking screws have been fastened

Repeat this step if the number of bars is significantly lower on one end of the system.

The alignment procedures are now completed.

2.7.2. LED Bar Graph – Optical Input Level

The bar graph is used to align the link head.

- One bar is equal to one green LED.
- The bars are counted from bottom to top.
- The number of bars will depend on the distance between the link heads and the actual weather conditions.
- The number of bars should be approximately equal when both link heads are correctly aligned.

When the alignment process is performed under clear weather conditions, and the link heads are no further apart than the recommended optimal distance, the bar indicator should illuminate between 5 and 9 bars.

Note: The system will operate when the bar graph indicator shows only one bar.

2.7.3. Power Adjustment Knob

The power adjustment knob is used to set the optimum received power level once the units are aligned. This avoids saturating the receiver with too much power, allowing the links to be installed at close range.

- During the initial alignment, turn the Power Adjustment Knob anticlockwise to the Maximum Power position (see picture below).
- Once the alignment procedure is complete, check the reading on the LED Bar Graph. If the reading is 9 bars or less, then the power does not need to be adjusted.
- If the reading is more than 9 bars or the Overload LED is illuminated, then turn the Power Adjustment Knob clockwise until the LED Bar Graph reads 8-9 bars.

When the alignment process is performed under clear weather conditions, and the link heads are no further apart than the recommended optimal distance, the bar indicator should illuminate between 5 and 9 bars. If the Overload LED is illuminated, then turn the Power Adjustment Knob as described above.

Note: The system will operate when the bar graph indicator shows only one bar.

2.8. Optical Cable Connection

Step 1 Connect the pre-wired fiber optic data cables from the network interface to the link head.

- ❑ Connect DATA OUT (TX) from the network interface to the DATA IN (RX) port (SC connector) on the link head.
- ❑ Connect DATA IN (RX) from the network interface to the DATA OUT (TX) port (SC connector) on the link head.

Note: The receive power levels may drop approximately 1 bar when the network interface fiber optic cables are attached.

Step 2 (Optional Step) Connect the pre-wired fiber optic OMI interface to the link head.

- ❑ Standard Mode: Connect the OMI PC RS-232 converter to the OMI port (SC connector) on the link head. The converter is directly attached to the PC COM port (a 9 pin COM port will require a 25 to 9 pin adapter).
- ❑ Optional Mode: Connect the NMS SNMP Interface (FMG LDX AIC or HDX) to the OMI port (SC connector) on the link head.

Step 3 Replace the link head rear protective cover.

The connection procedures are now completed.

2.9. Verify System Operation

Figure 2-5 shows the displays, controls, and indicators on the back panel of the link head. Table 2-3 describes these components.

