

# AireBeam™ Millimeter Wave Systems



**AireBeam™ G80-XX**

**Installation Manual**

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## Information to User

**Note:** Changes or modifications of the system not expressly approved by LightPointe could void the user's authority to operate the equipment.

## Safety

**Note:** There are no serviceable parts within the units and the system should not be opened in the field.

### Observe Standard Precautions

All persons having access to this equipment must observe all standard precautions as defined in applicable national statutory health and safety legislation.

The outdoor equipment must be properly grounded to provide protection against voltage surges and prevent the built-up of static electric charges. In the event of a short circuit, grounding considerably reduces the risk of electrical shock.

For installations in the U.S.A., for information with respect to proper grounding and applicable lightning protection for DC cables please refer to Articles 810830 of the National Electrical Code, ANSI/NFPA No. 70.

In case the system is installed in a country outside of the U.S.A., implement protection in accordance with local safety standards and regulatory requirements.

Do not install or operate this equipment in the presence of or close to flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a potential safety hazard.

### FCC Notice on Exposure to Millimeter Wave Frequencies

#### FCC ID : PHVABG80

Warning: This device is a high powered transceiver that operates at frequencies that could be potentially harmful to human tissue if the following precautions are not taken,

- (1) Minimum safe operating distance of 3.5 meters must be observed at all times between unit and users\*
- (2) Unit shall be mounted so that minimum operating distance is no inadvertently impinged by the general public, or non user personnel.



*\*Please see exposure limits listed in FCC §1.1310*

**Airebeam G80-MX**

#### FCC ID : PHVABG80

Warning: This device is a high powered transceiver that operates at frequencies that could be potentially harmful to human tissue if the following precautions are not taken,

- (1) Minimum safe operating distance of 7.0 meters must be observed at all times between unit and users\*
- (2) Unit shall be mounted so that minimum operating distance is no inadvertently impinged by the general public, or non user personnel.



*\*Please see exposure limits listed in FCC §1.1310*

**Airebeam G80-LX**

### Qualified Personnel

Qualified personnel who understand and are trained to work with the equipment must perform all repair, modification, reconfiguration, and upgrading operations.

**Note:** Always power the system down before moving or removing the system.

## Service

There are no serviceable parts within the radio units. Only factory trained personnel can provide service on any internal components of the radio units.

## Regulatory Information

### North America:

These devices have been type approved by FCC in accordance with 47 CFR PART 15B, Subpart J, Part 101 Subpart Q of the Federal Communication Commission rules and Industry Canada ICES-003 CLASS A

In the U.S. millimeter wave radio transmission equipment operating in the 71-76, 81-86, and 92-96 GHz frequency ranges must be registered with the FCC as provided for in Part 101 of the FCC regulations. Customers in the U.S. are responsible for obtaining proper operator licenses. For more information on how to get a license to install and operate millimeter wave radio transmission equipment contact LightPointe via E-mail [techsupport@lightpointe.com](mailto:techsupport@lightpointe.com) or call the LightPointe office at 858-863-0338.

### 47 CFR Part 15B

This device complies with part 15 of the FCC Rules. Operation is subject to the following conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

### IC-CES-003

**This Class A digital apparatus complies with Candian ICES-003.**

**Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada**

### Europe:

These devices are in compliance with the European Directive R&TTE 1999/5/EC on Radio Equipment and Telecommunications Terminal Equipment and have been assessed against the following Applicable Standards:

**R&TTE:**

- EN 302 217-3 v1.3.1 (2009-7)**
- EN 302 217-2-2 v1.4.1 (2010-07)**
- EN 302 217-4-2 (2010-01)**
- EN 301 489-04 v1.4.1 (2009-05)**
- EN 60950-1:2006+A1:2010**

*Environmental:* This product is ROHS compliant



## **Warranty**

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

## **Contacting LightPointe**

### **Corporate Office**

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F: 858.430.3458

Website: [www.LightPointe.com](http://www.LightPointe.com)

Email: [techsupport@LightPointe.com](mailto:techsupport@LightPointe.com)

## CE Declaration of Conformity

Date of Issue: 2011-11-02

**We, LightPointe Communications, Inc.,** with address 10140 Barnes Canyon Road, San Diego, CA 92121 **declares under our sole responsibility that:**

**Product Description:** Point-to-Point Millimeter Wave Transmission System

**Model Number(s):** AireBeam™ G80-xx

**To which this declaration relates is in conformity with the following standard(s) or other normative document(s) that this product has been assessed against the following Applicable Standards:**

**R&TTE:** EN 302 217-3 v1.3.1 (2009-7)  
EN 302 217-2-2 v1.4.1 (2010-07)  
EN 302 217-4-2 (2010-01)  
EN 301 489-04 v1.4.1 (2009-05)  
EN 60950-1:2006+A1:2010

**To which this declaration relates is in conformity with the provisions of the following Directives:**

**Directive R&TTE 1999/5/EC on Radio Equipment and Telecommunications Terminal Equipment**

The CE Mark shall be affixed on the product as evidence of compliance to this declaration.

Declaration by:

Heinz Willebrand  
Name

CEO & President  
Title



Signature

2011-11-02



## 1. AireBeam G80 System Components

The LightPointe AireBeam G80 systems come complete and ready for installation. The following components are included with your system:

- **Two radio transmission units**
- **Two antennas (either 12" or 24") attached to the radio housings**
- **Two Pan and Tilt assemblies** (standard option)
- **Two Universal Mounting Kits** (standard option)
- **Bolts and wrenches for installation and alignment**
- **Two Power over Ethernet modules**
- **Two RSSI Alignment cables for use with voltmeter**
- **AireManager management firmware pre-installed**
- **An RJ11 to RS232C DB-9 serial converter kit**

### 1.1. Transmission Unit – Housing and Antenna

The radio transmission unit is contained within an aluminum-based IP 66 rated outdoor housing to protect the electronics from rain, dust and other environmental conditions. The transmission equipment operates in full-duplex mode and consequently in slightly different frequency bands. The serial numbers displayed on the rear of the radio units are nearly, but not exactly, the same. The serial number of the **lower band unit** begins with "**S051...**", and the serial number of the **upper band unit** begins with "**S052...**".<sup>1</sup>

The rear of the housing can be opened to gain access to the fiber optic network transceiver, the RJ45 Ethernet data interface, the RJ45 interface for power and management, and the RJ11 interface for direct serial connection (not networked). See chapter 4. *Ports, Connections and System Alignment* for more detailed information.

### 1.2. Antenna



**Figure 1-1: AireBeam G80 MX (left) and LX (right) transmission units**

<sup>1</sup> When installing a licensed G80 GHz radio it is important to ensure that the individual radio units are installed according to the correct frequency allocation assigned at the specific deployment location.

Depending on the system ordered, either a high performance high gain 12" (MX Series) or 24" (LX Series) antenna is attached to the transmission unit. Fig. 1-1 shows the AireBeam G80 system with a 10" antenna and again with an 18" antenna attached to the radio housing. Both antennas are fully weatherproofed.

### 1.3. Mounting Styles

Several mounting options are available for the AireBeam G80 systems. The standard option includes Pedestal Style mounting directly atop the LightPointe Pan and Tilt and Universal Mount. For installations where a pole already exists LightPointe's Side Mount assembly is available. Both options are designed to provide no hassle installation and alignment of the AireBeam G80 system. Alternatively, if the Side Mount option is preferred but no pole exists, the Side Mount assembly is perfectly compatible with the LightPointe Universal Mount. Figure 1-2 displays both the Pedestal and Side Mount styles.



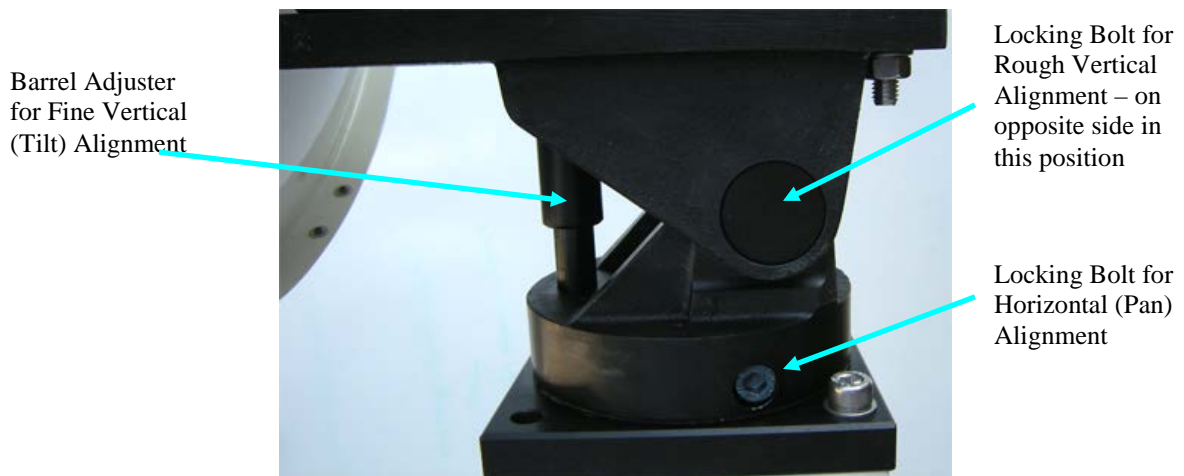
**Figure 1-2: Side pole Mount with LX antenna(left) and Mx antenna (right)**

It is important to choose the desired mounting style before ordering the AireBeam G80 system. This is because the radio housing must include an attached adapter plate when used with the standard pedestal style mounting option. This adapter plate can only be installed by LightPointe as it involves removal of the AireBeam G80 modulation unit and circuit board. Figure 1-3 displays the Pedestal Style with adapter plate.