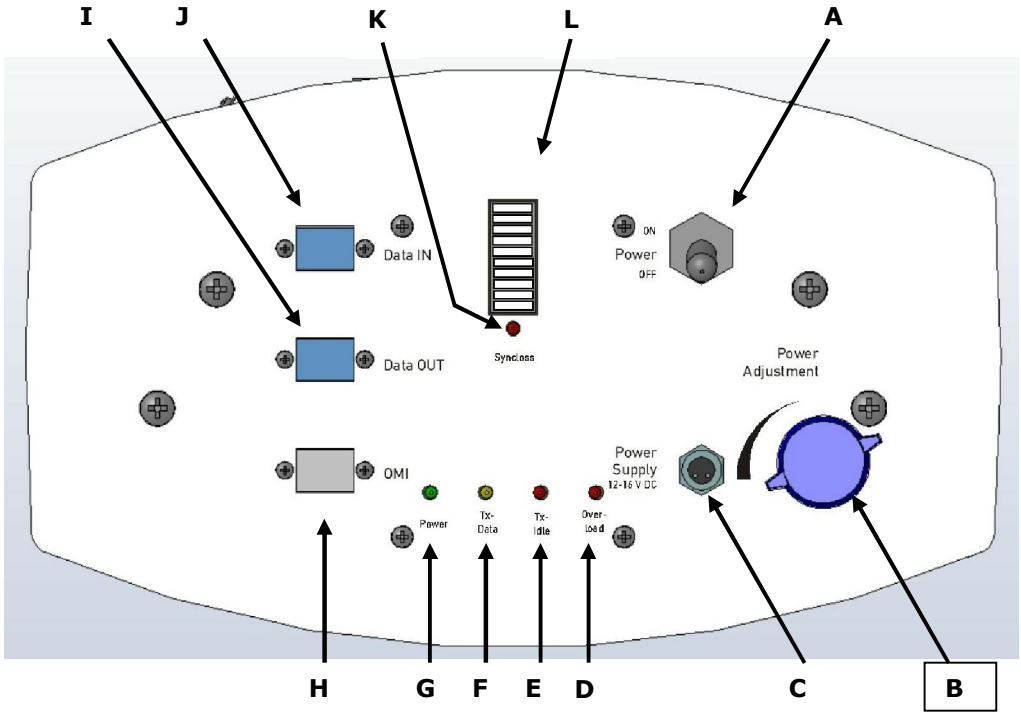


Figure 2-5: Link Head Back Panel

Table 2-3: Link Head Back Panel Displays, Controls, and Indicators

	Back Panel Item	Description
A	Power Switch	Main power switch
B	Power Adjustment Knob	Set the optimum received power level
C	Power Supply Connector	12Vdc power supply input
D	Receiver Overload LED	Illuminated red if the air interface receiver is overloaded
E	Transmit Idle	Illuminated yellow when idle signal is being transmitted and the link head is not connected to the network
F	Transmit Data	Illuminated yellow when signal is transmitted from the link head to fiber network
G	Power Indicator	Illuminated green when power is on
H	OMI Data Port	OMI Output (SC-connector 850 nm Multimode)
I	Data Out (SC-connector)	Data output from the link head to Network
J	Data In (SC-connector)	Data input from the network to link head

	Back Panel Item	Description
K	Loss of Signal LED	Illuminated red if the air interface receiver is too low (if displayed with power bars, indicates opposite link head is in Transmit Idle mode)
L	Receive Level LED Bar graph	Display receive signal strength

Check for normal operation of the link head system by observing the LEDs and bar graph displays on the back panel of each link head. Check the following displays for unit power and receive power status:

Table 2-4: Bar graph and LED Operational Checks

Display	Back Panel	Description
Bar graph	K	Current receive power level (should be 5 to 9 bars).
Power LED	F	Green when power supply is turned on
Transmit Data LED	E	Yellow receiving input from the network interface
Transmit Idle LED	D	Illuminated yellow • No data being received from the network • Network Data IN/OUT connections may be crossed

Please contact your distributor or LightPointe Technical Support if one of the red LEDs is illuminated and if you cannot fix the problem by using the troubleshooting procedures in Section 5.

System installation and alignment procedures are now completed. The system should be fully operational.

FlightTransport™ Systems

3. FlightManager Optical Management Interface

The FlightManager capability for the FlightLite™ 622 and FlightLite™ G are addressed in a separate manual, the FlightMangerPC Software User's Guide (Document Number 505-003298-00000). Please refer to this manual for information concerning the remote monitoring of the link head and how to use this capability to assist in trouble-shooting link head performance.

FlightTransport™ Systems

4. Maintenance

4.1. Scheduled Maintenance

In general, FlightLite™ 622 and FlightLite™ G systems are maintenance free. Clean the heatable front window at least twice a year using a moist (water) cloth. You may need to clean the window more often in dusty environments.

It is also useful to check the alignment from time to time. Compare the number of signal strength bars with the original values if you are not sure that the system needs to be re-aligned.

Do not attempt to open the housing, as there are no user-serviceable parts inside.

4.1.1. Field of View

Periodically check the link head field of view for obstructions.