**Figure 1-3: Adapter Plate** *Standard Pedestal Style Option with Pan and Tilt*

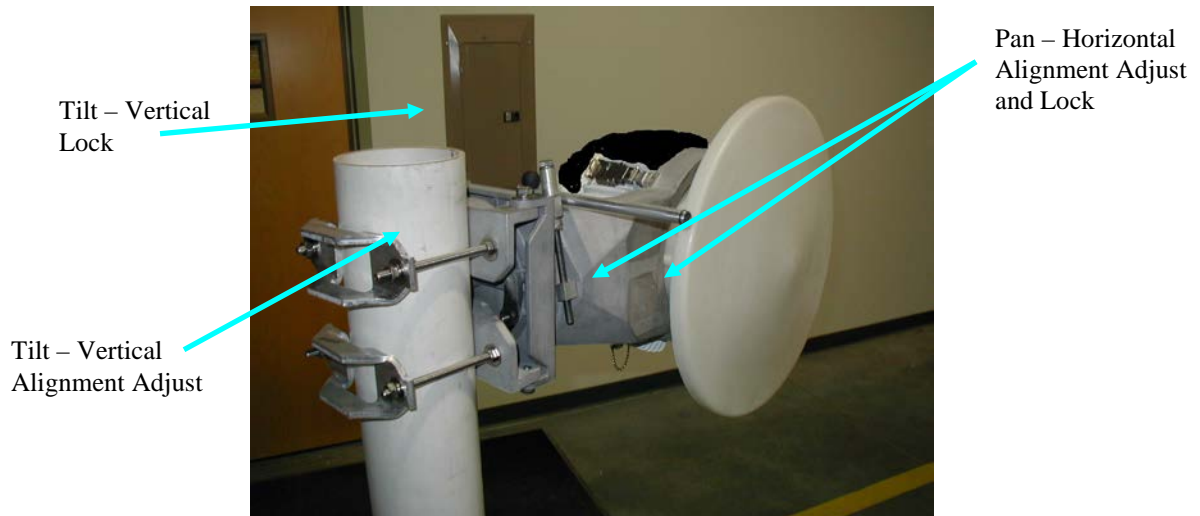
Due to the very narrow nature of millimeter wave radio beams a solid mounting design is essential in successfully deploying the system. Figure 1-4 displays the Pan and Tilt used in the alignment process of a Pedestal Style installation. To align the antenna vertically or horizontally one must loosen the alignment bolts (see arrows in Fig. 1-4). Because the antenna may tip over during the alignment procedure, a counter balance barrel adjuster is included.



**Figure 1-4: Pan and Tilt assembly showing alignment adjust**

### 1.3.1. Pole Side Mount Option

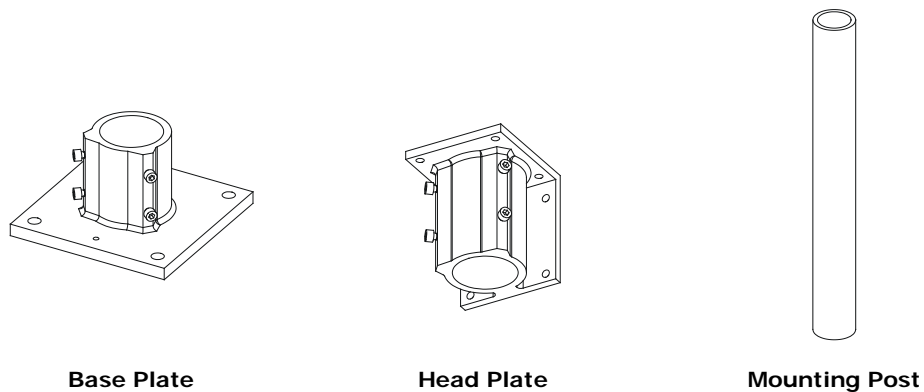
Figure 1-5 displays the optional Side Mount assembly. The clamp can accommodate either round or rectangular poles up to 4.3" (110 mm) in diameter. Before aligning the antenna it is important to unlock and slightly loosen the alignment bolts marked in Fig. 1-5 to easily move the antenna in vertical and horizontal directions.



**Figure 1-5: Side Mount assembly showing alignment adjust**

## 1.4. Universal Mounting Kit

The LightPointe Universal Mounting Kit is standard for Pedestal Style mount installation, in combination with LightPointe Pan and Tilts. The mounting kit can also be used as a pole mount for the Side Mount style option if desired. The components are shown Fig. 1-6, and include all bolts and necessary for assembly.



**Figure 1-6: Universal Mounting Kit components (bolts and wrench not shown)**

The Mounting Kit consists of four parts

- Base Plate
- 24" Mounting Post
- Head Plate (mounting platform for Pan and Tilt)
- 8mm Bolts and 6mm Allen Wrench

## 1.5. Power over Ethernet (PoE) Modules

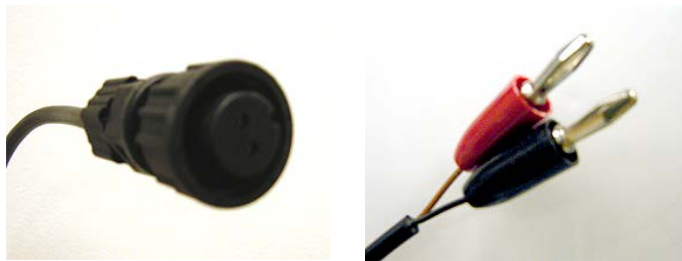
The AireBeam G80 system ships with two Power over Ethernet (PoE) modules (shown in Fig. 1-7) for powering the transmission units. The power provided to the AireBeam G80 unit travels over a separate cat5e or cat6 cable as the network data but shares a cable with the out-of-band management. The PoE modules accept universal input (90-264 vac) and provide 48v to the AireBeam G80 units. The port labeled Output on the PoE should be connected to the port labeled PoE/Management on the AireBeam G80 unit. The port labeled Input on the PoE can be connected to your management network or VLAN for monitoring of the AireBeam G80 system.



*Figure 1-7: Power over Ethernet modules supplied with all AireBeam G80 systems*

## 1.6. RSSI Alignment Cables

While the receive power LED on the AireBeam G80 indicator panel can be used to align the units, this is traditionally performed with a test receiver. For your convenience the AireBeam G80 comes pre-wired for this connection. Two cables, one for each AireBeam G80 transmission unit, are provided with the system to connect the AireBeam G80 housing to your test receiver.

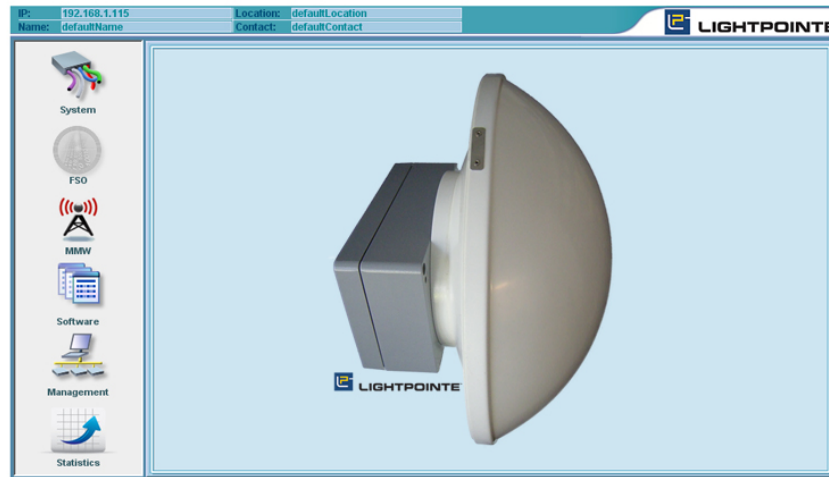


*Figure 1-8: RSSI alignment cables included with AireBeam G80 systems*

The cables are terminated on one side with a 2-pin female connector for attachment to the underside of the pre-wired AireBeam G80 housing and on the other side with banana plug connectors for attachment to your test receiver (see Fig. 1-8).

## 1.7. AireManager™ Management Software for AireBeam G80

The AireManager™ is a Java-based monitoring program, accessed from a web-browser, for status and performance monitoring of the system. It reports parameters such as receive power levels, internal temperature, or network connection status.



**Figure 1-9: AireManager management console**

For detailed information on how to access and run the monitoring program refer to the AireManager™ for AireBeam G80 User's Guide.



Note: The AireManager user passwords, and unit IP addresses, should be configured using direct serial port connection and a terminal program running on a PC or laptop BEFORE the units are installed at their permanent locations and connected to the network. User password edits can only be made from the serial interface. Refer to the AireManager™ for AireBeam G80 User's Guide.

## 1.8. RJ11 to DB-9 Serial Conversion Kit

An RJ11 to DB-9 serial conversion kit is included with each AireBeam G80 system. The kit consists of one RJ11 to DB-9 adapter and one, six foot RJ11 cable (see Fig. 1-10). The RJ11 cable connects directly to the AireBeam G80 serial port and the DB-9 is meant to connect to your laptop or notebook. Another adapter may be necessary for laptops that do not include a DB-9 serial port (eg. a USB to serial adapter). A terminal application, such as HyperTerminal, is used on the laptop for connecting over the proper COM port.



**Figure 1-10: RJ11 Cable and DB-9 Adapter**



Note: The AireManager user passwords for Administrator, Guest and Technician access can only be set using the serial connection on the AireBeam G80. It is recommended that the passwords and the IP addresses, used for management, be set using direct serial COM port access BEFORE installing the units. Please refer to the AireManager™ for AireBeam G80 User's Guide for instructions.





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## 2. Surveying the Installation Site

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Chapter 2 educates the user on millimeter wave transmission technology and the site survey/review process used in successful deployment of LightPointe AireBeam G80 systems. Please read this chapter before installing the system.

### 2.1. Tools

Please ensure that the following measures have been taken and that tools are available for surveying the installation site.

- Have permission of building owner to install the system
- Ensure that the installation meets any local requirements
- Use an accurately scaled map for locating sites and doing rough distance calculations
- Laser range finder or GPS for accurate distance measurement (optional)
- Binoculars to assist in locating opposite-end installation site
- Sketch or notepad to make rough drawings and notes
- Tape measure to determine approximate distance of fiber, power runs, etc.
- Camera to take pictures of the installation sites (optional)

### 2.2. Installation Site Review

When performing a site review certain measures must be taken to ensure the successful deployment of a millimeter wave transmission system.

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

- Data rate: 100 Mbps or 1250 Mbps?
- Measure point-to-point distance using a map, a laser range finder or GPS coordinates
- Refer to the ITU rain zone chart and locate the ITU rain zone where the system will be installed
- Is a multimode fiber or a copper connection required?

**Determine line-of-sight**

- Ensure that the antenna has sufficient path clearance. The **Fresnel Zone** is the area around the visual line-of-sight that radio waves spread out into after they leave the antenna (see Figure 2-1). To maintain good signal strength is important to maintain sufficient path clearance. Typically, a 20% **Fresnel Zone** blockage introduces little signal. However, nearing 40% blockage the signal loss will become significant.
- The Fresnel Zone formula shown below is based on a *flat earth*. In other words, it does not take the curvature of the earth into consideration. The effect of this is to

budge the earth in the middle of the link. However, for relatively short distances, the effect of the earth's curvature and the specific topography of the terrain are negligible.

- Table 2-1 shows the calculated minimum path clearance required for operation of a pt-to-pt millimeter wave operating in the 80 GHz band based on the Fresnel Zone formula shown below.

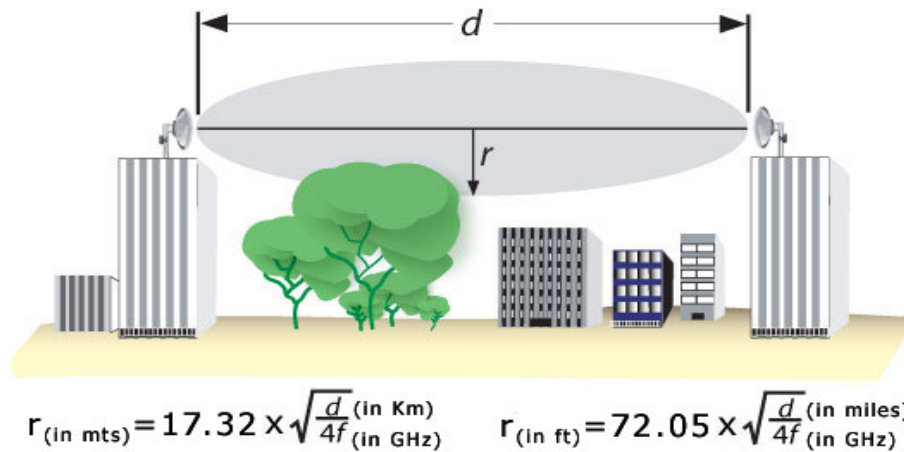


Figure 2-1: Fresnel Zone illustration.

Path length in meters	Path clearance radius r in meters
500	0.68
1000	0.96
2000	1.36
5000	2.16
10000	3.06

Table 2-1 Fresnel zone path clearance

- Can emissions, blowing or swaying trees, or other obstacles in the line of sight interrupt the connection?
- Is there a possibility of work activity or people passing in front of the transmission that could interfere with the clear line of sight?

#### Evaluate environmental mounting conditions.

- Only mount the radio transmission equipment to a stable and vibration-free mounting platform – this is a critical factor to successful performance.
- Evaluate that the foundation at the mounting location is not susceptible to change due to humidity or temperature (avoid wooden mounting platforms)

- Because the transmission equipment operates at 48VDC over Ethernet it does not require grounding to prevent personal injury when touching a wire. However, for general safety reasons we recommend that the system be grounded by connecting the installation mast (pole) to a ground source. If you have the need for a lightning protection system, contact your Certified Reseller or Installer.

### **Evaluate mounting locations for human access**

- Safe access to the radio transmission unit
- Stable location/platform to stand upon
- Safety considerations for installers and maintainers of the system in all weather conditions

### **Evaluate mounting locations to avoid interruptions of transmission**

- Near roof edge to avoid people walking in front of the transmission unit
- Non-penetrating roof mount and at least 7 foot high to avoid people walking in front of the transmission unit
- At the side or corner of a building wall without people being able to walk in front of the transmission unit
- Weather-protected location if possible
- Safe location that will not be subject to damage from vandals

### **Evaluate mount stability**

- Solid concrete or steel structural building member
- Directly on a flat roof surface if using a non-penetrating mount
- Securely fastened to the side or top of parapet wall

## **2.3. Link Distance**

Measurement of the link distance is important in estimating the link availability and calculating the expected Receive Signal Level (RSL). When using a Global Positioning System (GPS) device this measurement can be performed using the Latitude and Longitude coordinate readings from the proposed locations of the antennas. When a GPS device is not available, online tools like Google Earth are also very helpful to determine the link distance. However, GPS reading will be required in order to comply with the FCC registration process.

To avoid receiver saturation the minimum deployment distances for the AireBeam G80-Mx and AireBeam G80-LX are 100 meters (about 330 feet) and 500 meters (about 1600 feet), respectively.

To estimate maximum distances and availabilities for a given product and region please use the LightPointe Fade Margin/Availability calculator.

## 2.4. Antenna Location

For proper operation and easy maintenance the optimum location for the antennas must be determined. The ideal location should provide for ease of erecting and mounting the antenna, as well as providing unimpeded LOS to the remote location. The following factors should be taken into account:

- Type of mounting—fixed installation or non-penetrating roof pole mounting
- Access location of fiber/RJ-45 cables and power wiring of the building
- Length of cable runs
- Earth Grounding connection points
- Potential obstructions (also temporary), including allowances for tree growth
- Accessibility of the radio mounting location
- Accessibility of the site during and after working hours

## 2.5. Atmospheric and Rain Attenuation of Millimeter Wave Beams

Millimeter wave systems operating in the 60/70/80 GHz frequency ranges are able to transmit and receive high data rates such as 1250 Mbps (Gigabit Ethernet) over distances exceeding several kilometers. The actual distance/availability performance of a specific system depends on parameters such as transmission power, antenna size, and receiver sensitivity. In general terms millimeter wave frequencies are attenuated by rain and additionally by oxygen absorption in the case of systems operating in the 60 GHz frequency range. Oxygen absorption plays a minor role in the higher 70/80/90 GHz frequency ranges and therefore these systems are typically better suited in establishing a connection over longer distances. Millimeter wave transmission does not suffer from attenuation in fog or during sand storms. Figure 2-2 shows the typical atmospheric attenuation of signals in different frequency bands.

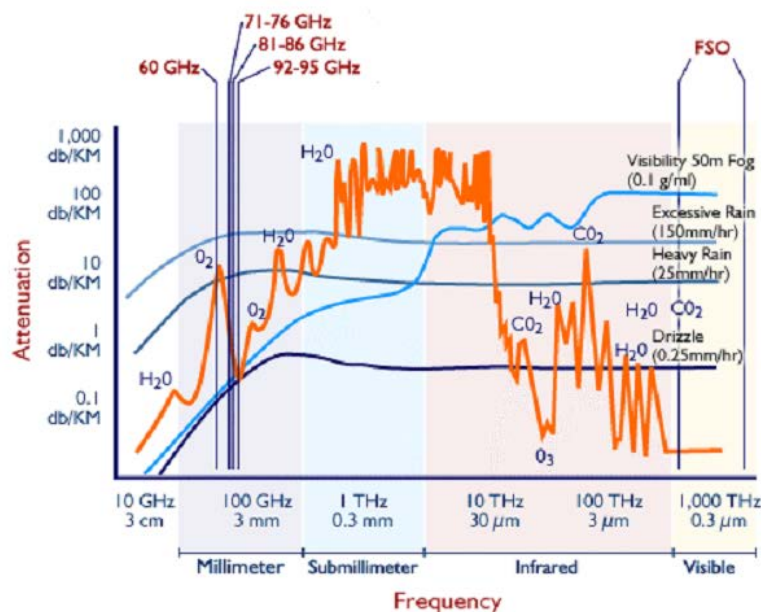
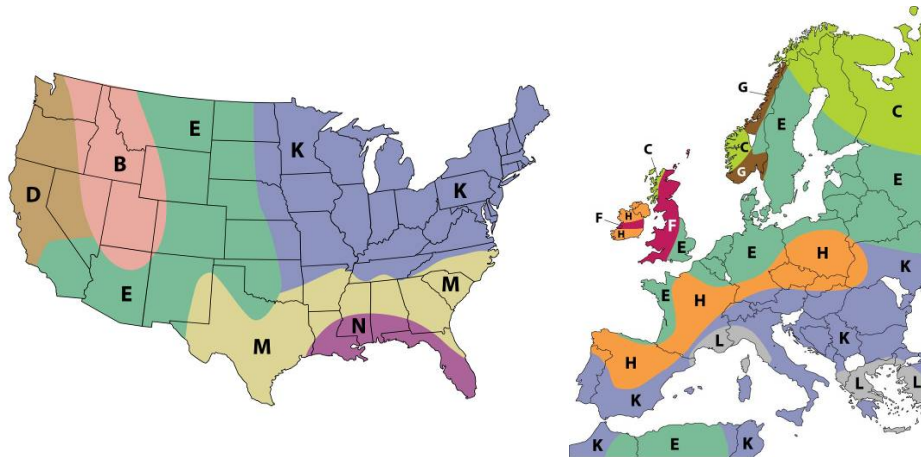


Figure 2-2: Atmospheric attenuation of signals at different frequencies.