FlightTransport™ Systems

5. Troubleshooting and Diagnostics

This chapter covers the following main topics

- Failure types
- Fault isolation troubleshooting trees
- Additional troubleshooting methods
- Technical support
- RMA procedures

The link heads can be thought of as nothing more than pipes used to move data. No processing of data occurs within the link heads. If the link heads are aligned and data is moving between them (i.e. Transmit Idle Mode), the problem is usually outside the system.

5.1. Failure Types

Three different kinds of failures can affect system performance:

- Failures caused by attached network components
- Failures caused by the environment
- LightPointe system failures

The troubleshooting flow chart (Section 5.2) 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 Optical Management Interface that allows you to pinpoint the failure precisely (refer to Section 3, FlightManager Optical Management Interface, and the FlightManagerPC manual). More detailed troubleshooting can be done through the optional FMG LDX AIC or FMG HDX SNMP Proxy Agent if it is installed in your system.

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

5.1.1. Network Component Problems

There are a number of network-related problems that can cause the optical transport systems to malfunction.

Table 5-1: Networking Equipment Problems

Network Problem	Effect on the Optical System
High output signal power of router/switch, etc.	Saturated receiver at the link head Data In port
Bad network input signal	System failure or high BER
Cables reversed	Incorrect signal at the link head
Cable length violation	Low signal strength at the link head
New network equipment	Network equipment and/or network software incompatible with link head
Optical fiber damaged	No signal at the link head
Free-space optical signal weak	Link failure
Damaged optical SC connector	No signal at the link head back panel Data ports
Incorrect input cable wave length	850 nm network cable (special order) only works with multimode fiber 1310 nm network cable (standard) works with single mode or multimode fiber

5.1.2. Environmental Problems

There are a number of environmental problems that can cause the optical transport systems to malfunction:

- Smoke emissions
- Fog, snow, or heavy rain
- Heat turbulence (shimmer)

5.1.3. System Failures

Checking Data IN/OUT LEDs

The Data Out (Transmit) and Data In (Receive) LEDs can be used to identify data transmit and receive problems.

Table 5-2: LED Operational Checks

TX Data	TX Idle	Over Load	Sync Loss	Description
On				Normal Transmit and Receive network traffic
	On			No network interface communications Link heads are transmitting a test signal
		On		Signal being received is saturating the link head receiver
			On	Missing data from the link head receiver

Operational Check

An operational link head will display the following status at the back panel. If any of the settings or indicators are different than those below, refer to Section 5.2, Fault Isolation Troubleshooting Trees.

Receive Power Meter showing between 5 – 9 bars; SyncLoss LED off

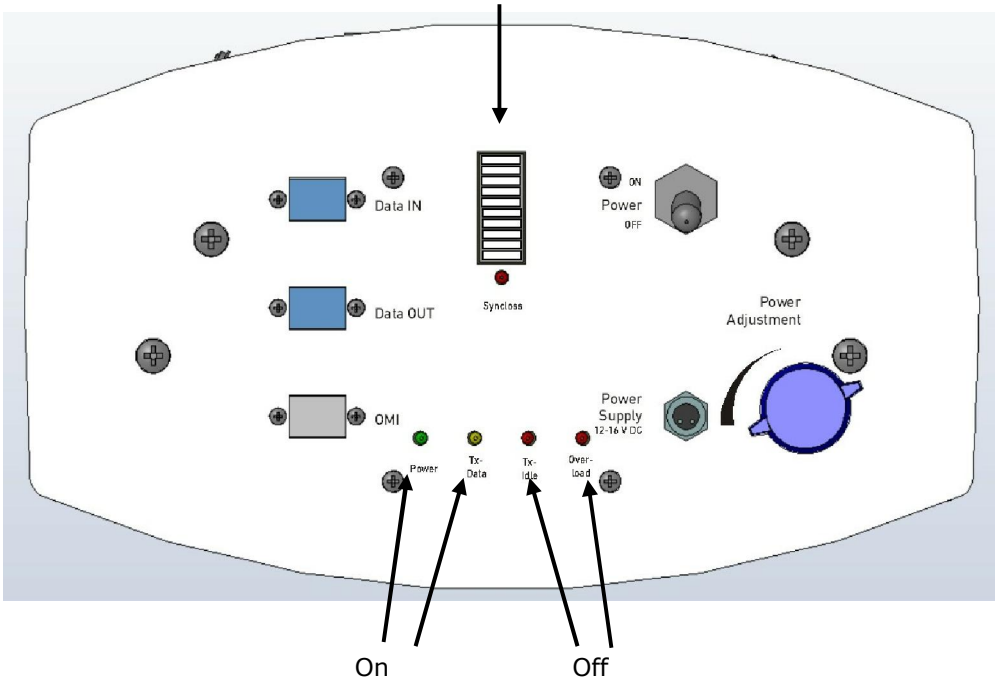


Figure 5-1: Normal Back Panel Display

5.2. Fault Isolation and Troubleshooting without FlightManagerPC

The following flowcharts can be used to troubleshoot the FlightTransport™ Systems system without using the LightPointe FlightManagerPC software. Tasks marked with a green dot can be accomplished using the FlightManagerPC diagnostic loop back tests.