Rain attenuation of millimeter wave signals has been studied extensively over several decades and models are available to reliably predict the availability of a millimeter wave transmission system in various rain zones around the world. Based on the actual rain rates collected in specific regions, the International Telecommunications Union (ITU) has published charts dividing the globe into separate rainfall regions. Similar charts with slightly different geographical breakdowns exist, based on the work of the researcher Crane. Both charts can be used to predict availability performance of millimeter wave transmission systems. Figure 2-3 shows the ITU chart of different rain rate regions of the United States and Europe. The regions are divided by using an alphanumeric notation with region A having the least and region N having the highest rain fall rates. The same rain charts exist for other regions of the world. Please, contact LightPointe for more information about a specific region outside of the United States or Europe.



**Figure 2-3: North American and European ITU rain zone chart**

Using the ITU or Crane rain zone charts one can calculate the availability of a millimeter wave transmission system in a specific rain zone. When it comes to rain attenuation it is important to keep in mind that the rain fall rate and not the total amount of yearly rainfall determines the availability of a millimeter wave radio system. For example, it is well known that the number of rainy days in the North Western region of the United States and in cities like Seattle greatly exceeds the number of rainy days in the South Eastern areas like Florida. However, when looking at Table 2-2, representing the actual duration of peak rain fall rates in mm/hour in different rain zones, one finds that the rain fall rate (or rain intensity) in the North Western region of the United States is far less when compared to the rain fall rate in the south. Consequently, and using the same system availability figure, a millimeter wave system installed in the North West (rain zone D) can operate over a longer distance compared to a system installed in Florida (rain zone N), for example.

Outage/Year			ITU-R Rain Regions. (Rainfall rates in mm/hr)														
Percent (%)	Time	Availability (%)	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
0.001	5 Min	99.999	22	32	42	42	70	78	65	83	55	100	150	120	180	250	170
0.003	11 Min		14	21	26	28	41	54	45	55	45	70	105	95	140	200	142
0.01	1 Hr	99.99	8	12	15	18	22	28	30	32	35	42	60	65	95	145	115
0.03	1.8 Hr		5	6	9	13	12	15	20	18	28	23	33	40	65	105	96
0.1	9 Hr	99.9	2	3	5	8	6	8	12	10	20	12	15	22	35	65	75
0.3	18 Hr		0.8	2	2.8	4.5	2.4	4.5	7	4	13	4.2	7	11	15	34	48
1	88 Hr	99	<0.1	0.5	0.7	2.1	0.6	1.7	3	2	8	1.5	2	4	5	12	24

Table 2-2: Peak rain rates vs. Duration in different ITU rain zones

LightPointe can provide availability vs. distance charts for LightPointe products operating in different rain zones. Typical RSSI vs. Distance charts for the AireBeam G80-MX and AireBeam G80-LX systems is shown in Figure 2-3 below. These RSSI vs. Distance readings can slightly vary from system to system. The actual values can be slightly different due to the installation locations of the antennas and weather of course weather conditions at the time of reading. However, the RSSI readings provide a very good guideline of the expected receive signal level for the specific installation distance. Please, contact LightPointe or your Reseller to obtain the chart for your specific system.

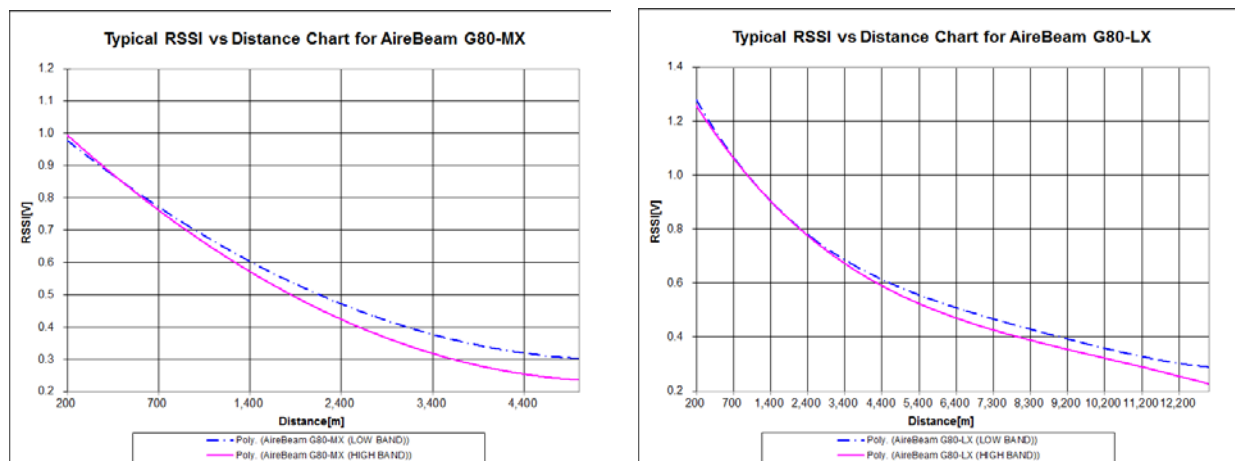


Figure 2-3: Typical AireBeam G80 RSSI vs. Distance charts



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## 3. Hardware and Cable Installation

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Chapter 3 documents the installation and alignment processes involved with successfully deploying the LightPointe AireBeam G80 system. Please read and be certain to understand the necessary steps in deploying a high availability point-to-point wireless link. Contact LightPointe customer support if any clarification is needed.

### 3.1. Tools

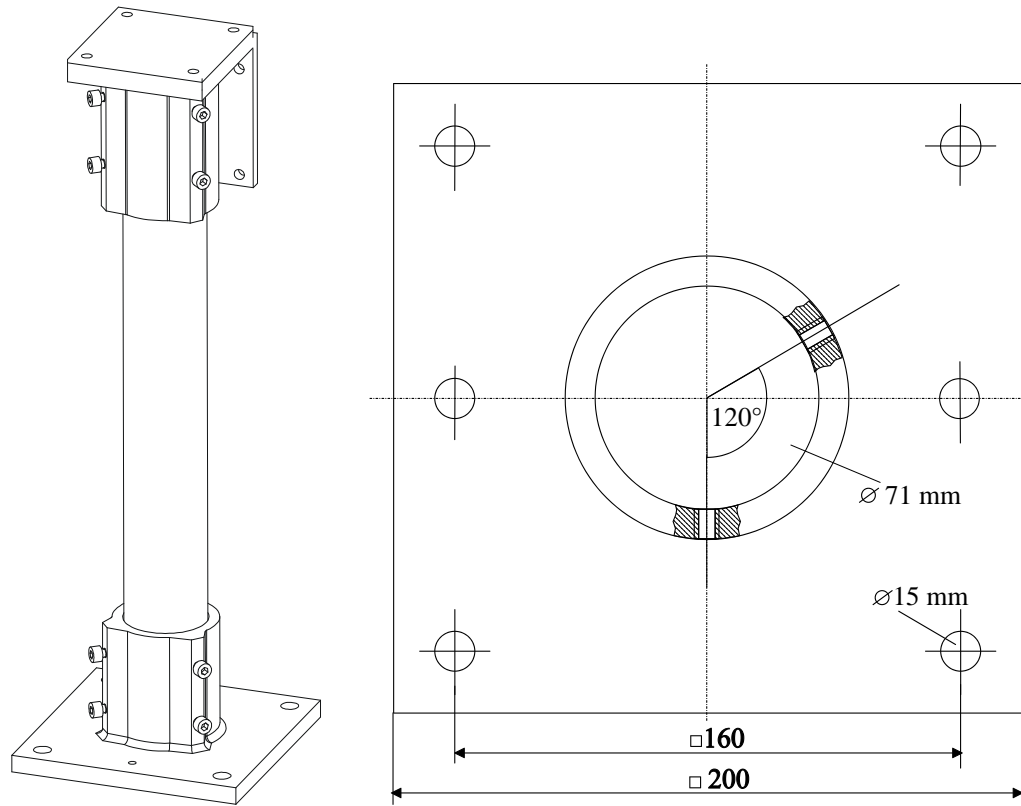
Please consider the following tools and supplies for use in installing the LightPointe AireBeam G80 system.