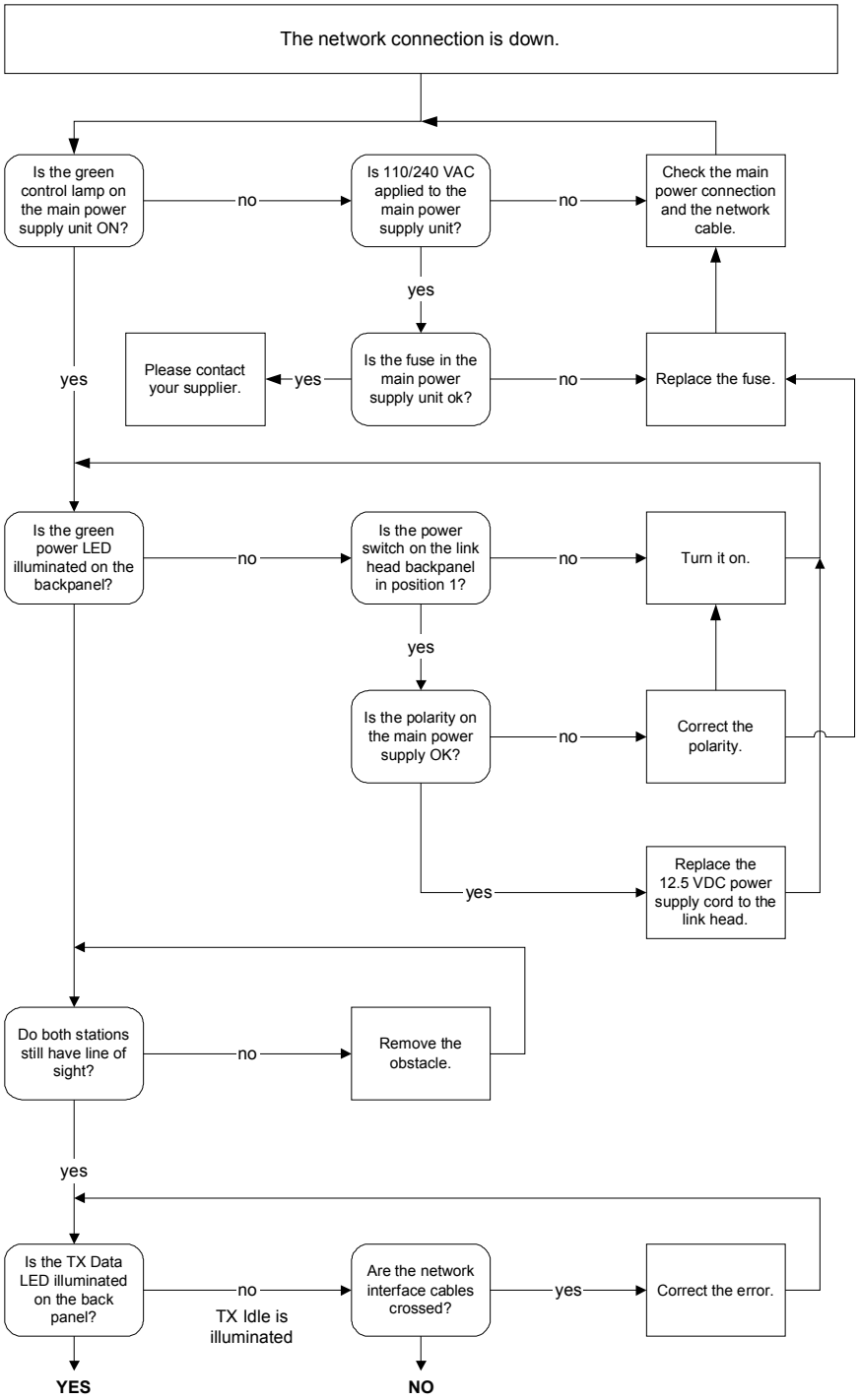


Figure 5-2: Troubleshooting without FlightManagerPC (Flowchart - Part 1)

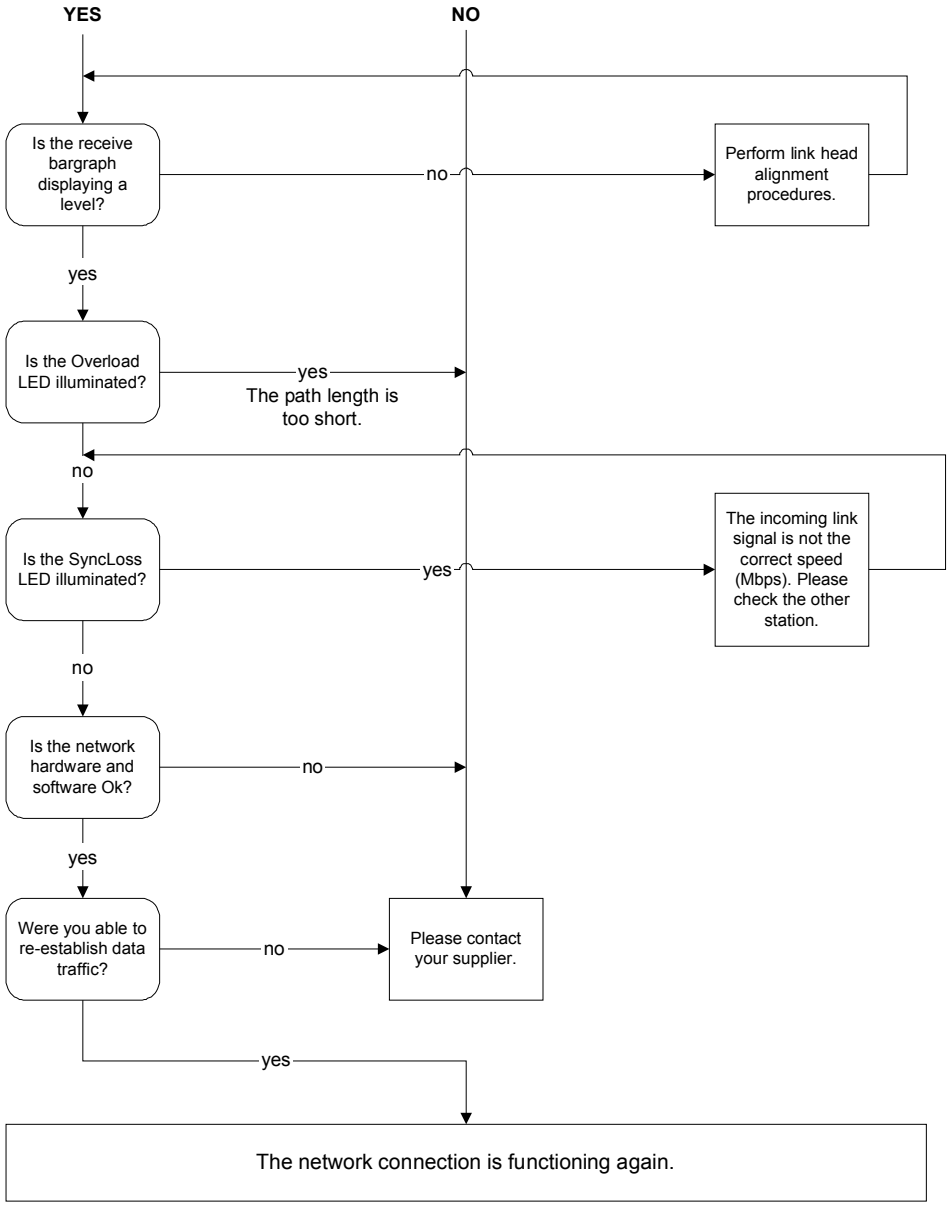


Figure 5-3: Troubleshooting without FlightManagerPC (Flowchart - Part 2)

5.3. Additional Troubleshooting Methods

5.3.1. Ping Test Setup

The following equipment and software are required to perform a ping test.

- Laptops with Ethernet cards
- Ethernet cables with RJ45 connectors
- RJ45 to Optical Cable 100mbs Media Converters
- Four optical fiber cables with SC connectors

The connections shown in Figure 5-4 are required to perform field diagnostic tests.

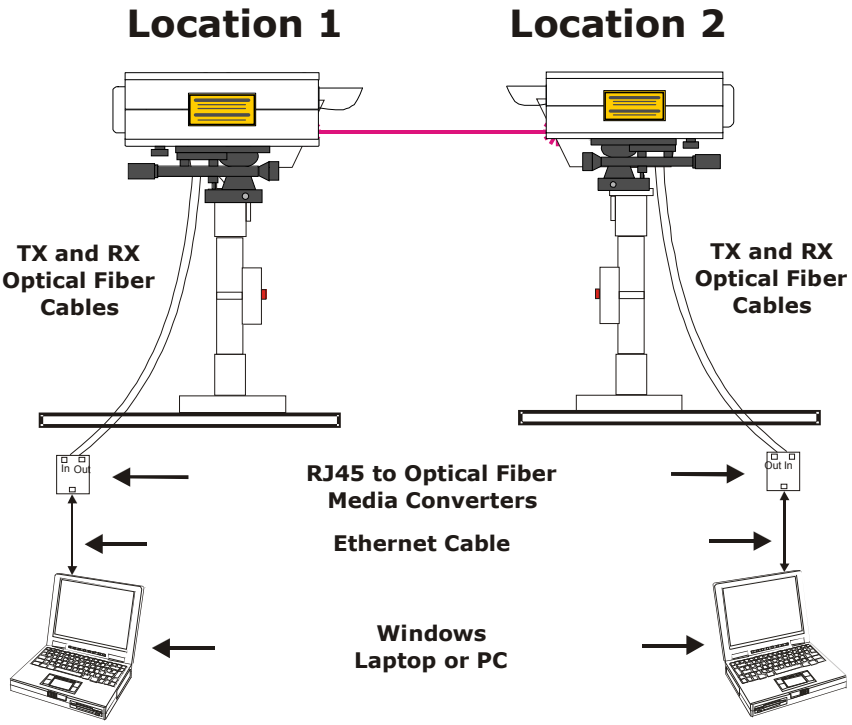


Figure 5-4: Ping Test Setup

5.3.2. Optical Link Ping Test

You can use a laptop with transceiver to send signals to the LightPointe system and perform a loop back test.