- Standard electro-mechanical tool kit with pliers, screwdrivers, wire cutters, wire strippers, etc.
- Two-way radio or cell phones to communicate when aligning transmission units
- Optical fiber connector cleaning kit - if using fiber to the network
- Plastic tie wraps to secure flexible conduits, etc.
- Two each 6mm hex (Allen) wrenches
- One each 17mm box wrench – \*if using Side Mount assembly
- One each 17mm open ended wrench – \*if using Side Mount assembly
- Whatever tools may be needed for securing the mount to surfaces/platforms
- Electrical tape for securing and fastening
- Optical light source and fiber power meter to ensure fiber performance from/to transmission unit
- Digital voltmeter to check electrical system connection and measure the receive signal level (RSSI)
- Step or extension ladder, in needed, 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
- Exterior rated extension cord for power tools
- At least one run of twisted pair cat5e cable for RJ45 monitoring and PoE connection
- At least one run of twisted pair cat5e cable for network connection – \*if using copper to the network
- At least two multimode (50/62.5 micron) fiber optic cables for network connection with LC type termination – \*if using fiber to the network
- Fish tape for pulling cable
- Flex conduit (3/4" or 22mm diameter)



### 3.2. Universal Mount Assembly and Installation

The fully assembled mount (without the radio link head attached) and the base plate hole mounting pattern are shown in Fig. 3-1. The 200 mm square Base Mounting Plate has four 15 mm screw holes with 160 mm center separation. During installation the Base Plate must be attached to a solid support structure (concrete parapet wall, concrete or brick wall, etc.) by using suitable heavy duty 3/8" or 1/2" masonry wall anchors (e.g. sleeve anchors).

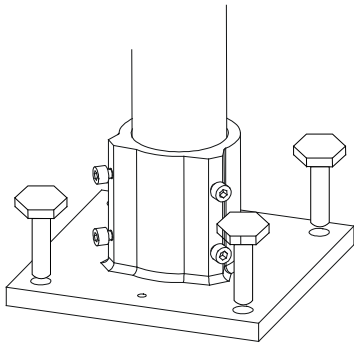


**Figure 3-1: Assembled Universal Mount and Base Plate hole pattern**

The Head Plate was designed specifically for use with LightPointe Pan and Tilts. The Pan and Tilt attaches directly to the head mounting plate, using four stainless steel bolts included with the system. However, without using the head mounting plate the pole can serve as the mounting pole for both the MX series and the LX series transmission units using the Side Mount assembly. If it is required for the specific installation, it is also possible to replace the standard 24" long pole of the Universal Mounting kit with a longer pole. However, it is **NOT** recommend that poles longer than 3 feet be used without stabilizing the mounting pole with guard wires.



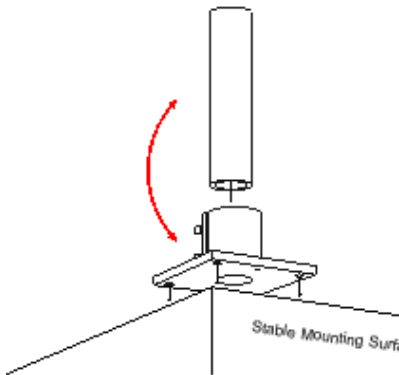
Please set the IP, Subnet Mask and Gateway information on the AireLite units before installing them at their permanent locations. Review the AireManager for AireBeam User's Guide for instructions.



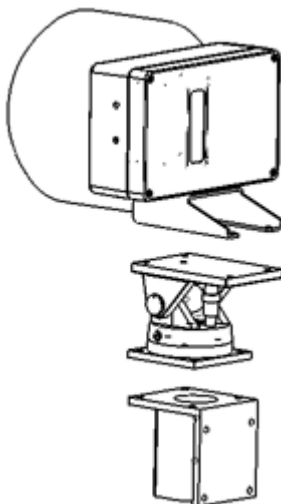
**Step 1** Install the mounting base plate to a solid platform using 12 mm (1/2") bolts.

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

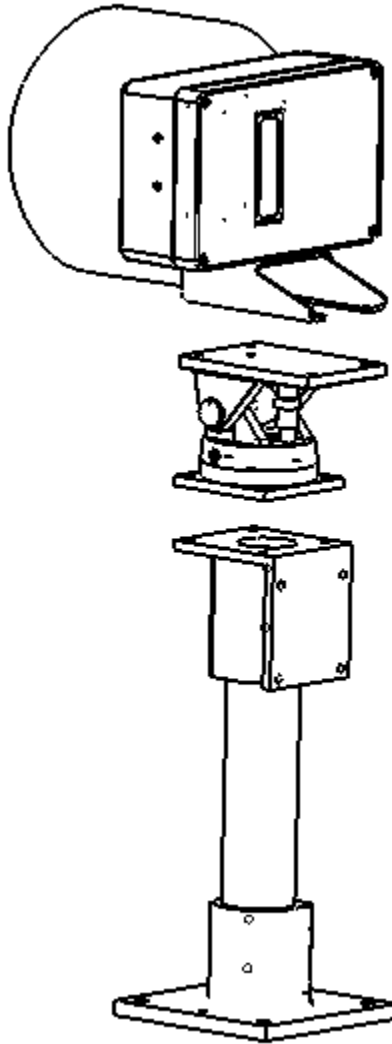
To ensure stability, keep the mounting post as short as possible. The maximum allowable mounting pole lengths are 110 cm.



**Step 2** Attach and fasten the mounting post assembly to the base plate using the supplied fastening 8mm screws with 6mm Allen heads. Do not over tighten the mounting screws.



**Step 3** Attach the Pan and Tilt assembly to the Head Plate using the 8mm screws with 6mm Allen heads and nuts supplied by LightPointe. Fasten the head plate to the mounting post, again using the 8mm screws with 6mm Allen heads supplied by LightPointe. Attach the radio housing adapter bracket to the Pan and Tilt assembly using the same screws and nuts supplied by LightPointe.



*Figure 3-2: Completed Pedestal Style Mounting assembly*

### 3.3. Radio Housing and Antenna Installation

While it is possible for one person to perform all installation and alignment procedures it is strongly recommended that two people perform the installation to maximize safety and alignment. The alignment procedure is the most critical task in ensuring a high availability connection.

The Universal Mounting Kit and Pan and Tilt hardware are included with the shipment of the AireBeam G80-MX and the AireBeam G80-LX systems. Optionally, the systems can be ordered with Side Mount assemblies for attaching to existing pole mounts. The Side Mount assembly is shown in Fig. 1-2 and 1-5.

In general any standard pole between the diameters of 50 and 110mm can be used as a mounting pole for the AireBeam system when used with the optional Side Mount assemblies. Consult LightPointe and/or the Certified Resellers and Installers for additional information on pedestal, wall mount or tower/pole mount installations.

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**Important Note:**

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When mounting the antenna, please ensure that the radios on each side operate in the same polarization. In other words, the physical orientation of the radio must be the same on both sides. There is an arrow symbol imprinted on the back of the antenna cover that must point in the same direction, either upwards or sideways, when looking at the back of each radio. This ensures that both radio antennas operate in the same horizontal or vertical polarization plane. A transmission link that uses a different polarization on each side will not function properly.

It is also critically important that a high-band radio on one side is paired with a low band radio on the opposite side to ensure proper operation. Before installing the radio units check each radio to verify one is a high-band and the other is a low-band version. The serial number of the low-band radio should begin with "S051" and the serial number of the high-band radio with "S052". When installing a licensed 70 GHz radio transmission system, ensure that the low-band and the high-band radios are installed at each side according to the assigned and approved frequency allocation plan.

### 3.4. Cable Installation

After installing the AireBeam unit onto an appropriate mount, one can begin the process of pulling cable. The AireBeam offers the option of connecting to the network with either fiber OR twister pair, cat5e or cat6, cabling. Data Port (Port 1) includes an SFP for fiber with an LC connection and Data Port (Port 2) includes an RJ45 transceiver. Access to the AireManager software on the AireBeam is necessary to select which port is the Primary Path. Refer to the *AireManager for AireBeam User's Guide* for more information. The other data port can be used to connect to another wireless device, such as the FlightStrata G optical system, to provide redundancy over the wireless link. Both data ports should not be connected to the network as this will create a loop. Contact LightPointe Customer Support for more advanced implementations of the back up port.



## 4. Ports, Connections and System Alignment

To remove the back of the AireBeam housing, unscrew the screws located in each of the four rear corners. Fig. 4-1 shows the inside of the radio housing after the back cover has been removed. There are four separate cable interfaces, clearly notated on an aluminum panel, inside the unit. The function of these connections is described in detail in following sections.



*Figure 4-1: Inside view of the radio housing*

### 4.1. Power over Ethernet Cabling – PoE Port

1. Standard power for the AireBeam is delivered by PoE injectors included with the system. Pull at least one cat5e or cat6 cable to the PoE and Outband Mgmt Port on the AireBeam. The other end will connect to the port labeled Output on the PoE module, in your network connection room.
2. The Input port on the PoE module will connect to your network at 100Mbps for management access to the AireManager software. Note: Outband Management must be in a separate VLAN or network than data.
3. Preferably, and if possible, run the cable/s through a 3/4" (or 22 mm) flex conduit tube to match the water-tight flex conduit connector on the radio. The total length from AireBeam to the network switch should not exceed 100 meters.

### 4.2. Fiber Data Connection – Data Port (Port 1)

1. If connecting to the network over fiber: Install a duplex multi-mode fiber from the network premise equipment to the Data Port (Port 1). If possible, run the two wires through a 3/4" (22 mm) flex conduit tube to match the water-tight flex conduit connector on the radio housing. The fiber must terminate to an LC type connector in order to match Data Port (Port 1). In case the fiber already has the connector attached,

please remove the duplex clip before trying to pull the fiber through the conduit by using a fish tape. There is not sufficient room for both connectors to fit through the conduit at the same time.

2. After pulling the fiber strands through the 3/4" (22 mm) flex tube conduit ensure that the fiber extends roughly 10 inches beyond the end of the flex conduit. This will provide some strain-relief to the network receiver after connecting the conduit to the radio housing.
3. In most cases the premise network equipment will be a switch or router with a 1000Base-SX Gigabit Ethernet port (850 nm).

### 4.3. Twisted Pair Data Connection – Data Port (Port 2)

1. If connecting to the network over twisted pair cable instead of fiber: Install a cat5e or cat6 cable from the network premise equipment to the Data Port (Port 2). If possible, run the cable through a 3/4" (22 mm) flex conduit tube to match the water-tight flex conduit connector on the radio housing.
2. The other end of the twisted pair cable will connect directly to the network switch or router interface. The cable should terminate in standard RJ45 connectors and length of cable should not exceed 100 meters.
3. Ensure that the cable has at least a few inches of slack on each end to provide strain relief.

### 4.4. Management Connection – PoE and Outband Mgmt Port

1. The Outband Management for the AireBeam shares an RJ45 port, and therefore a twisted pair cable, with the power being provided to the device via PoE.
2. To enable access to the AireManager management software running on the AireBeam, the Input port of the PoE module should connect to your management VLAN or network with a cat5e or cat6 twisted pair cable at 100Mbps.
3. The length of the management and PoE cable, from the AireBeam to the switch or router, should not exceed 100 meters.

### 4.5. Serial Port

1. It is not necessary to pull cable for the serial port as nearly all management functions can be performed over the AireManager Java web-console, SNMP, or telnet access via the PoE and Outbound Mgmt port. Refer to the AireManager for AireBeam Users' Guide for detailed connection information.

## 4.6. Connecting Cables

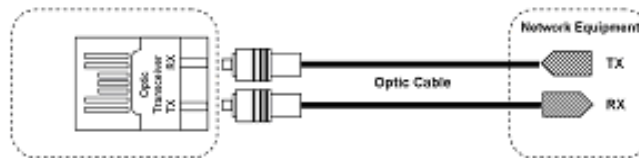
At this point during the installation process the radio transmission unit should be installed at both mounting locations. The following wires/cables should be pulled:

1. At least two fiber optic multimode strands with LC-type fiber termination OR a cat5e/cat6 cable to connect to the networking premise equipment. You may wish to pull multiple cables for redundancy.
2. A separate cat5e/cat6 cable for Power over Ethernet and Outband Management.

All cables should run within a  $\frac{3}{4}$ " flexible conduit and as the next installation step, the conduit should be connected to the fitting located on the underside of the radio housing. Conduit with an inner rubber-like coating is preferred for making a water-tight connection.

### 4.6.1. Network Connection

When using fiber to connect to the network, plug the TX and RX fibers into the Data Port (Port 1) of the radio unit, cross over, and connect to the network switch or router. Cables must be connected in "crossover" mode, meaning RX→TX and TX→RX. This is shown in Fig. 4-2.



**Figure 4-2: Fiber cable connection**

<b>Note:</b>	When the radio is powered ON and the fiber cable is correctly connected to the network premise equipment, the Link Status LED above the Data Port (Port 1) is ON (GREEN).
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When using a cat5e or cat6 twisted pair cable to the Data Port (Port 2), crossover is not necessary.

<b>Note:</b>	When the radio is powered ON and the cat5e/cat6 cable is correctly connected to the network premise equipment, the Link Status LED above the Data Port (Port 2) is ON (GREEN).
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### 4.6.2. RSSI Level Alignment Connector

The RSSI Alignment Cables, included with the AireBeam system and shown in Fig. 1-8, attach directly to the 2-pin male connector on the underside of the radio housing. The banana plug ends connect directly to your test receiver, such as a digital voltmeter, for taking RSSI readings used in achieving maximum alignment of the AireBeam system.



### 4.6.3. Grounding & Lightning Protection

It is recommended to use proper grounding practices in order to:

- Reduce electromagnetic interference
- Provide surge protection
- Protect against electrical discharge

For proper grounding, please locate the source and connection points for the building-to-earth ground in the vicinity of the antenna location. We recommended connecting the radio to the building ground by connecting the building ground to the conductive pole mount hardware structure or the antenna alignment assembly. The National Electrical Code provides recommendations for the size/diameter of the grounding wire to be used for outdoor equipment installations.

LightPointe recommends connecting the PoE modules to uninterruptable power supplies to protect the cat5e/cat6 power cable, providing power to the AireBeam, from power loss and electrical surges.

## 4.7. System Alignment

After finishing the mounting, cabling and connections, the system is ready for alignment. Most of the steps involved in the alignment procedure are independent of the size of the specific antenna or mounting option used. Because the system comes with two different alignment assembly options, the corresponding adjustment bolts for vertical and horizontal alignment are found in different locations (see Fig. 1-4 and Fig. 1-5). This issue is addressed further below.

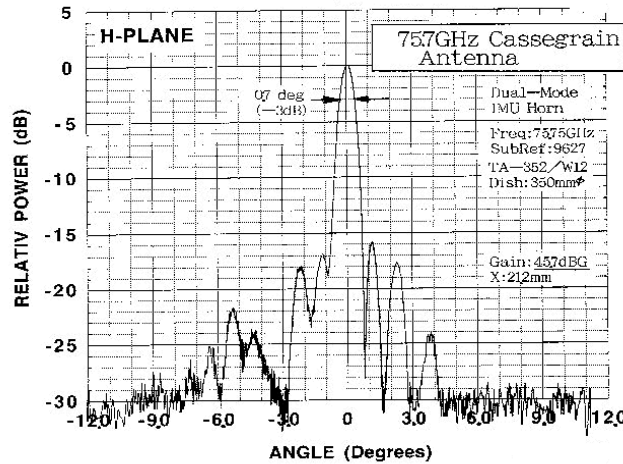
The alignment process itself will be eased if two people (one on each side) are involved in the alignment procedure. This is particularly true for the larger AireBeam G80-LX antenna due to its narrower beam pattern when compared to the smaller antenna of the AireBeam G80-MX solution. Two-way radios or cell phones are extremely helpful in exchanging information between the two parties performing the alignment. While it is possible for a single individual to align the units, walking or driving back and forth between the two mounting locations can be a cumbersome and time consuming process. The correct alignment of the system is crucial for ensuring proper performance of the system and no rush should be in play when aligning the system. Depending on the experience of the installer(s) in aligning narrow beam radio transmission equipment, this process can take anywhere from 15 to 60 minutes.

### 4.7.1. Antenna Radiation Pattern and Side Lobes

When aligning a millimeter wave radio with a narrow beam directional antenna pattern, it is important to understand that besides the “antenna main lobe” that contains most of the energy, there are also “antenna side lobes”. A “perfect” antenna would contain all energy in the main lobe but this is physically impossible. Although these side lobes contain far less energy - in the case of a good directional Cassegrain antenna the power of the 1<sup>st</sup> side lobe is typically around 20 dB lower when compared to the main lobe’s peak power - one can “see” the 1<sup>st</sup> side lobe during the alignment process. This is mainly because the main lobe and the 1<sup>st</sup> antenna side lobe are separated by an angle of just 1-2 degrees. This small value for the angular separation is actually close to the radiation angle of the main lobe itself.

**Note:**

During the alignment process it is important to find the main lobe and not to align the system on a side. To ensure that the main lobe is found, move the system about 10 degrees in horizontal and vertical direction and away from the perceived highest readout voltage. While “scanning” through the beam pattern from the left to the right (or from the top to the bottom) one can find the higher RSSI voltage readings before the signal drops significantly. These two “local” voltage maxima to the left and the right of the main lobe are the 1<sup>st</sup> side lobe.



**Figure 4-3: Millimeter wave radiation pattern of a Cassegrain antenna**

For illustrative purposes Fig. 4-3 shows the typical pattern of a millimeter wave Cassegrain antenna<sup>2</sup>. When installing a millimeter wave radio transmission system it is important to keep in mind that the antenna main lobe and the 1<sup>st</sup> antenna side lobe point in virtually the same direction. Aligning the system on a side lobe instead of aligning it on the main lobe will negatively impact performance of the system.