Step 1 Locate all required equipment (refer to section 5.3.1).

Step 2 On each side, attach two optical fiber cables to the link head Data IN/OUT ports. Connect the opposite ends of the fiber cables to the Media Converter IN/OUT ports.

Step 3 Connect an Ethernet cable between the PC RJ45 network port and the media converter RJ45 port on each laptop and complete the following steps on each laptop.

Step 4 From Windows click the **Start** button.

Step 5 Click on **Settings.**

Step 6 Click on **Control Panel.**

Step 7 Click on the **Network And Dial-Up Connector** icon.

Step 8 Click on **Incoming Connection.**

Step 9 Click on the **Network** tab**.**

Step 10 Double click on **Internet Protocol TCP/IP**.

Step 11 Select the **Specify TCP/IP Address** radio button.

Step 12 The near side should type **168.10.1.10** in the IP Address Box. The far side should type **168.10.1.11** in the IP address box. The Subnet address will automatically generate.

Step 13 Click the **Okay** button.

Step 14 **Exit** all dialog boxes.

Step 15 Click on the **Start** button.

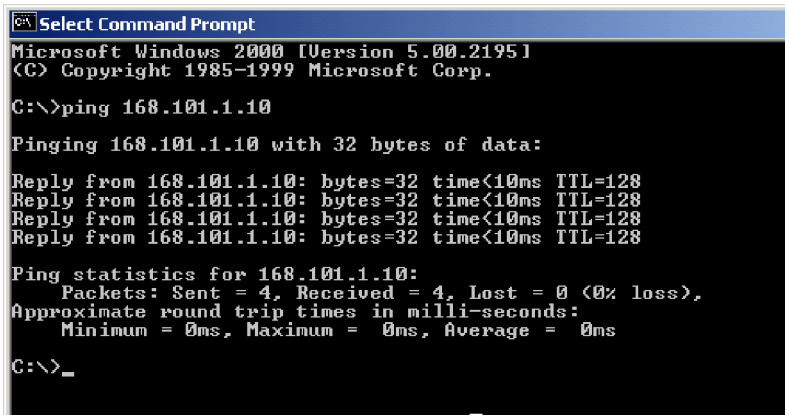
Step 16 Select **Programs**.

Step 17 Select the **MS-DOS** Prompt.

Step 18 The near side laptop type in the far side IP address. From C:\> Type: **ping 168.10.1.11 -T.** The far side laptop can ping by typing: **ping 168.10.1.10 -T**.

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

Step 19 A successful ping will display the following information on the PC screen.



Step 20 If you block the FOV (field of view) of the link head and ping, the PC screen should read "unreachable parameters".

BER Test

Bit Error Rate (BER) correlates directly with a cable's attenuation and cross talk measurements. Bit Error Rate increases as attenuation and/or cross talk increases.

A BER tester can be used to monitor the LightPointe System. Once the system has been placed in loop back mode, the BER tester is used to generate a test pattern over the looped line, read the received looped data, and report on the error rate.

Results can be automatically logged to a printer or disk to help isolate intermittent problems. The degree of error is usually expressed fractionally or as an exponential relationship between good data and data errors.

Refer to your BER tester manual for setup and operating instructions.

The following figure displays a typical printed BER test output.

ANT-20 - Anomaly/Defect Analyzer

Start of measurement: 03/26/01 09:02:20.0

End of measurement : 03/27/01 19:14:26.9

RX structure: STM1 optical AU4 VC4 140M framed PRBS23

Settings : BLOCK

TYPE	Total Results		Intermediate Results	
FAS-STM	0	*	0	*
B1	0	*	0	*
B2SUM	0	*	0	*
MS-REI	0	*	0	*
AU-PJE	0		0	
AU-NDF	0		0	
B3	1	1.48E-10	0	*
HP-REI	0	1.02E-11	0	*
FAS-140	1	1.71E-10	0	*
TSE	1	1.34E-11	0	*