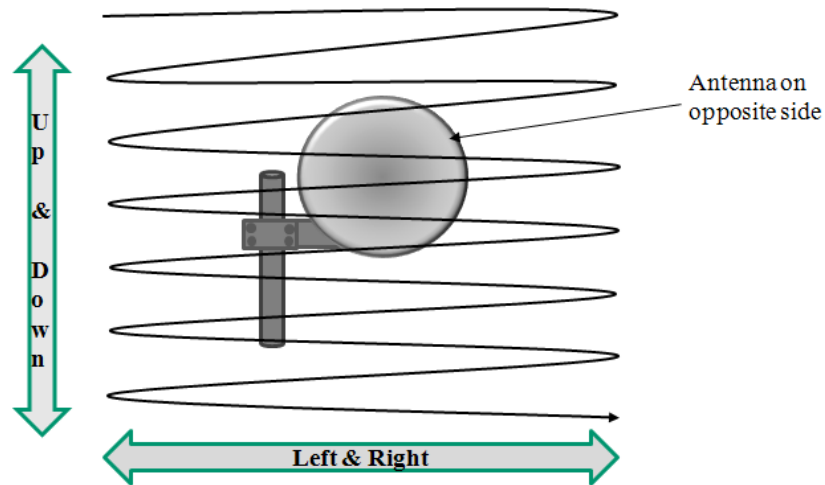
In preparation for the actual alignment process, carry out the following steps:

1. Connect the digital voltmeter to the 2-pin connector on the underside of the radio housing using the RSSI Alignment Cables included with the system. Make sure that the digital voltmeter readout can be clearly seen during the installation process (eg. Tape it to the installation pole).
2. Power-on both radios and verify that the green power-LEDs on the PC board inside the radio housings are lit.

<sup>2</sup> Although the antenna pattern shown in Figure 4-3 is the result of a real measurement it is just an example of an antenna pattern for illustrative purposes and not the actual radiation pattern of the antenna used in LightPointe products.

#### 4.7.2. Alignment

- At this point in time the antenna should be attached to the mounting pole and roughly point toward the opposite antenna location. As the next step slightly loosen the vertical and horizontal adjustment bolts. Figures 1-4 and 1-5 show the locations of the alignment adjust bolts. Do NOT completely remove the bolts but just loosen them enough so that one may easily turn the unit in the vertical and horizontal directions.
- Try to visually locate the precise side of the opposite radio link. Use binoculars in case you cannot locate the far end radio location with the naked eye.
- If you can see the far-end radio terminal, estimate the alignment visually and try to point the antenna directly at the far end radio location to the best of your ability. The Receive Signal Strength-LEDs can be used as a guide. Perform the same procedure at both sides.
- Slightly rotate each antenna left/right for best vertical alignment and up/down for best horizontal alignment by finding the maximum RSSI voltage reading. Using a meander-like scan pattern has proven to be the most efficient way to align the antennas. This is illustrated in Fig. 4-4.

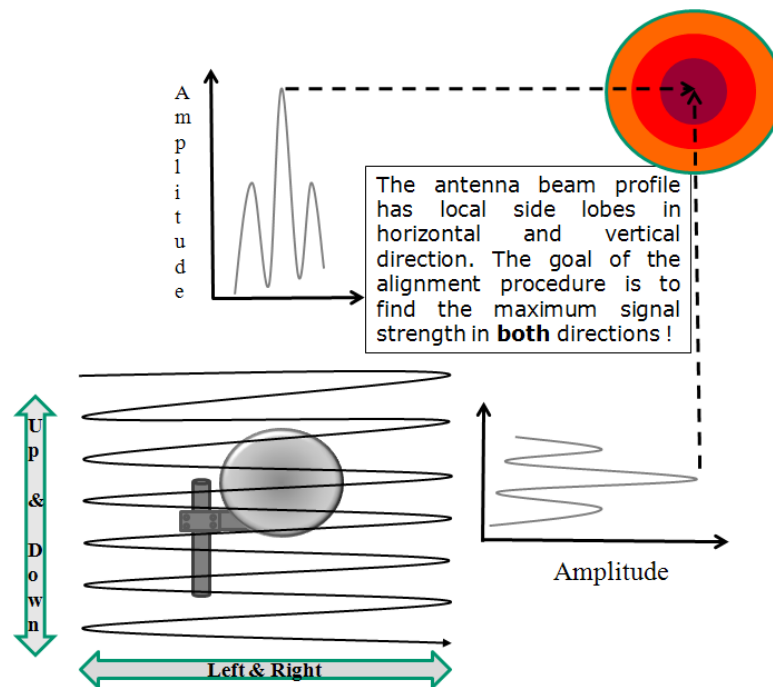


**Figure 4-4: Antenna alignment scan**

**Note:**

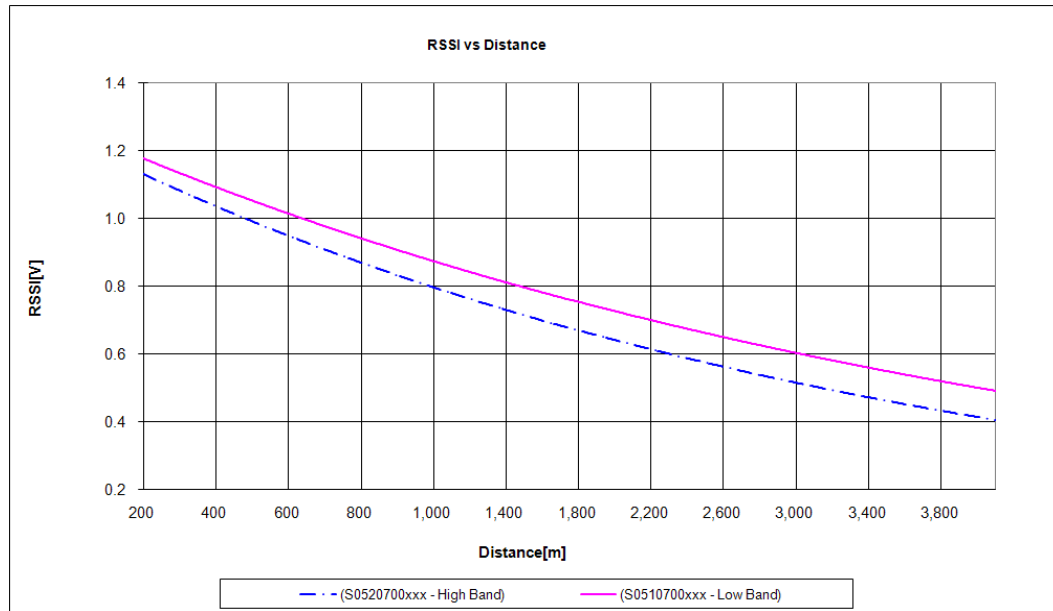
Do NOT move both radios at the same time. Try to optimize the RSSI signal level first at one side and then repeat this process at the opposite side. Communicate changes in signal levels during the adjustment process to the person at the opposite side via a two-way radio or cell phone.

- Ensure that the antennas are not aligned on a side-lobe. When rotating the antenna a few degrees to each side of the perceived alignment center, both side-lobes can be detected as “local RSSI voltage minima”. The main lobe which is located right in the middle between the two side lobes will have a much higher voltage reading. Fig. 4-5 shows a simple illustration of the alignment process and the location of the antenna side lobes in relation to the main lobe.



**Figure 4-5: Simple illustration of the alignment process**

- When aligning the system it is important to take a look at the Receive Signal Strength Indicator (RSSI) shown in Fig. 4-6. The RSSI chart shows the RSSI signal voltage as a function of the deployment distance in clear weather conditions. The RSSI values are different for the low band and the high band radio. These values vary slightly and within a few percent from one radio system to another due to manufacturing tolerances. However, the chart provides a very good indication of expected RSSI values as a function of deployment distance. The overall goal of the alignment process is to align the system as close as possible to the RSSI value provided in the chart.



**Figure 4-6: Typical AireBeam™ G80-MX RSSI vs. distance chart**

- After maximizing the RSSI signal levels on both sides, tighten the screws of the Pan and Tilt or Side Mount assembly and secure the back cover of the radio housing.

***The installation and alignment procedures are now completed and the system is ready for use!***



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## 5. Troubleshooting and Diagnostics

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This chapter provides helpful tips on troubleshooting the equipment and covers the following topics:

- Types of Failure

- Fault isolation troubleshooting charts

- Additional troubleshooting methods

To some extent the radio units can be considered to be a layer 1 pipe that moves data from point A to point B. Since no processing of the data occurs inside the radio the analogy of using a fiber instead of a wireless radio system is valid. If the radio units are correctly aligned and data is transmitted, 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

- System failure of one of the radio units

The use of the AireManager program is highly recommended during the troubleshooting process. Although the AireManager is not needed to transmit information through the system, the program is an essential component in monitoring and managing the AireBeam G80 system. Please refer to the *AireManager for AireBeam User's Guide*.

### 5.2. Troubleshooting Charts

The following troubleshooting charts are meant to guide the user through some simple failure analysis procedures. Following these procedures will greatly help to ease the troubleshooting process and many problems can be solved on short notice by the user of the equipment and consequently minimize the downtime of the system in case of a malfunction. Please consult the *AireManager for AireBeam User's Guide* and use the following charts to locate the problem before contacting LightPointe or your reseller.

**Observation:** Network connection cannot be established with the opposite radio. Received power is “low” or signal status is “off”

Problem	Cause	Action
Power Source	The equipment power supply at the opposite side is switched off.	Turn power supply on. Check that the green LED inside the radio unit is turned on.
	Broken power supply	Replace power supply. Call LightPointe or reseller in case the power supply was part of the shipment.
System Setup	System is misaligned.	Realign system. See chapter 3.6 in this manual.
	Dirt or dust in the antenna	Clean the antenna.
	Distance between locations exceeds specific system specification.	System can still be used but availability will be lower.
	Antenna is mounted incorrectly and the polarization is crossed.	Re-install the antenna and ensure that both antennas transmit at the same polarization. See chapter 4.7 in this manual.
Environment	High signal attenuation due to heavy rain	Wait until the rain stops and observe if this resolves the problem.
	Antenna covered with snow.	Remove snow from antenna.