Figure 5-5: Sample of a BER Test Printed Output

5.4. Technical Support

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

5.4.1. Checklist Before You Call Technical Support

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

General Information	Your Installation
❑ Application (Protocol)?	
❑ Distance?	
❑ How long has system been in operation?	
How does the error show up?	
❑ Temporary/permanent error?	
❑ Is error observed for the first time?	
How was the weather when error showed up?	
❑ Light or Dark?	
❑ Weather conditions (fog, snowfall)	
❑ Outside temperature	
Status of Back Panel LEDs	
❑ Syncloss off?	Yes/No
❑ TX Data or TX Idle on?	Which is illuminated?
❑ How many bars does the bar graph indicator show?	
Status of Back Panel Indicators	
❑ Connection to network	Yes/No
❑ Failure of endpoint equipment	Checked/Not Checked
What type of system is installed?	
❑ Warranty registration sent to LightPointe	
❑ Model number	
❑ Serial numbers	
❑ Singlemode or multimode	

5.5. Return Material Authorization (RMA) Procedure

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

RMA products include:

- Link head
- Standard power supply
- FMG LDX AIC
- FlightSwitch
- DualPath Kit

FlightTransport™ Systems

6. Specifications

Table 6-1: FlightLite™ 622 and FlightLite™ G System Specifications

	FlightLite™ 622	FlightLite™ G
Outdoor Unit		
Description	Single-beam system	Single-beam system
Dimensions	8.5 x 8 x 16 inches 215 x 200 x 400 cm	8.5 x 8 x 16 inches 215 x 200 x 400 cm
Weight	8.8 lbs / 4.5 kg	8.8 lbs / 4.5 kg
Link head input voltage	12 – 16 VDC	12 – 16 VDC
Operating voltage	115 / 230 VAC (50/60 Hz)	115 / 230 VAC (50/60 Hz)
Power consumption	Max. 20 W	Max. 20 W
Operating temperature	-13° to +140° F (-25° to +60° C)	-13° to +140° F (-25° to +60° C)
Relative humidity	Up to 95% (non-condensing)	Up to 95% (non-condensing)
Free-space Path		
Bandwidth	622 Mbps	1.25G Mbps
Recommended Distance	Refer to Table 1-1	Refer to Table 1-1
Optical transmitter	VCSEL	VCSEL
Output wavelength	850 nm	850 nm
Beam divergence	3.3 mrad	2.7 mrad
Laser Output Power	24 mW	24 mW
Receiver Sensitivity	-33 dB	-30 dB
Dynamics	34 dB	35 dB
Network Interface		
Protocol	Transparent	Transparent
System Interface	SC-compatible	SC-compatible
Connection optical fiber	Single mode: 6-9.5 µm inner core 125 µm external diameter Multimode: 50-62.5 µm inner core 125 µm external diameter	Single mode: 6-9.5 µm inner core 125 µm external diameter Multimode: 50-62.5 µm inner core 125 µm external diameter
Receiver Type	Si APD	Si APD
Wavelengths Supported	SMF/MMF: 1310 nm	SMF 1310 nm MMF 850 nm
Optical receive power	-8 to –25 dBm (single mode) -14 to –23 dBm (multimode)	-8 to –25 dBm (single mode) -14 to –23 dBm (multimode)
Optical transmit power	-8 to –15 dBm (single mode) -14 to –22 dBm (multimode)	-8 to –15 dBm (single mode) -14 to –22 dBm (multimode)
Status displays (LEDs)	Power, Syncloss, Data IN/OUT, LOS, Overload, Test, and Bar graph (10 Bars)	Power, Syncloss, Data IN/OUT, LOS, Overload, Test, and Bar graph (10 Bars)

Note: LightPointe FlightLite™ 622 and FlightLite™ G systems are certified eye-safe in accordance with IEC/EN 60825-1 A2:2001 Class 1M standards.

FlightTransport™ Systems

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