**Table 5-1: Troubleshooting Chart I**



**Observation:** 'Optic Status' reports "OFF", OSD LED is off

Problem	Cause	Action
Optic Cables or Transceiver	TX and RX terminal connection error	Check fiber cables and ensure that transceivers are connected correctly. See Figure 3-5
	Optical transceiver standards do not match	ONLY 1000Base-SX (850nm) multimode transceivers
	Dirt or dust or breakage of optical fiber	Clean fiber output or replace the cable with a new one.
	Broken transceiver at the network premise equipment side	Replace transceiver
	Broken transceiver at the radio side	Replace radio. Call LightPointe or reseller.
Premise Equipment Connection	The network premise equipment at the opposite side is turned off	Power on premise equipment
	Network port of premise equipment is de-activated	Activate network port

**Table 5-2: Troubleshooting Chart II**

## 5.3. Advanced Troubleshooting Methods

### 5.3.1. Performing a PING test

A ping test is not a particularly sophisticated networking test but it does provide the user with an easy method to check the connectivity of IP based network equipment. When performing a ping test between two laptops and without other network equipment in the circuit, the ping test provides valuable information about the performance of the radio transmission link itself. Other tests may involve additional network equipment and therefore complicate the issue, making it difficult to find the root cause of a potential problem. The following equipment and software are needed to perform a ping test:

- ❑ Two laptops or PCs with Ethernet cards
- ❑ Two Ethernet cables with RJ45 connectors

If performing the test over fiber:

- ❑ Two media converters
  - Multimode 1000Base-SX (850 nm) SC or LC connection. In case of using an older laptop that does not have a 1250 Mbps RJ45 (Gigabit Ethernet) connection, a 100/1000 switched media converter will be required.
- ❑ Four simplex (or two duplex) optical fiber patch cords with correct termination. The radio transceiver has a LC type connector and the other termination will depend on the termination of the media converter.

### 5.3.2. Equipment connection and network settings

To perform a ping test directly connect the two laptops/PCs to the radio link heads using either Cat5e cables or additionally with a media converter on each side, if connecting via fiber. It is important to know which port of the radio unit is Primary. Refer to the *AireManager for AireBeam User's Guide* for more information. Ensure that the radio units are aligned and that all status indicators show that the system is physically connected by following the instructions in chapter 4.

**Note:**

This ping test is based on using two computers. It is possible to do a ping test with just one laptop if the remote radio side is connected to the network and equipment (switch/router) with a known IP is available at the remote side. However, by doing so it might be difficult to isolate a potential networking problem and draw a definitive conclusion.

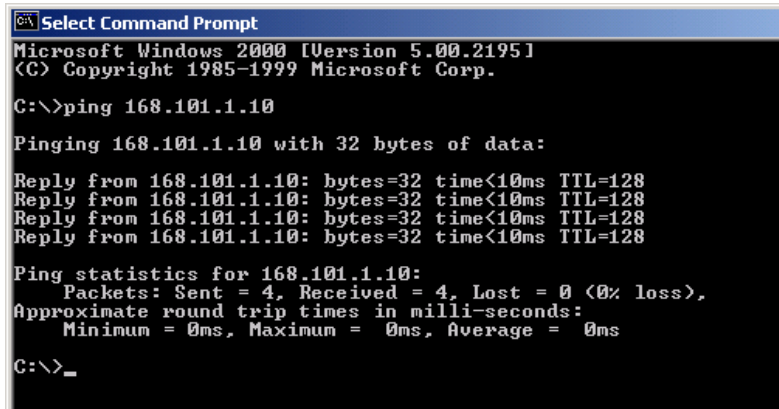
### 5.3.3. Step-By Step instructions to perform a ping test

- Step 1** Locate the required equipment listed above.
- Step 2** On each side, attach two optical fiber cables to the TX/RX ports of the network transceiver inside the radio unit enclosures (see Figure 3-3 and Figure 3-4) Connect the opposite ends of the fiber cables to the TX/RX ports of the media converters.
- Step 3** Connect an Ethernet cable between the PC RJ45 network port and the media converter RJ45 port on each laptop/PC and complete the following setup instructions on each laptop. The exact procedure will depend on the actual Windows operating system installed but the procedure is basically the same for any Windows operating system.
- 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 local side should type **192.0.0.1** in the IP Address Box. The remote side should type **192.0.0.2** 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** Type the word **ping** and the different **ping** command options will be displayed.

- Step 19** To perform the ping test, the local laptop has to ping the IP address of the laptop and the other way around. From C:\> Type: **ping -t 192.0.0.2** on the local laptop. The remote side laptop can ping by typing: **ping -t 192.0.0.1**.

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

- Step 20** A successful **ping** will display the following information on the PC screen.



```
Microsoft Windows [Version 5.00.2195]
(C) Copyright 1985-1999 Microsoft Corp.

C:\>ping 168.101.1.10

Pinging 168.101.1.10 with 32 bytes of data:

Reply from 168.101.1.10: bytes=32 time<10ms TTL=128
Reply from 168.101.1.10: bytes=32 time<10ms TTL=128
Reply from 168.101.1.10: bytes=32 time<10ms TTL=128
Reply from 168.101.1.10: bytes=32 time<10ms TTL=128

Ping statistics for 168.101.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>_
```

- Step 21** Let the **ping** program run for several minutes and then type **<Ctrl> C** to stop the program. Take a look at the lost ping counter to verify that the system operates correctly. We using two laptops, no packet should be lost during the transmission.

#### 5.3.4. BER Testing

Bit Error Rate (BER) testing is the most advanced way to check on the performance of a communication link. The radio transmission link operates virtually as a layer 1 connection. The radio operates in full-duplex mode at real network throughput speed and extremely low latency of typically < 50 microseconds. Higher protocol layer performance is not determined by the radio but by the attached networking equipment. Due to the fact that the system acts virtually like a bit pipe, it is possible to physically loop back the system by connecting the RX and TX fiber at the remote location and use only one BER tester at the local radio installation side. There are several vendors in the market that provide BER testing equipment. In case you are interested in performing a BER test and do not have a BER tester, please contact LightPointe for information on test equipment companies that lease BER Testers.



## 6. Specifications

Parameter		AireBeam™ G80-MX	AireBeam™ G80-LX
Frequency of Operation		74.875/84.875GHz	
Transmission Power		+17dBm (50mW) max	
Modulation		ASK	
Supply Voltage		48VDC via Power over Ethernet	
Power Consumption		15 Watts	
Network Interface		Fiber: Hot-swappable SFP or cat5e: RJ45 100/1000	
Data Rate		1250 Mbps/ Full duplex	
Data Format		802.3z (Gigabit Ethernet)	
OSI Layer		Layers 1 & 2 per IEEE 802.3 Ethernet Specification	
Management		AireBeam™ Manager Program	
Operating Temperature		-30°C ... +70°C	
Environmental / IP Rating		IP66	
Standard Compliance		United States: FCC Part 101 (USPAB701000) CE MARK (CE1313!) TS 102 524 V1.1.1 (2006-07) EN 301 389-04 V1.3.1 (2002-08) EN 60950-1:2001 + A11:2004 UK IR 2000 ROHS	
Size (LxWxD)		180x180x100mm (enclosure w/o antenna)	
Weight (Enclosure with Antenna)		8.2 kg	11.1kg
Antenna	Type	Cassegrain	Cassegrain
	Gain	45dBi	51 dBi
	Polarization	Horizontal/Vertical	Horizontal/vertical
	HPBW	0.7°	0.5°

## 7. Technical Support

Be sure to fill out the following checklist before calling your reseller or contacting LightPointe Technical Support.

General Information	Your Installation
<input type="checkbox"/> Application (Fast Ethernet or GbE)?	
<input type="checkbox"/> Distance?	
<input type="checkbox"/> How long has system been in operation?	
<b>How does the error show up?</b>	
<input type="checkbox"/> Temporary/permanent error?	
<input type="checkbox"/> Is error observed for the first time?	
<b>How was the weather when error showed up?</b>	
<input type="checkbox"/> Light or Dark?	
<input type="checkbox"/> Weather conditions (rain, fog, snowfall)	
<input type="checkbox"/> Outside temperature	
<b>Status of LEDs (inside radio unit)</b>	
<input type="checkbox"/> Is the power LED on (green)?	Yes/No
<input type="checkbox"/> Is the OSD LED on (red)?	Yes/No
<input type="checkbox"/> Did you measure the RSSI voltage?	Yes/No If yes, what was the reading?
<b>Status in AireBeam™ Manger</b>	
<input type="checkbox"/> AireBeam™ Manger connection ok?	Yes/No
<input type="checkbox"/> Is RF receive power value displayed?	Yes/No If yes, what is the reading in dBm?
<input type="checkbox"/> Is temperature value displayed?	Yes/No If yes, what is the reading in °C?
<b>What type of system is installed?</b>	
<input type="checkbox"/> Model number	
<input type="checkbox"/> Serial number	

### Return Material Authorization (RMA) Procedure

Please contact LightPointe before returning any system or system components for repair or replacement. A RMA number is required before sending back potentially defective equipment. Please, keep in mind that sending back equipment without a RMA number can delay the repair of the equipment.

#### RMA contact information:

Phone: 858.863.0338

Email: [customersupport@LightPointe.com](mailto:customersupport@LightPointe.com)